

# Memo

To: Director of NBDELG's Authorizations Branch  
From: Hammond River Holdings Ltd.  
Cc: Director of the Environmental Impact Assessment  
Date: January 20, 2020  
Subject: Upham Surface Water Sampling – December 2019  
Our File: File # 18-8346

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## Introduction

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Site preparation activities for the Upham gypsum quarry began with vegetation clearing starting on December 4, 2019. First ground disturbance commenced on December 11, 2019 and hauling of material beginning on December 12, 2019. During these activities, gypsum bedrock was not exposed. As a result of these earthworks activities, total suspended solids (TSS) is the only constituent of potential concern.

As required by the approval to operate, surface water sampling of the watercourse that crosses the site and in the Hammond River began immediately. Weekly compliance monitoring was conducted on December 4, December 11, December 19, and December 23, 2019, and January 3, 2020. An additional sampling event was completed on December 15 following a major rain event.

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## Field Methods

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Field parameters were measured using a calibrated multimeter. Field parameters included pH, temperature, specific conductivity, dissolved oxygen, and turbidity. On December 15, the multimeter was malfunctioning; therefore, field parameters were not measured.

Surface water samples were collected from five locations (**Figure 1**). They are as follows:

- PDP-1 was collected at the discharge point from the site, which is located before the confluence with the unnamed tributary to the Hammond River. This is the point of compliance;
- SW3 was the background sample. It was collected within the unnamed tributary approximately 100 m upstream from the PDP-1;
- SW5 was collected within the unnamed tributary approximately 100m downstream from PDP-1, at SW5.
- Two additional samples are collected in the Hammond River; H1 is collected upstream and H2 is downstream from the project site.

Surface water samples were collected using laboratory supplied bottles. The bottles were rinsed three times in the watercourse and then submerged below the water surface. The samples were submitted to the Research Productivity Council (RPC) in Fredericton, NB. RPC is accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for each of the laboratory analytical methods utilized and have in-house QA/QC programs to govern sample analysis and analytical data quality assurance.

## Compliance Monitoring Results

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Results of the surface water compliance monitoring are provided in **Table 1**. Analytical certificates are attached. Total suspended solids (TSS) and turbidity were within their limits in downstream samples compared to background. Chloride was below the CCME guidelines for protection of aquatic life.

During the December 23, 2019 monitoring event, pH was below the 6.5 lower limit for the protection of aquatic life. The earthworks activities occurring on site would not have an impact on the pH. In addition, the pH in the remaining monitoring events was within the acceptable range. It is therefore likely that, despite the multimeter being calibrated prior to sample collection, the pH probe was not functioning accurately. This is likely due to the colder temperatures experienced in December.

Dillon implemented a QA/QC program to evaluate whether the data collected was of suitable quality to characterize the surface water conditions observed. This program required the collection of field duplicates and the calculation of the relative percent difference (RPD). The calculation method and acceptance level of 40% are discussed in CCME (2016). Two duplicate samples were collected during the December water sampling program. The RPD results ranged from 0% to 3% (**Table 2**). Therefore, the data satisfies the quality objectives for the monitoring program.

## Summary

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The water chemistry at the discharge point into WC3 is comparable to background. Based on the results provided in **Table 1**, the earthworks activities being conducted on site have not had a negative impact on WC3 and subsequently the Hammond River.

## References

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Canadian Council of Ministers of the Environment (CCME). 2015. Canadian environmental quality guidelines. Available online at: <http://ceqg-rcqe.ccme.ca/en/index.html#void>

Canadian Council of Ministers of the Environment (CCME). 2016. Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment: Volume 1 Guidance Manual. Canadian environmental quality guidelines. ISBN 978-1-77202-026-7.

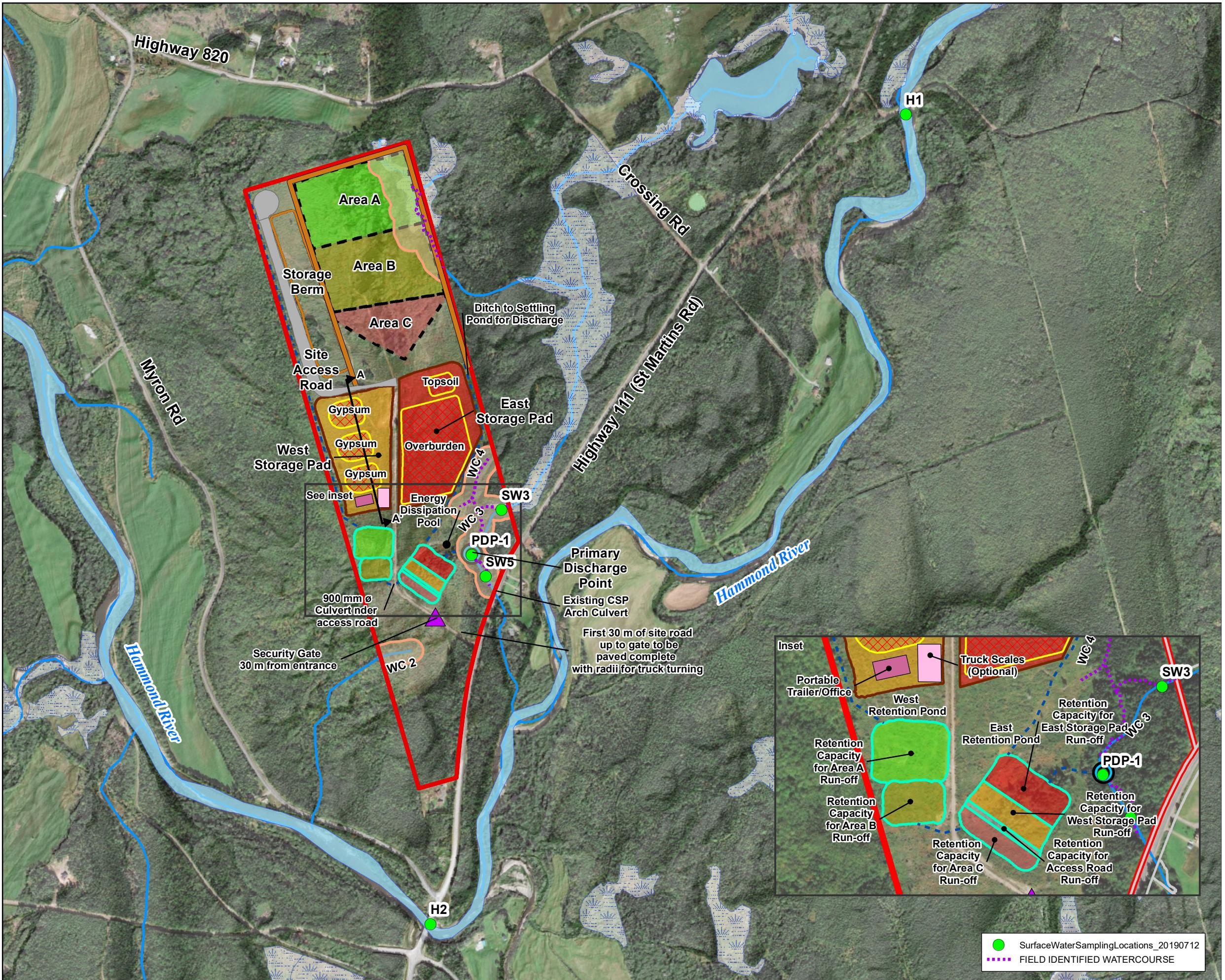


Table 1  
Surface Water Monitoring  
Upham East Gypsum Project  
Upham, New Brunswick  
Project No. 18-8346

