

# Technical Memo

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To: Mal Wensierski

Date: 2/10/2015

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Lafarge Canada Inc.

Re.: 2014 Monitoring Summary

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6509 Airport Road, Mississauga, ON L4V 1S7 Project: Oro Pit

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CC:

From: Andrew Pentney

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As requested we are providing a summary of the 2014 groundwater monitoring program results for the Oro Pit. A previous memo dated March 17, 2014 outlined the complete monitoring program requirements and summarized the results of initial baseline observations/sampling completed in 2012 and 2013.

Initial baseline monitoring included sampling of on-site monitoring wells and off-site private wells within 300 m (or more) of the Oro Pit. The private well sampling included properties on Sixth and Seventh Lines between County Road 11 (Old Barrie Road) and Bass Lake Sideroad. Please refer to the March 17, 2014 memo for details regarding program requirements and the results of previous monitoring.

## **Site Activities To Date**

Site preparation for the start of operations (access road building, clearing, berm construction, etc.) at the Oro Pit occurred in 2013 and 2014. Extraction activities began in January 2015. No water taking has occurred to date or is planned (e.g. for aggregate washing) on-site in the near future. No Permit To Take Water application has been made for the site.

## **Monitoring Program**

The monitoring program in 2014 continued to establish “baseline” conditions at the Oro Pit prior to site extraction. Monitoring to be completed in 2015 constitutes the first year of measurements during Oro Pit extraction operations.

The site location and monitoring network is shown in **Figure 1** (attached). Existing Oro Pit monitors include locations M6, DC-1, DC-2, DC-4 and DC-5. Based on the water table configuration, groundwater flows from the area of DC-1, and moves radially north, northeast and east across the site (north to DC-2; northeast to the Greek Pit; and, east to the Roehner Pit). The current extraction area is immediately north of M6, therefore locations M6 and DC-4 are upgradient of the current extraction area. Flow from the current extraction area is northeast toward the Greek Pit.

In 2014 it was decided to add the Greek Pit monitor OW1 to the program to ensure a monitoring location “downgradient” of the current Oro Pit (and Greek Pit) extraction area is included in the program. The inclusion of OW1 in the program ensures monitors are located in the groundwater flow system between the extraction area and local private wells. Monitor OW1 was located, and measurements initiated, in May 2014 (after snowmelt).

The monitoring program is defined through Site Plan conditions, which include a reference to OMB approval based on monitoring recommendations made in a report by Dixon Hydrogeology Limited (January 1992). The Site Plan conditions and report recommendations are summarized in detail in the March 17, 2014 memo.

The ongoing monitoring program to satisfy Site Plan conditions is summarized as follows:

- Bi-monthly water level measurements in 2014 and 2015 (during initial operations at the Oro Pit), and quarterly thereafter. Monitors include Oro Pit: M6, DC-1, DC-2, DC-4, DC-5; and, Greek Pit: OW1.
- Annual groundwater samples for general chemical parameters and phenols at current upgradient locations M6, DC-4 and downgradient location OW1. Calcium chloride is expected to be used as a dust suppressant and is included in the water quality analysis.

Monitoring completed in 2014 at the Oro Pit includes the following:

- Baseline private well survey and water quality sampling on December 1, 2014 at 2160 Line 6 North (at the landowners request).
- Bi-monthly water level measurements at monitoring wells M6, DC-1, DC-2, DC-4, DC-5 and OW1.

On-site water quality sampling was inadvertently missed in 2014. When this was noted in January 2015 water quality samples were taken immediately at M6, DC-4 and Owl. The January 2015 results can also be considered representative of “baseline” conditions with respect to Oro Pit operations. Water quality samples will be obtained again in late 2015 after the first year of extraction operations at the Oro Pit.

### **Monitoring Results Summary**

An updated table summarizing the baseline private well monitoring completed at the site is attached. We note that the respective sample results were provided by letter to each land owner. Copies of previous resident correspondence were provided in the March 17, 2014 memo. A copy of the December 2014 letter is attached for reference. No significant water quality concerns are noted.

As stated previously, based on the reported well construction obtained through the survey and water well record information available from the MOE, all of the wells sampled are completed in deep confined aquifers. This means that all of these wells are completed in sand and gravel layers (aquifers) that are much deeper than the proposed pit (which will remain above the water table), and, that one or more thick clay layers (aquitards) occur between the eventual pit floor and the water supply aquifers. The aquitard layers “protect” the lower aquifer(s) by limiting the vertical movement of water (and potential for impact). There is no direct “connection” expected between the water table at the pit and these water supply wells. This also means that water levels measured in the wells would not represent the water table condition at the pit.

