

May 24, 2014

EDI Job Number: 14-Y-0270

Assessment and Abandoned Mines
Yukon Government
Box 2703, K-419
Whitehorse, YT Y1A 2C6

Attention: Adrienne Turcotte, Project Officer

Re: Rose Creek Monitoring Program – April 29, 2014

Assessment and Abandoned Mines (AAM) retained EDI Environmental Dynamics Inc. (EDI) to conduct water quality sampling at the Faro Mine Site. The Rose Creek Monitoring Program has been ongoing since November 2013 in response to changing water quality conditions. Table 1, attached, summarizes the field trips completed for the 2014 fiscal year. The intent of this memo is to summarize field data obtained during the April 29, 2014 field trip.

The objective of this trip was to conduct surface water sampling at 10 monitoring sites, including QA/QC samples. Figure 1 provides the locations of all sampling sites. Table 2 summarizes field data collected at each sampling site.

Weather conditions on April 29, 2014 were mild, with temperatures near 6°C, overcast, and moderate wind. Seven sites were sampled. Sites NF1, R3 and R10 were not sampled due to inaccessibility; deep, wet snow prevented access by snowmobile or ATV. The following sample locations were modified:

- NF2-A samples were collected approximately 1 m west from the original site.
- NF2-B samples were collected approximately 7 m from the original site, towards NF2-A.

Representative photos of each site are attached. ALS laboratory analytical reports for all water chemistry samples submitted during this field trip are attached.

If you have any questions, please do not hesitate to contact me at (867) 393-4882 or through email at mkearns@edynamics.com.



Yours truly,

EDI Environmental Dynamics Inc.

Submitted via email

Meighan Kearns, B.Sc., R.P.Bio.
Aquatic Biologist

Attachments:

- Table 1. Summary of field trips conducted in the 2014 fiscal year, Rose Creek Monitoring Program.
- Table 2. Surface water sampling field data, Rose Creek Monitoring Program, April 29, 2014.
- Figure 1. Location of surface water sampling, Rose Creek Monitoring Program, April 29, 2014.
- Photos 1 – 7. Representative site photos.
- ALS Laboratory Analytical Reports



Table 1. Summary of field trips conducted in the 2014 fiscal year, Rose Creek Monitoring Program.

