Technical Memorandum

To: Chris Maurer, Washington Department of Ecology

From: Janet Knox and Glen Wallace, Pacific Groundwater Group

Re: Scougal Rubber Remedial Action Update (VCP Site NW 1707)

Date: December 3, 2012

This technical memorandum summarizes the remedial actions conducted at Scougal Rubber between September 2011 and September 2012. Remedial action at the site focuses on reduction of chlorinated solvent concentrations in soil and groundwater. Previous remedial actions at the site are described in other documents, including:

- *Scougal Rubber Remedial Action Update (VCP Site NW 1707)* (PGG, 2009).
- *Scougal Rubber Remedial Action Update (VCP Site NW 1707)* (PGG, 2011).
- *Scougal Rubber Final Remedial Action Plan* (PGG 2007).
- *Independent Remedial Action Report* (Retec, 2002).

The work was performed using generally accepted hydrogeologic practices at this time and in this vicinity, for exclusive application to the Scougal Rubber site and for the exclusive use of Scougal Rubber. This statement is in lieu of other warranties, express or implied.

INTRODUCTION

Scougal Rubber is located in the Georgetown neighborhood of Seattle, Washington at 6239 Corson Avenue (Figure 1). Remedial efforts have been underway at the site for over 20 years and have been successful in significantly reducing contaminant concentrations (Table 1). Confirmation soil samples from areas of known contamination have been non-detect. Source area groundwater concentrations were above MTCA Method A cleanup levels in the most recent sampling event.

The Scougal property overlies fine to medium silty sands with scattered, discontinuous silt and gravel stringers. These soils are commonly observed throughout the lower Duwamish area. Depth to groundwater at the site is between 7 and 9 feet. Groundwater flow direction is to the southwest toward the Duwamish River, approximately 0.5 miles away (Retec, 2003). Soil cores collected in 2009 identified a 6- to 12-inch thick silt layer at approximately 16 feet below ground surface (bgs) that appears to be laterally continuous within at least the alleyway area of the site.

Petroleum and chlorinated solvent-impacted soil was identified on the Scougal property in the late 1980s. This discovery led to remedial action at the site including removal of underground storage tanks, hotspot excavation, hydraulic containment, and operation of an air sparging soil vapor extraction (SVE) system (Retec, 2002). The SVE system was designed to reduce contaminant concentrations in soil and groundwater behind the Scougal main plant and beneath the Machinists Inc. property to the west. The SVE system was operated intermittently from 1994 through 1999.

Operation of the SVE system reduced groundwater concentrations by approximately 90 percent, and had inconsistent effectiveness in soil. In 1994, TCE (1,000 ug/L) and vinyl chloride (1,300 ug/L) concentrations at MW-14 were above cleanup levels. After operation of the SVE system, concentrations of TCE and vinyl chloride had decreased, but groundwater concentrations rebounded each time the system was shut down. The SVE system was effective at reducing contaminant mass, but soil and groundwater concentrations remained above cleanup levels.

Scougal Rubber contacted Pacific Groundwater Group (PGG) in 2005 to develop a plan to further reduce contaminant concentrations to below cleanup levels. PGG performed additional site investigation in 2006 as the basis for further remediation and found concentrations as high as TCE (110 ug/L) and vinyl chloride (33 ug/L) in groundwater.

PGG developed a Final Remedial Action Plan to address residual contamination. With that plan, Scougal Rubber chose to enter the Washington Department of Ecology's Voluntary Cleanup Program to receive Ecology's approval of the cleanup approach and to obtain a No Further Action (NFA) letter once the cleanup goals are achieved.

Upon review of the existing site documents and the Final Remedial Action Plan, Ecology provided approval of the plan. PGG then implemented the planned removal of shallow impacted soil, in-situ chemical oxidation with potassium permanganate, and confirmation sampling (PGG, 2009) All confirmation soil samples within the treatment area were non-detect for chlorinated solvents. Groundwater petroleum compound concentrations were reduced to below cleanup levels. Groundwater chlorinated ethene concentrations were reduced an additional 90 percent to approximately 1 percent of the pre-remediation (1993) levels. However, TCE and vinyl chloride concentrations remained above MTCA Method A cleanup values at the end of 2008. In 2009, PGG developed and implemented a targeted ozone injection system to further reduce concentrations. This system is described in the following sections.

OZONE REMEDIATION

PGG designed and observed installation of an ozone remediation system in May-June 2009. A second phase of ozone sparge points was added in June 2010. Ozone was selected to address residual groundwater contamination because of the ability to distribute oxidant to soil and groundwater in areas with difficult access with minimal disturbance to site structures and manufacturing operations. The ozone system installation included (Figures 2 and 3):

- An H2O Engineering model OSU-52 cabinet capable of producing 2.7 pounds of ozone per day at a concentration of 3,570 ppm in a 90% oxygen stream.
- 8 soil injection points screened between 5 and 6.5 feet bgs
- 8 groundwater sparge points screened between 15 and 16.5 feet bgs (keyed to top of silt) with proprietary micro-bubble screens to enhance ozone dispersal.
- 3 groundwater sparge points screened between 18.5 and 20 feet bgs (below silt interval) with proprietary micro-bubble screens to enhance ozone dispersal.

Between 1,500 and 1,800 lbs of ozone were delivered to groundwater sparge points[1] during ozone operations through September 2012.

OZONE PERFORMANCE MONITORING

Groundwater samples were collected from MW-14 during ozone treatment to monitor groundwater concentrations as a measure of remediation progress. MW-14 was selected for performance monitoring because it had the highest TCE concentrations, and was located towards the down gradient end of the treatment area (the ozone radius of influence likely extended approximately 15-25ft down gradient of MW-14). Performance monitoring results are included in Table 2.

Pre-ozone-treatment groundwater concentrations at MW-14 were 19.0 ug/L (July, 2009). TCE concentrations decreased to below cleanup levels (5 ug/L) by September 2009 (4 ug/L). Vinyl chloride concentrations decreased to below cleanup levels by 2009. However, concentrations subsequently fluctuated. Total VOC load continued a general downward trend and all constituents were below cleanup levels again by March 2011. PGG began the one-year confirmation sampling in September 2011 by turning off ozone treatment. However, rebound was observed during confirmation monitoring in November 2011, and ozone injection was resumed over the last year. Ozone injection has continued with occasional down time for equipment repair and service.

