G-000-711.86

5401

REMEDIAL INVESTIGATION AND FEASIBILITY STUDY MONTHLY TECHNICAL PROGRESS REPORT APRIL, 1989

04/01/89

DOE-FMPC/EPA
97
REPORT

REMEDIAL INVESTIGATION

AND

FEASIBILITY STUDY

MONTHLY TECHNICAL PROGRESS REPORT

APRIL 1989

FEED MATERIALS PRODUCTION CENTER
FERNALD, OHIO

FMPC SITEWIDE RI/FS
April 1989
MONTHLY TECHNICAL PROGRESS REPORT

5401

STATUS

General

Progressive actions continued on the FMPC sitewide RI/FS during April 1989. The installation of 10 off-site wells and the two facilities testing wells continued. One off-site well was completed during April. One cable tool drill rig and two auger rigs are currently in operation. The two auger rigs are being used for the Facilities Testing program.

The fifth quarterly groundwater sampling program was initiated during April for the wells that have not had four quarterly samples collected from them. Wells where the quarterly samples have been collected are no longer being sampled.

A meeting was held April 25, 1989 at the OEPA office in Columbus to discuss interim removal activities. Another meeting was scheduled for May 2, 1989 at DOE-ORO office in Oak Ridge, Tennessee to status interim removal activities and the Operable Unit schedules for the RI/FS.

Task 1 - Description of Current Situation

Task 1 Percent Complete: 100%

Task 2 - Remedial Investigation Work Plan Requirements

DOE directed that the Facilities Testing Work Plan and the Feasibility Study Work Plan be implemented while awaiting USEPA and OEPA comments on the plans. Feasibility Studies on Operable Units 4 and 6 were initiated in April.

Task 2 Percent Complete: 95%

Task 3 - Site Investigation

Groundwater and Subsurface Soils - One cable tool rig was in use for the 10 on-site well program and Facilities Testing. Two auger rigs were in operation to conduct the Facilities Testing program. Table 3-1 lists the one off-site well that was completed and the Facilities Testing well (#2006) in progress. Tables 3-2 and 3-3 provide additional data on the wells which were installed and well being development for sampling. The off-site well drilling program continues, with

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the FMPC working diligently to obtain license agreements for the remaining seven off-site wells.

TABLE 3-1

WELL DRILLING PROGRESS

WELL NO.	DATE	WELL DEPTH
2002	4/14/89	79.5
2066	In Progress	

Transit Survey - Surveying activities continued on establishing the horizontal and vertical coordinates of the completed wells and establish control points along Paddy's Run.

Radiation Measurement Survey - No field activity.

Surface Water and Sediment Sampling - The fourth quarter surface water sampling of the Great Miami River was completed in April. Sediment sampling of the Great Miami was attempted, but river flow was too high and fast to complete sampling this month. This will be completed when conditions become less hazardous. Sediment samples were collected from Paddy's Run. Paddy's Run was traversed three separate times to see if any seeps were active. None were observed.

Facilities Testing - During April, 17 borings ere completed in Sector 1 and 6. Work continued on implementation of Facility Testing borings and well installations. Seventeen 1000 series borings were completed during the month. Piezometers were installed in 14 of the 17 borings. Water yielding zones were not encountered in 3 of the 17 borings, hence these 3 borings were plugged and abandoned (See Page 3).

Biological Resources - During April, more results from the Biological Resources sampling program were received and are being incorporated into the RI report. Results from two samples remain outstanding and are expected in May. Work is continuing on the interpretation and presentation of results.

The Acute and Chronic Toxicity and Benthos studies of the FMPC are continuing.

Task 3 Percent Complete: 97%* through Rev 3
60%* post Rev 3

*does not include Facilities Testing

34-WELL PROGRAM

WELL DEVELOPMENT COMPLETED DURING APRIL 1989

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Well Number	Date Started	Date Finished	Total Gallons Purged	Final Turbidity (NTU)
2127	04-01-89	04-01-89	680	3.3
2055	04-02-89	04-04-89	6,060	6.8
2007	04-11-89	04-13-89	4,560	2.7
22053	04-14-89	04-16-89	4,060	2.3
2002	04-17-89	04-19-89	3,560	1.9

FACILITY TESTING
DRILLING PROGRESS BORINGS/WELLS COMPLETED
APRIL 1989

BORING/WELL NO.	DATE COMPLETED	BORING DEPTH	WELL DEPTH
1173	4-01-89	20.0	9.6
1172	4-02-89	10.0	9.6
1133	4-02-89	10.5	10.2
1174	4-03-89	10.0	9.9
1171	4-03-89	9.0	8.2
1160	4-04-89	9.5	9.5
1165	4-04-89	5.0	5.0
1152	4-05-89	20.0	10.2
1164	4-05-89	20.0	NA/Dry
1137	4-06-89	13.0	12.9
1156	4-12-89	7.5	7.5
1138	4-12-89	20.0	NA/Dry
1169	4-14-89	20.0	NA/Dry
1154	4-26-89	13.0	12.1
1150	4-27-89	15.0	14.5
1155	4-29-89	12.0	12.0
1239	4-30-89	12.0	12.0
2006	In Progress		
2002 (Southfield Off-site)	4-12-89	83.0	79.5

Task 4 - Site Investigation Analysis

Database - The level 1 verification of laboratory data continued in accordance with agreements and assignments resulting from the Data Management Task Force meeting held in March. Work was completed on qualifiers at detection limits, and on standard units and parameter names. A "working" draft of the system documentation and user guide was compiled. A status report on Task Force Action Items was submitted to DOE.

Data entry and map generation were maintained current with respect to new wells being installed.

Groundwater Modeling - The solute transport portion of the model continues to be developed.

Task 4 Percent Complete: 80% through Rev 3
0% post Rev 3

Tasks 5 and 6 - Laboratory & Benchscale Studies, and Reports

No activity since last report.

Tasks 5 and 6 Percent Complete: 0%

Task 7 - Program Management and Reports

7.1 Program Management

The RI/FS project team participated in and provided technical assistance for the following meeting with the USEPA and OEPA:

- FMPC FFCA Status Meeting April 25, 1989

7.2 Quality Assurance

The quality assurance activities for the month of April 1989 were categorized into general areas.

- Continued effort for closing of open audits, surveillances and nonconformances.

- Maintain field Quality Assurance on field activities through monitoring and surveillances.

- Approved DCRs are being prepared to issue to controlled copy holders. A sample package sent to DOE for review.

- Issued DCR #28, "Document Control" for review and approval.

- Continued efforts on organizing the project file into a task-oriented filing system.

7.3 Health and Safety

- All workers continue to be monitored for exposures to chemicals and radioactive materials during RI/FS operations. All monitoring results continue to remain well below recommended action guides and applicable limits.

- The new urine sampling schedule showing urine samples collected from every field employee at the end of each 10-day work period continues to show results less than 5 ug/l (WMCO's detection level). No positive results were obtained during April. Over 100 samples were analyzed.

- Health and Safety support has been ongoing for water sampling operations and the Facilities Testing Phase of the RI/FS.

- Extensive planning for drilling operations in Plant 6 have been conducted with WMCO to ensure worker safety and health. Review of underground piping, conduits, and lines have been completed. Radiological, industrial hygiene, and general safety surveys will be completed prior to the initiation of work. Electrical power as well as process lines will be locked out during drilling. Also to minimize damage to underground lines, a WMCO subcontractor surveyed proposed areas to pinpoint drilling locations.

- An additional health physics technician has been added to support drilling within the process area.

- An alpha counter has been procured to permit real constant air monitor (CAM) time monitoring of work place air during drilling operations. The CAM is equipped with an alarm to warn workers of high airborne radioactivity.

Task 7 Percent Complete: Not applicable (apportioned effort)

Task 8 - Community Relations Support

The final report on the January 31, 1989 public meeting is under DOE review. Distribution will be accomplished when DOE releases the report.

1. Planning is underway for the next community meeting on May 15, 1989, and has included the following:

   (a) Developed progress reports for the RI, FS, and interim action presentation;
   (b) Coordinated speaker preparation, dry runs, props, etc.;
   (c) Developed most of the graphics, including maps generated by the RI/FS data base;
   (d) Managed meeting logistics;
   (e) Held two dry runs, one for speakers and one for audio equipment;
   (f) Created and/or approved all pre-meeting publicity;
   (g) Coordinated technical input for and wrote responses to all comment cards.

Task 8 Percent Complete: Not applicable (apportioned effort).

Task 10 - Feasibility Study Work Plan

The Feasibility Study Work Plan was submitted to the USEPA and OEPA on August 15, 1988.

Task 10 Percent Complete: 95%

Task 11 - Remedial Technology Alternatives

The Remedial Technology Alternatives Report was submitted to USEPA on December 16, 1988.

Task 11 Percent Complete: 95%

Task 12 - Initial Screening of Alternatives

Task teams for Operable Units K-65 and the South Plume are in the process of screening alternatives on these operable units which were submitted in the Task 12 report.

Task 12 Percent Complete: 40% Complete Operable Unit 4
40% Complete Operable Unit 6

DIFFICULTIES ENCOUNTERED

None

ACTION TAKEN TO RECTIFY PROBLEMS

Seep sampling on Paddy's Run will be completed as soon as weather permits. Sample locations are being monitored after every rainfall to expedite the sampling programs. Although the area has received abundant rainfall, the seeps remain dry.

PLANNED ACTIVITIES FOR NEXT MONTH

- Conduct seep sampling,
- Continue installation of proposed additional monitoring wells with four drilling rigs,
- Start sampling to support geochemical study,
- Continue Facilities Testing Program, and
- Continue Initial Screening of Alternatives on K-65 and South Plume Operable Units.

ATTACHMENT 1

FERNALD
RI/FS

5401

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS
BORING NUMBER: 1175	COORDINATES:
ELEVATION:	GWL: Depth Date/Time
ENGINEER/GEOLOGIST: H.SUMMERS/C.COULTER	Depth Date/Time
DRILLING METHODS: AUGER (HOLLOW STEM) & Rock	

DATE: 03-29-89
DATE STARTED: 03-29-89
DATE COMPLETED: 03-31-
PAGE 1 OF 35

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	15066 0915 03-29	2	14	STIFF, YELLOW-BROWN (10 YR 5/3) SILTY CLAY, SOME SAND ORGANIC MATERIAL/ROOTLETS, DAMP	CL	1.0	HNU = 0 PPM α = 0 CPM BG: 40-120 CPM
	15067 0915 03-29	2 12		STIFF, YELLOW-BROWN (10YR 5/4)- SILTY CLAY, TRACE SAND, TRACE GRAVEL (.25-.50 IN), DAMP			
2	15068 0918 03-29	6	14	VERY STIFF, YELLOW-BROWN (10 YR 5/3) SILTY CLAY, TRACE SAND, ROOTLETS, DAMP	CL	3.5	HNU = 0 PPM α = 0 CPM BG: 40-120 CPM
	15069 0918 03-29	11		AS ABOVE			
3	15070 0918 03-29	14		AS ABOVE			
4	15071 0924 03-29	14 19 20	16	VERY STIFF, YELLOW-BROWN (10YR 5/3) SILTY CLAY, TRACE SAND, ROOTLETS, DAMP	CL	3.5	HNU = 0 PPM α = 0 CPM BG: 60-120 CPM
5	15072 0953 03-29	5	18	VERY STIFF, YELLOW-BROWN (10YR 5/3) SILTY CLAY, TRACE SAND, TRACE COARSE GRAVEL (1.5 IN), DAMP	CL	3.5	HNU = 0 PPM α = 0 CPM BG: 60-120 CPM
	15073 0953 03-29	11		AS ABOVE			
6	15074 0953 03-29	18		AS ABOVE			
7	15075 0832 03-30	3 8 10	12	STIFF, YELLOW-BROWN (10YR 5/3) SILTY CLAY, TRACE GRAVEL (.5 TO 1.5 IN) DAMP 65	CL	2.0	HNU = 0 PPM α = 0 CPM BG: 60-80 CPM
				STIFF, GREY (5Y 4/1) SILTY CLAY, SOME GRAVEL (.25 - .50 IN) DAMP			

NOTES: CONTRACTOR = PENNDRILL
RIG:
DRILLER: CRAIG COULTER
ASSISTANT: CHRIS COULTER

SAMPLES COLLECTED AS PER ASTM STANDARD PENETRATION T
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α = 0 CPM
BG = 40-120 CPM
LEL O_2: 0.0% O_2, 20.6% O_2
LEL

0 10

FERNALD RI/FS

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VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1175	COORDINATES:	DATE: 03-30-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03-29-89
ENGINEER/GEOLOGIST: M. SLUSARSKI / C. GRUBE	Depth Date/Time	DATE COMPLETED: 03-31-89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF 75

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	15076 0855 03-30	5 13 18	12	STIFF, YELLOW-BROWN (10 YR 5/3) SILTY CLAY, SOME GRAVEL (.25-1.0 IN) DAMP 8.0 STIFF, MOTTLED YELLOW-BROWN / GREY (10YR 5/3 / 5Y 4/1), SOME GRAVEL (.25-.75 IN) OXIDIZED, DAMP 8.5 STIFF, GREY (5Y 4/1) SILTY CLAY, SOME GRAVEL (.25-.75 IN) DAMP	CL	2.0	HNU = 0 PPM α = 0 CPM Bγ = 60-120 CPM
9	15077 1014 03-30	12 14	14	STIFF, GREY (5Y 4/1) SILTY CLAY TRACE SAND, TRACE GRAVEL (.25 IN) DAMP	CL	2.0	HNU = 0 PPM α = 0 CPM Bγ = 60-80 CPM
10	15078 1014 03-30	14		STIFF, GREY (5Y 4/1) SILTY CLAY TRACE SAND, TRACE FINE GRAVEL (.25 IN) WOOD FRAGMENTS, DAMP			
11	15079 1023 03-30	8 14 15	14	STIFF, GREY (5Y 4/1) SILTY CLAY TRACE SAND, TRACE FINE GRAVEL (.25 IN) WOOD FRAGMENTS, DAMP	CL	2.0	HNU = 0 PPM α = 0 CPM Bγ = 60-100 CPM
12	15080 1033 03-30	15 22 30	18	VERY STIFF, GREY (5Y 4/1), SILTY CLAY, TRACE SAND, TRACE FINE GRAVEL (.25 IN) WOOD FRAGMENTS DAMP	CL	3.5	HNU = 0 PPM α = 0 CPM Bγ = 60-80 CPM
13	15081 1100 03-30	8 10 22	18	VERY STIFF, GREY (5Y 4/1) SILTY CLAY, TRACE SAND, TRACE COARSE GRAVEL (1.0-1.5 IN) DAMP	CL	3.5	HNU = 0 PPM α = 0 CPM Bγ = 60-100 CPM
14							

NOTES:

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FERNALD RI/FS

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VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1175	COORDINATES:	DATE: 03-30-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03-29-89
ENGINEER/GEOLOGIST: M. SLUMARSKI/C. GRUBE	Depth Date/Time	DATE COMPLETED: 03-31-8
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 3 OF 3

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	15082 1310 03-30	11		VERY STIFF, GREY (5Y 4/1) SILTY CLAY, TRACE GRAVEL (.25-1.5 IN) DAMP			HNU = 0 PPM α = 0 CPM Bγ = 80-100 CPM
16	15083 1310 03-30	31 11	14	AS ABOVE	CL	3.5	
17	15084 1315 03-30	15 22 19	14	VERY STIFF, GREY (5Y 4/1) SILTY CLAY, TRACE GRAVEL (.25-1.5 IN) DAMP	CL	3.0	HNU = 0 PPM α = 0 CPM Bγ = 80-100 CPM
18	15085 1420 03-30	14 7 7	12	STIFF, GREY (5Y 4/1) SILTY CLAY TRACE GRAVEL (.25-.50) DAMP	CL	1.5	HNU = 0 PPM α = 0 CPM Bγ = 80-100 CPM
19							
20	15086 1420 03-30	13	4	STIFF, GREY (5Y 4/1) SILTY CLAY TRACE GRAVEL (.25-.50 IN) DAMP DEPTH OF SAMPLING 20.0	CL	1.5	HNU = 0 PPM α = 0 CPM Bγ = 80-100 CPM

NOTES:

0 12

FERNALD RI/FS

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PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS
FIELD ENG./GEO. M. Slusarski DATE 03-31-89
PROJECT NO. 602 3.7
CHECKED BY W A Hartel DATE 5-5-89
BORING NO. 1175
PIEZOMETER NO. ~~1175~~ N/A
DATE OF INSTALLATION Grouted to Surface 3-31-

BOREHOLE DRILLING

DRILLING METHOD Auger	TYPE OF BIT Auger (Hollow Stem)
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID N/A FROM — TO —	SIZE 4¼ ID FROM 0.0 FT. TO 15.0 FT
FLUID N/A FROM — TO —	SIZE N/A FROM — TO —

PIEZOMETER DESCRIPTION

TYPE N/A	RISER PIPE MATERIAL N/A
DIAMETER OF PERFORATED SECTION N/A	RISER PIPE DIAMETERS:
PERFORATION TYPE: N/A	O.D. N/A I.D. N/A
SLOTS ☐ HOLES ☐ SCREEN ☐	LENGTH OF PIPE SECTIONS N/A
AVERAGE SIZE OF PERFORATIONS N/A	JOINING METHOD N/A
TOTAL PERFORATED AREA N/A	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH N/A	OTHER PROTECTION N/A
PROTECTIVE PIPE O.D. N/A	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	N/A			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	N/A			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 20.0	TOP	BOTTOM
BENTONITE	TOP N/A	BOTTOM N/A	TOP	BOTTOM
SAND	TOP N/A	BOTTOM N/A	TOP	BOTTOM
GRAVEL	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PIEZOMETER TIP	N/A			
BOTTOM OF BOREHOLE	20.0 FT			
GWL AFTER INSTALLATION				

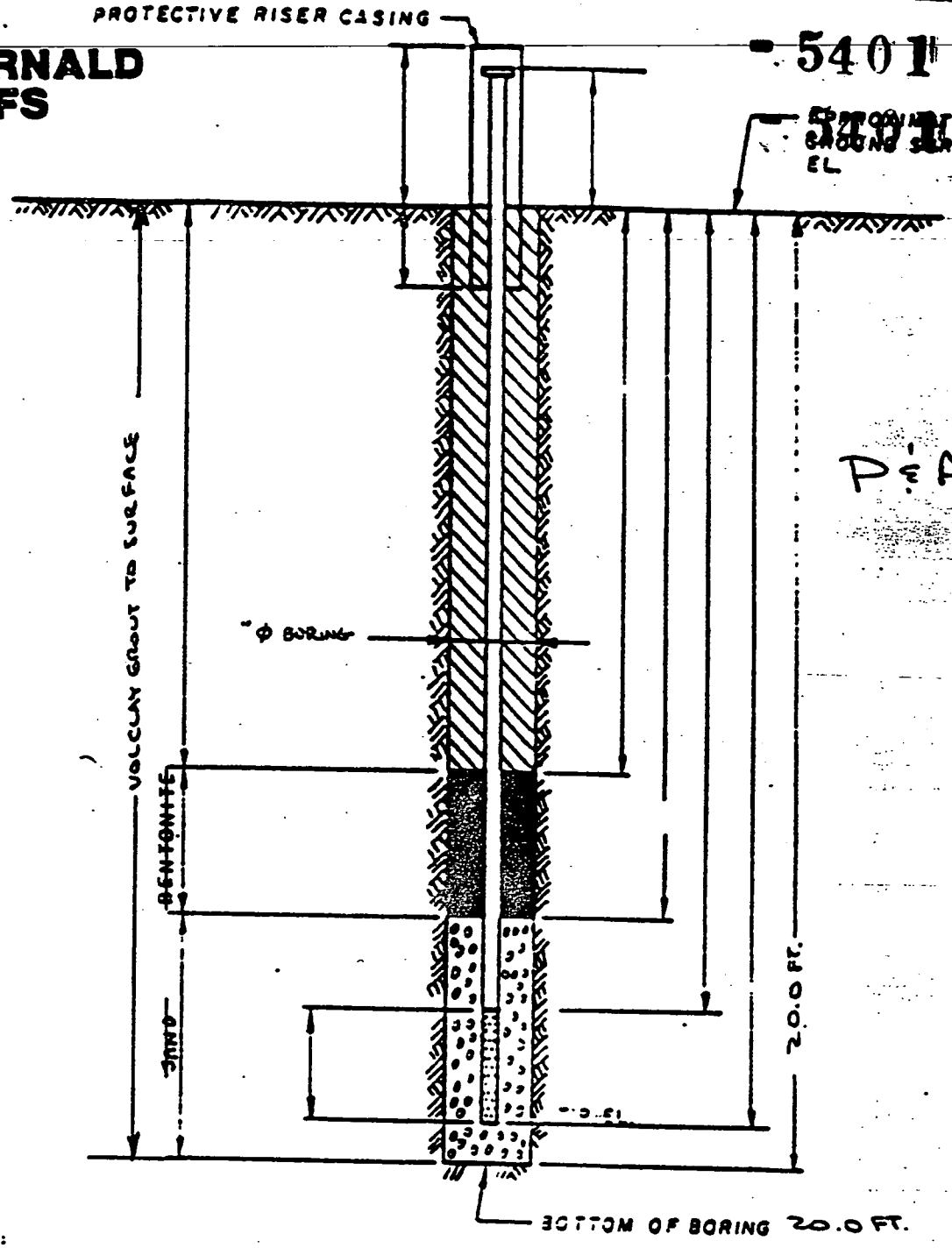
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☐ N/A
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☐ N/A

REMARKS No water producing zones were encountered in boring. The boring was plugged with volclay grout from 20.0 ft to 0.0 ft.

0 13

409-11

FERNALD RI/FS



P & A

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
HLS			

NOTES:

1. RISER PIPE IS — IN 10 SCHEDULE PIPE, THREADED, FLUSH-JOINTED. N/A
2. SCREEN IS — IN 1.0 — PIPE CONTINUOUS SLOT SCREEN (0.0—0 IN SLOT SIZE). N/A
3. LOWER END OF SCREEN IS CAPPED. N/A
4. ELEVATION OF WATER LEVEL N/A
5. WATER LEVEL READING ON N/A

MATERIALS USED TO P & A WELL BORING:
VOLCLAY GROUT: 3 - (50LB) SACKS

INSTALLATION DETAILS
MONITORING WELL # 1175

PREPARED FOR

FERNALD RI/FS

Field 5401 Copy

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 ~~3.2~~ 3.7	PROJECT NAME: FMPC RI/FS FACILITY TESTING BORIN		
BORING NUMBER: 1173	COORDINATES:	DATE: 4-1-89	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3-29-89	
ENGINEER/GEOLOGIST: E.T AND L.S.	Depth Date/Time	DATE COMPLETED: 4-1-89	
DRILLING METHODS: MOBILE AUGER CME 45 8" HSA		PAGE 1 OF 35	

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	15022 15023 No Recov.*	6 7 9	6"	Dark yellowish brown 10YR 3/4 Silt with clay and gravel, ML — Slightly moist, angular limestone gravel @ 0943	ML	Soft	HNU = N/A α = 0cpm Bγ = 100 to 150cpm
2 3	15024 NR* 15025 15026 NR*	8 10 12	6"	Mottled Dark Yellowish brown 10YR 4/6 to Very dark brown Clay, CL - Medium plastic, slightly moist to dry, rare gravel, massive. @ 0946	CL	Stiff	HNU = N/A α = ∅cpm Bγ = 80 to 120 cpm
4	15027 NR*	7 16 12	No Recovery	No Recovery @ 0955	CL?	Stiff	HNU = N/A α = ~~∅cpm~~ N/A Bγ = N/A
5 6	15028 15029 15030	15 15 22	14"	Light yellowish brown 10YR 6/4 to dark brown 10YR 3/3 clay CL - Very stiff to medium stiff, slightly moist, medium plastic, Low dilatancy massive, dry. @ 1002	CL CL	Very Stiff to medium Stiff	HNU = N/A α = ∅cpm Bγ = 100-120cpm
7	15031	8 21 23	12"	Very pale brown 10YR 7/4 to to dark yellow brown 10YR 4/6 Clay, CL - Slightly moist, medium plasticity, Very stiff to medium stiff, massive, 1" Silt layer - moist. @ 1020	CL CL ML CL	Medium to Very Stiff	HNU = N/A α = ∅cpm Bγ = 80-120cpm

NOTES. Driller: Penndrill — Dave Newman
Helper: Bill Anderson
Weather: Cloudy with occasional Rain
Rig: Trailer-mounted CME-45 Hollow-stem Auger.
Sample Tech: Cindy Melroy.
* = No Recovery
= HNU inoperable due to excessive Airborne moisture =

Background @ 0930 3-30-8
HNU = N/A
α = ∅cpm
Bγ = 100-120cpm

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FERNALD RI/FS

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VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6002 3.23.7	PROJECT NAME: FMPC RI/FS Facilities Testing		
BORING NUMBER: MW-1173	COORDINATES:	DATE: 4-1-89	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3-29-8	
ENGINEER/GEOLOGIST: L.S. AND E.T.	Depth Date/Time	DATE COMPLETED: 4-1-	
DRILLING METHODS: HUGER (CME 45 TRAILER MOUNTED) 8" HSA		PAGE 2 OF	

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
7.5 8 8.5 9	15032 3 samples	21 27 21	13"	Mottled white (10 YR 8/1) to Brownish yellow (10YR 6/8) Clay, CL - Very stiff to medium stiff, moderately plastic, slightly moist, 1" silt layer, massive 3/29/89 @ 1028	CL ML CL	med. to Very Stiff	HNU = N/A α = 0 cpm Bγ = 100- cpm 120
9.5 10	15033 15034	5 5 13	12"	Mottled white (10YR 8/1) to Brownish yellow (10YR, 6/8) Clay, CL: Medium to very stiff, moderately plastic, slightly moist to dry, 1" silt layer massive 3/29/89 @ 1340 ~~1022~~	CL ML CL	med. to Very Stiff	HNU = N/A α = ∅ cpm Bγ = 80- cpm 120
11	15035	32 35 37	18"	Yellowish Brown (10YR, 5/4) CLAY, CL - Dry, mottled with black (10YR, 2/1) organic flakes, Very stiff, moderately plastic, dry. massive 3/29/89 @ 1350 ~~1340~~	CL	V. Stiff	HNU = N/A α = ∅ cpm Bγ = 100- cpm 120
12 13	15036	44 69 59	12"	Mottled Very pale brown (10YR, 7/4) CLAY, CL - dry, moderately plastic, massive, Very stiff, Low dilantancy. 3/29/89 @ 1420 ~~1350~~	CL	Very Stiff	HNU = N/A α = ∅ cpm Bγ = 100-120 cpm
13.5 14 14.5 15.0	15037	30 38 54	18"	Mottled Very pale brown (10YR, 7/4) CLAY, CL - same as 12.0' to 13.5' Gray (10YR, 6/1) CLAY, CL - Dry, moderately plastic, massive, medium Dilantancy, Very stiff to stiff. 3/29/89 @ 1430	CL	med. to Very Stiff	HNU = N/A α = ∅ cpm Bγ = 100-120 cpm

NOTES: Driller: Pennydrill - Dave Newman
Helper: Bill Anderson
Sample Tech: Cindy Melroy
Weather: Cloudy with occasional Rain
Rigs: CME-45 Trailer-mount
Drilled: 0-15 feet on 3/30/89, 15-20 feet on 4/1/89.
HNU Inoperable due to excessive Airborne moisture.

