GEOTECHNICAL ENGINEERING REPORT
PROPOSED LINCOLN-ELIOT ELEMENTARY SCHOOL EXPANSION
150 JACKSON ROAD
NEWTON, MASSACHUSETTS

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EXECUTIVE SUMMARY

Ransom Consulting, LLC (Ransom) has prepared this Geotechnical Engineering Report for Arrowstreet, Inc. (Arrowstreet) for the proposed Lincoln-Eliot Elementary School expansion and renovations project, located at 150 Jackson Road in Newton, Massachusetts (the "Site"). This geotechnical report has been prepared in general accordance with our proposed scope of work, dated November 16, 2018, and revised February 17, 2022.

The Site includes a single parcel of land identified by the City of Newton as Property 12003 0004AQ and includes approximately 5.71 acres. The Site is currently developed with a two and three-story brick and concrete building with a small additional lower (basement) level. The school building encompasses an approximate gross building area of 99,451 square feet. The school building was constructed in 1965. The Site is currently occupied by the Newton Early Childhood Program with associated parking areas and recreation areas.

Ransom understands that construction is planned for the existing building including razing the northern wing and constructing a new wing and interior renovations to the remainder of the building, as well as improvements to the parking, playgrounds and the addition of an athletic field.

The geotechnical subsurface exploration program was conducted for the Site on February 24, 2022. The subsurface exploration program consisted of the advancement of four test borings, designated B201 through B204, and ten test pits, designated TP-02 through TP-11. The test pits were excavated to depths up to approximately 10 feet below the ground surface, and the borings to depths up to approximately 19 feet below the ground surface. Surficial geology maps indicate that the area along Jackson Road generally consists of placed fill materials at the ground surface, overlying glacial till. In general, the subsurface explorations encountered surficial layers of asphalt or topsoil, underlain by fill materials, organic materials, glacial till, and bedrock.

Water-saturated soils were encountered at soil boring B202 and test pit TP-3. Saturated soils, inferred to be indicative of groundwater, were observed at depths of approximately 10 and 5 feet below grade at explorations B202 and TP-3, respectively, corresponding to approximate elevations of 28 and 29 feet above mean sea level (MSL). Based on an assumed finished floor elevation of 45 feet above MSL we do not anticipate encountering groundwater in the proposed foundation excavations. The depth to groundwater should be considered when designing the proposed foundations and utilities. Depending on the final design elevations, groundwater may be encountered during excavation for proposed building foundations and utilities.

The inferred bedrock surface was observed at depths ranging from approximately 0.75 to 19 feet below grade, corresponding to elevations ranging from approximately 23.5 feet to 48 feet above MSL. The elevation of bedrock in the area of the proposed school expansion was approximately 29 to 40 feet above MSL. Assuming a finished floor elevation of 45 feet above MSL, bedrock is not anticipated to be encountered in foundation excavations. The depth to bedrock should be considered when designing the proposed building and utilities. Depending on the final design elevations, bedrock may be encountered during excavation for proposed building foundations and utilities. The bedrock surface is likely irregular, and areas of bedrock shallower than the elevations in the Site explorations should be anticipated during construction.

The fill materials and organic materials are considered unsuitable for providing support to the proposed building foundation elements. Unsuitable soils will require removal and replacement with compacted

structural fill within all areas proposed for new buildings/expansions. Unsuitable soils were generally encountered to depths up to approximately 3 to 8 feet below grade. These soils could likely be left in place below areas proposed for parking and play areas, provided that they are found to perform well during proof-rolling activities that should be conducted at the time of construction.

The native glacial till soils are considered to be the uppermost suitable bearing strata at the Site. With proper site preparation, the proposed building foundations could be supported on continuous and spread footings that bear directly on the native glacial till soils and/or compacted structural fill placed above the undisturbed, inorganic, native soils or bedrock. Foundation elements for buildings should be proportioned using a maximum allowable contact pressure of 3,500 pounds per square foot (psf).

Fill materials and organic materials were encountered within the footprint of the proposed building expansion. The fill materials and organic materials have the potential for non-uniform settlement that may exceed tolerable settlement limits. These unsuitable soils within the footprint of proposed structures should be excavated and replaced with compacted structural fill. Floor slabs should be underlain by a minimum of 12 inches of compacted structural fill.

To avoid adverse impacts on existing buildings, any new foundation elements needed to support new structures or building expansions should be located outside the zone of influence of the existing building foundations. For this purpose, the zone of influence should be considered the zone beneath lines extending downward and outward at a slope of one horizontal to one vertical (1H:1V) from the outside edges of the footings. If new footings must be located near or within this zone, the need for possible underpinning of the existing foundations or other special construction considerations should be evaluated.

Conversely, if proposed foundation elements are located at a higher elevation than existing building foundations, they could impose significant lateral loads on the existing foundation walls. We assume that the existing walls were not designed to resist these additional loads, and therefore, adjacent new footings will have to be lower than the existing building foundation walls to avoid application of additional lateral loads to the existing walls.

For the purposes of seismic design, the soil profile constitutes a “stiff soil profile” and we assign a seismic site class of “D” to the Site. It is our opinion that the Site soils are not susceptible to liquefaction.

Ransom should be provided the opportunity to review the final plans and specifications to confirm that the recommendations made in this report were interpreted and implemented as intended.

TABLE OF CONTENTS

1.0 INTRODUCTION

Ransom Consulting, LLC (Ransom) has prepared this Geotechnical Engineering Report for Arrowstreet, Inc. (Arrowstreet) for the proposed Lincoln-Eliot Elementary School expansion/renovation project at the property located at 15 Walnut Park (also known as 150 Jackson Road) in Newton, Massachusetts (the "Site"). This geotechnical report has been prepared in general accordance with our proposed scope of work titled "Proposed Scope of Work and Cost Estimate", dated November 16, 2018, and revised February 17, 2022. The general location of the Site can be seen on Figure 1.

This geotechnical engineering evaluation was performed to obtain site-specific subsurface soil information and to make geotechnical evaluations and recommendations for the proposed expansion. As completed, Ransom's scope of services included the following items:

1. Subcontracting and coordinating with a drilling contractor, excavator, and private utility locator, marking the Site for utility clearance, and contacting the Dig Safe utility clearance system as required by law.

2. Providing technical monitoring for the subsurface explorations, collecting soil samples, and preparing exploration logs.

3. Evaluating the data with respect to the proposed redevelopment and preparing this report of our findings, evaluations, and recommendations for the proposed design and construction.

2.0 SITE AND PROJECT DESCRIPTIONS

The Site is currently the location of the Newton Early Childhood Program and includes a single parcel of land located in Newton, Massachusetts. The parcel is identified by the City of Newton as Property 12003 0004AQ and includes approximately 5.71 acres. A Site Location Map and Subsurface Exploration Plan are provided as Figures 1 and 2, respectively.

2.1 Existing Conditions

The Site is currently developed with a two and three-story brick and concrete building with a small additional lower (basement) level. The school building encompasses an approximate gross building area of 99,451 square feet. The school building was constructed in 1965. The Site is currently occupied by the Newton Early Childhood Program with associated parking areas and recreation areas.

