



## CERTIFICATE OF ANALYSIS

<b>REPORTED TO</b>	Highway 12/21 Regional Water Services Commission RR3 Lacombe, AB T4L 2N3	<b>WORK ORDER</b>	8021928
<b>ATTENTION</b>	Darren Dempsey	<b>RECEIVED / TEMP REPORTED</b>	2018-02-28 09:35 / 10°C 2018-03-07 10:11
<b>PO NUMBER</b>		<b>COC NUMBER</b>	No Number
<b>PROJECT</b>	Water Sample		
<b>PROJECT INFO</b>	12/21 Annual		

### Introduction:

CARO Analytical Services is a testing laboratory full of smart, engaged scientists driven to make the world a safer and healthier place. Through our clients' projects we become an essential element for a better world. We employ methods conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts. CARO is accredited by the Canadian Association for Laboratories Accreditation (CALA) to ISO 17025:2005 for specific tests listed in the scope of accreditation approved by CALA.

#### *Big Picture Sidekicks*



You know that the sample you collected after snowshoeing to site, digging 5 meters, and racing to get it on a plane so you can submit it to the lab for time sensitive results needed to make important and expensive decisions (whew) is VERY important. We know that too.

#### *We've Got Chemistry*



It's simple. We figure the more you enjoy working with our fun and engaged team members; the more likely you are to give us continued opportunities to support you.

#### *Ahead of the Curve*



Through research, regulation knowledge, and instrumentation, we are your analytical centre for the technical knowledge you need, BEFORE you need it, so you can stay up to date and in the know.

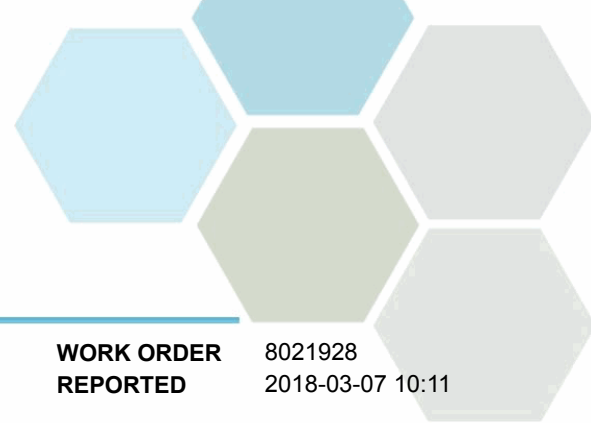
If you have any questions or concerns, please contact me at [jshanko@caro.ca](mailto:jshanko@caro.ca)

#### Authorized By:

Jennifer Shanko, A.Sc.T.  
Account Manager

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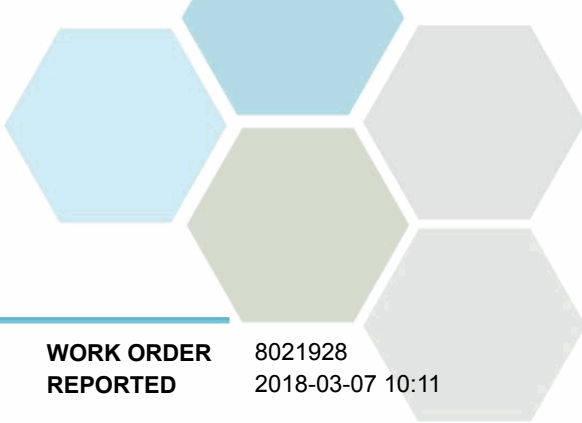
## TEST RESULTS