Background @ 0930 3-2
HNU = N/A
α = ∅ cpm
Bγ = 100-120 cpm

FERNALD RI/FS

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VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 ~~3.2~~ 3.3 (COS)	PROJECT NAME: FMPC RI/FS Facilities Testing		
BORING NUMBER: MW-1173	COORDINATES:	DATE: 4-1-89	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3-29-89	
ENGINEER/GEOLOGIST: L. Sinfield	Depth Date/Time	DATE COMPLETED: 4-1-89	
DRILLING METHODS: Auger (CME-45 Trailer-mount) 8" Hollow-Stem Auger		PAGE 3 OF 3	

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	15038 NR*	8	0"	No Recovery 4-1-89 @ 0900	CL	Very Stiff to med stiff	HNU = ∅ ppm α = ∅ cpm Bγ = 100-120 cpm
	15039 NR*	16 25					
17	15040	8 26 25	6"	Gray 10 YR 6/6 CLAY, CL- Saturated, massive, low plasticity, medium dilatancy, very stiff. 4-1-89 @ 0905	CL	Very Stiff	HNU = ∅ ppm α = ∅ cpm Bγ = 100-120 cpm
18	15041	21 25 30	18"	Gray 10 YR 6/6 Clay CL- Massive, low Plasticity, medium dilatancy, very stiff, saturated 4-1-89 @ 0906	CL	Very Stiff	HNU = ∅ ppm α = ∅ cpm Bγ = 100-120 cpm
19	15042	18	6"	Gray 10 YR 6/6 Clay, CL - Same as 18.0' to 18.5' 4-1-89 @ 0910	CL	Very Stiff	HNU = ∅ ppm α = ∅ cpm Bγ = 100-120 cpm
20				Borehole ~~to~~ collapsed to 10.0 feet 4/1/89. Well set End Cap 9.6' to 9.4' Depth .020" Screen Depth (PVC) 9.4' to 4.4' 2 bags Sand (10X20) = 9.6' to 3.6' Blank PVC = 4.4' to 0.0' 1 Bucket Bentonite Pellets ~~9.6' to 0.0~~ 3.6' to 0.0 Protective Cover Cemented on 4/1/89 All Well Casing Flush-mounted Sch 40 PVC			Total Depth Sounded Drilled = 20.0 feet Flush-mount Protective Cover

NOTES.
Driller: Penn Drill - Dave Newman
Helper: Bill Anderson
Sample Tech: Cindy Melroy
Rig: Trailer-mounted CME-45
Weather: Cloudy with occasional rain.
Drilled 0-15 feet 3/30/89 - Sampled.
Drilled 15 to 20 feet @ 4/1/89 - ~~Tried to Red~~ Well fou

* NR = No Recovery

Background @ 0900 4-1
HNU = 0 ppm
α = 0 cpm
Bγ = 80-140 cpm

FERNALD RI/FS

- 5401

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Facilities Testing
FIELD ENG./GEO. L. Sinfield
DATE 4/1/89
PROJECT NO. 602-37
CHECKED BY WA Hertel
DATE 5-6-89
BORING NO. 1173
PIEZOMETER NO. PW 1173
DATE OF INSTALLATION 4/1/89

BOREHOLE DRILLING

DRILLING METHOD Hollow Stem Auger-8inch
DRILLING FLUID (S) USED:
FLUID N/A FROM N/A TO N/A
FLUID N/A FROM N/A TO N/A

TYPE OF BIT Auger Bit
CASING SIZE (S) USED:
SIZE 8inch FROM 0.0ft TO 20.0ft
SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE ~~Sch~~ Schedule 40 PVC - 2inch
DIAMETER OF PERFORATED SECTION 2inch
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.020inch
TOTAL PERFORATED AREA 4.7feet

RISER PIPE MATERIAL Schedule 40 PVC
RISER PIPE DIAMETERS:
O.D. 2 1/4 inch I.D. 2inch
LENGTH OF PIPE SECTIONS 4.4feet
JOINING METHOD Flush-Threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 2feet
PROTECTIVE PIPE O.D. 4inch

OTHER PROTECTION Locking Cap

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	- 0.2 feet			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	0.5ft ~~0.0ft~~ JS			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP N/A ~~0.3ft~~ JS ~~0.3ft~~ JS	BOTTOM N/A ~~3.6~~ JS	TOP	BOTTOM
BENTONITE	TOP ~~0.0~~ JS 0.2ft	BOTTOM 3.6 ft	TOP	BOTTOM
SAND	TOP 3.6 ft	BOTTOM 9.6 ft	TOP	BOTTOM
GRAVEL	TOP ~~N/A~~	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP ~~4.~~ 9.4ft JS	BOTTOM 4.7 ft	TOP	BOTTOM
PIEZOMETER TIP	9.6 ft			
BOTTOM OF BOREHOLE	9.6 ft			
GWL AFTER INSTALLATION				

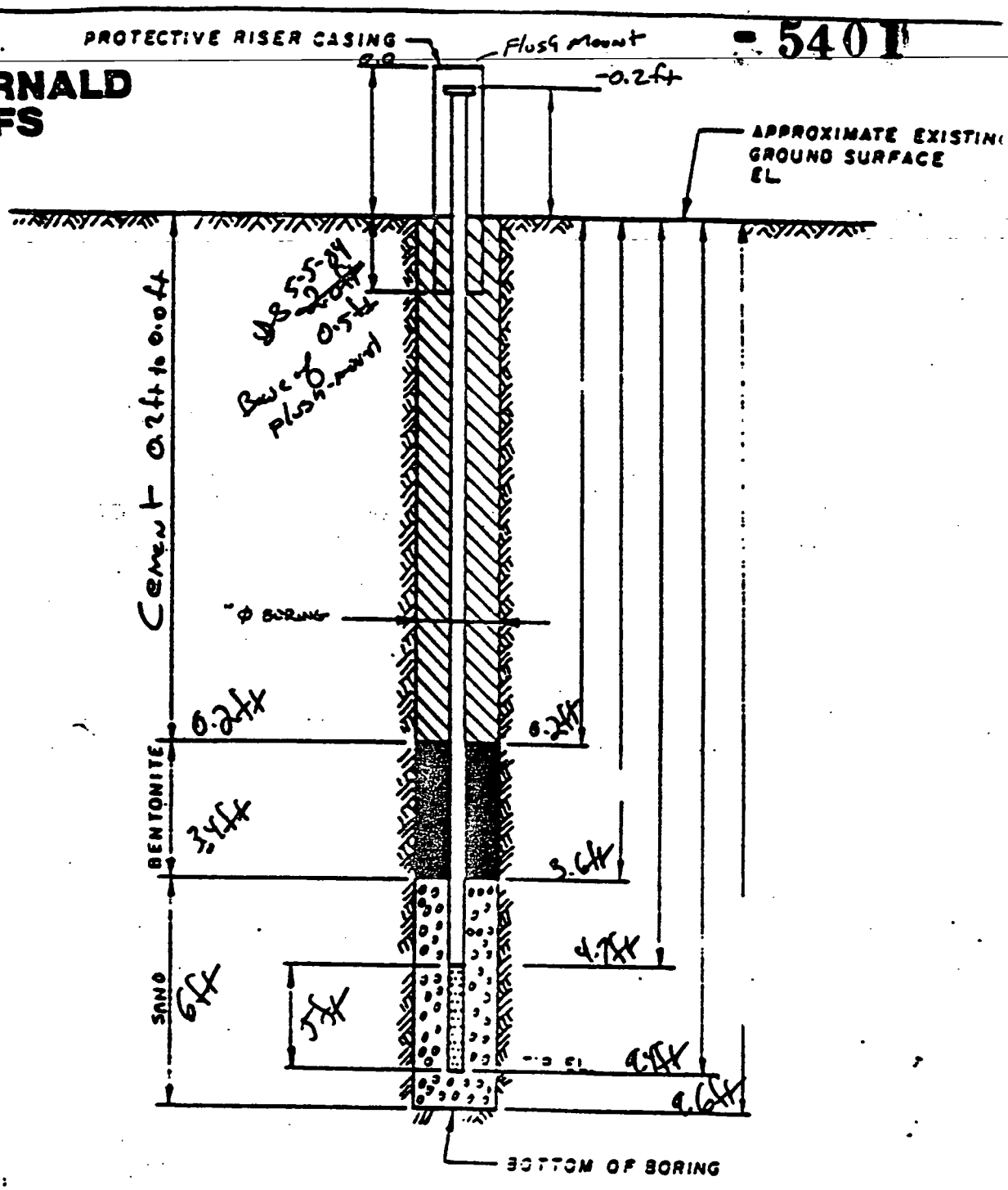
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS

0 18

- 5401

FERNALD RI/FS



DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
	WAH		5-6-22

NOTES:

1. RISER PIPE IS 2.0 IN I.D. SCHEDULE 40 PVC PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 2.0 IN I.D. Schedule 40 PVC PIPE ~~CONTINUOUS~~ SLOT SCREEN (0.020 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL 1173

0 19

PREPARED FOR

Materials Used:
2 gallons of Water
2-50lb bags of 10x20 SAND
1 - bucket of Bentonite pellets
1 - Flush Mount Locking Cap
4.4 feet of Schedule 40 PVC Blank - 2 inch I.D.
5.0 feet of Schedule 40 PVC Screen - 2 inch (0.020 inch Slotted)

Rigbers

FERNALD RI/FS

- 5401

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3.7	PROJECT NAME: FMPC RI/FS Facility Testing Boring		
BORING NUMBER: 1172	COORDINATES:	DATE: 4/2/89	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/1/89	
ENGINEER/GEOLOGIST: L. Sinfield	Depth Date/Time	DATE COMPLETED: 4/2/89	
DRILLING METHODS: Trailer-mounted CME-45 Hollow-Stem Auger		PAGE 1 OF 24	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION Start of Log = Bottom of Cement Pad	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS 6" Cement Cored at Surface on 4/1/89
0.5	15000	6		Gravel - Class II Base to Cement Pad	GW	Loose	Start of Soil Sampling @ 0900 4/2/89
1	15001	6	6"	Light yellowish brown (10YR, 6/4) to Yellowish brown (10YR, 5/8) Silty Sandy CLAY, CL - Mottled, Loose, dry, massive, moderately plastic, No dilantancy, CLAY. @ 900	CL	1.2 TSF Loose	HNU = 0 ppm α = 0 cpm Bγ = 40-120 cpm
1.5		6					
2.0	15002 NC	5		Light yellowish brown (10YR, 6/4) Silty Gravelly SAND, SP - Loose, dry, massive.	SP	1.5 TSF	HNU = 0 ppm α = 0 cpm Bγ = 40-120 cpm
	15003	5	6"				
2.5	15004 NC	6		Very dark brown (10YR, 2/2) CLAY, CL - Stiff, very slightly moist, massive, moderately plastic, No dil., black organic flakes, CLAY. @ 0902	CL	Stiff	Very Slight Petroleum odor
3.0	15005	5		Same as 2.25'-3.0' ↑	CL	1.5 TSF Stiff	HNU = 0 ppm α = 0 cpm Bγ = 40-120 cpm
3.5		5	6"	Pea Gravel, dry - low recovery.	GW		
4.0		6		@ 0910			
4.5	15006	10		Brown to dark brown (10YR, 4/3) CLAY, CL - Mottled, Stiff, dry, massive, moderately plastic, No dil, with 1" dry gravel layer (pea gravel).	CL	1.5 TSF Stiff	HNU = 0 ppm α = 0 cpm Bγ = 40-120 cpm
5.0	15007	11	18"		GW		
5.5	15008	14		@ 0915	CL		
6.0	15009	10		~~6.5 to 7.~~ 6.0 to 6.5 Very dark grey (7.5YR, N3) CLAY, CL - Medium Plastic, Moist, Soft No dil.	CL	0.5 Soft	HNU = 0 ppm α = 0 cpm Bγ = 60-120 cpm
6.5		11	6"	6.5 to 7.5 Light yellowish brown (10YR, 6/4) Pea Gravel with Sandy, GW - dry, Loose, massive @ 0930	GW	TSF	
7.0		14					
7.5							

NOTES: Contractor: Pennotill
Driller: Dave Newman
Helper: Bill Anderson
Weather: Cloudy, 45°F
Rig: CME-45
8" Augers Used

Background @ 0900 4/2/89
HNU = 0 ppm
α = 0 cpm
Bγ = 80-120 cpm

Background @ 1514 4/1/
HNU = 0 ppm
α = 0 cpm
Bγ = 80-120 cpm

0 20

FERNALD
RI/FS

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VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3.7	PROJECT NAME: Facilities Testing Boring		
BORING NUMBER: 1172	COORDINATES:	DATE: 4/2/89	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/1/89	
ENGINEER/GEOLOGIST: L. Sinfield	Depth Date/Time	DATE COMPLETED: 4/2/89	
DRILLING METHODS: Trailer-mounted CME-45 Hollow-Stem Auger		PAGE 2 OF 2	

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8.0 8.5 9.0	15010	2 5 5	18"	Brownish yellow (10YR, 6/6) to yellowish brown (10YR, 5/6) CLAY, CL-Mottled, Saturated, moderately plastic, massive, mod. dilatancy, CLAY. Gravel Lenses (1" thick)	CL GW	1.2 TSF STIFF	HNU = 3ppm α = 0 cpm β/γ = 80-120cpm
9.5 10.0	15011	7 10	6"	Brownish yellow (10YR, 6/6) CLAY, CL-Mottled, moist, moderately plastic, massive, mod. dil. CLAY.	CL	1.2 TSF STIFF	HNU = 2ppm α = 0cpm β/γ = 80-120cpm
10.5 11.0	15012 N/C 15013 VOA	14 4 Bottles		Total Depth = 10.0 feet Soil Cuttings coming out of hole from 10.0 ft = > 2,000ppm petroleum odors. @ 1120			500ppm petroleum odors being emitted from Auger at 9.0 to 10.5' depth @ 1130 ~~200~~ 20ppm after Lunch.

NOTES: Contractor: Penn Drill
Driller: Dave Newman
Helper: Bill Anderson
Weather: Cloudy & Occasional rain
Rig: CME-45
8" Augers Used — Hollow-Stem

Background @ 1030
HNU = 0 ppm
α = 0 cpm
β/γ = 60-120 cpm
4/2/89

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FERNALD RI/FS

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PIEZOMETER INSTALLATION SHEET

PROJECT NAME Facilities Testing - FMPC RI/FS FIELD ENG./GEO. L. Sinfield DATE 4-2-89
PROJECT NO. 602-3.7 CHECKED BY W.A. Hantel DATE 5-6-89
BORING NO. 1172
PIEZOMETER NO. MW 1172 DATE OF INSTALLATION 4-2-89

BOREHOLE DRILLING

DRILLING METHOD Hollow-Stem Auger 8" I.D.
DRILLING FLUID (S) USED: None
FLUID N/A FROM N/A TO
FLUID N/A FROM N/A TO

TYPE OF BIT Auger Bit (8.0 in)
CASING SIZE (S) USED:
SIZE ~~2" O.D.~~ N/A FROM ~~0.25 ft~~ N/A TO ~~10.0 ft~~ N/A
SIZE FROM TO

PIEZOMETER DESCRIPTION

TYPE Schedule 40 PVC, 2" diameter
DIAMETER OF PERFORATED SECTION 2" inch
PERFORATION TYPE: 0.020"
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.020 inch
TOTAL PERFORATED AREA 5.0 feet

RISER PIPE MATERIAL Schedule 40 PVC Blank
RISER PIPE DIAMETERS:
O.D. 2 inch I.D. 2 inch
LENGTH OF PIPE SECTIONS 5' ft
JOINING METHOD Flush Threads

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH Flush Mount 1.25 feet
PROTECTIVE PIPE O.D. 10 inch

OTHER PROTECTION Locking PVC Cap

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	-0.20			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	1.25			
BOREHOLE FILL MATERIALS: GROUT/SLURRY (cement)	TOP 0.0 ~~0.6 gs~~	BOTTOM 0.6 ~~1.7 gs~~	TOP	BOTTOM
BENTONITE	TOP 0.6	BOTTOM 1.8	TOP	BOTTOM
SAND	TOP 1.8	BOTTOM 10.0	TOP	BOTTOM
GRAVEL	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 4.6	BOTTOM ~~10.0 gs~~ 9.6	TOP	BOTTOM
PIEZOMETER TIP	9.6 ~~7.8 feet~~			
BOTTOM OF BOREHOLE	10.0 feet			
GWL AFTER INSTALLATION	5.35 deep			

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

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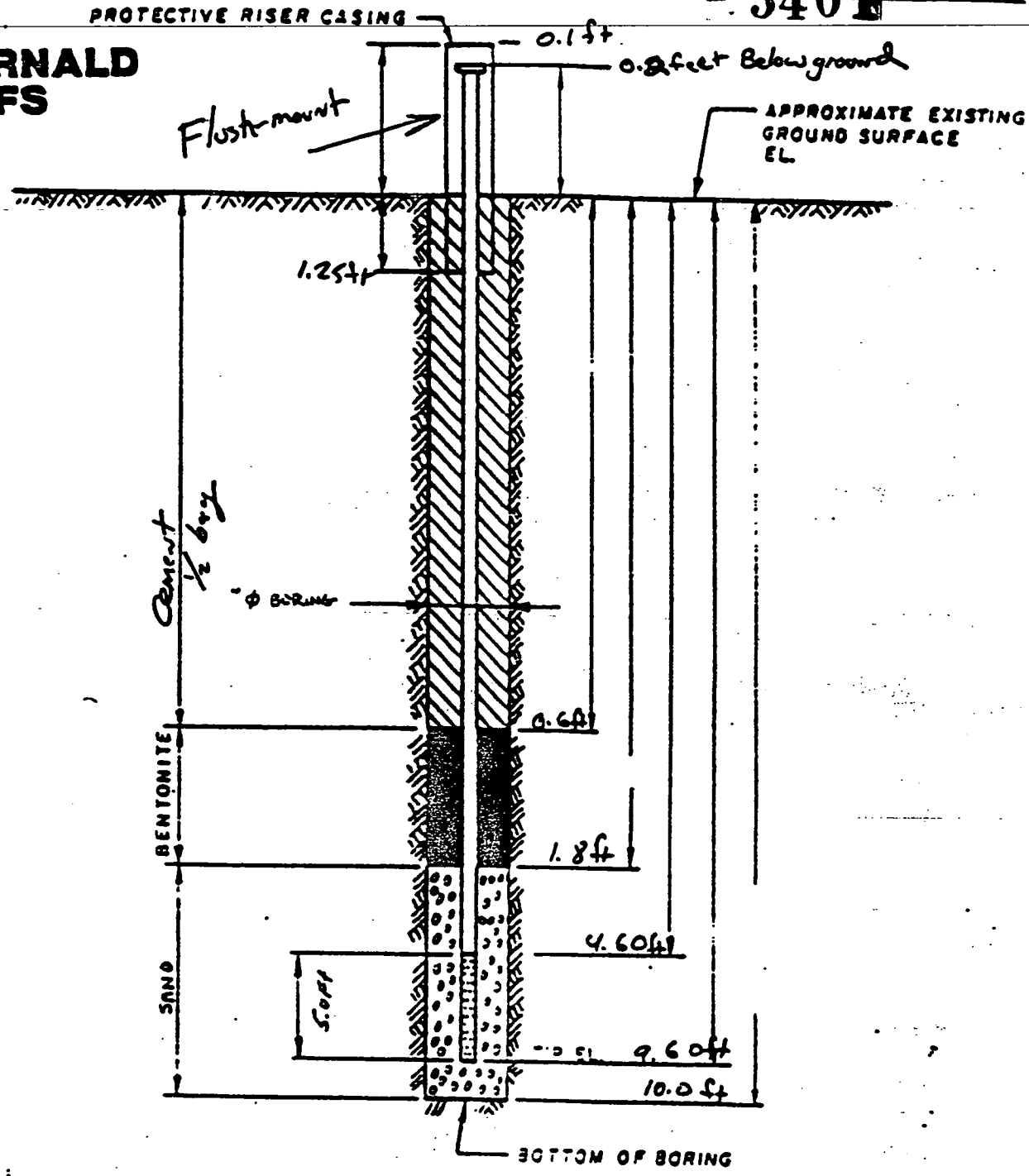
FERNALD RI/FS



DRAWN BY	CHECKED BY / APPROVED BY	DRAWING NUMBER
LS	KAH	5-6-89

NOTES:

1. RISER PIPE IS 2.0 IN I.D. SCHEDULE 40 PVC PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 2.0 IN I.D. PVC PIPE ~~CONTINUOUS~~ SLOT SCREEN (0.020 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL 5.65 feet deep on 4/2/89
5. WATER LEVEL READING ON 4/2/89

Materials used:

2 bags 10X20 Sand
1 bucket bentonite pellets
≈2 gallons water
1/2 bag of cement.

5.0 ft of 0.020 screen PVC
4.4 ft of 2 in ID schedule 40 PVC Blank

INSTALLATION DETAILS
MONITORING WELL

PREPARED FOR

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FERNALD RI/FS

5401

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1133	COORDINATES:	DATE: 04-01-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04-01-89
ENGINEER/GEOLOGIST: M. SLUSARSKI/C. GRUBE	Depth Date/Time	DATE COMPLETED: 04-01-89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF 24

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	15088 1510 04-01	2		STIFF, GREENISH YELLOW-BROWN (2.5Y 4/2) SILTY CLAY, TRACE SAND, TRACE GRAVEL (.25 IN) DAMP			H_{NU} = 0 PPM α = 0 CPM Bγ = 80-120 CPM
1	15089 1510 04-01	3 7	12	AS ABOVE	CL	2.0	
2	15090 1515 04-01	4		STIFF, GREENISH YELLOW-BROWN (2.5Y 4/2) SILTY CLAY, TRACE SAND, TRACE GRAVEL (.25 IN) DAMP			H_{NU} = 0 PPM α = 0 CPM Bγ = 80-120 CPM
	15091 1515 04-01	4	14	AS ABOVE	CL	2.0	
3	15092 1515 04-01	5		AS ABOVE			
	15093	4		STIFF, GREENISH YELLOW-BROWN (2.5Y 4/4) SILTY CLAY, TRACE SAND, TRACE GRAVEL (.25 IN) DAMP			H_{NU} = 0 PPM α = 0 CPM Bγ = 80-120 CPM
4	1520 04-01	8 11	14	AS ABOVE AS ABOVE	CL	2.0	
5	15094 1524 04-01	4		STIFF, GREENISH YELLOW-BROWN (2.5Y 5/4) SILTY CLAY, TRACE SAND, TRACE GRAVEL (.25 IN) DAMP			H_{NU} = 0 PPM α = 0 CPM Bγ = 80-120 CPM
	15095 1524 04-01	7	14	AS ABOVE	CL	1.5	
6	15096 1524 04-01	22		AS ABOVE			
	15097	6		STIFF, GREENISH YELLOW-BROWN (2.5Y 5/4) SILTY CLAY, TRACE SAND TRACE GRAVEL (.25 IN) DAMP 6.5	CL	1.5	H_{NU} = 0 PPM α = 0 CPM Bγ = 80-120 CPM
7	1530 04-01	15 16	14	MEDIUM DENSE, YELLOW-BROWN (10YR 4/3) WELL GRADED GRAVELLY SAND, GRAVEL RANGING (.25-.50 IN) WET 6.9	SW	N/A	
				STIFF, GREENISH YELLOW-BROWN (2.5Y 5/4) TRACE SAND, TRACE GRAVEL (.25 IN) DAMP BASE SAMPLED DEPTH 7.5	CL	1.5	

NOTES:
CONTRACTOR: PENNDRILL
RIG: PENNDRILL AUGER MODEL B
DRILLER: CRAIG COULTER
ASSISTANT: CHRIS COULTER

SAMPLES COLLECTED AS PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: H_{NU} = 0 PPM
α = 0 CPM
Bγ = 40-100 CPM
$LEL O_2$: 0 PPM LEL
20.6% O_2

TOTAL WATER USED IN WELL INSTALLATION: 10 GALS.

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VISUAL CLASSIFICATION OF SOILS

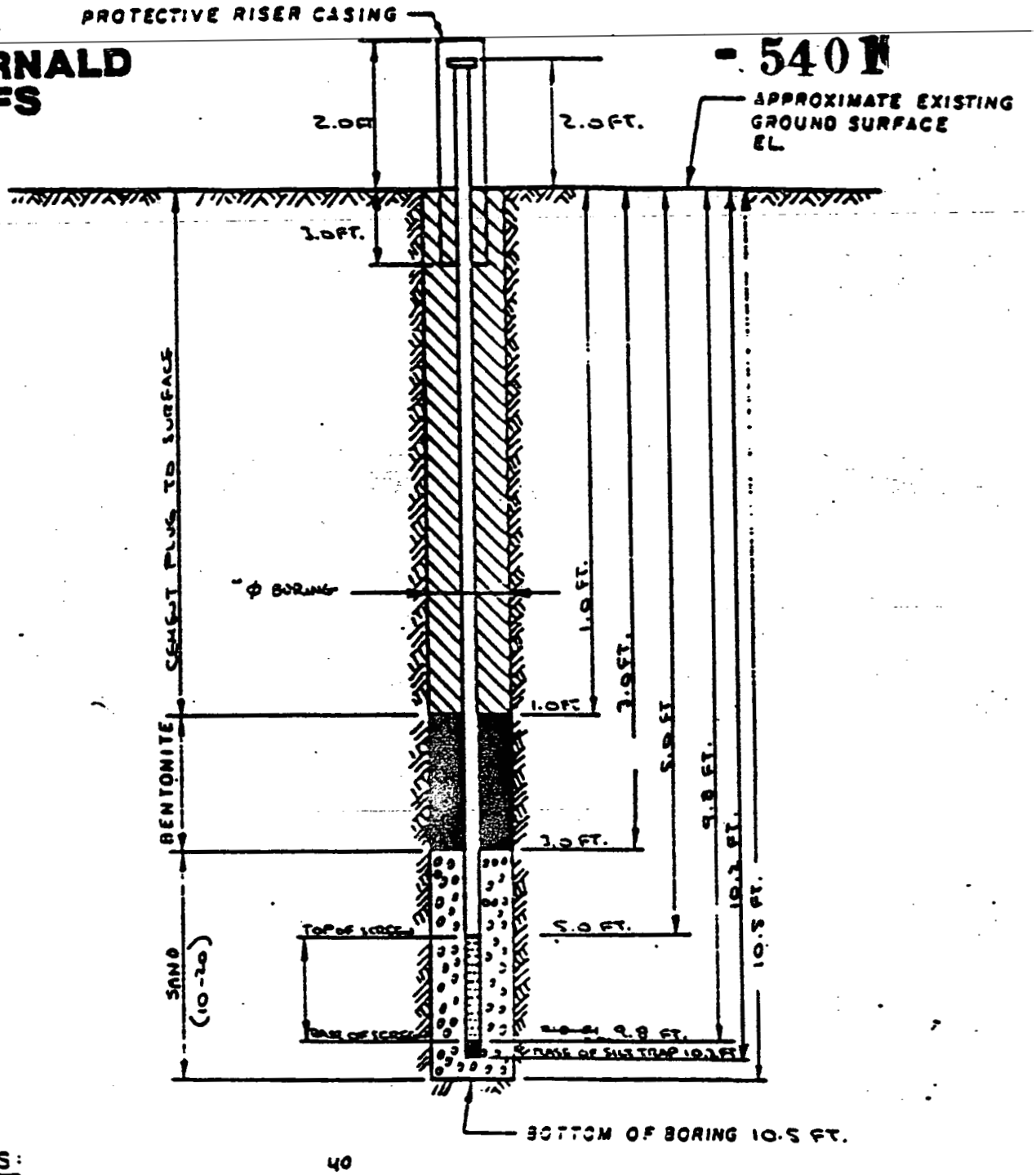
PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1133	COORDINATES:	DATE: 04-02-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04-01-8
ENGINEER/GEOLOGIST: [illegible]/C. [illegible]	Depth Date/Time	DATE COMPLETED: 04-01-
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF X4

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8				NO ADDITIONAL SAMPLES WERE ENCOUNTERED IN INTERVAL 7.5 FT TO 10.5 FT.			
9							
10				BOTTOM OF BORING 10.5			
11							

NOTES:

BORING # 1133

FERNALD RI/FS



DRAWN BY	CHECKED BY	DRAWING NUMBER
MLS	APPROVED BY	
	WAH	
	5-5-92	

NOTES:

1. RISER PIPE IS 2.0 IN I.D. SCHEDULE 40 PVC PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 2.0 IN I.D PVC PIPE ~~CONTINUOUS~~ SLOT SCREEN (0.020 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL N/A
5. WATER LEVEL READING ON N/A

MATERIALS USED IN WELL INSTALLATION:

10-20 SAND: 2 - (80 LB SACKS)

BENTONITE PELLETS: 1 - (5 GAL BUCKET)

CEMENT: 1/2 BAG - (40 LB BAG)

TOTAL WATER USED IN WELL INSTALLATION - 10 GALS.

INSTALLATION DETAILS
MONITORING WELL # 1133

PREPARED FOR

PVC PIPE: 1 - 5.2 FT SCREEN/SILTTRA
1 - 7.0 FT RISER PIPE (CUT TO LENGTH)

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FERNALD RI/FS

- 5401

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS
FIELD ENG./GEO. H. Sluiarski
DATE 04-02-89
PROJECT NO. 602 3.7
CHECKED BY W.A. Hentel
DATE 5-5-89
BORING NO. 1133
PIEZOMETER NO. 1133
DATE OF INSTALLATION 04/01/89

BOREHOLE DRILLING

DRILLING METHOD Auger
TYPE OF BIT Auger (Hollow Stem) 8.0 in
DRILLING FLUID (S) USED:
FLUID N/A FROM — TO —
FLUID N/A FROM — TO —
CASING SIZE (S) USED:
SIZE 4 1/4 ID. FROM 0.0 ft. TO 10.5 ft.
SIZE N/A FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Piezometer
DIAMETER OF PERFORATED SECTION 2.0 in ID.
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS .020 in
TOTAL PERFORATED AREA 4.8 ft.
RISER PIPE MATERIAL PVC Schedule 40
RISER PIPE DIAMETERS:
O.D. 2 5/16 in. I.D. 2.0 in ID
LENGTH OF PIPE SECTIONS 5.2 ft, 7.0 ft.
JOINING METHOD Screw type flush joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 ft.
PROTECTIVE PIPE O.D. 4 3/8 in.
OTHER PROTECTION Hinged locking cover w/ padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	3.0			
BOREHOLE FILL MATERIALS:	TOP 0.0	BOTTOM 1.0		
SURFACE CEMENT PLUG				
GROUT/SLURRY N/A	TOP —	BOTTOM —	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 3.0	TOP	BOTTOM
SAND (10-20)	TOP 3.0	BOTTOM 10.5	TOP	BOTTOM
GRAVEL N/A	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 5.0	BOTTOM 9.8	TOP	BOTTOM
PIEZOMETER TIP	10.2			
BOTTOM OF BOREHOLE	10.5			
GWL AFTER INSTALLATION				

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

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REMARKS

409-11-A

FERNALD RI/FS

- 5401

Date	4-3-89			
Initial	MJC			
	Field Check	1st Ver	2nd Ver	Hard Copy

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3.7	PROJECT NAME: Facilities Testing - FMPC RI/FS		
BORING NUMBER: MW-1174	COORDINATES:	DATE: ~~4/3/89~~ 4-3-	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/3/89	
ENGINEER/GEOLOGIST: L. Sinfield	Depth Date/Time	DATE COMPLETED: 4/3/8	
DRILLING METHODS: CME-45, Trailer-mount, with Hollow Stem Auger		PAGE 1 OF 2	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
½ 1 1.5	15044 15045	20 41 37	6"	Gravel with Sand, GW - Gray and yellowish brown, wet at surface, loose and poorly sorted. Yellowish brown (10YR, 6/4) Clay, CL - Moderately plastic, Hard with Gravel, dry, massive @1030	GW CL	Loose Hard	HNU = Ø ppm α = Ø cpm Bγ = 500 to 600 cpm
2.0 2.5	15046 15047 15048	80 29 27	6"	Brownish Yellow (10YR, 6/6) GRAVEL, GW - Poorly sorted, Wet with Silt and clay matrix. @1415	GW	Loose	HNU = Ø ppm α = Ø cpm Bγ = 150-200 cpm
3.0 3.5 4.0 4.5	15049	15 17 25	18"	Very dark grey (10YR, 3/1) CLAY, CL - Stiff to Very Stiff, mottled, massive, very slightly moist, medium plasticity @ 1119 ~~1259~~	CL	1.0 ↓ 2.5	HNU = Ø ppm α = Ø cpm Bγ = 60-100 cpm
5.0 5.5 6.0	15050 15051 15052	20 20 21	18"	Brownish yellow (10YR, 6/6) to grayish brown (10YR, 5/2) CLAY, CL - Stiff to very stiff, mottled, very slightly moist, massive, med plastic @ 1125	CL	1.0 to 2.5	HNU = Ø ppm α = Ø cpm Bγ = 60 to 100 cpm
6.5 7.0 7.5	15053	3 5 8	18"	Brownish yellow (10YR, 6/6) to grayish brown (10YR, 5/2) CLAY, CL Stiff, mottled, very slightly moist, massive, med. plastic. @1153	CL	1.5 to 1.0	HNU = Ø ppm α = Ø cpm Bγ = 60 to 100 cpm

NOTES: Contractor: Penn Drill
Driller: Dave Jennian
Helper: Bill Anderson
Sample Tech: Cindy Melroy

Background @ 1020
HNU = Ø ppm 4/3
α = Ø cpm
Bγ = 60-100 cpm

0 28

Surface Soil = Bγ = 200-250 cpm

FERNALD RI/FS

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VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3.7	PROJECT NAME: Facilities Testing Borings - FMPC RI/FS	
BORING NUMBER: MW-1174	COORDINATES:	DATE: 4-3-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/3/89
ENGINEER/GEOLOGIST: L. Sinfield	Depth Date/Time	DATE COMPLETED: 4/9/89
DRILLING METHODS: Trailer-mounted CME-45 Hollow-Stem Auger		PAGE 2 OF 24

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8.0 8.5 9.0	15054	13 19 13	18"	Brownish Yellow (10YR, 6/6) to grayish brown (10YR, 5/2) SILT with Clay, ML - Mottled, saturated loose, massive @ 1200	ML	1.0	HNU = Ø ppm α = Ø cpm βγ = 60 to 120 cpm
9.5 10.0 10.5	15055 15056	12 16 19	18"	Brownish yellow (10YR, 6/6) CLAY with Silt, CL - Stiff, moist, massive with occasional pebbles, moderately plastic. @ 1406	ML CL	1.5	HNU = Ø ppm α = Ø cpm βγ = 100-180 cpm
11.0 11.5 12.0	15057	24 23 26	18"	Brownish yellow (10YR, 6/6) CLAY, CL - Stiff, moist, massive, med. plastic Very stiff to hard @ 1412	CL	3.0 to 4.0	HNU = Ø ppm α = Ø cpm βγ = 100-120 cpm
12.5 13.0 13.5				Well set to 10.0' Top at (-) ~~0.25~~ 0.1 4.40 4.75 0.70 Sand 2.0 to 10.0 Bentonite 0.25 to 2.0 Cement to +0.25' to (-)0.25 TD = 4.4 + 4.75 + 0.7 + 0.1 = 9.95'			Background @ 1400 HNU = Ø ppm α = Ø ppm βγ = 60 to 120 cpm (Air) βγ = 200-250 cpm (gnd Surface)

NOTES: See Page 1 of 1

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FERNALD RI/FS

-5401

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Facilities Testing - FMPC RI/FS FIELD ENG./GEO. C. Sinfield DATE 4/4/89
PROJECT NO. 602-3.7 CHECKED BY L.A. Herted DATE 5-6-89
BORING NO. 1174
PIEZOMETER NO. 1174 DATE OF INSTALLATION 4/3/89

BOREHOLE DRILLING

DRILLING METHOD Hollow Stem Auger - 8 inch OD
DRILLING FLUID (S) USED:
FLUID n/a FROM n/a TO n/a
FLUID n/a FROM n/a TO n/a

TYPE OF BIT Auger Bit
CASING SIZE (S) USED:
SIZE ~~8 inch~~ N/A cb FROM ~~0 ft~~ N/A cb TO ~~10 ft~~ N/A cb
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE Schedule 40 PVC
DIAMETER OF PERFORATED SECTION 2 inch ID
PERFORATION TYPE:
SLOTS [x] HOLES [ ] SCREEN [ ]
AVERAGE SIZE OF PERFORATIONS 0.020 inch
TOTAL PERFORATED AREA 4.7 ft

RISER PIPE MATERIAL Schedule 40 PVC Blank
RISER PIPE DIAMETERS:
O.D. 2 1/4 inch I.D. 2 inch
LENGTH OF PIPE SECTIONS 4.40 ft
JOINING METHOD Flush-Threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 1.5 ft
PROTECTIVE PIPE O.D. 10 inch

OTHER PROTECTION Locking Cap

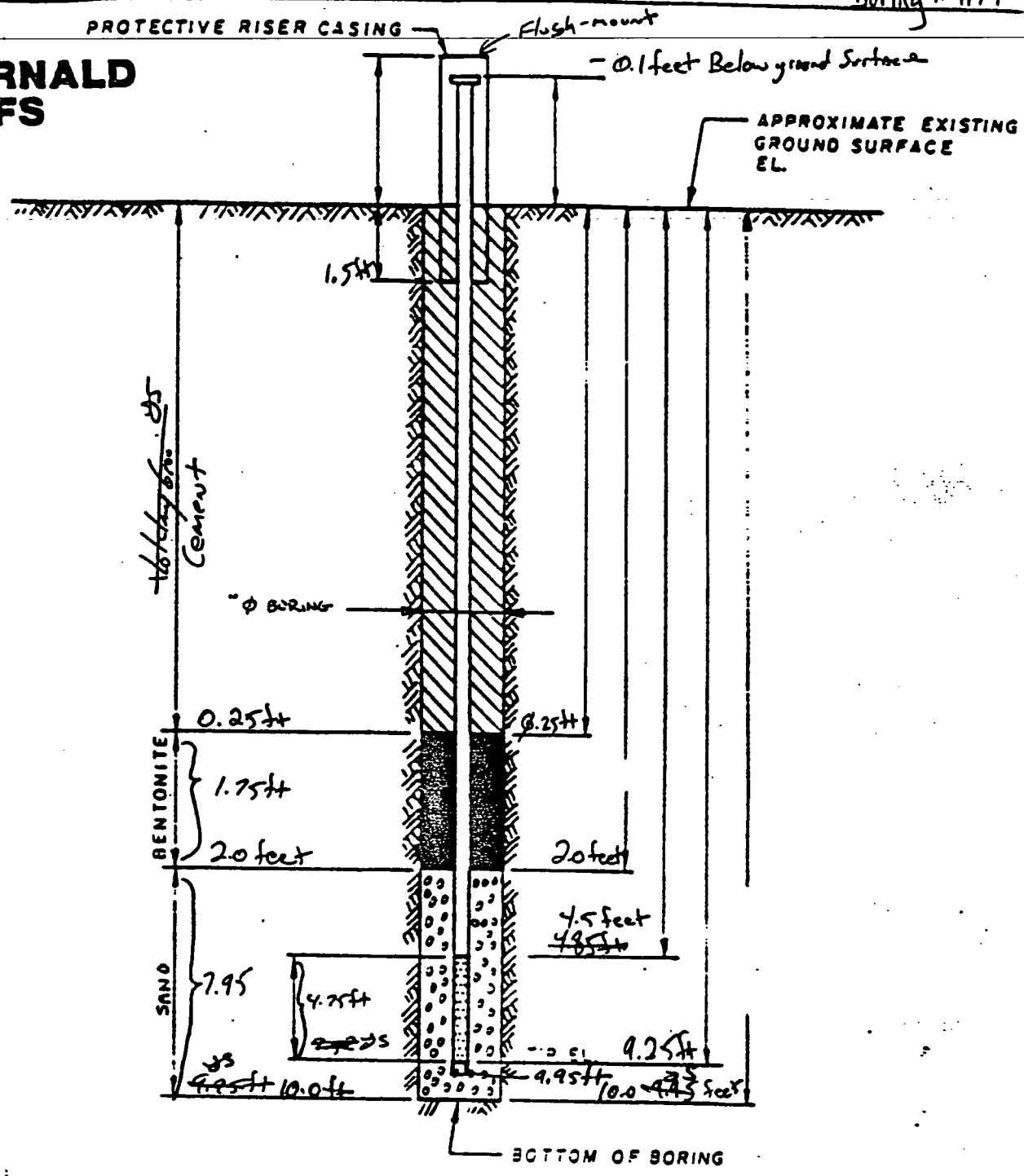
ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	-0.2 ft			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	1.5 ft			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP n/a	BOTTOM n/a	TOP	BOTTOM
BENTONITE	TOP 0.25 ft	BOTTOM 2.0 ft	TOP	BOTTOM
SAND	TOP 2.0 ft	BOTTOM 9.95 ft	TOP	BOTTOM
GRAVEL	TOP n/a	BOTTOM n/a	TOP	BOTTOM
PERFORATED SECTION	TOP 4.5 ft	BOTTOM 9.25 ft.	TOP	BOTTOM
PIEZOMETER TIP	9.95 ft.			
BOTTOM OF BOREHOLE	10.0 ft			
GWL AFTER INSTALLATION	5.65 ft TOC			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES [ ] NO [✓]
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES [ ] NO [✓]

0 30

REMARKS

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 2.0 IN I.D. SCHEDULE 40 PVC PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 2 IN I.D PVC PIPE ~~CONTINUOUS~~ SLOT SCREEN (0.020 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL 1174

PREPARED FOR

0 31

Materials Used:

2 Bags (80 lb) of 10X20 SAND
1 1/2 Buckets of Bentonite Pellets
1/2 Bag of Cement.
1 Flush-mount Protective Cover

2-inch ID Schedule 40 PVC Blank, 4.40 feet
2-inch ID, schedule 40 PVC Screen, 0.020 inch slotted. 4.75 feet.
2 gallons of water

FERNALD RI/FS

- 5401

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: 1171	COORDINATES:	DATE: 4-03-89	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4-03-89	
ENGINEER/GEOLOGIST: M. Slusarski/C. Gruhe	Depth Date/Time	DATE COMPLETED: 4-03-8	
DRILLING METHODS: AUGER (HOLLOW STEM) 8 inch		PAGE 1 OF 4	

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	15098 0920 04-03	3		Stiff, yellowish brown (10 YR 5/4), silty clay, trace sand, trace gravel (.25 in.), organics, damp	CL	1.5	HNU = 0 ppm α = 0 cpm Bγ = 20-40 cpm
1	15099 0920 04-03	4 9	14	As Above		1.5	
2	15100 0925 04-03	4		Stiff, yellowish brown (10 YR 5/4), silty clay, rootlets, trace sand, organics, damp	CL	2.0	HNU = 0 ppm α = 0 cpm Bγ = 40 cpm
	15101 0925 04-03	8	14	As Above		2.0	
3	15102 0925 04-03	9		As Above		2.0	
4	15103 0930 04-03	9 8 4	16	Stiff, yellowish brown (10 YR 5/4), silty clay, rootlets, trace sand, organics, damp	CL	1.5	HNU = 0 ppm α = 0 cpm Bγ = 20-40 cpm
5	15104 0934 04-03	4		Medium stiff, yellowish brown (10 YR 5/4), silty clay, trace sand, organics, very damp	CL	.5	HNU = 0 ppm α = 0 cpm Bγ = 20-40 cpm
	15105 0934 04-03	3	18	As Above 5.5		.5	
6	15106 0934 04-03	2		Soft, yellowish brown (10 YR 5/4), sandy clay, some silt, wet		.25	
7	15107 0950 04-03	1 1 1	6	As Above	CL	.25	HNU = 0 ppm α = 0 cpm Bγ = 40 cpm

NOTES: CONTRACTOR: PENN DRILL
RIG: Model B
DRILLER: Craig Coulter
ASSISTANT: Chris Coulter

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION T
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α = 0 CPM
Bγ = 40-80 CPM
LEL O_2: LEL = 0 PPM
O_2 = 20.6 %

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS - 540

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1171	COORDINATES:	DATE: 4-03-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4-03-89
ENGINEER/GEOLOGIST: M. Slusarski/C. Grube	Depth Date/Time	DATE COMPLETED: 4-03-89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF 24

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	15108	3		Stiff, yellowish brown (10 YR 5/4), silty Clay, damp			HNU = 0 ppm α = 0 cpm Bγ = 40-60 cpm
	0955	5	18		CL	2.0	
9	04-03	13		Depth of Sampling/Depth of Boring 9.0			
10							HNU = α = Bγ =
11							HNU = α = Bγ =
12							HNU = α = Bγ =
13							HNU = α = Bγ =
14							HNU = α = Bγ =

NOTES:

0 33

FERNALD RI/FS

-.5401

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS
PROJECT NO. 602 3.7
BORING NO. 1171
PIEZOMETER NO. 1171

FIELD ENG./GEO. M. Slusarek DATE 04-03-89
CHECKED BY U.A. Hertel DATE 5-5-89
DATE OF INSTALLATION 04-03-89

BOREHOLE DRILLING

DRILLING METHOD Auger
DRILLING FLUID (S) USED:
FLUID N/A FROM — TO —
FLUID N/A FROM — TO —

TYPE OF BIT Auger (8 in. Hollow Stem)
CASING SIZE (S) USED:
SIZE ~~4 1/4 in ID~~ N/A CB FROM ~~0.0 ft.~~ N/A CB TO ~~9.0 ft.~~ N/A CB
SIZE N/A FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Piezometer
DIAMETER OF PERFORATED SECTION 2.0 in ID
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS .020 in
TOTAL PERFORATED AREA 4.8 ft.

RISER PIPE MATERIAL PVC
RISER PIPE DIAMETERS:
O.D. 2 3/8 in I.D. 2.0 in
LENGTH OF PIPE SECTIONS ~~5.2 ft~~ CB, 5.0 ft.
JOINING METHOD Screw type flush joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 ft.
PROTECTIVE PIPE O.D. 4 3/8 in

OTHER PROTECTION Hinged locking cover w/padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft.)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	3.0			
BOREHOLE FILL MATERIALS:				
~~GROUT~~/SLURRY (cement)	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 2.0	TOP	BOTTOM
SAND	TOP 2.0	BOTTOM 9.0	TOP	BOTTOM
GRAVEL N/A	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 3.0	BOTTOM 7.8	TOP	BOTTOM
PIEZOMETER TIP	8.2			
BOTTOM OF BOREHOLE	9.0			
GWL AFTER INSTALLATION	—			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒ UAH 5-5-89

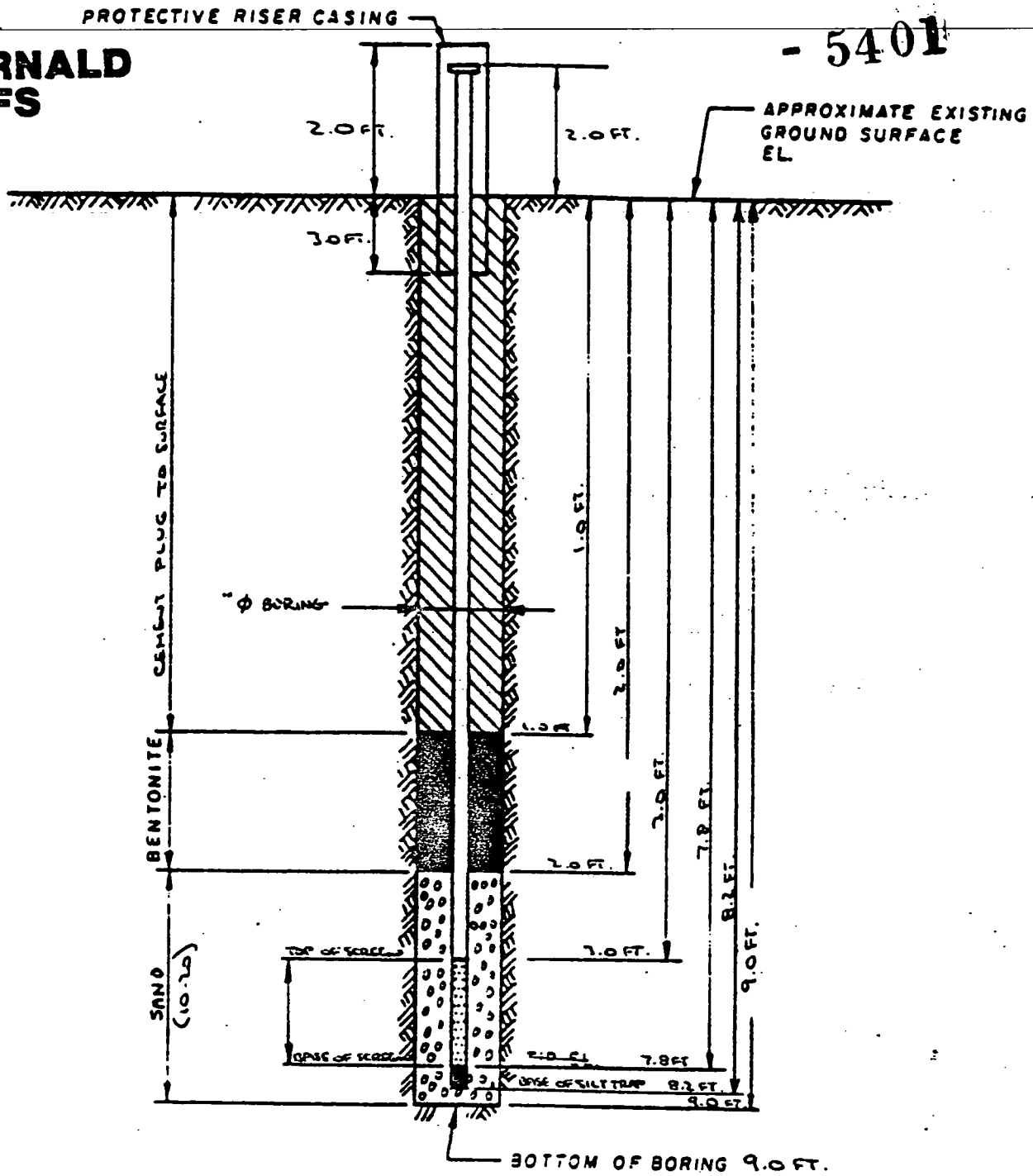
REMARKS Potable water (150 gallons) was used to flush silty clays ~~that~~ from the bore hole prior to piezometer installation.

PG 4 of 6

BORING #1171

- 5401

FERNALD RI/FS



DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
MLS	WAH		5-5-49

NOTES:

1. RISER PIPE IS 2.0 IN I.D. SCHEDULE 40 PVC PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 2.0 IN I.D PVC PIPE ~~CONTINUOUS~~ SLOT SCREEN (0.020 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL N/A
5. WATER LEVEL READING ON N/A

MATERIALS USED IN WELL INSTALLATION:
10-20 SAND : 3 - 80 LB SACKS
BENTONITE PELLETS : 1 - 5 GAL BUCKET.
CEMENT : 1/2 BAG - 40 LB SACK
WATER USED IN WELL INSTALLATION : 150 GAL.

INSTALLATION DETAILS
MONITORING WELL #1171

PREPARED FOR

PVC PIPE : 1 - 5.2 FT SCREEN / SILT TRAP
1 - 5.0 FT RISER PIPE (CUT TO LENGTH)

0 35

FERNALD RI/FS

- 5401

E.T. 4-17-89

Field Check	1st Key In	2nd Key In	Hard Copy
Initial	WAH		
Date	4-5-89		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1160	COORDINATES:	DATE: 4-4-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4-4-89
ENGINEER/GEOLOGIST: C. Grube/M. Skwarski	Depth Date/Time	DATE COMPLETED: 4-4-89
DRILLING METHODS: AUGER (HOLLOW STEM) 8 inch		PAGE 1 OF 2

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	16199 0823 04-04	2		Medium Stiff, dark yellowish brown (10YR ~~5/4~~ 4/3); silty clay; trace sand; trace gravel (.25 in); organics; damp.			HNU = 0 ppm α = 0 cpm Bγ = 40-90 cpm
1	16200 0823 04-04	3 4	13	As Above	CL	1.0	
2	16201 0825 04-04	6		Stiff, yellowish brown (10YR 5/4) silty clay, trace sand, trace gravel (.25 in), rootlets organics, slightly damp		1.75	HNU = 0 ppm α = 0 cpm Bγ = 60-100 cpm
	16202 0825 04-04	11	10	As Above	CL	1.75	
3	16203 0825 04-04	18		As Above		2.0	
4	16204 0830 04-04	6 11 18	11	Very Stiff, yellowish brown (10YR 5/4) silty clay, trace sand, trace gravel (.25 in), rootlets organics, damp	CL	2.75	HNU = 0 ppm α = 0 cpm Bγ = 50-90 cpm
5	16205 0835 04-04	28		Very Stiff, yellowish brown, ~~sat~~ (10YR 5/4) silty clay, trace sand, organics, rootlets, damp		2.5	HNU = 0 ppm α = 0 cpm Bγ = 70-90 cpm
	16206 0835 04-04	20	12	As Above	CL	2.5	
6	16207 0835 04-04	21		Stiff, yellowish brown (10YR 5/4), silty clay, trace sand, organics, rootlets, damp		1.75	
7	16208 0848 04-04	3 4 6	10	Soft, yellowish brown (10YR 5/4), (.25-.5 in) gravelly clay, some sand, trace silt, organics, very damp	CL	.25	HNU = 0 ppm α = 0 cpm Bγ = 60-80 cpm

NOTES: CONTRACTOR: PENN DRILL
RIG: Model B
DRILLER: Craig Coulter
ASSISTANT: Chris Coulter

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION T
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α = 0 CPM
Bγ = 40-100 CPM
LEL O_2: LEL = 0 PPM
O_2 = 20.6 %

FERNALD RI/FS

- 540

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1160	COORDINATES:	DATE: 4-4-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4-4-89
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 4-4-89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF ~~2~~ 4

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	16209	1		Soft, yellowish brown (10 YR 5/4), sandy clay, trace silt, some gravel (.25 in) wet		.25	Hnu = 0 ppm α = 0 cpm Bγ = 50-70 cpm
	0910	1	15	8.5	CL		
9	04-04	6		Stiff, yellowish brown (10 YR 5/4), silty clay, trace sand, damp ~~Depth of Sampling & Boring~~ CG 9.0 Depth of Boring 9.5 FT		1.5	
10							Hnu = α = Bγ =
11							Hnu = α = Bγ =
12							Hnu = α = Bγ =
13							
14							Hnu = α = Bγ =

NOTES:

0 37

FERNALD RI/FS

- 5401

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS
FIELD ENG./GEO. C. Gaube DATE 4/04/89
PROJECT NO. 602 3.7
CHECKED BY W.A. Herbel DATE 5-5-89
BORING NO. 1160
PIEZOMETER NO. 1160
DATE OF INSTALLATION 4/04/89

BOREHOLE DRILLING

DRILLING METHOD Auger
DRILLING FLUID (S) USED:
FLUID N/A FROM — TO —
FLUID N/A FROM — TO —

TYPE OF BIT Auger (Hollow Stem) 8.0 in.
CASING SIZE (S) USED:
SIZE ~~4 1/4 ID~~ N/A cy FROM ~~0.0 FT~~ N/A cy TO ~~9.5 FT~~ N/A cy.
SIZE N/A FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Piezometer
DIAMETER OF PERFORATED SECTION 2.0 in ID
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.20 in
TOTAL PERFORATED AREA 3.5 FT

RISER PIPE MATERIAL PVC
RISER PIPE DIAMETERS:
O.D. 2 5/16 in I.D. 2.0 in ID
LENGTH OF PIPE SECTIONS ~~3.5 FT~~ cy, 8.0 FT
JOINING METHOD Screw type flush joint threaded.

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 4 3/8 in

OTHER PROTECTION Hinged locking cover with padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.8			
BOREHOLE FILL MATERIALS:	TOP 0.0	BOTTOM 2.0		
Surface Cement Plug GROUT/SLURRY	TOP —	BOTTOM —	TOP	BOTTOM
BENTONITE	TOP 2.0	BOTTOM 4.0	TOP	BOTTOM
SAND (10-20)	TOP 4.0	BOTTOM 9.5	TOP	BOTTOM
GRAVEL N/A	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 6.0	BOTTOM 9.5	TOP	BOTTOM
PIEZOMETER TIP	9.5 FT			
BOTTOM OF BOREHOLE	9.5 FT			
GWL AFTER INSTALLATION				

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

REMARKS

0 38

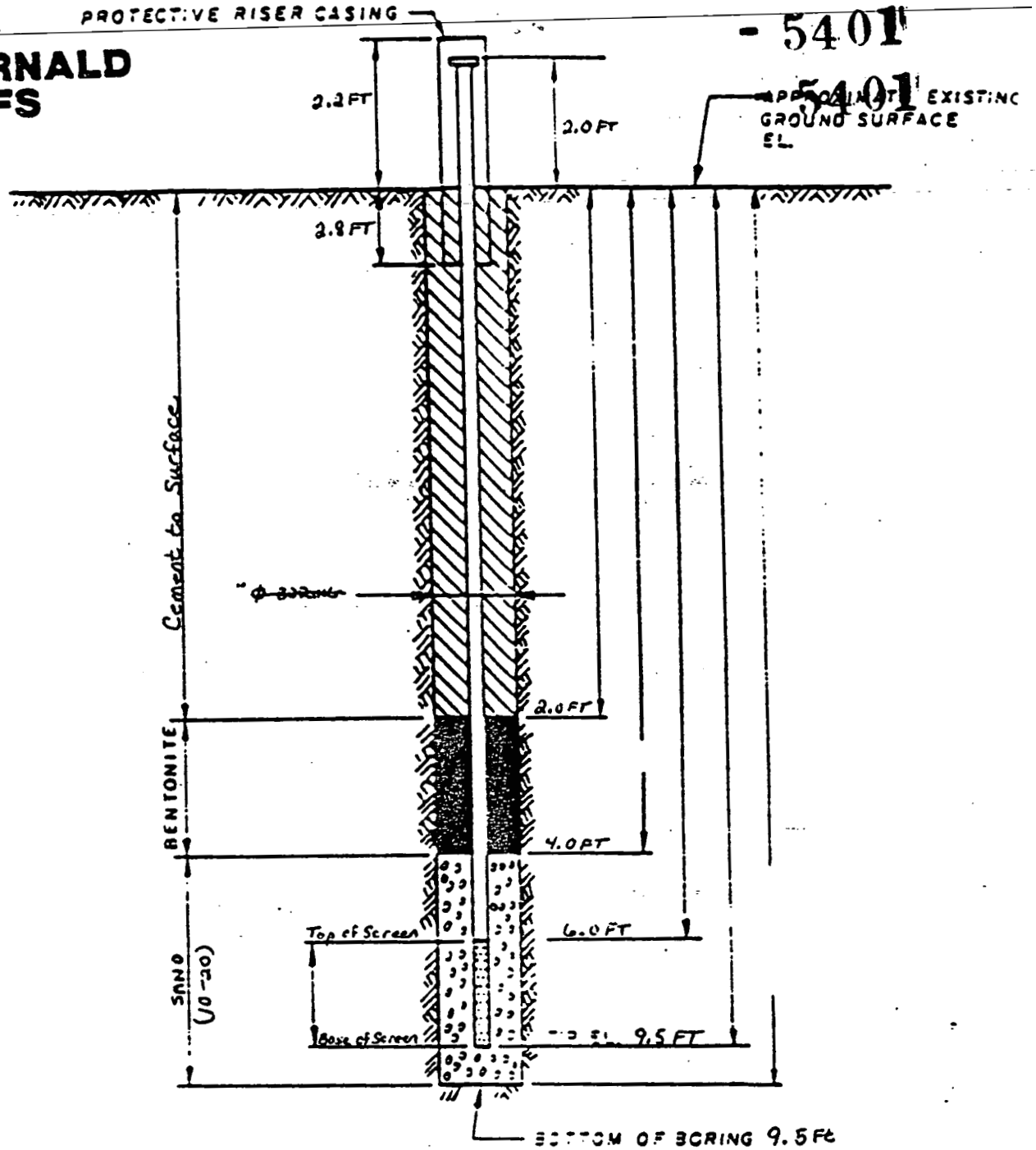
409

Boring # 1160

- 5401

5401

FERNALD RI/FS



DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
CG	LAH		5-5-89

NOTES:

1. RISER PIPE IS 2 IN 1.0 SCHEDULE 40 PVC PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 2.8 IN 1.0 PVC PIPE ~~CONTINUOUS~~ SLOT SCREEN (0.020 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL N/A
5. WATER LEVEL READING ON N/A

Materials used during well installation:
10-20 sand - 2 80 lb sacks
Bentonite Pellets 1-5 gal bucket
Cement: ½ sack

INSTALLATION DETAILS
MONITORING WELL # 1160.

PREPARED FOR
FMPC RI/FS

PVC Riser Pipe/Well screen = 1 - 3.5 FT Screen with bottom (cut to length)
1 - 8.0 FT Riser pipe (cut to length)

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FERNALD RI/FS

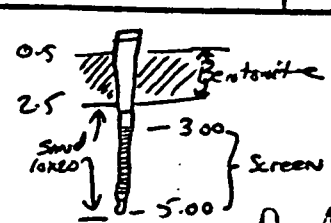
540

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: Facilities Testing 602-3.7-FMPC RI		
BORING NUMBER: MW-1165	COORDINATES:		DATE: 4/4/89
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 4/4/89
ENGINEER/GEOLOGIST: L. Sinfield	Depth	Date/Time	DATE COMPLETED: 4/4/89
DRILLING METHODS: CME-45 Hollow-Stem Auger with Split spoon			PAGE 1 OF 3

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
							Start @ 0900
0.5	16309	2		Gravel, GW - Loose, moist, massive		Loose	HNU = Ø ppm
1.0	16310	2	6"		GW		α = Ø cpm
1.5	No Rec.	3		@ 0909			βγ = 200-300 cpm
2.0	16311	3		Very Dark Grey (10YR, 3/1) CLAY, CL - Stiff, Very Slightly Moist, medium plastic, massive. Gravel at top	GW	1.0 to 1.5 TSF	HNU = Ø ppm
2.5	16312	2	12"		CL		α = Ø cpm
3.0	16313	5		@ 0900			βγ = 120 to 160 cpm
3.5	16314	7	18"	Gravel, GW - Pea sized, Loose Wet (saturated), sand matrix, from 3.0 to 3.5 feet. To dark grey	GW	1.0 to 2.5 TSF	HNU = Ø ppm
4.0		11		3.5 to 4.5' Brownish Yellow (10YR, 6/6) CLAY, CL - Mottled, Stiff to very stiff, Medium plastic, massive, slightly moist.	CL		α = Ø cpm
4.5		12					βγ = 80 to 120 cpm
							@ 0935
5.0	16315	7	18"	4.5' to 5.0' Gravel, GW - Pea sized, loose, saturated,	GW	1.0 to 1.5 TSF	HNU = Ø ppm
5.5	16316	8		5.0' to 6.0' Brownish Yellow (10YR, 6/6) to Dark Grey CLAY, CL - Mottled, Stiff, med plastic, slightly moist.	CL		α = Ø cpm
6.0	16317 No Rec.	15		@ 940			βγ = 80 to 120 cpm
6.5	~~16318~~ 35			Well Set 2" dia well Screen 5.0' to 3.00' deep Blank 3.00' to 0.0' deep Sand (10x20) 5.0' to 2.5' deep 2 bags Bentonite Pellets 2.5' to 0.5' deep 1 bucket			~~HNU = 35~~ ~~α = 35~~ ~~βγ = 35~~ Sch 40 PVC Blank & Screen 0.020" screen
7.0							
7.5							

NOTES: Contractor: Penn Drill
Driller: Dave Newman
Helper: Bill Anderson
Sample Tech: Cindy Melroy
Weather: Cloudy 35-55°F
No Rec. = No Recovery



Background @ 0900 4/4
HNU = Ø ppm
α = Ø cpm
βγ = 80 to 160 cpm

0 40

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET - 5401

PROJECT NAME Facilities Testing - FMPC RI/FS FIELD ENG./GEO. C. Sinfield DATE 4/4/89
PROJECT NO. 602-3.7 CHECKED BY W A Harbel DATE 5-5-89
BORING NO. 1165
PIEZOMETER NO. 1165 DATE OF INSTALLATION 4/4/89

BOREHOLE DRILLING

DRILLING METHOD Hollow Stem Auger
DRILLING FLUID (S) USED:
FLUID N/a FROM N/a TO N/a
FLUID N/a FROM N/a TO N/a

TYPE OF BIT Auger Bit (8.0 in)
CASING SIZE (S) USED:
SIZE ~~8 inch~~ N/A GB FROM ~~0.0 ft~~ N/A GB TO ~~5.0 ft~~ N/A GB
SIZE N/a FROM N/a TO N/a

PIEZOMETER DESCRIPTION

TYPE Schedule 40 PVC
DIAMETER OF PERFORATED SECTION 2-inch
PERFORATION TYPE:
SLOTS ☑ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.020 inch
TOTAL PERFORATED AREA 2.0 ft

RISER PIPE MATERIAL Schedule 40 PVC Blank
RISER PIPE DIAMETERS:
O.D. 2 1/4 inch I.D. 2 inch
LENGTH OF PIPE SECTIONS 3.0 ft
JOINING METHOD Flush-Threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 1.0 ft
PROTECTIVE PIPE O.D. 4-inch

OTHER PROTECTION Locking Cap

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	~~0.5 ft~~ 0.5 ft			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	1.0 ft			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP N/a	BOTTOM N/a	TOP	BOTTOM
BENTONITE	TOP 0.5 ft	BOTTOM 2.5 ft	TOP	BOTTOM
SAND	TOP 2.5	BOTTOM 5.0 ft	TOP	BOTTOM
GRAVEL	TOP N/a	BOTTOM N/a	TOP	BOTTOM
PERFORATED SECTION	TOP 3.0 ft	BOTTOM ~~5.0 ft~~ 4.8 ft 5-4-89	TOP	BOTTOM
PIEZOMETER TIP	5.0 ft			
BOTTOM OF BOREHOLE	5.0 ft			
GWL AFTER INSTALLATION	Dry			