[1] The ozone system had intermittent down time when oxygen was delivered to sparge points without ozone. For safety, when the cabinet detects a problem, ozone production to that point is discontinued.

Sampling Methods

Groundwater samples were collected using a peristaltic pump and low flow methods to minimize volatilization. Samples were collected into laboratory-provided sample containers and placed in coolers with ice, and chain of custody was maintained. Ozone distribution was turned off one week prior to groundwater performance sampling.

NEXT STEPS

Ozone treatment has reduced chlorinated ethene concentrations to below MTCA Method A groundwater cleanup levels several times during the course of the ozone treatment, followed by rebound to above MTCA cleanup levels. Ozone treatment is continuing to address these residual concentrations. Groundwater sampling will be continued in a spring/summer sampling event.

Attachments:

Table 1. Remedial Investigation and Action Timeline
Table 2. Groundwater Sampling Result Summary

Figure 1. Site Map and Ozone Sparge Point Locations
Figure 2. MW-14 VOC Concentration Trends

Appendix A. Analytical Lab Reports October 2011- September 2012

References:

Pacific Groundwater Group, 2007. *Final Remedial Action Plan, Scougal Rubber*. January 17, 2007.

Pacific Groundwater Group, 2009. *Letter to Chris Maurer, Washington Department of Ecology, RE: Scougal Rubber Remedial Action Update (VCP Site NW 1707)*. January 22, 2009.

Pacific Groundwater Group, 2011. *Letter to Chris Maurer, Washington Department of Ecology, RE: Scougal Rubber Remedial Action Update (VCP Site NW 1707)*. September 20, 2011.

Retec, 2002. *Independent Remedial Action Report*. March 28, 2002. Retec Project Number SRC00-02417-400.

cc: Matt Bowman, Scougal Rubber Corporation

Table 1. Remedial Investigation and Action Timeline

Scougal Rubber Corporation, Seattle, Washington

Date	Location*	Event	Result	Reference
1980s	AW, EW	Contamination identified on site	Contamination recognized; finding initiated remedial invesitgation and cleanup process.	Retec (2002)
1992	AW	UST removal, hotspot excavation	Bulk of contaminant mass removed; soil and groundwater impacts remained	Retec (2002)
1994-1999	AW	Air sparge and soil vapor extraction	Reduced contaminant mass; soil and groundwater remaiedn above cleanup levels	Retec (2002)
2006	AW	Soil and groundwater sampling	Contamination in alleyway area delinieated; provided baseline for remedial action	PGG (2006)
2007	AW	Soil hotspot excavation and permanganate application	Reduced soil VOC concentrations to non-detect; groundwater concentrations reduced by approximately 90%	PGG (2009)
2008	AW	Confirmation groundwater sampling	Groundwater rebound noted at MW-14 to above cleanup levels	PGG (2009)
2009-2012	AW	Ozone injection in two phases	Reduced groundwater VOC concentrations to near cleanup levels (ongoing)	Table 2
2009	EW	Soil and groundwater sampling	Identified remaining soil hotspot; groundwater concentrations at EW and down gradient below cleanup levels	PGG (2011)
2010	EW	Permanganate application	Reduced soil VOC concentrations to non-detect	PGG (2011)

