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Item No. Info Item 2
North West Community Council
October 7, 2024

TO: Chair and Members of North West Community Council

FROM: Brad Anguish, Commissioner of Operations

DATE: July 17, 2024

SUBJECT: Bedford West Water Quality Status Update – Spring 2024

INFORMATION REPORT

ORIGIN

Bedford Municipal Planning Strategy, Bedford West Secondary Planning Strategy, Policies BW-3, SW-4 and SW-5. Development Agreements between the Halifax Regional Municipality and West Bedford Holdings Ltd, between Halifax Regional Municipality and Cresco Ltd, and between Halifax Regional Municipality and Clayton Developments Ltd.

EXECUTIVE SUMMARY

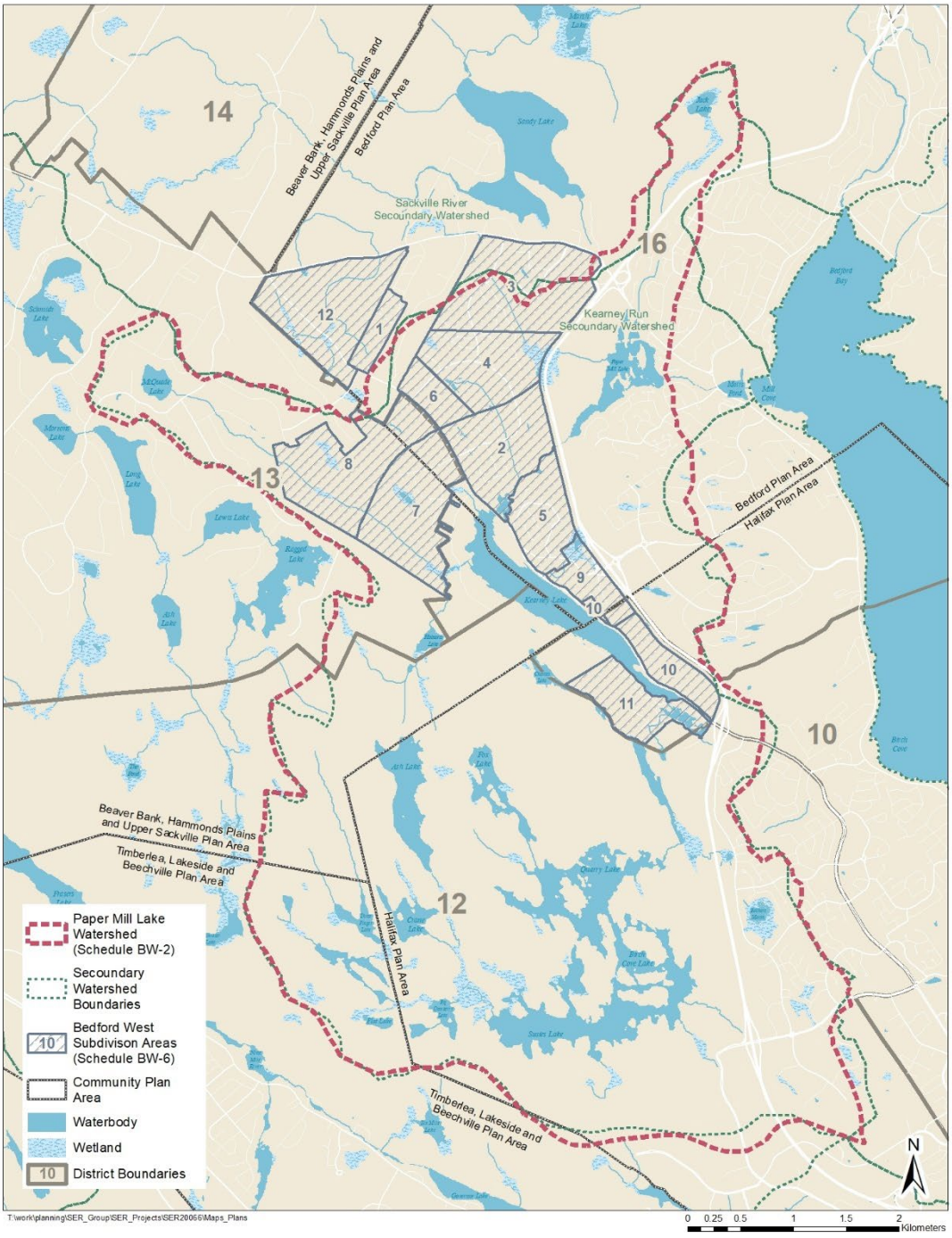
A water quality monitoring program has been ongoing in the Bedford West Secondary Plan area since 2009, through DAs executed under the Bedford West Secondary Planning Strategy. Results from the spring 2024 sampling event are presented in this report.