Site topography generally slopes downward to the west and northwest towards Jackson Road. Based on the Newton, Massachusetts United States Geological Survey (USGS) 7.5-minute Quadrangle and the "Existing Conditions Plan" provided by Nitsch Engineering, dated April 2019, Site elevations vary from approximately 29 feet above Mean Sea Level (MSL) in the northwestern gravel lot to approximately 60 feet above MSL neighboring the easternmost portions of the Site building.

2.2 Proposed Redevelopment

Ransom understands that construction is planned for the school building including interior renovations and razing the northern wing and constructing a new wing as well as improvements to the parking, playgrounds and the addition of an athletic field.

At the time of this report, a proposed grading plan had not been developed. We anticipate that the finished floor elevation of the expansion will approximately match the existing grades in the area at elevation 45 feet above MSL. Ransom assumes minor grade cuts and fills may be required for improvements to the parking, playgrounds, and addition of an athletic field.

3.0 SUBSURFACE INVESTIGATION

The geotechnical subsurface exploration program was conducted for the Site on February 24, 2022. The subsurface exploration program consisted of the advancement of four test borings, designated B201 through B204, and ten test pits, designated TP-02 through TP-11, as shown on Figure 2. The explorations were not surveyed; their locations and elevations should be considered approximate.

3.1 Subsurface Explorations

The test borings were performed by Technical Drilling Services (TDS) of Sterling, Massachusetts, with a track-mounted drill rig using a 2.75-inch, inside-diameter, hollow-stem auger. Split barrel sampling with standard penetration testing (SPT, ASTM D 1586) was conducted using an automatic drive hammer continuously from the ground surface to depths of approximately 6 feet below the ground surface (bgs) and at 5-foot intervals thereafter to the bottom of the borings or as advised by Ransom's field representative.

The test pits were performed by Trident Environmental Group, LLC (Trident) of Norfolk, Massachusetts with a Caterpillar 305C CR mini excavator with a maximum reach of approximately 10 feet. Test pits were completed to the max reach of the excavator or until refusal, whichever came first. All soils removed during the completion of the test pits were returned to the excavations and compacted with the excavator bucket to grade. The two test pits completed in the asphalt paved parking lot (TP-02 and TP-03), were saw cut through the asphalt as to not damage surface conditions outside of the test pit area. Following completion of these test pits, they were backfilled, compacted with the excavator bucket and topped with gravel, at which point asphalt repairs were completed by the Newton Department of Public Works (Newton DPW).

A Ransom representative monitored subsurface exploration activities, prepared exploration logs, and measured the depths to groundwater. Soil samples were placed in sealed containers and returned to Ransom's office for further evaluation. Soil samples were visually classified using modified Burmister Soil Classification System descriptors. Exploration logs are included in Appendix A.

3.2 Underground Utility Survey

Prior to conducting the subsurface explorations, Ransom coordinated an underground utility locating survey performed by TPI Environmental (TPI) to confirm the presence or absence of underground utilities in locations proposed for subsurface explorations. Ransom monitored the survey that was performed on February 22, 2022. The survey was completed by TPI using both ground-penetrating radar (GPR) and electromagnetic (EM) conductivity technologies.

4.0 SUBSURFACE CONDITIONS

Surficial geology maps indicate that the area along Jackson Road generally consists of placed fill materials at the ground surface, overlying glacial till. Subsurface conditions at the Site were characterized by advancing test borings and test pits into the unconsolidated overburden soil formations at accessible locations at the Site. Figure 2 illustrates the existing Site features and approximate exploration locations.

4.1 Subsurface Soils

The explorations were advanced to depths ranging from approximately 2 to 19 feet below grade corresponding to elevations ranging from approximately 23.5 to 48 feet above MSL. Subsurface conditions generally consisted of surficial layers of asphalt or topsoil, underlain by fill materials, organic materials, glacial till, and bedrock.

The general characteristics of the subsurface layers are described below in order of increasing depth encountered below the ground surface.

Surficial Materials

The explorations encountered asphalt pavement at four of the test pit locations. The asphalt was observed to be approximately 2 to 4 inches thick. The asphalt was saw cut prior to the test pit excavations. A layer of topsoil was encountered at each of the test pits and the soil borings with the exception of test pit TP-07 (fill material observed at surface). The topsoil was observed to be approximately 4 to 9 inches thick.

Fill Material

Fill materials were encountered at 9 of the 14 exploration locations, consisting of brown, coarse to fine-grained sand and gravel, with little silt, containing cobbles, brick, ruble, asphalt, metal, and/or slag. The fill materials were generally observed from beneath the surface materials extending to depths ranging from approximately 2 to 7 feet below grade, and generally in a medium dense to dense condition based on SPT testing.

Organic Materials

A layer of organic materials was observed in explorations B203, TP-02, TP-03, TP-05, TP-06, TP-08, and TP-09. The organic material was observed below the fill materials at depths of approximately 3 to 7 feet below grade, with a thickness ranging from approximately 3 inches to 1.5 feet. The organic materials are generally described as dark brown fine sand and silt with organics and varying amounts of cobbles. The presence of organic materials was more common at areas of the Site nearest Jackson Road. We believe the organic layer is likely indicative of the former ground surface prior to filling.

Glacial Till

A native glacial till deposit was encountered directly underlying the fill materials and organic materials (where present) at each exploration location. The glacial till deposit generally consisted of brown to gray, fine to medium sand with some silt and varying amounts of clay and gravel. The glacial till soils were generally observed to be in a medium dense to very dense condition based on SPT testing. The glacial till

deposit is classified as silty sand or silty sand with gravel (SM) in general accordance with the Unified Soil Classification System (USCS).

4.2 Refusal/Bedrock

Refusal, the depth at which the drilling or excavating equipment was not able to penetrate the deeper geologic formations, was encountered at each of the test borings at depths ranging from approximately 4 to 19 feet below grade, corresponding to elevations ranging from approximately 29 to 40 feet above MSL. Refusal was encountered at 9 of the 10 test pit locations, at depths ranging from approximately 8 inches to 9.5 feet below grade, corresponding to elevations ranging from approximately 23.5 to 48 feet above MSL. Test pit TP-06 was completed to the extent of the reach of the excavator at 10 feet below grade without refusal. Drilling/excavator refusal is inferred to represent the bedrock surface or large boulders. The observed refusal depths and elevations are presented in the table below.

Table 1 –Refusal Elevations

Test Pit ID	Estimated Ground Surface Elevation (feet)	Approximate Refusal Depth (feet)	Approximate Refusal Elevation (feet above MSL)
B201	53	15.25	37.75
B202	48	19	29
B203	45	13	32
B204	44	4.3	39.7
TP-2	33	9.5	23.5
TP-3	34	5	29
TP-4	37	5.5	31.5
TP-5	39	6	33
TP-6	32	NE (>10)	NE (<22)
TP-7	35	6	29
TP-8	50	9	41
TP-9	50	4	46
TP-10	50	0.75	48
TP-11	50	2.5	47.5

Notes:

1. Estimated ground surface elevations obtained from aerial imagery. Elevations should be considered approximate.
2. NE = Not Encountered.

4.3 Groundwater

Water-saturated soils were encountered at soil boring B202 and test pit TP-3. Saturated soils, inferred to be indicative of groundwater, were observed at depths of approximately 10 and 5 feet below grade at

explorations B202 and TP-3, respectively, corresponding to approximate elevations of 28 and 29 feet above MSL.

