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REMEDIAL INVESTIGATION AND FEASIBILITY STUDY MONTHLY TECHNICAL PROGRESS REPORT FEBRUARY 1990 FEED MATERIALS PRODUCTION CENTER FERNALD, OHIO

02/01/90

DOE-FMPC/USEPA
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REPORT

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REMEDIAL INVESTIGATION

AND

FEASIBILITY STUDY

MONTHLY TECHNICAL PROGRESS REPORT

FEBRUARY 1990

FEED MATERIALS PRODUCTION CENTER
FERNALD, OHIO

Attachment to:

STATUS

General

Progressive actions continued on the FMPC Site Wide RI/FS during February 1990.

Technical review of Cost Account Plans was completed with DOE/WMCO.

Task 1 - Description of Current Situation

Complete 100%

Task 2 - Remedial Investigation Work Plan Requirements

A Work Plan addendum was submitted in January, 1990, initially for thirty additional monitoring wells, including three off-site wells and four additional off-site contingency wells. Technical direction to proceed with a change to 31 wells, per meeting in January with DOE and EPA.

Task 2 percent complete: 95%

Task 3 - Site Investigation Facility Testing

Facility Testing

During February, three borings were drilled in the production area with two borings completed as piezometers. Borings were drilled at the fire training area as suspect areas outside the production area, eight borings were drilled as piezometers. Table 2.3.1 summarizes the Facility Testing borings drilled in February, with boring logs included in Attachment A. Table 2.3.2 summarizes the present status of the Facility Testing boring investigation.

Monitoring Well Installation

The additional monitoring well program began January 18, 1990 and the first well, 3120, was completed February 2, 1990. Monitoring well 2120 followed to complete the two well cluster for monitoring the Plant 6 area. Monitoring well 2032 was installed on the west side of the K-65 silos. Table 2.3.3 summarizes the monitoring wells completed in February, with boring logs included in Attachment B.

Geochemical Boring Program (Issue 2)

Three borings were completed within the production area: boring locations 1505, 1506, 1507. Borings were drilled to a total depth of 20.0 feet and plugged with volclay grout. Boring logs are included in Attachment C.

Outfall Pipeline Soil Sampling

Soil sampling borings were conducted along the Outfall Pipeline (effluent line from FMPC). A total of 14 borings were completed and are summarized in Table 2.3.4. Boring logs are included in Attachment D.

Transit Survey

Surveying activities continued on establishing the horizontal and vertical coordinates of the completed wells, piezometers, and borings. Surveying continued for the Remedial Investigation: Production and Suspect Area; five borings over the laboratory burial area and three borings over the laboratory waste pits. Boring locations were surveyed for Task 9.31 - Outfall Pipeline Investigation, and coordinates established.

The following are summaries of Ground Water Sampling, Well Development and Water Level Measurements that occurred during February 1990.

Facility Testing, Ground Water Sampling

Fifty-seven piezometers were sampled for nitrate analysis and fifteen piezometers were sampled for total uranium analysis. Additionally, at WMCO's request, the three piezometers in Plant 6 (1148, 1149 and 1161) were sampled for full radiological analysis and piezometer 1149 was sampled for full HSL parameters.

Well Development

Offsite monitor wells 2126 and 3126 were developed during February. These were the final two wells in the seven well South Plume well installation program. Development of wells included in the "Additional Monitoring Well Program" will begin in March.

RI/FS Ground Water Sampling

South Plume monitoring wells 2129, 2126 and 3126 were sampled after development was complete. Well 2129 was sampled for full HSL parameters. Wells 2126 and 3126 were sampled for the standard RI/FS, Table 6 parameters.

Water Level Measurements

Water level measurements for all ground water monitoring wells were taken in February.

Biological Resources

A progress report on acute and chronic testing of FMPC effluent, conducted in January 1990, was received on February 28, 1990. A revision on this report is due March 9, 1990.

TABLE 2.3.1

Facility Testing Drilling Progress

Date	Boring No.	Depth (Ft.)	Piezometer Installed Yes/No	Sector No.
2/02/90	1508	13.5	Yes	Fire Training Area
2/03/90	1509	20.0	Yes	Fire Training Area
2/03/90	1188	20.0	Yes	2
2/04/90	1510	9.0	Yes	Fire Training Area
2/05/90	1511	13.5	Yes	Fire Training Area
2/06/90	1512	14.0	Yes	Fire Training Area
2/06/90	1513	20.0	Yes	Fire Training Area
2/07/90	1514	13.5	Yes	Fire Training Area
2/07/90	1515	13.0	Yes	Fire Training Area
2/08/90	1319	N/A	Plugged and Abandoned	4 - Plant 9
2/18/90	1423 (Redrill 1319)	12.6	Yes	4 - Plant 9
2/28/90	1315	20.0	No (Dry)	4 - Plant 9

TABLE 2.3.2

Facility Testing Boring Status
February 1990

Sector	Percent Completed
I and VI	100% (58 of 58)
II	97% (68 of 70)
III	66% (19 of 29)
IV	93% (56 of 60)
V	100% (34 of 34)

TABLE 2.3.3

Monitoring Well Installation Progress
Task 3.2.1

Date	Well No.	Total Depth (Ft.)	Well Tip (Ft.)
2/02/90	3120	135.5	132.0
2/13/90	2120	76.0	75.4
2/17/90	2032	65.0	56.7

TABLE 2.3.4

Summary of Outfall Pipeline Borings
Task 9.31

Date	Boring No.	Depth Sampled (Ft.)
2/13/90	1524	9.5
2/13/90	1524 - Duplicate	9.5
2/16/90	1525	6.0
2/16/90	1526	8.0
2/16/90	1527	8.0
2/17/90	1528	14.0
2/17/90	1534	11.0
2/18/90	1534 - Duplicate	10.0
2/18/90	1529	10.5
2/18/90	1530	13.5
2/19/90	1531	14.0
2/19/90	1532	14.0
2/19/90	1533	15.0
2/19/90	1533 - Duplicate	15.0

TASK 4 - SITE INVESTIGATION ANALYSIS

Accomplishments: Database - Verification for ground water sampling rounds 5 and 6 was completed; those data are available for general access and use on FERNET. Homeowner reports for those rounds were transmitted to DOE.

The Data Management Team met with DOE and representatives of U.S. EPA and OEPA to streamline the process of transmitting data from the master database. Pursuant to agreements reached, RI/FS ground water for sampling rounds 1-6 were extracted and transmitted in a form available for direct upload to receiving databases. This was the first in what is expected to be a series of data transfers using methods that will be efficient for the groups involved.

Corrections in depth-to-water reference points on the wells were completed. Final installation of the programming changes and rerunning of all water elevation reports and maps await written documentation from technical personnel, QA approval, and changes to the field forms requested by Data Management.

Ongoing support functions are summarized as follows. Support was provided to the Operable Unit 2 RI report, in terms of data extractions and tabular presentation. Data entry support continued for Facilities Testing. Map production support was provided for Operable Unit 4. Data manipulation programs and map programs were produced for surface radiation data in support of the community meeting.

Problems:

It was reported last month that historic RCRA data received from WMCO in a file format inconsistent with the master database were converted by ASI/Albuquerque. The inconsistency was due to the diskettes transmitted being in Apple McIntosh format instead of IBM-PC format. The two are incompatible, thus the original files cannot be accessed for loading to the master database. The converted data show that after the first line, the data are inconsistently placed. ASI staff have called WMCO in an attempt to work out a way of resolving the problem. In the meantime, the historic RCRA data cannot be loaded.

Hardcopy data sheets were received via WMCO from National Environmental Testing, Inc., (Howard Labs) relative to task 9.27. CAS numbers were not reported; this is a problem because the master database is set up for those numbers to be the key data element into the lab chemistry parameters. Data Management is awaiting results of an effort to manually transpose CAS numbers onto the lab reports to permit data entry to the master database. Because of this problem, the thirty-day reporting requirement from the master database will not be met.

GROUND WATER FLOW AND TRANSPORT MODELING

Work Completed in February

This progress report covers ground water flow and solute transport modeling work for the period from February 1 through February 28, 1990. During this period, the following work was completed:

- Quality Assurance checking of solute transport model for work covered in the model construction and calibration report.
- Incorporation of reviewers' comments into the Model Calibration and Construction Report was approximately 60 percent completed.
- Adjustment of calibration of the solute transport model to match new uranium data is approximately 10 percent complete.

WORK PLANNED FOR MARCH

- Incorporation of reviewers' comments into the Model Calibration and Construction Report.
- Adjust calibration of the solute transport model to match uranium data from new monitoring wells.

Risk Assessment

The Risk Assessments (RAs) for Operable Units (OU) 1,2,3,4 and 5 are in progress. Most of the effort to date has focused on the Baseline Risk Assessment (BRA) as part of the RIs; however, the risk assessment team is routinely interfacing with, and supporting RI and FS activities. Risk assessment activities in support of the FS are increasing as FS engineering progresses.

The progress on RAs for each operable unit is summarized below:

Operable Unit 1

Risk assessment activities are proceeding on schedule. Progress continues to the extent practicable without data from the proposed sampling and analysis plan (SAP) for OU1.

The following sub-tasks are in progress:

- Selection of pathways of concern.
- Toxicity assessment.
- Compilation of environmental sampling data.
- Fate and transport modeling.

Operable Unit 2

The following sub-tasks were completed during February, 1990:

- Preparation of a preliminary working draft of each chapter of the baseline risk assessment report.
- Chemical toxicity assessment.
- Fate and transport modeling.
- Evaluation of transport modeling results.
- Quantification of exposures.

The following sub-tasks are in progress:

- Preparation of working draft for internal review.
- Modeling of waste constituents to the ground water at location of selected receptors.

Delays and difficulties in obtaining concentration estimates from ground water modeling have prevented finalization of exposure and risk estimates via this pathway. The working draft will be issued for internal review in early March, 1990, and will incorporate ground water modeling results, if available.

The working draft will be issued without data from the proposed SAP for OU1. This lack of data will result in significant uncertainty in defining the extent and level of contamination in OU2.

Operable Unit 3

The primary effort to date has been familiarization with the operable unit, definition of its components, and identification of available information and data.

Operable Unit 4

A working draft Baseline Risk Assessment Report is being revised and reformatted to be consistent with U.S. EPA Interim Final Risk assessment Guidance for Superfund - Human Health Evaluation Manual (December, 1989) and to incorporate comments from previous internal reviews. The revised BRA report will be submitted to DOE as part of the RI Report in March, 1990. It will reflect all data available at the time of submittal. However, completion of the final draft of the BRA is dependent on receipt of analytical results of samples from the planned supplemental Sampling and Analysis Plan (SAP) for OU4. These data are not expected to be available for several months. Any revisions to the BRA report resulting from these new data will be incorporated during the RI Report review cycle.

In anticipation of potential migration of contaminants from the K-65 Silos to the underlying aquifer, the RA team is performing fate and transport modeling for these pathways to expedite review and to incorporate these new data into the final BRA report.

Operable Unit 5

BRA tasks for Operable Unit 5 have begun. Analytical results for radionuclides and chemicals in sediments, surface water, ground water and biological data are being compiled and reviewed. Toxicity assessment, determination of potential exposure pathways and other sub-tasks have been initiated, but are in early stages of progress.

FS Risk Assessment

The RA team is working directly with the FS engineering task teams for Operable Units 1, 2, and 4 on a routine basis. The FS RAs are in the initial phases and are proceeding on schedule as an integral part of FS activities.

NEPA ACTIVITIES

In February, the ASI NEPA staff briefed many groups on the FMPC RI/FS EIS and NEPA Integration process. The groups included ASI and IT RI/FS project staff in Pittsburgh, Knoxville, and Oak Ridge; WMCO staff at the FMPC; and local FRESH members. NEPA coordinators have been assigned at off-site operable unit offices. The preparation of the Draft EIS outline and text was initiated. RI/FS-NEPA integration is proceeding with input to alternative screening and analysis, environmental risk analysis, and NEPA input is being provided to the South Plume-and Waste-Pit-EE/CA revision efforts.

Additional Notice of Intent text changes were made based on comments from the DOE-HQ staff. Proposed EIS scoping meetings have been replanned for March. Information on the planned EIS and upcoming scoping meetings was presented at the RI/FS community meeting in late February.

Activities next month will focus on finalization of the Notice of Intent, preparation for scoping meetings, assignment of NEPA staff at Fernald, and continuation of RI/FS and NEPA integration.

Task 5 - Laboratory & Benchscale Studies

Resampling of K-65 Silos is on hold until spring and review of various alternate methods have been evaluated for ensuring a high chance of success for obtaining high quality samples.

The sampling team is in the process of setting-up and conducting training in preparation for sampling in the spring.

Task 6 - Remedial Investigation RI Reports

Operable Unit 1

Remedial Investigation

No activity to date. Remedial Investigation report efforts are scheduled to start March 1, 1990. RI activity is scheduled to start March 1, 1990. The delivery date for the report is scheduled for July, 1990. A proposal for additional sampling for Operable Units 1 and 2 was completed in January.

Operable Unit 2

Remedial Investigation

- On the RI report, instead of placing raw data in the appendix and requiring the reader to analyze the data, the RI team is trying to compile the data in summary tables so the report will be easier to read and follow. This work requires a lot of tedious hours to perform but we have identified three additional people to assist in generating these tables.

- The RI report will require a great deal of work due to the lack of information and the format of information that is received.

- The RI team received biological data which is available for input into the report.

- The base maps have been generated.
- The cross sections for the wells in Operable Unit 2 have been developed.
- Summary tables for the soils and ground water data continue to be generated and evaluated.
- Sections 1 and 2 of the RI report are 100% complete.
- Section 4 - Fate and Transport cannot be written until the summary tables are generated and evaluated.
- The bulk of the RI report will be tables and figures. The tables are requiring a lot of calculations and placing the data in readable formats.
- The draft RI report will contain a lot of data gaps due to lack of information and time to compile the tables. Therefore, the RI team will identify the data gaps and state how the information will be collected.
- The draft RI report is scheduled for internal peer review on March 8. The peer review group has been informed that the document may be a little late. We still anticipate meeting the April 9 delivery date to DOE.

Operable Unit 3

Remedial Investigation

Work accomplished this month by IT's on-site staff included compilation of soils related total uranium data within the Production Area. A map defining total U levels by specific area with in the Production Area was prepared for soils located between the surface and 1-1/2' depth.

WORK PROJECTED FOR MARCH

- Complete the OU3 development of alternatives effort
- Initiate the writing of the OU3 initial screening of alternatives report
- Incorporate DOE comments and finalize the OU3 FS Scope of Work document
- Gather information from on-site ASI/IT and WMCO personnel for consideration in OU3 Risk Assessment activity by IT Knoxville

- Complete four additional total U soils maps for OU3 Production Area levels and initiate data validation
- Initiate evaluation of OU3 Production Area ground water for total U and flow directions

Operable Unit 4

The RI report has been sent out for formal peer review.

Operable Unit 5

Work Completed in February

- Work continued on data development activities and focused on the following:
  - Computer analysis of ground water data
  - Compilation of soil and surface water/sediment data
  - Development of site data on the characteristics of the till overlaying the site
- Initiation of report preparation

Work Planned for March

- Complete data compilation
- Continuation of RI report preparation

Problems and Concerns

None

Task 7 - Project Management & Reports

Project Management

The majority of this activity during February was spent on providing coverage for the DOE/WMCO Technical Review of the submitted Project Cost Account Plans. A presentation to DOE on the First Quarters Funding/Progress was held. The revised Project Management Plan is in internal review.

Health & Safety

Chemical and General Safety:

During February, 45 field workers performed work on the FMPC property. No work related accidents or injuries were reported. Workers continue to be monitored for possible chemical exposure in the workplace. Protective equipment and clothing are used when hazardous chemicals are known or suspected to be present.

General safety items were also addressed during operation on-site. Examples include: the enforced use of hard hats and safety glasses; daily inspection of drilling rigs for frayed ropes and support cables; and the removal of overhead electrical lines prior to drilling.

Radiological Safety:

Dosimetry - Thermoluminescent dosimeters are provided and analyzed by WMCO for all FMPC work. Exposure results are not available until approximately the 15th of the following month. All exposure results through February 1990 remained well below recommended action guides and applicable limits.

Urinalysis - Fifty-two urine samples were submitted by field workers during the month of February. The samples are analyzed by WMCO and are submitted at the end of each work period. All samples were found to contain concentrations of uranium below WMCO's action level of 15 micrograms per liter.

Air Sampling - Twenty-one air samples were collected and analyzed during February. Long-lived activity concentrations remain well below applicable Maximum Permissible Concentrations (MPC) values stated in 10 CFR 20.

RI/FS Support: All facility testing operations were supported by Health and Safety coverage. Approximately 26 borings were completed during February. Radiological, chemical, and general safety surveys were conducted prior to and during work at each location. WMCO Penetration Permits and Radiation Work Permits were completed prior to initiating work at each location. General air sampling was also performed at each location. Three of the 25 borings required EPA-Level-C protection. The remainder were completed in Level D. Several sites were worked within FMPC buildings. All drilling in the FMPC process buildings required the use of an alarming Constant Air Monitor (CAM) and shutdown of plant electricity to ensure electrical safety. Generator powered lights were used for illumination. Full-time on-site health and safety coverage was provided.

Five Site Specific Hazard Assessments were prepared during February. These reports document workplace hazards (general, chemical, radioactive). These reports also include a review of chemical MS/DS sheets, emergency and detection information, as well as specific hazards to the workers. Pre-job walkthroughs and interviews are conducted. Pre-work monitoring of radiological conditions is also performed and documented.

A formal request for an additional Health and Safety technician, preferably with industrial hygiene experience was made again to RI/FS management in February in order to support the operation. This request is being evaluated in light of the current freeze on new employee hiring mandated by DOE.

Two new RI/FS workers were trained during the month of February. In addition, worker annual OSHA training and physical requirements were completed as needed during February.

Quality Assurance

The activities for the month of February 1990 were categorized in general and as follows:

1. Issued nonconformances #18, #19, & #20

2. Audit performed on Database Management

3. Field QA on field activities through monitoring and surveillances

4. Worked with WMCO personnel to furnish copies to the administrative record for chain of custody, request for analysis and analytical data reports

Task 8 - RI/FS COMMUNITY RELATIONS

The second of three RI/FS Community Meetings in FY90 was held in Stricker's Grove near Ross on February 20, 1990. About 250 persons attended. Staff from ASI/IT, WMCO, and DOE participated. ASI coordinated the successful meeting. Meeting planning included a meeting with two members of the Fernald Residents for Environmental Safety and Health (FRESH) and representatives of U.S. EPA and the Ohio EPA.

Community meeting follow-up activity began. ASI assigned questions requiring written answers to technical staff. The meeting transcript was received and reviewed.

Detailed discussions of the RI/FS Community Relations budget were held.

DOE directed ASI to present a risk communication training session as part of preparations for the spring 1990 community meeting. Planning began.

DOE directed ASI to develop a separate publication dedicated to RI/FS and related cleanup information for the community. Planning began.

Presentations were made to the regular monthly meeting of FRESH; Suzanne Gray of ASI discussed the RI/FS-Wide Environmental Impact Statement and answered questions about the Restoration EIS; Andy Avel gave a DOE office update; and Pete Kelley kicked off the Community Roundtables.

Feasibility Reports

Operable Unit 1

Task 12 - Initial Screening of Alternatives

Due to EPA in June 1990.

Feasibility Study

Efforts were centered around the initial screening of alternatives for Task 12 and general budget support activities for the CAPs report.

During the month, a meeting was conducted between IT, ASI, DOE, and WMCO to discuss general data requirements for the Operable Unit 1 (OU-1) Sampling and Analysis Plan (SAP).

On January 8, 1990, IT Knoxville reissued the OU-1 SAP and Treatability Plan to the ASI/Fernald office. To date, no SAP field action has occurred. Therefore, the project schedule has experienced continual slippage.

Task 13 - Detailed Analysis of Alternatives

Due to EPA in August 1990.

Task 14 - Selection of Alternatives

Presentation to EPA in October 1990.

Task 15 - Feasibility Study Report

Efforts for the month centered around the initial screening of alternatives (Task 12) and general budget support activities for the CAPs report. Due to EPA in May 1991.

Operable Unit 2

Task 12 - Initial Screening of Alternatives

- The draft Task 12 Report (Initial Screening of Alternatives) was submitted to DOE on February 28 for review. Approximately 12 copies were forwarded to DOE for distribution to DOE, WMCO, and Lee Wan.

- The extent of time used for preparing the Task 12 report was necessary due to information floating into the ASI office past deadlines. Also, the report was able to incorporate information that will be presented in the baseline risk assessment.

Task 13 - Detailed Analysis of Alternatives

Due to EPA in August 1990.

Task 14 - Selection of Alternatives

Presentation to EPA in October 1990.

Task 15 - Feasibility Study Report

Due to EPA in March 1991. Information on contaminant fate and transport modeling is in progress.

Operable Unit 3

Task 12 - Initial Screening of Alternatives

The Operable Unit 3 FS Scope of Work was completed this month by ASI's on-site staff and has been sent to DOE for approval. Additional efforts for the month centered around initiation of the initial screening of alternatives by ASI's Albuquerque Office. Development of alternatives and refinement of task budgets are the initial activities currently underway for this task.

The new sampling proposal has been presented to DOE. The plan includes use of a "real" vibracorer with a backup of augers and new access to the silos. Work is proceeding on implementing the plan as presented.

Task 13 - Detailed Analysis of Alternatives

Due to EPA in November 1990.

Task 14 - Selection of Alternatives

Presentation to EPA in January 1991.

Task 15 - Feasibility Report

Due to EPA in May 1992.

Operable Unit 4

Task 12 - Initial Screening of Alternatives

The new sampling proposal has been presented to DOE. The plan includes use of a "real" vibracorer with a backup of augers and new access to the silos. Work is proceeding on implementing the plan as presented.

Task 13 - Detailed Analysis of Alternatives

The bulk of the engineering and cost estimates for Task 13 are complete. The development of the analysis of the alternatives is proceeding with the help of Expert Choice, a computer decision tree-type program which helps evaluate criteria on a pairwise basis. Work on the presentation is proceeding with a planned dry run for March 8.

Task 14 - Selection of Alternatives

The Recovery Plan calls for carrying forward all of the alternatives until resampling can be accomplished. The presentation to EPA is scheduled for July 1990.

Task 15 - Feasibility Study Report

Due to EPA in November 1990.

Operable Unit 5

Task 12 - Initial Screening of Alternatives

The Task 12 report for the FS and the RI report are being prepared for deliverable dates to DOE of April 4, 1990 and May 9, 1990, respectively.

Task 13 - Detailed Analysis of Alternatives

Due to EPA in November 1990.

Task 14 - Selection of Alternatives

Presentation to EPA in January 1991.

Task 15 - Feasibility Study Report

Continuation of work on preparation of outline for FS Report. Due to EPA in June 1991.

Planned Activities - Task 4 Site Investigation Analysis

- Provide requested reports to Geotrans for water elevation data.
- Upload verified round 5 and 6 lab data from the echo to the master database. Prepare diskettes for distribution to EPA and OEPA through DOE.
- Provide Homeowner Reports for round 5 and 6 data.
- Establish mechanism with DOE for providing updates to EPA and OEPA as new data become available, or as any corrections to previously supplied data are identified.
- Update all water elevation maps in light of QA approval on changes of measurement reference points.
- Complete documentation of flagging system for questionable data.
- Report August/September RCRA sampling data.
- Continue data entry for new wells and update survey data as it becomes available.
- Continue data entry for ongoing sampling activities.
- Process map requests received.
- Process data extraction requests received and provide user support as needed.
- Load historic RCRA data to database once conversion has been done.
- Load IT litigation data received on diskette in PC/SAS.

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Date	2/8/92			
Initial	E.T.			
	Field Check	1st Key In	2nd Key In	Final Copy Verification

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.07	PROJECT NAME: FMPC RI/FS - (Facility Testing Program)		
BORING NUMBER: 1508	COORDINATES:	DATE: 2/2/90	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2/2/90 MG	
ENGINEER/GEOLOGIST: CARMAN/SWANSON	Depth Date/Time	DATE COMPLETED: 2-2-90	
DRILLING METHODS: HOLLOW STEM AUGER(SPLIT SPOON SAMPLING)		PAGE 1 OF 4	

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 inches)	RECOVERY (inc.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0.5	15534 0905 2-2-90	2	6	(3 IN) TOPSOIL W/ ROOTLETS MEDIUM STIFF (2.5Y 5/6) LIGHT OLIVE BROWN SILTY CLAY. MED PLASTICITY. MOIST.	CL	1.0	Hnu = 5 ppm α = 0 cpm ⊿B = 40 cpm
1.0	15540 0905 2-2-90	2	0	NO RECOVERY	N/A	N/A	
1.5	15541 0905 2-2-90	2	0	NO RECOVERY	N/A	N/A	
2.0	15542 0909 2-2-90	7	5	(3 IN) DENSE (5Y, 3/1) VERY DARK GRAY WELL GRADED SAND. DRY.	SW	NA	Hnu = 6 ppm α = 0 cpm ⊿B = 40-50 cpm
2.5	15543 0909 2-2-90	14	0	(2 IN) VERY STIFF (5Y, 3/1) VERY DARK GRAY CLAY. TRACE SILT. LOW PLASTICITY. SLIGHTLY MOIST. NO RECOVERY	CL	2.5	
3.0	15544 0909 2-2-90	17	0	NO RECOVERY	N/A	N/A	
3.5	15545 0910 2-2-90	12	6	VERY STIFF (5Y, 3/1) VERY DARK GRAY CLAY. TRACE SILT. LOW PLASTICITY. SLIGHTLY MOIST. ↓	CL	2.5	Hnu = 9.5 ppm α = 0 ⊿B = 60-100 cpm
4.0	15546 0910 2-2-90	12	4				
4.5	15547 0910 2-2-90	10	0	NO RECOVERY	N/A	N/A	
5.0	15548 0924 2-2-90	4	6	VERY STIFF (5Y, 5/1) GRAY CLAY TO SILTY CLAY. LOW PLASTICITY. SLIGHTLY MOIST.	CL	2.5	Hnu = 11.5 ppm α = 0 ⊿B = 50 cpm
5.5	15549 0924 2-2-90	5	0	NO RECOVERY	N/A	N/A	
6.0	15550 0924 2-2-90	5	0	NO RECOVERY	N/A	N/A	
6.5	15551 0925 2-2-90	5	6	STIFF (5Y, 5/1) GRAY SILTY CLAY. LOW PLASTICITY. SLIGHTLY MOIST. MG 2-6-90	CL	2.0	Hnu = 0 α = 0 ⊿B = 40-140 cpm
7.0	15552 0925 2-2-90	5	0	NO RECOVERY	N/A	N/A	
7.5	15553 0925 2-2-90	5	0	NO RECOVERY	N/A	N/A	

NOTES: Contractor : Pennsylvania Drilling
Driller : J. SACCANI
Drillers Assistant: C. COULTER
SAT - same as above
NR - NO RECOVERY

All samples collected according to ASTM Standards for Classification described by Munsell Soil Color Charts.

Background Readings/Level
Hnu = 2.0-9.5 ppm
Alpha (α) = 0 ppm
Gamma - Beta = 40-140 cpm

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FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.07	PROJECT NAME: FMPC: RI/FS Facility Testing)		
BORING NUMBER: 1508	COORDINATES:	DATE: 2/2/90	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2/2/90	
ENGINEER/GEOLOGIST: GARMAN/SWANSON	Depth Date/Time	DATE COMPLETED: 2-2-90	
DRILLING METHODS: HOLLOW STEM AUGER - (Split Spoon Sampling)		PAGE 2 OF 4	

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 (in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8.0	15554 0928 2-2-90	7	6	STIFF (5Y, 5/1) GRAY SILTY SANDY CLAY. LOW TO MED PLASTICITY. SLIGHTLY MOIST TO MOIST.	CL	2.0	Hnu = 0 α = 0 γβ = 120 cpm
8.5	15555 0928 2-2-90	7	6	STIFF (2.5Y, 5/4) LIGHT OLIVE BROWN SANDY CLAY. LOW PLASTICITY. SLIGHTLY MOIST TO MOIST.	CL	1.5	
9.0	15556 0928 2-2-90	7	0	NO RECOVERY	u/A	u/A	
9.5	15557 1053 2-2-90	4	6	STIFF (2.5Y, 5/4) LIGHT OLIVE BROWN SANDY CLAY. LOW PLASTICITY SLIGHTLY MOIST. ↓	CL	1.5	Hnu = 0 α = 0 γβ = 40-80 cpm
10.0	15558 1053 2-2-90	7	6				
10.5	15559 1053 2-2-90	9	2				
11.0	15560 1056 2-2-90	10	6	HARD (2.5Y, 6/4) LIGHT YELLOWISH BROWN SILTY CLAY. TRACE PEBBLES. LOW PLASTICITY. LOW MOISTURE. ↓	CL	4.0	Hnu = 0 α = 0 γβ = 80 cpm
11.5	~~15561~~ 51156 1056 2-2-90	10	6				
12.0	~~15562~~ 51156 1056 2-2-90	14	3				
12.5	51157 1100 2-2-90	14	6	HARD (5Y, 5/1) GRAY MOTTLED. SILTY ~~SAND~~ CLAY. TRACE GRAVEL. LOW PLASTICITY. LOW ~~MOISTURE.~~ ~~TOP OF WATER~~	CL	>4.0	Hnu = 0 α = 0 γβ = 40 cpm
13.0	51158 1100 2-2-90	18	6	WATER SEAM ENCOUNTERED IN 12.5-13.0 SECTION. (SAA)			
13.5	51159 1100 2-2-90	21	5	HARD (5Y, 5/1) GRAY MOTTLED SILTY CLAY. TRACE GRAVEL. LOW PLASTICITY. LOW MOISTURE.			
14.0				BOTTOM OF BORING @ 13.5 FT PIEZOMETER INSTALLED.			Hnu = α = γβ =
14.5							
15.0							

BEGIN H_2O ZONE

END H_2O ZONE

NOTES:

SEE PAGE 1

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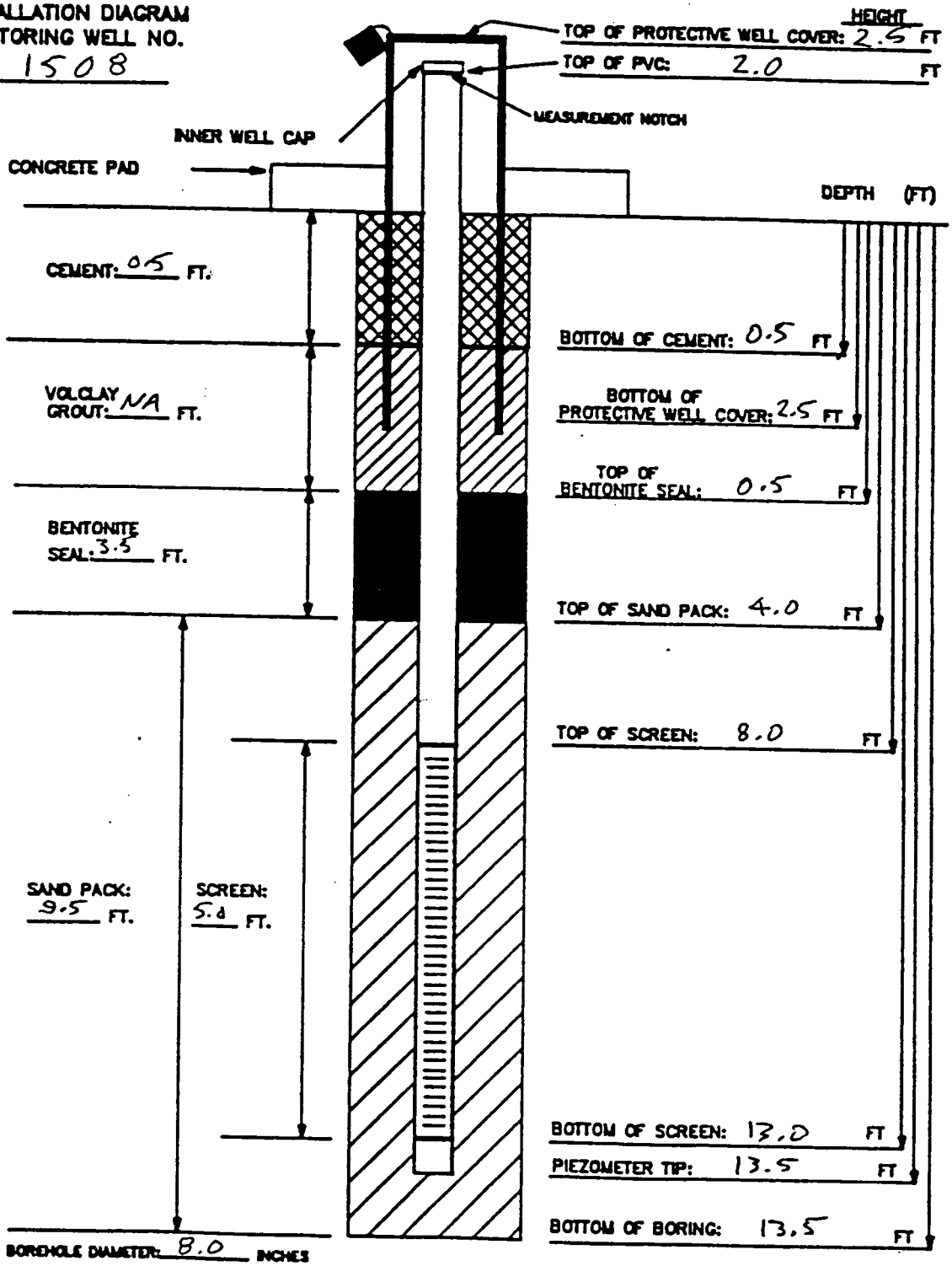
FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO.
1508

INSTALLATION DATE: 2-2-90



MATERIALS USED:

SAND TYPE AND QUANTITY: (1020) 4 80 lb. SACKS
BENTONITE PELLETS (5-GALLON BUCKETS): 1.5
BAGS OF VOLCLAY GROUT: NONE USED
AMOUNT OF CEMENT: 1/2 ~~mix~~ SAK 94 lb.
AMOUNT OF WATER USED: 2 gallons
OTHER:

NOTES:

1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK: 03.07.01

GEOLOGIST/ENGINEER: [illegible]

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FERNALD RI/FS

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PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FACILITIES TESTING
PROJECT NO. 602.03.07.01
BORING NO. 1508
PIEZOMETER NO. 1508

FIELD ENG./GEO. McGARMAN DATE 2-2-90
CHECKED BY S.T. DATE 2-8-9
DATE OF INSTALLATION 2-2-90

BOREHOLE DRILLING

DRILLING METHOD HOLLOW STEM AUGER
DRILLING FLUID (S) USED:
FLUID NONE ~~FROM~~ ____ TO ____
FLUID NONE ~~FROM~~ ____ TO ____

TYPE OF BIT AUGER
CASING SIZE (S) USED:
SIZE NONE ~~FROM~~ ____ TO ____
SIZE NONE ~~FROM~~ ____ TO ____

PIEZOMETER DESCRIPTION

TYPE SCHEDULE 40 PVC
DIAMETER OF PERFORATED SECTION 2.0 IN I.D.
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.02 IN
TOTAL PERFORATED AREA 5.0 FT

RISER PIPE MATERIAL SCHEDULE 40 PVC
RISER PIPE DIAMETERS:
O.D. 2 5/16 IN I.D. 2.0 IN
LENGTH OF PIPE SECTIONS 10.0 FT, 0.5 FT
JOINING METHOD FLUSH JOINT THREADED

PROTECTION SYSTEM

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

OTHER PROTECTION LOCK \ INNER LOCKING CAP

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	2.5			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY CEMENT	TOP 0.0	BOTTOM 0.5	TOP	BOTTOM
BENTONITE	TOP 0.5	BOTTOM 4.0	TOP	BOTTOM
SAND	TOP 4.0	BOTTOM 13.5	TOP	BOTTOM
GRAVEL NONE USED	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 8.0	BOTTOM 13.0	TOP	BOTTOM
PIEZOMETER TIP	13.5			
BOTTOM OF BOREHOLE	13.5			
GWL AFTER INSTALLATION	TO BE MEASURED BY GW CREW			

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

REMARKS 12.5 FT - BEGIN H_2O ZONE
13.5 FT - END H_2O ZONE
AFTER ALLOWING BORING TO REMAIN OPEN FOR 1 HR., THE WATER LEVEL BEFORE INSTALLATION WAS APPROX 10.0 FT.

Date	2/8/92			
Initial	ET			
	Field Check	1st Key In	2nd Key In	Hard Copy Verification

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.07	PROJECT NAME: FEPC RI/FS - (Facility Testing Program)		
BORING NUMBER: 1509	COORDINATES:	DATE: 2/2/90	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2/2/90	
ENGINEER/GEOLOGIST: SWANSON/GARMAN	Depth Date/Time	DATE COMPLETED: 2-3-90	
DRILLING METHODS: HOLLOW STEM AUGER(SPLIT SPOON SAMPLING)		PAGE 1 OF 5	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6" (Tubes)	RECOVERY (Inch)	DESCRIPTION NR = NO RECOVERY SAA = SAME AS ABOVE	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0.5	S3095 1428 2-2-90	2	6	(2 IN) TOPSOIL W/ ROOTLETS (4 IN) STIFF (2.5Y, 5/6) LIGHT OLIVE BROWN SILTY CLAY. LOW PLASTICITY. LOW MOISTURE.	CL	2.0	Hnu = 0 ppm α = 0 cpm βB = 100 - 140 cpm
1.0	S3096 1428 2-2-90	3	0	NR	N/A	N/A	
1.5	S3097 1428 2-2-90	3	0	NR	N/A	N/A	
2.0	S3098 1430 2-2-90	10	0	SPOON REFUSAL (HIT COBBLE) NR	N/A	N/A	Hnu = NA α = NA βB = ~~120 cpm~~ NA AG 2-2-90
2.5	S3099 1430 2-2-90	15	0	NR			
3.0	S3100 1430 2-2-90	15	0	NR			
3.5	S3101 1433 2-2-90	10	6	(4 IN) STIFF (10YR, 4/2) DARK GRAYISH BROWN SILTY CLAY. LOW MOISTURE. LOW PLASTICITY. (2 IN) STIFF (2.5Y, 5/4) GRAYISH BROWN SILTY CLAY. LOW PLASTICITY. LOW MOISTURE.	CL	2.0	Hnu = 0 ppm α = 0 cpm βB = 120 cpm
4.0	S3102 1433 2-2-90	16	2		CL	2.0	
4.5	S3103 1433 2-2-90	17	0	NR	N/A	N/A	
5.0	S3104 1441 2-2-90	2	6	STIFF (5Y, 5/2) OLIVE GRAY MOTTLED SILTY CLAY. TRACE SAND. LOW PLASTICITY. LOW MOISTURE.	CL	2.0	Hnu = 0 ppm α = 0 cpm βB = 80-140 cpm
5.5	S3105 1441 2-2-90	4	4				
6.0	S3106 1441 2-2-90	5	0	NR	N/A	N/A	
6.5	S3107 1442 2-2-90	5	2-2-90 AG 5/6	STIFF (5Y, 5/2) OLIVE GRAY MOTTLED SILTY CLAY. TRACE SAND. LOW PLASTICITY. LOW MOISTURE.	CL	2.0	Hnu = 0 ppm α = 0 cpm βB = 100-140 cpm
7.0	S3108 1442 2-2-90	5	2-2-90 AG 7/6				
7.5	S3109 1442 2-2-90	7	4				

NOTES: Contractor : Pennsylvania Drilling
Driller : J. SACCANI
Drillers Assistant: C. COULTER

All Samples collected according to ASTM Standards Soil Colors described by Munsell Soil Color Charts.

Background Readings/Level:
Hnu = 0 ppm.
Alpha (α) = 0 cpm
Gamma - Beta = 100 - 150 cpm

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.07	PROJECT NAME: FMPC RI/FS Facility Testing)		
BORING NUMBER: 1509	COORDINATES:	DATE: 2-2-90	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2-2-90	
ENGINEER/GEOLOGIST: SWANSON/GARMAN	Depth Date/Time	DATE COMPLETED: 2-3-90	
DRILLING METHODS: HOLLOW STEM AUGER - (Split Spoon Sampling)		PAGE 2 OF 5	

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 (in.)	RECOVERY (in.)	DESCRIPTION (NR = NO RECOVERY)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8.0	53110 1444 2-2-90	5	6	STIFF (2.5Y, 5/2) MOTTLED GRAYISH BROWN SILTY CLAY. MED PLASTICITY. LOW MOISTURE.	CL	2.0	Hnu = 0 ppm; α = 0 cpm; β = 90 - 130 cpm
8.5	53111 1444 2-2-90	7	6	STIFF (2.5Y, 5/4) LIGHT OLIVE BROWN CLAY. TRACE SILT. MED PLASTICITY. LOW MOISTURE.	CL	2.0	
9.0	53112 1444 2-2-90	8	3				
9.5	53113 1509 2-2-90	3	6	STIFF (2.5Y, 5/2) LIGHT OLIVE BROWN CLAY. TRACE SILT. MED PLASTICITY. LOW MOISTURE.	CL	1.5 ~~2.0~~	Hnu = 0 ppm; α = 0 cpm; β = 100 - 200 cpm
10.0	53114 1509 2-2-90	6	6				
10.5	53115 1509 2-2-90	9	3	VERY STIFF (2.5Y, 5/2) LIGHT OLIVE BROWN SILTY CLAY. SOME SAND AND GRAVEL. LOW PLASTICITY. LOW MOISTURE.	CL	2.5	
11.0	53116 1512 2-2-90	7	6	VERY STIFF (2.5Y, 5/4) LIGHT OLIVE BROWN SILTY CLAY. TRACE SAND. LOW PLASTICITY. DRY TO LOW MOISTURE	CL	3.0	Hnu = 0 ppm; α = 0 cpm; β = 60 - 100 cpm
11.5	53117 1512 2-2-90	9	6				
12.0	53118 1512 2-2-90	11	6				
12.5	53119 1514 2-2-90	10	6		CL	3.0	Hnu = 0 ppm; α = 0 cpm; β = 80 - 100 cpm
13.0	53120 1514 2-2-90	15	5				
13.5	53121 1514 2-2-90	12	0	NR	N/A	N/A	
14.0	53122 1519 2-2-90	15	6	HARD (5Y, 4/1) DARK GRAY SILTY CLAY (RUSTY STAINS). TRACE GRAVEL. LOW PLASTICITY. DRY TO LOW MOISTURE.	CL	>4.0	Hnu = 0 ppm; α = 0 cpm; β = 110 cpm
14.5	53123 1519 2-2-90	15	6				
15.0	53124 1519 2-2-90	20	2				

H_2O ZONE

NOTES:

SEE PAGE 1

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.07	PROJECT NAME: FMPC RI/FS - (Facility Testing Program)		
BORING NUMBER: 1508	COORDINATES:	DATE: 2/2/90	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2/2/90	
ENGINEER/GEOLOGIST: GARMAN/SWANSON	Depth Date/Time	DATE COMPLETED: 2-3-90	
DRILLING METHODS: HOLLOW STEM AUGER - (Split Spoon Sampling)		PAGE 3 OF 4	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION NR = NO RECOVERY	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15.5	53125 1528 2-2-90	8	6	MED STIFF (2.5Y, 5/4) LIGHT OLIVE BROWN SILTY CLAY. MED. PLASTICITY. LOW MOISTURE.	CL	<1.0	Ham = 0 α = 0 βB = 100 cpm
16.0	53126 1528 2-2-90	10	6	MED STIFF (5Y, 4/1) DARK GRAY CLAY. TRACE SILT AND GRAVEL. MED PLASTICITY. LOW MOISTURE.	CL	<1.0	
16.5	53127 1528 2-2-90	13	6				
17.0	53128 1531 2-2-90	12	6		CL	<1.0	Ham = 0 α = 0 βB = 80 cpm
17.5	53129 1531 2-2-90	12	4				
18.0	53130 1531 2-2-90	13	0	NR	N/A	N/A	
18.5	53131 1538 2-2-90	10	6	MED STIFF (5Y, 4/1) DARK GRAY CLAY. SOME SILT. TRACE FINE GRAVEL. LOW TO MED PLASTICITY. LOW MOISTURE.	CL	4.0	Ham = 0 α = 0 βB = 80 - 100 cpm
19.0	53132 1538 2-2-90	18	6				
19.5	53133 1538 2-2-90	20	6				MG 2-2-90
20	53134 1538 2-2-90	24	4			<1.0 ~~4.0~~	Ham = 0 α = 0 βB = 100 cpm
				BOTTOM OF BORING PIEZOMETER INSTALLED AT 20.0 FT			

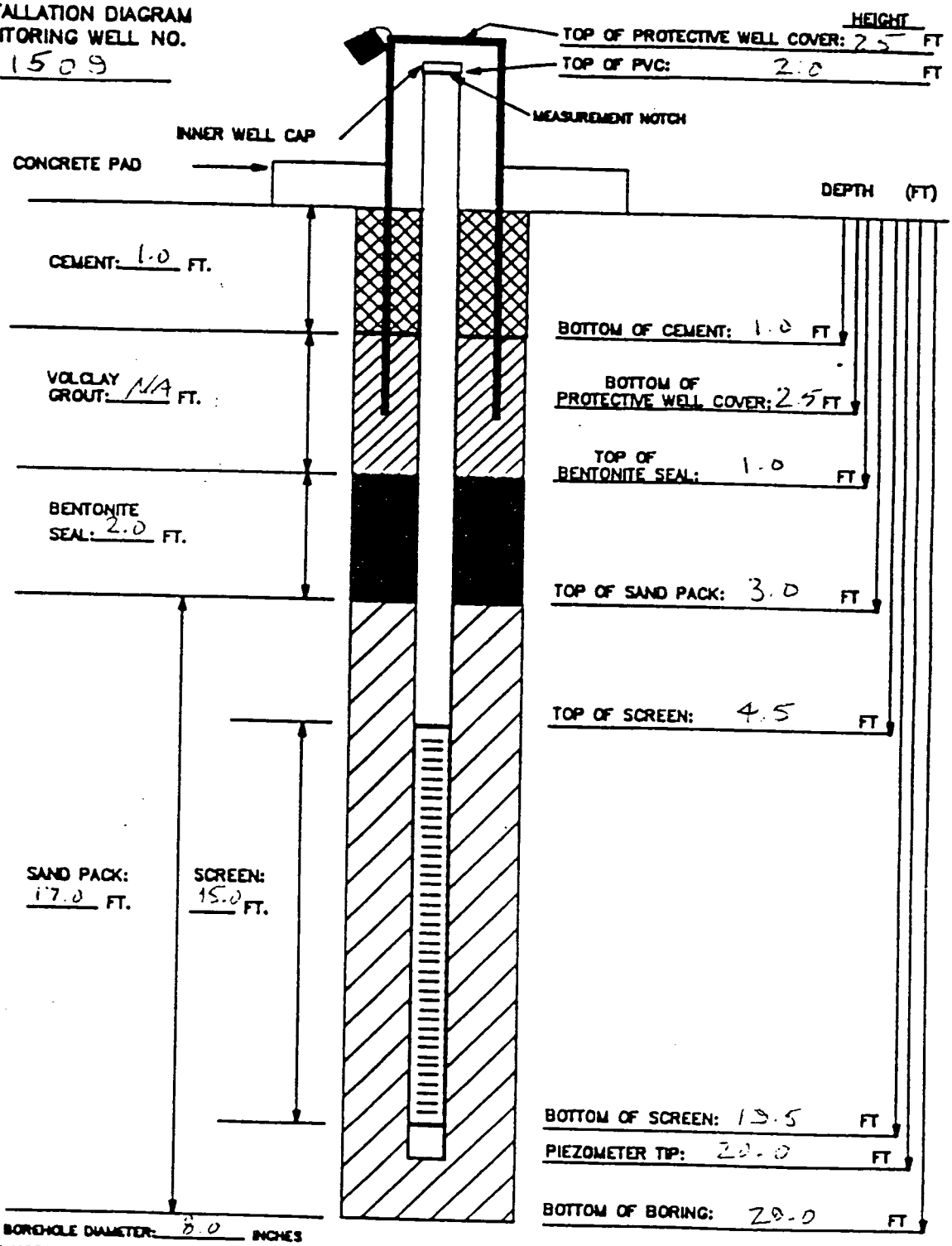
NOTES:

SEE PAGE 1

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 1509

INSTALLATION DATE: 2-3-90



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:
SAND TYPE AND QUANITITY: (1020) 12-80 lb. sks
BENTONITE PELLETS (5-GALLON BUCKETS): ~~1.5~~ 2.0
BAGS OF VOLCLAY GROUT:
AMOUNT OF CEMENT: 1/2 sack (94 lb)
AMOUNT OF WATER USED:
OTHER: A.G. 2-3-90

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK: 03.07

GEOLOGIST/ENGINEER: [illegible]

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RIVER FACILITIES TESTING FIELD ENG./GEO. M. GARMAN DATE 2-3-90
PROJECT NO. 603.03.07 CHECKED BY DATE
BORING NO. 1509
PIEZOMETER NO. 1509 DATE OF INSTALLATION 2-3-90

BOREHOLE DRILLING

DRILLING METHOD HOLLOW STEM AUGER
DRILLING FLUID (S) USED:
FLUID NONE FROM ~~TO~~ →
FLUID NONE FROM ~~TO~~ →

TYPE OF BIT AUGER
CASING SIZE (S) USED:
SIZE NONE ~~FROM~~ ~~TO~~ →
SIZE NONE ~~FROM~~ ~~TO~~ →

PIEZOMETER DESCRIPTION

TYPE SCHEDULE 40 PVC
DIAMETER OF PERFORATED SECTION 2.0 IN I.D.
PERFORATION TYPE:
SLOTS ☑ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.02 IN
TOTAL PERFORATED AREA 15.0 FT

RISER PIPE MATERIAL SCHEDULE 40 PVC
RISER PIPE DIAMETERS:
O.D. 2 5/16 IN I.D. 2.0 IN
LENGTH OF PIPE SECTIONS 5.0 FT, 2.0 FT
JOINING METHOD FLUSH JOINT THREADED

PROTECTION SYSTEM

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

OTHER PROTECTION LOCK\ INNER CEILING CAP

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	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 3.0	TOP	BOTTOM
SAND	TOP 3.0	BOTTOM 20.0	TOP	BOTTOM
GRAVEL NONE USED	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 4.5	BOTTOM 19.5	TOP	BOTTOM
PIEZOMETER TIP	20.0			
BOTTOM OF BOREHOLE	20.0			
GWL AFTER INSTALLATION	TO BE MEASURED BY GW CREW			

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

REMARKS 3.0 FT - BEGIN H_2O ZONE
13.0 FT - END H_2O ZONE
DRY BORING WAS LEFT OPEN OVERNIGHT, WATER LEVEL WAS APPROX. 3.0 - 4.0 FT. ON MORNING OF 2-3-90

409-11-86

FERNALD
RI/FS

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VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: 1188	COORDINATES:		DATE: 1/31/90
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 1/31/90
ENGINEER/GEOLOGIST: C. Grube	Depth	Date/Time	DATE COMPLETED: 2/3/90
DRILLING METHODS: AUGER (HOLLOW STEM)			PAGE 1 OF 5

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1/31	NA	6	Cement	NA	NA	HNU = 0 ppm α = 140-160 cpm Bγ = 7000-9000 cpm
	1/31		6	Cement	NA	NA	
1	16705 1545 1-31	5	6	Loose (2.5Y 4/4) olive brown well graded sand, trace of fine to coarse gravel, wet	SW	NA	
	16706 1545 1-31	5	6	medium stiff (5Y 4/3) olive silty clay, some sand, trace fine to coarse gravel, low plasticity, moist	CL	.75	HNU = 0 ppm α = 0 cpm Bγ = 70-80 cpm
2	16707 1545 1-31	3	0	NR	NA	NA	
	16708 1545 1-31	3	0	NR	NA	NA	
3	16709 1550 1-31	5	6	Medium dense (2.5Y 4/4) olive brown well graded sand trace of fine gravel, very moist to wet	SW	NA	HNU = 0 ppm α = 0 cpm Bγ = 80-90 cpm
	16710 1550 1-31	12	6	SAA very stiff (2.5Y 5/4) light olive brown silty clay, some sand, trace of fine gravel, high plasticity, moist	SW CL	NA 3.75	
4	16711 1550 1-31	11	4	Stiff SAA	CL	1.25	
	16712 1555 1-31	11	6	medium dense (2.5Y 5/4) light olive brown well graded sand, trace fine to medium gravel, wet	SW	NA	HNU = 0 PPM α = 0 cpm Bγ = 80-100 cpm
5	16713 1555 1-31	8	0	NR	NA	NA	
	16714 1555 1-31	8	0	NR	NA	NA	
6	16715 0946 2-1	2	6	Stiff (2.5Y 5/4) light olive brown silty clay trace of sand, medium plasticity, moist	CL	1.50	HNU = 0 ppm α = 0 cpm Bγ = 110-120 cpm
	16716 0946 2-1	3	6	SAA	CL	1.25	
7	16717 0946 2-1	4	2	SAA	CL	1.0	

NOTES: CONTRACTOR: PENN DRILL
RIG: CME-45
DRILLER: Dave Newman
ASSISTANT: Bob Johnson
GeoAssistant/HASO officer: Ben Brier

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TE
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α = 60-70 CPM
Bγ = 900-1000 CPM
LEL = 0% ~~PPM~~
O_2 = 20.6%

SAA = Same As Above
NR = No Recovery

HNU# 1234

LEL O_2:

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: 1188	COORDINATES:		DATE: 2/1/90
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 1/31/90
ENGINEER/GEOLOGIST: C. Gruber	Depth	Date/Time	DATE COMPLETED: 2/3/90
DRILLING METHODS: AUGER (HOLLOW STEM)			PAGE 2 OF 5

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	16718 0952 2-1	6	6	Med. uncons. (2.5Y 5/4) light olive brown silty clay trace of sand & fine gravel, medium plasticity, moist	CL	.5	HNU = 0 ppm α = 0 cpm Bγ = 100-110 cpm
	16719 0952 2-1	6	6	SAA	CL	.75	
	16720 0952 2-1	8	3	Med. uncons. (2.5Y 5/4) light olive brown clayey silt trace of fine gravel, moist	ML	NA	
Top of water bearing zone at 9.5 FT 9	16721 0957 2-1	8	6	Loose (2.5Y 5/4) light olive brown clayey silt very moist to wet	ML	NA	HNU = 0 ppm α = 0 cpm Bγ = 90-100 cpm
	16722 0957 2-1	4	6	SAA	ML	NA	
10	16723 0957 2-1	3	6	NR	NA	NA	
11	16724 1010 2-1	1	6	Med. uncons. (2.5Y 5/4) light olive brown clayey silt to silty sand, wet	ML to SM	NA	HNU = 0 ppm α = 0 cpm Bγ = 90-110 cpm
	16725 1010 2-1	3	6	SAA	ML to SM	NA	
	16726 1010 2-1	9	6	SAA	ML to SM	NA	
12	51835 1018 2-1	2	6	Loose (10YR 5/4) yellowish brown silty sand trace of clay, wet	SM	NA	HNU = 0 ppm α = 0 cpm Bγ = 80-110 cpm
	51836 1015 2-1	4	6	Loose (2.5Y 5/4) light olive brown to (5Y 4/2) olive gray silty to silty sand, wet	ML to SM	NA	
13	51837 1018 2-1	5	6	Loose (5Y 4/2) olive gray clayey silt, very moist to wet	ML	NA	
	51838 1024 2-1	7	6	Med. uncons. (5Y 4/1) dark gray clayey silt to silty sand, wet	SM to ML	NA	HNU = 0 ppm α = 0 cpm Bγ = 100-120 cpm
14	51839 1024 2-1	8	6	SAA	ML to SM	NA	
	51840 1024 2-1	8	6	Med. uncons. (5Y 4/1) dark gray clayey silt very moist to wet	ML	NA	

NOTES:

SAA = Same As Above
NR = No Recovery

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1188	COORDINATES:	DATE: 2/1/90
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 1/31/90
ENGINEER/GEOLOGIST: C. Grubes	Depth Date/Time	DATE COMPLETED: 2/3/90
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
	S1841 1040 2-1	2	6	medium dense (2.5Y 3/4) light olive brown clayey silt, very moist to wet	ML	NA	HNU = 0 ppm α = 0 cpm Bβ = 130-150 cpm
	S1842 1040 2-1	5	6	medium dense (5Y 4/1) olive gray clayey silt to silt, wet	ML	NA	
16	S1843 1040 2-1	7	5	medium dense (5Y 4/2) olive gray silt, wet	ML	NA	
	S1844 1047 2-1	7	6	Medium dense (2.5Y 4/4) olive brown silty sand, wet	SM	NA	HNU = 0 ppm α = 0 cpm Bβ = 70-80 cpm
17	S1845 1047 2-1	12	6	SAA	SM	NA	
	S1846 1047 2-1	17	6	medium dense (2.5Y 4/4) olive brown well graded sand, trace of fine to medium gravel, wet	SW	NA	
18	S1847 1054 2-1	12	6	Dense (2.5Y 4/4) olive brown poorly graded sand trace of silt, wet	SP	NA	HNU = 0 ppm α = 0 cpm Bβ = 70-80 cpm
	S1848 1054 2-1	16	6	SAA	SP	NA	
19	S1849 1054 2-1	17	6	Dense (2.5Y 4/4) olive brown silty sand, wet	SM	NA	
Bottom of Water bearing zone at 20.0 ft 20	S1850 1054 2-1	20	6	Dense (2.5Y 4/4) olive brown well graded gravelly sand (angular gravel) wet	SW	NA	HNU = 0 ppm α = 0 cpm Bβ = 70-80 cpm
				Bottom of Boring + sampling of aquifer			

NOTES:

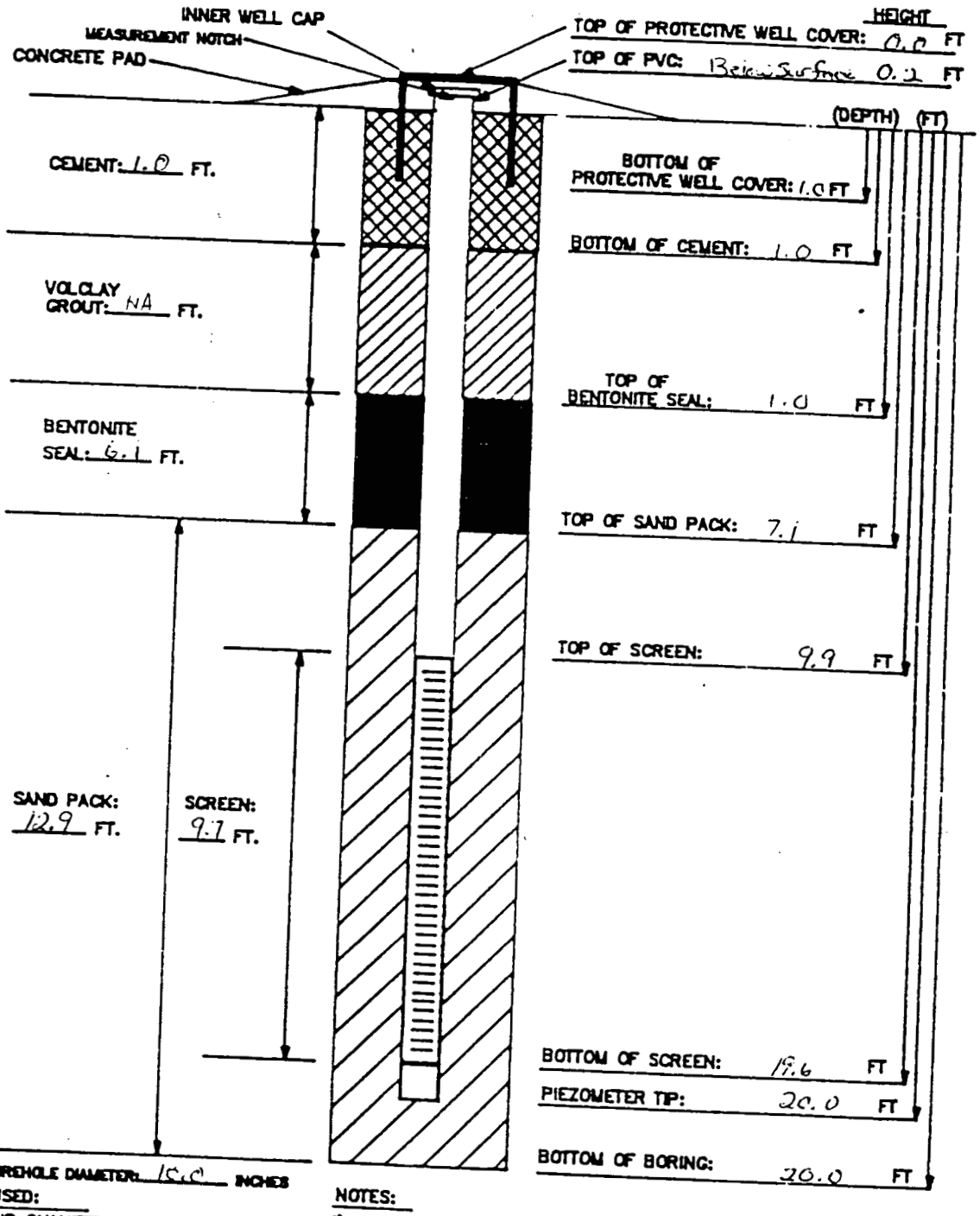
SAA = Same As Above
NR = No Recovery

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 1188

INSTALLATION DATE: 2-3-98

853



MATERIALS USED:

SAND TYPE AND QUANTITY: 6 sks (90#) 10/20 sand
BENTONITE PELLETS (5-GALLON BUCKETS): 5
BAGS OF VOLCLAY GROUT: NA
AMOUNT OF CEMENT: 1/2 (94#) sk
AMOUNT OF WATER USED: 10 gal
OTHER: Flush mount protective cover

NOTES:

1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:
5) TOP OF PVC IS SECURED WITH EXPANDABLE RUBBER PLUG AND PADLOCK.
6) PARENTHESIS INDICATE DEPTH BELOW GROUND LEVEL.

TASK: 602 3.7

GEOLOGIST/ENGINEER: C. Grube

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. C. Gaba DATE 2/3/90
PROJECT NO. 6023.7 CHECKED BY _____ DATE _____
BORING NO. 1189
PIEZOMETER NO. 1138 DATE OF INSTALLATION 2/3/90

BOREHOLE DRILLING

DRILLING METHOD Hollow Stem Auger	TYPE OF BIT Hollow Auger
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID NA FROM — TO —	SIZE NA FROM — TO —
FLUID NA FROM — TO —	SIZE NA FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Piezometer	RISER PIPE MATERIAL Schedule 40 PVC
DIAMETER OF PERFORATED SECTION 4.0 ID	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4½ in I.D. 4.0 in
SLOTS [X] HOLES [ ] SCREEN [ ]	LENGTH OF PIPE SECTIONS 9.7 FT
AVERAGE SIZE OF PERFORATIONS 0.020 in	JOINING METHOD Screw type - flush joint threaded
TOTAL PERFORATED AREA 9.7 FT	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 1.0 FT	OTHER PROTECTION Flush mount protective cover
PROTECTIVE PIPE O.D. 8¼ in	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	0.2 above surface			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	1.0			
BOREHOLE FILL MATERIALS:				
GROUT / SLURRY/cement	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 7.1	TOP	BOTTOM
SAND	TOP 7.1	BOTTOM 20.0	TOP	BOTTOM
GRAVEL - NA	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 9.7	BOTTOM 19.6	TOP	BOTTOM
PIEZOMETER TIP	20.0			
BOTTOM OF BOREHOLE	20.0			
GWL AFTER INSTALLATION	To be taken at a later date			

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

REMARKS Top of water bearing zone at 9.0 FT
Bottom of water bearing zone at 20.0 FT

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

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.07	PROJECT NAME: FMPC RI/FS - (Facility Testing Program)		
BORING NUMBER: 1510	COORDINATES:	DATE: 2-~~03~~-94 ~~2-03-90~~ MG	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: ~~2-03-90~~	
ENGINEER/GEOLOGIST: M. Coarsman.	Depth Date/Time	DATE COMPLETED: 2-4-9	
DRILLING METHODS: HOLLOW STEM AUGER(SPLIT SPOON SAMPLING)		PAGE 1 OF 4	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6-inches)	RECOVERY (inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0.5	53255 1514 02-04	8	6	Very stiff (2.5y, 4/4) olive brown sandy gravelly clay, low plasticity, moist.	CL	3.0	Hnu = .4 ppm, α = 0 cpm, βB = 100 cpm
1.0	53256 1514 02-04	11	6	Very stiff (2.5y, 4/4) olive brown sandy gravelly clay low plast. moist, Very stiff, 5y, 2.5/1 black silty clay, low plasticity, slightly moist	CL	3.0	
1.5	53257 1514 02-04	12	0	NR	NA	NA	
2.0	53258 1514 02-04	10	0	NR	NA	NA	Hnu = .4 ppm, α = 0 cpm, βB = 100 cpm
2.5	53259 1525 02-04	4	6	Hard (5y, 2.5/1) black silty clay, low plasticity, slightly moist.	CL	>4	
3.0	53260 1525 02-04	6	2	Hard (2.5y, 5/4) Lt. olive brown, mottled silty clay, med. plastic, very slightly moist	CL	>4	
3.5	53261 1525 02-04	6	0	NR	NA	NA	Hnu = 0 ppm, α = 0 cpm, βB = 80 cpm
4.0	53262 1530 02-04	54 cpm	6	Stiff (2.5y 5/4) light olive brown mottled, silty clay, med plasticity, slightly moist	CL	2.0	
4.5	53263 1530 02-04	57	4	Stiff (2.5y 5/4) Light olive brown mottled silty clay, trace sand & fine gravel, med plasticity, slightly moist	CL	1.5	
5.0	53264 1540 02-04	6	6	SAA	CL	1.5	Hnu = 0 ppm, α = 0 cpm, βB = 120 cpm
5.5	53265 1540 02-04	6	6	Stiff (5y, 5/3) olive mottled silty clay, trace fine gravel, low to med plasticity, slightly moist	CL	2.5	
6.0	53266 1540 02-04	7	0	NR	NA	NA	
6.5	53267 1615 02-04	7	6	Med. Dense (2.5y, 5/2) grayish brown sandy silt, trace fine gravel, wet	ML	NA	Hnu = 0 ppm, α = 0 cpm, βB = 100 cpm
7.0	53268 1615 02-04	10	6	Very stiff (2.5y, 5/2) grayish brown silty clay, some gravel, trace sand, low plasticity, slightly moist to moist	CL	2.5	
7.5	53269 1615 02-04	12	4	Very stiff SAA	CL	2.5	

H_2O ↑ ↓

NOTES: Contractor : Pennsylvania Drilling
Driller : Jim Saccani
Drillers Assistant: Chris Coulter

All samples collected according to ASTM standards. Soil colors described by Munsell Soil Color Charts.

SAA - Same as above
NR - No Recovery

Background Readings/Level
Hnu = 0 ppm
Alpha (α) = 0 cpm
Gamma - Beta = 80-120 cpm

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.07	PROJECT NAME: FMPC: RI/FS Facility Testing)		
BORING NUMBER: 1510	COORDINATES:	DATE: 2-4-90	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2-4-90	
ENGINEER/GEOLOGIST: M. GARMAN	Depth Date/Time	DATE COMPLETED: 2-4-90	
DRILLING METHODS: HOLLOW STEM AUGER - (Split Spoon Sampling)		PAGE 2 OF 4	

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 (in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8.0	53270 1630 02-04	10	6	very stiff (2.5Y, 5/4) Lt olive brown, silty clay, trace fine gravel, low to med plasticity, low moisture	CL	3.0	Hnu = 0 ppm; α = 0 cpm; β = 100 cpm
8.5	53271 1650 02-04	15	6	very stiff (2.5Y, 5/4) Lt olive brown SAT	CL	3.0	
9.0	53272 1610 02-04	16	0	NR	NA	NA	
9.5	53273			End of Boring, Piezometer installed (9.0 FT)			Hnu = ppm; α = cpm; β = cpm
10.0	53274						
10.5	53515						
11.0	53516						Hnu = ppm; α = cpm; β = cpm
11.5	53517						
12.0	53518						
12.5							Hnu = α = β =
13.0							
13.5							
14.0							Hnu = α = β =
14.5							
15.0							

NOTES:

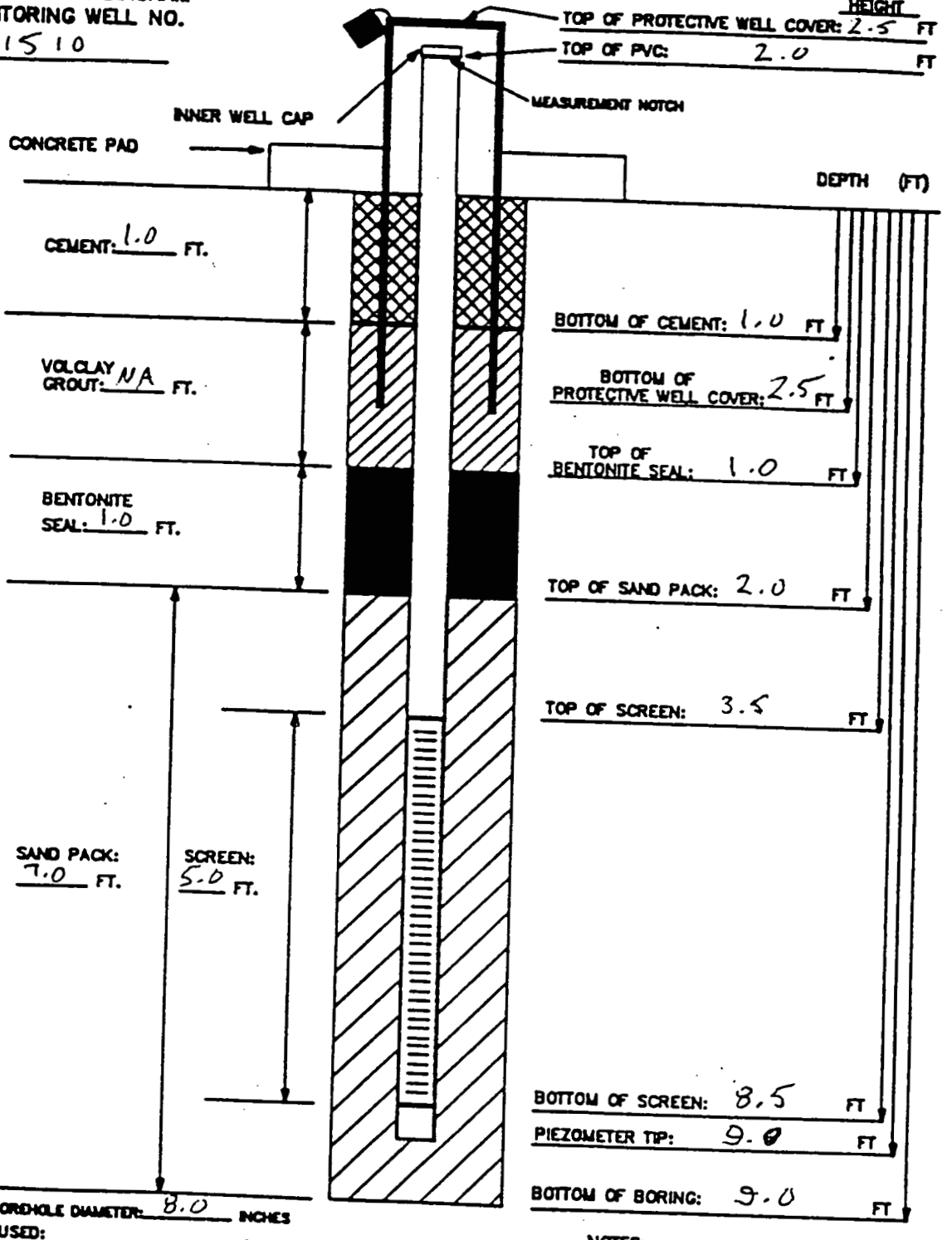
SEE PAGE 1

3/4

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 1510

INSTALLATION DATE: 2-4-90



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:

SAND TYPE AND QUANTITY: (1020) 4 80 lb. sks.
BENTONITE PELLETS (5-GALLON BUCKETS): 1.0
BAGS OF VOLCLAY GROUT: NOW & USED
AMOUNT OF CEMENT: ~~2 gal~~ 0.5 sack (94 lb)
AMOUNT OF WATER USED: 3 gal
OTHER:

NOTES:

1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK: 03.07

GEOLOGIST/ENGINEER: [signature]

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI\FS FACILITIES TESTING FIELD ENG./GEO. M. GARMAN DATE 2-4-90
PROJECT NO. 602.3.7.1 CHECKED BY E.T. DATE 2/4/90
BORING NO. 1510
PIEZOMETER NO. 1510 DATE OF INSTALLATION 2-4-90

BOREHOLE DRILLING

DRILLING METHOD HOLLOW STEM AUGER	TYPE OF BIT AUGER
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID NONE FROM ____ TO ____	SIZE NONE FROM ____ TO ____
FLUID NONE FROM ____ TO ____	SIZE NONE FROM ____ TO ____

PIEZOMETER DESCRIPTION

TYPE SCHEDULE 40 PVC	RISER PIPE MATERIAL SCHEDULE 40 PVC
DIAMETER OF PERFORATED SECTION 2.0 IN I.D.	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 2 5/16 IN I.D. 2.0 IN
SLOTS ☒ HOLES ☐ SCREEN ☐	LENGTH OF PIPE SECTIONS 5.0 FT, 1.0 FT
AVERAGE SIZE OF PERFORATIONS 0.02 IN	JOINING METHOD FLUSH JOINT
TOTAL PERFORATED AREA 5.0 FT	THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT	OTHER PROTECTION LOCK\ INNER
PROTECTIVE PIPE O.D. 4 3/8 IN	LOCKING CAP

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	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 NONE USED	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 3.5	BOTTOM 8.5	TOP	BOTTOM
PIEZOMETER TIP	9.0			
BOTTOM OF BOREHOLE	9.0			
GWL AFTER INSTALLATION	TO BE MEASURED BY GW CREW			

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

REMARKS 6.0 FT – BEGIN H_2O ZONE
6.5 FT – END H_2O ZONE

409-11-1

Date	2/8/90			853
Initial	E.T.			
	Field Check	1st Key In	2nd Key In	Hard Copy Verification

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.07	PROJECT NAME: FMPC RI/FS - (Facility Testing Program)		
BORING NUMBER: 1511	COORDINATES:	DATE: 2-5-90	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2-5-90	
ENGINEER/GEOLOGIST: M Garman	Depth Date/Time	DATE COMPLETED: 2-5-90	
DRILLING METHODS: HOLLOW STEM AUGER(SPLIT SPOON SAMPLING)		PAGE 1 OF 4	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6-inches)	RECOVERY (inches)	DESCRIPTION NR = NO RECOVERY SAA = SAME AS ABOVE	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0.5	54435 2-5 1340	2	6	VERY STIFF (2.5Y 4/4) OLIVE BROWN SILTY CLAY. SOME SAND AND GRAVEL, LOW PLASTICITY. LOW MOISTURE	CL	3.0	Hnu = 0 ppm α = 0 cpm βB = 80 cpm
1.0	54436 2-5 1348	4	6	HARD (5Y, 2.5/1) BLACK SILTY CLAY. LOW PLASTICITY. LOW MOISTURE.	CL	>4.0	
1.5	54437 2-5 1348	7	0	NR	NA	NA	
2.0	54438 2-5 1348	9	0	NR	NA	NA	Hnu = 0 ppm α = 0 cpm βB = 70 cpm
2.5	54439 2-5 1400	HAND AUGERED N/A	6	HARD (5Y, 2.5/1) BLACK SILTY CLAY LOW PLASTICITY, LOW MOISTURE	CL	>4.0	
3.0	54440 2-5 1437	4	6	STIFF (2.5Y, 4/4) OLIVE BROWN MOTTLED SILTY CLAY, TRACE GRAVEL. MED. PLASTICITY. LOW MOISTURE.	CL	2.0	
3.5	54441 2-5 1437	6	6	SAA	CL	2.0	Hnu = 0 ppm α = 0 cpm βB = 80 cpm
4.0	54442 2-5 1437	7	6	SAA	CL	2.0	
4.5	54443 2-5 1427	7	2	SAA	CL	2.0	
5.0	54444 2-5 1440	3	0	NR	NA	NA	Hnu = NA α = NA βB = NA
5.5	54445 2-5 1440	3	0	NR	NA	NA	
6.0	54446 2-5 1440	5	0	NR	NA	NA	
H_2O ZONE 6.5	54447 2-5 1441	4	6	MEDIUM STIFF (2.5Y, 5/4) LIGHT OLIVE BROWN SILTY SANDY CLAY. SOME GRAVEL. LOW PLASTICITY. MOIST TO VERY MOIST.	CL	<1.0	Hnu = 0 ppm α = 0 cpm βB = 70 cpm
7.0	54448 2-5 1441	4	2	SAA	CL	<1.0	
7.5	54449 2-5 1441	5	0	NR	NA	NA	

NOTES: Contractor : Pennsylvania Drilling
Driller : J. SACKA
Drillers Assistant : C. COULTER
All Samples collected according to ASTM Standards Soil Colors described by Munsell Soil Color Charts.