Water level monitoring results at on-site wells M6 DC-1, DC-2, DC-4, DC-5 and OW1 are summarized in the attached table and hydrograph. As illustrated, water level elevations are consistent through 2013 and 2014, and comparable to historical (1991) results.

Water quality sampling was completed at M6, DC-4 and OW1 in January 2015. The sample results to date are summarized on the attached table. The sample results to date represent baseline conditions with respect to Oro Pit site operations. Operations have occurred at the Greek Pit for a number of years. Note that colour and turbidity results are elevated at each of the monitoring well locations (indicative of silt or clay within the sample water) due to the typical construction of these wells and the fact that they are pumped very intermittently. The colour and turbidity results at the monitoring wells do not have any implications related to water supply within the aquifer. No significant water quality concerns are noted and no impacts due to Greek Pit operations are apparent. The results indicate that the groundwater quality within the water table system on-site is slightly hard, however meets the MOE drinking water health related guidelines.

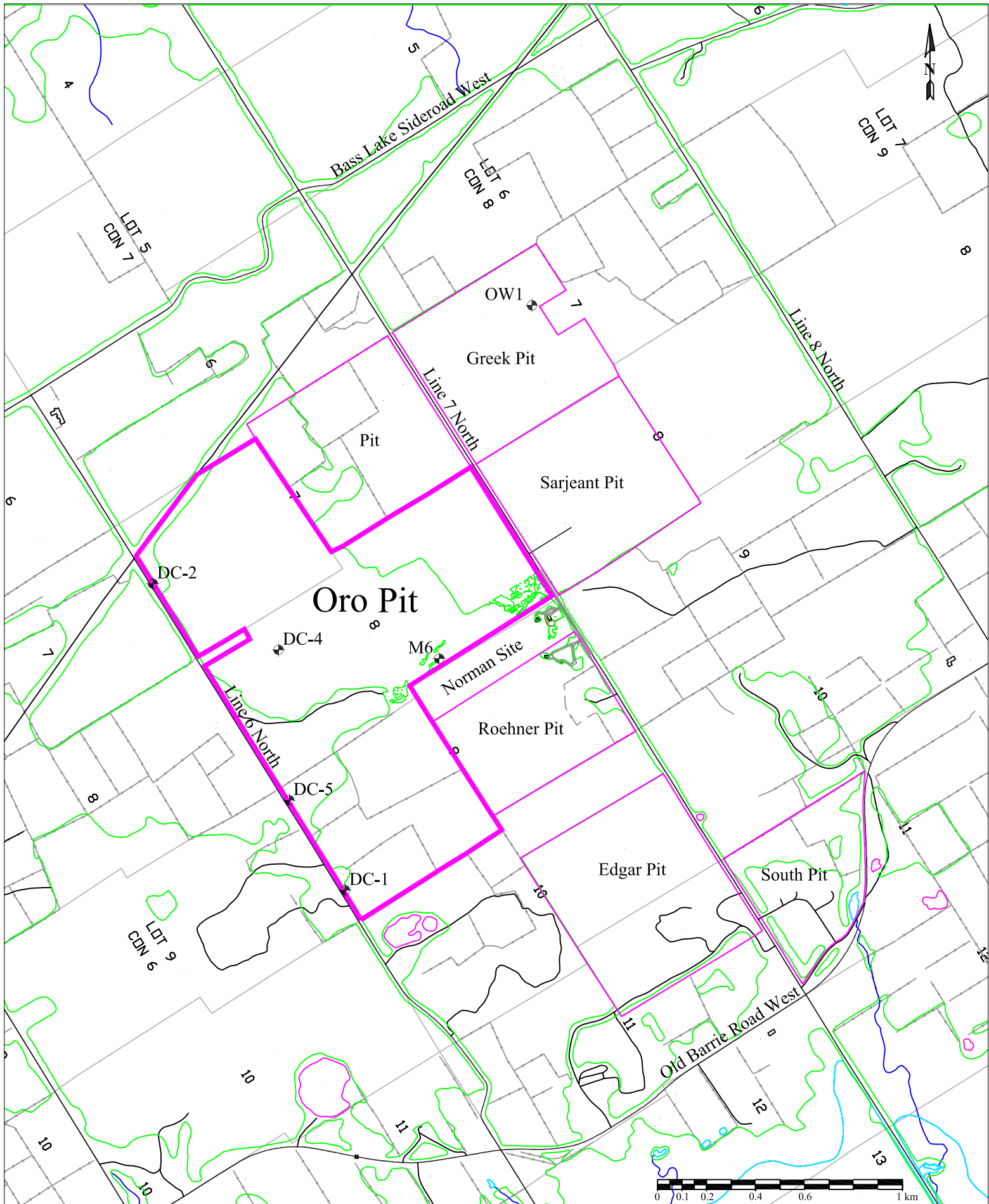
A slightly elevated Phenols result (just the above detection limit) is noted at monitor DC-4 in January 2015. Phenols in this setting are likely chosen as part of the analysis suite as an indicator of lubricants, solvents or petroleum products; however can also be related to the decay of naturally occurring organic material or sewage (e.g. septic system effluent). No phenols were present in the 2013 sample; the 2015 result is very low; and, location DC-4 is upgradient from the extraction area. Therefore the detection in 2015 may be a result of sampling or analysis error, natural presence (due to organic material entering the well) or upgradient impacts (e.g. septic systems). Continued monitoring is recommended, and will occur as part of the stipulated monitoring program.

Attached:

Figure 1: Site Location

Appendix A: Survey Response Summary  
Well Owner Letter

Appendix B: Water Level Summary Table  
Water Level Hydrograph  
On-site Water Quality Sampling Results Summary



- Pit licence boundary (approx)
- river, stream, pond
- treeline
- monitoring well location

modified from: OBM mapping, Site Plan  
 UNDER LICENSE, WITHOUT PREJUDICE OR ENDORSEMENT,  
 FROM THE QUEEN'S PRINTER OF ONTARIO, 2005

March 2014  
 Scale: as shown

Groundwater  
 Science Corp.

**Figure 1: Site Location**

Lafarge Canada Inc.  
 Oro Pit Monitoring Program

## Appendix A

**Private Water Well Door To Door Survey - Results Summary**

Lafarge Oro Pit

Street Address (emergency locate no.)	Survey Dates		Survey Response	Number of Wells	Type of Well	MOE Record Available	Well Depth (m)	Water Level (m)	Comment / Details Provided on Survey
	First	Second							
<b>Line 6 North</b>									
1721 Line 6 North	19-Nov-12	21-Feb-13	8-Apr-13	1	drilled	5708728	84.1	57.0	water quality sample taken 12-Apr-13
Barton County Forest	19-Nov-12								address unknown (Line 6 N), no residence
1832 Line 6 North	19-Nov-12								includes Hardwood Hills, no residence
2024 Line 6 North	19-Nov-12	21-Feb-13	none	n/a	n/a	n/a	n/a	n/a	survey form provided
2097 Line 6 North	19-Nov-12	21-Feb-13	14-Mar-13	1	drilled	5719519	46.0	42.4	water quality sample taken 14-Mar-13
2104 Line 6 North	19-Nov-12		28-Jan-13	1	drilled	yes	55.8	39.3	water quality sample taken 21-Feb-13
2160 Line 6 North	19-Nov-12	21-Feb-13	1-Dec-14	1	drilled	5725566	64.0	39.9	water quality sample taken 1-Dec-14
2272 Line 6 North	19-Nov-12	21-Feb-13	12-Apr-13	1	drilled	5730576	91.7	54.9	water quality sample taken 12-Apr-13
Brown County Forest	19-Nov-12								address unknown (Line 6 N), no residence
<b>Line 7 North</b>									
Walker Aggregates Edgar Pit									address unknown (Line 7 N), no residence
Vacant Land north of Edgar Pit									address unknown (Line 7 N), no residence
1908 Line 7 North	19-Nov-12								vacant, no residence
Strachan Tract Count Forest	19-Nov-12								address unknown (Line 7 N), no residence
1944 Line 7 North	19-Nov-12	21-Feb-13	none	n/a	n/a	n/a	n/a	n/a	property owned by Lafarge
1994 Line 7 North	19-Nov-12		none	n/a	n/a	n/a	n/a	n/a	property owned by Lafarge
2065 Line 7 North - Sarjeant Pit									no residence
2137 Line 7 North - Sarjeant Pit									no residence
2216 Line 7 North	19-Nov-12								vacant, no residence
2217 Line 7 North - Lafarge Greek Pit									no residence
Hutcheson County Forest	19-Nov-12								address unknown (Line 7 N), no residence
2376 Line 7 North	12-Apr-13		none	n/a	n/a	n/a	n/a	n/a	
<p>Note - Well Record correlated to address based on reported location in addition to survey details such as age, depth, well type, etc.                      - details provided as reported on well record if available, or, as reported by owner                      - survey response summary as of January 27, 2015</p>									