* Location Acronyms: AW- Alleyway; EW- East Warehouse

Table 2. Groundwater Sampling Result Summary

Scougal Rubber Corporation, Seattle, Washington

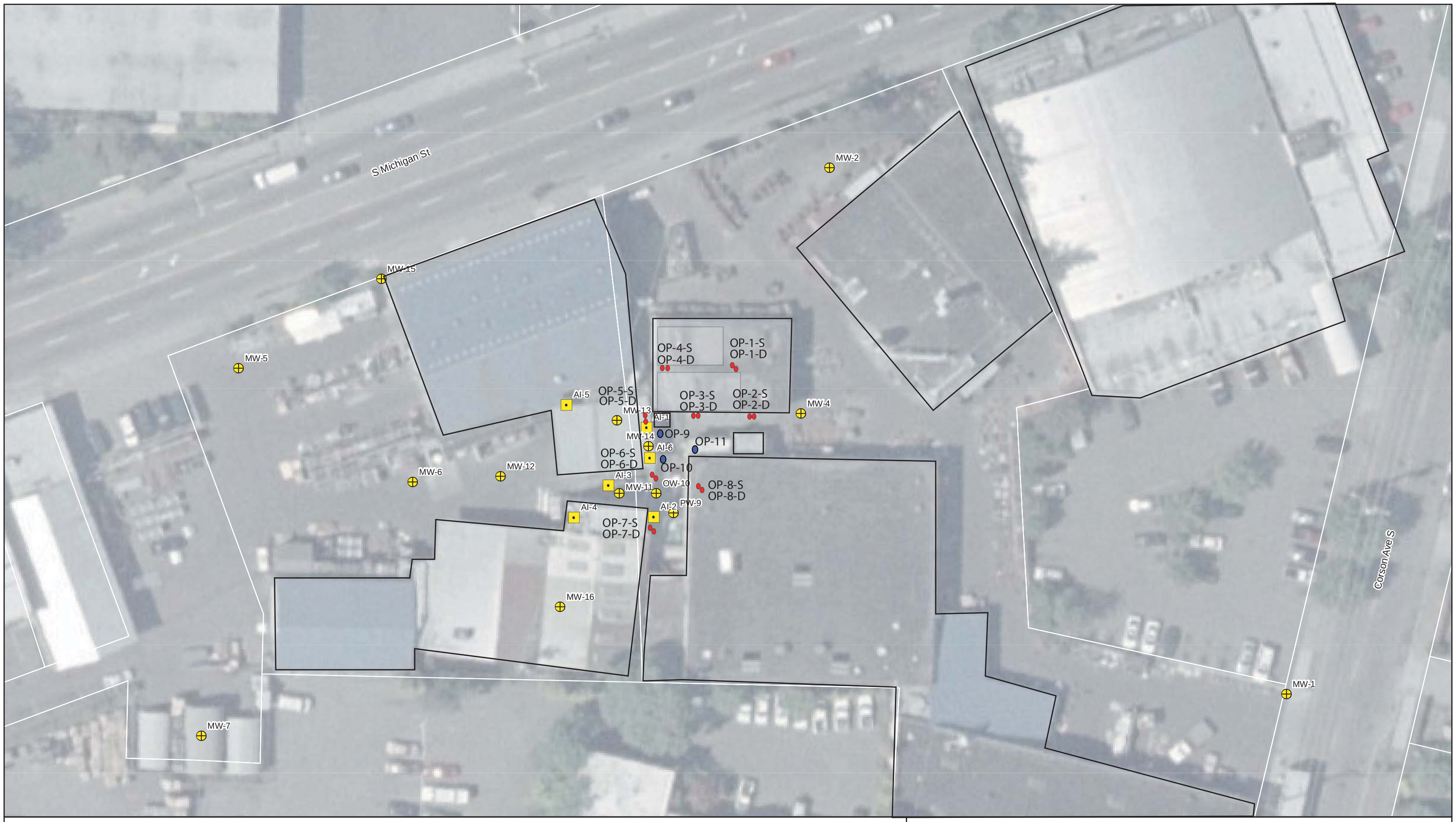
Sample Location	Date	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	Vinyl Chloride
Pre-Permanganate Concentrations					
MW-11	8/3/2006	0.3	**9.4**	8.7	U 0.2
MW-12	8/3/2006	U 1	0.2	0.4	**0.7**
MW-13	8/3/2006	U 1	**46**	11	**2.6**
MW-14	8/3/2006	4.1	**110**	26	**33**
MW-4	8/3/2006	0.2	3.3	U 1	U 0.2
OW-10	8/3/2006	U 1	**9.6**	18	**3.5**
Post-Permanganate Concentrations					
MW-11	6/10/2008	U 1	**10**	3.7	U 0.2
MW-12	6/10/2008	U 1	U 1	U 1	U 0.2
MW-14	6/10/2008	U 1	**13**	3.7	**15**
MW-11	9/5/2008	U 1	**13**	2.9	U 0.2
MW-12	9/5/2008	U 1	U 1	U 1	**1**
MW-14	9/5/2008	U 1	**14**	3.4	**25**
Ozone Install Reconnaissance Samples					
OP-10	6/29/2010	U 1	U 1	U 1	U 0.2
OP-11	6/29/2010	U 1	U 1	U 1	**0.51**
OP-9	6/29/2010	U 1	U 1	U 1	**0.7**
Ozone Operational Data					
MW-11	1/23/2009	U 1	**12**	U 1	U 0.2
MW-12	1/23/2009	U 1	U 1	U 1	U 0.2
MW-14	1/23/2009	1.6	**41**	1.3	**13**
MW-14	7/20/2009	0.8	**19**	5.8	**9.2**
MW-14	9/23/2009	U 0.2	4	1.7	1.9
MW-14	12/4/2009	0.3	3.7	1.3	**0.5**
MW-14	1/22/2010	0	1.4	1.8	**1**
MW-14	3/10/2010	0	2.3	2.3	**5.7**
MW-14	4/22/2010	U 1	1.6	U 1	U 0.2
MW-11	5/24/2010	U 1	U 1	U 1	U 0.2
MW-12	5/24/2010	U 1	U 1	U 1	U 0.2
MW-14	5/24/2010	U 1	3.1	U 1	**1.5**
MW-14	9/15/2010	U 1	U 1	U 1	U 0.2
MW-14	10/14/2010	U 1	0.89 J	U 1	**1.1**
MW-14	3/9/2011	0.39 J	1.6	0.12 J	0.08 J
MW-14	5/6/2011	0.18 J	1.9	0.34 J	0.15 J
MW-14	7/15/2011	U 0.11	0.49 J	U 1	0.1 UJ
MW-11	9/16/2011	U 0.5	2.6	U 1	U 0.2
MW-12	9/16/2011	U 0.5	U 0.5	U 1	**0.89**
MW-14	9/16/2011	U 0.5	2.8	U 1	**0.69**
MW-11	11/23/2011	U 0.12	2.5	U 1	**U 0.2**
MW-12	11/23/2011	U 0.12	0.22 J	U 1	**0.32**
MW-13	11/23/2011	0.24 J	**8.4**	3.3	**0.6**
MW-14	11/23/2011	0.3 J	4.2	1.5	**2.1**
East Warehouse Reconnaissance Samples					
SR-18	5/1/2009	U 1	U 1	U 1	U 0.2
SR-19	5/1/2009	U 1	U 1	U 1	U 0.2
SR-20	5/1/2009	U 1	U 1	U 1	U 0.2
SR-21	5/1/2009	U 1	1.1	U 1	U 0.2
SR-22	5/1/2009	U 1	1.1	U 1	U 0.2
SR-23	5/1/2009	U 1	U 1	1.4	U 0.2
MTCA Method A table values		*5*	*5*	*80*	*0.2*

Bold indicates exceedance of MTCA Method A table value.

U indicates non-detect at the shown reporting limit.

J indicates an estimated value. J-flag values occur where concentrations are reported between the method detection limit and reporting limit.

All Results ug/L.



