CITY OF PORTSMOUTH
Portsmouth, NH

BID #48-18 Route 33 Recreation Field
ADDENDUM #2

Issued: March 26, 2018

This Addendum forms part of the original document marked "*Bid 48-18 Route 33 Recreation Field*".

REVISIONS TO SOLICITATION

Written Changes to the Specifications

ADD # 2-1

Delete and Replace In Specification Section 32 18 13: SYNTHETIC GRASS INFILL SYSTEM

Part 1: QUALIFICATIONS AND SUBMITTALS

1.02 WORK INCLUDED

Delete c. The turf manufacturer shall have a minimum of ten (10) installations in the State of New Hampshire.

Replace with c. The turf manufacturer shall have a minimum of five (5) installations in New England.

ADD # 2-2

Delete and Replace In Specification Section 32 18 13: SYNTHETIC GRASS INFILL SYSTEM

Part 1: QUALIFICIATIONS AND SUBMITTALS

1.01 (3) APPROVED MANUFACTURERS

Delete e. Sportex

Replace with e. Shaw Sports Turf

Add f. Greenfields USA

ADD #2-3

Add Add sports lighting footing details to the end of Section 26 56 68 (included at the end as part of this addendum)

ADD #2-4

Add Add under Proposal Form the following ADJUSTMENT CLASSES:

20 CY Unsuitable soil\material removal and disposal $_____

21 CY Suitable Fill $_____

ADD #2-5

Add Add Geotechnical Report at the end of Section 00 31 32.
(included at the end as part of this addendum)

Contractor questions:

Q: Are we to assume the alternates for the project are progressive and must be taken sequentially, i.e. you must take #1 before taking #2, etc… **OR** can they be chosen individually? I cannot seem to locate a specification section for "alternates".

A: The alternates may be chosen individually by the City.

Q: What start date shall we use for bidding purposes?

A: Assume an April 25, 2018 start date.

Q. Spec section 32 18 13-2 states that the turf manufacturer has to have min 10 installations in state of NH. That seems like it would rule out a few vendors. Can we get this removed from the spec?

A: Refer to ADD #2-1

Q: Are you requiring chain link construction fence or just the orange plastic fence?

A: Chain link construction fence required.

Q: In regard to the bid documents for the Route 33 Recreation Field project, we call your attention to Page 263, Part 1 General, Sub-section 3e. Sportex is listed as an approved vendor.

A: Refer to ADD #2-2

Q: There is normally a handhole located at each Musco pole. Please advise if a total of 4 handholes should be added.

A: Handholes shall be provided as required. Refer to L3.00 that notes handholes as part of base bid.

Q.: Has there been a contract established with Eversource?

A: The project has a contract with Eversource. The work request # is 3086425.

Q: What is the communication line for shown at the electrical control box.

A: The communication line is for the future scoreboard which is Alternate #7

Q: Does the certified sports builder by the American Sports Builders Association need to be present during all phases of the entire project.

A: The certified sports builder is required to be present during all phases of the synthetic turf field construction, including subgrade verification, as described in the Invitation to Bid and Proposal Form of the Contract Documents and Specifications.

Q: Can you please clarify how Alternates #2 & #3 are supposed to be bid? Are they to be bid as the additional cost for the Field option, therefore the value gets added to the base bid or are they bid as full price for the entire amount of work for the field? If the latter is the case, shouldn't there be a deduct for the base bid field options.

A: Alternates #2 & 3 should be bid as full price options for the field work. There is no deduct line item to the base bid as these are separate items to the Bid. Pricing should include the full cost of the alternate turf system minus the cost to replace the turf system in the Bid.

Q: What to do if stumps are encountered in excavation, should they be removed, if so, is there a pay item?

A: Refer to ADD # 2-4.

Q: Are there provisions in the contract for settlement monitoring.

A: Settlement monitoring is not required.

Q: Can we substitute fiber for the rebar reinforcement in the turf nailers and mow strips? That is typically how we see them spec'd.

A: Yes

Q: Is there a geotextile fabric required between the permavoid product and turf carpet?

A: Refer to Drawings

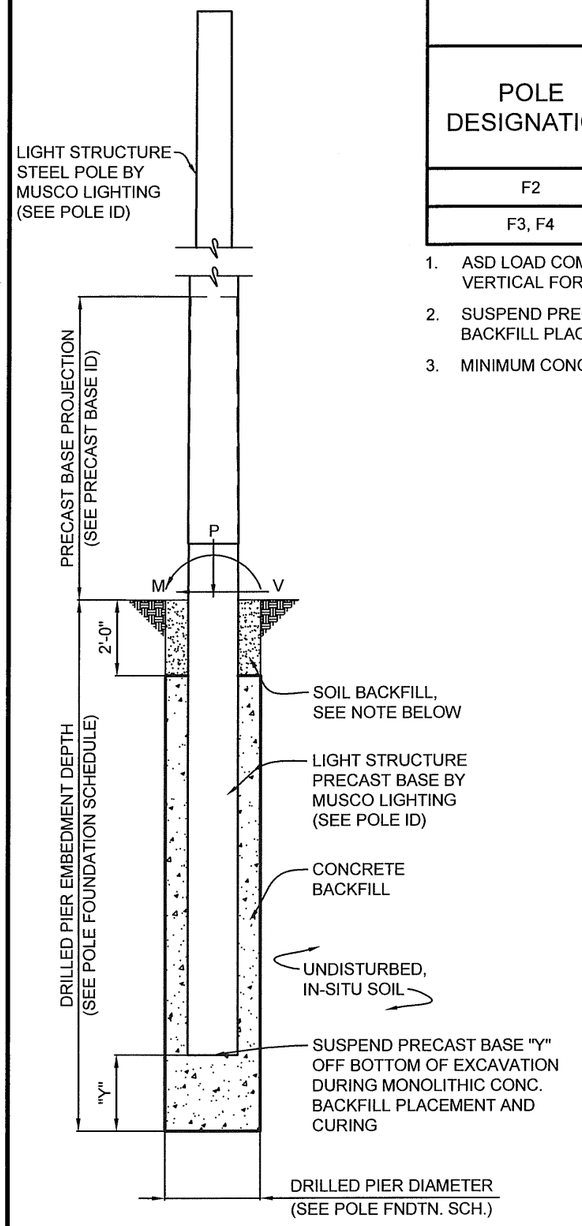
Q: Is there a geotextile fabric required between the permavoid product and drainage stone?