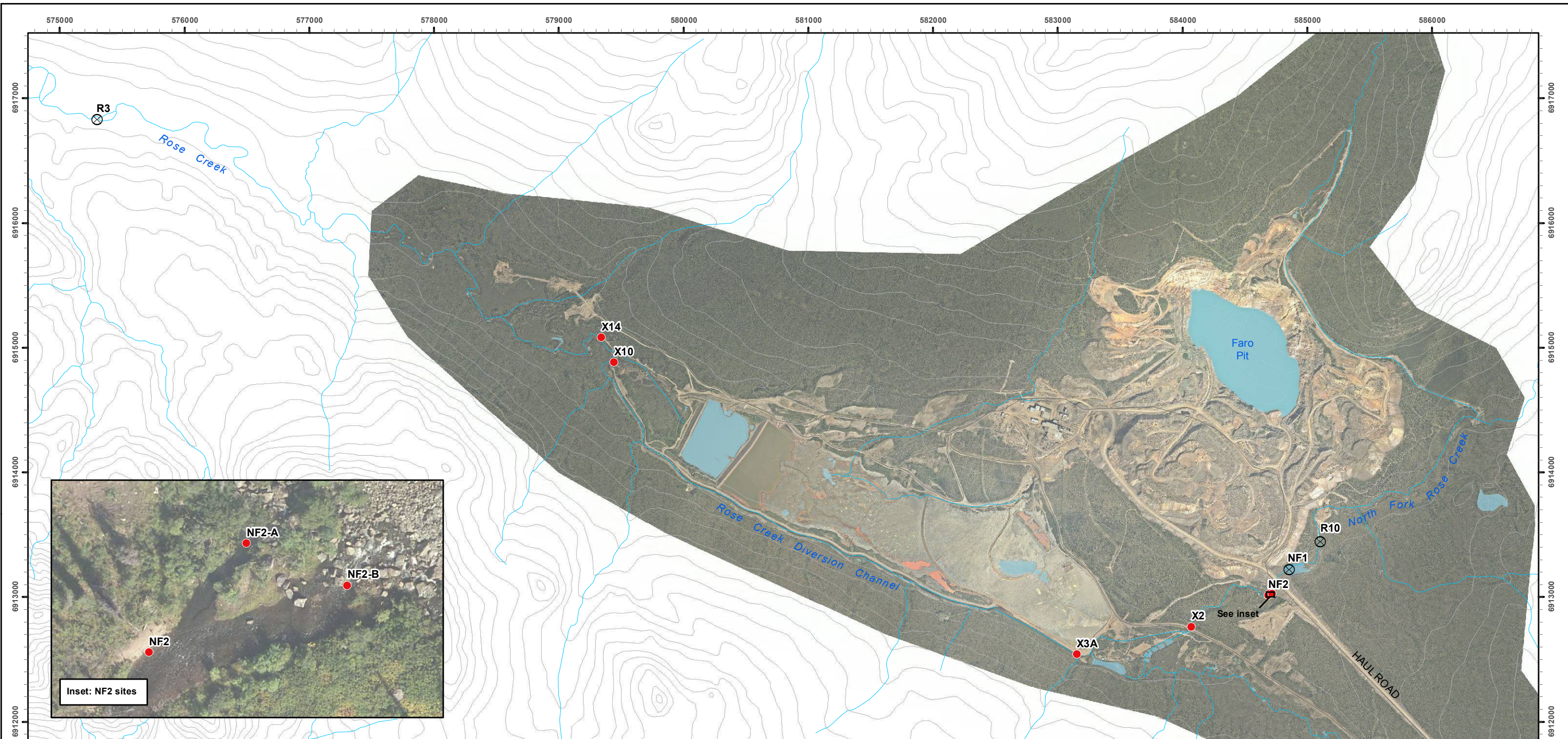
Field Date	General Tasks
April 01, 2014	<ul style="list-style-type: none">• Surface water sampling
April 08, 2014	<ul style="list-style-type: none">• Surface water sampling
April 15, 2014	<ul style="list-style-type: none">• Surface water sampling
April 22, 2014	<ul style="list-style-type: none">• Surface water sampling
April 29, 2014	<ul style="list-style-type: none">• Surface water sampling



Table 2. Surface water sampling field data, Rose Creek Monitoring Program, April 29, 2014.

Site Name	UTM Location		Sample		QA/ QC Rep. ID	In-situ Parameters			
	Easting	Northing	Date	Time		Temp (°C)	SPC (µS/cm)	pH	Turbidity (NTU)
R3	-	-	-	-	-	-	-	-	-
X14	0579343	6915076	29-Apr-2014	9:00	-	0.4	764.8	6.89	3.23
X10	0579348	6914880	29-Apr-2014	10:25	-	0.0	299.1	7.51	2.30
X3A	0583150	6912532	29-Apr-2014	10:55	-	0.2	290.0	7.44	7.19
X2	0584071	6912765	29-Apr-2014	11:15	-	0.0	282.3	7.20	5.28
NF2-A	0584706	6913033	29-Apr-2014	11:40	-	0.1	326.1	7.54	5.35
NF2-B	0584724	6913027	29-Apr-2014	11:55	-	0.0	253.1	7.28	4.70
NF2	0584685	6913005	29-Apr-2014	12:00	NF2-r	0.0	269.4	7.21	5.18
NF1	-	-	-	-	-	-	-	-	-
R10	-	-	-	-	-	-	-	-	-

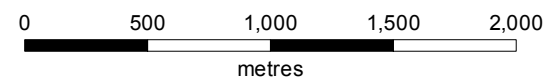
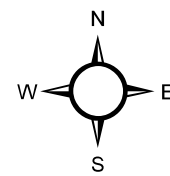
Where, UTM = Universal Transverse Mercator (NAD 83/ Zone 8);
 QA/QC Rep = Quality Assurance/ Quality Control Replicate;
 Temp = water temperature; and,
 SPC = specific conductance.