**REPORTED TO PROJECT** Highway 12/21 Regional Water Services Commission Water Sample

**WORK ORDER REPORTED** 8021928  
2018-03-07 10:11

Analyte	Result	Guideline	RL Units	Analyzed	Qualifier
<b>12/21 #1 (8021928-01)   Matrix: Water   Sampled: 2018-02-27 08:20</b>					
<i>Calculated Parameters</i>					
Hardness, Total (as CaCO3)	271	None Required	0.500 mg/L		N/A
<i>Total Metals</i>					
Aluminum, total	0.0156	OG < 0.1	0.0050 mg/L		2018-03-02
Antimony, total	< 0.00020	MAC = 0.006	0.00020 mg/L		2018-03-02
Arsenic, total	< 0.00050	MAC = 0.01	0.00050 mg/L		2018-03-02
Barium, total	0.0921	MAC = 1	0.0050 mg/L		2018-03-02
Beryllium, total	< 0.00010	N/A	0.00010 mg/L		2018-03-02
Bismuth, total	< 0.00010	N/A	0.00010 mg/L		2018-03-02
Boron, total	0.0250	MAC = 5	0.0050 mg/L		2018-03-02
Cadmium, total	< 0.000010	MAC = 0.005	0.000010 mg/L		2018-03-02
Calcium, total	70.7	None Required	0.20 mg/L		2018-03-02
Chromium, total	< 0.00050	MAC = 0.05	0.00050 mg/L		2018-03-02
Cobalt, total	< 0.00010	N/A	0.00010 mg/L		2018-03-02
Copper, total	0.00342	AO ≤ 1	0.00040 mg/L		2018-03-02
Iron, total	< 0.010	AO ≤ 0.3	0.010 mg/L		2018-03-02
Lead, total	< 0.00020	MAC = 0.01	0.00020 mg/L		2018-03-02
Lithium, total	0.00695	N/A	0.00010 mg/L		2018-03-02
Magnesium, total	23.0	None Required	0.010 mg/L		2018-03-02
Manganese, total	0.00081	AO ≤ 0.05	0.00020 mg/L		2018-03-02
Molybdenum, total	0.00131	N/A	0.00010 mg/L		2018-03-02
Nickel, total	0.00055	N/A	0.00040 mg/L		2018-03-02
Phosphorus, total	< 0.050	N/A	0.050 mg/L		2018-03-02
Potassium, total	1.74	N/A	0.10 mg/L		2018-03-02
Selenium, total	< 0.00050	MAC = 0.05	0.00050 mg/L		2018-03-02
Silicon, total	2.9	N/A	1.0 mg/L		2018-03-02
Silver, total	< 0.000050	None Required	0.000050 mg/L		2018-03-02
Sodium, total	18.7	AO ≤ 200	0.10 mg/L		2018-03-02
Strontium, total	0.421	N/A	0.0010 mg/L		2018-03-02
Sulfur, total	24.9	N/A	3.0 mg/L		2018-03-02
Tellurium, total	< 0.00050	N/A	0.00050 mg/L		2018-03-02
Thallium, total	< 0.000020	N/A	0.000020 mg/L		2018-03-02
Thorium, total	< 0.00010	N/A	0.00010 mg/L		2018-03-02
Tin, total	< 0.00020	N/A	0.00020 mg/L		2018-03-02
Titanium, total	< 0.0050	N/A	0.0050 mg/L		2018-03-02
Tungsten, total	0.0012	N/A	0.0010 mg/L		2018-03-02
Uranium, total	0.000796	MAC = 0.02	0.000020 mg/L		2018-03-02
Vanadium, total	< 0.0010	N/A	0.0010 mg/L		2018-03-02
Zinc, total	0.0053	AO ≤ 5	0.0040 mg/L		2018-03-02
Zirconium, total	< 0.00010	N/A	0.00010 mg/L		2018-03-02

**12/21 #2 (8021928-02) | Matrix: Water | Sampled: 2018-02-27 08:20**



# TEST RESULTS

**REPORTED TO PROJECT** Highway 12/21 Regional Water Services Commission Water Sample

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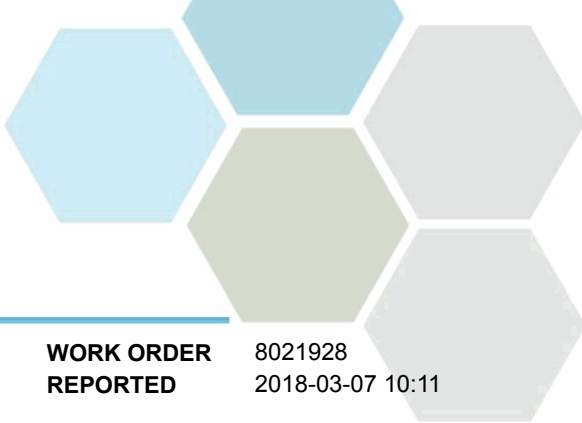
Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
<b>12/21 #2 (8021928-02)   Matrix: Water   Sampled: 2018-02-27 08:20, Continued</b>						
<i>Calculated Parameters</i>						
Total Trihalomethanes	0.0200	MAC = 0.1	0.00400	mg/L	N/A	
<i>Volatile Organic Compounds (VOC)</i>						
Bromodichloromethane	0.0024	N/A	0.0010	mg/L	2018-03-01	CT8
Bromoform	< 0.0010	N/A	0.0010	mg/L	2018-03-01	
Chloroform	0.0176	0.0018	0.0010	mg/L	2018-03-01	
Dibromochloromethane	< 0.0010	0.19	0.0010	mg/L	2018-03-01	
Surrogate: Toluene-d8	114		70-130	%	2018-03-01	
Surrogate: 4-Bromofluorobenzene	100		70-130	%	2018-03-01	

