GEODESIGN INC

Memorandum

To:	Kevin Dana	From:	Andrew S. Blake, R.G.
Company:	Oregon Department of Environmental Quality Northwest Region	Date:	August 6, 2015
Address:	700 NE Multnomah Street Suite 600 Portland, OR 97232		

cc:	Mark Desbrow, Green Light Development (via email only) Chris Wohlers, Wohlers Environmental Services, Inc. (via email only) Mark Schick, ARM Property Management (via email only)

GDI Project:	GreenLight-3-02
RE:	Soil Vapor Evaluation 2721 - 2731 SE Belmont Street Portland, Oregon

INTRODUCTION

This memorandum summarizes the results of our soil vapor evaluation completed at the former Washworld facility located at 2721 - 2731 SE Belmont Street in Portland, Oregon (project site). The project site includes a vacant commercial structure that was historically occupied by a dry-cleaning facility. During its operation, dry-cleaning solvents containing halogenated volatile organic compounds (HVOCs), primarily tetrachloroethylene (PCE), were released into the subsurface and impacted soil, groundwater, soil-gas, and indoor air at the project site.

Prior environmental work was completed at the project site by Wohlers Environmental Services, Inc. (Wohlers), which led to the enrollment of the project site into the Oregon Department of Environmental Quality (DEQ) Voluntary Cleanup Program (File No. 5731) via the Independent Cleanup Pathway. As in interim remedial action measure, a vapor extraction system (VES) was installed and activated at the project site. Based on our review of work completed by Wohlers, the environmental condition of the project site is summarized as follows:

- PCE is present in soil and groundwater at concentrations that are currently protective of human health and the environment.
- Prior to activation of the VES, indoor air and soil-gas samples contained high concentrations of PCE. The VES reduced the concentration of PCE in indoor air to acceptable levels for occupational receptors.

The project site is bound directly to the west and north by residential properties and to the east and south by SE 28th Avenue and SE Belmont Street (respectively), across which are residential properties. To evaluate whether the release of HVOCs has caused a potential adverse vapor intrusion condition

to the surrounding residential properties, GeoDesign collected soil vapor samples near the perimeter of the project site. A vicinity map for the project site is provided on Figure 1. The project site layout is shown on Figure 2.

FIELD ACTIVITIES

One week prior to sampling, the VES was deactivated to allow subsurface vapor conditions to equilibrate. A total of four soil vapor samples (SV-01 through SV-04) were collected near the boundaries of the project site as shown on Figure 2.

Each sample was collected using new Teflon tubing, which was attached to an AMS Retract-A-Tip Gas Vapor Probe that was decontaminated on site with a trisodium phosphate solution and a heat gun. Following decontamination, each probe was driven to a depth of 5 feet below ground surface using a roto-hammer drill, then retracted approximately 4 to 6 inches. The annular space between the probe and the ground surface was sealed with hydrated bentonite.

A leak check system was installed over the sampling train consisting of a plastic shroud charged with helium. The dead air was then purged from the system using a photoionization detector at less than 200 milliliters per minute. During this time, helium concentrations were measured to verify that the sample train was airtight. In each case, in-line helium concentrations were less than 1 percent of the shroud concentration. A pressure test was also completed to verify that each fitting was air-tight prior to sample collection. Approximately 30 minutes after purging the sampling train, the samples were collected in laboratory-supplied 1-liter Summa canisters equipped with flow controllers.

CHEMICAL ANALYTICAL PROGRAM AND RESULTS

All samples were submitted to ESC Lab Sciences of Mt. Juliet, Tennessee, for analysis of HVOCs by U.S. Environmental Protection Agency (EPA) Method TO-15. The chemical analytical results are presented in Table 1 and discussed in the following section. The chemical analytical laboratory report and chain-of-custody documentation are provided in the Attachment.

HVOCs

All four soil vapor samples were analyzed for the HVOCs cis-1,2-dichloroethene, trans-1,2-dichloroethene, PCE, trichloroethene (TCE), and vinyl chloride by EPA Method TO-15. The results are as follows:

- PCE was detected in sample SV-01 at a concentration of 5,500 micrograms per cubic meter (µg/m^3), which is greater than generic DEQ Residential and Urban Residential risk-based concentrations (RBCs) for vapor intrusion into buildings (1,900 µg/m^3 and 5,100 µg/m^3, respectively), but less than the Occupational RBC for vapor intrusion into buildings (47,000 µg/m^3).
- PCE was detected in sample SV-02 at a concentration of 95,000-µg/m^3, which is greater than all three of the above-noted RBCs.

- PCE was detected in samples SV-03 and SV-04 at concentrations less than the most conservative RBC.
- The remaining HVOCs were not detected at concentrations greater than their respective laboratory reported detection limits (RDLs) in the samples analyzed.