In 2024, samples were taking earlier than in previous years, in late April rather than late May, to better capture mixing conditions in the lake. Exceedances of the 10 µg/L phosphorus threshold were observed at every sampling station in the spring 2024. Resampling took place in June 2024, when all but two sampling stations also showed exceedances.

BACKGROUND

The Bedford West area is one of three areas designated as existing growth areas under the Regional Plan for serviced development (municipal water and wastewater systems). The Bedford West area is approximately 1,052 hectares (2,600 acres) in size and located on the west side of the Bicentennial Highway, in the vicinity of Hammonds Plains Road and Kearney Lake Road. In 2006, the Bedford West Secondary Planning Strategy (BWSPS) was adopted with the policy directive to enable new mixed-use communities while ensuring their design considered protection of the natural environment. *Figure 1* illustrates the areas encompassed by the BWSPS. Sub Areas 2 to 9 have approved development agreements and are either constructed or under construction. Sub Areas 1, 10 and 12 are Special Planning Areas designated through the Province of Nova Scotia's Housing in the Halifax Regional Municipality Act.

Policy BW-3 of the BWSPS requires a water quality monitoring program for the Paper Mill Lake watershed to track the eutrophication process. Eutrophication is the process of nutrient enrichment in lakes. While this eutrophication can happen naturally, it is primarily caused by human activities. Policy BW-3 aims to prevent nutrient enrichment from impacts of human activities in the Paper Mill Lake watershed. Land disturbances during construction, surface hardening, the use of chemical fertilizers, stormwater inputs, in-use and historic on-site septic systems, and vegetation removal are all potential sources of nutrients in lakes. These changes can result in relatively rapid changes in trophic status, from lower trophic states (fewer nutrients) to higher trophic states (more nutrients). This rapid change in water quality can lead to excessive aquatic plant growth, excessive algae growth, cyanobacteria blooms, and conditions generally resembling a poorly



circulating backyard pond.

The water quality monitoring program was specified in the BWSPS in response to the Municipality's statement "that best management practices may be needed both during development and afterward to maintain water quality in the lakes" and "that a water quality monitoring program be established on lakes throughout the watershed" as published in the BWSPS in 2006.[1]

The terms of the monitoring program are specified within the Development Agreements that have been negotiated in consultation with the former Bedford Watershed Advisory Board (Sub Areas 1-9). This board was dissolved in 2013 and replaced with the broader Regional Watersheds Advisory Board (RWAB). Development agreements for the Beford West subdivision negotiated between 2013-2022 occurred in consultation with RWAB, with the exception of those identified as Special Planning Areas.

All Development Agreements under the BWSPS have identified the value of 10 micrograms per litre (µg/L) of total phosphorus (TP) as a "trigger value," representing the transition point between the oligotrophic and mesotrophic states per Environment and Climate Change Canada's criteria (*Table 1*).

Table 1: Summary of Canadian trophic status triggers. Environment and Climate Change Canada (2004).

Trophic Status	Total Phosphorus (µg/L)
Ultra-oligotrophic	<4
Oligotrophic	4-10
Mesotrophic	10-20
Meso-Eutrophic	20-35
Eutrophic	35-100
Hyper-eutrophic	>100

Threshold values for acceptable *E. coli* concentration under the terms of the Bedford West Development Agreements conform to Health Canada's Guidelines for Canadian Recreational Water Quality.[2] Threshold values for other parameters monitored under the terms of the Bedford West Development Agreements conform to Canadian Council of Environment Ministers (CCME) Water Quality Guidelines for the Protection of Freshwater Aquatic Life (CCME FAL).[3]

In accordance with the terms for the Bedford West Development Agreements, the Municipality is required to submit test results to the Developer, the North West Community Council (NWCC), and RWAB within three months of being received from the consultant, or immediately, if TP or bacterial results exceed management thresholds identified therein. On July 9, 2024, Regional Council directed staff to begin the process to dissolve RWAB.[4] The impacts of this decision on the reporting process for the Bedford West water quality monitoring are currently being finalized by staff. This provision assumes that development

