

**Project No. 305945  
April 1994**

**Vapor Well and Probe Installations Plan  
Site 2/5  
POL Site Remediation  
Holloman AFB, New Mexico**

Prepared for:  
**U.S. Army Corps of Engineers  
Omaha District  
Omaha, Nebraska**

**Contract No. DACW45-89-D-0504  
Delivery Order No. 0009**

Prepared by:  
**IT Corporation  
Englewood, Colorado**

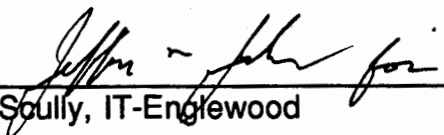
# VAPOR WELL AND PROBE INSTALLATIONS PLAN

Site 2/5  
POL Site Remediation

Holloman Air Force Base  
New Mexico


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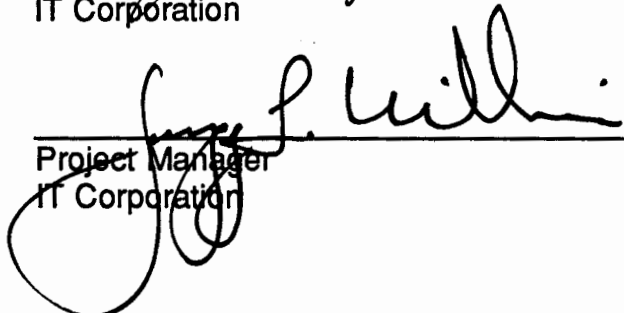
  
\_\_\_\_\_  
Richard W. Scully, IT-Englewood

4.12.94  
Date

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4/12/94  
Date

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## **List of Acronyms**

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| <b>Acronym</b> | <b>Description</b>                   |
|----------------|--------------------------------------|
| AFB            | Air Force Base                       |
| COR            | Contracting Officer's Representative |
| mm             | millimeter(s)                        |
| PID            | photoionization detector             |
| POL            | petroleum and other liquids          |
| PPE            | personal protective equipment        |
| ppm            | part(s) per million                  |
| PVC            | polyvinyl chloride                   |
| SVE            | soil vapor extraction                |
| TPH            | total petroleum hydrocarbons         |
| USACE          | U.S. Army Corps of Engineers         |

## **1.0 Introduction**

The field methods for installing vapor monitoring probes, soil vapor extraction (SVE) wells, and passive air vent wells are described in this Installations Plan. This work is part of the SVE system that will be installed to remediate Site 2/5 at Holloman Air Force Base (AFB), New Mexico.

This plan describes the installations required by specifications Section 02674, Vapor Monitoring Probe Installation, and Section 02675, Soil Vapor/Passive Air Vent Well Installation. The monitoring program required by these specifications is addressed in the Sampling, Analysis, and Monitoring Plan.

The Site 2/5 petroleum and other liquids (POL) remediation involves removal of diesel fuel contamination from vadose-zone soils using a SVE system. The site was previously occupied by 14 aboveground diesel fuel tanks. The area to be remediated measures approximately 80 by 200 feet by 16 feet deep. Boring logs from previous investigations are contained in the specifications.

## **2.0 Pre-Work Submittals**

Prior to the installation of the wells, a gradation analysis of the filter material that will be used to pack the well installations will be submitted to the U.S. Army Corps of Engineers (USACE) for approval.

## **3.0 Well Installation**

### **3.1 Well Locations**

A total of 22 SVE wells will be installed. Initially, some wells will be used for vapor extraction and others for passive air recharge; but all the wells will be constructed the same way and the use of some of the wells can be changed during system operation.

The wells will be located as shown in Figure 1:

- Ten 15-foot deep SVE wells will be located in the center of the contaminated area.
- Twelve 15-foot deep dual SVE/passive air vent wells will be located at the southern end of the contaminated area where fuel contamination is thought to be relatively more widespread.

The well location coordinates will be obtained from the specification drawings and the well locations surveyed and staked prior to installing the wells. The well locations will be cleared for utilities prior to drilling by Base personnel. A digging permit is required by the Base to mark utility and communications lines. The USACE Contracting Officer's Representative (COR) will be notified at least two weeks prior to any drilling activities so that the Base Environmental Flight may issue the required digging permits.

### **3.2 Well Installation Methods**

For vapor wells, such as these, neither a well permit nor a licensed water well driller is needed according to the New Mexico State Engineer Office.

