Rose & Westra
A Division of GZA

GEOTECHNICAL
ENVIRONMENTAL
ECOLOGICAL
WATER
CONSTRUCTION MANAGEMENT

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Sent Via Email: hendershotta@michigan.gov

June 11, 2018
File: 16.0062335.53

Ms. Abigail Hendershott
Michigan Department of Environmental Quality
5th Floor – Unit 10
350 Ottawa Avenue NE
Grand Rapids, MI 49503

Re: Wolverine World Wide, Inc.
MDOT Property Soil Verification Sampling and Additional Investigation Work Plan

Dear Ms. Hendershott:

Based on our on-going discussions with you regarding verification sampling at the MDOT property, Rose & Westra, a Division of GZA GeoEnvironmental, Inc. (R&W/GZA) is presenting this revised Work Plan (WP) on behalf of Wolverine World Wide, Inc. (Wolverine). This WP pertains to the property owned by MDOT located on the south side of House Street NE, commonly known as 1758 House Street ("Site"). Wolverine hired qualified contractors to remove debris including leather scrap, bottles, metal, rusted drums, and leather dust from the Site on October 11 to October 17, 2017. This WP outlines the planned soil verification sampling for this Site and additional soil investigation tasks requested in May by MDEQ.

Soil Verification Sampling

It is R&W/GZA's opinion that since the excavation was conducted in a ravine, the "sidewalls" are considered as part of the floor. This would result in the floor of the excavation being approximately 4,500 square feet (ft^2). Based on the MDEQ's 2002 "Sampling Strategies and Statistics Training Manual", the recommended number of floor samples is seven.

However, based on recent discussions, with the MDEQ, R&W/GZA has recalculated the excavation area, assuming that the excavation floor is only 444 ft^2 and that two sidewalls exist (the west and east sides of the valley). Based on 2002 sampling strategies document, the revised excavation configuration results in collection of 11 samples; 2 from the floor and 9 from the sidewalls. We intend to collect 2 sidewall samples from the west side of the excavation, which is approximately 345 ft^2 and 7 sidewall samples from the east sidewall which is approximately 3,620 ft^2.

Per your request, R&W/GZA will be implementing the more conservative sampling plan and collecting 11 samples. Consistent with MDEQ's 2002 guidance, the sample locations will be biased based on visual observations.

Waste characterization samples from the Site had detections of barium. Waste characterization samples from the nearby Imperial Pine Drive property had detections of barium and lead. Chromium is present in leather. Previous soil samples from the Site soil identified perfluorooctanoic Acid (PFOA), perfluorooctane sulfonic acid (PFOS), n-methyl perfluorooctane sulfonamide (MeFOSA). Previous soil samples from the nearby Imperial Pine property identified perfluoroheptane sulfonic acid (PFHpS) and perfluorooctane sulfonamide (FOSA). All of these compounds are included in the analyte list. Analytical results from the waste characterization and soil sampling are attached for reference.

Based on the former tannery operations, on-Site observations during the debris removal, EPA's analytical requirements for the on-going investigation at the adjoining House Street Property, and the above-described information, R&W/GZA selected the following analytes for the 11 soil verification samples:

- Total ammonia, nitrate, nitrite, chloride, total and available cyanide, acetate, formate, total phosphorus, sulfate, and sulfide;
- Metals (aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, total chromium, hexavalent chromium, cobalt, copper, iron, lead, magnesium, mercury, molybdenum, nickel, selenium, silver, sodium, titanium, thallium, vanadium, and zinc);
- Volatile Organic Compounds (VOCs);
- Semi-Volatile Organic Compounds (SVOCs); and
- Perfluorinated Sulfonic Acids and Perfluorinated Carboxylic Acids by U.S. EPA Method PFC/537M (analyte list attached).

To estimate the background arsenic concentration, R&W/GZA will collect nine soil samples from the undisturbed portion of the Site. These samples will be collected in the area shown on the attached figure and tested for arsenic only. Based on the Kent County Soil Survey, the soils in the proposed area are the same type (Chelsea loamy fine sand) as the soils in the area where the waste was removed.

If the above soil verification sampling does not identify any constituents of concern at concentrations greater than either background or Michigan's generic above MDEQ Part 201 cleanup criteria in the previously excavated area a summary report will be completed, and this former disposal area closed. As you know, groundwater investigation and monitoring near the Site is on-going.

Additional Soil Investigation

Via email on June 1, 2018, Mr. Mark Worrall requested additional soil sampling and investigation in the area of three "trenches" visible on a 1965 aerial photograph. The locations of these trenches are shown on the enclosed figure. The areas of disturbance are not consistent with aerial photographs or permit documents for the trench disposal on the House Street parcel. These "trenches" are too narrow and seem more likely to be borrow areas. An aerial photograph from 1960/1961 shows general soil disturbances in the area of the debris removed from the ravine area in 2017. The 1968 aerial photograph shows cleared land covered with low lying vegetation in the area of the alleged trenches. However, based on the proximity of the Site to the House Street parcel and the unknown use of this area, R&W/GZA proposes the following additional soil investigation tasks:

- Complete three direct push soil borings in each of the alleged trenches. These nine locations will be randomly selected along the length of each trench, taking into consideration access and visual characteristics.

- Each boring will be completed to a depth of 20 ft below grade, well below the deepest known waste disposal depth on the adjoining House Street parcel.

- Consistent with the EPA-approved Work Plan for the House St parcel investigation, the soil will be logged as well as screened at 2-foot intervals using a PID and XRF. If observable waste is present, the screening interval will be reduced to one foot. If no visual, XRF, or PID screening indicates the likely presence of waste, no samples will be collected for analysis.

- If visible waste is identified or if either PID or XRF screening suggests constituents of concern maybe present, soil samples will be collected from within the identified waste interval and approximately 2 ft below. These samples will be analyzed for the same analytes previously listed for the soil verification sampling.

- The findings of the additional soil investigation tasks will be summarized in a letter report.

Schedule

R&W/GZA anticipates conducting the above-described sampling within the next month. A summary report will be submitted within 30 days of receipt of all of the analytical reports.

Sincerely,

Rose & Westra, a Division of GZA GeoEnvironmental, Inc.

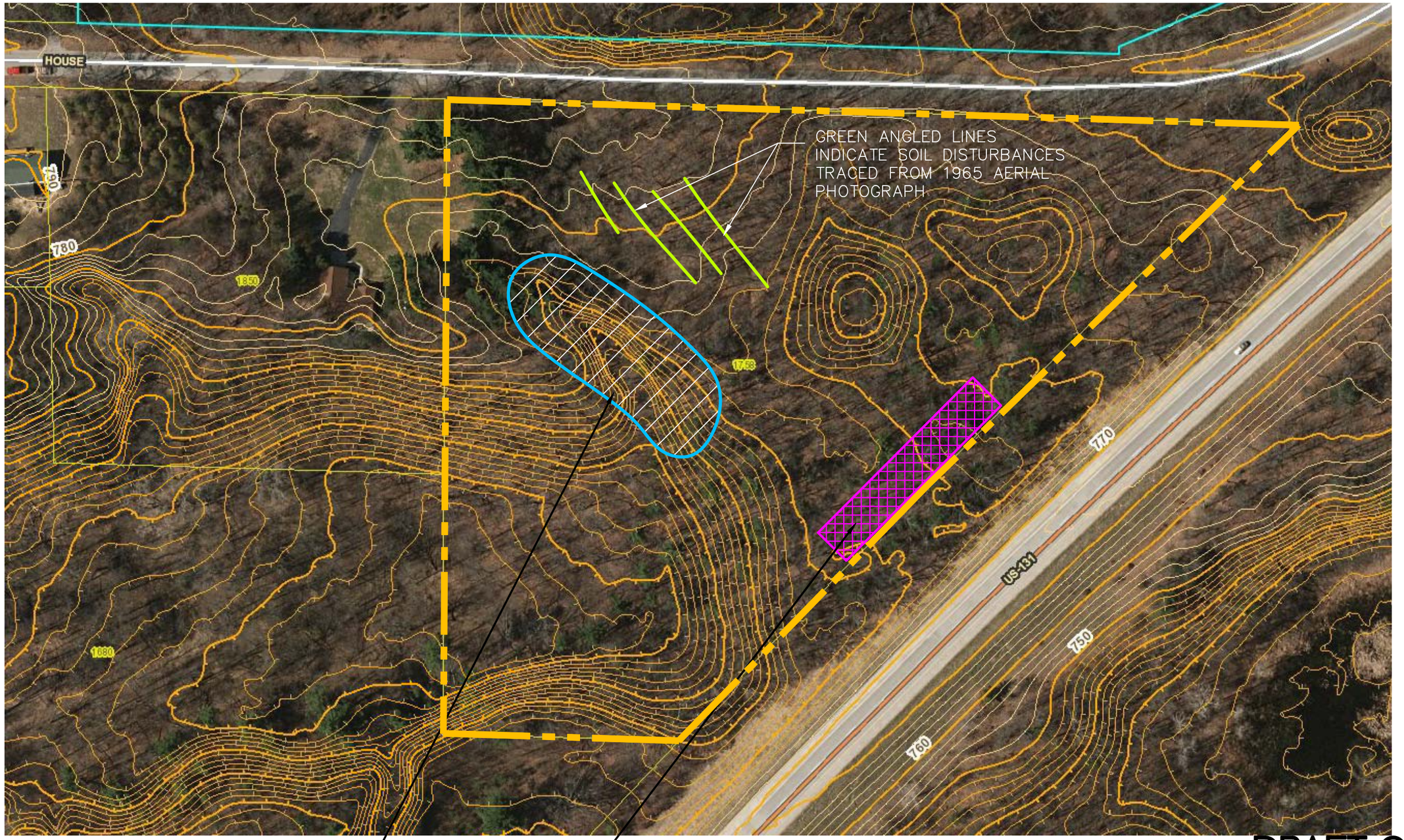
Loretta J. Powers
Senior Project Manager

Leslie M. Nelson, P.E.
Senior Project Manager

Mark A. Westra
Associate Principal

ljp/lmn/maw

c/enc: Mr. Dave Latchana – Wolverine World Wide, Inc. *via email David.Latchana@wwwinc.com*
Mr. John V. Byl – Warner Norcross & Judd LLP *via email* jbyl@wnj.com



SCALE: 1" = 100'

0' 100'

NORTH

NORTH ORIENTATION

DRAFT COPY

SITE PLAN

ROSE & WESTRA
A DIVISION OF GZA
Grand Rapids, Michigan
GEOTECHNICAL–ENVIRONMENTAL–ECOLOGICAL
WATER–CONSTRUCTION MANAGEMENT

MDOT PROPERTY
1758 HOUSE STREET NE, ROCKFORD, MICHIGAN
MDOT PROPERTY EXCAVATION

PROJECT NO.
16.0062335.53

1
FIGURE NO.

CREATED BY: KJB APPROVED BY: LJP DATE: 6/6/18 FILE NAME: 62335_53_EX_1758

ALS Environmental
ALS Group USA, Corp
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www.alsglobal.com

November 08, 2017 **Analytical Report for Service Request No:** K1711468

Lori Powers
Rose & Westra, a Division of GZA
601 Fifth Street NW, Suite 102
Grand Rapids, MI 49504

RE: 16.0062335.53 / 16.0062335.53 TO1

Dear Lori,

Enclosed are the results of the sample(s) submitted to our laboratory October 21, 2017
For your reference, these analyses have been assigned our service request number **K1711468.**

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please contact me if you have any questions. My extension is 3275. You may also contact me via email at Chris.Leaf@ALSGlobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Chris Leaf
Project Manager

ALS Environmental
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Table of Contents

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Inorganic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
E	The result is an estimate amount because the value exceeded the instrument calibration range.
J	The result is an estimated value.
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
i	The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
X	See case narrative.
Q	See case narrative. One or more quality control criteria was outside the limits.
H	The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory.

Metals Data Qualifiers

#	The control limit criteria is not applicable. See case narrative.
J	The result is an estimated value.
E	The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
M	The duplicate injection precision was not met.
N	The Matrix Spike sample recovery is not within control limits. See case narrative.
S	The reported value was determined by the Method of Standard Additions (MSA).
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
W	The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
i	The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
X	See case narrative.
+	The correlation coefficient for the MSA is less than 0.995.
Q	See case narrative. One or more quality control criteria was outside the limits.

Organic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
A	A tentatively identified compound, a suspected aldol-condensation product.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
C	The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
D	The reported result is from a dilution.
E	The result is an estimated value.
J	The result is an estimated value.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
P	The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results.
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
i	The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference.
X	See case narrative.
Q	See case narrative. One or more quality control criteria was outside the limits.