A: Refer to Drawings

Q: Do you have a foundation design from Musco?

A: Refer to ADD #2-3

End of Addendum #2



POLES F2 - F4 FOUNDATION ELEV.

SCALE: NOT TO SCALE

SOIL BACKFILL NOTE:
THE TOP TWO FEET OF ANNULUS SHALL BE BACKFILLED WITH SOIL, WITH A CLASSIFICATION OF CLASS 5 (TABLE 1806.2) OR BETTER. COMPACTION, 95% FOR COHESIVE SOIL AND 98% FOR A COHESIONLESS SOIL BASED UPON STANDARD PROCTOR TESTING (ASTM D698).

POLES F2 - F4 FOUNDATION SCHEDULE

POLE DESIGNATION	FORCES (1.)			DRILLED PIER			
	MOMENT (M) FT-LBS	SHEAR (V) LBS	VERTICAL (P) LBS	DIAMETER INCHES	EMBEDMENT DEPTH	SUSPENSION "Y" (2.)	CONCRETE BACKFILL YD^3 (3.)
F2	104,954	2,233	3,312	48	20'-0"	4'-0"	6.4
F3, F4	104,954	2,233	3,312	30	18'-0"	2'-0"	2.0

1. ASD LOAD COMBINATION D + W.
   VERTICAL FORCE IS WEIGHT OF DRESSED POLE (DOES NOT INCLUDE PRECAST BASE WEIGHT)
2. SUSPEND PRECAST BASE "Y" OFF THE BOTTOM OF THE EXCAVATION DURING MONOLITHIC CONCRETE BACKFILL PLACEMENT AND CURING.
3. MINIMUM CONCRETE BACKFILL VOLUME, SITE CONDITIONS MAY REQUIRE ADDITIONAL BACKFILL.

PRECAST BASE IDENTIFICATION

PRECAST BASE TYPE	PRECAST BASE WEIGHT	PRECAST BASE LENGTH	PROJECTION ABOVE GRADE	STANDARD EMBEDMENT	OUTSIDE DIAMETER
5B	4,580 LBS	23'-11"	7'-11"	16'-0"	18.25"

POLE IDENTIFICATION

POLE DESIGNATION	POLE TYPE	PRECAST BASE TYPE	FIXTURE CONFIGURATION (FIX. PER XARM)	FIXTURE AND ACCESSORIES EPA (FT^2)
F1 - F4	LSS70D	5B	11 (6+5)	26.4

CONCRETE/REINFORCEMENT NOTES

CONCRETE SHALL COMPLY WITH THE FOLLOWING ASTM STANDARDS:
MIXTURE WITH ASTM C-94, PORTLAND CEMENT WITH ASTM C-150 TYPE 1-A, AGGREGATES (0.75" MAX) WITH ASTM C-33 AND BE IN CONFORMANCE WITH ACI 318.

CONCRETE SHALL BE AIR-ENTRAINED (COMPLY WITH ASTM C-260), HAVE A MAXIMUM WATER-CEMENT RATIO, w/cm = 0.45 AND HAVE A MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS OF 4,500 PSI (SPREAD FOOTINGS) AND 3,000 PSI (DRILLED PIERS).

DESIGN SLUMP LIMITS ARE 4" MINIMUM AND 6" MAXIMUM. THE JOB SITE SLUMP MAY BE INCREASED BY THE USE OF A WATER REDUCING AGENT MEETING ASTM C494-92.

CONCRETE REINFORCEMENT SHALL COMPLY WITH ASTM A615 GRADE 60, EXCEPT TIES CAN BE OF GRADE 40 AND BE IN CONFORMANCE WITH ACI 315 & 318.

CONCRETE MUST ATTAIN DESIGN STRENGTH PRIOR TO POLE INSTALLATION AND FIXTURE MOUNTING.

DESIGN NOTES

DESIGN PARAMETERS:
WIND: 100 MPH (EXP. C, I = 1.0) PER IBC CODE, 2009 EDITION (ASCE 7-05).
DESIGN WIND PARAMETERS ARE AS NOTED. ACTUAL WIND SPEED AND EXPOSURE MUST BE VERIFIED FOR THE SITE BY THE PROPER GOVERNING OFFICIAL.

GEOTECHNICAL PARAMETERS:
ALLOWABLE END BEARING SOIL PRESSURE: 3,000 PSF
ALLOWABLE LATERAL SOIL BEARING PRESSURE:
112 PSF/FT (FILL); 56 PSF/FT (FILL NEAR SLOPE); 249 PSF/FT (NATIVE SAND);
IN ACCORDANCE WITH THE 2009 EDITION OF THE INTERNATIONAL BUILDING CODE, CHAPTER 18.

OVER EXCAVATE 1'-6 BELOW THE BOTTOM OF THE SPREAD FOOTING TO A DEPTH OF -8'-0" BELOW GRADE. REPLACE THE OVER EXCAVATED AREA WITH COMPACTED STRUCTURAL FILL. THE STRUCTURAL FILL SHOULD BE IBC, TABLE 1806.2, CLASS 3 OR BETTER AND BE COMPACTED TO 98% OF STANDARD PROCTOR (ASTM D698). FOOTINGS MAY BEAR ON BEDROCK, OVER EXCAVATION OF BEDROCK IS NOT REQUIRED.

