Gale Associates, Inc.
300 Ledgewood Place, Suite 300 | Rockland, MA 02370
P 781.335.6465 F 781.335.6467
www.galeassociates.com

March 7, 2024

Town of Hamilton
Planning Board
650 Ashbury Street
Hamilton, MA 01936

Attn: Mr. Patrick Reffett, Director of Planning and Inspectional Services

Re: Hamilton-Wenham Regional High School Athletic Campus Redevelopment
Outstanding Permit Items for the Planning Board
Gale JN 718601

Dear Mr. Reffett,

On behalf of the Hamilton-Wenham Regional School District (HWRSD), Gale Associates, Inc. (Gale) is submitting this letter in response to the discussions at the February 28, 2024, planning board meeting and the Boards remaining items. Below you will find the remaining items noted in **bold** font and Gale's responses in plain text.

1. **Private wells, they should test them for baselines**

   Response: As discussed at the 2/28/24 hearing, abutters with concerns regarding private wells should contact the Board of Health regarding getting their wells tested.

2. **Nobis Geotech Report is still in draft form**

   Response: A copy of the Final Geotechnical Report is attached.

3. **Design of PA System**

   Response: At this time, HWRSD is planning to place two PA system speakers on the press box or the adjacent light poles pointed in the northerly direction since the abutters to the north are much further away than those to the south of the stadium (±1300 ft). Gale will work with the PA system supplier to angle speakers to minimize impacts to the northern abutters taking into account the trees between the stadium field and the northern abutters. Also, volume levels in the sound system will be set and will not be able to be changed. As indicated by HWRSD, PA use is currently proposed up to 8:30 pm Sunday-Thursday and 9:30 pm Friday and Saturday.

4. **Amenities Building design is still in process**

Response: Gale provided the building layout and utility connections with our last submittal which were approved by the Peer Reviewer; however, we have attached the Amenities Building Plans again for your reference.

5. **Awaiting Comments from Fire Chief**

   Response: On February 28, 2024, Lt. Wallace of the Fire Department reviewed Gale's plans and provided an email noting approval. (refer to copy attached) Also, on March 5, 2024, Gale spoke with Chief Brunet confirming their review.

6. **Tennis Court sound mitigation**

   Response: As noted in our 2/20/24 response, HWRSD plans to include acoustic sound barrier on the north and west sides of the courts.

7. **O & M Budget**

   Response: Gale has developed draft Operation and Maintenance (O&M) Budgets for the project, one for the first year and one for the yearly budget addressing the O&M items outlined in the O&M plan included in the Stormwater Management Report reviewed and approved by the Peer Reviewer. O&M Budget also includes sampling of the Miles River as noted in the Order of Conditions.

8. **Heat Testing**

   Response: On 2/27/24 HWRSD provided the Planning Board with a copy of the MIAA Heat Modification Policy which the school district follows. (refer to copy attached)

9. **Illumination plan with property lines & wetland boundary**

   Response: Attached is a copy of the updated Illumination Plan with property lines and wetland boundaries added as requested.

We hope you find our responses to the above items acceptable. Please do not hesitate to contact the undersigned, at kdh@gainc.com or (508) 259-3534, if you require additional information or clarification.

Best regards,

GALE ASSOCIATES, INC.

Kathleen D. Hervol/lad

Kathleen D. Hervol
Director of Athletics

KDH/lad

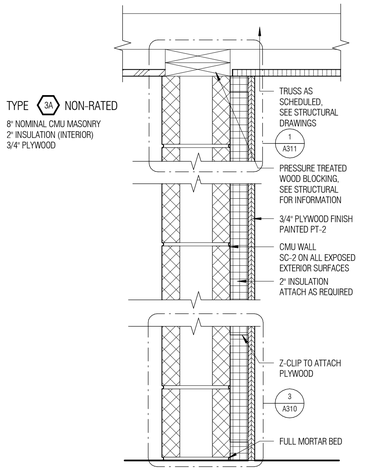
Enclosures:

- Updated Amenities Building Plan
- Fire Department Email
- O&M Budgets
- MIAA Heat Modification Policy
- Update Illumination Plan
- Geotechnical Report

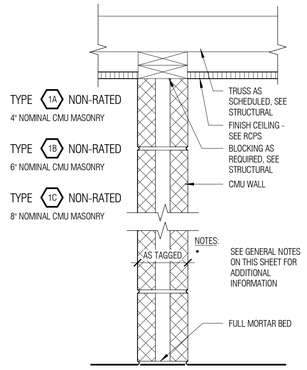
CC:

- Mr. Thomas Houston, Peer Reviewer – Professional Services Corp.
- Mr. Eric Tracy - Hamilton-Wenham Regional School District

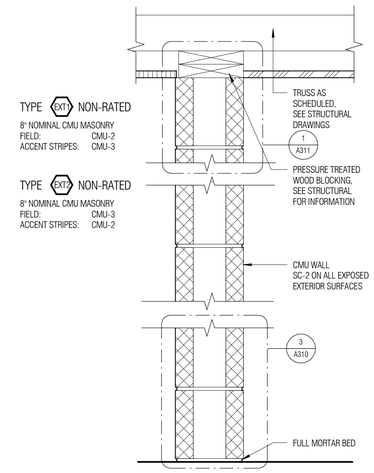
G:\718601\02 Design\permit reports\planning\Pl Bd Remaining Items-Response\Remaining Items Comments 2024 0307.docx



4 PARTITION TYPE 3
SCALE: 1 1/2" = 1'-0"



3 PARTITION TYPE 1
SCALE: 1 1/2" = 1'-0"



2 PARTITION TYPE EXT
SCALE: 1 1/2" = 1'-0"

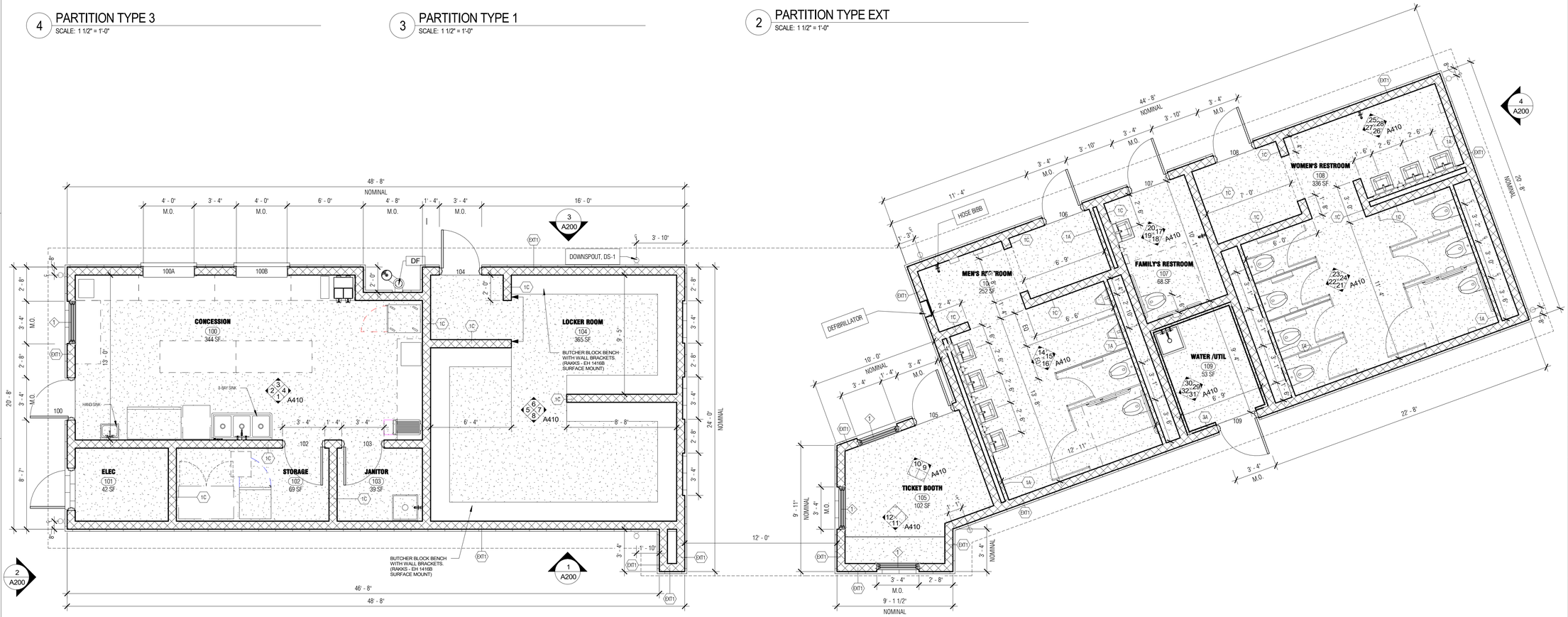
PLAN LEGEND:

NEW CMU PARTITION

NEW PARTITION

GENERAL PLAN/ROOF NOTES:

A. REFER TO PROJECT GENERAL NOTES FOR GENERAL REQUIREMENTS, WORKMANSHIP, MATERIALS, AND SHOP DRAWING REQUIREMENTS INCLUDED IN THIS CONTRACT.
B. FLOOR TO BE LEVEL, MAINTAINING A TOP SURFACE LEVEL OF 1/8 INCH SLOPE IN TEN FEET. THE CONTRACTOR SHALL PROVIDE SELF LEVELING UNDERLAYMENT WHERE REQUIRED AND INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS, SEE SPECIFICATIONS.
C. THE ARCHITECT SHALL REVIEW AND APPROVE PARTITION LAYOUT PRIOR TO PROCEEDING.
D. ALL CUTS AND PENETRATIONS SHALL BE FINISHED AND FIRESTOPPED WHERE REQUIRED. ALL FIRE RATED SYSTEMS TO BE MAINTAINED.
E. THE CONTRACTOR SHALL PROVIDE FIRE-RETARDANT TREATED WOOD BLOCKING FOR ATTACHMENT OF ALL DRAPERY TRACK, MILLWORK, EQUIPMENT, MIRRORS, WOOD BASE, ACCESSORIES, ETC., AS REQUIRED. COORDINATE QUANTITY AND LOCATION WITH ARCHITECT IF THERE IS A DISCREPANCY.
F. G.C. TO CORE AND COORDINATE ALL FLOOR PENETRATIONS FOR WATER RISERS, GAS RISERS, NETWORK CLOSET, ETC.
G. COORDINATE WITH ARCHITECT THE LOCATION OF ALL ACCESS PANELS PRIOR TO INSTALLATION
H. HINGE SIDE OF DOOR FRAME SHALL BE OFFSET FROM ADJACENT WALL 4" U.O.N.
I. SEE STRUCTURAL, MEP/FP, LIGHTING, AND ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION.
J. PATCH AND REPAIR AS REQUIRED ALL FLOOR SURFACES PRIOR TO INSTALLATION OF SCHEDULED FLOORING MATERIALS.
K. SEE SHEET A600 FOR DOOR AND HARDWARE SCHEDULE.
L. ALL WORK TO BE NEW UNLESS OTHERWISE NOTED.
M. AT NEW SHAFT PENETRATIONS MAINTAIN FIRE RATING CONSISTENT WITH BASE BUILDING.
N. SEE SHEET A600 FOR FINISH SCHEDULE.
O. METAL FRAMING TO BE ENGINEERED BY G.C. ADD KICKERS AS NECESSARY FOR WALLS TO MEET L/240 AT 5LBS PER SQ FT.
P. ALL REVEALS TO BE 1/4" ALUMINUM, UNLESS OTHERWISE NOTED.
Q. ALL WALLS TO BE PAINTED PT-2, UNLESS OTHERWISE NOTED.
R. ALL PAINTED WALLS ARE TO BE PAINTED WITH 100% ACRYLIC INTERIOR ENAMEL IN EGGSHELL FINISH.
S. ALL PAINTED DOORS AND FRAMES ARE TO BE PAINTED WITH 100% ACRYLIC INTERIOR ENAMEL IN SEMI-GLOSS FINISH.
T. ALL PAINTED SOFFITS AND CEILINGS TO BE PAINTED WITH 100% ACRYLIC INTERIOR ENAMEL IN FLAT FINISH.
U. ALL WALL COVERINGS ARE TO BE INSTALLED FROM TOP OF NEW BASE TO BOTTOM OF CEILING U.O.N.
V. ALL JOINTS AND PENETRATIONS OF FIRE RATED ASSEMBLIES TO BE SEALED WITH APPROVED U.L. LISTED "F" AND "T" SYSTEMS, SUBMIT PRODUCT DATA AND INSTALLATION INFORMATION PRIOR TO INSTALLATION FOR ARCHITECT'S APPROVAL.
W. DIMENSIONS ARE TAKEN FROM FACE OF MASONRY WALLS, COLUMN CENTERLINES, FINISH FACE OR EXISTING WALLS, AND FINISH FACE OF NEW WALLS UNLESS OTHERWISE INDICATED. NOTIFY ARCHITECT OF ANY DISCREPANCIES.
X. VERIFY ALL CRITICAL DIMENSIONS WITHIN AND/ OR RELATED TP THE EXISTING BUILDING, DIMENSIONS AND CONDITIONS INDICATED WERE DETERMINED BY VISUAL SURVEY AND/OR INFORMATION FROM EXISTING DRAWINGS.
Y. +/- DIMENSIONS IS EQUAL TO VERIFY IN FIELD
Z. PLANS ARE NOT TO BE SCALED FOR FINISH OR WALL INFORMATION.
AA. WALL BEHIND AND DIRECTLY ADJACENT TO ALL TOILET ROOM FIXTURES (LAVATORIES, TOILETS, AND URINALS) SHALL HAVE A SMOOTH, HARD NON ABSORBENT SURFACE. TOILET ROOM ACCESSORIES (GRAB BARS, TOILET PAPER DISPENSERS, ETC.) IN THESE AREAS SHALL BE INSTALLED AND SEALED TO PREVENT MOISTURE PENETRATION.



1 GROUND LEVEL FLOOR PLAN
SCALE: 1/4" = 1'-0"

GALE

Gale Associates, Inc .
Engineers and Planners

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Boston Baltimore Orlando Hartford Bedford

S3 Design, Inc.
S3 Design Architecture, Inc.
150 Wood Road, Suite 1000
Braintree, Massachusetts 02184
781.848.8804
www.s3design-inc.com

DESIGN DEVELOPMENT PROGRESS

PROJECT
ATHLETIC CAMPUS IMPROVEMENTS
HAMILTON-WENHAM REGIONAL HIGH SCHOOL
775 BAY ROAD
SOUTH HAMILTON, MA 01982

OWNER
HAMILTON-WENHAM REGIONAL SCHOOL DISTRICT
5 SCHOOL STREET
WENHAM, MA 01984

NO.	DATE	DESCRIPTION	BY

PROJECT NO.	718600
CADD FILE	
DESIGNED BY	Approver
DRAWN BY	SR
CHECKED BY	Checker
DATE	01/19/2024
DRAWING SCALE	As indicated

GRAPHIC SCALE

SHEET TITLE

GROUND FLOOR PLAN

DRAWING NO.
A101
OF

SITE UTILITY NOTES:

1. CONTRACTOR TO PROVIDE MINIMUM 5' COVER ALONG PROPOSED FORCE MAIN LINE AND WATER LINE (EXCLUDING IRRIGATION).
2. IN THE EVENT THAT 5' COVER IS NOT ACHIEVABLE, COVER MAY BE REDUCED TO BETWEEN 3'-5' FOR PIPE LENGTHS NO LONGER THAN 20'. ANY PORTIONS OF PIPE WITH REDUCED COVER MUST BE INSULATED.
3. CONTRACTOR TO PROVIDE MINIMUM 18" OF SEPARATION AT ALL UTILITY CROSSINGS.
4. REFER TO IRRIGATION NOTES ON SHEET G002.
5. UTILITY CROSSING G: PROPOSED WATER LINE TO CROSS ABOVE EXISTING DRAIN LINE (0.25' SEPARATION). EXISTING DRAIN LINE INVERT AT CROSSING = ±41.81 (TOP = ±43.98, BOTTOM = ±41.64). PROPOSED WATER LINE INVERT AT CROSSING = 44.31.

SITE UTILITY LEGEND

- W — WATER PIPE
- S — SEWER, GRAVITY
- FM — SEWER, FORCE MAIN
- IRR — IRRIGATION PIPE
- QUICK CONNECT VALVE BOX
- SEWER PUMP STATION / WET WELL
- WATER SERVICE GATE BOX

MATCHLINE - SHEET C301
MATCHLINE - SHEET C302

LOCATE AND CONNECT TO EXISTING IRRIGATION MAIN
4" PVC IRRIGATION MAIN LINE
4"x 4"x 2" TEE
2" PVC IRRIGATION LINE
4" PVC IRRIGATION MAIN LINE
45' RADIUS
FORCE MAIN LANDSCAPE TRENCH, LOAM AND SEED
90' RADIUS
2" HDPE SDR 11 SEWER FORCE MAIN, 1282 LF
90' RADIUS
UTILITY CROSSING F (BELOW 1.50' SEPARATION)
PROP. DRAIN INV. = 41.47; BOT = 41.30; TOP = 43.64
PROP. FORCE MAIN INV. = 39.61; TOP = 39.80
PUMP STATION / WET WELL
RIM = 46.20
INV. IN = 39.35
INV. OUT = 41.20
10' LIMITS FROM BUILDING EXTERIOR (TYP.)
22.5° ELBOW
COMBINED WYE / 90° ELBOW
4" SDR-35 PVC SEWER @ 2.0%, 7 LF (BY OTHERS)
INV. OUT = 39.84 (BY OTHERS)
FFE: 46.20
4" SDR-35 PVC SEWER @ 2.0%, 82 LF (CLEAN OUT TO WELL)
4" SDR-35 PVC SEWER @ 2.0%, 10 LF (BY OTHERS)
CONNECT TO EXISTING 6" DI WATER MAIN WITH 6"X6"X4" TEE
INV. OUT = 41.15 (BY OTHERS)
22.5° ELBOW
COMBINED WYE / 90° ELBOW
INV. IN = 40.78 (BY OTHERS)
SEWER CLEAN OUT
45° ELBOW
4" DI WATER MAIN
22.5° ELBOW
UTILITY CROSSING G
FFE: 46.20
WATER GATE VALVE
3" COPPER WATER SERVICE (BY OTHERS)
10' LIMITS FROM BUILDING EXTERIOR (TYP.)
CONNECT TO QUICK CONNECT VALVE BOX
2" PVC IRRIGATION LINE
MATCHLINE - SHEET C302
MATCHLINE - SHEET C303
CONNECT TO QUICK CONNECT VALVE BOX
NORTH

Gale Associates, Inc.
Engineers and Planners
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ROCKLAND, MA 02370
P 781.335.6465 F 781.335.6467 www.gainc.com
Boston Baltimore Orlando Hartford Bedford

BID SET

PROJECT
ATHLETIC CAMPUS IMPROVEMENTS
HAMILTON-WENHAM REGIONAL HIGH SCHOOL
775 BAY ROAD
SOUTH HAMILTON, MA 01982

OWNER
HAMILTON-WENHAM REGIONAL SCHOOL DISTRICT
5 SCHOOL STREET
WENHAM, MA 01984

NO.	DATE	DESCRIPTION	BY

PROJECT NO.	718601
CADD FILE	718601_C301
DESIGNED BY	CRR / KFR
DRAWN BY	CRR
CHECKED BY	KDH / PS
DATE	3/8/2024
DRAWING SCALE	1" = 20'

GRAPHIC SCALE
0 10' 20' 40'

SHEET TITLE
SITE
UTILITES PLAN
SHEET 2 OF 3

DRAWING NO.
C302

Kaitlyn M. Rogosch

From: Robert Wallace <rwallace@hamiltonma.gov>
Sent: Wednesday, February 28, 2024 4:27 PM
To: Kyle F. Rowan
Cc: Kathleen D. Hervol; b.menegoni@hwschools.net
Subject: RE: External Email Warning RE: External Email Warning Request for Meeting - HWRSD Athletics Project Review - Public Safety

Mr. Rowen,
The Hamilton Fire Department gives approval of the proposed HWRSD athletics project, as long as the 20' wide access road is maintained around the rear of the school.
Also, contingent on review of further plans yet to be submitted, as well as any modifications requested by the Police Dept.

Lt. Robert Wallace
Hamilton Fire
Fire Prevention
978-468-5560
rwallace@hamiltonma.gov

HWRHS Athletic Campus Improvements
Draft Operation & Maintenance Plan - First Year
Hamilton-Wenham Regional School District
Gale JN 718601

ITEM	DESCRIPTION	UNIT	QUANTITY	HOURS	RATE	UNIT COST	COST	TOTAL COST
BMPS								
1	**Synthetic Turf Fields (Structures outside fields)**							**$ 2,400.00**
a	Inspect Cleanouts and Drain Manholes		2	4	$ 150.00	$ -	$ 1,200.00	
b	Preventative Maintenance		2	4	$ 150.00	$ -	$ 1,200.00	
2	**Stone/Pipe Trenches**							**$ 1,200.00**
a	Inspect and Remove Debris		3	4	$ 100.00	$ -	$ 1,200.00	
3	**Catch Basins, Trench Drains, Slot Drains, and Area Drains**							**$ 8,000.00**
a	Inspect and Clean		4	4	$ 100.00	$ -	$ 1,600.00	
b	Vacuum Truck		4	8	$ 200.00		$ 6,400.00	
4	**Level Spreaders**							**$ 4,600.00**
a	Inspect		5	4	$ 150.00	$ -	$ 3,000.00	
b	Remove Sediment and Debris		2	4	$ 150.00	$ -	$ 1,200.00	
c	Regrade and Reseed		1	4	$ 100.00	$ -	$ 400.00	
5	**Miles River**							**$ 4,642.00**
a	Sample and Analysis (per the OOC) Includes 1 baseline test at 3 locations and 1 major storm test at 3 locations		2	-	$ -	$ 2,321.00	$ 4,642.00	
							SUBTOTAL	**$ 20,842.00**
							CONTINGENCY (5%)	**$ 1,042.10**
							ENG/CPS SERVICES	
							TOTAL	**$ 21,884.10**

Quantities determined by the Operation and Maintenance plan added to the assumption of 1 major storms per year on average that will require inspection (per OOC - 6" in 12 hours)
Baseline stream sampling of the Miles River based on the Order of Conditions (OOC)

HWRHS Athletic Campus Improvements
Draft Operation & Maintenance Plan - Yearly
Hamilton-Wenham Regional School District
Gale JN 718601

ITEM	DESCRIPTION	UNIT	QUANTITY	HOURS	RATE	UNIT COST	COST	TOTAL COST
BMPS								
1	**Synthetic Turf Fields (Structures outside fields)**							**$ 2,400.00**
a	Inspect Cleanouts and Drain Manholes		2	4	$ 150.00	$ -	$ 1,200.00	
b	Preventative Maintenance		2	4	$ 150.00	$ -	$ 1,200.00	
2	**Stone/Pipe Trenches**							**$ 1,200.00**
a	Inspect and Remove Debris		3	4	$ 100.00	$ -	$ 1,200.00	
3	**Catch Basins, Trench Drains, Slot Drains, and Area Drains**							**$ 8,000.00**
a	Inspect and Clean		4	4	$ 100.00	$ -	$ 1,600.00	
b	Vacuum Truck		4	8	$ 200.00		$ 6,400.00	
4	**Level Spreaders**							**$ 3,400.00**
a	Inspect		3	4	$ 150.00	$ -	$ 1,800.00	
b	Remove Sediment and Debris		2	4	$ 150.00	$ -	$ 1,200.00	
c	Regrade and Reseed		1	4	$ 100.00	$ -	$ 400.00	
5	**Miles River**							**$ 2,725.00**
a	Sample and Analysis (per the OOC) Includes 1 major storm test at 4 locations		1	-	$ -	$ 2,725.00	$ 2,725.00	
							SUBTOTAL	**$ 17,725.00**
							CONTINGENCY (5%)	**$ 886.25**
							ENG/CPS SERVICES	
							TOTAL	**$ 18,611.25**

Quantities determined by the Operation and Maintenance plan added to the assumption of 1 major storms per year on average that will require inspection (per OOC - 6" in 12 hours)
Baseline stream sampling of the Miles River based on the Order of Conditions (OOC)

HAMILTON-WENHAM REGIONAL SCHOOL DISTRICT

Eric Tracy
Superintendent of Schools

5 School Street
Wenham, MA 01984

MEMO

TO: HW Planning Board
FR: Eric Tracy, Superintendent
DT: February 27, 2024
RE: Heat Policy HWRSD Fields

There have been several questions about heat on the HS playing fields, specifically related to turf. We are governed by the Massachusetts Interscholastic Athletic Association (MIAA) policy for heat and heat emergencies.

The District hosting games or practices must take a wet bulb temperature reading. Each day the temps are high, the trainer (or the Athletic Director) walks around EACH FIELD - on and off campus - and several locations on each field - to determine the wet bulb temperature.

When the wet bulb temperature falls within one of the categories outlined, we modify games and practices accordingly as outlined. (see attached MIAA Guidelines)

The District owns a wet bulb device as does our everyday trainer. This policy is part of our Emergency Action Plans for each season. These plans are followed by the Coaches and the Trainer.

It should be noted we have postponed and modified games and practices for these reasons many times. A change to urf fields neither changes the process or the implementation of the guidelines noted above.

Please let me know if you have any questions.

MIAA Heat Modification Policy
August 18, 2021

During all activities, each individual school, or district, must select and promote a method of monitoring the environment for heat related concerns and comply with standard recommendations for activity modifications, for the safety of the student-athlete.

Schools must follow the statewide policy for conducting activities in all sports during times of extremely high environmental conditions. The policy shall follow modified guidelines of the American College of Sports Medicine in regard to:

1. The scheduling of practice and interscholastic competition activities at various heat/humidity levels
2. The ratio of workout time to time allotted for rest and hydration at various heat/humidity levels. Game conditions and actual competitions afford valuable work to rest ratios, ability to rest in the shade, ability to hydrate often and other aspects different than continuous 1 to 2 hour practices.
3. The heat/humidity level that will result in activity being modified/altered/cancelled

A scientifically approved instrument that measures Wet Bulb Globe Temperature (WBGT) reading must be utilized at each activity to ensure that the written policy is being followed properly. For indoor events without climate control, a WBGT reading should be taken indoors. For climate-controlled indoor events, this measurement is unnecessary. WBGT can change during an event and throughout the day.

WBGT READING	PRACTICE AND/OR COMPETITION ACTIVITY
Below 76°F	Normal activities. Provide at least 3 separate rest breaks each hour for a minimum duration of 3 minutes each during workout.
76.1-81.0°F	Use discretion for intense or prolonged exercise, and watch at-risk players carefully. Provide at least 3 separate rest breaks each hour for a minimum duration of 4 minutes each.
81.1-84.0°F	Maximum activity time is 2 hours. For equipment intensive sports: Players should be restricted to a helmet, shoulder pads, and shorts during activity; all protective equipment must be removed for conditioning activities. For all sports: Provide at least 4 separate rest breaks each hour for a minimum of 4 minutes each.

84.1-86.0°F	Maximum length of activity is 1 hour. No protective equipment may be worn during activity, and there may be no conditioning activities. There must be 20 minutes of rest breaks provided during the hour of activity.
Above 86.1°F	No outdoor workouts. Cancel exercise, and delay activity until a cooler wet-bulb globe temperature reading occurs.
**If equipment modifications are necessary, no games should occur for that sport.*	

Guidelines for hydration and rest breaks:

1. Rest time should involve both unlimited hydration intake (water or electrolyte drinks) and rest without any activity involved
2. For sports that use helmets, helmets should be removed during rest time
3. The site of the rest time should be a "cooling zone" and not in direct sunlight

When WBGT is **above 84**, ice water and towels should be available in the "cooling zone" to aid the cooling process. Cold-water immersion tubs should be available for the benefit of any player showing signs of heat illness.

Definitions

1. Practice activity: the period of time that a participant engages in coach-supervised, school-approved sport or conditioning-related practice activity. Practice activities are timed from the time the players report to the field until they leave.
2. Conditioning activities: warmup, stretching, cardio, moderate to intense aerobic activities, etc.
3. Walk through: this period of time shall last no more than one hour and is not considered to be a part of the practice time regulation, and may not involve conditioning or weight-room activities. Players may not wear protective equipment.
4. Interscholastic competition: actual game play between teams and players. Given the opportunity for pauses in play, breaks when changing possessions and valuable work to rest ratios, interscholastic competition can take place up to and including WBGT readings of 86.0°F.

Hamilton Wenham HS Complex

South Hamilton, MA

Grid Summary

Name	**Zero Grid**
Spacing	20.0' x 20.0'
Height	3.0' above grade

Illumination Summary

MAINTAINED HORIZONTAL FOOTCANDLES

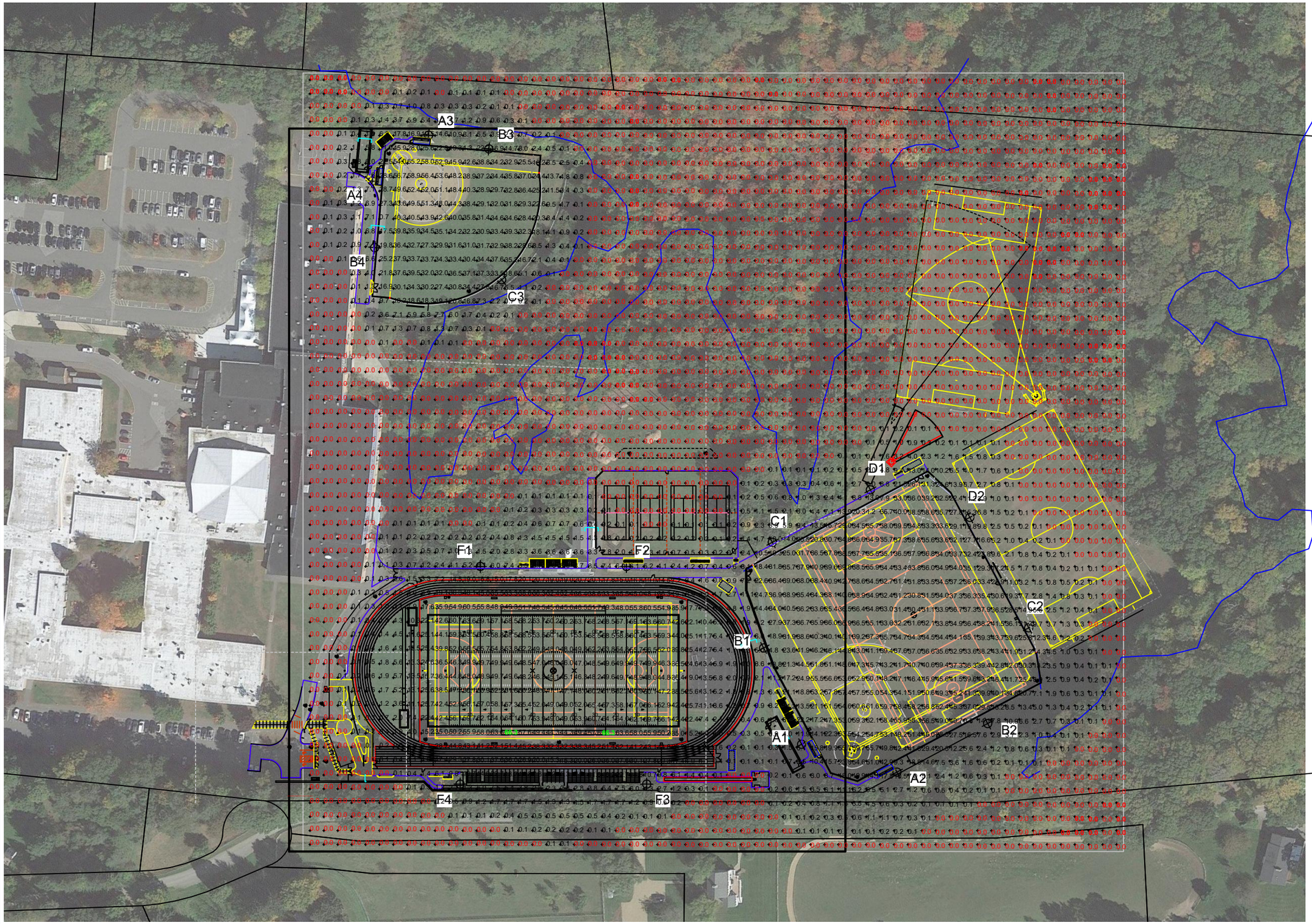
	Entire Grid
Scan Average	**8.96**
Maximum	66
Minimum	0
Avg/Min	-
Max/Min	**-**
UG (adjacent pts)	378.13
CU	0.89
No. of Points	3304
LUMINAIRE INFORMATION	
Applied Circuits	A,B,C,D
No. of Luminaires	**129**
Total Load	115.36 kW

Guaranteed Performance: The ILLUMINATION described above is guaranteed per your Musco Warranty document and includes a 0.95 dirt depreciation factor.

Field Measurements: Individual field measurements may vary from computer-calculated predictions and should be taken in accordance with IESNA RP-6-15.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the **"Musco Control System Summary"** for electrical sizing.

Installation Requirements: Results assume ± 3% nominal voltage at line side of the driver and structures located within 3 feet (1m) of design locations.



SCALE IN FEET 1 : 150

0' 150' 300'

ENGINEERED DESIGN By: T.Lanphier • File #108724F • 01-Mar-24

Pole location(s) ⊕ dimensions are relative to 0,0 reference point(s) ⊠

March 6, 2024
File No. 100772.000

Gale Associates, Inc.
Ms. Kathleen D. Hervol
Project Manager
163 Libbey Parkway
Weymouth, MA 02189

Re: **Geotechnical Engineering Report**
Hamilton-Wenham Regional High School Athletic Facilities Improvements
775 Bay Road
South Hamilton, Massachusetts

Dear: Ms. Hervol:

Nobis Group® (Nobis) has completed geotechnical engineering services for the above referenced project. Services were performed in general accordance with our proposal dated March 16, 2022, and your subsequent authorization. This geotechnical engineering report presents the results of the subsurface explorations and provides geotechnical recommendations concerning the design and construction of athletic field lighting and the proposed tennis courts. This report is subject to the limitations contained in **Appendix A**.

We appreciate the opportunity to be of service to you on this project. If you have questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
NOBIS GROUP®

Brien T. Waterman, PE
Senior Project Manager

Alfred Jones, PE
Reviewer

Nobis Group®
18 Chenell Drive
Concord, NH 03301
(603) 224-4182

nobis

TABLE OF CONTENTS

Attachments

EXECUTIVE SUMMARY

The executive summary should be used in conjunction with the entire report for design and/or construction purposes. It should be recognized that specific details are not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. **Appendix A** should be read for an understanding of the report limitations.

Nobis Group® (Nobis) has completed a subsurface exploration program for the proposed Hamilton-Wenham Regional High School Athletic Facilities Improvements project located at 775 Bay Road in South Hamilton, Massachusetts. Our geotechnical engineering scope of services included advancing four (4) test borings for proposed light poles around the baseball field and one (1) test boring for proposed tennis courts. During a previous boring program, boring B-2 was advanced near the proposed tennis court.

Based on the information obtained from our subsurface explorations, the following geotechnical considerations were identified:

- Subsurface conditions observed around the proposed baseball field lighting generally consist of topsoil and fill underlain by organic deposits, naturally deposited sand and gravel, sand and silt, and silts and clays. Organic deposits were observed up to 8 feet below current ground surface. Groundwater was encountered from approximately 5.3 to 8.5 feet below existing grade.
- Subsurface conditions within the existing baseball field area are generally favorable for supporting the proposed field light assemblies on drilled pier foundations or conventional shallow spread footings. For shallow spread footings we recommend a maximum net allowable bearing pressure of 3,000 pounds per square foot.
- Based on the Massachusetts State Building Code, 9th Edition, the seismic site classification for the baseball field is Site Class D. The site does not appear to be susceptible to liquefaction in the event of an earthquake.
- Subsurface conditions observed at the proposed tennis court consisted of topsoil over naturally deposited sand, silt and sand, and silts and clays. Groundwater was observed at a depth of approximately 5.5 feet below existing grade. We understand up to approximately 1-feet of fill is proposed for the tennis court area. Due to the presence of

clay we estimate approximately 1½ inch of settlement over 16 years. A preload/surcharge could be used to reduce the post-construction settlement, as discussed in this report.

Earthwork on the project should be evaluated by the geotechnical engineer of record (GER). The evaluation of earthwork should include review of engineered fill, subgrade preparation, and other geotechnical conditions exposed during construction. The observation and testing of engineered fill should be accomplished by a qualified testing agency.

1.0 INTRODUCTION

This report presents the results of our geotechnical engineering evaluations performed for the proposed athletic facilities improvements at Hamilton-Wenham Regional High School in Hamilton, Massachusetts. Our geotechnical engineering scope of services included advancing four (4) test borings for proposed baseball field lighting and one (1) test boring for the proposed tennis courts. During a previous boring program, boring B-2 was advanced near the proposed tennis court. Test borings, identified as B-101 through B-105, were advanced to depths ranging from approximately 17 to 24 feet below existing grade. This report is subject to the limitations contained in **Appendix A**.

The project utilizes two different surveys. The area of the existing baseball field is around El. 43 feet and is based on the North American Vertical Datum of 1988 (NAVD 88). The area of the proposed tennis court is around El. 97 feet and appears to be based on an arbitrary site datum (ASD).

A **Site Locus Plan** and an **Exploration Location Plan** are included as **Figure 1** and **Figure 2**, respectively. Exploration logs are included in **Appendix B**. The purpose of our services is to provide information and geotechnical engineering recommendations related to the following:

- Subsurface soil conditions
- Foundation design and construction
- Seismic design considerations
- Groundwater conditions
- Earthwork construction

2.0 PROJECT INFORMATION

2.1 Site Location and Description

Location	The project is located on the campus of Hamilton-Wenham Regional High School at 775 Bay Rd in South Hamilton, Massachusetts.
Existing Improvements & Current Ground Cover	The project area is currently developed with a grassed baseball field in the area of proposed lighting and a grassed field in the area of proposed tennis courts.
Existing Topography	The baseball field appears relatively level near elevation (El) 42 feet (NAVD 88) in the vicinity of the project area. The area of the proposed tennis courts is relatively level at about El. 97 feet (ASD).

2.2 Project Description

Project Description	We understand the project consists of constructing four new field light assemblies at the northern baseball field and proposed new tennis courts which are to be located in an existing flat grassed area northeast of the running track.
Grading/Cut and Fill Slopes	Based on the provided 75% grading plans, there will be no grade raises in the area of the proposed light assemblies. However, the proposed tennis courts will be at approximate El. 98 feet, which consists of an approximate grade raise of 1-foot.

3.0 SUBSURFACE CONDITIONS

3.1 Typical Subsurface Profile

Based on the results of the explorations, subsurface conditions within the area of the subsurface explorations generally consist of a surficial layer of topsoil and/or fill underlain by organic deposits, sand and gravel, and silts and clays. Not all strata were encountered at all locations. Subsurface conditions can be generalized as follows.

Stratum	Approximate Depth to Bottom of Stratum (feet)	Approx. Thickness (feet)	Material Description	Density/ Consistency
Fill [(1)]	4 to 5	3.5 to 4.7	Generally described as fine to coarse SAND, varying amounts of Gravel and Silt.	Medium dense to Very Dense
Buried Topsoil/ Organic Deposits [(1)(2)]	5.1 to 8	0.1 to 4	Generally described as SAND, SILT or Organic SILT of varying composition.	Loose to Medium Dense
Sands and Gravels[(1)]	8.5 to 13.5	2 to 7.8	Generally described as fine to coarse SAND with varying amounts of gravel and silt.	Generally Medium Dense to Very Dense
Silt / Sand & Silt[(3)]	8 to >18.5	5 to >8.5	Generally described as silt with varying amounts of sand or sand with varying amounts of silt.	Generally Medium Dense to Dense

Silts and Clays	>24.0	>16	Varies from SILT with some fine to medium Sand to Silty CLAY.	Very Stiff to Very Soft / Medium Dense
1. Not encountered in B-105. 2. Not encountered in B-104. 3. Not encountered in B-102 and B-103				

Details for each of the explorations can be found on the test boring logs in **Appendix B**. Visual soil classifications and conditions encountered at each exploration location are indicated on the individual test boring logs. Stratification boundaries on the logs represent the approximate location of changes in soil types; in-situ, the transition between materials may be gradual. A discussion of field sampling procedures is included in **Appendix B**.

3.2 Groundwater

At the time of the subsurface explorations, groundwater was observed at depths ranging approximately 5.3 to 8.5 feet below existing grades. Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff, and other factors not evident at the time the explorations were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

3.3 Geotechnical Laboratory Testing

Laboratory testing was performed on select soil samples obtained from the explorations to assist in classification and evaluating physical engineering characteristics. Geotechnical laboratory testing included particle size distribution (sieve analysis) and Atterberg Limits test performed by ConTest Consultants, Inc. (ConTest) of Goffstown, New Hampshire. Individual test reports provided by ConTest are included in **Appendix C**.

4.0 PROPOSED TENNIS COURTS

4.1 Settlement Evaluation

Based on boring B-105, compressible clay was encountered from a depth of approximately 8 feet below grades to a boring termination depth of 24 feet. Previously performed boring B-2

encountered clay from approximately 15 feet below grades to the termination depth of 22 feet. We understand that a raise in grades of approximately 1-foot is proposed in the northern portion of the proposed tennis court (i.e. the raise in grades starts at around the tennis court net-line and extends north).

We utilized a 3-dimensional settlement software by RocScience, Inc. to estimate the consolidation settlement in the area of the proposed tennis courts. Several assumptions were required to complete the analysis since the test boring terminated in clay. In our model we assumed that the clay was 50 feet thick. We estimate that load induced by the raise in grades will result in approximately 1½ inch of consolidation settlement over 16 years. We anticipate that the northern portion of the tennis courts would experience most of the settlement (i.e. area of most of the proposed fill).

We also evaluated the use of a preload and surcharge. Assuming a preload duration of 3 months, with a 1-foot surcharge, we estimate approximately 1-inch of post-construction settlement over 16 years. We recommend that the surcharge load cover approximately half the area of the proposed tennis courts (i.e. starting at the tennis court net-line and extending north).

We recommend that a preload/surcharge be used and monitored with a minimum of four (4) settlement platforms. The contractor should collect measurements daily for the first two weeks, then weekly up to month 3, then monthly until the end of the preload. The actual duration of the preload should be based on the settlement platform readings.

The use of a geogrid below the recommended pavement section should be considered. A geogrid won't reduce the amount of settlement; however, it may help to reduce the impact of differential settlement across the tennis court. We recommend that a Tensar InterAx NX850 geogrid, or approved equal, be used between the subgrade and pavement section.

4.2 Recommended Pavement Section

Nobis recommends a pavement section consisting of a court surfacing over 1 ½-inch layer of bituminous wearing surface, 2 ½-inch bituminous binder course, and an 8-inch layer of dense graded aggregate.

5.0 FIELD LIGHTING FOUNDATIONS

We understand the project consists of construction four field light assemblies for the baseball field; however, the project is in conceptual design and the light locations have not been finalized. Based on the results of our subsurface explorations and understanding of the project, it is our opinion the proposed field light assemblies can be supported on drilled pier foundations end bearing in the naturally deposited soils. Alternatively, field light assemblies can be supported on shallow foundations bearing on native sand and gravel, as discussed herein.

Geotechnical engineering recommendations for foundation systems and other earth-connected phases of the project are outlined below. The recommendations contained in this report are based upon the results of field testing, engineering analyses and our current understanding of the proposed development.

5.1 Drilled Pier Foundations

The proposed field light assemblies can be supported on drilled pier foundations bearing on the naturally-deposited non-organic soils. It is anticipated that the length of drilled piers will be based on either compression or the lateral capacity required to resist live loading such as a combination of wind and ice. Allowable deflection at the top of the drilled pier of 0.5 inch is recommended for calculating lateral capacity. Design recommendations for drilled pier foundations are presented below.

5.1.1 Drilled Pier Design Recommendations

Description	Value [1]	
End Bearing Material	Natural Sand and Gravel or Silt and Clay	
Net Allowable End Bearing Capacity [2,3]	Depth ≥10 feet:	3,000 psf
Minimum Pier Diameter	24 inches	
Ultimate Average Unit Side Friction	Depth <4 feet: Depth >4 feet:	neglect 65 + 5(z) psf [4,5,6,7]
Ultimate Coefficient of Friction (tanδ) [6]	Fill: Sand and Gravel: Silt and Clay:	0.30 0.30 0.30
Coefficient of Lateral Subgrade Reaction	Fill/Sand and Gravel: Silt and Clay:	40 (z/D) kcf [6,7] 20 (z/D) kcf

Angle of Internal Friction	Fill: Sand and Gravel: Silt and Clay:	30 degrees 30 degrees 0 degrees
Undrained Shear Strength (c_u)	Silts and Clays:	1,000 psf
Estimated In-Situ Soil Unit Weight (γ_{moist})	Existing Fill: Sand and Gravel: Silt and Clay:	120 pcf 120 pcf 105 pcf
Recommended Design Groundwater Depth	5 feet	

1. Variations in subsurface conditions may occur between borings, across the site, and due to modifying effects of weather. Subsurface conditions below a depth of 24 feet for the proposed field lighting have not been verified. If design shaft lengths are greater than the exploration depth at the planned foundation location, supplemental explorations and/or recommendations will be necessary.
2. Based on our understanding of the project and experience with similar projects, drilled pier foundations are anticipated to bear approximately 15 feet below existing grade.
3. The allowable end bearing pressure assumes that unsuitable soil at the base of the pier has been removed.
4. psf – pounds per square foot; psi – pounds per square inch; pcf – pounds per cubic foot; kcf – kips per cubic foot
5. Contribution to vertical capacity of the pier from soil within the frost depth of 4 feet should be ignored. The uplift capacity of the pier will be based on side friction and the dead weight of the pier.
6. Friction values are for mass concrete; for pre-cast concrete the friction coefficient is 80 percent of the values for mass concrete.
7. z is defined as the depth below the ground surface and D is the diameter of the pier, both in feet.

Side friction and lateral subgrade modulus values presented above are ultimate parameters based on data presented on the attached test boring logs, published values, and our experience with similar soil conditions, and do not include a factor of safety. The recommended net allowable end bearing pressure includes a factor of safety of 3.

The recommended design parameters presented above are for cast-in-place drilled pier foundations. If alternative construction methods are selected, such as installing precast piers in drilled holes, the design parameters presented above will be partially dependent on annular space backfill materials and should be re-evaluated.

The uplift capacity of the pier will be based on allowable friction of the soil and the dead weight of the pier. Compression capacity is based on side end bearing. Drilled piers designed to resist tension loads should have reinforcing steel installed the entire length of the pier.

5.2 Shallow Foundations

As an alternative to drilled pier foundations, the field light assemblies may be supported on conventional spread footing or pad-and-pier foundations bearing on a minimum 6-inch-thick layer of compacted crushed stone placed above undisturbed non-organic native sand and gravel subgrades. Due to the depth of the native sand and gravel in boring B-103 (i.e., greater than 8 feet below grade) shallow spread footings in these areas may not be feasible.

The use of crushed stone will help facilitate dewatering and provide a stable working surface. Crushed stone should be separated from soil subgrades, excavation sidewalls and backfill by a geotextile separation fabric such as Mirafi 140N, or equivalent.

5.2.1 Shallow Foundation Design Recommendations (Light Assemblies)

Bearing Material [1]	Minimum 6-inch-thick layer of compacted crushed stone placed above undisturbed sand and gravel subgrades provided subgrades are prepared as discussed herein.	
Maximum Net Allowable Bearing Pressure[2]	3,000 pounds per square foot (psf) (DL+LL)	
Minimum Foundation Depth [3]	48 inches (frost protection)	
Minimum Foundation Width	*Isolated Spread Footings*:	36 inches
Estimated Settlement [4]	*Total*:	1-inch
Ultimate Coefficient of Friction, tanδ [5]	Native Sand and Gravel	0.30
	Structural Fill/Crushed Stone:	0.60

1. Crushed stone should be separated from soil subgrades, excavation sidewalls and backfill using a geotextile separation fabric such as Mirafi 140N, or equivalent.
2. The recommended net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the foundation base elevation. Assumes unsuitable or soft soil, where present, will be replaced with compacted structural fill or crushed stone.
3. Minimum foundation depth for frost protection for exterior foundations and foundations below unheated interior spaces.
4. Foundation settlement will depend upon the variations within the subsurface soil profile, the structural loading conditions, the embedment depth of the foundation, the thickness of compacted fill, and the quality of the earthwork operations.
5. Friction values are for mass concrete; for pre-cast concrete the friction coefficient is 80 percent of the values for mass concrete.

The allowable foundation bearing pressure applies to dead loads plus design live load conditions. The weight of the foundation concrete below grade may be neglected in dead load computations.

6.0 SEISMIC DESIGN CRITERIA

Code Used	Massachusetts State Building Code, 9th Edition
Site Class	Site Class D [(1)(2)]
Maximum Considered Earthquake (MCE) Spectral Acceleration (5 percent damping)	S_s= 0.253g (0.2 second spectral response acceleration) S_1= 0.075g (1.0 second spectral response acceleration)
Liquefaction Potential	Not considered susceptible to liquefaction.

1. In general accordance with the Massachusetts State Building Code, 9th Edition (780 CMR) with reference to the 2015 International Building Code (IBC); Site Class is based on the average characteristics of the upper 100 feet of the subsurface profile. The Code requires a site soil profile determination extending a depth of 100 feet for seismic site classification. The current scope does not include the required 100-foot soil profile determination. Test borings extended to a maximum depth of 21 feet below existing grade. The seismic site class definition considers that similar soil conditions continue below the maximum depth of the subsurface explorations.
2. The recommended seismic site class of D is for the proposed light assembly area. For the proposed tennis court area we recommend a seismic site class of E, if required.

7.0 GENERAL CONSTRUCTION CONSIDERATIONS

The following sections present recommendations for site preparation, excavation, subgrade preparation, and placement of fill for the project. The recommendations presented for design and construction of earth-supported elements are contingent upon the recommendations outlined in this section.

7.1 Earthwork in Wet Environments

Excavated onsite soil will generally consist of existing topsoil, fill, and organic deposits. Excavated onsite soil may be selectively reused as common fill provided it is free of deleterious material and particles larger than 6 inches in diameter, and it is relatively dry such that it can be adequately compacted. Portions of the excavated onsite soil are anticipated to have an elevated percentage of silt and will be sensitive to moisture. This recommendation is applicable during periods of construction when the climate and moisture are favorable for reusing silty soil.

Contractors experienced in earthwork construction in New England should be aware of silty soil behavior and the effects that moisture and season have on its workability. If a contractor bids construction knowing that earthwork must begin during seasonally wet months, the owner

should expect a contingency by the contractor to create a suitable working surface for equipment, the use of off-site suitable fill and disposal of on-site soil.

Care must be taken by the contractor to avoid the disturbance of subgrades by minimizing construction traffic (including foot traffic) to the extent practical. Subgrades disturbed by construction traffic should be over-excavated and replaced with suitable backfill material.

7.2 Drilled Pier Construction Considerations

Drilled piers should be aligned vertically. The drilling method or combination of methods selected by the contractor should be submitted for review by the geotechnical engineer, prior to mobilization of drilling equipment. Temporary casing may be required to reduce the likelihood of caving of the granular soil, particularly below the water table. Concrete should be placed by tremie methods if the drilled pier is more than 10 feet deep or concrete is placed in the wet.

Consideration should be given to the possibility of encountering cobbles and/or boulders during construction of the drilled pier foundations. The augers did not encounter refusal, however, that does not preclude the possibility of obstructions in the area.

7.3 Subgrade Preparation (Shallow Foundations)

Following excavation to rough grade and before constructing foundations or placing new fill, the subgrades should be firm, stable, and unyielding. Subgrades should be proof-rolled with at least six passes in perpendicular directions using a minimum 10-ton vibratory roller in open areas, or a 1-ton vibratory roller or large plate compactor, such as a Wacker DPU4545 or equivalent, in confined areas and/or trenches. Proof-rolling subgrades in close proximity to the water table may need to be accomplished statically to reduce the potential for disturbance. Excavations should be accomplished using a smooth edge bucket to reduce the potential for subgrade disturbance.

Where fill, buried topsoil, organics, or other unsuitable material is encountered at or below proposed foundation subgrade it should be over-excavated and replaced with compacted crushed stone or compacted structural fill. Over-excavation below foundations should include the foundation bearing zone, defined as the area beneath 1 horizontal to 1 vertical (1H:1V) lines extending downward and outward from foundation edges.

The GER, or their representative, should review the subgrade during the proof-rolling process. Soft/unstable zones should be over-excavated to competent material and replaced with compacted structural fill or crushed stone as necessary. Following proof-rolling, crushed stone may be placed and compacted to achieve design elevation. Where subgrades become wet, unstable and/or difficult to proof-roll, they should be over-excavated to more competent material and backfilled with crushed stone. Crushed stone should be separated from the excavation subgrade, sidewalls, and granular backfill above the stone with a geotextile separation fabric, such as Mirafi 140N or equivalent. Excavated subgrades should not be left exposed overnight unless the forecast calls for above-freezing, clear conditions.

7.4 Subgrade Preparation (Proposed Tennis Court)

Following excavation to rough grade and before placing new fill, the subgrades should be firm, stable, and unyielding. Subgrades should consist of non-organic natural granular soils. Subgrades should be proof-rolled with at least six passes in perpendicular directions using a minimum 10-ton vibratory roller in open areas, or a 1-ton vibratory roller or large plate compactor, such as a Wacker DPU4545 or equivalent, in confined areas. Proof-rolling subgrades in close proximity to the water table may need to be accomplished statically to reduce the potential for disturbance. Excavations should be accomplished using a smooth edge bucket to reduce the potential for subgrade disturbance.
Where buried topsoil, organics, or other unsuitable material is encountered at or below proposed tennis court subgrade it should be over-excavated and replaced with compacted crushed stone or compacted structural fill.

After removal of organics, or other unsuitable materials, then the recommended surcharge fill should be placed a minimum 1-feet above proposed final grades in the area described in the above in the proposed Tennis Courts Section (Section 4.1). After completion of the preload/surcharge, the area should be excavated to natural sandy material below the proposed tennis court pavement section.

7.5 Fill and Placement

7.5.1 Reuse of Onsite Soil – Common Fill

Excavated onsite soil may be selectively reused as common fill outside of foundation bearing zones and as backfill above foundations, provided it is free of deleterious material and particles larger than 6 inches, and it can be adequately compacted. Common fill may also be used to raise

grades for the recommended 1-foot surcharge in the proposed tennis court area. We recommend that the proposed surcharge fill obtain a minimum dry density of 110 pounds per cubic foot, as determined by a modified Proctor.

7.5.2 Imported Structural Fill

Placement/Location	Material Properties
Recommended below footings, within footing bearing zones and under settlement-sensitive structures.	Imported structural fill should meet the following gradation: **Sieve Size** — **Percent Passing by Weight** 6-inch — 100* 3-inch — 70-100** ¾-inch — 45-95 No. 4 — 30-90 No. 10 — 25-80 No. 40 — 10-50 No. 200 — 0-10 * Maximum particle size limited to 2/3 the loose lift thickness. ** Maximum 3-inch particle size within 12 inches of the underside of footings.

7.5.3 Imported Common Fill

Placement/Location	Material Properties
May be used for site grading and fill outside footing bearing zones. Common fill should not be used under settlement sensitive structures.	The maximum particle size is recommended to be limited to 6 inches. Imported common fill should be limited to no more than 30 percent by weight should pass the No. 200 sieve.

7.5.4 Crushed Stone

Placement/Location	Material Properties
Recommended below footings, within footing bearing zones, under settlement-sensitive structures, or as drainage.	Crushed stone shall meet the requirements defined by the Massachusetts Department of Transportation (MassDOT) Standard Specifications for Highways and Bridges, Section M2.01.4 (¾-inch).
1. Crushed stone, if used, should be separated from soil subgrades, excavation sidewalls, and soil backfill with a geotextile separation fabric such as Mirafi 140N, or equivalent.	

7.6 Compaction Requirements

Fill Lift Thickness	*Vibratory Rollers:*	12 inches or less in loose thickness
	Plate Compactors:	8 inches or less in loose thickness
Compaction Requirements	*Structural Fill:*	95% maximum dry density
	Base/Subbase Course:	95% maximum dry density
	Common Fill:	92% maximum dry density
	Crushed Stone:	Compacted to a non-yielding state
Moisture Content	± 3% of Optimum Moisture Content	

1. Maximum dry density as determined by ASTM D-1557, Method C (Modified Proctor).
2. Fill should be tested for moisture content and percent compaction during placement. If in-place density test results indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested, as required, until the specified moisture and compaction requirements are achieved.

7.7 Temporary Excavations, Grading and Drainage

The individual contractor(s) is responsible for designing and constructing stable, temporary excavations or temporary bracing, as required, to maintain stability of the excavation sides and the excavation bottom. Instability in the form of slope raveling, caving, and sloughing should be expected in all excavations and trenches which extend into the granular materials with little to no cohesion. Excavations should be sloped or shored in the interest of safety following local and federal regulations, including current Occupational Safety and Health Administration (OSHA) excavation and trench safety standards. Lateral earth support systems, if used, should be designed by a licensed engineer.

Construction slopes should be reviewed for signs of mass movement. If potential stability problems are observed, work should cease and the GER should be contacted immediately. The responsibility for excavation safety and stability of temporary construction slopes should lie solely with the contractor.

Stockpiles should be placed well away from the edge of the excavation and their height should be controlled so they do not surcharge the sides of the excavation. Positive drainage should be provided during construction and maintained throughout the life of the development. Infiltration of water into utility trenches or foundation excavations should be prevented during construction.

7.8 Dewatering

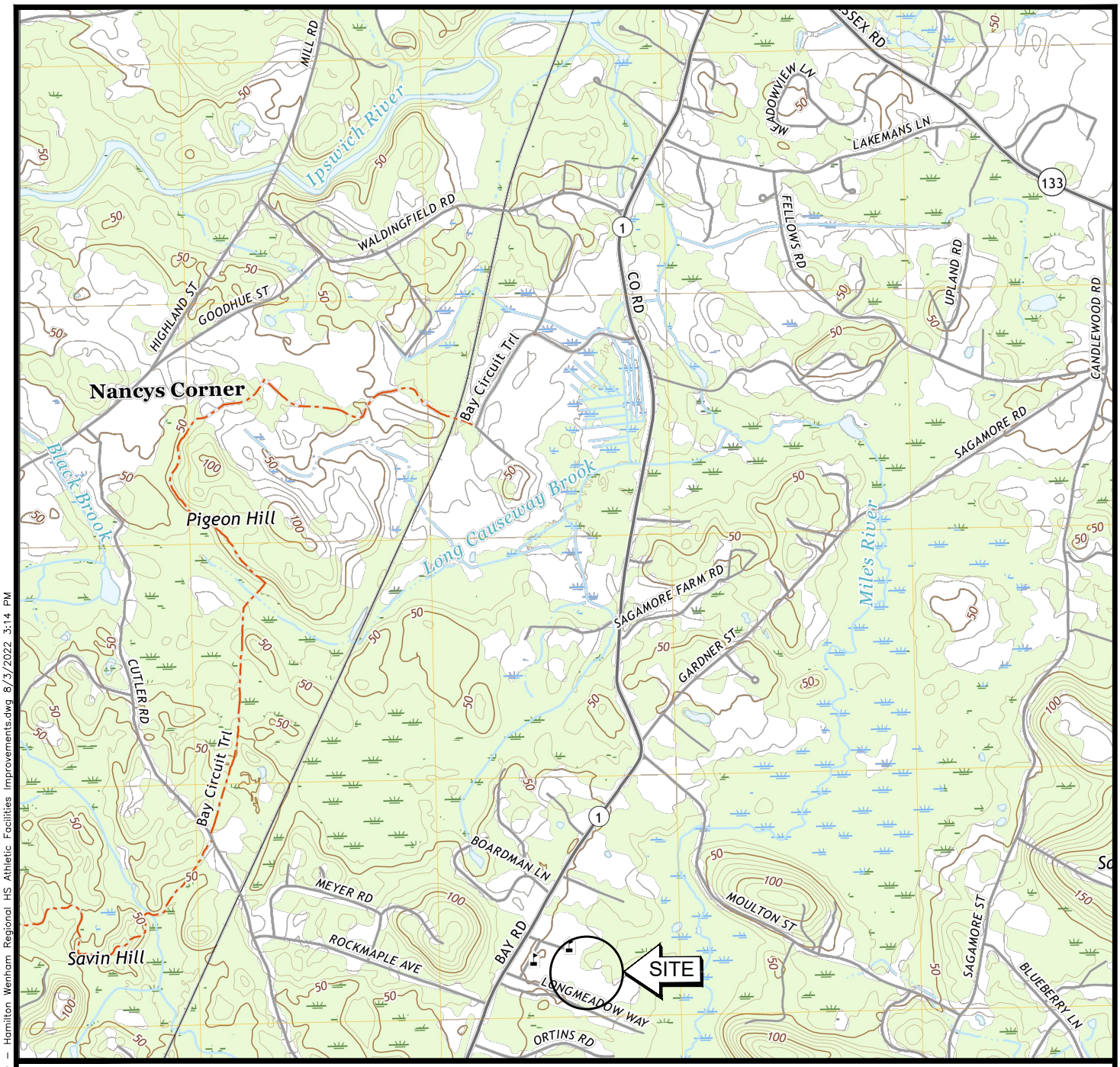
Based on observed groundwater levels and seasonal variations, anticipated finish grades, and anticipated excavation depths, dewatering may be needed for construction of the light pole foundations. Regardless of excavation depths, construction dewatering will likely be required to maintain a stable subgrade during construction and prevent surface water runoff from collecting in excavations. If dewatering becomes necessary, the contractor should select a dewatering method to lower groundwater at least 2 feet below the excavation subgrade in order to minimize bearing surface disturbance during excavation, fill placement and compaction.

Subgrade soil that becomes unstable should be replaced with crushed stone or structural fill as necessary. Crushed stone, where used, should be enveloped with a non-woven geotextile, such as Mirafi 140N or equivalent, to avoid separation of fines from the subgrade and backfill. Discharged water should be managed in accordance with local, state and federal government requirements.

8.0 DESIGN SERVICES AND CONSTRUCTION OBSERVATION

Nobis should be retained to review final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. The GER and an independent testing agency should also be retained to provide observation and testing services during grading, excavation, foundation construction and other earth-related construction phases of the project.

FIGURES



NORTH

2021 USGS TOPOGRAPHIC MAP

IPSWICH QUADRANGLE
HAMILTON, MASSACHUSETTS
NORTH AMERICAN VERTICAL DATUM OF 1988
CONTOUR INTERVAL 10 FEET

APPROXIMATE SCALE
1 INCH = 2,000 FEET

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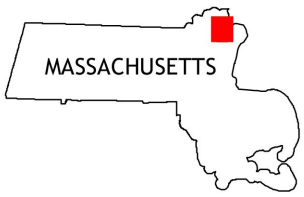

QUADRANGLE LOCATION

FIGURE 1

SITE LOCUS PLAN

GEOTECHNICAL ENGINEERING REPORT
HAMILTON-WENHAM REGIONAL HIGH SCHOOL
ATHLETIC FACILITIES IMPROVEMENTS
HAMILTON, MASSACHUSETTS

DRAWN BY: SNP	CHECKED BY: BTW
PROJECT NO. 100451.000	DATE: AUGUST 2022

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NOTES:

1. THE BASE PLAN WAS PREPARED BY GALE ASSOCIATES, INC DATED 10 FEBRUARY 2022.
2. LOCATIONS AND SITE FEATURES DEPICTED ARE APPROXIMATE AND GIVEN FOR ILLUSTRATIVE PURPOSES.
3. SOIL BORINGS WERE DRILLED BY NEW ENGLAND BORING CONTRACTORS, OF DERRY, NEW HAMPSHIRE AND OBSERVED BY NOBIS ON 07 JULY 2022.
4. THE PROJECT UTILIZES TWO DIFFERENT SURVEYS. THE AREA OF THE EXISTING BASEBALL FIELD IS AROUND EL. 43 FEET AND IS BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88). THE AREA OF THE PROPOSED TENNIS COURT IS AROUND EL. 97 FEET AND APPEARS TO BE BASED ON AN ARBITRARY SITE DATUM.

LEGEND

B-101	APPROXIMATE BORING LOCATION OBSERVED BY NOBIS ON 07 JULY 2022
B-1	APPROXIMATE BORING LOCATION OBSERVED BY NOBIS ON 11 AUGUST 2016

0 80' 160'

GRAPHIC SCALE

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FIGURE 2

SUBSURFACE EXPLORATION PLAN
GEOTECHNICAL ENGINEERING REPORT
HAMILTON-WENHAM REGIONAL HIGH SCHOOL
ATHLETIC FACILITIES IMPROVEMENTS
HAMILTON, MASSACHUSETTS

DRAWN BY: SNP	CHECKED BY: BTW
PROJECT NO. 100451.000	DATE: SEPTEMBER 30, 2022

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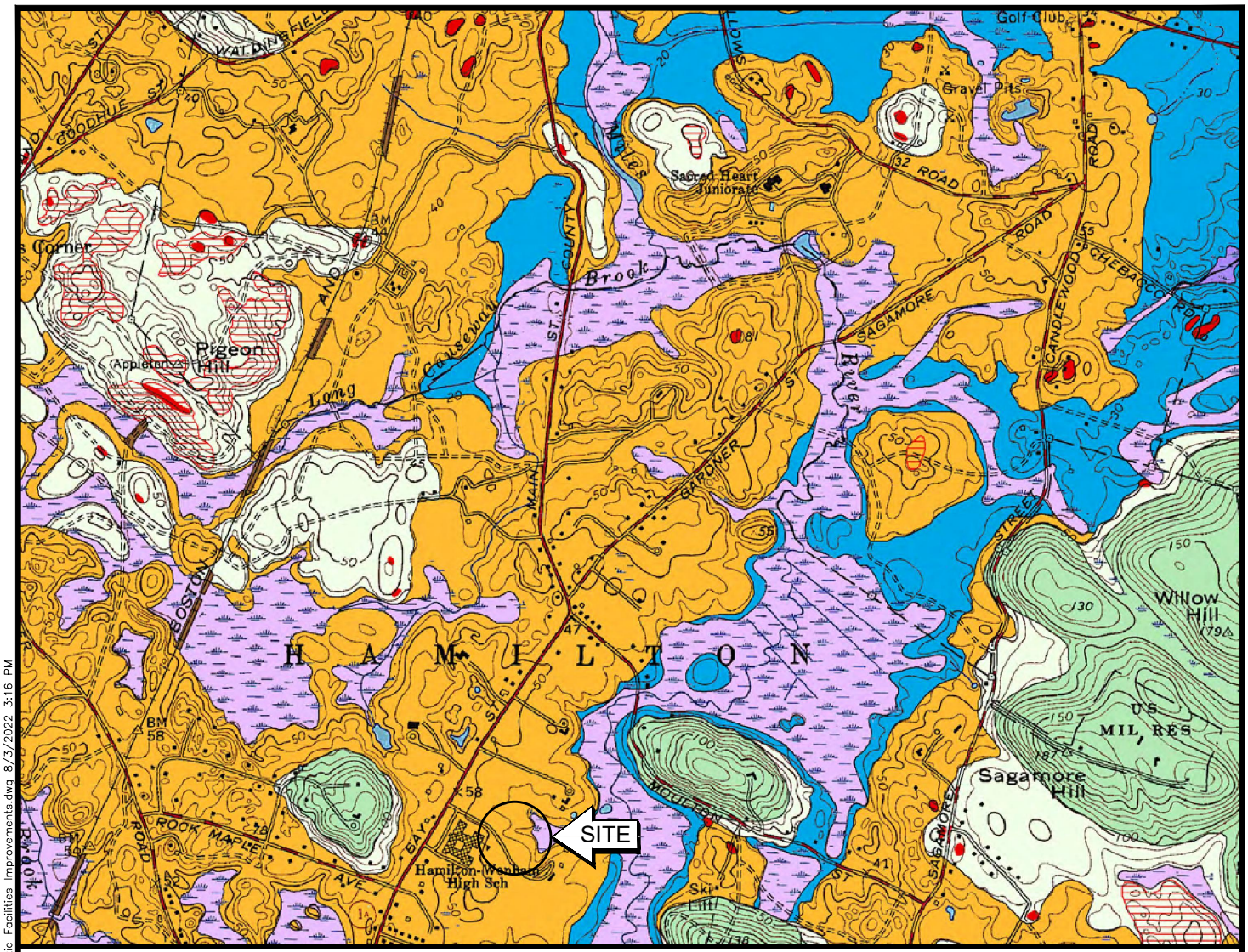

Coarse deposits consist of *gravel deposits*, *sand and gravel deposits*, and *sand deposits*, not differentiated in this report. *Gravel deposits* are composed of at least 50 percent gravel-size clasts; cobbles and boulders predominate; minor amounts of sand occur within gravel beds, and sand comprises a few separate layers. Gravel layers generally are poorly sorted, and bedding commonly is distorted and faulted due to postdepositional collapse related to melting of ice. *Sand and gravel deposits* occur as mixtures of gravel and sand within individual layers and as layers of sand alternating with layers of gravel. Sand and gravel layers generally range between 25 and 50 percent gravel particles and between 50 and 75 percent sand particles. Layers are well sorted to poorly sorted; bedding may be distorted and faulted due to postdepositional collapse. *Sand deposits* are composed mainly of very coarse to fine sand, commonly in well-sorted layers. Coarser layers may contain up to 25 percent gravel particles, generally granules and pebbles; finer layers may contain some very fine sand, silt, and clay

Glaciomarine fine deposits include clay, silty clay, fine sand, and some fine gravel deposited in a higher-level sea in environments of low wave energy along the coast and in river estuaries. Fine to very fine sand, massive and laminated, commonly is present at the surface and grades downward into interbedded very fine sand, silt, silty clay, and clay. The lower silty clay and clay is massive and thinly laminated. Total thickness is generally a few feet to 75 ft

Thick till—Nonsorted, nonstratified matrix of sand, some silt, and little clay containing scattered pebbles, cobbles, and boulders in the shallow subsurface; at greater depths consists of compact, nonsorted matrix of silt, very fine sand, and some clay containing scattered small gravel clasts. Mapped in areas where till is greater than 10 to 15 ft thick, mostly in drumlin landforms in which till thickness commonly exceeds 100 ft (maximum recorded thickness is 230 ft). Although upper till of late Wisconsinan age is the surface deposit, lower till of probable Illinoian age constitutes the bulk of the material in thick-till areas. Lower till is moderately to very compact and is commonly finer grained and less stony than upper till. An oxidized zone, the lower part of a soil profile formed during a period of interglacial weathering, is generally present in the upper part of the lower till. This zone commonly shows closely spaced joints that are stained with iron and manganese oxides

Swamp deposits—Organic muck and peat that contain minor amounts of sand, silt, and clay, are stratified and poorly sorted, and occur in swamps and freshwater marshes, in kettle depressions, or in poorly drained areas. Unit is shown only where deposits are estimated to be at least 3 ft thick; most deposits are less than 10 ft thick. Swamp deposits overlie glacial deposits or bedrock. They locally overlie glacial till even where they occur within thin glacial meltwater deposits

2018 USGS SURFICIAL GEOLOGIC MAP

NORTH

SURFICIAL GEOLOGIC MAP OF THE IPSWICH QUADRANGLE
HAMILTON, MASSACHUSETTS
NORTH AMERICAN VERTICAL DATUM OF 1988
CONTOUR INTERVAL 10 FEET

APPROXIMATE SCALE
1 INCH = 2,000 FEET

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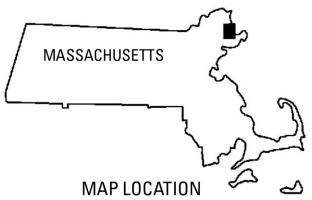


FIGURE 3

SURFICIAL GEOLOGY PLAN
HAMILTON-WENHAM REGIONAL HIGH SCHOOL
ATHLETIC FACILITIES IMPROVEMENTS
HAMILTON, MASSACHUSETTS

DRAWN BY: SNP	CHECKED BY: BTW
PROJECT NO. 100451.000	DATE: JULY 2022

APPENDIX A
Limitations

GEOTECHNICAL LIMITATIONS

Explorations and Subsurface Conditions

1. The analyses and design recommendations submitted in this report are based in part upon the data obtained from subsurface explorations. The nature and extent of variations between these explorations may not become evident until construction. If variations then appear evident, it will be necessary to reevaluate the recommendations of this report.

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

2. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretations of widely spaced explorations and samples; actual soil transitions are probably more erratic. For specific information, refer to the exploration logs.

3. Water level readings have been made in the explorations at times and under conditions stated on the logs. These data have been reviewed and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, and other factors occurring since the time measurements were made. The water table encountered in the course of the work may differ from that indicated in the Report.

   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.

4. Nobis' geotechnical 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.

Additional Services

5. Nobis recommends that we be retained to provide services during 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 recommendations, design concepts and/or opinions; ii) allow for changes in the event that conditions are other than anticipated; iii) provide modifications to our design recommendations; and iv) assess the consequences of changes in technologies and/or regulations.

Use of Report

6. Nobis prepared this report on behalf of, and for the exclusive use of our Client for the stated purpose(s) and location(s) identified in our proposal 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). Reliance by any party not expressly identified in the agreement, for any use, without our prior written permission, shall be at that party's sole risk, and without any liability to Nobis.

   This report is for design purposes only and is not sufficient to prepare an accurate construction bid. Contractors wishing a copy of the report may secure it with the understanding that its scope is limited to design considerations only.

7. Nobis' findings and conclusions are based on the work conducted as part of the scope of work set forth in our proposal 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 considering 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 project design has been altered in any way, Nobis shall be so notified and afforded the opportunity to revise the report, as appropriate, to reflect the unanticipated changed conditions.

8. Nobis' 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.

Compliance with Codes and Regulations

9. Nobis 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.

Opinion of Cost

10. This report may contain or be based on comparative cost opinions for the purpose of evaluating alternative foundation schemes. These opinions may also involve approximate quantity evaluations. It should be noted that quantity estimates may not be accurate enough for construction bids. In addition, since we are not professional estimators of labor and materials cost, the evaluation of construction costs should be considered as approximate guidelines and could vary significantly from actual costs. Nobis does not guarantee the accuracy of our cost opinions as compared to contractor's bids for construction costs.

END OF LIMITATIONS

APPENDIX B
Description of Field Explorations
Exploration Logs

DESCRIPTION OF FIELD EXPLORATIONS

In total, five test borings, identified as B-101 through B-105 were advanced within the project area on July 7, 2022. As part of a previous project at the site Nobis had advanced five test borings, identified as B-1 through B-5 on August 11, 2016.

Test borings performed in 2022 were advanced to depths ranging from approximately 17 to 24 feet below the existing ground surface by New England Boring Contractors of Derry, New Hampshire using track-mounted drilling equipment and hollow-stem auger techniques. Test boring soil samples were obtained nearly continuously from the ground surface to a depth of 12 feet and at 5-foot intervals thereafter, using a standard 2-inch outside-diameter split-barrel sampler. Standard Penetration Tests (SPTs) were performed in general accordance with industry standards. Density of soil samples are based on N-values, which is determined by the number of hammer blows required to advance the sampler from 6 to 18 inches.

An automatic SPT hammer was used to advance the split-barrel sampler in the borings performed on this site. A greater efficiency is typically achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope. Published correlations between the SPT values and soil properties are based on the lower efficiency cathead and rope method. This higher efficiency affects the standard penetration resistance blow count (N) value by increasing the penetration per hammer blow over what would be obtained using the cathead and rope method. The effect of the automatic hammer's efficiency has been considered in the interpretation and analysis of the subsurface information for this report.

Explorations were located in the field by using available site plans, paced measurement and line-of-site referencing existing site features. The accuracy of exploration locations should only be assumed to the level implied by the method used.

Visual classifications of soil are shown on the individual exploration logs included in **Appendix B** which include boring B-2 from the previous explorations. Groundwater conditions were evaluated in each exploration at the time of site exploration program.

BORING LOG

Project:	Hamilton-Wenham Regional High School Athletic Facilities Improvements
Location:	Hamilton, Massachusetts
Nobis Project No.:	100451.000
Boring No.:	**B-101**
Boring Location:	See Exploration Location Plan
Checked by:	K.Stanway
Date Start:	July 7, 2022
Date Finish:	July 7, 2022
Contractor:	New England Boring Contractors
Driller:	M. Thompson
Nobis Rep.:	S. Pape
Rig Type / Model:	ATV Track Rig / Mobile B-57
Hammer Type:	Automatic Hammer
Hammer Hoist:	Automatic
Ground Surface Elev.:	(+/-) 43
Datum:	NAVD 88

	Drilling Method	Sampler
Type	Hollow Stem Auger	Split-Spoon
Size ID (in.)	2-1/4	1-3/8
Advancement	Augered	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
▼ 07/07/22	08:40	7.5	4	8	While Sampling
▼ 07/07/22	09:00	6.5	10	12	While Sampling
▽ 07/07/22	09:40	5.3	OUT	Not Obs	5 min

Depth (ft.)	Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	Ground Water	Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	NOTES
1	S-1	20	0-2	4			42.7 / 0.3 TOPSOIL	S-1A (3"): Dense, brown, fine SAND AND SILT, very few fine roots. Dry. (TOPSOIL).	
				10				S-1B (17"): Dense, brown, fine to coarse SAND, some Silt, little fine to coarse Gravel. Dry. (FILL).	
2				31					
				38					
3	S-2	15	2-4	34			FILL	S-2: Dense, brown, fine to coarse SAND, some fine to coarse Gravel, some Silt, very few roots. Organic odor observed. Dry to moist. (FILL).	
				27					
4				19					
				22					
5	S-3	21	4-6	7				S-3A (12"): Medium dense, brown, fine to coarse SAND, some fine to coarse Gravel, little Silt. Organic odor observed. Moist. (FILL).	
				7			38.0 / 5.0		
6				7	▽		37.9 / 5.1 BURIED TOPSOIL	S-3B (1"): Medium dense, dark brown, Organic SILT, very few fine roots. Organic odor observed. (TOPSOIL).	
				9					
7	S-4	12	6-8	19	▼		CLAYEY SILT 37.0 / 6.0	S-3C (8"): Medium dense, gray with orange mottling, CLAY & SILT, some fine to coarse Sand, little fine to coarse Gravel. Wet. (CLAY).	
				19					
8				20	▼			S-4: Dense, orangish brown, fine to coarse SAND and fine to coarse Gravel, little Silt. Wet. (SAND AND GRAVEL).	
				22					
9	S-5	13	8-10	27				S-5: Dense, orangish brown, fine to coarse SAND and fine to coarse Gravel, little Silt. Wet. (SAND AND GRAVEL).	
				21					
10				19			SAND AND GRAVEL WITH SILT		
				19					
11	S-6	8	10-12	2				S-6: Medium dense, orange-brown, fine to coarse GRAVEL and fine to coarse Sand, little Silt. Wet. (SAND AND GRAVEL).	
				8					
12				15					
				24					
13									
14							29.5 / 13.5		
15									
16	S-7	12	15-17	5			SAND & SILT	S-7: Dense, orange-brown, fine SILT, some fine Sand. Wet. (SILT). Laboratory Analysis - Grain Size Sieve Only [0.2% GRAVEL, 31.6% SAND, 68.2% FINES].	
				17					
17				20					
				19					
18									
19							24.5 / 18.5		
20									
21	S-8	17	20-22	13			SILTS & CLAYS	S-8A (10"): Very stiff, gray, CLAY & SILT. Wet. (CLAY).	
				11					
22				7				S-8B (7"): Very stiff, gray, Silty CLAY. Wet. (CLAY).	
				9			21.0 / 22.0		
23								Boring terminated at 22 feet.	1
24									
25									

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:

1) Borehole backfilled with soil cuttings.

Soil descriptions, and lithology, are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

BORING LOG

Project:	Hamilton-Wenham Regional High School Athletic Facilities Improvements
Location:	Hamilton, Massachusetts
Nobis Project No.:	100451.000
Boring No.:	**B-102**
Boring Location:	See Exploration Location Plan
Checked by:	K.Stanway
Date Start:	July 7, 2022
Date Finish:	July 7, 2022
Contractor:	New England Boring Contractors
Driller:	M. Thompson
Nobis Rep.:	S. Pape
Rig Type / Model:	ATV Track Rig / Mobile B-57
Hammer Type:	Automatic Hammer
Hammer Hoist:	Automatic
Ground Surface Elev.:	(+/-) 42.5
Datum:	NAVD 88

	Drilling Method	Sampler
Type	Hollow Stem Auger	Split-Spoon
Size ID (in.)	2-1/4	1-3/8
Advancement	Augered	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
▽ 07/07/22	10:25	8.5	5	9	While Sampling

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	Ground Water	Graphic	Stratum Elev. / Depth (ft.)	Sample Description and Remarks (Classification System: Modified Burmister)	Notes
1	S-1	10	0-2	4			42.2 / 0.3 TOPSOIL	S-1A (4"): Dense, brown, SILT, some fine to coarse Sand, Numerous fine roots. Dry. (TOPSOIL).	
2				14				S-1B (6"): Dense, brown, fine to coarse SAND, some fine to coarse Gravel, little Silt. Dry. (FILL).	
3	S-2	12	2-4	24			FILL	S-2: Dense, brown, fine to coarse SAND, some fine to coarse Gravel, little Silt. Dry to moist. (FILL).	
4				32					
5	S-3	17	5-7	18					
6				17					
7				17					
8	S-4	17	7-9	14			37.5 / 5.0 ORGANIC DEPOSITS	S-3A (6"): Medium dense, dark brown, SILT and fine to medium Sand, some Organic Fibers. Organic odor observed. Wet. (ORGANIC DEPOSITS).	
9				2			36.8 / 5.7	S-3B (11"): Medium dense, orangish brown, fine to coarse SAND and fine to coarse Gravel, little Silt. Wet. (SAND AND GRAVEL).	
10				6	▽			S-4: Very dense, orange-brown, fine to coarse SAND, some fine to coarse Gravel, little Silt. Wet. (SAND AND GRAVEL).	
11	S-5	10	10-12	13			SAND AND GRAVEL		
12				32				S-5: Dense, orange-brown, fine to coarse GRAVEL, some fine to coarse Sand, some Silt. Wet. (SAND AND GRAVEL).	
13				16					
14				20					
15				14					
16	S-6	16	15-17	12			29.0 / 13.5 SILTS & CLAYS	S-6: Very stiff, orange-brown, Clayey SILT, trace fine to medium Sand. Redoximorphic staining present around 15 to 16 feet. Wet. (CLAY).	
17				12					
18				15					
19				15			25.5 / 17.0	Boring terminated at 17 feet.	1
20									
21									
22									
23									
24									
25									

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:

1) Borehole backfilled with soil cuttings.

Soil descriptions, and lithology, are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

BORING LOG

nobis

Project: Hamilton-Wenham Regional High School
Athletic Facilities Improvements
Location: Hamilton, Massachusetts
Nobis Project No.: 100451.000

Boring No.: **B-103**
Boring Location: See Exploration Location Plan
Checked by: K.Stanway
Date Start: July 7, 2022
Date Finish: July 7, 2022

Contractor: New England Boring Contractors
Driller: M. Thompson
Nobis Rep.: S. Pape

Rig Type / Model: ATV Track Rig / Mobile B-57
Hammer Type: Automatic Hammer
Hammer Hoist: Automatic

Ground Surface Elev.: (+/-) 41.5
Datum: NAVD 88

	Drilling Method	Sampler
Type	Hollow Stem Auger	Split-Spoon
Size ID (in.)	2-1/4	1-3/8
Advancement	Augered	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
▼ 07/07/22	12:00	14.2	20	22	While Sampling
▼ 07/07/22	12:10	9	12	Not Obs	5 min
▽ 07/07/22	12:25	7.8	OUT	Not Obs	10 min

Depth (ft.)	Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	Ground Water	Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	NOTES
1	S-1	14	0-2	2			TOPSOIL 41.0 / 0.5	S-1A (5"): Loose, tan, SILT and fine Sand. Few fine roots. Dry. (TOPSOIL).	
				14				S-1B (9"): Dense, brown, fine to coarse GRAVEL, some fine to coarse Sand, little Silt. Dry. (FILL).	
2				18					
				18			FILL		
3	S-2	11	2-4	11				S-2: Medium dense, brown, fine to coarse SAND, little fine to coarse Gravel, little Silt. Dry. (FILL).	
				10					
4				9					
				11			37.5 / 4.0		
5									
6	S-3	20	5-7	3			ORGANIC DEPOSITS	S-3: Loose, dark brown, fine to coarse SAND AND SILT, trace fine to coarse Gravel, trace Organic Silt. Moist. (ORGANIC DEPOSITS).	
				5					
7				5					
				5					
8	S-4	18	7-9	3	▽			S-4A (6"): Loose, dark brown, fine to coarse SAND AND SILT, trace fine to coarse Gravel, trace Organic Silt. Moist. (ORGANIC DEPOSITS).	
				3			33.5 / 8.0		
9				12				S-4B (6"): Loose, black, Organic SILT, some fine to coarse Sand, some Silt, few partially decomposed organic fibers. Moist to wet. (ORGANIC DEPOSITS).	
				15	▼		SAND AND GRAVEL WITH SILT		
10								S-4C (6"): Medium dense, gray, fine to coarse SAND, some fine to coarse Gravel, some Silt. Wet. (SAND AND GRAVEL).	
							31.5 / 10.0		
11	S-5	13	10-12	7				S-5: Very stiff, orange-brown, Clayey SILT, trace fine Sand. Redoximorphic staining present. Wet. (CLAY).	
				9					
12				10					
				10					
13									
14									
					▼				
15									
16	S-6	15	15-17	3			SILTS & CLAYS	S-6: Very stiff, orange-brown, SILT & CLAY. Redoximorphic staining present. Wet. (CLAY).	
				7					
17				10					
				11					
18									
19									
20									
21	S-7	22	20-22	5				S-7A (6"): Medium dense, brown, SILT, trace fine Sand. Wet. (SILT).	
				8				S-7B (16"): Stiff, gray, SILT & CLAY. Wet. (CLAY).	
22				5					
				4			19.5 / 22.0		
23								Boring terminated at 22 feet.	1
24									
25									

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:
1) Borehole backfilled with soil cuttings.

Soil descriptions, and lithology, are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

BORING LOG

nobis

Project: Hamilton-Wenham Regional High School
Athletic Facilities Improvements
Location: Hamilton, Massachusetts
Nobis Project No.: 100451.000

Boring No.: **B-104**
Boring Location: See Exploration Location Plan
Checked by: K.Stanway
Date Start: July 7, 2022
Date Finish: July 7, 2022

Contractor: New England Boring Contractors
Driller: M. Thompson
Nobis Rep.: S. Pape

Rig Type / Model: ATV Track Rig / Mobile B-57
Hammer Type: Automatic Hammer
Hammer Hoist: Automatic

Ground Surface Elev.: (+/-) 43
Datum: NAVD 88

	Drilling Method	Sampler
Type	Hollow Stem Auger	Split-Spoon
Size ID (in.)	2-1/4	1-3/8
Advancement	Augered	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
▽ 07/07/22	13:43	6	7	17	5 min

Depth (ft.)	Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	Ground Water	Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	NOTES
1	S-1	15	0-2	3 11			TOPSOIL 42.5 / 0.5	S-1A (7"): Dense, brown, Organic SILT and fine to medium Sand. Few fine roots. Dry. (TOPSOIL).	
2				28 11				S-1B (8"): Dense, brown, fine to coarse SAND, little fine to coarse Gravel, little Silt. Dry. (FILL).	
3	S-2	10	2-3	35 80			FILL	S-2: Very dense, brown, fine to coarse SAND, little fine to coarse Gravel, little Silt. Dry. (FILL).	
4									
5							38.0 / 5.0		
6	S-3	14	5-7	11 25	▽		CLAYEY SILT 37.5 / 5.5	S-3A (3"): Hard, gray, Clayey SILT, trace fine Sand. Redoximorphic staining present. Moist. (CLAY).	
7				21 21			SAND AND GRAVEL	S-3B (11"): Dense, brown, fine to coarse SAND and fine to coarse Gravel, little Silt. Moist to wet. (SAND AND GRAVEL).	
8	S-4	14	7-9	10 11				S-4A (12"): Medium dense, brown, fine to coarse SAND, some fine to coarse Gravel, little Silt. Wet. (SAND).	
9				13 14			34.5 / 8.5		
10								S-4B (2"): Medium dense, tan, SILT, some fine to medium Sand. Wet. (SILT).	
11	S-5	23	10-12	6 13				S-5: Medium dense, orange-brown, SILT, trace fine Sand. Wet. (SILT).	
12				15 20					
13							SANDY SILT		
14									
15									
16	S-6	22	15-17	4 10				S-6: Medium dense, orange-brown, SILT, little fine Sand. Redoximorphic staining present. Wet. (SILT).	
17				14 18			26.0 / 17.0		
18								Boring terminated at 17 feet.	1
19									
20									
21									
22									
23									
24									
25									

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:
1) Borehole backfilled with soil cuttings.

Soil descriptions, and lithology, are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

BORING LOG

Project: Hamilton-Wenham Regional High School
Athletic Facilities Improvements
Location: Hamilton, Massachusetts
Nobis Project No.: 100451.000

Boring No.: **B-105**
Boring Location: See Exploration Location Plan
Checked by: K.Stanway
Date Start: July 7, 2022
Date Finish: July 7, 2022

Contractor: New England Boring Contractors
Driller: M. Thompson
Nobis Rep.: S. Pape

Rig Type / Model: ATV Track Rig / Mobile B-57
Hammer Type: Automatic Hammer
Hammer Hoist: Automatic

Ground Surface Elev.:
Datum: NAVD 88

	Drilling Method	Sampler
Type	Hollow Stem Auger	Split-Spoon
Size ID (in.)	2-1/4	1-3/8
Advancement	Augered	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
▽ 07/07/22	15:22	5.5	OUT	24	5 min

Depth (ft.)	Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	Ground Water	Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	NOTES
1	S-1	14	0-2	4 11			TOPSOIL / 1.0	S-1A (10"): Medium dense, light brown, SILT, some fine to coarse Sand, very few fine roots. Dry. (TOPSOIL).	
2				20 25				S-1B (4"): Dense, brown, fine to coarse SAND, little Silt, little fine Gravel. Dry. (SAND).	
3	S-2	17	2-4	19 17				S-2A (3"): Dense, brown, fine to coarse SAND, little Silt, little fine Gravel. Dry. (SAND). S-2B (14"): Dense, tan, fine to coarse SAND, little Silt, trace fine Gravel. Dry to moist. (SAND).	
4				18 20			SAND		
5									
6	S-3	18	5-7	5 7	▽		/ 6.0	S-3A (9"): Medium dense, brown, fine to medium SAND, trace fine Gravel, trace Silt. Wet. (SAND).	
7				9 10			SILT AND SAND	S-3B (9"): Medium dense, brown, fine to medium SAND & SILT, trace fine Gravel. Wet. (SAND).	
8	S-4	16	7-9	9 9			/ 8.0	S-4A (8"): Medium dense, brown, fine to medium SAND & SILT, trace fine Gravel. Wet. (SAND).	
9				10 13				S-4B (8"): Very stiff, tan-gray, Clayey SILT, little fine Sand. Redoximorphic staining present. Wet. (CLAY).	
10									
11	S-5	11	10-12	5 7				S-5: Very stiff, gray-tan, Clayey SILT, little fine Sand. Redoximorphic staining present. Wet. (CLAY).	
12				10 12					
13									
14									
15									
16	S-6	10	15-17	9 3			SILTS & CLAYS	S-6A (2"): Medium stiff, tan, Clayey SILT, little fine Sand. Wet. (CLAY). S-6B (8"): Medium stiff, gray, SILT & CLAY. Wet. (CLAY).	
17				2 5					
18									
19									
20									
21	S-7	24	20-22	WOH /12"				S-7: Very soft, gray, Silty CLAY. Wet. (CLAY). Small Torvane: 500-750 psf, Medium Torvane: 500-700 psf, Laboratory Analysis - Atterberg [LL=42, PL=26, PI=16].	1
22				1 2					
23	S-8	24	22-24	WOH /18"				S-8: Very soft, gray, Silty CLAY. Wet. (CLAY). Medium Torvane: 600 psf at top to 200 psf at bottom.	
24				2			/ 24.0		
25								Boring terminated at 24 feet.	2

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:
1) The Torvane is intended for use on undisturbed soils. Split-spoon samples are disturbed. Values provided should be considered a lower limit of potential in-situ shear strengths.
2) Borehole backfilled with soil cuttings.

Soil descriptions, and lithology, are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

BORING LOG

Nobis — Engineering a Sustainable Future

Project: Hamilton Wenham Regional High School
775 Bay Road
Location: South Hamilton, Massachusetts
Nobis Project No.: 91770

Boring No.: B-2
Boring Location: See Site Plan
Checked by: SMC
Date Start: August 11, 2016
Date Finish: August 11, 2016

Contractor: New England Boring Contractors
Driller: M. Soucy
Nobis Rep.: J. Keohane

Rig Type / Model: ATV Track Rig / CME 55
Hammer Type: Safety Hammer
Hammer Hoist: Rope & Cathead

Ground Surface Elev.: (+/-) 97
Datum: Site Datum (Assumed)

	Drilling Method	Sampler
Type	Hollow Stem Auger	Split-Spoon
Size ID (in.)	2-1/2	1-3/8
Advancement	Augered	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
▼ 08/11/16	00:00	7	5	7	WS

Depth (ft.)	Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	Ground Water	Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	NOTES
1	S-1	15	0-2	4			96.8 / 0.2 TOPSOIL	3 inches topsoil moist. (TOPSOIL).	
2				10				S-1: Dense, brown, fine to medium SAND, little Gravel, little Silt. dry.	
3				26			SAND		
4				29					
5							92.0 / 5.0		
6	S-2	18	5-7	8				S-2: Medium dense, brown, fine SAND, some Silt. moist. sample wet at 7 feet.	
7				10	▼				
8				12					
9				15					
10							SILTY SAND		
11	S-3	18	10-12	14				S-3: Dense, alternating seams of brown and gray, fine SAND, some Silt. wet.	
12				16					
13				21					
14				17					
15							82.0 / 15.0		
16	S-4	24	15-17	6				S-4: Stiff, gray, Clayey SILT, trace fine Sand. wet.	
17				7					
18				7					
19				6			CLAYEY SILT		
20							77.0 / 20.0		
21	S-5	24	20-22	3				S-5: Medium stiff, gray, Silty CLAY. wet.	
22				3			SILTY CLAY		
23				3			75.0 / 22.0		
24				3				Boring terminated at 22 feet.	
25									

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:
1) Borehole backfilled with auger cuttings upon completion.
2) WS - While Sampling

Soil descriptions are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

APPENDIX C
Laboratory Test Reports

ConTest Consultants, Inc.

Providing Inspection/Testing & Consulting Services

LETTER OF TRANSMITTAL

TO: Nobis Group – Brien Waterman

DATE: 7/26/2022

PROJECT: Hamilton-Wenham HS Fields (100451.000) – Hamilton, MA

CTC PROJECT NO.: 222165

Attached are the following for your use:

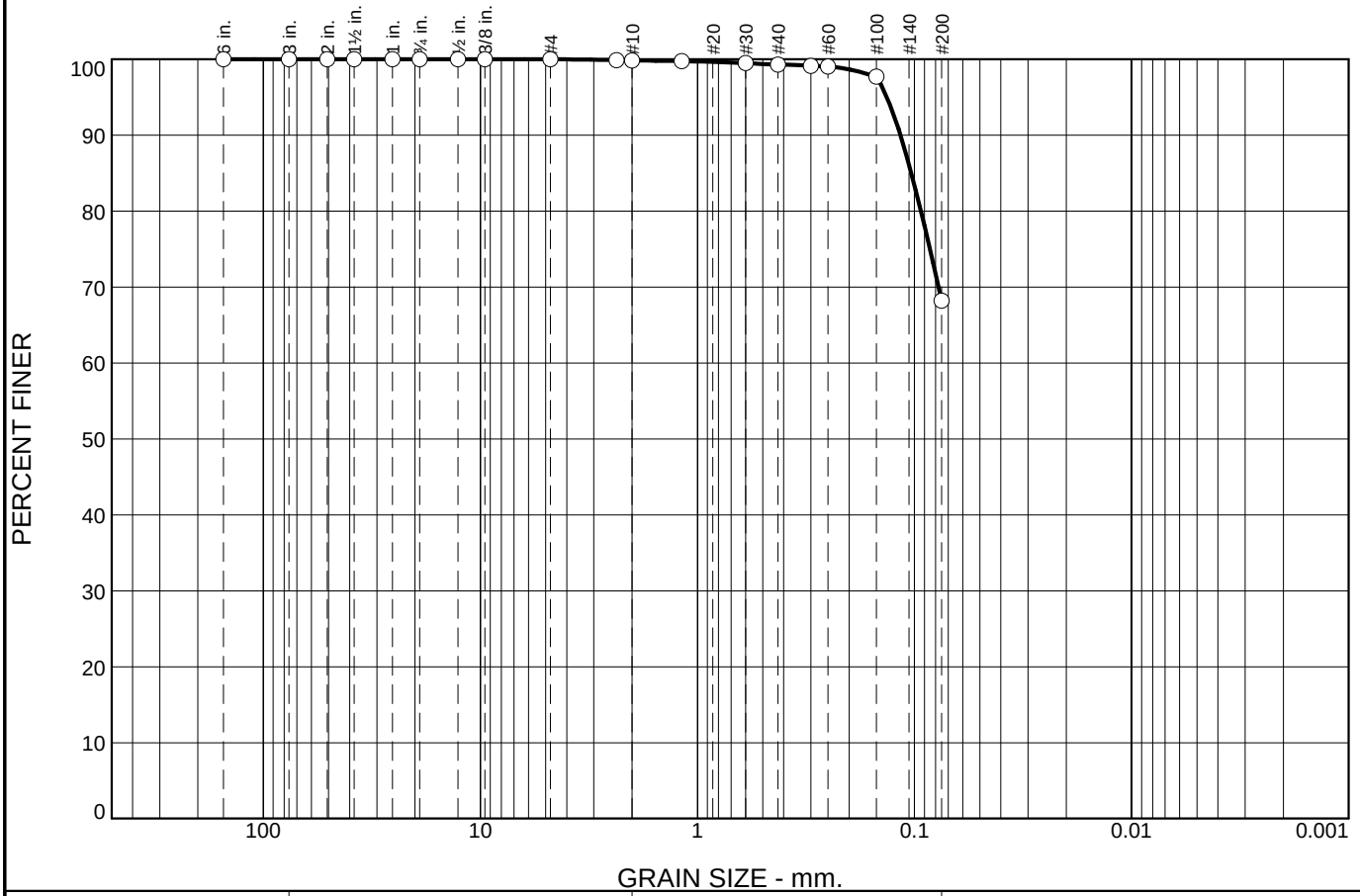
COPIES	DATE	LAB NUMBER	DESCRIPTION
			Concrete Report - Cylinders
			Concrete Inspection Report
			Reinforcing Steel Inspection Report
			Field Density Report
1		L-264-22	Particle Size Distribution Report
			Organic Content Letter
1		L-265-22	Atterberg Limit Report w/ Moisture Content

CC: Nobis Group - Serena Pape

Reviewed By: Donald Walden

18 Cote Ave. Unit 11 Goffstown, NH 03045
p (603) 626-4422 • *f* (603) 782-0064
www.contestconsultantsinc.com

Particle Size Distribution Report



% +3"	% Gravel			% Sand			% Fines
	Coarse	Medium	Fine	Coarse	Medium	Fine	
0.0	0.0	0.0	0.2	0.3	0.5	30.8	68.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
6"	100.0		
3"	100.0		
2"	100.0		
1.5"	100.0		
1"	100.0		
3/4"	100.0		
1/2"	100.0		
3/8"	100.0		
#4	100.0		
#8	99.9		
#10	99.8		
#16	99.8		
#30	99.5		
#40	99.3		
#50	99.1		
#60	99.0		
#100	97.7		
#200	68.2		

* (no specification provided)

Soil Description

SILT, some fine Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1161 D_{85}= 0.1035 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

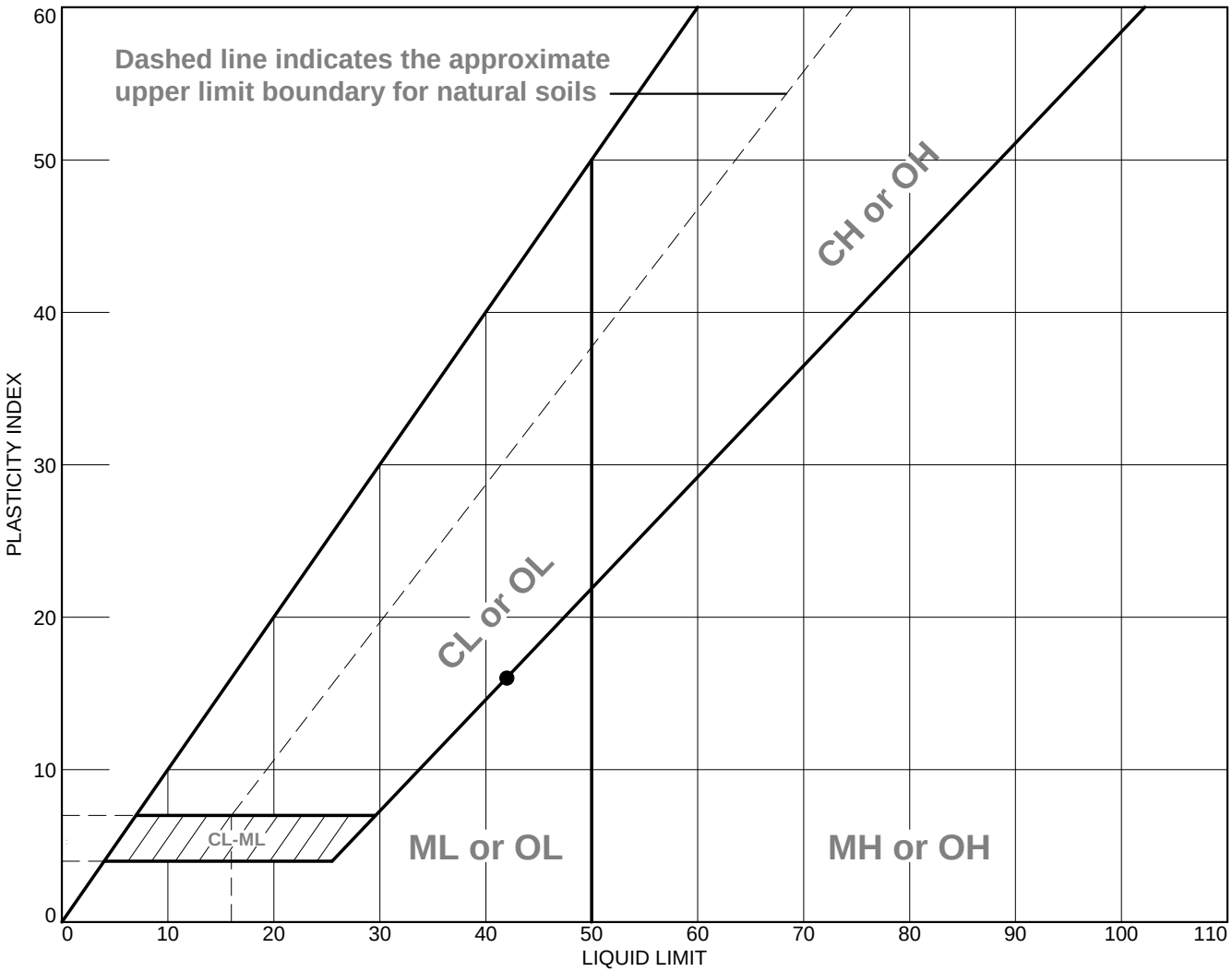
Location: B-101 / S-7
Sample Number: L-264-22 **Depth:** 15.0' - 17.0' **Date:** 7/18/2022

ConTest Consultants, Inc.

Goffstown, New Hampshire

Client: Nobis Group
Project: Hamilton-Wenham HS Fields (100451.000)
Hamilton, MA
Project No: 222165 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	42	26	16			

Project No. 222165 **Client:** Nobis Group

Project: Hamilton-Wenham HS Fields (100451.000)
Hamilton, MA

● **Location:** B-105 / S-7 **Depth:** 20.0' - 22.0' **Sample Number:** L-265-22

Remarks:

● Received Moisture Content: 26.2%

ConTest Consultants, Inc.

Goffstown, New Hampshire

Figure