ATLANTIC TESTING LABORATORIES, LIMITED

520 North Bedford St.
Manchester, N.H. 03104
(603) 669-4828

Box 29
Canton, N.Y. 13617
(315) 386-4578

May 26, 1988

U. S. Army Corps of Engineers
New England Division
424 Trapelo Road
Waltham, MA 02254-9194

Attn: Mr. Mark Vance

Re: Hopkinton Dam, Wall Foundation Investigation
Hopkinton Dam, Hopkinton, New Hampshire
Contract No. DACW 33-87-D-0007
Delivery Order No. 0004
ATL Report No. CD029-1-4-88

Gentlemen:

In accordance with your Delivery Order No. 0004 dated 88, February 08, attached are two **final** copies of our Engineering Report for the subsurface investigation performed at Hopkinton, New Hampshire.

Do not hesitate to contact our office should you have any questions or comments.

Respectfully submitted,

Gregory R. Hargrave

Gregory R. Hargrave
Geologist

GRH/dh

encs.

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

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## SECTION 2

## TABLE OF CONTENTS


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## SECTION 3 - SCOPE OF INVESTIGATION

a. Delivery Order No. 0004

CHECKED BOX APPLIES: [X] 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 OMS 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: [X] DEST [ ] OTHER *(See Schedule if other)*

9. 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: [X] SMALL [ ] SMALL DISADVANTAGED [ ] WOMEN-OWNED

12. DISCOUNT TERMS: NET

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

14. ~~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. TYPE OF ORDER
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 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 10 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
96X3123
CC113344DA0C000 (MD) $30,141.30

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

| 18. 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 |

** 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 ~~$30,141.00~~

29. DIFFERENCES ~~23,033.60~~

26. QUANTITY IN COLUMN 20 HAS BEEN: [ ] INSPECTED [✓] RECEIVED [ ] ACCEPTED, AND CONFORMS TO THE CONTRACT EXCEPT AS NOTED

DATE SIGNATURE OF AUTHORIZED GOVERNMENT REPRESENTATIVE

27. SHIP. NO. [ ] PARTIAL [ ] FINAL

28. D.O. VOUCHER NO.

30. INITIALS

32. PAID BY

33. AMOUNT VERIFIED CORRECT FOR

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.

FORM

RECEIVED 1 4 1988

NAME OF OFFEROR OR CONTRACTOR

ATLANTIC TESTING LABORATORIES, LIMITED

| ITEM NO. | SUPPLIES/SERVICES | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|
| | | APPROX. | | | ESTIMATED |
| 6.1 | Mobilization & Demobilization | 1 | JOB | $1,100.00 | $1,100.00 |
| 6.3 | Mileage, Manchester, NH and return | 42 | MI | 1.15 | 48.30 |
| 6.5 | Standby time | ~~32~~ 29.75 | HR | 80.00 | ~~2,560.00~~ 2,380.00 |
| 10.7 | Mobilization & Demobilization, 320 sq. ft. float | 1 | JOB | 1,200.00 | 1,200.00 |
| 10.6 | 320 Sq. ft. float | 1 | JOB | 950.00 | 950.00 |
| 14.1 | 0-50 ft. depth | ~~183~~ 67.9 | FT | 25.00 | ~~4,575.00~~ 1697.50 |
| 16.2 | 3-inch diam. X 30 inch tube | ~~16~~ 0 | EA | 110.00 | ~~1,760.00~~ 0.00 |
| 17.2 | HX and 6 inch size | ~~10~~ 0 | LF | 30.00 | ~~300.00~~ 0.00 |
| 18.2 | HX and 6 inch size | 120 | FT | 30.00 | 3,600.00 |
| 22.3 | NWX size | 24 | FT | 55.00 | 1,320.00 |
| 22.4 | 4 X 5 1/2 size | ~~8~~ 9 | FT | 75.00 | ~~600.00~~ 675.00 |
| 31.1 | Light Lumber for Shoring | ~~1~~ 0 | MBF | 800.00 | ~~800.00~~ 0.00 |
| 33.1 | Crane and Operator | ~~24~~ 12.5 | HR | 110.00 | ~~2,640.00~~ 1375.00 |

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.

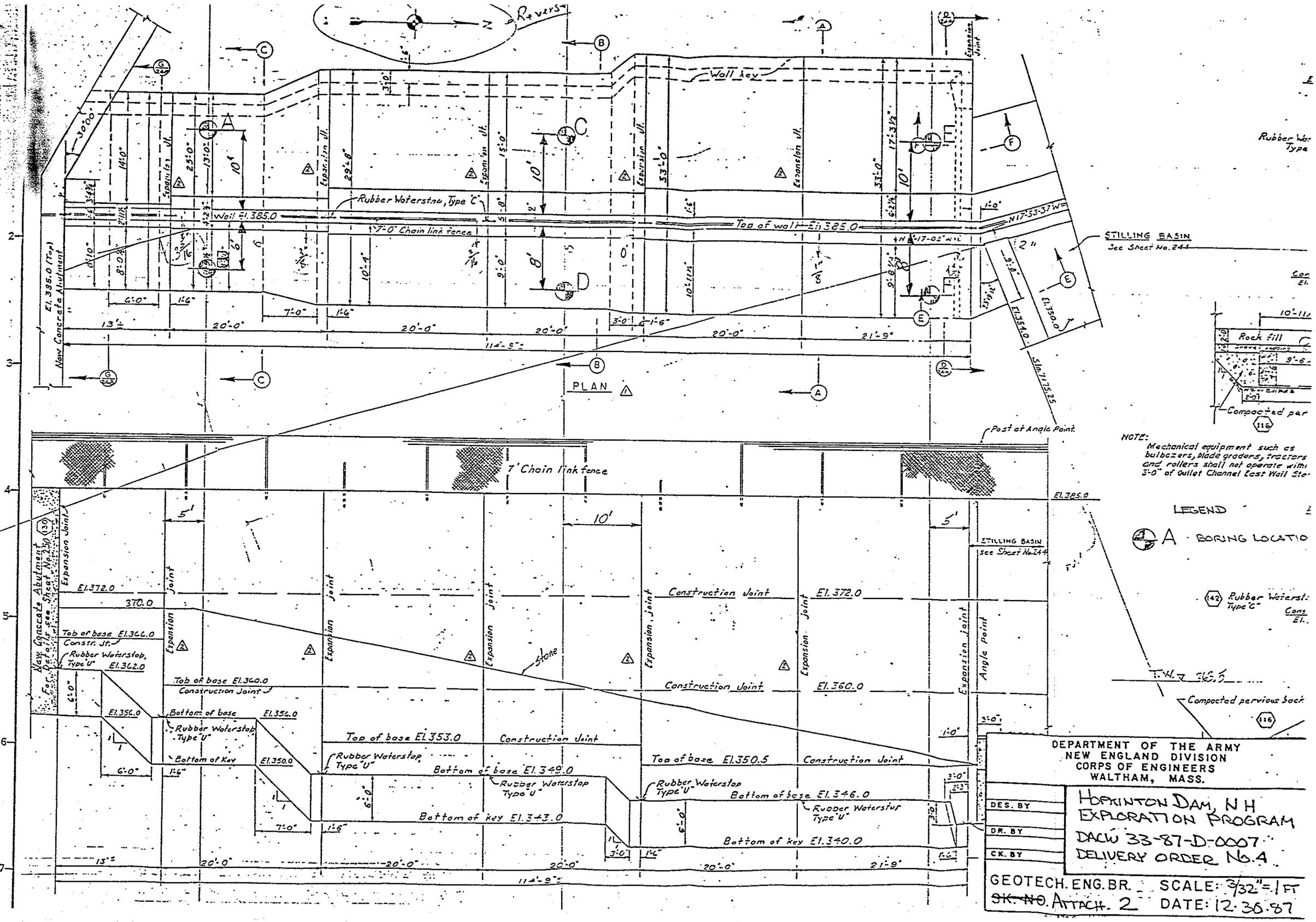
6. COMPLETION SCHEDULE.

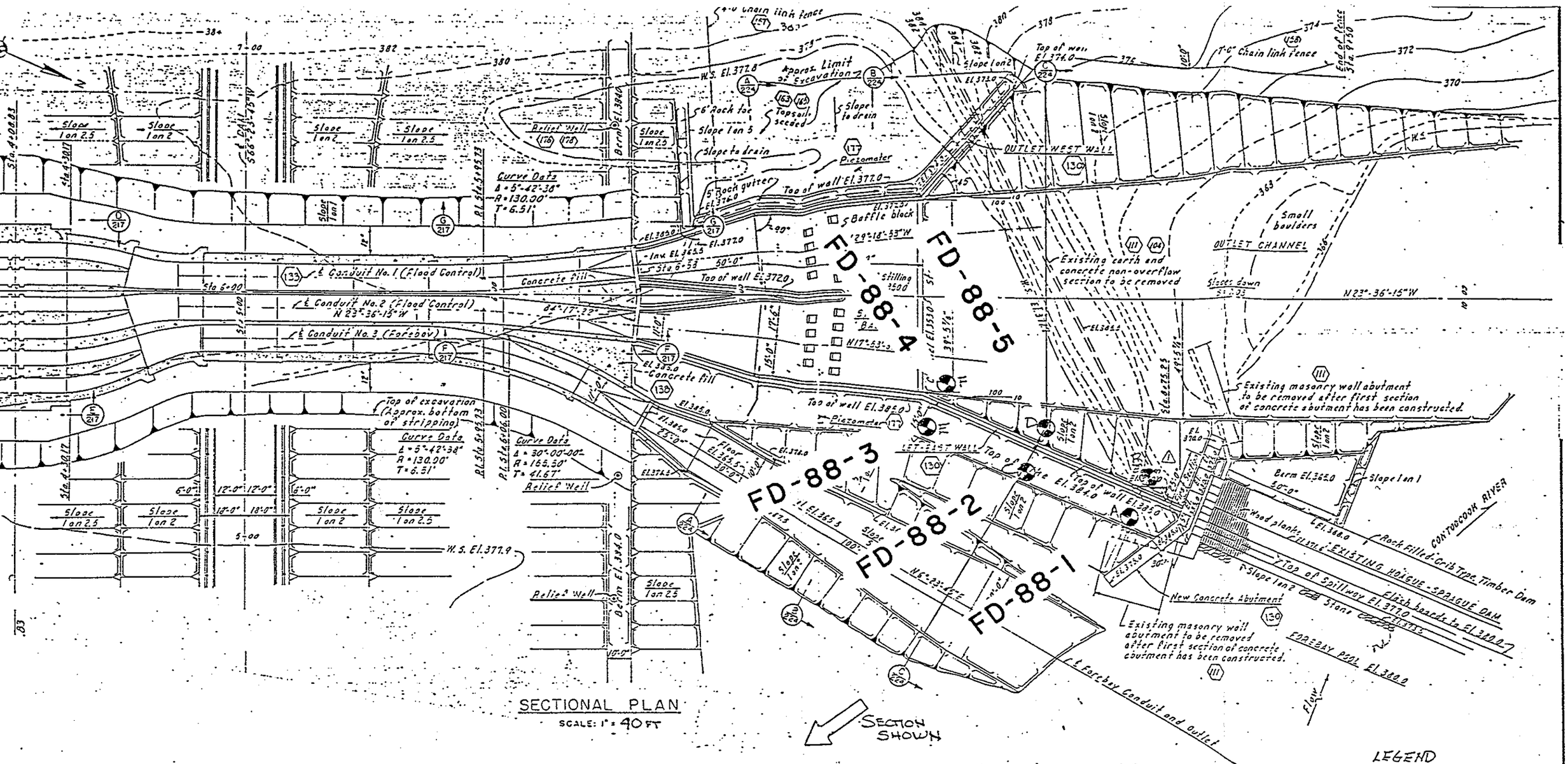
Services under this delivery order shall start on or before 25 January 1988. Duration of the field work is estimated to be 15 days. The geotechnical report shall be submitted in draft format for review (by the Government), postmarked no later than seven calendar days after the completion of field work.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

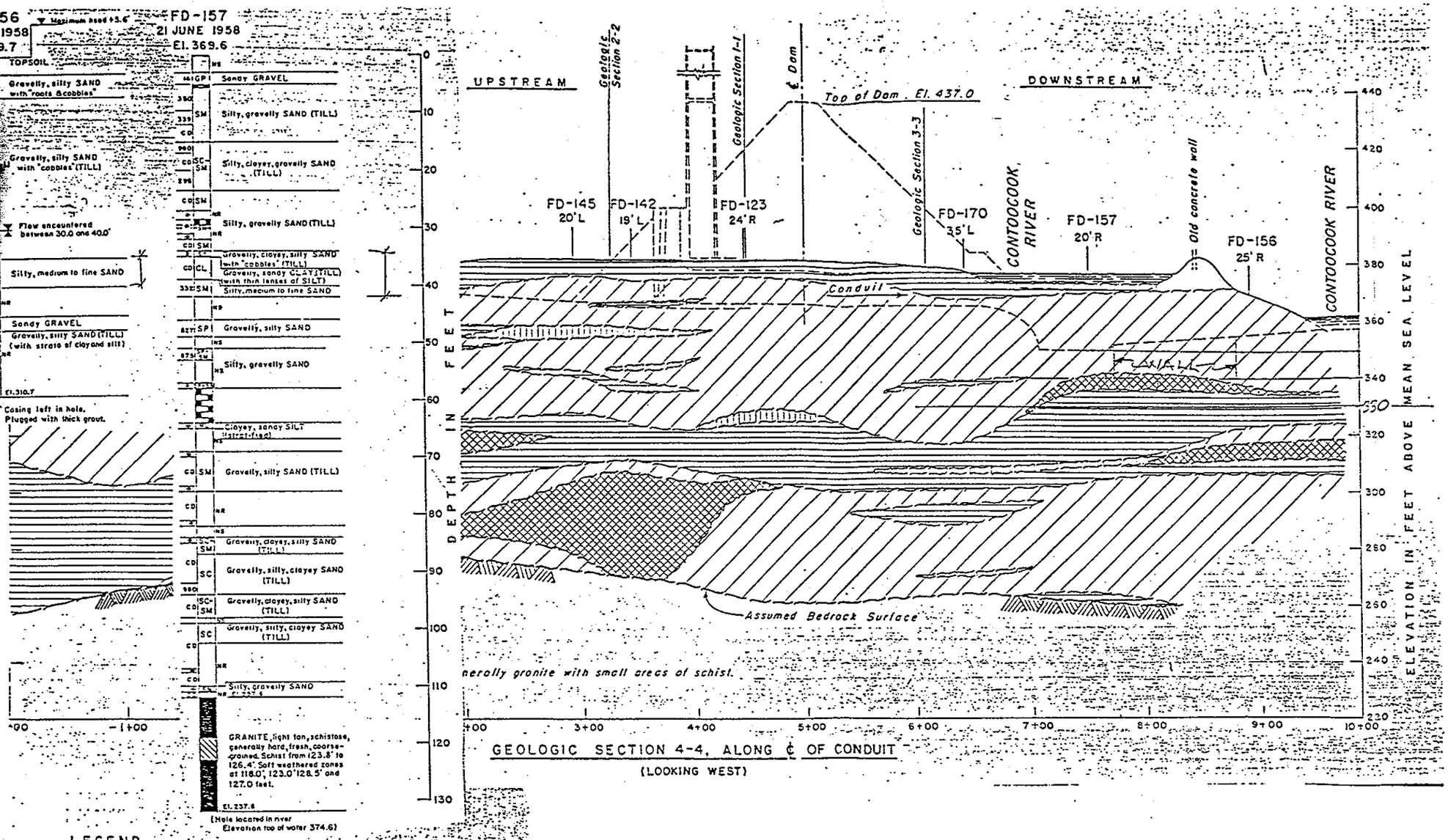
Although submissions required by your contract are technically reviewed by Government, it is emphasized that your work must be prosecuted using proper internal controls and review procedures. The letter of transmittal for each submission which you you make shall include a certification that the submission 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.


Reverse
Wall key
Rubber Waterstop, Type "C"
Wall El. 385.0
Top of wall El. 385.0
7'-0" Chain link fence
N17°-53'-37"W
N17°-02'-W
STILLING BASIN
See Sheet No. 244
Expansion Joint
Expansion Jt.
El. 385.0 (Top)
New Concrete Abutment
PLAN
Post at Angle Point
7' Chain link fence
El. 385.0
STILLING BASIN
see Sheet No. 244
Construction Joint
El. 372.0
El. 360.0
Angle Point
Compacted pervious back
Top of base El. 366.0
Constr. Jt.
Rubber Waterstop, Type "U"
El. 362.0
Top of base El. 360.0
Construction Joint
Bottom of base
El. 356.0
Rubber Waterstop Type "U"
Bottom of Key
El. 350.0
Top of base El. 353.0
Bottom of base El. 349.0
Bottom of key El. 343.0
Top of base El. 350.5
Bottom of base El. 346.0
Bottom of key El. 340.0
Stone
Rock fill
Compacted per
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
Rubber Waterst Type "C"
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.
DES. BY
DR. BY
CK. BY
HOPKINTON DAM, N.H.
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




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 |
| | DELIVERY ORDER No. 4 |
| CK. BY | |
| 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

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.

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

## 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 rip-rap, 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<br>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<br>- Drillers arrived and moved water truck and tools from pickup into storage at Corps Headquarters.<br>- 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)<br>- 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.)<br>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)<br>- M. Vance gave approval for labeling of sampling jar lids rather than stick-on label.<br>- 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.<br>- 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.<br>- Top of concrete at 23.5 ft below the surface (elev. 329.6)<br>- 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.<br>- 3 hours stand by for borehole moves and boring stake out |
| March 3, 1988<br>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. |

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| 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.<br>- 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.<br>- Boring FD 88-1 terminated at 46.4 ft.(elev. 337)<br>- Drill crew attended 1/2 hour safety meeting.<br>- 1.25 hours stand by - concrete coring |
| March 4, 1988<br>Friday | - Geotechnical Inspector onsite 8:00 a.m. to 11:00 a.m. Drillers onsite 8:00 a.m. to 12:30 p.m.<br>- Weather; Snowing, 28$^{o}$, light winds<br>- 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.<br>- Drillers cleaned up site |
| March 7, 1988<br>Monday | - Geotechnical Inspector, Doug Ferris and Drillers onsite 4:30 p.m. to 6:00 p.m.<br>Weather; sunny 40$^{o}$ to 50$^{o}$<br>Drillers finish installing piezometer. |
| March 8, 1988<br>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.<br>Weather; sunny, 30$^{o}$s, 10-15 mph winds<br>Mobilized to FD88-2 (C).<br>- 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'.<br>Drill crew attended 1/2 hour safety meeting<br>1 hour standby borehole move. |
| March 9, 1988<br>Wednesday | - Geotechnical Inspectors, D. Ferris, Jeff King, and Drillers onsite 7:00 a.m. to 5:00 p.m.<br>Weather; upper 30$^{o}$'s overcast, wind 0-5 mph<br>- 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<br>- 8:30 a.m. bottom of concrete footing at 36 ft (elev. 348.2) |

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| March 9, 1988<br>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.<br>- 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<br>- 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'.<br>FD 88-2 (C) advanced to 58' (elev. 326.2).<br>- 2.25 hours standby time waiting for USACE representative to arrive onsite to witness sampling operations<br>- 1.5 hours standby - concrete coring |
| March 10, 1988<br>Thursday | - Geotechnical Inspector, Jeff King and Drillers onsite 7:00 a.m. - 1:30 p.m.<br>Weather; 30° 25 mph wind, cloudy<br>- Drillers encounter difficulty keeping the hole open starting at approximately 57 ft.<br>- A coarse gravel wedged in the spoon at what felt like a sandy gravel layer at 59.8 to 60.5 ft.<br>- FD 88-2 terminated at 62 ft., piezometer tip set at 60.5 ft. |
| March 14, 1988<br>Monday | - Geotechnical Inspector, Jeff King and Drillers onsite 7:30 a.m. to 6:45 p.m.<br>Weather; 35°, cloudy<br>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.<br>- 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.<br>- Driller moved to FD88-3, letter "E".<br><br>- Drillers advanced FD88-3 (E) to 24'.<br>- Water reading taken at well FD88-1 was 17.1 and at well FD88-2 was 15.4 ft.<br>- Drill Crew attended 1/2 hour safety meeting.<br>- 2 hours stand by - bore hole moves |

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| March 15, 1988<br>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.<br>Weather; 25°-30°, cloudy, windy<br>- Mark Vance (USACE) onsite at 8:45 a.m.<br>- 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.<br>- 12:15 End of coring at 43.2'. Bottom of concrete slab is at 42.0' (elev. 342.0).<br>- Drillers started using "Clear Mud" at 50.0'. This was approved by Mark Vance prior to his departure at 2:30 p.m.<br>- Boring FD88-3 was terminated at 52.5 ft. (elev. 331.5)<br>- Drillers started piezometer installation in FD88-3, tip set at 44.0 ft.<br>- Inspector took a well reading at well no. 1, 17.8'; well no. 2, 15.8' and well no. 3, 15.1'<br>- 4.5 hours standby - concrete coring |
| March 16, 1988<br>Wednesday | - Geotechnical Inspector, Jeff King on site 7:00 a.m. to 9:00 a.m.<br>- Drillers onsite 7:00 a.m. to 11:00 a.m.<br>- Weather; cloudy, 10 mph winds, 30°<br>- Drillers finished installing piezometer in FD88-3<br>- 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.<br>- 1 hour stand by, borehole move |
| March 17, 1988<br>Thursday | - Geotechnical Inspector, Jeff King onsite 9:45 a.m. to 11:00 a.m.<br>- 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<br>Friday | - Geotechnical Inspector, Jeff King onsite 11:00 a.m. to 3:30 p.m.<br>- Weather 40°, cloudy, 10-15 mph winds<br>J. King inspected previous days progress and discussed extending the pad with D. Shepardson. |

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

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| March 24, 1988<br>Thursday | - Geotechnical Inspector, Jeff King, and Drillers onsite 7:00 a.m. to 5:00 p.m.<br>- Weather; warm 35-45°, rain slight wind<br>- Discussed daily progress with D. Shepardson (USACE)<br>- Boring FD-88-4 (F) terminated at 23.1 ft (elev. 330)<br>- 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)<br>- 1 hour standby - borehole move |
| March 25, 1988<br>Friday | - Geotechnical Inspector, Jeff King and Drillers onsite 7:00 a.m. to 6:15 p.m.<br>- Weather; cloudy damp 35-40°<br>- Talked with D. Shepardson about today's progress<br>- Drillers spun 3" HX casing through 7.5 ' of rip-rap. 9:00 a.m. started coring through the concrete footing (elev. 352.5)<br>- Water level of each well was recorded FD 88-3 19.6', FD 88-2 16.0 ft and FD 88-1 18.5'<br>- 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.<br>- 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.<br>- FD88-5 terminated at 28.1 ft (elev. 331.9).<br>- 2 hours standby - concrete coring |
| March 26, 1988<br>Saturday | - Geotechnical Inspector and Drillers onsite 7:00 a.m. to 11:45 p.m.<br>- Weather; rain, 40°<br>- Rain had washed the deck of the barge.<br>- Talked with the Dam Tender and said we would try to get the barge out this morning.<br>- Drillers grouted FD88-5.<br>- Crane arrived on site at 9:00 a.m. Drill rig and barge were removed by crane.<br>- 2 hours standby - borehole move |
| March 28, 1988<br>Monday | - Geotechnical Inspector, Jeff King and Drillers onsite 1:30 p.m. to 4:45 p.m.<br>- Weather 35° to 40°, partly cloudy winds 10-15 mph<br>- Drillers placed additional grout around casing<br>- J. King took well readings: FD 88-1, 16.8', FD 88-2, 14.7', and FD 88-3, 18.0' |
| March 29, 1988<br>Tuesday | - Geotechnical Inspector, Jeff King and Drillers onsite 7:30 a.m. to 3:30 p.m.<br>- Weather; sunny warm 45 to 60°<br>- Drillers cleaned up site. |

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| March 29, 1988<br>Tuesday (continued) | - Inspector took water readings, well FD 88-3, 16.8', well FD 88-2, 14.0', well FD 88-1, 15.5'.<br>- The flow gates were open at both bays.<br>- Returned boat and motor |
| April 1, 1988<br>Friday | - Geotechnical Inspector, Jeff King onsite 9:45 a.m. to 1:30 p.m.<br>- 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<br>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<br>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.<br>- 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<br>- Wanda Hawkins advised R. DeFilippo that no Delivery Order has been received yet; he will check and get back to Wanda<br>- R. DeFilippo was advised the order was signed and sent on 2/8/88 |
| February 19, 1988<br>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<br>Wednesday | - 6:00 a.m. D. Ferris (ATL) to T. Pahler (ATL) regarding yesterday's progress<br>- 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<br>Thursday | - 7:45 a.m.<br>- 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.<br><br>- 11:45 a.m.<br>- 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

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| March 4, 1988<br>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.<br>- 8:30 a.m.<br>- D. Ferris to Spencer Thew. S. Thew said to install piezometer according to Corps; original instructions.<br>- 11:00 a.m.<br>- D. Ferris (ATL) to Mark Vance (USACE), not available. Left message |
| March 8, 1988<br>Tuesday | - 8:20 a.m.<br>- 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.<br>- 3:20 p.m.<br>- 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<br>Wednesday | - 8:45 a.m.<br>- 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<br>Thursday | - 8:20 a.m.<br>- 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.<br><br>- 1:15 p.m.<br>- 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. |

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| March 14, 1988<br>Monday | - 2:45 p.m.<br>- 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<br>Wednesday | - 11:50<br>- Jeff King to TM Crane and set a tentative appointment for crane on Monday<br><br>- 1:30 p.m.<br>- 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<br>Thursday | - 12:30 p.m.<br>- Jeff King to TM Crane regarding specifics on crane needed. They cancelled due to another project.<br><br>- 1:45 p.m.<br>- Jeff King to Multiple Crane rentals, they were not available. |
| March 18, 1988<br>Friday | - 9:30 a.m.<br>- Jeff King to Mark Vance; he was not available<br><br>- 10:10 a.m.<br>- 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.<br><br>- 11:30 a.m.<br>- 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<br><br>- 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 |

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| March 18, 1988<br>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.<br>- 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.<br><br>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<br>Monday | - 10:25 a.m.<br>- 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.<br>- 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.<br>- 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.<br>- 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.<br>- D. Ferris to J. King received information on piezometers |
| March 22, 1988<br>Tuesday | - 7:20 a.m.<br>- 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.<br>- 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<br>Friday | - 1:10 p.m.<br>- 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.<br><br>- 2:05 p.m.<br>- J. King (ATL) to Spencer Thew (ATL) to report progress.<br><br>- 7:00 p.m.<br>- 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.<br><br>- 7:30 p.m.<br>- J. King (ATL) to Jim Reed , Crane Service to schedule for 10:00 a.m. (Saturday). |
| March 26, 1988<br>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<br>Monday | - 2:48 p.m.<br>- J. King (ATL) to Ed McCabe (USACE), Drillers are coming today to move out their equipment<br><br>- 3:00 p.m.<br>- 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<br>Friday | - 9:45 a.m.<br>- 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

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from 11:47 AM Jeff King

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| 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 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: _____

NED APP FL F2 251

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 3-14-88

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 [illegible]
Resident Engineer

CF: EXPOSURE HOURS:
Work Date: [illegible]
Non-work Date: [illegible]

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

NED FL APR 82 251

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

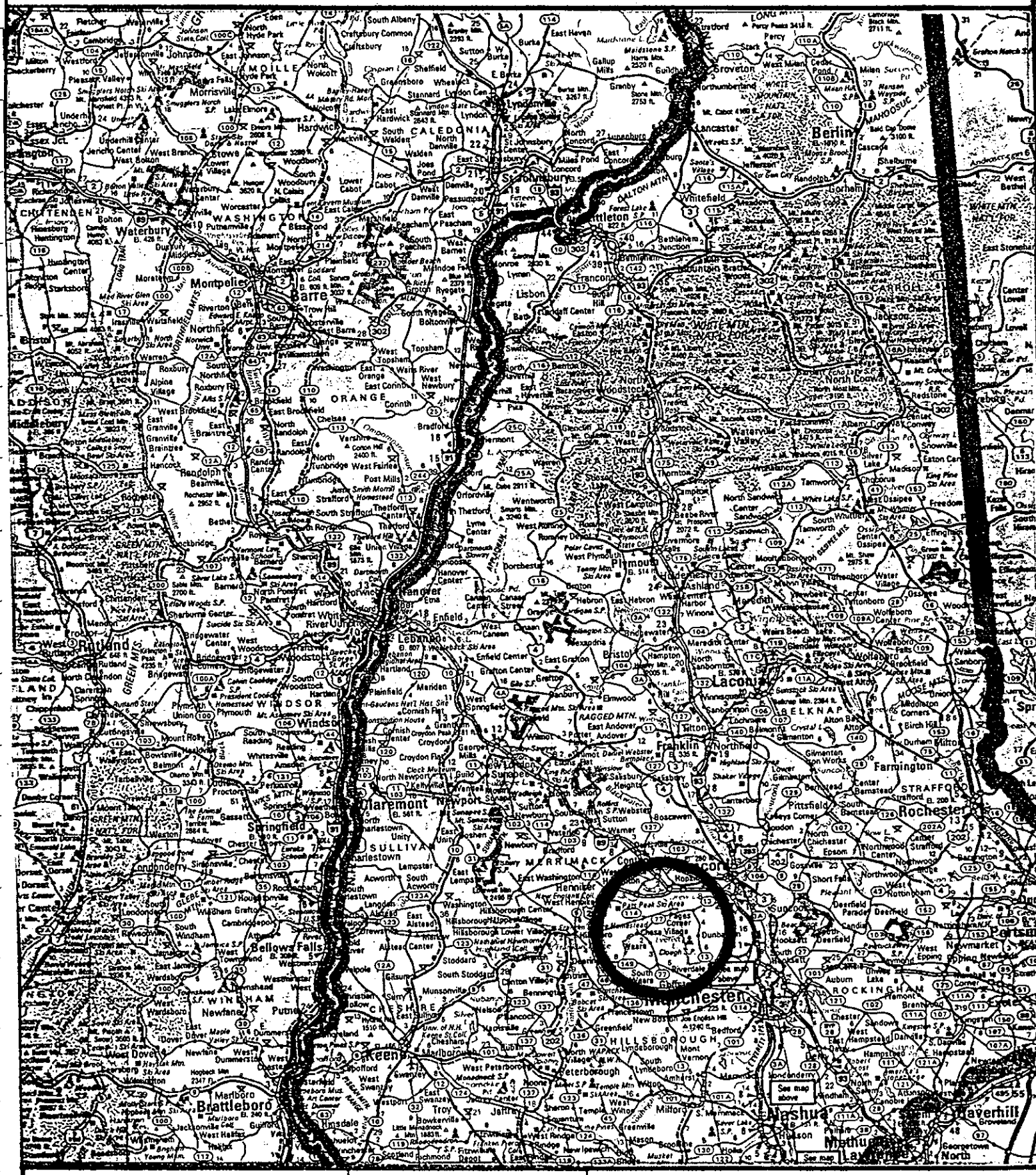
Man Hours:
Contr: 186 1/4
Subcontr: 7
Govt: _____
TOTAL: 193 1/4

NED APR FL 251

# SECTION 8 - FIELD INSPECTORS' LOGS

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. ED88-1 "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.

Total Overburden Drilled 46.4 Feet

Elevation Top of Rock NA M.S.L.

Elevation Bottom of Hole 336.8 M.S.L.

Total Concrete Rock 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.

Casing Left in Place 5 Feet

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 | Prosize 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 Details | Page | 15 |


Prepared by Douglas R. 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 2 of 15 Pages

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

Co-ordinates: N _____ E _____

Elevation Top of Boring 383.2' 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 ATV
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' | | | Rec. | | 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 | 1'-2' | CORE/SAMPLE NO. | SIZE | DEPTH RANGE / CORE RECVY | BLOWS PER FT. | 6" SAMPLING AND CORING —OPERATIONS | CLASSIFICATION OF MATERIALS |
|---|---|---|---|---|---|---|---|
| 11.8' | | | | Rec | | | |
| 13.8' | | S-3 | 2 3/8" | 47% | 13<br>12<br>9<br>9 | Sampled from 11.8' to 13.8'<br>Advanced casing to 16.8'<br>cleaned casing to 16.8' | Soil similar to sample 2<br>Included shards from rip rap |
| 16.8' | | | | | | | |
| 18.8' | | S-4A<br>S-4B | 2 3/8" | 67% | 8<br>8<br>3<br>1 | Sampled from 16.8' to 18.8'<br>Advanced casing to 21.8'<br>cleaned casing to 21.8' | Similar Soils<br>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<br>3<br>4<br>Refusal | Sampled from 21.8' to 23.5'<br>Advanced casing to 23.5'<br>cleaned casing to 23.5'<br>END OF EXPLORATION 3-2-88 | Grey-Brown cmf SAND; some SILT; little cmf GRAVEL; little CLAY (wet, slightly plastic) sm-sc<br>Included rip rap shards |
| | | Run 1 | NX | 96% | | Exploration resume 3-3-88<br>NX DIAMOND CORE with water from 23.5 to 27.8' | Sound concrete; 1.5" nominal size aggregate; entrapped air present<br>Recovery = 96%<br>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 cmf 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 cmf 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 | BLOWS PER FT. / CORE REC'VY | 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'<br>EXPLORATION TERMINATED @ 46.4' on 3-3-88 | Soil similar to Sample 13 - SM |

STANDARD PENETRATION TEST

Project Hopkinton Dam 114 Page 6 of 15

Hole No. FD 89-1 Date 3-3-88

Depth of Test 27.8' to 29.8

| Blow | Gage Reading (FT.) | Penetration per Blow (FT.) |
|---|---|---|
| 1 | 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 114 Page 7 of 15

Hole No. FD88-1 Date 3-3-88

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 Dam NH  Page 8 of 15

Hole No. FD88-1  Date 7-3-88

Depth of Test 31.8 to 33.8

| Blow | Gage Reading (FT.) | Penetration per Blow (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 UH  Page 9 of 15

Hole No. FD88-1  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 | 0.456 | 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 114 Page 10 of 15

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

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 DH

Page 11 of 15

Hole No. FD 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)

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

| DEPTH | 1' 2' | CORE/SAMPLE NO. | SIZE | DEPTH RANGE / CORE RECVT. | BLOWS PER FT. | 6" SAMPLING AND CORING OPERATIONS | CLASSIFICATION OF MATERIALS |
|---|---|---|---|---|---|---|---|
| 44.0 – 46.0 | | S-9 | 1 3/8" | Rec 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<br>Grey cmf SAND; little SILT (moist, np) - sw<br>Grey f SAND; some SILT (moist, n.p.); SP-SM |
| | | | | | | END OF EXPLORATION 3-9-88 | |
| 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 (moist, N.P.) SP-SM<br>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: Hopkinton Dam, NH
Boring No: FD-88-1

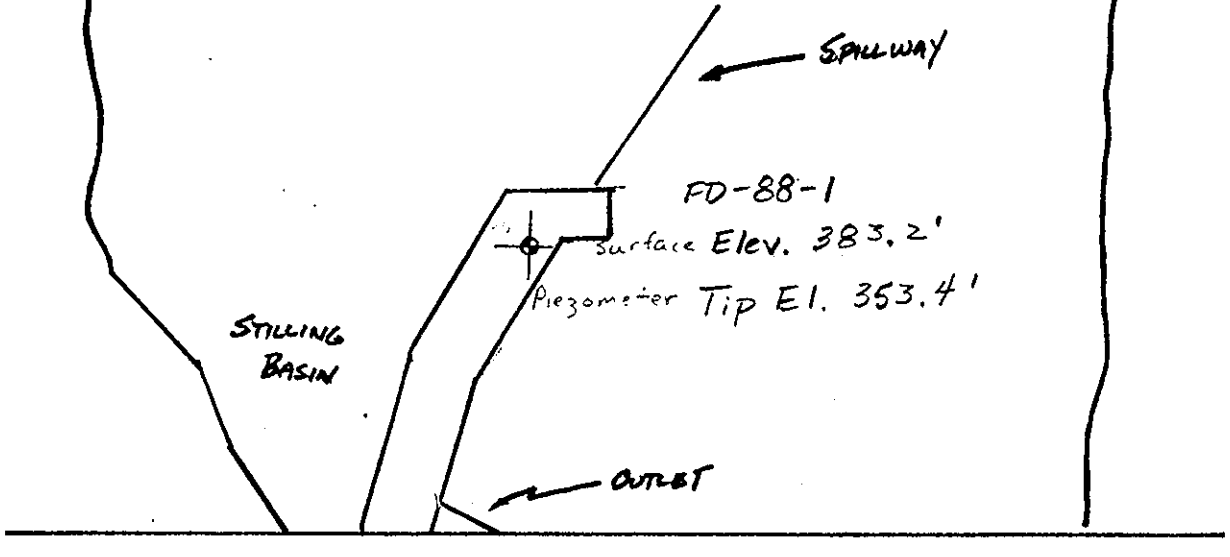
## SUBSURFACE WATER OBSERVATIONS

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' | |
| 3-16-88 | | | 34.2' | 17.8' | 365.4' | |
| 3-23-88 | | | 34.2' | 18.6' | 364.6' | |
| 3-25-88 | | | 34.2' | 18.6' | 364.6' | |
| 3-28-88 | | | 34.2' | 16.8' | 366.4' | |
| 3-29-88 | | | 34.2' | 15.5' | 367.7' | |
| 4-1-88 | | | 34.2' | 14.8 | 368.4' | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

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

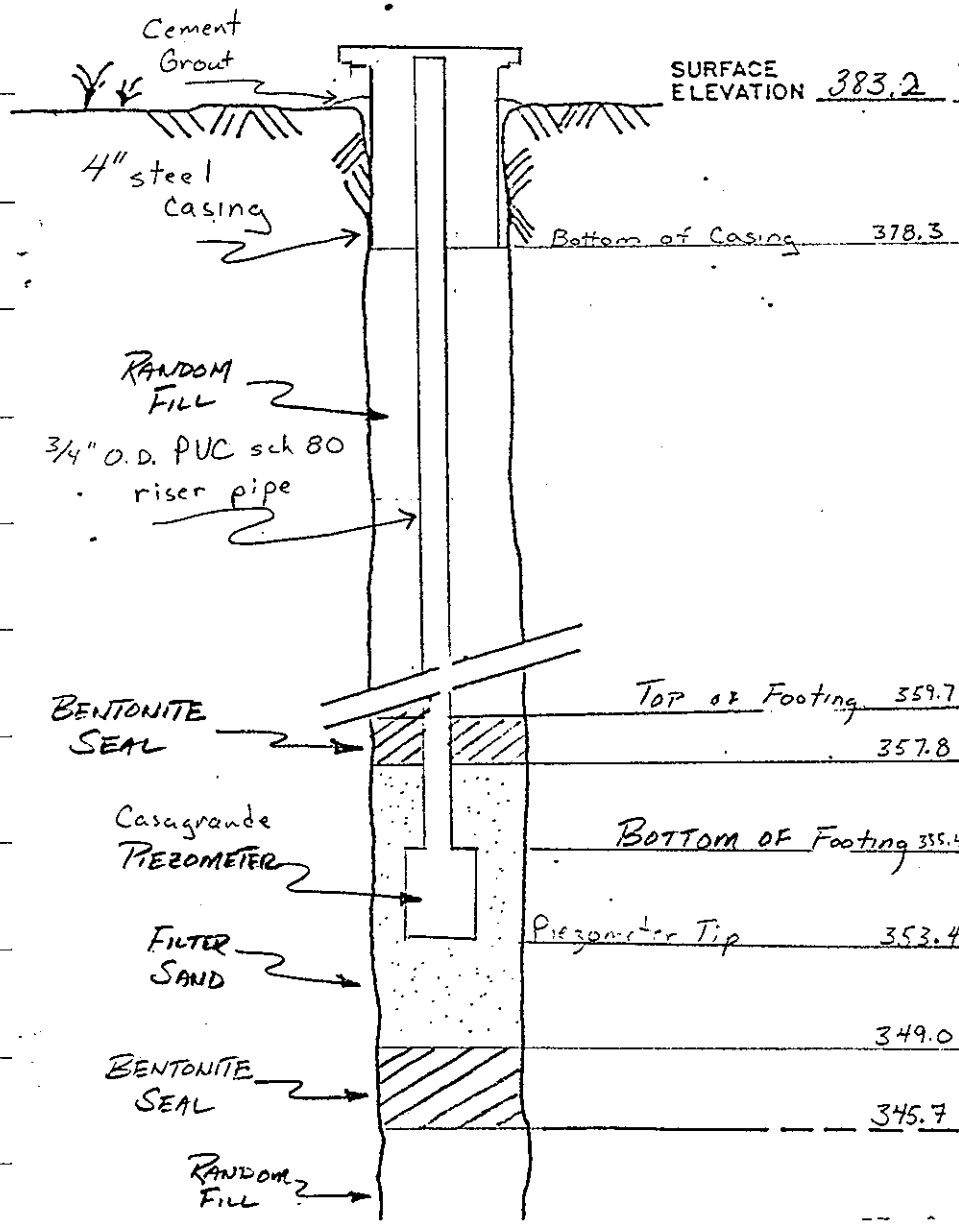
# ATLANTIC TESTING LABORATORIES, LIMITED

# PIEZOMETER INSTALLATION DETAIL

**PROJECT:** Hopkinton Dam
Hopkinton, NH

**PROJECT NO.** D.O. #0004
**ATL No.** CD029
**PIEZOMETER No.** FD-88-1
PZ-11

ELEVATION 384.1' top of pipe
384.0' top of PVC




| | | DEPTH | SOIL STRATA |
|---|---|---|---|
| SURFACE ELEVATION | 383.2 | | |
| | | | 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' | |
| | 357.8 | 25.4' | CONCRETE |
| Bottom of Footing | 355.4 | 27.8' | |
| Piezometer Tip | 353.4 | 29.8' | SANDY SILT SM |
| | 349.0 | 34.2' | |
| | 345.7 | 37.5' | |
| | | 39.4' | |
| | | 39.7' | CLAYEY SILT CL |
| | | [illegible] | SANDY S[illegible] 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 JH

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 Form Page 21
Piezometer Installation Detail Page 22


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 22 Pages

Boring No. ED88-2 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
Hammer Drop 18"/30"
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: ____

Boring Started 3-8-88
Boring Completed 3-10-88

| 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. ED 88-2

Site: Hopkinton Dam

Boring No. FD 88-2



| DEPTH | CORE/SAMPLE NO. | SIZE | DEPTH RANGE | BLOWS PER FT. / CORE RECVY | 6" SAMPLING AND CORING OPERATIONS | CLASSIFICATION OF MATERIALS |
|---|---|---|---|---|---|---|
| 12.5' | | | Rec | | | |
| 14.5' | S-2 | 2 3/8" | 50% | .21<br>23<br>26<br>30 | Sampled from 12.5' to 14.5'<br>Advanced casing to 17.5'<br>Cleaned casing to 17.5' | Similar Soil; some cmt GRAVEL |
| 17.5' | | | | | | |
| 19.5' | S-3 | 2 3/8" | 79% | 56<br>43<br>39<br>37 | Sampled from 17.5' to 19.5'<br>Advanced casing to 22.5'<br>Cleaned casing to 22.5' | Similar Soil, slight color change to brownish grey |
| 22.5' | | | | | | |
| 24.5' | S-4 | 2 3/8" | 10% | 25<br>40<br>29<br>30 | Sampled from 22.5' to 24.5<br>Advanced casing to 27.5'<br>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<br>END OF EXPLORATION 3-8-88 | |
| 36.0' | | R-1 | NX | | | EXPLORATION CONTINUED 3-9-8<br>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-ft SAND; little mf 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 / CORE RECVT. | BLOWS PER FT. | 6" SAMPLING AND CORING OPERATIONS | CLASSIFICATION OF MATERIALS |
|---|---|---|---|---|---|---|---|
| 44.0 – 46.0 | | S-9 | 1 3/8" | Rec 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<br>Grey cmf SAND; little SILT (moist, np) - sw<br>Grey f SAND; some SILT (moist, n.p.); SP-SM |
| | | | | | | END OF EXPLORATION 3-9-88 | |
| 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 (moist, N.P.) SP-SM<br>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 |
|---|---|---|---|---|---|---|---|
| | 1" = 2' | | | | | | |
| 62' | | | | | | wedged in spoon preventing sample recovery<br>Advanced boring to 62.0' using roller bit<br>Note: drillers felt that gravel layer exists from approximately 59.8'-60.5';<br>-also the hole would not stay open even with the use of clear mud below 61.5'<br>Exploration was terminated 3-10-88 at 62.0' | |

STANDARD PENETRATION TEST

Project Hopkinton Dam N.H. Page 7 of 22

Hole No. FDR8-2 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. FD 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 | 0.033 |
| 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. *FD88-2* Date *3-9-88*

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 Hopkinton Dam NH

Page 11 of 22

Hole No. FD 88-2

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 |
| 5 | 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 *3-9-88*

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 | 0.020 |
| 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

Attach. 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 3-9-88

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

Attach. 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 | 2.0 | 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" | |
| | |
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| | |
| | |
| | |
| | |
| 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 88-3  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 | 0.008 |
| 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" | |
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| | |
| | |
| | |
| | |
| 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. FD 90-2 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 | 0.008 |
| 14 9 92 | 0.9 | 0.007 |
| 11 10 103 | 1.0 | 0.009 |
| 9 11 112 | 1.1 | 0.011 |
| 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 NH  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 Hopkinton Dam UH  Page 19 of 22

Hole No. FD 88-1  Date 7-11-88

Depth of Test 60.0 to 62.0

| Blow | Gage Reading | Penetration per Blow |
|---|---|---|
| | | |
| 3 1 3 | 0.1 | 0.033 |
| 3 2 6 | 0.2 | 0.033 |
| 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] |
| 13 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)

Site: Hopkinton Dam, NH
Boring No: FD 88-2

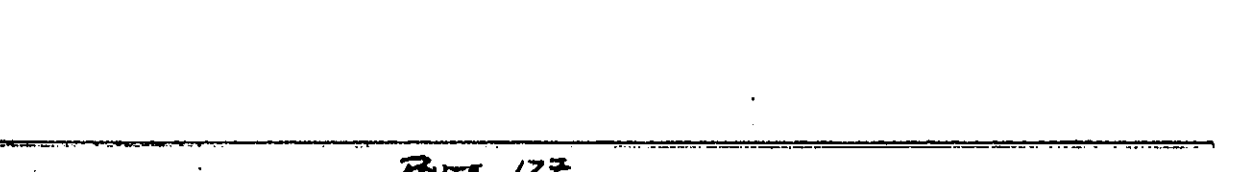
## SUBSURFACE WATER OBSERVATIONS

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' | |
| 3-16-88 | | | 62.0' | 15.8' | 368.4' | |
| 3-23-88 | | | 62.0' | 16.0' | 368.2' | |
| 3-25-88 | | | 62.0' | 16.0' | 368.2' | |
| 3-28-88 | | | 62.0' | 14.7' | 369.5' | |
| 3-29-88 | | | 62.0' | 14.0' | 370.2' | |
| 4-1-88 | | | 62.0' | 13.8 | 370.4' | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Note: Depths are in feet below original ground

BORING LOCATION SKETCH



# 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: # 0 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

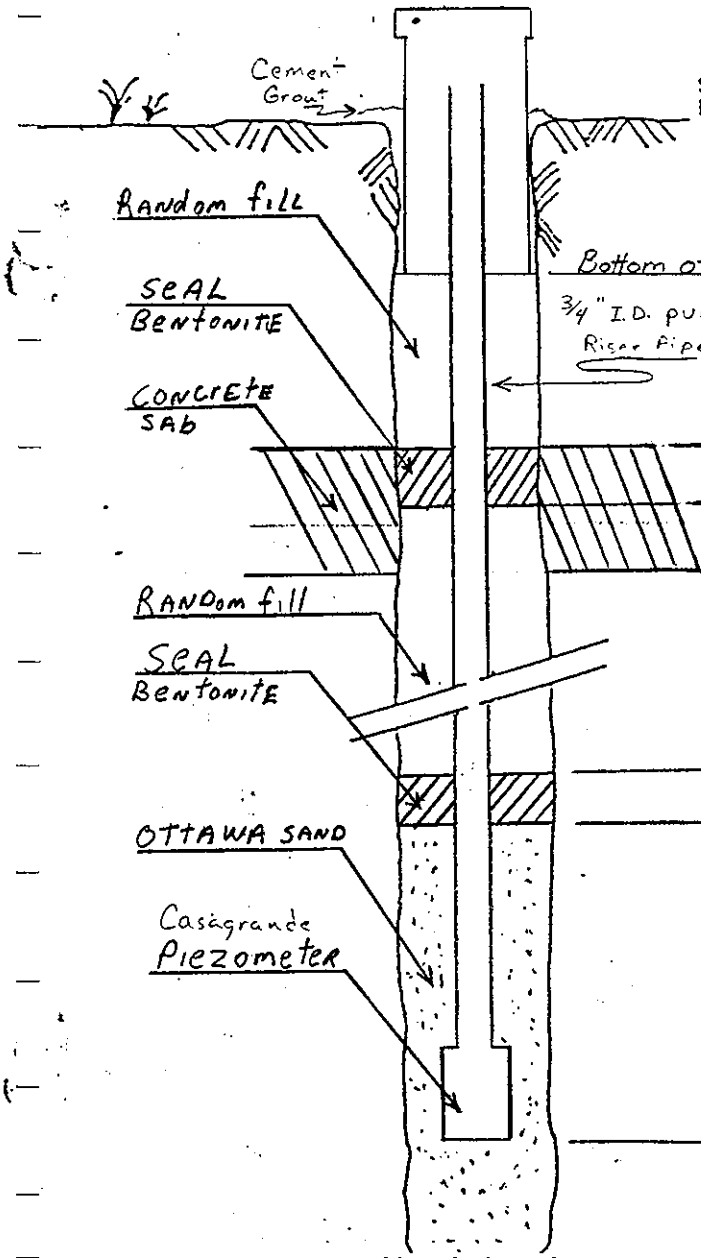
# ATLANTIC TESTING LABORATORIES, LIMITED

# PIEZOMETER INSTALLATION DETAIL

**PROJECT:** Hopkinton Dam
Hopkinton NH

**PROJECT NO.** D.O. # 0004
**ATL No.** CD 029
**PIEZOMETER No.** FD-88-2
PZ-10

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' | |
| 337.5' | 46.7' | Sandy Silt SM-SC |
| | 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 subsurface 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 water


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 Rock Drilled (CONCRETE) 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 |
|---|---|---|---|---|---|---|
| 3.0' | | | Rec. | | Advanced "P" size diamond core bit to 3.0' | Boulders (rip-rap) |
| 5.0' | 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 |
| 7.0' | | | | | | |
| 9.0' | 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 |

GENERAL REMARKS:

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

| DEPTH | 1" : 2' | CORE/SAMPLE NO. | SIZE | DEPTH/RADC | BLOWS PER FT. / CORE RECVY | 6" SAMPLING AND CORING OPERATIONS | CLASSIFICATION OF MATERIALS |
|---|---|---|---|---|---|---|---|
| | | | | Rac | | | |
| 12.0' | | | | | | | |
| 14.0' | | S-3 | 2 3/8" | 76% | 16<br>42<br>56<br>41 | Sampled from 12.0' to 14.0'<br>Advanced casing to 17.0'<br>Cleaned casing to 17.0' | Similar Soil; SP-SM<br>Note: coarse gravel in middle of sample |
| 17.0' | | | | | | | |
| 19.0' | | S-4 | 2 3/8" | 58% | 45<br>46<br>31<br>26 | Sampled from 17.0' to 19.0'<br>Advanced casing to 22.0'<br>cleaned casing to 22.0' | Similar Soil; SP-SM (mottled) |
| 22.0 | | | | | | | |
| 24.0 | | S-5 | 2 3/8" | 46% | 37<br>28<br>18<br>36 | Sampled from 22.0' to 24.0'<br>Advanced casing to 27.0'<br>Cleaned casing to 27.0'<br>END OF EXPLORATION 3-14-88 | Similar Soil - SP-SM |
| | | | | | | EXPLORATION CONTINUED 3-15-88 | |

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

| DEPTH | | CORE/SAMPLE NO. | SIZE | DEPTH RANGE | BLOWS PER FT. / CORE RECOVY | 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' | |

58A (Test)

Boring No. FD 88-3

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

| DEPTH | | CORE/SAMPLE NO. | SIZE | DEPTH RANGE | BLOWS PER FT. / CORE RECOVY | 6" SAMPLING AND CORING OPERATIONS | CLASSIFICATION OF MATERIALS |
|---|---|---|---|---|---|---|---|
| | 1" = 2' | | | REC | | | |
| 45.0' | | | | | 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. ED 99-3 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. FD88-3  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 NH

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 | 0.033 |
| 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. FD 88-2

Date 3-15-88

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 Hopkinton Dam, NH  Page 12 of 17

Hole No. FDB9-2  Date 7-15-88

Depth of Test 48' to 50'

| Blow | Gage Reading | Penetration per Blow |
|---|---|---|
| | | |
| 3 1 3 | 0.1 | 0.033 |
| 6 2 9 | 0.2 | 0.018 |
| 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 | 0.018 |
| 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 NH  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 | 0.018 |
| 6 11 37 | 1.1 | 0.018 |
| 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' | |
| 3-23-88 | | 44.0 | 47.0' | 19.6' | 364.4' | |
| 3-25-88 | | 44.0 | 47.0' | 19.6' | 364.4' | |
| 3-28-88 | | 44.0 | 47.0 | 18.0' | 366.0' | |
| 3-29-88 | | 44.0 | 47.0' | 16.8' | 367.2' | |
| 4-1-88 | | 44.0 | 47.0 | 15.5' | 368.5 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
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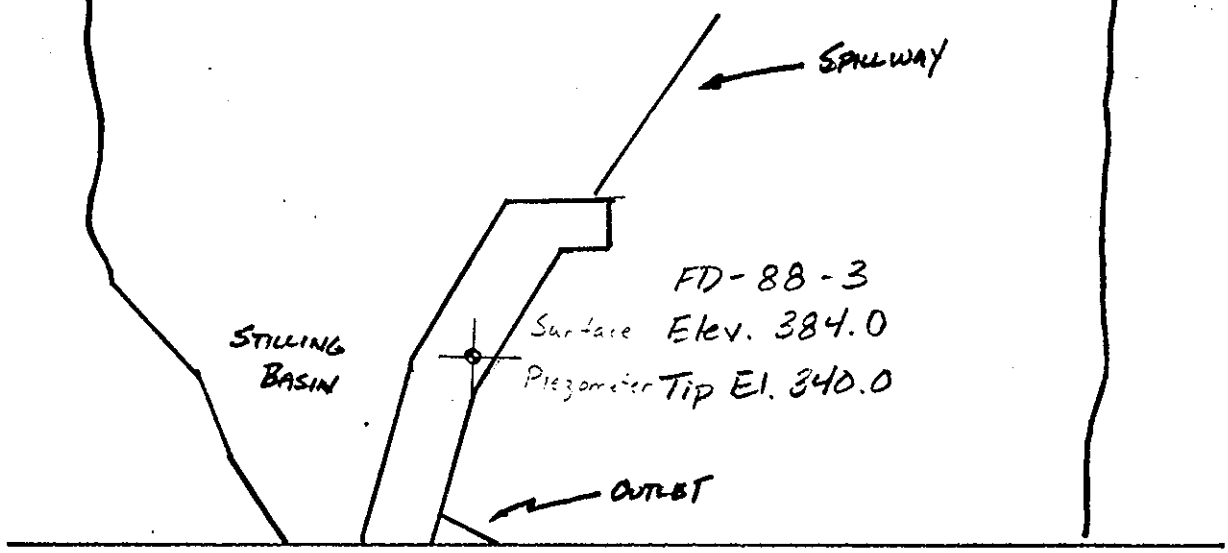
| | | | | | | |
| | | | | | | |

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 15.5' before falling head test was performed

Jeff King
INSPECTOR

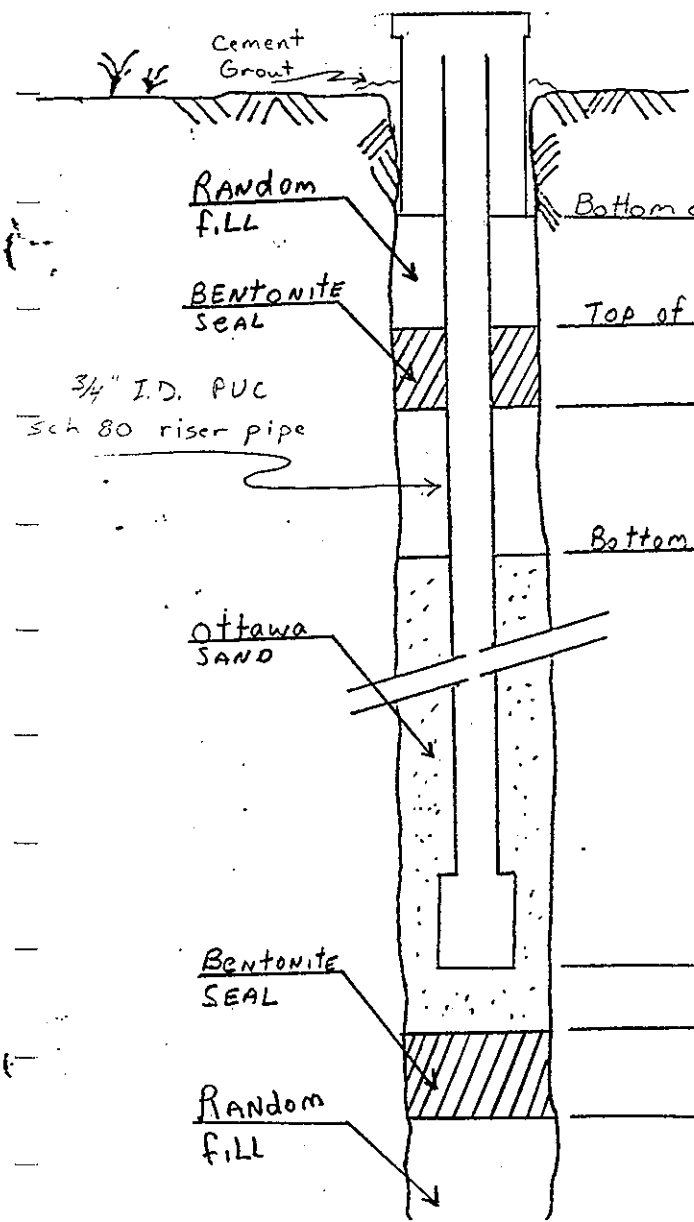
# ATLANTIC TESTING LABORATORIES, LIMITED

# 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. EDBB-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 Riprap

| 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 |
| | | |
| | | |
| | | |
| | | |

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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. ED 88-4 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 |
|---|---|---|---|---|---|---|
| | | | Rec | | Advanced NW casing to 2.8' Clean casing with 2 15/16" O.D roller bit | Rip-Rap |
| 2.8' | | | | | NX DIAMOND CORE | CONCRETE (reinforced) |
| | R-1 | NX | 100% | | | |
| 7.8' | | | | | | |
| | R-2 | NX | 83% | | | Impervious Fill (very dense) |
| 9.6' | | | | | END OF EXPLORATION 3-23-88 | |
| | | | | | EXPLORATION CONTINUED 3-24-88 | |

GENERAL REMARKS:

Boring No. ED 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' | |
| 15.6' | | S-3B | | | | | Similar Soils; trace SILT; SM-SP |
| 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 N.H. Page 4 of 11

Hole No. FD 88-4 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. FD88-4  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 | 0.009 |
| 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 EIH

Page 6 of 11

Hole No. FD 88-4

Date 3-24-88

Depth of Test 13.6' to 15.6'

| Blow | Gage Reading | Penetration per Blow |
|---|---|---|
| | | |
| 3 ~~1~~ 3 | 0.1 | 0.030 |
| 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 | 0.033 |
| 2 ~~7~~ 16 | 0.7 | 0.050 |
| 3 ~~8~~ 19 | 0.8 | 0.033 |
| 4 ~~9~~ 23 | 0.9 | 0.050 |
| 4 ~~10~~ 27 | 1.0 | 0.050 |
| 4 ~~11~~ 31 | 1.1 | 0.031 |
| 4 ~~12~~ 35 | 1.2 | 0.030 |
| 4 ~~13~~ 39 | 1.3 | 0.050 |
| 7 ~~14~~ 46 | 1.4 | 0.014 |
| 7 ~~15~~ 53 | 1.5 | 0.014 |
| 10 ~~16~~ 63 | 1.6 | 0.010 |
| 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 Hopkinton Dam NH

Page 8 of 11

Hole No. FD 88-4

Date 7-24-88

Depth of Test 17.6' 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 | 0.020 |
| 5 ~~5~~ 21 | 0.5 | 0.020 |
| 6 ~~6~~ 27 | 0.6 | 0.018 |
| 8 ~~7~~ 35 | 0.7 | 0.012 |
| 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 NH. Page 9 of 11

Hole No. FD 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. ED 80-1 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)

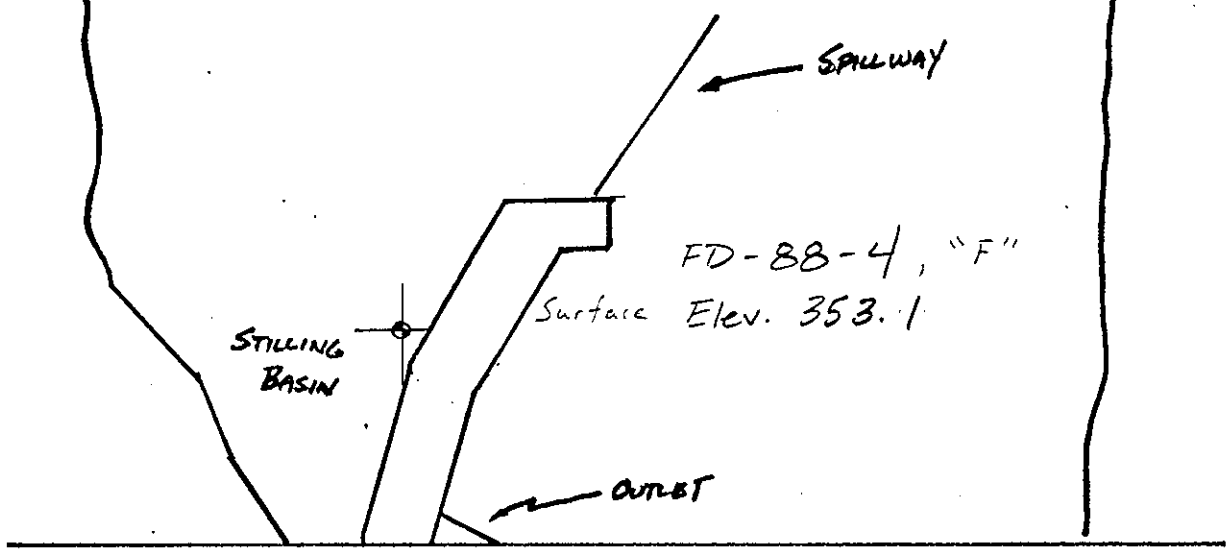
Site: Hopkinton Dam, NH
Boring No: FD 88-4

## SUBSURFACE WATER OBSERVATIONS

| DATE | TIME | DEPTH-BOT. OF CASING | DEPTH-BOT. OF BORING | DEPTH TO WATER | ELEVATION WATER | REMARKS |
|---|---|---|---|---|---|---|
| 3-23-88 | PM | | 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 |
| | | |
| | | |
| | | |

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Ground Water _____ Back of Page _____
Boring Location Sketch _____ Back of Page _____
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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
Hammer Drop 30"
Casing Left NA
Subsurface Water Data _____ Page NA
Obs. Well _____
Drilled By Todd & McAleer
Mfg. Des. Drill CME 45-C
Inspected By: Jeff S. King
Classification By: Jeff S. King
Classification By: _____

Boring Started 3-25-88
Boring Completed 3-26-88

| 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 / CORE RECVY | BLOWS PER FT. | 6" SAMPLING AND CORING OPERATIONS | CLASSIFICATION OF MATERIALS |
|---|---|---|---|---|---|---|---|
| | 1" = 2' | | | | | | |
| 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 NO. | SIZE | DEPTH RANGE / CORE RECVY | BLOWS PER FT. | 6" SAMPLING AND CORING OPERATIONS | CLASSIFICATION OF MATERIALS |
|---|---|---|---|---|---|---|---|
| | 1" = 2' | | | | | | |
| 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 3-25-88

Depth of Test 12.1' to 12.8

| Blow | Gage Reading | Penetration per Blow |
|---|---|---|
| | | |
| 5 ~~1~~ 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 |
| 32 ~~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. FD88-5 Date 3-25-88

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 3-25-88

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 | 0.008 |
| 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 | 0.009 |
| 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 NH

Page 8 of 13

Hole No. FD 89-5

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 |
| 13 9 81 | 0.9 | 0.008 |
| 12 10 93 | 1.0 | 0.008 |
| 12 11 105 | 1.1 | 0.008 |
| 26 12 131 | 1.2 | 0.004 |
| 29 13 160 | 1.3 | 0.007 |
| 54 14 214 | 1.4 | 0.002 |
| 34 15 248 | 1.5 | 0.003 |
| 15 16 263 | 1.6 | 0.007 |
| 14 17 277 | 1.7 | 0.007 |
| 13 18 290 | 1.8 | 0.009 |
| 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 N.H. Page 9 of 13

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

Depth of Test 20.1' to 22.1'

| Blow | Gage Reading | Penetration per Blow |
|---|---|---|
| | | |
| 6 1 6 | 0.1 | 0.017 |
| 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 21H

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 | 0.020 |
| 5 7 19 | 0.7 | 0.020 |
| 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 Hopkinton Dam N.H. Page 11 of 13

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

Depth of Test 24.1' to 26.1'

| Blow | Gage Reading | Penetration per Blow |
|---|---|---|
| | | |
| 2 x 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 | 0.011 |
| 4 6 13 | 0.6 | 0.025 |
| 3 7 16 | 0.7 | 0.033 |
| 6 8 22 | 0.8 | 0.017 |
| 5 9 27 | 0.9 | 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 NH. Page 12 of 13

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

Depth of Test 26.1' to 28.1'

| 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 | 0.6 | 0.025 |
| 3 ~~7~~ 20 | 0.7 | 0.033 |
| 6 ~~8~~ 26 | 0.8 | 0.017 |
| 7 ~~9~~ 33 | 0.9 | 0.014 |
| 7 ~~10~~ 40 | 1.0 | 0.014 |
| 7 ~~11~~ 47 | 1.1 | 0.014 |
| 8 ~~12~~ 55 | 1.2 | 0.012 |
| 7 ~~13~~ 62 | 1.3 | 0.014 |
| 7 ~~14~~ 69 | 1.4 | 0.014 |
| 14 ~~15~~ 83 | 1.5 | 0.007 |
| 18 ~~16~~ 101 | 1.6 | 0.006 |
| 17 ~~17~~ 118 | 1.7 | 0.006 |
| 19 ~~18~~ 137 | 1.8 | 0.005 |
| 13 ~~19~~ 150 | 1.9 | 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 |
|---|---|---|---|---|---|---|
| | | | | | | |
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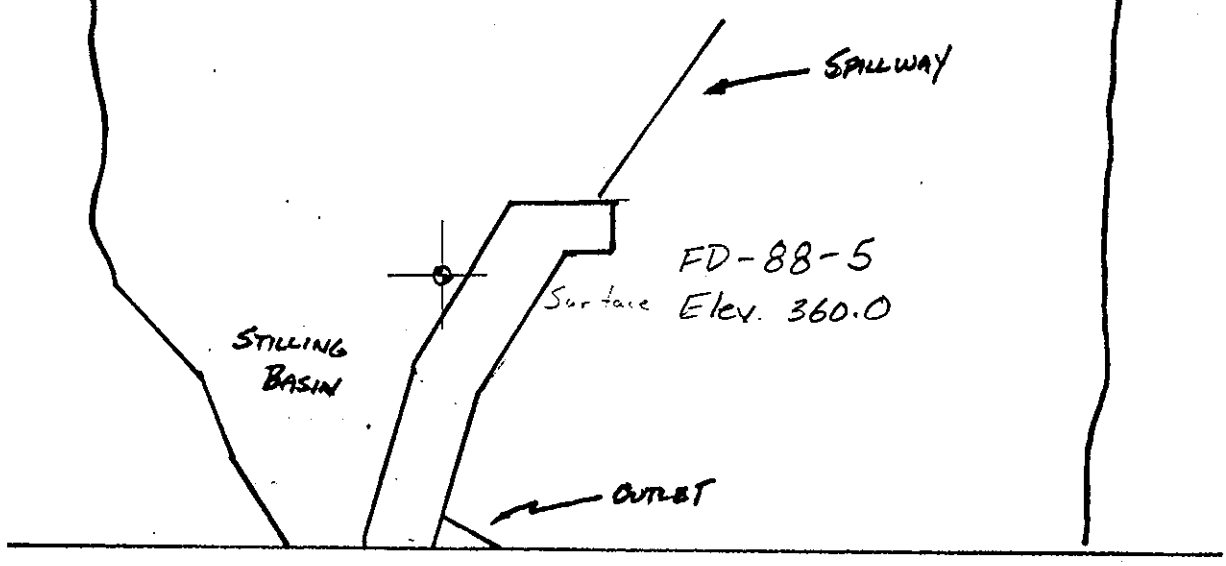
Note: Depths are in feet below original ground

BORING LOCATION SKETCH




ROUTE 127