**12/21 #3 (8021928-03) | Matrix: Water | Sampled: 2018-02-27 08:20**

<i>Calculated Parameters</i>						
Total Trihalomethanes	0.0196	MAC = 0.1	0.00400	mg/L	N/A	
<i>Volatile Organic Compounds (VOC)</i>						
Bromodichloromethane	0.0024	N/A	0.0010	mg/L	2018-03-01	
Bromoform	< 0.0010	N/A	0.0010	mg/L	2018-03-01	
Chloroform	0.0172	0.0018	0.0010	mg/L	2018-03-01	
Dibromochloromethane	< 0.0010	0.19	0.0010	mg/L	2018-03-01	
Surrogate: Toluene-d8	112		70-130	%	2018-03-01	
Surrogate: 4-Bromofluorobenzene	98		70-130	%	2018-03-01	

**Sample Qualifiers:**

CT8 Headspace in sample container is greater than 5% volume - VOC results may be compromised



## APPENDIX 1: SUPPORTING INFORMATION

**REPORTED TO PROJECT** Highway 12/21 Regional Water Services Commission Water Sample

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Analysis Description	Method Ref.	Technique	Location
Hardness in Water	SM 2340 B* (2011)	Calculation: 2.497 [total Ca] + 4.118 [total Mg] (Est)	N/A
Total Metals in Water	EPA 200.2* / EPA 6020B	HNO <sub>3</sub> +HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	Richmond
Trihalomethanes in Water	EPA 5030B / EPA 8260D	Purge&Trap / GC-MSD (SIM)	Richmond

*Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method*

### Glossary of Terms:

RL	Reporting Limit (default)
<	Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors
AO	Aesthetic Objective
MAC	Maximum Acceptable Concentration (health based)
mg/L	Milligrams per litre
OG	Operational Guideline (treated water)
EPA	United States Environmental Protection Agency Test Methods
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

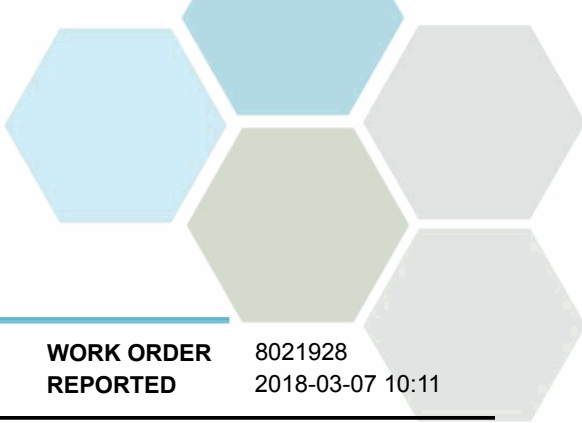
### Guidelines Referenced in this Report:

- [AB Tier 1 Commercial \(Feb 2016\)](#)
- [Guidelines for Canadian Drinking Water Quality \(Health Canada, Feb 2017\)](#)

*Note: In some cases, the values displayed on the report represent the lowest guideline and are to be verified by the end user*

### General Comments:

The results in this report apply to the samples analyzed in accordance with the Chain of Custody document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued unless otherwise agreed to in writing.