Location of surface water sampling, Rose Creek Monitoring Program, April 29, 2014

Legend

- Surface Water Sample Collected
- X Site Inaccessible
- Topographic Contour (30 m Interval)
- Road (Mine Access/Haul)



Map Scale = 1:30,000 (printed on 11 x 17)
 Map Projection: North American Datum 1983 UTM Zone 8N

Data sources

1:50,000 topographic spatial data provided by Geomatics - Yukon Government via online source (Corporate Spatial Warehouse) www.geomaticsyukon.ca.

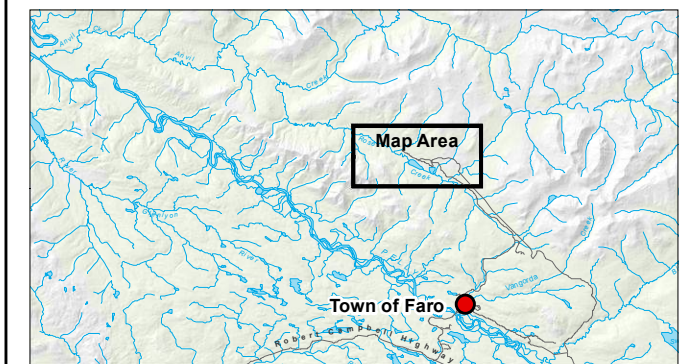
National Road Network courtesy of Her Majesty the Queen in Right of Canada, Department of Natural Resources. All Rights Reserved.

Detailed topographic features of the Faro, Grum and Vangorda mine sites were provided by Yukon Government - Energy, Mines and Resources - Assessment and Abandoned Mines Branch (March 2012).

Project data displayed is site specific. Data collected by EDI Environmental Dynamics Inc. was obtained using Garmin GPS technology.

This document is not an official land survey and the spatial data presented is subject to change.

Drawn: LG	Checked: MK	FIGURE 1	Date: 29/04/2014
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Map Prepared by
 EDI Environmental Dynamics Inc.



Site Photos



Photo 1. Downstream view at surface water sampling site X14, April 29, 2014.



Photo 2. Downstream view at surface water sampling site X10, April 29, 2014.



Photo 3. Upstream view at surface water sampling site X3A, April 29, 2014.



Photo 4. Downstream view at surface water sampling site X2, April 29, 2014.



Photo 5. Overview at surface water sampling site NF2-A, April 29, 2014.



Photo 6. Upstream view from surface water sampling site NF2-B, April 29, 2014.



Photo 7. Downstream view at surface water sampling site NF2, April 29, 2014.



ENVIRONMENTAL DYNAMICS INC.
ATTN: Meighan Kearns
2195 - 2nd Avenue
Whitehorse YT Y1A 3T8

Date Received: 30-APR-14
Report Date: 09-MAY-14 17:01 (MT)
Version: FINAL

Client Phone: 867-393-4882

Certificate of Analysis

Lab Work Order #: L1449577
Project P.O. #: NOT SUBMITTED
Job Reference: 14-Y-270
C of C Numbers:
Legal Site Desc:

Can Dang
Senior Account Manager

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ADDRESS: 8081 Lougheed Hwy, Suite 100, Burnaby, BC V5A 1W9 Canada | Phone: +1 604 253 4188 | Fax: +1 604 253 6700
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1449577-1 Grab 29-APR-14 09:00 X14	L1449577-2 Grab 29-APR-14 10:25 X10	L1449577-3 Grab 29-APR-14 10:55 X3A	L1449577-4 Grab 29-APR-14 11:15 X2	L1449577-5 Grab 29-APR-14 11:40 NF2-A
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)	736	290	235	274	323
	Hardness (as CaCO3) (mg/L)	395	146	130	137	168
	pH (pH)	7.94	8.11	8.00	7.96	8.10
	Total Suspended Solids (mg/L)	2.6	<1.0	4.9	2.2	3.4
	Total Dissolved Solids (mg/L)	529	177	147	172	209
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	173	124	100	115	124
	Ammonia, Total (as N) (mg/L)	0.0776	<0.0050	0.0082	0.0070	0.0074
	Chloride (Cl) (mg/L)	<2.5 ^{DLM}	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.13	0.160	0.140	0.167	0.188
	Nitrate (as N) (mg/L)	0.162	0.184	0.181	0.197	0.401
	Nitrite (as N) (mg/L)	<0.0050 ^{DLM}	<0.0010	<0.0010	<0.0010	0.0013
	Phosphorus (P)-Total (mg/L)	0.0051	0.0205	0.0130 ^{RRV}	0.0157	0.0193
	Sulfate (SO4) (mg/L)	243	30.1	23.0	28.7	43.1
	Anion Sum (meq/L)	8.53	3.13	2.50	2.91	3.41
	Cation Sum (meq/L)	8.48	3.10	2.78	2.95	3.64
	Cation - Anion Balance (%)	-0.3	-0.5	5.2	0.6	3.3
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.19	2.87	3.38	4.35	4.25
	Total Organic Carbon (mg/L)	2.76	2.90	3.62	4.38	4.35
Total Metals	Aluminum (Al)-Total (mg/L)	0.0438	0.0376	0.102	0.104	0.161
	Antimony (Sb)-Total (mg/L)	<0.00010	0.00014	0.00023	0.00014	<0.00010
	Arsenic (As)-Total (mg/L)	0.00078	0.00064	0.00092	0.00098	0.00092
	Barium (Ba)-Total (mg/L)	0.0650	0.0673	0.0680	0.0676	0.0623
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.000258	0.000243	0.000300	0.000443	0.000799
	Calcium (Ca)-Total (mg/L)	111	42.0	35.2	38.8	39.7
	Chromium (Cr)-Total (mg/L)	0.00015	0.00017	0.0200	0.00026	0.00039
	Cobalt (Co)-Total (mg/L)	0.00390	0.00069	0.00138	0.00227	0.00557
	Copper (Cu)-Total (mg/L)	0.00152	0.00167	0.00314	0.00246	0.00307
	Iron (Fe)-Total (mg/L)	0.935	0.385	0.838	0.653	0.534
	Lead (Pb)-Total (mg/L)	0.000578	0.000586	0.0102	0.00144	0.00228
	Lithium (Li)-Total (mg/L)	0.00826	0.00597	0.00522	0.00732	0.00723
	Magnesium (Mg)-Total (mg/L)	25.9	10.1	8.08	9.46	11.4
	Manganese (Mn)-Total (mg/L)	4.68	0.0832	0.126	0.173	0.312
	Molybdenum (Mo)-Total (mg/L)	0.000697	0.000709	0.00113	0.000856	0.000861

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1449577-6 Grab 29-APR-14 11:55 NF2-B	L1449577-7 Grab 29-APR-14 12:00 NF2	L1449577-8 Grab 29-APR-14 12:05 NF2-R	L1449577-9 Grab 29-APR-14 12:45 FIELD BLANK	L1449577-10 Grab TRAVEL BLANK
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)	246	264	262	<2.0	<2.0
	Hardness (as CaCO3) (mg/L)	121	131	126	<0.50	<0.50
	pH (pH)	8.01	7.99	8.00	5.52	5.52
	Total Suspended Solids (mg/L)	3.4	3.0	2.8	<1.0	<2.0
	Total Dissolved Solids (mg/L)	158	166	167	<10	<10
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	112	115	118	<2.0	<2.0
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0051	0.0052	<0.0050	<0.0050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.154	0.164	0.164	<0.020	<0.020
	Nitrate (as N) (mg/L)	0.190	0.200	0.197	<0.0050	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total (mg/L)	0.0242	0.0197	0.0193	<0.0020	<0.0020
	Sulfate (SO4) (mg/L)	18.9	24.1	24.1	<0.50	<0.50
	Anion Sum (meq/L)	2.66	2.83	2.88	<0.10	<0.10
	Cation Sum (meq/L)	2.60	2.81	2.71	<0.10	<0.10
	Cation - Anion Balance (%)	-1.1	-0.3	-3.1	0.0	0.0
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	4.86	4.52	4.57	<0.50	<0.50
	Total Organic Carbon (mg/L)	4.93	4.60	4.60	<0.50	<0.50
Total Metals	Aluminum (Al)-Total (mg/L)	0.136	0.119	0.114	<0.0030	<0.0030
	Antimony (Sb)-Total (mg/L)	0.00011	0.00010	0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00096	0.00096	0.00094	<0.00010	<0.00010
	Barium (Ba)-Total (mg/L)	0.0667	0.0674	0.0665	<0.000050	<0.000050
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.000164	0.000398	0.000404	<0.000010	<0.000010
	Calcium (Ca)-Total (mg/L)	35.5	36.0	36.3	<0.020	<0.020
	Chromium (Cr)-Total (mg/L)	0.00035	0.00034	0.00029	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	0.00062	0.00216	0.00221	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	0.00258	0.00255	0.00255	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.404	0.472	0.477	<0.010	<0.010
	Lead (Pb)-Total (mg/L)	0.00156	0.00152	0.00151	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	0.00641	0.00661	0.00666	<0.00050	<0.00050
	Magnesium (Mg)-Total (mg/L)	8.17	9.37	9.12	<0.0050	<0.0050
	Manganese (Mn)-Total (mg/L)	0.0471	0.149	0.147	<0.000050	<0.000050
	Molybdenum (Mo)-Total (mg/L)	0.000808	0.000815	0.000813	<0.000050	<0.000050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1449577-1	L1449577-2	L1449577-3	L1449577-4	L1449577-5
		Description	Grab	Grab	Grab	Grab	Grab
		Sampled Date	29-APR-14	29-APR-14	29-APR-14	29-APR-14	29-APR-14
		Sampled Time	09:00	10:25	10:55	11:15	11:40
		Client ID	X14	X10	X3A	X2	NF2-A
Grouping	Analyte						
WATER							
Total Metals	Nickel (Ni)-Total (mg/L)		0.00910	0.00307	0.00339	0.00391	0.00817
	Phosphorus (P)-Total (mg/L)		<0.30	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Total (mg/L)		2.27	1.41	1.29	1.46	1.57
	Selenium (Se)-Total (mg/L)		0.00042	0.00038	0.00031	0.00037	0.00043
	Silicon (Si)-Total (mg/L)		6.08	4.96	4.73	5.31	5.42
	Silver (Ag)-Total (mg/L)		<0.000010	<0.000010	0.000020	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)		7.15	2.77	2.35	2.88	3.66
	Strontium (Sr)-Total (mg/L)		0.350	0.204	0.174	0.191	0.184
	Thallium (Tl)-Total (mg/L)		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)		<0.00010	<0.00010	0.00012	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)		<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Total (mg/L)		0.00309	0.00232	0.00204	0.00226	0.00234
	Vanadium (V)-Total (mg/L)		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)-Total (mg/L)		0.309	0.393	0.393	0.554	1.20
	Zirconium (Zr)-Total (mg/L)		<0.00080	<0.00080	<0.00080	<0.00080	<0.00080
Dissolved Metals	Dissolved Metals Filtration Location		FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)		0.0091	0.0145	0.0215	0.0316	0.0355
	Antimony (Sb)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)		0.00044	0.00044	0.00041	0.00059	0.00067
	Barium (Ba)-Dissolved (mg/L)		0.0626	0.0670	0.0622	0.0665	0.0625
	Beryllium (Be)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Dissolved (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)-Dissolved (mg/L)		<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)		0.000245	0.000234	0.000296	0.000406	0.000867
	Calcium (Ca)-Dissolved (mg/L)		115	41.7	37.4	38.7	46.5
	Chromium (Cr)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	0.00072
	Cobalt (Co)-Dissolved (mg/L)		0.00378	0.00065	0.00131	0.00219	0.00577
	Copper (Cu)-Dissolved (mg/L)		0.00117	0.00167	0.00190	0.00209	0.00248
	Iron (Fe)-Dissolved (mg/L)		0.604	0.174	0.155	0.204	0.260
	Lead (Pb)-Dissolved (mg/L)		0.000128	0.000253	0.000405	0.000448	0.000995
	Lithium (Li)-Dissolved (mg/L)		0.00866	0.00633	0.00577	0.00760	0.00832
	Magnesium (Mg)-Dissolved (mg/L)		26.4	10.2	8.93	9.88	12.6
	Manganese (Mn)-Dissolved (mg/L)		4.61	0.0797	0.126	0.173	0.321
	Molybdenum (Mo)-Dissolved (mg/L)		0.000681	0.000665	0.000602	0.000765	0.000968
	Nickel (Ni)-Dissolved (mg/L)		0.00886	0.00309	0.00264	0.00379	0.00812
	Phosphorus (P)-Dissolved (mg/L)		<0.30	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Dissolved (mg/L)		2.24	1.42	1.39	1.49	1.62

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1449577-6	L1449577-7	L1449577-8	L1449577-9	L1449577-10
		Description	Grab	Grab	Grab	Grab	Grab
		Sampled Date	29-APR-14	29-APR-14	29-APR-14	29-APR-14	
		Sampled Time	11:55	12:00	12:05	12:45	
		Client ID	NF2-B	NF2	NF2-R	FIELD BLANK	TRAVEL BLANK
Grouping	Analyte						
WATER							
Total Metals	Nickel (Ni)-Total (mg/L)		0.00169	0.00366	0.00363	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)		<0.30	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Total (mg/L)		1.46	1.49	1.45	<0.050	<0.050
	Selenium (Se)-Total (mg/L)		0.00042	0.00039	0.00036	<0.00010	<0.00010
	Silicon (Si)-Total (mg/L)		5.03	5.30	5.10	<0.050	<0.050
	Silver (Ag)-Total (mg/L)		0.000013	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)		2.69	2.86	2.85	<0.050	<0.050
	Strontium (Sr)-Total (mg/L)		0.175	0.176	0.182	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)		<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Total (mg/L)		0.00198	0.00204	0.00207	<0.000010	<0.000010
	Vanadium (V)-Total (mg/L)		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)-Total (mg/L)		0.154	0.521	0.521	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)		<0.00080	<0.00080	<0.00080	<0.00080	<0.00080
Dissolved Metals	Dissolved Metals Filtration Location		FIELD	FIELD	FIELD	FIELD	
	Aluminum (Al)-Dissolved (mg/L)		0.0363	0.0352	0.0340	<0.0010	
	Antimony (Sb)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	
	Arsenic (As)-Dissolved (mg/L)		0.00064	0.00066	0.00063	<0.00010	
	Barium (Ba)-Dissolved (mg/L)		0.0657	0.0660	0.0640	<0.000050	
	Beryllium (Be)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	
	Bismuth (Bi)-Dissolved (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	
	Boron (B)-Dissolved (mg/L)		<0.010	<0.010	<0.010	<0.010	
	Cadmium (Cd)-Dissolved (mg/L)		0.000147	0.000386	0.000384	<0.000010	
	Calcium (Ca)-Dissolved (mg/L)		35.5	37.0	36.2	<0.020	
	Chromium (Cr)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	
	Cobalt (Co)-Dissolved (mg/L)		0.00051	0.00206	0.00206	<0.00010	
	Copper (Cu)-Dissolved (mg/L)		0.00227	0.00224	0.00222	<0.00020	
	Iron (Fe)-Dissolved (mg/L)		0.147	0.207	0.223	<0.010	
	Lead (Pb)-Dissolved (mg/L)		0.000467	0.000461	0.000462	<0.000050	
	Lithium (Li)-Dissolved (mg/L)		0.00689	0.00702	0.00673	<0.00050	
	Magnesium (Mg)-Dissolved (mg/L)		7.99	9.30	8.54	<0.0050	
	Manganese (Mn)-Dissolved (mg/L)		0.0373	0.140	0.141	<0.000050	
	Molybdenum (Mo)-Dissolved (mg/L)		0.000762	0.000779	0.000762	<0.000050	
	Nickel (Ni)-Dissolved (mg/L)		0.00182	0.00343	0.00338	<0.00050	
	Phosphorus (P)-Dissolved (mg/L)		<0.30	<0.30	<0.30	<0.30	
	Potassium (K)-Dissolved (mg/L)		1.48	1.47	1.45	<0.050	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1449577-1 Grab 29-APR-14 09:00 X14	L1449577-2 Grab 29-APR-14 10:25 X10	L1449577-3 Grab 29-APR-14 10:55 X3A	L1449577-4 Grab 29-APR-14 11:15 X2	L1449577-5 Grab 29-APR-14 11:40 NF2-A
Grouping	Analyte					
WATER						
Dissolved Metals	Selenium (Se)-Dissolved (mg/L)	0.00039	0.00041	0.00035	0.00044	0.00051
	Silicon (Si)-Dissolved (mg/L)	6.08	5.05	4.82	5.20	5.80
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	7.16	2.77	2.59	2.95	3.90
	Strontium (Sr)-Dissolved (mg/L)	0.357	0.196	0.180	0.186	0.214
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Dissolved (mg/L)	0.00307	0.00231	0.00209	0.00209	0.00268
	Vanadium (V)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)-Dissolved (mg/L)	0.306	0.403	0.404	0.579	1.35
	Zirconium (Zr)-Dissolved (mg/L)	<0.00080	<0.00080	<0.00080	<0.00080	<0.00080

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1449577-6 Grab 29-APR-14 11:55 NF2-B	L1449577-7 Grab 29-APR-14 12:00 NF2	L1449577-8 Grab 29-APR-14 12:05 NF2-R	L1449577-9 Grab 29-APR-14 12:45 FIELD BLANK	L1449577-10 Grab TRAVEL BLANK
Grouping	Analyte					
WATER						
Dissolved Metals	Selenium (Se)-Dissolved (mg/L)	0.00041	0.00039	0.00035	<0.00010	
	Silicon (Si)-Dissolved (mg/L)	5.19	5.13	5.12	<0.050	
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Dissolved (mg/L)	2.74	2.87	2.78	<0.050	
	Strontium (Sr)-Dissolved (mg/L)	0.170	0.177	0.165	<0.00020	
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	
	Uranium (U)-Dissolved (mg/L)	0.00197	0.00204	0.00207	<0.000010	
	Vanadium (V)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Zinc (Zn)-Dissolved (mg/L)	0.155	0.539	0.530	<0.0010	
	Zirconium (Zr)-Dissolved (mg/L)	<0.00080	<0.00080	<0.00080	<0.00080	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Antimony (Sb)-Dissolved	DLA	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Duplicate	Beryllium (Be)-Dissolved	DLA	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Duplicate	Bismuth (Bi)-Dissolved	DLA	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Duplicate	Cadmium (Cd)-Dissolved	DLA	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Duplicate	Chromium (Cr)-Dissolved	DLA	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Duplicate	Copper (Cu)-Dissolved	DLA	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Duplicate	Lead (Pb)-Dissolved	DLA	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Duplicate	Nickel (Ni)-Dissolved	DLA	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Duplicate	Phosphorus (P)-Dissolved	DLA	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Duplicate	Selenium (Se)-Dissolved	DLA	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Duplicate	Silver (Ag)-Dissolved	DLA	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Duplicate	Thallium (Tl)-Dissolved	DLA	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Duplicate	Tin (Sn)-Dissolved	DLA	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Duplicate	Titanium (Ti)-Dissolved	DLA	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Duplicate	Vanadium (V)-Dissolved	DLA	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Duplicate	Beryllium (Be)-Total	DLA	L1449577-1, -2, -3, -4, -5, -6, -7, -8
Duplicate	Bismuth (Bi)-Total	DLA	L1449577-1, -2, -3, -4, -5, -6, -7, -8
Duplicate	Phosphorus (P)-Total	DLA	L1449577-1, -2, -3, -4, -5, -6, -7, -8
Duplicate	Silver (Ag)-Total	DLA	L1449577-1, -2, -3, -4, -5, -6, -7, -8
Duplicate	Tin (Sn)-Total	DLA	L1449577-1, -2, -3, -4, -5, -6, -7, -8
Duplicate	Titanium (Ti)-Total	DLA	L1449577-1, -2, -3, -4, -5, -6, -7, -8
Duplicate	Vanadium (V)-Total	DLA	L1449577-1, -2, -3, -4, -5, -6, -7, -8
Duplicate	Nitrite (as N)	DLM	L1449577-10
Duplicate	Nitrate (as N)	DLM	L1449577-10
Duplicate	Nitrite (as N)	DLM	L1449577-10
Duplicate	Nitrate (as N)	DLM	L1449577-10
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Copper (Cu)-Dissolved	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Uranium (U)-Dissolved	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Phosphorus (P)-Total	MS-B	L1449577-1, -10, -2, -4, -5, -6, -7, -8, -9
Matrix Spike	Phosphorus (P)-Total	MS-B	L1449577-3
Matrix Spike	Phosphorus (P)-Total	MS-B	L1449577-3
Matrix Spike	Phosphorus (P)-Total	MS-B	L1449577-3
Matrix Spike	Nitrate (as N)	MS-B	L1449577-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sulfate (SO4)	MS-B	L1449577-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Aluminum (Al)-Dissolved	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Total	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Calcium (Ca)-Total	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Manganese (Mn)-Total	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Sodium (Na)-Total	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Strontium (Sr)-Total	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9

Reference Information

	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Aluminum (Al)-Dissolved	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Aluminum (Al)-Dissolved	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1449577-1, -2, -3, -4, -5, -6, -7, -8, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
DLM	Detection Limit Adjusted due to sample matrix effects.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-COL-VA	Water	Alkalinity by Colourimetric (Automated)	EPA 310.2
This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.			
ANIONS-CL-IC-VA	Water	Chloride by Ion Chromatography	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-F-IC-VA	Water	Fluoride by Ion Chromatography	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-NO2-IC-VA	Water	Nitrite in Water by Ion Chromatography	EPA 300.0
This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Nitrite is detected by UV absorbance.			
ANIONS-NO3-IC-VA	Water	Nitrate in Water by Ion Chromatography	EPA 300.0
This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Nitrate is detected by UV absorbance.			
ANIONS-SO4-IC-VA	Water	Sulfate by Ion Chromatography	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.			
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".			

Reference Information

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO ₃ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
IONBALANCE-VA	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030 B&E / EPA SW-846 6020A
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).			
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	APHA 3030 B&E / EPA SW-846 6020A
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).			
NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Weston et al.			
P-T-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorous
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorous is determined colourimetrically after persulphate digestion of the sample.			
PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H "pH Value"
This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode			
It is recommended that this analysis be conducted in the field.			
PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value
This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode			
It is recommended that this analysis be conducted in the field.			
TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.			
TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540 Gravimetric
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.			
ZR-D-MS-VA	Water	Dissolved Zr in Water by ICPMS	EPA SW-846 3005A/6020A
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).			
ZR-T-MS-VA	Water	Total Zr in Water by ICPMS	EPA SW-846 3005A/6020A
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).			

Reference Information

** 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
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

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-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

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.

