SUMMARY OF SERVICES (Exhibit A)-SCHEDULE OF SPECIAL INSPECTION SERVICES

Project: Multi Tenant Office Building @ 135 Marginal Way, Portland, ME

Material/Activity	Item	Service	Y/N	Extent	Comments	Agent	Date	Rev
1705. 5 Masonry Construction	**4.00**							
Materials		**Review Material Certifications**						
		1. Masonry Units	Y	All		BSE		
		2. Reinforcing Steel	Y	All		BSE		
Mix Designs		Review mortar materials & design	Y	All		BSE		
		Review Grout Materials & Design	Y	All		BSE		
Testing		Grout – Compressive Strength	Y	Sample		TL		
		Mortar – Compressive Strength	Y	Sample	ASTM C780	TL		
Masonry Installation		Review Mortar Mix proportions and Mixing	Y	Sample	ACI 530.1 – 2.3, 2.5	TL		
		Review Grout Mix proportions and Mixing	Y	Sample	ACI 530.1 – 2.3, 2.5	TL		
		Review General Installation of Mortar	Y	Sample	ACI 530.1; 4.2.2	BSE		
		Review General Installation of Grout	Y	Sample	ACI 530.1; 4.2.2	BSE		
		Review Installation of Masonry Units	Y	Sample	ACI 530.1;2.3.3.3, 4.3.3	BSE		
		Review Installation of Reinforcement	Y	Sample	ACI 530.1, Chapter 8	BSE		
		Review Hot/Cold Weather procedures	Y	Sample	ACI 530.1; 2.3.2.2,2.3.2.3	BSE		
		Review Installation of Anchorage	Y	Sample	ACI 530.1; 4.2, 5.14	BSE		
1705.7 Wood Construction	**5.00**	**NOT APPLICABLE**						
1705.7 Prepared Fill	**6.00**							
Site Preparation		Review Site Preparation prior to fill placement	N					
Fill Placement		**Review Compliance to Soils Report**						
		1. Material	N					
		2. Lift Thickness	N					
Evaluation		Review in-place dry density for compliance with soils report	N					

SUMMARY OF SERVICES (Exhibit A)-SCHEDULE OF SPECIAL INSPECTION SERVICES

Project: Multi Tenant Office Building @ 135 Marginal Way, Portland, ME

Material/Activity	Item	Service	Y/N	Extent	Comments	Agent	Date	Rev
1705.8 Pile Foundations	**7.00**							
Materials		1. Pile tip assembly	Y	Sample		TL		
		2. Pile Splice Assembly	Y	All		TL		
		3. Steel Pile Certifications	Y	All		TL/BSE		
Fabrication		1. Plant Certification	Y	Submit Certification		BSE		
Pile Driving		1. Review Pile Driving Records	Y	All		TL		
		2. Review Pile Driving Equipment & Procedure	Y	All		TL		
		3. Review Pile As-Built Survey	Y	All		TL/BSE		

R. W. Gillespie & Associates, Inc.
Geotechnical Engineering • Geohydrology • Materials Testing Services

24 May 2004

Mr. Bruce Kistler
Fore River Company
P.O. Box 7525
Portland, Maine 04112-7525

Subject: Pile Foundation Evaluation
Proposed 135 Marginal Way Office Building
Portland, Maine
RWG&A Project No. 816-04

Dear Mr. Kistler:

As requested and authorized, R. W Gillespie & Associates, Inc., (RWG&A) has conducted an evaluation of pile-supported foundations for a two-story office building proposed to be built at 135 Marginal Way in Portland, Maine. Location of the proposed building site is shown on Figure 1, *Locus Map.* This evaluation was based on a review of information about subsurface conditions at the site previously obtained by RWG&A. Purpose of the evaluation was to develop recommendations on the geotechnical aspects of pile foundations to support the proposed two-story office building.

1.0 BACKGROUND

RWG&A previously conducted a geotechnical investigation of the site and made recommendations for aproposed one-story office building. Results of that work were presented in a report dated 23 August 2001 (RWG&A Project No. 816-04). Subsequently, proposed development at the site was revised with plans for a two-story office building. During Fall 2003, RWG&A conducted an evaluation of the two-story building supported on shallow, spread footings and slab-on-grade first floor and concluded that total and differential settlements would exceed tolerable amounts for the proposed construction.

2.0 SUBSURFACE CONDITIONS

Subsoils at the site consisted of sandy fills mixed with ash, gravel, and silt which are underlain by a layer of clayey sand. Silty clay was encountered 14 to 15 feet below the ground surface and extended to depths of 38.5 to 48 feet; four borings were probed to refusal between depths of 43 and

51 feet. Locations of the explorations are shown on Figure 2, ***Exploration*** *Location Plan* Logs of the subsurface explorations are provided in Appendix A.

Free water was encountered at depths of 4 to 6 feet below the local ground surface. Groundwater levels at the site will fluctuate due to season, temperature, rainfall, and construction activity in the area. Therefore, water levels during and following construction will vary from those measured in the borings. Please refer to the 23 August 2001 report for additional information regarding subsurface site conditions.

3.0 ENGINEERING EVALUATIONS

3.1 General

Engineering evaluations for this project are based on the previous subsurface and laboratory testing data, and conceptual construction and structural loading information that are currently available to RWG&A. Should different information become known prior to or during design or construction, these evaluations should be reviewed by RWG&A to confirm their continued applicability.

3.2 Proposed Construction

It is understood the proposed two-story office building will be at the same location as the previously evaluated one-story building, with its first floor near the current ground surface and have no basement. The two-story building will be a steel-framed structure with a masonry exterior finish and have plan dimensions of approximately 200 by 90 feet; column spacing will be approximately 27 feet by 27 feet. Design loads provided by Becker Structural Engineers of Portland, Maine, were 177 kips per interior column and 167 kips per exterior column. The column loads included contributions from a structural ground-level floor slab. Structural loads on intermediate piles to support the ground level structural slab will be approximately 37 kips. Foundation recommendations made in this report are based on the ground level finished floor at El. 11.1 as was planned for the previously proposed one-story building.

3.3 Foundation Evaluation

Based on the magnitude of the structural loads, the existing fill and underlying silty clay would not provide adequate foundation support for the proposed office building if supported on spread footings. The dense silty sand and bedrock are considered suitable for direct support of the building on end-bearing pile foundations. **A** number of high capacity piles are technically feasible including prestressed-precast concrete, concrete-filled steel pipe and structural steel H-piles. Prestressed-

precast concrete piles are not readily available in the southern Maine region. There would be little or no cost advantage ofconcrete-filled pipe over steel H-piles at the design pile capacity needed. Based on the above and local construction practice it is recommended that the office building be supported on steel H-section piles.

Due to the deleterious effect of the ash in the fill on exposed steel surfaces, an allowance for corrosion loss will be necessary. Protective coatings are not considered appropriate due to the potential for abrasion as the piles are driven through the fill; in turn, it is recommended that a 1/8-inch allowance for corrosion loss be provided for the exposed pile surface.

Consolidation of the silty clay and settlement of the existing fill will cause negative skin friction, or downdrag, forces on the piles. Consolidation settlement is estimated at a couple of inches. All fill to raise grades within and around the building should be placed prior to pile driving to reduce downdrag forces. It is also recommended that a landscaped buffer be provided around the building to accommodate differential movements between the pile-supported building and surrounding soil supported site improvements such as sidewalks. Exterior slabs at entrances should be pile supported and underlain by non-frost susceptible soils to preclude settlement and frost heaving. Exterior structures supported on spread footings should not be structurally connected to the building, tie beams, or pile caps supported by deep foundations.

Piles should be sized to support a minimum total load of 80 kips (40 tons) which includes an allowance for downdrag; recommended structural load carrying capacity of the piles is 60 kips (30 tons). Section 1817.4 of *The BOCA National Building Code/1999* requires pile load testing when design compressive loads exceeds 80 kips and/or the allowable design compressive stress exceeds 0.35 times the minimum specified yield strength ofthe steel. Given the above it is recommended that HP8 by 36 steel H-piles (50 kips per square inch yield strength steel) be used to support the proposed office building. Based on a net cross-sectional steel area of 6.8 square inches (note: area of pile section equal to 10.6 square inches minus 1/8-inch corrosion loss) the static pile stresses would be approximately 11.8kips per square inch which is less than 0.33 times the steel yeld strength. In turn, a static load test will not be needed due to the design pile load or applied steel compressive stresses.

Preliminary dnveability analyses indicate HP8 by 36 steel H-piles can be driven to a minimum ultimate capacity of 240 kips (note: 80 kips design capacity with a factor of safety of three on geotechnical capacity) using a hammer with a rated energy on the order of 16,000 to 20,000 foot pounds. It is anticipated that most of the piles will penetrate the dense silty sand and develop capacity on or in bedrock. **A** wave equation analysis will be needed to verify that the contractor's pile hammer can drive the piles to the required minimum ultimate capacity without over stressing or damaging thepiles. Cast steel points should be provided to protect the pile tips from driving damage especially if sloping bedrock is encountered.

Pile driving for another building near the site resulted in pile tips at about El. -27 to El. -54, which corresponded to approximately 37 to 64 feet below the current ground surface. Comparison of test boring results at the two sites indicates that driven tip elevations at the 135 Marginal Way site will likely be lower.

4.0 RECOMMENDATIONS

The following recommendations are provided for use in the soil and foundation design for the project. Foundation requirements and site development considerations are significantly affected by the subsurface conditions present at the site. It is recommended that foundation design and construction be in accordance with all applicable codes and ordinances requirements; the City of Portland, Maine uses *The **BOCA** National Building Code/1999*.

4.1 Site Preparation

1. All topsoil, organic material, debris, and other unsuitable inaterials should be removed from the areas receiving new constructed facilities and fiom any excavated inaterials proposed to be used as granular fill.

2. Bituminous pavement, underground utilities and other structures should be removed to allow compaction of the subgrade and placement of fills to raise the site grade (note: both inside and outside the building limits).

3. Site grading should provide positive drainage away fiom constructed facilities both during and after construction. Surface runoff and infiltration of groundwater should be controlled so that excavation, filling, and foundation construction can be completed in-the-dry. Dewatering requirements will vary across the site based on precipitation and groundwater levels encountered during construction and soil type. It is anticipated that inflow of perched groundwater and surface water can be handled by sumps and open pumping techniques. The Contractor should control surface runoff and infiltration of groundwater so that excavation, pile installation, 'pile cap construction and backfilling can proceed in the dry.

