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TECHNICAL BULLETIN REGARDING FREE PHASE PRODUCT ASSESSMENT SITE 6 NCBC GULFPORT MS

1/6/1994

ABB

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TECHNICAL BULLETIN

FREE-PHASE PRODUCT ASSESSMENT
SITE 6 FORMER FIRE-FIGHTING TRAINING AREA
NCBC, GULFPORT, MISSISSIPPI

SUBJECT

Completion of recovery and monitoring wells, soil and groundwater sampling, and aquifer slug testing at Site 6 (Field Effort #2).

SUMMARY

The discovery of free-phase floating product in monitoring well GPT-6-1 initiated a Free-Phase Product Assessment (FPPA). The first field effort focused on evaluating the horizontal and vertical extent of the free-phase product at Site 6 using the Hydropunch II®, as well as the hydraulic conductivity and grain sizes of the surficial formation. Based on this data, five monitoring wells and one recovery well were installed within the free-phase product during the second field effort.

During the second field effort for the Free-Phase Product Assessment at NCBC, Gulfport, the following activities were performed: (1) accomplished the installation of three shallow monitoring wells (GPT-6-4, GPT-6-6, and GPT-6-8), (2) completion of two deeper monitoring wells at the clay layer (GPT-6-5 and GPT-6-7), and (3) installation of a recovery well (GPT-6-RW). Monitoring wells GPT-6-4/GPT-6-5 and GPT-6-6/GPT-6-7 were paired so that the vertical potential within the aquifer could be assessed. Soil samples were collected from split spoons taken from the two deep borings associated with wells GPT-6-5 and GPT-6-7. Samples from the vadose zone, saturated zone, and just above the clay layer were retained for analysis.

The shallow monitoring wells were installed so that the screened interval intersected the water table and/or free-phase product. The deep monitoring wells were installed several inches into the underlying silty clay layer. The depth of the clay layer was 35 feet below ground surface (bgs) in well GPT-6-5 and 47 feet bgs in GPT-6-7. These depths are deeper than previously reported by Harding Lawson (1987) which ranged from 22 to 27 feet bgs.

Drilling operations during this effort confirmed the existence of a continuous dark brown, fine to medium sand with little silt extending to a dark gray clay with some silt and little sand. Depths to the clay ranged from 35 to 47 feet bgs.

The monitoring wells were developed until groundwater parameters which included pH, temperature, and conductivity stabilized to within 10 percent and until groundwater was no longer turbid. Existing monitoring wells GPT-6-2 and GPT-6-3 were redeveloped. Groundwater from newly installed

(Continued)

The data and interpretation contained in this technical bulletin are derived from preliminary field data and are subject to revision as additional data become available.

SUMMARY (Continued)

monitoring wells and two existing monitoring wells (GPT-6-2 and GPT-6-3) were sampled within 24 hours after development or purging.

Rising head slug tests were performed on all the newly installed monitoring wells. Falling head slug tests were also performed on GPT-6-5 and GPT-6-7 because the screened intervals of these wells were below the water table. Analyses of these tests indicated hydraulic conductivity values (k) ranging on the order of 10^{-3} cm/sec.

Water levels in the shallow wells appear to be lower than in the paired deeper wells, indicating an upward gradient in the surficial aquifer. This preliminary data will be confirmed when civil survey data becomes available.

ATTACHMENTS

Attachment 1:	Chronology of Events at Site 6
Attachment 2:	Site Map
Attachment 3:	Boring Logs
Attachment 4:	Well Construction Details
Attachment 5:	Aquifer Slug Test Results

DISCUSSION

The following discussion presents the methods and results of the field activities conducted from 6 December to 16 December 1993. These activities included drilling, soil sampling, monitoring well installation and development, groundwater sampling, and aquifer slug testing for estimation of hydraulic conductivity. A chronology of events during the second field effort at Site 6 is provided in Attachment 1.

Monitoring Well Installation and Soil Sampling

The slot size and filter pack of the monitoring wells were designed based on the boring logs from Harding Lawson (1987) at Site 6. The location of the monitoring wells was based on product thicknesses observed during the first field effort (Attachment 2). Soil boring logs of drilling operations during the second field effort are presented in Attachment 3. Monitoring well construction details are contained in Attachment 4.

The monitoring wells were installed with a Mobile B-57 drill rig utilizing 8.25-inch outside diameter (OD) augers. No fluids or potable water were introduced into the ground during drilling. The shallow monitoring wells (GPT-6-4, GPT-6-6, and GPT-6-8) were designed to have screens intersecting the water table and floating free-phase product. The deep monitoring wells

were designed to determine the depth to, and the groundwater quality at the contact of the fine to medium sand formation and the underlying silty clay layer. All monitoring wells were constructed of Schedule 40 PVC riser pipe and Schedule 40, 20-slot well screen. The 16/30 filter pack was installed in the well annulus to 1 foot above the screen in shallow monitoring wells and 2 feet above the screen in the deeper monitoring wells. A one-foot bentonite pellet seal in the shallow wells and a two-feet bentonite pellet seal in the deeper wells were placed above the filter pack and allowed to hydrate for 24 hours. Monitoring well specifications are summarized in Table 1:

Table 1 Monitoring and Recovery Well Specifications

Well No.	Casing Diameter (feet)	Total Depth (feet bgs)	Screen Interval (feet bgs)	Screen Slot Size (inch)	Filter Pack Sand Type
GPT-6-4	0.17	13.7	3.2-13.2	0.020	16/30
GPT-6-5	0.17	32.1	26.6-31.6	0.020	16/30
GPT-6-6	0.17	13.7	3.2-13.2	0.020	16/30
GPT-6-7	0.17	44.9	39.4-44.4	0.020	16/30
GPT-6-8	0.17	14.7	4.2-14.2	0.020	16/30
GPT-6-RW	0.17	26.0	5-20	0.020	16/30

During drilling operations, soil samples were collected from GPT-6-5 and GPT-6-7 at intervals in the 1) vadose zone (unsaturated zone), 2) just below the water table in the saturated zone, and 3) near the contact of the fine to medium sand formation and the underlying silty clay. The depth to the silty clay formation was approximately 35 feet bgs at GPT-6-5 and approximately 47 feet bgs at GPT-6-7.

Monitoring well GPT-6-4 was installed in the north trench in backfill from the same formation. Since the backfill was not a different formation, it is not indicated as fill in the boring log.

Monitoring wells were developed using a Brainard-Killman handpump and a gasoline-powered centrifugal pump until pH, conductivity, and temperature had stabilized to within 10 percent and until the turbidity of the groundwater was considered acceptable. Typically, 100 to 150 gallons were removed from the wells before turbidity was considered acceptable and the parameters had stabilized. Development water was transferred to the 6,500-gallon Baker Tank located on-site. A total of approximately 800 gallons were developed from the monitoring wells and transferred to the Baker Tank.

As of this writing, analytical data from the collected soil samples were not available. The following table (Table 2) outlines the soil sampling program at Site 6 during monitoring well installation.

Table 2 Soil Sampling Plan

Sample Analysis Depth Interval (feet bgs)	Boring Number					
	B-6-5 3-5	B-6-5 8-10	B-6-4 20-22	B-6-7 8-10	B-6-7 20-22	B-6-7 45-47
TCL-CLP VOAs	X	X	X	X	X	X
TCL-CLP SVOAs	X	X	X	X	X	X
TCL-CLP PEST/PCBs	X	X				
TAL-CLP INORGANICS W/CYANIDE	X	X				
TPH (METHOD 418.1)	X	X		X		
TOC (METHOD 415.1)					X	
HERBICIDES (METHOD 8150)	X	X				
DIOXINS/FURANS (METHOD 8290)	X	X				
TRIP BLANK	XP			XP		XP
EQUIPMENT RINSATE FIELD BLANK	XF			XL		
DUPLICATE	XF					
MATRIX SPIKE	XF					
MATRIX SPIKE DUPLICATE	XF					

XF = FULL SUITE OF ANALYSIS (TOC not sampled in B-6-5).
XP = ONLY VOAs
XL = ONLY VOAs, SVOAs, TPH, TOC

Recovery Well Installation and Development

The recovery well, designated GPT-6-RW, was installed 12 December 1993 to a total depth of approximately 25 feet bgs (see Table 1). Slot size and the filter pack range were determined from Harding-Lawson (1987) soil boring logs at Site 6, and included in the Technical Bulletin that followed the first field effort. The recovery well is located within the free-phase product plume and downgradient of the suspected source, the former Fire-Fighting Training Area pits (Attachment 2). The recovery well is constructed of 5.6-inch outside diameter Schedule 10S Type 304 stainless steel casing and 10S Type 304 wire-wrapped 20-slot screen. A 5-foot long sump extends below the screen for installation of a groundwater depression pump. Twelve and one-quarter inch (outside diameter) augers were utilized

to create a 12.75-inch diameter boring within which the recovery well was installed. The 16/30 filter pack was tremied into the annulus from the bottom of the boring to 2 feet above the screen. Two-feet of bentonite pellets were installed above the filter pack and allowed to hydrate for 24 hours. Portland Type 1 cement with a 5 percent mixture of bentonite completed the well to the surface.

The recovery well was developed by mechanically surging the well and alternately pumping fluids from the well. The recovery well was alternately surged and pumped to develop out the fine-grained particles within the filter pack. A Moyno stadia pump, located on the drill rig, was used to discharge fluids from the recovery well. A 4-inch surge block, attached to 20 feet of rods was used to surge the well between pumping periods. Temperature, pH, and conductivity were recorded during development to ensure that these parameters stabilized to within 10 percent. Pumping rate and drawdown were recorded to monitor the specific capacity of the recovery well as development progressed. As expected, the specific capacity of the recovery well increased during development. This indicated that the efficiency of the well had increased as fine-grained particles were removed. The specific capacity (gallons per minute per foot of drawdown) increased from 2.31 at the start of development to 2.71 near the end. A total of 1,700 gallons of groundwater was removed from the recovery well and transferred to the Baker Tank.

A trace of free-phase product was observed in the recovery well prior to development. The free-phase product was quickly pinched off after development began due to a pumping rate of 25 gallons per minute, which resulted in little product removal.

A multi-staged free-phase pumping test will be performed in the recovery well during January 1994. Stage I will involve pumping free-phase product only. Stage II will entail pumping free-phase product while maintaining a set groundwater level. Stage III will consist of pumping free-phase product and groundwater, creating a cone of depression to influence flow of free-phase product into the recovery well.

Groundwater Sampling

Groundwater from the newly installed monitoring wells (except GPT-6-8) and existing monitoring wells GPT-6-2 and GPT-6-3 were sampled on 13 December 1993. The wells were developed and purged prior to sampling. Temperature, Ph, and conductivity had stabilized to within 10 percent. Table 3 summarizes the sampling and analyses performed on the groundwater from Site 6. Results of these analyses are not available at the time of this writing.

Table 3 Groundwater Samples

Sample Analysis	GPT-6-1	GPT-6-2	GPT-6-3	GPT-6-4	GPT-6-5	GPT-6-6	GPT-6-7	GPT-6-8	GPT-6-RW
TCL-CLP VOAs	NS	X	X	X	X	X	X	NS	TBS
TCL-CLP SVOAs		X	X	X	X	X	X		
TCL-CLP PEST/PCBs				X		X			
TAL-CLP INORGANICS W/CYANIDE				X		X			
TPH (METHOD 418.1)		X	X	X		X			
TOC (METHOD 415.1)				X		X			
HERBICIDES (METHOD 8150)				X		X			
DIOXINS/FURANS (METHOD 8290)				X		X			
TRIP BLANK		XP		XP		XP			
POTABLE WATER				XF					
DISTILLED WATER				XF					
EQUIPMENT RINSATE		XO		XF					
DUPLICATE				XF					
MATRIX SPIKE				XF					
MATRIX SPIKE DUPLICATE				XF					

NS = NOT SAMPLED
TBS = TO BE SAMPLED DURING MULTI-STAGED PRODUCT PUMPING TEST
XF = FULL SUITE OF ANALYSIS
XP = ONLY VOAs
XO = ONLY VOAs, SVOAs, TPH
XD = ONLY VOAs, SVOAs

SLUG TESTING OF MONITORING WELLS

Aquifer slug tests were performed on the newly installed wells. Rising head slug tests were performed on all of these monitoring wells, and falling head slug tests were also conducted on the deeper wells GPT-6-5 and GPT-6-7. Falling head slug tests were performed on these wells because water level changes fluctuate with in the riser pipe and not within the screened zone. A solid slug was used to displace volume in the wells and an electronic data logger (Hermit SE 1000 C) recorded the water level changes. Analyses of these tests indicated hydraulic conductivity values (k) ranging between 2.0 x 10^{-4} to 2.4 x 10^{-3} centimeters per second (cm/sec) in the shallow monitoring wells, 2.2 x 10^{-3} to 3.5 x 10^{-3} cm/sec in GPT-6-7, and 5.2 x 10^{-3} to 5.6 x 10^{-3} cm/sec in GPT-6-5. These results yield a geometric average of 2.9 x 10^{-3} cm/sec (excluding the results from GPT-6-4).

Table 4 presents tabulated slug test results, and Attachment 5 contains the graphical results of the slug tests.

Table 4 Slug Test Results

Well I.D.	Test #	Hydraulic Conductivity ft/min	Hydraulic Conductivity cm/sec
GPT-6-4	0	0.0003983	0.0002025
	1	0.0004488	0.0002281
GPT-6-5	6*	0.01032	0.005246
	7	0.01098	0.005581
GPT-6-6	2	0.004335	0.002204
	3	0.004068	0.002068
GPT-6-7	8*	0.004298	0.002185
	9	0.006846	0.003480
GPT-6-8	4	0.004221	0.002146
	5	0.004007	0.002037

* = Falling head slug test

An two anomalous slug test analysis require additional interpretation. The results from GPT-6-4 are an order of magnitude lower than all other results. This may be an indication of the hydraulic conductivity of the fill material used in the north pit, since GPT-6-4 was installed within that pit.

IMPLICATIONS OF RESULTS

Two deep monitoring well borings indicated that the depth to the silty clay formation was deeper than previously reported. A silty clay was encountered at 35 feet bgs in GPT-6-5 and at 47 feet bgs in GPT-6-7. Otherwise, the soils encountered were a dark brown fine to medium sand with little silt and a dark gray clay with some silt. Some coarsening of the formation was observed near the contact with the underlying silty clay.

Analyses of slug tests resulted in hydraulic conductivity values ranging on the order of 2.9×10^{-3} cm/sec; these results are typical for fine to medium sand. One notable exception was GPT-6-4, which indicated a hydraulic conductivity value on the order of 10^{-4} cm/sec. GPT-6-4 was completed in the former north pit, and the hydraulic conductivity in this monitoring well may result from the finer grained material used to backfill the pit.

Flow rates and drawdown were monitored in the recovery well during development. Results from these observations indicate that the pumping test scheduled for January will fill the remaining 3,500 gallons in the Baker Tank before the 25-hour test is completed.

Six Hydropunch II® well points remain open for observation purposes during the pumping test. Observations made prior to abandoning the other Hydropunch II® confirmed the plume delineation made during the first field effort. The remaining six well points will be abandoned following the pumping test in January.

Soil and groundwater sampling results are not available from the laboratory, CH2M Hill.

ATTACHMENT 1

Chronology of Events at Site 6

6 December

- Mobilize and stage equipment
- Install (2) stainless steel WP west of GPT-6-3

7 December

- Drillers mobilize and stage equipment
- Install GPT-6-4

8 December

- Install GPT-6-6
- Install GPT-6-8
- Grout abandon Hydropunch® II well points

9 December

- Take delivery of stainless steel RW
- Take delivery of Baker Tank
- Construct concrete pads and protective posts around completed monitoring wells
- Develop GPT-6-4

10 December

- Drill and collect subsurface soil samples and Install GPT-6-5
- Start boring for GPT-6-7 and collect subsurface soil samples

11 December

- Complete drilling and collection of subsurface soil sample and install GPT-6-7
- Develop GPT-6-6

ATTACHMENT 1 (Continued)

Chronology of Events at Site 6

12 December

- Develop GPT-6-8
- Develop GPT-6-5
- Purge GPT-6-4
- Install GPT-6-RW
- Develop GPT-6-3

13 December

- Develop GPT-6-5, GPT-6-7
- Collect GW samples from GPT-6-2 through GPT-6-7

14 December

- Set protective pads and posts around monitoring and recovery wells
- Stage drums

15 December

- Develop GPT-6-RW
- Secure site/stage drums

16 December

- Slug test GPT-6-4 through GPT-6-8

ATTACHMENT 2

Site Map

ATTACHMENT 3

Boring Logs

FIELD BORING LOG

BORING NO.: GPT-6-4

PROJECT NO.: 08505.30	PROJECT NAME: NCBC FPPA		PAGE 1 OF 1
DRILLING CONTRACTOR: GPI	DRILLER: Bowman	DATE STARTED: 12-7-93	COMPLETED: 12-7-93
METHOD: HSA	AUGER SIZE: 4.25"	OVA: PORTA FID	PROTECTION LEVEL: MODIFIED LEVEL D
GROUND ELEV.: NA	SOIL DRILLED: Sand	WATER LEVEL: ≈ 5'	TOTAL DEPTH: 13'
LOGGED BY: R. Fisher	CHECKED BY: R. Fisher		DATE: 12-7-93

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	LAB	FIELD SCREENING		MONITORING	
						FID	UV\IR	TIP	LEL
	0 - 2	PH		Light brown/yellow silt and gravel fill material		0 ppm			
	2 - 3	PH		Dark brown silty sand with gravel		100 ppm			
	3 - 13	HSA		Dark brown fine to medium sand with some silt		100 ppm			