#### **3.2.1 Drilling Method**

The well casing and screen will be installed through hollow-stem augers with a minimum internal diameter of 6¼ inches, to allow room around the casing/screen for placement of the filter pack material.

The drilling equipment and augers will be decontaminated by steam cleaning on site before and after the well installation program. It is unnecessary to decontaminate the drilling equipment between well installations.

#### **3.2.2 Boring Logs**

Two soil samples will be collected from each well boring at depths of approximately 5 and 10 feet. The soil samples will be collected by split-spoon sampler. The soil samples and drill cuttings will be logged and classified according to the Unified Soil Classification System. The soil boring log form presented in Appendix A will be used to record the drilling and soil information.

The soil samples will be jarred and tested for volatiles in the headspace with a photoionization detector (PID), as described in the Sampling, Analysis, and Monitoring Plan for the confirmation soil boring.

The following information will be recorded on the boring log:

- Name of the project and site
- Boring identification number

- Location of boring (coordinates)
- Type of drill rig, drilling methods used, and name of drilling firm
- Date(s) borings were drilled
- Reference point for all depth measurements
- Name of driller and name and signature of geologist preparing log
- Nominal hole diameter and depth at which hole diameter changes
- Total depth of boring
- Method of drilling, including sampling methods and sample depths
- Depth of each change of stratum
- Description of the material of which each stratum is composed, according to the Unified Soil Classification System and ASTM D 2488, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), as necessary
- Depth to water, if any, and date measured.

### **3.2.3 Well Depths**

The wells are planned to be about 15 feet deep. The planned well screen depth intervals are summarized in Table 1. The exact depth of each well will be determined in the field so that the base of the screen is located approximately 12 inches above the water table at the time of drilling. If the boring is advanced into the water table, it will be backfilled to above the water table with the filter material before the screen is placed.

### **3.2.4 Well Construction**

Well construction is illustrated on sheet C-5 of the drawings. The well will be constructed of 4-inch diameter polyvinyl chloride (PVC) flush-threaded casing and screen with a top cap and a bottom plug. The casing thickness will be schedule 40 or greater. The screen will have continuous slots with 0.040-inch openings [approximately 1 millimeter (mm)].

A filter pack consisting of pea gravel or No. 8/12 silica sand will be backfilled around the well screen, from the bottom of the boring to at least 6 inches above the screen. A gradation analysis of the filter pack material will be submitted to the USACE for approval prior to installing the wells.



Because of the coarse size of the filter material and because the wells are shallow and above the water table, a tremie will not be needed for placement of the filter pack. The quantity of filter material needed will be calculated prior to installing it, and the amount of filter material added to the well will be monitored as a check of proper filter pack placement.

Prior to placing the bentonite seal, the height of the filter pack will be rechecked to make sure it extends above the well screen. About 6 inches of fine sand will then be placed on the filter pack. A bentonite seal will be constructed by placing a 1-foot thick layer of 40-mesh granular sodium bentonite and hydrating it with tap water for at least four hours.

A grout seal will be placed above the bentonite seal. The grout will be mixed in the proportions of one 94-pound bag of Type II portland cement, 4 to 5 pounds of minus-200-sieve bentonite powder, and 8 gallons of tap water.

The wells will be completed at the surface with a concrete pad. The pad will be sloped for drainage away from the well.

Each well casing will be equipped with a barbed fitting, to which polypropylene tubing with a quick disconnect coupling will be attached, to provide access for vapor sampling and vacuum measurements.

### **3.2.5 Well Construction Diagrams**

A construction diagram will be completed by the field geologist on the Well Construction Summary form (Appendix A) for each vapor extraction or passive air vent well installed. The diagram will illustrate the as-built condition of the well and include:

- Name of the project and site.
- Well identification number.
- Name of driller and name and signature of geologist preparing diagram.
- Date(s) of well installation.
- Description of material from which the well is constructed, including casing and screen material, diameter and schedule of casing and screen, and joint type (threaded, coupled, etc.).
- Total depth of well.