4. Backfill should be a well-graded, non-frost susceptible sand and gravel mixture meeting the following gradation requirements:

Screen or Sieve Size	Percent Passing
6 inches	100
3 inches	70 - 100
No. 4	35 - 70
No. 40	5 - 35
No. 200	0 - 5

(Note: Maximum particle size limited to 3 inches within two feet of foundation walls, tie-beams and pile caps, or if compacted by hand-guided equipment.)

The above gradation requirements are subject to review by RWG&A during construction based on results of gradation tests or the fill obtained from the foundation and site work excavations. Fill materials will need to be carefully segregated during excavation to remove unsuitable materials so the more suitable materials may be reused as fill for the proposed building.

4.2 Pile Foundations

5. Steel H-piles are considered the most practical pile type for use on the project. A minimum of three piles should be provided at each column location and be spaced a minimum of 30 inches, center-to-center. Recommended minimum design eccentricity between the columns and centroid of supporting pile groups is three inches in pile groups of three or more; one inch for individual and groups of two-piles.

6. HP8 by 36 steel H-piles (50 kips per square inch yield strength) should be driven to a minimum ultimate capacity of 240 kips (80 kips allowable design capacity with a factor of safety of 3 on geoteclmical capacity). The piles should be driven to end-bearing on the naturally deposited dense silty sand and/or bedrock using apile hammer with a minimum rated energy of about 16,000 to 20,000 foot-pounds. Based on the test boring and probe results, and an assumed pile cutoff level at El. 8, typical embedded pile lengths are anticipated to range from about 40 to 65 feet.

A final penetration resistance of about 5 to 8 blows per inch should be required for the final 6 inches of driving. If abrupt refusal is encountered, driving may be terminated when penetration is less than ½ inch for eight successive blows. These driving criteria will be

revised based on the pile hammer proposed by the contractor and their associated wave equation analysis.

7. Driving stresses should be limited to a maximum compressive stress of 45 kips per square inch for the H-piles fabricated with steel having a minimum yield strength of *50* kips per square inch. Splices should not be allowed in the upper 10 feet of the embedded portion of the pile. Cast steel points should be provided to limit pile damage and prevent tip kick out during driving. The pile points should be "Hard-Bite" pile points manufactured by American Pile Fittings of Clifton, New Jersey, or equivalent.

8. The project specifications should require the contractor to submit information on his proposed pile driving system for review by the Owner's geoteclmical engineer, RWG&A, prior to equipment mobilization. The system should be capable of installing the piles to the specified minimum ultimate geotechnical capacity without exceeding the allowable driving stresses. The review will include a wave equation analysis of the proposed driving system. An equipment data fonn listing the data needed to perform the wave equation analysis is included in Appendix B.

9. Since the allowable design capacity of the piles does not exceed 80 kips, the building code does not require a static load test.

10. Each pile should be driven plumb at its prescribed location unless the pile is designed with a batter for lateral load resistance. **A** pile should be considered out of plumb if the inclination is greater than 6 inches in 10 feet from its design alignment.

    Lateral loads from wind and earthquake may be resisted by a combination of batter piles, lateral pile capacity and passive earth pressure on the side of the foundation. The pile batter should be no steeper than 3 horizontal to 12 vertical (3H:12V). An allowable lateral pile capacity of one kip per pile should be used for design. Passive pressure against backfilled pile caps, grade beams, and foundations walls may be calculated using an equivalent fluid unit weight of 120 pounds per cubic foot, which is based on a passive pressure coefficient of 3, a backfill unit weight of 120 pounds per cubic foot, and a safety factor of 3 (note: 1/3 reduction to account for strain-compatibility with lateral pile resistance).

11. In accordance with *The **BOCA** National Building Code/**1999*** the seismic parameters for the site are as follows:

    Soil Profile Type = S_3;
    Site Coefficient (S) = 1.5;

Effective Peak Velocity Related Acceleration Coefficient (A_v) = 0.10;
Effective Peak Acceleration Coefficient **(A_a)** = 0.10.

12. Bottoms of exterior pile caps should be founded at least 4.5 feet below adjacent finished ground surface for frost protection. At heated interior locations, pile caps maybe designed to bear a minimum of 24 inches below the top of ground floor slabs. If exposure to freezing is anticipated, either during or following construction, then interior pile caps should be lowered in accordance with the recommendations for exterior pile caps.

13. Pile cap subgrade soils should not be allowed to freeze. The fill soils at the site are considered moderately to slightly frost-susceptible. Freezing of subgrade soils beneath pile caps may result in frost heaving or lateral wedging. The Contractor should make every effort to prevent freezing of subgrade soils.

4.3 Utilities

14. Utilities within the site and beneath paved areas may be earth supported. Bedding placed between the utility and subgrade should meet the utility and manufacturer requirements for the type of conduit or pipe being installed.

Underground utilities beneath the building should be either entirely earth supported or entirely supported by pile caps, the structural slab ground floor, and /or tie beams so that the potential for abrupt differential settlement due to a mixed support system is reduced. Underground and at-grade utilities should be designed to allow for a minimum of 3 inches of differential movement where earth supported utilities connect to the pile supported foundation and building.

4.4 Temporary Excavations and Dewatering

15. Soils encountered at this site within foundation and utility excavation depth consist of sand and gravel fills. It is anticipated that excavations can be accomplished using sloped, open-cut techniques. Static groundwater levels should generally be below foundation excavation depths. However limited dewatering may be needed to remove inflow from perched water, precipitation, and surface runoff. It should be practical to dewater foundation excavations using sumps and open pumping methods.

The Contractor should be aware that slope height, slope inclination, or excavation depths (including utility trench excavations) should in no case exceed those specified in local, state, or federal safety regulations, e.g., OSHA Health and Safety Standards for

Excavations, 29 CFR Part 1926, or successor regulations. Such regulations are strictly enforced and, if they are not followed, the Owner, Contractor, and/or earthwork and utility subcontractors could be liable for substantial penalties.

As a safety measure, it is recommended that all vehicles and spoil piles be kept a minimum lateral distance from the top of excavations no less than 100 percent of the slope height. The exposed slope face should be protected against the elements.

4.5 Elevator Pits

16. It is recommended that the walls and bottom slabs of elevator pits be waterproofed and designed to resist hydrostatic pressures. An equivalent fluid unit weight of 90 pounds per cubic foot should be used for design of elevator pit walls.

4.6 Pavement **Section**

17. Parking areas and driveways should be provided with the following pavement section. Materials and placement methods should meet current MDOT requirements.

Component	Thickness (in)
Asphaltic Concrete (703.09 Grading C)	1
Asphaltic Base (703.09 Grading B)	2.5
Base (703.06 Type A Aggregate)	8
Subbase (703.06 Type D Aggregate*)	16
Total	27.5

*Except less than 5 percent passing the No. 200 sieve.

Based on visual descriptions the near surface, on-site sand and gravel fill may meet gradation requirements for Subbase (703.06 Type D Aggregate).

4.7 Geotechnical Observation

18. The geotechnical recommendations provided as the basis for design of this project were developed using limited numbers of observations and tests. The Owner should be sensitive to the potential need for adjustment in the field. It is recommended that the Owner retain RWG&A to observe geotechnical construction aspects of the project. These services should include observing general compliance with the design concepts, specifications and recommendations, and assisting in development of design changes

should subsurface conditions differ from those anticipated prior to the start of construction. Observation improves the likelihood that the design intent will be carried out during construction. In addition, it allows RWG&A to confirm its design recommendations.

For this project, geotechnical review and observation of the following aspects of construction will be needed:

- Review of the contractor submittals for the foundation pile driving system;
- Monitor pile driving and prepare driving records.

At your request, RWG&A can prepare technical specifications for pile installation. In addition, RWG&A can provide full service construction inspection and materials testing. This would include soils, Portland cement and asphaltic concrete, structural steel and welding inspections, destructive and nondestructive testing and special inspection services.

7.0 CLOSURE

This report has been prepared for specific application to the proposed two-story office building at 135 Marginal Way in Portland, Maine and for the exclusive use of Fore River Company and its consultants on this project. This work has been completed in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made. In the event that any changes are made in the nature, design, or location of the proposed building, the conclusions and recommendations of this report should be reviewed by RWG&A.

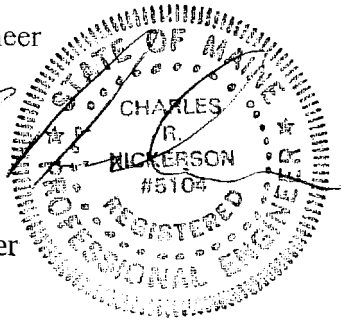
The recomiendations presented are based on the results of widely spaced explorations. The nature of variations between the explorations may not become evident until construction. If variations are encountered, it will be necessary for RWG&A to reevaluate the recommendations presented in this report. RWG&A requests an opportunity for a general review of the final design and specifications to determine that earthwork and foundation recommendations have been interpreted in the manner in which they were intended.

RWG&A appreciates the opportunity to work on this phase of the project and looks forward to providing continuing services as the project progresses through design and construction. If you have any questions or if we may be of further service, please contact us.

Very truly yours,
R. W. GILLESPIE &ASSOCIATES, INC.