FIELD BORING LOG			BORING NO.: GPT-6-5
PROJECT NO.: 08505.30	PROJECT NAME: NCBC FPPA		PAGE 1 OF 1
DRILLING CONTRACTOR: GPI	DRILLER: Bowman	DATE STARTED: 12-10-93	COMPLETED: 12-10-93
METHOD: HSA	AUGER SIZE: 4.25"	OVA: PORTA FID	PROTECTION LEVEL: MODIFIED LEVEL D
GROUND ELEV.: NA	SOIL DRILLED: Sand	WATER LEVEL: ≈ 5.0'	TOTAL DEPTH: 34'
LOGGED BY: R. Fisher	CHECKED BY: R.Fisher		DATE: 12-10-93

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	LAB	FIELD SCREENING		MONITORING	
						FID	UV\IR	TIP	LEL
	0 - 2		HSA	Light brown fine sand with some clay, fill material					
SBG6503	2 - 4	10,8,44	24/18	Dark brown fine sand, with little medium sand and little silt.		500 ppm			
		5,3,56	24/16	Dark brown fine sand, with little medium sand and little silt.		500 ppm			
	4 - 7	HSA		Dark brown fine sand, with little medium sand and little silt.					
SBG6508	7 - 9	6,10,9,8	24/12	Dark brown medium sand with some fine sand and little silt.		300 ppm			
		8,15,30,41	24/12	6,14,19,22 on the third spoon		300 ppm			
	9 - 20	HSA		Dark brown medium sand with some fine sand and little silt.		100 ppm			
SBG6520	20 - 22	8,11,10,12	24/10	Dark brown medium sand with some fine sand and little silt.		50 ppm			
	23 - 25	1,WOH,3,2	24/5	Dark brown medium sand with some fine sand and little silt.		15 ppm			
	24 - 27	8,10,14,27	24/24	Medium brown sand with some fine sand and little silt.		0 ppm			
	27 - 29	5,5,9,4	24/18	Medium brown sand with some fine sand and little silt.		0 ppm			
	29 - 31	2,3,7,11	24/16	Light brown sand with some fine sand and little silt.		0 ppm			
	31 - 33	4,5,6,7	24/18	Light brown sand with some clay modules present.		0 ppm			
	33 - 34	HSA		Dark gray silty clay		0 ppm			

FIELD BORING LOG				BORING NO.: GPT-6-6
PROJECT NO.: 08505.30		PROJECT NAME: NCBC FPPA		PAGE 1 OF 1
DRILLING CONTRACTOR: GPI		DRILLER: Bowman	DATE STARTED: 12-8-93	COMPLETED: 12-8-93
METHOD: HSA	AUGER SIZE: 4.25"	OVA: PORTA FID	PROTECTION LEVEL: MODIFIED LEVEL D	
GROUND ELEV.: NA	SOIL DRILLED: Sand	WATER LEVEL: ≈ 4'	TOTAL DEPTH: 13'	
LOGGED BY: R. Fisher	CHECKED BY: R. Fisher		DATE: 12-8-93	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	LAB	FIELD SCREENING		MONITORING	
						GC	UV\IR	TIP	LEL
	0 - 3	PH		Light brown clayey silt, fill material		10 ppm			
	3 - 13	HSA		Dark brown fine sand with some silt		50 ppm			

FIELD BORING LOG

BORING NO.: GPT-6-7

PROJECT NO.: 08505.30	PROJECT NAME: NCBC FPPA		PAGE 1 OF 1
DRILLING CONTRACTOR: GPI	DRILLER: Bowman	DATE STARTED: 12-10-93	COMPLETED: 12-11-93
METHOD: HSA	AUGER SIZE: 4.25"	TIP eV: Tip I 10.6 eV	PROTECTION LEVEL: MODIFIED LEVEL D
GROUND ELEV.: NA	SOIL DRILLED: Sand	WATER LEVEL: 5'	TOTAL DEPTH: 45
LOGGED BY: R. Fisher	CHECKED BY: R.Fisher		DATE: 12-10-93

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	LAB	FIELD SCREENING FID	FIELD SCREENING UV\IR	MONITORING TIP	MONITORING LEL
	0 - 8	HSA		Medium brown fine sand with some medium sand and little silt.					
SBG6708	8 - 12	8,6,16,25	24/16	Medium brown fine sand with some medium sand and little silt.		110 ppm			
	12 - 14	9,15,17,20	24/24	Second spoon to ensure enough sample.		150 ppm			
	14 - 20			HSA no apparent lithology change.					
SBG6720	20 - 22	2,2,4,5	24/22	Light brown,medium sand with some fine sand and little silt.		1 ppm			
	22 - 25			HSA					
	25 - 27	4,4,5,6	24/20	Light brown medium sand with some fine sand and little silt.		0 ppm			
	27 - 30			HSA					
	30 - 32	4,5,5,6	24/20	Light brown medium sand with some fine sand and little silt.		0 ppm			
	32 - 35			HSA					
	35 - 37	5,6,9,10	24/20	Light brown medium sand with some fine sand and little silt.		0 ppm			
	37 - 40			HSA					
	40 - 42	3,4,7,11	24/20	Dark brown medium sand with some fine sand and little silt. Clay modules present.		0 ppm			
	43 - 45	1,2,2,4	24/16	Dark brown medium sand with some fine sand and little silt. Clay modules present.		0 ppm			
SBG6745	45 - 47	7,8,9,40	24/18	Dark brown, medium sand. Dark gray silty clay in bottom 2 inches.		0 ppm			

FIELD BORING LOG

BORING NO.: GPT-6-8

PROJECT NO.: 08505.30	PROJECT NAME: NCBC FPPA		PAGE 1 OF 1
DRILLING CONTRACTOR: GPI	DRILLER: Bowman	DATE STARTED: 12-8-93	COMPLETED: 12-8-93
METHOD: HSA	AUGER SIZE: 4.25"	OVA: PORTA FID	PROTECTION LEVEL: MODIFIED LEVEL D
GROUND ELEV.: NA	SOIL DRILLED: Silty Sand	WATER LEVEL: 4'	TOTAL DEPTH: 13'
LOGGED BY: R. Fisher	CHECKED BY: R.Fisher		DATE: 12-8-93

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	LAB	FIELD SCREENING		MONITORING	
						GC	UV\IR	TIP	LEL
	0 - 4	HSA		Light brown silty sand with some clay and shell fill material.		10 ppm			
	4 - 13	HSA		Brown, fine silt sand with some medium sand and little silt.		100 ppm			

FIELD BORING LOG			BORING NO.: GPT-6-RW
PROJECT NO.: 08505.30	PROJECT NAME: NCBC FPPA		PAGE 1 OF 1
DRILLING CONTRACTOR: GPI	DRILLER: Bowman	DATE STARTED: 12-12-93	COMPLETED: 12-12-93
METHOD: HSA	AUGER SIZE: 12.25"	OVA: PORTA FID	PROTECTION LEVEL: MODIFIED LEVEL D
GROUND ELEV.: NA	SOIL DRILLED: Sand	WATER LEVEL: 8.5	TOTAL DEPTH: 26'
LOGGED BY: R. Fisher	CHECKED BY: R. Fisher		DATE: 12-12-93

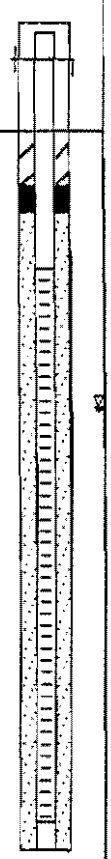
SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	LAB	FIELD SCREENING		MONITORING	
						FID	UV\IR	TIP	LEL
	0 - 2	HSA		Silty clay with sand fill, light brown		0			
	2 - 26	HSA		Medium sand, dark brown with some fine sand and little silt. Strong petroleum odor.		800 - 1,400 ppm			

ATTACHMENT 4

Well Construction Details

TITLE: NCBC Gulfport FPPA		LOG of WELL: GPT-6-4	BORING NO. GPT-6-4
CLIENT: U.S. NAVY, SOUTHNAVFACENGCOM			PROJECT NO: 8505-30
CONTRACTOR: Ground Water Protection		DATE STARTED: 12/7/93	COMPLTD: 12/7/93
METHOD: HSA	CASE SIZE: 2.0"	BORING DIA.: 4.25"	PROTECTION LEVEL: D
TOC ELEV.: NA FT.	MONITOR INST.: FID	TOT DPTH: 13.0FT.	DPTH TO ∇ 5.0 FT.
LOGGED BY: R. Fisher	WELL DEVELOPMENT DATE: 12/12/93		SITE: Site 6

DEPTH FT.	LABORATORY SAMPLE ID	SAMPLE	RECOVERY	HEADSPACE (ppm)	SOIL/ROCK DESCRIPTION AND COMMENTS	LITHOLOGIC SYMBOL	SOIL CLASS
					Silty sand, light brown to yellow, with gravel		SM
				0	Silty sand, dark brown, with gravel		
				100	Silty sand, dark brown, fine/medium sand with some silt		
5							
10							
				100	total depth = 13.0 ft.		
15							
20							
25							



TITLE: NCBC Gulfport FPPA		LOG of WELL: GPT-6-5	BORING NO. GPT-6-5
CLIENT: U.S. NAVY, SOUTHNAVFACENGCOM			PROJECT NO: 8505-30
CONTRACTOR: Ground Water Protection		DATE STARTED: 12/10/93	COMPLTD: 12/10/93
METHOD: HSA	CASE SIZE: 2.0"	BORING DIA.: 4.25"	PROTECTION LEVEL: D
TOC ELEV.: NA FT.	MONITOR INST.: FID	TOT DPTH: 33.0FT.	DPTH TO ∇ 5.0 FT.
LOGGED BY: R. Fisher	WELL DEVELOPMENT DATE: 12/13/93		SITE: Site 6 / Bldg. 383

DEPTH FT.	LABORATORY SAMPLE ID	SAMPLE	RECOVERY	HEADSPACE (ppm)	SOIL/ROCK DESCRIPTION AND COMMENTS	LITHOLOGIC SYMBOL	SOIL CLASS	
							SM	
	SBG6-5-3		18"	500	Silty sand, dark brown, with some silt			10,8,4,4
5								
			12"	300	Silty sand, dark brown, medium sand with some fine sand and a little silt			6,10,9,8
				100				
10								
15								
20			10"	50				8,11,10,12
				15				1,WOH,3,2
			5"					
25				0				8,10,14,27

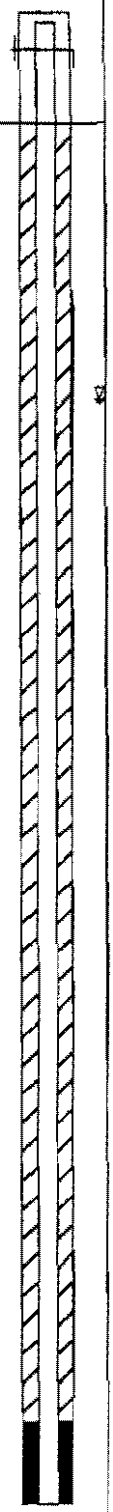


 ABB ENVIRONMENTAL SERVICES, INC.

TITLE: NCBC Gulfport FPPA	**LOG of WELL:** GPT-6-5		**BORING NO.** GPT-6-5
CLIENT: U.S. NAVY, SOUTHNAVFACENGCOM			**PROJECT NO:** 8505-30
CONTRACTOR: Ground Water Protection		**DATE STARTED:** 12/10/93	**COMPLTD:** 12/10/93
METHOD: HSA	**CASE SIZE:** 2.0"	**BORING DIA.:** 4.25"	**PROTECTION LEVEL:** D
TOC ELEV.: NA FT.	**MONITOR INST.:** FID	**TOT DPTH:** 33.0FT.	**DPTH TO ∇** 5.0 FT.
LOGGED BY: R. Fisher	**WELL DEVELOPMENT DATE:** 12/13/93		**SITE:** Site 6 / Bldg. 383

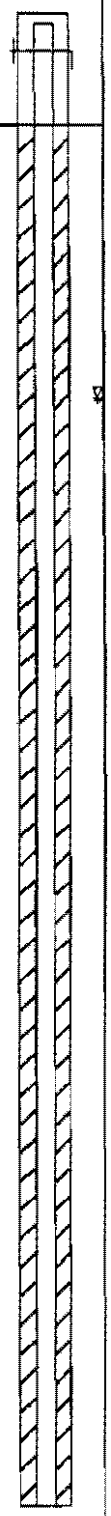
DEPTH FT.	LABORATORY SAMPLE ID	SAMPLE	RECOVERY	HEADSPACE (ppm)	SOIL/ROCK DESCRIPTION AND COMMENTS	LITHOLOGIC SYMBOL	SOIL CLASS	
					Continued from PAGE 1			
			24"		Silty sand, medium brown, medium sand with some fine sand and a little silt.		SM	
				0				5,5,9,14
			18"					
				0	Silty sand, light brown, with some silt			2,3,7,11
30			16"					
				0	Silty sand, light brown, clay nodules present			4,5,6,7
			18"					
					total depth = 33.0 ft.			
35								
40								
45								
50								

TITLE: NCSC Gulfport FPPA		LOG of WELL: GPT-6-6	BORING NO. GPT-6-6
CLIENT: U.S. NAVY, SOUTHNAVFACENGCOM			PROJECT NO: 8505-30
CONTRACTOR: Ground Water Protection		DATE STARTED: 12/8/93	COMPLTD: 12/8/93
METHOD: HSA	CASE SIZE: 2.0"	BORING DIA.: 4.25"	PROTECTION LEVEL: D
TOC ELEV.: NA FT.	MONITOR INST.: FID	TOT DPTH: 13.0FT.	DPTH TO ∇ 4.0 FT.
LOGGED BY: R. Fisher	WELL DEVELOPMENT DATE: 12/12/93		SITE: Site 6 / Bldg. 383

DEPTH FT.	LABORATORY SAMPLE ID	SAMPLE	RECOVERY	HEADSPACE (ppm)	SOIL/ROCK DESCRIPTION AND COMMENTS	LITHOLOGIC SYMBOL	SOIL CLASS
				10	Silty clay, light brown		CL
					Silty sand, dark brown, with strong fuel odor		SM
5							
				50			
10							
					total depth = 13.0 ft.		
15							
20							
25							

TITLE: NCBC Gulfport FPPA		**LOG of WELL:** GPT-6-7	**BORING NO.** GPT-6-7
CLIENT: U.S. NAVY, SOUTHNAVFACENGCOM			**PROJECT NO:** 8506-30
CONTRACTOR: Ground Water Protection		**DATE STARTED:** 12/11/93	**COMPLTD:** 12/11/93
METHOD: HSA	**CASE SIZE:** 2.0"	**BORING DIA.:** 4.25"	**PROTECTION LEVEL:** D
TOC ELEV.: NA FT.	**MONITOR INST.:** FID	**TOT DPTH:** 47.0FT.	**DPTH TO ∇** 5.0 FT.
LOGGED BY: R. Fisher	**WELL DEVELOPMENT DATE:** 12/13/93		**SITE:** Site 6 / Bldg. 383

DEPTH FT.	LABORATORY SAMPLE ID	SAMPLE	RECOVERY	HEADSPACE (ppm)	SOIL/ROCK DESCRIPTION AND COMMENTS	LITHOLOGIC SYMBOL	SOIL CLASS	
							SM	
5								
	SBG6-7-8		16"	110	Silty sand, medium brown, fine sand with some medium sand and a little silt			8,8,18,25
10								
			24"	150				9,15,17,20
15								
20	SBG6-7-20		22"	1	Silty sand, light brown, medium sand with some fine sand and a little silt			2,2,4,5
25				0				4,4,5,8

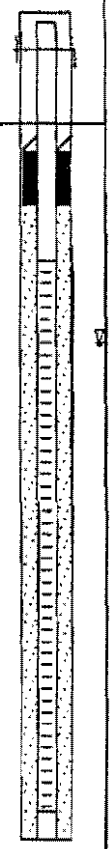


TITLE: NCBC Gulfport FPPA		**LOG of WELL:** GPT-6-7	**BORING NO.** GPT-6-7
CLIENT: U.S. NAVY, SOUTHNAVFACENGCOM			**PROJECT NO:** 8505-30
CONTRACTOR: Ground Water Protection		**DATE STARTED:** 12/11/93	**COMPLTD:** 12/11/93
METHOD: HSA	**CASE SIZE:** 2.0"	**BORING DIA.:** 4.25"	**PROTECTION LEVEL:** D
TOC ELEV.: NA FT.	**MONITOR INST.:** FID	**TOT DPTH:** 47.0FT.	**DPTH TO ∇** 5.0 FT.
LOGGED BY: R. Fisher	**WELL DEVELOPMENT DATE:** 12/13/93		**SITE:** Site 6 / Bldg. 383

DEPTH FT.	LABORATORY SAMPLE ID	SAMPLE	RECOVERY	HEADSPACE (ppm)	SOIL/ROCK DESCRIPTION AND COMMENTS	LITHOLOGIC SYMBOL	SOIL CLASS	
					Continued from PAGE 1			
			20"				SM	
30			20"	0				4,5,5,6
35			20"	0				5,6,9,10
40			20"	0	Silty sand, dark brown, medium sand with some fine sand and a little silt, clay nodules present			3,4,7,11
			16"	0				1,2,2,4
45			24"	0	Silty sand, no clay nodules present, clay stringer last 2"			7,8,9,40
					total depth = 47.0 ft.			
50								

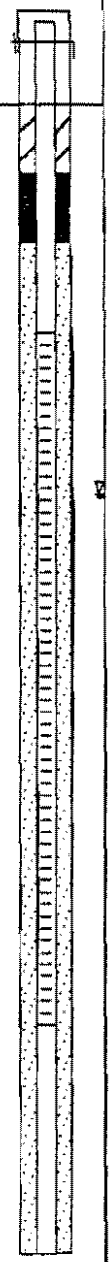
TITLE: NCBC Gulfport FPPA		LOG of WELL: GPT-6-8	BORING NO. GPT-6-8
CLIENT: U.S. NAVY, SOUTHNAVFACENGCOM			PROJECT NO: 8505-30
CONTRACTOR: Ground Water Protection		DATE STARTED: 12/8/93	COMPLTD: 12/8/93
METHOD: HSA	CASE SIZE: 2.0"	BORING DIA.: 4.25"	PROTECTION LEVEL: D
TOC ELEV.: NA FT.	MONITOR INST.: FID	TOT DPTH: 13.0FT.	DPTH TO ∇ 4.0 FT.
LOGGED BY: R. Fisher	WELL DEVELOPMENT DATE: 12/12/93		SITE: Site 6 / Bldg. 383

DEPTH FT.	LABORATORY SAMPLE ID	SAMPLE	RECOVERY	HEADSPACE (ppm)	SOIL/ROCK DESCRIPTION AND COMMENTS	LITHOLOGIC SYMBOL	SOIL CLASS
					Silty sand, light brown, with some clay and shell fill		SM
				10			
					Silty sand, brown		
5							
				100			
10							
					total depth = 13.0 ft.		
15							
20							
25							



TITLE: NCBC Gulfport FPPA		LOG of WELL: GPT-6-RW	BORING NO. GPT-6-RW
CLIENT: U.S. NAVY, SOUTHNAVFACENGCOM			PROJECT NO: 8505-30
CONTRACTOR: Ground Water Protection		DATE STARTED: 12/12/93	COMPLTD: 12/12/93
METHOD: HSA	CASE SIZE: 5.4"	BORING DIA.: 12.25"	PROTECTION LEVEL: D
TOC ELEV.: NA FT.	MONITOR INST.: FID	TOT DPTH: 25FT.	DPTH TO ▽ 8.5 FT.
LOGGED BY: R. Fisher	WELL DEVELOPMENT DATE: 12/15/93		SITE: Site 6

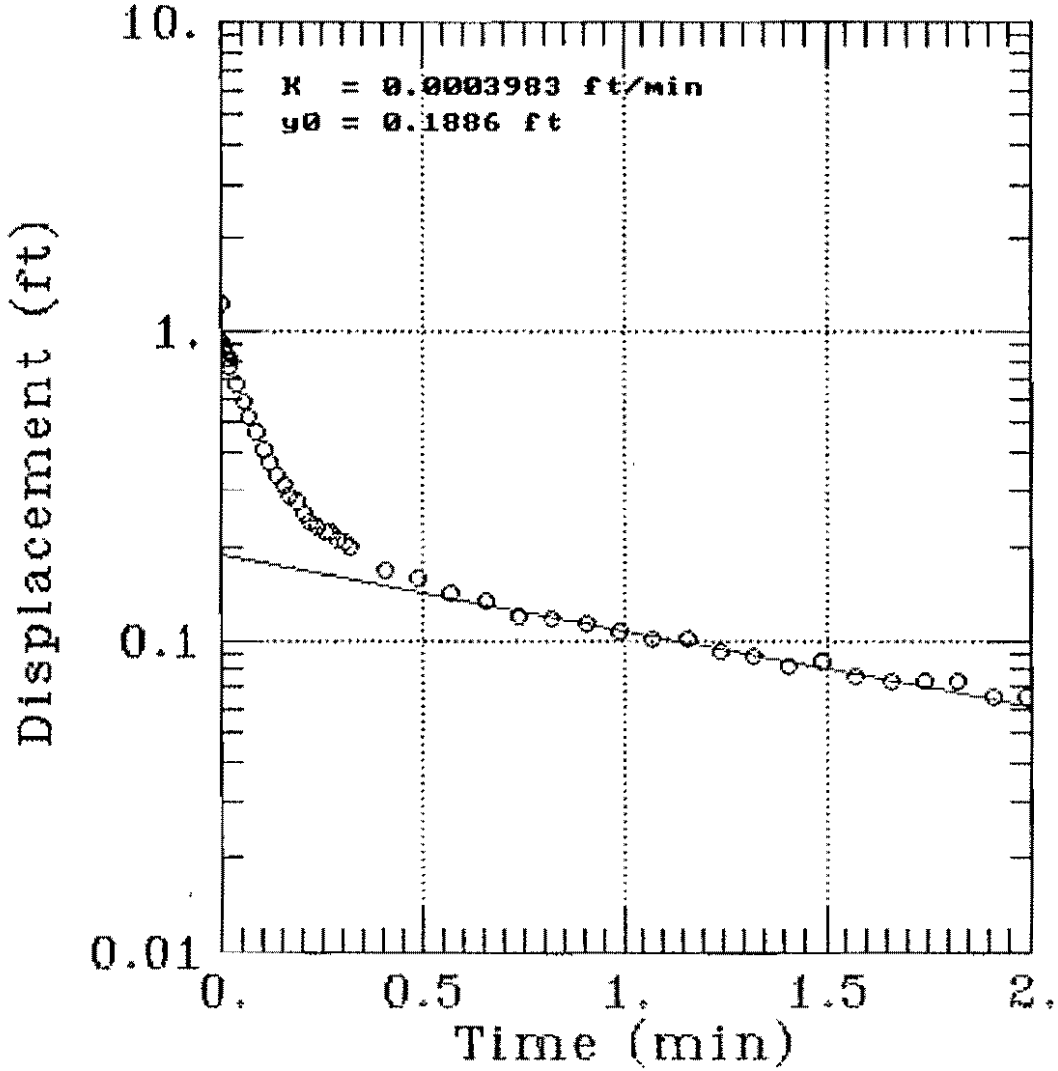
DEPTH FT.	LABORATORY SAMPLE ID	SAMPLE	RECOVERY	HEADSPACE (ppm)	SOIL/ROCK DESCRIPTION AND COMMENTS	LITHOLOGIC SYMBOL	SOIL CLASS
				0	Silty clay, light brown, with sand fill		CL
					Silty sand, dark brown, medium sand, some silt, strong petroleum odor		SM
5							
10							
15				800-1400			
20							
25					total depth = 25.0 ft.		
30							



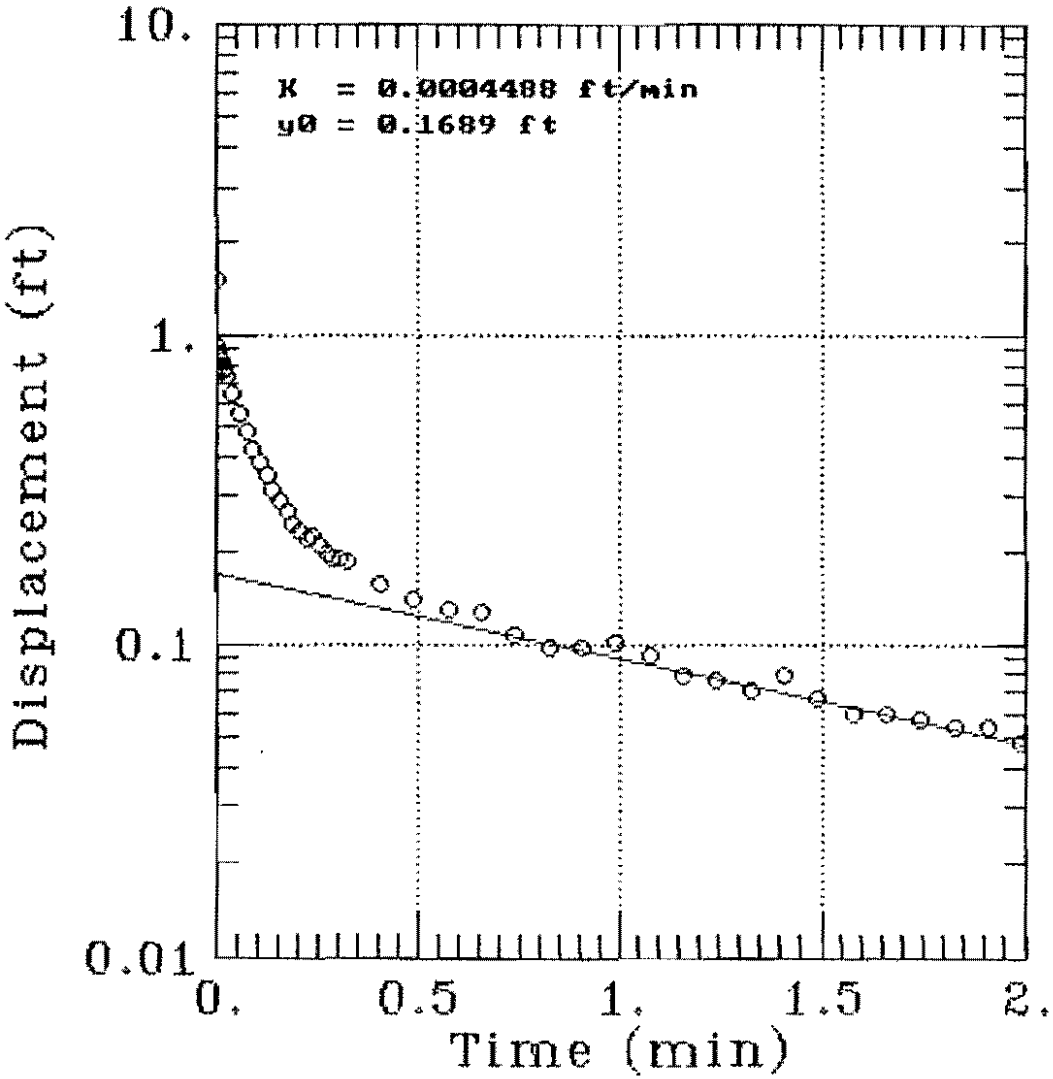
ATTACHMENT 5

Aquifer Slug Test Results

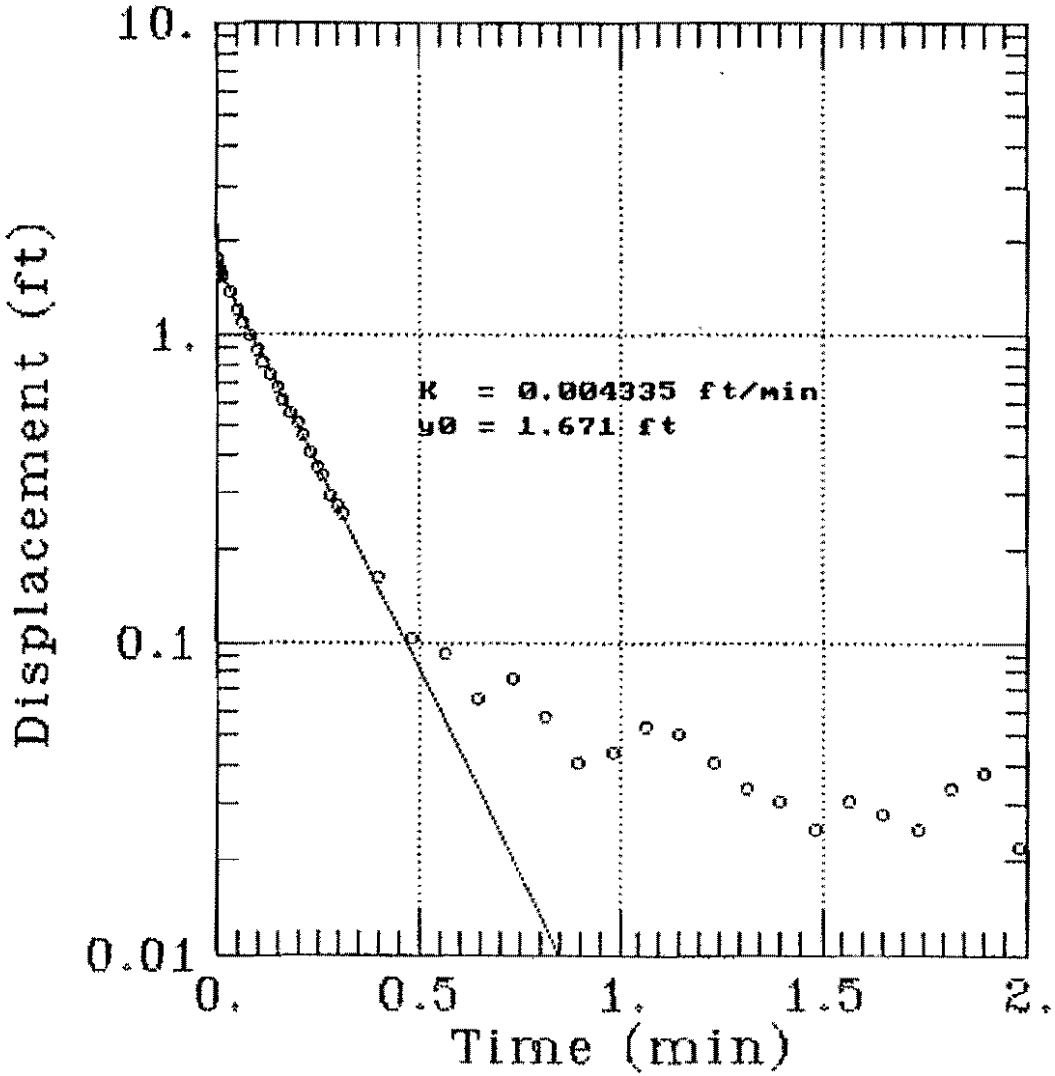
GPT-6-4 RISING HEAD SLUG TEST #0



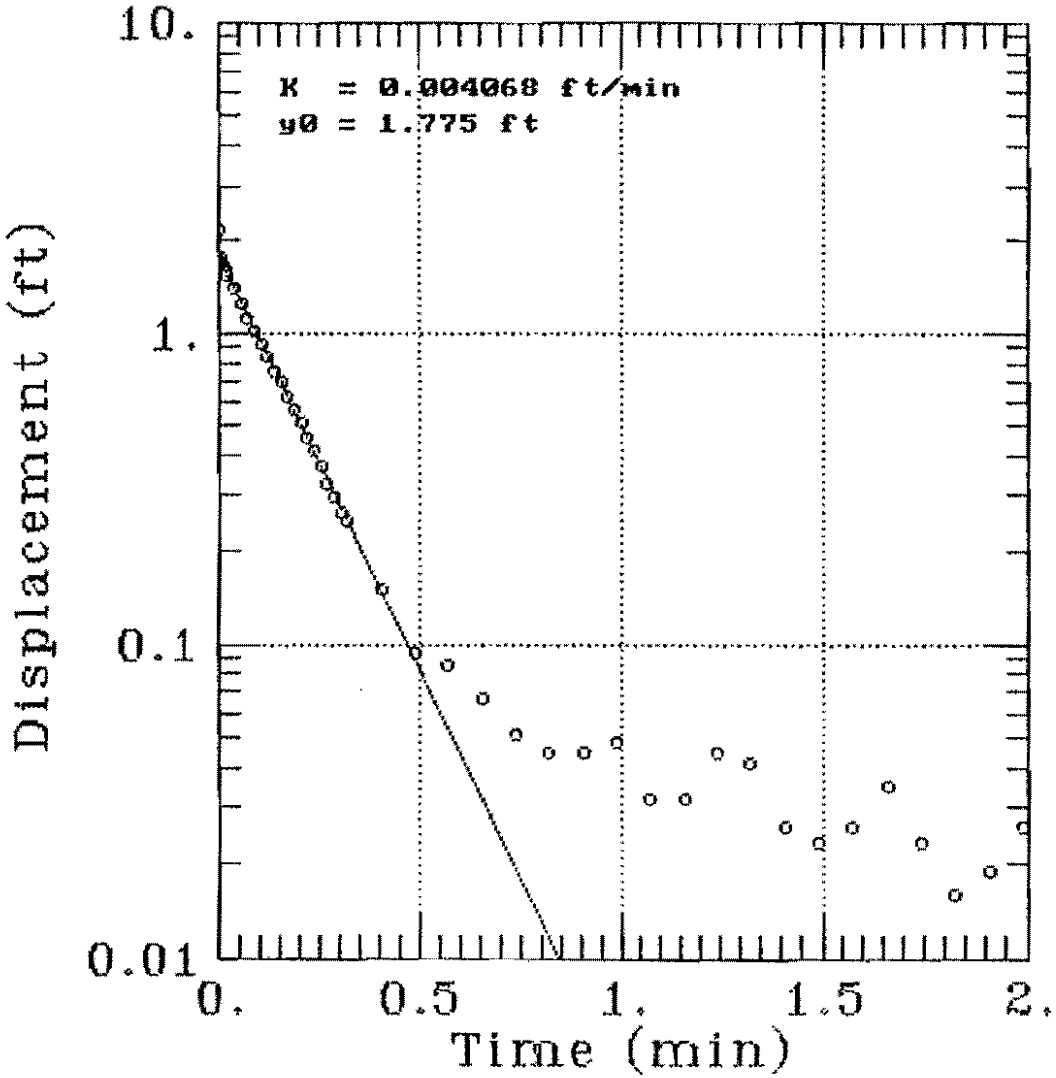
GPT-6-4 RISING HEAD SLUG TEST #1



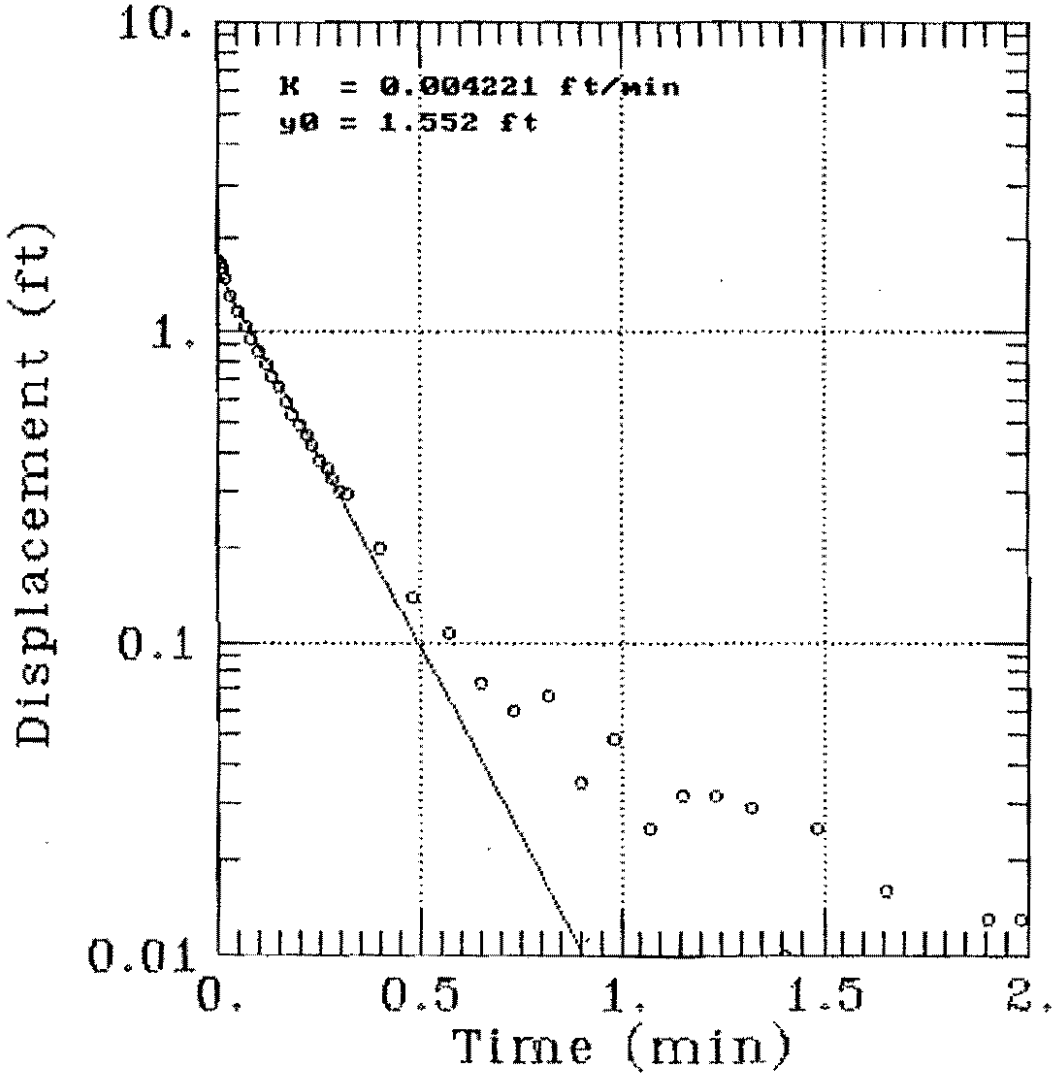
GPT-6-6 RISING HEAD SLUG TEST #2



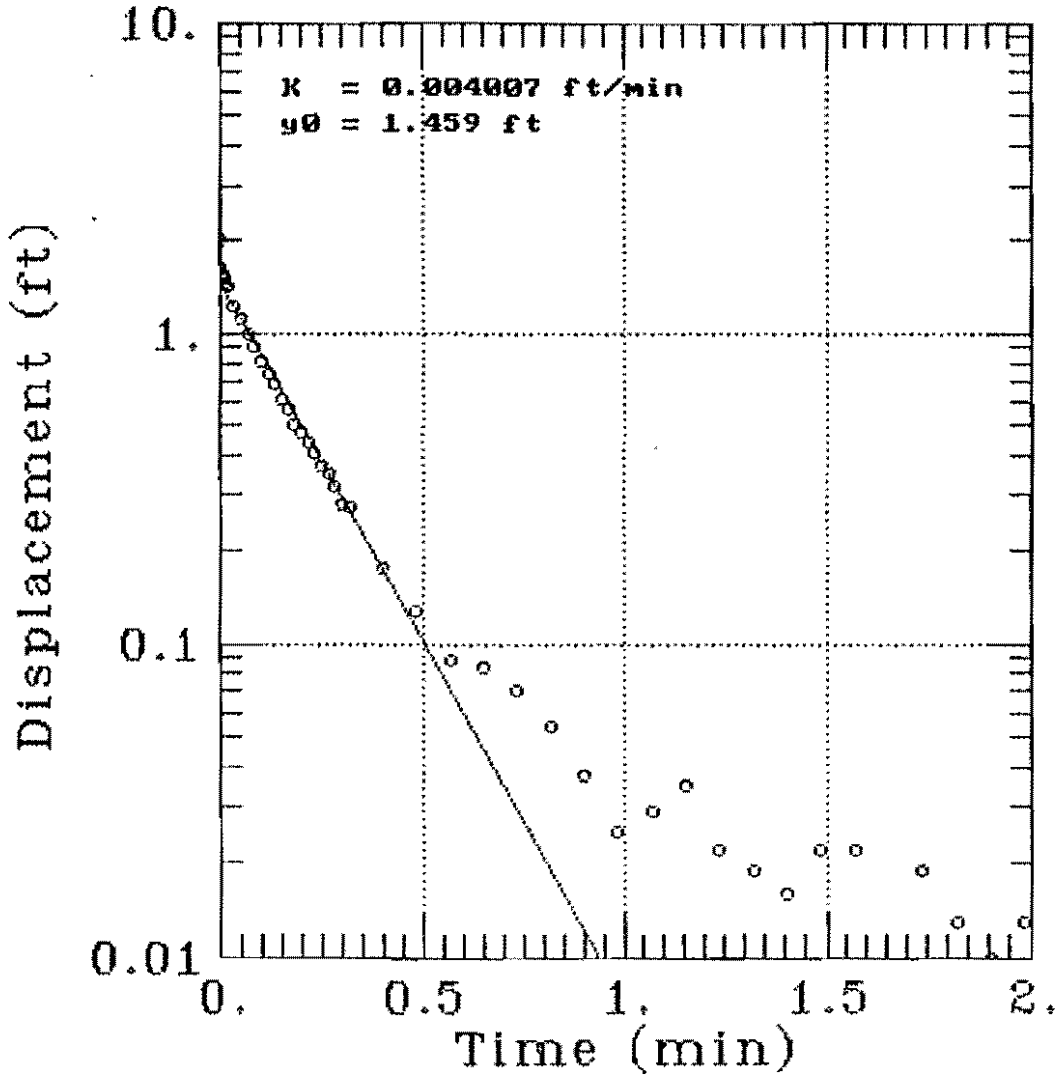
GPT-6-6 RISING HEAD SLUG TEST #3



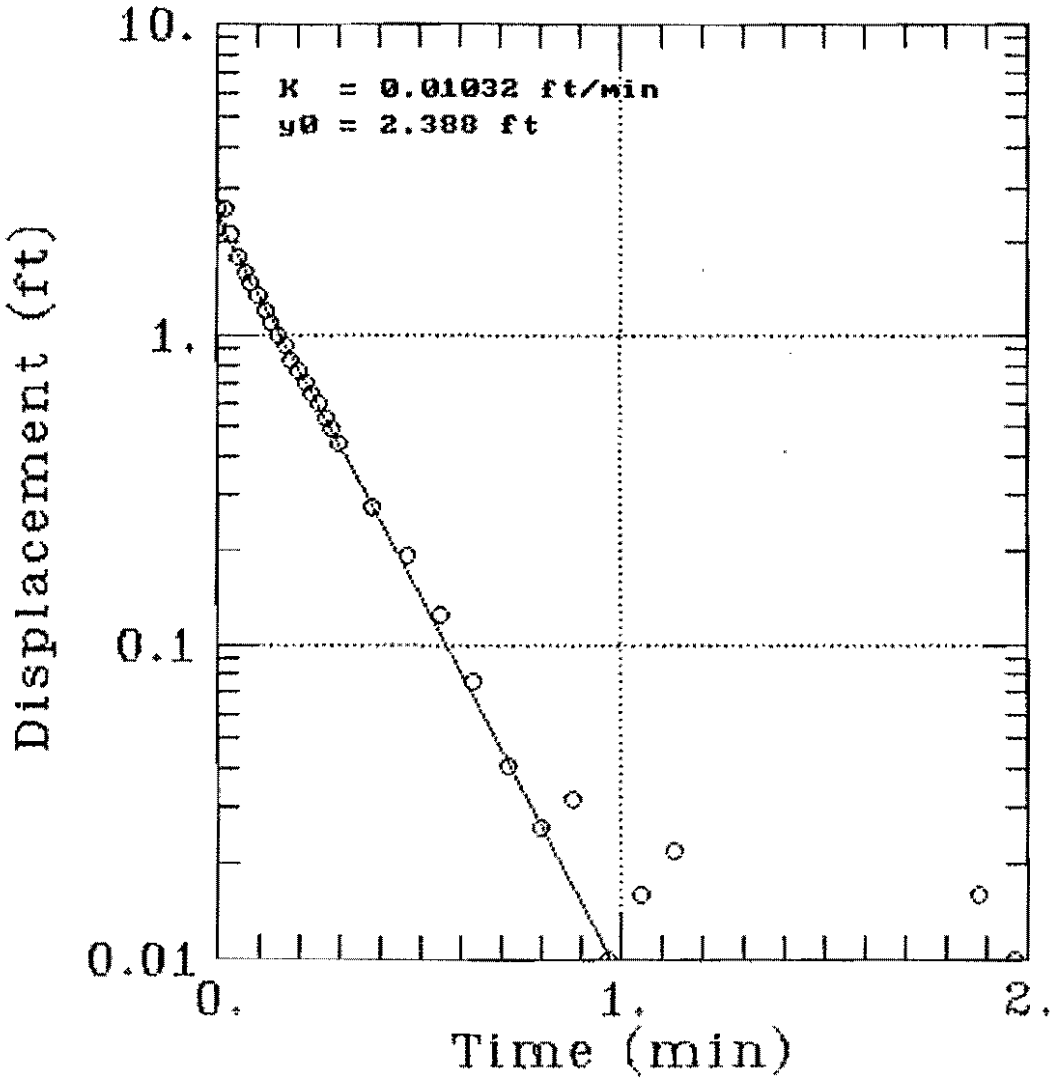
GPT-6-8 RISING HEAD SLUG TEST #4



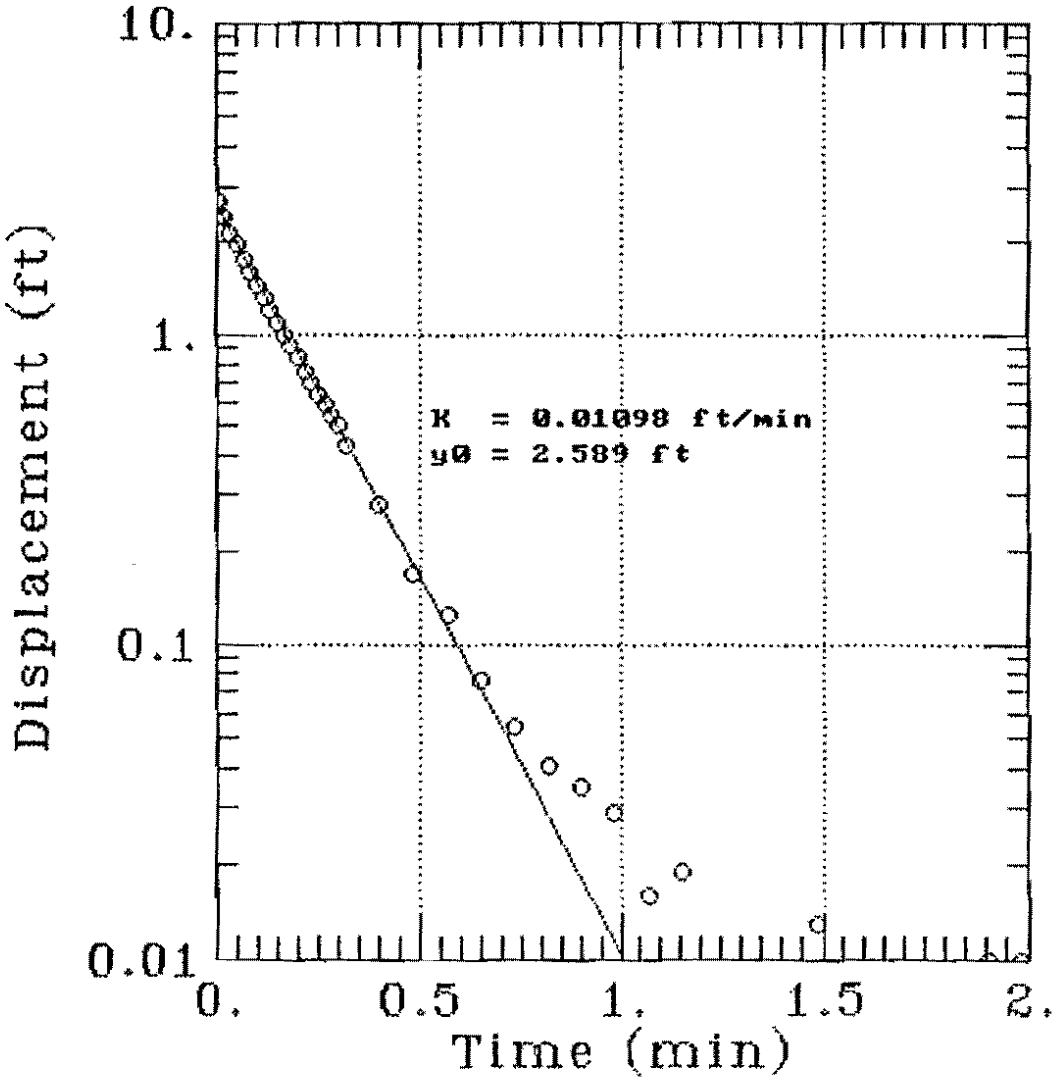
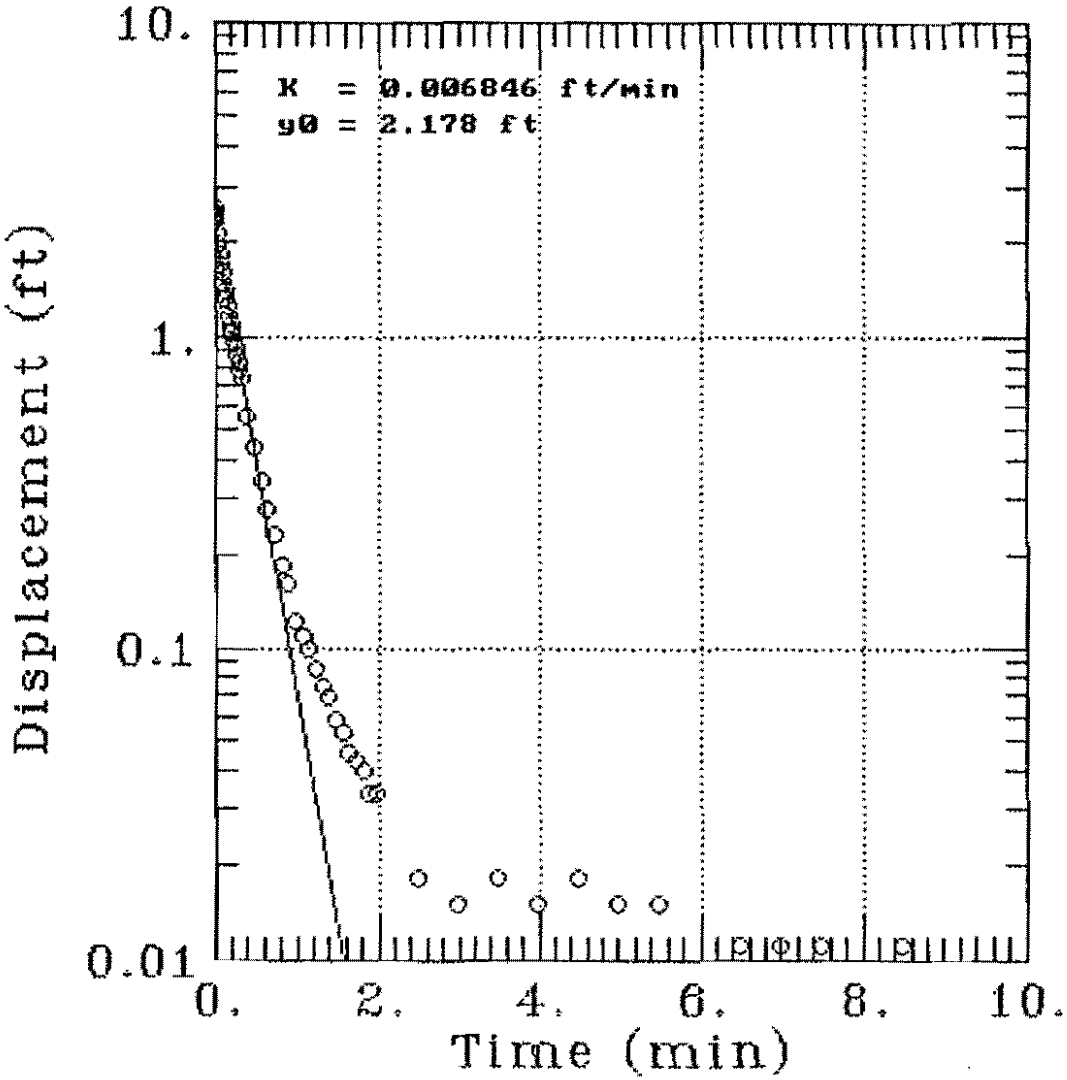
GPT-6-8 RISING HEAD SLUG TEST #5



GPT-6-5 FALLING HEAD SLUG TEST #6



GPT-6-5 RISING HEAD SLUG TEST #7



GPT-6-7 RISING HEAD SLUG TEST #9