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NSA MID SOUTH
5090.3a

FOURTH MOBILE ENHANCED MULTI-PHASE EXTRACTION (MEME) EVENT AND
ENHANCED FLUID RECOVERY (EFR) RESULTS MILLINGTON SUPPACT TN
11/05/1998
CMD ASSOCIATES

CMD ASSOCIATES, LLC

Knoxville Branch Office
333-M Troy Circle
Knoxville, TN 37919
Phone: 423-558-8852
Fax: 423-558-3529

3144 Stage Post Drive, Suite 112
Bartlett, Tennessee 38133
Phone: 901-259-2362 Fax: 901-259-2364

Nashville Branch Office
Post Office Box 147
Pegram, TN 37143
Phone: 615-662-9394
Fax: 615-662-3162

TRANSMITTED VIA REGULAR MAIL

November 5, 1998

Commanding Officer
ATTN: Code 1846
Southern Division, Naval Facilities Engineering Command
2155 Eagle Drive, P.O. Box 190010
North Charleston, South Carolina 29419-9010
POC: Mr. John Karlyk, P.E.

**RE: Report of Ground Water Sampling Results
Report for Mobile Enhanced Multi-Phase Extraction Event Number 4
CMD Invoice Number 100106
Underground Storage Tank System Adjacent to Naval Hospital Boiler System
Naval Support Activity, Memphis/Millington, Tennessee
Facility ID Number: 0-791707
Contract/Purchase Order Number: N62467-98-M-1046
CMD Project Number: 01-0177**

Dear Mr. Karlyk:

In accordance with the above-referenced contract/purchase order, enclosed are one (1) copy each of the following reports:

1. Laboratory analytical report for the duplicate set of ground water samples collected from well NSANHMW04 prior to performance of Mobile Enhanced Multi-Phase Extraction (MEME) Event Number 4.
2. EcoVac Services report of the results of MEME Event Number 4.

Three copies of these reports were hand-delivered to Mr. Randy Wilson at Naval Support Activity, Memphis, on November 5, 1998.

The ground water samples from well NSANHMW04 were collected by a CMD Associates, LLC (CMD), representative on October 15, 1998. The samples were analyzed for Extractable Petroleum Hydrocarbons (EPH) using the State of Tennessee Method by Memphis Environmental Center, Inc. MEME Event Number 4 was completed by CMD and EcoVac Services on October 16, 1998. This was the second of four (4) MEME Events to be completed under the above-referenced contract/purchase order. The first MEME Event (*i.e.*, Number 3) under the above-referenced contract/purchase order was completed by CMD and EcoVac Services on September 25, 1998. MEME Events Numbers 1 and 2 were completed

Mr. John Karlyk, P.E.
November 5, 1998
Page Two

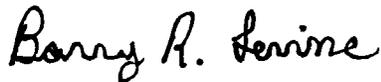
by CMD and EcoVac Services under a previous contract/purchase order on March 25 and April 10, 1998. MEME Event Number 5 (*i.e., third event under the above-referenced contract/purchase order*), is currently scheduled to be performed on Friday, November 6, 1998. MEME Event Number 6 (*i.e., fourth and final event under the above-referenced contract/purchase order*) will be completed approximately 21 days after MEME Event Number 5 (*i.e., last week of November or first week of December 1998*).

Based on completion of MEME Event Number 4, the associated ground water sampling, and submittal of the enclosed reports, also enclosed is CMD Invoice Number 100106 in the amount of \$3,541.75. This billing represents the second 25% of the contract/purchase order amount.

If you have any questions regarding this transmittal, please do not hesitate to contact me.

