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FINAL
WORK PLAN
FOR
TOW WAY FUEL FARM INVESTIGATIONS RELATED TO DETECTIONS OF TCE IN GROUNDWATER
NAVAL STATION ROOSEVELT ROADS
CEIBA, PUERTO RICO

CONTRACT TASK ORDER 0277

JUNE 25, 1999

Prepared for:

DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES
ENGINEERING COMMAND
Norfolk, Virginia

Under the:

LANTDIV CLEAN Program
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Comprehensive Long-Term Environmental Action Navy

TABLE OF CONTENTS

1.0 INTRODUCTION **1**

2.0 CURRENT CONDITIONS **1**

2.1 Sampling Results 1
2.2 Historical Building Use 2

3.0 SCOPE OF INVESTIGATIONS **2**

3.1 Confirmatory Sampling 2
3.2 Boring and Temporary Well Program 3
3.3 Laboratory Analysis and Data Validation 5
3.4 Other Investigation Considerations 5

4.0 REPORTING **5**

5.0 SCHEDULE **6**

FIGURES

Figure 1 – SWMU 7/8 – Tow Way Fuel Farm, Tricholoroethene in Groundwater, Sample Results and Boring Location

APPENDICES

Appendix A – Monitoring Well Logs

1.0 INTRODUCTION

The Tow Way Fuel Farm (TWFF) has been the subject of numerous investigations extending back beyond the advent of RCRA corrective action requirements. A full RCRA Facility Investigation (RFI) was performed at the site and the subsequent report for which was approved by the EPA. It was recommended in the report that a Corrective Measures Study (CMS) be performed at the site to select the appropriate corrective measure. The first step in the CMS was to perform certain additional investigations designed to fill data gaps remaining from the RFI. Groundwater samples were obtained during the additional investigations.

The most recent sampling indicated the presence of a significant level of TCE in monitoring well 7MW07. Based on this detection, its possible ramification in terms of a potential Dense Non-Aqueous Phase Liquid (DNAPL) plume and the historic use of the area surrounding the well, focused investigations of the TCE occurrence are warranted. This work plan describes the elements of the investigatory program.

2.0 CURRENT CONDITIONS

2.1 Sampling Results

Groundwater samples were obtained from the wells at the TWFF during the CMS investigations which were analyzed for, among other constituents, TCE. The results of the sampling are shown on Figure 1. It should be noted that this figure shows all the TCE detection and non-detection points. As can be seen, TCE was detected in three wells:

- UGW 24 at 2 μg/l
- 7MW07 at 2,000J μg/l (J=estimated), and
- 7MW08 at 3 μg/l.

It is the significant concentration seen at 7MW07 which has prompted the need for focused investigations.

2.2 Historical Building Use

The building immediately northeast of 7MW07 (between Forrestal Drive and the well) was comprised of a half-cylindrical structure constructed of cloth over a frame which was anchored to a concrete slab. The building was destroyed during hurricane Georges. A previous, more substantial, structure which was on the same pad was destroyed during hurricane Hugo.

The buildings which have occupied the area have been used for the storage and maintenance of small craft used in various harbor operations. This information is based on conversations with long-term Station employees. While the repair activities have apparently been somewhat limited, the fact that maintenance was performed indicates the potential for cleaning and degreasing operations which could have resulted in a release of solvents. Also, it is unclear to what extent the buildings were used for storage and what was stored. The potential of stored material release can not be discounted.

3.0 SCOPE OF INVESTIGATIONS

The "TCE" investigations at the TWFF will consist of confirmatory sampling, off-set drilling, installation of temporary wells and groundwater grab sampling with on-site screening. The various investigatory elements are described in detail in the subsections which follow.

3.1 Confirmatory Sampling

TCE was detected in wells 7MW07, 7MW08 and UGW 24. These wells will be resampled to ascertain if the TCE occurrence is persistent at these locations. Samples will be obtained without purging the well using a bottom filling bailer. Purging is generally employed to ensure that fresh, formation water is sampled. In this case, the intent is to maximize the ability of the sampling to detect a DNAPL layer which could be present in the well bottom. The bailer will be emptied from the bottom into sampling containers.

