

# FREEMAN

## COMPANIES

LAND DEVELOPMENT | ENGINEERING DESIGN | CONSTRUCTION SERVICES

Geotechnical Report  
Marina Village Housing Complex Redevelopment  
Bridgeport, Connecticut

May 29, 2015  
Freeman File No.: 2015-0408

*Prepared for:*  
Bridgeport Community Renewal Associates, LP  
c/o JHM Group of Companies  
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Suite 201  
Stamford, Connecticut

*Prepared by:*

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Hartford, CT 06106



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*Allison M. McCauliffe*  
5/29/15

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## **1.0 INTRODUCTION**

### **1.1 Summary**

This report presents the results of subsurface explorations and our geotechnical design and construction recommendations for the proposed Marina Village Housing Complex Redevelopment located in Bridgeport, Connecticut.

The existing fill is not suitable for support of foundations and should be removed. Foundations should be designed as spread footings bearing on the naturally deposited sands or on compacted structural fill or crushed stone placed after removal of existing fill.

The slab-on-grade may be supported on a 12 inch thick layer of compacted structural fill. The existing fill may be left in place below floor slabs provided that intense proof-compaction of the subgrade, as discussed below, is completed prior to placement of the structural fill.

### **1.2 Scope of Work**

Freeman Companies, LLC performed the following tasks:

- Engaged a drilling contractor to drill test borings and obtain soil samples.
- Observed the test borings.
- Arranged for laboratory testing of selected soil samples.
- Evaluated the subsurface conditions and prepared this report containing geotechnical design recommendations and construction considerations.

### **1.3 Authorization**

Work was completed in accordance with our agreement dated April 14, 2015.

### **1.4 Elevation Datum**

Survey information for the project site is not available at this time.

## **2.0 SITE AND PROJECT DESCRIPTION**

### **2.1 Site Description**

The project site is bounded to north by Railroad Avenue, to the east by Park Avenue, to the south by Johnson Street and the west by Columbia Street., in Bridgeport, Connecticut as shown on Figure 1, Site Location Map. The existing Marina Village Housing Complex currently occupies the site. As of the date of this report, the structures in the project parcel, are generally uninhabited, with the exception of a few apartments. Demolition of the existing structures is scheduled to be completed by October 2015.

The site is generally level, with both paved and grassy areas. The site is shown on Figure 2, Subsurface Exploration Location Plan.

## 2.2 Project Description

The proposed redevelopment will include construction of eight new housing structures. We understand that some of the proposed structures will have a maximum of four stories with floor slabs located at the existing ground surface with no basements. Based on the master plan, this first phase will include 123 units and 164 parking spaces, as well as a grassy recreation area.

## 3.0 SUBSURFACE EXPLORATIONS

Ten test borings (B-1/MW-3 through B-10) were drilled by New England Boring Contractors, Inc. of Glastonbury, Connecticut on May 12 through 14, 2015. Borings were completed with hollow-stem augers to depths ranging from 8 feet to 20.7 feet below the existing ground surface and were terminated at the predetermined depths. Borings B-1/MW-3, B-4/MW-1, and B-9/MW-2 were finished as environmental monitoring wells. The remaining borings were backfilled with cuttings upon completion.

Boring locations were determined by taping from existing structures. A Freeman Companies environmental scientist monitored the drilling, classified the soil samples, and prepared the test boring logs included in Appendix A. Boring locations are shown on Figure 2, Subsurface Exploration Location Plan.

Four grain size distribution analyses and one constant head (fixed wall) permeability test were performed on soil samples recovered from the borings by Geotesting Express of Acton, Massachusetts. Results of laboratory testing are provided in Appendix B.

## 4.0 SUBSURFACE CONDITIONS

The borings encountered topsoil, asphalt, fill, and sand, as described below. Subsurface conditions are known only at the boring locations and may differ significantly between borings. See the attached Table 1 for boring specific subsurface data.

**Topsoil/ Asphalt** – Topsoil was described as light brown to brown silty SAND (SM). Up to 1.1 feet of topsoil was encountered in the borings conducted in grassy areas. Asphalt thickness ranged from 1 inch to 3 inches.

**Fill** – Fill was described as very loose to dense, dark brown to light brown, silty SAND with gravel (SM), varying to poorly graded sand with gravel (SP), asphalt, crushed brick, concrete, and other manmade material debris. Standard Penetration Test N-Values ranged from 2 to 47 blows per foot (bpf). The fill extended to depths below ground surface ranging from 0 feet (B-9) to greater than 9 feet (B-8). Environmental testing indicated that the fill is environmentally impacted. Please reference the report titled “Environmental Evaluations and Materials Management Report” prepared by Freeman Cos., dated May 2015 for discussion on environmental impacts.

**Sand** – Sand was encountered in each of the borings, and was described as loose to very dense, tan to brown, poorly graded sand with silt and gravel (SP) varying to silty sand with gravel (SM). Standard Penetration Test N-Values ranged from 6 to 69 blows per foot (bpf).

**Silt** – A silt layer was encountered in Borings B-1/MW-3, B-2 and B-3 at a depth of approximately 16.5 feet. The silt is described as light brown, sandy silt (ML). The thickness of this deposit was not determined.

**Groundwater** – Soil samples were wet at depths ranging from 6 to 11 feet below the existing ground surface. Groundwater was measured in the monitoring wells at a depth of 6.4 feet to 7.6 feet after four to five days. Laboratory testing also indicated that the groundwater is environmentally impacted.

Groundwater level measurements represent conditions at the time of the explorations and may not represent static conditions. Groundwater levels will fluctuate with season, precipitation, nearby construction activities, and other conditions.

## 5.0 GEOTECHNICAL ENGINEERING RECOMMENDATIONS

### 5.1 Foundation Design

The existing fill is variable in consistency and density. Therefore, we recommend that the existing fill be removed below footings within the bearing zone which is defined by a 1 horizontal to 1 vertical (1H:1V) line sloped outward and downward from points located one foot outside the bottom exterior edge of the footing on all sides.

Foundations should be designed as spread footings bearing on the naturally deposited sand or on compacted structural fill or crushed stone wrapped in a geotextile separation fabric placed over the sand after removal of the unsuitable existing fill.

Footings should be designed for a maximum allowable bearing pressure of 4,000 pounds per square foot (psf). The allowable bearing pressure applies to footings having a minimum lateral dimension of at least 3 feet. For smaller footings, the recommended allowable bearing pressure should be reduced by the ratio of actual minimum footing size to 3 feet. At the recommended bearing pressure, total and differential settlements are anticipated to be less than 1 inch and  $\frac{3}{4}$  inch, respectively. Most settlement will occur during construction as dead load is applied.

Exterior footings should bear a minimum of 3.5 feet below the lowest adjacent ground surface for frost protection. Footings at heated interior locations may be designed to bear 2 feet below the proposed top of floor slab, however, building shut downs and power failures should be considered.

### 5.2 Floor Slab Design

The final floor elevation is not known at this time, but it is anticipated that it will be at or near the existing grade as no basement space is planned. The floor slab may be designed as a slab-on-grade bearing on a minimum 12 inch thick layer of compacted structural fill.

Existing fill may remain in place beneath the floor slabs provided that intense proof compaction of the subgrade is completed prior to placement of the compacted structural fill. The subgrade should be compacted with a minimum of 10 passes of a 10 ton vibratory drum roller. Any subgrades that are soft or yielding during proof compaction should be removed and replaced with compacted structural fill.

### 5.3 Foundation Drainage

The floor slab will be at or near existing grade. Water levels in the monitoring wells indicate that groundwater is a minimum of 6 feet below grade. Existing grade should be below floor grade and slope away from the building. Therefore, underslab or foundation drainage will not be necessary.

#### 5.4 Seismic Design

Soils at the site are classified as *Stiff Soil Profile* for earthquake design purposes, and are not susceptible to liquefaction. The corresponding site class is D. Design seismic coefficients are 0.270g for short period ( $S_s$ ) and 0.064g for one second period ( $S_1$ ), per the 2009 Amendment to the Connecticut State Building Code.

#### 5.5 Infiltration

We understand that project stormwater disposal will include infiltration. The existing fill on-site is not suitable for infiltration and will require removal and replacement with compacted Structural Fill or Crushed Stone over a geotextile fabric. Infiltration should assume flow into Structural Fill and the sand. A laboratory fixed wall permeability was completed on a composite sample of the sands. The results indicate a permeability of  $2.0 \times 10^{-2}$  centimeters per second (cm/sec).

The proposed infiltration area will be located in the grassy recreation area in the middle of the site, south of the parking area. The thickness of existing fill was 8 feet to 9 feet in this area. Groundwater levels noted in the monitoring wells were approximately 6 feet to 7 feet below existing grade.

#### 5.6 Backfill Materials

**Structural Fill** - Structural Fill should be used for fill within the building footprint. Structural Fill should consist of hard, durable sand and gravel, free of clay, organic matter, surface coatings, recycled materials, asphalt, and other deleterious materials, and meet the requirements of ConnDOT M.02.01, Granular Fill. The gradation should be M.02.06 grading A. Structural Fill shall be compacted in maximum 9-inch-thick, loose lifts to at least 95 percent of the maximum dry density determined in accordance with ASTM D1557.

**Crushed Stone** – Crushed Stone should consist of hard, durable, crushed or broken stone, free from recycled materials, asphalt, loam or clay. Crushed Stone should meet the gradation requirements of ConnDOT M.01.01, No. 6. Crushed stone should be placed in maximum 12-inch-thick loose lifts and compacted with at least 4 to 6 passes of a double-drum, walk-behind, vibratory compactor.

**Common Fill** – Common fill for general site filling outside the limits of structures should consist of mineral soil free from organic matter, recycled materials, asphalt, loam or clay, have a maximum particle size of 6 inches, and be capable of being placed and compacted. Common fill should be compacted in maximum 9-inch-thick, loose lifts to at least 92 percent of the maximum dry density determined in accordance with ASTM D1557.

**Geotextile Fabric** – Geotextile fabric should be a non-woven product similar to Mirafi 140N, or an approved equal product.

## **6.0 CONSTRUCTION CONSIDERATIONS**

### **6.1 Subgrade Preparation**

Foundation subgrade materials will consist of compacted structural fill placed after removal of unsuitable fill. Bearing surfaces should be free of standing water, frost, and loose soil before placement of reinforcing steel and concrete. It is recommended that Freeman Companies observe subgrade preparation activities.

### **6.2 Excavation and Dewatering**

Excavation of up to 9 feet of unsuitable existing fill will be required beneath the building footings. Conventional heavy construction equipment should be suitable for excavation in existing soil materials. Excavation should conform to OSHA excavation regulations contained in 29 CFR Part 1926, latest edition. Subgrades should be excavated in such a way to minimize disturbance, such as using a smooth faced bucket.