DESIGN SOIL PARAMETERS ARE AS NOTED. ACTUAL ALLOWABLE SOIL PARAMETERS MUST BE VERIFIED ON SITE. REFERENCE SOILS AND FOUNDATION REPORT, NO. 2160648, PREPARED BY WESTON & SAMPSON; PEABODY, MA.

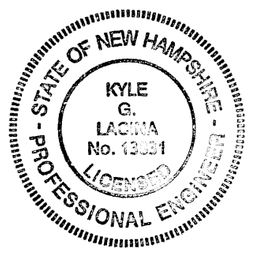
A GEOTECHNICAL ENGINEER OR REPRESENTATIVE OF IS RECOMMENDED (NOT REQUIRED) TO BE AVAILABLE AT THE TIME OF THE FOUNDATION INSTALLATION TO VERIFY THE SOIL DESIGN PARAMETERS AND TO PROVIDE ASSISTANCE IF ANY PROBLEMS ARISE IN FOUNDATION INSTALLATION.

ENCOUNTERING SOIL FORMATIONS THAT WILL REQUIRE SPECIAL DESIGN CONSIDERATIONS OR EXCAVATION PROCEDURES MAY OCCUR. POLE FOUNDATIONS WILL NEED TO BE ANALYZED ACCORDING TO THE SOIL CONDITIONS THAT EXIST. IF ANY DISCREPANCIES OR INCONSISTENCIES ARISE, NOTIFY THE ENGINEER OF SUCH DISCREPANCIES. FOUNDATIONS WILL THEN BE REVISED ACCORDINGLY. REVISIONS WILL BE ANALYZED PER RECOMMENDATIONS DIRECTED BY A REGISTERED ENGINEER.

ALL EXCAVATIONS MUST BE FREE OF LOOSE SOIL AND DEBRIS PRIOR TO FOUNDATION INSTALLATION AND CONCRETE BACKFILL PLACEMENT. TEMPORARY CASINGS OR DRILLERS SLURRY MAY BE USED TO STABILIZE THE EXCAVATION DURING INSTALLATION. CASINGS MUST BE REMOVED DURING CONCRETE BACKFILL PLACEMENT. CONCRETE BACKFILL MUST BE PLACED WITH A TREMIE WHEN SLURRY OR WATER IS PRESENT WITHIN THE EXCAVATION OR WHEN THE FREE DROP EXCEEDS 6'-0".

CONTRACTOR MUST BE FAMILIAR WITH THE COMPLETE SOIL INVESTIGATION REPORT AND BORINGS, AND CONTACT THE GEOTECHNICAL FIRM (IF NECESSARY) TO UNDERSTAND THE SOIL CONDITIONS AND THE POSSIBILITY OF GROUND WATER PUMPING AND EXCAVATION STABILIZATION OR BRACING DURING PRECAST BASE INSTALLATION AND PLACEMENT OF CONCRETE BACKFILL.

GENERAL NOTES:
FIXTURES MUST BE LOCATED TO MAINTAIN 10'-0" MINIMUM HORIZONTAL CLEARANCE FROM ANY OBSTRUCTION. ENGINEER MUST BE NOTIFIED IF FOUNDATIONS ARE NEAR ANY RETAINING WALLS OR WITHIN / NEAR ANY SLOPES STEEPER THAN 3H : 1V. POLES, FIXTURES, PRECAST BASES, ELECTRICAL ITEMS AND INSTALLATION PER MUSCO LIGHTING.



I HEREBY CERTIFY THAT THIS ENGINEERING DOCUMENT WAS PREPARED BY ME OR UNDER MY DIRECT PERSONAL SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF NEW HAMPSHIRE.