Sincerely,

CMD ASSOCIATES, LLC



Barry R. Levine, P.G.
Project Manager

Enclosures

#MEMPHISD\SITE0177\0177-009.LET

C: Ann Miller - CMD (*Memphis*)

CMD ASSOCIATES, LLC

3144 Stage Post Drive, Suite 112

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Nashville Branch Office
Post Office Box 147
Pegram, TN 37143
Phone: 615-662-9394
Fax: 615-662-3162

TRANSMITTED VIA HAND DELIVERY

COPY

November 5, 1998

Mr. Randy Wilson
Environmental Protection Specialist
Public Works Department, Environmental Division
Naval Support Activity, Memphis
7800 Third Avenue, Building 455, 2nd Floor
Millington, Tennessee 38054-0306

**Re: Report of Ground Water Sampling Results
Report for Mobile Enhanced Multi-Phase Extraction Event Number 4
Underground Storage Tank System Adjacent to Naval Hospital Boiler System
Naval Support Activity, Memphis/Millington, Tennessee
Facility ID Number: 0-791707
Contract/Purchase Order Number: N62467-98-M-1046
CMD Project Number: 01-0177**

Dear Mr. Wilson:

In accordance with the above-referenced contract/purchase order, enclosed are the original and two (2) copies each of the following reports:

1. Laboratory analytical report for the duplicate set of ground water samples collected from well NSANHMW04 prior to performance of Mobile Enhanced Multi-Phase Extraction (MEME) Event Number 4.
2. EcoVac Services report of the results of MEME Event Number 4.

The ground water samples from well NSANHMW04 were collected by a CMD Associates, LLC (CMD), representative on October 15, 1998. The samples were analyzed for Extractable Petroleum Hydrocarbons (EPH) using the State of Tennessee Method by Memphis Environmental Center, Inc. MEME Event Number 4 was completed by CMD and EcoVac Services on October 16, 1998. This was the second of four (4) MEME Events to be completed under the above-referenced contract/purchase order. The first MEME Event (i.e., Number 3) under the above-referenced contract/purchase order was completed by CMD and EcoVac Services on September 25, 1998. MEME Events Numbers 1 and 2 were completed by CMD and EcoVac Services under a previous contract/purchase order on March 25 and April 10, 1998.

Mr. Randy Wilson
November 5, 1998
Page Two

On the date of ground water sampling, a separate phase hydrocarbons (SPH) thickness of 0.07 foot was observed on the water surface in well NSANHWMW04. Prior to collection of the ground water samples, a volume of water equivalent to slightly more than three (3) volumes of the standing water column was purged from the well using a new, unused, disposable bottom-filling bailer. The ground water samples were then collected using another new, unused, disposable bottom-filling bailer. The samples were preserved on ice immediately upon collection and during transport to the laboratory.

As shown in the enclosed laboratory analytical report, EPH was detected in the original and duplicate samples at concentrations of 488,000 micrograms per liter ($\mu\text{g/L}$) and 308,000 $\mu\text{g/L}$, respectively. These EPH concentrations are much higher than those detected in the duplicate set of samples collected from well NSANHWMW04 on September 24, 1998 (109,000 $\mu\text{g/L}$ and 87,000 $\mu\text{g/L}$). However, Total Petroleum Hydrocarbon-Diesel Range Organic concentrations as high as 380,000 $\mu\text{g/L}$ had been detected in samples from this well during the four most recent sampling events preceding implementation of the current round of MEME Events.

Prior to initiating MEME Event Number 4, an SPH thickness of 0.06 foot was detected in extraction well NSANHWMW04; SPH were not detected in either of the two observation wells (NSANHWMW01 and NSANHWMW03). Upon completion of the 8-hour MEME Event, SPH were not detected in either the extraction or observation wells. SPH were also not detected in the vacuum truck upon completion of MEME Event.

Approximately 256 gallons of water and 0.80 or more equivalent gallons of fuel oil were recovered from extraction well NSANHWMW04 during the 8-hour duration of MEME Event Number 4. For comparison, the approximate volumes of water and equivalent volumes of fuel oil recovered during the 8-hour durations of the three previous MEME Events were as follows:

MEME Event Number	Approximate Volume of Water Recovered (Gallons)	Approximate Equivalent Volume of Fuel Oil Recovered (Gallons)
1	169	2 or more
2	229	1 or more
3	205	0.40 or more

Mr. Randy Wilson
November 5, 1998
Page Three

The recovered MEME event water and the purge water from ground water sampling were discharged into the Naval Support Activity, Memphis, oil/water separator system. Per my telephone conversation with the City of Millington Engineer (Mr. James Cox, Fisher & Arnold, Inc.) on August 5, 1998, collection and analysis of samples of the water were not required prior to discharge.

