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5397

REMEDIAL INVESTIGATION AND FEASIBILITY STUDY MONTHLY TECHNICAL PROGRESS REPORT MARCH 1989

03/01/89

DOE-FMPC/EPA
60
REPORT

5397

REMEDIAL INVESTIGATION

AND

FEASIBILITY STUDY

MONTHLY TECHNICAL PROGRESS REPORT

MARCH 1989

FEED MATERIALS PRODUCTION CENTER
FERNALD, OHIO

01

FMPC SITEWIDE RI/FS
March 1989
MONTHLY TECHNICAL PROGRESS REPORT

STATUS

General

Progressive actions continued on the FMPC sitewide RI/FS during March 1989. Drilling activities were completed on the proposed 24 additional on-site wells. The installation of 10 off-site wells and the two facilities testing wells continued. Five wells were completed during March. One cable tool drill rig and two auger rigs are currently in operation. The two auger rigs are being used for the Facilities Testing program.

The fourth quarterly groundwater sampling program was completed during March.

A meeting was held at the OEPA office in Columbus, Ohio on March 30, 1989 to discuss interim removal activities and other FFCA related action items. A working meeting has been scheduled for April 25, 1989 to discuss schedules for the interim removal activities and the operable units.

Task 1 - Description of Current Situation

Task 1 Percent Complete: 100%

Task 2 - Remedial Investigation Work Plan Requirements

DOE directed that the Facilities Testing Work Plan and the Feasibility Study Work Plan be implemented while awaiting USEPA and OEPA comments on the plans.

Task 2 Percent Complete: 95%

Task 3 - Site Investigation

Groundwater and Subsurface Soils - Four drilling rigs were in use for the 24 onsite wells program, which was completed in March with the completion of five additional wells. Table 3-1 lists the five onsite wells that were completed and the off-site well (#2002) in progress. Tables 3-2 and 3-3 provide additional data on the wells which were installed and the wells being developed for sampling. The off-site well drilling program continues, with the FMPC working diligently to obtain license agreements for all the off-site wells.

TABLE 3-1

WELL DRILLING PROGRESS

WELL NO.	DATE	WELL DEPTH
2107	3/10/89	58.7
2127	3/11/89	19.95
3127	3/13/89	67.3
2055	3/19/89	79.7
2007	3/21/89	71.7
2002	In Progress	

Seventy-four of the 192 wells installed and developed by March 31 were sampled to complete the fourth round of groundwater sampling. Samples are currently being analyzed.

Transit Survey - Surveying activities continued on establishing the horizontal and vertical coordinates of the completed wells.

Radiation Measurement Survey - No field activity.

Surface Water and Sediment Sampling - Sediment sampling was conducted on drainage ditches throughout the FMPC which contained water, including some which flow into Paddy's Run. No surface water sampling was conducted, as it is conducted only during sudden storm events.

Facilities Testing - During the reporting period, work resumed on the implementation of the Facilities Testing Plan, with the installation of two 2000-series wells in Sector 2 and additional borings around Plant 6. These wells are in the process of being developed. Subsequent sectors in the production area will be investigated as specified in the Work Plan.

Biological Resources - A meeting was held March 23 to discuss internal review comments on the draft reports for the acute and chronic testing and benthic macroinvertebrate community studies conducted in the Fall, 1988. Comments are being incorporated.

Task 3 Percent Complete: 92% * through Rev 3
42% * post Rev 3

*does not include Facilities Testing

Well Drilling Program Activity Table

WELL DRILLING PROGRAM ACTIVITY

MARCH 1989

Well Number	Date Started	Date Completed	Bottom of Boring	Screened Interval	Water Level/Date	Approximate Surface Elevation	Depth to Blue Clay/ Thickness
3127	02/26/89	03/13/89	70.0	55.5-65.5	9.55/3-01-89	550.1	Not Present
2107	02/28/89	03/10/89	65.0	42.0-57.0	47.2/3-08-89	568.6	NK
2007*	03/01/89	03/21/89	75.0	55.0-70.0	60.5/3-14-89	NK	NK
2127	03/10/89	03/11/89	19.9	18.2-8.2	9.2/3-11-89	550.1	NK
2055	03/10/89	03/19/89	81.5	63.0-78.0	68.2/3-13-89	589.0	NK

*Facility Testing Boring

Installation of Facility Testing Boring #2006 will not commence until April 25th, due to construction activity at the propsed drill site.

34-WELL PROGRAM

WELL DEVELOPMENT COMPLETED DURING MARCH 1989

Well Number	Date Started	Date Finished	Total Gallons Purged	Final Turbidity (NTU)
4010	03-02-89	03-10-89	10,750	1.3
3107	03-11-89	03-13-89	5,060	4.5
2107	03-14-89	03-14-89	1,550	1.6
3108	03-19-89	03-21-89	5,050	1.5
2108	03-22-89	03-22-89	1,300	1.3
3127	03-28-89	03-29-89	3,555	3.6

Task 4 - Site Investigation Analysis

Database - The Level 1 validation of laboratory data continued in accordance with agreements and assignments resulting from the Data Management Task Force meeting held in March.

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

Database capability for the Facilities Testing Program was initiated. Field forms having pre-programmed sample, well, and sector identification were completed to assist field teams in managing well- and sample-related information.

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

Task 4 Percent Complete: 75% through Rev 3
0% post Rev 3

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

The task teams for conducting benchscale testing to support Operable Units K-65 and the South Plume have been assembled. A vitrification alternative for the K-65 Silos is currently being investigated.

Tasks 5 and 6 Percent Complete: 0%

Task 7 - Program Management and Reports

7.1 Program Management

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

- FMPC FFCA Status Meeting

7.2 Quality Assurance

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

- Continued effort for closing of open audits, surveillances and nonconformances.
- Maintain field Quality Assurance on field activities through monitoring and surveillances.

- Approved DCRs are being prepared to issue to controlled copy holders.

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

7.3 Health and Safety

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

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

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

Task 7 Percent Complete: Not applicable (apportioned effort)

Task 8 - Community Relations Support

The final report on the January 31, 1989 public meeting is under review. Distribution will be accomplished in April.

Two additional activities have occurred since then:

1. On March 27, DOE and support contractors attended a meeting with USEPA to plan for the next community meeting. During that meeting, USEPA suggested revising the entire FMPC Community Relations Plan by mid-summer. As a result, a top-level scope of work, and a schedule with staffing requirements, have been prepared and are under review.

2. Planning is underway for the next community meeting, scheduled by USEPA for May 15, 1989. A team of technical experts and community relations specialists met in mid-March to draft the agenda, which USEPA has commented on. ASI has:

   (a) Prepared a detailed schedule and staffing responsibility;
   (b) Contacted WMCO for logistics support; and
   (c) Begun drafting the first of three fact sheets to be disseminated at the May 15 meeting.

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

Task 10 - Feasibility Study Work Plan

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

Task 10 Percent Complete: 95%

Task 11 - Remedial Technology Alternatives

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

Task 11 Percent Complete: 95%

Task 12 - Initial Screening of Alternatives

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

Task 12 Percent Complete: 5%

DIFFICULTIES ENCOUNTERED

None

ACTION TAKEN TO RECTIFY PROBLEMS

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

PLANNED ACTIVITIES FOR NEXT MONTH

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

ATTACHMENT 1

FERNALD
RI/FS

-. 5997

	Initial	Date
Field Check	JAH	3-27-89
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 2107	COORDINATES:	DATE: 03-10-89
ELEVATION: ~569.6 G.L.	GWL: Depth 47.2 ft Date/Time 03-09-89 0900	DATE STARTED: 02-28-89
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 03-10-89
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 3

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				SEE VISUAL CLASSIFICATION OF SOILS FOR BORING #3107 FOR DETAILED DESCRIPTION OF DRILLED INTERVAL.			
15							
30							
45							
60				BOTTOM OF BORING @ 65.0			
75							

0 11

NOTES: CONTRACTOR: PENN DRILL
RIG: BUCYRUS-ERIE
DRILLER: DAVE NEWMAN
ASSISTANT: BILL ANDERSON

BACKGROUND LEVELS: α = 0 CPM
BB = 40-60 CPM
LEL = 0 PPM
O_2 = 20.6%
HNU = 0 PPM

TOTAL WATER USED DURING DRILLING & WELL INSTALLATION: 250 GAL

402-1

CONSISTENCY OF COHESIVE SOILS

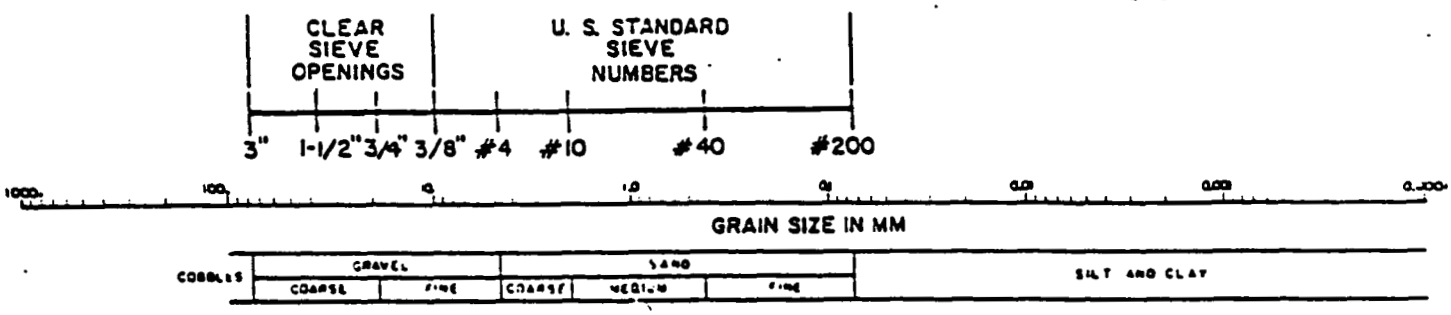
CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (TONS PER SQUARE FOOT)
VERY SOFT	LESS THAN 0.25
SOFT	0.25 TO 0.50
MEDIUM STIFF	0.50 TO 1.0
STIFF	1.0 TO 2.0
VERY STIFF	2.0 TO 4.0
HARD	MORE THAN 4.0

DENSITY OF GRANULAR SOILS

DENSITY	STANDARD PENETRATION RESISTANCE(1)
VERY LOOSE	0 – 4
LOOSE	5 – 10
MEDIUM DENSE	11 – 30
DENSE	31 – 50
VERY DENSE	OVER 50

(1) STANDARD PENETRATION RESISTANCE IS THE NUMBER OF BLOWS REQUIRED TO DRIVE A 2-INCH O.D. SPLIT BARREL SAMPLER 12 INCHES USING A 140-POUND HAMMER FALLING FREELY THROUGH 30 INCHES. THE SAMPLER IS DRIVEN 18 INCHES AND THE NUMBER OF BLOWS RECORDED FOR EACH 6-INCH INTERVAL. THE SUMMATION OF THE FINAL TWO INTERVALS IS THE STANDARD PENETRATION RESISTANCE.

5997



USCS CLASSIFICATION FOR SOILS

COARSE-GRAINED SOILS

CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
	GC	CLAYEY GRAVELS GRAVEL-SAND-CLAY MIXTURES
CLEAN SANDS (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
	SC	CLAYEY SANDS, SAND-CLAY MIXTURES

FINE-GRAINED/HIGHLY ORGANIC SOILS

SILTS AND CLAYS LIQUID LIMIT (LESS THAN 50)	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
SILTS AND CLAYS LIQUID LIMIT (GREATER THAN 50)	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS
	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

	Initial	Date
Field Check	WAH	3-27-89
1st Key In		
2nd Key In		
Hard Copy Verification		

2 of 2

FERNALD RI/FS

-5997

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. M. Sluzarski DATE 03-10-89
PROJECT NO. 602 3.2 CHECKED BY W.A. Hertel DATE 3-27-89
BORING NO. 2107
PIEZOMETER NO. 2107 DATE OF INSTALLATION 03-10-89

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM 0.0 FT. TO 65.0 FT.
FLUID — FROM — TO —

TYPE OF BIT Hammer
CASING SIZE (S) USED:
SIZE 10 in ID. 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 ☐ 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 2.0 FT, 10.0 FT, 16.7 FT.
JOINING METHOD Screw type, 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 w/ padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 33.0	TOP	BOTTOM
BENTONITE	TOP 33.0	BOTTOM 38.0	TOP	BOTTOM
SAND (10-20)	TOP 38.0	BOTTOM 63.0	TOP	BOTTOM
GRAVEL N/A	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 42.0	BOTTOM 57.0	TOP	BOTTOM
PIEZOMETER TIP	58.7 FT.			
BOTTOM OF BOREHOLE	65.0 FT.		0 13	
GWL AFTER INSTALLATION				

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

REMARKS Open hole section of borehole from 65.0 FT to 63.0 FT was allowed to collapse on itself. Two (2) buckets of bentonite pellets were poured around protective hole cover @ surface to serve as packing material & seal.

409-11-86

TEST EQUIPMENT LIST

TEST_____

EQUIPMENT NUMBER	EQUIPMENT NAME

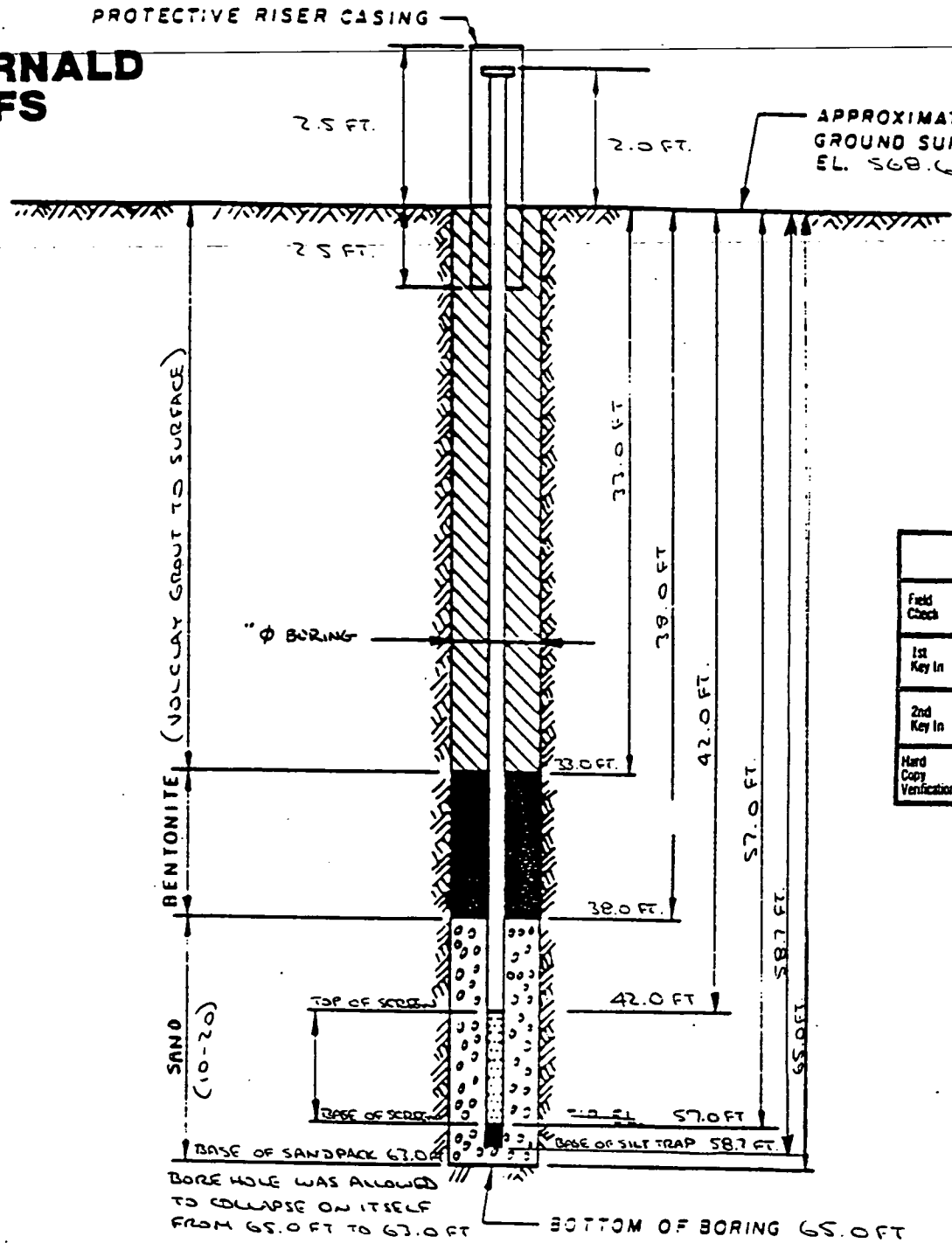
NOTE:

THIS LIST SHALL BE COMPLETED FOR ALL TESTS, ONLY EQUIPMENT SUBJECT TO CALIBRATION NEED BE LISTED.