Additional Petroleum Hydrocarbon Specific Qualifiers

F	The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
L	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
H	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
O	The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
Y	The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
Z	The chromatographic fingerprint does not resemble a petroleum product.

ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso
State Certifications, Accreditations, and Licenses

Agency	Web Site	Number
Alaska DEH	http://dec.alaska.gov/eh/lab/cs/csapproval.htm	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsvs/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx	2795
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	http://health.hawaii.gov/	-
Louisiana DEQ	http://www.deq.louisiana.gov/page/la-lab-accreditation	03016
Maine DHS	http://www.maine.gov/dhhs/	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/enforcement/oqa.html	WA005
New York - DOH	https://www.wadsworth.org/regulatory/elap	12060
North Carolina DEQ	https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA100010
South Carolina DHEC	http://www.scdhec.gov/environment/EnvironmentalLabCertification/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704427
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C544
Wyoming (EPA Region 8)	https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water-	-
Kelso Laboratory Website	www.alsglobal.com	NA

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.ALSGlobal.com or at the accreditation bodies web site.
Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/anlayte is offered by that state.

Case Narrative

ALS Environmental—Kelso Laboratory
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Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

ALS ENVIRONMENTAL

Client:	GZA GeoEnvironmental, Incorporated	**Service Request No.:**	K1711468
Project:	16.0062335.53 TO1	**Date Received:**	10/21/17
Sample Matrix:	Soil		

Case Narrative

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Surrogate recoveries have been reported for all applicable organic analyses. Additional quality control analyses reported herein include: Laboratory Control Sample (LCS), and Laboratory/Duplicate Laboratory Control Sample (LCS/DLCS).

Sample Receipt

Three soil samples were received for analysis at ALS Environmental on 10/21/17. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4ºC upon receipt at the laboratory.

Perfluorinated Sulfonic Acids and Perfluorinated Carboxylic Acids by HPLC/MS

Calibration Verification Exceptions:
The upper control criterion was exceeded for N-Methyl perfluorooctane sulfonamide (MeFOSA) and N-Ethyl perfluorooctane sulfonamidoethanol in the Continuing Calibration Verification (CCV) associated with several samples. There were no detections reported for these analytes from the associated field samples. Since the apparent problem indicated a potential high bias, the data quality was not affected. No further corrective action was required.

Surrogate Exceptions:
The upper control criterion was exceeded for several surrogates in sample SS-03. The associated native analytes were not detected in this sample. Assuming the native analytes performed similar to the labeled analogs, the effect on the reported results was minimal. The quality of the sample data was not significantly affected. No further corrective action was appropriate.

Elevated Detection Limits:
Sample SS-03 required dilution due to matrix interferences that caused suppression of the instrument internal standard. The detection limits were adjusted to reflect the dilution.

No other anomalies associated with the analysis of these samples were observed.

Approved by_____

Chain of Custody

ALS Environmental—Kelso Laboratory
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Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

ALS Environmental

CHAIN OF CUSTODY
82556

001, 002

SR# K1711468

COC Set____of____

COC#_____

1317 South 13th Ave, Kelso, WA 98626 Phone (360) 577-7222 / 800-695-7222 / FAX (360) 636-1068
www.alsglobal.com

Project Name: 16.0062335.53	Project Number: 16.0062335.53 TO1
Project Manager: Bryan Rose	
Company: Rose and Westra, a Division of GZA	
Address: 601 Fifth St NW Suite 102, Grand Rapids MI	
Phone #: 616-956-6123	email: bryan.rose@gza.com
Sampler Signature	Sampler Printed Name: Kevin Hedinger

CLIENT SAMPLE ID	LABID	SAMPLING Date	Time	Matrix	NUMBER OF CONTAINERS	14D EPA 1312 / SPLP	14D PFC/537M / PFOA	1	2	3	4	5	Remarks
1. SS-01		10/12/17	12:10	Soil	1		X						
2. SS-02		10/12/17	12:50	Soil	1		X						
3. SS-03		10/12/17	13:55	Soil	1		X						
4.													
5.													
6.													
7.													
8.													
9.													
10.													

Report Requirements

___ I. Routine Report: Method Blank, Surrogate, as required

___ II. Report Dup., MS, MSD as required

___ III. CLP Like Summary (no raw data)

___ IV. Data Validation Report

___ V. EDD

Invoice Information

P.O.# 16.0062335.53 TO1

Bill To: Rose & Westra / GZA SAA

Turnaround Requirements

___ 24 hr. ___ 48 hr.

X 5 Day Standard

Requested Report Date

Circle which metals are to be analyzed

Total Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Special Instructions/Comments:

*Indicate State Hydrocarbon Procedure: AK CA WI Northwest Other____(Circle One)

Relinquished By:	Received By:	Relinquished By:	Received By:	Relinquished By:	Received By:
Signature:	Signature:	Signature:	Signature:	Signature:	Signature: Rochelle Benez
Printed Name: Kevin M. Hedinger	Printed Name: William Bosze	Printed Name: William Bosze	Printed Name: FedEx	Printed Name:	Printed Name: Rochelle Benez
Firm: GZA	Firm: GZA	Firm: GZA	Firm:	Firm:	Firm: ALS - Kelso
Date/Time: 10/12/17 5:00p	Date/Time: 10/19/17 5:00p	Date/Time: 10/20/17 4:00p	Date/Time: 10/20/17 4:00p	Date/Time:	Date/Time: 10/21/17 10:00AM

PC CL

Cooler Receipt and Preservation Form

Client GZA Service Request K1711468

Received: 10/21/17 Opened: 10/21/17 By: RB Unloaded: 10/21/17 By: RB

1. Samples were received via? *USPS* (*Fed Ex*) *UPS* *DHL* *PDX* *Courier* *Hand Delivered*
2. Samples were received in: (circle) (*Cooler*) *Box* *Envelope* *Other* _____ *NA*
3. Were custody seals on coolers? NA (Y) N If yes, how many and where? (1) Front Lid
   If present, were custody seals intact? (Y) N If present, were they signed and dated? (Y) N

Raw Cooler Temp	Corrected Cooler Temp	Raw Temp Blank	Corrected Temp Blank	Corr. Factor	Thermometer ID	Cooler/COC ID NA	Tracking Number NA	Filed
0.3	———	———	0.2	-0.1	375		7705 5824 6151	

4. Packing material: *Inserts* *Baggies* *Bubble Wrap* *Gel Packs* *Wet Ice* *Dry Ice* *Sleeves* _____
5. Were custody papers properly filled out (ink, signed, etc.)? NA (Y) N
6. Were samples received in good condition (temperature, unbroken)? *Indicate in the table below.* NA (Y) N
   If applicable, tissue samples were received: *Frozen* *Partially Thawed* *Thawed*
7. Were all sample labels complete (i.e analysis, preservation, etc.)? NA (Y) N
8. Did all sample labels and tags agree with custody papers? *Indicate major discrepancies in the table on page 2.* NA (Y) N
9. Were appropriate bottles/containers and volumes received for the tests indicated? NA (Y) N
10. Were the pH-preserved bottles (*see SMO GEN SOP*) received at the appropriate pH? *Indicate in the table below* (NA) Y N
11. Were VOA vials received without headspace? *Indicate in the table below.* (NA) Y N
12. Was C12/Res negative? (NA) Y N

Sample ID on Bottle	Sample ID on COC	Identified by:

Sample ID	Bottle Count Bottle Type	Out of Temp	Head-space	Broke	pH	Reagent	Volume added	Reagent Lot Number	Initials	Time

Notes, Discrepancies, & Resolutions: _____

Total Solids

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www.alsglobal.com

Analytical Report

Client:	GZA GeoEnvironmental, Incorporated	**Service Request:**	K1711468
Project:	16.0062335.53/16.0062335.53 TO1	**Date Collected:**	10/12/17
Sample Matrix:	Soil	**Date Received:**	10/21/17
Analysis Method:	160.3 Modified	**Units:**	Percent
Prep Method:	None	**Basis:**	As Received

Solids, Total

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
SS-01	K1711468-001	**81.3**	-	1	10/23/17 11:25	
SS-02	K1711468-002	**94.2**	-	1	10/23/17 11:25	
SS-03	K1711468-003	**68.2**	-	1	10/23/17 11:25	

ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

Client:	GZA GeoEnvironmental, Incorporated	**Service Request:**	K1711468
Project	16.0062335.53/16.0062335.53 TO1	**Date Collected:**	10/12/17
Sample Matrix:	Soil	**Date Received:**	10/21/17
		Date Analyzed:	10/23/17

Replicate Sample Summary
Inorganic Parameters

Sample Name:	SS-01	**Units:**	Percent
Lab Code:	K1711468-001	**Basis:**	As Received

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample K1711468-001DUP Result	Average	RPD	RPD Limit
Solids, Total	160.3 Modified	-	81.3	81.4	81.4	<1	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Perfluorinated Sulfonic Acids and Perfluorinated Carboxylic Acids by HPLC/MS

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

Analytical Report

Client:	GZA GeoEnvironmental, Incorporated	**Service Request:**	K1711468
Project:	16.0062335.53/16.0062335.53 TO1	**Date Collected:**	10/12/17 12:10
Sample Matrix:	Soil	**Date Received:**	10/21/17 10:00
Sample Name:	SS-01	**Units:**	ng/g
Lab Code:	K1711468-001	**Basis:**	Dry

Perfluorinated Sulfonic Acids and Perfluorinated Carboxylic Acids by HPLC/MS

Analysis Method: PFC/537M
Prep Method: EPA 3550B

Analyte Name	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
Perfluorobutanoic acid (PFBA)	ND U	1.1	1	11/02/17 10:16	10/26/17	
Perfluoropentanoic acid (PFPeA)	ND U	1.1	1	11/02/17 10:16	10/26/17	
Perfluorobutane sulfonic acid (PFBS)	ND U	1.1	1	11/02/17 10:16	10/26/17	
Perfluorohexanoic acid (PFHxA)	ND U	1.1	1	11/02/17 10:16	10/26/17	
Perfluoroheptanoic acid (PFHpA)	ND U	1.1	1	11/02/17 10:16	10/26/17	
Perfluorohexane sulfonic acid (PFHxS)	ND U	1.1	1	11/02/17 10:16	10/26/17	
Perfluorooctanoic acid (PFOA)	ND U	1.1	1	11/02/17 10:16	10/26/17	
Perfluoroheptane sulfonic acid (PFHpS)	ND U	1.1	1	11/02/17 10:16	10/26/17	
Perfluorononanoic acid (PFNA)	ND U	1.1	1	11/02/17 10:16	10/26/17	
Perfluorooctane sulfonic acid (PFOS)	ND U	1.1	1	11/02/17 10:16	10/26/17	
Perfluorodecanoic acid (PFDA)	ND U	1.1	1	11/02/17 10:16	10/26/17	
Perfluoroundecanoic acid (PFUnDA)	ND U	1.1	1	11/02/17 10:16	10/26/17	
Perfluorooctane sulfonamide (FOSA)	ND U	1.1	1	11/02/17 10:16	10/26/17	
Perfluorododecanoic acid (PFDoDA)	ND U	1.1	1	11/02/17 10:16	10/26/17	
Perfluorotridecanoic acid (PFTrDA)	ND U	1.1	1	11/02/17 10:16	10/26/17	
N-Methyl perfluorooctane sulfonamide (MeFOSA)	ND U	1.1	1	11/02/17 10:16	10/26/17	*
N-Methyl perfluorooctane sulfonamidoethanol	ND U	1.1	1	11/02/17 10:16	10/26/17	
Perfluorotetradecanoic acid (PFTeDA)	ND U	1.1	1	11/02/17 10:16	10/26/17	
N-Ethyl perfluorooctane sulfonamidoethanol	ND U	1.1	1	11/02/17 10:16	10/26/17	*
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	ND U	1.1	1	11/02/17 10:16	10/26/17	
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	ND U	1.1	1	11/02/17 10:16	10/26/17	
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	ND U	1.1	1	11/02/17 10:16	10/26/17	
Perfluorodecane sulfonic acid (PFDS)	ND U	1.1	1	11/02/17 10:16	10/26/17	

Analytical Report

Client:	GZA GeoEnvironmental, Incorporated	**Service Request:**	K1711468
Project:	16.0062335.53/16.0062335.53 TO1	**Date Collected:**	10/12/17 12:10
Sample Matrix:	Soil	**Date Received:**	10/21/17 10:00
Sample Name:	SS-01	**Units:**	ng/g
Lab Code:	K1711468-001	**Basis:**	Dry