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

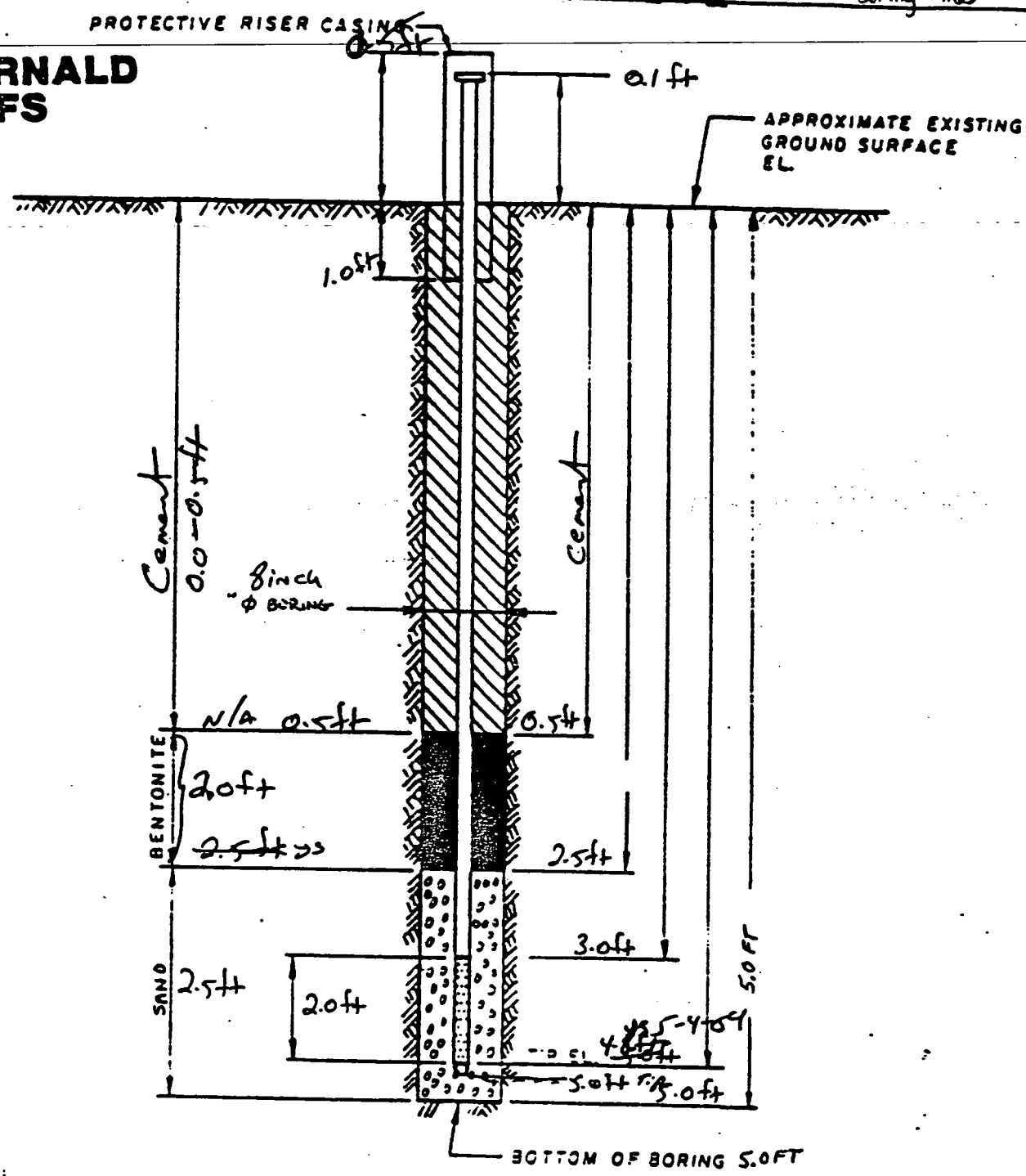
REMARKS

0 41

5401

Boring # 1165

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 2.0IN I.D. SCHEDULE 40 PVC PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 2.0IN I.D PVC PIPE ~~CONTINUOUS~~ SLOT SCREEN (0.020 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL 1165

PREPARED FOR

Materials Used:
1 Bucket Bentonite Pellets
2 gallons of water
2-80lb bags of 10x20 Sand
3 feet of Schedule 40 PVC Blank - 2 inch ID
2 feet of Schedule 40 PVC, 0.020 inch slotted, 2 inch ID

0 42

DRAWING NUMBER | CHECKED BY | APPROVED BY | DRAWN BY

FERNALD RI/FS

Field Copy

16309-16330

- 5401

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3.7	PROJECT NAME:		
BORING NUMBER: MW-1165	COORDINATES:		DATE: 4/4/89
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 4/4/89
ENGINEER/GEOLOGIST: L. Sinfield	Depth	Date/Time	DATE COMPLETED: 4/4/89
DRILLING METHODS: CME-45			PAGE 1 OF 1

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (0/2)	RECOVERY (2)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1/2	16309	2		Gravel, moist, loose		loose	HNU = Ø ppm
1.0	16310 NR	2	6"	massive	GW		α = Ø cpm
		3					Bγ = 200-300 cpm
1.5	16311 NR	3		Very dark grey (10YR, 3/1)			HNU = 0
2.0	16312	2	12"	Clay, CC, - very sl. moist	CL	1.0 to 1.5	α = 0
2.5	16313	5		med. plastic, massive, gravel at top			Bγ = 120-160 cpm
3.0	16314	7		Peasized gravel, wet, massive	GW		HNU = 0
3.5		11	18"	loose 3.0-3.5			α = 0
4.0		12		3.5-4.5 Clay, mottled, massive, med plastic, brownish yellow (10YR, 6/6) to dark grey	CC	1.0 2.5	Bγ = 80-120 cpm
4.5	16315	7		mottled brownish yellow (6/6)		1.0	HNU = 0
5.0	16316	9	18"	Stiff clay, massive, med plastic	CL	1.5	α = 0
5.5	NC	15					Bγ = 80-120 cpm
6.0							
6.5				Well Set ~~4.0-2.0~~ screen 5.0-3.00			
7.0				~~4.0-1.5~~ 1.5-0.0 3.00-0			
7.5							

NOTES: Dave Newman, Bill Anderson, Cindy Melroy

50m ... So what?

CHKD APR 04 1989

Sand 50-2.5' Bentonite 2.5' to 0.5'

Background @ 0900 4/4/89

HNU = Ø ppm

α = Ø cpm

Bγ = 80-160 cpm

0 43

402-1

FERNALD
RI/FS

- 5401

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: 1152	COORDINATES:	DATE: 04-04-89	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04-04-89	
ENGINEER/GEOLOGIST: C. Grube/M. Slusarski	Depth Date/Time	DATE COMPLETED: 04-05-89	
DRILLING METHODS: AUGER (HOLLOW STEM) Pinch		PAGE 1 OF 3 5	

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	16023 1345 04-04	1	15	Stiff, dark yellowish brown (10YR 4/4) silty clay, trace sand, trace gravel (.25 in), organics, rootlets, damp	CL	1	HNU = 0 ppm α = 0 cpm Bγ = 60-100 cpm
	16024 1345 04-04	4 4		As Above		1.5	
2	16025 1350 04-04	3	16	Stiff, yellowish brown (10YR 5/4) silty clay, trace sand, rootlets, organics, damp	CL	1	HNU = 0 ppm α = 0 cpm Bγ = 80-110 cpm
	16026 1350 04-04	6		As Above		1.5	
3	16027 1350 04-04	8		As Above		1.5	
4	16028 1355 04-04	3 7 6	12	Medium stiff yellowish brown (10YR 5/4), silty clay, trace sand, trace gravel (.25 in), rootlets, organics, damp	CL	.5	HNU = 0 ppm α = 0 cpm Bγ = 60-80 cpm
5	16029 1400 04-04	6	16	Medium stiff, yellowish brown (10YR 5/4), silty clay, trace sand, organics, rootlets, damp	CL	.5	HNU = 0 ppm α = 0 cpm Bγ = 120-140 cpm
	16030 1400 04-04	7		As Above		.5	
6	16031 1400 04-04	10		As Above		1.0	
7	16032 1407 04-04	2 2 4	16	Medium stiff, yellowish brown (10YR 5/4), silty clay, trace sand, trace gravel (.25 in to .50 in), organics, very damp	CL	1.0	HNU = 0 ppm α = 0 cpm Bγ = 80-100 cpm

NOTES: CONTRACTOR: PENNDRILL
RIG: Model B
DRILLER: Gaig Coulter
ASSISTANT: Chris Coulter

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TE
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α = 0 CPM
Bγ = 40-120 CPM

LELO$_2$: LEL = 0 PPM
O_2 = 20.6 %

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

- 540M

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1152	COORDINATES:	DATE: 04-04-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04-04-89
ENGINEER/GEOLOGIST: C. Grubs/M. Slusarski	Depth Date/Time	DATE COMPLETED: 04-05-89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF ~~3~~ 5

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	16033 1430 04-04	8 9 15	16	Stiff, yellowish brown (10YR 5/4) silty clay, trace sand, organics, damp.	CL	1	HNU = 0 ppm α = 0 cpm Bγ = 80-100 cpm
9 10	16034 1525 04-04	8 10	18	Stiff, yellowish brown (10YR 5/4), silty clay, trace sand, trace gravel (.25 in - .5 in), organics, damp	CL	1	HNU = 0 ppm α = 0 cpm Bγ = 80-100 cpm
	16035 1525 04-04	14		As Above			
11 12	16036 1530 04-04	6 6 12	13	Stiff, yellowish brown (10YR 5/4) silty clay, trace gravel (.25 in), trace sand, organics, damp	CL	1.5	HNU = 0 ppm α = 0 cpm Bγ = 100-120 cpm
13	16037 1525 04-04	17 18 21	18	Stiff, yellowish brown (10YR 5/4), silty clay, trace sand, trace gravel (.25 in), organics, damp	CL	1.5	HNU = 0 ppm α = 0 cpm Bγ = 80-100 cpm
14	16038 1612 04-04	3 4 13	18	Medium stiff, Yellowish brown (10YR 5/4) silty Clay, rootlets, organics, trace sand, trace gravel (.25 in), damp Base of Yellowish brown Clay (10YR 5/4) 15.0 FT	CL	.5 1.0	HNU = 0 ppm α = 0 cpm Bγ = 100-120 cpm

NOTES:

FERNALD RI/FS

- 5401

VISUAL CLASSIFICATION OF SOILS

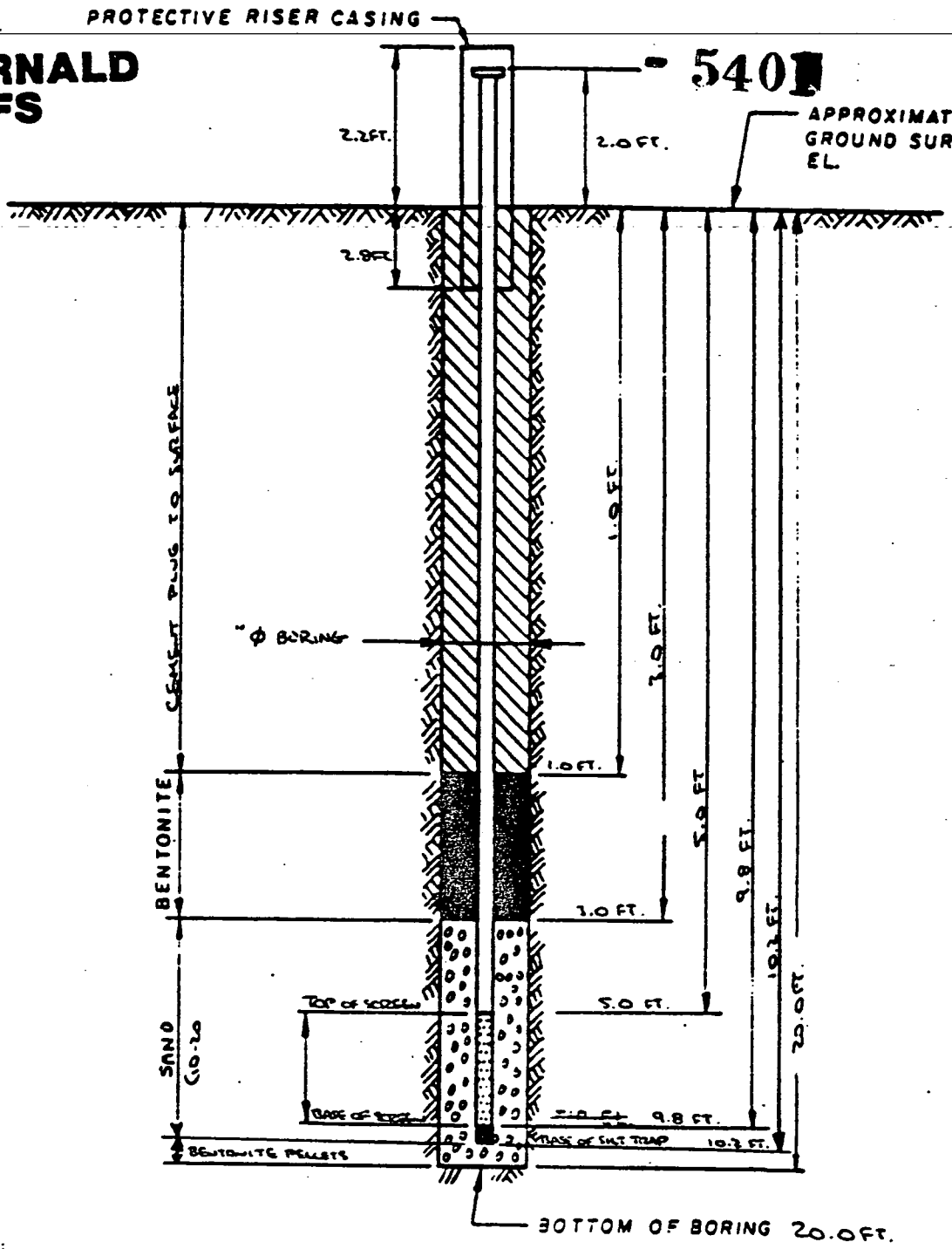
PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1152	COORDINATES:	DATE: 04-04-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04-04-89
ENGINEER/GEOLOGIST: C. Grube/M. Sluzarski	Depth Date/Time	DATE COMPLETED: 04-05-89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 3 OF 5

DEPTH	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	16039 1620 04-04	8	18	Stiff, Dark gray (5Y 4/1), silty clay, trace sand, trace gravel (up to .5 in), damp	CL	1	HNU = 0 ppm α = 0 cpm BG = 100-120 cpm
	16040 1620 04-04	12 13		As Above		1	
17	16041 1645 04-04	3 4 2	12	Medium stiff, dark gray (5Y 4/1) silty clay, trace sand, trace gravel (up to .5 in), rootlets, damp	CL	.5 .75	HNU = 0 ppm α = 0 cpm BG = 100-140 cpm
18 19	16042 1710 04-04	7 14 21	12	Medium stiff, dark gray (5Y 4/1) silty clay, trace sand, trace gravel (.25 in), damp	CL	.5	HNU = 0 ppm α = 0 cpm BG = 80-100 cpm
20	16043 1710 04-04			As Above Bottom of Boring & Sampling 20.0 FT	CL	1.0	HNU = 0 ppm α = 0 cpm BG = 80-100 cpm

NOTES:

BORING # 1152

FERNALD RI/FS



DRAWING NUMBER	5-C-89
CHECKED BY	WAH
APPROVED BY	
MIS.	
DRAWN BY	

NOTES:

1. RISER PIPE IS 2.0 IN I.D. SCHEDULE 40 PVC PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 2.0 IN I.D PVC PIPE ~~CONTINUOUS~~ SLOT SCREEN (0.020 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL N/A
5. WATER LEVEL READING ON N/A

MATERIALS USED IN WELL INSTALLATION:
10-20 SAND: 4 - 80LB SACKS
BENTONITE PELLETS: 4 - 5 GAL. BUCKETS
CEMENT: 1/2 BAG

WATER USED IN WELL INSTALLATION: 5 GAL.

INSTALLATION DETAILS
MONITORING WELL # 1152

PREPARED FOR

PVC PIPE: 1 - 5.2 FT. SCREEN / SILT TRAP
1 - 7.0 FT RISER PIPE (CUT TO LENGTH)

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET 5401

PROJECT NAME Fernald RI/FS - FMPC
FIELD ENG./GEO. M. Sluszalski DATE 04-05-89
PROJECT NO. 602 3.7
CHECKED BY W.A. Hertel DATE 5-5-89
BORING NO. 1152
PIEZOMETER NO. 1152
DATE OF INSTALLATION 04-05-89

BOREHOLE DRILLING

DRILLING METHOD Auger	TYPE OF BIT Auger (8.0 in Hollow Stem)
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID N/A FROM — TO —	SIZE ~~4 1/4 in ID~~ N/A CB FROM ~~0.0 ft.~~ N/A CB TO ~~20.0 ft.~~ N/A CB
FLUID N/A FROM — TO —	SIZE N/A FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Piezometer	RISER PIPE MATERIAL PVC
DIAMETER OF PERFORATED SECTION 2.0 in ID	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 2 5/16 in I.D. 2.0 in.
SLOTS ☒ HOLES ☐ SCREEN ☐	LENGTH OF PIPE SECTIONS ~~5.2 ft~~ CB, 7.0 ft.
AVERAGE SIZE OF PERFORATIONS .020	JOINING METHOD Screw type flush
TOTAL PERFORATED AREA 4.8 ft.	joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 ft.	OTHER PROTECTION Hinged locking
PROTECTIVE PIPE O.D. 4 3/8 in	cover w/ padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft.)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.8			
BOREHOLE FILL MATERIALS:				
~~GROUT~~/SLURRY (cement)	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0 10.2	BOTTOM 3.0 20.0	TOP	BOTTOM
SAND (10-20)	TOP 3.0	BOTTOM 10.2	TOP	BOTTOM
GRAVEL N/A	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 5.0	BOTTOM 9.8	TOP	BOTTOM
PIEZOMETER TIP	10.2 ft.			
BOTTOM OF BOREHOLE	20.0 ft			
GWL AFTER INSTALLATION				

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

0 48

REMARKS

409-11-86

4/15/89 CG

FERNALD RI/FS

- 5401

VISUAL CLASSIFICATION OF SOILS

Date	5-5-89			
Initial	JAH			
	Field Check	1st Key In	2nd Key In	Hard Copy Verification

PROJECT NUMBER: 602- 3.7	PROJECT NAME: Facilities Testing Program - FMPC RI/FS	
BORING NUMBER: 1164	COORDINATES:	DATE: 4/4/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/4/89
ENGINEER/GEOLOGIST: L. Sinfield	Depth Date/Time	DATE COMPLETED: 4/5/89
DRILLING METHODS: CME-45, Hollow-Stem Auger with Split Spoon		PAGE 1 OF 35

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
							4/4/89 Start = 1120
0.5	16287 WMCO	5	6"	Interbedded Clay and Gravel, CL-GW - Dark grey (10YR, 6/1), dry, lean massive, stiff, medium plastic clay with silt, intebedded with gravel, wellrounded, massive, loose, wet. @ 1124	CL	1.0 med stiff	HNU = Ø ppm α = Ø cpm Bγ = 200 cpm
1.0	16288	14			GW	Loose	
1.5	NR	4			CL	TSF	
2.0	16289 NR	8	6"	Yellowish brown (10YR, 7/6) Lean CLAY, CL - Dry, massive, medium plastic, stiff, with some gravel @ 1127	CL	1.0	HNU = Ø ppm α = Ø cpm Bγ = 100 cpm
2.5	16290 WMCO	10					
3.0	NR 16291	20				TSF	
3.5	16292	18	6"	Yellowish brown (10YR, 7/6) Lean CLAY, CL - Dry, massive, medium plastic, stiff, with some isolated gravel. @ 1132	CL	1.0	HNU = Ø ppm α = Ø cpm Bγ = 80 to 100 cpm
4.0		20					
4.5		26				TSF	
5.0	16293	20	12"	Mottled yellowish Brown (10YR, 7/6) to Dark yellowish Brown (10YR, 4/6) Lean CLAY, CL with Silt and Sand - Dry, massive, medium plastic, stiff to very stiff, with some silt and gravel. @ 1140	CL	1.5 to 3.0	HNU = Ø ppm α = Ø cpm Bγ = 60 to 100 cpm
5.5	16294 WMCO	20					
6.0	16295	26				TSF	
6.5	16296	14	18"	Mottled Yellowish Brown (10YR, 5/4) to Dark yellowish Brown (10YR, 4/6) Lean CLAY, CL - Dry, massive, medium plastic, Very stiff to Hard, with isolated gravel clasts and some silt. @ 1350	CL	4.0 to 4.5	HNU = Ø ppm α = Ø cpm Bγ = 60 to 100 cpm
7.0		19					
7.5		22				TSF	

NOTES: Contractor: Penn Drill
Driller: Dave Newman
Helper: Bill Anderson
Sample Tech: Cindy Melroy
Weather: Cloudy 45°F
HNU #: 00222

Methanol is rusty and not used during decontamination of split-spoons until we can get some clean Methanol. Also noted on Field Activities.

4/4/89 Background @ 1120
HNU = Ø ppm
α = Ø cpm
Bγ = 80 to 140 cpm

NR = No Recovery - No Sample Taken

402-11-86

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS - 5401

PROJECT NUMBER: 602-3.7	PROJECT NAME: Facilities Testing Program - FMPC RI/FS	
BORING NUMBER: 1164	COORDINATES:	DATE: 4/4/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/4/89
ENGINEER/GEOLOGIST: L. Sintield	Depth Date/Time	DATE COMPLETED: 4/5/89
DRILLING METHODS: CME-45, Hollow Stem Auger with Split-spoon		PAGE 2 OF 35

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS 4/4/89 Start = 1120
7.5 – 9.0	16297	16, 33, 38	18"	Mottled Yellowish Brown (10YR, 5/4) to Dark Yellowish Brown (10YR, 4/6) Lean CLAY, CL - Dry, Massive, medium plastic, very stiff to hard, with isolated gravel clasts and some silt. @ 1404	CL	4.0 to 9.5 TSF	HNU = ø ppm; α = ø cpm; Bγ = 80 to 120 cpm
9.0 – 10.5	16298	32, 44, 41	12"	Same as 7.5' to 9.0' 9.25 ft; Mottled Gray (10YR, 5/1) to Yellowish brown (10YR, 5/6) Lean CLAY, CL Dry, massive, medium plastic, very stiff to stiff, with rare gravel clasts. @ 1420	CL	2.2 to 1.7 TSF	HNU = ø ppm; α = ø cpm; Bγ = 80 to 120 cpm
10.5 – 12.0	16299 WMCO; 16300	14, 14, 16	6"	Same as 9.25 to 10.5 feet Very stiff @ 1510	CL	2.2 TSF	HNU = ø ppm; α = ø cpm; Bγ = 80 to 120 cpm
12.0 – 13.5	16301	7, 13, 14	8"	Mottled Dark Gray (10YR, 4/4) to Yellowish Brown (10YR, 5/6) Lean CLAY, CL - Dry, Massive, medium plastic, very stiff with some silt and gravel. @ 1520	CL	2.5 to 3.0 TSF	HNU = ø ppm; α = ø cpm; Bγ = 80 to 120 cpm
13.5 – 15.0	16302	10, 21, 11	8"	Same as 12.0 to 13.5 feet @ 1530	CL	1.0 to 1.5 TSF	HNU = ø ppm; α = ø cpm; Bγ = 60 to 120 cpm

NOTES: Contractor: Penn Drill
Driller: Dave Newman
Helper: Bill Anderson
Sample Tech: Cindy Melroy
Weather: cloudy - 45°F
HNU#: 00222

Methanol has rust in it. No used for decontamination because a potential for contamination of the Split-spoons.

4/4/89 Background @ 1402
HNU = ø ppm
α = ø cpm
Bγ = 80 to 120 cpm

0 50

402-11-86

4/15/89 CY

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS - 5401

PROJECT NUMBER: 602-3.7	PROJECT NAME: Facilities Testing Program - FMPC RI/FS	
BORING NUMBER: 1164	COORDINATES:	DATE: 4/4/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/4/89
ENGINEER/GEOLOGIST: L. Sinfield	Depth Date/Time	DATE COMPLETED: 4/5/89
DRILLING METHODS: CME-45 Rig, Hollow-Stem Auger with Split Spoon		PAGE 3 OF 35

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15.0	16303	7		Mottled Dark grey (10YR, 4/4) to Black (10YR) Lean CLAY, CL - Dry, massive, medium plastic, soft to medium stiff, CLAY. @ 1620	CL	0.5 to 0.75 TSF	~~Start~~ 35 HNU = Ø ppm α = Ø cpm Bγ = 60 to 120 cpm
15.5	16304	8	4"				
16.0	NR	10					
16.5	16305	5		Same as 15.0 to 16.5 feet but very soft to medium stiff @ 1629	CL	0.0 to 0.75 TSF	HNU = Ø ppm α = Ø cpm Bγ = 60 to 110 cpm
17.0		11	6"				
17.5		6					
18.0	16306	36		Same as above (15.0 to 16.5 feet) but Stiff to Hard @ 1639	CL	1.5 to 4.5 TSF	HNU = Ø ppm α = Ø cpm Bγ = 60 to 110 cpm
18.5		46	18"				
19.0		62					
19.5	16307	62	6"	Same as above (15.0 to 16.5 feet) but Hard. @ 1639	CL	4.5 TSF	HNU = Ø ppm α = Ø cpm Bγ = 60 to 110 cpm
20.0				@ 1030 4/5/89 Boring Grouted to Surface No Well Installed 2½ bags of Volclay used			

NOTES: Contractor: Penn Drill
Driller: Dave Newman
Helper: Bill Anderson
Sample Tech: Cindy Melroy
Weather: Cloudy
HNU#: 00222

No methanol used for Decontamination 4/4/89 of split-spoons.

Background @ 1600
HNU = Ø ppm
α = Ø cpm
Bγ = 80 to 120 cpm

0 51

4C2-11-86

4/15/89 [illegible]

pg 4 of 5

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET 5401

PROJECT NAME Facilities Testing - FMPC RI/FS FIELD ENG./GEO. L. Sinfield DATE 4/6/89
PROJECT NO. 602-37 CHECKED BY W.A. Hertel DATE 5-5-89
BORING NO. 1164
PIEZOMETER NO. N/A DATE OF INSTALLATION N/A

BOREHOLE DRILLING

DRILLING METHOD Hollow Stem Auger	TYPE OF BIT Auger Bit (8.0 in)
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID N/A FROM N/A TO N/A	SIZE N/A FROM N/A TO N/A
FLUID N/A FROM N/A TO N/A	SIZE N/A FROM N/A TO N/A

PIEZOMETER DESCRIPTION

TYPE N/A	RISER PIPE MATERIAL N/A
DIAMETER OF PERFORATED SECTION N/A	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. N/A I.D. N/A
SLOTS ☐ HOLES ☐ SCREEN ☐	LENGTH OF PIPE SECTIONS N/A
AVERAGE SIZE OF PERFORATIONS N/A	JOINING METHOD N/A
TOTAL PERFORATED AREA N/A	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH N/A	OTHER PROTECTION N/A
PROTECTIVE PIPE O.D. N/A	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE ( )		ELEVATION ( )	
TOP OF RISER PIPE	N/A		N/A	
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	N/A		N/A	
BOREHOLE FILL MATERIALS:				
Vocloy GROUT/~~SLURRY~~	TOP 0.5	BOTTOM 20.0	TOP N/A	BOTTOM N/A
BENTONITE	TOP N/A	BOTTOM N/A	TOP N/A	BOTTOM N/A
SAND	TOP N/A	BOTTOM N/A	TOP N/A	BOTTOM N/A
GRAVEL	TOP N/A	BOTTOM N/A	TOP N/A	BOTTOM N/A
PERFORATED SECTION	TOP N/A	BOTTOM	TOP N/A	BOTTOM N/A
PIEZOMETER TIP	N/A		N/A	
BOTTOM OF BOREHOLE	20.0 feet			
GWL AFTER INSTALLATION	N/A		N/A	

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑
REMARKS Boring Plugged and Abandoned on 4/5/89 @ 1030

0 52

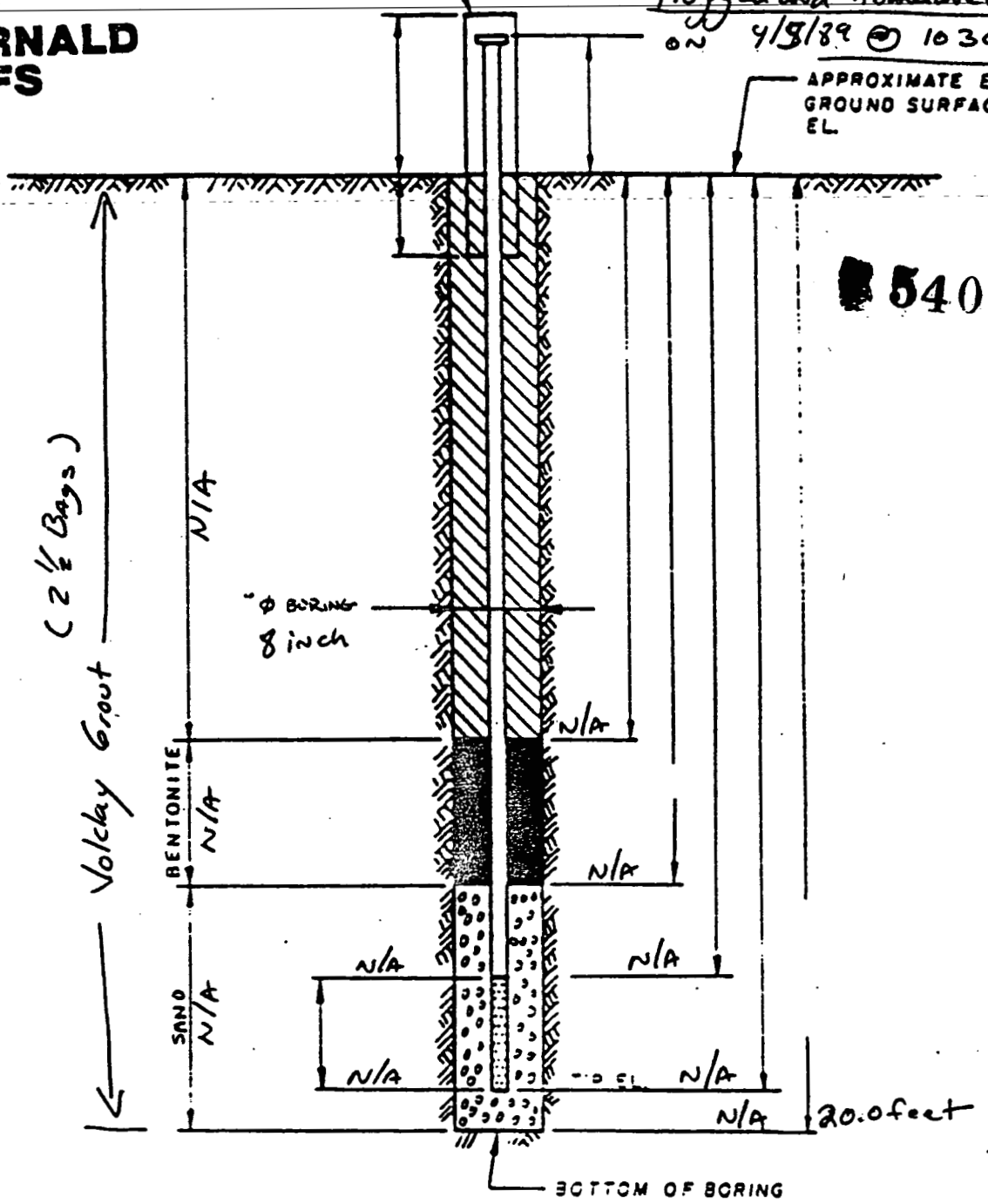
409-11-8

pg 5 of 5 4/15/89

Boring 1164

Plugged and Abandoned on 4/8/89 @ 1030

FERNALD RI/FS



DRAWING NUMBER	5-5-89	WGH	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

~~2 1/2 Volclay Grout~~

Materials Used: 2 1/2 bags of Volclay Grout (5016 bags)
20 gallons of water used.

