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Dear Mr. Kieling

Kirtland Air Force Base (AFB) is submitting the *Site Characterization and Soil Vapor Extraction Optimization Report for Solid Waste Management Unit (SWMU) ST-70, Buildings 481/482 Oil/Water Separator (OWS) (Former ST-219), July 2012 through June 2013, September 2013*. The report was prepared to present current site characterization information and evaluate the Interim Corrective Measure (ICM) performance from July 2012 through June 2013 at SWMU ST70.

Please contact Ms. Victoria R. Martinez at (505) 846-6362 or at victoria.martinez@kirtland.af.mil or Cole Crosgrove at (505) 853-3098 or at Cole.Crosgrove@kirtland.af.mil, if you have any questions.

Sincerely

TOM D. MILLER, Colonel USAF
Commander

Attachment:
Site Characterization and Soil Vapor Extraction Optimization Report for SWMU ST-70, Buildings 481/482 Oil/Water Separator (OWS) (Former ST-219), September 2013

cc:
NMED-HWB (Moats, McDonald), w/ attach electronic and hard copy
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/EXEC (Mr. Urrutia), w/out attach
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KAFB4111

ENVIRONMENTAL RESTORATION PROGRAM
KIRTLAND AIR FORCE BASE, NEW MEXICO

SITE CHARACTERIZATION AND SOIL VAPOR EXTRACTION OPTIMIZATION REPORT FOR SOLID WASTE MANAGEMENT UNIT ST-70, BUILDINGS 481/482 OIL WATER SEPARATOR (FORMER ST-219), JULY 2012 THROUGH JUNE 2013

September 2013

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ENVIRONMENTAL RESTORATION PROGRAM
KIRTLAND AIR FORCE BASE, NEW MEXICO

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September 2013

Prepared for

Air Force Civil Engineer Center
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NOTICE

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TOM D. MILLER, COLONEL, USAF
Commander, 377th Air Base Wing

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377th Air Base Wing Public Affairs

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NATURAL RESOURCE INJURY

U.S. Department of Defense (DoD) policy requires the identification of Natural Resource Injury (NRI) and, whenever practicable, the rectification of any NRI during the site assessment, investigation, and remedy selection and implementation process for cleanup actions (DoD, 2000). As stated in the policy, DoD's objectives are

"…to promote earlier and more complete consideration of the risks to natural resources associated with past activities and cleanup alternatives; to ensure that Components exercise their statutory Trustee authorities to address NRI on behalf of the public; to lower the total life-cycle costs of the Components' remediation programs; and to reduce the potential for response cost recovery or natural resource damage claims against the Components."

Based on the above discussions and the site-specific conditions presented in this report, implementation of the selected remedial alternative of soil vapor extraction (SVE) at Solid Waste Management Unit (SWMU) ST-70 (Former ST-219) will not result in any NRIs. Site contamination is largely restricted to soil and soil gas present in the vadose zone below paved surfaces. Site conditions prevent migration of contamination to surface soil or the atmosphere, and SVE is expected to prevent further migration to the groundwater. Therefore, contamination at the site does not pose any harm to natural resources such as groundwater or ecological receptors. Likewise, the continued implementation of selected remedial alternative will create no significant disturbance to native soils, or ecological habitat.

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ENVIRONMENTAL JUSTICE CONSIDERATION

Presidential Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of federal programs, policies, and activities on minority and low-income populations. For purposes of this report, the population within a 50-mile radius around Kirtland Air Force Base (AFB) was considered. Demographic and economic census information presented in Addressing Environmental Justice under the National Environmental Policy Act at Sandia National Laboratories/New Mexico (Sandia National Laboratory, 1997) and the United States Census web site (http://quickfacts.census.gov/ qfd/states/35/3502000.html accessed on 6 October 2010) were used as primary references.

The population living within a 50-mile radius of Kirtland AFB, which exceeds 49 percent of the total population according to census data (Sandia National Laboratory, 1997), was evaluated with regard to health and environmental effects from activities at Kirtland AFB. Similarly, the low-income population, which exceeds 21 percent of the general population, was analyzed for effects from corrective measures activities at Kirtland AFB.

Minority populations are considered to be all people of all color except white people who are not Hispanic. In 1990, 49 percent (51 percent by 1996, 54.2 percent by 2000) of New Mexico's population was minority (Bureau of the Census, 1998; http://quickfacts.census.gov/qfd/states/35/3502000.html accessed on 6 October 2010). Neighborhoods having minority population percentages exceeding the minority population percentage of 49 percent (slightly more conservative than 51 percent) were identified on a block-by-block basis, with clusters of blocks known as block groups.

The Bureau of the Census characterizes persons in poverty (low-income persons) as those whose incomes are less than a statistical poverty threshold. The threshold is a weighted-average based on family size and age of family members. For instance, the 1990 census threshold for a family of four was based on a 1989 household income of $12,674 (Census, 1990). By 1996, the household income threshold rose to $16,036 (Census, 1997). In 1989, 21 percent of New Mexico's population was listed in poverty or designated as having low income (Census, 1996). By 1996, the estimated percentage stood at 24 percent (Census, 1997) and by 2000, the state-wide percent decreased to 18.4 (http://quickfacts.census.gov/qfd/states/35/3502000.html accessed on 6 October 2010). In this analysis, low-income block groups (same as above) occur where the low-income population percentage in the block group exceeds the poverty percentage for the state of New Mexico.

According to 1990 census data, approximately 280,360 minority individuals from an approximate total population of 609,500 reside within the 50-mile radius. This represents 46 percent of the total radius-of-influence population (Sandia National Laboratory, 1997).

Block groups having less than 21 percent low-income individuals were not considered to contain a large number of low-income neighborhoods because they contain less than or equal to the state average of 21 percent. Approximately 85,330 persons were identified as being low income, representing approximately 14 percent of the radius-of-influence population.

This distribution of low-income population has a strong correlation to minority populations of Blacks, Native Americans, and Hispanics. For example, portions of the Pueblo of Isleta, south of the city, have high percentages of low-income individuals. To the southeast of Kirtland AFB, the rural Hispanic villages of Tajique, Torreon, and Escobosa are also low income.

To the north of Kirtland AFB, high concentrations of low-income populations are located in the Pueblos of Jemez, Santo Domingo, and Cochiti, as well as in the rural Hispanic villages of La Cienega and Jemez Springs. High concentrations of low-income populations occur west of Kirtland AFB, along the Rio Grande, in the predominantly Hispanic South Valley neighborhoods. In addition, small pockets of low-income populations reflect the locations of Black neighborhoods such as the Kirtland Addition and South Broadway/East San Jose areas.

Based on the findings of this report, there are no identified negative impacts from Solid Waste Management Unit ST-70, (Former ST-219) that would pose adverse health effects on the general human populations. Based on the analysis of any potential impacts, there would be no disproportionately high or adverse impacts to minority and low-income populations. Any impacts due to restrictions of access to cultural sites would be removed by coordination between the Kirtland AFB and the local Tribes to develop processes to allow access during periods in which safety standards and practices would be maintained.

PREFACE

This Site Characterization and Soil Vapor Extraction Optimization Report was prepared to document the operations and monitoring activities associated with the soil vapor extraction system at Solid Waste Management Unit (SWMU) ST-70 (Former ST-219) at Kirtland Air Force Base, New Mexico. The report covers the operational period of July 2012 through June 2013.

This report was prepared by Bhate Environmental Associates and CH2M HILL in August 2013. Mr. Joe Urrutia of the Air Force Center for Engineering and the Environment (AFCEE) served as the AFCEE Contracting Officers Representative.

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ACRONYMS AND ABBREVIATIONS

µg/L	microgram(s) per liter
AFB	Air Force Base
AFCEC	Air Force Civil Engineering Center
bgs	below ground surface
°C	degrees Celsius
cis-1,2-DCE	cis-1,2-dichloroethene
COPC	contaminant of potential concern
CSM	conceptual site model
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ERP	Environmental Restoration Program
ft^3	cubic feet
FY	fiscal year
g	gram(s)
GAC	granular activated carbon
HWB	Hazardous Waste Bureau (New Mexico Environment Department)
ICM	Interim Corrective Measure
JP-4	jet fuel formulation 4
JP-8	jet fuel formulation 8
kg	kilogram(s)
kg/d	kilogram(s) per day
kg/L	kilogram(s) per liter
L	liter(s)
L/day	liters per day
MCL	Maximum Contaminant Level
mg/kg	milligrams per kilograms
mg/L	milligrams per liter
NMED	New Mexico Environment Department
NRI	Natural Resource Injury
OWS	oil water separator

PCE	tetrachloroethene
ppbv	parts per billion by volume
RCRA	*Resource Conservation and Recovery Act*
RFI	RCRA Facility Investigation
ROI	radius of influence
SSL	soil screening level
SVE	soil vapor extraction
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TCE	trichloroethene
TPH	total petroleum hydrocarbons
TPH-DRO	total petroleum hydrocarbons-diesel range organic
TPH-GRO	total petroleum hydrocarbons-gasoline range organic
USAF	United States Air Force
USGS	U.S. Geological Survey
UST	underground storage tank
VOC	volatile organic compound

EXECUTIVE SUMMARY

This annual Site Characterization and Soil Vapor Extraction (SVE) Optimization Report for Solid Waste Management Unit (SWMU) ST-70 Building 481/482 Oil Water Separator (OWS) (Former ST-219) was prepared for the Air Force Civil Engineer Center (AFCEC) and presents current site characterization information and evaluates the Interim Corrective Measure (ICM) performance through June 2013.

The SWMU ST-70 is a small Environmental Restoration Program (ERP) site located in the northwest portion of Kirtland Air Force Base (AFB), in Albuquerque, New Mexico. The site in located in an industrial portion of the installation, with the entire site paved with concrete or asphalt. There are no surface water features or drainages, no ecological receptors, and no sensitive habitats in the vicinity. The subsurface consists thick units of alluvial sediments overlying Paleozoic bedrock. Based on soil boring data, sandy moderate- to high-permeability soils are abundant in the subsurface below SWMU ST-70. Low permeability units of silt and clay are present at roughly 25 to 40 feet and 95 to 110 feet below ground surface (bgs) across the site. These low permeability units retard downward contaminant migration and contain high concentrations of total petroleum hydrocarbons (TPH) and chlorinated solvent contaminants. Groundwater is present below the site in a regional unconfined aquifer. The depth to groundwater in the area is between 458.5 and 464 feet bgs.

The SWMU ST-70 site soils are impacted by chlorinated solvent and TPH contamination. Chlorinated volatile organic compounds (VOCs) and TPH impacts at the site appear to be a result of leaks from the former OWS and the associated drains and piping located near Hangar Buildings 481 and 482. Soil contamination was detected above New Mexico Environment Department (NMED) soil screening levels (SSLs) in soil borings surrounding the OWS and the area drain. TPH in the diesel range and gasoline range, as well as solvents trichloroethene (TCE) and tetrachloroethene (PCE), were detected above NMED SSLs in soils.

Contamination is detected in soil vapor in the same areas where high soil contamination was originally identified. Soil vapor concentrations of TPH contaminants continue to be detected at concentrations greater than 1,000 micrograms per liter (μg/L). Soil vapor concentrations of TCE continue to be detected at concentrations greater than 5,000 parts per billion by volume (ppbv) in soil vapor adjacent to the OWS.

Groundwater beneath the SWMU ST-70 site has been impacted by VOCs, but no site contaminants of potential concern (COPCs) are detected above regulatory criteria in groundwater. Vapor-phase transport of chlorinated solvents is believed to be the primary mechanism for impacts to groundwater. The solvent TCE is consistently detected in groundwater at concentrations below the U.S. Environmental Protection Agency (EPA) Maximum Contaminant Level (MCL).

There are data gaps associated with the soil, soil vapor, and groundwater media at SWMU ST-70 due to changing site conditions. The current extent of soil contamination above NMED SSLs is unknown. The current vertical extent of soil vapor contamination in the OWS and area drain locations are no longer adequately monitored by the existing monitoring network. Changes have occurred in the regional groundwater flow direction and water table elevation as a result of decreasing groundwater withdrawals by the Albuquerque Bernalillo County Water Utility Authority.

SVE is the current ICM for remediation of the vadose zone contamination. The primary objective of the SWMU ST-70 ICM is to remove VOC contamination released from the former OWS, area drain, and piping to the underlying vadose zone soils. This objective is evaluated by measuring the decrease in VOC concentrations within the extracted soil vapor of the SVE system. In addition to the mass recovery objective, a secondary objective of the ICM is to protect groundwater from impacts by chlorinated VOCs.

This is accomplished through the operation of the SVE system to provide pneumatic containment of the vapor-phase plume and minimize or eliminate vapor-phase contaminant transport to groundwater. The SVE system was placed into full-scale operation on April 15, 2008. Through the end of the reporting period on June 30, 2013, the SVE system has operated for approximately 1,560 days and has extracted and treated approximately 1.4 x 10^8 ft^3 (4.0 x 10^9 liters) of soil vapor. Over this period, the SVE system experienced approximately 28 days of unscheduled shutdown time resulting in a 98-percent system operational run time.

Operation of the SVE system from 2008 to 2013 removed more than 18,000 kilograms of contaminant mass. The current SVE system continues to remove significant TPH contaminant mass from the vadose zone. The system is operated to create upward gradients that inhibit downward migration of contaminants to the regional groundwater and create horizontal gradients to inhibit migration away from the site (USAF, 2013a). Unfortunately, soil vapor monitoring data indicates that significant contaminant mass remains in soils adjacent to the area drain and the former OWS location.

In order to address the above data gaps, to comply with NMED requirements for additional site characterization, and to advance site corrective measures, the following recommendations are proposed:

- A limited soil investigation is proposed to define the extent of fuel- and chlorinated-solvent-related contamination. The focus of the investigation should be the current lateral and vertical extent of soil contamination adjacent to the OWS and area drain. The data from the additional characterization should be used to guide future remediation strategies.

- Installation of additional vapor monitoring wells is recommended to facilitate monitoring of the remediation. Vapor monitoring well placement should be based on soil screening data collected during soil boring installation and sampling.

- A limited groundwater investigation is proposed to define the extent of groundwater TCE contamination. Installation of additional monitoring wells is recommended to address this data gap.

- Installation of one or more additional SVE wells and connection to the SVE system is recommended to facilitate more rapid removal of contaminants from the vadose zone. The locations and depths of the new SVE wells should be optimized for chlorinated solvent removal from the vadose zone. Additional contaminant source removal by excavation should be considered as a potential remedial alternative.

1.0 INTRODUCTION

This annual Site Characterization and Soil Vapor Extraction (SVE) Optimization Report for Solid Waste Management Unit (SWMU) ST-70 Building 481/482 Oil Water Separator (OWS) (Former ST-219) was prepared for the Air Force Civil Engineer Center (AFCEC) and covers the period of July 2012 through June 2013. The report was prepared under Contract Number FA8903-10-D-8594, Task Order 0049.

The SWMU ST-70 is located in the northwest portion of Kirtland Air Force Base (AFB), in Albuquerque, New Mexico (Figure 1-1). The site soils are impacted by chlorinated solvent and total petroleum hydrocarbons (TPH) contamination. SVE is the current Interim Corrective Measure (ICM) for remediation of the vadose zone contamination. Chlorinated volatile organic compounds (VOCs) and TPH impacts at the site appear to be a result of leaks from the former OWS and the associated drains and piping located near Hangar Buildings 481 and 482.

This report presents current site characterization information and evaluates the ICM performance. The most recent monitoring and SVE operations data are presented in the report. An evaluation of the ICM performance and recommendations for future optimization of the remedial action are also presented.

1.1 Purpose and Interim Corrective Measures Remediation Objectives

The primary objective of the SWMU ST-70 ICM is to remove VOC contamination released from the former OWS, area drain, and piping to the underlying vadose zone soils. This objective is evaluated by measuring the decrease in VOC concentrations within the extracted soil vapor of the SVE system. In addition to the mass recovery objective, a secondary objective of the ICM is to protect groundwater from impacts by chlorinated VOCs. This is accomplished through the operation of the SVE system to provide pneumatic containment of the vapor-phase plume and minimize or eliminate vapor-phase contaminant transport to groundwater.

The purpose of this document is to present the most recent data and use it to update the current site conceptual model and evaluate optimization strategies for the ICM. This document includes the following information:

- Summaries of recent site monitoring data
- Summaries of SVE performance data
- An updated conceptual site model (CSM)
- An updated discussion of the nature and extent of contamination
- An evaluation of ICM performance
- Recommendations for additional characterization and SVE optimization
- A discussion of potential exit strategies

The data summarized in this document are presented in detail in the following reports:

- *January 2013 through June 2013 Interim Corrective Measures Operation Report for Solid Waste Management Unit ST-70, Buildings 481/482 Oil Water Separator (Former ST-219)* (USAF, 2013a)

- *July 2012 through December 2012 Interim Corrective Measures Operation Report for Solid Waste Management Unit ST-70, Buildings 481/482 Oil Water Separator (Former ST-219)* (USAF, 2013b)

1.2 Regulatory Background

The site was identified from leaks at the OWS between Hangar Buildings 481 and 482. It was originally designated as SWMU ST-219 and later changed to SWMU ST-70 (or ST-70E) under the United States Air Force (USAF) Environmental Restoration Program (ERP). The site was characterized between 1992 and 2001 under the *Resource Conservation and Recovery Act* (RCRA) process. Corrective actions at SWMU ST-70 were initiated in 1999, and currently continue as a voluntary ICM.

The Hazardous Waste Bureau (HWB) of the New Mexico Environment Department (NMED) is the lead regulatory agency for the site. The HWB has not required Kirtland AFB to perform a corrective measures study or select a final corrective measure for the site. Regulators have not designated SWMU ST-70 as a high-priority site due to limited lateral extent of soil contamination and the absence of groundwater contamination above regulatory standards. Site remediation has been implemented through an ICM, which was initially expected achieve clean closure in a relatively short timeframe.

1.3 Report Organization

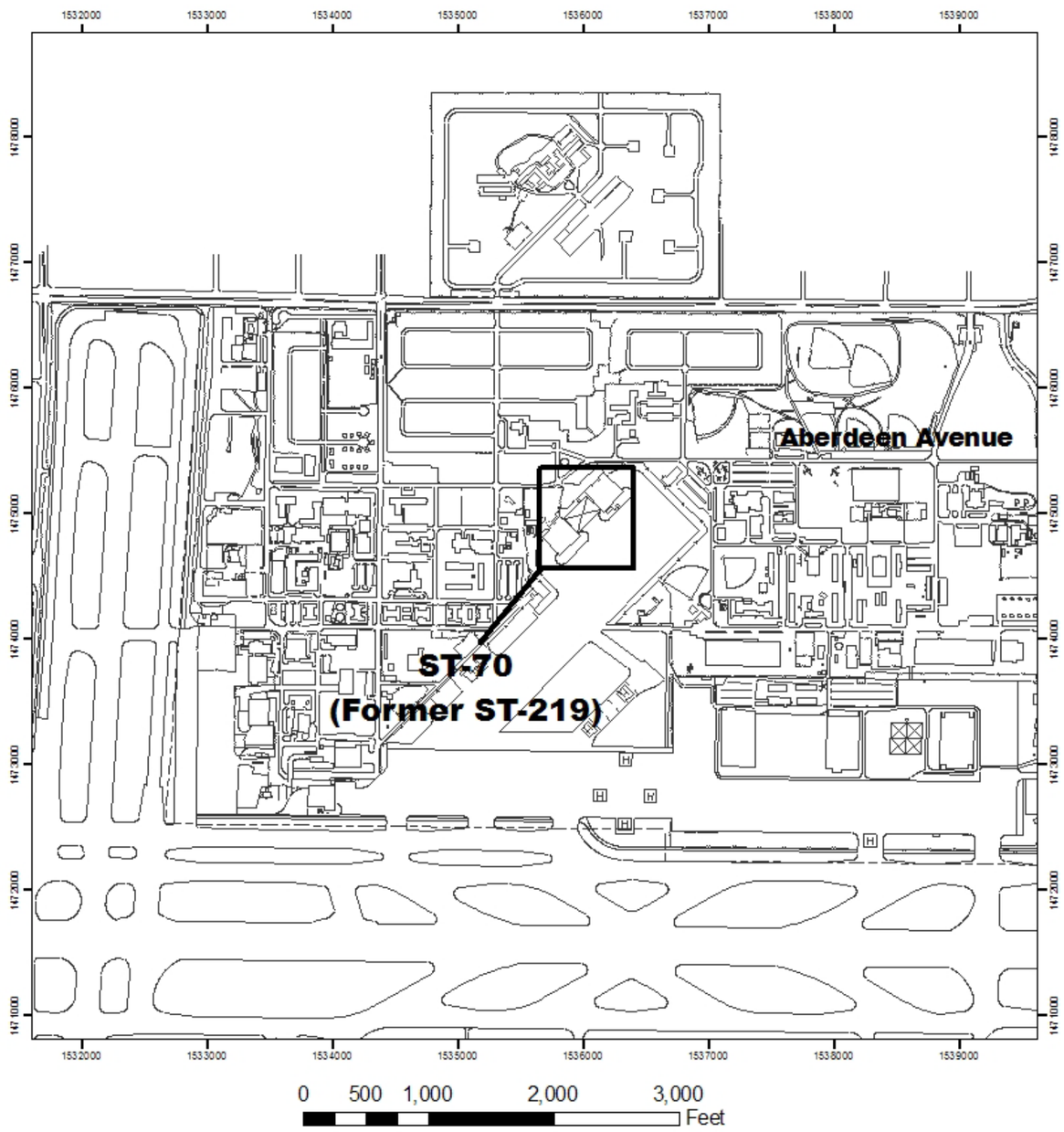
This report is organized into four sections, including this introduction. Additional data and documentation are presented in four appendices. The remainder of this document is organized into the following sections:

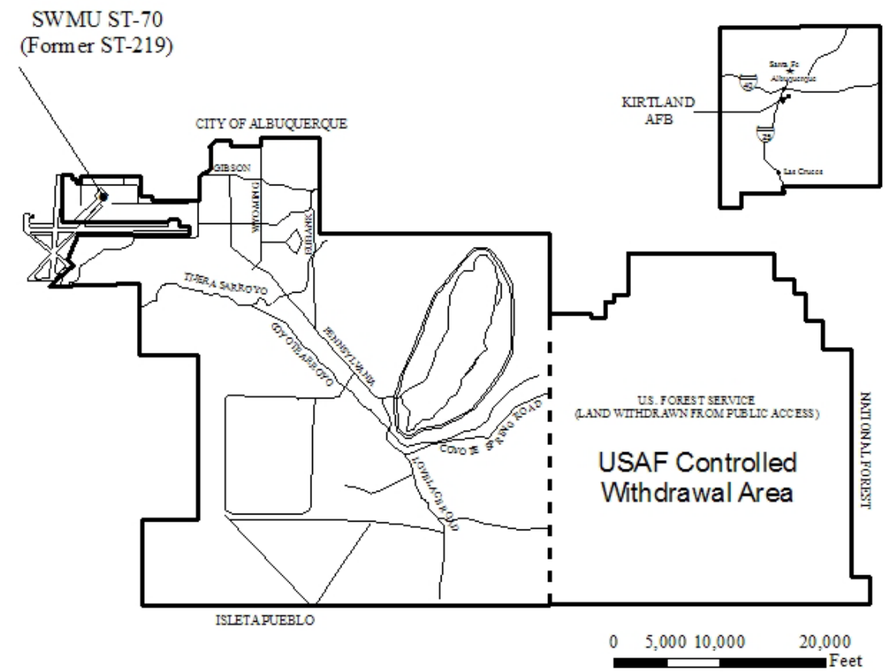
- Section 2 presents information on the site history and characterization. A site description, history, and background are presented in Section 2.1. The CSM, updated with the most recent data, is presented in Section 2.2. An analysis of monitoring data collected during the period of July 2012 through June 2013 is presented in the Section 2.3.

- Section 3 presents information on ICM performance and optimization activities. The SVE system performance data is evaluated along with a discussion of historic and recent system optimization activities.

- Section 4 presents recommendations for further actions at the site. Recommendations are presented for additional characterization activities and potential changes to the remedial action approach at the site.

- Appendices A, B, and C present historical monitoring data for soil vapor, groundwater, and SVE system operations. Appendix D presents the most recent correspondence from the NMED-HWB requesting a site characterization work plan.





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Kirtland AFB ICM
SWMU ST-70 (Former ST-219)

Figure 1-1

Site Location Map for
SWMU ST-70 (Former ST-219)

Revision Date: 25 June 2012

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2.0 SITE CHARACTERIZATION

A site description and history for SWMU ST-70 (Former ST-219) are presented in this section. The site history includes narratives on previous site characterization activities and corrective actions conducted as ICMs. The conceptual site model (CSM) and the discussion of the nature and extent of contamination are updated using data from the current reporting period.

2.1 Site Background

2.1.1 Site Description

Kirtland AFB is located in Bernalillo County, in central New Mexico, southeast of and adjacent to the City of Albuquerque and the Albuquerque International Sunport (Figure 1-1). The approximate area of the base is 52,287 acres. The SWMU ST-70 (Former ST-219) site is located between Hangar Buildings 481 and 482 in the northwestern part of Kirtland AFB, southeast of the intersection of Aberdeen Avenue and MacDill Street.

The SWMU ST-70 (Former ST-219) site is situated within an unrestricted portion of the flightline between Buildings 481 and 482. The concrete tarmac between the two buildings comes to an end approximately 30 feet southeast of the northwestern extent of the two buildings, with asphalt pavement located northwest of the concrete. A chain link fence (the flightline fence) topped with barbed wire separates the parking lot northwest of Buildings 481 and 482 from the flightline. A set of portable office buildings that house a U.S. Department of Energy (DOE) contractor are present in the northwest portion of the site.

The primary site features include a former OWS location, an area drain, and an active SVE system. The former OWS was located within a vault at the northern edge of the flightline concrete tarmac between Buildings 481 and 482. The OWS was made of concrete covered with a metal grate, and was 9 feet long, 7.6 feet wide, and 7 feet deep. Inflow was from an area drain in the flightline about 65 feet to the southeast. A second inflow line was apparently connected to a floor drain in the hazardous materials storage unit. The OWS received drainage that was potentially subject to releases of fluids associated with aircraft maintenance such as fuels, lubricants, and degreasers. The OWS discharged to a sanitary sewer line located northwest of the OWS. Failure of the OWS led to contaminant releases to the subsurface soil beneath the concrete tarmac. The OWS was removed in 1994. The SVE system consists of a shed on the northern portion of the site, which houses the blower, treatment vessels, monitoring components, and underground piping to extraction wells. The locations of monitoring points and extraction wells are shown in Figure 2-1. A covered hazardous materials storage and containment unit is present in the northeast corner of the site, and consists of a concrete pad with a 6-inch concrete containment curb. This storage area is used to temporarily house drums of SVE waste. A floor drain formerly leading to the OWS has reportedly been plugged.

The site is located within an active portion the Kirtland AFB, adjacent to aircraft maintenance hangars, which is in use for USAF and DOE aircraft parking, fueling, loading/unloading, and taxiing. Corrective measures at the site have been designed to present limited interference with USAF and DOE operations. The DOE operates an airline passenger terminal housed in the portable office buildings between Buildings 481 and 482 and an aircraft maintenance facility within Building 481. The central and southern portions of the SWMU ST-70 are routinely used for DOE passenger aircraft. Kirtland AFB uses Building 482 for the maintenance of large cargo aircraft and other operations. Air Force cargo aircraft and emergency ground vehicles are occasionally present in the SWMU ST-70 area.

2.1.2 Site Release History and Investigation History

The OWS at SWMU ST-70 was identified as a contaminant release site from visual inspections and samples collected from inside the OWS in 1990 and 1992. In subsequent years, several phases of RCRA Facility Investigation (RFI) were performed at the site that confirmed both the OWS and the area drain were primary routes of contaminant release to the subsurface. Data from the RFIs indicated that petroleum hydrocarbons were the primary type of contamination and that the extent of contamination was limited to vadose zone soils and soil vapor adjacent to the OWS and the area drain. A bioventing ICM was initiated in 1999 and continued into 2001. During this initial ICM, additional site characterization data was collected and identified significant soil contamination from chlorinated VOCs along with minor impacts to groundwater. After 2001, site investigations focused on data collection to evaluate the feasibility of using SVE to replace bioventing technology in the ICM.

2.1.2.1 Initial Assessments and Source Site Releases

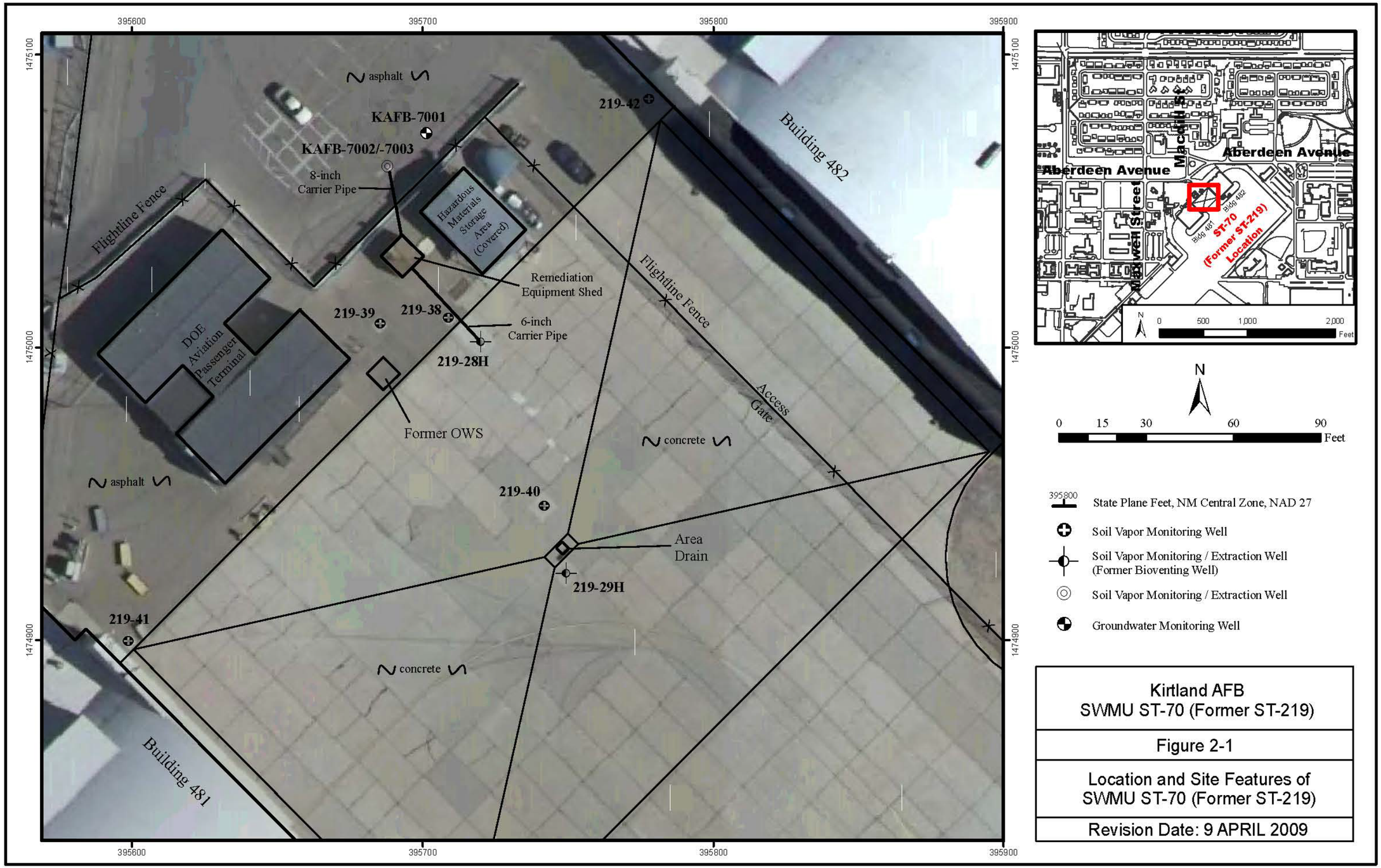
Initial inspections of the site were performed at the former OWS as part of routine maintenance activities. Visual inspections of the OWS vault and sediment samples were collected from within the OWS in 1990 and 1992. Sample results indicated that releases had occurred from failure of the OWS (USAF, 2005). The sample analytical data and visual inspection records prompted several rounds of soil investigation and these investigations were followed by corrective actions. The primary route of contaminant release to the subsurface was eliminated in October 1994 with the removal of the OWS and plumbing the area drain to the sanitary sewer.

Site records and staff interviews indicate that small releases over a long period of time resulted in subsurface contamination. According to site use history and site characterization data, the following materials may have been released to the subsurface at the SWMU ST-70 site:

- Fuel: Avgas, JP-4, JP-8, diesel, and gasoline
- Oils and grease: hydraulic and lubricating oils, and mechanical lubricating grease
- Solvents: Stoddard solvent (also known as mineral spirits) and chlorinated solvents including tetrachloroethene (PCE) and trichloroethene (TCE)

Sudden failures of subsurface pipes or large spills are not documented for the site. Instead, it is believed that the majority of the contaminant mass released to the subsurface resulted from small spills that occurred incrementally over a long period of time.

Only one significant release has been reported for the site and no documentation of the release was available. According to the 2005 RFI, a verbal account from a former Air Force employee familiar with the site described an approximately 1,000-gallon underground storage tank (UST) that had been located in the ST-219 area (Holmes, 2003). The UST reportedly contained Stoddard solvent and fed a pressurized system that supplied solvent for use within Buildings 481 and 482. (Stoddard solvent is an unspecified mixture of a variety of petroleum-based solvents.) The employee recounted a catastrophic failure of the tank in the early 1970s when nearly the entire contents of the tank were discharged to the subsurface. The tank was taken out of service following the incident and removed. Reportedly, no significant soil excavation or remedial actions were performed other than removal of the tank.



Kirtland AFB
SWMU ST-70 (Former ST-219)

Figure 2-1

Location and Site Features of
SWMU ST-70 (Former ST-219)

Revision Date: 9 APRIL 2009

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2.1.2.2 Soil Characterization Investigations

Several phases of RFI have been conducted at the site between 1993 and 1999 to characterize nature and extent of soil contamination. Subsurface investigations from 2001 to 2004 were primarily focused on soil vapor and groundwater characterization. Results of the investigations conducted during the period from 1993 to 2004 were presented in the following reports:

- *IRP Stage 2B Work Plan for Kirtland AFB* (USGS, 1993)
- *Final RCRA Facility Investigation (RFI) Report with Notice of Deficiency for Appendix II, Stage 2B* (USAF, 1995a)
- *RCRA Facility Investigation Report Appendix III Wasteline Sites, Draft Final* (USAF, 1995b)
- *RCRA Facility Investigation Report for Appendix I, Phase 2 Draft Final* (USAF, 1997)
- *Environmental Restoration Program RCRA Facility Investigation Report Solid Waste Management Unit ST-70 (Former ST-219)* (USAF, 2005)

1994 Stage 2B RFI Twelve soil borings were advanced adjacent to the OWS and area drain with soil samples collected to depths of up to 100 feet below ground surface (bgs). During the OWS removal action, two shallow soil borings were advanced adjacent to subsurface pipelines with one soil sample collected from each boring. Soil was analyzed for VOCs, semivolatile organic compounds (SVOCs), TPH, and metals. Results indicated chlorinated solvent and fuel range petroleum hydrocarbon compounds had impacted subsurface soils.

1997 Phase 2 RFI Fifteen soil borings were installed across the site to 50 feet bgs with soil samples collected at 10-foot intervals. Samples from these 15 borings were analyzed for VOCs, SVOCs, TPH, and metals. An additional 10 soil borings were installed in locations incrementally out from the OWS and area drain locations to determine the extent of petroleum hydrocarbon contamination. Soil samples from these ten borings were analyzed for TPH. Two vapor wells, ST-219-28H and ST-219-29H, were installed in soil borings in the areas of highest TPH contamination near the OWS and area drain. Soil samples from these two boreholes were collected at 10-foot intervals up to a maximum depth of 150 feet bgs and analyzed for TPH. The data from this phase of investigation was used to define the extent of TPH contamination in the vadose zone.

1999 RFI Seven soil borings were installed to depths of up to 112 feet bgs and sampled for TPH. Soil vapor monitoring points ST-219-38 (nested at 41, 74, and 99 feet bgs), ST-219-39 (nested at 42 and 75 feet bgs), ST-219-40 (nested at 20 and 40 feet bgs), ST-219-41, and ST-219-42 were installed at the site and used for performance monitoring of the ICM. The soil sample analytical results were used to refine the extent of TPH vadose zone contamination and to aid in placement of the screen intervals for the soil vapor monitoring points.

2.1.2.3 Soil Vapor and Groundwater Characterization Investigations

Initial soil vapor characterization investigations were performed between 1999 and 2001. Subsequent soil vapor investigation occurred between 2003 and 2008 with the installation of additional vapor monitoring points to support SVE feasibility testing. Groundwater characterization began in 2001 with the installation of monitoring well KAFB-7001.

1999 to 2001 RFI and Bioventing Monitoring Beginning in 1999, soil vapor monitoring points were routinely sampled during bioventing operations. Samples were analyzed for VOCs, TPH, and fixed gases (oxygen, nitrogen, carbon dioxide, and carbon monoxide). The vapor monitoring points were equipped with downhole electronic sensors for oxygen and TPH. Large data sets of oxygen and TPH concentrations were accumulated and used to evaluate the performance of the bioventing ICM. The results of the investigation indicated that bioventing was not effectively remediating TPH soil contamination and that the soil vapor plume was not migrating away from the site.

2001 Groundwater Investigation One regional groundwater monitoring well, KAFB-7001, was installed in May 2001. The well has been sampled on a quarterly frequency to the present. Groundwater analysis has been performed for VOCs, SVOC, TPH, metals, and nitrate. The results of this investigation identified chlorinated and fuel-related VOCs as groundwater contaminants of potential concern (COPCs). Fuel-related contaminants were rarely detected in groundwater samples and if detected, concentrations were far below regulatory levels. The chlorinated solvent compound, TCE, is routinely detected in groundwater samples at concentrations below the Maximum Contaminant Level (MCL) of 5 micrograms per liter (μg/L).

2001 to 2004 RFI and Feasibility Testing Additional soil vapor investigations were performed at the site in response to the identification of TCE detections in groundwater. A large-scale passive soil gas investigation was performed in 2001 to determine if there were other areas of chlorinated solvent releases to the subsurface. One additional soil boring was drilled and two soil vapor wells, KAFB-70-02 and KAFB-70-03, were installed to depths of 95 and 330 feet bgs, respectively. Feasibility testing was performed to determine if SVE was a viable alternative to bioventing at the site. The results of these investigations indicated that TCE migration to groundwater was by vapor transport and that SVE was a viable remediation technology for the site. The investigations did not identify other significant sources of chlorinated solvent releases in the area.

2.1.2.4 Soil Vapor and Groundwater Characterization Monitoring

The ICM at SWMU ST-70 was converted from bioventing to SVE in 2008. The feasibility testing and results are presented in the *Interim Corrective Measures Work Plan for Solid Waste Management Unit ST-70 (Former ST-219)* and *Interim Corrective Measures, Construction Summary Report for the Soil Vapor Extraction System, Solid Waste Management Unit ST-70 (Former ST-219)* (USAF, 2008; USAF, 2009). Subsequent to initiation of full-scale SVE operations, routine site monitoring, and ICM performance monitoring have been performed on a quarterly basis

Soil vapor and groundwater monitoring have been performed using the existing monitoring point and well network from 2008 to the present. Soil vapor and groundwater have been analyzed for VOC and TPH COPCs. Kirtland AFB has added supplemental analyses for nitrate and metals to the groundwater monitoring program to provide additional regional groundwater data.

The existing vapor monitoring network was largely constructed to support bioventing. The installed monitoring points and downhole electronic sensors were not intended for use in a long-term monitoring program. The electronic sensors failed prior to the conversion from bioventing to SVE and are no longer in use. The sample port tubing has clogged or failed at vapor well point locations ST-219-38-74, ST-219-39-75, ST-219-40-40, and ST-219-42, and is not repairable. Soil vapor monitoring is currently performed at seven vapor monitoring points, three vapor extraction wells, and several SVE system sample ports.

The groundwater monitoring well, KAFB-7001 continues to be monitored quarterly. A Bennett sample pump is installed in the well, which can be removed and repaired as necessary.

2.1.3 History of Interim Corrective Measures

The USAF has performed extended vadose zone remediation and treatment at SWMU ST-70. The primary source of contamination was eliminated with the removal of the OWS and repair of the area drain conveyance piping. The bioventing ICM was initiated subsequent to the 1999 RFI and was discontinued in 2001. The SVE ICM was initiated in 2008 and continues to the present. The history of the ICMs is summarized in the following paragraphs.

2.1.3.1 1999 to 2001 RFI and Bioventing

A bioventing system was installed in 1999 and operated until 2001 to remediate vadose-zone petroleum hydrocarbon contamination. A groundwater monitoring well (KAFB-7001) was installed in 2001. In December 2001, the bioventing system was shut down due to the low observed rates of petroleum hydrocarbon degradation in the vadose zone and the identification of chlorinated solvents in groundwater samples (USAF, 2005).

Construction of the bioventing system began in 1999. Much of the bioventing infrastructure installed at the site was later used for the SVE system. The bioventing system consisted of a humidified air injection system with one air injection well location and a network of soil vapor monitoring locations. The air injection well, ST-219-28H, was connected to a blower by subsurface piping installed beneath the pavement. Well ST-219-28H was later converted into an SVE well. The subsurface piping and blower shed were also utilized for the SVE system. The network of soil-vapor monitoring wells (ST-219-29H, ST-219-38, ST-219-39, ST-219-40, ST219-41, and ST-219-42) were later used as monitoring locations for the SVE system.

Bioventing feasibility testing was performed using data from the wells constructed on site, from subsurface sampling, and from testing at other similar areas of Kirtland AFB. Radius of influence (ROI) information was gathered from nearby site ST-341 and the blower size was calculated based on the air flow needed to affect the contaminated vadose zone area. Soil samples were collected at SWMU ST-70 in 1999 and analyzed for microbial populations. The sample analyses identified the presence of bacteria capable of degrading TPH contamination. In-situ respiration testing was performed at the site and initial results indicated that conditions were favorable for bioventing. Initial calculations indicated that most of the TPH contaminant mass would be degraded after 2½ years of bioventing (USAF, 2005). However, in-situ respiration testing conducted during bioventing operations in 2000 and 2001 failed to confirm the initial estimate of TPH degradation rates.