- Nominal hole diameter.
- Depth to top and bottom of screen and filter pack.
- Depth to top and bottom of grout and bentonite seals installed in the well boring.
- Type of cement and bentonite used, mix ratios of grout, and quantities used.
- Elevations of key features of the well, such as top of well casing, top and bottom of protective casing, ground surface, bottom of borehole, top and bottom of well screen, top and bottom of filter pack, and top and bottom of seal(s).
- Other pertinent construction details, such as gradation of filter pack, quantities of filter pack installed, slot size and percent open area of screen, and manufacturer of screen.
- Well location by New Mexico State Plane coordinates. A map will show the coordinate system used and the location of the wells prepared.
- A brief stratigraphic log showing major changes in lithology and the depths to those changes.

## **4.0 Vapor Monitoring Probe Installations**

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The purpose of the vapor probes is to monitor the distribution of soil gas contaminants and the vacuum induced in the soils by the SVE system, so that the remedial effectiveness of the SVE system can be evaluated.

### **4.1 Probe Array Layout**

The proposed layout of probe installations is shown in Figure 1 and designed as follows:

- The probe groups are arrayed in three lines transecting the contaminated area. This arrangement will provide the distribution of induced vacuum in the soils at three cross sections through the site.
- Three probe groups are to be installed in the central portion of the contaminated area where contamination is present through much of the soil profile. Each probe group will consist of three probes installed at depths of 5, 10, and 15 feet.
- Six probe groups (probes 5 and 15 feet) are to be installed along the perimeter of the contaminated area where the contamination is concentrated in the capillary fringe at the water table. These probe groups will consist of two probes each, installed at depths of 5 and 15 feet.

As shown in Figure 1, probe groups VP-1, VP-3, VP-4, and VP-6 are located 25 feet away from the centerline of the northern portion of the source area. Probe groups VP-7 and VP-9 are located 40 feet from the center of the southern portion of the contaminated area, thus covering an area approximately 80 feet wide. These probes will indicate whether the SVE system is operating with sufficient vacuum to induce the desired vacuum of 0.2 inches of water at the periphery of the contaminated area.

The probes will be designated with the identifiers shown in Figure 1 followed by the probe depth. For example, the deep probe at location VP-5 will be designated VP-5-15.

## ***4.2 Probe Installation Methods***

### ***4.2.1 Probe Installation***

Vapor probes will be advanced utilizing direct push methods. The sacrificial sampling point is placed at the end of a hollow drive pipe and the sampling tube is run up the center of the drive pipe. The drive pipe is advanced to the desired depth through hammer methods or hydraulic push. When the desired depth is reached, the drive pipe is pulled back to expose the vapor collection slots.

If the hole stays open after the drive casing is pulled, the hole will be filled with sand to 1 foot below ground surface.

### ***4.2.2 Bentonite Seal and Grout Placement***

A bentonite surface seal will be placed around the vapor sampling tube between 1 foot below grade and the ground surface. The seal will consist of sodium bentonite slurry or 40-mesh bentonite powder which shall be placed in ½-foot lifts and hydrated a minimum of one half hour between lifts.

### ***4.2.3 Surface Completion***

Vapor probes will be completed at final grade with a capped 1-inch diameter PVC casing. The casing will extend approximately 1 foot below the ground surface and will be set in the bentonite seal. The casing will be capped and equipped with a tap connected to polypropylene tubing with a quick disconnect coupling for the attachment of a vacuum gauge and for sampling. A metal tag indicating the probe designation and depth of the sampling point will be affixed to the PVC casing.

### **4.3 Probe Installation Diagrams**

The construction details of each group of vapor probes will be documented on a single Well Construction Summary form, similarly to the wells.

### **5.0 Disposal of Drilling Wastes**

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Drill cuttings and other solid wastes generated during the drilling activities will be drummed and remain on site until a disposition determination is made. Drill cuttings will be disposed in the Base landfill (Construction rubble area) or in a permitted facility [if a hazardous waste, total petroleum hydrocarbons (TPH) exceeds 1,000 parts per million (ppm)]. If necessary, a waste manifest will be prepared for signature by Base personnel. Used personal protective equipment (PPE) will be placed in double plastic bags and disposed in a dumpster or the Base landfill. Water from equipment decontamination will be stored in drums until it can be discharged to the Base sanitary sewer system.

### **6.0 Post-Work Submittals**

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The following documentation will be submitted to the USACE subsequent to the drilling and installation activities:

- Field Activity Daily Logs, including records of any corrective actions
- Well Installation Logs of:
  - SVE and passive air inlet well construction
  - Vapor probe construction
- Boring Logs of SVE and passive air inlet well borings
- Manufacturer's catalog data for:
  - Well construction materials:
    - a. Well casing
    - b. Well screen
    - c. Bentonite
    - d. Cement
  - Vapor probe construction materials:
    - a. Probe tips
    - b. Bentonite.