INSTALLATION DETAILS
MONITORING WELL 1164

PREPARED FOR

0 53

Leonard D Spaid 4/6/89

FERNALD
RI/FS

-5401

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3.7	PROJECT NAME: Facilities Testing Program - FMPC RI/FS	
BORING NUMBER: 1137	COORDINATES:	DATE: 4-7-89
ELEVATION:	GWL: Depth 9.32 Date/Time 0915/4/4/89	DATE STARTED: 4/5/89
ENGINEER/GEOLOGIST: L. Sinfield	Depth Date/Time	DATE COMPLETED: 4/6/89
DRILLING METHODS: Rig-CME-45: Hollow-Stem Auger with Split-Spoon		PAGE 1 OF 24

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
							Start = 1430
0.5	15693 wmco	6	6" in	Gravel, GW - Loose, wet, massive	GW	Loose	HNU = ø ppm α = ø cpm Bγ = 80 to 120 cpm
1.0	15694	9		Brownish yellow (10YR, 6/6) CLAY, CL - Moist, 4/5/89 @ 1440	CL	1.0 TSF	
1.5	NR	12					
2.0	15695	19	6" in	Mottled Brownish yellow (10YR, 6/6) Lean CLAY, CL - Moist, massive, Stiff, medium plastic, clay with Silt. 4/5/89 @ 1450	CL	1.5 TSF	HNU = ø ppm α = ø cpm Bγ = 80 to 100 cpm
2.5	15696 wmco	2					
3.0	15697	26					
3.5	15698	14	18" in	Mottled Brownish Yellow (10YR, 6/6) Lean Clay with Silt, CL - Dry, Massive Very Stiff to Hard, medium plastic, Clay with Silt. 4/5/89 @ 1500	CL	4.0 to 2.5 TSF	HNU = ø ppm α = ø cpm Bγ = 80 to 100 cpm
	2 Samples Taken						
4.0		19					
4.5		28					
5.0	15699	20	18" in	Mottled Strong Brown (7.5YR, 5/6) to Black (10YR, 2/1) spots Lean CLAY, CL - Dry, Massive, ~~Stf~~ very Stiff, medium plastic, lean clay. 4/5/89 @ 1507	CL	3.5 TSF	HNU = ø ppm α = ø cpm Bγ = 80 to 100 cpm
5.5	15700 wmco	40					
6.0	15701	50					
6.5	15702	17	17" in	Yellow (10YR, 7/6) to Brownish yellow (10YR, 5/6) CLAY, CL - Dry, massive, very stiff, medium plastic, mottled with Black specks. 4/5/89 @ 1535	CL	3.5 TSF	HNU = ø ppm α = ø cpm Bγ = 80 to 120 cpm
		16					
7.0		22					
7.5							

NOTES: Contractor: Penn Drill
Driller: Dave Newman
Helper: Bill Anderson
Sample Tech: Randal Odell - H&S too
Weather: cloudy
HNU #: 00222
NR = No Recovery, No Sample Taken

4/5/89 Background @ 1400
HNU = ø ppm
α = ø cpm
Bγ = 80 to 120 cpm

0 54

4C2-11-86

FERNALD RI/FS

5401

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602- 3.7	PROJECT NAME: Facilities Testing Program - FMPC RI/FS	
BORING NUMBER: 1137	COORDINATES:	DATE: 4/7/89
ELEVATION:	GWL: Depth 9.32 Date/Time 4/6/89-0915	DATE STARTED: 4/5/89
ENGINEER/GEOLOGIST: L. Sinfield	Depth Date/Time	DATE COMPLETED: 4/6/89
DRILLING METHODS: Rig-CME-45: Hollow-stem Auger with Split Spoon		PAGE 2 OF ~~2~~ 4

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
7.5	15703	26		Mottled Brownish Yellow (10YR, 6/6) to red (2.5YR, 4/6) CLAY, CL - Lean, dry, massive, very stiff, mediumplastic, CLAY.	CL	2.0 to 3.5	~~Start~~ 85 HNU = ∅ ppm α = ∅ cpm Bγ = 60 to 120 cpm
8.0	3 samples Taken	35	18" in				
8.5		43		@ 1540		TSF	
9.0	15704	26		Same as 7.5 to 9.0 feet	CL	2.5 to 3.5	HNU = ∅ ppm α = ∅ cpm Bγ = 60 to 120 cpm
9.5		50	18" in				
10.0	15705 WMCO	55		@ 1550		TSF	
10.5	15706	7		~~mottled~~ Dark Grey (10YR, 4/1) and mottled Brownish yellow (10YR, 6/6) CLAY, ~~CL with Silt, CL~~ and Silt, ML - Clay = Dry, massive Hard, mediumplastic. Silt = Moist, Massive, loose @ 1640	CL / ML / CL	4.5	HNU = ∅ ppm α = ∅ cpm Bγ = 60 to 120 cpm
11.0		11	18" in				
11.5		13				TSF	
12.0	15707	8		Grey (10YR, 5/1) CLAY, CL with Silt - Dry, massive, Hard, mediumplastic clay.	CL	4.5	HNU = ∅ ppm α = ∅ cpm Bγ = 60 to 120 cpm
12.5		14	12" in				
13.0		21		@ 1645		TSF	
13.5	15708	16		Same as 12.0 to 13.5 feet but stiff	CL	1.5 to 2.0	HNU = ∅ ppm α = ∅ cpm Bγ = 60 to 120 cpm
14.0		18	18" in				
14.5		20		@ 4/6/89			
15.0				Total Depth = 15.0 @ 1650		TSF	

NOTES: Contractor: Penn Drill
Driller: Dave Newman
Helper: Bill Anderson
Sample Tech: Randal Odell / Cindy Melroy
Weather: Cloudy
HNU#: 00222
NR = No Recovery, No Sample taken.

Well Set

4/5/89

Background @ 1400
HNU = ∅ ppm
α = ∅ cpm
Bγ = 80 to 120 cpm

0 55

402-11-86

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET - 5401

PROJECT NAME Facilities Testing FIELD ENG./GEO. L. Sinfield DATE 4/7/89
PROJECT NO. 602-3.7 CHECKED BY W.A. Hertel DATE 5-5-89
BORING NO. 1137
PIEZOMETER NO. MW-1137 DATE OF INSTALLATION 4/6/89

BOREHOLE DRILLING

DRILLING METHOD Hollow-Stem Auger
DRILLING FLUID (S) USED:
FLUID N/A FROM N/A TO N/A
FLUID N/A FROM N/A TO N/A

TYPE OF BIT Auger
CASING SIZE (S) USED:
SIZE ~~2 inch ID~~ N/A CB FROM ~~1.9 ft~~ N/A CB TO ~~8.2 ft~~ N/A CB
SIZE ~~2 inch ID~~ FROM ~~8.2 ft~~ TO ~~13.0 ft~~ JS

PIEZOMETER DESCRIPTION

TYPE Schedule 40 PVC Flush-Threaded
DIAMETER OF PERFORATED SECTION 2 inch ID
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.020 inch
TOTAL PERFORATED AREA 4.70 feet

RISER PIPE MATERIAL Schedule 40 PVC Blank
RISER PIPE DIAMETERS:
O.D. 2 1/4 inch I.D. 2 inch
LENGTH OF PIPE SECTIONS 9.80 feet
JOINING METHOD Flush-Threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH ~~2.0 ft~~ 2.0 ft JS-5-5-89
PROTECTIVE PIPE O.D. ~~8~~ 4 inch JS 5-5-89
OTHER PROTECTION Master Locks
Hinged Locking Cover with Padlock Installed

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (ft)	
TOP OF RISER PIPE	1.9 ft			
GROUND SURFACE	0.0 ft			
BOTTOM OF PROTECTIVE PIPE	3.0 ft ~~2.0 ft~~ JS-5-5-89 ~~2.0 ft~~			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.5 ft	BOTTOM 5.0 ft	TOP	BOTTOM
BENTONITE	TOP 5.0 ft	BOTTOM 7.6 ft	TOP	BOTTOM
SAND	TOP 7.6 ft	BOTTOM 13.0	TOP	BOTTOM
GRAVEL	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 8.2 ft	BOTTOM 12.9 ft	TOP	BOTTOM
PIEZOMETER TIP	12.9 ft			
BOTTOM OF BOREHOLE	13.0 ft			
GWL AFTER INSTALLATION	7.2 ft 4/15/89			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑
REMARKS Borehole collapsed Between 15.0 to 13.0 feet.

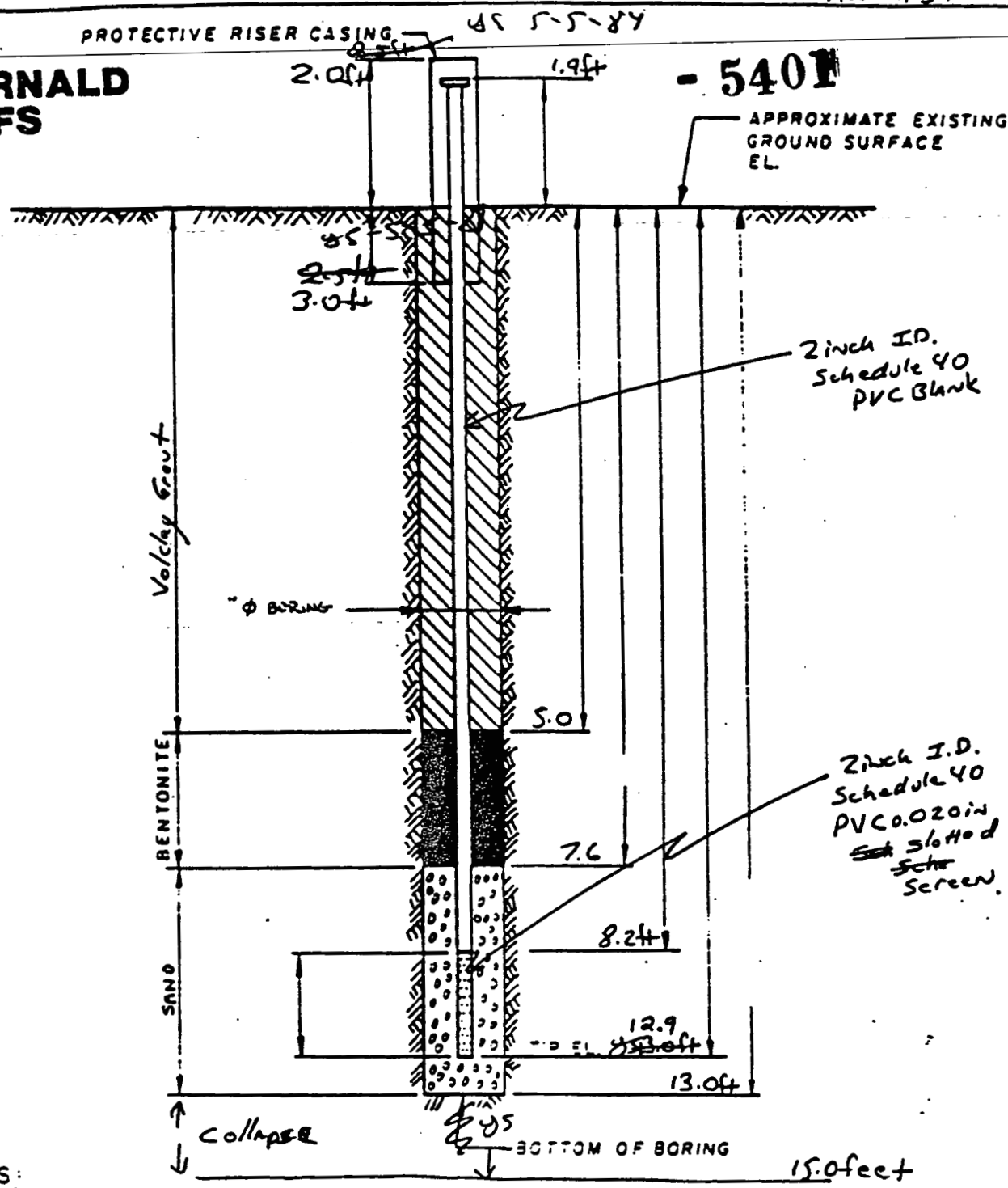
0 56

PS 4 of 1

MW-1137

FERNALD RI/FS

- 5401



DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER

NOTES:

1. RISER PIPE IS 2 IN I.D. SCHEDULE 40 PVC PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 2 IN I.D. PVC PIPE ~~CONTINUOUS~~ SLOT SCREEN (0.020 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL 9.32 feet depth
5. WATER LEVEL READING ON 4/6/84

Materials Used: 2 buckets of Bentonite Pellets
3 bags 10x20 Sand
1 bag of Volclay Grout (50lb Bag)
≈ 2 gallons of water used.

INSTALLATION DETAILS
MONITORING WELL 1137

PREPARED FOR

0 57

FERNALD RI/FS

- 540

Field Check	1st Key In	2nd Key In	Hard Copy Verification
Initial	WJH		
Date	5-5-89		

ET 4-17-89

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS - FMPC	
BORING NUMBER: 1156	COORDINATES:	DATE: 04-12-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04-12-89
ENGINEER/GEOLOGIST: C. Grube/M. Slusarski	Depth Date/Time	DATE COMPLETED: 04-12-8
DRILLING METHODS: AUGER (HOLLOW STEM) 8 inch		PAGE 1 OF 3

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	16111 0925 04-12 16112 0925 04-12	2 6 7	13	Well graded gravelly sand, dark yellowish brown (10YR 4/4), trace silt, some gravel (.25 in - 1.0 in), dry, Medium dense	SW	N/A	HNU = 0 ppm α = 0 cpm Bγ = 700-900 cpm
2	16113 0930 04-12 16114 0930 04-12 16115 0930 04-12	7 12 12	11	Well graded gravelly sand, dark yellowish brown (10YR 4/4) trace silt, some gravel (.25 in - 1.0 in) slightly moist, Medium dense	SW	N/A	HNU = 0 ppm α = 0 cpm Bγ = 700-900 cpm
3 4	16116 0935 04-12	12 14 14	14	Same As Above	SW	N/A	HNU = 0 ppm α = 0 cpm Bγ = 800-900 cpm
5	16117 0940 04-12 16118 0940 04-12 16119 0940 04-12	9 12 10	12	Well graded gravelly sand, dark yellowish brown (10YR 4/4), trace silt, Some gravel, (.25 in - .75 in) slightly moist at top to moist at base, medium dense	SW	N/A	HNU = 0 ppm α = 0 cpm Bγ = 700-800 cpm
6	16120	8		Well graded gravelly sand, dark yellowish brown (10YR 4/4) trace silt some gravel (.25 in - .75 in) damp/moist to saturated medium dense Contact between well graded gravelly sand + silty clay 6.5 FT	SW	N/A	HNU = 0 ppm α = 0 cpm Bγ = 800-900 cpm
7	1010 04-12	12 12	18	Very stiff, yellowish brown (10YR 5/4), silty clay, trace sand, trace gravel (.25 in), damp/moist Bottom of Sampling & Boring 7.5 FT	CL	2.5	

NOTES: CONTRACTOR: PENN DRILL
RIG: Model B
DRILLER: Harold Andrews
ASSISTANT: Chris Coulter

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TE
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0.0 PPM
α = 0.0 CPM
Bγ = 500-800 CPM
LEL O_2: LEL = 0.0 PPM
O_2 = 20.6 %

0 58

FERNALD RI/FS

5401

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS
PROJECT NO. 602 3.7
BORING NO. B1156
PIEZOMETER NO. 1156

FIELD ENG./GEO. C. Grube/m Slusarski DATE 4-12-89
CHECKED BY W. Hertel DATE 5-5-89
DATE OF INSTALLATION 04-12-89

BOREHOLE DRILLING

DRILLING METHOD Hollow Auger
DRILLING FLUID (S) USED:
FLUID N/A FROM — TO —
FLUID N/A FROM — TO —

TYPE OF BIT Auger (8 in Hollow Stem)
CASING SIZE (S) USED:
SIZE ~~4.5 in OD~~ N/A CB FROM ~~0.0 FT~~ N/A CB TO ~~20 FT~~ N/A CB
SIZE N/A FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Piezometer
DIAMETER OF PERFORATED SECTION 2.0 in ID
PERFORATION TYPE:
SLOTS [X] HOLES [ ] SCREEN [ ]
AVERAGE SIZE OF PERFORATIONS .020 in
TOTAL PERFORATED AREA 3.5 FT

RISER PIPE MATERIAL PVC
RISER PIPE DIAMETERS:
O.D. 2 5/16 in I.D. 2.0 in
LENGTH OF PIPE SECTIONS ~~2.5 FT~~ CB, 6.0 FT
JOINING METHOD screw type flush joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 4 3/8 in

OTHER PROTECTION Hinged locking cover with padlock

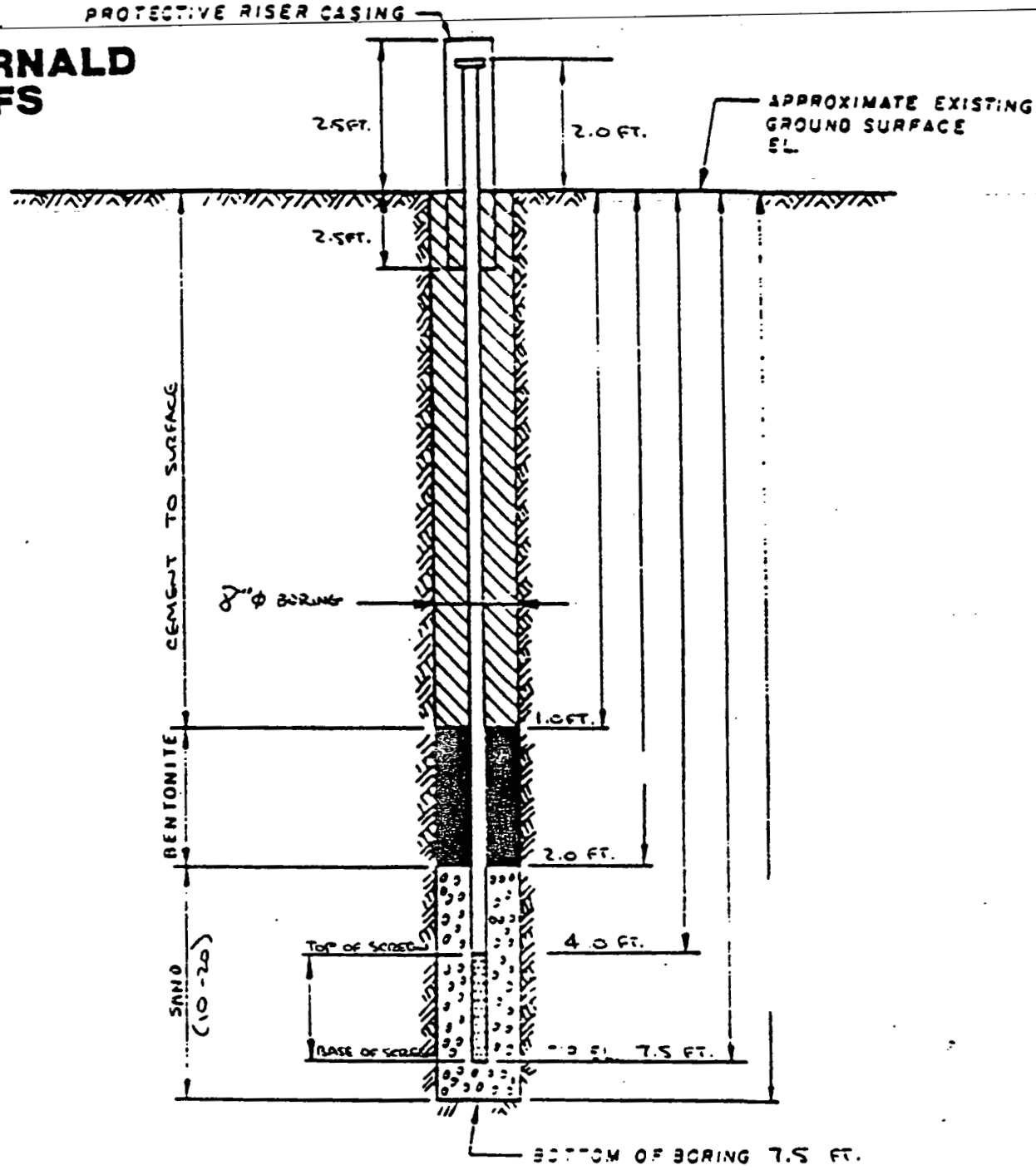
ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE ( )		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
~~GROUT/SLURRY~~ cement	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 2.0	TOP	BOTTOM
SAND (10-20)	TOP 2.0	BOTTOM 7.5	TOP	BOTTOM
GRAVEL N/A	TOP	BOTTOM	TOP	BOTTOM
PERFORATED SECTION	TOP 4.0	BOTTOM 7.5	TOP	BOTTOM
PIEZOMETER TIP	7.5			
BOTTOM OF BOREHOLE	7.5			
GWL AFTER INSTALLATION	—			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES [ ] NO [X]
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES [ ] NO [X] 0 59

REMARKS At 1500 on 4/2/89, attempted to measure water level in well with M-scope. There was not enough water in piezometer to measure.

5401

FERNALD RI/FS



DRAWN BY	MLS.	CHECKED BY / APPROVED BY		DRAWING NUMBER

NOTES:

1. RISER PIPE IS 2.0 IN I.D SCHEDULE 40 PVC PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 2.0 IN I.D PVC PIPE ~~CONTINUOUS~~ SLOT SCREEN (0.020 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

MATERIALS USED IN WELL INSTALLATION:

10-20 SAND - 2 80LB SACKS

BENTONITE - 1 5GAL BUCKET

CEMENT - 1/2 90 LB. SACK

PVC WELL SCREEN & RISER PIPE:

1 - 2.5FT WELL SCREEN (CUT TO LENGTH)

1 - 6.0 FT RISER PIPE (CUT TO LENGTH)

INSTALLATION DETAILS
MONITORING WELL #1156

PREPARED FOR

0 60

FERNALD RI/FS

Field Copy

- 5401

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS FMPC	
BORING NUMBER: 1156	COORDINATES:	DATE: 04-12-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04-12-89
ENGINEER/GEOLOGIST: C. Grube M. Slusarski	Depth Date/Time	DATE COMPLETED: 04-12-89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF 1

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	16111 0925 04-12 16112 0925 04-12	2 6 7	13	Well Graded gravelly sand, yellowish brown (10YR 4/4) trace silt, some gravel (.25in-1.0in), dry,	SW	N/A	HNU = ~~700-7~~ 0 ppm α = 0 cpm Bγ = 700-900 cpm
2	16113 0930 04-12 16114 0930 04-12 16115 0930 04-12	7 12 12	11	Same as above, slightly except Damp	SW	N/A	HNU = 0 PPM α = 0 CPM Bγ = 700-700 CPM
3 4	16116 0935 04-12	12 14 14	14	As Above slightly DAMP	SW	N/A	HNU = 0 PPM α = 0 CPM Bγ = 800 900 CPM
5	16117 0940 04-12 16118 0940 04-12 16119 0940 04-12	9 12 10	12	As Above slightly DAMP, gravel (.25-.75) Slightly damp to damp at base	SW	N/A	HNU = 0 PPM α = 0 CPM Bγ = 700-800 CPM
6	16120 1010 04-12	3 12 12	18	As Above, damp to saturated at contact Sand-clay Contact 6.5FT Very stiff, yellowish brown (10YR 5/4), silty clay, trace sand, trace gravel (.25in), damp Bottom of Sampling & Boring 7.5FT	SW CL	N/A 2.5	HNU = 0 ppm α = 0 cpm Bγ = 800-900 cpm

NOTES: CONTRACTOR: PENN DRILL
RIG: Model B
DRILLER: Harold Andrews
ASSISTANT: Chris Coulter

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TE
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0.0 PPM
α = 0.0 CPM
Bγ = 500-800 CPM
LEL O2: LEL = 0.0 PPM
O2 = 20.6 %

0 61

4/15/89 CB

FERNALD RI/FS

5401

Date				
Initial				
Field Check	1st Key In	2nd Key In	Hard Copy	

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602- 3.7	PROJECT NAME: Facilities Testing Program - FMPC RI/FS	
BORING NUMBER: 1138	COORDINATES:	DATE: 4/12/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/11/89
ENGINEER/GEOLOGIST: C. Sinfield	Depth Date/Time	DATE COMPLETED: 4/12/89
DRILLING METHODS: CME-45 Rig: Hollow Stem Auger with Split spoon Samples		PAGE 1 OF 35

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
							Start = 1510
0.5	15715 WMCO	3	4"	Brownish yellow (10YR, 6/8) to Dark Brown (10YR, 3/3) Lean CLAY, CL Hard to very stiff, massive, rare gravel, medium plastic, dry	CL	2.5 to 4.5	HNU = ø ppm α = ø cpm Bγ = 2800-3200 cpm
1.0	15716 N/C	7 10		4/11/89 @ 1515		TSF	
1.5	15717	18	18"	Mottled Dark yellowish Brown (10YR, 4/4) to light Brownish Gray (10YR, 6/2) Lean CLAY, CL with Silt - Hard, massive, rare gravel, medium plastic, dry	CL	4.5	HNU = ø ppm α = ø cpm Bγ = 120-140 cpm
2.0	15718 WMCO	20					
2.5	15719	24		4/11/89 @ 1520		TSF	
3.0	15720	24	18" 12"	Same as 1.5 to 3.0 feet but Hard to stiff	CL	2.0 to 4.5	HNU = ø ppm α = ø cpm Bγ = 100-120 cpm
3.5		25					
4.0		40		4/11/89 @ 1530		TSF	
4.5	15721	30	18"	Same as 3.0 to 4.5 feet Hard to Stiff	CL	4.5	HNU = ø ppm α = ø cpm Bγ = 100-120 cpm
5.0	15722 WMCO	38		5.5 ft 5.5 ft			
5.5	15723	38		Gray (10YR, 5/1) Lean CLAY, CL with Silt - Very stiff, massive, rare gravel, medium plastic, dry 4/11/89 @ 1535	CL	3.5 TSF	
6.0	15724	14	6"	Mottled Dark Yellowish Brown (10YR, 4/4) to light Brownish Gray CLAY, CL - Hard to Stiff, massive, medium plastic, rare gravel, dry	CL	3.0 to 4.5	HNU = ø ppm α = ø cpm Bγ = 100-140 cpm
6.5		15		1" Sand layer - wet	SW		
7.0		18		Gray Clay 4/11/89 @ 1600	CL	TSF	
7.5							

NOTES: Contractor: Penn Drill
Driller: Dave Newman
Helper: Bill Anderson
Sample Tech: Cindy Melroy
Weather: Clear, cold, to warm 25°F to 55°F
HNU #: 801548

Near Rig
HNU = 2 ppm
α = ø cpm
Bγ = 400-500 cpm

Background @ 1500
HNU = ø ppm
α = ø cpm
Bγ = 100-140 cpm

0 62

4C2-11-86

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS 5401

PROJECT NUMBER: 602-3.7	PROJECT NAME: Facilities Testing Program	
BORING NUMBER: 1138	COORDINATES:	DATE: 4/12/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/11/89
ENGINEER/GEOLOGIST: L. Sinfield	Depth Date/Time	DATE COMPLETED: 4/12/89
DRILLING METHODS: CME-45 Rig: Hollow Stem Auger with Split-spoon		PAGE 2 OF 35

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
							Start = 1510
7.5 – 8.0 – 8.5 – 9.0	15725	22 23 26	18"	Gray (10YR, 5/1) Lean CLAY, CL - Dry, very stiff, massive rare gravel, medium plastic, with 1" gravel layer dry. 4/11/89 @ 1612	CL / GW	2.0 to 2.5 TSF	HNU = ø ppm; α = ø cpm; Bγ = 100-140 cpm
9.5 – 10.0 – 10.5	15726 / 15727 MMCO	33 34 43	18"	Same as 7.5 to 9.0 ft but stiff and very slightly moist. 4/11/89 @ 1620	CL	1.5 TSF	HNU = ø ppm; α = ø cpm; Bγ = 140-160 cpm
11.0 – 11.5 – 12.0	15728	5 6 10	6"	Probably mostly Slough - Gravel with sand, some Brownish yellow (10YR, 6/1) CLAY Dry, massive 4/12/89 @ 0920	? GW / CL ?	Loose TSF	HNU = ø ppm; α = ø cpm; Bγ = 200-180 cpm
12.5 – 13.0 – 13.5	15729	11 15 23	18"	Gray (10YR, 5/1) Lean CLAY with silt, CL - Stiff to very stiff, massive, rare gravel, medium plastic, dry 4/12/89 @ 0930	CL	1.5 to 2.5 TSF	HNU = ø ppm; α = ø cpm; Bγ = 120-140 cpm
14.0 – 14.5 – 15.0	15730	30 30 31	12"	Same as 12.0 to 13.5 feet but stiff. 4/12/89 @ 0940	CL	1.0 to 1.5 TSF	HNU = ø ppm; α = ø cpm; Bγ = 120-140 cpm

NOTES: Contractor: Penn Drill
Driller: Dave Newman
Helper: Bill Anderson
Sample Tech: Cindy Metzg
Weather: Clear & Cold 25°F to 35°F
HNU #: 80/548

Near Rig
HNU = ø ppm
α = ø cpm
Bγ = 600-800 cpm

Background @ 900
HNU = ø ppm
α = ø cpm
Bγ = 120-180 cpm

0 63

4/15/89 CE

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

5401

PROJECT NUMBER: 602-	PROJECT NAME: Facilities Testing Program	
BORING NUMBER: 1138	COORDINATES:	DATE: 4/12/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/11/89
ENGINEER/GEOLOGIST: C Sinfield	Depth Date/Time	DATE COMPLETED: 4/12/89
DRILLING METHODS: CME 45 Rig: Hollow Stem Auger with Split-spoon		PAGE 3 OF 35 UP

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15.0							~~Start~~
15.5	15731	3		Gray (10YR, 5/1) Lean CLAY, CL-			HNU = ø ppm
	15732	3	4"	Soft, massive, rare gravel, medium			α = ø cpm
16.0	NR*			plastic, some silt, dry		0.5	Bγ = 120-160 cpm
		6			CL		
16.5				4/12/89 @ 1005		TSF	
	15733	3		Probably Slough —	?	Loose	HNU = ø ppm
17.0			1"	— Gravel — Dry	GW		α = ø cpm
		6		massive	?		Bγ = 120-160 cpm
17.5							
		10					
18.0				4/12/89 @ 1010		TSF	
	15734	9		Same as 15.0 to 16.5 ft			HNU = ø ppm
18.5		14				0.5 to	α = ø cpm
			24"		CL		Bγ = 300-350 cpm — Top of Spoon
19.0		18				1.0	Bγ = 120-160 cpm — Bottom of spoon
19.5				4/12/89 @ 1020		TSF	
	15735	21		Same as 18.0 to 19.5 feet	CL	0.5	HNU = ø ppm
20.0				4/12/89 @ 1020		TSF	α = ø cpm
				Plugged and Abandoned			Bγ = 120-160 cpm
				Note: Well was P&A on 4/12/89 and filled with VoClay grout from 20.0 FT to 0.0 FT — 2.5 Bags of 50 = VoClay Grout used			

NOTES: Contractor: Penn Drill
Driller: Dave Newman
Helper: Bill Anderson
Sample Tech: Cindy Melroy
Weather: Clear & Cold 25°-35°F
HNU#: 801548
*NR = No Recovery

4/12/89 Background @ 0900
HNU = ø ppm
α = ø cpm
Bγ = 120-180 cpm

0 64

4C2-11-86

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. L. Sinfield DATE 4/10/89
PROJECT NO. 6023.7 CHECKED BY W.A. Hertel DATE 5-5-89
BORING NO. 1138
PIEZOMETER NO. N/A DATE OF INSTALLATION N/A (P&A)

BOREHOLE DRILLING

DRILLING METHOD Auger
DRILLING FLUID (S) USED:
FLUID N/A FROM — TO —
FLUID N/A FROM — TO —

TYPE OF BIT Auger (Hollow Stem) 8.0 in
CASING SIZE (S) USED:
SIZE ~~4 in ID~~ N/A CL 4/4/89 FROM ~~0.0 FT~~ N/A CL 4/7/89 TO ~~20.0 FT~~ N/A CL 4/7/89
SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE N/A
DIAMETER OF PERFORATED SECTION N/A
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS N/A
TOTAL PERFORATED AREA N/A

RISER PIPE MATERIAL N/A
RISER PIPE DIAMETERS:
O.D. N/A I.D. N/A
LENGTH OF PIPE SECTIONS N/A
JOINING METHOD N/A

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH N/A
PROTECTIVE PIPE O.D. N/A

OTHER PROTECTION N/A

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	N/A			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	N/A			
BOREHOLE FILL MATERIALS:				
Voclay GROUT / ~~SLURRY~~	TOP 0.0	BOTTOM 20.0	TOP	BOTTOM
BENTONITE	TOP N/A	BOTTOM N/A	TOP	BOTTOM
SAND	TOP N/A	BOTTOM N/A	TOP	BOTTOM
GRAVEL	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PIEZOMETER TIP	N/A			
BOTTOM OF BOREHOLE	20.0 FT			
GWL AFTER INSTALLATION	N/A			

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

65

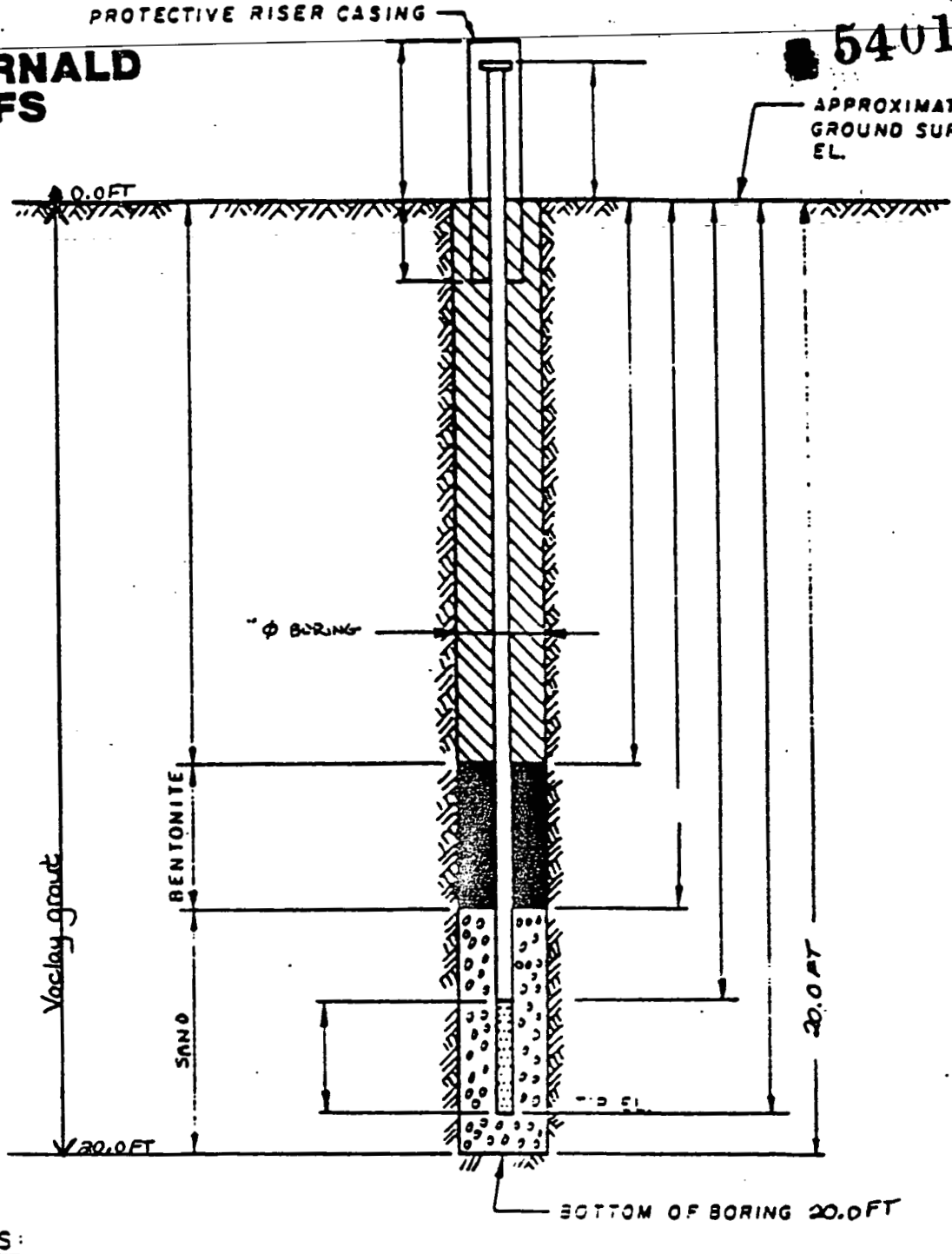
REMARKS No water producing zones were encountered in boring #1138. The well was plugged with Voclay grout from 20.0 FT to 0.0 FT.

PS 5 of 5 4/12/89

Boring # 1138

5401

FERNALD RI/FS



DRAWING NUMBER	5-5-89
	WAH
CHECKED BY	
APPROVED BY	
	PG
DRAWN BY	

NOTES:

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

Materials used to P+A well boring:
2.5 sacks — 50 lb. Voclay grout

INSTALLATION DETAILS
MONITORING WELL # 1138

PREPARED FOR

0 66

FERNALD
RI/FS

5401

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3.7	PROJECT NAME: Facilities Testing Program	
BORING NUMBER: 1169	COORDINATES:	DATE: 4/17/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/12/89
ENGINEER/GEOLOGIST: L. Sintfield	Depth Date/Time	DATE COMPLETED: 4/14/89
DRILLING METHODS: Hollow-Stem Auger with Split spoon Sampler - CME-45 Rig		PAGE 1 OF 35

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
							Start = 1510
0.5	16397 WMCO	4	8 IN	Hard, Very dark grayish Brown (10YR, 3/2) to dark yellowish brown (10YR, 4/4) CLAY, CL with some silt - Dry, massive, medium plastic @ 1510	CL	4.5 TSF	HNU = Ø ppm; α = Ø cpm; Bγ = 340-360 cpm; 4/12/89 @ 1510
1.0	16398	17					
1.5		25					
2.0	16399	17	8 IN	Medium Dense to Loose (in spoon) Brownish yellow, dry, massive @ 1020	GW	— TSF	HNU = Ø ppm; α = Ø cpm; Bγ = 100-120 cpm; 4/13/89 @ 1020
2.5	16400 WMCO	17					
3.0	16401	11					
3.5	16402	5	3 IN	Same as Above 1.5 to 3.0 feet @ 1025	GW	— TSF	HNU = Ø ppm; α = Ø cpm; Bγ = 140-180 cpm; 4/13/89 @ 1025
4.0		5					
4.5		8					
5.0	16403	5	5 IN	Very Stiff, Brown Yellow (10YR, 6/6) + yellowish Brown (10YR, 5/6) CLAY, CL-Lean, mottled, dry, massive, rare gravel, medium plastic. @ 1030	CL	2.0 to 2.5 TSF	HNU = Ø ppm; α = Ø cpm; Bγ = 80-120 cpm; 4/13/89 @ 1030
5.5	16404 WMCO	9					
6.0	16405	9					
6.5	16406	3	18 IN	Very Stiff, Same as above 4.5 to 6.0 feet @ 1135	CL	2.2 to 3.5 TSF	HNU = Ø ppm; α = Ø cpm; Bγ = 100-120 cpm; 4/13/89 @ 1135
7.0		6					
7.5		6					

NOTES: Contractor: Penn Drill
Driller: Dave Newman
Helper: Bill Anderson
Sample Tech: Cindy Metcy
Weather: clear - 45° to 55°F
HNU #: 8015804

4/13/89 Background @ 1000
HNU = 0 ppm
α = 0 cpm
Bγ = 140-180 cpm (Air)
Bγ = 800 cpm (ground surface)

4/12/89 Background @ 1400
HNU = Ø ppm
α = Ø cpm
Bγ = 100-140 cpm

0 67

ec2-11-86

FERNALD
RI/FS

54[illegible]1

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602- 3.7	PROJECT NAME: Facilities Testing Program	
BORING NUMBER: 1169	COORDINATES:	DATE: 4/17/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/12/89
ENGINEER/GEOLOGIST: L. Sinfield	Depth Date/Time	DATE COMPLETED: 4/14/89
DRILLING METHODS: Hollow-Stem Auger with Split spoon Sampler CME-45 Rig		PAGE 2 OF 35 WAH

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
7.5	16407	7		Very Stiff, Same as 6.0 to 7.5 feet			~~Start~~ JS HNU = ø ppm
8.0		8	12 in	Dry	CL	2.1	α = ø cpm
8.5		11					Bγ = 100 to 140 cpm
9.0				@ 1140		TSF	4/13/89 @ 1140
	16408	11		Very Stiff, Same as 7.5 to 9.0 feet			HNU = ø ppm
9.5		12	18 in	Dry	CL	2.0 to 2.5	α = ø cpm
10.0	16409 WMCO	21					Bγ = 80-100 cpm
10.5				@ 1145		TSF	4/13/89 @ 1145
	16410	3		~~FE~~ JS Same as 9.0 to 10.5 feet, but JS			HNU = ø ppm
11.0		6	12 in	Hard and less mottling	CL	4.5	α = ø cpm
11.5		7					Bγ = 80 to 120 cpm
12.0				@ 1420		TSF	4/13/89 @ 1420
	16411	16		Hard to very stiff, Brownish yellow			HNU = ø ppm
12.5	2 samples	17	18 in +	(10YR, 6/6) to Yellowish Brown	CL	2.5 to	α = ø cpm
13.0		19	6 in slough	(10YR, 5/6) Lean CLAY, CL - Mottled, dry, massive, rare gravel, medium plastic		4.5	Bγ = 100-120 cpm
13.5				@ 1430		TSF	4/13/89 @ 1430
	16412	14		Same as above: 12.0 to 13.5 ft. 14.0 ft	CL		HNU = ø ppm
14.0	2 samples	17	18 in	~~very stiff to~~ Hard, Gray (10YR, 5/1) Lean CLAY, CL with silt - Dry, Massive, rare	CL	3.5 to	α = ø cpm
14.5		27		gravel, medium plastic.		4.5	Bγ = 80-120 cpm
15.0				@ 1435		TSF	4/13/89 @ 1435

NOTES: Contractor: Penn Drill
Driller: Dave Newman
Helper: Bill Anderson
Sample Tech: Cindy Melroy
Weather: clear, warm 55°F
HNU #: 8015804

4/13/89

Background @ 1400
HNU = ø ppm
α = ø cpm
Bγ = 100-160 cpm

0 68

402-11-8

FERNALD
RI/FS

5401

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-37	PROJECT NAME: Facilities Testing Program	
BORING NUMBER: 1169	COORDINATES:	DATE: 4/12/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/12/89
ENGINEER/GEOLOGIST: L. Sinfield	Depth Date/Time	DATE COMPLETED: 4/14/89
DRILLING METHODS: Hollow-Stem Auger with Split-spoon Sampler		PAGE 3 OF ~~3~~ 5 SWAH 5

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15.0							Start=
15.5	16413	3		Probably Slough - Stiff, yellowish Brown (10 YR 6/4) Lean CLAY, CL with Silt - Dry, medium plastic, massive	CL	1.0 to 1.5	HNU= ø ppm α= ø cpm BG= 100-160 cpm
16.0	16414	4	3in				
	NR	9		@ 1456		TSF	4/13/89 @ 1456
16.5							
17.0	16415	12		Hard to Stiff, Gray (10YR, 5/1) Lean CLAY, CL - Hard, Dry, Massive, rare gravel, medium plastic		1.5 to 4.5	HNU= ø ppm α= ø cpm BG= 60-120 cpm
	3 samples	26	24in		CL		
17.5		21		@ 1503		TSF	4/13/89 @ 1503
18.0							
18.5	16416	22	↑	Hard, Gray (10YR, 5/1) CLAY, CL Dry, massive, rare gravel, medium plastic	CL	4.5	HNU= ø ppm α= ø cpm BG= 100-140 cpm
	2 samples	31	24in				
19.0		47		@ 1515		TSF	4/13/89 @ 1515
19.5							
	16417	62	↓	Same as 18.0 to 19.5 feet @ 1515	CL	TSF	HNU= ø ppm α= ø cpm BG= 100-140 cpm 4/13/89 @ 1515
20.0							
				Total Depth= 20.0 feet @ 1545			

NOTES: Contractor: Penn Drill
Driller: Dave Newman
Helper: Bill Anderson
Sample Tech: Cindy Melroy
Weather: clear 40°-55°F
HNU#: 805804
NR= No Recovery

4/13/89 Background @ 1400
HNU= ø ppm
α= ø cpm
BG= 100-140 cpm

0 69

4C2-11-86

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

-5401

PROJECT NAME Fernald RI/FS
FIELD ENG./GEO. C. Grube
DATE 04-14-89
PROJECT NO. 602 3.7
CHECKED BY W. A. Hertel
DATE 5-5-89
BORING NO. 1169
PIEZOMETER NO. N/A
DATE OF INSTALLATION N/A (P&A)

BOREHOLE DRILLING

DRILLING METHOD Auger
DRILLING FLUID (S) USED:
FLUID N/A FROM — TO —
FLUID N/A FROM — TO —

TYPE OF BIT Auger (Hollow Stem) 8.0 in
CASING SIZE (S) USED: N/A
SIZE ~~4½ in~~ N/A FROM ~~0.0 FT~~ N/A TO ~~20.0 FT~~ N/A
SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE N/A
DIAMETER OF PERFORATED SECTION N/A
PERFORATION TYPE: N/A
SLOTS ☐ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS N/A
TOTAL PERFORATED AREA N/A

RISER PIPE MATERIAL N/A
RISER PIPE DIAMETERS:
O.D. N/A I.D. N/A
LENGTH OF PIPE SECTIONS N/A
JOINING METHOD N/A

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH N/A
PROTECTIVE PIPE O.D. N/A

OTHER PROTECTION N/A

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	N/A			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	N/A			
BOREHOLE FILL MATERIALS:	TOP 0.0	BOTTOM 2.0		
Voclay GROUT / ~~SLURRY~~ Cement	TOP 2.0	BOTTOM 20.0	TOP	BOTTOM
BENTONITE	TOP N/A	BOTTOM N/A	TOP	BOTTOM
SAND	TOP N/A	BOTTOM N/A	TOP	BOTTOM
GRAVEL	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PIEZOMETER TIP	N/A			
BOTTOM OF BOREHOLE	20.0 FT			
GWL AFTER INSTALLATION	N/A			

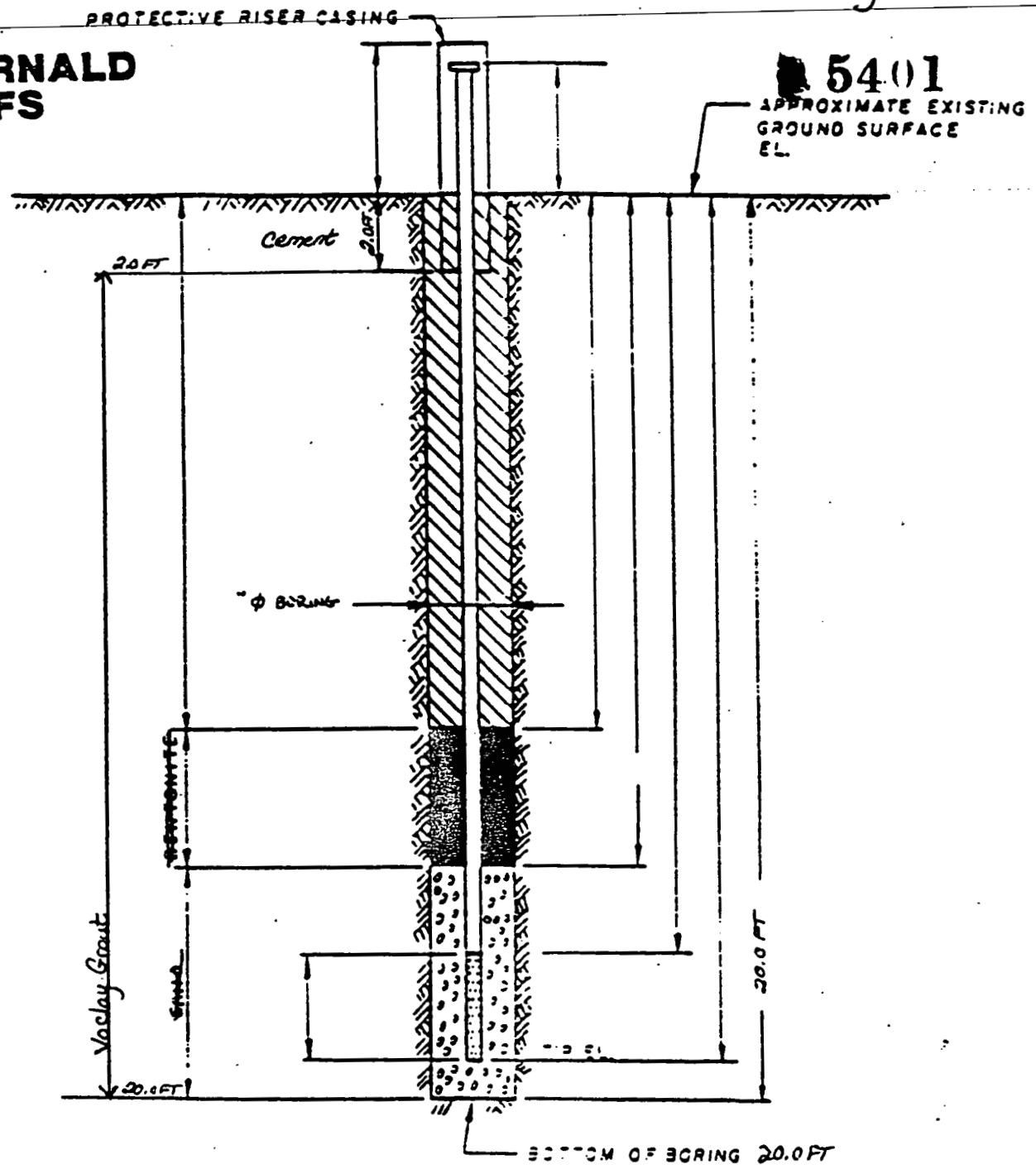
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ 0 NO ☐ N/A
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☐ N/A
REMARKS No water producing zones were encountered in Boring # 1169. The well was plugged with Voclay grout from 20.0 FT to 2.0 FT; then cement plug from 2.0 FT to 0.0 FT

PS 5 of 5

Boring 1169

FERNALD RI/FS

5401



DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
CG	WAH		5-5-89

NOTES:

1. RISER PIPE IS IN 1.0 SCHEDULE PIPE, THREADED, FLUSH-JOINTED. N/A
2. SCREEN IS IN 1.0 PIPE CONTINUOUS SLOT SCREEN (0.0 0 IN SLOT SIZE). N/A
3. LOWER END OF SCREEN IS CAPPED. N/A
4. ELEVATION OF WATER LEVEL N/A
5. WATER LEVEL READING ON N/A

Materials used to P&A well Boring:

Voclay grout - 2.5 50 lb. sacks

Voclay grout initiator - 3 2 lb bags

H_2O (5 gal buckets) - 10

1 bag cement

INSTALLATION DETAILS
MONITORING WELL # 1169

PREPARED FOR

0 71

FERNALD RI/FS

5401

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS - FMPC		
BORING NUMBER: 1154	COORDINATES:	DATE: 04-13-89	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04-13-89	
ENGINEER/GEOLOGIST: C. Grube/M. Sluzarski	Depth Date/Time	DATE COMPLETED: 04-14-89	
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF 26	

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	16067 1100 04-13	8		(Surface Ground)			HNU = 0 α = 0 BG = 150-200
1	16068 1100 04-13	12 7	14	very stiff, dk yellowish brown (10YR 4/4), silty clay, some gravel (0.25-1.0 in), trace sand, dry	CL	2.5 3.0	
2	16069 1105 04-13	8		very stiff, yellowish brown (10YR 5/4), silty clay, trace sand, trace gravel (up to 0.25 in), dry	CL	3.75	HNU = 0 α = 0 BG = 100-140 cpm
	16070 1105 04-13	14	16	Contact yellowish gray clay 2.5 ft.			
3	16071 1105 04-13	22		very stiff, dk gray (10YR 4/1) silty clay, trace sand, dry	CL	2.5	
	16072 1110 04-13	11 15 22	16	Stiff, dk gray (10YR 4/1) silty clay, trace sand, trace gravel (0.25-1.0 in) dry	CL	1.5 2.0	HNU = 0 α = 0 BG = 80-120 Note some orange clay outside of spoon. possible ferrous pipe pa
5	16073 1420 04-13	3		Stiff, dk greenish gray (10YR 4/1) silty clay, trace sand, trace gravel (0.5 in), moist/damp	CL	1.5	HNU = 0 α = 0 BG = 100-120 cpm
	16074 1420 04-13	3	14				
6	16075 1420 04-13	3					
	16076 1425 04-13	4 4 5	16	Stiff, dk greenish gray (10YR 4/1) silty clay, trace sand, moist/damp. Contact below (10YR 4/1) and (5Y 3/1) 6.5 ft. Stiff, very dark gray (5Y 3/1) silty clay, trace sand, moist/damp	CL	1.5 1.0	HNU = 0 α = 0 BG = 90-110

NOTES: CONTRACTOR: PENN DRILL
RIG: Model B
DRILLER: Harold Andrews
ASSISTANT: Chris Coulter

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TE
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α = 0 CPM
BG = 300-380 CPM
LEL/O2: LEL = 0.0 PPM
O2 = 20.6 %

FERNALD RI/FS

5401

VISUAL CLASSIFICATION OF SOILS

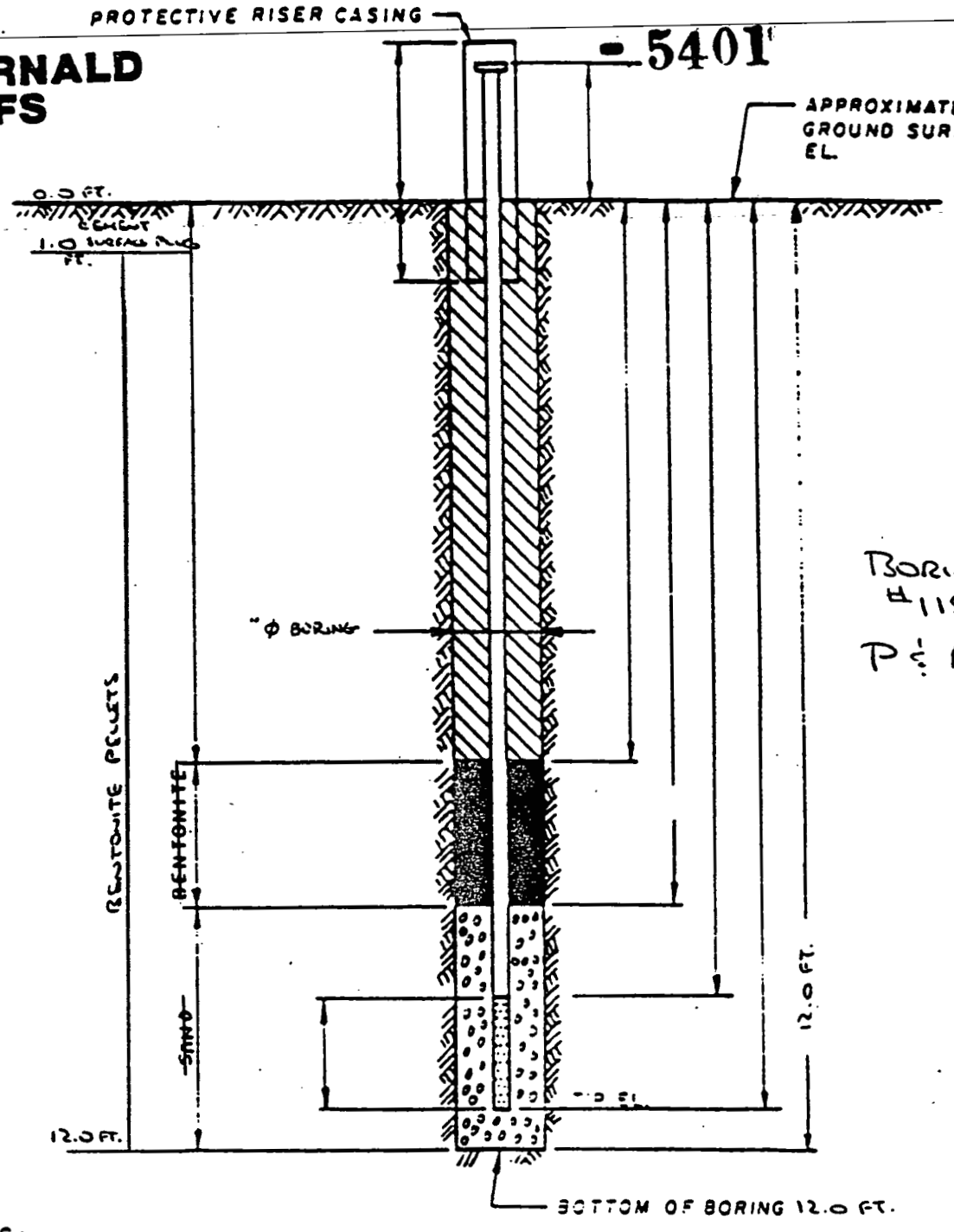
PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS - FMPC	
BORING NUMBER: 1154	COORDINATES:	DATE: 04-13-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 04-13-89
ENGINEER/GEOLOGIST: C. Grube/M. Slusarski	Depth Date/Time	DATE COMPLETED: 04-14-89
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF 26

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	16077 1430 04-13	6 8 11	16	Stiff, very dark gray (5Y 3/1) silty clay, trace sand, moist/damp. Mottled yellowbrown (10YR5/6) very stiff, olive gray (5Y 4/2) silty clay trace sand, moist/damp	CL	1.5 3.0	HNU = 0 α = 0 Bγ = 100-130 cpm
9	16078 1610 4-13	5 (W) 35	14	Stiff, mottled olive gray (5Y 5/2) to yellowBrown (10YR 5/6) silty clay, some sand very moist	CL	1.5	HNU = 0 α = 0 Bγ = 100-150 cpm
10	16079 1610 4-13	(W) 155				1.0	
11	16080 1625	2 3	12	soft, mottled olive gray (5Y 5/2) to yellowBrown (10YR 5/6) silty clay some sand, very moist/saturated	CL	.25	HNU = 0 α = 0 Bγ = 100-130 cpm
				Yellowish Brown (10YR 5/4) gravelly well graded sand, gravel (up to 1.0 in) wet	SW	N/A	
12	04-13	7		Stiff, Yellowish Brown (10YR 5/4) silty clay, trace sand, trace gravel, saturated. Bottom of ~~Bore~~ sampling ~~Bottom of Auger~~ 12.0 FT	CL	1.5	
13	16081			Bottom of Auger at 12.0 FT (Borehole			HNU = α = Bγ = THE BOREHOLE WAS P&A AS IT WAS FELT THAT IT MAY HAVE BEEN CONTAMINATED BY GREASE AND OIL FROM A DEFECTIVE SEAL ON THE RIG KELLY.
14	16082						HNU = α = Bγ =

NOTES:

0 73

FERNALD RI/FS



BORING #1154
P & A

DRAWN BY	MLS
CHECKED BY	WAH
APPROVED BY	
DRAWING NUMBER	

NOTES:

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

MATERIALS USED DURING BORING P & A
3 - 5 GALLON BUCKETS OF BENTONITE PELLETS
1/2 SACK (SOLE) CEMENT

INSTALLATION DETAILS
MONITORING WELL #1154

PREPARED FOR

FERNALD RI/FS

BORING # 1154 P&F - 5401

Pg 4 of.

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS
FIELD ENG./GEO. M. Slusarski / C. Cruce
DATE 04-15
PROJECT NO. 602 3.7
CHECKED BY W.A. Hertel
DATE 5-5-89
BORING NO. 1154
PIEZOMETER NO. N/A
DATE OF INSTALLATION 04-15-89

BOREHOLE DRILLING

DRILLING METHOD Auger	TYPE OF BIT Auger (Hollow Stem) 8 in.
DRILLING FLUID (S) USED: N/A	CASING SIZE (S) USED: N/A
FLUID ____ FROM ____ TO ____	SIZE ____ FROM ____ TO ____
FLUID ____ FROM ____ TO ____	SIZE ____ FROM ____ TO ____

PIEZOMETER DESCRIPTION

TYPE N/A	RISER PIPE MATERIAL N/A
DIAMETER OF PERFORATED SECTION N/A	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. N/A I.D. N/A
SLOTS ☒ (MLS. 04-15-89) HOLES ☐ SCREEN ☐	LENGTH OF PIPE SECTIONS N/A
AVERAGE SIZE OF PERFORATIONS N/A	JOINING METHOD N/A
TOTAL PERFORATED AREA N/A	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH N/A	OTHER PROTECTION N/A
PROTECTIVE PIPE O.D. N/A	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION ( )	
TOP OF RISER PIPE	N/A			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	N/A			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 12.0	TOP	BOTTOM
SAND	TOP N/A	BOTTOM N/A	TOP	BOTTOM
GRAVEL N/A	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PIEZOMETER TIP	N/A			
BOTTOM OF BOREHOLE	12.0			
GWL AFTER INSTALLATION	N/A			

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

0 75

REMARKS

THIS BORING WAS INTENTIONALLY PLUGGED & ABANDONED AS IT WAS FELT THAT THE BOREHOLE MAY HAVE BEEN CONTAMINATED BY GREASE AND OIL FROM A DEFECTIVE SEAL ON THE RIG. A REPLACEMENT BORING WILL BE DRILLED.

FERNALD RI/FS - 540

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Facilities Testing FMPC RI/FS FIELD ENG./GEO. L. Sinfield DATE 4-28-89
PROJECT NO. 602 3.7.4 CHECKED BY W. Hentel DATE 5-5-89
BORING NO. 1154
PIEZOMETER NO. 1154 DATE OF INSTALLATION 4-26-89

BOREHOLE DRILLING

DRILLING METHOD Hollow Stem Auger
DRILLING FLUID (S) USED: N/a
FLUID N/a FROM N/a TO N/a
FLUID N/a FROM N/a TO N/a

TYPE OF BIT Auger Bit
CASING SIZE (S) USED: N/a
SIZE N/a FROM N/a TO N/a
SIZE N/a FROM N/a TO N/a

PIEZOMETER DESCRIPTION

TYPE Flush-Threaded Schedule 40 PVC
DIAMETER OF PERFORATED SECTION 2 inch ID
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.020 inch
TOTAL PERFORATED AREA 4.8 ft

RISER PIPE MATERIAL Schedule 40 PVC Blank
RISER PIPE DIAMETERS:
O.D. 2 1/4 inch I.D. 2 inch
LENGTH OF PIPE SECTIONS 9.90 ft
JOINING METHOD Flush-Threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 ft
PROTECTIVE PIPE O.D. 4 3/8 inch

OTHER PROTECTION Locking Cap

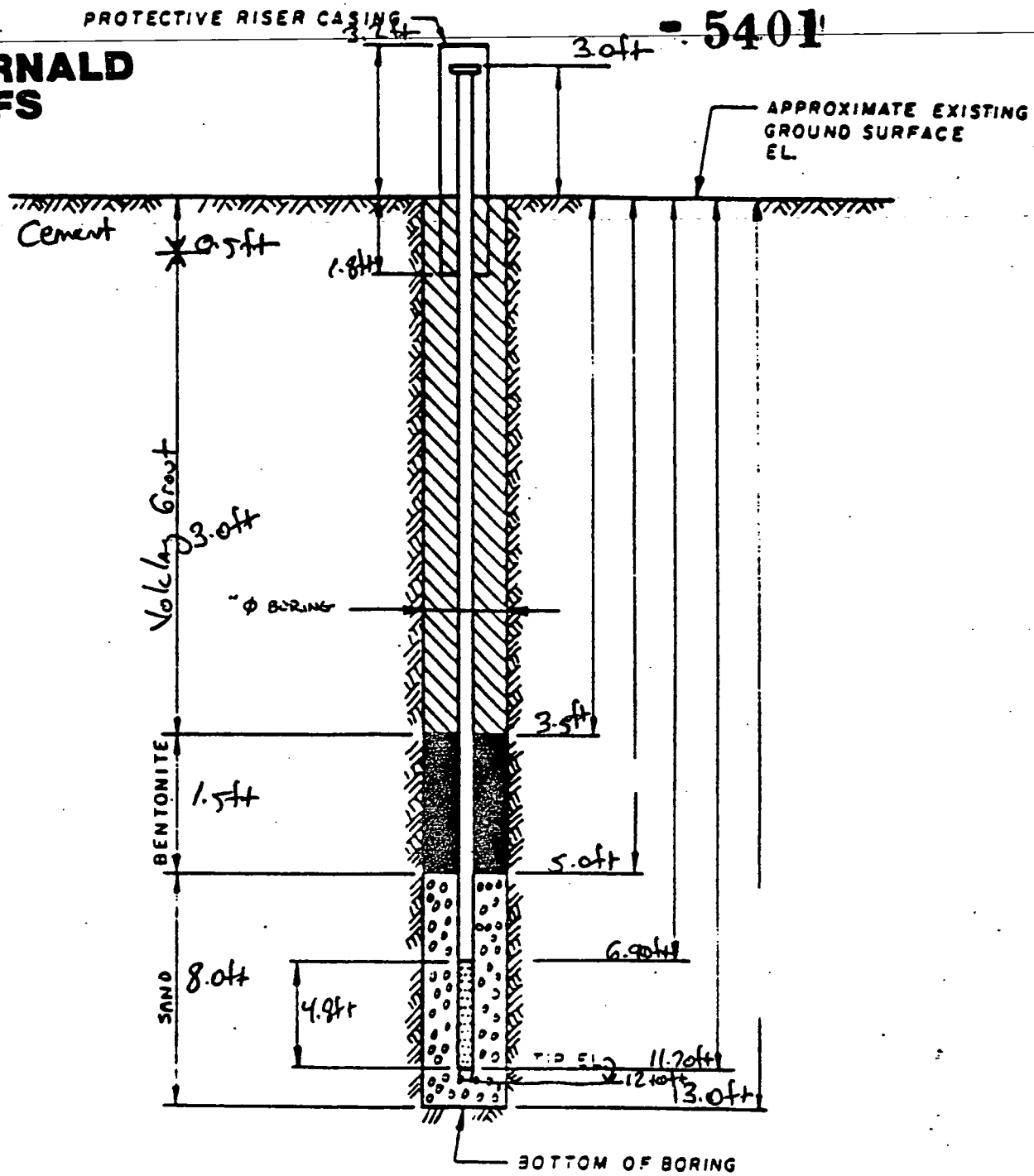
ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (ft)	
TOP OF RISER PIPE	3.2 ft			
GROUND SURFACE	0.0 ft			
BOTTOM OF PROTECTIVE PIPE	1.8 ft			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.5 ft	BOTTOM 3.5 ft	TOP	BOTTOM
BENTONITE	TOP 3.5 ft	BOTTOM 5.0 ft	TOP	BOTTOM
SAND	TOP 5.0 ft	BOTTOM ~~6.90 ft~~ 13.0 ft 8-26-89	TOP	BOTTOM
GRAVEL	TOP N/a	BOTTOM N/a	TOP	BOTTOM
PERFORATED SECTION	TOP 6.90 ft	BOTTOM 11.70 ft	TOP	BOTTOM
PIEZOMETER TIP	12.10 ft			
BOTTOM OF BOREHOLE	13.0 ft			
GWL AFTER INSTALLATION				

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

76

REMARKS No Soil Samples Taken, Boring is approximately 10 ft North of Boring 1154 which was sampled by C. Brake on 4-13-89 to 4-14-89.

FERNALD RI/FS



DRAWN BY	CHECKED BY / APPROVED BY	DRAWING NUMBER

NOTES:

1. RISER PIPE IS 2 IN I.D. SCHEDULE 40 PVC PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 2 IN I.D PVC PIPE ~~CONTINUOUS~~ SLOT SCREEN (0.020 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

Materials Used:

3 - 50lb bags of 10x20 SAND
1 - 5 gallon Bucket of Bentonite Pellets
1/2 - 50lb bag of Volclay Grout

0 77

INSTALLATION DETAILS
MONITORING WELL
1154

PREPARED FOR

1 - 4-inch ID, 5ft long Protective Cover
1 - 5ft Section of Schedule 40 PVC Screen 0.020 in slotted
1 - 9.90ft Section Schedule 40 PVC Blank

FERNALD RI/FS

- 5401

Date	4-5-89			
Initial	HMP			
	1000	1100	1200	1300

VISUAL CLASSIFICATION OF SOILS

Office Copy

PROJECT NUMBER: 602-3.7.1	PROJECT NAME: Facilities Testing Program		
BORING NUMBER: 1150	COORDINATES:	DATE: 4/28/89	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/27/89	
ENGINEER/GEOLOGIST: L. Sinfield-Catebub	Depth Date/Time	DATE COMPLETED: 4/27/89	
DRILLING METHODS: Hollow Stem Auger with Split Spoon Sampler		PAGE 1 OF 24	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
							Start = 0930
0.5	15979 WMCO	2	6IN	Very Stiff, Brownish yellow (10YR, 6/6) Lean Clay with Silt, CL and Gravel Med. plastic, Saturated @ 0935	CL GW	2.5 TSF	HNU = ø ppm; α = ø cpm; Bγ = 140-180 cpm
1.0	15980 NR	3					
1.5	15981 NR	5					
2.0	15982 NR	3	NR	No Recovery wet @ 0940	?	— TSF	HNU = ø ppm; α = ø cpm; Bγ = N/A cpm
2.5	15983 WMCO	6					
3.0	NR 15984	8					
3.5	15985	3	8IN	Very Stiff, Very dark gray (10YR, 3/1) Lean clay, Dry, medium plastic, @ 0945	CL	2.0 to 2.5 TSF	HNU = ø1 ppm; α = ø cpm; Bγ = 120-160 cpm
4.0	15986	5					
4.5	15987 NR	7					
5.0	15988 NR	8	8IN	Mottled, Stiff to very stiff Yellow (10YR, 7/6) to Very dark ~~dar~~ grayish brown lean clay, dry, medium plastic, @ 1000	CL	1.7 to 2.1 TSF	HNU = ø ppm; α = ø cpm; Bγ = 120-140 cpm
5.5	15989 WMCO	8					
6.0	15990 NR	15					
6.5	15991 NR	4	11IN	Same as above 4.5 to 6.0 ft. @ 1025	CL	1.7 to 2.1 TSF	HNU = ø ppm; α = ø cpm; Bγ = 120-160 cpm
7.0	15992 NR	5					
7.5	15993	6					

NOTES: Contractor: Penn Drill
Driller: Jim Sacconi
Helper: Gary
Sample Tech: Cindy Melroy
Weather: cloudy
HNU #: HH18
B-57 Rig Mobile Drill

NR = No Recovery

Background @ 930
HNU = ø ppm
α = ø cpm
Bγ = 80-120 cpm

0 78

ACZ-11-86

FERNALD RI/FS

- 5401

VISUAL CLASSIFICATION OF SOILS

office copy

PROJECT NUMBER: 602-3.7.1	PROJECT NAME: Facilities Testing Program	
BORING NUMBER: 1150	COORDINATES:	DATE: 4/28/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/27/89
ENGINEER/GEOLOGIST: L. Sinfield/Catebrobe	Depth Date/Time	DATE COMPLETED: 4/27/89
DRILLING METHODS: Hollow Stem Auger with Split Spoon Sampler		PAGE 2 OF 4

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
7.5	15994	9	18 in	Stiff to Very Stiff, Brownish yellow (10YR, 6/6) Lean Clay with Silt layers, med. plastic clay dry, massive, mottled. Silt is in 1" layers, moist @ 1045	CL/ML	1.5 to 2.5 TSF	Start= HNU= ∅ ppm α= ∅ cpm Bγ=120-160 cpm
8.0	15995	8					
8.5	15996	9					
9.0	15997	8	18 in	Moist Silt Seams Same As Above 7.5 to 9.0 ft @ 1050		2.1 to 4.0 TSF	HNU= ∅ ppm α= ∅ cpm Bγ= 120-160 cpm
9.5	15998	8					
10.0	15999 WMCO	8					
10.5	16000	8	18 in	Stiff, yellowish Brown (10YR, 5/4) Silty Clay trace sand, trace gravel, moist. 11.25 ft	CL	1.5	HNU= ∅ ppm α= ∅ cpm Bγ= 110-140 cpm
11.0	50576	8		Medium Dense, yellow Brown (10YR, 5/4) silt with trace gravel, moist @ 1507	ML	2.0 TSF	
11.5	50577	9					
12.0	50578	5	12 in	Soft to Very Stiff, Yellowish brown (10YR, 5/4) Silty Clay, trace sand, trace gravel, moist to wet @ 1515	CL	1.25	HNU= ∅ ppm α= ∅ cpm Bγ=110-130 cpm
12.5	50579	7			CL	0.5	
13.0	50580	12			CL	2.5 TSF	
13.5	50581	7	16 in	~~Soft to Very stiff~~ Same as Above 12.0 to 13.5 ft	CL	0.5	HNU= ∅ ppm α= ∅ cpm Bγ=100-120 cpm
14.0	50582	9		Very stiff, Dark Grey (5Y, 4/1) Silty clay, trace gravel & sand moist. Total Depth=15.0 ft @ 1525	CL	2.5	
14.5	50583	14			CL	2.25 TSF	
15.0							

NOTES: Contractor: Penn Drill
Driller: Jim Succoni
Helper: Gary
Sample Tech: Cindy Melroy
Weather: Cloudy
HNU#: HH18
B-53 Rig mobile Rig

Background @ 0930
HNU= ∅ ppm
α= ∅ cpm
Bγ= 120-160 cpm

0 79

602-11-86

FERNALD RI/FS

5401

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald FMPC, RI/FS
FIELD ENG./GEO. C. Grube/L. Sinfield DATE 4/27/89
PROJECT NO. 602 3.7
CHECKED BY W.A. Herted DATE 5-5-89
BORING NO. B 1150
PIEZOMETER NO. 1150
DATE OF INSTALLATION 4/27/89

BOREHOLE DRILLING

DRILLING METHOD Hollow Auger
DRILLING FLUID (S) USED:
FLUID N/A FROM — TO —
FLUID N/A FROM — TO —

TYPE OF BIT Auger (8 in hollow stem)
CASING SIZE (S) USED:
SIZE N/A FROM — TO —
SIZE N/A FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Piezometer
DIAMETER OF PERFORATED SECTION 2.0 in ID
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS .050 in
TOTAL PERFORATED AREA 5.0 FT

RISER PIPE MATERIAL PVC
RISER PIPE DIAMETERS:
O.D. 2 5/16 in I.D. 2.0 in
LENGTH OF PIPE SECTIONS 11.5 FT
JOINING METHOD screw type flush joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH ~~11.5 FT~~ 5.0 FT 4/27/89
PROTECTIVE PIPE O.D. 4 3/8 in

OTHER PROTECTION Hinged locking cover with padlock

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~~ Cement	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 7.0	TOP	BOTTOM
SAND	TOP 7.0	BOTTOM 15.0	TOP	BOTTOM
GRAVEL	TOP	BOTTOM	TOP	BOTTOM
PERFORATED SECTION	TOP 9.5	BOTTOM 14.5	TOP	BOTTOM
PIEZOMETER TIP	14.5			
BOTTOM OF BOREHOLE	15.0			
GWL AFTER INSTALLATION	—			

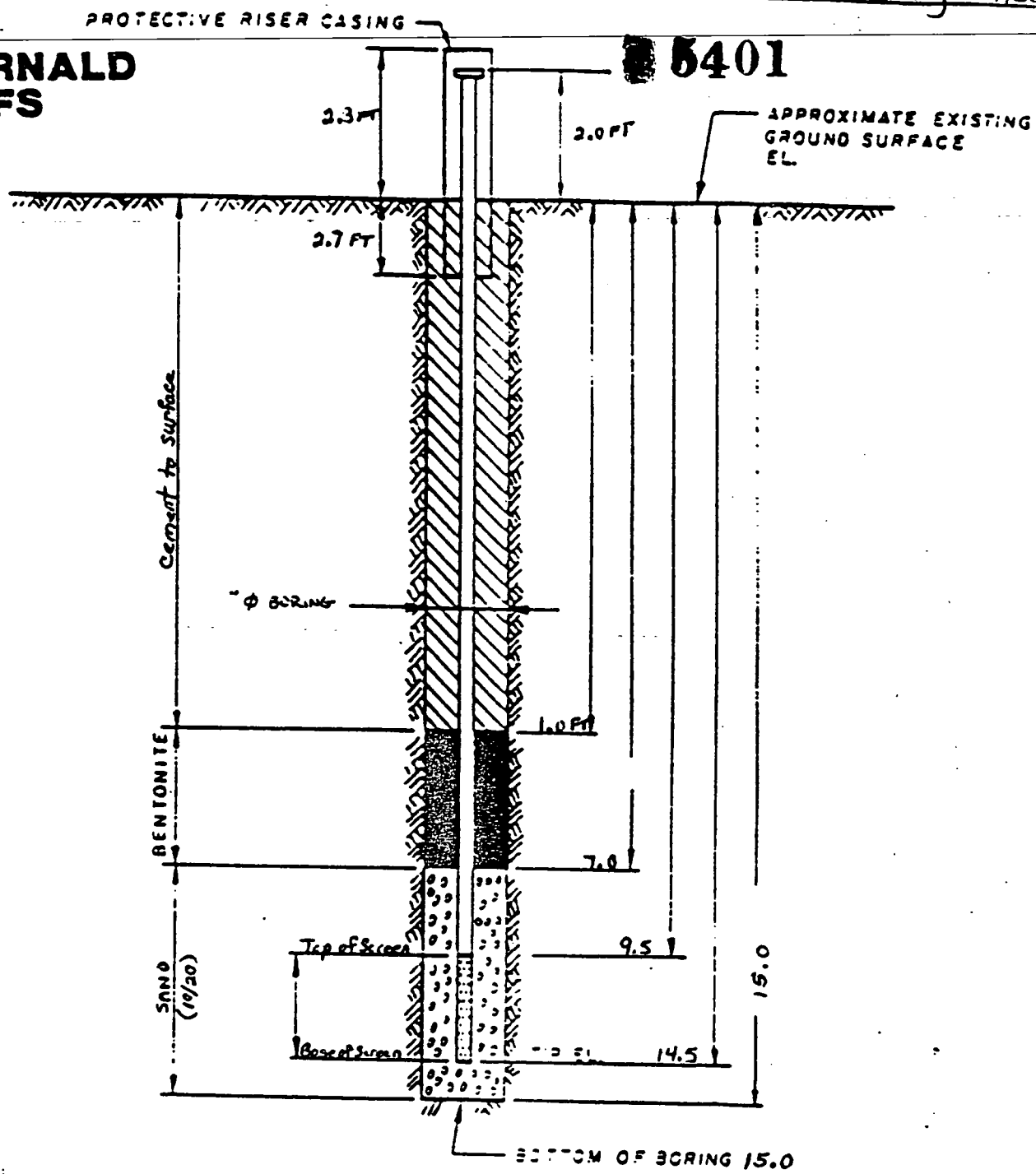
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS Note cement plug from 0.0 FT - 1.0 FT installed 4/28/89

0 80

Boring # 1150

FERNALD RI/FS

[redacted]401



DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER

NOTES:

1. RISER PIPE IS 2 IN 10 SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS IN 1.0 PVC PIPE CONTINUOUS SLOT SCREEN (0.020 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

Material used in well installation:

10/20 sand - 3 sks 80 lb.

Bentonite - 2 1/2 5 gal buckets

Cement - 3/4 50 lb sk.

INSTALLATION DETAILS
MONITORING WELL # 1150

PREPARED FOR

0 81

PVC Well Screen & Riser Pipe

1 - 5.0 FT Screen

1 - 11.5 FT Riser Pipe (cut to length)

FERNALD RI/FS

5401

Date				
Initial				
Field Check	1st Key In	2nd Key In	Hard Copy Verification	

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3.7.1	PROJECT NAME: Facilities Testing Program	
BORING NUMBER: ~~H32~~ 1155	COORDINATES:	DATE: 4/29/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/29/89
ENGINEER/GEOLOGIST: L. Sinfield	Depth Date/Time	DATE COMPLETED: 4/29/89
DRILLING METHODS: B-53, Hollow Stem Auger with Split-Spoon Sampler		PAGE 1 OF 324

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				From 1115 to 1445 Cored Concrete - 0.75 ft Thick			Start = 1115
0.5	16089 WMCO	1	12 in	Soft, Very Dark Gray (10YR, 3/1) Lean Clay, CL - medium plastic, dry, massive, occasional isolated gravel. 4/29/89 @ 1450	CL	0.5 TSF	HNU = Ø ppm; α = Ø cpm; Bγ = N/A cpm. Background too High 1000 cpm to get accurate reading.
1.0	16090 NR	2					
1.5	16091 NR	4					
2.0	16092 NR	5	3 in	Same as Above 0.0 to 1.5 ft 4/29/89 @ 1455	CL	0.5 TSF	HNU = Ø ppm; α = Ø cpm; Bγ = N/A cpm
2.5	16093 WMCO	3					
3.0	16094 NR	3					
3.5	16095	5	18 in	Stiff, Gray (10YR, 3/1), Lean Clay, CL - With Silt, Dry, medium plastic, massive, Mottled with Brownish yellow (10YR, 6/6). 4/29/89 @ 1500	CL	1.0 to 1.5 TSF	HNU = Ø ppm; α = Ø cpm; Bγ = N/A cpm
4.0	16096	9					
4.5	16097	11					
5.0	16098	3	18 in	Soft, Mottled Brownish yellow (10YR, 6/8) Silty Clay, CL - 5.2 ft Very plastic, massive	CL	1.0 to 1.5 TSF	HNU = 1 ppm; α = Ø cpm; Bγ = N/A cpm
5.5	16099 WMCO	5		Stiff, Mottled Dark Grey (10YR, 4/1) Lean Clay, CL - Medium plastic, massive rare roots, dry. 4/29/89 @ 1515			
6.0	16100	7					
6.5	16101 ~~NR~~	2	4 in	Same as Above 5.2 to 6.0 ft 4/29/89 @ 1525	CL	1.0 to 1.5 TSF	HNU = 1 ppm; α = Ø cpm; Bγ = N/A cpm
7.0	16102 NR	4					
7.5	16103 NR	6					

NOTES: Contractor: Penn drill
Driller: Jim Saccani
Helper: G. Dye
Sample Tech: C. Metroy
Weather: Cloudy and Partial Rain
HNU #: HH18

NR = No Recovery - No Sample Taken

Background @ 1100
HNU = Ø ppm
α = Ø cpm
Air Bγ = 1000 cpm
Near Barrels Bγ = 4000 cpm

0 82

4C2-11-86

FERNALD
RI/FS

5401

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602-3.7.1	PROJECT NAME: Facilities Testing Program	
BORING NUMBER: 115S	COORDINATES:	DATE: 4/29/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/29/89
ENGINEER/GEOLOGIST: L. Sinfield	Depth Date/Time	DATE COMPLETED: 4/29/89
DRILLING METHODS: B-53 Hollow Stem Auger with Split Spoon Sampler		PAGE 2 OF 24

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
7.5							Start=
8.0	16104	9	18in	Y. Stiff, Mottled Gray (10YR, 6/1) to light yellowish brown (10YR, 6/4) Lean Clay, CL - medium plastic, dry, massive @ 1530	CL	2.0 to 3.5 TSF	HNU= ø ppm α= ø cpm Bγ= N/A cpm
	16105	10					
8.5	16106	13					
9.0	16107	2	18in	Dry, Soft to very stiff, mottled 9.5ft Same as Above	CL	0.5 to 3.5	HNU= 1.0 ppm α= ø cpm Bγ= N/A cpm
9.5	16108	2		Loose, SILT-ML - Brownish Yellow (6/6, 10YR), rare gravel, massive, saturated @ 1540	ML	Loose TSF	
10.0	16109 WMCO	3					
10.5	16110	7	18in	Same as 9.5 to 10.5ft Saturated	ML	Loose	HNU= ø ppm α= ø cpm Bγ= N/A cpm
11.0	16111	7		Grades to Sand at 11.7 Base	SM		
11.5	16112	11		Very stiff Gray, Lean Clay, medium plastic, dry, massive @ 1550	2.0-3.5 CL	TSF	
12.0	~~16113~~	~~DS~~		TD = 12.0 ft Well Installed with Flush mount			HNU= ppm α= cpm Bγ= cpm
12.5	~~16114~~	~~DS~~					
13.0	~~16115~~	~~DS~~		@		TSF	
13.5	~~16116~~	~~DS~~					HNU= ppm α= cpm Bγ= cpm
14.0	~~16117~~	~~DS~~					
14.5	~~16118~~	~~DS~~		@		TSF	
15.0							

NOTES: Contractor:
Driller:
Helper:
Sample Tech:
Weather:
HNU #:
} See page 1

Background @ 1100
HNU= ø ppm
α= ø cpm
Bγ= 1,000 cpm

0 83

4C2-11-86

1 11.6 4.8 / 6.8

11 12.0 5.2 / 6.8

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET 5401

PROJECT NAME Facilities Testing & FMPC RI/FS FIELD ENG./GEO. L. Sintfield DATE 4/29/89
PROJECT NO. 602 371 CHECKED BY W.A. Hertel DATE 5-5-89
BORING NO. 1155
PIEZOMETER NO. 1155 DATE OF INSTALLATION 4/29/89

BOREHOLE DRILLING

DRILLING METHOD Hollow Stem Auger
DRILLING FLUID (S) USED:
FLUID N/A FROM N/A TO N/A
FLUID N/A FROM N/A TO N/A

TYPE OF BIT Auger Bit
CASING SIZE (S) USED: None
SIZE ~~8 inch~~ FROM ~~0.0~~ TO ~~12 ft~~ WAH 5-5-89
SIZE N/A FROM N/A TO N/A

PIEZOMETER DESCRIPTION

TYPE Schedule 40 PVC
DIAMETER OF PERFORATED SECTION 2.0 ID inch
PERFORATION TYPE:
SLOTS ☑ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.020 inch
TOTAL PERFORATED AREA 4.8 ft

RISER PIPE MATERIAL Schedule 40 PVC
RISER PIPE DIAMETERS:
O.D. 2 1/4 inch I.D. 2 inch
LENGTH OF PIPE SECTIONS 6.8 ft
JOINING METHOD Flush Threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 0.5 ft
PROTECTIVE PIPE O.D. 4 1/2 OD inch

OTHER PROTECTION Locking Cap

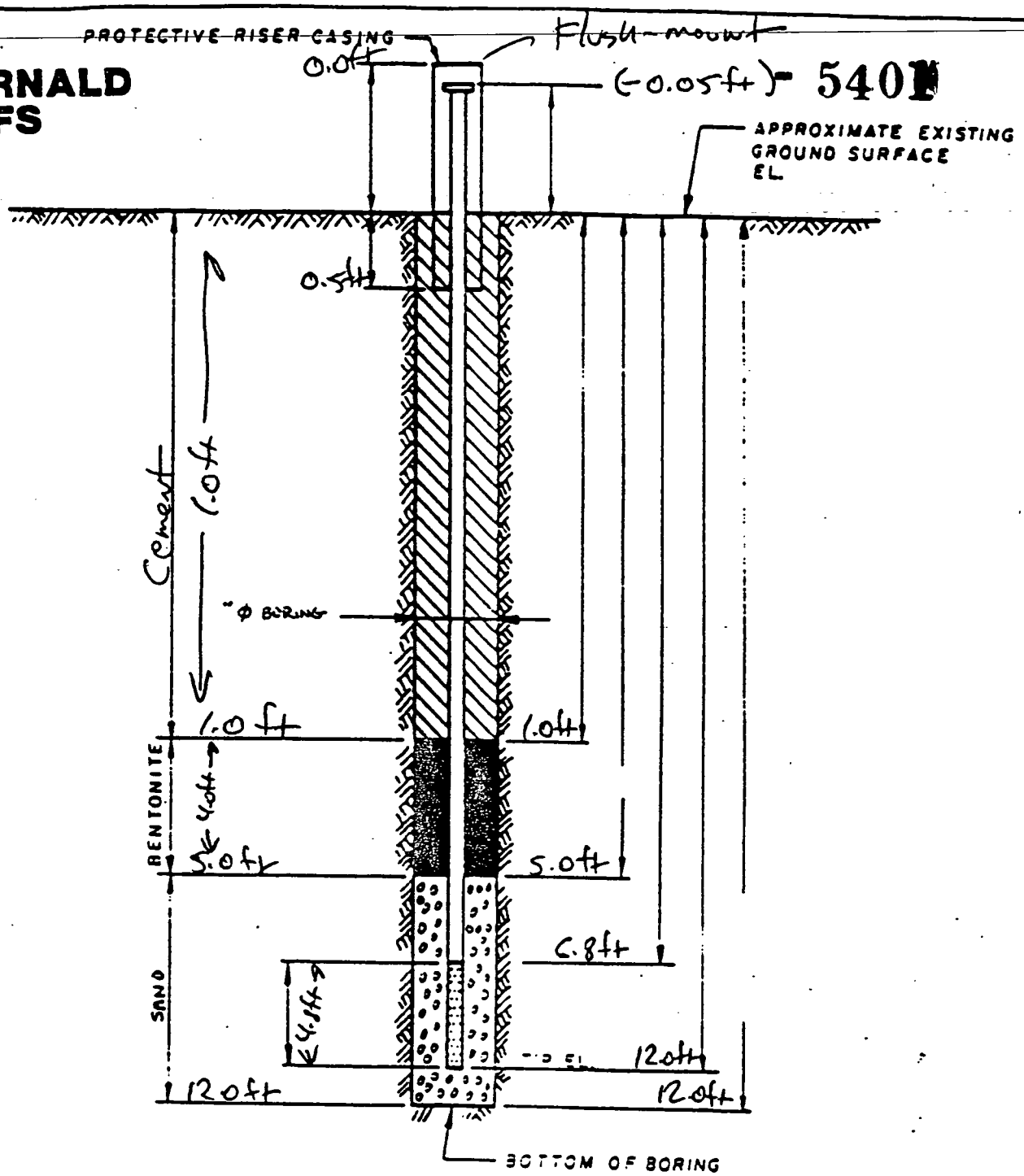
ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (ft)	
TOP OF RISER PIPE	0.05			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	0.5 ft			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP N/A	BOTTOM N/A	TOP	BOTTOM
BENTONITE	TOP 1.0 ft	BOTTOM 5.0 ft	TOP	BOTTOM
SAND	TOP 5.0 ft	BOTTOM 12.0 ft	TOP	BOTTOM
GRAVEL	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 6.8 ft	BOTTOM 11.6 ft	TOP	BOTTOM
PIEZOMETER TIP	12.0 ft ~~11.6 ft~~			
BOTTOM OF BOREHOLE	12.0 ft			
GWL AFTER INSTALLATION				

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

0 84

REMARKS

FERNALD RI/FS



DRAWN BY	CHECKED BY / APPROVED BY	DRAWING NUMBER
LS	KAH	Sc-12

NOTES:

1. RISER PIPE IS 2 IN I.D. SCHEDULE 40 PVC PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 2 IN I.D. PVC PIPE ~~CONTINUOUS~~ SLOT SCREEN (0.020 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

materials used:

3 1/2 bags of 10x20 Sand - 50lb Bags
2 buckets bentonite
10 gallons water

0 85

INSTALLATION DETAILS
MONITORING WELL 1155

PREPARED FOR

4.8 ft 0.020 PVC Screen
6.8 ft Sch 40 PVC Blank
Flush Thread Silt Trap.
4 1/2 x 0.5 ft Protective Cover

FERNALD RI/FS

- 5401

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1239	COORDINATES:	DATE: 4-30-89
ELEVATION:	GWL: Depth 10.5 ft Date/Time 4-30-89	DATE STARTED: 4-30-89
ENGINEER/GEOLOGIST: CGrube/E Trollinger	Depth Date/Time	DATE COMPLETED: 4-30-89
DRILLING METHODS: AUGER (HOLLOW STEM) 8"		PAGE 1 OF 4

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	17827 0920 4-30 17828 0920 4-30 17829 0920 4-30	4 8 10	13	HARD, LIGHT BROWN TO BROWN, (10YR 4/3) CLAY, TRACE OF MEDIUM GRAVEL, LOW PLASTICITY, MOIST.	CL	4.5	HNU: 0 ppm α: 0 cpm Bβ: 60-80 cpm
2	17830 0935 4-30 17831 0935 4-30 17832 0935 4-30	10 15 23	12	HARD, BROWNISH GRAY, (10YR 4/4) CLAY, TRACE OF MEDIUM GRAVEL, LOW PLASTICITY, MOIST.	CL	4.5	HNU: 0 ppm α: 0 cpm Bβ: 60-80 cpm
3 4	17833 0940 4-30 17834 0940 4-30 17835 0940 4-30	20 28 34	15	VERY STIFF, BROWN TO GRAY, (10YR 4/3) CLAY, LOW PLASTICITY, MOIST.	CL	3.0	HNU: 0 ppm α: 0 cpm Bβ: 60-80 cpm
5 6	17836 0947 4-30 17837 0947 4-30 17838 0947 4-30	28 29 29	15	STIFF, BROWNISH GRAY, (10YR 4/1), CLAY, MEDIUM PLASTICITY, MOIST.	CL	1.5	HNU: 0 ppm α: 0 cpm Bβ: 60-80 cpm
7	17839 1100 4-30 17840 1100 4-30 17841 1100 4-30	11 24 17	12	VERY STIFF, YELLOWISH BROWN TO GRAY, (10YR 5/4), CLAY, TRACE OF COARSE SAND, MEDIUM PLASTICITY, MOIST. VERY STIFF, DARK GRAY (10YR 3/1) CLAY, LOW PLASTICITY, MOIST.	CL	3.0	HNU: 0 ppm α: 0 cpm Bβ: 60-80 cpm

NOTES: CONTRACTOR: PENNDRILL
RIG: 53 MOBILE DRILL
DRILLER: Dave Newman
ASSISTANT: Bill Anderson

MATERIALS USED:
2 1/2 BAGS 10/20 SAND
1 1/2 BUCKETS BENTONITE PELLETS
5 GALS WATER

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION T
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0.2 PPM
α: 0 CPM
Bβ: 60-80 CPM

LEL O2: LEL: 0 PPM
O2: 20.6 %

FERNALD RI/FS

- 5401

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: 1239	COORDINATES:	DATE: 4-30-89	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4-30-89	
ENGINEER/GEOLOGIST: E. Tedlinger/K. Grove	Depth Date/Time	DATE COMPLETED: 4-30-89	
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF 4	

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 (IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	17842 1105 4-30	16	14	STIFF, YELLOWISH BROWN, (10YR 4/3), SANDY CLAY, TRACE OF MEDIUM GRAVEL, MEDIUM PLASTICITY, MOIST.	CL	1.75	HNU = 0 ppm α = 0 CPM Bβ = 60-80 CPM
	17843 1105 4-30	21					
	17844 1105 4-30	25		STIFF, DARK GRAY (5Y 4/1) CLAY, LOW PLASTICITY, MOIST.			
9	17845 1110 4-30	20	15	STIFF, MOTTLED GRAY BROWN, (10YR 4/3) SANDY CLAY, MEDIUM PLASTICITY, MOIST.	CL	1.25	HNU = 0 ppm α = 0 CPM Bβ = 60-80 CPM
PERCHED WATER @ 10.5 FT	17846 1110 4-30	21		STIFF, MOTTLED GRAY-BROWN (5Y 3/1) CLAY, MEDIUM PLASTICITY, MOIST.			
10	17847 1110 4-30	21					
11	17848 1400 4-30	3	14	STIFF, OLIVE GRAY, (5Y 4/2) CLAY, TRACE OF MEDIUM GRAVEL, MEDIUM PLASTIC, WET.	CL	1.25	HNU = 0 ppm α = 0 CPM Bβ = 60-80 CPM
	58625 1400 4-30	6		~~STIFF~~ EI MED. DENSE, YELLOWISH-BROWN, (5Y 4/2) SANDY SILT, TRACE OF GRAVEL (FINE TO MEDIUM), WET. CLAY-GRAY EVIDENT IN TIP OF SPOON	ML	ET. ~~1.25~~ N/A	
	58626 1400 4-30	7					
12				BOTTOM OF BORING @ 12.0 FT SAMPLING ENDED @ 12.0 FT			HNU = α = Bβ =
13							
14							HNU = α = Bβ =

NOTES:

0 87

FERNALD RI/FS

- 5401

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD FMPC
FIELD ENG./GEO. E. TROLLINGER C. GRUBE DATE 4-30-89
PROJECT NO. 602 3.7
CHECKED BY L.A. Hertel DATE 5-2-89
BORING NO. 1239
PIEZOMETER NO. 1239
DATE OF INSTALLATION 4-30-89

BOREHOLE DRILLING

DRILLING METHOD 8" HSA	TYPE OF BIT 8" HSA
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID N/A FROM — TO —	SIZE N/A FROM N/A TO N/A
FLUID N/A FROM — TO —	SIZE N/A FROM N/A TO N/A

PIEZOMETER DESCRIPTION

TYPE MONITORING PIEZOMETER	RISER PIPE MATERIAL SCH. 40 PVC
DIAMETER OF PERFORATED SECTION 20 in ID	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 2 5/16 in I.D. 2.0 in
SLOTS ☒ HOLES ☐ SCREEN ☐	LENGTH OF PIPE SECTIONS
AVERAGE SIZE OF PERFORATIONS 0.020 in	JOINING METHOD SCREW TYPE, FLUSH JOINTED.
TOTAL PERFORATED AREA 5.0 FT.	

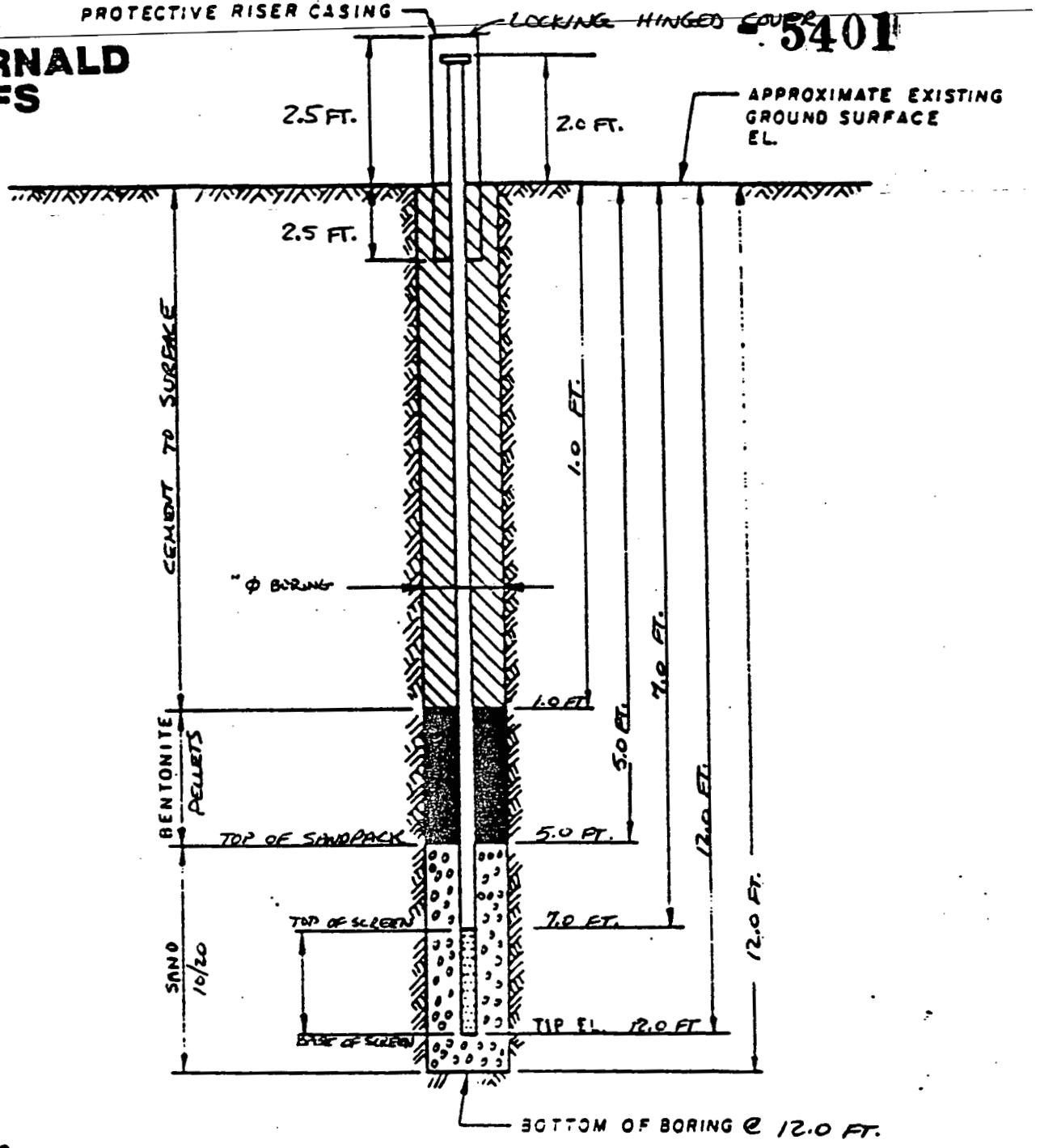
PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT.	OTHER PROTECTION HINGED COVER WITH INSTALLED PADLOCK
PROTECTIVE PIPE O.D. 4 3/8 in	

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~~ CEMENT PLUG	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
3/8 in BENTONITE PELLETS	TOP 1.0	BOTTOM 5.0	TOP	BOTTOM
SAND 10/20	TOP 5.0	BOTTOM 12.0	TOP	BOTTOM
~~GRAVEL~~ NONE USED	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 7.0	BOTTOM 12.0	TOP	BOTTOM
PIEZOMETER TIP	5.4 FT. ~~7.5~~ FT. 12.0 FT.			
BOTTOM OF BOREHOLE	12.0 FT.			
GWL AFTER INSTALLATION	—		0 88	

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS GWL AFTER INSTALLATION NOT ACCURATELY MEASURED DUE TO M-SCOPE MALFUNCTION.

FERNALD RI/FS



DRAWING NUMBER	MW-1239
	5-2-89
CHECKED BY	Wakefield
APPROVED BY	
E.T.	
DRAWN BY	

NOTES:

1. RISER PIPE IS 2 IN I.D. SCHEDULE 40 PVC PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 2 IN I.D. SCH 40 PVC PIPE ~~CONTINUOUS~~ SLOT SCREEN (0.020 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

MATERIALS USED:

10/20 SAND - 2½ BAGS (80 lb. ea.)
BENTONITE PELLETS - 1½ BUCKETS (5 gal ea.)
CEMENT - ½ BAG (50 lb.)
5 GALS WATER

INSTALLATION DETAILS
MONITORING WELL #1239

0 89

PREPARED FOR FINAL RI/FS
BORING #1239

PVC WELL SCREEN AND RISER PIPE.
1-5 FT. SCREEN SECTION
1-9 FT. SECTION (CUT TO LENGTH)

4/15/89 [illegible]

FERNALD RI/FS

- 5401

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2.1	PROJECT NAME: FMPC RI/FS (SOUTH FIELD)		
BORING NUMBER: 2002	COORDINATES:	DATE: 04-2-89 / 04-4-89	
ELEVATION:	GWL: Depth 70.0 FT Date/Time 4-11-89 @ 1500	DATE STARTED: 4-2-89	
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth 68.2 FT Date/Time 4-12-89 @ 0800	DATE COMPLETED: 04-12-89	
DRILLING METHODS: CABLE TOOL (CYCLONE) 69.9 FT	4-13-89 @ 0830	PAGE 1 OF 8	

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	32295 0938 04-2	1 2 6	8	STIFF, DARK YELLOWISH BROWN, (10YR 4/6), ORGANIC SILTY CLAY, LOW TO MED. PLASTICITY, WET	OL	1.5	H_{nu} = BKg. α = BKg. $\beta\gamma$ = 60 CPM
2 3	32296 0943 04-2	3 8 10	8	STIFF, DARK YELLOWISH BROWN, (10YR 4/6) ORGANIC SILTY CLAY, LOW TO MED. PLASTICITY, WET.	OL	1.5	H_{nu} = BKg. α = BKg. $\beta\gamma$ = 60 CPM
4	32297 0945 04-2	9 14 16	9	HARD, GRAY, (10YR 5/1), SANDY CLAY, MOIST, LOW PLASTICITY.	CL	4.5	H_{nu} = BKg. α = BKg. $\beta\gamma$ = 60 CPM
5 6	32298 0950 04-2	14 21 25	7	VERY STIFF, YELLOWISH BROWN, (10YR 5/4), GRAVELLY CLAY, MED. PLASTICITY, MOIST.	CL	4.0	H_{nu} = BKg. α = BKg. $\beta\gamma$ = 60-80 CPM
7	32299 1010 04-2	15 25 30	10	VERY STIFF, YELLOWISH BROWN-GRAY, (10YR 4/4), CLAY, SOME COARSE SAND, LOW TO MED. PLASTICITY, MOIST.	CL	4.0	H_{nu} = BKg. α = BKg. $\beta\gamma$ = 60-80 CPM
8 9	32300 1015 04-4	9 17 10	12	HARD, DARK YELLOWISH BROWN-GRAY, (10YR 4/6) GRAVELLY, SILTY CLAY, MOIST. MED. PLASTICITY.	CL	>4.0	H_{nu} = BKg. α = BKg. $\beta\gamma$ = 60-80 CPM
10	32301 1030 04-4	15 22 32	13	HARD, DARK GRAYISH BROWN, (10YR 4/2) SANDY CLAY, TRACE OF FINE GRAVEL, MOIST. MED. PLASTICITY.	CL	>4.0	H_{nu} = BKg. α = BKg. $\beta\gamma$ = 80-CPM
11 12	32302 1046 04-4	10 14 14	14	VERY STIFF, DARK GRAYISH BROWN, (2.5Y 4/2), CLAY, TRACE OF COARSE SAND, MOIST. MED. PLASTICITY.	CL	3.75	H_{nu} = BKg. α = BKg. $\beta\gamma$ = 60 CPM
13	32303 1115 04-4	6 10 14	8	VERY STIFF, DARK GRAY, (2.5Y 4/0), CLAY, TRACE OF COARSE SAND, MED PLASTICITY, MOIST.	CL	2.50	H_{nu} = BKg. α = BKg. $\beta\gamma$ = 60 CPM
14	32304 1127 04-4	5 12 17	10	VERY STIFF, DARK GRAY, (2.5Y 4/0), CLAY, TRACE OF COARSE SAND, MED. PLASTICITY, MOIST.	CL	2.50	H_{nu} = BKg. α = BKg. $\beta\gamma$ = 60 CPM

NOTES: PENN DRILL CO.
DRILLER: JOE BARILE
HELPER: BILL FELTY

MATERIALS USED
SAND: 20 BAGS 10/20 80 lb
BENTONITE: 5 BUCKETS
VOLCLAY GROUT: 12 BAGS
WATER: 650 GALS. TOTAL

SAMPLING PERFORMED IN ACCORDANCE WITH ASTM STANDARDS, COLOR DESCRIBED BY MUNSELL COLOR CHART.

0 90

INSTRUMENT BACKGROUND
H_{nu} = 0.4 PPM
α = 0 CPM
$\beta\gamma$ = 60-80 CPM
EXO TOX LEL_{O_2} = 0 PPM/0 %

4/13/89 CB

FERNALD RI/FS

5401

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2.1	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2002	COORDINATES:	DATE: 04-4-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4-2-89
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth Date/Time	DATE COMPLETED: 04-12-89
DRILLING METHODS: CABLE TOOL (CYCLONE)		PAGE 2 OF 8

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	32305 1136 04-4	5 10 11	10	VERY STIFF, DARK GREENISH GRAY, (2.5Y 4/0), CLAY, TRACE OF COARSE SAND, MED. PLASTICITY, MOIST	CL	3.50	Hnu = Bkg. α = Bkg. βγ = 60 CPM
17 18	32306 1345 04-4	5 12 14	8	VERY STIFF, DARK GRAY, (2.5Y 4/0), CLAY, TRACE OF COARSE SAND AND FINE GRAVEL, MED. PLASTICITY, MOIST.	CL	3.75	Hnu = Bkg. α = Bkg. βγ = 60 CPM
19	32307 1405 04-4	5 5 7	6	STIFF, DARK GRAY, (2.5Y 4/0), CLAY, TRACE OF COARSE SAND AND ORGANIC DEBRIS-WOOD, ETC., MED. PLASTICITY, MOIST TO WET.	CL	2.00	Hnu = Bkg α = Bkg βγ = 40-60 CPM
20 21	32308 1425 04-4	5 7 7	7	VERY STIFF, DARK GRAY, (2.5Y 4/0), CLAY, TRACE OF FINE GRAVEL, MED. PLASTICITY, WET.	CL	2.50	Hnu = Bkg α = Bkg βγ = 40-60 CPM
22	32309 1600 04-4	3 5 8	5	VERY STIFF, DARK GRAY, (2.5Y 4/0), SANDY CLAY, TRACE OF FINE GRAVEL, MED. PLASTICITY, MOIST	CL	2.50	Hnu = Bkg α = Bkg. βγ = 40-60 CPM
23 24	32310 1615 04-4	5 7 10	8	VERY STIFF, DARK GRAY, (10YR 4/1), SILTY CLAY, TRACE OF FINE GRAVEL, MED. PLASTICITY, MOIST.	CL	2.75	Hnu = Bkg. α = Bkg. βγ = 40-60 CPM
25	32311 1630 04-4	5 9 10	8	VERY STIFF, DARK GRAY, (10YR 4/1), CLAY, TRACE OF GRAVEL .50 IN, AND SOME SILT THROUGHOUT, MED. PLASTICITY, MOIST.	CL	2.75	Hnu = Bkg. α = Bkg. βγ = 60 CPM
26 27	32312 1645 04-4	5 8 11	7	VERY STIFF, DARK GRAY-BROWN, (10YR 4/1), SILTY CLAY, TRACE OF FINE GRAVEL, MED. TO LOW PLASTICITY, MOIST.	CL	3.50	Hnu = Bkg. α = Bkg. βγ = 40-60 CPM
28	32313 1700 04-4	7 8 20	9	MEDIUM DENSE, YELLOWISH BROWN-GRAY, (10YR 5/6), VERY SILTY CLAY, SILT TRACE, OF FINE GRAVEL, MOIST.	ML ~~CL~~ ET.	E.T. ~~4.00~~ N/A	Hnu = Bkg. α = Bkg. βγ = 40-60 CPM
29	32314 1715 04-4	22 21 14	10	DENSE, YELLOWISH BROWN, (10YR 5/6), POORLY GRADED SAND, MOIST.	SP	N/A ~~4.00~~ ET	Hnu = Bkg α = Bkg. βγ = 40-60 CPM

TILL EXTENT @28.5 FT.

NOTES:

DRILLER: JOE BITRICE
HELPER: BILL FELTY

INSTRU. BKG.
Hnu = 0.2-0.4 ppm
α = 0 CPM
βγ = 40-60 CPM

0 91

4/13/89 (2)

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

- 5401

PROJECT NUMBER: 602 32	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 2002	COORDINATES:		DATE: 4-5-89
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 4-2-89
ENGINEER/GEOLOGIST: E. TRUNNBEL	Depth	Date/Time	DATE COMPLETED: 04-12-89
DRILLING METHODS: CABLE TOOL			PAGE 3 OF 8

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31 32 33 34 35				PREVIOUS SAMPLE TAKEN AT 28.5 FT - 30.0 FT. THUS SAMPLING STARTED AT 35.0 FT AND EVERY 5.0 FT INTERVAL THEREAFTER.			
32315 2 → 36	32315 1515 04-05	42 50 50/4in	10	VERY DENSE, DARK YELLOWISH BROWN, (10YR 4/4), WELL GRADED SAND TRACE OF FINE GRAVEL, DRY.	SW	N/A	Hau = BKG. α = BKG βγ = 30-40 CPM
37 38 39 40							
41	32316 1700 04-05	47 50 5in	6	VERY DENSE, DARK YELLOWISH BROWN, (10YR 4/4), POORLY GRADED SAND, TRACE OF FINE GRAVEL, DRY.	SP	N/A	Hau = BKG. α = BKG. βγ = 40 CPM
42 43 44							

NOTES:

DRILLER: JOE BARILE
HELPER: BILL FOLTY

0 92

INSTRU. BKG.
Hau = 0.4 ppm
α = 0 CPM
βγ = 40 CPM

4/15/89

FERNALD RI/FS

- 5401

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2002	COORDINATES:	DATE: 46-89 / 4-11-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4-2-89
ENGINEER/GEOLOGIST: E. TRULLINGER	Depth Date/Time	DATE COMPLETED: 04-12-89
DRILLING METHODS: CABLE TOOL		PAGE 4 OF 8

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
32317 → 46	32317 1010 ~~1035~~ ET. 04-06	50+ / 4 in	4	VERY DENSE, YELLOWISH BROWN, (10YR 4/4), WELL GRADED SAND, MOIST.	SW	N/A	H_{nu} = BKG. α = BKG. $\beta\gamma$ = 40-50 cpm
47							
48							
49							
50							
51 ET	32318 1035 ~~1045~~ 04-06	42 50 / 5 in	7	VERY DENSE, YELLOWISH BROWN (10YR 4/4), WELL GRADED SAND, MOIST.	SW	N/A	H_{nu} = BKG. α = BKG. $\beta\gamma$ = 40 cpm
52							
53							
54							
55							
56	32319 1045 04-11	42 50 / 3 in	6	VERY DENSE, DARK YELLOWISH BROWN (10YR 4/4), POORLY GRADED SAND, MOIST.	SP	N/A	H_{nu} = BKG α = BKG $\beta\gamma$ = 40 cpm
57							
58							
59							

NOTES:

DRILLER: JOE BARKE
HELPER: BILL FELTY

INSTRU. BKG.
H_{nu} = 0.4 ppm
α = 0 cpm
$\beta\gamma$ = 40-50 cpm

0 93

FERNALD
RI/FS

- 5401

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 2002	COORDINATES:		DATE: 4-11-89
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 4-2-89
ENGINEER/GEOLOGIST: E. TOLLINGER	Depth	Date/Time	DATE COMPLETED: 04-12-89
DRILLING METHODS: CABLE TOOL			PAGE 5 OF 8

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	32320 1130 04-11	50 50+/4in	7	VERY DENSE, DARK YELLOWISH BROWN, (10YR 4/4) WELL GRADED GRAVELLY SAND, MOIST.	SW	N/A	Hnu = BKG. α = BKG. βγ = 50-60 CPM
62							
63							
64							
65							
66	32321 1400 04-11	50 50+/3in	6	VERY DENSE, GRAYISH BROWN, (10YR 4/2) SANDY, FINE, WELL GRADED GRAVEL, MOIST TO WET.	GW	N/A	Hnu = BKG. α = BKG. βγ = 60 CPM
67							
68							
69							
70	32322 1450 04-11	5 8 30	9	DENSE, BROWN, (10YR 4/3) POORLY GRADED SAND, WET	SP	N/A	Hnu = BKG. α = BKG. βγ = 60 CPM
71							
72							
73							
74							

AVERAGE WATER LEVEL @69.3 FT.

NOTES:

DRILLER: JOE BARKLE
HELPER: BILL FELTY

INSTRU. BKG.
Hnu = 0.4 ppm
α = 0 CPM
βγ = 60 CPM

0 94

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 2002	COORDINATES:		DATE: 4-11-89
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 4-2-89
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth	Date/Time	DATE COMPLETED: 04-12-89
DRILLING METHODS: CABLE TOOL			PAGE 6 OF 8

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76	32323 1515 0411	13 12 25	12	DENSE, BROWN, (10YR 4/3) WELL GRADED, GRAVELLY SAND, WET.	SW	N/A	H_{net} = BKG. α = BKG. $\beta\gamma$ = 60 CPM
77							
78							
79							
80							
81	32324 1556 04-11	10 14 18	10	DENSE, BROWN, (10YR 4/3) SANDY, WELL GRADED GRAVEL, WET.	GW	N/A	H_{net} = BKG. α = BKG. $\beta\gamma$ = 60 CPM
82				SAMPLING ENDED AT 81.5 FT. DRILLING ENDED AT 83.0 FT			
83							
84							
85							

NOTES:

DRILLER: JOE BARILE
HELPER: BILL FELTY

INSTRU. BKG.

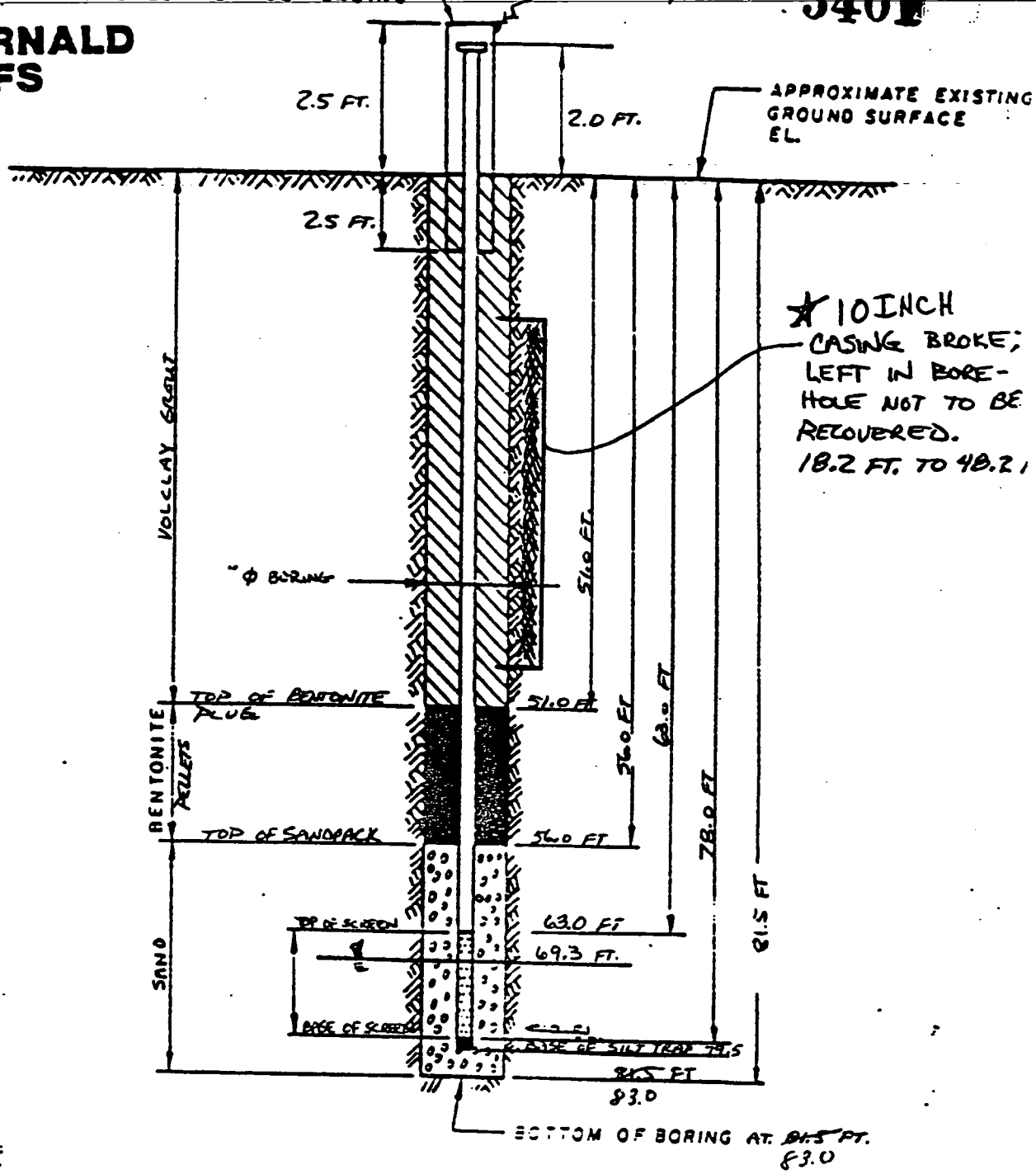
H_{net} = 0.4 ppm
α = 0 CPM
$\beta\gamma$ = 60-70 CPM

4/15/89 (W)

7/8

MW-2002

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. W/WELDED SILT TRAP
4. ELEVATION OF WATER LEVEL 68.2, 70.0 69.9 FT.
5. WATER LEVEL READING ON 4-11, 4-12, 4-13-89

MATERIALS USED:

20 BAGS 10/20 SAND (80 lb.) ea.
12 BAGS VOLCLAY GROUT (50 lb.) ea.
5 BUCKETS BENTONITE PELLETS (5 gal.) ea.
WATER: 450 GALS DRILLING
200 GROUTING
(650 GALS. TOTAL)

PIPE SECTIONS:
6 - 10 FT.
1 - 5 FT.
1 - 15 FT. PERF. SCREEN
1 - 1.5 FT. SILT TRAP (WELDED)

INSTALLATION DETAILS
MONITORING WELL #2002

PREPARED FOR FMPC RI/FS

0 96

DRAWING NUMBER MW-2002
CHECKED BY WAH 5-5-89
APPROVED BY
DRAWN BY E.T.

4/13/89 8/8

FERNALD RI/FS

MW-2002

PIEZOMETER INSTALLATION SHEET

-5401

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. E. TROLLINGER DATE 4-12-89
PROJECT NO. 6023.2.1 CHECKED BY W A Hertel DATE 5-5-89
BORING NO. 2002
PIEZOMETER NO. 2002 DATE OF INSTALLATION 4-14-89

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 0.0 FT. TO 83.0 FT
FLUID _____ FROM _____ TO _____

TYPE OF BIT HAMMER
CASING SIZE (S) USED:
SIZE 10 IN ID FROM 0.0 FT. TO 83.0 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 15.0 FT.

RISER PIPE MATERIAL (316) STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN I.D. 4.0 IN
LENGTH OF PIPE SECTIONS 10.0 FT., 5.0 FT.
JOINING METHOD THREADED, FLUSH JOINTED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT.
PROTECTIVE PIPE O.D. 10.75 IN

OTHER PROTECTION RISER PROTECTIVE PIPE HINGED LID COVER WITH LOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0 FT.	BOTTOM 51.0 FT.	TOP	BOTTOM
BENTONITE PELLETS	TOP 51.0 FT.	BOTTOM 56.0 FT.	TOP	BOTTOM
SAND 10/20	TOP 56.0 FT.	BOTTOM 81.5 FT.	TOP	BOTTOM
~~GRAVEL~~ NONE USED	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 63.0 FT.	BOTTOM 78.0 FT.	TOP	BOTTOM
PIEZOMETER TIP	79.5 FT.			
BOTTOM OF BOREHOLE	83.0 ~~81.5~~ FT.			
GWL AFTER INSTALLATION	69.9 FT.			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑ 0.97
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑
REMARKS 1.5 FOOT OF SETTLEMENT OF SUSPENDED MATERIAL.