

Memorandum

RE: Nicholson Area Groundwater Monitoring Program – 2019 Sampling to Address Ongoing Elevated Nitrate at Location 12 – Nicholson Elementary (School District No. 6 Rocky Mountain)

TO: Ben Van Nostrand P.Ag., ASCT.
Team Leader: Environmental Health Services
Operations Management (CSRD)

DATE: February 7, 2019

FR: Bryer Manwell, M.Sc. P.Eng.

REFERENCE: 14-024-18 – M3

The following memorandum:

- summarizes the water quality issues at the Nicholson Elementary (summarized from the 2014 memo). We have not seen the ongoing elevated nitrate data collected from Nicholson Elementary School and provided to Interior Health in recent years;
- recommends a program for 2019 (locations, frequency and parameter list); and
- provides a cost estimate to perform the recommended 2019 sampling program at Nicholson and provided a report on the results, including comparison to historic data (2005 to 2013).

Summary of Nicholson Area Water Quality Results

The Columbia Shuswap Regional District (CSRD) sponsored a groundwater monitoring program performed at the community of Nicholson between 2005 and 2013. The objective of the program was to assess the potential impact on groundwater from operation of private sewage disposal systems (PSDS). Of the 23 wells sampled in 2013, 11 had exceedances of GCDWQ MAC values (thresholds based on health concerns) and two had an exceedance of GCDWQ AO values (a threshold based on aesthetic concerns). For further information refer to the Nicholson Groundwater Quality Monitoring Report for 2013, accessible on the CSRD website. Considering the monitoring program results to-date and the hydrogeological setting, all drinking water wells across the site should be considered at risk for fecal contamination. It is possible that any well at the site could have one or more exceedances of *E. coil.* or other septic-related drinking water contaminants at some point during its lifespan.

Loc 12 – Nicholson Elementary School Water Quality Results

Between 2005 and 2013 concentrations of nitrate and chloride at the school water supply well indicate influence from septic systems operating in the vicinity. In Sept 2007 nitrate concentration was just below the Guidelines for Canadian Drinking Water Quality - Maximum Acceptable Concentrations of 10 mg/l at 8.98 mg/l. Further, since 2011 the concentrations of nitrate and chloride (a tracer of anthropogenic input) have been on the rise at the school supply well (see Figures 1 and 2, attached).

During the monitored period (2005 and 2013) Guidelines for Canadian Drinking Water Quality - Maximum Acceptable Concentrations was exceeded for Total Coliform once, on Sept 11, 2007.

Recommended 2019 Sampling Program

Field parameters to include: temperature, pH, ORP, electrical conductivity and dissolved oxygen. Laboratory parameters to include the following:

2019 WWAL Recommended Laboratory Parameter List for Nicholson
Alkalinity, total (speciated)
Ammonia, Total
Anions by IC (chloride, nitrate, nitrite, phosphate, sulphate, bromide)
Coliforms, Fecal
Coliforms, Total & E. coli
Conductivity
Metals, Dissolved by ICPMS (Low)
Phosphorus
Database Service
Total Number of samples. 32 (15X2=30 plus 2 for replicate sampling)

We are recommending 15 (of the previous 23 locations) be sampled twice in 2019, preferably to correspond with the CSR landfill sampling at Golden landfill (spring and fall/winter).

We recommend sampling at the following locations, based on their ranking of average nitrate concentrations (2005 to 2013):

Sampling Location	Average Nitrate (mg/l)
LOC-36	9.48
LOC-11 Nicholson	9.24
LOC-30	8.89
LOC-19 Nicholson	8.59
LOC-35	8.51
LOC-34	8.29
LOC-21 Nicholson	7.48
LOC-22 Nicholson	5.97
LOC-27 Nicholson	5.23
LOC-24 Nicholson	5.22
LOC-12 Nicholson Elementary School	4.22
LOC-37	4.19
LOC-26 Nicholson	4.08
LOC-25 Nicholson	3.03
LOC-16 Habart	2.87

Note: GCDWQ MAC is 10 mg/l

Costs

We provide an outline of the costs associated with the recommended 2019 monitoring in the table below. To complete the Nicholson sampling dovetailed with the Golden Landfill sampling, the program is estimated to cost **\$11,393**, if the program happens independent of the landfill sampling, we estimate the program will cost **\$12,983**.

Cost Estimate for 2019 Sampling at Nicholson (two events and reporting)

Western Water Cost Estimate for Groundwater Sampling at Nicholson in 2019		April /May (High Water)	November/ December Event (Baseflow)	Total for two sampling events at 15 locations
Sampling	Labour	\$1,113	\$1,113	\$2,225
	Lab and Database Manager (15 sites sampled 2 times per year plus a triplicate sample, taken once during the fall/winter event)	\$2,915	\$3,304	\$6,220
	Expenses (mileage, equipment rental, shipping and consumables)	\$347	\$347	\$693
	Labour plus additional mileage full distance from Vernon Expenses (mileage, equipment rental, shipping and consumables)	\$1,142	\$1,142	\$2,283
	Total, combined with Golden Landfill Sampling	\$4,374	\$4,763	\$9,138
	Total Independent of Golden Landfill Sampling - mob from Vernon	\$5,169	\$5,558	\$10,728
Reporting	Labour for Data Analysis and Reporting (interim update and final report)			\$2,255
Sampling and Reporting (dovetailed with Golden Landfill sampling)				\$11,393
Sampling and Reporting (mobilization from Vernon to Nicholson)				\$12,983

Labour is charged at the following hourly rates:

- Senior Review - \$165 / hour
- Project manger - \$125 / hour
- Mapping Tech - \$85 / hour
- Field Staff - \$75 / hour

Note: Laboratory Analysis includes replicate sampling and housing the data with a database manager for data QA/QC and data longevity (keeping consistent and accurate records of the water quality data over-time to monitor the source water).

Please let me know if you require further information at this time.