Each sample will be analyzed in an on-site mobile laboratory for VOCs so the information is available to make field decisions. This step will serve to confirm if TCE is still present in the existing wells.

3.2 Boring and Temporary Well Program

Three borings will be made near well 7MW07 (designated A, B and C) and two more (designated D and E) will be placed in the vicinity of 7MW08. The borings will be 50 feet from the monitoring wells and will be placed in the pattern shown on Figure 1. The purpose of the borings is to provide information near the wells which contained TCE. Boring placement is skewed in the downgradient direction: however sidegradient locations are included since DNAPL does not necessarily follow groundwater in terms of flow direction.

The borings will be advanced using hollow-stemmed augers and/or air rotary. Initially, the hole will be drilled to the same depth as the monitoring well (either 7MW07 or 7MW08 as appropriate). Split-spoon soil samples will be obtained at five foot intervals to verify stratigraphy; no soil samples will be analyzed. A boring log will be maintained indicating, among other things, lithology and water occurrence. The logs of 7MW07 and 7MW08 are provided in Appendix A for information.

Once the borings reach depth, a temporary well will be installed in the hole. This installation will consist of two-inch diameter, schedule 40 PVC, riser with a five foot screen that extends to the bottom. The temporary well will be sealed at the surface to prevent inflow of surface water or accidental introduction of foreign material into the hole.

A groundwater sample will be obtained from the temporary well after allowing sufficient time for the groundwater to enter the screen. Samples will be obtained using the techniques described for confirmatory sampling. Each sample will be analyzed in the on-site mobile laboratory. This will provide immediate information regarding the presence of TCE.

Once the initial sampling is performed, the temporary well will be removed and the boring will be advanced another five feet. Split-spoon samples will obtained at two foot intervals to the bottom of the boring to provide information on the lithology in this zone. A temporary well, as previously described, will be installed in the boring. This temporary well will be sampled and analyzed as described previously. Upon completion of the sampling, the temporary well will be removed and the hole backfilled with drill cuttings placed in the hole at approximately the same depth as that from which they were derived.

TCE detections in the temporary wells will trigger the following responses:

- If TCE is detected in temporary well "A"
  - Contingent temporary wells 1 and 2 will be installed
  - UGW 16 will be sampled and screened for TCE

- If TCE is detected in temporary well "B"
  - Contingent temporary wells 1, 2 and 3 will be installed

- If TCE is detected in temporary well "C"
  - Contingent temporary wells 3 and 4 will be installed

- If TCE is detected in any two temporary wells A, B and C
  - Contingent temporary wells 1-4 will be installed

- If TCE is detected in temporary well "D"
  - Contingent temporary wells 4 and 5 will be installed

- If TCE is detected in temporary well "E"
  - Contingent temporary wells 5 and 6 will be installed.

Each of the contingent temporary wells will be drilled, installed (including the two depths) and sampled in the same manner as the initial temporary wells. They will be placed 150 feet away from the original wells.

The detection of TCE in any of the contingent temporary wells will immediately be brought to the attention of the project manager who, in consultation with the Navy and EPA, will assess what, if any, further steps should be taken while the investigation team is in the field.

3.3 Laboratory Analysis and Data Validation

The investigations described are designed to verify the presence of TCE in the subsurface. Since no further action for TCE will be required if it is not found in the new investigations, the data gathered must be verifiable and valid. The following steps will be taken to ensure the data obtained meets the required standards:

- All samples in which the results from the on-site lab indicates the presence of TCE will be subjected to stateside laboratory analysis for volatile organics

- One sample of every four (25%) in which the results from the on-site lab indicates the absence of TCE will be subjected to stateside laboratory analysis for volatile organics.

Analyses in the stateside laboratory will be performed in accordance with SW-846 methodologies. CLP equivalent data packages will be provided.