CONCLUSION

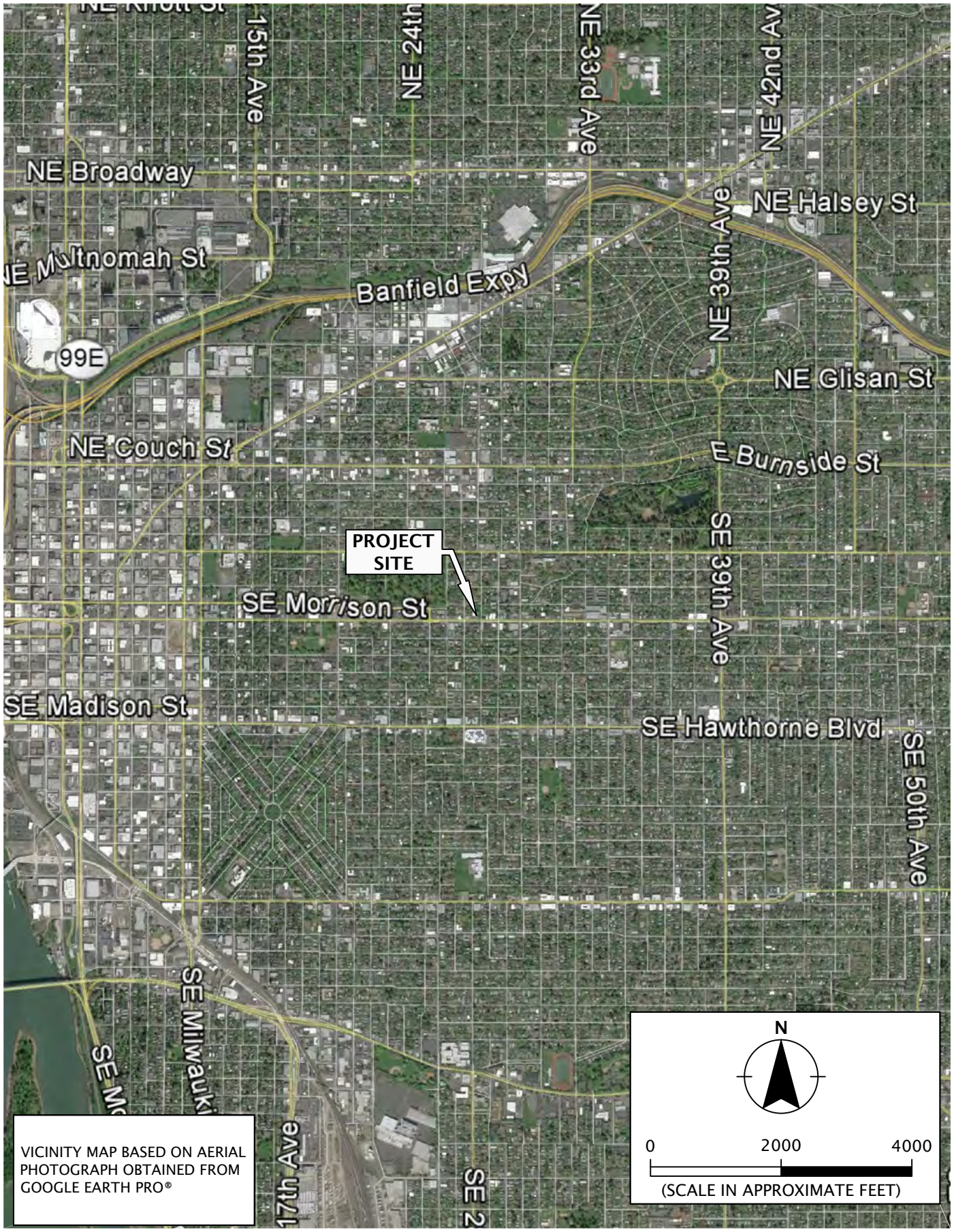
Based on the results of our assessment, it is our professional opinion that the following conclusions can be inferred:

- PCE was not detected at concentrations greater than the most conservative DEQ vapor intrusion RBCs in the soil vapor samples collected near the northern and eastern boundaries of the project site, which indicates that the risk of an adverse vapor intrusion condition to adjoining properties to the north and east is low.
- PCE was detected in the soil vapor sample collected near the southern boundary of the project site at a concentration greater than all DEQ generic vapor intrusion RBCs. However, the southern portion of the project site is bound by SE Belmont Street to the south, which is topographically lower than the residential property located across the street. Based on this information, it is unlikely that PCE from the project site would have migrated across SE Belmont Street to the nearest (anticipated up-gradient) residential property to the south.
- PCE was detected in the soil vapor sample collected near the western boundary of the project site at a concentration greater than the DEQ Residential and Urban Residential RBCs, but less than the Occupational RBC. This information indicates that soil vapor conditions could currently be protective of future occupational receptors at the project site, but could pose a risk to the urban residential property adjoining the project site to the west. The VES was reactivated shortly after this sample was collected. Although the VES has been shown to effectively reduce PCE concentrations in indoor air at the project site, it is not known if the VES prevents off-site migration of soil vapors.

We recommend continued operation of the VES. Upon reviewing this document, we would like to schedule a meeting to discuss options to pursue closure prior to site redevelopment.

KMC:ASB:JSO:kt
Attachments
One copy submitted
Document ID: GreenLight-3-02-080615-envm.docx

FIGURES



GeoDesign Inc
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Portland OR 97224
Off 503.968.8787 Fax 503.968.3068

GREENLIGHT-3-02	**VICINITY MAP**	
AUGUST 2015	2721 - 2731 SE BELMONT STREET PORTLAND, OR	**FIGURE 1**

Printed By: aday | Print Date: 8/6/2015 8:10:01 AM
File Name: J:\E-L\greenlight\greenlight-3\greenlight-3-02\Figures\CAD\GreenLight-3-02-VM01.dwg | Layout: FIGURE 1

LEGEND:

SV-01 (5,500 µg/m3) — SOIL VAPOR SAMPLE (CONCENTRATION OF PCE)

N

0 40 80

(SCALE IN FEET)

SITE PLAN BASED ON AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH PRO®, JULY 28, 2015

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GREENLIGHT-3-02	**SITE PLAN**	
AUGUST 2015	2721 - 2731 SE BELMONT STREET PORTLAND, OR	**FIGURE 2**