Monitoring data collected during operation of the bioventing system in 2000 and 2001 did not identify significant contaminant mass removal at the site. Continual operation of the system proved to be problematic. Monitoring data indicated that bacterial populations at the site were sufficient to degrade the TPH mass in the subsurface.

The bioventing system was shut down in December 2001 due to poor contaminant degradation rates and the inability to address chlorinated VOC contamination. In 2001, TCE was detected in groundwater beneath the site. The SWMU ST-70 remediation strategy subsequently changed to one that was capable of addressing both petroleum hydrocarbon and chlorinated solvent contamination.

2.1.3.2 2002 to 2008 SVE Feasibility and Testing

Soil vapor extraction feasibility testing was performed in 2003 using a short-term SVE test. These data were published in the 2005 RFI report, along with the recommendation that SVE be adopted as the preferred ICM. The recommendation was approved by reviewers, and the bioventing system was converted to the current SVE system between 2007 and 2008.

The initial pilot-scale SVE feasibility test in early 2003 used the existing well, ST-219-28H, as the extraction well. The existing blower was reversed and soil vapor was extracted from the well. The SVE system monitoring data indicated that contaminant mass was successfully removed from the vadose zone (USAF, 2009). Further pilot-scale testing was conducted in late 2003 following the installation of wells KAFB-7002 and KAFB-7003. The second phase of pilot-scale testing used the new soil vapor monitoring wells, in addition to well ST-219-28H, as extraction points. Results of the pilot-scale tests indicated that SVE would be an effective alternative for remediation of chlorinated solvents and petroleum hydrocarbons in the subsurface at the site (USAF, 2009).

Between November 2007 and April 2008, the pilot-scale system was expanded into a full-scale system with vapor monitoring wells (KAFB-7002 and KAFB-7003) converted into vapor extraction wells. The full-scale system was started in April 2008. After three months of operation, TPH concentrations in the treatment system influent soil vapor increased to levels higher than anticipated in the original design. These high concentrations had the effect of rapidly loading the granular activated carbon (GAC) offgas treatment system more than originally designed for or expected. The SVE system was shut down to perform further testing and evaluate options for offgas treatment. The offgas treatment was modified to handle higher influent vapor concentrations and the SVE system was restarted in December 2008 (USAF, 2009).

2.1.3.3 2009 to Present SVE Operation

The current SVE system was designed to recover chlorinated solvent and petroleum hydrocarbon VOCs released at the site and was constructed according to the design presented in the ICM Work Plan for SWMU ST-70 (USAF, 2008). The SVE system was installed within the flightline fence, between the hazardous waste storage area and the DOE contractor passenger terminal trailers. The SVE system is contained primarily within a wooden, 10-foot by 12-foot storage shed. The shed houses the extraction blower, above grade piping, gauges, and carbon vessels that are connected via subsurface piping to the three extraction wells (ST-219-28H, KAFB-7002, and KAFB-7003).

The SVE system has been in full-scale operation since the December 2008 restart with minimal unplanned downtime. System operational data indicate that TPH contaminant mass continues to be removed from the subsurface at significant rates. However, site monitoring data indicate that a significant mass of TPH and chlorinated solvents remain in the subsurface.

Contaminant mass removal efficiency during SVE operations is observed to fluctuate on a seasonal basis. A rebound study was proposed in prior ICM monitoring reports to evaluate the seasonal change in removal efficiency (USAF, 2011; USAF, 2012a). A limited rebound study was implemented in June 2011 and the results indicated that extended downtime would not result in significant contaminant migration. An extended rebound study was implemented from January to April 2012. The results indicated that a seasonal shut down of between one and three months would decrease the volume of waste generated and reduce wear on SVE system components without significant adverse impacts to the overall ICM performance (USAF, 2012b).

2.2 Site Conceptual Model

A brief CSM is presented in this section. The site CSM was originally presented in the 2005 RFI report and has been updated with the recent monitoring data.

2.2.1 Site Conditions

The SWMU ST-70 is a small ERP site is located at Kirtland AFB. The area is dry, receives mean annual precipitation of 8.9 inches, and is subject to large daily and seasonal fluctuations in temperature. The site is located in an industrial portion of the installation, with the entire site paved with concrete or asphalt. There are no surface water features or drainages, no ecological receptors, and no sensitive habitats in the vicinity.

The site is within the Albuquerque Basin. The subsurface is comprised of thick units of alluvial sediments overlying Paleozoic bedrock. The alluvial sediments in this area are present to depths of greater than 1,000 feet. Soils are predominantly sandy and silty. Based on soil boring data, sandy moderate- to high-permeability soils are abundant in the subsurface below SWMU ST-70. Low permeability units of silt and clay are present at roughly 25 to 40 feet bgs and 95 to 110 feet bgs across the site. These low permeability units retard downward contaminant migration and contain high concentrations of TPH and chlorinated solvent contaminants.

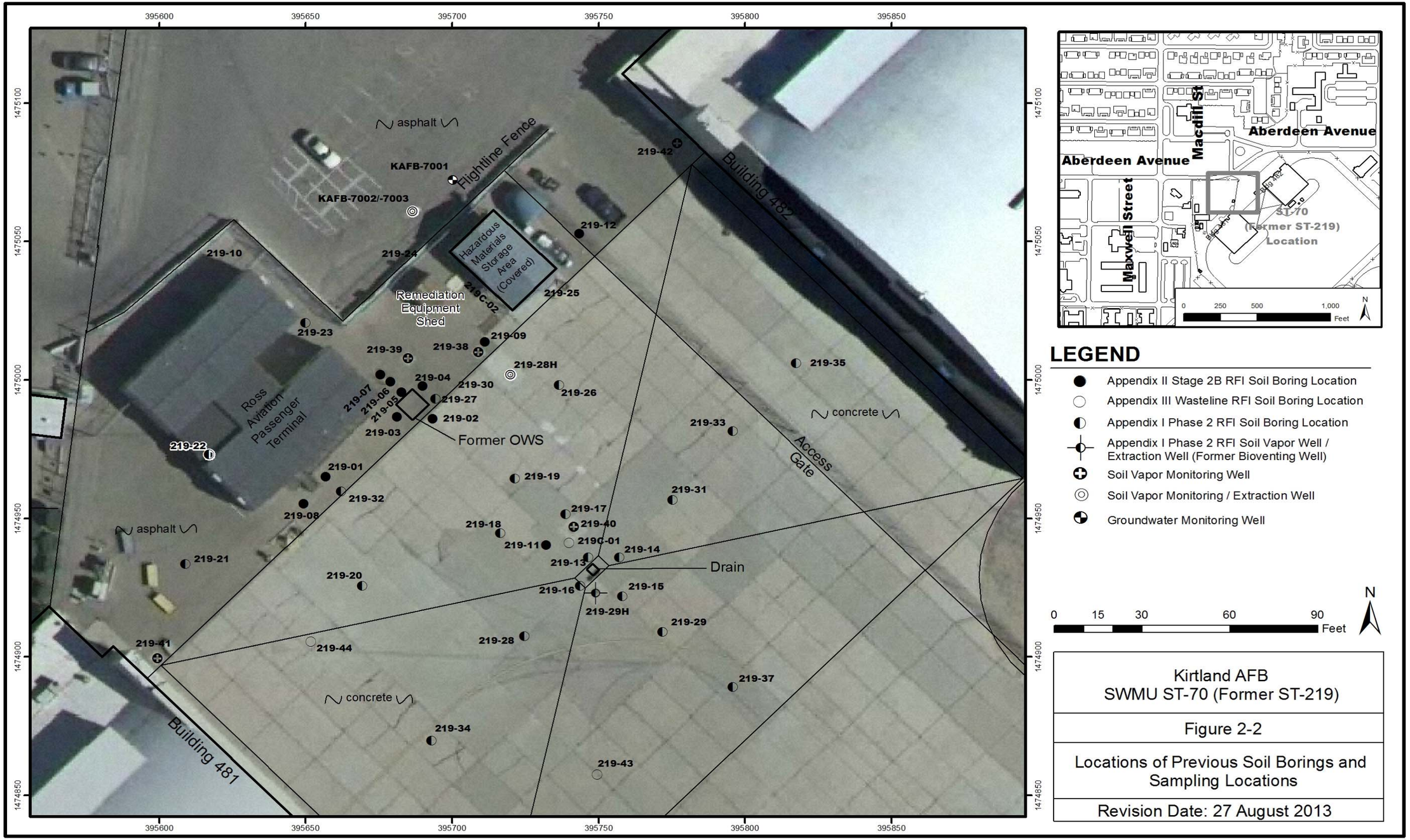
Groundwater is present below the site in a regional unconfined aquifer. The depth to groundwater in the area is between 458.5 and 464 feet bgs based on 2010 to 2013 monitoring data. Infiltration of precipitation is limited by the paved surface at the site, high evaporation rates, and low permeability units present at roughly 40 and 100 feet bgs.

2.2.2 Contaminant Pathways and Receptors

Petroleum hydrocarbon and solvent contaminants originated at the surface due to current and historic site activities. Site characterization data indicate that contaminant releases to the subsurface occurred primarily through leaks in the former OWS, the area drain, and the associated piping. Minor releases to soil may have also occurred through seams and cracks in the pavement. The dates of release and quantities of petroleum hydrocarbons and solvents released to the area drain are unknown. Kirtland AFB records do not indicate that specific spills or sudden failures of the drain piping or OWS accounted for the contamination detected in the subsurface. Instead incremental releases over a prolonged period are believed to be responsible for the site contamination.

Contaminants are believed to have been flushed downward through the vadose zone by water leaking from failures in the area drain and OWS. Removal of the OWS and repair of the area drain piping eliminated this mechanism for contaminant transport. Infiltration of precipitation is greatly inhibited by the pavement and the primary mechanism for contaminant transport is currently believed to be vapor-phase transport. Vertical transport of contaminants is greatly inhibited by low permeability sediments at roughly 25 to 40 feet bgs and 95 to 110 feet bgs. Figure 2-2 presents the historic sampling locations at SWMU ST-70. Soil sample data from previous investigations indicate that large portions of contaminant mass are sorbed to clay minerals in these low permeability zones (Figure 2-3). Vapor and groundwater monitoring data indicate that these low permeability units significantly inhibit TPH migration to the regional groundwater (Figure 2-4). However, chlorinated solvents are less strongly sorbed and migrate downward through the vadose zone by vapor-phase transport. The chlorinated solvent, TCE, is currently detected in the deeper vadose zone soil vapor and shallow groundwater at the site.

Potential receptor pathways for site contamination include drinking water production wells, the Rio Grande via storm sewers, and vapor intrusion into the adjacent hangers. The nearest production wells are KAFB-14, which is 1,600 feet southeast, and KAFB-12, which is 12,000 feet northwest of the site. If the OWS had overflowed, runoff would have flowed to the asphalt parking lot to the north. Only an exceptional flooding episode would create enough runoff to reach storm sewer drains along Aberdeen Drive (over 250 feet northwest of Former ST-219) and potentially convey the runoff to the Rio Grande. Indoor air quality at Hangar Buildings 481 and 482 was investigated in 2001 and recent sample data from vapor monitoring wells ST-219-41 and ST-219-42 indicate that vapor-phase contaminant migration is greatly inhibited by pressure gradients created by the SVE system, concrete foundations, and pavement (USAF, 2005; USAF, 2010).



Kirtland AFB
SWMU ST-70 (Former ST-219)

Figure 2-2

Locations of Previous Soil Borings and Sampling Locations

Revision Date: 27 August 2013

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Figure 2-3. Map View of the Total Petroleum Hydrocarbon Plume Shell for Soil Concentrations above 250 mg/kg, Solid Waste Management Unit ST-70

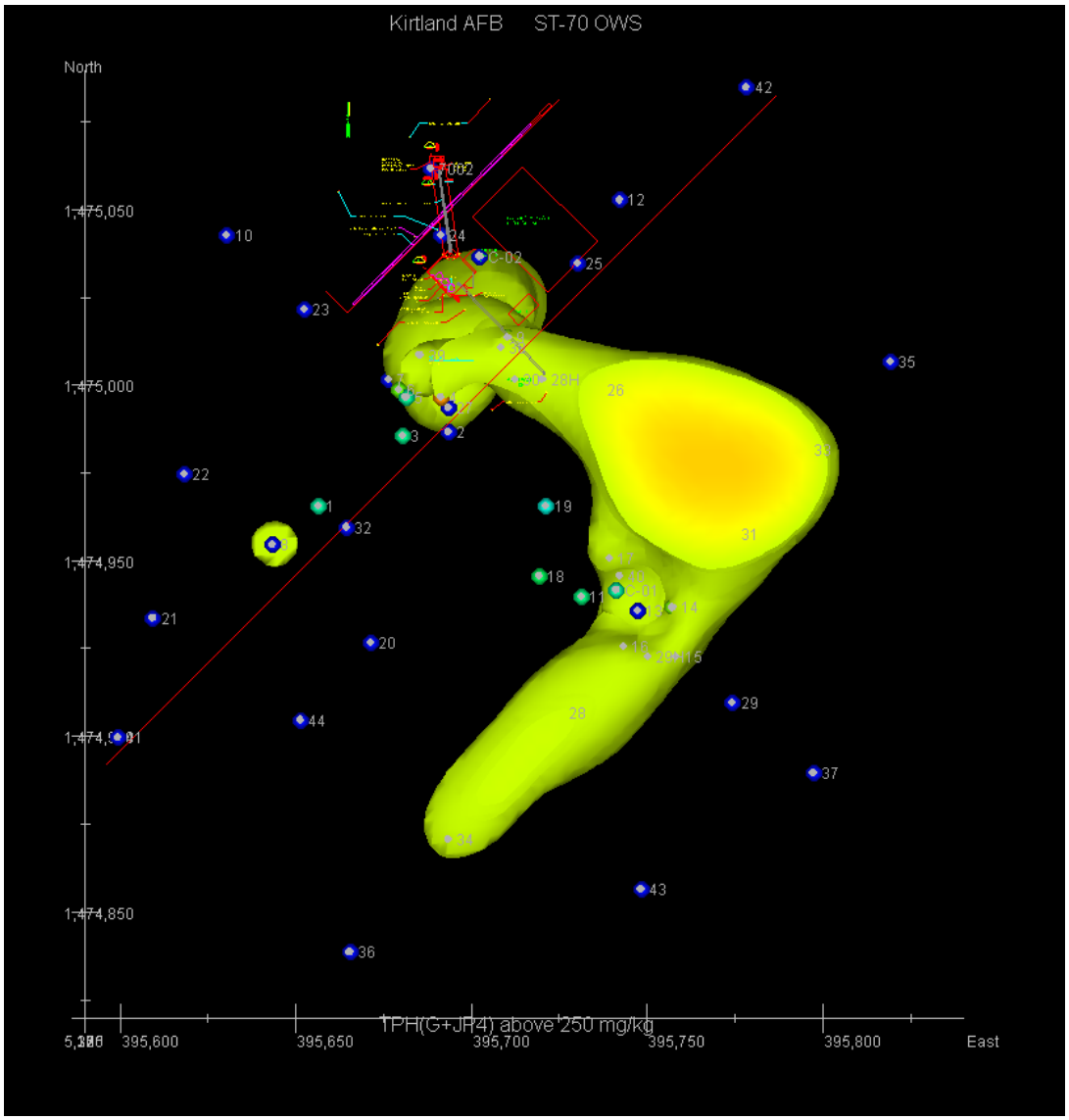
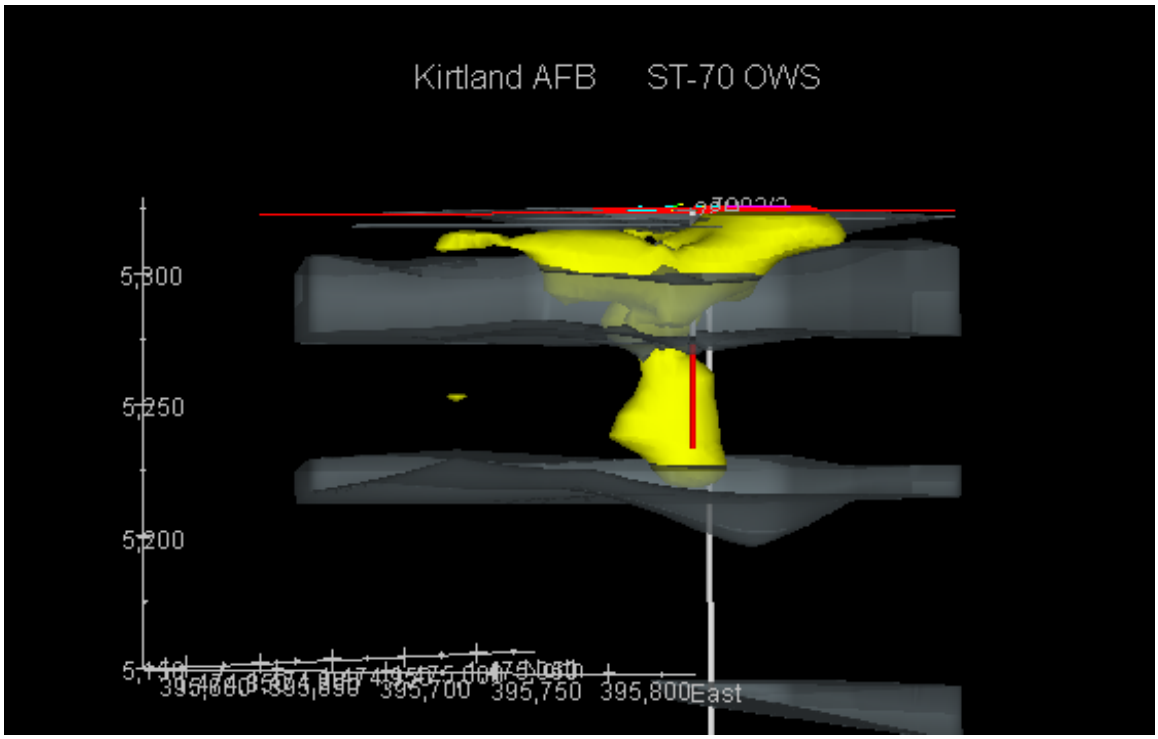


Figure 2-4. Cross Section of the Total Petroleum Hydrocarbon Plume Shell for Soil Concentrations above 250 mg/kg with Low Permeability Units Mapped in Gray, Solid Waste Management Unit ST-70



2.2.3 Effects of Corrective Measures

The current SVE system continues to remove significant TPH contaminant mass from the vadose zone. The system is operated to create upward gradients that inhibit downward migration of contaminants to the regional groundwater and create horizontal gradients to inhibit migration away from the site (USAF, 2013a). The removal of the OWS and repairs to the area drain piping have eliminated the pathway for additional contaminant releases to the subsurface. Bioventing was not successful in significantly degrading the TPH contaminant mass (USAF, 2005).

Based on initial contaminant mass estimates for the site, the ICM should have removed a significant portion of the vadose zone contaminant mass. Unfortunately, soil vapor monitoring data indicates that significant contaminant mass remains in soils adjacent to the area drain and the former OWS location.

2.2.4 Data Gaps

The data gaps that remain at the site are primarily due to changing site conditions. The current extent of soil contamination is not known. Soil sample data were collected primarily between 1992 and 1999. Since that time, the ICMs have had an effect on site contaminant concentrations and distribution. Soil vapor monitoring points have failed and need to be replaced. Changes have occurred to the regional groundwater flow direction and water table elevation as a result of the modifications to groundwater use by the Albuquerque Bernalillo County Water Utility Authority. Additional groundwater investigation at the site is warranted. Section 4 presents a discussion of recommendations to address the data gaps.

2.3 Current Extent of Contamination

The current extent of soil vapor and groundwater contamination, along with recent trends, is presented in this section. The nature and extent of soil contamination is summarized to provide a basis for soil vapor and groundwater contamination discussions. There are no recent soil analytical data and the nature and extent of soil contamination was discussed in detail in the most recent RFI report (USAF, 2005).

2.3.1 Subsurface Soil Contamination

Initial investigations at the Former ST-219 OWS site focused on characterizing the nature and extent of petroleum hydrocarbon contamination within subsurface soils surrounding the former OWS. TPH gasoline range organics (TPH-GRO) were identified in soil samples from borings surrounding the OWS, to a maximum depth of 107 feet bgs. TPH diesel range organics (TPH-DRO) exceeding the NMED SSLs were identified in soil samples collected from borings surrounding the OWS, but not from borings near the area drain. Jet fuel as JP-4 was not specifically analyzed for in soil samples collected from borings immediately surrounding the OWS, but JP-4 exceeding the NMED SSLs was identified in soil samples collected from borings ST-219-08 and ST-219-09 located approximately 50 feet southwest and 30 feet northeast, respectively, from the OWS. Soil contamination by both TPH-DRO and JP-4 was found in soils to a maximum depth of approximately 100 feet bgs.

During these initial investigations, chlorinated solvents (PCE and TCE) exceeding the NMED SSLs were identified in soil samples collected from borings within approximately 10 feet of the OWS and from a boring between the OWS and the hazardous waste storage unit. Chlorinated solvents were found to a maximum depth of approximately 100 feet bgs. In particular, soil samples from a boring just east of the OWS identified PCE concentrations in soil as high as 7,200 milligrams per kilograms (mg/kg) and TCE concentrations in soil as high as 120 mg/kg. These substantial chlorinated solvent concentrations originally appeared to be anomalous and subsequent investigations (Appendix III Wasteline Sites RFI [USAF, 1995b] and Appendix I Phase 2 RFI [USAF, 1997]) failed to find more widespread chlorinated solvent soil contamination. Therefore, it was assumed that the extent of the chlorinated solvent contamination had been defined and that petroleum hydrocarbons were the primary COPCs. Sampling for chlorinated solvents was discontinued during the final stages of the Appendix I Phase 2 RFI (USAF, 1997). Based on the detections of TCE in deep soil vapor and groundwater, chlorinated solvents were identified as COPCs, with TCE and PCE now considered primary COPCs.

2.3.2 Soil Vapor Plume and Vapor Contaminant Trends

2.3.2.1 Vapor Monitoring

Soil vapor monitoring has been performed on a quarterly basis in all functional monitoring points across SWMU ST-70 since the initiation of full-scale SVE operations. Soil vapor samples are analyzed for VOCs, TPH-GRO, and fixed gases (oxygen, nitrogen, carbon dioxide, and carbon monoxide). Field measurements of vapor pressure, fixed gases, and total VOCs (by photoionization detector) are also routinely collected at the site. Field data are used primarily to maintain and manage SVE operations, and as secondary data source to laboratory analytical data. Historical vapor monitoring data are provided in Appendix A.

2.3.2.2 Analytical Results Summary

Soil vapor contaminant concentrations have fluctuated over time, but indicate that significant contaminant mass remains in the areas adjacent to the former OWS and area drain. Soil vapor contaminant concentrations fluctuated significantly during the first year of SVE operation, but no longer show significantly decreasing trends at most monitoring locations. Contaminant concentrations at SVE wells fluctuate seasonally, with the lowest concentrations occurring in the winter months. The extraction system is less efficient during the winter months due to vapor condensation in the extraction piping and reduced volatilization of soil contaminants due to low temperatures (USAF, 2013a).

2.3.2.3 Current Vapor Contamination Extent

Contaminants detected in soil vapor are primarily associated with chlorinated solvents, fuel hydrocarbons, and their breakdown products. The highest concentrations of VOC contaminants are detected adjacent to the former OWS and the area drain. Recent concentrations and detection patterns are consistent with historical values from 2010 and 2011.

In 2012 and 2013, all 10 chlorinated VOC COPCs were detected in samples from vapor monitoring points and vapor extraction wells. However, only PCE, TCE and cis-1,2-dichloroethene (cis-1,2-DCE) were detected at relatively high concentrations above 500 parts per billion by volume (ppbv). The highest concentrations of these COPCs detected during the 2013 monitoring events were in samples from vapor monitoring point ST-219-39-42. This location is the shallow sample port adjacent to the former OWS.

In 2012 and 2013, all 10 fuel-related VOC COPCs and the COPC TPH-GRO were detected in samples from vapor monitoring points. However, only 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, xylenes, and TPH-GRO were detected at concentrations above 500 ppbv. The highest concentrations of these analytes were detected during the 2013 monitoring events were in samples from vapor monitoring point ST-219-40-20. This location is the shallow sample port adjacent to the area drain.

In addition to fuel and chlorinated solvent-related contaminants, three chlorofluorocarbons and one brominated VOC are regularly detected in samples from SWMU ST-70. These detections are typically at concentrations below 10 ppbv with no observed spatial distribution pattern.

2.3.2.4 Vapor Contamination Trends

Vapor concentrations of TPH fluctuate seasonally and concentrations of chlorinated COPCs decreased sharply during 2008 and 2009 at the soil vapor extraction wells (Figures 2-5, 2-6, 2-7, and 2-8). Vapor concentrations of all COPCs in samples from monitoring points adjacent to the area drain and the former OWS remain high, with little or no downward trend (Figures 2-9, 2-10, 2-11, and 2-12).

Chlorinated VOC concentrations in the 2012 and 2013 vapor samples from all extraction wells were below 500 ppbv. When SVE operations began, soil vapor concentrations of TCE and PCE were as high as 5,060 ppbv and 1,980 ppbv, respectively. The highest PCE concentrations were typically detected in the shallowest extraction well, ST-219-28H. The highest cis-1,2-DCE concentrations were detected at the mid-depth extraction well, KAFB-70-02. High concentrations of TCE were detected at all three extraction wells.

Chlorinated VOCs continue to be detected at high concentrations in samples from monitoring points ST-219-39 and ST-219-38, which are nearest the OWS. Concentrations of TCE and cis-1,2-DCE continue to be detected in samples from these monitoring points at concentrations greater than 5,000 ppbv. PCE is typically detected at lower concentrations; however, it continues to be detected at ST-219-39 at concentrations greater than 1,000 ppbv.

Soil vapor concentrations of TPH fluctuate seasonally in samples collected from the extraction wells. Low concentrations are measured during the winter months when condensation is present in the extraction piping and contaminant volatilization decreases due to lower temperatures. The highest measured concentrations typically occur in the summer months in samples from shallow extraction well ST-219-28H. Long-term trends in sample data from the extraction wells do not indicate a significant decline in TPH mass.

High concentrations of TPH-GRO are detected in samples from vapor monitoring points adjacent to both the OWS and the area drain (ST-219-38, ST-219-39, and ST-219-40). Soil vapor concentrations of TPH-GRO in samples from these monitoring locations remain above 1,000 µg/L.

Figure 2-5. Tetrachloroethene Vapor Concentrations at Solid Waste Management Unit ST-70 Soil Vapor Extraction Wells

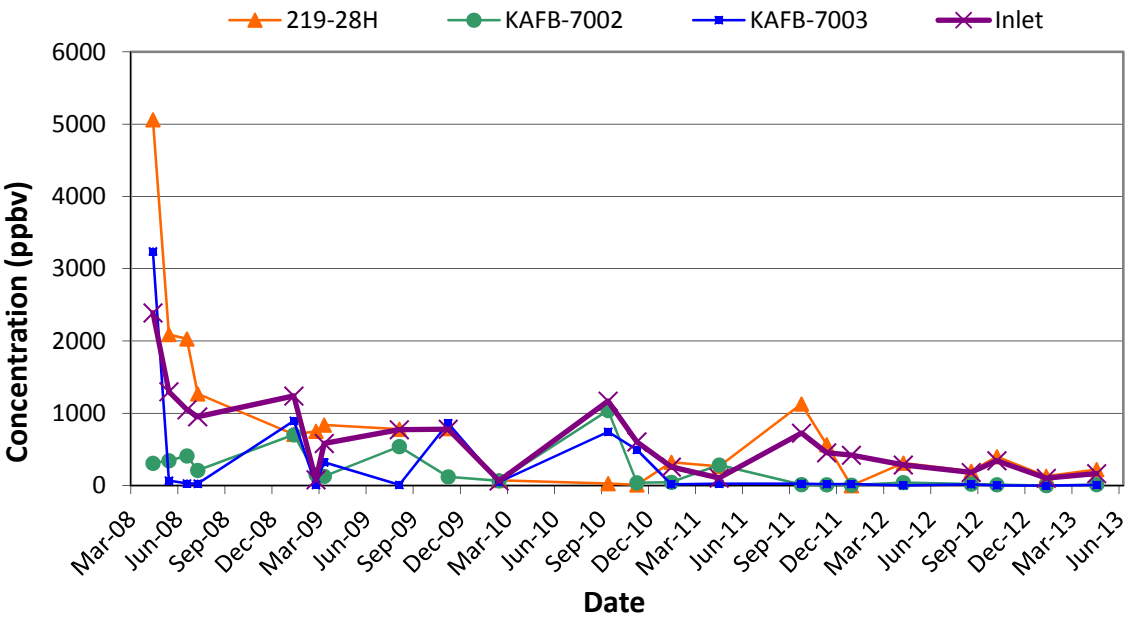


Figure 2-6. Trichloroethene Vapor Concentrations at Solid Waste Management Unit ST-70 Soil Vapor Extraction Wells

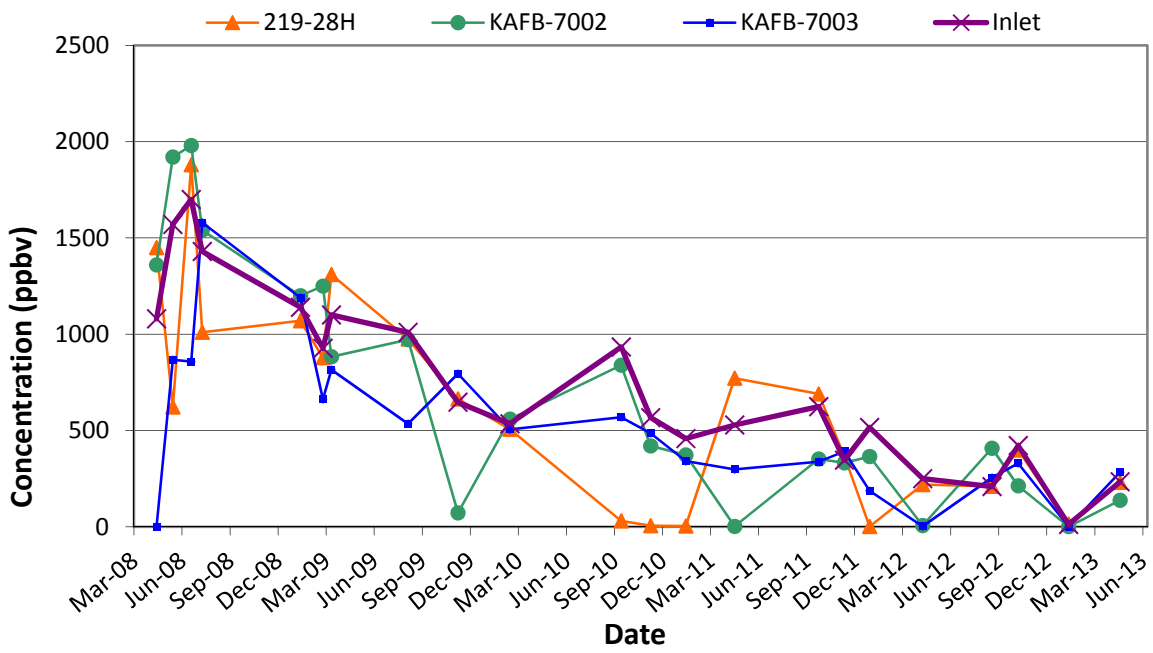


Figure 2-7. Cis-1,2-dichloroethene Vapor Concentrations at Solid Waste Management Unit ST-70 Soil Vapor Extraction Wells

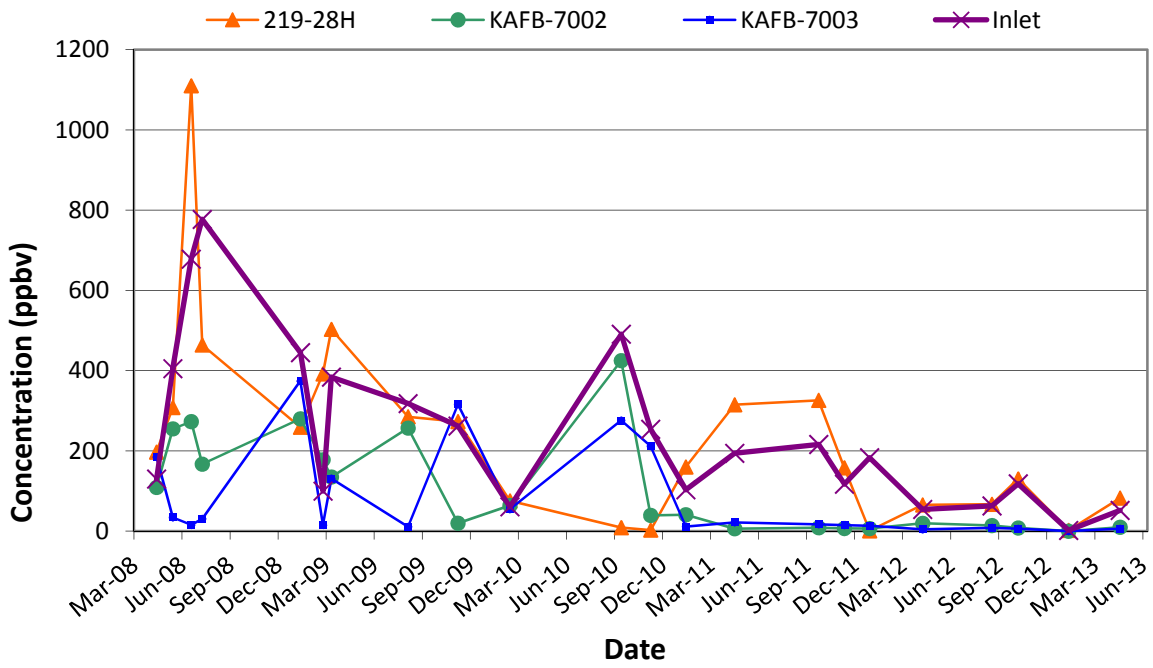


Figure 2-8. Total Petroleum Hydrocarbon-Gasoline Vapor Concentrations at Solid Waste Management Unit ST-70 Soil Vapor Extraction Wells

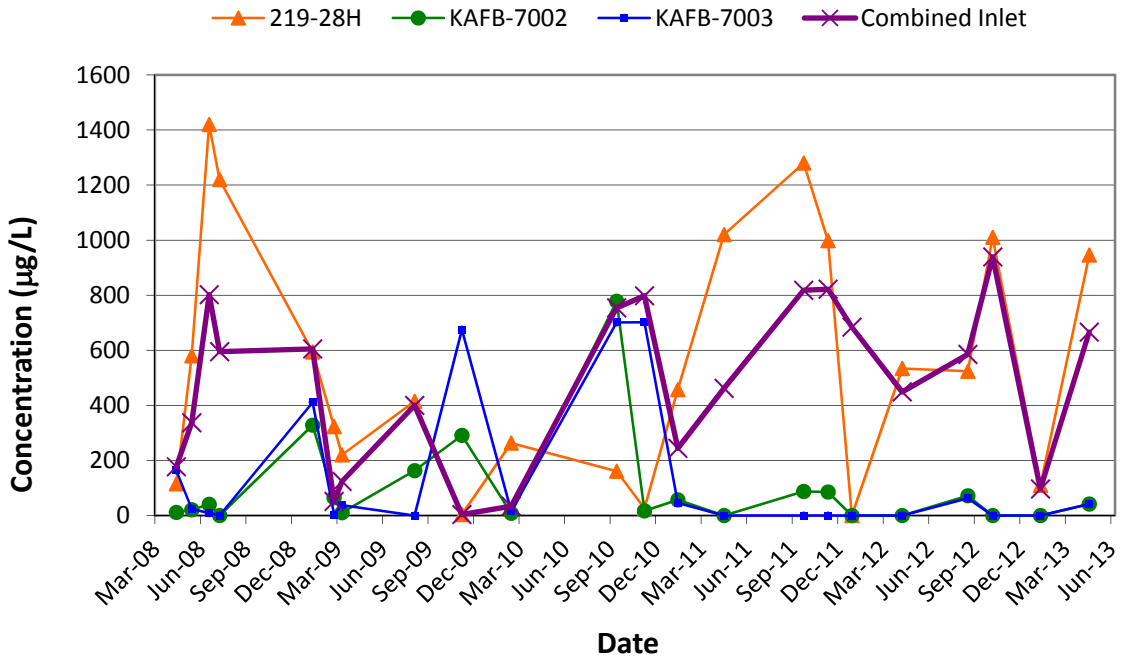


Figure 2-9. Tetrachloroethene Vapor Concentrations at Solid Waste Management Unit ST-70 Soil Vapor Monitoring Points

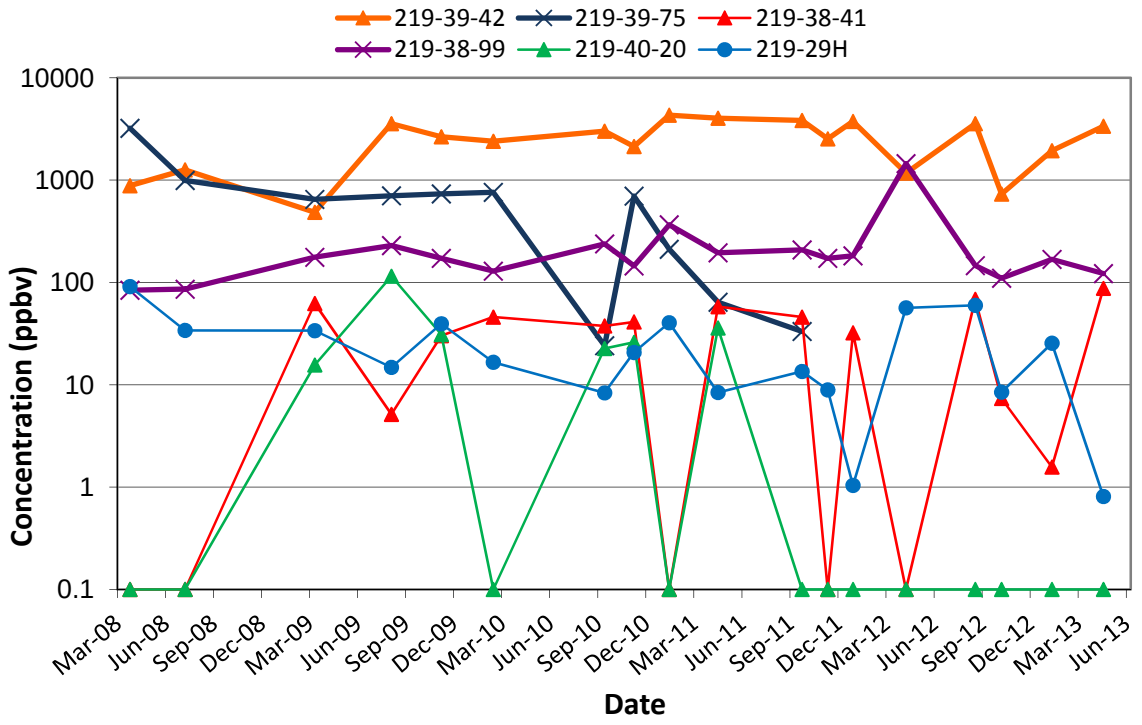


Figure 2-10. Trichloroethene Vapor Concentrations at Solid Waste Management Unit ST-70 Soil Vapor Monitoring Points

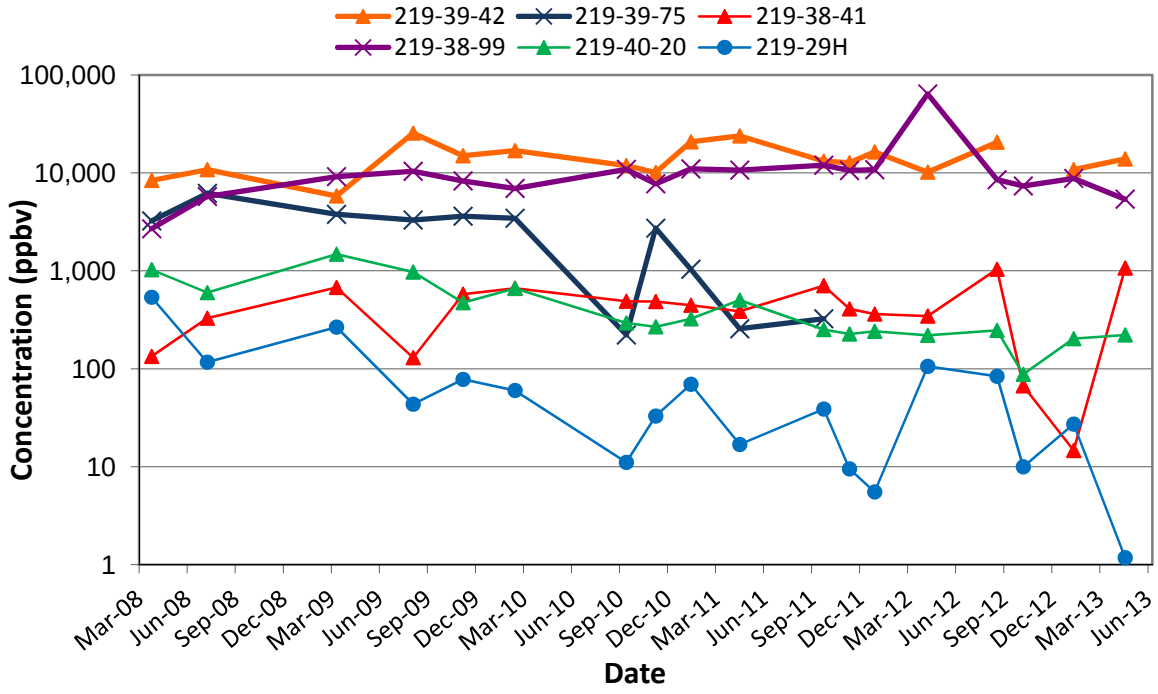


Figure 2-11. Cis-1,2-Dichloroethene Vapor Concentrations at Solid Waste Management Unit ST-70 Soil Vapor Monitoring Points

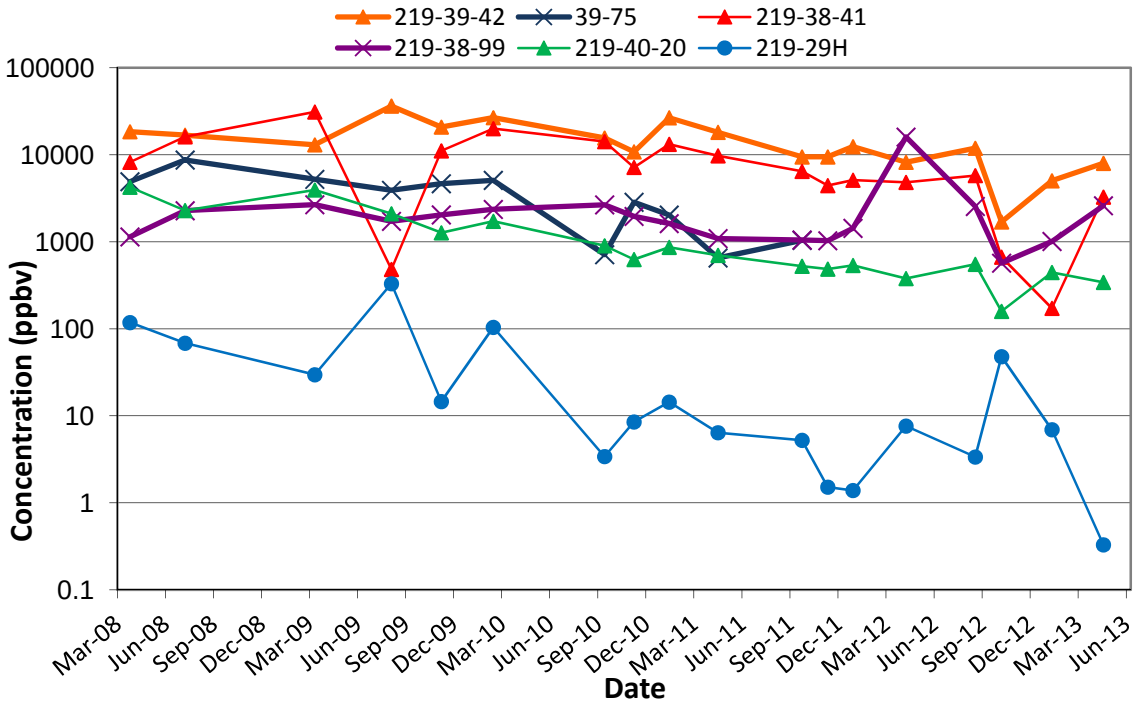
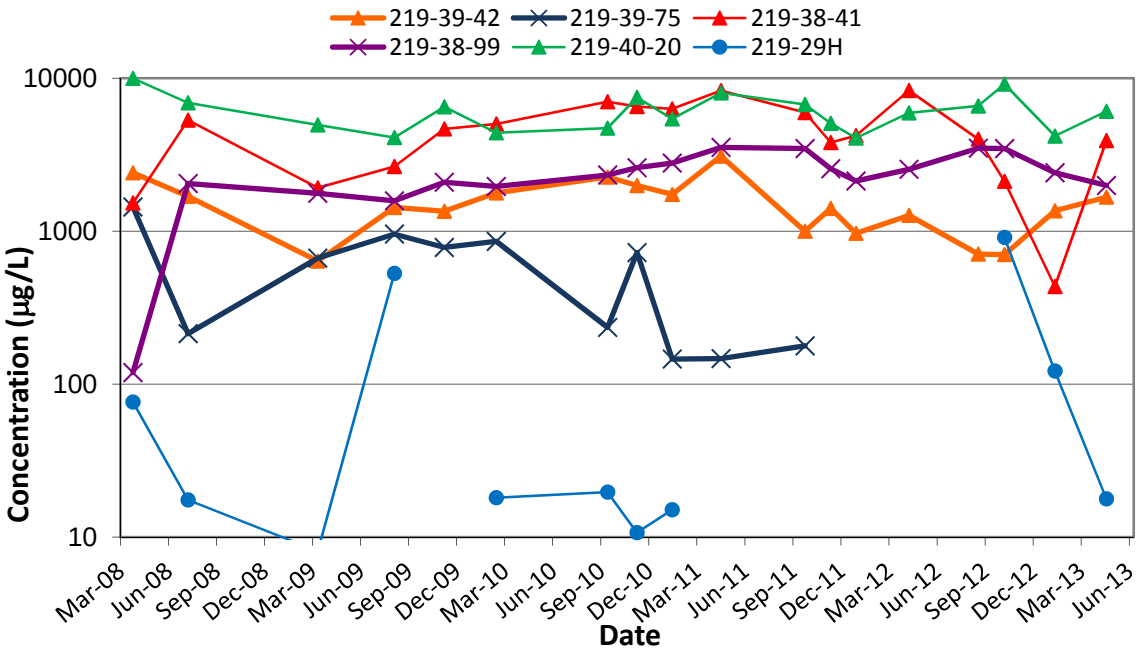


Figure 2-12. Total Petroleum Hydrocarbon-Gasoline Vapor Concentrations at Solid Waste Management Unit ST-70 Soil Vapor Monitoring Points



2.3.3 Groundwater Contaminant Trends

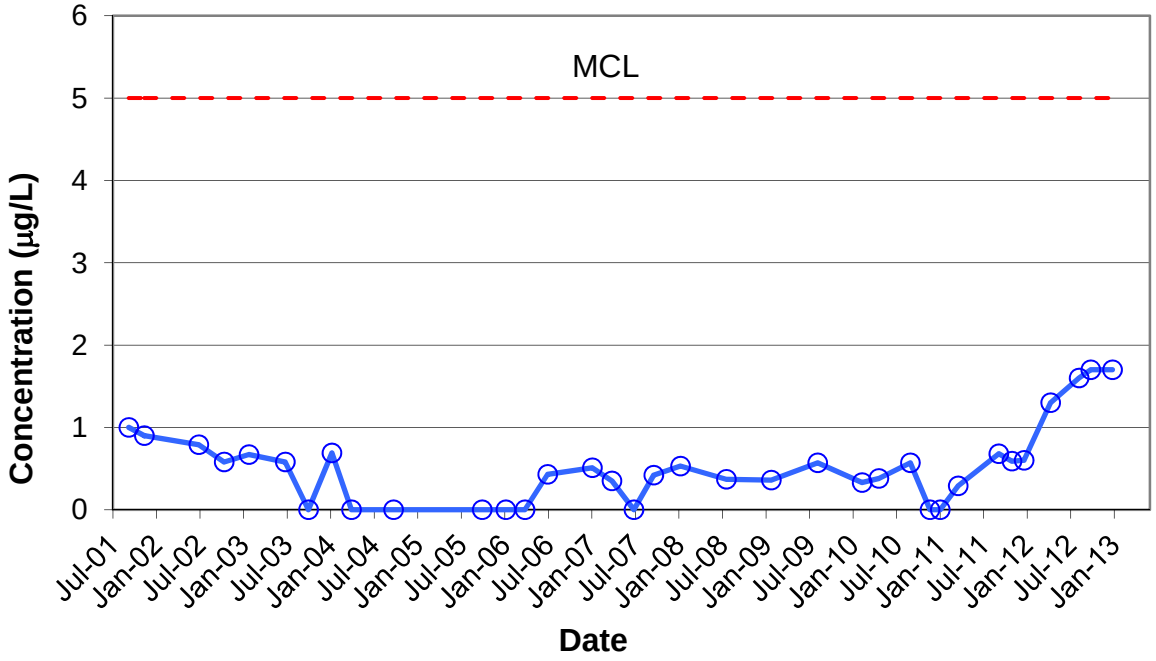
The purpose of groundwater monitoring is to evaluate whether site COPCs have impacted groundwater. To date, groundwater has not been impacted at concentrations above regulatory standards. Monitoring is performed quarterly from down gradient monitoring well KAFB-7001.

The primary groundwater COPC at the KAFB-7001 monitoring well is TCE, which has been detected at concentrations between 0.29 and 1.8 µg/L (Figure 2-13). After an increase in 2012, concentrations of TCE appear to have stabilized. Concentrations remain significantly below the drinking water MCL of 5.0 µg/L. Hydrocarbon fuel-related COPCs such as toluene and acetone have been sporadically detected in groundwater samples at concentrations below regulatory limits. Halogenated VOCs are detected in groundwater samples more regularly, but are detected below regulatory limits at commonly at J-flagged (estimated) concentrations below 1 µg/L. Groundwater is routinely monitored for TPH-GRO, and was historically monitored for SVOCs. These compounds have not been detected in validated sample results from monitoring well KAFB-7001. The groundwater laboratory analytical results are provided in Appendix B.

Concentrations trends of TCE in groundwater samples from monitoring well KAFB-7001 were stable for most of the historic monitoring period and then increased in 2012. Groundwater TCE concentrations were at or below 0.6 µg/L for much of the monitoring history from 2004 to 2011. Concentrations increased to 1.7 µg/L in 2012 and remained close to that concentration in sample results from 2013. The change in groundwater TCE concentration is believed to be associated with changes in the regional groundwater flow direction resulting from large-scale changes in groundwater use by the Albuquerque Bernalillo County Water Utility Authority. Over the last two years, groundwater elevations in monitoring well KAFB-7001 have risen from 464 feet bgs in 2010 to 458.5 feet bgs in 2013. Regional groundwater

flow direction appears to have shifted slightly in the northern portions of Kirtland AFB during this period. According to groundwater monitoring data from 2009 to 2012 in this area, flow gradients shifted from a northeastwardly flow to an east-northeasterly flow. It is believed that the shift in groundwater flow direction resulted in the increase in groundwater TCE concentration in monitoring well KAFB-7001 rather than any increase in contaminant transport to the groundwater table.

Figure 2-13. Trichloroethene Concentrations in Groundwater at Solid Waste Management Unit ST-70



3.0 INTERIM CORRECTIVE MEASURES PERFORMANCE AND OPTIMIZATION

This section presents summaries of SVE operation and an evaluation of the system performance and efficiency. Detailed ICM operational information is presented in semi-annual reports from 2009 to 2013.

3.1 Soil Vapor Extraction System Operation and Maintenance

The SVE system at SWMU ST-70 (Former ST-219) operated with little unscheduled downtime since full-scale operations began in 2008. The SVE intake has been modified based on monitoring data to maximize influent contaminant concentrations and to maintain upward pressure gradients towards the extraction wells. No major failures of the system have occurred since start up, however minor mechanical issues are routinely identified and corrected. Maintenance activities are generally performed in a manner that will minimize system downtime and on a schedule that will not interfere with Air Force or DOE operations.

Pulsed system operations were initiated in 2012 and were also performed in 2013 with a seasonal shutdown occurring during the winter months of January, February, and March. Full-time system operation occurred during the remaining 9 months of the year. Pulsed system operation was initiated to prevent excessive wear to the aging infrastructure and reduce waste generation.

Unscheduled system shutdowns are typically less than two hours in duration and are performed for system maintenance and monitoring. Since the SVE system was placed into full-scale operation on April 15, 2008 through the end of the reporting period on June 30, 2013, the SVE system has operated for approximately 1,560 days and has extracted and treated approximately 1.4×10^8 ft^3 (4.0×10^9 liters) of soil vapor. Over this period, the SVE system has had approximately 28 days of unscheduled shutdown time resulting in a 98-percent system operational run time (Table 3-1). Additional operational data is provided in Appendix C.

System monitoring data are used to determine the optimal SVE intake configuration. When concentrations of chlorinated VOCs are detected at relatively high or increasing concentrations in the deep SVE well ST70-03, air flow is increased from that zone. However, the system intake is generally operated so the majority of flow is from SVE well ST-219-28H. The highest TPH soil vapor concentrations are generally produced from this well, which extracts a majority of its flow from the shallow screen interval. This system configuration generally produces upward pressure gradients in the vadose zone, which inhibits downward migration of vapor-phase contaminants.

Table 3-1. Soil Vapor Extraction System Operation and Downtime at Solid Waste Management Unit ST-70 (Page 1 of 2)

Date	SVE Operation		Cumulative Time		Percent Downtime (%)	Flow Rate (scfm)	Cumulative Volume Extracted (liters)	Cumulative Volume Extracted (ft^3)	Notes
	Down Time (hours)	Start/ Restart (time)	Total Downtime (days)	Total Operation Time (days)					
Initial period reported in Construction Summary Report (April 2008 to March 2009)									
04/15/08		11:00	0	0	0	70	0		initial start-up
05/14/08	2	9:45	0.083	28.92	0.29	70	8.25E+07	2.91E+06	maintenance downtime
05/16/08	1	9:47	0.125	30.88	0.40	72	8.83E+07	3.12E+06	maintenance downtime
05/30/08	1.5	9:45	0.188	44.81	0.42	74	1.30E+08	4.60E+06	maintenance downtime
06/18/08	0.5	8:20	0.208	63.79	0.33	69	1.84E+08	6.49E+06	system sample
07/10/08	1	11:11	0.250	85.75	0.29	70	2.46E+08	8.70E+06	system sample
08/06/08	72	14:25	3.250	109.75	2.96	70	3.15E+08	1.11E+07	system inspection, power outage
08/07/08	off for optimization		3.250	110.75	2.93	70	3.18E+08	1.12E+07	end 1st quarter operation
Optimization Period (August to December 2008)									
12/17/08		11:00		110.75		70			re-start for second quarter
12/23/08	1	13:00	3.292	113.46	2.90	72	3.26E+08	1.15E+07	maintenance downtime
01/08/09	1.5	12:41	3.354	129.40	2.59	70	3.71E+08	1.31E+07	maintenance downtime
01/14/09	0.5	12:30	3.375	135.38	2.49	67	3.88E+08	1.37E+07	system sample
01/21/09	1	16:00	3.417	142.33	2.40	67	4.07E+08	1.44E+07	maintenance downtime
02/11/09	1.5	12:22	3.479	163.27	2.13	70	4.66E+08	1.65E+07	maintenance downtime
02/23/09	0.75	11:09	3.510	175.24	2.00	67	4.99E+08	1.76E+07	maintenance downtime
03/14/09	25	11:05	4.552	193.20	2.36	70	5.50E+08	1.94E+07	system inspection, power outage
03/14/09	Continue SVE system operation for 3rd quarter operation								end 2nd quarter operation
Construction Reporting Period (March to September 2009)									
03/30/09	0.75	12:55	4.583	209.20	2.19	70	5.96E+08	2.10E+07	maintenance downtime
04/14/09	0.25	9:40	4.594	224.19	2.05	70	6.39E+08	2.26E+07	monitoring downtime
04/29/09	0.67	9:30	4.622	239.16	1.93	67	6.80E+08	2.40E+07	maintenance downtime
06/12/09	1	10:10	4.663	283.12	1.65	67	8.00E+08	2.82E+07	maintenance downtime
07/27/09	1.5	13:00	4.726	328.06	1.44	70	9.28E+08	3.28E+07	maintenance downtime
08/07/09	0.75	10:45	4.757	339.02	1.40	69	9.59E+08	3.39E+07	maintenance downtime
09/14/09	0.25	11:15	4.768	377.01	1.26	69	1.07E+09	3.76E+07	maintenance downtime
09/18/09	0.5	9:45	4.788	380.99	1.26	67	1.08E+09	3.80E+07	monitoring downtime
Reporting Period (October 2009 to April 2010)									
10/07/09	1.0	10:00	4.830	399.99	1.21	67	1.13E+09	3.99E+07	maintenance downtime
10/27/09	0.25	9:40	4.840	419.98	1.15	67	1.18E+09	4.18E+07	monitoring downtime
11/09/09	0.33	14:20	4.854	432.97	1.12	67	1.22E+09	4.30E+07	maintenance downtime
11/11/09	0.67	9:57	4.882	434.94	1.12	67	1.22E+09	4.32E+07	monitoring downtime
12/15/09	1.0	14:28	4.924	468.90	1.05	50	1.29E+09	4.57E+07	monitoring downtime
01/27/10	0.50	14:34	4.945	511.88	0.97	50	1.38E+09	4.88E+07	monitoring downtime
01/29/10	0.67	12:25	4.973	513.85	0.97	50	1.38E+09	4.89E+07	maintenance downtime
02/10/10	26.5	16:20	6.077	524.75	1.16	60	1.41E+09	4.98E+07	maintenance downtime
02/17/10	1.0	15:25	6.118	531.70	1.15	67	1.43E+09	5.05E+07	monitoring downtime
03/08/10	1.0	15:25	6.160	550.66	1.12	67	1.48E+09	5.23E+07	monitoring/maintenance downtime
04/07/10	0.5	14:15	6.181	580.64	1.06	67	1.56E+09	5.52E+07	maintenance downtime
05/07/10	0.5	12:15	6.202	610.62	1.02	67	1.65E+09	5.81E+07	maintenance downtime
Reporting Period (September 2010 to June 2011)									
09/02/10	0.5	11:57	6.223	728.60	0.85	67	1.97E+09	6.95E+07	maintenance downtime
09/17/10	0.25	12:02	6.233	743.59	0.84	67	2.01E+09	7.10E+07	monitoring downtime
10/01/10	0.5	14:45	6.254	757.57	0.83	65	2.05E+09	7.23E+07	maintenance downtime
11/05/10	0.67	11:40	6.282	792.54	0.79	65	2.14E+09	7.55E+07	maintenance downtime
11/12/10	0.5	11:45	6.303	799.52	0.79	64	2.16E+09	7.62E+07	monitoring downtime
12/08/10	0.5	13:50	6.323	825.50	0.77	64	2.23E+09	7.86E+07	maintenance downtime
12/31/10	0	N/A	6.323	848.50	0.75	64	2.29E+09	8.07E+07	end of reporting period

Table 3-1. Soil Vapor Extraction System Operation and Downtime at Solid Waste Management Unit ST-70 (Page 2 of 2)

Date	SVE Operation		Cumulative Time		Percent Downtime (%)	Flow Rate (scfm)	Cumulative Volume Extracted (liters)	Cumulative Volume Extracted (ft^3)	Notes
	Down Time (hours)	Start/ Restart (time)	Total Downtime (days)	Total Operation Time (days)					
01/11/11	1.0	16:35	6.365	859.46	0.74	54	2.31E+09	8.16E+07	maintenance downtime
01/18/11	1.0	14:15	6.407	866.42	0.74	58	2.33E+09	8.21E+07	monitoring downtime
02/16/11	2.5	11:30	6.511	895.31	0.73	61	2.40E+09	8.47E+07	maintenance downtime
03/09/11	1.0	14:45	6.553	916.27	0.72	59	2.45E+09	8.65E+07	maintenance downtime
04/05/11	2.75	12:30	6.667	943.16	0.71	52	2.51E+09	8.85E+07	maintenance downtime
04/21/11	2.0	15:25	6.750	959.07	0.70	58	2.54E+09	8.98E+07	monitoring downtime
05/10/11	0.75	10:35	6.782	978.04	0.69	52	2.58E+09	9.12E+07	maintenance downtime
06/22/11	0	15:51OFF	6.782	1021.04	0.66	58	2.68E+09	9.48E+07	Mini-rebound baseline
06/28/11	139.3	9:10	12.59	1021.24	1.23	58	2.69E+09	9.48E+07	Mini-rebound end
06/30/11	0	N/A	12.59	1023.24	1.23	58	2.69E+09	9.50E+07	end of reporting period
Reporting Period (July 2011 to June 2011)									
07/20/11	0.5	12:50	12.61	1043.22	1.21	58	2.74E+09	9.67E+07	maintenance downtime
08/30/11	0.5	10:30	12.63	1084.20	1.16	62	2.84E+09	1.00E+08	maintenance downtime
09/28/11	1	12:05	12.67	1113.15	1.14	62	2.91E+09	1.03E+08	monitoring downtime
10/28/11	0.66	12:15	12.70	1143.13	1.11	62	2.99E+09	1.06E+08	maintenance downtime
11/16/11	0.25	11:00	12.71	1162.12	1.09	62	3.04E+09	1.07E+08	monitoring downtime
12/09/11	0.5	10:35	12.73	1185.10	1.07	62	3.10E+09	1.09E+08	maintenance downtime
12/15/11	0.2	16:20	12.74	1191.09	1.07	62	3.11E+09	1.10E+08	maintenance downtime
12/31/11	0	N/A	12.74	1207.09	1.06	66	3.15E+09	1.11E+08	end of reporting period
01/03/12	0	N/A	12.74	1210.09	1.05	62	3.16E+09	1.12E+08	monitoring, rebound baseline
01/03/12	shut down for rebound study starting at 13:45								begin rebound shut-off
04/20/12	0	16:25	12.74	1210.09	1.05	0	3.16E+09	1.12E+08	monitoring, re-start SVE system
04/25/12	0	N/A	12.74	1215.09	1.05	64	3.17E+09	1.12E+08	inspection
04/27/12	1	15:05	12.78	1217.05	1.05	64	3.18E+09	1.12E+08	maintenance downtime
05/04/12	0.5	9:15	12.80	1224.02	1.05	64	3.20E+09	1.13E+08	monitoring downtime
05/14/12	0	N/A	12.80	1234.02	1.04	64	3.22E+09	1.14E+08	inspection
06/08/12	6.0	15:35	13.05	1258.77	1.04	64	3.29E+09	1.16E+08	Power outage - construction
06/12/12	0	N/A	13.05	1262.77	1.03	62	3.30E+09	1.16E+08	inspection
06/16/12	24	7:30	14.05	1265.77	1.11	62	3.31E+09	1.17E+08	Power outage - construction
06/30/12	0	N/A	14.05	1279.77	1.10	62	3.34E+09	1.18E+08	end of reporting period
Reporting Period (July 2012 to June 2013)									
07/11/12	0.5	7:50	14.07	1290.75	1.09	64	3.37E+09	1.19E+08	maintenance downtime
08/23/12	0.6	15:15	14.09	1333.73	1.06	61	3.48E+09	1.23E+08	monitoring downtime
09/14/12	0.5	17:00	14.12	1355.71	1.04	62	3.53E+09	1.25E+08	maintenance downtime
10/12/12	0.4	14:55	14.13	1383.69	1.02	65	3.61E+09	1.27E+08	monitoring downtime
11/16/12	168	15:45	21.13	1411.69	1.50	58	3.67E+09	1.30E+08	power outage downtime
12/13/12	0.75	14:45	21.16	1438.66	1.47	54	3.73E+09	1.32E+08	maintenance downtime
12/21/12	0.2	16:20	21.17	1446.65	1.46	54	3.75E+09	1.32E+08	scheduled downtime begins
12/31/12	0	N/A	21.17	1446.65	1.46	0	3.75E+09	1.32E+08	end of reporting period
01/16/13	OFF	N/A	21.17	1446.65	1.46	0	3.75E+09	1.32E+08	Downtime monitoring
02/25/13	OFF	N/A	21.17	1446.65	1.46	0	3.75E+09	1.32E+08	Downtime monitoring
03/05/13	Restart	11:05	21.17	1446.65	1.46	58	3.75E+09	1.32E+08	system restart, field monitoring
03/21/13	0.5	8:45	21.19	1462.63	1.45	57	3.79E+09	1.34E+08	maintenance downtime
04/24/13	1.0	11:55	21.23	1496.59	1.42	63	3.87E+09	1.37E+08	monitoring downtime
05/22/13	0.5	13:15	21.26	1524.57	1.39	59	3.94E+09	1.39E+08	maintenance downtime
06/26/13	0.5	10:15	21.28	1559.55	1.36	64	4.03E+09	1.42E+08	maintenance downtime
06/30/13	0.0	N/A	21.28	1563.55	1.36	64	4.04E+09	1.43E+08	end of reporting period

Items noted as maintenance downtime indicate that the SVE system was off for a minimal amount of time
ft^3 = cubic feet
N/A = not applicable
scfm = standard cubic feet per minute
SVE = soil vapor extraction

3.2 Soil Vapor Extraction System Performance

This section discusses the SVE system performance at SWMU ST-70 (Former ST-219). The system performance is measured by the contaminant mass removed from the subsurface through the extraction wells.

The estimates of contaminant mass removal are calculated using flow readings and laboratory analytical data from the combined inlet of the SVE system (between the blower and the condensate drums). The mass of fuel hydrocarbons is estimated from the TPH-gasoline concentrations, and the mass of halogenated VOCs is estimated from the sum of all halogenated VOC detections.
Mass removal was estimated using the following conversion:

$$M = CQT \qquad \text{(Equation 1)}$$

where: M = cumulative mass removed (kilograms [kg])

C = vapor concentration ppbv converted to kilograms per liter [kg/L])

Q = extraction flow rate (standard cubic feet per minute [ft^3/m] converted to liters per day [L/day])

T = operational period (day)

In order to calculate the mass removal of halogenated VOCs, the concentrations were first converted by analyte from ppbv to µg/L by the following:

$$C = \frac{(conc)(MW)}{RT} \qquad \text{(Equation 2)}$$

where: $conc$ = vapor concentration (ppbv)

MW = molecular weight of the analyte

R = ideal gas constant for standard ambient pressure (24.04×10^{-3})

T = temperature for standard ambient temperature (25°C)

The sum of all reported halogenated VOC detections are converted to mass using Equation 1. Petroleum mass calculations are determined by using the TPH-gasoline concentrations in µg/L and by multiplying the numbers of liters processed to yield a total mass. Mass removal estimates are presented in Table 3-2.

The rate at which contaminant mass is removed from the subsurface is calculated by dividing the mass calculated in Equation 1 above by the time between sample events:

$$E = M/T \qquad \text{(Equation 3)}$$

where: E = estimated mass removal rate (kg or grams [g])

M = mass calculated in Equation 1(kg), mass is converted to grams for halogenated contaminants

T = operational period between sampling events (day)

The mass removal rate estimates are presented in Table 3-3.

Table 3-2. Estimated Total Contaminant Mass Removed at Solid Waste Management Unit ST-70

Period of Performance		Cumulative Volume Extracted (ft^3)	Analytical Data from SVE inlet			Cumulative Mass Removed	
			Dates of Inlet Sample	Sum of Halogenated VOCs (µg/L)	TPH-G (µg/L)	Chlorinated Mass (kg)	TPH Mass (kg)
04/15/08	03/14/09	1.94E+07	multiple	0.4 to 0.9	50 to 800	3.13	2,280
03/14/09	06/30/09	3.00E+07	03/14/09	0.359	51.4	4.20	2,440
07/01/09	09/30/09	3.92E+07	03/14/09	0.359	51.4	5.21	3,480
			08/07/09	0.386	400		
10/01/09	12/31/09	4.68E+07	08/07/09	0.386	400	6.13	3,490
			11/11/09	0.428	3.75		
01/01/10	03/31/10	5.46E+07	11/11/09	0.428	3.75	6.42	3,560
			02/10/10	0.128	34.1		
04/01/10	06/30/10	6.33E+07	02/10/10	0.128	34.1	6.73	3,650
07/01/10	09/30/10	7.22E+07	02/10/10	0.128	34.1	7.94	5,540
			09/17/10	0.482	754		
10/01/10	12/31/10	8.07E+07	09/17/10	0.482	754	8.58	7,460
			11/12/10	0.265	798		
01/01/11	03/31/11	8.65E+07	11/12/10	0.265	798	8.99	7,860
			01/18/11	0.249	244		
04/01/11	06/30/11	9.50E+07	01/18/11	0.249	244	9.39	8,970
			04/21/11	0.167	462		
07/01/11	09/30/11	1.04E+08	04/21/11	0.167	462	10.08	10,970
			09/28/11	0.281	818		
10/01/11	12/31/11	1.11E+08	09/28/11	0.281	818	10.4	12,800
			11/16/11	0.162	822		
01/01/12	06/30/12	1.18E+08	01/03/12	[1]Rebound Period		10.6	13,600
			04/13/12	0.0990	449		
07/01/12	09/30/12	1.26E+08	04/13/12	0.0990	449	10.8	15,000
			08/23/12	0.0816	585		
10/01/12	12/21/12	1.33E+08	08/23/12	0.0816	585	11.1	16,700
			10/12/12	0.164	939		
12/22/12	03/31/13	1.35E+08	10/12/12	[2]Winter Downtime		11.1	16,700
			01/16/13	0.0195	96.6		
04/01/13	06/30/13	1.42E+08	01/16/13	0.0195	96.6	11.3	18,200
			04/24/13	0.0833	666		

ft^3 = cubic foot of soil vapor at standard temperature and pressure
kg = kilograms
µg/L = micrograms per liter
TPH-G = total petroleum hydrocarbon-gasoline
VOCs = volatile organic compound
Notes:
1) No mass was removed during the scheduled downtime from 01/03/12 to 04/20/12
2) No mass was removed during the scheduled downtime from 12/21/12 to 03/05/13

Table 3-3. Estimated Contaminant Mass Removal Rates at Solid Waste Management Unit ST-70

Period of Performance		Chlorinated Mass Removal Rate (kg/day)	TPH Mass Removal Rate (kg/day)
04/15/08	07/10/08	0.0199	15.7
03/14/09	06/30/09	0.00993	1.42
07/01/09	09/30/09	0.0186	19.3
10/01/09	12/31/09	0.0101	0.088
01/01/10	03/31/10	0.00312	0.831
04/01/10	06/30/10	0.00350	0.931
07/01/10	09/30/10	0.01316	20.59
10/01/10	12/31/10	0.00693	20.8
01/01/11	03/31/11	0.00452	4.42
04/01/11	06/30/11	0.00444	12.3
07/01/11	09/30/11	0.00748	21.7
10/01/11	12/31/11	0.00383	19.4
01/01/12	04/20/12	[1]Rebound Downtime Period	
04/20/12	06/30/12	0.00266	12.0
07/01/12	09/30/12	0.00209	15.0
10/01/12	12/21/12	0.00354	20.3
12/22/12	03/31/13	[2] 0.000121	[2] 0.60
04/01/13	06/30/13	0.00206	16.4

kg = kilograms
Notes:
1) No mass was removed during the scheduled downtime from 01/03/12 to 04/20/12
2) No mass was removed during the scheduled downtime from 12/21/12 to 03/05/13

The SVE ICM at SWMU ST-70 has removed a large mass of TPH contamination from the vadose zone and a minor mass of chlorinated VOC contamination. Initial mass removal rates observed during system startup in 2008 exceeded those calculated from the pilot testing data. Contaminant concentrations in samples from the combined inlet decreased in 2009 and the first half of 2010 resulting in a decrease in contaminant mass removal rates. In September and November 2010, TPH concentrations at the combined inlet increased by an order of magnitude. Relatively high TPH vapor concentrations continued to be observed during the summer and fall of 2011 and 2012. Chlorinated VOC concentrations at the combined inlet sample port also fluctuate seasonally. However, there has been a decreasing trend in vapor concentrations of TCE, PCE, and cis-1,2-DCE during the SVE system operational period of the SVE system.

The total contaminant mass removed by the SVE system to date is approximately 18,200 kg, but only 11 kg of that mass is comprised of chlorinated VOCs. Total mass removal rates have ranged between 0.1 and 22 kilograms per day (kg/d), with a sharp decrease in removal rates observed during the winter months. Chlorinated VOC mass removal rates have ranged between 0.002 and 0.02 kg/d, and have remained below 0.01 kg/d since 2010.

The SVE system efficiency remains relatively high for the removal of TPH from the vadose zone. However, the system no longer effectively removes chlorinated solvents. Mass removal rates for TPH remained above 10 kg/d during 2012 and 2013, but removal rates for chlorinated VOCs were below 0.004 kg/d during that same period. The implementation of a winter seasonal downtime has not significantly affected overall efficiency, and has resulted in reduced operational cost and condensate liquid waste generation.

3.3 Soil Vapor Extraction System Optimization

The remediation strategy at SWMU ST-70 has been optimized by converting the ICM from bioventing to SVE, by increasing the number of extraction wells from one to three, and by instituting pulsed operations with a winter shutdown period. The SVE system continues to achieve relatively high rates of TPH contaminant mass removal. However, the rated of chlorinated solvent mass removal is minimal.

Initial SVE operations at SWMU ST-70 began with pilot-scale testing in 2003, 2006, and 2007. During that period, only well ST-219-28H was used as an extraction well. The Ametek Rotron Model #DR 523 regenerative blower was used from the previous bioventing ICM, and the system was converted to an extraction system from an air injection system.

In 2007 and 2008, wells KAFB-7002 and KAFB-7003 were added to the SVE system and the plumbing was reconfigured to allow for flow control and monitoring from each extraction well. The location and depths of wells KAFB-7002 and KAFB-7003 were chosen to facilitate extraction from the deeper vadose zone and to prevent additional disturbance to the active aircraft tarmac area. Neither well is ideally located or screened to remove of high concentrations of chlorinated solvent contaminant mass. Subsequent to these changes, the SVE system was put into full-time operation.

Pulsed operations began in 2012 as part of a rebound study and continued in 2013 with a scheduled winter shutdown. System performance monitoring data indicates that the ICM continues to operate as designed to remove contaminant mass and inhibit downward migration of contaminants (USAF, 2012a; USAF, 2013).

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4.0 RECOMMENDATIONS FOR SITE CHARACTERIZATION AND CORRECTIVE MEASURE OPTIMIZATION

This section makes recommendations for additional site characterization and SVE system optimization at SWMU ST-70. These recommendations are made for long-term planning purposes and to address the NMED request for additional site characterization (Appendix D).

4.1 Data Gaps

There are data gaps associated with the soil, soil vapor, and groundwater media at SWMU ST-70 due to changing site conditions.

Soil Data Gaps: The current extent of soil contamination is unknown. Soil sample data were collected between 1992 and 1999. Since that time, the ICMs are believed to have had a significant effect on the levels of soil contamination and contaminant migration. These soil data gaps are noted in the NMED request for a site characterization work plan (Appendix D).

Soil Vapor Data Gaps: The current vertical extent of soil vapor contamination in the OWS and area drain locations are no longer adequately monitored by the existing monitoring network. Several soil vapor monitoring points have failed and need to be replaced to adequately monitor remediation progress.

Groundwater Data Gaps: Changes have occurred in the regional groundwater flow direction and water table elevation as a result of decreasing groundwater withdrawals by the Albuquerque Bernalillo County Water Utility Authority. Additional groundwater investigation may be warranted to define the local groundwater flow direction and gradient as well as the extent of chlorinated VOC contamination. This groundwater data gap is noted in the NMED request for a site characterization work plan (Appendix D).

4.2 Recommendations for Interim Corrective Measure Optimization

In order to address the above data gaps and to comply with NMED requirements for additional site characterization, the following recommendations are proposed:

- A limited soil investigation is proposed to define the extent of fuel- and chlorinated-solvent-related contamination. The focus of the investigation should be the current lateral and vertical extent of soil contamination adjacent to the OWS and area drain. The data from the additional characterization should be used to guide future remediation strategies.

- Installation of additional vapor monitoring wells is recommended to facilitate monitoring of the remediation. Vapor monitoring well placement should be based on soil screening data collected during soil boring installation and sampling.

- A limited groundwater investigation is recommended to define the extent of groundwater TCE contamination. Installation of additional monitoring wells is recommended to address this data gap.

- Installation of one or more additional SVE wells and connection to the SVE system is recommended to facilitate more rapid removal contaminants from the vadose zone. The locations and depths of the new SVE wells should be optimized for chlorinated solvent removal from the

vadose zone. Additional contaminant source removal by excavation should be considered as a potential remedial alternative.

It is recognized that the recommendations proposed above would require additional funding that is not currently available. Therefore, these are considered long-term recommendations and are not intended to be implemented in fiscal year (FY) 2014.

4.3 Exit Strategy

The current exit strategy for SWMU ST-70 is the achievement of clean closure through the use of ICMs. In order to achieve clean closure for the site, soil and groundwater media need to have contaminant concentrations reduced below current regulatory screening levels. Monitoring data indicate the high concentrations of contaminants remain in the vadose zone near the former OWS and area drain source areas, despite SVE operation from 2008 to 2013. Additional corrective actions and site characterization are necessary to achieve clean closure of the site. More aggressive source area remedial actions, such as soil excavation and offsite disposal, along with the installation of additional vapor extraction wells for the SVE system should be considered to remove contaminant mass from the site.

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APPENDIX A

Historic Vapor Monitoring Data

Appendix A. Soil Vapor Sampling Results at SWMU ST-70
2008 to 2013

Chemical Class & Analytical Method	Location	Combined Inlet								
	Sample ID	ST70-AR-INLET-240413	ST70-AR-INLET-160113	ST70-AR-Inlet-121012	ST70-AR-Inlet-230812	ST70-AR-Inlet-130412	ST70-AR-Inlet-030112	ST219-AR-INLET-161111	ST70-AR-Inlet-28092011	ST219-AR-INLET-21042011
	Sample Date	04/24/13	01/16/13	10/12/12	08/23/12	04/13/12	01/03/12	11/16/11	09/28/11	04/21/11
	Analyte Screen Depth	not applicable								
VOCs (ppbv) Method TO-15[a]	1,1,1-Trichloroethane	< 3.09	< 0.24	< 4.02	< 3.12	<1.83	4.03 J	< 3.2	< 8.25	2.72 J
	1,1,2,2-Tetrachloroethane	< 3.09	< 0.24	< 4.02	< 3.12	<1.83	297	< 3.2	< 8.25	<0.65
	1,1,2-Trichloroethane	< 3.09	< 0.24	< 4.02	< 3.12	<1.83	<3.8	< 3.2	< 8.25	<1.09
	1,1,2-Trichloro-1,2,2-trifluoroethane	< 3.09	< 0.24	< 4.02	< 3.12	<1.83	<3.8	< 3.2	< 8.25	<2.7
	1,1-Dichloroethane	< 3.09	< 0.24	< 4.02	< 3.12	<1.83	<3.8	< 3.2	< 8.25	<1.2
	1,1-Dichloroethene	6.25J	< 0.24	13.7	< 3.12	<1.83	15.7	9.68 J	19.6 J	12.5
	1,2,4-Trichlorobenzene	< 3.09	< 0.24	< 4.02	< 3.12	<1.83	<3.8	< 3.2	< 8.25	<1.34
	1,2,4-Trimethylbenzene	34.9	4.17	226	< 3.12	10.8	154	203	357	49.6
	1,2-Dichloroethane (EDC)	< 3.09	0.31J	< 4.02	< 3.12	<1.83	<3.8	< 3.2	< 8.25	<1.25
	1,2-Dichlorobenzene	< 3.09	< 0.24	< 4.02	< 3.12	<1.83	<3.8	< 3.2	< 8.25	<1.21
	1,2-Dichloro-1,1,2,2-tetrafluoroethane	< 3.09	< 0.24	< 4.02	< 3.12	<1.83	<3.8	< 3.2	< 8.25	<1.27
	1,2-Dichloropropane	< 3.09	38.7	< 4.02	< 3.12	<1.83	<3.8	< 3.2	< 8.25	<1.14
	1,2-Dibromoethane (EDB)	< 3.09	< 0.24	< 4.02	< 3.12	<1.83	<3.8	< 3.2	< 8.25	<0.9
	1,3,5-Trimethylbenzene	53.2	3.48	229	5.68 J	7.9	186	204	363	25.6
	1,3-Dichlorobenzene	< 3.09	< 0.24	< 4.02	< 3.12	<1.83	<3.8	< 3.2	< 8.25	<0.99
	1,4-Dichlorobenzene	< 3.09	< 0.24	< 4.02	< 3.12	<1.83	<3.8	< 3.2	< 8.25	<1.28
	Acetone	17.1J	79.8	32.7	< 3.12	13.5	27.4	15.1 J	< 54.9	379
	Benzene	< 3.09	0.53J	< 4.02	< 3.12	3.25 J	36.1	22.4	98.6	12.7
	Bromomethane	< 3.09	0.85	< 4.02	< 3.12	<1.83	<3.8	< 3.2	< 8.25	1.2 J
	Carbon tetrachloride	4.03J	< 0.24	5.2 J	< 3.12	<1.83	5.26 J	< 3.2	< 8.25	5.84 J
	Chlorobenzene	< 3.09	< 0.24	< 4.02	< 3.12	<1.83	<3.8	< 3.2	< 8.25	<0.65
	Chloroethane	< 3.09	0.35J	< 4.02	< 3.12	<1.83	<3.8	< 3.2	< 8.25	<0.77
	Chloroform	5.65J	0.61J	11.6 J	6.03 J	8.24	15.3	8.32 J	16.8 J	12.4
	Chloromethane	< 3.09	3.03	< 4.02	< 3.12	<1.83	<3.8	< 3.2	< 8.25	<0.47
	cis-1,2-Dichloroethene	51.8	1.8	118	63	54.1	183	117	216	194
	cis-1,3-Dichloropropene	< 3.09	< 0.24	< 4.02	< 3.12	<1.83	<3.8	< 3.2	< 8.25	<0.62
	Dichlorodifluoromethane	< 3.09	0.37J	< 4.02	< 3.12	<1.83	<3.8	< 3.2	< 8.25	<0.38
	Ethylbenzene	< 3.09	0.27J	6.6 J	< 3.12	<1.83	<3.8	< 3.2	< 8.25	6.58 J
	Hexachlorobutadiene	< 3.09	< 0.24	< 4.02	< 3.12	<1.83	<3.8	< 3.2	< 8.25	<1.88
	m,p-Xylene	6.55J	1.17J	31.3	< 6.24	<3.66	24.7 J	25.2	39 J	80.3
	MEK (2-Butanone)	< 3.09	8.4	< 4.02	< 3.12	3.57 J	<3.8	< 3.2	< 8.25	76.9
	Methylene chloride	< 3.09	0.49J	4.13 J	< 3.37	<1.83	<3.8	< 3.2	< 8.25	<1.95
	MTBE (Methyl tert-butyl ether)	< 3.09	< 0.24	< 4.02	< 3.12	<1.83	<3.8	< 3.2	< 8.25	<0.59
	o-Xylene	< 3.09	< 0.24	< 4.02	< 3.12	<1.83	<3.8	< 3.2	< 8.25	44.7
	Styrene	< 3.09	< 0.24	< 4.02	< 3.12	<1.83	<3.8	< 3.2	< 8.25	<0.94
	TCE (Trichloroethene)	234	12.6	422	209	219	516	346	624	529
	PCE (Tetrachloroethene)	167	103	345	183	287	422	455	727	107
	Toluene	< 3.09	0.72J	< 4.02	< 3.12	<1.83	<3.8	< 3.2	< 8.25	23.7
	trans-1,3-Dichloropropene	< 3.09	< 0.24	< 4.02	< 3.12	<1.83	<3.8	< 3.2	< 8.25	<0.49
	Trichlorofluoromethane	< 3.09	< 0.24	< 4.02	< 3.12	<1.83	<3.8	< 3.2	< 8.25	3.18 J
	Vinyl chloride	< 3.09	< 0.24	< 4.02	< 3.12	<1.83	<3.8	< 3.2	< 8.25	<0.55
SW8015M[b] (µg/L)	Gasoline Range Organics (GRO)	666	96.6	939	585	449	684	822	818	462
Fixed Gases (%) Method SM2720C[c]	Carbon Dioxide	1.74	0.71J	1.4	5.12	9.61	3.08	2.46	2.58	2.55
	Carbon Monoxide	< 0.14	< 0.13	<0.15	< 0.14	<0.15	<0.14	< 0.15	< 0.12	<0.13
	Methane	< 0.14	< 0.13	<0.15	< 0.14	<0.15	<0.14	< 0.15	< 0.11	<0.11
	Nitrogen	74.6	75	131 UR	76.2	77.3	74.6	75.1	77.5	78.4
	Oxygen	23.7	24.3	15.7	18.7	13.1	22.3	22.4	19.9	19.1

Appendix A. Soil Vapor Sampling Results at SWMU ST-70
2008 to 2013

Chemical Class & Analytical Method	Location	Combined Inlet							
	Sample ID	ST70-AR-Inlet-18012011	ST219-AR-INLET-12112010	ST219-AR-Inlet-17092010	ST219-AR-Inlet-101109	ST219-AR-Inlet-070809	ST219-AR-Inlet-14032009	ST219-AR-InletD-14032009 (Duplicate)	ST219-AR-Inlet-10072008
	Sample Date	01/18/11	11/12/10	09/17/10	11/10/09	08/07/09	03/14/09	03/14/09	07/10/08
	Analyte Screen Depth	not applicable							
VOCs (ppbv) Method TO-15[a]	1,1,1-Trichloroethane	55.3	3.15 J	4.38 J	6.04	< 0.62	2.67 U	2.14 J	3.42 U
	1,1,2,2-Tetrachloroethane	<0.48	<3.31	<2.57	< 5.4	< 1.44	3.55 U	0.47 U	278
	1,1,2-Trichloroethane	1.2 J	<1.79	<4.31	ND	ND	ND	ND	ND
	1,1,2-Trichloro-1,2,2-trifluoroethane	4.99 J	3.28 J	<3.94	26.4	2.92 J	5.65 J	5.33 J	2.45 U
	1,1-Dichloroethane	34.4	<1.34	<4.76	2.64 J	1.56 J	2.86 J	2.39 J	3.27 U
	1,1-Dichloroethene	20.6	18.4	29.2	15.8	12.1	2.13 U	1.91 J	5.07 J
	1,2,4-Trichlorobenzene	<0.99	<1.54	<5.31	ND	ND	ND	ND	ND
	1,2,4-Trimethylbenzene	41.2	99.4	334	203	94.2	7.89 J	3.04 J	67
	1,2-Dichloroethane (EDC)	2.85 J	<1.27	<4.94	ND	ND	ND	ND	ND
	1,2-Dichlorobenzene	<0.9	<2.1	<4.8	ND	ND	ND	ND	ND
	1,2-Dichloro-1,1,2,2-tetrafluoroethane	<0.94	<1.5	<5.02	ND	ND	ND	ND	ND
	1,2-Dichloropropane	<0.85	<1.16	<4.53	ND	ND	ND	ND	ND
	1,2-Dibromoethane (EDB)	<0.67	<1.46	<3.56	ND	ND	ND	ND	ND
	1,3,5-Trimethylbenzene	45.1	130	331	252	127	6.67 J	3.02 J	158
	1,3-Dichlorobenzene	<0.74	<2.18	<3.94	ND	ND	ND	ND	ND
	1,4-Dichlorobenzene	<0.95	<2.07	<5.09	ND	ND	ND	ND	ND
	Acetone	7.26 J	207	36.8 J	30.8	39.4	16.5 J	8.94 J	72.3
	Benzene	6	23.5	33.3 B	< 5.4	5.9 J	3.04 J	2.71 J	8.49 J
	Bromomethane	<0.34	<1.84	<1.8	ND	ND	ND	ND	ND
	Carbon tetrachloride	7.47	7.45 J	9.33 J	9.74	7.71	8.42 J	8.69 J	6.33 J
	Chlorobenzene	<0.48	<1.51	12 J	< 5.4	< 1	2.87 U	1.87 J	4.59 U
	Chloroethane	<0.57	<2.41	<3.05	ND	ND	ND	ND	ND
	Chloroform	14.4	17	24.7 J	18.9	22.3	19.3 J	16.1	24.6
	Chloromethane	1.03 J	<1.6	<1.87	5.39 J	1.9 J	2.45 U	2.68 U	2.31 U
	cis-1,2-Dichloroethene	103	254	491	262	318	384	373	777
	cis-1,3-Dichloropropene	<0.46	<1.63	<2.46	ND	ND	ND	ND	ND
	Dichlorodifluoromethane	0.57 J	<1.84	<1.51	< 5.4	< 7	2.35 U	0.49 J	1.77 U
	Ethylbenzene	2.12 J	14.7	<3.33	14.8	< 0.75	1.99 U	1.75 U	4.9 U
	Hexachlorobutadiene	<0.73	<1.95	<3.89	ND	ND	ND	ND	ND
	m,p-Xylene	6.28	47.5	36.5	19.9	11.6	5.46 U	5.45 U	9.65 U
	MEK (2-Butanone)	5.24 J	65.1	<2.75	21.4	< 0.91	2.01 U	7.12 J	20.8
	Methylene chloride	268	2.36 J	7.91 J	< 27	< 34.8	5.23 J	4.75 J	8.81 J
	MTBE (Methyl tert-butyl ether)	<0.44	<2.33	<4.07	< 10.8	< 1.21	1.91 U	1.26 U	3.43 U
	o-Xylene	7.42	12.7	5.49 J	< 5.4	< 1.67	2.45 U	2.52 U	5.3 U
	Styrene	<0.7	<1.82	<3.73	ND	ND	ND	ND	ND
	TCE (Trichloroethene)	458	567	934	647	1010	1100	921	1,430
	PCE (Tetrachloroethene)	258	607	1,170	781	774	584	413	953
	Toluene	16.8	151	6.68 J	< 5.4	< 2.09	4.47 U	1.23 U	5.2 U
	trans-1,3-Dichloropropene	<0.36	<1.71	<1.94	ND	ND	ND	ND	ND
	Trichlorofluoromethane	2.63 J	3.13 J	9.96 J	22	2.91 J	3.75 J	4.1 J	2.29 U
	Vinyl chloride	<0.41	<1.31	<2.17	< 5.4	< 2.5	2.42 U	1.17 U	3.66 U
SW8015M[b] (µg/L)	Gasoline Range Organics (GRO)	244	798	754	< 54	400	124	58.8	595
Fixed Gases (%) Method SM2720C[c]	Carbon Dioxide	1.39	2.18	2.36	2.81	2.08	4.61	5.15	2.64
	Carbon Monoxide	<0.12	<0.12	<0.06	< 0.08	< 0.07	0.08 U	0.08 U	0.08 U
	Methane	<0.11	<0.11	<0.05	< 0.08	< 0.07	0.08 U	0.08 U	0.09 U
	Nitrogen	65	78.1	77.8	88.1	68.6	83.9	75.2	87.7
	Oxygen	16.6	19.7	19.8	24.7	17.2	15.7	12.6	19.5

Appendix A. Soil Vapor Sampling Results at SWMU ST-70
2008 to 2013

Chemical Class & Analytical Method	Location	219-28H								
	Sample ID	ST70-AR-28H-240413	ST70-AR-28H-160113	ST219-AR-28H-121012	ST219-AR-28H-230812	ST219-AR-28H-130412	ST219-AR-28H-030112	ST219-AR-28H-161111	ST219-AR-28H-28092011	ST219-AR-28H-21042011
	Sample Date	04/24/13	01/16/13	10/12/12	08/23/12	04/13/12	01/03/12	11/16/11	09/28/11	04/21/11
	Analyte Screen Depth	10-35 / 50-90								
VOCs (ppbv)	1,1,1-Trichloroethane	< 3.15	< 0.6	< 1.53	< 3.21	<1.34	<0.56	< 3.08	< 8.18	109
Method TO-15[a]	1,1,2,2-Tetrachloroethane	< 3.15	< 0.6	< 1.53	< 3.21	<1.34	<0.56	< 3.08	< 8.18	<1.34
	1,1,2-Trichloroethane	< 3.15	< 0.6	< 1.53	< 3.21	<1.34	<0.56	< 3.08	< 8.18	<2.24
	1,1,2-Trichloro-1,2,2-trifluoroethane	< 3.15	< 0.6	1.76 J	< 3.21	<1.34	<0.56	< 3.08	< 8.18	<6.96
	1,1-Dichloroethane	< 3.15	< 0.6	< 1.53	< 3.21	<1.34	<0.56	< 3.08	< 8.18	33.4
	1,1-Dichloroethene	7.56J	< 0.6	13.4	< 3.21	<1.34	<0.56	12.6	26.6 J	32.8
	1,2,4-Trichlorobenzene	< 3.15	< 0.6	< 1.53	< 3.21	<1.34	<0.56	< 3.08	< 8.18	<2.76
	1,2,4-Trimethylbenzene	44.1	4.2	203	4.24 J	6.5	1.12 J	210	474	53
	1,2-Dichloroethane (EDC)	< 3.15	< 0.6	< 1.53	< 3.21	<1.34	<0.56	< 3.08	< 8.18	<2.57
	1,2-Dichlorobenzene	< 3.15	< 0.6	< 1.53	< 3.21	<1.34	<0.56	< 3.08	< 8.18	<2.5
	1,2-Dichloro-1,1,2,2-tetrafluoroethane	< 3.15	< 0.6	< 1.53	< 3.21	<1.34	<0.56	< 3.08	< 8.18	<2.61
	1,2-Dichloropropane	< 3.15	< 0.6	< 1.53	< 3.21	<1.34	<0.56	< 3.08	< 8.18	7.49 J
	1,2-Dibromoethane (EDB)	< 3.15	< 0.6	< 1.53	< 3.21	<1.34	<0.56	< 3.08	< 8.18	<1.85
	1,3,5-Trimethylbenzene	70.8	3.6	191	6.68 J	5.08	0.74 J	231	548	67
	1,3-Dichlorobenzene	< 3.15	< 0.6	< 1.53	< 3.21	<1.34	<0.56	< 3.08	< 8.18	<2.05
	1,4-Dichlorobenzene	< 3.15	< 0.6	< 1.53	< 3.21	<1.34	<0.56	< 3.08	< 8.18	<2.64
	Acetone	115	8.86	14	24.1	31	84.4	16.7 J	< 44.9	<96
	Benzene	< 3.15	0.66J	2.37 J	< 3.21	2.77 J	3.9	26.5	77.3	24.4
	Bromomethane	< 3.15	< 0.6	< 1.53	< 3.21	1.35 J	<0.56	< 3.08	< 8.18	2.95 J
	Carbon tetrachloride	< 3.15	< 0.6	3.2 J	< 3.21	<1.34	<0.56	< 3.08	< 8.18	6.43 J
	Chlorobenzene	< 3.15	< 0.6	< 1.53	< 3.21	<1.34	<0.56	< 3.08	< 8.18	<1.34
	Chloroethane	< 3.15	< 0.6	< 1.53	< 3.21	<1.34	<0.56	< 3.08	< 8.18	<1.59
	Chloroform	5.85J	< 0.6	10.3	6.06 J	9.88	<0.56	8.5 J	16.2 J	15.7
	Chloromethane	< 3.15	< 0.6	< 1.53	< 3.21	2.25 J	1.34 J	< 3.08	< 8.18	<0.97
	cis-1,2-Dichloroethene	82.4	1.9J	130	67	65.3	0.75 J	158	326	315
	cis-1,3-Dichloropropene	< 3.15	< 0.6	< 1.53	< 3.21	<1.34	<0.56	< 3.08	< 8.18	<1.28
	Dichlorodifluoromethane	< 3.15	< 0.6	< 1.53	< 3.21	<1.34	<0.56	< 3.08	< 8.18	<0.79
	Ethylbenzene	< 3.15	< 0.6	5.59	< 3.21	<1.34	1.02 J	4.92 J	9.23 J	10.7 J
	Hexachlorobutadiene	< 3.15	< 0.6	< 1.53	< 3.21	<1.34	<0.56	< 3.08	< 8.18	<4.36
	m,p-Xylene	8.15J	< 1.19	31	< 6.42	<2.69	3.09 J	27.7	46.6 J	28.5
	MEK (2-Butanone)	< 3.15	3.8J	4.46 J	< 3.21	7.43 J	4.06	< 3.08	< 8.18	105
	Methylene chloride	< 3.15	< 0.6	1.88 J	< 3.32	1.5 J	1.67 J	< 3.08	< 8.18	196
	MTBE (Methyl tert-butyl ether)	< 3.15	< 0.6	< 1.53	< 3.21	<1.34	<0.56	< 3.08	< 8.18	<1.22
	o-Xylene	< 3.15	< 0.6	< 1.53	< 3.21	<1.34	1.06 J	< 3.08	< 8.18	18.1
	Styrene	< 3.15	< 0.6	< 1.53	< 3.21	<1.34	0.63 J	< 3.08	< 8.18	<1.94
	TCE (Trichloroethene)	231	13.8	399	210	250	1.74 J	368	690	772
	PCE (Tetrachloroethene)	223	131	401	200	313	1.16 J	567	1,130	266
	Toluene	< 3.15	0.7J	< 1.53	< 3.21	<1.34	22	< 3.08	< 8.18	296
	trans-1,3-Dichloropropene	< 3.15	< 0.6	< 1.53	< 3.21	<1.34	<0.56	< 3.08	< 8.18	<1.01
	Trichlorofluoromethane	< 3.15	< 0.6	2 J	< 3.21	1.4 J	<0.56	< 3.08	< 8.18	5.63 J
	Vinyl chloride	< 3.15	< 0.6	< 1.53	< 3.21	<1.34	<0.56	< 3.08	< 8.18	<1.13
SW8015M[b] (µg/L)	Gasoline Range Organics (GRO)	946	110	1,010	524	534	<15	998	1,280	1,020
Fixed Gases (%)	Carbon Dioxide	2.6	0.79J	1.9	5.11	8.52	0.19 J	3.38	3.28	3.65
Method SM2720C[c]	Carbon Monoxide	< 0.15	< 0.14	<0.15	< 0.15	<0.16	<0.13	< 0.14	< 0.13	<0.13
	Methane	< 0.15	< 0.14	<0.15	< 0.15	<0.16	<0.13	< 0.14	< 0.12	<0.12
	Nitrogen	74.5	75	129 UR	76.2	76.8	74.2	75	77.5	78.5
	Oxygen	22.9	24.2	16	18.7	14.6	25.6	21.6	19.2	17.8

Appendix A. Soil Vapor Sampling Results at SWMU ST-70
2008 to 2013

Chemical Class & Analytical Method	Location	219-28H								
	Sample ID	ST219-AR-28H-18012011	ST219-AR-28H-12112010	ST219-AR-28H-17092010	ST219-AR-28H-17022010	ST219-AR-28H-101109	ST219-AR-28H-070809	ST219-AR-28H-140309	ST219-AR-28HD-140309 (Duplicate)	ST219-AR-219-28H-10072008
	Sample Date	01/18/11	11/12/10	09/17/10	02/17/10	11/10/09	08/07/09	03/14/09	03/14/09	07/10/08
	Analyte Screen Depth	10-35 / 50-90								
VOCs (ppbv) Method TO-15[a]	1,1,1-Trichloroethane	65.7	<0.15	0.42 J	< 6.4	9.61	< 0.64	2.31 J	2.62 U	5.21 U
	1,1,2,2-Tetrachloroethane	<0.63	<0.38	<0.1	< 6.4	< 0.72	< 1.49	0.54 U	3.49 U	246
	1,1,2-Trichloroethane	<1.05	<0.21	<0.17	< 6.4	ND	ND	ND	ND	ND
	1,1,2-Trichloro-1,2,2-trifluoroethane	10.1	0.32 J	0.28 J	< 6.4	32	2.77 J	5.59 J	6.63 J	3.73 U
	1,1-Dichloroethane	14.7	<0.15	<0.19	< 6.4	3.41 J	1.34 J	2.43 J	3.77 J	4.98 U
	1,1-Dichloroethene	29.7	<0.3	0.36 J	< 6.4	17.1	11.1	2.12 J	2.18 J	3.68 U
	1,2,4-Trichlorobenzene	<1.29	<0.18	<0.21	< 6.4	ND	ND	ND	ND	ND
	1,2,4-Trimethylbenzene	109	9.49	74.6	8.65	200	102	6.29 J	8 J	60.6
	1,2-Dichloroethane (EDC)	<1.2	<0.15	<0.2	< 6.4	ND	ND	ND	ND	ND
	1,2-Dichlorobenzene	<1.17	<0.24	<0.19	< 6.4	ND	ND	ND	ND	ND
	1,2-Dichloro-1,1,2,2-tetrafluoroethane	<1.22	0.3 J	<0.2	< 6.4	ND	ND	ND	ND	ND
	1,2-Dichloropropane	<1.1	<0.13	<0.18	< 6.4	ND	ND	ND	ND	ND
	1,2-Dibromoethane (EDB)	<0.87	<0.17	<0.14	< 6.4	ND	ND	ND	ND	ND
	1,3,5-Trimethylbenzene	121	9.57	51.1	18.9	244	110	5.31 J	7.05 J	128
	1,3-Dichlorobenzene	<0.96	<0.25	<0.16	< 6.4	ND	ND	ND	ND	ND
	1,4-Dichlorobenzene	<1.24	<0.24	<0.21	< 6.4	ND	ND	ND	ND	ND
	Acetone	18	18.7	12.3	83.3	36	69.9	5.19 J	10.6 J	28
	Benzene	8.36	1.76	5.87	3.51 J	< 0.51	8.99	4.07 J	4.36 J	6.89 U
	Bromomethane	0.88 J	<0.21	0.25 J	1.24 J	ND	ND	ND	ND	ND
	Carbon tetrachloride	1.95 J	0.21 J	0.2 J	3.37 J	14.3	6.96 J	8.59 J	9.41 J	4.06 U
	Chlorobenzene	<0.63	<0.17	<0.1	< 6.4	< 0.47	< 1.03	0.33 U	2.82 U	6.98 U
	Chloroethane	<0.74	<0.28	<0.12	< 6.4	ND	ND	ND	ND	ND
	Chloroform	6.44 J	<0.41	0.3 J	17.3	22.2	19.5	16.1 J	22.9	9.67 J
	Chloromethane	1.06 J	1	0.75 J	< 6.4	< 0.45	3.08 J	3.09 U	2.41 U	3.51 U
	cis-1,2-Dichloroethene	160	2.54	8.87	75.4	273	285	444	503	464
	cis-1,3-Dichloropropene	<0.6	<0.19	<0.1	< 6.4	ND	ND	ND	ND	ND
	Dichlorodifluoromethane	0.56 J	0.78 J	0.57 J	< 6.4	1.03 J	< 7.2	0.6 J	2.31 U	2.69 U
	Ethylbenzene	2.98 J	1.02	3.03	< 6.4	16	< 0.77	2.02 U	1.95 U	7.46 U
	Hexachlorobutadiene	<0.94	<0.22	<0.16	< 6.4	ND	ND	ND	ND	ND
	m,p-Xylene	10.8	3.68	17.8	< 6.4	17.7	32.4	6.31 U	5.36 U	14.68 U
	MEK (2-Butanone)	6.88 J	7.62	1.84 J	24.6	27.1	< 0.93	1.37 U	1.98 U	8.97 J
	Methylene chloride	80.2	0.43 J	0.67 J	4.62 J	< 26.8	< 35.8	4.49 J	5.95 J	20.9 J
	MTBE (Methyl tert-butyl ether)	<0.57	<0.27	<0.16	< 12.7	< 0.76	< 1.24	1.46 U	1.87 U	5.22 U
	o-Xylene	<0.87	1.11	3.65	< 6.4	< 0.61	9.42	2.91 U	2.41 U	8.07 U
	Styrene	<0.91	<0.21	<0.15	< 6.4	ND	ND	ND	ND	ND
	TCE (Trichloroethene)	324	5.61	31	507	664	975	924	1310	1,010
	PCE (Tetrachloroethene)	492	12	30	73.3	791	782	521	839	1,270
	Toluene	3.96 J	5.91	18.8	1.55 J	2.07 J	4.05 J	1.43 U	4.39 U	7.91 U
	trans-1,3-Dichloropropene	<0.47	<0.2	<0.08	< 6.4	ND	ND	ND	ND	ND
	Trichlorofluoromethane	2.2 J	0.44 J	0.53 J	1.17 J	24	2.88 J	4.51 J	4.6 J	3.49 U
	Vinyl chloride	<0.53	0.2 J	<0.09	< 6.4	< 0.39	< 2.57	1.35 U	2.38 U	5.57 U
SW8015M[b] (µg/L)	Gasoline Range Organics (GRO)	457	26.1 J	161	263	< 53.5	415	209	220	1220
Fixed Gases (%) Method SM2720C[c]	Carbon Dioxide	1.25	<0.14	<0.07	1.2	2.6	2.43	5.81	5.81	4.33
	Carbon Monoxide	<0.13	<0.12	<0.06	< 0.5	< 0.07	< 0.08	0.08 U	0.08 U	0.08 U
	Methane	<0.11	<0.11	<0.05	< 0.5	< 0.08	< 0.08	0.08 U	0.08 U	0.09 U
	Nitrogen	69.4	77.9	78.2	77.7	80.8	68.1	74.3	74.9	95.2
	Oxygen	18.3	22.1	21.8	21.1	22.7	16.8	11.7	11.7	17.7

Appendix A. Soil Vapor Sampling Results at SWMU ST-70
2008 to 2013

Chemical Class & Analytical Method	Location	70-02								
	Sample ID	ST70-AR-7002-240413	ST70-AR-7002-160113	ST219-AR-7002-121012	ST219-AR-7002-230812	ST219-AR-7002-130412	ST219-AR-7002-030112	ST219-AR-7002-161111	ST219-AR-7002-28092011	ST219-AR-7002-21042011
	Sample Date	04/24/13	01/16/13	10/12/12	08/23/12	04/13/12	01/03/12	11/16/11	09/28/11	04/21/11
	Analyte Screen Depth	85-90								
VOCs (ppbv) Method TO-15[a]	1,1,1-Trichloroethane	< 1.27	< 0.24	< 0.62	< 1.29	<1.29	<0.87	< 0.82	< 0.64	2.5 J
	1,1,2,2-Tetrachloroethane	< 1.27	< 0.24	< 0.62	< 1.29	<1.29	<0.87	< 0.82	15.3	<0.35
	1,1,2-Trichloroethane	< 1.27	< 0.24	< 0.62	< 1.29	<1.29	<0.87	< 0.82	< 0.64	<0.58
	1,1,2-Trichloro-1,2,2-trifluoroethane	< 1.27	< 0.24	< 0.62	1.75 J	2.89 J	3.1	2.53 J	3.0	<3.53
	1,1-Dichloroethane	< 1.27	< 0.24	< 0.62	< 1.29	<1.29	<0.87	< 0.82	< 0.64	1.32 J
	1,1-Dichloroethene	< 1.27	< 0.24	< 0.62	< 1.29	<1.29	3.41	2.84	3.01	4.14
	1,2,4-Trichlorobenzene	< 1.27	< 0.24	< 0.62	< 1.29	<1.29	<0.87	< 0.82	< 0.64	<0.72
	1,2,4-Trimethylbenzene	4.18J	2.85	4.9	1.9 J	6.11	8.84	21.9	32.7	5.13
	1,2-Dichloroethane (EDC)	< 1.27	< 0.24	< 0.62	< 1.29	<1.29	<0.87	< 0.82	< 0.64	<0.67
	1,2-Dichlorobenzene	< 1.27	< 0.24	< 0.62	< 1.29	<1.29	<0.87	< 0.82	< 0.64	<0.65
	1,2-Dichloro-1,1,2,2-tetrafluoroethane	< 1.27	< 0.24	< 0.62	< 1.29	<1.29	<0.87	< 0.82	< 0.64	<0.68
	1,2-Dichloropropane	< 1.27	< 0.24	< 0.62	< 1.29	<1.29	<0.87	< 0.82	< 0.64	<0.61
	1,2-Dibromoethane (EDB)	< 1.27	< 0.24	< 0.62	< 1.29	<1.29	<0.87	< 0.82	< 0.64	<0.48
	1,3,5-Trimethylbenzene	4.17J	2.26	3.68	1.94 J	3.64 J	8.28	20.5	24.5	3.89
	1,3-Dichlorobenzene	< 1.27	< 0.24	< 0.62	< 1.29	<1.29	<0.87	< 0.82	< 0.64	<0.53
	1,4-Dichlorobenzene	< 1.27	< 0.24	< 0.62	< 1.29	<1.29	<0.87	< 0.82	< 0.64	<0.69
	Acetone	19.6	23.3	21	16.6	18	9.47	14.6	11.1	<8.45
	Benzene	< 1.27	0.56J	0.67 J	< 1.29	2.63 J	2.15 J	1.12 J	1.67 J	4.1
	Bromomethane	< 1.27	< 0.24	< 0.62	< 1.29	<1.29	<0.87	< 0.82	< 0.64	<0.24
	Carbon tetrachloride	< 1.27	< 0.24	1.07 J	2.97 J	4.18 J	12.8	10.6	12.9	9.48
	Chlorobenzene	< 1.27	< 0.24	< 0.62	< 1.29	<1.29	<0.87	< 0.82	< 0.64	<0.35
	Chloroethane	< 1.27	1.27	< 0.62	< 1.29	<1.29	<0.87	< 0.82	< 0.64	<0.41
	Chloroform	7.3	< 0.24	11	12.8	16.3	9.03	7.64	9.05	6.98
	Chloromethane	< 1.27	0.91	0.64 J	< 1.29	<1.29	<0.87	< 0.82	< 0.64	<0.25
	cis-1,2-Dichloroethene	9.78	< 0.24	8	14	19.5	6.54	6.77	8.62	6.12
	cis-1,3-Dichloropropene	< 1.27	< 0.24	< 0.62	< 1.29	<1.29	<0.87	< 0.82	< 0.64	<0.33
	Dichlorodifluoromethane	< 1.27	0.36J	< 0.62	< 1.29	<1.29	<0.87	< 0.82	< 0.64	<0.2
	Ethylbenzene	< 1.27	< 0.24	< 0.62	< 1.29	<1.29	<0.87	< 0.82	< 0.64	<0.45
	Hexachlorobutadiene	< 1.27	< 0.24	< 0.62	< 1.29	<1.29	<0.87	< 0.82	< 0.64	<1
	m,p-Xylene	< 2.54	0.74J	< 1.25	< 2.58	<2.58	2.49 J	3.79 J	3.29 J	<0.93
	MEK (2-Butanone)	5.71J	12.6	3.96 J	2.06 J	4.14 J	<0.87	2.44 J	2.06 J	11.4
	Methylene chloride	< 1.27	0.32J	0.71 J	< 1.53	1.39 J	1.51 J	< 1.26	1.09 J	<8.45
	MTBE (Methyl tert-butyl ether)	< 1.27	< 0.24	< 0.62	< 1.29	<1.29	<0.87	< 0.82	< 0.64	<0.32
	o-Xylene	< 1.27	< 0.24	< 0.62	< 1.29	<1.29	<0.87	< 0.82	< 0.64	0.95 J
	Styrene	< 1.27	< 0.24	< 0.62	< 1.29	<1.29	<0.87	< 0.82	< 0.64	<0.5
	TCE (Trichloroethene)	138	1.14	213	408	557	365	332	352	286
	PCE (Tetrachloroethene)	15.1	1.07	13.3	23	43.4	8	13.1	15	9.26
	Toluene	< 1.27	0.62J	< 0.62	< 1.29	<1.29	<0.87	< 0.82	< 0.64	2.01 J
	trans-1,3-Dichloropropene	< 1.27	< 0.24	< 0.62	< 1.29	<1.29	<0.87	< 0.82	< 0.64	<0.26
	Trichlorofluoromethane	< 1.27	< 0.24	0.78 J	1.83 J	2.75 J	2.32 J	1.98 J	2.3	1.62 J
	Vinyl chloride	< 1.27	< 0.24	< 0.62	< 1.29	<1.29	<0.87	< 0.82	< 0.64	<0.29
SW8015M[b] (µg/L)	Gasoline Range Organics (GRO)	41.7J	< 20.9	< 41.4	71.8	<32.2	<41.5	85.5	87.5	<76
Fixed Gases (%) Method SM2720C[c]	Carbon Dioxide	0.9J	< 0.13	0.7	1.34	1.85	0.29 J	0.34 J	0.34 J	0.32 J
	Carbon Monoxide	< 0.15	< 0.13	< 0.15	< 0.15	<0.15	<0.15	< 0.14	< 0.13	<0.13
	Methane	< 0.15	< 0.13	< 0.15	< 0.15	<0.15	<0.15	< 0.14	< 0.11	<0.12
	Nitrogen	74.3	74.4	132 UR	74.6	75.8	75.2	75.9	78.2	78.2
	Oxygen	24.8	25.5	16.7	24	22.4	24.5	23.8	21.4	21.5

Appendix A. Soil Vapor Sampling Results at SWMU ST-70
2008 to 2013

Chemical Class & Analytical Method	Location	70-02							
	Sample ID	ST219-AR-7002-18012011	ST219-AR-7002-12112010	ST219-AR-7002-17092010	ST219-AR-7002-17022010	ST219-AR-7002-101109	ST219-AR-7002-070809	ST219-AR-7002-14032009	ST219-AR-7002-10072008
	Sample Date	01/18/11	11/12/10	09/17/10	02/17/10	11/10/09	08/07/09	03/14/09	07/10/08
	Analyte / Screen Depth	85-90							
VOCs (ppbv) Method TO-15[a]	1,1,1-Trichloroethane	0.77 J	<0.39	4.36 J	< 4.4	< 0.16	< 0.61	2.19 J	4.15 U
	1,1,2,2-Tetrachloroethane	<0.32	<0.96	<2.48	< 4.4	< 0.24	< 1.42	0.64 U	5.63 U
	1,1,2-Trichloroethane	<0.54	<0.52	<4.15	< 4.4	ND	ND	ND	ND
	1,1,2-Trichloro-1,2,2-trifluoroethane	1.09 J	0.88 J	4.31 J	0.66 J	< 0.17	3.17 J	2.1 J	2.97 U
	1,1-Dichloroethane	<0.6	<0.39	<4.58	< 4.4	< 0.21	1.45 J	0.59 J	3.96 U
	1,1-Dichloroethene	<0.7	<0.74	27	< 4.4	< 0.14	10.2	0.98 U	2.93 U
	1,2,4-Trichlorobenzene	<0.66	<0.44	<5.11	< 4.4	ND	ND	ND	ND
	1,2,4-Trimethylbenzene	11.2	22	293	4.49	146 J	46.6	2.91 U	6.34 U
	1,2-Dichloroethane (EDC)	<0.62	<0.37	<4.76	< 4.4	ND	ND	ND	ND
	1,2-Dichlorobenzene	<0.6	<0.61	<4.62	< 4.4	ND	ND	ND	ND
	1,2-Dichloro-1,1,2,2-tetrafluoroethane	<0.63	<0.43	<4.83	< 4.4	ND	ND	ND	ND
	1,2-Dichloropropane	<0.57	<0.33	<4.36	< 4.4	ND	ND	ND	ND
	1,2-Dibromoethane (EDB)	<0.45	3.09	<3.43	< 4.4	ND	ND	ND	ND
	1,3,5-Trimethylbenzene	9.6	9.84	287	2.68 J	150 J	51.6	3.33 U	6.45 U
	1,3-Dichlorobenzene	<0.49	<0.63	<3.79	< 4.4	ND	ND	ND	ND
	1,4-Dichlorobenzene	<0.64	<0.6	<4.9	< 4.4	ND	ND	ND	ND
	Acetone	39.8	28.4	80.6	8.07 J	77.1	45.2	9.39 J	19 J
	Benzene	4.35	85.8	37.9 B	2.75 J	1.37 J	40.5	2.34 J	5.49 U
	Bromomethane	0.55 J	2.19 J	<1.73	0.88 J	ND	ND	ND	ND
	Carbon tetrachloride	2.33 J	4.94	8.34 J	3.71 J	< 0.13	10.1	3.57 U	3.23 U
	Chlorobenzene	<0.32	<0.44	<2.48	< 4.4	< 0.16	< 0.99	0.39 U	5.56 U
	Chloroethane	<0.38	<0.69	<2.94	< 4.4	ND	ND	ND	ND
	Chloroform	14.6	24.6	22.4 J	20.4	0.94 J	21.4	14.2 J	22.1
	Chloromethane	0.7 J	1.72 J	<1.8	< 4.4	0.94 J	4.3 J	3.67 U	2.79 U
	cis-1,2-Dichloroethene	40.9	39.3	425	64	19.8	257	135	167
	cis-1,3-Dichloropropene	<0.31	<0.47	<2.37	< 4.4	ND	ND	ND	ND
	Dichlorodifluoromethane	0.52 J	1.1 J	<1.46	< 4.4	0.67 J	< 6.9	0.6 U	2.14 U
	Ethylbenzene	<0.42	53.2	8.76 J	< 4.4	1.38 J	< 0.74	2.4 U	5.94 U
	Hexachlorobutadiene	<0.49	<0.56	<3.74	< 4.4	ND	ND	ND	ND
	m,p-Xylene	2.45 J	118	44.6	< 4.4	6.81	10.5	7.48 U	11.69 U
	MEK (2-Butanone)	3.64 J	9.25	<2.65	5.4 J	24.2	< 0.89	1.62 U	6.39 J
	Methylene chloride	2.04 J	<0.49	12 J	3.85 J	< 8.9	< 34.3	16.6 J	4.91 J
	MTBE (Methyl tert-butyl ether)	<0.29	<0.67	<3.92	< 8.8	0.99 J	< 1.19	2.18 J	4.15 U
	o-Xylene	<0.45	27.6	9.09 J	< 4.4	0.64 J	< 1.65	3.45 U	6.42 U
	Styrene	<0.47	<0.52	<3.59	< 4.4	ND	ND	ND	ND
	TCE (Trichloroethene)	373	420	839	559	72.4	972	883	1,540
	PCE (Tetrachloroethene)	47	40.7	1,040	67.3	123	541	130	212
	Toluene	<0.57	163	44.4	0.93 J	4.01	< 2.06	1.69 U	6.3 U
	trans-1,3-Dichloropropene	<0.24	<0.49	<1.87	< 4.4	ND	ND	ND	ND
	Trichlorofluoromethane	1.35 J	1.43 J	9.39 J	1.28 J	< 0.09	2.88 J	1.64 J	2.78 U
	Vinyl chloride	<0.27	<0.38	<2.09	< 4.4	< 0.13	< 2.46	1.6 U	4.44 U
SW8015M[b] (µg/L)	Gasoline Range Organics (GRO)	57	17 J	778	8.17 J	291	163	10.6 J	ND
Fixed Gases (%) Method SM2720C[c]	Carbon Dioxide	1.4	1.29	1.61	1.28	< 0.06	1.91	1.57	1.63
	Carbon Monoxide	<0.13	<0.12	<0.06	< 0.5	< 0.08	< 0.07	0.08 U	0.08 U
	Methane	<0.12	<0.11	<0.05	< 0.5	< 0.08	< 0.07	0.08 U	0.09 U
	Nitrogen	63.1	77.6	76.8	77.9	88.6	71.7	75.6	91.1
	Oxygen	16.6	21.1	21.6	20.9	25.1	17.9	18.1	20.4

Appendix A. Soil Vapor Sampling Results at SWMU ST-70
2008 to 2013

Chemical Class & Analytical Method	Location	70-03								
	Sample ID	ST70-AR-7003-240413	ST70-AR-7003-160113	ST219-AR-7003-121012	ST219-AR-7003-230812	ST219-AR-7003-130412	ST219-AR-7003-030112	ST219-AR-7003-161111	ST219-AR-7003-28092011	ST219-AR-7003-21042011
	Sample Date	04/24/13	01/16/13	10/12/12	08/23/12	04/13/12	01/03/12	11/16/11	09/28/11	04/21/11
	Analyte Screen Depth	315-330								
VOCs (ppbv)	1,1,1-Trichloroethane	< 0.84	< 0.4	< 1.01	< 0.64	<0.51	<0.93	< 1.22	< 0.68	0.6 J
Method TO-15[a]	1,1,2,2-Tetrachloroethane	< 0.84	< 0.4	< 1.01	< 0.64	<0.51	9.19	< 1.22	< 0.68	<0.34
	1,1,2-Trichloroethane	< 0.84	0.85J	< 1.01	< 0.64	<0.51	<0.93	< 1.22	< 0.68	<0.57
	1,1,2-Trichloro-1,2,2-trifluoroethane	3.73	< 0.4	2.61 J	1.89 J	2.01	<0.93	< 1.22	0.72 J	<0.7
	1,1-Dichloroethane	< 0.84	< 0.4	< 1.01	< 0.64	<0.51	<0.93	< 1.22	< 0.68	<0.63
	1,1-Dichloroethene	3.69	< 0.4	2.96 J	1.77 J	2.04	<0.93	< 1.22	< 0.68	<0.74
	1,2,4-Trichlorobenzene	4.84	< 0.4	< 1.01	< 0.64	<0.51	<0.93	< 1.22	< 0.68	<0.7
	1,2,4-Trimethylbenzene	3.56	1.41	4.4	2.45	3.66	8.49	12.1	21.1	3.42 J
	1,2-Dichloroethane (EDC)	< 0.84	< 0.4	< 1.01	< 0.64	<0.51	<0.93	< 1.22	< 0.68	<0.65
	1,2-Dichlorobenzene	< 0.84	< 0.4	< 1.01	< 0.64	<0.51	<0.93	< 1.22	< 0.68	<0.63
	1,2-Dichloro-1,1,2,2-tetrafluoroethane	< 0.84	< 0.4	< 1.01	< 0.64	<0.51	<0.93	< 1.22	< 0.68	<0.66
	1,2-Dichloropropane	< 0.84	< 0.4	< 1.01	< 0.64	<0.51	<0.93	< 1.22	< 0.68	<0.6
	1,2-Dibromoethane (EDB)	< 0.84	< 0.4	< 1.01	< 0.64	<0.51	<0.93	< 1.22	< 0.68	<0.47
	1,3,5-Trimethylbenzene	3.4	1.01J	3.17 J	2.29	2.25	7.61	11.3	14.8	2.05 J
	1,3-Dichlorobenzene	< 0.84	< 0.4	< 1.01	< 0.64	<0.51	<0.93	< 1.22	< 0.68	<0.52
	1,4-Dichlorobenzene	1.48J	< 0.4	< 1.01	< 0.64	<0.51	<0.93	< 1.22	< 0.68	<0.67
	Acetone	28	29.5	8.36	8.98	36	26.4	8.66	7.15	44
	Benzene	1.69J	0.54J	3.1 J	0.65 J	1.3 J	2 J	< 1.22	1.54 J	4.63
	Bromomethane	0.95J	< 0.4	< 1.01	< 0.64	<0.51	<0.93	< 1.22	< 0.68	0.35 J
	Carbon tetrachloride	14.4J	< 0.4	11	6.92	8.33	1.51 J	2.14 J	2.23 J	1.59 J
	Chlorobenzene	< 0.84	< 0.4	< 1.01	< 0.64	<0.51	<0.93	< 1.22	< 0.68	<0.34
	Chloroethane	< 0.84	< 0.4	< 1.01	< 0.64	<0.51	<0.93	< 1.22	< 0.68	<0.4
	Chloroform	7.56	< 0.4	7.48	5.82	6.36	17.5	14.9	17.7	10.9
	Chloromethane	1.43J	0.56J	< 1.01	< 0.64	0.71 J	<0.93	< 1.22	< 0.68	<0.25
	cis-1,2-Dichloroethene	5.93	< 0.4	6.04	8.15	4.29	13.2	15	16.9	21.8
	cis-1,3-Dichloropropene	< 0.84	< 0.4	< 1.01	< 0.64	<0.51	<0.93	< 1.22	< 0.68	<0.32
	Dichlorodifluoromethane	0.89J	< 0.4	< 1.01	< 0.64	<0.51	<0.93	< 1.22	< 0.68	<0.2
	Ethylbenzene	< 0.84	< 0.4	< 1.01	< 0.64	<0.51	<0.93	< 1.22	< 0.68	0.66 J
	Hexachlorobutadiene	< 0.84	< 0.4	< 1.01	< 0.64	<0.51	<0.93	< 1.22	< 0.68	<0.97
	m,p-Xylene	< 1.68	0.94J	< 2.02	1.37 J	<1.03	2.29 J	2.79 J	2.4 J	<0.91
	MEK (2-Butanone)	5.23J	19.7	< 1.01	< 0.64	4.97	4.56 J	< 1.22	1.64 J	78.1
	Methylene chloride	1.46J	0.45J	1.45 J	< 1.37	1.05 J	1.32 J	< 1.34	< 0.68	<0.97
	MTBE (Methyl tert-butyl ether)	< 0.84	< 0.4	< 1.01	< 0.64	<0.51	<0.93	< 1.22	< 0.68	<0.31
	o-Xylene	< 0.84	< 0.4	< 1.01	< 0.64	<0.51	<0.93	< 1.22	< 0.68	<0.47
	Styrene	< 0.84	< 0.4	< 1.01	< 0.64	<0.51	<0.93	< 1.22	< 0.68	3.15 J
	TCE (Trichloroethene)	283	0.55J	330	255	200	187	391	338	298
	PCE (Tetrachloroethene)	10.7	1.45	4.26	19	3.86	22.4	21.9	26.9	27.1
	Toluene	1.04J	1.17J	< 1.01	< 0.64	<0.51	<0.93	< 1.22	< 0.68	0.7 J
	trans-1,3-Dichloropropene	< 0.84	< 0.4	< 1.01	< 0.64	<0.51	<0.93	< 1.22	< 0.68	<0.26
	Trichlorofluoromethane	2.33J	< 0.4	1.88 J	1.53 J	1.42 J	<0.93	1.25 J	1.04 J	<1.11
	Vinyl chloride	< 0.84	< 0.4	< 1.01	< 0.64	<0.51	<0.93	< 1.22	< 0.68	<0.29
SW8015M[b] (µg/L)	Gasoline Range Organics (GRO)	41.9J	< 22.9	< 36.3	62.8	<24.8	<30.4	< 54.8	< 50.1	<44
Fixed Gases (%)	Carbon Dioxide	0.29J	< 0.13	0.2	0.3 J	0.28 J	1.71	1.53	1.49	1.75
Method SM2720C[c]	Carbon Monoxide	< 0.15	< 0.13	<0.15	< 0.15	<0.15	<0.15	< 0.14	< 0.14	<0.12
	Methane	< 0.15	< 0.13	<0.15	< 0.15	<0.15	<0.15	< 0.14	< 0.12	<0.11
	Nitrogen	75.1	74.5	130 UR	74.9	75	74	74.8	77.1	77.6
	Oxygen	24.6	25.5	17.2	24.8	24.7	24.3	23.6	21.5	20.6

Appendix A. Soil Vapor Sampling Results at SWMU ST-70
2008 to 2013

Chemical Class & Analytical Method	Location	70-03							
	Sample ID	ST219-AR-7003-18012011	ST219-AR-7003-12112010	ST219-AR-7003-17092010	ST219-AR-7003-17022010	ST219-AR-7003-101109	ST219-AR-7003-070809	ST219-AR-7003-14032009	ST219-AR-7003-10072008
	Sample Date	01/18/11	11/12/10	09/17/10	02/17/10	11/10/09	08/07/09	03/14/09	07/10/08
	Analyte / Screen Depth	315-330							
VOCs (ppbv) Method TO-15[a]	1,1,1-Trichloroethane	1.34 J	2.19 J	2.36 J	< 4.5	11	< 0.4	1.54 J	2.06 U
	1,1,2,2-Tetrachloroethane	36.5	<3.27	450	5.34	< 0.75	< 0.93	1.67 U	2.8 U
	1,1,2-Trichloroethane	154	<1.76	<3.35	< 4.5	ND	ND	ND	ND
	1,1,2-Trichloro-1,2,2-trifluoroethane	2.46 J	2.77 J	<3.06	1.28 J	37.4	2.55 J	4.84 J	2.68 J
	1,1-Dichloroethane	<2.22	<1.33	<3.7	< 4.5	3.89 J	< 0.52	1.35 J	1.97 U
	1,1-Dichloroethene	11.2 J	16.3	16.7 J	< 4.5	19.6	2 J	3.16 J	1.46 U
	1,2,4-Trichlorobenzene	<2.48	<1.52	<4.13	< 4.5	ND	ND	ND	ND
	1,2,4-Trimethylbenzene	8.14 J	82.2	220	0.58 J	193	1.13 J	4.87 J	3.15 U
	1,2-Dichloroethane (EDC)	88.6	<1.25	<3.84	< 4.5	ND	ND	ND	ND
	1,2-Dichlorobenzene	<2.24	<2.08	<3.74	< 4.5	ND	ND	ND	ND
	1,2-Dichloro-1,1,2,2-tetrafluoroethane	<2.35	<1.49	<3.91	< 4.5	ND	ND	ND	ND
	1,2-Dichloropropane	1,310	<1.14	<3.52	< 4.5	ND	ND	ND	ND
	1,2-Dibromoethane (EDB)	<1.66	<1.44	<2.77	< 4.5	ND	ND	ND	ND
	1,3,5-Trimethylbenzene	6.98 J	109	221	0.98 J	260	< 1.24	3.54 J	3.21 U
	1,3-Dichlorobenzene	<1.84	<2.16	<3.06	< 4.5	ND	ND	ND	ND
	1,4-Dichlorobenzene	<2.38	<2.04	<3.96	< 4.5	ND	ND	ND	ND
	Acetone	19.6 J	37.8	46	12	49.8	35.6	12.4	27.5
	Benzene	12.3 J	5.34 J	24.4 B	2.82 J	5.76	13.2	2.9 J	9.29 J
	Bromomethane	<0.84	<1.82	<1.4	< 4.5	ND	ND	ND	ND
	Carbon tetrachloride	9.36 J	6.62 J	5.57 J	4.39 J	16.1	16.8	14.6	20.1
	Chlorobenzene	<1.2	<1.49	<2	< 4.5	< 0.49	< 0.65	1.35 U	2.77 U
	Chloroethane	<1.43	<2.38	<2.37	< 4.5	ND	ND	ND	ND
	Chloroform	13.5	14.6	14.7 J	17.7	26.1	12.5	20.8	15.7
	Chloromethane	<0.88	4.55 J	<1.46	< 4.5	< 0.47	< 0.67	1.15 U	1.39 U
	cis-1,2-Dichloroethene	11.4 J	212	276	54.9	316	10.8	131	15.3
	cis-1,3-Dichloropropene	<1.15	<1.61	<1.92	< 4.5	ND	ND	ND	ND
	Dichlorodifluoromethane	<0.71	<1.82	1.37 J	0.7 J	< 5.6	< 4.5	1.11 U	1.07 U
	Ethylbenzene	<1.55	11	10.7 J	< 4.5	15.5	< 0.48	0.94 U	2.95 U
	Hexachlorobutadiene	<1.82	<1.93	<3.02	< 4.5	ND	ND	ND	ND
	m,p-Xylene	<3.24	<4.19	36.9	< 4.5	17.7	< 1	2.57 U	5.82 U
	MEK (2-Butanone)	3.69 J	6.48 J	<2.14	5.18 J	20.8	< 0.58	2.1 J	7.58 J
	Methylene chloride	7.9 J	2.36 J	11.3 J	4.16 J	< 27.8	< 22.4	4.39 J	4.72 J
	MTBE (Methyl tert-butyl ether)	<1.1	<2.3	<3.17	< 9	< 0.79	< 0.78	0.9 U	2.07 U
	o-Xylene	<1.66	<2.19	<2.77	< 4.5	< 0.63	< 1.08	1.15 U	3.2 U
	Styrene	<1.74	<1.8	<2.9	< 4.5	ND	ND	ND	ND
	TCE (Trichloroethene)	341	486	569	506	795	535	816	788
	PCE (Tetrachloroethene)	18.5	496	745	50.1	864	11.3	323	14.3
	Toluene	2.15 J	4.78 J	22.2	< 4.5	1.34 J	< 1.35	2.1 U	3.13 U
	trans-1,3-Dichloropropene	<0.91	<1.69	<1.51	< 4.5	ND	ND	ND	ND
	Trichlorofluoromethane	<3.94	2.95 J	7.22 J	1.23 J	26	2.54 J	2.72 J	1.38 U
	Vinyl chloride	<1.02	<1.29	<1.69	< 4.5	< 0.4	< 1.61	1.14 U	2.21 U
SW8015M[b] (µg/L)	Gasoline Range Organics (GRO)	45.7 J	702	701	15.7 J	675	< 53.8	37.6 J	ND
Fixed Gases (%) Method SM2720C[c]	Carbon Dioxide	0.23 J	1.97	0.59	1.1	2.2	0.28 J	0.56 J	0.26
	Carbon Monoxide	<0.12	<0.12	<0.06	< 0.5	< 0.08	< 0.08	0.08 U	0.08 U
	Methane	<0.11	<0.11	<0.05	< 0.5	< 0.08	< 0.08	0.08 U	0.09 U
	Nitrogen	72.1	76.4	77.1	77.9	89.5	70.8	73.1	95.4
	Oxygen	19.5	21.7	22.3	21	25.3	18.9	18.4	19.2

Appendix A. Soil Vapor Sampling Results at SWMU ST-70
2008 to 2013

Chemical Class & Analytical Method	Location	219-29H								
	Sample ID	ST70-AR-29H-240413	ST70-AR-29H-160113	ST219-AR-29H-121012	ST219-AR-29H-230812	ST219-AR-29H-130412	ST219-AR-29H-030112	ST219-AR-29H-161111	ST219-AR-29H-28092011	ST219-AR-29H-21042011
	Sample Date	04/24/13	01/16/13	10/12/12	08/23/12	04/13/12	01/03/12	11/16/11	09/28/11	04/21/11
	Analyte Screen Depth	50-90								
VOCs (ppbv) Method TO-15[a]	1,1,1-Trichloroethane	< 0.24	< 1.18	< 3.9	1.58	1.73 J	0.49 J	0.36 J	1.53	0.35 J
	1,1,2,2-Tetrachloroethane	< 0.24	< 1.18	< 3.9	< 0.27	<0.64	<0.29	< 0.24	< 0.41	<0.09
	1,1,2-Trichloroethane	< 0.24	< 1.18	< 3.9	< 0.27	<0.64	<0.29	< 0.24	< 0.41	<0.16
	1,1,2-Trichloro-1,2,2-trifluoroethane	< 0.24	< 1.18	< 3.9	2.99	2.88	<0.29	0.29 J	< 0.41	0.48 J
	1,1-Dichloroethane	< 0.24	< 1.18	< 3.9	0.36 J	0.65 J	<0.29	< 0.24	< 0.41	0.33 J
	1,1-Dichloroethene	< 0.24	< 1.18	< 3.9	< 0.27	<0.64	<0.29	< 0.24	< 0.41	<0.21
	1,2,4-Trichlorobenzene	< 0.24	< 1.18	7.85 J	< 0.27	<0.64	<0.29	< 0.24	< 0.41	<0.2
	1,2,4-Trimethylbenzene	1.96	2.79J	1,060	1.37	<0.64	<0.29	< 0.24	3.87	0.33 J
	1,2-Dichloroethane (EDC)	< 0.24	< 1.18	< 3.9	< 0.27	<0.64	<0.29	< 0.24	< 0.41	<0.18
	1,2-Dichlorobenzene	< 0.24	< 1.18	< 3.9	< 0.27	<0.64	<0.29	< 0.24	< 0.41	<0.18
	1,2-Dichloro-1,1,2,2-tetrafluoroethane	< 0.24	< 1.18	< 3.9	< 0.27	<0.64	<0.29	< 0.24	< 0.41	<0.19
	1,2-Dichloropropane	< 0.24	< 1.18	< 3.9	< 0.27	<0.64	<0.29	< 0.24	< 0.41	<0.17
	1,2-Dibromoethane (EDB)	< 0.24	< 1.18	< 3.9	< 0.27	<0.64	<0.29	< 0.24	< 0.41	<0.13
	1,3,5-Trimethylbenzene	1.49	11.6	948	5.05	0.8 J	<0.29	< 0.24	1.27 J	0.38 J
	1,3-Dichlorobenzene	< 0.24	< 1.18	< 3.9	< 0.27	<0.64	<0.29	< 0.24	< 0.41	<0.15
	1,4-Dichlorobenzene	< 0.24	< 1.18	< 3.9	< 0.27	<0.64	<0.29	< 0.24	< 0.41	<0.19
	Acetone	29.3	7.2J	< 3.9	14.8	7.37	9.17	8.18	7.34	19
	Benzene	0.26J	< 1.18	< 3.9	< 0.27	<0.64	<0.29	< 0.24	2.94	0.7 J
	Bromomethane	0.49J	< 1.18	< 3.9	0.59 J	<0.64	<0.29	< 0.24	< 0.41	<0.07
	Carbon tetrachloride	< 0.24	< 1.18	< 3.9	2.17	1.82 J	<0.29	< 0.24	< 0.41	0.14 J
	Chlorobenzene	< 0.24	< 1.18	< 3.9	< 0.27	<0.64	<0.29	< 0.24	< 0.41	<0.09
	Chloroethane	< 0.24	< 1.18	< 3.9	< 0.27	<0.64	<0.29	< 0.24	< 0.41	<0.11
	Chloroform	< 0.24	< 1.18	< 3.9	6.64	3.01	<0.29	0.27 J	< 0.41	0.32 J
	Chloromethane	1.22	< 1.18	< 3.9	0.68 J	<0.64	0.31 J	0.37 J	< 0.41	<0.07
	cis-1,2-Dichloroethene	0.33J	6.94	47.9	3.37	7.64	1.39	1.52	5.24	6.41
	cis-1,3-Dichloropropene	< 0.24	< 1.18	< 3.9	< 0.27	<0.64	<0.29	< 0.24	< 0.41	<0.09
	Dichlorodifluoromethane	0.45J	< 1.18	< 3.9	0.43 J	<0.64	0.58 J	< 0.24	< 0.41	<0.06
	Ethylbenzene	< 0.24	< 1.18	18	0.68 J	<0.64	<0.29	< 0.24	23.1	0.26 J
	Hexachlorobutadiene	< 0.24	< 1.18	< 3.9	< 0.27	<0.64	<0.29	< 0.24	< 0.41	<0.29
	m,p-Xylene	0.55J	< 2.36	163	2.71	<1.28	<0.59	< 0.48	23	<0.26
	MEK (2-Butanone)	3.13	< 1.18	< 3.9	4.41	1.33 J	2.71	0.9 J	1.85 J	3.73
	Methylene chloride	0.39J	< 1.18	4.91 J	< 1.09	0.68 J	0.68 J	< 0.26	2.81 J	<0.25
	MTBE (Methyl tert-butyl ether)	< 0.24	< 1.18	< 3.9	< 0.27	<0.64	<0.29	< 0.24	< 0.41	<0.09
	o-Xylene	< 0.24	< 1.18	< 3.9	0.83 J	<0.64	<0.29	< 0.24	9.46	<0.13
	Styrene	< 0.24	< 1.18	< 3.9	< 0.27	<0.64	<0.29	< 0.24	8.93	<0.14
	TCE (Trichloroethene)	1.18	27.3	10 J	84	106	5.54	9.53	38.9	16.9
	PCE (Tetrachloroethene)	0.81	25.5	8.47 J	59.8	56.5	1.04	8.91	13.5	8.41
	Toluene	0.4J	< 1.18	< 3.9	0.28 J	<0.64	<0.29	< 0.24	18	0.44 J
	trans-1,3-Dichloropropene	< 0.24	< 1.18	< 3.9	< 0.27	<0.64	<0.29	< 0.24	< 0.41	<0.07
	Trichlorofluoromethane	< 0.24	1.23J	< 3.9	3.98	3.31	1.34	1.17	0.79 J	0.71 J
	Vinyl chloride	< 0.24	< 1.18	< 3.9	< 0.27	<0.64	<0.29	< 0.24	< 0.41	<0.08
SW8015M[b] (µg/L)	Gasoline Range Organics (GRO)	17.8J	122	911	< 40.9	<14.7	<11.2	< 11.5	< 17.7	<22.4
Fixed Gases (%) Method SM2720C[c]	Carbon Dioxide	0.32J	8.28	3.8	7.41	7.83	3.76	6.43	5.17	8.5
	Carbon Monoxide	< 0.14	< 0.13	<0.15	< 0.16	<0.15	<0.13	< 0.14	< 0.12	<0.15
	Methane	< 0.14	< 0.13	<0.15	< 0.16	<0.15	<0.13	< 0.14	< 0.11	<0.14
	Nitrogen	74.3	78	128 UR	75.6	77.2	75.6	76.4	78	80.9
	Oxygen	25.3	13.7	13.8	17	15	20.7	17.2	16.8	10.6

Appendix A. Soil Vapor Sampling Results at SWMU ST-70
2008 to 2013

Chemical Class & Analytical Method	Location	219-29H								
	Sample ID	ST219-AR-29H-18012011	ST219-AR-29H-12112010	ST219-AR-29H-17092010	ST219-AR-29H-17022010	ST219-AR-29H-101109	ST219-AR-29H-070809	ST219-AR-29H-14032009	ST219-AR-219-29H-10072008	ST219-AR-219-29H-27032008
	Sample Date	01/18/11	11/12/10	09/17/10	02/17/10	11/10/09	08/07/09	03/14/09	07/10/08	03/27/08
	Analyte Screen Depth	50-90								
VOCs (ppbv)	1,1,1-Trichloroethane	1.92	0.83 J	1.18 J	0.84 J	3.48	< 0.43	2.18 J	1.28 J	2.01 U
Method TO-15[a]	1,1,2,2-Tetrachloroethane	<0.12	<0.37	10.8	< 1.1	6.09	< 1.01	0.61 U	0.56 U	20.3
	1,1,2-Trichloroethane	<0.2	<0.2	<0.2	< 1.1	ND	ND	ND	ND	ND
	1,1,2-Trichloro-1,2,2-trifluoroethane	5.05	1.38	0.27 J	1.33	2.89	< 0.75	5.16	1.3 J	2.71 J
	1,1-Dichloroethane	0.53 J	0.43 J	<0.22	2	1.55	3.69 J	4	1.62 J	12.7
	1,1-Dichloroethene	1.62	<0.29	0.32 J	1.46	0.99 J	< 0.98	0.36 U	1.02 J	2.93 U
	1,2,4-Trichlorobenzene	<0.25	<0.17	<0.24	< 1.1	ND	ND	ND	ND	ND
	1,2,4-Trimethylbenzene	0.35 J	12.1	3.79	< 1.1	69.7	453	2.31 J	58.3	26
	1,2-Dichloroethane (EDC)	<0.23	<0.14	<0.23	< 1.1	ND	ND	ND	ND	ND
	1,2-Dichlorobenzene	<0.23	<0.23	<0.22	< 1.1	ND	ND	ND	ND	ND
	1,2-Dichloro-1,1,2,2-tetrafluoroethane	<0.24	<0.17	<0.23	< 1.1	ND	ND	ND	ND	ND
	1,2-Dichloropropane	<0.21	<0.13	<0.21	< 1.1	ND	ND	ND	ND	ND
	1,2-Dibromoethane (EDB)	<0.17	0.71 J	<0.16	< 1.1	ND	ND	ND	ND	ND
	1,3,5-Trimethylbenzene	0.23 J	6.01	4.78	0.6 J	46.9	571	4.48	29.1	28.9
	1,3-Dichlorobenzene	<0.19	<0.24	<0.18	< 1.1	ND	ND	ND	ND	ND
	1,4-Dichlorobenzene	<0.24	<0.23	<0.23	< 1.1	ND	ND	ND	ND	ND
	Acetone	<0.45	21.9	19 B	3.63	20.1	72.4	8.01	18.6	78.9
	Benzene	0.34 J	23.5	6.42	1.07 J	< 0.14	< 0.68	0.3 U	3.85	2.99 J
	Bromomethane	<0.08	<0.2	<0.08	0.43 J	ND	ND	ND	ND	ND
	Carbon tetrachloride	1.75	0.25 J	<0.09	< 1.1	0.35 J	< 0.39	1.88 J	0.32 U	2.18 U
	Chlorobenzene	<0.12	<0.17	<0.12	< 1.1	< 1.5	< 0.7	0.49 U	0.55 U	1.87 U
	Chloroethane	<0.14	<0.27	<0.14	< 1.1	ND	ND	ND	ND	ND
	Chloroform	1.73	0.78 J	<0.18	0.83 J	0.81 J	< 0.3	5.22	1.06 J	7.41 J
	Chloromethane	0.2 J	<0.18	0.44 J	< 1.1	< 0.12	3.36 J	0.47 J	0.28 U	2.74 U
	cis-1,2-Dichloroethene	14.4	8.52	3.41	104	14.6	330	29.7	68.4	118
	cis-1,3-Dichloropropene	<0.12	<0.18	<0.11	< 1.1	ND	ND	ND	ND	ND
	Dichlorodifluoromethane	0.58 J	0.65 J	0.52 J	0.58 J	0.83 J	< 4.9	0.94 J	0.21 U	3.04 U
	Ethylbenzene	<0.16	12.1	5.67	< 1.1	1.46 J	18.3	0.34 U	1.68 J	2.19 J
	Hexachlorobutadiene	<0.18	<0.22	0.24 J	< 1.1	ND	ND	ND	ND	ND
	m,p-Xylene	<0.33	31.3	24.3	< 1.1	12.5	212	1.07 J	11.7	9.69 J
	MEK (2-Butanone)	<0.13	3.03	5.13	< 2.2	14.5	< 0.63	0.55 J	0.56 U	30.5
	Methylene chloride	0.77 J	<0.19	0.68 J	1.55 J	7.34	< 24.3	5.31	4.37	12.2
	MTBE (Methyl tert-butyl ether)	<0.11	<0.26	<0.19	< 2.2	1.88 J	< 0.84	0.58 J	0.41 U	5.11 U
	o-Xylene	<0.17	11.6	18	< 1.1	< 0.17	< 1.17	0.42 U	0.64 U	2.46 U
	Styrene	<0.18	<0.2	<0.17	< 1.1	ND	ND	ND	ND	ND
	TCE (Trichloroethene)	69.6	33	11.1	60.2	78.1 J	43.6	267	117	538
	PCE (Tetrachloroethene)	40.4	20.7	8.34	16.6	39.5	14.8	33.8	34	91.1
	Toluene	<0.21	87.9	16.6	0.44 J	0.98 J	< 1.46	0.76 U	0.91 J	6.93 J
	trans-1,3-Dichloropropene	<0.09	<0.19	<0.09	< 1.1	ND	ND	ND	ND	ND
	Trichlorofluoromethane	4.98	2.14	1.23	1.93	2.56	1.44 J	3.92	4.34	3.34 U
	Vinyl chloride	<0.1	<0.15	<0.1	< 1.1	< 0.11	< 1.74	0.41 U	1.29 J	2.39 U
SW8015M[b] (µg/L)	Gasoline Range Organics (GRO)	15.1 J	10.7 J	19.7 J	18.1 J	< 58.5	530	8.1 J	17.5	76.4
Fixed Gases (%)	Carbon Dioxide	4.85	5.02	4.04	7.34	7.2	8.28	7.34	7.37	13.2
Method SM2720C[c]	Carbon Monoxide	<0.12	<0.11	<0.06	< 0.5	< 0.09	< 0.07	0.07 U	0.08 U	0.1 U
	Methane	<0.11	<0.1	<0.05	< 0.5	< 0.09	< 0.07	0.07 U	0.09 U	0.09 U
	Nitrogen	69.9	78.8	78.5	79.7	87.3	70.4	76.2	75.7	73.5
	Oxygen	12.5	16.2	17.4	12.9	16.4	11.7	10.4	11.8	6.55

Appendix A. Soil Vapor Sampling Results at SWMU ST-70
2008 to 2013

Chemical Class & Analytical Method	Location	219-38-41								
	Sample ID	ST70-AR-38-41-240413	ST70-AR-38-41-160113	ST219-AR-38-41-121012	ST219-AR-38-41-230812	ST219-AR-38-41-130412	ST219-AR-38-41-030112	ST219-AR-38-41-161111	ST219-AR-38-41-28092011	ST219-AR-38-41-21042011
	Sample Date	04/24/13	01/16/13	10/12/12	08/23/12	04/13/12	01/03/12	11/16/11	09/28/11	04/21/11
	Analyte Screen Depth	38-43								
VOCs (ppbv)	1,1,1-Trichloroethane	< 30.3	< 1.18	< 3.02	< 33.3	<153	<20.1	< 31.4	< 38.7	<13.8
Method TO-15[a]	1,1,2,2-Tetrachloroethane	< 30.3	< 1.18	< 3.02	< 33.3	<153	<20.1	< 31.4	5,470	<12.9
	1,1,2-Trichloroethane	< 30.3	< 1.18	< 3.02	< 33.3	<153	<20.1	< 31.4	< 38.7	<21.6
	1,1,2-Trichloro-1,2,2-trifluoroethane	< 30.3	< 1.18	< 3.02	< 33.3	<153	<20.1	< 31.4	< 38.7	<19.7
	1,1-Dichloroethane	< 30.3	< 1.18	< 3.02	< 33.3	<153	<20.1	< 31.4	< 38.7	<23.8
	1,1-Dichloroethene	< 30.3	< 1.18	< 3.02	< 33.3	<153	<20.1	< 31.4	< 38.7	<28.1
	1,2,4-Trichlorobenzene	< 30.3	< 1.18	3.28 J	< 33.3	<153	<20.1	< 31.4	< 111	<26.6
	1,2,4-Trimethylbenzene	385	65.1	501	504	8,410	1,140	1,630	3,370	9,970
	1,2-Dichloroethane (EDC)	< 30.3	< 1.18	< 3.02	< 33.3	<153	<20.1	< 31.4	< 38.7	<24.8
	1,2-Dichlorobenzene	< 30.3	< 1.18	< 3.02	< 33.3	<153	<20.1	< 31.4	< 38.7	<24.1
	1,2-Dichloro-1,1,2,2-tetrafluoroethane	< 30.3	< 1.18	< 3.02	< 33.3	<153	<20.1	< 31.4	< 38.7	<25.2
	1,2-Dichloropropane	< 30.3	< 1.18	< 3.02	< 33.3	<153	<20.1	< 31.4	< 38.7	<22.7
	1,2-Dibromoethane (EDB)	< 30.3	< 1.18	< 3.02	< 33.3	<153	<20.1	< 31.4	< 38.7	<17.8
	1,3,5-Trimethylbenzene	454	72.4	384	561	6,120	1,510	1,930	3,570	8,390
	1,3-Dichlorobenzene	< 30.3	< 1.18	< 3.02	< 33.3	<153	<20.1	< 31.4	< 38.7	<19.7
	1,4-Dichlorobenzene	< 30.3	< 1.18	< 3.02	< 33.3	<153	<20.1	< 31.4	< 38.7	<25.5
	Acetone	63.6J	8.12	32.5	< 33.3	<153	<20.1	< 31.4	< 137	<48.2
	Benzene	54.6J	1.36J	< 3.02	< 33.3	227 J	113	144	386	158
	Bromomethane	< 30.3	< 1.18	< 3.02	< 33.3	<153	<20.1	< 31.4	< 38.7	<9.01
	Carbon tetrachloride	< 30.3	< 1.18	< 3.02	< 33.3	<153	<20.1	< 31.4	< 38.7	<9.74
	Chlorobenzene	< 30.3	< 1.18	< 3.02	< 33.3	<153	<20.1	< 31.4	< 38.7	<12.9
	Chloroethane	< 30.3	< 1.18	< 3.02	< 33.3	<153	<20.1	< 31.4	< 38.7	<15.3
	Chloroform	< 30.3	< 1.18	< 3.02	< 33.3	<153	<20.1	< 31.4	< 38.7	<19.4
	Chloromethane	< 30.3	< 1.18	< 3.02	< 33.3	<153	<20.1	< 31.4	< 38.7	<9.38
	cis-1,2-Dichloroethene	3,270	172	667	5,770	4,820	5,110	4,420	6,450	9,730
	cis-1,3-Dichloropropene	< 30.3	< 1.18	< 3.02	< 33.3	<153	<20.1	< 31.4	< 38.7	<12.3
	Dichlorodifluoromethane	< 30.3	< 1.18	< 3.02	< 33.3	<153	<20.1	< 31.4	< 38.7	<7.58
	Ethylbenzene	103	7.57	25.9	< 33.3	306 J	177	166	250	332
	Hexachlorobutadiene	< 30.3	< 1.18	< 3.02	< 33.3	<153	<20.1	< 31.4	< 38.7	<36.2
	m,p-Xylene	402	40.8	168	411	1,550	954	909	1,520	2,170
	MEK (2-Butanone)	< 30.3	< 1.18	< 3.02	< 33.3	<153	<20.1	< 31.4	103 J	<13.8
	Methylene chloride	< 30.3	< 1.18	< 3.02	< 33.3	<153	<20.1	< 31.4	< 38.7	<33.3
	MTBE (Methyl tert-butyl ether)	< 30.3	< 1.18	< 3.02	< 33.3	<153	<20.1	< 31.4	< 38.7	<11.8
	o-Xylene	< 30.3	3.65J	< 3.02	< 33.3	<153	<20.1	< 31.4	< 38.7	<17.8
	Styrene	< 30.3	< 1.18	< 3.02	< 33.3	<153	<20.1	< 31.4	< 38.7	<18.7
	TCE (Trichloroethene)	1,070	14.7	67	1,040	346 J	363	409	707	387
	PCE (Tetrachloroethene)	87.5J	1.57J	7.35 J	68.4 J	<153	32.2 J	< 31.4	45.9 J	58 J
	Toluene	< 30.3	1.68J	3.47 J	< 33.3	<153	24.8 J	< 31.4	58.7 J	40.5 J
	trans-1,3-Dichloropropene	< 30.3	< 1.18	< 3.02	< 33.3	<153	<20.1	< 31.4	< 38.7	<9.74
	Trichlorofluoromethane	< 30.3	< 1.18	< 3.02	< 33.3	<153	<20.1	< 31.4	< 38.7	<42.3
	Vinyl chloride	< 30.3	< 1.18	< 3.02	< 33.3	<153	<20.1	< 31.4	< 38.7	<10.9
SW8015M[b] (µg/L)	Gasoline Range Organics (GRO)	3,910	435	2,120	4,000	8,320	4,220	3,800	5,970	8,300
Fixed Gases (%)	Carbon Dioxide	13.7	0.95J	3.2	12.5	14.8	18.7	16.6	15.7	15.5
Method SM2720C[c]	Carbon Monoxide	< 0.14	< 0.13	< 0.15	< 0.15	<0.15	<0.14	< 0.14	< 0.13	<0.13
	Methane	0.77J	< 0.13	0.2	1.07	1.69	1.75	1.56	1.32	2.1
	Nitrogen	76.6	74.5	125 UR	75.4	75.7	76.5	77.2	81	80.3
	Oxygen	8.97	24.5	17.2	11	7.78	3.07	4.63	2.08	2.16

Appendix A. Soil Vapor Sampling Results at SWMU ST-70
2008 to 2013

Chemical Class & Analytical Method	Location	219-38-41								
	Sample ID	ST219-AR-38-41-18012011	ST219-AR-38-41-12112010	ST219-AR-38-41-17092010	ST219-AR-38-41-17022010	ST219-AR-38-41-101109	ST219-AR-38-41-070809	ST219-AR-38-41-140309	ST219-AR-219-38-41-10072008	ST219-AR-219-38-41-27032008
	Sample Date	01/18/11	11/12/10	09/17/10	02/17/10	11/10/09	08/07/09	03/14/09	07/10/08	03/27/08
	Analyte / Screen Depth	38-43								
VOCs (ppbv) Method TO-15[a]	1,1,1-Trichloroethane	<15.8	<10.1	<18.2	< 160.5	< 5.07	< 0.44	11.74 U	75.29 U	98.37U
	1,1,2,2-Tetrachloroethane	<14.8	<24.9	<17	< 160.5	< 7.71	< 1.02	11.25 U	102.15 U	102.9U
	1,1,2-Trichloroethane	<24.8	<13.4	<28.5	< 160.5	ND	ND	ND	ND	ND
	1,1,2-Trichloro-1,2,2-trifluoroethane	<22.7	<11.1	<26.1	< 160.5	< 5.36	3.42 J	8.02 U	53.84 U	120.5U
	1,1-Dichloroethane	<27.4	<10.1	<31.5	< 160.5	< 6.82	< 0.56	8.02 U	71.95 U	89.87U
	1,1-Dichloroethene	<32.3	<19.4	<37.2	23.6 J	14.9 J	< 0.99	50.5 J	53.16 U	142.9U
	1,2,4-Trichlorobenzene	<30.6	<11.6	<35.1	< 160.5	ND	ND	ND	ND	ND
	1,2,4-Trimethylbenzene	5,910	1,240	12,200	1720	3830 J	430	1350	3,200	397 J
	1,2-Dichloroethane (EDC)	<28.4	<9.54	<32.7	< 160.5	ND	ND	ND	ND	ND
	1,2-Dichlorobenzene	<27.7	<15.8	<31.8	< 160.5	ND	ND	ND	ND	ND
	1,2-Dichloro-1,1,2,2-tetrafluoroethane	<28.9	<11.3	<33.2	< 160.5	ND	ND	ND	ND	ND
	1,2-Dichloropropane	<26.1	<8.7	<30	< 160.5	ND	ND	ND	ND	ND
	1,2-Dibromoethane (EDB)	<20.5	<11	<23.6	< 160.5	ND	ND	ND	ND	ND
	1,3,5-Trimethylbenzene	5,750	1,440	9,260	2070	3930 J	340	1620	2,570	435 J
	1,3-Dichlorobenzene	<22.7	<16.4	<26.1	< 160.5	ND	ND	ND	ND	ND
	1,4-Dichlorobenzene	<29.3	<15.6	<33.7	< 160.5	ND	ND	ND	ND	ND
	Acetone	<55.3	281	138 J	104 J	< 6.78	11.7	49.66 U	87.84 U	220 J
	Benzene	272	52 J	261	330	42.3 J	4.81 J	121 J	99.6 U	79.52U
	Bromomethane	<10.4	<13.8	<11.9	< 160.5	ND	ND	ND	ND	ND
	Carbon tetrachloride	<11.2	<10.5	<12.9	< 160.5	< 4.07	< 0.39	62.57 U	58.65 U	106.4U
	Chlorobenzene	<14.8	<11.4	<17	< 160.5	< 5.01	< 0.71	6.88 U	129 J	91.18U
	Chloroethane	<17.6	<18.1	<20.2	< 160.5	ND	ND	ND	ND	ND
	Chloroform	<22.3	<26.8	<25.6	< 160.5	< 6.82	3.29 J	8.44 U	68.9 U	98.59U
	Chloromethane	<10.8	<12.1	<12.4	< 160.5	< 4.82	< 0.73	64.31 U	50.72 U	133.8U
	cis-1,2-Dichloroethene	13,200	7,160	14,200	20000	11,100	482	31000	16,100	8,210
	cis-1,3-Dichloropropene	<14.2	<12.3	<16.3	< 160.5	ND	ND	ND	ND	ND
	Dichlorodifluoromethane	<8.72	<13.8	<10	< 160.5	< 4.07	< 0.43	10.51 U	38.92 U	148.7U
	Ethylbenzene	397	204	341	< 160.5	< 8.25	< 0.53	176 J	138 J	102.9U
	Hexachlorobutadiene	<22.4	<14.7	<25.7	< 160.5	ND	ND	ND	ND	ND
	m,p-Xylene	1,980	1,060	1,750	1330	1050	82.7	681 J	681 J	218 J
	MEK (2-Butanone)	<15.8	<8.29	<18.2	< 321	< 7.86	< 0.64	28.41 U	102.79 U	203.1U
	Methylene chloride	82 J	14.7 J	58.4 J	107 J	< 285	< 24.5	94.6 J	369 J	333 J
	MTBE (Methyl tert-butyl ether)	<13.5	<17.5	<26.9	< 321	< 8.13	< 9.8	30.33 U	75.4 U	249.5 U
	o-Xylene	<20.5	<16.7	<23.6	< 160.5	< 6.45	3.69 J	60.48 U	116.58 U	120.3U
	Styrene	<21.5	<13.7	<24.7	< 160.5	ND	ND	ND	ND	ND
	TCE (Trichloroethene)	446	487	490	665	578 J	130	677	329 J	134 J
	PCE (Tetrachloroethene)	<18.4	41.1 J	37.6 J	45.9 J	30.2 J	5.14	62.3 J	70.07 U	116.7U
	Toluene	36.2 J	147	52.4 J	65.2 J	< 9.46	4.1 J	29.67 U	114.33 U	116.5U
	trans-1,3-Dichloropropene	<11.2	<12.9	<12.9	< 160.5	ND	ND	ND	ND	ND
	Trichlorofluoromethane	<48.6	<14.1	<55.8	< 160.5	< 2.93	< 0.46	3.67 U	50.38 U	162.9 U
	Vinyl chloride	<12.5	<9.86	<14.4	< 160.5	< 4.14	< 1.76	57.5 J	80.55 U	116.9U
SW8015M[b] (µg/L)	Gasoline Range Organics (GRO)	6,300	6,530	7,020	5030	4,660	2650	1920	5320	1,530
Fixed Gases (%) Method SM2720C[c]	Carbon Dioxide	13.5	13.8	11.6	14.2	11.2	11.4	14.8	9.42	5.79
	Carbon Monoxide	<0.13	<0.11	<0.06	< 0.5	< 0.08	< 0.07	0.08 U	0.08 U	0.09 U
	Methane	1.97	1.28	0.95	1.32	1.21	1.4	1.81	1.36	0.75 J
	Nitrogen	69.9	80.5	79.7	79.1	106 R	70.6	74.8	73.6	69.6
	Oxygen	3.59	4.47	7.69	5.37	16.3	6.3	2.83	11.2	14.2

Appendix A. Soil Vapor Sampling Results at SWMU ST-70
2008 to 2013

Chemical Class & Analytical Method	Location	219-38-99								
	Sample ID	ST70-AR-38-99-240413	ST70-AR-38-99-160113	ST219-AR-38-99-121012	ST219-AR-38-99-230812	ST219-AR-38-99-130412	ST219-AR-38-99-030112	ST219-AR-38-99-161111	ST219-AR-38-99-28092011	ST219-AR-38-99-21042011
	Sample Date	04/24/13	01/16/13	10/12/12	08/23/12	04/13/12	01/03/12	11/16/11	09/28/11	04/21/11
	Analyte Screen Depth	98-103								
VOCs (ppbv)	1,1,1-Trichloroethane	< 15.5	< 18.9	< 22.7	< 30.6	<381	<30.3	< 20.1	< 22.8	<13.7
Method TO-15[a]	1,1,2,2-Tetrachloroethane	< 15.5	< 18.9	< 22.7	< 30.6	<381	<30.3	< 20.1	< 22.8	<12.8
	1,1,2-Trichloroethane	< 15.5	< 18.9	< 22.7	< 30.6	<381	<30.3	< 20.1	< 22.8	<21.4
	1,1,2-Trichloro-1,2,2-trifluoroethane	< 15.5	< 18.9	< 22.7	< 30.6	<381	<30.3	< 20.1	< 22.8	<19.6
	1,1-Dichloroethane	< 15.5	< 18.9	< 22.7	< 30.6	<381	<30.3	< 20.1	< 22.8	<23.7
	1,1-Dichloroethene	< 15.5	< 18.9	< 22.7	< 30.6	<381	<30.3	< 20.1	< 22.8	<27.9
	1,2,4-Trichlorobenzene	< 15.5	< 18.9	31.2 J	175 J	<381	<30.3	< 20.1	< 22.8	<26.4
	1,2,4-Trimethylbenzene	263	1,910	4,270	772	44,400	1,950	2,580	6,120	6,210
	1,2-Dichloroethane (EDC)	< 15.5	< 18.9	< 22.7	< 30.6	<381	<30.3	< 20.1	< 22.8	<24.6
	1,2-Dichlorobenzene	< 15.5	< 18.9	< 22.7	< 30.6	<381	<30.3	< 20.1	< 22.8	<23.9
	1,2-Dichloro-1,1,2,2-tetrafluoroethane	< 15.5	< 18.9	< 22.7	< 30.6	<381	<30.3	< 20.1	< 22.8	<25
	1,2-Dichloropropane	< 15.5	< 18.9	< 22.7	< 30.6	<381	<30.3	< 20.1	< 22.8	<22.5
	1,2-Dibromoethane (EDB)	< 15.5	< 18.9	< 22.7	< 30.6	<381	<30.3	< 20.1	< 22.8	<17.7
	1,3,5-Trimethylbenzene	297	1,800	2,630	773	26,700	2,020	2,390	4,470	4,000
	1,3-Dichlorobenzene	< 15.5	< 18.9	< 22.7	< 30.6	<381	<30.3	< 20.1	< 22.8	<19.6
	1,4-Dichlorobenzene	< 15.5	< 18.9	< 22.7	< 30.6	<381	<30.3	< 20.1	< 22.8	<25.3
	Acetone	142	153	149 J	314	542 J	<307	144	< 164	<136
	Benzene	41.4J	21.1J	< 22.7	36.1 J	638 J	187	123	275	115 J
	Bromomethane	< 15.5	< 18.9	< 22.7	< 30.6	<381	<30.3	< 20.1	< 22.8	9.48 J
	Carbon tetrachloride	< 15.5	< 18.9	< 22.7	< 30.6	<381	<30.3	< 20.1	< 22.8	<9.67
	Chlorobenzene	< 15.5	< 18.9	< 22.7	< 30.6	<381	<30.3	< 20.1	< 22.8	<12.8
	Chloroethane	< 15.5	< 18.9	< 22.7	< 30.6	<381	<30.3	< 20.1	< 22.8	<15.2
	Chloroform	48.5J	94.2	61.3 J	97.7 J	704 J	128	113	123	103 J
	Chloromethane	< 15.5	< 18.9	< 22.7	< 30.6	<381	<30.3	< 20.1	< 22.8	<9.31
	cis-1,2-Dichloroethene	2,600	1,010	569	2,550	16,000	1,430	1,030	1,050	1,090
	cis-1,3-Dichloropropene	< 15.5	< 18.9	< 22.7	< 30.6	<381	<30.3	< 20.1	< 22.8	<12.3
	Dichlorodifluoromethane	< 15.5	< 18.9	< 22.7	< 30.6	<381	<30.3	< 20.1	< 22.8	<7.53
	Ethylbenzene	70	104	110	167	1110 J	140	123	160	163
	Hexachlorobutadiene	< 15.5	< 18.9	< 22.7	136	<381	<30.3	< 20.1	< 22.8	<37.3
	m,p-Xylene	279	429	343	633	3,850	542	489	638	527
	MEK (2-Butanone)	71.6J	< 18.9	< 22.7	< 30.6	<381	<30.3	< 20.1	< 22.8	<13.7
	Methylene chloride	16.6J	21.6J	24.4 J	< 45.2	<381	31.2 J	< 20.1	28.5 J	<38
	MTBE (Methyl tert-butyl ether)	< 15.5	< 18.9	< 22.7	< 30.6	<381	<30.3	< 20.1	< 22.8	<11.7
	o-Xylene	< 15.5	< 18.9	< 22.7	< 30.6	<381	<30.3	< 20.1	42.5 J	<17.7
	Styrene	< 15.5	< 18.9	< 22.7	< 30.6	<381	<30.3	< 20.1	< 22.8	<18.5
	TCE (Trichloroethene)	5,400	8,800	7,370	8,530	64,100	10,800	10,600	12,000	10,700
	PCE (Tetrachloroethene)	122	168	110	146	1,450	182	172	208	195
	Toluene	26.6J	22J	< 22.7	39.4 J	<381	31.8 J	31.6 J	45.5 J	40.6 J
	trans-1,3-Dichloropropene	< 15.5	< 18.9	< 22.7	< 30.6	<381	<30.3	< 20.1	< 22.8	<9.67
	Trichlorofluoromethane	< 15.5	< 18.9	< 22.7	< 30.6	<381	<30.3	< 20.1	< 22.8	<41.9
	Vinyl chloride	< 15.5	< 18.9	< 22.7	< 30.6	<381	<30.3	< 20.1	< 22.8	<10.8
SW8015M[b] (µg/L)	Gasoline Range Organics (GRO)	1,990	2,410	3,470	3,490	2,540	2,130	2,560	3,470	3,530
Fixed Gases (%)	Carbon Dioxide	12.2	11.5	7.5	15.9	13.1	17.9	18.3	16.1	15.4
Method SM2720C[c]	Carbon Monoxide	< 0.14	< 0.13	< 0.16	< 0.16	<0.16	<0.14	< 0.14	< 0.12	<0.13
	Methane	< 0.14	< 0.13	< 0.16	< 0.16	<0.16	<0.14	< 0.14	< 0.11	<0.12
	Nitrogen	76	76.7	130 UR	77.2	77.6	78.5	78.9	82	81.4
	Oxygen	11.8	11.7	15.8	6.87	9.33	3.58	2.75	1.87	3.14

Appendix A. Soil Vapor Sampling Results at SWMU ST-70
2008 to 2013

Chemical Class & Analytical Method	Location	219-38-99								
	Sample ID	ST219-AR-38-99-18012011	ST219-AR-38-99-12112010	ST219-AR-38-99-17092010	ST219-AR-38-99-17022010	ST219-AR-38-99-101109	ST219-AR-38-99-070809	ST219-AR-38-99-140309	ST219-AR-219-38-99-10072008	ST219-AR-219-38-99-27032008
	Sample Date	01/18/11	11/12/10	09/17/10	02/17/10	11/10/09	08/07/09	03/14/09	07/10/08	03/27/08
	Analyte Screen Depth	98-103								
VOCs (ppbv)	1,1,1-Trichloroethane	31.8 J	<10.8	<6.06	< 77.5	< 58.5	< 5.38	58.9 J	20.84 U	12.3 U
Method TO-15[a]	1,1,2,2-Tetrachloroethane	<6.15	<26.5	<5.67	< 77.5	< 58.5	< 12.6	22.67 U	28.28 U	12.87 U
	1,1,2-Trichloroethane	<10.3	<14.3	<9.51	< 77.5	ND	ND	ND	ND	ND
	1,1,2-Trichloro-1,2,2-trifluoroethane	<9.42	12.4 J	16.3 J	< 77.5	9.18 J	19.4 J	12.9 U	14.9 U	15.06 U
	1,1-Dichloroethane	25.2 J	<10.7	<10.5	< 77.5	< 58.5	12 J	16.24 U	19.92 U	11.23 U
	1,1-Dichloroethene	<13.4	<20.6	<12.4	< 77.5	< 58.5	< 12.2	13.56 U	14.72 U	17.87 U
	1,2,4-Trichlorobenzene	<12.7	<12.3	<11.7	< 77.5	ND	ND	ND	ND	ND
	1,2,4-Trimethylbenzene	3,420	1,280	3,730	308	2,410	4100	1890	31.83 U	1,190
	1,2-Dichloroethane (EDC)	<11.8	<10.1	<10.9	< 77.5	ND	ND	ND	ND	ND
	1,2-Dichlorobenzene	<11.5	<16.8	<10.6	< 77.5	ND	ND	ND	ND	ND
	1,2-Dichloro-1,1,2,2-tetrafluoroethane	<12	<12	<11.1	< 77.5	ND	ND	ND	ND	ND
	1,2-Dichloropropane	<10.8	<9.24	<9.99	< 77.5	ND	ND	ND	ND	ND
	1,2-Dibromoethane (EDB)	<8.52	<11.7	<7.86	< 77.5	ND	ND	ND	ND	ND
	1,3,5-Trimethylbenzene	3,420	1,110	2,410	342	2,290	2620	1390	32.4 U	945
	1,3-Dichlorobenzene	<9.42	<17.4	<8.69	< 77.5	ND	ND	ND	ND	ND
	1,4-Dichlorobenzene	<12.2	<16.6	<11.2	< 77.5	ND	ND	ND	ND	ND
	Acetone	131	748	241	72.1 J	344	231	203	111	137
	Benzene	147	84.5	<9.99	140	32.5 J	39 J	54 J	27.57 U	9.94 U
	Bromomethane	<4.3	<14.7	<3.97	< 77.5	ND	ND	ND	ND	ND
	Carbon tetrachloride	<4.65	<11.2	<4.29	< 77.5	< 58.5	< 4.84	14.26 U	16.23 U	13.3 U
	Chlorobenzene	<6.15	<12.1	<5.67	< 77.5	< 58.5	< 8.71	87.7 J	27.93 U	11.4 U
	Chloroethane	<7.3	<19.3	<6.73	< 77.5	ND	ND	ND	ND	ND
	Chloroform	139	137	185	125	158	179	149	78.8 J	51.9 J
	Chloromethane	<4.48	<12.8	<4.13	< 77.5	< 58.5	12.5 J	15.65 U	14.04 U	16.73 U
	cis-1,2-Dichloroethene	1,620	1,960	2,660	2360	2,040	1720	2670	2,280	1,140
	cis-1,3-Dichloropropene	<5.9	<13	<5.44	< 77.5	ND	ND	ND	ND	ND
	Dichlorodifluoromethane	<3.62	<14.7	<3.34	< 77.5	< 58.5	< 60.5	15.02 U	10.77 U	18.59 U
	Ethylbenzene	185	122	133	57.6 J	106	163	142	72.2 J	81.2
	Hexachlorobutadiene	<9.3	<15.6	<8.57	< 77.5	ND	ND	ND	ND	ND
	m,p-Xylene	785	492	488	207	471	605	684	58.74 U	246
	MEK (2-Butanone)	<6.58	200	<6.06	< 155	88.5 J	< 121	47.4 J	42.1 J	25.39 U
	Methylene chloride	79.4 J	24.4 J	<14.6	53.8 J	< 292.5	< 302.5	184	175	45 J
	MTBE (Methyl tert-butyl ether)	<5.63	<18.6	<8.98	< 155	< 117	< 10.5	13.8 J	20.87 U	31.19 U
	o-Xylene	<8.52	36.8 J	34.6 J	< 77.5	< 58.5	30.9 J	15.63 U	32.27 U	15.04 U
	Styrene	<8.92	<14.6	<8.22	< 77.5	ND	ND	ND	ND	ND
	TCE (Trichloroethene)	11,000	7,750	10,900	6950	8,290	10400	9170	5,750	2,690
	PCE (Tetrachloroethene)	366	145	238	129	172 J	229	176	85.9 J	83.9
	Toluene	175	269	51.3 J	41.1 J	39 J	53.7 J	67.5 J	31.65 U	19.5 J
	trans-1,3-Dichloropropene	<4.65	<13.7	<4.29	< 77.5	ND	ND	ND	ND	ND
	Trichlorofluoromethane	<20.2	<15	26.8 J	< 77.5	7.71 J	12.2 J	19.54 U	13.95 U	20.36 U
	Vinyl chloride	<5.2	<10.5	<4.79	< 77.5	< 58.5	< 21.7	15.45 U	22.3 U	14.61 U
SW8015M[b] (µg/L)	Gasoline Range Organics (GRO)	2,790	2,600	2,330	1960	2,090	1580	1770	2050	119
Fixed Gases (%)	Carbon Dioxide	10.9	9.41	17.4	9.45	16.2	13.4	14.7	7.97	7.15
Method SM2720C[c]	Carbon Monoxide	<0.12	<0.12	<0.06	< 0.5	< 0.08	< 0.07	0.09 U	0.08 U	0.09 U
	Methane	<0.11	<0.1	<0.05	< 0.5	< 0.08	< 0.07	0.09 U	0.09 U	0.09 U
	Nitrogen	76.9	79.7	80.9	79.8	92.3	75	77.9	78.7	70.6
	Oxygen	8.69	10.9	1.69	10.7	6.1	4.33	4.3	16.3	13.3

Appendix A. Soil Vapor Sampling Results at SWMU ST-70
2008 to 2013

Chemical Class & Analytical Method	Location	219-39-42								
	Sample ID	ST70-AR-39-42-240413	ST70-AR-39-42-160113	ST219-AR-39-42-121012	ST219-AR-39-42-230812	ST219-AR-39-42-130412	ST219-AR-39-42-030112	ST219-AR-39-42-161111	ST219-AR-39-42-28092011	ST219-AR-39-42-21042011
	Sample Date	04/24/13	01/16/13	10/12/12	08/23/12	04/13/12	01/03/12	11/16/11	09/28/11	04/21/11
	Analyte Screen Depth	40-45								
VOCs (ppbv)	1,1,1-Trichloroethane	< 28.2	< 18.9	<18NR	< 41.7	<49.2	<26.9	< 31.2	< 7.73	<17.3
Method TO-15[a]	1,1,2,2-Tetrachloroethane	< 28.2	< 18.9	<18NR	< 41.7	<49.2	1,330	< 31.2	640	<16.2
	1,1,2-Trichloroethane	< 28.2	< 18.9	<18NR	< 41.7	<49.2	<26.9	< 31.2	< 7.73	<27.2
	1,1,2-Trichloro-1,2,2-trifluoroethane	< 28.2	< 18.9	<18NR	< 41.7	<49.2	<26.9	< 31.2	< 7.73	<24.8
	1,1-Dichloroethane	< 28.2	< 18.9	<18NR	< 41.7	<49.2	<26.9	< 31.2	15.2 J	<30
	1,1-Dichloroethene	< 28.2	< 18.9	<18NR	< 41.7	<49.2	<26.9	< 31.2	< 7.73	<35.4
	1,2,4-Trichlorobenzene	< 28.2	< 18.9	<18NR	< 41.7	<49.2	<26.9	< 31.2	< 22.2	<33.5
	1,2,4-Trimethylbenzene	119	67.4	164NR	57.3 J	591	147	104	163	692
	1,2-Dichloroethane (EDC)	< 28.2	< 18.9	<18NR	< 41.7	<49.2	<26.9	< 31.2	< 7.73	<31.1
	1,2-Dichlorobenzene	< 28.2	< 18.9	<18NR	< 41.7	<49.2	<26.9	< 31.2	< 7.73	<30.3
	1,2-Dichloro-1,1,2,2-tetrafluoroethane	< 28.2	< 18.9	<18NR	< 41.7	<49.2	<26.9	< 31.2	< 7.73	<31.6
	1,2-Dichloropropane	< 28.2	< 18.9	<18NR	< 41.7	<49.2	<26.9	< 31.2	< 7.73	<28.5
	1,2-Dibromoethane (EDB)	< 28.2	< 18.9	<18NR	< 41.7	<49.2	<26.9	< 31.2	< 7.73	<22.4
	1,3,5-Trimethylbenzene	142	85.7	127NR	55.8 J	480	193	127	143	655
	1,3-Dichlorobenzene	< 28.2	< 18.9	<18NR	< 41.7	<49.2	<26.9	< 31.2	< 7.73	<24.8
	1,4-Dichlorobenzene	< 28.2	< 18.9	<18NR	< 41.7	<49.2	<26.9	< 31.2	< 7.73	<32.1
	Acetone	147J	< 18.9	<18NR	< 41.7	<49.2	<202	158 J	< 7.73	<60.6
	Benzene	292	194	64NR	348	325	502	367	423	758
	Bromomethane	< 28.2	< 18.9	<18NR	< 41.7	<49.2	<26.9	< 31.2	< 7.73	<11.3
	Carbon tetrachloride	< 28.2	< 18.9	<18NR	< 41.7	<49.2	<26.9	< 31.2	< 7.73	<12.2
	Chlorobenzene	< 28.2	< 18.9	<18NR	< 41.7	<49.2	<26.9	< 31.2	< 7.73	<16.2
	Chloroethane	< 28.2	< 18.9	<18NR	< 41.7	<49.2	<26.9	< 31.2	< 7.73	<19.2
	Chloroform	39.2J	32J	<18NR	62.4 J	50.8 J	69.2 J	50.9 J	65.6	104 J
	Chloromethane	< 28.2	< 18.9	<18NR	< 41.7	<49.2	<26.9	< 31.2	10.2 J	<11.8
	cis-1,2-Dichloroethene	7,980	5,030	1700NR	11,900	8,200	12,400	9,460	< 7.73	18,100
	cis-1,3-Dichloropropene	< 28.2	< 18.9	<18NR	< 41.7	<49.2	<26.9	< 31.2	< 7.73	<15.5
	Dichlorodifluoromethane	< 28.2	< 18.9	<18NR	< 41.7	<49.2	<26.9	< 31.2	< 7.73	<9.54
	Ethylbenzene	< 28.2	< 18.9	<18NR	< 41.7	<49.2	<26.9	< 31.2	17.4 J	31 J
	Hexachlorobutadiene	< 28.2	< 18.9	<18NR	< 41.7	<49.2	<26.9	< 31.2	< 7.73	<45
	m,p-Xylene	91.5J	58.5J	<35NR	< 83.4	102 J	96.8 J	< 62.4	78.9	142 J
	MEK (2-Butanone)	< 28.2	< 18.9	<18NR	< 41.7	<49.2	<26.9	< 31.2	265	<17.3
	Methylene chloride	< 28.2	< 18.9	<18NR	47.8 J	51.2 J	29.6 J	< 31.2	15.1 J	<51.6
	MTBE (Methyl tert-butyl ether)	< 28.2	< 18.9	<18NR	< 41.7	<49.2	<26.9	< 31.2	< 7.73	<14.8
	o-Xylene	< 28.2	< 18.9	<18NR	< 41.7	<49.2	<26.9	< 31.2	13.9 J	28.5 J
	Styrene	< 28.2	< 18.9	<18NR	< 41.7	<49.2	<26.9	< 31.2	< 7.73	<23.5
	TCE (Trichloroethene)	13,900	10,800	4000NR	20,600	10,200	16,400	12,700	13,200E	23,900
	PCE (Tetrachloroethene)	3,360	1,940	731NR	3,560	1,170	3,740	2,530	3,830	4,030
	Toluene	94.7	55.5J	18NR	114 J	64.9 J	80.8 J	67.2 J	109	125 J
	trans-1,3-Dichloropropene	< 28.2	< 18.9	<18NR	< 41.7	<49.2	<26.9	< 31.2	< 7.73	<12.2
	Trichlorofluoromethane	< 28.2	< 18.9	<18NR	< 41.7	<49.2	<26.9	< 31.2	< 7.73	<53.1
	Vinyl chloride	< 28.2	< 18.9	<18NR	< 41.7	<49.2	<26.9	< 31.2	< 7.73	<13.7
SW8015M[b] (µg/L)	Gasoline Range Organics (GRO)	1,670	1,360	704NR	709	1,270	969	1,410	1,000	3,100
Fixed Gases (%)	Carbon Dioxide	14.7	15.2	2.8NR	18.2	11.8	19.1	20.0	6.39	15.6
Method SM2720C[c]	Carbon Monoxide	< 0.15	< 0.14	<0.2NR	< 0.15	<0.16	<0.14	< 0.15	< 0.13	<0.14
	Methane	< 0.15	< 0.14	<0.2NR	< 0.15	<0.16	<0.14	< 0.15	< 0.12	<0.12
	Nitrogen	77.3	77.1	129 UR	76.9	74.9	77.1	78.4	78.7	80.1
	Oxygen	7.99	7.6	15NR	4.94	13.3	3.81	1.65	14.9	4.3

Appendix A. Soil Vapor Sampling Results at SWMU ST-70
2008 to 2013

Chemical Class & Analytical Method	Location	219-39-42									
	Sample ID	ST219-AR-39-42-18012011	ST219-AR-39-42-12112010	ST219-AR-39-42-17092010	ST219-AR-39-42-17022010	ST219-AR-39-42-101109	ST219-AR-39-42-070809	ST219-AR-39-42-140309	ST219-AR-219-39-42-10072008	ST219-AR-219-39-42-10072008DUP (Duplicate)	ST219-AR-219-39-42-27032008
	Sample Date	01/18/11	11/12/10	09/17/10	02/17/10	11/10/09	08/07/09	03/14/09	07/10/08	07/10/08	03/27/08
	Analyte / Screen Depth	40-45									
VOCs (ppbv) Method TO-15[a]	1,1,1-Trichloroethane	31.2 J	<19.6	<14.2	< 205	< 12.4	< 28.4	6.15 U	68.48 U	233	56.86 U
	1,1,2,2-Tetrachloroethane	<24.3	<48.3	<13.3	< 205	< 13.8	< 66.3	5.89 U	92.91 U	56.83 U	59.5 U
	1,1,2-Trichloroethane	<40.7	<26	<22.3	< 205	ND	ND	ND	ND	ND	ND
	1,1,2-Trichloro-1,2,2-trifluoroethane	<37.2	<21.5	<20.3	< 205	< 17.7	< 49	4.2 U	48.97 U	29.95 U	69.65 U
	1,1-Dichloroethane	<44.9	<19.6	25 J	54.6 J	43.5 J	< 36.7	32.6 J	65.44 U	40.02 U	56 J
	1,1-Dichloroethene	<53	<37.6	<29	< 205	< 8.88	< 64.2	8.95 U	48.35 U	29.57 U	82.62 U
	1,2,4-Trichlorobenzene	<50.1	<22.5	<27.4	< 205	ND	ND	ND	ND	ND	ND
	1,2,4-Trimethylbenzene	285	152	373	478	183	1250	107 J	145 J	63.97 U	228 J
	1,2-Dichloroethane (EDC)	<46.6	<18.5	<25.5	< 205	ND	ND	ND	ND	ND	ND
	1,2-Dichlorobenzene	<45.3	<30.7	<24.8	< 205	ND	ND	ND	ND	ND	ND
	1,2-Dichloro-1,1,2,2-tetrafluoroethane	<47.4	<21.9	<25.9	< 205	ND	ND	ND	ND	ND	ND
	1,2-Dichloropropane	<42.7	<16.9	<23.4	< 205	ND	ND	ND	ND	ND	ND
	1,2-Dibromoethane (EDB)	<33.6	<21.3	<18.4	< 205	ND	ND	ND	ND	ND	ND
	1,3,5-Trimethylbenzene	355	162	336	511	206	1060	103 J	156 J	65.1 U	243 J
	1,3-Dichlorobenzene	<37.2	<31.8	<20.3	< 205	ND	ND	ND	ND	ND	ND
	1,4-Dichlorobenzene	<48	<30.2	<26.3	< 205	ND	ND	ND	ND	ND	ND
	Acetone	<90.7	<27.8	<49.6	112 J	< 247	< 55.4	26.02 U	79.89 U	48.86 U	126.9U
	Benzene	802	349	508 B	1000	504	982	292	275 J	349	544
	Bromomethane	<17	<26.8	<9.28	23.2 J	ND	ND	ND	ND	ND	ND
	Carbon tetrachloride	<18.4	<20.4	<10	< 205	< 6.93	< 25.5	32.78 U	53.34 U	32.62 U	61.49 U
	Chlorobenzene	<24.3	<22	<13.3	< 205	< 15.2	< 45.9	3.61 U	91.78 U	56.14 U	52.7 U
	Chloroethane	<28.8	<35.1	<15.7	< 205	ND	ND	ND	ND	ND	ND
	Chloroform	153 J	77.4 J	89.6 J	149 J	98.3 J	225 J	44 J	65.6 J	77.7 J	107 J
	Chloromethane	<17.7	<23.4	<9.66	< 205	< 10.3	< 47.6	33.69 U	46.13 U	28.22 U	77.33 U
	cis-1,2-Dichloroethene	26,600	10,800	15,600	26700	20,800	36300	13000	16,800	18,600	18,400
	cis-1,3-Dichloropropene	<23.3	<23.8	<12.7	< 205	ND	ND	ND	ND	ND	ND
	Dichlorodifluoromethane	<14.3	<26.8	<7.81	< 205	< 18.9	< 27.7	5.5 U	35.4 U	21.65 U	85.93 U
	Ethylbenzene	<31.4	<26.5	18 J	38.8 J	< 16	< 34.5	22.01 U	98 U	59.94 U	59.5 U
	Hexachlorobutadiene	<36.7	<28.4	<20	< 205	ND	ND	ND	ND	ND	ND
	m,p-Xylene	122 J	128	79.7 J	182 J	50.4 J	286 J	68.67 U	192.99 U	118.04 U	120.2 U
	MEK (2-Butanone)	<25.9	<16.1	<14.2	< 410	< 4.91	< 41.5	14.89 U	93.49 U	57.18 U	117.4 U
	Methylene chloride	<62.7	<25	46.3 J	142 J	< 617.5	< 1595	34.6 J	212 J	140 J	250 J
	MTBE (Methyl tert-butyl ether)	<22.2	<34	<21	< 410	< 21.4	< 55.3	15.89 U	68.58 U	41.95 U	144.2U
	o-Xylene	<33.6	<32.3	<18.4	< 205	< 17.3	< 76.8	31.69 U	106.03 U	64.85 U	69.52 U
	Styrene	<35.2	<26.5	<19.2	< 205	ND	ND	ND	ND	ND	ND
	TCE (Trichloroethene)	20,800	10,100	11,900	16900	15,000	25500	5820	10,800	11,400	8,380
	PCE (Tetrachloroethene)	4,310	2,130	3,010	2400	2,650	3560	485	1,260	1,350	882
	Toluene	126 J	90.9 J	96.5 J	150 J	58.4 J	278 J	27 J	103.98 U	63.6 U	73.2 F
	trans-1,3-Dichloropropene	<18.4	<25	<10	< 205	ND	ND	ND	ND	ND	ND
	Trichlorofluoromethane	<79.6	<27.4	<43.5	< 205	< 18.9	< 30	1.92 U	45.82 U	28.03 U	94.15 U
	Vinyl chloride	<20.5	<19.1	<11.2	< 205	< 21.8	< 115	14.72 U	73.26 U	44.81 U	67.54 U
SW8015M[b] (µg/L)	Gasoline Range Organics (GRO)	1,740	1,990	2,260	1780	1,350	1430	638	1690	637	2,410
Fixed Gases (%) Method SM2720C[c]	Carbon Dioxide	13.9	14.9	12.8	14.7	14	14.2	7.73	13.6	13.4	20.4
	Carbon Monoxide	<0.12	<0.12	<0.06	< 0.5	< 0.08	< 0.08	0.08 U	0.08 U	0.08 U	0.11 U
	Methane	<0.11	<0.11	<0.05	< 0.5	< 0.08	< 0.08	0.08 U	0.09 U	0.09 U	0.11 U
	Nitrogen	72.9	81.1	79.6	79.3	90.6	75.1	77.3	90	92.3	74.4
	Oxygen	5.01	4.05	7.69	5.98	9.3	5.7	12.2	6.08	7.13	5.05

Appendix A. Soil Vapor Sampling Results at SWMU ST-70
2008 to 2013

Chemical Class & Analytical Method	Location	219-39-75										
	Sample ID	ST219-AR-39-75-28092011	ST219-AR-39-75-21042011	ST219-AR-39-75-18012011	ST219-AR-39-75-12112010	ST219-AR-39-75-17092010	ST219-AR-39-75-17022010	ST219-AR-39-75-101109	ST219-AR-39-75-070809	ST219-AR-39-75-140309	ST219-AR-219-39-75-10072008	ST219-AR-219-39-75-27032008
	Sample Date	09/28/11	04/21/11	01/18/11	11/12/10	09/17/10	02/17/10	11/10/09	08/07/09	03/14/09	07/10/08	03/27/08
	Analyte Screen Depth	73-78										
VOCs (ppbv) Method TO-15[a]	1,1,1-Trichloroethane	< 2.15	<1.08	3.36 J	<4.12	<1.72	3.12 J	< 3.42	< 2.16	10.7 J	25.93 U	33.84 U
	1,1,2,2-Tetrachloroethane	50.9	<1.01	<2.5	<10.1	<1.61	< 27.1	227	< 5.04	10.09 U	35.18 U	35.42 U
	1,1,2-Trichloroethane	< 2.15	<1.69	<4.19	<5.46	<2.69	< 27.1	ND	ND	ND	ND	ND
	1,1,2-Trichloro-1,2,2-trifluoroethane	< 2.15	<1.55	<3.83	<4.5	<2.46	< 27.1	< 4.6	< 3.72	13.6 J	18.54 U	41.46 U
	1,1-Dichloroethane	3.76 J	<1.87	5.1 J	<4.1	<2.97	6.06 J	< 3.03	7.84 J	15.5 J	24.78 U	30.92 U
	1,1-Dichloroethene	2.49 J	<2.21	<5.46	<7.89	<3.51	< 27.1	< 6.65	< 4.88	6.04 U	18.31 U	49.18 U
	1,2,4-Trichlorobenzene	< 2.15	<2.08	<5.16	<4.71	<3.32	< 27.1	ND	ND	ND	ND	ND
	1,2,4-Trimethylbenzene	162	93	294	127	178	135	47 J	973	165	39.6 U	73.4 J
	1,2-Dichloroethane (EDC)	< 2.15	<1.94	<4.8	<3.88	<3.09	< 27.1	ND	ND	ND	ND	ND
	1,2-Dichlorobenzene	< 2.15	<1.89	<4.67	<6.44	<3	< 27.1	ND	ND	ND	ND	ND
	1,2-Dichloro-1,1,2,2-tetrafluoroethane	< 2.15	<1.97	<4.88	<4.6	<3.14	< 27.1	ND	ND	ND	ND	ND
	1,2-Dichloropropane	< 2.15	<1.78	<4.4	<3.53	<2.83	< 27.1	ND	ND	ND	ND	ND
	1,2-Dibromoethane (EDB)	< 2.15	<1.4	<3.46	<4.47	<2.22	< 27.1	ND	ND	ND	ND	ND
	1,3,5-Trimethylbenzene	104	63.2	214	111	125	134	96.2	777	151	40.3 U	97.2 J
	1,3-Dichlorobenzene	< 2.15	<1.55	<3.83	<6.67	<2.46	< 27.1	ND	ND	ND	ND	ND
	1,4-Dichlorobenzene	< 2.15	<2	<4.95	<6.33	<3.18	< 27.1	ND	ND	ND	ND	ND
	Acetone	16.3	<3.77	21.3 J	28.5 J	14.3 J	54.9	62 J	72.1	105	38.2 J	75.51 U
	Benzene	30.3	28.9	101	79.6	17.6	165	129	109	155	180	118 J
	Bromomethane	< 2.15	0.97 J	<1.75	<5.62	<1.12	5.74 J	ND	ND	ND	ND	ND
	Carbon tetrachloride	< 2.15	<0.76	<1.89	<4.27	<1.21	< 27.1	< 2.74	2.91 J	6.35 U	20.2 U	36.6 U
	Chlorobenzene	< 2.15	<1.01	<2.5	<4.61	<1.61	< 27.1	< 3.38	< 3.49	8.15 U	34.75 U	31.37 U
	Chloroethane	< 2.15	<1.2	<2.97	<7.37	<1.91	< 27.1	ND	ND	ND	ND	ND
	Chloroform	3.21 J	2.01 J	8.7 J	22.3 J	<2.42	34.7	33.5 J	37.7	41.3 J	40.5 J	33.92 U
	Chloromethane	< 2.15	<0.74	3.04 J	<4.91	2.05 J	6.55 J	< 3.25	< 3.62	7.61 J	17.47 U	46.03 U
	cis-1,2-Dichloroethene	1,040	653	2,030	2,850	712	5090	4,650	3910	5230	8,710	4,910
	cis-1,3-Dichloropropene	< 2.15	<0.97	<2.4	<4.98	<1.54	< 27.1	ND	ND	ND	ND	ND
	Dichlorodifluoromethane	< 2.15	<0.59	<1.47	<5.62	<0.95	< 27.1	< 2.74	< 2.11	6.68 U	13.4 U	51.15 U
	Ethylbenzene	3.64 J	2.08 J	5.94 J	14.1 J	3.72 J	24.1 J	16.8 J	< 2.62	17.8 J	37.11 U	35.42 U
	Hexachlorobutadiene	< 2.15	<2.94	<3.78	<5.96	<2.43	< 27.1	ND	ND	ND	ND	ND
	m,p-Xylene	22.6	11.5	36.6	63.6	22.8	104	47.4	149	70.7 J	73.07 U	71.55 U
	MEK (2-Butanone)	< 2.15	<1.08	<2.67	<3.37	<1.72	< 54.1	< 5.3	< 3.16	12.4 J	35.4 U	69.88 U
	Methylene chloride	3.35 J	<3.31	15.8 J	<5.25	7.87 J	18.3 J	< 192	< 121.3	25.3 J	74.6 J	137 J
	MTBE (Methyl tert-butyl ether)	< 2.15	<0.92	<2.29	<7.12	<2.54	< 54.1	< 5.48	< 4.21	5.41 U	25.97 U	85.84 U
	o-Xylene	< 2.15	<1.4	<3.46	<6.77	<2.22	10 J	< 4.35	13.4 J	6.96 U	40.15 U	41.38 U
	Styrene	< 2.15	<1.46	<3.62	<5.56	<2.33	< 27.1	ND	ND	ND	ND	ND
	TCE (Trichloroethene)	325	257	1,040	2,730	222	3450	3,620	3310	3780	6,190	3,240
	PCE (Tetrachloroethene)	33.2	64.1	211	698	24.1	759	733	703	648	992	3,210
	Toluene	2.54 J	4.95 J	11.2 J	32.9	<2.83	47.4	46.8	45.1	37 J	40.7 J	49.4 J
	trans-1,3-Dichloropropene	< 2.15	<0.76	<1.89	<5.24	<1.21	< 27.1	ND	ND	ND	ND	ND
	Trichlorofluoromethane	< 2.15	<3.31	<8.2	<5.74	<5.27	< 27.1	< 1.97	2.76 J	8.7 U	17.35 U	56.04 U
	Vinyl chloride	< 2.15	<0.85	<2.11	<4.01	<1.36	< 27.1	< 2.79	< 8.72	6.88 U	27.74 U	40.2 U
SW8015M[b] (µg/L)	Gasoline Range Organics (GRO)	178	147	146	725	235	858	783	958	667	214	1,440
Fixed Gases (%) Method SM2720C[c]	Carbon Dioxide	1.64	1.71	1.3	3.15	0.82	5.97	3.7	3.09	12.7	3.47	18.7
	Carbon Monoxide	< 0.13	<0.12	<0.12	<0.11	<0.06	< 0.5	< 0.1	< 0.07	0.08 U	0.08 U	0.13 U
	Methane	< 0.11	<0.11	<0.11	<0.1	<0.05	< 0.5	< 0.1	< 0.07	0.09 U	0.09 U	0.13 U
	Nitrogen	77.4	77.8	70.2	77.6	77.9	79.4	86.7	88.3	77.5	88.4	72.8
	Oxygen	21.0	20.5	18.6	19.3	21.3	14.6	21.2	22.3	3.11	20.3	3.02

Appendix A. Soil Vapor Sampling Results at SWMU ST-70
2008 to 2013

Chemical Class & Analytical Method	Location	219-40-20								
	Sample ID	ST70-AR-40-20-240413	ST70-AR-40-20-160113	ST219-AR-40-20-121012	ST219-AR-40-20-230812	ST219-AR-40-20-130412	ST219-AR-40-20-030112	ST219-AR-40-20-161111	ST219-AR-40-20-28092011	ST219-AR-40-20-21042011
	Sample Date	04/24/13	01/16/13	10/12/12	08/23/12	04/13/12	01/03/12	11/16/11	09/28/11	04/21/11
	Analyte Screen Depth	18-23								
VOCs (ppbv) Method TO-15[a]	1,1,1-Trichloroethane	< 45.2	< 30.3	< 53.6	< 40.5	<37.5	<33	< 40.1	< 38.6	<26.7
	1,1,2,2-Tetrachloroethane	< 45.2	< 30.3	< 53.6	< 40.5	<37.5	<33	< 40.1	< 38.6	<25
	1,1,2-Trichloroethane	< 45.2	< 30.3	< 53.6	< 40.5	<37.5	<33	< 40.1	< 38.6	<41.9
	1,1,2-Trichloro-1,2,2-trifluoroethane	< 45.2	< 30.3	< 53.6	< 40.5	<37.5	<33	< 40.1	< 38.6	<38.3
	1,1-Dichloroethane	< 45.2	< 30.3	< 53.6	< 40.5	<37.5	<33	< 40.1	< 38.6	<46.3
	1,1-Dichloroethene	< 45.2	< 30.3	< 53.6	< 40.5	<37.5	<33	< 40.1	< 38.6	<54.6
	1,2,4-Trichlorobenzene	< 45.2	< 30.3	< 53.6	< 40.5	<37.5	<33	< 40.1	< 38.6	56.3 J
	1,2,4-Trimethylbenzene	5,740	5,070	19,900	5,090	10400	9,020	8,380	19,000	30,100
	1,2-Dichloroethane (EDC)	< 45.2	< 30.3	< 53.6	< 40.5	<37.5	<33	< 40.1	< 38.6	<48
	1,2-Dichlorobenzene	< 45.2	< 30.3	< 53.6	< 40.5	<37.5	<33	< 40.1	< 38.6	<46.7
	1,2-Dichloro-1,1,2,2-tetrafluoroethane	< 45.2	< 30.3	< 53.6	< 40.5	<37.5	<33	< 40.1	< 38.6	<48.8
	1,2-Dichloropropane	< 45.2	< 30.3	< 53.6	< 40.5	<37.5	<33	< 40.1	< 38.6	<44
	1,2-Dibromoethane (EDB)	< 45.2	< 30.3	< 53.6	< 40.5	<37.5	<33	< 40.1	< 38.6	<34.6
	1,3,5-Trimethylbenzene	4,560	4,140	12,000	4,350	6,960	7,020	6,430	12,500	19,700
	1,3-Dichlorobenzene	< 45.2	< 30.3	< 53.6	< 40.5	<37.5	<33	< 40.1	< 38.6	<38.3
	1,4-Dichlorobenzene	< 45.2	< 30.3	< 53.6	< 40.5	<37.5	<33	< 40.1	< 38.6	<49.5
	Acetone	59J	< 30.3	< 53.6	< 40.5	<37.5	<33	171 J	< 165	<134
	Benzene	< 45.2	< 30.3	< 53.6	< 40.5	<37.5	172	155	259	157 J
	Bromomethane	< 45.2	< 30.3	< 53.6	< 40.5	<37.5	<33	< 40.1	< 38.6	<17.5
	Carbon tetrachloride	< 45.2	< 30.3	< 53.6	< 40.5	<37.5	<33	< 40.1	< 38.6	<18.9
	Chlorobenzene	< 45.2	< 30.3	< 53.6	< 40.5	<37.5	<33	< 40.1	< 38.6	<25
	Chloroethane	< 45.2	< 30.3	< 53.6	< 40.5	<37.5	<33	< 40.1	< 38.6	<29.7
	Chloroform	< 45.2	< 30.3	< 53.6	< 40.5	<37.5	<33	< 40.1	< 38.6	<37.6
	Chloromethane	< 45.2	< 30.3	< 53.6	< 40.5	<37.5	<33	< 40.1	< 38.6	<18.2
	cis-1,2-Dichloroethene	342	445	159 J	551	378	535	486	525	700
	cis-1,3-Dichloropropene	< 45.2	< 30.3	< 53.6	< 40.5	<37.5	<33	< 40.1	< 38.6	<24
	Dichlorodifluoromethane	< 45.2	< 30.3	< 53.6	< 40.5	<37.5	<33	< 40.1	< 38.6	<14.7
	Ethylbenzene	358	293	386	372	375	422	392	463	849
	Hexachlorobutadiene	< 45.2	< 30.3	< 53.6	< 40.5	<37.5	<33	< 40.1	< 38.6	<76.3
	m,p-Xylene	2,640	2,300	3,200	4,180	2,920	3,570	3,310	4,850	7,890
	MEK (2-Butanone)	< 45.2	< 30.3	< 53.6	< 40.5	<37.5	<33	< 40.1	63.3 J	<26.7
	Methylene chloride	< 45.2	< 30.3	< 53.6	< 40.5	<37.5	<33	< 40.1	< 38.6	<76.3
	MTBE (Methyl tert-butyl ether)	< 45.2	< 30.3	< 53.6	< 40.5	<37.5	<33	< 40.1	< 38.6	<22.9
	o-Xylene	< 45.2	< 30.3	< 53.6	< 40.5	<37.5	107 J	< 40.1	< 38.6	<34.6
	Styrene	< 45.2	< 30.3	< 53.6	< 40.5	<37.5	<33	< 40.1	< 38.6	<36.2
	TCE (Trichloroethene)	222	203	87.9 J	247	220	242	227	252	503
	PCE (Tetrachloroethene)	< 45.2	< 30.3	< 53.6	< 40.5	<37.5	<33	< 40.1	< 38.6	35.9 J
	Toluene	57.4J	34.9J	< 53.6	65.1 J	<37.5	43 J	55.6 J	70.9 J	52.1 J
	trans-1,3-Dichloropropene	< 45.2	< 30.3	< 53.6	< 40.5	<37.5	<33	< 40.1	< 38.6	<18.9
	Trichlorofluoromethane	< 45.2	< 30.3	< 53.6	< 40.5	<37.5	<33	< 40.1	< 38.6	<82
	Vinyl chloride	< 45.2	< 30.3	< 53.6	< 40.5	<37.5	<33	< 40.1	< 38.6	<21.1
SW8015M[b] (µg/L)	Gasoline Range Organics (GRO)	6,080	4,190	9,160	6,590	5,940	4,070	5,080	6,750	8,020
Fixed Gases (%) Method SM2720C[c]	Carbon Dioxide	13.4	13.4	11.5	12.8	13.8	16.8	18.5	8.54	12.4
	Carbon Monoxide	< 0.14	< 0.13	<0.15	< 0.16	<0.15	<0.51	< 0.14	< 0.12	<0.12
	Methane	< 0.14	0.21J	<0.15	0.36 J	0.21 J	<0.51	0.26 J	< 0.11	0.22 J
	Nitrogen	79.1	78.7	128 UR	74.8	79.1	79.3	78.3	78.7	81.3
	Oxygen	7.36	7.7	5.3	12.1	6.86	3.9 J	2.9	12.7	6.07

Appendix A. Soil Vapor Sampling Results at SWMU ST-70
2008 to 2013

Chemical Class & Analytical Method	Location	219-40-20								
	Sample ID	ST219-AR-40-20-18012011	ST219-AR-40-20-12112010	ST219-AR-40-20-17092010	ST219-AR-40-20-17022010	ST219-AR-40-20-101109	ST219-AR-40-20-070809	ST219-AR-40-20-140309	ST219-AR-219-40-20-10072008	ST219-AR-219-40-20-27032008
	Sample Date	01/18/11	11/12/10	09/17/10	02/17/10	11/10/09	08/07/09	03/14/09	07/10/08	03/27/08
	Analyte Screen Depth	18-23								
VOCs (ppbv)	1,1,1-Trichloroethane	<13.1	<32.3	<12.9	< 160.5	< 14.2	< 6	5.97 U	47.64 U	19.95 U
Method TO-15[a]	1,1,2,2-Tetrachloroethane	<12.3	<79.5	<12.1	< 160.5	3,930	< 14	7.95 U	64.63 U	20.87 U
	1,1,2-Trichloroethane	<20.6	<42.8	<20.3	< 160.5	ND	ND	ND	ND	ND
	1,1,2-Trichloro-1,2,2-trifluoroethane	<18.8	<35.3	<18.6	< 160.5	< 20.3	< 10.4	5.59 J	34.06 U	24.43 U
	1,1-Dichloroethane	<22.7	<32.2	<22.4	< 160.5	< 19.6	11.8 J	17.2 J	45.52 U	18.22 U
	1,1-Dichloroethene	<26.8	<61.9	<26.5	< 160.5	< 10.2	< 13.6	16.7 J	33.63 U	28.98 U
	1,2,4-Trichlorobenzene	<25.3	<36.9	<25	< 160.5	ND	ND	ND	ND	ND
	1,2,4-Trimethylbenzene	20,800	13,700	7,680	11500	14,500	10300	3700	7,560	8,680
	1,2-Dichloroethane (EDC)	<23.6	<30.4	<23.3	< 160.5	ND	ND	ND	ND	ND
	1,2-Dichlorobenzene	<22.9	<50.5	<22.6	< 160.5	ND	ND	ND	ND	ND
	1,2-Dichloro-1,1,2,2-tetrafluoroethane	<23.9	<36.1	<23.7	< 160.5	ND	ND	ND	ND	ND
	1,2-Dichloropropane	<21.6	<27.7	<21.3	< 160.5	ND	ND	ND	ND	ND
	1,2-Dibromoethane (EDB)	<17	<35.1	<16.8	< 160.5	ND	ND	ND	ND	ND
	1,3,5-Trimethylbenzene	13,900	9,970	5,390	7640	8,680	7110	2880	4,830	6,310
	1,3-Dichlorobenzene	<18.8	<52.3	<18.6	< 160.5	ND	ND	ND	ND	ND
	1,4-Dichlorobenzene	<24.3	<49.7	<24	< 160.5	ND	ND	ND	ND	ND
	Acetone	<45.8	<45.7	104 J	111 J	< 284	142	76.4	64.9 J	52.9 J
	Benzene	<21.6	<28.1	109 J	175	< 142	494	63.5	63.01 U	44.2 J
	Bromomethane	<8.58	<44.1	<8.47	21.6 J	ND	ND	ND	ND	ND
	Carbon tetrachloride	<9.27	<33.5	<9.16	< 160.5	< 7.97	< 5.4	5 U	37.1 U	21.57 U
	Chlorobenzene	<12.3	<36.2	<12.1	< 160.5	< 17.5	< 9.72	347	183 J	18.49 U
	Chloroethane	<14.5	<57.8	<14.4	< 160.5	ND	ND	ND	ND	ND
	Chloroform	<18.4	<85.3	<18.2	< 160.5	< 19.8	< 4.14	4.95 U	43.59 U	19.99 U
	Chloromethane	<8.93	<38.5	<8.82	< 160.5	< 11.8	< 10.1	8.12 J	32.09 U	27.13 U
	cis-1,2-Dichloroethene	863	626	900	1720	1,270	2100	3940	2,290	4,250
	cis-1,3-Dichloropropene	<11.7	<39.1	<11.6	< 160.5	ND	ND	ND	ND	ND
	Dichlorodifluoromethane	<7.22	<44.1	<7.13	< 160.5	< 21.7	< 5.86	9.5 J	24.63 U	30.14 U
	Ethylbenzene	740	554	343	< 160.5	277	470	408	322	749
	Hexachlorobutadiene	<18.5	<46.8	<18.3	< 160.5	ND	ND	ND	ND	ND
	m,p-Xylene	6,990	5,320	2,690	5000	4810	4920	3490	4,270	6,960
	MEK (2-Butanone)	<13.1	<26.4	<12.9	< 321	< 5.65	96.6 J	44.2 J	65.03 U	41.18 U
	Methylene chloride	71.1 J	41.9 J	40 J	124 J	102 J	290 J	46.9 J	160 J	52.9 J
	MTBE (Methyl tert-butyl ether)	<11.2	<55.9	<19.2	< 321	< 24.6	62.9 J	8.43 J	47.71 U	50.59 U
	o-Xylene	<17	<53.1	<16.8	< 160.5	125 J	< 16.2	47.5 J	73.76 U	24.39 U
	Styrene	<17.8	<43.7	<17.6	< 160.5	ND	ND	ND	ND	ND
	TCE (Trichloroethene)	324	269	294	663	474	974	1480	600	1,030
	PCE (Tetrachloroethene)	<15.3	26 J	22.6 J	< 160.5	31 J	115	15.6 J	44.33 U	23.67 U
	Toluene	36.3 J	<39.2	67.5 J	66.3 J	40.6 J	151	65.3	72.33 U	23.62 U
	trans-1,3-Dichloropropene	<9.27	<41.1	<9.16	< 160.5	ND	ND	ND	ND	ND
	Trichlorofluoromethane	<40.2	<45	<39.7	< 160.5	< 21.7	< 6.35	6.85 U	31.88 U	33.03 U
	Vinyl chloride	<10.4	<31.4	<10.2	< 160.5	< 25.1	< 24.3	9.79 J	50.96 U	23.69 U
SW8015M[b] (µg/L)	Gasoline Range Organics (GRO)	5,430	7,500	4,720	4400	6,500	4100	4950	6910	9,980
Fixed Gases (%)	Carbon Dioxide	11.6	13.9	16.5	13.3	14.1	16.8	13.1	11.8	16.2
Method SM2720C[c]	Carbon Monoxide	<0.12	<0.11	<0.06	< 0.5	< 0.08	< 0.08	0.08 U	0.08 U	0.09 U
	Methane	<0.11	<0.1	<0.05	0.32 J	< 0.08	0.4 J	0.4 J	0.39	0.73 J
	Nitrogen	72.3	81.3	78.9	82	84.8	83.6	82.1	78	69.4
	Oxygen	4.51	4.78	4.67	4.34	7.2	7.48	4.62	9.41	2.2

Appendix A. Soil Vapor Sampling Results at SWMU ST-70
2008 to 2013

Chemical Class & Analytical Method	Location	219-41								
	Sample ID	ST70-AR-41-240413	ST70-AR-41-160113	ST219-AR-41-121012	ST219-AR-41-230812	ST219-AR-41-130412	ST219-AR-41-030112	ST219-AR-41-161111	ST219-AR-41-28092011	ST219-AR-41-21042011
	Sample Date	04/24/13	01/16/13	10/12/12	08/23/12	04/13/12	01/03/12	11/16/11	09/28/11	04/21/11
	Analyte Screen Depth	10-15								
VOCs (ppbv)	1,1,1-Trichloroethane	< 1.25	< 0.24	< 0.3	< 1.36	0.38 J	<0.3	< 0.35	< 0.74	0.37 J
Method TO-15[a]	1,1,2,2-Tetrachloroethane	< 1.25	< 0.24	< 0.3	< 1.36	<0.26	<0.3	< 0.35	13.3	3.72
	1,1,2-Trichloroethane	< 1.25	< 0.24	< 0.3	< 1.36	<0.26	<0.3	< 0.35	< 0.74	<0.13
	1,1,2-Trichloro-1,2,2-trifluoroethane	< 1.25	< 0.24	< 0.3	< 1.36	<0.26	<0.3	< 0.35	< 0.74	<0.12
	1,1-Dichloroethane	< 1.25	< 0.24	< 0.3	< 1.36	<0.26	<0.3	< 0.35	< 0.74	<0.15
	1,1-Dichloroethene	< 1.25	< 0.24	< 0.3	< 1.36	<0.26	<0.3	< 0.35	< 0.74	<0.17
	1,2,4-Trichlorobenzene	< 1.25	< 0.24	< 0.3	< 1.36	<0.26	<0.3	1.1 J	< 0.74	<0.17
	1,2,4-Trimethylbenzene	6.95	6.05	17.1	14.5	18.5	17.7	13.5	35.5	14.5
	1,2-Dichloroethane (EDC)	< 1.25	< 0.24	< 0.3	< 1.36	<0.26	<0.3	< 0.35	< 0.74	<0.15
	1,2-Dichlorobenzene	< 1.25	< 0.24	< 0.3	< 1.36	<0.26	<0.3	< 0.35	< 0.74	<0.15
	1,2-Dichloro-1,1,2,2-tetrafluoroethane	< 1.25	< 0.24	< 0.3	< 1.36	<0.26	<0.3	< 0.35	< 0.74	<0.16
	1,2-Dichloropropane	< 1.25	< 0.24	< 0.3	< 1.36	<0.26	<0.3	< 0.35	< 0.74	<0.14
	1,2-Dibromoethane (EDB)	< 1.25	< 0.24	< 0.3	< 1.36	<0.26	<0.3	< 0.35	< 0.74	<0.11
	1,3,5-Trimethylbenzene	5.96	5.1	9.63	11.7	11.4	17	11.6	22.5	8
	1,3-Dichlorobenzene	< 1.25	< 0.24	< 0.3	< 1.36	<0.26	<0.3	< 0.35	< 0.74	<0.12
	1,4-Dichlorobenzene	< 1.25	< 0.24	< 0.3	< 1.36	<0.26	<0.3	< 0.35	< 0.74	<0.16
	Acetone	10.7	7.24	4.87	25.8	18.8	6.46	4.08	5.79	<6.66
	Benzene	< 1.25	0.25J	0.56 J	< 1.36	0.66 J	0.59 J	0.37 J	1.95 J	2.45
	Bromomethane	< 1.25	< 0.24	< 0.3	< 1.36	0.31 J	<0.3	< 0.35	< 0.74	0.47 J
	Carbon tetrachloride	< 1.25	< 0.24	< 0.3	< 1.36	<0.26	<0.3	< 0.35	< 0.74	<0.06
	Chlorobenzene	< 1.25	< 0.24	< 0.3	< 1.36	<0.26	<0.3	< 0.35	< 0.74	<0.08
	Chloroethane	< 1.25	< 0.24	< 0.3	< 1.36	<0.26	<0.3	< 0.35	< 0.74	<0.09
	Chloroform	< 1.25	0.52J	0.35 J	3.26 J	0.65 J	0.67 J	0.56 J	0.81 J	0.45 J
	Chloromethane	< 1.25	< 0.24	< 0.3	< 1.36	0.27 J	<0.3	< 0.35	< 0.74	<0.06
	cis-1,2-Dichloroethene	1.27J	0.91	1.49	1.78 J	1.85	10.4	4.53	4.36	2.04
	cis-1,3-Dichloropropene	< 1.25	< 0.24	< 0.3	< 1.36	<0.26	<0.3	< 0.35	< 0.74	<0.08
	Dichlorodifluoromethane	< 1.25	0.37J	0.44 J	< 1.36	0.43 J	0.55 J	< 0.35	< 0.74	<0.05
	Ethylbenzene	< 1.25	< 0.24	0.31 J	1.68 J	<0.26	1.33	0.58 J	0.85 J	0.77 J
	Hexachlorobutadiene	< 1.25	< 0.24	< 0.3	< 1.36	<0.26	<0.3	< 0.35	< 0.74	<0.25
	m,p-Xylene	< 2.49	1.15J	1.34 J	6.35 J	1.51 J	7.58	3.21	4.77 J	3.23
	MEK (2-Butanone)	< 1.25	2.67	0.78 J	6.16 J	5.07	4.52	0.63 J	< 0.74	1.88
	Methylene chloride	< 1.25	< 0.24	0.6 J	< 2.92	0.3 J	0.35 J	< 0.42	0.77 J	<0.21
	MTBE (Methyl tert-butyl ether)	< 1.25	< 0.24	< 0.3	< 1.36	<0.26	<0.3	< 0.35	< 0.74	<0.07
	o-Xylene	< 1.25	< 0.24	< 0.3	< 1.36	0.28 J	<0.3	< 0.35	< 0.74	0.85
	Styrene	< 1.25	< 0.24	< 0.3	< 1.36	<0.26	<0.3	< 0.35	< 0.74	<0.12
	TCE (Trichloroethene)	6.78	4.69	6.08	5.83	4.92	32.6	14.9	10.7	4.47
	PCE (Tetrachloroethene)	15.1	5.78	13.3	39.5	22.4	19.7	17.1	31.6	42.6
	Toluene	< 1.25	0.25J	< 0.3	< 1.36	0.27 J	0.72 J	< 0.35	< 0.74	2.11
	trans-1,3-Dichloropropene	< 1.25	< 0.24	< 0.3	< 1.36	<0.26	<0.3	< 0.35	< 0.74	<0.06
	Trichlorofluoromethane	1.73J	0.95	1.21	3.39 J	1.75	1.44	3.18	7.91	2.93
	Vinyl chloride	< 1.25	< 0.24	< 0.3	< 1.36	<0.26	<0.3	< 0.35	< 0.74	<0.07
SW8015M[b] (µg/L)	Gasoline Range Organics (GRO)	36.8J	< 27.1	46.9 J	174	<55	<41.7	< 55.9	< 46.6	<32.9
Fixed Gases (%)	Carbon Dioxide	1.13	1.23	0.3	1.31	0.96 J	1.21	1.02 J	1.02	0.88 J
Method SM2720C[c]	Carbon Monoxide	< 0.14	< 0.14	<0.15	< 0.16	<0.15	<0.14	< 0.16	< 0.11	<0.12
	Methane	< 0.14	< 0.14	<0.15	< 0.16	<0.15	<0.14	< 0.16	< 0.09	<0.11
	Nitrogen	74.1	74.3	127 UR	74.2	75.2	74	74.8	77	77.3
	Oxygen	24.7	24.5	17.9	24.5	23.8	24.8	24.2	22	21.8

Appendix A. Soil Vapor Sampling Results at SWMU ST-70
2008 to 2013

Chemical Class & Analytical Method	Location	219-41								
	Sample ID	ST219-AR-41-18012011	ST219-AR-41-12112010	ST219-AR-41-17092010	ST219-AR-41-17022010	ST219-AR-41-101109	ST219-AR-41-070809	ST219-AR-41-140309	ST219-AR-219-41-10072008	ST219-AR-219-41-27032008
	Sample Date	01/18/11	11/12/10	09/17/10	02/17/10	11/10/09	08/07/09	03/14/09	07/10/08	03/27/08
	Analyte / Screen Depth	10-15								
VOCs (ppbv)	1,1,1-Trichloroethane	6.02	0.79 J	1.94	0.22 J	1.39	3.45	1.18 J	4.14 J	1.48 J
Method TO-15[a]	1,1,2,2-Tetrachloroethane	<0.1	<0.36	<0.11	< 0.8	< 0.16	< 0.28	0.33 U	1.37 U	0.92 U
	1,1,2-Trichloroethane	<0.16	<0.2	<0.19	< 0.8	ND	ND	ND	ND	ND
	1,1,2-Trichloro-1,2,2-trifluoroethane	0.61 J	<0.16	0.48 J	< 0.8	2.52	0.54 J	0.44 J	0.72 U	1.44 J
	1,1-Dichloroethane	1.14	<0.15	0.57 J	0.12 J	< 0.15	0.38 J	1.06 J	2.21 J	3.91 J
	1,1-Dichloroethene	0.48 J	<0.28	0.52 J	< 0.8	< 0.1	< 0.27	0.2 U	0.73 J	1.27 U
	1,2,4-Trichlorobenzene	<0.2	<0.17	0.31 J	< 0.8	ND	ND	ND	ND	ND
	1,2,4-Trimethylbenzene	31.9	31.5	58.1	37.8	16.7 J	16.8	39.2	55.5	1.78 J
	1,2-Dichloroethane (EDC)	<0.19	<0.14	<0.21	< 0.8	ND	ND	ND	ND	ND
	1,2-Dichlorobenzene	1.57	<0.23	<0.21	< 0.8	ND	ND	ND	ND	ND
	1,2-Dichloro-1,1,2,2-tetrafluoroethane	<0.19	<0.17	<0.22	< 0.8	ND	ND	ND	ND	ND
	1,2-Dichloropropane	<0.17	<0.13	<0.2	< 0.8	ND	ND	ND	ND	ND
	1,2-Dibromoethane (EDB)	<0.14	<0.16	0.16 J	< 0.8	ND	ND	ND	ND	ND
	1,3,5-Trimethylbenzene	20.1	25.8	36.6	29.9	11.3 J	6.96	29.3	25.3	0.95 J
	1,3-Dichlorobenzene	<0.15	<0.24	<0.17	< 0.8	ND	ND	ND	ND	ND
	1,4-Dichlorobenzene	<0.19	<0.23	<0.22	< 0.8	ND	ND	ND	ND	ND
	Acetone	3.43	25.7	11.9 B	4.08	9.86	14.2	20.4	16.4	21.1
	Benzene	0.3 J	4.06	1.15 J	4.35	< 0.12	1.16 J	2.58	1.76 J	20
	Bromomethane	<0.07	<0.2	0.25 J	0.14 J	ND	ND	ND	ND	ND
	Carbon tetrachloride	<0.07	<0.15	<0.08	< 0.8	< 0.09	0.3 J	0.21 U	1.61 J	0.95 U
	Chlorobenzene	1.36	<0.17	<0.11	< 0.8	< 0.11	< 0.19	0.27 U	1.36 U	0.81 U
	Chloroethane	<0.12	<0.27	<0.13	< 0.8	ND	ND	ND	ND	ND
	Chloroform	0.72 J	1.93	1.58	1.64	3.13	8.33	19.4	112	4.59 J
	Chloromethane	0.29 J	<0.18	0.48 J	< 0.8	< 0.1	2.06	0.54 J	3.23 J	1.19 U
	cis-1,2-Dichloroethene	2.48	37.2	16.6	84.3	4	7.64	50.5	17.1	53.3
	cis-1,3-Dichloropropene	<0.09	<0.18	<0.11	< 0.8	ND	ND	ND	ND	ND
	Dichlorodifluoromethane	0.46 J	<0.2	0.43 J	< 0.8	< 0.09	< 1.3	0.99 J	2.05 J	1.33 U
	Ethylbenzene	0.96 J	3.34	1.19 J	< 0.8	< 0.18	0.38 J	1.27 J	1.45 U	0.92 U
	Hexachlorobutadiene	<0.15	<0.21	0.21 J	< 0.8	ND	ND	ND	ND	ND
	m,p-Xylene	6.87	19.5	8.2	21.4	3	2.12	10.1	7.58 J	1.85 U
	MEK (2-Butanone)	1.22 J	5.44	3.68	< 1.6	1.53 J	4.35	3.6	1.38 U	1.81 U
	Methylene chloride	2.87 J	0.47 J	6.33	2.89 J	< 6.1	13	3.84	0.63 U	3.62 J
	MTBE (Methyl tert-butyl ether)	<0.09	<0.26	<0.18	< 1.6	0.62 J	< 2.7	0.59 J	1.01 U	2.22 U
	o-Xylene	0.55 J	1.61	0.55 J	< 0.8	< 0.14	0.52 J	0.44 J	1.57 U	1.07 U
	Styrene	<0.14	<0.2	<0.16	< 0.8	ND	ND	ND	ND	ND
	TCE (Trichloroethene)	6.08	65.8	33.8	106	20.2	25.3	115	77.1	198
	PCE (Tetrachloroethene)	12.2	59.7	72.5	40.1	70.9	228	144	311	249
	Toluene	0.49 J	4.97	0.96 J	1.5	< 0.2	0.46 J	1.31 J	1.54 U	1.04 U
	trans-1,3-Dichloropropene	<0.07	<0.19	<0.08	< 0.8	ND	ND	ND	ND	ND
	Trichlorofluoromethane	1.76	6.7	7.47	1.71	6.74	10.2	1.83 J	3.56 J	1.45 U
	Vinyl chloride	<0.08	<0.14	<0.09	< 0.8	< 0.09	< 0.48	0.22 U	1.68 J	1.04 U
SW8015M[b] (µg/L)	Gasoline Range Organics (GRO)	32.1 J	62.9	73.1	80.7	< 60.5	30.1 J	44.2 J	ND	31.1 J
Fixed Gases (%)	Carbon Dioxide	0.87 J	0.91	0.68	1.05	1.07 J	1.44	1.57	1.35	3.29
Method SM2720C[c]	Carbon Monoxide	<0.12	<0.11	<0.06	< 0.5	< 0.09	< 0.07	0.08 U	0.08 U	0.1 U
	Methane	<0.11	<0.1	<0.05	< 0.5	< 0.09	< 0.07	0.08 U	0.09 U	0.1 U
	Nitrogen	65.1	82	79.6	77.6	90.5	67.1	70.4	72.8	69.5
	Oxygen	18	17	19.7	21.3	25.1	18.4	17.6	21.4	16.5

Appendix A. Soil Vapor Sampling Results at SWMU ST-70
2008 to 2013

Chemical Class & Analytical Method	Location	70-01								
	Sample ID	ST70-AR-7001-240413	ST70-AR-7001-160113	ST219-AR-7001-121012	ST219-AR-7001-230812	ST219-AR-7001-130412	ST219-AR-7001-030112	ST219-AR-7001-161111	ST219-AR-7001-28092011	ST219-AR-7001-21042011
	Sample Date	04/24/13	01/16/13	10/12/12	08/23/12	04/13/12	01/03/12	11/16/11	09/28/11	04/21/11
	Analyte Screen Depth	454-479								
VOCs (ppbv)	1,1,1-Trichloroethane	< 0.25	< 0.24	< 0.38	< 0.26	<0.65	<0.31	< 0.3	< 0.33	<0.13
Method TO-15[a]	1,1,2,2-Tetrachloroethane	1.85	< 0.24	< 0.38	< 0.26	<0.65	<0.31	< 0.3	< 0.33	<0.12
	1,1,2-Trichloroethane	< 0.25	< 0.24	< 0.38	< 0.26	<0.65	<0.31	< 0.3	< 0.33	<0.2
	1,1,2-Trichloro-1,2,2-trifluoroethane	< 0.25	< 0.24	< 0.38	< 0.26	<0.65	<0.31	< 0.3	< 0.33	<0.19
	1,1-Dichloroethane	< 0.25	< 0.24	< 0.38	< 0.26	<0.65	<0.31	< 0.3	< 0.33	<0.23
	1,1-Dichloroethene	< 0.25	< 0.24	< 0.38	< 0.26	<0.65	<0.31	< 0.3	< 0.33	<0.27
	1,2,4-Trichlorobenzene	< 0.25	< 0.24	< 0.38	< 0.26	<0.65	<0.31	< 0.3	< 0.33	<0.25
	1,2,4-Trimethylbenzene	0.63J	0.29J	< 0.38	< 0.26	10.1	4.44	4.76	1.37	3.67
	1,2-Dichloroethane (EDC)	< 0.25	< 0.24	< 0.38	< 0.26	<0.65	<0.31	< 0.3	< 0.33	<0.23
	1,2-Dichlorobenzene	< 0.25	< 0.24	< 0.38	< 0.26	<0.65	<0.31	< 0.3	< 0.33	<0.23
	1,2-Dichloro-1,1,2,2-tetrafluoroethane	< 0.25	< 0.24	< 0.38	< 0.26	<0.65	<0.31	< 0.3	< 0.33	<0.24
	1,2-Dichloropropane	< 0.25	< 0.24	< 0.38	< 0.26	<0.65	<0.31	< 0.3	< 0.33	<0.21
	1,2-Dibromoethane (EDB)	< 0.25	< 0.24	< 0.38	< 0.26	<0.65	<0.31	< 0.3	< 0.33	<0.17
	1,3,5-Trimethylbenzene	0.56J	< 0.24	< 0.38	< 0.26	2.5	4.32	4.3	0.93 J	2.24
	1,3-Dichlorobenzene	< 0.25	< 0.24	< 0.38	< 0.26	<0.65	<0.31	< 0.3	< 0.33	<0.19
	1,4-Dichlorobenzene	< 0.25	< 0.24	< 0.38	< 0.26	<0.65	<0.31	< 0.3	< 0.33	<0.24
	Acetone	12.3	6.68	22.1	15.6	370	5.22	3.8	8.97	16.4
	Benzene	< 0.25	0.28J	1.81	< 0.26	16.4	0.53 J	0.41 J	0.81 J	2.4
	Bromomethane	< 0.25	< 0.24	0.95 J	0.55 J	<0.65	<0.31	< 0.3	< 0.33	0.3 J
	Carbon tetrachloride	< 0.25	< 0.24	< 0.38	< 0.26	<0.65	<0.31	2.22	0.79 J	1.59
	Chlorobenzene	0.32J	< 0.24	< 0.38	< 0.26	<0.65	<0.31	< 0.3	< 0.33	<0.12
	Chloroethane	< 0.25	< 0.24	< 0.38	< 0.26	<0.65	<0.31	< 0.3	< 0.33	<0.14
	Chloroform	< 0.25	< 0.24	< 0.38	< 0.26	<0.65	<0.31	1.9	0.68 J	1.31
	Chloromethane	0.48J	0.42J	2.01	0.3 J	0.83 J	0.57 J	0.45 J	< 0.33	<0.09
	cis-1,2-Dichloroethene	< 0.25	< 0.24	< 0.38	< 0.26	1.26 J	0.58 J	0.79 J	< 0.33	0.49 J
	cis-1,3-Dichloropropene	< 0.25	< 0.24	< 0.38	< 0.26	<0.65	<0.31	< 0.3	< 0.33	<0.12
	Dichlorodifluoromethane	0.43J	0.38J	0.41 J	0.48 J	0.87 J	0.51 J	< 0.3	< 0.33	<0.07
	Ethylbenzene	0.28J	< 0.24	< 0.38	< 0.26	12.4	0.39 J	< 0.3	< 0.33	<0.16
	Hexachlorobutadiene	< 0.25	< 0.24	< 0.38	< 0.26	<0.65	<0.31	< 0.3	< 0.33	<0.32
	m,p-Xylene	0.68J	< 0.47	< 0.77	< 0.52	38.7	1.87 J	1.06 J	< 0.65	0.39 J
	MEK (2-Butanone)	2.98	1.65	4.18	2.15	31.3	1.81 J	0.57 J	1.93 J	2.03 J
	Methylene chloride	0.33J	0.27J	0.63 J	< 0.58	0.75 J	0.56 J	< 0.36	0.54 J	<0.37
	MTBE (Methyl tert-butyl ether)	< 0.25	< 0.24	< 0.38	< 0.26	<0.65	<0.31	< 0.3	< 0.33	<0.11
	o-Xylene	0.3J	< 0.24	< 0.38	< 0.26	13.4	<0.31	< 0.3	< 0.33	<0.17
	Styrene	< 0.25	< 0.24	< 0.38	< 0.26	<0.65	<0.31	< 0.3	< 0.33	<0.18
	TCE (Trichloroethene)	0.31J	< 0.24	5.35	< 0.26	8.21	3.64	47.4	14.3	30.5
	PCE (Tetrachloroethene)	1.68	< 0.24	0.39 J	< 0.26	0.78 J	2.09	1.32	< 0.33	0.42 J
	Toluene	0.47J	0.44J	0.62 J	< 0.26	84.6	1.26	< 0.3	< 0.33	0.36 J
	trans-1,3-Dichloropropene	< 0.25	< 0.24	< 0.38	< 0.26	<0.65	<0.31	< 0.3	< 0.33	<0.09
	Trichlorofluoromethane	< 0.25	< 0.24	< 0.38	< 0.26	<0.65	<0.31	< 0.3	< 0.33	<0.4
	Vinyl chloride	< 0.25	< 0.24	0.88 J	< 0.26	2.89	<0.31	< 0.3	< 0.33	<0.1
SW8015M[b] (µg/L)	Gasoline Range Organics (GRO)	11.4J	< 11	< 15.4	< 15.8	<14.3	<19.5	< 25.6	< 13.7	<20.6
Fixed Gases (%)	Carbon Dioxide	< 0.15	< 0.13	< 0.15	< 0.15	<0.15	<0.14	< 0.14	< 0.15	<0.18
Method SM2720C[c]	Carbon Monoxide	< 0.15	< 0.13	< 0.15	< 0.15	<0.15	<0.14	< 0.14	< 0.13	<0.15
	Methane	< 0.15	< 0.13	< 0.15	< 0.15	<0.15	<0.14	< 0.14	< 0.12	<0.14
	Nitrogen	74.5	74.4	128 UR	74.5	74.9	74.4	75	77.4	77.8
	Oxygen	25.5	25.6	19.3	25.6	25.1	25.6	24.8	22.6	22.1

Appendix A. Soil Vapor Sampling Results at SWMU ST-70
2008 to 2013

Chemical Class & Analytical Method	Location	70-01							
	Sample ID	ST219-AR-7001-18012011	ST219-AR-7001-12112010	ST219-AR-7001-17092010	ST219-AR-7001-17022010	ST219-AR-7001-101109	ST219-AR-7001-070809	ST219-AR-7001-140309	ST219-AR-7001-27032008
	Sample Date	01/18/11	11/12/10	09/17/10	02/17/10	11/10/09	08/07/09	03/14/09	03/27/08
	Analyte / Screen Depth	454-479							
VOCs (ppbv) Method TO-15[a]	1,1,1-Trichloroethane	<0.13	0.24 J	0.16 J	< 0.9	9	< 1	0.26 U	1.62 J
	1,1,2,2-Tetrachloroethane	<0.12	<0.38	<0.11	< 0.9	< 0.15	< 0.21	0.35 U	0.87 U
	1,1,2-Trichloroethane	<0.21	<0.2	<0.19	< 0.9	ND	ND	ND	
	1,1,2-Trichloro-1,2,2-trifluoroethane	<0.19	0.33 J	<0.17	< 0.9	16.5	1.28	0.26 J	1.01 U
	1,1-Dichloroethane	<0.23	0.28 J	<0.21	< 0.9	< 0.13	< 0.12	0.25 U	0.76 U
	1,1-Dichloroethene	<0.27	<0.29	<0.25	< 0.9	0.39 J	< 0.2	0.21 U	1.2 U
	1,2,4-Trichlorobenzene	<0.25	<0.18	<0.23	< 0.9	ND	ND	ND	ND
	1,2,4-Trimethylbenzene	<0.15	10.9	52.5	< 0.9	88.9 J	3.1	5.93	30.6
	1,2-Dichloroethane (EDC)	<0.24	0.24 J	<0.22	< 0.9	ND	ND	ND	ND
	1,2-Dichlorobenzene	<0.23	<0.24	<0.21	< 0.9	ND	ND	ND	ND
	1,2-Dichloro-1,1,2,2-tetrafluoroethane	<0.24	0.28 J	<0.22	< 0.9	ND	ND	ND	ND
	1,2-Dichloropropane	<0.22	<0.13	<0.2	< 0.9	ND	ND	ND	ND
	1,2-Dibromoethane (EDB)	<0.17	<0.17	<0.16	< 0.9	ND	ND	ND	ND
	1,3,5-Trimethylbenzene	<0.19	10.1	32.8	< 0.9	64.6 J	1.65	4.15	19.7
	1,3-Dichlorobenzene	<0.19	<0.25	<0.17	< 0.9	ND	ND	ND	ND
	1,4-Dichlorobenzene	0.54 J	<0.24	<0.23	< 0.9	ND	ND	ND	ND
	Acetone	3.95	8.11	11.3 B	0.54 J	13.8 J	38.4	9.18	24.3
	Benzene	0.5 J	2.55	0.79 J	1.81	0.83 J	0.46 J	0.46 J	1.26 J
	Bromomethane	<0.09	0.37 J	<0.08	< 0.9	ND	ND	ND	ND
	Carbon tetrachloride	0.18 J	0.22 J	<0.09	< 0.9	0.38 J	< 0.08	1.81 J	0.89 U
	Chlorobenzene	<0.12	<0.17	<0.11	< 0.9	2.22	< 0.15	0.28 U	1.11 J
	Chloroethane	<0.15	<0.27	<0.14	< 0.9	ND	ND	ND	ND
	Chloroform	0.21 J	<0.4	<0.17	< 0.9	0.28 J	< 0.06	1.34 J	0.83 U
	Chloromethane	0.34 J	1.28	0.58 J	< 0.9	0.95 J	1.01	0.31 J	1.32 J
	cis-1,2-Dichloroethene	0.34 J	6.73	4.89	0.16 J	27.4	2.69	6.3	4.68
	cis-1,3-Dichloropropene	<0.12	<0.19	<0.11	< 0.9	ND	ND	ND	ND
	Dichlorodifluoromethane	0.58 J	0.82 J	0.46 J	< 0.9	0.95 J	< 1	0.66 J	1.25 U
	Ethylbenzene	<0.16	2.47	0.98 J	< 0.9	2.49	0.26 J	0.26 J	2.06 J
	Hexachlorobutadiene	<0.19	<0.22	<0.17	< 0.9	ND	ND	ND	ND
	m,p-Xylene	0.49 J	12.1	6.89	< 0.9	23.5	0.95 J	1.95 J	16.2
	MEK (2-Butanone)	9.52	2.38	64	< 1.7	< 0.15	2.4	1.08 J	3.94 J
	Methylene chloride	0.87 J	0.56 J	1.88 J	3.8 J	6.79	68.7	2.63	15.7
	MTBE (Methyl tert-butyl ether)	<0.11	<0.26	<0.18	1.72	5.63	20.5	0.21 J	9.57
	o-Xylene	<0.17	2.1	0.36 J	< 0.9	0.73 J	< 0.24	0.24 U	1.01 U
	Styrene	<0.18	<0.21	<0.16	< 0.9	ND	ND	ND	ND
	TCE (Trichloroethene)	4.28	16.7	24.7	< 0.9	170	3.01	44.7	13.4
	PCE (Tetrachloroethene)	0.18 J	6.67	7.02	< 0.9	14.4	9.16	2.63	6.46
	Toluene	1.63	6.46	0.86 J	0.47 J	1.44	0.84 J	0.44 U	2.3 J
	trans-1,3-Dichloropropene	<0.09	<0.19	<0.09	< 0.9	ND	ND	ND	ND
	Trichlorofluoromethane	<0.4	0.49 J	0.65 J	< 0.9	0.63 J	0.45 J	0.31 J	1.37 U
	Vinyl chloride	<0.1	0.32 J	<0.1	< 0.9	< 0.08	< 0.36	0.24 U	0.98 U
SW8015M[b] (µg/L)	Gasoline Range Organics (GRO)	11.4 J	31.4 J	40.2 J	5.6 J	11.6 J	< 50.3	20.2 J	74.2
Fixed Gases (%) Method SM2720C[c]	Carbon Dioxide	<0.14	<0.14	<0.07	< 0.5	< 0.06	< 0.06	0.06 U	0.1 U
	Carbon Monoxide	<0.12	<0.12	<0.06	< 0.5	< 0.08	< 0.08	0.08 U	0.1 U
	Methane	<0.11	<0.1	<0.05	< 0.5	< 0.08	< 0.08	0.08 U	0.1 U
	Nitrogen	72.7	27.2	78.5	77.9	77.3	68.7	76.2	77.9
	Oxygen	20.6	7.77	21.5	22.1	22	19.4	19.8	22.1

[b] EPA, 1996. EPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW-846) 3rd ed. with updates. U.S. Environmental Protection Agency.

[c] AWWA, 1998. Standard Methods for the Examination of Water and Wastewater, 20th Edition. American Water Works Association.

Shading indicates the analyte was detected

% = percent

ID = identification

J = estimated value, the concentration is less than PQL but greater than Laboratory MDL

UR = rejected value; compoud was introduced at the laboratory during sample extraction

MDL = method detection limit

ND = not detected

NR = Data not representative due to air leaks from sample port; data was invalidated during data validation

ppbv = parts per billion by volume

PQL = practical quantitation limit

TPH = total petroleum hydrocarbons

µg/L = microgram per liter

VOC = volatile organic compound

APPENDIX B

Historic Groundwater Monitoring Data

Appendix B. Groundwater Analytical Sample Results, SWMU ST-70, 2008 to 2013

Chemical Class & Analytical Method	Analyte	Location	KAFB-7001					
		Sample Date	4/22/13	1/9/13	1/9/13	10/10/12	8/23/12	4/25/12
		Sample ID	ST70-GW-7001-220413	ST70-GW-7001-090113	ST70-FD-7001-090113 (Duplicate)	ST70-GW-7001-101012	ST70-GW-7001-230812	ST70-GW-7001-250412
		EPA MCLs [a]						
VOCs (µg/L) **Method SW8260B**[b]	1,1,1,2-Tetrachloroethane	N/A	< 0.2	< 0.2	< 0.2	<0.2	<0.2	<0.2
	1,1,1-Trichloroethane	60 [c]	< 0.2	< 0.2	< 0.2	<0.2	<0.2	<0.2
	1,1,2,2-Tetrachloroethane	10 [c]	< 0.4	< 0.4	< 0.4	<0.4	<0.4	<0.4
	1,1,2-Trichloroethane	5.0	< 0.4	< 0.4	< 0.4	<0.4	<0.4	<0.4
	1,1-Dichloroethane	25 [c]	< 0.2	< 0.2	< 0.2	<0.2	<0.2	<0.2
	1,1-Dichloroethene	5.0 [c]	< 0.2	< 0.2	< 0.2	<0.2	<0.2	<0.2
	1,1-Dichloropropene	N/A	< 0.4	< 0.4	< 0.4	<0.4	<0.4	<0.4
	1,2,3-Trichlorobenzene	N/A	< 0.4	< 0.4	< 0.4	<0.4	<0.4	<0.4
	1,2,3-Trichloropropane	N/A	< 0.8	< 0.8	< 0.8	<0.8	<0.8	<0.8
	1,2,4-Trichlorobenzene	70	< 0.8	< 0.8	< 0.8	<0.8	<0.8	<0.8
	1,2,4-Trimethylbenzene	N/A	< 0.2	< 0.2	< 0.2	<0.2	<0.2	<0.2
	1,2-Dibromo-3-chloropropane	0.2	< 1.6	< 1.6	< 1.6	<1.6	<1.6	<1.6
	1,2-Dibromoethane (EDB)	0.05	< 0.2	< 0.2	< 0.2	<0.2	<0.2	<0.2
	1,2-Dichlorobenzene	600	< 0.2	< 0.2	< 0.2	<0.2	<0.2	<0.2
	1,2-Dichloroethane	5.0	< 0.2	< 0.2	< 0.2	<0.2	<0.2	<0.2
	1,2-Dichloropropane	5.0	< 0.2	< 0.2	< 0.2	<0.2	<0.2	<0.2
	1,3,5-Trimethylbenzene	N/A	< 0.4	< 0.4	< 0.4	<0.4	<0.4	<0.4
	1,3-Dichlorobenzene	N/A	< 0.2	< 0.2	< 0.2	<0.2	<0.2	<0.2
	1,3-Dichloropropane	N/A	< 0.2	< 0.2	< 0.2	<0.2	<0.2	<0.2
	1,4-Dichlorobenzene	75	< 0.4	< 0.4	< 0.4	<0.4	<0.4	<0.4
	2,2-Dichloropropane	N/A	< 0.4	< 0.4	< 0.4	<0.4	<0.4	<0.4
	2-Butanone (MEK)	N/A	< 3.2	< 3.2	< 3.2	<3.2	<3.2	<3.2
	2-Chlorotoluene	N/A	< 0.4	< 0.4	< 0.4	<0.4	<0.4	<0.4
	2-Hexanone	N/A	< 3.2	< 3.2	< 3.2	<3.2	<3.2	<3.2
	4-Chlorotoluene	N/A	< 0.4	< 0.4	< 0.4	<0.4	<0.4	<0.4
	4-Isopropyltoluene	N/A	< 0.4	< 0.4	< 0.4	<0.4	<0.4	<0.4
	4-Methyl-2-pentanone	N/A	< 3.2	< 3.2	< 3.2	<3.2	<3.2	<3.2
	Acetone	N/A	< 6.4	< 6.4	< 6.4	<2.8	<6.4	<2.8
	Benzene	5.0	< 0.2	< 0.2	< 0.2	<0.2	<0.2	<0.2
	Bromobenzene	N/A	< 0.2	< 0.2	< 0.2	<0.2	<0.2	<0.2
	Bromoform	N/A	< 0.4	< 0.4	< 0.4	<0.4	<0.4	<0.4
	Bromomethane	N/A	< 0.4	< 0.4	< 0.4	<0.4	<0.4	<0.4
	Carbon disulfide	N/A	< 0.8	< 0.8	< 0.8	<0.8	<0.8	<0.8
	Carbon tetrachloride	5.0	< 0.4	< 0.4	< 0.4	<0.4	<0.4	<0.4
	Chlorobenzene	100	< 0.2	< 0.2	< 0.2	<0.2	<0.2	<0.2
	Chloroethane	N/A	< 1.6	< 1.6	< 1.6	<1.6	<1.6	<1.6
	Chloroform	100 [c]	0.17J	0.16J	0.17J	0.17 J	0.2 J	<0.2
	Chloromethane	N/A	< 0.8	< 0.8	< 0.8	0.82 J	<1.6	<0.8
	cis-1,2-Dichloroethene	70	< 0.2	< 0.2	< 0.2	<0.2	<0.2	<0.2
	cis-1,3-Dichloropropene	N/A	< 0.2	< 0.2	< 0.2	<0.2	<0.2	<0.2
	Dibromochloromethane	N/A	0.18J	0.18J	< 0.2	0.29 J	0.28 J	0.24 J
	Dibromomethane	N/A	< 0.4	< 0.4	< 0.4	<0.2	<0.2	<0.2
	Dichlorodifluoromethane	N/A	< 0.8	< 0.8	< 0.8	<0.8	<0.8	<0.8
	Ethylbenzene	700	< 0.2	< 0.2	< 0.2	<0.2	<0.2	<0.2
	Hexachlorobutadiene	N/A	< 0.4	< 0.4	< 0.4	<0.4	<0.4	<0.4
	Isopropylbenzene	N/A	< 0.4	< 0.4	< 0.4	<0.4	<0.4	<0.4
	Methylene chloride	N/A	< 0.4	< 0.4	< 0.4	<1.3	<0.4	<1.3
	Methyl tert-butyl ether (MtBE)	5.0	< 0.4	< 0.4	< 0.4	<0.4	<0.4	<0.4
	Naphthalene	30 [d]	< 0.8	< 0.8	< 0.8	<0.8	<0.8	<0.8
	n-Butylbenzene	N/A	< 0.4	< 0.4	< 0.4	<0.4	<0.4	<0.4
	n-Propylbenzene	N/A	< 0.2	< 0.2	< 0.2	<0.2	<0.2	<0.2
	sec-Butylbenzene	N/A	< 0.4	< 0.4	< 0.4	<0.4	<0.4	<0.4
	Styrene	100	< 0.4	< 0.4	< 0.4	<0.4	<0.4	<0.4
	tert-Butylbenzene	N/A	< 0.4	< 0.4	< 0.4	<0.4	<0.4	<0.4
	Tetrachloroethene	5.0	< 0.4	< 0.4	< 0.4	<0.4	<0.4	<0.4
	Toluene	750 [c]	< 0.4	< 0.4	< 0.4	<0.4	<0.4	<0.4
	trans-1,2-Dichloroethene	100	< 0.2	< 0.2	< 0.2	<0.2	<0.2	<0.2
	trans-1,3-Dichloropropene	N/A	< 0.4	< 0.4	< 0.4	<0.4	<0.4	<0.4
	Trichloroethene	5.0	1.7	1.7	1.8	1.7	1.6	1.3
	Trichlorofluoromethane	N/A	< 0.8	< 0.8	< 0.8	<0.8	<0.8	<0.8
	Vinyl chloride	1.0 [c]	< 0.4	< 0.8	< 0.8	<0.8	<0.8	<0.8
	Xylenes (total)	620 [c]	< 1.6	< 1.6	< 1.6	<0.8	<0.8	<0.8
TPH (µg/L) **Method 8015**	Gasoline Range Organics (GRO) C6-C10	N/A	< 20	< 20	< 25	<20	<20	NA

Appendix B. Groundwater Analytical Sample Results, SWMU ST-70, 2008 to 2013

Chemical Class & Analytical Method	Analyte	Location	KAFB-7001					
		Sample Date	1/5/12	11/15/11	9/21/11	9/21/11	4/4/11	1/19/11
		Sample ID	ST70-GW-7001-21092011	ST70-GW-7001-151111	ST70-GW-7001-21092011	ST70-FD-7001-21092011 (Duplicate)	ST70-GW-7001-04042011	ST70-GW-7001-19012011
		EPA MCLs [a]						
VOCs (µg/L) **Method SW8260B**[b]	1,1,1,2-Tetrachloroethane	N/A	<0.2	<0.17	<0.17	<0.17	<0.0681	<0.399
	1,1,1-Trichloroethane	60 [c]	<0.2	<0.16	<0.16	<0.16	<0.0243	<0.408
	1,1,2,2-Tetrachloroethane	10 [c]	<0.4	<0.20	<0.20	<0.20	<0.04	<0.469
	1,1,2-Trichloroethane	5.0	<0.4	<0.32	<0.32	<0.32	<0.0675	<0.336
	1,1-Dichloroethane	25 [c]	<0.2	<0.16	<0.16	<0.16	<0.0268	<0.412
	1,1-Dichloroethene	5.0 [c]	<0.2	<0.14	<0.14	<0.14	<0.0332	<0.352
	1,1-Dichloropropene	N/A	<0.4	<0.15	<0.15	<0.15	<0.0353	<0.391
	1,2,3-Trichlorobenzene	N/A	<0.4	<0.18	<0.18	<0.18	<0.0571	<0.546
	1,2,3-Trichloropropane	N/A	<0.8	<0.77	<0.77	<0.77	<0.065	<0.464
	1,2,4-Trichlorobenzene	70	<0.8	<0.32	<0.32	<0.32	<0.0555	<0.447
	1,2,4-Trimethylbenzene	N/A	<0.2	<0.14	<0.14	<0.14	<0.0508	<0.7
	1,2-Dibromo-3-chloropropane	0.2	<1.6	<0.81	<0.81	<0.81	<0.0626	<0.65
	1,2-Dibromoethane (EDB)	0.05	<0.2	<0.13	<0.13	<0.13	<0.0758	<0.504
	1,2-Dichlorobenzene	600	<0.2	<0.13	<0.13	<0.13	<0.0495	<0.401
	1,2-Dichloroethane	5.0	<0.2	<0.15	<0.15	<0.15	<0.0789	<0.336
	1,2-Dichloropropane	5.0	<0.2	<0.13	<0.13	<0.13	<0.0417	<0.429
	1,3,5-Trimethylbenzene	N/A	<0.8	<0.14	<0.14	<0.14	<0.0362	<0.441
	1,3-Dichlorobenzene	N/A	<0.2	<0.16	<0.16	<0.16	<0.0558	<0.435
	1,3-Dichloropropane	N/A	<0.2	<0.15	<0.15	<0.15	<0.0588	<0.395
	1,4-Dichlorobenzene	75	<0.4	<0.16	<0.16	<0.16	<0.0475	<0.353
	2,2-Dichloropropane	N/A	<0.4	<0.20	<0.20	<0.20	<0.0432	<0.312
	2-Butanone (MEK)	N/A	<3.2	<1.8	<1.8	<1.8	<0.146	<0.888
	2-Chlorotoluene	N/A	<0.4	<0.17	<0.17	<0.17	<0.046	<0.489
	2-Hexanone	N/A	<3.2	<1.4	<1.4	<1.4	<0.0969	<1.36
	4-Chlorotoluene	N/A	<0.4	<0.17	<0.17	<0.17	<0.0454	<0.345
	4-Isopropyltoluene	N/A	<0.4	<0.17	<0.17	<0.17	<0.0338	<0.384
	4-Methyl-2-pentanone	N/A	<3.2	<1.0	<1.0	<1.0	<0.0897	<1.79
	Acetone	N/A	<6.4	<1.9	<1.9	<1.9	<0.569	<1.61
	Benzene	5.0	<0.2	<0.16	<0.16	<0.16	<0.0351	<0.347
	Bromobenzene	N/A	<0.2	<0.17	<0.17	<0.17	<0.0691	<0.436
	Bromoform	N/A	<0.4	<0.19	<0.19	<0.19	<0.0631	<0.247
	Bromomethane	N/A	<0.4	<0.21	<0.21	<0.21	<0.107	<0.419
	Carbon disulfide	N/A	<0.8	<0.45	<0.45	<0.45	<0.0774	<1.54
	Carbon tetrachloride	5.0	<0.4	<0.19	<0.19	<0.19	<0.0387	<0.42
	Chlorobenzene	100	<0.2	<0.17	<0.17	<0.17	<0.0617	<0.404
	Chloroethane	N/A	<1.6	<0.10	<0.10	<0.41	<0.0998	<0.463
	Chloroform	100 [c]	<0.2	<0.16	<0.16	<0.16	<0.153	<0.402
	Chloromethane	N/A	<1.6	<0.30	<0.30	<0.30	<0.13	<0.43
	cis-1,2-Dichloroethene	70	<0.2	<0.15	<0.15	<0.15	<0.0571	<0.407
	cis-1,3-Dichloropropene	N/A	<0.2	<0.16	<0.16	<0.16	<0.0487	<0.391
	Dibromochloromethane	N/A	<0.4	<0.17	<0.17	<0.17	<0.101	<0.357
	Dibromomethane	N/A	<0.2	<0.17	<0.17	<0.17	<0.0641	<0.35
	Dichlorodifluoromethane	N/A	<0.8	<0.31	<0.31	<0.31	<0.302	<0.857
	Ethylbenzene	700	<0.2	<0.16	<0.16	<0.16	<0.0327	<0.404
	Hexachlorobutadiene	N/A	<0.4	<0.18	<0.18	<0.12	<0.0411	<0.589
	Isopropylbenzene	N/A	<0.4	<0.16	<0.12	<0.16	<0.0278	<0.397
	Methylene chloride	N/A	<0.4	0.46 J	<0.32	<0.21	<0.0271	<0.49
	Methyl tert-butyl ether (MtBE)	5.0	<0.4	<0.25	<0.25	<0.25	<0.033	<0.32
	Naphthalene	30 [d]	<0.8	<0.22	<0.22	<0.22	<0.0434	<0.365
	n-Butylbenzene	N/A	<0.4	<0.14	<0.14	<0.14	<0.0431	<0.422
	n-Propylbenzene	N/A	<0.2	<0.16	<0.16	<0.16	<0.029	<0.434
	sec-Butylbenzene	N/A	<0.4	<0.17	<0.17	<0.17	<0.0367	<0.412
	Styrene	100	<0.4	<0.18	<0.17	<0.17	<0.0409	<0.345
	tert-Butylbenzene	N/A	<0.4	<0.16	<0.16	<0.16	<0.0247	<0.454
	Tetrachloroethene	5.0	<0.4	<0.20	<0.20	<0.20	<0.04	<0.347
	Toluene	750 [c]	<0.4	<0.17	<0.17	<0.17	<0.0523	<0.415
	trans-1,2-Dichloroethene	100	<0.2	<0.15	<0.15	<0.15	<0.0505	<0.43
	trans-1,3-Dichloropropene	N/A	<0.4	<0.19	<0.19	<0.19	<0.0512	<0.442
	Trichloroethene	5.0	0.60 J	0.59 J	0.68 J	0.67 J	0.29 J	<0.455
	Trichlorofluoromethane	N/A	<0.8	<0.29	<0.29	<0.29	<0.167	<0.477
	Vinyl chloride	1.0 [c]	<0.8	<0.40	<0.40	<0.40	<0.0421	<0.328
	Xylenes (total)	620 [c]	<0.8	<0.38	<0.38	<0.38	<0.112	<1.56
TPH (µg/L) **Method 8015**	Gasoline Range Organics (GRO) C6-C10	N/A	NA	NA	NA	NA	NA	NA

Appendix B. Groundwater Analytical Sample Results, SWMU ST-70, 2008 to 2013

Chemical Class & Analytical Method	Analyte	Location	KAFB-7001				
		Sample Date	12/7/10	12/7/10	9/16/10	5/7/10	2/26/10
		Sample ID	ST70-GW-7001-07122010	ST70-FD-7001-07122010 (Duplicate)	ST70-GW-7001-16092010	ST70-GW-7001-05072010	ST219-GW-7001-26022010
		EPA MCLs [a]					
VOCs (µg/L) **Method SW8260B**[b]	1,1,1,2-Tetrachloroethane	N/A	< 1	< 1	NA	< 1	< 1
	1,1,1-Trichloroethane	60 [c]	< 1	< 1	< 0.5	< 1	< 1
	1,1,2,2-Tetrachloroethane	10 [c]	< 1	< 1	< 0.18	< 1	< 1
	1,1,2-Trichloroethane	5.0	< 1	< 1	< 0.13	< 1	< 1
	1,1-Dichloroethane	25 [c]	< 1	< 1	< 0.25	< 1	< 1
	1,1-Dichloroethene	5.0 [c]	< 1	< 1	< 0.11	< 1	< 1
	1,1-Dichloropropene	N/A	< 1	< 1	NA	< 1	< 1
	1,2,3-Trichlorobenzene	N/A	< 1	< 1	NA	< 1.2	< 1.2
	1,2,3-Trichloropropane	N/A	< 1	< 1	NA	< 1.5	< 1.5
	1,2,4-Trichlorobenzene	70	< 1	< 1	NA	< 1	< 1
	1,2,4-Trimethylbenzene	N/A	< 1	< 1	NA	< 1	< 1
	1,2-Dibromo-3-chloropropane	0.2	< 2	< 2	NA	< 5	< 5
	1,2-Dibromoethane (EDB)	0.05	< 1	< 1	NA	< 1	< 1
	1,2-Dichlorobenzene	600	< 1	< 1	NA	< 1	< 1
	1,2-Dichloroethane	5.0	< 1	< 1	< 0.1	< 1	< 1
	1,2-Dichloropropane	5.0	< 1	< 1	< 0.13	< 1	< 1
	1,3,5-Trimethylbenzene	N/A	< 1	< 1	NA	< 1	< 1
	1,3-Dichlorobenzene	N/A	< 1	< 1	NA	< 1	< 1
	1,3-Dichloropropane	N/A	< 1	< 1	NA	< 1	< 1
	1,4-Dichlorobenzene	75	< 1	< 1	NA	< 1	< 1
	2,2-Dichloropropane	N/A	< 2	< 2	NA	< 5	< 5
	2-Butanone (MEK)	N/A	< 10	< 10	< 1	< 6	< 6
	2-Chlorotoluene	N/A	< 1	< 1	NA	< 1	< 1
	2-Hexanone	N/A	< 1	< 1	< 1	< 5	< 5
	4-Chlorotoluene	N/A	< 1	< 1	NA	< 1	< 1
	4-Isopropyltoluene	N/A	< 1	< 1	NA	< 1	< 1
	4-Methyl-2-pentanone	N/A	< 10	< 10	< 1	< 5	< 5
	Acetone	N/A	< 10	< 10	< 5	< 10	< 10
	Benzene	5.0	< 1	< 1	< 0.25	< 1	< 1
	Bromobenzene	N/A	< 1	< 1	NA	< 1	< 1
	Bromoform	N/A	< 1	< 1	< 0.5	< 1	< 1
	Bromomethane	N/A	< 3	< 3	< 0.8	< 2	< 2
	Carbon disulfide	N/A	< 10	< 10	< 0.6	< 2	0.22 J
	Carbon tetrachloride	5.0	< 1	< 1	< 0.5	< 1	< 1
	Chlorobenzene	100	< 1	< 1	< 0.25	< 1	< 1
	Chloroethane	N/A	< 2	< 2	< 1	< 2	< 2
	Chloroform	100 [c]	< 1	< 1	< 0.14	0.62 J	< 1
	Chloromethane	N/A	< 2	< 2	< 0.33	< 2	< 2
	cis-1,2-Dichloroethene	70	< 1	< 1	< 0.15	< 1	< 1
	cis-1,3-Dichloropropene	N/A	< 1	< 1	< 0.11	< 1	< 1
	Dibromochloromethane	N/A	< 1	< 1	0.17 J	1.9	< 1
	Dibromomethane	N/A	< 1	< 1	NA	< 1.1	< 1.1
	Dichlorodifluoromethane	N/A	< 1	< 1	NA	< 2	< 2
	Ethylbenzene	700	< 1	< 1	<0.11	< 1	< 1
	Hexachlorobutadiene	N/A	< 1	< 1	NA	< 1	< 1
	Isopropylbenzene	N/A	< 1	< 1	NA	< 1	< 1
	Methylene chloride	N/A	< 3	< 3	< 1	< 5	< 5
	Methyl tert-butyl ether (MtBE)	5.0	< 1	< 1	NA	< 5	< 5
	Naphthalene	30 [d]	< 2	< 2	NA	< 1	< 1
	n-Butylbenzene	N/A	< 1	< 1	NA	< 1	< 1
	n-Propylbenzene	N/A	< 1	< 1	NA	< 1	< 1
	sec-Butylbenzene	N/A	< 1	< 1	NA	< 1	< 1
	Styrene	100	< 1	< 1	<0.11	< 1	< 1
	tert-Butylbenzene	N/A	< 1	< 1	NA	< 1	< 1
	Tetrachloroethene	5.0	< 1	< 1	<0.15	< 1	< 1
	Toluene	750 [c]	< 1	< 1	<0.33	0.19 J	1.4
	trans-1,2-Dichloroethene	100	< 1	< 1	<0.2	< 1	< 1
	trans-1,3-Dichloropropene	N/A	< 1	< 1	<0.21	< 1	< 1
	Trichloroethene	5.0	< 1	< 1	0.57 J	0.38 J	0.33 J
	Trichlorofluoromethane	N/A	< 1	< 1	NA	< 2	< 2
	Vinyl chloride	1.0 [c]	< 1	< 1	<0.18	< 1	< 1
	Xylenes (total)	620 [c]	< 1.5	< 1.5	<0.2	1.4 J	< 3
TPH (µg/L) **Method 8015**	Gasoline Range Organics (GRO) C6-C10	N/A	NA	NA	NA	N/A	<64

Appendix B. Groundwater Analytical Sample Results, SWMU ST-70, 2008 to 2013

Chemical Class & Analytical Method	Analyte	Location	KAFB-7001			
		Sample Date	8/24/09	2/11/09	8/7/08	1/27/08
		Sample ID	ST219-GWQ3-7001-24082009	ST219-GW-7001-11022009	ST219-GW-7001-07082008	ST219-GW-7001-27012008
		EPA MCLs [a]				
VOCs (µg/L) **Method SW8260B**[b]	1,1,1,2-Tetrachloroethane	N/A	< 1	< 1	< 1	< 1
	1,1,1-Trichloroethane	60 [c]	< 1	< 1	< 1	< 1
	1,1,2,2-Tetrachloroethane	10 [c]	< 1	< 1	< 1	< 1
	1,1,2-Trichloroethane	5.0	< 1	< 1	< 1	< 1
	1,1-Dichloroethane	25 [c]	< 1	< 1	< 1	< 1
	1,1-Dichloroethene	5.0 [c]	< 1	< 1	< 1	< 1
	1,1-Dichloropropene	N/A	< 1	< 1	< 1	< 1
	1,2,3-Trichlorobenzene	N/A	< 1.2	< 1.2	< 1.2	< 1.2
	1,2,3-Trichloropropane	N/A	< 1.5	< 1.5	< 1.5	< 1.5
	1,2,4-Trichlorobenzene	70	< 1	< 1	< 1	< 1
	1,2,4-Trimethylbenzene	N/A	< 1	< 1	< 1	< 1
	1,2-Dibromo-3-chloropropane	0.2	< 5	< 5	< 5	< 5
	1,2-Dibromoethane (EDB)	0.05	< 1	< 1	< 1	< 1
	1,2-Dichlorobenzene	600	< 1	< 1	< 1	< 1
	1,2-Dichloroethane	5.0	< 1	< 1	< 1	< 1
	1,2-Dichloropropane	5.0	< 1	< 1	< 1	< 1
	1,3,5-Trimethylbenzene	N/A	< 1	< 1	< 1	< 1
	1,3-Dichlorobenzene	N/A	< 1	< 1	< 1	< 1
	1,3-Dichloropropane	N/A	< 1	< 1	< 1	< 1
	1,4-Dichlorobenzene	75	< 1	< 1	< 1	< 1
	2,2-Dichloropropane	N/A	< 5	< 5	< 5	< 5
	2-Butanone (MEK)	N/A	< 6	< 6	< 6	< 6
	2-Chlorotoluene	N/A	< 1	< 1	< 1	< 1
	2-Hexanone	N/A	< 5	< 5	< 5	< 5
	4-Chlorotoluene	N/A	< 1	< 1	< 1	< 1
	4-Isopropyltoluene	N/A	< 1	< 1	< 1	< 1
	4-Methyl-2-pentanone	N/A	< 5	< 5	< 5	< 5
	Acetone	N/A	92.8 J	< 10	< 10	< 10
	Benzene	5.0	< 1	< 1	< 1	< 1
	Bromobenzene	N/A	< 1	< 1	< 1	< 1
	Bromoform	N/A	< 1	< 1	< 1	< 1
	Bromomethane	N/A	< 2	< 2	< 2	< 2
	Carbon disulfide	N/A	< 2	< 2	< 2	< 2
	Carbon tetrachloride	5.0	< 1	< 1	< 1	< 1
	Chlorobenzene	100	< 1	< 1	< 1	< 1
	Chloroethane	N/A	< 2	< 2	< 2	< 2
	Chloroform	100 [c]	< 1	< 1	< 1	< 1
	Chloromethane	N/A	< 2	< 2	< 2	< 2
	cis-1,2-Dichloroethene	70	< 1	< 1	< 1	< 1
	cis-1,3-Dichloropropene	N/A	< 1	< 1	< 1	< 1
	Dibromochloromethane	N/A	< 1	< 1	< 1	< 1
	Dibromomethane	N/A	< 1.1	< 1.1	< 1.1	< 1.1
	Dichlorodifluoromethane	N/A	< 2	< 2	< 2	< 2
	Ethylbenzene	700	< 1	< 1	< 1	< 1
	Hexachlorobutadiene	N/A	< 1	< 1	< 1	< 1
	Isopropylbenzene	N/A	< 1	< 1	< 1	< 1
	Methylene chloride	N/A	< 5	< 5	< 5	< 5
	Methyl tert-butyl ether (MtBE)	5.0	< 5	< 5	< 5	< 5
	Naphthalene	30 [d]	< 1	< 1	< 1	< 1
	n-Butylbenzene	N/A	< 1	< 1	< 1	< 1
	n-Propylbenzene	N/A	< 1	< 1	< 1	< 1
	sec-Butylbenzene	N/A	< 1	< 1	< 1	< 1
	Styrene	100	< 1	< 1	< 1	< 1
	tert-Butylbenzene	N/A	< 1	< 1	< 1	< 1
	Tetrachloroethene	5.0	< 1	< 1	< 1	< 1
	Toluene	750 [c]	1.6	< 1	< 1	< 1
	trans-1,2-Dichloroethene	100	< 1	< 1	< 1	< 1
	trans-1,3-Dichloropropene	N/A	< 1	< 1	< 1	< 1
	Trichloroethene	5.0	0.57 J	0.36 J	0.37 J	0.53 J
	Trichlorofluoromethane	N/A	< 2	< 2	< 2	< 2
	Vinyl chloride	1.0 [c]	< 1	< 1	< 1	< 1
	Xylenes (total)	620 [c]	0.35 J	< 1	< 1	< 1
TPH (µg/L) **Method 8015**	Gasoline Range Organics (GRO) C6-C10	N/A	<64	<64	<64	<64

Appendix B. Groundwater Analytical Sample Results, SWMU ST-70, 2008 to 2013

[b] EPA, 1996. EPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW-846) 3rd ed. with updates. U.S. Environmental Protection Agency.

[c] AWWA, 1998. Standard Methods for the Examination of Water and Wastewater, 20th Edition. American Water Works Association.

Shading indicates the analyte was detected

% = percent

ID = identification

J = estimated value, the concentration is less than PQL but greater than Laboratory MDL

UR = rejected value; compoud was introduced at the laboratory during sample extraction

MDL = method detection limit

ND = not detected

NR = Data not representative due to air leaks from sample port; data was invalidated during data validation

ppbv = parts per billion by volume

PQL = practical quantitation limit

TPH = total petroleum hydrocarbons

µg/L = microgram per liter

VOC = volatile organic compound

APPENDIX C

Soil Vapor Extraction System Operation Data

Appendix C-1. SWMU ST-70 Vacuum and Pressure Readings

		SVE System					Vapor Extraction Wells		
Date	System ON/OFF	Combined Inlet	Pre-Blower	Post-Blower	Primary Exhaust	Final Exhaust	219-28H	ST-7002	ST-7003
1/11/2011	ON	>30	>20	6.5	2.8	0.0	>10	>10	>10
1/18/2011	ON	18.7	>20	10.0	5.3	0.0	>10	>10	>10
2/16/2011	ON	19.5	20.0	10.5	5.3	0.0	>10	>10	>10
3/9/2011	ON	19.0	20.5	10.0	5.2	0.0	>10	2.8	4.5
4/5/2011	ON	40.0	>30	7.0	4.0	0.0	>20	4.0	2.4
4/21/2011	ON	22.0	23.0	9.5	5.2	0.0	>20	2.2	1.0
5/10/2011	ON	14.2	16.0	11.0	6.2	0.0	9.5	1.3	2.1
6/22/2011	ON	13.2	14.8	11.3	6.0	0.1	8.5	4.0	2.6
6/22/2011	OFF	3.2	NM	0.0	0.0	0.0	3.3	1.8	1.0
6/22/2011	OFF	limited rebound study		0.0	0.0	0.0	1.0	0.4	0.0
6/23/2011	OFF	limited rebound study		0.0	0.0	0.0	0.5	1.7	0.8
6/28/2011	ON	limited rebound study		0.0	0.0	0.0	1.8	2.1	0.3
7/20/2011	ON	14.2	16.0	11.5	6.0	0.0	9.2	2.2	1.7
8/30/2011	ON	14.4	15.8	10.8	5.8	0.0	9.2	1.8	1.7
9/28/2011	ON	14.5	16.0	11.2	5.6	0.0	9.2	3.0	2.0
10/28/2011	ON	20.5	21.0	11.0	5.4	0.0	15.5	4.8	2.0
11/16/2011	ON	22.0	23.0	8.4	4.0	0.1	16.5	7.8	2.2
12/9/2011	ON	20.5	22.0	7.4	4.2	0.1	14.5	6.2	3.2
12/15/2011	ON	21.0	22.5	8.5	4.5	0.1	15.5	8.2	3.0
12/29/2011	ON	21.0	22.5	8.5	4.3	0.0	15.5	6.2	2.9
1/3/2012	ON	20.0	21.0	8.8	4.6	0.0	14.5	7.2	1.9
1/11/2012	OFF	Off for winter downtime/rebound study					0.2	0.4	0.8
1/17/2012	OFF	Off for winter downtime/rebound study					0.3	0.5	0.6
2/16/2012	OFF	Off for winter downtime/rebound study					0.8	0.9	1.7
3/13/2012	OFF	Off for winter downtime/rebound study					0.1	0.1	0.2
4/13/2012	OFF	Off for winter downtime/rebound study					0.5	0.3	0.6
4/13/2012	ON	15.5	18.0	9.2	4.8	0.1	11.5	0.0	1.9
4/20/2012	ON	16.0	18.0	9.2	4.8	0.1	11.0	0.0	1.9
4/25/2012	ON	17.5	18.5	9.2	4.8	0.1	11.2	0.0	1.8
4/27/2012	ON	18.5	20.0	9.6	4.9	0.1	12.0	0.0	1.4
5/4/2012	ON	17.5	19.8	9.5	5.0	0.1	12.2	0.8	3.8
5/14/2012	ON	17.8	20.0	9.6	4.9	0.1	12.6	0.8	3.5
6/12/2012	ON	18.5	20.0	9.2	5.0	0.1	11.8	0.7	2.2
6/16/2012	ON	19.8	20.9	8.6	4.3	0.1	12.2	2.0	2.5
7/11/2012	ON	20.0	21.0	9.4	4.2	0.1	13	1.0	1.7
8/23/2012	ON	19.5	21.0	9.2	4.2	0.1	13	0.3	2.0
9/14/2012	ON	17.2	18.5	10.5	5.6	0.1	11	0.2	2.9
10/12/2012	ON	17.0	18.5	11.0	5.4	0.2	10.8	0.0	1.6
11/16/2012	ON	22.0	23.0	9.5	5.0	0.1	15	0.0	0.8
12/13/2012	ON	27.5	29.0	7.8	4.3	0.1	19	0.0	0.8
12/21/2012	OFF	Off for winter downtime					0	0	0
1/16/2013	OFF	0.0	0.0	0.0	0.0	0.0	0	0	0
2/25/2013	OFF	0.0	0.0	0.0	0.0	0.0	0	0	0
3/5/2013	Restart	19.0	20.0	10.5	5.6	0.04	18	1.0	6.0
3/21/2013	ON	21.0	22.5	8.6	4.0	0.04	15	0.0	6.0
4/24/2013	ON	18.0	20.0	10.0	5.0	0.05	15	5.0	3.0
5/22/2013	ON	16.0	14.5	10.5	3.6	0.04	7.5	3.6	0.0
6/26/2013	ON	13.5	15.0	10.8	4.7	0.08	9	4.9	2.0

Appendix C-1. SWMU ST-70 Vacuum and Pressure Readings

Date	System ON/OFF	Vapor Monitoring Wells						Groundwater Monitoring Well
		219-29H	219-38-41	219-38-99	219-39-42	219-40-20	219-41	KAFB-7001
1/18/2011	ON	0.61	1.10	0.79	0.52	0.06	0.04	0.2
2/16/2011	ON	0.10	0.04	atm	0.04	0.16	atm	1.1
3/9/2011	ON	0.10	0.04	0.06	0.02	atm	atm	0.1
4/21/2011	ON	0.22	0.02	atm	0.04	atm	0.05	0.4
5/10/2011	ON	0.31	0.03	0.02	0.09	0.08	0.42	0.3
6/22/2011	ON	0.48	0.32	0.07	0.08	atm	0.03	1.3
6/22/2011	OFF	0.32	0.08	0.18	0.04	0.08	atm	1.4
6/23/2011	OFF	0.45	0.02	0.12	0.03	0.02	0.45	1.0
6/28/2011	ON	0.58	0.11	0.02	0.05	0.04	atm	0.7
7/20/2011	ON	0.26	0.06	0.04	0.07	atm	atm	0.4
8/30/2011	ON	0.10	0.02	atm	0.04	0.04	0.02	0.2
9/28/2011	ON	0.53	0.10	0.07	0.08	0.07	0.10	0.8
10/28/2011	ON	0.26	0.08	0.04	0.06	0.06	0.05	0.3
11/16/2011	ON	0.50	0.04	0.10	0.11	0.06	atm	0.6
12/15/2011	ON	0.54	0.04	0.08	0.08	0.04	0.06	0.9
1/3/2012	ON	0.10	0.02	0.02	0.21	0.04	atm	1.3
1/11/2012	OFF	0.11	0.05	atm	0.02	0.02	0.02	0.1
1/17/2012	OFF	0.02	0.06	0.06	0.02	0.02	0.01	0.8
2/16/2012	OFF	1.30	0.05	0.12	0.03	0.02	atm	1.6
3/13/2012	OFF	0.42	0.02	0.04	atm	0.02	atm	0.6
4/13/2012	OFF	0.46	0.63	0.39	0.22	0.53	atm	0.1
4/13/2012	ON	0.42	0.06	0.24	0.04	0.24	atm	0.2
4/27/2012	ON	0.05	0.04	0.02	0.05	atm	atm	0.4
5/4/2012	ON	atm	0.06	0.02	0.06	0.03	0.01	0.3
5/14/2012	ON	0.03	0.05	0.02	0.05	0.04	atm	0.1
6/12/2012	ON	0.04	atm	0.02	0.04	0.06	atm	0.2
7/11/2012	ON	0.07	0.02	0.04	0.08	atm	atm	0.42
8/23/2012	ON	0.19	0.03	0.02	0.05	atm	0.08	0.42
10/12/2012	ON	0.05	0.07	0.04	0.08	0.05	0.06	0.32
11/16/2012	ON	0.04	0.02	atm	0.06	0.02	0.02	0.3
12/13/2012	ON	0.10	0.03	0.04	0.03	0.01	atm	0.1
1/16/2013	OFF	0.04	atm	atm	0.05	0.09	atm	0.05
2/25/2013	OFF	0.02	0.01	0.02	atm	atm	atm	0.18
3/5/2013	Restart	0.4	0.22	0.09	0.25	0.26	0.08	0.09
3/21/2013	ON	NM	NM	NM	NM	NM	NM	NM
4/24/2013	ON	0.62	atm	atm	0.05	0.03	0.21	0.18
5/22/2013	ON	0.24	0.04	0.06	0.04	0.02	0.02	0.18
6/26/2013	ON	0.20	0.06	0.02	0.04	atm	0.01	0.21

All vacuum readings are in pressure readings of negative inches of water
shading indicates that the pressure is in positive inches of water
atm = atmospheric pressure
NM = not measured
OFF = SVE was offline for seasonal downtime, maintenance or rebound testing
SVE = soil vapor extraction system
Vapor monitoring wells 219-38-74, 219-37-75, 219-40-40, and 219-42 are no longer functional

Appendix C-2. SWMU ST-70 Flow Rate Readings

Date	System ON/OFF	SVE System		Vapor Extraction Wells			Note
		Combined Inlet	Final Exhaust	219-28H	ST-70-02	ST-70-03	
1/11/2011	ON	60	48	35	10	10	SVE well flow meters corroded
1/18/2011	ON	62	54	24	20	18	SVE well flow meters corroded
2/16/2011	ON	67	55	30	17	17	SVE well flow meters corroded
3/9/2011	ON	65	52	35	5	15	SVE well flow meters corroded
4/5/2011	ON	55	48	43.9	3.5	3.8	Re-plumb lines with flow meter ports and vacuum meter replacement (all SVE flow reads from anenometer)
4/21/2011	ON	65	55	48.7	5.6	3.2	
5/10/2011	ON	71	60	35	10.4	10.5	
6/22/2011	ON	72	55	36	12	9	
6/22/2011	OFF	0	0	0	0	0	SVE off for limited rebound testing
6/28/2011	ON	82	56	38	11	8	Restart SVE for normal operation
7/20/2011	ON	73	50	37	10	8	
8/30/2011	ON	72	52	38	9	8	
9/28/2011	ON	71	52	39	9.4	7.1	
10/28/2011	ON	70	55	40	9.5	7.0	
11/16/2011	ON	68	55	30.5	14.6	8.8	
12/9/2011	ON	70	55	38	11	8.0	
12/15/2011	ON	68	54	40	9.4	7.2	
12/29/2011	ON	70	58	40	8	7	
1/3/2012	ON	70	55	34	16	11.5	Pre-rebound readings
1/3/2012	OFF	0	0	0	0	0	START Rebound Test
4/13/2012	OFF	72	58	52	0	12	Temporary Re-start
4/20/2012	ON	72	58	51	0.5	12	Full Restart
4/25/2012	ON	78	55	52	0	12	
5/4/2012	ON	72	55	35	2.8	12.7	2 week restart reading
5/14/2012	ON	72	54	37.1	2.6	12.2	3 week restart reading
6/12/2012	ON	70	54	50.2	2.1	9.6	
6/16/2012	ON	72	54	45	5	10	
7/11/2012	ON	73	55	50	1.9	12	
8/23/2012	ON	75	55	49.7	0.9	10.2	
9/14/2012	ON	68	55	47.1	0.7	12.3	
10/12/2012	ON	75	55	50.1	0.5	10.2	
11/16/2012	ON	65	55	49.6	0.2	8.3	
12/13/2012	ON	75	40	39.8	0	14.4	
12/21/2012	OFF	0	0	0	0	0	Season shut down.
1/16/2013	OFF	0	0	0	0	0	Winter downtime
2/25/2013	OFF	0	0	0	0	0	Winter downtime
03/05/13	Restart	75	55	47	0.5	10	Restart system
03/21/13	ON	71	58	42	0	15	
04/24/13	ON	71	58	31.7	16.4	14.9	
05/22/13	ON	75	55	36.5	19.9	2.4	
06/26/13	ON	79	50	39.3	18.5	6.0	

NM = not measured
OFF = SVE was offline for seasonal downtime, maintenance or rebound testing
SVE = soil vapor extraction system
Vapor monitoring wells 219-38-74, 219-37-75, 219-40-40, and 219-42 are no longer functional

Appendix C-3. SWMU ST-70 SVE System Operation and Downtime

Date	SVE Operation		Cumulative Time		Percent Downtime (%)	Flow Rate (scfm)	Cumulative Volume Extracted (L)	Cumulative Volume Extracted (ft^3)
	Down Time (hours)	Start/ Restart (time)	Total Downtime (days)	Total Operation Time (days)				
Initial period reported in Construction Summary Report (April 2008 to March 2009)								
04/15/08		11:00	0	0	0	70	0	
05/14/08	2	9:45	0.083	28.92	0.29	70	8.25E+07	2.91E+06
05/16/08	1	9:47	0.125	30.88	0.40	72	8.83E+07	3.12E+06
05/30/08	1.5	9:45	0.188	44.81	0.42	74	1.30E+08	4.60E+06
06/18/08	0.5	8:20	0.208	63.79	0.33	69	1.84E+08	6.49E+06
07/10/08	1	11:11	0.250	85.75	0.29	70	2.46E+08	8.70E+06
08/06/08	72	14:25	3.250	109.75	2.96	70	3.15E+08	1.11E+07
08/07/08	off for optimization		3.250	110.75	2.93	70	3.18E+08	1.12E+07
Optimization Period (August to December 2008)								
12/17/08		11:00		110.75		70		
12/23/08	1	13:00	3.292	113.46	2.90	72	3.26E+08	1.15E+07
Full-Time Opperation Period (2009 to 2012)								
01/08/09	1.5	12:41	3.354	129.40	2.59	70	3.71E+08	1.31E+07
01/14/09	0.5	12:30	3.375	135.38	2.49	67	3.88E+08	1.37E+07
01/21/09	1	16:00	3.417	142.33	2.40	67	4.07E+08	1.44E+07
02/11/09	1.5	12:22	3.479	163.27	2.13	70	4.66E+08	1.65E+07
02/23/09	0.75	11:09	3.510	175.24	2.00	67	4.99E+08	1.76E+07
03/14/09	25	11:05	4.552	193.20	2.36	70	5.50E+08	1.94E+07
03/30/09	0.75	12:55	4.583	209.20	2.19	70	5.96E+08	2.10E+07
04/14/09	0.25	9:40	4.594	224.19	2.05	70	6.39E+08	2.26E+07
04/29/09	0.67	9:30	4.622	239.16	1.93	67	6.80E+08	2.40E+07
06/12/09	1	10:10	4.663	283.12	1.65	67	8.00E+08	2.82E+07
07/27/09	1.5	13:00	4.726	328.06	1.44	70	9.28E+08	3.28E+07
08/07/09	0.75	10:45	4.757	339.02	1.40	69	9.59E+08	3.39E+07
09/14/09	0.25	11:15	4.768	377.01	1.26	69	1.07E+09	3.76E+07
09/18/09	0.5	9:45	4.788	380.99	1.26	67	1.08E+09	3.80E+07
10/07/09	1.0	10:00	4.830	399.99	1.21	67	1.13E+09	3.99E+07
10/27/09	0.25	9:40	4.840	419.98	1.15	67	1.18E+09	4.18E+07
11/09/09	0.33	14:20	4.854	432.97	1.12	67	1.22E+09	4.30E+07
11/11/09	0.67	9:57	4.882	434.94	1.12	67	1.22E+09	4.32E+07
12/15/09	1.0	14:28	4.924	468.90	1.05	50	1.29E+09	4.57E+07
01/27/10	0.50	14:34	4.945	511.88	0.97	50	1.38E+09	4.88E+07
01/29/10	0.67	12:25	4.973	513.85	0.97	50	1.38E+09	4.89E+07
02/10/10	26.5	16:20	6.077	524.75	1.16	60	1.41E+09	4.98E+07
02/17/10	1.0	15:25	6.118	531.70	1.15	67	1.43E+09	5.05E+07
03/08/10	1.0	15:25	6.160	550.66	1.12	67	1.48E+09	5.23E+07
04/07/10	0.5	14:15	6.181	580.64	1.06	67	1.56E+09	5.52E+07
05/07/10	0.5	12:15	6.202	610.62	1.02	67	1.65E+09	5.81E+07
09/02/10	0.5	11:57	6.223	728.60	0.85	67	1.97E+09	6.95E+07
09/17/10	0.25	12:02	6.233	743.59	0.84	67	2.01E+09	7.10E+07
10/01/10	0.5	14:45	6.254	757.57	0.83	65	2.05E+09	7.23E+07
11/05/10	0.67	11:40	6.282	792.54	0.79	65	2.14E+09	7.55E+07
11/12/10	0.5	11:45	6.303	799.52	0.79	64	2.16E+09	7.62E+07
12/08/10	0.5	13:50	6.323	825.50	0.77	64	2.23E+09	7.86E+07
12/31/10	0	N/A	6.323	848.50	0.75	64	2.29E+09	8.07E+07
01/11/11	1.0	16:35	6.365	859.46	0.74	54	2.31E+09	8.16E+07
01/18/11	1.0	14:15	6.407	866.42	0.74	58	2.33E+09	8.21E+07
02/16/11	2.5	11:30	6.511	895.31	0.73	61	2.40E+09	8.47E+07
03/09/11	1.0	14:45	6.553	916.27	0.72	59	2.45E+09	8.65E+07
04/05/11	2.75	12:30	6.667	943.16	0.71	52	2.51E+09	8.85E+07

Appendix C-3. SWMU ST-70 SVE System Operation and Downtime

Date	SVE Operation		Cumulative Time		Percent Downtime (%)	Flow Rate (scfm)	Cumulative Volume Extracted (L)	Cumulative Volume Extracted (ft^3)
	Down Time (hours)	Start/ Restart (time)	Total Downtime (days)	Total Operation Time (days)				
04/21/11	2.0	15:25	6.750	959.07	0.70	58	2.54E+09	8.98E+07
05/10/11	0.75	10:35	6.782	978.04	0.69	52	2.58E+09	9.12E+07
06/22/11	0	15:51OFF	6.782	1021.04	0.66	58	2.68E+09	9.48E+07
06/28/11	139.3	9:10	12.59	1021.24	1.23	58	2.69E+09	9.48E+07
06/30/11	0	N/A	12.59	1023.24	1.23	58	2.69E+09	9.50E+07
07/20/11	0.5	12:50	12.61	1043.22	1.21	58	2.74E+09	9.67E+07
08/30/11	0.5	10:30	12.63	1084.20	1.16	62	2.84E+09	1.00E+08
09/28/11	1	12:05	12.67	1113.15	1.14	62	2.91E+09	1.03E+08
10/28/11	0.66	12:15	12.70	1143.13	1.11	62	2.99E+09	1.06E+08
11/16/11	0.25	11:00	12.71	1162.12	1.09	62	3.04E+09	1.07E+08
12/09/11	0.5	10:35	12.73	1185.10	1.07	62	3.10E+09	1.09E+08
12/15/11	0.2	16:20	12.74	1191.09	1.07	62	3.11E+09	1.10E+08
12/31/11	0	N/A	12.74	1207.09	1.06	66	3.15E+09	1.11E+08
Pulsed Operation with Winter Downtime (2012 and ongoing)								
01/03/12	0	N/A	12.74	1210.09	1.05	62	3.16E+09	1.12E+08
01/03/12	shut down for rebound study starting at 13:45							
04/20/12	0	16:25	12.74	1210.09	1.05	0	3.16E+09	1.12E+08
04/25/12	0	N/A	12.74	1215.09	1.05	64	3.17E+09	1.12E+08
04/27/12	1	15:05	12.78	1217.05	1.05	64	3.18E+09	1.12E+08
05/04/12	0.5	9:15	12.80	1224.02	1.05	64	3.20E+09	1.13E+08
05/14/12	0	N/A	12.80	1234.02	1.04	64	3.22E+09	1.14E+08
06/08/12	6.0	15:35	13.05	1258.77	1.04	64	3.29E+09	1.16E+08
06/12/12	0	N/A	13.05	1262.77	1.03	62	3.30E+09	1.16E+08
06/16/12	24	7:30	14.05	1265.77	1.11	62	3.31E+09	1.17E+08
06/30/12	0	N/A	14.05	1279.77	1.10	62	3.34E+09	1.18E+08
07/11/12	0.5	7:50	14.07	1290.75	1.09	64	3.37E+09	1.19E+08
08/23/12	0.6	15:15	14.09	1333.73	1.06	61	3.48E+09	1.23E+08
09/14/12	0.5	17:00	14.12	1355.71	1.04	62	3.53E+09	1.25E+08
10/12/12	0.4	14:55	14.13	1383.69	1.02	65	3.61E+09	1.27E+08
11/16/12	168	15:45	21.13	1411.69	1.50	58	3.67E+09	1.30E+08
12/13/12	0.75	14:45	21.16	1438.66	1.47	54	3.73E+09	1.32E+08
12/21/12	0.2	16:20	21.17	1446.65	1.46	54	3.75E+09	1.32E+08
12/31/12	0	N/A	21.17	1446.65	1.46	0	3.75E+09	1.32E+08
01/16/13	OFF	N/A	21.17	1446.65	1.46	0	3.75E+09	1.32E+08
02/25/13	OFF	N/A	21.17	1446.65	1.46	0	3.75E+09	1.32E+08
03/05/13	Restart	11:05	21.17	1446.65	1.46	58	3.75E+09	1.32E+08
03/21/13	0.5	8:45	21.19	1462.63	1.45	57	3.79E+09	1.34E+08
04/24/13	1.0	11:55	21.23	1496.59	1.42	63	3.87E+09	1.37E+08
05/22/13	0.5	13:15	21.26	1524.57	1.39	59	3.94E+09	1.39E+08
06/26/13	0.5	10:15	21.28	1559.55	1.36	64	4.03E+09	1.42E+08
06/30/13	0.0	N/A	21.28	1563.55	1.36	64	4.04E+09	1.43E+08

Abbreviations:

scfm = standard cubic feet per minute, ft^3 = cubic feet

L = liters of soil vapor at standard temperature and pressure

APPENDIX D

NMED Notice of Acceptance and Request for Work Plan

NEW MEXICO ENVIRONMENT DEPARTMENT

Hazardous Waste Bureau

2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303
Phone (505) 476-6000 Fax (505) 476-6030
www.nmenv.state.nm.us

SUSANA MARTINEZ
Governor

JOHN A. SANCHEZ
Lieutenant Governor

DAVE MARTIN
Secretary

BUTCH TONGATE
Deputy Secretary

JAMES H. DAVID, Ph.D.
Director
Resource Protection Division

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

July 23, 2012

Colonel John Kubinec
Base Commander
377 ABW/CC
2000Wyoming Blvd. SE
Kirtland AFB, NM 87117-5606

John Pike
Director, Environmental Management Services
377 MSG
2050 Wyoming Blvd. SE, Suite 116
Kirtland AFB, NM 87117-5270

RE: NOTICE OF APPROVAL
JULY 2011 TO DECEMBER 2011, INTERIM CORRECTIVE MEASURES REPORT FOR SOLID WASTE MANAGEMENT UNIT ST-70, BUILDINGS 481/482 OIL/WATER SEPARATOR (FORMER ST-219), FEBRUARY 2012
KIRTLAND AIR FORCE BASE, EPA ID# NM9570024423
HWB-KAFB-12-004

Dear Col. Kubinec and Mr. Pike:

The New Mexico Environment Department (NMED has reviewed the report *July 2011 to December 2011, Interim Corrective Measures Report for Solid Waste Management Unit ST-70, Buildings 481/482 Oil/Water Separator (Former ST-219),* dated February 2012, detailing the operation and efficiency of the ST-70 soil-vapor extraction (SVE) interim corrective measure. The NMED agrees with the following with respect to this interim measure:

- SVE operations need to continue and that soil-vapor sampling can be reduced from monthly to quarterly.
- A rebound study would not be detrimental to the environment and would provide beneficial data that could lead to more efficient removal of contaminants.
- Depending upon the results of a rebound study, it is possible that SVE can be optimized as a pulsed SVE system.

The U. S. Air Force (Permittee) was directed in NMED's letter of April 12, 2006, to determine the extent of soil and groundwater contamination. This work has not been achieved. Thus, the Permittee must submit to the NMED no later than **October 31, 2012**, an investigation plan to complete characterization of soil and groundwater at SWMU ST-70 (ST-219).

If you have any questions please contact Mr. William McDonald of my staff at (505) 222-9582.

Sincerely,

John E. Kieling
Chief
Hazardous Waste Bureau

cc: W. Moats, NMED HWB
W. McDonald, NMED HWB
L. King, EPA 6PD-N
File: KAFB 2012 and Reading