Background Readings/Level
Hnu = 0.40 ppm
Alpha (α) = 0 cpm
Gamma - Beta = 60-100

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.07	PROJECT NAME: FMPC: RI/FS Facility Testing)		
BORING NUMBER: 1511	COORDINATES:	DATE: 2-5-90	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2-5-90	
ENGINEER/GEOLOGIST: M GARMAN	Depth Date/Time	DATE COMPLETED: 2-5-90	
DRILLING METHODS: HOLLOW STEM AUGER - (Split Spoon Sampling)		PAGE 2 OF 4	

SAA = SAME AS ABOVE
NR = NO RECOVERY

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 (in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8.0	54450 2-5 1448	17	6	VERY STIFF (2.5Y, 5/4) LIGHT OLIVE BROWN SILTY CLAY. SOME GRAVEL. LOW PLASTICITY. LOW MOISTURE.	CL	3.5	Hnu = 0 α = 0 SB = 90 cpm
8.5	54451 2-5 1448	24	6	SAA	CL	3.5	
9.0	54452 2-5 1448	13	0	NR	NA	NA	
9.5	54453 2-5 1452	9	6	VERY STIFF (2.5Y, 5/4) LIGHT OLIVE BROWN SILTY CLAY. TRACE SAND AND GRAVEL. LOW PLASTICITY. LOW MOISTURE.	CL	3.0	Hnu = 0 α = 0 SB = 70-80 cpm
10.0	54454 2-5 1452	8	6	SAA	CL	3.0	
10.5	53775 2-5 1452	13	2	SAA	CL	3.0	
11.0	53776 2-5 1457	18	6	SAA	CL	3.0	Hnu = 0 α = 0 SB = 80 cpm
11.5	53777 2-5 1457	13	4	VERY STIFF (2.5Y, 5/0) DARK GRAY SILTY CLAY. TRACE GRAVEL. LOW TO MED PLASTICITY. LOW MOISTURE.	CL	3.5	
12.0	53778 2-5 1457	17	0	NR	NA	NA	
12.5	53779 2-5 1500	14	6	HARD (2.5Y, 5/0) DARK GRAY CLAY. SOME SILT. TRACE GRAVEL. LOW PLASTICITY. LOW MOISTURE.	CL	>4.0	Hnu = 0 α = 0 SB = 70 cpm
13.0	53780 2-5 1500	17	6	SAA	CL	>4.0	
13.5	53781 2-5 1500	17	6	SAA	CL	>4.0	
14.0				13.5 FT - BOTTOM OF BORING PIEZOMETER INSTALLED			Hnu = α = SB =
14.5							
15.0							

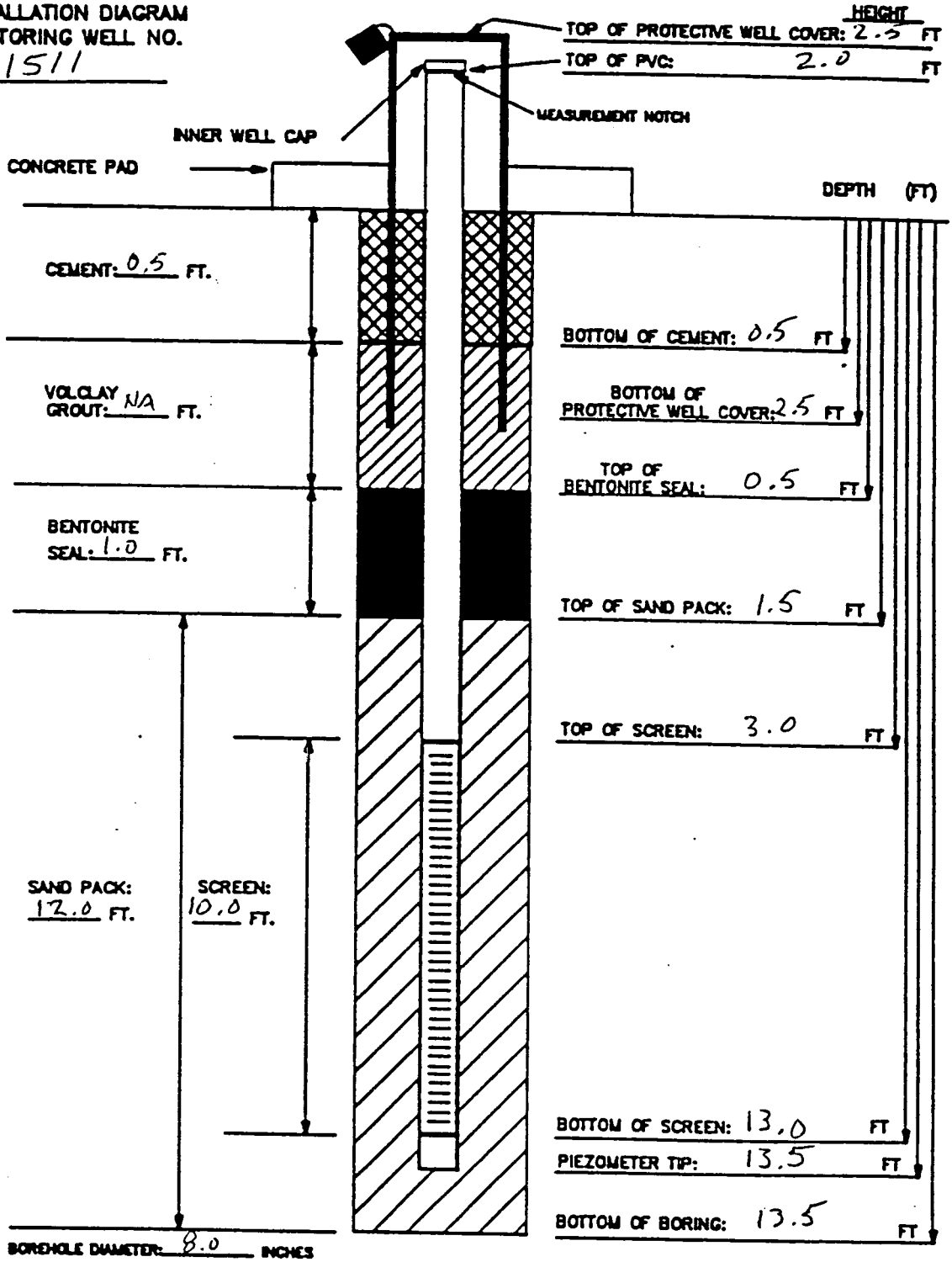
NOTES:

SEE PAGE 1

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 1511

INSTALLATION DATE: 2-3-90 853



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:
SAND TYPE AND QUANTITY: (1020) ~~3.5~~ 6.5 80 lb. SKS
BENTONITE PELLETS (5-GALLON BUCKETS): 0.5
BAGS OF VOLCLAY GROUT: NONE USED
AMOUNT OF CEMENT: ~~[illegible]~~ 0.5 SACK (94 lb)
AMOUNT OF WATER USED: NONE (WATER IN THE HOLE)
OTHER:

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK: 03.07

GEOLOGIST/ENGINEER: [signature]

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FACILITIES TESTING FIELD ENG./GEO. M. GARNAN DATE 2-5-90
PROJECT NO. 602.3.7 CHECKED BY E.T. DATE 2/8/90
BORING NO. 1511
PIEZOMETER NO. 1511 DATE OF INSTALLATION 2-5-90

BOREHOLE DRILLING

DRILLING METHOD HOLLOW STEM AUGER	TYPE OF BIT AUGER
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID NONE ~~FROM~~ ~~TO~~	SIZE NONE ~~FROM~~ ~~TO~~
FLUID NONE ~~FROM~~ ~~TO~~	SIZE NONE ~~FROM~~ ~~TO~~

PIEZOMETER DESCRIPTION

TYPE SCHEDULE 40 PVC	RISER PIPE MATERIAL SCHEDULE 40 PVC
DIAMETER OF PERFORATED SECTION 2.0 IN I.D.	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 2 5/16 IN I.D. 2.0 IN
SLOTS ☒ HOLES ☐ SCREEN ☐	LENGTH OF PIPE SECTIONS 5.0 FT, 0.5 FT
AVERAGE SIZE OF PERFORATIONS 0.02 IN	JOINING METHOD FLUSH JOINT
TOTAL PERFORATED AREA 10.0 FT	THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT	OTHER PROTECTION LOCK \ INNER
PROTECTIVE PIPE O.D. 4 3/8 IN	PROTECTIVE CAP

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	TOP 0.0	BOTTOM 0.5	TOP	BOTTOM
BENTONITE	TOP 0.5	BOTTOM 1.5	TOP	BOTTOM
SAND	TOP 1.5	BOTTOM 13.5	TOP	BOTTOM
GRAVEL NONE USED	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 3.0	BOTTOM 13.0	TOP	BOTTOM
PIEZOMETER TIP	13.5			
BOTTOM OF BOREHOLE	13.5			
GWL AFTER INSTALLATION	TO BE MEASURED BY GW CREW			

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

REMARKS 6.0 FT – BEGIN H_2O ZONE
7.0 FT – END H_2O ZONE

409-11-86

FERNALD RI/FS

	Date	Initial	Field Check	1st Key In	2nd Key In	Hard Copy Verification
	2/8/90	E.T.				

853

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.07	PROJECT NAME: FMPC RI/FS - (Facility Testing Program)		
BORING NUMBER: 1512	COORDINATES:	DATE: 2-6-90	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2-6-90	
ENGINEER/GEOLOGIST: M. GARMAN	Depth Date/Time	DATE COMPLETED: 2-6-90	
DRILLING METHODS: HOLLOW STEM AUGER(SPLIT SPOON SAMPLING)		PAGE 1 OF 4	

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (Inch)	DESCRIPTION NR = NO RECOVERY SAA = SAME AS ABOVE	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0.5	51675 0950 2-6	12	6	Med Dense (2.5y 4/4) olive brown silty sand, some gravel, moist.	SM	NA	Hnu = 0 ppm, α = 0 cpm, βB = 80 cpm
1.0	51676 0950 2-6	5	6	Stiff (2.5y 3/2) very Dark grayish brown, silty clay, trace gravel, low plasticity low moisture	CL	2.0	
1.5	51677 0950 2-6	4	5	Stiff SAA	CL	2.0	
2.0	51678 0950 2-6	6	0	NR	NA	NA	Hnu = 1 ppm, α = 0 cpm, βB = 100 cpm
2.5	51679 1015 2-6	HAND AUGERED	6	Very stiff (5y, 3/1) Very Dark gray Clay some silt, med to high plastic, moist to wet.	CL	2.5	
3.0	51680 1045 2-6	4	6	Very stiff (5y, 4/2) mottled olive gray silty clay, trace gravel, moist, low plasticity	CL	2.5	
3.5	51681 1045 2-6	5	6	SAA	CL	2.5	Hnu = 0 ppm, α = 0 cpm, βB = 80 cpm
4.0	51682 1045 2-6	7	0	NR	NA	NA	
4.5	51683 1045 2-6	8	0	NR	NA	NA	
H2O zone 5.0	51684 1050 2-6	8	6	Med Dense (2.5y 4/4) olive brown silty sand, some gravel, moist	SM	NA	Hnu = 0.2 ppm, α = 0 cpm, βB = 120 cpm
5.5	51685 1050 2-6	5	6	Stiff (2.5y 3/2) Very Dark grayish brown silty clay, trace gravel, low plasticity, low moisture	CL	2.0	
6.0	51686 1050 2-6	7	4	Very stiff (5y, 5/3) olive silty clay, trace gravel, low to med plasticity low moisture.	CL	2.5	
6.5	51687 1055 2-6	6	6	SAA	CL	2.5	Hnu = 0 ppm, α = 0 cpm, βB = 120 cpm
7.0	51688 1055 2-6	8	5	SAA	CL	2.5	
7.5	51689 1055 2-6	9	0	NR	NA	NA	

NOTES: Contractor : Pennsylvania Drilling
Driller : J. SACCANI
Drillers Assistant: C. COULTER
All Samples collected according to ASTM Standards Soil Colors described by Munsell Soil Color Charts.

Background Readings/Level
Hnu = 0 ppm
Alpha (α) = 0 cpm
Gamma - Beta = 60-100 cpm

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FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.07	PROJECT NAME: FMPC RI/FS Facility Testing)		
BORING NUMBER: 1512	COORDINATES:	DATE: 2-6-90	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2-6-90	
ENGINEER/GEOLOGIST: M. Gorman	Depth Date/Time	DATE COMPLETED: 2-6-90	
DRILLING METHODS: HOLLOW STEM AUGER - (Split Spoon Sampling)		PAGE 2 OF 4	

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 (in.)	RECOVERY (in.)	DESCRIPTION NR = NO RECOVERY SAA = SAME AS ABOVE	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8.0	51690 1058 2-6	8	6	Very Stiff (2.5y, 5/4) Lt olive brown silty clay, trace fine gravel, low plasticity low moisture.	CL	3.0	Hnu = 0 ppm, α = 0 cpm, β = 100 cpm
8.5	51691 1058 2-6	10	6	SAA	CL	3.0	
9.0	51692 1059 2-6	11	0	NR	NA	NA	
9.5	51693 1102 2-6	5	6	SAA (7.5-8.0 ft)	CL	3.5	Hnu = 0 ppm, α = 0 cpm, β = 80 cpm
10.0	51694 1102 2-6	8	6	SAA	CL	3.5	
10.5	51895 1102 2-6	9	2	SAA	CL	3.5	
11.0	51896 1105 2-6	5	6	HARD (2.5y, 5/4) Lt olive brown SILTY CLAY, trace gravel, low plasticity, low moisture.	CL	4.0	Hnu = 0 ppm, α = 0 cpm, β = 80 cpm
11.5	51897 1105 2-6	7	6	SAA	CL	4.0	
12.0	51898 1105 2-6	13	6	SAA	CL	4.0	
12.5	51899 1120 2-6	20	6	~~Bottom of Boring~~ 2-6-90 SAA	CL	4.0	Hnu = 0 ppm, α = 0 cpm, β = 80 cpm
13.0	51900 1120 2-6	19	6	SAA	CL	4.0	
13.5	51901 1120 2-6	23	6	Very Stiff (5y, 4/1) dark gray silty clay low plasticity, low moisture	CL	3.0	
14.0	51902 1120 2-6	23	5	SAA	CL	3.0	Hnu = 0 ppm, α = 0 cpm, β = 80 cpm
14.5				Bottom of Boring and Sampling @ 14.0 FT Piezometer installed			
15.0							

NOTES:

SEE PAGE 1

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FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 1512

INSTALLATION DATE: 2-6-90

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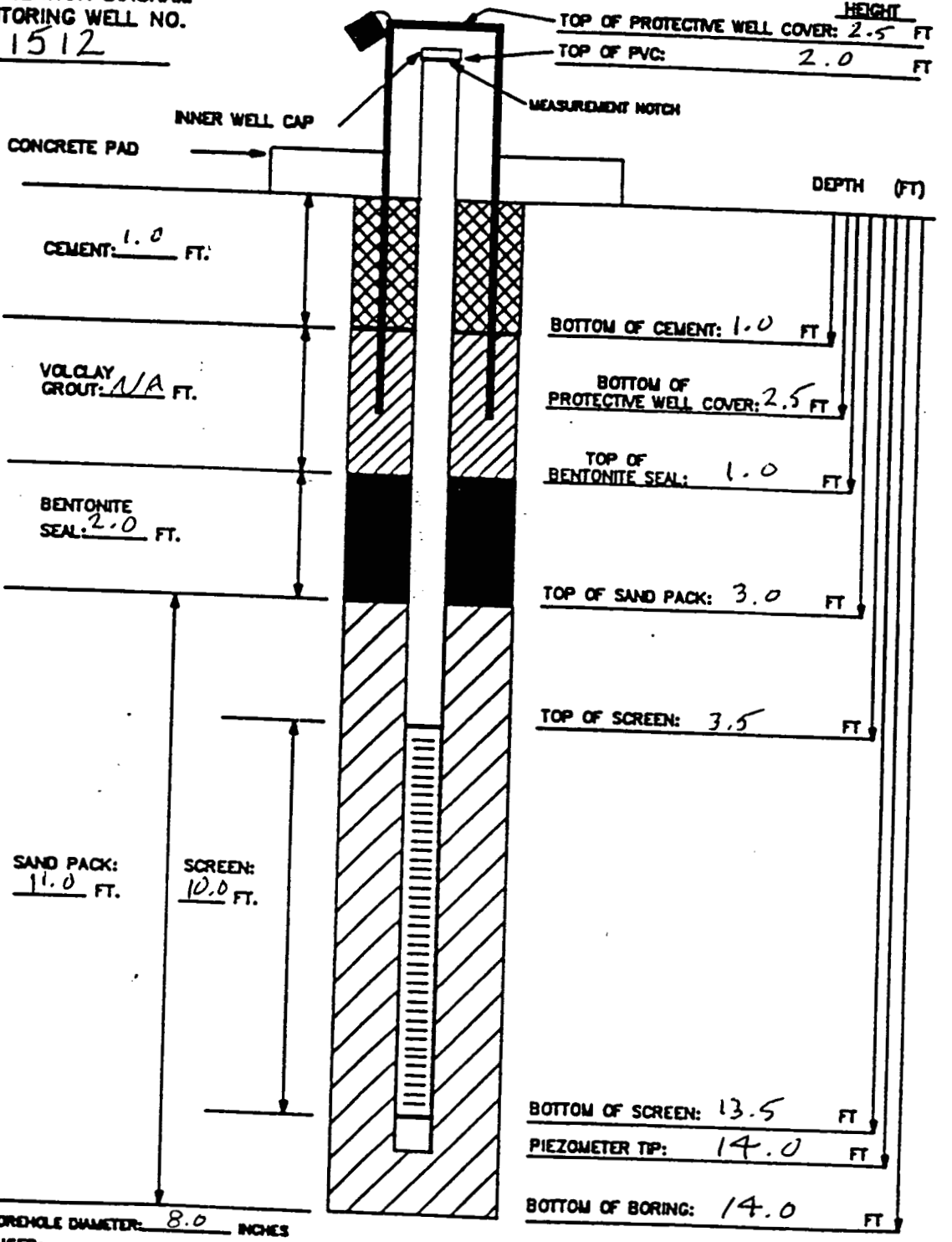


BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:

SAND TYPE AND QUANITITY: (1020) 5.0 80 lb. SKS
BENTONITE PELLETS (5-GALLON BUCKETS): 1.0
BAGS OF VOLCLAY GROUT: NONE USED
AMOUNT OF CEMENT: ~~2.0 gal~~ 0.5 SACK (@ 4 lb)
AMOUNT OF WATER USED: 1.5 gal
OTHER:

NOTES:

1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK: 03.07.01

GEOLOGIST/ENGINEER:

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. M. Lourman DATE 2-6-90
PROJECT NO. 6002.3.7 CHECKED BY G.T. DATE 2/8/90
BORING NO. 1512
PIEZOMETER NO. 1512 DATE OF INSTALLATION 2-6-90

BOREHOLE DRILLING

DRILLING METHOD HOLLOW STEM AUGER	TYPE OF BIT AUGER
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID NONE FROM ___ TO ___	SIZE NONE FROM ___ TO ___
FLUID NONE FROM ___ TO ___	SIZE NONE FROM ___ TO ___

PIEZOMETER DESCRIPTION

TYPE SCHEDULE 40 PVC	RISER PIPE MATERIAL SCHEDULE 40 PVC
DIAMETER OF PERFORATED SECTION 2.0 IN I.D.	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 2 5/16 IN I.D. 2.0 IN
SLOTS ☒ HOLES ☐ SCREEN ☐	LENGTH OF PIPE SECTIONS 5.0 FT, 1.0 FT
AVERAGE SIZE OF PERFORATIONS 0.02 IN	JOINING METHOD FLUSH JOINT
TOTAL PERFORATED AREA 10.0 FT	THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT	OTHER PROTECTION LOCK \ INNER
PROTECTIVE PIPE O.D. 4 3/8 IN	LOCKING CAP

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	~~2.5~~ MC 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 3.0	TOP	BOTTOM
SAND	TOP 3.0	BOTTOM 14.0	TOP	BOTTOM
GRAVEL NONE USED	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 3.5	BOTTOM 13.5	TOP	BOTTOM
PIEZOMETER TIP	14.0			
BOTTOM OF BOREHOLE	14.0			
GWL AFTER INSTALLATION	TO BE MEASURED BY GW CREW			

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

REMARKS 4.5 FT – BEGIN H_2O ZONE
5.0 FT – END H_2O ZONE

Date	2/8/90	853	
Initial	E.T.		
	Field Clerk	1st Review	2nd Review

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.07	PROJECT NAME: FMPC RI/FS - (Facility Testing Program)		
BORING NUMBER: 513	COORDINATES:	DATE: 2-6-90	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2-6-90	
ENGINEER/GEOLOGIST: M. Garmon	Depth Date/Time	DATE COMPLETED: 2-7-9	
DRILLING METHODS: HOLLOW STEM AUGER(SPLIT SPOON SAMPLING)		PAGE 1 OF 5	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0.5	53515 1400 2-6	2	6	Med Stiff (2.5y 3/2) very dark grayish brown silty, sandy clay, low plasticity, very moist	CL	1.0	Hnu = 0 ppm, α = 0 cpm, βB = 80 cpm
1.0	53516 1400 2-6	3	6	Stiff (2.5y 3/2) very dark grayish brown silty clay, low plasticity, low moisture	CL	1.5	
1.5	53517 1400 2-6	4	4	SAA	CL	1.5	
2.0	53518 1400 2-6	4	0	NR	NA	NA	Hnu = 0.2 ppm, α = 0 cpm, βB = 80 cpm
2.5	53519 1415 2-6	HAND AUGERED	6	Very Stiff (2.5y, 5/6) Lt olive brown silty clay, low to med plasticity, low moisture	CL	2.5	
3.0	53520 1445 2-6	2	6	Very stiff (2.5y, 5/4) Lt. olive brown silty clay, trace gravel, low plasticity, slightly moist to moist	CL	2.5	
3.5	53521 1445 2-6	4	6	SAA	CL	2.5	Hnu = 0 ppm, α = 0 cpm, βB = 80 cpm
4.0	53522 1445 2-6	7	3	SAA	CL	2.5	
4.5	53523 1445 2-6	9	0	NR	NA	NA	
5.0	53524 1450 2-6	7	6	Very Stiff (2.5y, 5/4) Lt olive brown silty clay, trace gravel, low plasticity slightly moist	CL	3.5	Hnu = 0.2 ppm, α = 0 cpm, βB = 60-80 cpm
5.5	53525 1450 2-6	9	6	SAA	CL	3.5	
6.0	53526 1450 2-6	12	1	SAA	CL	3.5	
6.5	53527 1452 2-6	7	6	HARD SAA	CL	4.0	Hnu = 0 ppm, α = 0 cpm, βB = 120 cpm
7.0	53528 1452 2-6	10	6	SAA	CL	4.0	
7.5	53529 1452 2-6	10	3	SAA	CL	4.0	

NOTES: Contractor : Pennsylvania Drilling
Driller : Jim Saccani
Drillers Assistant: Chris Coulter.

SAA-SAME as above
NR- NO RECOVERY

All samples collected according to ASTM Standards Soil Colors Described by Munsell Soil Color Charts.

Background Readings/Level

Hnu = 0 ppm
Alpha (α) = 48 cpm
Gamma - Beta = 60-80 cpm

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.07	PROJECT NAME: FMPC RI/FS Facility Testing)		
BORING NUMBER: 1513	COORDINATES:	DATE: 2-6-90	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2-6-90	
ENGINEER/GEOLOGIST: M Coarman	Depth Date/Time	DATE COMPLETED: 2-7-90	
DRILLING METHODS: HOLLOW STEM AUGER - (Split Spoon Sampling)		PAGE 2 OF 5	

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 In.)	RECOVERY (In.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8.0	53530 1454 2-6	13	6	Hard (2.5y 5/4) Lt olive brown silty clay, trace gravel, low plasticity low moisture	CL	4.0	Hnu = 0 ppm, α = 0 cpm, 5β = 80 cpm
8.5	53531 1454 2-6	18	6	Very Stiff SAA	CL	2.5	
9.0	53532 1454 2-6	15	2	Very Stiff SAA	CL	2.5	
9.5	53533 1503 2-6	13	6	Very Stiff 2.5y 5/4 Lt olive brown silty clay, trace gravel, low plasticity, low moisture	CL	3.0	Hnu = 0 ppm, α = 0 cpm, 5β = 80 cpm
10.0	53534 1503 2-6	12	6	Very Stiff SAA	CL	3.0	
10.5	53255 1503 2-6	15	6	Very Stiff SAA	CL	3.0	
11.0	53256 1508 2-6	10	6	Very Stiff SAA	CL	3.0	Hnu = 0 ppm, α = 0 cpm, 5β = 100 cpm
11.5	53257 1508 2-6	12	6	HARD SAA	CL	>4.0	
12.0	53258 1508 2-6	14	6	HARD SAA	CL	>4.0	
12.5	53259 1515 2-6	13	6	HARD (2.5y, 4/4) olive brown silty clay, trace gravel, low plasticity low moisture	CL	>4.0	Hnu = 0 ppm, α = 0 cpm, 5β = 60 cpm
13.0	53260 1515 2-6	16	6	HARD SAA	CL	>4.0	
13.5	53261 1515 2-6	17	2	HARD SAA	CL	>4.0	
14.0	53262 1520 2-6	16	6	HARD SAA	CL	>4.0	Hnu = 0 ppm, α = 0 cpm, 5β = 80 cpm
14.5	53263 1520 2-6	16	6	Very Stiff (5y, 5/1) gray, silty clay, trace gravel, low to med plasticity, low moisture	CL	2.5	
15.0	53264 1520 2-6	19	6	Very Stiff SAA	CL	2.5	

NOTES:

SEE PAGE 1

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.07	PROJECT NAME: FMPC RI/FS - (Facility Testing Program		
BORING NUMBER: 1513	COORDINATES:	DATE: 2-06-90	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2-06-90	
ENGINEER/GEOLOGIST: M. Learman	Depth Date/Time	DATE COMPLETED: 2-7-90	
DRILLING METHODS: HOLLOW STEM AUGER - (Split Spoon Sampling)		PAGE 3 OF 5	

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 In.)	RECOVERY (In.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15.5	53265 1533 2-6	3	6	Stiff (5y, 5/1) gray silty clay, trace gravel, low to med plasticity, low moisture	CL	2.0	Hnu = 0 ppm, α = 0 cpm, βB = 80 cpm
16.0	53266 1533 2-6	9	4	M. Dense (5y, 5/1) gray clayey silt, trace gravel, moist	ML	NA	
16.5	53267 1533 2-6	10	0	NR	NA	NA	
17.0	53268 1538 2-6	10	6	Med. Dense (5y, 5/1) gray clayey silt, trace gravel, moist	ML	NA	Hnu = 0 ppm, α = 0 cpm, βB = 60-80 cpm
17.5	53269 1538 2-6	13	6	SAA	ML	NA	
18.0	53270 1538 2-6	10	6	~~Med~~ Stiff (5y 5/1) gray silty clay trace gravel, med plasticity, moist	CL	1.5	
18.5	53271 1548 2-6	8	6	Stiff SAA	CL	1.5	Hnu = 0 ppm, α = 0 cpm, βB = 60 cpm
19.0	53272 1548 2-6	12	6	Med Dense (5y, 5/1) gray clayey silt, trace gravel, moist	ML	NA	
19.5	53273 1548 2-6	10	6	SAA	ML	NA	
20	53274 1548 2-6	14	0	NR	NA	NA	Hnu = NA, α = NA, βB = NA
				Bottom of Boring and Sampling @ 20 FT PIEZOMETER INSTALLED			

H_2O ZONE

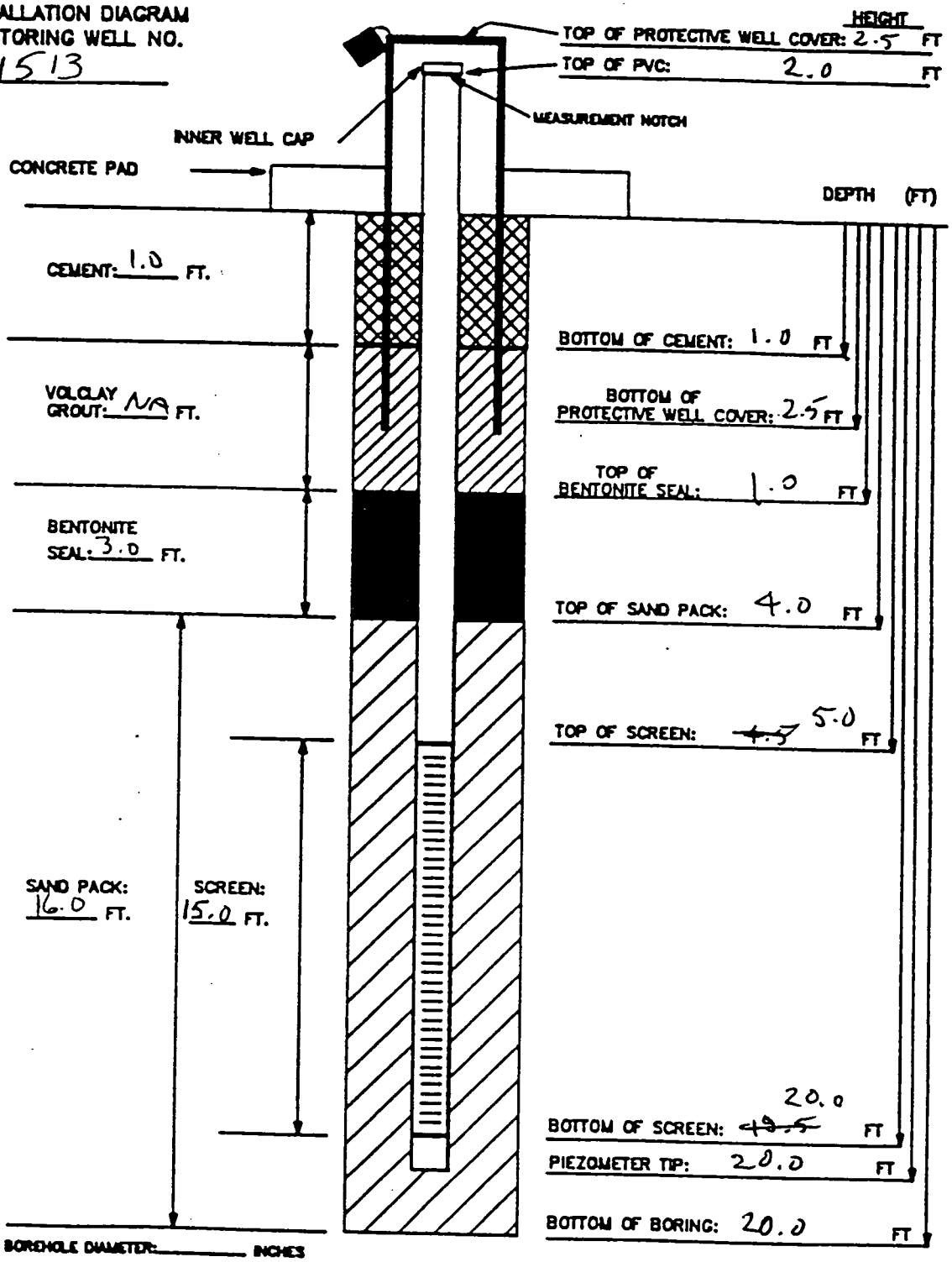
NOTES:

SEE PAGE 1

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 1513

INSTALLATION DATE: 2-7-90



BOREHOLE DIAMETER: _____ INCHES

MATERIALS USED:

SAND TYPE AND QUANTITY: (1020) 8.0 80 lb. sks
BENTONITE PELLETS (5-GALLON BUCKETS): 2.0
BAGS OF VOLCLAY GROUT: NONE USED
AMOUNT OF CEMENT: ~~8 gal~~ 0.5 SAK (94 lb.)
AMOUNT OF WATER USED: 2.0 gal
OTHER:

NOTES:

1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK: 602.3.7.1

GEOLOGIST/ENGINEER: [signature]

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC\RI\FS FACILITIES TESTING FIELD ENG./GEO. M GARMAN DATE 2-7-90
PROJECT NO. 6023.7.1 CHECKED BY RK DATE 2/8-90
BORING NO. 1513
PIEZOMETER NO. 1513 DATE OF INSTALLATION 2-7-90

BOREHOLE DRILLING

DRILLING METHOD HOLLOW STEM AUGER	TYPE OF BIT AUGER
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID NONE FROM ~~TO~~	SIZE NONE FROM ~~TO~~
FLUID NONE FROM ~~TO~~	SIZE NONE FROM ~~TO~~

PIEZOMETER DESCRIPTION

TYPE SCHEDULE 40 PVC	RISER PIPE MATERIAL SCHEDULE 40 PVC
DIAMETER OF PERFORATED SECTION 2.0 IN I.D.	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 2 5/16 IN I.D. 2.0 IN
SLOTS ☒ HOLES ☐ SCREEN ☐	LENGTH OF PIPE SECTIONS 5.0 FT, 2.0 FT
AVERAGE SIZE OF PERFORATIONS 0.02 IN	JOINING METHOD FLUSH JOINT
TOTAL PERFORATED AREA 15.0 FT	THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT	OTHER PROTECTION LOCK\INNER
PROTECTIVE PIPE O.D. 4 3/8 IN	LOCKING CAP

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	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 4.0	TOP	BOTTOM
SAND	TOP 4.0	BOTTOM 20.0	TOP	BOTTOM
GRAVEL NONE USED	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 5.0	BOTTOM 20.0	TOP	BOTTOM
PIEZOMETER TIP	20.0			
BOTTOM OF BOREHOLE	20.0			
GWL AFTER INSTALLATION	TO BE MEASURED BY GW CREW			

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

REMARKS 15.5 FT - BEGIN H_2O ZONE
19.5 FT - END H_2O ZONE
15 FT SCREEN USE BECAUSE OF APPARENT SEAMS OF WATER ENTRY ABOVE A DEPTH OF 10.0 FT.

Date	2/8/90			
Initial	E.T.		853	
	Field Check	1st Key In	2nd Key In	Hard Copy Validation

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.07	PROJECT NAME: FMPC RI/FS - (Facility Testing Program)		
BORING NUMBER: 1514	COORDINATES:	DATE: 2-7-90	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2-7-90	
ENGINEER/GEOLOGIST: M. Garman	Depth Date/Time	DATE COMPLETED: 2-7-90	
DRILLING METHODS: HOLLOW STEM AUGER(SPLIT SPOON SAMPLING)		PAGE 1 OF 4	

NR = NO RECOVERY

SAA = SAME AS ABOVE

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 inches)	RECOVERY (Inches)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0.5	54555 2-7 1545	2	6	Stiff (2.5y, 3/2) V. Dark grayish brown silty clay, some sand, low plasticity, very moist	CL	1.0	Hnu = 0 ppm; α = 0 cpm; γβ = 100 cpm
1.0	54556 2-7 1545	3	4	Stiff (2.5y, 4/2) dark grayish brown silty clay, low plasticity, moist	CL	1.0	
1.5	54557 2-7 1545	2	0	NR	NA	NA	
2.0	54558 2-7 1545	2	0	NR	NA	NA	Hnu = 0 ppm; α = 0 cpm; γβ = 140 cpm
2.5	54559 1550 2-7	2	6	Stiff (2.5y, 4/4) olive brown silty sandy clay, some gravel, low plasticity, moist	CL	1.5	
3.0	54560 1550 2-7	7	6	Very Stiff (2.5y, 5/4) Lt. olive brown mottled silty clay, low plasticity, low moisture	CL	2.5	AN HSL SAMPLE # 53782 WAS HAND AUGERED AT 2.0-2.5FT ON 2-6-90 @1700
3.5	54561 1550 2-7	10	2	SAA	CL	2.5	Hnu = 0 ppm; α = 0 cpm; γβ = 80 cpm
4.0	54562 1550 2-7	10	0	NR	NA	NA	
4.5	54563 1554 2-7	10	6	Very Stiff (2.5y, 5/4) Lt olive brown silty clay, (mottled) trace gravel trace sand, low plasticity, low moisture	CL	2.0	
5.0	54564 1554 2-7	10	6	SAA	CL	2.0	Hnu = 0 ppm; α = 0 cpm; γβ = 80 cpm
5.5	54565 1554 2-7	12	4	SAA	CL	2.0	
6.0	54566 1554 2-7	11	0	NR	NA	NA	
H_2O zone 6.5	54567 1608 2-7	4	6	Stiff (2.5y, 5/4) Lt olive brown silty clay trace gravel, with a sand seam occurring at 6.3 feet, low plasticity, slightly moist	CL	1.0	Hnu = 0 ppm; α = 0 cpm; γβ = 80 cpm
7.0	54568 1608 2-7	10	4	Stiff (2.5y, 5/4) Lt olive brown silty clay, trace sand and gravel, slightly moist	CL	1.0	
7.5	54569 1608 2-7	9	0	NR	NA	NA	

NOTES: Contractor : Pennsylvania Drilling
Driller : Jim Seccani
Drillers Assistant: Chris Coulter.

All samples collected according to ASTM Standards Soil Colors described by Munsell Soil Color Charts.

NR = No Recovery

Background Readings/Level

Hnu = 0 ppm

Alpha (α) = 0 cpm

Gamma - Beta = 80 cpm

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FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.07	PROJECT NAME: FMPC: RI/FS Facility Testing)		
BORING NUMBER: 1514	COORDINATES:	DATE: 2-7-90	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2-7-90	
ENGINEER/GEOLOGIST: M. Leaman	Depth Date/Time	DATE COMPLETED: 2-7-90	
DRILLING METHODS: HOLLOW STEM AUGER - (Split Spoon Sampling)		PAGE 2 OF 4	

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN.	RECOVERY (IN.)	NR = NO RECOVERY DESCRIPTION SAA = SAME AS ABOVE	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8.0	54570 1610 2-7	8	6	Very stiff (2.5y,5/4) Lt olive brown silty clay, some sand and gravel, low to med plasticity, low moisture	CL	2.0	Hnu = 0 ppm α = 0 cpm β = 80 cpm
8.5	54571 1610 2-7	8	6	SAA	CL	2.0	
9.0	54572 1610 2-7	13	2	SAA	CL	2.0	
9.5	54573 1613 2-7	10	6	Very stiff (2.5y,5/4) Lt olive brown silty clay, trace gravel, low plasticity low moisture	CL	3.0	Hnu = 0 ppm α = 0 cpm β = 90 cpm
10.0	54574 1613 2-7	13	6	SAA	CL	3.0	
10.5	54935 1613 2-7	15	6	SAA	CL	3.0	
11.0	54936 1620 2-7	4	6	SAA	CL	3.5	Hnu = 0 ppm α = 0 cpm β = 80 cpm
11.5	54937 1620 2-7	9	6	HARD SAA	CL	4.0	
12.0	54938 1620 2-7	10	4	HARD SAA	CL	4.0	
12.5	54939 1625 2-7	10	6	SAA	CL	>4.0	Hnu = 0 ppm α = 0 cpm β = 80 cpm
13.0	54940 1625 2-7	10	6	HARD (5y,4/1) dark gray, silty clay, trace gravel, low plasticity, low moisture	CL	>4.0	
13.5	54941 1625 2-7	12	4	SAA	CL	>4.0	
14.0	54942			Bottom of Boring and Sampling at 13.5 FT PIEZOMETER INSTALLED			Hnu = ppm α = cpm β = cpm
14.5	54943						
15.0	54944						

NOTES:

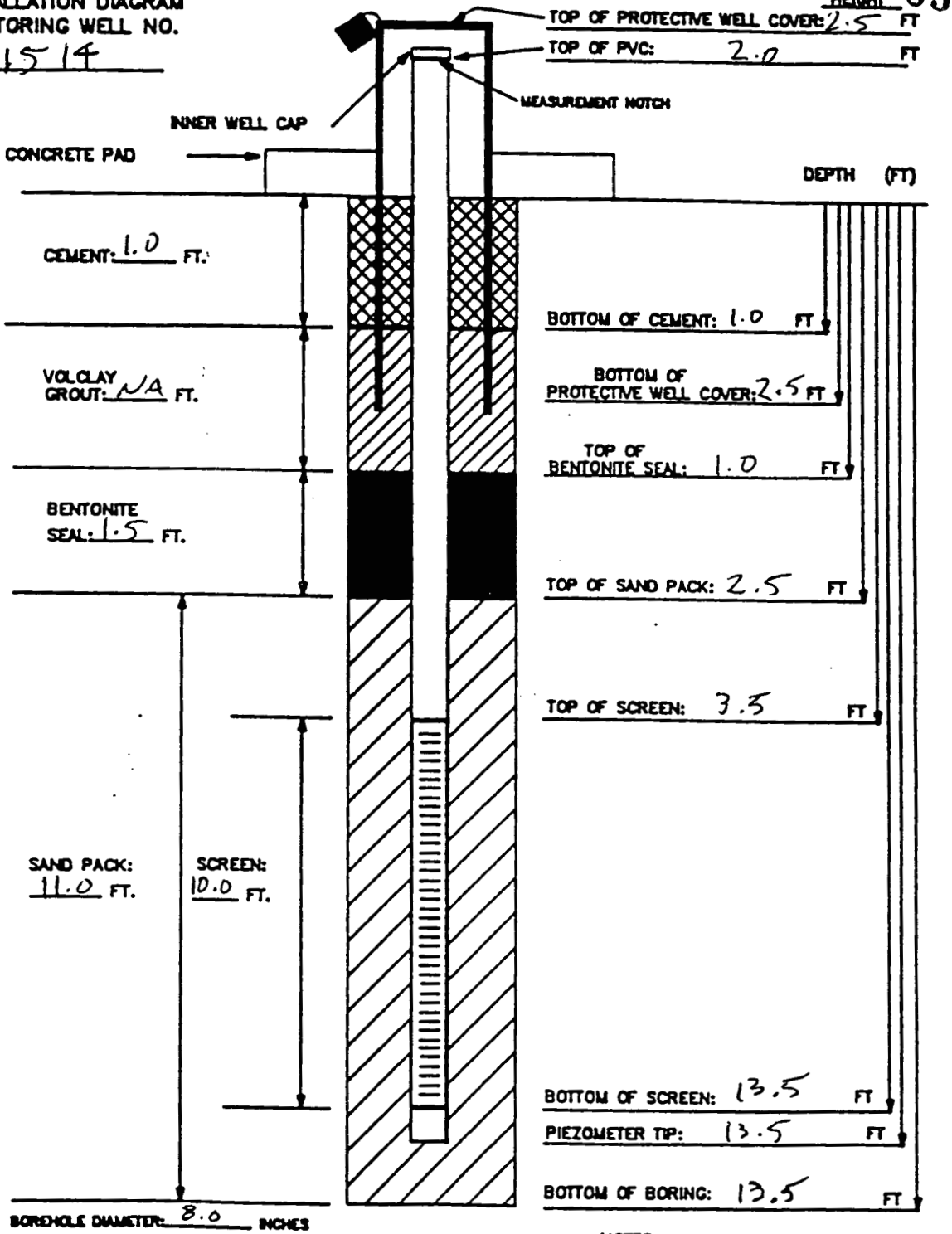
SEE PAGE 1

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO.
1514

INSTALLATION DATE: 2-7-90

HEIGHT 853



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:

SAND TYPE AND QUANTITY: (10 20) 5 80 lb. SKS.
BENTONITE PELLETS (5-GALLON BUCKETS): 1.0
BAGS OF VOLCLAY GROUT: NONE USED
AMOUNT OF CEMENT: ~~[illegible]~~ .5 SAK (94 lb)
AMOUNT OF WATER USED: 1.5 gal
OTHER:

NOTES:

1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK: 602.07.1 GEOLOGIST/ENGINEER: [illegible]

FERNALD RI/FS

853

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FACILITIES TESTING FIELD ENG./GEO. M. GARMAN DATE 2-7-90
PROJECT NO. 602-3.7.1 CHECKED BY E.T. DATE 3/8/90
BORING NO. 1514
PIEZOMETER NO. 1514 DATE OF INSTALLATION 2-7-90

BOREHOLE DRILLING

DRILLING METHOD HOLLOW STEM AUGER
DRILLING FLUID (S) USED:
FLUID NONE FROM ~~TO~~
FLUID NONE FROM ~~TO~~

TYPE OF BIT AUGER
CASING SIZE (S) USED:
SIZE NONE FROM ~~TO~~
SIZE NONE FROM ~~TO~~

PIEZOMETER DESCRIPTION

TYPE SCHEDULE 40 PVC
DIAMETER OF PERFORATED SECTION 2.0 IN I.D.
PERFORATION TYPE:
SLOTS ☑ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.02 IN
TOTAL PERFORATED AREA 10.0 FT

RISER PIPE MATERIAL SCHEDULE 40 PVC
RISER PIPE DIAMETERS:
O.D. 2 5/16 IN I.D. 2.0 IN
LENGTH OF PIPE SECTIONS 5.0 FT, 0.5 FT
JOINING METHOD FLUSH JOINT THREADED

PROTECTION SYSTEM

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

OTHER PROTECTION LOCK \ INNER LOCKING CAP

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	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 2.5	TOP	BOTTOM
SAND	TOP 2.5	BOTTOM 13.5	TOP	BOTTOM
GRAVEL NONE USED	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 3.5	BOTTOM 13.5	TOP	BOTTOM
PIEZOMETER TIP	13.5			
BOTTOM OF BOREHOLE	13.5			
GWL AFTER INSTALLATION	TO BE MEASURED BY GWTRAM			

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

REMARKS 6.0 FT - BEGIN H_2O ZONE
6.5 FT - END H_2O ZONE

56

409-11-A

Date	2/16/90			
Initial	K.T			853
	Field Check	1st Rev In	2nd Rev In	Hard Copy Verification

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.07	PROJECT NAME: FMPC RI/FS - (Facility Testing Program)		
BORING NUMBER: 1515	COORDINATES:	DATE: 2-7-90	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2-7-90	
ENGINEER/GEOLOGIST: M. Gearman	Depth Date/Time	DATE COMPLETED: 2-7-90	
DRILLING METHODS: HOLLOW STEM AUGER (SPLIT SPOON SAMPLING)		PAGE 1 OF 4	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6"	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0.5	2-7 1340 52255	3	6	Soft (2.5y 4/2) Dk grayish brown silty clay med plastic, very moist. 4in Med dense 2.5y 4/4 olive brown clayey sand very moist	CL / SC	0.5 / NA	Hnu = 0 ppm α = 0 cpm β = 80 cpm
1.0	2-7 1340 52256	7	6	Very stiff (2.5y, 3/2) very dark grayish brown silty clay, low plasticity, low moisture	CL	3.5	
1.5	2-7 1340 52257	8	4	SAA	CL	3.5	
2.0	2-7 1340 52258	9	0	NR	NA	NA	Hnu = .2 ppm α = 0 cpm β = 80 cpm
2.5	2-7 1415 52259	HAND AUGERED	6	Very stiff (2.5y, 3/4) Lt olive brown mottled silty clay, low to med plasticity low moisture	CL	3.0	
3.0	2-7 1424 52260	3	6	Very stiff (2.5y, 5/6) Lt olive brown mottled silty clay, trace sand & gravel low plasticity, moist, (water seam)	CL	2.5	
3.5	2-7 1424 52261	5	6	SAA	CL	2.5	Hnu = 0 ppm α = 0 cpm β = 80 cpm
4.0	2-7 1424 52262	7	2	SAA	CL	2.5	
4.5	2-7 1424 52263	9	0	NR	NA	NA	
5.0	2-7 1428 52264	10	6	Soft (2.5y, 4/4) olive brown gravelly clay, ~~some~~ trace silt, low plasticity, wet CAM 2-7-90	CL	<.5	Hnu = 0 ppm α = 0 cpm β = 80-100 cpm
5.5	2-7 1428 52265	13	6	Hard (2.5y, 5/4) Lt olive brown silty clay trace gravel, low plasticity, moist	CL	>4.0	
6.0	2-7 1428 52266	10	3	SAA	CL	~~3.5~~ >4.0	CAM 2-7-90
6.5	2-7 1430 52267	6	6	Very stiff SAA + Low moisture	CL	3.5	Hnu = 0 ppm α = 0 cpm β = 80-100 cpm
7.0	2-7 1430 52268	7	6	Very stiff (2.5y, 5/4) Lt olive brown silty clay, trace gravel, low plasticity, low moisture	CL	3.5	
7.5	2-7 1430 52269	9	0	NR	NA	NA	

NOTES: Contractor : Pennsylvania Drilling
Driller : Jim Saccani
Drillers Assistant: Chris Coulter

SAA - Same as above
NR - No Recovery

All samples collected according to ASTM Standards for colors described by Munsell Soil Color Charts.

Background Readings/Level
Hnu = 0 ppm
Alpha (α) = 0 cpm
Gamma - Beta = 80 cpm

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.07	PROJECT NAME: FMPC RI/FS Facility Testing)		
BORING NUMBER: 1515	COORDINATES:	DATE: 2-7-90	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2-7-90	
ENGINEER/GEOLOGIST: M. Gormen.	Depth Date/Time	DATE COMPLETED: 2-7-90	
DRILLING METHODS: HOLLOW STEM AUGER - (Split Spoon Sampling)		PAGE 2 OF 4	

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 (in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8.0	52270 1435 2-7	9	6	Very Stiff (2.5y 5/4) Lt olive brown, silty clay, trace gravel, low plasticity, low moisture	CL	3.5	Hnu = 0 ppm
				Med Dense (2.5y, 5/4) Lt olive brown clayey silt very moist	ML	NA	α = 0 cpm
8.5	52271 1435 2-7	13	6	Very Stiff (2.5y 5/4) Lt olive brown, silty clay, trace gravel, low plasticity, low moisture.	CL	2.5	SB = 80 cpm
9.0	52272 1435 2-7	16	4	Med Dense (2.5y, 5/4) Lt olive brown clayey silt, very moist	ML	NA	
9.5	52273 1445 2-7	9 ~~157~~	6	Hard (2.5y, 5/4) Lt olive brown silty clay, trace gravel, low plasticity, low moisture	CL	4.0	Hnu = 0 ppm
10.0	52274 1445 2-7	13 ~~139~~	6	SAA	CL	4.0	α = 0 cpm
							SB = 80 cpm
10.5	54435 1445 2-7	13 ~~13~~	5	SAA	CL	4.0	
11.0	54436 1452 2-7	15	6	SAA	CL	4.0	Hnu = 0 ppm
11.5	54437 1452 2-7	13	6	SAA	CL	4.0	α = 0 cpm
							SB = 80-100 cpm
12.0	54438 1452 2-7	13	6	SAA	CL	4.0	
12.5	54439 1458 2-7	12	6	SAA	CL	4.0	Hnu = 0 ppm
13.0	54440 1458 2-7	14	6	HARD (5y, 4/1) Dark gray silty clay low plasticity, low moisture	CL	>4.0	α = 0 cpm
							SB = 80-100 cpm
13.5	54441 1458 2-7	15	0	NR	NA	NA	
14.0				Bottom of Boring and Sampling at 13.5 ft Piezometer installed			Hnu =
							α =
14.5							SB =
15.0							

H_2O ZONE

NOTES:

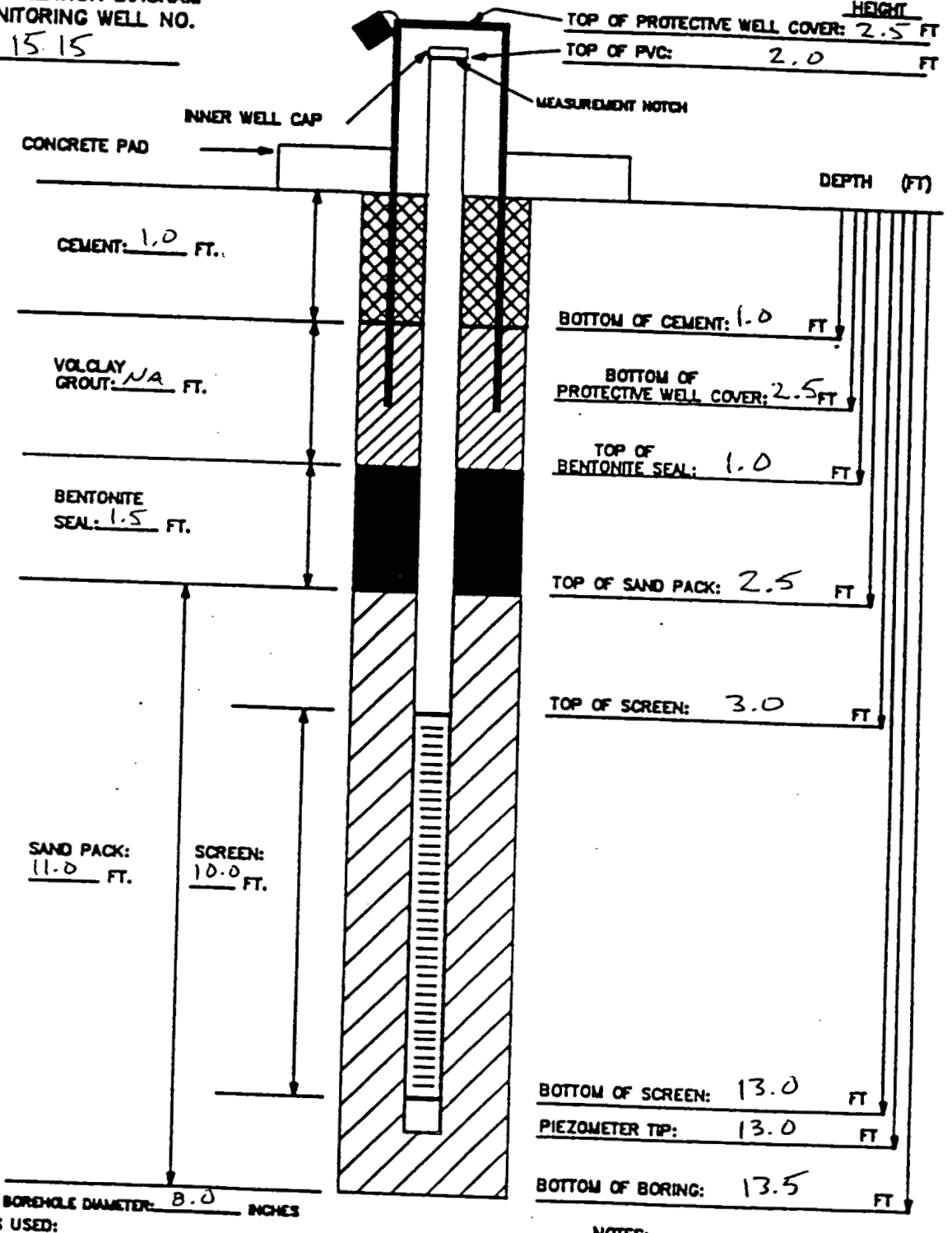
SEE PAGE 1

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 15.15

INSTALLATION DATE: 2-7-90

853



BOREHOLE DIAMETER: 8.0 INCHES

MATERIALS USED:

SAND TYPE AND QUANTITY: (1026) 5 80 lb SACS
BENTONITE PELLETS (5-GALLON BUCKETS): (0.5)
BAGS OF VOLCLAY GROUT: NONE USED
AMOUNT OF CEMENT: 0.5 SAK (94 lb)
AMOUNT OF WATER USED: 2.0 gal
OTHER:

NOTES:

1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK: 602.3.7.1

GEOLOGIST/ENGINEER: [illegible]

FERNALD RI/FS

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PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI\FS FACILITIES TESTING
FIELD ENG./GEO. M. GARMAN DATE 2-7-90
PROJECT NO. 607.3.7.1
CHECKED BY E.T. DATE 2/8/90
BORING NO. 1515
PIEZOMETER NO. 1515
DATE OF INSTALLATION 2-7-90

BOREHOLE DRILLING

DRILLING METHOD HOLLOW STEM AUGER
TYPE OF BIT AUGER
DRILLING FLUID (S) USED:
FLUID NONE FROM ~~TO~~ →
FLUID NONE FROM ~~TO~~ →
CASING SIZE (S) USED:
SIZE NONE ~~FROM~~ ~~TO~~ →
SIZE NONE ~~FROM~~ ~~TO~~ →

PIEZOMETER DESCRIPTION

TYPE SCHEDULE 40 PVC
DIAMETER OF PERFORATED SECTION 2.0 IN I.D.
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.02 IN
TOTAL PERFORATED AREA 10.0 FT
RISER PIPE MATERIAL SCHEDULE 40 PVC
RISER PIPE DIAMETERS:
O.D. 2 5/16 IN I.D. 2.0 IN
LENGTH OF PIPE SECTIONS 5.0 FT, 0.5 FT
JOINING METHOD FLUSH JOINT THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH
PROTECTIVE PIPE O.D. 4 3/8 IN
OTHER PROTECTION LOCK \ INNER LOCKING CAP

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	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 2.5	TOP	BOTTOM
SAND	TOP 2.5	BOTTOM 13.5	TOP	BOTTOM
GRAVEL NONE USED	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 3.0	BOTTOM 13.0	TOP	BOTTOM
PIEZOMETER TIP	13.0			
BOTTOM OF BOREHOLE	13.5			
GWL AFTER INSTALLATION	TO BE MEASURED BY GW TEAM			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS ~ 7.8 FT – BEGIN H_2O ZONE
9.0 FT – END H_2O ZONE

409-11-86

FERNALD RI/FS

Date	9/8/90			
Initial	FT	853		
	Field Check	1st Key In	2nd Key In	Final Verification

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1319	COORDINATES:	
ELEVATION:	GWL: Depth Date/Time	DATE: 02-06-90
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE STARTED: 02-06-90
DRILLING METHODS: AUGER (HOLLOW STEM)		DATE COMPLETED: 02-06-90
		PAGE 1 OF 3

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	2-6	NA	6	Cement	NA	NA	HNU: 0 ppm α = 140-160 cpm Bγ = 2500-2800 cpm
	2-6		6	Cement	NA	NA	
1	19587 1333 2-6	5	6	medium dense (10YR5/4) yellowish brown well graded gravelly sand, trace of silt or clay, Gravel fine to coarse, very moist	SW	NA	
2	19588 1333 2-6	6	4	medium dense (10YR5/4) yellowish brown poorly graded sand, trace of silt and fine to medium gravel, moist	SP	NA	HNU: 0 ppm α: 0-20 cpm Bγ = 290-300 cpm
	19589 1333	10/3	0	NR	NA	NA	
	~~19590~~ ~~1333~~	2/4/90					
3				Well bore was sampled to 2.3 FT then hand dug to 2.3 FT - A steel pipe was encountered at that Depth of at least 8 in diameter. Borehole was plugged on 2/6/90 with 1-5gal bucket of Bentonite Pellets and capped with 1/2-94 sack of cement			HNU: α: Bγ:
4							
5							HNU: α: Bγ:
6							
7							HNU: α: Bγ:

NOTES: CONTRACTOR: PENNDRILL
RIG: CME-45
DRILLER: Bob Yost
ASSISTANT: Brian Strapazon
GeoAssistant-H&S: Ben Brier

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TE
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α: 0-40 CPM Bγ = 180-280 cpm w/o
Bγ: 800-1000 CPM w/o lead Bricks
LEL: 0% 2/4/90
O_2: 20.8%

NR = No Recovery
SAA = Same As Above
LEL O_2:

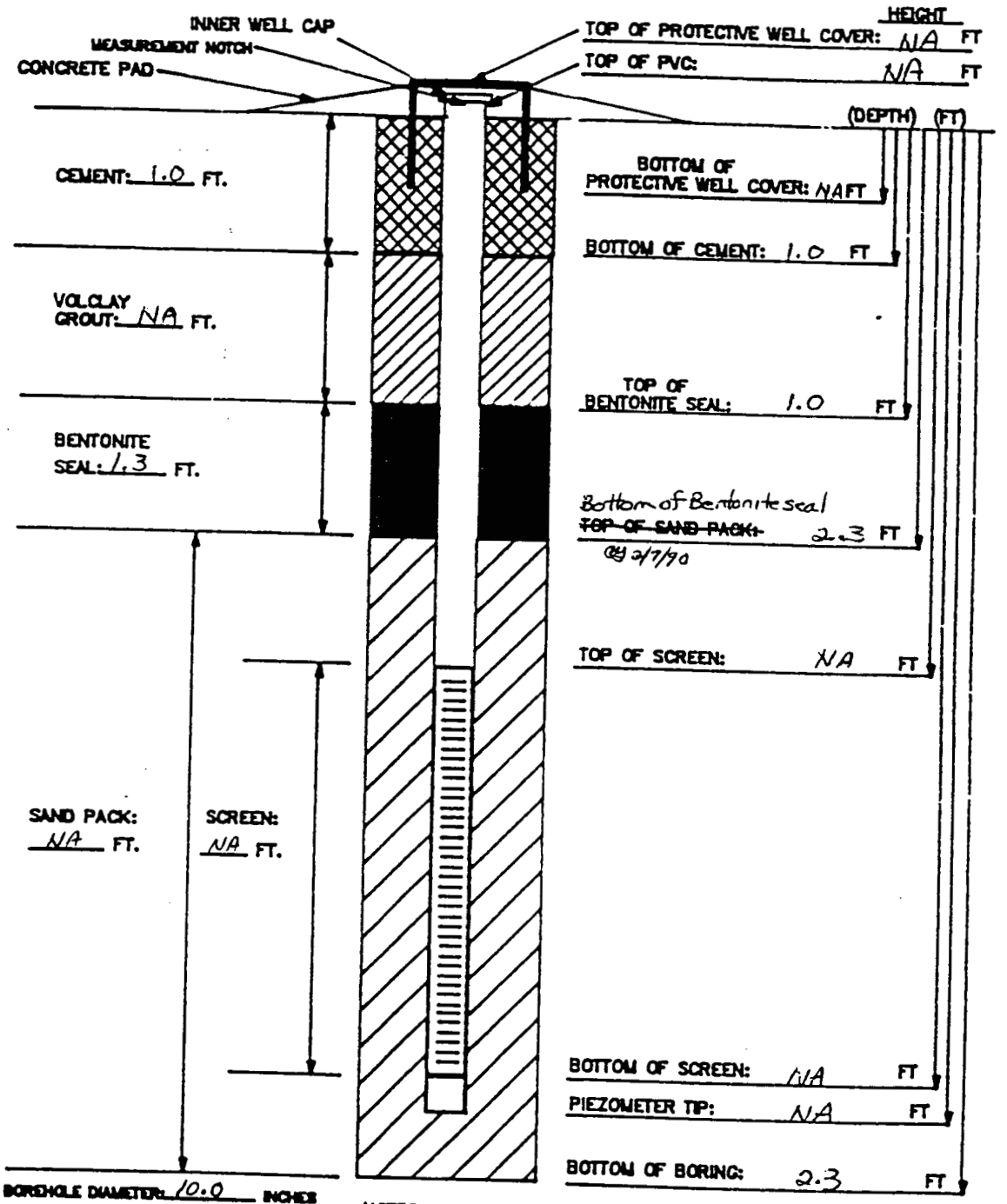
HNU # 1234

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO.
1319

Plugging ~~INSTALLATION~~ DATE: 2-6-90
CY 2/7/90

853



MATERIALS USED:
SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): 1
BAGS OF VOLCLAY GROUT: NA
AMOUNT OF CEMENT: 1/2 94# sk
AMOUNT OF WATER USED: 5 gal
OTHER: NA

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:
5) TOP OF PVC IS SECURED WITH EXPANDABLE RUBBER PLUG AND PADLOCK.
6) PARENTHESIS INDICATE DEPTH BELOW GROUND LEVEL.

TASK: 602 3.7

GEOLOGIST/ENGINEER: C. Grube

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS
FIELD ENG./GEO. C. Goube
DATE 2/6/90
PROJECT NO. 6023.7
CHECKED BY
DATE
BORING NO. 1319
PIEZOMETER NO. NA
DATE OF ~~INSTALLATION~~ Plugging 2/6/90 CB 2/7/90

BOREHOLE DRILLING

DRILLING METHOD Hollow Stem Auger	TYPE OF BIT Hollow Auger
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID NA FROM — TO —	SIZE NA FROM — TO —
FLUID NA FROM — TO —	SIZE NA FROM — TO —

PIEZOMETER DESCRIPTION

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

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA	OTHER PROTECTION NA
PROTECTIVE PIPE O.D. NA	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	NA			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	NA			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY/cement	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 2.3	TOP	BOTTOM
SAND	TOP NA	BOTTOM NA	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP	BOTTOM
PIEZOMETER TIP	NA			
BOTTOM OF BOREHOLE	2.3			
GWL AFTER INSTALLATION	NA			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS At 2.3 FT an 8 to 10 in diameter pipe was tagged – well was plugged and abandoned on 2/6/90

FERNALD RI/FS

	2/14		
	GT.		853

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1423	COORDINATES:	DATE: 2/14/90
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2/14/90
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 2/18/90
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF 4

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	2-14	NA	6	Cement	NA	NA	HNU = 0ppm, α = 40-60cpm, Bγ = 3800-4400cpm
	2-15		1	Cement	NA	NA	
	19549 1044 2-15	11/3	4	Dense (10YR 5/4) yellowish brown, well graded gravelly sand, (Gravel fine to coarse) very moist	SW	NA	HNU = 0ppm, α = 0-20cpm, Bγ = 800-850cpm
1	2-16		1	Cement	NA	NA	
	2-16	NA	6	Cement	NA	NA	HNU = 0 ppm, α = 20-40cpm, Bγ = 2200 cpm
	2-16	NA	1	Cement	NA	NA	
	19590 1450 2-16	7/2	3	Dense (10YR 5/4) yellowish brown well graded gravelly sand (Gravel fine to coarse) very moist	SW	NA	HNU = 0 ppm, α = 40cpm, Bγ = 1000 cpm
2			2	Cement CJ 2/17/90	NA	NA	
2-16-90	~~19591~~ 2-16	19591 1000 2-17 NA	6	Dense (10YR 4/2) dark grayish brown silty ~~same~~ sand, trace of fine gravel, slightly moist ~~Cement~~ CJ 2/17/90	~~SM~~ ~~NA~~	CJ 2/17/90 NA	
2/14/90	~~19592~~ ~~2-16~~	Grab Sample	6	SAA ~~Cement~~ CJ 2/17/90	~~SM~~ ~~NA~~	CJ 2/17/90 NA	HNU = 0ppm, α = 0 cpm, Bγ = 240-260 cpm
3	~~19597~~ 19592 1030 2-17	NA	6	SAA	SM	NA	HNU = 0 ppm, α = 0 cpm, Bγ = 160 cpm
	Grab sample		6	Dense (10YR 4/2) dark grayish brown silty sand, trace of fine gravel and clay, slightly moist	SM	NA	
4	19593 1037 2-17	39	6	medium stiff (2.5Y 4/4) olive brown silty clay, some sand, trace fine to medium gravel, low plasticity, moist	CL	JS	HNU = 0 ppm, α = 0 cpm, Bγ = 160 cpm
	19594 1037 2-17	50/2	4 ~~6~~ CJ 2/17/90	Dense (2.5Y 4/4) olive brown silty sand, trace of fine gravel and gray slag like material, slightly moist	SM	NA	HNU = 0 ppm, α = 0 cpm, Bγ = 160-180 cpm
5	19595 1053 2-17	15	6	SAA	SM	NA	
	19596 1053 2-17	8	5	SAA medium dense (10YR 5/4) yellowish brown clayey silt some sand and fine gravel, moist	SM ML	NA NA	
6	19597 1056 2-17	7	6	SAA	ML	NA	HNU = 0ppm, α = 0cpm, Bγ = 160cpm
Top of water bearing zone at 6.5 ft	19598 1056 2-17	6	6	medium dense (2.5Y 5/4) light olive brown silt, very moist	ML	NA	
7				medium dense (5YR 5/4) reddish brown well graded sand some silt wet	SW	NA	
	19599 1056 2-17	5	6	SAA	SW	NA	

NOTES: CONTRACTOR: PENN DRILL
RIG: UME-45
DRILLER: Bob Yost
ASSISTANT: Brian Strapuzan
Geo Assistant and H&S Officer: Ben Brier

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α = 0-20 CPM Bγ = 160-240 cpm w/ loca
Bγ = 1000-1100 CPM w/ local
LEL: 0% CJ 2/14/90
O_2: 20.8%

SAA = Same As Above
NR = No Recovery

LEL O_2:

HNU # 1234

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: 1423	COORDINATES:	DATE: 2/17/90	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2/14/90	
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 2/18/90	
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	19600 1103 2-17	11	6	medium dense (10 YR 5/4) yellowish brown, well graded sand, some silt, trace of clay and fine gravel, wet	SW	NA	HNU = 0 ppm α = 0 cpm Bγ = 140-60 cpm
	19601 1103 2-17	11	6	medium dense (2.5 Y 5/4) light olive brown, well graded sand, trace of fine to med. gravel, traces silt wet	SW	NA	
9	19602 1103 2-17	8	6	medium dense (7.5 YR 2/0) black silty sand, some coal fines and (5 Y 4/2) olive gray silt, wet	SM to ML	NA	
	19603 1108 2-17	5	6	medium dense (2.5 Y 5/4) light olive brown well graded sand, trace of fine gravel with bottom 2 inches of (7.5 YR 2/0) black coal fines in sand, wet	SW	NA	HNU = 0 ppm α = 0 cpm Bγ = 180-200 cpm
10	19604 1108 2-17	5	6	medium dense (5 Y 4/1) dark gray silt, trace of sand and clay, wet	ML	NA	
	19605 1108 2-17	8	6	medium dense (5 Y 4/1) dark gray sandy silt, wet	ML	NA	
11	19606 1423 2-17	2	6	SAA	ML	NA	HNU = 0 ppm α = 0 cpm Bγ = 160-180 cpm
	19607 1423 2-17	3	6	SAA	ML	NA	
12	19608 1423 2-17	7	5	Loose (2.5 Y 5/4) light olive brown poorly graded sand trace of silt, very moist Loose (2.5 Y 5/4) light olive brown silt, some clay, moist	SP ML	NA NA	
Bottom of water bearing zone at 12.5 FT	54075 1434 2-17	17	6	Dense (2.5 Y 4/4) olive brown poorly graded sand trace of fine to coarse gravel, wet	SP	NA	HNU = 0 ppm α = 0 cpm Bγ = 240-260 cpm
13	54076 1434 2-17	50/1	3	very stiff (5 Y 4/1) dark gray silty clay, trace of sand and fine gravel, low plasticity, moist	CL	2.25	
			✗	Bottom of Boring and sampling at 12.6 FT			
14							HNU = α = Bγ =

NOTES:

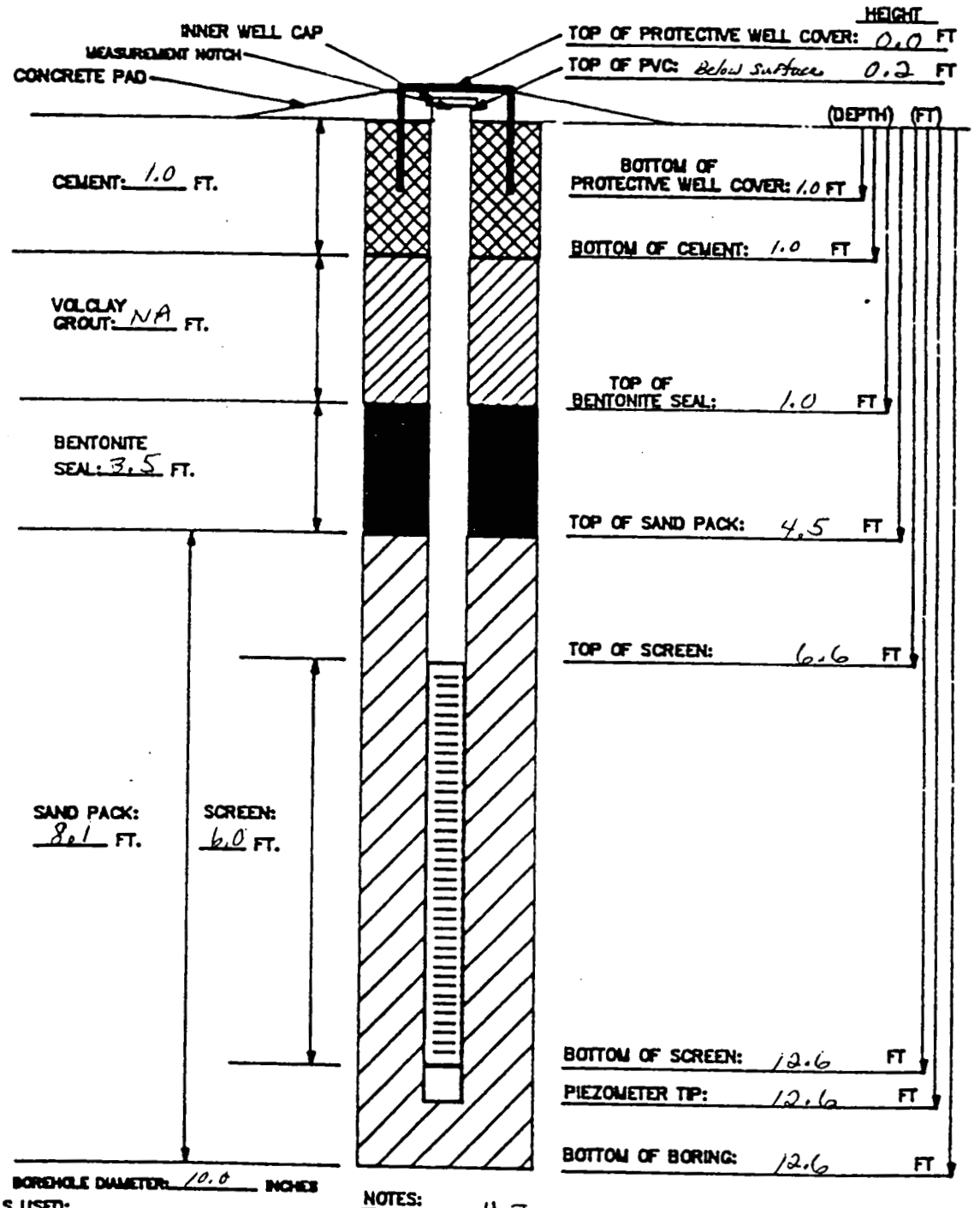
SAA = Same As Above
NR = No Recovery

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO.
1423

INSTALLATION DATE: 2-18-90

853



BOREHOLE DIAMETER: 10.0 INCHES

MATERIALS USED:

SAND TYPE AND QUANTITY: 10/20 sand - 5 - 80 lb sks
BENTONITE PELLETS (5-GALLON BUCKETS): 2 1/2
BAGS OF VOLCLAY GROUT: NA
AMOUNT OF CEMENT: 1/2 - 94 lb sk
AMOUNT OF WATER USED: 10 gal
OTHER: Protective flush mount cover

NOTES:

1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS. 4 ea.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:
5) TOP OF PVC IS SECURED WITH EXPANDABLE RUBBER PLUG AND PADLOCK.
6) PARENTHESIS INDICATE DEPTH BELOW GROUND LEVEL.

TASK: 6023.7

GEOLOGIST/ENGINEER: C. Grube

FERNALD
RI/FS

853

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. C. Grube DATE 2/18/90
PROJECT NO. 602 3.7 CHECKED BY S.T. DATE 2/22/90
BORING NO. 1423
PIEZOMETER NO. 1423 DATE OF INSTALLATION 2/18/90

BOREHOLE DRILLING

DRILLING METHOD Hollow Auger
DRILLING FLUID (S) USED:
FLUID NA FROM — TO —
FLUID NA FROM — TO —

TYPE OF BIT Hollow Stem Auger
CASING SIZE (S) USED:
SIZE NA FROM — TO —
SIZE NA FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring piezometer
DIAMETER OF PERFORATED SECTION 4.0 in ID
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.020 in
TOTAL PERFORATED AREA 6.0 FT

RISER PIPE MATERIAL Schedule 40 PVC
RISER PIPE DIAMETERS:
O.D. 4½ in I.D. 4.0 in.
LENGTH OF PIPE SECTIONS 6.4 FT
JOINING METHOD Screw type - flush joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 1.0 FT
PROTECTIVE PIPE O.D. 8¼ in

OTHER PROTECTION Protective flush mount cover

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	0.2 Below Surface			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	1.0			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY/Cement	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 4.5	TOP	BOTTOM
SAND	TOP 4.5	BOTTOM 12.6	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 6.6	BOTTOM 12.6	TOP	BOTTOM
PIEZOMETER TIP	12.6			
BOTTOM OF BOREHOLE	12.6			
GWL AFTER INSTALLATION	To be taken at a later date			

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

REMARKS Top of water bearing zone at 6.5 FT
Bottom of water bearing zone at 12.5 FT

FERNALD RI/FS

Date	3/4/90			
Initial	ET.			
	Field Check	1st Key Ch	2nd Key Ch	Hard Copy Verification

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1315	COORDINATES:	DATE: 2/20/90
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2/20/90
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 2/28/90
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 1 OF 5

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION (1.0 FT SECTION FLOOR SLAB)	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	2-20	NA	6	Cement	NA	NA	HNU = 0 ppm α = 120 cpm Bγ = 20,000-30,000 cpm
	2-20		6	Cement	NA	NA	
1	19499 1615 2-20	2	6	Stiff (2.5Y 5/4) light olive brown silty clay, some sand, trace fine gravel, very moist, low plasticity	CL	2.0	
2	19500 1615 2-20	4	5	Soft (2.5Y 5/4) light olive brown sandy clay, trace of fine to coarse gravel, low plasticity, very moist	CL	0.50	HNU = 0 ppm α = 0-20 cpm Bγ = 100-120 cpm
	19501 1615 2-20	24/3	0	NR Cement	NA NA	NA NA	
3	2-21	NA	NA	Cement	NA	NA	
	2-21	NA	NA	Cement	NA	NA	HNU = 0 ppm α = 0 cpm Bγ = 100-120 cpm
	2-21		NA	Cement	NA	NA	
4	19502 1020 2-21	7	6	Very stiff (10YR 5/4) yellowish brown silty clay, trace of sand & fine gravel, low plasticity, moist	CL	2.75	
	19503 1020 2-21	7	6	SAA	CL	3.0	HNU = 0 ppm α = 0 cpm Bγ = 100-120 cpm
5	19504 1020 2-21	10	6	Hard SAA	CL	4.5	
	19505 1020 2-21	17	6	Very stiff SAA	CL	3.75	
6	19506 1031 2-21	26	6	Hard, 10YR 5/4 yellowish brown silty clay, trace of sand and fine gravel, low plasticity, moist to medium	CL	4.25	HNU = 0 ppm α = 0 cpm Bγ = 100-110 cpm
	19507 2-21 1031	25	6	SAA	CL	4.5	
7	19508 1031 2-21	26	0	NR	NA	NA	

NOTES: CONTRACTOR: PENN DRILL
RIG: CME-45
DRILLER: Bob Yast
ASSISTANT: Brian Strapazzon
GeoAssistant & Hand & Officer: Ben Brier

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION TEST
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α = 0-10 CPM Bγ = 1000-1100 cpm w/o lead bricks
Bγ = 100-110 CPM w/ lead bricks
LEL = 0%
O_2 = 20.8 %

SAA = Same As Above
NR = No Recovery

HNU # 1234

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1315	COORDINATES:	DATE: 2/21/90
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2/20/90
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 2/28/90
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF 5

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	19509 0948 2-22	36	0	NR	NA	NA	HNU = NA α = NA Bγ = NA
	19510 0948 2-22	31	0	NR	NA	NA	
9	19511 0948 2-22	24	0	NR	NA	NA	
	19512 1012 2-22	5	6	Very stiff (5Y4/1) dark gray, silty clay, trace of sand and fine gravel, low plasticity, moist	CL	3.25	HNU = 0 ppm α = 0 cpm Bγ = 100-120 cpm
10	19513 1012 2-22	9	6	SAA	CL	2.0	
CB 2/21/90	19514 1012 2-22	12	6	SAA	CL	2.0	
11	19515 1023 2-27	3	6	Soft (5Y4/1) dark gray silty clay, trace of sand and fine to coarse gravel, low plasticity, moist	CL	.25	HNU = 0 ppm α = 0 cpm Bγ = 90-100 cpm
	19516 1023 2-27	5	6	medium stiff SAA	CL	.75	
12	19517 1023 2-27	6	6	SAA	CL	1.0	
	19518 1029 2-27	9	6	stiff SAA	CL	1.75	HNU = 0 ppm α = 0 cpm Bγ = 90-110 cpm
13	19519 1029 2-27	10	6	Very stiff SAA	CL	2.25	
	19520 1029 2-27	14	6	stiff SAA	CL	1.75	
14	53995 1035 2-27	10	6	SAA	CL	1.25	HNU = 0 ppm α = 0 cpm Bγ = 80-90 cpm
	53996 1035 2-27	15	6	SAA	CL	1.75	
	53997 1035 2-27	14	0	NR	NA	NA	

NOTES:

SAA = Same As Above
NR = No Recovery

402-11-86

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: 1315	COORDINATES:	DATE: 2/27/90	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2/20/90	
ENGINEER/GEOLOGIST: C. Grube	Depth Date/Time	DATE COMPLETED: 2/28/90	
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 3 OF 5	

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	53998 1040 2-27	16	6	medium stiff (SY411) dark gray silty clay, trace of sand and fine to coarse gravel / low plasticity moist	CL	.75	HNU = 0 ppm α = 0 cpm Bβ = 100-110 cpm
16	53999 1040 2-27	15	6	SAA	CL	.5	
	54000 1040 2-27	15	3	SAA	CL	.75	
17	54001 1050 2-27	18	6	SAA	CL	.5	HNU = 0 ppm α = 0 cpm Bβ = 110-120 cpm
	54002 1050 2-27	14	6	SAA	CL	1.0	
18	54003 1050 2-27	14	6	SAA	CL	.75	
	54004 1102 2-27	8	6	Stiff SAA	CL	1.0	HNU = 0 ppm α = 0 cpm Bβ = 90-100 cpm
19	54005 1102 2-27	13	6	SAA	CL	1.0	
	54006 1102 2-27	13	6	SAA	CL	1.0	
20	54007 1102 2-27	13	6	SAA	CL	1.25	HNU = 0 ppm α = 0 cpm Bβ = 90-100 cpm
				Bottom of Boring & Sampling at 20.0 FT. Borehole plugged and abandoned on 2/28/90 with Volclay grout			

NOTES:

SAA = Same As Above
NR = No Recovery

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO.
1315

~~INSTALLATION~~ Plugging DATE: 2/28/90
(BY 2/28/90)

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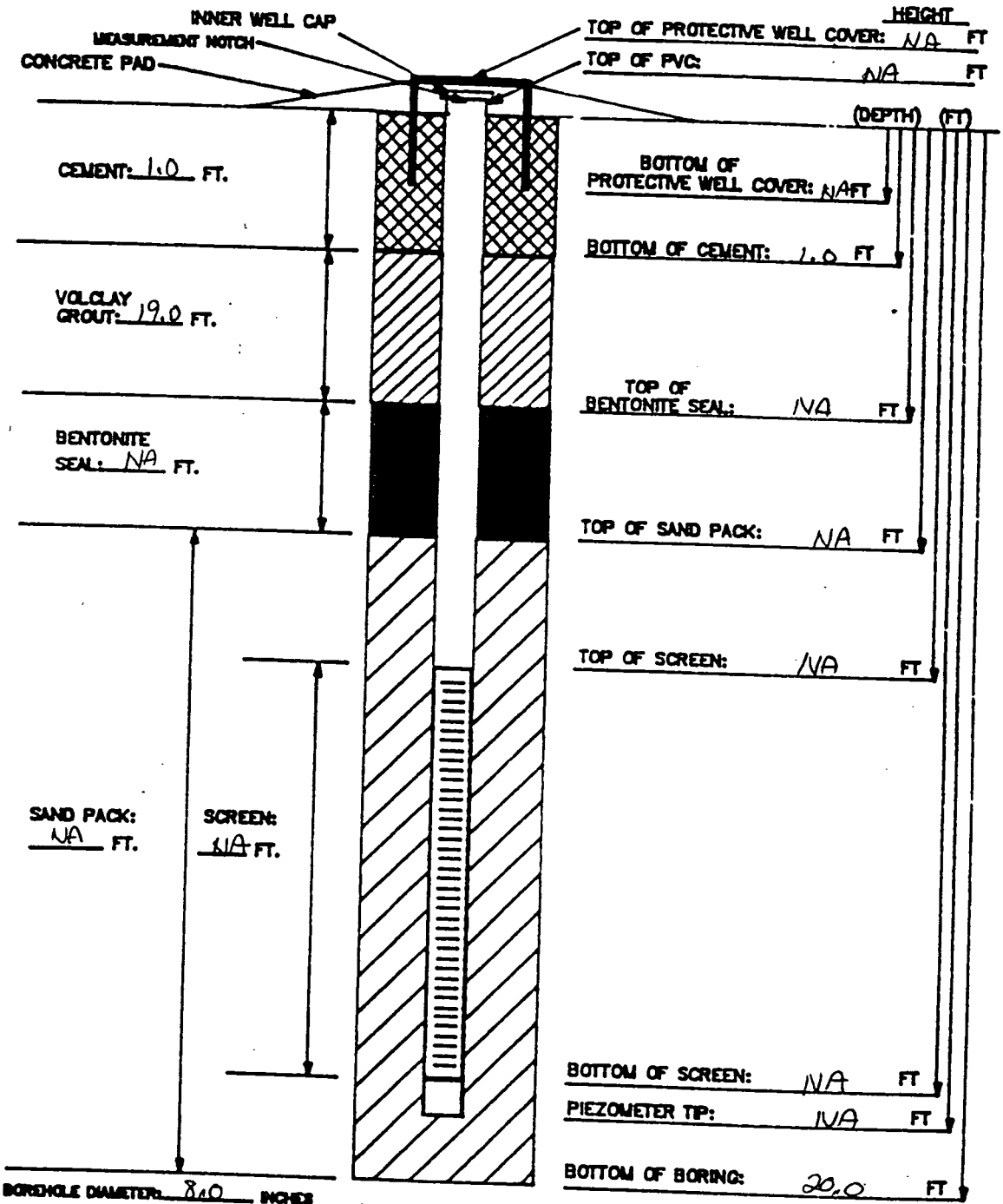

MATERIALS USED:
SAND TYPE AND QUANTITY: NA
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 2 (50#) sks
AMOUNT OF CEMENT: 1/2 (94#) sk.
AMOUNT OF WATER USED: 25 GALS.
OTHER: NA

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:
5) TOP OF PVC IS SECURED WITH EXPANDABLE RUBBER PLUG AND PADLOCK.
6) PARENTHESES INDICATE DEPTH BELOW GROUND LEVEL.

TASK: 6023.7

GEOLOGIST/ENGINEER: C. Grube

FERNALD RI/FS

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PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS
PROJECT NO. 602 3.7
BORING NO. 1315
PIEZOMETER NO. NA

FIELD ENG./GEO. C. Grubes DATE 2/28/90
CHECKED BY ET. DATE 3/4/90
CW 2/28/90 Plugging
DATE OF ~~INSTALLATION~~ 2/28/90

BOREHOLE DRILLING

DRILLING METHOD Hollow Stem Auger
DRILLING FLUID (S) USED:
FLUID NA FROM — TO —
FLUID NA FROM — TO —

TYPE OF BIT Hollow Auger
CASING SIZE (S) USED:
SIZE NA FROM — TO —
SIZE NA FROM — TO —

PIEZOMETER DESCRIPTION

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

RISER PIPE MATERIAL NA
RISER PIPE DIAMETERS:
O.D. NA I.D. NA
LENGTH OF PIPE SECTIONS NA
JOINING METHOD NA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH NA
PROTECTIVE PIPE O.D. NA

OTHER PROTECTION NA

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (Ft)		ELEVATION ( )	
TOP OF RISER PIPE	NA			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	NA			
BOREHOLE FILL MATERIALS:				
GROUT / SLURRY / cement	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP NA	BOTTOM NA	TOP	BOTTOM
CW 2/28/90 ~~SAND~~ Voclay grout	TOP 1.0	BOTTOM 20.0	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP	BOTTOM
PIEZOMETER TIP	NA			
BOTTOM OF BOREHOLE	20.0			
GWL AFTER INSTALLATION	NA			

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

REMARKS No water bearing zone encountered – check after letting set over night – borehole was plugged on 2/28/90 with 2-50# bags of voclay grout and capped on 3/1/90 with cement.

ATTACHMENT B

FERNALD
RI/FS

Date	2/5/90			
Initial	853			
	Field Check	1st Key In	2nd Key In	Hard Copy Verification

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6002 3.2.1	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 3120	COORDINATES:	DATE: 1-18-90 / 1-19-90	
ELEVATION: M. SWANSON	GWL: Depth / Date/Time	DATE STARTED: 1-18-90	
ENGINEER/GEOLOGIST: ~~E. TROUTNER~~	Depth / Date/Time	DATE COMPLETED: 2-2-90	
DRILLING METHODS: CABLE TOOL DRILLING		PAGE 1 OF 11	

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	WELL CONSTRUCTION N/A	REMARKS
1	32409 0905 1-18	4 4 7	10	FIRM, DARK BROWN (7.5YR 3/3) CLAYEY SILT, TRACE OF ORGANIC MATERIAL ROOTLETS, MOIST. ↓	ML	1.5		Hnu = 0.2 ppm, α = 0 cpm, βγ = 40 cpm
2	32410 0912 1-18	8 15 18	12	HARD, LIGHT BROWN (10YR 5/3) SILT, TRACE OF COARSE SAND, DRY.	ML	1.5		Hnu = 0.2 ppm, α = 0 cpm, βγ = 50-100 cpm
3					ML	2.5		
4	32411 0920 1-18	15 28 29	12	HARD, MOTTLED GRAY-YELLOWISH BROWN (10YR 5/2, 4/4) SILTY CLAY, TRACE OF MEDIUM SAND, MOIST, LOW PLASTICITY. ↓	CL	3.0		Hnu = 0.0 ppm, α = 0 cpm, βγ = 50-60 cpm
5	32412 0930 1-18	24 28 36	10		CL	3.0		Hnu = 0.0 ppm, α = 0 cpm, βγ = 60 cpm
6								
7	32413 0935 1-18	25 32 38	15	FIRM, YELLOWISH BROWN (10YR 4/4) SANDY CLAY, LOW PLASTICITY, MOIST TO WET ↓	CL	1.0		Hnu = 0.0 ppm, α = 0 cpm, βγ = 50 cpm
8	32414 1555 1-19	8 10 12	15		CL	1.0		Hnu = 0.2 ppm, α = 0 cpm, βγ = 60 cpm
9								
10	32415 1610 1-19	6 10 11	10	MEDIUM DENSE, OLIVE (5Y 5/3) SILT, TRACE OF FINE SAND, MOIST TO WET.	ML	N/A		Hnu = 0.0 ppm, α = 0 cpm, βγ = 60 cpm
11	32416 1625 1-19	10 10 17	10	MEDIUM DENSE, GRAY (10YR 5/1) CLAYEY SILT, LOW PLASTICITY, MOIST. ↓	ML	1.5		Hnu = 0.2 ppm, α = 0 cpm, βγ = 60 cpm
12								
13	32417 1637 1-19	6 11 10	10		ML	1.5		Hnu = 0.2 ppm, α = 0 cpm, βγ = 60 cpm
14	32418 1700 1-19	5 8 11	13	FIRM, GRAY (10YR 4/1) CLAY, TRACE OF FINE SAND, IRON OR ~~MANGANESE~~ MANGANESE STAINING ON SAND GRAINS, LOW PLASTICITY, MOIST	CL	1.5		Hnu = 0.0 ppm, α = 0 cpm, βγ = 50-60 cpm

NOTES:

Drilling Contractor: Penn Drill Co.

Drilling Equipment: Cyclone cable tool

Driller: Joe Barile

Asst. Ken Reynolds

Robert Yost

SAMPLING AND DRILLING IN ACCORDANCE TO ASTM STANDARDS. MUNSELL COLOR CHART USED FOR SOIL DESCRIPTION.

INSTRUMENT BACKGROUND

Hnu = 0.0-0.4 ppm

α = 0 cpm

βγ = 80-100 cpm

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2.1	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 3120	COORDINATES: ~~K~~ AQUIFER		DATE 1-19 / 1-20
ELEVATION: M. SWANSON	GWL: Depth 26.5 ft Date/Time 1/21/90 1000		DATE STARTED: 1-18-90
ENGINEER/GEOLOGIST: ~~E. TROLLINGER~~ AS	Depth	Date/Time	DATE COMPLETED: 2-2-90
DRILLING METHODS: CABLE TOOL			PAGE 2 OF 11

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	WELL CONSTRUCTION	REMARKS
16	32419 1710 1-19	4 8 10	8	FIRM, GRAY (10YR 4/1) CLAY, TRACE OF MEDIUM SAND, LOW TO MEDIUM SAND, MOIST.	CL	2.0		Hnu = 0.0 ppm; α = 0 cpm; βγ = 60 cpm
17–18	32420 1530 1-20	8 10 12	6	↓	CL	2.0		Hnu = 0.0 ppm; α = 0 cpm; βγ = 50 cpm
19	32421 1610 1-20	11 11 28	9	FIRM, GRAY (10YR 4/1) GRAVELLY CLAY, GRAVEL (.5-1.5 in) TRACE TO SOME SAND FINE TO COARSE, LOW PLASTICITY, WET.	CL	2.0		Hnu = 0.0 ppm; α = 0 cpm; βγ = 40-50 cpm
20–21	32422 1650 1-20	12 12 18	10	↓	CL	2.0		Hnu = 0.0 ppm; α = 0 cpm; βγ = 50 cpm
22	32423 1249 1-21	6 11 13	9	VERY STIFF, GRAY (5Y 5/1) SILTY CLAY TRACE OF SUBROUNDED TO ROUNDED SAND, LOW PLASTICITY, MOIST	CL	3.5		Hnu = 0 ppm; α = 0 cpm; βγ = 100 cpm
23–24	32424 1311 1-21	9 11 17	10	VERY STIFF, GRAY (5Y 5/1) SILTY CLAY, TRACE OF SAND, GRAVEL (x.25 in.), LOW PLASTICITY, SLIGHTLY MOIST	CL	3.0		Hnu = 0 ppm; α = 0 cpm; βγ = 60 cpm
25	32425 1329 1-21	13 13 19	9	HARD, GRAY (5Y 5/1) SILTY CLAY, TRACE OF SAND, GRAVEL (.25-.50 in.) LOW PLASTICITY, SLIGHTLY MOIST TO MOIST	CL	>4.0		Hnu = 0 ppm; α = 0 cpm; βγ = 75 cpm
26–27	32426 1459 1-21	10 7 9	6	↓	CL	3.5		Hnu = 0 ppm; α = 0 cpm; βγ = 150 cpm
END OF TILL / START OF AQUIFER 28	32427 1517 1-21	28 50	8	VERY DENSE, LIGHT OLIVE BROWN (2.5Y 5/6) SAND, SUBROUNDED, MOIST TO WET	SW	N/A		Hnu = 0 ppm; α = 0 cpm; βγ = 120 cpm
29	32428 1522 1-21	10 8 12	7	MEDIUM DENSE, LIGHT OLIVE BROWN (2.5Y 5/6) WELL GRADED SAND, SUBROUNDED TO SUBANGULAR, MOIST	SW	N/A		Hnu = 0 ppm; α = 0 cpm; βγ = 90 cpm

NOTES

Drilling Contractor: Penn Drill Co.

Drilling Equipment: cyclone cable tool

Driller: Joe Baile

ASST. BRIAN STRAPAZZON

RECORDED WATER-LEVELS:
61.8 on 1/31/90
64.13 on 1/24/90
62.25 on 1/25/90

INSTRUMENT BACKGROUND
Hnu = 0.20 ppm
α = 0 cpm
βγ = 80-100 cpm

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2.1	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 3120	COORDINATES:		DATE: 1-22-90
ELEVATION:	M. SWANSON	GWL: Depth / Date/Time	DATE STARTED: 1-18-90
ENGINEER/GEOLOGIST: ~~E Fullright~~ MS		Depth / Date/Time	DATE COMPLETED: 2-2-90
DRILLING METHODS: Cable tool			PAGE 3 OF 11

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (PSI)	WELL CONSTRUCTION	REMARKS
30								
31	32429 1533 1-21	17 12 12	10	MEDIUM DENSE, LIGHT OLIVE BROWN (2.5Y 5/6) GRAVELY SAND, SUBANGULAR TO SUB ROUNDED, MOIST (SLIGHTLY)	SW	N/A		Hnu = 0 ppm α = 0 cpm βγ = 100 cpm
32								
33								
34								
35	32430 1715 1-21	23 50/8in	9	VERY DENSE, LIGHT OLIVE BROWN, (2.5Y 5/6) GRAVELY SAND, SUBANGULAR TO ROUNDED, WET	SW	N/A		Hnu = 0 ppm α = 0 cpm βγ = 90 cpm
36								
37								
38								
39								
40	32431 1039 1-22	12 21 21	12	DENSE, YELLOWISH BROWN (10YR 5/6) POORLY GRADED SAND, TRACE OF SILT, PEBBLES, GRAVEL (.1-.25 in.) SLIGHTLY MOIST	SP	N/A		Hnu = 0 ppm α = 0 cpm βγ = 70 cpm
41								
42								
43								
44								

NOTES.

Drilling Contractor: Penn Drill Co

Drilling Equipment: Cyclone cable tool

Driller: Joe Barile

ASST.: BRIAN STRAPAZZON

B-15G
Hnu = 0.2 ppm
α = 0 cpm
βγ = 80-100 cpm

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: GOZ 3.2.1	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 3120	COORDINATES:		DATE: 1-22-90
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 1-18-90
ENGINEER/GEOLOGIST: M. SWANSON	Depth	Date/Time	DATE COMPLETED: 2-2-90
DRILLING METHODS: CABLE TOOL			PAGE 4 OF 11

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 (IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	WELL CONSTRUCTION	REMARKS
45								
46	32432 1153 1-22	25 50/8in	14	VERY DENSE, LIGHT OLIVE BROWN (2.5Y 5/6) POORLY GRADED SAND, TRACE OF SILT, PEBBLES, SUBROUNDED; SLIGHTLY MOIST	SP	N/A		HNU = 0 ppm α = 0 cpm βγ = 80 cpm
47								
48								
49								
50	32433 1351 1-22	37 50 8in	13	VERY DENSE, GRAYISH BROWN (2.5Y 5/2) WELL GRADED SAND; TRACE OF SILT PEBBLES, GRAVEL (.1-.50 in.); SLIGHTLY MOIST TO MOIST	SW	N/A		HNU = 0 ppm α = 0 cpm βγ = 140 cpm
51								
52								
53								
54								
55	32434 1511 1-22	30 50/9in	10	VERY DENSE, GRAYISH BROWN (2.5Y 5/2) POORLY GRADED SAND; TRACE OF SILT, GRAVEL (.25-.50 in.) WET	SP	N/A		HNU = 0 ppm α = 0 cpm βγ = 60-80 cpm
56								
57								
58								
59								
60								

NOTES:

Drilling Contractor: PERMA-DRILL CO.

Drilling Equipment: CYCLONE CABLE TOOL

Driller: JOE BARILE

ASST. BRIAN STRAPAZON

BISG.
HNU = .2 ppm
α = 0 cpm
βγ = 80 cpm

FERNALD
RI/FS

853

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2.1	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 3120	COORDINATES:		DATE: 1-22-90
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 1-18-90
ENGINEER/GEOLOGIST: M. SWANSON	Depth	Date/Time	DATE COMPLETED: 2-2-90
DRILLING METHODS: CABLE TOOL			PAGE 3 OF 11

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED GROUNDWATER (FT)	WELL CONSTRUCTION	REMARKS
60								
61	32435 1537 1-22	50/6in	6	VERY DENSE, GRAYISH BROWN (2.5Y 5/2) WELL GRADED SANDY GRAVEL; TRACE OF SILT; SUBANGULAR TO ROUNDED, WET	GW	N/A		H_{AU} = 0 PPM α = 0 CPM $\beta\gamma$ = 40-60 CPM
62								
63								
64								
65	32436 1654 1-22	28 45 50	14	VERY DENSE, DARK GRAY (5Y 4/1) SILTY SAND; WELL GRADED SANDS, TRACE OF GRAVEL, SUBANGULAR, WET	SM	N/A		H_{AU} = 0 PPM α = 0 CPM $\beta\gamma$ = 100-130 CPM
66								
67								
68								
69								
70	32437 1711 1-22	23 21 16	9	DENSE, DARK GRAY (5Y 4/1) SILTY SAND, TRACE OF GRAVEL (.25 IN.) COARSENING SAND, SUBANGULAR TO SUBROUNDED, WET	SM	N/A		H_{AU} = 0 PPM α = 0 CPM $\beta\gamma$ = 70 CPM
71								
72								
73								
74								
75								

NOTES:

Drilling Contractor: PENN DRILL CO.

Drilling Equipment: CYCLONE CABLE TOOL

Driller: JOE BARILE

ASST.: BRIAN STRAPAZZON

BKG
H_{AU} = .1 PPM
α = 0 CPM
$\beta\gamma$ = 60 CPM

78

FERNALD
RI/FS

853

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6023.2.1	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 3120	COORDINATES:		DATE: 1-23-90
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 1-18-90
ENGINEER/GEOLOGIST: M. SWANSON	Depth	Date/Time	DATE COMPLETED: 2-2-90
DRILLING METHODS: CABLE TOOL			PAGE 6 OF 11

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN.	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	WELL CONSTRUCTION	REMARKS
75								
76	32438 1020 1-23	13 27 38	14	VERY DENSE, GRAY (10YR 5/1) SAND, SOME SILT, TRACE OF GRAVEL, SUBROUNDED TO SUBANGULAR, WET	SM	N/A		HNU = 0 PPM α = 0 CPM βγ = 60 CPM
77								
78								
79								
80	32439 1045 1-23	21 29 18	8	DENSE, GRAY (10YR 5/1) WELL GRADED SAND, SOME GRAVEL, TRACE OF SILT, SUBANGULAR GRAVEL, WET	SW	N/A		HNU = 0 PPM α = 0 CPM βγ = 80 CPM
81								
82								
83								
84								
85	32440 1155 1-23	9 30 50	10	VERY DENSE, GRAY (10YR 5/1) WELL GRADED SAND, SOME GRAVEL, TRACE OF SILT, SUBANGULAR, WET	SW	N/A		HNU = 0 PPM α = 0 CPM βγ = 100 CPM
86								
87								
88								
89								
90								

NOTES:

Drilling Contractor: PENN DRILL CO.

Drilling Equipment: CYCLONE CABLE TOOL

Driller: JOE BARILE

ASST: DUANE STRAPAZZON

BKG
HNU = 20 PPM
α = 0 CPM
βγ = 70 CPM

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2.1	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 3120	COORDINATES:		DATE: 1-23-90
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 1-18-90
ENGINEER/GEOLOGIST: M. SWANSON	Depth	Date/Time	DATE COMPLETED: 2-2-90
DRILLING METHODS: CABLE TOOL			PAGE 7 OF 11

DEPTH (FT)	SAMPLE (TYPE & NO.)	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (PSI)	WELL CONSTRUCTION	REMARKS
90								
91	32441 1400 1-23	42 25 20	3	DENSE, GRAY (10YR 5/1) WELL GRADED SAND, SOME GRAVEL, TRACE SILT SUBANGULAR TO SUBROUNDED, WET	SW	N/A		H_{NU} = 0 PPM α = 0 CPM $\beta\gamma$ = 100 CPM
92								
93								
94								
95								
96	32442 1528 1-23	29 50/7in	7	VERY DENSE GRAY (10YR 5/1) WELL GRADED SAND, SOME SILT, PEBBLES, SUBROUNDED TO SUBANGULAR, WET	SW	N/A		H_{NU} = 0 PPM α = 0 CPM $\beta\gamma$ = 40 CPM
97								
98								
99								
100								
101	32443 1558 1-23	9 10 23	7	DENSE, GRAY (10YR 5/1) WELL GRADED SAND, SOME SILT, PEBBLES, SUBROUNDED TO SUB ANGULAR, WET	SW	N/A		H_{NU} = 0 PPM α = 0 CPM $\beta\gamma$ = 50 CPM
102								
103								
104								
105								

NOTES:

Drilling Contractor: DENO DRILL CO.

Drilling Equipment: CYCLONE CABLE TOOL

Driller: JOE BARILE

ASST.: BRIAN SFARRAZZON

BKG

H_{NU} = .20 PPM

α = 0 CPM

$\beta\gamma$ = 80 CPM

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2.1	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 3120	COORDINATES:		DATE: 1-23/24-90
ELEVATION:	GWL: Depth 64 ft bgs Date/Time 1/24/90 0941		DATE STARTED: 1-18-90
ENGINEER/GEOLOGIST: M. SWANSON	Depth	Date/Time	DATE COMPLETED: 2-2-90
DRILLING METHODS: CABLE TOOL			PAGE 8 OF 11

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	WELL CONSTRUCTION	REMARKS
105	32444 1744 1-23	36 22 39	8	VERY DENSE, GRAY (10YR 5/1) SILTY SAND, TRACE OF GRAVEL, PEBBLES, SUBANGULAR, WET	SM	N/A		Hnu = 0 ppm α = 0 cpm βγ = 50 cpm
106								
107								
108								
109								
110	32445 0907 1-24	9 9 12	3	MEDIUM DENSE, DARK GRAY (5Y 4/1) SILTY SAND, TRACE OF GRAVEL PEBBLES, SUBANGULAR TO SUBROUNDED, WET	SM	N/A		Hnu = 0 ppm α = 0 cpm βγ = 130 cpm
111								
112								BLOW SANDS ENCOUNTERED
113								
114								
115	32446 1042 1-24	26 32 50	10	VERY DENSE, DARK GRAY (5Y 4/1), WELL ~~SORTED~~ GRADED SAND, SOME SILT, PEBBLES, GRAVEL (x .25 in.) SUBANGULAR, WET	SW	N/A		Hnu = 0 ppm α = 0 cpm βγ = 110 cpm
116								
117								
118								
119								
120								

NOTES

Drilling Contractor: PEARL-ARILL CO.

Drilling Equipment: CYCLONE CABLE TOOL

Driller: JOE BABLE

ASST. BRIAN SHAPAZZON

BKG
Hnu = .20 ppm
α = 0 cpm
βγ = .80 cpm
FOR 1/23/90 AND 1/24/90

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6.0.2 3.2.1	PROJECT NAME: EMPC RI/FS		
BORING NUMBER: 3120	COORDINATES:		DATE: 1-24-90
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 1-18-90
ENGINEER/GEOLOGIST: M. SWANSON	Depth	Date/Time	DATE COMPLETED: 2-2-90
DRILLING METHODS: CABLE TOOL			PAGE 9 OF 11

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN.	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED GROUNDWATER (FT)	WELL CONSTRUCTION	REMARKS
120	32447 1107 1-24	14 29 42	7	VERY DENSE, DARK GRAY (5Y 4/1) MEDIUM GRADED SAND, SOME SILT, PEBBLES, GRAVEL (≈.25 in.) SUBANGULAR, WET	SP	N/A		H_{AV}: 0 ppm α: 0 cpm P_f: 90 cpm
121								
122								BLOW SANDS ENCOUNTERED
123								
124								
125	32448 1517 1-24	9 12 15	5	MEDIUM DENSE, DARK GRAY (5Y 4/1) WELL GRADED SANDY GRAVEL, TRACE OF SILT, SOME PEBBLES, ROUNDED TO SUBANGULAR, WET	GW	N/A		H_{AV}: 0 ppm α: 0 cpm P_f: 70 cpm
126								
127								
128								
129								
130								DRILLING THROUGH BLOW SANDS USING SAMPLE TUBE TAKEN @ 131.0 FT.
131	32449 1642 1-24	7 10 12	9	MEDIUM DENSE, DARK GRAY (5Y 4/1) WELL GRADED SANDY GRAVEL, TRACE OF SILT, SOME PEBBLES, ROUNDED TO SUBANGULAR, WET	GW	N/A		H_{AV}: 0 ppm α: 0 cpm P_f: 40 cpm
132								
133								
134	32450 SHELBY TUBE 1410 1-30-90			HARD, VERY DARK GRAY (5Y 3/1) CLAY MOIST, LOW PLASTICITY ("BLUE CLAY") SAMPLER END OF ~~BORING~~: 135.2 FT	CL	2.5		SHELBY TUBE PUSHED FROM 133.5 FT TO 135.2 WITH PUSHED. 100% RECOVERY
135								

NOTES.

Drilling Contractor: Pedro Drill Co.

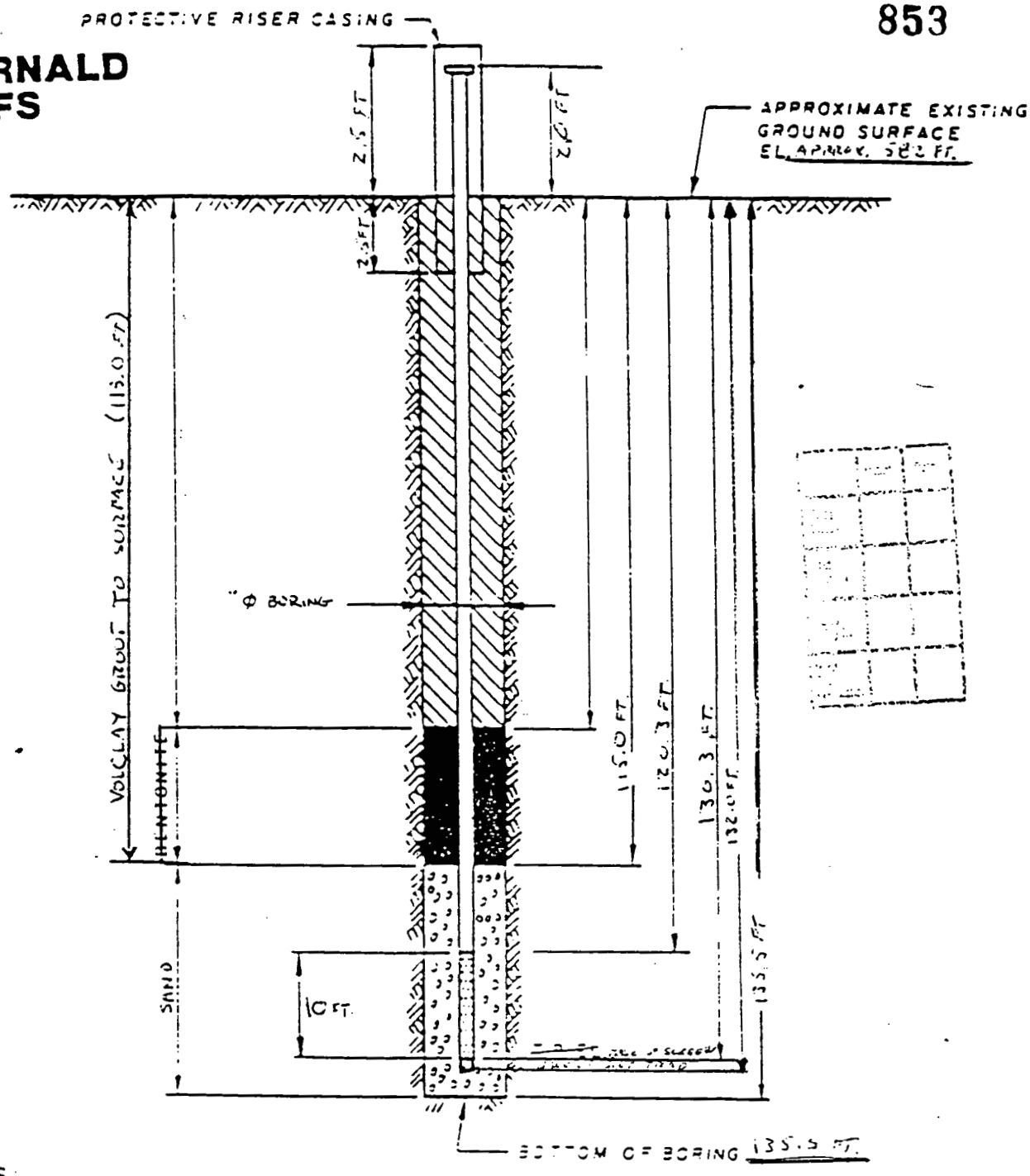
Drilling Equipment: CYCLONE CABLE TOOL

Driller: JOE BARILE

Asst.: BOB YOST

BKG
H_{AV} = 20 ppm
α = 0 cpm
P_f = 20 cpm

FERNALD RI/FS



DRAWN BY	CHECKED BY	DRAWING NUMBER
M.S. 2/1/90	APPROVED BY	

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED (WITH WELDED SILT TRAP)
4. ELEVATION OF WATER LEVEL 61.8 FT. BELOW GROUND SURFACE
5. WATER LEVEL READING ON 01/31/90 @ 09:30

MATERIALS USED DURING WELL INSTALLATION

13 BAGS OF 10/20 SAND (50.0 LBS. EACH)
32 BAGS OF VOLCLAY GROUT (50 LBS. EACH)
1 10.0 FT. SCREEN WITH 1.7 FT. WELDED SILT TRAP AND 2.0 FT. BLANK STICKUP
12 10.0 FT. SECTIONS, 0 5.0 FT. SECTIONS, 1 2.0 FT SECTIONS OF 4.0 IN I.D. SS RISER PIPE
TOTAL WATER ADDED TO BORING DURING DRILLING AND GROUTING = 950 GALS.
1 BUCKETS OF BENTONITE PELLETS (5 GALS. EACH)

INSTALLATION DETAILS
MONITORING WELL # 3120

PREPARED FOR
FERNALD RI/FS

FERNALD RI/FS

853

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS
FIELD ENG./GEO. M. SWANSON
DATE 1/30/90
PROJECT NO. 662 3.2.1
CHECKED BY /
DATE
BORING NO. # 3120
PIEZOMETER NO. # 3120
DATE OF INSTALLATION 2/2/90

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
TYPE OF BIT HAMMER
DRILLING FLUID (S) USED:
FLUID H_2O FROM 0 FT TO 135.0 FT
FLUID — FROM — TO —
CASING SIZE (S) USED:
SIZE 10 in. I.D. FROM 0 FT TO 135.0 FT
SIZE FROM TO

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION 4.0 in. I.D.
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.01 in.
TOTAL PERFORATED AREA 10.0 FT
RISER PIPE MATERIAL 316 STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/2 in. I.D. 4.0 in.
LENGTH OF PIPE SECTIONS 10.0 FT.
JOINING METHOD FLUSH JOINTED, THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT.
PROTECTIVE PIPE O.D. 10 3/4 in.
OTHER PROTECTION HINGED LOCKING COVER W/ PADLOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION ( )	
TOP OF RISER PIPE	2.0 ABOVE GROUND SURFACE (AGS)			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5 BELOW GROUND SURFACE (BGS)			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 2.0 FT (BGS)	BOTTOM 115.0 FT	TOP	BOTTOM
BENTONITE	TOP 1.0 FT (AGS)	BOTTOM 2.0 FT (BGS)	TOP	BOTTOM
SAND	TOP 115.0 FT	BOTTOM 135.5 FT	TOP	BOTTOM
GRAVEL NONE USED	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 120.3 FT.	BOTTOM 130.3 FT.	TOP	BOTTOM
PIEZOMETER TIP	132.0 FT			
BOTTOM OF BOREHOLE	135.5 FT			
GWL AFTER INSTALLATION	65.0 FT BELOW TOP OF RISER PIPE			

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

REMARKS GROUT POURED FROM 115.0 FT TO 2.0 FT BELOW GROUND SURFACE. BENTONITE ADDED (3 BUCKETS 5 gals EACH) FROM 2 FT BELOW GROUND SURFACE TO 1.0 FT ABOVE GROUND SURFACE AND WILL PROBABLY SETTLE TO GROUND SURFACE INSIDE PROTECTIVE CASING.

84

409-11-86

FERNALD RI/FS

Note: No Well Installed
1st Attempt
Casing broke off in hole while driving from 0.0 ft to 80.0 ft.

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2.1	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: #2120	COORDINATES: NA		DATE: 2-15-90
ELEVATION: NA	GWL: Depth 63.1 ft Date/Time 2-13-90 / 1520		DATE STARTED: 2-4-90
ENGINEER/GEOLOGIST: M. Hardner	Depth	Date/Time	DATE COMPLETED: 2-13-90
DRILLING METHODS: Cable tool rig, 10.0" OD OUTER CASING			PAGE 1 OF 2

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER ( )	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	WELL CONSTRUCTION	REMARKS
0	NA	NA	NA	* SEE VISUAL CLASSIFICATION OF SOILS LOG FOR BORING #3120 for description of SOILS.				
10								
20								
				APPROXIMATE TILL Bottom 27.0'				
30				APPROXIMATE TOP OF SAND and Gravel AQUIFER				
40								
50								
60								

NOTES.

Drilling Contractor: Penn Drill

Drilling Equipment: CYCLONE Cable Tool RIG

Driller: Joe Barile
Ken Reynolds

Background levels:
@ γ = 40 to 140 cpm
on 2-13-90
α = 0 cpm

Water Quantity used during drilling: 950 gallons

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER	602.3.2.1	PROJECT NAME	Fernald RI/FS		
BORING NUMBER	#2120	COORDINATES	NA	DATE	2-15-90
ELEVATION	NA	GWL: Depth	Date/Time	DATE STARTED	2-4-90
ENGINEER/GEOLOGIST	M. Hardner	Depth	Date/Time	DATE COMPLETED	2-13-90
DRILLING METHODS	See p.1			PAGE	2 OF 2

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (")	RECOVERY (")	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	WELL CONSTRUCTION	REMARKS
60	NA	NA	NA					
▼ 63.1' 2-13-90 1520hrs								GWL measured @ 63.1' bgs** @ 1520hrs on 2-13-90.
70								Fine to medium sand from 63.0' to 80.0'
80				Bottom of Boring @ 80.0'				

NOTES: 1) 20.0ft of 10.0" OD CASING left @ Bottom of Boring @ 80.0' up to ~60.0'.
2) NO WELL INSTALLED.
3) Grout up hole.

NOTES. See p.1

** bgs = below ground surface

Drilling Contractor TENN DRILL

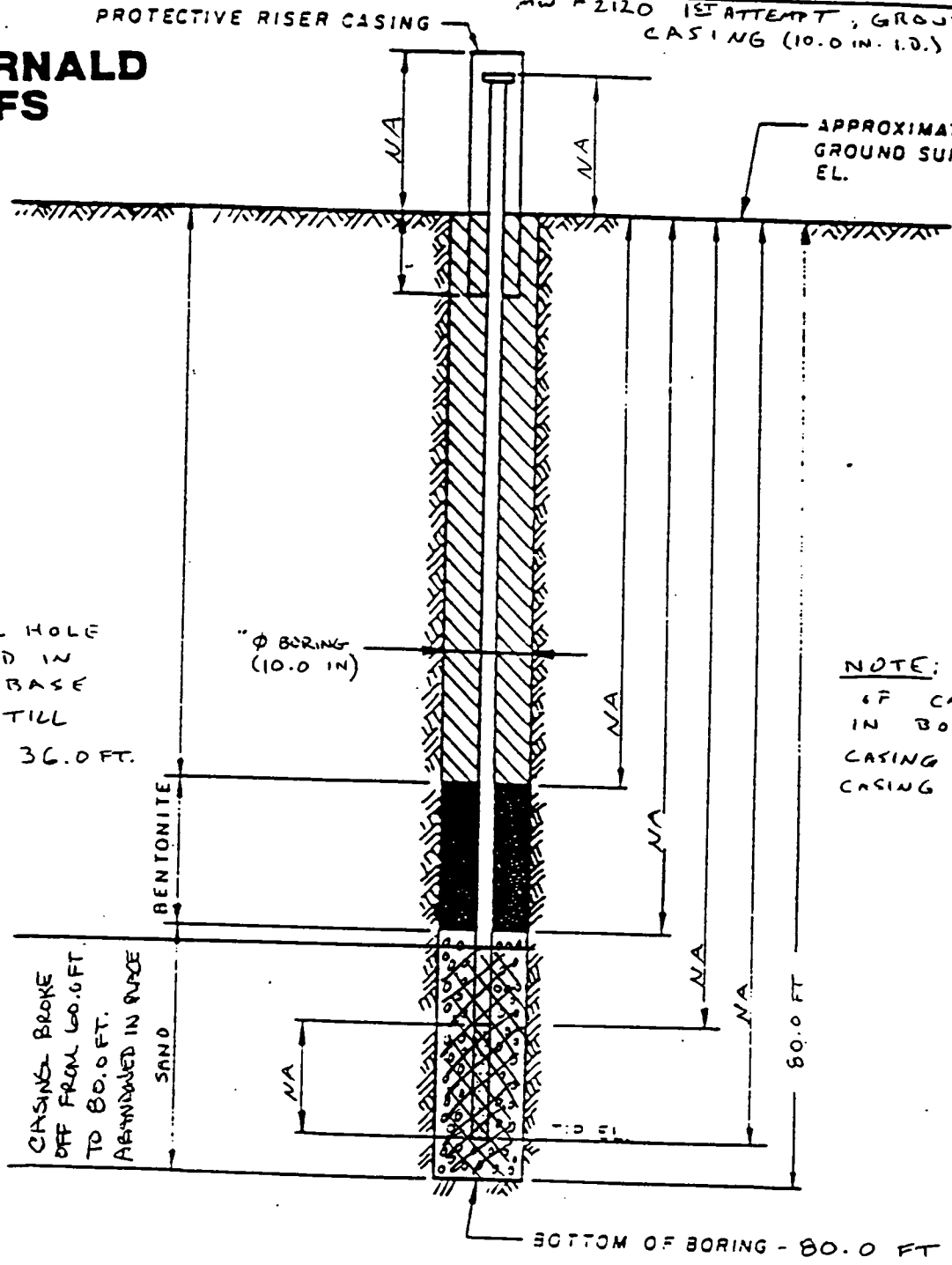
Drilling Equipment CYCLONE 43

Driller: JOE BARILE

ASST. KEN REYNOLDS

NO WELL INSTALLED, BORING ONLY
MW #2120 1ST ATTEMPT, GROUTED UP, CASING (10.0 IN. I.D.) BROKE

FERNALD RI/FS



NOTE: HOLE CAVED IN TO BASE OF TILL AT ~ 36.0 FT.

" Ø BORING (10.0 IN)

CASING BROKE OFF FROM 60.0 FT TO 80.0 FT. ABANDONED IN PLACE

NOTE: 20.0 FT OF CASING LEFT IN BORING. CASING TOP: 60.0 FT CASING BOTTOM: 80

DRAWING NUMBER	
CHECKED BY	
APPROVED BY	
MG	2-28-90
DRAWN BY	

NOTES:

1. RISER PIPE IS IN 10 SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS IN 1.0 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

MATERIALS USED TO PLUG BORING:
M.G. 2-28-90
~~5~~ 3 BUCKETS BENTONITE PELLETS (5 gal. each)
21 BAGS VOLCLAY GROUT (50 lbs. EACH)
1 BAG CEMENT (50 lbs.)

INSTALLATION DETAILS
MONITORING WELL #2120

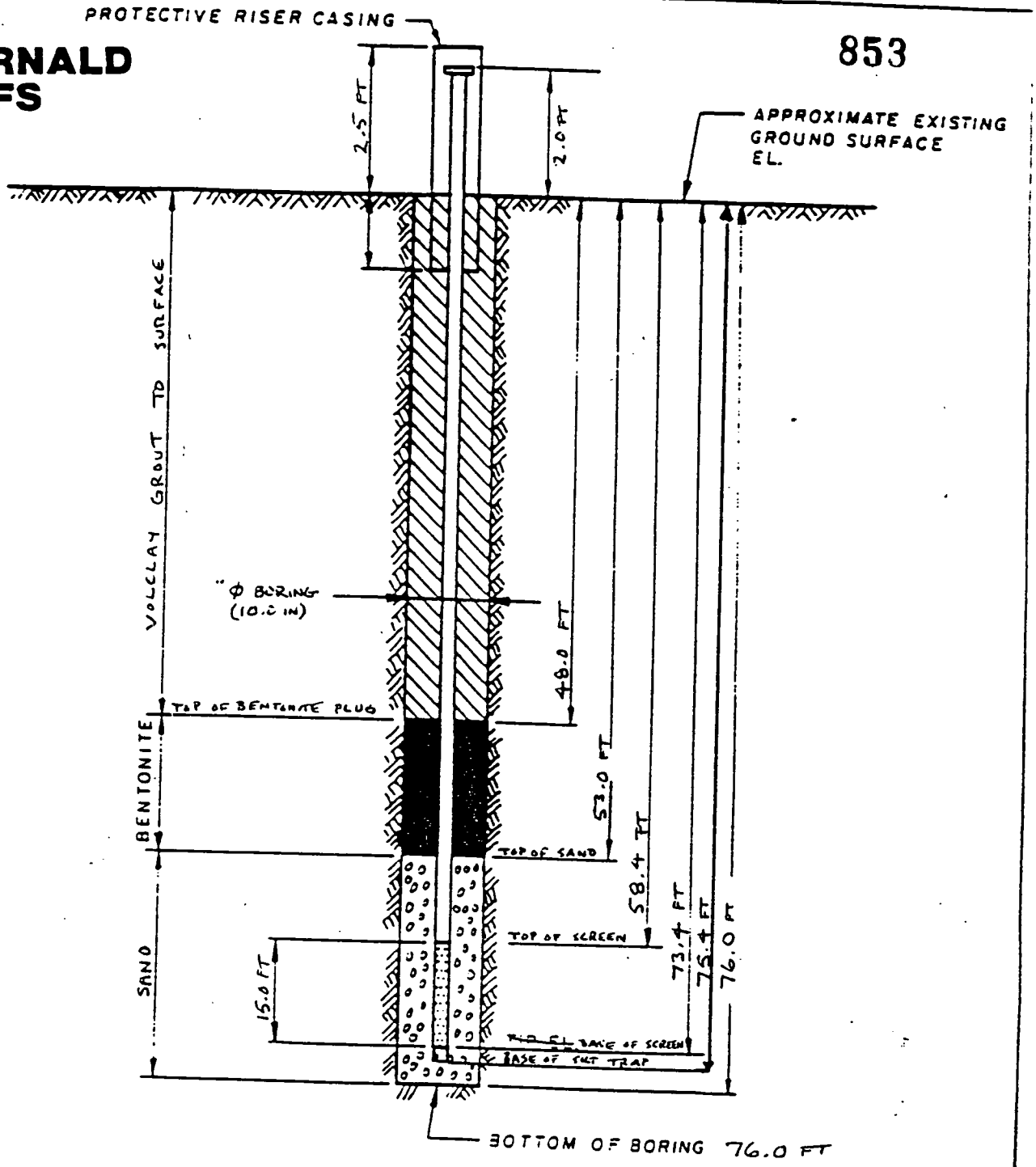
PREPARED FOR
FERNALD RI\FS

TOTAL WATER ADDED DURING DRILLING AND GROUTING = 950 gal.

BORING 2120 2nd ATTEMPT

FERNALD RI/FS

853



DRAWING NUMBER	
CHECKED BY	
APPROVED BY	
DRAWN BY	MG 2-28-90

NOTES:

1. RISER PIPE IS 4.0 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4.0 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 63.65 FT FROM TOP OF RISER
5. WATER LEVEL READING ON 3-1-90 (A-SCOPE SN-00263)

MATERIALS USED DURING WELL INSTALLATION:

16 BAGS 10\20 SAND (80 lbs. EACH)

11 BAGS VOLCLAY GROUT (50 lbs. EACH)

~~4~~ 8 BUCKETS BENTONITE PELLETS (5 gal. EACH)

1 - 15.0 FT SCREEN WITH 2.0 FT WELDED SILT TRAP, 6 - 10.0 FT SECTIONS STAINLESS STEEL RISER (4.0 IN I.D.) 2.0 FT STICK UP ABOVE GROUND SURFACE

INSTALLATION DETAILS
MONITORING WELL # 2120

PREPARED FOR
FERNALD RI\FS

TOTAL WATER ADDED DURING DRILLING AND GROUTING = 870 88 gal.

FERNALD RI/FS

853

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI\FS FIELD ENG./GEO. M. GARMAN DATE 2-28-90
PROJECT NO. 602.3.2.1 CHECKED BY ET. DATE 3-2-90
BORING NO. 2120
PIEZOMETER NO. 2120 DATE OF INSTALLATION 2-28-90

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 0 TO 76.0 FT
FLUID N/A FROM — TO —

TYPE OF BIT HAMMER
CASING SIZE (S) USED:
SIZE 10.0 IN. I.D. FROM 0 TO 78.0 FT
SIZE N/A FROM — TO —

PIEZOMETER DESCRIPTION

TYPE MONITOR WELL
DIAMETER OF PERFORATED SECTION 4.0 IN I.D.
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.01 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
JOINING METHOD FLUSH JOINT THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 10 3/4 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	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 48.0	TOP	BOTTOM
BENTONITE	TOP 48.0	BOTTOM 53.0	TOP	BOTTOM
SAND	TOP 53.0	BOTTOM 76.0	TOP	BOTTOM
GRAVEL NONE USED	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 58.4	BOTTOM 73.4	TOP	BOTTOM
PIEZOMETER TIP	75.4			
BOTTOM OF BOREHOLE	76.0			
GWL AFTER INSTALLATION	63.65			

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

REMARKS FIRST ATTEMPT OF THIS BORING WAS RELOCATED DUE TO CASING BREAKING FROM 60.0 FT. TO 80.0 FT. 20 FT. TOTAL LEFT IN GROUND.

89

409-11-88

FERNALD RI/FS

Date	2/2/90			
Initials	CT	853		
	Field Check	1st Rev.	2nd Rev.	Final Check

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2.1 | PROJECT NAME: FMPC RI/FS
BORING NUMBER: 2032 | COORDINATES: | DATE: 2/6/90
ELEVATION: ~560.0 FT | GWL: Depth / Date/Time | DATE STARTED: 2/6/90
ENGINEER/GEOLOGIST: SWANSON, MINE | Depth / Date/Time | DATE COMPLETED: ~~2/13/90~~
DRILLING METHODS: CABLE TOOL | PAGE 1 OF 7

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONTAMINATION (PPM)	WELL CONSTRUCTION	REMARKS
1	32451 1310 2/6	3 5 6	7	TOPSOIL, VERY DARK GRAY (10YR 2/1) SILT, PEBBLES SLIGHTLY MOIST, SLIGHT PLASTICITY 3 / 3 HARD, GRAY - DARK GRAY (10YR 5/1, 2.5Y 4/0) SILTY CLAY, TRACE OF SAND, LOW PLASTICITY, DRY TO SLIGHTLY MOIST	ML / CL	2.0 / 3.0		Hnu = .1 ppm, α = 0 cpm, βγ = 400-500 cpm
2 3	32452 1316 2/6	2 2 3	2	↓				Hnu = .1 ppm, α = 0 cpm, βγ = 400-500 cpm
4	32453 1321 2/6	3 6 5	7	HARD, YELLOWISH BROWN (10YR 5/6) SILTY CLAY, TRACE OF SAND, LOW PLASTICITY, SLIGHTLY MOIST	CL	2.5		Hnu = .1 ppm, α = 0 cpm, βγ = 300-400 cpm
5 6	32454 1324 2/6	5 8 11	11	MEDIUM DENSE GRAVELY WELL GRADED SAND, BROWNISH YELLOW (10YR 6/6), SOME CLAY, TRACE OF SILT, SUBANGULAR GRAVEL & SAND GRAINS, SLIGHTLY MOIST ↓ 6.7	SW	N/A		Hnu = 0 ppm, α = 0 cpm, βγ = 300-600 cpm
7	32455 1329 2/6	10 11 8	10	6.7 HARD, DARK YELLOWISH BROWN (10YR 4/6) SANDY, SILTY CLAY, TRACE OF PEBBLES, LOW PLASTICITY, SLIGHTLY MOIST	CL	3.5		Hnu = 0 ppm, α = 0 cpm, βγ = 400-600 cpm
8 9	32456 1335 2/6	8 8 8	13	VERY SOFT, LIGHT OLIVE BROWN (2.5Y 5/6), SANDY SILT, SOME CLAY, WET	ML	<2.5		Hnu = 0 ppm, α = 0 cpm, βγ = 400-600 cpm
10	32457 1454 2/6	3 5 6	8	FIRM; LIGHT OLIVE BROWN (2.5Y 5/6) SANDY, CLAYEY SILT, SLIGHT PLASTICITY, SLIGHTLY MOIST TO MOIST	ML	1.0		Hnu = 0 ppm, α = 0 cpm, βγ = 400-500 cpm
11 12	32458 1501 2/6	6 6 11	9	10.8 HARD, GRAY (5Y, 5/1) SILTY CLAY, TRACE OF SAND, LOW PLASTICITY, SLIGHTLY MOIST	CL	2.5		Hnu = .1 ppm, α = 0 cpm, βγ = 300-500 cpm
13	32459 1513 2/6	2 5 10	5					Hnu = .1 ppm, α = 0 cpm, βγ = 400-600 cpm
14 15	32460 1519 2/6	12 5 15	8	HARD, GRAY (5Y 5/1) SILTY CLAY, SOME PEBBLES AND GRAVEL, TRACE OF SAND. PEBBLES AND GRAVEL ABOUT 3.5 IN., LOW PLASTICITY, SLIGHTLY MOIST	CL	3.0		Hnu = 0 ppm, α = 0 cpm, βγ = 400-500 cpm

NOTES.

Drilling Contractor: PENN-DRILL CO.
Drilling Equipment: BUCYRUS ERIE CABLE TOOL
Driller: D. NEWMAN
ASST.: B. JOHNSON

ALL SAMPLES IN ACCORDANCE WITH ASTM STANDARD PENETRATION TEST. MUNSELL COLOR CHART USED FOR SOIL SAMPLE COLOR DESCRIPTION.

BACKGROUND READINGS
Hnu = .1 ppm
α = 0 cpm
βγ = 600-1000 cpm

* HIGH BACKGROUND CAUSES DOUBT IN βγ READINGS FOR SOIL SAMPLES.

90

* ALL CORRECTIONS ON PAGES 1-2 WERE MADE ON 2/6/90 AND 2/7/90, AND 2/13/90, UNLESS OTHERWISE NOTED. Mike Swanson 2/28/90

FERNALD RI/FS

853

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6023.2.1	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 2032	COORDINATES:		DATE: 2/6/90 - 2/7/90
ELEVATION: ~560.0 FT	GWL: Depth	Date/Time	DATE STARTED: 2/6/90
ENGINEER/GEOLOGIST: M. SWANSON	Depth	Date/Time	DATE COMPLETED: ~~2/13/90~~ 2/7
DRILLING METHODS: CABLE TOOL			PAGE 2 OF 7

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 (IN)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED GROUNDWATER (FT.)	WELL CONSTRUCTION	REMARKS
15–16	32466 MS 1553 2/6	25 16 16	7	HARD, OLIVE GRAY (2.5Y 4/2) SILTY CLAY, COBBLES, SOME SAND AND PEBBLES LOW PLASTICITY, TOP 3 IN MOIST, BOTTOM 4 IN. SLIGHTLY MOIST	CL	2.0		HNU: 0 PPM; α: 0 CPM; βγ: 300-400 CPM
17–18	32462 1601 2/6	25 36 40	16	VERY HARD, DARK GRAY (2.5Y 4/1) SILTY CLAY, TRACE OF SAND PEBBLES, ONE COBBLE, LOW PLASTICITY, DRY TO SLIGHTLY MOIST	CL	>4		HNU: 0 PPM; α: 0 CPM; βγ: 200-400 CPM
18–19	32463 1053 2/7/90	20 21 30	9	HARD, GRAY (5Y 5/1) SILTY CLAY, TRACE OF SAND, COBBLES (QUARTZ), LOW PLASTICITY, SLIGHTLY MOIST	CL	2.75		HNU: .1 PPM; α: 0 CPM; βγ: 600-800 CPM
20–21 (No sample # assigned)	~~32464~~ MS 1345 2/7	48 50/4 in.	NONE	SPOON REFUSAL - ASSUMED THAT SPOON PUSHED UP A COBBLE AT START OF SAND AQUIFER	N/A	N/A		HNU: N/A; α: N/A; βγ: N/A
21–22	32465 MS 1412 2/7	12 13 19	13	DENSE BROWNISH YELLOW TO YELLOWISH BROWN (10YR 6/8 TO 5/8), FINE, POORLY GRADED SAND, DRY	SP	N/A		HNU: .1 PPM; α: 0 CPM; βγ: 300-400 CPM
25.0–26.5 (Sample is from 25.0 to 26.5 foot interval)	32467 MS 1439 2/7	8 7 11	12	MEDIUM DENSE, BROWNISH YELLOW TO YELLOWISH BROWN (10YR 6/6 TO 5/8). POORLY GRADED SAND, DRY	SP	N/A		HNU: .1 PPM; α: 0 CPM; βγ: 400 CPM
25–30	~~32468~~ MS			25.0 - 26.5 FT. INTERVAL M.A. 2-7-90 SAMPLING WILL BE DONE EVERY 5.0 FT HEREAFTER, STARTING WITH SAMPLE NUMBER ~~32467~~ MS 32466 @ 30.0 TO 31.5 FT				HNU: ; α: ; βγ:
26–27	~~32469~~ MS							HNU: ; α: ; βγ:
27–28	~~32469~~ MS							HNU: ; α: ; βγ:
28–29	~~32469A~~ ~~32470~~							HNU: ; α: ; βγ:
29–30								

NOTES.

Drilling Contractor: PENNAL DRILL CO.

Drilling Equipment: BUCYRUS ERIE CABLE TOOL

Driller: D. NEWMAN

ASST. B. JOHNSON

BACKGROUND
HNU = .2 PPM
α = 0 CPM
βγ = 600-900 CPM

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 60C 3.2.1	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 2032	COORDINATES:		DATE 2/7/90 ; 2/13/90
ELEVATION: ~ 689.0 FT	GWL: Depth	Date/Time	DATE STARTED: 2/6/90
ENGINEER/GEOLOGIST: M. SWANSON	Depth	Date/Time	DATE COMPLETED: 2/13/90
DRILLING METHODS: CABLE TOOL			PAGE 3 OF 7

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN.	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONTAMINANT (PPM)	WELL CONSTRUCTION	REMARKS
30	32466 ~~32467~~ 1602 2/7	3 15 25	10	DENSE LIGHT YELLOWISH BROWN (10YR, 6/4), WITH A 3 IN LAYER OF BLACK AND WHITE SAND; SAND, MEDIUM TO WELL GRADED, TRACE OF PEBBLES (.2 IN), COARSENING DOWNWARD, DRY	SW	N/A		H_{AV} = .1 PPM α = 0 CPM $\beta\gamma$ = 350-450 CPM
31								
32								
33								
34								
35	32467 ~~32468~~ 0916 2/13/90	13 27 50	9	VERY DENSE, YELLOWISH BROWN (10YR 5/6) WELL GRADED SAND, SOME PEBBLES (.2 IN) TRACE OF SILT, CLAY; ROUNDED TO SUBANGULAR, DRY	SW	N/A		H_{AV} = 0 PPM α = 0 CPM $\beta\gamma$ = 350-450 CPM
36								
37								
38								
39								
40	32468 0946 2/13	11 18 23	3	DENSE, OLIVE YELLOW (2.5Y 6/6) POORLY GRADED FINE GRAINED SAND, DRY TO SLIGHTLY MOIST	SP	N/A		H_{AV} = .1 PPM α = 0 CPM $\beta\gamma$ = 300-400 CPM
41								
42								
43								
44				GWL = 44.9 FT FROM GROUND SURFACE				
45								

NOTES:

Drilling Contractor: PENWAY DRILL CO.

Drilling Equipment: BUCYRUS ERIE CABLE TOOL

Driller: D. NEWMAN

ASST. J. JOHNSON

BACKGROUND:

H_{AV} = 0.1 PPM

α = 0 CPM

$\beta\gamma$ = 800-1000 CPM

FERNALD
RI/FS

853

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2.1	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 2032	COORDINATES:		DATE: 2/13/90
ELEVATION: ~584.0 FT	GWL: Depth	Date/Time	DATE STARTED: 2/6/90
ENGINEER/GEOLOGIST: M. SWANSON	Depth	Date/Time	DATE COMPLETED: 2/13/90
DRILLING METHODS: CABLE TOOL (BUCYRUS ERIE)			PAGE 4 OF 7

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	WELL CONSTRUCTION	REMARKS
45	32469 ~~32470~~ 1114 2/13	10 15 23	8	DENSE, DARK YELLOWISH BROWN (10YR 4/6) WELL GRADED SAND, SOME PEBBLES, SUBROUNDED; TRACE OF GRAVEL (%.25-.5 IN) SUBANGULAR TO SUBROUNDED, SLIGHTLY MOIST	SW	NA		HNU = 0.0 PPM ∝ = 0 CPM βγ = 300-400 CPM
46								
47								
48								
49								
50	32470 1354 2/13	7 9 13	5	MEDIUM DENSE, DARK BROWN (10YR 3/3) WELL GRADED SANDY GRAVEL (.25-.4 IN) SUBANGULAR TO SUBROUNDED, WET	GW	NA		HNU = 0.0 PPM ∝ = 0 CPM βγ = 200-400 CPM
51								
52								
53								
54								
55	32471 ~~32472~~ 1423 2/13	5 5 8	6	MEDIUM DENSE, DARK BROWN (10YR 3/3) GRAVELLY SAND, WELL GRADED, SUBANGULAR TO ROUNDED, WET	SW	NA		HNU = 0.1 PPM ∝ = 0 CPM βγ = 250-300 CPM
56								
57								BLOW SANDS ENCOUNTERED
58								
59								
60								

NOTES:

Drilling Contractor: PEARL DRILL CO.

Drilling Equipment: BUCYRUS ERIE CABLE TOOL

Driller: D. NEWMAN

ASST.: B. JOHNSON

BACKGROUND:
HNU = 0.0-0.1 PPM
∝ = 0 CPM
βγ = 800-1100 CPM

93

FERNALD
RI/FS

853

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2.1	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 2032	COORDINATES:		DATE: 2/13/90
ELEVATION: ~589.0 FT	GWL: Depth	Date/Time	DATE STARTED: 2/6/90
ENGINEER/GEOLOGIST: M. SWANSON	Depth	Date/Time	DATE COMPLETED: 2/13/90
DRILLING METHODS: CABLE TOOL			PAGE 5 OF 7

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 (IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED GAMMA RADIATION (CPM)	WELL CONSTRUCTION	REMARKS
60	32472 ~~32473~~ 1537 2/13	2 3 6	7	LOOSE, LIGHT YELLOWISH BROWN (10YR 6/4) WELL GRADED GRAVELLY SAND, (.25-.5 IN) ANGULAR TO ROUNDED, WET	SW	N/A		H_{NU}: 0.1 PPM α: 0 CPM $\beta\gamma$: 400-500 CPM
61								
62								
63								
64								
65	32473 1621 2/13	5 8 12	6	MEDIUM DENSE, DARK BROWN (10YR 3/3) (WITH BLACK AND WHITE PARTICLES) GRAVELLY SAND, SOME COBBLES (.5 IN-.75 IN) TRACE OF SILT, WET, WELL GRADED	SW	N/A		H_{NU}: 0.0 PPM α: 0 CPM $\beta\gamma$: 300-450 CPM
66								
67				BOTTOM OF BORING @ 65.0 FT SAMPLED TO 66.5 FT.				
68								
69								
70								
71								
72								
73								
74								
75								

NOTES.

Drilling Contractor: PENN-DRILL CO.

Drilling Equipment: BUCYRUS ERIE CABLE TOOL

Driller: D. NEWMAN

ASST.: B. JOHNSON

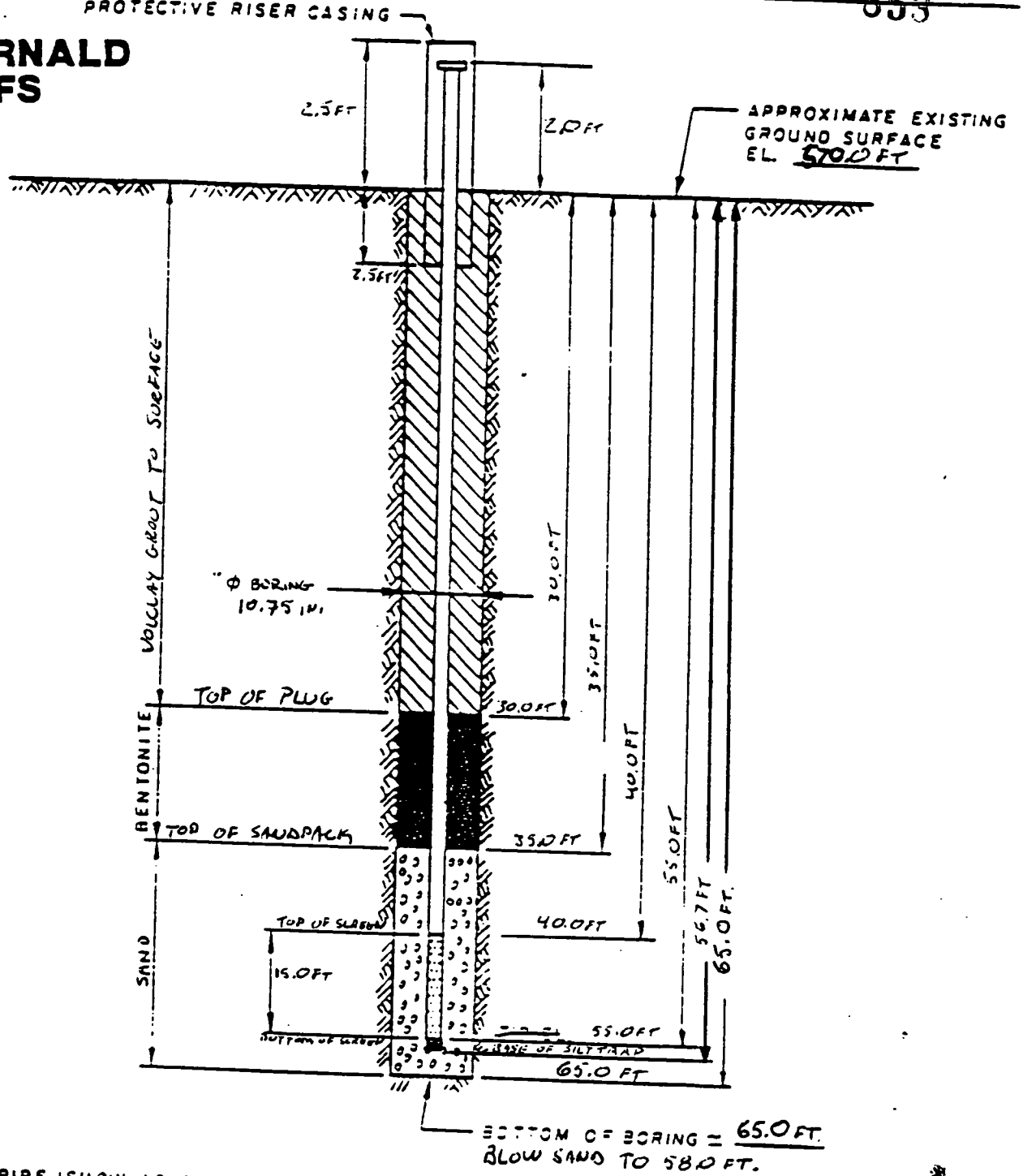
BACKGROUND

H_{NU}: 0.0-0.1 PPM

α: 0 CPM

$\beta\gamma$: 800-1000 CPM

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY | APPROVED BY

DRAWN BY | 2/17/90

NOTES:

1. RISER PIPE IS 4.0 IN 10 SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4.0 IN 1.0 SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED (W/1.7 FT WELDED SILTTRAP)
4. ELEVATION OF WATER LEVEL 44.9 FT; 43.7 FT;
5. WATER LEVEL READING ON 2/14/90; 2/16/90;

MATERIALS USED FOR INSTALLATION:

22 BAGS OF 10/20 SAND (80 lbs. EACH)
6 BUCKETS OF BENTONITE PELLETS (5 gals. EACH)
10 BAGS OF VOLCLAY GROUT (50 lbs. EACH)
330 GALLONS OF H2O USED FOR DRILLING & GROUTING

SS PIPE SECTIONS: 0 2 FT, 0 5 FT, 4 10 FT, 2 FT. STICKUP; 15 FT SCREEN

INSTALLATION DETAILS
MONITORING WELL # 2032

PREPARED FOR
FERNALD RI/FS

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS
PROJECT NO. 602 3.2.1
BORING NO. 2032
PIEZOMETER NO. 2032

FIELD ENG./GEO. M. SWANSON DATE 2/14/90
CHECKED BY S.T. DATE 3/2/90
DATE OF INSTALLATION 2/17/90

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID H_2O FROM 0.0 FT TO 65.0 FT
FLUID – FROM – TO –

TYPE OF BIT HAMMER
CASING SIZE (S) USED:
SIZE 10 IN. I.D. FROM 0.0 FT TO 65.0 FT
SIZE – FROM – TO –

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION 4.0 IN. ID
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SLOTTED 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 5, 10 FT & 15 FT. SCREEN
JOINING METHOD THREADED, FLUSH MOUNTED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 10 3/4 IN.

OTHER PROTECTION HINGED LID 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	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 30.0	TOP	BOTTOM
BENTONITE	TOP 30.0	BOTTOM 35.0	TOP	BOTTOM
SAND	TOP 35.0	BOTTOM 58.0	TOP	BOTTOM
GRAVEL NONE USED	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 40.0	BOTTOM 55.0	TOP	BOTTOM
PIEZOMETER TIP	BASE OF SILTTRAP @ 56.7 FT			
BOTTOM OF BOREHOLE	65.0 FT			
GWL AFTER INSTALLATION	43.7 FT.			

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

REMARKS ONE BUCKET OF BENTONITE PUT IN PROTECTIVE PIPE, GROUTED TO SURFACE. SAND PACK ADDED ON TOP OF BLOW SANDS, WHICH OCCURRED FROM 65.0 FT TO 58.0 FT.

ATTACHMENT C

Date	3/4/90			
Initial	E.T.			
Field Check	1st Key In	2nd Key In	Hard Copy Verification	

FERNALD RI/FS

Suspect Geochem. Boring Program (Inside Production)

VISUAL CLASSIFICATION OF SOILS

853

PROJECT NUMBER: 602.03.07.05	PROJECT NAME: FMPC RI/FS - (Facility Testing Program)		
BORING NUMBER: 1505	COORDINATES: NA	DATE: 02-20-90	
ELEVATION: NA	GWL: Depth NR Date/Time	DATE STARTED: 02-20-90	
ENGINEER/GEOLOGIST: M. HARDNER	Depth NA Date/Time	DATE COMPLETED: 2-21-90	
DRILLING METHODS: HOLLOW STEM AUGER (SPLIT SPOON SAMPLING)		PAGE 1 OF 3	

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6-Inches	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				MEDDENSE (7.5 YR 3/2) DARK BROWN CLAYEY GRAVEL, DRY TO MOIST.			Start Drilling @ 1510
0.5	00568 1510 02-20-90	6	6		GC	NA	Hnu = 0 ppm, α = 0 cpm, βγ = 350 cpm
1.0	00569 1510 02-20-90	5	2	SAA	GC	NA	
1.5	00570 1510 02-20-90	7	0	NR	NA	NA	
2.0	00571 1512 02-20-90	4	6	STIFF (10YR 3/1) VERY DARK GREY, CLAY MEDIUM PLASTIC, DRY TO SLIGHTLY MOIST	CL	2.0	Hnu = 0 ppm, α = 0 cpm, βγ = 180 cpm
2.5	00572 1512 02-20-90	6	6	SAA	CL	2.0	
3.0	00573 1512 02-20-90	5	0	NR	NA	NA	
3.5	00574 1515 02-20-90	9	6 3	~~(3") STIFF (10YR 4/1) DARK GREY, MOTTED ORANGE~~, (10YR 3/1) VERY DARK GREY, CLAY MED. PLASTIC, DRY TO SLIGHTLY MOIST	CL	1.0	Hnu = 0 ppm, α = 0 cpm, βγ = 220 cpm
4.0	00575 1515 02-20-90	6	36	(3") STIFF (10YR 4/1) DARK GREY MOTTED ORANGE, SILTY CLAY, MEDIUM PLASTIC MOIST, TRACE OF GRAVEL	CL	1.25	
4.5	00576 1515 02-20-90	4	0	NR	NA	NA	
5.0	00577 1517 02-20-90	5	6	STIFF (10YR 4/1) DARK GREY, CLAY, SILTY, SLIGHTLY MOIST, MED. PLASTIC	CL	1.0	Hnu = 0 ppm, α = 0 cpm, βγ = 160 cpm
5.5	00578 1517 02-20-90	4	6	STIFF (10YR 5/1) GREY, SILTY CLAY, MOIST, LOW PLASTICITY	CL	1.0	
6.0	00579 1517 02-20-90	4	4	STIFF (10YR 4/1) DARK GREY, SILTY CLAY, MOTTED ORANGE, MED. PLASTIC, SLIGHTLY MOIST.	CL	1.25	
6.5	00580 1518 02-20-90	2	6	(10YR 4/1) DARK GREY, CLAYEY SAND. FINE GRAIN, WET	SC ~~CL~~	NA ~~0~~	Hnu = 0 ppm, α = 0 cpm, βγ = 300 cpm
7.0	00581 1518 02-20-90	2	4	STIFF (10YR 4/1) DARK GREY, ORANGE MOTTLING, SILTY CLAY, TRACE OF SAND. MOIST	CL	1.0	
7.5	00582 1518 02-20-90	2	0	NR	NA	NA	

NOTES: Contractor : Pennsylvania Drilling
Driller : JIM SACCANI
Driller's Assistant : CHRIS COULTER

All Samples collected according to ASTM Standards. Soil Colors described by Munsell Soil Color Charts.

Serial # Background Readings/Levels
#00199 Hnu = 0 ppm.
#13 Alpha (α) = 0 d.p.m.
#5 Gamma - Beta = 200 d.p.m.

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FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.07	PROJECT NAME: FMPC RI/FS Facility Testing)		
BORING NUMBER: 1505	COORDINATES: NA	DATE: 02-20-90	
ELEVATION: NA	GWL: Depth NR Date/Time	DATE STARTED: 2-20-90	
ENGINEER/GEOLOGIST: M. HARDNER	Depth NR Date/Time	DATE COMPLETED: 2-21-90	
DRILLING METHODS: HOLLOW STEM AUGER - (Split Spoon Sampling)		PAGE 2 OF 3	

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 Inch	RECOVERY (In.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8.0	00583 1630 02-20-90	1	6	VERY LOOSE (10YR 4/6) DARK YELLOWISH BROWN SILTY SAND, CLAYEY, WET, (FINE GRAIN SAND)	SM	NA	Hnu = 0 ppm, α = 0 cpm, β = 160 cpm
8.5	00584 1630 02-20-90	0	6	SAA	SM	NA	
9.0	00585 1630 02-20-90	0	2	SAA	Sm	NA	
9.5	00586 1632 02-20-90	2	0	NR	NA	NA	Hnu = 0 ppm, α = 0 cpm, β = 200 cpm
10.0	00587 1632 02-20-90	2	0	NR	NA	NA	
10.5	00588 1632 02-20-90	1	0	NR	NA	NA	
11.0	00589 1634 02-20-90	3	6	Loose, (10YR 4/6) DARK YELLOWISH BROWN, SILTY SAND, MOIST TO WET	Sm	NA	Hnu = 0 cpm, α = 0 cpm, β = 160 cpm
11.5	00590 1634 02-20-90	5	6	Loose, (10YR 5/1) GREY, CLAYEY SILT, TRACE OF SAND AND GRAVEL LOW PLASTICITY, MOIST	CL	1.5	
12.0	00591 1634 02-20-90	5	0	NR	NA	NA	
12.5	00592 1640 02-20-90	5	6	Loose, (~~10YR 5/1~~ 2.5Y 4/0) ~~GREY~~ DARK GREY, FINE TO MED GRAIN SAND, WET,	SW	NA	Hnu = 0 ppm, α = 0 cpm, β = 200 cpm
13.0	00593 1640 02-20-90	6	6	(2.5Y 4/0) DARK GREY FINE TO MED GRAIN SAND, WET, SILT WITH CLAY	SW	NA	First distinct sand layer.
13.5	00594 1640 02-20-90	7	0	NR	NA	NA	
14.0	00595 1650 02-20-90	4	6	loose (2.5Y 4/0) DARK GREY FINE to med. Grain sand, wet,	SW	NA	Hnu = 0 ppm, α = 0 cpm, β = 160 cpm
14.5	00596 1650 02-20-90	5	6	STIFF, (2.5Y 4/0) DARK GREY, SILTY CLAY, LOW PLASTICITY, SLIGHTLY MOIST TRACES OF SAND.	CL	2.0	
15.0	00597 1650 02-20-90	6	4	SAA	CL	2.0	

NOTES:

SEE PAGE 1

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.07	PROJECT NAME: FMPC RI/FS - (Facility Testing Program)		
BORING NUMBER: 1505	COORDINATES: NA	DATE: 02-20-90	
ELEVATION: NA	GWL: Depth NR Date/Time	DATE STARTED: 02-20-90	
ENGINEER/GEOLOGIST: M. HARDNER	Depth NR Date/Time	DATE COMPLETED: 02-21-90	
DRILLING METHODS: HOLLOW STEM AUGER - (Split Spoon Sampling)		PAGE 3 OF 3	

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 Inch)	RECOVERY (In.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
							1008 Start drilling
15.5	00598 1009 02-21-90	6	6	loose (10YR 3/3) DARK BROWN, FINE TO MEDIUM SAND, TRACE OF GRAVEL, WET.	GP	NA	Hnu = 0 ppm, α = 0 dpm, βγ = 200 dpm
16.0	00599 1009 02-21-90	8	6	Stiff (10YR 4/1) DARK GREY, CLAYEY SILT, MOIST TO WET, LOW PLASTICITY.	M1	1.25	
16.5	00600 1009 02-21-90	12	3	very ~~soft~~ SAA	M1 ~~1.25~~	1.25	
17.0	00601 1012 02-21-90	11	6	~~loose~~ (10YR 4/1) DARK GREY, SILTY CLAY, SOME FINE SAND, TRACE OF GRAVEL, WET LOW PLASTICITY.	CI	NR	Hnu = 0, α = 0, βγ = 200
17.5	00602 1012 02-21-90	12	6	SAA	CI	NR	
18.0	00603 1012 02-21-90	9	6	v stiff ~~stiff, loose~~ (10YR 4/2) DARK GREYISH BROWN, SILTY CLAY, TRACE OF GRAVEL LOW PLASTICITY.	CI	3.0	
18.5	00604 1019 02-21-90	10	6	loose (10YR 5/1) GREY, SANDY SILT, SOME GRAVEL, SOME CLAY, WET, LOW PLASTICITY	SM	NA	Hnu = 0, α = 0, βγ = 180
19.0	00605 1019 02-21-90	8	6	SAA	SM	NA	
19.5	00606 1019 02-21-90	9	6	v. stiff (10YR 3/2) VERY DARK GREYISH BROWN, CLAYEY SILT, TRACE OF FINE SAND, MOIST TO WET, LOW PLASTICITY	M1	3.25	
20	00607 1019 02-21-90	9	6	SAA	M1	3.25	Hnu = 0, α = 0, βγ = 180
				BOTTOM OF BORING @ 20.0 FT. ☆ BORING PLUGGED AND ABANDONED WITH BENTONITE PELLETS TO WITHIN 1.0 FT OF SURFACE, CAPPED WITH CEMENT PLUG TO SURFACE. 6 BUCKETS BENTONITE/5 gals ea. 1/2 SACK (94 lb.) CEMENT.			

NOTES:

SEE PAGE 1

BACKGROUND ON 02-21-90

HNU = .8 ppm 100

Alpha = 0 dpm

βγ = ~~180~~ 200 dpm

02/21/90

FERNALD RI/FS

SUSPECT GEOCHEM. BORING (INSIDE PRODUCTION AREA)

VISUAL CLASSIFICATION OF SOILS

Date	9/4/90			
Initial				

PROJECT NUMBER: 602 37.05	PROJECT NAME: FERNALD RI/FS
BORING NUMBER: 1506	COORDINATES:
ELEVATION:	GWL: Depth: Date/Time
ENGINEER/GEOLOGIST: D. EVANS	Depth: Date/Time
DRILLING METHODS: AUGER (HOLLOW STEM)	

DATE: 2/28/90
DATE STARTED: 2/28/90
DATE COMPLETED: 2/28/90
PAGE 1 OF 3

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6"	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	00648 1425 2/28	3	6	SOFT, YELLOWISH BROWN (10YR 5/4), SILTY CLAY, TRACE SAND, MED. PLASTICITY, MOIST	CL	.5	HNU = 0 PPM
	00649 1425 2/28	3	6	~~SOFT~~ VERY STIFF, YELLOWISH BROWN (10YR/5/4), SILTY CLAY, TRACE SAND AND FINE GRAVEL, LOW PLASTICITY, MOIST	CL	2.75	α = 0 CPM BG = 1000 CPM
1	00650 1425 2/28	3	1	STIFF, VERY DARK GREYISH BROWN (10YR 3/2), SILTY CLAY, LOW PLASTICITY, MOIST	CL	2.0	
	00651 1428 2/28	3	6	VERY STIFF, VERY DK. GREYISH BROWN (10YR 3/2), SILTY CLAY, LOW PLASTICITY, MOIST	CL	2.5	HNU = 0 PPM
2	00652 1428 2/28	4	2	STIFF, DK BROWN (10YR 3/3) SILTY CLAY, MED. PLASTICITY, MOIST	CL	2.0	α = 0 CPM BG = 800 CPM
	00653 1428 2/28	7	0	NR	NA	NA	
3	00654 1430 2/28	7	6	MED. STIFF, DK. BROWN, (10YR 3/3), SILTY CLAY, MED. PLASTICITY, MOIST	CL	1.0	HNU = 0 PPM
	00655 1430 2/28	7	6	SAA	CL	1.0	α = 0 CPM BG = 1400 CPM
4	00656 1430 2/28	7	3	LOOSE, YELLOWISH BROWN (10YR 5/4), SILTY SAND SOME CLAY, TRACE GRAVEL, MOIST	SM	NA	
	00657 1435 2/28	7	6	MED. DENSE, DK. YELLOWISH BROWN (10YR 4/2), SILTY SAND, SOME CLAY, WET	SM	NA	HNU = 0 PPM
5	00658 1435 2/28	7	6	SAA	SM	NA	α = 0 CPM BG = 800 CPM
	00659 1435 2/28	7	2	SAA	SM	NA	
6	00660 1439 2/28	18	6	DENSE, DK. YELLOWISH BROWN (10YR 4/4), SILTY SAND, WET	SM	NA	HNU = 0PPM
	00661 1439 2/28	19	6	DENSE, DK. YELLOWISH BROWN (10YR 4/4) SILTY SAND, SOME GRAVEL, WET	SM	NA	α = 0 CPM BG = 1000 CPM
7	00662 1439 2/28	19	6	VERY STIFF, YELLOWISH BROWN (10YR 5/4), SILTY CLAY, SOME COARSE GRAVEL, LOW PLASTICITY, MOIST	CL	2.5	

NOTES:
CONTRACTOR: PENN DRILL
RIG: B-53 MOBILE
DRILLER: JIM SACCANI
ASSISTANT: CHRIS COULTER

SAMPLES COLLECTED PER ASTM STANDARD PENETRATION T
COLORS IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM
α = 0 CPM
BG = 1400 CPM
LEL = 0 PPM
O_2 = 21.1 %

LELO2:

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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: 1506	COORDINATES:	DATE: 2/28/90	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2/26/90	
ENGINEER/GEOLOGIST: D. EVANS	Depth Date/Time	DATE COMPLETED: 2/28/90	
DRILLING METHODS: AUGER (HOLLOW STEM)		PAGE 2 OF 3	

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8	00663 1525 2/28	7	6	VERY STIFF, YELLOWISH BROWN (10YR 5/4), SILTY CLAY, TRACE SAND, LOW PLASTICITY, MOIST	CL	2.5	HNU = 0 PPM α = 0 CPM Bγ = 1000 CPM
	00664 1525 2/28	15	6	DE 2/28 MED DENSE SAA	CL	2.5	
9	00665 1525 2/28	12	4	~~LOOSE~~, DK. YELLOWISH BROWN (10YR 4/4), SILTY SAND, TRACE GRAVEL, WET	SM	NA	
	00666 1527 2/28	9	6	MED. DENSE, DK. YELLOWISH BROWN (10YR 4/4) SILTY SAND, SOME CLAY, WET	SM	NA	HNU = 0 PPM α = 0 CPM Bγ = 1000 CPM
10	00667 1527 2/28	10	6	HARD, OLIVE GREY (5Y 4/2), CLAY, MEDIUM PLASTICITY, MOIST	CL	4.25	
	00668 1527 2/28	12	4	SAA.	CL	>4.0	
11	00669 1530 2/28	10	6	STIFF, DK. YELLOWISH BROWN (10YR 4/6), SILTY CLAY, TRACE SAND AND GRAVEL, LOW PLASTICITY, WET	CL	1.5	HNU = 0 PPM α = 0 CPM Bγ = 800 CPM
	00670 1530 2/28	10	6	VERY STIFF, OLIVE GREY (5Y 4/2), CLAY, TRACE COARSE GRAVEL, MED. PLASTICITY, MOIST	CL	3.5	
12	00671 1530 2/28	10	0	NR	NA	NA	
	00672 1532 2/28	9	6	MED DENSE, OLIVE GREY (5Y 4/2), SILTY SAND, TRACE GRAVEL, WET	SM	NA	HNU = 0 PPM α = 0 CPM Bγ = 1000 CPM
13	00673 1532 2/28	9	6	VERY STIFF, OLIVE GREY (5Y 4/2), CLAY, TRACE FINE SAND, MED PLASTICITY, MOIST	CL	3.5	
	00674 1532 2/28	10	6	SAA	CL	3.5	
14	00675 1606 2/28	5	6	STIFF, DARK GREY (5Y 4/1), CLAY, SOME SILT, TRACE SAND, LOW PLASTICITY, ~~MO~~ WET	CL	1.5	HNU = 0 PPM α = 0 CPM Bγ = 800 CPM
	00676 1606 2/28	9	6	STIFF, OLIVE GREY (5Y 4/2), CLAY, MED PLASTICITY, MOIST	CL	1.5	
	00677 1606 2/28	15	2	SAA	CL	1.0	

NOTES:

SAA - SAME AS ABOVE
NR - NO RECOVERY

SEE PAGE 1

402-11-88

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.7	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 1506	COORDINATES:	DATE: 2/28/90
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2/28/90
ENGINEER/GEOLOGIST: D. EVANS	Depth Date/Time	DATE COMPLETED: 2/28/90
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
	00678 1609 2/28	6	6	VERY STIFF, OLIVE GREY (5Y 4/2) CLAY, TRACE SILT AND SAND, MED. PLASTICITY, WET	CL	3.5	HNU = 0 PPM α = 0 CPM BG = 1200 CPM
	00679 1609 2/28	5	6	SAA	CL	3.5	
16	00680 1609 2/28	5	4	SAA	CL	3.5	
	00681 1612 2/28	6	6	STIFF, OLIVE (5Y 5/3) MOTTLED YELLOW BROWN (10YR 5/4), CLAY, TRACE SILT, MED. PLASTICITY, WET	CL	1.5	HNU = 0 PPM α = 0 CPM BG = 1000 CPM
17	00682 1612 2/28	6	6	VERY STIFF, OLIVE GREY (5Y 4/2), CLAY, SOME SAND, TRACE SILT, LOW PLASTICITY, WET	CL	2.5	
	00683 1612 2/28	7	6	VERY STIFF, OLIVE (5Y 5/3), CLAY, TRACE SILT AND SAND; MED PLASTICITY, MOIST	CL	2.5	
18	00684 1634 2/28	9	6	VERY SOFT, OLIVE GREY (5Y 4/2), SILTY CLAY, TRACE SAND AND GRAVEL, LOW PLASTICITY, WET	CL	<.25	HNU = 0 PPM α = 0 CPM BG = 1000 CPM
	00685 1634 2/28	10	6	VERY SOFT, OLIVE GREY (5Y 4/2), SILTY CLAY, SOME SAND, LOW PLASTICITY, WET	CL	<.25	
19	00686 1634 2/28	10	6	MED STIFF, OLIVE (5Y 5/3), CLAY, MED. PLASTICITY, MOIST	CL	1.0	
20	00687 1634 2/28	9	6	MED STIFF, OLIVE GREY (5Y 4/2), SILTY CLAY, LOW PLASTICITY, MOIST	CL	1.0	HNU = 0 PPM α = 0 CPM BG = 1000 CPM
				BOTTOM OF BORING @ 20.0 FT *			

NOTES:

* BORING PLUGGED WITH FOUR BUCKETS (5 GAL EA) BENTONITE PELLETS ON 2/28/90

* CEMENT PLUG TO SURFACE 1/4 (94 lb. sack.)

SEE PAGE 1

FERNALD RI/FS

Suspect Geochem. Boring (inside production area)

VISUAL CLASSIFICATION OF SOILS

Date	3/4/90		852	
Initial	KT.			
	Field Check	1st Review	2nd Review	Hard Copy Verification

PROJECT NUMBER: 602.03.07.05	PROJECT NAME: FMPC RI/FS - (Facility Testing Program)		
BORING NUMBER: 1507	COORDINATES: NA	DATE: 2-21-90	
ELEVATION: NA	GWL: Depth NA Date/Time	DATE STARTED: 2-21-90	
ENGINEER/GEOLOGIST: M. HARDNER	Depth NR Date/Time	DATE COMPLETED: 2-22-90	
DRILLING METHODS: HOLLOW STEM AUGER (SPLIT SPOON SAMPLING)		PAGE 1 OF 3	

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6-Inches)	RECOVERY (Inch)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				Loose 2-21-90 (CLAYEY GRAVEL			Start drilling @ 1530
0.5	00608 1531 02-21-90	3	6	~~Stiff~~ (10YR 4/4) DARK YELLOWISH BROWN, SOME BLACK, ~~GRAVELY CLAY~~ DRY, LOW PLASTICITY, ORGANIC MATERIAL	GC	~~1.5~~ N/A	Hnu = 0 ppm
1.0	00609 1531 02-21-90	6	4	SAA	GC	~~1.5~~ N/A	α = 0 cpm
1.5	00610 1531 02-21-90	6	0	NR	NA	NA	γB = 210 cpm
2.0	00611 1532 02-21-90	6	6	V. Stiff (10YR 4/4) DARK YELLOWISH BROWN SILTY CLAY, TRACE OF GRAVEL, SOME BLACK ORGANIC MATERIAL, LOW PLASTICITY, DRY.	CI	2.75	Hnu = 0 ppm
2.5	00612 1532 02-21-90	5	3	SAA.	CI	2.0	α = 0 cpm
3.0	00613 1532 02-21-90	6	0	NR	NA	NA	γB = 210 cpm
3.5	00614 1535 02-21-90	7	6	Stiff (10YR 4/4) DARK YELLOWISH BROWN, SILTY CLAY, SOME BLACK ORGANIC MATERIAL, TRACE OF SAND AND FINE GRAVEL MEDIUM PLASTICITY, DRY TO SLIGHTLY MOIST	CI	1.5	Hnu = 0 ppm
4.0	00615 1535 02-21-90	10	3	SAA	CI	3.5	α = 0 cpm
4.5	00616 1535 02-21-90	13	0	NR	NA	NA	γB = 260 cpm.
5.0	00617 1540 02-21-90	5	6	V. Stiff (10YR 5/6) YELLOWISH BROWN CLAYEY SILT, TRACE OF MOTTLED ORANGE, MED. TO COURSE GRAVEL, DRY, LOW PLASTICITY,	MI	2.5	Hnu = 0 ppm
5.5	00618 1540 02-21-90	4	6	SAA	MI	2.5	α = 0 cpm
6.0	00619 1540 02-21-90	7	0	NR	NA	NA	γB = 240 cpm
6.5	00620 1545 02-21-90	4	6	V. Stiff (10YR 5/6) YELLOWISH BROWN MOTTLED ORANGE AND GREY, CLAYEY SILT, TRACE OF COURSE GRAVEL COURSE SAND, MED. PLASTICITY, DRY	MI	2.5	Hnu = 0 ppm
7.0	00621 1545	7	6	SAA	MI	4.0	α = 0 cpm
7.5	00622 1545 02-21-90	10	4	SAA	MI	3.75	γB = 280 cpm

NOTES: Contractor : Pennsylvania Drilling
Driller : Jim Saccani
Drillers Assistant: Chris Coulter

All Samples collected according to ASTM Standards. Soil Colors described by Munsell Soil Color Charts.

Background Readings/Levels
Hnu = 0.0 ppm
Alpha (α) = 0 d.p.m
Gamma - Beta = 200 d.p.m.

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FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER:	602.03.07.05	PROJECT NAME:	FMPC: RI/FS Facility Testing)		
BORING NUMBER:	1507	COORDINATES:	NA	DATE:	02-21-90
ELEVATION:	NA	GWL: Depth NA Date/Time		DATE STARTED:	02-21-90
ENGINEER/GEOLOGIST:	M. HARDNER	Depth NA Date/Time		DATE COMPLETED:	2-22-90
DRILLING METHODS:	HOLLOW STEM AUGER - (Split Spoon Sampling)			PAGE 2	OF 3

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 Inch)	RECOVERY (In.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
8.0	00623 1632 02-21-90	8	6	V.stiff (10YR 5/4) YELLOWISH BROWN CLAYEY SILT, MEDIUM PLASTICITY, DRY	ml	3.0	Hnu = 0 ppm; α = 0 cpm; SB = 260 cpm
8.5	00624 1632 02-21-90	10	3	SAA	ml	4.0	
9.0	00625 1632 02-21-90	12	0	NR	NA	NA	
9.5	00626 1633 02-21-90	10	6	V.stiff (10YR 5/6) BROWNISH YELLOW, SILTY CLAY, LITTLE FINE TO MEDIUM GRAVEL, MEDIUM PLASTICITY, DRY TO SLIGHTLY MOIST	Cl	2.75	Hnu = 0 ppm; α = 0 cpm; SB = 260 cpm
10.0	00627 1633 02-21-90	10	6	SAA	Cl	2.5	
10.5	00628 1633 02-21-90	10	4	SAA	Cl	2.75	
11.0	00629 1635 02-21-90	5	6	V.stiff (10YR 5/6) YELLOWISH BROWN MOTTLED, CLAYEY SILT, LOW PLASTICITY DRY TO SLIGHTLY MOIST,	ml	2.5	Hnu = 0 ppm; α = 0 cpm; SB = 300 cpm
11.5	00630 1635 02-21-90	9	6	SAA	ml	2.75	
12.0	00631 1635 02-21-90	12	6	SAA	ml	2.25	
12.5	00632 1638 02-21-90	12	6	med dense (10YR 5/4) YELLOWISH BROWN, SANDY SILT, VERY FINE GRAIN SAND, SOME CLAY, LOW PLASTICITY, MOIST,	SM	NA	Hnu = 0 ppm; α = 0 cpm; SB = 240 cpm
13.0	00633 1638 02-21-90	10	6	SAA w/ SOME MOTTLED GREY	SM	NA	
13.5	00634 1638 02-21-90	10	6	V.stiff (10YR 4/1) DARK GREY, CLAY, WITH SOME MEDIUM TO COURSE GRAVEL, MOIST, MEDIUM PLASTICITY.	Cl	3.25	
14.0	00635 1642 02-21-90	12	6	V.stiff (10YR 4/1) DARK GREY, SOME MED TO COURSE GRAVEL, MOIST, LOW PLASTICITY.	CL	2.25	Hnu = 0 ppm; α = 0 cpm; SB = 280 cpm
14.5	00636 1642 02-21-90	13	6	SAA	CL	2.50	
15.0	00637 1642 02-21-90	9	6	SAA	CL	2.25	

NOTES:

SEE Page 1

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.07.05	PROJECT NAME: FMPC RI/FS - (Facility Testing Program)		
BORING NUMBER: 150M	COORDINATES: NA	DATE: 2-21-90	
ELEVATION: NA	GWL: Depth NA Date/Time	DATE STARTED: 2-21-90	
ENGINEER/GEOLOGIST: M. HARDNER	Depth NA Date/Time	DATE COMPLETED: 2-22-90	
DRILLING METHODS: HOLLOW STEM AUGER - (Split Spoon Sampling)		PAGE 3 OF 3	

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 In.)	RECOVERY (In.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS Started @ 0914
15.5	00638 0915 02-22-90	3	6	V. stiff (10YR4/1) DARK GREY, SILTY CLAY TRACE OF FINE SAND, MEDIUM PLASTICITY, WET	CI	2.5	Hnu = 0 ppm, α = 0 cpm, βB = 200 cpm
16.0	00639 0915 02-22-90	9	6	SAA	CI	2.5	
16.5	00640 0915 02-22-90	9	0	~~SAA~~ NR	NA	NA	
17.0	00641 0919 02-22-90	9	6	V. soft (2.5Y 5/2) GREYISH BROWN SILTY CLAY, SOME MEDIUM TO COURSE GRAVEL TRACE OF SAND, WET	CI	NA	Hnu = 0 ppm, α = 0 cpm, βB = 260 cpm
17.5	00642 0919 02-22-90	9	6	V. stiff (10YR4/1) DARK GREY SILTY CLAY, TRACE OF FINE GRAVEL, MOIST TO WET, MEDIUM PLASTICITY.	CI	2.0	
18.0	00643 0919 02-22-90	9	6	SAA	CI	2.25	
18.5	00644 0927 02-22-90	8	6	V. stiff (10YR4/1) DARK GREY, SILTY CLAY, WET, HIGH PLASTICITY.	CI	2.0	Hnu = 0 ppm, α = 0 cpm, βB = 260 cpm
19.0	00645 0927 02-22-90	9	3	SAA	CI	1.5	
19.5	00646 0927 02-22-90	10	0	NR	NA	NA	
20	00647 0927 02-22-90	9	0	NR	NA	NA	Hnu = NA, α = NA, βB = NA
				BOTTOM OF BORING @ 20.0 FT.			

* BORING PLUGGED AND ABANDONED WITH BENTONITE PELLETS TO WITHIN 1.0 FT. OF SURFACE, CEMENT PLUG TO SURFACE.

MATERIALS USED:
5 buckets bentonite 5 gal ea.
1/2 sack. (94 lb) cement.

NOTES:

SEE PAGE 1
Background on 02-22-90
HNU = 0.3
α = 0 cpm
βB = 180 cpm

ATTACHMENT D

FERNALD
RI/FS

Date			
Initial			
Field Check	Tech. Ver.	Eng. Ver.	Hard Copy Verification

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.~~9 3~~ET 9.31 | PROJECT NAME: EMPC RI/FS (OUTFALL-PIPELINE)
BORING NUMBER: 1524 | COORDINATES:
ELEVATION: 537.00 | GWL: Depth Date/Time
ENGINEER/GEOLOGIST: M. GARMAN | Depth Date/Time
DRILLING METHODS: HOLLOW STEM AUGER

DATE: 2-13-90
DATE STARTED: 2-13-90
DATE COMPLETED: 2-13-90
PAGE 1 OF 1

SAA = SAME AS ABOVE
NR = NO RECOVERY

DEPTH (FT.)	SAMPLE (TYPE & NO.)	BLOWS ON SAMPLER PER 6 in.	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED GROUNDWATER (FT.)	WELL CONSTRUCTION N/A	REMARKS
				0.0 - 3.5 FT WERE AUGERED WITH 8 in. HSA. COMMENCED SAMPLING AT 3.5 FT				
3.5	00386 2-13 1518	5	6	MED. DENSE (2.5Y, 3/2) VERY DARK GRAYISH BROWN CLAYEY SILT. SOME SAND. LOW MOISTURE.	ML	NA		HNU 0; α 0; βB 40 cpm
4.0	00387 2-13 1518	5	6	SAA	ML	NA		HNU 0; α 0; βB 40 cpm
4.5	00388 2-13 1518	6	2	SAA	ML	NA		HNU 0; α 0; βB 40 cpm
5.0	00389 2-13 1520	2	6	LOOSE (2.5Y, 3/2) VERY DARK GRAYISH BROWN CLAYEY SILT. SOME SAND. TRACE GRAVEL. SLIGHTLY MOIST TO MOIST.	ML	NA		HNU 0; α 0; βB 50 cpm
5.5	00390 2-13 1520	2	0	NR	NA	NA		HNU NA; α NA; βB NA
6.0	00391 2-13 1520	3	0	NR	NA	NA		HNU NA; α NA; βB NA
6.5	00392 2-13 1522	3	6	MED. DENSE (10YR, 4/2) DARK GRAYISH BROWN CLAYEY SILT. SOME SAND AND GRAVEL. LOW MOISTURE.	ML	NA		HNU 0; α 0; βB 60 cpm
7.0	00393 2-13 1522	5	4	SAA	ML	NA		HNU 0; α 0; βB 60 cpm
7.5	00394 2-13 1522	7	0	NR	NA	NA		HNU NA; α NA; βB NA
8.0	00395 2-13 1524	4	6	MED. DENSE (10YR, 3/3) DARK BROWN CLAYEY SILT. TRACE SAND. SOME GRAVEL. LOW MOISTURE.	ML	NA		HNU 0; α 0; βB 60 cpm
8.5	00396 2-13 1524	5	4	SAA	ML	NA		HNU 0; α 0; βB 60 cpm
9.0	00397 2-13 1524	6	0	NR	NA	NA		HNU NA; α NA; βB NA
9.5				END OF SAMPLING, P/A. BOTTOM OF BORING @ 9.5 FT.				

DEPTH OF PIPELINE

NOTES:

Drilling Contractor: PENNSYLVANIA DRILLING CO.
Drilling Equipment: MOBILE B53
Driller: J. SALCANI
Mgr: C. COULTER

HOLE WAS BACK-FILLED TO SURFACE WITH BENTONITE PELLETS

MATERIALS USED: 1 BUCKET BENTONITE PELLETS
1 gal WATER

FERNALD RI/FS

Date	3/14/90			
Initial	ET			
	Field Check	Ist Ver.	2nd Ver.	Hard Copy Verification

VISUAL CLASSIFICATION OF SOILS

ET 3/14/90

PROJECT NUMBER: 602.~~23~~-1 9.31 | PROJECT NAME: FMPC RI/FS (OUTFALL PIPELINE)

BORING NUMBER: 1524 DUPLICATE | COORDINATES:

ELEVATION: 537.00 | GWL: Depth Date/Time | DATE: 2-13-90

ENGINEER/GEOLOGIST: M. GARMAN | Depth Date/Time | DATE STARTED: 2-13-90

DRILLING METHODS: HOLLOW STEM AUGER | DATE COMPLETED: 2-13-90

PAGE 1 OF 1

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN.	RECOVERY (IN)	DESCRIPTION (SAA = SAME AS ABOVE; NR = NO RECOVERY)	USCS SYMBOL	MEASURED GROUNDWATER (FT)	WELL CONSTRUCTION	REMARKS
				0.0 - 3.5 FT WERE AUGERED WITH 8 in HSA.				
3.5				SAMPLING COMMENCED AT 3.5 FT				
	00516 2-13 1610	5	6	MED. DENSE ~~SAMPLE~~ AG (10YR 4/2) DARK GRAYISH BROWN SANDY SILT. SOME CLAY AND GRAVEL. LOW MOISTURE.	ML	N/A		HNU 0 ∝ 0 ⊼B 40cpm
4.0	00517 2-13 1610	7	2	SAA	ML	N/A		HNU 0 ∝ 0 ⊼B 40cpm
4.5	00518 2-13 1610	4	0	NR	N/A	N/A		HNU NA ∝ NA ⊼B NA
5.0	00519 2-13 1611	4	6	MED. DENSE (10YR 4/3) BROWN SANDY ~~SILT~~ SILT. SOME CLAY AND GRAVEL. LOW ~~MOISTURE~~ MOISTURE.	ML	NA		HNU 0 ∝ 0 ⊼B 40cpm
5.5	00520 2-13 1611	5	6	HARD (2.5Y 3/2) VERY DARK GRAYISH BROWN SILTY CLAY. LOW PLASTICITY. LOW MOISTURE.	CL	4.0		HNU 0 ∝ 0 ⊼B 40cpm
6.0	00521 2-13 1611	6	0	NR	NA	NA		HNU NA ∝ NA ⊼B NA
6.5	00522 2-13 1614	6	6	HARD (2.5Y 3/2) VERY DARK GRAYISH BROWN SILTY CLAY. TRACE GRAVEL. LOW PLASTICITY. LOW MOISTURE.	CL	3.0		HNU 0 ∝ 0 ⊼B 60-100cp
7.0	00523 2-13 1614	10	0	NR	NA	NA		HNU NA ∝ NA ⊼B NA
7.5	00524 2-13 1614	11	0	NR	NA	NA		HNU NA ∝ NA ⊼B NA
8.0	00525 2-13 1618	24	0	SPOON REFUSAL CLOGGED BY COBBLE. NO RECOVERY.	NA	NA		HNU NA ∝ NA ⊼B NA
8.5	00526 2-13 1618	21	0		NA	NA		HNU NA ∝ NA ⊼B NA
9.0	00527 2-13 1618	28	0		NA	NA		HNU NA ∝ NA ⊼B NA
9.5				END OF SAMPLING, D/A				

CALCULATED DEPTH OF PIPELINE

NOTES: BOTTOM OF BORING @ 9.5 FT. → HOLE WAS BACKFILLED TO SURFACE WITH BENTONITE PELLETS

Drilling Contractor: PENNSYLVANIA DRILLING CO.

Drilling Equipment: Mobile B53

Driller: J. SACCAN

ASST.: C. COULTER

MATERIALS USED: 1 BUCKET BENTONITE PELLETS
1 gal WATER

FERNALD
RI/FS

Date	3/1/90		
Initial	E.T.	858	
Field Data	1st Rev.	2nd Rev.	Hard Copy Verification

VISUAL CLASSIFICATION OF SOILS

ET 3/1/90

PROJECT NUMBER: 602. ~~D.3.T~~ 9.31 | PROJECT NAME: OUTFALL PIPELINE FMPC RI/FS
BORING NUMBER: 1525 | COORDINATES:
ELEVATION: 530.5 FT | GWL: Depth Date/Time | DATE: 2-16-90
ENGINEER/GEOLOGIST: M. GARMAN | Depth Date/Time | DATE STARTED: 2-16-90
DRILLING METHODS: HOLLOW STEM AUGER | DATE COMPLETED: 2-16-90
PAGE 1 OF 1

NR = NO RECOVERY
SAA = SAME AS ABOVE

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED GAMMA RADIOACTIVITY (CPS)	WELL CONSTRUCTION	REMARKS
0.0	00399 1248 2-16	2	6	LOOSE (2.5Y, 3/2) VERY DARK GRAYISH BROWN CLAYEY SILT. MOIST.	ML	NA	NA	HNU 0; α 0; βB 40
0.5	00400 1248 2-16	4	2	LOOSE (2.5Y, 3/2) VERY DARK GRAYISH BROWN SANDY SILT. SOME CLAY. MOIST.	ML	NA		HNU 0; α 0; βB 60
1.0	00401 1248 2-16	5	0	NR	NA	NA		HNU NA; α NA; βB NA
1.5	00402 1250 2-16	7	6	MEDIUM DENSE (2.5Y, 3/2) VERY DARK GRAYISH BROWN CLAYEY SILT. SLIGHTLY MOIST TO MOIST.	ML	NA		HNU 0; α 0; βB 20-40
2.0	00403 1250 2-16	8	3	MEDIUM DENSE (2.5Y, 4/2) DARK GRAYISH BROWN CLAYEY SILT. TRACE SAND. SLIGHTLY MOIST TO MOIST.	ML	NA		HNU 0; α 0; βB 40-60
2.5	00404 1250 2-16	7	0	NR	NA	NA		HNU NA; α NA; βB NA
3.0	00405 1252 2-16	3	6	LOOSE (2.5Y, 4/4) OLIVE BROWN SANDY SILT. TRACE CLAY. MOIST.	ML	NA		HNU 0; α 0; βB 50
3.5	00406 1252 2-16	3	6	SAA	ML	NA		HNU 0; α 0; βB 50
4.0	00407 1252 2-16	5	2	SAA	ML	NA		HNU 0; α 0; βB 50
4.5	00408 1254 2-16	14	6	DENSE + SAA	ML	NA		HNU 0; α 0; βB 70
5.0	00409 1254 2-16	21	6	DENSE (10YR, 5/2) GRAYISH BROWN SILTY GRAVEL (FINE TO COARSE), DRY	GM	NA		HNU 0; α 0; βB 50
5.5	00410 1254 2-16	17	3	SAA	GM	NA		HNU 0; α 0; βB 60
6.0				END OF SAMPLING P/A HOLE WAS BACKFILLED TO SURFACE WITH BENTONITE PELLETS BOTTOM OF BORING @ 6.0 FT.				

CALCULATED DEPTH OF P...

NOTES.
Drilling Contractor: PENN DRILL
Drilling Equipment: MOBILE B-53
Driller: J. SACCANI
Asst.: C. COULTER
MATERIALS USED: 0.5 kg + BUCKET BENTONITE

BACKGROUND.
HNU = 0 ppm
α = 0 cpm
βB = 40-60 cpm

FERNALD RI/FS

Date	3/4/90			
Initial	E.T.	8:53		
	Field Check	1st Key In	2nd Key In	Hard Copy Verification

VISUAL CLASSIFICATION OF SOILS

ET 3/4/90

PROJECT NUMBER: 6020 3.1 9.31	PROJECT NAME: OUTFALL PIPELINE FNPO RI/FS		
BORING NUMBER: 1526	COORDINATES:	DATE: 02-16-90	
ELEVATION: 533.2 FT	GWL: Depth / Date/Time	DATE STARTED: 2-16-90	
ENGINEER/GEOLOGIST: M. GARMAN	Depth / Date/Time	DATE COMPLETED: 2-16-90	
DRILLING METHODS: 8 in HSA		PAGE 1 OF 1	

NR = NO RECOVERY
SAA = SAME AS ABOVE

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED GROUNDWATER (FT)	NA WELL CONSTRUCTION	REMARKS
				0.0 - 2.0 FT WERE AUGERED. WITH 8 in HSA.				
2.0				BEGAN SAMPLING AT 2.0 FT				
2.5	00412 1430 02-16-90	2	6	Very loose, (2.5Y 4/4) Olive Brown, silty sand, moist	SM	NA		HNU 0; α 0; γB 40
3.0	00413 1430 02-16-90	1	6	SAA	SM	NA		HNU 0; α 0; γB 20
3.5	00414 1430 02-16-90	1	2	SAA	SM	NA		HNU 0; α 0; γB 40
4.0	00415 1432 02-16-90	2	6	Very loose (2.5Y 4/2), Dark Grayish brown Clayey sand, trace of silt, Moist,	SC	NA		HNU 0; α 0; γB 50
4.5	00416 1432 02-16-90	2	6	Very loose, SAA	SC	NA		HNU 0; α 0; γB 40
5.0	00417 1432 02-16-90	2	0	NR	NA	NA		HNU NA; α NA; γB NA
5.5	00418 1434 02-16-90	2	6	Very loose (10YR 5/3) Brown, fine to coarse sand Trace of silt, Slightly moist,	SW	NA		HNU 0; α 0; γB 50
6.0	00419 1434 02-16-90	2	6	SAA	SW	NA		HNU 0; α 0; γB 50
6.5	00420 1434 02-16-90	1	3	Very loose, (10YR 5/3) Brown, Silty sand, Slightly moist,	SM	NA		HNU 0; α 0; γB 50
7.0	00421 1440 02-16-90	3	6	Loose, (10YR 4/3), Brown, Clayey sand Some silt, Slightly moist,	SC	NA		HNU 0; α 0; γB 40
7.5	00422 1440 02-16-90	3	6	Loose, (10YR 5/3), Brown, Silty sand trace of clay, Slightly moist.	SM	NA		HNU 0; α 0; γB 50
8.0	00423 1440 02-16-90	2	6	(3") SAA (3") Loose, (10YR 4/3), Brown, Clayey sand, trace of silt Slightly moist.	SC	NA		HNU 0; α 0; γB 50
				END OF SAMPLING P/A				

CALCULATED DEPTH OF PIPE

BOTTOM OF BORING @ 8.0 FT

HOLE WAS BACKFILLED TO SURFACE WITH BENTONITE PELLETS

BACKGROUND
HNU = 0
α = 0
γB = 40-60

NOTES.

Drilling Contractor: PENN DRILL

Drilling Equipment: MOBILE B-53

Driller: J. SACCANI

Asst.: C. COULTER

MATERIALS USED: 1 BUCKET BENTONITE PELLETS

FERNALD
RI/FS

Date	3/4/90		
Initial	ET.	853	
	Field Check	1st Key In.	2nd Key In.	Hard Copy Verification

VISUAL CLASSIFICATION OF SOILS

ET 3/4/90

PROJECT NUMBER: 602.9.31 9.31 | PROJECT NAME: OUTFALL PIPELINE FMPC N/FS
BORING NUMBER: 1527 | COORDINATES: | DATE: 02-16-90
ELEVATION: 537.4 | GWL: Depth Date/Time | DATE STARTED: 2-16-90
ENGINEER/GEOLOGIST: M. GARMAN | Depth Date/Time | DATE COMPLETED: 2-16-90
DRILLING METHODS: Hollow-Stemed Auger | PAGE 1 OF 1

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER (6 IN)	RECOVERY (IN)	DESCRIPTION (SAA = SAME AS ABOVE; NR = NO RECOVERY)	USCS SYMBOL	MEASURED CONSOLIDATION (FT)	WELL CONSTRUCTION (NA)	REMARKS
				0.0 - 6.5 FT WERE AUGERED, WITH 8in HSA.				
6.5				BEGAN SAMPLING AT 6.5 FT.				
7.0	00425 1505 02-16-90	3	6	LOOSE, (10YR. 3/2) Very dark greyish brown, clayey silt, some sand, moist.	ML	NA		HNU 0, α 0, γB 50
7.5	00426 1505 02-16-90	2	6	SAA	ML	NA		HNU 0, α 0, γB 50
8.0	00427 1505 02-16-90	2	0	NR	NA	NA		HNU NA, α NA, γB NA
8.5	00428 1507 02-16-90	3	6	LOOSE, (10YR. 3/2), Very dark greyish brown clayey silt, some sand, moist	ML	NA		HNU 0, α 0, γB 40
9.0	00429 1507 02-16-90	3	0	NR	NA	NA		HNU NA, α NA, γB NA
9.5	00430 1507 02-16-90	4	0	NR	NA	NA		HNU NA, α NA, γB NA
10.0	00431 1509 02-16-90	3	6	LOOSE, (10YR. 3/2), Very dark greyish brown clayey silt, some sand, moist.	ML	NA		HNU 0, α 0, γB 40
10.5	00432 1509 02-16-90	3	6	SAA	ML	NA		HNU 0, α 0, γB 50
11.0	00433 1509 02-16-90	2	2	SAA	ML	NA		HNU 0, α 0, γB 40
11.5	00434 1514 02-16-90	3	6	MEDIUM DENSE + SAA	ML	NA		HNU 0, α 0, γB 30
12.0	00435 1514 02-16-90	4	6	MEDIUM DENSE, (10YR 5/2) Greyish brown, Sandy gravel, (Fine to course) slightly moist.	GW	NA		HNU 0, α 0, γB 30
12.5	00436 1514 02-16-90	6	0	NR.	NA	NA		HNU NA, α NA, γB NA
				END OF SAMPLING P/A				

CALCULATED DEPTH OF PIPE

NOTES: BOTTOM OF BORING @ 12.5 FT.

HOLE WAS BACKFILLED TO SURFACE WITH BENTONITE PELLETS

Drilling Contractor: PENN-DRILL
Drilling Equipment: MOBILE B-53
Driller: JIM SACCINI
Helper: CHRIS COOLTER

MATERIALS USED: 2 mg + BUCKETS BENTONITE

BackGround
Hnu = 0
Alpha = 0
GammaBeta = 30-50

FERNALD
RI/FS

853

VISUAL CLASSIFICATION OF SOILS

ET 3/1/90

PROJECT NUMBER: 602.~~2.3.1~~ 9.31	PROJECT NAME: OUTFALL PIPELINE FMPC RI/FS		
BORING NUMBER: 1528	COORDINATES:	DATE: 02-17-90	
ELEVATION: 538.7	GWL: Depth / Date/Time	DATE STARTED: 2-17-90	
ENGINEER/GEOLOGIST: M. GARMAN	Depth / Date/Time	DATE COMPLETED: 2-17-90	
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 1 OF 1	

NR = NO RECOVERY
SAA = SAME AS ABOVE

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN	RECOVERY IN	DESCRIPTION	USCS SYMBOL	MEASURED GROUNDWATER (FT)	WELL CONSTRUCTION	REMARKS
				0.0 – 8.0 FT WERE AUGERED WITH 8in HSA.				
				BEGAN SAMPLING AT 8.0 FT				
8.0	00438 1005 02-17-90	2	6	LOOSE (10YR 3/1). VERY DARK GREY, SANDY SILT, TRACE OF CLAY, MOIST.	ML	NA		HNU 0 α 0 YB 30
8.5	00439 1005 02-17-90	3	6	SAA	ML	NA		HNU 0 α 0 YB 60
9.0	00440 1005 02-17-90	3	0	NR	NA	NA		HNU NA α NA YB NA
9.5	00441 1006 02-17-90	2	5	VERY LOOSE, (10YR 3/2) VERY DARK GREYISH BROWN CLAYEY SILT, SOME SAND, MOIST				HNU 0 α 0 YB 30
10.0	00442 1006 02-17-90	2	0	NR	NA	NA		HNU NA α NA YB NA
10.5	00443 1006 02-17-90	2	0	NR	NA	NA		HNU NA α NA YB NA
11.0	00444 1007 02-17-90	1	6	VERY LOOSE, (10YR 3/4) YELLOWISH BROWN, SANDY SILT, MOIST.	ML	NA		HNU 0 α 0 YB 40
11.5	00445 1007 02-17-90	1	3	SAA	ML	NA		HNU 0 α 0 YB 70
12.0	00446 1009 02-17-90	1	0	NR	NA	NA		HNU NA α NA YB NA
12.5	00447 1009 02-17-90	1	6	VERY LOOSE, (10YR 5/8) BROWN, SILTY SAND, SOME GRAVEL (FINE TO COURSE)	SM	NA		HNU 0 α 0 YB 40
13.0	00448 1009 02-17-90	1	3	VERY LOOSE, (10YR 5/2) GREYISH BROWN, SANDY, COURSE GRAVEL, SLIGHTLY MOIST.	GP	NA		HNU 0 α 0 YB 60
13.5	00449 1009 02-17-90	3	0	NR	NA	NA		HNU NA α NA YB NA
14.0				BOTTOM OF SAMPLING P/A				

CALCULATED DEPTH OF PIPE

NOTES.

BOTTOM OF BORING @ 14.0 FT.

HOLE WAS BACKFILLED TO SURFACE WITH BENTONITE PELLETS

BACKGROUND
HNU = 0
α = 0
YB = 20-80

Drilling Contractor: PENN-DRILL
Drilling Equipment: MOBILE B-53
Driller: J. SACCANI
ASST.: C. COULTER

MATERIALS USED:
~~1~~ 2 BUCKETS BENTONITE

FERNALD RI/FS

Date	3/4/90			
Initial	ET	853		
	Field Check	1st Key L.	2nd Key In	Hand Copy Verification

VISUAL CLASSIFICATION OF SOILS

ET 3/4/90

PROJECT NUMBER: 602.~~2.3~~.1 9.21 | PROJECT NAME: OUTFALL PIPELINE FMPC RI/FS
BORING NUMBER: 1534 | COORDINATES: | DATE: 02-17-90
ELEVATION: 536.4 FT | GWL: Depth Date/Time | DATE STARTED: 2-17-90
ENGINEER/GEOLOGIST: M. GARMAN | Depth Date/Time | DATE COMPLETED: 2-17-90
DRILLING METHODS: HOLLOW STEM AUGER | PAGE 1 OF 1

NR = NO RECOVERY
SAA = SAME AS ABOVE

DEPTH (FT)	SAMPLE (TYPE & NO.)	BLOWS ON SAMPLER (PER 6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED GROUNDWATER (FT)	NA WELL CONSTRUCTION	REMARKS
				0.0 - 5.0 FT. WERE AUGERED WITH 8in HSA. BEGAN SAMPLING AT 5.0 FT.				
5.0	00451 1340 02-17-90	5	6	(2") MEDIUM DENSE (2.5Y 4/4) Olive brown, silty sandy gravel slightly moist.	GM	NA		HNU 0; ∝ 0; YB 50
5.5	00452 1340 02-17-90	4	4	(4") MEDIUM DENSE (2.5Y 3/2) Very dark grayish brown clayey silt. Low moisture. SAA	ML	NA		HNU 0; ∝ 0; YB 50
6.0	00453 1340 02-17-90	M	0	NR	NA	NA		HNU NA; ∝ NA; YB NA
6.5	00454 1342 02-17-90	M	6	MEDIUM DENSE (2.5Y 4/4) Olive brown silty sandy grave (Fine to coarse) Slightly moist to moist,	GM	NA		HNU 0; ∝ 0; YB 30
7.0	00455 1342 02-17-90	6	6	MEDIUM DENSE (2.5Y 3/2). Very Dark grayish brown, clayey silt, Low moisture.	ML	NA		HNU 0; ∝ 0; YB 30
7.5	00456 1342 02-17-90	M	0	NR	NA	NA		HNU NA; ∝ NA; YB NA
8.0	00457 1344 02-17-90	9	6	MEDIUM DENSE (2.5Y 4/4) Olive brown silty sandy gravel (Fine to coarse). Trace of clay, Slightly moist to moist	GM	NA		HNU 0; ∝ 0; YB 40-60
8.5	00458 1344 02-17-90	11 WKB 18 2-11-90	6	SAA	GM	NA		HNU 0; ∝ 0; YB 40
9.0	00459 1344 02-17-90	10 WKB N 2-11-90	4	SAA	GM	NA		HNU 0; ∝ 0; YB 40
9.5	00460 1345 02-17-90	9	6	SAA	GM	NA		HNU 0; ∝ 20 WKB 2/21/90; YB 20
10.0	00461 1345 02-17-90	12	6	SAA	GM	NA		HNU 0; ∝ 0; YB 40
10.5	00462 1345 02-17-90	11	5	SAA	GM	NA		HNU 0; ∝ 0; YB 30-60
11.0				END OF SAMPLING P/A				

CALCULATED DEPTH OF PIPE

NOTES: BOTTOM OF BORING @ 11.0 FT.

HOLE WAS BACKFILLED TO SURFACE WITH BENTONITE PELLETS

BACKGROUND
HNU = 0
∝ = 0
YB = 20-60

Drilling Contractor: PENN-DRILL
Drilling Equipment: MOBILE B-53
Driller: J. SACCANI
Asst: C. COULTER

MATERIALS USED: 1 BUCKET BENTONITE

FERNALD
RI/FS

Date			
3/4/90			
E.T.	853		
Field Check	1st Key	2nd Key	Hard Copy Verification

VISUAL CLASSIFICATION OF SOILS

ET 3/4/90

PROJECT NUMBER: 602.9.3.1 9.31	PROJECT NAME: OUTFALL PIPELINE FMPC RI/FS		
BORING NUMBER: 1534-DUPLICATE	COORDINATES:		DATE 02-17-90
ELEVATION: 536.4 FT.	GWL: Depth	Date/Time	DATE STARTED: 2-17-90
ENGINEER/GEOLOGIST: M. Garman	Depth	Date/Time	DATE COMPLETED: 2-17-90
DRILLING METHODS: HOLLOW STEM AUGER			PAGE 1 OF 1

NR = NO RECOVERY
SAA = SAME AS ABOVE

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER (6,6,6)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	NA WELL CONSTRUCTION	REMARKS		
				0.0 – 5.0 FT WERE AUGERED WITH 8in HSA						
				BEGAN SAMPLING AT 5.0 FT						
5.0	00464 1535 02-17-90	3	6	LOOSE, (10YR 4/2) DARK GREYISH BROWN, CLAYEY SANDY, SILT, MOIST.	ML	NA		HNU 0	α 0	γB 50
5.5	00465 1535 02-17-90	4	6	LOOSE, (10YR 3/2) VERY DARK GREYISH BROWN CLAYEY, SILT, LOW MOISTURE	ML	NA		HNU 0	α 0	γB 50
6.0	00466 1535 02-17-90	4	4	SAA	ML	NA		HNU 0	α 0	γB 70
6.5	00467 1537 02-17-90	7	6	(4") MEDIUM DENSE, (10YR5/3) Brown, Silty, Sand, moist. (2") HARD (10YR3/2) VERY DARK GREYISH BROWN SILTY CLAY, LOW PLASTICITY, LOW MOISTURE	SM	NA		HNU 0	α 0	γB 30
7.0	00468 1537 02-17-90	10	6	SAA	CL	3.5		HNU 0	α 0	γB 20
7.5	00469 1537 02-17-90	9	2	SAA	CL	3.5		HNU 0	α 0	γB 50
8.0	00470 1540 02-17-90	10	6	MEDIUM DENSE, (10YR 4/3) CLAYEY, SANDY, GRAVEL, SLIGHTLY MOIST TO MOIST.	GC	NA		HNU 0	α 0	γB 40
8.5	00471 1540 02-17-90	12	6	MEDIUM DENSE, (10YR 5/3) BROWN SILTY GRAVEL, TRACE OF CLAY, LOW MOISTURE.	GM	NA		HNU 0	α 0	γB 50
9.0	00472 1540 02-17-90	11	2	SAA	GM	NA		HNU 0	α 0	γB 50
9.5	00473 1545 02-17-90	4	6	SAA	GM	NA		HNU 0	α 0	γB 30
10.0	00474 1545 02-17-90	9	3	SAA	GM	NA		HNU 0	α 0	γB 30
10.5	00476 1545 02-17-90	7	0	NR	NA	NA		HNU NA	α NA	γB NA
11.0				END OF SAMPLING (BOTTOM OF BORING @ 11.0 FT.)						

CALCULATED DEPTH OF PIPE

NOTES.

Drilling Contractor: PENN DRILL
Drilling Equipment: MOBILE B-53
Driller: JIM SACANNI
Asst: CHRIS COULTER

MATERIALS USED: 1 BUCKET BENTONITE

HOLE WAS BACKFILLED TO SURFACE WITH BENTONITE PELLETS

BACKGROUND:
HNU = 0
α = 0
γB = 20-60

FERNALD RI/FS

Date	3/4/90		85	3
Initial	ET			
Field Check	Log In	End Log In	Hard Copy Verification	

VISUAL CLASSIFICATION OF SOILS

ET 3/4/90

PROJECT NUMBER: 602.9.31 | PROJECT NAME: OUTFALL PIPELINE | FMPC-RI/FS

BORING NUMBER: 1529 | COORDINATES: | DATE: 02-18-90

ELEVATION: 534.5 | GWL: Depth Date/Time | DATE STARTED: 2-18-90

ENGINEER/GEOLOGIST: M. GARMAN | Depth Date/Time | DATE COMPLETED: 2-18-90

DRILLING METHODS: HOLLOW STEM AUGER | PAGE 1 OF 1

NR = NO RECOVERY
SAA = SAME AS ABOVE

DEPTH (FT)	SAMPLE (TYPE & NO.)	BLOWS ON SAMPLER (6 IN.)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED GROUNDWATER (FEET)	WELL CONSTRUCTION	REMARKS
				0.0 – 4.0 FT. WERE AUGERED WITH 8 in HSA.				
4.0				BEGAN SAMPLING AT 4.0 FT				
4.5	00477 1033 02-18-90	3	6	VERY LOOSE, (2.5Y 3/2) VERY DARK GREYISH BROWN, CLAYEY, SILT. LOW MOISTURE.	ML	NA	NA	HNU 0, α 0, γB 40
5.0	00478 1033 02-18-90	2	6	SAA	ML	NA		HNU 0, α 0, γB 40
5.5	00479 1033 02-18-90	2	0	NR	NA	NA		HNU NA, α NA, γB NA
6.0	00480 1034 02-18-90	2	6	LOOSE, (2.5Y 3/2) VERY DARK GREYISH BROWN, CLAYEY, SILT, LOW MOISTURE	ML	NA		HNU 0, α 0, γB 50
6.5	00481 1034 02-18-90	2	3	SAA	ML	NA		HNU 0, α 0, γB 50
7.0	00482 1034 02-18-90	3	0	NR	NA	NA		HNU NA, α NA, γB NA
7.5	00483 1035 02-18-90	5	6	LOOSE, (2.5Y 3/2) VERY DARK GREYISH BROWN, CLAYEY SILT, TRACE OF FINE SAND LOW MOISTURE	ML	NA		HNU 0, α 0, γB 50
8.0	00484 1035 02-18-90	5	5	SAA	ML	NA		HNU 0, α 0, γB 60
8.5	00485 1035 02-18-90	5	0	NR	NA	NA		HNU NA, α NA, γB NA
9.0	00486 1037 02-18-90	5	6	LOOSE, (10YR. 4/2) DARK GREYISH BROWN CLAYEY SILT, TRACE OF SAND AND FINE GRAEL LOW MOISTURE.	ML	NA		HNU 0, α 0, γB 80
9.5	00487 1037 02-18-90	4	6	SAA	ML	NA		HNU 0, α 0, γB 80
10.0	00488 1037 02-18-90	4	6	SAA	ML	NA		HNU 0, α 0, γB 80
				END OF SAMPLING P/A				

CALCULATED DEPTH OF PIPE

NOTES.

BOTTOM OF BORING @ 10.0 FT.

HOLE WAS BACKFILLED TO SURFACE WITH BENTONITE PELLETS

BACKGROUND
HNU = 0ppm
α = 0. cpm
γB = 20-80 cpm

Drilling Contractor: PENN DRILL

Drilling Equipment: MOBILE B-53

Driller: J. SACCANI

Asst.: C. COULTER

MATERIALS USED: 1 BUCKET BENTONITE

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602.9.31 9.31	PROJECT NAME: OUTFALL PIPELINE		
BORING NUMBER 1530	COORDINATES:		DATE 02-18-90
ELEVATION: 534.7	GWL: Depth	Date/Time	DATE STARTED: 2-18-90
ENGINEER/GEOLOGIST M. GARMAN	Depth	Date/Time	DATE COMPLETED 2-18-90
DRILLING METHODS HOLLOW STEM AUGER			PAGE 1 OF 1

NR = NO RECOVERY
SAA = SAME AS ABOVE

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN	RECOVERY IN	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (PSI)	NA WELL CONSTRUCTION	REMARKS		
				0.0 - 4.5 FT WERE AUGERED WITH 8in HSA.						
				BEGAN SAMPLING AT 4.5 FT						
4.5	00490 1404 02-18-90	3	6	LOOSE, (10YR 3/2) Very dark grayish brown, Clayey Silt, Low moisture.	ML	NA		HNU 0	α 0	γB 40
5.0	00491 1404 02-18-90	4	2	SAA	ML	NA		HNU 0	α 0	γB 40
5.5	00492 1404 02-18-90	4	0	NR	NA	NA		HNU NA	α NA	γB NA
6.0	00493 1405 02-18-90	5	6	MEDIUM DENSE, (10YR 4/2) Dark grayish brown, Clayey Silt, Low moisture.	ML	NA		HNU 0	α 0	γB 50
6.5	00494 1405 02-18-90	6	3	SAA	ML	NA		HNU 0	α 0	γB 50
7.0	00495 1405 02-18-90	8	0	NR	NA	NA		HNU NA	α NA	γB NA
7.5	00496 1406 02-18-90	5	6	LOOSE, (10YR 4/2) DARK GREYISH BROWN, CLAYEY SILT, LOW MOISTURE.	ML	NA		HNU 0	α 0	γB 50
8.0	00497 1406 02-18-90	5	6	LOOSE, (10YR 4/2) DARK GREYISH BROWN, CLAYEY SILT. TRACE OF SAND, LOW MOISTURE.	ML	NA		HNU 0	α 0	γB 50
8.5	00498 1406 02-18-90	4	5	SAA	ML	NA		HNU 0	α 0	γB 50
9.0	00499 1407 02-18-90	4	6	LOOSE, (10YR 4/3) BROWN, SANDY SILT, LOW MOISTURE.	ML	NA		HNU 0	α 0	γB 40
9.5	00500 1407 02-18-90	4	6	LOOSE, (10YR 4/3) BROWN, SILTY SAND LOW MOISTURE.	GM	NA		HNU 0	α 0	γB 50
10.0	00501 1407 02-18-90	6	6	LOOSE, (10YR 4/3 BROWN SANDY SILT, TRACE OF CLAY, SLIGHTLY MOIST TO MOIST.	ML	NA		HNU 0	α 0	γB 50
10.5				END OF SAMPLING P/A						

CALCULATED DEPTH OF PIPE

NOTES.

BOTTOM OF BORING @ 10.5 FT.

HOLE WAS BACKFILLED TO SURFACE WITH BENTONITE PELLETS

BACKGROUND
HNU = 0 ppm
α = 0 cpm
γB = 20-80 cpm.

Drilling Contractor: PENN DRILL
Drilling Equipment: MOBILE B-53
Driller: J. SACCANI
REGST: C. COULTER

MATERIALS USED:
1 BUCKET BENTONITE

FERNALD
RI/FS

Date	3/14/90		853
Initial	E.T.		
	Field Check	1st Rev.	2nd Rev. In	Hard Copy Verification

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.9.31	PROJECT NAME: OUTFALL PIPELINE FMPC-RI/FS		
BORING NUMBER: 1531	COORDINATES:	DATE: 02-18-90	
ELEVATION: 537.1	GWL: Depth / Date/Time	DATE STARTED: 2-18-90	
ENGINEER/GEOLOGIST: M. GARMAN	Depth / Date/Time	DATE COMPLETED: 2-18-90	
DRILLING METHODS: HOLLOW STEM AUGER		PAGE 1 OF 1	

NR = NO RECOVERY
SAA = SAME AS ABOVE

DEPTH (FT)	SAMPLE (TYPE & NO.)	BLOWS ON SAMPLER (PER 6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED GRANULARITY (RSD)	NA WELL CONSTRUCTION	REMARKS
				0.0 - 7.5 FT WERE AUGERED WITH 8in HSA. BEGAN SAMPLING AT 7.5 FT.				
7.5	00503 1550 02-18-90	2	6	VERY LOOSE (10YR 8/2) VERY DARK GREYISH BROWN, CLAYEY SILT, TRACE OF SAND, SLIGHTLY MOIST TO MOIST.	ML	NA		HNU 0; α 0; γB 50
8.0	00504 1550 02-18-90	2	6	SAA	ML	NA		HNU 0; α 0; γB 50
8.5	00505 1550 02-18-90	2	3	SAA	ML	NA		HNU 0; α 0; γB 50
9.0	00506 1551 02-18-90	2	6	VERY LOOSE (10YR 4/2) VERY DARK GREYISH BROWN, CLAYEY SILT, SLIGHTLY MOIST TO MOIST	ML	NA		HNU 0; α 0; γB 50
CALCULATED 9.5	00507 1551 02-18-90	2	4	SAA	ML	NA		HNU 0; α 0; γB 50
DEPTH 10.0	00508 1551 02-18-90	2	0	NR	NA	NA		HNU NA; α NA; γB NA
OF PIPE 10.5	00509 1554 02-18-90	2	6	LOOSE, (10YR 4/2) DARK GREYISH BROWN, CLAYEY SILT, SLIGHTLY MOIST TO MOIST.	ML	NA		HNU 0; α 0; γB 50
11.0	00510 1554 02-18-90	2	6	LOOSE, (10YR 4/2) DARK GREYISH BROWN, SILTY SAND, TRACE OF GRAVEL, SLIGHTLY MOIST TO MOIST.	GM	NA		HNU 0; α 0; γB 50
11.5	00511 1554 02-18-90	3	1	LOOSE (10YR 4/2) DARK GREYISH BROWN, SANDY SILT, TRACE OF GRAVEL, SLIGHTLY MOIST TO MOIST.	ML	NA		HNU 0; α 0; γB 40
12.0	00512 1555 02-18-90	3	6	LOOSE (10YR 4/2) DARK GREYISH BROWN SILTY SAND, TRACE OF CLAY, SLIGHTLY MOIST TO MOIST	GM	NA		HNU 0; α 0; γB 60
12.5	00513 1555 02-18-90	3	6	(2") → SAA; (4") (10YR 5/2) GREYISH BROWN, FINE TO COARSE SAND SOME GRAVEL TRACE OF SILT, SLIGHTLY MOIST TO MOIST	2" GM 4" GW	NA		HNU 0; α 0; γB 60
13.0	00514 1555 02-18-90	5	0	NR	NA	NA		HNU NA; α NA; γB NA
13.5				END OF SAMPLING P/A				

NOTES: BOTTOM OF BORING @ 13.5 FT.

HOLE WAS BACKFILLED TO SURFACE WITH BENTONITE PELLETS

BACKGROUND
HNU 0 ppm
α 0 cpm
γB 20-60 cpm.

Drilling Contractor: PENN-DRILL
Drilling Equipment: MOBILE B-53
Driller: J. SACCANI
Asst: C. COULTER

MATERIALS USED:
2 BUCKETS BENTONITE

FERNALD
RI/FS

Date	2/4/90			
Initial	E.T.	853		
	Field Check	1st Rev In	2nd Rev In	Hard Copy Verification

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.9.31	PROJECT NAME: Outfall Pipeline FMPC RI/FS		
BORING NUMBER: 1532	COORDINATES:	DATE: 02-28-90	
ELEVATION: 536.8	GWL: Depth Date/Time	DATE STARTED: 2-19-90	
ENGINEER/GEOLOGIST: M. Garman	Depth Date/Time	DATE COMPLETED: 2-19-90	
DRILLING METHODS: Hollow Stem Auger		PAGE 1 OF 1	

SAA = SAME AS ABOVE
NR = NO RECOVERY

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED GRANULARITY (FT)	NA WELL CONSTRUCTION	REMARKS
				0.0 – 8.0 FT WERE AUGERED WITH 8 in HSA.				
				BEGAN SAMPLING AT 8.0 FT				
8.0	00529 1015 02-19-90	1	6	VERY LOOSE, (10YR 3/0) DARK BROWN, SILT, TRACE of clay, trace of sand, MOIST	ML	NA		HNU 0 ppm; ∝ 0; BB 40
8.5	00530 1015 02-19-90	1	6	SAA	ML	NA		HNU 0 ppm; ∝ 0; BB 40
9.0	00531 1015 02-19-90	1	4	SAA	ML	NA		HNU 0 ppm; ∝ 0; BB 40
9.5	00532 1016 02-19-90	1	6	SAA	ML	NA		HNU 0 ppm; ∝ 0; BB 60
10.0	00533 1016 02-19-90	1	6	SAA	ML	NA		HNU 0 ppm; ∝ 0; BB 60
10.5	00534 1016 02-19-90	1	0	NR	NA	NA		HNU NA; ∝ NA; BB
11.0	00535 1017 02-19-90	1	6	VERY LOOSE, (10YR 3/3) DARK BROWN, SILT TRACE OF CLAY, TRACE OF SAND, MOIST	ML	NA		HNU 0 ppm; ∝ 0; BB 60
11.5	00536 1017 02-19-90	1	6	SAA	ML	NA		HNU 0 ppm; ∝ 0; BB 60
12.0	00537 1017 02-19-90	1	1	VERY LOOSE, (10YR 4/2) DARK GREYISH BROWN CLAYEY SILT, TRACE of SAND, LOW MOISTURE	ML	NA		HNU 0 ppm; ∝ 0; BB 60
12.5	00538 1018 02-19-90	1	6	SAA	ML	NA		HNU 0 ppm; ∝ 0; BB 50
13.0	00539 1018 02-19-90	1	4	VERY LOOSE, (10YR 4/2) DARK GREYISH BROWN SILTY SAND, SOME GRAVEL, LOW MOISTURE	GM	NA		HNU 0 ppm; ∝ 0; BB 50
13.5	00540 1018 02-19-90	2	0	NR	NA	NA		HNU NA; ∝ NA; BB NA
14.0				END OF SAMPLING P/A				

ALTERNATED 8 H OF PIPE

NOTES.

BOTTOM OF BORING @ 14.0 FT.

HOLE WAS BACKFILLED TO SURFACE WITH BENTONITE PELLETS

Drilling Contractor: PENN-DRILL
Drilling Equipment: MOBILE B-
Driller: JIM SACANNI
Asst: CHRIS COULTER

MATERIALS USED: 2 BUCKETS BENTONITE

BACKGROUND
HNU 0 ppm
∝ 0 cpm
BB 20-60 cpm

FERNALD
RI/FS

Date	3/4/90	0853	
Initials	K.T.		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.9.31 | PROJECT NAME: Outfall Pipeline FMPC RI/FS
BORING NUMBER: 1537 | COORDINATES: | DATE: 02-19-90
ELEVATION: 537.6 | GWL: Depth Date/Time | DATE STARTED: 2-19-90
ENGINEER/GEOLOGIST: M. GARMAN | Depth Date/Time | DATE COMPLETED: 2-19-90
DRILLING METHODS: Hollowed Stem Auger | PAGE 1 OF 1

SAA = SAME AS ABOVE
NR = NO RECOVERY

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN	RECOVERY (%)	DESCRIPTION	USCS SYMBOL	MEASURED GROUNDWATER LEVEL	WELL CONSTRUCTION	REMARKS
				0.0 - 9.0 FT WERE AUGERED WITH 8 in HSA.				
9.0				BEGAN SAMPLING AT 9.0 FT				
9.5	00542 1351 02-19-90	3	5	LOOSE (10YR 3/2) VERY DARK GREYISH BROWN. CLAYEY SILT LOW MOISTURE	ML	NA		HNU 0, α 0, βB 60
10.0	00543 1351 02-19-90	4	0	NR	NA	NA		HNU NA, α NA, βB NA
10.5	00544 1351 02-19-90	2	0	NR	NA	NA		HNU NA, α NA, βB NA
11.0	00545 1352 02-19-90	1	6	LOOSE (10YR 3/2) VERY DARK GREYISH BROWN CLAYEY SILT, LOW MOISTURE. (TRACE SAND)	ML	NA		HNU 0, α 0, βB 60
11.5	00546 1352 02-19-90	1	6	SAA	ML	NA		HNU 0, α 0, βB 60
12.0	00547 1352 02-19-90	1	2	SAA	ML	NA		HNU 0, α 0, βB 60
12.5	00548 1355 02-19-90	4	6	LOOSE, (10YR 3/2) VERY DARK GREYISH BROWN CLAYEY SILT, TRACE OF SAND, MOIST. (3") → SAA	ML	NA		HNU 0, α 0, βB 60
13.0	00549 1355 02-19-90	5	6	(3') LOOSE (10YR 5/2) Greyish brown, sandy GRAVEL, TRACE SILT, MOIST.	3" ML / 3' GW	NA		HNU 0, α 0, βB 60
13.5	00550 1355 02-19-90	7	2	SAA	GW	NA		HNU 0, α 0, βB 60
14.0	00551 1359 02-19-90	7	6	SAA	GW	NA		HNU 0, α 0, βB 40
14.5	00552 1359 02-19-90	21	6	SAA	GW	NA		HNU 0, α 0, βB 40
15.0	00553 1359 02-19-90	15	0	NR	NA	NA		HNU NA, α NA, βB NA
				END OF SAMPLING PA				

CALCULATED DEPTH OF PIPE

NOTES: BOTTOM OF BORING @ 15.0 FT.

Drilling Contractor: PENN-DRILL
Drilling Equipment: MOBILE B-53
Driller: JIM JACANNI
Asst: CHRIS COULTER

HOLE WAS BACKFILLED TO SURFACE WITH BENTONITE PELLETS

BACKGROUND
HNU = 0 ppm
α = 0 cpm
βB = 20-80 cpm

MATERIALS USED: 2 BUCKETS BENTONITE

FERNALD
RI/FS

853

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602.9.31	PROJECT NAME OUTFALL PIPELINE FMPC-RI/FS		
BORING NUMBER 1533 DUPLICATE	COORDINATES		DATE 02-19-90
ELEVATION 537.6	GWL: Depth	Date/Time	DATE STARTED 2-19-90
ENGINEER/GEOLOGIST M. Garman	Depth	Date/Time	DATE COMPLETED 2-19-90
DRILLING METHODS Hollow-Stem Auger			PAGE 1 OF 1

SAA = SAME AS ABOVE
NR = NO RECOVERY

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED GROUNDWATER (FT)	NA WELL CONSTRUCTION	REMARKS
				0.0 - 9.0 FT WERE AUGERED				
9.0				BEGAN SAMPLING AT 9.0 FT				
9.5	00555 1515 02-19-90	2	6	VERY LOOSE (10YR 3/3) DARK BROWN, CLAYEY SILT, TRACE OF SAND LOW MOISTURE	ML	NA		HNU 0, α 0, γB 50
10.0	00556 1515 02-19-90	1	6	SAA	ML	NA		HNU 0, α 0, γB 50
10.5	00557 1515 02-19-90	2	6	SAA	ML	NA		HNU 0, α 0, γB 50
11.0	00558 1516 02-19-90	2	6	SAA	ML	NA		HNU 0, α 0, γB 60
11.5	00559 1516 02-19-90	3	6	SAA	ML	NA		HNU 0, α 0, γB 60
12.0	00560 1516 02-19-90	3	3	SAA	ML	NA		HNU 0, α 0, γB 60
12.5	00561 1518 02-19-90	3	6	VERY LOOSE (10YR 3/3) DARK BROWN CLAYEY SILT, TRACE SAND, MOIST.	ML	NA		HNU 0, α 0, γB 50
13.0	00562 1518 02-19-90	3	2	VERY LOOSE (10YR 3/3) DARK BROWN CLAYEY SILT, TRACE OF SAND AND GRAVEL MOIST.	ML	NA		HNU 0, α 0, γB 50
13.5	00563 1518 02-19-90	3	0	NR	NA	NA		HNU NA, α NA, γB NA
14.0	00564 1520 02-19-90	3	5	MEDIUM DENSE, (10YR 5/2) GREYISH BROWN SANDY GRAVEL, TRACE OF SILT, LOW MOISTURE — well graded	GW	NA		HNU 0, α 0, γB 50
14.5	00565 1520 02-19-90	9	0	NR	NA	NA		HNU NA, α NA, γB NA
15.0	00566 1520 02-19-90	4	0	NR	NA	NA		HNU NA, α NA, γB NA
				END OF SAMPLING PIA BOTTOM OF BORING @ 15.0 FT.				

ESTIMATED DEPTH OF PIPE

NOTES.

Drilling Contractor PENN DRILL

Drilling Equipment MOBILE B-53

Driller: JIM SPCANNI
CHRIS COULTER

HOLE WAS BACKFILLED TO SURFACE WITH BENTONITE PELLETS

BACKGROUND
HNU = 0 ppm
α = 0 cpm
γB = 20-80 cpm

MATERIALS USED: 2 BUCKETS BENTONITE