SECTION 1

Hopkinton Dam, Wall Foundation Investigation
Hopkinton Dam, Hopkinton, New Hampshire

Contract No. DACW 33-87-D-0007
Delivery Order No. 0004

Contracting Officer:

Stanley J. Murphy, Lt. Colonel, CE,
Deputy Division Engineer

PREPARED FOR: U. S. Army Corps of Engineers
New England Division
424 Trapelo Road
Waltham, MA 02254-9149

PREPARED BY: Atlantic Testing Laboratories, Limited
P. O. Box 29
Canton, New York 13617

ATL Report No. CD029-1-4-88

7 April 88

SECTION 2

TABLE OF CONTENTS

SECTION 2

TABLE OF CONTENTS

SECTION 1	Title Page
SECTION 2	Table of Contents
SECTION 3	Scope of Investigation a. Delivery Order b. Project Site c. Purpose d. Scope of Work
SECTION 4	Quality Control a. General Certification Statement b. Records Taken c. Equipment Used d. Procedures
SECTION 5	Summary of Activities and Telephone Table I - Daily Activity Log Table II - Telephone Log
SECTION 6	Chain of Custody Log
SECTION 7	Safety Reports
SECTION 8	Field Inspector's Logs a. Figure 1 - General Project Map b. Figure 2 - Site Location Map c. Boring Logs

SECTION 3 - SCOPE OF INVESTIGATION

a. Delivery Order No. 0004

HECKED BOX APPLIES

☐ ORDER FOR SUPPLIES OR SERVICES

☐ REQUEST FOR QUOTATIONS NO.

RETURN COPY(IES) OF THIS QUOTE BY

(THIS IS NOT AN ORDER. See DD Form 1155r)

5. CERTIFIED FOR NATIONAL DEFENSE UNDER DMS REG 1 DO

1. CONTRACT/PURCH ORDER NO.	2. DELIVERY ORDER NO.	3. DATE OF ORDER	4. REQUISITION/PURCH REQUEST NO.
DACW33-87-D-0007	0004	88 FEB 08	GEB 88-11

6. ISSUED BY: Dept. of the Army CODE
New England Division, Corps of Engineers
424 Trapelo Road
Waltham, MA 02254-9149
Buyer/Symbol: Apidianakis/CENED-CT-C Phone: 617-647-8207

7. ADMINISTERED BY: *(If other than 6)* CODE

8. DELIVERY FOB
☒ DEST
☐ OTHER
(See Schedule if other)

CONTRACTOR/QUOTER CODE FACILITY CODE

NAME AND ADDRESS
Atlantic Testing Laboratories, Limited
P.O. Box 29
Canton, New York 13617

10. DELIVER TO FOB POINT BY: In accordance with Paragraph 6 of the Scope of Work

11. CHECK IF BUSINESS IS
☒ SMALL
☐ SMALL DISADVANTAGED
☐ WOMEN-OWNED

12. DISCOUNT TERMS NET

13. MAIL INVOICES TO: Finance & Accounting Officer at issuing office

~~SHIP TO~~ Services for: CODE
U.S. Army Engineer Division, New England
ATTN: Geotechnical Engineering Branch
424 Trapelo Road
Waltham, Massachusetts 02254-9149

15. PAYMENT WILL BE MADE BY: CODE
Finance and Accounting Officer
U.S. Army Engineer Division, N.E.
424 Trapelo Road
Waltham, Massachusetts 02254-9149

MARK ALL PACKAGES AND PAPERS WITH CONTRACT OR ORDER NUMBER

16. ~~ITEMS~~

DELIVERY	X	This delivery order is subject to instructions contained on this side of form only and is issued ~~on another Government agency or~~ in accordance with and subject to terms and conditions of above numbered contract.
PURCHASE		Reference your ~~XXXXXXXXXXXXXXXX~~ furnish the following on terms specified herein, including, for U.S. purchases. General Provisions of Purchase Order on DD Form 1155r *(EXCEPT CLAUSE NO. 12 APPLIES ONLY IF THIS BOX* ☐ *IS CHECKED, AND NO. 14 IF THIS BOX* ☐ *IS CHECKED);* special provisions ; and delivery as indicated. This purchase is negotiated under authority of USC 2304(a)(3) or as specified in the schedule if within U.S., its possessions or Puerto Rico; if otherwise under 2304(a)(6).

☐ *If checked, Additional General Provisions apply; Supplier shall sign "Acceptance" on DD Form 1155r and return* copies.

17. ACCOUNTING AND APPROPRIATION DATA/LOCAL USE
6X3123
C113344DA0C000 (MD) $30,141.30

RECEIVED 2/5/88 Budget Branch GEB STATUS AE/PS

18. ~~ITEM~~ ITEM NO.	19. SCHEDULE OF SUPPLIES/SERVICES	20. QUANTITY ORDERED/ ACCEPTED *	21. UNIT	22. UNIT PRICE	23. AMOUNT
	Furnish the necessary personnel and equipment to perform eight exploratory borings at Hopkinton Dam, New Hampshire, in accordance with Attachment No. 1.	APPROX.			ESTIMATED
1.1	Geologist	120	HR	$42.00	$5,040.00
1.3	Per Diem - overnight stay	15	DAY	50.00	750.00
1.4	Mileage from Waltham, MA and return	360	MI	.35	126.00
2.1	Geotechnical Report	1	JOB	55% of Line Item 1.1	2,772.00 ESTIMATED

* *If quantity accepted by the Government is same as quantity ordered, indicate by ✓ mark. If different, enter actual quantity accepted below quantity ordered and encircle.*

24. UNITED STATES OF AMERICA
BY: STANLEY J. MURPHY, Lt. Col, CE, Deputy Division Engineer
CONTRACTING/ORDERING OFFICER

25. TOTAL $30,141.30

29. DIFFERENCES

6. QUANTITY IN COLUMN 20 HAS BEEN:
☐ INSPECTED ☐ RECEIVED ☐ ACCEPTED, AND CONFORMS TO THE CONTRACT EXCEPT AS NOTED

27. SHIP. NO.
☐ PARTIAL
☐ FINAL

28. D.O. VOUCHER NO.

30. INITIALS

32. PAID BY

33. AMOUNT VERIFIED CORRECT FOR

DATE SIGNATURE OF AUTHORIZED GOVERNMENT REPRESENTATIVE

31. PAYMENT
☐ COMPLETE
☐ PARTIAL
☐ FINAL

34. CHECK NUMBER

36. I certify this account is correct and proper for payment.

DATE SIGNATURE AND TITLE OF CERTIFYING OFFICER

35. BILL OF LADING NO.

37. RECEIVED AT	38. RECEIVED BY	39. DATE RECEIVED	40. TOTAL CONTAINERS	41. S/R ACCOUNT NUMBER	42. S/R VOUCHER NO.

CONTINUATION SHEET	REFERENCE NO. OF DOCUMENT BEING CONTINUED Delivery Order No. 0004 to DACW33-87-D-0007	PAGE 2	OF 2 PAGES

NAME OF OFFEROR OR CONTRACTOR

ATLANTIC TESTING LABORATORIES, LIMITED

ITEM NO.	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
6.1	Mobilization & Demobilization	APPROX. 1	JOB	$1,100.00	ESTIMATED $1,100.00
6.3	Mileage, Manchester, NH and return	42	MI	1.15	48.30
6.5	Standby time	32	HR	80.00	2,560.00
0.7	Mobilization & Demobilization, 320 sq. ft. float	1	JOB	1,200.00	1,200.00
0.6	320 Sq. ft. float	1	JOB	950.00	950.00
14.1	0-50 ft. depth	183	FT	25.00	4,575.00
6.2	3-inch diam. X 30 inch tube	16	EA	110.00	1,760.00
7.2	HX and 6 inch size	10	LF	30.00	300.00
18.2	HX and 6 inch size	120	FT	30.00	3,600.00
2.3	NWX size	24	FT	55.00	1,320.00
22.4	4 X 5 1/2 size	8	FT	75.00	600.00
1.1	Light Lumber for Shoring	1	MBF	800.00	800.00
3.1	Crane and Operator	24	HR	110.00	2,640.00

ATTACHMENT NO. 1

GEB REQUISITION 88-11- DACW 33-87-D-0007

DELIVERY ORDER NO. 0004

INSPECTION AND EXPLORATION INSTRUCTIONS

PROJECT: Hopkinton Dam, Wall Foundation Investigation

SITE: Hopkinton Dam, Hopkinton, NH

PURPOSE: Determine cause of wall movement

1. SCOPE OF INVESTIGATIONS

a. Eight borings shall be completed in and to the left side of the dike which separates the forebay pool from the outlet channel immediately downstream of Hopkinton Dam. Six of the borings shall be in the locations shown (Attachment 2). Three are on the dike and three are on water in the channel. The locations of the remaining two borings (FD-G and FD-H) to be done for undisturbed sampling shall be determined by the Government after the review of information gathered from the preceding holes. Profiles, sections, and details of the wall are provided separately.

b. Borings FD-A thru FD-F shall be cased with NX casing down to the base slab of the concrete wall. FD-G and FD-H shall also be cased except with 6 inch casing. All borings shall be advanced to the concrete foundation slab with sampling every 5 feet using a 2 3/8-inch ID x 2.5 ft split spoon sampler.

c. All exploration holes shall be drilled through the steel reinforced wall base slab (Shown in Attachments 2 and 3). Holes FD-A through FD-F shall be drilled through the slab using an NWX size diamond core barrel while holes FD-G and FD-H shall be advanced using a 4 x 5 1/2-inch core barrel.

d. All exploration holes shall be completed to elevation 330.0 ft. NGVD (average of 20 feet below the wall foundation slab). FD-A through FD-F shall be completed using continuous sampling with a 2 3/8 diameter split spoon and a 140 lb. hammer in accordance with the drilling procedures contained in Attachment No. 5. FD-G and FD-H shall be completed using continuous undisturbed sampling by means of a 3-inch fixed-piston sampler. If the ground is too resistant to the above prescribed sampling methods, other samplers may be used at the Government's discretion (ie. Dennison sampler, core barrel, etc...) to achieve a final elevation of 330 ft. NGVD. All holes through the base slab shall be grouted.

e. A geotechnical inspector shall act as field inspector while performing the borings. The inspector shall provide telephone reports to Mr. Mark Vance, Corps of Engineers, at tel. 617-647-8178 at least once every working day and upon completion of each boring. The alternate point of contact is Mr. John Hart at tel. 617-647-8389.

f. Boring elevations shall be determined by the inspector with reference to the top of the concrete wall (elevation 385.0) separating the forebay pool from the outlet channel.

g. All samples shall be delivered by the Contractor to the Corps of Engineers Headquarters in Waltham, MA by the field inspector. Sample delivery shall be coordinated with the Director, NED Materials and Water Quality Laboratory at tel. 617-647-8367/8392.

2. SITE CONDITIONS.

All holes are located in and to the left of a dike, separating the forebay pool from the outlet channel at the downstream toe of Hopkinton Dam. Borings are in the channel and on the dike. Depth of water varies from 0 to 12 feet. Access is limited so that special measures will have to be taken to deploy the drill rig to the drilling site. These measures may include a crane to lift the drill rig and floats, placing gravel fills and or constructing special drilling platforms. Soils information is shown in Attachment 4.

3. COORDINATION.

The Contractor shall contact Mr. Mark Vance, Corps of Engineers at tel. 617-647-8178 one week prior to the start of work. The field inspector shall give a daily telephone report on the progress of the work to Mr. Vance. The Contractor shall also coordinate with Mr. Dave Shepardson, Project Manager at Hopkinton Dam, tel. 802-886-7775.

4. EXPLORATION DESIGNATIONS.

Borings FD-A through FD-H shall be redesignated FD-88-1 through FD-88-8 in order of their completion.

5. GOVERNMENT REVIEW.

The Government will review the draft submittal as well as the completed work. Subsequent to such review, the Contractor shall accomplish any corrections which may be directed as the result of the Government review.

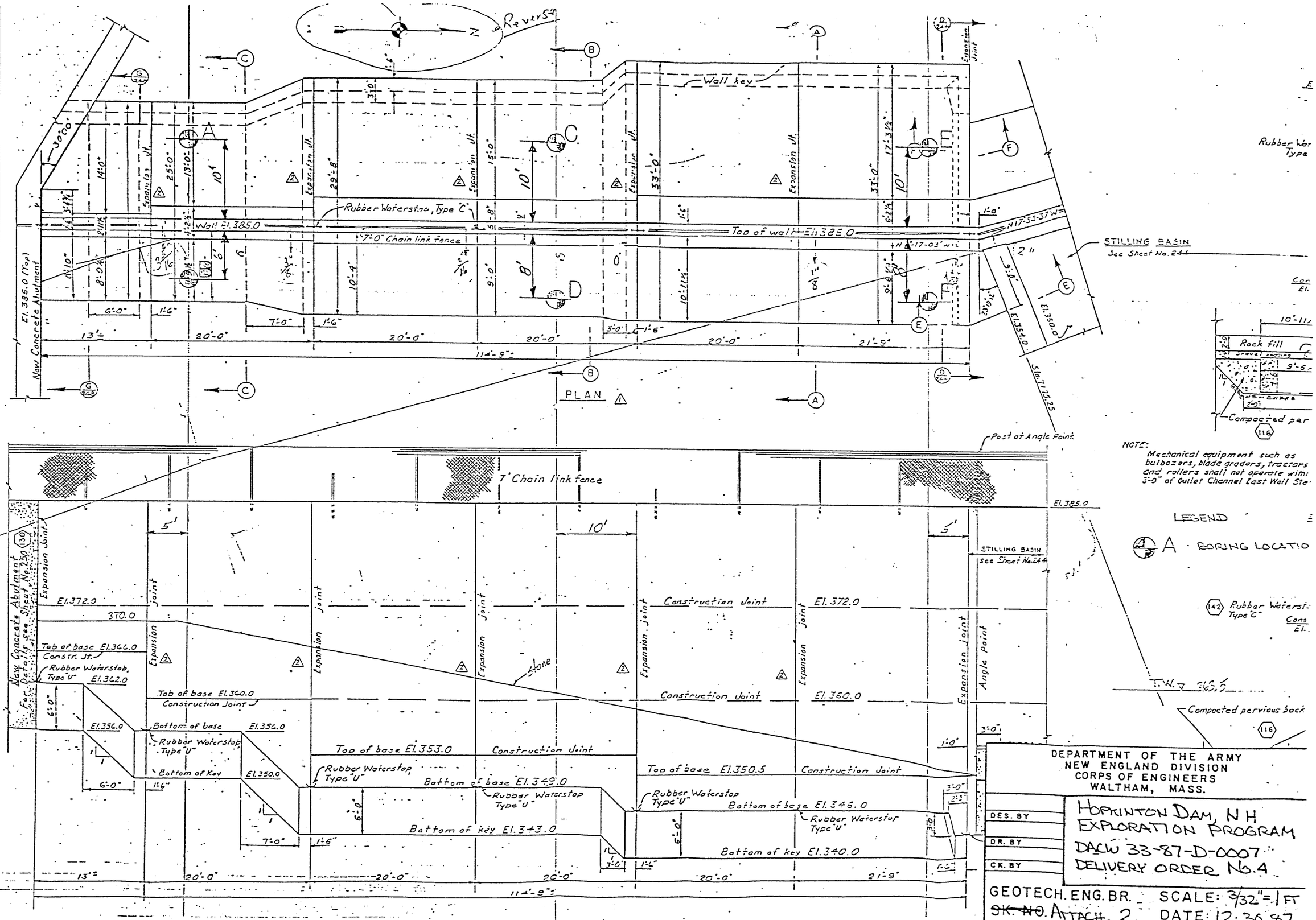
6. COMPLETION SCHEDULE.

Services under this delivery order shall start on or before 25 January 1988. Duration of the field work is estimated to be 15 days. The geotechnical report shall be submitted in draft format for review (by the Government), postmarked no later than seven calendar days after the completion of field work. Government review will take approximately ten calendar days from the receipt of the draft report. The final geotechnical report shall be submitted postmarked no later than seven calendar days after the receipt of the draft report with Government comments.

7. QUALITY CONTROL.

You will be held responsible for the quality of the maps submitted and for all damages caused the Government as a result of your negligence in the performance of any services furnished under the contract.

Although submissions required by your contract are technically reviewed by Government, it is emphasized that your work must be prosecuted using proper internal controls and review procedures. The letter of transmittal for each submission which you you make shall include a certification that the submission has been subjected to your own review and coordination procedures to insure (a) completeness for each discipline commensurate with the level of effort required for that submission, (b) elimination of conflicts, errors and omissions, and (c) the overall professional and technical accuracy of the submission. Documents which are significantly deficient in any of these areas will be returned to you for correction and/or upgrading prior to our completing our review. Contract submission dates will not be extended if a resubmission or draft material is required for this reason.



NOTE:
Mechanical equipment such as bulbozers, blade graders, tractors and rollers shall not operate within 3'-0" of Outlet Channel East Wall Ste

LEGEND

A · BORING LOCATIO

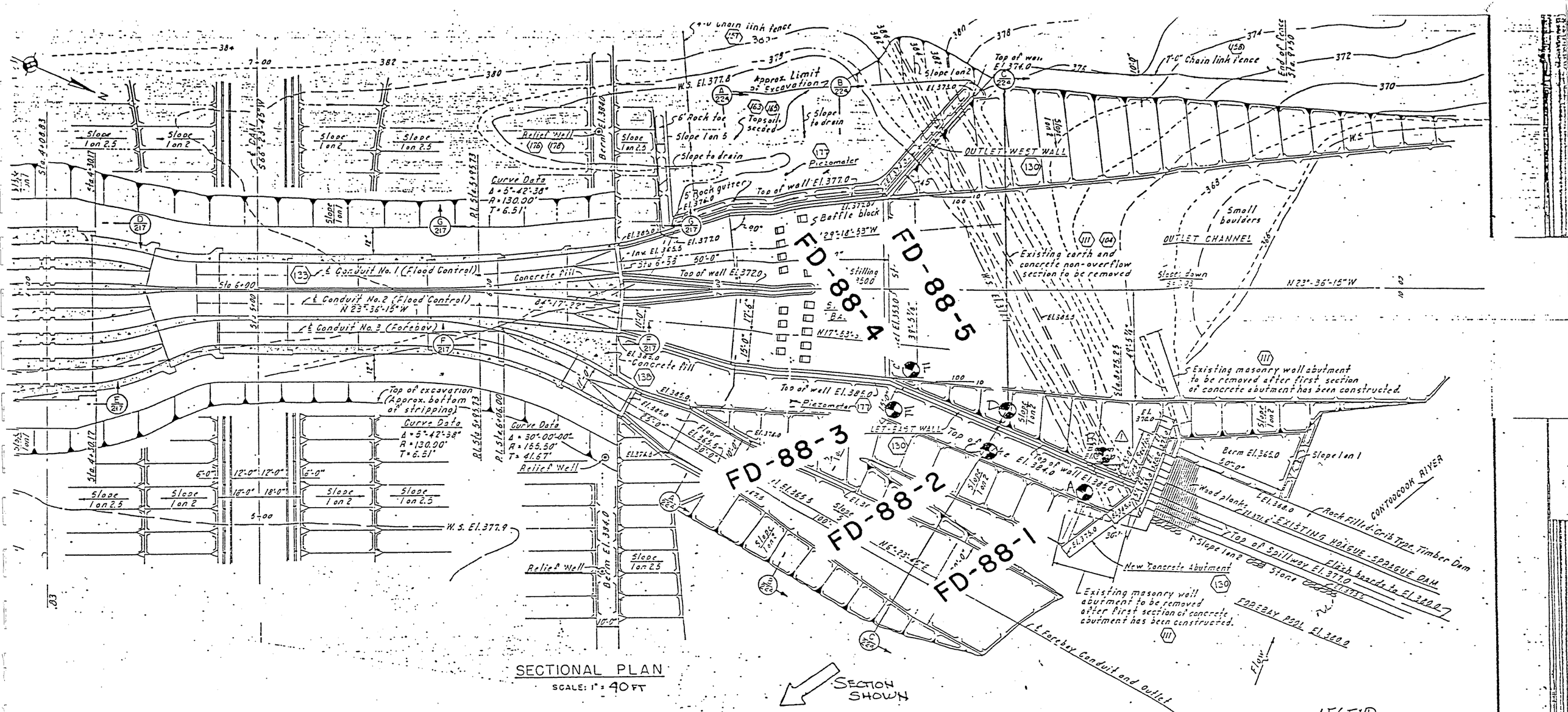
142 Rubber Waterst Type "C"

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY
DR. BY
CK. BY

HOPKINTON DAM, NH
EXPLORATION PROGRAM
DACW 33-87-D-0007
DELIVERY ORDER No. 4

GEOTECH. ENG. BR. SCALE: 3/32" = 1 FT
~~SK. NO.~~ ATTACH. 2 DATE: 12.30.87



LEGEND

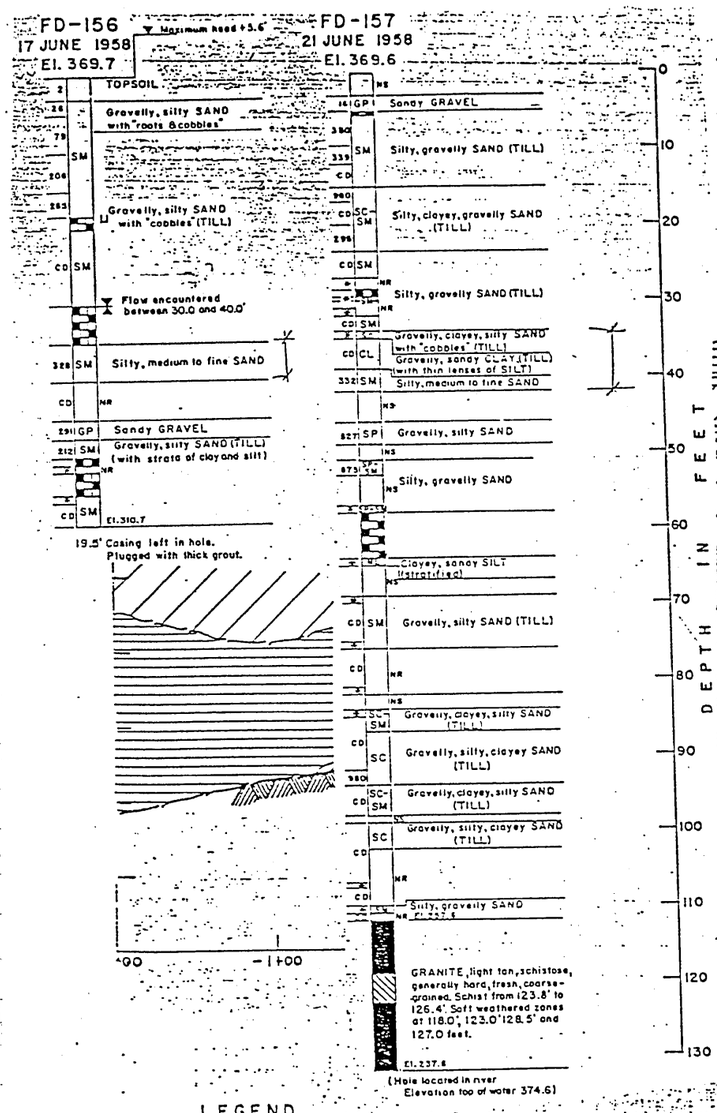
A Boring Location

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	HOPKINTON DAM, NH
	EXPLORATION PROGRAM
DR. BY	DACW 33-87-D-0007
CK. BY	DELIVERY ORDER No 4

GEOTECH. ENG. BR. SCALE: As Shown

~~SK. NO~~. ATTACH. 3 DATE: 12·30·87



GEOLOGIC SECTION 4-4, ALONG ℄ OF CONDUIT

(LOOKING WEST)

LEGEND

- *TILL, a heterogeneous mixture of variable gravelly, silty to clayey SAND with cobbles and boulders.*
- *Variable gravelly, silty and clayey SAND (TILL) with numerous thin laminae of sand, silt and clay.*
- *Laminated SILT and CLAY*
- *Variable SAND and GRAVEL, ranging from silty SAND to sandy GRAVEL*

NOTES

This drawing is presented for general information and is to be considered only as a supplement to the records of exploration in other contract drawings. Geologic sections shown hereon are the Government interpretation of subsurface conditions believed to exist at and between borings. Variations between elevations, composition and structure of the individual formations as represented hereon and as actually encountered in the progress of the work are to be anticipated.

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	HOPKINTON DAM, NH
DR. BY	EXPLORATION PROGRAM
CK. BY	DACW 33-87-D-0007
	DELIVERY ORDER No. 4

GEOTECH. ENG. BR. SCALE: As Shown

~~SK. NO.~~ ATTACH. 4 DATE: 12-30-87

STANDARD PENETRATION TEST

Project _____ Page ____ of ____

Hole No. _____ Date _____

Depth of Test _____ to _____

Blow	Gage Reading	Penetration per Blow
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Depth of Test _____ to _____

Blow	Gage Reading	Penetration per Blow
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

MRO Form 1713, 1 Dec 78 (Temp)

ATTACH. 6

ATTACHMENT NO. 5

CONTINUOUS SAMPLING

1. SCOPE. Apparatus and procedures shall be in conformance with ASTM D-1586-67, STANDARD METHOD FOR PENETRATION TESTS AND SPLIT-BARREL SAMPLING SOILS, except as modified and/or amplified hereinafter.

2. Use a rope and drum system, with two turns of the rope around the drum, to lift the falling weight. The rope shall be replaced before it becomes worn or polished.

3. The type of rods used shall be recorded on the boring log and the length of rods shall be recorded for each drive.

4. A 2-3/8-inch x 2.5 ft. split spoon sampler shall be used.

5. The hole shall be continuously sampled.

6. The hole shall be cleaned out to the top of the next drive with any overwash noted. The split-spoon shall be driven no more than 24-inches, including slough, if any. The cumulative penetration resistance per blow, measured to the nearest .025-ft shall be measured and recorded with the aid of a graduated measuring rule securely attached to the casing or fixed reference. If the penetration per blow is less than 0.1-ft, the measurement shall be made after every other blow, or less frequently, so long as at least one measurement is recorded for each 0.1-ft of penetration. For each measurement, record the cumulative number of blows and the cumulative penetration on the form provided in Attachment No. 6. Depth of the beginning and end of drive shall be measured and recorded for each test. The amount of slough shall be recorded on the forms for the Standard Penetration Tests. If the amount of slough exceeds 0.25-ft, the sampler shall be pulled from the hole and the hole cleaned out before proceeding with the test.

7. Refusal is defined as 100 blows with no penetration of the sampler. The material giving the refusal shall then be sampled with a 2 1/2-inch by 5-ft solid spoon using a 300 pound hammer until refusal is reached. The material shall then be sampled by using a core barrel.

8. Two disturbed jar samples shall be taken from each split spoon sample.

9. Casing shall be used only above the wall base slab.

10. Drilling mud shall be used to support the hole and prevent heave of the bottom of the hole. The mud column must be above the water table at all times. The weight and viscosity of the drilling fluid shall be controlled so that the cuttings would be effectively removed from the hole. The actual weight and viscosity shall be varied as necessary. Cuttings shall be cleaned from the hole by stopping rotation at the required depth and maintaining circulation until the final cuttings are removed. The hole shall be cleaned out to the bottom of every sample drive with a fishtail bit fitted with upward deflectors of the circulation ports. To prevent disturbances of the material being tested, slow withdrawal rates of about 0.5-ft per second shall be used near the bottom of the hole when removing tools after cleanout.

b. Project Site

The investigation took place on the left side of a dike that separates the fore bay pool from the outlet channel immediately downstream of Hopkinton Dam, Hopkinton, New Hampshire.

A General Project Map and a Site Location Plan are included in Section 8. A general plan of this site was provided to us in the Delivery Order, and is included in Section 3a.

c. Purpose

The purpose of the exploration was to core through a concrete footing to obtain soil samples. The soil samples were to be used in a study to determine the cause of movement of the outlet East wall. Piezometers were installed to monitor hydrostatic pressures.

d. Scope of Work

Inspection and exploration instructions, which were provided by the Army Corps of Engineers, New England Division, in Delivery Order No. 0004, are included in Section 3a. General inspection, exploration, and piezometer installation instructions were provided by the Army Corps of Engineers, New England Division, through the contracted Geotechnical Exploratory Work Various Locations in New England. Specific instructions and changes during the course of the work were given verbally during on-site and telephone conversations with a USACE representative. All new instructions and changes can be found listed in Table II, Section 5 (Telephone Log).

Drilling, sampling and piezometer installation was performed by Atlantic Testing Laboratories' personnel using Atlantic Testing Laboratories' equipment. The test borings were advanced and sampled as indicated on Attachment No. 1 of the Delivery Order (Section 3a) and as outlined in the contract specifications and ammended in the conversations outlined in Table II, Section 5. Overburden sampling was performed using a 140 lb hammer driving a 2 ft split spoon sampler (1-3/8" I.D.) and a 300 lb hammer driving a 2 ft split spoon sampler (2-3/8" I.D.).

SECTION 4 - QUALITY CONTROL

a. General Certification Statement

I hereby certify that the records, equipment and procedures mentioned herein were used to perform the subsurface exploration described herein. I also certify that the work was performed in a professional manner and meets the requirements set forth in the delivery order. This report has been subject to my review and is both complete and technically accurate.

CERTIFIED APRIL 7, 1988

Spencer F. Thew, P.E./L.S.

b. Records Taken

Pertinent drilling procedures, sampling operations, and soil classifications were noted on the following forms provided for use by the Corps of Engineers:

NED 121 - Field Log of Test Boring, Summary
NED 58 and 58a - Field Log of Test Boring
NED 59 - Subsurface Water Observations and Boring Location Sketch
MRO 1713, Dec. 78 (Temp) - Standard Penetration Test

Information outlining the installed piezometer characteristics were noted on the Piezometer Installation Report and the Piezometer Installation Detail. A completed series of logs for each of the borings is included in Section 8. The Project Maps are included in Section 8.

Samples were delivered to the USACE NED Materials and Water Quality Laboratory on April 4, 1988.

A Summary of Daily Activities and Telephone Logs are Tables I and II, respectively of Section 5. A chain of custody log is included in Section 6. The Safety Meeting Reports, NED Form 251, including exposure time for Atlantic Testing Laboratories', USACE, and subcontract personnel, is included in Section 7.

c. Equipment Used

All equipment and supplies were provided by Atlantic Testing Laboratories, Limited, with the exception of that provided by subcontractors. A listing of pertinent equipment follows:

1. Drilling Equipment

- CME 45 skid drill rig
- CME 850 ATV drill rig
- Water truck
- 4-5/8" O.D. by 5 ft diamond bit core barrel
- 2.98" O.D. by 5 ft diamond bit core barrel
- NW casing with drive and spin shoes
- HW casing with drive and spin shoes
- drill rod, NX taper threaded in 2 ft, 5 ft, and 10 ft lengths used for sampling and turning 3-7/8" and 2-15/16" roller bits
- split spoon samplers, 1-3/8" I.D. and 2-3/8" I.D. by 2 ft in length

Piezometer supplies

- Casagrande piezometer 1" I.D. by 2 ft in length
- threaded 3/4" I.D. schedule 80 PVC riser pipe in 2 ft, 5 ft and 10 ft lengths
- filter sand Ottowa sand in 100 lbs bags
- Bentonite well seal, 3/8" diameter Peltonite Pellets
- backfill material was random fill, all purpose sand
- cement, used to grout around the outside of casing

Piezometer Test Equipment

- 200 ft electronic water level indicator (Roctest Model CPR4)
- standard watch with stopwatch function

Subcontracted Equipment

- Crane with operator

d. Procedures

1. Sampling and Drilling Procedures

Five (5) borings were performed at Hopkinton Dam, Dam, however, the Delivery Order had referenced six (6) borings to be performed as shown on attachment 2, section 3a. The reduction in the number of boring was requested by a U.S.A.C.E. representative. Piezometers were installed in three (3) of the borings. The field exploration included drilling, concrete coring and soil sampling followed by piezometer installation and testing.

Soil sampling techniques, as described in the Contract, Delivery Order, and as modified during the work period, involved retrieving material using the Standard Penetration Test. A 1-3/8" I.D. by 2 ft long or a 2-3/8" I.D. by 2 ft long spoon was driven the length of the spoon or until refusal was encountered. The blow counts were recorded for each 0.5 ft of advancement above the concrete slab. Below the concrete slab the number of blows per 0.1 ft penetration was recorded. Samples were classified in the field in accordance with ASTM D-2488 and the Burmister System. Representative samples were taken from each soil sampling run and placed in 32 oz. jar with hermetically sealed lids. Rock core was placed in 5 ft long core boxes as specified in the Contract. A Chain of Custody Log was maintained to document custody of samples between ATL and the USACE.

The CME 850 and CME 45 drill rigs were both equipped to handle several different methods of drilling. Different techniques for advancing each hole, in conjunction with sampling, were employed to best suit the situation. These systems are generally described as follows:

- "P" or NX size diamond coring washed with water was used to penetrate riprap, NX size diamond coring was used to core the concrete footing for the retaining wall
- HW or NW spin casing was used to advance the hole above the concrete footing
- 2-15/16" O.D. roller bit using either water or "Clear Mud" as a drilling fluid was used to advance the hole below the concrete footing

2. Well Installation Procedures

After boring had been advanced to the required depth, the Clear Mud, if used was deactivated using Clorox. Either tamped sand or bentonite pellets were placed in the bottom of the hole to the specific depth. The 2 ft long porous plastic piezometer and 3/4" PVC riser pipe were connected and lowered to the determined depth as specified by the USACE. Ottawa sand was added, followed by a bentonite seal (3/8" Peltonite pellets), at the specified depth. The remainder of the open hole was filled with either random fill or all purpose sand. A 4" diameter by 5 ft length of casing was left in place around the 3/4" riser pipe for protection. The piezometer riser pipe protectors have between a 0.1 ft and 0.6 ft stick up. The piezometer was secured with a screw-on pipe cap on the protective casing. Cement grout was placed around the outside of the casing to prevent if from moving.

3. Well Testing Procedures

A falling head test, as described in the contract, was performed on each well after installation. This required pouring water down the riser pipe until it completely fills and measuring the water level drop against time. The depth was measured using an electronic water level indicator at 1, 3, 5, 10, 20 and 30 minute increments.

SECTION 5 - DAILY ACTIVITY AND TELEPHONE LOG

HOPKINTON, NH

TABLE 1

CD029 - DAILY ACTIVITY LOG

Date	Activity
March 2, 1988 Wednesday	- Geotechnical Inspector, Doug Ferris onsite at 7:30 a.m. to 5:00 p.m., met with Dave Shepardson (USACE), Project Manager at Hopkinton Dam - Drillers arrived and moved water truck and tools from pickup into storage at Corps Headquarters. - Mobilization completed at 12:00 noon, P-size core barrel used to core through 2" crushed stone fill and two ft layer of riprap, on FD88-1 (A) - Mark Vance (USACE) onsite at approximately 10:00 a.m. M. Vance approved use of automatic hammer and "Clear Mud" for continuous sampling portion of borings. M. Vance also left additional drawings for project (construction drawings, etc.) M. Vance approved coring approach to begin FD88-1 (A). Switched P-size core barrel bits, first one not cutting well, boring is situated directly over large boulder. Started coring at el. 383.2. Stopped at el. 380.2 in gravel layer. Spun HX size casing to 3 ft (el. 380.2) - M. Vance gave approval for labeling of sampling jar lids rather than stick-on label. - M. Vance notified us we should honor 10 hour work day limit and quit operations at 5:45 p.m. We told M. Vance the 2-3/8" I.D. split spoon sampler would be difficult to move through the concrete footing. After a discussion he approved the use of 2" O.D. split spoon sampler for continuous sampling below the concrete footing. - Before M. Vance left site at 3:00 p.m. he asked D. Ferris (ATL) to contact Paul L'Hereaux (USACE) to discuss the 10 hour day ceiling on 3, March 1988. Walter Bartlau (ATL) delivered, as requested by Drillers suction hose and couplings for the rigs. - Top of concrete at 23.5 ft below the surface (elev. 329.6) - Began preparation (3:45 p.m.) for concrete coring. At 4:15 p.m. terminated work for day with NWX core bit on top of concrete. Completed cleanup operations. - 3 hours stand by for borehole moves and boring stake out
March 3, 1988 Thursday	- Geotechnical Inspector D. Ferris, onsite 7:30 a.m. to 4:45 p.m. Drillers onsite 6:45 a.m. to 4:45 p.m.

March 3, 1988	- Began coring through concrete at 6:45 a.m. (top concrete - elev. 359.1) Missed upper layer of rebar. Hit lower layer of rebar. Cored through concrete at 8:00 a.m. (bottom concrete - elev. 355.4). Began continuous sampling per M. Vance's instructions, encountered refusal at 36.0 ft. - Began to roller bit through obstruction. Pulled core barrel, obtained partial cobble/boulder and till (S-10). Another obstruction was present, core bit was wearing, so returned to roller bit. Resumed continuous sampling (S-11) then obstruction required (use of roller bit). Obstruction removed, sampling resumed. Obstruction again, (use of roller bit) resumed at 43.3 ft. Sampling resumed at 44 ft. - Boring FD 88-1 terminated at 46.4 ft.(elev. 337) - Drill crew attended 1/2 hour safety meeting. - 1.25 hours stand by - concrete coring
March 4, 1988 Friday	- Geotechnical Inspector onsite 8:00 a.m. to 11:00 a.m. Drillers onsite 8:00 a.m. to 12:30 p.m. - Weather; Snowing, 28°, light winds - Piezometer installed in FD 88-1 (A), tip set at 29.8 ft (elev. 353.4). Casing was left in place with cap on top for weekend. - Drillers cleaned up site
March 7, 1988 Monday	- Geotechnical Inspector, Doug Ferris and Drillers onsite 4:30 p.m. to 6:00 p.m. Weather; sunny 40° to 50° Drillers finish installing piezometer.
March 8, 1988 Tuesday	- Geotechnical Inspectors, Doug Ferris, Jeff King on site 7:45 a.m. to 5:00 p.m. Drillers on site at 6:30 a.m. to 5:00 p.m. Weather; sunny, 30°s, 10-15 mph winds Mobilized to FD88-2 (C). - Began P-size (4-5/8" O.D.) coring through rip-rap. Cored 3 ft and began to spin HW casing (4" I.D.) The 3-7/8" roller bit was used to clean out the 7.5 ft casing. Started sampling at 7.5 ft. FD88-2 (C) advanced to 31.3'. Drill crew attended 1/2 hour safety meeting 1 hour standby borehole move.
March 9, 1988 Wednesday	- Geotechnical Inspectors, D. Ferris, Jeff King, and Drillers onsite 7:00 a.m. to 5:00 p.m. Weather; upper 30°'s overcast, wind 0-5 mph - 7:00 a.m. started coring concrete at 31.3' (elev. 352.9), hit steel, ruined 2-5/8" I.D. core bit, resumed coring hit second rebar and cut through - 8:30 a.m. bottom of concrete footing at 36 ft (elev. 348.2)

March 9, 1988 Wednesday	- Mark Vance (USACE) and another (USACE) representative arrive on site to witness operations. M. Vance asks D. Ferris (ATL) to check with Dave Shepardson (USACE) on whether locking cap or screw caps will be preferred on well casings. M. Vance requested all concrete core samples be retained in a core box for USACE. M. Vance emphasized that soil classifications are Burmister classifications and not ASTM. He received drill logs and samples. Also discussed safety meetings. - Dave Shepardson (USACE) informed ATL that McGlashan has 3/4" riser pipe for the piezometers. Also informed ATL that the screw on caps for the well casing would be acceptable in lieu of the locking caps - M. Vance asked us to take FD88-2 (C) deeper than el. 330' (as budgeted) to either find the gravel layer or terminate the boring at el. 320'. FD 88-2 (C) advanced to 58' (elev. 326.2). - 2.25 hours standby time waiting for USACE representative to arrive onsite to witness sampling operations - 1.5 hours standby - concrete coring
March 10, 1988 Thursday	- Geotechnical Inspector, Jeff King and Drillers onsite 7:00 a.m. - 1:30 p.m. Weather; 30° 25 mph wind, cloudy - Drillers encounter difficulty keeping the hole open starting at approximately 57 ft. - A coarse gravel wedged in the spoon at what felt like a sandy gravel layer at 59.8 to 60.5 ft. - FD 88-2 terminated at 62 ft., piezometer tip set at 60.5 ft.
March 14, 1988 Monday	- Geotechnical Inspector, Jeff King and Drillers onsite 7:30 a.m. to 6:45 p.m. Weather; 35°, cloudy Gary Hart (ATL) and Jeff King (ATL)inspected site and decided they could not place the barge in the water without a crane. Ed McCabe (USACE) came over to suggest putting a ramp in from the existing road to the river with his payloader and skid the barge to thewater. - Soft ground next to the concrete retaining wall is going to cause a problem for crane stability. Some coarse fill may be needed or the crane will get stuck. - Driller moved to FD88-3, letter "E". - Drillers advanced FD88-3 (E) to 24'. - Water reading taken at well FD88-1 was 17.1 and at well FD88-2 was 15.4 ft. - Drill Crew attended 1/2 hour safety meeting. - 2 hours stand by - bore hole moves

March 15, 1988
Tuesday

- Geotechnical Inspector, Jeff King, onsite 7:30 a.m. to 6:45 p.m. Drillers onsite 7:00 a.m. to 6:45 p.m.
  Weather; 25°-30°, cloudy, windy
- Mark Vance (USACE) onsite at 8:45 a.m.
- 7:45 a.m. Began coring through concrete slab at 33.6' (elev. 350.4), tried to sample from 38.2' to 38.3' with 1-3/8" I.D. spoon; no penetration. Roller bit then tried to sample again from 38.3' to 38.7' and from 38.7' to 40.2'; still no penetration and no recoveries. With the concrete footing still present and at an unknown thickness, the NX core barrel was used, with the approval of Mark Vance. Cored from 40.2' to 43.2', 24" recovery.
- 12:15 End of coring at 43.2'. Bottom of concrete slab is at 42.0' (elev. 342.0).
- Drillers started using "Clear Mud" at 50.0'. This was approved by Mark Vance prior to his departure at 2:30 p.m.
- Boring FD88-3 was terminated at 52.5 ft. (elev. 331.5)
- Drillers started piezometer installation in FD88-3, tip set at 44.0 ft.
- Inspector took a well reading at well no. 1, 17.8'; well no. 2, 15.8' and well no. 3, 15.1'
- 4.5 hours standby - concrete coring

March 16, 1988
Wednesday

- Geotechnical Inspector, Jeff King on site 7:00 a.m. to 9:00 a.m.
- Drillers onsite 7:00 a.m. to 11:00 a.m.
- Weather; cloudy, 10 mph winds, 30°
- Drillers finished installing piezometer in FD88-3
- Drillers moved CME850 to the opposite side of the dam and and unloaded the (4") casing J. King took water readings at well no. 1, 17.8' and at well no. 2, 15.8 ft.
- 1 hour stand by, borehole move

March 17, 1988
Thursday

- Geotechnical Inspector, Jeff King onsite 9:45 a.m. to 11:00 a.m.
- J. King inspected the platform for the crane and it appeared Dave Shepardson and Ed MaCabe were building it too far from the retaining wall for a small crane. They did not have enough stone present to extend the pad to the retaining wall.

March 18, 1988
Friday

- Geotechnical Inspector, Jeff King onsite 11:00 a.m. to 3:30 p.m.
- Weather 40°, cloudy, 10-15 mph winds
  J. King inspected previous days progress and discussed extending the pad with D. Shepardson.

March 18, 1988 Friday (continued)	Work began on clearing snow and extending the pad. Drillers arrived at approximately 1:45 p.m. to unload the CME45 and load the CME850. Stone arrived at 2:45 p.m. and was placed on the access road. Stone would be spread Monday and another load placed on access road according to D. Shepardson (USACE).
March 21, 1988 Monday	- Geotechnical Inspector Jeff King on site 1:45 p.m. to 4:15 p.m. - Drillers onsite 3:10 p.m. to 4:15 p.m. - Weather; cold 10°-20°, partly cloudy, windy - Inspector directed crane to the pad and he set up - Crane is scheduled for Tuesday 3/22/88 at 10:00 a.m. to pick the barge
March 22, 1988 Tuesday	- Geotechnical Inspector, Jeff King, and Drillers onsite 7:00 a.m. to 4:45 p.m. - Weather; clear, windy cold 10-20° - Barge was mobilized - Boat was used to assist in anchoring the barge to the side of the dam - J. King went to see D. Shepardson to request that the water flow through the dam be reduced. This was done. - D. Shepardson came to the job site and took some pictures. - The drill rig was placed on the barge. Pipe and equipment was placed on barge. Crane left site - Drill Crew attended 1/2 hour safety meeting
March 23, 1988 Wednesday	- Geotechnical Inspector, Jeff King, and Drillers onsite 7:00 a.m. to 5:00 p.m. - Weather; clear, little wind 25-40° - Drillers untied the barge and began to set up over Boring FD88-4 (F). The barge was slightly frozen. - Water level reading were taken on FD88-1, 18.6'; FD88-2, 16.0', and FD88-3, 19.6' - Ron DeFilippo (USACE) arrived on site at 8:50 a.m. - 1:30 p.m. Drillers started coring concrete footing, top of concrete at 2.8 ft (elev. 350.3) - Ron DeFilippo (USACE) returned on site and said hole B will be drilled. Dam tender wants to open the gates Saturday 3/26/88. - 2:45 p.m. Drillers finish coring concrete footing, bottom of concrete at 7.8 ft (elev. 345.3) - Advanced FD88-4 to 9.6 ft. - 1.25 hours standby - concrete coring - 4.5 hours standby - borehole move

March 24, 1988
Thursday

- Geotechnical Inspector, Jeff King, and Drillers onsite 7:00 a.m. to 5:00 p.m.
- Weather; warm 35-45°, rain slight wind
- Discussed daily progress with D. Shepardson (USACE)
- Boring FD-88-4 (F) terminated at 23.1 ft (elev. 330)
- John Hart (USACE) arrived to look over the site of hole #B. Finished grouting FD88-4 then moved barge to Boring FD88-5 (letter D)
- 1 hour standby - borehole move

March 25, 1988
Friday

- Geotechnical Inspector, Jeff King and Drillers onsite 7:00 a.m. to 6:15 p.m.
- Weather; cloudy damp 35-40°
- Talked with D. Shepardson about today's progress
- Drillers spun 3" HX casing through 7.5 ' of rip-rap. 9:00 a.m. started coring through the concrete footing (elev. 352.5)
- Water level of each well was recorded FD 88-3 19.6', FD 88-2 16.0 ft and FD 88-1 18.5'
- D. Shepardson came out to the job site to tell me Boring #6, "B" is not to be drilled. He also wanted the Barge out of the water Saturday because they expect 1" of rain.
- Started using "Clear Mud" at 20.1' on Boring FD88-5 rods were clogging with flowing sand. Obtained next 2 samples with difficulty, flowing sand was pushing the mud up the rods.
- FD88-5 terminated at 28.1 ft (elev. 331.9).
- 2 hours standby - concrete coring

March 26, 1988
Saturday

- Geotechnical Inspector and Drillers onsite 7:00 a.m. to 11:45 p.m.
- Weather; rain, 40°
- Rain had washed the deck of the barge.
- Talked with the Dam Tender and said we would try to get the barge out this morning.
- Drillers grouted FD88-5.
- Crane arrived on site at 9:00 a.m. Drill rig and barge were removed by crane.
- 2 hours standby - borehole move

March 28, 1988
Monday

- Geotechnical Inspector, Jeff King and Drillers onsite 1:30p.m.to4:45p.m.
- Weather 35° to 40°, partly cloudy winds 10-15 mph
- Drillers placed additional grout around casing
- J. King took well readings: FD 88-1, 16.8', FD 88-2, 14.7', and FD 88-3, 18.0'

March 29, 1988
Tuesday

- Geotechnical Inspector, Jeff King and Drillers onsite 7:30 a.m. to 3:30 p.m.
- Weather; sunny warm 45 to 60°
- Drillers cleaned up site.

March 29, 1988 Tuesday (continued)	- Inspector took water readings, well FD 88-3, 16.8', well FD 88-2, 14.0', well FD 88-1, 15.5'. - The flow gates were open at both bays. - Returned boat and motor
April 1, 1988 Friday	- Geotechnical Inspector, Jeff King onsite 9:45 a.m. to 1:30 p.m. - Inspector performed falling head tests on piezometer FD88-1, FD88-2 and FD88-3

HOPKINTON, NH

TABLE 2

CD029 - DAILY TELEPHONE LOG

Date	Conversation
February 17, 1988 Wednesday	- R. DeFilippo (USACE) to Wanda Hawkins (ATL) Checking on start up date for Delivery Order No. 0004. Wanda to check and get back to DeFilippo.
February 18, 1988 Thursday	- Wanda Hawkins (ATL) to R. DeFilippo (USACE) Rig to be used on that project is scheduled for maintenance; plan for week of 2/29 start up. - R. DeFilippo schedule for 2/29; request us to advise hime (prior to start up) of anything we may need. Right now there is approx. 20 inches of snow to move - Wanda Hawkins advised R. DeFilippo that no Delivery Order has been received yet; he will check and get back to Wanda - R. DeFilippo was advised the order was signed and sent on 2/8/88
February 19, 1988 Friday	- Wanda Hawkins (ATL) to R. DeFilippo (USACE). Delivery Order received today. Post mark 2/16/88. Will send note regarding same with copy of envelope
March 2, 1988 Wednesday	- 6:00 a.m. D. Ferris (ATL) to T. Pahler (ATL) regarding yesterday's progress - Doug Ferris (ATL) to W. Bartleau (ATL) he is to purchase 2" rubber reinforced suction hose (20 ft length) with cam lock couplings and bring to Hopkinton.
March 3, 1988 Thursday	- 7:45 a.m. - D. Ferris (ATL) to Mark Vance (USACE) Drillers are about to break through bottom of footing. Mark Vance told D. Ferris to proceed cautiously through the footing. He preferred coring through versus punching through with the standard size spoon. - 11:45 a.m. - D. Ferris (ATL) to Mark Vance (USACE), explained refusal, he agreed to let us try and roller bit (2-15/16") through the blockage, and if roller bit did not work we should core through to resume continuous sampling down to el. 330. M. Vance also mentioned the Corps was calling Canton to discuss the drilling strategy (i.e. casing sizes, core bit size, etc) for the following borings. Inspector told M. Vance that drillers had cored through the concrete

March 3, 1988
Thursday (continued)

footing successfully and obtained representative samples from below the footing which showed that till lies directly below the concrete and possibly had a higher moisture content than the other samples and possibly some softer seams. Had similar conversation with J. Hart. (USACE)

- 11:45 a.m.
- D. Ferris (ATL) to P. L'Hereaux (USACE), gave his approval to exceed the 10 hour/day work limit if we cleared it with him on an individual case basis. He said he did not want us working before sunrise or after sunset, and we were not to make a habit of exceeding 10 hour days nor would he give a blanket okay to exceed 10 hours days. D. Ferris is to talk directly with P. L'Hereaux regarding work day length.

- 5:30 p.m.
- D. Ferris (ATL) to S. Thew (ATL) informed of Wednesday's and Thursday's progress. S. Thew indicated he wanted to discuss piezometer installation with M. Vance (USACE).

March 4, 1988
Friday

- 7:00 a.m.
- D. Ferris (ATL) to Mark Vance (USACE), got DeFilippo and gave him Mr. Thew's message from day before.
- 7:30 a.m.
- D. Ferris to Mark Vance, he agreed to terminate boring FD88-1 and talk to Mr. Thew about piezometer installation.
- 7:40 a.m.
- D. Ferris (ATL) to Spencer Thew (ATL) informed him of above conversation
- Mark Vance (USACE) to Spencer Thew (ATL)
  At the request of Spencer Thew, Mark Vance called to discuss the piezometer installation. Spencer questioned if the installation was to measure hydrostatic pressures or if it was to be used for purposes of determining in-situ permeability. Mark Vance indicated that the primary purpose of the piezometer installation was to measure hydrostatic pressure. A fairly lengthy discussion pursued regarding the effective length of the sand column around the piezometer for purposed of calculating permeability. If the piezometer installation is to be used solely for determining in-situ permeability, it is important that the piezometer be sealed into the specific layer where the permeability is to be determined i.e.; if a clean sandy layer was overlain by silty sand and it was desireable to obtain the permeability of the clean sand layer, then it would be necessary to place the impermeable top and bottom seals such that the clean sandy layer would be isolated from the overlaying

March 4, 1988 Friday	silty sand. When permeability is to be determined, it is extremely important that the ATL representative identify the various soil strata to the Corps of Engineer's representative in order that they may select the specific location of the impermeable seals. - 8:30 a.m. - D. Ferris to Spencer Thew. S. Thew said to install piezometer according to Corps; original instructions. - 11:00 a.m. - D. Ferris (ATL) to Mark Vance (USACE), not available. Left message
March 8, 1988 Tuesday	- 8:20 a.m. - Doug Ferris (ATL) to Mark Vance (USACE); received approval for using 4" protective well casing versus curb box and for NX core and 1-3/8" I.D. split spoon sampler for borings FD88-2, FD88-3 and FD88-1. - 3:20 p.m. - Doug Ferris (ATL) to Mark Vance (USACE), informed him drillers expected to punch through bottom of concrete slab tomorrow a.m. He said he would be at site around 10:00 a.m. Dave Shepardson (USACE) asked inspector about a sealant to protect rebar drillers intersected during coring, from subsequent corrosion. D. Ferris told him he'd talk to his firm about it.
March 9, 1988 Wednesday	- 8:45 a.m. - D. Ferris (ATL) to Paul L'Heuerx (USACE) he approved stand by time until Mark Vance was onsite to witness sampling procedures
March 10, 1988 Thursday	- 8:20 a.m. - Jeff King (ATL) to Mark Vance (USACE), advised him of the present situation (boring FD88-2 caving in). Jeff King asked if drill crew could use "Clear Mud" to keep the hole open and if he still wanted 64' to be the designated depth. He okayed the use of "Clear Mud" and Drillers are to go as far as possible (to 64') and set piezometer. - 1:15 p.m. - Jeff King (ATL) to Mark Vance (USACE) regarding setting the piezometer in FD88-2 at 60.5' and the bentonite seals at 45.0' and 31.3'. The casing was still present in the boring and the casing was secured with the spin head. M. Vance (USACE) gave his approval to leave the casing in place over the weekend.

March 14, 1988 Monday	- 2:45 p.m. - Jeff King (ATL) to Mark Vance (USACE), J. King gave M. Vance update on job progress, also, told M. Vance Drillers planned to hit concrete footing by early morning Tuesday. M. Vance said he would like to be there around 9:00 a.m. or earlier. The piezometer should be set in boring FD88-3 by Wednesday morning.
March 16, 1988 Wednesday	- 11:50 - Jeff King to TM Crane and set a tentative appointment for crane on Monday
	- 1:30 p.m. - Jeff King (ATL) to Mark Vance (USACE) regarding daily progress, pad preparation for the crane on Monday. M. Vance said he would call David Shepardson (USACE) at Hopkinton to take care of it
March 17, 1988 Thursday	- 12:30 p.m. - Jeff King to TM Crane regarding specifics on crane needed. They cancelled due to another project.
	- 1:45 p.m. - Jeff King to Multiple Crane rentals, they were not available.
March 18, 1988 Friday	- 9:30 a.m. - Jeff King to Mark Vance; he was not available
	- 10:10 a.m. - Jeff King (ATL) to E.D. Sweet to rent crane They will have a 35 ton hydraulic crane with a 100 ft boom on site at 2:00 p.m. Monday 3/21/88.
	- 11:30 a.m. - Ed McCabe (USACE) to Waltham office to obtain information about spring condition for water entering the dam. Drillers need to know how the water is regulated and how much time do they have to remove their barge in case of a problem
	- Ron DeFilippo (USACE) to Spencer Thew (ATL) regarding timing arrival of crane for Monday. Corps has authorized Dam Tender to purchase stone for the crane pad. S. Thew said Jeff King will be in contact with Dam Tender today. Jeff King may have been on site Thursday, March 17, 1988, with copper pipe and apparently was not totally cooperative with Dam Tender as to what he was doing. S. Thew said he would check on this and make sure J.King touches base with Dam Tender. R. DeFilippo said operation of dam is priority and we should be prepared in

March 18, 1988 Friday	case there is a rapid release of water (alternative mooring area, make sure we have a plan, Corps will try to release in the evening, Dam Tender will try to coordinate with Drillers). - 9:45 a.m. - Spencer Thew (ATL) talked to Jeff King (ATL) to make sure when he goes on-site that he checks with Dam Tender and let him know what Drill crew plans are for the day. Jeff King is to make a visit to the site today and make arrangements with the Corps to construct a level area for the crane. J. King (ATL) and S. Thew (ATL) also discussed a contingency plan with the Dam Tender should a large release of water be necessary.
March 21, 1988 Monday	- 10:25 a.m. - J. King (ATL) to Canton ATL office to check on departure time of Drill Crew to coordinate them with arrival of crane - 11:00 a.m. - J. King (ATL) to E. D. Sweet to check on the crane. Mr. Cole was busy and had to call back. Upon calling back it was verified that crane was still available - 2:30 p.m. - J. King (ATL) to Mark Vance, (USACE) progress report. Discussed which hole to set up on first, procedures, if an emergency came up, how we were going to access hole No. B, also possibility of working on the weekend.
March 21, 1988	- 5:50 p.m. - J. King (ATL) to Doug Ferris, ATL Manchester office regarding the piezometer design for B, D, and F piezometers. D. Ferris was not available, left message - 6:25 p.m. - D. Ferris to J. King received information on piezometers
March 22, 1988 Tuesday	- 7:20 a.m. - J. King (ATL) to Ed McCabe (USACE) about today's schedule. He seemed upset that the barge was not in the water. - 8:20 a.m. - J. King (ATL) to Mark Vance (USACE) to give a progress report and ask if we could use 3" not 4" (HW) casing with the 3" NX core barrel.

March 22, 1988
Tuesday

- Yuri Yatsevitch (USACE) to Spencer Thew (ATL). Yuri indicated that the Water Control Branch was concerned about releases from the reservoir that may be required in the immediate future should spring flooding be excessive. He wanted to know if we could work through the weekend in an effort to complete the project. Spencer Thew indicated that ATL woul attempt to revise our schedule such that we could work through the weekend - at this time Yuri also okayed a 12 hour work day.

- 1:45 p.m.
- J. King (ATL) to Spencer Thew ATL Canton office discussed setting up over hole No. B. He wanted to float the barge over to determine how close we can get to drill hole, then call Ron DeFilippo (USACE) to report how close to the actual location Also discussed working through the weekend.

- 2:00 p.m.
- J. King (ATL) to Mark Vance (USACE) to give him the progress report. He said it was acceptable to use NW casing if we could still use the NX core barrel

- 3:20 p.m.
- J. King (ATL) to Ron DeFilippo (USACE) to give him the distance that the barge was from hole No. B. Ron DeFilippo said move to a different boring. They would cancel the boring or investigate moveing the boring.

- 3:30 p.m.
- J. King (ATL) to Mark Vance (USACE) to give a progress report. Jeff King is going to follow Ron DeFilippo (USACE) instructions and have the Drillers set up over Boring FD88-4, (F) rather than Boring B.

- 3:25 p.m.
- J. King (ATL) to Spencer Thew (ATL) to give same progress report. S. Thew asked J. King to call Wednesday at 1:00 and Friday at 10:00 for progress on the borings so we could schedule weekend work.

- 3:40 p.m.
- J. King to Spencer Thew regarding emergency plan. J. King well be the first person the USACE will contact

March 23, 1988 Wednesday	- 1:40 p.m. - J. King (ATL) to Spencer Thew (ATL) with a progress report. The Drillers were set up on Boring FD88-4 and were coring into the concrete slab. S. Thew requested that J. King call Tom Pahler on Thursday with a progress report, also to call Yuri Yatsevitch (USACE) and tell him we plan to work the weekend. J. King informed S. Thew that Ron DeFilippo (USACE) was present and would tell him to inform Yuri. S. Thew wanted to know if we had to drill Boring B or not. J. King will find out as soon as possible if Boring B will be canceled or not.
March 24, 1988 Thursday	- 12:55 p.m. - J. King (ATL) to Mark Vance (USACE) gave him daily progress. Will call back later with an idea when Drillers will break through the concrete footing of Boring FD88-4. - 3:40 p.m. - J. King (ATL) to Mark Vance (USACE), he was not in left message that Drillers would be coring through the concrete slab in the morning. M. Vance left message saying he planned to come out in morning 3/25/88.
March 25, 1988 Friday	- 7:40 a.m. - J. King (ATL) to S. Thew (ATL) regarding weekend schedule. S. Thew wants drillers to finish Boring FD88-5, which should be early Saturday. J. King (ATL) is to have the Army Corps open the far flood gate over the weekend and lower the water level behind the dam. - 10:10 a.m. - Yuri Yatsevitch (USACE) to Spencer Thew (ATL). Yuri Yatsevitch called to indicate that they had repositioned Boring No. B such that it was in the channel, in order that we could move to it with the barge. S. Thew indicated that we would be working this weekend until we completed the boring that we are currently on (Boring FD88-5). Once we did that, we would secure the equipment for the remainder of the weekend and we would return to finish the last hole on Monday. By doing this, it will give the Dam Tender an opportunity to release some water if necessary.

March 25, 1988 Friday	- 1:10 p.m. - J. King (ATL) to Mark Vance (USACE) with progress report. The soil was hard under concrete footing. M. Vance said to go ahead with hole #B out 20 ft from the face of the wall on line. - 2:05 p.m. - J. King (ATL) to Spencer Thew (ATL) to report progress. - 7:00 p.m. - J. King (ATL) to Spencer Thew (ATL) to inform him Boring B was cancelled and the drillers could only sample to 28.1 ft on FD88-5 due to the flowing sand. Jeff King said they could spin the casing down through the rebar of the concrete footing. S. Thew instructed Drillers to finish boring Saturday and remove the barge before leaving the site. - 7:30 p.m. - J. King (ATL) to Jim Reed , Crane Service to schedule for 10:00 a.m. (Saturday).
March 26, 1988 Saturday	- J. King (ATL) to Jim Reed, Crane Service to ask him to come as soon as possible because the rain is increasing and crane might not make it to the pad.
March 28, 1988 Monday	- 2:48 p.m. - J. King (ATL) to Ed McCabe (USACE), Drillers are coming today to move out their equipment - 3:00 p.m. - J. King (ATL) to Mark Vance (USACE) with Saturday progress report; took barge out and finished Boring FD88-5. Explained how Driller hit flowing sand late Friday 3/25/88 and how it kept pushing up into the drill rods. Mark Vance asked when the samples would be sent to Waltham. J. King will check with D. Ferris (ATL) to see how soon they will be sent. J. King estimated the middle or end of the week.
April 1, 1988 Friday	- 9:45 a.m. - J. King (ATL) to Dave Shepardson (USACE) regarding his plans to perform falling head test

SECTION 6 - CHAIN OF CUSTODY LOG

ATLANTIC TESTING LABORATORIES, Limited

CHAIN OF CUSTODY LOG NE CP 029

PROJECT: Hopkinton Dam, NH

ITEMS:

Tubes

Bottles

Jar Samples

Core Boxes

Sampling Logs

Date & Time Received	Date & Time Transferred	Comments	Custodian
Daily Progress	4-4-88 11:47	as sampled	Jeff King
	4-4-88 11:48 ACOE	See Att.	

Date

ROUTING AND TRANSMITTAL SLIP

TO: (Name, office symbol, room number, building, Agency/Post)	Initials	Date
1.		
2.		
3.		
4.		
5.		

	Action		File		Note and Return
	Approval		For Clearance		Per Conversation
	As Requested		For Correction		Prepare Reply
	Circulate		For Your Information		See Me
	Comment		Investigate		Signature
	Coordination		Justify		

REMARKS

Atlantic testing

Mark Vance

Hopkinton Dam, NH

Core, Sample

from 11:47 AM Jeff King

to 11:48 am Alexis M. Rainin

DO NOT use this form as a RECORD of approvals, concurrences, disposals, clearances, and similar actions

FROM: (Name, org. symbol, Agency/Post)	Room No.—Bldg.
	Phone No.

5041-102

☆U.S. G.P.O. 1980-311-156/4

OPTIONAL FORM 41 (Rev. 7-76)
Prescribed by GSA
FPMR (41 CFR) 101-11.206

ATLANTIC TESTING LABORATORIES, Limited

CHAIN OF CUSTODY LOG NE CP 029

PROJECT: Hopkinton Dam, NH

ITEMS:

Tubes _____

Bottles _____

Jar Samples _____

Core Boxes _____

Sampling Logs _____

Date & Time Received	Date & Time Transferred	Comments	Custodian
Daily Progress	4-4-88 11:47	as sampled	Jeff King
	4-4-88 11:48 ACOE	See Att.	

Date

ROUTING AND TRANSMITTAL SLIP

TO: (Name, office symbol, room number, building, Agency/Post)	Initials	Date
1.		
2.		
3.		
4.		
5.		

	Action		File		Note and Return
	Approval		For Clearance		Per Conversation
	As Requested		For Correction		Prepare Reply
	Circulate		For Your Information		See Me
	Comment		Investigate		Signature
	Coordination		Justify		

REMARKS

Atlantic testing

Mark Vance

Hopkinton Dam, NH

Core, Sample

from 11:47 AM Jeff King

to 11:48 am Alexis M. Rainini

DO NOT use this form as a RECORD of approvals, concurrences, disposals, clearances, and similar actions

FROM: (Name, org. symbol, Agency/Post)	Room No.—Bldg.
	Phone No.

5041-102

☆U.S. G.P.O. 1980-311-156/4

OPTIONAL FORM 41 (Rev. 7-76)
Prescribed by GSA
FPMR (41 CFR) 101-11.206

SECTION 7 - SAFETY REPORTS

WEEKLY SAFETY MEETING

NEDSO

Date held 8 MARCH '88

THRU: Area Engineer, _____ Area

Time 1:00 - 1:30

TO: Safety Office, NED

Report No. 2

1. Weekly safety meeting was held this date for the following personnel:

Contract No. /D.O.No. 0004 Contractor Atlantic Testing Laboratories, Ltd.

Conducted By D.R. Ferris

All personnel present (Contr) 4
(Sub) -
(Govt) -

Subjects discussed (Note, delete, or add):
EM 385-1-1, Section: _____

Accident Prevention Plan

Individual Protective Equipment -

Prevention of Falls -

Back Injury, Safe Lifting Techniques -

Fire Prevention -

Sanitation, First Aid, Waste Disposal -

Tripping Hazards - trash, hose, nails in lumber -

Staging, Ladders, Concrete Forms, Safety Nets -

Hand Tools, Portable Power Tools, Woodworking Machinery -

Equipment Inspection & Maintenance (Zero Defects) -

Hoisting Equipment -

Ropes, Hooks, Chains and Slings -

Electrical Grounding, Temporary Wiring, GFCI -

Lockouts for safe clearance procedures - electrical, pressure, moving parts -

Welding, Cutting -

Excavations -

Loose Rock and Steep Slopes -

Explosives -

Water Safety -

Toxic materials - hazards, MSDS, respiratory, ventilation -

Other -

Prepared by D.R. Ferris Title Engineer

2. Forwarded.

Signature Douglas R. Ferris
Resident Engineer

CF: EXPOSURE HOURS:
Work Date: 3/4, 3/7, 3/8
Non-work Date: 3/5, 3/6

Man Hours:
Contr: 14
Subcontr: 0
Govt: 0
TOTAL: 14

NED FL APR 82 251

WEEKLY SAFETY MEETING

NEDSO

Date held 3 March '88

THRU: Area Engineer, _____ Area

Time 11:45 a.m.

TO: Safety Office, NED

Report No. _____

1. Weekly safety meeting was held this date for the following personnel:

Contract No. /D.O.No. 0004 Contractor Atlantic Testing Laboratories, Ltd.

Conducted By D.R. FERRIS All personnel present (Contr) BURNHAM, FOX
(Sub) _____
(Govt) _____

Subjects discussed (Note, delete, or add):
EM 385-1-1, Section: _____

Accident Prevention Plan

Individual Protective Equipment -

Prevention of Falls -

Back Injury, Safe Lifting Techniques -

Fire Prevention -

Sanitation, First Aid, Waste Disposal -

Tripping Hazards - trash, hose, nails in lumber -

Staging, Ladders, Concrete Forms, Safety Nets -

Hand Tools, Portable Power Tools, Woodworking Machinery -

Equipment Inspection & Maintenance (Zero Defects) -

Hoisting Equipment -

Ropes, Hooks, Chains and Slings -

Electrical Grounding, Temporary Wiring, GFCI -

Lockouts for safe clearance procedures - electrical, pressure, moving parts -

Welding, Cutting -

Excavations -

Loose Rock and Steep Slopes -

Explosives -

Water Safety -

Toxic materials - hazards, MSDS, respiratory, ventilation -

Other - Personal hygiene, general discussion on out of town work conditions and accidents.

Prepared by D.R. FERRIS Title Engineer

2. Forwarded.

Signature Douglas R. Ferris
Resident Engineer

CF: EXPOSURE HOURS:
Work Date: 3/2, 3/3
Non-work Date: _____

Man Hours:
Contr: 51
Subcontr: _____
Govt: _____
TOTAL: 51

NED FL APR 82 251

WEEKLY SAFETY MEETING

NEDSO

Date held 3-14-88

THRU: Area Engineer, _____ Area

Time 400-430

TO: Safety Office, NED

Report No. 3

1. Weekly safety meeting was held this date for the following personnel:

Contract No. /D.O.No. 004 Contractor Atlantic Testing Laboratories, Ltd.

Conducted By J.S. King All personnel present (Contr) T. Burnham S. Fox
(Sub) _____
(Govt) _____

Subjects discussed (Note, delete, or add):
EM 385-1-1, Section: _____

Accident Prevention Plan

Individual Protective Equipment -

Prevention of Falls -

Back Injury, Safe Lifting Techniques -

Fire Prevention -

Sanitation, First Aid, Waste Disposal -

Tripping Hazards - trash, hose, nails in lumber -

Staging, Ladders, Concrete Forms, Safety Nets -

Hand Tools, Portable Power Tools, Woodworking Machinery -

Equipment Inspection & Maintenance (Zero Defects) -

Hoisting Equipment -

Ropes, Hooks, Chains and Slings -

Electrical Grounding, Temporary Wiring, GFCI -

Lockouts for safe clearance procedures - electrical, pressure, moving parts -

Welding, Cutting -

Excavations -

Loose Rock and Steep Slopes -

Explosives -

Water Safety -

Toxic materials - hazards, MSDS, respiratory, ventilation -

Other -

Prepared by J.S. King Title Geotechnical Eng.

2. Forwarded.

Signature Douglas R. Farris
Resident Engineer

CF: EXPOSURE HOURS:
Work Date: 2/9, 2/10, 2/14
Non-work Date: 2/11, 2/12, 3/12

Man Hours:
Contr: 65
Subcontr: _____
Govt: _____

NED APP FL 251

WEEKLY SAFETY MEETING

NEDSO

Date held 3-22-88

THRU: Area Engineer, _____ Area

Time 1:15 - 1:45

TO: Safety Office, NED

Report No. 4

1. Weekly safety meeting was held this date for the following personnel:

Contract No. /D.O.No. 004 Contractor Atlantic Testing Laboratories, Ltd.

Conducted By J. D. King

All personnel present (Contr) R. Todd
(Sub) T Burnham
(Govt) _____

Subjects discussed (Note, delete, or add):
EM 385-1-1, Section: _____

Accident Prevention Plan

Individual Protective Equipment -

Prevention of Falls -

Back Injury, Safe Lifting Techniques -

Fire Prevention -

Sanitation, First Aid, Waste Disposal -

Tripping Hazards - trash, hose, nails in lumber -

Staging, Ladders, Concrete Forms, Safety Nets -

Hand Tools, Portable Power Tools, Woodworking Machinery -

Equipment Inspection & Maintenance (Zero Defects) -

Hoisting Equipment -

Ropes, Hooks, Chains and Slings -

Electrical Grounding, Temporary Wiring, GFCI -

Lockouts for safe clearance procedures - electrical, pressure, moving parts -

Welding, Cutting -

Excavations -

Loose Rock and Steep Slopes -

Explosives -

Water Safety -

Toxic materials - hazards, MSDS, respiratory, ventilation -

Other - Safty on a Barge - Loose Boards Pick up All Equipment

Prepared by J. D. King Title Geotechnical Eng.

2. Forwarded. Neat Work area

Signature Douglas R. Ferris
Resident Engineer

CF: EXPOSURE HOURS:
Work Date: 3/15, 3/16, 3/17, 3/18, 3/21, 3/22, 3/23, 3/24, 3/25, 3/26
Non-work Date: 3/19, 3/20

Man Hours:
Contr: 186 1/4
Subcontr: 7
Govt: _____
TOTAL: 193 1/4

NED FL APR 82 251

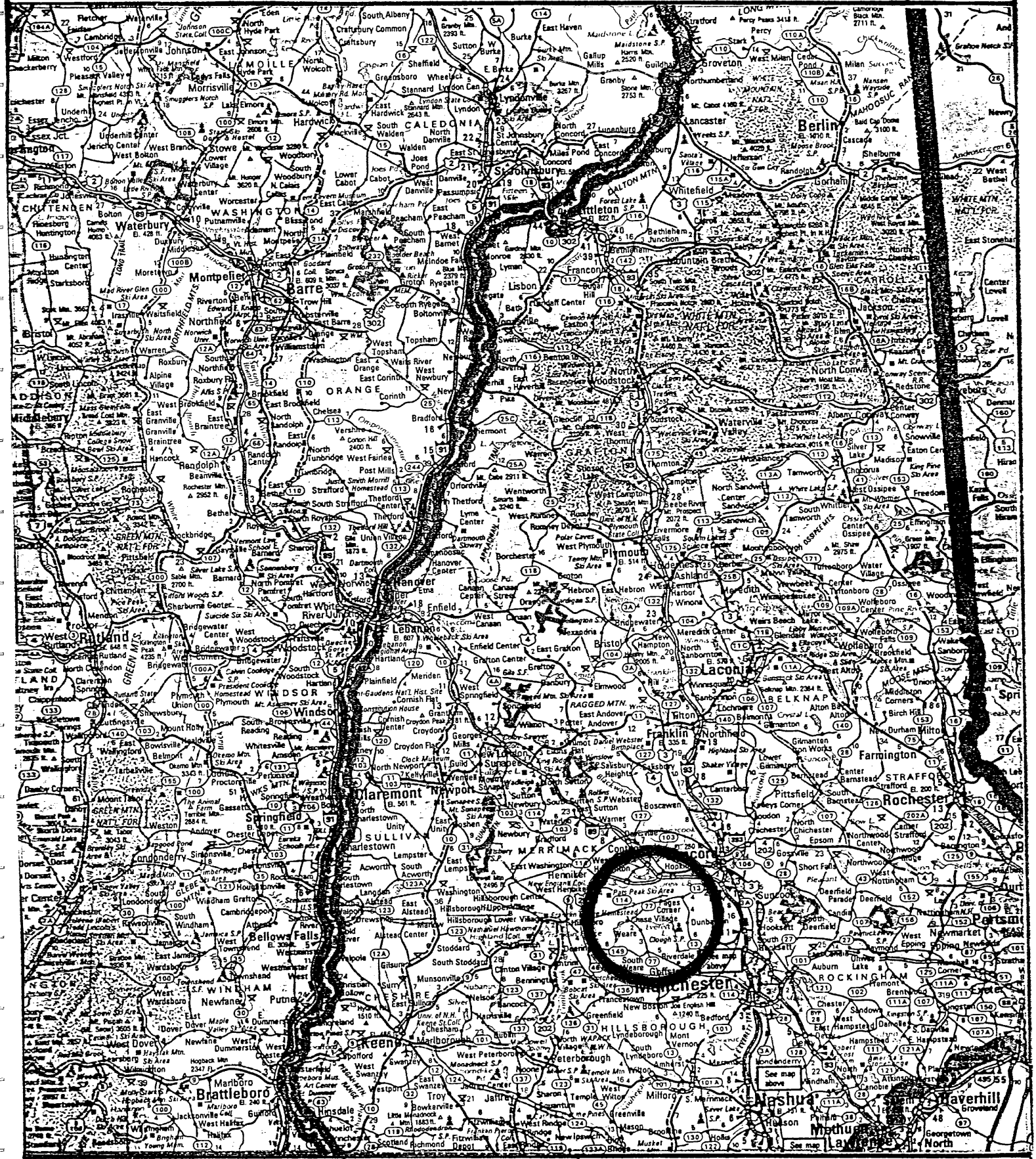
SECTION 8 - FIELD INSPECTORS' LOGS

Site	Boring No.	Page 3 of 17
Hopkinton Dam	FD 88-3	

DEPTH	1" = 2'	CORE/SAMPLE NO.	SIZE	DEPTH/RUN	BLOWS PER FT. / CORE RECVY	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
12.0'				Rec			
14.0'		S-3	2 3/8"	74%	16 42 56 41	Sampled from 12.0' to 14.0' Advanced casing to 17.0' Cleaned casing to 17.0'	Similar Soil; SP-SM Note: coarse gravel in middle of sample
17.0'							
19.0'		S-4	2 3/8"	58%	45 46 31 26	Sampled from 17.0' to 19.0' Advanced casing to 22.0' Cleaned casing to 22.0'	Similar Soil; SP-SM (mottled)
22.0							
24.0		S-5	2 3/8"	46%	37 28 18 36	Sampled from 22.0' to 24.0' Advanced casing to 27.0' Cleaned casing to 27.0' END OF EXPLORATION 3-14-88	Similar Soil - SP-SM
						EXPLORATION CONTINUED 3-15-88	

a. Figure 1 - General Project Map

GENERAL PROJECT MAP



PROJECT No CD029	***SCALE:*** None	Hopkinton Dam, NH

B. Figure 2 - Site Location Map

SITE LOCATION MAP

PROJECT No CD029	SCALE: 1:62500	U.S.G.S. QUAD: Concord, NH

CORPS OF ENGINEERS, U. S. ARMY
NEW ENGLAND DIVISION
FOUNDATION AND MATERIALS BRANCH

FIELD LOG OF TEST BORING

PROJECT NO. D.O. 0004

Site Hopkinton Dam NH — Page 1 of 15 Pages

Hole No. FD88-1 "A" Diam. (Casing) HW (4") — Boring Started 2 March 1988

Co-ordinates: N _____ E _____ — Boring Completed 3 March 1988

Drilled by Burnham & Fox — Report Submitted 12 April 1988

Purpose of Exploration To determine subsurface conditions

Elevation Top of Hole 383.2' M.S.L. — Casing Left in Place 5 Feet

Total Overburden Drilled 46.4 Feet

Elevation Top of Rock NA M.S.L.

Elevation Bottom of Hole 336.8 M.S.L.

Total ~~Rock~~ Concrete Drilled 4.7 Feet

Total Depth of Hole 46.4' Feet

Core Recovered 95 %

Core Recovered 5.3 Ft.; NX Diam. 2 1/8 In.

Soil Samples 2 3/8 In. Diam. 5 No.

Soil Samples 1 3/8 In. Diam. 8 No. — Water Table Depth 14.8' (4-1-88)

Depth From	Depth To	Method of Drilling and Type of Bit Used
0'	23.5'	Spun HW (4") casing
0	23.5'	Split spoon sampling @ 5' intervals
		with a 2 3/8" I.D. sampler
23.5'	27.8'	NX DIAMOND CORE
36.6'	37.9'	NX DIAMOND CORE
38.2'	46.4'	Continuous split spoon sampling with
		a 1 3/8" I.D. sampler
23.5'	44.4'	2 7/8" roller bit
0	3.0	"P" size diamond bit core

INDEX

Ground Water _____ Back of Page _____
Boring Location Sketch _____ Back of Page _____
Overburden Record page 2 thru Page 5
Rock Drilling _____ Page _____
Subsurface water observation Page 13
Boring location sketch Page 13
Piezometer Installation Report Page 14
Piezometer Installation Data Page 15

Prepared by Douglas K. Ferris — Field Data — Lab. Data

Submitted by Atlantic Testing Laboratories Limited

NED FORM DEC 63 121 — REPLACES EDITION OF JUN 51 WHICH MAY BE USED UNTIL EXHAUSTED

U. S. ARMY
CORPS OF ENGINEERS
NEW ENGLAND DIVISION

FIELD LOG OF TEST BORING

Site Hopkinton Dam — Page 1 of 15 Pages

Boring No. FD88-1 Desig. A Diam. (Casing) HW (4")

Co-ordinates: N _____ E _____

Elevation Top of Boring 353.2' M.S.L.
Total Overburden Drilled 46.4' Feet
Elevation Top of Rock N/A M.S.L.
Total ~~Rock~~ Concrete Drilled 4.7 Feet
Elevation Bottom of Boring 336.8 M.S.L.
Total Depth of Boring 46.4 Feet
Core Recovered 95 % No. Boxes _____
Core Recovered 5.3 Ft : NX Diam. 2 1/8 in.
Soil Samples 2 3/8 in. Diam. 5 No.
Soil Samples 1 3/8 in. Diam. 8 No.

Hammer Wt. 300/140
Hammer Drop 18"/30"
Casing Left 5ft
~~Subsurface~~ Water Data _____ Page _____
Obs. Well _____
Drilled By Burnham Fox
Mfg. Des. Drill CME 850 12TV
Inspected By: Douglas R. Ferris
Classification By: D. R. Ferris
Classification By: _____

Boring Started 3-2-88
Boring Completed 3-4-88

DEPTH 1"=2'	CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER 6" / CORE RECVY	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
3.0'			Per.		Advanced P-size core barrel through 2"-crushed stone and rip rap, to 3.0' Advanced HW casing to 3', cleaned casing to 3' using 3 7/8" roller bit and water	Crushed stone and rip rap
5.0'	S-1	2 3/8	25%	10 6 4 6	Sampled using a 2 3/8" I.D. split spoon sampler advanced from 3.0' to 5.0' using a 300 lbs hammer with a 18" drop	Brown cm f SAND and coarse GRAVEL; trace SILT (moist, non-plastic) SW
6.8'					Advanced casing to 6.8' cleaned casing to 6.8	
8.8'	S-2	2 3/8	8%	7 7 6 9	Sampled to 8.8' Advanced casing to 11.8' cleaned casing to 11.8'	Grey SILT and m f SAND; trace CLAY (wet, slightly plastic) SM

GENERAL REMARKS:

Site	Boring No.	Page 3 of 15
Hopkinton Dam	FD 88-1	

DEPTH		CORE/SAMPLE NO.	SIZE	~~DEPTH RANGE~~ Rec	BLOWS PER FT. / ~~CORE RECVY~~	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
11.8'							
13.8'		S-3	2 3/8"	49%	13 12 9 9	Sampled from 11.8' to 13.8' Advanced casing to 16.8' cleaned casing to 16.8'	Soil similar to sample 2 Included shards from rip rap
16.8'							
18.8'		S-4A S-4B	2 3/8"	67%	8 8 3 1	Sampled from 16.8' to 18.8' Advanced casing to 21.8' cleaned casing to 21.8'	Similar Soils Grey Brown c-m f+ SAND; and SILT; little cmf GRAVEL; little CLAY; (moist, slightly plastic) sm-sc
21.8'							
23.5'		S-5	2 3/8"	33%	5 3 4 Refusal	Sampled from 21.8' to 23.5' Advanced casing to 23.5' cleaned casing to 23.5' END OF EXPLORATION 3-2-88	Grey-Brown cmf SAND; some SILT; little cmf GRAVEL; little CLAY (wet, slightly plastic) sm-sc Included rip rap shards
		Run 1	NX	96%		Exploration resume 3-3-88 NX DIAMOND CORE with water from 23.5 to 27.8'	Sound concrete; 1.5" nominal size aggregate; entrapped air present Recovery = 96% Reinforced concrete

Site	Boring No.	Page 4 of 15
Hopkinton Dam	FD 88-1	

DEPTH	1" 2"	CORE/SAMPLE NO.	SIZE	DEPTH RANGE / Rec.	BLOWS PER FT. / CORE RECVY	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
27.8'							–
29.8'		S-6	1 3/8"	83%	See page 6	Sampled from 27.8' to 29.8' using a 1 3/8" I.D. split spoon sampler advanced with a 140 lbs hammer dropping 18" Advanced boring with a 2 15/16" O.D. roller bit and "Clear mud" Drilling fluid to 29.8'	Grey cm-ft SAND; some cm-f GRAVEL; some SILT; trace CLAY (wet, very slightly plastic) SM
31.8'		S-7	1 3/8"	88%	See page 7	Sampled from 29.8' to 31.8' Advanced boring with roller bit to 31.8'	Similar Soils, SM (moist)
33.8'		S-8	1 3/8"	88%	See page 8	Sampled from 31.8' to 33.8' Advanced boring with roller bit to 33.8'	Similar Soils; SM
35.8'		S-9	1 3/8"		See page 9	Sampled from 33.8 to 35.8' Advanced boring with roller bit to 35.8'	Similar Soils; SM
36.6'						Sampling attempted, refusal @ 36.0', Advanced boring to 36.6' with roller bit	COBBLE/possible boulder
37.9'		S-10	NX	90%		NX DIAMOND CORE with from 36.6' to 37.9'	
38.2'						Advanced boring to 38.2' with roller bit	Soil similar to sample 9; SM
39.4'		S-11A	1 3/8"	80%	See page 10	Sampled from 38.2' to 39.7' Advanced boring 40.8' with roller bit	
39.7'		S-11B					Grey SILT; some CLAY (moist, slightly plastic) CL
40.8'							
42.8'		S-12	1 3/8"	75%	See page 11	Sampled from 40.8' to 42.8' Advanced boring to 42.8' using a 2 15/16" O.D roller bit	Grey cm-ft SAND; some cm-f GRAVEL; some SILT; trace CLAY (moist, very slightly plastic) - SM
43.3'		S-13	1 3/8"	50%		Sampled from 42.8' to 43.3' Advanced boring from 42.8 to 44.4 using a 2 15/16" roller bit	Similar soil - SM

Site	Boring No.	Page 5 of 15
Hopkinton Dam	FD 88-1	

DEPTH		CORE/SAMPLE NO.	SIZE	~~DEPTH RANGE~~ Rec	~~CORE RECVY~~ BLOWS PER FT.	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
44.4'							
46.4'		S-14	1 3/8"	90%	See page 12	Sampled from 44.4' to 46.4' EXPLORATION TERMINATED @ 46.4' on 3-3-88	Soil similar to Sample 13 - SM

STANDARD PENETRATION TEST

Project Hopkinton Dam NH

Page 6 of 15

Hole No. ED 88-1

Date 3-3-88

Depth of Test 27.0' to 29.8

Blow	Gage Reading (FT.)	Penetration per Blow (FT.)
	0.150	0.150
~~2~~ 4	0.250	0.033
~~3~~ 8	0.350	0.025
~~4~~ 13	0.450	0.020
~~5~~ 18	0.550	0.020
~~6~~ 21	0.650	0.033
~~7~~ 25	0.750	0.025
~~8~~ 30	0.850	0.020
~~9~~ 35	0.950	0.020
~~10~~ 39	1.050	0.025
~~11~~ 43	1.150	0.025
~~12~~ 48	1.250	0.020
~~13~~ 54	1.350	0.017
~~14~~ 60	1.450	0.017
~~15~~ 66	1.550	0.017
~~16~~ 71	1.650	0.020
~~17~~ 76	1.775	0.025
~~18~~ 80	1.875	0.025
~~19~~ 84	1.975	0.025
~~20~~ 86	2.000	0.013

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Hopkinton Dam

Page 7 of 15

Hole No. [illegible]-1

Date 3-2-88

Depth of Test 29.8 to 31.8

Blow	Gage Reading	Penetration per Blow
~~1~~ 2	0.100	0.050
~~2~~ 5	0.200	0.020
~~3~~ 9	0.300	0.025
~~4~~ 12	0.400	0.033
~~5~~ 16	0.500	0.025
~~6~~ 21	0.600	0.020
~~7~~ 26	0.700	0.020
~~8~~ 30	0.800	0.025
~~9~~ 35	0.900	0.020
~~10~~ 39	1.000	0.025
~~11~~ 43	1.100	0.025
~~12~~ 47	1.200	0.025
~~13~~ 53	1.300	0.017
~~14~~ 57	1.400	0.025
~~15~~ 60	1.500	0.033
~~16~~ 64	1.600	0.025
~~17~~ 68	1.700	0.025
~~18~~ 72	1.800	0.025
~~19~~ 77	1.900	0.020
~~20~~ 83	2.000	0.017

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Hopkinton [illegible]

Page 8 of 15

Hole No. [illegible]

Date [illegible]

Depth of Test 31.8 to 33.8

Blow	Gage Reading	Penetration per Blow
	(FT.)	(FT.)
~~1~~ 4	0.100	0.025
~~2~~ 7	0.200	0.033
~~3~~ 10	0.300	0.033
~~4~~ 13	0.400	0.033
~~5~~ 16	0.500	0.033
~~6~~ 20	0.625	0.031
~~7~~ 23	0.725	0.033
~~8~~ 27	0.825	0.025
~~9~~ 31	0.925	0.025
~~10~~ 35	1.025	0.025
~~11~~ 39	1.125	0.025
~~12~~ 44	1.225	0.020
~~13~~ 49	1.325	0.020
~~14~~ 55	1.425	0.017
~~15~~ 60	1.525	0.020
~~16~~ 69	1.625	0.011
~~17~~ 75	1.725	0.017
~~18~~ 81	1.825	0.017
~~19~~ 88	1.925	0.015
~~20~~ 95	2.000	0.011

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Hopkinton Dam 25 Page 9 of 15

Hole No. EP00-1 Date 3-3-88

Depth of Test 33.8 to 35.8

Blow	Gage Reading	Penetration per Blow
~~1~~ 2	0.125	0.063
~~2~~ 5	0.225	0.033
~~3~~ 8	0.325	0.033
~~4~~ 12	0.450	0.031
~~5~~ 17	0.550	0.020
~~6~~ 22	0.650	0.020
~~7~~ 27	0.750	0.020
~~8~~ 32	0.850	0.020
~~9~~ 38	0.950	0.017
~~10~~ 44	1.050	0.017
~~11~~ 50	1.150	0.017
~~12~~ 58	1.250	0.012
~~13~~ 64	1.350	0.017
~~14~~ 70	1.450	0.017
~~15~~ 78	1.550	0.012
~~16~~ 85	1.650	0.014
~~17~~ 93	1.750	0.012
~~18~~ 100	1.850	0.014
~~19~~ 109	1.950	0.011
~~20~~ 115	2.000	0.008

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Hopkinton Dam

Page 10 of 15

Hole No. [illegible]

Date 3-2-88

Depth of Test 38.2 to 39.7

Blow	Gage Reading (FT.)	Penetration per Blow (FT.)
~~1~~ 3	0.100	0.033
~~2~~ 7	0.200	0.025
~~3~~ 12	0.300	0.020
~~4~~ 16	0.400	0.025
~~5~~ 21	0.500	0.020
~~6~~ 25	0.600	0.025
~~7~~ 29	0.700	0.025
~~8~~ 35	0.800	0.017
~~9~~ 39	0.900	0.025
~~10~~ 43	1.000	0.025
~~11~~ 47	1.100	0.025
~~12~~ 51	1.200	0.025
~~13~~ 53	1.300	0.050
~~14~~ 57	1.400	0.025
~~15~~ 60	1.500	0.023
~~16~~ 65	1.525	0.005
17		
18		
19		
20		

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Hopkinton Dam NH

Page 11 of 15

Hole No. ED 88-1

Date 3-2-88

Depth of Test 40.8 to 42.8

Blow	Gage Reading (FT.)	Penetration per Blow (FT.)
~~1~~ 1	0.100	0.100
~~2~~ 5	0.200	0.020
~~3~~ 11	0.300	0.017
~~4~~ 19	0.400	0.012
~~5~~ 25	0.500	0.017
~~6~~ 31	0.600	0.017
~~7~~ 37	0.700	0.017
~~8~~ 45	0.800	0.012
~~9~~ 52	0.900	0.014
~~10~~ 61	1.000	0.011
~~11~~ 73	1.100	0.008
~~12~~ 91	1.200	0.005
~~13~~ 107	1.300	0.006
~~14~~ 119	1.400	0.008
~~15~~ 132	1.500	0.008
~~16~~ 146	1.600	0.007
~~17~~ 161	1.700	0.007
~~18~~ 175	1.800	0.007
~~19~~ 189	1.900	0.007
~~20~~ 211	2.000	0.005

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project [illegible]

Page 12 of 15

Hole No. FD 88-1

Date [illegible]

Depth of Test 44.4 to 46.4

Blow	Gage Reading (FT)	Penetration per Blow (FT)
1 5	0.100	0.020
2 12	0.200	0.014
3 20	0.300	0.012
4 30	0.400	0.010
5 39	0.500	0.011
6 51	0.600	0.008
7 63	0.700	0.008
8 78	0.800	0.006
9 93	0.900	0.006
10 112	1.000	0.005
11 129	1.100	0.005
12 145	1.200	0.006
13 161	1.300	0.006
14 172	1.400	0.009
15 181	1.500	0.011
16 194	1.600	0.007
17 222	1.700	0.005
18 245	1.800	0.004
19 275	1.900	0.003
20 317	2.000	0.002

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

PZ #11

page 13 of 15

Site: Hopkinton Dam, NH

Boring No: FD-88-1

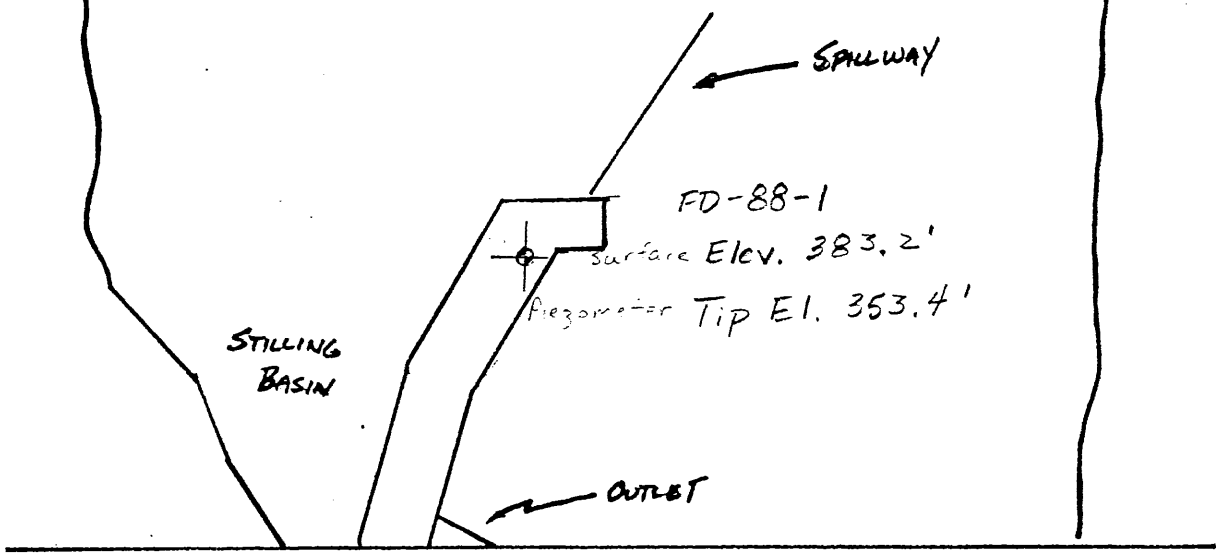
SUBSURFACE WATER OBSERVATIONS

Surface Elevation: 383.2'

DATE	TIME	DEPTH-BOT. OF CASING	DEPTH-BOT. OF BORING	DEPTH TO WATER	ELEVATION WATER	REMARKS
3-15-88			34.2'	17.8'	365.4'	366.2'
3-16-88			34.2'	17.8'	365.4'	
3-23-88			34.2'	18.6'	364.6'	365.4
3-25-88			34.2'	18.6'	364.6'	365.4
3-28-88			34.2'	16.8'	366.4'	367.2
3-29-88			34.2'	15.5'	367.7'	368.1
4-1-88			34.2'	14.8	368.4'	369.2

Note: Depths are in feet below original ground

BORING LOCATION SKETCH



ROUTE 127

PIEZOMETER INSTALLATION REPORT

PROJECT: Hopkinton Dam, NH | DATE: 4-1-88

LOCATION (STA): | OFFSET FROM CENTER LINE: | PIEZ NO.: FD88-1

PIEZ TYPE: Casagrande | DEPTH OF PIEZ: 29.8 | RISER PIPE DIAM: 3/4" I.D.

PIEZ TIP SET IN (SOIL TYPE): SM | SOIL SAMPLE NO.: S-6 | BORING DIAM: 2 15/16"

METHOD OF INSTALLATION: Rotary wash boring

TYPE OF PROTECTION FOR PIEZ: 4" steel casing | VENT: screw on cap

GROUND ELEV.: 383.2' | ELEV. TOP OF RISER: 384.0' | ELEV PIEZ TIP: 353.4'

FILTER: Ottawa Sand | FROM ELEV: 357.8 | TO ELEV: 349.8'

SEAL: bentonite pellets | FROM ELEV: 359.7' | TO ELEV: 357.8'

INSTALLED BY: Burnham & Fox | CONTRACT NO.: D.0.0004 | FOREMAN: D. Ferris

DATE OF INSTALLATION: 3-1-88 | DATE OF OBSERVATIONS: 4-1-88

METHOD OF TESTING PIEZ.: Falling head test

TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET
	0.5	2.0		20.0	14.4			
	1.0	4.5		30.0	14.5			
	3.0	9.0						
	5.0	12.7						
	10.0	13.6						

REMARKS:

Water reading taken prior to falling head test was 14.8'

Jeff King, Doug Ferris
INSPECTOR

ATLANTIC TESTING LABORATORIES, LIMITED

PIEZOMETER INSTALLATION DETAIL

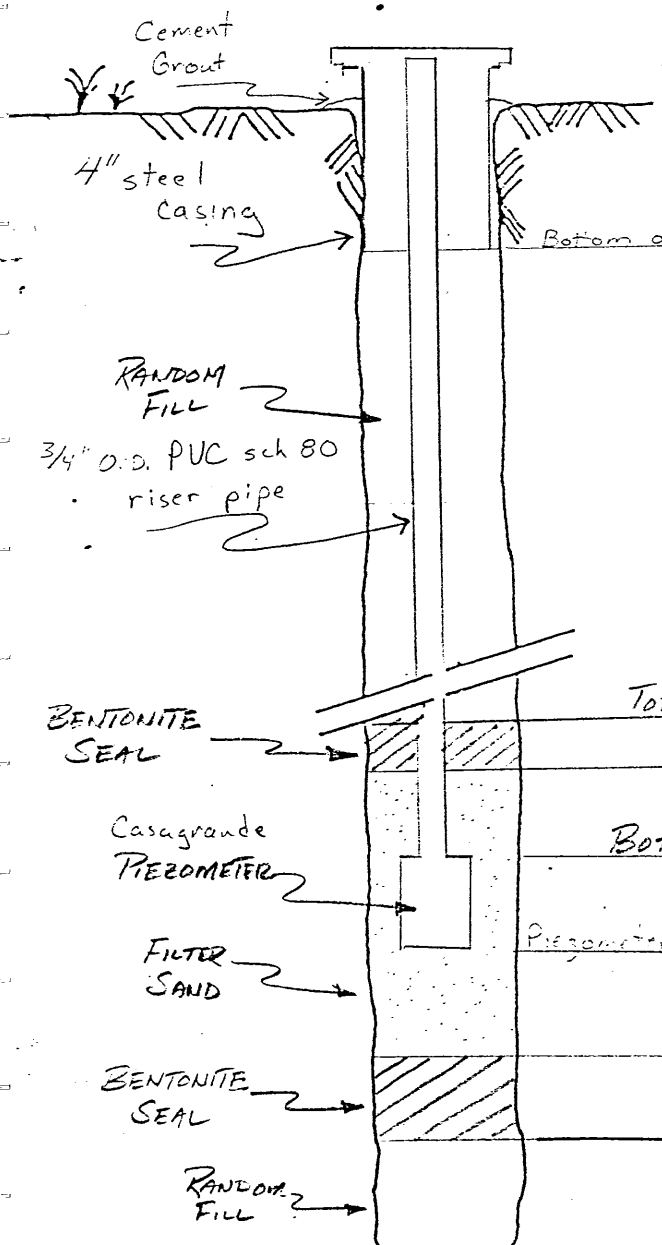
PROJECT: Hopkinton Dam / HOPKINTON, NH

PROJECT NO. D.O. #0004

ATL No. CD029

PIEZOMETER No. FD-88-1

ELEVATION 384.1' top of pipe
384.0' top of PVC



SURFACE ELEVATION 383.2	DEPTH	SOIL STRATA
		Gravelly SAND SW
Bottom of Casing 378.3	4.9'	
	5.0'	Sandy Silt SM
	11.8'	Sandy Silt SM-SC
Top of Footing 359.7	23.5'	CONCRETE
357.8	25.4'	
BOTTOM OF Footing 355.4	27.8'	Sandy Silt SM
Piezometer Tip 353.4	29.8'	
349.0	34.2'	
345.7	37.5'	
	39.4'	
	39.7'	Clayey Silt CL
336.8	46.4'	Sandy Silt SM

CORPS OF ENGINEERS, U. S. ARMY
NEW ENGLAND DIVISION
FOUNDATION AND MATERIALS BRANCH

FIELD LOG OF TEST BORING

PROJECT NO. D.O. 0004

Site Hopkinton Dam IH

Page 1 of 22 Pages

Hole No. FD88-2 "C" Diam. (Casing) HW (4")

Boring Started 8, March 88

Co-ordinates: N _____ E _____

Boring Completed 10, March 88

Drilled by Burnham & Fox

Report Submitted 12, April 88

Purpose of Exploration To determine subsurface conditions

Elevation Top of Hole 384.2 M.S.L.

Total Overburden Drilled 61.5 Feet

Elevation Top of Rock NA M.S.L.

Elevation Bottom of Hole 322.2 M.S.L.

Total ~~Rock~~ Concrete Drilled 4.7 Feet

Total Depth of Hole 62.0 Feet

Core Recovered _____ %

Core Recovered _____ Ft.; NX Diam. 2 1/8 In.

Soil Samples 2 3/8 In. Diam. 5 No.

Soil Samples 1 3/8 In. Diam. 11 No.

Casing Left in Place 5 Feet

Water Table Depth 13.8 ft (4-1-88)

Depth From	Depth To	Method of Drilling and Type of Bit Used
0	3.0'	"P" size Diamond Bit Core
0	31.3	Spun HW (4") casing
7.5'	31.3'	Sampled with 2 3/8" I.D. sampler @ 5' intervals
31.3'	36.0'	NX DIAMOND CORE
33.1	62.0	2 15/16" roller bit
36.0	60.0	Continuous sampling with 1 3/8" I.D. sampler

INDEX

Ground Water _____ Back of Page _____
Boring Location Sketch _____ Back of Page _____
Overburden Record page 2 thru Page 6
Rock Drilling _____ Page _____
Subsurface water observations Page 20
Boring Location Sketch Page 20
Piezometer Installation Report Page 21
[illegible] Page 22

Prepared by Jeff King

Field Data

Lab. Data

Submitted by Ashworth Testing Laboratories, Limited

NED FORM DEC 63 121

REPLACES EDITION OF JUN 51 WHICH MAY BE USED UNTIL EXHAUSTED

U. S. ARMY
CORPS OF ENGINEERS
NEW ENGLAND DIVISION

FIELD LOG OF TEST BORING

Site Hopkinton Dam — Page 2 of 22 Pages

Boring No. FD88-2 Desig. C Diam. (Casing) HW (4")

Co-ordinates: N _____ E _____

Elevation Top of Boring 384.2 M.S.L.
Total Overburden Drilled 62.0 Feet
Elevation Top of Rock NA M.S.L.
Total ~~Rock~~ Concrete Drilled 4.7 Feet
Elevation Bottom of Boring 322.2 M.S.L.
Total Depth of Boring 61.5 Feet
Core Recovered ____ % No. Boxes ____
Core Recovered ____ Ft: NX Diam. 2 1/8 In.
Soil Samples 2 3/8 In. Diam. 5 No.
Soil Samples 1 3/8 In. Diam. 11 No.

Hammer Wt. 300/140 Boring Started 3-8-88
Hammer Drop 18"/30" Boring Completed 3-10-88
Casing Left 5 ft
~~Subsurface~~ Water Data ____ Page ____
Obs. Well ____
Drilled By Burnham & Fox
Mfg. Des. Drill CME 850
Inspected By: Jeff King
Classification By: Jeff King
Classification By: ____

DEPTH 1"=2'	CORE/SAMPLE NO.	SIZE	~~DEPTH RANGE~~	~~CORE RECVY~~	BLOWS PER FT.	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
3.0'			Rec			"P" size diamond bit coring through boulders (Rip Rap) Advanced core barrel to 3'	Rip - Rap
7.5'						Advanced HW (4") casing to 7.5'; Clean casing to 7.5' using a 3 7/8" roller bit and water	
9.5'	S-1	2 3/8"	40%		32 44 22 22	Sampled from 7.5' to 9.5 with a 2 3/8" I.D. sampler advanced with a 300 lbs hammer dropping 18" Advanced casing to 12.5' Clean casing to 12.5'	Grey SILT; and c-m f+ SAND; little m f+ GRAVEL trace CLAY; (dry; vsp)

GENERAL REMARKS:

NED FORM MAR 71 58(Test)

Boring No. FD 88-2

Site	Boring No.	Page 3 of 22
Hopkinton Dam	FD 88-2	

DEPTH 1" 2'	CORE/SAMPLE NO.	SIZE	~~DEPTH RANGE~~ Rec	BLOWS PER FT. / CORE RECVY	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
12.5'						
14.5'	S-2	2 3/8"	50%	.21 23 26 30	Sampled from 12.5' to 14.5' Advanced casing to 17.5' Cleaned casing to 17.5'	Similar Soil, some cm+ GRAVEL
17.5'						
19.5'	S-3	2 3/8"	79%	56 43 39 37	Sampled from 17.5' to 19.5' Advanced casing to 22.5' Cleaned casing to 22.5'	Similar Soil, slight color change to brownish grey
22.5'						
24.5'	S-4	2 3/8"	10%	25 40 29 30	Sampled from 22.5' to 24.5 Advanced casing to 27.5' Cleaned casing to 27.5'	A piece of coarse GRAVEL wedged in the end of the sampler preventing any sample other than coarse gravel from entering spoon

Site	Boring No.	Page 4 of 22
Hopkinton Dam	FD 88-2	

DEPTH		CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT. 6" / CORE RECVY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
27.5'					–		
29.5'		S-5	2 3/8"	40%	14 9 10 22	Sampled from 27.5 to 29.5' Advanced casing to 31.3' Cleaned casing to 31.3'	Soil Similar to sample (moist)
31.3'						Note: 31.3' is top of concrete END OF EXPLORATION 3-8-88	
36.0'		R-1	NX			EXPLORATION CONTINUED 3-9-8 NX DIAMOND CORE	Concrete (Reinforced)
37.0'		S-6A	1 3/8	80%	see page 7	Sampled from 36.0' to 38.0' Advanced 2 15/16" O.D. roller bit to 38.0' using "Clear Mud" as a drilling fluid	Grey cm-f+ SAND; little m+ GRAVEL; some SILT; trace CLAY, (moist, usp) SM-SC
38.0'		S-6B					Similar soil; softer portion of sample ; SM-SC
39.7'		S-7A	1 3/8	80%	see page 8	Sampled from 38.0' to 40.0' Advanced roller bit to 40.0'	Similar Soil; SM-SC
40.0'		S-7B					Grey fine SAND and SILT; trace CLAY; (moist, very slightly plastic) varved - SM
42.0'		S-8	1 3/8"	88%	see page 9	Sampled from 40.0 to 42.0'	Soil Similar to sample 7-A; SM-SC
						Sampling attempted @ 42.0 encounter cobble. Advanced boring to 44.0' using roller bit	Cobble

Site	Boring No.	Page 5 of 22
Hopkinton Dam	FD 88-2	

DEPTH	1" : 2'	CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT. / CORE RECVY	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
44.0' – 46.0'		S-9	1 3/8"	see	79%	see page 11	Sampled from 44.0' to 46.0' Advanced boring to 46.0' using roller bit	Soil similar to sample; sm-sc
46.0' – 47.8'		S-10	1 3/8"	63%	see page 12	Sampled from 46.0' to 47.8' Advanced boring to 48' using roller bit	Similar soil; sm-sc
48.0' – 50.0'		S-11	1 3/8"	67%	see page 13	Sampled from 48.0' to 50.0' Advanced boring to 50' using roller bit	Grey fine SAND, and varved SILT; trace CLAY (moist, usp) - sm-sc Note: vertical seam between SAND and varved SILT. Primarily SAND at bottom of spoon
50.0' – 52.0'		S-12	1 3/8"	67%	see page 14	Sampled from 50.0' to 52.0' Advanced boring to 50' using roller bit	Grey f SAND; little SILT (moist, non-plastic) sp
52.0' – 54.0'		S-13	1 3/8"	88%	see page 15	Sampled from 52.0 to 54.0' Advanced boring to 54.0' using roller bit	Grey cmf SAND; little mf GRAVEL; little SILT; trace CLAY (moist, usp) SM-sc
54.0' – 56.0'		S-14	1 3/8"	67%	see page 16	Sampled from 54.0 to 56.0' Advanced boring to 56.0' using roller bit Note: hole started to cave-in	Similar soil; sm-sc
56.0' – 58.0'		S-15	1 3/8"	60%	see page 17	Sampled from 56.0 to 58.0' Note: hole partially collapsed	Similar soils; sm-sc
						END OF EXPLORATION 3-9-88	Grey cmf SAND; little SILT (moist, np) - sw
							Grey f SAND; some SILT (moist, n.p.); SP-SM
							Grey cmf SAND; little SILT (moist, N.P.) SP-SM
58.0' – 60.0'		S-16	1 3/8"	75%	see page 18	EXPLORATION CONTINUED 3-10-88 Advanced boring to 58.0' using 2 15/16" roller bit and clear mud drilling fluid Sampled from 58.0' to 60.0	Grey cmf SAND; little SILT; trace GRAVEL (moist, N.P.) SW-SM
60.0' –				0%	see page 19	Sampled from 60.0' to 62; coarse gravel	Coarse gravel and possible cobbles

Site	Boring No.	Page 6 of 22
Hopkinton Dam	FD 88-2	

DEPTH		CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT / CORE RECVY	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
62'						wedged in spoon preventing sample recovery Advanced Boring to 62.0' using roller bit Note: drillers felt that gravel layer exists from approximately 59.8'-60.5'; -also the hole would not stay open even with the use of Clear mud below 61.5' Exploration was terminated 3-10-88 at 62.0'	

STANDARD PENETRATION TEST

Project Hopkinton Dam N.H. Page 7 of 22

Hole No. ED 22-2 Date 3-9-88

Depth of Test 36.0 to 38.0'

Blow	Gage Reading	Penetration per Blow
1 3	0.1	0.033
2 8	0.2	0.020
3 14	0.3	0.017
4 20	0.4	0.017
5 27	0.5	0.014
6 32	0.6	0.020
7 38	0.7	0.017
8 45	0.8	0.014
9 54	0.9	0.011
10 62	1.0	0.012
11 69	1.1	0.014
12 77	1.2	0.012
13 86	1.3	0.011
14 98	1.4	0.008
15 108	1.5	0.010
16 119	1.6	0.009
17 131	1.7	0.008
18 143	1.8	0.008
19 152	1.9	0.011
20 166	2.0	0.007

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Hopkinton Dam

Page 8 of 22

Hole No. ED 88-2

Date 9 March 88

Depth of Test 38.0' to 40.0'

Blow			Gage Reading	Penetration per Blow
5	1	5	0.1	0.020
8	2	13	0.2	0.0125
9	3	22	0.3	0.011
6	4	28	0.4	0.018
6	5	34	0.5	0.018
6	6	40	0.6	0.018
7	7	47	0.7	0.014
7	8	54	0.8	0.014
6	9	60	0.9	0.018
10	10	70	1.0	0.010
8	11	78	1.1	0.0125
6	12	84	1.2	0.018
7	13	91	1.3	0.0142
8	14	99	1.4	0.0125
7	15	106	1.5	0.014
7	16	113	1.6	0.014
9	17	122	1.7	0.011
10	18	132	1.8	0.010
9	19	141	1.9	0.010
8	20	149	2.0	0.013

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Hopkinton Dam NH

Page 9 of 22

Hole No. FD-88-2

Date 3-9-88

Depth of Test 40.0' to 42.0'

Blow			Gage Reading	Penetration per Blow
2	1	2	0.1	0.050
3	2	5	0.2	0.032
5	3	10	0.3	0.020
7	4	17	0.4	0.014
5	5	22	0.5	0.020
3	6	25	0.6	0.033
4	7	29	0.7	0.025
4	8	33	0.8	0.25
4	9	37	0.9	0.25
8	10	45	1.0	0.013
12	11	57	1.1	0.008
11	12	68	1.2	0.009
10	13	78	1.3	1.010
12	14	90	1.4	0.008
8	15	98	1.5	0.013
9	16	107	1.6	0.011
9	17	116	1.7	0.011
9	18	125	1.8	0.011
12	19	137	1.9	0.008
10	20	147	2.0	0.010

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Hopkinton Dam N.H. Page 10 of 22

Hole No. FD 88-2 Date 3-0-00

Depth of Test 42' to 42.6'

Blow	Gage Reading	Penetration per Blow
5 1 5	0.1	0.020
10 2 15	0.2	0.010
10 3 25	0.3	0.010
18 4 43	0.4	0.005
17 5 60	0.5	0.006
28 6 88	0.6	0.003
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Hooksett Dam NH

Page 11 of 22

Hole No. FD 09-2

Date 3-9-88

Depth of Test 44' to 46'

Blow	Gage Reading	Penetration per Blow
		0.050
2 1 2	0.1	0.020
2 2 7	0.2	0.020
5 3 12	0.3	0.020
6 4 18	0.4	0.017
6 5 24	0.5	0.017
8 6 32	0.6	0.013
10 7 42	0.7	0.010
10 8 52	0.8	0.010
9 9 61	0.9	0.011
9 10 70	1.0	0.011
10 11 80	1.1	0.010
9 12 89	1.2	0.011
14 13 103	1.3	0.007
22 14 125	1.4	0.005
14 15 139	1.5	0.007
13 16 152	1.6	0.008
13 17 165	1.7	0.008
10 18 175	1.8	0.010
11 19 186	1.9	0.009
11 20 197	2.0	0.009

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Hopkinton Dam N.H. Page 12 of 22

Hole No. FD 89-2 Date 2-2-88

Depth of Test 46.0' to 47.8'

Blow	Gage Reading	Penetration per Blow
2 1 2	0.1	0.050
3 2 5	0.2	0.033
6 3 11	0.3	0.017
7 4 18	0.4	0.014
6 5 24	0.5	0.021
7 6 31	0.6	0.014
7 7 38	0.7	0.014
8 8 46	0.8	0.013
8 9 54	0.9	0.013
7 10 61	1.0	0.014
8 11 69	1.1	0.013
8 12 77	1.2	0.013
9 13 86	1.3	0.011
8 14 95	1.4	0.013
10 15 105	1.5	0.010
10 16 115	1.6	0.010
14 17 129	1.7	0.007
17 18 146	1.8	0.006
10 19 156	1.9	0.010
20		

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Atach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Hopkinton Dam NH

Page 13 of 22

Hole No. FD 88-2

Date 8-9-88

Depth of Test 48' to 50'

Blow			Gage Reading	Penetration per Blow
1	1	1	0.1	1.10
3	2	4	0.2	0.033
3	3	7	0.3	0.033
6	4	13	0.4	0.016
3	5	16	0.5	0.033
3	6	19	0.6	0.033
5	7	24	0.7	0.020
4	8	28	0.8	0.025
4	9	32	0.9	0.025
4	10	36	1.0	0.025
6	11	42	1.1	0.016
6	12	48	1.2	0.016
7	13	55	1.3	0.014
6	14	61	1.4	0.016
8	15	69	1.5	0.013
9	16	78	1.6	0.011
11	17	89	1.7	0.009
11	18	100	1.8	0.009
10	19	110	1.9	0.010
8	20	118	2.0	0.013

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Atrach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Hopkinton Dam NH

Page 14 of 22

Hole No. FD 88-2

Date 3-9-88

Depth of Test 50' to 52'

Blow			Gage Reading	Penetration per Blow
1	1	1	0.1	0.100
3	2	4	0.2	0.033
2	3	6	0.3	0.050
4	4	10	0.4	0.025
3	5	13	0.5	0.033
5	6	18	0.6	0.020
5	7	23	0.7	0.020
4	8	27	0.8	0.025
5	9	32	0.9	0.020
6	10	38	1.0	0.016
4	11	42	1.1	0.025
7	12	49	1.2	0.014
9	13	58	1.3	0.011
8	14	64	1.4	0.013
8	15	72	1.5	0.013
8	16	80	1.6	0.013
12	17	92	1.7	0.008
12	18	104	1.8	0.008
14	19	118	1.9	0.007
14	20	132	2.0	0.007

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Hopkinton Dam NH

Page 15 of 22

Hole No. ED88-2

Date 3-9-88

Depth of Test 52' to 54'

Blow	Gage Reading	Penetration per Blow
7 1 7	0.1	0.014
10 2 17	0.2	0.010
11 3 28	0.3	0.009
11 4 39	0.4	0.009
14 5 53	0.5	0.007
13 6 66	0.6	0.008
13 7 79	0.7	0.008
14 8 93	0.8	0.007
12 9 105	0.9	0.008
10 10 115	1.0	0.010
11 11 126	1.1	0.009
9 12 135	1.2	0.011
5 13 140	1.3	0.020
9 14 149	1.4	0.011
11 15 160	1.5	0.009
15 16 175	1.6	0.007
10 17 185	1.7	0.010
9 18 194	1.8	0.011
10 19 204	1.9	0.010
8 20 212	2.0	0.013

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Hopkinton Dam NH Page 16 of 22

Hole No. FD 88-2 Date 3-9-88

Depth of Test 54' to 56'

Blow	Gage Reading	Penetration per Blow
1 1 1	0.1	0.10
1 2 2	0.2	0.10
4 3 6	0.3	0.025
7 4 13	0.4	0.014
6 5 19	0.5	0.017
8 6 27	0.6	0.013
7 7 34	0.7	0.014
8 8 42	0.8	0.013
10 9 52	0.9	0.010
9 10 61	1.0	0.011
10 11 71	1.1	0.010
10 12 81	1.2	0.010
12 13 93	1.3	0.008
13 14 106	1.4	0.009
12 15 118	1.5	0.008
11 16 129	1.6	0.009
11 17 140	1.7	0.009
12 18 152	1.8	0.008
12 19 164	1.9	0.008
11 20 175	2.0	0.009

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Hopkinton Dam N.H. Page 17 of 22

Hole No. ED 88-2 Date 3-9-88

Depth of Test 56' to 58'

Blow	Gage Reading	Penetration per Blow
4 1 4	0.1	0.025
5 2 9	0.2	0.020
10 3 19	0.3	0.010
13 4 32	0.4	0.007
11 5 43	0.5	0.009
11 6 54	0.6	0.009
12 7 66	0.7	0.008
12 8 78	0.8	0.009
14 9 92	0.9	0.007
11 10 103	1.0	0.009
9 11 112	1.1	0.01[illegible]
10 12 122	1.2	0.010
9 13 131	1.3	0.011
9 14 140	1.4	0.011
10 15 150	1.5	0.010
10 16 160	1.6	0.010
11 17 171	1.7	0.009
12 18 183	1.8	0.008
12 19 195	1.9	0.008
14 20 209	2.0	0.007

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Hopkinton Dam 114 Page 18 of 22

Hole No. FD 88-2 Date 3-10-88

Depth of Test 58' to 60'

Blow	Gage Reading	Penetration per Blow
2 1 2	0.1	0.050
3 2 5	0.2	0.033
4 3 9	0.3	0.025
7 4 16	0.4	0.014
6 5 22	0.5	0.017
16 6 38	0.6	0.006
15 7 53	0.7	0.007
19 8 72	0.8	0.005
19 9 91	0.9	0.005
20 10 111	1.0	0.005
16 11 127	1.1	0.006
9 12 136	1.2	0.011
13 13 149	1.3	0.008
16 14 165	1.4	0.006
16 15 181	1.5	0.006
15 16 196	1.6	0.007
17 17 213	1.7	0.006
19 18 232	1.8	0.005
18 19 250	1.9	0.006
17 20 267	2.0	0.006

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Harbor [illegible] 14 Page 19 of 22

Hole No. [illegible] Date [illegible]

Depth of Test 60.0 to 62.0

Blow	Gage Reading	Penetration per Blow
3 1 3	0.1	0.022
3 2 6	0.2	0.022
12 3 18	0.3	0.008
19 4 37	0.4	0.005
18 5 55	0.5	0.006
22 6 77	0.6	0.005
18 7 95	0.7	0.006
16 8 111	0.8	0.006
12 9 123	0.9	0.008
14 10 137	1.0	0.007
11 11 148	1.1	0.009
12 12 160	1.2	0.008
9 13 169	1.3	0.01[illegible]
12 14 182	1.4	0.008
11 15 193	1.5	0.009
12 16 205	1.6	0.008
14 17 219	1.7	0.007
14 18 233	1.8	0.007
15 19 248	1.9	0.007
14 20 262	2.0	0.007

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

PZ #10

Site: Hopkinton Dam, NH

Boring No: FD 88-2

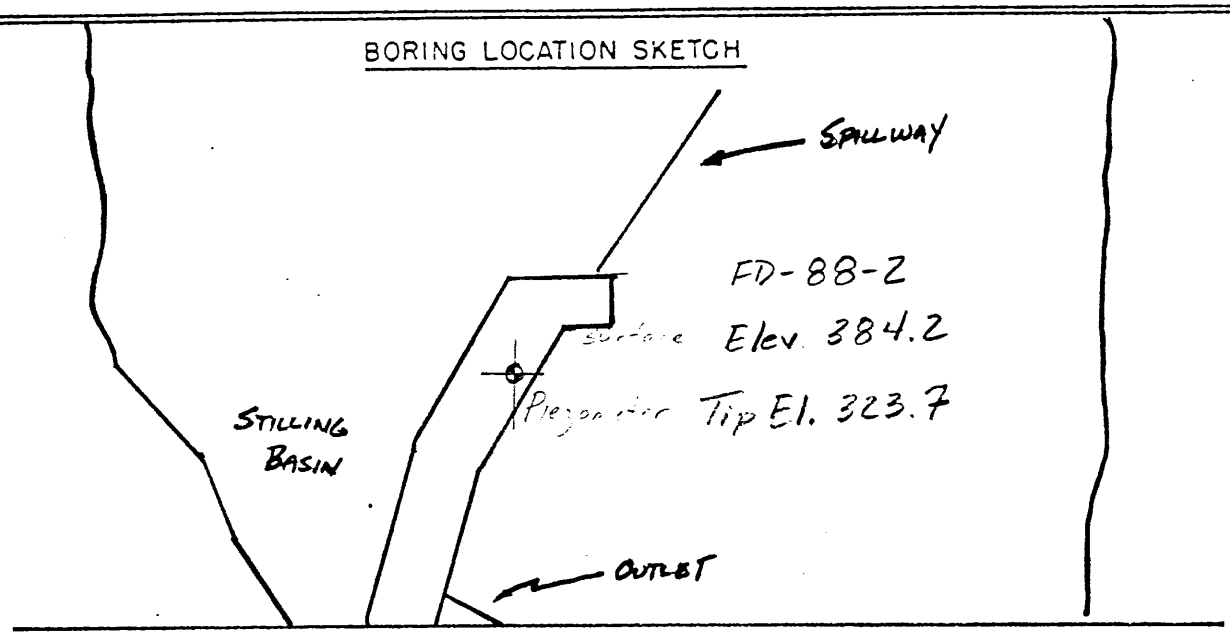
SUBSURFACE WATER OBSERVATIONS

Surface elevation 384.2'

DATE	TIME	DEPTH-BOT. OF ~~CASING~~ Piezometer	DEPTH-BOT. OF BORING	DEPTH TO WATER	ELEVATION WATER	REMARKS
3-15-88		60.5	62.0'	15.8'	368.4'	368.8'
3-16-88			62.0'	15.8'	368.4'	368.8
3-23-88			62.0'	16.0'	368.2'	368.6
3-25-88			62.0'	16.0'	368.2'	368.6
3-28-88			62.0'	14.7'	369.5'	369.9 371.1
3-29-88			62.0'	14.0'	370.2'	370.6 ~~370.7~~ NED
4-1-88			62.0'	13.8	370.4'	370.8

Note: Depths are in feet below original ground

BORING LOCATION SKETCH



ROUTE 127

PIEZOMETER INSTALLATION REPORT

PROJECT: Hopkinton Dam, NH | DATE: 4-1-88

LOCATION (STA): | OFFSET FROM CENTER LINE: | PIEZ NO.: FD 88-2

PIEZ TYPE: Casagrande | DEPTH OF PIEZ: 60.5' | RISER PIPE DIAM: 3/4" I.D.

PIEZ TIP SET IN (SOIL TYPE): SP-SM | SOIL SAMPLE NO.: S-16 | BORING DIAM: 2 15/16"

METHOD OF INSTALLATION: Rotary-wash boring

TYPE OF PROTECTION FOR PIEZ: 4" steel casing | VENT: screw on cap

GROUND ELEV.: 384.2 | ELEV. TOP OF RISER: 384.6 | ELEV PIEZ TIP: 323.7'

FILTER: # Ottawa Sand | FROM ELEV: 322.2' | TO ELEV: 337.5'

SEAL: bentonite pellets | FROM ELEV: 337.5' | TO ELEV: 339.2'

INSTALLED BY: Burnham & Fox | CONTRACT NO.: D.O. 0004 | FOREMAN: Jeff King

DATE OF INSTALLATION: 3-10-88 | DATE OF OBSERVATIONS: 4-1-88

METHOD OF TESTING PIEZ.: Falling head test

TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET
	0.5	3.4		20.0	13.3			
	1.0	5.6		30.0	13.5			
	3.0	9.5						
	5.0	11.4						
	10.0	12.7						

REMARKS:

Water reading taken prior to falling head test was 13.8'

Jeff King
INSPECTOR

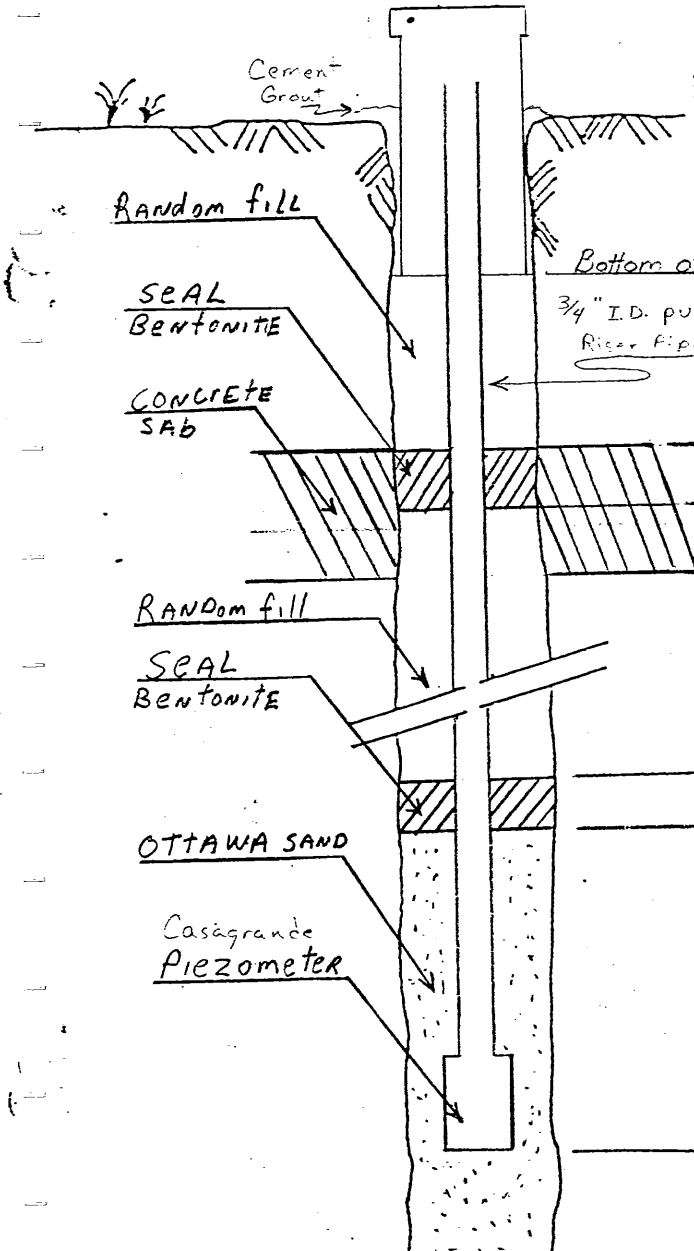
ATLANTIC TESTING LABORATORIES, LIMITED

PIEZOMETER INSTALLATION DETAIL

PROJECT: Hopkinton Dam
Hopkinton NH

PROJECT NO. D.O. # 0004
ATL No. CD 029
PIEZOMETER No. FD-88-2

ELEVATION 384.8 Top of pipe
384.6' Top of PVC



SURFACE ELEVATION	384.2'	DEPTH	SOIL STRATA
			Sandy Silt SM
Bottom of Casing	379.8	4.4'	
	352.9'	31.3'	
	350.9'	33.3'	Concrete (reinforced)
	348.2'	36.0	
			Sandy Silt SM-SC
		39.7'	
		40.0'	Sandy Silt: SM
	339.2'	45.0'	Sandy Silt SM-SC
	337.5'	46.7'	
		49.8'	
		52.0'	Silty Sand SP
		56.5'	Sandy Silt SM-SC
		57.5'	Silty Sand SW
	323.7'	60.5	Silty Sand SP-SM
	322.2	62.0'	

CORPS OF ENGINEERS, U. S. ARMY
NEW ENGLAND DIVISION
FOUNDATION AND MATERIALS BRANCH

FIELD LOG OF TEST BORING

PROJECT NO. D.O. 0004

Site Hopkinton Dam

Page 1 of 17 Pages

Hole No. FD88-3 "E" Diam. (Casing) HW (4")

Boring Started 14, March, 88

Co-ordinates: N _____ E _____

Boring Completed 15, March 88

Drilled by Burnham & Fox

Report Submitted 12, April 88

Purpose of Exploration To determine sub surface conditions

Elevation Top of Hole 384.0 M.S.L.

Total Overburden Drilled 54.0 Feet

Elevation Top of Rock NA M.S.L.

Elevation Bottom of Hole 331.5 M.S.L.

Total ~~Rock~~ CONCRETE Drilled 8.4 Feet

Total Depth of Hole 54.0 Feet

Core Recovered 53.6 %

Core Recovered 4.5 Ft.; NX Diam. 2 1/8 In.

Soil Samples - 2 3/8 In. Diam. 7 No.

Soil Samples - 1 3/8 In. Diam. 5 No.

Casing Left in Place 5 Feet

Water Table Depth 15.5 ft (4-1-88)

Depth From	Depth To	Method of Drilling and Type of Bit Used
0	3.0'	"P" Diamond Core
0	33.6	Spun HW (4") casing
3.0	33.6'	Sampling @ 5' intervals with 2 3/8" I.D. sampler
38.2	54.0	Continuous sampling with 1 3/8" I.D. sampler
33.6	38.2	NX Diamond Core
33.6	52.0	roller bit with 2 15/16" O.D. bit

INDEX

Ground Water _____ Back of Page _____
Boring Location Sketch _____ Back of Page _____
Overburden Record page 2 thru Page 5
Rock Drilling _____ Page _____
Subsurface water observations Page 14
Piezometer Installation Report Page 15
Boring Location sketch Page 14
Piezometer Installation sketch

Prepared by Jeff King
Field Data Lab. Data

Submitted by Atlantic Testing Laboratories

NED FORM DEC 63 121 REPLACES EDITION OF JUN 51 WHICH MAY BE USED UNTIL EXHAUSTED

U. S. ARMY
CORPS OF ENGINEERS
NEW ENGLAND DIVISION

FIELD LOG OF TEST BORING

Site Hopkinton Dam — Page 2 of 17 Pages

Boring No. FD88-3 Desig. E Diam. (Casing) HW (4")

Co-ordinates: N _____ E _____

Elevation Top of Boring 384.0 M.S.L.
Total Overburden Drilled 54.0 Feet
Elevation Top of Rock NA M.S.L.
Total Concrete Rock Drilled 8.4 Feet
Elevation Bottom of Boring 331.5 M.S.L.
Total Depth of Boring 52.5 Feet
Core Recovered 53.6 % No. Boxes _____
Core Recovered 4.5 Ft : NX Diam. 2 1/8 in.
Soil Samples 2 3/8 in. Diam. 7 No.
Soil Samples 1 3/8 in. Diam. 5 No.

Hammer Wt. 300/140 Boring Started 3-14-88
Hammer Drop 18/30 Boring Completed 3-15-88
Casing Left 5 ft
~~Subsurface~~ Water Data _____ Page _____
Obs. Well _____
Drilled By _____
Mfg. Des. Drill Burnham & Fox
Inspected By: Jeff King
Classification By: Jeff King
Classification By: _____

DEPTH 1" = 2'	CORE/SAMPLE NO.	SIZE	~~DEPTH RANGE~~	~~CORE RECVY~~	BLOWS PER FT.	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
			Rec.			Advanced "P" size diamond core bit to 3.0'	Boulders (rip-rap)
3.0'							
	S-1	2 3/8"		50%	9 7 9 15	Sample from 3.0 to 5.0' Advanced HW (4") casing to 7.0' Clean casing to 7.0' using a 3 7/8" O.D. roller bit and water	Brown c+m+f SAND SW GREY SILT; and c-m-f+ SAND; little c-m f GRAVEL; trace CLAY; (moist, usp) sp-sm
5.0'							
7.0'							
	S-2	2 3/8"		75%	14 18 13 14	Sampled from 7.0 to 9.0' Advanced casing to 12.0'; cleaned casing to 12.0'	Similar Soil; SP-SM
9.0'							

GENERAL REMARKS:

Boring No. FD88-3

NED FORM 58 (Test) MAR 71

Site	Boring No.	Page 4 of 17
Hopkinton Dam	FD 88-3	

DEPTH		CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT. / CORE RECVY	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
27.0'		S-6	2 3/8"	Rec. 58%	21 19 18 31	Sampled from 27.0' to 29.0' Advanced casing to 32.0' Cleaned casing to 32.0'	Similar soil; SP-SM
29.0'							
32.0							
33.6'		S-7	2 3/8"	71%	9 7 12 10/1"	Sampled from 32.0' to 33.6' Advanced casing to 33.6' Cleaned casing to 33.6'	Grey c-m f+ SAND; trace m f+ GRAVEL; trace SILT (moist, n.p.) SP-SM
38.2'		R-1	NX	98%		NX DIAMOND CORE with water from 33.6' to 38.2'	CONCRETE (reinforced)
40.2'						Attempted to sample Advanced boring with 2 15/16" roller bit to 40.2'	
42.0'						NX DIAMOND CORE with water from 40.2' to 43.2'	
43.2'							Soil Similar to Sample 7
		S-8	1 3/8"	63%		Sampled from 43.2 to 45.0'	

Site	Boring No.	Page 5 of 17
Hopkinton Dam	FD 88-3	

DEPTH		CORE/SAMPLE NO.	SIZE	~~DEPTH RANGE~~ REC	~~BLOWS PER FT.~~ CORE RECOVY	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
45.0'	1" = 2'			REC	see page 10	Advanced 2 15/16" O.D. roller bit to 46.0'	
46.0'							Cobble or possible boulder
48.0'		S-9	1 3/8"	71%	see page 11	Sampled from 46.0' to 48.0' Advanced boring using 2 15/16" O.D. roller bit to 48.0'	Grey cmf + SAND; trace SILT (moist, N.P.) SP-SM
		S-10A	1 3/8"	58%	see page 12	Sampled from 48.0' to 50.0' Advanced boring using 2 15/16" O.D. roller bit to 50.0'	Similar soil; SP-SM
50.0'		S-10B					Grey cmf. SAND; trace SILT (moist, N.P.); SW-SM
52.0'		S-11	1 3/8"	46%	see page 13	Sampled from 50.0' to 52.0' Advanced boring using 2 15/16" O.D. roller bit and "Clear Mud" drilling fluid to 52.0'	Grey c-m-f + SAND; and SILT (moist, N.P.) SP-SM
52.5		S-12	1 3/8	3%	see page 14	Sampled from 52.0 to 52.5' Exploration Terminated @ 52.5' on 3-15-88	Similar soil; SP-SM

STANDARD PENETRATION TEST

Project Hopkinton Dam N.H. Page 6 of 17

Hole No. FD 88-3 Date 3-15-88

Depth of Test 38.2' to 38.3

Blow	Gage Reading	Penetration per Blow
1 40	0.1	0.003
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Hopkinton Dam NH

Page 7 of 17

Hole No. FD AR-3

Date 3-15-88

Depth of Test 38.5' to 38.7'

Blow	Gage Reading	Penetration per Blow
1 11	0.1	0.009
2 100	0.2	0.001
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Hopkinton Dam UE

Page 8 of 17

Hole No. FD 88-3

Date 3-15-88

Depth of Test 38.7' to 40.0'

Blow	Gage Reading	Penetration per Blow
1 100	0.1	0.001
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Hopkinton Dam NH. Page 9 of 17

Hole No. FD88-3 Date 3-15-88

Depth of Test 40.0' to 40.0'

Blow	Gage Reading	Penetration per Blow
1 50	0.1	0.000
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Hopkinton Dam NH

Page 10 of 17

Hole No. FD 88-3

Date 3-15-88

Depth of Test 43.2' to 45.0'

Blow	Gage Reading	Penetration per Blow
1 1 1	0.1	0.100
3 2 4	0.2	0.073
5 3 9	0.3	0.020
5 4 14	0.4	0.020
4 5 18	0.5	0.030
5 6 23	0.6	0.020
7 7 30	0.7	0.014
8 8 38	0.8	0.012
8 9 46	0.9	0.012
7 10 53	1.0	0.014
10 11 63	1.1	0.010
9 12 72	1.2	0.010
11 13 83	1.3	0.009
10 14 93	1.4	0.010
9 15 102	1.5	0.010
9 16 111	1.6	0.010
15 17 126	1.7	0.007
20 18 146	1.8	0.005
19	1.9	
20	2.0	

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Hopkinton Dam UH

Page 11 of 17

Hole No. FB 82-2

Date 3-15-82

Depth of Test 46' to 48'

Blow	Gage Reading	Penetration per Blow
4 1 4	0.1	0.030
7 2 11	0.2	0.014
9 3 20	0.3	0.011
7 4 27	0.4	0.014
8 5 35	0.5	0.012
10 6 45	0.6	0.010
15 7 60	0.7	0.007
9 8 69	0.8	0.011
14 9 83	0.9	0.007
10 10 93	1.0	0.010
12 11 105	1.1	0.008
9 12 114	1.2	0.011
8 13 122	1.3	0.012
9 14 131	1.4	0.011
10 15 141	1.5	0.010
8 16 149	1.6	0.012
9 17 158	1.7	0.011
9 18 167	1.8	0.011
9 19 176	1.9	0.011
12 20 188	2.0	0.008

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project [illegible] Page 12 of 17

Hole No. FL 89-2 Date 3-15-92

Depth of Test 48' to 50'

Blow	Gage Reading	Penetration per Blow
3 1 3	0.1	0.033
6 2 9	0.2	0.016
3 3 12	0.3	0.033
3 4 15	0.4	0.033
4 5 19	0.5	0.030
3 6 22	0.6	0.033
4 7 26	0.7	0.030
5 8 31	0.8	0.030
6 9 37	0.9	0.016
10 10 47	1.0	0.010
7 11 54	1.1	0.014
10 12 64	1.2	0.010
10 13 74	1.3	0.010
9 14 83	1.4	0.011
9 15 92	1.5	0.011
10 16 102	1.6	0.010
11 17 113	1.7	0.009
12 18 125	1.8	0.008
13 19 138	1.9	0.008
13 20 151	2.0	0.008

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Hopkinton Dam UH

Page 13 of 17

Hole No. FD 88-3

Date 3-15-88

Depth of Test 50' to 52'

Blow	Gage Reading	Penetration per Blow
3 1 3	0.1	0.033
2 2 5	0.2	0.050
2 3 7	0.3	0.050
2 4 9	0.4	0.050
2 5 11	0.5	0.050
3 6 14	0.6	0.033
2 7 16	0.7	0.050
4 8 20	0.8	0.030
5 9 25	0.9	0.020
6 10 31	1.0	0.012
6 11 37	1.1	0.012
7 12 44	1.2	0.014
7 13 51	1.3	0.014
7 14 58	1.4	0.014
10 15 68	1.5	0.010
11 16 79	1.6	0.009
12 17 91	1.7	0.008
14 18 105	1.8	0.007
14 19 119	1.9	0.007
16 20 135	2.0	0.006

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Hopkinton Dam NH

Page 14 of 17

Hole No. FD88-3

Date 3-15-88

Depth of Test 52' to 52.5'

Blow	Gage Reading	Penetration per Blow
4 1 4	0.1	0.030
7 2 11	0.2	0.014
12 3 23	0.3	0.008
28 4 51	0.4	0.004
15 5 66	0.5	0.007
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

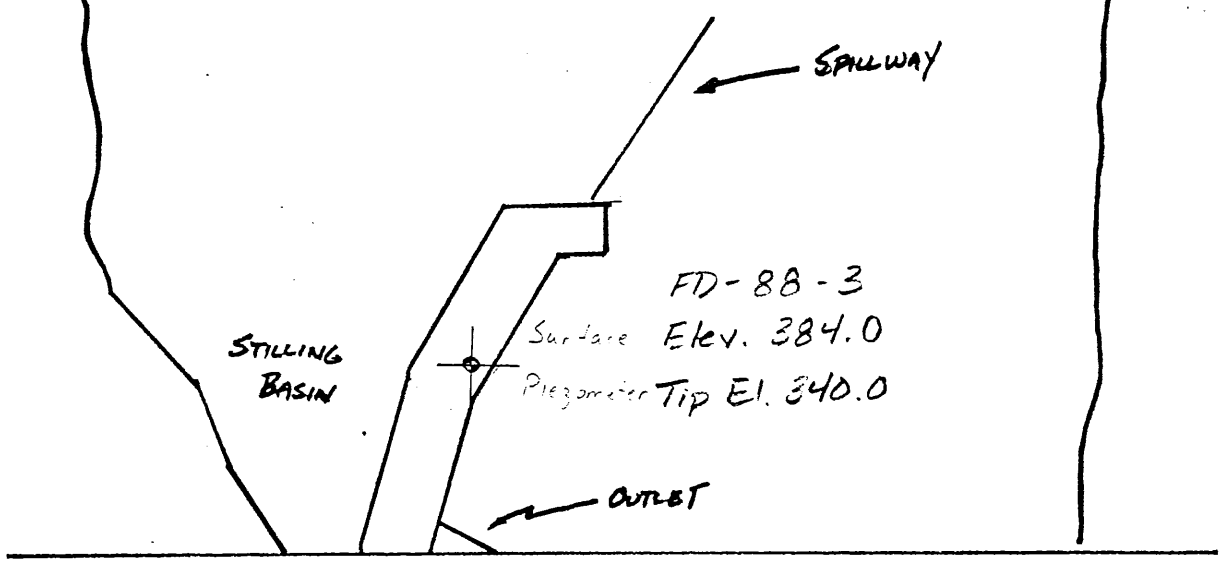
Site: Hopkinton Dam NH
Boring No: FD 88-3

SUBSURFACE WATER OBSERVATIONS
Surface elevation 384.0'

DATE	TIME	DEPTH-BOT. OF ~~CASING~~ Piezometer	DEPTH-BOT. OF BORING	DEPTH TO WATER	ELEVATION WATER	REMARKS
3-15-88		44.0'	47.0'	15.1'	368.9'	369.2
3-23-88		44.0	47.0'	19.6'	364.4'	364.7
3-25-88		44.0	47.0'	19.6'	364.4'	364.7
3-28-88		44.0	47.0	18.0'	366.0'	366.3 367.8
3-29-88		44.0	47.0'	16.8'	367.2'	367.5 ~~367.5~~ NED
4-1-88		44.0	47.0	15.5'	368.5	368.8

Note: Depths are in feet below original ground

BORING LOCATION SKETCH



ROUTE 127

PIEZOMETER INSTALLATION REPORT

PROJECT: Hopkinton Dam, NH | DATE: 4-1-88

LOCATION (STA): | OFFSET FROM CENTER LINE: | PIEZ NO.: FD 88-3

PIEZ TYPE: Casagrande | DEPTH OF PIEZ: 44.0' | RISER PIPE DIAM: 3/4" I.D.

PIEZ TIP SET IN (SOIL TYPE): SP-SM | SOIL SAMPLE NO.: S-8 | BORING DIAM: 2 15/16"

METHOD OF INSTALLATION: rotary-wash boring

TYPE OF PROTECTION FOR PIEZ: 4" steel casing | VENT: screw on cap

GROUND ELEV.: 384.0' | ELEV. TOP OF RISER: 384.3 | ELEV PIEZ TIP: 340.0

FILTER: # Ottawa sand | FROM ELEV: 337.0' | TO ELEV: 348.4

SEAL: bentonite pellets | FROM ELEV: 348.4' | TO ELEV: 350.4

INSTALLED BY: Burnham & Fox | CONTRACT NO.: D.O. 0004 | FOREMAN: J. King

DATE OF INSTALLATION: 3-15-88 | DATE OF OBSERVATIONS: 4-1-88

METHOD OF TESTING PIEZ.: Falling Head Test

TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET
	0.5	4.8		20.0	12.2			
	1.0	6.0		30.0	13.0			
	3.0	8.1						
	5.0	9.2						
	10.0	10.9						

REMARKS:

Water level was at 13.5' before falling head test was performed

Jeff King
INSPECTOR

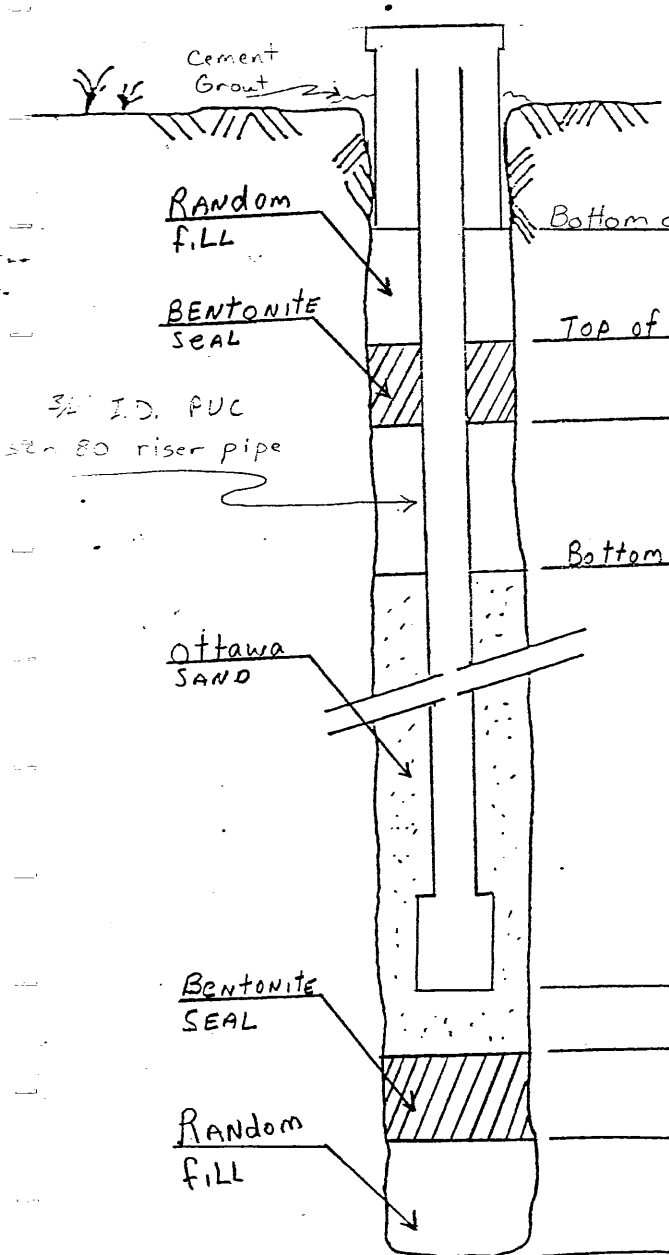
ATLANTIC TESTING LABORATORIES, LIMITED

PIEZOMETER INSTALLATION DETAIL

PROJECT: Hopkinton Dam
Hopkinton Dam

PROJECT NO. D.O. # 004
ATL No. CO 029
PIEZOMETER No. FD-88-3

top of casing ELEVATION 384.6'
top of pvc 384.3'



		DEPTH	SOIL STRATA
SURFACE ELEVATION	384.0'		
		3.0'	SAND - SW
Bottom of Casing	379.6'	4.4'	SANDY SILT SP-SM
Top of slab	350.4'	33.6	
	348.4	35.6	CONCRETE
Bottom of slab	342.2	42.0	
	340.0'	44.0'	SANDY SILT SP-SM
	337.0'	47.0'	
		49.0'	
	334.0'	50.0'	SAND SW-SM
	331.5'	52.5	SANDY SILT SP-SM

CORPS OF ENGINEERS, U. S. ARMY
NEW ENGLAND DIVISION
FOUNDATION AND MATERIALS BRANCH

FIELD LOG OF TEST BORING

PROJECT NO. DO 0004

Site HOPKINTON DAM — Page 1 of 11 Pages

Hole No. ED88-4 "F" Diam. (Casing) NW (3") — Boring Started 23, March 88

Co-ordinates: N _____ E _____ — Boring Completed 24, March 88

Drilled by Todd & Burnham — Report Submitted 12, April 88

Purpose of Exploration To determine subsurface conditions

Elevation Top of Hole 353.1 M.S.L.
Total Overburden Drilled 23.1 Feet
Elevation Top of Rock NA M.S.L.
Elevation Bottom of Hole 331.0 M.S.L.
Total Rock Drilled NA Feet
Total Depth of Hole 22.1 Feet
Core Recovered 96 %
Core Recovered 6.5 Ft.; NX Diam. 2 1/8 in.
Soil Samples 2 3/8 in. Diam. 0 No.
Soil Samples 1 3/8 in. Diam. 6 No.

Casing Left in Place NA Feet

Water Table Depth 11.2 ft of water over Rock

Depth From	Depth To	Method of Drilling and Type of Bit Used
0'	2.8'	Rotary wash boring using 3 7/8" roller bit
2.8'	9.6'	NX DIAMOND CORE
9.6'	23.1'	Continuous sampling using 1 3/8" I.D. sampler
2.8	21.6	Rotary wash boring using 2 15/16" roller bit

INDEX

Ground Water _____ Back of Page _____
Boring Location Sketch _____ Back of Page _____
Overburden Record page 2 thru Page 3
Rock Drilling _____ Page _____
Boring Location Sketch Page 11
_____ Page _____
_____ Page _____

Prepared by Jeff King — Field Data — Lab. Data

Submitted by Atlantic Testing Laboratories Limited

NED FORM DEC 63 121 — REPLACES EDITION OF JUN 51 WHICH MAY BE USED UNTIL EXHAUSTED

U. S. ARMY
CORPS OF ENGINEERS
NEW ENGLAND DIVISION

FIELD LOG OF TEST BORING

Site Hopkinton Dam — Page 2 of 11 Pages

Boring No. FD88-4 Desig. F Diam. (Casing) NW (3")

Co-ordinates: N _____ E _____

Elevation Top of Boring 353.1 M.S.L.
Total Overburden Drilled 23.1 Feet
Elevation Top of Rock NA M.S.L.
Total Rock Drilled NA Feet
Elevation Bottom of Boring 331.0 M.S.L.
Total Depth of Boring 22.1 Feet
Core Recovered 96 % No. Boxes _____
Core Recovered 6.5 Ft : NX Diam. 2 1/8 In.
Soil Samples 1 3/8 In. Diam. 6 No.
Soil Samples _____ In. Diam. _____ No.

Hammer Wt. 140 lbs
Hammer Drop 30"
Casing Left NA
Subsurface Water Data _____ Page NA
Obs. Well _____
Drilled By Todd & Burnham
Mfg. Des. Drill CME 45-C
Inspected By: Jeff King
Classification By: Jeff King
Classification By: _____

Boring Started 3-23-88
Boring Completed 3-24-88

DEPTH 1" = 2'	CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT. / CORE RECVY	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
2.8'			Rec		Advanced NW casing to 2.8' Clean casing with 2 15/16" O.D roller bit	Rip-Rap
7.8'	R-1	NX	100%		NX DIAMOND CORE	CONCRETE (reinforced)
9.6'	R-2	NX	83%		END OF EXPLORATION 3-23-88	Impervious Fill (very dense)
					EXPLORATION CONTINUED 3-24-88	

GENERAL REMARKS:

Boring No. FD 88-4

NED FORM 58 (Test) MAR 71

Site	Boring No.	Page 3 of 11
Hopkinton Dam	FD 88-4	

DEPTH	1" = 2'	CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT. / CORE REC'VY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
11.6'		S-1	1 3/8"	67%	See page 4	Sampled from 9.6' to 11.6' using a 1 3/8" I.D. sampler advanced with a 140 lbs hammer Note: coarse gravel was wedged into sampler	Grey c-m-f + SAND; some c-m-f+ GRAVEL; little SILT; trace CLAY (moist, ~usp) SM-SP
13.0'		S-2A	1 3/8"		See page 5	Advanced boring using 2 15/16" O.D. roller bit to 17.6' Sampled from 11.6' to 13.6'	Similar Soil; SM-SP
13.6'		S-2B					Similar Soils, No GRAVEL SM-SP
14.6'		S-3A	1 3/8"	41%	See page 6	Sampled from 13.6' to 15.6' Advanced boring using roller bit to 15.6'	Similar Soils; trace SILT; SM-SP
15.6'		S-3B					
17.6'		S-4	1 3/8"	67%	See page 7	Sampled from 15.6' to 17.6'	
18.6'		S-5A	1 3/8"	21%	See page 8	Sampled from 17.6' to 19.2' Advanced boring to 19.6' using roller bit	Similar Soils, some SILT SM-SP
19.2'		S-5B					Similar Soils; little c-m-f+ GRAVEL; trace SILT; SP-SM
21.6'					See page 9	Attempted to sample at 19.6', bouncing refusal, Advanced roller bit to 21.6'	
22.1		S-6	1 3/8"	20%	See page 10	Sampled from 21.6' to 23.1' Exploration Terminated 3-24-88	Similar Soils - SP-SM

STANDARD PENETRATION TEST

Project Hopkinton Dam MA. Page 4 of 11

Hole No. FD 89-4 Date 3-24-88

Depth of Test 9.6 to 11.6

Blow	Gage Reading	Penetration per Blow
10 1 10	0.1	0.010
25 2 35	0.2	0.004
22 3 57	0.3	0.005
23 4 80	0.4	0.004
15 5 95	0.5	0.007
17 6 112	0.6	0.006
21 7 133	0.7	0.005
19 8 152	0.8	0.005
31 9 183	0.9	0.003
18 10 201	1.0	0.005
19 11 220	1.1	0.005
16 12 236	1.2	0.006
18 13 254	1.3	0.006
26 14 280	1.4	0.004
27 15 307	1.5	0.004
28 16 335	1.6	0.004
40 17 375	1.7	0.003
50 18 425	1.8	0.002
48 19 473	1.9	0.002
30 20 503	2.0	0.003

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Hopkinton Dam NH

Page 5 of 11

Hole No. FD 88-4

Date 3-24-88

Depth of Test 11.6 to 13.6

Blow	Gage Reading	Penetration per Blow
2 ~~1~~ 12	0.1	0.050
11 2 13	0.2	0.000
15 3 28	0.3	0.007
31 4 59	0.4	0.003
38 5 97	0.5	0.003
18 6 115	0.6	0.006
27 7 142	0.7	0.004
38 8 180	0.8	0.003
18 9 198	0.9	0.006
21 10 219	1.0	0.005
27 11 246	1.1	0.004
20 12 266	1.2	0.005
14 13 280	1.3	0.007
13 14 293	1.4	0.008
13 15 306	1.5	0.008
17 16 323	1.6	0.006
8 17 331	1.7	0.012
13 18 344	1.8	0.008
12 19 356	1.9	0.008
13 20 369	2.0	0.008

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Hopkinton Dam NH Page 6 of 11

Hole No. FD 88-4 Date 3-24-88

Depth of Test 13.6' to 15.6'

Blow	Cage Reading	Penetration per Blow
3 ~~1~~ 3	0.1	0.033
4 ~~2~~ 7	0.2	0.030
4 ~~3~~ 11	0.3	0.030
5 ~~4~~ 16	0.4	0.020
7 ~~5~~ 23	0.5	0.014
7 ~~6~~ 30	0.6	0.014
14 7 44	0.7	0.007
11 8 55	0.8	0.009
16 9 71	0.9	0.006
12 10 83	1.0	0.008
16 11 99	1.1	0.006
20 12 119	1.2	0.005
15 13 134	1.3	0.007
15 14 149	1.4	0.007
21 15 170	1.5	0.005
22 16 192	1.6	0.005
25 17 217	1.7	0.004
22 18 239	1.8	0.005
23 19 262	1.9	0.004
26 20 288	2.0	0.004

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Hopkinton Dam NH

Page 7 of 11

Hole No. FD 88-4

Date 3-24-88

Depth of Test 15.6' to 17.6'

Blow	Gage Reading	Penetration per Blow
2 2 2	0.1	0.050
2 2 4	0.2	0.050
2 3 6	0.3	0.050
3 4 9	0.4	0.030
2 5 11	0.5	0.050
3 6 14	0.6	0.030
2 7 16	0.7	0.050
3 8 19	0.8	[illegible]
4 9 23	0.9	0.030
4 10 27	1.0	0.030
4 11 31	1.1	0.031
4 12 35	1.2	0.030
4 13 39	1.3	0.030
7 14 46	1.4	0.014
7 15 53	1.5	0.014
10 16 63	1.6	[illegible]
7 17 70	1.7	0.014
7 18 77	1.8	0.014
9 19 86	1.9	0.011
9 20 95	2.0	0.011

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project [illegible] Page 8 of [illegible]

Hole No. [illegible] Date [illegible]

Depth of Test [illegible] to 19.2'

Blow	Gage Reading	Penetration per Blow
4 1 4	0.1	0.030
3 2 7	0.2	0.033
4 3 11	0.3	0.030
5 4 16	0.4	0.030
5 5 21	0.5	0.020
6 6 27	0.6	0.018
8 7 35	0.7	0.018
9 8 44	0.8	0.011
21 9 65	0.9	0.005
31 10 96	1.0	0.003
31 11 127	1.1	0.003
35 12 162	1.2	0.003
30 13 192	1.3	0.003
37 14 229	1.4	0.003
33 15 262	1.5	0.003
32 16 294	1.6	0.003
17	1.7	
18	1.8	
19	1.9	
20	2.0	

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Hopkinton Dam MA

Page 9 of 11

Hole No. EO 88-4

Date 7-24-88

Depth of Test 19.6' to 19.6'

Blow	Gage Reading	Penetration per Blow
1 50	0.1	0.000
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Hopkinton Dam 114 Page 10 of 11

Hole No. FD 90-1 Date 3-24-88

Depth of Test 21.6' to 22.1'

Blow	Gage Reading	Penetration per Blow
11 x 11	0.1	0.009
28 2 39	0.2	0.004
31 3 70	0.3	0.003
37 4 107	0.4	0.003
38 5 145	0.5	0.003
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

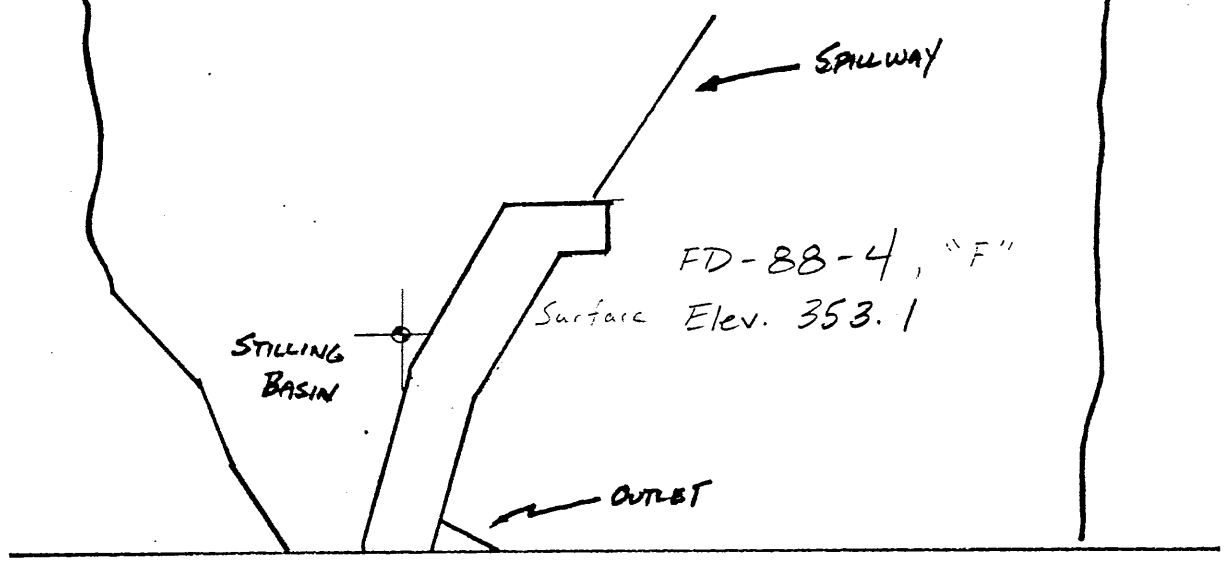
Site: Hopkinton Dam, NH
Boring No: FD 88-4

SUBSURFACE WATER OBSERVATIONS

DATE	TIME	DEPTH-BOT. OF CASING	DEPTH-BOT. OF BORING	DEPTH TO WATER	ELEVATION WATER	REMARKS
3-23-88	P.M.		23.1'	(+) 11.2'	364.3	

Note: Depths are in feet below original ground

BORING LOCATION SKETCH



ROUTE 127

CORPS OF ENGINEERS, U. S. ARMY
NEW ENGLAND DIVISION
FOUNDATION AND MATERIALS BRANCH

FIELD LOG OF TEST BORING

PROJECT NO. D.O. 0004

Site Hopkinton Dam — Page 1 of 13 Pages

Hole No. FD88-5 "D" Diam. (Casing) NW (3") — Boring Started 25, March 88

Co-ordinates: N _____ E _____ — Boring Completed 26, March 88

Drilled by Todd & McAloon — Report Submitted 12, April 88

Purpose of Exploration To determine subsurface conditions

Elevation Top of Hole 360.0 M.S.L.
Total Overburden Drilled 28.1 Feet
Elevation Top of Rock NA M.S.L.
Elevation Bottom of Hole 331.9 M.S.L.
Total ~~Rock~~ Concrete Drilled 4.6 Feet
Total Depth of Hole 28.1 Feet
Core Recovered 100 %
Core Recovered 4.6 Ft.; NX Diam. 2 1/8 In.
Soil Samples 1 3/8 In. Diam. 6 No.
Soil Samples _____ In. Diam. _____ No.

Casing Left in Place NA Feet

Water Table Depth 4.5' of water over rip-rap

Depth From	Depth To	Method of Drilling and Type of Bit Used
0	7.5'	NW(3") spun casing
7.5	12.1	NX DIAMOND CORE
12.1	28.1	Continuous sampling with 1 3/8" I.D.
		Sampler
7.5	28.1	2 15/16" roller bit

INDEX

Ground Water	Back of Page	
Boring Location Sketch	Back of Page	
Overburden Record	Page 2 thru	Page 4
Rock Drilling	Page	
Boring Location Sketch	Page	13
	Page	
	Page	

Prepared by Jeff King — Field Data — Lab. Data

Submitted by Atlantic Testing Laboratories Limited

NED FORM DEC 63 121 — REPLACES EDITION OF JUN 51 WHICH MAY BE USED UNTIL EXHAUSTED

U. S. ARMY
CORPS OF ENGINEERS
NEW ENGLAND DIVISION

FIELD LOG OF TEST BORING

Site Hopkinton Dam — Page 2 of 13 Pages

Boring No. FD88-5 Desig. D Diam. (Casing) NW (3")

Co-ordinates: N _____ E _____

Elevation Top of Boring 360.0 M.S.L.
Total Overburden Drilled 28.1 Feet
Elevation Top of Rock NA M.S.L.
Total ~~Rock~~ Concrete Drilled 4.6 Feet
Elevation Bottom of Boring 331.9 M.S.L.
Total Depth of Boring 28.1 Feet
Core Recovered 100 % No. Boxes _____
Core Recovered 4.6 Ft : NX Diam. 2 1/8 In.
Soil Samples 1 3/8 In. Diam. 6 No.
Soil Samples _____ In. Diam. ____ No.

Hammer Wt. 140 Boring Started 3-25-88
Hammer Drop 30" Boring Completed 3-26-88
Casing Left NA
~~Subsurface~~ Water Data _____ Page NA
Obs. Well _____
Drilled By Todd & McAloon
Mfg. Des. Drill CME 45-C
Inspected By: Jeff S. King
Classification By: Jeff S. King
Classification By: _____

DEPTH 1" = 2'	CORE/SAMPLE NO.	SIZE	~~DEPTH RANGE~~	BLOWS PER FT. ~~CORE RECVY~~	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
			Rec.		Advanced NW casing to 7.5'. Cleaned casing with 2 15/16" O.D. roller bit to 7.5'	Rip-Rap
7.5	R-1	NX	100%		NX DIAMOND CORE	CONCRETE (reinforced)

GENERAL REMARKS:

Site	Boring No.	Page 3 of 13
Hopkinton Dam	FD 88-5	

DEPTH	CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT. / CORE RECVY	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
12.1'			Rec			CONCRETE (reinforced)
12.8	S-1	1 3/8"	25%	See page 5	Sampled from 12.1 to 14.1' with a 1 3/8" I.D. sampler advanced with a 140 lbs hammer dropping 30"	Grey c-m f+ SAND; little SILT; trace CLAY (moist, USP) SP-SM
14.1'					Advanced boring to 14.1' with a 2 15/16" O.D. roller bit	COBBLES
16.1'				See page 6	Attempted to sample at 14.1' encountered cobbles which prevented sampling. Advanced boring to 16.1' with roller bit	
18.1'	S-2	1 3/8"	58%	See page 7	Sampled from 16.1 to 18.1' Advanced boring with roller bit to 18.1'	Grey cmf SAND; little SILT; trace fine GRAVEL trace CLAY (moist, USP) SP-SM
20.1'	S-3	1 3/8"	38%	See page 8	Sampled from 18.1 to 20.1' Advanced boring with roller bit to 20.1'	Similar Soil; some c-m f GRAVEL; SP-SM
22.1'	S-4	1 3/8"	38%	See page 9	Sampled from 20.1' to 22.1' Advanced boring with roller bit to 22.1'	Similar Soils; no clay
24.1	S-5	1 3/8"	42%	See page 10	Sampled from 22.1' to 24.1'	Grey c-m-f SAND; some SILT; trace CLAY (moist, USP)
26.1	S-6	1 3/8"	33%	See page 11	Sampled from 24.1' to 26.1' Advanced boring to 26.1' using a 2 15/16" O.D. roller bit and "Clear Mud" drilling fluid	Similar Soil
	S-7A	1 3/8"	16%	See page 12	Sampled from 26.1' to 28.1	

Site	Boring No.	Page 1 of 13
Hopkinton	FD 88-5	

DEPTH		CORE/SAMPLE			BLOWS PER FT.	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
	1' 2'	NO.	SIZE	~~DEPTH RANGE~~	~~CORE RECVY~~		
28.1'		S-7B	1 3/8	Rec 16%		Advanced boring to 28.1' with roller bit. Note: hole collapsed even with use of "clear mud". Exploration Terminated @ 28.1' on 3-26-88	Similar soils; trace SILT

STANDARD PENETRATION TEST

Project Hopkinton Dam 11H

Page 5 of 13

Hole No. FD 88-5

Date 7-25-88

Depth of Test 12.1' to 12.8

Blow	Gage Reading	Penetration per Blow
5 2 5	0.1	0.02
7 2 12	0.2	0.014
7 3 19	0.3	0.014
8 4 27	0.4	0.012
14 5 41	0.5	0.007
22 6 53	0.6	0.007
+62 7 115	0.7	0.002
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Hopkinton Dam N.H. Page 6 of 13

Hole No. FD 88-5 Date 7-25-88

Depth of Test 14.1 to 14.2

Blow	Gage Reading	Penetration per Blow
1 75	0.1	0.001
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Hopkinton Dam NH

Page 7 of 13

Hole No. FD 88-5

Date 7-25-88

Depth of Test 16.1' to 18.1'

Blow	Gage Reading	Penetration per Blow
7 1 7	0.1	0.014
9 2 16	0.2	0.011
9 3 25	0.3	0.011
11 4 36	0.4	0.009
12 5 48	0.5	0.009
9 6 57	0.6	0.011
11 7 68	0.7	0.009
11 8 79	0.8	0.009
13 9 92	0.9	0.009
12 10 104	1.0	0.008
14 11 118	1.1	0.007
15 12 133	1.2	0.007
14 13 147	1.3	0.007
12 14 159	1.4	0.008
13 15 172	1.5	0.008
14 16 186	1.6	0.007
14 17 200	1.7	0.007
13 18 213	1.8	0.009
12 19 225	1.9	0.008
11 20 236	2.0	0.009

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Hopkinton Dam 1/4 Page 8 of 13

Hole No. ED 04-5 Date 3-25-89

Depth of Test 18.1' to 20.1'

Blow	Gage Reading	Penetration per Blow
5 1 5	0.1	0.020
8 2 13	0.2	0.012
8 3 21	0.3	0.012
9 4 30	0.4	0.011
9 5 39	0.5	0.011
9 6 48	0.6	0.011
10 7 58	0.7	0.010
10 8 68	0.8	0.010
12 9 81	0.9	0.008
12 10 93	1.0	0.008
13 11 106	1.1	0.008
26 12 131	1.2	0.004
29 13 160	1.3	0.004
54 14 214	1.4	0.002
34 15 248	1.5	0.003
15 16 263	1.6	0.003
14 17 277	1.7	0.003
13 18 290	1.8	0.003
17 19 307	1.9	0.007
13 20 320	2.0	0.008

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Hopkinton Dam NH

Page 9 of 13

Hole No. FD 90-E

Date 3-25-88

Depth of Test 20.1' to 22.1'

Blow	Gage Reading	Penetration per Blow
6 1 6	0.1	0.013
14 2 20	0.2	0.007
23 3 43	0.3	0.004
30 4 70	0.4	0.003
21 5 91	0.5	0.005
20 6 110	0.6	0.005
29 7 139	0.7	0.003
23 8 162	0.8	0.004
41 9 203	0.9	0.002
57 10 260	1.0	0.002
38 11 298	1.1	0.003
29 12 327	1.2	0.003
26 13 353	1.3	0.004
25 14 378	1.4	0.004
21 15 399	1.5	0.005
22 16 421	1.6	0.005
18 17 439	1.7	0.006
17 18 456	1.8	0.006
52 19 508	1.9	0.002
48 20 556	2.0	0.002

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Hopkinton Dam 214 Page 10 of 13

Hole No. FD 88-5 Date 3-25-88

Depth of Test 22.1' to 24.1'

Blow	Gage Reading	Penetration per Blow
1 1 1	0.1	0.100
2 2 3	0.2	0.050
2 3 5	0.3	0.050
3 4 8	0.4	0.080
1 5 9	0.5	0.100
5 6 14	0.6	0.050
5 7 19	0.7	0.050
8 8 27	0.8	0.012
6 9 33	0.9	0.017
8 10 41	1.0	0.012
7 11 48	1.1	0.014
8 12 56	1.2	0.012
18 13 74	1.3	0.005
9 14 83	1.4	0.011
11 15 94	1.5	0.009
12 16 106	1.6	0.008
13 17 119	1.7	0.008
16 18 135	1.8	0.007
20 19 155	1.9	0.005
35 20 190	2.0	0.003

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project [illegible] Dam 14 Page 11 of 13

Hole No. [illegible] Date 3-25-88

Depth of Test [illegible] to [illegible]

Blow	Gage Reading	Penetration per Blow
2 2 2	0.1	0.050
2 2 4	0.2	0.050
1 3 5	0.3	0.100
3 4 8	0.4	0.033
1 5 9	0.5	[illegible]
4 6 13	0.6	0.025
3 7 16	0.7	[illegible]
6 8 22	[illegible]	0.017
5 9 27	[illegible]	0.020
4 10 31	1.0	0.025
4 11 35	1.1	0.025
4 12 39	1.2	0.025
4 13 43	1.3	0.025
4 14 47	1.4	0.025
5 15 51	1.5	0.020
5 16 56	1.6	0.020
5 17 61	1.7	0.020
6 18 67	1.8	0.017
6 19 73	1.9	0.017
6 20 79	2.0	0.017

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

STANDARD PENETRATION TEST

Project Hopkinton Dam N.H. Page 12 of 13

Hole No. EL 89-5 Date 3-25-99

Depth of Test [illegible] to 28.11'

Blow	Gage Reading	Penetration per Blow
2 ~~1~~ 2	0.1	0.050
2 ~~2~~ 4	0.2	0.050
3 ~~3~~ 7	0.3	0.033
3 ~~4~~ 10	0.4	0.033
3 ~~5~~ 13	0.5	0.033
4 ~~6~~ 17	[illegible]	0.025
3 ~~7~~ 20	[illegible]	0.033
6 ~~8~~ 26	[illegible]	0.017
7 ~~9~~ 33	[illegible]	0.014
7 ~~10~~ 40	[illegible]	0.014
7 ~~11~~ 47	[illegible]	0.014
8 ~~12~~ 55	[illegible]	0.012
7 ~~13~~ 62	[illegible]	0.014
7 ~~14~~ 69	[illegible]	0.014
14 ~~15~~ 83	[illegible]	0.007
18 ~~16~~ 101	[illegible]	0.006
17 ~~17~~ 118	[illegible]	0.006
19 ~~18~~ 137	[illegible]	0.005
13 ~~19~~ 150	[illegible]	0.008
13 ~~20~~ 163	2.0	0.008

	Blows per Inch
0	
6"	
1'-0"	
1'-6"	

Remarks

Attach. 6

MRO Form 1713, 1 Dec 78 (Temp)

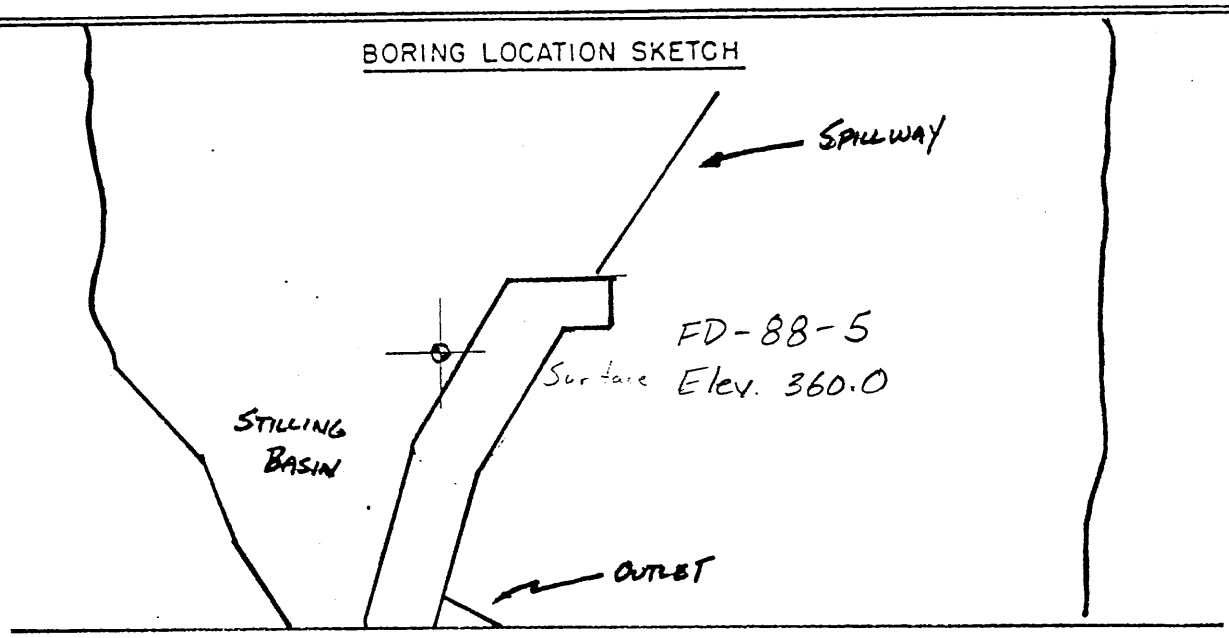
Site: Hopkinton Dam, NH
Boring No: FD 88-5 "D"

SUBSURFACE WATER OBSERVATIONS

DATE	TIME	DEPTH-BOT. OF CASING	DEPTH-BOT. OF BORING	DEPTH TO WATER	ELEVATION WATER	REMARKS

Note: Depths are in feet below original ground

BORING LOCATION SKETCH



ROUTE 127

1 - A

CORPS OF ENGINEERS, U. S. ARMY
NEW ENGLAND DIVISION
FOUNDATION AND MATERIALS BRANCH

FIELD LOG OF TEST BORING

PROJECT NO. D.D. 0053

Site North Springfield Dam Springfield Vt

Page 1 of 2 Pages

Hole No. FD-88-1 Diam. (Casing) HW

Boring Started January 20, 1988

Co-ordinates: N _____ E _____

Boring Completed January 25, 1988

Drilled by Hawkins + Burham

Report Submitted _____

Purpose of Exploration To monitor seepage at downstream right abutment area

Elevation Top of Hole _____ M.S.L.

Casing Left In Place 10 Ft

Total Overburden Drilled 38.8 Feet

Elevation Top of Rock _____ M.S.L.

Elevation Bottom of Hole _____ M.S.L.

Total Rock Drilled 15 Feet

Total Depth of Hole 53.8 Feet

Core Recovered 74 %

Core Recovered 13 Ft.; ____ Diam. 2 in. NX

Soil Samples _____ in. Diam. ____ No.

Soil Samples _____ in. Diam. ____ No.

Water Table Depth 37.6

Depth From	Depth To	Method of Drilling and Type of Bit Used
0	38.8	[illegible]
	38.8	[illegible]
38.8	52.8	NX diamond core

INDEX

Ground Water [illegible]	Back of Page ____
Boring Location Sketch _____	~~Back of Page~~ ____
Overburden Record page 2 through	Page ____
Rock Drilling _____	Page ____
[illegible] Report	Page ____
[illegible]	Page ____
_____	Page ____

Prepared by Gregory L. Hargraves
Field Data

Lab. Data

Submitted by Atlantic Testing Laboratories Limited

NED FORM DEC 63 121

REPLACES EDITION OF JUN 51 WHICH MAY BE USED UNTIL EXHAUSTED

U. S. ARMY
CORPS OF ENGINEERS
NEW ENGLAND DIVISION

FIELD LOG OF TEST BORING

Site North Springfield Vt — Page 2 of 9 Pages

Boring No. FD88-1 Desig. FD-A Diam. (Casing) HW

Co-ordinates: N _____ E _____

Elevation Top of Boring _____ M.S.L.
Total Overburden Drilled 37.8 Feet
Elevation Top of Rock _____ M.S.L.
Total Rock Drilled 15 Feet
Elevation Bottom of Boring _____ M.S.L.
Total Depth of Boring 52.8 Feet
Core Recovered 94 % No. Boxes _____
Core Recovered 13 Ft : _____ Diam. _____ In.
Soil Samples _____ In. Diam. _____ No.
Soil Samples _____ In. Diam. _____ No.

Hammer Wt. 300 lbs Boring Started 1/20/88
Hammer Drop 18" Boring Completed 1/25/88
Casing Left 10'
Subsurface Water Data _____ Page 8
Obs. Well 9
Drilled By Hawkins & Fox
Mfg. Des. Drill CME 850
Inspected By: Greg Hargrave
Classification By: Greg Hargrave
Classification By: _____

DEPTH 1"= 2'	CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT. / CORE REC'VY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
1'					Advanced HW casing to 10' using 300 lbs hammer with 18" drop Cleaned casing with 3 7/8" roller bit and water	Coarse granular material
2'						
3'						
4'						
5'						
6'						
7'						
8'						
9'						
10'						

GENERAL REMARKS:
Advanced casing to 10' then started sampling

NED FORM 58 (Test) MAR 71

Boring No. FD-A

Site: North Springfield, Vt

Boring No.: FD - 88-1

DEPTH		CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT / CORE RECVY	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
10'		S-1	2 3/8"		2 4 3	Sampled with 2 3/8" I.D. advanced with 300 lbs. hammer	grey brown c-m SAND some GRAVEL (wet, non plastic) SP
11.5'							
12'		S-2	2 3/8"		3 4 5	Sample	Similar Soils - SP
13'							
14'		S-3	2 3/8"		4 4 5 4	Sample Drive HW casing to 15' using 300 lbs. hammer Clean casing using 3 7/8" OD rotary bit and water	Similar Soils - SP
15'							
16'		S-4	2 3/8"		8 7 6	Sample	Similar Soils - SP
16.5							
18'		S-5	2 3/8"		3 6 7	Sample	
20'		S-6	2 3/8"		10 15 13 15	Sample Drive casing to 20' Clean casing to 20'	grey-brown c-m SAND, some GRAVEL, trace SILT (wet, non-plastic) SM
21.5		S-7	2 3/8"		20 21 5	Sample	Similar Soils - SM
22'		S-8	2 3/8"		6 8 8	Sample	Grey-Brown GRAVEL, and c-m SAND, trace SILT GM GW-GM SC
23'							
24		S-9	2 3/8"		8 20 10 11	Sample Drive casing to 25' Clean casing to 25'	Similar Soils - GM
25'							
26'		S-10	2 3/8		26 32 9	Sample	Grey-Brown GRAVEL, some c-m SAND, trace SILT, trace CLAY (wet, very slightly plastic) - SC
26.5'							
					32	Sample	

Site	Boring No.	Page 4 of 9
North Springfield, Vt	FD-88-1	

DEPTH	1" = 2'	CORE/SAMPLE NO.	SIZE I.D.	DEPTH RANGE	BLOWS PER FT / CORE REC'VY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
27' 28'		S-11	2 3/8"	Rec.	29 34	Note: Inst S.P.S. shoe down rods. End of exploration 1/20/88	Soil Sample similar to Sample # 8 GM
30'						Resume exploration 1/21/88 Advanced 3 7/8" roller bit to 30' Advanced HX casing with 200 lb hammer to 30'. Note: No sample taken from 27' to 30' as driller attempted to clear S.P.S. shoe out during sampling	Grey-Brown fine SAND, little GRAVEL (wet in places) SP
31.5'		S-12	2 3/8"	75%	5 12 23		Similar Soils SP
33'		S-13	2 3/8"	100%	11 10 8	Sampling	Similar Soils SP
35'		S-14	2 3/8"	50%	10 8 8 7	Advanced HX casing to 35.0' using 300 lb hammer, cleaned casing to 35' using 3 7/8" roller bit and water. Sampling	Similar Soils SP
36.5		S-15	2 3/8"	30%	10 8 8		Similar Soils (trace Silt) SP
37.8		S-16	2 3/8"	80%	8 15 30/3"	Advanced casing to 37.8' Advanced 3 7/8" roller bit to 39' using water	
38' 39'						Note: Advanced roller bit through 2.2' of rock, hit rock at 37.8'	Schist
40' 42'		R-1	NX	93%		NX Diamond Core using water to 44'	13 pieces, some fragments RQD = 65%

Site	Boring No	Page 5 of 9
North Springfield VA	FD-88-1	

DEPTH	CORE/SAMPLE NO	SIZE I.D.	DEPTH RANGE	BLOWS PER 6" / CORE RECVY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
44'						
45'					NX Diamond Core with water to 47.8'	Similar Rock 3 pieces
46'	R-2	NX				RQD = 90%
47'						
47.8'					End of Exploration 1/21/88	
					Exploration Resumed 1/25/88	
48'					NX Diamond Core with water to 52.8'	Similar Rock 3 pieces RQD = 96
50'	R-3	NX				
52'						
52.8'					Exploration Terminated 1/25/88	

FIELD LOG OF TEST BORING IN ROCK

SITE North Springfield Dam VT ROLE NO. [illegible] PAGE 6 of 9

DATE	DEPTH PT. FROM	DEPTH PT. TO	RUN PT.	RUN REC'V'Y PT.	REC'V'Y %	DRILLING BEHAVIOR: FEED	DRILLING BEHAVIOR: WATER	DRILLING BEHAVIOR: REASON FOR PULL	ACTUAL DRILLING TIME	BIT NO. SIZE AND TYPE	ADDITIONAL REMARKS
1/21/88	39.0	44.0	5.0	4.7	93%	100psi	Slight loss at one point	5' run	≈ 90min	NX [illegible]	Run #1 [illegible]
1/22/88	44.0	47.8	3.8	3.4	90%	100psi	No loss	3.8' run	≈ 50min	NX [illegible]	Run #2
1/25/88	47.8	52.8	5.0	4.9	98%	300psi	No loss	5' run	≈ 75min	NX [illegible]	Run #3

TOTAL BED ROCK DRILLED 13.8 FEET

TOTAL BED-ROCK RECOVERED 13.0 FEET

BED ROCK RECOVERY 94% PERCENT

DRILLER Hawkins

INSPECTOR Greg Hargrave

NED FORM 130 DEC

REPLACES EDITION OF APR 63 WHICH MAY BE USED UNTIL EXHAUSTED

PIEZOMETER INSTALLATION REPORT

PROJECT: North Springfield Dam | DATE. 1/26/88

LOCATION (STA): | OFFSET FROM CENTER LINE: | PIEZ NO.: FD 88-1

PIEZ TYPE: Casagrande | DEPTH OF PIEZ: 42.5' | RISER PIPE DIAM: 3/4"

PIEZ TIP SET IN (SOIL TYPE): Bedrock | SOIL SAMPLE NO.: | BORING DIAM: 4"

METHOD OF INSTALLATION:

TYPE OF PROTECTION FOR PIEZ: 4" casing | VENT:

GROUND ELEV.: | ELEV. TOP OF RISER: | ELEV PIEZ TIP:

FILTER: #4 SAND | FROM ELEV: | TO ELEV:

SEAL: | FROM ELEV: | TO ELEV:

INSTALLED BY: Hawkins | CONTRACT NO.: D.O 0003 | FOREMAN: Hargrave

DATE OF INSTALLATION: 1/26/88 | DATE OF OBSERVATIONS: 1/26/88

METHOD OF TESTING PIEZ.: Falling Head Test

TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH WATER FEET
	0	0.0'		0	0		2.5	38.15
	1	36.0'		0.5	33.0'		3.0	38.[illegible]
	3	38.15'		1.0	36.7'		3.5	38.[illegible]
	5	38.2'		1.5	37.6'		4.0	38.[illegible]
	10	38.3		2.0	38.0'		4.5	38.[illegible]
							5.0	38.[illegible]

REMARKS:

We performed 2 falling head test the first test had following time intervals 0, [illegible] 10 minutes

The second test [illegible] time intervals 0, 0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5 minutes

Gregory Hargrave
INSPECTOR

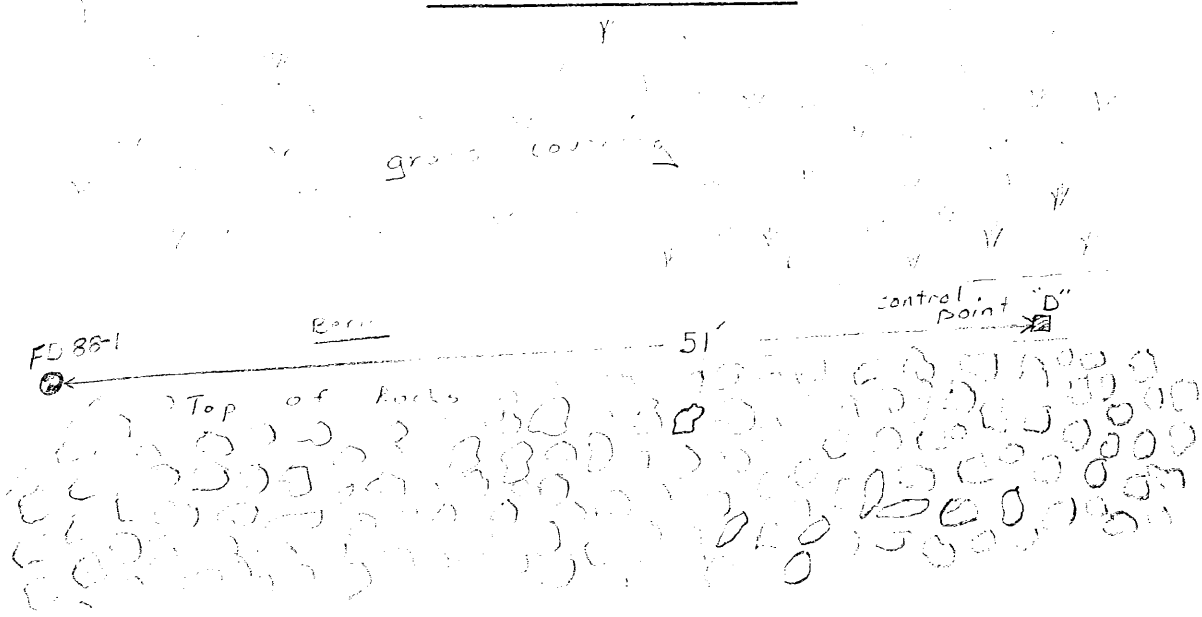
Site: North Springfield
Boring No: FD-88-1

SUBSURFACE WATER OBSERVATIONS

DATE	TIME	DEPTH-BOT. OF CASING	DEPTH-BOT. OF BORING	DEPTH TO WATER	ELEVATION WATER	REMARKS
1/27/88	9:00 am	8.5'	47.7	37.6		
1/28/88	[illegible]	8.5'	47.7	37.6'		
2/3/88	[illegible]	8.5'	47.7	37.6'		
2/4/88	12:15 pm	8.5'	47.7	37.65		
2/9/88	[illegible]	8.5'	47.7	37.5'		
2/10/88	7:20 am	8.5'	47.7	37.6'		
2/12/88	6:30 am	8.5'	47.7	37.6'		
2/16/88	[illegible]	8.5'	47.7	37.6'		
2/17/88	7:15 am	8.5	47.7	37.6'		

Note: Depths are in feet below original ground

BORING LOCATION SKETCH



ATLANTIC TESTING LABORATORIES, LIMITED

MONITORING WELL INSTALLATION DETAIL

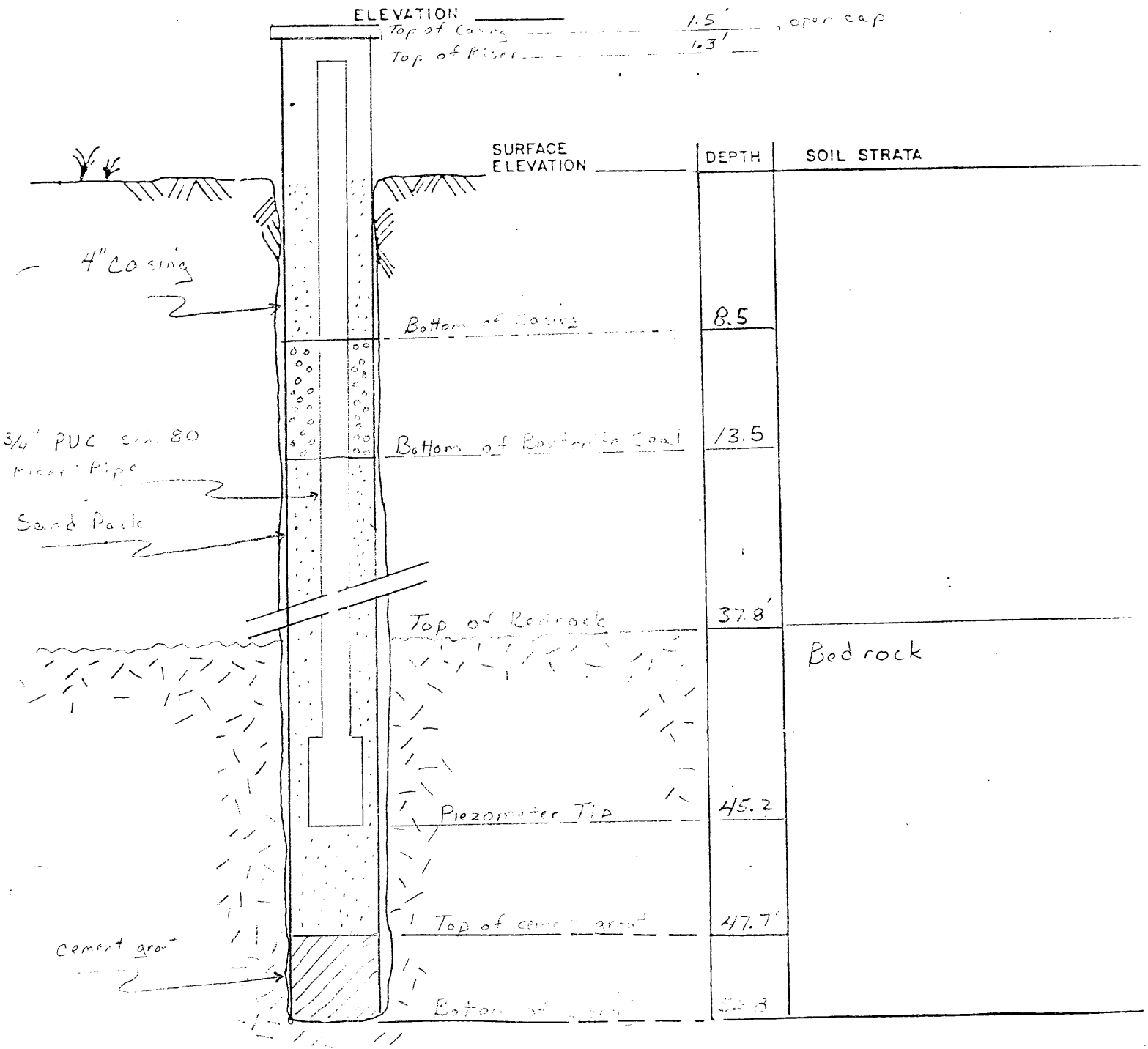
PROJECT: North Springfield

PROJECT NO. CD 030

CLIENT: USACE

WELL NO. FD 88-L

Piezometer No. PZ-16



2 C

CORPS OF ENGINEERS, U. S. ARMY
NEW ENGLAND DIVISION
FOUNDATION AND MATERIALS BRANCH

FIELD LOG OF TEST BORING

PROJECT NO. DO 0004

Site North Springfield Dam, No. Springfield Vt — Page 1 of 11 Pages

Hole No. FD-88-2 Diam. (Casing) HX — Boring Started January 20, 1988

Co-ordinates: N _____ E _____ — Boring Completed 2/2/88

Drilled by Hawkins & Fox — Report Submitted _____

Purpose of Exploration To monitor seepage at downstream right abutment area

Elevation Top of Hole _____ M.S.L.
Total Overburden Drilled 120' Feet
Elevation Top of Rock _____ M.S.L.
Elevation Bottom of Hole _____ M.S.L.
Total Rock Drilled 20.5 Feet
Total Depth of Hole 135.5 Feet
Core Recovered 89 %
Core Recovered 17.7 Ft.; _____ Diam. _____ in. NX
Soil Samples _____ in. Diam. _____ No.
Soil Samples _____ in. Diam. _____ No.

Casing Left in Place 10 Ft.

Water Table Depth _____

Depth From	Depth To	Method of Drilling and Type of Bit Used
0	63	[illegible] HX [illegible]
		[illegible]
63	120.5	[illegible]
		[illegible]
101'	106'	Cored with NX [illegible]
120.5	135.5	[illegible]
60.0	119.0	[illegible]
		[illegible]

INDEX

Ground Water		Back of Page
Boring Location Sketch		Back of Page
Overburden Record	page 2 thru	Page
Rock Drilling		Page
[illegible]		Page
[illegible]		Page
		Page

Prepared by Gregory R. Hargrave — Field Data — Lab. Data

Submitted by Atlantic Testing Laboratories Limited

MED FORM DEC 63 121 — REPLACES EDITION OF JUN 51 WHICH MAY BE USED UNTIL EXHAUSTED

U. S. ARMY
CORPS OF ENGINEERS
NEW ENGLAND DIVISION

FIELD LOG OF TEST BORING

Site North Springfield, Vt — Page 2 of 11 Pages

Boring No. FD 88-2 Desig. FD-C Diam. (Casing) HX

Co-ordinates: N _____ E _____

Elevation Top of Boring _____ M.S.L.
Total Overburden Drilled 120 Feet
Elevation Top of Rock _____ M.S.L.
Total Rock Drilled 20.5 Feet
Elevation Bottom of Boring _____ M.S.L.
Total Depth of Boring 135.5 Feet
Core Recovered 89 % No. Boxes _____
Core Recovered 17.7 Ft : _____ Diam. _____ In.
Soil Samples _____ In. Diam. _____ No.
Soil Samples _____ In. Diam. _____ No.

Hammer Wt. 140 Boring Started 1/20/88
Hammer Drop 30"
Boring Completed 2/2/88
Casing Left 10'
Subsurface Water Data _____ Page _____
Obs. Well _____
Drilled By Hawkins + Fox
Mfg. Des. Drill CME 75
Inspected By: Greg Hargrave
Classification By: Greg Hargrave
Classification By: _____

DEPTH 1" = 2'	CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT. / CORE REC'VY	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
0					Advanced HX casing to 40' using 300 lbs hammer, Advanced 3 3/8" roller bit to 110'	Coarse granular material
40'					END OF EXPLORATION 1/20/88	Test [illegible]
					Continued EXPLORATION 1/21/88	
60'					Advanced casing and roller bit to 60'	
	S-1	1 3/8"		45 62 61 54	Sampled with 1 3/8" ID split spoon sampler, advanced with 140 lbs hammer. Advanced 3 3/8" roller bit using clear flow drilling fluid to 62'. Advanced casing to 62'	Grey cm f SAND; some GRAVEL; trace SILT (wet, non-plastic) SW
62'						
	S-2	1 3/8"		40 49 59 62	Sampled	Similar soil, SW
64'						
	S-3	1 3/8"		42 50 175	Sampled. Advanced roller bit to 66' using clear flow drilling fluid. Advanced casing to 66'	Similar Soil, SW
65.5'						
66'						
	S-4			21 38 20 18	Sampled	Similar Soil, SW
68'						

GENERAL REMARKS:
The first 60' was advanced without sampling

Site	Boring No.	Page 3 of 11
North Springfield Vt	FD 88-2	

DEPTH		CORE/SAMPLE			BLOWS PER FT. / CORE REC'VY	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
	1" 2"	NO.	SIZE	DEPTH RANGE			
68'					16	Sampled	Similar Soil, trace GRAVEL
			"		19	Advanced roller bit to 70'	~~SW~~
		S-5	1 3/8		31	using "Clear Mud" drilling fluid	
						Advanced HX casing to 68'	
70'					40		
					38	Sampled	Soil Similar to Sample #1
			"		83	Advanced roller bit to 72'	SW
71.5'		S-6	1 3/8		100/6"	using "Clear Mud" drilling fluid	
72'							
72.3'		S-7	1 3/8		100/4"	Sampled	Soil Similar to Sample #5, SW.
						Advanced roller bit to 74'	
						using "Clear Mud" drilling	
74'						End of Exploration 1/21/88	
74.2'		S-8	1 3/8"		100/3"	EXPLORATION CONTINUED 1/22/88	Grey cm f SAND, some SILT,
						Sampled	trace GRAVEL (wet, non-plastic)
						Advanced roller bit to 78'	SM
						using "Clear Mud" drilling	
76'						fluid	
						No sampled due to	gravel and possible
						gravel and possible cobbles	cobbles
78'							
					20	Sampled	Soil similar to sample
					19		#1, SW
		S-9	1 3/8"		35		
80'					17		
					19	Sampled	
					18	Advanced roller bit to 82'	Similar Soil, SW
		S-10	1 3/8"		27	using "Clear Mud" drilling	
82'					54	fluid	
					21	Sampled	Similar Soil, SW
					28		
		S-11	1 3/8"		30		
84'					41	END OF EXPLORATION 1/22/88	
		S-12	1 3/8	83%	41	Exploration [illegible] 1/22/88	Similar Soil, ~~SW~~
					86	Sampled	SP-SM

FORM 58A (Test)

Boring No. FD 88-2

Site	Boring No.	Page 4 of 11
North Springfield 1c	TD 88-2	

DEPTH	1" = 2	CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT. / CORE REC'VY	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
85.8'			1 3/8"		81 100/4"		
88'						No sample taken due to gravel and possible cobbles	possible gravel and cobbles
89						No Sample taken due to coarse material Advanced 3 1/8" roller bit to 89' with "Clearmud" drilling fluid	
90'		S-13	2 3/8"	60%	150 163	Sample	Grey GRAVEL and cmf SAND, little SILT (wet, non plastic) GW
92'						No sample taken due to coarse material Advanced 3 7/8" roller bit to 92' using "Clearmud" drilling fluid	possible cobbles and gravel
94.2'		S-14	2 3/8"	50%	52 43 61 89 100/2"	Sample	Soil similar to sample #13 GW
94.5'						No Sample due to coarse material Advanced roller bit to 94.5'	possible gravel and cobbles
95'			2 3/8"	0%	150/6"	Sampled	
97'						No Sample due to coarse material, Advanced 3 7/8" roller bit to 97' using "Clearmud"	possible gravel and cobbles
99'		S-15	2 3/8"	100%	46 65 80 130	Sampled	Grey cmf SAND, and GRAVEL little SILT (wet, non plastic) SP
101'						No Sample due to coarse material Advanced 3 7/8" roller bit to 101'	possible gravel and cobbles
		R-1	NX	70%			cobbles and granular soils

FORM 58A (Test)

Boring No. TD 88-2

Site	Boring No.	Page 5 of 11
North Springfield Dam	FD 88-2	

DEPTH		CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT / CORE REC'VY	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
	1" = 2'						
102 104' 106'		R-1	NX	Rec. 70%		NX Diamond core with water to 106'	Cobbles and granular soil
106.5'		S-16	1 7/8"	25%	100/6"	Sample END of EXPLORATION 11/20/88	Grey cmf SAND, little SILT, trace GRAVEL (wet, non-plastic) SM
108'			"			Advanced 3 7/8" roller bit to 108' using "Clear Mud" drilling fluid. Note: Loss of water from 101.5'-105' End of Exploration 11/28/88	
110'		S-17	1 3/8"	67%	54 71 66 135	Explored intermittently 11/2/88 Sampled	Grey cmf SAND; trace GRAVEL; trace SILT (wet, non-plastic) SP
110.2 112'			1 3/8	0%	200/3"	Sampled Advanced 3 7/8" roller bit to 112' using "Clear Mud" drilling fluid	Possible coarse GRAVEL and COBBLES
112.8'		S-18	1 3/8	10%	94 200/3"	Sampled	Grey cmf SAND; some SILT; trace GRAVEL (wet, non-plastic) SM
114'						Advanced 3 7/8" roller bit to 114' using "Clear Mud" drilling fluid	Possible coarse GRAVEL and COBBLES
114.8'		S-19	1 3/8	30%	94 200/1"	Sampled	Soils similar to Sample # 18 SM
116'							Possible coarse GRAVEL and COBBLES
116.8'		S-20	1 3/8	45%	99 200/3"	Sampled Advanced 3 7/8 roller bit to 118' using "Clear Mud" drilling fluid	Soil similar to Sample # 18 SM
118'							Possible GRAVEL and cobbles
		S-21	1 3/8	50%	86 150	Sampled Advanced 3 7/8 roller bit to 120.5' using "Clear Mud" drilling fluid	Soil similar to Sample # 18 SM

SM

Site	Boring No.	Page 6 of 11
North Springfield Dam	FD 83-2	

DEPTH	1" 2'	CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT / CORE REC'VY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
119'				Rec			
120'							
120.5'							Bedrock
						NX Diamond Core	Grey Gneiss
122		R-1	NX				10 pieces, some fragments RQD = 90%
							Note: vertical fractures
124							
125.5							
126						NX Diamond Core	Similar Rock
							9 pieces, some fragments
128		R-2	NX				RQD = 78%
							Note: vertical fractures
130							
130.5							
						NX Diamond Core	Similar Rock
132							pieces
		R-4	NX				RQD = 64%
134							
135.5'						Exploration Terminated 7/2/83	

4/6.7
135.5
552.2

FIELD LOG OF TEST BORING IN ROCK

SITE North Springfield Dam, VT HOLE NO. FD 88-2 PAGE 7 of 11

DATE	DEPTH PT. FROM	DEPTH PT. TO	RUN PT.	RUN REC'V'Y PT.	REC'V'Y %	DRILLING BEHAVIOR: FEED	DRILLING BEHAVIOR: WATER	DRILLING BEHAVIOR: REASON FOR PULL	ACTUAL DRILLING TIME	BIT NO. SIZE AND TYPE	ADDITIONAL REMARKS
1/26/88	101.0'	106.0'	5'	3.5'	70%	250psi	lost water @ 102.4'	5' run	≈ 80 min	NX Diamond	Run #1 was through cobbles and soil
2/1/88	120.5	125.5	5'	5'	100%	300psi	no loss of water	5' run		NX Diamond	Run #2 [illegible]
2/1/88	125.5	130.5	5'	4.9'	98%	300 [illegible]	no loss of water	5' run		NX Diamond	Run #3 [illegible]
2/1/88	130.5	[illegible]	5'	[illegible]	86%	400 [illegible]	[illegible] water	5' run		NX Diamond	Run #4 [illegible]

TOTAL BED ROCK DRILLED 20' FEET

TOTAL BED-ROCK RECOVERED 17.7 FEET

BED ROCK RECOVERY 89 PERCENT

DRILLER Hawkins

INSPECTOR Hargrave

MED FORM DEC 130

REPLACES EDITION OF APR 63 WHICH MAY BE USED UNTIL EXHAUSTED

PIEZOMETER INSTALLATION REPORT

PROJECT: North Springfield Dam, North Springfield VT | DATE: 2/3/88

LOCATION (STA): | OFFSET FROM CENTER LINE: | PIEZ NO.: FD 88-17

PIEZ TYPE: Casagrande | DEPTH OF PIEZ: 120.5' | RISER PIPE DIAM: 3/4"

PIEZ TIP SET IN (SOIL TYPE): Filter Sand/Bedrock | SOIL SAMPLE NO.: | BORING DIAM: 3 7/8"

METHOD OF INSTALLATION:

TYPE OF PROTECTION FOR PIEZ: 4" casing | VENT:

GROUND ELEV.: | ELEV. TOP OF RISER: | ELEV PIEZ TIP:

FILTER: #4 filter sand | FROM ELEV: | TO ELEV:

SEAL: Bentonite Pellets | FROM ELEV: | TO ELEV:

INSTALLED BY: Hawkins + Fox | CONTRACT NO.: D.O. 0003 | FOREMAN: Hargrave

DATE OF INSTALLATION: 2/2/88 | DATE OF OBSERVATIONS: 2/3/88

METHOD OF TESTING PIEZ.: Falling Head Test

TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH WATER FEET
	1/2	38.9'		27	91.8			
	1	55.1'		34	91.8			
	5	77.5						
	10	87.2						
	15	91.4						

REMARKS:

24 hours prior to test drilling mud was deactivated with 2 gallons of bleach

Gregory P. Hargrave
INSPECTOR

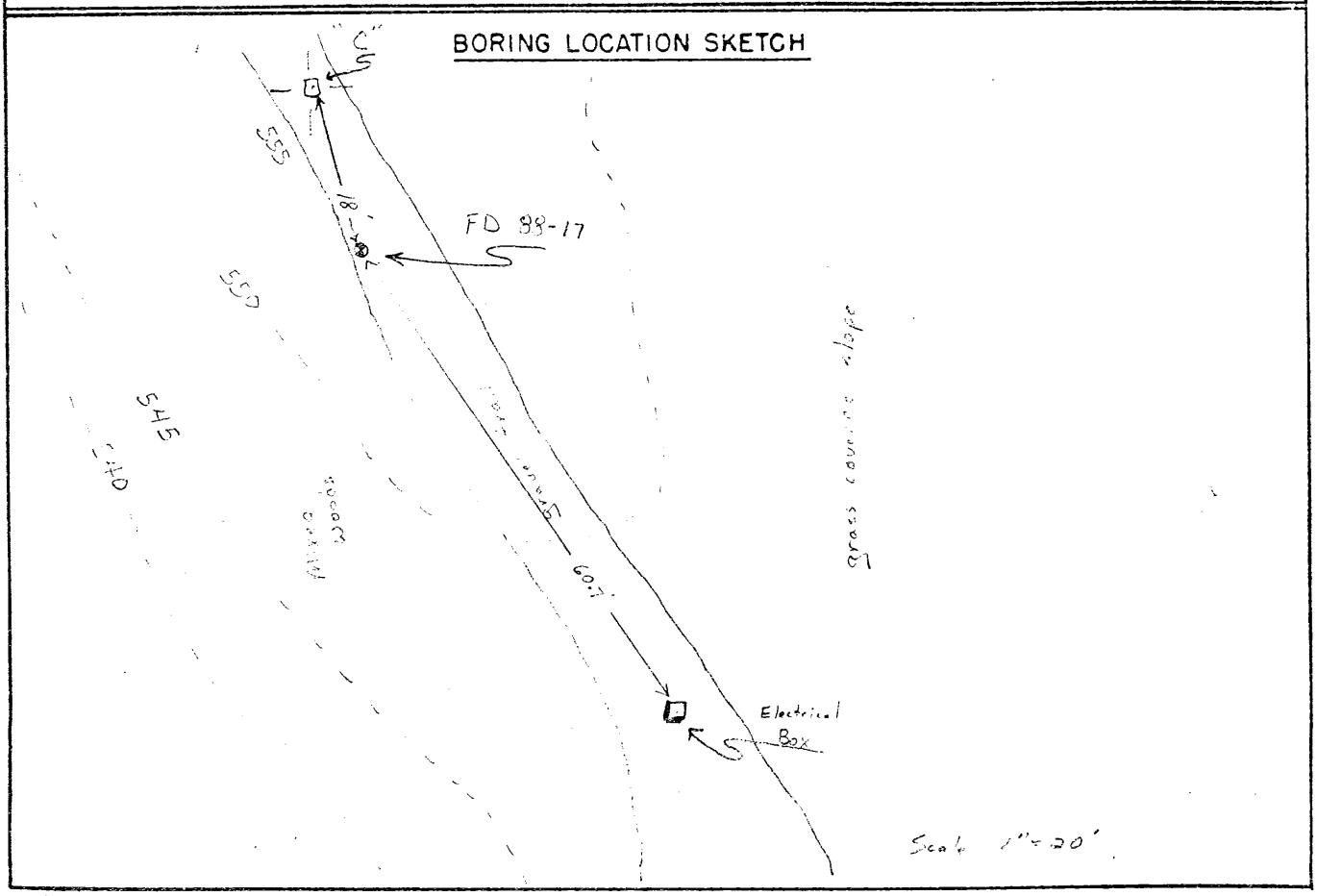
Site: North Springfield Dam, Vt
Boring No: FD 88-2

SUBSURFACE WATER OBSERVATIONS

DATE	TIME	DEPTH-BOT. OF CASING	DEPTH-BOT. OF BORING	DEPTH TO WATER	ELEVATION WATER	REMARKS
2/3/88	4:30pm	7.5'	126.0	91.9'		
2/4/88	11:15am	7.5	126.0	91.7'		
2/9/88	[illegible]	7.5	126.0	91.85'		
2/10/88	7:30am	7.5'	126.0	[illegible]		
2/10/88	9:15	7.5	126.0	92.0		
2/17/88	7:50	7.5	126.0	91.9'		

Note: Depths are in feet below original ground

BORING LOCATION SKETCH



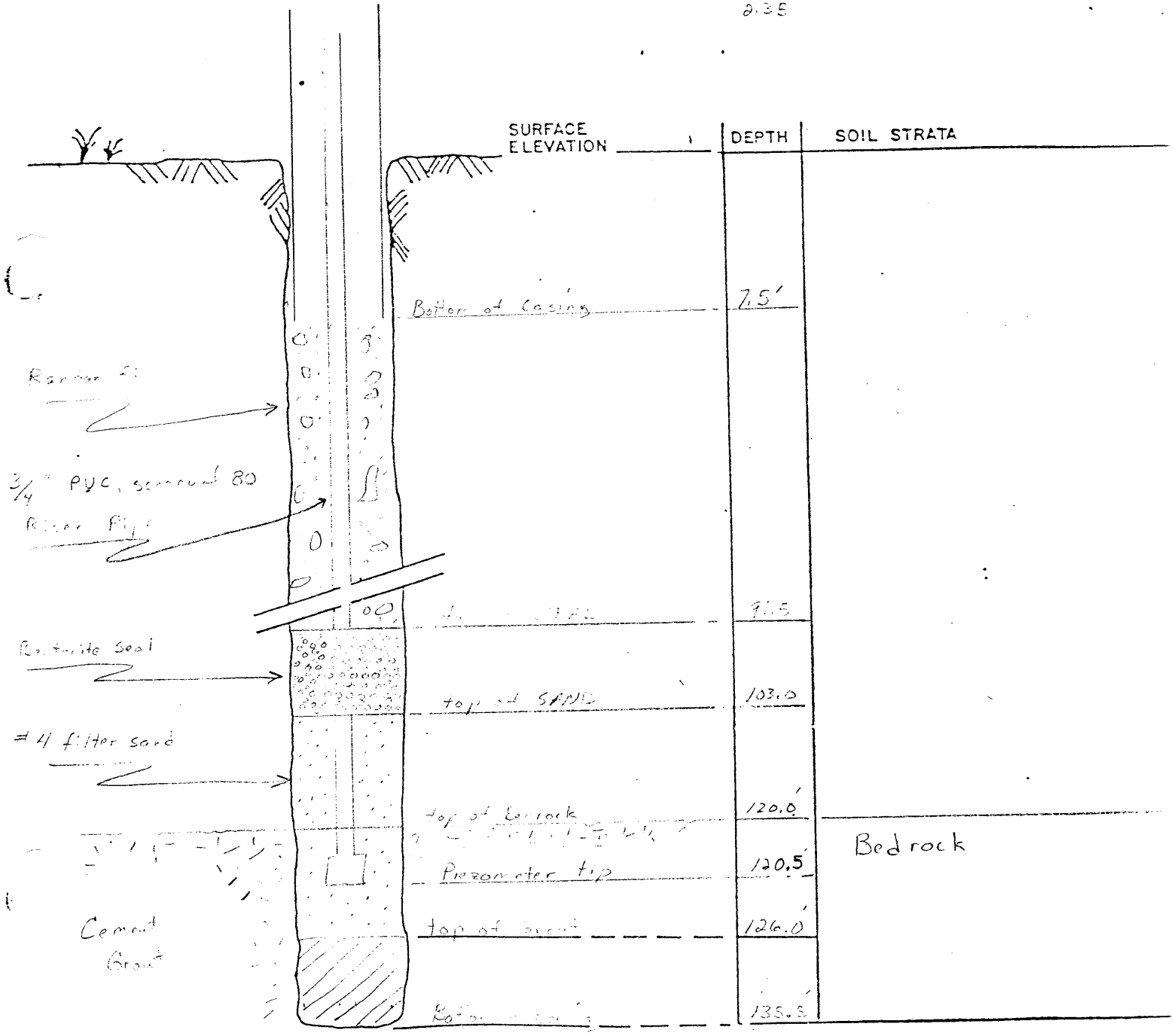
ATLANTIC TESTING LABORATORIES, LIMITED

PIEZOMETER INSTALLATION DETAIL

PROJECT: North Springfield Dam
North Springfield, Va

PROJECT NO. D.O. 0003
ATL No. CD 030
PIEZOMETER No. FD 88-2

ELEVATION _____ 2.5
2.35



FD-88-3(D)

CORPS OF ENGINEERS, U. S. ARMY
NEW ENGLAND DIVISION
FOUNDATION AND MATERIALS BRANCH

FIELD LOG OF TEST BORING

PROJECT NO. D.O. 003

Site North Springfield Dam Vt — Page 1 of 9 Pages

Hole No. FD 88-3 Diam. (Casing) HW — Boring Started 1/27/88

Co-ordinates: N 51448 E 50159 — Boring Completed 1/28/88

Drilled by Hawkin's and Todd — Report Submitted 3/3/88

Purpose of Exploration To monitor seepage at downstream right abutment area

Elevation Top of Hole 504.5 M.S.L.
Total Overburden Drilled 62.4 Feet
Elevation Top of Rock 442.1 M.S.L.
Elevation Bottom of Hole 427.3 M.S.L.
Total Rock Drilled 14.8 Feet
Total Depth of Hole 77.2 Feet
Core Recovered 100 %
Core Recovered 13.5 Ft.; NX Diam. ____ In.
Soil Samples ____ In. Diam. ____ No.
Soil Samples ____ In. Diam. ____ No.

Casing Left in Place 10 Feet

Water Table Depth 43.7'

Depth From	Depth To	Method of Drilling and Type of Bit Used
0	62.5	HW casing advanced with 300 lbs hammer
0	63.7	3 7/8" O.D. roller bit advanced
		with water
63.7	77.2	NX Diamond core

INDEX

Ground Water	Back of Page	6
Boring Location Sketch	Back of Page	6
Overburden Record	2 through Page	4
Rock Drilling	Page	5
Piezometer installation report	Page	7,8
Piezometer installation detail	Page	9
	Page	

Prepared by Gregory R. Horsgrave — Field Data — Lab. Data

Submitted by Atlantic Testing Laboratories, Limited

NED FORM DEC 63 121 REPLACES EDITION OF JUN 51 WHICH MAY BE USED UNTIL EXHAUSTED

U. S. ARMY
CORPS OF ENGINEERS
NEW ENGLAND DIVISION

FIELD LOG OF TEST BORING

Site North Springfield Vt — Page 2 of 9 Pages

Boring No. FD 88-3 Desig. FD 85-1 Diam. (Casing) HW

Co-ordinates: N 51448 E 50159

Elevation Top of Boring _____ M.S.L.
Total Overburden Drilled 62.4' Feet
Elevation Top of Rock _____ M.S.L.
Total Rock Drilled 14.8 Feet
Elevation Bottom of Boring _____ M.S.L.
Total Depth of Boring 77.2 Feet
Core Recovered 100 % No. Boxes 1
Core Recovered 13.5 Ft : ____ Diam. ____ In.
Soil Samples — In. Diam. — No.
Soil Samples — In. Diam. — No.

Hammer Wt. 300 lbs Boring Started 1/27/88
Hammer Drop 18" Boring Completed 1/28/88
Casing Left _____
Subsurface Water Data _____ Page _____
Obs. Well _____
Drilled By Hawkin's and Todd
Mfg. Des. Drill CME 850
Inspected By: Hargrave
Classification By: Hargrave
Classification By: _____

DEPTH 1" = 2'	CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT. / CORE REC'VY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
0'						
10'						
20'						
30'						
40'						
42'					Advanced HW casing with 300 lbs hammer to 55.5' Note: casing advanced easily	
44'						
45'						

GENERAL REMARKS:
Note change in scale, 0-40'; 1" = 20', 40- ' ; 1" = 2'

Boring No. FD 88-3

NED FORM 58 (Test) MAR 71

Site	Boring No.	Page 3 of 9
North Springfield Dam	FD 88-3	

DEPTH	CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT. / CORE REC'VY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
46'						Coarse Granular material
48'						
50'						
52'					Advanced HW casing with 300 lbs hammer to 55.5' Note: casing advanced easily	
54'					Advanced 3 7/8" O.D. roller bit to 56.1' Note: loss of water @ 55.5' - 56.1'	
56'					Advanced casing to 58.1' with difficulty	Coarse Granular material possible cobbles and gravel
					Advanced roller bit to 60' no water loss	
58'					Note: roller bit cored through cobble from 58.2' to 58.7'	cobble
60'						
					Advanced casing to 62' with difficulty	
62'					Advanced roller bit to 63.7' Note: encountered bedrock at 62.4'	Bedrock

Site	Boring No.	Page 4 of 9
North Springfield Dam Vt	FD 88-3	

DEPTH		CORE/SAMPLE NO.	SIZE	~~DEPTH RANGE~~ Rec	BLOWS PER FT. / CORE REC'VY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
63.7						END of EXPLORATION 1/27/88	
66'		R-1	NX	100%		EXPLORATION Continued 1/28/88 Note: hole filled in to ≈62.9' Advanced HW casing to 62.5' using 300 lbs hammer Cleaned casing with 3 7/8" roller bit and water to 63.7'	3 pieces RQD = 100%
67.2'						NX DIAMOND CORE with water to 77.2' Note: No Loss of water during entire drilling sequence	
68'							Similar Rock 9 pieces, some fragments RQD = 84%
70'		R-2	NX	100%			
72'							
72.2'							
74'							Similar Rock 12 pieces, some fragments RQD = 92%
76'		R-3	NX	100%			
77.2'						Exploration Terminated 1/28/88	

FIELD LOG OF TEST BORING IN ROCK

SITE North Springfield Vt. HOLE NO. FD 88-3 PAGE 5 of 9

DATE	DEPTH PT. FROM	DEPTH PT. TO	RUN PT.	RUN REC'V'Y PT.	REC'V'Y %	DRILLING BEHAVIOR: FEED	DRILLING BEHAVIOR: WATER	DRILLING BEHAVIOR: REASON FOR PULL	ACTUAL DRILLING TIME	BIT NO. SIZE AND TYPE	ADDITIONAL REMARKS
1/28/88	63.7	67.2'	3.5'	3.5'	100%	200 psi	No loss of water	3.5' Run	≈50 min	NX	Run # 1, coring started 1.3' into bed rock
1/28/88	67.2	72.2'	5'	5'	100%	200 psi	No loss of water	5' Run	≈ 70 min	NX	Run # 2
1/28/88	72.2'	77.2'	5'	5'	100%	200 psi	No loss of water	5' Run	≈ 70 min	NX	Run # 3

TOTAL BED ROCK DRILLED 14.8 FEET *
Total Bed Rock Cored 13.5 Feet
TOTAL BED-ROCK RECOVERED 13.5 FEET

BED ROCK RECOVERY 100 PERCENT

DRILLER Hawkins

INSPECTOR Hargrave

NED FORM DEC 130 * includes rock drilled with roller bit

REPLACES EDITION OF APR 63 WHICH MAY BE USED UNTIL EXHAUSTED

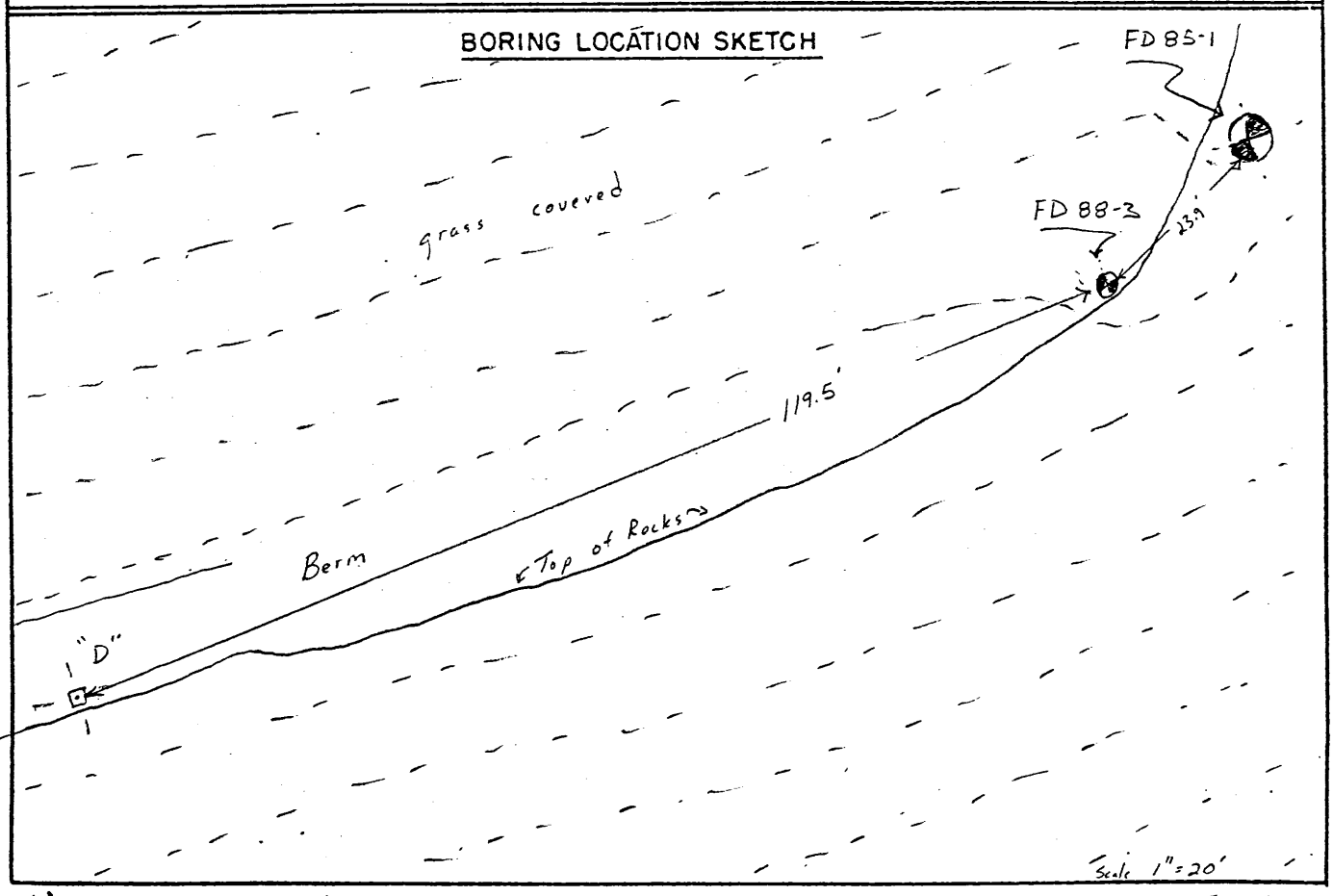
Site: North Springfield Dam Vt.
Boring No: FD 88-1

SUBSURFACE WATER OBSERVATIONS

DATE	TIME	DEPTH-BOT. OF CASING	DEPTH-BOT. OF BORING	DEPTH TO WATER	ELEVATION WATER	REMARKS
1/29/88	9:00	62.5'	69.0'	42.1'	462.4	water depth prior to piezometer installation
2/3/88	4:45pm	7.7	69.0	Dry		~~Depth to bottom of piezom. is 40'~~
2/11/88		7.7	69.0	44.0'	460.5	Recorded water level after
2/18/88	8:00	7.7	69.0	43.7'	460.8	piezometer was flushed
2/24/88	8:30	7.7	69.0	43.7'	460.8	out
					Note:	
					sand was	accidently spilled
					down riser	pipe during piezometer
					installation	preventing water reading
					from being	obtained/piezometer was
					flushed out	and water readings were
					obtained	

Note: Depths are in feet below original ground

BORING LOCATION SKETCH



NED FORM 59 (Test) MAR 71

Boring No. FD 88-

PIEZOMETER INSTALLATION REPORT

PROJECT: North Springfield Dam, VT | DATE: 2-10-88

LOCATION (STA): N- 51448 | OFFSET FROM CENTER LINE: 50159 | PIEZ NO.: FD 88-3 PZ-18

PIEZ TYPE: Casagrande | DEPTH OF PIEZ: 68.9 | RISER PIPE DIAM: 3/4"

PIEZ TIP SET IN (SOIL TYPE): | SOIL SAMPLE NO.: | BORING DIAM: 4"

METHOD OF INSTALLATION:

TYPE OF PROTECTION FOR PIEZ: 4" casing | VENT: Screw on cap

GROUND ELEV.: 504.5' | ELEV. TOP OF RISER: 505.61' | ELEV PIEZ TIP: 435.6'

FILTER: #4 SAND | FROM ELEV: 435.5 | TO ELEV: 490'

SEAL: Bentonite Pellets | FROM ELEV: 490' | TO ELEV: 495.2'

INSTALLED BY: Hawkins | CONTRACT NO.: D.O. 0003 | FOREMAN: Hargrave

DATE OF INSTALLATION: 1/29/88 | DATE OF OBSERVATIONS: 2/10/88

METHOD OF TESTING PIEZ.: Falling Head Test

TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET
	1/2	2.5		15	14.3			
	1	3.5		20	17.6			
	3	4.8		25	20.7			
	5	6.8		30	21.0			
	10	10.7						

REMARKS:

Filter sand was flushed out of piezometer and riser pipe prior to performing falling head test.

Static water level was measured 2/11/88, depth to water was 44.0

Gregory P. Hargrave
INSPECTOR

PIEZOMETER INSTALLATION REPORT

PROJECT: North Springfield Dam, Vt | DATE: 2-24-88

LOCATION (STA): | OFFSET FROM CENTER LINE: | PIEZ NO.: FD 88-3 PZ-18

PIEZ TYPE: | DEPTH OF PIEZ: | RISER PIPE DIAM:

PIEZ TIP SET IN (SOIL TYPE): | SOIL SAMPLE NO.: | BORING DIAM:

METHOD OF INSTALLATION:

TYPE OF PROTECTION FOR PIEZ: | VENT:

GROUND ELEV.: | ELEV. TOP OF RISER: | ELEV PIEZ TIP:

FILTER: | FROM ELEV: | TO ELEV:

SEAL: | FROM ELEV: | TO ELEV:

INSTALLED BY: Hawkins | CONTRACT NO.: D.O. 0003 | FOREMAN: Hargrave

DATE OF INSTALLATION: | DATE OF OBSERVATIONS: 2-24-88

METHOD OF TESTING PIEZ.: Falling Head Test

TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET
	0.5	2.3		15	13.1			
	1	3.0		20	16.2			
	2	3.6		25	19			
	3	4.4						
	5	6						

REMARKS:

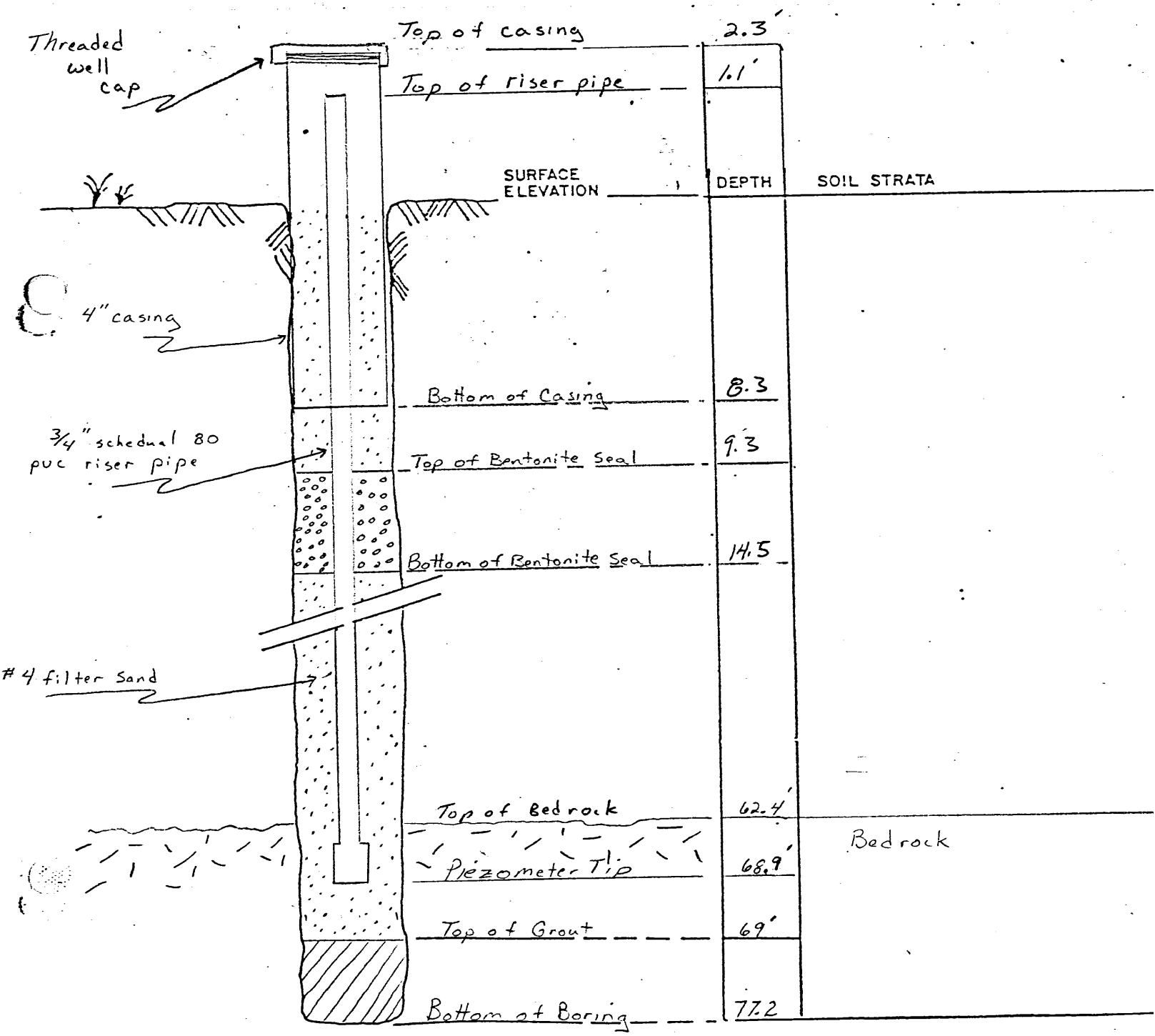
Gregory R. Hargrave
INSPECTOR

ATLANTIC TESTING LABORATORIES, LIMITED

PIEZOMETER INSTALLATION DETAIL

PROJECT: North Springfield Dam
North Springfield, VT

PROJECT NO. D.O. 0003
ATL No. CD 030
PIEZOMETER No. FD 88-3



4- F

CORPS OF ENGINEERS, U. S. ARMY
NEW ENGLAND DIVISION
FOUNDATION AND MATERIALS BRANCH

FIELD LOG OF TEST BORING

PROJECT NO. [illegible]

Site North Spillway [illegible] — Page 1 of 1 Pages

Hole No. FD 88-4 Diam. (Casing) HW — Boring Started 2/2/88

Co-ordinates: N _____ E _____ — Boring Completed 2/ /88

Drilled by Hawkins — Report Submitted _____

Purpose of Exploration To monitor movement at downstream right abutment area

Elevation Top of Hole _____ M.S.L.
Total Overburden Drilled 24.1 Feet
Elevation Top of Rock _____ M.S.L.
Elevation Bottom of Hole _____ M.S.L.
Total Rock Drilled _____ Feet
Total Depth of Hole _____ Feet
Core Recovered _____ %
Core Recovered _____ Ft.; _____ Diam. _____ In.
Soil Samples _____ In. Diam. _____ No.
Soil Samples _____ In. Diam. _____ No.

Casing Left in Place _____ Fe

Water Table Depth _____

Depth From	Depth To	Method of Drilling and Type of Bit Used

INDEX

Ground Water _____ Back of Page ____
Boring Location Sketch _____ Back of Page ____
Overburden Record _____ Page ____
Rock Drilling _____ Page ____
_____ Page ____
_____ Page ____
_____ Page ____

Prepared by Greg Hargraves — Field Data — Lab. Data

Submitted by Atlantic Testing Laboratories, Ltd.

NED FORM DEC 63 121

REPLACES EDITION OF JUN 51 WHICH MAY BE USED UNTIL EXHAUSTED

U. S. ARMY
CORPS OF ENGINEERS
NEW ENGLAND DIVISION

FIELD LOG OF TEST BORING

Site [illegible] Dam — Page 1 of ___ Pages

Boring No. [illegible] Desig. FC 88-4 Diam. (Casing) 4"

Co-ordinates: N ___ E ___

Elevation Top of Boring ___ M.S.L. — Hammer Wt. 300 lbs — Boring Started 2/2/88

Total Overburden Drilled ___ Feet — Hammer Drop 18" — Boring Completed ___

Elevation Top of Rock ___ M.S.L. — Casing Left ___

Total Rock Drilled ___ Feet — Subsurface Water Data ___ Page ___

Elevation Bottom of Boring ___ M.S.L. — Obs. Well ___

Total Depth of Boring ___ Feet — Drilled By Hawkins

Core Recovered ___ % No. Boxes ___ — Mfg. Des. Drill CME 850

Core Recovered ___ Ft ___ Diam. ___ In. — Inspected By: Hargrave

Soil Samples ___ In. Diam. ___ No. — Classification By: Hargrave

Soil Samples ___ In. Diam. ___ No. — Classification By: ___

DEPTH (1" = 2')	CORE/SAMPLE NO.	SIZE	DEPTH RANGE	CORE REC'VY	BLOWS PER FT.	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
0 – 2' – 2.5'	S-1	2 3/8"	Rec	10%	1 / 1	Sampled with 2 3/8" x 2.5' Split Spoon Sampler advanced with 300 lbs hammer dropping 18"	Fill material
2.5' – 4' – 5'	S-2	2 3/8"		20%	1 2 2 1 3	Sampled Advanced HW casing to 5' using 300 lbs hammer cleaned casing to 5' using 3 7/8 O.D. roller bit and water	Brown cmt SAND; little SILT; trace GRAVEL; trace organic material (wet, non-plastic) SM
5' – 6' – 7.5'	S-3	2 3/8"	30%		2 1 1	Sampled	Brown cmt SAND; and GRAVEL; trace SILT (wet, non-plastic) SW
7.5' – 8'	S-4	2 3/8"	90%		3 3	Sampled	Similar Soils, SW

GENERAL REMARKS:
≈ 4" of water at [illegible] was fill material cut from bank

ED FORM 58 (Test)

Boring No. FC 88-4

Site	Boring No.	Page ___ of ___
North Sandwich [illegible]	FD 88-4	

DEPTH		CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT. / CORE REC'VY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
				Per	4	Advanced casing to 10', cleaned casing to 10'	
10'					3		
		S-5A			7	Sampled with 2 3/8" x 5' split spoon sampler advanced with [illegible] hammer	Grey GRAVEL; and cmf SAND, trace SILT (wet, non-plastic) GP
					7		
					8		
12'			2 3/8	60%	10	Advanced casing to 15' then cleaned casing to 15'	Similar Soils, GP
		S-5B			10		
					10		
					13		
14'					18		Grey GRAVEL cmf SAND SILT (wet, non-plastic) GM
		S-5C			22		
15'					23		
					14	Sampled	Grey cmf SAND, and GRAVEL little SILT, (wet, non plastic) SM
16'		S-6A			21	Advanced roller bit to 20' with difficulty	
			2 3/8		19	Advanced casing to 20', cleaned casing to 20'	
					17		Sample similar to Sample #5C, GM
					35		
		S-6B			32		
18' 18.5'					50/3"		
						No sample taken due to coarse gravel and possible cobbles	No sample taken due to coarse gravel and possible cobbles
20'							
					23	Sampled	Soils similar to Sample #5C GM
		S-7	2 3/8		40		
21.1'					25/2"	End of Boring 2/2/88	
						Continued exploration 2/3/88 Advanced roller bit to 22'	Bed rock
22'							Gneiss
						NX Diamond Core	Grey to Pink in color
		R-1	NX	98%			4.4' Recovery or 98%
24'							RQD = 76%
						Note: Driller had difficult time getting core because drilling was leaking sand and gravel into hole, apparently due to [illegible]	9 pieces, some fragments
26'							

FORM 58A (Test)

Boring No. FD 88-4

Site	Boring No.	Page ___ of ___
North Springfield Dam Pt	FD 88-4	

DEPTH		CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT / CORE REC'VY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
26'							
26.5'						END OF EXPLORATION 2/3/88	
28'							
30'							
32							
34							
36							
38							
40							
42							

FIELD LOG OF TEST BORING IN ROCK

SITE North Springfield Dam #4 HOLE NO. FD 88-4 PAGE

DATE	DEPTH FT. FROM	DEPTH FT. TO	RUN FT.	RUN REC'V'Y FT.	REC'V'Y %	DRILLING BEHAVIOR: FEED	DRILLING BEHAVIOR: WATER	DRILLING BEHAVIOR: REASON FOR PULL	ACTUAL DRILLING TIME	BIT NO. SIZE AND TYPE	ADDITIONAL REMARKS
3/13/88	[illegible]	26.5	4.5'	4.4'	98%	350psi	No loss of water	4.5' Run	≈ 90 min	4X	Run #1

TOTAL BED ROCK DRILLED _____ FEET

TOTAL BED-ROCK RECOVERED _____ FEET

BED ROCK RECOVERY _____ PERCENT

DRILLER _____

INSPECTOR _____

NED FORM DEC 130

REPLACES EDITION OF APR 63 WHICH MAY BE USED UNTIL EXHAUSTED

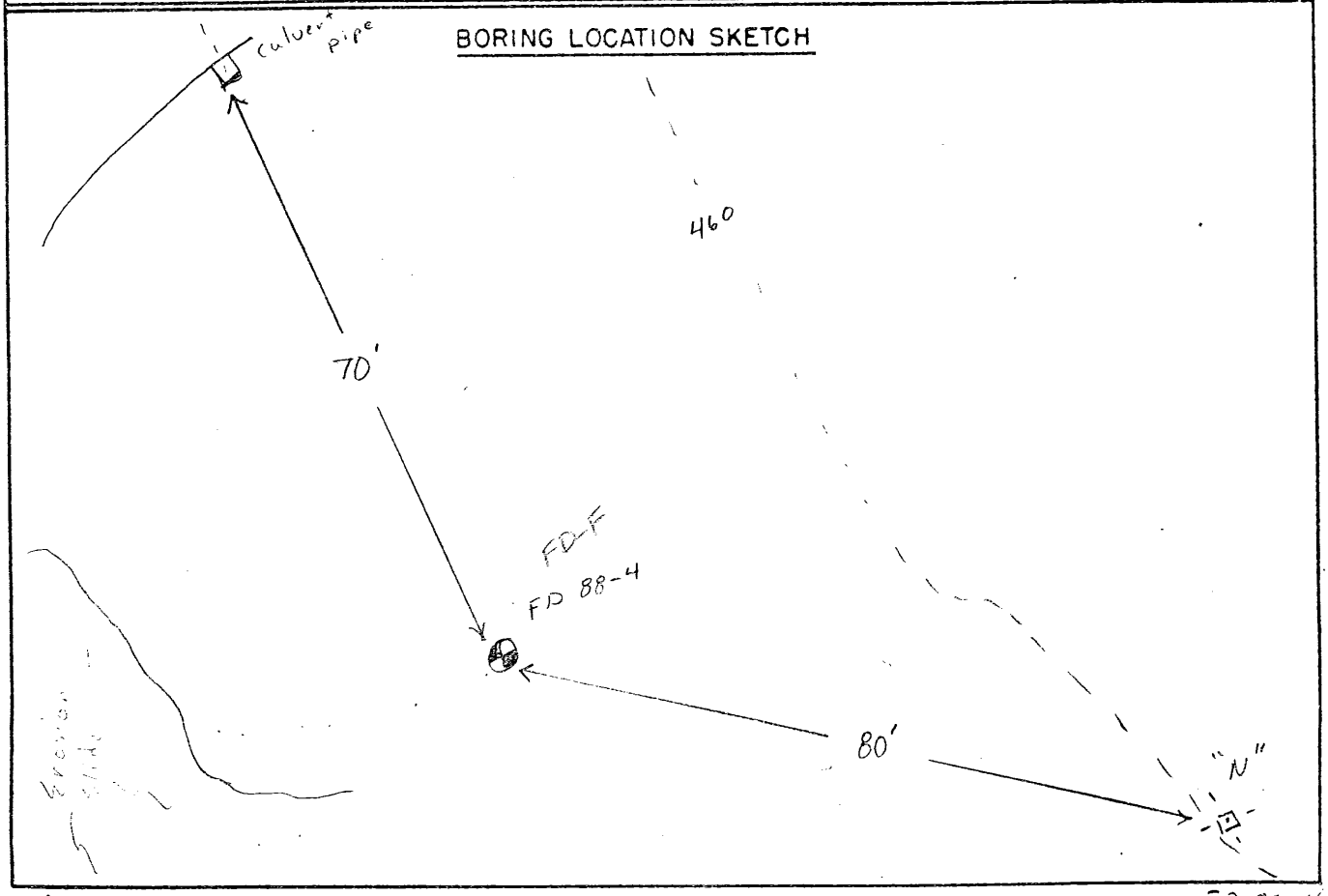
Site: North Springfield Dam
Boring No: FD 88-4

SUBSURFACE WATER OBSERVATIONS

DATE	TIME	DEPTH-BOT. OF CASING	DEPTH-BOT. OF BORING	DEPTH TO WATER	ELEVATION WATER	REMARKS
2/3/88	5:15 PM	20'	26.5'	5.35'		Boring incomplete
2/4/88	2:00 PM	20'	26.5'	5.65'		Boring incomplete
2/5/88	7:30 AM	20'	26.5	5.8'		Boring incomplete
2/9/88	8:25 pm	20'	26.5	6.[illegible]		Boring incomplete
2/10/88	7:45 a.	20'	26.5'	5.9'		
2/16/88	9:00 AM	20'	26.5	5.8		
2/17/88	7:30	20'	26.5	5.9		

Note: Depths are in feet below original ground

BORING LOCATION SKETCH



NED FORM 59 (Test) MAR 71

Boring No. FD 88-4

5 - B

CORPS OF ENGINEERS, U. S. ARMY
NEW ENGLAND DIVISION
FOUNDATION AND MATERIALS BRANCH

FIELD LOG OF TEST BORING

PROJECT NO. 20 0003

Site North Springfield Dam — Page 1 of ___ Pages

Hole No. [illegible] S Diam. (Casing) ___ — Boring Started 2/3/88

Co-ordinates: N ___ E ___ — Boring Completed 2/9/88

Drilled by Hayward — Report Submitted ___

Purpose of Exploration [illegible] seepage at downstream right abutment area

Elevation Top of Hole ___ M.S.L.
Total Overburden Drilled ___ Feet
Elevation Top of Rock ___ M.S.L.
Elevation Bottom of Hole ___ M.S.L.
Total Rock Drilled ___ Feet
Total Depth of Hole ___ Feet
Core Recovered ___ %
Core Recovered ___ Ft.: ___ Diam. ___ In.
Soil Samples ___ In. Diam. ___ No.
Soil Samples ___ In. Diam. ___ No.

Casing Left in Place ___ Fe
Water Table Depth ___

Depth From	Depth To	Method of Drilling and Type of Bit Used

INDEX

Ground Water ___ Back of Page ___
Boring Location Sketch ___ Back of Page ___
Overburden Record ___ Page ___
Rock Drilling ___ Page ___
___ Page ___
___ Page ___
___ Page ___

Prepared by Greg Hargraves
Field Data — Lab. Data

Submitted by Atlantic Testing Laboratories Ltd.

NED FORM DEC 63 121

REPLACES EDITION OF JUN 51 WHICH MAY BE USED UNTIL EXHAUSTED

U. S. ARMY
CORPS OF ENGINEERS
NEW ENGLAND DIVISION

FIELD LOG OF TEST BORING

Site North Springfield Dam — Page 1 of ___ Pages

Boring No. FD88-5 Desig. FD-B Diam. (Casing) ___

Co-ordinates: N ___ E ___

Elevation Top of Boring ___ M.S.L.
Total Overburden Drilled ___ Feet
Elevation Top of Rock ___ M.S.L.
Total Rock Drilled ___ Feet
Elevation Bottom of Boring ___ M.S.L.
Total Depth of Boring ___ Feet
Core Recovered ___ % No. Boxes ___
Core Recovered ___ Ft: ___ Diam. ___ In.
Soil Samples ___ In. Diam. ___ No.
Soil Samples ___ In. Diam. ___ No.

Hammer Wt. 300 lbs Boring Started 2/3/88
Hammer Drop 18 Boring Completed ___
Casing Left ___
Subsurface Water Data ___ Page ___
Obs. Well ___
Drilled By Hawkins
Mfg. Des. Drill CME 850
Inspected By: Hargrave
Classification By: Hargrave
Classification By: ___

DEPTH		CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT. / CORE REC'VY	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
				Rec.		Advanced HW casing to 25' using a 300 lbs hammer	GRANULAR MATERIAL
10'							
20'						END of EXPLORATION 2/3/88	
25'						Exploration Continued 2/4/88 Advanced casing to 40' Cleaned casing using 2 1/8" roller bit and air	
40'					2	Sampled using 2 3/8" I.D. x 5' sampler advanced with 300 lbs hammer	Brown m f SAND; trace SILT (moist, non-plastic) SP
		S-1A			3		
41					3		
					3		
42		S1B	2 3/8	60%	3		Similar Soil (cm f SAND; trace GRAVEL) SP
					7	Advanced casing to 45'	
43					9	Cleaned casing to 45'	
					9		
44					7		
					8		
45'		S-1C					Brown GRAVEL; and cm f SAND trace SILT (moist, non-plastic) GW
		S-2A	2 3/8	80%	4	Sampled	
					4		Brown cm f SAND; and GRAVEL, trace SILT (moist, non-plastic) SW

GENERAL REMARKS:
Sampling began [illegible] because elevation at actual boring location is lower than proposed boring location, also note change is [illegible]

NED FORM 58 (Test) MAR 71

Boring No. FD 88-5

Site	Boring No.	Page ___ of ___
North Springfield Dam	FD 88-5	

DEPTH		CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER 6" / CORE RECV'Y	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
46'				Pen.	4	Sampled	
47'		2B			4	Advanced casing to 50'	Similar Soil, (trace GRAVEL) SW
			2 3/8	80%	4	[illegible] to 50'	
48'					4		
					7		Similar Soil, SW
49'		2C			11		
					13		
50'					13		
		S-3A			5	Sampled	Similar Soil, SW
51'					4	Advanced casing to 54.5'	Brown SILT, some cmf SAND, trace GRAVEL (wet, non-plastic) ML
					4		
					9		
52'		S-3B	2 3/8	67%	8	[illegible] casing to 54.5'	Soil similar to Sample = 3A
					10		
53'					11		
		S-3C			11		
54'							
54.5'					9		
55'		S-4	2 3/8		7	Sampled Note: hammer was bouncing after 32 blows	Brown cmf SAND and SILT, little GRAVEL, wet, non-plastic SM
55.2'					32		
56'						Advanced roller bit to 57.5 using clear mud drilling fluid. Note: encountered cobble from 56.3' to 56.5', encountered coarse gravel and possible cobbles from 56.5' to 57.5'	Cobbles and coarse GRAVEL
57							
57.5'							
58		S-5	2 3/8	50%	30	Sampled. Note: hammer was bouncing after 30 blows	Grey-Brown GRAVEL, trace cmf SAND (wet, non-plastic) GP
58.5						Advanced roller bit to 58.5'	Possible COBBLES and GRAVEL
		S-6A			3	Sampled. Note: hammer was bouncing after 30 blows	Grey Brown cmf SAND and GRAVEL, little SILT (wet, non-plastic) SM
			2 3/8	80%	13		
					10	Advanced casing to 60'	Similar Soil, SM
60		S-6B			10	Advanced roller bit to 60.7'	
60.7					30/3"	END of EXPLORATION 2/4/88	
						EXPLORATION CONTINUED 2/8/88	Bad rock @ 60.7 Note driller encountered seam of soft rock @ 62.9'-63'
62						Advanced roller bit using clear mud drilling fluid to 62.9'	
62.9						After [illegible] hammer was	
63			2 3/8	0%	10		

58A(Test)

Boring No. FD-5

Site	Boring No.	Page ___ of ___
North Springfield [illegible]	[illegible]	

DEPTH		CORE/SAMPLE NO.	SIZE	DEPTH RUN	BLOWS PER FT / CORE RECVY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
63				1 sec		Advance a roller bit to 64.2' using "clear mud" drilling fluid	
64.2						END of Exploration 2/8/88	
						EXPLORATION [illegible] 2/9/88	
		R-1	NX	100%		NX DIAMOND CORE	Greenish schist to 64.5, remainder of run greyish pink gneiss 1 piece, RQD = 100%
65.7'							
66'						NX DIAMOND CORE [illegible] water @ [illegible]	greyish pink gneiss to 67.8', thin seam of quartz, remainder of run Greenish schist 4 pieces; few fragments RQD = 95%
68'		R-2	NX	100%			
70'							
[illegible]							
72'						NX DIAMOND CORE	
		R-3	NX	100%			3 pieces RQD = 100%
74'							
75.7						EXPLORATION PROGRAM TERMINATED	
						2/9/88 @ 75.7	

FIELD LOG OF TEST BORING IN ROCK

SITE [illegible] HOLE NO. [illegible] PAGE

DATE	DEPTH PT. FROM	DEPTH PT. TO	RUN PT.	RUN REC'V'Y PT.	REC'V'Y %	DRILLING BEHAVIOR: FEED	DRILLING BEHAVIOR: WATER	DRILLING BEHAVIOR: REASON FOR PULL	ACTUAL DRILLING TIME	BIT NO. SIZE AND TYPE	ADDITIONAL REMARKS
2/9/88	64.2	65.7	1.5	1.5'	100%	[illegible]	[illegible]	1.5' run	[illegible]	NX	Run #1
2/9/88	65.7	70.7	5	5	100%	Medium	[illegible] 66.6	5' run	25 min	NX	Run #2
2/9/88	[illegible]	[illegible]	5	5	100%		[illegible]		38 min	NX	Run #3

TOTAL BED ROCK DRILLED 15 FEET*

Total Bed Rock cored 11.5 Feet

TOTAL BED ROCK RECOVERED 11.5 FEET

BED ROCK RECOVERY 100 PERCENT!

DRILLER Hawkins

INSPECTOR Hargrave

NED FORM DEC 130 * includes rock drilled

REPLACES EDITION OF APR 63 WHICH MAY BE USED UNTIL EXHAUSTED

PIEZOMETER INSTALLATION REPORT

PROJECT: North Springfield Dam [illegible] | DATE: [illegible]-9-88

LOCATION (STA): | OFFSET FROM CENTER LINE: | PIEZ NO.: FD 88-5

PIEZ TYPE: | DEPTH OF PIEZ: 67.7' | RISER PIPE DIAM: 3/4

PIEZ TIP SET IN (SOIL TYPE): Rock | SOIL SAMPLE NO.: | BORING DIAM:

METHOD OF INSTALLATION:

TYPE OF PROTECTION FOR PIEZ: | VENT:

GROUND ELEV.: | ELEV. TOP OF RISER: | ELEV PIEZ TIP:

FILTER: #4 SAND | FROM ELEV: | TO ELEV:

SEAL: Bentonite pellets | FROM ELEV: | TO ELEV:

INSTALLED BY: [illegible] | CONTRACT NO.: [illegible] | FOREMAN: Haverque

DATE OF INSTALLATION: [illegible] | DATE OF OBSERVATIONS: [illegible]

METHOD OF TESTING PIEZ.:

TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH WATER FEET
	1/2	17.8		30	55.2			
	3	44.8						
	5	49.2						
	10	53.8						
	20	54.8						

REMARKS:

[illegible]
INSPECTOR

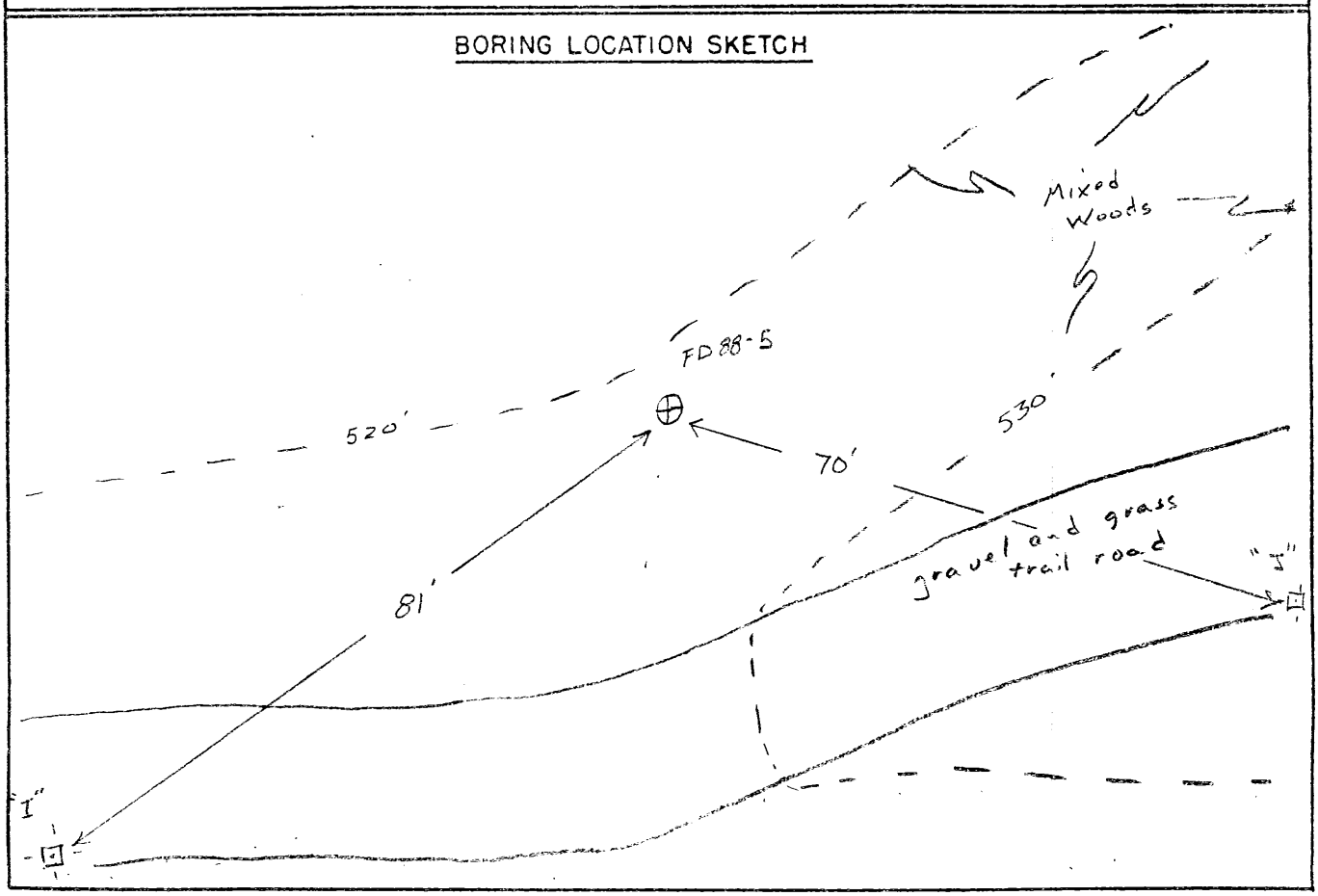
Site: [illegible]
Boring No: FD 88-5

SUBSURFACE WATER OBSERVATIONS

DATE	TIME	DEPTH-BOT. OF CASING	DEPTH-BOT. OF BORING	DEPTH TO WATER	ELEVATION WATER	REMARKS
2/10/88	7:15AM	6.95'	75.7	57.1'		
2/16/88	9:25	6.95'	75.7	57.2'		
2/17/88	7:45	6.95	75.7	57.3'		

Note: Depths are in feet below original ground

BORING LOCATION SKETCH



NED FORM 59 (Test) MAR 71

Boring No. FD 88-5

ATLANTIC TESTING LABORATORIES, LIMITED

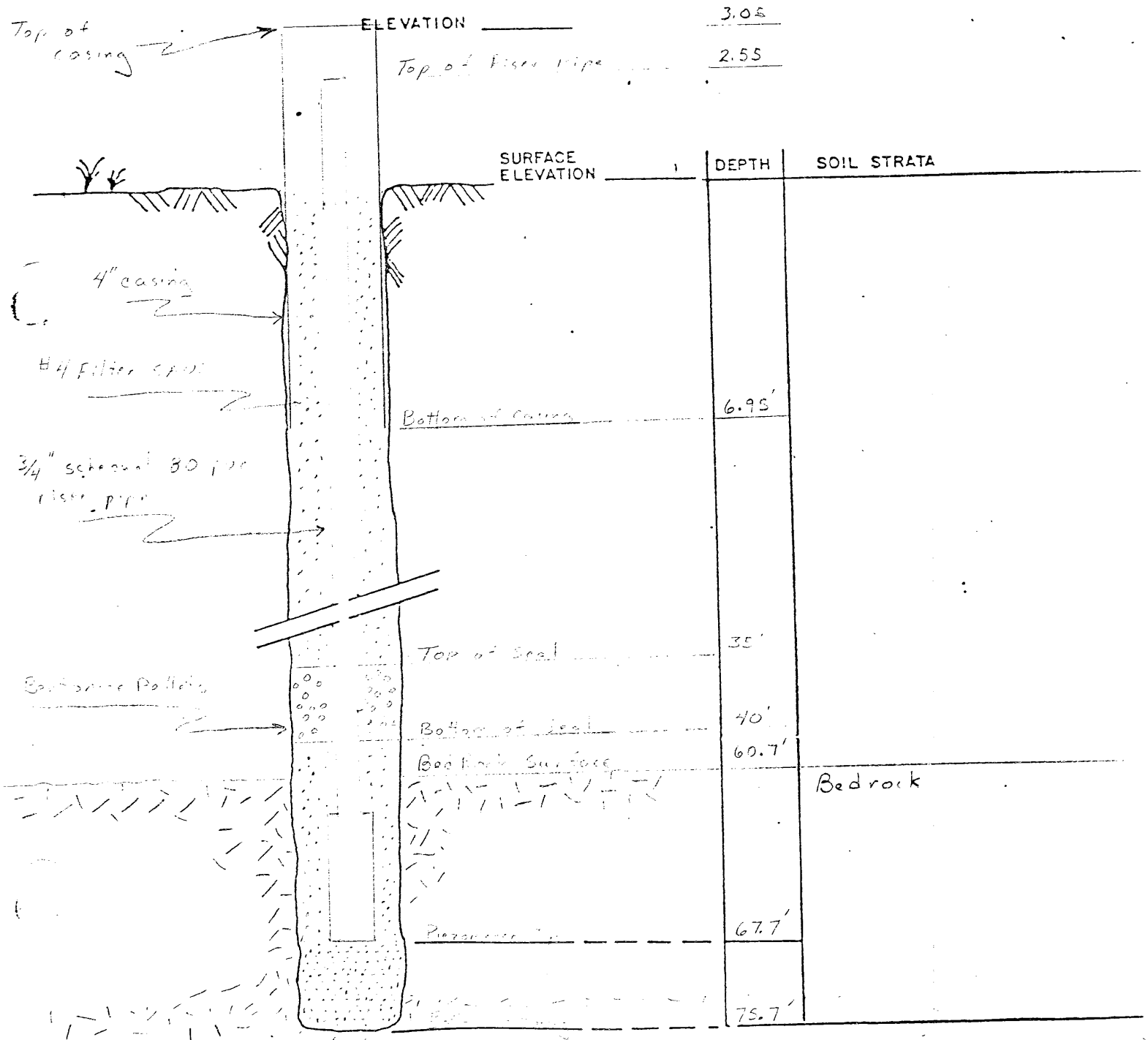
PIEZOMETER INSTALLATION DETAIL

PROJECT: [illegible]

PROJECT NO. D.O. 0203

ATL No. CD 030

PIEZOMETER No. CD 88-5 PZ-



6 - H
(WASH)

CORPS OF ENGINEERS, U. S. ARMY
NEW ENGLAND DIVISION
FOUNDATION AND MATERIALS BRANCH

FIELD LOG OF TEST BORING

PROJECT NO. D.O. 0003

Site North Springfield Dam VT

Page 1 of ___ Pages

Hole No. ED 88-6 Diam. (Casing) _____

Boring Started February 10, 1988

Co-ordinates: N _____ E _____

Boring Completed February 11, 1988

Drilled by Hawkins

Report Submitted _____

Purpose of Exploration _____

Elevation Top of Hole _____ M.S.L.

Total Overburden Drilled _____ Feet

Elevation Top of Rock _____ M.S.L.

Elevation Bottom of Hole _____ M.S.L.

Total Rock Drilled _____ Feet

Total Depth of Hole _____ Feet

Core Recovered _____ %

Core Recovered _____ Ft.; _____ Diam. _____ In.

Soil Samples _____ In. Diam. _____ No.

Soil Samples _____ In. Diam. _____ No.

Casing Left in Place _____ Feet

Water Table Depth _____

Depth From	Depth To	Method of Drilling and Type of Bit Used

INDEX

Ground Water	Back of Page ___
Boring Location Sketch	Back of Page ___
Overburden Record	Page ___
Rock Drilling	Page ___
	Page ___
	Page ___
	Page ___

Prepared by Gregory R. Harrison
Field Data Lab. Data

Submitted by [illegible]

NED FORM DEC 63 121 REPLACES EDITION OF JUN 51 WHICH MAY BE USED UNTIL EXHAUSTED

U. S. ARMY
CORPS OF ENGINEERS
NEW ENGLAND DIVISION

FIELD LOG OF TEST BORING

Site North Springfield Dam Vt — Page 1 of ___ Pages

Boring No. [illegible] Desig. FD-H Diam. (Casing) ___

Co-ordinates: N ___ E ___

Elevation Top of Boring ___ M.S.L. Hammer Wt. ___ Boring Started ___

Total Overburden Drilled ___ Feet Hammer Drop ___ Boring Completed ___

Elevation Top of Rock ___ M.S.L. Casing Left ___

Total Rock Drilled ___ Feet Subsurface Water Data ___ Page ___

Elevation Bottom of Boring ___ M.S.L. Obs. Well ___

Total Depth of Boring ___ Feet Drilled By Hawkins

Core Recovered ___ % No. Boxes ___ Mfg. Des. Drill CME 850

Core Recovered ___ Ft: ___ Diam. ___ In. Inspected By: Hargrave

Soil Samples ___ In. Diam. ___ No. Classification By: Hargrave

Soil Samples ___ In. Diam. ___ No. Classification By: ___

DEPTH		CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT. CORE REC'VY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
	1" = 20'						
				Rec		Advanced HW casing to 15' using 300 lbs hammer [illegible] 2/13/88	
10							
						Continued [illegible] 2/14/88 Advanced 8 7/8" roller bit to 55' using clear mud [illegible] Note: [illegible] gravel from 41'-45' Bed rock [illegible] @ 53.8'	
20							
30'							
40'							
50'							
55'							Bed rock Run #1 Grey Gneiss 6 pieces RQD = 86% Run #2 Similar to #1 8 pieces, few fragments RQD = 85%
60'		R-1	NX	100%		NX DIAMOND CORE	
64		R-2	NX	100%		NX DIAMOND CORE	
70'							
80'							
100'							

GENERAL REMARKS:

Boring No. [illegible]

NED FORM 58 (Test) MAR 71

FIELD LOG OF TEST BORING IN ROCK

SITE [illegible] HOLE NO. ED 82-6 PAGE

DATE	DEPTH FT. FROM	DEPTH FT. TO	RUN FT.	RUN REC'V'Y FT.	REC'V'Y %	DRILLING BEHAVIOR: FEED	DRILLING BEHAVIOR: WATER	DRILLING BEHAVIOR: REASON FOR PULL	ACTUAL DRILLING TIME	BIT NO. SIZE AND TYPE	ADDITIONAL REMARKS
2/11/82	55	60	5	5	100%	[illegible]	No [illegible]	[illegible]	35 min	NX	Run #1
2/11/82	60	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4 run	30 min	NX	Run #2

TOTAL BED ROCK DRILLED _____ FEET

Total Bed Rock Cored 9 Feet

TOTAL BED ROCK RECOVERED 9 FEET

BED ROCK RECOVERY 100 PERCENT

DRILLER Hawkins

INSPECTOR Hargrave

MED FORM DEC 130

REPLACES EDITION OF APR 62 WHICH MAY BE USED UNTIL EXHAUSTED

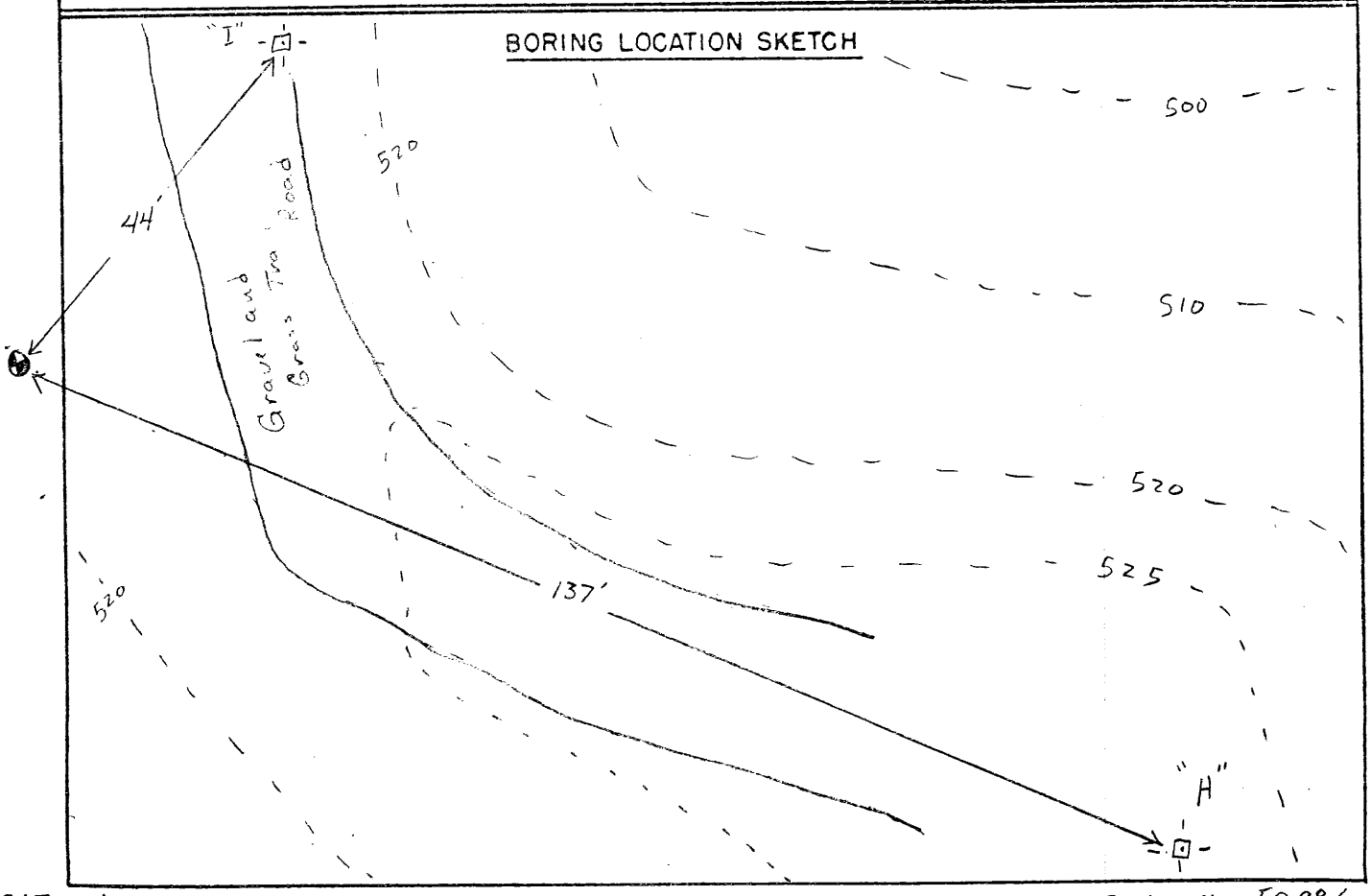
Site: North Springfield Dam, VT
Boring No: FD 88-6

SUBSURFACE WATER OBSERVATIONS

DATE	TIME	DEPTH-BOT. OF CASING	DEPTH-BOT. OF BORING	DEPTH TO WATER	ELEVATION WATER	REMARKS
2-16-88	12:30	NA	≈ 56'	54.5'		open, uncased hole
2-17-88	7:40	NA	≈ 56'	54.4'		open, uncased hole

Note: Depths are in feet below original ground

BORING LOCATION SKETCH



NED FORM 59 (Test) MAR 71

Boring No. FD 88-6

7-G

CORPS OF ENGINEERS, U. S. ARMY
NEW ENGLAND DIVISION
FOUNDATION AND MATERIALS BRANCH

FIELD LOG OF TEST BORING

PROJECT NO. D.O. 0003

Site North Springfield Dam, Vt — Page 1 of 8 Pages

Hole No. ID88-7 Diam. (Casing) _____ — Boring Started 2-11-88

Co-ordinates: N _____ E _____ — Boring Completed 2-16-88

Drilled by Hawkins & Burnham — Report Submitted _____

Purpose of Exploration _____

Elevation Top of Hole _____ M.S.L.
Total Overburden Drilled _____ Feet
Elevation Top of Rock _____ M.S.L.
Elevation Bottom of Hole _____ M.S.L.
Total Rock Drilled _____ Feet
Total Depth of Hole _____ Feet
Core Recovered _____ %
Core Recovered _____ Ft.; _____ Diam. _____ In.
Soil Samples _____ In. Diam. _____ No.
Soil Samples _____ In. Diam. _____ No.

Casing Left in Place _____ Fe

Water Table Depth _____

Depth From	Depth To	Method of Drilling and Type of Bit Used

INDEX

Ground Water	Back of Page 7
Boring Location Sketch	Back of Page 7
Overburden Record page 2 through	Page 4
Rock Drilling	Page 5
Piezometer installation report	Page 6
Piezometer installation detail	Page 6
	Page

Prepared by Gregory R. Harrigan — Field Data — Lab. Data

Submitted by Atlantic Testing Laboratories Ltd.

NED FORM DEC 63 121 — REPLACES EDITION OF JUN 51 WHICH MAY BE USED UNTIL EXHAUSTED

U. S. ARMY
CORPS OF ENGINEERS
NEW ENGLAND DIVISION

FIELD LOG OF TEST BORING

Site North Springfield Dam VT — Page 2 of 8 Pages

Boring No. [illegible] Desig. FD-G Diam. (Casing) _____

Co-ordinates: N _____ E _____

Elevation Top of Boring _____ M.S.L.
Total Overburden Drilled _____ Feet
Elevation Top of Rock _____ M.S.L.
Total Rock Drilled _____ Feet
Elevation Bottom of Boring _____ M.S.L.
Total Depth of Boring _____ Feet
Core Recovered _____ % No. Boxes _____
Core Recovered _____ Ft : _____ Diam. _____ In.
Soil Samples _____ In. Diam. _____ No.
Soil Samples _____ In. Diam. _____ No.

Hammer Wt. 300 lbs
Hammer Drop 18"
Casing Left _____
Subsurface Water Data _____ Page _____
Obs. Well _____
Drilled By Hawkins + Todd
Mfg. Des. Drill CME 850
Inspected By: Greg Hargrave
Classification By: Greg Hargrave
Classification By: _____

Boring Started 2-11-88
Boring Completed _____

DEPTH (1"=)	CORE/SAMPLE NO.	SIZE	DEPTH RANGE	CORE REC'VY	BLOWS PER FT.	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
5'			Rec			Advanced HW casing to 10' using spin bit. Cleaned casing to 10' using a 3 7/8" roller bit and water as a drilling fluid	GRANULAR SOILS
10'							
	S-1A	2 3/8"	60%		4 5 17 8 6 7 11 9	Sampled using a 5' x 2 3/8" ID sampling spoon advanced with a 140 lb hammer. Note: only obtained 4' sample because sand "T" was in way of hammer. Advanced 3 7/8" roller bit to 15' using clear water drilling fluid	Brownish cm f SAND; and GRAVEL. (Wet, non plastic) SW gravel (20-30) SR→SA SD-SM cobble frags. Similar soil SR SM
	S-1B						
14'							
15'							Coarse gravel and possible cobbles
16	S-2	2 3/8"	50%		4 13	Sampled	~~Soil similar to sample #1, with trace SILT (SW)~~ Brown GRAVEL with silt (6.4) and sand (32.7) GP-GM

GENERAL REMARKS:

N/A

NED FORM 58 (Test) MAR 71

Boring No. FD 88-7

Site	Boring No.	Page 3 of 8
North Springfield UT	FD 88-7	

DEPTH		CORE/SAMPLE NO.	SIZE	~~DEPTH RANGE~~	BLOWS ~~PER FT~~ ~~CORE RECVY~~	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
16'		S-2	2 3/8"		14, 11, 13, 15	Advance 3 7/8" rollerbit to 20' using clear water drilling fluid. Water [illegible] @ 19-19.1'	
18.2'				bouncing refusal	11		
20'							Coarse gravel and possible cobbles
22		S-3	2 3/8"	60%	8, 4, 6, 6, 6, 9, 11, 11	Sampled (MA)	Brown mf SAND, trace SILT (<5%) (wet, nonplastic) SP
24					13		
25'					12	END OF EXPLORATION 2-11-88	
26'		S-4	2 3/8"	30%	10, 17, 11, 7, 9, 8, 6, 7, 6, 10	EXPLORATION CONTINUED 2-15-88. Advanced HW casing with spin bit to 25' casing state, then [illegible] and a 3 7/8" roller bit to 25'. Sampled from 25'-30'	Soil similar to sample # 3
30'						END OF EXPLORATION 2-15-88	
32'		S-5	2 3/8"	70%	7, 6, 10, 11, 13	EXPLORATION CONTINUED 2-16-88. Spun HW casing to 30, cleaned casing with 3 7/8" roller bit to 30'. Sampled from 30' to 32.8' (Sand silty (SM))	Brownish ~~GRAVEL, and~~ gravelly (25-35%) ~~mf SAND little SILT~~ (SP-SM) (wet, ~~non-plastic~~) GM
32.8				bouncing refusal	4		

Starts changes

58A (Test)

Boring No. FD 88-7

Site	Boring No.	Page 4 of 8
North Springfield Dam, Vt	FD 88-7	

DEPTH	1" = 2'	CORE/SAMPLE NO.	SIZE	DEPTH PER FT / CORE REC'VY	BLOWS PER FT	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
34'				Rec		Advanced casing to 34.9' cleaned casing to 34.9'	Coarse gravel and possible cobbles
34.9'		S-6	2 3/8	bouncing refusal	10	Sampled Advanced casing to 35'	~~GRAVEL, GP~~ (Gravel, poorly graded, trace sand)
36'						Advanced roller bit to 38' Note: Bedrock @ 36.75'	Coarse gravel and possible cobbles
38'							Bedrock
40'		R-1	NX	88%		NX DIAMOND CORE	Grey Gneiss with seams of schist 6 pieces, some fragments RQD = 78% Note: verticals fractures from 39.3' to 43'
42'							
43'							
44'		R-2	NX	67%		NX DIAMOND CORE	Grey Gneiss 2 pieces, RQD = 58%
46'							
46.75						EXPLORATION TERMINATED 2-16-88	

FIELD LOG OF TEST BORING IN ROCK

SITE North Springfield Dam, VT HOLE NO. FD 88-7 PAGE 5 of 8

DATE	DEPTH FT. FROM	DEPTH FT. TO	RUN FT.	RUN REC'V'Y FT.	REC'V'Y %	DRILLING BEHAVIOR: FEED	DRILLING BEHAVIOR: WATER	DRILLING BEHAVIOR: REASON FOR PULL	ACTUAL DRILLING TIME	BIT NO. SIZE AND TYPE	ADDITIONAL REMARKS
2/16/88	38	43	5'	4.4'	88%	Medium	No loss of water noted	5' run	20 min.	NX	Run #1
2/16/88	43	46.75	3.75'	2.5	67%	Medium	slight loss of water noted	3.75' run	27 min	NX	Run #2

TOTAL BED ROCK ~~DRILLED~~ Cored 8.75' FEET

TOTAL BED-ROCK RECOVERED 6.9 FEET

BED ROCK RECOVERY 79% PERCENT

DRILLER Burham

INSPECTOR Hargrave

NED FORM DEC 130

REPLACES EDITION OF APR 63 WHICH MAY BE USED UNTIL EXHAUSTED

PIEZOMETER INSTALLATION REPORT

PROJECT: North Springfield Dam | DATE: 2-16-88

LOCATION (STA): | OFFSET FROM CENTER LINE: | PIEZ NO.: FD88-7

PIEZ TYPE: Casagrande | DEPTH OF PIEZ: 40.35 | RISER PIPE DIAM: 3/4"

PIEZ TIP SET IN (SOIL TYPE): | SOIL SAMPLE NO.: | BORING DIAM:

METHOD OF INSTALLATION:

TYPE OF PROTECTION FOR PIEZ: 4" casing | VENT: screw on cap

GROUND ELEV.: | ELEV. TOP OF RISER: | ELEV PIEZ TIP:

FILTER: | FROM ELEV: | TO ELEV:

SEAL: | FROM ELEV: | TO ELEV:

INSTALLED BY: Burnham | CONTRACT NO.: D.O. 0003 | FOREMAN: Hargrave

DATE OF INSTALLATION: 2-16-88 | DATE OF OBSERVATIONS: 2-16-88

METHOD OF TESTING PIEZ.:

TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET
	0	0		10.0	33.4			
	0.5	28.6		15.0	33.4			
	1.0	32.6		20.0	33.4			
	3.0	32.9						
	5.0	33.2						

REMARKS:

Gregory R. Hargrave
INSPECTOR

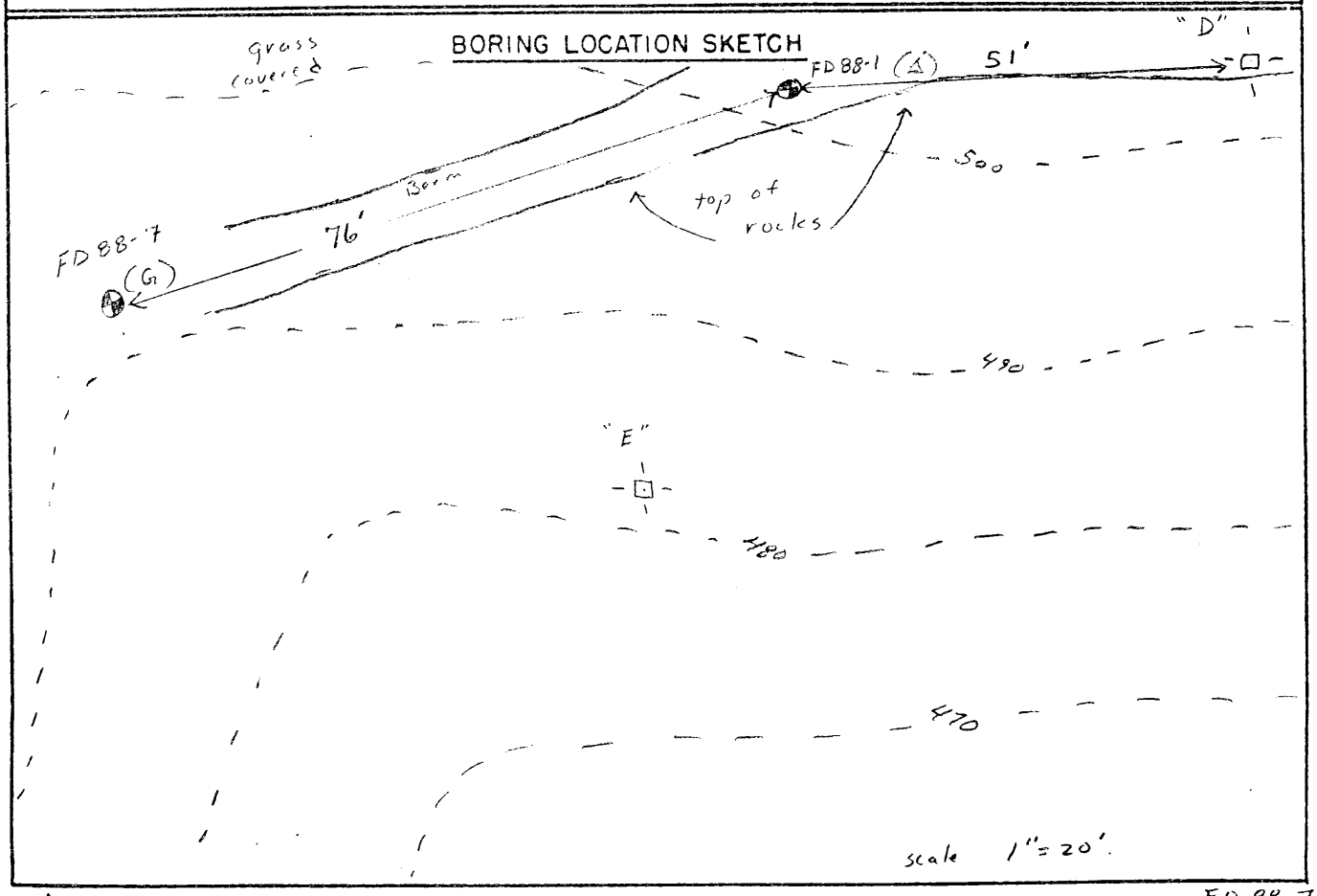
Site: North Springfield Dam, VT
Boring No: FD 88-7

SUBSURFACE WATER OBSERVATIONS

DATE	TIME	DEPTH-BOT. OF CASING	DEPTH-BOT. OF BORING	DEPTH TO WATER	ELEVATION WATER	REMARKS
2-17-88	7:25	6.9	46.75'	34.0		

Note: Depths are in feet below original ground

BORING LOCATION SKETCH



ATLANTIC TESTING LABORATORIES, LIMITED

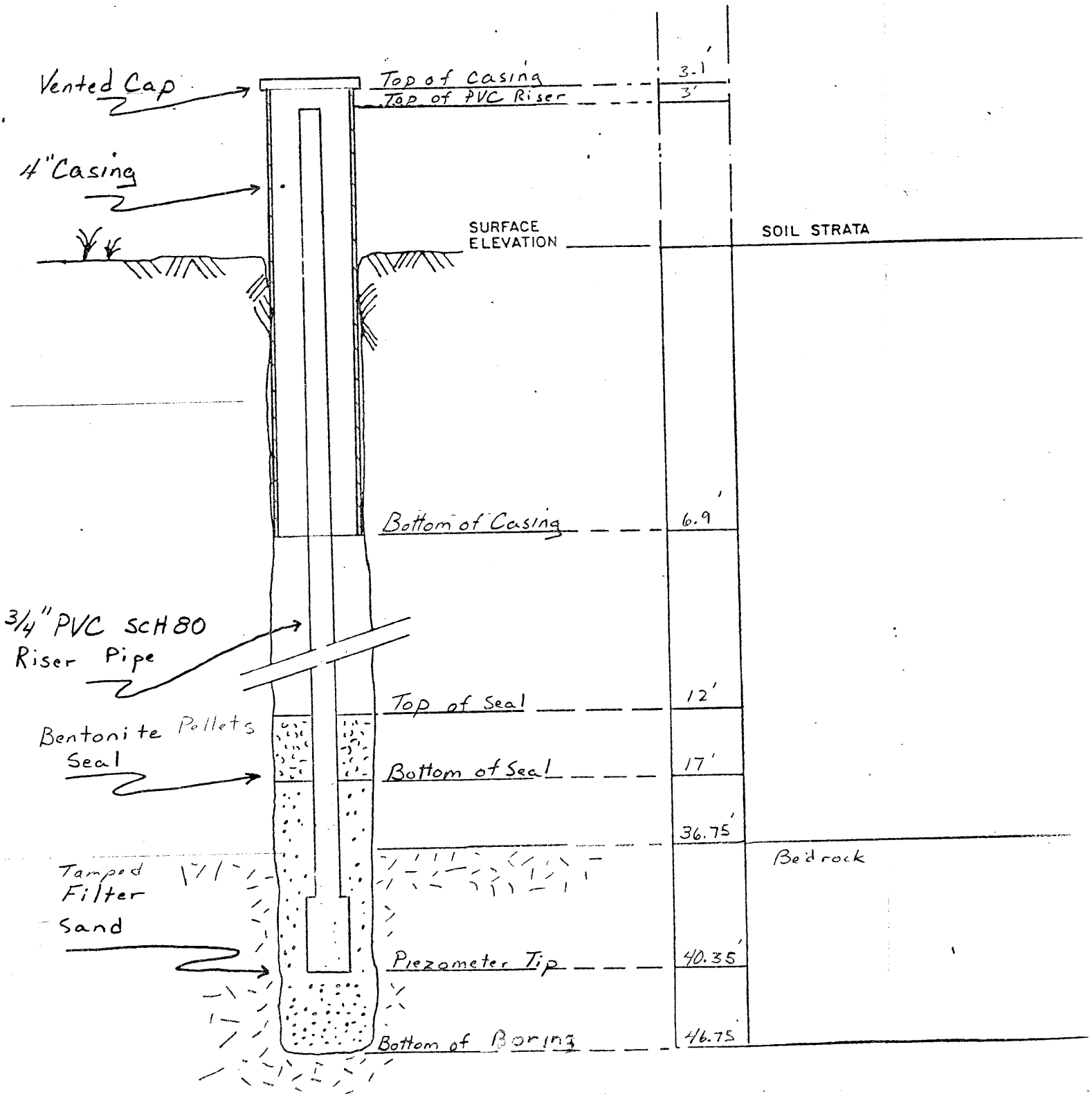
PIEZOMETER INSTALLATION DETAIL

PROJECT: North Springfield Dam Piezometer Installation

PROJECT NO. CD 030

CLIENT: USACE, NED

WELL NO. FD 88-7



FD-88-8 (E)

Engr. log

CORPS OF ENGINEERS, U. S. ARMY
NEW ENGLAND DIVISION
FOUNDATION AND MATERIALS BRANCH

FIELD LOG OF TEST BORING

PROJECT NO. D.O.0003

Site North Springfield Dam — Page 1 of 11 Pages

Hole No. FD 88-8 Diam. (Casing) HW — Boring Started Febuary 17, 1988

Co-ordinates: N 51109 E 50146 — Boring Completed Febuary 24, 1988

Drilled by Burnham — Report Submitted March 3, 1988

Purpose of Exploration To investigate seepage in right abutment area

Elevation Top of Hole 530.6 M.S.L. — Casing Left in Place 10 Feet

Total Overburden Drilled 81.7 Feet

Elevation Top of Rock 448.9' M.S.L.

Elevation Bottom of Hole 439.1 M.S.L.

Total Rock Drilled 9.8 Feet; Total Rock Cored ____

Total Depth of Hole 91.5 Feet

Core Recovered 91 %

Core Recovered 8 Ft.; NX Diam. ____ In.

Soil Samples ____ In. Diam. ____ No.

Soil Samples ____ In. Diam. ____ No. — Water Table Depth 72.2'

Depth From	Depth To	Method of Drilling and Type of Bit Used
0	74.5	Continuous split spoon sampling
0	55'	HW casing advanced with 300lbs hammer
57.2	59.2	NX DIAMOND CORE
77.7	81.5	NX DIAMOND CORE
82.7	91.5	NX DIAMOND CORE

INDEX

Ground Water ____ ~~Back of~~ Page 10
Boring Location Sketch ____ Back of Page ____
Overburden Record page 2 thru Page 7
Rock Drilling ____ Page 8
Piezometer Installation Report Page 9
Piezometer Installation Retail Page 11
____ Page ____

Prepared by Gregory R. Hargrave
Field Data — Lab. Data

Submitted by Atlantic Testing Laboratories Ltd.

NED FORM DEC 63 121 — REPLACES EDITION OF JUN 51 WHICH MAY BE USED UNTIL EXHAUSTED

U. S. ARMY
CORPS OF ENGINEERS
NEW ENGLAND DIVISION

FIELD LOG OF TEST BORING

Site North Springfield Dam — Page 2 of 11 Pages

Boring No. FD 88-8 Desig. _____ Diam. (Casing) HW

Co-ordinates: N 51109 E 50146

Elevation Top of Boring 530.6 M.S.L.
Total Overburden Drilled 81.7 Feet
Elevation Top of Rock 448.9 M.S.L.
Total Rock Drilled _____ Feet
Elevation Bottom of Boring 439.1 M.S.L.
Total Depth of Boring 91.5 Feet
Core Recovered _____ % No. Boxes _____
Core Recovered _____ Ft: _____ Diam. _____ In.
Soil Samples _____ In. Diam. _____ No.
Soil Samples _____ In. Diam. _____ No.

Hammer Wt. 300lbs Boring Started 2-17-88
Hammer Drop 18" Boring Completed 2-24-88
Casing Left 10'
~~Subsurface Water Data~~ _____ ~~Page~~ _____
Obs. Well _____
Drilled By Burnham
Mfg. Des. Drill CME 850
Inspected By: Greg Hargrave
Classification By: Hargrave
Classification By: _____

DEPTH 1"=2'	CORE/SAMPLE NO.	SIZE	~~DEPTH RANGE~~	CORE REC'VY	BLOWS PER ~~FT.~~	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
			Rec.		4	Sampled using a 2 3/8" I.D. x 5' sampling spoon advanced with a 300lbs hammer dropping 18"	Brown mf SAND tr. f. gravel ~~(moist, nonplastic)~~ (v. clean) SP
					2		
					2		
					2		
2'	S-1	2 3/8"	54%		1	Spun HW casing to 5', cleaned casing with a 3 7/8" roller bit and water to 5'	
					3		
					2		
					3		
4'							
					4		
5'					3		
					2	Sampled spun casing to 10', cleaned casing to 10'	Brown cm f SAND; trace f. GRAVEL ~~(wet, nonplastic)~~ SP (v. clean)
					1		
6'					1		
					2		
	S-2	2 3/8"	62%		1		
					2		
8'							
					2		
					2		
					3		
10'					3		

GENERAL REMARKS:

NED FORM 58 (Test) MAR 71

Boring No. FD 88-8

Site	Boring No.	Page 3 of 11
North Springfield Dam	FD 88-8	

DEPTH		CORE/SAMPLE NO.	SIZE	DEPTH ~~RANGE~~	BLOWS PER FT. / CORE REC'VY	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
10'				Rec	2 2	Sampled to 13.6', advanced roller bit to 15' using water as drilling fluid, advanced HW casing, cleaned casing to 15'	Brown well graded cmf SAND; with silt (5.2) and ~~some~~ GRAVEL (36.8) (wet, nonplastic) ~~SW~~ SW-SM
12'		S-3	2 3/8"		2 3 3 3		
13.6'		bouncing refusal			6 11	Note: encountered cobbles from 13.8' to 14.9'	
14'							Cobbles
15'							
16'		S-4A			2 6 5 5	Sampled to 20' Spun casing to 20' cleaned casing to 20'	Grey GRAVEL ~~and~~ with silt (5-15) and ~~cmf~~ SAND; ~~trace~~ (30-40) ~~SILT (wet, nonplastic)~~ ~~GP~~ GP-GM
			2 3/8"	26%	4 5		
18'		S-4B			4 5 6 6		Brown poorly graded ~~cmf~~ SAND; with silt (6.7) and ~~little~~ GRAVEL; ~~trace~~ (27.1) ~~SILT (wet, nonplastic)~~ ~~SP~~ SP-SM sub-round to subangular
20'							
22'		S-5	2 3/8"	50%	3 3 3 3 4 4 5 5 4 5	Sampled to 25' Spun casing to 25' cleaned casing to 25'	Grey mf SAND; with ~~trace~~ SILT (5-15) ~~(wet, nonplastic)~~ ~~SP~~ SP-SM
24'							
25'						END OF EXPLORATION 2-17-88	
26'		S-6	2 3/8"	50%	4 4	EXPLORATION CONTINUED 2-18-88 Sampled	Grey m-f SAND; with ~~trace~~ GRAVEL (5-15) SP

Site: North Springfield Dam, Vt

Boring No. FD 88-8

DEPTH	1" : 2'	CORE/SAMPLE NO.	SIZE	DEPTH MADE	BLOWS PER FT. / CORE REC'VY	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
26'				Rec	4	Sampled to 30'	
					2	advanced roller bit to	
					3	30.5', advanced	
28'		S-6	2 3/8"		3	casing to 30.5', cleaned	
					3	casing to 30.5'	
					.5	Note: cobble encountered	
					5	from 30' to 30.5'	
30'					8		
30.5'							COBBLE (1.6)
					5	Sampled to 35',	Grey GRAVEL; ~~some~~ with silt (5-15) and ~~cmt~~ SAND (22-5) ~~little SILT~~ GW (30-40) GP-GM ~~(wet, nonplastic)~~ ~~GM~~ SUB B - SUB A
		S-7A			7	advanced roller bit to	
					6	35', advanced casing	
32'					8	to 35', cleaned casing	~~Grey GRAVEL; trace SAND;~~ Similar except sand (10-20) ~~trace SILT (wet, nonplastic)~~ ~~GP~~ GP-GM
					9	to 35'	
		S-7B	2 3/8"	40%	8		
					8		Grey poorly graded ~~cmt~~ SAND; with ~~trace~~ (9-7) GRAVEL; trace SILT ~~(wet, nonplastic)~~ SP
34'					7		
		S-7C			7		
35'							
					3	Sampled to 40',	Similar soil, ~~(little GRAVEL)~~ SP
					4	advanced roller bit to	
36'					4	40', advanced casing	
					5	to 40', cleaned casing	
					7	to 40'	
38'		S-8	2 3/8"	60%	7		
					7		
					5		
					7		
40'					13		
					5	Sampled to 45',	~~Grey cmt SAND;~~ ~~little GRAVEL~~ ~~(wet, non plastic) SP~~
					5	advanced roller bit to	
					4	45', advanced casing	
42'		S-9	2 3/8"	50%	4	to 45', cleaned casing	Similar except trace gravel SP ~~SM~~
					5	to 45'	
					5		

Site	Boring No.	Page 5 of 11
North Springfield Dam, Vt	FD 88-8	

DEPTH	1" = 2'	CORE/SAMPLE NO.	SIZE	DEPTH RUN	BLOWS PER FT. / CORE REC'VY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
44'				Rec	7 7 8		~~SP~~ SP-SM
45'					8		
46'		S10A			8 8 .8 9 9	Sampled, advanced roller bit to 50', advanced casing to 50', cleaned casing to 50'	Grey ~~GRAVEL~~ SAND ~~with~~ ~~and~~ with ~~cmf SAND; trace~~ SILT (5-15) and gravel (30-40) (wet, non-plastic) ~~GW~~ w/cobble fragments SP-SM
		S-10B		60%			Grey silty (15-25) ~~cmf~~ f SAND ~~little SILT; trace GRAVEL~~ (wet, nonplastic) SM
48'			2 3/8"		12 11 15 15		
50'		S-10C			8 10		Grey SAND ~~GRAVEL; and cmf SAND trace~~ with SILT (5-15) and gravel (30-40) (wet, nonplastic) ~~GW~~ SP-SM
52'					7 5 5 6 6	Sampled, advanced roller bit to 55', advanced casing to 55', cleaned casing to 55'	Grey m f SAND; ~~trace~~ with SILT (5-15) (wet, nonplastic) ~~SP~~ SP-SM
		S-11	2 3/8"	60%	8 8 9		
54'					10		Grey ~~m~~ f SAND; ~~some~~ with SILT (15-25) (wet, nonplastic) SM
55'					13		
56.2'		S-12A S-12B S-12C	2 3/8"	80%	3 11 13	Sampled to 56.2' advanced roller bit to 57.2'	Brown cmf SAND; ~~and~~ with GRAVEL (25-35) and ~~trace~~ SILT (5-15) (wet, nonplastic) ~~SW~~ SP-SM
57' 57.2				bouncing refusal		Note: END OF EXPLORATION 2-18-88	GREY poorly graded GRAVEL; with ~~and cmf~~ SAND (45-7) and ~~little~~ SILT (7-1) (wet, nonplastic) ~~GM~~ GP-GM
58'		R-1	NX			CONTINUED EXPLORATION 2-19-88 NX DIAMOND CORE	Boulder
59.2'						END of EXPLORATION 2-19-88	
60						EXPLORATION CONTINUED 2-22-88 Advanced 3 7/8" roller bit to	coarse gravel and cobbles

Site	Boring No.	Page 6 of 11
North Springfield Dam, Vt	FD 88-8	

DEPTH	1" = 2'	CORE/SAMPLE NO.	SIZE	DEPTH RUN	BLOWS PER 6" / CORE REC'VY	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
60'				Rec		59.2' using Clear mud drilling fluid. Advance casing to 56'. END OF EXPLORATION 2-22-88	
60.8'						EXPLORATION CONTINUED 2-23-88	
61.8'		S-13	2 3/8"	80%	3 5-. bouncing refusal	Sample to 61.8'	Grey cm-f SAND; ~~trace GRAVEL~~ SP (60% of sample) very clean (wet, non plastic) ~~SW~~ Br. silty (15-25) m-f SAND SM (clumps; 40% of sample)
62'							Coarse gravel and cobbles
64'						Advanced roller bit to 65.5' using "Clear mud" drilling fluid. Note: encountered coarse gravel and cobbles from 61.8' to 65.5'	
65.5'							
65.6'			2 3/8"	0%	5 bouncing refusal	Sample 65.6'. Advanced roller bit to 68'. Note: encountered possible boulder from 65.6' to 68'	Possible Boulder
68'							
68.6'		S-14	2 3/8	50%	3 2-. bouncing refusal	Sample to 68.6'. Advanced roller bit to 73.5'. Note: encountered coarse gravel and cobbles from 68.6' to 71.9', encountered a large cobble from 71.9' to 72.7'; encountered coarse gravel and cobbles from 72.7' to 73.5	Soil similar to sample #13, SW. DK. Br. c-m SAND tr. silt SP very pervious (10% clumps of Br. silty (15-25) m-f SAND SM)
70'							coarse gravel and cobbles
72'							cobble
73.5							coarse gravel and cobbles
74.5		S-15	2 3/8	30%	10 17-. bouncing refusal	Sample to 74.5'. Advanced roller bit to 77.7'. Note: encountered coarse gravel and cobbles from 74.5' to 77.7';	grey-brown cm-f SAND; ~~some~~ with GRAVEL (37.3) and SILT (wet, non-plastic) ~~SM~~ SP-SM (8.5)
							coarse gravel and cobbles
76'							

Site	Boring No.	Page 7 of 11
North Springfield Dam, Vt	FD 88-8	

DEPTH		CORE/SAMPLE NO.	SIZE	~~DEPTH RANGE~~	CORE REC'VY	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
	1" 2'			Rec			
77.7'							
78'		R-2	NX	76%		NX DIAMOND CORE, 3.8' run	Cobbles with seams of cm + SAND, little GRAVEL little SILT,
80'							
81.5'						END OF EXPLORATION 2-23-88	
82'						EXPLORATION CONTINUED 2-24-88 Advanced 3 7/8" roller bit to 82.7' Note: bedrock @ 81.7	Bedrock
82.7'							
84'		R-3	NX	79%		NX DIAMOND CORE; 3.8' run	Greyish-Pink Gneiss 3' recovery 8 pieces, few fragments RQD = 57%
86							
86.5							
88'		R-4	NX	100%		NX DIAMOND CORE; 5' run	Similar Rock 100% recovery 4 pieces RQD = 100%
90'							
91.5'						EXPLORATION TERMINATED 2-24-88	

PIEZOMETER INSTALLATION REPORT

PROJECT: North Springfield Dam, Vt | DATE: 2-25-88

LOCATION (STA): | OFFSET FROM CENTER LINE: | PIEZ NO.: PZ-21 FD88-8

PIEZ TYPE: Casagrande | DEPTH OF PIEZ: 87.0 | RISER PIPE DIAM: 3/4"

PIEZ TIP SET IN (SOIL TYPE): Bedrock | SOIL SAMPLE NO.: | BORING DIAM: 4" overburden 3" in bedrock

METHOD OF INSTALLATION:

TYPE OF PROTECTION FOR PIEZ: 4" casing | VENT: screw on cap

GROUND ELEV.: 530.6' | ELEV. TOP OF RISER: 533' | ELEV PIEZ TIP: 443.6'

FILTER: #3 graded Q-rock SAND | FROM ELEV: 443.1' | TO ELEV: 469.6'

SEAL: Bentonite Pellets | FROM ELEV: 469.6' | TO ELEV: 474.6'

INSTALLED BY: Burnham | CONTRACT NO.: D0.0003 | FOREMAN: Hargrave

DATE OF INSTALLATION: 2-24-88 | DATE OF OBSERVATIONS: 2-25-88

METHOD OF TESTING PIEZ.: Falling Head Test

TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET
	0.5	19.1		10.0	37.9			
	1.0	21.0		15.0	43.1			
	2.0	23.6		20.0	47.2			
	3.0	26.0		25.0	50.7			
	5.0	30.3		30.0	53.3			

REMARKS:

Static water level was recorded prior to performing falling head test, level was 72.2'

Gregory P. Hargrave
INSPECTOR

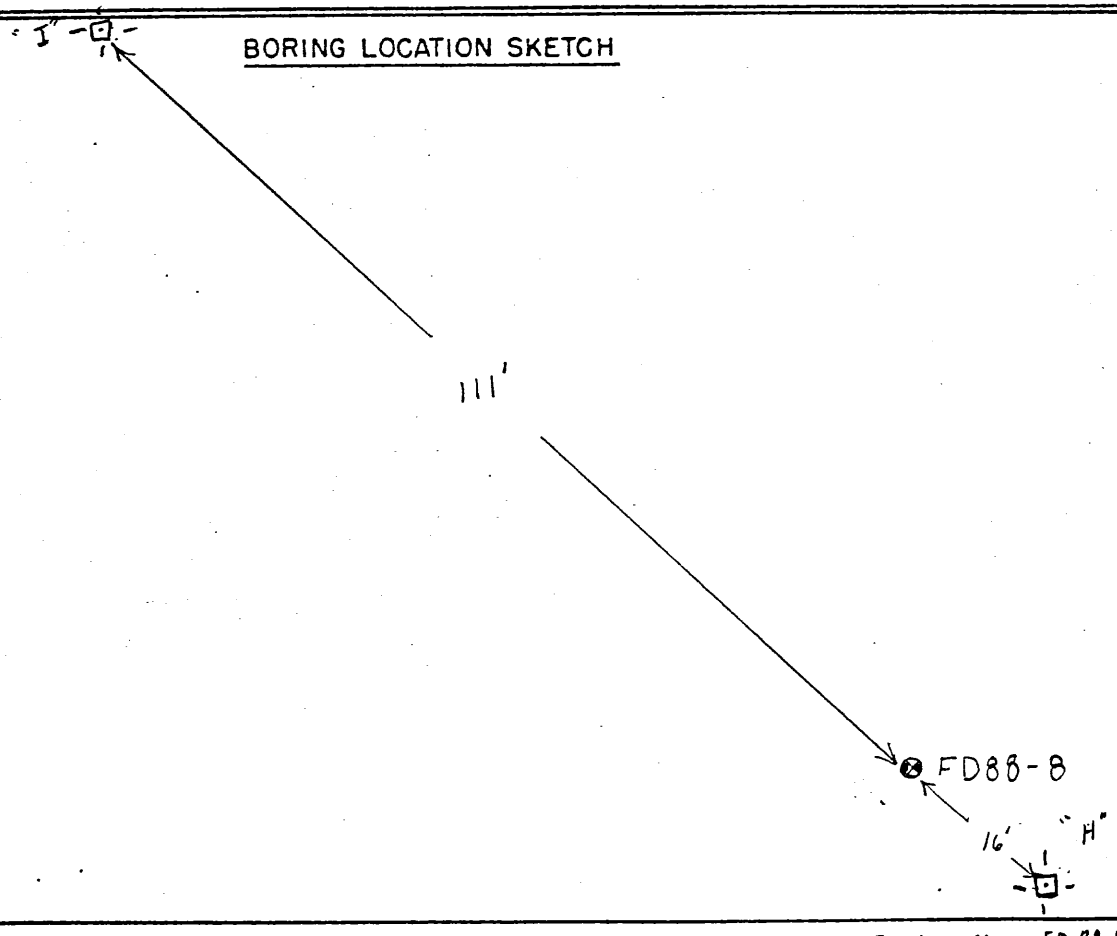
Site: North Springfield Dam, Vt
Boring No: FD 88-8

SUBSURFACE WATER OBSERVATIONS

DATE	TIME	DEPTH-BOT. OF CASING	DEPTH-BOT. OF BORING	DEPTH TO WATER	ELEVATION WATER	REMARKS
2-24-88	11:00Am	7'	87.7	72.2	458.4	water level before falling head test performed

Note: Depths are in feet below original ground

BORING LOCATION SKETCH



ATLANTIC TESTING LABORATORIES, LIMITED

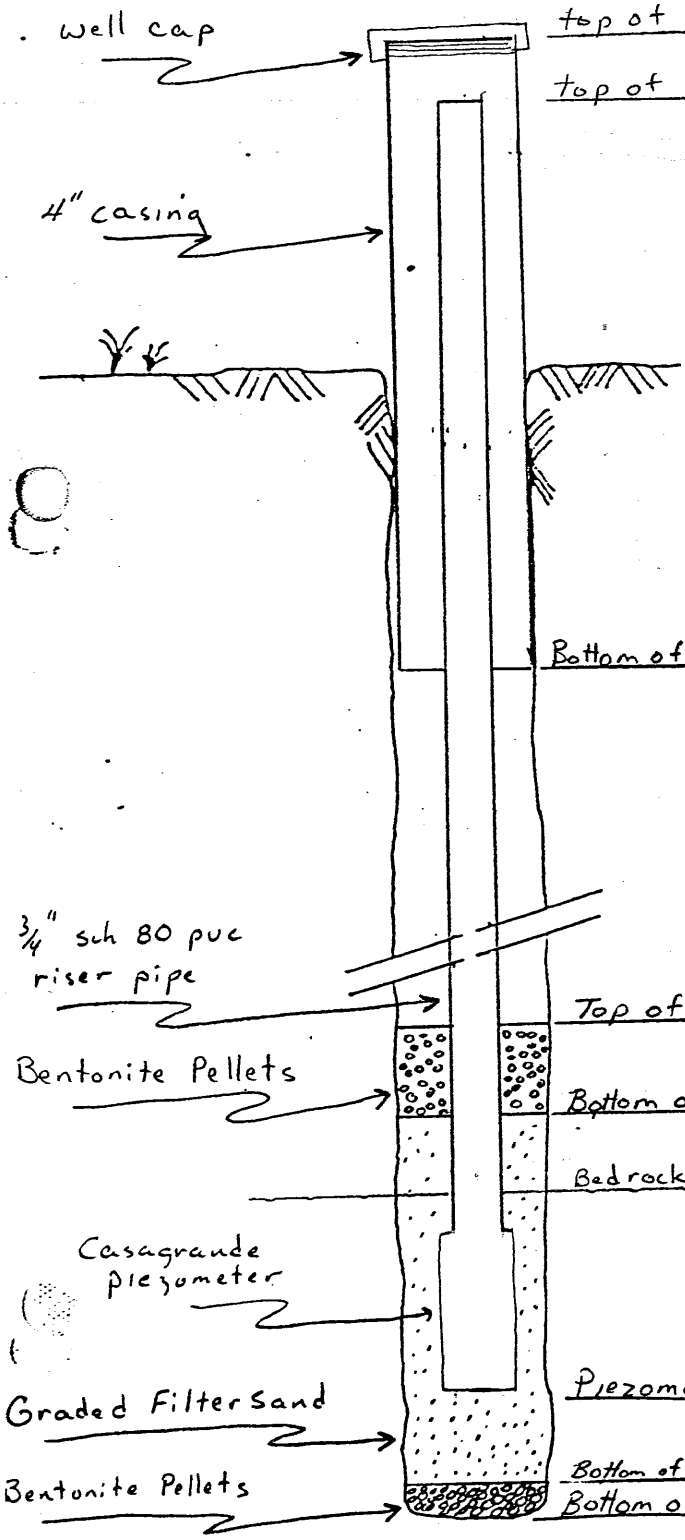
PIEZOMETER INSTALLATION DETAIL

PROJECT: North Springfield Dam VT

PROJECT NO. D.O. 0003

ATL No. CD 030

PIEZOMETER No. FD 88-8



top of casing	3'	
top of riser pipe	2.4'	
SURFACE ELEVATION	DEPTH	SOIL STRATA
Bottom of casing	7'	
Top of Seal	56.0'	
Bottom of Seal	61.0'	
Bedrock surface	81.7'	
Piezometer tip	87.0'	
Bottom of SAND	87.5	
Bottom of Boring	91.5'	

FIELD LOG OF TEST BORING IN ROCK

SITE North Springfield Dam, VT HOLE NO. FD 88-8 PAGE 8 of 11

DATE	DEPTH PT. FROM	DEPTH PT. TO	RUN PT.	RUN REC'V'Y PT.	REC'V'Y %	DRILLING BEHAVIOR: FEED	DRILLING BEHAVIOR: WATER	DRILLING BEHAVIOR: REASON FOR PULL	ACTUAL DRILLING TIME	BIT NO. SIZE AND TYPE	ADDITIONAL REMARKS
2-19-88	57.2'	59.2'	2'	0.9	45%	Medium	No loss of water noted	2' run	25 min	NX	Run #1, broke through boulder @ 59.2'
2-23-88	77.7	81.5	3.8'	2.9'	76%	Medium	loss of water noted from 80.4' to 80.5'	3.8' run	35 min	NX	Run #2
2-24-88	82.7	86.5	3.8'	3'	79%	Medium	No loss noted	3.5' run	40 min.	NX	Run #3
2-24-88	86.5	91.5	5'	5'	100%	Medium	No loss noted	5' run	50 min	NX	Run #4

TOTAL BED ROCK DRILLED 9.8 FEET; total rock cored – 14.6 ; total bedrock cored 8.8

TOTAL BED-ROCK RECOVERED 8 FEET

BED ROCK RECOVERY 91 PERCENT

DRILLER Burnham

INSPECTOR Hargrove

NED FORM DEC 130

REPLACES EDITION OF APR 63 WHICH MAY BE USED UNTIL EXHAUSTED

USF Label

FD-88-5

S-1A 40-41.5 M-f SAND Lt. brown (SP) MA

S-1B 41.5-44.5 similar (SP)

S-1C 44.5-45 Lt. br. gravelly (30-40) sand (SP) (MA)
silty (5-10)
well-rounded to sub-angular

S-2A 45-47 ~~Lt. br. Gravelly~~ Similar (SP)

S-2B 47-48.5 Lt. br. m-f SAND (SP) MA

S-2C 48.5-50 Similar (SP)

S-3A 50-50.5 Dk. br. gravelly (35-45) silty (5-15) sand SP-SM ← MA
pieces of cobble ~~(25-40)~~

S-3B 50.5-51 Lt. br. silty (15-25) m-f sand w/ layers of silt (ML) 1/4"-3/4"
piece of cobble

S-3C 51-54.5 Lt. br. silty (5-15) gravelly (20-30) SAND (SP-SM)
well round - sub-ang gravel

S-4 54.5-55.2 Dk. br. silty (30-40) SAND (SM) w/ 1/2" layer silty (40-50) SAND (SM)
tr. gravel

S-5 57.5-58.0 Cobble fragments of large gravel.

S-6A 58.5-59.5 Dk. gray silty (10-20) gravelly (10-20) SAND SM (MA)
(remove large frags prior to test) sub-rnd to sub-A grav. also large gravel fragments. R. SP-SM → TB

Run MA on S-15 + S-16 combined

FD-88-5

S-6B 89.5-60.7 similar

END FD-88-5

FD 88-1

S-1 10-11.5 gr. brown gravelly (10-20) C-M SAND (SP)
V. pervious washed sand wet
subrnd to sub-angular

S-2 11.5-13 similar (SP)

S-3 13-15 similar (SP)

S-4 15-16.5 gr. br. gravelly (20-30) SAND (SP) wet MA
clean - trace silt (0-5)

S-5 16.5-18 gr. br gravelly (5-10) SAND (SP)

S-6 18-20 gr. br. silty (5-15) gravelly (35-45) SAND (SP-SM)

S-7

S-8 SP-SM (MA)

S-9 (MA)

S-10

FD 88-9

S-1 lt. brown m-f SAND, trace fi gravel SP
very clean

S-2 ~~med~~ brown SAND, tr fi gravel, v. clean SP

S-3 DK brown SAND w/ gravel (15-20) and silt (5-15) SP-SM
MA

S-4A Dk. br. silty (5-15) sandy (30-40) gravel GP-GM

S-4B Dk. br. silty (5-15) gravelly (10-20) SAND SP-SM MA
subang-subrnd

S-5 Lt. br. silty (5-15) M-F SAND SP-SM

S-6 Lt. br. gravelly (5-15) M-F SAND SP
~~sa~~ subrnded

S-7A Dk br. silty (5-15) sandy (30-40) Gravel GP-GM (possible GM) MA GM?
subrnd-subang.

S-7B ✓ Similar except sandy (10-20) GP-GM GM?
broken pcs of gravel

S-7C Dk. Br. silty (5-15) gravelly (5-15) SAND SP-SM

S-8 Med Dk. Br. silty (5-15) gravelly (5-15) SAND SP-SM MA

S-9 similar but trace gravel SP-SM

S-10A Dk br. silty (5-15) gravelly (30-40) SAND
SP-SM sub-rnd-sub-ang grav. broken cobble fragments

S-10B DK Br silty (15-25) f. SAND SM trace gravel (MA)

S-10C Br. silty (5-15) gravelly (30-40) SAND SP-SM
cobble frag.

S-11 Br. silty (5-15) m-f SAND SP-SM

S-12A Br. silty (15-25) f. SAND SM

S-12-B Br. silty (5-15) gravelly (25-35) SAND SP-SM
sub-rnd, sub-ang.

} skipped on profile

S-12C br. silty (5-15) sandy (25-35) gravel GP-GM (MA)
subrnd - subang

S-13 60% of sample br. c-M SAND (SP) v. clean
40% br. silty (15-25) m-f sand SM (clumps)

S-14 90% dk Br c-m Sand w/ trace silt SP very K
10% Br. silty (15-25) m-f sand SM (clumps)

S-15 Br. silty (10-20) gravelly (25-35) SAND SM. (MA)