1-18-2018

KYLE G. LACINA - NO. 13831 DATE:
SEPC OF IOWA - 1427

LICENSE RENEWAL DATE: NOVEMBER 30, 2019
DRAWING NO. COVERED BY THIS SEAL: C1, C2

PORTSMOUTH ROUTE 33
SOCCER FIELD
LIGHTING
PORTSMOUTH, NH

musco Lighting
CORPORATE: 100 1ST AVE WEST
OSKALOOSA, IA 52577
(800) 825-6020

SEPC OF IOWA
114 NICHOLAS DRIVE
MARSHALLTOWN, IOWA 50158
PHONE NUMBER: 641-752-6334
EMAIL: MSL.INFO@SEPC.BIZ

DRAWING TITLE: POLE AND FOUNDATION
SCALE: SEE PLAN
NOTES: SCAN #183762A

PROJECT NUMBER
183762

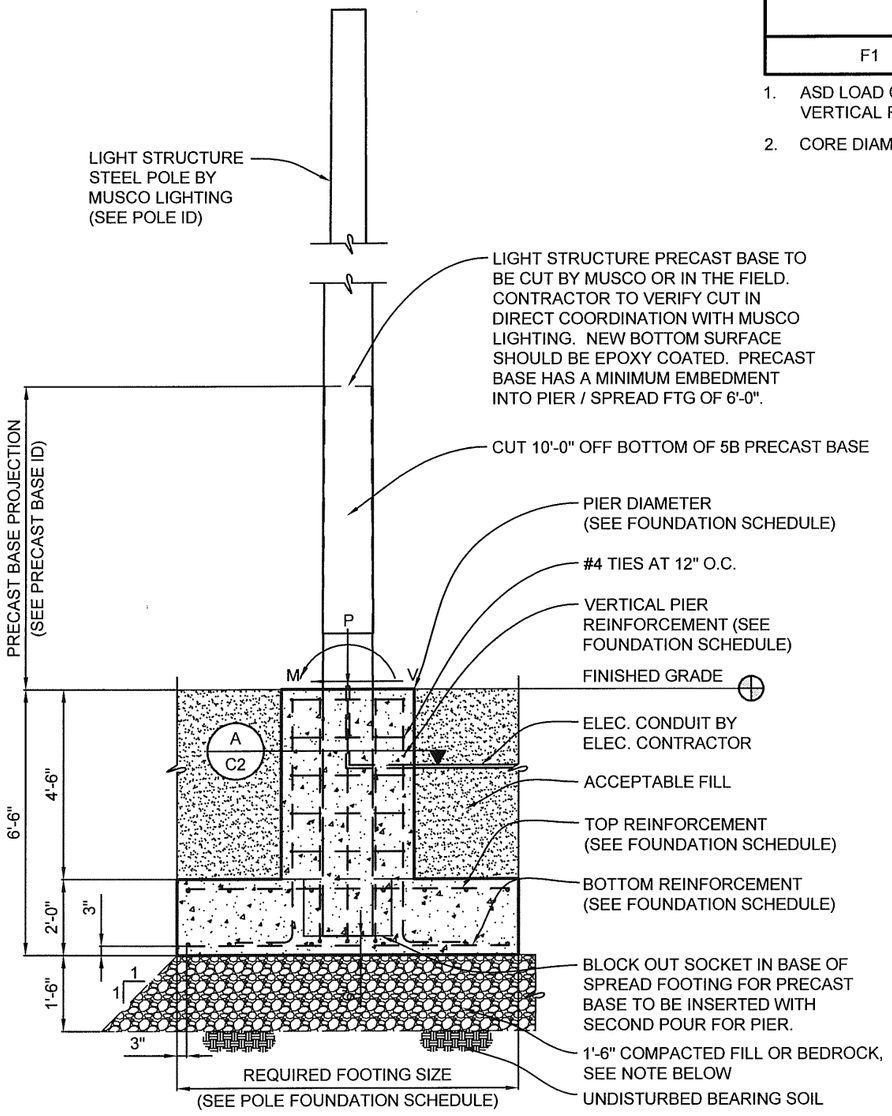
DATE
18 JANUARY 2018

DRAWING NUMBER
C1
OF TWO

POLE F1 FOUNDATION SCHEDULE

POLE DESIGNATION	FORCES (1.)			FOOTING			PIER		
	MOMENT (M) FT-LBS	SHEAR (V) LBS	VERTICAL (P) LBS	SIZE	THICKNESS	REINFORCEMENT TOP & BOTTOM (TOTAL) QUANTITY - SIZE	DIAMETER INCHES	CORE DIA. INCHES (2.)	VERTICAL REINFORCING
F1	104,954	2,233	3,312	10'-6" x 10'-6"	2'-0"	(48) 12 - #7's EACH WAY	48	41	18 - #7

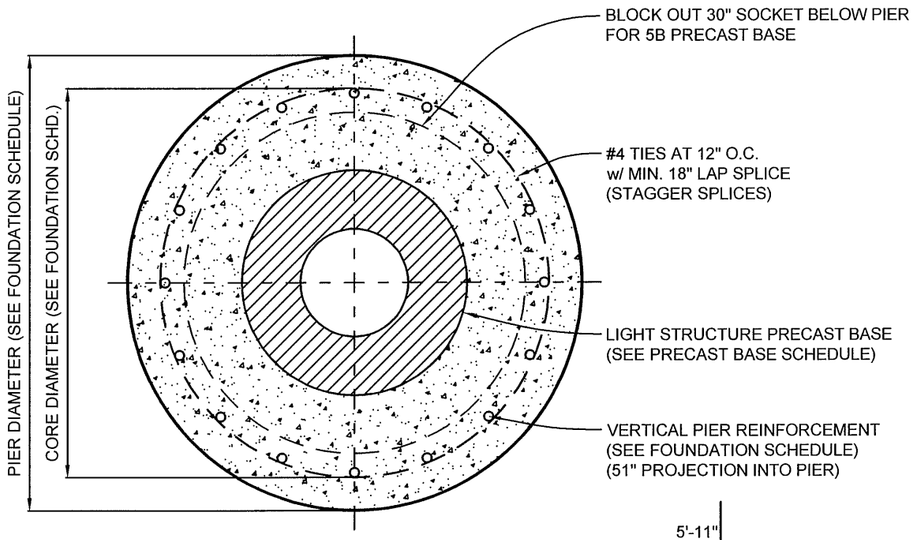
1. ASD LOAD COMBINATION D + W.
   VERTICAL FORCE IS WEIGHT OF DRESSED POLE (DOES NOT INCLUDE PRECAST BASE WEIGHT).
2. CORE DIAMETER EQUAL TO INSIDE DIAMETER OF TIES. #4 TIES @ 12" O.C. w/ 18" MIN. LAP SPLICE (STAGGER SPLICES)



POLE FOUNDATION ELEVATION

SCALE: NOT TO SCALE

NOTE:
OVER EXCAVATE ANY EXISTING FILL MATERIAL 1'-6" BELOW THE BOTTOM OF THE SPREAD FOOTING TO A DEPTH OF -8'-0" BELOW GRADE. REPLACE THE OVER EXCAVATED AREA WITH COMPACTED STRUCTURAL FILL. THE STRUCTURAL FILL SHOULD BE IBC, TABLE 1806.2, CLASS 3 OR BETTER AND BE COMPACTED TO 98% OF STANDARD PROCTOR. FOOTINGS MAY BEAR ON BEDROCK, OVER EXCAVATION OF BEDROCK IS NOT REQUIRED.



A PIER DETAIL

SCALE: NOT TO SCALE

PORTSMOUTH ROUTE 33
SOCCER FIELD
LIGHTING
PORTSMOUTH, NH

musco Lighting
CORPORATE: 100 1ST AVE WEST
OSKALOOSA, IA 52577
(800) 825-6020

SEPC OF IOWA
114 NICHOLAS DRIVE
MARSHALLTOWN, IOWA 50158
PHONE NUMBER: 641-752-6334
EMAIL: MSL.INFO@SEPC.BIZ

DRAWING TITLE: POLE AND FOUNDATION
SCALE: SEE PLAN
NOTES: SCAN #183762A

PROJECT NUMBER
183762

DATE
18 JANUARY 2018

DRAWING NUMBER
C2
OF TWO

5 Centennial Drive, Peabody, MA 01960 (HQ)
Tel: 978.532.1900

Portsmouth Public Works Department
Weston & Sampson Project No. 2160648

January 3, 2017

Portsmouth Public Works Department
C/o Mr. Michael Moonan, RLA, LEED AP BD+C
Weston & Sampson
427 Main Street, 4th Floor
Worcester, MA 01608

RE: Geotechnical Report
Route 33 Recreation Field
Portsmouth, New Hampshire

INTRODUCTION

Weston & Sampson is pleased to present this report of geotechnical engineering services for the proposed Route 33 Recreation Field project at 305 Greenland Road (Route 33) in Portsmouth, New Hampshire.

PROJECT UNDERSTANDING

Based on our review of December 19, 2016 Design Development Plans prepared by Weston & Sampson, we understand construction will include a synthetic turf athletic field, concrete pad, segmental block retaining walls, four sport light poles, sport netting/poles, two shade shelters, a scoreboard, and bituminous pavement and/or gravel surfaced parking and access road areas, as shown in the attached *Sheet L3.00*.

The proposed approximately 86,250 square foot (SF) synthetic turf athletic field, with a surface elevation of approximately 57 ft., will occupy most of the south and central sections of the site. The turf will be fastened to a 12-inch high cement concrete curb around the field perimeter. An approximately 900 square foot concrete pad with a finished surface elevation of approximately El. 57 ft. is proposed near the southwest corner of the field. A new subsurface drainage system consisting of 12-inch wide flat drains spaced 10 ft. on-center and perimeter 12-inch diameter perforated collector pipes surrounded by crushed stone wrapped in geotextile fabric, is proposed below the field. A 14-inch layer of 1-1/2-inch drainage stone is proposed below the field. Existing drainage pipes below the proposed field will be abandoned. Cuts and fills less than approximately 3 ft. are anticipated over much of the field and concrete pad areas to established proposed elevations; however, up to approximately 8 ft. of fill will be required to raise grades below the southwest corners of the field and the concrete pad and earth cuts up to approximately 5 ft. will be required in the southeast corner of the field to establish proposed elevations. An approximately 90 ft. long segmental block retaining with retained soil heights up to approximately 9 ft. is proposed at the southwest corners of the field and concrete pad to facilitate site grading. An approximately 50 ft. long segmental block retaining wall with retained soil heights up to approximately 5 ft. is proposed at the southeast corner of the field to facilitate site grading.

Information on wall block type, size, and construction was not available at the time of this report. Proposed grading is indicated in the attached *Sheet L5.00*.

Four sport light poles, two on the west side of the field and two on the east side of the field, are proposed. Light pole foundation types are not known at the present time, but typically consist of cylindrical precast concrete bases installed in drilled excavations and backfilled with structural concrete. Light pole heights and loading information were also not available at the time of this report. Sport netting attached to approximately 20 ft. high poles are proposed on the south and north ends of the field and a scoreboard is proposed on the southwest end of the field. According to the design development plans, the netting pole foundations will consist of 3-foot diameter pier type concrete footings embedded 6 ft. below the ground surface and the scoreboard foundation will consist of 3-foot diameter pier type concrete footings embedded 12 ft. below the ground surface. The number of netting poles and loading information for the netting poles and scoreboard were not available at the time of this report.

Two shade shelter structures are proposed southeast of the field. One structure will occupy a footprint area of 375 square feet (SF) and have a finished floor elevation of 59 ft. and the other will occupy a footprint area of 180 SF and have a finished floor elevation of 58 ft. Concrete floor slabs on-grade are proposed. The steel roofing of the structures will be supported by 5-inch by 5-inch tubular steel columns. According to the project structural engineer (Weston & Sampson), the columns are typically supported on isolated pier footings but can be supported by continuous concrete footings that would help reduce damage to the structure due to potential differential settlement below the foundations. Cuts and fill up to approximately 2 ft. are anticipated to establish finished floor elevations. A drainage utility pipe with an invert elevation of approximately 53 ft. is located below the north portion of the northernmost proposed structure.

Bituminous pavement and/or gravel surfaced parking and access road areas are proposed east and north of the proposed field as shown in the attached *Sheet L3.00*. Cuts and fill up to approximately 2 ft. are anticipated to establish proposed surface elevations in these areas.

Site History

We understand the site formerly operated as a gravel pit followed by a disposal location for stumps and excess soil generated from local municipal projects. The height of the stumps/fill disposed at the site is not known. According to the City, most stumps were removed prior to use as a staging/storage area for local municipal sewer projects. The site is known locally as “the stump dump.”

Underwood Engineers, Inc. (Underwood) originally prepared plans for the project titled “Route 33 Recreation Area – Lincoln Area Sewer Separation – Contract 3C” dated January 8, 2014. We understand that in 2014, the site was filled to current elevations and drainage pipes and retaining walls constructed using the Underwood plans. Construction records on cuts and fills, fill materials, and compaction were not available to us at the time of this report.

SITE OBSERVATIONS AND CONDITIONS

Existing Site Conditions

The site is located on the north side of Route 33, between a Boston and Maine Railroad easement and Islington Street in Portsmouth, New Hampshire, as shown in the attached *Sheet L3.00*. The sand and gravel surface is covered with weeds in many areas. Stockpiles of soil and wood debris are located in central and

northern areas of the site. An approximately 150 ft. long modular block retaining wall with a maximum height of about 5 ft. is located in the southwest area of the site. A gravel access road underlain by geotextile fabric is located along the east side of the site.

According to the design development plans, the ground surface in most of the site area is relatively flat between approximately El. 55 ft. and El. 56 ft. The ground surface in the southwest corner of the proposed field slopes down to approximately El. 48 ft. The ground surface in the southeast corner of the proposed field slopes up to approximately El. 62 ft. The ground surface west of the site slopes down towards the Boston and Maine Railroad easement from approximately El. 56 ft. to El. 50 ft. and the ground surface south of the site slope up towards Route 33 from approximately El. 56 ft. to El. 70 ft.

Drainage pipes are located below the proposed field area and drainage pipes and catch basin and outfall structures are located west, east, and south of the proposed field area. High density polyethylene (HDPE) drainage pipes below the west side of the proposed field are 30-inch diameter with invert elevations ranging between approximately 35.0 and 38.3 ft. Given existing site elevations, the invert of the 30-inch pipe is up to about 22 ft. below the existing ground surface. Surface grades southwest of the proposed field direct storm water into an outfall and a 15-inch diameter HDPE pipe that empties into a catch basin structure connected to the 30-inch diameter pipes. The catch basin structure is located approximately 2 ft. away from the southwest corner of the proposed field. HDPE drainage pipes south and along the west side of the proposed field are 12-inch diameter with invert elevations ranging between approximately 45.5 and 53.2 ft. HDPE drainage pipes below the proposed field are 6-inch diameter drain towards catch basin structures west and east of the proposed field. Invert elevations range between approximately 44.4 and 53.7 ft.

Geologic Setting

Surficial geology information available from the New Hampshire Department of Environmental Services (Portsmouth and Kittery Quadrangle) indicates the site is located in an area of glacial and post-glacial water-laid deposits typically comprised of a mixture of sand, gravel, and silt.

Subsurface Explorations

Subsurface conditions at site were explored between September 27 and 29, 2016 by completing sixteen borings (B-1 through B-16) to depths ranging between 17 and 34 ft. below the existing ground surface (BGS) at the approximate locations shown in the attached *Sheets L3.00 and L5.00.*

The borings were completed by New England Boring Contractors of Derry, New Hampshire using a truck-mounted drill rig and hollow-stem auger drilling methods. The augers had inside and outside diameters of 2-1/4-inch and 5-5/8-inch, respectively. Standard penetration tests (SPTs) and sampling were conducted in each boring by driving a 24 in. long by 1-3/8 in. inside diameter (2 in. outside diameter) split spoon sampler with blows from a 140 lb. cat-head operated hammer falling 30 in. per blow. Sampling intervals were generally every 5 ft.

Weston & Sampson geotechnical engineering staff monitored drilling activities in the field and prepared logs for each boring. Subsurface conditions encountered in our explorations are described in the following sections.

Environmental Sampling and Analyses

One soil sample was collected from each boring for environmental analyses. Soil samples were also screened in the field with a photoionization detector (PID) for potential contamination. Descriptions of the environmental soil sampling and results of the analyses will be submitted by others under separate cover.

Subsurface Conditions

General – Subsurface conditions encountered in the borings generally consisted of FILL with debris above native SAND. Detailed soil descriptions are provided on the attached ***Boring Logs***. General soil layer descriptions are as follows:

Fill – Very loose to very dense SAND FILL with variable amounts of debris was encountered in each boring from the ground surface to depths ranging between approximately 8.5 and 28.5 ft. BGS. This layer was generally comprised of fine to coarse sand with varying amounts of gravel, silt, and debris. Debris materials included brick, asphalt, wood fragments, roots, concrete, ash, paper, fabric, and foam. A few samples contained large percentages of wood fragments, which could indicate the presence of large wood debris and possible remaining stumps in the fill. Layers of medium stiff to hard CLAYEY SILT with debris were encountered in B-3, B-9, B-10, B-11, and B-15. This layer generally contained varying amounts of fine to medium sand, gravel, and debris. The type of debris observed in the CLAYEY SILT FILL was generally consistent with debris observed in the SAND FILL. A layer of medium stiff ORGANIC CLAYEY SILT FILL was encountered in B-9 between the approximate depths of 8.5 and 13.5 ft. BGS. Borings B-5 through B-8, B-10, B-14, and B-15 were terminated at 17 ft. BGS and did not penetrate the fill.

Native Sand – Medium dense to very dense native SAND was encountered below the fill in each exploration, except in B-5 through B-8, B-10, B-14, and B-15. This layer was generally comprised of fine to coarse sand, variable gravel (trace to gravelly), and trace to little silt. Borings B-1 through B-4, B-9, B-11, B-12, B-13, and B-16 were terminated in the sand at depths ranging between 17 and 34 ft. BGS.

Groundwater – Groundwater was observed in B-16 at approximately 25 ft. BGS. Groundwater was not observed in other borings. The groundwater depth was estimated based on observation of the split-spoon samples. We anticipate that groundwater levels will fluctuate with season, variations in precipitation, construction in the area, and other factors. Perched groundwater conditions could exist close to the ground surface, especially during and after extended periods of wet weather.

GEOTECHICAL CONSIDERATIONS AND RECOMMENDATIONS

General

The primary geotechnical consideration for the project is the presence of up to at least 28.5 ft. of undocumented fill with debris below the site. Given the history of the site, the fill was likely placed in various stages after completion of gravel pit operations. The fill was likely generated from various sources and placed in uncontrolled lifts based on the variability of fill consistency and composition encountered in the borings. Records of fill placement and compaction, if they exist, were not available for review at the time of this report. Additionally, although we were informed that most stumps were removed prior to use as a storage/staging area, records of removal were not available for review and some samples obtained in the

borings contained high percentages of wood fragments, which could indicate the presence of large wood debris and possible remaining stumps in the fill.

Up to several inches of differential settlement should be anticipated below proposed site features if constructed on the existing fill due to variability in consistency, composition, and organic content. The differential settlement could result in variable surface deflections across the turf field and poor long-term performance, inconsistent slopes in drainage pipes, movement of the segmental block wall and retained soil backfill, damage to the concrete pad and shade shelters, movement of the scoreboard and netting poles, and reduced bituminous pavement life. Removal of up to 28.5 ft. of fill and replacement with compacted structural fill below these features to provide adequate subgrade support is not considered a cost-effective practicable approach for this project. Therefore, periodic maintenance and repair of these features should be anticipated if constructed on the existing fill.

