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Summary Report

To :	Nick Colucci, Director	Date :	May 5, 2020
	Town of Erin, Infrastructure Services	Re. :	Pre-Construction Baseline
From :	Andrew Pentney		Groundwater Monitoring Report
CC :	Triton Engineering	Project :	Station Street Dam Monitoring

The following is a summary report regarding the monitoring completed to date as part of the *Groundwater Monitoring and Mitigation Plan, Reconstruction of Station Street and Replacement of Station Street Bridge (Structure 2064) and Dam Control Structure, Hilllsburgh* (May 23, 2019).

Monitoring Locations

As per the monitoring plan the following monitors were installed on April 20, 2020:

- Hillsburgh Pond (stilling well)
- 3 drive-point piezometers at locations around the perimeter of the Pond

The approximate monitoring locations (visually estimated at the time of installation) are shown on the attached **Figure 1**. We note that the locations are to be surveyed by Triton Engineering, after which accurate locations and elevations will be available.

The drive-point piezometers were installed by hand into the shallow sediments along the perimeter of the pond, and allow a comparison of the pond levels to the water table elevations immediately adjacent to the pond at those locations.

Water levels at DP1 are lower than anticipated when installed on April 20, 2020 (over 2.1 m lower than the pond), therefore the monitor needed to be deepened in order to intercept the water table. This occurred on April 30, 2020.

Monitoring Completed

Water level monitoring is completed through occasional manual measurements and on an hourly basis by transducer/dataloggers installed at each location. At most locations water level monitoring began on April 20, 2010. At DP1 water level monitoring began on April 30, 2020. Water level monitoring to date represents pre-construction baseline data. The monitor installation details are provided on the attached **Table 1**.

A hydrograph showing water level measurements to data (water level in metres below top of monitors at each location) is attached as **Figure 2**. Note that the water levels to date as shown in **Figure 2** cannot be compared directly from location to location. Once monitor elevations are available a direct comparison will be made which will allow a determination of groundwater-surface water interaction. Reported precipitation (rainfall) at the Environment Canada Fergus Shand Dam weather station (closest monitoring station) is plotted on **Figure 2** for comparison.

Water quality sampling occurred on April 24th and May 4th, prior to construction activities in order to provide baseline data. Water quality samples can be obtained from the Pond and from DP1 and DP3. Monitors DP1 and DP3 are installed in sandy deposits and can be pumped sufficiently to obtain water quality samples. Monitor DP2 is installed in fine grain sediments that do not "produce" sufficient water to obtain representative samples.

Water quality sampling results to date are summarized on the attached **Table 2**. We note that the water quality results from the May 4th sample event are not yet available, these results will be summarized in the next status report.

Summary

The monitoring completed to date establishes baseline pre-construction conditions at, and near, the pond. Ongoing monitoring will help assess conditions during (and after) construction activities. The monitoring schedule includes weekly checks of the pond level and biweekly water level and water quality sampling at the monitoring locations. Monthly reports will be prepared during construction to update the monitoring results and assess groundwater conditions at, and near, the pond.

On a preliminary basis, the following observations are made:

- Water levels at DP1 show that the water table along the east (downgradient) edge of the pond is lower than the pond, indicating recharge conditions.
- Water levels at DP2 and DP3 indicate that the water table is at, or near, the pond level along the upgradient edge of the pond.
- The water level response to the rainfall event on April 29th/30th was delayed at all monitoring locations, which suggests the response was associated primarily with increased streamflow entering the pond (as opposed to direct precipitation on the pond).
- The largest water level response to rainfall occurred at DP3, likely as a result of the influence of the creek inflow into the pond. The creek at this location exerts some control on water table levels along the north edge of the pond, which may moderate potential effects that may be associated with the reconstruction activities.

Sincerely,

Andrew Pentney, P.Geo.
Senior Hydrogeologist
Groundwater Science Corp.

Attached: Figure 1, Figure 2
Table 1, Table 2

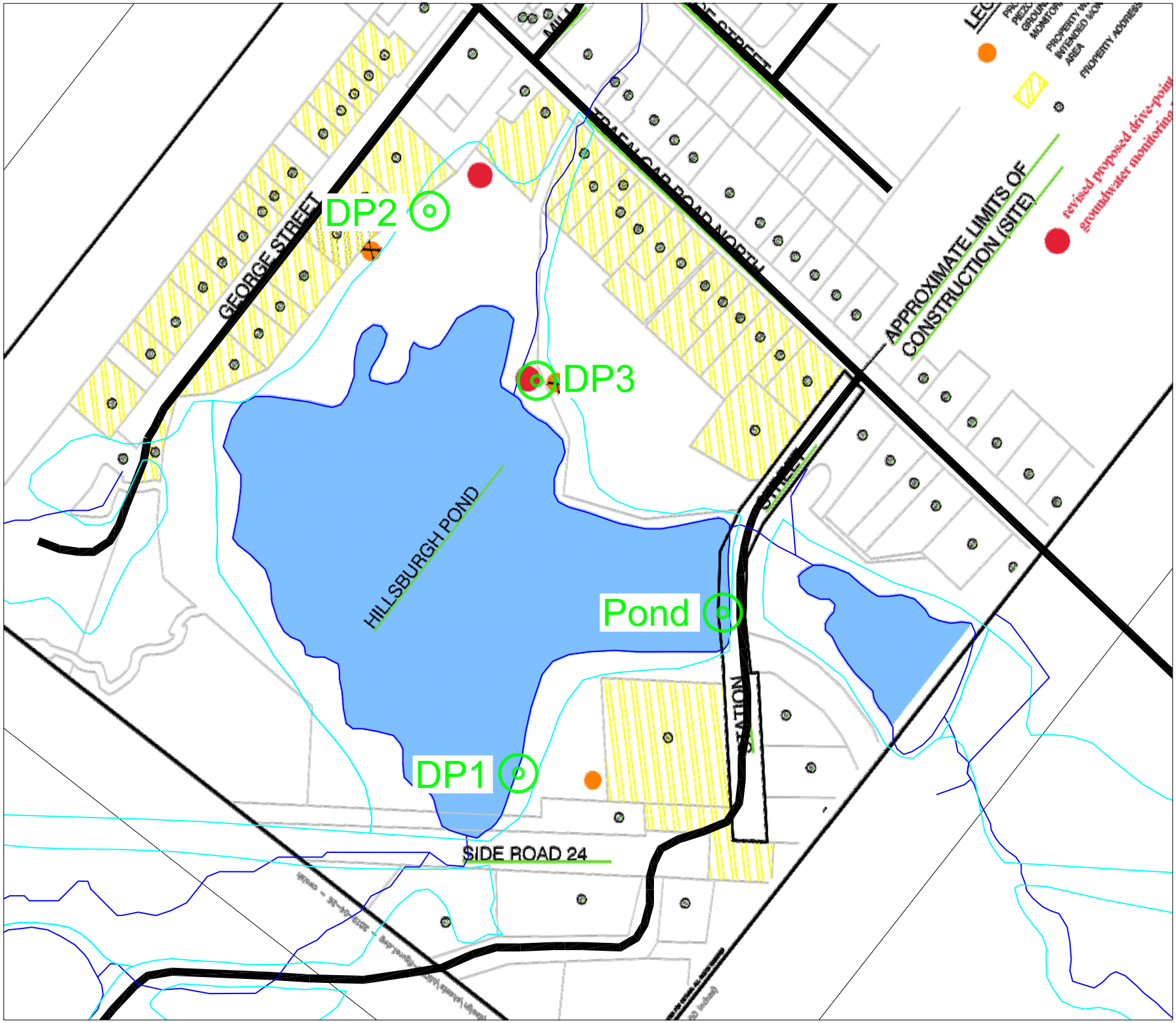
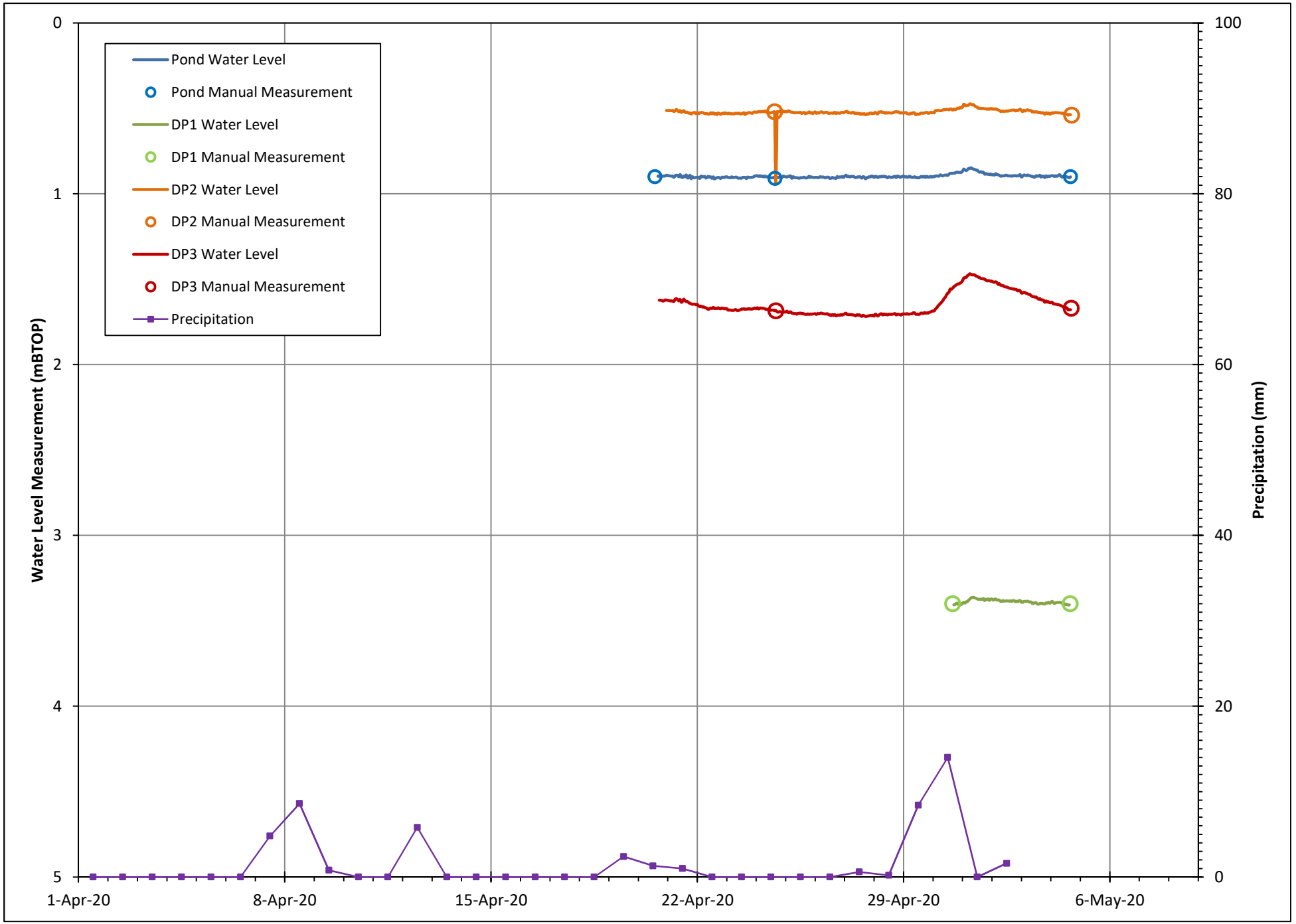


Figure 1

Station Street Dam
Monitoring Network



Town of Erin
Station Street Dam Reconstruction

Figure 2: Water Level Hydrograph

Groundwater Science Corp
Monitoring Program

Location	Type	As Installled			Elevations	
		Total Depth	Stick-Up	Screen Lenth	Ground Surface	Top of Pipe
		(mBTOP)	(mAGS)	(m)	(mASL)	(mASL)
Pond	stilling well	1.9	1.9	1	N/A	N/A
DP1	piezometer	4.09	1.22	0.3	N/A	N/A
DP2	piezometer	2.21	0.42	0.3	N/A	N/A
DP3	piezometer	2.84	1.26	0.3	N/A	N/A

Notes: mBTOP = metres below top of pipe
mAGS = metres above ground surface
mASL = metres above sea level

Sample Location:		POND
Date:		24-Apr-2020
Parameter	Units	Water
Anions and Nutrients		
Bromide (Br)	mg/L	<0.10
Chloride (Cl)	mg/L	24.7
Fluoride (F)	mg/L	0.045
Nitrate (as N)	mg/L	3.20
Nitrite (as N)	mg/L	0.014
Sulfate (SO4)	mg/L	18.1
Total Metals		
Aluminum (Al)-Total	mg/L	0.0680
Antimony (Sb)-Total	mg/L	<0.00010
Arsenic (As)-Total	mg/L	0.00025
Barium (Ba)-Total	mg/L	0.0342
Beryllium (Be)-Total	mg/L	<0.00010
Bismuth (Bi)-Total	mg/L	<0.000050
Boron (B)-Total	mg/L	<0.010
Cadmium (Cd)-Total	mg/L	0.0000076
Calcium (Ca)-Total	mg/L	69.2
Cesium (Cs)-Total	mg/L	<0.000010
Chromium (Cr)-Total	mg/L	<0.00050
Cobalt (Co)-Total	mg/L	<0.00010
Copper (Cu)-Total	mg/L	0.00060
Iron (Fe)-Total	mg/L	0.108
Lead (Pb)-Total	mg/L	0.000297
Lithium (Li)-Total	mg/L	0.0021
Magnesium (Mg)-Total	mg/L	21.2
Manganese (Mn)-Total	mg/L	0.0122
Molybdenum (Mo)-Total	mg/L	0.000263
Nickel (Ni)-Total	mg/L	<0.00050
Phosphorus (P)-Total	mg/L	<0.050
Potassium (K)-Total	mg/L	1.09
Rubidium (Rb)-Total	mg/L	0.00071
Selenium (Se)-Total	mg/L	0.000141
Silicon (Si)-Total	mg/L	3.82
Silver (Ag)-Total	mg/L	<0.000050
Sodium (Na)-Total	mg/L	11.7
Strontium (Sr)-Total	mg/L	0.117
Sulfur (S)-Total	mg/L	7.01
Tellurium (Te)-Total	mg/L	<0.00020
Thallium (Tl)-Total	mg/L	<0.000010
Thorium (Th)-Total	mg/L	<0.00010
Tin (Sn)-Total	mg/L	0.00028
Titanium (Ti)-Total	mg/L	0.00318
Tungsten (W)-Total	mg/L	<0.00010
Uranium (U)-Total	mg/L	0.000524
Vanadium (V)-Total	mg/L	<0.00050
Zinc (Zn)-Total	mg/L	0.0139
Zirconium (Zr)-Total	mg/L	<0.00020

Sample Location:		DP3
Date:		24-Apr-2020
Parameter	Units	Water
Anions and Nutrients		
Bromide (Br)	mg/L	<0.10
Chloride (Cl)	mg/L	20.9
Fluoride (F)	mg/L	0.055
Nitrate (as N)	mg/L	0.060
Nitrite (as N)	mg/L	<0.010
Sulfate (SO4)	mg/L	32.7
Dissolved Metals		
Aluminum (Al)-Dissolved	mg/L	0.0058
Antimony (Sb)-Dissolved	mg/L	<0.00010
Arsenic (As)-Dissolved	mg/L	0.00088
Barium (Ba)-Dissolved	mg/L	0.0750
Beryllium (Be)-Dissolved	mg/L	<0.00010
Bismuth (Bi)-Dissolved	mg/L	<0.000050
Boron (B)-Dissolved	mg/L	<0.010
Cadmium (Cd)-Dissolved	mg/L	<0.0000050
Calcium (Ca)-Dissolved	mg/L	85.5
Cesium (Cs)-Dissolved	mg/L	<0.000010
Chromium (Cr)-Dissolved	mg/L	<0.00050
Cobalt (Co)-Dissolved	mg/L	0.00150
Copper (Cu)-Dissolved	mg/L	<0.00020
Iron (Fe)-Dissolved	mg/L	<0.010
Lead (Pb)-Dissolved	mg/L	0.000135
Lithium (Li)-Dissolved	mg/L	<0.0010
Magnesium (Mg)-Dissolved	mg/L	19.0
Manganese (Mn)-Dissolved	mg/L	0.849
Molybdenum (Mo)-Dissolved	mg/L	0.00106
Nickel (Ni)-Dissolved	mg/L	0.00450
Phosphorus (P)-Dissolved	mg/L	<0.050
Potassium (K)-Dissolved	mg/L	0.768
Rubidium (Rb)-Dissolved	mg/L	0.00097
Selenium (Se)-Dissolved	mg/L	<0.000050
Silicon (Si)-Dissolved	mg/L	5.51
Silver (Ag)-Dissolved	mg/L	<0.000050
Sodium (Na)-Dissolved	mg/L	11.6
Strontium (Sr)-Dissolved	mg/L	0.124
Sulfur (S)-Dissolved	mg/L	12.2
Tellurium (Te)-Dissolved	mg/L	<0.00020
Thallium (Tl)-Dissolved	mg/L	<0.000010
Thorium (Th)-Dissolved	mg/L	<0.00010
Tin (Sn)-Dissolved	mg/L	<0.00010
Titanium (Ti)-Dissolved	mg/L	0.00030
Tungsten (W)-Dissolved	mg/L	<0.00010
Uranium (U)-Dissolved	mg/L	0.000185
Vanadium (V)-Dissolved	mg/L	<0.00050
Zinc (Zn)-Dissolved	mg/L	3.43
Zirconium (Zr)-Dissolved	mg/L	<0.00020

Table 2: Water Quality Results Summary