All data generated in the stateside laboratory will be subjected to independent, third-party, validation in accordance with EPA Region II protocol.

3.4 Other Investigation Considerations

Investigation Derived Wastes (IDW)

The generation of IDW is not anticipated since wells will not be purged and drill cuttings will be returned to the boring.

Decontamination

Disposal, single use, bailers will be employed for the sampling. New riser and screen will be used for each temporary well. The drill rig will be decontaminated in accordance with the EPA approved RCRA Facility Investigation Work Plans between each use.

Surveying

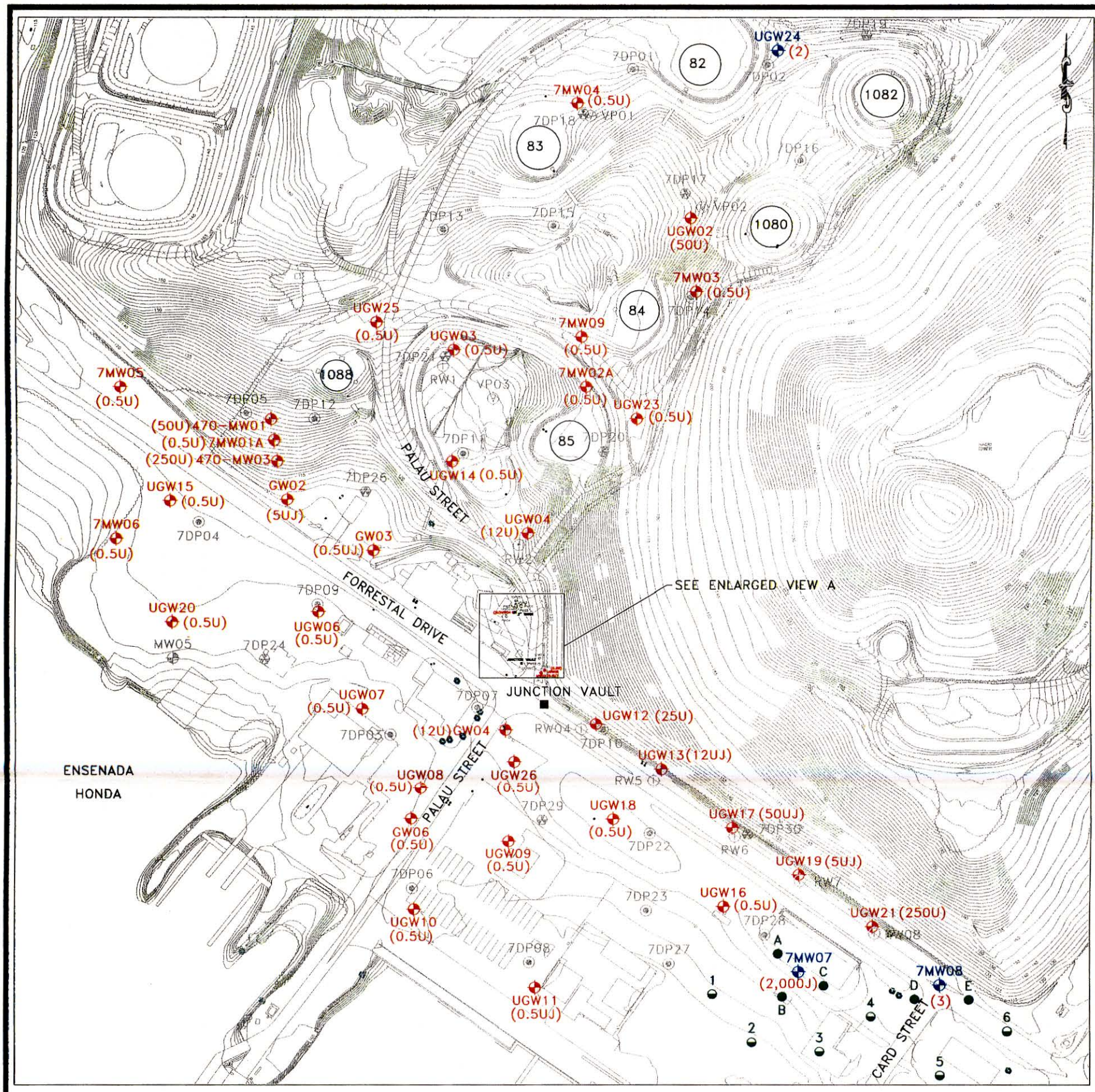
The borings for temporary well installation will be surveyed by field measurements to permanent objects.