If you have any questions regarding this transmittal or other project matters, please do not hesitate to contact me.

Sincerely,

CMD ASSOCIATES, LLC



Barry R. Levine, P.G.
Project Manager

Enclosures

#MEMPHIS\SITE0177\0177-08.LTR

C: John Karlyk - SOUTHDIV-NFEC (*with enclosures*)

CMD ASSOCIATES, LLC

ECOVAC SERVICES

November 6, 1998

Mr. John Karlyk
Commanding Officer
JK, 1846
South NAVFAC Eng Com
P.O. Box 190010
North Charleston, South Carolina 29419-9010

**Subject: Proposal to Provide Enhanced Fluid Recovery (EFR®)
NAS Memphis
NEX (Navy Exchange) Auto Part/Fuel Lock
757 Old Navy Road
Millington, Tennessee**

Dear Mr. Karlyk:

It was my pleasure to have had the opportunity to visit with you on the telephone October 28, 1998 regarding this site. I have closely reviewed the data resultant from the four EFR® events at this site and have concluded that this site may not be an ideal candidate for an abbreviated (four hour) extraction event. My conclusion is based upon the following:

- The number of extraction wells (as many as eight at this site) will be difficult to extract from during this brief time period
- Groundwater drawdowns at this site increase with time and did not appear to have reached a steady state even after eight hours of extraction
- The offgas concentrations generally did not decrease significantly during the latter portion of the events (for example the final and ending offgas concentrations were the same during one event and remained at the same concentration during the final 4.5 to 5 hours during two of the other events)
- Additional influx of oxygen (for aerobic biodegradation) and additional mobilization of petroleum hydrocarbons is achieved during longer extraction times
- The extraction well vacuums were not particularly high. Extraction events of shorter duration are generally suited for "tight" sites (i.e. high extraction well vacuums) that have experienced a significant decrease in offgas concentration

We are concerned with the possibility of partially incapacitating the effects of EFR® at this site by decreasing the extraction time. The constraints of the base operating hours, having to dispose onsite (i.e. we must be certain to arrive at the site "empty"), the 8 hour minimum

Mr. John Karlyk
November 6, 1998
Page 2

charge from our vacuum truck subcontractor, and the distance to other work in Memphis will also adversely impact the cost of conducting two four-hour events at this site.

Our estimated cost to perform two four-hour EFR[®] events at this site (in the morning hours one day and in the afternoon the following day) is \$3,100.

Please contact me should you have any questions.

Sincerely,

EcoVac Services



Nick Athens

MEMPHIS ENVIRONMENTAL CENTER, INC.

2603 Corporate Avenue, Suite 100
Memphis, Tennessee 38132
Phone:(901) 345-1788 Fax: (901) 398-4719



COPY

VIA FIRST CLASS MAIL

October 27, 1998

Mr. Barry Levine
CMD Associates, LLC
3144 Stage Post Road, Suite 112
Bartlett, Tennessee 38133

Re: Analytical Laboratory Report No. R-981852

Dear Mr. Levine:

Enclosed is Memphis Environmental Center, Inc. (MEC) Laboratory Report No. R-981852 for the water samples received 10/15/98. If you have any questions, please call me at (901) 323-5554.

Thank you for your continued business with our laboratory.

Sincerely,

Memphis Environmental Center, Inc.

A handwritten signature in black ink that reads "Keith W. Hoover". The signature is written in a cursive style with a large initial "K".

Keith W. Hoover
Quality Assurance Officer

KWH/kh/cmd

Enclosure

MEMPHIS ENVIRONMENTAL CENTER, INC.

ANALYTICAL LABORATORY
2603 Corporate Avenue, Suite 150
Memphis, Tennessee 38132
(901) 323-5554

Client Contact: Barry Levine
Project: CMD Associates, LLC
NSA - Memphis
Sample(s) Type: Water

Report Date: 10/27/98
Report No: R-981852
Facility ID#: 0-791707

All sample results reported on an "as-received" basis unless otherwise indicated.