Modification to the proposed construction with features more tolerant to differential settlement, such as constructing a natural turf field, constructing a bituminous concrete pavement or gravel-surfaced area in-place of the concrete pad, and construction of gravel surfaced access road and parking spaces, could be considered to reduce the potential for damage and need for periodic maintenance. Alternatively, ground improvement using rapid impact compaction (RIC) could be used to improve (densify) a minimum thickness of the existing fill and reduce (but not eliminate) the risk of damage from differential settlement.

The sports light poles are considered more susceptible to damage from movement and settlement than the proposed site features discussed above and costs to repair could be excessive; therefore, foundations for sport light poles should extend through the fill and at least 2 ft. into the native sand. If some vertical movement of the scoreboard and netting poles is not considered acceptable, the pier type foundations for these structures should similarly extend through the fill and at least 2 ft. into the sand. Geotechnical design and construction considerations for sport light pole, scoreboard, and netting pole foundations are presented in the following sections.

The two sports light poles proposed west of the field are located approximately 0.5 to 2 ft. from the 30-inch subsurface drainage pipe. Damage to the pipe could occur during foundation construction and/or from normal horizontal movement of the foundations from bending moment forces. We recommend relocating the sport light poles at least 5 ft. from the 30-inch subsurface drainage pipe to reduce the risk of damage.

According to the design development plans, the face of the proposed segmental block wall will be located approximately 2 ft. away from an existing catch basin structure and 30-inch diameter drainage pipe. The invert of the 30-inch pipe in the area of the wall is approximately El. 38 ft. and about 12 ft. below the approximate ground surface elevation of 50 ft. Movement of the wall could damage the existing 30-inch drainage pipe and catch basin structure. Damage to these structures could exacerbate movement of the wall and increased settlement below the adjacent field and concrete slab. Alternatives to a segmental block retaining wall that would reduce the potential of damage to the adjacent drainage pipe and catch basin and settlement below the field and concrete slab include construction of a concrete cantilever gravity wall that is supported at or below the 30-inch drainage pipe invert elevation and using light weight fill such as geofoam that is properly faced to raise grades below the field and concrete slab. The use of RIC to improve/densify the fill is not recommended in this area as vibration could damage the 30-inch pipe. We can provide geotechnical construction and design recommendations for these alternatives if requested.

The presence organic and debris materials will affect the magnitude of anticipated differential settlement and installation and performance expectations of RIC. Additional explorations are recommended to better define the composition and characteristics of the fill. Test pits are recommended as they can allow for better visual observation of actual shallow subsurface conditions than borings, especially if large debris materials or stumps are present. The test pits can be excavated using City equipment and personal and observed by Weston & Sampson geotechnical engineering staff if the City can provide equipment capable of excavating to a depth of approximately 15 ft.

Earthwork

Site Preparation – All vegetation, soil stockpiles, and surficial organic materials should be removed from proposed construction areas. Removal should extend at least 5 ft. beyond proposed construction areas. The presence of boulders, cobbles, construction debris, and stumps should be anticipated in site excavations. Any organic, debris, or other deleterious materials exposed at subgrade elevations should be removed and replaced with structural fill that is compacted as described below.

Subgrade Preparation and Construction – After site preparation, the exposed subgrades should be proof compacted with at least 6 complete passes of a 10-ton vibratory roller, or equivalent effort. Areas with limited access should be proof compacted with a minimum 6 passes of a 700-pound vibratory plate compactor, or equivalent effort. The proof compaction is intended to help densify surficial soils and will not significantly limit or control differential settlement. All proof compaction efforts should be observed by Weston & Sampson. The proof compaction should extend at least 5 ft. beyond field and pavement areas and all foundations. Soft or disturbed areas will require over-excavation and backfilling with structural fill placed and compacted as described below.

Soils containing more than trace amounts of silt, such as the existing fill, are susceptible to softening and disturbance by construction activity during wet or freezing weather. Subgrade protection should be the responsibility of the contractor and special precautions and protective measures appropriate for the weather conditions during construction should be used during earthwork and construction to preserve the integrity of subgrade. Construction traffic should not operate directly on prepared subgrades.

If construction occurs during freezing conditions, insulating blankets, heaters, or other suitable measured should be employed to prevent subgrades from freezing. Fill, concrete, foundations, and wall units should not be installed on frozen subgrades.

Structural Fill – Structural fill should meet the requirements of Item No. 304.2 Gravel in the latest edition of the New Hampshire Department of Transportation Standard Specifications for Roads and Bridge Construction. This material should be used to replace unsuitable soils, to elevate site grades up to proposed subgrade and bottom of foundation elevations, to construct structural fill footing pads (as discussed below), and to backfill foundation elements. Gravel should be placed in lifts no greater than 12-inches (uncompacted thickness), with each lift compacted to 95 percent of the material's maximum dry density as determined by ASTM D1557. Existing fill derived from site excavations is not anticipated to meet the requirements for structural fill.

Underslab Fill – A minimum of 12-inches of underslab fill should be installed below and at least 12-inches beyond the perimeter of all concrete slabs. Underslab fill should meet the requirements of Item No. 304.4 Crushed Stone Fine in the latest edition of the New Hampshire Department of Transportation Standard Specifications for Roads and Bridge Construction. The fill should be placed in lifts no greater than 12 inches (uncompacted thickness), with each lift compacted to 95 percent of the material's maximum dry density as determined by ASTM D1557.

Segmental Block Retaining Walls – Segmental block retaining wall unit construction, including backfilling and drainage requirements, should meet the manufacturer's requirements.

