# Closure Decision Document SWMU K03a

**June 2009**

**The selected remedy is protective of human health and the environment. It has been shown that a complete pathway to human health and the environment does not exist, and there is no potential for an exposure pathway to be completed in the future.**

**U.S. Army**

16 June 2009
**Date**

Kimberly L. Gilbert-Mason
**Kimberly L. Gilbert-Mason**
**Lieutenant Colonel, U.S. Army**
**Commanding**

**State of Nevada**

July 6, 2009
**Date**

**Jim Najima**
**Chief, Corrective Actions Bureau**
**Division of Environmental Protection**

# REVISED FINAL

# Closure Decision Document for SWMU K03a: Underground Storage Tank Site Hawthorne Army Depot Hawthorne, Nevada

**Facility I.D. Number 9-000031**
Contract No. W91ZLK-05-D-0011
Delivery Order 0002

Prepared for:
**U.S. Army Environmental Command**

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CH2MHILL

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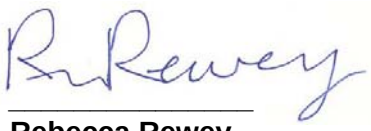
Columbia, MD 21046

June 2009

# Closure Decision Document
# SWMU K03a: Underground Storage Tank Sites

## Hawthorne Army Depot
## Hawthorne, Nevada

## June 2009



**Prepared By:** _____
**Rebecca Rewey**
**Task Manager**

**Reviewed By:** _____
**Oscar Sorensen**
**Project Manager**

# Contents

# Acronyms and Abbreviations

| | |
|---|---|
| AIW | air injection well |
| bgs | below ground surface |
| CAP | Corrective Action Plan |
| HWAAP | Hawthorne Army Ammunition Plant |
| HWAD | Hawthorne Army Depot |
| mg/kg | milligrams per kilogram |
| NAC | Nevada Administrative Code |
| NDEP | Nevada Division of Environmental Protection |
| NFA | No Further Action |
| PVC | polyvinyl chloride |
| SWMU | Solid Waste Management Unit |
| TPH | total petroleum hydrocarbons |
| USACE | U.S. Army Corps of Engineers |
| USEPA | U.S. Environmental Protection Agency |
| UST | underground storage tank |
| VMW | vapor monitoring well |
| VOC | volatile organic compound |

# 1.0 Introduction

This Closure Decision Document describes the rationale for the proposed closure of Solid Waste Management Unit (SWMU) Hawthorne Army Ammunition Plant (HWAAP) K03a, Underground Storage Tanks (USTs), hereafter referred to as SWMU K03a, at Hawthorne Army Depot (HWAD), Hawthorne, Nevada (Figure 1). As described in the approved Correction Action Plan (CAP) for SWMUs K03a, K03b, and K03d (CH2M HILL, 2007), closure has been approved for K03a with No Further Action (NFA).

A Final CAP was prepared for SWMUs K03a, K03b, and K03d (CH2M HILL, 2007), and approved by the Nevada Division of Environmental Protection (NDEP) on May 7, 2007 (NDEP, 2007). The Final CAP recommended closure for SWMU K03a. The following paragraphs provide a brief overview of the site history, physical setting, investigation history, conclusions, and decommissioning activities completed for SWMU K03a. Additional background information is provided in the Final CAP for SWMU K03a (CH2M HILL, 2007).

# 2.0 Site History

SWMU K03a is a former UST site at HWAD located south of Building 101-25 and southeast of Building 101-30. From 1936 to 1992, seven USTs containing #2 diesel fuel or #6 fuel oil were in operation at the site (Figure 2). On Figure 2, Tank #1 (formerly designated HWAP-46) is shown as UST-1, Tank #2 (HWAP-47) is shown as UST-2, Tank #3 (HWAP-48) is shown as UST-3, Tank #4 (HWAP-49) is shown as UST-4, Tank #5 (HWAP-50) is shown as UST-5, Tank #6 (HWAP-51) is shown as UST-6, and Tank #7 (HWAP-52) is shown as UST-7.

# 3.0 Physical Setting

SWMU K03a is bordered by railroad tracks to the north and northeast that run parallel to Third Avenue North, which borders the site to the south and southwest. Several underground utility lines are present at the site, some of which were installed as a part of the enhanced bioventing system. According to boring logs, soils at this site are predominantly sands and silty sands to a depth of 45 feet below ground surface (bgs).

No groundwater quality monitoring wells are present at the site. The depth to groundwater at the site is estimated to be 100 feet bgs, and the estimated regional groundwater flow direction is to the northwest naturally and to the southeast when influenced by site groundwater pumping operations. Water supply well #7, which is used for non-potable purposes (dust suppression), is located approximately 1.8 miles downgradient of SWMU K03a (Tetra Tech, 2006). No surface water bodies exist at SWMU K03a (USACE, 2003).

# 4.0 Investigation History

In late October 1991, six of the seven USTs (UST-1 to UST-6 [three 10,000-gallon and three 12,000-gallon tanks]) were removed from two separate excavations (three tanks per excavation) and cut up in place (Bramco, 1991). UST-7 was considered closed pursuant to HWAAP's UST Identification Cross-Reference dated March 28, 1994 (Woodward Clyde, 1994; USACE, 2003). UST-7 was removed in 1991 by Bramco Construction Corp. and Desert Mountain Oil (Bramco, 1991).

UST locations are shown on Figure 2. Soil samples were collected during excavation activities from depths of 13 to 16 feet bgs and submitted for analysis for total petroleum hydrocarbons (TPH) as diesel (TPH-diesel). Results of the analyses are presented in Table 1.

Two samples were collected at the east and west ends of UST-7 during and after excavation (Bramco, 1991); each of the samples was non-detect for TPH (U.S. Environmental Protection Agency [USEPA] Method 8015M), metals (TCLP-8), pesticides (USEPA Method 680), and volatile organic compounds (VOCs) (USEPA Method 8240). UST-7 has been closed and confirmation sampling has occurred.

In 1992, three soil borings (G-1, G-5, and G-9) were advanced to depths ranging from 14 to 25 feet bgs to characterize the extent of the TPH-diesel contamination. Results of the analyses are presented in Table 1.

Two soil borings (SO-1 and SO-2) were advanced in 2002 to depths ranging from 10 to 40 feet bgs to determine the lateral and vertical extent of contamination remaining in the soil after 6 years of enhanced bioremediation. Soil samples from the boring locations, situated within the footprints of two of the tanks (UST-3 and UST-5), were analyzed for TPH-diesel and TPH as motor oil (TPH-motor oil). Results of the analyses are presented in Table 1.

The fate of the excavated soil at SWMU K03a is unclear. According to the Draft Closure Report prepared by the U.S. Army Corps of Engineers (USACE) in May 2003, a total of 450 cubic yards of contaminated soil were excavated from the surrounding soil to a depth of approximately 16 feet bgs (USACE, 2003). The Remedial Activity Report prepared by Allied Technology Group in 1998, meanwhile, stated that the stockpiled soil was later mixed with 481 cubic yards of approved borrow material from another HWAD site and used to backfill the onsite excavation (Allied Technology Group, 1998). However, according to the Enhanced Bioremediation Pilot Test Final Summary Report prepared by Tetra Tech in December 1996, 789 cubic yards of the stockpiled soil at SWMU K03a were transported to SWMU J03 for treatment (Tetra Tech, 1996).

The May 2003 Draft Closure Report prepared by USACE (USACE, 2003) recommended closure of this site with regard to all chemicals of concern for UST-1 to UST-6, although the report was not submitted to NDEP for approval.

# 5.0 Conclusions

a. Depth of groundwater: 100 feet bgs.

b. Distance to irrigation or drinking water wells: Water supply well #7, which is used for non-potable purposes (dust suppression), is located approximately 1.8 miles downgradient of SWMU K03a.

c. Type of contaminated soil: Fine to medium sand, silty sands.

d. Annual precipitation: 4.6 inches (evapotranspiration potential is 45 inches per year).

e. Type of waste/substance released: Diesel fuel.

f. Extent of contamination: Concentrations of TPH-diesel in samples collected within the footprints of the USTs in 1991 and 1992, during and immediately following the removal of the tanks, respectively, ranged from non-detect (at 13 and 25 feet bgs) to 27,000 milligrams per kilogram (mg/kg) (at 14 feet bgs). Concentrations of TPH-diesel in two samples collected within the footprint of the former storage tanks in 2002 following the UST excavation and treatment ranged from 3 J mg/kg (at 40 feet bgs) to 190 mg/kg (at 10 feet bgs).

g. Present and potential use of the land: Industrial (present and future). Significant changes in land use (e.g., residential use) in the future may require a reassessment of the results.

h. Preferred routes of migration: Downward migration of fuel in soil into groundwater and lateral movement in groundwater. Soil contamination profiles indicate that Bunker C and diesel contamination are no longer migrating downward. These heavy oils contain few water soluble compounds that can impact groundwater quality.

i. Structures and impediments: No buildings or structures are located within the SWMU boundary. Building 101-30, Building 101-25, and new storage are located nearby. A soil stockpile location is present near the former site of UST-3, and an abandoned railroad spur runs through the western portion of the SWMU.

j. Potential fire, vapor, or explosion: None.

k. Other factors: The USTs were excavated and an enhanced bioventing system was installed to reduce TPH soil concentrations. Concentrations of TPH-diesel in samples collected within the footprints of the USTs initially ranged from non-detect to 27,000 mg/kg, and decreased to a range from 3 J mg/kg to 190 mg/kg.