Parameter	Ambient Air Temperature <sup>a</sup>	Precipitation 48 hours prior to sample collection <sup>a</sup>	Field Parameters					General Chemistry									
			pH	Water Temperature	Specific Conductivity	Dissolved Oxygen	Turbidity	Alkalinity (as CaCO <sub>3</sub> )	Calcium	Chloride	Hardness	Magnesium	Potassium	Sodium	Sulphate	Total Dissolved Solids	Total Suspended Solids <sup>b</sup>
Units	°C	mm	-	°C	mS/cm	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
CCME PAL <sup>c</sup>			6.5 - 9.0	-	-	-	8 <sup>d</sup>	-	-	640 (short term) 120 (long term)		-	-	-	-	-	-
Sample ID	Date																
SW-3 <sup>f,g</sup>	04-Dec-19	0.2	17.90	7.40	2.62	0.330	9.90	0.0	20	58.7	6.6	150	0.81	0.51	3.89	132	262
SW-5 <sup>g</sup>	04-Dec-19			7.20	2.39	0.313	8.19	0.0	17	55.0	6.7	141	0.79	0.50	3.81	124	240
PDP-1 <sup>g</sup>	04-Dec-19			7.30	2.44	0.321	7.61	0.0	19	56.7	6.6	145	0.80	0.51	3.84	130	252
PDP-1 (FD) <sup>g</sup>	04-Dec-19			7.10	2.44	0.321	7.61	0.0	20	57.1	6.6	146	0.80	0.52	3.84	131	254
SW-3 <sup>f</sup>	11-Dec-19	-4	74.50	6.61	3.73	0.125	7.48	-	8	20.2	5.5	53	0.49	0.60	2.95	46	99
SW-5	11-Dec-19			6.55	4.65	0.116	8.29	7.8	8	17.7	4.8	46	0.48	0.62	2.85	36	93
PDP-1	11-Dec-19			6.94	5.06	0.116	8.31	5.7	8	17.9	4.7	47	0.48	0.63	2.88	36	92
H1 <sup>f</sup>	11-Dec-19			6.91	9.81	0.065	13.90	6.5	9	5.3	4.6	15	0.42	0.48	2.90	3	41
H2	11-Dec-19			6.61	4.47	0.057	7.97	13.6	9	5.5	4.6	16	0.43	0.49	3.00	5	45
SW-3 <sup>f,g</sup>	15-Dec-19	05-Jan-00	58.40	6.70	-	0.118	-	6.7	6	16.3	5.1	43	0.44	0.57	2.85	38	90
SW-5 <sup>g</sup>	15-Dec-19			6.60	-	0.112	-	7.4	6	15.4	4.4	40	0.43	0.59	2.80	35	87
PDP-1 <sup>g</sup>	15-Dec-19			7.00	-	0.050	-	6.1	7	5.5	4.0	15	0.40	0.46	2.67	7	45
H1 <sup>g,f</sup>	15-Dec-19			7.00	-	0.050	-	4.8	8	5.5	5.0	15	0.41	0.47	2.70	5	42
H2 <sup>g</sup>	15-Dec-19			6.70	-	0.113	-	7.0	6	15.5	4.4	41	0.43	0.60	2.80	34	82
SW-3 <sup>f</sup>	19-Dec-19	-8.8	0.60	-	2.33	0.416	7.69	0.4	20	81.1	6.8	206	0.87	0.65	3.77	189	319
SW-5	19-Dec-19			7.12	2.45	0.402	7.17	2.0	19	79.2	7.0	201	0.88	0.62	3.74	186	312
PDP-1	19-Dec-19			7.04	2.37	0.403	6.45	1.6	19	79.2	6.7	201	0.86	0.61	3.74	171	311
PDP-1 (FD)	19-Dec-19			7.04	2.37	0.403	6.45	1.6	19	79.2	6.8	199	0.86	0.61	3.74	177	311
H1 <sup>f</sup>	19-Dec-19			6.58	2.58	0.074	10.00	0.0	15	9.9	5.6	27	0.57	0.36	3.18	10	50
H2	19-Dec-19			7.37	2.95	0.091	11.84	0.0	16	12.3	6.0	33	0.59	0.40	3.06	16	58
SW-3 <sup>f</sup>	23-Dec-19	-0.2	3.30	6.10	1.98	0.517	5.13	7.4	26	109.0	8.2	277	1.04	0.72	4.53	250	398
SW-5	23-Dec-19			5.92	2.03	0.480	5.82	6.2	22	101.0	7.0	257	0.98	0.64	4.13	230	372
PDP-1	23-Dec-19			5.49	1.97	0.500	5.52	5.7	26	101.0	7.4	257	1.08	0.70	4.35	240	400
H1 <sup>f</sup>	23-Dec-19			5.37	2.19	0.080	6.17	1.8	18	11.0	6.4	30	0.65	0.32	3.32	13	58
H2	23-Dec-19			5.33	2.21	0.091	7.14	2.0	18	12.1	6.0	33	0.65	0.32	3.33	16	66
SW-3 <sup>f,g</sup>	03-Jan-20	5.1	0.00	7.20	-	0.535	-	1.8	27	97.6	10.1	248	1.15	0.59	5.08	220	378
SW-5 <sup>g</sup>	03-Jan-20			7.30	-	0.505	-	1.5	27	91.2	8.6	232	1.08	0.58	4.91	200	358
PDP-1 <sup>g</sup>	03-Jan-20			7.20	-	0.508	-	1.4	25	91.9	9.0	234	1.10	0.58	4.81	200	354
H1 <sup>g</sup>	03-Jan-20			7.30	-	0.114	-	0.7	21	14.2	7.7	39	0.81	0.36	4.07	18	74
H2 <sup>g</sup>	03-Jan-20			7.30	-	0.122	-	0.6	20	15.5	7.5	42	0.81	0.37	4.06	21	80

a) temperature based on data from the climate station at the Saint John airport. Temperature is the value recorded at 12:00pm on the day of sampling. Data available at: [https://climate.weather.gc.ca/historical\\_data/search\\_historic\\_data\\_e.html](https://climate.weather.gc.ca/historical_data/search_historic_data_e.html)

b) Precipitation based on data from the climate station at the Saint John airport. Data available at: [https://climate.weather.gc.ca/historical\\_data/search\\_historic\\_data\\_e.html](https://climate.weather.gc.ca/historical_data/search_historic_data_e.html)

c) Site specific guideline, TSS cannot exceed 25 mg/L above background.

d) Canadian Council of Ministers of Environment (CCME) for the Protection of Aquatic Life.

e) Guideline for turbidity is for short-term exposure (e.g. 24 hour period) above background.

f) Background sample.

g) Multimeter was not functioning properly. Results for pH on December 4, 2019, and pH, conductivity, and turbidity on December 15, 2019 and January 3, 2020 were measured in the laboratory.

'-' denotes no guideline, not analyzed, or not applicable; FD = field duplicate.

75 bold/shaded value denotes concentration exceeds CCME criteria or TSS background.

Table 2  
 Surface Water Monitoring - QA/QC Results  
 Upham East Gypsum Project  
 Upham, New Brunswick  
 Project No. 18-8346

Parameter	Field Parameters					General Chemistry										
	pH	Temperature	Specific Conductivity	Dissolved Oxygen	Turbidity	Alkalinity (as CaCO <sub>3</sub> )	Calcium	Chloride	Hardness	Magnesium	Potassium	Sodium	Sulphate	Total Dissolved Solids	Total Suspended Solids	
Units	-	°C	mS/cm	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
Sample ID	Date															
PDP-1	04-Dec-19	7.30	2.44	0.321	7.61	0.0	19	56.7	6.6	145	0.80	0.51	3.84	130	252	<5
PDP-1 (FD)	04-Dec-19	7.10	2.44	0.321	7.61	0.0	20	57.1	6.6	146	0.80	0.52	3.84	131	254	<5
RPD value		3%	0%	0%	0%	5%	1%	0%	1%	0%	2%	0%	1%	1%	-	
PDP-1	19-Dec-19	7.04	2.37	0.403	6.45	1.6	19	79.2	6.7	201	0.86	0.61	3.74	171	311	<5
PDP-1 (FD)	19-Dec-19	7.04	2.37	0.403	6.45	1.6	19	79.2	6.8	199	0.86	0.61	3.74	177	311	<5
RPD value		0%	0%	0%	0%	0%	0%	1%	1%	0%	0%	0%	3%	0%	-	

RPD calculations and acceptance criteria based on CCME (2016).  
 ' - ' denotes RPD could not be calculated because one or more parameters was below detection limit.

75 bold/shaded value denotes RPD above criteria of 40%.

Report ID: 338986-IAS  
Report Date: 20-Dec-19  
Date Received: 05-Dec-19

## CERTIFICATE OF ANALYSIS

for  
Dillon Consulting Ltd  
274 Sydney Street, Suite 200  
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Tel: 506.452.1212  
Fax: 506.452.0594  
www.rpc.ca

Attention: Jonathan Oliver

**Project #: 18-8346-3000**

Location: Upham

### Analysis of Water

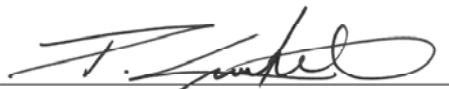
RPC Sample ID:		338986-1	338986-2	338986-3
Client Sample ID:		SW-3	SW-5	PDP-1
Date Sampled:		4-Dec-19	4-Dec-19	4-Dec-19
Analytes	Units	RL		
Sodium	mg/L	0.05	3.89	3.84
Potassium	mg/L	0.02	0.51	0.51
Calcium	mg/L	0.05	58.7	55.0
Magnesium	mg/L	0.01	0.81	0.79
Iron	mg/L	0.02	0.13	0.13
Manganese	mg/L	0.001	0.057	0.053
Copper	mg/L	0.001	< 0.001	< 0.001
Zinc	mg/L	0.001	0.002	0.002
Ammonia (as N)	mg/L	0.05	< 0.05	< 0.05
pH	units	-	7.4	7.2
Alkalinity (as CaCO <sub>3</sub> )	mg/L	2	20	19
Chloride	mg/L	0.5	6.6	6.6
Sulfate	mg/L	1	132	124
Nitrate + Nitrite (as N)	mg/L	0.05	0.10	0.10
o-Phosphate (as P)	mg/L	0.01	< 0.01	< 0.01
r-Silica (as SiO <sub>2</sub> )	mg/L	0.1	4.3	4.3
Carbon - Total Organic	mg/L	0.5	6.1	6.4
Turbidity	NTU	0.1	1.2	0.9
Solids - Total Dissolved	mg/L	5	262	240
Solids - Total Suspended	mg/L	5	< 5	< 5
Conductivity	µS/cm	1	363	344
Calculated Parameters				
Bicarbonate (as CaCO <sub>3</sub> )	mg/L	-	19.9	17.0
Carbonate (as CaCO <sub>3</sub> )	mg/L	-	0.047	0.025
Hydroxide (as CaCO <sub>3</sub> )	mg/L	-	0.013	0.008
Cation Sum	meq/L	-	3.19	3.00
Anion Sum	meq/L	-	3.34	3.12
Percent Difference	%	-	-2.36	-1.98
Theoretical Conductivity	µS/cm	-	374	352
Hardness (as CaCO <sub>3</sub> )	mg/L	0.2	150	141
Ion Sum	mg/L	-	220	206
Saturation pH (5°C)	units	-	8.6	8.7
Langelier Index (5°C)	-	-	-1.16	-1.46

This report relates only to the sample(s) and information provided to the laboratory.

RL = Reporting Limit; Organic Carbon and ion chemistries for turbid samples are determined on filtered aliquots.

  
Ross Kean

Ross Kean  
Department Head  
Inorganic Analytical Chemistry

  
Peter Crowhurst

Analytical Chemist  
Inorganic Analytical Chemistry

### WATER CHEMISTRY

Report ID: 338986-IAS  
Report Date: 20-Dec-19  
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[www.rpc.ca](http://www.rpc.ca)

Attention: Jonathan Oliver

**Project #: 18-8346-3000**

Location: Upham

### Analysis of Water

RPC Sample ID:	338986-4		
Client Sample ID:	PDP-FD		
Date Sampled:	4-Dec-19		
Analytes	Units	RL	
Sodium	mg/L	0.05	3.84
Potassium	mg/L	0.02	0.52
Calcium	mg/L	0.05	57.1
Magnesium	mg/L	0.01	0.80
Iron	mg/L	0.02	0.13
Manganese	mg/L	0.001	0.055
Copper	mg/L	0.001	< 0.001
Zinc	mg/L	0.001	0.002
Ammonia (as N)	mg/L	0.05	< 0.05
pH	units	-	7.1
Alkalinity (as CaCO <sub>3</sub> )	mg/L	2	20
Chloride	mg/L	0.5	6.6
Sulfate	mg/L	1	131
Nitrate + Nitrite (as N)	mg/L	0.05	0.10
o-Phosphate (as P)	mg/L	0.01	< 0.01
r-Silica (as SiO <sub>2</sub> )	mg/L	0.1	4.3
Carbon - Total Organic	mg/L	0.5	6.4
Turbidity	NTU	0.1	0.8
Solids - Total Dissolved	mg/L	5	254
Solids - Total Suspended	mg/L	5	< 5
Conductivity	µS/cm	1	355
Calculated Parameters			
Bicarbonate (as CaCO <sub>3</sub> )	mg/L	-	20.0
Carbonate (as CaCO <sub>3</sub> )	mg/L	-	0.024
Hydroxide (as CaCO <sub>3</sub> )	mg/L	-	0.006
Cation Sum	meq/L	-	3.10
Anion Sum	meq/L	-	3.32
Percent Difference	%	-	-3.35
Theoretical Conductivity	µS/cm	-	369
Hardness (as CaCO <sub>3</sub> )	mg/L	0.2	146
Ion Sum	mg/L	-	217
Saturation pH (5°C)	units	-	8.6
Langelier Index (5°C)	-	-	-1.47

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**Project #: 18-8346-3000**

Location: Upham

### Analysis of Metals in Water

RPC Sample ID:		338986-1	338986-2	338986-3
Client Sample ID:		SW-3	SW-5	PDP-1
Date Sampled:		4-Dec-19	4-Dec-19	4-Dec-19
Analytes	Units	RL		
Aluminum	µg/L	1	97	101
Antimony	µg/L	0.1	< 0.1	< 0.1
Arsenic	µg/L	1	< 1	< 1
Barium	µg/L	1	18	18
Beryllium	µg/L	0.1	< 0.1	< 0.1
Bismuth	µg/L	1	< 1	< 1
Boron	µg/L	1	25	20
Cadmium	µg/L	0.01	< 0.01	< 0.01
Calcium	µg/L	50	58700	55000
Chromium	µg/L	1	< 1	< 1
Cobalt	µg/L	0.1	< 0.1	< 0.1
Copper	µg/L	1	< 1	< 1
Iron	µg/L	20	130	130
Lead	µg/L	0.1	< 0.1	< 0.1
Lithium	µg/L	0.1	0.3	0.3
Magnesium	µg/L	10	810	790
Manganese	µg/L	1	57	53
Mercury	µg/L	0.025	< 0.025	< 0.025
Molybdenum	µg/L	0.1	0.1	0.1
Nickel	µg/L	1	< 1	< 1
Potassium	µg/L	20	510	500
Rubidium	µg/L	0.1	0.7	0.7
Selenium	µg/L	1	< 1	< 1
Silver	µg/L	0.1	< 0.1	< 0.1
Sodium	µg/L	50	3890	3810
Strontium	µg/L	1	199	188
Tellurium	µg/L	0.1	< 0.1	< 0.1
Thallium	µg/L	0.1	< 0.1	< 0.1
Tin	µg/L	0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	< 0.1	< 0.1
Vanadium	µg/L	1	< 1	< 1
Zinc	µg/L	1	2	2

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Attention: Jonathan Oliver

**Project #: 18-8346-3000**

Location: Upham

### Analysis of Metals in Water

RPC Sample ID:	338986-4		
Client Sample ID:	PDP-FD		
Date Sampled:	4-Dec-19		
Analytes	Units	RL	
Aluminum	µg/L	1	99
Antimony	µg/L	0.1	< 0.1
Arsenic	µg/L	1	< 1
Barium	µg/L	1	18
Beryllium	µg/L	0.1	< 0.1
Bismuth	µg/L	1	< 1
Boron	µg/L	1	18
Cadmium	µg/L	0.01	0.01
Calcium	µg/L	50	57100
Chromium	µg/L	1	< 1
Cobalt	µg/L	0.1	< 0.1
Copper	µg/L	1	< 1
Iron	µg/L	20	130
Lead	µg/L	0.1	< 0.1
Lithium	µg/L	0.1	0.3
Magnesium	µg/L	10	800
Manganese	µg/L	1	55
Mercury	µg/L	0.025	< 0.025
Molybdenum	µg/L	0.1	0.1
Nickel	µg/L	1	< 1
Potassium	µg/L	20	520
Rubidium	µg/L	0.1	0.7
Selenium	µg/L	1	< 1
Silver	µg/L	0.1	< 0.1
Sodium	µg/L	50	3840
Strontium	µg/L	1	194
Tellurium	µg/L	0.1	< 0.1
Thallium	µg/L	0.1	< 0.1
Tin	µg/L	0.1	< 0.1
Uranium	µg/L	0.1	< 0.1
Vanadium	µg/L	1	< 1
Zinc	µg/L	1	2

### WATER METALS

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### Methods

<u>Analyte</u>	<u>RPC SOP #</u>	<u>Method Reference</u>	<u>Method Principle</u>
Ammonia	4.M47	APHA 4500-NH <sub>3</sub> G	Phenate Colourimetry
pH	4.M03	APHA 4500-H <sup>+</sup> B	pH Electrode - Electrometric
Alkalinity (as CaCO <sub>3</sub> )	4.M43	EPA 310.2	Methyl Orange Colourimetry
Chloride	4.M44	APHA 4500-CL E	Ferricyanide Colourimetry
Sulfate	4.M45	APHA 4500-SO <sub>4</sub> E	Turbidimetry
Nitrate + Nitrite (as N)	4.M48	APHA 4500-NO <sub>3</sub> H	Hydrazine Red., Derivitization, Colourimetry
o-Phosphate (as P)	4.M50	APHA 4500-P F	Molybdate/Ascorbic Acid Colourimetry
r-Silica (as SiO <sub>2</sub> )	4.M46	APHA 4500-SI F	Heteropoly Blue Colourimetry
Carbon - Total Organic	4.M38	APHA 5310 C	UV-Persulfate Digestion, NDIR Detection
Turbidity	4.M06	APHA 2130 B	Nephelometry
Conductivity	4.M04	APHA 2510 B	Conductivity Meter - Electrode
Solids - Total Suspended	4.M05	APHA 2540 D	Filtration, Gravimetry
Solids - Total Dissolved	-	APHA 2540 G	Evaporation, Gravimetry
Trace Metals	4.M01/4.M29	EPA 200.8/EPA 200.7	ICP-MS/ICP-ES
Mercury	4.M52	EPA 245.1	Cold Vapor AAS

Report ID: 339817-IAS  
Report Date: 19-Dec-19  
Date Received: 12-Dec-19

## CERTIFICATE OF ANALYSIS

for  
Dillon Consulting Ltd  
274 Sydney Street, Suite 200  
Saint John, NB E2L 0A8

rpc

921 College Hill Rd  
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Tel: 506.452.1212  
Fax: 506.452.0594  
www.rpc.ca

Attention: Jonathan Oliver

**Project #: 18-8346-3000**

Location: Upham

### Analysis of Water

RPC Sample ID:		339817-1	339817-2	339817-3
Client Sample ID:		SW-3	SW-5	PDP-1
Date Sampled:		11-Dec-19	11-Dec-19	11-Dec-19
Analytes	Units	RL		
Sodium	mg/L	0.05	2.95	2.88
Potassium	mg/L	0.02	0.60	0.63
Calcium	mg/L	0.05	20.2	17.7
Magnesium	mg/L	0.01	0.49	0.48
Iron	mg/L	0.02	0.19	0.20
Manganese	mg/L	0.001	0.029	0.029
Copper	mg/L	0.001	< 0.001	< 0.001
Zinc	mg/L	0.001	0.003	0.002
Ammonia (as N)	mg/L	0.05	< 0.05	< 0.05
pH	units	-	6.8	6.7
Alkalinity (as CaCO <sub>3</sub> )	mg/L	2	8	8
Chloride	mg/L	0.5	5.5	4.7
Sulfate	mg/L	1	46	36
Nitrate + Nitrite (as N)	mg/L	0.05	0.11	0.10
o-Phosphate (as P)	mg/L	0.01	< 0.01	< 0.01
r-Silica (as SiO <sub>2</sub> )	mg/L	0.1	2.9	2.8
Carbon - Total Organic	mg/L	0.5	7.8	8.5
Turbidity	NTU	0.1	6.1	6.5
Solids - Total Dissolved	mg/L	5	99	93
Solids - Total Suspended	mg/L	5	8	< 5
Conductivity	µS/cm	1	136	129
Calculated Parameters				
Bicarbonate (as CaCO <sub>3</sub> )	mg/L	-	8.0	8.0
Carbonate (as CaCO <sub>3</sub> )	mg/L	-	0.005	0.004
Hydroxide (as CaCO <sub>3</sub> )	mg/L	-	0.003	0.003
Cation Sum	meq/L	-	1.20	1.07
Anion Sum	meq/L	-	1.28	1.05
Percent Difference	%	-	-3.14	1.03
Theoretical Conductivity	µS/cm	-	150	127
Hardness (as CaCO <sub>3</sub> )	mg/L	0.2	52.5	46.2
Ion Sum	mg/L	-	84	71
Saturation pH (5°C)	units	-	9.4	9.4
Langelier Index (5°C)	-	-	-2.56	-2.71

This report relates only to the sample(s) and information provided to the laboratory.

RL = Reporting Limit; Organic Carbon and ion chemistries for turbid samples are determined on filtered aliquots.

*Ross Kean*

Ross Kean  
Department Head  
Inorganic Analytical Chemistry

*P. Crowhurst*

Peter Crowhurst  
Analytical Chemist  
Inorganic Analytical Chemistry

### WATER CHEMISTRY

Report ID: 339817-IAS  
Report Date: 19-Dec-19  
Date Received: 12-Dec-19

## CERTIFICATE OF ANALYSIS

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Attention: Jonathan Oliver

**Project #: 18-8346-3000**

Location: Upham

### Analysis of Water

RPC Sample ID:		339817-4	339817-5
Client Sample ID:		H1	H2
Date Sampled:		11-Dec-19	11-Dec-19
Analytes	Units	RL	
Sodium	mg/L	0.05	2.90
Potassium	mg/L	0.02	0.48
Calcium	mg/L	0.05	5.25
Magnesium	mg/L	0.01	0.42
Iron	mg/L	0.02	0.14
Manganese	mg/L	0.001	0.027
Copper	mg/L	0.001	< 0.001
Zinc	mg/L	0.001	0.001
Ammonia (as N)	mg/L	0.05	< 0.05
pH	units	-	7.0
Alkalinity (as CaCO <sub>3</sub> )	mg/L	2	9
Chloride	mg/L	0.5	4.6
Sulfate	mg/L	1	3
Nitrate + Nitrite (as N)	mg/L	0.05	0.12
o-Phosphate (as P)	mg/L	0.01	< 0.01
r-Silica (as SiO <sub>2</sub> )	mg/L	0.1	4.0
Carbon - Total Organic	mg/L	0.5	5.7
Turbidity	NTU	0.1	6.0
Solids - Total Dissolved	mg/L	5	41
Solids - Total Suspended	mg/L	5	6
Conductivity	µS/cm	1	50
			52
Calculated Parameters			
Bicarbonate (as CaCO <sub>3</sub> )	mg/L	-	9.0
Carbonate (as CaCO <sub>3</sub> )	mg/L	-	0.008
Hydroxide (as CaCO <sub>3</sub> )	mg/L	-	0.005
Cation Sum	meq/L	-	0.444
Anion Sum	meq/L	-	0.381
Percent Difference	%	-	7.64
Theoretical Conductivity	µS/cm	-	46
Hardness (as CaCO <sub>3</sub> )	mg/L	0.2	14.8
Ion Sum	mg/L	-	27
Saturation pH (5°C)	units	-	9.8
Langelier Index (5°C)	-	-	-2.85
			-2.62

Report ID: 339817-IAS  
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Attention: Jonathan Oliver

**Project #: 18-8346-3000**

Location: Upham

### Analysis of Metals in Water

RPC Sample ID:		339817-1	339817-2	339817-3
Client Sample ID:		SW-3	SW-5	PDP-1
Date Sampled:		11-Dec-19	11-Dec-19	11-Dec-19
Analytes	Units	RL		
Aluminum	µg/L	1	242	260
Antimony	µg/L	0.1	< 0.1	< 0.1
Arsenic	µg/L	1	< 1	< 1
Barium	µg/L	1	13	13
Beryllium	µg/L	0.1	< 0.1	< 0.1
Bismuth	µg/L	1	< 1	< 1
Boron	µg/L	1	8	8
Cadmium	µg/L	0.01	0.01	0.01
Calcium	µg/L	50	20200	17700
Chromium	µg/L	1	< 1	< 1
Cobalt	µg/L	0.1	< 0.1	< 0.1
Copper	µg/L	1	< 1	< 1
Iron	µg/L	20	190	200
Lead	µg/L	0.1	0.2	0.2
Lithium	µg/L	0.1	0.2	0.3
Magnesium	µg/L	10	490	480
Manganese	µg/L	1	29	29
Mercury	µg/L	0.025	< 0.025	< 0.025
Molybdenum	µg/L	0.1	< 0.1	< 0.1
Nickel	µg/L	1	< 1	< 1
Potassium	µg/L	20	600	620
Rubidium	µg/L	0.1	0.7	0.7
Selenium	µg/L	1	< 1	< 1
Silver	µg/L	0.1	< 0.1	< 0.1
Sodium	µg/L	50	2950	2850
Strontium	µg/L	1	58	57
Tellurium	µg/L	0.1	< 0.1	< 0.1
Thallium	µg/L	0.1	< 0.1	< 0.1
Tin	µg/L	0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	< 0.1	< 0.1
Vanadium	µg/L	1	< 1	< 1
Zinc	µg/L	1	3	2

Report ID: 339817-IAS  
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Attention: Jonathan Oliver

**Project #: 18-8346-3000**

Location: Upham

### Analysis of Metals in Water

RPC Sample ID:		339817-4	339817-5
Client Sample ID:		H1	H2
Date Sampled:		11-Dec-19	11-Dec-19
Analytes	Units	RL	
Aluminum	µg/L	1	184
Antimony	µg/L	0.1	< 0.1
Arsenic	µg/L	1	< 1
Barium	µg/L	1	18
Beryllium	µg/L	0.1	< 0.1
Bismuth	µg/L	1	< 1
Boron	µg/L	1	5
Cadmium	µg/L	0.01	0.01
Calcium	µg/L	50	5250
Chromium	µg/L	1	< 1
Cobalt	µg/L	0.1	< 0.1
Copper	µg/L	1	< 1
Iron	µg/L	20	140
Lead	µg/L	0.1	0.3
Lithium	µg/L	0.1	0.2
Magnesium	µg/L	10	420
Manganese	µg/L	1	27
Mercury	µg/L	0.025	< 0.025
Molybdenum	µg/L	0.1	< 0.1
Nickel	µg/L	1	< 1
Potassium	µg/L	20	480
Rubidium	µg/L	0.1	0.5
Selenium	µg/L	1	< 1
Silver	µg/L	0.1	< 0.1
Sodium	µg/L	50	2900
Strontium	µg/L	1	28
Tellurium	µg/L	0.1	< 0.1
Thallium	µg/L	0.1	< 0.1
Tin	µg/L	0.1	< 0.1
Uranium	µg/L	0.1	< 0.1
Vanadium	µg/L	1	< 1
Zinc	µg/L	1	2

Report ID: 339817-IAS  
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### Methods

<u>Analyte</u>	<u>RPC SOP #</u>	<u>Method Reference</u>	<u>Method Principle</u>
Ammonia	4.M47	APHA 4500-NH <sub>3</sub> G	Phenate Colourimetry
pH	4.M03	APHA 4500-H <sup>+</sup> B	pH Electrode - Electrometric
Alkalinity (as CaCO <sub>3</sub> )	4.M43	EPA 310.2	Methyl Orange Colourimetry
Chloride	4.M44	APHA 4500-CL E	Ferricyanide Colourimetry
Sulfate	4.M45	APHA 4500-SO <sub>4</sub> E	Turbidimetry
Nitrate + Nitrite (as N)	4.M48	APHA 4500-NO <sub>3</sub> H	Hydrazine Red., Derivitization, Colourimetry
o-Phosphate (as P)	4.M50	APHA 4500-P F	Molybdate/Ascorbic Acid Colourimetry
r-Silica (as SiO <sub>2</sub> )	4.M46	APHA 4500-SI F	Heteropoly Blue Colourimetry
Carbon - Total Organic	4.M38	APHA 5310 C	UV-Persulfate Digestion, NDIR Detection
Turbidity	4.M06	APHA 2130 B	Nephelometry
Conductivity	4.M04	APHA 2510 B	Conductivity Meter - Electrode
Solids - Total Suspended	4.M05	APHA 2540 D	Filtration, Gravimetry
Solids - Total Dissolved	-	APHA 2540 G	Evaporation, Gravimetry
Trace Metals	4.M01/4.M29	EPA 200.8/EPA 200.7	ICP-MS/ICP-ES
Mercury	4.M52	EPA 245.1	Cold Vapor AAS

Report ID: 339950-IAS  
Report Date: 19-Dec-19  
Date Received: 16-Dec-19

## CERTIFICATE OF ANALYSIS

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Tel: 506.452.1212  
Fax: 506.452.0594  
www.rpc.ca

Attention: Jonathan Oliver

**Project #: 18-8346**

Location: Upham

### Analysis of Water

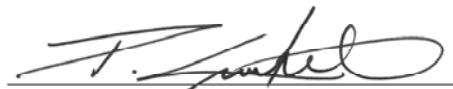
RPC Sample ID:		339950-1	339950-2	339950-3
Client Sample ID:		SW-3	SW-5	SW-6
Date Sampled:		15-Dec-19	15-Dec-19	15-Dec-19
Analytes	Units	RL		
Sodium	mg/L	0.05	2.85	2.67
Potassium	mg/L	0.02	0.57	0.59
Calcium	mg/L	0.05	16.3	15.4
Magnesium	mg/L	0.01	0.44	0.43
Iron	mg/L	0.02	0.26	0.29
Manganese	mg/L	0.001	0.027	0.023
Copper	mg/L	0.001	< 0.001	< 0.001
Zinc	mg/L	0.001	0.002	0.002
Ammonia (as N)	mg/L	0.05	< 0.05	< 0.05
pH	units	-	6.7	6.6
Alkalinity (as CaCO <sub>3</sub> )	mg/L	2	6	7
Chloride	mg/L	0.5	5.1	4.4
Sulfate	mg/L	1	38	35
Nitrate + Nitrite (as N)	mg/L	0.05	0.09	0.09
o-Phosphate (as P)	mg/L	0.01	< 0.01	< 0.01
r-Silica (as SiO <sub>2</sub> )	mg/L	0.1	2.9	2.9
Carbon - Total Organic	mg/L	0.5	8.4	8.4
Turbidity	NTU	0.1	6.7	7.4
Solids - Total Dissolved	mg/L	5	90	87
Solids - Total Suspended	mg/L	5	< 5	< 5
Conductivity	µS/cm	1	118	112
Calculated Parameters				
Bicarbonate (as CaCO <sub>3</sub> )	mg/L	-	6.0	6.0
Carbonate (as CaCO <sub>3</sub> )	mg/L	-	0.003	0.002
Hydroxide (as CaCO <sub>3</sub> )	mg/L	-	0.003	0.002
Cation Sum	meq/L	-	1.00	0.957
Anion Sum	meq/L	-	1.06	0.979
Percent Difference	%	-	-2.81	-1.14
Theoretical Conductivity	µS/cm	-	126	117
Hardness (as CaCO <sub>3</sub> )	mg/L	0.2	42.5	40.2
Ion Sum	mg/L	-	71	66
Saturation pH (5°C)	units	-	9.6	9.6
Langelier Index (5°C)	-	-	-2.87	-2.99

This report relates only to the sample(s) and information provided to the laboratory.

RL = Reporting Limit; Organic Carbon and ion chemistries for turbid samples are determined on filtered aliquots.

  
Ross Kean

Ross Kean  
Department Head  
Inorganic Analytical Chemistry

  
Peter Crowhurst

Analytical Chemist  
Inorganic Analytical Chemistry

### WATER CHEMISTRY

Report ID: 339950-IAS  
Report Date: 19-Dec-19  
Date Received: 16-Dec-19

## CERTIFICATE OF ANALYSIS

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Attention: Jonathan Oliver

**Project #: 18-8346**

Location: Upham

### Analysis of Water

RPC Sample ID:		339950-4	339950-5
Client Sample ID:		SW-7	PDP-1
Date Sampled:		15-Dec-19	15-Dec-19
<b>Analytics</b>	<b>Units</b>	<b>RL</b>	
Sodium	mg/L	0.05	2.70
Potassium	mg/L	0.02	0.47
Calcium	mg/L	0.05	5.47
Magnesium	mg/L	0.01	0.41
Iron	mg/L	0.02	0.16
Manganese	mg/L	0.001	0.020
Copper	mg/L	0.001	< 0.001
Zinc	mg/L	0.001	0.001
Ammonia (as N)	mg/L	0.05	< 0.05
pH	units	-	7.0
Alkalinity (as CaCO <sub>3</sub> )	mg/L	2	8
Chloride	mg/L	0.5	5.0
Sulfate	mg/L	1	5
Nitrate + Nitrite (as N)	mg/L	0.05	0.12
o-Phosphate (as P)	mg/L	0.01	< 0.01
r-Silica (as SiO <sub>2</sub> )	mg/L	0.1	4.1
Carbon - Total Organic	mg/L	0.5	5.4
Turbidity	NTU	0.1	4.8
Solids - Total Dissolved	mg/L	5	42
Solids - Total Suspended	mg/L	5	10
Conductivity	µS/cm	1	50
			113
<b>Calculated Parameters</b>			
Bicarbonate (as CaCO <sub>3</sub> )	mg/L	-	8.0
Carbonate (as CaCO <sub>3</sub> )	mg/L	-	0.008
Hydroxide (as CaCO <sub>3</sub> )	mg/L	-	0.005
Cation Sum	meq/L	-	0.446
Anion Sum	meq/L	-	0.414
Percent Difference	%	-	3.72
Theoretical Conductivity	µS/cm	-	49
Hardness (as CaCO <sub>3</sub> )	mg/L	0.2	15.3
Ion Sum	mg/L	-	29
Saturation pH (5°C)	units	-	9.9
Langelier Index (5°C)	-	-	-2.88
			-2.89

Report ID: 339950-IAS  
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Attention: Jonathan Oliver

**Project #: 18-8346**

Location: Upham

### Analysis of Metals in Water

RPC Sample ID:		339950-1	339950-2	339950-3
Client Sample ID:		SW-3	SW-5	SW-6
Date Sampled:		15-Dec-19	15-Dec-19	15-Dec-19
Analytes	Units	RL		
Aluminum	µg/L	1	402	284
Antimony	µg/L	0.1	< 0.1	< 0.1
Arsenic	µg/L	1	< 1	< 1
Barium	µg/L	1	13	13
Beryllium	µg/L	0.1	< 0.1	< 0.1
Bismuth	µg/L	1	< 1	< 1
Boron	µg/L	1	8	8
Cadmium	µg/L	0.01	0.01	0.02
Calcium	µg/L	50	16300	5480
Chromium	µg/L	1	< 1	< 1
Cobalt	µg/L	0.1	< 0.1	< 0.1
Copper	µg/L	1	< 1	< 1
Iron	µg/L	20	260	170
Lead	µg/L	0.1	0.2	0.3
Lithium	µg/L	0.1	0.4	0.3
Magnesium	µg/L	10	440	430
Manganese	µg/L	1	27	23
Molybdenum	µg/L	0.1	< 0.1	< 0.1
Nickel	µg/L	1	< 1	< 1
Potassium	µg/L	20	570	590
Rubidium	µg/L	0.1	0.9	0.6
Selenium	µg/L	1	< 1	< 1
Silver	µg/L	0.1	< 0.1	< 0.1
Sodium	µg/L	50	2850	2800
Strontium	µg/L	1	53	50
Tellurium	µg/L	0.1	< 0.1	< 0.1
Thallium	µg/L	0.1	< 0.1	< 0.1
Tin	µg/L	0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	< 0.1	< 0.1
Vanadium	µg/L	1	< 1	< 1
Zinc	µg/L	1	2	1

Report ID: 339950-IAS  
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Attention: Jonathan Oliver

**Project #: 18-8346**

Location: Upham

### Analysis of Metals in Water

RPC Sample ID:		339950-4	339950-5
Client Sample ID:		SW-7	PDP-1
Date Sampled:		15-Dec-19	15-Dec-19
Analytes	Units	RL	
Aluminum	µg/L	1	269
Antimony	µg/L	0.1	< 0.1
Arsenic	µg/L	1	< 1
Barium	µg/L	1	17
Beryllium	µg/L	0.1	< 0.1
Bismuth	µg/L	1	< 1
Boron	µg/L	1	5
Cadmium	µg/L	0.01	0.01
Calcium	µg/L	50	5470
Chromium	µg/L	1	< 1
Cobalt	µg/L	0.1	< 0.1
Copper	µg/L	1	< 1
Iron	µg/L	20	160
Lead	µg/L	0.1	0.2
Lithium	µg/L	0.1	0.3
Magnesium	µg/L	10	410
Manganese	µg/L	1	20
Molybdenum	µg/L	0.1	< 0.1
Nickel	µg/L	1	< 1
Potassium	µg/L	20	470
Rubidium	µg/L	0.1	0.6
Selenium	µg/L	1	< 1
Silver	µg/L	0.1	< 0.1
Sodium	µg/L	50	2700
Strontium	µg/L	1	29
Tellurium	µg/L	0.1	< 0.1
Thallium	µg/L	0.1	< 0.1
Tin	µg/L	0.1	< 0.1
Uranium	µg/L	0.1	< 0.1
Vanadium	µg/L	1	< 1
Zinc	µg/L	1	2

Report ID: 339950-IAS  
Report Date: 19-Dec-19  
Date Received: 16-Dec-19

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for  
Dillon Consulting Ltd  
274 Sydney Street, Suite 200  
Saint John, NB E2L 0A8

**rpc**  
921 College Hill Rd  
Fredericton NB  
Canada E3B 6Z9  
Tel: 506.452.1212  
Fax: 506.452.0594  
[www.rpc.ca](http://www.rpc.ca)

### Methods

<u>Analyte</u>	<u>RPC SOP #</u>	<u>Method Reference</u>	<u>Method Principle</u>
Ammonia	4.M47	APHA 4500-NH <sub>3</sub> G	Phenate Colourimetry
pH	4.M03	APHA 4500-H <sup>+</sup> B	pH Electrode - Electrometric
Alkalinity (as CaCO <sub>3</sub> )	4.M43	EPA 310.2	Methyl Orange Colourimetry
Chloride	4.M44	APHA 4500-CL E	Ferricyanide Colourimetry
Sulfate	4.M45	APHA 4500-SO <sub>4</sub> E	Turbidimetry
Nitrate + Nitrite (as N)	4.M48	APHA 4500-NO <sub>3</sub> H	Hydrazine Red., Derivitization, Colourimetry
o-Phosphate (as P)	4.M50	APHA 4500-P F	Molybdate/Ascorbic Acid Colourimetry
r-Silica (as SiO <sub>2</sub> )	4.M46	APHA 4500-SI F	Heteropoly Blue Colourimetry
Carbon - Total Organic	4.M38	APHA 5310 C	UV-Persulfate Digestion, NDIR Detection
Turbidity	4.M06	APHA 2130 B	Nephelometry
Conductivity	4.M04	APHA 2510 B	Conductivity Meter - Electrode
Solids - Total Suspended	4.M05	APHA 2540 D	Filtration, Gravimetry
Solids - Total Dissolved	-	APHA 2540 G	Evaporation, Gravimetry
Trace Metals	4.M01/4.M29	EPA 200.8/EPA 200.7	ICP-MS/ICP-ES

Report ID: 340646-IAS  
Report Date: 09-Jan-20  
Date Received: 20-Dec-19

## CERTIFICATE OF ANALYSIS

for  
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Attention: Geoff Allaby

**Project #: 17-5121-4100**

Location: Upham

### Analysis of Water

RPC Sample ID:			340646-1	340646-2	340646-3	340646-4	340646-5	340646-6
Client Sample ID:			SW3	SW5	PDP-1	SW38	H1	H2
Date Sampled:			19-Dec-19	19-Dec-19	19-Dec-19	19-Dec-19	19-Dec-19	19-Dec-19
Analytes	Units	RL						
Alkalinity (as CaCO <sub>3</sub> )	mg/L	2	20	19	19	19	15	16
Chloride	mg/L	0.5	6.8	7.0	6.7	6.8	5.6	6.0
Sulfate	mg/L	1	189	186	171	177	10	16
Solids - Total Dissolved	mg/L	5	319	312	311	311	50	58
Solids - Total Suspended	mg/L	5	< 5	< 5	< 5	< 5	< 5	< 5
Hardness (as CaCO <sub>3</sub> )	mg/L	0.2	206.	201.	201.	199.	27.2	33.1

This report relates only to the sample(s) and information provided to the laboratory.

RL = Reporting Limit



Ross Kean  
Department Head  
Inorganic Analytical Chemistry



Peter Crowhurst  
Analytical Chemist  
Inorganic Analytical Chemistry

### WATER CHEMISTRY

Report ID: 340646-IAS  
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Attention: Geoff Allaby

**Project #: 17-5121-4100**

Location: Upham

### Analysis of Metals in Water

RPC Sample ID:			340646-1	340646-2	340646-3	340646-4	340646-5	340646-6
Client Sample ID:			SW3	SW5	PDP-1	SW38	H1	H2
Date Sampled:			19-Dec-19	19-Dec-19	19-Dec-19	19-Dec-19	19-Dec-19	19-Dec-19
Analytes	Units	RL						
Calcium	µg/L	50	81100	79200	79200	78400	9940	12300
Magnesium	µg/L	10	870	880	860	870	570	590
Potassium	µg/L	20	650	620	610	600	360	400
Sodium	µg/L	50	3770	3740	3740	3830	3180	3060

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### Methods

<u>Analyte</u>	<u>RPC SOP #</u>	<u>Method Reference</u>	<u>Method Principle</u>
Alkalinity (as CaCO <sub>3</sub> )	4.M43	EPA 310.2	Methyl Orange Colourimetry
Chloride	4.M44	APHA 4500-CL E	Ferricyanide Colourimetry
Sulfate	4.M45	APHA 4500-SO <sub>4</sub> E	Turbidimetry
Solids - Total Suspended	4.M05	APHA 2540 D	Filtration, Gravimetry
Solids - Total Dissolved	-	APHA 2540 G	Evaporation, Gravimetry
Trace Metals	4.M01/4.M29	EPA 200.8/EPA 200.7	ICP-MS/ICP-ES

Report ID: 340842-IAS  
Report Date: 10-Jan-20  
Date Received: 24-Dec-19

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Attention: Geoff Allaby

**Project #: 17-5121-4100**

Location: Upham

### Analysis of Water

RPC Sample ID:		340842-1	340842-2	340842-3	340842-4	340842-5
Client Sample ID:		SW3	SW5	PDP-1	H1	H2
Date Sampled:		23-Dec-19	23-Dec-19	23-Dec-19	23-Dec-19	23-Dec-19
Analytes	Units	RL				
Alkalinity (as CaCO <sub>3</sub> )	mg/L	2	26	22	26	18
Chloride	mg/L	0.5	8.2	7.0	7.4	6.4
Sulfate	mg/L	1	250	230	240	13
Solids - Total Dissolved	mg/L	5	398	372	400	58
Solids - Total Suspended	mg/L	5	< 5	< 5	< 5	< 5
Hardness (as CaCO <sub>3</sub> )	mg/L	0.2	277.	257.	257.	30.1
						32.8

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Ross Kean

Ross Kean  
Department Head  
Inorganic Analytical Chemistry

T. Crowhurst

Peter Crowhurst  
Analytical Chemist  
Inorganic Analytical Chemistry

Report ID: 340842-IAS  
Report Date: 10-Jan-20  
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Attention: Geoff Allaby

**Project #: 17-5121-4100**

Location: Upham

### Analysis of Metals in Water

RPC Sample ID:		340842-1	340842-2	340842-3	340842-4	340842-5
Client Sample ID:		SW3	SW5	PDP-1	H1	H2
Date Sampled:		23-Dec-19	23-Dec-19	23-Dec-19	23-Dec-19	23-Dec-19
Analytes	Units	RL				
Calcium	mg/L	0.05	109.	101.	101.	11.0
Magnesium	mg/L	0.01	1.04	0.98	1.08	0.65
Potassium	mg/L	0.02	0.72	0.64	0.70	0.32
Sodium	mg/L	0.05	4.53	4.13	4.35	3.32
						3.33

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### Methods

<u>Analyte</u>	<u>RPC SOP #</u>	<u>Method Reference</u>	<u>Method Principle</u>
Alkalinity (as CaCO <sub>3</sub> )	4.M43	EPA 310.2	Methyl Orange Colourimetry
Chloride	4.M44	APHA 4500-CL E	Ferricyanide Colourimetry
Sulfate	4.M45	APHA 4500-SO <sub>4</sub> E	Turbidimetry
Solids - Total Suspended	4.M05	APHA 2540 D	Filtration, Gravimetry
Solids - Total Dissolved	-	APHA 2540 G	Evaporation, Gravimetry
Trace Metals	4.M01/4.M29	EPA 200.8/EPA 200.7	ICP-MS/ICP-ES

Report ID: 341223-IAS  
Report Date: 17-Jan-20  
Date Received: 03-Jan-20

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Attention: Jonathan Oliver

**Project #: 18-8346**

Location: Upham

### Analysis of Water

RPC Sample ID:		341223-1	341223-2	341223-3	341223-4	341223-5
Client Sample ID:		SW-3	SW-5	PDP-1	H1	H2
Date Sampled:		3-Jan-20	3-Jan-20	3-Jan-20	3-Jan-20	3-Jan-20
Analytes	Units	RL				
pH	units	-	7.2	7.3	7.2	7.3
Alkalinity (as CaCO <sub>3</sub> )	mg/L	2	27	27	25	21
Chloride	mg/L	0.5	10.1	8.6	9.0	7.7
Sulfate	mg/L	1	220	200	200	18
Turbidity	NTU	0.1	1.8	1.5	1.4	0.7
Solids - Total Dissolved	mg/L	5	378	358	354	74
Solids - Total Suspended	mg/L	5	< 5	< 5	< 5	< 5
Conductivity	µS/cm	1	535	505	508	114
Hardness (as CaCO <sub>3</sub> )	mg/L	0.05	248.	232.	234.	38.8
						42.0

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Ross Kean

Ross Kean  
Department Head  
Inorganic Analytical Chemistry

Peter Crowhurst

Peter Crowhurst  
Analytical Chemist  
Inorganic Analytical Chemistry

Report ID: 341223-IAS  
Report Date: 17-Jan-20  
Date Received: 03-Jan-20

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Attention: Jonathan Oliver

**Project #: 18-8346**

Location: Upham

### Analysis of Metals in Water

RPC Sample ID:		341223-1	341223-2	341223-3	341223-4	341223-5
Client Sample ID:		SW-3	SW-5	PDP-1	H1	H2
Date Sampled:		3-Jan-20	3-Jan-20	3-Jan-20	3-Jan-20	3-Jan-20
Analytes	Units	RL				
Calcium	mg/L	0.05	97.6	91.2	91.9	14.2
Magnesium	mg/L	0.01	1.15	1.08	1.10	0.81
Potassium	mg/L	0.02	0.59	0.58	0.58	0.36
Sodium	mg/L	0.05	5.08	4.91	4.81	4.07
						4.06

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Sulfate	4.M45	APHA 4500-SO <sub>4</sub> E	Turbidimetry
Turbidity	4.M06	APHA 2130 B	Nephelometry
Conductivity	4.M04	APHA 2510 B	Conductivity Meter - Electrode
Solids - Total Suspended	4.M05	APHA 2540 D	Filtration, Gravimetry
Solids - Total Dissolved	-	APHA 2540 G	Evaporation, Gravimetry
Trace Metals	4.M01/4.M29	EPA 200.8/EPA 200.7	ICP-MS/ICP-ES