Erik J. Wiberg, P.E.
Senior Geotechnical Engineer

Charles R. Nickerson, P.E.
Chief Geotechnical Engineer



EJW/CRN:sab
In quadruplicate
copy: Paul B. Becker, P E. - Becker Structura Engineers

Attachments:

Figure1, Locus Map
Figure 2, Exploration Location Plan
Appendix A, Exploration Logs
Appendix B, Pile Driving Equipment Data Form

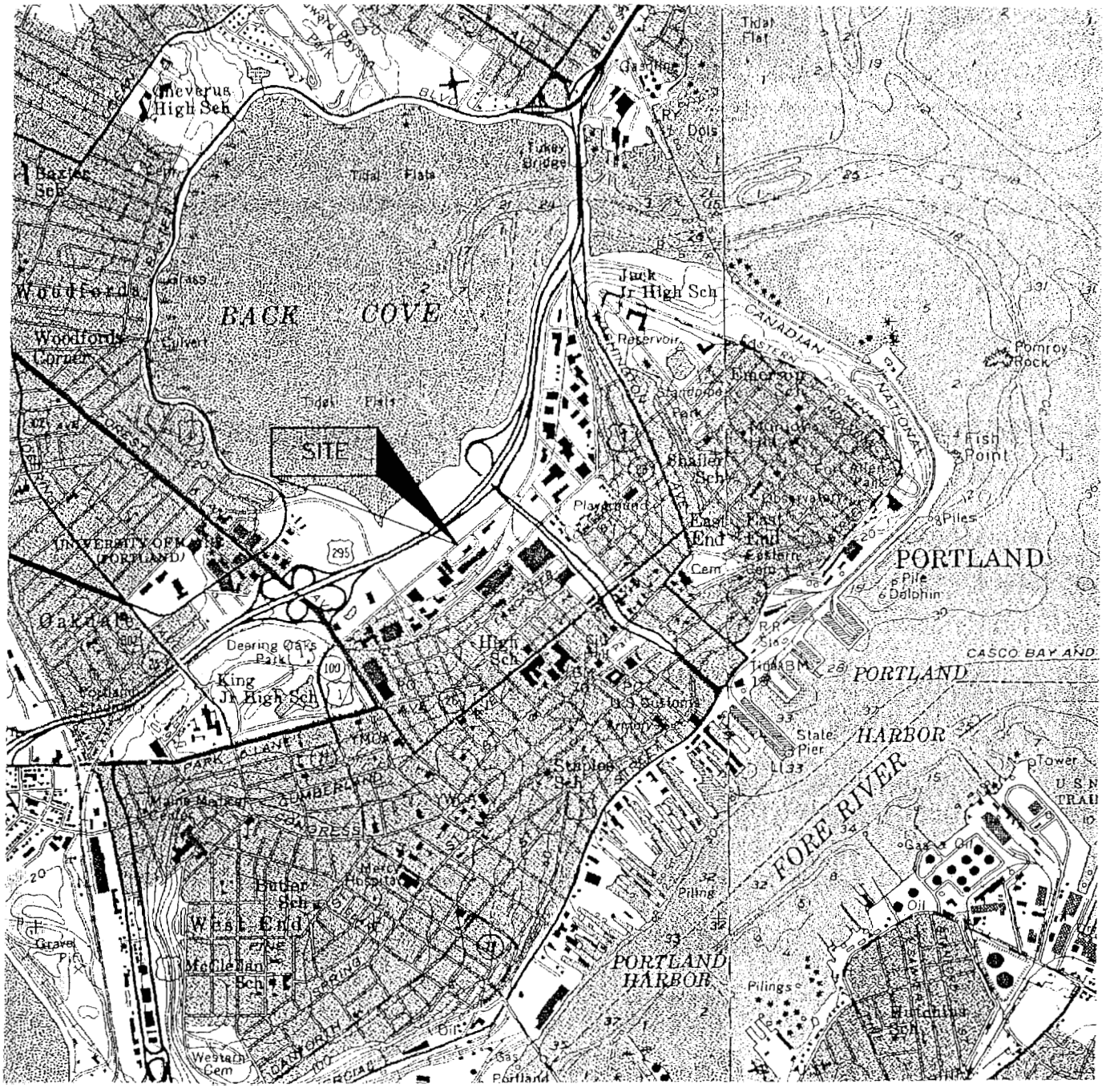


FIGURE 1
LOCUS MAP
135 MARGINAL WAY
PORTLAND, MAINE

AUGUST 2001 PROJECT NO. 816-04

SOURCE:

FIGURE ADAPTED FROM USGS 7.5-MINUTE SERIES TOPOGRAPHIC QUADRANGLE OF PORTLAND WEST, 1978.

R.W. Gillespie & Associates, Inc.
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Fax: (207) 286-2882 E-mail: rwg-a@cybertours.com

APPENDIX A

EXPLORATION LOGS

Proposed Two-Story Office Building
135 Marginal Way
Portland, Maine

BORING LOG B-1

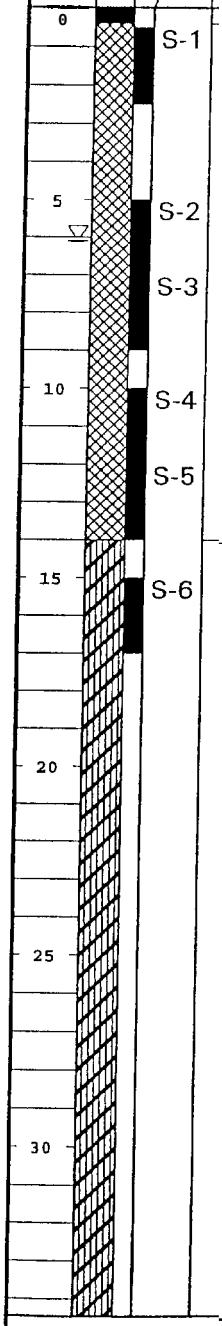
Project: 135 Marginal Way
Location: Portland, Maine

Approximate Surface Elevation: 10
Ground Water Depth: 6

Client: Fore River Company

Date: 7/26/0

Project No. 816-04



DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE #	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN	BLOWS PER 6	SPT-N BLOWS PER FT.	MOISTURE CONTENT	Lab Tests
0			S-1	ASPHALTIC CONCRETE (0.2 feet) Base course (0.2 feet) FILL; black, moist to wet, sand, silt, ash, fine gravel, silty clay.	24	6 4 5 4	9		
5			S-2		24	5 2 2 2 | 3	4		
			S-3		24	2 1 2 | 3	3		
10			S-4		24	1 2 1 | 2	3		
			S-5		24	1 2 I 1 | 2	4		
15			S-6	**SILTY** CLAY (CL-ML); very stiff to soft, moist to wet, tan to gray, with shells. Probed By Hydraulic Push to 48'	24	2 2 2 2 | 5	16		
20						8 8			
25									
30									

R.W. Gillespie & Associates, Inc.
Saco, Maine

BORING LOG B-1

Project: 135 Marginal Way
Location: Portland, Maine

Approximate Surface Elevation: 1
Ground Water Depth:

Client: Fore River Company

Date: 7/26/C

Project No. 816-04

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE #	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT	Lab Tests
35									
40									
45									
50				Depth Blows per ft 48.0 to 49.0 38 49.0 to 50.0 34 50.0 to 50.5 >50/6" Dense Glacial Soil (note: interpreted from rod probe blow count resistance). Bottom of Exploration at 50.5': refusal in dense glacial soil or on bedrock.					
55									
60									
65									

R.W. Gillespie & Associates, Inc.
Saco, Maine

BORING LOG B-2

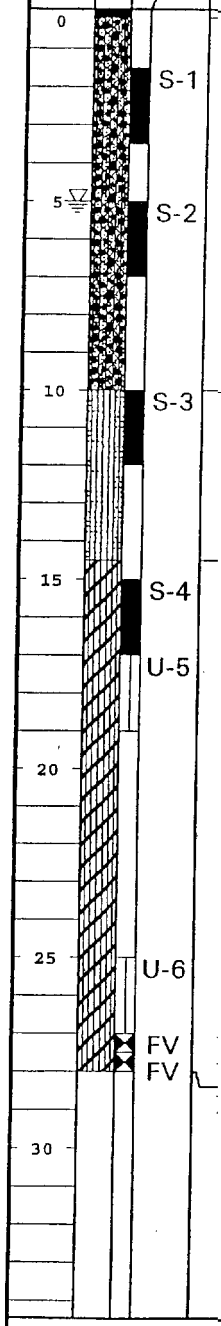
Project: 135 Marginal Way
Location: Portland, Maine

Approximate Surface Elevation: 10
Ground Water Depth: 5

Client: Fore River Company

Date: 7/26/01

Project No. 816-04



DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE #	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT	Lab Tests
0				\ASPHALTIC CONCRETE					
			S-1	FILL; silty sand with gravel; sand, ash, black, tan, gray, wet.		6 12 5 3	17		
				Becomes loose.					
5			S-2			2 1 1 1	2		
10			S-3	SILTY CLAYEY SAND (SM-ML)	24	1 1 1 2	2		
15			S-4	SILTY CLAY (CL-ML); stiff *to* very soft, moist to wet.	24	6 7 7	14		
			U-5		24	7			
20									
25			U-6		24				
			FV	Jndisturbed: Su = 0.24 ksf, Residual: Su = 0.10 ksf					
			FV	Jndisturbed: Su = 0.25, Residual: Su = 0.09					
30				Bottom **of** Exploration at 28': not refusal.					

R.W. Gillespie & Associates, Inc.
Saco, Maine

BORING LOG B-3

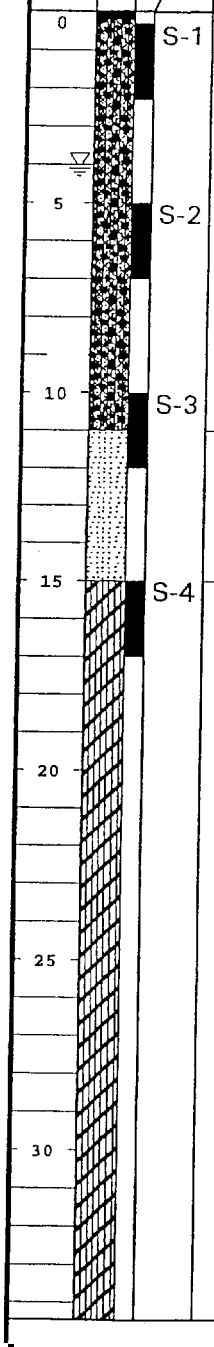
Project: 135 Marginal Way
Location: Portland, Maine

Approximate Surface Elevation: 10'
Ground Water Depth: 4'

Client: Fore River Company

Date: 7/26/01

Project No. 816-04



DEPTH FT.	SYMBOL	SAMPLES	SAMPLE #	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6	SPT-N BLOWS PER FT.	MOISTURE CONTENT	Lab Tests
0			S-1	\ASPHALTIC CONCRETE	24	11	21		
				(FILL), SILTY SAND WITH GRAVEL; medium dense, black, tan, gray, wet.		12			
				Becomes loose.		9			
						7			
5			S-2		24	1	4		
						2			
						2			
						1			
10			S-3		24	1	3		
				SAND (SP); loose, wet, medium to fine, gray shells.		2			
						1			
						1			
15			S-4	SILTY CLAY (CL); stiff to very stiff, moist, medium, tan to gray.	24	5	16		
						9			
				Probed with Hydraulic Push to 44.5		7			
						11			
20									
25									
30									