Quality Assurance Summary:

<u>Type of Analysis</u>	<u>Method</u>	<u>Holding Time</u>	<u>Surrogate Recoveries</u>	<u>Matrix Spike Recoveries</u>	<u>Blanks</u>	<u>Overall Summary</u>
TPH	Tenn. EPH	A	N-1	N-2	A	A (See N-1 and N-2)

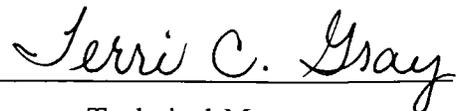
N-1: Recoveries were unavailable due to dilution.

N-2: Laboratory control samples (blank spikes) were analyzed as required by the method and had acceptable recoveries.

A = Requirements by method were met
NA = Not applicable



QA Officer



Technical Manager

CHAIN OF CUSTODY RECORD

PROJECT NO:
01-0177

PROJECT NAME:
NSA - MEMPHIS

SAMPLER'S SIGNATURE Evan Spann
(sign)

MATRIX
NO. OF CONTAINERS

REMARKS

SEQ. NO.	SAMPLE NO.	DATE	TIME	SAMPLE LOCATION	MATRIX	NO. OF CONTAINERS	REMARKS
16	101598-EWS-01	10/15	930	NH6W04	WZIL		EPH
7	101598-EWS-02	10/15	930	NH6W04	WZIL		EPH
							* FACILITY ID # 0-791707
							* REPORT TO B. LEVINE - CMD

PH
2
2

TOTAL NO. OF CONTAINERS - 4

RELINQUISHED BY:
1 Evan Spann
(sign)

DATE/TIME
10/15 1020

RECEIVED BY:
2 _____
(sign)

RELINQUISHED BY:
2 _____
(sign)

DATE/TIME

RECEIVED BY:
3 _____
(sign)

METHOD OF SHIPMENT:
Hand Delivery

SHIPPED BY:
Evan Spann

RECEIVED FOR LABORATORY BY:
(sign) Denetria King

DATE/TIME
10/15 10:20am

CONDITION OF SEAL UPON RECEIPT:
Sealed ONCE

COOLER OPENED BY:
(sign) Denetria King

DATE/TIME
10/15 10:20am



Memphis Environmental Center, Inc.
 2603 Corporate Avenue, Suite 100
 Memphis, Tennessee 38132
 (901) 345-1788

Printed: 14:18:17 27 OCT 1998

Final Report Summary

Charge Number: 915500000 File Number: 981852 Client: CMD ASSOCIATES, LLC
 Description: NSA-MEMPHIS

Contact: BARRY LEVINE

Sample: 9805316*SAMPLE Date Collected: 10/15/98 Date Received: 10/15/98 Test: EXTRACTABLE PETROLEUM HYDROCARBONS
 Client Sample Number: 101598-EWS-01 Matrix: WATER Facility ID: 0-791707

Compound	Result	PQL	Unit	Method	Extracted	Analyzed	Flag
EPH	488000	50000	µg/L	TN EPH	10/19/98	10/23/98	
o-Terphenyl, % Recovery	-	50-150	%	TN EPH	10/19/98	10/23/98	D
o-Terphenyl, amount added	20.0		µg/L	TN EPH	10/19/98	10/23/98	

D: Recovery unavailable due to dilution.

Sample: 9805317*SAMPLE Date Collected: 10/15/98 Date Received: 10/15/98 Test: EXTRACTABLE PETROLEUM HYDROCARBONS
 Client Sample Number: 101598-EWS-02 Matrix: WATER Facility ID: 0-791707

Compound	Result	PQL	Unit	Method	Extracted	Analyzed	Flag
EPH	308000	50000	µg/L	TN EPH	10/19/98	10/23/98	
o-Terphenyl, % Recovery	-	50-150	%	TN EPH	10/19/98	10/23/98	D
o-Terphenyl, amount added	20.0		µg/L	TN EPH	10/19/98	10/23/98	

D: Recovery unavailable due to dilution.

ECOVAC SERVICES

COPY

November 3, 1998

Mr. Barry R. Levine, P.G.
CMD Associates
3144 Stage Post Drive, Suite 112
Bartlett, Tennessee 38133

**Subject: Enhanced Fluid Recovery (EFR®) Results
Event No. 4
Memphis Support Activity
Naval Hospital Boiler System
Navy Road
Millington, Tennessee
FID #0-791707**

Dear Mr. Levine:

Please find attached the data summary for the fourth EFR® event conducted at the subject site on October 16, 1998. EFR® was previously conducted at this site on March 25, 1998, April 10, 1998, and September 25, 1998. The following summarizes the results of EFR® at this site.

SUMMARY OF RESULTS

Separate phase hydrocarbons (SPH) were detected in one monitor well (NSANHMW-04 - 0.06 feet) prior to conducting this EFR® event. This represents an increase from the sheen of SPH detected in monitor well NASNHMW-04 prior to the third event and is within the range of thicknesses detected in NSANHMW-04 prior to previous events (i.e. 0.00 to 0.08 feet). This EFR® event was performed for a duration of eight hours at one extraction point, consisting of monitor well NSANHMW-04. SPH was not detected in the monitor wells upon completion of EFR®.

A calculated total of 2 pounds of carbon (approximately equivalent to 5 pounds of petroleum hydrocarbons - 0.8 equivalent gallon of fuel oil) were removed during this EFR® event. This recovered mass/volume of petroleum hydrocarbons represents an increase in the mass/volume of petroleum hydrocarbons recovered during the third event (i.e. a calculated total of 3 pounds of petroleum hydrocarbons - approximately 0.4 equivalent gallon of fuel oil) and represents a decrease from the removal achieved during previous events (i.e. calculated totals of approximately 6 to 15 pounds of petroleum hydrocarbons - approximately 1 to 2 equivalent gallons of fuel oil).

Mr. Barry R. Levine, P.G.

November 3, 1998

Page 2

The carbon removal rate ranged from 0.2 to 0.3 pound per hour during this EFR[®] event. The removal rate remained at 0.3 pound per hour during the initial 1.25 hours of extraction and decreased and remained stable at 0.2 pound per hour during the final 6.75 hours of this event. These carbon removal rates ranged higher than those achieved during the third event (i.e. 0.1 to 0.2 pound per hour) and were approximately equal to the range of removal achieved during previous events (i.e. 0.2 to 0.3 pound per hour).

Offgas concentrations ranged from 62 to 82 ppm with a trend of generally decreasing concentrations throughout this EFR[®] event. These offgas concentrations were within the range of those recorded during the third event (i.e. 36 to 120 ppm) and represent a decrease from those recorded during the previous events (i.e. 120 to 600 ppm). It is noted that the measured offgas concentrations may represent an underestimate of the actual concentrations (perhaps detecting only 25 to 40 percent of the actual concentrations), and consequently the calculated volume of fuel oil removed, since fuel oil contains some non-volatile fractions that may not be entirely detected by the field instrument.

Air flow rates ranged from 348 to 477 CFM (271 to 332 DSCFM) during this EFR[®] event, including approximately 15 CFM attributed to atmospheric air inflow at the extraction wellhead breather port. Breather ports are sometimes used to enhance the recovery of petroleum hydrocarbon and/or groundwater. The air flow rate increased from 348 to 477 CFM during the initial 1.75 hours of extraction and generally remained stable at 477 CFM during the final 6.25 hours of this event. These flow rates represented an increase from those recorded during the third event (i.e. 183 to 257 CFM) and previous events (i.e. 220 to 299 CFM).

The vacuum readings recorded at the extraction wellhead, which may have been biased by atmospheric air inflow at the breather port, ranged from 13 to 15 inches of mercury as detailed on the attached EFR[®] Field Data Sheet

Differential pressures were recorded at monitor wells NSANHMW-01 and NSANHMW-03 during this event to assess the radius of vacuum influence induced by EFR[®] in the vadose zone. The differential pressure data are detailed in the attached data table and summarized below:

<u>Monitor Well</u>	<u>Maximum Change</u>	<u>Approximate Distance from NSANHMW-04</u>
NSANHMW-03	-0.01 inches of water	55 feet
NSANHMW-01	-0.01 inches of water	80 feet

Groundwater levels were recorded during this event to assess the groundwater drawdown induced by EFR[®]. The groundwater drawdown data are detailed in the attached table and summarized below:

Mr. Barry R. Levine, P.G.
November 3, 1998
Page 3

<u>Monitor Well</u>	<u>Maximum Change</u>	<u>Approximate Distance from NSANHMW-04</u>
NSANHMW-03	-0.16 feet	55 feet
NSANHMW-01	-0.12 feet	80 feet

Approximately 256 gallons of liquid (SPH was not detected on the vacuum truck upon completion of the event) were recovered during this EFR[®] event and offloaded to an on-site groundwater treatment system.

Thank you for the continued opportunity to team with CMD Associates in serving the environmental needs of The Department of the Navy. We look forward to working with you again in the future to provide innovative and cost effective environmental solutions at this and other sites.

Sincerely,

EcoVac Services



Nick Athens

EFR[®] FIELD DATA SHEET

Client: CMD Associates				Facility Name: Naval Hospital Boiler Area (Memphis NSA)				Facility ID#: 0-791707				Event #: 4				
Facility Address: Memphis Naval Support Activity, Navy Road, Millington, Tennessee								Technician: Lewis				Date: 10/16/98				
Extraction Well(s)	Start Time (hh:mm)	End Time (hh:mm)	Interval Time (min)	Extraction Well-head Vacuum (in. Hg)				Offgas Velocity (ft/min)	Total Flow (CFM)	Stack Gas Temp. (° F)	Total Flow (DSCFM)	Offgas Concentrations			Rate of Carbon Removal (lbs/hour)	Total Carbon Removed (pounds)
				Inlet	MW-4							Initial PPM _v	Ending PPM _v	Average PPM _v		
NSANHMW-04	7:30	7:45	15	20	15			1,900	348	90	332	82	80	81	0.3	0.08
"	7:45	8:00	15	20	15			2,000	367	130	311	80	78	79	0.3	0.07
"	8:00	8:15	15	19	14			2,300	422	150	315	78	79	79	0.3	0.07
"	8:15	8:30	15	19	14			2,500	458	160	310	79	78	79	0.3	0.07
"	8:30	8:45	15	18	14			2,500	458	160	310	78	77	78	0.3	0.07
"	8:45	9:00	15	19	14			2,500	458	165	292	77	75	76	0.2	0.06
"	9:00	9:15	15	19	14			2,500	458	170	271	75	75	75	0.2	0.06
"	9:15	9:30	15	18	14			2,600	477	170	282	75	72	74	0.2	0.06
"	9:30	10:00	30	18	13			2,600	477	170	282	72	72	72	0.2	0.11
"	10:00	10:30	30	18	13			2,600	477	170	282	72	70	71	0.2	0.11
"	10:30	11:00	30	18	13			2,600	477	170	282	70	70	70	0.2	0.11
"	11:00	11:30	30	18	13			2,600	477	170	282	70	69	70	0.2	0.11
"	11:30	12:00	30	19	14			2,500	458	160	310	69	68	69	0.2	0.12
"	12:00	12:30	30	18	13			2,600	477	170	282	68	69	69	0.2	0.11
"	12:30	13:00	30	18	13			2,600	477	170	282	69	67	68	0.2	0.11
"	13:00	13:30	30	18	13			2,600	477	170	282	67	67	67	0.2	0.11
"	13:30	14:00	30	18	13			2,600	477	170	282	67	65	66	0.2	0.10
"	14:00	14:30	30	18	13			2,600	477	170	282	65	65	65	0.2	0.10
"	14:30	15:00	30	18	13			2,600	477	170	282	65	65	65	0.2	0.10
"	15:00	15:30	30	18	13			2,600	477	170	282	65	62	64	0.2	0.10
Vacuum Truck Information				Well No.		Breather Port (CFM)		Stinger Depth (feet)			Recovery/Disposal Information					
Subcontractor: NB Env.		Invoice No.: 1324		NSANHMW-04		15		10			Total Gal. of Liquid: 256*		Disposal Facility: *			
Truck Operator: Lowe		Truck No.: VK-35 KingVac									Manifest No.: N/A		Total Lbs. of Carbon (Offgas): 2			
Vacuum Pump Type: Liquid Ring		Tank Capacity: 2,866 gallons									Cum. Lbs. Carbon Removed: 10		Lbs. Hydrocarbons Removed: 5			
Stack I.D. (inches): 5.8		Calibration Gas: 500 ppm Hexane									Cum. Lbs. Hydrocarbons: 29		Equiv. Gal. Removed: 0.8			
Molecular Weight: 130 g/mole											Cum. Equiv. Gal. Removed: 4.2					
				Comments: * Recovered liquid offloaded to on-site treatment system												

EFR[®] EVENT GAUGING DATA

Client: CMD Associates		Facility Name: Naval Hospital Boiler Area (Memphis NSA)			Facility ID#: 0-791707		Event #: 4		
Facility Address: Memphis Naval Support Activity, Navy Road, Millington, Tennessee					Technician: Lewis		Date: 10/16/98		
Well Designation	Well Diameter (inches)	Total Depth (feet)	Before EFR [®] Event			After EFR [®] Event			Depth to Liquid Change (feet)
			Depth to SPH (feet)	Depth to Water (feet)	SPH Thickness (feet)	Depth to SPH (feet)	Depth to Water (feet)	SPH Thickness (feet)	
NSANHMW-01	2	27.46	-	13.89	0.00	-	14.01	0.00	-0.12
NSANHMW-03	2	22.88	-	2.13	0.00	-	2.29	0.00	-0.16
NSANHMW-04*	2	15.81	1.10	1.16	0.06	-	11.30	0.00	-10.19
		Comments: * Denotes monitor well utilized as an extraction well Top of well screens in NSAHMW-01,03, and 04 are at approximately 17', 12', and 5', respectively							

Differential Pressure and Groundwater Drawdown Data Recorded During EFR®
 Event No. 4 (October 16,1998)
 Memphis Naval Support Activity - Naval Hospital Boiler System
 Navy Road
 Millington, Tennessee
 FID #0-791707

DIFFERENTIAL PRESSURE DATA

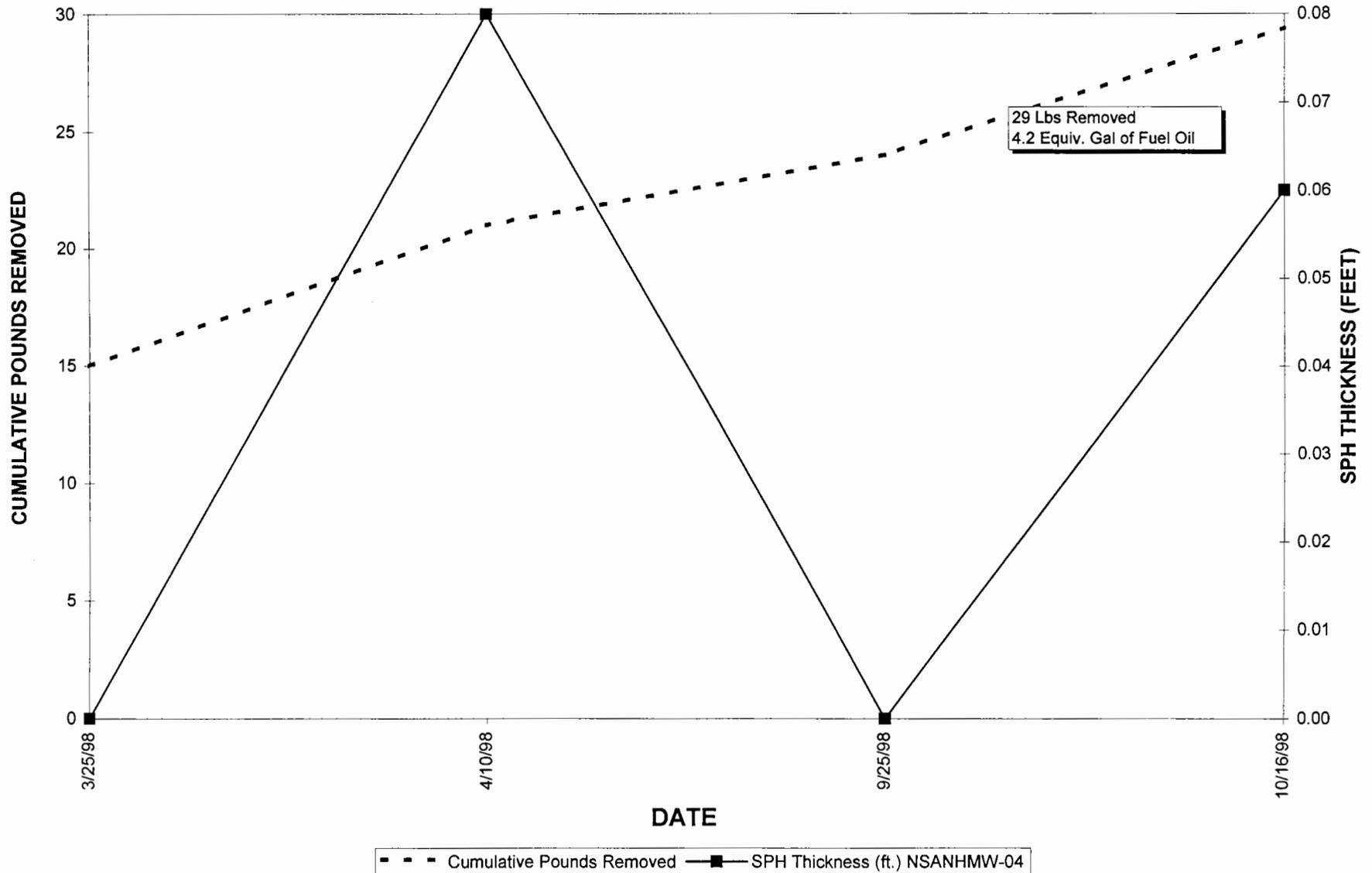
		Well Designation:	
		NSANHMW-03	NSANHMW-01
Nearest Extraction Well:		NSANHMW-04	NSANHMW-04
Approximate Distance:		55 feet	80 feet
Time	Elapsed Time	Differential Pressure Readings (inches of water):	
8:00	0.5 hr.	0.00	0.00
8:30	1.0 hr.	0.00	0.00
9:00	1.5 hrs.	-0.01	0.00
9:30	2.0 hrs.	-0.01	0.00
10:30	3.0 hrs.	-0.01	0.00
11:30	4.0 hrs.	0.00	-0.01
12:30	5.0 hrs.	0.00	0.00
13:30	6.0 hrs.	0.00	0.00
14:30	7.0 hrs.	0.00	0.00
Maximum Change:		-0.01	-0.01

GROUNDWATER DRAWDOWN DATA

		Well Designation:	
		NSANHMW-03	NSANHMW-01
Nearest Extraction Well:		NSANHMW-04	NSANHMW-04
Approximate Distance:		55 feet	80 feet
Time	Elapsed Time	Depth to Liquid (feet below top of casing):	
Prior to EFR®		2.13	13.89
14:30	7.0 hrs.	2.29	14.01
Maximum Change:		-0.16	-0.12

CUMULATIVE EFR GRAPH

Memphis Support Activity
Naval Hospital Boiler System
Navy Road
Millington, Tennessee
FID #0-791707



CUMULATIVE EFR DATA TABLE

Memphis Support Activity
Naval Hospital Boiler System
Navy Road
Millington, Tennessee
FID #0-791707

	3/25/98	4/10/98	9/25/98	10/16/98
Cumulative Pounds Removed	15	21	24	29
Cumulative Liquid Removed (Gal.)	169	398	603	859
SPH Thickness (ft.) NSANHMW-04	0.00	0.08	Sheen	0.06
Pounds Removed/Event	15	6	3	5
Liquid Removed/Event (Gal.)	169	229	205	256
Equiv. Gal. Fuel Oil Removed/Event	2	1	0.4	0.8
Cumul. Equivalent Gal. Removed	2	3	3.4	4.2