5897

MW-2107

FERNALD RI/FS



	Initial	Date
Field Check	VAH	3-27-89
1st Key In		
2nd Key In		
Hard Copy Verification		

DRAWN BY	MLS.	CHECKED BY	VAH	3-27-89	DRAWING NUMBER
		APPROVED BY			

NOTES:

1. RISER PIPE IS IN 10 SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN 1.0 SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL 47.2 FT.
5. WATER LEVEL READING ON 03-08-89, 0900

MATERIALS USED IN WELL INSTALLATION:

10-20 SAND: 16 (80LB SKS)

BENTONITE PELLETS: 17 BUCKETS (5 GAL)

VOLCLAY GROUT: 7 (50 LB SKS)

0 15

INSTALLATION DETAILS
MONITORING WELL 2107

PREPARED FOR

RISER PIPE MATERIAL:

2 - 2.0 FT. SS SECTIONS

4 - 10.0 FT. SS SECTIONS

1 - ~~10.0~~ 16.7 FT. SCREEN/SILT TRAP

MLS. 03-10-89

TOTAL WATER USED IN WELL INSTALLATION & DRILLING: 250 GALLONS

FERNALD RI/FS

- 5397

	Initial	Date
Field Check	E.T.	3/22/89
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: Fernald RI FS		
BORING NUMBER: 2007	COORDINATES:	DATE: 3-1-89	
ELEVATION:	GWL: Depth 60.9 Date/Time 3-13/1100	DATE STARTED: 3-1-89	
ENGINEER/GEOLOGIST: L. Adams	Depth 60.5 Date/Time 3-14/0835	DATE COMPLETED: 03-13-89	
DRILLING METHODS: Cable Tool		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	10770 1340 3-1-89	12 11 8	6 in.	~~Very si~~ loose Medium dense, silty gravel (gravel mostly from surface cover.) Yellowish brown 10yr 5/3. Damp.	GP	N/A	Hnu = Bkg α = 0 cpm βγ = 800 cpm
2 3	10771 1345 3-1-89	5 8 13	12 - - - 1	Stiff, greenish gray silty clay (5yr 5/2) trace gravel, damp. Dense, brown well graded sand, trace gravel. damp (10yr 4/4)	CL - - - SW	2.0	Hnu = 0 ppm α = 0 cpm βγ = 80-100 cpm
4	10772 1350 3-1-89	13 14 15	11 - - - 5	very stiff, ~~brown~~ LA dark greenish gray clay (5yr 4/2) Damp. med. dense, well sorted sand. Brown (10yr 4/3)	CL - - - SW	3.0	Hnu = 0 ppm α = 0 cpm βγ = 80-100 cpm
5 6	10773 1525 3-1-89	5 12 18	13	Hard, dark gray (5yr 4/1) clay, trace gravel, (gravel .20 in.) damp. Sample has a slight acidic odor. Some silt present.	CL	LA ~~2.25~~ 4.25	Hnu = 0-4 ppm α = 0 cpm βγ = 80-100 cpm
7	10774 1530 3-1-89	20 21 20	16	Very stiff, very dark gray (5yr 3/1) silty clay with organics (wood pieces) present. Gravel (.5 in) present. Wet.	OL	LA ~~2.75~~ 2.25	Hnu = 0-4 ppm α = 0 cpm βγ = 80 cpm
8 9	10775 1605 3-1-89	1 3 10	13 ~~16~~ LA 3	Very stiff, Brownish yellow silty clay (10yr 4/5) gradually becoming greenish gray (5yr 5/2). Damp. Greenish gray (5yr 5/2) sandy silty clay with organics (wood) present. Very soft, wet.	CL - - OH	2.75	Hnu = .2 ppm α = 0 cpm βγ = 80 cpm
10	10776 1610 3-1-89	2 20 18	18	Hard, yellow brown clay (10yr 4/5) with gravel present (trace). Gravel to .5 in. Damp	CL	4.5+	Hnu = 2.5 ppm α = 0 cpm βγ = 80 cpm
11	10777 1655 3-1-89	8 15 19	13	Very stiff, greenish gray (5yr 5/2) clay with organics present (wood.) Damp	OL	3.75	Hnu = 0 ppm α = 0 cpm βγ = 80 cpm
12 13	10778 1325 03-11	2 6 9	8	VERY STIFF, GREENISH-GRAY (5Y 4/1) CLAY, TRACE GRAVEL (.25 IN) DAMP	CL	3.75	Hnu = 0 PPM (WMCO METER) 44237 α = 0 CPM βγ = 80 CPM
14	10779 1440 03-11	4 9 13	6	VERY STIFF, GREENISH GREY (5Y 4/1) CLAY, SOME GRAVEL (.25-.50 IN) DAMP	CL	4.0	Hnu = 0 PPM α = 0 CPM βγ = 80-100 CPM

NOTES: Contractor: Penn Drill
Rig: Cyclone Model #42
Driller: Craig Coulter
Assistant: Chris Coulter

Samples collected as per ASTM Standard Penetration Test. Colors identified using Munsell Color Chart.

Background Levels: Hnu = 0-2 ppm
α = 0-1 cpm
βγ = 80-100 cpm
LEL O_2 = 0%
= 20.2 % O_2

WATER ADDED TO BOREHOLE DURING DRILLING ACTIVITIES: 700 GAL.
TOTAL WATER ADDED DURING DRILLING & COMPLETION ACTIVITIES: 920 GAL.

0 16

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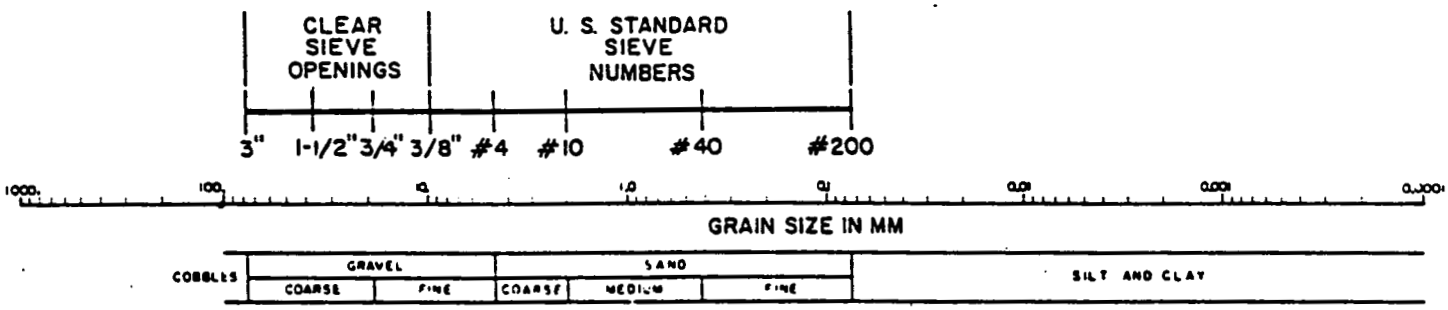
CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (TONS PER SQUARE FOOT)
VERY SOFT	LESS THAN 0.25
SOFT	0.25 TO 0.50
MEDIUM STIFF	0.50 TO 1.0
STIFF	1.0 TO 2.0
VERY STIFF	2.0 TO 4.0
HARD	MORE THAN 4.0

DENSITY OF GRANULAR SOILS

DENSITY	STANDARD PENETRATION RESISTANCE(1)
VERY LOOSE	0 – 4
LOOSE	5 – 10
MEDIUM DENSE	11 – 30
DENSE	31 – 50
VERY DENSE	OVER 50

(1) STANDARD PENETRATION RESISTANCE IS THE NUMBER OF BLOWS REQUIRED TO DRIVE A 2-INCH O.D. SPLIT BARREL SAMPLER 12 INCHES USING A 140-POUND HAMMER FALLING FREELY THROUGH 30 INCHES. THE SAMPLER IS DRIVEN 18 INCHES AND THE NUMBER OF BLOWS RECORDED FOR EACH 6-INCH INTERVAL. THE SUMMATION OF THE FINAL TWO INTERVALS IS THE STANDARD PENETRATION RESISTANCE.



USCS CLASSIFICATION FOR SOILS

COARSE-GRAINED SOILS

CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
	GC	CLAYEY GRAVELS GRAVEL-SAND-CLAY MIXTURES
CLEAN SANDS (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
	SC	CLAYEY SANDS, SAND-CLAY MIXTURES

FINE-GRAINED/HIGHLY ORGANIC SOILS

SILTS AND CLAYS LIQUID LIMIT (LESS THAN 50)	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
SILTS AND CLAYS LIQUID LIMIT (GREATER THAN 50)	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS
	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 2007	COORDINATES:	DATE: 03-11-89 / 03-12-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03-01-89
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 03-13-89
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 5

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	10780 1500 03-11	2 4 7	4	VERY STIFF, GREENISH-GREY (5Y 4/1) CLAY, SOME GRAVEL (.25-.75 IN), TRACE SAND, DAMP	CL	4.0	HNU = 0 PPM α = 0 CPM Bγ = 80 CPM
17 18	10781 1520 03-11	2 6 7	4	MEDIUM STIFF, GREENISH-GREY (5Y 4/1) CLAY, SOME GRAVEL (.25-.75 IN), TRACE SAND, WET	CL	2.0	HNU = 0 PPM α = 0 CPM Bγ = 80 CPM
19	10782 1540 03-11	3 5 7	14	STIFF, GREENISH-GREY (5Y 4/1) CLAY, TRACE GRAVEL (.25 IN) TRACE SAND WET	CL	1.5	HNU = 0 PPM α = 0 CPM Bγ = 80 CPM
20 21	10783 1555 03-11	2 4 5	12	MEDIUM STIFF, GREENISH-GREY (5Y 4/1) CLAY, TRACE GRAVEL (.25 IN) WET	CL	.75	HNU = 0 PPM α = 0 CPM Bγ = 80 CPM
22	10784 1615 03-11	25 35 50/5	12	VERY STIFF, GREENISH-GREY (5Y 4/1) CLAY, SOME GRAVEL (.25-.50 IN) TRACE SAND, DAMP	CL	4.0+	HNU = 0 PPM α = 0 CPM Bγ = 80 CPM
23 24	10785 1645 03-11	19 50 61	14	HARD, GREENISH-GREY (5Y 4/1) CLAY SOME GRAVEL (.25-.50 IN), TRACE SAND, DAMP	CL	4.0+	HNU = 0 PPM α = 0 CPM Bγ = 80 CPM
25	10786 0840 03-12	16 35 50/3	12	VERY STIFF, GREENISH-GREY (5Y 4/1) CLAY, SOME GRAVEL (.25-.50 IN) TRACE SAND,	CL	3.5	HNU = 0 PPM α = 0 CPM Bγ = 80 CPM
26 27	10787 0900 03-12	10 18 32	12	STIFF, GREENISH-GREY (5Y 4/1) CLAY TRACE GRAVEL (.25 IN), TRACE OF SAND, DAMP	CL	3.5	HNU = 0 PPM α = 0 CPM Bγ = 80 CPM
28	10788 0925 03-12	14 16 16	10	STIFF, GREENISH-GREY (5Y 4/1) CLAY TRACE GRAVEL (.25 IN), TRACE SAND, DAMP (SAME AS ABOVE)	CL	2.0	HNU = 0 PPM α = 0 CPM Bγ = 80 CPM
29	10789 0935 03-12	3 3 7	12	"BASE OF TILL" LOOSE, YELLOW-BROWN (10YR 5/6) POORLY GRADED SAND, TRACE GRAVEL (.25-.50 IN) DRY 29.8	CL SP	2.0 N/A	HNU = 0 PPM α = 0 CPM Bγ = 80 CPM

NOTES:

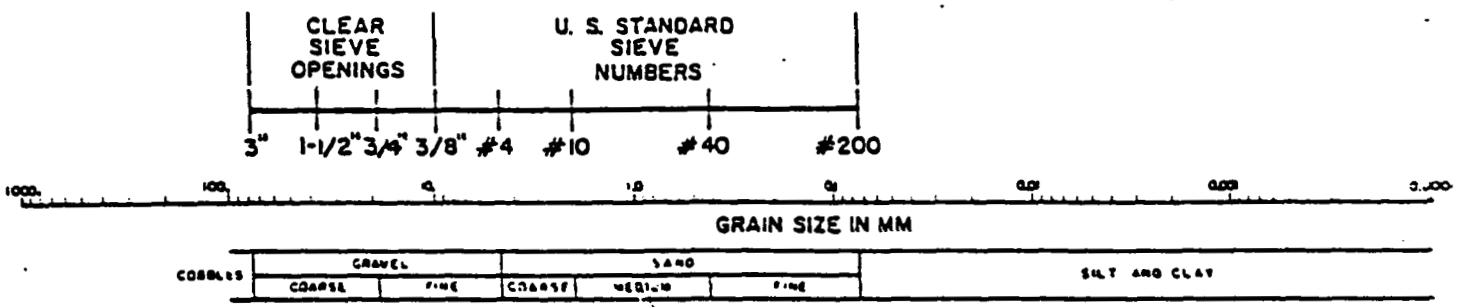
CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (TONS PER SQUARE FOOT)
VERY SOFT	LESS THAN 0.25
SOFT	0.25 TO 0.50
MEDIUM STIFF	0.50 TO 1.0
STIFF	1.0 TO 2.0
VERY STIFF	2.0 TO 4.0
HARD	MORE THAN 4.0

DENSITY OF GRANULAR SOILS

DENSITY	STANDARD PENETRATION RESISTANCE(1)
VERY LOOSE	0 – 4
LOOSE	5 – 10
MEDIUM DENSE	11 – 30
DENSE	31 – 50
VERY DENSE	OVER 50

(1) STANDARD PENETRATION RESISTANCE IS THE NUMBER OF BLOWS REQUIRED TO DRIVE A 2-INCH O.D. SPLIT BARREL SAMPLER 12 INCHES USING A 140-POUND HAMMER FALLING FREELY THROUGH 30 INCHES. THE SAMPLER IS DRIVEN 18 INCHES AND THE NUMBER OF BLOWS RECORDED FOR EACH 6-INCH INTERVAL. THE SUMMATION OF THE FINAL TWO INTERVALS IS THE STANDARD PENETRATION RESISTANCE.



USCS CLASSIFICATION FOR SOILS

COARSE-GRAINED SOILS

CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
	GC	CLAYEY GRAVELS GRAVEL-SAND-CLAY MIXTURES
CLEAN SANDS (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
	SC	CLAYEY SANDS, SAND-CLAY MIXTURES

FINE-GRAINED/HIGHLY ORGANIC SOILS

SILTS AND CLAYS LIQUID LIMIT (LESS THAN 50)	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
SILTS AND CLAYS LIQUID LIMIT (GREATER THAN 50)	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS
	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 2007	COORDINATES:	DATE: 03-12-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03-01-89
ENGINEER/GEOLOGIST: M SLUSARSKI	Depth Date/Time	DATE COMPLETED: 03-13-89
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 5

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31							
32							
33							
34							
35							
36	10790 1020 03-12	2 40 50/3	10	VERY DENSE, YELLOW-BROWN (10YR 5/6) POORLY GRADED FINE SAND, TRACE GRAVEL (.25 IN) DRY	SP	N/A	HNU = 0 PPM α = 0 CPM Bβ = 40-60 CPM
37							
38							
39							
40							
41	10791 1045 03-12	30 50 50	12	VERY DENSE, YELLOW-BROWN (10YR 5/4) WELL GRADED GRAVELLY SAND, GRAVEL RANGING FROM (.25-1.0 IN) DRY	SW	N/A	HNU = 0 PPM α = 0 CPM Bβ = 40-60 CPM
42							
43							
44							

NOTES:

0 20

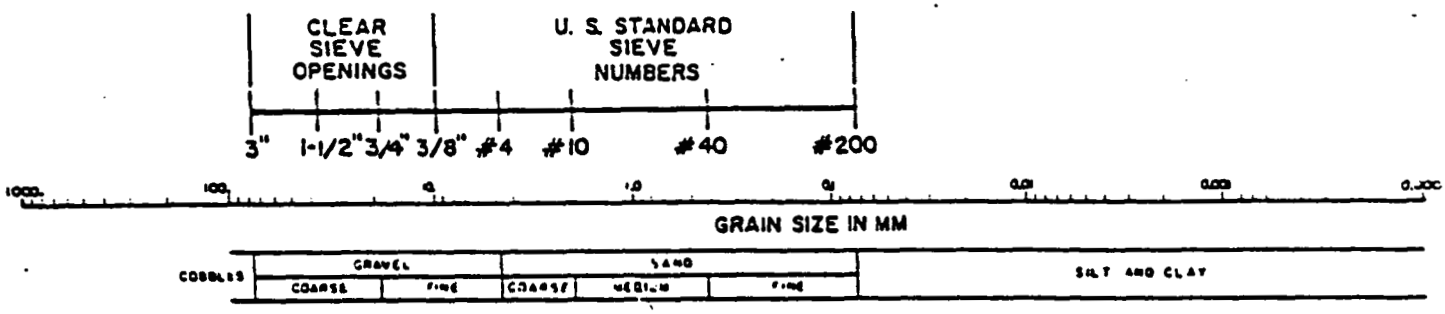
CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (TONS PER SQUARE FOOT)
VERY SOFT	LESS THAN 0.25
SOFT	0.25 TO 0.50
MEDIUM STIFF	0.50 TO 1.0
STIFF	1.0 TO 2.0
VERY STIFF	2.0 TO 4.0
HARD	MORE THAN 4.0

DENSITY OF GRANULAR SOILS

DENSITY	STANDARD PENETRATION RESISTANCE(1)
VERY LOOSE	0 – 4
LOOSE	5 – 10
MEDIUM DENSE	11 – 30
DENSE	31 – 50
VERY DENSE	OVER 50

(1) STANDARD PENETRATION RESISTANCE IS THE NUMBER OF BLOWS REQUIRED TO DRIVE A 2-INCH O.D. SPLIT BARREL SAMPLER 12 INCHES USING A 140-POUND HAMMER FALLING FREELY THROUGH 30 INCHES. THE SAMPLER IS DRIVEN 18 INCHES AND THE NUMBER OF BLOWS RECORDED FOR EACH 6-INCH INTERVAL. THE SUMMATION OF THE FINAL TWO INTERVALS IS THE STANDARD PENETRATION RESISTANCE.