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**Table**

**Table 1**  
**SVE Well Screen Depth Intervals**  
**Site 2/5**  
**POL Site Remediation**  
**Holloman AFB, New Mexico**

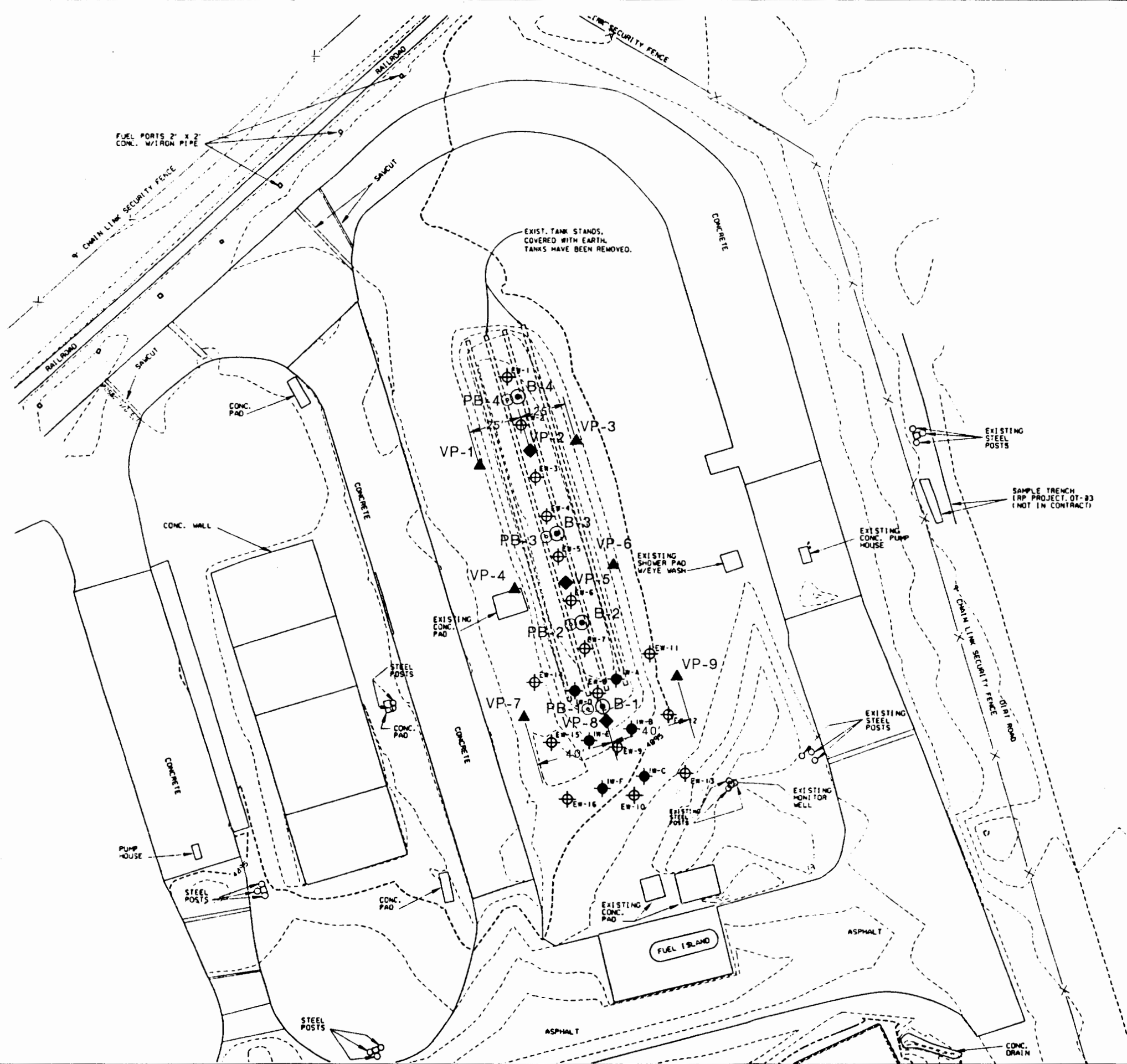
| Well No. | Planned Depth of Screened Interval<br>(below ground surface) | Screen Length |
|----------|--|---------------|
| EW-1     | 13-15 feet   | 2 feet        |
| EW-2     | 10-15 feet   | 5 feet        |
| EW-3     | 10-15 feet   | 5 feet        |
| EW-4     | 5-15 feet  | 10 feet       |
| EW-5     | 5-15 feet  | 10 feet       |
| EW-6     | 5-15 feet  | 10 feet       |
| EW-7     | 5-15 feet  | 10 feet       |
| EW-8     | 5-15 feet  | 10 feet       |
| EW-9     | 13-15 feet   | 2 feet        |
| EW-10    | 13-15 feet   | 2 feet        |
| EW-11    | 13-15 feet   | 2 feet        |
| EW-12    | 13-15 feet   | 2 feet        |
| EW-13    | 13-15 feet   | 2 feet        |
| EW-14    | 13-15 feet   | 2 feet        |
| EW-15    | 13-15 feet   | 2 feet        |
| EW-16    | 13-15 feet   | 2 feet        |
| IW-A     | 5-15 feet  | 10 feet       |
| IW-B     | 5-15 feet  | 10 feet       |
| IW-C     | 5-15 feet <sup>a</sup>                                       | 10 feet       |
| IW-D     | 5-15 feet <sup>a</sup>                                       | 10 feet       |
| IW-E     | 5-15 feet  | 10 feet       |
| IW-F     | 5-15 feet  | 10 feet       |