TABLES

TABLE 1
Summary of Vapor Sample Chemical Analytical Results[1]
HVOCs
2721 - 2731 SE Belmont Street
Portland, Oregon

Sample I.D.	Sample Date	Sample Depth (feet)	HVOCs by EPA Method TO-15 ($\mu g/m^3$)				
			cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Tetrachloroethene (PCE)	Trichloroethene (TCE)	Vinyl Chloride
SV-01	07/20/15	5.0	1.6 U	1.6 U	**5,500**	2.1 U	1 U
SV-02	07/20/15	5.0	20 U	20 U	**95,000**	27 U	13 U
SV-03	07/20/15	5.0	1.6 U	1.6 U	**1,500**	2.1 U	1 U
SV-04	07/20/15	5.0	1.6 U	1.6 U	**290**	2.1 U	1 U
DEQ Generic RBCs[2]							
Vapor Intrusion into Buildings							
Residential			NE	13,000	1,900	86	33
Urban Residential			NE	13,000	5,100	200	41
Occupational			NE	260,000	47,000	2,900	2,800

Notes:
1. Chemical analysis completed by ESC Lab Sciences of Mt. Juliet, Tennessee.
2. DEQ Generic RBCs updated July 23, 2013
U: not detected at concentrations greater than the laboratory RDL (shown)
Bolding indicates analyte detection.
Shading indicated analyte detected at a concentration greater than one or more DEQ RBCs.

ATTACHMENT

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

Kevin Cline
GeoDesign Inc.
15575 SW Sequoia Pkwy. Suite 100
Portland, OR 97224

Report Summary

Tuesday July 28, 2015

Report Number: L778009
Samples Received: 07/21/15
Client Project: Greenlight-3-02

Description: Greenlight-3-02

The analytical results in this report are based upon information supplied by you, the client, and are for your exclusive use. If you have any questions regarding this data package, please do not hesitate to call.

Entire Report Reviewed By:

Jarred Willis , ESC Representative

Laboratory Certification Numbers

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - 01157CA, CT - PH-0197, FL - E87487, GA - 923, IN - C-TN-01, KY - 90010, KYUST - 0016, NC - ENV375/DW21704/BIO041, ND - R-140. NJ - TN002, NJ NELAP - TN002, SC - 84004, TN - 2006, VA - 460132, WV - 233, AZ - 0612, MN - 047-999-395, NY - 11742, WI - 998093910, NV - TN000032011-1, TX - T104704245-11-3, OK - 9915, PA - 68-02979, IA Lab #364, EPA - TN002

Accreditation is only applicable to the test methods specified on each scope of accreditation held by ESC Lab Sciences.

Where applicable, sampling conducted by ESC is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.

ESC LAB SCIENCES
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REPORT OF ANALYSIS

Kevin Cline
GeoDesign Inc.
15575 SW Sequoia Pkwy. Suite 100
Portland, OR 97224

July 28, 2015

ESC Sample # : L778009-01

Site ID :

Project # : Greenlight-3-02

Date Received : July 21, 2015
Description : Greenlight-3-02

Sample ID : SV-01

Collected By : Kevin Cline
Collection Date : 07/20/15 11:05

Parameter	Cas#	Mol Wght	RDL1	RDL2	ppbv	ug/m3	Method	Date	Dil.
Volatile Organics									
cis-1,2-Dichloroethene	156-59-2	96.9	0.400	1.60	< 0.40	< 1.6	TO-15	07/24/15	2
trans-1,2-Dichloroethene	156-60-5	96.9	0.400	1.60	< 0.40	< 1.6	TO-15	07/24/15	2
Tetrachloroethylene	127-18-4	166	16.0	110.	810	5500	TO-15	07/24/15	80
Trichloroethylene	79-01-6	131	0.400	2.10	< 0.40	< 2.1	TO-15	07/24/15	2
Vinyl chloride	75-01-4	62.5	0.400	1.00	< 0.40	< 1.0	TO-15	07/24/15	2
1,4-Bromofluorobenzene	460-00-4				108	% Rec.	TO-15	07/24/15	1

RDL1 = ppbv , RDL2 = ug/m3
Note:
Units are based on (STP) - Standard Temperature and Pressure
The reported analytical results relate only to the sample submitted.

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Reported: 07/27/15 16:57 Revised: 07/28/15 11:59

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REPORT OF ANALYSIS

Kevin Cline
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July 28, 2015

ESC Sample # : L778009-02

Site ID :

Project # : Greenlight-3-02

Date Received : July 21, 2015
Description : Greenlight-3-02

Sample ID : SV-02

Collected By : Kevin Cline
Collection Date : 07/20/15 12:23

Parameter	Cas#	Mol Wght	RDL1	RDL2	ppbv	ug/m3	Method	Date	Dil.
Volatile Organics									
cis-1,2-Dichloroethene	156-59-2	96.9	5.00	20.0	< 5.0	< 20.	TO-15	07/24/15	25
trans-1,2-Dichloroethene	156-60-5	96.9	5.00	20.0	< 5.0	< 20.	TO-15	07/24/15	25
Tetrachloroethylene	127-18-4	166	200.	1400	14000	95000	TO-15	07/24/15	1000
Trichloroethylene	79-01-6	131	5.00	27.0	< 5.0	< 27.	TO-15	07/24/15	25
Vinyl chloride	75-01-4	62.5	5.00	13.0	< 5.0	< 13.	TO-15	07/24/15	25
1,4-Bromofluorobenzene	460-00-4				100	% Rec.	TO-15	07/24/15	1

RDL1 = ppbv , RDL2 = ug/m3
Note:
Units are based on (STP) - Standard Temperature and Pressure
The reported analytical results relate only to the sample submitted.