As approved in the CAP, closure at SWMU K03a is recommended in accordance with Nevada Administrative Code (NAC) 459.9973 (1) guidelines. The USTs were excavated and the enhanced bioventing systems were in operation from 1998 to 2001 to reduce TPH soil concentrations. Concentrations of TPH-diesel in samples collected within the footprints of the USTs initially ranged from non-detect to 27,000 mg/kg, and decreased to a range from 3 J mg/kg to 190 mg/kg. The area occupied by SWMU K03a is visited infrequently and never for extended periods. The current and reasonably anticipated future use of the HWAD is as a secured industrial military facility and training grounds.

# 6.0 Decommissioning Activities

Decommissioning activities at SWMU K03a were performed on March 16, 2009, and included the abandonment of two air injection wells, two vapor monitoring wells, two soil moisture probes, approximately 85 feet of subsurface horizontal conveyance piping, and removal of the concrete pad for the former blower system. Decommissioning activities were performed by WDC Exploration and Wells, Zamora, California, in accordance with the Well Decommissioning Variance approved by the Division of Water Resources in September 2008 (Appendix A). Walker Lake Disposal, Inc., Mineral County, Nevada, was subcontracted to transport and dispose of all debris generated during decommissioning activities.

The grout-in-place abandonment method was used to abandon the two air injection wells (AIW-1 and AIW-2) and the 2-inch-diameter conveyance piping at SWMU K03a. The grout-in-place method was performed by placing a tremie pipe (1.5-inch-diameter) inside the well casing and pumping grout composed of a bentonite mixture through the tremie pipe to the bottom of the well. The tremie pipe was slowly withdrawn keeping the bottom of the pipe below the level of the grout until the well casing was filled to ground surface. Following grout placement within the casing, a John Deere 310E backhoe was used to excavate/remove the concrete pads, well vaults, and well casings (to at least 1 foot bgs) for the two air injection wells, two vapor monitoring wells (VMW-1 and VMW-2), and the two soil moisture probes (SM-1 and SM-2). Once the surface completions were removed, the tops of the remaining well casings were capped with concrete and backfilled with surrounding clean soil. Photographs of SWMU K03a before and after the decommissioning activities were completed are included in Figure 3.

The grout-in-place method was used to abandon the 85 feet of subsurface horizontal conveyance piping connecting the two air injection wells to the former treatment system. The grout-in-place method was performed by using a fitting to connect the grout hose to the end of the 2-inch-diameter line and pumping a volume of bentonite grout into the line based on the approximate length and diameter of the piping. Following grout placement within the piping, the backhoe was used to excavate/remove the exposed end of the pipe and the resulting excavation was backfilled with surrounding clean soil. The concrete pad (treatment system foundation) was broken into manageable pieces using the backhoe bucket and placed into the debris roll-off. Following the completion of decommissioning activities at SWMU K03a, the backhoe was used to grade the site to match the surrounding area.

The debris generated during decommissioning activities at SWMU K03a (polyvinyl chloride [PVC] pipe and concrete) was placed into one of two 20-cubic-yard roll-off containers with similar debris generated during decommissioning activities conducted at four other HWAD sites (B20, J03, K03d, and K05). Upon completion of the decommissioning activities at all of the sites, the debris roll-off containers were transported by truck to the HWAD construction-debris landfill for disposal, while the roll-off container with the metal debris was transported by truck to a local metal recycler.

Prior to CH2M HILL demobilizing from the facility, HWAD conducted a site inspection of SWMU K03a and found no outstanding issues at that time. Therefore, based on the above-described decommissioning activities conducted at SWMU K03a in addition to the request for closure, Response Complete is requested for this site.

# 7.0 References


Allied Technology Group, 1998. *Remedial Activity Report and Operations and Maintenance Manual, Installation of Remedial Bioventing Systems at Two Former UST Sites, Hawthorne Army Depot, Hawthorne, Nevada.* August.

Bramco, 1991. *Closure of Unactive Underground Storage Tanks – Tank #101-2, #7.* October.

CH2M HILL, 2007. *Final Corrective Action Plan for K03 a, b, d: Underground Storage Tank Sites*. April.

Nevada Division of Environmental Protection (NDEP), 2007. "Approval of Final Corrective Action Plan for SWMUs K03a, b, and d: Underground Storage Tank Sites, Hawthorne Army Depot, Hawthorne, Nevada, April 2007." Letter dated May 7, 2007.

Tetra Tech, Inc., 1996. *Final Summary Report for the Building 13 Enhanced Bioremediation Pilot Test, Hawthorne Army Depot, Hawthorne, Nevada.* December.

Tetra Tech, Inc., 2006. *Draft Annual 2005 Groundwater Monitoring Report.* June.

U.S. Army Corps of Engineers (USACE), 2003. *Draft Closure Report Solid Waste Management Unit K03 Building 101-25 Underground Storage Site, Hawthorne Army Depot, Hawthorne, Nevada*. May.

Woodward-Clyde, 1994. *Site Characterization Work Plan, Hawthorne Ammunition Plant, Hawthorne, Nevada.* September 29.

# Table

**Table 1**
**Summary of Soil Analytical Data**
*Closure Decision Document for SWMU K03a Underground Storage Tank Site, Hawthorne Army Depot, Nevada*

| Sample ID | Sample Date | Depth (feet bgs) | TPH-Diesel (mg/kg) | TPH-Motor Oil (mg/kg) |
|---|---|---|---|---|
| **Samples Collected During UST Excavation Activities** | | | | |
| Tank #1 (UST-1) North | 1991 | 13 | *2,490* | *NA* |
| Tank #1 (UST-1) South | 1991 | 13 | *4,700* | *NA* |
| Tank #2 (UST-2) North | 1991 | 13 | *1,000* | *NA* |
| Tank #2 (UST-2) South | 1991 | 13 | *2,100* | *NA* |
| Tank #3 (UST-3) North | 1991 | 13 | < 10 | NA |
| Tank #3 (UST-3) South | 1991 | 13 | < 10 | NA |
| Tank #4 (UST-4) North | 1991 | 16 | *460* | *NA* |
| Tank #4 (UST-4) South | 1991 | 16 | *1,320* | *NA* |
| Tank #5 (UST-5) North | 1991 | 16 | *385* | *NA* |
| Tank #5 (UST-5) South | 1991 | 16 | *535* | *NA* |
| Tank #6 (UST-6) North | 1991 | 16 | *3,780* | *NA* |
| Tank #6 (UST-6) South | 1991 | 16 | *5,300* | *NA* |
| Tank #7 (UST-7) #1 | 10/11/1991 | 13 | < 10 | *NA* |
| Tank #7 (UST-7) #2 | 10/11/1991 | 13 | < 10 | *NA* |
| **Samples Collected After UST Excavation Activities** | | | | |
| Tank #7 (UST-7) East | 11/11/1991 | 11 | < 10 | *NA* |
| Tank #7 (UST-7) West | 11/11/1991 | 11 | < 10 | *NA* |
| G-1 | 1992 | 14 | *27,000* | *NA* |
| G-1 | 1992 | 24 | *110* | *NA* |
| G-1 | 1992 | 29 | 53 | *NA* |
| G-1 | 1992 | 34 | *900* | *NA* |
| G-5 | 1992 | 25 | < 10 | *NA* |
| G-9 | 1992 | 25 | < 10 | *NA* |
| **Soil Confirmation Samples** | | | | |
| SO-1 | 2002 | 10 | *110* | *160* |
| SO-1 | 2002 | 20 | < 11 | < 11 |
| SO-1 | 2002 | 40 | 7 J | 6 J |
| SO-2 | 2002 | 10 | 26 | 38 |
| SO-2 | 2002 | 20 | 6 J | 10 J |
| SO-2 | 2002 | 40 | 3 J | 5 J |
| SO-1-DUP | 2002 | 10 | *190* | *200* |

***Notes:***

TPH: Total Petroleum Hydrocarbons

J = The reported value is an estimate (the detected concentration was below the PQL).

NA = Samples were not analyzed for the specified contaminant.

*Italics* : Concentration exceeds TPH soil action level of 100 mg/kg.

**BOLD**: Concentration exceeds TPH soil Tier 2 Site-Specific Target Limit (SSTL) of 10,000 mg/kg (based on 100 feet bgs depth-to-groundwater; fine-to-medium sands and silty sands).

Source : U.S. Army Corps of Engineers, May 2003. Bramco Construction, 1991.

# Figures


**Legend:**

- Water Supply Well

Regional Groundwater Flow Direction (Draft Annual 2005 Groundwater Monitoring Report, Tetra Tech, 2005)

**FIGURE 1**
**SITE LOCATION**
**CLOSURE REPORT/DECISION DOCUMENT, SWMU K03a**
HAWTHORNE ARMY DEPOT
Hawthorne, Nevada

CH2MHILL

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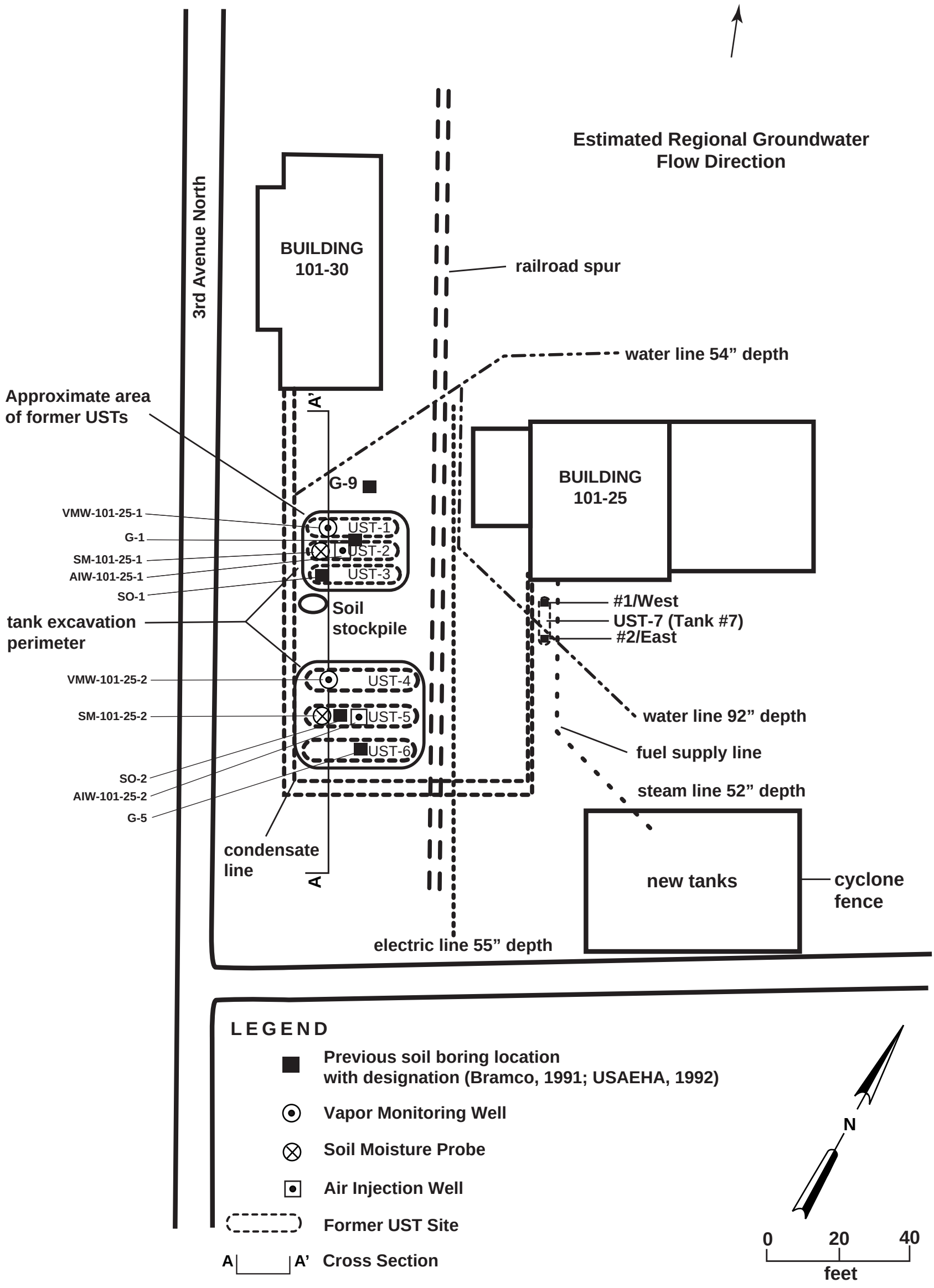



Closure Report: Solid Waste Managment Unit K03a,
Building 101-25, Underground Storage Site
Hawthorne Army Depot, Hawthorne, Nevada

**FIGURE 2**
**SITE LAYOUT**
**CLOSURE REPORT/DECISION DOCUMENT, SWMU K03a**
HAWTHORNE ARMY DEPOT
Hawthorne, Nevada

CH2MHILL

350552_Hawthorne_Figure2_SiteLayout_SWMU_K03a

Figure 3: Photographs of SWMU K03a before (top photograph) and after (bottom photograph) decommissioning activities were completed.

**APPENDIX A**

# Well Decommissioning Variance

JIM GIBBONS
*Governor*

**STATE OF NEVADA**

ALLEN BIAGGI
*Director*

TRACY TAYLOR, P.E.
*State Engineer*

**DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES**
**DIVISION OF WATER RESOURCES**
**901 S. Stewart Street, Suite 2002**
**Carson City, Nevada 89701**
**(775) 684-2800 • Fax (775) 684-2811**
**water.nv.gov**

Waiver Correspondence 2008

September 19, 2008

CH2MHILL
Attn: Oscar Sorensen
9193 So. Jamaica Street
Englewood, CO 80112

**RE: Vadose Zone Well Plugging, Hawthorne Army Depot**

Dear Mr. Sorensen:

This will acknowledge your waiver request, dated September 8, 2008, received by this office September 15, 2008

Division of Water Resources Staff have reviewed your proposal and, as Provided in Section 534.450 of the Regulation for Water Well and Related Drilling as adopted under Chapter 534 of the Nevada Administrative Code, and for good cause shown, authorization is herewith **granted** to complete the subject well plugging and abandonment as described in your September 8, 2008 letter.

It is expressly understood this authorization does not relieve the operator of the permitting requirements of other state, federal and local agencies.

If you have any questions, please contact this office, (775) 684-2800.

Sincerely,

Wm Hamilton Reed, RPG, PE
Staff Engineer

WHR/sg

CH2M HILL
9193 S. Jamaica Street
Englewood, CO 80112
Tel 720.286.0241
Fax 720.286.9230

CH2MHILL

September 8, 2008

Division of Water Resources
Attn: Hamilton Reed
901 S. Stewart Street, Suite 2002
Carson City Nevada 89701

Subject: Well Decommissioning Variance Request
Hawthorne Army Depot
Hawthorne, Nevada

Dear Mr. Reed:

This well-abandonment variance request has been prepared based on discussions between Rebecca Rewey (CH2M HILL) and yourself on June 4, 2008 regarding required well abandonment procedures for a project at the Hawthorne Army Depot (HWAD) in Hawthorne, Nevada. During the phone call, well abandonment options for passive vent wells at Solid Waste Management Unit (SWMU) K05 were discussed. This letter expands the request for a variance to Nevada Administrative Code (NAC) 534.420 to include wells associated with remediation systems in SWMUs B20, J03, K03d in addition to SWMU K05, which was specifically discussed on the June 4 phone call.

The remediation systems consist of passive vent wells, vapor monitoring wells, air injection wells, horizontal injection lines, background vadose zone monitoring wells, and soil moisture probes. The remediation system wells either (1) do not meet the definition of a "well" as defined in Nevada Administrative Code (NAC) 534.220 as they were not used for "measuring, testing or sampling the underground strata or producing groundwater" or (2) do not pose a threat to groundwater. This letter presents well-construction details for the various remediation systems and proposes alternate decommissioning activities to those described in NAC 534.420.

# Remediation System Design Summary

## SWMU B20 Passive Vapor Extraction Well System Design

The passive vapor extraction well system at SWMU B20 consists of four vertical passive vent wells constructed of 2-inch-diameter PVC casing and 0.010-inch slotted screen to a maximum depth of 100-feet below grade (Figure 1). Aboveground, each passive vent well is connected to a ball valve, a sample port, and an 8-inch-diameter PVC stack pipe with a wind-driven turbine. The groundwater at this site ranges from approximately 129-feet to 134-feet below ground surface (bgs).

## SWMU J03 Enhanced Bioremediation System Design

The enhanced bioremediation system at SWMU J03 consists of horizontal and vertical air injection lines, vapor monitoring wells, and soil moisture probes. The groundwater at this site is approximately 104-feet bgs.

Horizontal injection lines (Figure 2), each approximately 80 feet in length, consist of 1-inch diameter schedule-40 PVC screen with 0.010-inch-diameter slots; two lines are located at 10-feet bgs and two are located at 22-feet bgs. Vertical air-injection wells (Figures 3 and 4) at SWMU J03 are constructed of 2-inch diameter, schedule-40 PVC casing with 0.010-inch slot screen; screens are set at various target depths.