Groundwater levels at the Site will fluctuate due to season, temperature, precipitation, nearby underground utilities, and construction activity. Therefore, water levels at other times may differ from the observations and measurements made during this evaluation.

5.0 ENGINEERING EVALUATIONS

The subsurface explorations encountered surficial layers of topsoil or asphalt overlying fill materials, organic materials, glacial till, and bedrock. The controlling geotechnical features for the development of the Site are:

1. Foundation-Bearing Soils - The naturally-occurring glacial till soils are considered the uppermost suitable bearing stratum for the proposed foundations at the Site. The proposed structures could be supported on conventional, shallow foundation systems of spread and continuous footings that bear on the naturally occurring glacial till or on structural fill placed and properly compacted above these soils or bedrock.

2. Unsuitable Soils. The fill materials and organic materials are considered unsuitable for providing support to the proposed building foundation elements. Unsuitable soils will require removal and replacement with compacted structural fill within all areas proposed for new buildings/expansions. Unsuitable soils were generally encountered to depths of approximately 3 to 8 feet below grade. These soils could likely be left in place below areas proposed for parking and play areas provided that they are found to perform well during proof-rolling activities that should be conducted at the time of construction.

3. Groundwater - Saturated soils were encountered in just two of the explorations, at depths of approximately 5 to 10 feet below grade, corresponding to elevations of approximately 28 to 29 feet above MSL. Based on an assumed finished floor elevation of 45 feet above MSL we do not anticipate encountering groundwater in the proposed foundation excavations. The depth of groundwater should be considered when designing the proposed buildings and utilities.

4. Bedrock - The inferred bedrock surface was observed at depths ranging from approximately 0.75 to 19 feet below grade, corresponding to elevations ranging from 23.5 feet to 48 feet above MSL. The elevation of bedrock in the area of the proposed school expansion was approximately 29 to 40 feet above MSL. Assuming a finished floor elevation of 45 feet above MSL, bedrock is not anticipated to be encountered in foundation excavations. The depth to bedrock should be considered when designing the proposed foundations and utilities. Depending on the final design elevations, bedrock may be encountered during excavation for proposed building foundations and utilities. The bedrock surface is likely irregular, and areas of bedrock shallower than the elevations in the Site explorations should be anticipated during construction.

Geotechnical engineering evaluations for this project are based on the subsurface conditions interpreted from widely spaced subsurface explorations and the project design information currently available. Should differing information become known prior to or during construction, the following evaluations and recommendations should be reviewed by Ransom and modifications to these recommendations may be necessary.

6.0 DESIGN RECOMMENDATIONS

Based on the subsurface explorations and our geotechnical evaluations, Ransom presents the following recommendations for the design of the proposed renovations and new construction at the proposed Lincoln-Eliot School expansion/renovation at 150 Jackson Road in Newton, Massachusetts.

6.1 Building Foundations

The subsurface conditions generally consist of topsoil or asphalt overlying fill materials, organic materials, glacial till, and bedrock. The native glacial till soils are considered the uppermost suitable bearing strata for foundation elements. Surficial layers, fill materials, and organic materials located within the footprint of proposed buildings/expansions should be excavated and replaced with compacted structural fill. Excavation to remove and replace the unsuitable soils is anticipated to generally be less than 8 feet below grade. With proper site preparation, the proposed building foundations could be supported on continuous and spread footings that bear directly on the native glacial till soils and/or compacted structural fill placed above the undisturbed, inorganic, native soils or bedrock.

Foundation elements for buildings should be proportioned using a maximum allowable contact pressure of 3,500 pounds per square foot (psf). Spread footings should be at least 2 feet wide and continuous footings should be at least 1.5 feet wide. Post-construction total and differential settlements are anticipated to be no more than approximately 1 inch and 0.5 inch, respectively.

Lateral loads may be resisted by friction between the bottoms of footings and supporting subgrades, and by passive earth pressure against the sides of the foundation. A friction coefficient of 0.45 and an equivalent fluid unit weight of 200 pounds per cubic foot (pcf) against the sides of footings should be used.

Exterior footings should be placed a minimum of 4 feet below the lowest existing or proposed adjacent ground surface exposed to freezing. If exposure to freezing is anticipated during or after construction, any interior footings should be lowered to bear 4 feet below the top of the ground floor slab or protected from frost. To avoid adverse impacts on existing buildings, any new foundation elements needed to support new structures or building expansions should be located outside the zone of influence of the existing building foundations . For this purpose, the zone of influence should be considered the zone beneath lines extending downward and outward at a slope of one horizontal to one vertical (1H:1V) from the outside edges of the footings. If new footings must be located near or within this zone, the need for possible underpinning of the existing foundations or other special construction considerations should be evaluated.

Conversely, if proposed foundation elements are located at a higher elevation than existing building foundations, they could impose significant lateral loads on the existing foundation walls. We assume that the existing walls were not designed to resist these additional loads, and therefore, adjacent new footings will have to be lower than the existing building foundation walls to avoid application of additional lateral loads to the existing walls.

6.2 Floor Slabs

Fill materials and organic materials were encountered within the footprint of the proposed building expansion. The fill materials and organic materials have the potential for non-uniform settlement that may exceed tolerable settlement limits. These unsuitable soils within the footprint of proposed structures

should be excavated and replaced with compacted structural fill. Floor slabs should be underlain by a minimum of 12 inches of compacted structural fill. With proper Site preparation, conditions are suitable for a slab-on-grade ground floor. A modulus of subgrade reaction of 200 pounds per cubic inch (pci) should be used to proportion the slabs-on-grade constructed on properly compacted structural fill.

Exterior slabs at entrances should be underlain by at least 4 feet of free-draining material, such as structural fill or crushed stone, to reduce the potential for frost heaving. Surrounding grades should be sloped away from the buildings to reduce available moisture for forming frost and ice.

6.3 Seismic Considerations

For the purposes of seismic design, the soil profile constitutes a "stiff soil profile" and we assign a seismic site class of "D" to the Site. It is our opinion that the Site soils are not susceptible to liquefaction.

6.4 Groundwater and Drainage Issues

Saturated soils were encountered in just two of the explorations, at depths of approximately 5 to 10 feet below grade, corresponding to elevations of approximately 28 to 29 feet above MSL. Based on an assumed finished floor elevation of 45 feet above MSL we do not anticipate encountering groundwater in the proposed foundation excavations. The depth of groundwater should be considered when designing the proposed building and utilities. Depending on the final design elevations, groundwater may be encountered during excavation for proposed building foundations and utilities.

The buildings should be constructed with perimeter foundation drainage systems if the foundation elevations are within 4 feet of the observed groundwater elevation. The perimeter drainage systems should consist of 4-inch-diameter, flexible polyethylene pipe with perforations of ¼ to ½ inch (openings should be oriented downward). The drain lines should be surrounded by a minimum of 6 inches of ¾-inch crushed stone wrapped in a nonwoven geotextile filter fabric (Mirafi 140N or approved equivalent). The foundation drains should be placed adjacent to the exterior sides of the spread footings at a minimum depth of 4 feet below adjacent exterior grades to protect against frost.

Where possible, the foundation drains should be pitched down at a minimum slope of 0.5 percent in the direction of flow. Cleanouts should be provided at every other 90-degree bend in order to provide for future flushing of the system as needed.