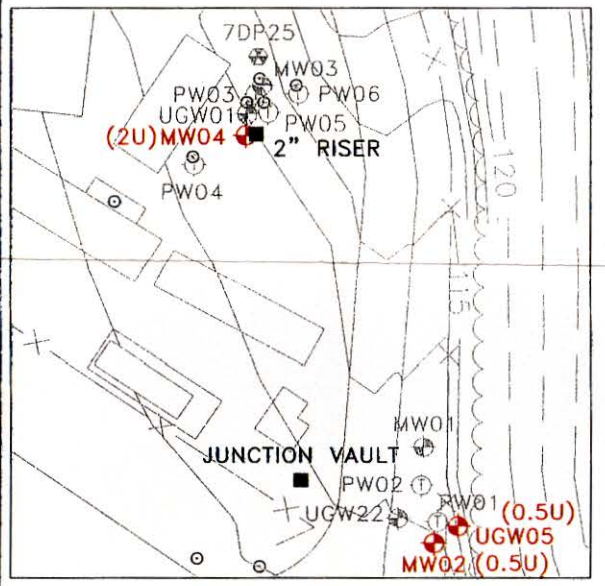
4.0 REPORTING

A full report on the investigations described herein will be prepared and submitted. Included will be a description of the field activities, boring logs, all on-site and stateside laboratory analytical results, data validation summaries and an interpretation of the information obtained.

5.0 SCHEDULE

It is the intent to include the investigations described in this work plan in the June 1999 field program.





VIEW A

NOTE:
DATUM PLAN USED IS MEAN LOW WATER = 100.00 FT. AS ESTABLISHED BY U.S. NAVY SURVEY SECTION AS OF NOVEMBER 1941.

Baker

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LEGEND
- MONITORING WELL LOCATION WITHOUT TCE DETECTION
- MONITORING WELL LOCATION WITH TCE DETECTION
- VERTICAL PERMEABILITY SAMPLE LOCATION
- SOIL BORING LOCATION
- SOIL BORING AND SOIL GAS SAMPLE LOCATION
- TERRAVAC PRODUCT RECOVERY WELL LOCATION
- ICHOR PRODUCT RECOVERY WELL LOCATION
- INITIAL BORING LOCATION
- CONTINGENT BORING LOCATION

SOURCE: LANTDIV, FEB. 1992/1997

FIGURE 1
SWMU 7/8 – TOW WAY FUEL FARM
TRICHLOROETHENE (ug/L) IN GROUNDWATER
SAMPLE RESULTS AND BORING LOCATION

NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

APPENDIX A
MONITORING WELL LOGS

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TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Tow Way Fuel Farm SWMU 7
CTO NO.: 0277 BORING NO.: 7MW07
COORDINATES: EAST: NORTH:
ELEVATION: SURFACE: TOP OF PVC CASING:

RIG: Mobil B-90	SPLIT SPOON	CASING	AUGERS	CORE BARREL	DATE	PROGRESS (FT.)	WEATHER	WATER DEPTH (FT.)	TIME
SIZE (DIAM.)	3"		8 1/4"		10/21/97	20' 10/21 10' 10/22	mostly sunny 85-90°	10.3'	10/22 24hr.
LENGTH	2'		5'						
TYPE	STD		HSA						
HAMMER WT.	140 lbs								
FALL	30"								
STICK UP									