Well

- Air Sparging Well
- Monitoring Well
- Ozone Sparge Points (June 2009)
- Ozone Sparge Points (June 2010)

0 Feet 100

N

Figure 1. Site Map and Ozone Sparge Point Locations
Scougal Rubber Corporation
Seattle, Washington

JK0605 / 2-27-09

PgG

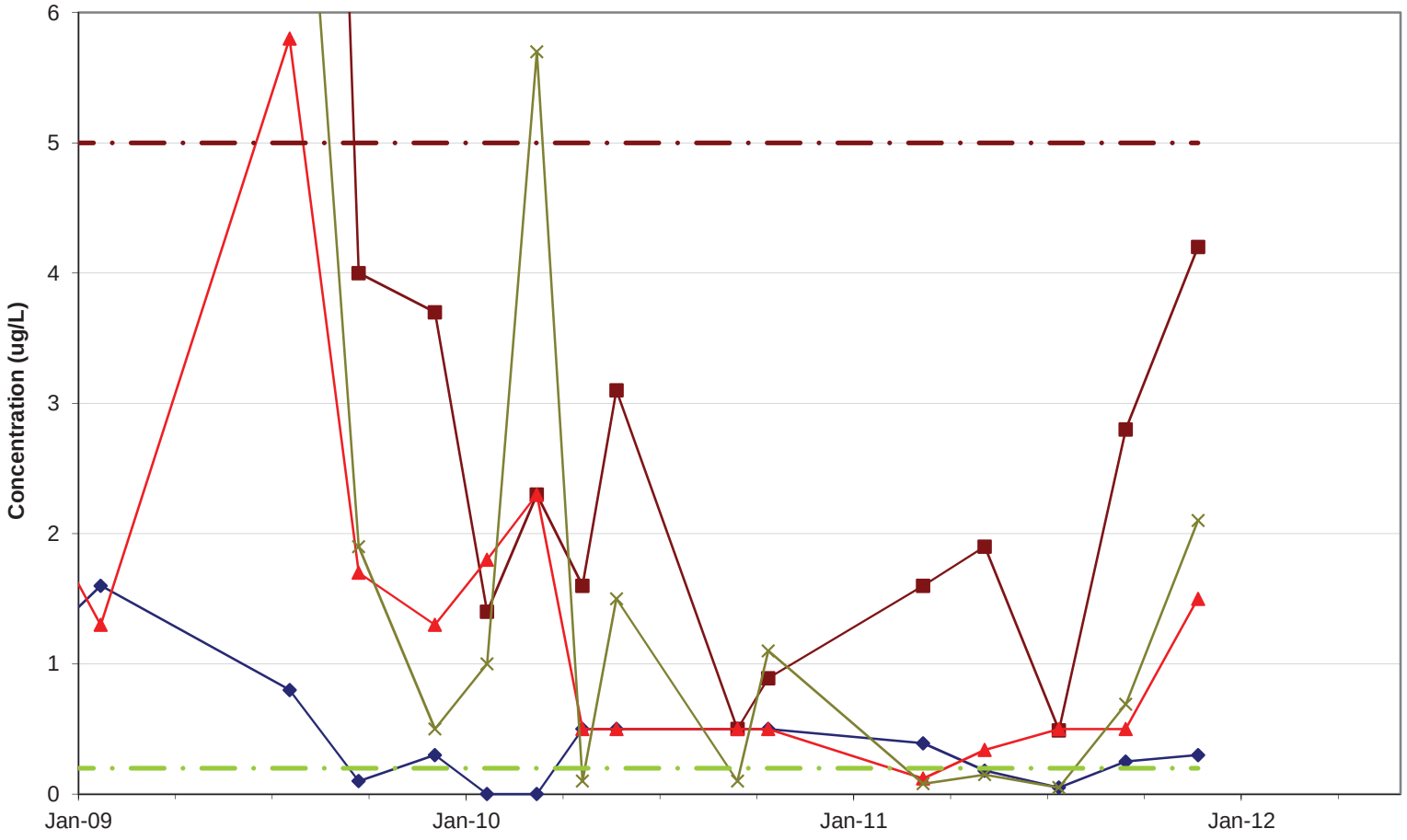


Figure 2. MW-14 Concentration Trends
Scougal Rubber Corporation
Seattle, Washington

PgG

APPENDIX 1

ANALYTICAL LAB REPORTS

OCTOBER 2011 THROUGH SEPTEMBER 2012

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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December 1, 2011

Glen Wallace, Project Manger
Pacific Groundwater Group
2377 Eastlake Ave East
Seattle, WA 98102

Dear Mr. Wallace:

Included are the results from the testing of material submitted on November 23, 2011 from the Scougal Rubber, JK0605, F&BI 111303 project. There are 9 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
PGG1201R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on November 23, 2011 by Friedman & Bruya, Inc. from the Pacific Groundwater Group Scougal Rubber, JK0605, F&BI 111303 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Pacific Groundwater Group
111303-01	MW-11
111303-02	MW-12
111303-03	MW-14
111303-04	MW-13

The 8260C calibration standard failed the acceptance criteria for several analytes. The data were flagged accordingly.

2,2-Dichloropropane in the 8260C laboratory control sample, laboratory control sample duplicate, and matrix spike exceeded the acceptance criteria. The analyte was not detected in the sample, therefore the data were acceptable.

All other quality control requirements were acceptable.

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MW-11	Client:	Pacific Groundwater Group
Date Received:	11/23/11	Project:	JK0605, F&BI 111303
Date Extracted:	11/29/11	Lab ID:	111303-01
Date Analyzed:	11/29/11	Data File:	112928.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	JS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	98	57	121
Toluene-d8	100	63	127
4-Bromofluorobenzene	100	60	133

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<1	1,3-Dichloropropane	<1
Chloromethane	<10	Tetrachloroethene	<0.12 j
Vinyl chloride	<0.2	Dibromochloromethane	<1
Bromomethane	<1	1,2-Dibromoethane (EDB)	<1
Chloroethane	<1	Chlorobenzene	<1
Trichlorofluoromethane	<1	Ethylbenzene	<1
Acetone	<10 ca	1,1,1,2-Tetrachloroethane	<1
1,1-Dichloroethene	<1	m,p-Xylene	<2
Methylene chloride	<5	o-Xylene	<1
Methyl t-butyl ether (MTBE)	<1	Styrene	<1
trans-1,2-Dichloroethene	<1	Isopropylbenzene	<1
1,1-Dichloroethane	<1	Bromoform	<1
2,2-Dichloropropane	<1	n-Propylbenzene	<1
cis-1,2-Dichloroethene	<1	Bromobenzene	<1
Chloroform	<1	1,3,5-Trimethylbenzene	<1
2-Butanone (MEK)	<10 ca	1,1,2,2-Tetrachloroethane	<1
1,2-Dichloroethane (EDC)	<1	1,2,3-Trichloropropane	<1
1,1,1-Trichloroethane	<1	2-Chlorotoluene	<1
1,1-Dichloropropene	<1	4-Chlorotoluene	<1
Carbon tetrachloride	<1	tert-Butylbenzene	<1
Benzene	<0.35	1,2,4-Trimethylbenzene	<1
Trichloroethene	2.5	sec-Butylbenzene	<1
1,2-Dichloropropane	<1	p-Isopropyltoluene	<1
Bromodichloromethane	<1	1,3-Dichlorobenzene	<1
Dibromomethane	<1	1,4-Dichlorobenzene	<1
4-Methyl-2-pentanone	<10	1,2-Dichlorobenzene	<1
cis-1,3-Dichloropropene	<1	1,2-Dibromo-3-chloropropane	<10 ca
Toluene	<1	1,2,4-Trichlorobenzene	<1
trans-1,3-Dichloropropene	<1	Hexachlorobutadiene	<1
1,1,2-Trichloroethane	<1	Naphthalene	<1 ca
2-Hexanone	<10	1,2,3-Trichlorobenzene	<1