R.W. Gillespie & Associates, Inc.
Saco, Maine

BORING LOG B-3

Project: 135 Marginal Way
Location: Portland, Maine

Approximate Surface Elevation: 1
Ground Water Depth:

Client: Fore River Company

Date: 7/26/

Project No. 816-04

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE #	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT	Lab Tests
35									
40									
45				Depth / Blows per ft 44.5 to 45.5 — 39 45.5 to 46.5 — 27 46.5 to 47.5 — 38 47.5 to 48.5 — 100 Dense Glacial Soil (note: interpreted from rod probe blow count resistance.					
50				Bottom of Exploration at 49': refusal in dense glacial soil or on bedrock.					
55									
60									
65									

BORING LOG B-4

Project: 135 Marginal Way
Location: Portland, Maine

Approximate Surface Elevation: 10'
Ground Water Depth: 4'

Client: Fore River Company

Date: 7/26/01

Project No. 816-04

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE #	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT	Lab Tests
0			S-1	FILL; gravelly sand; ash, wet, loose, petroleum odor.	24	6 8	19		
			S-2		24	11 13	10		
5			S-3		24	11 6 4	5		
			S-4		24	4 4 3	2		
10			S-5	CLAYEY *SAND* (SC); wet, gray, shells.	24	2 2 2	11		
15			S-6	SILTY **CLAY** (CL-ML); stiff to very soft, moist to wet, tan-gray.	24	2 1 1 1 3 5	11		
				Probed with Hydraulic Push to 44.5'		6 3 5 5 6 7			
20									
25									
30									

R.W. Gillespie & Associates, Inc.
Saco, Maine

BORING LOG B-4

Project: 135 Marginal Way
Location: Portland, Maine

Approximate Surface Elevation: 1(
Ground Water Depth: .

Client: Fore River Company

Date: 7/26/0

Pro ct No. 816-04

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE #	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT	Lab Tests
35									
40									
45				Depth Blows per ft 44.5 to 45.5 39 45.5 to 46.5 27 46.5 to 47.5 38 47.5 to 48.5 100 Dense Glacial Soil (note: interpreted from rod probe blow count resistance.)					
50				Bottom of Exploration at 48.5': refusal in dense glacial soil or on bedrock.					
55									
60									
65									

R.W. Gillespie & Associates, Inc.
Saco, Maine

BORING LOG B-5

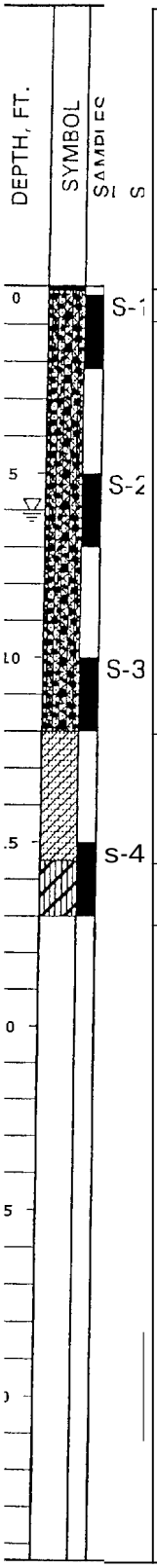
Project: 135 Marginal Way
Location: Portland, Maine

Approximate Surface Elevation: 1(
Ground Water Depth: (

Client: Fore River Company

Date: 7/26/0

Pro ct No. 816-04



DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT	Lab Tests
\ASPHALTIC CONCRETE		**12**	40		
(FILL), SILTY SAND WITH GRAVEL; ash, moist to wet, dense black-tan-gray.		*28*			
		12			
		15			
		5	7		
		4			
		3			
		5			
		1	4		
		2			
CLAYEY *SAND* (SC); soft, wet, low.		2			
		2			
		5	12		
SILTY CLAY (CL-ML); medium stiff to **very** soft, moist to wet,		***6***			
		6			
Bottom of Exploration at 17': not refusal.		7			

R.W. Gillespie & Associates, Inc.
Saco, Maine

BORING LOG B-6

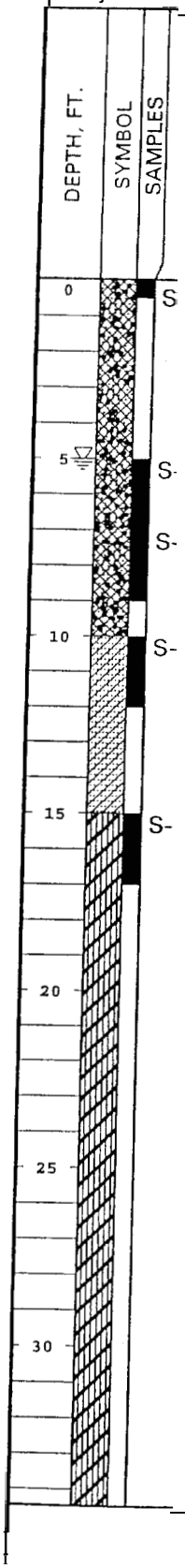
Project: 135 Marginal Way
Location: Portland, Maine

Approximate Surface Elevation: 1
Ground Water Depth: !

Client: Fore River Company

Date: 7/16/0

Project No. 816-04



DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS/6"	SPT-N BLOWS/FT	MOISTURE CONTENT	Lab Tests
FILL; sandy gravel; ash, trace clay, dense, wet.		10 25 0'	25 0'		
		6 8 2 1 2	IC 4		
CLAYEY *SAND* (SC); clayey seams, very loose, wet, gray, shells.		5 3 1	5		
SILTY CLAY (CL-ML); medium stiff *to* stiff, sand seams, ma ist,] an-gray.		5 3 2 1	10		
'robed with Hydraulic Push to 38.5'		5 5 5 6			

BORING LOG B-6

Project: 135 Marginal **Way**
Location: Portland, Maine

Approximate Surface Elevation: 1
Ground Water Depth:

Client: Fore River Company

Date: 7/16/(

Project No. 816-04

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE #	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT	Lab Tests
35									
				Depth Blows per ft 38.5 to 39.5 40 39.5 to 40.5 26 40.5 to 41.5 20 **41.5** to 42.5 46 42.5 to 43.0 50/6"					
40				Dense Glacial Soil (note: interpreted from rod probe blow count resistance.)					
45				Bottom of Exploration at 43.0': refusal in dense glacial soil or on bedrock.					
50									
55									
60									
65									

R.W. Gillespie & Associates, Inc.
Saco, Maine

APPENDIX B

PILE AND DRIVING EQUIPMENT DATA FORM

Proposed Two-Story Office Building
135 Marginal Way
Portland, Maine

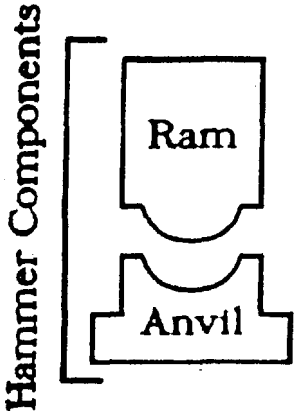
Contract No.: _____ Structure Name and/or No.: _____

Project: _____

_____ Pile Driving Contractor or Subcontractor: _____

County: _____

(Piles driven by)



Hammer

Manufacturer: _____ Model No.: _____

Hammer Type: _____ Serial No.: _____

Manufacturers Maximum Rated Energy: _____ (Joules)

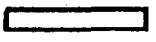
Stroke at Maximum Rated Energy: _____ (meters)

Range in Operating Energy: _____ to _____ (Joules)

Range in Operating Stroke: _____ to _____ (meters)

Modifications: _____

_____



Striker Plate

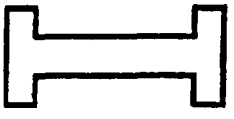
Weight: _____ (N) Diameter: _____ (mm)

Thickness: _____ (mm)

Hammer Cushion

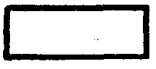
	Material #1	Material #2 (for Composite Cushion)
Name:	_____	_____
Area:	_____ (cm^2)	_____ (cm^2)
Thicknus / Pktc:	_____ (mm)	Thickness / Plate: _____ (mm)
No. of Plates:	_____	No. of Plates: _____

Total Thickness of Hammer Cushion: _____



Helmet (Drive Head)

Weight: _____ (kN)



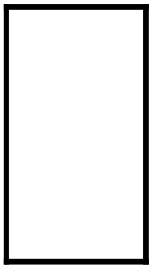
Pile Cushion

Material: _____

Area: _____ (cm^2) Thickness / Sheet: _____ (mm)

No. of Sheets: _____

Total Thickness of Pile Cushion: _____ (mm)



Pile

Pile Type: _____

Wall Thickness: _____ (mm) Taper: _____

Cross Sectional Area: _____ (cm^2) Weight / meter: _____

Ordered Length: _____ (m)

Design Load: _____ (kN)

Ultimate Pile Capacity: _____ (kN)

Description of Splice: _____

_____

Driving Shoe/Closure Plate Description: _____

_____

Submitted By: _____ Date: _____

Telephone No.: _____

PILE AND DRIVING EQUIPMENT **DATA** FORM

R. W. Gillespie & Associates, Inc.
CONSULTING GEOTECHNICAL & ENVIRONMENTAL SPECIALISTS

23 August 2001

Mr. Bruce Kistler
Fore River Company
P.O. **Box** 7525
Portland, Maine 04112

Subject: Geotechnical Investigation
Proposed 135 Marginal Way Office Building
Portland, Maine
RWG&A Project No. 816-04

Dear **Mr.** Kistler:

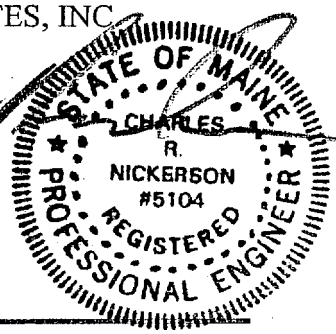
As requested and authorized, R. W. Gillespie & Associates, Inc. (RWG&A) has conducted a geotechnical investigation of the site of the proposed office building at 135 Marginal Way in Portland, Maine. Included in this report are the findings from the field and laboratory work, and recommendations for soil and foundation design.

Subsoils at the site consist of sandy fill mixed with ash, gravel, and silt which is underlain by **a** layer of clayey sand. Silty clay at the site is typically fourteen to fifteen feet below existing ground surface and to a depth of 38.5 to 48 feet. Four borings were probed to refusal at depths of 43 to **51** feet below the existing surface.

Spread and/or continuous footings can be used for support of the structure following subgrade improvement, structural fill placement, and frost protection considerations.

Very truly yours,
R. W. GILLESPIE & ASSOCIATES, INC.

Charles R. Nickerson, P.E.
Chief Geotechnical Engineer



CRN:ci
In duplicate

86 Industrial Park Road, Suite 4 • Saco, ME 04072 • (207) 286-8008 • Fax (207) 286-2882
80 Rochester Ave., Suite 101 • Portsmouth, NH 03801 • (603) 427-0244 • Fax (603) 430-2041

Report
of
GEOTECHNICAL INVESTIGATION
for
PROPOSED 135 MARGINAL, WAY
OFFICE BUILDING

Prepared
for
FORE RIVER COMPANY
PORTLAND, MAINE

Prepared
by
R W. GILLESPIE & ASSOCIATES, INC.
SACO, MAINE

RWG&A Project No. 816-04

August 2001

TABLE OF CONTENTS

INTRODUCTION

This report presents the results of our geotechnical investigation for the proposed office building to be built at 135 Marginal Way in Portland, Maine, see Figure 1, Locus Map. The purpose of the geotechnical investigation was to obtain information regarding subsurface conditions and soil properties on which to base recommendations for design and construction of the building foundation, ground floor slabs, and the pavement section.

Our scope of services did not include an assessment of the presence, or potential impact, of oil and hazardous materials on the design, earthwork construction activities, or health and safety considerations associated with the proposed (re)development of the site. However, it is noted that petroleum odors were detected within the fill materials in one of the borings made for this project.

The proposed structure is a single story building along the southeast side of Marginal Way. Plan dimensions are 200 by 90 feet, with the long dimension parallel to Marginal Way. Construction will consist of steel framing with steel studs and brick facade. Column spacing is shown as approximately 25 by 29 feet on the concept structural drawings prepared by Becker Structural Engineers. Total column loads are understood to be on the order of 50 kips per interior column. The finished floor will be at El. 11.1.

SUBSURFACE INVESTIGATION

Six test borings (designated B-1 through B-6) were drilled at the approximate locations shown on Figure 2, Exploration Location Plan. Four of the borings (B-1, B-3, B-4 and B-6) were completed as rod probes advanced to refusal surfaces at depths of 43 to 50.5 feet below local ground surface. Standard penetration resistance tests were made at intervals of 5 feet or less within the upper part of the borings to determine soil density/consistency and recover samples to determine the description of the materials. Thin-wall tube samples and field vane strength tests were taken at selected depths in boring B-2. The thin-wall tube samples were obtained for laboratory consolidation testing. Recovered samples and auger cuttings were used to describe soils and prepare the boring logs provided in Appendix A.

LABORATORY TESTING

All samples were visually examined and, where necessary, the field soil descriptions were revised using the procedures of the Unified Soil Classification System. To aid in classification and obtain estimates of certain engineering properties laboratory tests including vane shear, one-

dimensional consolidation, Atterberg limits, and water content were performed on the thin-wall tube samples. Laboratory results are presented in Appendix B.

SITE AND SUBSURFACE CONDITIONS

Site

Historically, it is known that the site and surrounding area was formed by filling in parts of Back Cove. The site is relatively flat at about El. 10 and located on the southeast side of Marginal Way. Currently, an old, single-story building occupies the southwest corner of the lot. Parking areas surround this existing building, and other, nearby areas of the lot are vacant. A new, multi-story building occupies the northeast half of the property.

Subsurface

In summary, subsurface soils consist of fill over a sand/clayey sand layer underlain by silty clay. Geology of the region dictates that the silty clay is underlain by dense glacial soils (i.e., glacial till) over bedrock.

The fill consisted primarily of sand with varying percentages of ash, gravel, silt, and clay. Standard penetration resistance blow counts (i.e., N-values) indicate the fill is loose to medium dense. Encountered thickness of the fill varied from 10 to 13 feet in the six borings. Petroleum odors were apparent in samples of the fill from B-4 at about the depth water was encountered in that boring.

The silty clayey sand layer consisted of medium to fine grained sand with scattered shells. Thickness of this layer was 3.5 to 5 feet in borings B-2 through B-6; the stratum was not observed in B-1. The silty clayey sand layer is believed to be the recent, estuarine deposits of the Back Cove area that were filled over.

The silty clay layer, locally known as the Presumpscot Formation, is a glacial marine clay. Consistency of the silty clay varies fiom stiff to very stiff at the top of the unit and decreases, with increasing depth, to soft to very soft. The encountered thickness, as determine by the four borings that were probed to refusal, was 23.5 to 35 feet. The four borings that were probed encountered about 2.5 to 5 feet of dense granular soil which is interpreted to be glacial till.

Groundwater

Free water was encountered at depths of 4 to 6 feet below the local ground surface at the boring locations. Based on ground surface at the site the free water depths are slightly above and correspond to about high tide level in Back Cove. In our opinion, the free water levels are

considered representative of groundwater at the site which is anticipated to vary on the order of a foot, annually.

EVALUATION OF GEOTECHNICAL DATA

The explorations indicate the fill consists mostly of mineral soil in a loose to medium dense condition. Reasonable contact pressure and settlements can be achieved through site improvement techniques such as controlled compaction of the fill material and placing compacted granular fill on top of it. Alternatively, the building would need to be supported on pile foundations.

Based on discussions with Curtis Walter Stewart, the project architect, and Becker Structural Engineers, it is understood that, due to the past development history of the land, off-sight disposal of soil from the proposed foundation excavation may not be practical. In turn, it has been requested that earthwork for the project utilize the existing on-site fill to the maximum extent practicable.

Based on the above considerations, it is recommended that site improvement for this project consist of over-excavation, or under cutting, to a predetermined depth of 2 feet below the bottom of footings and floor slabs. The exposed subgrade should be compacted with a minimum of four complete coverages with a vibratory drum compactor. The compacted subgrade must then be tested by proofrolling with a fully-loaded dump truck. Any soft, loose, or unstable areas detected by proof rolling must be removed and replaced with suitable compacted granular fill. Compacted granular fill can then be placed over the compacted and proof rolled surface up to footing or floor slab bearing subgrade.

It is noted that re-use of the on-site fill materials in the above noted manner could result in frost heaving of the floor slabs and footings if the building is left unheated through a winter season. Frost heaving could cause cracking of the floor and walls.

RECOMMENDATIONS

General

1. All topsoil, organic material, debris, and other unsuitable materials should be removed from the areas receiving new constructed facilities and from any excavated materials proposed to be used as granular fill.

2. Site grading should provide positive drainage away fiom constructed facilities both during and after construction. Surface runoff and infiltration of groundwater should be controlled so that excavation, filling, and foundation construction can be completed in-the-dry. Dewatering requirements will vary across the site based on groundwater levels encountered during construction and local soil conditions. It is generally practical to dewater by open-

pumping from within excavations to a depth of one to two feet below groundwater. If excavations extend more than one to two feet below groundwater levels, then wells may be required.

An assessment of the environmental considerations or permitting requirements for disposal of pumped water from the foundation or sitework excavations was beyond RWG&A's scope of services on this project.

3. Compacted granular fill should be a clean, well-graded sand and gravel mixture meeting the following gradation.

Granular Fill Gradation

Screen or Sieve Size	Percent Passing
6 inches	100
3 inches	70 - 100
No. 4	35 - 70
No. 40	5 - 35
No. 200	0 - 10

(Note: Maximum particle size limited to 3 in. within two feet of walls, piers, footings, and ground floor slabs.)

The above gradation is subject to review by the RWG&A during construction based on results of gradation tests on the fill obtained from the foundation and sitework excavations. Fill materials will need to be carefully segregated during excavation to remove unsuitable materials so the better materials may be selected for re-use below the proposed building footings and floor slab.

4. In open areas, granular fill should be placed in level, uniform lifts not exceeding 9 inches in uncompacted thickness and be compacted with self-propelled compaction equipment. In confined areas, structural fill should be placed in lifts not exceeding 6 inches in uncompacted thickness (note: maximum particle size 3 in.) and be compacted with hand-operated compaction equipment. Granular fill should be compacted to at least 95 percent of maximum dry density as determined by ASTM D1557.

5. Only compacted granular fill should be used as fill below the proposed building.

Foundations

6. The proposed building may be supported on spread and/or continuous footings bearing on compacted granular fill. Footings should be designed for a maximum contact pressure of 2,000 pounds per square foot; minimum footing width should be 3 feet.

7. Interior and exterior footing areas should be over excavated to a depth of **4** feet below finished floor level and finished exterior grade (i.e., 2 feet below bottom of footing), respectively. Compacted granular fill should extend to limits defined by lines sloping downward and outward from the bottom outside edge of the footings at a slope of 1 horizontal to 1 vertical, down to the compacted and proof rolled subgrade.

8. Exterior footings may be located at a depth of **2** feet below exterior finished grade and must be frost protected with a minimum of 2 inches of rigid insulation placed on the top of the footings and extending **4** feet outward from the foundation walls. Insulation of the foundation wall should be in accordance with the architect's or structural engineer's typical practice.

9. The new building foundation should be designed to withstand lateral, uplift, and overturning forces due to earthquakes. In accordance with *The **BOCA** National Building Code / **1999,*** the soil profile at the site is classified as $S_,$, with a seismic coefficient "S" of 1.0. The effective peak acceleration coefficient (A_a) is approximately 0.10 and the effective peak velocity-related acceleration coefficient (A_v) is approximately 0.10. These coefficients should be used in conjunction with the design occupancy to determine the seismic hazard exposure group and seismic performance category.

10. Lateral foundation loads from wind and earthquake may be resisted by friction between the bottom of the spread footing and bearing subgrade. **A** friction coefficient of 0.35 is recommended for use in design.

Ground Floor Slabs

Ground floor slabs may be slab-on-grade construction bearing on six inches of structural fill compacted to a minimum of 95 percent of ASTM 1557. **A** modulus of subgrade reaction of 150 pounds per cubic inch may be used in the design of the floor.

Structural fill should be a clean, well-graded sand and gravel mixture meeting the following gradation.

Structural Fill Gradation

Screen or Sieve Size	Percent Passing
6 inches	100
3 inches	70 - 100
No. 4	35 - 70
No. 40	5 - 35
No. 200	0 - 5

(Note: Maximum particle size limited to 3 in. within two feet of walls, piers, footings, and ground floor slabs.)

12. A vapor barrier should be used below interior slab-on-grade ground floors to minimize infiltration of moisture. Exterior perimeter footing drains should be provided to minimize the accumulation of water near foundations and below the ground floor slab.

Pavement Sections

13. Parking areas and driveways should be provided with the following pavement section. Materials and placement methods should meet current MDOT requirements.

Component	Thickness (in)
Asphaltic Concrete (703.09 Grading C)	1
Asphaltic Base (703.09 Grading B)	2.5
Base Course (703.06 Type A Aggregate)	8
Subbase (703.06 Type D Aggregate)	16
Total	27.5

Geotechnical Observation

The geotechnical recommendations provided as the basis for design of this project were developed using limited numbers of observations and tests. The Owner should be sensitive to the potential need for adjustment in the field. It is recommended that the Owner retain RWG&A to observe geotechnical construction aspects of the project. These services should include observing general compliance with the design concepts, specifications and recommendations, and assisting in development of design changes should subsurface conditions differ from those anticipated prior to the start of construction. Observation improves the likelihood that the design intent will be carried out during construction, In addition, it allows RWG&A to confirm its designrecommendations. For this project, geotechnical observation of the following aspects is recommended:

- observation of subgrade compaction and proofrolling; and
- structural fill placement and compaction.

RWG&A can also perform construction materials testing as may be required by the project specifications and building code. In particular, we can cast concrete cylinders and conduct compressive strength testing.

CLOSURE

This report has been prepared for specific application to the proposed Office Building at 135 Marginal Way in Portland, Maine, and for the exclusive use of Fore River Company. This work has been completed in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made. In the event that any changes are made in the nature, design, or location of the proposed addition, the conclusions and recommendations of this report should be reviewed by RWG&A.

The recommendations presented are based on the results of widely spaced explorations. The nature of variations between the explorations may not become evident until construction has begun. Ifvariations are encountered, it will be necessary for RWG&A to re-evaluate the recommendations presented in this report. RWG&A requests an opportunity for a general review of the final design and specifications in order to determine that earthwork and foundation recommendations have been interpreted in the manner in which they were intended.

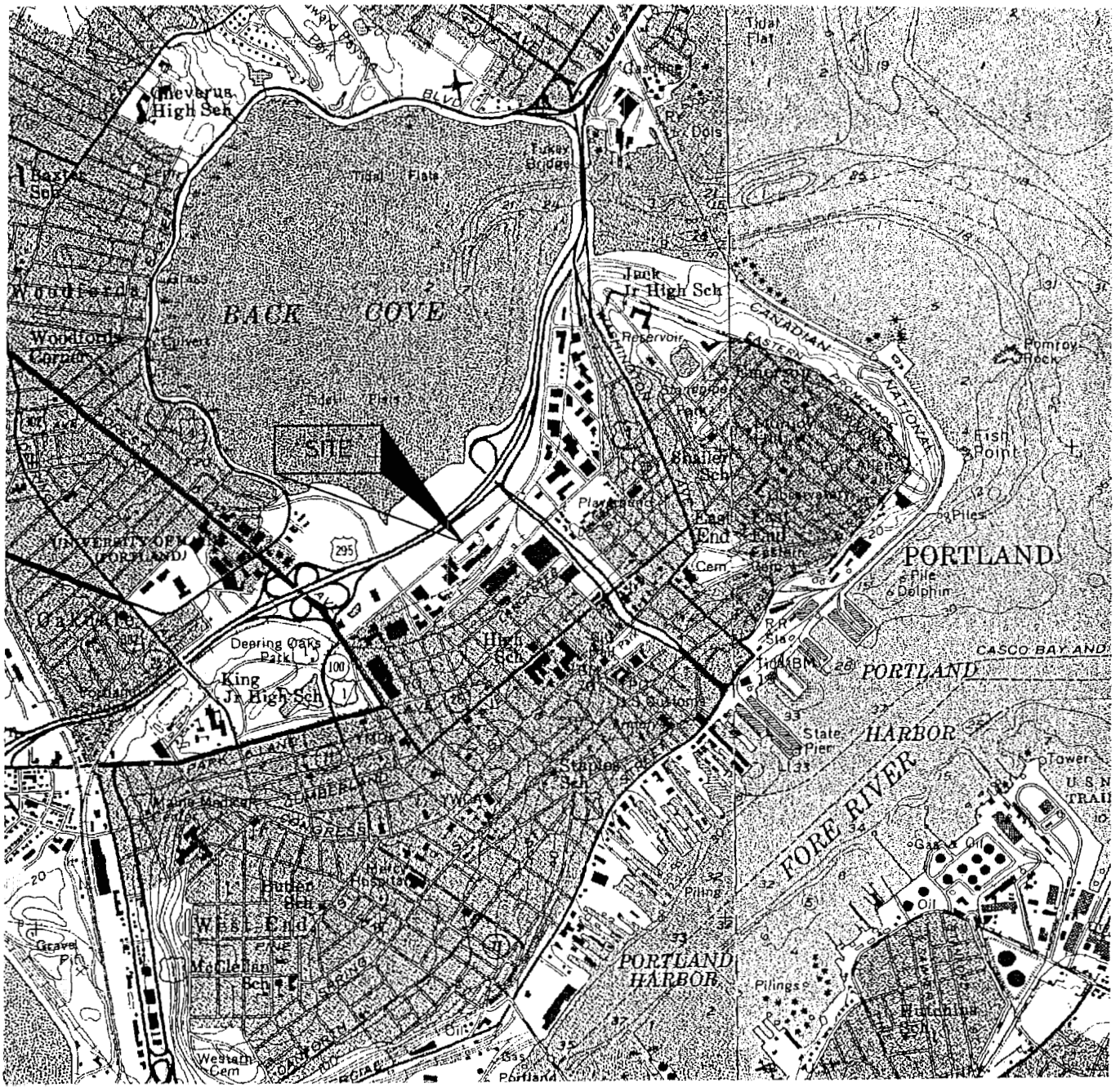


FIGURE 1
LOCUS MAP
135 MARGINAL WAY
PORTLAND, MAINE

AUGUST 2001 PROJECT NO. 816-04

SOURCE:

FIGURE ADAPTED FROM USGS 7.5-MINUTE SERIES TOPOGRAPHIC QUADRANGLE OF PORTLAND WEST, 1978.

R.W. Gillespie & Associates, Inc.
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Fax (207) 288-2882 E-mail: rwg-ad@cybertours.com

R. W. Gillespie & Associates

APPENDIX A

TEST BORING LOGS

Geotechnical Investigation
Proposed Office Building
135 Marginal Way
Portland, Maine

BORING LOG B-1

Project: 135 Marginal Way
Location: Portland, Maine

Approximate Surface Elevation: 10'
Ground Water Depth: 6'

Client: Fore River Company

Date: 7/26/01

Project No. 816-04

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE #	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT	Lab Tests
0			S-1	ASPHALTIC CONCRETE (0.2 feet) Base course (0.2 feet) FILL; black, moist to wet, sand, silt, ash, fine gravel, silty clay.	24	6 4 5 4	9		
5			S-2		24	5 2 2 2	4		
			S-3		24	3 2 1 2	3		
10			S-4		24	1 2 1 1	3		
			S-5		24	2 2 2 2	4		
15			S-6	SILTY CLAY (CL-ML); very stiff to soft, moist to wet, tan to gray, with shells. Probed By Hydraulic Push to 48'	24	5 8 8 8	16		
20									
25									
30									

R.W. Gillespie & Associates, Inc.
Saco, Maine

BORING LOG B-1

'roject: 135 Marginal Way
.ocation: Portland, Maine

Approximate Surface Elevation: 10'
Ground Water Depth: 6'

Client: Fore River Company

Date: 7/26/01

Project No. 8 5-04

DEPTH FT.	SYMBOL	SAMPLES	SAMPLE #	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT	Lab Tests
35									
40									
45									
50				Depth / Blows per ft 48.0 to 49.0 — 38 49.0 to 50.0 — 34 50.0 to 50.5 — >50/6" Dense Glacial Soil (note: interpreted from rod probe blow count resistance). Bottom of Exploration at 50.5': refusal in dense glacial soil or on bedrock.					
55									
60									
65									

R.W. Gillespie & Associates, Inc.
Saco, Maine

BORING LOG B-2

Project: 135 Marginal Way
Location: Portland, Maine

Approximate Surface Elevation: 10'
Ground Water Depth: 5'

Client: Fore River Company

Date: 7/26/01

Project No. 816-04

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE #	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6	SPT-N BLOWS PER FT.	MOISTURE CONTENT	Lab Tests
0				ASPHALTIC CONCRETE					
			S-1	FILL; silty sand with gravel; sand, ash, black, tan, gray, wet.		6 12 5 3	17		
				Becomes loose.					
5 ▽			S-2			2 1 1 1	2		
10			S-3	SILTY CLAYEY SAND (SM-ML)	24	1 1 1 2	2		
15			S-4	**SILTY** CLAY (CL-ML); stiff to very soft, moist to wet.	24	6 7 7 7	14		
			U-5		24				
20									
25			U-6		24				
			FV	Undisturbed Su = 0.24 **ksf,** Residual: Su = 0.10 ksf					
			FV	Undisturbed: Su = 0.25, Residual: Su = 0.09					
				Bottom of Exploration at 28': not refusal.					
30									

BORING LOG B-3

roject: 135 Marginal Way
ɔcation: Portland, Maine

Approximate Surface Elevation: 10'
Ground Water Depth: 4'

lient: Fore River Company

Date: 7/26/01

roject No. 816-04

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE #	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT	Lab Tests
0			S-1	ASPHALTIC CONCRETE (FILL), SILTY SAND WITH GRAVEL; medium dense, black, tan, gray, wet. Becomes loose.	24	11 12 9 7	21		
5			S-2		24	1 2 2 1	4		
10			S-3	SAND (SP); loose, wet, medium to fine, gray shells.	24	1 2 1 1	3		
15			S-4	SILTY CLAY (CL); stiff to very stiff, moist, medium, tan to gray. Probed with Hydraulic Push to 44.5	24	5 9 7 11	16		
20									
25									
30									

R.W. Gillespie & Associates, Inc.
Saco, Maine

BORING LOG B-3

Project: 135 Marginal Way
Location: Portland, Maine

Approximate Surface Elevation: 10'
Ground Water Depth: 4'

Client: Fore River Company

Date: 7/26/01

Project No. 816-04

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE #	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT	Lab Tests
35									
40									
45				Depth / Blows per ft 44.5 to 45.5 — 39 45.5 to 46.5 — 27 46.5 to 47.5 — 38 47.5 to 48.5 — 100 Dense Glacial Soil (note: interpreted from rod probe blow count resistance.					
50				Bottom of Exploration at 49': refusal in dense glacial soil or on bedrock.					
55									
60									
65									

R.W. Gillespie & Associates, Inc.
Saco, Maine

BORING LOG B-4

Project: 135 **Marginal Way**
Location: Portland, Maine

Approximate Surface Elevation: 10'
Ground Water Depth: 4'

Client: Fore River Company

Date: 7/26/01

Project No. 816-04

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE #	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT	Lab Tests
0			S-1	FILL; gravelly sand; **ash,** wet, loose, petroleum odor.	24	6 8 11 13	19		
			S-2		24	11 6 4 4	10		
5			S-3		24	4 3 2 2	5		
			S-4		24	2 1 1 1	2		
10			S-5	CLAYEY SAND (SC); wet, gray, shells.	24	3 5 6 3 5 5 6 7	11		
15			S-6	**SILTY** CLAY (CL-ML); **stiff** to very **soft,** moist to wet, tan-gray.	24		11		
				Probed with Hydraulic Push **to** 44.5'					
20									
25									
30									

R.W. Gillespie & Associates, Inc.
Saco, Maine

BORING LOG B-4

Project: 135 Marginal Wav
Location: Portland, Maine.

Approximate Surface Elevation: 10'
Ground Water Depth: 4'

Client: Fore River Company

Date: 7/26/01

Project No. **816-04**

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE #	DESCRIPTION **OF** MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT	Lab Tests
35									
40									
45				Depth — Blows per ft 44.5 to 45.5 — 39 45.5 to 46.5 — 27 46.5 to 47.5 — 38 47.5 to 48.5 — 100 Dense Glacial Soil (note: interpreted from rod probe blow count resistance.)					
50				Bottom **of** Exploration at **48.5'**: refusal in dense glacial soil or on bedrock.					
55									
60									
65									

R.W. Gillespie & Associates, Inc.
Saco, Maine

BORING LOG B-5

Project: **135** Marainal **Way**
Location: Portland, Maine

Approximate Surface Elevation: 10'
Ground Water Depth: *6'*

Client: Fore River Company

Date: 7/26/01

Project No. 816-04

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE #	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6	SPT-N BLOWS PER FT.	MOISTURE CONTENT	LIQUID LIMIT
0			S-1	ASPHALTIC CONCRETE		12	40		
				(FILL), SILTY SAND WITH GRAVEL; ash, moist to wet, dense. black-tan-gray.		28			
						12			
						15			
5			S-2			5	7		
						4			
						3			
						5			
10			S-3			1	**4**		
						2			
						2			
				CLAYEY SAND (SC); soft, wet, low.		2			
15			S-4			**5**	12		
				SILTY *CLAY* (CL-ML); medium **stiff** to very **soft,** moist to wet, gray.		6			
						6			
				Bottom **of Exploration** at 17': not refusal.		**7**			
20									
25									
30									

R.W. Gillespie & Associates, Inc.
Saco, Maine

BORING LOG B-6

Project: 135 Marginal Way
Location: Portland, Maine

Approximate Surface Elevation: 10'
Ground Water Depth: 5'

Client: Fore River Company

Date: 7/16/01

Project No. 816-04

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE #	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT	Lab Tests
0			S-1	FILL; sandy gravel; ash, trace clay, dense, wet.		10 25/ 0"	25 0"		
5			S-1			6 8 2 1 2	10		
			S-3				4		
10			S-4	CLAYEY SAND (SC); clayey seam, very loose, wet, gray, shells.		5 3 1 5 3 2 1	5		
15			S-5	SILTY CLAY (CL-ML); medium stiff to stiff, sand seams, moist, tan-gray. Probed with Hydraulic Push to 38.5'		5 5 5 6	10		
20									
25									
30									

R.W. Gillespie & Associates, Inc.
Saco, Maine

BORING LOG B-6

Project: 135 Marginal Way
Location: Portland, Maine

Approximate Surface Elevation: 10'
Ground Water Depth: 5'

Client: Fore River Company

Date: 7116/01

Project NO. 816-04

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE #	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER ft	SPT-N BLOWS PER FT.	MOISTURE CONTENT	Lab Tests
35									
40				Depth Blows per ft 38.5 to 39.5 40 39.5 to 40.5 26 40.5 to 41.5 20 41.5 to 42.5 46 42.5 to 43.0 50/6" Dense Glacial Soil (note: interpreted from rod probe blow count resistance.)					
45				Bottom of Exploration at 43.0': refusal in dense glacial soil or on bedrock.					
50									
55									
60									
65									

KEY TO SYMBOLS

Symbol	Description
Strata symbols	
	Paving
	Fill
	Silty low plasticity clay
	Poorly graded sand
	Description not given for: "08F"
	Poorly graded silty fine sand
	Description not given for: ":GF"
	Clayey sand
Misc. Symbols	
	Water table during drilling
Soil Samplers	
	California sampler

Symbol	Description
	Rock core
	Piston

Notes:

1. Exploratory borings were drilled on @BDATE using a 4-inch diameter continuous flight power auger.
2. No free water was encountered at the time of drilling or when re-checked the following day.
3. Boring locations were taped from existing features and elevations extrapolated from the final design schematic plan.
4. These logs are subject to the limitations, conclusions, and recommendations in this report.
5. Results of tests conducted on samples recovered are reported on the logs.

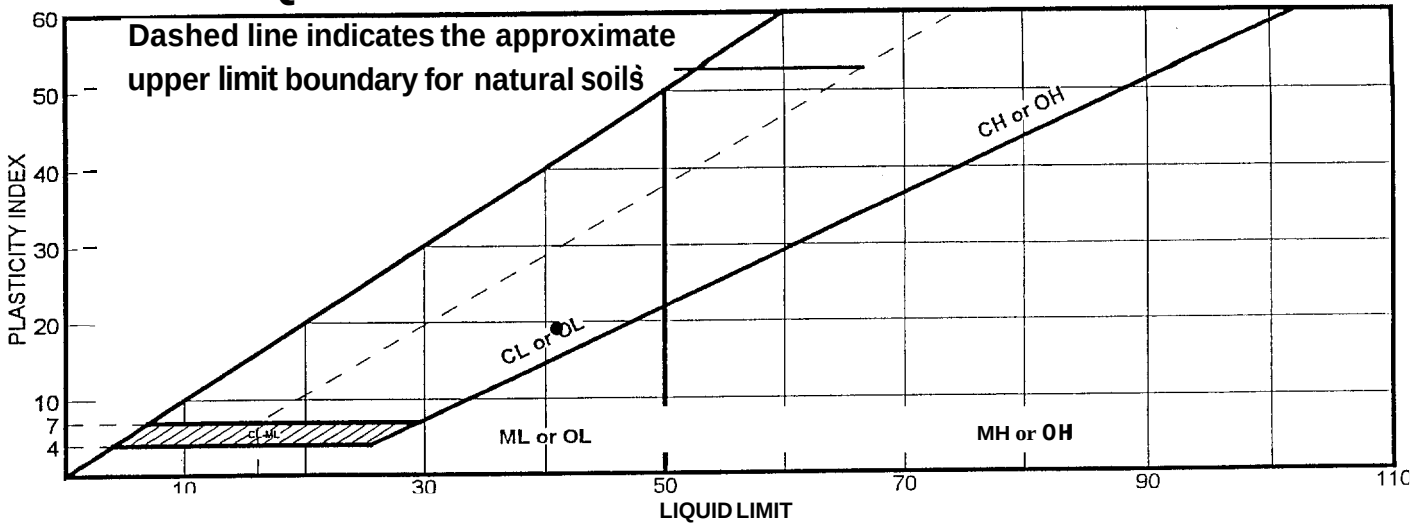
R. W. Gillespie & Associates

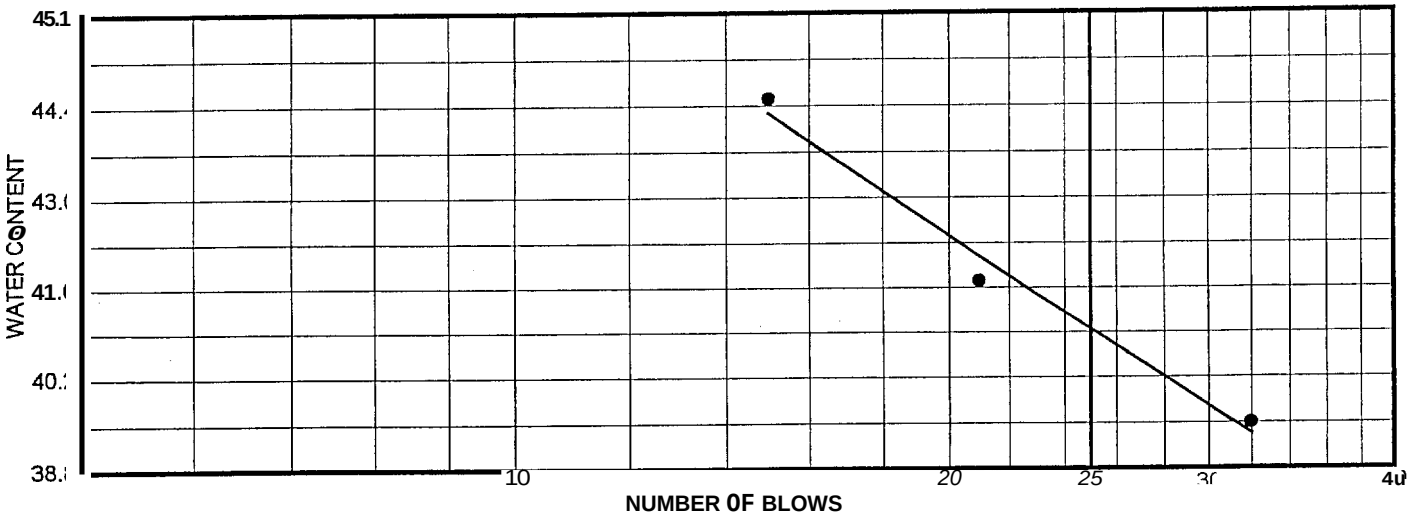
APPENDIX B

LABORATORY TESTING

Geotechnical Investigation
Proposed Office Building
135 Marginal Way
Portland, Maine

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Clay	**41**	22	19			

Jroject No. 816-04 **Client:** Fore River Company

Jroject: 135 Marginal Way Office Building

● **Location:** Portland, ME

Remarks:

● Moisture Content 43.19%
Tested by AMA

LIQUID AND PLASTIC LIMITS TEST REPORT

R.W. Gillespie & Associates, Inc.

Lab No. 5631

CONSOLIDATION TEST REPORT

NO.	Load (ksf)	C_v (ft.2/day)	NO.	Load (ksf)	C_v (ft.2/day)	NO.	Load (ksf)	C_v (ft.2/day)
1	0.10	1.15	13	2.00	0.26			
Z	0.50	1.03	Id	0.50	0.07			
3	1.00	1.47						
d	2.00	0.48						
5	4.00	0.50						
6	6.00	0.29						
7	8.00	0.19						
8	12.00	0.27						
9	16.00	0.23						
10	32.00	0.21						
11	16.00	1.17						
12	8.00	0.96						

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_r	Swell Press. (ksf)	Swell %	e_o
Sat.	Moist.											
53.8 %	33.3 %	63.1			2.7		13.06	0.36	0.04			1.670

MATERIAL DESCRIPTION	USCS	AASHTO
Shelby Tube	CL	

Project No. 816-04 **Client:** Fore River Company

Project: 135 Marginal Way Office Building

Location: Boring B-2

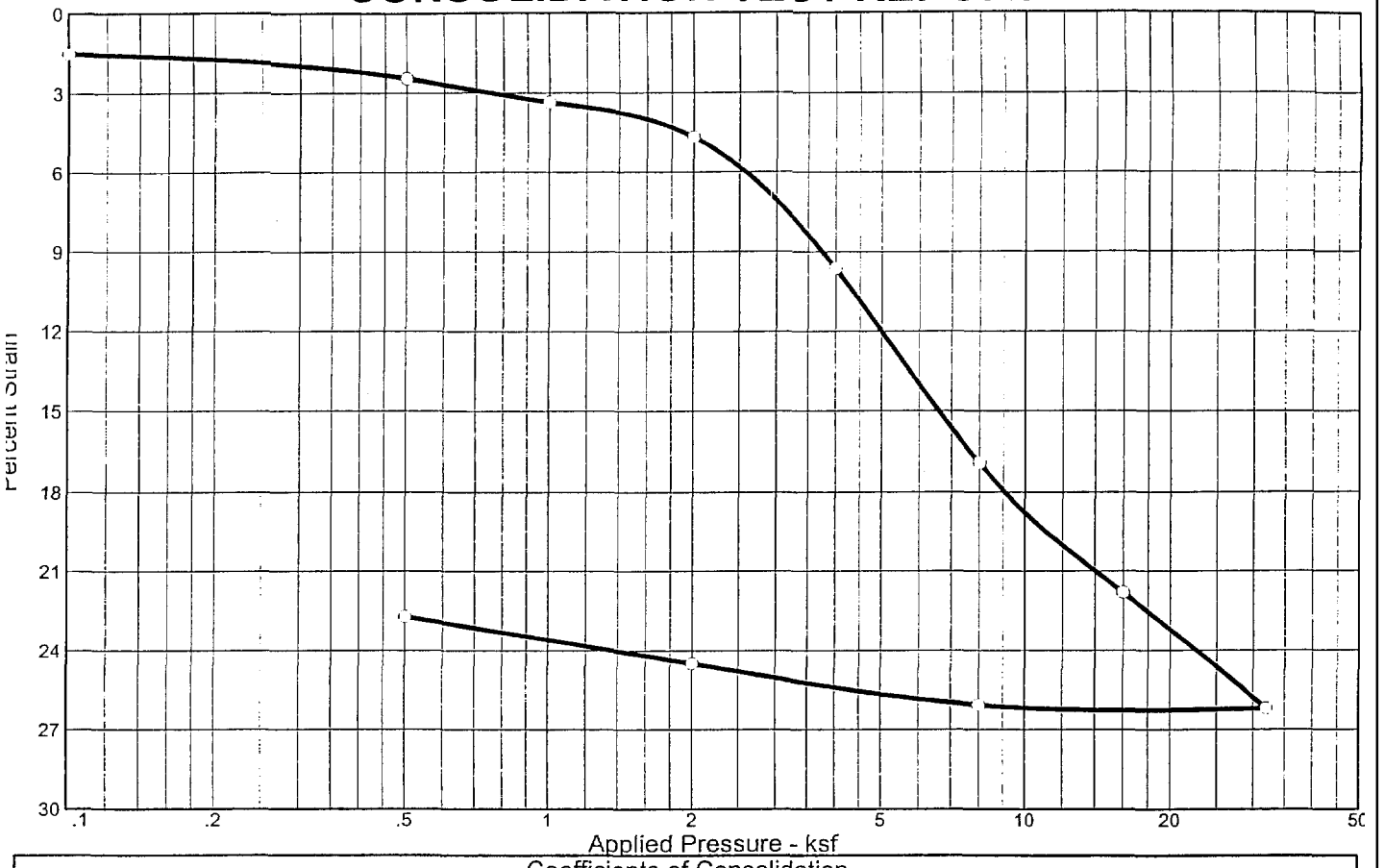
Remarks:
Shelby Tube

CONSOLIDATION TEST REPORT

R.W. Gillespie & Associates, Inc.

Plate

CONSOLIDATION TEST REPORT



Coefficients of Consolidation

No.	Load (ksf)	C_v (ft.^{2}/day)	No.	Load (ksf)	C_v (ft.^{2}/day)	No.	Load (ksf)	C_v (ft.^{2}/day)
1	0.10	0.41						
2	0.50	0.57						
3	1.00	0.45						
4	2.00	0.40						
5	4.00	0.08						
6	8.00	0.08						
7	16.00	0.14						
8	32.00	0.20						
9	8.00	0.88						
10	2.00	0.37						
11	0.50	0.06						

Natural Sat.	Natural Moist.	Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_r	Swell Press. (ksf)	Swell %	e_o
97.2 %	40.8 %	79.0			2.7		0.82	0.31	0.04			1.135

MATERIAL DESCRIPTION	USCS	AASHTO
Shelby Tube	CH	

Project No. 816-04 **Client:** Fore River Company

Project: 135 Marginal Way Office Building

Location: Boring B-2

Remarks:
Shelby Tube

CONSOLIDATION TEST REPORT

R.W. Gillespie & Associates, Inc.

Plate

R. W. Gillespie & Associates, Inc.

86 Industrial Park Road Suite 4
Saco, ME 04072
Tel: 207-286-8008
Fax: 207-286-2882

200 International Drive, Suite 170
Portsmouth, NH 03801
Tel: 603-427-0244
Fax: 603-430-2041

LETTER OF TRANSMITTAL

Date:	Project No.:
24 May 2004	816-04

Attention: Mr. Bruce Kistler

Re: Pile Foundation Evaluation
Proposed 135 Marginal Way Office Building
Portland, Maine

Fore River Company

P.O. Box 7525

Portland, Maine 04112-7525

We are sending you: _X_Enclosed ___ Attached ___Under separate cover via _____ the following items:

___Copy of Invoice ___Copy of Documentation/Details for Invoice ___ Copy of Letter ___ Copies of Report

Four original copies of our "Pile Foundation Evaluation" dated 24 May 2004 for the referenced project.

One copy also provided-to Paul B. Becker, P.E. of Becker Structural Engineers.

These are transmitted: ___As Requested ___For Your Use ___For Approval ___ For Review and Comment

Remarks:

BECKER STRUCTURAL ENGINEERS, INC.
MAY 25 2004

25 BOCS

AUG 5

Copy To: File

Signed:

R. W. Gillespie & Associates, Inc.
Geotechnical Engineering • Geohydrology • Materials Testing Services

23 June2004

Mr. Bruce Kistler
Fore River Company
P.O. Box 7525
Portland, Maine 04112-7525

Subject: Addendum to Pile Foundation Evaluation Report
Proposed 135 Marginal Way Office Building
Portland, Maine
RWG&A Project No. 816-04

Dear Mr. Kistler:

As requested by Mr. Paul B. Becker, P.E. of Becker Structural Engineers, Inc., R. W Gillespie & Associates, Inc., (RWG&A) has evaluated pile foundation recommendations made in our report dated 24 May 2004 relative to a proposed structural load of 66 kips per pile. The structural load carrying capacity in the report is 60 kips.

Based on our evaluation of the proposed pile load, HP8 by 36 steel H-piles (50 kips per square inch yield strength steel) remain appropriate to support the proposed two-story office building. It is recommended the H-piles be driven to a minimum ultimate capacity of 255 kips (increased from 240 kips) which provides a minimum factor of safety three on geotechnical capacity.

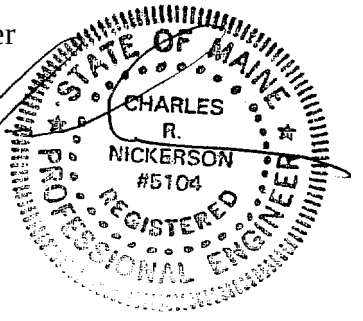
Preliminary driveability analyses indicate the piles can be driven to the recommended ultimate capacity using a hammer with a rated energy on the order of 17,000 to 21,000 foot pound. **A** wave equation analysis will be needed to verify that the contractor's pile hammer can drive the piles to the required minimum ultimate capacity without over-stressing or damaging the piles. Other recommendations provided in the report remain appropriate for the proposed project.

We trust this addendum meets your current needs, and RWG&A looks forward to providing continuing services as the project progresses through design and construction. If you have any questions or if we may be of further service, please contact us.

Very truly yours,
R. W. GILLESPIE & ASSOCIATES, INC.

Erik J. Wiberg, P.E.
Senior Geotechnical Engineer

Charles R. Nickerson, P.E.
Chief Geotechnical Engineer



EJW/CRN:ci
In quadruplicate
copy: Paul B. Becker, P.E. - Becker Structural Engineers