Groundwater is expected to be encountered during over-excavation activities for foundation construction or during other deep excavations at the site. If dewatering quantities are excessive Crushed Stone could be used in lieu of Structural Fill. We anticipate that excavation dewatering may be accomplished by pumping from properly filtered sumps discharged according to federal, state, and local regulations. The site should be graded to direct runoff away from excavations.

Specifications should require the contractor to maintain groundwater one foot below the bottom of excavation at all times.

### **6.3 Temporary Lateral Support**

Open cut excavations appear feasible for the majority of excavations, provided there is adequate space to slope the excavation. Temporary lateral support of excavations may be necessary where excavations extend below groundwater, for utility excavations, or where excavations are close to existing structures, roads, or utilities. Trench boxes, steel sheeting or soldier piles and lagging may be feasible. Excavations and excavation support should be designed and constructed in conformance all OSHA, State, and Federal Regulations.

### **6.4 Freezing Conditions**

If construction is performed during freezing weather, special precautions will be required to prevent the subgrade from freezing. Freezing of soil beneath foundations and slabs during construction may result in settlement when the soil thaws.

Subgrades should be free of frost prior to placement of concrete for footings. Frost-susceptible soils that have frozen should be removed and replaced with compacted Structural Fill or geotextile fabric and Crushed Stone. The footing and the soil adjacent to the footing should be protected from freezing until they are backfilled.

Soils placed as fill should be free of frost, as should be the ground on which it is placed. Floor slabs should be heated or insulated during freezing weather to prevent freezing of the subgrade.

### **6.5 Backfilling and Compaction**

Fill placed within the building limits should consist of Structural Fill or Crushed Stone wrapped in a geotextile fabric.

## **6.6 Use of On-Site Excavated Soils**

The existing fill is not suitable for reuse as compacted Structural Fill but could be used as Common Fill provided that environmental requirements can be met. Please reference environmental report for direction on storage and disposal of the existing fill materials.

## **6.7 Site Disturbance**

The existing fill will be sensitive to disturbance from construction equipment, due to the fines and debris content. Soils could easily become disturbed, and the ground surface could become excessively muddy and unstable due to traffic by heavy construction equipment, particularly during or immediately following periods of inclement weather. Project specifications should require that the Contractor maintain stable site conditions at all times.

## **7.0 FUTURE SERVICES AND LIMITATIONS**

### **7.1 Future Engineering Services**

Freeman Companies should be engaged during final design to:

- Review final design drawings and prepare an earthwork specification.
- Provide consultation to the design team on geotechnical issues on an as-needed basis.

Freeman Companies should be engaged during construction to:

- Review contractor submittals related to geotechnical issues.
- Provide construction monitoring to verify that soil conditions exposed in excavations are in general conformance with our design assumptions, to observe that the subgrades for the footings and floor slabs are prepared in the intended manner, and that fill materials are properly placed and compacted.

### **7.2 Limitations**

This report was prepared for the exclusive use of Bridgeport Community Renewal Associates, LP, and the project design team. The recommendations provided herein are based on the project information provided at the time of this report and may require modification if there are any changes in the nature, design, or location of the facility.

The recommendations in this report are based in part on the data obtained from the subsurface explorations. The nature and extent of variations between explorations may not become evident until construction. If variations from the anticipated conditions are encountered, it may be necessary to revise the recommendations in this report.

Our professional services for this project have been performed in accordance with generally accepted engineering practices; no warranty, express or implied, is made.



**2015-0408**  
**Marina Village Housing Complex Redevelopment**  
**Bridgeport, Connecticut**

**Table 1**  
**Subsurface Data**

Boring No.	Depth (ft.)	Pavement/				Groundwater Depth
		Topsoil	Fill	Sand	Silt	
B-1/MW	17	0.08	7	9	>1	6.4
B-2	17	0.8	3	13.3	>.7	8
B-3	17	0.2	5	11.4	>0.6	8
B-4/MW	17	0.08	4	>13	--	7.56
B-5	8	1.1	7.6	>8	--	6.5
B-6	10	0.2	8.5	>1.5	--	7
B-7	8	0.3	4.4	>3.6	--	6
B-8	12	0.5	10	>2	--	6.5
B-9/MW	17	--	--	>17	--	6.41
B-10	20.7	--	8.5	>12.2	--	11

**Notes:**

1. Groundwater levels are approximate, except in those borings designated as monitoring wells, and may not represent static groundwater levels.
2. "--" - Not Encountered



**MAP REFERENCE**  
 7.5 MINUTE SERIES TOPOGRAPHIC MAP  
 BRIDGEPORT, CONN. 1984

**FREEMAN**  
 COMPANIES  
LAND DEVELOPMENT | ENGINEERING DESIGN | CONSTRUCTION SERVICES  
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 TOLL FREE: (800)604-5141  
 FAX: (860)986-7161  
 ELEVATE YOUR EXPECTATIONS

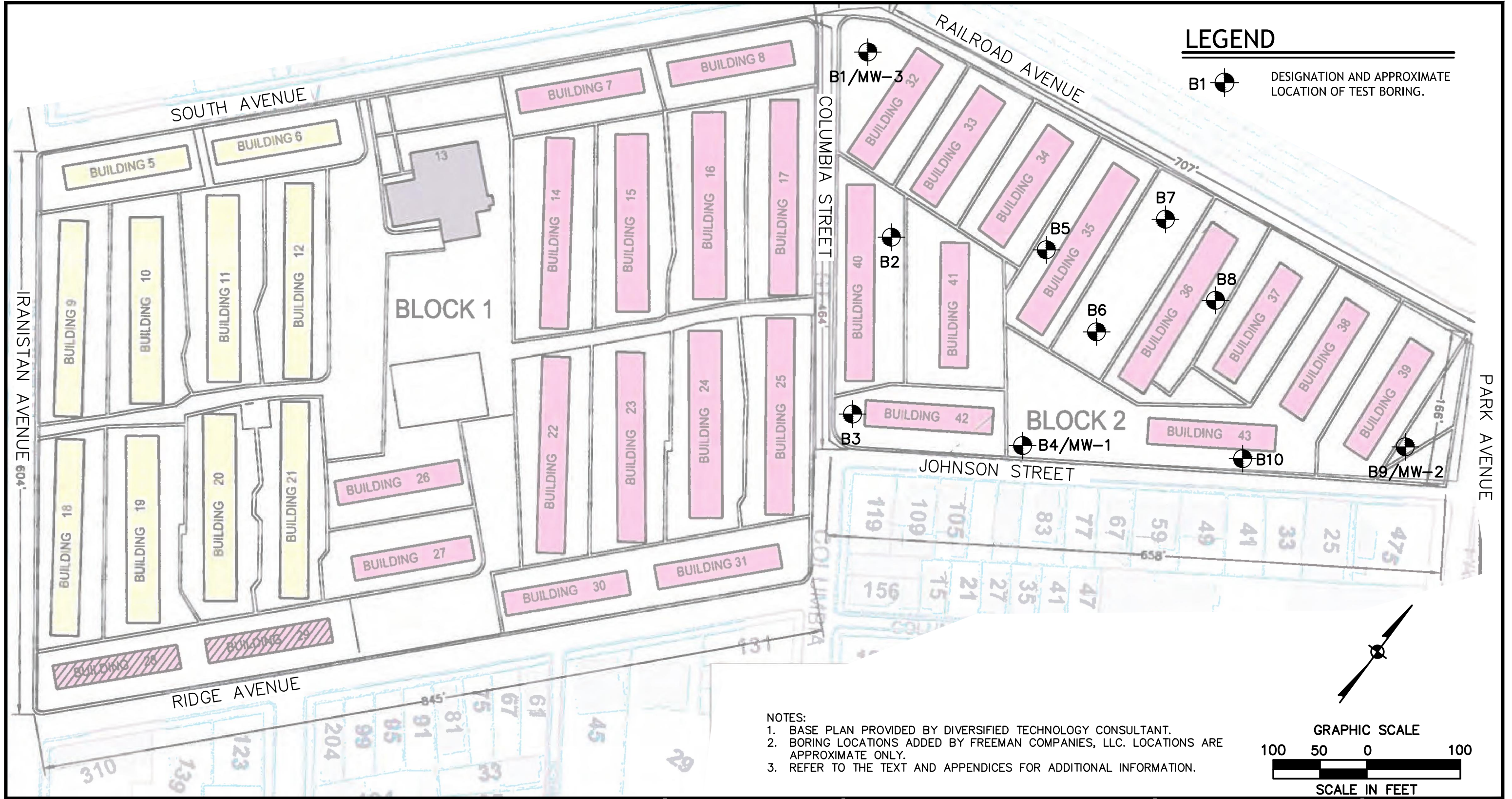
**SITE LOCATION MAP**  
**MARINA VILLAGE HOUSING COMPLEX**  
**REDEVELOPMENT**  
**BRIDGEPORT, CONNECTICUT**

DRAFTED: C.B.  
 CHECKED: A.M.  
 APPROVED: N.W.  
 SCALED: 1"=1000'  
 PROJECT NO.: 2015-0408  
 DATE: 05/29/15

FIG.  
**FIGURE 1**

Freeman Companies, LLC - Y: 2015\_2015-0408 - Marina Village\DWG\Figure 1 and 2.dwg May 28, 2015-2:09pm Plotted By: cbarzola

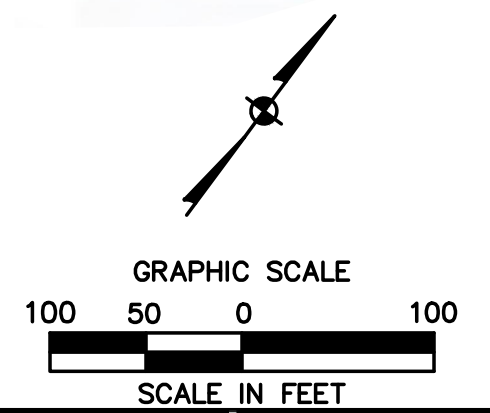
Freeman Companies, LLC . Y:\2015\2015-0408 - Marina Village\DWG\Figure 1 and 2.dwg May 28, 2015-2:21pm Plotted By: cbarzola



**LEGEND**

B1 DESIGNATION AND APPROXIMATE LOCATION OF TEST BORING.

- NOTES:  
 1. BASE PLAN PROVIDED BY DIVERSIFIED TECHNOLOGY CONSULTANT.  
 2. BORING LOCATIONS ADDED BY FREEMAN COMPANIES, LLC. LOCATIONS ARE APPROXIMATE ONLY.  
 3. REFER TO THE TEXT AND APPENDICES FOR ADDITIONAL INFORMATION.



**SUBSURFACE EXPLORATION LOCATION PLAN**

MARINA VILLAGE HOUSING COMPLEX REDEVELOPMENT  
 BRIDGEPORT, CONNECTICUT

**FREEMAN**  
 COMPANIES  
LAND DEVELOPMENT | ENGINEERING DESIGN | CONSTRUCTION SERVICES

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 (860)251-9550  
 TOLL FREE: (800)604-5141  
 FAX: (860)986-7161  
 ELEVATE YOUR EXPECTATIONS

No.	Date	Description

REVISIONS

DESIGNED:	AM
DRAWN:	CB
CHECKED:	AM
APPROVED:	NW
SCALE:	1"=100'
PROJECT NO.:	2015-0408
DATE:	05/29/15

SHEET NO.  
**FIGURE 2**

Geotechnical Report  
Marina Village Housing Complex Redevelopment  
Bridgeport, Connecticut  
May 29, 2015



**APPENDIX A**  
**TEST BORING LOGS**

**Exploration Location**  
 NORTHING: \_\_\_\_\_ EASTING: \_\_\_\_\_ STATION: \_\_\_\_\_ OFFSET: \_\_\_\_\_  
 HORIZONTAL DATUM: \_\_\_\_\_ STATION CENTERLINE: \_\_\_\_\_  
 VERTICAL DATUM: \_\_\_\_\_ ESTIMATED GROUND SURFACE ELEV. (FT): \_\_\_\_\_  
 LOCATION: \_\_\_\_\_

**EXPLORATION**

**B-1/MW-3**

PAGE 1 of 1

**Drilling Information**

DATE START / END: 5/14/2015 - 5/14/2015 TOTAL DEPTH (FT): 17.0  
 CONTRACTOR: New England Boring DRILLER: Mike St. John LOGGED BY (Person): J. Herpich  
 EQUIPMENT: \_\_\_\_\_ EXPLORATION TYPE/METHOD: Hollow Stem Auger  
 AUGER ID/OD: 4.25 in / N/A CASING ID/OD: N/A / N/A CORE INFO: \_\_\_\_\_  
 HAMMER TYPE: Safety Hammer HAMMER WEIGHT (lbs): 140 HAMMER DROP (inch): 30  
 WATER LEVEL DEPTHS (ft): ▼ 8.00 5/14/2015 ▼ 6.40 5/18/2015  
 GENERAL NOTES: \_\_\_\_\_

**ABBREVIATIONS:** ID = Inside Diameter bpf = Blows per Foot U = Undisturbed Tube Sample WOH = Weight of Hammer S<sub>v</sub> = Pocket Torvane Shear Strength  
 OD = Outside Diameter mpf = Minute per Foot C = Rock Core RQD = Rock Quality Designation F<sub>v</sub> = Field Vane Shear Strength  
 Pen. = Penetration Length S = Split Spoon SC = Sonic Core PID = Photoionization Detector NA, NM = Not Applicable, Not Measured  
 Rec. = Recovery Length DP = Direct Push Sample WOR = Weight of Rods Q<sub>v</sub> = Pocket Penetrometer Strength

Elev. (ft)	Depth (ft)	Casing Pen. (bpf) or Core Rate (mpf)	SAMPLE INFORMATION					GRAPHIC LOG	Sample Description & Classification	H <sub>2</sub> O Depth	WELL CONSTRUCTION DETAILS
			Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blows Count or RQD				
			S-1	0.25 to 2.25	24/18	23-8-7-10		ASPHALT (1 in.) (0.1'- 0.3') POORLY GRADED GRAVEL (GP); ~100% gravel, coarse; dry, black, FILL.		backfill cuttings 6" bentonite seal. 1/4 bag	
	5		S-2	4 to 6	24/6	3-2-7-22		(0.3'- 3') SILTY SAND (SM); ~75% sand, fine to coarse, ~15% fines, ~10% gravel, fine to medium; brown, FILL, with crushed brick. (3'- 7') SILTY SAND WITH GRAVEL (SM); ~50% sand, fine to medium, ~35% gravel, coarse, ~15% fines; brown, FILL, with crushed brick, glass, black material (odor).			
	10		S-3	8 to 10	24/20	9-12-12-14		(7'- 16') POORLY GRADED SAND (SP); ~85% sand, medium to coarse, ~10% gravel, fine, ~5% fines; brown.		#2 sand for sand pack. 3 bags. 2" diameter PVC Screen, 0.010 slot size	
	15		S-4	15 to 17	24/18	5-8-14-20		(16'- 17') SANDY SILT (ML); ~60% fines, ~40% sand, fine to medium; brown.		17' bottom depth of boring, backfill cuttings, PVC plug	
	20							Bottom of Exploration at 17 feet			

FREEMAN COMPANIES PROJECT: 2015-0408 - MARINA VILLAGE.GPJ\_GINT STD US LAB.GDT 5/29/15

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

LOGGED BY (Consultant): Freeman Companies, LLC  
 PROJECT NAME: Marina Village Housing Complex Redevel  
 CITY/STATE: Bridgeport, CT  
 PROJECT NUMBER: 2015-0408

**FREEMAN COMPANIES**  
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 www.freemancos.com

**Exploration Location**  
 NORTHING: \_\_\_\_\_ EASTING: \_\_\_\_\_ STATION: \_\_\_\_\_ OFFSET: \_\_\_\_\_  
 HORIZONTAL DATUM: \_\_\_\_\_ STATION CENTERLINE: \_\_\_\_\_  
 VERTICAL DATUM: \_\_\_\_\_ ESTIMATED GROUND SURFACE ELEV. (FT): \_\_\_\_\_  
 LOCATION: \_\_\_\_\_

**EXPLORATION**  
**B-2**  
 PAGE 1 of 1

**Drilling Information**

DATE START / END: 5/12/2015 - 5/12/2015 TOTAL DEPTH (FT): 17.0  
 CONTRACTOR: New England Boring DRILLER: Mike St. John LOGGED BY (Person): J. Herpich  
 EQUIPMENT: \_\_\_\_\_ EXPLORATION TYPE/METHOD: Hollow Stem Auger  
 AUGER ID/OD: N/A / N/A CASING ID/OD: N/A / N/A CORE INFO: \_\_\_\_\_  
 HAMMER TYPE: Safety Hammer HAMMER WEIGHT (lbs): 140 HAMMER DROP (inch): 30  
 WATER LEVEL DEPTHS (ft): ▼ 8.00 5/12/2015  
 GENERAL NOTES: \_\_\_\_\_

**ABBREVIATIONS:** ID = Inside Diameter bpf = Blows per Foot U = Undisturbed Tube Sample WOH = Weight of Hammer S<sub>v</sub> = Pocket Torvane Shear Strength  
 OD = Outside Diameter mpf = Minute per Foot C = Rock Core RQD = Rock Quality Designation F<sub>v</sub> = Field Vane Shear Strength  
 Pen. = Penetration Length S = Split Spoon SC = Sonic Core PID = Photoionization Detector NA, NM = Not Applicable, Not Measured  
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Elev. (ft)	Depth (ft)	Casing Pen. (bpf) or Core Rate (mpf)	SAMPLE INFORMATION				GRAPHIC LOG	Sample Description & Classification	H <sub>2</sub> O Depth	Remarks
			Sample No.	Type	Depth (ft)	Pen./ Rec. (in)				
			S-1	0 to 2	24/19	2-6-13-6		TOPSOIL		
	5		S-2	4 to 6	24/23	2-1-1-3		(1'- 1.5') POORLY GRADED SAND WITH GRAVEL (SP); ~70% sand, fine to coarse, ~25% gravel, fine to coarse, ~5% fines; tan, FILL, asphalt pieces. (1.5'- 3') POORLY GRADED SAND WITH GRAVEL (SP); ~50% sand, fine to coarse, ~45% gravel, fine to coarse, ~5% fines; brown, FILL, crushed concrete and asphalt.		
	10		S-3	8 to 10	24/24	8-10-10-11		(3'- 4.9') SILTY SAND (SM); ~70% sand, fine to coarse, ~30% fines; brown. (4.9'- 16.3') POORLY GRADED SAND (SP); ~95% sand, medium to coarse, ~5% fines; tan.	▼	
	15		S-4	15 to 17	24/24	15-14-16-18		(16.3'- 17') SILT (ML); ~80% fines, ~20% sand; wet, light brown.		
	20							Bottom of Exploration at 17 feet		

FREEMAN COMPANIES PROJECT: 2015-0408 - MARINA VILLAGE.GPJ\_GINT STD US LAB.GDT 5/29/15

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

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**Exploration Location**  
 NORTHING: \_\_\_\_\_ EASTING: \_\_\_\_\_ STATION: \_\_\_\_\_ OFFSET: \_\_\_\_\_  
 HORIZONTAL DATUM: \_\_\_\_\_ STATION CENTERLINE: \_\_\_\_\_  
 VERTICAL DATUM: \_\_\_\_\_ ESTIMATED GROUND SURFACE ELEV. (FT): \_\_\_\_\_  
 LOCATION: \_\_\_\_\_

**EXPLORATION**  
**B-3**  
 PAGE 1 of 1

**Drilling Information**

DATE START / END: 5/12/2015 - 5/12/2015 TOTAL DEPTH (FT): 17.0  
 CONTRACTOR: New England Boring DRILLER: Mike St. John LOGGED BY (Person): J. Herpich  
 EQUIPMENT: \_\_\_\_\_ EXPLORATION TYPE/METHOD: Hollow Stem Auger  
 AUGER ID/OD: N/A / N/A CASING ID/OD: N/A / N/A CORE INFO: \_\_\_\_\_  
 HAMMER TYPE: Safety Hammer HAMMER WEIGHT (lbs): 140 HAMMER DROP (inch): 30  
 WATER LEVEL DEPTHS (ft): ▼ 8.00 5/12/2015  
 GENERAL NOTES: \_\_\_\_\_

**ABBREVIATIONS:** ID = Inside Diameter bpf = Blows per Foot U = Undisturbed Tube Sample WOH = Weight of Hammer S<sub>v</sub> = Pocket Torvane Shear Strength  
 OD = Outside Diameter mpf = Minute per Foot C = Rock Core RQD = Rock Quality Designation F<sub>v</sub> = Field Vane Shear Strength  
 Pen. = Penetration Length S = Split Spoon SC = Sonic Core PID = Photoionization Detector NA, NM = Not Applicable, Not Measured  
 Rec. = Recovery Length DP = Direct Push Sample WOR = Weight of Rods Q<sub>v</sub> = Pocket Penetrometer Strength

Elev. (ft)	Depth (ft)	Casing Pen. (bpf) or Core Rate (mpf)	SAMPLE INFORMATION				GRAPHIC LOG	Sample Description & Classification	H <sub>2</sub> O Depth	Remarks
			Sample No.	Type	Depth (ft)	Pen./ Rec. (in)				
			S-1	0.2 to 2.2	24/13	8-8-5-9		ASPHALT (2 in.)		
	5		S-2	4 to 6	24/14	2-4-3-4		(0.2'- 2.2') POORLY GRADED SAND WITH GRAVEL (SP); ~60% sand, medium to coarse, ~30% gravel, fine, ~10% fines; dry, tan, FILL, concrete, asphalt and brick pieces (fill). (2.2'- 5') SILTY SAND (SM); ~60% sand, fine to coarse, ~25% gravel, fine, ~15% fines; dry, tan, FILL, concrete, asphalt and brick pieces (fill).		
	10		S-3	8 to 10	24/24	6-5-7-8		(5'- 12.5') POORLY GRADED SAND (SP); ~95% sand, coarse, ~5% fines; dry, tan, FILL.	▼	
	15		S-4	15 to 17	24/24	22-24-27-28		(12.5'- 16.4') POORLY GRADED SAND (SP); ~85% sand, medium to coarse, ~10% gravel, fine, ~5% fines; wet, brown.		
	20							(16.4'- 17') SILT (ML); ~60% fines, ~40% sand; wet, light brown. Bottom of Exploration at 17 feet		

FREEMAN COMPANIES PROJECT: 2015-0408 - MARINA VILLAGE.GPJ\_GINT STD US LAB.GDT 5/29/15

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

LOGGED BY (Consultant): Freeman Companies, LLC  
 PROJECT NAME: Marina Village Housing Complex Redevel  
 CITY/STATE: Bridgeport, CT  
 PROJECT NUMBER: 2015-0408

**FREEMAN COMPANIES**  
LAND DEVELOPMENT ENGINEERING DESIGN CONSTRUCTION SERVICES

**Freeman Companies, LLC**  
 36 John Street  
 Hartford, CT 06102  
 (860) 251-9550  
 www.freemancos.com

**Exploration Location**

NORTHING: \_\_\_\_\_ EASTING: \_\_\_\_\_ STATION: \_\_\_\_\_ OFFSET: \_\_\_\_\_  
 HORIZONTAL DATUM: \_\_\_\_\_ STATION CENTERLINE: \_\_\_\_\_  
 VERTICAL DATUM: \_\_\_\_\_ ESTIMATED GROUND SURFACE ELEV. (FT): \_\_\_\_\_  
 LOCATION: \_\_\_\_\_

**EXPLORATION**

**B-4/MW-1**

PAGE 1 of 1

**Drilling Information**

DATE START / END: 5/13/2015 - 5/13/2015 TOTAL DEPTH (FT): 17.0  
 CONTRACTOR: New England Boring DRILLER: Mike St. John LOGGED BY (Person): J. Herpich  
 EQUIPMENT: \_\_\_\_\_ EXPLORATION TYPE/METHOD: Hollow Stem Auger  
 AUGER ID/OD: 4.25 in / N/A CASING ID/OD: N/A / N/A CORE INFO: \_\_\_\_\_  
 HAMMER TYPE: Safety Hammer HAMMER WEIGHT (lbs): 140 HAMMER DROP (inch): 30  
 WATER LEVEL DEPTHS (ft): 8.00 5/13/2015 7.56 5/18/2015  
 GENERAL NOTES: \_\_\_\_\_

**ABBREVIATIONS:** ID = Inside Diameter bpf = Blows per Foot U = Undisturbed Tube Sample WOH = Weight of Hammer S<sub>v</sub> = Pocket Torvane Shear Strength  
 OD = Outside Diameter mpf = Minute per Foot C = Rock Core RQD = Rock Quality Designation F<sub>v</sub> = Field Vane Shear Strength  
 Pen. = Penetration Length S = Split Spoon SC = Sonic Core PID = Photoionization Detector NA, NM = Not Applicable, Not Measured  
 Rec. = Recovery Length DP = Direct Push Sample WOR = Weight of Rods Q<sub>v</sub> = Pocket Penetrometer Strength

Elev. (ft)	Depth (ft)	Casing Pen. (bpf) or Core Rate (mpf)	SAMPLE INFORMATION					GRAPHIC LOG	Sample Description & Classification	H <sub>2</sub> O Depth	WELL CONSTRUCTION DETAILS
			Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blows Count or RQD				
			S-1	0.1 to 2.1	24/2	20-9-10-4		ASPHALT (1 in.)			
			S-2	2 to 4	24/9	4-2-3-3	(0.1'- 0.4') POORLY GRADED GRAVEL (GP); ~60% gravel, medium to coarse, ~40% sand, fine; FILL.				
			S-3	4 to 6	24/15	4-6-8-12	(0.4'- 2.1') POORLY GRADED GRAVEL WITH SAND (GP); ~60% gravel, medium to coarse, ~40% sand, fine; dry, black, FILL.				
	5						(2.1'- 2.5') SILTY SAND (SM); ~60% sand, fine, ~40% fines; dry, tan, FILL.				
			S-4	8 to 10	24/24	4-9-14-43	(2.5'- 4') POORLY GRADED SAND WITH SILT AND GRAVEL (SM); ~70% sand, fine, ~20% fines, ~10% gravel, coarse, angular; dry, brown, FILL, asphalt pieces.				
	10						(4'- 9') POORLY GRADED SAND WITH GRAVEL (SP); ~90% sand, fine to coarse, ~10% gravel, fine; wet, tan.				
							(9'- 12.5') SILTY SAND (SM); ~50% sand, fine to medium, ~40% fines, ~10% gravel, fine to coarse; wet, light brown.				
	15		S-5	15 to 17	24/14	18-13-16-18	(12.5'- 17') SILTY SAND WITH GRAVEL (SC); ~65% sand, medium to coarse, ~20% fines, ~15% gravel, fine to coarse; wet, gray.				
							Bottom of Exploration at 17 feet				
	20										

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LOGGED BY (Consultant): Freeman Companies, LLC  
 PROJECT NAME: Marina Village Housing Complex Redevelopment  
 CITY/STATE: Bridgeport, CT  
 PROJECT NUMBER: 2015-0408

**Freeman Companies, LLC**  
 36 John Street  
 Hartford, CT 06102  
 (860) 251-9550  
 www.freemancos.com

FREEMAN COMPANIES PROJECT: 2015-0408 - MARINA VILLAGE.GPJ\_GINT STD US LAB.GDT 5/29/15



**Exploration Location**  
 NORTHING: \_\_\_\_\_ EASTING: \_\_\_\_\_ STATION: \_\_\_\_\_ OFFSET: \_\_\_\_\_  
 HORIZONTAL DATUM: \_\_\_\_\_ STATION CENTERLINE: \_\_\_\_\_  
 VERTICAL DATUM: \_\_\_\_\_ ESTIMATED GROUND SURFACE ELEV. (FT): \_\_\_\_\_  
 LOCATION: \_\_\_\_\_

**EXPLORATION**  
  
**B-5**  
 PAGE 1 of 1

**Drilling Information**  
 DATE START / END: 5/12/2015 - 5/12/2015 TOTAL DEPTH (FT): 8.0  
 CONTRACTOR: New England Boring DRILLER: Mike St. John LOGGED BY (Person): J. Herpich  
 EQUIPMENT: \_\_\_\_\_ EXPLORATION TYPE/METHOD: Hollow Stem Auger  
 AUGER ID/OD: N/A / N/A CASING ID/OD: N/A / N/A CORE INFO: \_\_\_\_\_  
 HAMMER TYPE: Safety Hammer HAMMER WEIGHT (lbs): 140 HAMMER DROP (inch): 30  
 WATER LEVEL DEPTHS (ft): ▼ 6.50 5/12/2015  
 GENERAL NOTES: \_\_\_\_\_

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 OD = Outside Diameter mpf = Minute per Foot C = Rock Core RQD = Rock Quality Designation F<sub>v</sub> = Field Vane Shear Strength  
 Pen. = Penetration Length S = Split Spoon SC = Sonic Core PID = Photoionization Detector NA, NM = Not Applicable, Not Measured  
 Rec. = Recovery Length DP = Direct Push Sample WOR = Weight of Rods Q<sub>v</sub> = Pocket Penetrometer Strength

Elev. (ft)	Depth (ft)	Casing Pen. (bpf) or Core Rate (mpf)	SAMPLE INFORMATION					GRAPHIC LOG	Sample Description & Classification	H <sub>2</sub> O Depth	Remarks
			Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blows Count or RQD				
			S-1		0 to 2	24/21	2-6-13-17		TOPSOIL (13 in.)		
			S-2		2 to 4	24/22	25-15-32-23		(1.1'- 2') SILTY SAND (SM); ~50% sand, ~50% fines, ~0% gravel; dry, dark brown, FILL, Pieces of brick and asphalt.		
			S-3		4 to 6	24/19	17-8-5-6		(2'- 2.75') WELL GRADED SAND (SW); ~100% sand, fine to coarse; dry, light brown, FILL.		
			S-4		6 to 8	24/24	4-3-3-18		(2.75'- 4.8') SILTY SAND (SM); ~80% sand, fine, ~20% fines; dry, dark brown, FILL, with brick, asphalt, roof felt, and concrete.		
									(4.8'- 5.4') SANDY SILT (ML); ~70% fines, ~30% sand, fine to coarse; moist, dark brown, FILL.		
									(5.4'- 6') SILTY SAND (SM); ~80% sand, fine to coarse, ~20% fines; moist, tan, FILL.		
									(6'- 6.4') SANDY SILT (ML); ~70% fines, ~30% sand, fine to coarse; wet, dark brown, FILL.		
									(6.4'- 6.7') SILTY SAND (SM); ~80% sand, medium to coarse, ~20% fines; wet, tan, FILL.		
									(6.7'- 7.6') SILTY SAND WITH GRAVEL (SM); ~50% sand, medium to coarse, ~30% fines, ~20% gravel, fine; wet, tan, FILL.		
									(7.6'- 8') SILTY SAND (SM); ~85% sand, fine to medium, ~15% fines; wet, tan.		
									Bottom of Exploration at 8 feet		

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LOGGED BY (Consultant): Freeman Companies, LLC  
 PROJECT NAME: Marina Village Housing Complex Redevel  
 CITY/STATE: Bridgeport, CT  
 PROJECT NUMBER: 2015-0408

**Freeman Companies, LLC**  
 36 John Street  
 Hartford, CT 06102  
 (860) 251-9550  
 www.freemancos.com



FREEMAN COMPANIES PROJECT: 2015-0408 - MARINA VILLAGE.GPJ\_GINT STD US LAB.GDT 5/29/15

**Exploration Location**  
 NORTHING: \_\_\_\_\_ EASTING: \_\_\_\_\_ STATION: \_\_\_\_\_ OFFSET: \_\_\_\_\_  
 HORIZONTAL DATUM: \_\_\_\_\_ STATION CENTERLINE: \_\_\_\_\_  
 VERTICAL DATUM: \_\_\_\_\_ ESTIMATED GROUND SURFACE ELEV. (FT): \_\_\_\_\_  
 LOCATION: \_\_\_\_\_

**EXPLORATION**  
**B-6**  
 PAGE 1 of 1

**Drilling Information**

DATE START / END: 5/13/2015 - 5/13/2015 TOTAL DEPTH (FT): 10.0  
 CONTRACTOR: New England Boring DRILLER: Mike St. John LOGGED BY (Person): J. Herpich  
 EQUIPMENT: \_\_\_\_\_ EXPLORATION TYPE/METHOD: Hollow Stem Auger  
 AUGER ID/OD: N/A / N/A CASING ID/OD: N/A / N/A CORE INFO: \_\_\_\_\_  
 HAMMER TYPE: Safety Hammer HAMMER WEIGHT (lbs): 140 HAMMER DROP (inch): 30  
 WATER LEVEL DEPTHS (ft): ▼ 7.00 5/13/2015  
 GENERAL NOTES: \_\_\_\_\_

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 OD = Outside Diameter mpf = Minute per Foot C = Rock Core RQD = Rock Quality Designation F<sub>v</sub> = Field Vane Shear Strength  
 Pen. = Penetration Length S = Split Spoon SC = Sonic Core PID = Photoionization Detector NA, NM = Not Applicable, Not Measured  
 Rec. = Recovery Length DP = Direct Push Sample WOR = Weight of Rods Q<sub>p</sub> = Pocket Penetrometer Strength

Elev. (ft)	Depth (ft)	Casing Pen. (bpf) or Core Rate (mpf)	SAMPLE INFORMATION					GRAPHIC LOG	Sample Description & Classification	H <sub>2</sub> O Depth	Remarks
			Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blows Count or RQD				
			S-1	0 to 2	24/19	13-17-11-14		ASPHALT (2 in.)			
			S-2	2 to 4	24/19	13-22-105-30		(0.2'- 4.7') SILTY SAND WITH GRAVEL (SM); ~65% sand, fine to coarse, ~20% fines, ~15% gravel, fine to coarse; dark brown, FILL, with concrete, brick, and black material.			
	5		S-3	4 to 6	24/21	15-2-2-2		(4.7'- 4.8') SILT WITH SAND (ML); ~50% sand, fine, ~50% fines; tan, FILL.			
			S-4	6 to 8	24/19	2-1-1-1		(4.8'- 6') SILT WITH SAND (ML); ~70% sand, fine to coarse, ~30% fines; gray, FILL, with concrete, brick, black material, unknown white material.	▼		
			S-5	8 to 10	24/24	8-10-15-19		(6'- 7.6') SILTY SAND (SM); ~70% sand, fine to coarse, ~30% fines; tan, FILL.			
	10							(7.6'- 8.5') SILTY SAND (SM); ~85% sand, fine to coarse, ~15% fines; gray, FILL, with concrete, brick, black material, unknown white material.			
								(8.5'- 10') POORLY GRADED SAND (SP); ~98% sand, fine to coarse, ~2% fines; tan.			
								Bottom of Exploration at 10 feet			

FREEMAN COMPANIES PROJECT: 2015-0408 - MARINA VILLAGE.GPJ\_GINT STD US LAB.GDT 5/29/15

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

LOGGED BY (Consultant): Freeman Companies, LLC  
 PROJECT NAME: Marina Village Housing Complex Redevel  
 CITY/STATE: Bridgeport, CT  
 PROJECT NUMBER: 2015-0408

**FREEMAN COMPANIES**  
 LAND DEVELOPMENT ENGINEERING DESIGN CONSTRUCTION SERVICES  
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 36 John Street  
 Hartford, CT 06102  
 (860) 251-9550  
 www.freemancos.com

**Exploration Location**  
 NORTHING: \_\_\_\_\_ EASTING: \_\_\_\_\_ STATION: \_\_\_\_\_ OFFSET: \_\_\_\_\_  
 HORIZONTAL DATUM: \_\_\_\_\_ STATION CENTERLINE: \_\_\_\_\_  
 VERTICAL DATUM: \_\_\_\_\_ ESTIMATED GROUND SURFACE ELEV. (FT): \_\_\_\_\_  
 LOCATION: \_\_\_\_\_

**EXPLORATION**  
**B-7**  
 PAGE 1 of 1

**Drilling Information**

DATE START / END: 5/12/2015 - 5/12/2015 TOTAL DEPTH (FT): 8.0  
 CONTRACTOR: New England Boring DRILLER: Mike St. John LOGGED BY (Person): J. Herpich  
 EQUIPMENT: \_\_\_\_\_ EXPLORATION TYPE/METHOD: Hollow Stem Auger  
 AUGER ID/OD: N/A / N/A CASING ID/OD: N/A / N/A CORE INFO: \_\_\_\_\_  
 HAMMER TYPE: Safety Hammer HAMMER WEIGHT (lbs): 140 HAMMER DROP (inch): 30  
 WATER LEVEL DEPTHS (ft): 6.00 5/12/2015  
 GENERAL NOTES: \_\_\_\_\_

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 OD = Outside Diameter mpf = Minute per Foot C = Rock Core RQD = Rock Quality Designation F<sub>v</sub> = Field Vane Shear Strength  
 Pen. = Penetration Length S = Split Spoon SC = Sonic Core PID = Photoionization Detector NA, NM = Not Applicable, Not Measured  
 Rec. = Recovery Length DP = Direct Push Sample WOR = Weight of Rods Q<sub>p</sub> = Pocket Penetrometer Strength

Elev. (ft)	Depth (ft)	Casing Pen. (bpf) or Core Rate (mpf)	SAMPLE INFORMATION					GRAPHIC LOG	Sample Description & Classification	H <sub>2</sub> O Depth	Remarks
			Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blows Count or RQD				
			S-1		0 to 2	24/17	9-21-21-39		APHALT (3 in.)		
			S-2		2 to 4	24/24	11-8-4-5		(0.3'- 4.4') SILTY SAND WITH GRAVEL (SM); ~65% sand, fine to medium, ~20% gravel, fine to coarse, ~15% fines; brown, FILL, with asphalt, plastic, and black materials.		
	5		S-3		4 to 6	24/24	2-2-2-2		(4.4'- 6') SILTY SAND WITH GRAVEL (SM); ~60% sand, fine to medium, ~20% gravel, fine, ~20% fines; moist, tan.		
			S-4		6 to 8	24/20	4-16-21-14		(6'- 6.5') SILTY SAND WITH GRAVEL (SM); ~70% sand, fine, ~20% fines, ~10% gravel, medium to coarse; wet.		
									(6.5'- 8') POORLY GRADED SAND (SP); ~95% sand, medium to coarse, ~5% fines; wet, tan.		
	10								Bottom of Exploration at 8 feet		
	15										
	20										

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LOGGED BY (Consultant): Freeman Companies, LLC  
 PROJECT NAME: Marina Village Housing Complex Redevelopment  
 CITY/STATE: Bridgeport, CT  
 PROJECT NUMBER: 2015-0408

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FREEMAN COMPANIES PROJECT: 2015-0408 - MARINA VILLAGE.GPJ\_GINT STD US LAB.GDT 5/29/15

**Exploration Location**  
 NORTHING: \_\_\_\_\_ EASTING: \_\_\_\_\_ STATION: \_\_\_\_\_ OFFSET: \_\_\_\_\_  
 HORIZONTAL DATUM: \_\_\_\_\_ STATION CENTERLINE: \_\_\_\_\_  
 VERTICAL DATUM: \_\_\_\_\_ ESTIMATED GROUND SURFACE ELEV. (FT): \_\_\_\_\_  
 LOCATION: \_\_\_\_\_

**EXPLORATION**  
  
**B-8**  
 PAGE 1 of 1

**Drilling Information**

DATE START / END: 5/13/2015 - 5/13/2015 TOTAL DEPTH (FT): 12.0  
 CONTRACTOR: New England Boring DRILLER: Mike St. John LOGGED BY (Person): J. Herpich  
 EQUIPMENT: \_\_\_\_\_ EXPLORATION TYPE/METHOD: Hollow Stem Auger  
 AUGER ID/OD: N/A / N/A CASING ID/OD: N/A / N/A CORE INFO: \_\_\_\_\_  
 HAMMER TYPE: Safety Hammer HAMMER WEIGHT (lbs): 140 HAMMER DROP (inch): 30  
 WATER LEVEL DEPTHS (ft): ▼ 6.50 5/13/2015  
 GENERAL NOTES: \_\_\_\_\_

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 OD = Outside Diameter mpf = Minute per Foot C = Rock Core RQD = Rock Quality Designation F<sub>v</sub> = Field Vane Shear Strength  
 Pen. = Penetration Length S = Split Spoon SC = Sonic Core PID = Photoionization Detector NA, NM = Not Applicable, Not Measured  
 Rec. = Recovery Length DP = Direct Push Sample WOR = Weight of Rods Q<sub>v</sub> = Pocket Penetrometer Strength

Elev. (ft)	Depth (ft)	Casing Pen. (bpf) or Core Rate (mpf)	SAMPLE INFORMATION					GRAPHIC LOG	Sample Description & Classification	H <sub>2</sub> O Depth	Remarks
			Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blows Count or RQD				
			S-1		0 to 2	24	9-12-8-16		TOPSOIL (6 in.)		
			S-2		2 to 4	24	5-5-4-4		(0.5'- 2') POORLY GRADED SAND WITH GRAVEL (SP); ~60% sand, fine to coarse, ~30% gravel, fine to coarse, ~10% fines; dry, FILL, with brick, concrete, and black material.		
			S-3		4 to 6	24	7-7-9-8		(2'- 4') POORLY GRADED SAND WITH GRAVEL (SP); ~70% sand, medium to coarse, ~30% gravel, fine to coarse; dry, tan, FILL, black material.		
	5		S-4		6 to 8	24	5-5-4-3		(4'- 7') POORLY GRADED SAND WITH GRAVEL (SP); ~75% sand, fine to coarse, ~20% gravel, fine to coarse, ~5% fines; moist, dark brown, FILL, with brick, black material, unknown white material.	▼	
			S-5		8 to 10	24	100/2"		(7'- 10') SILTY SAND WITH GRAVEL (SM); ~60% sand, fine to coarse, ~20% gravel, fine to coarse, ~20% fines; wet, dark brown, FILL, with brick, black material, unknown white material.		
	10		S-6		10 to 12	24	11-15-16-21		(10'- 12') SILTY SAND WITH GRAVEL (SM); ~55% sand, fine to coarse, ~30% gravel, fine to coarse, ~15% fines; wet, brown.		
									Bottom of Exploration at 12 feet		
	15										
	20										

FREEMAN COMPANIES PROJECT: 2015-0408 - MARINA VILLAGE.GPJ\_GINT STD US LAB.GDT 5/29/15

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

LOGGED BY (Consultant): Freeman Companies, LLC  
 PROJECT NAME: Marina Village Housing Complex Redevel  
 CITY/STATE: Bridgeport, CT  
 PROJECT NUMBER: 2015-0408

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**Exploration Location**  
 NORTHING: \_\_\_\_\_ EASTING: \_\_\_\_\_ STATION: \_\_\_\_\_ OFFSET: \_\_\_\_\_  
 HORIZONTAL DATUM: \_\_\_\_\_ STATION CENTERLINE: \_\_\_\_\_  
 VERTICAL DATUM: \_\_\_\_\_ ESTIMATED GROUND SURFACE ELEV. (FT): \_\_\_\_\_  
 LOCATION: \_\_\_\_\_

**EXPLORATION**

**B-9/MW-2**

PAGE 1 of 1

**Drilling Information**

DATE START / END: 5/14/2015 - 5/14/2015 TOTAL DEPTH (FT): 17.0  
 CONTRACTOR: New England Boring DRILLER: Mike St. John LOGGED BY (Person): J. Herpich  
 EQUIPMENT: \_\_\_\_\_ EXPLORATION TYPE/METHOD: Hollow Stem Auger  
 AUGER ID/OD: 4.25 in / N/A CASING ID/OD: N/A / N/A CORE INFO: \_\_\_\_\_  
 HAMMER TYPE: Safety Hammer HAMMER WEIGHT (lbs): 140 HAMMER DROP (inch): 30  
 WATER LEVEL DEPTHS (ft): 6.41 5/18/2015  
 GENERAL NOTES: \_\_\_\_\_

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 OD = Outside Diameter mpf = Minute per Foot C = Rock Core RQD = Rock Quality Designation F<sub>v</sub> = Field Vane Shear Strength  
 Pen. = Penetration Length S = Split Spoon SC = Sonic Core PID = Photoionization Detector NA, NM = Not Applicable, Not Measured  
 Rec. = Recovery Length DP = Direct Push Sample WOR = Weight of Rods Q<sub>p</sub> = Pocket Penetrometer Strength

Elev. (ft)	Depth (ft)	Casing Pen. (bpf) or Core Rate (mpf)	SAMPLE INFORMATION					GRAPHIC LOG	Sample Description & Classification	H <sub>2</sub> O Depth	WELL CONSTRUCTION DETAILS
			Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blows Count or RQD				
			S-1	0 to 2	24/20	14-16-24-24		(0'- 9.5') SILTY SAND WITH GRAVEL (SM); ~55% sand, fine to coarse, ~30% fines, ~15% gravel, fine to medium; moist, brown.		backfill cuttings 6" bentonite seal. 1/4 bag.	
			S-2	4 to 6	24/17	14-19-17-21					
			S-3	8 to 10	24/18	21-30-39-33		(9.5'- 10') SILTY SAND WITH GRAVEL (SM); ~55% sand, fine to coarse, ~30% fines, ~15% gravel, fine to medium; moist, black, odor.		#2 sand for sand pack.	
			S-4	15 to 17	24/22	32-41-72-100		(10'- 17') SILTY SAND WITH GRAVEL (SM); ~55% sand, fine to coarse, ~30% fines, ~15% gravel, fine to medium; moist, brown.		2" diameter PVC Screen, 0.010 slot size.	
								Bottom of Exploration at 17 feet		17' bottom depth of boring, backfill cuttings, PVC plug	

FREEMAN COMPANIES PROJECT: 2015-0408 - MARINA VILLAGE.GPJ\_GINT STD US LAB.GDT 5/29/15

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LOGGED BY (Consultant): Freeman Companies, LLC  
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**FREEMAN COMPANIES**  
 LAND DEVELOPMENT ENGINEERING DESIGN CONSTRUCTION SERVICES  
**Freeman Companies, LLC**  
 36 John Street  
 Hartford, CT 06102  
 (860) 251-9550  
 www.freemancos.com

**Exploration Location**  
 NORTHING: \_\_\_\_\_ EASTING: \_\_\_\_\_ STATION: \_\_\_\_\_ OFFSET: \_\_\_\_\_  
 HORIZONTAL DATUM: \_\_\_\_\_ STATION CENTERLINE: \_\_\_\_\_  
 VERTICAL DATUM: \_\_\_\_\_ ESTIMATED GROUND SURFACE ELEV. (FT): \_\_\_\_\_  
 LOCATION: \_\_\_\_\_

**EXPLORATION**  
**B-10**  
 PAGE 1 of 1

**Drilling Information**

DATE START / END: 5/13/2015 - 5/13/2015 TOTAL DEPTH (FT): 20.7  
 CONTRACTOR: New England Boring DRILLER: Mike St. John LOGGED BY (Person): J. Herpich  
 EQUIPMENT: \_\_\_\_\_ EXPLORATION TYPE/METHOD: Hollow Stem Auger  
 AUGER ID/OD: N/A / N/A CASING ID/OD: N/A / N/A CORE INFO: \_\_\_\_\_  
 HAMMER TYPE: Safety Hammer HAMMER WEIGHT (lbs): 140 HAMMER DROP (inch): 30  
 WATER LEVEL DEPTHS (ft): 11.00 5/13/2015  
 GENERAL NOTES: \_\_\_\_\_

**ABBREVIATIONS:** ID = Inside Diameter bpf = Blows per Foot U = Undisturbed Tube Sample WOH = Weight of Hammer S<sub>v</sub> = Pocket Torvane Shear Strength  
 OD = Outside Diameter mpf = Minute per Foot C = Rock Core RQD = Rock Quality Designation F<sub>v</sub> = Field Vane Shear Strength  
 Pen. = Penetration Length S = Split Spoon SC = Sonic Core PID = Photoionization Detector NA, NM = Not Applicable, Not Measured  
 Rec. = Recovery Length DP = Direct Push Sample WOR = Weight of Rods Q<sub>p</sub> = Pocket Penetrometer Strength

Elev. (ft)	Depth (ft)	Casing Pen. (bpf) or Core Rate (mpf)	SAMPLE INFORMATION					GRAPHIC LOG	Sample Description & Classification	H <sub>2</sub> O Depth	Remarks
			Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blows Count or RQD				
			S-1	0 to 2	24/10	11-6-6-5		(0'- 3.5') SILTY SAND WITH GRAVEL (SM); ~40% sand, fine to coarse, ~40% fines, ~20% gravel, fine to medium; dry, brown.			
	5		S-2	4 to 6	24/24	20-17-20-16		(3.5'- 8.5') SILTY SAND WITH GRAVEL (SM); ~40% sand, fine to medium, ~40% fines, ~20% gravel, fine to coarse; dry, brown.			
	10		S-3	8 to 10	24/20	16-32-30-40		(8.5'- 20.7') SILTY SAND WITH GRAVEL (SM); ~60% sand, fine to coarse, ~20% gravel, fine to medium, ~20% fines; wet, brown.		▼	
	15		S-4	15 to 17	24/24	57-77-59-129					
	20		S-5	20 to 20.7	8/8	30-140/2"		Bottom of Exploration at 20.67 feet			

FREEMAN COMPANIES PROJECT: 2015-0408 - MARINA VILLAGE.GPJ\_GINT STD US LAB.GDT 5/29/15

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

LOGGED BY (Consultant): Freeman Companies, LLC  
 PROJECT NAME: Marina Village Housing Complex Redevel  
 CITY/STATE: Bridgeport, CT  
 PROJECT NUMBER: 2015-0408

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Geotechnical Report  
Marina Village Housing Complex Redevelopment  
Bridgeport, Connecticut  
May 29, 2015

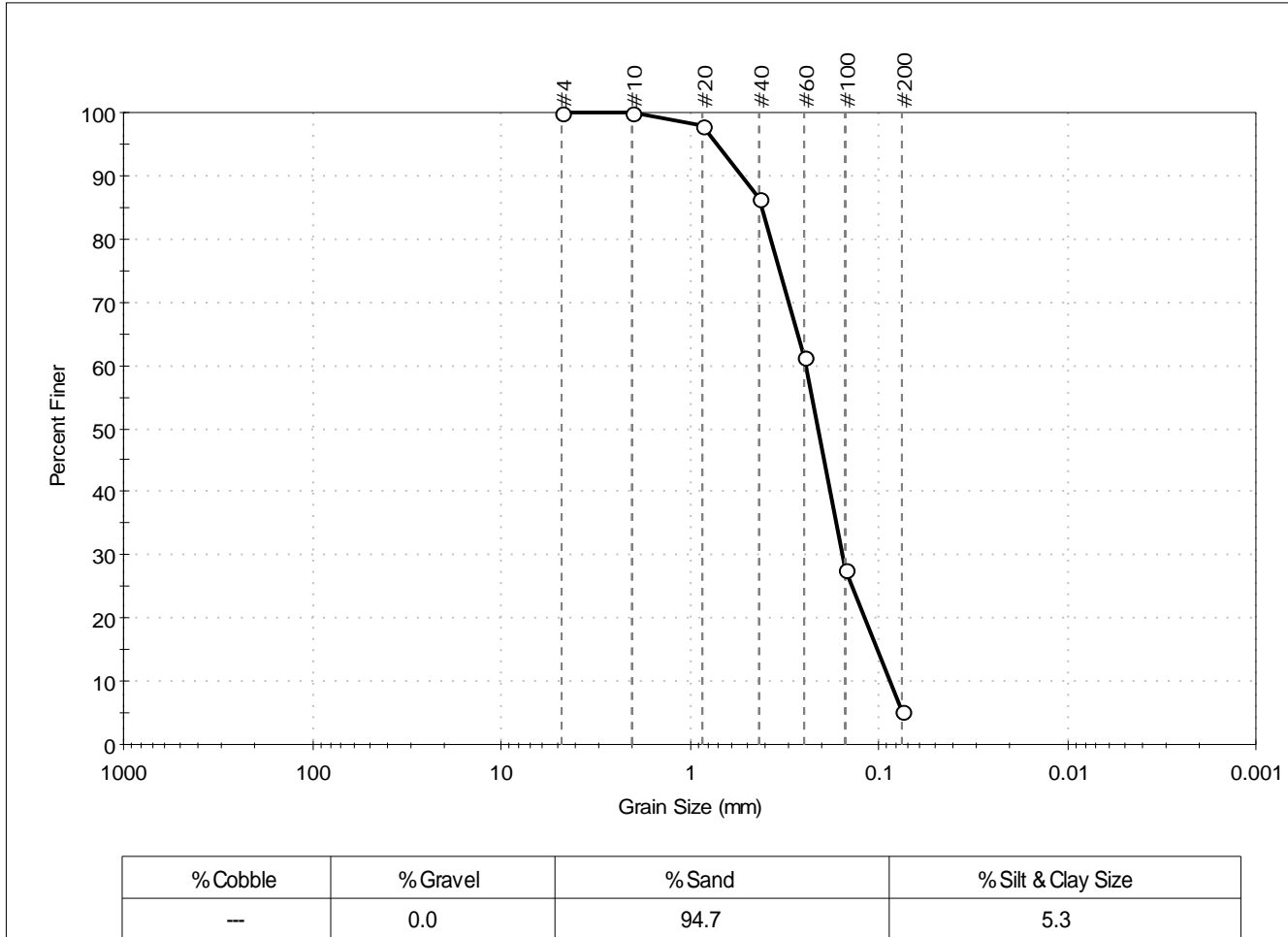


**APPENDIX B**  
**LABORATORY TEST RESULTS**



Client:	Freeman Companies, LLC		Project No:	GTX-303192
Project:	Marina Village Housing Redevelopment		Tested By:	jbr
Location:	Bridgeport, CT		Checked By:	emm
Boring ID:	B-2	Sample Type:	bag	
Sample ID:	S3	Test Date:	05/27/15	
Depth :	8-10 ft	Test Id:	333328	
Test Comment:	---			
Sample Description:	Moist, brownish yellow sand with silt			
Sample Comment:	---			

## Particle Size Analysis - ASTM D422



Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	98		
#40	0.42	87		
#60	0.25	61		
#100	0.15	28		
#200	0.075	5.3		

<u>Coefficients</u>	
D <sub>85</sub> = 0.4112 mm	D <sub>30</sub> = 0.1550 mm
D <sub>60</sub> = 0.2446 mm	D <sub>15</sub> = 0.1011 mm
D <sub>50</sub> = 0.2101 mm	D <sub>10</sub> = 0.0867 mm
C <sub>u</sub> = 2.821	C <sub>c</sub> = 1.133

<u>Classification</u>	
<u>ASTM</u>	N/A
<u>AASHTO</u>	Fine Sand (A-3 (1))

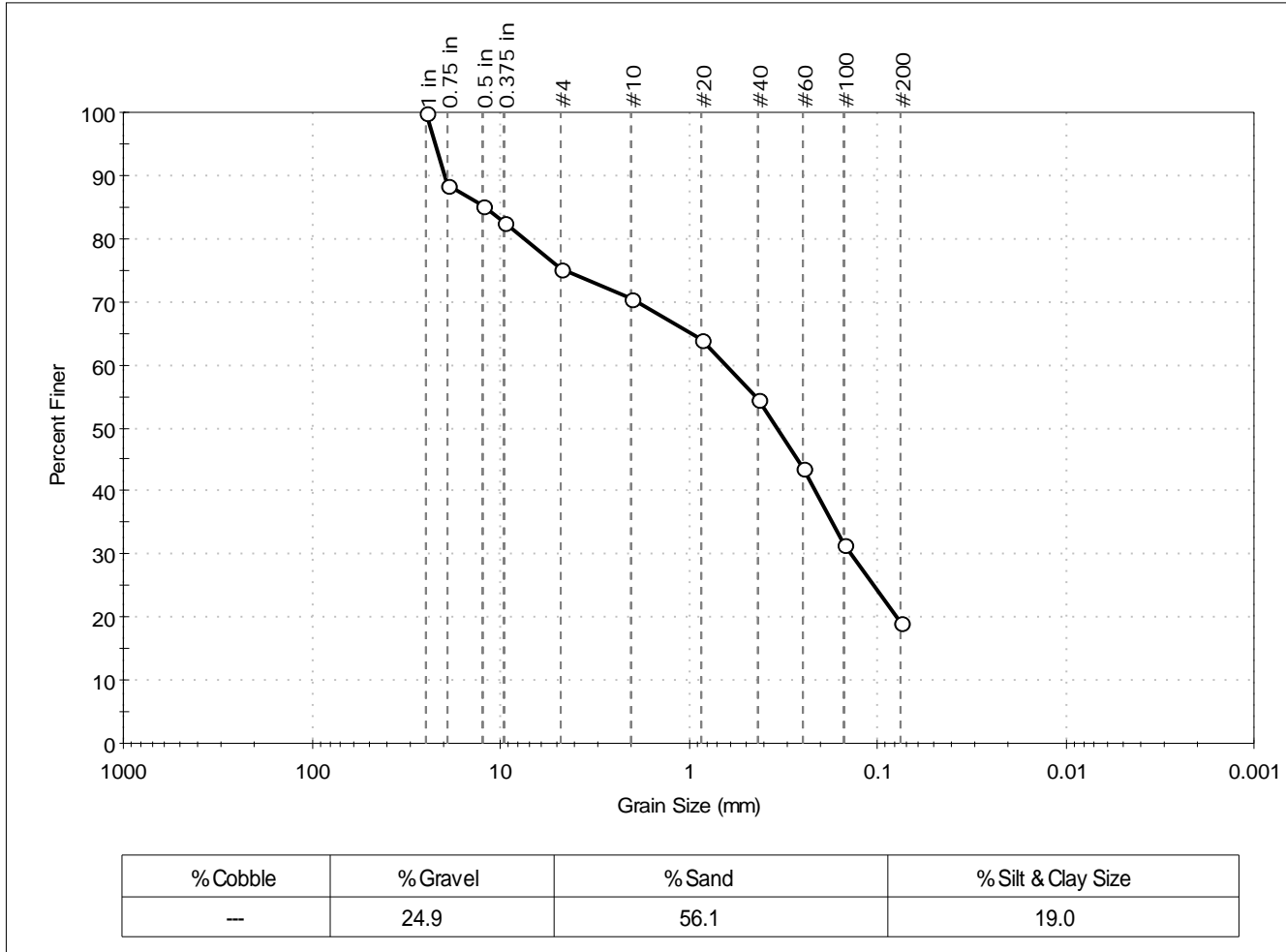
<u>Sample/Test Description</u>
Sand/Gravel Particle Shape : <b>ROUNDED</b>
Sand/Gravel Hardness : <b>HARD</b>





Client:	Freeman Companies, LLC		
Project:	Marina Village Housing Redevelopment		
Location:	Bridgeport, CT	Project No:	GTX-303192
Boring ID:	B-4	Sample Type:	bag
Sample ID:	S5	Test Date:	05/27/15
Depth :	15-17 ft	Test Id:	333329
Test Comment:	---		
Sample Description:	Moist, light gray silty sand with gravel		
Sample Comment:	---		

## Particle Size Analysis - ASTM D422



Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 in	25.00	100		
0.75 in	19.00	89		
0.5 in	12.50	85		
0.375 in	9.50	82		
#4	4.75	75		
#10	2.00	71		
#20	0.85	64		
#40	0.42	54		
#60	0.25	44		
#100	0.15	31		
#200	0.075	19		

<u>Coefficients</u>	
D <sub>85</sub> = 12.1370 mm	D <sub>30</sub> = 0.1382 mm
D <sub>60</sub> = 0.6376 mm	D <sub>15</sub> = N/A
D <sub>50</sub> = 0.3418 mm	D <sub>10</sub> = N/A
C <sub>u</sub> = N/A	C <sub>c</sub> = N/A

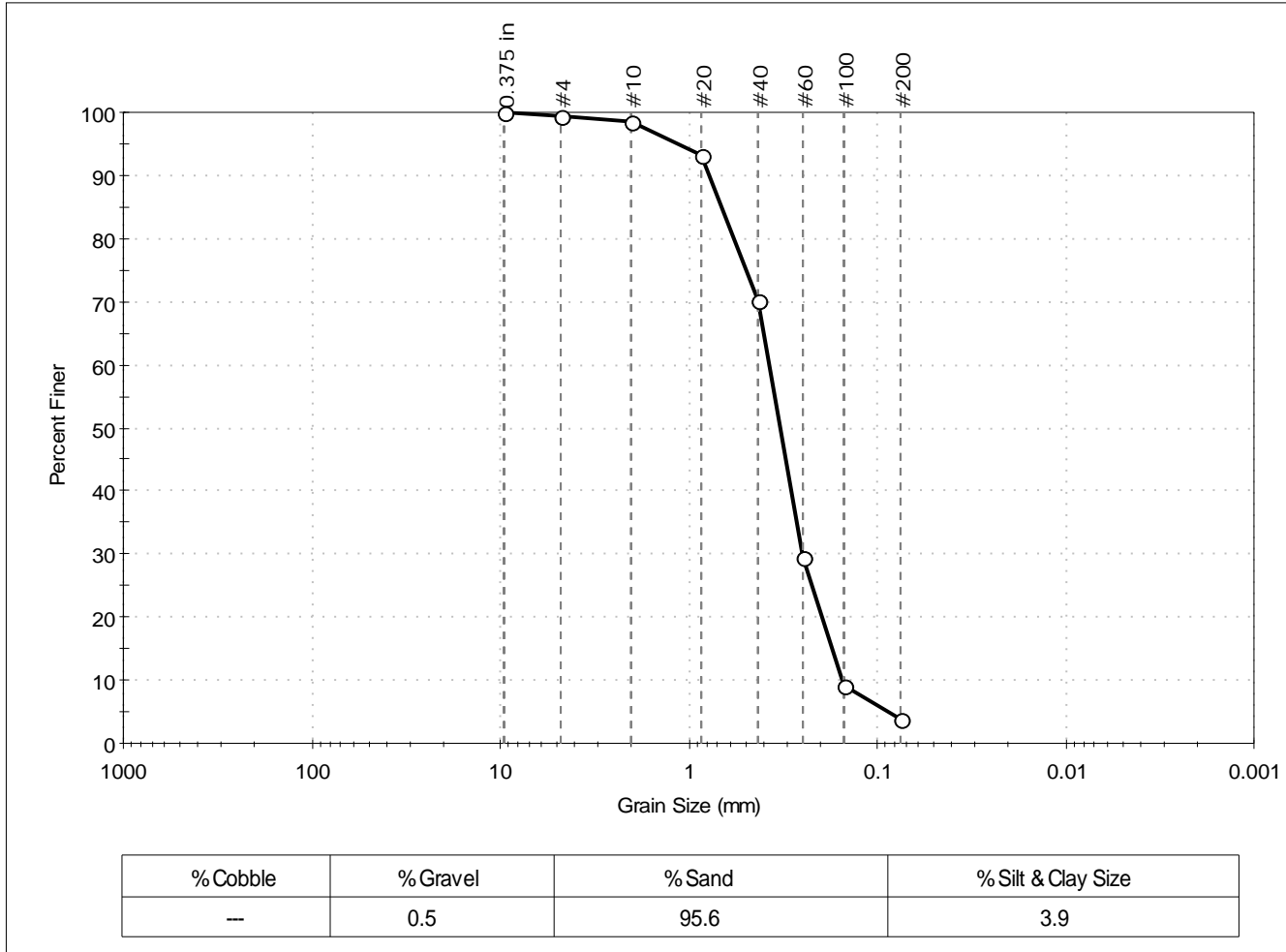
<u>Classification</u>	
<u>ASTM</u>	N/A
<u>AASHTO</u>	Silty Gravel and Sand (A-2-4 (0))