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Reported: 07/27/15 16:57 Revised: 07/28/15 11:59

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REPORT OF ANALYSIS

Kevin Cline
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July 28, 2015

ESC Sample # : L778009-03

Site ID :

Project # : Greenlight-3-02

Date Received : July 21, 2015
Description : Greenlight-3-02

Sample ID : SV-03

Collected By : Kevin Cline
Collection Date : 07/20/15 14:15

Parameter	Cas#	Mol Wght	RDL1	RDL2	ppbv	ug/m3	Method	Date	Dil.
Volatile Organics									
cis-1,2-Dichloroethene	156-59-2	96.9	0.400	1.60	< 0.40	< 1.6	TO-15	07/24/15	2
trans-1,2-Dichloroethene	156-60-5	96.9	0.400	1.60	< 0.40	< 1.6	TO-15	07/24/15	2
Tetrachloroethylene	127-18-4	166	5.00	34.0	220	1500	TO-15	07/24/15	25
Trichloroethylene	79-01-6	131	0.400	2.10	< 0.40	< 2.1	TO-15	07/24/15	2
Vinyl chloride	75-01-4	62.5	0.400	1.00	< 0.40	< 1.0	TO-15	07/24/15	2
1,4-Bromofluorobenzene	460-00-4				101	% Rec.	TO-15	07/24/15	1

RDL1 = ppbv , RDL2 = ug/m3
Note:
Units are based on (STP) - Standard Temperature and Pressure
The reported analytical results relate only to the sample submitted.

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Reported: 07/27/15 16:57 Revised: 07/28/15 11:59

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REPORT OF ANALYSIS

Kevin Cline
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July 28, 2015

ESC Sample # : L778009-04

Site ID :

Project # : Greenlight-3-02

Date Received : July 21, 2015
Description : Greenlight-3-02

Sample ID : SV-04

Collected By : Kevin Cline
Collection Date : 07/20/15 15:10

Parameter	Cas#	Mol Wght	RDL1	RDL2	ppbv	ug/m3	Method	Date	Dil.
Volatile Organics									
cis-1,2-Dichloroethene	156-59-2	96.9	0.400	1.60	< 0.40	< 1.6	TO-15	07/24/15	2
trans-1,2-Dichloroethene	156-60-5	96.9	0.400	1.60	< 0.40	< 1.6	TO-15	07/24/15	2
Tetrachloroethylene	127-18-4	166	0.400	2.70	42.	290	TO-15	07/24/15	2
Trichloroethylene	79-01-6	131	0.400	2.10	< 0.40	< 2.1	TO-15	07/24/15	2
Vinyl chloride	75-01-4	62.5	0.400	1.00	< 0.40	< 1.0	TO-15	07/24/15	2
1,4-Bromofluorobenzene	460-00-4				102	% Rec.	TO-15	07/24/15	1

RDL1 = ppbv , RDL2 = ug/m3
Note:
Units are based on (STP) - Standard Temperature and Pressure
The reported analytical results relate only to the sample submitted.

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Reported: 07/27/15 16:57 Revised: 07/28/15 11:59

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Quality Assurance Report
Level II

L778009

July 28, 2015

Laboratory Blank

Analyte	Result	Units	% Rec	Limit	Batch	Date Analyzed
1,1,1-Trichloroethane	< .2	ppb			WG804424	07/23/15 15:22
1,1,2,2-Tetrachloroethane	< .2	ppb			WG804424	07/23/15 15:22
1,1,2-Trichloroethane	< .2	ppb			WG804424	07/23/15 15:22
1,1,2-Trichlorotrifluoroethane	< .2	ppb			WG804424	07/23/15 15:22
1,1-Dichloroethane	< .2	ppb			WG804424	07/23/15 15:22
1,1-Dichloroethene	< .2	ppb			WG804424	07/23/15 15:22
1,2,4-Trichlorobenzene	< .63	ppb			WG804424	07/23/15 15:22
1,2,4-Trimethylbenzene	< .2	ppb			WG804424	07/23/15 15:22
1,2-Dibromoethane	< .2	ppb			WG804424	07/23/15 15:22
1,2-Dichlorobenzene	< .2	ppb			WG804424	07/23/15 15:22
1,2-Dichloroethane	< .2	ppb			WG804424	07/23/15 15:22
1,2-Dichloropropane	< .2	ppb			WG804424	07/23/15 15:22
1,2-Dichlorotetrafluoroethane	< .2	ppb			WG804424	07/23/15 15:22
1,3,5-Trimethylbenzene	< .2	ppb			WG804424	07/23/15 15:22
1,3-Butadiene	< 2	ppb			WG804424	07/23/15 15:22
1,3-Dichlorobenzene	< .2	ppb			WG804424	07/23/15 15:22
1,4-Dichlorobenzene	< .2	ppb			WG804424	07/23/15 15:22
1,4-Dioxane	< .2	ppb			WG804424	07/23/15 15:22
2,2,4-Trimethylpentane	< .2	ppb			WG804424	07/23/15 15:22
2-Butanone (MEK)	< 1.25	ppb			WG804424	07/23/15 15:22
2-Chlorotoluene	< .2	ppb			WG804424	07/23/15 15:22
2-Propanol	< 1.25	ppb			WG804424	07/23/15 15:22
4-Ethyltoluene	< .2	ppb			WG804424	07/23/15 15:22
4-Methyl-2-pentanone (MIBK)	< 1.25	ppb			WG804424	07/23/15 15:22
Acetone	< 1.25	ppb			WG804424	07/23/15 15:22
Allyl chloride	< .2	ppb			WG804424	07/23/15 15:22
Benzene	< .2	ppb			WG804424	07/23/15 15:22
Benzyl Chloride	< .2	ppb			WG804424	07/23/15 15:22
Bromodichloromethane	< .2	ppb			WG804424	07/23/15 15:22
Bromoform	< .6	ppb			WG804424	07/23/15 15:22
Bromomethane	< .2	ppb			WG804424	07/23/15 15:22
Carbon disulfide	< .2	ppb			WG804424	07/23/15 15:22
Carbon tetrachloride	< .2	ppb			WG804424	07/23/15 15:22
Chlorobenzene	< .2	ppb			WG804424	07/23/15 15:22
Dibromochloromethane	< .2	ppb			WG804424	07/23/15 15:22
Chloroethane	< .2	ppb			WG804424	07/23/15 15:22
Chloroform	< .2	ppb			WG804424	07/23/15 15:22
Chloromethane	< .2	ppb			WG804424	07/23/15 15:22
cis-1,2-Dichloroethene	< .2	ppb			WG804424	07/23/15 15:22
cis-1,3-Dichloropropene	< .2	ppb			WG804424	07/23/15 15:22
Cyclohexane	< .2	ppb			WG804424	07/23/15 15:22
Dichlorodifluoromethane	< .2	ppb			WG804424	07/23/15 15:22
Ethanol	< .63	ppb			WG804424	07/23/15 15:22
Ethylbenzene	< .2	ppb			WG804424	07/23/15 15:22
Heptane	< .2	ppb			WG804424	07/23/15 15:22
Hexachloro-1,3-butadiene	< .63	ppb			WG804424	07/23/15 15:22
Isopropylbenzene	< .2	ppb			WG804424	07/23/15 15:22
m&p-Xylene	< .4	ppb			WG804424	07/23/15 15:22
Methyl Butyl Ketone	< 1.25	ppb			WG804424	07/23/15 15:22
Methyl methacrylate	< .2	ppb			WG804424	07/23/15 15:22
MTBE	< .2	ppb			WG804424	07/23/15 15:22
Methylene Chloride	< .2	ppb			WG804424	07/23/15 15:22
n-Hexane	< .2	ppb			WG804424	07/23/15 15:22
Naphthalene	< .63	ppb			WG804424	07/23/15 15:22
o-Xylene	< .2	ppb			WG804424	07/23/15 15:22
Propene	< .4	ppb			WG804424	07/23/15 15:22
Styrene	< .2	ppb			WG804424	07/23/15 15:22
Tetrachloroethylene	< .2	ppb			WG804424	07/23/15 15:22
Tetrahydrofuran	< .2	ppb			WG804424	07/23/15 15:22

* Performance of this Analyte is outside of established criteria.
For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'

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Quality Assurance Report
Level II

L778009

July 28, 2015

Laboratory Blank

Analyte	Result	Units	% Rec	Limit	Batch	Date Analyzed
Toluene	< .2	ppb			WG804424	07/23/15 15:22
TPH (GC/MS) Low Fraction	< 50	ppb			WG804424	07/23/15 15:22
trans-1,2-Dichloroethene	< .2	ppb			WG804424	07/23/15 15:22
trans-1,3-Dichloropropene	< .2	ppb			WG804424	07/23/15 15:22
Trichloroethylene	< .2	ppb			WG804424	07/23/15 15:22
Trichlorofluoromethane	< .2	ppb			WG804424	07/23/15 15:22
Vinyl acetate	< .2	ppb			WG804424	07/23/15 15:22
Vinyl Bromide	< .2	ppb			WG804424	07/23/15 15:22
Vinyl chloride	< .2	ppb			WG804424	07/23/15 15:22
1,4-Bromofluorobenzene		% Rec.	87.80	60-140	WG804424	07/23/15 15:22
Ethanol	< .63	ppb			WG804660	07/24/15 12:17
Tetrachloroethylene	< .2	ppb			WG804660	07/24/15 12:17
1,4-Bromofluorobenzene		% Rec.	98.00	60-140	WG804660	07/24/15 12:17

Laboratory Control Sample

Analyte	Units	Known Val	Result	% Rec	Limit	Batch
1,1,1-Trichloroethane	ppb	3.75	3.69	98.3	70-130	WG804424
1,1,2,2-Tetrachloroethane	ppb	3.75	3.96	105.	70-130	WG804424
1,1,2-Trichloroethane	ppb	3.75	3.92	105.	70-130	WG804424
1,1,2-Trichlorotrifluoroethane	ppb	3.75	3.90	104.	70-130	WG804424
1,1-Dichloroethane	ppb	3.75	3.67	97.9	70-130	WG804424
1,1-Dichloroethene	ppb	3.75	3.91	104.	70-130	WG804424
1,2,4-Trichlorobenzene	ppb	3.75	4.00	107.	53.6-154	WG804424
1,2,4-Trimethylbenzene	ppb	3.75	3.83	102.	70-130	WG804424
1,2-Dibromoethane	ppb	3.75	4.00	107.	70-130	WG804424
1,2-Dichlorobenzene	ppb	3.75	4.08	109.	70-130	WG804424
1,2-Dichloroethane	ppb	3.75	4.07	109.	70-130	WG804424
1,2-Dichloropropane	ppb	3.75	3.93	105.	70-130	WG804424
1,2-Dichlorotetrafluoroethane	ppb	3.75	3.99	106.	70-130	WG804424
1,3,5-Trimethylbenzene	ppb	3.75	3.80	101.	70-130	WG804424
1,3-Butadiene	ppb	3.75	3.89	104.	70-130	WG804424
1,3-Dichlorobenzene	ppb	3.75	3.95	105.	70-130	WG804424
1,4-Dichlorobenzene	ppb	3.75	3.97	106.	70-130	WG804424
1,4-Dioxane	ppb	3.75	4.33	115.	48-156	WG804424
2,2,4-Trimethylpentane	ppb	3.75	3.56	94.9	70-130	WG804424
2-Butanone (MEK)	ppb	3.75	3.57	95.1	70-130	WG804424
2-Chlorotoluene	ppb	3.75	3.89	104.	70-130	WG804424
2-Propanol	ppb	3.75	3.51	93.6	50.4-152	WG804424
4-Ethyltoluene	ppb	3.75	3.86	103.	70-130	WG804424
4-Methyl-2-pentanone (MIBK)	ppb	3.75	3.98	106.	55.3-154	WG804424
Acetone	ppb	3.75	3.14	83.8	70-130	WG804424
Allyl chloride	ppb	3.75	3.51	93.5	70-130	WG804424
Benzene	ppb	3.75	4.00	107.	70-130	WG804424
Benzyl Chloride	ppb	3.75	4.23	113.	55.6-160	WG804424
Bromodichloromethane	ppb	3.75	3.99	106.	70-130	WG804424
Bromoform	ppb	3.75	3.89	104.	70-130	WG804424
Bromomethane	ppb	3.75	4.12	110.	70-130	WG804424
Carbon disulfide	ppb	3.75	3.89	104.	70-130	WG804424
Carbon tetrachloride	ppb	3.75	3.71	99.0	70-130	WG804424
Chlorobenzene	ppb	3.75	3.96	106.	70-130	WG804424
Dibromochloromethane	ppb	3.75	3.98	106.	70-130	WG804424
Chloroethane	ppb	3.75	4.03	107.	70-130	WG804424
Chloroform	ppb	3.75	3.71	99.0	70-130	WG804424
Chloromethane	ppb	3.75	3.79	101.	70-130	WG804424
cis-1,2-Dichloroethene	ppb	3.75	3.60	96.0	70-130	WG804424
cis-1,3-Dichloropropene	ppb	3.75	3.84	102.	70-130	WG804424

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Quality Assurance Report
Level II

L778009

July 28, 2015

Laboratory Control Sample

Analyte	Units	Known Val	Result	% Rec	Limit	Batch
Cyclohexane	ppb	3.75	3.65	97.2	70-130	WG804424
Dichlorodifluoromethane	ppb	3.75	3.97	106.	56.7-140	WG804424
Ethanol	ppb	3.75	3.60	96.1	34.3-167	WG804424
Ethylbenzene	ppb	3.75	3.81	102.	70-130	WG804424
Heptane	ppb	3.75	3.81	102.	70-130	WG804424
Hexachloro-1,3-butadiene	ppb	3.75	3.83	102.	62.1-143	WG804424
Isopropylbenzene	ppb	3.75	3.82	102.	70-130	WG804424
m&p-Xylene	ppb	7.5	7.65	102.	70-130	WG804424
Methyl Butyl Ketone	ppb	3.75	4.34	116.	47.9-165	WG804424
Methyl methacrylate	ppb	3.75	3.49	93.2	70-130	WG804424
MTBE	ppb	3.75	3.41	90.9	70-130	WG804424
Methylene Chloride	ppb	3.75	3.26	86.9	70-130	WG804424
n-Hexane	ppb	3.75	3.63	96.7	70-130	WG804424
Naphthalene	ppb	3.75	3.95	105.	52-158	WG804424
o-Xylene	ppb	3.75	3.77	101.	70-130	WG804424
Propene	ppb	3.75	3.68	98.2	53.9-143	WG804424
Styrene	ppb	3.75	3.93	105.	70-130	WG804424
Tetrachloroethylene	ppb	3.75	4.01	107.	70-130	WG804424
Tetrahydrofuran	ppb	3.75	3.54	94.3	65-140	WG804424
Toluene	ppb	3.75	3.85	103.	70-130	WG804424
TPH (GC/MS) Low Fraction	ppb	150	160.	107.	70-130	WG804424
trans-1,2-Dichloroethene	ppb	3.75	3.72	99.2	70-130	WG804424
trans-1,3-Dichloropropene	ppb	3.75	3.72	99.3	70-130	WG804424
Trichloroethylene	ppb	3.75	3.96	106.	70-130	WG804424
Trichlorofluoromethane	ppb	3.75	4.24	113.	70-130	WG804424
Vinyl acetate	ppb	3.75	3.48	92.9	70-130	WG804424
Vinyl Bromide	ppb	3.75	4.29	114.	70-130	WG804424
Vinyl chloride	ppb	3.75	3.97	106.	70-130	WG804424
1,4-Bromofluorobenzene				96.70	60-140	WG804424
Ethanol	ppb	3.75	4.78	127.	34.3-167	WG804660
Tetrachloroethylene	ppb	3.75	3.93	105.	70-130	WG804660
1,4-Bromofluorobenzene				103.0	60-140	WG804660