## APPENDIX 2: QUALITY CONTROL RESULTS

**REPORTED TO PROJECT** Highway 12/21 Regional Water Services Commission  
Water Sample

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The following section displays the quality control (QC) data that is associated with your sample data. Groups of samples are prepared in "batches" and analyzed in conjunction with QC samples that ensure your data is of the highest quality. Common QC types include:

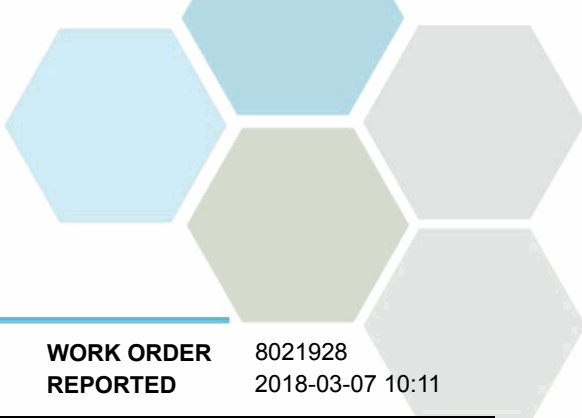
- **Method Blank (Blk):** A blank sample that undergoes sample processing identical to that carried out for the test samples. Method blank results are used to assess contamination from the laboratory environment and reagents.
- **Duplicate (Dup):** An additional or second portion of a randomly selected sample in the analytical run carried through the entire analytical process. Duplicates provide a measure of the analytical method's precision (reproducibility).
- **Blank Spike (BS):** A sample of known concentration which undergoes processing identical to that carried out for test samples, also referred to as a laboratory control sample (LCS). Blank spikes provide a measure of the analytical method's accuracy.
- **Matrix Spike (MS):** A second aliquot of sample is fortified with with a known concentration of target analytes and carried through the entire analytical process. Matrix spikes evaluate potential matrix effects that may affect the analyte recovery.
- **Reference Material (SRM):** A homogenous material of similar matrix to the samples, certified for the parameter(s) listed. Reference Materials ensure that the analytical process is adequate to achieve acceptable recoveries of the parameter(s) tested.

Each QC type is analyzed at a 5-10% frequency, i.e. one blank/duplicate/spike for every 10-20 samples. For all types of QC, the specified recovery (% Rec) and relative percent difference (RPD) limits are derived from long-term method performance averages and/or prescribed by the reference method.

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
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### Total Metals, Batch B8C0124

Blank (B8C0124-BLK1)			Prepared: 2018-03-02, Analyzed: 2018-03-02						
Aluminum, total	< 0.0050	0.0050 mg/L							
Antimony, total	< 0.00020	0.00020 mg/L							
Arsenic, total	< 0.00050	0.00050 mg/L							
Barium, total	< 0.0050	0.0050 mg/L							
Beryllium, total	< 0.00010	0.00010 mg/L							
Bismuth, total	< 0.00010	0.00010 mg/L							
Boron, total	< 0.0050	0.0050 mg/L							
Cadmium, total	< 0.000010	0.000010 mg/L							
Calcium, total	< 0.20	0.20 mg/L							
Chromium, total	< 0.00050	0.00050 mg/L							
Cobalt, total	< 0.00010	0.00010 mg/L							
Copper, total	< 0.00040	0.00040 mg/L							
Iron, total	< 0.010	0.010 mg/L							
Lead, total	< 0.00020	0.00020 mg/L							
Lithium, total	< 0.00010	0.00010 mg/L							
Magnesium, total	< 0.010	0.010 mg/L							
Manganese, total	< 0.00020	0.00020 mg/L							
Molybdenum, total	< 0.00010	0.00010 mg/L							
Nickel, total	< 0.00040	0.00040 mg/L							
Phosphorus, total	< 0.050	0.050 mg/L							
Potassium, total	< 0.10	0.10 mg/L							
Selenium, total	< 0.00050	0.00050 mg/L							
Silicon, total	< 1.0	1.0 mg/L							
Silver, total	< 0.000050	0.000050 mg/L							
Sodium, total	< 0.10	0.10 mg/L							
Strontium, total	< 0.0010	0.0010 mg/L							
Sulfur, total	< 3.0	3.0 mg/L							
Tellurium, total	< 0.00050	0.00050 mg/L							
Thallium, total	< 0.000020	0.000020 mg/L							
Thorium, total	< 0.00010	0.00010 mg/L							
Tin, total	< 0.00020	0.00020 mg/L							
Titanium, total	< 0.0050	0.0050 mg/L							
Tungsten, total	< 0.0010	0.0010 mg/L							
Uranium, total	< 0.000020	0.000020 mg/L							
Vanadium, total	< 0.0010	0.0010 mg/L							

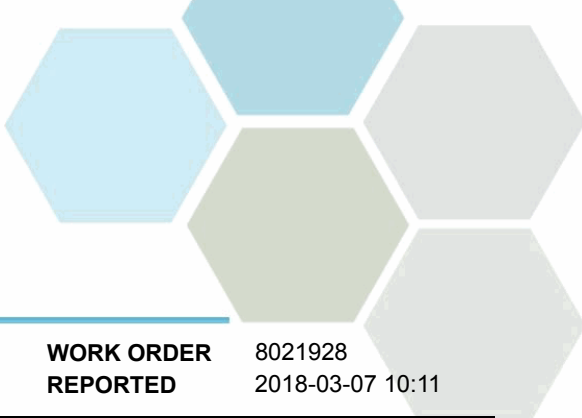


## APPENDIX 2: QUALITY CONTROL RESULTS

**REPORTED TO PROJECT** Highway 12/21 Regional Water Services Commission  
Water Sample

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Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
<b>Total Metals, Batch B8C0124, Continued</b>									
<b>Blank (B8C0124-BLK1), Continued</b>					Prepared: 2018-03-02, Analyzed: 2018-03-02				
Zinc, total	< 0.0040	0.0040 mg/L							
Zirconium, total	< 0.00010	0.00010 mg/L							
<b>LCS (B8C0124-BS1)</b>					Prepared: 2018-03-02, Analyzed: 2018-03-02				
Aluminum, total	0.0225	0.0050 mg/L	0.0200		113	80-120			
Antimony, total	0.0212	0.00020 mg/L	0.0200		106	80-120			
Arsenic, total	0.0207	0.00050 mg/L	0.0200		103	80-120			
Barium, total	0.0190	0.0050 mg/L	0.0200		95	80-120			
Beryllium, total	0.0220	0.00010 mg/L	0.0200		110	80-120			
Bismuth, total	0.0225	0.00010 mg/L	0.0200		113	80-120			
Boron, total	0.0226	0.0050 mg/L	0.0200		113	80-120			
Cadmium, total	0.0205	0.000010 mg/L	0.0200		103	80-120			
Calcium, total	2.25	0.20 mg/L	2.00		112	80-120			
Chromium, total	0.0209	0.00050 mg/L	0.0200		104	80-120			
Cobalt, total	0.0211	0.00010 mg/L	0.0200		105	80-120			
Copper, total	0.0223	0.00040 mg/L	0.0200		112	80-120			
Iron, total	2.09	0.010 mg/L	2.00		104	80-120			
Lead, total	0.0224	0.00020 mg/L	0.0200		112	80-120			
Lithium, total	0.0213	0.00010 mg/L	0.0200		106	80-120			
Magnesium, total	2.27	0.010 mg/L	2.00		114	80-120			
Manganese, total	0.0200	0.00020 mg/L	0.0200		100	80-120			
Molybdenum, total	0.0205	0.00010 mg/L	0.0200		103	80-120			
Nickel, total	0.0218	0.00040 mg/L	0.0200		109	80-120			
Phosphorus, total	1.99	0.050 mg/L	2.00		100	80-120			
Potassium, total	2.12	0.10 mg/L	2.00		106	80-120			
Selenium, total	0.0235	0.00050 mg/L	0.0200		118	80-120			
Silicon, total	2.1	1.0 mg/L	2.00		106	80-120			
Silver, total	0.0209	0.000050 mg/L	0.0200		105	80-120			
Sodium, total	2.27	0.10 mg/L	2.00		113	80-120			
Strontium, total	0.0192	0.0010 mg/L	0.0200		96	80-120			
Sulfur, total	4.6	3.0 mg/L	5.00		92	80-120			
Tellurium, total	0.0192	0.00050 mg/L	0.0200		96	80-120			
Thallium, total	0.0222	0.000020 mg/L	0.0200		111	80-120			
Thorium, total	0.0207	0.00010 mg/L	0.0200		104	80-120			
Tin, total	0.0210	0.00020 mg/L	0.0200		105	80-120			
Titanium, total	0.0215	0.0050 mg/L	0.0200		108	80-120			
Tungsten, total	0.0185	0.0010 mg/L	0.0200		92	80-120			
Uranium, total	0.0236	0.000020 mg/L	0.0200		118	80-120			
Vanadium, total	0.0202	0.0010 mg/L	0.0200		101	80-120			
Zinc, total	0.0217	0.0040 mg/L	0.0200		108	80-120			
Zirconium, total	0.0208	0.00010 mg/L	0.0200		104	80-120			
<b>Reference (B8C0124-SRM1)</b>					Prepared: 2018-03-02, Analyzed: 2018-03-02				
Aluminum, total	0.309	0.0050 mg/L	0.303		102	82-114			
Antimony, total	0.0523	0.00020 mg/L	0.0511		102	88-115			
Arsenic, total	0.123	0.00050 mg/L	0.118		104	88-111			
Barium, total	0.759	0.0050 mg/L	0.823		92	83-110			
Beryllium, total	0.0541	0.00010 mg/L	0.0496		109	80-119			
Boron, total	3.56	0.0050 mg/L	3.45		103	80-118			
Cadmium, total	0.0501	0.000010 mg/L	0.0495		101	90-110			
Calcium, total	12.5	0.20 mg/L	11.6		107	85-113			
Chromium, total	0.269	0.00050 mg/L	0.250		108	88-111			
Cobalt, total	0.0409	0.00010 mg/L	0.0377		109	90-114			
Copper, total	0.547	0.00040 mg/L	0.486		113	90-117			
Iron, total	0.523	0.010 mg/L	0.488		107	90-116			
Lead, total	0.224	0.00020 mg/L	0.204		110	90-110			



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<b>Total Metals, Batch B8C0124, Continued</b>									
<b>Reference (B8C0124-SRM1), Continued</b>					Prepared: 2018-03-02, Analyzed: 2018-03-02				
Lithium, total	0.416	0.00010 mg/L	0.403		103	79-118			
Magnesium, total	4.22	0.010 mg/L	3.79		111	88-116			
Manganese, total	0.109	0.00020 mg/L	0.109		100	88-108			
Molybdenum, total	0.207	0.00010 mg/L	0.198		104	88-110			
Nickel, total	0.267	0.00040 mg/L	0.249		107	90-112			
Phosphorus, total	0.208	0.050 mg/L	0.227		91	72-118			
Potassium, total	7.75	0.10 mg/L	7.21		107	87-116			
Selenium, total	0.143	0.00050 mg/L	0.121		118	90-122			
Sodium, total	8.44	0.10 mg/L	7.54		112	86-118			
Strontium, total	0.364	0.0010 mg/L	0.375		97	86-110			
Thallium, total	0.0899	0.000020 mg/L	0.0805		112	90-113			
Uranium, total	0.0319	0.000020 mg/L	0.0306		104	88-112			
Vanadium, total	0.398	0.0010 mg/L	0.386		103	87-110			
Zinc, total	2.72	0.0040 mg/L	2.49		109	90-113			

### Volatile Organic Compounds (VOC), Batch B8C0050

<b>Blank (B8C0050-BLK1)</b>					Prepared: 2018-03-01, Analyzed: 2018-03-01				
Bromodichloromethane	< 0.0010	0.0010 mg/L							
Bromoform	< 0.0010	0.0010 mg/L							
Chloroform	< 0.0010	0.0010 mg/L							
Dibromochloromethane	< 0.0010	0.0010 mg/L							
Surrogate: Toluene-d8	0.0278	mg/L	0.0246		113	70-130			
Surrogate: 4-Bromofluorobenzene	0.0252	mg/L	0.0250		101	70-130			
<b>LCS (B8C0050-BS1)</b>					Prepared: 2018-03-01, Analyzed: 2018-03-01				
Bromodichloromethane	0.0210	0.0010 mg/L	0.0200		105	70-130			
Bromoform	0.0201	0.0010 mg/L	0.0202		100	70-130			
Chloroform	0.0210	0.0010 mg/L	0.0202		104	70-130			
Dibromochloromethane	0.0204	0.0010 mg/L	0.0201		102	70-130			
Surrogate: Toluene-d8	0.0281	mg/L	0.0246		114	70-130			
Surrogate: 4-Bromofluorobenzene	0.0271	mg/L	0.0250		108	70-130			