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MW-12	Client:	Pacific Groundwater Group
Date Received:	11/23/11	Project:	JK0605, F&BI 111303
Date Extracted:	11/29/11	Lab ID:	111303-02
Date Analyzed:	11/29/11	Data File:	112929.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	JS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	96	57	121
Toluene-d8	101	63	127
4-Bromofluorobenzene	103	60	133

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<1	1,3-Dichloropropane	<1
Chloromethane	<10	Tetrachloroethene	<0.12 j
Vinyl chloride	0.32	Dibromochloromethane	<1
Bromomethane	<1	1,2-Dibromoethane (EDB)	<1
Chloroethane	<1	Chlorobenzene	<1
Trichlorofluoromethane	<1	Ethylbenzene	<1
Acetone	<10 ca	1,1,1,2-Tetrachloroethane	<1
1,1-Dichloroethene	<1	m,p-Xylene	<2
Methylene chloride	<5	o-Xylene	<1
Methyl t-butyl ether (MTBE)	<1	Styrene	<1
trans-1,2-Dichloroethene	<1	Isopropylbenzene	<1
1,1-Dichloroethane	<1	Bromoform	<1
2,2-Dichloropropane	<1	n-Propylbenzene	<1
cis-1,2-Dichloroethene	<1	Bromobenzene	<1
Chloroform	<1	1,3,5-Trimethylbenzene	<1
2-Butanone (MEK)	<10 ca	1,1,2,2-Tetrachloroethane	<1
1,2-Dichloroethane (EDC)	<1	1,2,3-Trichloropropane	<1
1,1,1-Trichloroethane	<1	2-Chlorotoluene	<1
1,1-Dichloropropene	<1	4-Chlorotoluene	<1
Carbon tetrachloride	<1	tert-Butylbenzene	<1
Benzene	<0.35	1,2,4-Trimethylbenzene	<1
Trichloroethene	0.22 j	sec-Butylbenzene	<1
1,2-Dichloropropane	<1	p-Isopropyltoluene	<1
Bromodichloromethane	<1	1,3-Dichlorobenzene	<1
Dibromomethane	<1	1,4-Dichlorobenzene	<1
4-Methyl-2-pentanone	<10	1,2-Dichlorobenzene	<1
cis-1,3-Dichloropropene	<1	1,2-Dibromo-3-chloropropane	<10 ca
Toluene	<1	1,2,4-Trichlorobenzene	<1
trans-1,3-Dichloropropene	<1	Hexachlorobutadiene	<1
1,1,2-Trichloroethane	<1	Naphthalene	<1 ca
2-Hexanone	<10	1,2,3-Trichlorobenzene	<1

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MW-14	Client:	Pacific Groundwater Group
Date Received:	11/23/11	Project:	JK0605, F&BI 111303
Date Extracted:	11/29/11	Lab ID:	111303-03
Date Analyzed:	11/29/11	Data File:	112930.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	JS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	98	57	121
Toluene-d8	102	63	127
4-Bromofluorobenzene	101	60	133

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<1	1,3-Dichloropropane	<1
Chloromethane	<10	Tetrachloroethene	0.30 j
Vinyl chloride	2.1	Dibromochloromethane	<1
Bromomethane	<1	1,2-Dibromoethane (EDB)	<1
Chloroethane	<1	Chlorobenzene	<1
Trichlorofluoromethane	<1	Ethylbenzene	<1
Acetone	<10 ca	1,1,1,2-Tetrachloroethane	<1
1,1-Dichloroethene	<1	m,p-Xylene	<2
Methylene chloride	<5	o-Xylene	<1
Methyl t-butyl ether (MTBE)	<1	Styrene	<1
trans-1,2-Dichloroethene	<1	Isopropylbenzene	<1
1,1-Dichloroethane	<1	Bromoform	<1
2,2-Dichloropropane	<1	n-Propylbenzene	<1
cis-1,2-Dichloroethene	1.5	Bromobenzene	<1
Chloroform	<1	1,3,5-Trimethylbenzene	<1
2-Butanone (MEK)	<10 ca	1,1,2,2-Tetrachloroethane	<1
1,2-Dichloroethane (EDC)	<1	1,2,3-Trichloropropane	<1
1,1,1-Trichloroethane	<1	2-Chlorotoluene	<1
1,1-Dichloropropene	<1	4-Chlorotoluene	<1
Carbon tetrachloride	<1	tert-Butylbenzene	<1
Benzene	<0.35	1,2,4-Trimethylbenzene	<1
Trichloroethene	4.2	sec-Butylbenzene	<1
1,2-Dichloropropane	<1	p-Isopropyltoluene	<1
Bromodichloromethane	<1	1,3-Dichlorobenzene	<1
Dibromomethane	<1	1,4-Dichlorobenzene	<1
4-Methyl-2-pentanone	<10	1,2-Dichlorobenzene	<1
cis-1,3-Dichloropropene	<1	1,2-Dibromo-3-chloropropane	<10 ca
Toluene	<1	1,2,4-Trichlorobenzene	<1
trans-1,3-Dichloropropene	<1	Hexachlorobutadiene	<1
1,1,2-Trichloroethane	<1	Naphthalene	<1 ca
2-Hexanone	<10	1,2,3-Trichlorobenzene	<1