Laboratory Control Sample Duplicate

Analyte	Units	Result	Ref	%Rec	Limit	RPD	Limit	Batch
1,1,1-Trichloroethane	ppb	3.81	3.69	102.	70-130	3.38	25	WG804424
1,1,2,2-Tetrachloroethane	ppb	4.58	3.96	122.	70-130	14.6	25	WG804424
1,1,2-Trichloroethane	ppb	4.38	3.92	117.	70-130	11.1	25	WG804424
1,1,2-Trichlorotrifluoroethane	ppb	3.94	3.90	105.	70-130	0.960	25	WG804424
1,1-Dichloroethane	ppb	3.79	3.67	101.	70-130	3.11	25	WG804424
1,1-Dichloroethene	ppb	3.94	3.91	105.	70-130	0.830	25	WG804424
1,2,4-Trichlorobenzene	ppb	4.84	4.00	129.	53.6-154	19.1	25	WG804424
1,2,4-Trimethylbenzene	ppb	4.42	3.83	118.	70-130	14.4	25	WG804424
1,2-Dibromoethane	ppb	4.48	4.00	120.	70-130	11.4	25	WG804424
1,2-Dichlorobenzene	ppb	4.71	4.08	126.	70-130	14.4	25	WG804424
1,2-Dichloroethane	ppb	4.54	4.07	121.	70-130	10.8	25	WG804424
1,2-Dichloropropane	ppb	4.32	3.93	115.	70-130	9.46	25	WG804424
1,2-Dichlorotetrafluoroethane	ppb	4.04	3.99	108.	70-130	1.47	25	WG804424
1,3,5-Trimethylbenzene	ppb	4.38	3.80	117.	70-130	14.2	25	WG804424
1,3-Butadiene	ppb	3.95	3.89	105.	70-130	1.60	25	WG804424
1,3-Dichlorobenzene	ppb	4.61	3.95	123.	70-130	15.4	25	WG804424
1,4-Dichlorobenzene	ppb	4.66	3.97	124.	70-130	16.1	25	WG804424
1,4-Dioxane	ppb	4.94	4.33	132.	48-156	13.3	25	WG804424
2,2,4-Trimethylpentane	ppb	3.71	3.56	99.0	70-130	4.23	25	WG804424
2-Butanone (MEK)	ppb	3.96	3.57	105.	70-130	10.3	25	WG804424
2-Chlorotoluene	ppb	4.51	3.89	120.	70-130	14.9	25	WG804424

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Quality Assurance Report
Level II

L778009

July 28, 2015

		Laboratory Control Sample Duplicate						
Analyte	Units	Result	Ref	%Rec	Limit	RPD	Limit	Batch
2-Propanol	ppb	4.03	3.51	107.	50.4-152	13.7	25	WG804424
4-Ethyltoluene	ppb	4.47	3.86	119.	70-130	14.8	25	WG804424
4-Methyl-2-pentanone (MIBK)	ppb	4.64	3.98	124.	55.3-154	15.4	25	WG804424
Acetone	ppb	3.53	3.14	94.0	70-130	11.6	25	WG804424
Allyl chloride	ppb	3.70	3.51	99.0	70-130	5.40	25	WG804424
Benzene	ppb	4.39	4.00	117.	70-130	9.29	25	WG804424
Benzyl Chloride	ppb	5.06	4.23	135.	55.6-160	17.9	25	WG804424
Bromodichloromethane	ppb	4.33	3.99	115.	70-130	8.22	25	WG804424
Bromoform	ppb	4.52	3.89	121.	70-130	15.1	25	WG804424
Bromomethane	ppb	3.93	4.12	105.	70-130	4.56	25	WG804424
Carbon disulfide	ppb	3.96	3.89	106.	70-130	1.64	25	WG804424
Carbon tetrachloride	ppb	3.80	3.71	101.	70-130	2.35	25	WG804424
Chlorobenzene	ppb	4.41	3.96	118.	70-130	10.7	25	WG804424
Dibromochloromethane	ppb	4.44	3.98	118.	70-130	11.1	25	WG804424
Chloroethane	ppb	3.89	4.03	104.	70-130	3.46	25	WG804424
Chloroform	ppb	3.83	3.71	102.	70-130	3.15	25	WG804424
Chloromethane	ppb	3.82	3.79	102.	70-130	0.800	25	WG804424
cis-1,2-Dichloroethene	ppb	3.81	3.60	102.	70-130	5.72	25	WG804424
cis-1,3-Dichloropropene	ppb	4.30	3.84	115.	70-130	11.4	25	WG804424
Cyclohexane	ppb	3.74	3.65	100.	70-130	2.61	25	WG804424
Dichlorodifluoromethane	ppb	4.02	3.97	107.	56.7-140	1.22	25	WG804424
Ethanol	ppb	4.01	3.60	107.	34.3-167	10.6	25	WG804424
Ethylbenzene	ppb	4.41	3.81	118.	70-130	14.7	25	WG804424
Heptane	ppb	4.15	3.81	110.	70-130	8.52	25	WG804424
Hexachloro-1,3-butadiene	ppb	4.48	3.83	119.	62.1-143	15.7	25	WG804424
Isopropylbenzene	ppb	4.39	3.82	117.	70-130	13.8	25	WG804424
m&p-Xylene	ppb	8.85	7.65	118.	70-130	14.5	25	WG804424
Methyl Butyl Ketone	ppb	5.03	4.34	134.	47.9-165	14.7	25	WG804424
Methyl methacrylate	ppb	3.98	3.49	106.	70-130	12.9	25	WG804424
MTBE	ppb	3.58	3.41	96.0	70-130	4.97	25	WG804424
Methylene Chloride	ppb	3.33	3.26	89.0	70-130	2.34	25	WG804424
n-Hexane	ppb	3.73	3.63	100.	70-130	2.87	25	WG804424
Naphthalene	ppb	4.74	3.95	126.	52-158	18.2	25	WG804424
o-Xylene	ppb	4.38	3.77	117.	70-130	14.9	25	WG804424
Propene	ppb	3.73	3.68	99.0	53.9-143	1.20	25	WG804424
Styrene	ppb	4.65	3.93	124.	70-130	16.6	25	WG804424
Tetrachloroethylene	ppb	4.37	4.01	116.	70-130	8.61	25	WG804424
Tetrahydrofuran	ppb	3.80	3.54	101.	65-140	7.32	25	WG804424
Toluene	ppb	4.25	3.85	113.	70-130	9.98	25	WG804424
TPH (GC/MS) Low Fraction	ppb	186.	160.	124.	70-130	15.3	25	WG804424
trans-1,2-Dichloroethene	ppb	3.87	3.72	103.	70-130	3.98	25	WG804424
trans-1,3-Dichloropropene	ppb	4.21	3.72	112.	70-130	12.3	25	WG804424
Trichloroethylene	ppb	4.27	3.96	114.	70-130	7.39	25	WG804424
Trichlorofluoromethane	ppb	3.82	4.24	102.	70-130	10.4	25	WG804424
Vinyl acetate	ppb	3.74	3.48	100.	70-130	6.96	25	WG804424
Vinyl Bromide	ppb	3.85	4.29	103.	70-130	10.8	25	WG804424
Vinyl chloride	ppb	3.98	3.97	106.	70-130	0.280	25	WG804424
1,4-Bromofluorobenzene				92.50	60-140			WG804424
Ethanol	ppb	4.75	4.78	127.	34.3-167	0.630	25	WG804660
Tetrachloroethylene	ppb	3.99	3.93	106.	70-130	1.33	25	WG804660
1,4-Bromofluorobenzene				103.0	60-140			WG804660

Batch number /Run number / Sample number cross reference

WG804424: R3052528: L778009-01 02 03 04
WG804660: R3052703: L778009-01 02 03
* * Calculations are performed prior to rounding of reported values.
* Performance of this Analyte is outside of established criteria.
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Quality Assurance Report
Level II

L778009

July 28, 2015

The data package includes a summary of the analytic results of the quality control samples required by the SW-846 or CWA methods. The quality control samples include a method blank, a laboratory control sample, and the matrix spike/matrix spike duplicate analysis. If a target parameter is outside the method limits, every sample that is effected is flagged with the appropriate qualifier in Appendix B of the analytic report.

Method Blank - an aliquot of reagent water carried through the entire analytic process. The method blank results indicate if any possible contamination exposure during the sample handling, digestion or extraction process, and analysis. Concentrations of target analytes above the reporting limit in the method blank are qualified with the "B" qualifier.

Laboratory Control Sample - is a sample of known concentration that is carried through the digestion/extraction and analysis process. The percent recovery, expressed as a percentage of the theoretical concentration, has statistical control limits indicating that the analytic process is "in control". If a target analyte is outside the control limits for the laboratory control sample or any other control sample, the parameter is flagged with a "J4" qualifier for all effected samples.

Matrix Spike and Matrix Spike Duplicate - is two aliquots of an environmental sample that is spiked with known concentrations of target analytes. The percent recovery of the target analytes also has statistical control limits. If any recoveries that are outside the method control limits, the sample that was selected for matrix spike/matrix spike duplicate analysis is flagged with either a "J5" or a "J6". The relative percent difference (%RPD) between the matrix spike and the matrix spike duplicate recoveries is all calculated. If the RPD is above the method limit, the effected samples are flagged with a "J3" qualifier.

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Billing Information:

Accounts Payable
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Portland, OR 97224

Report to: Kevin Cline

Email To: kcline@geodesigninc.com; ablake@geodesigninc.com;

Project Description: Greenlight-3-02

City/State Collected:

Phone: 503-968-8787
Fax:

Client Project # Greenlight-3-02

Lab Project # GEODESPOR-GREENLIGHT

Collected by (print): KEVIN CLINE

Site/Facility ID #

P.O. #

Collected by (signature):

Immediately Packed on Ice N ___ Y ___

Rush? (Lab MUST Be Notified)
___ Same Day 200%
___ Next Day 100%
___ Two Day 50%
___ Three Day 25%

Date Results Needed

Email? ___No X__Yes
FAX? ___No ___Yes

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	TO-15 Summa (HVOCs)										Rem./Contaminant	Sample # (lab only)
SV-01	—	Air	—	7/20/15	11:05	1	X											-01
SV-02	—	Air	—	↓	~~1123~~	1	X											-02
SV-03	—	Air	—		14:15	1	X											-03
SV-04	—	Air	—	—	15:10	1	X											-04
		~~Air~~				~~1~~	~~X~~											

Analysis / Container / Preservative

Chain of Custody Page ___ of ___

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L# L778009

Table # F026

Acctnum: GEODESPOR
Template: T104031
Prelogin: P517367
TSR: 358 - Jarred Willis
PB: BAK 7-13-15
Shipped Via: FedEX Ground

* Matrix: SS - Soil GW - Groundwater WW - WasteWater DW - Drinking Water OT - Other_____

Remarks:(5) 1L summa cans and (5) sampling manifolds

pH _____ Temp _____

Flow _____ Other _____

Hold #

Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)
	7-20-15	17:00	
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)

Samples returned via: ☐ UPS ☒ FedEx ☐ Courier ☐ _____

Temp: Amb. °C Bottles Received: 4

Date: 7/21/15 Time: 0900

Condition: (lab use only) TD OK

COC Seal Intact: ___Y ___N ___NA ✓

pH Checked: NCF: