

U.S. ENVIRONMENTAL PROTECTION AGENCY REGION 4, SCIENCE and ECOSYSTEM SUPPORT DIVISION ATHENS, GEORGIA 30605-2720

RECORD CO

4SESD-EIB

NOV 0 3 2005

MEMORANDUM

SUBJECT:

Laboratory Results of Paducah Gaseous Diffusion Plant, Paducah, Kentucky

SESD Project Number: 05-0806

FROM:

Tim Slagle

Superfund and Air Section

THRU:

Danny France, Chief

Superfund and Air Section

TO:

cc:

David Williams, Remedial Project Manager,

EPA Region IV, Waste Management Division, North Site Management Branch

Attached is a copy of the laboratory results, and locations of samples collected during our September 14, 2005 soil gas study, conducted at residential properties located adjacent to the Paducah Gaseous Diffusion Plant in Paducah, Kentucky.

If you have any questions please give Tim Slagle a call at (706) 355-8741.

Antonio Quinones

H-00013-0995

UNCLASSIFIED

AIR STUDY PLAN Paducah Gaseous Diffusion Plant Paducah, Kentucky September 14, 2005

INTRODUCTION

03-28-06

On September 14, 2005 the Region 4, Science and Ecosystem Support Division (SESD) conducted a soil gas study in the residential neighborhood adjacent to the Paducah Gaseous Diffusion Plant (PGDP) and south of the Ohio River located in Paducah, Kentucky. The objective of the soil gas study was to assess the concentrations of Volatile Organic Compounds (VOCs) near the soil surface that may be caused by contaminated ground water emanating from the PGDP. The investigation was requested by David Williams, Remedial Project Manager, EPA Region 4, Waste Management Division.

STUDY DESIGN

The study was designed to assess the concentrations of Volatile Organic Compounds (VOCs) near the soil surface that may be caused by contaminated ground water emanating from the PGDP facility. The data collected would be used to help determine if the VOCs contained in the contaminated groundwater were migrating through the soil and cause concern to residents living above the contaminated groundwater plume. The target list of compounds was limited to VOCs found in previous groundwater studies at this location.

SITING OBJECTIVES

The soil gas sampling sites were selected in the residential neighborhood located over the contaminated groundwater plume and adjacent to the Paducah Gaseous Diffusion Plant (PGDP) and south of the Ohio River located in Paducah, Kentucky. The sampling locations were selected by the EPA Remedial Project Manager, David Williams.

Three sampling sites were selected for sampling soil gas. The sites are designated SVO-1, SVO-2 and SVO-3. The samples collected at these locations will share the same identification. A duplicate sample was collected at the same location and time as SVO-1, the duplicate sample was designated as SVO-1D. The sampling sites are depicted on MAP 1.

Two ambient air samples; designated SVO-B1 located approximately 40 yards north of the SVO-1 site and SVO-B2 located approximately 60 yards northeast of SVO-3 were collected. These sampling locations were used to determine the typical ambient VOC concentrations in the ambient air in the vicinity of the sampling locations.

Site	Sample Description	GPS Location		
SV0-1 and SVO-1D	Soil Gas /Duplicate	37° 07.98N 88° 48.87W		
SVO-B1	Ambient Air	37° 07.99N 88° 48.87W		
SV0-2	Soil Gas	37° 08.26N 88° 48.14W		
SV0-3	Soil Gas	37° 07.22N 88° 46.77W		
SVO-B2	Ambient Air	37° 07.23N 88° 46.74W		

SAMPLING PROCEDURE

03-28-06

All of the soil gas samples were collected as specified in the Environmental Investigations Standard Operating Procedures and Quality Assurance Manual, (EISOPQAM), November 2001. Sampling for VOCs conforms to method TO-15 from the "EPA Compendium of Methods to the Determination of Toxic Organic Compounds in Ambient Air."

The soil gas sampling was accomplished using a self propelled track mounted Geoprobe® that was maneuvered to the sampling location. A sampling rod was hydraulically pushed into the soil to the prescribed sampling depth of 6.1 feet (BGL) below grade level. Then the sampling rod was with-drawn to 4.9 feet BGL leaving a void in the subsurface soil at the end of the sampling rod 1.2 feet long and 1.25 inches in diameter.

The expendable point was knocked free from the sampling rod, leaving a path to sample the soil gas from the void created. A 0.25 inch Teflon® sampling tube with an attached threaded fitting was pushed thru the sampling rod and threaded into the inside end of the rod that is located just above where the void was created.

Next, a TVA 1000® PID/FID (photo ionization detector/flame ionization detector) was connected to the free end of the 0.25 inch sampling tube and field screened for high concentrations of VOCs for several minutes. This action also purged the sampling apparatus of any ambient air.

Then a Ludlum® Geiger counter enclosed in an air-tight container was connected to the free end of the 0.25 inch sampling tube and evacuated with a personal sampling pump. This action was used to screen the soil gas to determine if any radiation was detected above background.

After the purging process; a soil gas sampling apparatus with a limiting orifice designed to control the sampling interval to approximately 30 minutes was connected to the free end of the Teflon® sampling tube. An evacuated six-liter Summa® electro polished stainless steel canister was connected and the 30 minute VOC composite soil gas sample collected.

The duplicate samples were collected at the same time and through a common 0.25 inch sampling tube. This was accomplished by installing a "tee" at the free end of the sample tube and splitting the flow of soil gas through 2 separate limiting orifices and into 2 separate evacuated six-liter Summa® electro polished stainless steel canisters.

The sampling locations were sampled following EPA sample collection by the United States Department of Energy (DOE) contractor; Bechtel Jacobs Company LLC. They supplied their own sampling equipment which connected to the free end of the 0.25 inch sampling tube. In addition, Bechtel Jacobs provided additional radiation screening of the sites and exposed soil gas sampling equipment.

ANALYTICAL PLAN

The VOC samples were analyzed by the SESD laboratory using the SESD modified TO-15 method. An Entech® autosampler and concentrator interfaced to a Hewlett-Packard® gas chromatograph and mass spectrometer were used to analyze the samples.

The target list of compounds was limited to VOCs found in previous groundwater studies:

Vinyl chloride
1,1-Dichloroethene
1,1-Dichloroethene
cis-1,2-Dichloroethene
trans-1,2-Dichloroethene
Chloroform
1,2-Dichloroethane
1,1,1-Trichloroethane
Trichloroethene
1,1,2-Trichloroethane
Tetrachloroethene

QUALITY ASSURANCE

All of the canisters and sampling devices were checked for contamination before use.

Duplicate samples were collected at the same time and location to determine the precision of the sampling method.

A field blank canister was evacuated and transported to the field, but not exposed, to check the possibility of contamination of the samples during transport and storage.

The laboratory analysis sheets are attached as Appendix A

At two of the soil sampling locations SVO-1 and SVO-3 the soil was dense enough that a sample was not obtained. The sampling apparatus used to collect the samples did not have a device for measuring the vacuum in the canister as it filled with the soil gas. Consequently, there was no indication that the sampling canisters used at these locations were not filling properly. The DOE contractor's sampling apparatus did have vacuum gauges on their sampling canisters. But, even after an extended sampling period the cans were filling at an extremely slow rate.

The SVO-2 sampling location was the only one of the three sites where a complete soil gas sample could be collected. When grouting the holes after sample collection, it was discovered that the direct-push sampling cavity apparently intercepted an existing subsurface void. There was only one detection of volatile organic compounds (VOCs) in this soil gas sample. Sample SVO-2 contained an estimated amount of 0.50J ug/m3 Chloroform.

Neither of the two ambient air samples, SVO-1B and SVO-2B, contained any target compounds.

No radiation was found at any of the sites during the sampling procedure or on the exposed sampling equipment when checked by EPA or the Department of Energy (DOE) contractor; Bechtel Jacobs Company LLC.

The field blank canister QAFA914 was clean, confirming there were no contaminates introduced during the sampling period or analysis.

Map1, EPA Soil Gas Sampling near the Paducah Gaseous Diffusion Plant, September 14, 2005 Shawnee Steam Plant **TVA** Metropolis Lake Road Soil Gas Sample #SVO-2 **DOE Boundary** Ogden Landing Road Background Sample #SVO-B1 Background Sample #SVO-B2 Soil Gas Samples #SVO-1 Soil Gas Sample #SVO-3 and #SVO 1D PGDP Boundary Grahamville Heath Schools Woodville Road U.S. DEPARTMENT OF ENERGY LEGEND: DOE OAK RIDGE OPERATIONS PADUCAH GASEOUS DIFFUSION PLANT Sampling Location 3000 6000 Feet BECHTEL JACOBS COMPANY LLC
MANAGED FOR THE US DEPARTMENT OF ENERGY UNDER
US GOVERNMENT CONTRACT DE-AC-45-580R22700 JACOBS . EPA Soil Gas Sampling near the Paducah Gaseous Diffusion Plant, September 14, 2005 FIGURE No. c5ac90002sk241 DATE 09-14-05

TABLE 1

Paducah Gaseous Diffusion Plant Soil Gas Study Paducah, Kentucky September 14,2005

Compound	Units	Field Blank	Soil Gas Monitoring Sites					
ioon ipaira	511115	QAFA914	SVO01	SVO-1D	SVO-2	SVO-3	SVO-B1	SVO-B2
1,1,1:Trichloroethane	UG/M3	1.2 U	NA	NA	1.4 U	NA	1.4 U	1.5 U
1,1,2Trichloroethane	UG/M3	1.2 U	NA	NA	1.4 U	NA NA	1.4 U	1.5 U
1,1-Cichloroethane	UG/M3	0.91 U	NA	NA	1 U	NA	1 U	1.1 U
1,1-Dichloroethene (1,1-Dichloroethylene)	UG/M3	0.89 U	NA	NA	0.98 U	NA NA	1 U	1.1 U
1,2-Dichloroethane	UG/M3	0.91 U	NA	NA	1 U	NA NA	1 U	110
Chlaroform	UG/M3	1.1 U	NA	NA	0.5 J	NA	1.3 U	1.3 U
cis-12-Dichloroethene	UG/M3	0.89 U	NA	NA	0.98 U	NA	10	1.1 U
Tetrachloroethene (Tetrachloroethylene)	UG/M3	1.5 U	NA	NA	1.7 U	NA	1.7 U	1.8 U
trans-1,2-Dichloroethene	UG/M3	0.87 U	NA	NA	0.96 U	NA	1 U	1 U
Trichloroethene (Trichloroethylene)	UG/M3	1.2 U	NA	NA	1.3 U	NA	1.4 U	1.4 U
VinylChloride	UG/M3	0.59 U	NA	NA	0.66 U	NA	0.68 ป	0.71 U

DataQualifiers

- U-Aralyte not detected at or above reporting limit. The number is the minimum quantitation limit.
- J-Identification of analyte is acceptable; reported value is an estimate.
- UJ-Analyte not detected at or above reporting limit. Reporting limit is an estimate.
- N-Presumptive evidence analyte is present; analyte reported as tentative identification.
- NJ-Presumptive evidence analyte is present; analyte reported as tentative identification. Reported value is an estimate.
- K-Idintification of analyte is acceptable; reported value may be biased high. Actual value expected to be less than the reported value.
- L-Identification of analyte is acceptable; reported value may be biased low. Actual value expected to be greater than reported value.
- NA-llot Analyzed. | NAI-Not Analyzed due to Interferences. | A-Analyte analyzed in replicate. Reported value is 'average' of replicates.
- R-Presence or absence of analyte can not be determined from data due to severe quality control problems. Data are rejected and considered unusable
- C-confirmed by GCMS | /1-when no value is reported, see chlordane constituents | /2-constituents or metabolites of technical chlordane
- NR-lot Reported

03-28-06

Appendix A

Laboratory Analysis Sheets

Paducah Gaseous Diffusion Plant Paducah, Kentucky **September 14, 2005**

Sample 9118 FY 2005

SPECIFIED TESTS

Program: SF

Project: 05-0806

Facility: Paducah Gaseous Diffusion Plant (DOE) Paducah, KY

Produced by: Hale, Sallie

Project Leader: TSLAGLE

Beginning: 09/14/2005 16:00

Requestor: Williams

Ending:

id/Station: QAFA914 / 0040 Media: AMBIENT AIR RESULTS UNITS ANALYTE 0.59 U **UG/M3** Vinyl Chloride 0.89 U 1,1-Dichloroethene (1,1-Dichloroethylene) UG/M3 0.91 U UG/M3 1,1-Dichloroethane 0.89 U UG/M3 cis-1,2-Dichloroethene 0.87 U UQ/M3 trans-1,2-Dichloroethene 1.1 U UG/M3 Chloroform 0.91 U UG/M3 1,2-Dichloroethane 1.2 0 UG/M3 1.1.1-Trichloroethane 1.2 0 UG/M3 Trichloroethene (Trichloroethytene) 1.2 U UG/M3 1.1.2-Trichloroethane 1.5 U UG/M3 Tetrachloroethene (Tetrachloroethylene)

U-Analyte not detected at or above reporting limit. | J-Identification of analyte is acceptable; reported value is an estimate. | UJ-Analyte not detected at or above reporting limit. Reporting limit is an estimate. N-Presumptive evidence analyte is present; analyte reported as tentative identification. | NJ-Presumptive evidence analyte is present; analyte reported as tentative identification. Reported value is an estimate. K-Identification of analyte is acceptable; reported value may be biased high. Actual value expected to be less than the reported value.

L-Identification of analyte is acceptable; reported value may be biased low. Actual value expected to be greater than reported value,

NA-Not Analyzed. | NAI-Not Analyzed due to Interferences. | A-Analyte analyzed in replicate. Reported value is "average" of replicates.

R-Presence or absence of analyte can not be determined from data due to severe quality control problems. Data are rejected and considered unusable.

Produced by: Hale, Sallie Sample 9112 FY 2005 Project: 05-0806 Requestor: Williams SPECIPIED TESTS Project Leader: TSLAGLE Facility: Paducah Gaseous Diffusion Plant (DOE) Paducah, KY Beginning: 09/14/2005 10:38

Endina:

Program: SF Id/Station: SVO01 / 0047

Modia: AMBIENT AIR

RESULTS	UNITS	ANALYTE
HA	UG/M3	Vinyl Chloride
A.IS	UG/M3	1,1-Dichloroethene (1,1-Dichloroethylene)
AK	UG/M3	1,1-Dichloroethane
ŀА	UG/M3	cis-1,2-Dichloroethene
ŀΑ	UG/M3	trans-1,2-Dichloroethene
НA	UG/M3	Chloroform
NA	UG/M3	1,2-Dichloroethane
NA	UG/M3	1,1,1-Trichloroethane
NA	UG/M3	Trichloroelhene (Trichloroethylene)
NA	UG/M3	1,1,2-Trichloroethane
NA	UG/M3	Tetrachioroethene (Tetrachioroethylene)

Emply canster received

U-Analyte not detected at or above reporting limit. | J-Identification of analyte is acceptable; reported value is an estimate. | UJ-Analyte not detected at or above reporting limit. | Reporting limit is an estimate. N-Presumptive evidence analyte is present; analyte reported as tentative identification. [NJ-Presumptive evidence analyte is present; analyte reported as tentative identification. Reported value is an estimate. K-Identification of analyte is acceptable; reported value may be plased high. Actual value expected to be less than the reported value. L-Identification of analyte is acceptable; reported value may be biased low. Actual value expected to be greater than reported value.

NA-Not Analyzed. | NAI-Not Analyzed due to Interferences. | A-Analyte analyzed in replicate. Reported value is "average" of replicates.

R-Presence of absence of analyte can not be determined from data due to severe quality control problems. Data are rejected and considered unusable.

Production Date: 10/20/2005 12:03

Produced by: Hale, Sallie Requestor: Williams Project Leader: TSLAGLE

Beginning: 09/14/2005 10:38

Ending:

SPECIFIED TESTS

Facility: Paducah Gaseous Diffusion Plant (DOE) Paducah, KY

Program: SF

Id/Station: SVO-1D / 0036 Media: AMBIENT AIR

RESULTS UNITS ANALYTE

NA UG/M3 Vinyl Chloride

Sample 9113 FY 2005 Project: 05-0806

IIA UG/M3 1.1-Dichloroethene (1.1-Dichloroethylene)

NA UG/M3 1,1-Dichloroethane
NA UG/M3 cis-1,2-Dichloroethene
NA UG/M3 trans-1,2-Dichloroethene
NA UG/M3 Chloroform

NA UG/M3 1,2-Dichloroethane

NA UG/M3 1,1,1-Trichloroethane
NA UG/M3 Trichloroethene (Trichloroethylene)

IIA UG/M3 1,1,2-Trichloroethane

NA UG/M3 Totrachloroethene (Tetrachloroethylene)

Empty canister received

-145 P.012/016

Fram-USEPA

L-Identification of analyte is acceptable; reported value may be biased low. Actual value expected to be greater than reported value.

NA-Not Analyzed. | NAI-Not Analyzed due to Interferences. | A-Analyte analyzed in replicate. Reported value is "average" of replicates.

Sample 9114 FY 2005 Project: 05-0806	Produced by: Hale, Sallie
	Requestor: Williams
SPECIFIED TESTS	Project Leader: TSLAGLE
Facility: Paducah Gaseous Diflusion Plant (DOE) Paducah, KY	Beginning: 09/14/2005 10:48
Program; SF	Ending:

Id/Station: SVO-B1 / 14135

Media: AMBIENT AIR

RESULTS	UNITS	ANALYTE
0.68 U	UG/M3	Vinyl Chtoride
1.0 0	UG/M3	1,1-Dichloroethene (1,1-Dichloroethylene)
1.0 U	UG/M3	1,1-Dichloroethane
1.0 9	UG/M3	cis-1,2-Dichlorgethene
1.0 V	UG/M3	trans-1,2-Dichloroethene
1.3 ປ	UG/M3	Chlorolorm
1.0 U	UG/M3	1,2-Dichloroethane
1.4 U	UG/M3	1,1,1-Trichloroethans
1.4 0	UG/M3	Trichloroethene (Trichloroethylene)
1.4 0	UG/M3	1,1,2-Trichloroethane
1.7 0	UG/M3	Tetrachloroethene (Tetrachloroethylene)

U-Analyte not detected at or above reporting limit. | J-Identification of analyte is acceptable; reported value is an estimate. | UJ-Analyte not detected at or above reporting limit. | Beporting limit is an estimate. | N-Presumptive evidence analyte is present; analyte reported as tentative identification. | NJ-Presumptive evidence analyte is present; analyte reported as tentative identification. Reported value is an estimate. | K-Identification of analyte is acceptable; reported value may be biased high. Actual value expected to be less than the reported value.

L-identification of analyte is acceptable; reported value may be biased low. Actual value expected to be greater than reported value.

NA-Not Analyzed. | NAI-Not Analyzed due to Interferences. | A-Analyte analyzed in replicate. Reported value is "average" of replicates.

R-Presence or absence of analyte can not be determined from data due to severe quality control problems. Data are rejected and considered unusable.

Sample	9115	FY	2005	Project:	05-0806
SPECIFIED TESTS					

Facility: Paducah Gaseous Diffusion Plant (DOE) Paducah, KY

Program: SF

Id/Slatim: SVO-2 / 0044 Media: AMBIENT AIR Produced by: Hale, Saliie Requestor: Williams Project Leader: TSLAGLE Beginning: 09/14/2005 12:40

Ending:

_			
	RESULTS	UNITS	ANALYTE
	0.66 ป	UG/M3	Vinyl Chloride
	0.98 U	UG/M3	1,1-Dichloroethane (1,1-Dichloroethylene)
	1.0 U	UG/M3	1,1-Dichloroethane
	0.98 U	UG/M3	cis-1,2-Dichtoroethene
	0.96 U	UG/M3	trans-1,2-Dichtoroethene
	0.50 J	UG/M3	Chlorotorm
	1.0 8	UG/M3	1,2-Dichloroethane
	1.4 ป	UG/M3	1,1,1-Trichloroethane
	1.3 U	UG/M3	Trichloroethene (Trichloroethylene)
	1.4 U	UG/M3	1,1,2-Trichloroethane
	1.70	UG/M3	Tetrachloroethene (Tetrachloroethylene)

ChloroformJ qualified: value is >MDL but <MQL

Sample 9116 FY 2005

Production Date: 10/20/2005 12:03

Project: 05-0806

SPECIFIED TESTS

Facility, Paducah Gaseous Diffusion Plant (DOE) Paducah, KY

Program: SF

Id/Station: SVO-3 / 0052 Media: AMBIENT AIR

Produced by: Hale, Sallie Requestor: Williams Project Leader: TSLAGLE Beginning: 09/14/2005 15:09 Ending:

RESULTS UNITS ANALYTE

> NA UG/M3 Vinvl Chloride

NA UG/M3 1.1-Dichloroethene (1.1-Dichloroethylene)

NA UG/M3 1.1-Dichloroethane NA UG/M3 cis-1.2-Dichloroethene UG/M3 trans-1,2-Dichloroelhene lίΑ

ľΑ UG/M3 Chloroform

UG/M3 1.2-Dichloroethane ΝA MA UG/M3 1.1.1-Trichloroethane

NA UG/M3 Trichloroethene (Trichloroethylene)

NA UG/M3 1.1.2-Trichloroalhane

UG/M3 Tetrachloroethene (Tetrachloroethylene)

Empty carrister received

015/016

U-Analyte nit detected at or above reporting limit. | J-identification of analyte is acceptable; reported value is an estimate. | UJ-Analyte not detected at or above reporting limit. Reporting limit is an estimate. N-Presumptive evidence analyte is present; analyte reported as tentative identification. | NJ-Presumptive evidence analyte is present; analyte reported as tentative identification. Reported value is an estimate. K-Identification of analyte is acceptable; reported value may be biased high. Actual value expected to be less than the reported value.

E-Identification of analyte is acceptable; reported value may be biased low. Actual value expected to be greater than reported value.

NA-Not Analyzed. | NAI-Not Analyzed due to Interferences. | A-Inalyte analyzed in replicate. Reported value is "average" of replicates.

R-Fresence or absence of analyte can not be determined from data due to severe quality control problems. Data are rejected and considered unusable.

VOLATIELS SAMIFILE ANAL 1515	El M. Hadiolitte Capaliticiani	110000
On the Office To oppose the property of the oppose		Produced by: Hale, Sallie
Sample 9117 FY 2005 Project: 05-0806		Requestor: Williams
SPECIFIED TESTS		Project Leader: TSLAGLE
Facility: Paducah Gaseous Diffusion Plant (DOE) Paducah,	KY	Beginning: 09/14/2005 15:14
Program: SF		Ending:
ld/Station: SVO-B2 / 0037		-
Media: AMBIENT AIR		

UNITS	ANALYTE
UG/M3	Vinyl Chloride
UG/M3	1,1-Dichloroethene (1,1-Dichloroethylene)
UG/M3	1,1-Dichloroethane
UG/M3	cis-1,2-Dichloroethene
UG/M3	trans-1,2-Dichloroethene
UG/M3	Chloroform
UG/M3	1,2-Dichloroethane
UG/M3	1,1,1-Trichioroethane
UG/M 3	Trichloroethene (Trichloroethylene)
UG/M3	1,1,2-Trichloroethane
UG/M3	Tetrachloroethene (Tetrachloroethylene)
	UG/M3 UG/M3 UG/M3 UG/M3 UG/M3 UG/M3 UG/M3 UG/M3 UG/M3 UG/M3