USCS CLASSIFICATION FOR SOILS

COARSE-GRAINED SOILS

CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
	GC	CLAYEY GRAVELS GRAVEL-SAND-CLAY MIXTURES
CLEAN SANDS (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
	SC	CLAYEY SANDS, SAND-CLAY MIXTURES

FINE-GRAINED/HIGHLY ORGANIC SOILS

SILTS AND CLAYS LIQUID LIMIT (LESS THAN 50)	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
SILTS AND CLAYS LIQUID LIMIT (GREATER THAN 50)	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS
	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

FERNALD RI/FS

5397

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 2007	COORDINATES:	DATE: 03-12-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 03-01-89
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth Date/Time	DATE COMPLETED: 03-13-89
DRILLING METHODS: CABLE TOOL		PAGE 4 OF 5

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	10792 1405 03-12	19 50/3	7	VERY DENSE, YELLOW-BROWN (10YR 5/4) POORLY GRADED SAND, TRACE GRAVEL (.50-.75 IN) DRY	SP	N/A	HNU = 0 PPM α = 0 CPM βγ = 80 CPM
47							
48							
49							
50							
51	10793 1430 03-12	25 50 50/3	14	VERY DENSE, YELLOW-BROWN (10YR 5/4) WELL GRADED GRAVEL-SAND MIXTURE, WET	GW	N/A	HNU = 0 PPM α = 0 CPM βγ = 80 CPM
52							
53							
54							
55	10794 1550 03-12	16 50 50/1	10	VERY DENSE, YELLOW-BROWN (10YR 5/4) WELL GRADED GRAVELLY SAND, WET	SW	N/A	HNU = 0 PPM α = 0 CPM βγ = 80 CPM
56							
57							
58							
59							

NOTES:

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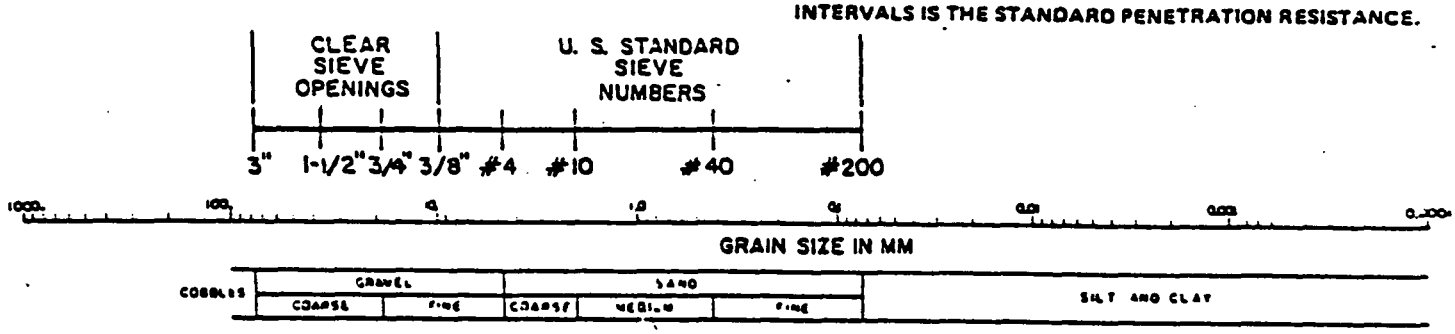
CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (TONS PER SQUARE FOOT)
VERY SOFT	LESS THAN 0.25
SOFT	0.25 TO 0.50
MEDIUM STIFF	0.50 TO 1.0
STIFF	1.0 TO 2.0
VERY STIFF	2.0 TO 4.0
HARD	MORE THAN 4.0

DENSITY OF GRANULAR SOILS

DENSITY	STANDARD PENETRATION RESISTANCE(1)
VERY LOOSE	0 – 4
LOOSE	5 – 10
MEDIUM DENSE	11 – 30
DENSE	31 – 50
VERY DENSE	OVER 50

(1) STANDARD PENETRATION RESISTANCE IS THE NUMBER OF BLOWS REQUIRED TO DRIVE A 2-INCH O.D. SPLIT BARREL SAMPLER 12 INCHES USING A 140-POUND HAMMER FALLING FREELY THROUGH 30 INCHES. THE SAMPLER IS DRIVEN 18 INCHES AND THE NUMBER OF BLOWS RECORDED FOR EACH 6-INCH INTERVAL. THE SUMMATION OF THE FINAL TWO INTERVALS IS THE STANDARD PENETRATION RESISTANCE.



USCS CLASSIFICATION FOR SOILS

COARSE-GRAINED SOILS

CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
	GC	CLAYEY GRAVELS GRAVEL-SAND-CLAY MIXTURES
CLEAN SANDS (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
	SC	CLAYEY SANDS, SAND-CLAY MIXTURES

FINE-GRAINED/HIGHLY ORGANIC SOILS

SILTS AND CLAYS LIQUID LIMIT (LESS THAN 50)	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
SILTS AND CLAYS LIQUID LIMIT (GREATER THAN 50)	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS
	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 2007	COORDINATES:	DATE: 03-12-89/03-13-9
ELEVATION:	GWL: Depth 60.9 Date/Time 03-13-89, 1100	DATE STARTED: 03-01-89
ENGINEER/GEOLOGIST: M.SLUSARSKI	Depth 60.5 Date/Time 03-14-89, 0815	DATE COMPLETED: 03-13-89
DRILLING METHODS: CABLE TOOL		PAGE 5 OF 5

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	10795 1640 03-12	23 50/1	9	VERY DENSE, GREY (10YR 5/1) POORLY SORTED SAND, TRACE GRAVEL (.25 IN) WET	SP	N/A	HNU = 0 PPM α = 0 CPM Bβ = 80 CPM
62							
63							
64							
65	10796 0935 03-13	19 32 35	12	VERY DENSE, GREY (10YR 5/1) WELL GRADED GRAVELLY SAND, GRAVEL RANGING FROM (.25 - .75 IN) WET	SW	N/A	HNU = 0 PPM α = 0 CPM Bβ = 60 CPM
66							
67							
68							
69							
70	10797 1035 03-13	19 31 32	14	VERY DENSE, GREY (10YR 5/1) WELL GRADED GRAVELLY SAND, GRAVEL RANGING FROM (.25 - 1.0 IN) WET	SW	N/A	HNU = 0 PPM α = 0 CPM Bβ = 60 CPM
71							
72							
73							
74				"BOTTOM OF BORING" 75.0			

NOTES:

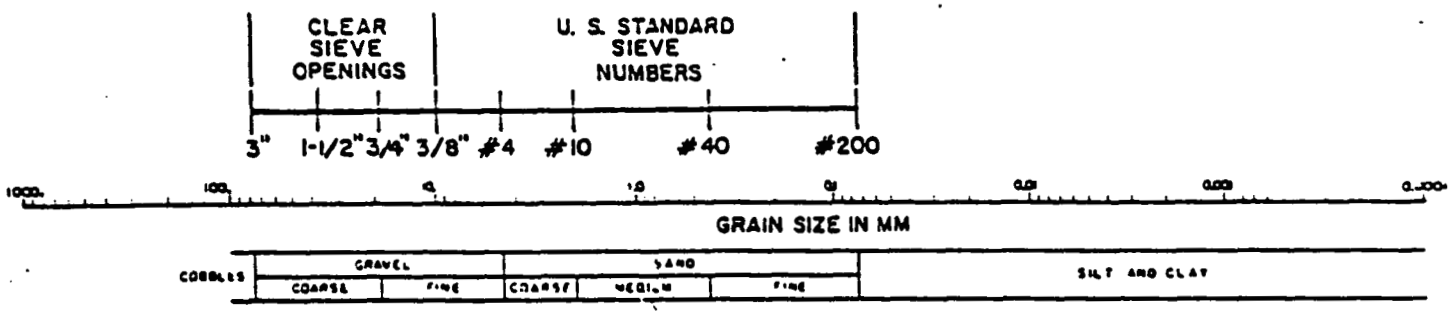
CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (TONS PER SQUARE FOOT)
VERY SOFT	LESS THAN 0.25
SOFT	0.25 TO 0.50
MEDIUM STIFF	0.50 TO 1.0
STIFF	1.0 TO 2.0
VERY STIFF	2.0 TO 4.0
HARD	MORE THAN 4.0

DENSITY OF GRANULAR SOILS

DENSITY	STANDARD PENETRATION RESISTANCE(1)
VERY LOOSE	0 – 4
LOOSE	5 – 10
MEDIUM DENSE	11 – 30
DENSE	31 – 50
VERY DENSE	OVER 50

(1) STANDARD PENETRATION RESISTANCE IS THE NUMBER OF BLOWS REQUIRED TO DRIVE A 2-INCH O.D. SPLIT BARREL SAMPLER 12 INCHES USING A 140-POUND HAMMER FALLING FREELY THROUGH 30 INCHES. THE SAMPLER IS DRIVEN 18 INCHES AND THE NUMBER OF BLOWS RECORDED FOR EACH 6-INCH INTERVAL. THE SUMMATION OF THE FINAL TWO INTERVALS IS THE STANDARD PENETRATION RESISTANCE.



USCS CLASSIFICATION FOR SOILS

COARSE-GRAINED SOILS

CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
	GC	CLAYEY GRAVELS GRAVEL-SAND-CLAY MIXTURES
CLEAN SANDS (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
	SC	CLAYEY SANDS, SAND-CLAY MIXTURES

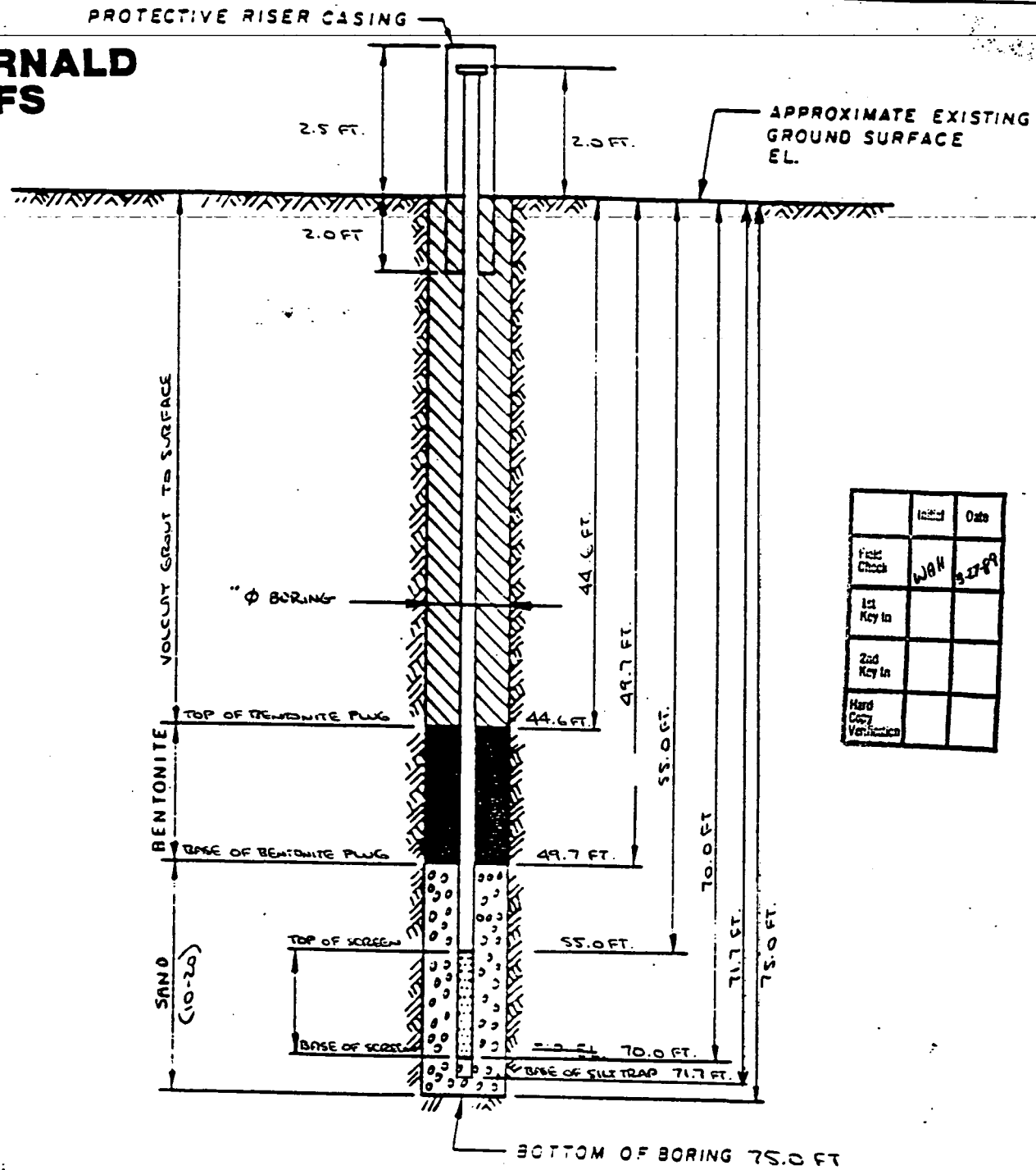
FINE-GRAINED/HIGHLY ORGANIC SOILS

SILTS AND CLAYS LIQUID LIMIT (LESS THAN 50)	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
SILTS AND CLAYS LIQUID LIMIT (GREATER THAN 50)	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS
	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

-5397

BORING 2007

FERNALD RI/FS



	Initial	Date
Field Check	WBH	3-17-89
1st Key In		
2nd Key In		
Hard Copy Verification		

DRAWING NUMBER

CHECKED BY ST.

APPROVED BY

DRAWN BY KLS.

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.
4. ELEVATION OF WATER LEVEL 60.9 FT, 1100 60.5 FT, 0835 03-14-89
5. WATER LEVEL READING ON 03-13-89

MATERIALS USED DURING WELL INSTALLATION:

~~13~~ 16 - (80 LB. SKS) 10-20 SAND

11 - (80 LB SKS) VOLCLAY GROUT

7 - (5 GAL BUCKETS) BENTONITE PELLETS

4.0 IN I.D. SS RISER PIPE:

1 - 2.0 FT. SECTION
1 - 5.0 FT SECTION
5 - 10.0 FT SECTIONS
1 - 15.0 FT SCREEN WITH 1.7 FT WELDED SILT TRAP

WATER USED DURING DRILLING ACTIVITIES: 700 GALS.

TOTAL WATER USED DURING DRILLING AND WELL INSTALLATION ACTIVITIES: 920 GALS.

INSTALLATION DETAILS
MONITORING WELL #2007

PREPARED FOR
FERNALD RI/FS

0 26

FERNALD RI/FS

- 5997

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS FIELD ENG./GEO. M. SLUSARSKI DATE 03-21-89
PROJECT NO. 602 3.2 CHECKED BY E. TROLLINGER DATE 03-22-89
BORING NO. 2007
PIEZOMETER NO. 2007 DATE OF INSTALLATION 03-21-89

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL	TYPE OF BIT HAMMER
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID WATER FROM 0.0 FT. TO 75.0 FT.	SIZE 10.0 IN ID FROM 0.0 FT. TO 75.0 FT.
FLUID — FROM — TO —	SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL	RISER PIPE MATERIAL 316 STAINLESS STEEL
DIAMETER OF PERFORATED SECTION 4.0 IN ID.	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 IN. I.D. 4.0 IN
SLOTS ☒ HOLES ☐ SCREEN ☐	LENGTH OF PIPE SECTIONS 2.0 FT, 5.0 FT, 10.0 FT.
AVERAGE SIZE OF PERFORATIONS 0.01 IN	JOINING METHOD SCREW TYPE, FLUSH-JOINT
TOTAL PERFORATED AREA 15.0 FT.	THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT.	OTHER PROTECTION HINGED LOCKING
PROTECTIVE PIPE O.D. 10 3/4 IN.	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 44.6	TOP	BOTTOM
BENTONITE	TOP 44.6	BOTTOM 49.7	TOP	BOTTOM
SAND (10-20)	TOP 49.7	BOTTOM 73.0	TOP	BOTTOM
~~GRAVEL~~ N/A	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 55.0	BOTTOM 70.0	TOP	BOTTOM
PIEZOMETER TIP	71.7			
BOTTOM OF BOREHOLE	75.0			
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒ 0 27
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS OPEN HOLE INTERVAL FROM 75.0 FT TO 73.0 FT WAS ALLOWED TO FILL WITH "BLOW SAND". ONE (1) BUCKET OF BENTONITE PELLETS WAS POURED AROUND PROTECTIVE HOLE COVER AT SURFACE TO SERVE AS PACKING AND SEALING MATERIAL

TEST EQUIPMENT LIST

TEST _____

EQUIPMENT NUMBER	EQUIPMENT NAME

NOTE:

THIS LIST SHALL BE COMPLETED FOR ALL TESTS, ONLY EQUIPMENT SUBJECT TO CALIBRATION NEED BE LISTED.

FERNALD RI/FS

39

	Initial	Date
Field Check	WJW	3-27-89
1st Key In		
2nd Key In		
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 3127	COORDINATES:	DATE: 2/26/89
ELEVATION:	GWL: Depth 4.25 Date/Time 2/26/89-0940	DATE STARTED: 2/26/89
ENGINEER/GEOLOGIST: F. MacNeil	Depth 4.55 Date/Time 3/1/89-0800	DATE COMPLETED: 2/28/89
DRILLING METHODS: Cable Tool		PAGE 1 OF 57

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS (WAH 3-27) Background: α = 0-1 cpm, β-γ = 40-60 cpm
1	2/26/89 0830 32260	3 4 6	10	Stiff, Brown (10YR 5/3) Clay, Some Silt, Moist, Slightly Mottled w/ Roots.	CL	1.5	hnu = 0, α = BG, β-γ = BG
2	2/26/89 0840 32261	6 10 14	12	Stiff, Brown (10YR 5/3) Clay, Some Silt, Slightly Mottled, ~~Dry~~, Moist.	CL	1.5	hnu = 0, α = BG, β-γ = BG
3 4	2/26/89 0850 32262	6 10 12	9	Stiff, Brown (10YR 4/6) Clay, Trace Silt, Moist.	CL	1.75	hnu = 0, α = BG, β-γ = BG
5 6	2/26/89 0900 32263	30 20 25	10	Very Stiff, Brown (10YR 4/3) Clay, Dry.	CL	2.5	hnu = 0, α = BG, β-γ = BG
7	2/26/89 1035 32264	3 6 11	7	Very Stiff, Brown (10YR 4/3) Clay, Trace Silt, Dry.	CL	2.5	hnu = 0, α = BG, β-γ = BG
8 9	2/26/89 1050 32265	3 6 19	18	Very Stiff, Brown (10YR 4/4) Clay, Trace Silt, Dry.	CL	2.0	hnu = 0, α = BG, β-γ = BG
10	2/26/89 1100 32266	9 13 13	16	Very Stiff, Brown (10YR 4/6) Clay, Some Silt, Some Fine Sand, Trace Black Organics, Dry.	CL	2.0	hnu = 0, α = BG, β-γ = BG
11	2/26/89 1110	8 6 5	15	9.5 - Medium Dense, Brown (10YR 5/4) Fine Sand, Some Fine Gravel, Some Silt, Well Sorted, Well Graded, Good Stratification, Dry.	SW	—	hnu = 0, α = BG, β-γ = BG
12	32267			Medium Dense, Grey (10YR 4/1) Silt, Some Organics, Trace Fine→Med Sand, Moist.	ML	—	
13	2/26/89 1130 32268	20 20 22	7	Dense, Brown (10YR 5/3) Med→Crse Gravel, Some Fine Sand, Poorly Sorted, Poorly Graded, Dry.	GP	—	hnu = 0, α = BG, β-γ = BG
14							
15							

NOTES: *

Contractor: PennDrill
Rig #/Model: #3/Cyclone 42
Driller: J. Banile
Assistant: L. Booth

Samples collected per ASTM standard penetration test. Colors identified using the Munsell Color Chart.

0 29

Total water added to borehole for drilling and completion activities = 500 gallons

*: Notes were filled in by W.A. Hertel 3-27-89

402-11

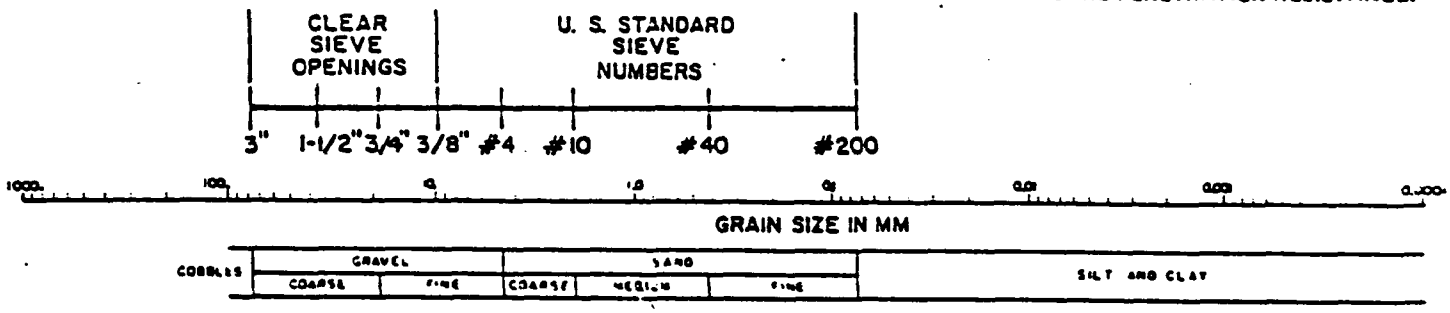
CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (TONS PER SQUARE FOOT)
VERY SOFT	LESS THAN 0.25
SOFT	0.25 TO 0.50
MEDIUM STIFF	0.50 TO 1.0
STIFF	1.0 TO 2.0
VERY STIFF	2.0 TO 4.0
HARD	MORE THAN 4.0

DENSITY OF GRANULAR SOILS

DENSITY	STANDARD PENETRATION RESISTANCE (1)
VERY LOOSE	0 – 4
LOOSE	5 – 10
MEDIUM DENSE	11 – 30
DENSE	31 – 50
VERY DENSE	OVER 50

(1) STANDARD PENETRATION RESISTANCE IS THE NUMBER OF BLOWS REQUIRED TO DRIVE A 2-INCH O.D. SPLIT BARREL SAMPLER 12 INCHES USING A 140-POUND HAMMER FALLING FREELY THROUGH 30 INCHES. THE SAMPLER IS DRIVEN 18 INCHES AND THE NUMBER OF BLOWS RECORDED FOR EACH 6-INCH INTERVAL. THE SUMMATION OF THE FINAL TWO INTERVALS IS THE STANDARD PENETRATION RESISTANCE.



USCS CLASSIFICATION FOR SOILS

COARSE-GRAINED SOILS

CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
	GC	CLAYEY GRAVELS GRAVEL-SAND-CLAY MIXTURES
CLEAN SANDS (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
	SC	CLAYEY SANDS, SAND-CLAY MIXTURES

FINE-GRAINED/HIGHLY ORGANIC SOILS

SILTS AND CLAYS LIQUID LIMIT (LESS THAN 50)	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
SILTS AND CLAYS LIQUID LIMIT (GREATER THAN 50)	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS
	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

FERNALD RI/FS

-.5397

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: 3127	COORDINATES:		DATE: 2/26/89
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 2/26/89
ENGINEER/GEOLOGIST: F. Mac-Kent	Depth	Date/Time	DATE COMPLETED: 2/26/89
DRILLING METHODS: Cable Tool			PAGE 2 OF 57

WAH 3-2

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15 16	2/26/89 1145 32269	18 26 14	10	Dense, Brown (10YR 6/3) Fine→Cse Gravel, Some Fine→Med Sand, Well Rounded, Poorly Sorted, Poorly Graded, Dry.	GP	—	Background: α=0-1 cpm β-γ=40-60 cpm hmu=0 α=BG β-γ=BG
17 18 19							
20 21	2/26/89 1540 32270	7 14 13	6	Medium Dense, Brown (10YR 7/4) Fine→Cse Gravel, Some Fine→Med Sand, Well Rounded, Poorly Sorted, Poorly Graded, Dry.	GP	—	hmu=0 α=BG β-γ=BG
22 23 24							
25 26	2/26/89 1700 32271	30 37 22	14	Very Dense, Brown (10YR 5/3) Fine→Med Sand, Some Fine→Cse Gravel, Poorly Sorted, Well Graded, Fair Rounding, Dry.	SW	—	hmu=0 α=BG β-γ=BG
27 28 29 30							

NOTES:

0 31

402-11

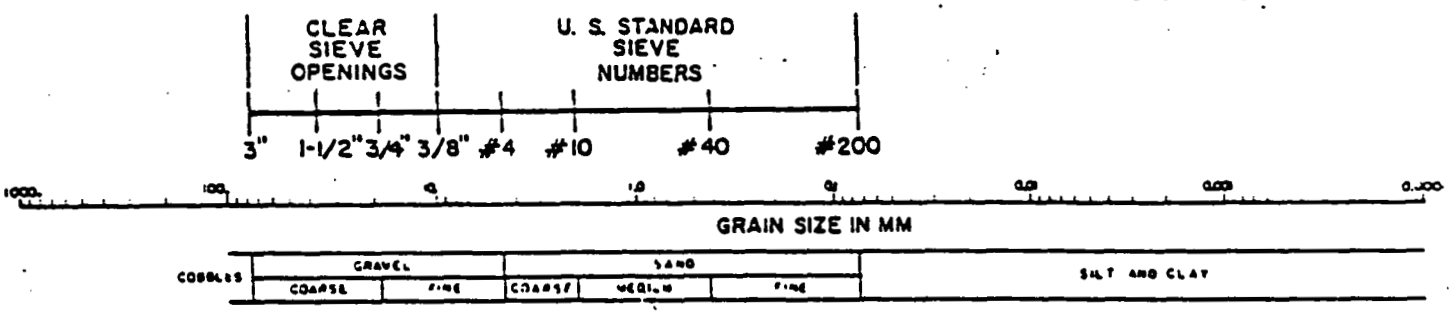
CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (TONS PER SQUARE FOOT)
VERY SOFT	LESS THAN 0.25
SOFT	0.25 TO 0.50
MEDIUM STIFF	0.50 TO 1.0
STIFF	1.0 TO 2.0
VERY STIFF	2.0 TO 4.0
HARD	MORE THAN 4.0

DENSITY OF GRANULAR SOILS

DENSITY	STANDARD PENETRATION RESISTANCE[1]
VERY LOOSE	0 – 4
LOOSE	5 – 10
MEDIUM DENSE	11 – 30
DENSE	31 – 50
VERY DENSE	OVER 50

(1) STANDARD PENETRATION RESISTANCE IS THE NUMBER OF BLOWS REQUIRED TO DRIVE A 2-INCH O.D. SPLIT BARREL SAMPLER 12 INCHES USING A 140-POUND HAMMER FALLING FREELY THROUGH 30 INCHES. THE SAMPLER IS DRIVEN 18 INCHES AND THE NUMBER OF BLOWS RECORDED FOR EACH 6-INCH INTERVAL. THE SUMMATION OF THE FINAL TWO INTERVALS IS THE STANDARD PENETRATION RESISTANCE.



USCS CLASSIFICATION FOR SOILS

COARSE-GRAINED SOILS

CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
	GC	CLAYEY GRAVELS GRAVEL-SAND-CLAY MIXTURES
CLEAN SANDS (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
	SC	CLAYEY SANDS, SAND-CLAY MIXTURES

FINE-GRAINED/HIGHLY ORGANIC SOILS

SILTS AND CLAYS LIQUID LIMIT (LESS THAN 50)	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
SILTS AND CLAYS LIQUID LIMIT (GREATER THAN 50)	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS
	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

FERNALD RI/FS

5397

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 3127	COORDINATES:	DATE: 2/28/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2/26/89
ENGINEER/GEOLOGIST: F MacKert	Depth Date/Time	DATE COMPLETED: 2/28/89
DRILLING METHODS: Cable Tool		PAGE 3 OF 5

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
~~30~~ 31	2/27/89 1550 32272	7 17 30	15	Dense, Brown (10YR 4/3) Med → Cse Sand, Trace Fine & Cse Gravel, Trace Silt, Semi-Angular, Fair Sorting, Poorly Graded, Wet	SP	—	Background: α = 0-1 cpm β-γ = 40-60 cpm; hand = 0; α = BG; β-γ = BG
32							
33							
34							
35	2/27/89 1630 32273	15 18 16	12	Dense, Brown (10YR 5/3) Med → Cse Sand, ~~Trace Fine~~ Some Fine → Med Gravel, Well Rounded, Trace Silt, Poorly Sorted, Well Graded, Wet	SW	—	hand = 0; α = BG; β-γ = BG
36							
37							
38							
39							
~~40~~ 41	2/28/89 0945 32274	9 11 11	7	Medium Dense, Brown (10YR 5/4) Fine → Cse Sand, Some Fine → Cse Gravel, Semi-Angular, Poorly Sorted, Poorly Graded, Wet.	SP	—	hand = 0; α = BG; β-γ = BG
42							
43							
44							
45							

NOTES:

WAH 3-2

0 33

402-

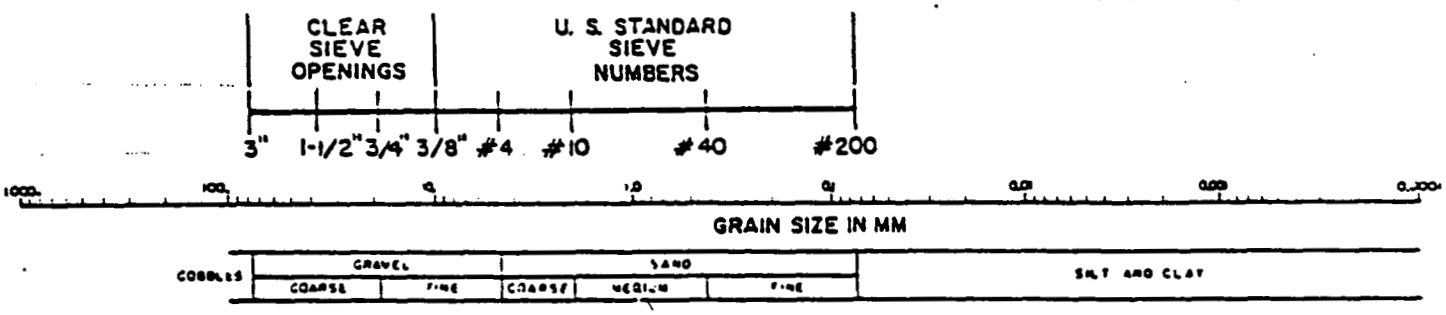
CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (TONS PER SQUARE FOOT)
VERY SOFT	LESS THAN 0.25
SOFT	0.25 TO 0.50
MEDIUM STIFF	0.50 TO 1.0
STIFF	1.0 TO 2.0
VERY STIFF	2.0 TO 4.0
HARD	MORE THAN 4.0

DENSITY OF GRANULAR SOILS

DENSITY	STANDARD PENETRATION RESISTANCE[1]
VERY LOOSE	0 – 4
LOOSE	5 – 10
MEDIUM DENSE	11 – 30
DENSE	31 – 50
VERY DENSE	OVER 50

(1) STANDARD PENETRATION RESISTANCE IS THE NUMBER OF BLOWS REQUIRED TO DRIVE A 2-INCH O.D. SPLIT BARREL SAMPLER 12 INCHES USING A 140-POUND HAMMER FALLING FREELY THROUGH 30 INCHES. THE SAMPLER IS DRIVEN 18 INCHES AND THE NUMBER OF BLOWS RECORDED FOR EACH 6-INCH INTERVAL. THE SUMMATION OF THE FINAL TWO INTERVALS IS THE STANDARD PENETRATION RESISTANCE.



USCS CLASSIFICATION FOR SOILS

COARSE-GRAINED SOILS

CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
	GC	CLAYEY GRAVELS GRAVEL-SAND-CLAY MIXTURES
CLEAN SANDS (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
	SC	CLAYEY SANDS, SAND-CLAY MIXTURES

FINE-GRAINED/HIGHLY ORGANIC SOILS

SILTS AND CLAYS LIQUID LIMIT (LESS THAN 50)	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
SILTS AND CLAYS LIQUID LIMIT (GREATER THAN 50)	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS
	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

FERNALD RI/FS

5397

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.4	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: 3127	COORDINATES:		DATE: 2/28/89
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 2/28/89
ENGINEER/GEOLOGIST: F. Ma. Mt	Depth	Date/Time	DATE COMPLETED: 2/28/89
DRILLING METHODS: Cable Tool			PAGE 4 OF 5

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45							WA1 3-2 Background; α = 0-10 ppm β-γ = 20-40 ppm
46	2/28/89 1110 32275	11 21 22	15	Dense, Brown (10YR 4/2) Med → Crse Sand, Some Fine → Med Gravel, Trace Crse Gravel, Subangular, Poorly Sorted, Well Graded, Wet.	SW	—	hma = 0 α = BG β-γ = BG
47							
48							
49							
50	2/28/89 1145 32276	4 1 1	18	Very Loose, Brown (10YR 4/2) Med → Crse Sand Trace Fine → Crse Gravel, Rounded, Poorly Sorted, Well Graded, Wet.	SW	—	hma = 0 α = BG β-γ = BG
51							
52							
53							
54							
55	2/28/89 1355 32277	13 22 33	14	Very Dense, Brown (10YR 4/2) Fine → Crse Sand, Some Fine → Med Gravel, Trace Silt, Subangular, Poorly Sorted, Fair Grading, Wet.	SW	—	hma = 0 α = BG β-γ = BG
56							
57							
58							
59							
60							

NOTES:

0 35

4G2-11

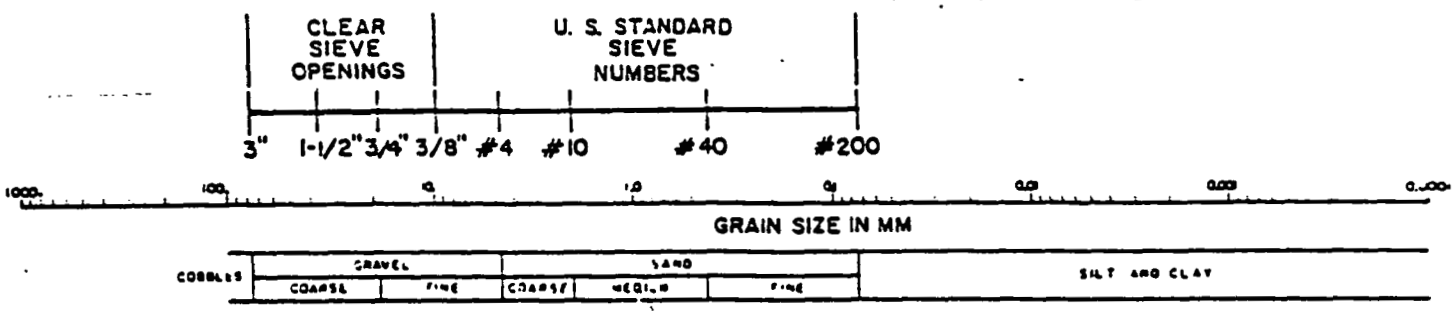
CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (TONS PER SQUARE FOOT)
VERY SOFT	LESS THAN 0.25
SOFT	0.25 TO 0.50
MEDIUM STIFF	0.50 TO 1.0
STIFF	1.0 TO 2.0
VERY STIFF	2.0 TO 4.0
HARD	MORE THAN 4.0

DENSITY OF GRANULAR SOILS

DENSITY	STANDARD PENETRATION RESISTANCE (1)
VERY LOOSE	0 – 4
LOOSE	5 – 10
MEDIUM DENSE	11 – 30
DENSE	31 – 50
VERY DENSE	OVER 50

(1) STANDARD PENETRATION RESISTANCE IS THE NUMBER OF BLOWS REQUIRED TO DRIVE A 2-INCH O.D. SPLIT BARREL SAMPLER 12 INCHES USING A 140-POUND HAMMER FALLING FREELY THROUGH 30 INCHES. THE SAMPLER IS DRIVEN 18 INCHES AND THE NUMBER OF BLOWS RECORDED FOR EACH 6-INCH INTERVAL. THE SUMMATION OF THE FINAL TWO INTERVALS IS THE STANDARD PENETRATION RESISTANCE.



USCS CLASSIFICATION FOR SOILS

COARSE-GRAINED SOILS

CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
	GC	CLAYEY GRAVELS GRAVEL-SAND-CLAY MIXTURES
CLEAN SANDS (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
	SC	CLAYEY SANDS, SAND-CLAY MIXTURES

FINE-GRAINED/HIGHLY ORGANIC SOILS

SILTS AND CLAYS LIQUID LIMIT (LESS THAN 50)	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
SILTS AND CLAYS LIQUID LIMIT (GREATER THAN 50)	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS
	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

FERNALD RI/FS

- 5397

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6027.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 3127	COORDINATES:	DATE: 2/28/89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2/26/89
ENGINEER/GEOLOGIST: F. Hamlet	Depth Date/Time	DATE COMPLETED: 2/28/89
DRILLING METHODS: Cable Tool		PAGE 5 OF 87

WAH 3-27

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60							Background: α = 0-1 cpm; β-γ = 40-60 cpm
61	2/28/89 1430 32278	50/5in	4	Very Dense, Gray (10YR 5/1) Fine → Coarse Gravel, Well Rounded, Fair Sorting, Well Graded, Wet.	GW		hm = 0; α = BG; β-γ = BG
62							
63							
64							
65	2/28/89 1525 32279	9 17 24	15	Dense, Gray (10YR 4/1) Fine Sand, Well Sorted, Well Graded, Wet.	SW		hm = 0; α = BG; β-γ = BG
66				66.0 - Dense, Gray (10YR 4/1) Fine → Coarse Gravel, Trace Silt, Rounded, Poor Sorting, Poor Grading, Wet.	GP		
67							
68							
69				69.0 - Very Dense, Gray (10YR 5/1) Fine-Packed Sand, Well Sorted, Well Graded, Wet.	SW		
70	2/28/89 1700 32280	60 Ref.	12	69.5 - Very Dense, Gray (10YR 4/1) Medium Gravel, Some Clay, Some Silt, Well Rounded, Poorly Sorted, Well Graded, Some Rock Frags, Dry.	GM		hm = 0; α = BG; β-γ = BG
71							
72				69.8 - Very Dense, Gray (10YR 3/1) Clay-rich Fissile Limestone, Partially Decayed, Trace Silt, Trace Clay, Dry.			
73							
74				BOH = 70.0 ft			
75							

NOTES:

0 37

402-11-

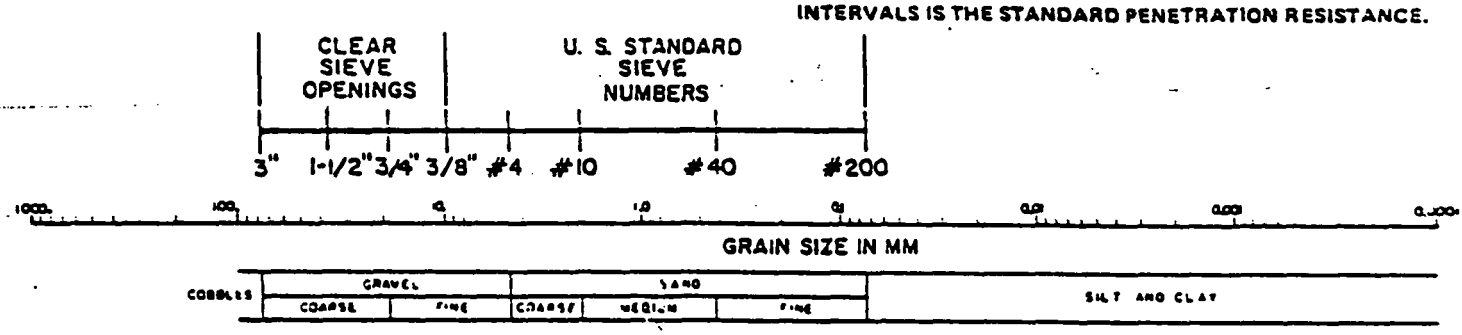
539 NSISTENCY OF COHESIVE SOILS

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (TONS PER SQUARE FOOT)
VERY SOFT	LESS THAN 0.25
SOFT	0.25 TO 0.50
MEDIUM STIFF	0.50 TO 1.0
STIFF	1.0 TO 2.0
VERY STIFF	2.0 TO 4.0
HARD	MORE THAN 4.0

DENSITY OF GRANULAR SOILS

DENSITY	STANDARD PENETRATION RESISTANCE[1]
VERY LOOSE	0 – 4
LOOSE	5 – 10
MEDIUM DENSE	11 – 30
DENSE	31 – 50
VERY DENSE	OVER 50

(1) STANDARD PENETRATION RESISTANCE IS THE NUMBER OF BLOWS REQUIRED TO DRIVE A 2-INCH O.D. SPLIT BARREL SAMPLER 12 INCHES USING A 140-POUND HAMMER FALLING FREELY THROUGH 30 INCHES. THE SAMPLER IS DRIVEN 18 INCHES AND THE NUMBER OF BLOWS RECORDED FOR EACH 6-INCH INTERVAL. THE SUMMATION OF THE FINAL TWO INTERVALS IS THE STANDARD PENETRATION RESISTANCE.



USCS CLASSIFICATION FOR SOILS

COARSE-GRAINED SOILS

CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
	GC	CLAYEY GRAVELS GRAVEL-SAND-CLAY MIXTURES
CLEAN SANDS (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
	SC	CLAYEY SANDS, SAND-CLAY MIXTURES

FINE-GRAINED/HIGHLY ORGANIC SOILS

SILTS AND CLAYS LIQUID LIMIT (LESS THAN 50)	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
SILTS AND CLAYS LIQUID LIMIT (GREATER THAN 50)	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS
	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

FERNALD RI/FS

5997

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS
FIELD ENG./GEO. F. W. ARKERT DATE 3-1-89
PROJECT NO. 602 3.2
CHECKED BY W.A. Hertel DATE 3-27-89
BORING NO. 3127
PIEZOMETER NO. 3127
DATE OF INSTALLATION 3-13-89

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 0.0 FT. TO 70.0 FT.
FLUID — FROM — TO —

TYPE OF BIT HAMMER
CASING SIZE (S) USED:
SIZE 10.0 in ID FROM 0.0 FT. TO 70.0 FT.
SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION 4.0 in ID
PERFORATION TYPE:
SLOTS [X] HOLES [ ] SCREEN [ ]
AVERAGE SIZE OF PERFORATIONS 0.010 in.
TOTAL PERFORATED AREA 10.0 FT.

RISER PIPE MATERIAL STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 in. I.D. 4.0 in
LENGTH OF PIPE SECTIONS 2 FT., 5 FT., 10 FT.
JOINING METHOD FLUSH JOINTED SCREW TYPE

PROTECTION SYSTEM

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

OTHER PROTECTION RISER PROTECTIVE PIPE LID WITH PADLOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION ( )	
TOP OF RISER PIPE	3-27-89 ~~2.2~~ 1.5 FT			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.8			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0 FT.	BOTTOM 49.4 FT.	TOP	BOTTOM
BENTONITE	TOP —	BOTTOM —	TOP	BOTTOM
SAND 10/20 AND 4/30 USED	TOP 49.4 FT.	BOTTOM 70.0 FT	TOP	BOTTOM
GRAVEL	TOP — 3-27 WAH	BOTTOM — 3-27 WAH	TOP	BOTTOM
PERFORATED SECTION	TOP 55.16 5 FT.	BOTTOM 65.16 5 FT.	TOP	BOTTOM
PIEZOMETER TIP	67.2 FT.			
BOTTOM OF BOREHOLE	70.0 FT.			
GWL AFTER INSTALLATION				

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

0 39

REMARKS WELL WAS ORIGINALLY SET UP AS FLUSH MOUNTED ON 3-8-89, CHANGED TO STANDARD RISER PIPE STICKUP WITH PROTECTIVE PIPE CASING ON 3-10-89, DUE TO LOW AREA; POSSIBLE FLOODED SITE. HOLE COVER SET ON 3-13-89.

4C9-11-8

TEST EQUIPMENT LIST

TEST _____

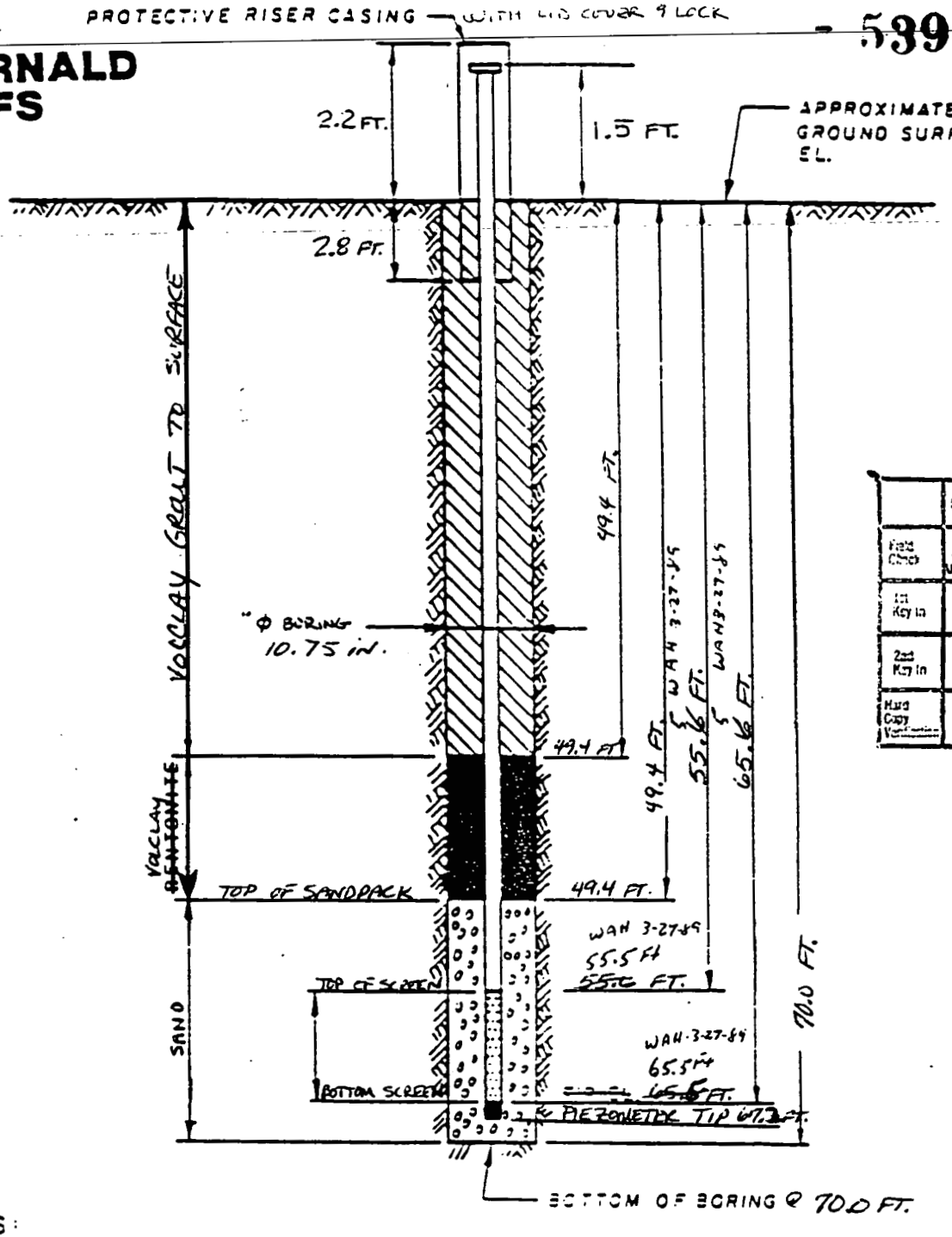
EQUIPMENT NUMBER	EQUIPMENT NAME

NOTE:

THIS LIST SHALL BE COMPLETED FOR ALL TESTS, ONLY EQUIPMENT SUBJECT TO CALIBRATION NEED BE LISTED.

