OFF DEPOT AIR SPARGE - SOIL VAPOR EXTRACTION SYSTEM
ANNUAL OPERATIONS REPORT, YEAR TWO

DUNN FIELD

Defense Depot Memphis, Tennessee

Prepared for:

Department of the Army

HDR | ONE COMPANY *Many Solutions*®

AFCEE Contract No. FA8903-08-D-8771
Task Order No. 0069

April 2012
Revision 0

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TABLE OF CONTENTS

Page

LIST OF APPENDICES

Appendix

LIST OF TABLES

Table

LIST OF FIGURES

Figure

LIST OF ACRONYMS AND ABBREVIATIONS

acfm	actual cubic feet per minute
AFCEE	Air Force Center for Engineering and the Environment
AMD	automatic magnetic drain
AS/SVE	air sparging and soil vapor extraction
AWS	air/water separator
bgs	below ground surface
BRAC	base realignment and closure
CVOC	chlorinated volatile organic compound
DDMT	Defense Depot Memphis, Tennessee
DQE	data quality evaluation
DQO	data quality objectives
FSVE	fluvial soil vapor extraction
IAQ	intermediate aquifer
in. H_2O	inches of water
in. Hg.	inches of mercury
IRACR	Interim Remedial Action Completion Report
lb/hr	pounds per hour
LTM	long-term monitoring
µg/L	micrograms per liter
MI	Main Installation
MNA	monitoring natural attenuation
MSCHD	Memphis/Shelby County Health Department
NPL	National Priorities List
O&M	operations and maintenance
PID	photoionization detector
PLC	programmable logic controller
PMW	performance monitoring well
ppbv	parts per billion by volume
ppm	parts per million
psi	pounds per square inch
QC	quality control
RA	remedial action
RAWP	Remedial Action Work Plan
RA SAP	Remedial Action Sampling and Analysis Plan

LIST OF ACRONYMS AND ABBREVIATIONS
(CONTINUED)

RD	remedial design
RL	reporting limit
scfm	standard cubic feet per minute
SVE	soil vapor extraction
TA	treatment area
TCE	trichloroethene
TDEC	Tennessee Department of Environment and Conservation
TeCA	1,1,2,2 tetrachloroethane
TO	task order
U.S.	United States
USEPA	United States Environmental Protection Agency
VFD	variable frequency drive
VMP	vapor monitoring point
VOC	volatile organic compound

1.0 INTRODUCTION

HDR has prepared this Annual Operations Report for the Off Depot air sparging and soil vapor extraction (AS/SVE) system under Contract FA8903-08-D-8771, Task Order (TO) 69 to the Air Force Center for Engineering and the Environment (AFCEE). This report summarizes the operations and maintenance (O&M) activities and the results of system monitoring for Year Two AS/SVE operations at the Off Depot groundwater plume west of Dunn Field at Defense Depot Memphis, Tennessee (DDMT). The report covers operations from 1 January through 31 December 2011.

1.1 SITE DESCRIPTION AND BACKGROUND

DDMT, which originated as a military facility in the early 1940s, received, warehoused, and distributed supplies common to all United States (U.S.) military services and some civil agencies located primarily in the southeastern U.S., Puerto Rico, and Panama. Stocked items included food, clothing, petroleum products, construction materials, and industrial, medical, and general supplies. In 1995, DDMT was placed on the list of the Department of Defense facilities to be closed under Base Realignment and Closure (BRAC). Storage and distribution of material continued until the facility closed in September 1997.

DDMT is located in southeastern Memphis, Shelby County, Tennessee approximately five miles east of the Mississippi River and northeast of Interstate 240. The property consists of approximately 642 acres and includes the Main Installation (MI) and Dunn Field. The MI contains approximately 578 acres used for open storage areas, warehouses, military family housing, and outdoor recreational areas. Dunn Field, located across Dunn Avenue from the north-northwest portion of the MI, covers approximately 64 acres with former mineral storage and waste disposal areas.

In 1992, DDMT was added to the National Priorities List (NPL); the facility identification number is TN4210020570. The lead agency for environmental restoration activities at DDMT was the Defense Logistics Agency; the Department of the Army, BRAC Division assumed responsibility for restoration activities in December 2010, once all property at DDMT was approved for transfer. The regulatory oversight agencies are the U.S. Environmental Protection Agency (USEPA) Region 4 and the Tennessee Department of Environment and Conservation (TDEC).

Upon completion of the AS/SVE system for Off Depot groundwater in 2009, construction of the selected remedies for DDMT was complete. The *Preliminary Close Out Report* (USEPA, 2010) was approved in May 2010 and the DDMT NPL site status was revised to Construction Complete.

1.2 SITE GEOLOGY AND HYDROGEOLOGY

The geologic units of interest at Dunn Field are (from youngest to oldest): loess, including surface soil; fluvial deposits; Jackson Formation/Upper Claiborne Group; and Memphis Sand.

The loess consists of wind-blown and deposited, brown to reddish-brown, low plasticity clayey silt to silty clay. The loess deposits are about 20 to 30 feet thick and are continuous throughout the Dunn Field area.

The fluvial (terrace) deposits consist of two general layers. The upper layer is a silty, sandy clay that transitions to a clayey sand and ranges from about 10 to 36 feet thick. The lower layer is composed of interlayered sand, sandy gravel, and gravelly sand, and has an average thickness of approximately 40 feet. The uppermost aquifer is the unconfined fluvial aquifer, consisting of saturated sands and gravelly sands in the lower portion of the deposits. The saturated thickness of the fluvial aquifer ranges from 3 to 50 feet and is controlled by the configuration of the uppermost clay in the Jackson Formation/Upper Claiborne Group. The groundwater in the fluvial aquifer is not a drinking water source for area residents.

The Jackson Formation/Upper Claiborne Group consists of clays, silts, and sands. The uppermost clay unit appears to be continuous, except in the southwestern area of Dunn Field. Off site, to the west and northwest of Dunn Field, there are possible gaps in the clay. Where present, these gaps create connections to the underlying intermediate aquifer (IAQ) from the fluvial deposits. The IAQ is locally developed in deposits of the Jackson Formation/Upper Claiborne Group.

The Memphis Sand primarily consists of thick bedded, white to brown or gray, very fine grained to gravelly, partly argillaceous and micaceous sand. Lignitic clay beds constitute a small percentage of the total thickness. The Memphis Sand ranges from 500 to 890 feet in thickness, and begins at a depth below ground surface (bgs) of approximately 120 to 300 feet. The Memphis aquifer is confined by overlying clays and silts in the Cook Mountain Formation (part of the Jackson/Upper Claiborne Group) and contains groundwater under strong artesian (confined) conditions regionally. The City of Memphis obtains the majority of its drinking water from this unit. The Allen Well Field, which is operated by Memphis Light Gas & Water, is located approximately two miles west of Dunn Field.

1.3 OFF DEPOT REMEDIAL ACTION

The *Memphis Depot Dunn Field Off Depot Groundwater Final Remedial Design, Revision 1* (Off Depot RD) (CH2M HILL, 2008) was approved by USEPA and TDEC in October 2008. The *Dunn Field Off Depot Groundwater Remedial Action Work Plan, Revision 2* (Off Depot RAWP) (e^2M, 2009) was

submitted to USEPA and TDEC 15 April 2009. TDEC approved Revision 0 of the Off Depot RAWP on 18 October 2008 and USEPA approved Revision 1 on 18 March 2009. In the approval letter, USEPA suggested two revisions regarding reporting requirements and contingency action; those changes were made in the final version. The Off Depot remedial action (RA) included the following components:

- Installation of an AS/SVE system across the core of the plume near the downgradient end.
- Monitored natural attenuation (MNA) and long-term groundwater monitoring to document remedy performance as indicated by changes in chlorinated volatile organic compound (CVOC) concentrations and/or changes in the lateral or vertical extent of the CVOC plume
- Institutional controls to prevent access to contaminated groundwater

The RA construction activities and Year 1 operations were described in the *Off Depot Groundwater Interim Remedial Action Completion Report, Rev.1* (Off Depot IRACR) (HDR, 2011a), which was submitted to USEPA and TDEC on 29 July 2011. The Off Depot IRACR was approved by USEPA on 29 August 2011 and by TDEC on 15 November 2011.

1.4 AS/SVE SYSTEM DESCRIPTION

AS/SVE is being conducted near the leading edge of the groundwater plume west of Dunn Field to remove CVOCs from groundwater and prevent further plume migration. The AS/SVE system was designed to intercept the majority of the Off-Depot CVOC plume and to reduce individual CVOC concentrations below 50 micrograms per liter (µg/L). AS/SVE operations began 21 December 2009 and are expected to continue up to 5 years in order to meet remedial action objectives.

AS/SVE operations were incorporated in the Memphis/Shelby County Health Department (MSCHD) Permit #01030-01P issued for the fluvial soil vapor extraction (FSVE) on Dunn Field. Permit conditions include maintaining volatile organic compound (VOC) emissions below 5.71 pounds per hour (lb/hr) or 25 tons per year with documentation provided in an annual emissions report.

The AS/SVE system consists of 90 AS wells, 12 SVE wells, 10 pairs of vapor monitoring points (VMPs) and control buildings for the AS compressor, SVE blowers and system controls. The system layout is shown on Figure 1.

The AS system is powered by a Kaeser CSD 100 rotary screw air compressor specified at 500 standard cubic feet per minute (scfm) at 125 pounds per square inch (psi); air filters minimize oil particles in the air stream from the compressor. The other AS components are a receiving tank, refrigerated dryer,

pressure regulator and relief valve, solenoid panel and sparge manifold, and the AS wells. Each AS well was installed at the base of the fluvial aquifer at depths of 82 to 115 feet bgs. Compressed air is fed to each solenoid bank (each containing 20 solenoid valves) via 3/8-inch tubing. As each solenoid valve opens, compressed air travels through individual 5/16-inch tubing to a manifold leg (one leg for each AS well). Each manifold leg consists of a check valve, speed control valve, rotameter and pressure regulator. At startup, the total flow rate to the AS wells was 220 scfm, well below the target of 450 scfm; the reduction was considered to be due to friction loss in the AS lines. System tests and modifications were made in 2010 as described in the Off Depot IRACR. Air lines were added to each solenoid bank, the speed control valves were removed and the pressure regulators were all set at 30 psi.

The SVE system consists of two Kaeser positive displacement rotary blowers (Model 420C/53P) installed in parallel configuration; each 40-horsepower blower is specified for 485 scfm at 10 inches of mercury (in. Hg). The blowers are connected to 12 SVE wells with 30-foot screens beginning at depths of 35 to 45 feet bgs. The SVE wells were installed on roughly 50-foot centers to capture the vapors from the AS points; the maximum separation between an AS well and the nearest SVE well (SVE-12 and AS-90) is approximately 60 feet. Extracted vapor from the individual wells combine in a single 6-inch header at the piping manifold outside the SVE building. The vapor stream passes through the air/water separator (AWS) tank to remove entrained vapor and debris from the air stream. No other treatment is performed prior to discharge.

VMPs were installed to monitor the radius of influence of the SVE wells and the CVOC concentrations in the vadose zone. There are 10 pairs of nested VMPs with 5-foot screens located 20 to 60 feet from the nearest SVE well; the shallow ('B') VMPs are screened at an average depth of 49 feet bgs and the deep ('A') VMPs are screened at an average depth of 64 feet bgs.

The amount of air required for the 90 AS points, 450 scfm, was calculated based on a maximum injection rate of 15 scfm and pulsed operation such that 1/3 of the AS points are operating at any one time. Pulsed operation was selected to decrease the required system injection flow capacity, optimize air distribution by limiting the formation of permanent air channels, and minimize the likelihood that groundwater will bypass the AS barrier due to permeability reductions caused by the air injection.

The AS points and SVE wells are connected via buried piping to two equipment buildings; one housing the compressor for the sparge points and the other housing two blowers for the SVE wells. The AS-SVE system is operated through programmable logic controllers (PLCs) in the AS and SVE control buildings. The AS PLC operates the solenoids to direct air to the individual AS points for the programmed daily

schedule, to monitor operations and to trigger alarms or shut downs as necessary. The SVE PLC monitors blower operations and sends alarm notifications or shuts down the system if necessary. The AS compressor has a separate controller to monitor operations and trigger alarms or shut downs as necessary.

During normal system operations, all 12 of the SVE wells operate with 1/3 of the 90 AS wells. The SVE wells are adjusted at the manifold periodically to balance individual flow rates. The design air injection rate is 15 cfm at each AS well for a total of 450 cfm and the design vapor extraction rate is 1.5 times the air injection rate, 675 cfm or approximately 55 cfm per well. The AS PLC operates the wells in three groupings (A: AS-1, AS-4, AS-7...; B: AS-2, AS-5, AS-8...; and C: AS-3, AS-6, AS-9...). Each AS group is operated for four hours before the system switches to the next group.

Condensate from SVE operations is collected in a 160-gallon cylindrical AWS, which separates entrained liquid and debris within the air stream. Condensate is transferred from the AWS to a 505-gallon polyethylene tank outside the SVE building. Once the exterior tank nears capacity, water is pumped to a trailer-mounted transfer tank and transferred to a condensate storage tank on Dunn Field for analysis prior to discharge.

1.5 PREVIOUS OPERATIONS AND MONITORING RESULTS

1.5.1 Year One Operations and Monitoring

Year 1 system operations were described in the Off Depot IRACR. The SVE system was initially operated with two blowers during the day and one blower on nights and weekends due to noise complaints from a nearby resident during system startup. The SVE system began operations with both blowers full-time on 7 May 2010. System uptime during Year One from startup on 21 December 2009 through 31 December 2010 was 97%. Downtime was generally due to normal equipment maintenance and sampling activities.

Groundwater monitoring results in September 2010 indicated the plume may be partially diverted around the southern edge of the AS/SVE system, possibly due to decreased permeability from the air injection. On 24 November 2010, normal operations with the AS compressor and both SVE blowers was reduced to two days per week with one blower operated at other times.

AS injection rates averaged 285 scfm from December 2009 through December 2010; the average AS injection rate after 25 May 2010 was 344 scfm. System vacuum and flow rate averaged approximately 1093 scfm at 9.8 in. Hg with both blowers and 693 scfm at 5.8 in. Hg with a single blower. The SVE wells were initially operated in the 100% open position but adjustments were made to balance flow rates.

Average flow rates at individual wells ranged from 49 actual cubic feet per minute (acfm) to 148 acfm. Average vacuum at VMPs ranged from 18.2 to 34.4 inches of water (in. H_2O) with both blowers operating. The vacuum measurements demonstrated air injected during sparging is captured throughout the treatment area (TA) by the SVE wells.

Total primary CVOCs in the system effluent decreased from 1201 parts per billion by volume (ppbv) at start-up in December 2009 to to 58.4 ppbv in December 2010. The CVOCs detected at the highest concentrations were trichloroethene (TCE) and 1,1,2,2 tetrachloroethane (TeCA); TCE was 40% to 70% of total CVOCs, while TeCA was 10% to 35% of total CVOCs. VOC mass removal was estimated from system operating hours, flow rates and VOC concentrations in the effluent sample, based on the primary constituent (TCE). VOC emission rates decreased from 0.025 lb/hr at startup to 0.001 lb/hr in December 2010. The emissions were below the de minimus standard of 0.1 lb/hr for the MSCHD operating permit. The AS/SVE system removed approximately 71 pounds of VOCs from startup through December 2010.

1.5.2 Groundwater Monitoring

Groundwater monitoring results from 36 performance monitoring wells (PMWs) are used to assess the overall effectiveness of the AS-SVE system. The treatment goal for the AS/SVE system is to reduce groundwater concentrations downgradient of AS/SVE barrier below 50 µg/L for individual CVOCs. The goal was met in the 5 PMWs immediately downgradient of the AS/SVE barrier in June 2010. The total CVOC concentration in MW-246, the PMW with the highest baseline concentration, decreased 99.7 percent from October 2009 (4607 µg/L) to January 2011 (13.5 µg/L).

In January 2011, CVOC concentrations in the Off Depot plume met the treatment goal of 50 µg/L for individual CVOCs in all but five PMWs (MW-54, MW-149, MW-159, MW-166 and MW-166A), including all wells downgradient of the AS/SVE system. These five PMWs represent the core of the Off-Depot plume.

1.6 SCOPE OF WORK

HDR has performed O&M activities for the AS/SVE system since system startup in December 2009. The goals for O&M are to:

- Maintain system operations through regular field inspections, maintenance, and repairs; and

- Monitor system effectiveness through air injection and vapor extraction flow rates, vacuum measurements, photoionization detector (PID) measurements, and laboratory analysis of system effluent samples.

O&M activities follow procedures described in the *Dunn Field Off Depot Groundwater Air Sparge and Soil Vapor Extraction System Operations and Maintenance Manual* (AS/SVE O&M Manual) (HDR, 2011b).

The scope for AS/SVE operations included the following activities:

- Weekly system inspections with repair or replacement of components, as required;
- Weekly readings at AS compressor, SVE wells and system effluent for flow rate, vacuum, temperature, and operating hours;
- Weekly PID measurements at SVE wells and system effluent;
- Monthly PID and vacuum measurements at VMPs;
- Quarterly laboratory samples from system effluent analyzed for VOCs;
- Quarterly reports to describe O&M activities, system status, performance and monitoring results; and
- Annual operations report to summarize system operations and monitoring results with data validation and to provide recommendations for future operations.

2.0 SYSTEM OPERATIONS

Operation of the AS compressor with both SVE blowers had been reduced from daily to two days per week in November 2010 during Year One to limit potential plume diversion around the AS/SVE system. At other times, the AS compressor was off-line and one SVE blower was operated. Groundwater monitoring results in January 2011 did not indicate significant plume migration, but an increase in total CVOCs was observed at MW-247, downgradient of the AS/SVE system. The increase was attributed to reduced AS/SVE operations, and operation of the AS compressor and both SVE blowers was increased to three days per week on 14 March 2011. Normal operations were maintained at 3 to 4 days per week throughout the remainder of Year Two.

2.1 SYSTEM PERFORMANCE

AS/SVE system uptime during Year Two was approximately 94%. The primary causes of downtime were power outages from storms and system maintenance. During Year Two, the AS compressor and SVE blowers were operated 2 to 4 days per week, or approximately 43% of the time. When the AS system was off-line, the SVE system operated with a single blower.

Problems with Blower #1 resulted in system operations with the AS compressor and a single blower for much of the time after August 2011. While the AS system was in use, the SVE system was operated with one blower for approximately 27% of the third quarter (July through September 2011) and 100% of the fourth quarter (October through December 2011). System modifications in March 2012 have allowed operations with both blowers to resume.

2.2 SYSTEM FLOW RATES AND VACUUMS

Operating conditions were recorded weekly during Year Two. The AS parameters include pressure and air temperature at the AS compressor and the manifold, maximum and minimum air flow rates at the manifold, and pressure and flow rate at each operating AS well. The SVE parameters include vacuum and air temperature for each blower and the system effluent, and vacuum and flow rate for each SVE well. Operating hours for each blower and the compressor are also recorded. SVE system effluent flow rates are measured using a pitot tube and flow rates at individual wells are measured by a vane-type meters at the well manifold. Vacuum measurements are made using a digital manometer. Operating conditions are recorded on forms provided in the AS/SVE O&M Manual.

AS injection rates, listed on Table 1, ranged from 231 to 357 scfm and averaged 300 scfm during Year Two. Air flow rates and vacuum measurements at SVE wells and system effluent are also shown on

Table 1. Average flow rates at individual SVE wells were 64 to 104 acfm with both blowers in operation and 22 to 78 acfm with one blower. Combined flow from all SVE wells averaged 1004 scfm at 13.0 in. Hg with both blowers operating and 655 scfm at 8.0 in. Hg with a single blower.

The design combined flow rate with both blowers in operation was 675 scfm, or 1.5 times the target injection rate of 450 scfm. Based on the average AS injection rate of 300 scfm, the SVE system extracted approximately 3.3 times the injection rate with both blowers in operation and approximately 2.2 times the injection rate with one blower in operation during Year Two.

2.3 SYSTEM MAINTENANCE

General preventative maintenance, performed after weekly system readings are recorded, include: checking the oil level in the compressor and adding oil as necessary, checking and cleaning air filter mats in the compressor control panel, and checking automatic drains in the refrigerated dryer. Monthly preventative maintenance includes cleaning the compressor and dryer heat exchange radiators, emptying moisture from the compressor vacuum line, checking air intake filters for the AS building, checking and tightening blower v-belts, and checking SVE blower oil levels and adding oil as necessary. Field notes are recorded on maintenance and inspection forms. General housekeeping of the AS and SVE buildings and equipment compound is performed as needed.

Maintenance activities and system shutdowns during Year Two are listed below:

- The system went down on 20 February at 03:04 due to a Variable Frequency Drive (VFD) fault alarm and was restarted on 21 February at 07:20. The VFD regulates voltage and amperage to the blowers; if either drops or spikes too much the fault shuts down the system and trips an alarm. The cause of the alarm was probably due to a power outage.
- Oil was found on the floor of the AS building on 17 March. The compressor vacuum line filled with water causing oil to leak from the inlet valve. The spilled oil was cleaned up using an absorbent and the vacuum line was drained. The vacuum line check was increased from monthly to bi-weekly. The compressor manufacturer, Kaeser, stated the problem has not been observed with other units.
- There were several system shutdowns in the second quarter due to Low Voltage/Phase alarms: 4 hours on 4 April; 64 hours on 6-9 May; 25 hours on 15-16 May; 16 hours on 7-8 June; 17 hours on 16-17 June; and 2 hours on 28 June. The shutdowns were believed to be caused by problems with power supply, and were generally associated with storms.

- AS-51 and AS-54 were observed to have broken connections on 25 April. AS-51 apparently failed under pressure; the pad was lifted out of place and the conveyance line connection blown off. While checking AS-51, air was observed to be leaking at AS-54 and the well cap was found to have blown off. The two AS points were turned off at the manifold and capped. AS-62 was found to have failed under pressure on 13 June; the pad was lifted out of place and the conveyance line connection broken. The AS point was turned off at the manifold and capped.

- The system shut down on 31 May due to an SVE Exhaust Air High Temp alarm. The air filters were determined to be clogged and new filters were ordered. A single blower was re-started on 1 June but the AS compressor remained off. The filters on the blowers and the KCF filter on the compressor were replaced and both blowers were started on 6 June; the system shut down again due to an SVE Exhaust Air High Temp alarm after 15 minutes. The system was restarted on 7 June with one blower and the AS compressor running. Following review of operating parameters, the temperature set point for the alarm was increased from 200 to 250 degrees Fahrenheit and the system was operated with both blowers and the AS compressor for the 3-day cycle beginning 13 June.

- The AS system was turned off on 21 June for maintenance on the air holding tank. The automatic magnetic drain (AMD) was not operating properly, allowing water to build up in the tank; sediment and scale apparently blocked the small-diameter AMD. Approximately 200 gallons of water was drained into the poly tank and the AMD was removed, cleaned, and replaced.

- Blower #1 operated sporadically after 10 August due to VFD alarms. The system controls were reviewed with the programmer on 22 August; a temporary change was made to keep the Blower #1 VFD alarm from shutting down the system. A Kaeser technician checked the blower on 29 August but did not find any problems that would account for the recorded VFD alarms. A Rockwell technician tested the VFD on 16 September but did not find any problems; the VFDs for each blower were then switched to isolate the problem component. The electrical contractor (Overton) attached a data recorder to evaluate the power supply; the data indicated a potential problem with the power supply but was not conclusive.

- The system shut down briefly on 15 July, 23 August and 18 September due to Low Voltage/Phase alarms apparently related to power outages from storms.

- The pitot tube was not functioning during the readings on 30 September. Initial repair attempts were not successful and the pitot tube was replaced on 7 November.

- The system shut down due to Low Voltage/Phase alarms on 30 September to 3 October, 8 to 12 October and 25 to 27 October, apparently related to power outages from storms.
- The coupler on the AS compressor was replaced on 12 October.
- Blower #1 was shutdown for most of the fourth quarter while problems with the VFD were evaluated. Because the AS compressor was run only 3 to 4 days per week, use of a single blower did not impact overall system effectiveness. Both blowers were run from 31 October until a Blower #1 VFD fault on 1 November.
- The system was down briefly on 18 November while system software controls were reviewed.
- Annual system maintenance was performed on 7 December.

3.0 SYSTEM MONITORING

AS/SVE system monitoring consists of vacuum measurements at VMPs; PID readings at the system effluent, SVE wells and VMPs; and laboratory analysis of vapor samples from the system effluent. PID readings at the SVE well manifold and the system effluent are made weekly; PID readings and vacuum measurements at VMPs are made monthly; and vapor samples from the system effluent are collected quarterly for laboratory analysis. The monitoring activities are performed in accordance with the AS/SVE RAWP. Sampling and analysis are performed in accordance with the *Remedial Action Sampling and Analysis Plan* (RA SAP) (MACTEC, 2005).

3.1 VACUUM MEASUREMENTS

Vacuum measurements are collected at VMPs by connecting a digital manometer (Dwyer Series 475 Mark 3) to a quick-connect fitting in the sealed cap of each VMP well casing. The vacuum measurements are shown on Table 2. Average vacuum at VMPs ranged from 13 to 28 in. H_2O with both blowers operating and 3.7 to 16 in. H_2O with one blower. Two VMP pairs, 7A/B and 10A/B, had a few vacuum measurements at 0 in. H_2O; the measurements are believed to results from water in the VMP tubing. The other measurements demonstrate air injected during sparging is captured throughout the TA by the SVE wells.

3.2 PID MEASUREMENTS

VOC concentrations are estimated through field measurements at individual SVE wells, system effluent, and VMPs with a MiniRae 2000 (10.6 eV lamp) PID. The PID is calibrated with a 100 parts per million (ppm) concentration of isobutylene prior to use. At each location, vapor is collected in a dedicated Tedlar® bag, the PID meter is connected to the Tedlar® bag and the maximum reading is recorded. For measurements at the SVE wells and VMPs, an oil-less high vacuum sampling pump is used to draw the vapor stream into a tedlar bag. No pump is needed at the system effluent as it is under positive pressure.

Weekly measurements at SVE wells and system effluent were varied between standard operations with the AS compressor and one or both blowers operating, and with the AS compressor off and a single blower operating; the measurements are shown on Table 3. The PID measurements were generally at low levels during Year Two but increased during the second half of the year. During standard operations in the first half of the year, the system effluent measured 0.1 to 0.3 ppm and SVE wells measured 0 to 0.8 ppm. When the AS compressor was off, PID measurements for SVE wells and effluent were 0 to 0.3 ppm. One set of higher measurements was observed on 16 June when the effluent was at 1.9 ppm and the

SVE wells were at 0 to 10.4 ppm. The cause of the higher readings is not known, although the AS compressor was operated with a single blower the previous week.

In the third quarter, the system effluent measured 0.2 ppm and SVE wells measured 0.1 to 0.5 ppm during standard operations with two blowers. The PID measurements were similar when a single blower was operating, with or without the AS compressor, except that the measurements increased slightly later in the quarter. The later measurements were up to 1.8 ppm in the system effluent and 4.3 ppm in SVE wells.

Operations were generally limited to a single blower during the fourth quarter; the system effluent measured 0.9 to 1.2 ppm and SVE wells measured 0.1 to 2.9 ppm. The PID measurements increased during the last two measurements on 21 and 30 December to 13 ppm at the effluent and 4.4 to 33 ppm at SVE wells.

The VMPs are first purged of three tubing volumes using the sampling pump. Multiple PID readings are collected at each VMP using a dedicated Tedlar bag until three consecutive readings are within 10%. The final PID readings from VMPs are shown on Table 4. PID measurements at VMPs were at low levels during Year Two, ranging from 0.1 to 2.3 ppm. In contrast to PID readings at SVE wells and system effluent, PID measurements at VMPs were lower in the fourth quarter, ranging from 0.1 to 0.4 ppm.

3.3 VAPOR SAMPLES

Quarterly vapor samples were collected from the system effluent during Year Two to monitor system performance and to confirm treatment system compliance with permitted discharge limits. Vapor samples were collected in 6-liter Summa canisters without a flow regulator. The Summa canisters were shipped from the laboratory with negative pressure; a sampling pump was not required for sample collection. Samples were submitted to Columbia Analytical Services Inc. in Simi Valley, CA for analysis of VOCs by USEPA Method TO-15.

Complete analytical results for the effluent vapor samples are presented in Appendix A, Table A-1. Table 5 lists the analytical results for the primary CVOCs historically detected at Dunn Field and for other VOCs detected above the reporting limit (RL) in a sample. The totals for primary CVOCs and for all VOCs detected above the RL are also listed.

Total primary CVOCs in the system effluent ranged from 26.4 to 50.6 ppbv and total VOCs from 38.3 to 65.2 ppbv; in contrast to the PID measurements, the lowest concentration was from the fourth quarter sample. The CVOC detected at the highest concentrations was TCE at 47% to 71% of the total primary

CVOC concentration. System effluent concentration trends from PID measurements and analytical results are shown on Figure 2.

3.4 DATA QUALITY EVALUATION

HDR performed data quality evaluation (DQE) of the laboratory data packages for the vapor samples collected during Year Two operations to qualify the data relative to the data quality objectives (DQOs) described in the RA SAP. Data qualifiers are shown on the analytical results tables. Any result reported below the RL but above the method detection limit was flagged "J" and considered an estimated result, unless overridden by other quality control (QC) flags.

The effluent vapor sample data collected from March through December 2011 are deemed sufficient to support decisions regarding the effectiveness of SVE system performance. The DQE for Year Two samples is provided in Appendix B.

3.5 MASS REMOVAL ESTIMATE

The VOC mass removed from the Off Depot TA is estimated from the average VOC concentrations in the effluent sample (based on TCE), system operating hours and flow rates. System operating hours are based on operation of the AS compressor and the SVE blower(s); operating hours for the SVE blower without the AS compressor were not included in the mass removal estimate. The mass emission calculations are shown on Table 6.

Estimated VOC emission rates in the effluent remained at 0.001 lb/hr throughout Year Two. The emissions are below the de minimus standard of 0.1 lb/hr for the MSCHD permit. The AS/SVE system removed approximately 4 pounds of VOCs in Year Two and 75 pounds of VOCs since startup (Table 6).

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 SYSTEM OPERATIONS

The AS/SVE system uptime was approximately 94% during Year Two (1 January to 31 December 2011). Standard system operations with the AS compressor and SVE blowers were limited to two days per week until 14 March and three to four days per week for the remainder of the year; the AS compressor and SVE blowers were operated approximately 43% of the time during Year Two. When the AS system was off-line, the SVE system operated with a single blower. Problems with Blower #1 resulted in system operation with the AS compressor and a single blower for much of the time after August 2011; system modifications in March 2012 have allowed operations with both blowers to resume.

PID measurements at VMPs and SVE wells were at generally low levels but increased over the year. The measurements generally ranged from 0.1 to 1.2 ppm for SVE system effluent, 0 to 2.9 ppm at SVE wells and 0.1 to 2.3 ppm at VMPs; higher PID measurements at SVE wells and the effluent were observed in three of the weekly readings but are not considered representative. The increased PID measurements were not confirmed by analytical results for quarterly system effluent samples which remained at low levels during Year Two; total VOC concentrations were 38.3 to 65.2 ppbv. Estimated VOC emission rates in the effluent were 0.001 lb/hr throughout Year Two, below the de minimus standard of 0.1 lb/hr for the MSCHD permit. Approximately 75 pounds of VOCs have been removed since startup.

The SVE design flow rates at individual wells (55 acfm) and for the system (675 scfm) were generally met. Average flow rates at individual SVE wells were 40 to 110 acfm with both blowers and 20 to 81 acfm with one blower. Combined flow from all SVE wells averaged 1014 scfm with both blowers and 655 scfm with a single blower. The AS air injection rate averaged 301 scfm, approximately two-thirds the design rate (450 scfm). The SVE system extracted approximately 3.4 times the average air injection rate with both blowers and approximately 2.2 times the injection rate with one blower. Field measurements demonstrated vacuum at all VMPs and corresponding vapor capture throughout the TA.

4.2 RECOMMENDATIONS

No change to AS/SVE system operation is currently planned. Weekly visits for system inspections and maintenance and for recording operational data will be continued. System monitoring through weekly PID measurements at SVE wells and system effluent, and monthly PID and vacuum measurements at VMPs will be used to evaluate system effectiveness. Quarterly samples of system effluent will be analyzed to confirm compliance with emission limits.

The *Off Depot Annual Groundwater Monitoring Report-2011* (HDR, 2012) noted continued, significant reduction of CVOC concentrations in groundwater. The AS/SVE system will continue to operate until the upgradient concentrations from the Dunn Field plume do not exceed 50 µg/L for individual CVOCs. None of the long-term monitoring (LTM) wells sampled in 2011 contained individual CVOC concentrations above 50 µg/L and only three PMWs upgradient of the AS/SVE TA exceeded that goal in September 2011. Following review of the April 2012 Off Depot LTM event, temporary shutdown of some AS wells and SVE wells will be considered to reduce the AS/SVE footprint to the area exceeding the treatment goal.

5.0 REFERENCES

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TABLES

TABLE 1
FLOW RATE AND VACUUM READINGS AT SVE WELLS AND SYSTEM EFFLUENT
OFF DEPOT AS/SVE SYSTEM
ANNUAL OPERATIONS REPORT, YEAR TWO
Dunn Field - Defense Depot Memphis, Tennessee

Date/Time of Recording	Number of Blowers in Operation	AS Compressor Flow rate (scfm)	SVE Effluent		SVE-1		SVE-2		SVE-3		SVE-4		SVE-5		SVE-6	
			Flow rate (scfm)	Vacuum (in. Hg.)	Flow rate (acfm)	Vacuum (in. H_2O)	Flow rate (acfm)	Vacuum (in. H_2O)	Flow rate (acfm)	Vacuum (in. H_2O)	Flow rate (acfm)	Vacuum (in. H_2O)	Flow rate (acfm)	Vacuum (in. H_2O)	Flow rate (acfm)	Vacuum (in. H_2O)
12/30/2010	2	354	906	13.5	100	83	90	61	70	62	180	122	100	99	100	64
1/14/2011	2	357	1026	13.5	100	80	100	61	100	69	100	61	100	95	100	60
1/21/2011	1	0	580	8.4	50	60	70	53	60	54	70	51	60	66	80	48
1/28/2011	2	350	972	13.3	100	87	110	72	100	76	100	70	100	102	100	63
2/5/2011	1	0	654	8.4	50	60	70	43	60	59	70	53	60	66	80	49
2/11/2011	2	332	972	13.7	90	91	110	76	110	89	100	76	100	106	100	70
2/18/2011	2	347	969	12.9	100	83	110	67	110	80	90	68	100	96	100	60
2/23/2011	1	0	634	7.9	50	58	60	53	70	59	60	54	50	65	70	47
3/4/2011	2	336	974	12.9	90	84	110	69	120	81	100	69	100	97	90	61
3/9/2011	1	0	630	8.2	50	63	70	57	70	63	70	58	60	69	80	51
3/18/2011	1	0	628	8.1	50	63	70	56	70	63	60	56	50	68	80	50
3/23/2011	2	343	959	12.5	90	81	110	67	120	80	100	68	100	94	90	59
4/1/2011	1	0	590	8.6	50	62	60	57	70	62	60	57	50	69	70	51
4/7/2011	2	323	985	12.8	90	79	110	66	120	80	100	68	100	94	90	58
4/15/2011	1	0	590	7.9	50	60	70	53	70	59	60	52	50	65	70	44
4/20/2011	2	314	953	12.9	90	84	110	70	120	83	100	71	100	98	90	60
4/29/2011	1	0	605	8.1	50	63	70	58	60	64	70	57	50	69	80	49
5/5/2011	2	305	1127	12.7	100	85	100	65	100	71	100	70	100	95	100	62
5/12/2011	2	287	1123	13.1	100	91	100	68	90	75	100	72	90	95	110	72
5/20/2011	1	0	628	7.7	60	64	60	53	50	56	60	54	40	65	60	55
5/27/2011	2	242	854	12.8	100	90	100	71	100	78	100	73	100	98	100	59
6/3/2011	1	0	619	7.6	50	64	50	52	50	58	70	54	50	67	50	43
6/9/2011	1	318	612	7.4	60	54	60	40	50	46	70	41	50	57	70	29
6/16/2011	2	270	1164	13.2	110	87	90	64	90	72	90	68	90	92	90	51
6/16/2011	2	-	-	-	100	82	100	68	100	78	100	72	100	98	100	65
6/24/2011	2	297	984	12.9	100	83	100	68	100	79	100	75	100	98	100	72
7/1/2011	1	0	778	7.7	50	61	60	53	50	58	70	57	50	66	80	56
7/8/2011	2	300	1030	12.5	100	84	100	65	100	76	100	74	100	96	100	71
7/15/2011	2	290	1061	12.2	100	64	100	45	100	60	100	57	100	78	110	52
8/5/2011	1	0	635	7.6	50	59	50	51	50	56	60	55	50	69	90	54
8/18/2011	1	310	645	7.6	50	59	50	52	50	57	60	55	50	68	70	53
8/26/2011	1	0	795	7.9	50	61	50	51	50	57	60	55	50	65	80	55
9/1/2011	1	284	618	7.5	50	60	60	52	50	57	70	56	50	68	80	55
9/9/2011	1	0	580	7.9	50	60	60	52	50	56	60	56	50	68	90	54
9/15/2011	1	294	698	7.5	50	55	60	44	50	50	70	49	50	58	80	48
9/23/2011	1	0	631	7.8	50	59	50	49	50	56	60	55	50	64	80	55
9/30/2011	1	0	(1)	8.3	50	63	50	52	50	59	70	58	50	68	80	56
9/30/2011	1	0	(1)	8.3	50	63	50	52	50	59	70	58	50	68	80	56
10/7/2011	1	274	(1)	7.7	50	54	70	43	50	49	60	47	50	58	80	44
10/14/2011	1	296	(1)	7.8	50	54	70	44	50	48	60	48	50	59	80	44
10/21/2011	1	0	(1)	8.5	50	62	50	53	40	58	60	57	20	67	80	55
10/28/2011	1	289	(1)	8.4	50	61	50	54	50	57	60	57	20	68	80	55
11/4/2011	1	0	(1)	7.9	50	60	50	55	50	56	60	58	30	69	80	54
11/11/2011	1	233	619	7.5	50	53	50	43	50	48	60	47	30	56	80	44
11/18/2011	1	0	652	7.8	50	61	50	51	50	56	60	54	30	65	50	53
11/23/2011	1	231	769	8.8	50	64	60	55	50	59	60	58	50	70	90	57
12/2/2011	1	255	649	8.0	50	52	50	43	50	47	60	44	40	56	80	45
12/10/2011	1	0	712	8.8	50	62	50	52	50	57	60	57	50	65	90	54
12/16/2011	1	302	696	8.1	50	53	60	44	50	47	60	48	50	58	80	45
12/21/2011	1	286	654	8.1	50	56	60	48	50	51	70	50	30	60	90	48
12/30/2011	1	267	797	8.2	50	58	60	47	50	50	60	48	50	59	80	43

Notes:
acfm: actual cubic feet per minute
in. Hg: inches of mercury
in. H_2O: inches of water
scfm: standard cubic feet per minute

1) Pitot tube was blocked 9/30 to 11/4; effluent flow rate not measured.

TABLE 1
FLOW RATE AND VACUUM READINGS AT SVE WELLS AND SYSTEM EFFLUENT
OFF DEPOT AS/SVE SYSTEM
ANNUAL OPERATIONS REPORT, YEAR TWO
Dunn Field - Defense Depot Memphis, Tennessee

Date/Time of Recording	Number of Blowers in Operation	SVE-7		SVE-8		SVE-9		SVE-10		SVE-11		SVE-12	
		Flow rate (acfm)	Vacuum (in. H_2O)	Flow rate (acfm)	Vacuum (in. H_2O)	Flow rate (acfm)	Vacuum (in. H_2O)	Flow rate (acfm)	Vacuum (in. H_2O)	Flow rate (acfm)	Vacuum (in. H_2O)	Flow rate (acfm)	Vacuum (in. H_2O)
12/30/2010	2	80	144	100	69	60	148	110	57	90	40	70	38
1/14/2011	2	90	136	100	68	70	138	100	47	100	41	70	60
1/21/2011	1	20	82	50	52	40	82	60	44	70	37	100	46
1/28/2011	2	80	150	100	72	60	149	100	52	100	46	100	47
2/5/2011	1	50	81	60	53	50	82	50	45	70	41	70	40
2/11/2011	2	70	146	90	78	60	145	100	58	100	54	90	55
2/18/2011	2	90	143	100	70	60	141	100	52	90	45	90	48
2/23/2011	1	20	81	50	52	20	81	50	43	60	40	60	37
3/4/2011	2	50	142	98	69	70	141	100	51	100	45	90	47
3/9/2011	1	20	85	60	57	20	84	60	47	70	40	70	41
3/18/2011	1	20	85	60	56	30	85	60	45	60	38	60	38
3/23/2011	2	70	138	90	68	60	138	90	50	90	43	90	45
4/1/2011	1	20	86	60	56	20	87	50	46	70	38	70	40
4/7/2011	2	60	139	100	69	60	140	90	49	90	43	90	43
4/15/2011	1	20	82	60	52	20	82	60	42	60	35	70	35
4/20/2011	2	70	144	90	71	60	143	90	52	90	46	90	45
4/29/2011	1	20	87	50	56	20	87	50	46	60	39	70	38
5/5/2011	2	80	138	100	70	70	138	100	53	100	45	100	48
5/12/2011	2	50	145	90	74	60	148	110	63	110	54	140	62
5/20/2011	1	20	81	50	56	50	80	70	60	70	42	100	46
5/27/2011	2	70	144	100	74	70	144	100	58	100	51	100	46
6/3/2011	1	20	83	50	55	30	82	60	46	60	39	60	35
6/9/2011	1	20	75	60	43	30	72	60	34	50	24	60	25
6/16/2011	2	60	144	90	69	70	145	100	55	70	40	80	42
6/16/2011	2	50	141	100	73	60	139	100	56	100	47	100	46
6/24/2011	2	60	136	100	73	70	144	100	57	100	50	100	49
7/1/2011	1	20	80	50	55	50	79	50	47	70	41	70	39
7/8/2011	2	60	141	100	76	60	141	100	55	100	47	100	47
7/15/2011	2	80	127	100	56	70	130	100	44	100	37	90	38
8/5/2011	1	20	78	50	53	50	78	50	47	80	40	70	38
8/18/2011	1	20	79	50	51	50	78	50	47	80	39	80	38
8/26/2011	1	20	79	50	55	50	79	50	47	80	41	70	38
9/1/2011	1	20	78	50	54	50	78	50	46	80	40	80	38
9/9/2011	1	20	78	60	55	50	78	50	47	80	40	70	39
9/15/2011	1	20	73	60	48	50	72	60	40	80	35	70	33
9/23/2011	1	20	78	50	52	50	77	50	45	80	40	70	38
9/30/2011	1	20	82	50	57	50	81	50	49	80	44	70	40
9/30/2011	1	20	82	50	57	50	81	50	49	80	44	70	40
10/7/2011	1	20	72	50	46	50	71	60	39	80	33	70	32
10/14/2011	1	20	72	50	46	50	72	60	39	80	33	70	33
10/21/2011	1	20	80	50	56	50	79	50	48	70	43	60	38
10/28/2011	1	20	81	50	57	50	79	50	48	70	43	60	38
11/4/2011	1	20	81	50	57	50	80	50	45	70	44	70	39
11/11/2011	1	20	70	50	45	50	69	50	37	70	34	60	31
11/18/2011	1	20	78	50	55	50	78	50	46	70	42	70	38
11/23/2011	1	30	82	50	60	50	81	50	49	60	47	60	42
12/2/2011	1	20	70	50	46	40	70	50	38	70	34	70	32
12/10/2011	1	20	82	50	55	50	75	60	47	80	42	70	43
12/16/2011	1	50	69	50	47	50	72	50	39	80	35	70	34
12/21/2011	1	30	74	50	48	50	73	50	40	70	37	70	36
12/30/2011	1	20	75	50	45	50	70	50	39	70	38	70	37

Notes:
acfm: actual cubic feet per minute
in. Hg: inches of mercury
in. H_2O: inches of water
scfm: standard cubic feet per minute

1) Pitot tube was blocked 9/30 to 11/4; effluent flow rate not measured.

TABLE 2
VACUUM READINGS AT VMPs
OFF DEPOT AS/SVE SYSTEM
ANNUAL OPERATIONS REPORT, YEAR TWO
Dunn Field - Defense Depot Memphis, Tennessee

Date	12/30/2010	2/18/2011	3/23/2011	3/23/2011	4/19/2011	6/9/2011	6/28/2011	6/30/2011	7/28/2011	8/30/2011	9/21/2011	10/19/2011	12/3/2011	12/21/2011
Blowers	2	2	2	2	2	1	2	2	2	1	2	1	1	1
Sparge	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y
VMP1A	18.4	16.7	17.3	17.3	11.8	5.8	18.1	18.6	18.2	7.1	18.4	8.9	7.8	7.8
VMP1B	9.8	11.3	14.2	14.2	9.8	2.5	14.8	15.2	15.3	3.4	14.5	4.4	3.9	4.2
VMP2A	8.4	13.5	15.0	15.0	10.1	7.8	15.2	15.2	15.0	7.4	14.9	7.5	7.2	7.1
VMP2B	6.7	7.0	17.1	17.1	4.8	5.4	17.8	17.8	17.3	6.1	17.2	7.1	6.5	6.9
VMP3A	17.9	21.1	22.3	22.3	19.1	10.8	23.1	23.5	23.4	9.8	23.2	9.2	9.9	9.2
VMP3B	17.5	20.9	22.1	22.1	18.7	10.2	22.7	22.8	22.2	9.5	22.7	9.2	9.2	8.9
VMP4A	23.3	25.3	26.0	26.0	23.6	13.2	26.2	26.4	26.3	9.0	25.8	8.8	8.9	9.0
VMP4B	20.3	25.0	25.1	25.1	4.3	8.9	25.5	24.8	24.9	9.0	25.4	9.1	9.2	9.0
VMP5A	15.4	16.5	16.7	16.7	10.4	7.6	13.0	17.9	14.0	8.4	13.7	8.5	8.2	8.0
VMP5B	26.0	23.3	24.5	24.5	22.5	11.0	23.8	21.0	19.8	10.5	19.5	10.2	9.1	9.2
VMP6A	23.2	24.5	24.3	24.3	22.0	12.6	24.9	23.6	23.2	11.9	22.7	10.5	10.1	9.9
VMP6B	25.7	27.5	27.2	27.2	22.3	12.7	28.1	27.1	26.9	12.1	26.3	11.4	10.9	10.3
VMP7A	24.7	24.0	25.1	25.1	15.3	14.3	25.3	25.3	24.8	13.5	25.3	12.9	0.0	0.0
VMP7B	28.3	27.9	27.6	27.6	3.2	6.5	27.1	27.4	27.4	6.7	27.2	8.7	0.0	0.0
VMP8A	22.1	23.1	23.8	23.8	22.5	12.7	23.9	23.8	23.2	12.9	23.7	13.1	12.6	12.9
VMP8B	16.7	19.7	20.3	20.3	19.8	10.6	19.7	20.4	20.0	9.9	20.1	10.0	9.7	10.2
VMP9A	26.3	28.1	28.0	28.0	26.3	15.1	27.9	27.8	27.3	15.5	27.4	15.5	15.2	15.6
VMP9B	26.9	28.2	28.2	28.2	27.3	15.7	28.2	26.2	26.5	15.7	29.2	15.2	15.4	16.0
VMP10A	32.3	12.6	17.2	17.2	0.0	0.0	11.2	15.3	15.9	12.6	14.2	11.9	0.0	0.0
VMP10B	27.4	27.3	29.1	29.1	27.0	16.5	29.1	28.8	28.1	16.8	23.2	14.9	0.0	0.0

Notes:

1) Vacuum measurements made with a digital manometer; units are in inches of water

TABLE 3
PID MEASUREMENTS AT SVE WELLS AND SYSTEM EFFLUENT
OFF DEPOT AS/SVE SYSTEM
ANNUAL OPERATIONS REPORT, YEAR TWO
Dunn Field - Defense Depot Memphis, Tennessee

Date	Blowers	Sparge	Sparge Group	SVE1	SVE2	SVE3	SVE4	SVE5	SVE6	SVE7	SVE8	SVE9	SVE10	SVE11	SVE12	Effluent
12/30/2010	2	Y	A	0.3	0.3	0.2	0.3	0.2	0.1	0.2	0.1	0.2	0.1	0.1	0.1	0.3
1/14/2011	2	Y	A	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.3
1/21/2011	1	N	-	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0
1/28/2011	2	Y	A	0.3	0.2	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.2
2/5/2011	1	N	-	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.1
2/11/2011	2	Y	B	0.3	0.3	0.2	0.2	0.2	0.1	0.0	0.1	0.0	0.1	0.1	0.0	0.2
2/18/2011	2	Y	A	0.3	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
2/23/2011	1	N	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3/4/2011	2	Y	C	0.6	0.1	0.3	0.3	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.1
3/9/2011	1	N	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
3/18/2011	1	N	-	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
3/23/2011	2	Y	C	0.1	0.5	0.4	0.2	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1
4/1/2011	1	N	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.1
4/1/2011	1	N	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.1
4/7/2011	2	Y	A	0.2	0.4	0.4	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.2
4/15/2011	1	N	-	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1
4/20/2011	2	Y	A	0.2	0.2	0.4	0.3	0.2	1.0	0.1	0.1	0.1	0.1	0.1	0.1	0.2
4/29/2011	1	N	-	0.2	0.2	0.3	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1
5/5/2011	2	Y	A	0.2	0.5	0.7	0.7	0.5	0.6	0.6	0.4	0.4	0.3	0.2	0.2	0.1
5/12/2011	2	Y	C	0.2	0.2	0.3	0.3	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.2
5/20/2011	1	N	-	0.2	0.1	0.2	0.3	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.2
5/27/2011	2	Y	A	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
6/3/2011	1	N	-	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
6/9/2011	1	Y	B	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1
6/16/2011	2	Y	A	0.3	10.4	3.8	0.4	0.2	0.0	7.9	0.3	10.3	0.2	0.1	0.0	1.9
6/24/2011	2	Y	B	0.3	0.5	0.4	0.4	0.1	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.2
7/1/2011	1	N	-	0.2	0.4	0.4	0.3	0.1	0.1	0.8	0.2	0.4	0.0	0.1	0.1	0.2
7/1/2011	1	N	-	0.2	0.4	0.4	0.3	0.1	0.1	0.8	0.2	0.4	0.0	0.1	0.1	0.2
7/8/2011	2	Y	B	0.3	0.4	0.4	0.4	0.1	0.1	0.3	0.2	0.1	0.1	0.1	0.1	0.2
7/15/2011	2	Y	B	0.3	0.5	0.4	0.4	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.2
8/5/2011	1	N	-	0.1	0.3	0.2	0.3	0.2	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.2
8/19/2011	2	Y	A	0.2	0.3	0.3	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
8/26/2011	1	N	-	0.1	0.4	0.3	0.3	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.3
9/1/2011	1	Y	B	0.2	0.3	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
9/9/2011	1	N	-	0.1	0.2	0.4	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.2
9/15/2011	1	Y	B	1.8	1.3	1.4	0.9	1.1	1.3	1.6	1.0	0.9	1.4	1.4	1.4	1.8
9/23/2011	1	N	-	1.8	1.6	1.4	0.9	1.2	1.2	1.5	1.1	1.0	1.3	1.4	1.3	1.8
9/30/2011	1	N	-	1.7	2.4	1.6	1.3	1.6	1.3	3.4	1.2	4.3	0.7	0.4	0.5	1.5
10/7/2011	1	Y	C	1.2	1.0	1.2	1.2	0.9	0.7	2.9	0.5	1.8	0.3	0.0	0.0	1.1
10/7/2011	1	Y	C	1.2	1.0	1.2	1.2	0.9	0.7	2.9	0.5	1.8	0.3	0.0	0.0	1.1
10/7/2011	1	Y	C	1.2	1.0	1.2	1.2	0.9	0.7	2.9	0.5	1.8	0.3	0.0	0.0	1.1
10/14/2011	1	Y	C	1.5	1.8	1.5	1.2	1.0	0.8	2.4	0.8	0.1	0.4	0.9	0.9	1.2
10/21/2011	1	N	-	1.5	1.0	1.2	1.2	1.0	1.0	1.9	0.1	0.1	0.1	0.4	0.1	1.0
10/28/2011	1	Y	A	1.6	1.2	1.4	1.4	0.9	1.1	1.4	1.0	0.8	0.5	0.6	0.5	1.2
11/4/2011	1	N	-	1.2	1.0	1.3	1.2	0.9	0.7	1.6	0.5	0.1	0.2	0.8	0.4	0.9
11/11/2011	1	Y	C	1.4	1.2	1.3	1.2	0.9	1.0	1.8	0.8	0.5	0.4	0.4	0.9	1.1
11/18/2011	1	N	-	1.0	1.1	1.1	0.9	0.8	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.9
11/23/2011	1	Y	C	1.2	1.1	1.3	1.3	1.0	1.0	1.7	0.4	0.2	0.4	0.5	0.8	1.1
12/2/2011	1	Y	B	1.2	1.0	1.4	1.3	1.0	0.9	1.2	0.5	0.4	0.4	0.2	0.9	1.0
12/10/2011	1	N	-	1.3	1.0	1.4	1.4	0.9	0.9	0.9	0.6	0.4	0.5	0.1	0.8	1.1
12/16/2011	1	Y	A	1.0	1.2	1.3	1.4	1.0	0.9	0.8	0.4	0.3	0.4	0.2	0.8	1.1
12/21/2011	1	Y	B	12.7	9.3	9.2	14.6	32.9	12.5	12.9	17.5	4.5	4.4	11.9	6.1	13.2
12/30/2011	1	Y	C	11.9	8.8	9.2	14.5	28.7	12.1	12.2	18.0	5.0	4.7	11.2	5.8	13.1

Notes:

1) PID measurements made with a MiniRae 2000 (10.6 ev lamp); units are in parts per million

TABLE 4
PID MEASUREMENTS AT VMPs
OFF DEPOT AS/SVE SYSTEM
ANNUAL OPERATIONS REPORT, YEAR TWO
Dunn Field - Defense Depot Memphis, Tennessee

Date	12/30/2010	2/18/2011	3/23/2011	4/19/2011	6/9/2011	6/30/2011	7/28/2011	8/30/2011	9/21/2011	10/19/2011	12/3/2011	12/21/2011
Blowers	2	2	2	2	1	2	2	1	2	1	1	1
Sparge	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y
VMP1A	0.5	0.4	0.5	0.4	0.1	0.4	0.4	0.1	0.2	0.2	0.3	0.2
VMP1B	0.3	0.6	0.5	0.5	0.2	0.8	0.7	0.2	0.8	0.2	0.2	0.2
VMP2A	0.3	0.6	0.3	0.2	0.1	0.3	0.3	0.1	0.2	0.1	0.2	0.2
VMP2B	0.4	0.4	0.8	0.1	0.1	0.2	0.2	0.1	0.2	0.2	0.2	0.2
VMP3A	1.5	0.6	0.9	0.2	0.1	0.5	0.4	0.1	0.4	0.1	0.1	0.1
VMP3B	0.4	0.6	0.6	0.2	0.1	0.2	0.3	0.1	0.8	0.1	0.3	0.2
VMP4A	0.4	0.6	0.6	0.1	0.1	0.6	0.6	0.1	0.5	0.2	0.4	0.4
VMP4B	0.3	0.7	0.9	0.3	0.2	0.4	0.5	0.1	0.1	0.1	0.2	0.3
VMP5A	0.2	0.3	0.2	0.5	0.2	0.3	0.4	0.2	0.1	0.2	0.3	0.2
VMP5B	0.2	0.2	0.3	0.1	0.1	0.4	0.4	0.2	0.5	0.2	0.2	0.3
VMP6A	0.4	0.0	0.1	0.3	0.1	0.1	0.2	0.1	0.2	0.3	0.1	0.1
VMP6B	0.4	0.1	0.1	0.3	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.2
VMP7A	0.3	0.1	0.3	0.2	0.1	2.3	1.0	0.1	0.9	0.3	0.1	0.1
VMP7B	0.6	0.2	0.2	0.4	0.2	0.9	0.8	0.2	0.8	0.2	0.1	0.1
VMP8A	0.5	0.2	0.1	0.1	0.1	0.3	0.3	0.2	0.2	0.1	0.3	0.2
VMP8B	0.4	0.2	0.2	0.2	0.1	0.4	0.4	0.2	0.4	0.3	0.4	0.3
VMP9A	0.4	0.2	1.0	0.1	0.1	0.2	0.2	0.1	0.3	0.2	0.2	0.2
VMP9B	0.4	0.3	1.1	0.3	0.1	0.3	0.3	0.1	0.3	0.3	0.2	0.2
VMP10A	0.3	0.2	0.1	0.3	0.2	2.1	0.4	0.1	0.4	0.1	0.1	0.1
VMP10B	0.4	0.2	0.1	0.2	0.2	1.8	1.1	0.2	0.8	0.4	0.1	0.1

Notes:

1) PID measurements made with a MiniRae 2000 (10.6 eV lamp); units are in parts per million

TABLE 5
ANALYTICAL RESULT SUMMARY - SVE SYSTEM EFFLUENT
OFF DEPOT AS/SVE SYSTEM
ANNUAL OPERATIONS REPORT, YEAR TWO
Dunn Field-Defense Depot Memphis, Tennessee

	Sample ID	ODSVE-EFF-1Q11-NS	ODSVE-EFF-2Q11-NS	ODSVE-EFF-3Q11	ODSVE-EFF-4Q11
	Lab ID	P1101088-001	P1102292-001	P1103550-001	P1104969-001
	Date	23-Mar-11	16-Jun-11	15-Sep-11	21-Dec-11
Analyte	Units				
1,1,2,2-Tetrachloroethane	ppbV	1.7	0.59	2.3	2.5
1,1,2-Trichloroethane	ppbV	0.098 J	0.092 J	0.073 J	0.081 J
1,1-Dichloroethene	ppbV	2.3	1.6	1.9	1.2
1,2-Dichloroethane	ppbV	0.055 J	<0.33	<0.15	<0.3
Carbon Tetrachloride	ppbV	0.21 J	0.36	0.47	0.38
Chloroform	ppbV	3.1	2.1	3	2.4
cis-1,2-Dichloroethene	ppbV	3	2.1	2.3	1.7
Methylene Chloride	ppbV	0.24 JB	0.099 JB	0.085 JB	0.11 JB
Tetrachloroethene	ppbV	0.81	19	1.2	0.63
trans-1,2-Dichloroethene	ppbV	0.34 J	0.32 J	0.41	0.2 J
Trichloroethene	ppbV	25	24	30	17
Vinyl Chloride	ppbV	0.45 J	0.37 J	0.3	0.16 J
Total CVOCs		**37.3**	**50.6**	**42.0**	**26.4**
1,1,1-Trichloroethane	ppbV	1.6	0.69	1.1	0.98
1,1,2-Trichlorotrifluoroethane	ppbV	8.2	8.1	6.1	3.4
1,1-Dichloroethane	ppbV	1	0.71	0.83	0.56
Acetone	ppbV	4.1	4.5	1.1 J	<2.6
Acrolein	ppbV	0.38 J	0.36 J	0.11 J	<1.1
Cyclohexane	ppbV	1.2	0.19 J	0.14 J	0.12 J
Dichlorodifluoromethane (CFC 12)	ppbV	0.81	0.58	0.48	0.61
Ethanol	ppbV	3.2 J	<3.6	<3.2	4.4
Ethyl Acetate	ppbV	0.38 J	<0.37	<0.34	0.84
n-Heptane	ppbV	0.78	<0.33	<0.15	0.074 J
n-Hexane	ppbV	5.1	0.21 J	0.099 J	0.14 J
Toluene	ppbV	0.39 J	<0.36	<0.16	0.86
Trichlorofluoromethane	ppbV	0.3	0.23 J	0.3	0.3
Total VOCs		**60.4**	**65.2**	**50.8**	**38.3**

Notes:
<: Result is less than RL
J: Estimated
B: Blank contamination
NR: Not Reported
ppbv: part per billion volume
RL: laboratory reporting limit

TABLE 6
MASS REMOVAL CALCULATIONS
OFF DEPOT AS-SVE SYSTEM
ANNUAL OPERATIONS REPORT, YEAR TWO
Dunn Field – Defense Depot Memphis, Tennessee

Start Date	End Date	Hours Operating Between Dates	Average Flow rate (scfm)	Laboratory Total VOC Influent Concentration (ppbv)	Average Influent VOC Concentration (ppbv)	Influent Emission Rate (lb/hr)	Estimated VOC Mass Removal During Period (lbs)	Cumulative Mass Removed From Fluvial Subsurface (lbs)
11/12/2009	12/11/2009	92	977	1240	1240	0.025	2.3	2.3
12/11/2009	1/25/2010	1074	1054	447	844	0.018	19.9	22.2
1/25/2010	2/23/2010	665	926	351	399	0.008	5.1	27.3
2/23/2010	3/31/2010	890	916	267	309	0.006	5.2	32.5
3/31/2010	6/17/2010	1854	1119	633	450	0.010	19.4	51.9
6/17/2010	9/16/2010	1958	1114	73.8	353	0.008	16.0	68.0
9/16/2010	12/7/2010	1695	1006	68.9	71.4	0.001	2.5	70.5
12/7/2010	3/24/2011	872	965	60.4	64.7	0.001	1.1	71.6
3/24/2011	6/17/2011	783	974	65.2	62.8	0.001	1.0	72.6
6/17/2011	9/16/2011	1042	958	50.8	58.0	0.001	1.2	73.8
9/16/2011	12/22/2011	1148	724	38.3	44.6	0.001	0.8	74.6
12/22/2011	12/31/2011	101	797	-	38.3	0.001	0.1	74.7

Notes:

lbs: pounds
lb/hr: pounds per hour
ppbv: parts per billion by volume
scfm: standard cubic feet per minute
VOC: volatile organic compound

Constants:

Mass of TCE: 131.4 lb/lb mol
Molar Vol Air 379 ft^3/lbmol (@ 60 deg F)