[1] The Bedford West Secondary Planning Strategy can be found online here: THE BEDFORD WEST SECONDARY PLANNING STRATEGY.pdf (halifax.ca)
[2] Health Canada's Guidelines for Recreational Water Quality can be found online here: recreational-water-quality-guidelines-indicators-fecal-contamination.pdf (canada.ca)
[3] The CCME Water Quality Guidelines for the Protection of Freshwater Aquatic Life can be found online here: Canadian Council of Ministers of the Environment | Le Conseil canadien des ministres de l'environment (ccme.ca)
[4] The full report is available online here: Governance Review – Phase 1 Implementation Plan and Advisory Committee Review - July 9/24 Regional Council | Halifax.ca.

activity bears relation to the test results. Research done by the Centre for Water Resource Studies[5] in the Paper Mill Lake Watershed has since pointed out that site-specific changes in water quality identified from lake sampling cannot be attributed to a single source and has recommended that individual developments should not be regulated based on trophic state indicators in a lake. Some reasons for this are:

1. Development-derived surface water contamination tends to originate from non-point sources, for example contamination tends to come from overland water flow across an entire site rather than from a single discharge pipe into a lake.
2. In-lake phosphorus, while easily measured, cannot be traced back to a single source. For example, phosphorus released by decomposing plant material in a lake cannot be differentiated analytically from phosphorus released by sediment flowing into a lake from a development site.

In cases where an exceedance of phosphorus is noted, staff can request confirmation testing and assess whether any corrective action is required by the developer as per their sedimentation and erosion plan.

DISCUSSION

The purpose of this report is to share the results of the water quality monitoring program in the Paper Mill Lake watershed undertaken as part of the Bedford West Development Agreements at the spring 2024 sampling event. A map identifying sampling locations is included in Attachment A. Sampling was done by WSP Canada Inc, and took place over two days on April 25-26, 2024.

Results from the spring 2024 sampling event are posted publicly on the HRM Lakes & Rivers webpage. Exceedances of the 10 µg/L phosphorus threshold were observed at every sampling location during the spring event. It should be noted that the sampling date was moved from late May to late April for the first time in 2024 to better capture mixing conditions in the lake. This change will better indicate the total phosphorus concentration in the entire water column of both lakes, which may not have been captured in May when stratification has begun in the lake.

Table 2: Spring 2024 Total Phosphorus

Sampling Location	Acceptable Phosphorus Concentration (µg/L)	April 25-26 Total Phosphorus (µg/L)	June 20 Total Phosphorus (µg/L)
PML-1	10	**24**	**12**
PML-2	10	**15**	**12**
HWY102-1	10	**26**	**72**
HWY102-2	10	**16**	**17**
LU	10	**26**	9
KL-1	10	**27**	**13**
KL-2	10	**21**	**13**
KL-3	10	**19**	**11**
KL-4	10	**28**	9
KL-5	10	**27**	**11**
LSD	10	**15**	**14**

[5] Presentation by Rob Jamieson, Ph.D., P.Eng., entitled “Phosphorus Loading and Trophic State Assessment in the Paper Mill Lake Watershed”, North West Community Council, November 15. 2016. The presentation can be found online here: https://legacycontent.halifax.ca/Commcoun/central/documents/161115nwcc1131pres.pdf.

Low-level total phosphorus values measured from spring sampling are listed in *Table 2*. Concentrations above the 10 µg/L threshold are in red. Staff requested that resampling for phosphorus take place at all locations. This resampling was completed over two days on June 19-20, 2024. The results of resampling are listed in *Table 2*.

Exceedances were observed at 9/11 sampling locations at the resampling event (*Table 2*). However, except for HWY102-1, all sample locations saw a decrease in total phosphorus from the original spring event. Future spring sampling events will be scheduled for the same late-April timeline to establish if the higher phosphorus concentrations observed in late-April represent a trend.

Total phosphorus reported in the municipality's LakeWatchers baseline water quality monitoring program was significantly lower than what was observed during the Bedford West Spring sampling. LakeWatchers samples were collected in Paper Mill Lake three weeks later than the Bedford West samples. Samples were collected in Kearney Lake ten days later than the Bedford West samples. Data from LakeWatchers sampling in all spring events are listed in *Table 3*.