Each vapor monitoring well (Figure 5) consists of three ¼-inch diameter polyethylene piping with a 6-inch long schedule-40, 0.010-inch slotted, 1-inch diameter PVC screen, set at 59.5-, 30-, and 15-feet bgs.

Soil-moisture probes (Figure 6) consist of wire leads attached to 7/8-inch diameter gypsum soil-moisture blocks. The soil-moisture probes were installed in 8-inch diameter boreholes at depths of 5-, 15-, and 30-feet bgs. The boreholes were backfilled with native material, finished with a 3-foot tall, two-inch-diameter PVC pipe and cemented in place.

## SWMU K03d Enhanced Bioremediation System Design

The enhanced bioremediation system at SWMU K03d consists of horizontal manifold lines, an air-injection well, a background vadose zone monitoring well, and a vapor-monitoring well. The groundwater at this site is approximately 121-feet bgs.

The horizontal manifold lines (Figure 7) are constructed of 1-inch diameter schedule-40 PVC screened pipe with 0.010-inch slots at approximately 10 feet below grade. Each screened horizontal manifold is connected to a 1-inch-diameter solid PVC riser pipe (Figure 8). Each riser pipe is connected to the main air injection well via above ground piping.

The main air injection well (similar to Figure 4) is constructed of 2-inch-diameter schedule-40 PVC casing with 0.010-inch slot screen from 15-to 60-feet bgs. The well was sealed with bentonite chips and bentonite/cement grout and finished with a flush-mount steel cover.

The background vadose zone monitoring well (Figure 9) was constructed of 1-inch diameter schedule-40 PVC and 0.010-inch slot screen from 33-to 38-feet bgs. The well was sealed with bentonite chips and bentonite/cement grout and finished with a stickup steel cover.

The vapor monitoring well (similar to Figure 5) consists of three ¼-inch diameter polyethylene tubes with a 6-inch long schedule-40, 0.010-inch slot, 1-inch-diameter PVC screen, set at 16-, 31-, and 46-feet bgs.

## SWMU K05 Passive Bioventing System Design

The passive bioventing system at SWMU K05 consists of pairs of vertical passive vent wells which may be connected by horizontal perforated pipe. Each vent well is constructed of 4- to 6-inch diameter PVC casing and screen. The depths of the wells range from 13- to 15-feet bgs; the screen interval and slot size are not known (Figure 10). The groundwater at this site is approximately 19-feet bgs.

# Decommissioning Activities

## Passive Vent Wells, Horizontal Injection Lines, Air Injection Wells, and Background Vadose Zone Monitoring Wells

Due to the distance between the bottom of the perforated PVC casing and groundwater table at each of the SWMUs, CH2M HILL proposes to abandon the passive vent wells (including horizontal conveyance pipe if present at SWMU K05), horizontal injection lines, air injection wells, and background vadose zone monitoring wells by:

1. Injecting bentonite grout or concrete into the PVC casing,
2. Removing the above ground conveyance piping (if any), removing the flush mount or stick up protective cover, and removing the PVC casing to at least 1 foot below grade, and
3. Placing a concrete cap/seal over the vertical opening.

## Vapor Monitoring Well Decomissioning Activities

Due to the narrow diameter (¼-inch diameter flexible tubing) and shallow depths of the vapor monitoring wells at SWMUs J03 and K03d, CH2M HILL proposes to abandon these wells by removing the flush mount cover and piping to 1-foot bgs and placing a concrete seal/cap over the vertical openings.

## Soil Moisture Probe Decomissioning Activities

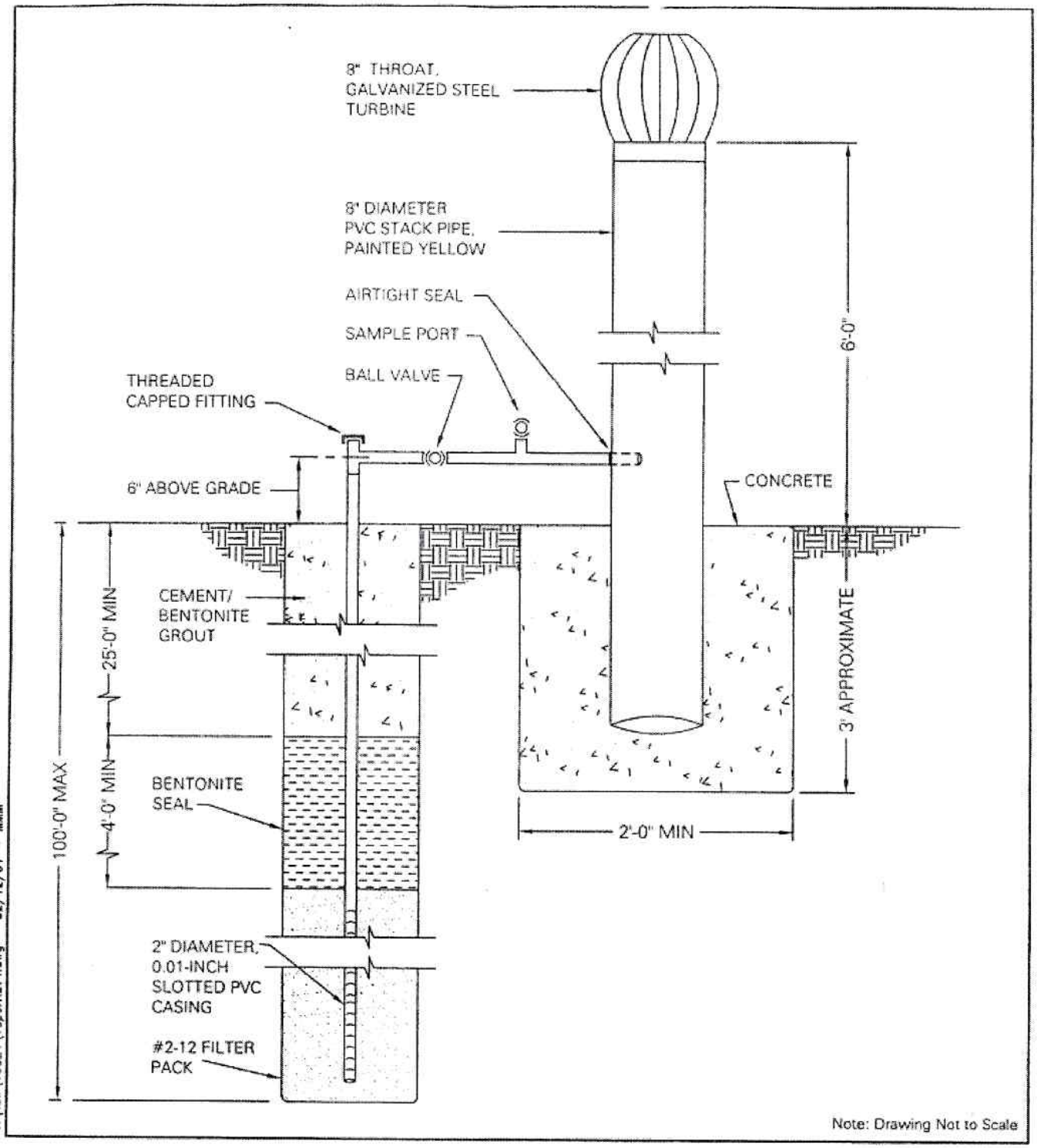
Due to the shallow depths and type of construction of the soil moisture monitoring points at SWMU J03 (lead wires buried in native-soil-filled PVC casing [Figure 6]), CH2M HILL proposes to remove the 3-foot stickup, but to leave the casing and buried wire in place.

Please contact me at 720-286-0241 or via email (oscar.sorensen@ch2m.com) with approval of this plan or if you have any questions or comments.

Sincerely,

CH2M HILL

Project Manager
Oscar Sorensen

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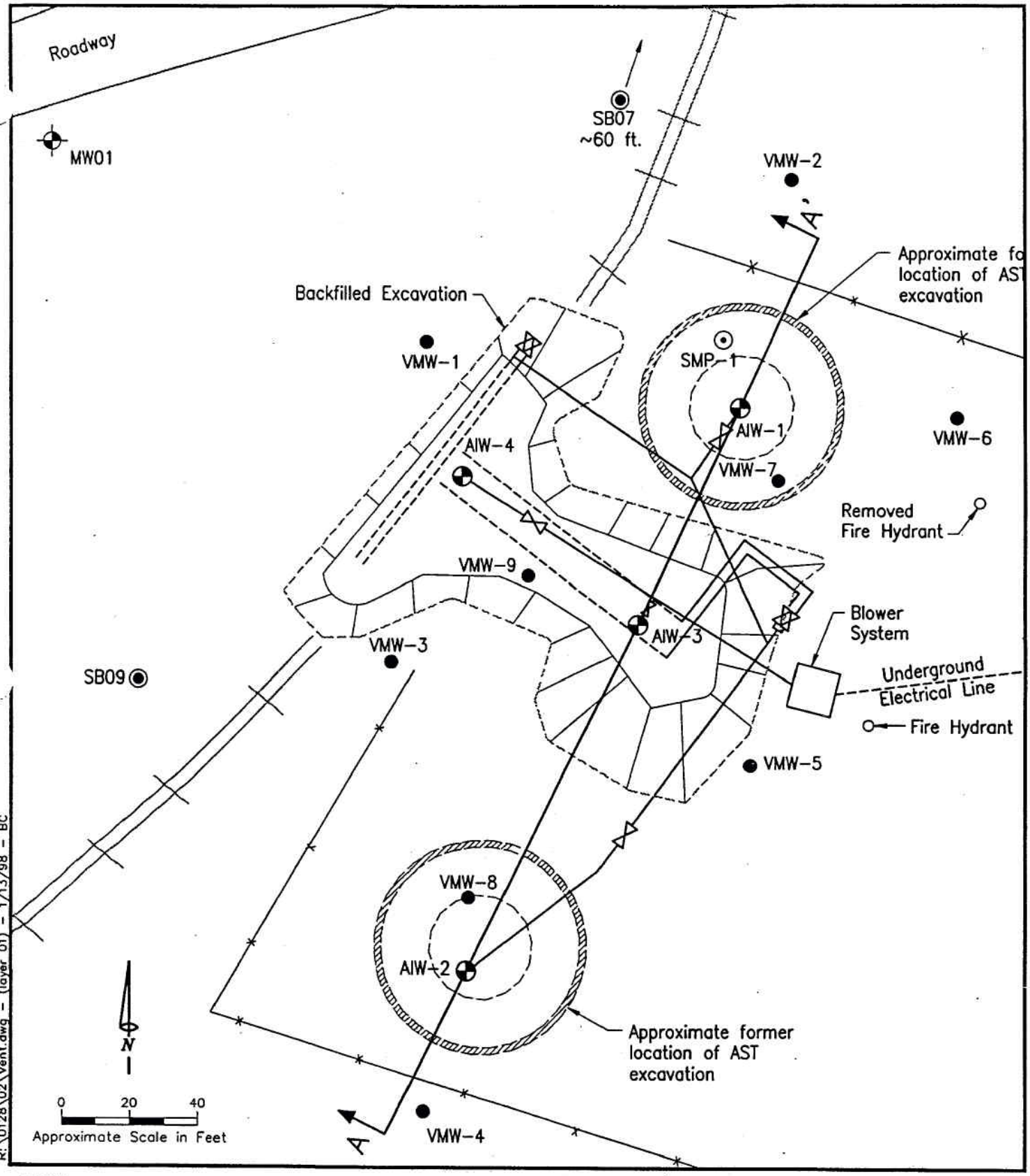
# *Passive Vapor Extraction Well System Design*

Hawthorne Army Depot
Hawthorne, Nevada

CH2MHILL

FIGURE 1




LEGEND

- R.R. tracks
- Fence
- Underground PVC Line (slotted, 0.01 inch slots)
- Aboveground PVC Line
- Air Flow Control Valve
- Vapor Monitoring Well
- Air Injection Well
- Soil Moisture Monitoring Probe
- Monitoring Well
- Soil Boring Installed in 1994
- Cross Section (Figure 3-2)

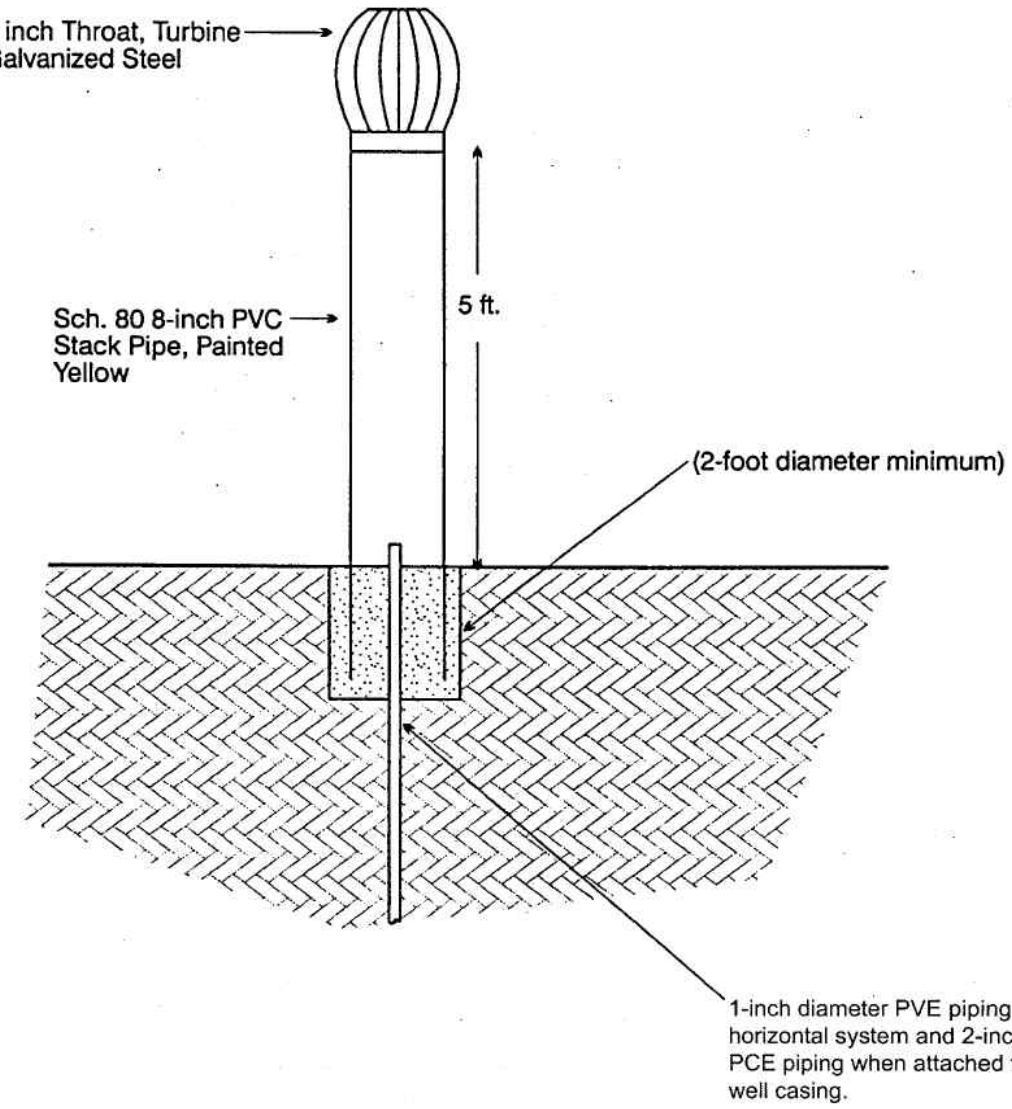
# *Enhanced Bioremediation System Layout*

**Hawthorne Army Depot**
**Hawthorne, Nevada**

Note: Only four of the eight total horizontal lines are shown.

CH2MHILL

FIGURE 2

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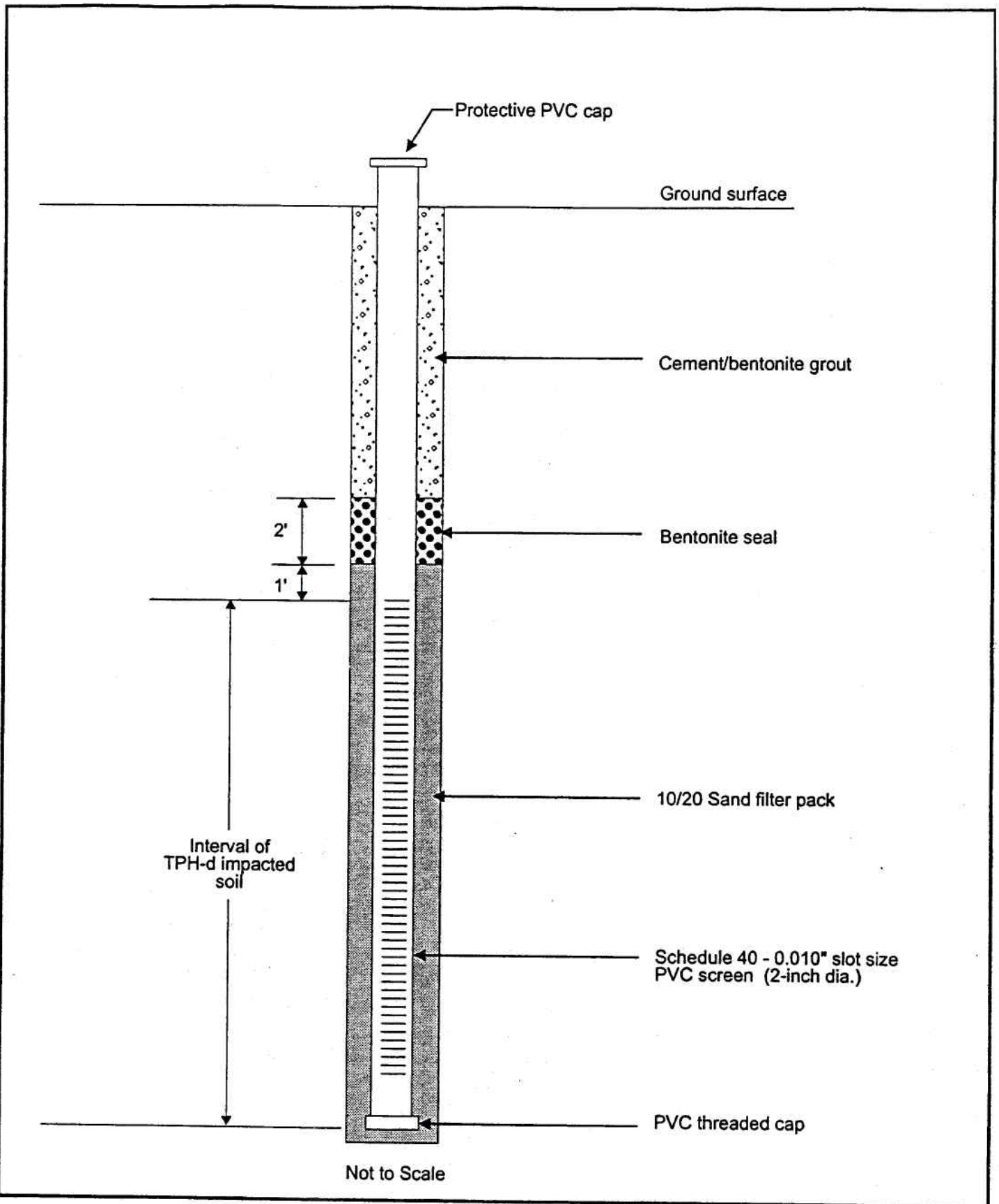
# *Attic Turbine Wind Powered Bioventing System Design*

CH2MHILL

Hawthorne Army Depot
Hawthorne, Nevada

FIGURE 3




R:\0128\02\air well.cdr - 1/12/98 - kp

Note: Construction depths for each of the air iniection wells vary.

## *Typical Air Injection Well Construction*

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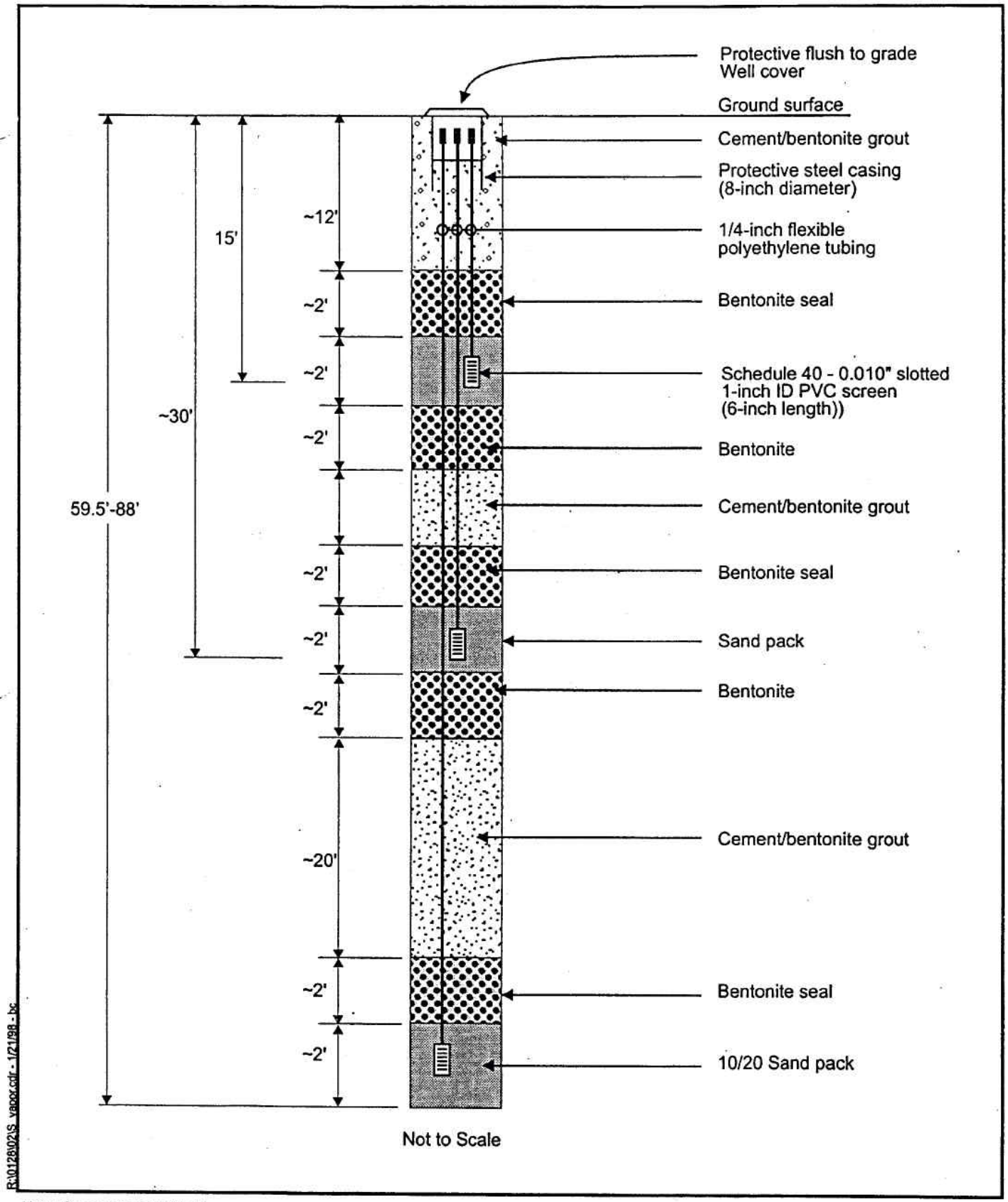
Hawthorne Army Depot
Hawthorne, Nevada

FIGURE 4




Note: Construction depths for each of the vapor monitoring wells are approximate.

## *Typical Soil Vapor Monitoring Well Construction*

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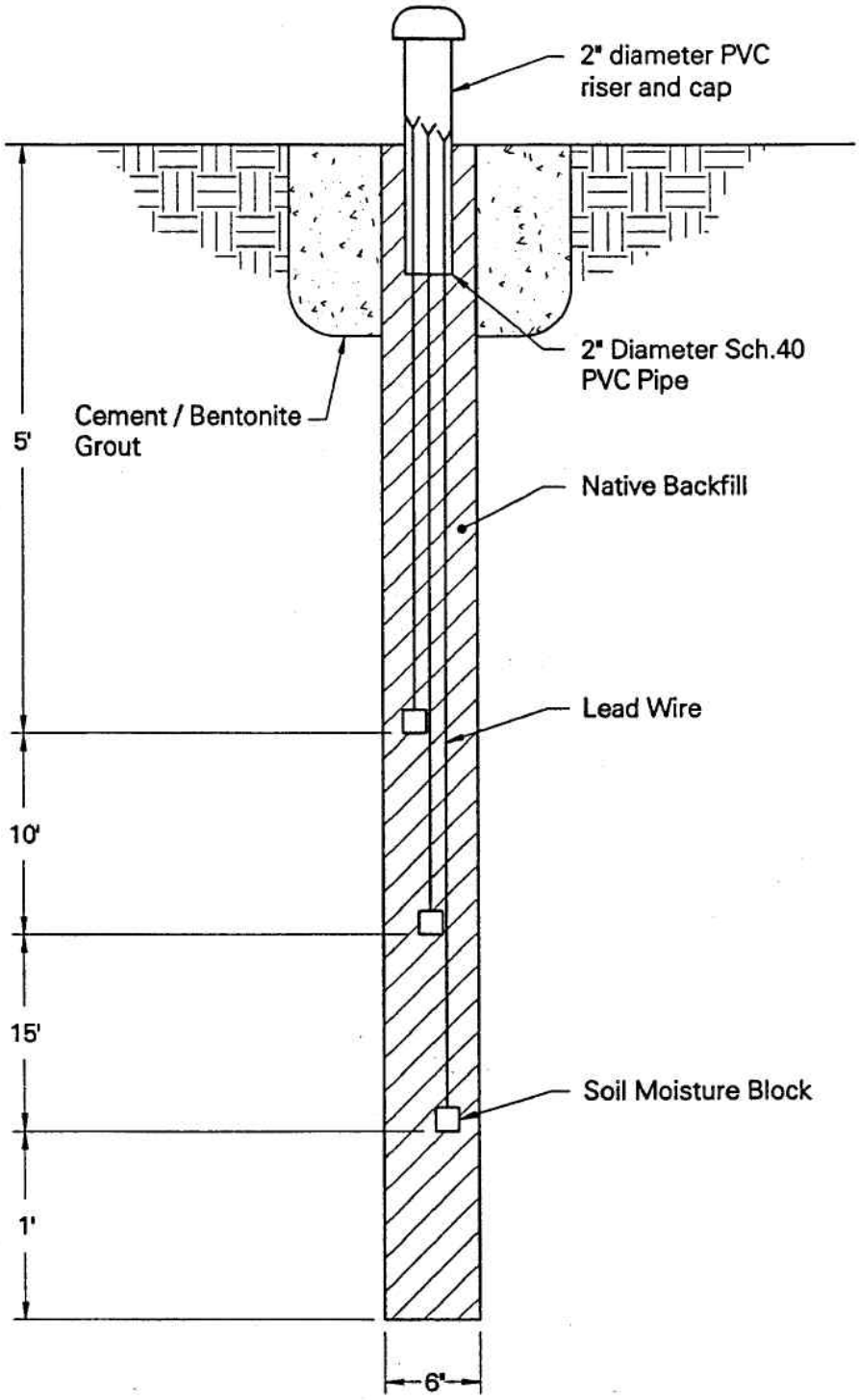
Hawthorne, Nevada

FIGURE 5




Not to Scale

r:\0128\02\Soilprob.dwg – 1/13/98 – BC

## *Soil Moisture Probe Construction*

Hawthorne Army Depot
Hawthorne, Nevada

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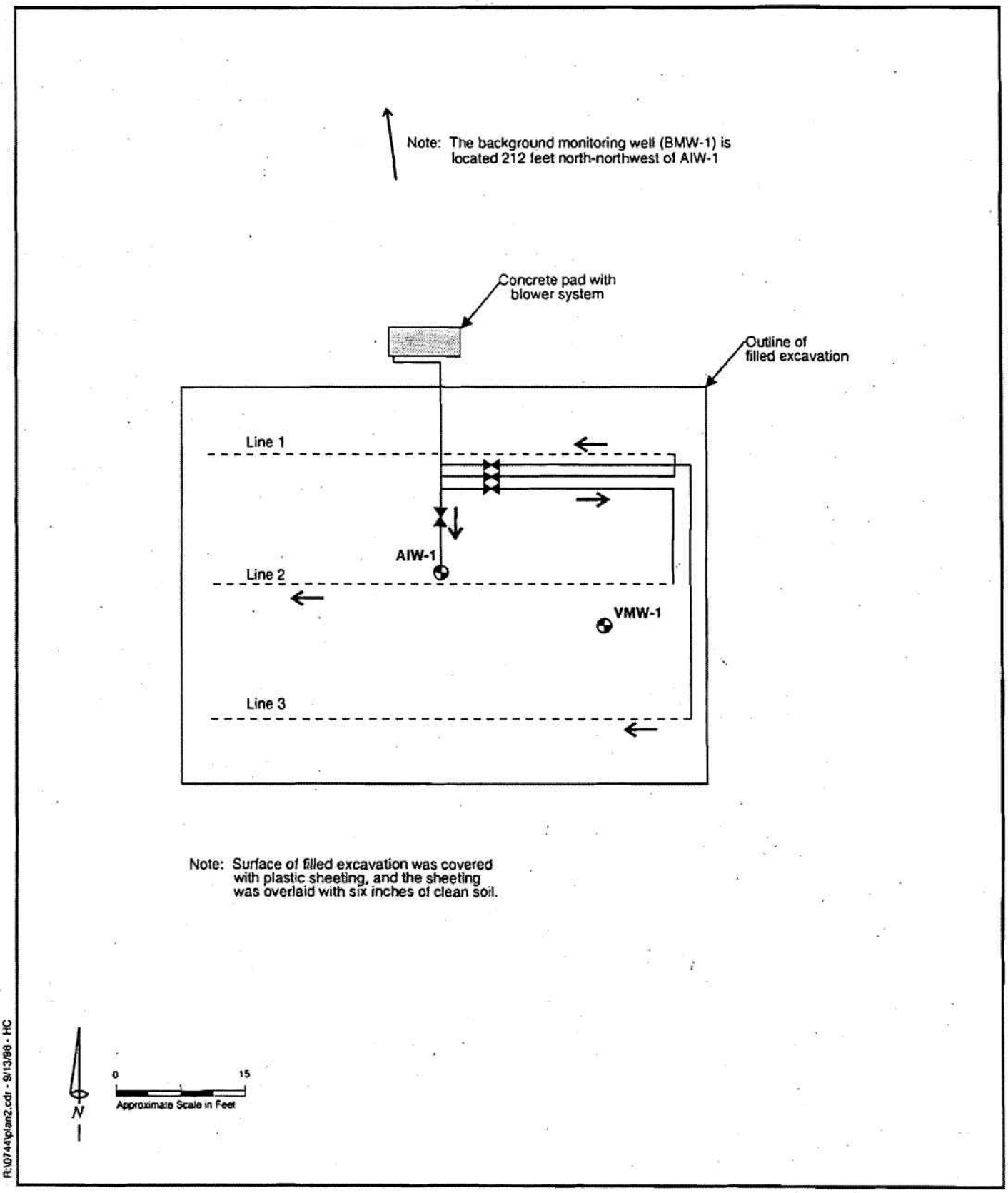
FIGURE 6




Legend:

- AIW-1 — Air injection well
- VMW-1 — Vapor monitoring well
- Air flow direction
- Underground PVC line
- Above ground PVC line
- Air flow control valve

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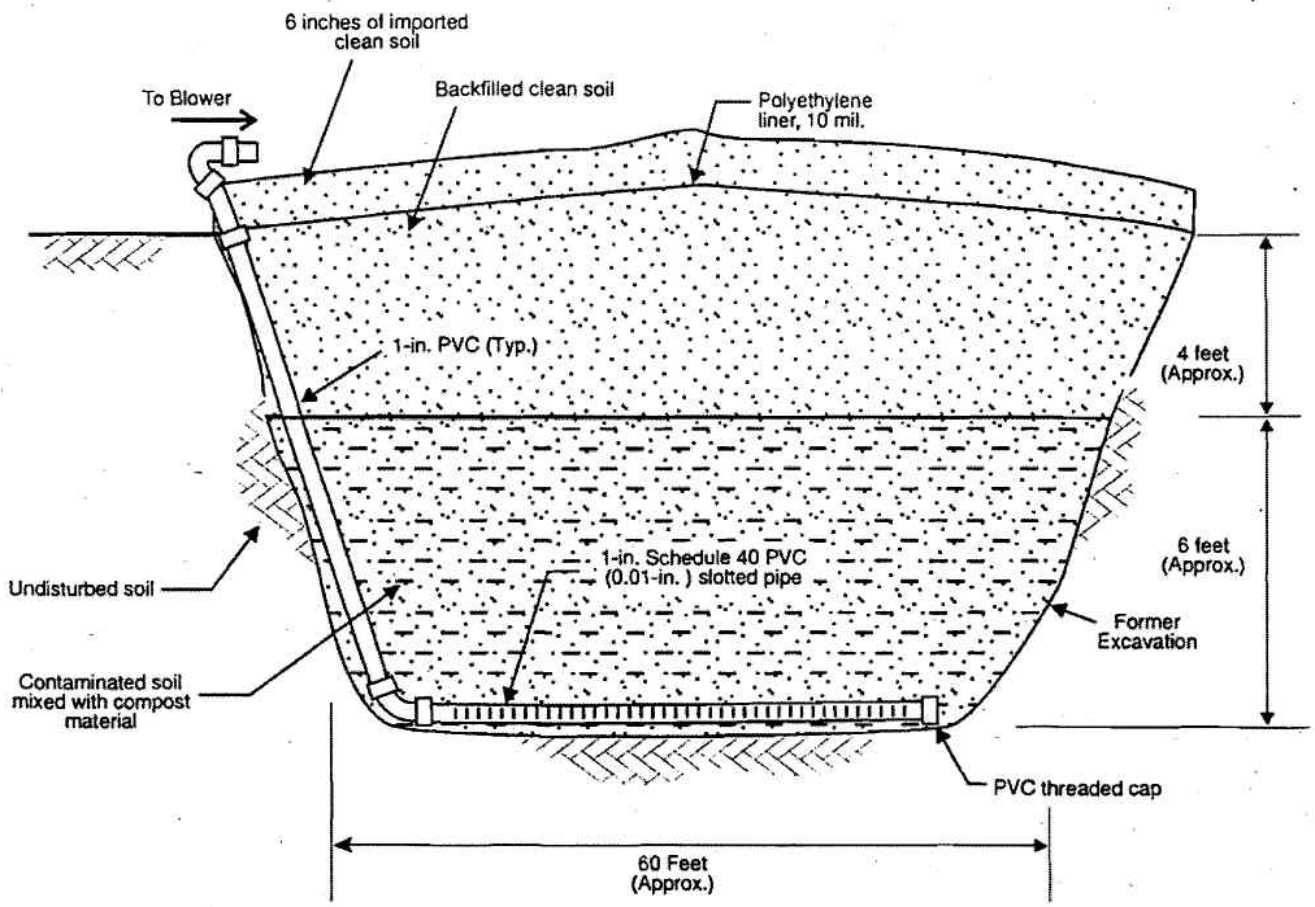
# *Piping Layout of Enhanced Bioremediation System*

Hawthorne Army Depot
Hawthorne, Nevada

FIGURE 7




Note: View is looking to the south.
Not to scale.

R:\0744\schemat.cdr - 9/12/96 - HC

## *Horizontal Enhanced Bioremediation System Schematic*

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Hawthorne Army Depot
Hawthorne, Nevada

FIGURE 8

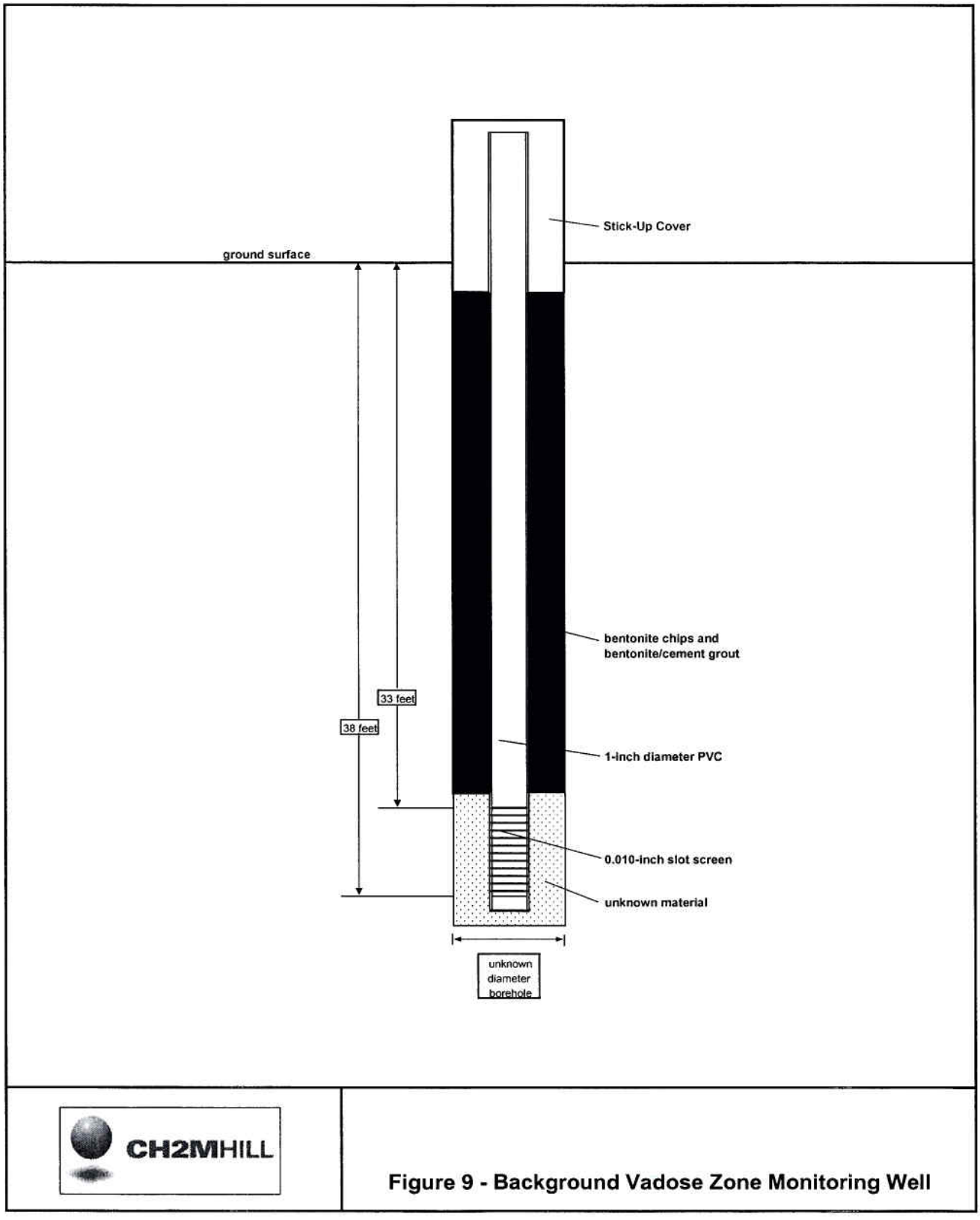


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**Figure 9 - Background Vadose Zone Monitoring Well**

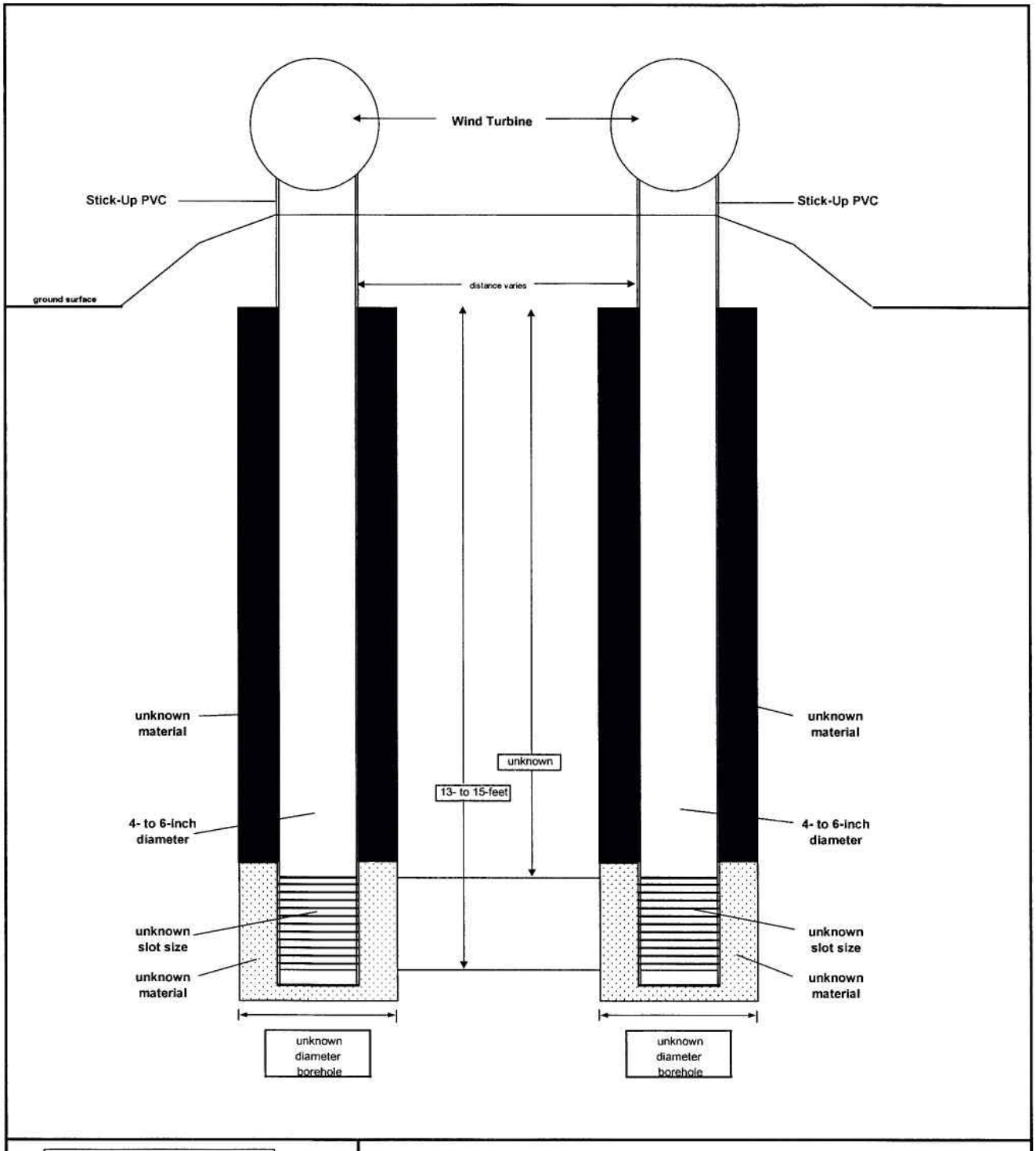


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**Figure 10 - Passive Bioventing System at SWMU K05**