- 5397

FERNALD RI/FS



	Initial	Date
Field Check	WAH	3-27-89
1st Key In		
2nd Key In		
Hard Copy Verification		

DRAWN BY	CHECKED BY	DRAWING NUMBER
CFT 3-27-89	WAH 3-27-89	
	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
5. WATER LEVEL READING ON

0 41

MATERIALS USED:

3 BAGS 4/30 SAND
8 BAGS 10/20 SAND
15 BAGS (50 lb) VOLCLAY GROUT
1 1/2 BUCKETS BENTONITE PELLETS
500 GALLONS WATER (TOTAL TO BOREHOLE)

STAINLESS STEEL RISER SECTIONS:
1-2 FT.
5-10 FT
1-5 FT
(1-10 FT. SLOTTED SCREEN)
(1-1.7 FT. (WELD) SILT TRAP)

INSTALLATION DETAILS
MONITORING WELL MW#312

PREPARED FOR
FMPC RI/FS

FERNALD RI/FS

-.5397

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

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS		
BORING NUMBER: MW-2127	COORDINATES:	DATE: 3-10-89	
ELEVATION: ±550.1	GWL: Depth 9.2 FT Date/Time 3-11-89 / 0930	DATE STARTED: 3-10-89	
ENGINEER/GEOLOGIST: M. JORDAN	Depth 11.7 FT Date/Time 3-11-89 / 1545	DATE COMPLETED: 3-10-89	
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 3	

DEPTH (FEET)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (0.5FT)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
5.0				SEE VISUAL CLASSIFICATION OF SOILS FOR BORING #3127 FOR DETAILED DESCRIPTION OF DRILLED INTERVAL.			
10.0							
15.0							
20.0				BOTTOM OF BORING 20.0 FT			

0 42

NOTES:

CONTRACTOR: PENN DRILL
RIG: CYCLONE MODEL 42
DRILLER: D. BARILE
HELPER: K. FELTY

BACKGROUND LEVELS: α = 0 ppm
$\beta\gamma$ = 20-80 cpm
HNU = 0 ppm

TOTAL WATER USED DURING DRILLING + WELL INSTALLATION: 110 GALLONS

402-1

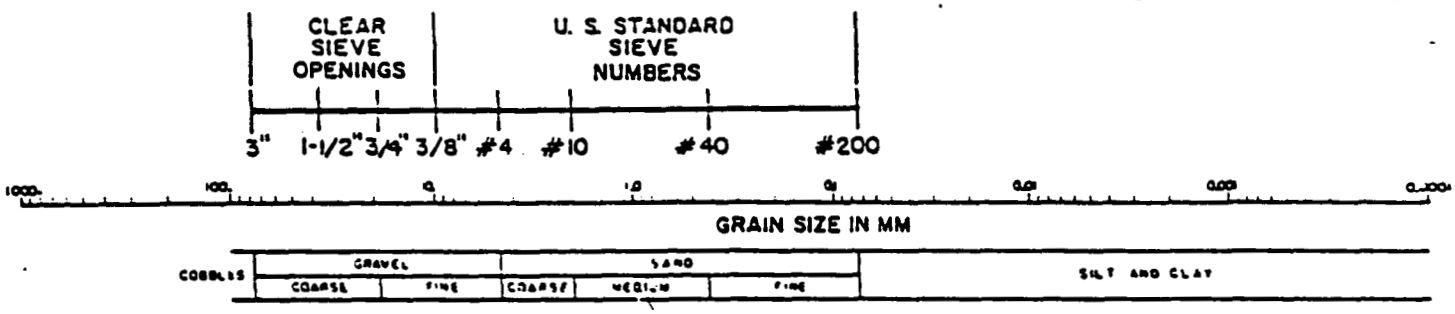
CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (TONS PER SQUARE FOOT)
VERY SOFT	LESS THAN 0.25
SOFT	0.25 TO 0.50
MEDIUM STIFF	0.50 TO 1.0
STIFF	1.0 TO 2.0
VERY STIFF	2.0 TO 4.0
HARD	MORE THAN 4.0

DENSITY OF GRANULAR SOILS

DENSITY	STANDARD PENETRATION RESISTANCE(1)
VERY LOOSE	0 – 4
LOOSE	5 – 10
MEDIUM DENSE	11 – 30
DENSE	31 – 50
VERY DENSE	OVER 50

(1) STANDARD PENETRATION RESISTANCE IS THE NUMBER OF BLOWS REQUIRED TO DRIVE A 2-INCH O.D. SPLIT BARREL SAMPLER 12 INCHES USING A 140-POUND HAMMER FALLING FREELY THROUGH 30 INCHES. THE SAMPLER IS DRIVEN 18 INCHES AND THE NUMBER OF BLOWS RECORDED FOR EACH 6-INCH INTERVAL. THE SUMMATION OF THE FINAL TWO INTERVALS IS THE STANDARD PENETRATION RESISTANCE.



USCS CLASSIFICATION FOR SOILS

COARSE-GRAINED SOILS

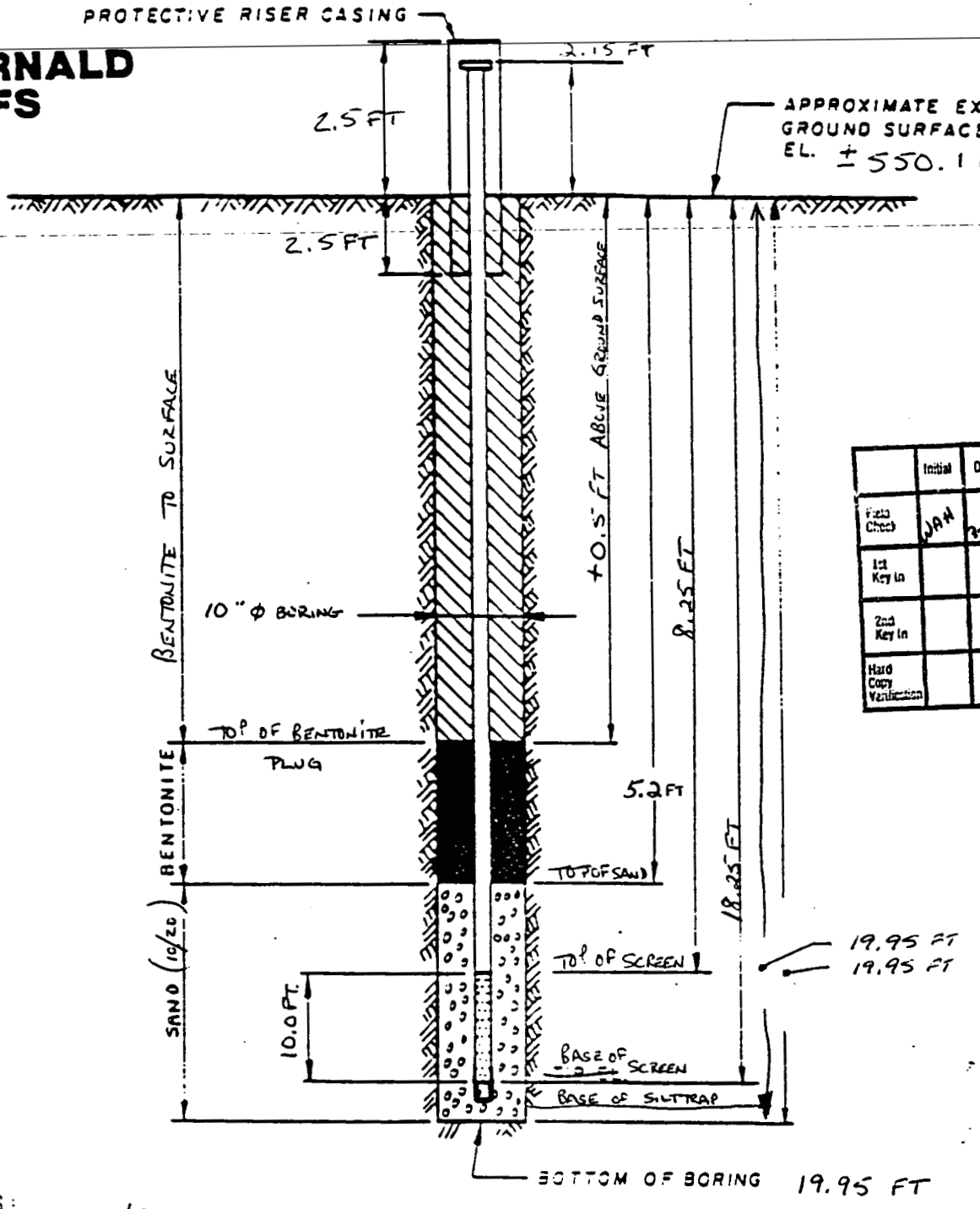
CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
	GC	CLAYEY GRAVELS GRAVEL-SAND-CLAY MIXTURES
CLEAN SANDS (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
	SC	CLAYEY SANDS, SAND-CLAY MIXTURES

FINE-GRAINED/HIGHLY ORGANIC SOILS

SILTS AND CLAYS LIQUID LIMIT (LESS THAN 50)	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
SILTS AND CLAYS LIQUID LIMIT (GREATER THAN 50)	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS
	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

- 5397

FERNALD RI/FS



	Initial	Date
Field Check	WAN	3-27-89
1st Key In		
2nd Key In		
Hard Copy Verification		

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
3-11-89 MKJ	WA Hertel	3-27-89	

NOTES:

1. RISER PIPE IS 4.0 IN ID 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 SILTTRAP)
4. ELEVATION OF WATER LEVEL ± 538.4 FT. ASSUMING GROUND SURFACE AT 550.1 FT AMSL
5. WATER LEVEL READING ON 3-11-89 AT 1545 HOURS

MATERIALS USED DURING WELL INSTALLATION:

11 BAGS OF 10/20 SAND (80 LB EACH).
5 BUCKETS OF BENTONITE PELLETS (5 GAL/EA)
1 10.0 FT SCREEN w/ 1.7 FT WELDED SILTTRAP AND 0.4 FT BLANK STICK-UP. (ALL 4.0 IN I.D STAINLESS STEEL
1 10.0 FT RISER 4.0 IN I.D. STAINLESS STEEL

INSTALLATION DETAILS
MONITORING WELL - 2127
PREPARED FOR
FERNALD RI/FS

0 44

FERNALD RI/FS

5397

	Initial	Date
Field Check	DAN	3-27-89
1st Key In		
2nd Key In		
Hard Copy Verification		

page 3

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD FIELD ENG./GEO. M. JORDAN DATE 3/11/89
PROJECT NO. 303317 03.02.01 602.3.2 CHECKED BY W.A. Hertel DATE 3-27-89
BORING NO. MW-2127
PIEZOMETER NO. MW-2127 DATE OF INSTALLATION 3/11/89 - PROTECTIVE CASING IN PLACE BUT NOT CEMENTED

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 0 TO 19.95 FT
FLUID — FROM — TO —

TYPE OF BIT HAMMER
CASING SIZE (S) USED:
SIZE 10.0 IN I.D FROM 0 TO 19.95 FT.
SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION 4.0 IN ID
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.010 IN
TOTAL PERFORATED AREA 10.0 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 THREADED, FLUSH-JOINT

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	2.15			
GROUND SURFACE	0.0 (±550.1)			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY NONE USED	TOP —	BOTTOM —	TOP	BOTTOM
BENTONITE	TOP +0.5	BOTTOM 5.2	TOP	BOTTOM
SAND 10/20	TOP 5.2	BOTTOM 19.95	TOP	BOTTOM
~~GRAVEL~~ NONE USED	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 8.25	BOTTOM 18.25	TOP	BOTTOM
PIEZOMETER TIP	19.95 FT			
BOTTOM OF BOREHOLE	19.95 FT			
GWL AFTER INSTALLATION	11.70 FT AT 1545 hrs. ON 3-11-89			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒ 0 45
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS W.A. Hertel supervised the drilling and installation of this well. M. Jordan was undergoing training on this well. A variance was submitted concerning the use of a ten foot screen in this well.

409-11-86

TEST EQUIPMENT LIST

TEST _____

EQUIPMENT NUMBER	EQUIPMENT NAME

NOTE:

THIS LIST SHALL BE COMPLETED FOR ALL TESTS, ONLY EQUIPMENT SUBJECT TO CALIBRATION NEED BE LISTED.

FERNALD RI/FS

(ORIGINAL)

- 5997

(* ELEVATION AND COORDINATES ESTABLISHED UPON SURVEY.)

	Initial	Date
Field Check	BLS	03-22
1st Key In		
2nd Key In		
Final Copy		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2055	COORDINATES:	DATE: 3-10-89
ELEVATION:	GWL: Depth 68.1 Date/Time 3-12/0830	DATE STARTED: 3-10-89
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth 68.2 Date/Time 3-13/1000	DATE COMPLETED: 3-13-89
DRILLING METHODS: CABLE TOOL '72 SPEED STAR		PAGE 1 OF 8

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	10735 1338 03-10	2 8 8	8	SOFT, DARK YELLOWISH BROWN (10 YR 5/4), CLAYEY SILT, TRACE OF FINE GRAVEL, MOIST, MED. PLASTICITY.	ML	.25	Hnu = BKg α = 0 CPM βγ = 100-110 CPM
2 3	10736 1345 03-10	5 7 11	6	SOFT, YELLOWISH BROWN (10 YR 5/6) CLAYEY SILT, TRACE OF FINE GRAVEL, MOIST, LOW PLASTICITY.	ML	.25	Hnu = BKg α = 0 CPM βγ = 120-130 CPM
4	10737 1350 03-10	13 17 20	12	SOFT, LIGHT OLIVE BROWN (2.5Y 5/4) CLAYEY SILT, TRACE OF FINE GRAVEL, MOIST, LOW TO MED. PLASTICITY.	ML	.50	Hnu = BKg α = 0 CPM βγ = 120-140 CPM
5 6	10738 1357 03-10	19 23 25	10	MEDIUM STIFF, BROWN (10YR 5/3), SILTY CLAY, TRACE OF FINE TO MED. GRAVEL, MED. PLASTICITY, MOIST.	CL	.50	Hnu = BKg α = 0 CPM βγ = 120-140 CPM
7	10739 1407 03-10	40 42 37	6	MEDIUM STIFF, DARK GRAYISH BROWN, (10YR 5/2), TRACE OF MED. GRAVEL, MED. PLASTICITY, MOIST.	CL	.75	Hnu = BKg α = 0 CPM βγ = 120-140 CPM
8 9	10740 1410 03-10	26 32 40	12	MEDIUM STIFF, GRAY, (10YR 5/1), CLAY, TRACE OF MED. COARSE GRAVEL, MEDIUM PLASTICITY, MOIST.	CL	.50	Hnu = BKg α = 0 CPM βγ = 120 CPM
10	10741 1415 03-10	20 18 20	15	MEDIUM STIFF, DARK GRAY, (5Y 4/1), CLAY, TRACE OF FINE GRAVEL, MED. PLASTICITY, MOIST TO WET.	CL	.75	Hnu = 0.8 PPM α = 0 CPM βγ = 110-120 CPM
				SOFT, CLAYEY SILT, (5Y 4/1), WET.	ML	.50	
11 12	10742 1535 03-10	11 19 11	8	SOFT, GRAY (5Y 4/2), SANDY CLAY, TRACE OF FINE GRAVEL, MOIST TO WET SATURATED, MED TO LOW PLASTICITY.	CL	.50	Hnu = BKg α = 0 CPM βγ = 120 CPM
PERCHED ZONE 13	10743 0910 03-11	4 4 7	8	SOFT, GRAY, (2.5Y 5/0), SLIGHTLY SILTY CLAY, LOW TO MED. PLASTICITY, MOIST TO WET.	CL	.25	Hnu = BKg α = 0 CPM βγ = 120-140 CPM
14	10744 0915 03-11	12 10 13	10	STIFF, GRAYISH BROWN (2.5Y 5/2), CLAY, TRACE OF FINE GRAVEL, MOIST, MED. PLASTICITY.	CL	1.75	Hnu = 0.8 PPM α = 0 CPM βγ = 120-130 CPM

NOTES: PENN. DRILLING CO.
DRILLER: HARRY DYKES JR.
HELPER: ROBERT YOST.

MATERIALS USED:
SAND: 20 80 lb. BAGS
GROUT: 12 50 lb. BAGS
BENTONITE: (5) 5 gal. BUCKETS, 1 AROUND TOP
WATER: 1550 GALS DRILL, 300 GROUTING
850 TOTAL GALS.

SAMPLING IN ACCORDANCE WITH ASTM STANDARDS USING 18" SPLITSPOON. MUNSELL COLOR CHART FOR DESCRIPTION.
color UAH 3-27-89

INSTRU. BACKGROUND
Hnu = 0.6 PPM
α = 0 CPM
βγ = 100-120 CPM
LEL CO_2 = 0-1 %

0 47

402-11-86

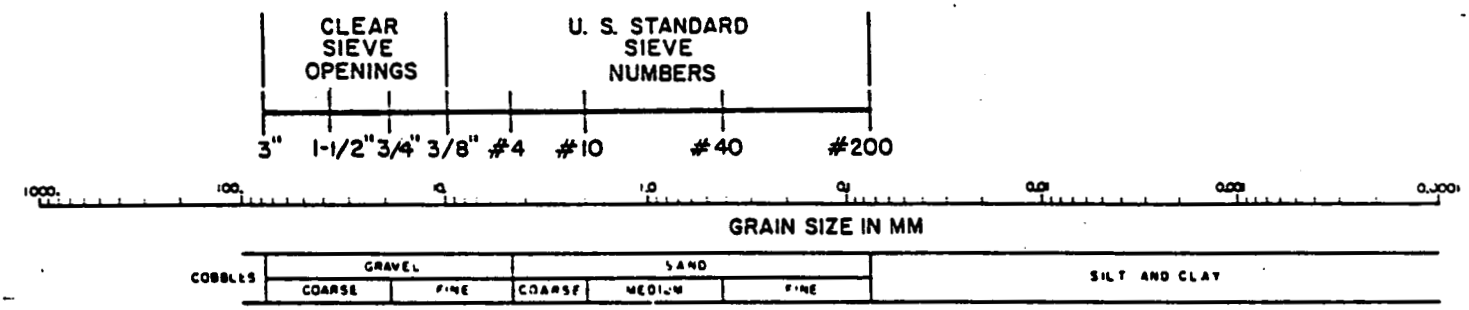
CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (TONS PER SQUARE FOOT)
VERY SOFT	LESS THAN 0.25
SOFT	0.25 TO 0.50
MEDIUM STIFF	0.50 TO 1.0
STIFF	1.0 TO 2.0
VERY STIFF	2.0 TO 4.0
HARD	MORE THAN 4.0

DENSITY OF GRANULAR SOILS

DENSITY	STANDARD PENETRATION RESISTANCE(1)
VERY LOOSE	0 – 4
LOOSE	5 – 10
MEDIUM DENSE	11 – 30
DENSE	31 – 50
VERY DENSE	OVER 50

(1) STANDARD PENETRATION RESISTANCE IS THE NUMBER OF BLOWS REQUIRED TO DRIVE A 2-INCH O.D. SPLIT BARREL SAMPLER 12 INCHES USING A 140-POUND HAMMER FALLING FREELY THROUGH 30 INCHES. THE SAMPLER IS DRIVEN 18 INCHES AND THE NUMBER OF BLOWS RECORDED FOR EACH 6-INCH INTERVAL. THE SUMMATION OF THE FINAL TWO INTERVALS IS THE STANDARD PENETRATION RESISTANCE.