Staff are investigating the low total phosphorus values that LakeWatchers samples are returning. Bedford West sample location KL-5 most closely correlates to the LakeWatchers' Kearney Lake Deep and Surface sampling locations, although it should be noted that KL-5 is nearer to shore, where decreased water circulation may lead to phosphorus concentrations not being fully representative of conditions in the lake. On Paper Mill Lake, sampling location PML-2 most closely correlates with LakeWatchers' Paper Mill Lake Deep and Surface sampling locations. However, PML-2 is located on the opposite shore of the lake to the Deep sampling location.

Table 3:Total Phosphorus Observed under LakeWatchers

Lake and location	RDL	2022	2023	2024
		May 4	**April 24**	**May 6**
Kearney - Deep	1.0	1.9 µg/L	4.4 µg/L	ND
Kearney - Surface	1.0	2.0 µg/L	4.6 µg/L	3.4 µg/L
Kearney - Outlet	1.0	1.6 µg/L	2.6 µg/L	240 µg/L
	RDL	**April 29**	**April 19**	**May 16**
Papermill - Deep	1.0	3.3 µg/L	2.2 µg/L	3.2 µg/L
Papermill - Surface	1.0	2.6 µg/L	1.8 µg/L	1.4 µg/L
Papermill - Outlet	1.0	2.5 µg/L	1.3 µg/L	4.2 µg/L

Other water quality parameters were measured that exceed thresholds set in the Nova Scotia Tier 1 Environmental Quality Standards for Surface Water and Groundwater Discharging to Surface Water (EQS).[6] These values are tabulated in Attachment B. These exceedances are consistent with results found during other sampling events under this program, and likely reflect background concentrations in the watershed.

[6] These standards can be found online here: Tab 3, NS Tier I EQS Surface Water and GW discharging to SW.xlsx (novascotia.ca).

To address the requirements of BWSPS Policy BW-5[7] moving forward, staff are taking a combination of approaches to monitoring and managing development impacts on water systems. Water quality data collected under this program and through other programs underway in the area subject to the Bedford West Development Agreements is being considered collectively to assess current watershed health and lake trophic status. Staff are using this information to inform future development approvals, and to develop a watershed management framework for the entire municipality, A description of these programs is below.

Development with the potential to affect lakes is being monitored as part of the LakeWatchers baseline water quality monitoring program. This program samples 73 lakes in the municipality semi-annually and reports the results against CCME thresholds. An example of this is the development underway at the former Penhorn Mall, upslope from Penhorn Lake.

A specific management plan for Kearney Lake, one of two primary lakes sampled under this program, was requested by Regional Council. A report recommending remediation actions was presented to Regional Council on August 23, 2022, and the recommendations put forward by staff in the report were accepted by Regional Council at that time. Staff are currently working to complete the recommended remediation, including sourcing designs to install floating treatment wetlands in Kearney Lake to lower the concentration of phosphorus in the water column.

In addition, staff are developing a framework for improved watershed-level management at the request of Regional Council. In coordination with the Green Network Plan and Regional Plan, this framework will support proactive protection of aquatic ecosystems and set water quality targets for managing land-based activities affecting water quality, aquatic and riparian ecosystems, and water resources. This framework will seek to manage collective land-use impacts on a watershed scale, in alignment with the terms of Policy BW-5 as quoted above.

FINANCIAL IMPLICATIONS

There are no financial implications associated with this report.

COMMUNITY ENGAGEMENT

No community engagement was required for this report.

LEGISLATIVE AUTHORITY

The Halifax Regional Municipality Charter, Part VIII, Planning and Development, Section 240, Development Agreements.

ATTACHMENTS

Attachment A Bedford West Water Quality Monitoring Program Sampling Locations
Attachment B Spring 2024 Exceedances

[7] Policy BW-5 states: In the event that water quality threshold levels, as specified under clause (c) of Policy BW-3, for Paper Mill Lake of Kearney Lake are reached, the Municipality shall undertake an assessment and determine an appropriate course of action respecting watershed management and future land use development in the area. An assessment shall consider the CCME guidelines. Water quality thresholds and any assessment reports shall be made available to the public