REMARKS: Located South of Bldg. # 2314

SAMPLE TYPE

S = Split Spoon
T = Shelby Tube
R = Air Rotary
D = Denison
A = Auger
W = Wash
C = Core
P = Piston
N = No Sample

Well Information	Diam.	Type	Top Depth (ft.)	Bottom Depth (ft.)
Riser	6"	PVC	-2.5 Stick-up	5
Screen 0.020 slot	6"	PVC	5	25

Depth (ft.)	Samp. Type and No.	Samp. Rec. (ft. & %)	SPT or RQD	Lab Class. or Pen. Rate	PID (ppm) BG/PS	Visual Description	Well Installation Detail	Elevation (ft. MSL)
1, 2, 3	AN					Auger to 3' bgs No Sample	Bentonite @ 1' bgs; Sand @ 3' bgs	
4, 5	S-1 1621	0.5/2.0 25%	9 8 4 4		0.5/0.5	Lt. Brn/Gray Rock, angular to sltly. Rounded. Some silt. Dry to wet @ tip of sample, water @ 5.0' bgs *	Top of screen @ 5' bgs	
6, 7, 8	AN							
9, 10	S-2 1645	0.83/2.0 42%	3 1 50/5"		0.5/0.5	Lt. Brn. Rock and Silt. moist to wet. sample 7MW07-02 TPH DRO/GRO Grain Size		

Match to Sheet 2

DRILLING CO.: Soil Tech BAKER REP.: J. Tepsic
DRILLER: Jorge Diaz BORING NO.: 7MW07 SHEET 1 OF 2

* Alot of rain @ NSRR last week, Possibly Perched Zone, Probably Not True Watertable

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Baker Environmental, Inc.

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Tow Way Fuel Farm SWMU 7
CTO NO.: 0277 BORING NO.: 7MW07

SAMPLE TYPE

S = Split Spoon
T = Shelby Tube
R = Air Rotary
D = Denison
A = Auger
W = Wash
C = Core
P = Piston
N = No Sample

DEFINITIONS

SPT = Standard Penetration Test (ASTM D-1586)(Blows/0.5')
RQD = Rock Quality Designation (%)
Lab. Class. = USCS (ASTM D-2487) or AASHTO (ASTM D-328
Lab. Moist. = Moisture Content (ASTM D-2216) Dry Weight Basis

Depth (ft.)	Samp. Type and No.	Samp. Rec. (ft. & %)	SPT or RQD	Lab Class. or Pen. Rate	PID (ppm) BG/PS	Visual Description	Well Installation Detail	Elevation (ft. MSL)
						Continued from Sheet 1		
11								
	AN							
12								
13								
14	S-3 1710	1.25/2.0 63%	12 37 50/5"		0.5/0.5	Lt. Brn Rock w/ some silt and Trace clay and Trace Sand. wet. 7MW07-03 TPH DRO/GRO Grain Size		
15								
16								
17								
18								
19	S-4 1755	1.67/2.0 83%	20 21 50/6"			Lt. Brn. Rock, angular to Subangular w/ Some silt Trace clay. wet. 7MW07-04 TPH DRO/GRO		
20								
21								
22								
23								
24	S-5 10/22 0800	0.83/2.0 42%	28 40 50/3"		0.5/2.0	Lt. Brn/Gray Rock, angular to Subangular, Fragmented w/ Some clay. wet. 7MW07-05 TPH DRO/GRO		
25								Bottom of Screen @ 25' bgs
26								
27								
28								
29	S-6 10/22 0905	0.83/2.0 42%	26 25 16 7		0.5/0.5	Lt. Brn. Rock w/ Trace to Little clay & Trace Sand. wet. RX. is angular to subangular. 7MW07-06 TPH DRO/GRO		
30								

END OF BORING 30'

DRILLING CO.: Soil Tech BAKER REP.: J. Tepsic
DRILLER: Jorge' Diaz BORING NO.: 7MW07 SHEET 2 O

Baker Environmental, Inc.

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Tow Way Fuel Farm
CTO NO.: 0277 BORING NO.: 7MW08
COORDINATES: EAST: NORTH:
ELEVATION: SURFACE: TOP OF PVC CASING:

RIG: Mobil B-90	SPLIT SPOON	CASING	AUGERS	CORE BARREL	DATE	PROGRESS (FT.)	WEATHER	WATER DEPTH (FT.)	TIME
SIZE (DIAM.)	3"		8 1/4"		10/27/97 10/28/97	10 20	Clear 90°	11'	
LENGTH	2'		5						
TYPE	STD		HSA						
HAMMER WT.	140 lbs								
FALL	30"								
STICK UP									

REMARKS: Auger Refusal @ 8.0' Finish boring by Air Hammer Located on Forrestal Dr.

SAMPLE TYPE

S = Split Spoon
T = Shelby Tube
R = Air Rotary
D = Denison
A = Auger
W = Wash
C = Core
P = Piston
N = No Sample

Well Information	Diam.	Type	Top Depth (ft.)	Bottom Depth (ft.)
Riser	6"	PVC	0.5	8
Screen 0.020 Slot	6"	PVC	8	28

Depth (ft.)	Samp. Type and No.	Samp. Rec. (ft. & %)	SPT or RQD	Lab Class. or Pen. Rate	PID (ppm)	Visual Description	Well Installation Detail	Elevation (ft. MSL)
1, 2, 3	AN					Attempted 2 holes. Can't Advance augers b/c of RX. V. hard. Chg. to new cutter head, attempt 3rd hole.		
4, 5	S-1 1110	0.83 / 2.0 42%	28 18 13 15		0.5/0.5	Lt. Brn Fragmented RX. w/ Some Silt. Dry. Lab Sample 7MW08-01 TPH Pro/GRO Grain Size 7MW08-01D Dup Collected		
6, 7, 8	AN						Top of Screen @ 8' bgs	
9, 10	S-2 1133	0.83 / 2.0 42%	13 5 8 50/5"		0.5/0.5	Same Material as above, Dry to sltly. moist 7MW08-02 TPH DRO/GRO 7MW08-02D Dup collected MS/MSD. Cannot advance augers any further. Switch to Air Hammer		

Match to Sheet 2

DRILLING CO.: Soil Tech BAKER REP.: J. Tepsic
DRILLER: Jorge' Diaz BORING NO.: 7MW05 SHEET 1 OF 2

Baker
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TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Tow Way Fuel Farm
CTO NO.: 0277 BORING NO.: 7MW08

SAMPLE TYPE

S = Split Spoon
T = Shelby Tube
R = Air Rotary
D = Denison
A = Auger
W = Wash
C = Core
P = Piston
N = No Sample

DEFINITIONS

SPT = Standard Penetration Test (ASTM D-1586)(Blows/0.5')
RQD = Rock Quality Designation (%)
Lab. Class. = USCS (ASTM D-2487) or AASHTO (ASTM D-328
Lab. Moist. = Moisture Content (ASTM D-2216) Dry Weight Basis

Depth (ft.)	Samp. Type and No.	Samp. Rec. (ft. & %)	SPT or RQD	Lab Class. or Pen. Rate	PID (ppm)	Visual Description	Well Installation Detail	Elevati (ft. MS
						Continued from Sheet 1		
11						Begin Air Hammer @ 8' bgs @ 0800 10/28/97		
12	Downhole Air Hammer							
13								
14								
15								
16						Water encountered @ 16' bgs Nearby existing MW has water @ 11' bgs		
17								
18								
19								
20						20' V. Hard RX. Advance Air Hammer 1' for 5 min.		
21								
22								
23								
24								
25								
26								
27								
28						28' Alot of water! Produced From MW V. "clean" ie. sediment free.	Bottom of Screen @ 28' bgs	
29								
30						END of Boring 30'		

DRILLING CO.: Soil Tech BAKER REP.: J. Tepsic
DRILLER: Jorge' Diaz BORING NO.: 7MW08 SHEET: