Advantage Environmental Consultants, LLC

January 21, 2013

Mr. John Scherer
Maryland Department of the Environment
Air and Radiation Management Administration
Air Quality Permits Program
1800 Washington Boulevard
Baltimore, Maryland 21230

Re: **Request for Removal of Control Devices**
Gasoline Fueling Station – Royal Farms #96
500 Mechanics Valley Road
North East, Maryland 21901
Facility ID 13326
OCP Case No. 2011-0729-CE
MDE ARMA ID Numbers: 015-9-0191 and 015-9-0193
AEC Project # 05-056

Dear Mr. Scherer:

A Vapor Extraction / Groundwater Extraction (VE/GE) system has been operating since startup (December 11, 2012) at the above referenced site. This system was installed and activated under an emergency condition related to a significant petroleum release at the Site. Two control devices were subsequently attached to the effluent side of the system: a catalytic oxidizer and a series of vapor phase granular activated carbon (GAC) vessels. The Maryland Department of the Environment (MDE) Air and Radiation Management Administration (ARMA) issued permits for each control device identified as 015-9-0191 for the catalytic oxidizer and 015-9-0193 for the vapor phase GAC array.

Advantage Environmental Consultants, LLC (AEC) requests that the MDE allow the removal of the vapor control devices. It is our understanding that two criteria must be met in order to remove the control device including: (a) Both VOC and benzene emissions are decreasing over time; and (b) The maximum uncontrolled emissions of VOC are less than 20 pounds per day and benzene is less than 0.02 pounds per hour. These respective criteria will hereinafter be referred to as condition (a) and condition (b). This letter presents a review of field monitoring activities and results from laboratory sample analysis in support of AEC's request.

Catalytic Oxidizer Model 500E
ARMA ID Number: 015-9-0193

As required by the Air Quality General Permit to Construct for Soil Vapor Extraction Equipment, AEC has completed the pilot study at the above referenced site. During the system check/compliance visits, AEC measured air flow rates and vapor concentrations at the control device influent port (prior to the Air-water separator knock out tank and catalytic oxidizer), and at the control device effluent stack (after catalytic oxidizer). The air flow rates were measured with an Extech model 407119A Hot Wire Anemometer and the daily field vapor concentrations were measured with a MiniRAE 2000 portable Volatile Organic Compound (VOC) Monitor. This instrument is also known as a Photoionization Device (PID). On three occasions (December 13, January 2, and January 11) vapor samples were collected from the system and laboratory analyzed for VOCs per EPA Method 8260. These samples were collected in tedlar bags from the control device influent port prior to the Air-water separator knock out tank and catalytic oxidizer (sample ID: CO-In) and at the control device effluent stack (sample ID: CO-Eff). The samples were analyzed by Maryland Spectral Services in Baltimore, Maryland within the required method holding time and under strict chain-of-custody protocols. Tables summarizing flow, as well as, field and laboratory analyzed VOC measurements are included as Attachment A. Copies of the laboratory analytical results for the three tedlar bag sampling events are included as Attachment B.

With respect to condition (a), the field data (as summarized on the tables in Attachment A) shows a downward trend in influent PID measurements during the pilot study. When the system is optimized for maximum recovery (i.e. well settings are adjusted to focus recovery on wells which have historically exhibited greater VOC concentrations); higher corresponding influent values are observed. Although well settings were continually "optimized", influent levels to the catalytic oxidizer fell below the required levels within eleven days of beginning the pilot study and remained significantly below required levels for the duration of the study. The laboratory analytical data shows benzene concentration of influent air at 36.7 µg/l (0.0367 ppm) on December 13, 2012, 9.4 µg /l (0.0094 ppm) on January 2, 2013 and a level of 7.2 µg /l (0.0072 ppm) on January 11, 2013. As the system continues to operate, it is expected that levels of VOCs will decrease with time as the Site cleanup progresses.

With respect to condition (b), AEC has determined that mass of total VOCs prior to treatment by the catalytic oxidizer has declined to approximately 10 pounds per day (based on field data) and is expected to continue to decline. Total benzene prior to treatment by the catalytic oxidizer has declined to approximately 0.0004 pounds per day (based on laboratory data). These emission rates are below the required standard for uncontrolled emissions in Maryland for this type of discharge. A copy of the calculations used to determine the uncontrolled emission rates are presented in Attachment C.

Vapor phase GAC array with Blower model MKE SA60 HE-2
ARMA ID Number: 015-9-0191

The vapor phase GAC treatment has been operating in tandem with the VE/GE system since startup (December 11, 2012). Off gas from an air stripper unit associated with the VE/GE system is forced through the vapor Phase GAC array via an electrical blower (model #MKE SA60 HE-2). The vapor phase GAC treatment consists of two parallel treatment Legs (Leg-A and Leg-B) each consisting of two 150-lb vapor phase GAC units in series. An extra unit was placed onsite as a standby. During the system check/compliance visits, AEC measured air flow rates and vapor concentrations of the air stripper off gas prior to the control device and at the control device effluent stacks on Leg-A and Leg-B. The air flow rates were measured with an anemometer and the daily field vapor concentrations were measured with a PID. On three occasions (December 13, January 2, and January 11) vapor samples were collected from the system and laboratory analyzed for VOCs per EPA Method 8260. These samples were collected in tedlar bags from the control device influent port (sample ID: SE-In) and at the control device effluent stack on Leg-A (sample ID: SEA-

Eff) and Leg B (sample ID: SEB-Eff). The samples were analyzed by Maryland Spectral Services in Baltimore, Maryland within the required method holding time and under strict chain-of-custody protocols. Tables summarizing flow, as well as, field and laboratory analyzed VOC measurements are included as Attachment A. Copies of the laboratory analytical results for the three tedlar bag sampling events are included as Attachment B.

With respect to condition (a), the field data (as summarized on the tables in Attachment B) shows a downward trend to zero in influent PID measurements during the pilot study. The laboratory analytical data shows a benzene concentration of influent air of 7.06 µg/l (0.0007 ppm) on December 13, 2012, below detection limits on January 2, 2013 and a level of 0.21 µg /l (0.0002 ppm) on January 11, 2013.

With respect to condition (b), AEC has determined that the mass of total VOCs prior to treatment by the GAC has declined to zero (based on PID field data). Total benzene prior to treatment by the GAC has also declined to zero (based on laboratory data). Laboratory results from January 2 and January 11, 2013 show concentrations of VOCs near detection limits in samples prior to treatment by the vapor phase GAC array. These emission rates are well below the required standard for uncontrolled emissions in Maryland for this type of discharge. A copy of the calculations used to determine the uncontrolled emission rates are presented in Attachment C.

If you have any questions regarding the letter, please feel free to contact me at (301) 776-0500.

Sincerely,

ADVANTAGE ENVIRONMENTAL CONSULTANTS, LLC.

Jeffey Stein

Jeff Stein
Project Manager

Attachments

cc: T. Ruszin

Attachment A

Catalytic Oxidizer - Field Data Summary
Gasoline Fueling Station – Royal Farms #96
500 Mechanics Valley Road
North East, MD

Influent			
Date	**Air Flow (SCFM)**	**VOCs (PPM)**	**Pounds per day**
12/13/2012	150	508.0	32.126
12/14/2012	160	473.0	31.907
12/19/2012	152	449.0	28.774
12/20/2012	135	487.0	27.718
12/21/2012	115	436.0	21.139
12/24/2012	115	389.0	18.861
12/26/2013	105	350.0	15.494
12/28/2012	102	312.0	13.417
12/31/2012	110	307.0	14.238
1/2/2013	105	215.0	9.518
1/4/2013	105	212.0	9.385
1/7/2013	113	184.0	8.766
1/8/2013	116	241.0	11.786
1/11/2013	111	210.0	9.828

VOC readings obtained using Photoionization Detector
Airflow readings obtained using a Hot Wire Anemometer

Effluent			
Date	**Air Flow (SCFM)**	**VOCs (PPM)**	**Pounds per day**
12/13/2012	150	1.5	0.095
12/14/2012	160	0.0	0.000
12/19/2012	152	0.0	0.000
12/20/2012	135	0.7	0.040
12/21/2012	115	0.0	0.000
12/24/2012	115	0.0	0.000
12/26/2013	105	0.0	0.000
12/28/2012	102	0.0	0.000
12/31/2012	110	0.0	0.000
1/2/2013	105	0.0	0.000
1/4/2013	105	0.0	0.000
1/7/2013	113	0.0	0.000
1/8/2013	116	0.0	0.000
1/11/2013	121	0.0	0.000

Catalytic Oxidizer - Laboratory Results Summary
Gasoline Fueling Station – Royal Farms #96
500 Mechanics Valley Road
North East, MD

Benzene					
Date	**Sample Port**	**Air Flow (SCFM)**	**Total Benzene (PPM)**	**Pounds per day**	**Pounds per hour**
12/13/2012	Influent	150.00	0.0367	0.0023	0.000097
	Effluent	150.00	0.0000	0.0000	0.000000
1/2/2013	Influent	105.00	0.0094	0.0004	0.000017
	Effluent	105.00	0.0000	0.0000	0.000000
1/11/2013	Influent	111.00	0.0072	0.0003	0.000014
	Effluent	111.00	0.0000	0.0000	0.000000

Total VOCs					
Date	**Sample Port**	**Air Flow (SCFM)**	**Total VOCs (PPM)**	**Pounds per day**	**Pounds per hour**
12/13/2012	Influent	150.00	0.2680	0.0169	0.000706
	Effluent	150.00	0.0000	0.0000	0.000000
1/2/2013	Influent	105.00	0.2040	0.0090	0.000376
	Effluent	105.00	0.0000	0.0000	0.000000
1/11/2013	Influent	111.00	0.1630	0.0076	0.000318
	Effluent	111.00	0.0000	0.0000	0.000000

Airflow readings obtained using a Hot Wire Anemometer

Vapor Phase GAC - Field Data Summary
Gasoline Fueling Station – Royal Farms #96
500 Mechanics Valley Road
North East, MD

LEG A							
Influent				Effluent			
Date	**Air Flow (CFM)**	**VOCs (PPM)**	**Pounds per day**	**Date**	**Air Flow (CFM)**	**VOCs (PPM)**	**Pounds per day**
12/13/2012	138	7.8	0.454	12/13/2012	130	0.0	0.000
12/14/2012	129	8.1	0.441	12/14/2012	129	0.0	0.000
12/19/2012	103	4.9	0.213	12/19/2012	117	0.0	0.000
12/20/2012	125	5.0	0.264	12/20/2012	119	0.0	0.000
12/21/2012	118	21.3	1.060	12/21/2012	115	0.0	0.000
12/24/2012	166	2.7	0.189	12/24/2012	128	0.0	0.000
12/26/2013	122	4.2	0.216	12/26/2013	136	0.0	0.000
12/28/2012	125	0.0	0.000	12/28/2012	110	0.0	0.000
12/31/2012	120	0.0	0.000	12/31/2012	120	0.0	0.000
1/2/2013	120	0.0	0.000	1/2/2013	120	0.0	0.000
1/4/2013	120	0.0	0.000	1/4/2013	69	0.0	0.000
1/7/2013	120	0.0	0.000	1/7/2013	94	0.0	0.000
1/8/2013	123	0.0	0.000	1/8/2013	105	0.0	0.000
1/11/2013	114	0.0	0.000	1/11/2013	96	0.0	0.000

LEG B							
Influent				Effluent			
Date	**Air Flow (SCFM)**	**VOCs (PPM)**	**Pounds per day**	**Date**	**Air Flow (SCFM)**	**VOCs (PPM)**	**Pounds per day**
12/13/2012	130	7.7	0.422	12/13/2012	128	0.0	0.000
12/14/2012	132	8.7	0.484	12/14/2012	115	0.0	0.000
12/19/2012	117	4.7	0.232	12/19/2012	115	0.0	0.000
12/20/2012	123	4.6	0.239	12/20/2012	132	0.0	0.000
12/21/2012	111	17.9	0.838	12/21/2012	104	0.0	0.000
12/24/2012	142	2.0	0.120	12/24/2012	134	0.0	0.000
12/26/2013	135	3.9	0.222	12/26/2013	126	0.0	0.000
12/28/2012	117	0.0	0.000	12/28/2012	120	0.0	0.000
12/31/2012	120	0.0	0.000	12/31/2012	120	0.0	0.000
1/2/2013	120	0.0	0.000	1/2/2013	120	0.0	0.000
1/4/2013	113	0.0	0.000	1/4/2013	88	0.0	0.000
1/7/2013	117	0.0	0.000	1/7/2013	74	0.0	0.000
1/8/2013	115	0.0	0.000	1/8/2013	78	0.0	0.000
1/11/2013	100	0.0	0.000	1/11/2013	100	0.0	0.000

VOC readings obtained using Photoionization Detector
Airflow readings obtained using a Hot Wire Anemometer
Airflow rates on 1/2 and 1/4, 2013 were estimated due to malfunctioning equipment

Vapor Phase GAC - Laboratory Results Summary
Gasoline Fueling Station – Royal Farms #96
500 Mechanics Valley Road
North East, MD

Benzene						
Date	**Leg**	**Sample Port**	**Air Flow (SCFM)**	**Total Benzene (PPM)**	**Pounds per day**	**Pounds per hour**
12/13/2012	Leg A	Influent	138	0.0071	0.0004	0.000017
		Effluent	130	0.0000	0.0000	0.000000
	Leg B	Influent	130	0.0071	0.0004	0.000016
		Effluent	128	0.0000	0.0000	0.000000
1/2/2013	Leg A	Influent	120	0.0000	0.0000	0.000000
		Effluent	120	0.0000	0.0000	0.000000
	Leg B	Influent	120	0.0000	0.0000	0.000000
		Effluent	120	0.0000	0.0000	0.000000
1/11/2013	Leg A	Influent	114	0.0002	0.0000	0.000000
		Effluent	96	0.0000	0.0000	0.000000
	Leg B	Influent	100	0.0002	0.0000	0.000000
		Effluent	100	0.0000	0.0000	0.000000

Total VOCs						
Date	**Leg**	**Sample Port**	**Air Flow (SCFM)**	**Total VOCs (PPM)**	**Pounds per day**	**Pounds per hour**
12/13/2012	Leg A	Influent	138	0.0298	0.0017	0.000072
		Effluent	130	0.0000	0.0000	0.000000
	Leg B	Influent	130	0.0298	0.0016	0.000068
		Effluent	128	0.0000	0.0000	0.000000
1/2/2013	Leg A	Influent	120	0.0012	0.0001	0.000003
		Effluent	120	0.0000	0.0000	0.000000
	Leg B	Influent	120	0.0012	0.0001	0.000003
		Effluent	120	0.0000	0.0000	0.000000
1/11/2013	Leg A	Influent	114	0.0043	0.0002	0.000009
		Effluent	96	0.0000	0.0000	0.000000
	Leg B	Influent	100	0.0043	0.0002	0.000008
		Effluent	100	0.0000	0.0000	0.000000

Airflow readings obtained using a Hot Wire Anemometer
Airflow rates on 1/2/2013 were estimated due to malfunctioning equipment

Attachment B

Analytical Results

1500 Caton Center Dr Suite G
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www.mdspectral.com
VELAP ID 460040

SE = GAC Treatment
CO = Cat Ox Treatment

Project: **RF-96 PILOT STUDY**

Project Number: 05-056RF096 — Advantage Environmental Consultants, LLC

Project Manager: James Wolf — 8610 Baltimore Washington Blvd, Suite 217

Report Issued: 12/17/12 14:15 — Jessup MD, 20794

CLIENT SAMPLE ID:		SE-IN	SEA-MID	SEA-EFF	SEB-MID	SEB-EFF	CO-IN
LAB SAMPLE ID:		2121310-01	2121310-02	2121310-03	2121310-04	2121310-05	2121310-06
SAMPLE DATE:		12/13/12	12/13/12	12/13/12	12/13/12	12/13/12	12/13/12
RECEIVED DATE:		12/13/12	12/13/12	12/13/12	12/13/12	12/13/12	12/13/12
MATRIX	Units	Vapor	Vapor	Vapor	Vapor	Vapor	Vapor

VOLATILE ORGANICS BY EPA METHOD 8260B (GC/MS) (Vapor)

Acetone	ug/L	<2.50	<1.00	<1.00	<1.00	<1.00	<10.0
tert-Amyl alcohol (TAA)	ug/L	<5.00	<2.00	<2.00	<2.00	<2.00	<20.0
tert-Amyl methyl ether (TAME)	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
Benzene	ug/L	**7.06**	<0.50	<0.50	<0.50	<0.50	**36.7**
Bromobenzene	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
Bromochloromethane	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
Bromodichloromethane	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
Bromoform	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
Bromomethane	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
tert-Butanol (TBA)	ug/L	<3.75	<1.50	<1.50	<1.50	<1.50	<15.0
2-Butanone (MEK)	ug/L	<2.50	<1.00	<1.00	<1.00	<1.00	<10.0
n-Butylbenzene	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
sec-Butylbenzene	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
tert-Butylbenzene	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
Carbon disulfide	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
Carbon tetrachloride	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
Chlorobenzene	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
Chloroethane	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
Chloroform	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
Chloromethane	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
2-Chlorotoluene	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
4-Chlorotoluene	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
1,2-Dibromo-3-chloropropane	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
Dibromochloromethane	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
1,2-Dibromoethane (EDB)	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
Dibromomethane	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
1,2-Dichlorobenzene	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
1,3-Dichlorobenzene	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
1,4-Dichlorobenzene	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
Dichlorodifluoromethane	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
1,1-Dichloroethane	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
1,2-Dichloroethane	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
1,1-Dichloroethene	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
cis-1,2-Dichloroethene	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
trans-1,2-Dichloroethene	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
Dichlorofluoromethane	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00

Analytical Results

1500 Caton Center Dr Suite G
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410-247-7600
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VELAP ID 460040

Project: **RF-96 PILOT STUDY**

Project Number: 05-056RF096

Project Manager: James Wolf

Report Issued: 12/17/12 14:15

Advantage Environmental Consultants, LLC
8610 Baltimore Washington Blvd, Suite 217
Jessup MD, 20794

CLIENT SAMPLE ID:		SE-IN	SEA-MID	SEA-EFF	SEB-MID	SEB-EFF	CO-IN
LAB SAMPLE ID:		2121310-01	2121310-02	2121310-03	2121310-04	2121310-05	2121310-06
SAMPLE DATE:		12/13/12	12/13/12	12/13/12	12/13/12	12/13/12	12/13/12
RECEIVED DATE:		12/13/12	12/13/12	12/13/12	12/13/12	12/13/12	12/13/12
MATRIX	Units	Vapor	Vapor	Vapor	Vapor	Vapor	Vapor
VOLATILE ORGANICS BY EPA METHOD 8260B (GC/MS) (continued)							
1,2-Dichloropropane	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
1,3-Dichloropropane	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
2,2-Dichloropropane	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
1,1-Dichloropropene	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
cis-1,3-Dichloropropene	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
trans-1,3-Dichloropropene	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
Diisopropyl ether (DIPE)	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
Ethyl tert-butyl ether (ETBE)	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
Ethylbenzene	ug/L	**1.40**	<0.50	<0.50	<0.50	<0.50	**18.9**
Hexachlorobutadiene	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
2-Hexanone	ug/L	<2.50	<1.00	<1.00	<1.00	<1.00	<10.0
Isopropylbenzene (Cumene)	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
4-Isopropyltoluene	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
Methyl tert-butyl ether (MTBE)	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
4-Methyl-2-pentanone	ug/L	<2.50	<1.00	<1.00	<1.00	<1.00	<10.0
Methylene chloride	ug/L	<2.50	<1.00	<1.00	<1.00	<1.00	<10.0
Naphthalene	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
n-Propylbenzene	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
Styrene	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
1,1,1,2-Tetrachloroethane	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
1,1,2,2-Tetrachloroethane	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
Tetrachloroethene	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
Toluene	ug/L	**12.6**	<0.50	<0.50	<0.50	<0.50	**124**
1,2,3-Trichlorobenzene	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
1,2,4-Trichlorobenzene	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
1,1,1-Trichloroethane	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
1,1,2-Trichloroethane	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
Trichloroethene	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
Trichlorofluoromethane (Freon 11)	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
1,2,3-Trichloropropane	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
1,2,4-Trimethylbenzene	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	**12.2**
1,3,5-Trimethylbenzene	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	**22.2**
Vinyl chloride	ug/L	<1.25	<0.50	<0.50	<0.50	<0.50	<5.00
o-Xylene	ug/L	**2.67**	<0.50	<0.50	<0.50	<0.50	**19.5**
m- & p-Xylenes	ug/L	**6.05**	<0.50	<0.50	<0.50	<0.50	**68.7**

Analytical Results

1500 Caton Center Dr Suite G
Baltimore MD 21227
410-247-7600
www.mdspectral.com
VELAP ID 460040

Project: **RF-96 PILOT STUDY**

Project Number: 05-056RF096

Project Manager: James Wolf

Report Issued: 12/17/12 14:15

Advantage Environmental Consultants, LLC
8610 Baltimore Washington Blvd, Suite 217
Jessup MD, 20794

CLIENT SAMPLE ID:		CO-EFF
LAB SAMPLE ID:		2121310-07
SAMPLE DATE:		12/13/12
RECEIVED DATE:		12/13/12
MATRIX	Units	Vapor

VOLATILE ORGANICS BY EPA METHOD 8260B (GC/MS) (Vapor)

Acetone	ug/L	<1.00
tert-Amyl alcohol (TAA)	ug/L	<2.00
tert-Amyl methyl ether (TAME)	ug/L	<0.50
Benzene	ug/L	<0.50
Bromobenzene	ug/L	<0.50
Bromochloromethane	ug/L	<0.50
Bromodichloromethane	ug/L	<0.50
Bromoform	ug/L	<0.50
Bromomethane	ug/L	<0.50
tert-Butanol (TBA)	ug/L	<1.50
2-Butanone (MEK)	ug/L	<1.00
n-Butylbenzene	ug/L	<0.50
sec-Butylbenzene	ug/L	<0.50
tert-Butylbenzene	ug/L	<0.50
Carbon disulfide	ug/L	<0.50
Carbon tetrachloride	ug/L	<0.50
Chlorobenzene	ug/L	<0.50
Chloroethane	ug/L	<0.50
Chloroform	ug/L	<0.50
Chloromethane	ug/L	<0.50
2-Chlorotoluene	ug/L	<0.50
4-Chlorotoluene	ug/L	<0.50
1,2-Dibromo-3-chloropropane	ug/L	<0.50
Dibromochloromethane	ug/L	<0.50
1,2-Dibromoethane (EDB)	ug/L	<0.50
Dibromomethane	ug/L	<0.50
1,2-Dichlorobenzene	ug/L	<0.50
1,3-Dichlorobenzene	ug/L	<0.50
1,4-Dichlorobenzene	ug/L	<0.50
Dichlorodifluoromethane	ug/L	<0.50
1,1-Dichloroethane	ug/L	<0.50
1,2-Dichloroethane	ug/L	<0.50
1,1-Dichloroethene	ug/L	<0.50
cis-1,2-Dichloroethene	ug/L	<0.50
trans-1,2-Dichloroethene	ug/L	<0.50
Dichlorofluoromethane	ug/L	<0.50

Analytical Results

1500 Caton Center Dr Suite G
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VELAP ID 460040

Project: **RF-96 PILOT STUDY**

Project Number: 05-056RF096

Project Manager: James Wolf

Report Issued: 12/17/12 14:15

Advantage Environmental Consultants, LLC
8610 Baltimore Washington Blvd, Suite 217
Jessup MD, 20794

CLIENT SAMPLE ID:		CO-EFF
LAB SAMPLE ID:		2121310-07
SAMPLE DATE:		12/13/12
RECEIVED DATE:		12/13/12
MATRIX	Units	Vapor

VOLATILE ORGANICS BY EPA METHOD 8260B (GC/MS) (continued)

1,2-Dichloropropane	ug/L	<0.50
1,3-Dichloropropane	ug/L	<0.50
2,2-Dichloropropane	ug/L	<0.50
1,1-Dichloropropene	ug/L	<0.50
cis-1,3-Dichloropropene	ug/L	<0.50
trans-1,3-Dichloropropene	ug/L	<0.50
Diisopropyl ether (DIPE)	ug/L	<0.50
Ethyl tert-butyl ether (ETBE)	ug/L	<0.50
Ethylbenzene	ug/L	<0.50
Hexachlorobutadiene	ug/L	<0.50
2-Hexanone	ug/L	<1.00
Isopropylbenzene (Cumene)	ug/L	<0.50
4-Isopropyltoluene	ug/L	<0.50
Methyl tert-butyl ether (MTBE)	ug/L	<0.50
4-Methyl-2-pentanone	ug/L	<1.00
Methylene chloride	ug/L	<1.00
Naphthalene	ug/L	<0.50
n-Propylbenzene	ug/L	<0.50
Styrene	ug/L	<0.50
1,1,1,2-Tetrachloroethane	ug/L	<0.50
1,1,2,2-Tetrachloroethane	ug/L	<0.50
Tetrachloroethene	ug/L	<0.50
Toluene	ug/L	<0.50
1,2,3-Trichlorobenzene	ug/L	<0.50
1,2,4-Trichlorobenzene	ug/L	<0.50
1,1,1-Trichloroethane	ug/L	<0.50
1,1,2-Trichloroethane	ug/L	<0.50
Trichloroethene	ug/L	<0.50
Trichlorofluoromethane (Freon 11)	ug/L	<0.50
1,2,3-Trichloropropane	ug/L	<0.50
1,2,4-Trimethylbenzene	ug/L	<0.50
1,3,5-Trimethylbenzene	ug/L	<0.50
Vinyl chloride	ug/L	<0.50
o-Xylene	ug/L	<0.50
m- & p-Xylenes	ug/L	<0.50

CHAIN-OF-CUSTODY RECORD

Maryland Spectral Services, Inc.
1500 Caton Center Drive, Suite G
Baltimore, MD 21227
410-247-7600 • Fax 410-247-7602
labman@mdspectral.com

Company Name: AEC
Project Manager: J. Wolf
Project Name: RF-96 Pilot Study
Project ID: 05-056RF096
Sampler(s): Wolf
P.O. Number: 05-056RF096

Field Sample ID	Date	Time	Water	Soil	Other	No. of Containers	VOCs via 8260	Preservative/Remarks	MSS Lab ID
SE - In	12.13.12	12:30			X	1	X		2121310-01
SEA - Mid	↓	12:16			↓	↓	X		02
SEA - Eff	↓	12:10			↓	↓	X		03
SEB - Mid	↓	12:13			↓	↓	X		04
SEB - Eff	↓	12:05			↓	↓	X		05
CO - In	↓	12:35			↓	↓	X		06
CO - Eff	↓	12:20			↓	↓	X		07

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
[signature] (Printed) James Wolf	12.13.12 17:44	[signature] (Printed) S Hamner	(Printed)		(Printed)

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Remarks
(Printed)		(Printed)		Results to J Stein, J Wolf

Page 1 of 1

MSS-F001-0309

Maryland spectral Services

Analytical Chemistry Services

Analytical Results

1500 Caton Center Dr Suite G
Baltimore MD 21227
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VELAP ID 460040

Project: **RF-96 SYSTEM**

SE = GAC Treatment
CO = Cat Ox Treatment

Project Number: 05-056RF096

Advantage Environmental Consultants, LLC

Project Manager: James Wolf

8610 Baltimore Washington Blvd, Suite 217

Report Issued: 01/03/13 17:39

Jessup MD, 20794

CLIENT SAMPLE ID:		SE-IN	SEA-EFF	SEB-EFF	CO-IN	CO-EFF
LAB SAMPLE ID:		3010203-01	3010203-02	3010203-03	3010203-04	3010203-05
SAMPLE DATE:		01/02/13	01/02/13	01/02/13	01/02/13	01/02/13
RECEIVED DATE:		01/02/13	01/02/13	01/02/13	01/02/13	01/02/13
MATRIX	Units	Vapor	Vapor	Vapor	Vapor	Vapor

VOLATILE ORGANICS BY EPA METHOD 8260B (GC/MS) (Vapor)

Acetone	ug/L	<1.00	<1.00	<1.00	<5.00	<1.00
tert-Amyl alcohol (TAA)	ug/L	<2.00	<2.00	<2.00	<10.0	<2.00
tert-Amyl methyl ether (TAME)	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
Benzene	ug/L	<0.50	<0.50	<0.50	**9.35**	<0.50
Bromobenzene	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
Bromochloromethane	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
Bromodichloromethane	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
Bromoform	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
Bromomethane	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
tert-Butanol (TBA)	ug/L	<1.50	<1.50	<1.50	<7.50	<1.50
2-Butanone (MEK)	ug/L	<1.00	<1.00	<1.00	<5.00	<1.00
n-Butylbenzene	ug/L	<0.50	<0.50	<0.50	**1.20 [1]**	<0.50
sec-Butylbenzene	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
tert-Butylbenzene	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
Carbon disulfide	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
Carbon tetrachloride	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
Chlorobenzene	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
Chloroethane	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
Chloroform	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
Chloromethane	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
2-Chlorotoluene	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
4-Chlorotoluene	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
1,2-Dibromo-3-chloropropane	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
Dibromochloromethane	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
1,2-Dibromoethane (EDB)	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
Dibromomethane	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
1,2-Dichlorobenzene	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
1,3-Dichlorobenzene	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
1,4-Dichlorobenzene	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
Dichlorodifluoromethane	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
1,1-Dichloroethane	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
1,2-Dichloroethane	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
1,1-Dichloroethene	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
cis-1,2-Dichloroethene	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
trans-1,2-Dichloroethene	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
Dichlorofluoromethane	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50

1 = Detected but below the reporting limit; therefore, result is an estimated concentration (CLP J-Flag).

Maryland spectral Services

Analytical Chemistry Services

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VELAP ID 460040

Analytical Results

Project: **RF-96 SYSTEM**

Project Number: 05-056RF096

Project Manager: James Wolf

Report Issued: 01/03/13 17:39

Advantage Environmental Consultants, LLC
8610 Baltimore Washington Blvd, Suite 217
Jessup MD, 20794

CLIENT SAMPLE ID:		SE-IN	SEA-EFF	SEB-EFF	CO-IN	CO-EFF
LAB SAMPLE ID:		3010203-01	3010203-02	3010203-03	3010203-04	3010203-05
SAMPLE DATE:		01/02/13	01/02/13	01/02/13	01/02/13	01/02/13
RECEIVED DATE:		01/02/13	01/02/13	01/02/13	01/02/13	01/02/13
MATRIX	Units	Vapor	Vapor	Vapor	Vapor	Vapor
VOLATILE ORGANICS BY EPA METHOD 8260B (GC/MS) (continued)						
1,2-Dichloropropane	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
1,3-Dichloropropane	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
2,2-Dichloropropane	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
1,1-Dichloropropene	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
cis-1,3-Dichloropropene	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
trans-1,3-Dichloropropene	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
Diisopropyl ether (DIPE)	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
Ethyl tert-butyl ether (ETBE)	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
Ethylbenzene	ug/L	<0.50	<0.50	<0.50	**18.5**	<0.50
Hexachlorobutadiene	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
2-Hexanone	ug/L	<1.00	<1.00	<1.00	<5.00	<1.00
Isopropylbenzene (Cumene)	ug/L	<0.50	<0.50	<0.50	**1.50 [1]**	<0.50
4-Isopropyltoluene	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
Methyl tert-butyl ether (MTBE)	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
4-Methyl-2-pentanone	ug/L	<1.00	<1.00	<1.00	<5.00	<1.00
Methylene chloride	ug/L	<1.00	<1.00	<1.00	<5.00	<1.00
Naphthalene	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
n-Propylbenzene	ug/L	<0.50	<0.50	<0.50	**4.58**	<0.50
Styrene	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
1,1,1,2-Tetrachloroethane	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
1,1,2,2-Tetrachloroethane	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
Tetrachloroethene	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
Toluene	ug/L	**0.33 [1]**	<0.50	<0.50	**66.3**	<0.50
1,2,3-Trichlorobenzene	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
1,2,4-Trichlorobenzene	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
1,1,1-Trichloroethane	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
1,1,2-Trichloroethane	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
Trichloroethene	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
Trichlorofluoromethane (Freon 11)	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
1,2,3-Trichloropropane	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
1,2,4-Trimethylbenzene	ug/L	**0.21 [1]**	<0.50	<0.50	**20.3**	<0.50
1,3,5-Trimethylbenzene	ug/L	<0.50	<0.50	<0.50	**7.32**	<0.50
Vinyl chloride	ug/L	<0.50	<0.50	<0.50	<2.50	<0.50
o-Xylene	ug/L	**0.21 [1]**	<0.50	<0.50	**25.8**	<0.50
m- & p-Xylenes	ug/L	**0.47 [1]**	<0.50	<0.50	**76.7**	<0.50

1 = Detected but below the reporting limit; therefore, result is an estimated concentration (CLP J-Flag).

CHAIN-OF-CUSTODY RECORD

Maryland Spectral Services, Inc.
1500 Caton Center Drive, Suite G
Baltimore, MD 21227
410-247-7600 • Fax 410-247-7602
labman@mdspectral.com

Company Name: AEL	Project Manager: J. Wolf
Project Name: RF-96	Project ID: 05-056RF096
Sampler(s): Wolf	P.O. Number: 05.056RF096

Field Sample ID	Date	Time	Water	Soil	Other	No. of Containers	Vol Scan 8260 (Parameters)	Preservative/Remarks	MSS Lab ID
SE-In	1.2.13	09:55			X	1	X	Tedlar bag	3010203-01
SEA-Eff	↓	09:50			X	1	X	↓	-02
SEB-Eff	↓	09:57			X	1	X	↓	-03
CO-In	↓	10:00			X	1	X	↓	-04
CO-Eff	↓	10:10			X	1	X	↓	-05

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
[signature] (Printed) James Wolf	1/2/13 1300	[signature] (Printed) William Brewington	(Printed)		(Printed)

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Remarks
(Printed)		(Printed)		Results to J.Stein, J.Wolf

Page 1 of 1

MSS-F001-0309

Maryland Spectral Services

Analytical Chemistry Services

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VELAP ID 460040

Analytical Results

Project: **RF-96 PILOT STUDY**

Project Number: 05-056RF096

Project Manager: James Wolf

Report Issued: 01/14/13 11:51

SE = GAC Treatment
CO = Cat Ox Treatment

Advantage Environmental Consultants, LLC
8610 Baltimore Washington Blvd, Suite 217
Jessup MD, 20794

CLIENT SAMPLE ID:		SE-IN	SEA-EFF	SEB-EFF	CO-IN	CO-EFF
LAB SAMPLE ID:		3011102-01	3011102-02	3011102-03	3011102-04	3011102-05
SAMPLE DATE:		01/11/13	01/11/13	01/11/13	01/11/13	01/11/13
RECEIVED DATE:		01/11/13	01/11/13	01/11/13	01/11/13	01/11/13
MATRIX	Units	Vapor	Vapor	Vapor	Vapor	Vapor

VOLATILE ORGANICS BY EPA METHOD 8260B (GC/MS) (Vapor)

Acetone	ug/L	<1.00	<1.00	<1.00	<10.0	<1.00
tert-Amyl alcohol (TAA)	ug/L	<2.00	<2.00	<2.00	<20.0	<2.00
tert-Amyl methyl ether (TAME)	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
Benzene	ug/L	**0.21 [1]**	<0.50	<0.50	**7.21**	<0.50
Bromobenzene	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
Bromochloromethane	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
Bromodichloromethane	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
Bromoform	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
Bromomethane	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
tert-Butanol (TBA)	ug/L	<1.50	<1.50	<1.50	<15.0	<1.50
2-Butanone (MEK)	ug/L	<1.00	<1.00	<1.00	<10.0	<1.00
n-Butylbenzene	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
sec-Butylbenzene	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
tert-Butylbenzene	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
Carbon disulfide	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
Carbon tetrachloride	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
Chlorobenzene	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
Chloroethane	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
Chloroform	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
Chloromethane	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
2-Chlorotoluene	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
4-Chlorotoluene	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
1,2-Dibromo-3-chloropropane	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
Dibromochloromethane	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
1,2-Dibromoethane (EDB)	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
Dibromomethane	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
1,2-Dichlorobenzene	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
1,3-Dichlorobenzene	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
1,4-Dichlorobenzene	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
Dichlorodifluoromethane	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
1,1-Dichloroethane	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
1,2-Dichloroethane	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
1,1-Dichloroethene	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
cis-1,2-Dichloroethene	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
trans-1,2-Dichloroethene	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
Dichlorofluoromethane	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50

1 = Detected but below the reporting limit; therefore, result is an estimated concentration (CLP J-Flag).

Maryland Spectral Services

Analytical Chemistry Services

Analytical Results

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VELAP ID 460040

Project: **RF-96 PILOT STUDY**

Project Number: 05-056RF096

Project Manager: James Wolf

Report Issued: 01/14/13 11:51

Advantage Environmental Consultants, LLC
8610 Baltimore Washington Blvd, Suite 217
Jessup MD, 20794

CLIENT SAMPLE ID:		SE-IN	SEA-EFF	SEB-EFF	CO-IN	CO-EFF
LAB SAMPLE ID:		3011102-01	3011102-02	3011102-03	3011102-04	3011102-05
SAMPLE DATE:		01/11/13	01/11/13	01/11/13	01/11/13	01/11/13
RECEIVED DATE:		01/11/13	01/11/13	01/11/13	01/11/13	01/11/13
MATRIX	Units	Vapor	Vapor	Vapor	Vapor	Vapor

VOLATILE ORGANICS BY EPA METHOD 8260B (GC/MS) (continued)

Analyte	Units	SE-IN	SEA-EFF	SEB-EFF	CO-IN	CO-EFF
1,2-Dichloropropane	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
1,3-Dichloropropane	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
2,2-Dichloropropane	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
1,1-Dichloropropene	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
cis-1,3-Dichloropropene	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
trans-1,3-Dichloropropene	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
Diisopropyl ether (DIPE)	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
Ethyl tert-butyl ether (ETBE)	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
Ethylbenzene	ug/L	**0.22 [1]**	<0.50	<0.50	**13.3**	<0.50
Hexachlorobutadiene	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
2-Hexanone	ug/L	<1.00	<1.00	<1.00	<10.0	<1.00
Isopropylbenzene (Cumene)	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
4-Isopropyltoluene	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
Methyl tert-butyl ether (MTBE)	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
4-Methyl-2-pentanone	ug/L	<1.00	<1.00	<1.00	<10.0	<1.00
Methylene chloride	ug/L	<1.00	<1.00	<1.00	<10.0	<1.00
Naphthalene	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
n-Propylbenzene	ug/L	<0.50	<0.50	<0.50	**4.13 [1]**	<0.50
Styrene	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
1,1,1,2-Tetrachloroethane	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
1,1,2,2-Tetrachloroethane	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
Tetrachloroethene	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
Toluene	ug/L	**0.96**	<0.50	<0.50	**55.3**	<0.50
1,2,3-Trichlorobenzene	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
1,2,4-Trichlorobenzene	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
1,1,1-Trichloroethane	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
1,1,2-Trichloroethane	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
Trichloroethene	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
Trichlorofluoromethane (Freon 11)	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
1,2,3-Trichloropropane	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
1,2,4-Trimethylbenzene	ug/L	**0.61**	<0.50	<0.50	**18.3**	<0.50
1,3,5-Trimethylbenzene	ug/L	**0.68**	<0.50	<0.50	**31.4**	<0.50
Vinyl chloride	ug/L	<0.50	<0.50	<0.50	<5.00	<0.50
o-Xylene	ug/L	**0.50 [1]**	<0.50	<0.50	**22.4**	<0.50
m- & p-Xylenes	ug/L	**1.07**	<0.50	<0.50	**64.8**	<0.50

1 = Detected but below the reporting limit; therefore, result is an estimated concentration (CLP J-Flag).

Advantage Environmental Consultants, LLC
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Environmental Sample Chain-of-Custody Record

CLIENT: AEC
TURN-AROUND TIME: Standard
Job Number: 05-056RF096
Site: RF-96
Sampler (s):
Report to: J Wolf

Analyses Requested: VOC Scan 8260

Sample ID	Date	Time	Comp	Grab	Matrix	Preserv. pH	~~#~~ Bottles	VOC Scan 8260						Comments	VOA ONLY Air Bubbles (Y or N)	pH	TPH Chlorine Check Na2S2O3	
SE - In	1.11.13	09:40		X	Air		tedlar	X										3011102-01
SEA - Eff		09:36		X	↓		bags	X										-02
SEB - Eff		09:38		X	↓		↓	X										-03
CO - In		09:46		X	↓		↓	X										-04
CO - Eff		09:43		X	↓		↓	X										-05

Section to be completed by Laboratory
Initials:
Temp:
Custody seal: Y N
Sample Storage:

Relinquished By:	Date/Time	Received By:	Date/Time
James Wolf [signature]	1.11.13 11 46	[signature]	

Results to J Stein J Wolf

~~# 9~~

Attachment C

Exhibit 2

Sample Method for Calculating Contaminant Mass Loading

Contaminant mass loading for water and air can be calculated for each chemical constituent in the extracted water with the same basic equation. However, the units and conversion factors are different for air than they are for water. To find the total mass loading for a class of constituents (e.g., VOCs), the mass loading for that class of constituents can be calculated by summing the mass loading rates for the individual constituents.

For Water:

$$M_{H_2O} = Q_{H_2O} \times C_{H_2O} \times \frac{3.785\ \text{L}}{\text{gallon}} \times \frac{1440\ \text{min.}}{\text{day}} \times \frac{2.2\ \text{lbs.}}{10^9\ \text{ug}}$$

M_{H_2O} = mass loading in water (lbs / day)

Q_{H_2O} = flow rate in water (gpm)

C_{H_2O} = contaminant concentration (ug / L)

For Air:

$$M_{air} = Q_{air} \times C_{air} \times \frac{0.0283\ \text{m}^3}{\text{ft}^3} \times \frac{1440\ \text{min.}}{\text{day}} \times \frac{2.2\ \text{lbs.}}{10^6\ \text{mg}}$$

M_{air} = mass loading in air (lbs / day)

Q_{air} = flow rate in air (cfm)

C_{air} = contaminant concentration (mg / m^3)

For air calculations, C_{air} in mg/m^3 (with molecular weight, MW_X, in grams per mole) can be obtained at 70°F and a pressure of 1 atmosphere from parts per million by volume (ppmv) by the following steps:

$$C_{air}(mg/m^3) = \frac{Conc(ppmv)}{10^6} \times \frac{1\ \text{mole air}}{24.1\ \text{L}} \times \frac{1000\ \text{L}}{\text{m}^3} \times \frac{1000\ \text{mg}}{\text{g}} \times MW_X$$

Note: The conversion factor (1 mole air)/(24.1 L) varies with both temperature and pressure. At a pressure of 1 atmosphere and a temperature of 32°F (0°C), the conversion is (1 mole air)/(22.4 L).

Approximate Molecular Weights (MW) in grams/mole of Common Volatile Organic Compounds (VOCs)

Benzene: 78	DCE: 97	TCE: 131
Carbon tetrachloride: 154	Ethylbenzene: 106	Toluene: 92
Chlorobenzene: 113	PCE: 166	Vinyl chloride: 62.5
DCA: 99	TCA: 133	Xylene: 106

Basing the influent concentrations on samples obtained during sustained pumping is particularly cost-effective if traditional monitoring well sampling techniques yield organic contaminants with concentrations >1% of their solubility or naturally occurring inorganic compounds are present at levels that may need treatment. In both cases, concentrations under sustained pumping may be sufficiently low compared to traditional monitoring well sampling results to allow for more cost-effective treatment options.

Non-Aqueous Phase Liquid (NAPL)

The presence of NAPL (or even evidence that suggests the presence of NAPL) in the subsurface complicates remedial system design. NAPL can be found in three general types at impacted sites:

- lighter than water NAPL (LNAPL), such as gasoline
- denser than water NAPL (DNAPL), such as chlorinated solvents
- NAPL that has a similar specific gravity to water, such as coal tar, that may be difficult to separate from extracted water by gravity

In addition, NAPL can be found as either free product or as residual product. Free product moves in a separate phase from water and is recoverable via extraction whereas residual product is trapped in the pore spaces. Both free and residual NAPL serve as continuing sources of contamination to the dissolved contaminant ground water plume.

The presence of free LNAPL may impact extraction and treatment component selection. If free LNAPL is present in monitoring wells, it is an indication that LNAPL is also present in the formation around the well, and recovery tests using pumps or bailers should

Table 7-4
Total Hydrocarbon Air Emission Calculations

$ER = [(Q \times C \times MW \times 2.68 \times 10^{-3})\ (kg/1000g)]$

where

ER = emission rate (kg/hr)

Q = blower pumping rate (m3/min)

C = soil gas concentration (ppm-v)

MW = molecular weight of contaminant (g/g mole)

The constant (2.68×10^{-3}) has units of [(g-mole min)/m^3 ppm-v-hr)] and was derived in the following manner:

$[(1/10^{6}\ \text{ppm-v}) \times (60\ \text{min}/1\ \text{hr}) \times (1\text{g-mole}/0.0224\ m^3)] = 2.68 \times 10^{-3}$

<u>CALCULATIONS</u>

Q = 7.08 m^3/min

C = 302 ppm-v (total hydrocarbons)

MW = 177 g/g mole (weathered gasoline, USEPA, 1991)

ER = $[(7.08 \times 302 \times (1.77 \times 10^{2}) \times (2.68 \times 10^{-3}) \times 1/1000)]$

ER = 1.01 Kg/hr

ER = 24.2 Kg/day

Source: after USEPA 1989d

The equation above is based on the following assumptions:

1) Standard temperature (0°C) and pressure (one atmosphere, or 760 mmHg)
2) Negligible change in air density
3) Constant concentration
4) Constant average molecular weight