



Environmental Assessment Branch

Nova Scotia Environment and Climate Change
Mount Uniacke Quarry Expansion Project

Environmental Assessment Registration Addendum

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Prepared for

Northumberland Capital Corporation Inc. (NCCI)

Submitted to

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1. Introduction

Northumberland Capital Corporation Inc. (NCCI) is proposing the expansion of its existing quarry (Industrial Approval # 2014-091797) in Mount Uniacke, Hants County, Nova Scotia (the Project; Figure 1). The expansion will allow for the possibility of adjustments to the existing alignment and layout of the quarry, in addition to the continued production of an average of 30,000-50,000 tons of aggregate annually. The expansion is proposed to take place over approximately 40.5 hectares (ha) of land and is anticipated to provide sufficient aggregate for the quarry for the next 30 to 50 years based on current market demands (Figure 2).

The proposed quarry expansion will exceed four hectares in total area and will therefore require environmental registration as a Class 1 Undertaking, pursuant to the Nova Scotia *Environment Act* and the associated *Environmental Assessment (EA) Regulations*. WSP was retained by NCCI to complete the Environmental Assessment for the proposed Quarry Expansion Project and the Environmental Assessment Registration Document (EARD) was submitted to Nova Scotia Environment and Climate Change (NSECC) in August 2023.

On October 6, 2023, the Minister of Environment issued a review suspension notice due to a Directive issued by NSECC on September 8, 2023, related to NCCI's active quarry footprint and rehabilitation plan for the quarry located at 213 Uniacke Mines Road (PID 45409950). NCCI complied with the Directive prior to the September 30, 2023, deadline; the Figures associated with this Addendum reflect the revised active quarry footprint resulting from the Directive.

The Minister of Environment issued a decision letter (File number: PNS-46442-M4H4Z2) for the EARD on September 16, 2024, to advise that there was missing information related to surface water that is required in order to evaluate potential environmental effects that may be caused by the Project.

WSP has been retained by NCCI to address the deficiencies outlined in the Minister's decision letter.

2. Water Balance Assessment

2.1 Surface Water Components

As part of the September 16, 2024, Minister of Environment's decision letter (File number: PNS-46442-M4H4Z2), the following was requested:

- A water balance assessment of potential impacts to the local hydrologic cycle as well as subsequent potential impacts to the wetland/watercourse system, including the headwaters of the Sackville River, over the duration of the proposed quarry expansion. This work must include:
 - An assessment of potential impacts to surface water resources identified in the vicinity of the proposed quarry expansion area, and any related mitigation measures
 - Justification of assumptions and parameters used for the water balance assessment (e.g., field monitoring), or validation of the approach/model used for this assessment
 - Consideration of climate change and/or severe weather conditions for the duration of the proposed quarry expansion
 - Development of a wetland monitoring plan to assess the impacts and inform mitigations for all potentially impacted wetlands adjacent to and downgradient of the proposed expansion

NCCI and WSP proposed a workplan to NSECC to address these items, during a meeting held on November 21, 2024. NSECC agreed to the principal of the workplan and emphasized the importance of detailing mitigation measures regarding changes in surface water quality. The workplan is as follows:

- Describe the area's hydrology and the interaction between onsite components (e.g. wetlands, watercourses, surface drainage, quarry);
- Watershed delineation pre and post quarry development to determine the possible changes of drainage areas and flow direction;
- Assuming that the quarry will discharge no water, assess the change in inflows to the receiving wetland immediately downstream. Compare the reduction in flows to the environmental flow criteria;
- Assess the potential for impacts of high-flow events. Utilize the rational method to describe the potential change in flows at both the receiving wetland and at the watercourse crossing at East Uniacke Road (as the nearest man-made structure that can be impacted by flooding);
- Assess the changes in high-flows for the quarry development, assuming the quarry is 100% impervious and that no flow control exists at the sedimentation pond. As a comparison point, the flow gauge on the Sackville River will be used;
- Describe the impacts of mitigation efforts on the low-flow and high-flow regimes at the site. This will require details on the existing and proposed sediment ponds and flow channels or structures; and

- Describe the anticipated effects of climate change on the low-flow and high-flow regimes in Nova Scotia and how this will impact the area's hydrology. Note that this is largely independent of the quarry development.

These analyses and the results are detailed in the subsequent subsections.

2.1.1 Surface Water Conditions

The Study Area is located on the upper extent of the Sackville River watershed (Figure 3). A review of aerial imagery and the Nova Scotia Hydrographic Network (Service NS, 2023) identified one waterbody, one watercourse and one wetland within 1 km of the Project site. The waterbody, Little West Lake, is situated 250 m north of the Study Area and 950 m from the current active quarry, and is located within an adjacent local watershed (Cockscombe Watershed on Figure 4, Appendix A) to the Project site (East Uniacke Watershed on Figure 4, Appendix A). The wetland is at the headwater of the Sackville River, located approximately 220 m south of the Study Area and active quarry. No natural watercourses or other water features were noted within the proposed quarry expansion area during field investigations.

Forestry operations carried out previously by Elmsdale Lumber Company within the Study Area appear to have altered surface water hydrology, with current conditions consisting of sporadic unconsolidated overland flow without the presence of incised channels. Given this lack of channels, there is no interaction between watercourses and other features (e.g., wetlands). Instead, water makes its way over land as direct runoff feeding into the nearby wetland or lakes. There is also the possibility of some groundwater interaction between these water features, but this is likely minimal, if present.

The existing quarry is tapered at an approximate 2% grade in such a way that precipitation falling on the quarry floor is directed to a 26.8 m long by 21.3 m wide by 1.8 m deep settling pond. This pond discharges water in the direction of the downstream wetland and eventually the Sackville River. The flow path from the settling pond to the wetland is densely vegetated with graminoids, shrubs and some trees. Precipitation falling outside of the quarry floor is not managed; however, a berm positioned parallel to the edge of the cliff face prevents surface water runoff from entering the quarry from above.

While the parcel on which the Project is located (PID 45155801) drains in multiple different directions (Little West Lake and Cockscomb Lake to the west and Long Lake to the North), the entirety of the quarry site (existing and proposed) drains toward the wetland and the Sackville River (see Figure 4). The proposed quarry expansion therefore does not modify watershed areas.

2.1.2 Environmental Effects Assessment – Low Flows

As part of the environmental effects assessment, the impact of the proposed quarry on low flows was analyzed. It was found that the entire proposed quarry area is contained within the same local watershed, and as such, it is anticipated that the proposed expansion of the quarry will not alter the size of the watershed. Since the watershed area is not changing, the changes in the hydrologic regime associated with alteration of topography and land use associated with the quarry should be minimal. However, to quantify the possible impact of low flows at the receiving wetland, a water balance assessment was completed. A conservative approach was employed to emphasize the minimal changes expected. Specifically, it was assumed that the entirety of the proposed quarry area would not discharge any water. This would represent a scenario where the settling pond was no longer discharging any water (e.g., a blocked outlet). This situation would not occur for very long, if at all, and is considered an extreme case. It is more likely that any blockage would be identified and remedied quickly (e.g., during weekly inspections), or that the settling pond would overtop, and the water would make its way downgradient.

The water balance assessment assumes that water entering the site (e.g., from precipitation) must either exit the site or be stored on site. Water can be subject to evapotranspiration, infiltration, or runoff (or streamflow). For the wetland being assessed, it can be assumed that the overall evapotranspiration, infiltration and precipitation, pre and post quarry expansion, will remain unchanged. As such, the uncertainty of these parameters does not impact the water balance assessment. Any uncertainty equally impacts the pre and post quarry expansion, and so the analysis and conclusions remain the same. The only parameter being modified in the water balance is the drainage area (by removing the quarry area), and therefore, runoff entering the wetland. For the purposes of this assessment, it is assumed that the rolling development-remediation area is 10-hectares. This allows for the comparison of drainage area change for both a 10-hectare development area and for the entire proposed development area of 40.5-hectares, as if there would be no remediation throughout the life of the quarry in sections that are no longer active (refer to Table 1). This is the most conservative estimate and is being shown for comparison. The estimated change in flows based on the water balance assessment for the receiving wetland are also shown in Table 1. As indicated, the impacts on the flow entering the wetland are minimal, particularly in the case of a 10-hectare quarry. The anticipated -0.8% reduction compared to present conditions is negligible. The -5.3% reduction for the total area is also minimal, and has assumed conservative estimates. Given that the watershed area for the wetland does not change, the change in flow amounts is likely much less than the -5.3% stated as the proposed quarry would likely absorb less water than the undisturbed ground, and increased runoff would be expected. This increase could assist in alleviating drought concerns. It is also possible that the proposed quarry would modify the timing of flows into the wetland, but this would be minimal (in the order of hours or days, not weeks).

Given the above, the development of the proposed quarry will not significantly impact the ecological flows or the surface water and flow regimes at the wetland. The impact is further reduced as the drainage area accumulates moving downstream, and therefore, less significant on the Sackville River.

Table 1: Water Balance Assessment for the Proposed Quarry Development

	Present Condition	10 ha Quarry	40.5 ha Quarry
Drainage Area (ha)	678.3	672.6	642.1
Drainage area (% change from present condition)	N/A	-0.8%	-5.3%
Flow (% change from present condition)	N/A	-0.8%	-5.3%

2.1.3 Environmental Effects Assessment – High Flows

In addition to assessing the potential impacts on low flows, it is important to assess the potential impacts on high flows. To estimate the high flows, the Rational Method (MNRFAQ 2024) is used (Equation 1). This methodology is useful in estimating high flows based on return period precipitation (e.g. 1:20-year rainfall). It uses the terrain's slope, soil type, and land cover to estimate how much of the precipitation would be absorbed into the ground and how much would become runoff. Some factors can also be applied for storage and routing.



Equation 1

$$Q = C * I * A * F$$

Where:

Q= Flow in m³/s

A = Drainage area (km²)

C= Runoff coefficient (dimensionless)

F= Adjustment factor for storage and routing

I= Rainfall intensity (mm/hr)

The precipitation intensity is taken from widely used Intensity-Duration-Frequency (IDF) curves (UWO 2015). It requires the watershed time of concentration, which is estimated based on watershed slope and length of channel flow (if any). The time of concentration is equal for pre and post quarry development, and so any uncertainty in this value is equal for both conditions and does not impact the assessment. The runoff coefficient is estimated based on soil type and land use (MTQ 2020). Similar to the time of concentration, the runoff coefficient (outside of the quarry) is equal for the for pre and post quarry development. Any uncertainty in this value is equal for both conditions and does not impact the assessment. For this study, the quarry is assumed to be completely impervious, and therefore, all rainfall directly runs off. It is also assumed that the settling pond does not provide any attenuation of flows. Both of these assumptions are conservative and will overestimate flows. The parameters used in the analyses are presented in Table 2. The results of the analysis at the quarry outlet, receiving wetland, and the Sackville River crossing at East Uniacke Road (as the nearest man-made structure that can be impacted by flooding) are shown in Table 3.

Table 2: Parameters used in the Rational Method for the High-flow Analysis Scenarios

	Quarry Outlet			Receiving Wetland			East Uniacke Road		
	Present Conditions	10 ha quarry	40.5 ha quarry	Present Conditions	10 ha quarry	40.5 ha quarry	Present Conditions	10 ha quarry	40.5 ha quarry
Drainage Area (km ²)	0.043	0.1	0.405	6.783	6.783	6.783	16.644	16.644	16.644
Lake Area (km ²)	0	0	0	0	0	0	0.401	0.401	0.401
Wetland Area (km ²)	0	0	0	0.866	0.866	0.866	1.320	1.320	1.320
Watercourse length (km)	N/A	N/A	N/A	2.5	2.5	2.5	5.2	5.2	5.2
Watercourse 10-85 slope (%)	N/A	N/A	N/A	0.107%	0.107%	0.107%	0.128%	0.128%	0.128%
Watershed Average Slope (%)	2%	2%	2%	4.17%	4.17%	4.17%	4.41%	4.41%	4.41%
Soil Type	Bedrock	Bedrock	Bedrock	Organic / Bedrock	Organic / Bedrock	Organic / Bedrock	Organic / Bedrock	Organic / Bedrock	Organic / Bedrock

Table 3: Results of the Rational Method Analysis

	Quarry Outlet			Receiving Wetland			East Uniacke Road		
	Present Conditions	10 ha quarry	40.5 ha quarry	Present Conditions	10 ha quarry	40.5 ha quarry	Present Conditions	10 ha quarry	40.5 ha quarry
Drainage Area (km ²)	0.043	0.1	0.405	6.783	6.783	6.783	16.644	16.644	16.644
Runoff Coefficient	1	1	1	0.385	0.390	0.416	0.414	0.416	0.426
Time of Concentration (min)	<10	<10	<10	146	146	146	213	213	213
1:20-year Precipitation Intensity (mm/hr)	86.4	86.4	86.4	21.2	21.2	21.2	16.9	16.9	16.9
1:100-year Precipitation Intensity (mm/hr)	108.4	108.4	108.4	26.1	26.1	26.1	20.8	20.8	20.8
Storage/Routing reduction factor	1	1	1	0.58	0.58	0.58	0.66	0.66	0.66
1:20-year Peak flow (m ³ /s)	1.03	2.40	9.72	8.84	9.00	9.58	21.19	21.30	21.83
1:100-year Peak flow (m ³ /s)	1.29	3.01	12.19	10.94	11.13	11.85	26.16	26.30	26.95

As indicated in Table 3, precipitation intensity for a 1:20 year event is 86.4 mm/hour and 108.4 mm/hr for a 1:100 year event. Based on this:

- The proposed 40.5 hectare quarry development would increase the existing quarry development drainage area from 0.043 km² to 0.401 km², respectively;
 - The receiving wetland would experience an 8.0% increase for both a 1:20-year and 1:100-year flow. This is not a significant change for a large wetland that can provide some storage and attenuation.
 - East Uniacke Road would experience a minor increase of 3.0% for both a 1:20-year and 1:100-year flow.
- The simulated 10 hectare rolling development-remediation quarry would be less impactful, increasing the existing quarry development drainage area from 0.043 km² to 0.100 km², respectively;
 - The receiving wetland would experience a 1.8% increase for both a 1:20-year and 1:100-year flow.
 - East Uniacke Road would experience an increase of 0.5% for both a 1:20-year and 1:100-year flow.

As a comparison point, the Sackville River flow gauge (WSC 2024) is located near the mouth of the Sackville River and has a much larger drainage area (146 km²) than the areas analyzed above. At this gauge, the highest peak flows in over 50 years of records are in the range of 80 m³/s to 110 m³/s. Therefore, the increases of less than 1 m³/s noted above are negligible.

Considering the above analysis, it is concluded that the proposed quarry does not significantly impact the potential for high-flow or flooding events downstream.

2.1.4 Environmental Effects Assessment – Climate Change

It is well known that the climate is changing and impacting weather conditions in Nova Scotia and globally. It is therefore relevant to assess the climate change impacts in the area and the risk associated with these. The Understanding Climate Change Impacts in Relation to Wellbeing for Nova Scotia – Final Synthesis Report (ESSA Technologies Ltd. 2022) was prepared for NSECC. This report suggests a 2.6°C increase in mean annual temperature from 2010 (6.6°C) to 2095 (9.2°C) for the RCP4.5 climate scenario. The RCP4.5 climate scenario is generally in line with current greenhouse gas emission trajectories, and is a reasonable scenario to use for climate analyses. The report also suggests a 6.4% increase in annual precipitation from 2010 (1315 mm) to 2095 (1399 mm), an increase of 84 mm per year on average. This includes an 4% increase in precipitation in the traditionally dry summer months (from 259 mm to 269.5 mm). Intensity of extreme rainfall is expected to increase by approximately 10%, with the maximum 1-day storm increasing from 53.2 mm to 58.3 mm.

The increased precipitation in the summer months can help alleviate present-day drought concerns, although this is partially offset by increased evapotranspiration due to the increased temperatures. Adaptation to drought conditions for the proposed quarry or receiving wetland due to climate change is not anticipated to be necessary.

The increased intensity of extreme rainfall can have impacts on the proposed quarry and therefore the receiving wetland. A 10% increase in extreme rainfall implies that flooding issues may become more prevalent. As discussed in the following section, the settling pond is a useful mitigation tool to manage some of these impacts. In addition, the wetland itself can mitigate impacts downstream of the wetland, such as on the Sackville River.

It should be noted that climate change and its impacts on the local meteorology and surface water conditions are independent of the proposed quarry and would occur regardless of its presence. Therefore, it is not possible for the proposed quarry development to limit the effects of climate change on local meteorology, but only to adapt to them.

2.1.5 Environmental Effects Assessment – Mitigation Measures

An important component of the environmental effects assessment are the mitigation measures used to minimize impacts on the environment from the proposed project. The mitigation measures are separated into four categories:

- Water quantity;
- Water quality;
- Fish and fish habitat; and
- Wetlands health.

The mitigation measures for water quantity are discussed below. The mitigation measures for water quality are discussed in Section 2.2. The mitigation measures for fish and fish habitat and wetland health are discussed in the original EA registration document (WSP 2023). A wetland monitoring plan is described in Section 2.1.6 of the present report.

The proposed quarry development is not expected to significantly affect downstream water quantity. However, identifying mitigation measures remains necessary to ensure any impacts are minimized. As discussed in previous sections, the existing quarry drains towards a settling pond with an outlet towards the receiving wetland. The quarry expansion will use the current flow path, with adjustments to the pond size or the addition of new ponds as needed to meet engineering and NSECC standards for the increased quarry area. It is anticipated that up to 10 hectares



will be active at once, while inactive sections will undergo ongoing reclamation. The site drainage and settling ponds will be designed as appropriate for this expansion regime, accounting for climate change, as per NSECC Industrial Approval requirements. The settling pond will contribute to mitigating impacts downstream of the quarry by attenuating high-flows and providing a consistent low-flow discharge from the site, to the extent possible, and protecting downstream areas from drought conditions. Sizing of the settling pond is outside of the scope of this EA.

Additionally, as part of the wetland monitoring plan, shallow monitoring wells will be installed in the receiving wetland where water levels will be measured quarterly. This will serve as the basis for long-term monitoring of any impacts on inflows to the wetland. It is anticipated that any differences in water levels will be negligible and attributable to long-term meteorological conditions and changing climates. However, the monitoring wells can signal if abrupt, unexplained changes occur within the wetland. The causes can then be investigated to determine if the quarry is adversely impacting the wetland and determine the appropriate actions to remediate any issues.

2.1.6 Wetland Monitoring Plan

The wetland monitoring plan has been developed based on the results of the water balance assessment and has been reviewed with NSECC's wetland specialist in advance of submission to the EA Branch.

It is recommended that a combination of shallow monitoring wells and visual assessment monitoring locations be established within the wetland associated with the Sackville River headwaters, located downstream of the Project site. The following subsections provide the recommended monitoring methodologies for the duration of the quarry expansion Project.

2.1.6.1 Methodologies

The monitoring program is designed to assess hydrological and vegetative conditions within existing wetland habitat to allow for early detection of changes in wetland hydrology and plant communities, as well as wetland function. The hydrological assessment involves the collection of static water level data from shallow monitoring wells installed within the wetland, as well as the documentation of other indicators of wetland hydrology (refer to Section 2.1.6.1.1 Hydrology). Visual assessment of the wetland area will include photo documentation and vegetation plots to facilitate comparisons between years (refer to Section 2.1.6.1.2 Visual Assessment).

The following sections outline the specific data gathering techniques used for evaluation of hydrologic and vegetative conditions within the wetlands.

2.1.6.1.1 Hydrology

Wetland hydrology is assessed using visual indicators (refer to Table 4) and shallow monitoring wells installed within the natural wetland habitat. A monitoring well is constructed using a 2" x 5' PVC screen with a 2" PVC point on the bottom, connected to a 2" x 5' PVC casing which extends above the ground; the casing and screening are cut to length based on the required well depth which is dug using an Eijkelkamp soil auger. The screen is wrapped in filter fabric cloth prior to installation to allow water to filter into the well without sediment and debris, and the casing is sealed with a j-plug. The static water level is recorded from the monitoring well location during quarterly monitoring events, in addition to the collection of in-situ water quality parameters using a YSI Professional Plus Multiparameter Water Quality Meter, or comparable device.

Table 4: Wetland hydrology indicators (NS Wetland Delineation Form, adopted from USACOE 2011)

Primary Indicators		
▪ Surface Water	▪ High Water Table	▪ Saturation
▪ Water Marks	▪ Sediment Deposits	▪ Drift Deposits
▪ Algal Mat or Crust	▪ Iron Deposits	▪ Inundation Visible on Aerial Imagery
▪ Sparsely Vegetated Concave Surface	▪ Water–Stained Leaves	▪ Aquatic Fauna
▪ Marl Deposits	▪ Hydrogen Sulfide Odour	▪ Oxidized Rhizospheres on Living Roots
▪ Presence of Reduced Iron	▪ Recent Iron Reduction in Tilled Soils	▪ Thin Muck Surface

Secondary Indicators		
▪ Surface Soil Cracks	▪ Drainage Patterns	▪ Moss Trim Lines
▪ Dry–Season Water Table	▪ Saturation Visible on Aerial Imagery	▪ Stunted or Stressed Plants
▪ Geomorphic Position	▪ Shallow Aquitard	▪ Microtopographic Relief
▪ FAC–Neutral Test		

2.1.6.1.2 Visual Assessment

A visual assessment will be completed by a qualified wetland specialist in July of each year at two visual assessment monitoring locations positioned at the proposed monitoring well locations (refer to Figure 5). Wooden stakes will be installed to allow for assessment of the same locations between monitoring years.

The assessment will include photographs taken in all four cardinal directions and the completion of a vegetation plot to document herbaceous, shrub, and tree species relative percent cover at the visual assessment monitoring locations using the data point methodology to identify groups of plants as follows:

- All plants under 1 m in height (i.e., the herbaceous layer);
- All plants over 1 m in height but less than 7.5 cm in diameter (i.e., the shrub layer); and
- All plants over 1 m in height and greater than 7.5 cm in diameter (i.e., the tree layer).

Observations of the wetland area will be used to determine if the wetland hydrology and/or plant community has changed significantly.

2.2 Water Quality Conditions

The Minister of Environment's decision letter (File number: PNS-46442-M4H4Z2) requested the following information for baseline water quality conditions:

- *Detail regarding water quality conditions and water quality monitoring results for the settling pond and in the wetland/watercourse system including headwaters of the Sackville River. This work must include:*
 - *Information on total suspended solids (TSS); and,*
 - *Information on general chemistry and metals laboratory analysis for the characterization and assessment of water quality. Rationale must be provided if any aspects of this analysis are determined to be not necessary.*

WSP proposed the following items to NSECC at a meeting on November 21, 2024:

- Prepare a summary table of the water quality conditions ((i.e., TSS and pH) collected from 2015 to 2024 from the settling pond outflow and the headwaters of the Sackville River; and,
- Prepare a summary table of the general chemistry and water quality monitoring results from baseline samples from the settling pond outflow location, collected in November 2024; and
- Prepare a proposed water quality monitoring plan based on the results of the 2024 analysis.

2.2.1 Surface Water TSS and pH Monitoring

The current Industrial Approval (No. 2014-091797) for the Mt. Uniacke Quarry requires monthly surface water monitoring and monitoring within 48 hours of major rain events (exceeding 7 mm/hour precipitation), to ensure that water exiting the quarry settling pond meets the specified water quality parameters. Samples are also collected quarterly (four times/year) from the receiving wetland to monitor for any changes in surface water quality. To date, no samples have exceeded the limits outlined in the current industrial approval for TSS and pH.

A summary of the surface water TSS and pH data collected between 2015 and 2024 is provided in Appendix B.

2.2.2 General Chemistry and Total Metals

In addition to the standard TSS and pH data collected monthly at the settling pond outfall, general chemistry and total metals testing was also completed on the water samples collected during the November 20, 2024 monitoring event. Refer to Appendix C for a summary of the results for all general chemistry and total metals testing events to-date.

The general chemistry and total metals values were compared to the Canadian Council of Ministers of the Environment (CCME) guidelines for the Protection of Aquatic Life, where applicable. The water outflowing from the settling pond had one exceedance, Nitrite as N. The CCME guidelines do not have a recommendation of short-term concentrations; however, long term concentrations should not exceed 0.06 m/L; the water collected from the settling pond had a value of 0.15 m/L.

According to the Canadian Water Quality Guidelines (1987-1997), small fish are less sensitive than adult individuals to nitrites in freshwater and salmonids are the most sensitive species to nitrites. Studies have shown that juvenile steelhead trout who were exposed to nitrites over a 6-month period showed increased levels of methemoglobin but did not suffer from tissue damage until nitrite levels reached 0.06 mg/L. However, higher chloride levels can reduce the effect nitrites have on salmonids. Because methemoglobin is a derivative of hemoglobin (which is unable to bond with oxygen), it is possible that liver hypoxia is the cause of nitrite toxicity. Because levels higher than 0.06 mg/L are unlikely to exist in natural surface water, levels below the 0.06 mg/L should not have an effect of salmonids.

As part of the January 2025 scheduled quarterly monitoring event, in addition to the standard TSS and pH analyses for water samples collected from the receiving wetland, general chemistry and total metals were also assessed. The sampling location nearest to the quarry, SW3, was frozen during the site visit so the water sample collected downstream at SW4, was tested. Future general chemistry and total metals analyses will be completed at SW3, whenever possible. The water sample collected on January 24, 2025, was found to have a Nitrite as N value of <0.05 mg/L. Other notable results included a pH of 4.99, which falls below the CCME guidelines (6.5 – 9.0), but within the tolerance range for brook trout according to Raleigh (1982), Total Iron was 244 µg/L, 56 µg/L below the limit of exceedance. Total Aluminum was notably higher within the SW4 water sample when compared to the settling pond sample, though no limit of exceedance has been established by CCME, 231 µg/L and 96 µg/L / 184 µg/L (see note about additional testing below), respectively.

In February 2025, the settling pond was pumped out to allow for maintenance of the pond to be completed. The water removed from the settling pond was trucked off-site for disposal. In March 2025, NCCI requested another round of tests for general chemistry and total metals be completed on the settling pond outflow. The sample was collected on March 12, and had lower levels of most parameters compared to the sample collected in November 2024, with a Nitrite as N value of <0.05 mg/L. It was speculated that the elevated nitrite levels within the settling pond were the result of residues left within the quarry from previous blasting activities and collected by surface water as it flows across the surface of quarry.

2.2.3 Water Quality Monitoring Plan

Based on the consistency of the TSS and pH values over time at all three surface water sampling locations (refer to Figure 5), as well as the results of the general chemistry and total metals analyses completed in November 2024 and March 2025, it recommended that general chemistry and total metals be tested annually from both the settling pond outfall and the Sackville River headwaters (Outfall and SW3 on Figure 5). It is also recommended that for the next year nitrite levels be tested in the settling pond outfall during the monthly surface water monitoring events (to monitor TSS and pH), which are completed as a condition of the Industrial Approval. Following one year of data collection, the surface water monitoring plan will be reevaluated to determine if nitrite testing should continue to be monitored monthly, or if testing can be decreased. In the event that additional exceedances are reported in future, the monitoring plan may need to be revised to increase the number of monitoring events per year, and consultation with regulators may be required to address any potential concerns.

References

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wsp

A

Figures





KEY MAP:

LEGEND:

- EXISTING QUARRY - LOT MA1 (~4 ha)
- PROPOSED EXPANSION AREA (40.5 ha)
- PID 45155801
- PROPERTY BOUNDARIES

MAPPED WATER FEATURES

- WATERCOURSES
- WATERCOURSES (INDEFINITE)
- MAPPED WATERBODIES
- MAPPED WETLANDS
- FIELD IDENTIFIED WETLANDS

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PROJECT:
PROJECT:
MT. UNIACKE QUARRY EXPANSION - ADDENDUM

PROJECT NO.: **CA0046632.0394**

CLIENT:
NORTHUMBERLAND CAPITAL CORPORATION INC.

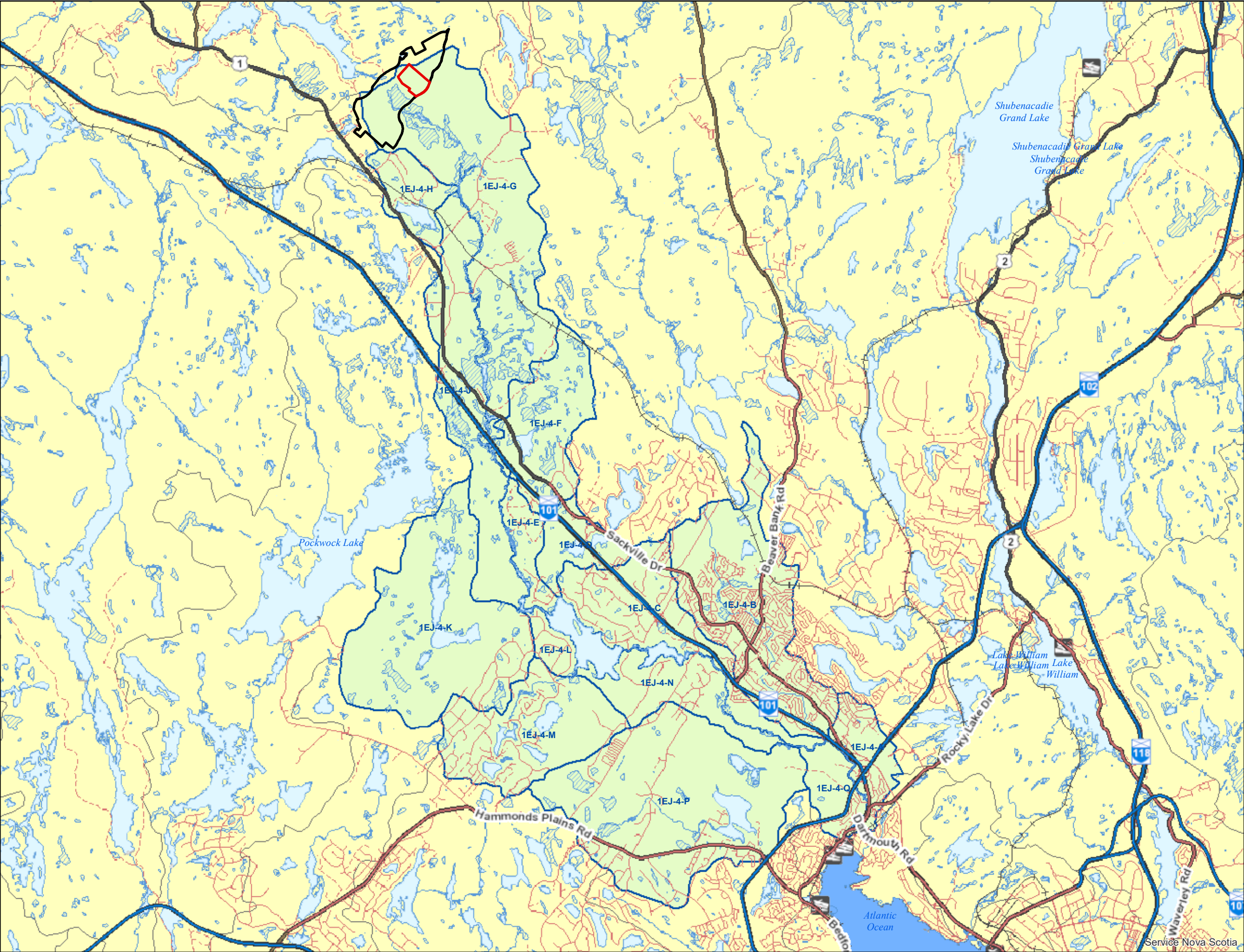
FIGURE:
TITLE:
PROJECT LOCATION

FIGURE NO.: 2	REVISION NO.: 0
----------------------	------------------------

SCALE: 1:15,000

DATUM: NAD 83 CSRS	PROJECTION: UTM ZONE 20 NORTH
DRAWN BY: M. MARRIOTT	CHECKED BY: E. GILLIS
CREATED DATE: (YYYY-MM-DD) 2025-01-17	REVISION DATE: (YYYY-MM-DD) 2025-01-17

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KEY MAP:

LEGEND:

- PROPOSED EXPANSION AREA (40.5 ha)
- PID 45155801
- TERTIARY_WATERSHEDS
- SECONDARY WATERSHEDS
 - OTHER WATERSHEDS
 - SACKVILLE RIVER

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PROJECT:

PROJECT:

MT. UNIACKE QUARRY EXPANSION - ADDENDUM

PROJECT NO.: **CA0046632.0394**

CLIENT: **NORTHUMBERLAND CAPITAL CORPORATION INC.**

FIGURE:

TITLE: **WATERSHEDS**

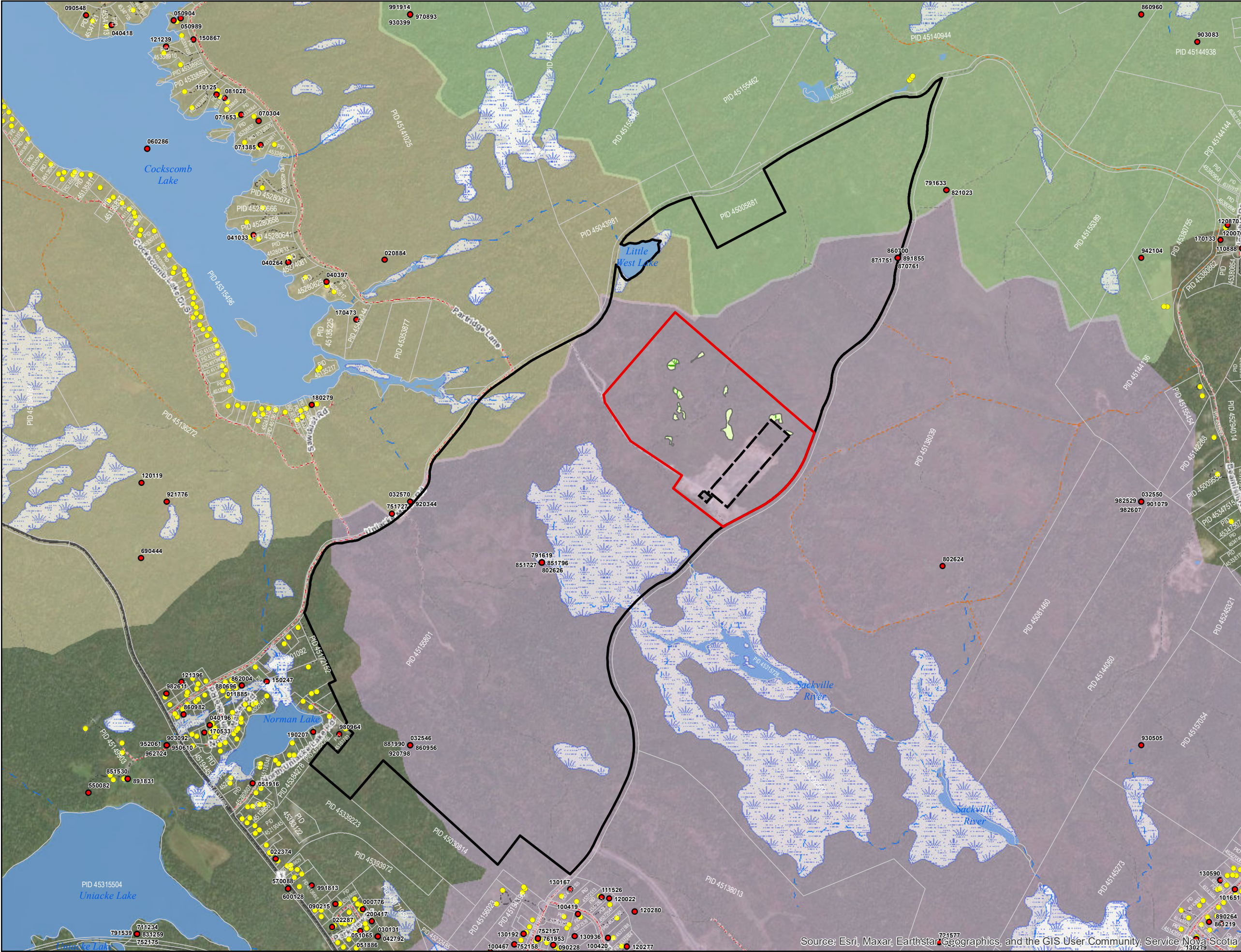
FIGURE NO.: 3	REVISION NO.: 0
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SCALE: 1:100,377

0 1 2 4 Kilometers

DATUM: NAD 83 CSRS	PROJECTION: UTM ZONE 20 NORTH
DRAWN BY: M. MARRIOTT	CHECKED BY: J. BOISVERT
CREATED DATE: (YYYY-MM-DD) 2025-01-10	REVISION DATE: (YYYY-MM-DD) 2025-01-14

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KEY MAP:

LEGEND:

NS WATER WELL LOGS

- DRILLED
- DUG
- BUILDING LOCATIONS
- ▭ EXISTING QUARRY - LOT MA1 (~4 ha)
- ▭ PROPOSED EXPANSION AREA (40.5 ha)
- ▭ PID 45155801
- ▭ PROPERTY BOUNDARIES

MAPPED WATER FEATURES

- WATERCOURSE
- WATERCOURSE (INDEFINITE)
- ▭ MAPPED WATERBODIES
- ▭ MAPPED WETLANDS
- ▭ FIELD IDENTIFIED WETLANDS
- ▭ EAST UNIACKE WATERSHED
- ▭ LONG WATERSHED
- ▭ COCKSCOMBE WATERSHED

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PROJECT:

PROJECT:

MT. UNIACKE QUARRY EXPANSION - ADDENDUM

PROJECT NO.: **CA0046632.0394**

CLIENT: **NORTHUMBERLAND CAPITAL CORPORATION INC.**

FIGURE:

TITLE: **BUILDINGS, WELLS AND WATERSHEDS**

FIGURE NO.: 4	REVISION NO.: 0
----------------------	------------------------

SCALE: 1:15,000

0 200 400 800 Metres

DATUM: NAD 83 CSRS	PROJECTION: UTM ZONE 20 NORTH
DRAWN BY: M. MARRIOTT	CHECKED BY: J. BOISVERT
CREATED DATE: (YYYY-MM-DD) 2025-01-15	REVISION DATE: (YYYY-MM-DD) 2025-01-17

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PATH: S:\GIS\2_PROJECTS\2024\CA0046632_CA_NCCI_MtUniacke_PostEA_Support\8_MXD\2025_Addendum_Figures\20250110_CA0046632_MtU_Quarry_FIG04_Buildings_Wells_watersheds.mxd

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community, Service Nova Scotia



KEY MAP:

LEGEND:

- PROPOSED SHALLOW MONITORING WELL LOCATIONS
- PROPOSED VISUAL ASSESSMENT MONITORING LOCATIONS
- SURFACE WATER SAMPLING LOCATIONS (EST. IN 2015)
- EXISTING QUARRY - LOT MA1 (~4 ha)
- PROPOSED EXPANSION AREA (40.5 ha)
- PID 45155801
- FIELD IDENTIFIED WETLANDS

MAPPED WATER FEATURES

- WATERCOURSE
- WATERCOURSE (INDEFINITE)
- MAPPED WATERBODIES
- MAPPED WETLANDS

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PROJECT:
PROJECT:
MT. UNIACKE QUARRY EXPANSION - ADDENDUM

PROJECT NO.: **CA0046632.0394**

CLIENT:
NORTHUMBERLAND CAPITAL CORPORATION INC.

FIGURE:
TITLE:
SURFACE WATER & WETLAND MONITORING LOCATIONS

FIGURE NO.: 5	REVISION NO.: 0
----------------------	------------------------

SCALE: 1:10,000

DATUM: NAD 83 CSRS	PROJECTION: UTM ZONE 20 NORTH
DRAWN BY: M. MARRIOTT	CHECKED BY: J. BOISVERT
CREATED DATE: (YYYY-MM-DD) 2025-08-05	REVISION DATE: (YYYY-MM-DD) 2025-08-05

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B

Surface Water TSS and pH from 2015 - 2024



Table 1: Summary of Surface Water Sampling Results

Date	Sampling Event Type	Outfall		SW1		SW2		SW3		SW4		Notes
				5553680 E	4975323 N	5554391 E	4975247 N	5554131 E	4974494 N	5554681 E	4974053 N	
		pH	TSS (mg/L) ¹	pH	TSS (mg/L)	pH	TSS (mg/L)	pH	TSS (mg/L)	pH	TSS (mg/L)	
12-Dec-24	Monthly	7.34	<5	-	-	-	-	-	-	-	-	Outfall had flow, cattails blocking flow slightly worker cleared cattails from pipe.
20-Nov-24	Monthly	7.91	<5	-	-	-	-	-	-	-	-	Outflow has partial blockage of cattails; plant material removed, and water collected. Standard Water Analysis + Total Metals completed.
07-Oct-24	Monthly	-	-	-	-	-	-	-	-	-	-	Outfall had no flow, water in pond, pipe was replaced but no water coming out of pipe but seepage noted from berm; no sample taken. Client notified; settling pond lining repaired.
27-Sep-24	Monthly	-	-	-	-	-	-	-	-	-	-	Outfall had no flow, lots of water in pond. No sample taken. Client notified; pipe replaced.
21-Aug-24	Quarterly	8.09	<5	-	-	-	-	6.93	<5	5.64	<5	Outfall minimal flow, all sampling points sampled.
23-Jul-24	Monthly	7.35	<5	-	-	-	-	-	-	-	-	Outfall flowing, no obstructions.
17-Jun-24	Monthly	7.49	<5	-	-	-	-	-	-	-	-	Outfall flowing, no obstructions.
10-May-24	Monthly	7.66	<5	-	-	-	-	-	-	-	-	Outfall flowing, no obstructions.
10-Apr-24	Quarterly	7.09	<5	-	-	-	-	6.96	<5	5.34	<5	Outfall flowing, all sampling site sampled.
11-Mar-24	Monthly	7.56	<5	-	-	-	-	-	-	-	-	Outfall flowing, sample taken after 2 rain events.
26-Feb-24	Monthly	-	-	-	-	-	-	-	-	-	-	Outfall minimal flow covered in deep snow (>50 cm), after rain event, no sample taken.
24-Jan-24	Quarterly	6.84	<5	-	-	-	-	-	-	6.09	<5	Outfall flowing, SW3 frozen over.
19-Dec-23	Monthly + Rain Event	6.6	<5	-	-	-	-	-	-	-	-	Outfall flowing
20-Nov-23	Monthly + Rain Event	7.54	<5	-	-	-	-	-	-	-	-	Outfall flowing
19-Oct-23	Quarterly	7.03	<5	-	-	-	-	6.54	<5	5.44	<5	Outfall flowing, all sampling sites sampled
10-Oct-23	Rain Event	7.56	<5	-	-	-	-	-	-	-	-	Outfall flowing
25-Sep-23	Monthly	6.9	<5	-	-	-	-	-	-	-	-	Outfall flowing
21-Aug-23	Monthly	6.99	<5	-	-	-	-	-	-	-	-	Outfall flowing
31-Jul-23	Quarterly	6.41	<5	-	-	-	-	6.16	<5	5.5	<5	Outfall flowing, all sampling sites sampled
04-Jul-23	Rain Event	6.68	<5	-	-	-	-	-	-	-	-	Outfall flowing, rain event
06-Jun-23	Monthly	6.6	<5	-	-	-	-	-	-	-	-	Outflow flowing

Table 1: Summary of Surface Water Sampling Results

Date	Sampling Event Type	Outfall		SW1		SW2		SW3		SW4		Notes
				5553680 E	4975323 N	5554391 E	4975247 N	5554131 E	4974494 N	5554681 E	4974053 N	
		pH	TSS (mg/L) ¹	pH	TSS (mg/L)	pH	TSS (mg/L)	pH	TSS (mg/L)	pH	TSS (mg/L)	
02-May-23	Monthly	7.18	<5	-	-	-	-	-	-	-	-	Outfall flowing, rain event prior to collection
14-Apr-23	Quarterly	6.79	<5	-	-	-	-	6.09	<5	5.49	<5	Outfall flowing, all sampling sites sampled
13-Mar-23	Monthly	7.32	<5	-	-	-	-	-	-	-	-	Outflow flowing, slight ice build-up down-slope of outflow
07-Feb-23	Monthly	6.61	<5	-	-	-	-	-	-	-	-	Outflow flowing, ice build-up down-slope of outflow
11-Jan-23	Quarterly	6.74	<5	-	-	-	-	5.9	<5	5.37	<5	Outflow flowing
06-Dec-22	Monthly	6.92	<5	-	-	-	-	-	-	-	-	Outflow flowing
07-Nov-22	Monthly	6.63	<5	-	-	-	-	-	-	-	-	Outflow flowing
11-Oct-22	Quarterly	6.94	<5	-	-	-	-	5.54	<5	4.97	<5	Outflow flowing
13-Apr-22	Quarterly	7.2	<5	-	-	-	-	5.31	<5	4.96	<5	Outflow flowing
29-Mar-22	Monthly	7.34	<5	-	-	-	-	-	-	-	-	Outflow flowing
09-Feb-22	Monthly	-	-	-	-	-	-	-	-	-	-	Outfall dry / Snow covered
19-Jan-22	Quarterly	-	-	-	-	-	-	-	-	5.35	<5	Outfall and SW3 Frozen
08-Dec-21	Monthly	-	-	-	-	-	-	-	-	-	-	Outfall dry
25-Nov-21	Monthly	7.45	<5	-	-	-	-	-	-	-	-	Sampled following a rain event
05-Nov-21	Monthly	7.62	<5	-	-	-	-	-	-	-	-	Outfall flowing well
22-Sep-21	Quarterly	-	-	-	-	-	-	5.07	<5	4.61	<5	Outfall dry
17-Aug-21	Monthly	-	-	-	-	-	-	-	-	-	-	Outfall dry
27-Jul-21	Monthly	-	-	-	-	-	-	-	-	-	-	Outfall dry
28-Jun-21	Quarterly	-	-	-	-	-	-	5.47	<5	5.15	<5	Outfall dry
16-May-21	Monthly	-	-	-	-	-	-	-	-	-	-	Outfall dry
23-Apr-21	Monthly	-	-	-	-	-	-	-	-	-	-	Outfall dry
25-Mar-21	Quarterly	-	-	-	-	-	-	4.86	<5	5.03	<5	Outfall dry
25-Feb-21	Monthly	-	-	-	-	-	-	-	-	-	-	Outfall dry
18-Jan-21	Monthly	-	-	-	-	-	-	-	-	-	-	Outfall dry
15-Dec-20	Quarterly	-	-	-	-	-	-	4.56	<5	4.41	<5	Outfall dry

Table 1: Summary of Surface Water Sampling Results

Date	Sampling Event Type	Outfall		SW1		SW2		SW3		SW4		Notes
				5553680 E	4975323 N	5554391 E	4975247 N	5554131 E	4974494 N	5554681 E	4974053 N	
		pH	TSS (mg/L) ¹	pH	TSS (mg/L)	pH	TSS (mg/L)	pH	TSS (mg/L)	pH	TSS (mg/L)	
25-Nov-20	Monthly	-	-	-	-	-	-	-	-	-	-	Outfall dry
23-Oct-20	Monthly	-	-	-	-	-	-	-	-	-	-	Outfall dry
25-Sep-20	Quarterly	-	-	-	-	-	-	4.65	<5	4.24	6	Outfall dry
26-Aug-20	Monthly	-	-	-	-	-	-	-	-	-	-	Outfall dry
21-Jul-20	Monthly	-	-	-	-	-	-	-	-	-	-	Outfall dry
19-Jun-20	Quarterly	-	-	-	-	-	-	5.47	<5	5.15	<5	Outfall dry
18-Nov-19	Quarterly	-	-	-	-	-	-	4.97	14	4.46	<5	Outfall dry
26-Jul-19	Monthly	-	-	-	-	-	-	-	-	-	-	Outfall dry
21-Jul-19	Rainfall event	-	-	-	-	-	-	-	-	-	-	Rainfall event, not sampled
21-Jun-19	Monthly	-	-	-	-	-	-	-	-	-	-	Outfall dry
17-May-19	Quarterly	-	-	-	-	-	-	5.33	<5	5.11	<5	Outfall dry
23-Apr-19	Monthly	7.26	<5	-	-	-	-	-	-	-	-	-
04-Apr-19	Rainfall Event	7.28	<5	-	-	-	-	-	-	-	-	Rainfall event
25-Mar-19	Monthly	-	-	-	-	-	-	-	-	-	-	Outfall frozen
20-Feb-19	Quarterly	-	-	-	-	-	-	5.53	15	5.47	5	Outfall frozen; SW3 frozen and moved 140 m upstream.
22-Jan-19	Monthly	7.27	<5	-	-	-	-	-	-	-	-	Monthly and rainfall event
11-Dec-18	Monthly	-	-	-	-	-	-	-	-	-	-	Outfall frozen
09-Nov-18	Quarterly	7.28	<5	-	-	-	-	5.16	<5	4.58	<5	-
12-Oct-18	Monthly	-	-	-	-	-	-	-	-	-	-	Outfall dry
07-Sep-18	Monthly	-	-	-	-	-	-	-	-	-	-	Outfall dry
10-Aug-18	Quarterly	-	-	-	-	-	-	5.58	<5	5.23	18	Outfall dry
04-Jul-18	Monthly	-	-	-	-	-	-	-	-	-	-	Outfall dry
01-Jun-18	Monthly	-	-	-	-	-	-	-	-	-	-	Outfall dry
02-May-18	Quarterly	7.11	<5	-	-	-	-	5.38	<5	5.53	5	-
18-Sep-17	Monthly	-	-	-	-	-	-	-	-	-	-	Outfall dry

Table 1: Summary of Surface Water Sampling Results

Date	Sampling Event Type	Outfall		SW1		SW2		SW3		SW4		Notes
				5553680 E	4975323 N	5554391 E	4975247 N	5554131 E	4974494 N	5554681 E	4974053 N	
		pH	TSS (mg/L) ¹	pH	TSS (mg/L)	pH	TSS (mg/L)	pH	TSS (mg/L)	pH	TSS (mg/L)	
04-Aug-17	Quarterly	-	-	-	-	-	-	5.24	<5	4.78	<5	Outfall dry
04-Jul-17	Monthly	7.3	<5	-	-	-	-	-	-	-	-	-
16-Jun-17	Monthly	-	-	-	-	-	-	-	-	-	-	Outfall dry
05-May-17	Quarterly	7.45	6	-	-	-	-	5.33	<5	4.81	<5	-
05-Jan-17	Quarterly	7.29	<5	-	-	-	-	5.37	<5	4.88	<5	-
08-Aug-16	Quarterly	-	-	-	-	-	-	5.75	<5	5.4	<5	Outfall dry
08-Jul-16	Monthly	-	-	-	-	-	-	-	-	-	-	Outfall dry
03-Jun-16	Monthly	-	-	-	-	-	-	-	-	-	-	Outfall dry
09-May-16	Quarterly	7.27	6	-	-	-	-	5.87	<5	5.28	<5	-
06-Apr-16	Monthly	7.5	197	-	-	-	-	-	-	-	-	-
03-Mar-16	Monthly	7.37	43	-	-	-	-	-	-	-	-	-
03-Feb-16	Monthly	-	-	-	-	-	-	-	-	-	-	Sample location frozen
07-Jan-16	Quarterly	-	-	-	-	-	-	-	-	-	-	All sample locations frozen
02-Dec-15	Monthly	-	-	-	-	-	-	-	-	-	-	Outfall dry
04-Nov-15	Quarterly	-	-	-	-	-	-	5.22	<5	4.67	<5	Outfall constructed after November sampling event
31-Jul-15	Initial Baseline	-	-	5.84	40	4.71	335	4.37	<5	4.32	<5	SW1/SW2 collected as part of initial baseline sampling only

Guidelines for Surface Water Discharge from the Site

Surface Water Criteria as Outlined in the Approval to Construct, Operate and Reclaim (Approval 2014-091797)

The Site shall be developed and maintained to prevent surface water contaminants from being discharged into a watercourse, wetland, water resource, or beyond the property boundary, in excess of the following criteria:

- i) Total Suspended Solids: Clear Flows (Normal Background Conditions)
 - 1) Maximum increase of 25 mg/L from background levels for any short term exposure (24 hour or less);
 - 2) Maximum average increase of 5 mg/L from background levels for long term exposure (inputs lasting between 24 hours and 30 days);
- ii) Total Suspended Solids: High Flow (Spring Freshets and Storm Events)
 - 1) Maximum increase of 25 mg/L from background levels at any time when background levels are between 25 mg/L and 250 mg/L;
 - 2) Maximum increase of 10% over background levels when background is >250 mg/L;
- iii) pH (Outfall)
 - 1) Maximum 5 to 9 in grab sample;
 - 2) Maximum 6 to 9 as a Monthly Arithmetic Mean;

Liquid Effluent Discharge Levels as per the NSDEL Pit and Quarry Guidelines (1999)

- (1) All storm run-off from the operating site and all liquid effluents resulting from the operation shall be collected and treated to meet the following suspended solids concentrations prior to discharge into a watercourse or beyond the property boundaries:
 - (a) maximum suspended solids concentration in an grab sample – 50 mg/L;
 - (b) maximum arithmetic monthly average suspended solids concentration - 25 mg/L;



C1

Water Chemistry and Total Metals Lab Results - November 20, 2024



**CLIENT NAME: WSP E&I CANADA LIMITED
1 SPECTACLE LAKE DRIVE
DARTMOUTH, NS B3B 1X7
(902) 468-2848**

ATTENTION TO: Meghan Marriott

PROJECT: 151-05369-00

AGAT WORK ORDER: 24X223191

WATER ANALYSIS REVIEWED BY: Kaliegh Cullen, Report Writer

DATE REPORTED: Jan 09, 2025

PAGES (INCLUDING COVER): 12

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (902) 468-8718

*Notes

Disclaimer:

- All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.
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- This document is signed by an authorized signatory who meets the requirements of the MELCCFP, CALA, CCN and NELAP.
- For environmental samples in the Province of Quebec: The analysis is performed on and results apply to samples as received. A temperature above 6°C upon receipt, as indicated in the Sample Reception Notification (SRN), could indicate the integrity of the samples has been compromised if the delay between sampling and submission to the laboratory could not be minimized.



AGAT Laboratories

Certificate of Analysis

AGAT WORK ORDER: 24X223191

PROJECT: 151-05369-00

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
<http://www.agatlabs.com>

CLIENT NAME: WSP E&I CANADA LIMITED

ATTENTION TO: Meghan Marriott

SAMPLING SITE:

SAMPLED BY:

Standard Water Analysis + Total Metals

DATE RECEIVED: 2024-11-20

DATE REPORTED: 2025-01-09

		SAMPLE DESCRIPTION:		OF1
		SAMPLE TYPE:		Water
		DATE SAMPLED:		2024-11-20 14:06
Parameter	Unit	G / S	RDL	6339979
pH		6.5-9.0		7.91
Reactive Silica as SiO ₂	mg/L		0.5	7.1
Chloride	mg/L	640, 120	1	4
Fluoride	mg/L	0.12	0.12	<0.12
Sulphate	mg/L		2	13
Alkalinity	mg/L		5	63
True Color	TCU	Narrative	5	<5
Turbidity	NTU	Narrative	0.50	5.05
Electrical Conductivity	umho/cm		1	810
Nitrate + Nitrite as N	mg/L		0.05	36.3
Nitrate as N	mg/L	550, 13	0.5	36.1
Nitrite as N	mg/L	0.06	0.05	0.15
Ammonia as N	mg/L	Fact Sheet	0.03	0.38
Total Organic Carbon	mg/L		0.5	1.4
Ortho-Phosphate as P	mg/L		0.01	<0.01
Total Sodium	mg/L		0.1	8.0
Total Potassium	mg/L		0.1	10.6
Total Calcium	mg/L		0.1	65.2
Total Magnesium	mg/L		0.1	6.1
Bicarb. Alkalinity (as CaCO ₃)	mg/L		5	63
Carb. Alkalinity (as CaCO ₃)	mg/L		10	<10
Hydroxide	mg/L		5	<5
Calculated TDS	mg/L		1	306
Hardness	mg/L			188
Langelier Index (@20C)	NA			-0.11
Langelier Index (@ 4C)	NA			-0.43
Saturation pH (@ 20C)	NA			8.02
Saturation pH (@ 4C)	NA			8.34
Anion Sum	me/L			4.23

Certified By:

Katiegh Cullen



AGAT Laboratories

Certificate of Analysis

AGAT WORK ORDER: 24X223191

PROJECT: 151-05369-00

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
<http://www.agatlabs.com>

CLIENT NAME: WSP E&I CANADA LIMITED

ATTENTION TO: Meghan Marriott

SAMPLING SITE:

SAMPLED BY:

Standard Water Analysis + Total Metals

DATE RECEIVED: 2024-11-20

DATE REPORTED: 2025-01-09

		SAMPLE DESCRIPTION:		OF1
		SAMPLE TYPE:		Water
		DATE SAMPLED:		2024-11-20 14:06
Parameter	Unit	G / S	RDL	6339979
Cation sum	me/L			4.42
% Difference/ Ion Balance	%			2.2
Total Aluminum	ug/L	Variable	5	96
Total Antimony	ug/L		2	<2
Total Arsenic	ug/L	5	2	<2
Total Barium	ug/L		5	44
Total Beryllium	ug/L		2	<2
Total Bismuth	ug/L		2	<2
Total Boron	ug/L	29000,	5	<5
Total Cadmium	ug/L	1.0, 0.09	0.09	<0.09
Total Chromium	ug/L		1	<1
Total Cobalt	ug/L		1	8
Total Copper	ug/L	Equation	1	<1
Total Iron	ug/L	300	50	104
Total Lead	ug/L	Equation	0.5	<0.5
Total Manganese	ug/L		2	57
Total Molybdenum	ug/L	73	2	<2
Total Nickel	ug/L	Equation	2	<2
Total Phosphorous	mg/L	Fact Sheet	0.02	2.27
Total Selenium	ug/L	1	1	<1
Total Silver	ug/L	0.25	0.1	<0.1
Total Strontium	ug/L		5	261
Total Thallium	ug/L	0.8	0.1	<0.1
Total Tin	ug/L		2	<2
Total Titanium	ug/L		2	3
Total Uranium	ug/L	33, 15	0.2	3.0
Total Vanadium	ug/L		2	<2
Total Zinc	ug/L	30	5	<5

Certified By:

Kathleen Cullen



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Certificate of Analysis

AGAT WORK ORDER: 24X223191

PROJECT: 151-05369-00

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CLIENT NAME: WSP E&I CANADA LIMITED

SAMPLING SITE:

ATTENTION TO: Meghan Marriott

SAMPLED BY:

Standard Water Analysis + Total Metals

DATE RECEIVED: 2024-11-20

DATE REPORTED: 2025-01-09

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to CCME FWAL - update 2015
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

6339979 % Difference / Ion Balance, Hardness, Langelier Index, Nitrate + Nitrite, Hydroxide and Saturation pH are calculated parameters. The calculated parameters are non-accredited. The component parameters of the calculations are accredited.
pH has been analyzed past the recommended holding time of 15 minutes from sampling. Field measurement recommended for most accurate result

Analysis performed at AGAT Halifax (unless marked by *)

Certified By:

Katiegh Cullen



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Certificate of Analysis

AGAT WORK ORDER: 24X223191

PROJECT: 151-05369-00

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<http://www.agatlabs.com>

CLIENT NAME: WSP E&I CANADA LIMITED

ATTENTION TO: Meghan Marriott

SAMPLING SITE:

SAMPLED BY:

TOC (Water)

DATE RECEIVED: 2024-11-20

DATE REPORTED: 2025-01-09

SAMPLE DESCRIPTION: OF1
SAMPLE TYPE: Water
DATE SAMPLED: 2024-11-20
14:06
6339979

Parameter	Unit	G / S	RDL
Total Organic Carbon	mg/L	0.5	1.4

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

Katiegh Cullen



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AGAT WORK ORDER: 24X223191

PROJECT: 151-05369-00

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<http://www.agatlabs.com>

CLIENT NAME: WSP E&I CANADA LIMITED

SAMPLING SITE:

ATTENTION TO: Meghan Marriott

SAMPLED BY:

TSS

DATE RECEIVED: 2024-11-20

DATE REPORTED: 2025-01-09

SAMPLE DESCRIPTION: OF1
SAMPLE TYPE: Water
DATE SAMPLED: 2024-11-20
14:06
6339979

Parameter	Unit	G / S	RDL	
Total Suspended Solids	mg/L	Narrative	5	<5

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to CCME FWAL - update 2015
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
Analysis performed at AGAT Halifax (unless marked by *)

Certified By:

Katiegh Cullen



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Exceedance Summary

AGAT WORK ORDER: 24X223191

PROJECT: 151-05369-00

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<http://www.agatlabs.com>

CLIENT NAME: WSP E&I CANADA LIMITED

ATTENTION TO: Meghan Marriott

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
6339979	OF1	NS-CCME FWAL	Standard Water Analysis + Total Metals	Nitrite as N	mg/L	0.06	0.15



C2

Water Chemistry and Total Metals Lab Results - January 24, 2025



CLIENT NAME: WSP CANADA INC.
1 SPECTACLE LAKE DRIVE
DARTMOUTH, NS B3B1X7
(902) 835-9955

ATTENTION TO: Meghan Marriott

PROJECT: 151-05369-00

AGAT WORK ORDER: 25X241562

WATER ANALYSIS REVIEWED BY: Kaliegh Cullen, Report Writer

DATE REPORTED: Feb 04, 2025

PAGES (INCLUDING COVER): 11

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (902) 468-8718

*Notes

Disclaimer:

- All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.
- All samples will be disposed of within 30 days after receipt unless a Long Term Storage Agreement is signed and returned. Some specialty analysis may be exempt, please contact your Client Project Manager for details.
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- All reportable information is available on request from AGAT Laboratories, in accordance with ISO/IEC 17025:2017, ISO/IEC 17025:2005 (Quebec), DR-12-PALA and/or NELAP Standards.
- This document is signed by an authorized signatory who meets the requirements of the MELCCFP, CALA, CCN and NELAP.
- For environmental samples in the Province of Quebec: The analysis is performed on and results apply to samples as received. A temperature above 6°C upon receipt, as indicated in the Sample Reception Notification (SRN), could indicate the integrity of the samples has been compromised if the delay between sampling and submission to the laboratory could not be minimized.



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Certificate of Analysis

AGAT WORK ORDER: 25X241562

PROJECT: 151-05369-00

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FAX (902)468-8924
<http://www.agatlabs.com>

CLIENT NAME: WSP CANADA INC.

SAMPLING SITE:

ATTENTION TO: Meghan Marriott

SAMPLED BY:

AGAT Halifax - Anion Scan

DATE RECEIVED: 2025-01-24

DATE REPORTED: 2025-02-04

SAMPLE DESCRIPTION: SW4
SAMPLE TYPE: Water
DATE SAMPLED: 2025-01-24
11:52
6478931

Parameter	Unit	G / S	RDL	
Fluoride	mg/L		0.05	<0.05
Chloride	mg/L		0.10	4.92
(Nitrate + Nitrite) as N (Calculated)	mg/L		0.07	0.54
Nitrate as N	mg/L		0.05	0.54
Nitrite as N	mg/L		0.05	<0.05
Sulphate	mg/L		0.10	3.07

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

Katiegh Cullen



Certificate of Analysis

AGAT WORK ORDER: 25X241562

PROJECT: 151-05369-00

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<http://www.agatlabs.com>

CLIENT NAME: WSP CANADA INC.

SAMPLING SITE:

ATTENTION TO: Meghan Marriott

SAMPLED BY:

Standard Water Analysis + Total Metals

DATE RECEIVED: 2025-01-24

DATE REPORTED: 2025-02-04

SAMPLE DESCRIPTION: SW4
SAMPLE TYPE: Water
DATE SAMPLED: 2025-01-24
11:52
6478931

Parameter	Unit	G / S	RDL
pH			4.99
Reactive Silica as SiO2	mg/L		0.5
Chloride	mg/L		1
Fluoride	mg/L		0.05
Sulphate	mg/L		2
Alkalinity	mg/L		5
True Color	TCU		5
Turbidity	NTU		0.50
Electrical Conductivity	umho/cm		1
Nitrate + Nitrite as N	mg/L		0.05
Nitrate as N	mg/L		0.05
Nitrite as N	mg/L		0.05
Ammonia as N	mg/L		0.03
Total Organic Carbon	mg/L		0.50
Ortho-Phosphate as P	mg/L		0.01
Total Sodium	mg/L		0.1
Total Potassium	mg/L		0.1
Total Calcium	mg/L		0.1
Total Magnesium	mg/L		0.1
Bicarb. Alkalinity (as CaCO3)	mg/L		5
Carb. Alkalinity (as CaCO3)	mg/L		10
Hydroxide	mg/L		5
Calculated TDS	mg/L		1
Hardness	mg/L		
Langelier Index (@20C)	NA		-5.60
Langelier Index (@ 4C)	NA		-5.92
Saturation pH (@ 20C)	NA		10.6
Saturation pH (@ 4C)	NA		10.9
Anion Sum	me/L		0.24

Certified By:

Katiegh Cullen



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AGAT WORK ORDER: 25X241562

PROJECT: 151-05369-00

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<http://www.agatlabs.com>

CLIENT NAME: WSP CANADA INC.

SAMPLING SITE:

ATTENTION TO: Meghan Marriott

SAMPLED BY:

Standard Water Analysis + Total Metals

DATE RECEIVED: 2025-01-24

DATE REPORTED: 2025-02-04

SAMPLE DESCRIPTION: SW4
SAMPLE TYPE: Water
DATE SAMPLED: 2025-01-24
11:52
6478931

Parameter	Unit	G / S	RDL	
Cation sum	me/L			0.34
% Difference/ Ion Balance	%			16.3
Total Aluminum	ug/L		5	231
Total Antimony	ug/L		2	<2
Total Arsenic	ug/L		2	<2
Total Barium	ug/L		5	<5
Total Beryllium	ug/L		2	<2
Total Bismuth	ug/L		2	<2
Total Boron	ug/L		5	8
Total Cadmium	ug/L		0.09	<0.09
Total Chromium	ug/L		1	<1
Total Cobalt	ug/L		1	<1
Total Copper	ug/L		1	<1
Total Iron	ug/L		50	244
Total Lead	ug/L		0.5	<0.5
Total Manganese	ug/L		2	46
Total Molybdenum	ug/L		2	<2
Total Nickel	ug/L		2	<2
Total Phosphorous	mg/L		0.02	1.29
Total Selenium	ug/L		1	<1
Total Silver	ug/L		0.1	<0.1
Total Strontium	ug/L		5	10
Total Thallium	ug/L		0.1	<0.1
Total Tin	ug/L		2	<2
Total Titanium	ug/L		2	<2
Total Uranium	ug/L		0.2	<0.2
Total Vanadium	ug/L		2	<2
Total Zinc	ug/L		5	<5

Certified By:

Katiegh Cullen



AGAT Laboratories

Certificate of Analysis

AGAT WORK ORDER: 25X241562

PROJECT: 151-05369-00

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FAX (902)468-8924
<http://www.agatlabs.com>

CLIENT NAME: WSP CANADA INC.

SAMPLING SITE:

ATTENTION TO: Meghan Marriott

SAMPLED BY:

Standard Water Analysis + Total Metals

DATE RECEIVED: 2025-01-24

DATE REPORTED: 2025-02-04

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

6478931 % Difference / Ion Balance, Hardness, Langelier Index, Nitrate + Nitrite, Hydroxide and Saturation pH are calculated parameters. The calculated parameters are non-accredited. The component parameters of the calculations are accredited.

pH has been analyzed past the recommended holding time of 15 minutes from sampling. Field measurement recommended for most accurate result

The cation and anion sums are at, or below, 1 me/L, therefore the acceptable criteria is a difference of less than 0.3me/L.

Analysis performed at AGAT Halifax (unless marked by *)

Certified By:

Katiegh Cullen



AGAT Laboratories

Certificate of Analysis

AGAT WORK ORDER: 25X241562

PROJECT: 151-05369-00

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FAX (902)468-8924
<http://www.agatlabs.com>

CLIENT NAME: WSP CANADA INC.

SAMPLING SITE:

ATTENTION TO: Meghan Marriott

SAMPLED BY:

TSS, pH					
DATE RECEIVED: 2025-01-24			DATE REPORTED: 2025-02-04		
		SAMPLE DESCRIPTION:		OF1	SW4
		SAMPLE TYPE:		Water	Water
		DATE SAMPLED:		2025-01-24 12:23	2025-01-24 11:52
Parameter	Unit	G / S	RDL	6478930	6478931
Total Suspended Solids	mg/L		5	<5	<5
pH	pH unit			7.42	4.99

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

6478930-6478931 pH has been analyzed past the recommended holding time of 15 minutes from sampling. Field measurement recommended for most accurate result

Analysis performed at AGAT Halifax (unless marked by *)

Certified By:

Katiegh Cullen



C3

Water Chemistry and Total Metals Lab Results - March 12, 2025



CLIENT NAME: WSP CANADA INC.
1 SPECTACLE LAKE DRIVE
DARTMOUTH, NS B3B1X7
(902) 835-9955

ATTENTION TO: Meghan Marriott

PROJECT: 151-05369-00

AGAT WORK ORDER: 25X257693

WATER ANALYSIS REVIEWED BY: Kaliegh Cullen, Report Writer

DATE REPORTED: Mar 27, 2025

PAGES (INCLUDING COVER): 10

VERSION*: 1

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*Notes

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- All reportable information is available on request from AGAT Laboratories, in accordance with ISO/IEC 17025:2017, ISO/IEC 17025:2005 (Quebec), DR-12-PALA and/or NELAP Standards.
- This document is signed by an authorized signatory who meets the requirements of the MELCCFP, CALA, CCN and NELAP.
- For environmental samples in the Province of Quebec: The analysis is performed on and results apply to samples as received. A temperature above 6°C upon receipt, as indicated in the Sample Reception Notification (SRN), could indicate the integrity of the samples has been compromised if the delay between sampling and submission to the laboratory could not be minimized.



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<http://www.agatlabs.com>

CLIENT NAME: WSP CANADA INC.

ATTENTION TO: Meghan Marriott

SAMPLING SITE:

SAMPLED BY:

Standard Water Analysis + Total Metals - CCME FWAL

DATE RECEIVED: 2025-03-12

DATE REPORTED: 2025-03-27

		SAMPLE DESCRIPTION:		OF 1
		SAMPLE TYPE:		Water
		DATE SAMPLED:		2025-03-12 10:12
Parameter	Unit	G / S	RDL	6578237
pH		6.5-9.0		7.17
Reactive Silica as SiO ₂	mg/L		0.5	6.8
Chloride	mg/L	640, 120	1	5
Fluoride	mg/L	0.12	0.12	<0.12
Sulphate	mg/L		2	5
Alkalinity	mg/L		5	48
True Color	TCU	Narrative	5	<5
Turbidity	NTU	Narrative	0.5	3.44
Electrical Conductivity	umho/cm		1	318
Nitrate + Nitrite as N	mg/L		0.05	21.7
Nitrate as N	mg/L	550, 13	0.05	21.7
Nitrite as N	mg/L	0.06	0.05	<0.05
Ammonia as N	mg/L	Fact Sheet	0.03	2.84
Ortho-Phosphate as P	mg/L		0.01	<0.01
Total Sodium	mg/L		0.1	6.2
Total Potassium	mg/L		0.1	6.7
Total Calcium	mg/L		0.1	39.0
Total Magnesium	mg/L		0.1	3.8
Bicarb. Alkalinity (as CaCO ₃)	mg/L		5	48
Carb. Alkalinity (as CaCO ₃)	mg/L		10	<10
Hydroxide	mg/L		5	<5
Calculated TDS	mg/L		1	195
Hardness	mg/L			113
Langelier Index (@20C)	NA			-1.17
Langelier Index (@ 4C)	NA			-1.49
Saturation pH (@ 20C)	NA			8.34
Saturation pH (@ 4C)	NA			8.66
Anion Sum	me/L			2.76
Cation sum	me/L			2.94

Certified By:

Katiegh Cullen



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Certificate of Analysis

AGAT WORK ORDER: 25X257693

PROJECT: 151-05369-00

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<http://www.agatlabs.com>

CLIENT NAME: WSP CANADA INC.

SAMPLING SITE:

ATTENTION TO: Meghan Marriott

SAMPLED BY:

Standard Water Analysis + Total Metals - CCME FWAL

DATE RECEIVED: 2025-03-12

DATE REPORTED: 2025-03-27

SAMPLE DESCRIPTION: OF 1				
SAMPLE TYPE: Water				
DATE SAMPLED: 2025-03-12 10:12				
Parameter	Unit	G / S	RDL	6578237
% Difference/ Ion Balance	%			3.2
Total Aluminum	ug/L	Variable	5	184
Total Antimony	ug/L		2	<2
Total Arsenic	ug/L	5	2	<2
Total Barium	ug/L		5	24
Total Beryllium	ug/L		2	<2
Total Bismuth	ug/L		2	<2
Total Boron	ug/L	29000,	5	41
Total Cadmium	ug/L	1.0, 0.09	0.017	0.040
Total Chromium	ug/L		1	<1
Total Cobalt	ug/L		1	4
Total Copper	ug/L	Equation	1	<1
Total Iron	ug/L	300	50	153
Total Lead	ug/L	Equation	0.5	<0.5
Total Manganese	ug/L		2	146
Total Molybdenum	ug/L	73	2	<2
Total Nickel	ug/L	Equation	2	<2
Total Phosphorous	mg/L	Fact Sheet	0.02	2.08
Total Selenium	ug/L	1	1	<1
Total Silver	ug/L	0.25	0.1	<0.1
Total Strontium	ug/L		5	152
Total Thallium	ug/L	0.8	0.1	<0.1
Total Tin	ug/L		2	<2
Total Titanium	ug/L		2	6
Total Uranium	ug/L	33, 15	0.2	1.5
Total Vanadium	ug/L		2	<2
Total Zinc	ug/L	30	5	<5

Certified By:

Katiegh Cullen



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AGAT WORK ORDER: 25X257693

PROJECT: 151-05369-00

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FAX (902)468-8924
<http://www.agatlabs.com>

CLIENT NAME: WSP CANADA INC.

SAMPLING SITE:

ATTENTION TO: Meghan Marriott

SAMPLED BY:

Standard Water Analysis + Total Metals - CCME FWAL

DATE RECEIVED: 2025-03-12

DATE REPORTED: 2025-03-27

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to CCME FWAL - update 2015
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
6578237 % Difference / Ion Balance, Hardness, Langelier Index, Nitrate + Nitrite, Hydroxide and Saturation pH are calculated parameters. The calculated parameters are non-accredited. The component parameters of the calculations are accredited.
pH has been analyzed past the recommended holding time of 15 minutes from sampling. Field measurement recommended for most accurate result

Analysis performed at AGAT Halifax (unless marked by *)

Certified By:

Katiegh Cullen



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TEL (902)468-8718
FAX (902)468-8924
<http://www.agatlabs.com>

CLIENT NAME: WSP CANADA INC.

SAMPLING SITE:

ATTENTION TO: Meghan Marriott

SAMPLED BY:

TOC (Water)

DATE RECEIVED: 2025-03-12

DATE REPORTED: 2025-03-27

SAMPLE DESCRIPTION: OF 1
SAMPLE TYPE: Water
DATE SAMPLED: 2025-03-12
10:12
6578237

Parameter	Unit	G / S	RDL
Total Organic Carbon	mg/L	0.5	1.7

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

Katiegh Cullen

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