n/a = not available



*Groundwater  
Science Corp.*

24 Erb Street East,  
Waterloo, ON N2J 1L6  
Phone: (519) 746-6916  
groundwaterscience.ca

December 15, 2014

Bob Hornsby  
Christian Horizons  
2160 Line 6 North  
RR1  
Oro Station, Ontario  
L0L 2E0

Dear Mr. Hornsby:

**RE: Water Well Survey and Water Quality Sample Results  
Lafarge Canada Inc. Oro Pit Monitoring Program.**

This letter is to provide you with a copy of the water quality analysis results for the sample obtained on December 1, 2014 as part of the monitoring program for the Lafarge Canada Inc. Oro Pit. At that time a water well survey was completed and a water sample obtained by Groundwater Science Corp. personnel under your authorization. The water quality sample was intended to establish existing conditions at your well.

The sample was analyzed by ALS Laboratories (Waterloo, Ontario). The analysis result for your well water as provided by the laboratory is attached to this letter. We note that the analysis results are all within the corresponding drinking water criteria established by the Ministry of the Environment (MOE) for health related purposes. In general your water quality is considered typical for a well located in this area of southern Ontario.

If you have any questions regarding this information please do not hesitate to contact me.

Sincerely,

Andrew Pentney, P.Geo.  
Hydrogeologist

Attached: copy of ALS Laboratories Certificate of Analysis for 2160 Line 6 N.



GROUNDWATER SCIENCE  
ATTN: ANDREW PENTNEY  
328 Daleview Place  
WATERLOO ON N2L 5M5

Date Received: 01-DEC-14  
Report Date: 08-DEC-14 14:52 (MT)  
Version: FINAL

Client Phone: 519-746-6916

## Certificate of Analysis

**Lab Work Order #:** L1552991  
**Project P.O. #:** NOT SUBMITTED  
**Job Reference:** ORO PIT  
**C of C Numbers:** 14-396686  
**Legal Site Desc:**

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Austin Paterson  
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 60 Northland Road, Unit 1, Waterloo, ON N2V 2B8 Canada | Phone: +1 519 886 6910 | Fax: +1 519 886 9047  
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company



## ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1552991-1 2160 LINE 6 N Sampled By: DAVE NAHRGANG on 01-DEC-14 @ 12:10 Matrix: WATER							
<b>Physical Tests</b>							
Color, Apparent	<1.0		1.0	C.U.		02-DEC-14	R3112947
Conductivity	364		3.0	umhos/cm		02-DEC-14	R3113038
Hardness (as CaCO3)	181		10	mg/L		04-DEC-14	
pH	8.17		0.10	pH units		02-DEC-14	R3113018
Total Dissolved Solids	201		20	mg/L	04-DEC-14	05-DEC-14	R3115522
Turbidity	0.43		0.10	NTU	02-DEC-14	02-DEC-14	R3112203
<b>Anions and Nutrients</b>							
Alkalinity, Total (as CaCO3)	179		10	mg/L		02-DEC-14	R3112946
Ammonia, Total (as N)	<0.050		0.050	mg/L		03-DEC-14	R3114865
Chloride	<2.0		2.0	mg/L		03-DEC-14	R3115080
Fluoride	<0.10		0.10	mg/L		03-DEC-14	R3115080
Nitrate-N	<0.10		0.10	mg/L		03-DEC-14	R3115080
Nitrite-N	<0.10		0.10	mg/L		03-DEC-14	R3115080
Phosphate-P (ortho)	0.0031		0.0030	mg/L		03-DEC-14	R3115621
Sulphate	20.5		2.0	mg/L		03-DEC-14	R3115080
<b>Dissolved Metals</b>							
Dissolved Metals Filtration Location	FIELD					02-DEC-14	R3112019
Aluminum (Al)-Dissolved	<0.010		0.010	mg/L	02-DEC-14	03-DEC-14	R3114848
Antimony (Sb)-Dissolved	<0.0050		0.0050	mg/L	02-DEC-14	03-DEC-14	R3114848
Arsenic (As)-Dissolved	<0.0010		0.0010	mg/L	02-DEC-14	03-DEC-14	R3114848
Barium (Ba)-Dissolved	0.091		0.010	mg/L	02-DEC-14	03-DEC-14	R3114848
Beryllium (Be)-Dissolved	<0.0010		0.0010	mg/L	02-DEC-14	03-DEC-14	R3114848
Bismuth (Bi)-Dissolved	<0.0010		0.0010	mg/L	02-DEC-14	03-DEC-14	R3114848
Boron (B)-Dissolved	<0.050		0.050	mg/L	02-DEC-14	03-DEC-14	R3114848
Cadmium (Cd)-Dissolved	<0.000090		0.000090	mg/L	02-DEC-14	03-DEC-14	R3114848
Calcium (Ca)-Dissolved	41.1		0.50	mg/L	02-DEC-14	03-DEC-14	R3114848
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	02-DEC-14	03-DEC-14	R3114848
Cobalt (Co)-Dissolved	<0.00050		0.00050	mg/L	02-DEC-14	03-DEC-14	R3114848
Copper (Cu)-Dissolved	<0.0010		0.0010	mg/L	02-DEC-14	03-DEC-14	R3114848
Iron (Fe)-Dissolved	0.073		0.050	mg/L	02-DEC-14	03-DEC-14	R3114848
Lead (Pb)-Dissolved	<0.0010		0.0010	mg/L	02-DEC-14	03-DEC-14	R3114848
Magnesium (Mg)-Dissolved	18.9		0.50	mg/L	02-DEC-14	03-DEC-14	R3114848
Manganese (Mn)-Dissolved	0.0220		0.0010	mg/L	02-DEC-14	03-DEC-14	R3114848
Molybdenum (Mo)-Dissolved	<0.0010		0.0010	mg/L	02-DEC-14	03-DEC-14	R3114848
Nickel (Ni)-Dissolved	<0.0020		0.0020	mg/L	02-DEC-14	03-DEC-14	R3114848
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	02-DEC-14	03-DEC-14	R3114848
Potassium (K)-Dissolved	2.0		1.0	mg/L	02-DEC-14	03-DEC-14	R3114848
Selenium (Se)-Dissolved	<0.00040		0.00040	mg/L	02-DEC-14	03-DEC-14	R3114848
Silicon (Si)-Dissolved	7.5		1.0	mg/L	02-DEC-14	03-DEC-14	R3114848
Silver (Ag)-Dissolved	<0.00010		0.00010	mg/L	02-DEC-14	03-DEC-14	R3114848
Sodium (Na)-Dissolved	3.70		0.50	mg/L	02-DEC-14	03-DEC-14	R3114848

\* Refer to Referenced Information for Qualifiers (if any) and Methodology.

# ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1552991-1    2160 LINE 6 N Sampled By:    DAVE NAHRGANG on 01-DEC-14 @ 12:10 Matrix:        WATER							
<b>Dissolved Metals</b>							
Strontium (Sr)-Dissolved	0.139		0.0010	mg/L	02-DEC-14	03-DEC-14	R3114848
Thallium (Tl)-Dissolved	<0.00030		0.00030	mg/L	02-DEC-14	03-DEC-14	R3114848
Tin (Sn)-Dissolved	<0.0010		0.0010	mg/L	02-DEC-14	03-DEC-14	R3114848
Titanium (Ti)-Dissolved	<0.0020		0.0020	mg/L	02-DEC-14	03-DEC-14	R3114848
Tungsten (W)-Dissolved	<0.010		0.010	mg/L	02-DEC-14	03-DEC-14	R3114848
Uranium (U)-Dissolved	<0.0050		0.0050	mg/L	02-DEC-14	03-DEC-14	R3114848
Vanadium (V)-Dissolved	<0.0010		0.0010	mg/L	02-DEC-14	03-DEC-14	R3114848
Zinc (Zn)-Dissolved	<0.0030		0.0030	mg/L	02-DEC-14	03-DEC-14	R3114848
Zirconium (Zr)-Dissolved	<0.0040		0.0040	mg/L	02-DEC-14	03-DEC-14	R3114848
<b>Aggregate Organics</b>							
Phenols (4AAP)	<0.0010		0.0010	mg/L	03-DEC-14	03-DEC-14	R3115172
<b>Hydrocarbons</b>							
F1 (C6-C10)	<25		25	ug/L		03-DEC-14	R3112508
F2 (C10-C16)	<100		100	ug/L	03-DEC-14	08-DEC-14	R3113982
F3 (C16-C34)	<250		250	ug/L	03-DEC-14	08-DEC-14	R3113982
F4 (C34-C50)	<250		250	ug/L	03-DEC-14	08-DEC-14	R3113982
Total Hydrocarbons (C6-C50)	<370		370	ug/L		08-DEC-14	
Chrom. to baseline at nC50	YES				03-DEC-14	08-DEC-14	R3113982
Surrogate: 2-Bromobenzotrifluoride	88.2		60-140	%	03-DEC-14	08-DEC-14	R3113982
Surrogate: 3,4-Dichlorotoluene	91.0		60-140	%		03-DEC-14	R3112508

\* Refer to Referenced Information for Qualifiers (if any) and Methodology.

## Reference Information

### QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Aluminum (Al)-Dissolved	MS-B	L1552991-1
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1552991-1
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1552991-1
Matrix Spike	Cobalt (Co)-Dissolved	MS-B	L1552991-1
Matrix Spike	Copper (Cu)-Dissolved	MS-B	L1552991-1
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1552991-1
Matrix Spike	Potassium (K)-Dissolved	MS-B	L1552991-1
Matrix Spike	Selenium (Se)-Dissolved	MS-B	L1552991-1
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1552991-1
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1552991-1

### Sample Parameter Qualifier key listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

### Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-WT	Water	Alkalinity, Total (as CaCO <sub>3</sub> )	EPA 310.2
ANIONS5-WT	Water	CL,F,NO <sub>2</sub> ,NO <sub>3</sub> ,SO <sub>4</sub>	EPA 300.0 (IC)
COLOUR-WT	Water	Colour	APHA 2120
Apparent colour is determined by analysis of the decanted sample using the platinum-cobalt colourimetric method.			
EC-WT	Water	Conductivity	APHA 2510 B
Water samples can be measured directly by immersing the conductivity cell into the sample.			
ETL-HARDNESS-CALC-WT	Water	Hardness (as CaCO <sub>3</sub> )	APHA 2340 B

F1-F4-511-CALC-WT      Water      F1-F4 Hydrocarbon Calculated Parameters      CCME CWS-PHC DEC-2000 - PUB# 1310-L

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.

In samples where BTEX and F1 were analyzed, F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:

1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:

1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

F1-HS-511-WT      Water      F1-O.Reg 153/04 (July 2011)      E3398/CCME TIER 1-HS  
 Fraction F1 is determined by analyzing by headspace-GC/FID.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

F2-F4-511-WT      Water      F2-F4-O.Reg 153/04 (July 2011)      MOE DECPH-E3398/CCME TIER 1

Fractions F2, F3 and F4 are determined by liquid/liquid extraction with a solvent. The solvent recovered from the extracted sample is dried and treated to remove polar material. The extract is then analyzed by GC/FID.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental

# Reference Information

Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

MET-D-MS-WT            Water            Dissolved Metals in Water by ICPMS    EPA 200.8

The metal constituents of a non-acidified sample that pass through a membrane filter prior to ICP/MS analysis.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

NH3-WT                Water            Ammonia, Total as N                        EPA 350.1

Sample is measured colorimetrically. When sample is turbid a distillation step is required, sample is distilled into a solution of boric acid and measured colorimetrically.

P-ORTHO-LOW-WT      Water            Phosphorus-P (ortho)                        APHA 4500-P B E

PH-WT                 Water            pH                                                 APHA 4500 H-Electrode

Water samples are analyzed directly by a calibrated pH meter.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

PHENOLS-4AAP-WT    Water            Phenol (4AAP)                                EPA 9066

An automated method is used to distill the sample. The distillate is then buffered to pH 9.4 which reacts with 4AAP and potassium ferricyanide to form a red complex which is measured colorimetrically.

SOLIDS-TDS-WT        Water            Total Dissolved Solids                        APHA 2540C

A well-mixed sample is filtered through glass fibres filter. A known volume of the filtrate is evaporated and dried at 105–5°C overnight and then 180–10°C for 1hr.

TURBIDITY-WT         Water            Turbidity                                        APHA 2130 B

Sample result is based on a comparison of the intensity of the light scattered by the sample under defined conditions with the intensity of light scattered by a standard reference suspension under the same conditions. Sample readings are obtained from a Nephelometer.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

*The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:*

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

**Chain of Custody Numbers:**

14-396686

**GLOSSARY OF REPORT TERMS**

*Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.*

*mg/kg - milligrams per kilogram based on dry weight of sample*

*mg/kg wwt - milligrams per kilogram based on wet weight of sample*

*mg/kg lwt - milligrams per kilogram based on lipid weight of sample*

*mg/L - unit of concentration based on volume, parts per million.*

*< - Less than.*

*D.L. - The reporting limit.*

*N/A - Result not available. Refer to qualifier code and definition for explanation.*

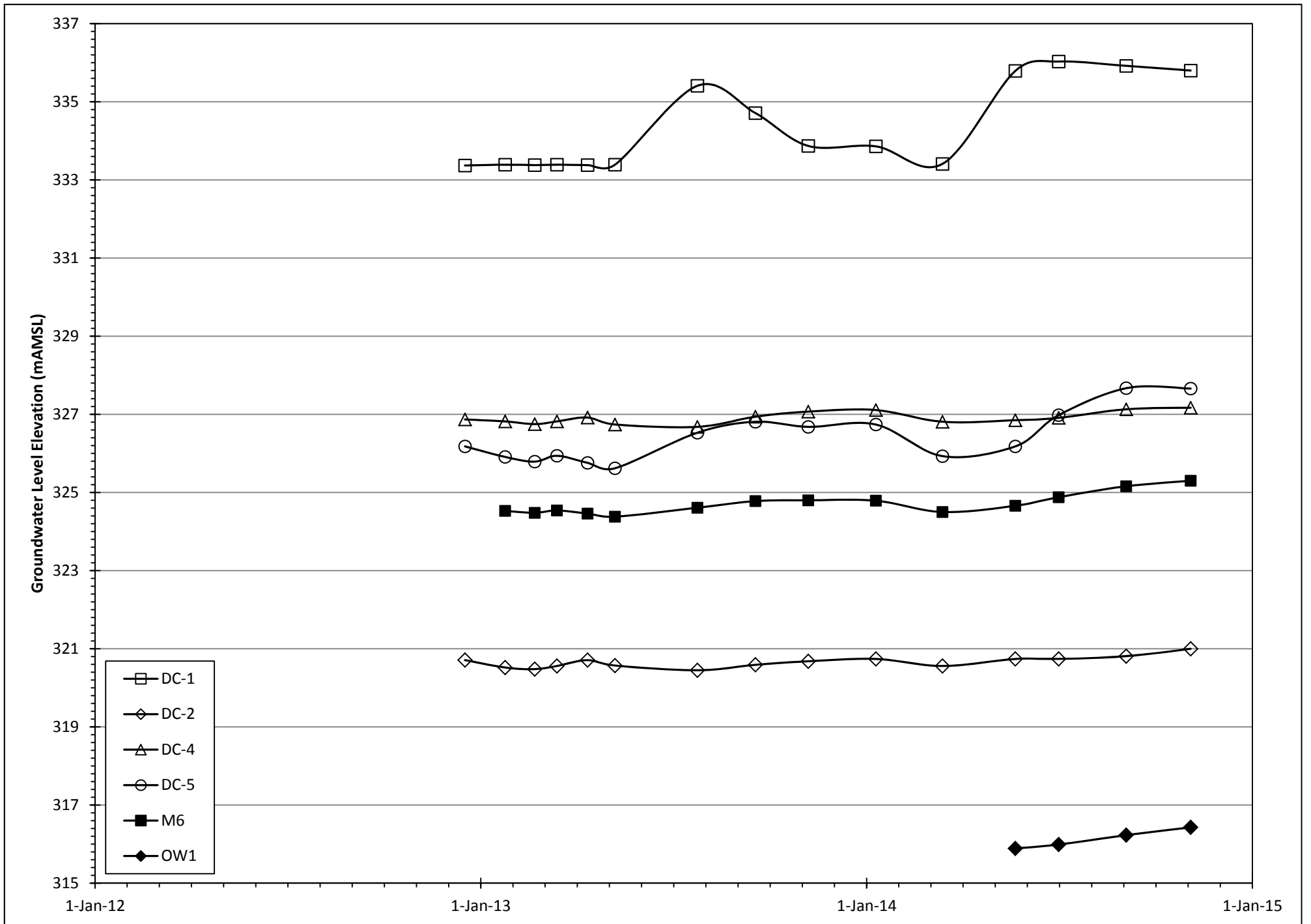
*Test results reported relate only to the samples as received by the laboratory.*

*UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.*

*Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.*

## Appendix B





Analyte	Units	DC-4		M6		OW1	
		21-Feb-13	29-Jan-15	21-Feb-13	29-Jan-15	29-Jan-15	
Color, Apparent	C.U.	59.3	101	43.8	69.8	107	
Conductivity	umhos/cm	342	324	337	333	387	
Hardness (as CaCO3)	mg/L	189	170	182	178	203	
pH	pH units	8.13	8.14	8.17	8.16	8.12	
Total Dissolved Solids	mg/L	184	222	188	215	259	
Turbidity	NTU	59	64.4	53	17.9	23.3	
Alkalinity, Total (as CaCO3)	mg/L	174	172	179	182	206	
Ammonia, Total (as N)	mg/L	0.074	0.106	<0.050	<0.050	<0.050	
Chloride	mg/L	<2.0	0.63	<2.0	0.62	4.65	
Fluoride	mg/L	<0.10	0.04	<0.10	0.044	0.033	
Nitrate-N	mg/L	0.19	0.516	0.8	1.09	1.88	
Nitrite-N	mg/L	<0.10	<0.010	<0.10	<0.010	<0.010	
Phosphate-P (ortho)	mg/L	0.0057	<0.0030	0.0031	<0.0030	<0.0030	
Sulphate	mg/L	11	12.2	7.9	9	7.08	
Aluminum (Al)-Dissolved	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	
Antimony (Sb)-Dissolved	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	
Arsenic (As)-Dissolved	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
Barium (Ba)-Dissolved	mg/L	0.042	0.043	0.061	0.061	0.041	
Beryllium (Be)-Dissolved	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
Bismuth (Bi)-Dissolved	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
Boron (B)-Dissolved	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	
Cadmium (Cd)-Dissolved	mg/L	<0.000090	<0.000090	<0.000090	<0.000090	<0.000090	
Calcium (Ca)-Dissolved	mg/L	46.1	42.1	48.3	47.2	59.9	
Chromium (Cr)-Dissolved	mg/L	0.00094	<0.00050	0.00118	0.00134	0.00094	
Cobalt (Co)-Dissolved	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
Copper (Cu)-Dissolved	mg/L	0.0011	<0.0010	<0.0010	<0.0010	<0.0010	
Iron (Fe)-Dissolved	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	
Lead (Pb)-Dissolved	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
Magnesium (Mg)-Dissolved	mg/L	18	15.8	15	14.6	13	
Manganese (Mn)-Dissolved	mg/L	0.0024	0.011	<0.0010	<0.0010	<0.0010	
Molybdenum (Mo)-Dissolved	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
Nickel (Ni)-Dissolved	mg/L	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	
Phosphorus (P)-Dissolved	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	
Potassium (K)-Dissolved	mg/L	1.3	1.2	1	1.1	<1.0	
Selenium (Se)-Dissolved	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	
Silicon (Si)-Dissolved	mg/L	5.5	5.3	5.7	5.6	5.1	
Silver (Ag)-Dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
Sodium (Na)-Dissolved	mg/L	2.55	2.4	2.14	2.18	2.34	
Strontium (Sr)-Dissolved	mg/L	0.0979	0.107	0.118	0.124	0.125	
Thallium (Tl)-Dissolved	mg/L	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	
Tin (Sn)-Dissolved	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
Titanium (Ti)-Dissolved	mg/L	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	
Tungsten (W)-Dissolved	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	
Uranium (U)-Dissolved	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	
Vanadium (V)-Dissolved	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
Zinc (Zn)-Dissolved	mg/L	0.0044	<0.0030	<0.0030	<0.0030	<0.0030	
Zirconium (Zr)-Dissolved	mg/L	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	
Phenols (4AAP)	mg/L	<0.0010	0.0021	<0.0010	<0.0010	<0.0010	