<sup>a</sup> Specifications showed 13 to 15 feet, with 10-foot screen.

**Figure**

DRAWN BY A. KRONER 2/9/94 CHECKED BY [Signature] 4/13/94 DRAWING NUMBER 305945-B1 APPROVED BY [Signature] 4/13/94

5945B1 4/11/94



LEGEND

- EW-1 SVE WELLS
- IW-C COMBINATION SVE/PASSIVE AIR VENT WELLS
- PB-1 PRELIMINARY SOIL BORING
- B-1 CONFIRMATION SOIL BORING
- VP-9 VAPOR MONITORING PROBE GROUP, WITH TWO PROBES
- VP-5 VAPOR MONITORING PROBE GROUP, WITH THREE PROBES

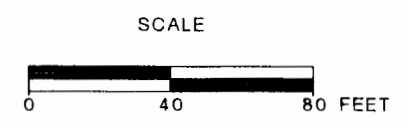


FIGURE 1  
 NEW WELL, PROBE AND BORING PLAN  
 SITE 2/5  
 POL SITE REMEDIATION  
 PREPARED FOR  
 HOLLOMAN A.F.B.  
 ALBUQUERQUE, NEW MEXICO





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## **Appendix A**

## **Field Forms**

### **Contents:**

Well Construction Summary Form  
Soil Boring Log  
Jar Headspace Testing for Volatiles Form  
Field Activity Daily Log

# WELL CONSTRUCTION SUMMARY

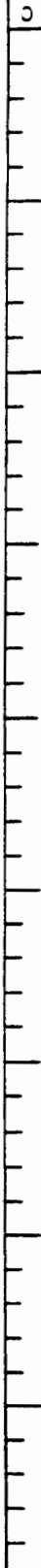
PROJECT NAME: \_\_\_\_\_

DEPTH (Ft) \_\_\_\_\_  
 AS-BUILT DIAGRAM  
 LITH- OLOGY \_\_\_\_\_

PROJECT NUMBER: \_\_\_\_\_ DATE: \_\_\_\_\_ WELL: \_\_\_\_\_

LOCATION: \_\_\_\_\_

ELEVATION (GROUND): \_\_\_\_\_ GEOLOGIST \_\_\_\_\_



### DRILLING SUMMARY

TOTAL DEPTH \_\_\_\_\_

HOLE DIAM. \_\_\_\_\_

DRILLER \_\_\_\_\_

RIG \_\_\_\_\_

BIT(S) \_\_\_\_\_

FLUID \_\_\_\_\_

CASING \_\_\_\_\_

### CONSTRUCTION TIME LOG

| TASK          | START |      | ENC  |      |
|---------------|-------|------|------|------|
|               | DATE  | TIME | DATE | TIME |
| DRILLING:     |       |      |      |      |
|               |       |      |      |      |
|               |       |      |      |      |
| GEOPHYS. LOG: |       |      |      |      |
| CASING:       |       |      |      |      |
|               |       |      |      |      |
| FILTER PACK:  |       |      |      |      |
| CEMENT:       |       |      |      |      |
| DEVELOPMENT:  |       |      |      |      |
| OTHER:        |       |      |      |      |
|               |       |      |      |      |
|               |       |      |      |      |
|               |       |      |      |      |
|               |       |      |      |      |

