[redacted]

2658

REMEDIAL INVESTIGATION
AND
FEASIBILITY STUDY
FEED MATERIALS PRODUCTION CENTER
FERNALD, OHIO

MONTHLY TECHNICAL PROGRESS REPORTS

MARCH 1988

FMPC SITEWIDE RI/FS
MARCH 1988
MONTHLY TECHNICAL PROGRESS REPORTS

STATUS

General

Progressive actions continued on the FMPC sitewide RI/FS during March, 1988. Twelve monitoring wells were completed during the month, for a total of 62 wells, and a total drilling footage of 4074.1 feet.

Monitoring well development in support of the first round of water quality sampling continued during March. Eleven additional wells were developed during the month for a total of thirteen to date. Consistent with a request from USEPA-Region 5, a sample of the development water from well 184 in the waste storage area was collected and submitted for analysis for the HSL plus listing. Results of these analyses will be transmitted to USEPA during April, 1988.

The RI/FS Work Plan Revision 3 and supporting documentation were transmitted to USEPA on March 31, 1988. The Work Plan Revision 3 incorporates all responses to EPA comments on the RI/FS Work Plan to date and minor consistency changes identified by FMPC personnel during internal reviews of the document.

Volume 3 of the Characterization Investigation Study (CIS) final report was transmitted to USEPA on March 7, 1988. Volume 3 of the CIS final report presents the results of the detailed radiological surveys performed on the surface soils in the FMPC waste storage area.

Task 1 - Description of Current Situation

Task Completed.

Task 2 - RI Work Plan Requirements

Work was completed during March on the preparation of the RI/FS Work Plan Revision 3 and supporting documents that incorporate all change pages resultant from EPA comments. Also, minor technical inconsistencies identified during detailed reviews of the RI/FS Work Plan were incorporated into Revision 3 of the documents. The RI/FS Work Plan Revision 3 and supporting documentation were transmitted to USEPA on March 31, 1988.

Task 2 Percent Complete: Original Deliverable - Complete
Work Plan Rev. 1 - Complete
Work Plan Rev. 2 - Complete
Work Plan Rev. 3 - Complete

Task 3 - Site Investigation

Groundwater and Subsurface Soils - Drilling was completed at monitoring well locations 344, 176, 172, 244, 177, 130, 135, 208, 334, 210, 108, and 315 during March. Additionally, drilling was initiated at well locations 234, 154, 215. A summary of the wells completed during March and their respective final completion depths appears in Table 1:

TABLE 1

WELL COMPLETIONS

RI/FS WELL LOCATION	COMPLETION DEPTH (ft)
344	125.4
176	31.5
172	31.0
244	65.5
177	31.5
130	30.0
135	26.5
208	72.8
334	112.0
210	75.5
108	31.0
315	127.0
234	(In Progress)
154	(In Progress)
215	(In Progress)

Total drilling footage for the month of March was 759.7 feet. Total drilling footage on the RI/FS through March 31, 1988 is 4074.1 feet. The twelve wells installed during March were completed in a manner consistent with the protocols defined within the Work Plan Revision 3 and supporting documentation.

Monitoring well development was completed on 11 wells during March. The well number, date of development, and final NTU readings are shown in Table 2. Through March 31, 1988, thirteen wells have been developed under the sitewide RI/FS.

TABLE 2

WELL DEVELOPMENT RECORD

WELL NO.	DATE	NTU
266	3/2/88	35
109	3/6/88	>100 Not Done
209	3/6/88	4.5
249	3/7/88	4
265	3/17/88	4
343	3/21/88	30
243	3/22/88	5
351	3/23/88	5
251	3/28/88	4.5
344	3/30/88	5
244	3/31/88	5

During operations at well location 173, between waste storage pits 1 and 3, the residues from pit 3 were contacted by the drill rig. Drilling, which commenced to a depth of 28 feet, was halted and the boring grouted to the surface with Volclay. Further attempts to locate wells 173 and 175 on the berm between the waste storage pits will be completed during April, 1988.

Transit Survey - Surveying activities during March were concentrated on extending the site grid system in the northwest portion of the site. Activities also continued on establishing the horizontal and vertical coordinates of the completed wells on the northern portion of the site.

Radiation Measurement Survey - Surface radiological surveys continued in the FMPC production area and within the security buffer zone on the eastern portion of the site. To date 408 one hundred foot grids have been surveyed with the SPA-3 and FIDLER detection systems.

The Ultra Sonic Ranging and Data System (USRADS) was acquired from Oak Ridge National Laboratory on March 28, 1988. The USRAD system will be integrated into the RI/FS Radiation Measurements Program during April, 1988.

A QA audit was conducted on March 31, 1988 by FMPC personnel on the RI/FS Radiation Measurements Program. No significant deviations or findings were identified. The recommendations of the audit will be incorporated into the program during April.

Surface Soil Sampling - Members of the Radiation Measurement team participated in soil sample training on the collection of biased soil samples in accordance with RI/FS procedures. Soil sampling activities were resumed on March 29, 1988 with random samples collected at 250 foot intervals along the east perimeter. A total of 11 locations were sampled with 46 samples collected.

Biological Resources - Analytical results from 42 biological resources samples were received during March, including fish tissue, benthic macroinvertebrate, garden produce, agricultural crops, and vegetation shoots and roots. Results of fish tissue analyses from samples collected from the Great Miami River showed total uranium concentration of less than 1.0 pCi/g. These concentrations are consistent with other results compiled as part of the FMPC Environmental Monitoring Program. Analysis of a benthos sample from the Great Miami River showed results similar to those of benthos from Paddy's Run Creek.

Radiochemical analyses performed on garden produce and agricultural crops showed, in general, activities less than 2.0 pCi/g for all measured parameters. One sample of cucumber did, however, contain a slightly higher amount of uranium 234 with an activity of 3.0 pCi/g. Vegetative shoots and stems for grasses and forbs analyzed to date showed activity levels below 1.0 pCi/g for the radiological parameters measured. One sample of grass roots was analyzed at 8.4 pCi/g U-234 and 9.5 pCi/g U-238. These anomalous results are believed to be due to some adhering soil particles. Other activity levels for root samples were at or below 2.0 pCi/g for the measured parameters.

Proposed D&D Area Site Investigation - Thirty- four shallow borings were placed across the study area on a 50 foot grid spacing. Soil samples were collected at each location with 18 inch split spoon samplers. Soil samples were collected to a depth of 36 inches at each location. HNu surveys were performed during all drilling operations to establish the relative concentration of volatile organics in the area. Discrete samples were collected from 0-12, 12- 24 and 24- 36

inches at each boring location. Collected samples were moved to a low radiation background location and scanned with a NaI detection system. Ten percent of the collected samples were submitted to the IT Laboratory for total uranium analysis. A correlation curve was developed to relate count per minute data from the hand held survey meters to activity concentrations in the soil. Seven samples were submitted for isotopic uranium analysis and two samples were also submitted for HSL analysis.

Results of the correlation indicate that the above background activity material is generally limited to the upper 12 inches of soil in an approximate area of 30,000 square feet. Total uranium concentrations in these material generally ranged from background to 1780 ppm. The average concentration of the material is less than 200 ppm of total uranium.

During interviews with long term FMPC employees, a trench was identified on the northern portion of the study area. This trench is believed to contain scrap metal to a depth of approximately 10 feet. Surface surveys performed in the area with hand held meters did not provided conclusive data as to the existence of these buried materials. A Ground Penetrating Radar Survey in the area also did not provide any conclusive information. As a result, a subsurface investigation of the area was initiated during the week of March 28, 1988. A series of shallow monitoring wells are in the process of being installed at the perimeter of the trench unit. Completion of the wells is anticipated for early April, 1988. Water quality samples will be withdrawn from the till water interrupted in the area to determine if there is migration from the buried materials.

Task 3 Percent Complete: 55%

Task 4 - Site Investigation Analysis

Data Base - Programming was completed for a report listing all chain-of-custody and request-for-analysis numbers resident in the data management system. Programming for several CPS-PC plots was also completed during March. Development of site maps in Autocad was initiated, as was SAS programming to develop SAS Graph displays for data analysis and presentation.

Training on the USRAD system was completed during the reporting period. System development to accept data from the USRAD system directly into the data management system was initiated during the week of March 28, 1988.

Groundwater Modeling - The analytical comparisons were completed between the SWIFT III, GEOFLOW and the McDonald & Harbaugh models. Data received from GeoTrans indicates that a substantial portion of the SWIFT III model verification has been successfully completed by GeoTrans firm under a separate effort. The implications of this verification data to the RI/FS groundwater modeling program will be evaluated during April.

Task 4 Percent Complete: 30%

Tasks 5 and 6

No activity during the month.

Task 7 - Program Management and Reports

On March 4, 1988, the FMPC received a correspondence from USEPA-Region 5 requesting clarification on the RI/FS health and safety action levels for increased levels of personnel protection. A response to the request was issued to USEPA on March 17, 1988.

Task 7 Percent Complete: Not applicable (apportioned effort)

Task 8 - Community Relations Support

A community meeting was held on March 15, 1988 with key personnel from WMCO and DOE present to address the concerns of local residents related to the FMPC. Members of the sitewide RI/FS team were also present to answer questions and address the concerns of the citizens in attendance related to the ongoing project.

Task 8 Percent Complete: Not applicable (apportioned effort)

Task 11 - Feasibility Study Work Plan

A detailed personnel utilization plan was developed for the feasibility study. Background data research continued to support the completion of the Feasibility Study Work Plan.

Task 11 Percent Complete: 10 %

Task 12 - Remedial Technology Alternatives

Remedial action technology research continued during March. Detailed descriptions of applicable remedial action technologies identified during February were compiled during

the month. These descriptions will be incorporated in the next phase of the FS, the "Initial Screening of Alternatives."

Task 12 Percent Complete: 5%

CHARACTERIZATION INVESTIGATION STUDY

Volume 3 of the Characterization Investigation Study final report was transmitted to USEPA on March 31, 1988. Volume 3 presents the results of the detailed radiological characterization of the surface soils in the FMPC waste storage area.

DIFFICULTIES ENCOUNTERED

Field investigations, particularly drilling, well development and ground water sampling were hampered by rainy weather and muddy conditions that prevented vehicles from reaching well sites.

ACTIONS TAKEN TO RECTIFY PROBLEMS

Work activities have been rescheduled to take full advantage of the good weather days during the month of April.

CHANGES IN PERSONNEL

There were no changes in RI/FS personnel during the reporting period.

RESULTS OF SAMPLING

Radiochemical analysis results from the RI site investigation are now becoming available. As data are received, they are being reported in Technical Information Exchange (TIE) meetings.

Attachment 1 to this report provides the lithologic and well completion logs for monitoring wells 344, 176, 172, 244, 177, 130, 135, 208, 334, 210, 108, and 315.

PLANNED ACTIVITIES FOR NEXT MONTH

- Complete well installation and well development for the 74 on-site wells.
- Initiate electronic transfer of data from the Characterization Investigation Study TIMS system to the Flow Gemini data base.
- Generate a site map on Autocad including all well locations.
- Finalize contacts with off-site property owners for the installation of the fifteen off-site groundwater monitoring wells.
- Complete soil sampling along the north and east FMPC boundary lines.
- Complete the investigation of the area of the proposed D&D facility.
- Transmit analytical results of the sample collected from the development water at well location 184 to USEPA.

FERNALD RI/FS

2658

PAC

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B344	COORDINATES:	DATE: 3/1/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/1/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 3/7/88
DRILLING METHODS: Cable Tool		PAGE 1 OF 9

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1½ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	08083 1010 3/1	2 3 4	13	stiff, brown 10YR 4/2 organic rich silt and clay, abundant roots, dry. 0.5	ml/cl	1.5	HNU=0ppm γB=100cpm α=0cpm
2	08084 1030 3/1	2 3 6	14	very stiff, yellow-brown 10YR 4/4 clay, trace organic material. very stiff, yellow-brown 10YR 4/4 clay, slightly mottled, dry.	cl	2.75	HNU=0ppm γB=80cpm α=0cpm
3 4	08085 1035 3/1	3 6 7	15	very stiff, yellow-brown 10YR 4/4 clay, trace silt, slightly mottled, 1" silt lens at 4.3', dry.	cl	2.5	HNU=0ppm γB=140cpm α=4cpm
5 6	08086 1040 3/1	7 10 9	18	hard, yellow-brown 10YR 5/4 clay, slightly mottled, trace silt in bottom 2", dry.	cl	4.25	HNU=0ppm γB=120cpm α=2cpm
7	08087 1042 3/1	10 11 11	16	very stiff, yellow-brown 10YR 5/4 mottled with light gray 10YR 6/3 clay, trace silt, dry. 7.3	cl	3	HNU=0ppm γB=100cpm α=2cpm
8 9	08088 1430 3/1	4 8 13	14	very stiff, yellow-brown 10YR 6/4 clay with some fine gravel, trace silt, dry. very stiff, yellow-brown 10YR 6/6 clay, some silt, slightly mottled, dry. 9.0	cl cl	3.25 3.5	HNU=0ppm γB=100cpm α=2cpm Duplicate sample
10	08091 1450 3/1	3 11 13	10	med. dense, yellow-brown 10YR 4/4 sand, some silt, some clay, trace gravel, moist, sandy clay lens at 9.6' and 10.0', 1" thick.	sm	NA	HNU=0ppm γB=80cpm α=0cpm
11 12	08092 1515 3/1	10 8 14	6	med. dense, yellow-brown 10YR 4/4 sand, some silt and clay, trace fine gravel, moist. 11.3	sm	NA	HNU=0ppm γB=80cpm α=0cpm
13	08093 1525 3/1	4 9 9	11	very stiff, yellow-brown 10YR 5/4 clay, trace gravel, dry. 12.0 med. stiff, gray 10YR 4/1 sandy clay, some silt, moist, bottom 3" very sandy.	cl cl	2.5 1.0	HNU=0ppm γB=80cpm α=0cpm
14	08094 1540 3/1	4 4 3	1	gray-brown 10YR 4/3 sandy clay, trace gravel, some silt, moist.	cl	Unk	HNU=0ppm γB=80cpm α=2cpm No recovery on 1st & 2nd try, 1" 3rd try. Insufficient recovery for consistency.

NOTES:

Pennsylvania Drilling Co., Bucyrus Erie 24-W Drilling Rig.
Driller: Dave Newman, Helper: Bob Johnson
Blows on sampler follow ASTM standard for 2x18in. split spoon.
Soil colors follow Musell color charts.
Approximately 300 gallons used in drilling.

Background
HNU=0ppm
γB=60-120cpm
α=0-2cpm

FERNALD RI/FS

2658

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B 344	COORDINATES:	DATE: 3/1/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/1/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 3/7/88
DRILLING METHODS: Cable Tool		PAGE 2 OF 9

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	08095 1605 3/1	2 2 3	1	gray 10YR 4/1 clay, some silt and sand, trace gravel, moist.	cl	Insufficient recovery	HNU = 0 ppm, dB = 80 cpm, α = 0 cpm; No recovery 1st try, 1" 2nd try.
17	08096 1615 3/1	3 2 5	6	stiff, gray 10YR 5/1 clay, trace silt, trace gravel, moist. 18.0	cl	1.5	HNU = 0 ppm, dB = 80 cpm, α = 0 cpm
18							
19	08097 1630 3/1	7 26 26	5	very dense, gray-brown 10YR 5/2 coarse sand, some gravel, some silt and clay, moist. 19.3	SM	NA	HNU = 0 ppm, dB = 80 cpm, α = 0 cpm
20	08098 1725 3/1	15 25 28	8	hard, gray-brown 10YR 5/2 clay, some coarse gravel, trace silt, dry. 19.5	cl	>5	HNU = 0 ppm, dB = 100 cpm, α = 2 cpm
21				hard, gray-green 5Y 3/2 clay, trace silt, trace gravel, dry. 21.0	cl	>5	
22	08099 0805 3/2	8 15 21	13	dense, yellow-brown 10YR 4/4 fine to med. sand, trace silt, dry.	SM	NA	HNU = 0 ppm, dB = 80 cpm, α = 0 cpm
23	08100 0820 3/2	9 19 23	14	dense, yellow-brown 10YR 4/4 fine grained sand, trace silt, dry.	SM	NA	HNU = 0 ppm, dB = 60 cpm, α = 2 cpm
24							
25	08101 0850 3/2	9 10 18	11	med. dense, yellow-brown 10YR 5/4 very fine sand, some silt, dry.	SM	NA	HNU = 0 ppm, dB = 100 cpm, α = 2 cpm
26							
27							
28							
29							

NOTES: Base of till at 21.0 ft.

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B344	COORDINATES:	DATE: 3/2/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/1/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 3/7/88
DRILLING METHODS: Cable Tool		PAGE 3 OF 9

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	08102 1035 3/2	6 11 13	9	med. dense, gray 10YR 5/3 fine sand, some silt, dry.	SM	NA	HNU=0ppm γB=100cpm α=2cpm
32							
33							
34							
35	08103 1100 3/2	18 17 22	12	dense, tan 10YR 5/4 very fine sand, some silt, dry, gravel in bottom 2".	SM	NA	HNU=0ppm γB=100cpm α=2cpm
36							
37							
38							
39							
40	08104 1335 3/2	14 27 30	11	very dense, tan 10YR 5/4 med. to coarse sand, trace silt, some gravel, dry.	SM	NA	HNU=0ppm γB=80cpm α=2cpm
41							
42							
43							
44							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B344	COORDINATES:	DATE: 3/2/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/1/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 3/7/88
DRILLING METHODS: Cable Tool		PAGE 4 OF 9

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	08245 1445 3/2	17 55 —	8	very dense, brown-gray 10YR 5/3 fine-medium sand, some silt, trace clay, dry.	SM	NA	HNU=0ppm JB=80cpm α=0cpm
47							
48							
49							
50	08246 1520 3/2	11 16 18	13	dense, gray-brown 10YR 4/3 medium-coarse sand, trace silt, trace fine gravel, wet.	SM	NA	HNU=0ppm JB=100cpm α=0cpm
51							
52							
53							
54							
55	08247 1545 3/2	8 8 11	8	med. dense, gray-brown 10YR 4/2 medium sand, trace silt, trace fine gravel, wet.	SM	NA	HNU=0ppm JB=80cpm α=0cpm / No recovery 1st try - cobble caught in spoon, 8" recovery 2nd try.
56							
57							
58							
59							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B344	COORDINATES:	DATE: 3/5/88
ELEVATION:	GWL: Depth 48.05 Date/Time 3/5/83 09:00	DATE STARTED: 3/1/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 3/7/88
DRILLING METHODS: Cable Tool		PAGE 5 OF 9

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	08248 1010 3/5	5 12 21	13	dense, brown-gray 10YR 4/2 medium sand, some silt, trace fine gravel, wet.	SM	NA	HNU = 0 ppm γB = 60 cpm α = 0 cpm
62							
63							
64							
65	08249 1310 3/5	5 12 14	13	med. dense, brown-gray 10YR 4/2 medium sand, some silt, trace fine to coarse gravel, wet.	SM	NA	HNU = 0 ppm γB = 80 cpm α = 0 cpm
66							
67							
68							
69							
70	08250 1500 3/5	22 53 34	17	very dense, brown-gray 10YR 4/2 medium to coarse sand, some silt, wet. 70.3	SM	NA	HNU = 0 ppm γB = 100 cpm α = 2 cpm; Cobble smashed in spoon
71				dense, brown-gray 10YR 4/2 coarse sand, gravelly, some silt, wet.	SW		
72							
73							
74				74.0			

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B344	COORDINATES:	DATE: 3/6/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/1/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 3/7/88
DRILLING METHODS: Cable Tool		PAGE 6 OF 9

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76	08251 1535 3/5	9 13 14	18	med. dense, gray-brown 10YR 4/3 medium sand, trace silt, wet.	SM	NA	HNU=0 ppm γB=90cpm α=2cpm
77							
78							
79							
80							
81	08252 1555 3/5	4 10 12	17	med. dense, brown 10YR 4/2 fine-medium sand, some silt, wet. 81.0	SM	NA	HNU=0 ppm γB=80cpm α=2 cpm
82				med. dense, brown 10YR 4/2 medium to coarse sand, some coarse gravel, some silt, wet.	SP		
83							
84				84.0			
85	08253 1725 3/5	12 24 24	18	dense, brown 10YR 4/2 fine to medium sand, some silt, wet. 85.5	SM	NA	HNU=0 ppm γB=100cpm α=0 cpm
86				dense, brown 10YR 4/2 sandy gravel, medium to coarse sand, some pebbles, some silt, wet.	SP		
87							
88							
89				87.0			

NOTES:

FERNALD RI/FS

2658 PAC

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B344	COORDINATES:	DATE: 3/6/88
ELEVATION:	GWL: Depth 49.75 Date/Time 3/6/88 08:00	DATE STARTED: 3/1/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 3/7/88
DRILLING METHODS: Cable Tool		PAGE 7 OF 9

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
91	08254 08/25 3/6	5 6 7	11	med. dense, brown 10YR 4/2 fine sand, some silt, uniform grain size, wet. Gravelly lens at 90.1 to 90.2 ft.	SM	NA	HNU=0 ppm $\gamma\beta$=60 cpm α=0 cpm
92							
93							
94							
95	08255 1030 3/6	15 22 24	16	dense, brown 10YR 3/3 very fine sand, well graded, some silt, wet.	SM	NA	HNU=0 ppm $\gamma\beta$=40 cpm α=0 cpm
96							
97							
98							
99							
100	08256 1100 3/6	5 4 5	18	loose, gray-brown 10YR 4/2 very fine grained sand, some silt, some clay, wet.	SM	NA	HNU=0 ppm $\gamma\beta$=60 cpm α=2 cpm
101							
102							
103							
104							

NOTES:

FERNALD RI/FS

2658

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B344	COORDINATES:	DATE: 3/6/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/1/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 3/7/88
DRILLING METHODS: Cable Tool		PAGE 8 OF 9

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
106	08257 1335 3/6	2 3 4	16	loose, gray 10YR3/1 fine sand, some silt, trace clay, well graded, wet.	sm	NA	HNU=0 ppm βB=80 cpm α=0 cpm
107							
108							
109							
110	08258 1450 3/6	5 9 13	16	med. dense, gray 10YR 4/1 fine sand, some silt, trace clay, wet. 111.3	sm	NA	HNU=0 ppm βB=80 cpm α=2 cpm
111							
112				gray 10YR 4/1 very fine sand and silt, some clay, wet.	ml		
113							
114				114.0			
115	08259 1630 3/6	5 15 28	18	dense, gray 10YR 4/1 fine – medium sand, some silt, trace clay, wet.	sm	NA	HNU=0 ppm βB=60 cpm α=0 cpm
116							
117							
118							
119							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

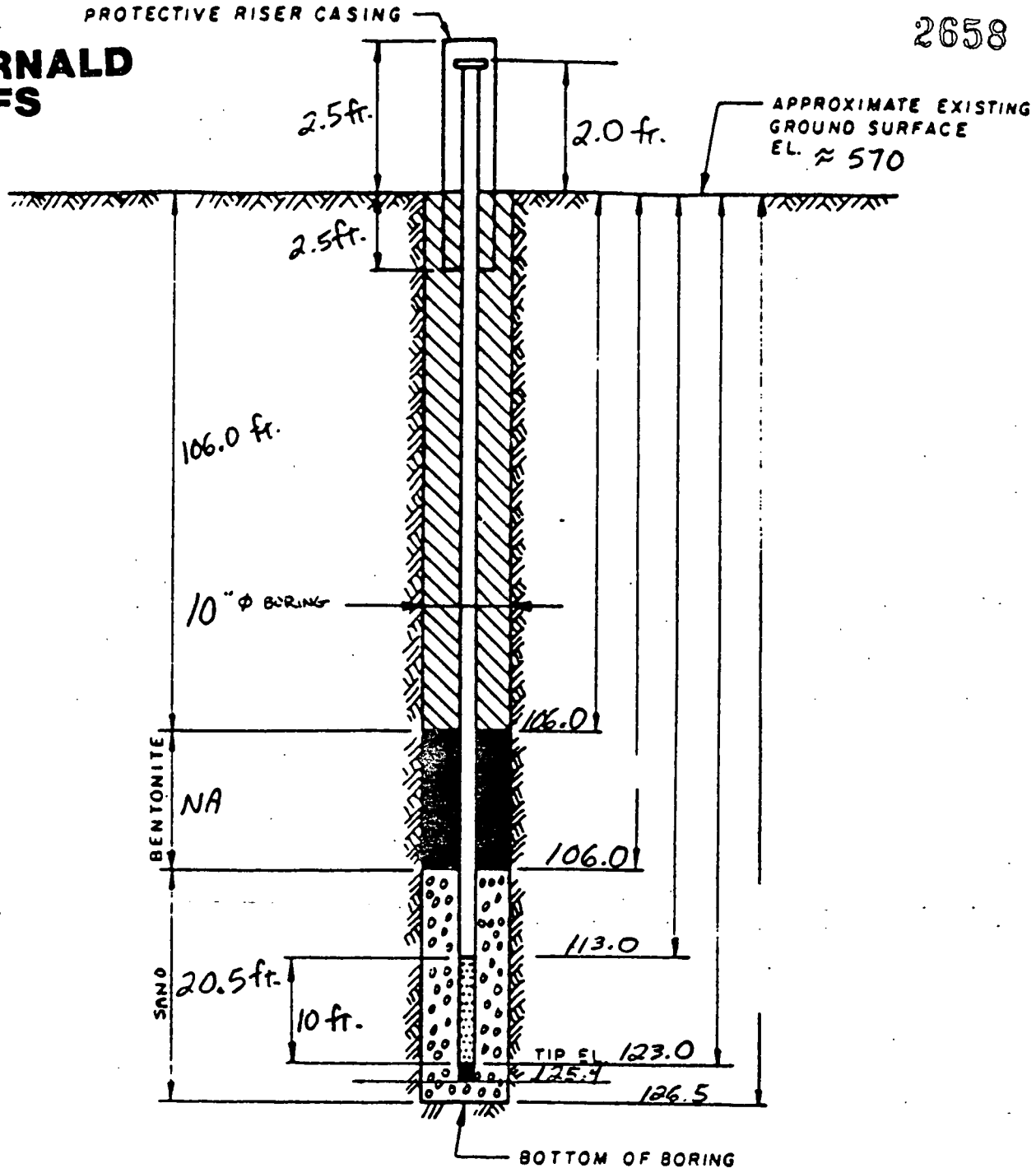
PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B 344	COORDINATES:	DATE: 3/6/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/1/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 3/7/88
DRILLING METHODS: Cable Tool		PAGE 9 OF 9

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
121	08260 1745 3/6	8 24 26	18	dense, gray 10YR4/1 fine sand, some silt, trace clay, wet.	SM	NA	HNU=0ppm γB=60cpm α=0cpm
122							
123							
124				124-124.5 ft.			"Blue" clay encountered at approximately 124 to 124.5 ft.
125 126	08261 0920 3/7	4 7 8	18	stiff, gray-green 5Y4/1 clay, some silt, moist.	cl	1.25	HNU=0ppm γB=60cpm α=2cpm
127	08262 1040 3/7	Shelby Tube		very stiff, gray-green 5Y 3/1 clay, some silt, dry.	cl	2.5	HNU=0ppm γB=60cpm α=0cpm
128				E.O.B. 126.5 ft. Shelby Tube 126.5-127.4 ft.			Pushed Shelby Tube at 126.5 ft.; 1.7 ft. penetrated, 0.9 ft. recovered. Approximately 0.6 ft. of sand cleaned out of tube.

NOTES:

2658

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL 51.3 ft. below grd. surface, 53.3 ft. below TOC.
5. WATER LEVEL READING ON 3/9/88 13:20

INSTALLATION DETAILS
MONITORING WELL 344

PREPARED FOR

DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

2658 PA

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. T. Sullivan DATE 3/8/88
PROJECT NO. 602.3.2 CHECKED BY _____ DATE _____
BORING NO. 344
PIEZOMETER NO. 344 DATE OF INSTALLATION 3/8/88

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM 0 TO 90 ft.
FLUID — FROM — TO —

TYPE OF BIT Hammer
CASING SIZE (S) USED:
SIZE 10in ID FROM 0 TO 125 ft.
SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Well
DIAMETER OF PERFORATED SECTION 4in.
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 in.
TOTAL PERFORATED AREA 10 ft.

RISER PIPE MATERIAL Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8 in. I.D. 4 in.
LENGTH OF PIPE SECTIONS 10ft., 5ft., 2ft.
JOINING METHOD Screw flush joint threads.

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 ft.
PROTECTIVE PIPE O.D. 10 3/4 in.

OTHER PROTECTION Locking cap and lock.

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft.)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 106.0	TOP	BOTTOM
BENTONITE (None used)	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND	TOP 106.0	BOTTOM 126.5	TOP	BOTTOM
GRAVEL (None used)	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 113.0	BOTTOM 123.0	TOP	BOTTOM
PIEZOMETER TIP	125.4			
BOTTOM OF BOREHOLE	126.5			
GWL AFTER INSTALLATION	51.3 ft.			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

21

REMARKS _____

2658 DA

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 176	COORDINATES:	DATE: 3-6-88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03-06-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 3-8-88
DRILLING METHODS: Cable Tool		PAGE 1 OF 4

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	08148 1045 03-06	3 5 7	12	STIFF, YELLOWISH BROWN (10YR 3/4) CLAY SOME FINE GRAVEL, ROOTLETS, DRY	CL	2.0	HNU = 0 α = — BG = 100 CPM
2 3	08149 1050 03-06	1 4 5	10	VERY STIFF, YELLOWISH BROWN (10YR 4/4) SILTY CLAY, SOME FINE GRAVEL, DRY	CL	2.5	HNU = 0 α = — BG = 100 CPM
4	08150 1053 03-06	4 4 5	10	VERY STIFF, YELLOWISH BROWN (10 YR 4/4) SILTY CLAY, SOME FINE GRAVEL, DRY	CL	2.5	HNU = 0 α = — BG = 100 CPM
5 6	08151 1056 03-06	3 4 5	9	MEDIUM STIFF YELLOWISH BROWN SILTY CLAY; SOME GRAVEL (10YR 4/5) WET 5.8	CL	1.0	HNU = 0 α = — BG = 100 CPM
7	08152 1059 03-06	3 4 4	10	MEDIUM STIFF OLIVE-GRAY (5Y 3/3) SILTY CLAY, SOME GRAVEL MOIST		1.0	HNU 0 α = — BG = 100 CPM
8 9	08153 1410 03-06	1 2 1	8		CL	1.0	HNU = 0 α = — BG = 100 CPM
10	08154 1430 03-06		18"	SHELBY TUBE PUSHED FROM 9.0 FT. TO 10.5 FT, SAMPLE RECOVERED FROM 9.0 FT TO 10.5 FT 10.5			
11 12	08155 1035 03-07	7 14 25	18	VERY STIFF, YELLOWISH BROWN (10YR 4/5) SILTY CLAY, TRACE OF FINE SAND, SOME FINE GRAVEL DRY	CL	3.0	HNU = 0 α = — BG = 160 CPM
13	08156 1047 03-07	14 18 25	18			3.0	HNU = 0 α = — BG = 140 CPM
14	08157 1100 03-07	7 13 15	18	14.0 VERY STIFF, GREY (5Y 4/1) CLAY SOME FINE GRAVEL, DRY		2.0	HNU = 0 α = — BG = 100 CPM

NOTES:
CONTRACTOR: PENNDRILL
RIG: CYCLONE 42
DRILLER: HARRY DYKES JR
ASSISTANT: JOHN VANDING

WATER ADDED TO HOLE: 500 GALLONS

SAMPLES COLLECTED AS PER ASTM STANDARD PENETRATION TEST

COLORS: IDENTIFIED USING MUNSELL COLOR CHART

BACKGROUND LEVELS: HNU = 0
LEL O_2: 0 PPM LEL, 20.1% O_2
BG = 120 CPM
α = 0 CPM

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 176	COORDINATES:	DATE: 3-7-88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03-06-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 3-8-88
DRILLING METHODS: Cable tool		PAGE 2 OF 4

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	08158 1107 03-07	3 8 14	16	VERY STIFF, MEDIUM GRAY (5Y 4/1) CLAY, WITH SOME FINE GRAVEL AND SILT, DRY	CL	2.0	HNU: 0 α: – BG: 140 CPM
17	08159 1115 03-07	8 7 11	14		CL	2.0	HNU: 0 α: – BG: 140 CPM
18							
19	08160 1320 03-07	6 8 10	12	19.5	CL	2.0	HNU: 0 α: – BG: 120 CPM
20	~~08160~~ 08161 1525 03-07	9 5 8	4	VERY STIFF, MEDIUM GRAY (5Y 4/1) GRAVELLY CLAY, SOME SAND AND SILT, WET 21.2	CL	2.0	HNU: 0 α: – BG: 120 CPM ATTEMPTED TO PUSH SHELBY TUBE FROM 19.5 FT TO 21.5 FT TUBE COLLAPSED NO RECOVERY SPLIT SPOON SAMPLE TAKEN
21							
22	08162 1538 03-07	2 5 8	10	VERY STIFF, OLIVE-GRAY, SILTY (10YR 4/1) CLAY, SOME FINE GRAVEL, SOME FINE SAND, MOIST	CL	2.5	HNU: 0 α: – BG: 120 CPM
23	08163 1548 03-07	2 4 8	10		CL	2.5	HNU: 0 α: – BG: 140 CPM
24							
25	08164 1557 03-07	2 4 6	10		CL	2.5	HNU: 0 α: – BG: 120 CPM
26	08165 1603 03-07	4 6 10	12	26.5	CL	—	HNU: 0 α: – BG: 120 CPM
27				MEDIUM DENSE, OLIVE-GRAY (10YR 4/1) COARSE SAND AND GRAVEL, SILTY, WET 27.0			
28	08166 1640 03-07	3 6 9	14	VERY STIFF, OLIVE GRAY (10YR 4/1) CLAY, SOME FINE GRAVEL, MOIST	CL	3.0	HNU: 0 α: – BG: 80 CPM
29	08167 1650 03-07	4 8 12	16		CL	3.0	HNU: 0 α: – BG: 80 CPM

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 176	COORDINATES:	DATE: 3-8-88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03-06-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 3-8-88
DRILLING METHODS: Cable tool		PAGE 3 OF 4

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	08168 1705 03-07	4 7 11	12	VERY STIFF, OLIVE-GRAY (10YR 4/1) CLAY, SOME FINE GRAVEL, TRACE SAND, MOIST	CL	3.5	HNU: 0 α: — BG: 80 CPM
32	08169 0900 03-08	4 7 11	14		CL	4.0	HNU: 0 α: — BG: 120 CPM
33							
34	08170 0920 03-08	16 25 50	16	HARD, OLIVE-GRAY, SILTY (10YR 4/1) CLAY, SOME FINE GRAVEL, TRACE SAND, MOIST	CL	>4.0	HNU: 0 α: — BG: 120 CPM
35	08171 0940 03-08	50 50 50	8	36.0		>4.0	HNU: 0 α: — BG: 120 CPM
36				VERY DENSE, OLIVE-GRAY (5Y 5/1) CLAYEY GRAVEL AND SAND, DAMP 37.0	GC		
37	08172 1313 03-08	26 32 41	12	VERY STIFF, OLIVE-GRAY (5Y 5/1) CLAY SOME SAND AND GRAVEL, DAMP 37.5	CL	>4.0	HNU: 0 α: — BG: 100 CPM
38	08173 1400 03-08	26 30 36	12	VERY DENSE, OLIVE-GRAY (5Y 5/1) CLAYEY GRAVEL AND SAND, DAMP 38.5	GC		HNU: 0 α: — BG: 100 CPM
39				VERY DENSE, YELLOWISH-BROWN (10YR 5/4) SAND, DRY	SP		
40							
41							
42							
43							
44							

NOTES:

FERNALD RI/FS

2658

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 176	COORDINATES:	DATE: 3-8-88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03-06-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 3-8-88
DRILLING METHODS: Cable tool		PAGE 4 OF 4

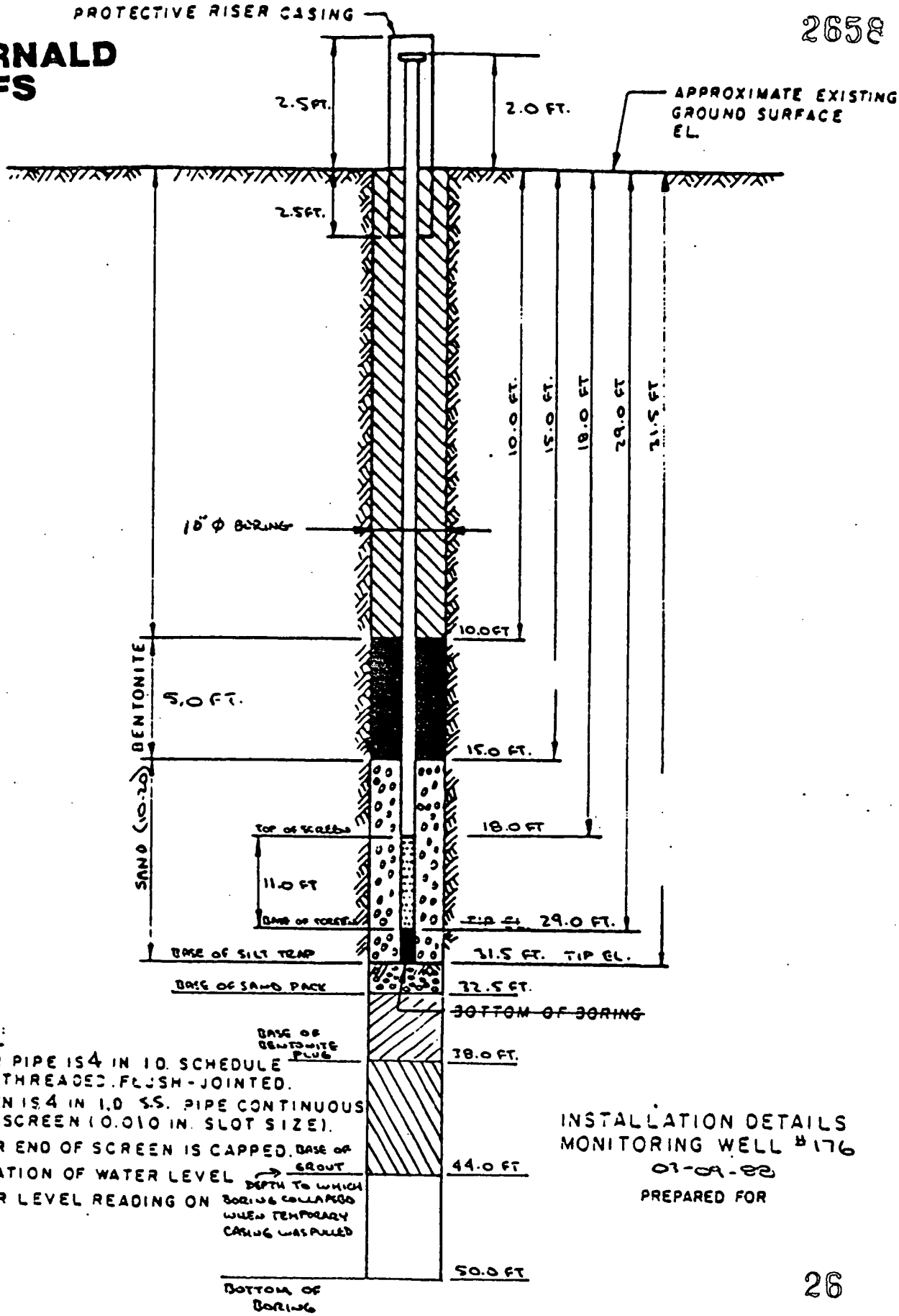
DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (%)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	08174 1601 03-08	22 45 43	14	VERY DENSE, YELLOWISH-BROWN (10 YR 5/4) SAND, DRY, SOME FINE GRAVEL	SP		HNU = 0 α = — BG = 120 CPM
47							
48							
49	08350 1640 03-08	25 45 50	16	VERY DENSE, YELLOWISH-BROWN (10 YR 5/4) SAND, DRY, SOME FINE GRAVEL,	SP		HNU = 0 α = — BG = 120 CPM
50				BOTTOM OF BOREHOLE - 50.0 FT			

NOTES:

Boring # 176

2658

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. S.S. PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL # 176
03-09-88
PREPARED FOR

DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

YPAC

FERNALD RI/FS

2658

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS
FIELD ENG./GEO. M. SLUSARSKI
DATE 03-09-88
PROJECT NO. 602 TASK 3.2
CHECKED BY
DATE
BORING NO. 176
PIEZOMETER NO. 176
DATE OF INSTALLATION 03-09-88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
TYPE OF BIT HAMMER
DRILLING FLUID (S) USED:
FLUID WATER FROM 0 FT. TO 48.5 FT
FLUID FROM TO
CASING SIZE (S) USED:
SIZE 10" ID FROM 0 FT. TO 48.5 FT.
SIZE FROM TO

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 IN.
TOTAL PERFORATED AREA 11.0 FT.
RISER PIPE MATERIAL STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8" I.D. 4"
LENGTH OF PIPE SECTIONS
JOINING METHOD SCREW FLUSH JOINT THREADS