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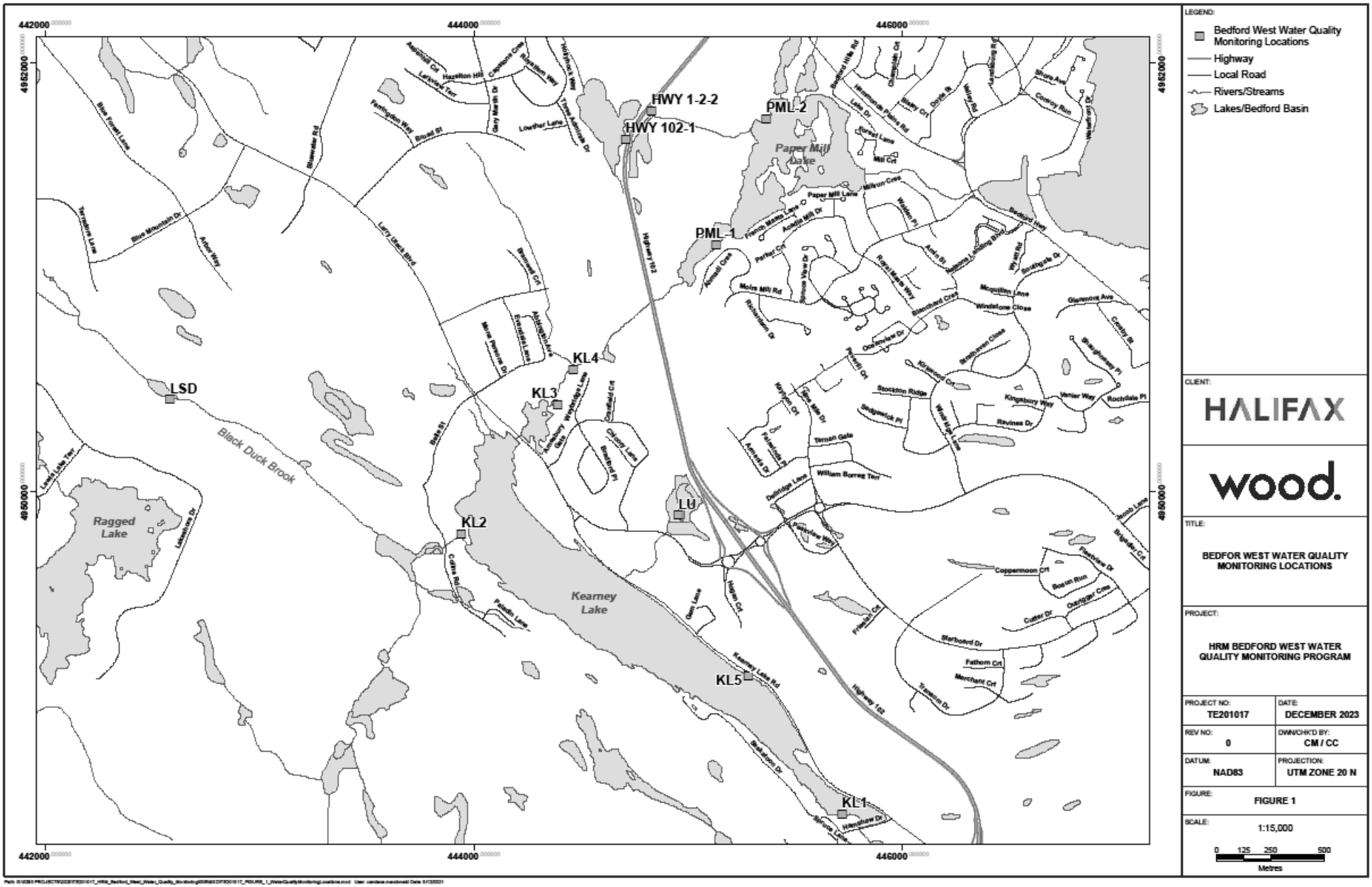
Attachment A – Bedford West Water Quality Monitoring Program Sampling Locations



Appendix B - Nova Scotia Tier 1 Environmental Quality Standards Exceedances Observed - Spring 2024

Water Quality Parameter	Lead (mg/L)	Aluminum (µg/L)	Zinc (µg/L)	Iron (µg/L)
Threshold Value	**1**	**5**	**7**	**300**
KL-1		216		
KL-5		176		
HWY-102-1		60		
HWY-102-2		82		664
LSD		232		417
LU	6.9	112	8	