Shade Shelter Foundation Design Recommendations

Up to 18 ft. of fill is present below the proposed shade shelter structures. As discussed above, up to several inches of differential settlement below the foundations should be anticipated if constructed on the existing, unimproved fill soils. The settlement could cause damage to the shade shelter concrete slab, steel framing systems, and roofs. According to our conversations with the project structural engineer, the foundations will likely be designed as continuous spread footings as opposed to isolated column footings to help limit differential movement between column locations. Additionally, construction of structural fill footing pads below the foundations is recommended to further reduce differential movement if the existing fill is not improved with RIC. The footings pads should be a minimum of 2 ft. thick, extend at least 1-foot beyond footing edges on all sides, and constructed using structural fill placed and compacted as recommended in the *Earthwork* section of this report. An existing drainage pipe is located below the north section of the northernmost shade shelter. We recommend relocation of the drainage pipe outside the foundation zone-of-influence to avoid damage to the pipe.

Structures supported on continuous spread footings bearing on structural fill footing pads constructed on the existing unimproved fill soils will not reduce long-term differential settlement of the fill soils but could limit movement between column locations by helping to bridge areas of settlement. As such, some damage to the framing systems and roofs could still occur. Long-term maintenance of concrete slabs constructed on the fill soils should be anticipated. Removal and replacement of the fill soils below the structures or improvement of the fill using RIC would be necessary to limit differential settlement/movement to tolerable limits and damage to the slabs.

Shallow Spread Foundations – Footings bearing on properly constructed structural fill footing pads directly overlying the properly prepared existing unimproved fill should be designed using an allowable bearing pressure of 2,000 pounds per square foot (psf). The allowable bearing pressure can be increased to 3,000 psf to resist temporary wind and seismic loads provided the resultant load eccentricities remain within the middle third of the footing. Footings bearing on RIC improved fill soils should be designed using an allowable bearing capacity provided by the RIC designer. Resistance to lateral loads can be obtained by passive pressure against the sides of the footings equivalent to a fluid with a unit weight of 350 pounds per cubic foot (pcf). The top 12-inches of embedment should be ignored. Lateral resistance can also be provided by friction along the bottoms of the footings assuming a footing base friction of 0.45.

Footings should be embedded at least 4 ft. below the nearest proposed adjacent ground surface exposed to freezing.

Seismic Site Class – In accordance with the 2009 International Building Code (IBC) as adapted by the New Hampshire State Building Code and based on our explorations and analyses, foundations for the proposed addition should be evaluated using parameters associated with Site Class D.

Sports Light Pole, Scoreboard, and Netting Pole Foundation Construction and Design Considerations

The light pole, scoreboard, netting pole foundations should be designed in accordance with the provisions of Section 1807.3 (Embedded Posts and Poles) of the 2009 IBC.

Up to approximately 18.5 feet of fill was encountered in borings completed in proposed light pole foundation areas. Deeper fill could exist in scoreboard and netting pole foundation areas where borings were not completed. The proposed sports light poles can be supported by precast concrete bases installed in drilled shafts and backfilled with concrete. The drilled shafts should extend through the fill and at least 2 ft. into the native sand. If some vertical movement of the scoreboard and netting poles is not considered acceptable, the pier type foundations for these structures should similarly extend through the fill and at least 2 ft. into the sand. The scoreboard and netting pole foundation should not be installed directly on soft and unstable soils or organic debris. These materials should be removed to expose firm and stable, inorganic fill soils. An allowable bearing pressure of 5,000 psf is recommended at the base of foundations embedded in the sand to resist axial loads provided all loose materials and slough are removed from the excavations prior to placement of precast light pole bases and poured concrete. An allowable bearing pressure of 2,000 psf is recommended at the base of the foundations in existing firm and stable fill to resist axial loads provided all loose materials and slough are removed from the excavations prior to placement of poured concrete.

Resistance to lateral loads can be calculated using the soil parameters in the following table. Resistance in the top 2 ft. should be ignored.

	Fill	Native Sand
Saturated Unit Weight, lb/ft^3	110	135
Soil Angle of Internal Friction, ϕ	20	35
Unconfined Compressive Strength, psf	-	-
Coefficient of Active Earth Pressure, K_a (Rankine)	0.49	0.27
Coefficient of Passive Earth Pressure, K_p (Rankine)	2.0	3.7

The foundation contractor should be responsible for selecting appropriate construction methods to assure each foundation is constructed in accordance with project design drawings and specifications. The presence of obstructions and need for removal should be anticipated. The presence of caving soils and/or groundwater infiltration in foundation excavations could require the use of casing or drilling slurry to maintain excavation integrity. Cleanout buckets may be required to remove loose and unstable material from the shaft base. A geotechnical engineer should observe the base conditions at each foundation location prior to concrete and reinforcing steel placement. Tremie methods should be utilized to install concrete if water is present at the bottom of the excavations.

LIMITATIONS

We have prepared this report for use by the City of Portsmouth Public Works Department and the design and construction teams for this project and this site only. The information herein could be used for bidding or estimating purposes but should not be construed as a warranty of subsurface conditions. We have made observations only at the aforementioned locations and only to the stated depths. These observations do not reflect soil types, strata thicknesses, water levels or seepage that may exist between observations. We should be consulted to observe site and subgrade preparations. We should be consulted to review final design and specifications in order to see that our recommendations are suitably followed. If any changes are made to the anticipated locations, loads, grading, configurations, or construction timing, our recommendations may not be applicable, and we should be consulted.

The preceding recommendations should be considered preliminary, as actual soil conditions may vary. In order for our recommendations to be final, we should be retained to observe actual subsurface conditions encountered. Our observations will allow us to interpret actual conditions and adapt our recommendations if needed.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with the generally accepted practices in this area at the time this report was prepared. No warranty, expressed or implied, is given.

It has been a pleasure assisting you with this project and we look forward to our continued involvement. Please call if you have any questions.

Sincerely,

WESTON & SAMPSON ENGINEERS, INC.

Thomas J. Strike, PE
Project Manager

Christopher J. Palmer, PE
Team Leader