CN Milton Logistic Hub Surface Water Quality and Quantity Follow-up Program

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Abbreviations

CEAA	Canadian Environmental Assessment Agency
CH	Conservation Halton
CWQG-FAL	Canadian Water Quality Guidelines for Protection of Aquatic Life
DFO	Department of Fisheries and Oceans Canada
ECCC	Environment and Climate Change Canada
ESC	Erosion and Sedimentation Control
EIS	Environmental Impact Statement
IAAC	Impact Assessment Agency of Canada
PDA	Project Development Area
POPC	Parameters of Potential Concern

1.0 INTRODUCTION

This document outlines the follow-up and monitoring program for surface water quality in relation to construction and operation of the Milton Logistics Hub.

The surface water quality monitoring program presented below, and the associated monitoring details, have been developed to comply with the conditions of approval in the Minister of the Environment's Decision Statement issued January 21,2021. This program has been developed to comply with Conditions 5.9 and 5.10 of the Decision Statement and has been developed in consultation with Environment and Climate Change Canada (ECCC), Department of Fisheries and Oceans (DFO), the Ministry of the Environment, Climate Change and Parks (MECP), Conservation Halton (CH) and the Town of Milton. Draft versions of this FUP were sent to ECCC on May 31, 2021, DFO on September 30, 2020 and April 14, 2021, CH on July 30, 2020, the MECP on June 7, 2021 and the Town of Milton on June 4, 2021. Comments were received from ECCC, DFO and MECP and have been considered in finalizing this document. Any revisions and manner by which comments were addressed, including corresponding rationale, were communicated to those who responded to CN's request for input. No updates to this follow-up program are proposed over the program's period of implementation.

2.0 PROGRAM DESIGN CONSIDERATIONS

A follow-up program for surface water will be implemented during construction and operation to verify the accuracy of the environmental assessment and determine the effectiveness of proposed mitigation measures. The program has been developed in accordance with the information outlined in Condition 2.6 of the Decision Statement.

The program will consist of two components:

1. Monitoring of surface water quantity and quality within Tributary A and Indian Creek during construction and for at least 5 years of operation to verify the effects predicted in the EIS and to confirm the effectiveness of mitigation (Condition 5.10).
2. Monitoring of surface water effluent quantity and quality at the stormwater management ponds during construction and operation to monitor the effectiveness of stormwater management infrastructure in improving runoff quality and to assess potential water quality changes within Tributary A and Indian Creek (Condition 5.9).

3.0 PRE-CONSTRUCTION MONITORING

Baseline and predictive surface water quantity and quality studies were completed as part of the EIS and subsequent IR submissions. Baseline data, future predictions and regulatory guidance such as the CWQG-FAL will form criteria for comparative purposes during the construction phase.

Additionally, prior to construction, CN will install stream surface water quantity monitoring stations at the five stream locations described below in Section 4.2. This pre-construction station installation and flow monitoring will provide data to establish site specific rating curves for conditions prior to construction. Methodology for monitoring these stations will follow the measures described in in Section 4.3.2 (station flow rates estimated by periodic in-situ channel velocity, depth and flow profiling measurements, supported by continuous water level monitoring).

4.0 CONSTRUCTION MONITORING

The purpose of monitoring surface water quantity and quality within Tributary A and Indian Creek during construction is to verify the effects predicted in the EIS and to confirm the effectiveness of mitigation. Monitoring water quality will help to determine the effectiveness of construction phase environmental protection measures, such as erosion and sedimentation controls to mitigate site runoff effects (i.e., erosion, sedimentation), and to monitor for water quality changes within Tributary A and Indian Creek during construction. Monitoring water quantity will aim to confirm CN's prediction that the Project will not have adverse effects on downstream hydrology.

4.1 CRITERIA

In support of the project, baseline water quality and water quantity monitoring were conducted on site as described in the Technical Data Report - Hydrology and Surface Water Quality Baseline Study and Effects Assessment (Appendix E.15). Supplemental water quality and quantity monitoring was undertaken subsequent to submission of the baseline report as summarized in response to information request (IR) 1.2, specifically within the Hydrology and Surface Water Quality Baseline Study Update (CEAR #561). The 95th percentile baseline water quality concentrations for Tributary A and Indian Creek were calculated from the entire baseline water quality monitoring dataset (June 2015-June 2016).

During the follow-up monitoring program, water quality measurements will be compared against the following criteria:

- the Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (CWQG-FAL);
- the baseline and predicted water quality information as identified in the EIS and IR responses; and
- water quality concentrations at project development area (PDA) inflow stations.

Surface water quantity measurements will be compared against the baseline hydrological modeling predictions presented in the EIS and IR responses, monitored PDA inflows and information gathered from the five, pre-construction stream water quantity stations.

4.2 LOCATION

In accordance with Condition 5.10, CN intends to monitor surface water quality and quantity at each of the seven monitoring locations where:

- flows enter and exit the PDA along Tributary A and Indian Creek (five stations installed during pre-construction) and
- at the outlets of the two stormwater management ponds (once ponds are constructed and operational).

The nomenclature for the baseline stations continuing to be used in the construction and operation monitoring have been revised to provide descriptive names relating to their location in relation to the new station locations. The seven surface water quality and quantity monitoring locations are identified as follows: Trib-Ain, Trib-Ain2, Trib-Aout (formerly TRIB A), IC-in, IC-out (formerly IC3), SWMP-O1 and SWMP-O2. The specific monitoring locations are shown on Figure 1 (**Appendix A**).

Baseline monitoring locations TRIB A (Trib-A out) and IC3 (IC-out) are located at the downstream extents of the PDA for Tributary A and Indian Creek, respectively. The first upstream Tributary A monitoring location would be located on the south (downstream) side of Britannia Road where the PDA entrance is located. As Tributary A leaves the PDA 213 m downstream of Britannia Road and runs for approximately 2.3 km outside the PDA before re-entering the PDA at the Mainline crossing, a second upstream monitoring station is proposed for Tributary A. By monitoring at these seven locations, the project will confirm the absence of adverse water quality and water quantity effects from the Project.

4.3 METHODS

In accordance with Conditions 5.10, CN will collect surface water quality samples and execute surface water quantity monitoring in order to monitor surface water quality and quantity on a monthly basis throughout construction. Frozen/dry water conditions or unsafe conditions may prevent sampling events at some or all stations during the sampling period.

4.3.1 Water Quality Sampling

During construction, composite surface water samples will be taken monthly and during high flows and upset conditions as per the baseline sampling program at the seven monitoring locations identified above. High flow events will be defined as 35 mm rainfall amount over a 1 to 12-hour period. This threshold rainfall amount is slightly less than the 2-year, 12-hour return period storm event (42 mm; EIS Appendix E.15), which represents bankfull flow conditions. Two potential forecasting tools will be used to identify a potential high flow event to be monitored: Environment and Climate Change Canada Toronto International Airport forecast (https://weather.gc.ca/city/pages/on-143_metric_e.html) and the Ontario Ministry of Natural Resources and Forestry Flood Forecasting and Warning Program (https://www.gisapplication.lrc.gov.on.ca/webapps/flood/). Water quality samples will be collected and submitted for analysis at an accredited laboratory and will be compared to the CWQG-FAL, baseline and predicted concentrations. The routine monitoring water quality parameters and associated criteria are provided in **Table 4-1**.

Table 4-1: Routine Water Quality Parameters and Threshold Criteria – Construction & Operation

Parameters[1]	Units	Threshold 1 Trigger [2,]	Threshold 1 Trigger [2] CWQG-FAL Guidelines		Predicted	Threshold 1 Trigger [2]	95th Percentile Baseline [3]	
		Detection Limit (DL)	Short Term	Long Term	Annual Average Pond Effluent Concentration	Pond Effluent Concentration	Tributary A (TRIB A Baseline Monitoring Station at downstream extent of PDA)	Indian Creek (Average of Baseline Monitoring Stations IC2 and IC3)
MONITORED PARAMETERS WITH THRESHOLDS[1]								
Non-grouped parameters								
Total Phosphorus	mg/L	0.004	-	Narrative [c]	0.07 – 0.11	0.14	0.20	0.17
Dissolved Chloride (Cl)	mg/L	1	640	120	-	-	161	145
Total Suspended Solids	mg/L	1	-	Narrative [a]	1.30 – 3.76	4.70	34.6	44.1
Dissolved Oxygen	mg/L	0.05	-	Narrative [d]	-	-	11.2 [d]	15.2 [d]
Metals								
Total Chromium (Cr)	ug/L	5	-	Narrative [b]	0.11 – 1.72	2.15	5.74	4.24
Total Copper (Cu)	ug/L	1	-	4	0.95 – 29.90	37.38	6.19	7.63
Total Iron (Fe)	ug/L	100	-	300	133.0 - 4,008.7	5,010.88	4,145	3,413
Total Lead (Pb)	ug/L	0.50	-	7	0.35 – 5.20	6.50	1.89	2.18
Total Zinc (Zn)	ug/L	5	-	30	0.87 – 58.5	73.13	19.0	25.0
Hydrocarbons								
Benzene	ug/L	0.2	-	370	-	-	-	-
Toluene	ug/L	0.2	-	2	-	-	-	-
Ethylbenzene	ug/L	0.2	-	90	-	-	-	-

Table 4-1: Routine Water Quality Parameters and Threshold Criteria – Construction & Operation

Parameters[1]	Units	Threshold 1 Trigger [2,]	Threshold 1 Trigger [2]		Predicted	Threshold 1 Trigger [2]	95th Percentile Baseline [3]	
			CWQG-FAL Guidelines					
		Detection Limit (DL)	Short Term	Long Term	Annual Average Pond Effluent Concentration	Pond Effluent Concentration	Tributary A (TRIB A Baseline Monitoring Station at downstream extent of PDA)	Indian Creek (Average of Baseline Monitoring Stations IC2 and IC3)
MONITORED PARAMETERS WITH THRESHOLDS[1]								
Total Petroleum Hydrocarbons*	mg/L	-	-	-	3.40 – 3.94	4.93	-	-
MONITORED PARAMETERS WITHOUT THRESHOLDS[1]								
Non-grouped parameters								
Phenols	ug/L	1	-	-	-	-	-	-
Temperature	°C	-5	-	-	-	-	23.2	26.0
Hydrocarbons								
Total Oil and Grease	ug/L	500	-	-	-	-	-	-
Xylenes	ug/L	0.4	-	-	-	-	-	-
Total Petroleum Hydrocarbons*	mg/L	-	-	-	3.40 – 3.94	4.93	-	-
Fraction 1 (C6 – C10)	ug/L	25	-	-	-	-	-	-
Fraction 2 (C10 – C16)	ug/L	100	-	-	-	-	-	-
Fraction 3 (C16 – C34)	ug/L	200	-	-	-	-	-	-

Table 4-1: Routine Water Quality Parameters and Threshold Criteria – Construction & Operation

Parameters[1]	Units	Threshold 1 Trigger [2,]	Threshold 1 Trigger [2] CWQG-FAL Guidelines		Predicted	Threshold 1 Trigger [2]	95th Percentile Baseline [3]	
		Detection Limit (DL)	Short Term	Long Term	Annual Average Pond Effluent Concentration	Pond Effluent Concentration	Tributary A (TRIB A Baseline Monitoring Station at downstream extent of PDA)	Indian Creek (Average of Baseline Monitoring Stations IC2 and IC3)
MONITORED PARAMETERS WITH THRESHOLDS[1]								

"-" = No standard/guideline, or value for this parameter
[1] = Only parameters with regulatory or predicted thresholds will be used as trigger parameters
[2] = Threshold 1 for stormwater pond effluent is defined as: A. Predicted effluent concentration range parameter - Four consecutive monthly parameter concentration exceedances 25% above the maximum predicted annual average pond effluent range and five-times the detection limit. B. No predicted effluent concentration range parameter - Four consecutive monthly parameter concentration values at or above the respective CWQG-FAL or five-times the detection limit (DL).
[3] = Threshold 1 for Tributary A and Indian Creek watercourse sites is defined as four consecutive monthly parameter concentration exceedances above the 95th percentile baseline concentration or five-times the DL. These threshold criteria apply when the inflow concentration (as measured at the upstream monitoring stations) does not exceed this threshold at a given monitoring station. Except for dissolved oxygen, which will apply the CWQG-FAL guideline value (Note d).
* = a modified total petroleum hydrocarbon value to be calculated per CCME procedures for CCME petroleum hydrocarbon standards
[a] narrative = Total suspended solids – "clear flow: Maximum increase of 25 mg/L from background levels for any short-term exposure (e.g., 24-h period). Maximum average increase of 5 mg/L from background levels for longer term exposures (e.g., inputs lasting between 24 h and 30 d)."
[b] narrative = Chromium, hexavalent (Cr(VI)) = 1 ug/L; Chromium, trivalent (Cr(III)) = 8.9 ug/L; Chromium, total = no standard/guideline
[c] narrative = Range for Total Phosphorus (mg/L) (see Guidance Framework for Phosphorus factsheet): hyper-eutrophic >0.1; Tributary A and Indian Creek 95th percentile baseline TP concentrations are both classified as hyper-eutrophic;
[d] Indian Creek and Tributary A are both warmwater waterbodies. Narrative = Lowest acceptable DO concentrations for the protection of freshwater organisms; 6 mg/L or greater for early life stages of warmwater species, 5.5 mg/L or greater for other life stages of warmwater species. The threshold trigger value will be 6 mg/L or less for pond effluent, Tributary A and Indian Creek.

In addition to the routine water quality parameters identified above, CN will also monitor select parameters related to potential residual agricultural contamination (nitrogen compounds, pathogenic organisms, pesticides and herbicides). A summary of the select short-term agricultural water quality parameters are provided in **Table 4-2**. These parameters are proposed to be monitored for the first six months of construction and then reviewed with ECCC, DFO and CH to determine if further monitoring is required.

Table 4-2: Select Short-Term Water Quality Parameters

Parameters	Units	Detection Limit (DL)	CWQG-FAL Guidelines	
			Short Term	Long Term
Ammonia (total)	ug/L	10	-	Narrative [a]
Ammonia (unionized)	ug/L	-	-	19
Nitrate	ug/L	100	550,000	13,000
Nitrite	ug/L	10	-	197
Coliform, total	CFU/100mL	0	-	-
E. Coli	CFU/100mL	0	-	-
Pesticides				
Organophosphate Package				
Metolachlor	ug/L	5	-	-
Fenchlorphos (Ronnel)	ug/L	2	-	-
Mevinphos	ug/L	2	-	-
Trifluralin	ug/L	0.05	ND	0.2
Phosmet	ug/L	2	-	-
Dichlorvos	ug/L	2	-	-
Dimethoate	ug/L	2	ND	6.2
Fonofos	ug/L	2	-	-
Triallate	ug/L	0.05	ND	0.24
Demeton-S	ug/L	2	-	-
Atrazine	ug/L	1	ND	1.8
Diazinon	ug/L	2	-	-
Malathion	ug/L	2	-	-
Parathion Ethyl	ug/L	2	-	-
Parathion Methyl	ug/L	2	-	-
Simazine	ug/L	2	ND	10
Aldicarb	ug/L	0.1	ND	1
Bendiocarb	ug/L	2	-	-
Carbaryl	ug/L	0.1	3.3	0.2
Carbofuran	ug/L	0.1	ND	1.8
Cyanazine (Bladex)	ug/L	0.1	ND	2
Prometryne	ug/L	1	-	-
Chloropryifos (Dursban)	ug/L	2	-	-
Terbufos	ug/L	1	-	-
Phorate	ug/L	1	-	-
Guthion (Azinophos-methyl)	ug/L	1	-	-
Ethion	ug/L	1	-	-
Fenthion	ug/L	1	-	-

Parameters	Units	Detection Limit (DL)	CWQG-FAL Guidelines	
			Short Term	Long Term
Herbicides				
Dicamba	ug/L	0.5	ND	10
Picloram	ug/L	0.5	ND	29
MCPB	ug/L	0.5	-	-
2,4-D(BEE)	ug/L	0.5	-	-
MCPP	ug/L	0.5	-	-
MCPA	ug/L	0.5	ND	2.6
2,4-DP (Dichloroprop)	ug/L	0.5	-	-
2,4-D	ug/L	0.5	ND	4
2,4,5-TP (Silvex)	ug/L	0.5	-	-
2,4,5-T	ug/L	0.5	-	-
2,4-DB	ug/L	0.5	-	-

ND – no data; NLR – no longer recommended as water quality guideline as exposure predominantly via sediment, soil and/or tissue

[a] - Guideline for total ammonia is temperature and pH dependent. Measurements of total ammonia in the aquatic environment are often expressed as mg/L total ammonia-N. The present guideline values (mg/L NH_3) can be converted to mg/L total ammonia-N by multiplying the corresponding guideline value by 0.8224. Consult the CWQG-FAL factsheet for more details.

CN will monitor for pesticides and herbicides using a standard suite of parameters to determine potential mobilization during initial ground disturbance / grading.

4.3.1.1 In-Situ Water Quality

During construction, CN also intends to monitor turbidity at the seven monitoring stations discussed above. Turbidity monitoring will occur regularly (i.e., 2 to 3 times per week) throughout the duration of construction, including daily turbidity monitoring during periods of construction dewatering and when ESC measures are discharging. Turbidity monitoring will be conducted using a handheld turbidity monitoring unit. Frequent turbidity monitoring will document changes in turbidity from upstream of the PDA (inflow conditions), at the outlet of the stormwater ponds, and at the PDA downstream outflow stations throughout the construction process. Turbidity criteria will be compared to the CWQG-FAL as illustrated in **Table 4-3**.

If no flow is observed at the time of turbidity monitoring (e.g., intermittent Tributary A) at the stations upstream of the PDA, the observed conditions will be documented within the environmental monitoring field notes. To assess background turbidity levels during periods of dry upstream (background) conditions, a background value of 0 NTUs will be considered.

Table 4-3: Daily Turbidity Monitoring Guidelines

Parameter	Unit	CWQG-FAL Guideline
Turbidity	NTU	Clear flow - Short Term; Maximum increase of 8 NTUs from background levels for a short-term exposure (e.g., 24-h period).
		High flow or turbid waters; Maximum increase of 8 NTUs from background levels at any one time when background levels are between 8 and 80 NTUs. Should not increase more than 10% of background levels when background is >80 NTUs.

If there is an exceedance in turbidity, a duplicate measurement should be immediately taken to confirm there is an exceedance. If the result is confirmed, CN will apply an adaptive management approach to apply corrective measures as per Section 4.4.1.2.

Additionally, CN intends to continuously monitor the temperature of stormwater management pond effluent. The water level loggers installed at the stormwater pond outlets associated with monitoring flow also measure water temperature on a continuous basis. These measurements will continue throughout the construction phase of the Project once the ponds are operational.

4.3.2 Water Quantity

During construction, water quantity will be monitored at the seven monitoring locations identified above by measuring water levels, channel velocity, depth and flow. The flow rates will be estimated using a combination of periodic in-situ channel velocity, depth and flow profiling measurements, supported by continuous water level monitoring.

In-situ water level and velocity measurements will be collected monthly throughout construction at the stream monitoring stations. Velocity measurements will be collected using a portable flow meter. Stream transects will be divided into a number of manageable subsections (minimum of ten) and the velocity will be measured at the depth that corresponds to 60% of the total depth when the total depth is less than 0.75 m. When total depths exceed 0.75 m, flow measurements will be taken at 20 and 80% of the total depth. The measured velocity at each section and corresponding water depths will be used to estimate the total stream flow using the Mid-Section Method recommended and used by the Water Survey of Canada (Environment Canada 1999). Similarly, methods outlined by Pelletier (1990) will be used for under ice measurements during winter monitoring, when safe to do so. In-situ water level and velocity data will be used to refine the rating curves (stage: discharge relationships) for existing stream stations (Trib-A-out, formerly TRIB A and IC-out, formerly IC3) and to develop rating curves for the new stream monitoring stations. Flow hydrographs for each stream monitoring location will be developed based on monitored water level data and generated rating curves.

Using datalogging instrumentation (level loggers), water level and water temperature will be monitored on a continuous basis at the water monitoring locations. These loggers will be set to measure water level on a continuous basis by measuring at a 15-minute frequency. A barologger will also be deployed at one of the monitoring stations to collect barometric pressure. Level logger and barologger data will be downloaded monthly at the time of the in-situ stream measurements. Monitored atmospheric pressure and ambient temperature will be used to barometrically compensate level logger water level data. Subsequently, this will enable conversion of level data to flow using the station rating curves discussed above.

At the outlets of the stormwater ponds, flows will be monitored by installing a level logger within each pond near the outlet once the ponds are operational. Using the water level data obtained from the loggers, flow rates for the stormwater outlets will be monitored by calculating the flow of the outlets using an orifice/culvert discharge equation incorporating the outlet's known elevation, length, slope and diameter.

4.4 ADAPTIVE MANAGEMENT

CN plans to implement construction surface water adaptive management to ensure that (a) monitoring results track as expected and are relevant to construction phasing, (b) is capable of detecting and identifying an unforeseen effect, and (c) has a process established to investigate the source of the effect and if necessary, implement additional mitigative measures to respond to the identified effect. Every year, monitoring approaches and results will be reviewed with ECCC, DFO and CH to ensure monitoring is sufficient to respond to any changing conditions, in support of adaptive management. Adaptive Management is the current and appropriate terminology to describe the requirements of Condition 5.10. 4. This adaptive management section explicitly covers all the requirements of Condition 5.10.4.

4.4.1 Water Quality

4.4.1.1 Trigger Thresholds

Threshold 1 for stormwater pond effluent is defined as for the Table 4-1 parameters:

- Predicted effluent concentration range parameter – Four consecutive monthly parameter concentration exceedances 25% above the maximum predicted annual average pond effluent range and five-times the detection limit. Note: the stormwater pond effluent quality predictions were normalized for seasons and therefore, to account for seasonality and inter-event natural variation, a 25% variance above the predicted water quality value is included in the threshold definition.
- No predicted effluent concentration range parameter – Four consecutive monthly parameter concentration values at or above the respective CWQG-FAL or five-times the detection limit (DL).

Threshold 1 for the stream monitoring locations (Tributary A and Indian Creek) for the Table 4-1 parameters is defined as four consecutive monthly parameter concentration exceedances above the 95th percentile baseline concentration or five-times the DL. These threshold criteria apply when the inflow

concentration (as measured at the upstream monitoring stations) does not exceed this threshold at a given monitoring station.

The exceedance of five-times the DL within the definition of Threshold 1 was introduced to eliminate outliers related to parameters which are consistently less than the laboratory DL, or non-detectable. For these parameters, the 95th percentile values would result in values very close to the DL. Any measurement above the DL will automatically trigger Threshold 1. The value of 5 times detection limits is often used in water chemistry for QA/QC control. This threshold is based on the Practical Quantitation Limit defined by the Alberta Environment (AENV, 2006) and takes into account the potential for reduced accuracy when concentrations approach DLs (USEPA 2000; AENV 2006; Clark 2003).

The use of the 95th percentile of baseline monitoring data is often used in water quality data analysis. Additionally, in systems where some baseline water quality concentrations exceed regulatory guidelines, such as this Project, summary statistics are commonly used as threshold criteria. The use of the 95th percentile threshold is supported by the following documents: Brown and Berthouex 2002; DAWE 2019; Environment Canada 2012.

It should be noted that only parameters with regulatory or predicted thresholds will be used as trigger parameters.

4.4.1.2 Action Plan

If Threshold 1 for the stormwater pond effluent or stream monitoring stations is exceeded, then action will be taken to confirm the result by completing a QA/QC review of the sampling methods, laboratory report, and Chain of Custody. If the original sample is available and within the hold time, the sample will be re-analyzed to determine whether the exceedance was due to a potential laboratory error. In addition, the surface water monitoring station may be resampled within one month of the original exceedance to confirm the indicator parameter concentration. If the QA/QC review and/or resampling finds that the parameter concentration is within the threshold criteria, then no action is required, and the monitoring plan continues.

If the original sample is validated, and Threshold 1 is exceeded, then action will be taken to review the previous data for trends to determine if the exceedance is a result of sample variation, a single anomalous event such as a meteorological event, seasonal variation, or the potential for a project-related effect. If monitoring confirms Project related water quality parameter or parameters is or are trending towards or exceeding applicable threshold criteria outside the range of variability, CN will conduct an investigation to determine the source of the exceedance and whether an unforeseen adverse effect due to the Project is anticipated. If so, CN will ensure that appropriate additional mitigation measures will be assessed, designed, and implemented where appropriate. Additional construction-based mitigation measures that may be considered include but are not limited to, additional ESC measures, improved dewatering practices, vehicle fueling and review of details regarding the timing, location, and methods for inspection/monitoring. Upon confirmation, project construction related water quality exceedances of Threshold 1 will be documented and reported to ECCC, IAAC and DFO.

Similarly, should an exceedance in turbidity be noted and the result is confirmed, CN and the contractor will be notified, and corrective measures will be taken to address the turbidity increase. Corrective measures that may be considered include but are not limited to, modified work procedures, additional ESC measures and improved dewatering practices.

4.4.2 Water Quantity

4.4.2.1 Trigger Threshold

The criteria threshold for water quantity is defined as a 25% exceedance of the range of variability predicted in the EIS as provided in Table 4-4. A 25% variance above the predicted range is included in the threshold definition to account for seasonality and inter-event natural variation within the system.

Table 4-4: Range of Flow Variability Observed at Indian Creek and Tributary A and their Monitoring Criteria Thresholds

Watercourse (station)	Range of flow variability observed during baseline monitoring from June 2015 - June 2016	Criteria thresholds of 25% exceedance of the range of variability
Tributary A (Trib A; Trib-A-out)	0 m^3/s (dry) to 0.36 m^3/s	0 m^3/s (dry) to 0.45 m^3/s
Indian Creek (IC2 and IC3; IC-out)	0.004 m^3/s to 6.7m^3/s	0.003 m^3/s to 8.38 m^3/s

4.4.2.2 Action Plan

In the event that monitoring confirms flows are outside this threshold, an investigation of cause will be conducted to confirm the source and whether the variability may result in an adverse effect. When the source(s) of the variability has been identified and is attributable to the Project, and if warranted based on the potential for adverse effects, then appropriate, additional mitigation measures will be considered, assessed, designed, and implemented as appropriate (e.g., change in the stormwater management system design (e.g., orifice size, culvert size) or maintenance schedule).

5.0 OPERATIONS MONITORING

The objectives of the surface water quality follow-up program during operation is to monitor the effectiveness of stormwater management infrastructure in improving runoff quality and to assess potential water quality changes within Tributary A and Indian Creek. The purpose is to monitor stormwater pond effluent and receiver conditions to determine the water quality draining from the Terminal into Tributary A and Indian Creek. The monitoring program is intended to observe potential concentration increases in contaminants of concern and, or changes in non-concentration parameter values or trends in parameter values outside the predicted changes identified in the EIS attributable to the Project and whether there are exceedances of applicable criteria.

The objectives of the surface water quantity follow-up program are to monitor the effectiveness of stormwater management infrastructure to control flooding, attenuate discharge peaks, maintain erosion control flows and augment baseflows as well as potential water quantity changes associated with the stormwater management ponds during operation. The purpose is to identify whether there is an observed increase or decrease in Tributary A and/or Indian Creek flows outside the predicted changes identified in the EIS at the monitoring sites from the Project, and the SWM Pond outflows.

5.1 CRITERIA

Water quality criteria will be compared against the CWQG-FAL, the baseline and predicted water quality information as identified in the EIS and water quality concentrations at PDA inflow stations. Surface water quantity criteria will be compared against the baseline hydrological modeling predictions presented in the EIS and monitored PDA inflows.

References to the baseline monitoring program and predicted values used as monitoring criteria are provided in Section 4.1.

5.2 LOCATION

In accordance with Condition 5.10.3, as was proposed for construction, CN intends to monitor surface water quality and quantity at seven monitoring locations where:

- flows enter and exit the PDA along Tributary A and Indian Creek; and
- at the outlets of the two stormwater ponds.

The specific monitoring locations are shown on Figure 1 of **Appendix A** and are identified as follows: Trib-Ain, Trib-Ain2, Trib-Aout, IC-in, IC-out, SWMP-O1 and SWMP-O2. These are the same locations that were utilized for the construction monitoring program.

5.3 METHODS

CN will collect surface water quality samples and execute surface water quantity monitoring. In accordance with Conditions 5.10.1 and 5.10.2, CN proposes to:

- monitor surface water quality on a monthly basis and during high flows and upset conditions for the first five years of operation; and
- monitor surface water quantity continuously for the first five years of operation

5.3.1 Water Quality Sampling

5.3.1.1 In-Situ Water Quality

As was proposed for construction, during operations composite surface water samples will be taken as per the baseline sampling program. Water quality samples will be collected and submitted for analysis at an accredited laboratory and will be compared to the CWQG-FAL, baseline and predicted concentrations. The water quality parameters and associated criteria are provided in Table 4-1. In addition, CN proposes to monitor the temperature of stormwater management pond effluent using the temperature data from the water level loggers used to monitor effluent flow.

5.3.2 Water Quantity

During operation, water quantity is proposed to continue to be monitored on a continuous basis using datalogging instrumentation supported by quarterly in-situ channel depth, velocity and flow measurements used to further refine the monitoring station stage discharge curves. Water quantity monitoring techniques proposed for operation are the same as those outlined for construction (Section 4.3.2).

The water quantity thresholds for exceedance are provided in Table 4-4.

5.4 ADAPTIVE MANAGEMENT

During operation, CN plans to execute surface water adaptive management to ensure that (a) monitoring results track as expected, (b) is capable of detecting and identifying an unforeseen effect, and (c) has a process established to investigate the source of the effect and if necessary, implement additional mitigative measures to respond to the identified effect. Every year, monitoring results will be submitted to ECCC, DFO and CH. Should adaptive management measures be required, CN will engage with regulators to review adaptive management measures. This adaptive management section explicitly covers all the requirements of Condition 5.10.4.

Proposed adaptive management strategies related to surface water quality and quantity are provided in Sections 5.4.1 and 5.4.2.

5.4.1 Water Quality

5.4.1.1 Trigger Thresholds

Threshold 1 for stormwater pond effluent is defined as for the Table 4-1 parameters:

- Predicted effluent concentration range parameter - Four consecutive monthly parameter concentration exceedances 25% above the maximum predicted annual average pond effluent range and five-times the detection limit. Note: the stormwater pond effluent quality predictions were normalized for seasons and therefore, to account for seasonality and inter-event natural variation, a 25% variance above the predicted water quality value is included in the threshold definition.
- No predicted effluent concentration range parameter - Four consecutive monthly parameter concentration values at or above the respective CWQG-FAL or five-times the detection limit (DL).

Threshold 1 for the stream monitoring locations (Tributary A and Indian Creek) for the Table 4-1 parameters is defined as four consecutive monthly parameter concentration exceedances above the 95th percentile baseline concentration or five-times the DL. These threshold criteria apply when the inflow concentration (as measured at the upstream monitoring stations) does not exceed this threshold at a given monitoring station.

The exceedance of five-times the DL within the definition of Threshold 1 was introduced to eliminate outliers related to parameters which are consistently less than the laboratory DL, or non-detectable. For these parameters, the 95th percentile values would result in values very close to the DL. Any measurement above the DL will automatically trigger Threshold 1. The value of 5 times detection limits is often used in water chemistry for QA/QC control. This threshold is based on the Practical Quantitation Limit defined by Alberta Environment (AENV, 2006) and takes into account the potential for reduced accuracy when concentrations approach DLs (USEPA 2000; AENV 2006; Clark 2003).

The use of the 95th percentile of baseline monitoring data is often used in water quality data analysis. Additionally, in systems where some baseline water quality concentrations exceed regulatory guidelines, such as this Project, summary statistics are commonly used as threshold criteria. The use of the 95th percentile threshold is supported by the following documents: Brown and Berthouex 2002; DAWE 2019; Environment Canada 2012.

It should be noted that only parameters with regulatory or predicted thresholds will be used as trigger parameters.

5.4.1.2 Action Plan

If Threshold 1 for the stormwater pond effluent or stream monitoring stations is exceeded, then action will be taken to confirm the result by completing a QA/QC review of the sampling methods, laboratory report, and Chain of Custody. If the original sample is available and within the hold time, the sample will be re-analyzed to determine whether the exceedance was due to a potential laboratory error. In addition, the surface water monitoring station may be resampled within one month of the original exceedance to confirm the indicator parameter concentration. If the QA/QC review and/or resampling finds that the parameter concentration is within the threshold criteria, then no action is required, and the monitoring plan continues.

If the original sample is validated, and Threshold 1 is exceeded, then action will be taken to review the previous data for trends to determine if the exceedance is a result of sample variation, a single anomalous event or the potential for a project-related effect. If monitoring confirms a Project related water quality parameter(s) exceeds applicable threshold criteria, CN will conduct an investigation to determine the source of the exceedance and whether an unforeseen adverse condition occurred resulting in the water quality exceedance.

If necessary (and attributable to the project), CN will oversee that appropriate mitigation measures will be assessed, designed and implemented. Mitigation measures that may be considered include but are not limited to, additional ESC measures and a change to maintenance schedules of the Terminal (i.e., increased sweeping, inspection of culverts, storm sewers, stormwater pond maintenance, etc.). Following implementation of modified or additional mitigation measures to address either assessed increase in contaminants of concern concentrations or negative changes to other water quality parameter values beyond applicable limits, surface water quality monitoring will continue to assess mitigation measure effectiveness in addressing the impact of concern. The monitoring program may be revised, including additional surface water quality monitoring sites and increased monitoring/sampling frequencies, to provide more detailed assessment of the modified/additional mitigation measure impacts on surface water quality.

5.4.2 Water Quantity

5.4.2.1 Trigger Threshold

The criteria threshold for water quantity is defined as a 25% exceedance of the range of variability predicted in the EIS. A 25% variance above the predicted range is included in the threshold definition to account for seasonality and inter-event natural variation within the system.

5.4.2.2 Action Plan

In the event that monitoring confirms flows are outside this threshold, CN will conduct an investigation to confirm the source and whether the variability may result in an adverse effect. When the source(s) of the variability has been identified and if attributable to the project, if warranted based on the potential for adverse effects, then appropriate, additional mitigation measures will be considered, assessed, designed and implemented as appropriate (e.g., change in the stormwater management system design (e.g., orifice

size, culvert size) or maintenance schedule)). Following implementation of modified or additional mitigation measures to address either assessed decreases or increases in surface water quantity, monitoring will continue to assess mitigation measure effectiveness in addressing the impact of concern on a continuous basis. The monitoring program may be revised, including additional surface water quantity monitoring sites and increased monitoring frequencies, to provide more detailed assessment of the modified/additional mitigation measure impacts on the surface water flow regime.

6.0 REPORTING

The results of the surface water monitoring activities as part of the follow-up program will be reviewed, analyzed and presented in an annual report to document (a) the results of the monitoring program, (b) conformity with specified water quality and water quantity thresholds, (c) the effectiveness of the surface water quality mitigation measures, and (d) any adaptive management measures (i.e., additional mitigation) employed, if required. Although the annual report will only discuss the water quality concentrations of the select routine water quality parameters (Table 4-1) and select short-term water quality parameters (Table 4-2), the complete metals scan analytical results will be appended to each Annual Water Quality and Quantity Monitoring Report.

Additionally, water quality results of the Table 4-2 parameters monitored for the first six months of construction will be provided to ECCC, DFO and CH on a monthly basis for review to determine if further monitoring is required for these parameters beyond the first six months of construction.

A summary of the report deliverables is presented in **Table 6-1**.

Table 6-1: Surface Water Monitoring Reports

Deliverable	Pre-Construction	Construction	Operations
Monthly Water Quality Results of Table 4-2	N/A	Technical memo – submitted to ECCC, DFO and CH	N/A
Annual Water Quality and Quantity Report	N/A	Technical memo – submitted to ECCC, DFO and CH	Technical memo – submitted to ECCC, DFO and CH
Water Quality Exceedances (as defined by the trigger thresholds described in Sections 4.4.1 and 5.4.1)	N/A	Reported to ECCC, IAAC and DFO upon occurrence.	Reported to ECCC, IAAC and DFO upon occurrence.

A summary of the annual water quality and quantity report will also be included as a component of the annual report to be submitted to IAAC.

7.0 REFERENCES

AENV (Alberta Environment). 2006. Guidelines for Quality Assurance and Quality Control in Surface Water Quality Programs in Alberta. Edmonton, AB, Canada.

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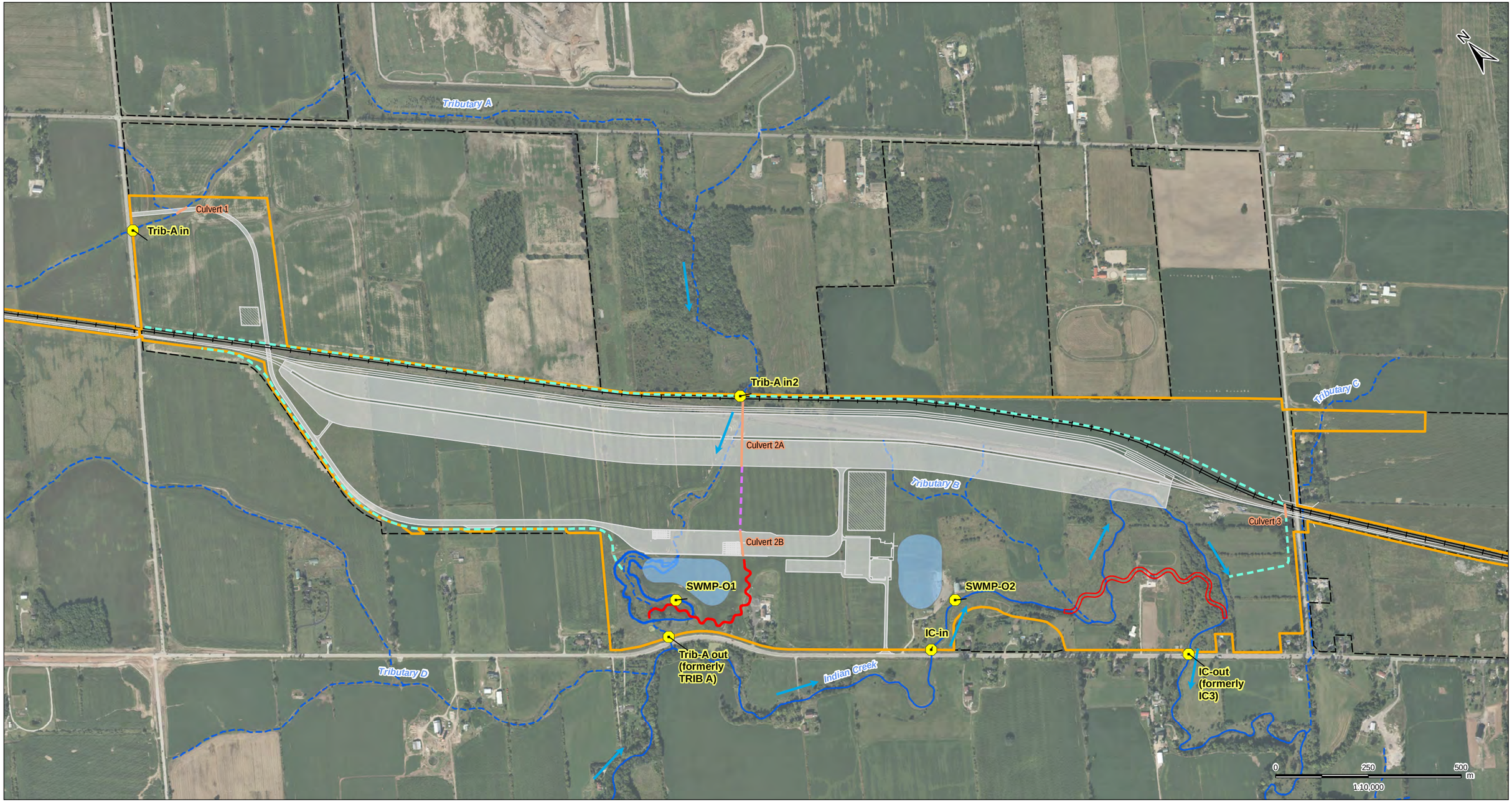
Pelletier, P.M. 1990. “A Review of techniques Used by Canada and Other Northern Countries for Measurement and Computation of Streamflow under Ice Conditions.” Nordic Hydrology, 21: 317-340.

US EPA. 2000. EPA Quality Manual for Environmental Programs. CIO 2105-P-01-0.

APPENDIX A: CONSTRUCTION AND OPERATION SURFACE WATER MONITORING LOCATIONS



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Revised: 2020-05-06 By: dharvey

May 2020
160960844

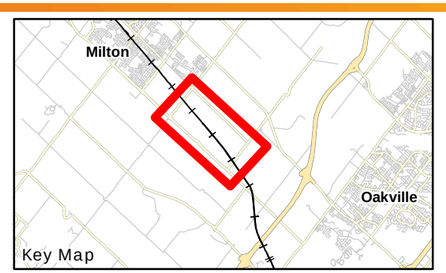
Stantec

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2015. Site layout: July 10, 2015.
3. Orthoimagery © First Base Solutions, 2015. Imagery taken in 2014.

Legend

- Surface Water Monitoring Station
- Project Components
  - Project Development Area
  - Existing Single Track Mainline
  - Existing Double Track Mainline
  - Single Track - Mainline
  - Double Track - Mainline
  - Project Component
  - CN-Owned Property
- SWM Pond
- Existing Features
  - Permanent Watercourse
  - Intermittent Watercourse
  - Waterbody
  - Flow Direction
  - Proposed Culvert
  - Drainage Ditch
  - Tributary A Regional Diversion Ditch
- Creek Realignment



Client/Project
Canadian National Railway
Milton Logistics Hub
Technical Data Report - Channel Realignment (Appendix E.2)

Figure No.
1

Title
Construction and Operation Surface Water Monitoring Stations