USCS CLASSIFICATION FOR SOILS

COARSE-GRAINED SOILS

CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
	GC	CLAYEY GRAVELS GRAVEL-SAND-CLAY MIXTURES
CLEAN SANDS (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
	SC	CLAYEY SANDS, SAND-CLAY MIXTURES

FINE-GRAINED/HIGHLY ORGANIC SOILS

SILTS AND CLAYS LIQUID LIMIT (LESS THAN 50)	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
SILTS AND CLAYS LIQUID LIMIT (GREATER THAN 50)	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS
	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

FERNALD RI/FS

599

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 2055	COORDINATES:		DATE: 3-11-89
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 3-10-89
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth	Date/Time	DATE COMPLETED: 3-13-89
DRILLING METHODS: CABLE TOOL			PAGE 2 OF 8

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	10745 0922 03-11	10 9 9	9	MEDIUM STIFF, DARK GRAY (2.5Y 4/1), SANDY CLAY, TRACE OF COARSE SAND THROUGHOUT, LOW PLASTICITY, MOIST.	CL	1.0	Hnu = BKG. α = 0 CPM βγ = 110-120 CPM
17 18	10746 0934 03-11	5 9 9	10	MEDIUM STIFF, GRAY (2.5Y 5/0), CLAY, TRACE OF COARSE SAND THROUGHOUT, MOIST, MED. PLASTICITY.	CL	1.0	Hnu = BKG. α = 0 CPM βγ = 110-140 CPM
19	10747 1048 03-11	4 4 4	14	SOFT, OLIVE GRAY (5Y 5/1), CLAY, TRACE OF FINE GRAVEL, MOIST TO WET, LOW TO MED. PLASTICITY.	CL	.25	Hnu = BKG. α = 0 CPM βγ = 120 CPM
20 21	10748 1055 03-11	5 7 10	16	SOFT, OLIVE GRAY, (5Y 5/2), CLAY, TRACE OF FINE GRAVEL, MOIST, MED. PLASTICITY.	CL	.50	Hnu = BKG. α = 0 CPM βγ = 120 CPM
22	10749 1315 03-11	3 5 5	16	SOFT, GRAY, (5Y 5/1), GRAVELLY CLAY, MOIST, LOW TO MED. PLASTICITY.	CL	.35	Hnu = BKG. α = 0 CPM βγ = 110-120 CPM
23 24	10750 1325 03-11	6 8 9	8	MEDIUM STIFF, GRAY, (5Y 5/1), CLAY, TRACE OF FINE GRAVEL AND COARSE SAND THROUGHOUT, MOIST, MED. PLASTICITY.	CL	1.0	Hnu = BKG. α = 0 CPM βγ = 100-120 CPM
25	10751 1336 03-11	7 8 8	8	MEDIUM STIFF, GRAY (5Y 5/1) SANDY CLAY, TRACE OF FINE GRAVEL, MOIST, MED. PLASTICITY.	CL	1.0	Hnu = BKG. α = 0 CPM βγ = 100-120 CPM
26 27	10752 1350 03-11	2 6 9	6	MEDIUM STIFF, GRAY, (5Y 5/1), GRAVELLY CLAY, MOIST, MED. PLASTICITY.	CL	1.0	Hnu = BKG. α = 0 CPM βγ = 120 CPM
28	10753 1427 03-11	20 29 39	15	STIFF, VERY DARK GRAY, (5Y 3/1) GRAVELLY CLAY, MOIST, MED. PLASTICITY.	CL	2.0	Hnu = BKG. α = 0 CPM βγ = 120-140 CPM
29	10754 1450 03-11	48. 50+ 5 in.	9	HARD, DARK OLIVE GRAY (5Y 4/2) SANDY CLAY, TRACE OF FINE GRAVEL, MOIST, MED PLASTICITY.	CL	>4.0	Hnu = BKG. α = 0 CPM βγ = 120 CPM

NOTES:

DRILLER: Harry Dykes.
HELPER: Robert Yost.

INSTRU. BKG.
Hnu = 0.4-0.8 ppm
α = 0 CPM
βγ = 150-180 CPM
LEL O_2 = 0%

402-11-86

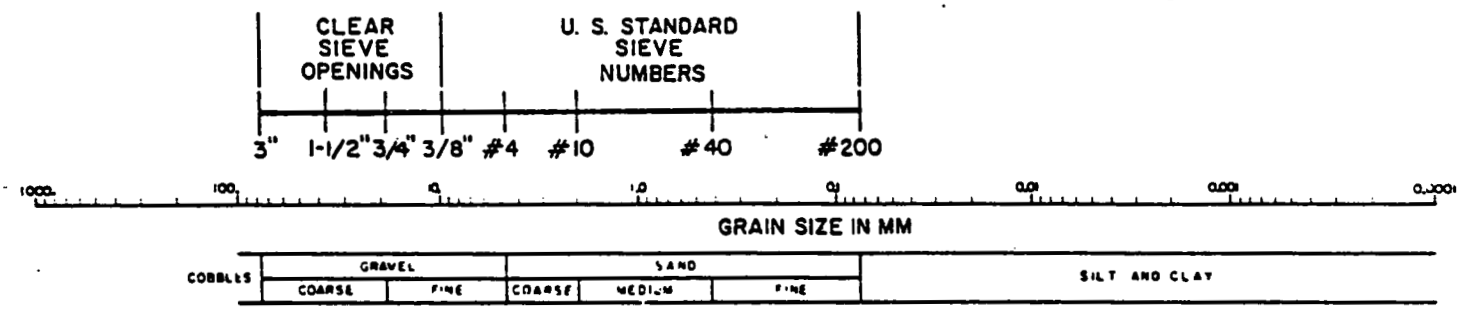
CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (TONS PER SQUARE FOOT)
VERY SOFT	LESS THAN 0.25
SOFT	0.25 TO 0.50
MEDIUM STIFF	0.50 TO 1.0
STIFF	1.0 TO 2.0
VERY STIFF	2.0 TO 4.0
HARD	MORE THAN 4.0

DENSITY OF GRANULAR SOILS

DENSITY	STANDARD PENETRATION RESISTANCE(1)
VERY LOOSE	0 – 4
LOOSE	5 – 10
MEDIUM DENSE	11 – 30
DENSE	31 – 50
VERY DENSE	OVER 50

(1) STANDARD PENETRATION RESISTANCE IS THE NUMBER OF BLOWS REQUIRED TO DRIVE A 2-INCH O.D. SPLIT BARREL SAMPLER 12 INCHES USING A 140-POUND HAMMER FALLING FREELY THROUGH 30 INCHES. THE SAMPLER IS DRIVEN 18 INCHES AND THE NUMBER OF BLOWS RECORDED FOR EACH 6-INCH INTERVAL. THE SUMMATION OF THE FINAL TWO INTERVALS IS THE STANDARD PENETRATION RESISTANCE.



USCS CLASSIFICATION FOR SOILS

COARSE-GRAINED SOILS

CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
	GC	CLAYEY GRAVELS GRAVEL-SAND-CLAY MIXTURES
CLEAN SANDS (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
	SC	CLAYEY SANDS, SAND-CLAY MIXTURES

FINE-GRAINED/HIGHLY ORGANIC SOILS

SILTS AND CLAYS LIQUID LIMIT (LESS THAN 50)	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
SILTS AND CLAYS LIQUID LIMIT (GREATER THAN 50)	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS
	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

FERNALD RI/FS

- 0397

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2.1	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 2055	COORDINATES:	DATE: 3-11-89 / 3-12-89	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3-10-89	
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth Date/Time	DATE COMPLETED: 3-13-89	
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 8	

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	10755 1630 03-11	39 18 24	10	VERY STIFF, DARK OLIVE GRAY, (5Y 5/1), GRAVELLY CLAY, MOIST, MED. PLASTICITY.	CL	3.0	Hnu = Bkg. α = 0 cpm βγ = 120-130 cpm
32 33	10756 1636 03-11	30 50+ 3in	8	VERY STIFF, DARK OLIVE GRAY (5Y 4/1), GRAVELLY CLAY, MOIST, MED. PLASTICITY.	CL	3.0	Hnu = Bkg. α = 0 cpm βγ = 130 cpm
34	10757 0848 03-12	6 16 21	10	~~MEDIUM~~ STIFF, DARK OLIVE GREEN-GRAY (5Y 4/1) SANDY CLAY, TRACE OF FINE GRAVEL, MOIST, LOW TO MED. PLASTICITY.	CL	2.0	Hnu = Bkg. α = 0 cpm βγ = 120-130 cpm
35 36	10758 0900 03-12	9 12 21	16	MEDIUM STIFF, OLIVE GRAY, (5Y 5/2) SANDY CLAY, TRACE OF FINE GRAVEL AND SILT THROUGHOUT, MOIST MED. PLASTICITY.	CL	1.0	Hnu = Bkg. α = 0 cpm βγ = 120-130 cpm
37	10759 0910 03-12	5 16 15	8	DENSE, GRAYISH BROWN (10YR 5/2), SANDY SILT, NON PLASTIC, MOIST.	ML	N/A	Hnu = Bkg. α = 0 cpm βγ = 120-130 cpm
TILL DEPTH				DENSE GRAYISH BROWN (10YR 5/2), POORLY GRADED SAND, MOIST TO DRY. 37.5	SP	N/A	
38 39 40				EXTENT OF GLACIAL TILL, SAMPLING AT 5.0 FT INTERVALS FROM 40.0 FT. THEREAFTER.			
41	10760 1035 03-12	19 30 45	11	VERY DENSE, YELLOWISH BROWN, (10YR 5/4) POORLY GRADED SAND, MOIST TO DRY.	SP	N/A	Hnu = Bkg. α = 0 cpm βγ = 120 cpm
42 43 44							

NOTES:

DRILLER: Harry Dykes
HELPER: Robert Yost.

0 51

0164020

INSTRU. BACKGROUND
Hnu = 0.6-0.8 ppm
α = 0 cpm
βγ = 120-150 cpm

5397

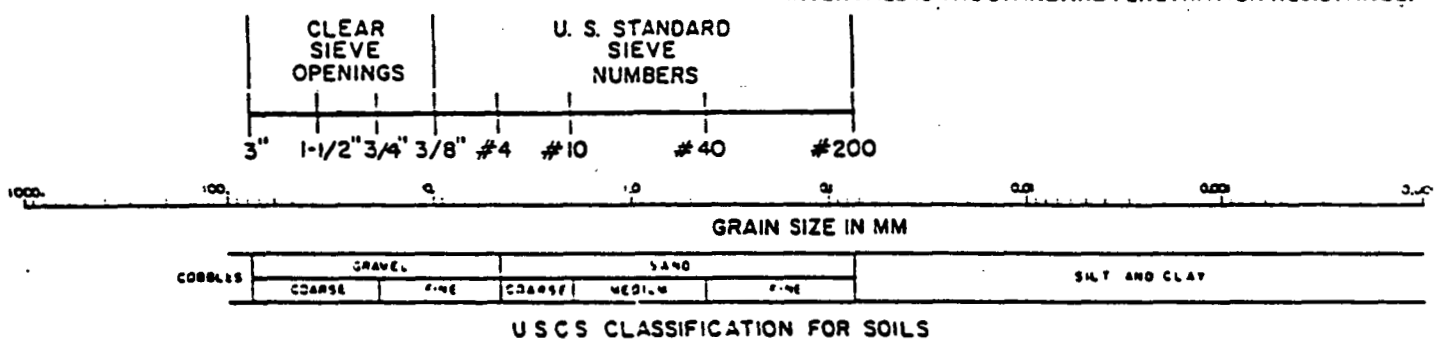
CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (TONS PER SQUARE FOOT)
VERY SOFT	LESS THAN 0.25
SOFT	0.25 TO 0.50
MEDIUM STIFF	0.50 TO 1.0
STIFF	1.0 TO 2.0
VERY STIFF	2.0 TO 4.0
HARD	MORE THAN 4.0

DENSITY OF GRANULAR SOILS

DENSITY	STANDARD PENETRATION RESISTANCE(1)
VERY LOOSE	0 – 4
LOOSE	5 – 10
MEDIUM DENSE	11 – 30
DENSE	31 – 50
VERY DENSE	OVER 50

(1) STANDARD PENETRATION RESISTANCE IS THE NUMBER OF BLOWS REQUIRED TO DRIVE A 2-INCH O.D. SPLIT BARREL SAMPLER 12 INCHES USING A 140-POUND HAMMER FALLING FREELY THROUGH 30 INCHES. THE SAMPLER IS DRIVEN 18 INCHES AND THE NUMBER OF BLOWS RECORDED FOR EACH 6-INCH INTERVAL. THE SUMMATION OF THE FINAL TWO INTERVALS IS THE STANDARD PENETRATION RESISTANCE.



USCS CLASSIFICATION FOR SOILS

COARSE-GRAINED SOILS

CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
	GC	CLAYEY GRAVELS GRAVEL-SAND-CLAY MIXTURES
CLEAN SANDS (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
	SC	CLAYEY SANDS, SAND-CLAY MIXTURES

FINE-GRAINED/HIGHLY ORGANIC SOILS

SILTS AND CLAYS LIQUID LIMIT (LESS THAN 50)	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
SILTS AND CLAYS LIQUID LIMIT (GREATER THAN 50)	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS
	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

FERNALD
RI/FS

5397

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2.1	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 2055	COORDINATES:	DATE: 3-12-89	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3-10-89	
ENGINEER/GEOLOGIST: E. TROWINEER	Depth Date/Time	DATE COMPLETED: 3-13-89	
DRILLING METHODS: CABLE TOOL		PAGE 4 OF 8	

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	10761 1100 03-12	50+ / 5in	5	VERY DENSE, YELLOWISH BROWN (10YR 5/4) POORLY GRADED SAND, MOIST.	SP	N/A	Hnu = BKg. α = 0 CPM βγ = 120 CPM
47							
48							
49							
50							
51	10762 1345 03-12	50+ / 4in	4	VERY DENSE, GRAYISH BROWN, (10YR 5/2), POORLY GRADED SAND, TRACE OF FINE GRAVEL, MOIST.	SP	N/A	Hnu = BKg. α = 0 CPM βγ = 120-130 CPM
52							
53							
54							
55							
56	10763 1540 03-12	50+ / 5in	5	VERY DENSE, GRAYISH BROWN, (10YR 5/2), POORLY GRADED SAND, TRACE OF FINE GRAVEL, MOIST.	SP	N/A	Hnu = BKg. α = 0 CPM βγ = 120 CPM
57							
58							
59							

NOTES:

DRILLER: HARRY DYKOS JR.
HELPER: ROBERT YOST

0 53

INSTRU. BKg.
Hnu = 0.6 PPM
α = 0 CPM
βγ = 150 CPM

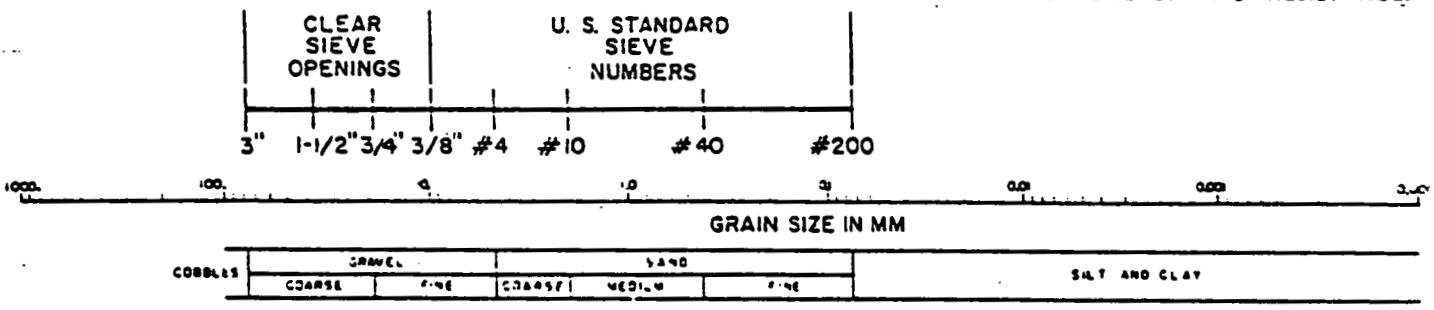
CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (TONS PER SQUARE FOOT)
VERY SOFT	LESS THAN 0.25
SOFT	0.25 TO 0.50
MEDIUM STIFF	0.50 TO 1.0
STIFF	1.0 TO 2.0
VERY STIFF	2.0 TO 4.0
HARD	MORE THAN 4.0

DENSITY OF GRANULAR SOILS

DENSITY	STANDARD PENETRATION RESISTANCE[1]
VERY LOOSE	0 – 4
LOOSE	5 – 10
MEDIUM DENSE	11 – 30
DENSE	31 – 50
VERY DENSE	OVER 50

(1) STANDARD PENETRATION RESISTANCE IS THE NUMBER OF BLOWS REQUIRED TO DRIVE A 2-INCH O.D. SPLIT BARREL SAMPLER 12 INCHES USING A 140-POUND HAMMER FALLING FREELY THROUGH 30 INCHES. THE SAMPLER IS DRIVEN 18 INCHES AND THE NUMBER OF BLOWS RECORDED FOR EACH 6-INCH INTERVAL. THE SUMMATION OF THE FINAL TWO INTERVALS IS THE STANDARD PENETRATION RESISTANCE.