Perfluorinated Sulfonic Acids and Perfluorinated Carboxylic Acids by HPLC/MS

Analysis Method: PFC/537M
Prep Method: EPA 3550B

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
13C4-PFBA	83	50 - 150	11/02/17 10:16	
13C2-PFHxA	80	50 - 150	11/02/17 10:16	
18O2-PFHxS	94	50 - 150	11/02/17 10:16	
13C2-6:2 FTS	77	50 - 150	11/02/17 10:16	
13C4-PFOA	86	50 - 150	11/02/17 10:16	
13C5-PFNA	88	50 - 150	11/02/17 10:16	
13C4-PFOS	87	50 - 150	11/02/17 10:16	
13C2-PFDA	90	50 - 150	11/02/17 10:16	
13C2-PFUnDA	92	50 - 150	11/02/17 10:16	
13C2-PFDoDA	85	50 - 150	11/02/17 10:16	
D7-MeFOSE	60	50 - 150	11/02/17 10:16	
D9-EtFOSE	64	50 - 150	11/02/17 10:16	
D5-EtFOSA	91	50 - 150	11/02/17 10:16	
13C2-8:2 FTS	90	50 - 150	11/02/17 10:16	
13C2-PFTeDA	80	50 - 150	11/02/17 10:16	
13C4-PFHpA	91	50 - 150	11/02/17 10:16	
13C5-PFPeA	82	50 - 150	11/02/17 10:16	
13C3-PFBS	74	50 - 150	11/02/17 10:16	
13C8-FOSA	96	50 - 150	11/02/17 10:16	

Analytical Report

Client:	GZA GeoEnvironmental, Incorporated	**Service Request:**	K1711468
Project:	16.0062335.53/16.0062335.53 TO1	**Date Collected:**	10/12/17 12:50
Sample Matrix:	Soil	**Date Received:**	10/21/17 10:00
Sample Name:	SS-02	**Units:**	ng/g
Lab Code:	K1711468-002	**Basis:**	Dry

Perfluorinated Sulfonic Acids and Perfluorinated Carboxylic Acids by HPLC/MS

Analysis Method: PFC/537M
Prep Method: EPA 3550B

Analyte Name	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
Perfluorobutanoic acid (PFBA)	ND U	1.0	1	11/02/17 10:47	10/26/17	
Perfluoropentanoic acid (PFPeA)	ND U	1.0	1	11/02/17 10:47	10/26/17	
Perfluorobutane sulfonic acid (PFBS)	ND U	1.0	1	11/02/17 10:47	10/26/17	
Perfluorohexanoic acid (PFHxA)	ND U	1.0	1	11/02/17 10:47	10/26/17	
Perfluoroheptanoic acid (PFHpA)	ND U	1.0	1	11/02/17 10:47	10/26/17	
Perfluorohexane sulfonic acid (PFHxS)	ND U	1.0	1	11/02/17 10:47	10/26/17	
Perfluorooctanoic acid (PFOA)	**1.9**	1.0	1	11/02/17 10:47	10/26/17	
Perfluoroheptane sulfonic acid (PFHpS)	ND U	1.0	1	11/02/17 10:47	10/26/17	
Perfluorononanoic acid (PFNA)	ND U	1.0	1	11/02/17 10:47	10/26/17	
Perfluorooctane sulfonic acid (PFOS)	**2.3**	1.0	1	11/02/17 10:47	10/26/17	
Perfluorodecanoic acid (PFDA)	ND U	1.0	1	11/02/17 10:47	10/26/17	
Perfluoroundecanoic acid (PFUnDA)	ND U	1.0	1	11/02/17 10:47	10/26/17	
Perfluorooctane sulfonamide (FOSA)	ND U	1.0	1	11/02/17 10:47	10/26/17	
Perfluorododecanoic acid (PFDoDA)	ND U	1.0	1	11/02/17 10:47	10/26/17	
Perfluorotridecanoic acid (PFTrDA)	ND U	1.0	1	11/02/17 10:47	10/26/17	
N-Methyl perfluorooctane sulfonamide (MeFOSA)	ND U	1.0	1	11/02/17 10:47	10/26/17	*
N-Methyl perfluorooctane sulfonamidoethanol	ND U	1.0	1	11/02/17 10:47	10/26/17	
Perfluorotetradecanoic acid (PFTeDA)	ND U	1.0	1	11/02/17 10:47	10/26/17	
N-Ethyl perfluorooctane sulfonamidoethanol	ND U	1.0	1	11/02/17 10:47	10/26/17	*
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	ND U	1.0	1	11/02/17 10:47	10/26/17	
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	ND U	1.0	1	11/02/17 10:47	10/26/17	
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	ND U	1.0	1	11/02/17 10:47	10/26/17	
Perfluorodecane sulfonic acid (PFDS)	ND U	1.0	1	11/02/17 10:47	10/26/17	

Client:	GZA GeoEnvironmental, Incorporated	**Service Request:**	K1711468
Project:	16.0062335.53/16.0062335.53 TO1	**Date Collected:**	10/12/17 12:50
Sample Matrix:	Soil	**Date Received:**	10/21/17 10:00
Sample Name:	SS-02	**Units:**	ng/g
Lab Code:	K1711468-002	**Basis:**	Dry

Perfluorinated Sulfonic Acids and Perfluorinated Carboxylic Acids by HPLC/MS

Analysis Method: PFC/537M
Prep Method: EPA 3550B

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
13C4-PFBA	86	50 - 150	11/02/17 10:47	
13C2-PFHxA	91	50 - 150	11/02/17 10:47	
18O2-PFHxS	93	50 - 150	11/02/17 10:47	
13C2-6:2 FTS	87	50 - 150	11/02/17 10:47	
13C4-PFOA	85	50 - 150	11/02/17 10:47	
13C5-PFNA	94	50 - 150	11/02/17 10:47	
13C4-PFOS	95	50 - 150	11/02/17 10:47	
13C2-PFDA	92	50 - 150	11/02/17 10:47	
13C2-PFUnDA	90	50 - 150	11/02/17 10:47	
13C2-PFDoDA	84	50 - 150	11/02/17 10:47	
D7-MeFOSE	59	50 - 150	11/02/17 10:47	
D9-EtFOSE	62	50 - 150	11/02/17 10:47	
D5-EtFOSA	89	50 - 150	11/02/17 10:47	
13C2-8:2 FTS	90	50 - 150	11/02/17 10:47	
13C2-PFTeDA	86	50 - 150	11/02/17 10:47	
13C4-PFHpA	98	50 - 150	11/02/17 10:47	
13C5-PFPeA	87	50 - 150	11/02/17 10:47	
13C3-PFBS	84	50 - 150	11/02/17 10:47	
13C8-FOSA	97	50 - 150	11/02/17 10:47	

Client:	GZA GeoEnvironmental, Incorporated	**Service Request:**	K1711468
Project:	16.0062335.53/16.0062335.53 TO1	**Date Collected:**	10/12/17 13:55
Sample Matrix:	Soil	**Date Received:**	10/21/17 10:00
Sample Name:	SS-03	**Units:**	ng/g
Lab Code:	K1711468-003	**Basis:**	Dry

Perfluorinated Sulfonic Acids and Perfluorinated Carboxylic Acids by HPLC/MS

Analysis Method: PFC/537M
Prep Method: EPA 3550B

Analyte Name	Result		MRL	Dil.	Date Analyzed	Date Extracted	Q
Perfluorobutanoic acid (PFBA)	ND	U	26	20	11/02/17 12:42	10/26/17	
Perfluoropentanoic acid (PFPeA)	ND	U	26	20	11/02/17 12:42	10/26/17	
Perfluorobutane sulfonic acid (PFBS)	ND	U	26	20	11/02/17 12:42	10/26/17	
Perfluorohexanoic acid (PFHxA)	ND	U	26	20	11/02/17 12:42	10/26/17	
Perfluoroheptanoic acid (PFHpA)	ND	U	26	20	11/02/17 12:42	10/26/17	
Perfluorohexane sulfonic acid (PFHxS)	ND	U	26	20	11/02/17 12:42	10/26/17	
Perfluorooctanoic acid (PFOA)	ND	U	26	20	11/02/17 12:42	10/26/17	
Perfluoroheptane sulfonic acid (PFHpS)	ND	U	26	20	11/02/17 12:42	10/26/17	
Perfluorononanoic acid (PFNA)	ND	U	26	20	11/02/17 12:42	10/26/17	
Perfluorooctane sulfonic acid (PFOS)	ND	U	26	20	11/02/17 12:42	10/26/17	
Perfluorodecanoic acid (PFDA)	ND	U	26	20	11/02/17 12:42	10/26/17	
Perfluoroundecanoic acid (PFUnDA)	ND	U	26	20	11/02/17 12:42	10/26/17	
Perfluorooctane sulfonamide (FOSA)	ND	U	26	20	11/02/17 12:42	10/26/17	
Perfluorododecanoic acid (PFDoDA)	ND	U	26	20	11/02/17 12:42	10/26/17	
Perfluorotridecanoic acid (PFTrDA)	ND	U	26	20	11/02/17 12:42	10/26/17	
N-Methyl perfluorooctane sulfonamide (MeFOSA)	**37**		26	20	11/03/17 11:35	10/26/17	
N-Methyl perfluorooctane sulfonamidoethanol	ND	U	26	20	11/02/17 12:42	10/26/17	
Perfluorotetradecanoic acid (PFTeDA)	ND	U	26	20	11/02/17 12:42	10/26/17	
N-Ethyl perfluorooctane sulfonamidoethanol	ND	U	26	20	11/02/17 12:42	10/26/17	*
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	ND	U	26	20	11/02/17 12:42	10/26/17	
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	ND	U	26	20	11/02/17 12:42	10/26/17	
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	ND	U	26	20	11/02/17 12:42	10/26/17	
Perfluorodecane sulfonic acid (PFDS)	ND	U	26	20	11/02/17 12:42	10/26/17	

Analytical Report

Client:	GZA GeoEnvironmental, Incorporated	**Service Request:**	K1711468
Project:	16.0062335.53/16.0062335.53 TO1	**Date Collected:**	10/12/17 13:55
Sample Matrix:	Soil	**Date Received:**	10/21/17 10:00
Sample Name:	SS-03	**Units:**	ng/g
Lab Code:	K1711468-003	**Basis:**	Dry

Perfluorinated Sulfonic Acids and Perfluorinated Carboxylic Acids by HPLC/MS

Analysis Method: PFC/537M
Prep Method: EPA 3550B

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
13C4-PFBA	142	50 - 150	11/02/17 12:42	
13C2-PFHxA	154	50 - 150	11/02/17 12:42	*
18O2-PFHxS	154	50 - 150	11/02/17 12:42	*
13C2-6:2 FTS	172	50 - 150	11/02/17 12:42	*
13C4-PFOA	132	50 - 150	11/02/17 12:42	
13C5-PFNA	147	50 - 150	11/02/17 12:42	
13C4-PFOS	151	50 - 150	11/02/17 12:42	*
13C2-PFDA	141	50 - 150	11/02/17 12:42	
13C2-PFUnDA	141	50 - 150	11/02/17 12:42	
13C2-PFDoDA	122	50 - 150	11/02/17 12:42	
D7-MeFOSE	91	50 - 150	11/02/17 12:42	
D9-EtFOSE	137	50 - 150	11/02/17 12:42	
D5-EtFOSA	107	50 - 150	11/02/17 12:42	
13C2-8:2 FTS	129	50 - 150	11/02/17 12:42	
13C2-PFTeDA	112	50 - 150	11/02/17 12:42	
13C4-PFHpA	167	50 - 150	11/02/17 12:42	*
13C5-PFPeA	159	50 - 150	11/02/17 12:42	*
13C3-PFBS	162	50 - 150	11/02/17 12:42	*
13C8-FOSA	139	50 - 150	11/02/17 12:42	

Analytical Report

Client:	GZA GeoEnvironmental, Incorporated	**Service Request:**	K1711468
Project:	16.0062335.53/16.0062335.53 TO1	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
Sample Name:	Method Blank	**Units:**	ng/g
Lab Code:	KQ1715748-04	**Basis:**	Dry

Perfluorinated Sulfonic Acids and Perfluorinated Carboxylic Acids by HPLC/MS

Analysis Method: PFC/537M
Prep Method: EPA 3550B

Analyte Name	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
Perfluorobutanoic acid (PFBA)	ND U	1.0	1	11/02/17 09:55	10/26/17	
Perfluoropentanoic acid (PFPeA)	ND U	1.0	1	11/02/17 09:55	10/26/17	
Perfluorobutane sulfonic acid (PFBS)	ND U	1.0	1	11/02/17 09:55	10/26/17	
Perfluorohexanoic acid (PFHxA)	ND U	1.0	1	11/02/17 09:55	10/26/17	
Perfluoroheptanoic acid (PFHpA)	ND U	1.0	1	11/02/17 09:55	10/26/17	
Perfluorohexane sulfonic acid (PFHxS)	ND U	1.0	1	11/02/17 09:55	10/26/17	
Perfluorooctanoic acid (PFOA)	ND U	1.0	1	11/02/17 09:55	10/26/17	
Perfluoroheptane sulfonic acid (PFHpS)	ND U	1.0	1	11/02/17 09:55	10/26/17	
Perfluorononanoic acid (PFNA)	ND U	1.0	1	11/02/17 09:55	10/26/17	
Perfluorooctane sulfonic acid (PFOS)	ND U	1.0	1	11/02/17 09:55	10/26/17	
Perfluorodecanoic acid (PFDA)	ND U	1.0	1	11/02/17 09:55	10/26/17	
Perfluoroundecanoic acid (PFUnDA)	ND U	1.0	1	11/02/17 09:55	10/26/17	
Perfluorooctane sulfonamide (FOSA)	ND U	1.0	1	11/02/17 09:55	10/26/17	
Perfluorododecanoic acid (PFDoDA)	ND U	1.0	1	11/02/17 09:55	10/26/17	
Perfluorotridecanoic acid (PFTrDA)	ND U	1.0	1	11/02/17 09:55	10/26/17	
N-Methyl perfluorooctane sulfonamide (MeFOSA)	ND U	1.0	1	11/02/17 09:55	10/26/17	
N-Methyl perfluorooctane sulfonamidoethanol	ND U	1.0	1	11/02/17 09:55	10/26/17	
Perfluorotetradecanoic acid (PFTeDA)	ND U	1.0	1	11/02/17 09:55	10/26/17	
N-Ethyl perfluorooctane sulfonamidoethanol	ND U	1.0	1	11/02/17 09:55	10/26/17	
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	ND U	1.0	1	11/02/17 09:55	10/26/17	
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	ND U	1.0	1	11/02/17 09:55	10/26/17	
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	ND U	1.0	1	11/02/17 09:55	10/26/17	
Perfluorodecane sulfonic acid (PFDS)	ND U	1.0	1	11/02/17 09:55	10/26/17	

Client:	GZA GeoEnvironmental, Incorporated	**Service Request:**	K1711468
Project:	16.0062335.53/16.0062335.53 TO1	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
Sample Name:	Method Blank	**Units:**	ng/g
Lab Code:	KQ1715748-04	**Basis:**	Dry

Perfluorinated Sulfonic Acids and Perfluorinated Carboxylic Acids by HPLC/MS

Analysis Method: PFC/537M
Prep Method: EPA 3550B

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
13C4-PFBA	88	50 - 150	11/02/17 09:55	
13C2-PFHxA	92	50 - 150	11/02/17 09:55	
18O2-PFHxS	95	50 - 150	11/02/17 09:55	
13C2-6:2 FTS	91	50 - 150	11/02/17 09:55	
13C4-PFOA	91	50 - 150	11/02/17 09:55	
13C5-PFNA	95	50 - 150	11/02/17 09:55	
13C4-PFOS	97	50 - 150	11/02/17 09:55	
13C2-PFDA	97	50 - 150	11/02/17 09:55	
13C2-PFUnDA	94	50 - 150	11/02/17 09:55	
13C2-PFDoDA	90	50 - 150	11/02/17 09:55	
D7-MeFOSE	64	50 - 150	11/02/17 09:55	
D9-EtFOSE	66	50 - 150	11/02/17 09:55	
D5-EtFOSA	99	50 - 150	11/02/17 09:55	
13C2-8:2 FTS	102	50 - 150	11/02/17 09:55	
13C2-PFTeDA	89	50 - 150	11/02/17 09:55	
13C4-PFHpA	95	50 - 150	11/02/17 09:55	
13C5-PFPeA	88	50 - 150	11/02/17 09:55	
13C3-PFBS	85	50 - 150	11/02/17 09:55	
13C8-FOSA	101	50 - 150	11/02/17 09:55	

Client: GZA GeoEnvironmental, Incorporated **Service Request:** K1711468
Project: 16.0062335.53/16.0062335.53 TO1
Sample Matrix: Soil

SURROGATE RECOVERY SUMMARY

Perfluorinated Sulfonic Acids and Perfluorinated Carboxylic Acids by HPLC/MS

Analysis Method: PFC/537M
Extraction Method: EPA 3550B

Sample Name	Lab Code	13C2-6:2 FTS 50 - 150	13C2-8:2 FTS 50 - 150	13C2-PFDA 50 - 150
SS-01	K1711468-001	77	90	90
SS-02	K1711468-002	87	90	92
SS-03	K1711468-003	172 *	129	141
SS-01	KQ1715748-01	73	92	91
SS-01	KQ1715748-02	78	99	97
Lab Control Sample	KQ1715748-03	80	104	97
Method Blank	KQ1715748-04	91	102	97

Client: GZA GeoEnvironmental, Incorporated **Service Request:** K1711468
Project: 16.0062335.53/16.0062335.53 TO1
Sample Matrix: Soil

SURROGATE RECOVERY SUMMARY

Perfluorinated Sulfonic Acids and Perfluorinated Carboxylic Acids by HPLC/MS

Analysis Method: PFC/537M
Extraction Method: EPA 3550B

Sample Name	Lab Code	13C2-PFDoDA 50 - 150	13C2-PFHxA 50 - 150	13C2-PFTeDA 50 - 150
SS-01	K1711468-001	85	80	80
SS-02	K1711468-002	84	91	86
SS-03	K1711468-003	122	154 *	112
SS-01	KQ1715748-01	82	83	84
SS-01	KQ1715748-02	90	90	87
Lab Control Sample	KQ1715748-03	87	91	94
Method Blank	KQ1715748-04	90	92	89

Client: GZA GeoEnvironmental, Incorporated **Service Request:** K1711468
Project: 16.0062335.53/16.0062335.53 TO1
Sample Matrix: Soil

SURROGATE RECOVERY SUMMARY

Perfluorinated Sulfonic Acids and Perfluorinated Carboxylic Acids by HPLC/MS

Analysis Method: PFC/537M
Extraction Method: EPA 3550B

Sample Name	Lab Code	13C2-PFUnDA 50 - 150	13C3-PFBS 50 - 150	13C4-PFBA 50 - 150
SS-01	K1711468-001	92	74	83
SS-02	K1711468-002	90	84	86
SS-03	K1711468-003	141	162 *	142
SS-01	KQ1715748-01	89	83	83
SS-01	KQ1715748-02	96	87	90
Lab Control Sample	KQ1715748-03	97	82	89
Method Blank	KQ1715748-04	94	85	88

Client: GZA GeoEnvironmental, Incorporated **Service Request:** K1711468
Project: 16.0062335.53/16.0062335.53 TO1
Sample Matrix: Soil

SURROGATE RECOVERY SUMMARY

Perfluorinated Sulfonic Acids and Perfluorinated Carboxylic Acids by HPLC/MS

Analysis Method: PFC/537M
Extraction Method: EPA 3550B

Sample Name	Lab Code	13C4-PFHpA 50 - 150	13C4-PFOA 50 - 150	13C4-PFOS 50 - 150
SS-01	K1711468-001	91	86	87
SS-02	K1711468-002	98	85	95
SS-03	K1711468-003	167 *	132	151 *
SS-01	KQ1715748-01	88	83	89
SS-01	KQ1715748-02	95	95	94
Lab Control Sample	KQ1715748-03	93	96	96
Method Blank	KQ1715748-04	95	91	97

Client: GZA GeoEnvironmental, Incorporated **Service Request:** K1711468
Project: 16.0062335.53/16.0062335.53 TO1
Sample Matrix: Soil

SURROGATE RECOVERY SUMMARY

Perfluorinated Sulfonic Acids and Perfluorinated Carboxylic Acids by HPLC/MS

Analysis Method: PFC/537M
Extraction Method: EPA 3550B

Sample Name	Lab Code	13C5-PFNA 50 - 150	13C5-PFPeA 50 - 150	13C8-FOSA 50 - 150
SS-01	K1711468-001	88	82	96
SS-02	K1711468-002	94	87	97
SS-03	K1711468-003	147	159 *	139
SS-01	KQ1715748-01	86	84	90
SS-01	KQ1715748-02	91	91	96
Lab Control Sample	KQ1715748-03	94	92	101
Method Blank	KQ1715748-04	95	88	101

Client: GZA GeoEnvironmental, Incorporated **Service Request:** K1711468
Project: 16.0062335.53/16.0062335.53 TO1
Sample Matrix: Soil

SURROGATE RECOVERY SUMMARY

Perfluorinated Sulfonic Acids and Perfluorinated Carboxylic Acids by HPLC/MS

Analysis Method: PFC/537M
Extraction Method: EPA 3550B

Sample Name	Lab Code	18O2-PFHxS 50 - 150	D5-EtFOSA 50 - 150	D7-MeFOSE 50 - 150
SS-01	K1711468-001	94	91	60
SS-02	K1711468-002	93	89	59
SS-03	K1711468-003	154 *	107	91
SS-01	KQ1715748-01	88	90	63
SS-01	KQ1715748-02	93	100	66
Lab Control Sample	KQ1715748-03	93	103	67
Method Blank	KQ1715748-04	95	99	64

Client: GZA GeoEnvironmental, Incorporated **Service Request:** K1711468
Project: 16.0062335.53/16.0062335.53 TO1
Sample Matrix: Soil

SURROGATE RECOVERY SUMMARY

Perfluorinated Sulfonic Acids and Perfluorinated Carboxylic Acids by HPLC/MS

Analysis Method: PFC/537M
Extraction Method: EPA 3550B

Sample Name	Lab Code	D9-EtFOSE 50 - 150
SS-01	K1711468-001	64
SS-02	K1711468-002	62
SS-03	K1711468-003	137
SS-01	KQ1715748-01	64
SS-01	KQ1715748-02	68
Lab Control Sample	KQ1715748-03	73
Method Blank	KQ1715748-04	66

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	GZA GeoEnvironmental, Incorporated	**Service Request:**	K1711468
Project:	16.0062335.53/16.0062335.53 TO1	**Date Collected:**	10/12/17
Sample Matrix:	Soil	**Date Received:**	10/21/17
		Date Analyzed:	11/2/17
		Date Extracted:	10/26/17

Duplicate Matrix Spike Summary
Perfluorinated Sulfonic Acids and Perfluorinated Carboxylic Acids by HPLC/MS

Sample Name:	SS-01	**Units:**	ng/g
Lab Code:	K1711468-001	**Basis:**	Dry
Analysis Method:	PFC/537M		
Prep Method:	EPA 3550B		

		Matrix Spike			Duplicate Matrix Spike					
		KQ1715748-01			KQ1715748-02					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Perfluorobutanoic acid (PFBA)	ND U	38.4	44.6	86	34.6	40.5	85	50-150	1	50
Perfluoropentanoic acid (PFPeA)	ND U	36.2	44.6	81	32.5	40.5	80	50-150	1	50
Perfluorobutane sulfonic acid (PFBS)	ND U	39.3	39.5	99	38.0	36.0	106	50-150	7	50
Perfluorohexanoic acid (PFHxA)	ND U	39.9	44.6	90	35.0	40.5	86	50-150	5	50
Perfluoroheptanoic acid (PFHpA)	ND U	34.1	44.6	76	30.0	40.5	74	50-150	3	50
Perfluorohexane sulfonic acid (PFHxS)	ND U	30.5	40.7	75	29.6	37.0	80	50-150	6	50
Perfluorooctanoic acid (PFOA)	ND U	43.9	44.6	98	39.1	40.5	97	50-150	1	50
Perfluoroheptane sulfonic acid (PFHpS)	ND U	42.5	42.5	100	38.8	38.6	100	50-150	<1	50
Perfluorononanoic acid (PFNA)	ND U	41.3	44.6	93	37.5	40.5	93	50-150	<1	50
Perfluorooctane sulfonic acid (PFOS)	ND U	36.7	41.4	89	32.3	37.7	86	50-150	3	50
Perfluorodecanoic acid (PFDA)	ND U	37.5	44.6	84	34.8	40.5	86	50-150	2	50
Perfluoroundecanoic acid (PFUnDA)	ND U	38.8	44.6	87	34.6	40.5	85	50-150	2	50
Perfluorooctane sulfonamide (FOSA)	ND U	35.1	44.6	79	32.0	40.5	79	50-150	<1	50
Perfluorododecanoic acid (PFDoDA)	ND U	37.9	44.6	85	34.2	40.5	84	50-150	1	50
Perfluorotridecanoic acid (PFTrDA)	ND U	42.6	44.6	96	39.3	40.5	97	50-150	1	50
N-Methyl perfluorooctane sulfonamide (MeFOSA)	ND U	55.6	44.6	125	51.4	40.5	127	50-150	2	50
N-Methyl perfluorooctane sulfonamidoethanol	ND U	50.5	44.6	113	47.1	40.5	116	50-150	3	50
Perfluorotetradecanoic acid (PFTeDA)	ND U	41.6	44.6	93	39.6	40.5	98	50-150	5	50
N-Ethyl perfluorooctane sulfonamidoethanol	ND U	51.8	44.6	116	47.6	40.5	117	50-150	<1	50
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	ND U	39.7	44.6	89	35.3	40.5	87	50-150	2	50
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	ND U	32.1	42.8	75	28.7	38.9	74	50-150	1	50
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	ND U	37.3	42.4	88	34.6	38.5	90	50-150	2	50
Perfluorodecane sulfonic acid (PFDS)	ND U	38.0	43.0	88	35.1	39.1	90	50-150	2	50

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client:	GZA GeoEnvironmental, Incorporated	**Service Request:**	K1711468
Project:	16.0062335.53/16.0062335.53 TO1	**Date Analyzed:**	11/02/17
Sample Matrix:	Soil	**Date Extracted:**	10/26/17

Lab Control Sample Summary
Perfluorinated Sulfonic Acids and Perfluorinated Carboxylic Acids by HPLC/MS

Analysis Method:	PFC/537M	**Units:**	ng/g
Prep Method:	EPA 3550B	**Basis:**	Dry
		Analysis Lot:	568551

Lab Control Sample
KQ1715748-03

Analyte Name	Result	Spike Amount	% Rec	% Rec Limits
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	34.5	38.0	91	50-150
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	29.4	38.4	77	50-150
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	34.4	40.0	86	50-150
N-Ethyl perfluorooctane sulfonamidoethanol	46.0	40.0	115	50-150
N-Methyl perfluorooctane sulfonamide (MeFOSA)	51.9	40.0	130	50-150
N-Methyl perfluorooctane sulfonamidoethanol	45.4	40.0	113	50-150
Perfluorobutane sulfonic acid (PFBS)	35.9	35.5	101	50-150
Perfluorobutanoic acid (PFBA)	34.3	40.0	86	50-150
Perfluorodecane sulfonic acid (PFDS)	34.2	38.6	89	50-150
Perfluorodecanoic acid (PFDA)	35.0	40.0	88	50-150
Perfluorododecanoic acid (PFDoDA)	34.2	40.0	85	50-150
Perfluoroheptane sulfonic acid (PFHpS)	40.3	38.1	106	50-150
Perfluoroheptanoic acid (PFHpA)	31.4	40.0	79	50-150
Perfluorohexane sulfonic acid (PFHxS)	29.7	36.5	81	50-150
Perfluorohexanoic acid (PFHxA)	36.1	40.0	90	50-150
Perfluorononanoic acid (PFNA)	34.8	40.0	87	50-150
Perfluorooctane sulfonamide (FOSA)	31.6	40.0	79	50-150
Perfluorooctane sulfonic acid (PFOS)	33.3	37.2	89	50-150
Perfluorooctanoic acid (PFOA)	36.0	40.0	90	50-150
Perfluoropentanoic acid (PFPeA)	31.5	40.0	79	50-150
Perfluorotetradecanoic acid (PFTeDA)	38.0	40.0	95	50-150
Perfluorotridecanoic acid (PFTrDA)	37.0	40.0	92	50-150
Perfluoroundecanoic acid (PFUnDA)	35.5	40.0	89	50-150

Bio-Chem LABORATORIES, INC.

1049 - 28th Street SE
Grand Rapids, MI 49508
Ph: 616/248-4900
Toll Free: 800/362-LABS
Fax: 616/248-4904

October 13, 2017

Lori Powers
Rose & Westra, Inc.
A Division of GZA
601 Fifth St NW
Grand Rapids, MI 49504

TEL: (616) 956-6123
FAX (616) 288-3327

RE: 16.0062335.51

Dear Lori Powers:

Order No.: 1710031

BIO-CHEM Laboratories, Inc. received 2 samples on 10/5/2017 for the analyses presented in the following report.

There were no problems with the analyses and all data for associated QC met EPA or laboratory specifications except where noted in the Case Narrative.

If you have any questions regarding these tests results, please feel free to call.

Please note that unless otherwise instructed, residual samples will be held for sixty (60) days from the original report date. At that time, all non-hazardous samples will be disposed of in accordance with federal, state and local regulations and ordinances, and hazardous samples shall be returned to you. Please contact the laboratory within thirty (30) days if other arrangements for sample retention need to be made.

Sincerely,

Cindy Euwema

Cindy Euwema
Office Manager

Working with you to ensure a better tomorrow.

17100031

Bio Chem LABORATORIES, INC.

Chain of Custody

1049 28th Street SE • Grand Rapids, MI 49508
Ph: (616) 248-4900 • Toll Free: 800-362-LABS
Fax: (616) 248-4904

Firm Name: R-W/ GZA	Turn around time: Std	Project Number	
Firm Address: 601 Ottawa St NW	Project Name: 16.0062335.51	Date	Date Due
City, State, Zip: Grand Rapids MI 49504	State Samples Taken From: MI		
Phone: 616 956.6123 / Fax: 616.2883327	Contact Person: Lori J. Powers		

Item No	Lab I.D.	Client Sample Number	Date Taken	Time Taken	Sample Description (sample type: water, soil, other)	Number of Containers	Analysis Desired (One per line): TCLP RCRA metals	TCLP VOCs	TCLP Semi. VOCs	TCLP PCBs	TCLP Pesticides				Remarks
1		CP-1	10/5/17	12:08	Soil	4	X	X	X	X	X				
2		CP-2	10/5/17	12:24	Soil	4	X	X	X	X	X				
3															
4															
5															
6															
7															
8															
9															
10															

Released by	Received by	Date	Time
[signature]	[signature]	10/5/17	2:25
[signature]	Cindy Edwards	10-5-17	3:00

Laboratory use only

- ☐ Blue Ice ____°
- ☐ Regular Ice
- ☐ No Coolant

BIO-CHEM Laboratories, Inc.

Date: *13-Oct-17*

CLIENT: Rose & Westra, Inc.
Project: 16.0062335.51
Lab Order: 1710031

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Matrix	Collection Date	Date Received
1710031-01A	CP-1	Soil	10/5/2017	10/5/2017
1710031-02A	CP-2	Soil	10/5/2017	10/5/2017

BIO-CHEM Laboratories, Inc.

Date: *13-Oct-17*

CLIENT: Rose & Westra, Inc.
Project: 16.0062335.51
Lab Order: 1710031

CASE NARRATIVE

Samples are routinely analyzed using methods outlined in the following references:

(SW) Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, 3rd Ed.
(E) Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020.
(A) Standard Methods for the Examination of Water and Wastewater, APHA, 18th Ed.
(D) Annual Book of ASTM Standards.

Specific methods utilized for this project are provided in the analytical report and are identified by the reference document abbreviation ( ) followed by the method number.

All QA/QC and sample analyses met method, laboratory and/or regulatory data quality objectives unless otherwise specified below.

No data qualifications required.

BIO-CHEM Laboratories, Inc.

Date: *10/13/2017*

ANALYTICAL REPORT

CLIENT: Rose & Westra, Inc.
Lab Order: 1710031
Project: 16.0062335.51
Lab Sample ID: 1710031-01A

Project Number: 16.0062335.51
Client Sample ID: CP-1
Collection Date: 10/5/2017
Matrix: SOIL

Analyses	Method Ref.	Result	Q	PQL	Units	DF	Analyst	Date
TCLP PCBs by GC/ECD								
1. Aroclor 1016	SW1311/8082	< 2.0		2.0	µg/L	1	LEB	10/12/2017
2. Aroclor 1221	SW1311/8082	< 2.0		2.0	µg/L	1	LEB	10/12/2017
3. Aroclor 1232	SW1311/8082	< 4.0		4.0	µg/L	1	LEB	10/12/2017
4. Aroclor 1242	SW1311/8082	< 2.0		2.0	µg/L	1	LEB	10/12/2017
5. Aroclor 1248	SW1311/8082	< 2.0		2.0	µg/L	1	LEB	10/12/2017
6. Aroclor 1254	SW1311/8082	< 2.0		2.0	µg/L	1	LEB	10/12/2017
7. Aroclor 1260	SW1311/8082	< 2.0		2.0	µg/L	1	LEB	10/12/2017
TCLP Pesticides by GC/ECD								
1. Chlordane (Technical)	SW1311/8081A	< 10		10	µg/L	1	LEB	10/17/2017
2. Endrin	SW1311/8081A	< 2.0		2.0	µg/L	1	LEB	10/17/2017
3. gamma-BHC	SW1311/8081A	< 1.0		1.0	µg/L	1	LEB	10/17/2017
4. Heptachlor	SW1311/8081A	< 1.0		1.0	µg/L	1	LEB	10/17/2017
5. Heptachlor epoxide	SW1311/8081A	< 1.0		1.0	µg/L	1	LEB	10/17/2017
6. Methoxychlor	SW1311/8081A	< 50		50	µg/L	1	LEB	10/17/2017
7. Toxaphene	SW1311/8081A	< 100		100	µg/L	1	LEB	10/17/2017
TCLP Mercury by CVAA								
1. Mercury	SW1311/7470A	< 10		10	µg/L	1	RHS	10/9/2017
TCLP Metal(s) by ICP								
1. Arsenic	SW1311/6010B	< 250		250	µg/L	1	RHS	10/10/2017
2. Barium	SW1311/6010B	< 250		250	µg/L	1	RHS	10/10/2017
3. Cadmium	SW1311/6010B	< 250		250	µg/L	1	RHS	10/10/2017
4. Chromium	SW1311/6010B	< 250		250	µg/L	1	RHS	10/10/2017
5. Lead	SW1311/6010B	< 250		250	µg/L	1	RHS	10/10/2017
6. Silver	SW1311/6010B	< 250		250	µg/L	1	RHS	10/10/2017
TCLP Selenium by NaBHR								
1. Selenium	SW1311/7742	< 250		250	µg/L	1	RHS	10/10/2017

Definitions: PQL - Practical Quantitation Limit
DF - Dilution Factor

Qualifiers (Q): J - Detected below PQL but above MDL: Estimated
S - Spike Recovery Outside Acceptance Limits
B - Analyte detected in associated Method Blank
N - See case narrative for explanation

Note: The sample results reported are based on the sample aliquot(s) tested.

CLIENT: Rose & Westra, Inc.
Lab Order: 1710031
Project: 16.0062335.51
Lab Sample ID: 1710031-01A

Project Number: 16.0062335.51
Client Sample ID: CP-1
Collection Date: 10/5/2017
Matrix: SOIL

Analyses	Method Ref.	Result	Q	PQL	Units	DF	Analyst	Date
TCLP Semivolatiles by GC/MS								
1. 1,2,4-Trichlorobenzene	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
2. 1,4-Dichlorobenzene	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
3. 2,4,5-Trichlorophenol	SW1311/8270C	< 500		500	µg/L	1	LEB	10/9/2017
4. 2,4,6-Trichlorophenol	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
5. 2,4-Dinitrotoluene	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
6. 2-Chlorophenol	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
7. 2-Methylphenol	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
8. 3-Methylphenol	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
9. 4-Chloro-3-methylphenol	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
10. 4-Methylphenol	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
11. 4-Nitrophenol	SW1311/8270C	< 200		200	µg/L	1	LEB	10/9/2017
12. Acenaphthene	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
13. Hexachlorobenzene	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
14. Hexachlorobutadiene	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
15. Hexachloroethane	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
16. Nitrobenzene	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
17. N-Nitrosodi-n-propylamine	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
18. Pentachlorophenol	SW1311/8270C	< 200		200	µg/L	1	LEB	10/9/2017
19. Phenol	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
20. Pyrene	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
21. Pyridine	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
TCLP Volatiles by GC/MS								
1. 1,1-Dichloroethene	SW1311/8260B	< 10		10	µg/L	10	ATD	10/10/2017
2. 1,2-Dichloroethane	SW1311/8260B	< 10		10	µg/L	10	ATD	10/10/2017
3. 1,4-Dichlorobenzene	SW1311/8260B	< 10		10	µg/L	10	ATD	10/10/2017
4. 2-Butanone	SW1311/8260B	< 100		100	µg/L	10	ATD	10/10/2017
5. Benzene	SW1311/8260B	< 10		10	µg/L	10	ATD	10/10/2017
6. Carbon tetrachloride	SW1311/8260B	< 10		10	µg/L	10	ATD	10/10/2017
7. Chlorobenzene	SW1311/8260B	< 10		10	µg/L	10	ATD	10/10/2017
8. Chloroform	SW1311/8260B	< 10		10	µg/L	10	ATD	10/10/2017
9. Hexachlorobutadiene	SW1311/8260B	< 10		10	µg/L	10	ATD	10/10/2017
10. Hexachloroethane	SW1311/8260B	< 10		10	µg/L	10	ATD	10/10/2017
11. Tetrachloroethene	SW1311/8260B	< 10		10	µg/L	10	ATD	10/10/2017
12. Trichloroethene	SW1311/8260B	< 10		10	µg/L	10	ATD	10/10/2017
13. Vinyl chloride	SW1311/8260B	< 10		10	µg/L	10	ATD	10/10/2017

Definitions: PQL - Practical Quantitation Limit
DF - Dilution Factor

Qualifiers (Q): J - Detected below PQL but above MDL: Estimated
S - Spike Recovery Outside Acceptance Limits
B - Analyte detected in associated Method Blank
N - See case narrative for explanation

Note: The sample results reported are based on the sample aliquot(s) tested.

CLIENT: Rose & Westra, Inc.
Lab Order: 1710031
Project: 16.0062335.51
Lab Sample ID: 1710031-02A

Project Number: 16.0062335.51
Client Sample ID: CP-2
Collection Date: 10/5/2017
Matrix: SOIL

Analyses	Method Ref.	Result	Q	PQL	Units	DF	Analyst	Date
TCLP PCBs by GC/ECD								
1. Aroclor 1016	SW1311/8082	< 2.0		2.0	µg/L	1	LEB	10/12/2017
2. Aroclor 1221	SW1311/8082	< 2.0		2.0	µg/L	1	LEB	10/12/2017
3. Aroclor 1232	SW1311/8082	< 4.0		4.0	µg/L	1	LEB	10/12/2017
4. Aroclor 1242	SW1311/8082	< 2.0		2.0	µg/L	1	LEB	10/12/2017
5. Aroclor 1248	SW1311/8082	< 2.0		2.0	µg/L	1	LEB	10/12/2017
6. Aroclor 1254	SW1311/8082	< 2.0		2.0	µg/L	1	LEB	10/12/2017
7. Aroclor 1260	SW1311/8082	< 2.0		2.0	µg/L	1	LEB	10/12/2017
TCLP Pesticides by GC/ECD								
1. Chlordane (Technical)	SW1311/8081A	< 10		10	µg/L	1	LEB	10/17/2017
2. Endrin	SW1311/8081A	< 2.0		2.0	µg/L	1	LEB	10/17/2017
3. gamma-BHC	SW1311/8081A	< 1.0		1.0	µg/L	1	LEB	10/17/2017
4. Heptachlor	SW1311/8081A	< 1.0		1.0	µg/L	1	LEB	10/17/2017
5. Heptachlor epoxide	SW1311/8081A	< 1.0		1.0	µg/L	1	LEB	10/17/2017
6. Methoxychlor	SW1311/8081A	< 50		50	µg/L	1	LEB	10/17/2017
7. Toxaphene	SW1311/8081A	< 100		100	µg/L	1	LEB	10/17/2017
TCLP Mercury by CVAA								
1. Mercury	SW1311/7470A	< 10		10	µg/L	1	RHS	10/9/2017
TCLP Metal(s) by ICP								
1. Arsenic	SW1311/6010B	< 250		250	µg/L	1	RHS	10/10/2017
2. Barium	SW1311/6010B	380		250	µg/L	1	RHS	10/10/2017
3. Cadmium	SW1311/6010B	< 250		250	µg/L	1	RHS	10/10/2017
4. Chromium	SW1311/6010B	< 250		250	µg/L	1	RHS	10/10/2017
5. Lead	SW1311/6010B	3,000		250	µg/L	1	RHS	10/10/2017
6. Silver	SW1311/6010B	< 250		250	µg/L	1	RHS	10/10/2017
TCLP Selenium by NaBHR								
1. Selenium	SW1311/7742	< 250		250	µg/L	1	RHS	10/10/2017

Definitions: PQL - Practical Quantitation Limit
DF - Dilution Factor

Qualifiers (Q): J - Detected below PQL but above MDL: Estimated
S - Spike Recovery Outside Acceptance Limits
B - Analyte detected in associated Method Blank
N - See case narrative for explanation

Note: The sample results reported are based on the sample aliquot(s) tested.

CLIENT: Rose & Westra, Inc.
Lab Order: 1710031
Project: 16.0062335.51
Lab Sample ID: 1710031-02A

Project Number: 16.0062335.51
Client Sample ID: CP-2
Collection Date: 10/5/2017
Matrix: SOIL

Analyses	Method Ref.	Result	Q	PQL	Units	DF	Analyst	Date
TCLP Semivolatiles by GC/MS								
1. 1,2,4-Trichlorobenzene	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
2. 1,4-Dichlorobenzene	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
3. 2,4,5-Trichlorophenol	SW1311/8270C	< 500		500	µg/L	1	LEB	10/9/2017
4. 2,4,6-Trichlorophenol	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
5. 2,4-Dinitrotoluene	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
6. 2-Chlorophenol	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
7. 2-Methylphenol	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
8. 3-Methylphenol	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
9. 4-Chloro-3-methylphenol	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
10. 4-Methylphenol	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
11. 4-Nitrophenol	SW1311/8270C	< 200		200	µg/L	1	LEB	10/9/2017
12. Acenaphthene	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
13. Hexachlorobenzene	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
14. Hexachlorobutadiene	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
15. Hexachloroethane	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
16. Nitrobenzene	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
17. N-Nitrosodi-n-propylamine	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
18. Pentachlorophenol	SW1311/8270C	< 200		200	µg/L	1	LEB	10/9/2017
19. Phenol	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
20. Pyrene	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
21. Pyridine	SW1311/8270C	< 50		50	µg/L	1	LEB	10/9/2017
TCLP Volatiles by GC/MS								
1. 1,1-Dichloroethene	SW1311/8260B	< 10		10	µg/L	10	ATD	10/10/2017
2. 1,2-Dichloroethane	SW1311/8260B	< 10		10	µg/L	10	ATD	10/10/2017
3. 1,4-Dichlorobenzene	SW1311/8260B	< 10		10	µg/L	10	ATD	10/10/2017
4. 2-Butanone	SW1311/8260B	< 100		100	µg/L	10	ATD	10/10/2017
5. Benzene	SW1311/8260B	< 10		10	µg/L	10	ATD	10/10/2017
6. Carbon tetrachloride	SW1311/8260B	< 10		10	µg/L	10	ATD	10/10/2017
7. Chlorobenzene	SW1311/8260B	< 10		10	µg/L	10	ATD	10/10/2017
8. Chloroform	SW1311/8260B	< 10		10	µg/L	10	ATD	10/10/2017
9. Hexachlorobutadiene	SW1311/8260B	< 10		10	µg/L	10	ATD	10/10/2017
10. Hexachloroethane	SW1311/8260B	< 10		10	µg/L	10	ATD	10/10/2017
11. Tetrachloroethene	SW1311/8260B	< 10		10	µg/L	10	ATD	10/10/2017
12. Trichloroethene	SW1311/8260B	< 10		10	µg/L	10	ATD	10/10/2017
13. Vinyl chloride	SW1311/8260B	< 10		10	µg/L	10	ATD	10/10/2017

Definitions: PQL - Practical Quantitation Limit
DF - Dilution Factor

Qualifiers (Q): J - Detected below PQL but above MDL: Estimated
S - Spike Recovery Outside Acceptance Limits
B - Analyte detected in associated Method Blank
N - See case narrative for explanation

Note: The sample results reported are based on the sample aliquot(s) tested.

Lab Order: 1710031
Client: Rose & Westra, Inc.
Project: 16.0062335.51

ANALYTICAL DETAIL REPORT

Sample ID	Client Sample ID	Matrix	Test Name	Date Sampled	TCLP/SPLP Date	Prep Date	QC Batch	Analysis Date	Analytical Batch
1710031-01A	CP-1	Soil	TCLP Mercury by CVAA	10/5/2017	10/5/2017	10/9/2017	41271	10/9/2017	MTL_D_HY_171009A
	CP-1	Soil	TCLP Metal(s) by ICP	10/5/2017	10/5/2017	10/9/2017	41275	10/10/2017	MTL_G_ICP_171010A
	CP-1	Soil	TCLP PCBs by GC/ECD	10/5/2017	10/5/2017	10/11/2017	41280	10/12/2017	GC_G_ECD1_171012B
	CP-1	Soil	TCLP Pesticides by GC/ECD	10/5/2017	10/5/2017	10/11/2017	41281	10/17/2017	GC_G_ECD1_171012D
	CP-1	Soil	TCLP Selenium by NaBHR	10/5/2017	10/5/2017	10/9/2017	41275	10/10/2017	MTL_C_FL_171010A
	CP-1	Soil	TCLP Semivolatiles by GC/MS	10/5/2017	10/5/2017	10/9/2017	41269	10/9/2017	GCMS_S_171009D
	CP-1	Soil	TCLP Volatiles by GC/MS	10/5/2017	10/6/2017		R88486	10/10/2017	GCMS_Q_171009A
1710031-02A	CP-2	Soil	TCLP Mercury by CVAA	10/5/2017	10/5/2017	10/9/2017	41271	10/9/2017	MTL_D_HY_171009A
	CP-2	Soil	TCLP Metal(s) by ICP	10/5/2017	10/5/2017	10/9/2017	41275	10/10/2017	MTL_G_ICP_171010A
	CP-2	Soil	TCLP PCBs by GC/ECD	10/5/2017	10/5/2017	10/11/2017	41280	10/12/2017	GC_G_ECD1_171012B
	CP-2	Soil	TCLP Pesticides by GC/ECD	10/5/2017	10/5/2017	10/11/2017	41281	10/17/2017	GC_G_ECD1_171012D
	CP-2	Soil	TCLP Selenium by NaBHR	10/5/2017	10/5/2017	10/9/2017	41275	10/10/2017	MTL_C_FL_171010A
	CP-2	Soil	TCLP Semivolatiles by GC/MS	10/5/2017	10/5/2017	10/9/2017	41269	10/9/2017	GCMS_S_171009D
	CP-2	Soil	TCLP Volatiles by GC/MS	10/5/2017	10/6/2017		R88486	10/10/2017	GCMS_Q_171009A

Bio-Chem LABORATORIES, INC.

1049 - 28th Street SE
Grand Rapids, MI 49508
Ph: 616/248-4900
Toll Free: 800/362-LABS
Fax: 616/248-4904

October 26, 2017

Bryan Rose
Rose & Westra, Inc.
A Division of GZA
601 Fifth St NW
Grand Rapids, MI 49504

TEL: (616) 956-6123
FAX (616) 288-3327

RE: 16.0062335.53 T01

Dear Bryan Rose: Order No.: 1710107

BIO-CHEM Laboratories, Inc. received 3 samples on 10/20/2017 for the analyses presented in the following report.

There were no problems with the analyses and all data for associated QC met EPA or laboratory specifications except where noted in the Case Narrative.

If you have any questions regarding these tests results, please feel free to call.

Please note that unless otherwise instructed, residual samples will be held for sixty (60) days from the original report date. At that time, all non-hazardous samples will be disposed of in accordance with federal, state and local regulations and ordinances, and hazardous samples shall be returned to you. Please contact the laboratory within thirty (30) days if other arrangements for sample retention need to be made.

Sincerely,

Cindy Euwema

Cindy Euwema
Office Manager

Working with you to ensure a better tomorrow.

1710107

Bio Chem LABORATORIES, INC.

Chain of Custody

1049 28th Street SE • Grand Rapids, MI 49508
Ph: (616) 248-4900 • Toll Free: 800-362-LABS
Fax: (616) 248-4904

Project Number: 16.0062335.53 TO1
Date:
Date Due:

Firm Name: Rose & Westra, a Division of GZA
Turn around time: Standard
Firm Address: 601 Fifth St NW Suite 102
Project Name: 16.0062335.53 TO1
City, State, Zip: Grand Rapids MI 49504
State Samples Taken From: MI
Phone: 616-956-6123
Fax: 616-288-3327
Contact Person: Bryan Rae

Item No	Lab I.D.	Client Sample Number	Date Taken	Time Taken	Sample Description (sample type: water, soil, other)	Number of Containers	MI 10 Metals	VOCs 8260 - Ext (per attached) 1020-17							Remarks
1		SS-01	10/12/17	12:10	Soil	2	X	X							10ml meth
2		SS-02	10/12/17	12:50	Soil	2	X	X							
3		SS-03	10/12/17	13:55	Soil	2	X	X							
4															
5															
6															
7															
8															
9															
10															

Released by	Received by	Date	Time
[signature]	[signature]	10/20/2017	11:00am
[signature]	Cindy Guevema	10/20/2017	12:55p

Laboratory use only

- [X] Blue Ice 1.9°
- [ ] Regular Ice
- [ ] No Coolant

Drop Off

BIO-CHEM Laboratories, Inc.

Date: *26-Oct-17*

CLIENT: Rose & Westra, Inc.
Project: 16.0062335.53 T01
Lab Order: 1710107

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Matrix	Collection Date	Date Received
1710107-01A	SS-01	Soil	10/12/2017	10/20/2017
1710107-02A	SS-02	Soil	10/12/2017	10/20/2017
1710107-03A	SS-03	Soil	10/12/2017	10/20/2017

BIO-CHEM Laboratories, Inc.

Date: *26-Oct-17*

CLIENT: Rose & Westra, Inc.
Project: 16.0062335.53 T01
Lab Order: 1710107

CASE NARRATIVE

Samples are routinely analyzed using methods outlined in the following references:

(SW) Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, 3rd Ed.
(E) Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020.
(A) Standard Methods for the Examination of Water and Wastewater, APHA, 18th Ed.
(D) Annual Book of ASTM Standards.

Specific methods utilized for this project are provided in the analytical report and are identified by the reference document abbreviation ( ) followed by the method number.

All QA/QC and sample analyses met method, laboratory and/or regulatory data quality objectives unless otherwise specified below.

No data qualifications required.

BIO-CHEM Laboratories, Inc.

Date: *10/26/2017*

ANALYTICAL REPORT

CLIENT: Rose & Westra, Inc.
Lab Order: 1710107
Project: 16.0062335.53 T01
Lab Sample ID: 1710107-01A

Project Number: 16.0062335.53 T01
Client Sample ID: SS-01
Collection Date: 10/12/2017
Matrix: SOIL

Analyses	Method Ref.	Result	Q	PQL	Units	DF	Analyst	Date
Total Mercury by CVAA								
1. Mercury	SW7471A	< 50		50	µg/Kg-dry	1	RHS	10/24/2017
Total Metal(s) by ICP								
1. Arsenic	SW6010B	6,400		1,000	µg/Kg-dry	1	RHS	10/25/2017
2. Barium	SW6010B	100,000		500	µg/Kg-dry	1	RHS	10/25/2017
3. Cadmium	SW6010B	< 200		200	µg/Kg-dry	1	RHS	10/25/2017
4. Chromium	SW6010B	38,000		500	µg/Kg-dry	1	RHS	10/25/2017
5. Copper	SW6010B	27,000		500	µg/Kg-dry	1	RHS	10/25/2017
6. Lead	SW6010B	14,000		1,000	µg/Kg-dry	1	RHS	10/25/2017
7. Silver	SW6010B	< 100		100	µg/Kg-dry	1	RHS	10/25/2017
8. Zinc	SW6010B	63,000		500	µg/Kg-dry	1	RHS	10/25/2017
Total Selenium by NaBHR								
1. Selenium	SW7742	< 200		200	µg/Kg-dry	1	RHS	10/24/2017

Definitions: PQL - Practical Quantitation Limit
DF - Dilution Factor

Qualifiers (Q): J - Detected below PQL but above MDL: Estimated
S - Spike Recovery Outside Acceptance Limits
B - Analyte detected in associated Method Blank
N - See case narrative for explanation

Note: The sample results reported are based on the sample aliquot(s) tested.

CLIENT: Rose & Westra, Inc.
Lab Order: 1710107
Project: 16.0062335.53 T01
Lab Sample ID: 1710107-01A

Project Number: 16.0062335.53 T01
Client Sample ID: SS-01
Collection Date: 10/12/2017
Matrix: SOIL

Analyses	Method Ref.	Result	Q	PQL	Units	DF	Analyst	Date
Volatiles by GC/MS (5035)								
1. 1,1,1,2-Tetrachloroethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
2. 1,1,1-Trichloroethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
3. 1,1,2,2-Tetrachloroethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
4. 1,1,2-Trichloroethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
5. 1,1-Dichloroethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
6. 1,1-Dichloroethene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
7. 1,1-Dichloropropene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
8. 1,2,3-Trichlorobenzene	SW8260B	< 250		250	µg/Kg-dry	1	ATD	10/24/2017
9. 1,2,3-Trichloropropane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
10. 1,2,4-Trichlorobenzene	SW8260B	< 250		250	µg/Kg-dry	1	ATD	10/24/2017
11. 1,2,4-Trimethylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
12. 1,2-Dibromo-3-chloropropane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
13. 1,2-Dibromoethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
14. 1,2-Dichlorobenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
15. 1,2-Dichloroethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
16. 1,2-Dichloropropane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
17. 1,3,5-Trimethylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
18. 1,3-Dichlorobenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
19. 1,3-Dichloropropane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
20. 1,4-Dichlorobenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
21. 2,2-Dichloropropane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
22. 2-Butanone	SW8260B	< 250		250	µg/Kg-dry	1	ATD	10/24/2017
23. 2-Chlorotoluene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
24. 2-Hexanone	SW8260B	< 250		250	µg/Kg-dry	1	ATD	10/24/2017
25. 4-Chlorotoluene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
26. 4-Isopropyltoluene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
27. 4-Methyl-2-pentanone	SW8260B	< 250		250	µg/Kg-dry	1	ATD	10/24/2017
28. Acetone	SW8260B	< 750		750	µg/Kg-dry	1	ATD	10/24/2017
29. Benzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
30. Bromobenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
31. Bromochloromethane	SW8260B	< 100		100	µg/Kg-dry	1	ATD	10/24/2017
32. Bromodichloromethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
33. Bromoform	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
34. Bromomethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
35. Carbon disulfide	SW8260B	< 250		250	µg/Kg-dry	1	ATD	10/24/2017
36. Carbon tetrachloride	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
37. Chlorobenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
38. Chloroethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
39. Chloroform	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
40. Chloromethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017

Definitions: PQL - Practical Quantitation Limit
DF - Dilution Factor

Qualifiers (Q): J - Detected below PQL but above MDL: Estimated
S - Spike Recovery Outside Acceptance Limits
B - Analyte detected in associated Method Blank
N - See case narrative for explanation

Note: The sample results reported are based on the sample aliquot(s) tested.

CLIENT: Rose & Westra, Inc.
Lab Order: 1710107
Project: 16.0062335.53 T01
Lab Sample ID: 1710107-01A

Project Number: 16.0062335.53 T01
Client Sample ID: SS-01
Collection Date: 10/12/2017
Matrix: SOIL

Analyses	Method Ref.	Result	Q	PQL	Units	DF	Analyst	Date
41. cis-1,2-Dichloroethene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
42. cis-1,3-Dichloropropene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
43. Dibromochloromethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
44. Dibromomethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
45. Dichlorodifluoromethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
46. Diethyl ether	SW8260B	< 200		200	µg/Kg-dry	1	ATD	10/24/2017
47. Ethylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
48. Hexachlorobutadiene	SW8260B	< 250		250	µg/Kg-dry	1	ATD	10/24/2017
49. Hexachloroethane	SW8260B	< 330		330	µg/Kg-dry	1	ATD	10/24/2017
50. Iodomethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
51. Isopropylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
52. m,p-Xylene	SW8260B	< 100		100	µg/Kg-dry	1	ATD	10/24/2017
53. Methyl tert-butyl ether	SW8260B	< 250		250	µg/Kg-dry	1	ATD	10/24/2017
54. Methylene chloride	SW8260B	< 100		100	µg/Kg-dry	1	ATD	10/24/2017
55. n-Butylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
56. n-Propylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
57. o-Xylene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
58. sec-Butylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
59. Styrene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
60. tert-Butylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
61. Tetrachloroethene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
62. Toluene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
63. trans-1,2-Dichloroethene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
64. trans-1,3-Dichloropropene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
65. trans-1,4-Dichloro-2-butene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
66. Trichloroethene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
67. Trichlorofluoromethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
68. Vinyl chloride	SW8260B	< 40		40	µg/Kg-dry	1	ATD	10/24/2017

Definitions: PQL - Practical Quantitation Limit
DF - Dilution Factor

Qualifiers (Q): J - Detected below PQL but above MDL: Estimated
S - Spike Recovery Outside Acceptance Limits
B - Analyte detected in associated Method Blank
N - See case narrative for explanation

Note: The sample results reported are based on the sample aliquot(s) tested.

CLIENT: Rose & Westra, Inc.
Lab Order: 1710107
Project: 16.0062335.53 T01
Lab Sample ID: 1710107-02A

Project Number: 16.0062335.53 T01
Client Sample ID: SS-02
Collection Date: 10/12/2017
Matrix: SOIL

Analyses	Method Ref.	Result	Q	PQL	Units	DF	Analyst	Date
Total Mercury by CVAA								
1. Mercury	SW7471A	1,300		50	µg/Kg-dry	1	RHS	10/24/2017
Total Metal(s) by ICP								
1. Arsenic	SW6010B	2,900		1,000	µg/Kg-dry	1	RHS	10/25/2017
2. Barium	SW6010B	47,000		500	µg/Kg-dry	1	RHS	10/25/2017
3. Cadmium	SW6010B	250		200	µg/Kg-dry	1	RHS	10/25/2017
4. Chromium	SW6010B	810,000		500	µg/Kg-dry	1	RHS	10/25/2017
5. Copper	SW6010B	9,300		500	µg/Kg-dry	1	RHS	10/25/2017
6. Lead	SW6010B	22,000		1,000	µg/Kg-dry	1	RHS	10/25/2017
7. Silver	SW6010B	< 100		100	µg/Kg-dry	1	RHS	10/25/2017
8. Zinc	SW6010B	51,000		500	µg/Kg-dry	1	RHS	10/25/2017
Total Selenium by NaBHR								
1. Selenium	SW7742	< 200		200	µg/Kg-dry	1	RHS	10/24/2017

Definitions: PQL - Practical Quantitation Limit
DF - Dilution Factor

Qualifiers (Q): J - Detected below PQL but above MDL: Estimated
S - Spike Recovery Outside Acceptance Limits
B - Analyte detected in associated Method Blank
N - See case narrative for explanation

Note: The sample results reported are based on the sample aliquot(s) tested.

CLIENT: Rose & Westra, Inc.
Lab Order: 1710107
Project: 16.0062335.53 T01
Lab Sample ID: 1710107-02A

Project Number: 16.0062335.53 T01
Client Sample ID: SS-02
Collection Date: 10/12/2017
Matrix: SOIL

Analyses	Method Ref.	Result	Q	PQL	Units	DF	Analyst	Date
Volatiles by GC/MS (5035)								
1. 1,1,1,2-Tetrachloroethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
2. 1,1,1-Trichloroethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
3. 1,1,2,2-Tetrachloroethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
4. 1,1,2-Trichloroethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
5. 1,1-Dichloroethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
6. 1,1-Dichloroethene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
7. 1,1-Dichloropropene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
8. 1,2,3-Trichlorobenzene	SW8260B	< 250		250	µg/Kg-dry	1	ATD	10/24/2017
9. 1,2,3-Trichloropropane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
10. 1,2,4-Trichlorobenzene	SW8260B	< 250		250	µg/Kg-dry	1	ATD	10/24/2017
11. 1,2,4-Trimethylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
12. 1,2-Dibromo-3-chloropropane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
13. 1,2-Dibromoethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
14. 1,2-Dichlorobenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
15. 1,2-Dichloroethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
16. 1,2-Dichloropropane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
17. 1,3,5-Trimethylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
18. 1,3-Dichlorobenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
19. 1,3-Dichloropropane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
20. 1,4-Dichlorobenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
21. 2,2-Dichloropropane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
22. 2-Butanone	SW8260B	< 250		250	µg/Kg-dry	1	ATD	10/24/2017
23. 2-Chlorotoluene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
24. 2-Hexanone	SW8260B	< 250		250	µg/Kg-dry	1	ATD	10/24/2017
25. 4-Chlorotoluene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
26. 4-Isopropyltoluene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
27. 4-Methyl-2-pentanone	SW8260B	< 250		250	µg/Kg-dry	1	ATD	10/24/2017
28. Acetone	SW8260B	< 750		750	µg/Kg-dry	1	ATD	10/24/2017
29. Benzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
30. Bromobenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
31. Bromochloromethane	SW8260B	< 100		100	µg/Kg-dry	1	ATD	10/24/2017
32. Bromodichloromethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
33. Bromoform	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
34. Bromomethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
35. Carbon disulfide	SW8260B	< 250		250	µg/Kg-dry	1	ATD	10/24/2017
36. Carbon tetrachloride	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
37. Chlorobenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
38. Chloroethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
39. Chloroform	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
40. Chloromethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017

Definitions: PQL - Practical Quantitation Limit
DF - Dilution Factor

Qualifiers (Q): J - Detected below PQL but above MDL: Estimated
S - Spike Recovery Outside Acceptance Limits
B - Analyte detected in associated Method Blank
N - See case narrative for explanation

Note: The sample results reported are based on the sample aliquot(s) tested.

CLIENT: Rose & Westra, Inc.
Lab Order: 1710107
Project: 16.0062335.53 T01
Lab Sample ID: 1710107-02A

Project Number: 16.0062335.53 T01
Client Sample ID: SS-02
Collection Date: 10/12/2017
Matrix: SOIL

Analyses	Method Ref.	Result	Q	PQL	Units	DF	Analyst	Date
41. cis-1,2-Dichloroethene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
42. cis-1,3-Dichloropropene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
43. Dibromochloromethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
44. Dibromomethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
45. Dichlorodifluoromethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
46. Diethyl ether	SW8260B	< 200		200	µg/Kg-dry	1	ATD	10/24/2017
47. Ethylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
48. Hexachlorobutadiene	SW8260B	< 250		250	µg/Kg-dry	1	ATD	10/24/2017
49. Hexachloroethane	SW8260B	< 330		330	µg/Kg-dry	1	ATD	10/24/2017
50. Iodomethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
51. Isopropylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
52. m,p-Xylene	SW8260B	< 100		100	µg/Kg-dry	1	ATD	10/24/2017
53. Methyl tert-butyl ether	SW8260B	< 250		250	µg/Kg-dry	1	ATD	10/24/2017
54. Methylene chloride	SW8260B	< 100		100	µg/Kg-dry	1	ATD	10/24/2017
55. n-Butylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
56. n-Propylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
57. o-Xylene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
58. sec-Butylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
59. Styrene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
60. tert-Butylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
61. Tetrachloroethene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
62. Toluene	SW8260B	73		50	µg/Kg-dry	1	ATD	10/24/2017
63. trans-1,2-Dichloroethene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
64. trans-1,3-Dichloropropene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
65. trans-1,4-Dichloro-2-butene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
66. Trichloroethene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
67. Trichlorofluoromethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/24/2017
68. Vinyl chloride	SW8260B	< 40		40	µg/Kg-dry	1	ATD	10/24/2017

Definitions: PQL - Practical Quantitation Limit
DF - Dilution Factor

Qualifiers (Q): J - Detected below PQL but above MDL: Estimated
S - Spike Recovery Outside Acceptance Limits
B - Analyte detected in associated Method Blank
N - See case narrative for explanation

Note: The sample results reported are based on the sample aliquot(s) tested.

BIO-CHEM Laboratories, Inc.

Date: *10/26/2017*

ANALYTICAL REPORT

CLIENT: Rose & Westra, Inc.
Lab Order: 1710107
Project: 16.0062335.53 T01
Lab Sample ID: 1710107-03A

Project Number: 16.0062335.53 T01
Client Sample ID: SS-03
Collection Date: 10/12/2017
Matrix: SOIL

Analyses	Method Ref.	Result	Q	PQL	Units	DF	Analyst	Date
Total Mercury by CVAA								
1. Mercury	SW7471A	< 50		50	µg/Kg-dry	1	RHS	10/24/2017
Total Metal(s) by ICP								
1. Arsenic	SW6010B	7,800		1,000	µg/Kg-dry	1	RHS	10/25/2017
2. Barium	SW6010B	150,000		500	µg/Kg-dry	1	RHS	10/25/2017
3. Cadmium	SW6010B	470		200	µg/Kg-dry	1	RHS	10/25/2017
4. Chromium	SW6010B	97,000		500	µg/Kg-dry	1	RHS	10/25/2017
5. Copper	SW6010B	25,000		500	µg/Kg-dry	1	RHS	10/25/2017
6. Lead	SW6010B	45,000		1,000	µg/Kg-dry	1	RHS	10/25/2017
7. Silver	SW6010B	< 100		100	µg/Kg-dry	1	RHS	10/25/2017
8. Zinc	SW6010B	130,000		500	µg/Kg-dry	1	RHS	10/25/2017
Total Selenium by NaBHR								
1. Selenium	SW7742	< 200		200	µg/Kg-dry	1	RHS	10/24/2017

Definitions: PQL - Practical Quantitation Limit
DF - Dilution Factor

Qualifiers (Q): J - Detected below PQL but above MDL: Estimated
S - Spike Recovery Outside Acceptance Limits
B - Analyte detected in associated Method Blank
N - See case narrative for explanation

Note: The sample results reported are based on the sample aliquot(s) tested.

CLIENT: Rose & Westra, Inc.
Lab Order: 1710107
Project: 16.0062335.53 T01
Lab Sample ID: 1710107-03A

Project Number: 16.0062335.53 T01
Client Sample ID: SS-03
Collection Date: 10/12/2017
Matrix: SOIL

Analyses	Method Ref.	Result	Q	PQL	Units	DF	Analyst	Date
Volatiles by GC/MS (5035)								
1. 1,1,1,2-Tetrachloroethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
2. 1,1,1-Trichloroethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
3. 1,1,2,2-Tetrachloroethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
4. 1,1,2-Trichloroethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
5. 1,1-Dichloroethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
6. 1,1-Dichloroethene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
7. 1,1-Dichloropropene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
8. 1,2,3-Trichlorobenzene	SW8260B	< 250		250	µg/Kg-dry	1	ATD	10/26/2017
9. 1,2,3-Trichloropropane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
10. 1,2,4-Trichlorobenzene	SW8260B	< 250		250	µg/Kg-dry	1	ATD	10/26/2017
11. 1,2,4-Trimethylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
12. 1,2-Dibromo-3-chloropropane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
13. 1,2-Dibromoethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
14. 1,2-Dichlorobenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
15. 1,2-Dichloroethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
16. 1,2-Dichloropropane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
17. 1,3,5-Trimethylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
18. 1,3-Dichlorobenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
19. 1,3-Dichloropropane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
20. 1,4-Dichlorobenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
21. 2,2-Dichloropropane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
22. 2-Butanone	SW8260B	< 250		250	µg/Kg-dry	1	ATD	10/26/2017
23. 2-Chlorotoluene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
24. 2-Hexanone	SW8260B	< 250		250	µg/Kg-dry	1	ATD	10/26/2017
25. 4-Chlorotoluene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
26. 4-Isopropyltoluene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
27. 4-Methyl-2-pentanone	SW8260B	< 250		250	µg/Kg-dry	1	ATD	10/26/2017
28. Acetone	SW8260B	< 750		750	µg/Kg-dry	1	ATD	10/26/2017
29. Benzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
30. Bromobenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
31. Bromochloromethane	SW8260B	< 100		100	µg/Kg-dry	1	ATD	10/26/2017
32. Bromodichloromethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
33. Bromoform	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
34. Bromomethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
35. Carbon disulfide	SW8260B	< 250		250	µg/Kg-dry	1	ATD	10/26/2017
36. Carbon tetrachloride	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
37. Chlorobenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
38. Chloroethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
39. Chloroform	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
40. Chloromethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017

Definitions: PQL - Practical Quantitation Limit
DF - Dilution Factor

Qualifiers (Q): J - Detected below PQL but above MDL: Estimated
S - Spike Recovery Outside Acceptance Limits
B - Analyte detected in associated Method Blank
N - See case narrative for explanation

Note: The sample results reported are based on the sample aliquot(s) tested.

CLIENT: Rose & Westra, Inc.
Lab Order: 1710107
Project: 16.0062335.53 T01
Lab Sample ID: 1710107-03A

Project Number: 16.0062335.53 T01
Client Sample ID: SS-03
Collection Date: 10/12/2017
Matrix: SOIL

Analyses	Method Ref.	Result	Q	PQL	Units	DF	Analyst	Date
41. cis-1,2-Dichloroethene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
42. cis-1,3-Dichloropropene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
43. Dibromochloromethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
44. Dibromomethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
45. Dichlorodifluoromethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
46. Diethyl ether	SW8260B	< 200		200	µg/Kg-dry	1	ATD	10/26/2017
47. Ethylbenzene	SW8260B	170		50	µg/Kg-dry	1	ATD	10/26/2017
48. Hexachlorobutadiene	SW8260B	< 250		250	µg/Kg-dry	1	ATD	10/26/2017
49. Hexachloroethane	SW8260B	< 330		330	µg/Kg-dry	1	ATD	10/26/2017
50. Iodomethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
51. Isopropylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
52. m,p-Xylene	SW8260B	< 100		100	µg/Kg-dry	1	ATD	10/26/2017
53. Methyl tert-butyl ether	SW8260B	< 250		250	µg/Kg-dry	1	ATD	10/26/2017
54. Methylene chloride	SW8260B	< 100		100	µg/Kg-dry	1	ATD	10/26/2017
55. n-Butylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
56. n-Propylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
57. o-Xylene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
58. sec-Butylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
59. Styrene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
60. tert-Butylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
61. Tetrachloroethene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
62. Toluene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
63. trans-1,2-Dichloroethene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
64. trans-1,3-Dichloropropene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
65. trans-1,4-Dichloro-2-butene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
66. Trichloroethene	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
67. Trichlorofluoromethane	SW8260B	< 50		50	µg/Kg-dry	1	ATD	10/26/2017
68. Vinyl chloride	SW8260B	< 40		40	µg/Kg-dry	1	ATD	10/26/2017

Definitions: PQL - Practical Quantitation Limit
DF - Dilution Factor

Qualifiers (Q): J - Detected below PQL but above MDL: Estimated
S - Spike Recovery Outside Acceptance Limits
B - Analyte detected in associated Method Blank
N - See case narrative for explanation

Note: The sample results reported are based on the sample aliquot(s) tested.

BIO-CHEM Laboratories, Inc.

Lab Order: 1710107
Client: Rose & Westra, Inc.
Project: 16.0062335.53 T01

ANALYTICAL DETAIL REPORT

Sample ID	Client Sample ID	Matrix	Test Name	Date Sampled	TCLP/SPLP Date	Prep Date	QC Batch	Analysis Date	Analytical Batch
1710107-01A	SS-01	Soil	Total Mercury by CVAA	10/12/2017		10/24/2017	41344	10/24/2017	MTL_D_HY_171024A
	SS-01	Soil	Total Metal(s) by ICP	10/12/2017		10/23/2017	41338	10/25/2017	MTL_G_ICP_171025A
	SS-01	Soil	Total Selenium by NaBHR	10/12/2017		10/23/2017	41338	10/24/2017	MTL_C_FL_171024A
	SS-01	Soil	Volatiles by GC/MS (5035)	10/12/2017		10/23/2017	41342	10/24/2017	GCMS_Q_171024A
1710107-02A	SS-02	Soil	Total Mercury by CVAA	10/12/2017		10/24/2017	41344	10/24/2017	MTL_D_HY_171024A
	SS-02	Soil	Total Metal(s) by ICP	10/12/2017		10/23/2017	41338	10/25/2017	MTL_G_ICP_171025A
	SS-02	Soil	Total Metal(s) by ICP	10/12/2017		10/23/2017	41338	10/25/2017	MTL_G_ICP_171025A
	SS-02	Soil	Total Selenium by NaBHR	10/12/2017		10/23/2017	41338	10/24/2017	MTL_C_FL_171024A
	SS-02	Soil	Volatiles by GC/MS (5035)	10/12/2017		10/23/2017	41342	10/24/2017	GCMS_Q_171024A
1710107-03A	SS-03	Soil	Total Mercury by CVAA	10/12/2017		10/24/2017	41344	10/24/2017	MTL_D_HY_171024A
	SS-03	Soil	Total Metal(s) by ICP	10/12/2017		10/23/2017	41338	10/25/2017	MTL_G_ICP_171025A
	SS-03	Soil	Total Selenium by NaBHR	10/12/2017		10/23/2017	41338	10/24/2017	MTL_C_FL_171024A
	SS-03	Soil	Volatiles by GC/MS (5035)	10/12/2017		10/23/2017	41342	10/26/2017	GCMS_Q_171024A