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT.
PROTECTIVE PIPE O.D. 10 3/4 IN.
OTHER PROTECTION LOCKING CAP

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION ( )	
TOP OF RISER PIPE	2.5			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY (1) UPPER PLUG (2) BASAL PLUG	TOP (1) 0.0 (2) 38.0	BOTTOM 10.0 44.0	TOP	BOTTOM
BENTONITE (1) UPPER PLUG (2) BASAL PLUG	TOP (1) 10.0 (2) 32.5	BOTTOM 15.0 38.0	TOP	BOTTOM
SAND	TOP 15.0	BOTTOM 32.5	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 18	BOTTOM 29	TOP	BOTTOM
PIEZOMETER TIP	31.5			
BOTTOM OF BOREHOLE	50.0			
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

27

REMARKS

2658 YPAC

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T 3.2		
BORING NUMBER: 172	COORDINATES:	DATE: 3-6-88	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03/06/88	
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 03/15/88	
DRILLING METHODS: Cable Tool		PAGE 1 OF 4	

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	08188	3 5 7	12"	Very STIFF light olive Brown clay (2.5Y 5/4) DRY 1.5ft	2.5	CL	Hnu=0 α=0 γB=120 1035
2 3	08189	3 6 6	14"	STIFF Dark grayish Brown clay (10YR 4/2) DRY 3 Ft	2.0	CL	Hnu=0 α=0 γB=100 1045
4	08190	9 13 14	14"	STIFF yellowish Brown clay (10YR 5/6) DRY Trace sand & silt	1.5	ML	Hnu=0 α=0 γB=120 1050
5 6	08191	14 34 43	18"	Very STIFF Yellowish Brown clay (10YR 5/6) Trace sand and silt 6 Ft	2.5	ML	Hnu=0 α=0 γB=120 1055
7	08192	NA	12"	Shelby Tube 7 Ft	N/A	N/A	Hnu= α= 1600
8 9	08193	2 3 2	12"	STIFF Yellowish Brown clay (10YR 5/6) wet 9 Ft	2.0	CI	Hnu=0 α=0 γB=140 very plastic 1635
10	08194	3 4 3	18"	Very Soft yellowish Brown clay (10YR 5/4) Wet 10.5 Ft	<1	CH	Hnu=0 α=0 γB=160 Very plastic 1640
11 12	08195	13 16 23	18"	Very STIFF yellowish Brown clay (10YR 5/8) DRY 12 Ft	2.5	CL	Hnu=0 α=0 γB=150 3/17/88 0850
13	08196	20 23 26	18"	Very STIFF Reddish Brown clay (5YR 4/4) Trace gravel DRY 14 Ft	2.5	CL	Hnu=0 α=0 γB=150 0900
14 15	08197	11 12 16	18"	STIFF gray clay (5Y 5/1) DRY Trace gravel	1.5	CL	Hnu=0 α=0 γB=130 0935

NOTES:

I) Drilling Contractor: Pennsylvania Drilling
Driller: Tim Harris
Helper: Craig Coulter

II) Background measurements
a) Hnu = 0 B) α = 0 c) γB = 120cpm

III Water used ≈ 400 gallons
28

IV Samples via Muncell Color chart

N/A = not Applicable

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T 3.2		
BORING NUMBER: ~~FFS~~ 172	COORDINATES:	DATE: 3-7-88	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3-6-88	
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 3-15-88	
DRILLING METHODS: Cable Tool		PAGE 2 OF 4	

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15							
16	08198	3 5 7	12"	STIFF ~~olive~~ gray clay (5Y 5/1) DRY trace gravel	1.5	CL	Hnu = 0 α = 0 δB = 130 0940
17	08199	6 7 9	18"	Medium STIFF ~~olive~~ gray clay (5Y 5/1) Dry trace gravel	1.0	CL	Hnu = 0 α = 0 δB = 120 0945
18							
19	08200	2 6 6	18"	Soft gray clay (5Y 5/1) Dry Trace gravel	<1	CL	Hnu = 0 α = 0 δB = 140 1410
20	08201	6 7 12	18"	Soft gray clay (5Y 5/1) DRY Trace gravel	<1	CL	Hnu = 0 α = 0 δB = 140 1417
21							
22	08202	NA	24"	SHELBY Tube	NA	NA	~~Hnu~~ = ~~α~~ = ~~δB~~ = ~~Hnu~~ = 1555
23	08203	3 6 6	12"	medium STIFF gray clay (5Y 5/1) DRY trace gravel	1.0	CL	α = 0 Hnu = 0 δB = 140 ~~Hnu~~ 1635
24	08204	5 6 13	12"	Medium STIFF Dark gray clay (5Y 5/1) Dry trace gravel			Hnu = 0 03/08/88 α = 0 δB = 110 0850
25							
26	08205	3 4 6	10"	STIFF Dark gray clay (5Y 5/1) DRY Trace gravel	1.5	CL	Hnu = 0 α = 0 δB = 100 0915
27							
28	08206	4 6 18	16"	STIFF Dark gray clay (5Y 5/1) DRY Trace gravel.	1.5		Hnu = 0 α = 0 δB = 100 1020
29	08207	22 30 41	18"	Hard Dark gray clay (5Y 5/1) DRY Trace gravel. Blue gravel and clay STRINGERS	4.0	CL	Hnu = 0 α = 0 δB = 120 Bright Blue Traces of clay 1105
30							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T 3.2		
BORING NUMBER: 172	COORDINATES:	DATE: 3-8-88	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03/06/88	
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 3-15-88	
DRILLING METHODS: Cable Tool		PAGE 3 OF 4	

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30							
31	0 8 2 08	12 22 41	18"	Very STIFF Dark olive grey clay (5Y 3/2) Abundant Gravel, DRY.	3.5	CL	Hnu = 0 α = 0 δB = 100 1425
32	0 8 2 09	12 22 38	18"	Very STIFF Yellowish Brown silty clay (10YR 6/8) DRY 32 Ft	2.5	CL	Hnu = 0 α = 0
33				Dense Yellowish Brown sand (10YR 6/6) dry	<1	SW	δB = 100 1600
34							
35							
36							
37							
38							
39	0 8 2 10	19 31 37	18"	Very Dense Yellowish Brown sand (10YR 6/6) DRY	<1	SW	Hnu = 0 α = 0 δB = 140 03/09/88 0930
40							
41							
42							
43							
44	0 8 2 11	26 28 34	18"	Very Dense Yellowish Brown sand (10YR 6/6) DRY. Trace gravel	<1	SW	Hnu = 0 α = 0 δB = 160 1035
45							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T3.2		
BORING NUMBER: 172	COORDINATES:	DATE: 3-8-88	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03/06/88	
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 3-15-88	
DRILLING METHODS: Cable Tool		PAGE 4 OF 4	

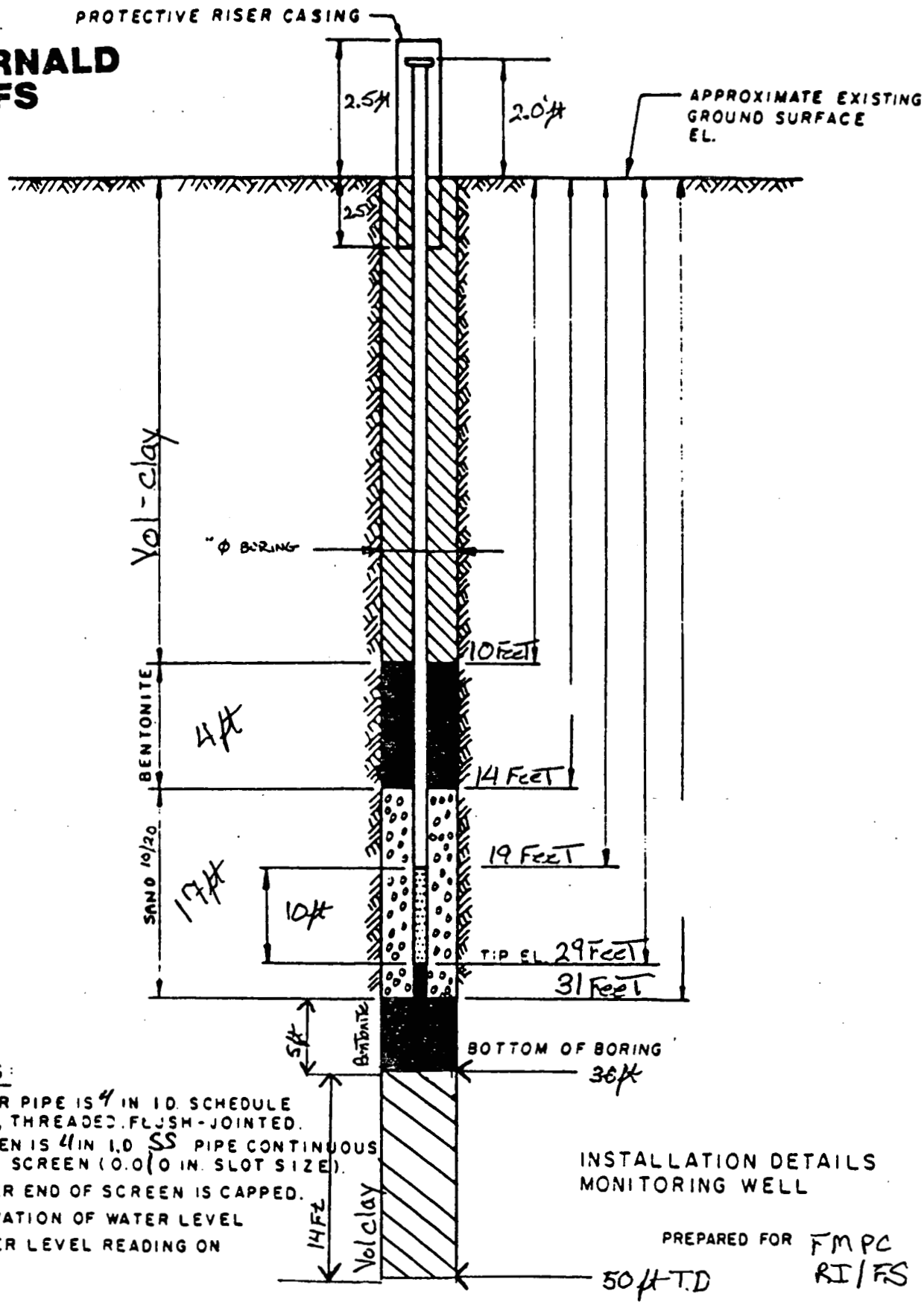
DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER ( )	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45							
46							
47							
48							
49	8 B 2 12	10 28 50 30	20"	Very Dense yellowish Brown sand (10YR 6/6) DRY trace gravel	SW		Hnu = 0 α = 0 δB = 140cpm 1115
50				Bottom of Boring 50 FT			

NOTES:

Monitoring Well #172

2658

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL

PREPARED FOR FMPC RI/FS

DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

FERNALD RI/FS

2658

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO M. Goldberg DATE 03/15/88
PROJECT NO. 602 CHECKED BY _____ DATE _____
BORING NO. 172
PIEZOMETER NO. N/A DATE OF INSTALLATION 03/15/88

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM 3 TO 50ft
FLUID _____ FROM _____ TO _____

TYPE OF BIT Flat Head
CASING SIZE (S) USED:
SIZE 10" FROM 3ft TO 50ft
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE Monitoring
DIAMETER OF PERFORATED SECTION 4"
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .010" inches
TOTAL PERFORATED AREA 10 Feet

RISER PIPE MATERIAL 316 Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8" I.D. 4" inches
LENGTH OF PIPE SECTIONS 10 Ft
JOINING METHOD Thread and couple

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 Ft
PROTECTIVE PIPE O.D. 10" inches

OTHER PROTECTION Lockable cap

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE ( )		ELEVATION ( )	
TOP OF RISER PIPE	2.0 Ft			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5 Ft			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 10Ft	TOP	BOTTOM
BENTONITE	TOP 10 Ft	BOTTOM 14ft	TOP	BOTTOM
~~SAND~~	TOP	BOTTOM	TOP	BOTTOM
GRAVEL	TOP 14 Ft	BOTTOM 31 Ft	TOP	BOTTOM
PERFORATED SECTION	TOP 19 Ft	BOTTOM 29 Ft	TOP	BOTTOM
PIEZOMETER TIP	31 ft			
BOTTOM OF BOREHOLE	31 ft			
GWL AFTER INSTALLATION	N/A			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

33

REMARKS Well 172 was overdrilled to 50 ft to determine Lithology. A Volclay plug was set from 50ft → 36ft with a 5Ft Bentonite Plug from 36ft → 31ft to seal Till/sand contact @ 33Ft.

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B244	COORDINATES:	DATE: 3/15/88
ELEVATION:	GWL: Depth 51.23 Date/Time 3/17/88-0730	DATE STARTED: 3/9/88
ENGINEER/GEOLOGIST: FXM/TCS	Depth Date/Time	DATE COMPLETED: 3/15/88
DRILLING METHODS: Cable Tool		PAGE 1 OF 1

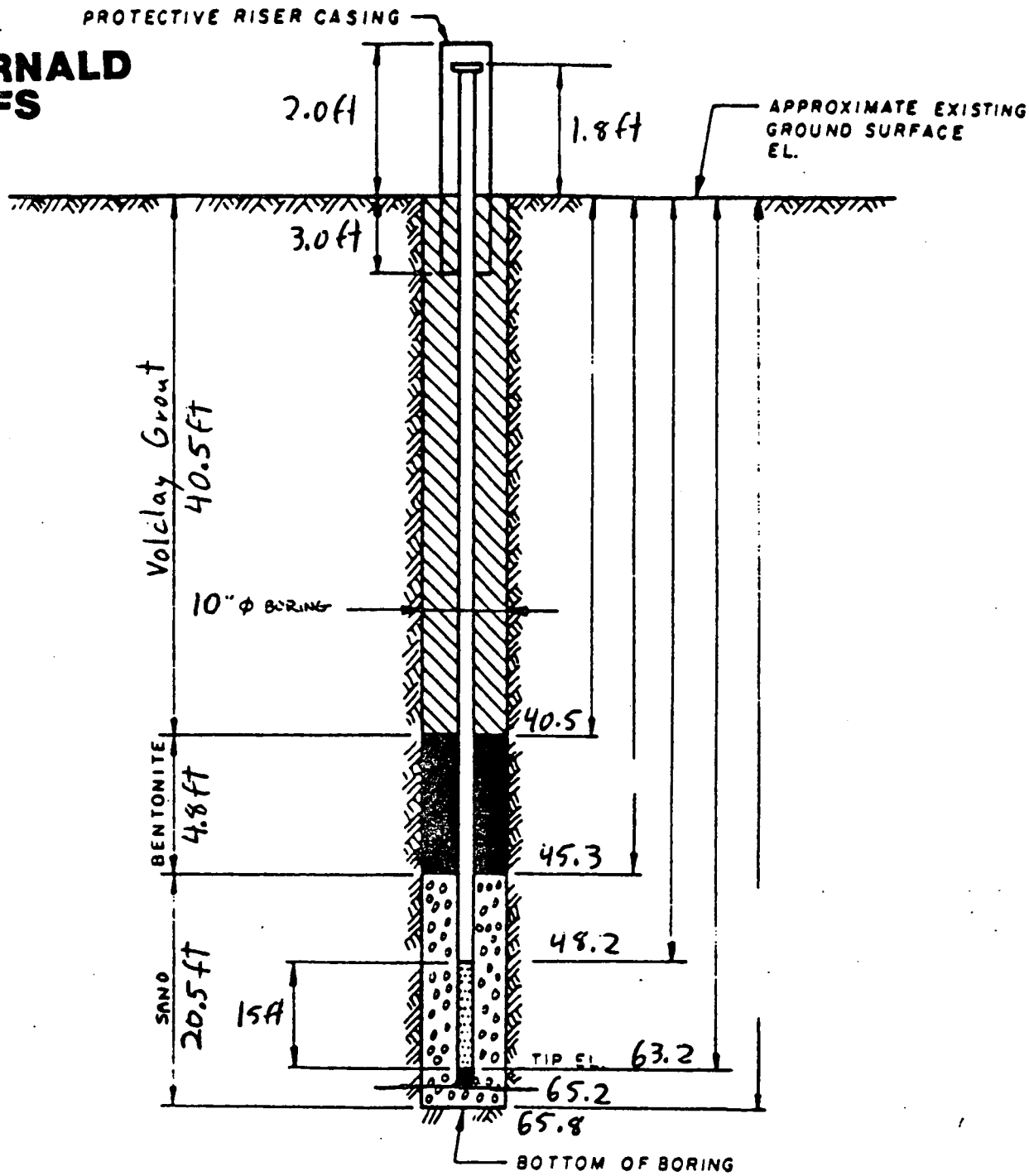
DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER ( )	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
5				For description of soils and deposits encountered see visual classification log for B344.			ST 1: Attempted pushing shelby tube in weathered till - tube was refused and dented.
10	ST 1						
15	ST 2						ST 2: Pushed Shelby tube 2 ft. in unweathered till, no recovery.
20							
25							
30							
35							
40							
45							
50							
55							
60							
65				Bottom of boring @ 65.8 ft			
							34

NOTES:

Pennsylvania Drilling Co., Bucyrus Erie 24W Drill Rig.
Driller: Dave Newman Helper: Bob Johnson
Sampling follows ASTM standards.
Approximate Water Used Drilling: 125 gal (5 gal. buckets)

Background:
HNU = 0 ppm
γB = 40-100 cpm
α = 0-2 cpm

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL 51.23 ft below top casing
5. WATER LEVEL READING ON 3/17/88 0730

INSTALLATION DETAILS
MONITORING WELL 244

PREPARED FOR

2658

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. F. MacKert DATE 3/16/88
PROJECT NO. 607.3.2 CHECKED BY _____ DATE _____
BORING NO. 244
PIEZOMETER NO. 244 DATE OF INSTALLATION 3/16/88

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM 0 TO 70 ft
FLUID — FROM — TO —

TYPE OF BIT Hammer
CASING SIZE (S) USED:
SIZE 10" ID FROM 0 TO 70 ft
SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Well
DIAMETER OF PERFORATED SECTION 4"
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 in
TOTAL PERFORATED AREA 15 ft

RISER PIPE MATERIAL Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8 in I.D. 4 in
LENGTH OF PIPE SECTIONS 10 ft, 2 ft
JOINING METHOD Screw flush joint threads

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 ft
PROTECTIVE PIPE O.D. 10 3/4 in

OTHER PROTECTION Locking cap with lock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	1.8			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	3.0			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 40.5	TOP	BOTTOM
BENTONITE	TOP 40.5	BOTTOM 45.3	TOP	BOTTOM
SAND	TOP 45.3	BOTTOM 65.8	TOP	BOTTOM
GRAVEL	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 48.2	BOTTOM 63.2	TOP	BOTTOM
PIEZOMETER TIP	65.2			
BOTTOM OF BOREHOLE	65.8			
GWL AFTER INSTALLATION	51.23 from TOC			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS

2658

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 32	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 177	COORDINATES:	DATE: 03-18-88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03-15-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 03-18-88
DRILLING METHODS: Cable Tool		PAGE 1 OF 3

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (FT)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	08352 1320 03-15	1 4 10	12	STIFF, YELLOW-BROWN (10YR 4/2) SILTY CLAY, SOME FINE GRAVEL, TRACE ORGANIC MATERIAL AND ROOTLETS, DRY 1.5	CL	2.0	HNU = 0 α: — BS: 120 CPM
2 3	08353 1324 03-15	7 7 9	14	VERY STIFF YELLOW-BROWN (10YR 4/4) SILTY CLAY, SOME FINE GRAVEL, DRY	CL	3.5	HNU: 0 α: — BS: 140 CPM
4	08354 1328 03-15	8 12 16	14	VERY STIFF YELLOW-BROWN (10YR 4/4) SILTY CLAY, SOME FINE GRAVEL, DRY	CL	4.0	HNU: 0 α: — BS: 140 CPM
5 6	08355 1332 03-15	20 28 25	8	HARD, YELLOW-BROWN (10YR 4/4) SILTY CLAY, SOME FINE GRAVEL, DRY	CL	>4.0	HNU: 0 α: — BS: 140 CPM
7	08356 1339 03-15	23 30 30	7		CL	>4.0	HNU: 0 α: — BS: 140 CPM
8 9	08357 1345 03-15	30 35 40	18		CL	>4.0	HNU: 0 α: — BS: 140 CPM
10 11	08358 1614 03-15	SHELBY TUBE		PUSHED SHELBY TUBE FROM 9.0 FT TO 11.0 FT. RECOVERED 1.5 FT	CL	3.0	HNU: 0 α: — BS: 120 CPM
12	08359 1656 03-15	12 16	12	VERY STIFF, YELLOW-BROWN (10YR 4/6) SILTY CLAY, SOME FINE GRAVEL, DRY 13.8	CL	3.0	HNU: 0 α: — BS: 140 CPM
13	08360 0835 03-16	6 15 20	14				HNU: 0 α: — BS: 140 CPM
14	08361 0903 03-16	6 12 15	12	STIFF, GRAY (5YR 4/1) SILTY CLAY, SOME FINE GRAVEL, DRY	CL	1.5	HNU: 0 α: — BS: 120 CPM

NOTES: CONTRACTOR: PENN DRILL
RIG: CYCLONE 42
DRILLER: HARRY DYKES JR.
ASSISTANT: JOHN VANDING
WATER ADDED TO HOLE: 500 GALLONS

SAMPLES COLLECTED AS PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU: 0 α: 0 CPM BS: 120 CPM
LEL_{O_2}: 0 PPM LEL 20.1% O_2

37

FERNALD RI/FS

2658

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 177	COORDINATES:	DATE: 03-18-88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03-15-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 03-18-88
DRILLING METHODS: Cable Tool		PAGE 2 OF 3

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	08362 0912 03-16	5 9 11	14	STIFF, GREY (5Y 4/1) SILTY CLAY SOME FINE GRAVEL DAMP	CL	2.0	HNU: 0 α: — BZ: 140 CPM
17	08363 0924 03-16	3 6 9	8	18.0			HNU: 0 α: — BZ: 140 CPM
19	08364 0937 03-16	2 6 12	8	VERY STIFF, GREY (5Y 4/1) GRAVELLY CLAY, SOME SILT, WET 19.5	CL	2.5	HNU: 0 α: — BZ: 140 CPM
20	08365 0945 03-16	6 5 6	8	MEDIUM, GREY (5YR 4/1) SILTY SAND, WITH SOME FINE GRAVEL, WET	SM		HNU: 0 α: — BZ: 120 CPM
21 22	08366 1030 03-16	SHELBY TUBE		PUSHED SHELBY TUBE FROM 21.0 FT TO 22.5 FT. RECOVERED 1.1 FT			HNU: 0 α: — BZ: 120 CPM
23 24	08367 1115 03-16	2 14 11	10	VERY STIFF, GREY (5YR 7/1) GRAVELLY CLAY, WET 24.0	CL	2.5	HNU: 0 α: — BZ: 120 CPM
25	08368 1336 03-16	43 41 29	10	MEDIUM DENSE (5YR 5/1) SILTY GRAVEL WITH SOME SAND, WET 26.3	GM		HNU: 0 α: — BZ: 140 CPM
26 27	08369 1417 03-16	15 15 15	10	MEDIUM DENSE (5YR 5/1) GREY, WELL-GRADED GRAVEL-SAND MIXTURE, WET	GW		HNU: 0 α: — BZ: 140 CPM
29	08370 1517 03-16	14 23 19	12				HNU: 0 α: — BZ: 140 CPM
29	08371 1556 03-16	33 23 14	12				HNU: 0 α: — BZ: 140 CPM

NOTES:

2658 PAC

FERNALD RI/FS

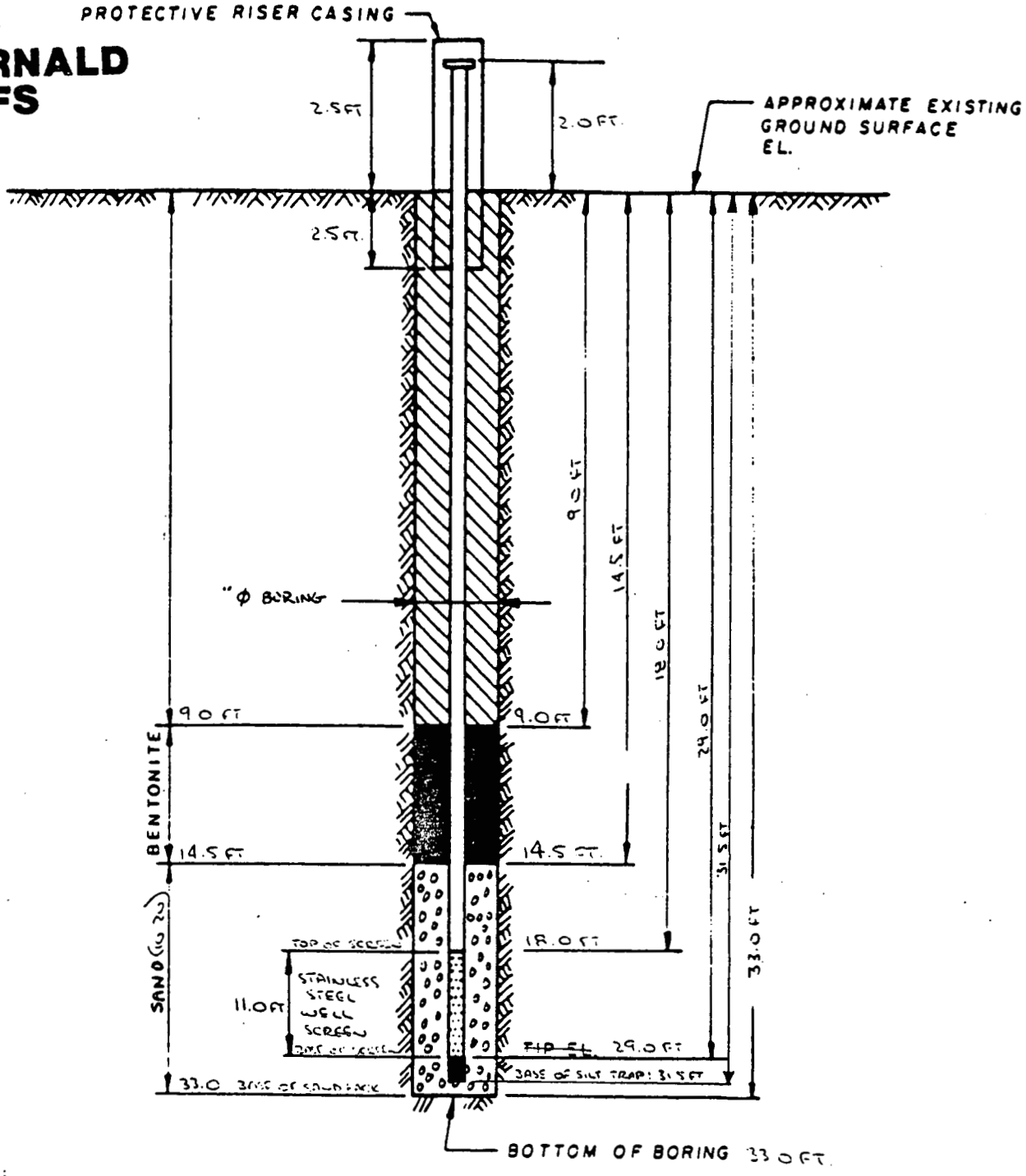
VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 177	COORDINATES:	DATE: 03-18-88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03-15-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 03-18-88
DRILLING METHODS: Cable Tool		PAGE 3 OF 3

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	08372 1626 03-16	22 24 13	12	MEDIUM DENSE, GREY (5YR 5/1) WELL-GRADED, GRAVEL-SAND MIXTURE, WET	GW		HNU = 0 X = — BG = 140 CPM
32							
33				BOTTOM OF BOREHOLE: 33.0 FT			

NOTES:

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D S.S PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL
03-18-88
PREPARED FOR
BORING # 177

FERNALD RI/FS

2658

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS
FIELD ENG./GEO. M SLUSARSKI
DATE 03-18-88
PROJECT NO. 602 TASK 3.2
CHECKED BY
DATE
BORING NO. 177
PIEZOMETER NO. 177
DATE OF INSTALLATION 03-18-88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
TYPE OF BIT HAMMER
DRILLING FLUID (S) USED:
FLUID WATER FROM 0.0 FT TO 33.0 FT
FLUID FROM TO
CASING SIZE (S) USED:
SIZE 10" ID FROM 0.0 FT TO 35.0 FT
SIZE FROM TO

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION 4" ID
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 IN.
TOTAL PERFORATED AREA 11.0 FT.
RISER PIPE MATERIAL STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN I.D. 4 IN
LENGTH OF PIPE SECTIONS
JOINING METHOD SCREW FLUSH JOINT THREADS

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT
PROTECTIVE PIPE O.D. 10 3/4 IN
OTHER PROTECTION LOCKING CAP

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION ( )	
TOP OF RISER PIPE	2.5			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0 FT.	BOTTOM 9.0 FT.	TOP	BOTTOM
BENTONITE	TOP 9.0 FT	BOTTOM 14.5 FT	TOP	BOTTOM
SAND	TOP 14.5 FT	BOTTOM 33.0 FT	TOP	BOTTOM
GRAVEL	TOP	BOTTOM	TOP	BOTTOM
PERFORATED SECTION	TOP 18.0 FT.	BOTTOM 29.0 FT.	TOP	BOTTOM
PIEZOMETER TIP	31.5 FT			
BOTTOM OF BOREHOLE	33.0 FT			
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

41

REMARKS

2658 PAC

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T 3.2		
BORING NUMBER: 130	COORDINATES:	DATE: 3-16-88	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03/16/88	
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 03/19/88	
DRILLING METHODS: Cable Tool		PAGE 1 OF 4	

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	08214	1 3 12	12"	Very STIFF Dark Yellowish Brown silty clay (10YR 4/4) Dry 1.5ft	ML	3.5	Hnu = 4ppm α = 0 γB = 120 1030
2 3	08215	10 13 15	14"	Very STIFF yellowish Brown silty clay (10YR 5/6) Trace sand	OL	4.0	Hnu = 4ppm α = 0 γB = 100 1045
4	08216	15 18 22	18"	Very STIFF yellowish Brown (10YR 5/6) silty clay trace sand. Dry	OL	4.0	Hnu = 4ppm α = 0 γB = 100 1050
5 6	08217	35 45 42	18"	Hard Dark yellowish Brown (10YR 4/6) clay. Trace gravel w/silt 6.5ft	OL	4.0	Hnu = 0.5ppm α = 0 γB = 100 1100
7	08218	11 27 31	14"	Hard Yellowish Brown clay (10YR 5/6) Trace gravel DRY 7.5ft	CL	4.0	Hnu = 0 α = 0 γB = 100 1450
8 9	08219	36 46 50	10"	Hard Dark gray clay (5Y 4/1) Dry Trace gravel	CL	4.0	Hnu = 0 α = 0 γB = 100 Blue clay fragments 1500
10	082201	12 14 24	12"	Hard Dark grey clay (5Y 4/1) DRY trace gravel	CL	4.0	Hnu = 0 α = 0 γB = 120 Shelby Tube No 08220 1600
11 12	082202	7 8 10	10"	Very STIFF Dark grey clay (5Y 4/1) Dry Trace gravel	CL	3.0	Hnu = 0 α = 0 γB = 120 1635
13	082203	11 17 13	10"	Very STIFF Dark grey clay (5Y 4/1) DRY Trace gravel			Hnu = 0 α = 0 γB = 120 1640
14 15	082204	7 8 15	10"	Very STIFF Dark gray clay (5Y 4/1) Dry. gravel			Hnu = 0 α = 0 γB = 120 03/17/88 0930

NOTES:

I) Drilling Contractor: Pennsylvania D[illegible]ng Co.
Driller: Tim Harris
Helper: Craig Coulter

II) Background measurements
A) Hnu = 0 B) α = 0 C) γB = 120 cpm.

III) Water used 85 gallons
42

IV Colors via Muncell color chart

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T3.2		
BORING NUMBER: 130	COORDINATES:	DATE: 3-17-88	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 09/16/88	
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 3-/8-88	
DRILLING METHODS: Cable Tool		PAGE 2 OF 4	

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15							
16	08225	14 14 12	10"	STIFF Dark gray clay (5Y 4/1) DRY. Gravel Fragments →	CL	1.5	Hnu = 0 α = 0 δB = 120 Blue Fragments 0935
17	08226	6 6 7	10"	Very STIFF Dark gray clay (5Y 4/1) Dry Abundant Gravel		2.5	Hnu = 0 α = 0 δB = 100 1005
18							
19	08227	N/A	24"	SHELBY Tube 20.0ft	NA	NA	1100
20							
21	08228	5 6	10"	Medium STIFF Dark grey silty clay (5Y 4/1) Trace sand. moist	ML	<1	Hnu = 5ppm α = 0 δB = 90 1450
22	08229	2 2 3	8"	Medium STIFF Dark grey silty clay (5Y 4/1). moist	ML	<1	Hnu = 0 α = 0 δB = 90 1505
23	08230	4 2 2	6"	Medium STIFF Dark grey silty clay (5Y 4/1) Trace gravel, moist	ML	<1	Hnu = 5ppm α = 0 δB = 110 1520
24							
25	08231	2 3 2	6"	Med STIFF Dark grey silty clay (5Y 4/1) Trace gravel 25.5ft	ML	<1	Hnu = 5ppm α = 0 δB = 110 1530
26	08232	7 9 11	16"	Very STIFF olive gray clay (5Y 4/2) Trace gravel. DRY	CL	3.5	Hnu = 5ppm α = 0 δB = 110 1545
27							
28	08233	18 22 31	18"	Very STIFF Dark gray clay (5Y 4/1) DRY Trace gravel	CL	3.5	Hnu = 7ppm α = 0 δB = 110 1630
29	08234	10 14 18	18"	Very STIFF Dark gray clay (5Y 4/1) Dry trace gravel	CL	3.5	Hnu = 7ppm α = 0 δB = 110 1700
30							

NOTES:

FERNALD RI/FS

2658

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T32		
BORING NUMBER: 130	COORDINATES:	DATE: 3-18-88	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03/16/88	
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 3-18-88	
DRILLING METHODS: Cable Tool		PAGE 3 OF 4	

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30							03/18/88
31	0 3 2 3 5	12 16 32	18"	Very STIFF Dark gray clay (5Y 4/1) Dry Trace Gravel 31 FT; Very STIFF Dark Yellowish Brown clay (10YR 4/6) DRY Trace sand / 31.5 FT	CL	3.5	Hnu = 0 α = 0 γB = 110 0945
32	0 3 2 3 6	6 19 19	18"	Dense Yellowish Brown sand (10YR 5/6) Dry	SP	<1	Hnu = 0 α = 0 γB = 110 0950
33							
34							
35							
36							
37							
38	0 8 2 3 9	19 50 50	18"	Very Dense yellowish Brown Sand (10YR 5/6) DRY	SP	<1	Hnu = 0 α = 0 γB = 110 1025
39							
40							
41							
42							
43	0 8 2 3 8	13 25 50/4	16"	Very Dense yellowish Brown gravel (10YR 5/6) with trace of sand, poorly sorted	GW	<1	Hnu = 0 α = 0 γB = 110 1515
44							
45							

NOTES:

2658 pmc

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T3.2		
BORING NUMBER: 130	COORDINATES:	DATE: 3-18-88	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03/16/88	
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 3-18-88	
DRILLING METHODS: Cable Tool		PAGE 4 OF 4	

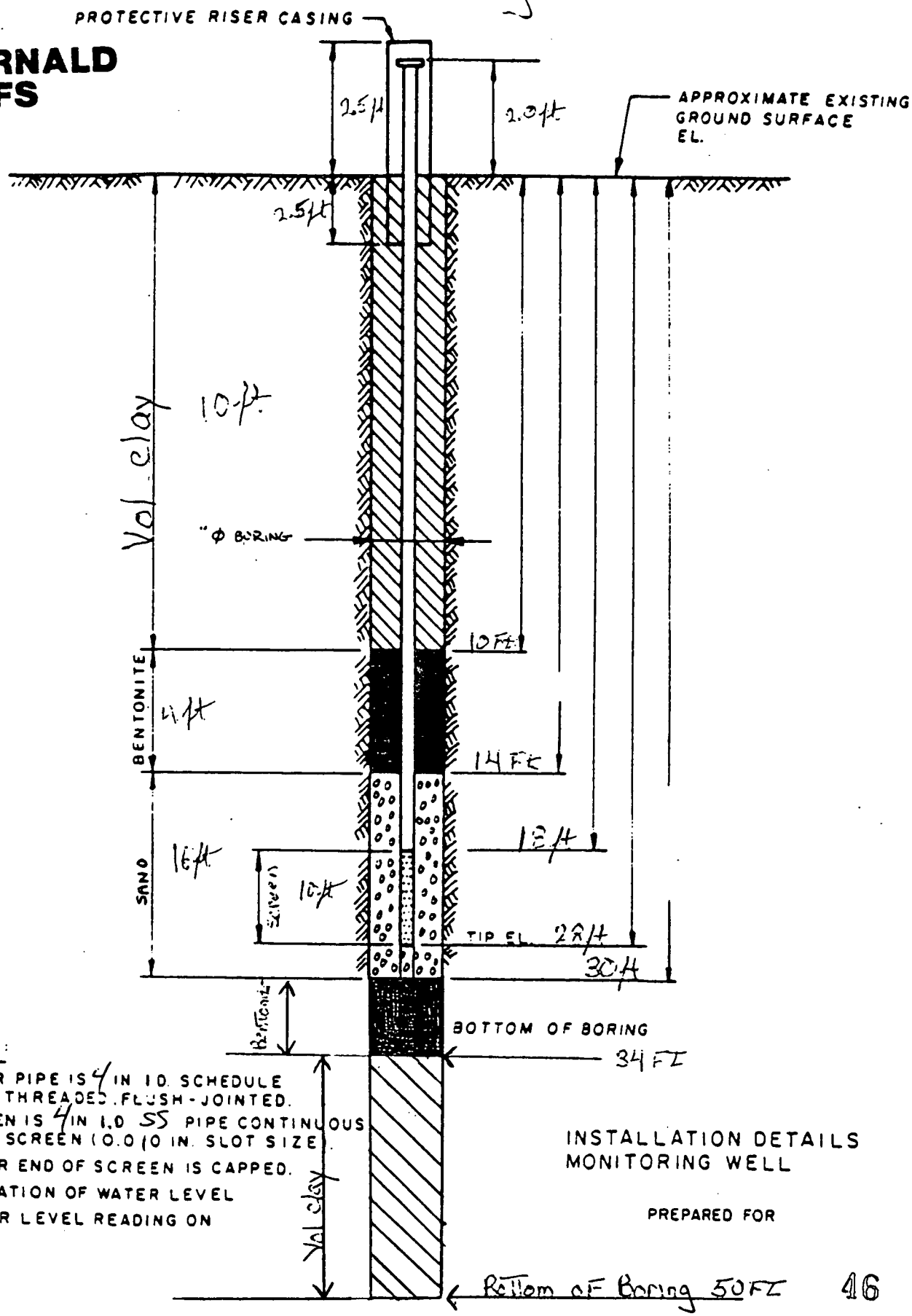
DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (FT)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45							
46							
47							
48				Very Dense gravel Yellowish Brown 10YR 4/4	GW		
49	0 B 2 3 9	17 31 45 50	24"	Very Dense Yellowish Brown sand (10YR5/8) DRY.	SP	41	Hnu=0 α=0 γB=90 1605
50				Bottom of Boring 50 FT.			

NOTES:

Monitoring Well #130

2658

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL

PREPARED FOR

46

2658 Ø1

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. M Goldberg DATE 03/19/88
PROJECT NO. 602 T 3.2 CHECKED BY _____ DATE _____
BORING NO. 130
PIEZOMETER NO. N/A DATE OF INSTALLATION 03/19/88

BOREHOLE DRILLING

DRILLING METHOD Cable Tool	TYPE OF BIT Flat Head
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID Water FROM 3 ft TO 50 ft	SIZE 10" FROM 3 ft TO 50 ft
FLUID _____ FROM _____ TO _____	SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE Monitoring	RISER PIPE MATERIAL 316 Stainless Steel
DIAMETER OF PERFORATED SECTION _____	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8" I.D. 4" inches
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 10 ft
AVERAGE SIZE OF PERFORATIONS .010" inches	JOINING METHOD Thread and couple
TOTAL PERFORATED AREA 10 ft	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT	OTHER PROTECTION Lockable cap
PROTECTIVE PIPE O.D. 10" inches	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE ( )		ELEVATION ( )	
TOP OF RISER PIPE	2.0 FT			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5 FT			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 10 FT	TOP	BOTTOM
BENTONITE	TOP 10 ft	BOTTOM 14 ft	TOP	BOTTOM
~~SAND~~	TOP	BOTTOM	TOP	BOTTOM
GRAVEL	TOP 14 ft	BOTTOM 30 ft	TOP	BOTTOM
PERFORATED SECTION	TOP 18 ft	BOTTOM 28 ft	TOP	BOTTOM
PIEZOMETER TIP	30 FT			
BOTTOM OF BOREHOLE	30 FT			
GWL AFTER INSTALLATION	N/A			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS Well 130 was overdrilled to 50 ft to determine lithology A Vol clay plug was set from 50 FT → 34 ft with a 4 FT Bentonite plug from 34 ft - 30 ft to seal base of Till/sand contact @ 31.5 ft. MJG

FERNALD RI/FS

2658 PAC

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 135	COORDINATES:	DATE: 03-21-88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03-20-88
ENGINEER/GEOLOGIST: H. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 03-21-88
DRILLING METHODS: Cable tool		PAGE 1 OF 2

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
SAMPLE # TIME DATE							
1	08374 0933 03-20	1 3 4	8	MEDIUM STIFF, YELLOW-BROWN (10YR 4/2) CLAY, SOME SILT, ROOTLETS, DRY	CL	1.0	HNU = 0 α = – BG: 80 CPM
2	08375 0935 03-20	2 3 4	10	MEDIUM STIFF, YELLOW-BROWN (10YR 4/4) CLAY, SOME SILT, DRY 3.0	CL	1.0	HNU = 0 α = – BG: 80 CPM
3							
4	08376 0938 03-20	4 6 8	14	STIFF, GREY (10YR 6/1) CLAY, SOME SILT, DRY 4.5	CL	1.5	HNU = 0 α = – BG: 80 CPM
5	08377 0941 03-20	7 8 9	12	STIFF, GREY (10YR 6/1) CLAY, TRACE MEDIUM GRAVEL, DRY 5.5	CL	2.0	HNU = 0 α = – BG: 80 CPM
6							
7	08378 0945 03-20	7 8 9	2	SOFT, GREY (10YR 6/1) CLAY, SOME SILT, DAMP 7.0	CL	.5	HNU = 0 α = – BG: 80 CPM
				SOFT, GRAY BROWN (10YR 5/4) CLAY SOME SILT, DAMP 7.5			
8	08379 1031 03-20	6 8 12	18	STIFF, YELLOW-BROWN (10YR 5/2) CLAY, SOME SILT, SOME FINE GRAVEL, DRY	CL	2.0	HNU = 0 α = – BG: 80 CPM
9							
10	08380 1405 03-20	SHELBY TUBE		PUSHED SHELBY TUBE FROM 9.0 FT TO 11.0 FT, RECOVERED 1.3 FT			HNU = 0 α = – BG: 80 CPM
11							
12	08381 1518 03-20	12 20	10	STIFF YELLOW-BROWN (10YR 5/4) CLAY, SOME SILT AND MEDIUM GRAVEL, DRY	CL	2.0	HNU = 0 α = – BG = 80 CPM
13	08382 1540 03-20	12 10 13	12	STIFF, YELLOW-BROWN (10YR 5/4) CLAY SOME SILT AND FINE GRAVEL, DRY	CL	1.5	HNU = 0 α = – BG = 80 CPM
14	08383 1550 03-20	3 5 6	14	SOFT GREY (5Y 5/1) CLAY, SOME SILT AND FINE GRAVEL, DAMP	CL	.5	HNU = 0 α = – BG = 80 CPM

NOTES:
CONTRACTOR: PENDRILL
RIG: CYCLONE 42
DRILLER: HARRY DYKES JR.
ASSISTANT: JOHN VANDINE

SAMPLES COLLECTED AS PER ASTM STANDARD PENETRATION TEST
COLORS: IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0, α = –, BG = 80 CPM
LEL: 0 PPM LEL, 20.1% O_2

WATER ADDED TO HOLE: 830

402-11-86

FERNALD RI/FS

2658

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 135	COORDINATES:	DATE: 03-21-88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03-20-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 03-21-88
DRILLING METHODS: Cable tool		PAGE 2 OF 2

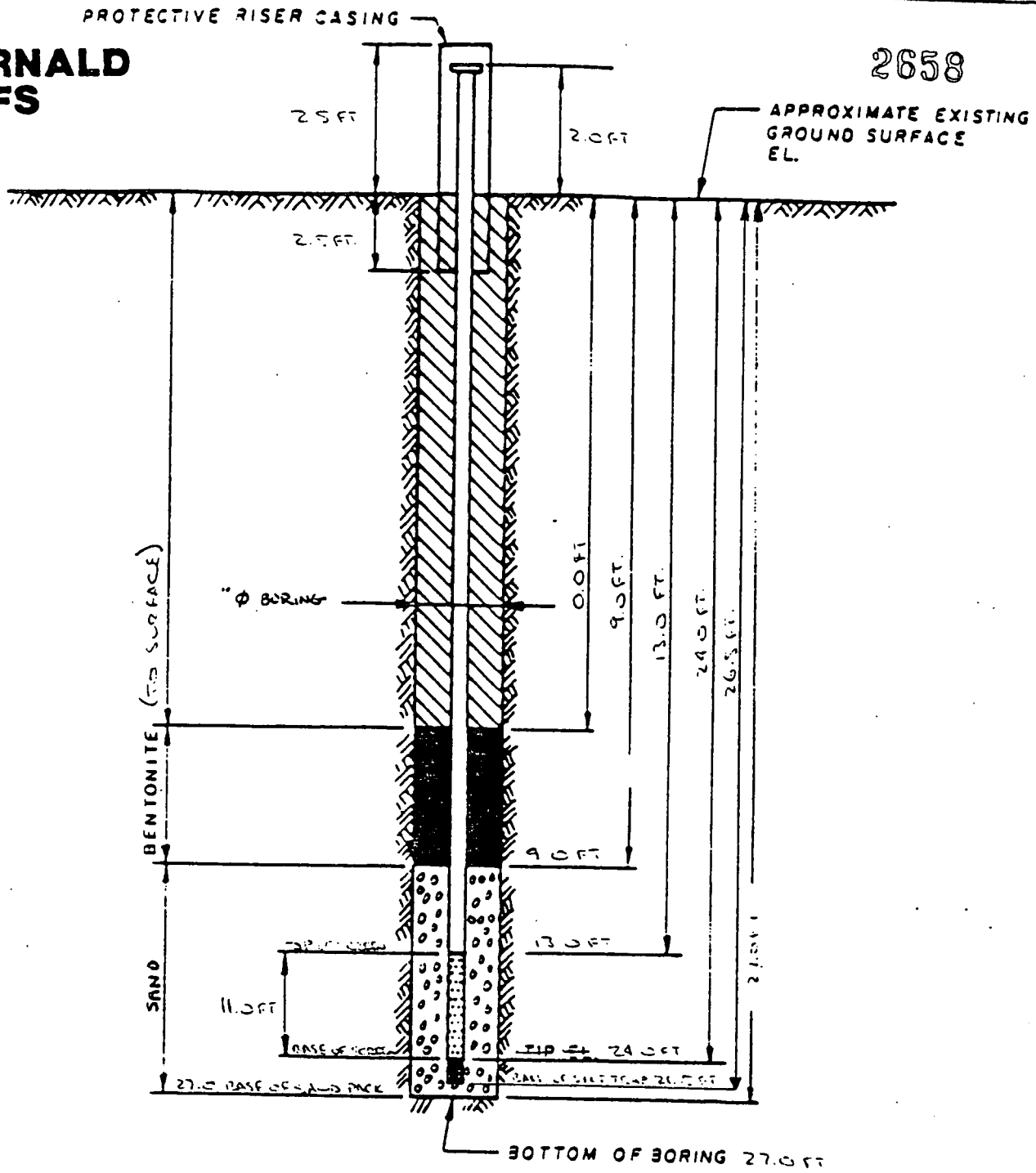
DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	08384 1600 03-20	2 5 5	14	SOFT, GREY (5Y 5/1) CLAY, SOME SILT AND FINE GRAVEL, DAMP	CL	.5	HNU = 0 α = – BS = 80 CPM
17	08385 1608 03-20	2 3 4	14	SOFT, GREY (5Y 5/1) CLAY, SOME SILT AND FINE GRAVEL, DAMP	CL	.5	HNU = 0 α = – BS = 80 CPM
18 19	08386 1617 03-20	3 4 6	14	MEDIUM STIFF, GREY (5Y 5/1) CLAY SOME SILT AND FINE GRAVEL, DAMP	CL	1.0	HNU = 0 α = – BS = 80 CPM
20 21	08387 0907 03-21	5 5 7	8	PUSHED SHELBY FROM 19.5 FT TO 21.5 FT. NO RECOVERY. OPTED TO TAKE SPLIT SPOON SAMPLE FROM 19.5 FT TO 21.0' SOFT, GREY (5Y 5/1) CLAY, SOME MEDIUM-FINE GRAVEL, DAMP	CL	.5	HNU = 0 α = – BS = 80 CPM
22	08388 0920 03-21	5 13 >50	12	MEDIUM STIFF, GREY (5Y 5/1) CLAY SOME FINE GRAVEL DAMP 22.5	CL	1.0	HNU = 0 α = – BS = 80 CPM
23 24	08389 0955 03-21	14 50 34	10	STIFF, GREY-GREEN (5Y 5/2) SILTY CLAY, DRY 24.0	CL	1.5	HNU = 0 α = – BS = 80 CPM
25	08390 1051 03-21	9 14 23	16	MEDIUM DENSE, GREY (5Y 5/1) WELL GRADED GRAVEL-SAND MIXTURE, WET 24.9	GW		HNU = 0 α = – BS = 80 CPM
				HARD, GREY (5Y 5/1) CLAY, SOME SILT DRY 26.5	CL	>4.0	
26 27	08391 1117 03-21	11 18 20	14	MEDIUM DENSE, GREY (5Y 5/1) WELL GRADED GRAVEL-SAND MIXTURE, WET 26.0	GW		HNU = 0 α = – BS = 80 CPM
				STIFF, GREY (5Y 4/1) CLAY, SOME SILT DRY	CL	3.5	
28				BOTTOM OF BOREHOLE 27.0 FT			

NOTES:

402-11-86

FERNALD RI/FS

2658



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED. FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL
03-21-88
PREPARED FOR
BORING # 135

2658

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. M. SLUSARSKI DATE 03-21-88
PROJECT NO. 603 32 CHECKED BY _____ DATE _____
BORING NO. ~~127~~ 135
PIEZOMETER NO. ~~127~~ 135 DATE OF INSTALLATION 03-21-88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL	TYPE OF BIT HAMMER
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID WATER FROM 0.0 FT TO 27.0 FT	SIZE 10" ID FROM 0.0 FT TO 27.0 FT.
FLUID _____ FROM _____ TO _____	SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL	RISER PIPE MATERIAL STAINLESS STEEL
DIAMETER OF PERFORATED SECTION 4" ID	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 IN. I.D. 4 IN.
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS _____
AVERAGE SIZE OF PERFORATIONS 0.010 IN	JOINING METHOD SCREW TYPE FLUSH
TOTAL PERFORATED AREA 11.0 FT	JOINT THREADS

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT.	OTHER PROTECTION LOCKING CAP
PROTECTIVE PIPE O.D. 10 3/4 IN.	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION ( )	
TOP OF RISER PIPE	2.5			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP	BOTTOM	TOP	BOTTOM
BENTONITE	TOP 0.0 FT.	BOTTOM 9.0 FT.	TOP	BOTTOM
SAND (10-20)	TOP 19.0 FT	BOTTOM 27.0 FT.	TOP	BOTTOM
GRAVEL (4-30)	TOP 9.0 FT.	BOTTOM 19.0 FT.	TOP	BOTTOM
PERFORATED SECTION	TOP 13.0 FT	BOTTOM 24.0 FT	TOP	BOTTOM
PIEZOMETER TIP	26.5 FT.			
BOTTOM OF BOREHOLE	27.0 FT.			
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

51

REMARKS _____

2658 YPK

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. DAVIES DATE 3/31/88
PROJECT NO. 602.3.2 CHECKED BY _____ DATE _____
BORING NO. 315
PIEZOMETER NO. 315 DATE OF INSTALLATION 3/29/88 to 3/31/88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL	TYPE OF BIT Steel
DRILLING FLUID (S) USED: 1375 gallon	CASING SIZE (S) USED:
FLUID H_2O FROM _____ TO _____	SIZE 10" FROM 0 TO 135'
FLUID _____ FROM _____ TO _____	SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE Monitoring Well	RISER PIPE MATERIAL Stainless Steel
DIAMETER OF PERFORATED SECTION 4"	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4.375" I.D. 4"
SLOTS ☒ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 10 Ft
AVERAGE SIZE OF PERFORATIONS 0.01"	JOINING METHOD Screw wrench tight
TOTAL PERFORATED AREA 10 Ft	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 Ft.	OTHER PROTECTION _____
PROTECTIVE PIPE O.D. 10.75"	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (Ft)		ELEVATION ( )	
TOP OF RISER PIPE	2.2			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.8			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 111.5	BOTTOM .5	TOP	BOTTOM
BENTONITE	TOP 0	BOTTOM .5	TOP	BOTTOM
SAND	TOP 136.5	BOTTOM 111.5	TOP	BOTTOM
GRAVEL	TOP	BOTTOM	TOP	BOTTOM
PERFORATED SECTION	TOP 115.0	BOTTOM 125.0	TOP	BOTTOM
PIEZOMETER TIP	127.0			
BOTTOM OF BOREHOLE	136.5			
GWL AFTER INSTALLATION	Not measured			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑

52

REMARKS _____

2658 PAC

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI FS T 3.2		
BORING NUMBER: 208	COORDINATES:	DATE: 3-20-88	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03/20/88	
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 3-27-88	
DRILLING METHODS: Cable Tool		PAGE 1 OF 5	

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	0 8 2 41	2 2 4	12"	STIFF yellowish Brown silty clay (10YR 5/6) dry	CL	1.5	Hnu = 3 α = 0 δB = 260 1516
2 3	0 8 2 42	6 7 11	9"	Very STIFF Dark Yellowish Brown silty clay (10YR 4/6) dry. 3.0ft	CL		Hnu = 1.5 α = 0 δB = 270 1520
4	0 8 2 43	5 8 9	6"	Med. STIFF yellowish Brown clayey silt (10YR 5/4) Dry 4.5ft	ML	0.5	Hnu = 2.0 α = 0 δB = 250 1524
5 6	0 8 2 44	3 4 4	11"	STIFF dark Yellowish Brown sandy clay (10YR 5/4) moist 6.0ft	CL	1.25	Hnu = 1.25 α = 0 δB = 240 1540
7	0 8 8 05	N/A	18"	SHELBY Tube 7.5ft	N/A	N/A	1645
8 9	0 8 8 06	4 8 8	10"	Loose Yellowish Brown sand (10YR 5/8) WET Trace silt	SP	<1	Hnu = 0 α = 0 δB = 200 03/21/88 1430
10	0 8 8 07	6 9 10	14"	Loose Yellowish Brown sand (10YR 5/8 WET. Trace silt 10.5	SP	<1	Hnu = 0 α = 0 δB = 200 1435
11 12	0 8 8 08	7 9 10	14"	STIFF Dark grey clay (5Y4/1) w/ sand. ~~wet~~ and silt 12ft	CL	1.5	Hnu = 0 α = 0 δB = 200 1440
13	0 8 8 09	10 10 9	14"	STIFF Dark grey silt (5Y4/1) w/sand trace clay. wet 13.5ft	ML	1.5	Hnu = 0 α = 0 δB = 200 1445
14 15	0 8 8 10	2 3 4	16"	Medium STIFF Dark gray clay (5Y4/1) Trace silt moist	CL	<1	Hnu 0 α = 0 δB = 200 1500

NOTES:

1) Pennsylvania Drilling co.
Driller: Tim Harris
Helper: Craig Coalter

2) Background measurements
a) HNU = 0 ppm b) α = 0 cpm c) δB = 200 cpm

III Water used = 600 gallons

53

IV Colors via Muncell color chart.

576

FERNALD RI/FS

2658

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T3.2		
BORING NUMBER: 208	COORDINATES:	DATE: 3-21-88	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 03/20/88	
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 3-22-88	
DRILLING METHODS: Cable Tool		PAGE 2 OF 5	

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15							
16	08 8 11	5 7 6	18"	Medium STIFF Dark gray silty clay (5Y4/1) Trace sand and silt WET	ML	1.5	Hnu = 0 α = 0 δB = 200 1510
17	08 8 12	6 7 10	18"	Medium STIFF Dark gray silty clay (5Y4/1) Trace sand & gravel Wet	ML	1.5	Hnu = 0 α = 0 δB = 210 1535
18	08 8 13	N/A	12"	S Helby Tube	N/A	N/A	1650
19	08 8 14	13 13 15	12"	STIFF Dark gray silty clay (5Y4/1) trace gravel. moist 20.5	CL	2.0	Hnu = 0 α = 0 δB = 210 3/22/88 0855
20	08 8 15	7 7 9	10"	STIFF Dark gray clay (5Y4/1) trace gravel. DRY	CL	2.0	Hnu = 0 α = 0 δB = 210 0900
21	08 8 16	5 6 9	12"	Very STIFF Dark gray clay (5Y4/1) trace gravel. moist	CL	2.5	Hnu = 0 α = 0 δB = 210 0925
22	08 8 17	4 6 10	12"	Very STIFF Dark gray clay (5Y4/1) trace gravel moist	CL	2.0	Hnu = 0 α = 0 δB = 180 0940
23	08 8 18	4 5 7	8"	Very STIFF Dark gray clay (5Y4/1) trace gravel. DRY	CL	2.0	Hnu = 0 α = 0 δB 180 0950
24	08 8 19	2 4 3	12"	STIFF Dark gray clay (5Y4/1) trace gravel. DRY	CL	1.0	~~δB = 180~~ Hnu = 0 α = 0 1030
25	08 8 20	5 7 50/4	14"	STIFF Dark gray clay (5Y4/1) trace gravel. DRY.	CL	1.0	Hnu = 0 α = 0 δB = 190 1335
26		33					
27							
28							
29							
30							

NOTES:

FERNALD RI/FS

2658

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T3.2		
BORING NUMBER: 208	COORDINATES:	DATE: 3-22-88	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03/20/88	
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 3-22-88	
DRILLING METHODS: Cable Tool		PAGE 3 OF 5	

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER ( )	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30							
31	1	50 50	18"	Very Hard olive gray clay (5Y4/2) Trace Gravel. DRY.	CL	>4.0	Hnu=0 α=0 δB=190 1400
32	2	14 34 50	18"	Very Hard Dark gray clay (5Y4/1) Trace gravel DRY	CL	>4.0	Hnu=0 α=0 δB=190 1415
33	3	14 24 35	18	Very Hard Dark gray clay (5Y4/1) trace gravel 33.5ft	CL	>4.0	Hnu=0 α=0 Thin lense of Yellowish Brown clay at contact. (10YR5/6) δB=180 1445
34				Dense Yellowish Brown sand (10YR5/6) DRY	SW	<1	
35							
36							
37							
38							
39	4	14 47 50	18"	Very Dense Yellowish Brown sand (10YR5/6) DRY.	SW	<1	Hnu=0 α=0 δB=190 1545
40							
41							
42							
43							
44							
45							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T32		
BORING NUMBER: 208	COORDINATES:	DATE:	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03/20/88	
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED:	
DRILLING METHODS: Cable Tool		PAGE 4 OF 5	

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45							03/23/88
46	8 8 2 5	40 50 ~~58~~ 3	16"	Very dense Yellowish Brown sand (10YR 5/6) Trace gravel. DRY	SW	<1	Hnu=0 α=0 δB=190 0835
47							
48							
49				49 Ft			
50	8 8 2 6	15 20 25	18"	Dense Yellowish Brown sand (10YR 5/6) DRY	SP	<1	Hnu=0 α=0 δB=120 0900
51							
52							
53							
54				54 Ft			
55	8 8 2 7	7 14 22	18"	Dense Dark gray sand (2.5Y 4/1) moist.	SP	<1	Hnu=0 α=0 δB=120 0925
56							
57							
58							
59							
60							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

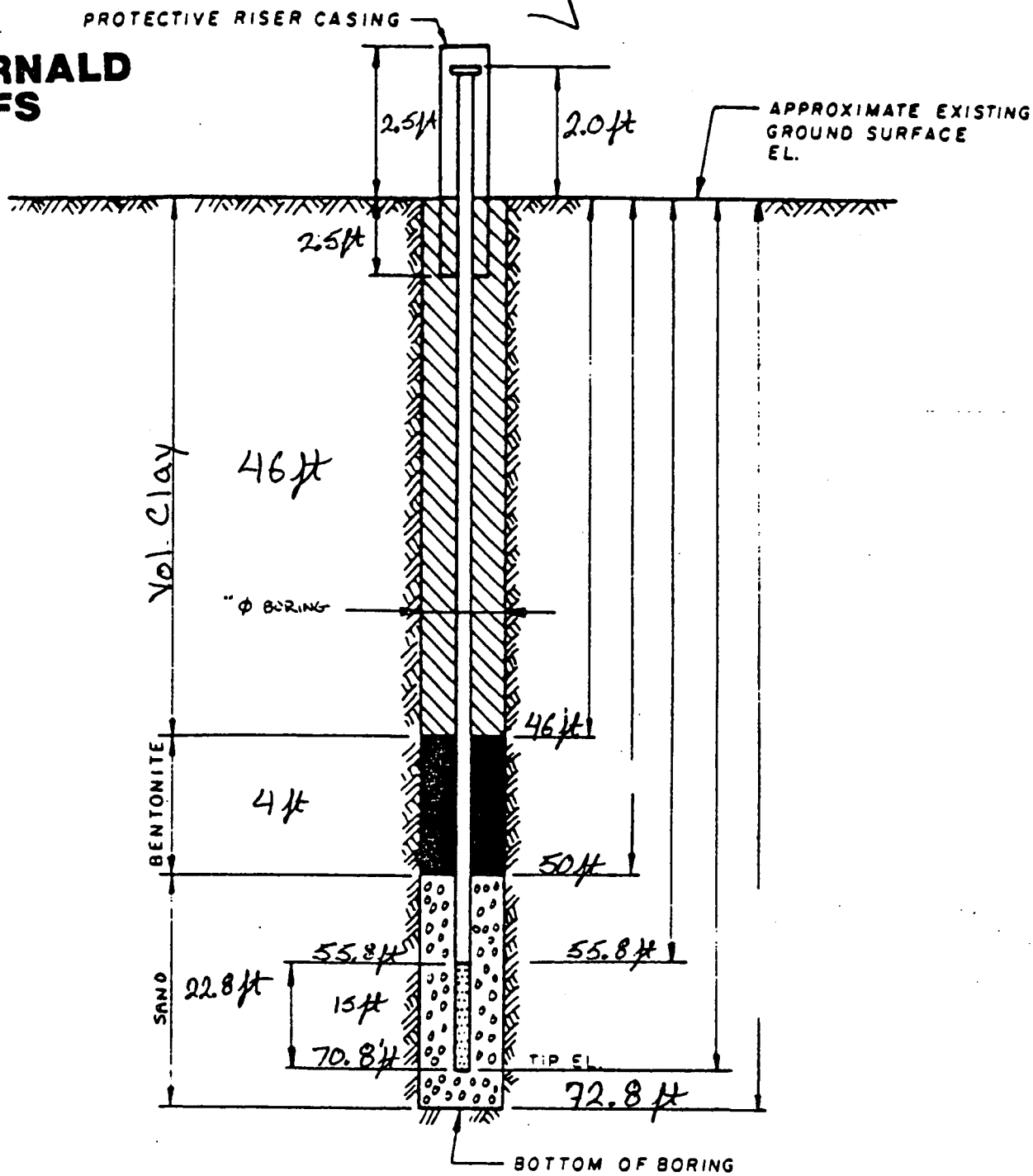
PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T3.2		
BORING NUMBER: 208	COORDINATES:	DATE:	
ELEVATION:	GWL: Depth 59.53 Date/Time 03/28/88 1630	DATE STARTED: 03/20/88	
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 03/28/88	
DRILLING METHODS: Cable Tool		PAGE 5 OF 5	

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60							
61	08 8 28	5 7 11	14"	Medium Dense yellowish Brown sand (10YR5/6). WET.	SW	<1	Hnu=0 α=0 γB=120 1030
62							
63							
64							
65							~~1310~~
66	08 8 29	12 10 16	18"	Medium Dense yellowish Brown sand (10YR5/6) WET trace gravel	SW	<1	Hnu=0 α=0 γB=120 1310
67							
68							
69							
70							
71	08 8 30	11 12 21	18"	Medium Dense yellowish Brown sand (10YR 5/6) w/Gravel. Wet	SW	<1	Hnu=0 α=0 γB=110 14 1555
72							
73							
74				Bottom of Boring 73'ft			
75							

NOTES:

Monitoring Well 208

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL

PREPARED FOR

FMPC RI/FS

2658 PA

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS
PROJECT NO. 6027 3.2
BORING NO. 2CB
PIEZOMETER NO. N/A

FIELD ENG./GEO. M. Goldberg DATE 03/28/88
CHECKED BY _____ DATE _____
DATE OF INSTALLATION 03/28/88

BOREHOLE DRILLING

DRILLING METHOD Water
DRILLING FLUID (S) USED:
FLUID _____ FROM 0 TO 73 ft
FLUID _____ FROM _____ TO _____

TYPE OF BIT Flat Head
CASING SIZE (S) USED:
SIZE 10" FROM 0 TO 73 ft
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE Monitoring
DIAMETER OF PERFORATED SECTION _____
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS .010" inches
TOTAL PERFORATED AREA 10 ft

RISER PIPE MATERIAL 316 Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8" I.D. 4"
LENGTH OF PIPE SECTIONS 10 ft
JOINING METHOD Thread and couple

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 ft
PROTECTIVE PIPE O.D. 10"

OTHER PROTECTION Lockable cap

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE ( )		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5 ft			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0 ft	BOTTOM 46 ft	TOP	BOTTOM
BENTONITE	TOP 46 ft	BOTTOM 50 ft	TOP	BOTTOM
~~SAND~~	TOP	BOTTOM	TOP	BOTTOM
GRAVEL	TOP 50	BOTTOM 72.8 ft	TOP	BOTTOM
PERFORATED SECTION	TOP 55.8 ft	BOTTOM 70.8	TOP	BOTTOM
PIEZOMETER TIP	72.8 ft			
BOTTOM OF BOREHOLE	72.8 ft			
GWL AFTER INSTALLATION	57.53 ft ~~N/A~~			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

59

REMARKS _____

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 334	COORDINATES:	DATE: 3/19/88 3/20/88
ELEVATION:	GWL: Depth 48.7 Date/Time 3/22/88 0745	DATE STARTED: 3/19/88
ENGINEER/GEOLOGIST: F. Marchert	Depth 47.55 Date/Time 3/23/88 0730	DATE COMPLETED: 3/23/88
DRILLING METHODS: Cable Tool		PAGE 1 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS β = 250-300 cpm BG
0	08265 3/19/88 1645	2 5 6	17	Medium Dense, Dark Brown (10YR 3/3) Soil, Some Silt, Some Clay, Organic rich, roots, dry.	OH 0.5	2.0	α = 0 β = BG hnu = 0 ppm
1				Medium Dense, Brown (10YR 4/4) Clay, Trace Silt, Trace Organics, Mottled, Dry.	CL	4.0	
2	08266 3/19/88 1700	3 8 15	15	Medium Dense, Grey (10YR 6/2) Clay, Some Silt, Trace Organics @ Top, Mottled, Dry.	CL	>4.5	α = 2 cpm β = BG hnu = 0.
3	08267 3/19/88 1715	15 18 21	18	Dense, Grey (10YR 5/2) Clay, Some Silt w/ silt leases, Trace Organics, Mottled Tan @ Bottom, Dry.	CL	>4.5	α = 1 cpm β = BG hnu = 0
5	08268 3/19/88 1725	15 18 21	17	Dense, Grey (10YR 5/1) Clay, Trace Silt w/ Silt Leases, Mottled Tan, Dry.	CL	>4.5	α = 0 β = BG hnu = 0
6	08269 3/19/88 1735	21 23 19	18	Dense, Grey (10YR 6/2) Clay, Some Silt w/ Silt Leases, Mottled Tan, Dry.	CL 6.9	3.5	α = 1 cpm β = BG hnu = 0
7				Dense, Brown (10YR 5/4) Fine Sand, Some Silt, Some Angular Gravel, Mottled Dark Grey, Moist.	SM	N/A	
8	08270 3/20/88 1045	1 3 7	7	Loose, Brown (2.5Y 4/2) Fine Sand, Some Gravel, Trace clay, Trace silt, Poorly Graded, Unstratified, Moist	SP	N/A	α = No Reading 3/20/88 β = BG hnu = 0
9	08271 3/20/88 1100	5 9 10	9	Medium Dense, Brown (10YR 4/4) Fine Sand, Some Gravel, Trace Clay, Trace Silt, Poorly Graded, Unstratified, Moist.	SP 9.5	N/A	α = No Reading β = BG hnu = 0
10				Medium Dense, Grey (10YR 4/2) Clay, Some Silt, Moist	CH	1.0	
11	08272 3/20/88 1120	4 5 9	10	Medium Dense, Grey (10YR 5/1) Clay, Some Silt, Dry.	CL	1.25	α = 0 β = BG hnu = 0
12	08273 3/20/88 1145	5 6 10	12	Medium Dense, Grey (5Y 4/1) Clay, Trace Angular Gravel, Some Silt, Dry.	CL 12.6-12.9	2.75	α = 0 β = BG hnu = 0
13				Medium Dense, Grey (5Y 3/1) Fine sand lens, Some Gravel, Some Silt, Moist.	SM	N/A	
14	08274 3/20/88 1340	3 5 9	9	Medium Dense, Grey (5Y 4/1) Clay, Trace Angular Gravel, Some Silt, Dry.	CL	2.5	α = 1 cpm β = BG hnu = 0 1st Sample lost.
15							

NOTES: 3/20/88 - α meter discovered to be faulty. No readings taken on 1st Two samples as replacement meter had not arrived.

β = 200-250 cpm BG

Water Total = 300 gal for hole

See Next Page for Additional notes

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 334	COORDINATES:	DATE: 3/20/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/19/88
ENGINEER/GEOLOGIST: F. Marhet	Depth Date/Time	DATE COMPLETED: 3/23/88
DRILLING METHODS: Cable Tool		PAGE 2 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS β=200-250cpm BG
15 16	08275 3/20/88 1400	2 2 5	9	Loose, Grey (5Y 4/1) Clay, Some Angular Gravel, Trace Sand, Some Silt, Dry.	CL	0.75	α=0 β=BG hnu=0
17	08276 3/20/88 1415	7 19 22	15	Dense, Grey (5Y 3/1) Clay, Some Angular Gravel, Trace Sand, Some Silt, Dry.	CL	4.0	α=0 β=BG hnu=0
18 19	08277 3/20/88 1430	8 13 31	6	Dense, Grey (5Y 4/1) Clay, Some Angular Gravel, Some Sand, Some Silt, Dry.	CL	3.5	α=0 β=BG hnu=0
20	08278 3/20/88 1450	9 13 25	9	Dense, Grey (5Y 4/1) Clay, Some rounded gravel, Some Sand, Some silt, Dry.	CL	3.0	α=0 β=BG hnu=0
21 22	08279 3/20/88 1645	8 11 21	16	Dense, Grey (5Y 3/1) Clay, Some rounded gravel, Some Silt, Trace Sand, Dry.	CL	2.75	α=0 β=BG hnu=0 No recovery 1st Sample
23	08280 3/20/88 1700	9 15 22	14	Dense, Tan (10YR 6/4) Fine Sand, Extremely well Graded, Unstratified, Dry.	SW	N/A	α=0 β=BG hnu=0
24 25	08281 3/20/88 1715	8 21 23	15	Dense, Tan (10YR 7/4) Fine Sand, well Graded, Stratified, Some Silt in lenses of darker (10YR 5/6) 1/2" to 1" thick, dry.	SM	N/A	α=0 β=BG hnu=0
26							
27							
28							
29							
30							

NOTES:
Pennsylvania Drilling Company
Bucyrus Erie 24-W Drilling Rig
Driller: Dave Newman
Helper: Bob Johnson
Blows on sampler follow ASTM standard for 2X18 inch split spoon samples.
Soil colors follow Munsell color charts.

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 334	COORDINATES:	DATE: 3/21/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/19/88
ENGINEER/GEOLOGIST: F. Marlert	Depth Date/Time	DATE COMPLETED: 3/23/88
DRILLING METHODS: Cable Tool		PAGE 3 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS β=300-350cpm BG
30	08282 3/21/88 0850	5 9 14	12	Medium Dense, Tan (10YR 5/6) Fine Sand, Trace Silt, Extremely well Graded, Partially Stratified, Dry.	SW	N/A	hnu=0 α=0 β=BG
31							
32							
33							
34							
35	08283 3/21/88 1030	14 49 Ref.	14	Very Dense, Tan (10YR 5/4) Fine Sand, Trace rounded gravel, Trace silt, Well graded, unstratified, Dry.	SW	N/A	hnu=0 α=0 β=BG Last 1" refused
36							
37							
38							
39							
40	08284 3/21/88 1050	12 15 17	13	Dense, Tan (10YR 6/4) Fine Sand, Trace Silt, Extremely Well Graded, Unstratified, Dry.	SW	N/A	hnu=0 α=0 β=BG
41							
42							
43							
44							
45							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernall RI/FS	
BORING NUMBER: 334	COORDINATES:	DATE: 3/21/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/19/88
ENGINEER/GEOLOGIST: F. Marchet	Depth Date/Time	DATE COMPLETED: 3/23/88
DRILLING METHODS: Cable Tool		PAGE 4 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS β=300-350cpm BG
45 46 47	08285 3/21/88 1120	8 22 20	13	Dense, Light Tan (10YR 6/2) Fine Sand, Trace Silt, Extremely well Graded, Partially Stratified, Dry. ▽ Water Table	SW	N/A	hnu=0 α=1cpm β=BG
48 49 50 51 52 53 54	08286 3/21/88 1335	9 14 17	11	Dense, Brown (10YR 4/2) Med to Cse Sand, Trace Rounded Gravel, Trace Silt, Fair-Poor grading, unstratified, wet	SP	N/A	hnu=0 α=0 β=BG
55 56	08287 3/21/88 1350	5 10 21	9	Dense, Brown (10YR 4/2) Med to Cse Sand, Some rounded gravel, Trace Silt, Poorly Graded, Unstratified, wet.	SP SGD	N/A	hnu=0 α=0 β=BG
57 58 59 60				Dense, Brown (10YR 4/2) Rounded Gravel, Some Med→Cse Sand, Some Silt, Poorly Graded, Unstratified, wet. Large 2" Chert pebble @ bottom	GM	N/A	

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 334	COORDINATES:	DATE: 3/21/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/19/88
ENGINEER/GEOLOGIST: F. Markert	Depth Date/Time	DATE COMPLETED: 3/23/88
DRILLING METHODS: Cable Tool		PAGE 5 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS β = 300-350 cpm BG
60							
61	08288 3/21/88 1455	9 15 19	12	Dense, Brown (10YR 3/3) Fine → Cse Gravelly Sand, Some Rounded Gravel, Poorly Graded, Unstratified, Wet.	GP	N/A	hnu = 0 α = 0 β = BG
62							
63							
64							
65	08289 3/21/88 1635	10 20 24	14	Dense, Brown (10YR 3/3) Med → Cse Gravelly Sand, Some rounded gravel, Poorly Graded, Unstratified, Wet.	GP	N/A	hnu = 0 α = 0 β = BG
66							
67							
68							
69							
70	08290 3/21/88 1750	12 33 28	11	Very Dense, Brown (10YR 4/2) Med → Cse Gravelly Sand, Some round gravel (pebbles), Some Silt, Poorly Graded, Unstratified, Wet.	GM	N/A	hnu = 0 α = 0 β = BG
71							
72							
73							
74							
75							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6023.2	PROJECT NAME: Fernall RI/FS	
BORING NUMBER: 334	COORDINATES:	DATE: 3/22/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/19/88
ENGINEER/GEOLOGIST: F. Marhert	Depth Date/Time	DATE COMPLETED: 3/23/88
DRILLING METHODS: Cable Tool		PAGE 6 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS β=200-250cpm BG
75							
76	08291 3/22/88 0830	13 24 36	14	Very Dense, Brown (10YR 4/3). Gravelly Medium Sand, Some round gravel (pebbles), Trace Silt, Poorly graded, Unstratified, wet.	GM	N/A	hnu = — α=0 β=BG
77							
78							
79							
80	08292 3/22/88 0945	15 29 26	12	Very Dense, Brown (10YR 3/3) Med→Crse Sand, Some rounded gravel, Some silt, Poorly Graded, Unstratified, wet.	GM 80.8	N/A	Dragger = OK α=2 cpm β=BG
81							
82				Very Dense, Brown (10YR 4/3) Fine Sand, Some Silt, Well Graded, Unstratified, wet.	SM	N/A	
83							
84							
85	08293 3/22/88 1010	6 13 17	11	Medium Dense, Brown (10YR 3/3) Fine→Med Sand, Some Silt, Well Graded, Unstratified, wet.	SM	N/A	Dragger = OK α=0 β=BG
86							
87							
88							
89							
90							

NOTES: hnu meter uncharged @ beginning of day. Had to switch to Dragger Tubes.

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: 334	COORDINATES:		DATE: 3/22/88
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 3/14/88
ENGINEER/GEOLOGIST: F. Marlatt	Depth	Date/Time	DATE COMPLETED: 3/23/88
DRILLING METHODS: Cable Tool			PAGE 7 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS β = 200-250cpm BG
90	08294 3/22/88 1100	5 12 18	8	Medium Dense, Brown (10YR 3/2) Fine→Med Sand, Some Silt, Fair Grading, Unstratified, wet.	SM	N/A	Draeger = OK α = 0 β = BG
91							
92							
93							
94							
95	08295 3/22/88 1410	5 10 15	9	Medium Dense, Brown (10YR 3/2) Med→Cse Sand, Some Silt, Trace rounded gravel, Fair Grading, Unstratified, wet	SM	N/A	Draeger = OK α = 0 β = BG
96							
97							
98							
99							
100	08296 3/22/88 1430	2 3 8	9	Medium Dense, Brown (10YR 4/2) Fine→Cse Sand, Trace Silt, Trace rounded gravel, Fair grading, Partially stratified, wet.	SM	N/A	Draeger = OK α = 0 β = BG
101							
102							
103							
104							
105							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: 334	COORDINATES:		DATE: 3/22/88 & 3/23/88
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 3/19/88
ENGINEER/GEOLOGIST: F. MacKert	Depth	Date/Time	DATE COMPLETED: 3/23/88
DRILLING METHODS: Cable Tool			PAGE 8 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
							β = 200-250 cpm BG
105	08297 3/22/88 1615	12 19 27	12	Dense, Brown (10YR 4/2) Medium Sand, Well Graded, Unstratified, Wet.	SW 106.0	N/A	Drager = OK α = 0 β = BG
106				Dense, Brown (10YR 5/2) Very Fine Sand, Some Silt, Extremely Well Graded, Partially Stratified, Wet.	SM	N/A	
107							
108							
109							
110	08298 3/22/88 1645	3 9 13	7	Medium Dense, Grey-Black (5Y 2.5/1) Clay, Some Silt, Trace Sand, Moist.	CL	275	Drager = OK α = 1 cpm β = BG Pushed Shelby @ 1800 112.1 - 114.1 Recovered 1.7 ft Sample #08299
111							
112							
113							
114							
115	08300 3/23/88 0800	4 5 5	16	Loose, Grey (5Y 3/1) Fine Sand, Some Silt, Some Clay, Well Graded, Unstratified, Wet. More Clay rich in last 4".	SM	N/A	3/23/88 Drager = OK α = 0 β = BG
116							
117							
118							
119							
120							

NOTES:

3/23/88 - β = 250-300 cpm BG

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 334	COORDINATES:	DATE: 3/23/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/19/88
ENGINEER/GEOLOGIST: F. Mac Kent	Depth Date/Time	DATE COMPLETED: 3/23/88
DRILLING METHODS: Cable Tool		PAGE 9 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS B=250-300cpm BG
120	08301 3/23/88 1030	5 8 15	11	Medium Dense, Grey (5Y 4/1) Fine→Cse Gravelly Sand, Some cse round gravel, Some Silt, Trace Clay, Poorly Graded, Unstratified, Wet.	GM	N/A	hnu=0 α=1 cpm β=BG
121							
122							
123							
124							
125	08302 3/23/88 1155	32 48 37	11	Dense, Grey (5Y 3/2) Med→Cse Gravelly Sand, Some cse round gravel, Some silt, poorly graded, Unstratified, Wet.	GM	N/A	hnu=0 α=0 β=BG
126							
127							
128							
129							
130	08303 3/23/88 1525	70 Ref.	8	Dense, Grey (2.5Y 5/2) Coarse Gravelly Sand, Some cse round gravel, Trace silt, poorly graded, unstratified, Wet.	GP	N/A	hnu=0 α=0 β=BG
131							
132							
133							
134							
135							

NOTES:

FERNALD RI/FS

2658

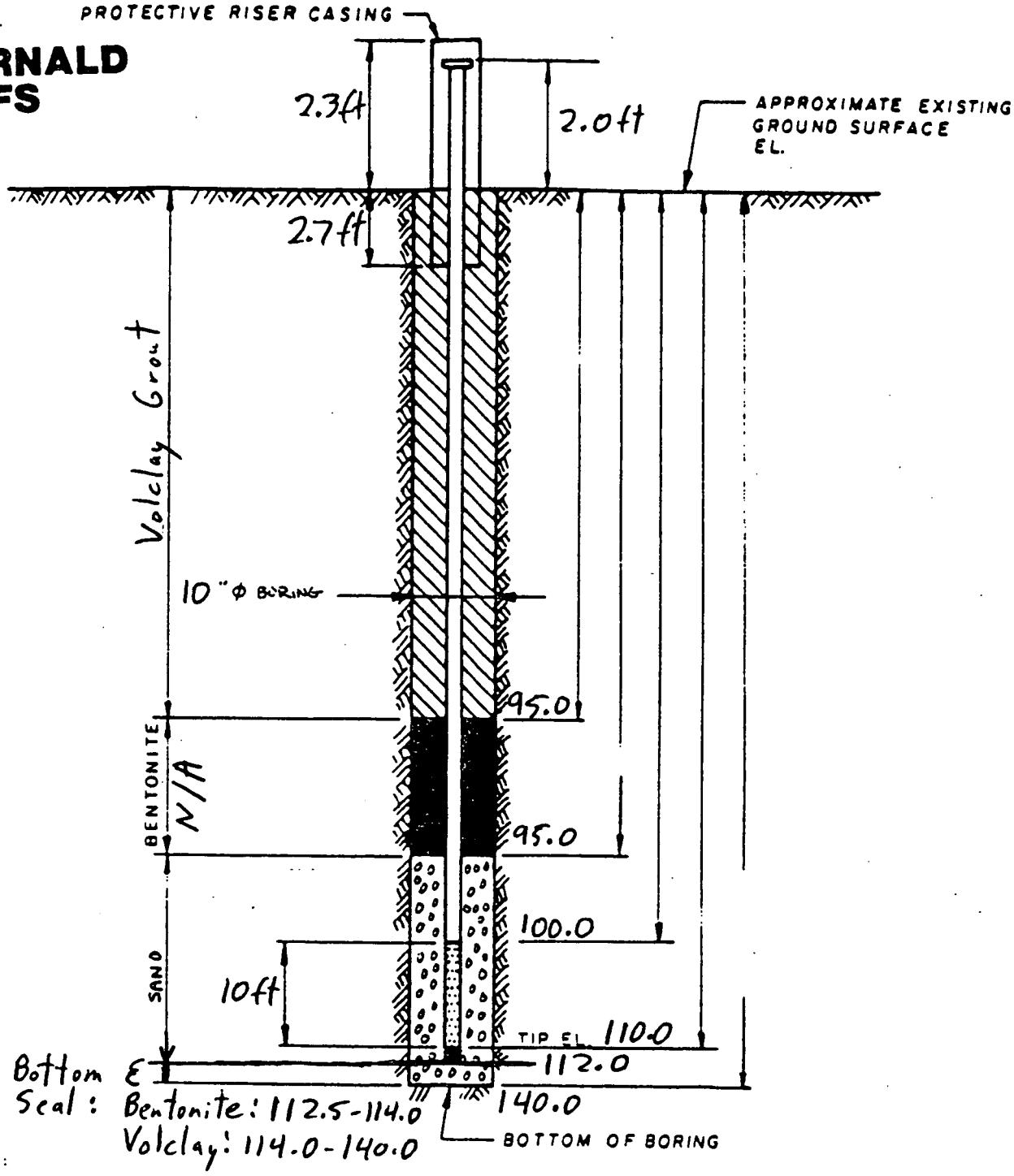
VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 334	COORDINATES:	DATE: 3/23/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/19/88
ENGINEER/GEOLOGIST: F. Markert	Depth Date/Time	DATE COMPLETED: 3/23/88
DRILLING METHODS: Cable Tool		PAGE 10 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
135							β = 250-300 cpm BG
136	08304 3/23/88 1635	10 14 18	10	Dense, Grey-Brown (10YR 5/2) Med-Crse Sand, Trace rounded gravel, Trace Silt, Fair Grading, Unstratified, Wet.	SP	N/A	H_{nu} = 0 α = 0 β = BG
137							
138							
139							
140	08305 3/23/88 1745	5 11 19	9	Medium Dense, Grey-Brown (10YR 5/2) Fine→Med Sand, Trace Silt, Fair Grading, Unstratified, Wet.	SP	N/A	H_{nu} = 0 α = 0 β = BG
141							
142				Bottom of Boring 141½ ft			

NOTES:

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL 50.14 from TOC
5. WATER LEVEL READING ON 3/30/88-0740

INSTALLATION DETAILS
MONITORING WELL 334

PREPARED FOR

DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

2658 PAC

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. F. MacKert DATE 3/30/88
PROJECT NO. 602.3.2 CHECKED BY _____ DATE _____
BORING NO. 334
PIEZOMETER NO. 334 DATE OF INSTALLATION 3/29/88

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID water FROM 0 TO 60 ft
FLUID _____ FROM _____ TO _____

TYPE OF BIT Hammer
CASING SIZE (S) USED:
SIZE 10" ID FROM 0 TO 140 ft
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE Monitoring Well
DIAMETER OF PERFORATED SECTION 4"
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 in.
TOTAL PERFORATED AREA 10 ft

RISER PIPE MATERIAL Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8 in. I.D. 4 in.
LENGTH OF PIPE SECTIONS 10 ft, 2 ft
JOINING METHOD Screw flush joint threads

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 ft
PROTECTIVE PIPE O.D. 10 3/4 in.

OTHER PROTECTION Locking Cap with lock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.7			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 95.0	TOP	BOTTOM
BENTONITE	TOP N/A	BOTTOM N/A	TOP	BOTTOM
SAND	TOP N/A	BOTTOM N/A	TOP	BOTTOM
GRAVEL	TOP 95.0	BOTTOM 112.5	TOP	BOTTOM
PERFORATED SECTION	TOP 100.0	BOTTOM 110.0	TOP	BOTTOM
PIEZOMETER TIP	112.0			
BOTTOM OF BOREHOLE	140.0			
GWL AFTER INSTALLATION	50.14 from TOC - 3/30/88 - 0740			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

71

REMARKS Bottom of borehole back filled to 112.5 ft.
Bentonite: 112.5 - 114.0 ft
Grout/Slurry: 114.0 - 140.0 ft

FERNALD RI/FS

2658

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 32	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 210	COORDINATES:	DATE: 03-30-88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03-23-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 03-30-88
DRILLING METHODS: Cable tool		PAGE 1 OF 6

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	08393 0850 03-23	1 5 6	8	SOFT, BROWN (10YR 4/2) CLAY, SOME FINE GRAVEL, ROOTLETS, DAMP	CL	.5	HNU = 0 α: — BZ: 100 CPM
2 3	08394 0852 03-23	5 6 8	12	STIFF, BROWN (10YR 4/2) CLAY, SOME SILT AND FINE GRAVEL, DRY	CL	1.5	HNU = 0 α: — BZ: 100 CPM
4	08395 0856 03-23	6 8 9	12	STIFF, BROWN (10YR 4/4) CLAY, SOME SILT AND FINE GRAVEL, DRY 4.5	CL	1.5	HNU = 0 α: — BZ: 100 CPM
5 6	08396 0859 03-23	9 9 9	14	MEDIUM STIFF, GREY-OLIVE (5Y 4/1) CLAY SOME SILT, DRY	CL	1.0	HNU = 0 α: — BZ: 100 CPM
7	08397 0901 03-23	7 9 10	18	MEDIUM STIFF, GREY-OLIVE (5Y 3/1) CLAY SOME SILT, DRY 7.0	CL	1.0	HNU = 0 α: — BZ: 100 CPM
8 9	08398 0905 03-23	7 13 14	18	MEDIUM STIFF, GREY-OLIVE (5Y 5/2) CLAY SOME SILT, DRY	CL	1.0	HNU = 0 α: — BZ: 80 CPM
10	08399 1032 03-23	2 2 4	14	MEDIUM STIFF, GREY-OLIVE (5Y 5/2) CLAY SOME SILT, DRY	CL	1.0	HNU = 0 α: — BZ: 80 CPM
11 12	08400 1038 03-23	4 4 4	14	SOFT, GREY-OLIVE (5Y 5/2) CLAY, SOME SILT, DAMP 12.5	CL	.25	HNU = 0 α: — BZ: 80 CPM
13	08401 1050 03-23	4 5 6	12	STIFF, BROWN-GREY (2.5Y 5/4) CLAY, SOME SILT, DAMP 14.0	CL	1.5	HNU = 0 α: — BZ: 80 CPM
14	08402 1056 03-23	8 7 8	18	VERY STIFF, GREY (5Y 5/1) CLAY, SOME SILT, DAMP	CL	2.5	HNU = 0 α: — BZ: 80 CPM

NOTES:
CONTRACTOR: PENNDRILL
RIG: CYCLONE 42
DRILLER: HARRY DYKES JR.
ASSISTANT: JOHN VALDINE

SAMPLES COLLECTED AS PER ASTM STANDARD PENETRATION TEST
COLORS: IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0, α: —, BZ = 100
LEL/O_2: 0 PPM LEL, 21.9% O_2

WATER ADDED TO BOREHOLE: 750 GAL.

FERNALD RI/FS

2658

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 210	COORDINATES:	DATE: 03-20-88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03-22-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 03-30-88
DRILLING METHODS: Cable tool		PAGE 2 OF 6

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	08403 1113 03-23	10 9 10	14	MEDIUM DENSE GREY (5Y 5/1) CLAYEY FINE SAND, SOME SILT, DAMP	ML		HNU = 0 α = — BG = 80 CPM
17 18	08404 1310 03-23	12 16 12	14	MEDIUM DENSE GREY (5Y 5/1) CLAYEY FINE SAND, SOME SILT, ~~DAMP~~ WET	ML		HNU = 0 α = — BG = 80 CPM
19	08405 1316 03-23	6 6 6	12	MEDIUM DENSE GREY (5Y 5/1) CLAYEY FINE SAND, SOME SILT, WET 19.5	ML		HNU = 0 α = — BG = 80 CPM
20	08406 1330 03-23	11 10 9	12	MEDIUM DENSE GREY (5Y 5/1) CLAYEY GRAVEL, SOME SAND WET 20.0	GC		HNU = 0 α = — BG = 80 CPM
21				MEDIUM DENSE GREY (5Y 5/1) SILTY FINE SAND, WET	SM		
22	08407 1339 03-23	8 8 10	12	MEDIUM DENSE GREY (5Y 5/1) SILTY FINE SAND, TRACE FINE GRAVEL, WET	SM		HNU = 0 α = — BG = 80 CPM
23 24	08408 1456 03-23	13 10 15	9	HARD GREY (5Y 4/1) CLAY TRACE FINE GRAVEL, DRY	CL	>4.0	HNU = 0 α = — BG = 80 CPM
25	08409 1510 03-23	7 7 10	10	VERY STIFF GREY (5Y 4/1) CLAY TRACE SILT, DRY	CL	2.5	HNU = 0 α = — BG = 80 CPM
26 27	08410 1520 03-23	3 5 7	14	STIFF GREY (5Y 4/1) CLAY TRACE SILT, DRY	CL	2.0	HNU = 0 α = — BG = 80 CPM
28	08411 1558 03-23	2 5 7	8	STIFF GREY (5Y 4/1) CLAY SOME FINE GRAVEL DAMP	CL	2.0	HNU = 0 α = — BG = 80 CPM
29	08412 1605 03-23	2. 4 9	14	STIFF GREY (5Y 4/1) CLAY SOME FINE GRAVEL, DAMP	CL	2.0	HNU = 0 α = — BG = 80 CPM

NOTES:

DAK

FERNALD RI/FS

2658

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 32	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 210	COORDINATES:	DATE: 03-30-88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03-23-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 03-30-88
DRILLING METHODS: Cable tool		PAGE 3 OF 6

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1 (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	08413 1617 03-23	3 7 12	12	STIFF GREY (5Y 4/1) CLAY, SOME SAND AND FINE GRAVEL DAMP 32.0	CL	2.0	HNU = 0 α = — BS = 80 CPM
32 33	08414 1627 03-23	10 20 50	14	VERY DENSE GREY (5Y 4/1) CLAYEY GRAVEL, GRAVEL-SAND-CLAY MIXTURE TRACE COARSE GRAVEL, DAMP 33.5	GC		HNU = 0 α = — BS = 80 CPM
34	08415 1637 03-23	PENETRATION 4" >50	4	VERY DENSE GREY (5Y 5/1) SILTY GRAVEL, GRAVEL-SAND-SILT MIXTURE TRACE SAND, DRY	GM		HNU = 0 α = — BS = 80 CPM
35 36	08416 1704 03-23	PENETRATION 7" 50 >50	7	VERY DENSE GREY (5Y 5/1) SILTY GRAVEL, GRAVEL-SAND-SILT MIXTURE TRACE SAND, DAMP 36.0	GM		HNU = 0 α = — BS = 80 CPM
37	08417 1030 03-28	16 43 80	14	VERY DENSE GREY (5Y 5/1) CLAYEY GRAVEL, GRAVEL-SAND-CLAY MIXTURE TRACE COARSE GRAVEL DAMP	GC		HNU = 0 α = — BS = 80 CPM
38 39	08418 1048 03-28	15 29 33	2	VERY DENSE GREY (5Y 5/1) CLAYEY GRAVEL, GRAVEL-SAND-CLAY MIXTURE TRACE COARSE GRAVEL DAMP 39.0	GC		HNU = 0 α = — BS = 80 CPM
40	08419 1115 03-28	9 20 28	14	VERY STIFF GREY (5Y 4/1) CLAY WITH SOME FINE TO MEDIUM GRAVEL DAMP 41.0	CL	2.0	HNU = 0 α = — BS = 80 CPM
41 42	08420 1330 03-28	9 32 36	18	HARD, BROWN (10YR 4/3) CLAY, SOME FINE GRAVEL & SAND DRY 41.5	CL	4.0	HNU = 0 α = — BS = 80 CPM *BASE OF TILL @ 41.5 FT.
43 44				VERY DENSE YELLOW-BROWN (10YR 5/4) SAND, TRACE FINE GRAVEL, DRY			

NOTES:

FERNALD RI/FS

2658

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 210	COORDINATES:	DATE: 03-30-88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03-23-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 03-30-88
DRILLING METHODS: Cable tool		PAGE 4 OF 6

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (FT)	RECOVERY (%)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	08421 1423 03-28	40 95 —	10	VERY DENSE YELLOW-BROWN (10YR 5/4) WELL GRADED GRAVELLY SAND DRY	SW		HNU = 0 * COULD ONLY DRIVE SPOON 1.0 FT α = — BG = 80 CPM
47							
48							
49							
50							
51	08422 1555 03-28	75 50 —	8	VERY DENSE YELLOW-BROWN (10YR 5/4) WELL GRADED GRAVELLY SAND DAMP	SW		HNU = 0 * COULD ONLY DRIVE SPOON 1.0 FT α = — BG = 80 CPM
52							
53							
54							
55	08423 1707 03-28	90 — —	10	VERY DENSE YELLOW-BROWN (10YR 5/4) WELL GRADED GRAVELLY SAND DAMP	SW		HNU = 0 * COULD ONLY DRIVE SPOON .5 FT α = — BG = 80 CPM
56							
57							
58							
59							

NOTES:

FERNALD RI/FS

2658

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 210	COORDINATES:	DATE: 03-30-88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03-27-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 03-30-88
DRILLING METHODS: Cable tool		PAGE 5 OF 6

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	08424 0851 03-29	26 48 48	12	VERY DENSE YELLOW-BROWN (10YR 5/4) WELL GRADED, GRAVELLY SAND DAMP 61.0	SW		HNU = 0 x = — BS = 80 CPM
62 63 64				VERY DENSE GREY (10YR 4/1) SAND TRACE FINE GRAVEL DAMP	SP		* ESTIMATED WATER TABLE 03-29-88: 63.0 FT
65 66	08425 0938 03-29	13 23 37	10	VERY DENSE GREY (10YR 4/1) SAND TRACE FINE GRAVEL, WET 66.0	SP		HNU = 0 x = — BS = 80 CPM
67 68 69				STIFF GREY (5Y 4/1) SILTY CLAY, WET	CL		
70 71	08426 1102 03-29	58 60 >80	14	VERY DENSE, GREY (10YR 4/1) POORLY GRADED GRAVELLY SAND WET	SP		HNU = 0 x = — BS = 80 CPM
72 73 74							

NOTES:

WATER TABLE ON 03-29-88 ESTIMATED @ 63.0 FT.

FERNALD RI/FS

2658

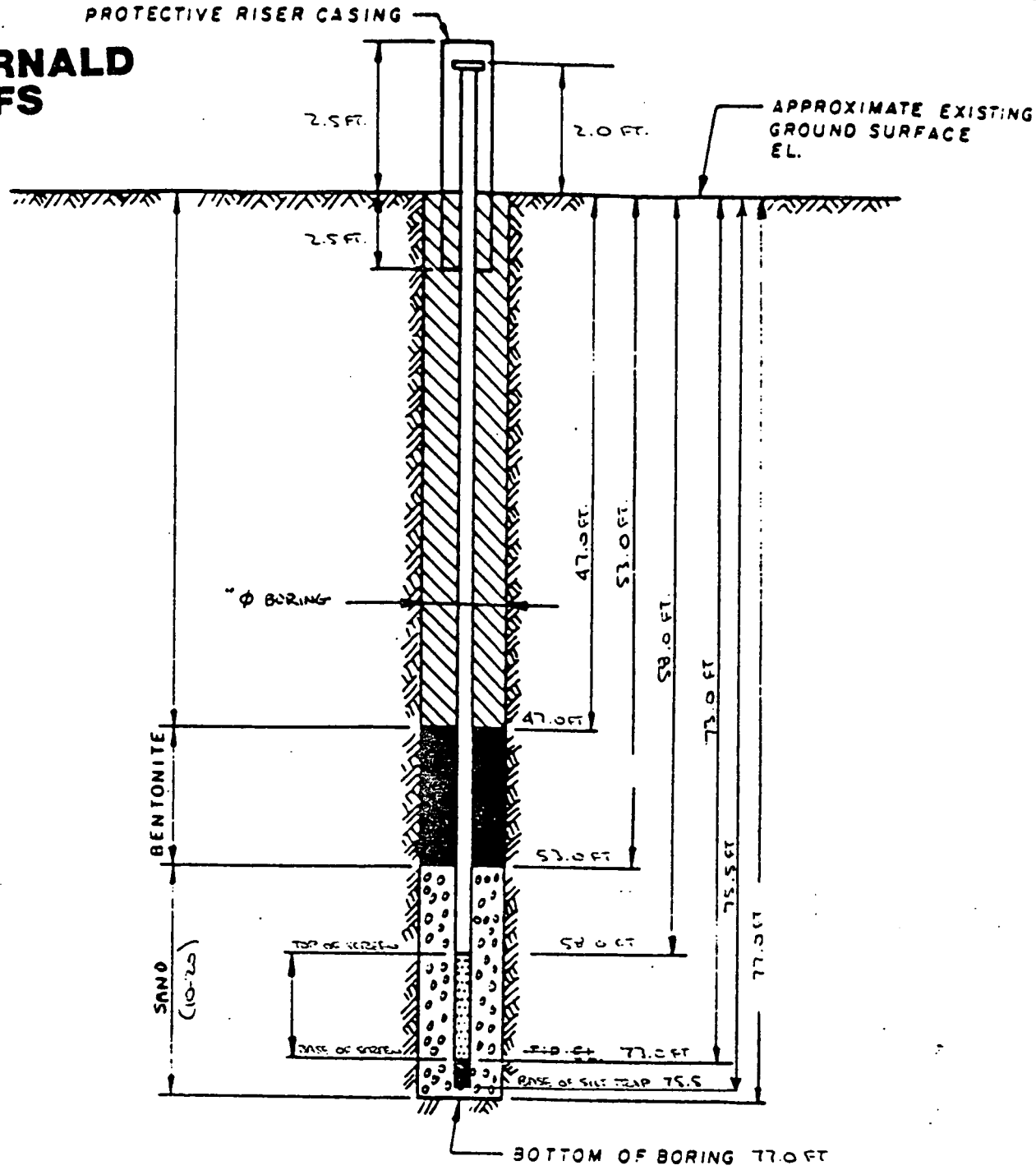
VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6023.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 210	COORDINATES:	DATE: 03-30-88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03-23-88
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 03-30-88
DRILLING METHODS: Cable tool		PAGE 6 OF 6

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76	08427 1358 03-29	9 45 35	10	VERY DENSE GRAY, (10YR 4/1) WELL GRADED GRAVELLY SAND WET	SW		HNU: 0 X: – BK: 80 CPM
77							
78							
79							
80							

NOTES:

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL
03-30-88
PREPARED FOR
BORING # 210

DRAWING NUMBER
CHECKED BY
APPROVED BY
MLS
DRAWN BY

FERNALD RI/FS

2658

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. M. SLUSARSKI DATE 03-30-88
PROJECT NO. 602 3.2 CHECKED BY _____ DATE _____
BORING NO. 210
PIEZOMETER NO. _____ DATE OF INSTALLATION 03-30-88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL	TYPE OF BIT HAMMER
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID WATER FROM 0.0 FT TO 77.0 FT	SIZE 10" ID FROM 0.0 FT TO 27.0 FT
FLUID _____ FROM _____ TO _____	SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL	RISER PIPE MATERIAL STAINLESS STEEL
DIAMETER OF PERFORATED SECTION 4" ID	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 IN I.D. 4 IN
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS _____
AVERAGE SIZE OF PERFORATIONS 0.010 IN	JOINING METHOD SCREW TYPE FLUSH
TOTAL PERFORATED AREA 15.0 FT.	JOINT THREADS

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT	OTHER PROTECTION LOCKING CAP
PROTECTIVE PIPE O.D. 10 3/4 IN.	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION ( )	
TOP OF RISER PIPE	2.5			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0 FT.	BOTTOM 47.0 FT.	TOP	BOTTOM
BENTONITE	TOP 47.0 FT.	BOTTOM 53.0 FT	TOP	BOTTOM
SAND (10-20)	TOP 53.0 FT.	BOTTOM 77.0 FT	TOP	BOTTOM
GRAVEL	TOP	BOTTOM	TOP	BOTTOM
PERFORATED SECTION	TOP	BOTTOM	TOP	BOTTOM
PIEZOMETER TIP	75.5 FT.			
BOTTOM OF BOREHOLE	77.0 FT			
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

79

REMARKS _____

FERNALD RI/FS

2658

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T 3.2		
BORING NUMBER: 108	COORDINATES:	DATE: 3-29-88	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03/29/88	
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 3-29-88	
DRILLING METHODS: Cable Tool		PAGE 1 OF 2	

DEPTH ( )	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER ( )	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1				See Soil Boring 208 For Lithology			
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

NOTES:

Drilling Contractor: Pennsylvania Drilling Co.

I) Driller: Tim Harris

Helper: Craig Coulter

II) Background measurements:

A) Hnu = 0 B) ∝ = 0 C) γR = 260cpm

III Water used = 80

IV Color via Muncell Color chart

2658 PAC

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602	PROJECT NAME: FMPC RI/FS T3.2		
BORING NUMBER: 108	COORDINATES:	DATE: 3-29-88	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03/29/88	
ENGINEER/GEOLOGIST: M. Goldberg	Depth Date/Time	DATE COMPLETED: 03/29/88	
DRILLING METHODS: Cable Tool		PAGE 2 OF 2	

DEPTH ( )	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER ( )	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15							
16				See Soil			
17				Boring 208			
18				for Lithology			
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
NOTES: 31							

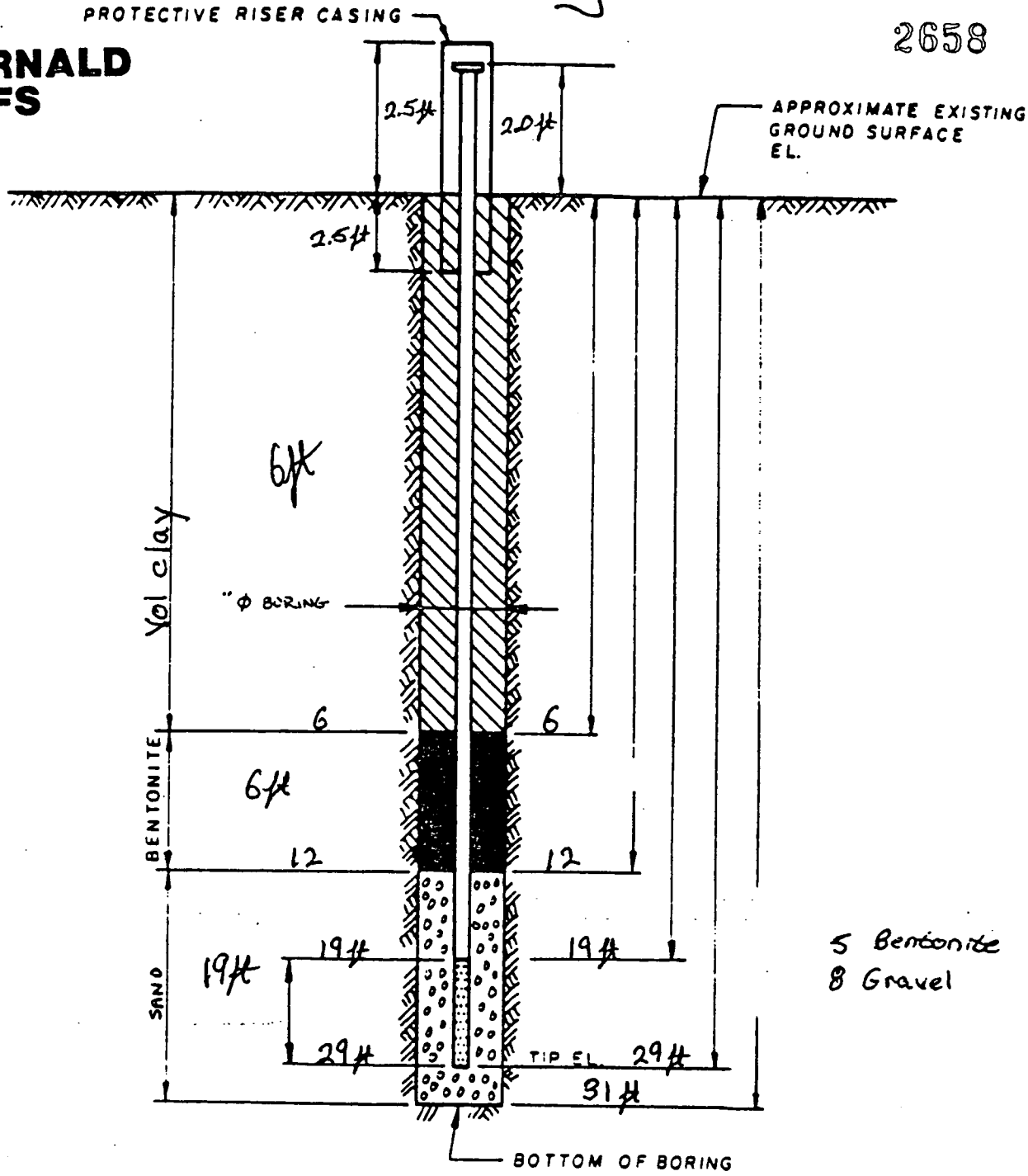
Bottom of Boring 31 ft

81

Monitoring Well #108

2658

FERNALD RI/FS



5 Bentonite
8 Gravel

DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS IN I.D. PIPE CONTINUOUS SLOT SCREEN (0.0 0 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL

PREPARED FOR
FMPC RI/FS

82

PAC

2658

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. M. Goldberg DATE 03/30/88
PROJECT NO. 602 T 3.2 CHECKED BY _____ DATE _____
BORING NO. 108
PIEZOMETER NO. N/A DATE OF INSTALLATION 03/30/88

BOREHOLE DRILLING

DRILLING METHOD Water	TYPE OF BIT Flat Head
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID _____ FROM 3 TO 31 ft	SIZE 10" FROM 0 TO 31 ft
FLUID _____ FROM _____ TO _____	SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE Monitoring	RISER PIPE MATERIAL 316 Stainless Steel
DIAMETER OF PERFORATED SECTION _____	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8" I.D. 4"
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 10 ft
AVERAGE SIZE OF PERFORATIONS .010" inches	JOINING METHOD Thread and couple
TOTAL PERFORATED AREA 10 ft	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 ft	OTHER PROTECTION Lockable cap
PROTECTIVE PIPE O.D. 10"	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE ( )		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5 ft			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 6	TOP	BOTTOM
BENTONITE	TOP 6	BOTTOM 12	TOP	BOTTOM
~~SAND~~	TOP	BOTTOM	TOP	BOTTOM
GRAVEL	TOP 12 ft	BOTTOM 31 ft	TOP	BOTTOM
PERFORATED SECTION	TOP 19 ft	BOTTOM 29 ft	TOP	BOTTOM
PIEZOMETER TIP	31 ft			
BOTTOM OF BOREHOLE	31 ft			
GWL AFTER INSTALLATION	N/A			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

83

REMARKS _____

FERNALD RI/FS

2658

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 315	COORDINATES:	DATE: 3/18/88
ELEVATION: ~573'	GWL: Depth Date/Time	DATE STARTED: 3/18/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 3/31/88
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 10

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	08700	3 7 6	13	Med. Stiff, V. Dark Grayish Brown (10YR 3/2) Silty Clay, trace Sand moist. 0.7 Med. Stiff, Dark Yellowish Brown (10YR 4/4) Clay, Some Silt, Moist. 1.5	CL	1.6	t: 1455 Hnu: 0ppm α: 2cpm γ/β: 50cpm
2.5	08701	2 10 6	12	Med. Stiff, Dark Yellowish Brown (10YR 4/6), Clay, Some Silt, Moist 3.0	CL	1.8	t: 1515 Hnu: 0ppm α: 2cpm γ/β: 40cpm
	08702	9 10 13	13	Medium Stiff, Yellowish Brown (10YR 5/6), Clay, Moist. 4.5	CL	1.2	t: 1525 Hnu: 0ppm α: 2cpm γ/β: 40cpm
5.0	08703	24 38 30	18	Hard, Yellowish Brown (10 YR 5/4), Silty Clay, Moist. 6.0	CL	>4.5	t: 1535 Hnu: 0ppm α: 2ppm γ/β: 40cpm
	08704	15 14 12	15	Hard, Brownish Yellow (10YR 6/6) Silty Clay, Moist. 7.5	CL	>4.5	t: 0845 End Shift 3/19/88 Hnu: 0ppm α: 2cpm γ/β: 40cpm Perched Water Zone
7.5	08705	13 20 19	18	Very Stiff, Yellowish Brown (10YR 5/6) Silty Clay, wet. 9.0	CL	3.0	t: 0905 Hnu: 0ppm α: 2cpm γ/β: 50cpm
10.0	08706	4 7 7	14	Med. Stiff, Yellowish Brown (10YR 5/6), Silty Clay, some sand, wet. 10.0 Med. Dense, Dark Yellowish Brown (10YR 4/4), Silty, Fine Sand, some clay, wet. 10.5	CL SM	1.0	t: 0925 Hnu: 0ppm α: 2cpm γ/β: 40cpm
	08707	8 12 16	18	Very Stiff, Dark Gray (7.5 YR 4/0), Fine Sandy Silt, some clay, trace gravel, moist. 12.0	ML	3.0	t: 0940 Hnu: 0ppm α: 2cpm γ/β: 40cpm
12.5	08708	3 7 9	12	Very Stiff, Gray (7.5 YR 5/0) Clayey Silt, some Sand, trace gravel, moist 12.5	ML	2.7	t: 1000 Hnu: 0ppm α: 2cpm γ/β: 50cpm
15.0	08709	5 15 8	14	Medium Stiff, Grayish Brown (2.5Y 5/2), Sandy Silt, some gravel and clay. Moist 15.0	ML	1.5	t: 1017 Hnu: 0ppm α: 2cpm γ/β: 40cpm

NOTES:

Drilling Contractor: Pennsylvania Drilling
Driller: Joe Barile
Helper: Tim Vandine
Rig: 72 Speedstar

Water Used During Drilling = 1375 gallons
Soil Sampling as per ASTM
Color descriptions as per Munsell
Field Measurements: Hnu, γ/β, α

84

402.11.88

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 3/5	COORDINATES:	DATE: 3/19/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/18/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 3/31/88
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15.0	08710	15 20 25	18	Hard, Dark Gray (5Y 4/1), Clay, some fine to coarse gravel, moist 16.5	CL	>4.5	t: 1028 Hau: 0ppm α: 2cpm β/β: 60cpm
17.5	08711	15 22 24	18	Hard, Dark Gray (5Y 4/1), Clay, some gravel, moist 18.0	CL	4.0	t: 1050 Hau: 0ppm α: 2cpm β/β: 50cpm
	08712	11 8 13	5	Hard, Gray (5Y 5/1), Gravelly Clay, moist 19.5	CL	4.0	t: 1456 Hau: 0ppm α: 2cpm β/β: 60cpm
20.0	08713	5 7 10	13	Very Stiff, Dark Gray (5Y 4/1) Gravelly Clay, some sand. moist 21.0	CL	3.5	t: 1545 Hau: 0ppm α: 2cpm β/β: 60cpm
	08714	4 8 13	2	Dark Gray (5Y 4/1) Gravelly Clay. moist 22.5	CL		t: 1605 Hau: 0ppm α: 2cpm β/β: 60cpm Gravel plugged sampler
22.5	08715	6 16 35	17	Hard, Dark Gray (5Y 4/1), Gravelly Clay, moist. 23.5	CL	4.0	t: 1633 Hau: 0ppm α: 2cpm β/β: 40cpm
				Very Stiff, Brown (7.5 YR 5/6) Clayey Silt, moist. 24.5	ML	3.5	
25.0	08716	20 35 45	13	Dense, Yellow (10 YR 7/6), Gravelly Sand, Poorly Sorted, trace silt, moist. 25.5	SP		t: 1658 Hau: 0ppm α: 2cpm β/β: 60cpm
27.5							
30.0							

NOTES:

402-11-86

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 315	COORDINATES:	DATE: 3/20/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/18/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 3/31/88
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 10

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30.0	08717	32 36 31	16	Very Dense, Brownish Yellow (10YR 6/6) Gravelly Sand, poorly sorted with trace silt, Moist.	SP		t: 0824 Hnu: 0ppm α: 2cpm β/p: 50cpm
32.5							
35.0	08718	30 51/3"	9	Very Dense, Yellowish Brown (10YR 5/6), Sand, poorly sorted with some gravel and trace silt. Moist	SP		t: 1556 Hnu: 0ppm α: 1cpm β/p: 50cpm
37.5							
40.0	08719	11 20 29	18	Very Dense, Yellowish Brown (10YR 5/6). Sand, poorly sorted, trace fine to coarse gravel and silt. Moist.	SP		t: 1629 Hnu: 0ppm α: 1cpm β/p: 50cpm
42.5							
45.0							

NOTES:

FERNALD RI/FS

2658

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 315	COORDINATES:	DATE: 3/21/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/18/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 3/31/88
DRILLING METHODS: CABLE TOOL		PAGE 4 OF 10

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45.0	08720	50 50/2"	8	Very Dense, Brownish Yellow (10YR 6/6), Gravelly Sand, poorly sorted fine sand to coarse gravel, trace silt, Moist.	SP		t: 0858 Hnu: 0ppm α: 1cpm γ/β: 50cpm
47.5							
50.0	08721	24 51/5"	9	Very Dense, Very Pale Brown (10YR 7/3), Sand, poorly sorted with some gravel, trace silt, Moist.	SP		t: 1000 Hnu: 0ppm α: 1cpm γ/β: 40cpm
52.5							
55.0	08722	30 50/5"	9	Very Dense, Light Yellowish Brown, Gravelly Sand, poorly sorted, trace silt, Moist	SP		t: 1105 Hnu: 0ppm α: 1cpm γ/β: 40cpm
57.5							
60.0							

NOTES:

87

402-11-86

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 315	COORDINATES:	DATE: 3/21/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/18/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 3/31/88
DRILLING METHODS: CABLE TOOL		PAGE 5 OF 10

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (")	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60.0	08723	17 29 39	12	Very Dense, Dark Yellowish Brown (10YR 4/4), Sand, poorly sorted with some gravel, trace silt, ~~moist~~ wet.	SP		t: 1503 Hau: 0ppm α: 1cpm γ/β: 60cpm
62.5							
65.0	08724	14 27 38	18	Very Dense, Yellowish Brown (10YR 5/4), Sand, some gravel, trace silt, wet	SP		t: 1707 Hau: 0ppm α: 2cpm γ/β: 40cpm
67.5							
70.0	08725	5 11 12	13	Medium Dense, Dark Yellowish Brown (10YR 4/4), Sand, some gravel, trace silt, wet.	SP		t: 0845 3/22/88 Hau: 0ppm α: 1cpm γ/β: 40cpm
72.5							
75.0							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 315	COORDINATES:	DATE: 3/22/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/18/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 3/31/88
DRILLING METHODS: CABLE TOOL		PAGE 6 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
75.0							
76.2							76.2
77.5	08726	5 8 5	8	Medium Dense, Dark Yellowish Brown (10 YR 4/4) Sand with Some gravel, trace silt, wet.	SP		t: 1056 Hnu: 0ppm α: 0cpm γ/β: 40cpm 77.7
							Sampler Continued to Fall After Hammering (Blow Sand)
80.0	08727	8 11 11	10	Medium Dense, Dark Yellowish Brown (10 YR 4/4) Gravelly Sand, trace silt, wet.	SP		t: 1432 Hnu: 0ppm α: 1cpm γ/β: 40cpm
82.5							
85.0	08728	44 50/4"	5	Very Dense, Yellowish Brown (10 YR 5/4) Sand with some gravel, trace silt, wet	SP		t: 1614 Hnu: 0ppm α: 1cpm γ/β: 40cpm
87.5							
90.0							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

2658

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 3/5	COORDINATES:	DATE: 3/23/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/18/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 3/31/88
DRILLING METHODS: CABLE TOOL		PAGE 7 OF 10

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
90.0	0872A	48 41 25	12	Very Dense, Dark Yellowish Brown (10YR 4/4) Sand with some gravel, trace silt, wet.	SP		t: 0727 Hnu: 0ppm α: 0cpm γ/β: 40cpm
92.5							
95.0		5 6 6	0	No Recovery			t: 1415 Blow sand not in situ. After sampling sand continued to rise to 90'
97.5							
100.0	0873O	10 12 14	6	Medium Dense, Yellowish Brown (10YR 5/4) Sand with some gravel, trace silt, wet	SP		t: 0750 3/24/88 Hnu: 0ppm α: 1cpm γ/β: 40cpm
102.5							
105.0							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

2658

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 315	COORDINATES:	DATE: 3/28/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/18/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 3/31/88
DRILLING METHODS: CABLE TOOL		PAGE 8 OF 10

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
105.0	08731	22 50 50/5"	13	V. Dense, Dark Yellowish Brown (10YR 4/4), Gravelly Sand, trace silt, wet.	SP		t: 0958 Hnu: 0ppm α: 0cpm γ/β: 40cpm
107.5							
110.0	08732	4 6 16	8	Loose, Dark Yellowish Brown (10YR 4/4) Sand with some gravel, trace silt, wet. 111.0	SP		t: 1056 Hnu: 0ppm α: 0cpm γ/β: 40cpm
				Medium Dense, Dark Gray (10YR 4/1) Sand with trace gravel and silt, wet	SP		
112.5							
115.0	08733	34 46 34	14	Very Dense, Dark Gray (10YR 4/1) Sand with some gravel and silt wet.	SP		t: 1318 Hnu: 0ppm α: 0cpm γ/β: 40cpm
117.5							
120.0							

NOTES:

FERNALD RI/FS

2658

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 315	COORDINATES:	DATE: 3/28/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/18/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 3/31/88
DRILLING METHODS: CABLE TOOL		PAGE 9 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
120.0	08734	9 19 14	12	Dense. Dark Gray (10YR 4/1) Fine Sand, some silt, trace gravel. wet	SP		t: 1408 Hnu: 0ppm α: 0cpm γ/β: 80cpm
122.5							
125.0	08735	6 9 12	16	Medium Dense, Dark Gray (10YR 4/1) Sand, fine to medium poorly sorted, trace silt and gravel wet.	SP		t: 1533 Hnu: 0ppm α: 0cpm γ/β: 40cpm
127.5							
130.0	08736	6 12 16	13	Medium Dense, Dark Gray (10YR 4/1) Sand, fine to medium poorly sorted, trace silt and gravel, wet	SP		t: 1658 Hnu: 0ppm α: 0cpm γ/β: 40cpm
132.5							
135.0							

NOTES:

FERNALD RI/FS

2658

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 315	COORDINATES:	DATE: 3/29/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/18/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 3/31/88
DRILLING METHODS: CABLE TOOL		PAGE 10 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
135.0	08737	3 14 25	15	Dense, Dark Gray (10 YR 4/1) Sand trace gravel and silt, wet	SP		t: 0823 H_{2O}: 0ppm a: broken γ/β: 40cpm
137.5				END OF BORING			

NOTES:
12 Bags Coarse Sand
30 Bags Volclay
2 Buckets Bentonite
Screened 115 - 125 Ft.