<u>Sample/Test Description</u>
Sand/Gravel Particle Shape : <b>ROUNDED</b>
Sand/Gravel Hardness : <b>HARD</b>



Client: Freeman Companies, LLC	Project No: GTX-303192
Project: Marina Village Housing Redevelopment	
Location: Bridgeport, CT	
Boring ID: B-7	Sample Type: bag
Sample ID: S4	Test Date: 05/27/15
Depth: 6-8 ft	Test Id: 333330
Test Comment: ---	Tested By: jbr
Sample Description: Moist, brownish yellow sand	Checked By: emm
Sample Comment: ---	

## Particle Size Analysis - ASTM D422



Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	99		
#10	2.00	98		
#20	0.85	93		
#40	0.42	70		
#60	0.25	30		
#100	0.15	9		
#200	0.075	3.9		

<u>Coefficients</u>	
D <sub>85</sub> = 0.6636 mm	D <sub>30</sub> = 0.2513 mm
D <sub>60</sub> = 0.3720 mm	D <sub>15</sub> = 0.1739 mm
D <sub>50</sub> = 0.3264 mm	D <sub>10</sub> = 0.1536 mm
C <sub>u</sub> = 2.422	C <sub>c</sub> = 1.105

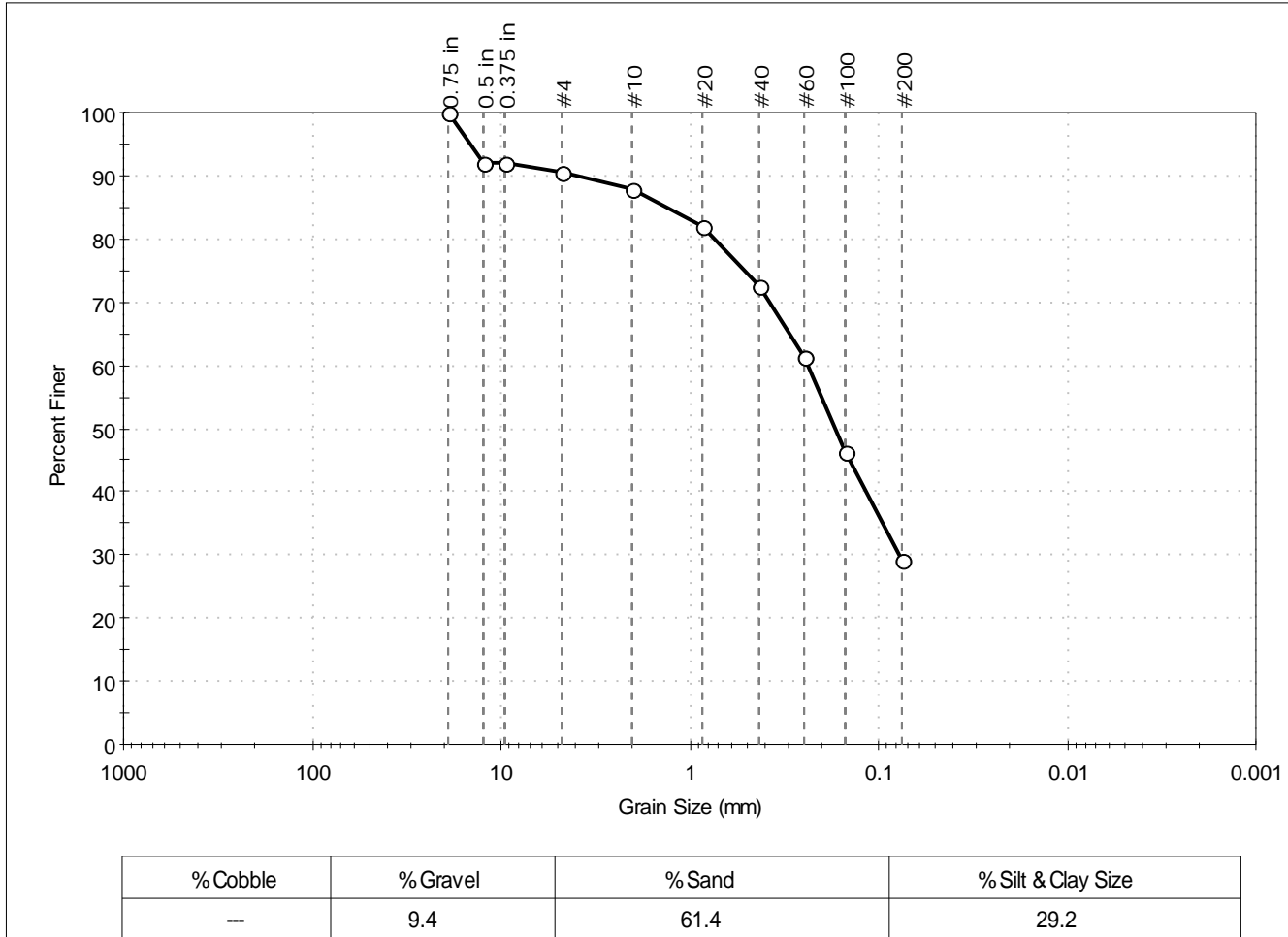
<u>Classification</u>	
<u>ASTM</u>	Poorly graded sand (SP)
<u>AASHTO</u>	Fine Sand (A-3 (1))

<u>Sample/Test Description</u>	
Sand/Gravel Particle Shape :	---
Sand/Gravel Hardness :	---



Client: Freeman Companies, LLC	Project: Marina Village Housing Redevelopment	Location: Bridgeport, CT	Project No: GTX-303192
Boring ID: B-10	Sample Type: bag	Tested By: jbr	Checked By: emm
Sample ID: S5	Test Date: 05/27/15	Test Id: 333331	
Depth: 20-22 ft			
Test Comment: ---			
Sample Description: Moist, brown silty sand			
Sample Comment: ---			

## Particle Size Analysis - ASTM D422



Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	92		
0.375 in	9.50	92		
#4	4.75	91		
#10	2.00	88		
#20	0.85	82		
#40	0.42	73		
#60	0.25	61		
#100	0.15	46		
#200	0.075	29		

<u>Coefficients</u>	
D <sub>85</sub> = 1.3240 mm	D <sub>30</sub> = 0.0775 mm
D <sub>60</sub> = 0.2386 mm	D <sub>15</sub> = N/A
D <sub>50</sub> = 0.1696 mm	D <sub>10</sub> = N/A
C <sub>u</sub> = N/A	C <sub>c</sub> = N/A

<u>Classification</u>	
<u>ASTM</u>	N/A
<u>AASHTO</u>	Silty Gravel and Sand (A-2-4 (0))

<u>Sample/Test Description</u>
Sand/Gravel Particle Shape : ROUNDED
Sand/Gravel Hardness : HARD



Client:	Freeman Companies, LLC		
Project Name:	Marina Village Housing Redevelopment		
Project Location:	Bridgeport, CT		
GTX #:	303192		
Start Date:	05/28/15	Tested By:	jcw
End Date:	05/29/15	Checked By:	emm
Boring #:	B-4/Combined		
Sample #:	S4		
Depth:	6-10 ft		
Visual Description:	Moist, yellowish brown sand with gravel		

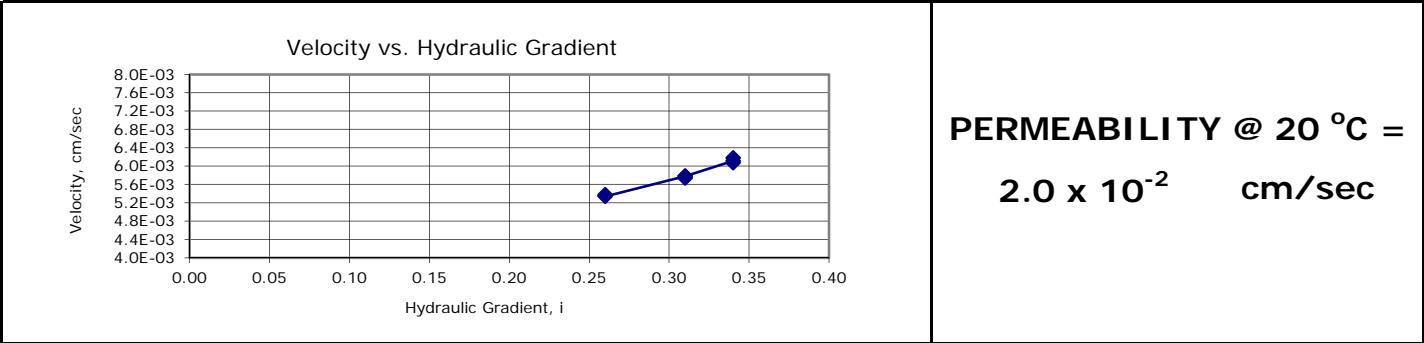
## Permeability of Granular Soils (Constant Head) by ASTM D2434

Sample Type:	Remolded		
Sample Information:	Maximum Dry Density:	---	pcf
	Optimum Moisture Content:	---	%
	Compaction Test Method:	---	
	Classification (ASTM D2487):	---	
	Assumed Specific Gravity:	2.65	
Sample Preparation / Test Setup:	Test specimen compacted with moderate effort at air-dried moisture content. Material >3/8-inch removed from sample prior to testing (0% of sample).		

Parameter	Initial	Final
Height, in	4.03	4.03
Diameter, in	3.98	3.98
Area, in <sup>2</sup>	12.4	12.4
Volume, in <sup>3</sup>	50.1	50.1
Mass, g	1239	1575
Bulk Density, pcf	94.2	120
Moisture Content, %	0.9	28.3
Dry Density, pcf	93.3	93.3
Degree of Saturation, %	---	97.0
Void Ratio, e	---	0.77

Date	Reading #	Volume of Flow, cc	Time of Flow, sec	Flow Rate, cc/sec	Gradient	Permeability, cm/sec	Temp., °C	Correction Factor	Permeability @ 20 °C, cm/sec
5/28	1	4.3	10	0.43	0.26	2.1E-02	19.1	1.023	2.1E-02
5/28	2	4.3	10	0.43	0.26	2.1E-02	19.1	1.023	2.1E-02
5/28	3	4.3	10	0.43	0.26	2.1E-02	19.1	1.023	2.1E-02
5/28	4	4.6	10	0.46	0.31	1.9E-02	19.1	1.023	1.9E-02
5/28	5	4.6	10	0.46	0.31	1.9E-02	19.1	1.023	1.9E-02
5/28	6	4.6	10	0.46	0.31	1.9E-02	19.1	1.023	1.9E-02
5/28	7	4.9	10	0.49	0.34	1.8E-02	19.1	1.023	1.8E-02
5/28	8	4.9	10	0.49	0.34	1.8E-02	19.1	1.023	1.8E-02
5/28	9	5.0	10	0.50	0.34	1.8E-02	19.1	1.023	1.9E-02



Note: This standard has been withdrawn by ASTM with no replacement.