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MW-13	Client:	Pacific Groundwater Group
Date Received:	11/23/11	Project:	JK0605, F&BI 111303
Date Extracted:	11/29/11	Lab ID:	111303-04
Date Analyzed:	11/29/11	Data File:	112931.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	JS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	97	57	121
Toluene-d8	100	63	127
4-Bromofluorobenzene	101	60	133

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<1	1,3-Dichloropropane	<1
Chloromethane	<10	Tetrachloroethene	0.24 j
Vinyl chloride	0.60	Dibromochloromethane	<1
Bromomethane	<1	1,2-Dibromoethane (EDB)	<1
Chloroethane	<1	Chlorobenzene	<1
Trichlorofluoromethane	<1	Ethylbenzene	<1
Acetone	<10 ca	1,1,1,2-Tetrachloroethane	<1
1,1-Dichloroethene	<1	m,p-Xylene	<2
Methylene chloride	<5	o-Xylene	<1
Methyl t-butyl ether (MTBE)	<1	Styrene	<1
trans-1,2-Dichloroethene	<1	Isopropylbenzene	<1
1,1-Dichloroethane	<1	Bromoform	<1
2,2-Dichloropropane	<1	n-Propylbenzene	<1
cis-1,2-Dichloroethene	3.3	Bromobenzene	<1
Chloroform	<1	1,3,5-Trimethylbenzene	<1
2-Butanone (MEK)	<10 ca	1,1,2,2-Tetrachloroethane	<1
1,2-Dichloroethane (EDC)	<1	1,2,3-Trichloropropane	<1
1,1,1-Trichloroethane	<1	2-Chlorotoluene	<1
1,1-Dichloropropene	<1	4-Chlorotoluene	<1
Carbon tetrachloride	<1	tert-Butylbenzene	<1
Benzene	<0.35	1,2,4-Trimethylbenzene	<1
Trichloroethene	8.4	sec-Butylbenzene	<1
1,2-Dichloropropane	<1	p-Isopropyltoluene	<1
Bromodichloromethane	<1	1,3-Dichlorobenzene	<1
Dibromomethane	<1	1,4-Dichlorobenzene	<1
4-Methyl-2-pentanone	<10	1,2-Dichlorobenzene	<1
cis-1,3-Dichloropropene	<1	1,2-Dibromo-3-chloropropane	<10 ca
Toluene	<1	1,2,4-Trichlorobenzene	<1
trans-1,3-Dichloropropene	<1	Hexachlorobutadiene	<1
1,1,2-Trichloroethane	<1	Naphthalene	<1 ca
2-Hexanone	<10	1,2,3-Trichlorobenzene	<1

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	Method Blank	Client:	Pacific Groundwater Group
Date Received:	Not Applicable	Project:	JK0605, F&BI 111303
Date Extracted:	11/29/11	Lab ID:	01-2039 mb
Date Analyzed:	11/29/11	Data File:	112907.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	JS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	98	57	121
Toluene-d8	99	63	127
4-Bromofluorobenzene	102	60	133

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<1	1,3-Dichloropropane	<1
Chloromethane	<10	Tetrachloroethene	<0.12 j
Vinyl chloride	<0.2	Dibromochloromethane	<1
Bromomethane	<1	1,2-Dibromoethane (EDB)	<1
Chloroethane	<1	Chlorobenzene	<1
Trichlorofluoromethane	<1	Ethylbenzene	<1
Acetone	<10 ca	1,1,1,2-Tetrachloroethane	<1
1,1-Dichloroethene	<1	m,p-Xylene	<2
Methylene chloride	<5	o-Xylene	<1
Methyl t-butyl ether (MTBE)	<1	Styrene	<1
trans-1,2-Dichloroethene	<1	Isopropylbenzene	<1
1,1-Dichloroethane	<1	Bromoform	<1
2,2-Dichloropropane	<1	n-Propylbenzene	<1
cis-1,2-Dichloroethene	<1	Bromobenzene	<1
Chloroform	<1	1,3,5-Trimethylbenzene	<1
2-Butanone (MEK)	<10 ca	1,1,2,2-Tetrachloroethane	<1
1,2-Dichloroethane (EDC)	<1	1,2,3-Trichloropropane	<1
1,1,1-Trichloroethane	<1	2-Chlorotoluene	<1
1,1-Dichloropropene	<1	4-Chlorotoluene	<1
Carbon tetrachloride	<1	tert-Butylbenzene	<1
Benzene	<0.35	1,2,4-Trimethylbenzene	<1
Trichloroethene	<0.12 j	sec-Butylbenzene	<1
1,2-Dichloropropane	<1	p-Isopropyltoluene	<1
Bromodichloromethane	<1	1,3-Dichlorobenzene	<1
Dibromomethane	<1	1,4-Dichlorobenzene	<1
4-Methyl-2-pentanone	<10	1,2-Dichlorobenzene	<1
cis-1,3-Dichloropropene	<1	1,2-Dibromo-3-chloropropane	<10 ca
Toluene	<1	1,2,4-Trichlorobenzene	<1
trans-1,3-Dichloropropene	<1	Hexachlorobutadiene	<1
1,1,2-Trichloroethane	<1	Naphthalene	<1 ca
2-Hexanone	<10	1,2,3-Trichlorobenzene	<1

Date of Report: 12/01/11
Date Received: 11/23/11
Project: Scougal Rubber, JK0605, F&BI 111303

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR VOLATILES BY EPA METHOD 8260C

Laboratory Code: 111301-04 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Acceptance Criteria
Dichlorodifluoromethane	ug/L (ppb)	50	<10	107	10-172
Chloromethane	ug/L (ppb)	50	<10	105	25-166
Vinyl chloride	ug/L (ppb)	50	<0.2	107	36-166
Bromomethane	ug/L (ppb)	50	<1	109	47-169
Chloroethane	ug/L (ppb)	50	<1	122	46-160
Trichlorofluoromethane	ug/L (ppb)	50	<1	123	44-165
Acetone	ug/L (ppb)	250	<10	69	10-182
1,1-Dichloroethene	ug/L (ppb)	50	<1	96	60-136
Methylene chloride	ug/L (ppb)	50	<5	83	67-132
Methyl t-butyl ether (MTBE)	ug/L (ppb)	50	<1	95	74-127
trans-1,2-Dichloroethene	ug/L (ppb)	50	<1	103	72-129
1,1-Dichloroethane	ug/L (ppb)	50	<1	105	70-128
2,2-Dichloropropane	ug/L (ppb)	50	<1	172 vo	36-154
cis-1,2-Dichloroethene	ug/L (ppb)	50	<1	101	71-127
Chloroform	ug/L (ppb)	50	<1	105	65-132
2-Butanone (MEK)	ug/L (ppb)	250	<10	72	10-129
1,2-Dichloroethane (EDC)	ug/L (ppb)	50	<1	106	69-133
1,1,1-Trichloroethane	ug/L (ppb)	50	<1	115	60-146
1,1-Dichloropropene	ug/L (ppb)	50	<1	106	69-133
Carbon tetrachloride	ug/L (ppb)	50	<1	123	56-152
Benzene	ug/L (ppb)	50	<0.35	100	76-125
Trichloroethene	ug/L (ppb)	50	<1	91	66-135
1,2-Dichloropropane	ug/L (ppb)	50	<1	102	78-125
Bromodichloromethane	ug/L (ppb)	50	<1	113	61-150
Dibromomethane	ug/L (ppb)	50	<1	99	66-141
4-Methyl-2-pentanone	ug/L (ppb)	250	<10	82	10-185
cis-1,3-Dichloropropene	ug/L (ppb)	50	<1	112	72-132
Toluene	ug/L (ppb)	50	<1	100	76-122
trans-1,3-Dichloropropene	ug/L (ppb)	50	<1	113	76-130
1,1,2-Trichloroethane	ug/L (ppb)	50	<1	97	68-131
2-Hexanone	ug/L (ppb)	250	<10	85	10-185
1,3-Dichloropropane	ug/L (ppb)	50	<1	99	71-128
Tetrachloroethene	ug/L (ppb)	50	<1	100	73-129
Dibromochloromethane	ug/L (ppb)	50	<1	112	70-139
1,2-Dibromoethane (EDB)	ug/L (ppb)	50	<1	96	69-134
Chlorobenzene	ug/L (ppb)	50	<1	101	77-122
Ethylbenzene	ug/L (ppb)	50	<1	104	69-135
1,1,1,2-Tetrachloroethane	ug/L (ppb)	50	<1	109	73-137
m,p-Xylene	ug/L (ppb)	100	<2	104	69-135
o-Xylene	ug/L (ppb)	50	<1	105	68-137
Styrene	ug/L (ppb)	50	<1	108	71-133
Isopropylbenzene	ug/L (ppb)	50	<1	108	65-142
Bromoform	ug/L (ppb)	50	<1	102	65-142
n-Propylbenzene	ug/L (ppb)	50	<1	105	58-144
Bromobenzene	ug/L (ppb)	50	<1	100	75-124
1,3,5-Trimethylbenzene	ug/L (ppb)	50	<1	105	66-137
1,1,2,2-Tetrachloroethane	ug/L (ppb)	50	<1	87	51-154
1,2,3-Trichloropropane	ug/L (ppb)	50	<1	85	53-150
2-Chlorotoluene	ug/L (ppb)	50	<1	104	66-127
4-Chlorotoluene	ug/L (ppb)	50	<1	106	65-130
tert-Butylbenzene	ug/L (ppb)	50	<1	104	65-137
1,2,4-Trimethylbenzene	ug/L (ppb)	50	<1	106	59-146
sec-Butylbenzene	ug/L (ppb)	50	<1	104	64-140
p-Isopropyltoluene	ug/L (ppb)	50	<1	106	65-141
1,3-Dichlorobenzene	ug/L (ppb)	50	<1	101	72-123
1,4-Dichlorobenzene	ug/L (ppb)	50	<1	99	69-126
1,2-Dichlorobenzene	ug/L (ppb)	50	<1	97	69-128
1,2-Dibromo-3-chloropropane	ug/L (ppb)	50	<10	69	32-164
1,2,4-Trichlorobenzene	ug/L (ppb)	50	<1	89	76-132
Hexachlorobutadiene	ug/L (ppb)	50	<1	89	60-143
Naphthalene	ug/L (ppb)	50	<1	75	44-164
1,2,3-Trichlorobenzene	ug/L (ppb)	50	<1	83	69-148

Date of Report: 12/01/11
Date Received: 11/23/11
Project: Scougal Rubber, JK0605, F&BI 111303

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR VOLATILES BY EPA METHOD 8260C