FIGURES

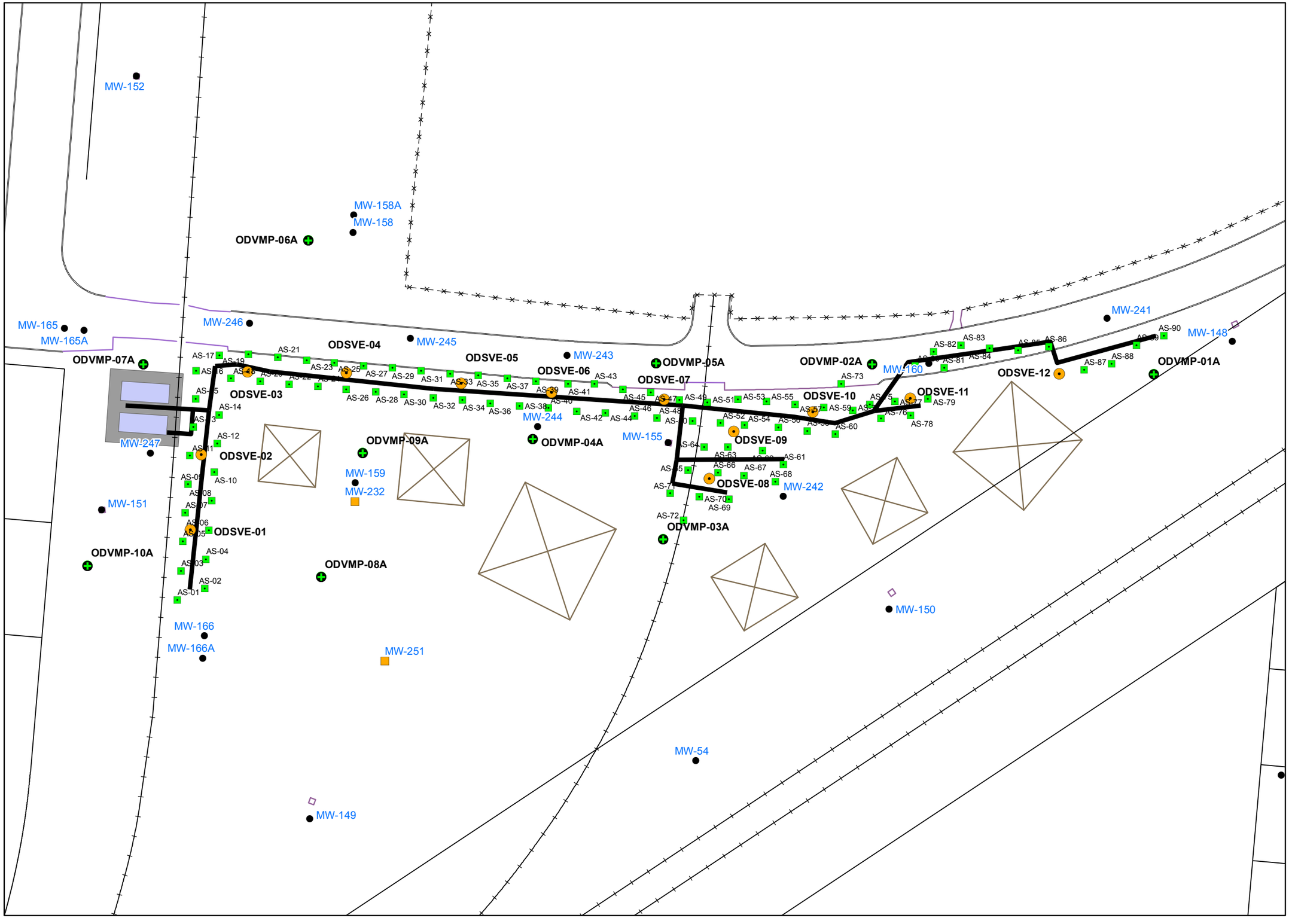

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Figure 1

AS-SVE SYSTEM PLAN MAP

OFF DEPOT AS-SVE SYSTEM
ANNUAL OPERATIONS REPORT, YEAR TWO

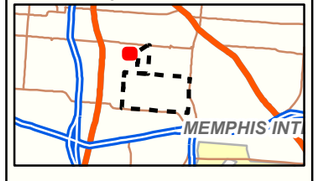
DUNN FIELD
DEFENSE DEPOT
MEMPHIS TENNESSEE

Legend

- Monitoring Well Screened in the Fluvial Aquifer
- Monitoring Well Screened in the Intermediate Aquifer
- AS Well Location
- VMP Location
- SVE Location
- Conveyance Lines
- SVE Compound

0 25 50 75 100
Feet

Installation Location
Memphis, Tennessee



Date: April 2012
Edition: Rev 0

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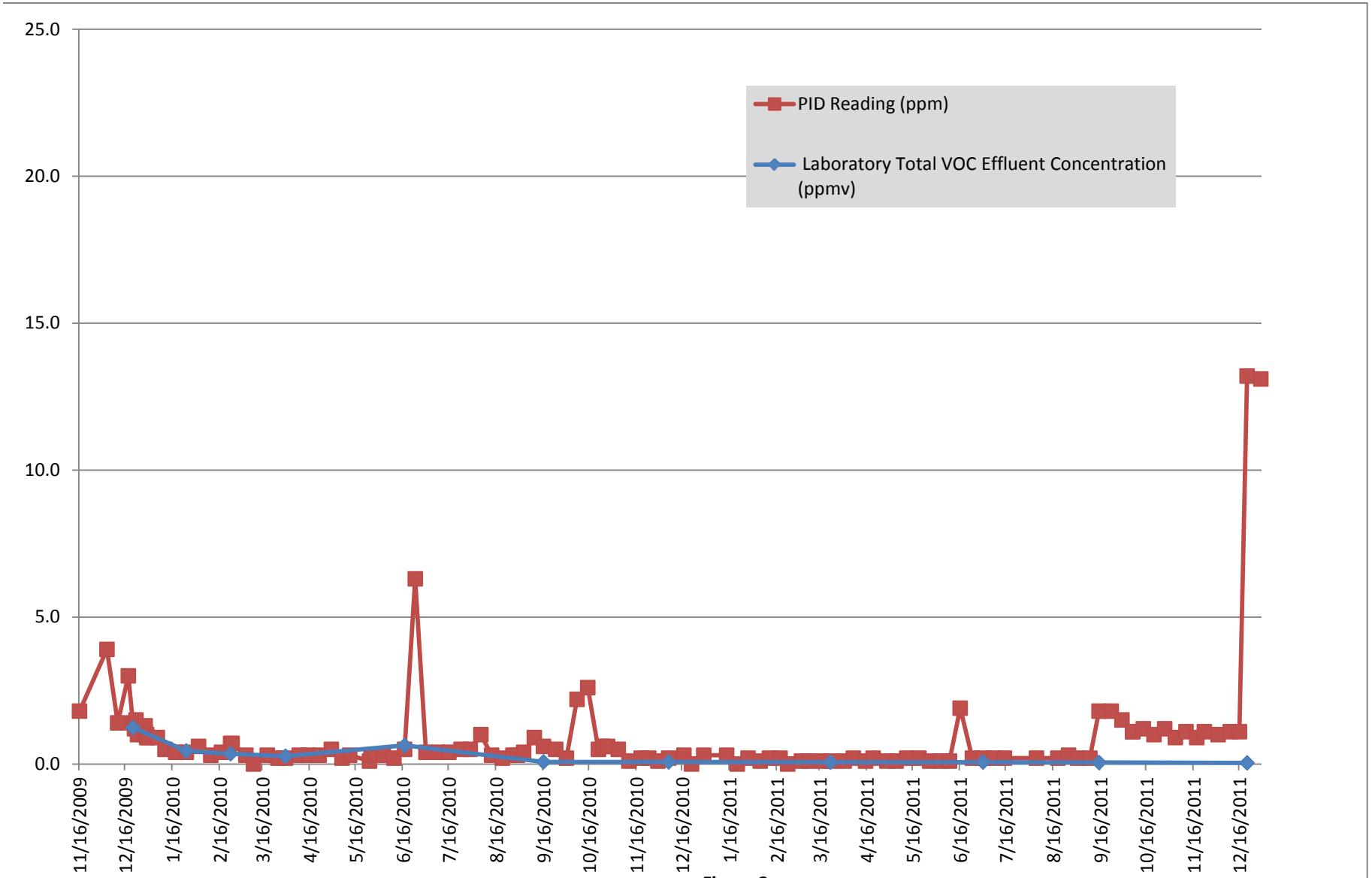

Figure 2
EFFLUENT CONCENTRATION TREND - ANALYTICAL RESULTS AND FIELD PID MEASUREMENTS
OFF DEPOT AS-SVE SYSTEM
ANNUAL OPERATIONS REPORT, YEAR 2
Dunn Field – Defense Depot Memphis, Tennessee

APPENDIX A

RESULTS OF LABORATORY ANALYSES

TABLE A-1
ANALYTICAL RESULTS - SVE SYSTEM EFFLUENT
OFF DEPOT AS/SVE SYSTEM
ANNUAL OPERATIONS REPORT, YEAR TWO
Dunn Field-Defense Depot Memphis, Tennessee

	Sample ID	ODSVE-EFF-1Q11-NS	ODSVE-EFF-2Q11-NS	ODSVE-EFF-3Q11	ODSVE-EFF-4Q11
	Lab ID	P1101088-001	P1102292-001	P1103550-001	P1104969-001
	Date	23-Mar-11	16-Jun-11	15-Sep-11	21-Dec-11
Analyte	Units				
1,1,1-Trichloroethane	ppbV	1.6	0.69	1.1	0.98
1,1,2,2-Tetrachloroethane	ppbV	1.7	0.59	2.3	2.5
1,1,2-Trichloroethane	ppbV	0.098 J	0.092 J	0.073 J	0.081 J
1,1,2-Trichlorotrifluoroethane	ppbV	8.2	8.1	6.1	3.4
1,1-Dichloroethane	ppbV	1	0.71	0.83	0.56
1,1-Dichloroethene	ppbV	2.3	1.6	1.9	1.2
1,2,4-Trichlorobenzene	ppbV	<0.21	<0.18	<0.082	<0.17
1,2,4-Trimethylbenzene	ppbV	<0.32	<0.27	<0.12	<0.25
1,2-Dibromo-3-chloropropane (DBCP)	ppbV	<0.16	<0.14	<0.063	<0.13
1,2-Dibromoethane	ppbV	<0.2	<0.17	<0.079	<0.16
1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ppbV	<0.22	<0.19	<0.087	<0.18
1,2-Dichlorobenzene	ppbV	<0.26	<0.22	<0.1	<0.2
1,2-Dichloroethane	ppbV	0.055 J	<0.33	<0.15	<0.3
1,2-Dichloropropane	ppbV	<0.34	<0.29	<0.13	<0.27
1,3,5-Trimethylbenzene	ppbV	<0.32	<0.27	<0.12	<0.25
1,3-Butadiene	ppbV	<0.71	<0.61	<0.28	<0.56
1,3-Dichlorobenzene	ppbV	<0.26	<0.22	<0.1	<0.2
1,4-Dichlorobenzene	ppbV	<0.26	<0.22	<0.1	<0.2
1,4-Dioxane	ppbV	<0.44	<0.37	<0.17	<0.34
2-Butanone (MEK)	ppbV	0.8 J	0.65 J	0.19 J	0.16 J
2-Hexanone	ppbV	<0.38	<0.33	<0.15	<0.3
2-Propanol (Isopropyl Alcohol)	ppbV	<0.64	<0.55	<0.5	<0.5
3-Chloro-1-propene (Allyl Chloride)	ppbV	<0.5	<0.43	<0.19	<0.39
4-Ethyltoluene	ppbV	<0.32	<0.27	<0.12	<0.25
4-Methyl-2-pentanone	ppbV	<0.38	<0.33	<0.15	<0.3
Acetone	ppbV	4.1	4.5	1.1 J	<2.6
Acetonitrile	ppbV	<0.94	<0.80	<0.36	<0.73
Acrolein	ppbV	0.38 J	0.36 J	0.11 J	<1.1
Acrylonitrile	ppbV	<0.72	<0.62	<0.28	<0.57
alpha-Pinene	ppbV	<0.28	<0.24	<0.11	<0.22
Benzene	ppbV	0.16 J	0.096 J	0.082 J	0.17 J
Benzyl Chloride	ppbV	<0.3	<0.26	<0.12	<0.24
Bromodichloromethane	ppbV	<0.23	<0.2	<0.091	<0.18
Bromoform	ppbV	<0.15	<0.13	<0.059	<0.12
Bromomethane	ppbV	<0.4	<0.35	<0.16	<0.32
Carbon Disulfide	ppbV	1.8 J	0.92 J	0.33 J	0.22 J
Carbon Tetrachloride	ppbV	0.21 J	0.36	0.47	0.38
Chlorobenzene	ppbV	<0.34	<0.29	<0.13	<0.27
Chloroethane	ppbV	<0.6	<0.51	<0.23	<0.47
Chloroform	ppbV	3.1	2.1	3	2.4
Chloromethane	ppbV	<0.76	<0.65	<0.3	<0.6
cis-1,2-Dichloroethene	ppbV	3	2.1	2.3	1.7
cis-1,3-Dichloropropene	ppbV	<0.35	<0.3	<0.13	<0.27
Cyclohexane	ppbV	1.2	0.19 J	0.14 J	0.12 J
Dibromochloromethane	ppbV	<0.18	<0.16	<0.072	<0.14
Dichlorodifluoromethane (CFC 12)	ppbV	0.81	0.58	0.48	0.61
Methylene Chloride	ppbV	0.24 JB	0.099 JB	0.085 JB	0.11 JB
d-Limonene	ppbV	<0.28	<0.24	<0.11	<0.22
Ethanol	ppbV	3.2 J	<3.6	<3.2	4.4
Ethyl Acetate	ppbV	0.38 J	<0.37	<0.34	0.84
Ethylbenzene	ppbV	<0.36	<0.31	<0.14	0.055 J
Hexachlorobutadiene	ppbV	<0.15	<0.13	<0.057	<0.12
Isopropylbenzene (Cumene)	ppbV	<0.32	<0.27	<0.12	<0.25
m,p-Xylenes	ppbV	<0.36	<0.31	<0.28	0.19 J
Methyl Methacrylate	ppbV	<0.38	<0.33	<0.30	<0.30
Methyl tert-Butyl Ether	ppbV	<0.44	<0.37	<0.17	<0.34
Naphthalene	ppbV	<0.30	<0.26	<0.12	<0.23
n-Butyl Acetate	ppbV	<0.33	<0.28	<0.13	<0.26
n-Heptane	ppbV	0.78	<0.33	<0.15	0.074 J
n-Hexane	ppbV	5.1	0.21 J	0.099 J	0.14 J
n-Nonane	ppbV	<0.30	<0.26	<0.12	<0.23
n-Octane	ppbV	<0.34	<0.29	<0.13	<0.26
n-Propylbenzene	ppbV	<0.32	<0.27	<0.12	<0.25
o-Xylene	ppbV	<0.36	<0.31	<0.14	0.066 J
Propene	ppbV	0.57 J	0.52 J	<0.35	<0.71
Styrene	ppbV	<0.37	<0.31	<0.14	<0.29
Tetrachloroethene	ppbV	0.81	19	1.2	0.63
Tetrahydrofuran (THF)	ppbV	<0.53	<0.45	<0.21	<0.42
Toluene	ppbV	0.39 J	<0.36	<0.16	0.86
trans-1,2-Dichloroethene	ppbV	0.34 J	0.32 J	0.41	0.2 J
trans-1,3-Dichloropropene	ppbV	<0.35	<0.3	<0.13	<0.27
Trichloroethene	ppbV	25	24	30	17
Trichlorofluoromethane	ppbV	0.3	0.23 J	0.3	0.3
Vinyl Acetate	ppbV	<2.2	<1.9	<1.7	0.36 J
Vinyl Chloride	ppbV	0.45 J	0.37 J	0.3	0.16 J

Notes:
<: Result is less than RL
J: Estimated
B: Blank contamination
NR: Not Reported
ppbv: part per billion volume
RL: laboratory reporting limit

APPENDIX B

DATA QUALITY EVALUATION

DATA QUALITY EVALUATION

System monitoring for the Off Depot Air Sparging and Soil Vapor Extraction (AS/SVE) System during Year Two included sampling and analysis of soil vapor effluent. Samples were collected quarterly in March, June, September and December 2011 to evaluate performance and ensure compliance with discharge limits. System monitoring was performed in accordance with the *Dunn Field Off Depot Groundwater Remedial Action Work Plan, Revision 2* (HDR, 2009). The vapor samples were submitted to Columbia Analytical Services in Simi Valley, California for analysis under subcontract to Microbac Laboratories in Marietta, Ohio. The field and laboratory procedures were performed in accordance with past practice and the *Remedial Action Sampling and Analysis Plan* (RA SAP) (MACTEC, 2005).

The data quality evaluation (DQE) process involves assessment of field and laboratory procedures, including independent data validation completed by Diane Short and Associates, Inc. (DSA) in accordance with the RA SAP. The assessment is designed to evaluate the quality assurance (QA)/quality control (QC) associated with the laboratory data and potential impact to data quality objectives (DQOs). Final qualification and data usability reports were prepared by HDR. The data validation reports and usability reports are included in this appendix. The DQE findings are summarized in the following sections.

FIELD ACTIVITIES AND FIELD QUALITY CONTROL

The field effort included the collection of AS/SVE effluent vapor samples using 6-liter (L) Summa canisters during four quarterly events in March, June, September and December 2011. The AS/SVE effluent sample location is on the north side of the SVE compound shown on Figure 1 of the report. Documentation of the sampling was performed in the field to ensure that the samples collected, sample labels, chain-of-custody (COC) records and requests for analysis were consistent. COC forms were filled out manually.

ANALYTICAL METHODS

The air samples were analyzed for volatile organic compounds (VOCs) by Toxic Organics (TO) Method TO-15.

LABORATORY QUALITY CONTROL

The laboratory QC program, including sample handling, laboratory control, and reporting, is documented in the RA SAP. Sample handling includes documentation of sample receipt, placement in storage, lab

personnel using the sample and disposal. The laboratory control consists of instrument calibration and maintenance, laboratory control samples and duplicates (LCS/LCSD), surrogates, laboratory duplicates and method blanks. Reporting of the laboratory control data was planned prior to the collection of the data, allowing the laboratory to place the appropriate information into the data package so that the DQE could be performed in a timely manner.

DQE SUMMARY

The objective of the DQE was to provide a review of the chemical data reports submitted by the laboratory and to assess the data in relation to the DQOs stated in the RA SAP. The DQE consisted of review of laboratory QC data and field QC parameters, and flagging of the data as usable, usable with qualification, or unusable in accordance with the DQE standard operating procedures (SOPs) using the criteria stated in the RA SAP for each analytical method performed. The following information was reviewed:

- Sample Integrity (Deliverables)
- Sample Completeness
- Sample Holding Times
- Laboratory Methods for Analysis (Calibration, Internal Standards)
- Method Accuracy (bias) and Precision (Surrogates, LCS Recoveries, Laboratory Duplicates)
- Laboratory Performance Criteria (Blanks, Instrument Performance Checks)

Field QC parameters were evaluated through field documentation and shipping criteria. Field duplicates, which are collected at a frequency of 10 percent, were not collected due to the small number of samples.

The DQE was summarized by use of flags that indicate to the reviewer that the data being considered has been qualified using the established criteria. Sample delivery group (SDG) narratives detailing the evaluation of the laboratory data by DSA are included as attachments in this Appendix. The SDGs and associated air samples are listed on Table B-1.

The following sections provide summary discussions of the required data qualifications for each sampling event. A Level III DQE was performed and the data quality indicators (DQIs), expressed in terms of precision, accuracy, representativeness, comparability, completeness, and sensitivity, were assessed. This included the evaluation of sample integrity, holding times, method blanks, internal standards, surrogate

recoveries, LCSs and laboratory duplicate precision. The results of the DQI assessment are provided below.

Precision

Laboratory duplicates were analyzed to assess laboratory precision and consisted of a second sample analyzed from the same canister. Precision is best expressed in terms of relative percent difference (RPD). Laboratory precision goals were met for the duplicate sample pairs. Laboratory precision is discussed in more detail in the attached narratives.

Accuracy

Accuracy or bias was measured through the analysis of LCSs. Sample specific accuracy is measured through surrogate recovery. Accuracy is expressed as percent recovery (%R).

Accuracy goals based upon LCS and surrogates were met. Further discussion of the LCS and surrogate recoveries is provided in the attached DQE narratives.

Representativeness

Representativeness refers to the degree sample data accurately and precisely describes the population of samples at a sampling point or under certain environmental conditions. Samples that are not properly preserved or are analyzed beyond holding times may not be considered representative. Review of sampling procedures, laboratory preparation, analysis holding times and method blank analysis help in providing this assessment.

Sampling procedures followed the RA SAP and were considered representative of the matrix collected. Laboratory preparation and analysis followed method guidelines.

Comparability

The selection of standardized methods and consistent laboratory practices facilitates the comparison of data between events. Past data are comparable to recent events. Consistent methodology has been maintained throughout the sampling events.

Completeness

Completeness is determined for both field and analytical objectives. Field completeness is calculated from the number of samples proposed versus the actual number of samples collected. Analytical completeness is expressed in terms of usable data. The project completeness goal for DDMT is 90 percent as stated in the RA SAP.

Field completeness for the AS/SVE effluent sample events was 100 percent. Analytical completeness was 100 percent for all events as all samples collected were analyzed by the appropriate method and with usable results.

Sensitivity

Analytical sensitivity is the concentration at which the measurement system can quantitate target analytes in the environmental matrices of concern. Analytical sensitivity is expressed in terms of the reporting limit (RL), which is provided by the respective laboratories as their reasonable and defensible quantitation limit for environmental samples above the method detection limit (MDL), which is established by each laboratory using clean matrix. The analytical method RLs and MDLs were compared to protective soil vapor concentrations as provided in Dunn Field Record of Decision and were determined to meet the overall project objectives, except for the result for 1,1,2,2-tetrachloroethane in the June 2011 sampling event. The MDL of 0.031 ppbv in the sample was above the protective soil vapor concentration of 0.030 ppbv. However, for this sample, 1,1,2,2-tetrachloroethane was detected well above the protective soil vapor concentration, so the sample was above the screening level. Dilutions were necessary in some cases to achieve the proper quantification of high-level targets, but only the high-level analytes were reported from the dilutions, so there were no raised RLs and MDLs for non-detect results.

The following sections discuss only those deficiencies encountered during the evaluation that resulted in qualified and/or unusable data.

AS/SVE Effluent Quarterly Sampling Event – March 2011

A total of one air sample including one field sample and no QA/QC samples was collected from one effluent location. The sample was analyzed for VOCs. The data are usable with qualifications as described below:

- Any result reported below the RL but above the MDL was flagged “J” and considered an estimated result.

- Methylene chloride was additionally qualified "B" due to the presence of methylene chloride in the method blank.

AS/SVE Effluent Quarterly Sampling Event – June 2011

A total of one air sample including one field sample and no QA/QC samples was collected from one effluent location. The sample was analyzed for VOCs. The data are usable with qualifications as described below:

- Any result reported below the RL but above the MDL was flagged "J" and considered an estimated result.
- Methylene chloride was additionally qualified "B" due to the presence of methylene chloride in the method blank.

AS/SVE Effluent Quarterly Sampling Event – September 2011

A total of one air sample including one field sample and no QA/QC samples was collected from one effluent location. The sample was analyzed for VOCs. The data are usable with qualifications as described below:

- Any result reported below the RL but above the MDL was flagged "J" and considered an estimated result.
- Methylene chloride was additionally qualified "B" due to the presence of methylene chloride in the method blank.

AS/SVE Effluent Quarterly Sampling Event – December 2011

A total of one air sample including one field sample and no QA/QC samples was collected from one effluent location. The sample was analyzed for VOCs. The data are usable with qualifications as described below:

- Any result reported below the RL but above the MDL was flagged "J" and considered an estimated result.
- Methylene chloride was additionally qualified "B" due to the presence of methylene chloride in the method blank.

SUMMARY

The sample data from the AS/SVE effluent events met the data quality objectives and are of sufficient quality to support the evaluation of remedial actions.

TABLE B-1
SDG SUMMARY TABLE
OFF DEPOT SVE SYSTEM
ANNUAL OPERATIONS REPORT, YEAR 2
Dunn Field - Defense Depot Memphis, Tennessee

SDG	Field Samples
AS/SVE Effluent Quarterly Event - March 2011	
P1101088	ODSVE-EFF-1Q11-NS
AS/SVE Effluent Quarterly Event - June 2011	
P1102292	ODSVE-EFF-2Q11-NS
AS/SVE Effluent Quarterly Event - September 2011	
P1103550	ODSVE-EFF-3Q11
AS/SVE Effluent Quarterly Event - December 2011	
P1104969	ODSVE-EFF-4Q11

ORGANIC AIR QUALITY REPORT
METHOD TO-15

SDG: P1101088

PROJECT: Memphis Defense Depot Off Depot soil vapor extraction for HDR Inc. (formerly e2m)

LABORATORY: Columbia Analytical Services, Simi Valley CA

SAMPLE MATRIX: Air

SAMPLING DATE (Month/Year): March 2011

NUMBER OF SAMPLES: 1 air sample

ANALYSES REQUESTED: Summa Canister VOA TO-15

SAMPLE NO.: OD-SVE-EFF-1Q11 NS

DATA REVIEWER: Diane Short

QA REVIEWER: Diane Short & Associates, Inc. INITIALS/DATE: _____

Telephone Logs included Yes____ No __X__

Contractual Violations Yes____ No __X_

The EPA CLP National Functional Guidelines for Organic Data Review, 2001 (SOP), EPA Method TO-15 current updates have been referenced by the reviewer to perform this data validation review. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the HDR/e2m Project Manager. Per the Scope of Work, the review of these samples includes validation of all QC forms and submitted calibrations referencing the QC limits in the above documents.

DELIVERABLES
All deliverables were present as specified in the Statement of Work (SOW) or in the project contract.
Yes _X__ No ____
Note an extended list of volatile compounds was reported. Full raw data packages were submitted. Level III validation was performed for holding times, chain of custody, calibrations and QC.

II. ANALYTICAL REPORT FORMS
A. The Analytical Report or Data Sheets are present and complete for all requested analyses.
Yes __X__ No___

B. Holding Times
The contract holding times were met for all analyses (Time of sample receipt to time of analysis (VOA) or extraction and from extraction to analysis). Contract holding times for TO-15 canisters is 30 days from date of collection.
Yes ___X__ No____

C. Chains of Custody
Chains of Custody were present and were complete with signatures, sign-offs and complete entry of data. Canisters were properly sampled and received.
Yes ___X__ No ___
The project manager is informed of the following and the project record is being updated.
The chain of custody has FedEx courier notations but there is no airbill (tracking) number reported on the chain or the log in form. The coolers are often sealed before the airbill number is available.
The chain is correct and the canister did not have a sample ID.

D. Canister Pressure
Canister pressures were measured and recorded for initial vacuum check, initial field vacuum, final field reading, lab initial pressure and final pressure.
Yes ___X____ No _____ NA _____
Pressures were reported and were acceptable for the initial and final pressures.

All readings met the limits or exceptions were noted and pressure corrected
Yes ___X__ No ____ NA ____
Not part of this review level, but is performed to ensure sample integrity.

III. INSTRUMENT CALIBRATION

A. Initial Calibration – GC/MS
1. The Relative Response Factors (RRF) and average RRF for all compounds for all analyses met the required criteria.
Yes __X__ No____ NA____
Minimum response factors are not defined by the method but meet routine Method 8260 limits. This method does not involve purging water samples. Consequently, all targets, including the typically poor-purging compounds, normally have response factors that are acceptable per validation criteria for volatiles.

The relative standard deviation (RSD) for the five-point calibration was within the 30% limit.
Yes __X__ No ___

B. Continuing Calibration – GC/MS
1. The RRF standard was analyzed for each analysis at the required frequency and the QC criteria were met
Yes __X__ No____ NA____
Minimum response factors are not defined by the method, but met validation guidance.

2. The percent difference (%D) limits of 30% were met.
Yes __X__ No ____
The routine Method 8260 limits of 25% and the TO-15 limits of 30% were met with the following exceptions No data were qualified when data were non-detect. The response factor was acceptable to verify the non-detect. Detected data are not qualified as they meet the TO-15 %D and the QAPP does not specifically address air limits. There could be a slight low bias to the data as the response decreases for these compounds.

Date	Compound	% D	Qualification
CCAL 4/7/11	Dichlorodifluoromethane	-27.2	Meet TO-15 limits
	n-hexane	-28.6	Meet TO-15 limits.

IV. GC/MS INSTRUMENT PERFORMANCE CHECK
A. The BFB performance check was injected once at the beginning of each 12-hour period and relative abundance criteria for the ions were met.
Yes __X___ No____ NA ____
The BFB was acceptable for the tunes.

V. INTERNAL STANDARDS

A. Area Limits

The Internal Standards met the 100% upper and -50% lower limits criteria and the Retention times were within the required windows.

Yes __X___ No____ NA ____

B. Retention Times

The relative retention times of the internal standards and sample compounds met the $\pm$ 0.06 RRT units limit.

Yes __ X ___ No____ NA ____

VI. SURROGATE

Surrogate spikes were analyzed with every sample.

Yes __X___ No ____

Note that only one surrogate is used 4-bromofluorobenzene. Method 8260 requires 3 surrogates, but one is acceptable for TO-15.

And met the recovery limits defined in the current contract

Yes __ X _ No ____

VII. MATRIX SPIKE/MATRIX SPIKE DUPLICATE

A. Matrix spike (MS) and matrix spike duplicates (MSD) were analyzed for every analysis performed and for every 20 samples or for every matrix whichever is more frequent.

Yes____ No ____NA ___X__

Spikes are not amenable to canister analysis and are not required. Laboratory duplicates are required and are provided by the laboratory. Three duplicates are present.

B. The laboratory duplicate relative percent differences (RPD) were within the defined contract limits. Method requirements are 25% maximum RPD.

Yes ____ No ____ NA__X__

For validation purposes, only results > 5x PQL are qualified for RPD outliers. For results < 5x PQL, results are qualified if the absolute difference is greater than 2x PQL. The qualifier added is JD#, where # is the RPD or the absolute difference observed, as appropriate.

A client sample was not used for the duplicate and none was reported as none was designated on the chains and data are not qualified for non-client samples. These samples are collected on a regular basis and field precision is monitored over time.

VIII. DUPLICATE CONTROL SAMPLES

A. Duplicate Control and Duplicate Control Sample Duplicates similar to Laboratory Control Samples (LCS) were performed for every set.

Yes _X_ No ___

The laboratory does analyze laboratory control samples (LCS) .

B. And percent recoveries were acceptable at 70 – 130%.

Yes __X__ No ____

The laboratory limits are used for air samples and both laboratory and the 70 – 130% limits are met.

C. And Relative Percent Differences were within lab limits.

Yes ___ No____ NA___X_

IX. SHIFT CHECKS

Shift checks were performed and were within time limits.

Yes __X__ No____

X. BLANKS
A. Method Blanks were analyzed at the required frequency and for each matrix and analysis.
Yes __X___ No____
This is a nitrogen blank run with each set.

B. The method blank was free of contamination.
Yes _____ No ___X__
Methylene chloride is reported at 0.2 ug/m3 (0.056 ppbv). The client data are qualified BMB0.2 (or 0.056) to indicate the value is from the laboratory contamination.

C. If Field Blanks were identified, they were free of contamination.
Yes _____ No ____ NA ___X___
There were no field blanks identified.

D. Contamination level was less than 0.03 mg/cubic meter before samples were analyzed per the method.
Yes ____ No____ NA ____X___
Reporting units include both ppbv and ug/m3.

XI. FIELD QC
A. If Field duplicates or Performance Check Compounds were identified, they met the RPD or % recovery criteria for the project.
Yes ___ No ____ NA__X_
Qualifiers are not added for field duplicate differences. When results are > 5x the reporting limit, a 35% RPD is used to identify potential deviations. When results are < 5x the reporting limit, an absolute difference between the results that is < 2x PQL is considered to be acceptable reproducibility.
There are no field duplicates.

XII. TCL COMPOUNDS
A. The identification is accurate and all retention times, library spectra and reconstructed ion chromatograms (RIC) were evaluated for all detected compounds:
Yes ___ No____ NA__X_

B. Quantitation was checked to determine the accuracy of calculations for representative compounds in each internal standard set
Yes___ No ____ NA___X__
Not part of this review level.

OVERALL ASSESSMENT
Data are considered to be usable for project purposes after consideration of comments. No qualifiers have been applied with the exception of blank qualifiers. Points of significance are summarized below:

Chain of Custody:
The canister arrived without a label.

Initial and Continuing Calibration:
Initial calibrations for the client samples are noted in the report although all calibrations were reviewed. No data are qualified as outlier compounds had acceptable response factors and the non-detect is verified at the reporting limit. The TO-15 limits were met.

Method Blank:
Methylene chloride is reported at 0.2 ug/m3 (0.056 ppbv). The client data are qualified BMB0.2 (or 0.056) to indicate the value is from the laboratory contamination.

Laboratory Duplicate:
A client sample was not used for any of the duplicates as none was designated on the chains and data are not qualified for non-client samples. These samples are collected on a regular basis and field precision is monitored over time.

Field Duplicates:
No field duplicate was identified. See note regarding laboratory precision.

Final Data Qualification and Usability Report

Project:	Defense Depot Memphis, TN (DDMT) AS-SVE
Sampling Event:	ODSVE March 2011
Project / Task Number:	121842-002
Sample Data Package(s):	P1101088
Data Validation Performed by:	Diane Short & Associates (DSA)
Final Data Qualification and Usability Report Prepared by:	Lynn K. Lutz, HDR Inc.

Data Validation Report Review and Comments

The data validation report was acceptable.

Final Data Qualifiers

Final qualifiers for detected methylene chloride results associated with the method blank that contained a trace level of methylene chloride was B where DSA had qualified as BMB.056. These results were also between the MDL and RL, therefore the final qualifier was JB.

Final qualifiers were J where detected results were between the MDL and RL.

Data Usability

There were no rejected sample results. All results are usable as qualified.

25 April 2012

Lynn K. Lutz, HDR Inc. Date

ORGANIC AIR QUALITY REPORT
METHOD TO-15

SDG: P1102292 (L1108138)

PROJECT: Memphis Defense Depot Off Depot soil vapor extraction for HDR Inc. (formerly e2m)

LABORATORY: Columbia Analytical Services, Simi Valley CA

SAMPLE MATRIX: Air

SAMPLING DATE (Month/Year): June 2011

NUMBER OF SAMPLES: 1 air sample

ANALYSES REQUESTED: Summa Canister VOA TO-15

SAMPLE NO.: OD-SVE-EFF-2Q11 -NS

DATA REVIEWER: Diane Short

QA REVIEWER: Diane Short & Associates, Inc. INITIALS/DATE: _____

Telephone Logs included Yes____ No __X__

Contractual Violations Yes____ No __X_

The EPA CLP National Functional Guidelines for Organic Data Review, 2001 (SOP), EPA Method TO-15 current updates have been referenced by the reviewer to perform this data validation review. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the HDR/e2m Project Manager. Per the Scope of Work, the review of these samples includes validation of all QC forms and submitted calibrations referencing the QC limits in the above documents.

DELIVERABLES
All deliverables were present as specified in the Statement of Work (SOW) or in the project contract.
Yes _X__ No ____
Note an extended list of volatile compounds was reported. Full raw data packages were submitted. Level III validation was performed for holding times, chain of custody, calibrations and QC. Some review of the raw calibration data was required to determine the application of the standards.

II. ANALYTICAL REPORT FORMS
A. The Analytical Report or Data Sheets are present and complete for all requested analyses.
Yes __X__ No___
Note that the result form notes the instrument used for analysis as HP5973/HP6890/MS3. Review of the raw data indicates that all but 2 of the requested compounds were analyzed on an instrument identified as CASS. Only 2 special compounds, vinyl bromide and 2-chlorotoluene, were present in the raw data on the instrument on the result form.

B. Holding Times
The contract holding times were met for all analyses (Time of sample receipt to time of analysis (VOA) or extraction and from extraction to analysis). Contract holding times for TO-15 canisters is 30 days from date of collection.
Yes ___X__ No____

C. Chains of Custody
Chains of Custody were present and were complete with signatures, sign-offs and complete entry of data. Canisters were properly sampled and received.
Yes ___X__ No ___
The project manager is informed of the following and the project record is being updated.
The chain of custody has no courier notations and no airbill (tracking) number reported on the chain or the log in form. The coolers are often sealed before the airbill number is available.
There is no relinquishment signature, date or time, although there is a sampler name and signature in the 'Sampler' field.

D. Canister Pressure
Canister pressures were measured and recorded for initial vacuum check, initial field vacuum, final field reading, lab initial pressure and final pressure.
Yes ___X____ No _____ NA _____
Pressures were reported and were acceptable for the initial and final pressures.

All readings met the limits or exceptions were noted and pressure corrected
Yes ___X__ No ____ NA ____
Not part of this review level, but is performed to ensure sample integrity.

III. INSTRUMENT CALIBRATION

A. Initial Calibration – GC/MS
1. The Relative Response Factors (RRF) and average RRF for all compounds for all analyses met the required criteria.
Yes __X__ No____ NA____
Minimum response factors are not defined by the method but meet routine Method 8260 limits. This method does not involve purging water samples. Consequently, all targets, including the typically poor-purging compounds, normally have response factors that are acceptable per validation criteria for volatiles.
Note that there are two standards on two different instruments: CASS and HP5973/HP6890/MS3. The latter is used for 'custom compounds' 2 of which are client compounds. Thus, the sample is run twice on 2 different instruments.

The relative standard deviation (RSD) for the five-point calibration was within the 30% limit.
Yes __X__ No ___

B. Continuing Calibration – GC/MS
1. The RRF standard was analyzed for each analysis at the required frequency and the QC criteria were met
Yes __X__ No____ NA____
Minimum response factors are not defined by the method, but met validation guidance.
There was no CCV submitted for the custom compounds (vinyl bromide, 2- chlorotoluene). They were non-detect and no further action is taken.

2. The percent difference (%D) limits of 30% were met.
Yes __X__ No ____
The routine Method 8260 limits of 25% and the TO-15 limits of 30% were met with the following exceptions
No data were qualified as data were non-detect. The response factor was acceptable to verify the non-detect.

Detected data are not qualified as they meet the TO-15 %D and the QAPP does not specifically address air limits.

Date	Compound	% D	Qualification
CCAL 6/29/11	2-propanol	-28.4	Meet TO-15 limits
	Ally chloride	-26.5	Meet TO-15 limits.

IV. GC/MS INSTRUMENT PERFORMANCE CHECK
A. The BFB performance check was injected once at the beginning of each 12-hour period and relative abundance criteria for the ions were met.
Yes __X___ No____ NA ____
The BFB was acceptable for the tunes.

V. INTERNAL STANDARDS
A. Area Limits
The Internal Standards met the 100% upper and -50% lower limits criteria and the Retention times were within the required windows.
Yes __X___ No____ NA ____

B. Retention Times
The relative retention times of the internal standards and sample compounds met the $\pm$ 0.06 RRT units limit.
Yes __ X ___ No____ NA ____

VI. SURROGATE
Surrogate spikes were analyzed with every sample.
Yes __X___ No ____
Note that only one surrogate is used 4-bromofluorobenzene. Method 8260 requires 3 surrogates, but one is acceptable for TO-15.

And met the recovery limits defined in the current contract
Yes __ X _ No ____

VII. MATRIX SPIKE/MATRIX SPIKE DUPLICATE
A. Matrix spike (MS) and matrix spike duplicates (MSD) were analyzed for every analysis performed and for every 20 samples or for every matrix whichever is more frequent.
Yes____ No ____NA ___X__
Spikes are not amenable to canister analysis and are not required. Laboratory duplicates are required and are provided by the laboratory.

B. The laboratory duplicate relative percent differences (RPD) were within the defined contract limits. Method requirements are 25% maximum RPD.
Yes ____ No ____ NA__X__
For validation purposes, only results > 5x PQL are qualified for RPD outliers. For results < 5x PQL, results are qualified if the absolute difference is greater than 2x PQL. The qualifier added is JD#, where # is the RPD or the absolute difference observed, as appropriate.
A client sample was not used for the duplicate and none was reported as none was designated on the chains and data are not qualified for non-client samples. These samples are collected on a regular basis and field precision is monitored over time.

VIII. DUPLICATE CONTROL SAMPLES
A. Duplicate Control and Duplicate Control Sample Duplicates similar to Laboratory Control Samples (LCS) were performed for every set.
Yes _X_ No ___

The laboratory does analyze laboratory control samples (LCS) .

B. And percent recoveries were acceptable at 70 – 130%.
Yes __X__ No ____
The laboratory limits are used for air samples and both laboratory and the 70 – 130% limits are met.

C. And Relative Percent Differences were within lab limits.
Yes ___ No____ NA___X_

IX. SHIFT CHECKS
Shift checks were performed and were within time limits.
Yes __X__ No____

X. BLANKS
A. Method Blanks were analyzed at the required frequency and for each matrix and analysis.
Yes __X___ No____
This is a nitrogen blank run with each set.

B. The method blank was free of contamination.
Yes _____ No ___X__
Methylene chloride is reported at 0.18 ug/m3 (0.052 ppbv). The client data are qualified BMB0.18 (or 0.052) to indicate the value is from the laboratory contamination.
Acetone was present in the method blank at low levels in the raw data. No data are qualified as the client value is > 5 x blank.

C. If Field Blanks were identified, they were free of contamination.
Yes _____ No ____ NA ___X___
There were no field blanks identified.

D. Contamination level was less than 0.03 mg/cubic meter before samples were analyzed per the method.
Yes ____ No____ NA ____X___
Reporting units include both ppbv and ug/m3.

XI. FIELD QC
A. If Field duplicates or Performance Check Compounds were identified, they met the RPD or % recovery criteria for the project.
Yes ___ No ____ NA__X_
Qualifiers are not added for field duplicate differences. When results are > 5x the reporting limit, a 35% RPD is used to identify potential deviations. When results are < 5x the reporting limit, an absolute difference between the results that is < 2x PQL is considered to be acceptable reproducibility.
There are no field duplicates.

XII. TCL COMPOUNDS
A. The identification is accurate and all retention times, library spectra and reconstructed ion chromatograms (RIC) were evaluated for all detected compounds:
Yes ___ No____ NA__X_

B. Quantitation was checked to determine the accuracy of calculations for representative compounds in each internal standard set
Yes___ No ____ NA___X__
Not part of this review level.

OVERALL ASSESSMENT
Data are considered to be usable for project purposes after consideration of comments. No qualifiers have been applied with the exception of blank qualifiers. Points of significance are summarized below:
Note an extended list of volatile compounds was reported. Full raw data packages were submitted. Level III validation was performed for holding times, chain of custody, calibrations and QC. Some review of the raw calibration data was required to determine the application of the standards.

Data Reporting Forms
Note that the result form notes the instrument used for analysis as HP5973/HP6890/MS3. Review of the raw data indicates that all but 2 of the requested compounds were analyzed on an instrument identified as CASS. Only 2 special compounds, vinyl bromide and 2-chlorotoluene, were present in the raw data on the instrument on the result form.

Chain of Custody:
The project manager is informed of the following and the project record is being updated.
The chain of custody has no courier notations and no airbill (tracking) number reported on the chain or the log in form. The coolers are often sealed before the airbill number is available.
There is no relinquishment signature, date or time, although there is a sampler name and signature in the 'Sampler' field.

Initial and Continuing Calibration:
Minimum response factors are not defined by the method but meet routine Method 8260 limits. This method does not involve purging water samples. Consequently, all targets, including the typically poor-purging compounds, normally have response factors that are acceptable per validation criteria for volatiles.
Note that there are two standards on two different instruments: CASS and HP5973/HP6890/MS3. The latter is used for 'custom compounds' 2 of which are client compounds. Thus, the sample is run twice on 2 different instruments.
There was no CCV submitted for the custom compounds (vinyl bromide, 2- chlorotoluene). They were non-detect and no further action is taken.
The routine Method 8260 limits of 25% and the TO-15 limits of 30% were met with the following exceptions
No data were qualified as data were non-detect. The response factor was acceptable to verify the non-detect.
Detected data are not qualified as they meet the TO-15 %D and the QAPP does not specifically address air limits.

Date	Compound	% D	Qualification
CCAL 6/29/11	2-propanol	-28.4	Meet TO-15 limits
	Ally chloride	-26.5	Meet TO-15 limits.

Method Blank:
Methylene chloride is reported at 0.18 ug/m3 (0.052 ppbv). The client data are qualified BMB0.18 (or 0.052) to indicate the value is from the laboratory contamination.
Acetone was present in the method blank at low levels in the raw data. No data are qualified as the client value is > 5 x blank.

Laboratory Duplicate:
A client sample was not used for any of the duplicates as none was designated on the chains and data are not qualified for non-client samples. These samples are collected on a regular basis and field precision is monitored over time.

Field Duplicates:
No field duplicate was identified. See note regarding laboratory precision.

Final Data Qualification and Usability Report

Project:	Defense Depot Memphis, TN (DDMT) AS-SVE
Sampling Event:	ODSVE June 2011
Project / Task Number:	121842-002
Sample Data Package(s):	P1102292
Data Validation Performed by:	Diane Short & Associates (DSA)
Final Data Qualification and Usability Report Prepared by:	Lynn K. Lutz, HDR Inc.

Data Validation Report Review and Comments

The data validation report was acceptable.

Final Data Qualifiers

Final qualifiers for detected methylene chloride results associated with the method blank that contained a trace level of methylene chloride was B where DSA had qualified as BMB.052. These results were also between the MDL and RL, therefore the final qualifier was JB.

Final qualifiers were J where detected results were between the MDL and RL.

Data Usability

There were no rejected sample results. All results are usable as qualified.

25 April 2012

Lynn K. Lutz, HDR Inc. Date

DIANE SHORT & ASSOCIATES, INC.
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ORGANIC AIR QUALITY REPORT
METHOD TO-15

SDG: P1103550

PROJECT: Memphis Defense Depot Off Depot soil vapor extraction for HDR Inc. (formerly e2m)

LABORATORY: Columbia Analytical Services, Simi Valley CA

SAMPLE MATRIX: Air

SAMPLING DATE (Month/Year): September 2011

NUMBER OF SAMPLES: 1 air sample

ANALYSES REQUESTED: Summa Canister VOA TO-15

SAMPLE NO.: OD-SVE-EFF-3Q11

DATA REVIEWER: Diane Short

QA REVIEWER: Diane Short & Associates, Inc. INITIALS/DATE: _ DLS _ 2/17/2011

Telephone Logs included Yes____ No __X__

Contractual Violations Yes____ No __X_

The EPA CLP National Functional Guidelines for Organic Data Review, 2001 (SOP), EPA Method TO-15 current updates have been referenced by the reviewer to perform this data validation review. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the HDR/e2m Project Manager. Per the Scope of Work, the review of these samples includes validation of all QC forms and submitted calibrations referencing the QC limits in the above documents.

DELIVERABLES
All deliverables were present as specified in the Statement of Work (SOW) or in the project contract.
Yes _X__ No ____
Note an extended list of volatile compounds was reported. Full raw data packages were submitted. Level III validation was performed for holding times, chain of custody, calibrations and QC.
The EDD contains ppbV results and the result forms also contain ug/m3 results. The EDD also contains chemical names like dichloroethane instead of what is on the result form, which is methylene chloride. This is the case for several compounds and the end user of the data should be aware of watching for name distinctions.

II. ANALYTICAL REPORT FORMS
A. The Analytical Report or Data Sheets are present and complete for all requested analyses.
Yes __X__ No___
The laboratory runs 2 standards in order to accommodate the client list.

B. Holding Times
The contract holding times were met for all analyses (Time of sample receipt to time of analysis (VOA) or extraction and from extraction to analysis). Contract holding times for TO-15 canisters is 30 days from date of collection.
Yes ___X__ No____

C. Chains of Custody
Chains of Custody were present and were complete with signatures, sign-offs and complete entry of data. Canisters were properly sampled and received.
Yes ___X__ No ___
The project manager is informed of the following and the project record is being updated.
The chain of custody has no airbill (tracking) number reported on the chain or the log in form. The coolers are often sealed before the airbill number is available.
There is a 2nd relinquishment with no date or time.

D. Canister Pressure
Canister pressures were measured and recorded for initial vacuum check, initial field vacuum, final field reading, lab initial pressure and final pressure.
Yes ___X____ No _____ NA _____
Pressures were reported and were acceptable for the initial and final pressures.

All readings met the limits or exceptions were noted and pressure corrected
Yes ___X__ No ____ NA ____
Not part of this review level, but is performed to ensure sample integrity.

III. INSTRUMENT CALIBRATION

A. Initial Calibration – GC/MS
1. The Relative Response Factors (RRF) and average RRF for all compounds for all analyses met the required criteria.
Yes __X__ No____ NA____
Minimum response factors are not defined by the method but meet routine Method 8260 limits. This method does not involve purging water samples. Consequently, all targets, including the typically poor-purging compounds, normally have response factors that are acceptable per validation criteria for volatiles.
The client list of reported compounds contains a number of compounds in the 3Q that are not in the 4Q list and vice versa.

The relative standard deviation (RSD) for the five-point calibration was within the 30% limit.
Yes __X__ No ___
The routine Method 8260 limits of 25% and the TO-15 limits of 30% were met with the following exceptions
No data were qualified as data were non-detect. The response factor was acceptable to verify the non-detect.
Detected data are not qualified as they meet the TO-15 %D and the QAPP does not specifically address air limits.

Date	Compound	% D	Qualification
ICAL 9/7/11	2-methyl-2-propanol	27.2	Meet TO-15 limits
	2-propanol	27.7%	Meet TO-15 limits

B. Continuing Calibration – GC/MS
1. The RRF standard was analyzed for each analysis at the required frequency and the QC criteria were met
Yes __X__ No____ NA____
Minimum response factors are not defined by the method, but met validation guidance.

2. The percent difference (%D) limits of 30% were met.
Yes __X__ No ____

IV. GC/MS INSTRUMENT PERFORMANCE CHECK
A. The BFB performance check was injected once at the beginning of each 12-hour period and relative abundance criteria for the ions were met.
Yes __X___ No____ NA ____
The BFB was acceptable for the tunes.

V. INTERNAL STANDARDS
A. Area Limits
The Internal Standards met the 100% upper and -50% lower limits criteria and the Retention times were within the required windows.
Yes __X___ No____ NA ____

B. Retention Times
The relative retention times of the internal standards and sample compounds met the $\pm$ 0.06 RRT units limit.
Yes __ X ___ No____ NA ____

VI. SURROGATE
Surrogate spikes were analyzed with every sample.
Yes __X___ No ____
Method 8260 requires 3 surrogates, but one is acceptable for TO-15. Three have been reported.

And met the recovery limits defined in the current contract
Yes __ X _ No ____

VII. MATRIX SPIKE/MATRIX SPIKE DUPLICATE
A. Matrix spike (MS) and matrix spike duplicates (MSD) were analyzed for every analysis performed and for every 20 samples or for every matrix whichever is more frequent.
Yes____ No ____NA ___X__
Spikes are not amenable to canister analysis and are not required. Laboratory duplicates are required and are provided by the laboratory.

B. The laboratory duplicate relative percent differences (RPD) were within the defined contract limits. Method requirements are 25% maximum RPD.
Yes _X___ No ____ NA____
For validation purposes, only results > 5x PQL are qualified for RPD outliers. For results < 5x PQL, results are qualified if the absolute difference is greater than 2x PQL. The qualifier added is JD#, where # is the RPD or the absolute difference observed, as appropriate.
The client sample was used for the duplicate and results are fully acceptable. In addition, these samples are collected on a regular basis and field precision is monitored over time.

VIII. DUPLICATE CONTROL SAMPLES
A. Duplicate Control and Duplicate Control Sample Duplicates similar to Laboratory Control Samples (LCS) were performed for every set.
Yes _X_ No ___
The laboratory does analyze laboratory control samples (LCS) .

B. And percent recoveries were acceptable at 70 – 130%.
Yes __X__ No ____
The laboratory limits are used for air samples and both laboratory and the 70 – 130% limits are met.

C. And Relative Percent Differences were within lab limits.

Yes ___ No____ NA___X_

IX. SHIFT CHECKS
Shift checks were performed and were within time limits.
Yes __X__ No____

X. BLANKS
A. Method Blanks were analyzed at the required frequency and for each matrix and analysis.
Yes __X___ No____
This is a nitrogen blank run with each set.

B. The method blank was free of contamination.
Yes _____ No ___X__
Methylene chloride is reported at 0.17 ug/m3 (0.050 ppbv). The client data are qualified BMB0.17 (or 0.050) to indicate the value is from the laboratory contamination.

C. If Field Blanks were identified, they were free of contamination.
Yes _____ No ____ NA ___X___
There were no field blanks identified.

D. Contamination level was less than 0.03 mg/cubic meter before samples were analyzed per the method.
Yes ____ No____ NA ____X___
Reporting units include both ppbv and ug/m3.

XI. FIELD QC
A. If Field duplicates or Performance Check Compounds were identified, they met the RPD or % recovery criteria for the project.
Yes ___ No ____ NA__X_
Qualifiers are not added for field duplicate differences. When results are > 5x the reporting limit, a 35% RPD is used to identify potential deviations. When results are < 5x the reporting limit, an absolute difference between the results that is < 2x PQL is considered to be acceptable reproducibility.
There are no field duplicates.

XII. TCL COMPOUNDS
A. The identification is accurate and all retention times, library spectra and reconstructed ion chromatograms (RIC) were evaluated for all detected compounds:
Yes ___ No____ NA__X_
Note that TCE was run at a 10x dilution to bring it into linear range.

B. Quantitation was checked to determine the accuracy of calculations for representative compounds in each internal standard set
Yes___ No ____ NA___X__
Not part of this review level.

OVERALL ASSESSMENT
Data are considered to be usable for project purposes after consideration of comments. No qualifiers have been applied with the exception of blank qualifiers. Points of significance are summarized below:

Note an extended list of volatile compounds was reported. Full raw data packages were submitted. Level III validation was performed for holding times, chain of custody, calibrations and QC. Some review of the raw calibration data was required to determine the application of the standards.

Data Reporting Forms
Note that there are reported compounds for the 4Q sample that were not reported for the 3Q sample and vice versa.
Note that TCE was run at a 10x dilution to bring it into linear range.

Chain of Custody:
The project manager is informed of the following and the project record is being updated.
The chain of custody has no airbill (tracking) number reported on the chain or the log in form. The coolers are often sealed before the airbill number is available.
There is a 2nd relinquishment signature with no date or time.

Initial and Continuing Calibration:
Minimum response factors are not defined by the method but meet routine Method 8260 limits. This method does not involve purging water samples. Consequently, all targets, including the typically poor-purging compounds, normally have response factors that are acceptable per validation criteria for volatiles. Note there are 2 standards run to accommodate the client list.

The routine Method 8260 limits of 25% and the TO-15 limits of 30% were met with the following exceptions
No data were qualified as data were non-detect. The response factor was acceptable to verify the non-detect.
Detected data are not qualified as they meet the TO-15 %D and the QAPP does not specifically address air limits.

Date	Compound	% D	Qualification
ICAL 9/7/11	2-methyl-2-propanol	27.2	Meet TO-15 limits
	2-propanol	27.7%	Meet TO-15 limits

Method Blank:
Methylene chloride is reported at 0.17 ug/m3 (0.049 ppbv). The client data are qualified BMB0.17 (or 0.049) to indicate the value is from the laboratory contamination.

Laboratory Duplicate:
A client sample was used and was fully acceptable. In addition, these samples are collected on a regular basis and field precision is monitored over time.

Field Duplicates:
No field duplicate was identified. See note regarding laboratory precision.

Final Data Qualification and Usability Report

Project:	Defense Depot Memphis, TN (DDMT) AS-SVE
Sampling Event:	ODSVE September 2011
Project / Task Number:	121842-002
Sample Data Package(s):	P1103550
Data Validation Performed by:	Diane Short & Associates (DSA)
Final Data Qualification and Usability Report Prepared by:	Lynn K. Lutz, HDR Inc.

Data Validation Report Review and Comments

The data validation report was acceptable.

Final Data Qualifiers

Final qualifiers for detected methylene chloride results associated with the method blank that contained a trace level of methylene chloride was B where DSA had qualified as BMB.05. These results were also between the MDL and RL, therefore the final qualifier was JB.

Final qualifiers were J where detected results were between the MDL and RL.

Data Usability

There were no rejected sample results. All results are usable as qualified.

22 February 2012

Lynn K. Lutz, HDR Inc. Date

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ORGANIC AIR QUALITY REPORT
METHOD TO-15

SDG: P1104969

PROJECT: Memphis Defense Depot Off Depot soil vapor extraction for HDR Inc. (formerly e2m)

LABORATORY: Columbia Analytical Services, Simi Valley CA

SAMPLE MATRIX: Air

SAMPLING DATE (Month/Year): December 2011

NUMBER OF SAMPLES: 1 air sample

ANALYSES REQUESTED: Summa Canister VOA TO-15

SAMPLE NO.: OD-SVE-EFF-4Q11

DATA REVIEWER: Diane Short

QA REVIEWER: Diane Short & Associates, Inc. INITIALS/DATE: _ DLS _ 2/17/2011

Telephone Logs included Yes____ No __X__

Contractual Violations Yes____ No __X_

The EPA CLP National Functional Guidelines for Organic Data Review, 2001 (SOP), EPA Method TO-15 current updates have been referenced by the reviewer to perform this data validation review. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the HDR/e2m Project Manager. Per the Scope of Work, the review of these samples includes validation of all QC forms and submitted calibrations referencing the QC limits in the above documents.

DELIVERABLES
All deliverables were present as specified in the Statement of Work (SOW) or in the project contract.
Yes _X__ No ____
Note an extended list of volatile compounds was reported. Full raw data packages were submitted. Level III validation was performed for holding times, chain of custody, calibrations and QC.
The EDD contains ppbV results and the result forms also contain ug/m3 results. The EDD also contains chemical names like dichloroethane instead of what is on the result form, which is methylene chloride. This is the case for several compounds and the end user of the data should be aware of watching for name distinctions.

II. ANALYTICAL REPORT FORMS
A. The Analytical Report or Data Sheets are present and complete for all requested analyses.
Yes __X__ No___

B. Holding Times
The contract holding times were met for all analyses (Time of sample receipt to time of analysis (VOA) or extraction and from extraction to analysis). Contract holding times for TO-15 canisters is 30 days from date of collection.
Yes ___X__ No____

C. Chains of Custody
Chains of Custody were present and were complete with signatures, sign-offs and complete entry of data. Canisters were properly sampled and received.
Yes ___X__ No ___
The project manager is informed of the following and the project record is being updated.
The chain of custody has no airbill (tracking) number reported on the chain or the log in form. The coolers are often sealed before the airbill number is available.
The sample ID is corrected with a write over. The protocol recommended is a one line cross out with initial.

D. Canister Pressure
Canister pressures were measured and recorded for initial vacuum check, initial field vacuum, final field reading, lab initial pressure and final pressure.
Yes ___X____ No _____ NA _____
Pressures were reported and were acceptable for the initial and final pressures.

All readings met the limits or exceptions were noted and pressure corrected
Yes ___X__ No ____ NA ____
Not part of this review level, but is performed to ensure sample integrity.

III. INSTRUMENT CALIBRATION

A. Initial Calibration – GC/MS
1. The Relative Response Factors (RRF) and average RRF for all compounds for all analyses met the required criteria.
Yes __X__ No____ NA____
Minimum response factors are not defined by the method but meet routine Method 8260 limits. This method does not involve purging water samples. Consequently, all targets, including the typically poor-purging compounds, normally have response factors that are acceptable per validation criteria for volatiles.
The client list of reported compounds contains a number of compounds that are not in the 3Q list and vice versa.

The relative standard deviation (RSD) for the five-point calibration was within the 30% limit.
Yes __X__ No ___

B. Continuing Calibration – GC/MS
1. The RRF standard was analyzed for each analysis at the required frequency and the QC criteria were met
Yes __X__ No____ NA____
Minimum response factors are not defined by the method, but met validation guidance.

2. The percent difference (%D) limits of 30% were met.
Yes __X__ No ____
The routine Method 8260 limits of 25% and the TO-15 limits of 30% were met for all compounds with %D of less than 25%.

IV. GC/MS INSTRUMENT PERFORMANCE CHECK
A. The BFB performance check was injected once at the beginning of each 12-hour period and relative abundance criteria for the ions were met.

Yes __X___ No____ NA ____
The BFB was acceptable for the tunes.

V. INTERNAL STANDARDS
A. Area Limits
The Internal Standards met the 100% upper and -50% lower limits criteria and the Retention times were within the required windows.
Yes __X___ No____ NA ____

B. Retention Times
The relative retention times of the internal standards and sample compounds met the $\pm$ 0.06 RRT units limit.
Yes __ X ___ No____ NA ____

VI. SURROGATE
Surrogate spikes were analyzed with every sample.
Yes __X___ No ____
Method 8260 requires 3 surrogates, but one is acceptable for TO-15. Three have been reported.

And met the recovery limits defined in the current contract
Yes __ X _ No ____

VII. MATRIX SPIKE/MATRIX SPIKE DUPLICATE
A. Matrix spike (MS) and matrix spike duplicates (MSD) were analyzed for every analysis performed and for every 20 samples or for every matrix whichever is more frequent.
Yes____ No ____NA ___X__
Spikes are not amenable to canister analysis and are not required. Laboratory duplicates are required and are provided by the laboratory.

B. The laboratory duplicate relative percent differences (RPD) were within the defined contract limits. Method requirements are 25% maximum RPD.
Yes _X___ No ____ NA____
For validation purposes, only results > 5x PQL are qualified for RPD outliers. For results < 5x PQL, results are qualified if the absolute difference is greater than 2x PQL. The qualifier added is JD#, where # is the RPD or the absolute difference observed, as appropriate.
The client sample was used for the duplicate and results are fully acceptable. In addition, these samples are collected on a regular basis and field precision is monitored over time.

VIII. DUPLICATE CONTROL SAMPLES
A. Duplicate Control and Duplicate Control Sample Duplicates similar to Laboratory Control Samples (LCS) were performed for every set.
Yes _X_ No ___
The laboratory does analyze laboratory control samples (LCS) .

B. And percent recoveries were acceptable at 70 – 130%.
Yes __X__ No ____
The laboratory limits are used for air samples and both laboratory and the 70 – 130% limits are met.

C. And Relative Percent Differences were within lab limits.
Yes ___ No____ NA___X_

IX. SHIFT CHECKS
Shift checks were performed and were within time limits.
Yes __X__ No____

X. BLANKS
A. Method Blanks were analyzed at the required frequency and for each matrix and analysis.
Yes __X___ No____
This is a nitrogen blank run with each set.

B. The method blank was free of contamination.
Yes _____ No ___X__
Methylene chloride is reported at 0.16 ug/m3 (0.047 ppbv). The client data are qualified BMB0.16 (or 0.047) to indicate the value is from the laboratory contamination.

C. If Field Blanks were identified, they were free of contamination.
Yes _____ No ____ NA ___X___
There were no field blanks identified.

D. Contamination level was less than 0.03 mg/cubic meter before samples were analyzed per the method.
Yes ____ No____ NA ____X___
Reporting units include both ppbv and ug/m3.

XI. FIELD QC
A. If Field duplicates or Performance Check Compounds were identified, they met the RPD or % recovery criteria for the project.
Yes ___ No ____ NA__X_
Qualifiers are not added for field duplicate differences. When results are > 5x the reporting limit, a 35% RPD is used to identify potential deviations. When results are < 5x the reporting limit, an absolute difference between the results that is < 2x PQL is considered to be acceptable reproducibility.
There are no field duplicates.

XII. TCL COMPOUNDS
A. The identification is accurate and all retention times, library spectra and reconstructed ion chromatograms (RIC) were evaluated for all detected compounds:
Yes ___ No____ NA__X_

B. Quantitation was checked to determine the accuracy of calculations for representative compounds in each internal standard set
Yes___ No ____ NA___X__
Not part of this review level.

OVERALL ASSESSMENT
Data are considered to be usable for project purposes after consideration of comments. No qualifiers have been applied with the exception of blank qualifiers. Points of significance are summarized below:
Note an extended list of volatile compounds was reported. Full raw data packages were submitted. Level III validation was performed for holding times, chain of custody, calibrations and QC. Some review of the raw calibration data was required to determine the application of the standards.

<u>Data Reporting Forms</u>
Note that there are reported compounds for the 4Q sample that were not reported for the 3Q sample and vice versa.
Note that TCE was run at a 10x dilution to bring it into linear range.

<u>Chain of Custody:</u>
The project manager is informed of the following and the project record is being updated.
The chain of custody has no airbill (tracking) number reported on the chain or the log in form. The coolers are often sealed before the airbill number is available.

The sample ID is corrected with a write over. The protocol recommended is a one line cross out with initial.

Initial and Continuing Calibration:
Minimum response factors are not defined by the method but meet routine Method 8260 limits. This method does not involve purging water samples. Consequently, all targets, including the typically poor-purging compounds, normally have response factors that are acceptable per validation criteria for volatiles.

The routine Method 8260 limits of 25% and the TO-15 limits of 30% were met.

Method Blank:
Methylene chloride is reported at 0.16 ug/m3 (0.047 ppbv). The client data are qualified BMB0.16 (or 0.047) to indicate the value is from the laboratory contamination.

Laboratory Duplicate:
A client sample was used and was fully acceptable. In addition, these samples are collected on a regular basis and field precision is monitored over time.

Field Duplicates:
No field duplicate was identified. See note regarding laboratory precision.

Final Data Qualification and Usability Report

Project:	Defense Depot Memphis, TN (DDMT) AS-SVE
Sampling Event:	ODSVE December 2011
Project / Task Number:	121842-002
Sample Data Package(s):	P1104969
Data Validation Performed by:	Diane Short & Associates (DSA)
Final Data Qualification and Usability Report Prepared by:	Lynn K. Lutz, HDR Inc.

Data Validation Report Review and Comments

The data validation report was acceptable.

Final Data Qualifiers

Final qualifiers for detected methylene chloride results associated with the method blank that contained a trace level of methylene chloride was B where DSA had qualified as BMB.047. These results were also between the MDL and RL, therefore the final qualifier was JB.

Final qualifiers were J where detected results were between the MDL and RL.

Data Usability

There were no rejected sample results. All results are usable as qualified.

22 February 2012

Lynn K. Lutz, HDR Inc. Date