The foundation drains should be gravity drained to daylight or to a suitable system outlet. The final outlet of the drainage systems should be designed by the project Civil Engineer in consideration of all applicable municipal, state, and federal regulations.

Roof downspout drains should not be connected to the foundation drain system. Roof downspouts should be separately tight lined to their discharge outlets.

If basement levels are proposed additional moisture control measures such as slab underdrains and/or vapor barriers may be warranted. Ransom should be provided the opportunity to review the final design to reevaluate the need for drainage and moisture control measures at that time.

7.0 EARTHWORK AND CONSTRUCTION RECOMMENDATIONS

Based on the subsurface explorations and our geotechnical evaluations, Ransom presents the following recommendations for the construction of the proposed renovations and new buildings for the proposed Lincoln-Eliot School at 150 Jackson Road in Newton, Massachusetts.

7.1 Subgrade Preparation

The surficial materials, fill materials, and organic materials are considered to be unsuitable for providing support to the proposed structures. The native glacial till soils are considered to be the uppermost suitable bearing strata at this Site.

All topsoil, unsuitable soils, debris, and loose or disturbed soils should be removed from below the building footprints and foundation bearing zones. These unsuitable materials should be completely removed from foundation bearing zones (to the lateral limits defined by a one horizontal to one vertical (1H:1V) line sloped down and away from the bottom edge of foundations to the top of undisturbed native till soils) and replaced with compacted structural fill.

After site stripping has been completed, the subgrade beneath the building footprints and 10 feet beyond, parking lots, loading areas, and driveways should be compacted with at least four complete passes of a 15-ton vibratory drum roller in directions perpendicular to one another. Silty subgrades which are saturated or are observed to pump and weave during rolling should be rolled statically.

Unstable subgrade areas would be characterized by weaving or rutting of more than one inch during proof rolling. Any unstable areas identified should be undercut at least 12 inches, or to competent soil, and replaced with compacted structural fill, crushed stone, or common fill. The depth of undercutting and type of backfill material should be selected with consideration of proposed use (i.e., building or pavement) and soil and weather conditions encountered during construction.

The contractor is responsible for construction means and methods and should anticipate the need for methods to prevent disturbance, softening, or rutting of subgrades, or damage to overlying soils resulting from construction traffic. Care must be taken to avoid disturbing subgrades by keeping construction traffic off of subgrades during wet conditions and/or inclement weather until a firm fill layer has been placed. Subgrade soils that become unstable should be undercut and replaced with structural fill, crushed stone or common fill, as necessary.

Final foundation subgrade preparation should include re-compaction of bearing surfaces. Care should be taken to limit disturbance to bearing surfaces prior to placement of concrete. Any loose, softened, or disturbed material should be removed and replaced with compacted structural fill prior to placement of concrete. Excavated subgrades should not be left exposed overnight unless the forecast calls for above-freezing, clear conditions.

7.2 Temporary Excavations

Construction site safety means and methods, and sequencing of construction activities is the sole responsibility of the contractor. Under no circumstances should the following information be interpreted to mean that Ransom is assuming responsibility for construction site safety, trench protection, or the contractor's responsibilities. Such responsibility is not being implied and should not be inferred.

All temporary excavations should be performed according to Occupational Safety and Health Administration (OSHA) Standards (29 CFR 1926 Subpart P). The fill materials and glacial till soils are OSHA Type C soils and should be cut for temporary unbraced excavations no steeper than 1.5H:1V under dry or dewatered conditions.

7.3 Dewatering and Runoff Control

Saturated soils were encountered in the explorations at depths of approximately 5 to 10 feet below grade, corresponding to elevations of approximately 28 to 29 feet above MSL. It is likely that groundwater will be encountered in some excavations for foundations and utilities. The contractor should be prepared to implement water controls as needed.

Surface water runoff should be directed away from excavations to reduce dewatering efforts and to protect subgrades from becoming soft and unstable. The contractor should anticipate the need for controlling runoff during wet periods; pumping from open sumps will likely provide adequate control of water within excavations during construction.

Earthwork should be completed "in the dry" if possible. Subgrade soils that become unstable should be undercut and replaced with structural fill or crushed stone, as necessary. Excavation side slopes should be monitored for potential seepage and maintained to promote stability, accordingly.

Temporary detention ponds, trenches, ditches, and dewatering sumps should not be made in areas to be filled.

7.4 Placement of Granular Engineered Fills

Engineered fills may be required to achieve the final design grades in areas of the Site. The table below presents recommended gradation specifications for soils used in engineered fills at the Site. Reference is made to materials, described by the Massachusetts Highway Department (MHD) *Standard Specifications for Highways and Bridges*, as possible alternatives. The different granular fill types should be used as follows:

1. Structural Fill should be used for engineered fills below proposed building and foundation areas.

2. Common Fill should be used for engineered fills below roadway, parking, and other non-structural areas.

Type	Size or Sieve	% Passing
Structural Fill MHD M1.03.0a	6" (150 mm) 1/2" (12.5 mm) No. 4 (4.75 µm) No. 50 (300 µm) No. 200 (75 µm)	100 50–85 40–75 8–28 0–10
Common Fill	8" No. 200 (75 µm)	100 0–15 (when placed within 4 feet of finished grade in paved areas)

All granular fills should be placed in 12-inch maximum loose lifts and should be compacted to a minimum of 95 percent of the material's maximum dry density, as determined by ASTM D 1557 (modified proctor test) and confirmed through field density testing (ASTM D 6938 or equivalent method). Lift thickness should be a maximum of 6-inch loose lifts when compacted with hand-guided equipment.

Where subgrades become saturated, unstable, and/or difficult to compact, ¾-inch crushed stone (or approved equivalent) should be placed and compacted in lieu of structural fill. Crushed stone, when used, should be wrapped in a geotextile filter fabric, such as Mirafi 140N or equal. At no time should structural fill or common fill be placed over crushed stone that has not been wrapped in a geotextile filter fabric.

7.5 Reuse of Site Soils

A preliminary assessment of the suitability of using the unconsolidated soils at the Site in the proposed construction is based on the soil classifications and observations at the Site. The suitability of these materials is summarized below.

1. Topsoils and organic materials are suitable only for reuse in landscaped areas.

2. The naturally-occurring glacial till soils that will be excavated are suitable for reuse only as common fill below non-structural areas and landscaped areas. The high fines content will make reusing this material difficult if the moisture content is not controlled.

3. The existing fill materials that will be excavated might be suitable for reuse as common fill below non-structural areas and landscaped areas following additional evaluations, such as grain size analyses, at the time of construction.

Materials to be used as structural fill may need to be imported to the Site. Representative samples of all proposed fills should be submitted for testing during construction to compare their gradation characteristics to the requirements of the project specifications, and to establish their optimum water contents and maximum dry densities (modified Proctor testing, ASTM D 1557). The geotechnical engineer must approve use and reuse of on-site or borrow soils for structural and common fills. Use of fills assumes that the moisture content of the material will be strictly controlled in order to allow for proper placement and compaction.

7.6 Underground Utilities

Bedding placed below utilities should be in accordance with the utility and manufacturer requirements. In general, utilities may be supported directly on a minimum 6-inch-thick layer of compacted structural fill, crushed stone, or other suitable pipe bedding materials. Fill placed as backfill for utilities below building floor slabs should consist of compacted structural fill or crushed stone. Elsewhere, fill placed as backfill for utilities should consist of compacted common fill.

7.7 Construction Quality Control

Ransom should be provided the opportunity to review the final design drawings and specifications to ensure our recommendations presented in this report have been properly interpreted and applied. All fills, backfills, and compaction should be inspected and tested by a qualified firm to make sure the proper materials are placed and adequately compacted. Ransom should review all soil inspection and testing

reports. Ransom should be retained to provide construction observation for the following aspects of site redevelopment:

1. Observe the subsurface conditions as they are exposed and confirm that the exposed conditions are as anticipated in this report;

2. Provide geotechnical observation of foundation, floor slab, and pavement subgrade preparations;

3. Confirm that the soils used as fills and backfills conform to the project specifications; and

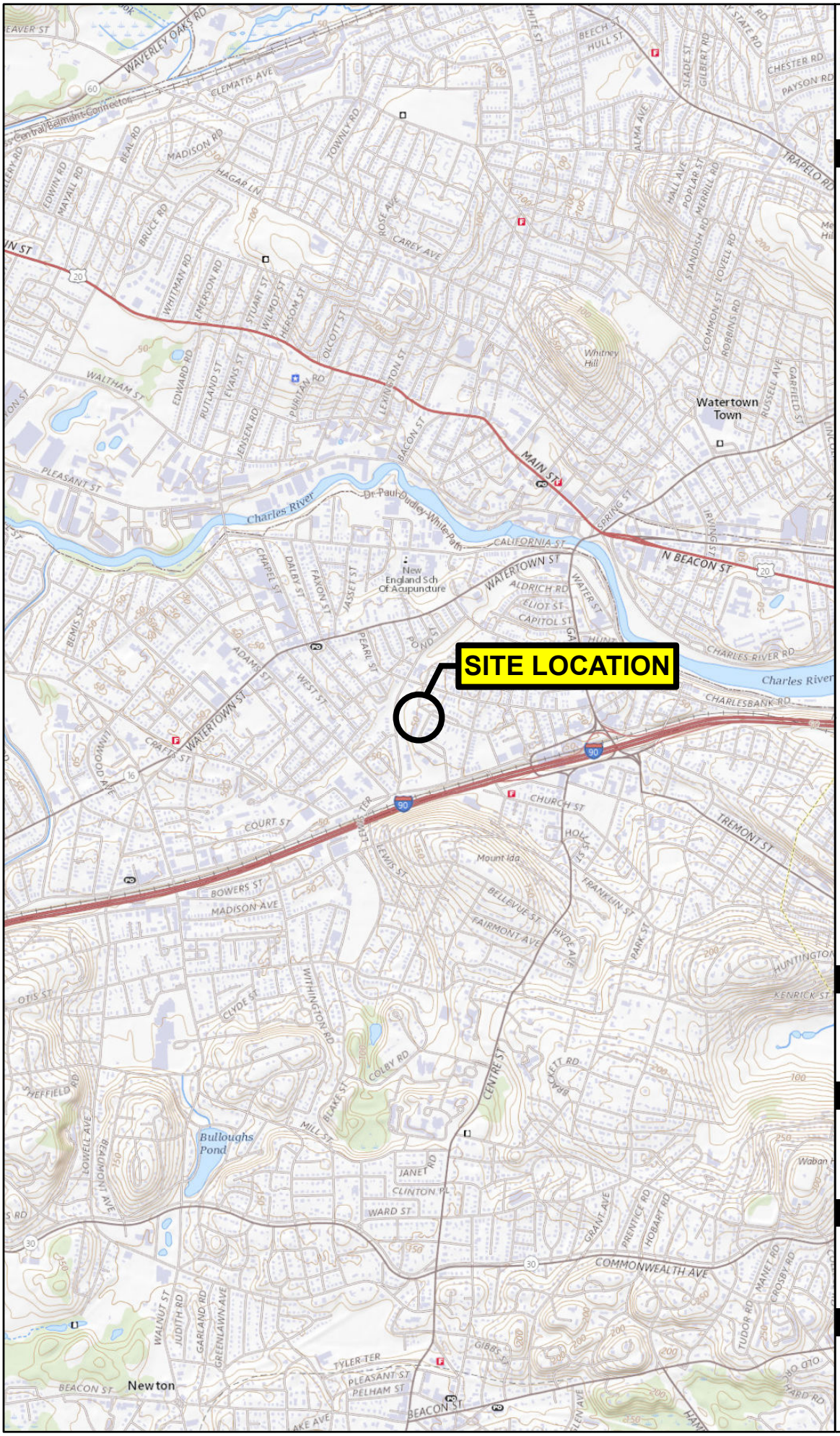
4. Document the preparation of foundation bearing surfaces and other subgrades.

8.0 CLOSING COMMENTS

This report has been prepared for specific application to the proposed expansion and renovations of the existing building for the Lincoln-Eliot Elementary School expansion/renovations at 150 Jackson Road in Newton, Massachusetts as understood by Ransom at the time of this report. In the event that material changes in the design or location of the proposed structures are planned, the conclusions and recommendations contained in this report should not be considered valid unless they have been reviewed and modified or verified in writing by Ransom. Our recommendations are based in part upon data obtained from widely spaced explorations. The nature and extent of variations between explorations will not become evident until construction. If significant variations then appear, it may be necessary to reevaluate the recommendations of this report.

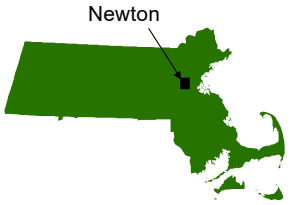
We recommend that Ransom be provided the opportunity to review the final design plans and project specifications in order to confirm that the recommendations made in this report were interpreted and implemented as intended.

The findings, recommendations, specifications, and professional opinions contained within this project geotechnical report have been prepared in accordance with generally accepted professional geotechnical engineering practice. No other warranties are implied or expressed.



RANSOM Consulting, LLC

Regional Locator Map



Notes

1. Data Source: USGS. The National Map
2. USGS Quad Name: Newton, Massachusetts
3. Latitude: 42°21'28.622"N Longitude: 71°11'39.065"W

Scale and Orientation

0 1,000 2,000

1 inch = 2,000 feet

Prepared For

Arrowstreet, Inc.
10 Post Office Square
Suite 700N
Boston, Massachusetts

Site Address

Proposed Lincoln Eliot Elementary School
150 Jackson Road
Newton, MA

222.01003 | March 2022

Figure 1

Site Location Map

X:\Ransom_NewEngland\Massachusetts\Newton_MA\LincolnEliotElemSchool\LEES_NewtonMA_F1_SLM.mxd

RANSOM Consulting, LLC

Legend & Notes

- Site Boundary
- Soil Boring
- Test Pit

Notes

1. Site Plan based on MassGIS. USGS Orthos. 2021.
2. Some features are approximate in location and scale
3. This plan has been prepared for Arrowstreet, Inc. . All other uses are not authorized unless written permission is obtained from Ransom Consulting, LLC.

Scale & Orientation

0 50 100

1 inch = 100 feet

Prepared For

Arrowstreet, Inc.
10 Post Office Square
Suite 700N
Boston, Massachusetts

Site Address

Lincoln Eliot Elementary School
150 Jackson Road
Newton, MA

222.01003 | March 2022

Figure 2

Subsurface Exploration Location Plan

X:\Ransom_NewEngland\Massachusetts\Newton_MA\LincolnEliotElemSchool\LEES_NewtonMA_F2_SP.mxd

APPENDIX A

Exploration Logs

Geotechnical Engineering Report
Proposed Lincoln-Eliot Elementary School Expansion
150 Jackson Road
Newton, Massachusetts

RANSOM

TEST PIT LOG

Project: Proposed Lincoln Eliot School	Project #: 222.01003.001
TEST PIT IDENTIFICATION: TP-02	
Location: 150 Jackson Road	Ground Elevation: +/-33 feet
Client: Arrowstreet	Datum: NAVD
Contractor: Trident	Operator: Jack N.
Equipment: Caterpillar 305C Excavator	Samples Collected _X_ Yes __ No
Capacity/Reach: ≈10 feet	Time Started: 0830 Time Completed: 0825
Weather: +/-20º, windy	
Logged by: DTC	Date: 2/24/22
Checked by: HED	Date: 3/23/22

TEST PIT INFORMATION

Depth of Stratum Change Feet	Sample No. and Type	Sample Depth Feet	Soil Description
0-3′	S1	0-3′	Brown, coarse SAND and GRAVEL with cobbles, trace silt, moist, some slag and rubble.
3-5′	S2		Brown, silty SAND, some cobbles, little clay, moist.
5-8.5′	S3		Brown, silty CLAY, little gravel and cobbles. Shale fragment at approximately 6-7′, moist, becoming more damp and clayey with depth, but not saturated.
8.5-9.5′	S4		Black, fine SAND with silt and organics, moist.
			Bucket refusal on boulder/ledge, nearly at reach. End of TP-02 at 9.5′ bgs. Backfilled with native, compacted.

Pit Dimensions (Feet): Length 10 Width 3 Depth 9.5	Remarks: Saw cut asphalt (4″ thick). DPW to patch asphalt.

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TEST PIT LOG

Project: Proposed Lincoln Eliot School	Project #: 222.01003.001
TEST PIT IDENTIFICATION: TP-03	
Location: 150 Jackson Road	Ground Elevation: +/-34 feet
Client: Arrowstreet	Datum: NAVD
Contractor: Trident	Operator: Jack N.
Equipment: Caterpillar 305C Excavator	Samples Collected _X_ Yes __ No
Capacity/Reach: ≈10 feet	Time Started: 0930 Time Completed: 1010
Weather: +/-20º, windy	
Logged by: DTC	Date: 2/24/22
Checked by: HED	Date: 3/23/22

TEST PIT INFORMATION

Depth of Stratum Change Feet	Sample No. and Type	Sample Depth Feet	Soil Description
0-2.5′	S1		Brown, coarse SAND and GRAVEL fill with slag, metal debris, rubble, etc., moist, cobbles.
			Ledge at 2.5′ in northern extent of test pit, southern portion fragmented and can be broken.
2.5-3.0′	S2		Gray CLAY, large wood debris and ledge cobbles, moist.
5.5′			Becoming wet at 5′, consistency becoming crushed stone intermixed with gray clay ledge/stone appears to be shale/schist based on exposed surfaces with quartz veins/nodes.
			End of test pit at 5.5′ (ledge with wet clay), backfilled with native and compacted.

Pit Dimensions (Feet): Length 10 Width 3 Depth 2.5 (north) to 5.6 (south)	Remarks: Saw cut asphalt (4″ thick). DPW to patch asphalt.

TEST PIT LOG

Project: Proposed Lincoln Eliot School	Project #: 222.01003.001
TEST PIT IDENTIFICATION: TP-04	
Location: 150 Jackson Road	Ground Elevation: +/-37 feet
Client: Arrowstreet	Datum: NAVD
Contractor: Trident	Operator: Jack N.
Equipment: Caterpillar 305C Excavator	Samples Collected _X_ Yes __ No
Capacity/Reach: ≈10 feet	Time Started: 1140 Time Completed: 1210
Weather: +/-20º, windy	
Logged by: DTC	Date: 2/24/22
Checked by: HED	Date: 3/23/22

TEST PIT INFORMATION

Depth of Stratum Change Feet	Sample No. and Type	Sample Depth Feet	Soil Description
0-5.5′	S1		Brown, coarse SAND and GRAVEL (fill), moist with brick, rubble, slag and cobbles. Concrete filled pipe (bollard) at approximately 5′.
			Refusal on ledge/boulder at 5.5′, no groundwater encountered. Backfilled with native and compacted.

Pit Dimensions (Feet): Length 10 Width 3 Depth 5.5	Remarks: Saw cut 2″ asphalt.

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TEST PIT LOG

Project: Proposed Lincoln Eliot School	Project #: 222.01003.001
TEST PIT IDENTIFICATION: TP-05	
Location: 150 Jackson Road	Ground Elevation: +/-39 feet
Client: Arrowstreet	Datum: NAVD
Contractor: Trident	Operator: Jack N.
Equipment: Caterpillar 305C Excavator	Samples Collected _X_Yes__No
Capacity/Reach: ≈10 feet	Time Started: 1250 Time Completed:
Weather: +/-30º, windy	
Logged by: DTC	Date: 2/24/22
Checked by: HED	Date: 3/23/22

TEST PIT INFORMATION

Depth of Stratum Change Feet	Sample No. and Type	Sample Depth Feet	Soil Description
0-1.5′			Black, coarse SAND and GRAVEL, some crushed asphalt (fill).
1.5-6′	S1		Brown, coarse SAND and GRAVEL, some cobbles and organics. Larger boulder fragments 4-6′.
			Refusal on boulder/ledge at 6′. Backfilled with native and compacted.

Pit Dimensions (Feet): Length 7 Width 3 Depth 6	Remarks: Saw cut 2″ asphalt.

RANSOM

TEST PIT LOG

Project: Proposed Lincoln Eliot School	Project #: 222.01003.001
TEST PIT IDENTIFICATION: TP-06	
Location: 150 Jackson Road	Ground Elevation: +/-32 feet
Client: Arrowstreet	Datum: NAVD
Contractor: Trident	Operator: Jack N.
Equipment: Caterpillar 305C Excavator	Samples Collected _X_ Yes __ No
Capacity/Reach: ≈10 feet	Time Started: 1015 Time Completed: 1100
Weather: +/-20º, windy, cloudy	
Logged by: DTC	Date: 2/24/22
Checked by: HED	Date: 3/23/22

TEST PIT INFORMATION

Depth of Stratum Change Feet	Sample No. and Type	Sample Depth Feet	Soil Description
0-7′	S1		Brown, moist, coarse SAND and GRAVEL with cobbles, brick rubble, slag, little silty clay, large boulder/ledge cobles at 3′.
7-10′			Rusty, light brown, moist, silty fine SAND with trace cobbles and organic matter. Becoming mixed with large, well-rounded cobbles at 8.5-9′.
			End of test pit 10′ (max reach/sidewalls collapsing). Groundwater not encountered. Backfilled with native and compacted.

Pit Dimensions (Feet): Length 10 Width 3 Depth 10	Remarks:

TEST PIT LOG

Project: Proposed Lincoln Eliot School	Project #: 222.01003.001
TEST PIT IDENTIFICATION: TP-07	
Location: 150 Jackson Road	Ground Elevation: +/-35 feet
Client: Arrowstreet	Datum: NAVD
Contractor: Trident	Operator: Jack N.
Equipment: Caterpillar 305C Excavator	Samples Collected _X_Yes__No
Capacity/Reach: ≈10 feet	Time Started: 1105 Time Completed: 1135
Weather: +/-20º, windy, cloudy	
Logged by: DTC	Date: 2/24/22
Checked by: HED	Date: 2/23/22

TEST PIT INFORMATION

Depth of Stratum Change Feet	Sample No. and Type	Sample Depth Feet	Soil Description
0-6′	S1		Brown, coarse SAND and GRAVEL (fill), dry to moist with cobbles, brick rubble and slag. Becoming mixed with large broken cobble/ledge at approximately 3′, less rubble.
			Refusal on boulder or ledge at 6′, excavator couldn't get through or around. Groundwater not encountered. Backfilled with native and compacted.

Pit Dimensions (Feet): Length 10 Width 3 Depth 6	Remarks: Some asphalt and rubble at surface.

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TEST PIT LOG

Project: Proposed Lincoln Eliot School	Project #: 222.01003.001
TEST PIT IDENTIFICATION: TP-08	
Location: 150 Jackson Road	Ground Elevation: +/-50 feet
Client: Arrowstreet	Datum: NAVD
Contractor: Trident	Operator: Jack N.
Equipment: Caterpillar 305C Excavator	Samples Collected _X_ Yes __ No
Capacity/Reach: ≈10 feet	Time Started: 1340 Time Completed: 1400
Weather: +/-30º, cloudy	
Logged by: DTC	Date: 2/24/22
Checked by: HED	Date: 3/23/22

TEST PIT INFORMATION

Depth of Stratum Change Feet	Sample No. and Type	Sample Depth Feet	Soil Description
0-4′	S1		4″ loamy TOPSOIL, over light to dark brown, silty fine SAND with little gravel and cobbles, moist.
4-9′	S2		Brown, clayey SAND, moist with cobbles, rock fragments and organics.
			Refusal on boulder/ledge at 9′ 4″. Backfilled with native and compacted.

Pit Dimensions (Feet): Length 8 Width 3 Depth 9′ 4″	Remarks:

RANSOM

TEST PIT LOG

Project: Proposed Lincoln Eliot School	Project #: 222.01003.001
TEST PIT IDENTIFICATION: TP-09	
Location: 150 Jackson Road	Ground Elevation: +/-50 feet
Client: Arrowstreet	Datum: NAVD
Contractor: Trident	Operator: Jack N.
Equipment: Caterpillar 305C Excavator	Samples Collected _X_ Yes __ No
Capacity/Reach: ≈10 feet	Time Started: 1405 Time Completed: 1420
Weather: +/-30º, cloudy	
Logged by: DTC	Date: 2/24/22
Checked by: HED	Date: 3/23/22

TEST PIT INFORMATION

Depth of Stratum Change Feet	Sample No. and Type	Sample Depth Feet	Soil Description
0-4′	S1		4″ Loamy TOPSOIL, moist, over brown, clayey SAND and GRAVEL with cobbles (pockets of dark brown, silty sand with woody debris and organic matter, only several observed).
			Refusal on boulder/ledge at 4′. Backfilled with native and compacted.

Pit Dimensions (Feet): Length 8 Width 3 Depth 4	Remarks:

RANSOM

TEST PIT LOG

Project: Proposed Lincoln Eliot School	Project #: 222.01003.001
TEST PIT IDENTIFICATION: TP-10	
Location: 150 Jackson Road	Ground Elevation: +/-50 feet
Client: Arrowstreet	Datum: NAVD
Contractor: Trident	Operator: Jack N.
Equipment: Caterpillar 305C Excavator	Samples Collected __Yes X No
Capacity/Reach: ≈10 feet	Time Started: 1420 Time Completed: 1435
Weather: +/-30º, cloudy	
Logged by: DTC	Date: 2/24/22
Checked by: HED	Date: 3/23/22

TEST PIT INFORMATION

Depth of Stratum Change Feet	Sample No. and Type	Sample Depth Feet	Soil Description
0-2’	S1		Ledge encountered 6″ beneath topsoil. Extended north 3′, same conditions. Extended south approximately 5′, ledge dipping south sightly to max of 2′ bgs. Soil consists of 4″ topsoil underlain by brown, clayey sand, moist with cobbles. No sample collected, same as TP-09-S1.
			Refusal on ledge 6″ to 2′ bgs.

Pit Dimensions (Feet): Length 14 Width 3 Depth 6″ to 2′	Remarks:

RANSOM

TEST PIT LOG

Project: Proposed Lincoln Eliot School	Project #: 222.01003.001
TEST PIT IDENTIFICATION: TP-11	
Location: 150 Jackson Road	Ground Elevation: +/-50 feet
Client: Arrowstreet	Datum: NAVD
Contractor: Trident	Operator: Jack N.
Equipment: Caterpillar 305C Excavator	Samples Collected _X_ Yes __ No
Capacity/Reach: ≈10 feet	Time Started: 1437 Time Completed: 1450
Weather: +/-30º, cloudy	
Logged by: DTC	Date: 2/24/22
Checked by: HED	Date: 3/23/22

TEST PIT INFORMATION

Depth of Stratum Change Feet	Sample No. and Type	Sample Depth Feet	Soil Description
0-2.5’	S1		Ledge encountered approximately 8″ bgs in center of test pit, dips to south to approximately 1′ bgs to refusal. Dips north to max depth of 2.5′ bgs to refusal. Soils encountered above ledge (TP-11-S1) consisted of approximately 4″ topsoil underlain by brown, silty sand with gravel and cobbles.
			Refusal 8″ to 2.5′ on ledge. Backfilled and compacted.
Pit Dimensions (Feet): Length 10 Width 3 Depth 0.75″ to 2′			Remarks:

BORING LOG
B201

Project Number: 222.01003.002	Drilling Company: TDS	Total Depth: 15 Feet, 3 Inches
Project: Lincoln Eliot Expansion	Drilling Method: Hollow-stem auger	Datum: NAVD
Site Location: 150 Jackson Road	Drilling Equipment: Track-Mounted Rig	Start/Finish Date: 2/24/22
Newton, Massachusetts	Boring Diameter: 8 inches	Logged by: QSH
Client: Arrowstreet	Surface Elevation (ft): +/-53	Reviewed by: JPJ
Water Levels:	During Drilling: NE	End of Boring: Date:

DESCRIPTION Based on USCS and Modified Burmister Soil Classification System	Soil Profile	SAMPLE*	SAMPLE NUMBER	PENETRATION / RECOVERY	BLOWS (PER 6")	SPT-N VALUE	PID/FID (PPM)	DEPTH (FT.)	WELL CONSTRUCTION
S1 (0-2') TOPSOIL, trace medium gravel.	TOPSOIL		S1	24/7	2-3-1-1	4		1	
								2	
S2 (2-4') Medium dense, brown, fine SAND, some silt, trace fine to medium gravel.	SAND		S2	24/5	5-9-14-11	23		3	
								4	
S3 (4-6') 3" Dense, brown, fine SAND, some silt, trace fine to medium gravel, over 6" tan, fine SAND, little silt, trace fine gravel, over 7" tan/gray, fine to medium SAND, some fine to medium gravel, trace silt.	SAND		S3	24/16	2-10-25-42	35		5	
								6	
Augered to 10'.								7	
								8	
								9	
								10	
S4 (10-12') Medium dense, gray/tan, fine to coarse SAND, some fine to medium gravel, trace silt.	SAND		S4	3/0	8-12-13-11	25		11	
								12	
								13	
								14	
								15	
Auger refusal, end of boring 15' 3".								16	
								17	
								18	
								19	

Notes:

Well Legend:

FS	NF	B	BG	C	
Filter Sand	Native Fill	Bentonite	Bentonite grout	Concrete	PVC Screen

NA=not applicable; NM=not measured; NE=not encountered
*Sample designated with black fill submitted for laboratory analysis.

BORING LOG
B202

Project Number: 222.01003.002	Drilling Company: TDS	Total Depth: 19 Feet
Project: Lincoln Eliot Expansion	Drilling Method: Hollow-stem auger	Datum: NAVD
Site Location: 150 Jackson Road	Drilling Equipment: Track-Mounted Rig	Start/Finish Date: 2/24/22
Newton, Massachusetts	Boring Diameter: 8 inches	Logged by: QSH
Client: Arrowstreet	Surface Elevation (ft): +/-48	Reviewed by: JPJ
Water Levels:	During Drilling: 10-11' End of Boring:	Date:

DESCRIPTION Based on USCS and Modified Burmister Soil Classification System	Soil Profile	SAMPLE*	SAMPLE NUMBER	PENETRATION / RECOVERY	BLOWS (PER 6")	SPT-N VALUE	PID/FID (PPM)	DEPTH (FT.)	WELL CONSTRUCTION
TOPSOIL									
S1 (0-2') 9" TOPSOIL, over 9" tan/brown, fine SAND and SILT, trace fine gravel.			S1	24/18	5-5-6-5	11		1	
								2	
S2 (2-4') Medium dense, tan/brown, fine SAND and SILT, trace fine gravel.	SAND & SILT		S2	24/19	6-7-9-20	16		3	
Augered through boulder.								4	
								5	
S3 (5-7') Dense, 3" Crushed ROCK, over 4" brown, fine to medium SAND, some silt, trace fine gravel, over 6" brown, fine to medium SAND and SILT.	SAND & SILT		S3	24/13	35-32-16-15	48		6	
								7	
Augered to 10'.								8	
								9	
								10	
S4 (10-12') 4" loose, brown, fine SAND and SILT, wet (perched), over 2" brown, fine to medium SAND, some silt, over 5" brown, fine to medium SAND and SILT, over 3" crushed ROCK.	SAND & SILT		S4	24/14	3-2-3-21	5		11	
								12	
Augered to 15'.								13	
								14	
								15	
S5 (15-17') No recovery.			S5	9/0	51-100/3"	>100		16	
								17	
Augered to 19'.								18	
								19	
Spoon refusal, end of boring 19'.									

Notes:

Well Legend:

FS	NF	B	BG	C	
Filter Sand	Native Fill	Bentonite	Bentonite grout	Concrete	PVC Screen

NA=not applicable; NM=not measured; NE=not encountered
*Sample designated with black fill submitted for laboratory analysis.

BORING LOG
B203

Project Number: 222.01003.002	Drilling Company: TDS	Total Depth: 13 Feet
Project: Lincoln Eliot Expansion	Drilling Method: Hollow-stem auger	Datum: NAVD
Site Location: 150 Jackson Road	Drilling Equipment: Track-Mounted Rig	Start/Finish Date: 2/24/22
Newton, Massachusetts	Boring Diameter: 8 inches	Logged by: QSH
Client: Arrowstreet	Surface Elevation (ft): +/-45	Reviewed by: JPJ
Water Levels:	During Drilling: NE	End of Boring: Date:

DESCRIPTION Based on USCS and Modified Burmister Soil Classification System	Soil Profile	SAMPLE*	SAMPLE NUMBER	PENETRATION / RECOVERY	BLOWS (PER 6")	SPT-N VALUE	PID/FID (PPM)	DEPTH (FT.)	WELL CONSTRUCTION
S1 (0-2') 9" TOPSOIL, over 10" tan, fine SAND, some fine to medium gravel, some silt, over 3" SAND and SILT, little fine to medium gravel.	TOPSOIL SAND & SILT		S1	24/22	2-8-17-16	25		1 2	
S2 (2-4') 12" Very dense, tan, fine SAND and SILT, trace fine to medium gravel, over 12" tan, fine SAND and SILT, some fine to medium gravel.	SAND & SILT		S2	24/24	21-59-53-51	112		3 4	
S3 (4-6') 3" Very dense, dark brown SILT, some fine sand and organics, over 2" crushed ROCK, over 3" tan, fine SAND and SILT, over 2" crushed ROCK, over 6" tan, fine to medium SAND and SILT, some fine to medium gravel.	SAND & SILT		S3	24/16	22-29-42-99	71		5 6	
Augered to 10'.								7 8 9 10	
S4 (10-12') 5" Very dense, gray/tan, fine SAND, some silt, some fine gravel (weathered), over 5" fine SAND and SILT, some fine gravel (weathered) over 6" gray, weathered ROCK.	SAND & SILT		S4	24/16	6-35-49-26	84		11 12	
Auger refusal, end of boring 13'.								13 14 15 16 17 18 19	

Notes:

Well Legend:

FS	NF	B	BG	C	
Filter Sand	Native Fill	Bentonite	Bentonite grout	Concrete	PVC Screen

NA=not applicable; NM=not measured; NE=not encountered
*Sample designated with black fill submitted for laboratory analysis.

BORING LOG
B204

Project Number: 222.01003.002	Drilling Company: TDS	Total Depth: 4 Feet, 3 Inches
Project: Lincoln Eliot Expansion	Drilling Method: Hollow-stem auger	Datum: NAVD
Site Location: 150 Jackson Road	Drilling Equipment: Track-Mounted Rig	Start/Finish Date: 2/24/22
Newton, Massachusetts	Boring Diameter: 8 inches	Logged by: QSH
Client: Arrowstreet	Surface Elevation (ft): +/-44	Reviewed by: JPJ
Water Levels:	During Drilling: NE	End of Boring: Date:

DESCRIPTION Based on USCS and Modified Burmister Soil Classification System	Soil Profile	SAMPLE*	SAMPLE NUMBER	PENETRATION / RECOVERY	BLOWS (PER 6")	SPT-N VALUE	PID/FID (PPM)	DEPTH (FT.)	WELL CONSTRUCTION
S1 (0-2') 2" Crushed ASPHALT, over 3" brown fine to medium SAND, some gravel, over 7"gray fine SAND and fine to medium GRAVEL.	ASPHALT SAND SAND & GRAVEL		S1	24/12	16-26-38-36	64		1	
S2 (2-4') 2" Very dense dark brown fine SAND, trace pieces of asphalt, over 4" gray/tan fine to course SAND and fine to medium GRAVEL.	SAND SAND & GRAVEL		S2	8/6	58- >50/2"	>50		2 3	
Spoon refusal at 4', auger refusal at 4' 3".								4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19	

Notes:

Well Legend:

FS	NF	B	BG	C	
Filter Sand	Native Fill	Bentonite	Bentonite grout	Concrete	PVC Screen

NA=not applicable; NM=not measured; NE=not encountered
*Sample designated with black fill submitted for laboratory analysis.