### WELL DATA

CASING: C = CASING S = SCREEN

|   |   |   |   |
|---|---|---|---|
| — | — | — | — |
| — | — | — | — |
| — | — | — | — |
| — | — | — | — |
| — | — | — | — |
| — | — | — | — |

CASING: C1 \_\_\_\_\_

C2 \_\_\_\_\_

SCREEN: S1 \_\_\_\_\_

S2 \_\_\_\_\_

FILTER PACK: \_\_\_\_\_

DEPTH: \_\_\_\_\_

BENTONITE: \_\_\_\_\_

DEPTH: \_\_\_\_\_

CEMENT: \_\_\_\_\_

DEPTH: \_\_\_\_\_

APPROX. PROTECTIVE COVER

STICKUP: \_\_\_\_\_

OTHER: \_\_\_\_\_

### WELL DEVELOPMENT

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

### REMARKS

STATIC WATER LEVEL \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



# SOIL BORING LOG

HOLE NO.

1. COMPANY NAME

2. DRILLING SUBCONTRACTOR

SHEET 1

OF SHEETS

3. PROJECT

4. LOCATION

5. NAME OF DRILLER

6. MANUFACTURER'S DESIGNATION OF DRILL

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT

8. HOLE LOCATION

9. SURFACE ELEVATION

10. DATE STARTED

11. DATE COMPLETED

12. OVERBURDEN THICKNESS

15. DEPTH GROUNDWATER ENCOUNTERED

13. DEPTH DRILLED INTO ROCK

16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED

14. TOTAL DEPTH OF HOLE

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)

18. GEOTECHNICAL SAMPLES

DISTURBED

UNDISTURBED

19. TOTAL NUMBER OF CORE BOXES

20. SAMPLES FOR CHEMICAL ANALYSIS

VOC

METALS

OTHER (SPECIFY)

OTHER (SPECIFY)

OTHER (SPECIFY)

21. TOTAL CORE RECOVERY

%

21. DISPOSITION OF HOLE

BACKFILLED

MONITORING WELL

OTHER (SPECIFY)

23. SIGNATURE OF INSPECTOR

| ELEV.<br>a | DEPTH<br>b | DESCRIPTION OF MATERIALS<br>c | FIELD SCREENING RESULTS<br>d | GEOTECH SAMPLE OR CORE BOX NO.<br>e | ANALYTICAL SAMPLE NO.<br>f | BLOW COUNTS<br>g | REMARKS<br>h |
|------------|------------|-------------------------------|------------------------------|-------------------------------------|----------------------------|------------------|--------------|
|            |            |                               |                              |                                     |                            |                  |              |

PROJECT

HOLE NO.

# SOIL BORING LOG

HOLE NO.

PROJECT

INSPECTOR

SHEET

OF SHEETS

| ELEV.<br><small>a</small> | DEPTH<br><small>b</small> | DESCRIPTION OF MATERIALS<br><small>c</small> | FIELD SCREENING RESULTS<br><small>d</small> | GEOTECH SAMPLE OR CORE BOX NO.<br><small>e</small> | ANALYTICAL SAMPLE -NO.<br><small>f</small> | BLOW COUNTS<br><small>g</small> | REMARKS<br><small>h</small> |
|---------------------------|---------------------------|--|---|--|--|---------------------------------|-----------------------------|
|                           |                           |  |   |  |  |                                 |                             |

PROJECT

HOLE NO.





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| DAILY LOG | DATE  |    |  |  |
|           | NO.   |    |  |  |
|           | SHEET | OF |  |  |

## FIELD ACTIVITY DAILY LOG

|   |  |
|---|--|
| PROJECT NAME                                | PROJECT NO.  |
| FIELD ACTIVITY SUBJECT:                     |  |
| DESCRIPTION OF DAILY ACTIVITIES AND EVENTS: |  |
| VISITORS ON SITE:                           | CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS. |
| WEATHER CONDITIONS:                         | IMPORTANT TELEPHONE CALLS:   |
| IT PERSONNEL ON SITE:                       |  |
| SIGNATURE                                   | DATE:  |