Ten-Mile River Ecosystem Restoration September 3, 2003
East Providence
Rhode Island

Geotechnical Design Summary Memorandum

Background:

Fish passages are planned at the site of three run-of-the-river dams on the Ten-Mile River in East Providence, Rhode Island. This report presents the subsurface exploration, and feasibility phase design of foundations for the concrete fish ladders.

Subsurface Explorations

Geotek Engineering, Inc. of Framingham, Massachusetts made three borings and three probeholes at the dam sites, at locations shown on the attached plans, in August 2002. Standard Penetration Testing and recovery of samples were performed in the borings, generally at 5-feet intervals. Bedrock cores were taken at the borings at Hunts Mill and Turner Dams. Samples were visually classified in the field, and were subsequently transported to, and stored at, USACE's Concord office. The Contractor provided logs of the borings and probeholes, as well as photos of the rock cores.

Subsurface Conditions

Omega Dam

The strata beneath the downstream apron of Omega Dam, based on Boring B3 and Probehole P3 in descending order, consist of approximately 12 feet of loose to medium dense SAND with some gravel, 12 feet of loose to medium dense SILT, and at least 24 feet of medium dense to dense SAND and SILT. Bedrock was not encountered in the explorations at Omega dam (minimum of 50 feet beneath the apron level).

Hunts Mill Dam

The strata beneath the top of Hunts Mill Dam, based on Boring B2 and Probeholes P1 and P2, consist of up to 10-12 feet of dense fine SAND overlying fresh to slightly weathered medium grained, SANDSTONE, with an RQD of 100.

Turner Dam

The strata beneath the downstream apron of Turner Dam, based on Boring B1 and the existing borings included in the 1981 dam inspection report consist of approximately 40 feet of medium dense to dense SAND, overlying fresh to slightly weathered, SANDSTONE, with an RQD of 100, interbedded with SHALE.

Foundation Design

Omega Dam

The use of shallow spread foundations is ruled out, due to the presence of liquefiable loose sands beneath the site. The fish passage structure must be carried on deep foundations. Since bedrock is not present at moderately shallow depths, friction piles, which derive their capacity from shaft friction and end resistance, have been selected.

Driven pre cast piles can be used to support the design loads. However, there are two drawbacks. First, pile driving equipment with high masts will be difficult to operate around and beneath the railroad bridge. Second, vibrations as well as possible heave from pile driving may cause structural damage to the old dam structure, the exact condition of which is not fully known.

The fish ladder structure will therefore be supported on 16" diameter cast-in-place concrete caissons, placed 20 feet into the medium dense to dense SAND and SILT (total length of approximately 34 feet). Each caisson will carry an allowable load of 33 tons. Structural (dead + live) load of the structure is 1.5 tons per linear foot of the structure, hence 1 caisson every 20 to 22 feet of the structure will be needed.

Hunts Mill Dam

It is envisioned that the fish ladder will be installed through the existing sheeted draw-off structure, which is assumed to be founded on bedrock. However, top of bedrock appears to slope down towards the downstream, so that the southern end of the fish ladder structure could be underlain by as much as 12 feet of sand before reaching bedrock. To avoid founding the structure across two different strata (rock and sand) with a consequent potential for differential settlement and cracking, it is recommended to excavate and remove the sands, and place the spread foundation directly on bedrock. As an added consideration, moving the footprint of the structure northwards, assuming it does not conflict with the intended function and geometry, would reduce the quantity of overburden sand to be excavated.

Turner Dam

Since top of bedrock is present at relatively shallow depths at Turner Dam, it is recommended that the structural load of the fish ladder be carried on 12" diamater cast-in-place concrete caissons, with a 5-foot penetration into bedrock. Since the bedrock will have ample capacity for carrying the loads, the capacity will be governed by the structural capacity of the caisson itself.

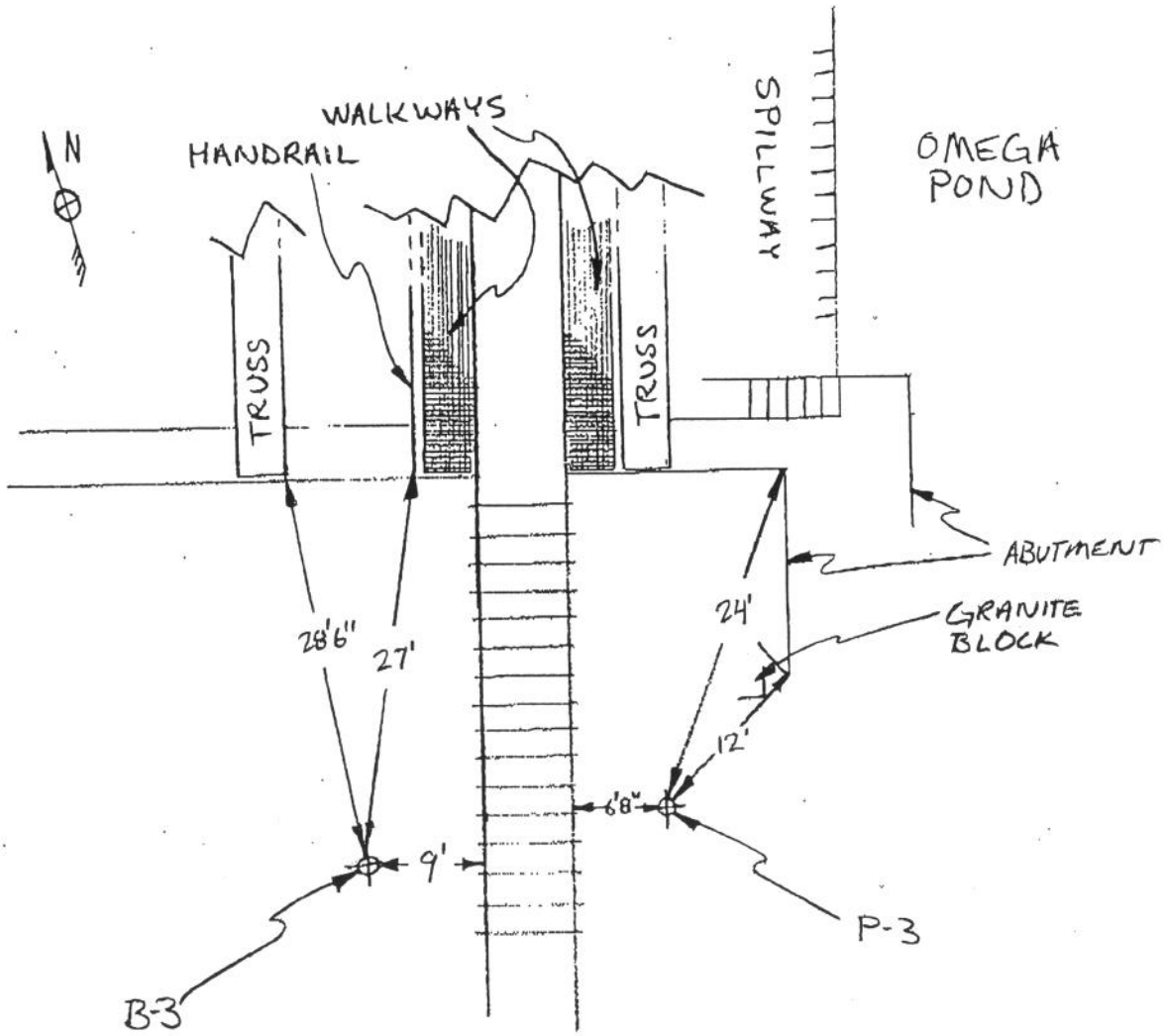
References:

Phase 1 Inspection Report, National Dam Inspection Program, James V.Turner Dam, 1981

Attachments: Boring Location Plans
Boring and Probehole Logs
Foundation Design Calculations

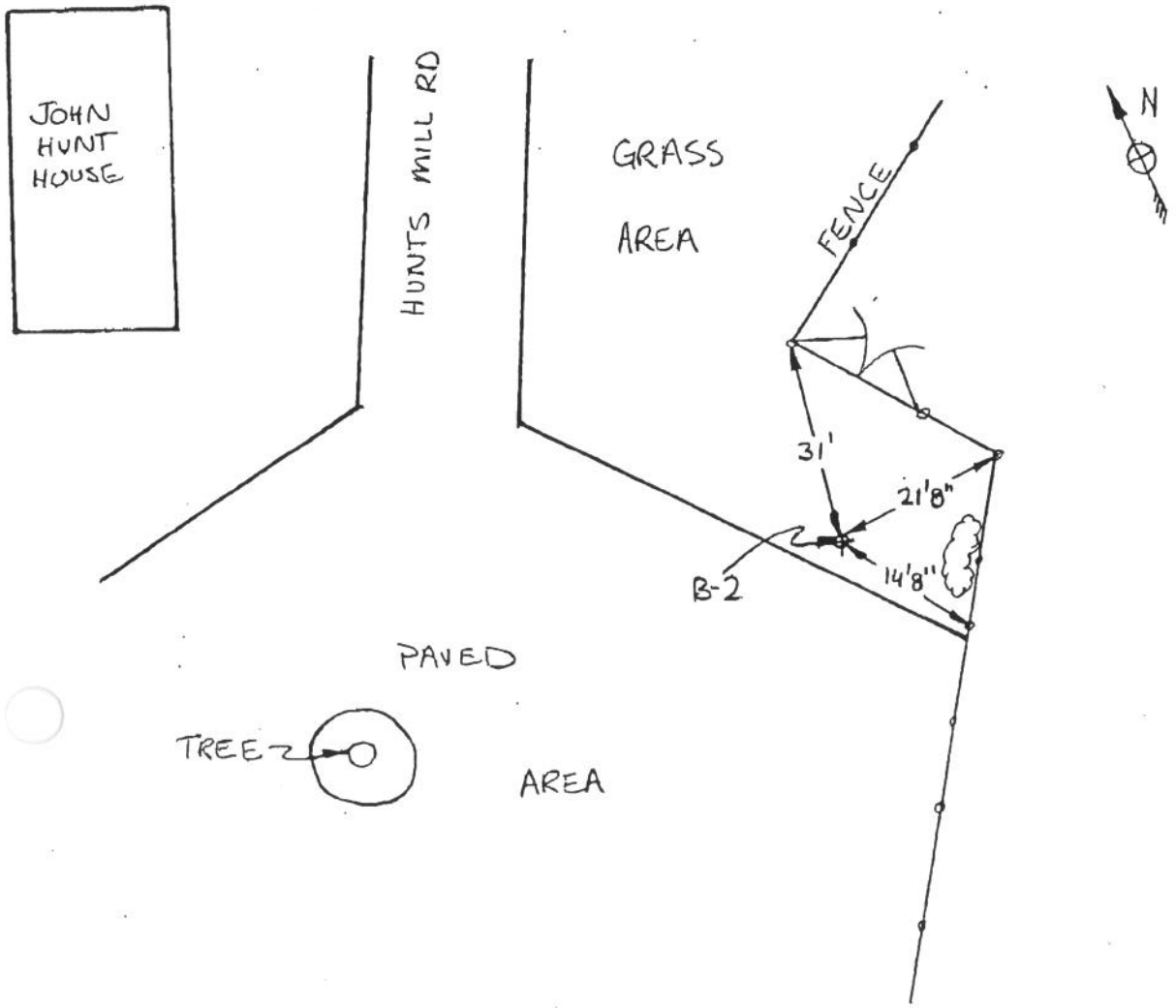
Siamac Vaghar
Geotechnical Engineering Section

OMEGA DAM



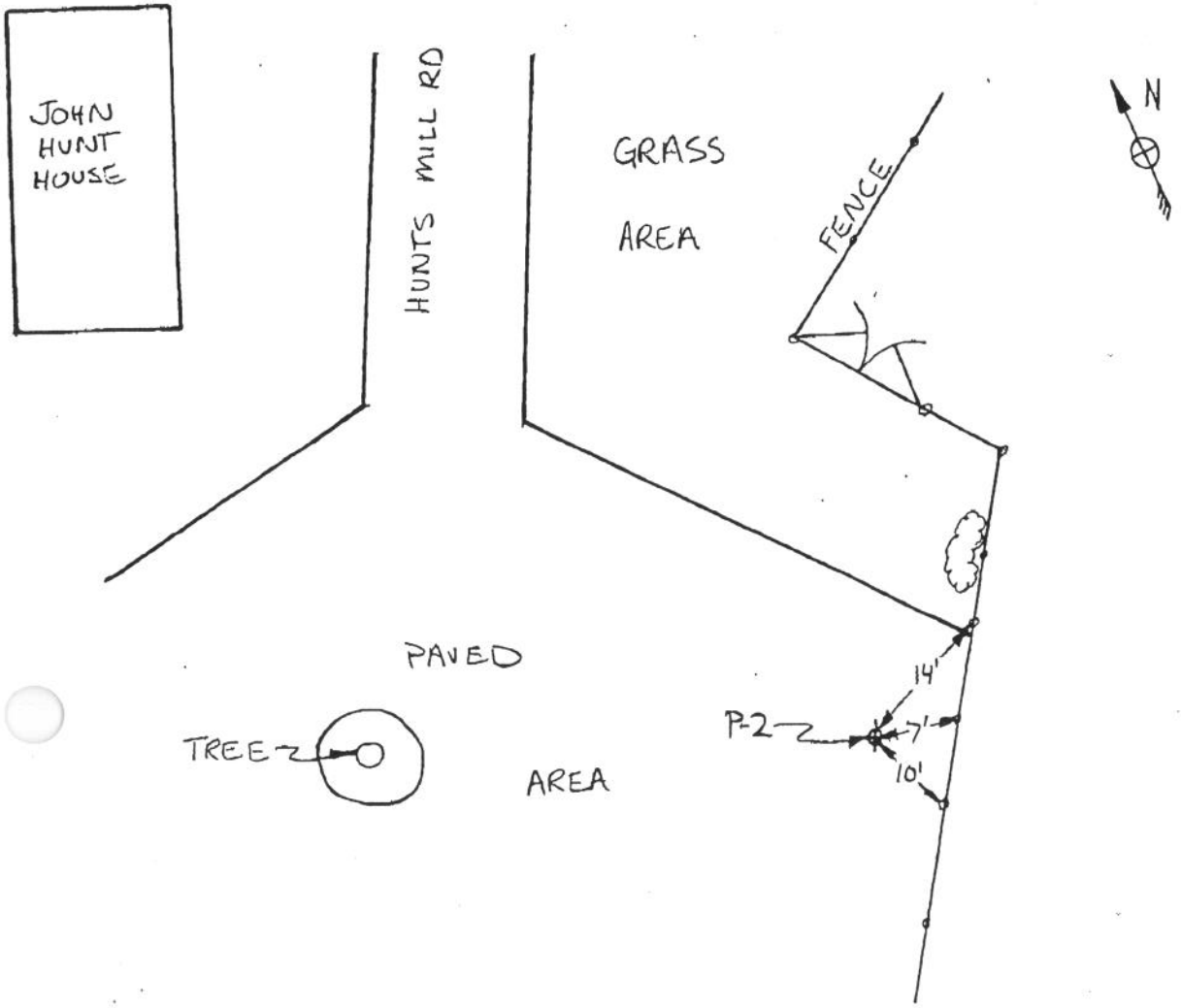
ASBUILT LOCATIONS B-3 & P-3

HUNTS MILL DAM



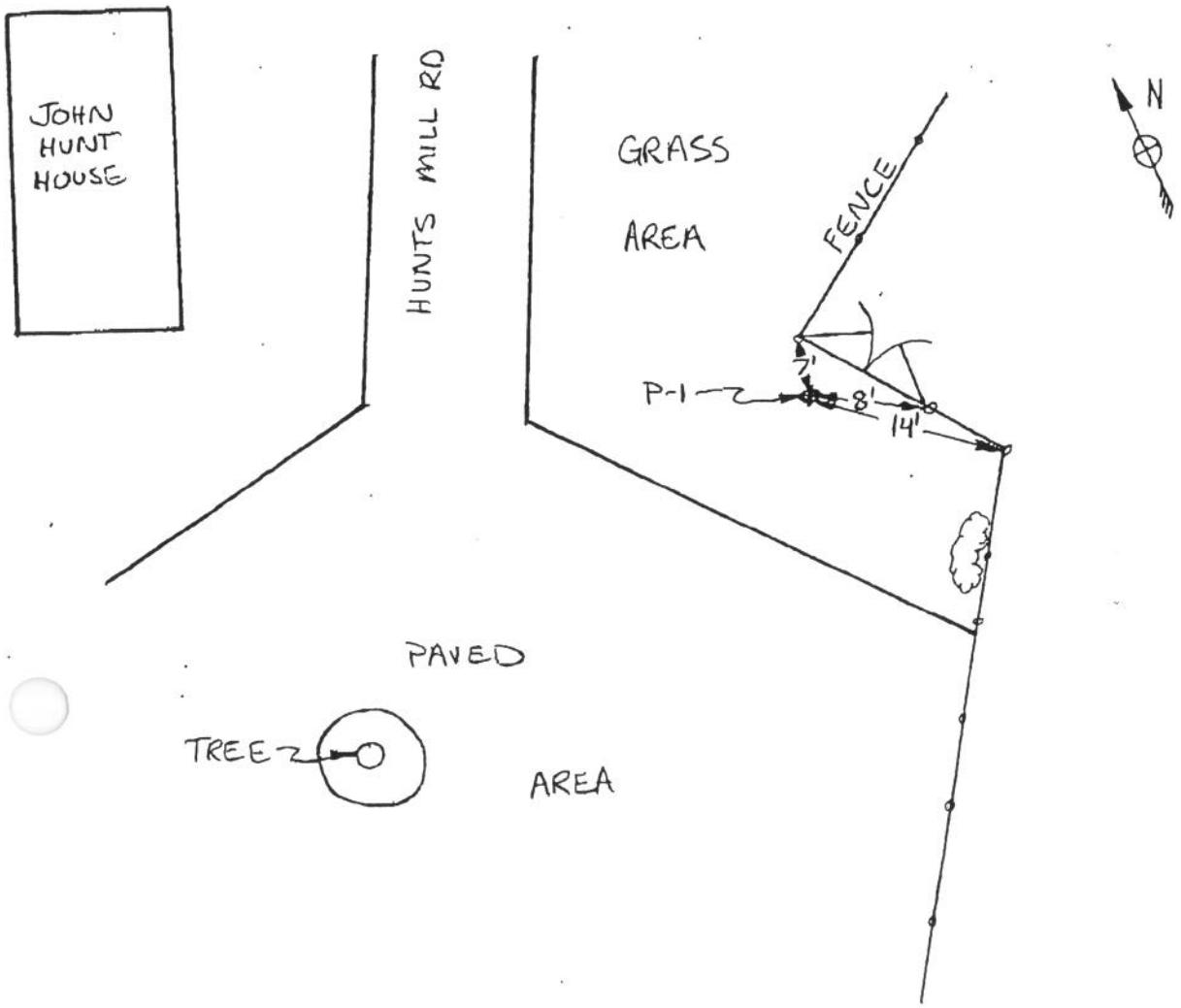
ASBUILT LOCATION
BORING # B-2

HUNTS MILL DAM



ASBUILT LOCATION
PROBE# P-2

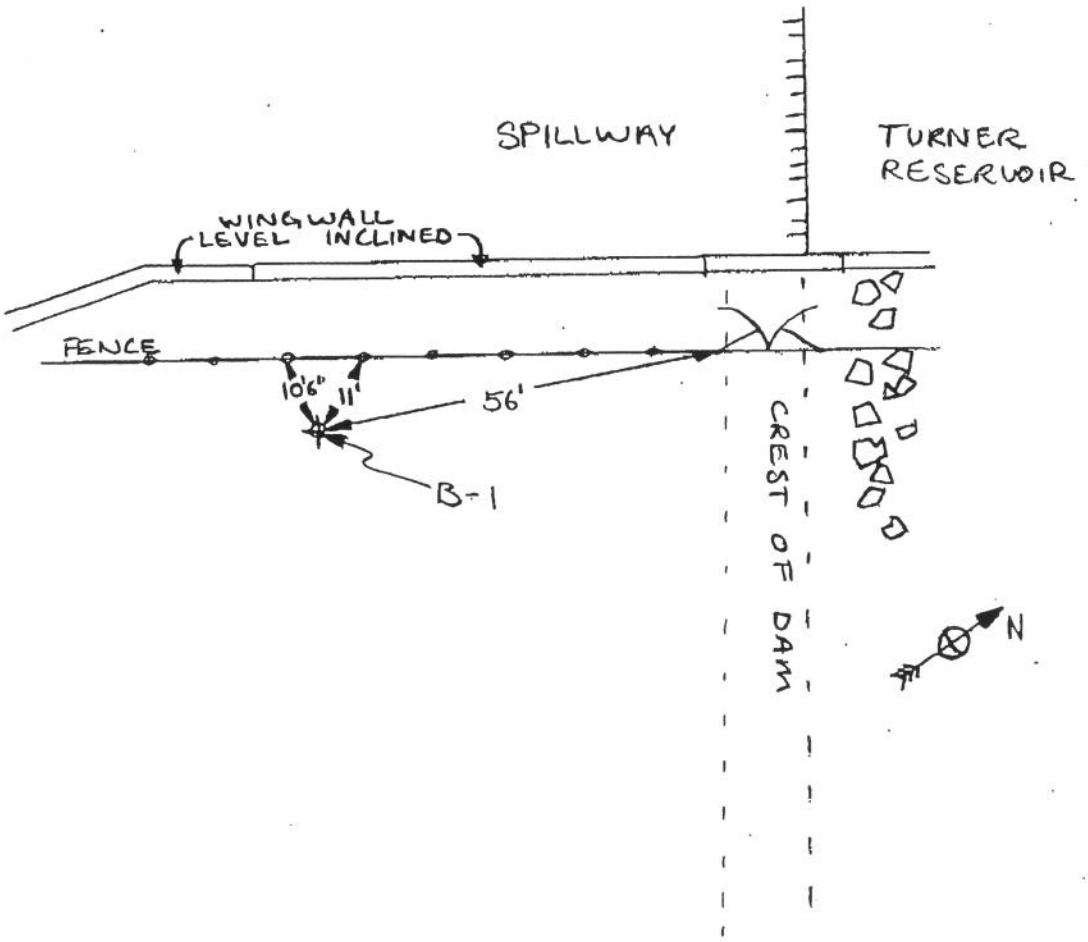
HUNTS MILL DAM



ASBUILT LOCATION

PROBE # P-1

TURNER DAM



ASBUILT LOCATION
BORING # B-1

US Army Corps of Engineers
New England District

PROJECT
TEN MILE RIVER FISHWAYS
EAST PROVIDENCE, RI

BORING NO. B-1
SHEET 1 of 5
FILE NO.
CHKD. BY

Boring Co. GEOTEK ENGINEERING
Driller BARRY WORDELL
Logged By DAVID TEOSTE

Boring Location northing easting
~~Mudline El.~~ est. GROUND EL 38.5' Datum NGVD
Date Start 8-19-02 Date End 8-20-02

Sampler: 2" SPLIT SPOON + NX CORE
Drill Rig: SIMCO 4100
Drilling Method: MUD ROTARY

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows/Ft	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS
0							NO SAMPLING REQUIRED ABOVE DEPTH OF 15'		
1									
2							BORING WAS ADVANCED TO 13' BY SPINNING 4" CASING		
3									
4									
5									
6									
7									
8									
9									
10									

0 to 4 - Very Loose
5 to 10 - Loose
11 to 30 - Medium Dense
31 to 50 - Dense
Over 50 - Very Dense

0 to 2 - Very Soft
3 to 4 - Soft
5 to 8 - Medium Stiff
9 to 15 - Stiff
16 to 30 - Very Stiff
Over 30 - Hard

1. S denotes split-barrel sampler.
2. U denotes 3-inch O.D. Undisturbed sample.
3. UO denotes 3-inch Osterberg undisturbed sample.
4. PEN denotes penetration length of sampler.
5. REC denotes recovered length of sample.
6. SPT denotes Standard Penetration Test
7. PID denotes Photoionization Detector
8. PPM denotes parts per million.
9. PP denotes Pocket Penetrometer.
10. FVST denotes field vane shear test.
11. RQD denotes Rock Quality Designation.
12. R denotes core run number.

REMARKS:
1)
2)
3)
4)

Engineering Log Template

US Army Corps of Engineers
New England District

PROJECT
TEN MILE RIVER
EAST PROVIDENCE, RI

BORING NO. B-1
SHEET 2 of 5
FILE NO.
CHKD. BY

Boring Co. GEOTEK ENGINEERING
Driller BARRY WORDELL
Logged By DAVID TEOSTE

Boring Location northing easting
~~Mudline El.~~
Date Start
Datum NGVD
Date End

Sampler:
Drill Rig:
Drilling Method:

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

Depth	Casing Blows (#)	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS
11									
12									
13		S-1	24/16	13'-15'	8-10-13-15		moist, stiff, light gray, CLAY, with occaisional very thin bed of fine sand, high plasticity		
14									
15									
16									
17									
18		S-2	24/14	18'-20'	8-6-8-10		wet, medium gray, angular, medium to coarse SAND, grading to light gray SILT with fine sand		
19									
20									

0 to 4 - Very Loose
5 to 10 - Loose
11 to 30 - Medium Dense
31 to 50 - Dense
Over 50 - Very Dense

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3 to 4 - Soft
5 to 8 - Medium Stiff
9 to 15 - Stiff
16 to 30 - Very Stiff
Over 30 - Hard

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Engineering Log Template

US Army Corps of Engineers
New England District

PROJECT
TEN MILE RIVER FISHWAYS
EAST PROVIDENCE, RI

BORING NO. B-1
SHEET 3 of 5
FILE NO.
CHKD. BY

Boring Co. GEOTEK
Driller
Logged By

Boring Location northing easting
Mudline El.
Date Start
Datum NGVD
Date End

Sampler:
Drill Rig:
Drilling Method:

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (#)	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	Anal.
							LOSS OF DRILLING FLUID BETWEEN 20'-23' SPUN 4" PIPE DOWN TO 23'		
21									
22									
23		S-3	24/20	23-25'	27-18-10-17		wet, medium dense, light gray, FINE SAND little medium to coarse sand, trace fine gravel, silt		
24									
25									
26									
27									
28		S-4	24/12	28-30'	15-11-21-22		wet, light gray, medium SAND, trace fine gravel, fine sand, coarse sand		
29									
30									

0 to 4 - Very Loose
5 to 10 - Loose
11 to 30 - Medium Dense
31 to 50 - Dense
Over 50 - Very Dense

0 to 2 - Very Soft
3 to 4 - Soft
5 to 8 - Medium Stiff
9 to 15 - Stiff
16 to 30 - Very Stiff
Over 30 - Hard

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REMARKS:
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Engineering Log Template

US Army Corps of Engineers
New England District

PROJECT
TEN MILE RIVER FISHWAYS
EAST PROVIDENCE, RI

BORING NO. B-1
SHEET 4 of 5
FILE NO.
CHKD. BY

Boring Co. GEOTEK
Driller
Logged By

Boring Location northing easting
Mudline El. Datum NGVD
Date Start Date End

Sampler:
Drill Rig:
Drilling Method:

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

Depth	Casing Blows (in)	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	Remarks
31									
32									
33			100/1"	33'			TOP OF BEDROCK 33'1" BOUNCING REFUSAL NO RECOVERY		
					DRILL TIME				
34		C-1	60/60	33.5-38.5	4-3-3-4		C-1 33.5'-38.5' HARD, MECHANICALLY BROKEN MED GRAY, SANDSTONE, faint MODERATE ANGLE FISSILITY and bedding, 2" gravel filled fracture at 35.5' RQD = 100%		
35									
36									
37									
38									
39		C-2	60/60	38.5-43	3-3-3-3-3		C-2 38.5'-43.5' HARD MECHANICALLY BROKEN MED GRAY, SANDSTONE, GRADING TO SANDSTONE/SHALE RQD = 100%		
40									

0 to 4 - Very Loose
5 to 10 - Loose
11 to 30 - Medium Dense
31 to 50 - Dense
Over 50 - Very Dense

0 to 2 - Very Soft
3 to 4 - Soft
5 to 8 - Medium Stiff
9 to 15 - Stiff
16 to 30 - Very Stiff
Over 30 - Hard

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9. PP denotes Pocket Penetrometer.
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Engineering Log Template

US Army Corps of Engineers
New England District

PROJECT
TEN MILE RIVER FISHWAYS
EAST PROVIDENCE, RI

BORING NO. B-1
SHEET 5 of 5
FILE NO.
CHKD. BY

Boring Co.
Driller
Logged By

Boring Location northing easting
Mudline El. Datum NGVD
Date Start Date End

Sampler:
Drill Rig:
Drilling Method:

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION: Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS
41									
42									
43									
44							BOTTOM OF BORING 43.5'		
45									
46									
47									
48									
49									
50									

0 to 4 - Very Loose
5 to 10 - Loose
11 to 30 - Medium Dense
31 to 50 - Dense
Over 50 - Very Dense

0 to 2 - Very Soft
3 to 4 - Soft
5 to 8 - Medium Stiff
9 to 15 - Stiff
16 to 30 - Very Stiff
Over 30 - Hard

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12. R denotes core run number.

REMARKS:
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Engineering Log Template

US Army Corps of Engineers
New England District

PROJECT
TEN MILE RIVER FISHWAYS
EAST PROVIDENCE, RI

BORING NO. P-1
SHEET 1 of 2
FILE NO.
CHKD. BY

Boring Co. GEOTEK ENGINEERING
Driller BARRY WORDELL
Logged By DAVID TEOSTE

Boring Location northing easting
~~Mudline El.~~ EST. GROUND EL=32' Datum NGVD
Date Start 8-19-02 Date End 8-19-02

Sampler:
Drill Rig: SIMCO 9100
Drilling Method: PROBE WITH ROLLER BIT

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (#)	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS
1							5' COBBLES		
2									
3									
4									
5									
6							8'-8'6" COBBLE		
7									
8									
9									
10									

0 to 4 - Very Loose
5 to 10 - Loose
11 to 30 - Medium Dense
31 to 50 - Dense
Over 50 - Very Dense

0 to 2 - Very Soft
3 to 4 - Soft
5 to 8 - Medium Stiff
9 to 18 - Stiff
19 to 30 - Very Stiff
Over 30 - Hard

1. S denotes split-barrel sampler.
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Engineering Log Template

US Army Corps of Engineers
New England District

PROJECT
TEN MILE RIVER FISHWAYS
EAST PROVIDENCE, RI

BORING NO. P-1
SHEET 2 of 2
FILE NO.
CHKD. BY

Boring Co. GEOTEK
Driller
Logged By

Boring Location northing easting
Mudline El. Datum NGVD
Date Start Date End

Sampler:
Drill Rig:
Drilling Method:

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (in)	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS
11									
12									
13									
14									
15									
16							15'6" HARD, PRESUMED BOULDER or BEDROCK		
17							BOTTOM OF BORING 16.5'		
18									
19									
20									

0 to 4 - Very Loose 5 to 10 - Loose 11 to 30 - Medium Dense 31 to 50 - Dense Over 50 - Very Dense	0 to 2 - Very Soft 3 to 4 - Soft 5 to 8 - Medium Stiff 9 to 15 - Stiff 16 to 30 - Very Stiff Over 30 - Hard	1. S denotes split-barrel sampler. 2. U denotes 3-inch O.D. Undisturbed sample. 3. UO denotes 3-inch Osterberg undisturbed sample. 4. PEN denotes penetration length of sampler. 5. REC denotes recovered length of sample. 6. SPT denotes Standard Penetration Test	7. PID denotes Photoionization Detector 8. PPM denotes parts per million. 9. PP denotes Pocket Penetrometer. 10. FVST denotes field vane shear test. 11. RQD denotes Rock Quality Designation. 12. R denotes core run number.

REMARKS:
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Engineering Log Template

US Army Corps of Engineers
New England District

PROJECT
TEN MILE RIVER FISHWAYS
EAST PROVIDENCE, RI

BORING NO. P-2
SHEET 1 of 2
FILE NO.
CHKD. BY

Boring Co. GEOTEK ENGINEERING
Driller BARRY WORDEL
Logged By DAVID TEOSTE

Boring Location northing easting
~~Mudline El.~~ EST. GROUND EL = 29.5' Datum NGVD
Date Start 8-19-02 Date End 8-19-02

Sampler:
Drill Rig: SIMCO 9100
Drilling Method: PROBE WITH ROLLER BIT

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows/Ft	SAMPLE INFORMATION: Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS
1									
2									
3									
4									
5							5' COBBLES		
6									
7									
8									
9									
10							9.5' DRILL RATE SLOWED SIGNIFICANTLY COLOR OF WASH CHANGED TO SAME AS CORING ON	B-2	

0 to 4 - Very Loose
5 to 10 - Loose
11 to 30 - Medium Dense
31 to 50 - Dense
Over 50 - Very Dense

0 to 2 - Very Soft
3 to 4 - Soft
5 to 8 - Medium Stiff
9 to 15 - Stiff
16 to 30 - Very Stiff
Over 30 - Hard

1. S denotes split-barrel sampler.
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REMARKS:
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Engineering Log Template

US Army Corps of Engineers
New England District

PROJECT
TEN MILE RIVER FISHWAYS
EAST PROVIDENCE, RI

BORING NO. P-2
SHEET 2 of 2
FILE NO.
CHKD. BY

Boring Co. GEOTEK ENGINEERING
Driller
Logged By

Boring Location northing easting
Mudline El. Datum NGVD
Date Start 8-19-02 Date End 8-19-02

Sampler:
Drill Rig:
Drilling Method:

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (#)	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
							No Change, Presumed Boulder or Bedrock		
							Bottom of Boring 10.5'		
11									
12									
13									
14							NOTE! Boring was offset 6' S-SW due to overhead obstruction (trees)		
15									
16									
17									
18									
19									
20									

0 to 4 - Very Loose
5 to 10 - Loose
11 to 30 - Medium Dense
31 to 50 - Dense
Over 50 - Very Dense

0 to 2 - Very Soft
3 to 4 - Soft
5 to 8 - Medium Stiff
9 to 15 - Stiff
16 to 30 - Very Stiff
Over 30 - Hard

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Engineering Log Template

US Army Corps of Engineers
New England District

PROJECT
TEN MILE RIVER FISHWAYS
EAST PROVIDENCE, RI

BORING NO. B-2
SHEET 1 of 3
FILE NO.
CHKD. BY

Boring Co. GEOTEK ENGINEERING
Driller BARRY WORCEL-
Logged By DAVID TEOSTE

Boring Location northing easting
~~Mudline~~ El. EST. GROUND EL = 31' Datum NGVD
Date Start 8-19-02 Date End 8-19-02

Sampler 2" SPLITSPOON + NX CORE
Drill Rig: SIMCO 4100
Drilling Method: MUD ROTARY

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

Depth (ft)	Casing Blows (#)	SAMPLE INFORMATION: Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS
5		S-1	24/5	5'-7'	5-12-7-6		wet, brown, fine to coarse, SAND; little angular to sub angular, fine gravel, trace inorganic silt		
9							COBBLE @ 9'		

0 to 4 - Very Loose
5 to 10 - Loose
11 to 30 - Medium Dense
31 to 50 - Dense
Over 50 - Very Dense

0 to 2 - Very Soft
3 to 4 - Soft
5 to 8 - Medium Stiff
9 to 15 - Stiff
16 to 30 - Very Stiff
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Engineering Log Template

US Army Corps of Engineers
New England District

PROJECT
TEN MILE RIVER FISHWAYS
EAST PROVIDENCE, RI

BORING NO. B-2
SHEET 2 of 3
FILE NO.
CHKD. BY

Boring Co.
Driller
Logged By

Boring Location northing easting
Mudline El.
Date Start
Datum NGVD
Date End

Sampler:
Drill Rig:
Drilling Method:

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH (ft)	Casing Blows (in)	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS
		S-2	24/16	10'-12'	22-50-60-5	5	moist, very dense, light olive, fine SAND little fine to coarse gravel, trace silt		
11									
					DRILL TIME				
12					MIN/FT.		TOP OF BEDROCK 12'		
		C-1	60/49	12'-17'	4-4-7-8-8		hard, mechanicaly broken, unfractured, light gray, medium grained, conglomerate SANDSTONE no apparent bedding or fissility, occasional clasts of various lithology. RQD = 100%		
13									
14									
15									
16									
17									
		C-2	60/60	17'-22'	7-10-10-8-9		As above w/moderate to high angle natural fracture at bottom of run RQD = 100%		
18									
19									
20									

0 to 4 - Very Loose
5 to 10 - Loose
11 to 30 - Medium Dense
31 to 50 - Dense
Over 50 - Very Dense

0 to 2 - Very Soft
3 to 4 - Soft
5 to 8 - Medium Stiff
9 to 15 - Stiff
16 to 30 - Very Stiff
Over 30 - Hard

1. S denotes split-barrel sampler
2. U denotes 3-inch O.D. Undisturbed sample.
3. UO denotes 3-inch Osterberg undisturbed sample.
4. PEN denotes penetration length of sampler.
5. REC denotes recovered length of sample.
6. SPT denotes Standard Penetration Test
7. PID denotes Photoionization Detector
8. PPM denotes parts per million.
9. PP denotes Pocket Penetrometer.
10. FVST denotes field vane shear test
11. RQD denotes Rock Quality Designation.
12. R denotes core run number.

REMARKS:
1)
2)
3)
4)

Engineering Log Template

US Army Corps of Engineers
New England District

PROJECT
TEN MILE RIVER FISHWAYS
EAST PROVIDENCE, RI

BORING NO. B-2
SHEET 3 of 3
FILE NO.
CHKD. BY

Boring Co.
Driller
Logged By

Boring Location northing easting
Mudline El. Datum NGVD
Date Start Date End

Sampler:
Drill Rig:
Drilling Method:

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows/Ft.	SAMPLE INFORMATION: Type & No.	PEN/REC (inches)	DEPTH (ft)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	NOTES
21									
22							BOTTOM OF BORING 22'		
23									
24									
25									
26									
27									
28									
29									
30									

Cohesionless	Cohesive	
0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. Undisturbed sample.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test

7. PID denotes Photoionization Detector
8. PPM denotes parts per million.
9. PP denotes Pocket Penetrometer.
10. FVST denotes field vane shear test.
11. RQD denotes Rock Quality Designation.
12. R denotes core run number.

REMARKS:
1)
2)
3)
4)

Engineering Log Template

US Army Corps of Engineers
New England District

PROJECT
TEN MILE RIVER FISHWAYS
EAST PROVIDENCE, RI

BORING NO. B-3
SHEET 1 of 7
FILE NO.
CHKD. BY

Boring Co. GEOTEK ENGINEERING INC.
Driller BARRY WORDELL
Logged By DAVID TEOSTE

Boring Location northing easting
Mudline El. EST. GROUND EL = 17.8' Datum NGVD
Date Start 8-15-02 Date End 8-16-02

Sampler 2" SPLIT SPOON
Drill Rig: SIMCO 9100
Drilling Method: MUD ROTARY

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows/ft	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS
1							NO SAMPLES REQUIRED ABOVE DEPTH OF 15'		
2									
3									
4									
5									
6									
7									
8									
9									
10									

0 to 4 - Very Loose
5 to 10 - Loose
11 to 30 - Medium Dense
31 to 50 - Dense
Over 50 - Very Dense

0 to 2 - Very Soft
3 to 4 - Soft
5 to 8 - Medium Stiff
9 to 15 - Stiff
16 to 30 - Very Stiff
Over 30 - Hard

1. S denotes split-barrel sampler.
2. U denotes 3-inch O.D. Undisturbed sample.
3. UO denotes 3-inch Osterberg undisturbed sample.
4. PEN denotes penetration length of sampler.
5. REC denotes recovered length of sample.
6. SPT denotes Standard Penetration Test
7. PID denotes Photoionization Detector
8. PPM denotes parts per million.
9. PP denotes Pocket Penetrometer.
10. FVST denotes field vane shear test.
11. RQD denotes Rock Quality Designation.
12. R denotes core run number.

REMARKS:
1)
2)
3)
4)

Engineering Log Template

US Army Corps of Engineers
New England District

PROJECT
TEN MILE RIVER FISHWAYS
EAST PROVIDENCE, RI

BORING NO. B-3
SHEET 2 of 7
FILE NO.
CHKD. BY

Boring Co. GEO TEK ENGINEERING
Driller BARRY WORDELL
Logged By DAVID TEOSTE

Boring Location northing
Mudline El. 17.8'
Date Start 8-15-02

easting
Datum NGVD
Date End 8-16-02

Sampler:
Drill Rig:
Drilling Method:

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH (ft)	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS
11									
12									
13		S-1	24/9	13'-15'	24-13-8-5		wet, medium dense, olive, med-coarse, SAND, trace fine gravel		
14									
15									
16									
17									
18		S-2	24/10	18'-20'	7-9-13-13		wet, medium dense, olive, medium to coarse SAND, little fine to coarse gravel, trace inorganic silt		
19									
20									

0 to 4 - Very Loose
5 to 10 - Loose
11 to 30 - Medium Dense
31 to 50 - Dense
Over 50 - Very Dense

0 to 2 - Very Soft
3 to 4 - Soft
5 to 8 - Medium Stiff
9 to 15 - Stiff
16 to 30 - Very Stiff
Over 30 - Hard

1. S denotes split-barrel sampler.
2. U denotes 3-inch O.D. Undisturbed sample.
3. UO denotes 3-inch Osterberg undisturbed sample.
4. PEN denotes penetration length of sampler.
5. REC denotes recovered length of sample.
6. SPT denotes Standard Penetration Test

7. PID denotes Photoionization Detector
8. PPM denotes parts per million.
9. PP denotes Pocket Penetrometer.
10. FVST denotes field vane shear test.
11. RQD denotes Rock Quality Designation.
12. R denotes core run number.

REMARKS:
1)
2)
3)
4)

Engineering Log Template

US Army Corps of Engineers
New England District

PROJECT
TEN MILE RIVER FISHWAYS
EAST PROVIDENCE, RI

BORING NO. B-3
SHEET 3 of 7
FILE NO.
CHKD. BY

Boring Co. GEOTEK ENGINEERING
Driller
Logged By
Boring Location northing easting
Mudline El.
Date Start 8-15-02
Datum NGVD
Date End 8-16-02

Sampler:
Drill Rig:
Drilling Method:

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (#)	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
21									
22									
23		S-3	24/3	23'-25'	9-10-20-10		wet, angular to sub-rounded, fine to coarse GRAVEL, trace fine sand		
24									
25									
26									
27									
28		S-4	24/9	28'-30'	9-5-6-8		wet, loose, olive gray, COARSE SAND, little fine gravel		
29									
30									

0 to 4 - Very Loose
5 to 10 - Loose
11 to 30 - Medium Dense
31 to 50 - Dense
Over 50 - Very Dense

0 to 2 - Very Soft
3 to 4 - Soft
5 to 8 - Medium Stiff
9 to 15 - Stiff
16 to 30 - Very Stiff
Over 30 - Hard

1. S denotes split-barrel sampler.
2. U denotes 3-inch O.D. Undisturbed sample.
3. UO denotes 3-inch Osterberg undisturbed sample.
4. PEN denotes penetration length of sampler.
5. REC denotes recovered length of sample.
6. SPT denotes Standard Penetration Test
7. PID denotes Photoionization Detector
8. PPM denotes parts per million.
9. PP denotes Pocket Penetrometer.
10. FVST denotes field vane shear test
11. RQD denotes Rock Quality Designation.
12. R denotes core run number.

REMARKS:
1)
2)
3)
4)

Engineering Log Template

US Army Corps of Engineers
New England District

PROJECT
TEN MILE RIVER FISHWAYS
EAST PROVIDENCE, RI

BORING NO. B-3
SHEET 4 of 7
FILE NO.
CHKD. BY

Boring Co. GEOTEK ENGINEERING
Driller
Logged By
Boring Location northing easting
Mudline El. Datum NGVD
Date Start Date End

Sampler:
Drill Rig:
Drilling Method:

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (#)	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
31									
32									
33		S-5	24/19	33'-35'	5-4-10-7		wet, med gray, med, SAND, changing to med stiff, med gray, SILT, high plasticity, little fine sand		
34							STRATA CHANGE ≈ 34.5' SANDS / SILT		
5									
36									
37									
38		S-6	24/24	38'-40'	4-55-7		moist, medium stiff, olive gray, clayey, SILT, high plasticity, trace fine sand		
39									
40									

0 to 4 - Very Loose
5 to 10 - Loose
11 to 30 - Medium Dense
31 to 50 - Dense
Over 50 - Very Dense

0 to 2 - Very Soft
3 to 4 - Soft
5 to 8 - Medium Stiff
9 to 15 - Stiff
16 to 30 - Very Stiff
Over 30 - Hard

1. S denotes split-barrel sampler.
2. U denotes 3-inch O.D. Undisturbed sample.
3. UO denotes 3-inch Osterberg undisturbed sample.
4. PEN denotes penetration length of sampler.
5. REC denotes recovered length of sample.
6. SPT denotes Standard Penetration Test
7. PID denotes Photoionization Detector
8. PPM denotes parts per million.
9. PP denotes Pocket Penetrometer.
10. FVST denotes field vane shear test.
11. RQD denotes Rock Quality Designation.
12. R denotes core run number.

REMARKS:
1)
2)
3)
4)

Engineering Log Template

US Army Corps of Engineers
New England District

PROJECT
TEN MILE RIVER FISHWAYS
EAST PROVIDENCE, RI

BORING NO. B-3
SHEET 5 of 7
FILE NO.
CHKD. BY

Boring Co. GEOTEK ENGINEERING
Driller
Logged By
Boring Location northing easting
Mudline El. Datum NGVD
Date Start Date End

Sampler:
Drill Rig:
Drilling Method:

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

Depth	Casing Blows (in)	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	SLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	Remarks
41									
42									
43		S-7	24/7	43'-45'	4-8-17-30		moist, medium stiff, olive gray, clayey SILT, high plasticity, trace fine sand		
44									
45									
46							STRATA CHANGE ≈ 46'	SILT	
47								SANDS + GRAVEL	
48		S-8	24/9	48'-50'	25-22-18-15		wet, medium dense, olive gray, fine to coarse SAND, some fine to coarse gravel		
49									
50									

0 to 4 - Very Loose
5 to 10 - Loose
11 to 30 - Medium Dense
31 to 50 - Dense
Over 50 - Very Dense

0 to 2 - Very Soft
3 to 4 - Soft
5 to 8 - Medium Stiff
9 to 15 - Stiff
16 to 30 - Very Stiff
Over 30 - Hard

1. S denotes split-barrel sampler.
2. U denotes 3-inch O.D. Undisturbed sample.
3. UO denotes 3-inch Osterberg undisturbed sample.
4. PEN denotes penetration length of sampler.
5. REC denotes recovered length of sample.
6. SPT denotes Standard Penetration Test

7. PID denotes Photoionization Detector
8. PPM denotes parts per million.
9. PP denotes Pocket Penetrometer.
10. FVST denotes field vane shear test.
11. RQD denotes Rock Quality Designation.
12. R denotes core run number.

REMARKS:
1)
2)
3)
4)

Engineering Log Template

US Army Corps of Engineers
New England District

PROJECT
TEN MILE RIVER FISHWAYS
EAST PROVIDENCE, RI

BORING NO. B-3
SHEET 6 of 7
FILE NO.
CHKD. BY

Boring Co. GEOTEK ENGINEERING
Driller
Logged By

Boring Location northing easting
Mudline El. Datum NGVD
Date Start Date End

Sampler:
Drill Rig:
Drilling Method:

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (#)	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS
51									
52							52'-53' GRAVEL SEAM 52'		
53							53'		
		S-9	24/12	53'-55'	30-17-22-25		wet, light gray, SILT, trace fine sand, clay moderate plasticity		
54									
55									
56									
57									
58		S-10	24/14	58'-60'	8-11-14-17		wet, olive gray, SILT, little clay, trace fine sand, moderate plasticity		
59									
60									

0 to 4 - Very Loose
5 to 10 - Loose
11 to 30 - Medium Dense
31 to 50 - Dense
Over 50 - Very Dense

0 to 2 - Very Soft
3 to 4 - Soft
5 to 8 - Medium Stiff
9 to 15 - Stiff
16 to 30 - Very Stiff
Over 30 - Hard

1. S denotes split-barrel sampler.
2. U denotes 3-inch O.D. Undisturbed sample.
3. UO denotes 3-inch Osterberg undisturbed sample.
4. PEN denotes penetration length of sampler.
5. REC denotes recovered length of sample.
6. SPT denotes Standard Penetration Test

7. PID denotes Photoionization Detector
8. PPM denotes parts per million.
9. PP denotes Pocket Penetrometer.
10. FVST denotes field vane shear test.
11. RQD denotes Rock Quality Designation.
12. R denotes core run number.

REMARKS:
1)
2)
3)
4)

Engineering Log Template

US Army Corps of Engineers
New England District

PROJECT
TEN MILE RIVER FISHWAYS
EAST PROVIDENCE, RI

BORING NO. B-3
SHEET 7 of 7
FILE NO.
CHKD. BY

Boring Co. GEOTEK ENGINEERING
Driller
Logged By
Sampler:
Drill Rig:
Drilling Method:

Boring Location northing easting
Mudline El. Datum NGVD
Date Start 8-15-02 Date End 8-16-02

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (#)	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS
61									
62									
63		S-11	24/14	63'-65'	14-14-22-28		wet, olive gray, coarse SAND, trace fine gravel, silt		
64									
65									
66									
67									
68		S-12	24/10	68'-70'	15-17-28-24		wet, olive gray, fine GRAVEL, trace silt		
69									
70							BOTTOM OF BORING 70'		

0 to 4 - Very Loose
5 to 10 - Loose
11 to 30 - Medium Dense
31 to 50 - Dense
Over 50 - Very Dense

0 to 2 - Very Soft
3 to 4 - Soft
5 to 8 - Medium Stiff
9 to 15 - Stiff
16 to 30 - Very Stiff
Over 30 - Hard

1. S denotes split-barrel sampler.
2. U denotes 3-inch O.D. Undisturbed sample.
3. UO denotes 3-inch Osterberg undisturbed sample.
4. PEN denotes penetration length of sampler.
5. REC denotes recovered length of sample.
6. SPT denotes Standard Penetration Test
7. PID denotes Photoionization Detector
8. PPM denotes parts per million.
9. PP denotes Pocket Penetrometer.
10. FVST denotes field vane shear test.
11. RQD denotes Rock Quality Designation.
12. R denotes core run number.

REMARKS:
1)
2)
3)
4)

Engineering Log Template

US Army Corps of Engineers
New England District

PROJECT
TEN MILE RIVER - FISHWAYS
EAST PROVIDENCE, RI

BORING NO. P-3
SHEET 1 of 4
FILE NO.
CHKD. BY

Boring Co. GEOTEK ENGINEERING
Driller BARRY WORDELL
Logged By DAVID TEOSTE

Boring Location northing easting
~~Mudline El.~~ EST. GROUND EL 17.8' Datum NGVD
Date Start 8-22-02 Date End 8-22-02

Sampler
Drill Rig: SIMCO 9100
Drilling Method: PROBE WITH ROLLERBIT

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows/Ft	SAMPLE INFORMATION: Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS
1									
2									
3									
4							SANDS + GRAVEL		
5									
6									
7									
8									
9									
10									

0 to 4 - Very Loose
5 to 10 - Loose
11 to 30 - Medium Dense
31 to 50 - Dense
Over 50 - Very Dense

0 to 2 - Very Soft
3 to 4 - Soft
5 to 8 - Medium Stiff
9 to 18 - Stiff
19 to 30 - Very Stiff
Over 30 - Hard

1. S denotes split-barrel sampler.
2. U denotes 3-inch O.D. Undisturbed sample.
3. UO denotes 3-inch Osterberg undisturbed sample.
4. PEN denotes penetration length of sampler.
5. REC denotes recovered length of sample.
6. SPT denotes Standard Penetration Test
7. PID denotes Photoionization Detector
8. PPM denotes parts per million.
9. PP denotes Pocket Penetrometer.
10. FVST denotes field vane shear test.
11. RQD denotes Rock Quality Designation.
12. R denotes core run number.

REMARKS:
1)
2)
3)
4)

Engineering Log Template

US Army Corps of Engineers
New England District

PROJECT
TEN MILE RIVER - FISHWAYS
EAST PROVIDENCE, RI

BORING NO. P-3
SHEET 2 of 4
FILE NO.
CHKD. BY

Boring Co. GEOTEK ENGINEERING
Driller
Logged By

Boring Location northing easting
Mudline El. Datum NGVD
Date Start Date End

Sampler:
Drill Rig:
Drilling Method:

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS
11							SANDS		
12									
13									
14									
15									
16									
17									
18									
19									
20									

0 to 4 - Very Loose 5 to 10 - Loose 11 to 30 - Medium Dense 31 to 50 - Dense Over 50 - Very Dense	0 to 2 - Very Soft 3 to 4 - Soft 5 to 8 - Medium Stiff 9 to 15 - Stiff 16 to 30 - Very Stiff Over 30 - Hard	1. S denotes split-barrel sampler. 2. U denotes 3-inch O.D. Undisturbed sample. 3. UO denotes 3-inch Osterberg undisturbed sample. 4. PEN denotes penetration length of sampler. 5. REC denotes recovered length of sample. 6. SPT denotes Standard Penetration Test	7. PID denotes Photoionization Detector 8. PPM denotes parts per million. 9. PP denotes Pocket Penetrometer. 10. FVST denotes field vane shear test. 11. RQD denotes Rock Quality Designation. 12. R denotes core run number.

REMARKS:
1)
2)
3)
4)

Engineering Log Template

US Army Corps of Engineers
New England District

PROJECT
TEN MILE RIVER - FISHWAYS
EAST PROVIDENCE, RI

BORING NO. P-3
SHEET 3 of 4
FILE NO.
CHKD. BY

Boring Co. GEOTEK ENGINEERING
Driller BARRY WORDELL
Logged By DAVID TEOSTE

Boring Location northing easting
Mudline El. Datum NGVD
Date Start Date End

Sampler:
Drill Rig:
Drilling Method:

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (#)	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS
21							SANDS		
22									
23									
24									
25									
26									
27									
28									
29									
30									

0 to 4 - Very Loose 5 to 10 - Loose 11 to 30 - Medium Dense 31 to 50 - Dense Over 50 - Very Dense	0 to 2 - Very Soft 3 to 4 - Soft 5 to 8 - Medium Stiff 9 to 15 - Stiff 16 to 30 - Very Stiff Over 30 - Hard	1. S denotes split-barrel sampler. 2. U denotes 3-inch O.D. Undisturbed sample. 3. UO denotes 3-inch Osterberg undisturbed sample. 4. PEN denotes penetration length of sampler. 5. REC denotes recovered length of sample. 6. SPT denotes Standard Penetration Test	7. PID denotes Photoionization Detector 8. PPM denotes parts per million. 9. PP denotes Pocket Penetrometer. 10. FVST denotes field vane shear test. 11. RQD denotes Rock Quality Designation. 12. R denotes core run number.

REMARKS:
1)
2)
3)
4)

Engineering Log Template

US Army Corps of Engineers
New England District

PROJECT
TEN MILE RIVER - FISHWAYS
EAST PROVIDENCE, RI

BORING NO. P-3
SHEET 4 of 4
FILE NO.
CHKD. BY

Boring Co. GEOTEK
Driller
Logged By

Boring Location northing easting
Mudline El. Datum NGVD
Date Start Date End

Sampler:
Drill Rig:
Drilling Method:

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (#)	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
							SANDS 31'		
31							COBBLES + COARSE GRAVEL 32'		
32									
33							SILT + FINE SAND		
34									
35									
36									
37									
38									
39							NO REFUSAL ENCOUNTERED DURING COMPLETION OF BORING		
40							BOTTOM OF BORING 40'		

0 to 4 - Very Loose 5 to 10 - Loose 11 to 30 - Medium Dense 31 to 50 - Dense Over 50 - Very Dense	0 to 2 - Very Soft 3 to 4 - Soft 5 to 8 - Medium Stiff 9 to 15 - Stiff 16 to 30 - Very Stiff Over 30 - Hard	1. S denotes split-barrel sampler. 2. U denotes 3-inch O.D. Undisturbed sample. 3. UO denotes 3-inch Osterberg undisturbed sample. 4. PEN denotes penetration length of sampler. 5. REC denotes recovered length of sample. 6. SPT denotes Standard Penetration Test	7. PID denotes Photoionization Detector 8. PPM denotes parts per million. 9. PP denotes Pocket Penetrometer. 10. FVST denotes field vane shear test. 11. RQD denotes Rock Quality Designation. 12. R denotes core run number.

REMARKS:
1)
2)
3)
4)

Engineering Log Template