USCS CLASSIFICATION FOR SOILS

COARSE-GRAINED SOILS

CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
	GC	CLAYEY GRAVELS GRAVEL-SAND-CLAY MIXTURES
CLEAN SANDS (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
	SC	CLAYEY SANDS, SAND-CLAY MIXTURES

FINE-GRAINED/HIGHLY ORGANIC SOILS

SILTS AND CLAYS LIQUID LIMIT (LESS THAN 50)	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
SILTS AND CLAYS LIQUID LIMIT (GREATER THAN 50)	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS
	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.21	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2055	COORDINATES:	DATE: 3-12-89 / 3-13-89
ELEVATION:	GWL: Depth 68.2 Date/Time 3-11 @ 1645	DATE STARTED: 3-10-89
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth 68.1 Date/Time 3-12 @ 0830	DATE COMPLETED: 3-13-89
DRILLING METHODS: CABLE TOOL	68.2 3-13 @ 1000	PAGE 5 OF 8

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	10764 1630 03-12	50+ / 5in	5	VERY DENSE, GRAYISH BROWN (10YR 5/2), POORLY GRADED SAND, TRACE OF FINE GRAVEL, MOIST.	SP	N/A	Hmu = BKg. α = 0 CPM βγ = 120 CPM
62							
63							
64							
65							
66	10765 1000 03-13	50+ / 6in	6	VERY DENSE, GRAYISH BROWN, (10YR 5/2), POORLY GRADED SAND, MOIST.	SP	N/A	Hmu = BKg α = 0 CPM βγ = 110-120 CPM
67							
68				WATER TABLE ELEVATION FROM GROUND SURFACE 68.2 FT.			
69							
70							
71	10766 1250 03-13	32 22 24	8	DENSE, DARK GRAYISH BROWN, (10YR 4/2), WELL GRADED SAND, TRACE OF FINE GRAVEL THROUGHOUT, WET.	SW	N/A	Hmu = BKg. α = 0 CPM βγ = 110-120 CPM
72							
73							
74							

NOTES:

DRILLER: Harry Dykos Jr.
HELPER: Robert Yost.

INSTRU. BKg.

Hmu = 0.6 ppm
α = 0 CPM
βγ = 150-170 CPM

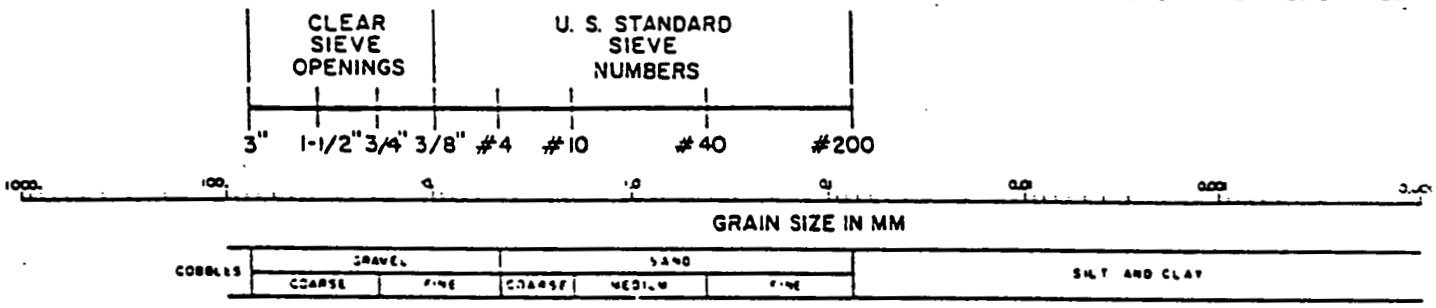
CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (TONS PER SQUARE FOOT)
VERY SOFT	LESS THAN 0.25
SOFT	0.25 TO 0.50
MEDIUM STIFF	0.50 TO 1.0
STIFF	1.0 TO 2.0
VERY STIFF	2.0 TO 4.0
HARD	MORE THAN 4.0

DENSITY OF GRANULAR SOILS

DENSITY	STANDARD PENETRATION RESISTANCE(1)
VERY LOOSE	0 – 4
LOOSE	5 – 10
MEDIUM DENSE	11 – 30
DENSE	31 – 50
VERY DENSE	OVER 50

(1) STANDARD PENETRATION RESISTANCE IS THE NUMBER OF BLOWS REQUIRED TO DRIVE A 2-INCH O.D. SPLIT BARREL SAMPLER 12 INCHES USING A 140-POUND HAMMER FALLING FREELY THROUGH 30 INCHES. THE SAMPLER IS DRIVEN 18 INCHES AND THE NUMBER OF BLOWS RECORDED FOR EACH 6-INCH INTERVAL. THE SUMMATION OF THE FINAL TWO INTERVALS IS THE STANDARD PENETRATION RESISTANCE.



USCS CLASSIFICATION FOR SOILS

COARSE-GRAINED SOILS

CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
	GC	CLAYEY GRAVELS GRAVEL-SAND-CLAY MIXTURES
CLEAN SANDS (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
	SC	CLAYEY SANDS, SAND-CLAY MIXTURES

FINE-GRAINED/HIGHLY ORGANIC SOILS

SILTS AND CLAYS LIQUID LIMIT (LESS THAN 50)	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
SILTS AND CLAYS LIQUID LIMIT (GREATER THAN 50)	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS
	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

FERNALD RI/FS

5397

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 32.1	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2055	COORDINATES:	DATE: 3-13-89
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3-10-89
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth Date/Time	DATE COMPLETED: 3-13-89
DRILLING METHODS: CABLE TOOL		PAGE 6 OF 8

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76	10767 1310 03-13	22 27 36	10	VERY DENSE, DARK GRAYISH BROWN, (10 YR 4/2), WELL GRADED SAND, WET.	SW	N/A	Hmu = Bkg. α = 0 cpm βγ = 120 cpm
				VERY DENSE, DARK GRAYISH BROWN (10 YR 4/2), POORLY GRADED SAND, WET.	SP		
77							
78							
79							
80							
81	10768 1430 03-13	48 45 36	15	VERY DENSE, DARK GRAYISH BROWN, (10 YR 4/2), WELL GRADED GRAVELLY SAND, WET.	SW	N/A	Hmu = Bkg. α = 0 cpm βγ = 110-120 cpm
82				SAMPLING ENDED AT 81.5 FT. DRILLING STOPPED AT 80.0 FT.			
83							
84							
85							

NOTES:

INSTRU. BKg.
Hmu = 0.6 ppm
α = 0 CPM
βγ = 140 CPM - 160 CPM

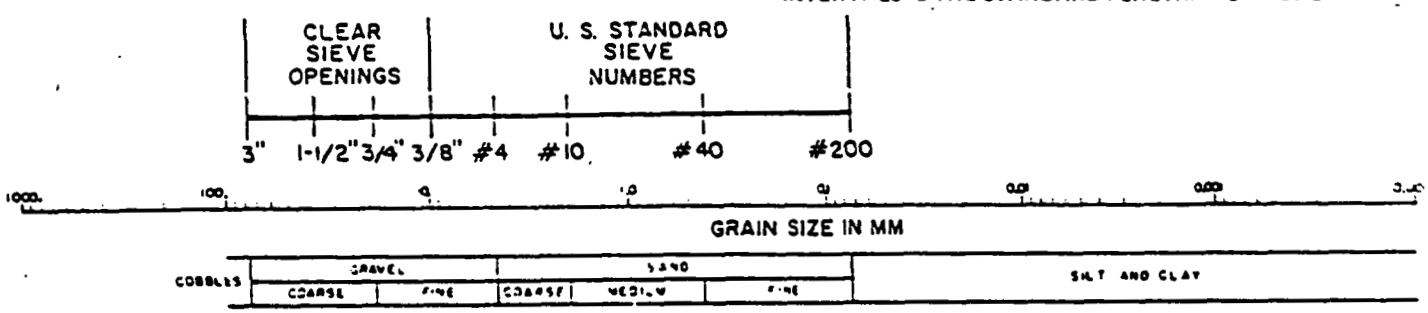
CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (TONS PER SQUARE FOOT)
VERY SOFT	LESS THAN 0.25
SOFT	0.25 TO 0.50
MEDIUM STIFF	0.50 TO 1.0
STIFF	1.0 TO 2.0
VERY STIFF	2.0 TO 4.0
HARD	MORE THAN 4.0

DENSITY OF GRANULAR SOILS

DENSITY	STANDARD PENETRATION RESISTANCE(1)
VERY LOOSE	0 – 4
LOOSE	5 – 10
MEDIUM DENSE	11 – 30
DENSE	31 – 50
VERY DENSE	OVER 50

(1) STANDARD PENETRATION RESISTANCE IS THE NUMBER OF BLOWS REQUIRED TO DRIVE A 2-INCH O.D. SPLIT BARREL SAMPLER 12 INCHES USING A 140-POUND HAMMER FALLING FREELY THROUGH 30 INCHES. THE SAMPLER IS DRIVEN 18 INCHES AND THE NUMBER OF BLOWS RECORDED FOR EACH 6-INCH INTERVAL. THE SUMMATION OF THE FINAL TWO INTERVALS IS THE STANDARD PENETRATION RESISTANCE.



USCS CLASSIFICATION FOR SOILS

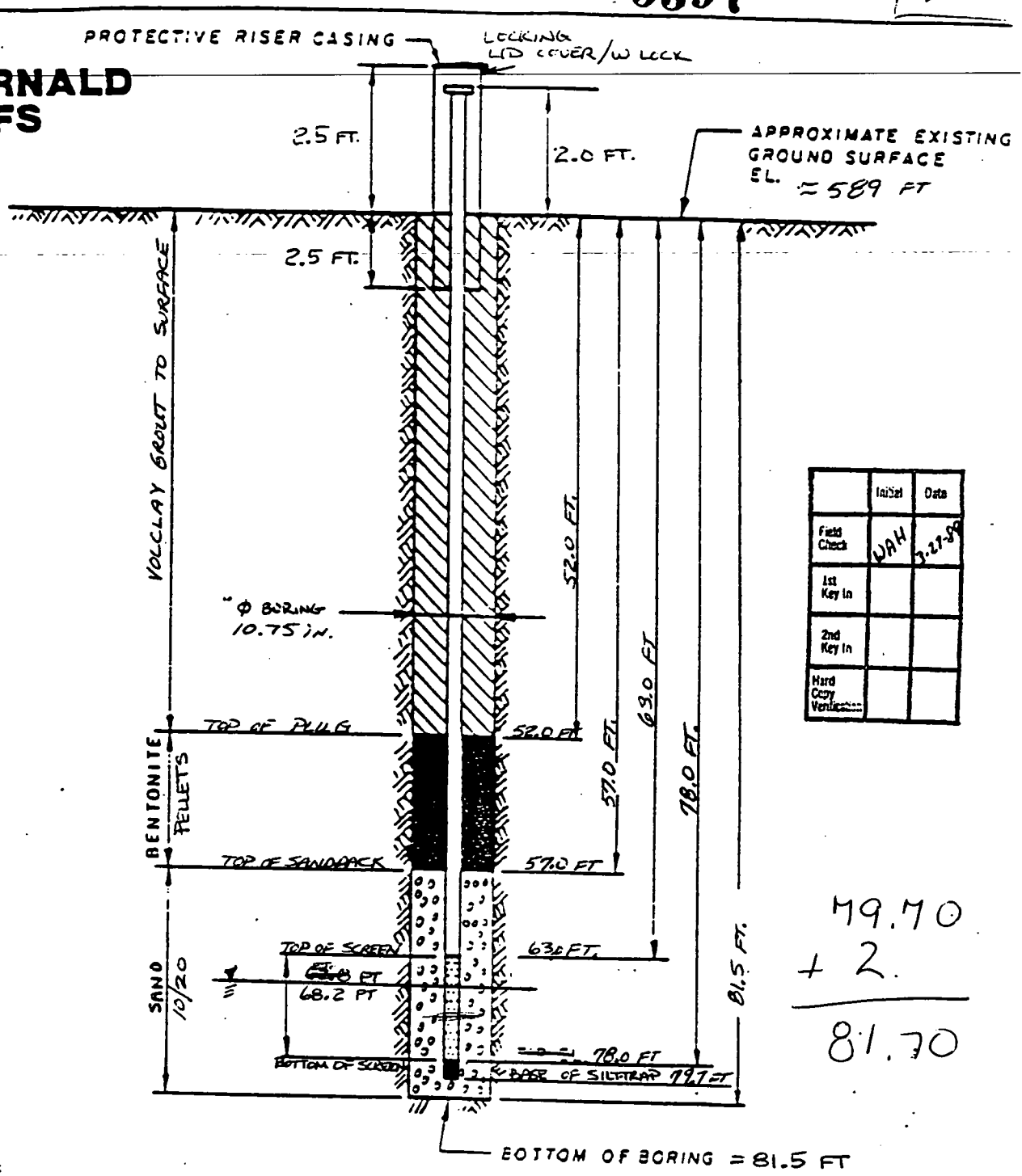
COARSE-GRAINED SOILS

CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
	GC	CLAYEY GRAVELS GRAVEL-SAND-CLAY MIXTURES
CLEAN SANDS (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
	SC	CLAYEY SANDS, SAND-CLAY MIXTURES

FINE-GRAINED/HIGHLY ORGANIC SOILS

SILTS AND CLAYS LIQUID LIMIT (LESS THAN 50)	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
SILTS AND CLAYS LIQUID LIMIT (GREATER THAN 50)	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS
	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

FERNALD RI/FS



	Initial	Date
Field Check	WAH	3-27-89
1st Key In		
2nd Key In		
Hard Copy Verification		

79.70
+ 2.
81.70

DRAWING NUMBER MW-2055
CHECKED BY
APPROVED BY
E.T.
DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED. FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED (+1.7 FT WELDED SILT TRAP)
4. ELEVATION OF WATER LEVEL 68.2 FT, 68.2 FT, 68.1 FT
5. WATER LEVEL READING ON 3-11-89, 3-12-89, 3-13-89

INSTALLATION DETAILS
MONITORING WELL #2055

0 59

PREPARED FOR
FMPC RI/FS

MATERIALS USED TO COMPLETE

10/20 SAND = (20) 80lb. BAGS
BENTONITE PELLETS = (5) 5 gal. BUCKETS PLUG, 1 AROUND CASING AT TOP.
VOLCLAY GROUT 50(lb) = 12 BAGS
WATER = 550 gals DRILLING, 300 gals GROUTING ⇒ 850 TOTAL GALLONS WATER
PIPE SECTIONS: 5 FT., 10 FT., 15 FT. SCREEN, 1.7 FT SILT TRAP (WELDED), PROTECTIVE RISER CASING

Field Check	WAH	3-27-89
1st Key In		
2nd Key In		
Copy Verification		

8/8

FERNALD RI/FS

5997

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. E. TROLLINGER DATE 3-14-89 7 3-19-89

PROJECT NO. 602 3.2 CHECKED BY DATE

BORING NO. 2055

PIEZOMETER NO. 2055 DATE OF INSTALLATION 3-19-89

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL

DRILLING FLUID (S) USED:

FLUID WATER FROM 0.0 FT. TO 81.5 FT.

FLUID — FROM — TO —

TYPE OF BIT HAMMER

CASING SIZE (S) USED:

SIZE 10.0 IN ID FROM 0.0 FT. TO 82.0 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 STAINLESS STEEL (316)

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 JOINTED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT.

PROTECTIVE PIPE O.D. 10.75 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 52.0	TOP	BOTTOM
BENTONITE PELLETS	TOP 52.0	BOTTOM 57.0	TOP	BOTTOM
SAND 10/20	TOP 57.0	BOTTOM 81.5	TOP	BOTTOM
GRAVEL NONE USED	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 63.0	BOTTOM 78.0	TOP	BOTTOM
PIEZOMETER TIP	79.7 FT.			
BOTTOM OF BOREHOLE	81.5 FT.			
GWL AFTER INSTALLATION	68.4 FT			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑

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

0 60

REMARKS

409-11-8

TEST EQUIPMENT LIST

TEST_____

EQUIPMENT NUMBER	EQUIPMENT NAME

NOTE:

THIS LIST SHALL BE COMPLETED FOR ALL TESTS, ONLY EQUIPMENT SUBJECT TO CALIBRATION NEED BE LISTED.