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Dichlorodifluoromethane	ug/L (ppb)	50	125	117	25-158	7
Chloromethane	ug/L (ppb)	50	111	109	45-156	2
Vinyl chloride	ug/L (ppb)	50	115	112	50-154	3
Bromomethane	ug/L (ppb)	50	112	109	55-143	3
Chloroethane	ug/L (ppb)	50	121	123	58-146	2
Trichlorofluoromethane	ug/L (ppb)	50	119	115	50-150	3
Acetone	ug/L (ppb)	250	78	77	60-155	1
1,1-Dichloroethene	ug/L (ppb)	50	101	99	67-136	2
Methylene chloride	ug/L (ppb)	50	85	83	39-148	2
Methyl t-butyl ether (MTBE)	ug/L (ppb)	50	100	100	64-147	0
trans-1,2-Dichloroethene	ug/L (ppb)	50	104	105	68-128	1
1,1-Dichloroethane	ug/L (ppb)	50	105	104	79-121	1
2,2-Dichloropropane	ug/L (ppb)	50	176 vo	175 vo	55-143	1
cis-1,2-Dichloroethene	ug/L (ppb)	50	105	105	80-123	0
Chloroform	ug/L (ppb)	50	103	104	80-121	1
2-Butanone (MEK)	ug/L (ppb)	250	82	81	57-149	1
1,2-Dichloroethane (EDC)	ug/L (ppb)	50	103	105	73-132	2
1,1,1-Trichloroethane	ug/L (ppb)	50	114	114	83-130	0
1,1-Dichloropropene	ug/L (ppb)	50	106	107	77-129	1
Carbon tetrachloride	ug/L (ppb)	50	121	120	75-158	1
Benzene	ug/L (ppb)	50	100	101	69-134	1
Trichloroethene	ug/L (ppb)	50	90	92	80-120	2
1,2-Dichloropropane	ug/L (ppb)	50	102	104	77-123	2
Bromodichloromethane	ug/L (ppb)	50	110	111	81-133	1
Dibromomethane	ug/L (ppb)	50	102	102	82-125	0
4-Methyl-2-pentanone	ug/L (ppb)	250	88	89	70-140	1
cis-1,3-Dichloropropene	ug/L (ppb)	50	118	119	82-132	1
Toluene	ug/L (ppb)	50	101	103	72-122	2
trans-1,3-Dichloropropene	ug/L (ppb)	50	114	116	80-136	2
1,1,2-Trichloroethane	ug/L (ppb)	50	99	100	75-124	1
2-Hexanone	ug/L (ppb)	250	90	91	64-152	1
1,3-Dichloropropane	ug/L (ppb)	50	103	104	76-126	1
Tetrachloroethene	ug/L (ppb)	50	103	104	76-121	1
Dibromochloromethane	ug/L (ppb)	50	111	114	84-133	3
1,2-Dibromoethane (EDB)	ug/L (ppb)	50	101	101	82-125	0
Chlorobenzene	ug/L (ppb)	50	101	102	83-114	1
Ethylbenzene	ug/L (ppb)	50	103	104	77-124	1
1,1,1,2-Tetrachloroethane	ug/L (ppb)	50	108	109	84-127	1
m,p-Xylene	ug/L (ppb)	100	104	105	83-125	1
o-Xylene	ug/L (ppb)	50	106	106	86-121	0
Styrene	ug/L (ppb)	50	108	108	85-127	0
Isopropylbenzene	ug/L (ppb)	50	107	107	87-122	0
Bromoform	ug/L (ppb)	50	105	106	74-136	1
n-Propylbenzene	ug/L (ppb)	50	107	109	74-126	2
Bromobenzene	ug/L (ppb)	50	103	105	80-121	2
1,3,5-Trimethylbenzene	ug/L (ppb)	50	107	108	80-126	1
1,1,2,2-Tetrachloroethane	ug/L (ppb)	50	93	95	66-126	2
1,2,3-Trichloropropane	ug/L (ppb)	50	91	93	67-124	2
2-Chlorotoluene	ug/L (ppb)	50	105	107	77-127	2
4-Chlorotoluene	ug/L (ppb)	50	107	108	78-128	1
tert-Butylbenzene	ug/L (ppb)	50	106	106	85-127	0
1,2,4-Trimethylbenzene	ug/L (ppb)	50	108	108	82-125	0
sec-Butylbenzene	ug/L (ppb)	50	106	107	80-125	1
p-Isopropyltoluene	ug/L (ppb)	50	108	108	82-127	0
1,3-Dichlorobenzene	ug/L (ppb)	50	102	102	85-116	0
1,4-Dichlorobenzene	ug/L (ppb)	50	100	101	84-121	1
1,2-Dichlorobenzene	ug/L (ppb)	50	99	100	85-116	1
1,2-Dibromo-3-chloropropane	ug/L (ppb)	50	78	79	57-141	1
1,2,4-Trichlorobenzene	ug/L (ppb)	50	92	94	72-130	2
Hexachlorobutadiene	ug/L (ppb)	50	93	93	53-141	0
Naphthalene	ug/L (ppb)	50	82	84	64-133	2
1,2,3-Trichlorobenzene	ug/L (ppb)	50	89	90	65-136	1

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

A1 – More than one compound of similar molecule structure was identified with equal probability.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for this range fell outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte indicated may be due to carryover from previous sample injections.

d - The sample was diluted. Detection limits may be raised due to dilution.

ds - The sample was diluted. Detection limits are raised due to dilution and surrogate recoveries may not be meaningful.

dv - Insufficient sample was available to achieve normal reporting limits and limits are raised accordingly.

fb - Analyte present in the blank and the sample.

fc – The compound is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. The variability is attributed to sample inhomogeneity.

ht - Analysis performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of normal control limits. Compounds in the sample matrix interfered with the quantitation of the analyte.

j – The result is below normal reporting limits. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The analyte result in the laboratory control sample is out of control limits. The reported concentration should be considered an estimate.

jr - The rpd result in laboratory control sample associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the compound indicated is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc – The sample was received in a container not approved by the method. The value reported should be considered an estimate.

pr – The sample was received with incorrect preservation. The value reported should be considered an estimate.

ve - Estimated concentration calculated for an analyte response above the valid instrument calibration range. A dilution is required to obtain an accurate quantification of the analyte.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

111303

SAMPLE CHAIN OF CUSTODY ME 11-23-11 V2

Page # 1 of 1

Send Report To Glen Wallace
Company PGC
Address 2377 Eastlake Ave E
City, State, ZIP Seattle WA 98102
Phone # 206 329-0141 Fax # ——

SAMPLERS *(signature)*

PROJECT NAME/NO. Scogul Rubble

PO# JK0605

REMARKS Please Report to MDL. Flag Values Between MDL & RL as needed.

TURNAROUND TIME
☑ Standard (2 Weeks)
☐ RUSH
Rush charges authorized by

SAMPLE DISPOSAL
☑ Dispose after 30 days
☐ Return samples
☐ Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of containers	ANALYSES REQUESTED: TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by8260	SVOCs by 8270	HFS							Notes
MW-11	01A-D	11/23/11	1100	Aq	4				X									
MW-12	02		1115	Aq	4				X									
MW-14	03		1200	Aq	4				X									
MW-13	04		1145	Aq	4				X									

Friedman & Bruya, Inc.
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Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

FORMS\COC\COC.DOC

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Glen Wallace	Glen Wallace	PGC	11/23/11	1417
Received by:	James E K	JAMES KOCHER	CHAMPION	11/23/11	1417
Relinquished by:	James E K	JAMES KOCHER	CHAMPION	11/23/11	1437
Received by:	James Bruya	JAMES BRUYA	F&B	11/23/11	1434