Draft Surface Water Quality Effects Assessment Report

Twin Creeks Environmental Centre Landfill Optimization Project Environmental Assessment

WM Canada

Watford, Ontario

November 2024

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Executive Summary

RWDI AIR Inc. (RWDI) was contracted by HDR Corporation on behalf of WM Canada (WM) to prepare this Draft Surface Water Quality Effects Assessment Report as part of the Twin Creeks Environmental Centre (TCEC) Landfill Optimization Project Environmental Assessment (EA). The EA is being carried out in accordance with the requirements of the *Ontario Environmental Assessment Act* (*OEAA*) and the EA Terms of Reference (ToR), which was approved by the Ministry of Environment, Conservation and Parks (MECP) on December 13, 2022. The Surface Water Quality evaluation criteria consider the following indicators:

- Changes in Surface Water Quality on-site prior to off-site discharge
  - Erosional effects on TSS and heavy metal concentrations in surface water; and
  - Leachate seep impacts to Surface Water Quality,
- Changes in Surface Water Quality within the roadside ditch of the northbound lane on Nauvoo Road from the TCEC to Hwy 402 in the Off-site Study Area from polyaromatic hydrocarbons (PAHs) in Automobile Shredder Residue (ASR).

Surface Water Quantity is considered in a separate report.

The purpose of this Effects Assessment Report is to present the:

- Potential environmental effects of the Alternative Methods on the Surface Water Quality;
- Comparison of the net effects of each Alternative Method;
- Selection of a Preferred Alternative;
- Assessment of the environmental effects of the Preferred Alternative; and
- Commitments and monitoring.

There are approximately 8 years of approved landfill airspace capacity remaining at the TCEC (e.g., capacity will be reached in approximately 2031). The Landfill Optimization would provide additional airspace of approximately 14 million cubic metres (m^3), which could extend the site life by approximately 12 years (from 2031 to 2043) and may be achieved through alternative landfill configurations (Alternative Methods) within the existing 301-hectare TCEC site area. No changes are proposed to the size of the TCEC site area, approved service area, or annual fill rate.

Three (3) Alternative Methods for carrying out the optimization were developed to a preliminary conceptual design level in the Conceptual Design Report (CDR). The three (3) Alternative Methods are relatively similar to each other, in that they each represent vertical expansions with the placement of waste on top of the current MECP-approved footprint of the Expansion Landfill. The differences between the three (3)

Alternative Methods is that there are different proposed geometries as it relates to sideslope steepness and final cap elevation.

The study areas for Surface Water Quality are as follows:

- On-site Study Area: the existing TCEC; and
- Off-site Study Area: the lands immediately west of the TCEC property boundary from approximately 1 km north and 500 m south of the entrance to the TCEC along the northbound roadside ditch of Nauvoo Road.

A net effects assessment was carried out for the three (3) Alternative Methods following the methods outlined in the approved ToR incorporating the information contained in the CDR, and the Surface Water Quality Existing Conditions Report (RWDI, 2024). The results of the net effects assessment were used in a comparative evaluation of the three (3) Alternative Methods.

As it relates to Surface Water Quality, given that the Expansion Landfill footprint is not proposed to be altered under any of the Alternative Methods nor under the 'Do Nothing' Alternative (which leads to Future Baseline Conditions), there are no net effects with adequate mitigative measures (e.g., clayey soil erosion and leachate seep control, as well as ASR track-out control) in place to manage potential increased soil erosion and potential leachate seepage. Additionally, there are no substantial differences in expected net effects to Surface Water Quality at the TCEC between any of the Alternative Methods. As such, no Preferred Alternative is identified with respect to Surface Water Quality and no advantages or disadvantages are identified for any Alternative Method when compared to the 'Do Nothing' Alternative.

There are no proposed modifications or changes to the currently proposed monitoring program under Future Baseline and/or any of the Alternative Methods presented herein, in consideration of climate change. As further monitoring is completed at the TCEC over time, changes to the Surface Water Quality monitoring programs that may be required to adapt to changing climatic conditions could be considered and implemented through regulatory approval. Further detail is provided in **Section 5.1**.

The current Surface Water Quality monitoring program as well as the proposed exceptions/modifications to the surface water monitoring programs presented in as detailed within **Section 3.1.4** through **Section 3.1.10** of this Report, will continue to provide an overview of the status of Surface Water Quality conditions at the TCEC. They will also continue to provide an overview of whether contingency and/or mitigation measures should be implemented such that surface water that discharges from the TCEC satisfies the regulatory requirements of the Waste and Sewage Environmental Compliance Approvals (ECAs).

In addition to EA approval, and under the current monitoring program during the Future Baseline Conditions and/or any of the Alternative Methods, the following regulatory approvals would require amendment to reflect the Surface Water Quality monitoring and assessment outlined herein:

- An amendment to the Waste ECA with respect to updating the 2007 EMP for the TCEC as outlined herein.
- An amendment to the Sewage ECA with respect to updating the 2007 EMP as outlined herein.
- As part of the amendments for both the Waste and Sewage ECAs, the following documents would need to be amended.
    - The 2007 EMP for the TCEC would need to be amended to reflect the monitoring and assessment process discussed in **Sections 3.1.5** through **3.1.9**.
    - The D&O for the TCEC would need to be amended to reflect the amendment of the 2007 EMP.
    - The *Surface Water Contingency and Remedial Action Plan Warwick Landfill Site*, dated April 29, 2008 (Jagger Hims Limited) would need to be amended to account for the mitigative measures presented in **Section 3.1.10**.

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Acronyms, Units and Glossary

Acronyms

Acronym	Definition
ASR	Automobile Shredder Residue
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
CDR	Conceptual Design Report (WSP, 2024)
COD	Chemical Oxygen Demand
D&O	2008 Design & Operations Report for the Expansion Landfill
DOC	Dissolved Organic Carbon
EA	Environmental Assessment
ECA	Environmental Compliance Approval
EMP	Environmental Monitoring Plan
LMP	Leachate Management Plan
MECP	Ministry of Environment, Conservation and Parks
OEAA	Ontario Environmental Assessment Act
PAH	Polycyclic Aromatic Hydrocarbons
PHC	Petroleum Hydrocarbon
PLIL	Primary Leachate Indicator List
PTTW	Permit-To-Take-Water
PWQMN	Provincial Water Quality Monitoring Network
PWQO	Provincial Water Quality Objectives
RDL	Reportable Detection Limit (laboratory data-related)
ROW	Right-of-way
SCRCA	St. Clair Region Conservation Authority
SGRA	Significant Groundwater Recharge Area
SLIL	Secondary Leachate Indicator List
SP	Sedimentation Ponds
SVOC	Semi-volatile Organic Compounds
TCEC	Twin Creeks Environmental Centre
TDS	Total Dissolved Solids
TKN	Total Kjeldahl Nitrogen
ToR	Terms of Reference
TSS	Total Suspended Solids
VOC	Volatile Organic Compound
WM	WM Canada

Units

Unit	Definition
ha	Hectare
hrs	Hours
km	Kilometre
L	Litre
m	Metre
mASL	Metres Above Sea Level
mbgs	Metres below ground surface
m^3	Cubic metres
M	Million
mg	Milligram
mm	Millimetre
ppm	Parts per million
µg	Microgram
µm	Micrometer

Glossary

Term	Definition
Approval	Permission granted by an authorized individual or organization for an undertaking to proceed. This may be in the form of program approval, certificate of approval or provisional certificate of approval.
Capacity (Disposal Volume)	The total volume of air space available for disposal of waste at a landfill site for a particular design (typically in m^3); includes both waste and daily cover materials but excludes the final cover.
Composting	The controlled microbial decomposition of organic matter, such as food and yard wastes, in the presence of oxygen, into finished compost (humus), a soil-like material. Humus can be used in vegetable and flower gardens, hedges, etc.
Composting facility	A facility designed to compost organic matter either in the presence of oxygen (aerobic) or absence of oxygen (anaerobic).
Environment	As defined by the Environmental Assessment Act, environment means: • air, land or water; • plant and animal life, including human life; • the social, economic and cultural conditions that influence the life of humans or a community; • any building, structure, machine or other device or thing made by humans; • any solid, liquid, gas, odour, heat, sound, vibration or radiation resulting directly or indirectly from human activities; or • any part or combination of the foregoing and the interrelationships between any two or more of them (ecosystem approach).
Environmental Assessment (EA)	A systematic planning process that is conducted in accordance with applicable laws or regulations aimed at assessing the effects of a proposed undertaking on the environment.

Glossary

Term	Definition
Evaluation criteria	Evaluation criteria are considerations or factors taken into account in assessing the advantages and disadvantages of various alternatives being considered.
Existing Landfill	The landfill along the eastern portion of the TCEC that was the 'Warwick Landfill' that opened in 1972.
Expansion Landfill	The landfill west of the Existing Landfill at the TCEC that was approved for construction in 2008 with landfilling initiated in late 2009.
Greenhouse gas (GHG)	Any of the gases whose absorption of solar radiation is responsible for the greenhouse effect, including carbon dioxide, methane, ozone, and the fluorocarbons.
Indicators	Indicators are specific characteristics of the evaluation criteria that can be measured or determined in some way, as opposed to the actual criteria, which are fairly general.
Landfill gas (LFG)	The gases produced from the wastes disposed in a landfill; the main constituents are typically carbon dioxide and methane, with small amounts of other organic and odour-causing compounds.
Landfill site	An approved engineered site/facility used for the final disposal of waste. Landfills are waste disposal sites where waste is spread in layers, compacted to the smallest practical volume, and typically covered by soil.
Leachate	Liquid that drains from solid waste in a landfill and which contains dissolved, suspended and/or microbial contaminants from the breakdown of this waste.
Mitigation	Measures taken to reduce adverse impacts on the environment.
Proponent	A person who: • carries out or proposes to carry out an undertaking; or • is the owner or person having charge, management or control of an undertaking.
Receptor	The person, plant or wildlife species that may be affected due to exposure to a contaminant.
Sewage ECA	Amended ECA for an Industrial Sewage Works No. 8117-CUSNXX, dated April 29, 2024
Terms of Reference (ToR)	A terms of reference is a document that sets out detailed requirements for the preparation of an Environmental Assessment.
Undertaking	Is defined in the Environmental Assessment Act as follows: • An enterprise or activity or a proposal, plan or program in respect of an enterprise or activity by or on behalf of Her Majesty in right of Ontario, by a public body or public bodies or by a municipality or municipalities; • A major commercial or business enterprise or activity or a proposal, plan or program in respect of a major commercial or business enterprise or activity of a person or persons other than a person or persons referred to in clause (1) that is designated by the regulations; or • An enterprise or activity or a proposal, plan or program in respect of an enterprise or activity of a person or persons, other than a person or persons referred to in clause (a), if an agreement is entered into under section 3.0.1 in respect of the enterprise, activity, proposal, plan or program ("enterprise").
Waste	Refuse from places of human or animal habitation; unwanted materials left over from a manufacturing process.
Waste ECA	Amended Environmental Compliance Approval (ECA) No. A032203, dated December 16, 2023

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Appendices

1 Introduction

RWDI AIR Inc. (RWDI) was contracted by HDR Corporation on behalf of WM Canada (WM) to prepare this Draft Surface Water Quality Effects Assessment Report as part of the Twin Creeks Environmental Centre (TCEC) Landfill Optimization Project Environmental Assessment (EA). The EA is being carried out in accordance with the requirements of the *Ontario Environmental Assessment Act* (*OEAA*) and the EA Terms of Reference (ToR), which was approved by the Ministry of Environment, Conservation and Parks (MECP) on December 13, 2022.

The *OEAA* defines the environment in a broad, general sense that comprises physical, biological, and human considerations. In this EA, the environment has been separated broadly into the natural, socio-economic, cultural, and built aspects, with environmental components and evaluation criteria identified within each aspect as listed in **Table 1-1**, consistent with the approved ToR. The organization of the Effects Assessment Reports is also provided in **Table 1-1**.

Table 1-1. Environmental Aspects, Components, and Evaluation Criteria

Environmental Aspect	Environmental Component	Evaluation Criteria	Effects Assessment Report
Natural Environment	Atmospheric Environment	• Air Quality – Dust • Air Quality – Landfill Gas and Combustion By-Products • Air Quality – Blowing Litter • Odour • Noise	• Air Quality
			• Noise
	Hydrogeology	• Groundwater Quality • Groundwater Quantity	• Hydrogeology
	Surface Water Environment	• Surface Water Quality • Surface Water Quantity	• Surface Water Quality
			• Surface Water Quantity
	Ecological Environment	• Terrestrial Ecosystems • Aquatic Ecosystems	• Ecological Environment
Socio-Economic Environment	Social Environment	• Human Health • Effects on Local Community	• Human Health
			• Socio-Economic Environment
	Economic Environment	• Economic Effects on Local Community	
	Visual Landscape	• Visual Impact of Facility	• Visual Landscape
Cultural Environment	Cultural Environment	• Cultural Heritage Resources • Archaeological Resources	• Cultural Heritage Resources
			• Archaeological Resources
Built Environment	Transportation	• Traffic Operations	• Transportation
	Current and Planned Future Land Use	• Effects on Current and Future Land Uses	• Land Use

The Surface Water Quality evaluation criteria identified in **Table 1-1** consider the following indicators.

- Changes in Surface Water Quality on-site prior to off-site discharge
    - Erosional effects on TSS and heavy metal concentrations in surface water; and
    - Leachate seep impacts to Surface Water Quality,
- Changes in Surface Water Quality within the roadside ditch of the northbound lane on Nauvoo Road from the TCEC to Hwy 402 in the Off-site Study Area from polyaromatic hydrocarbons (PAHs) in Automobile Shredder Residue (ASR).

The purpose of this Effects Assessment Report is to present the potential environmental effects of Alternative Methods of landfill expansion on Surface Water Quality, which includes a comparison of the net effects of each Alternative Method, the selection of a Preferred Alternative, the assessment of the environmental effects of the Preferred Alternative, and commitments and monitoring associated with the identified preferred alternative. This Surface Water Quality Effects Assessment Report assesses the effects of the project on the Surface Water Quality portion of the surface water environment. The effects of the project on Surface Water Quantity (e.g., hydrology) are assessed in a separate report (Surface Water Quantity Effects Assessment).

This Surface Water Quality Effects Assessment Report is one component of the EA. The EA Study Report will incorporate the information presented herein as appropriate, and this report will be included with the EA Study Report as a supporting document.

1.1 Project and Alternative Methods

There are approximately 8 years of approved landfill airspace capacity remaining at the TCEC (e.g., capacity will be reached in approximately 2031). The Landfill Optimization would provide additional airspace of approximately 14.3 million cubic metres (m^3), which could extend the site life by approximately 12 years (from 2031 to 2043) and may be achieved through alternative landfill configurations (Alternative Methods) within the existing 301-hectare (ha) TCEC site area. No changes are proposed to the size of the TCEC waste footprint, approved service area, haul route, or annual fill rate. The increased height presented through the Alternative Methods is proposed to accommodate the increased airspace volume. Currently, the Expansion Landfill is fully engineered and has an approved peak elevation of 280 metres above sea level (masl).

Three (3) Alternative Methods for carrying out the Landfill Optimization were developed to a preliminary conceptual design level in the Conceptual Design Report (CDR) and are described below as they are relevant to Surface Water Quality.

1.1.1 Alternative Method 1

Under the proposed vertical expansion for Alternative Method 1, the existing approved waste disposal footprint area of the TCEC would not change, but rather, the maximum

permitted height of waste would be increased by 44.5 metres (m). The peak landfill elevation would increase from its currently approved peak elevation of 280 masl to a proposed new peak elevation of 324.5 masl under Alternative Method 1.

Alternative Method 1 also consists of altering the landfill side slopes from 4H:1V to 3H:1V beginning at original grade (varies around footprint but is approximately 242 masl) of the Expansion Landfill footprint up to elevation 320 masl where it then transitions to a 20H:1V upper slope and peaking at a maximum elevation of 324.5 masl within the Expansion Landfill footprint.

Alternative Method 1 would provide an additional 14.3 million m^3 of landfill capacity.

For the plan and cross-sectional views of Alternative Method 1, which present above ground details, as presented in the CDR, refer to **Figure 1-1** and **Figure 1-2**. For further reference of the above ground details along with details of the surface water drainage network, refer to **Figure 1-3**.

Figure 1-1. Alternative Method 1 Proposed Landfill Contours

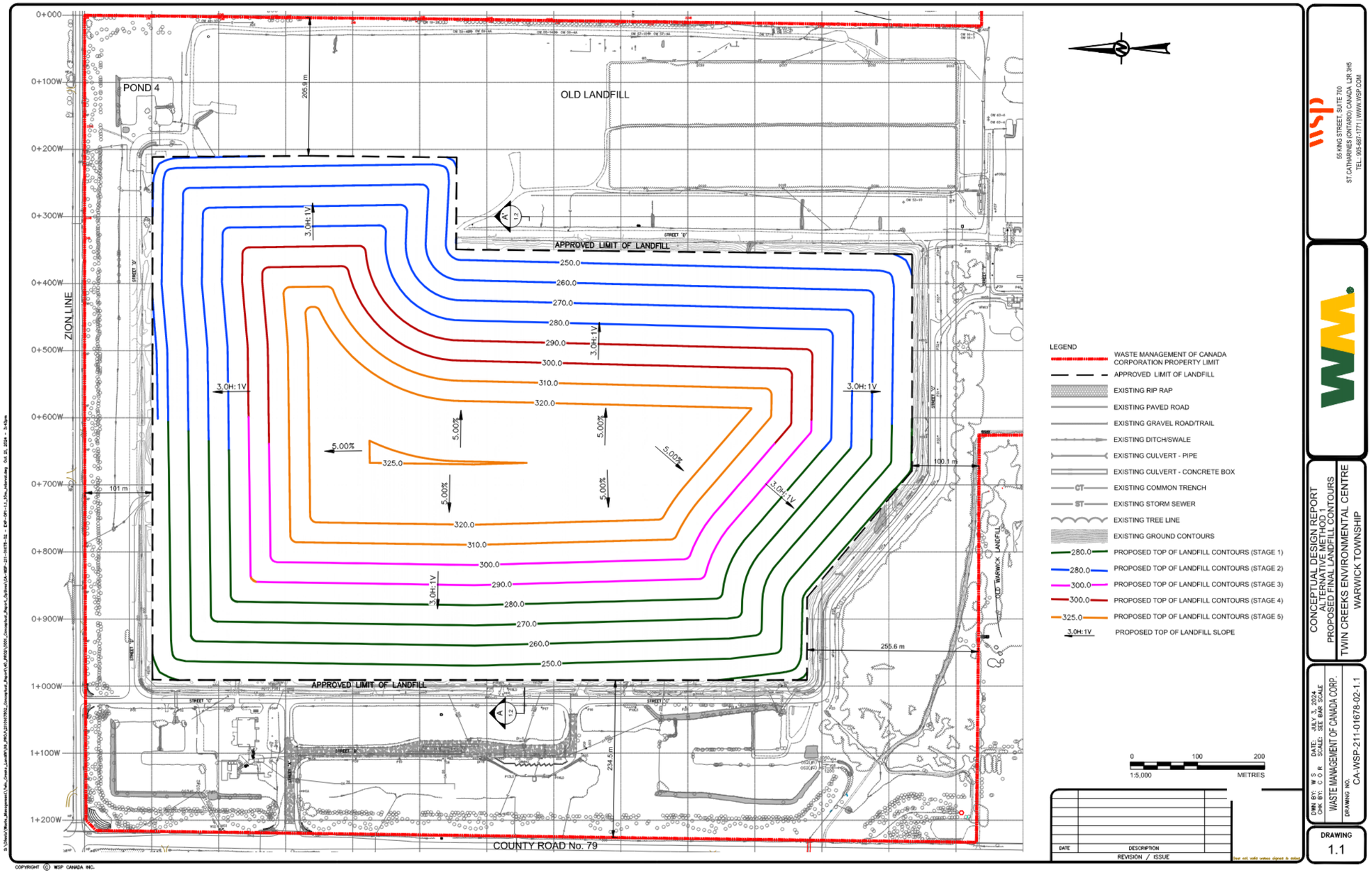


Figure 1-2. Alternative Method 1 Proposed Landfill Cross-section

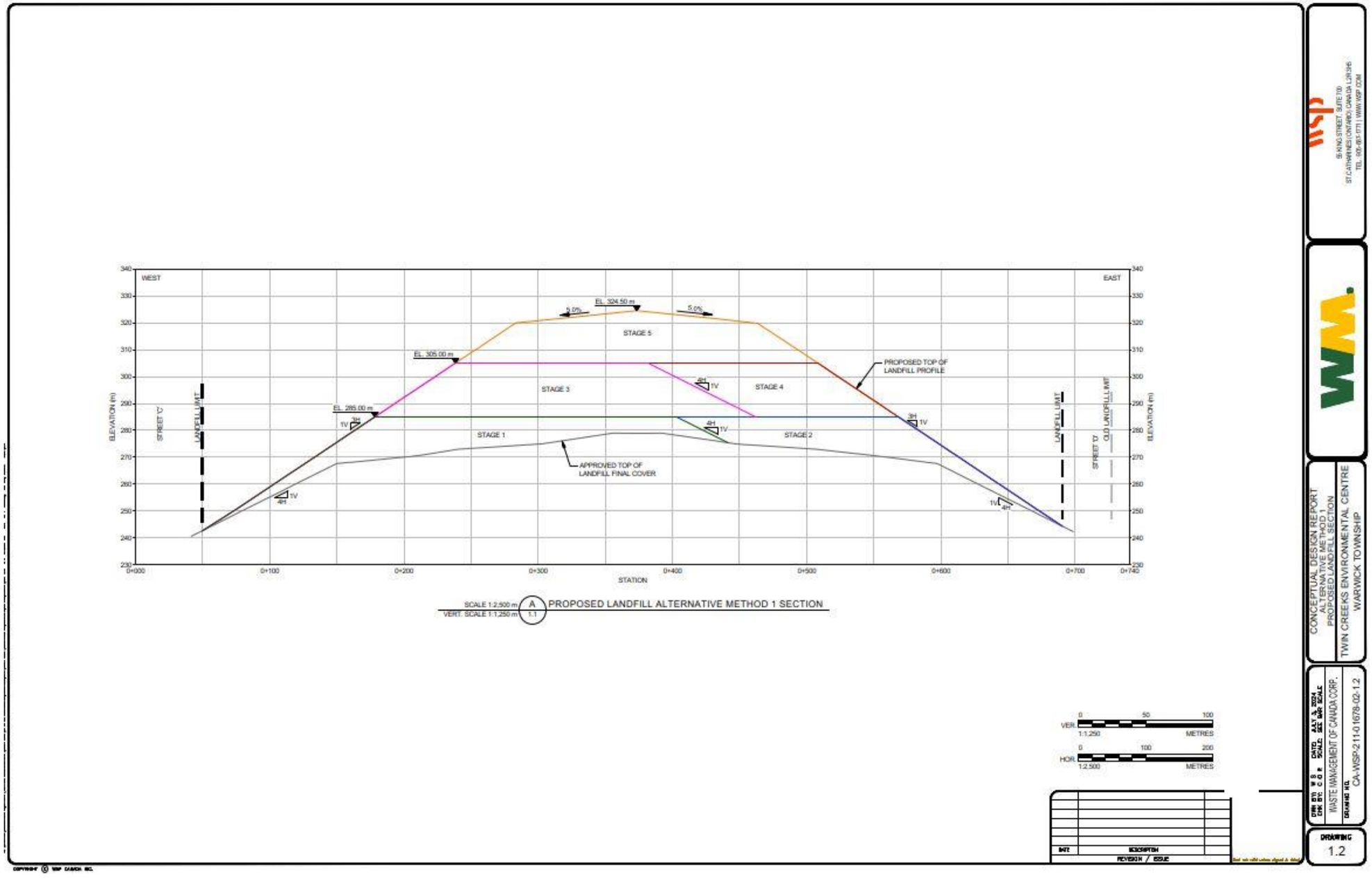
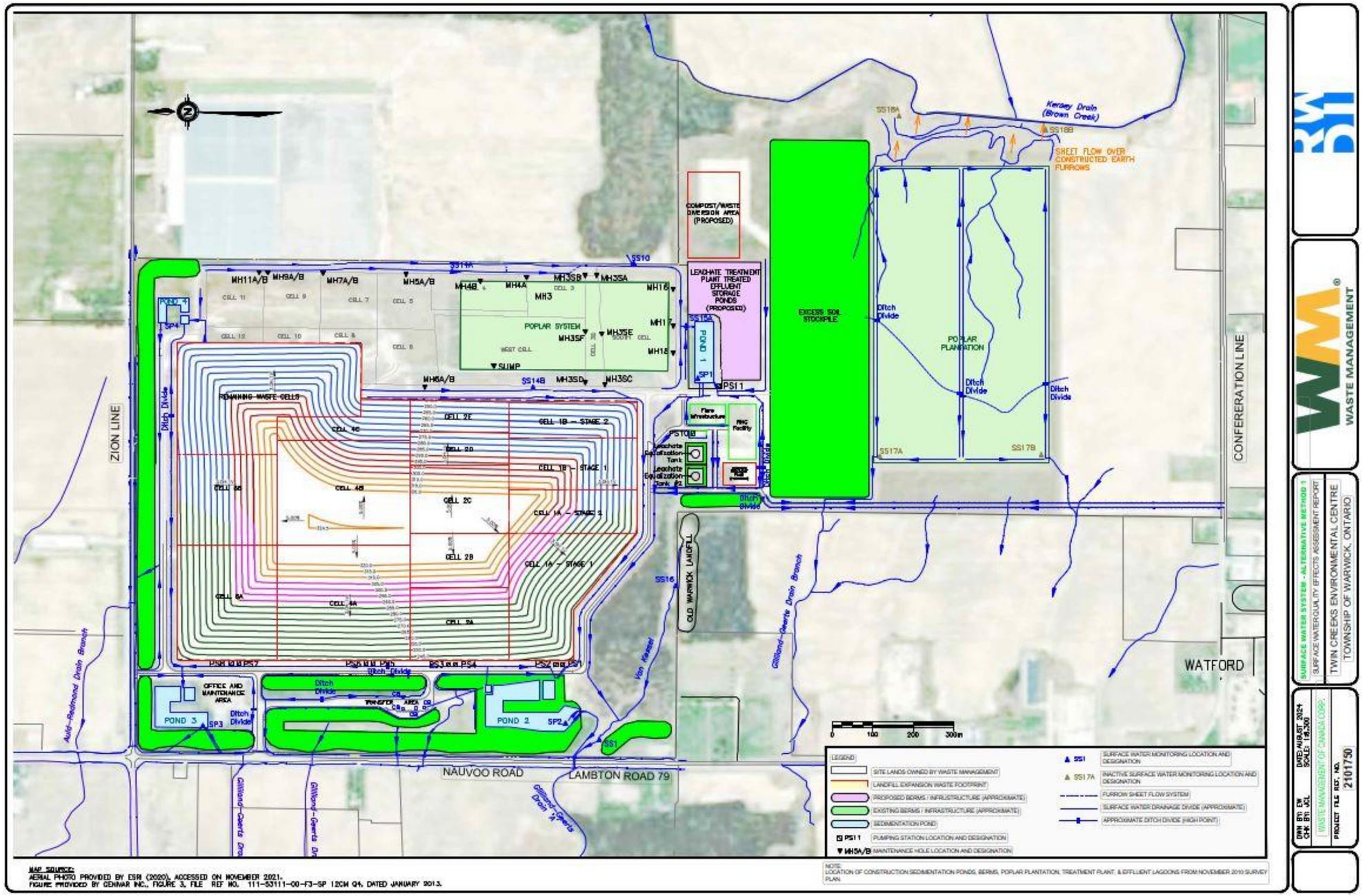


Figure 1-3. Alternative Method 1 Proposed Landfill Contours on Surface Water Drainage Network Site Plan



1.1.2 Alternative Method 2

Under the proposed vertical expansion for Alternative Method 2, the existing approved waste disposal footprint area of the TCEC would not change, but rather, the maximum permitted height of waste would be increased by 39 m. The peak landfill elevation would increase from its currently approved peak elevation of 280 masl to a proposed new peak elevation of 319 masl under Alternative Method 2.

Alternative Method 2 consists of altering the landfill side slopes from 4H:1V to 2.5H:1V between elevation 250 masl and elevation 313 masl. At 313 masl, the slope transitions to a 20H:1V upper slope and peaks at elevation 319 masl over the Expansion Landfill.

Alternative Method 2 provides an additional 14.3 million m^3 of landfill capacity.

For the plan and cross-sectional views of Alternative Method 2, which present above ground details, as presented in the CDR, refer to **Figure 1-4** and **Figure 1-5**. For further reference of the above ground details along with details of the surface water drainage network, refer to **Figure 1-6**.

Figure 1-4. Alternative Method 2 Proposed Landfill Contours

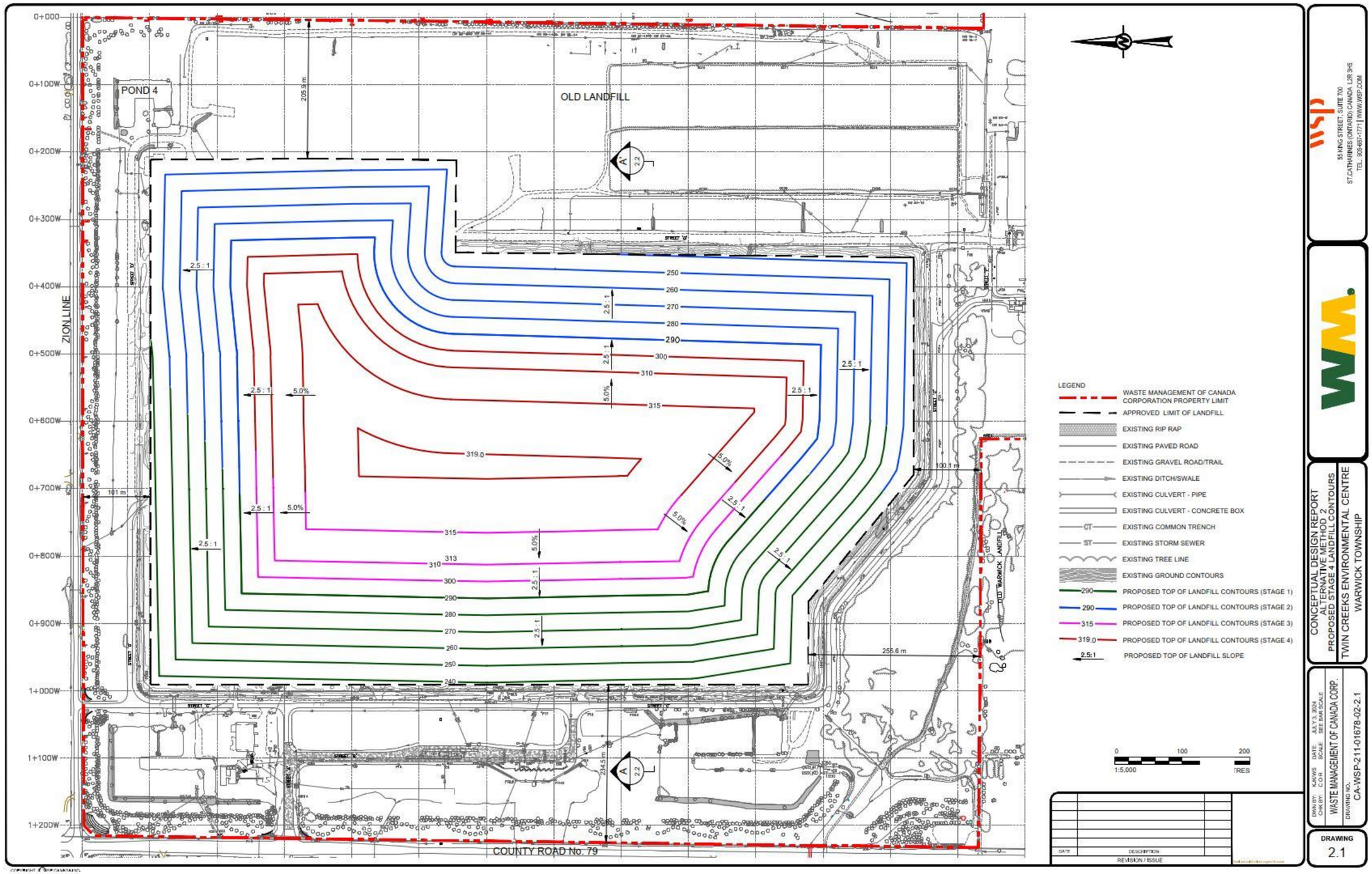


Figure 1-5. Alternative Method 2 Proposed Landfill Cross-section

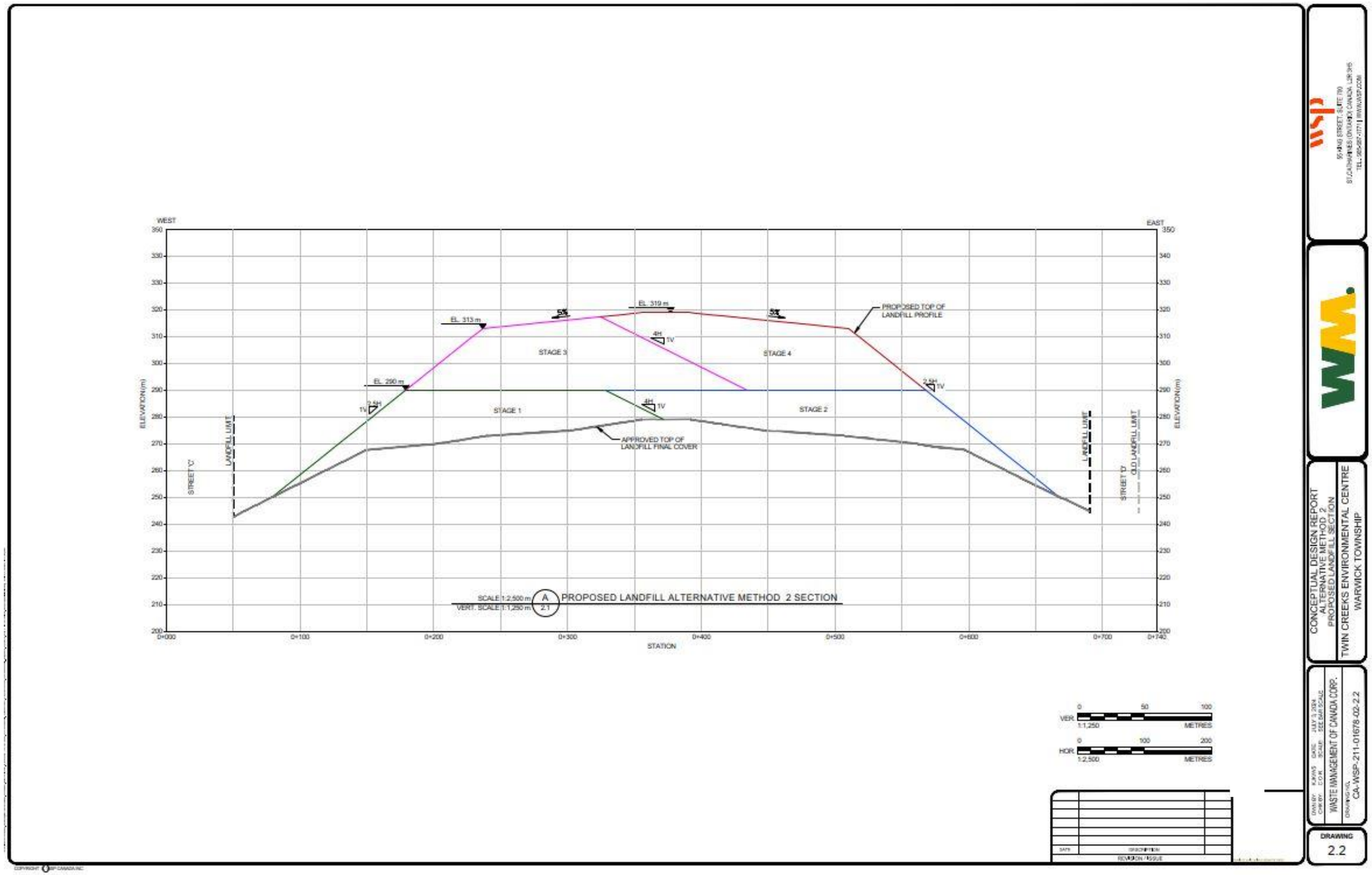
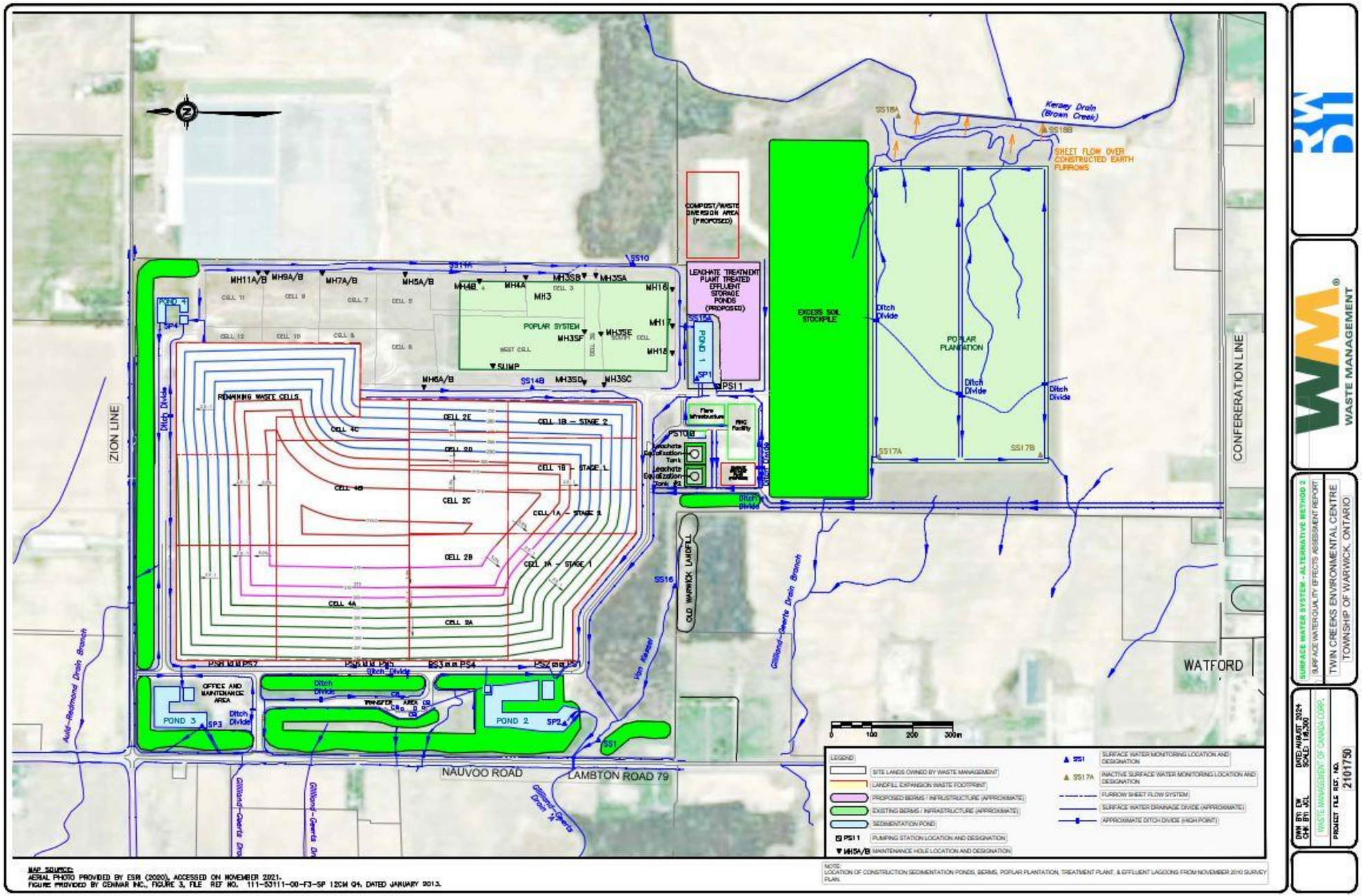


Figure 1-6. Alternative Method 2 Proposed Landfill Contours on Surface Water Drainage Network Site Plan



1.1.3 Alternative Method 3

Under the proposed vertical expansion for Alternative Method 3, the existing approved waste disposal footprint area of the TCEC would not change, but rather, the maximum permitted height of waste would be increased by 80 m. The peak landfill elevation would increase from its currently approved peak elevation of 280 masl to a proposed new peak elevation of 360 masl under Alternative Method 3.

Alternative Method 3 consists of increasing the landfill side slopes from 4H:1V to 2.5H:1V between elevation 260 masl and elevation 360 masl.

Alternative Method 3 provides an additional 14.3 million m^3 of landfill capacity.

For the plan and cross-sectional views of Alternative Method 3, which present above ground details, as presented in the CDR, refer to **Figure 1-7** and **Figure 1-8**. For further reference of the above ground details along with details of the surface water drainage network, refer to **Figure 1-9**.

Figure 1-7. Alternative Method 3 Proposed Landfill Contours

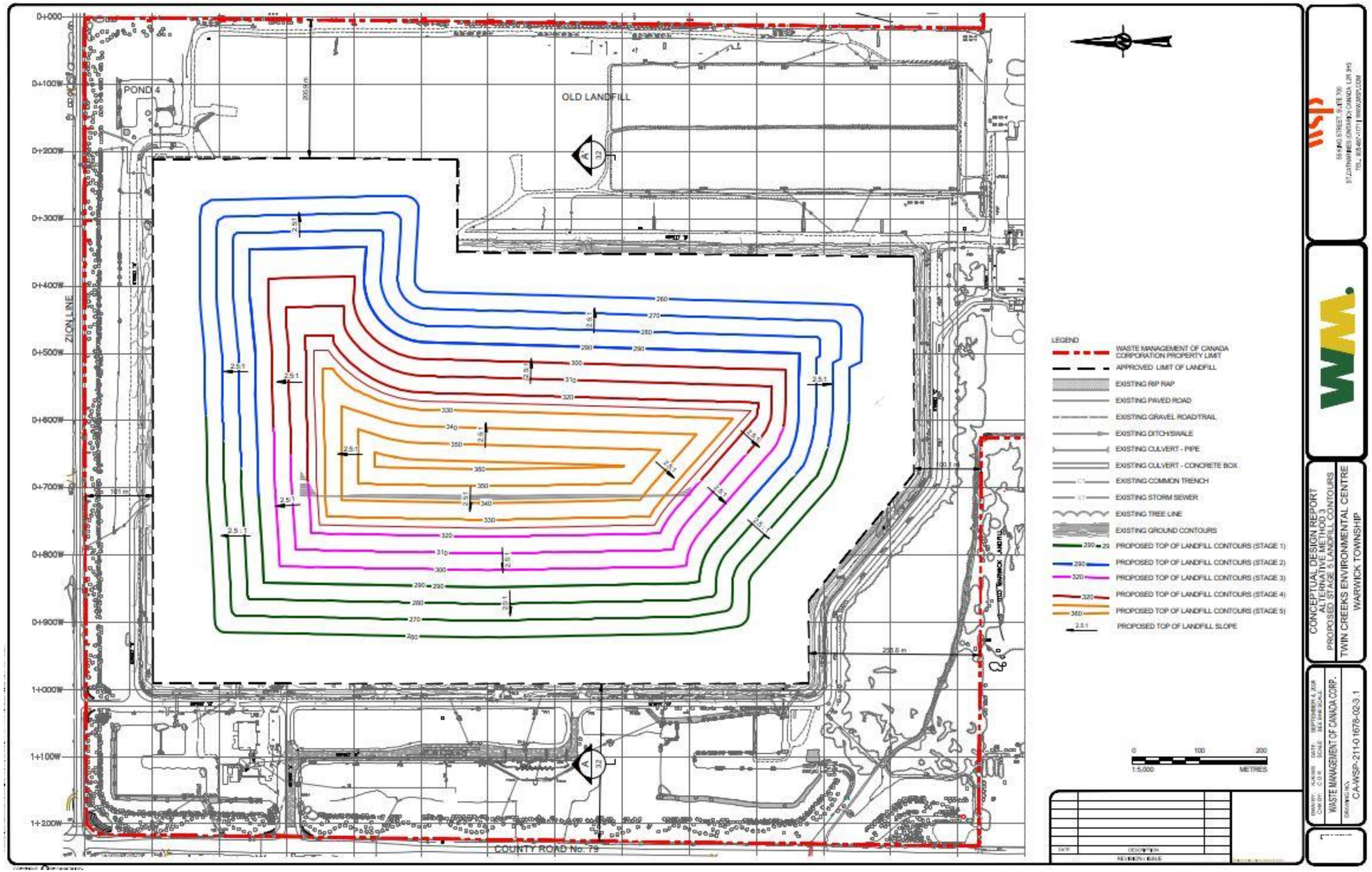


Figure 1-8. Alternative Method 3 Proposed Landfill Cross-section

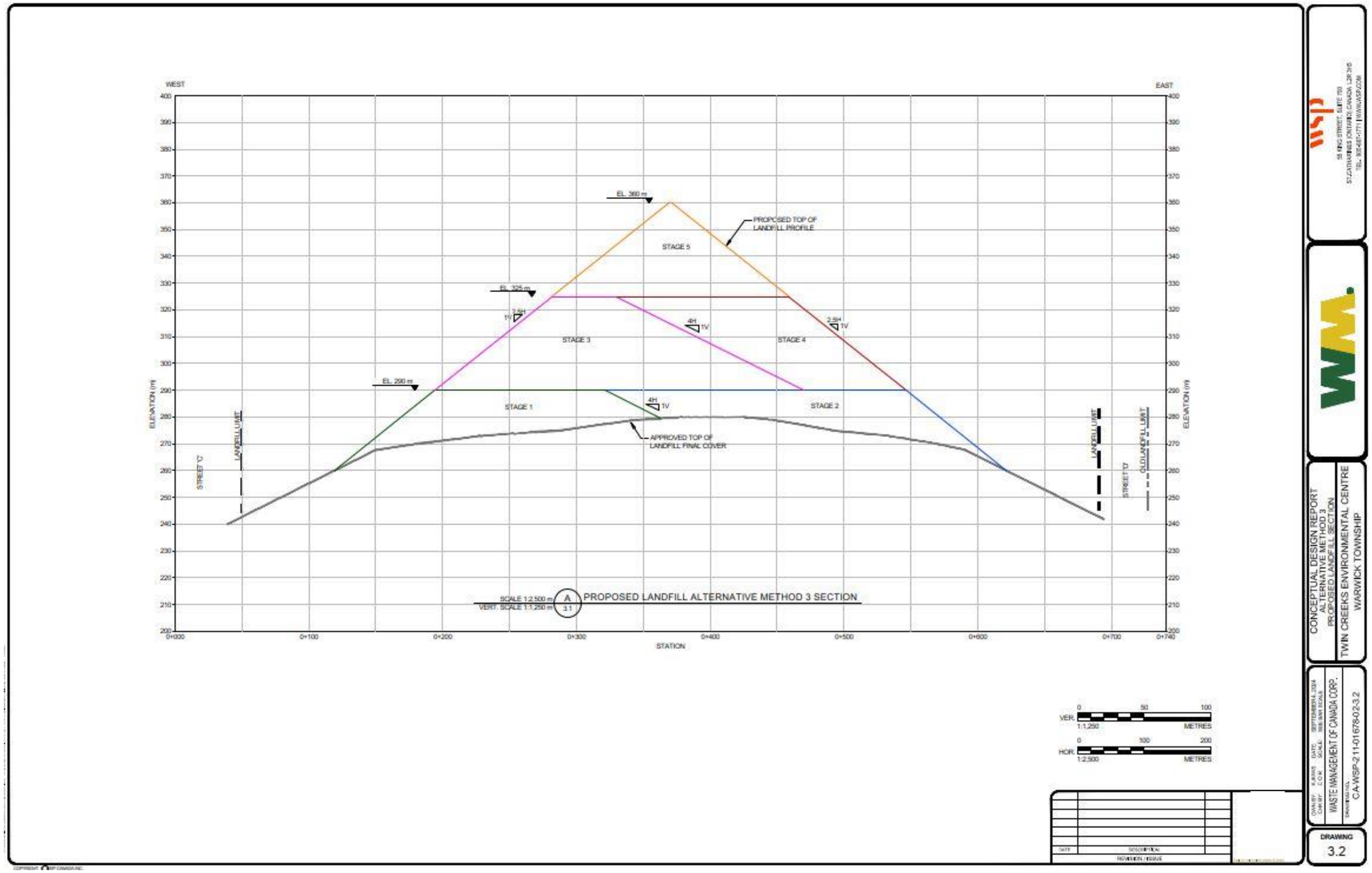
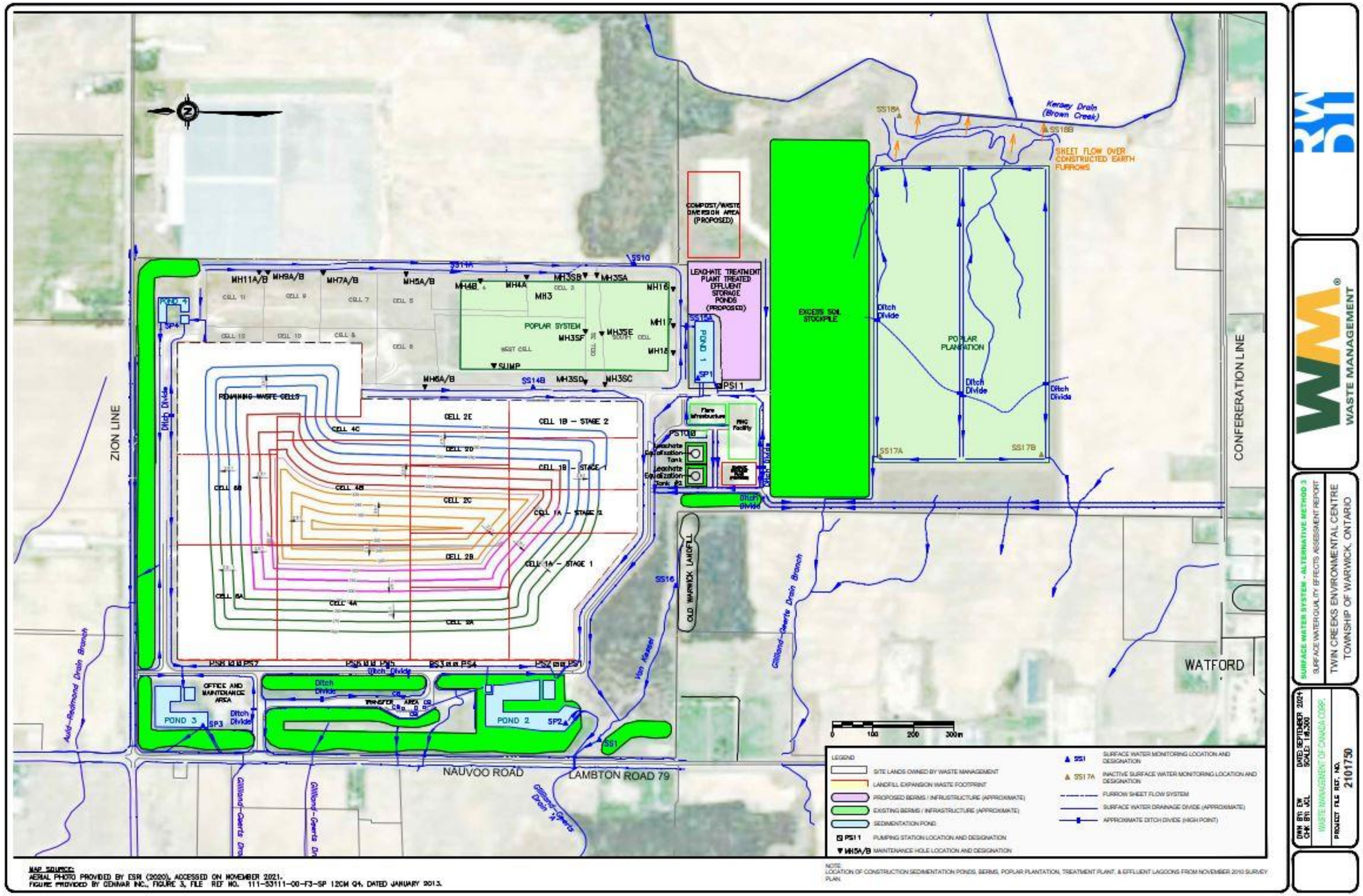


Figure 1-9. Alternative Method 3 Proposed Landfill Contours on Surface Water Drainage Network Site Plan



2 Effects Assessment Methods

Using the evaluation criteria, indicators, rationale and data sources from the approved ToR and the Existing Conditions from the Surface Water Quality Existing Conditions Report (RWDI, 2024), the Effects Assessment is carried out as follows:

- Predict the potential environmental effects for each Alternative Method (**Section 2.1**);
- Identify the Preferred Alternative based on a comparative evaluation of the potential environmental effects of each Alternative Method (refer to **Section 2.2**);
- Conduct an effects assessment on the Preferred Alternative, including the identification of mitigation measures and monitoring programs (refer to **Section 2.3)**; and
- Compare the effects of the Preferred Alternative to those of the 'Do Nothing' Alternative (e.g., the Expansion Landfill as approved) (refer to **Section 2.4)**.

2.1 Predicting Potential Environmental Effects for Alternative Methods

The potential environmental effects for each Alternative Method are identified within the study areas based on the application of the evaluation criteria, indicators and data sources in the approved ToR and based on the maximum allowable waste receipt level for the TCEC landfill. The potential effects can be positive or negative, direct or indirect, and short- or long-term. Mitigation measures are identified to minimize or mitigate the potential effects and then the net effects are evaluated taking into consideration the application of mitigation measures. The study areas, evaluation criteria, indicators, data source, and key design considerations and assumptions for Surface Water Quality are provided below.

2.1.1 Study Areas

The TCEC landfill is located within the Township of Warwick, in the County of Lambton, approximately 1 km north of the Village of Watford. The TCEC is situated south of Highway 402 and southeast of the intersection of Nauvoo Road and Zion Line. The municipal street address of the TCEC is 5768 Nauvoo Road, Watford, Ontario. The area being considered for the Landfill Optimization is the approved 75.4 ha Expansion Landfill footprint located within the northern portion of the 301 ha TCEC.

The study areas include the existing TCEC, as well as the potentially affected surrounding areas. The On-Site Study Area (the existing TCEC showing the Surface Water Drainage Network and on-site Surface Water Monitoring Stations) is presented on **Figure 2-1**. The Off-Site Study Area (also showing the Surface Water Drainage Network as well as the on-site and off-site Surface Water Monitoring Stations) is presented on **Figure 2-2.**

These study areas, also considered during the development of the Surface Water Quality Existing Conditions Report (RWDI, 2024), are as follows:

- On-Site Study Area: the existing TCEC; and
- Off-Site Study Area: the lands immediately west of the TCEC property boundary from approximately 1 km north and 500 m south of the entrance to the TCEC along the northbound roadside ditch of Nauvoo Road.

Figure 2-1: On-Site Study Area (Showing the Surface Water Drainage Network and on-site Surface Water Monitoring Stations)

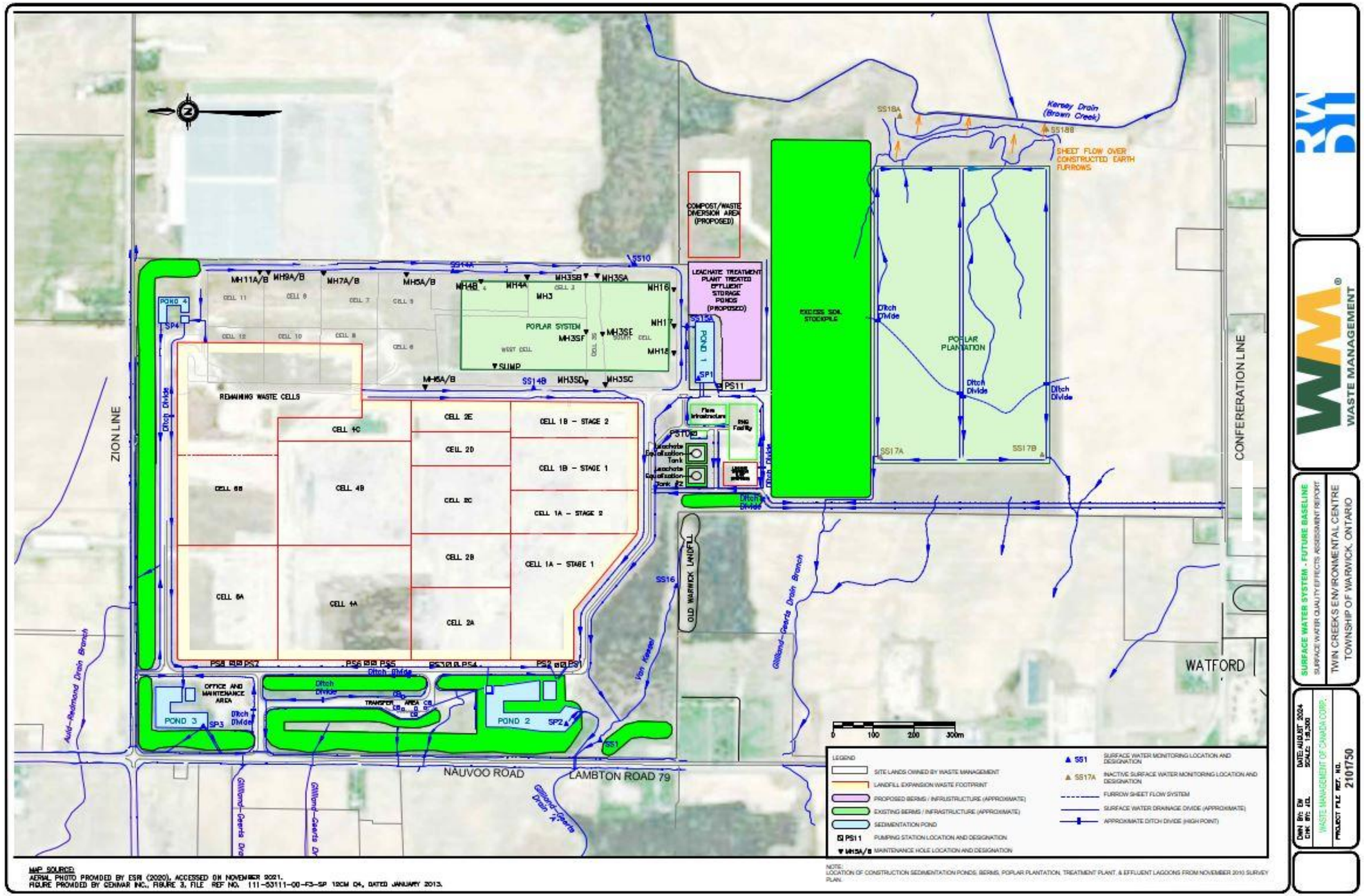
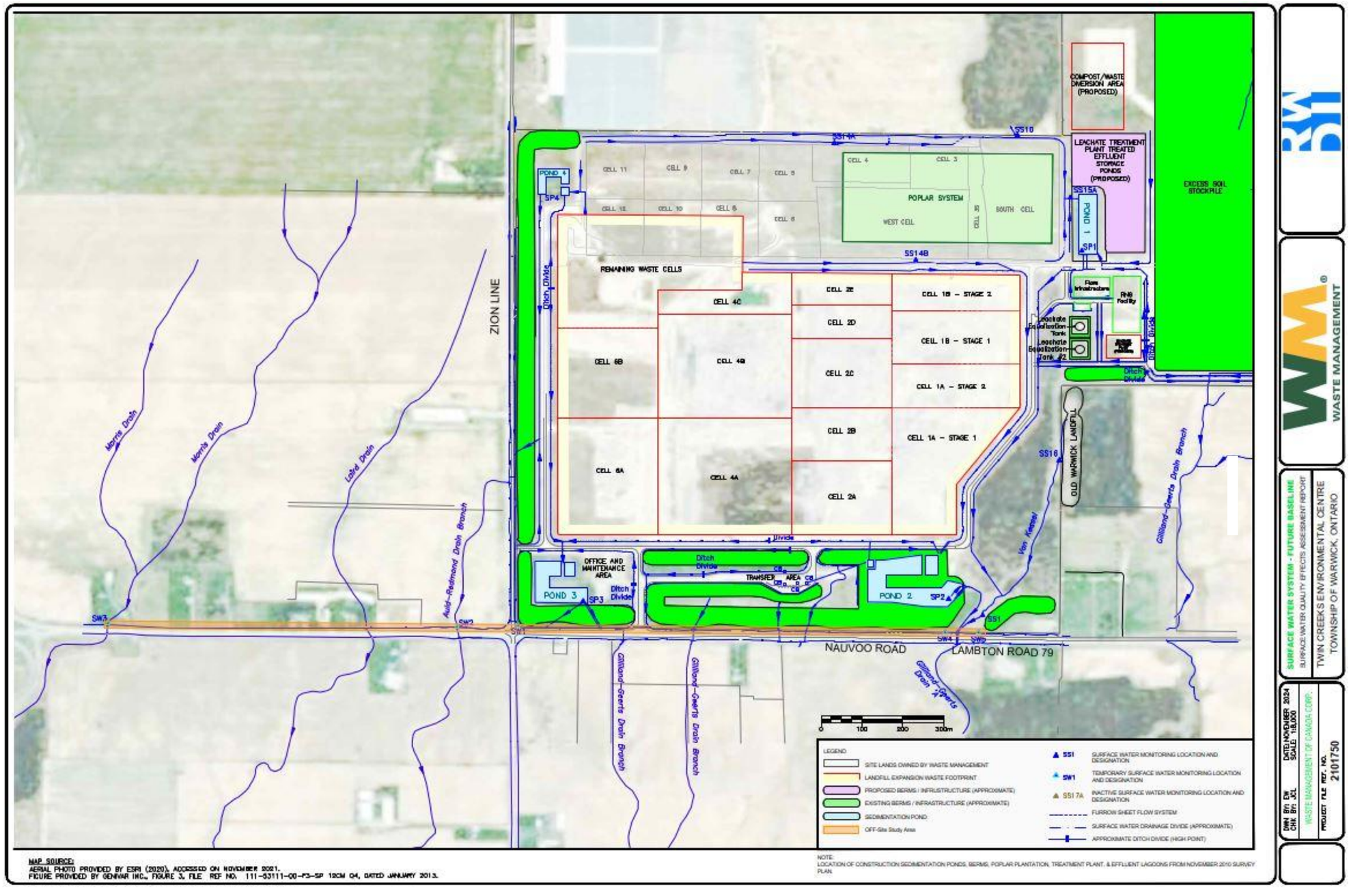


Figure 2-2: Off-Site Study Area (Also showing the Surface Water Drainage Network as well as the on-site and off-site Surface Water Monitoring Stations)



2.1.2 Evaluation Criteria, Indicators, and Data Sources

The evaluation criteria, rationale, indicators, and data sources used for Surface Water Quality as per the approved ToR are provided in **Table 2-1**.

Table 2-1. Evaluation Criteria, Indicators, and Data Sources for Surface Water Quality

Evaluation Criteria	Rationale	Indicators	Data Sources
Natural Environment			
Surface Water Environment			

Surface Water Quality	The Landfill Optimization has the potential to affect Surface Water Quality through either possible increased erosion of the landfill clayey soil cap or leachate seepage through the landfill cap or track-out of ASR wastes off-site.	• Predicted effects on Surface Water Quality on-site prior to off-site discharge.
		  ○ Erosional effects on TSS and heavy metal concentrations in surface water; and
		  ○ Leachate seep impacts to Surface Water Quality
		• Predicted effects from PAHs, in ASR, on Surface Water Quality within the roadside ditch of the northbound lane of Nauvoo Road from the TCEC to Hwy 402 in the Off-Site Study Area.
			• Applicable regulatory documentation (e.g., Amended TCEC ECAs, MECP guidelines, technical standards, etc.).
			• Landfill Environmental Monitoring Plan (Jagger Hims Limited, 2007) (2007 EMP), and as amended per MECP approval.
			• Surface Water Quality monitoring data at each on-site background, internal, and discharge (compliance) monitoring stations.
			• PWQMN.
			• Topographic maps and aerial photos.
			• On-site stormwater management system design for the TCEC.
			• Quarterly and Annual TCEC compliance monitoring reports.
			• Leachate generation and management assessments, as outlined in the LMP, (HDR, March 2023).
			• Proposed facility characteristics.
			• Testing for potential PAH impacts from ASR track-out within the surface water of the roadside ditch along the northbound lane of Nauvoo Road in the Off-Site Study Area.

2.1.3 Key Considerations and Assumptions

The key existing condition elements, design considerations, and assumptions for the Surface Water Quality effects assessment are described below.

2.1.3.1 Key Elements of Existing Conditions

In order to understand if the Landfill Optimization will affect the understood Surface Water Quality as it relates to the TCEC the following key elements from the Surface Water Quality Existing Conditions will be compared to each of the Alternative Methods.

- The Surface Water Quality on-site prior to off-site discharge is understood to periodically be impacted by clayey soil erosion. This is observed in terms of measured TSS and soil-related metals concentrations in the surface water.
- Potential leachate impacts to Surface Water Quality on-site prior to off-site discharge are understood based on leachate (elevated Primary Leachate Indicator List (PLIL) constituent concentrations) and surface water (low PLIL constituent concentrations) chemical quality.
- There are no effects from PAHs in ASR, on Surface Water Quality within the roadside ditch of the northbound lane of Nauvoo Road from the TCEC to Hwy 402 in the Off-Site Study Area such that the mitigative measured detailed herein continue to be carried out.

2.1.3.2 Key Design Considerations

The key design elements from the CDR, with respect to the Alternative Methods, that will be used in the Surface Water Quality Effects Assessment consist of the following changes from Existing Conditions to Future Baseline Conditions and from Future Baseline Conditions to each of the Alternative Methods. Additionally, the Surface Water Quality Effects Assessment identifies a preferred Alternative Method as it relates to Surface Water Quality. Thus, the Surface Water Quality effects assessment considers the following:

- Slope grading proposed for the vertical expansion of the Expansion Landfill with consideration toward the potential of increased erosional effects to Surface Water Quality.
- Increase in waste mound height and the associated cap surface area as it relates to leachate seep probability.
- No proposed changes to the landfill base design as well as leachate collection and management for the Expansion Landfill.
- The existing TCEC property boundaries and buffer width will remain the same under any of the Alternative Methods.

2.1.3.3 Key Assumptions

The key assumptions that will be used in the Surface Water Quality effects assessment consist of the following.

- Under each of the Alternative Methods, the slight alterations to the surface water management infrastructure (e.g., swales, ditching, and sedimentation ponds)) are not considered to significantly impact Surface Water Quality as flow rates and volumes are similar to the approved Future Baseline Conditions.

- Sedimentation Ponds 1 to 4 current designs are sufficient to manage Future Baseline flow conditions, as well as each Alternative Method even when considering climate change (Section 5.1.1 of the CDR), thus, the sedimentation ponds' capacities to attenuate chemical constituents are not expected to change.
- Stormwater is currently, and will continue to be, managed on-site through swales and sedimentation ponds.
- Within the Expansion Landfill, leachate mounding is not expected to develop based on the landfill's design.
- Landfilling operational conditions (e.g. leachate management, waste disposal operations, waste cover placement, etc.) are expected to remain the same for each Alternative Method and be consistent with current-approved Future Baseline operational requirements.
- During operation to closure, daily and interim cover will continue to be placed as part of the landfill operations as per Existing Conditions, the approved Future Baseline and each Alternate Method.
- No changes to the annual fill rate.
- The current approach to managing leachate generated will continue until an on-site leachate treatment facility is constructed:
    - Phytoremediation of a portion of the leachate volume generated through irrigation of the on-site Poplar System.
    - Trucking of leachate to an off-site wastewater treatment plant.
- On-site leachate treatment will occur in the future.
    - Irrigation liquid that satisfies the Amended ECA for an Industrial Sewage Works No. 8117-CUSNXX, dated April 29, 2024 (Sewage ECA) Effluent Trigger Concentration Criteria for application onto the trees of the Poplar Plantation is not expected to cause adverse effects to Surface Water Quality.
- The condensate captured by the Renewable Natural Gas (RNG) Facility will be managed per the Sewage ECA.
- Stormwater capture for the Compost and Waste Diversion Area, is proposed to be evaluated for potential management as surface water through Sedimentation Pond 1 rather than just automatically managing it as leachate.

2.2 Comparative Evaluation and Identification of the Preferred Alternative

The three (3) Alternative Methods are comparatively assessed and evaluated using the criteria and indicators to determine the Preferred Alternative. The differences in the potential environmental effects remaining following the implementation of potential mitigation/management measures (e.g., net effects) are used to identify and compare each Alternative Method.

The net environmental effects are used to compare the three (3) Alternative Methods to one another at the criteria and indicator level for each discipline. The following two step methodology was applied to carry out the comparative evaluation for Surface Water Quality:

1. Identify the predicted net effect(s) associated with each Alternative Method for each indicator and assign a preference rating (e.g., Preferred, Not Preferred, No Substantial Difference); and
2. Rate each Alternative Method at the criteria level (e.g., Preferred, Not Preferred, No Substantial Difference) based on the identified preference rating for each indicator and provide a rationale.

2.3 Effects Assessment of the Preferred Alternative

An assessment of the environmental effects of the Preferred Alternative is carried out considering the same criteria, indicators, and data sources, considering potential mitigation/management measures and cumulative effects. The effects assessment of the Preferred Alternative will be compiled and presented in the EA Study Report.

2.4 Comparison of the Preferred Alternative against the 'Do Nothing' Alternative

The effects of the Preferred Alternative are compared against the predicted effects of the currently approved Expansion Landfill based on similar environmental criteria and indicators, with the understanding that the criteria and indicators used in the current effects assessment may differ from those used for the effects assessment of the Expansion Landfill. The effects are compared against each other in terms of magnitude, extent, and duration. The advantages and disadvantages of the Preferred Alternative compared to the 'Do Nothing' Alternative are identified. The comparison of the effects of the Preferred Alternative against the 'Do Nothing' Alternative will be compiled and presented in the EA Study Report.

3 Net Effects Assessment

To identify the potential effects of the Landfill Optimization on Surface Water Quality, the conceptual design of each Alternative Method for the Landfill Optimization is examined to determine if it will have an effect on:

- Surface Water Quality on-site prior to off-site discharge through:
    - Changes in TSS concentrations within the surface water due to erosional effects from exposed clayey soil surfaces. As discussed within the Surface Water Quality Existing Conditions Report (RWDI, 2024), soil-related metal constituents can be heavily influenced within a surface water setting where TSS concentrations are elevated.

- PLIL constituent concentration trends in the surface watercourses and sedimentation ponds based on a comparison of Existing Conditions, Future Baseline Conditions, and Alternative Methods.

- Surface Water Quality within the roadside ditch of the northbound lane of Nauvoo Road from the TCEC to Hwy 402 in the Off-Site Study Area from changes to PAHs as a result of track-out of ASR material from waste hauling truck traffic.

The results of the net effects assessment for each Alternative Method are provided in **Sections 3.2** through **3.4**, below.

3.1 Future Baseline Conditions

There are changes that will occur at the TCEC between what was presented in the Surface Water Quality Existing Conditions Report (RWDI, 2024) to what will be developed by the start of the Landfill Optimization based on the current MECP-approved design for the Expansion Landfill.

For the purposes of this assessment, Future Baseline Conditions consider that the Expansion Landfill has reached the current MECP-approved design with respect to the horizontal footprint and peak height of 280 masl.

The difference between Existing Conditions and Future Baseline Conditions, with respect to Surface Water Quality, relates to the full build-out of the northeastern portion of the current approved Expansion Landfill footprint. With the construction of Cells 6B and 6C, as well as Cells 8A and 8B, the Expansion Landfill footprint will increase from the Existing Conditions of 55.8 ha to Future Baseline Conditions of 75.4 ha.

The evaluation of Surface Water Quality Future Baseline Conditions considers the following general aspects.

- Overview of the surface water flow regime and physical setting on-site as it relates to Existing Conditions and how the surface water network may change as it approaches Future Baseline Conditions.

- Consideration of the findings presented in the Surface Water Quality Existing Conditions Report (RWDI, 2024) to be able to predict Future Baseline Conditions using historical surface water chemical constituent concentration ranges (e.g., maximums and minimums) and trends, while considering the Expansion Landfill's construction development over time.

Surface Water Quality data collected at the TCEC as part of ongoing environmental monitoring, current approvals for the TCEC, as well as information provided in the CDR, were evaluated toward predicting Future Baseline Conditions as it pertains to Surface Water Quality at the TCEC.

3.1.1 On-Site Study Area

3.1.1.1 Surface Water Physical Setting

Existing Conditions Compared to the Future Baseline Conditions

The on-site surface water flow regime is depicted on **Figure 3-1**. Surface water at the TCEC is managed through on-site drainage features such as ditches and swales, as well as Sedimentation Ponds 1 through 4. Surface water that is managed by the Sedimentation Ponds consists of runoff that originates from operational areas of the TCEC.

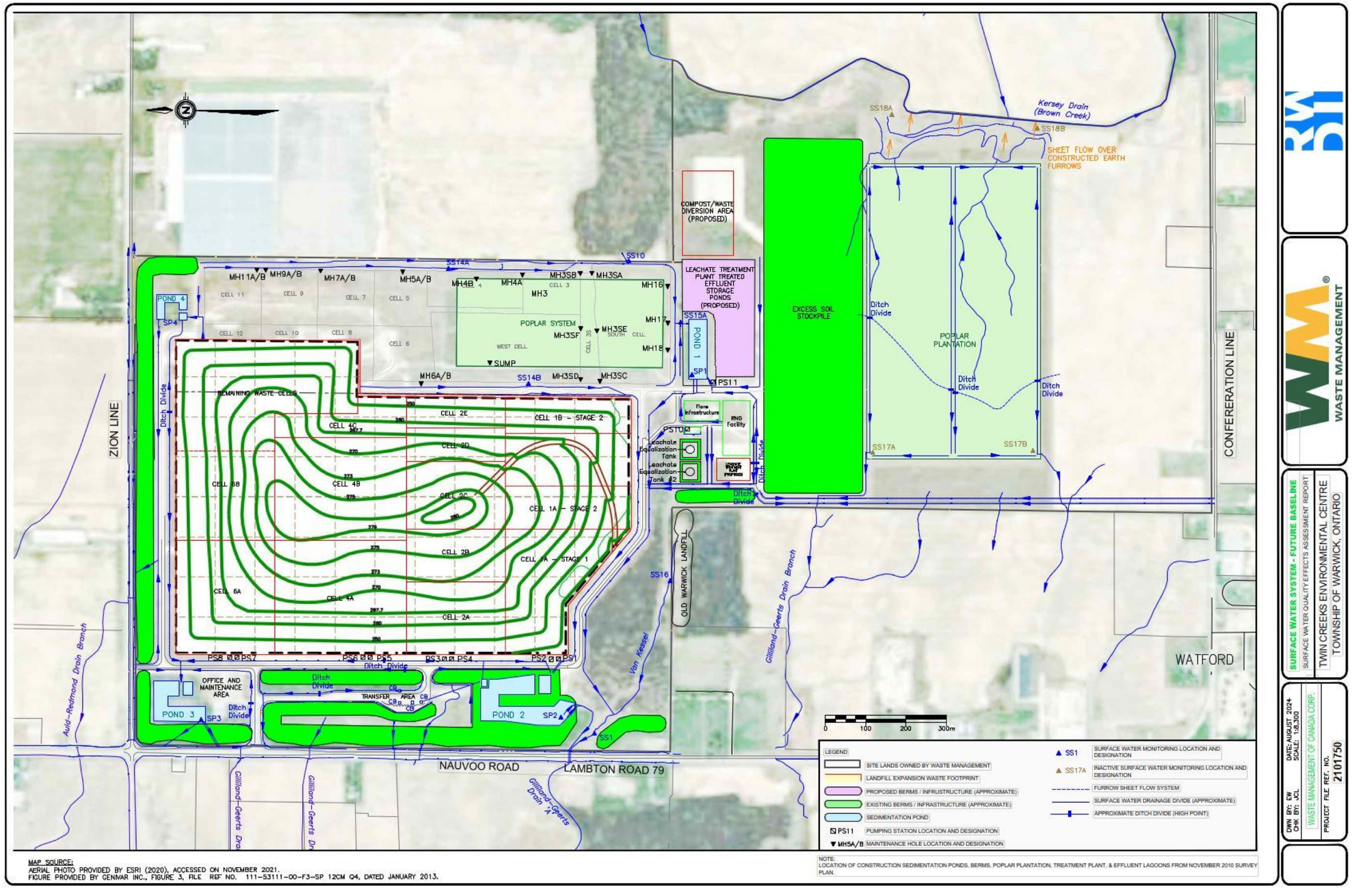
Except for some minor drainage realignment within the northeastern portion of the TCEC (swale lengths to Ponds 2 and 4 and addition of a culvert under the servicing road – Section 2.7.2 of the CDR), the physical setting for surface water management is not anticipated to change from the Existing Conditions to the Future Baseline Conditions. Thus, it is expected that Surface Water Quality overall will also not significantly change or be impacted by minor runoff conveyance modifications, which are expected to negligibly impact flow to Sedimentation Ponds 2 and 4. Also, flow to Sedimentation Ponds 1 and 3 would not be expected to be impacted as there are no expected upstream conveyance modifications.

Being that flow changes are negligible for Ponds 2 and 4 and that flows are not expected to deviate toward Ponds 1 and 3 under expected Future Baseline Conditions, surface water quality can be predicted based on monitoring data collected since the expansion construction was initiated in 2008.

Under Future Baseline Conditions, as outlined in the Surface Water Quality Existing Conditions Report (RWDI, 2024), it is expected that surface water flow will continue to be precipitation dependent. Similar to Existing Conditions, under Future Baseline Conditions, surface water flow will continue to be ephemeral and will be typically noted following snowmelt or prolonged periods of precipitation. Historically, adequate flowing conditions have generally been noted following precipitation measurements of 10 mm or more in a 24-hour period with Future Baseline Conditions not expected to change this observation.

Future Baseline Conditions are also expected to occasionally show that where 10 mm or more of precipitation (in the form of rain) is received at the Site in a 24-hour period, precipitation may not generate sufficient flowing conditions as is the case for past and Existing Conditions. These ‘no flow’ scenarios are anticipated to continue to occasionally occur during drier periods from late spring to early fall when lacking precipitation results in drier ground surface conditions such that it will absorb most of the precipitation. These ‘no flow’ scenarios may even occasionally be observed after measuring over 25 mm of precipitation in the five days leading up a 10 mm/24-hour precipitation event and are also anticipated to continue to occur during Future Baseline Conditions.

Figure 3-1: On-site Study Area – Future Baseline Conditions



Leachate Treatment Plant and Poplar Plantation Considerations

Leachate Treatment Plant

As a result of the January 15, 2007 EA approval conditions for the TCEC, no untreaded or treated leachate shall be discharged to surface water at the TCEC. As such, a leachate treatment plant (LTP) was designed and permitted to operate in the future. Per the current Condition 8.6 (1) (a) of the Amended Environmental Compliance Approval (ECA) No. A032203, dated December 16, 2023 (Waste ECA), within a minimum of three (3) years prior to the closure of the TCEC, a leachate treatment system is to be installed and operational at the site.

The LTP should be designed to reflect actual leachate generation rates observed on-site such that an appropriately rated treatment capacity is considered and that the LTP is not over- or under-designed. This LTP forms part of the expected Future Baseline Conditions.

There are ditches and swales associated with runoff from the LTP area, which are directed to Sedimentation Pond 1. As such runoff water from the LTP area is evaluated through the ongoing quality monitoring of Sedimentation Pond 1 as detailed below in **Sections 3.1.5** through **3.1.9**.

Poplar Plantation

The intent of the LTP is to treat leachate to meet the Sewage ECA Effluent Trigger Concentration Criteria for eventual irrigation to the Poplar Planation. As it relates to Surface Water Quality, irrigation liquid that meets the Sewage ECA Effluent Trigger Concentration Criteria applied to the Poplar Plantation is not expected to have a negative impact to Surface Water Quality.

The Poplar Plantation consists of a plot of trees planted on native soil that is situated south of the excess soil stockpile at the TCEC. During Future Baseline Conditions, the constructed area will be approximately 28 ha compared to its current approximate 22 ha area. Surface water runoff from the Poplar Plantation flows overland to the east (swales to Brown Creek) and to the west (Bear Creek tributary). There is a surface water drainage divide in a generally north-south orientation within the western portion of the Poplar Plantation, as shown on **Figure 3-1**. The quality of this runoff water is evaluated as detailed below in **Sections 3.1.5** through **3.1.9.**

RNG Facility Considerations

Since the development of the Surface Water Quality Existing Conditions Report (RWDI, 2024), the TCEC has been approved for the development and operation of a RNG Facility. The RNG Facility converts landfill gas to marketable natural gas of sufficient quality and pressure for supply to a natural gas pipeline distribution system.

There are ditches and swales associated with runoff from the RNG Facility area, which are directed to Sedimentation Pond 1. As such runoff water from the RNG Facility is evaluated through the ongoing quality monitoring of Sedimentation Pond 1 as detailed below in **Sections 3.1.5** through **3.1.9**. It is noted that for access roads to the RNG

Facility, the water is managed through ditches and swales to direct runoff to existing swales or ditches prior to off-site discharge. These areas currently manage runoff water in this fashion. There is no significant net difference in the water flow at these areas that would affect surface water quality.

Compost and Waste Diversion Area Considerations

The TCEC is currently approved to have a Compost and Waste Diversion Area, which is proposed to be located to the east of the Treated Leachate Effluent Lagoons.

Under the current approval, the water that lands on this area is to be automatically managed as leachate. Under Future Baseline Conditions, it is proposed that the retention pond for this area be batch sampled for Surface Water Quality (e.g., PLIL and Secondary Leachate Indicator List (SLIL) parameters). Upon verification of acceptable quality, the water in the retention pond would be batch-discharged such that the discharge water flows through Sedimentation Pond 1 as detailed below in **Sections 3.1.5** through **3.1.9.**

3.1.2 Off-Site Study Area

As part of the Existing Conditions for the EA, a monitoring program was developed to monitor off-site Surface Water Quality within the eastern (northbound) roadside ditch of Nauvoo Road (from approximately 1 km north and 500 m south of the entrance, as depicted on **Figure 2-2**) for a 12-month period in concert with the current Surface Water Quality monitoring program, detailed in **Sections 3.1.4** through **3.1.9.**

Off-site Surface Water Quality was evaluated toward its Existing Conditions as it relates to the potential for PAH impacts from ASR track-out material.

Under Future Baseline Conditions, there is no expectation to implement a surface water monitoring program off-site based on the findings during the Existing Conditions assessment completed for 2022. Although monitoring in the Off-Site Study Area is not required under Future Baseline Conditions, for reference the off-site surface water monitoring stations and designations that were evaluated under Existing Conditions are depicted on **Figure 3-2.**

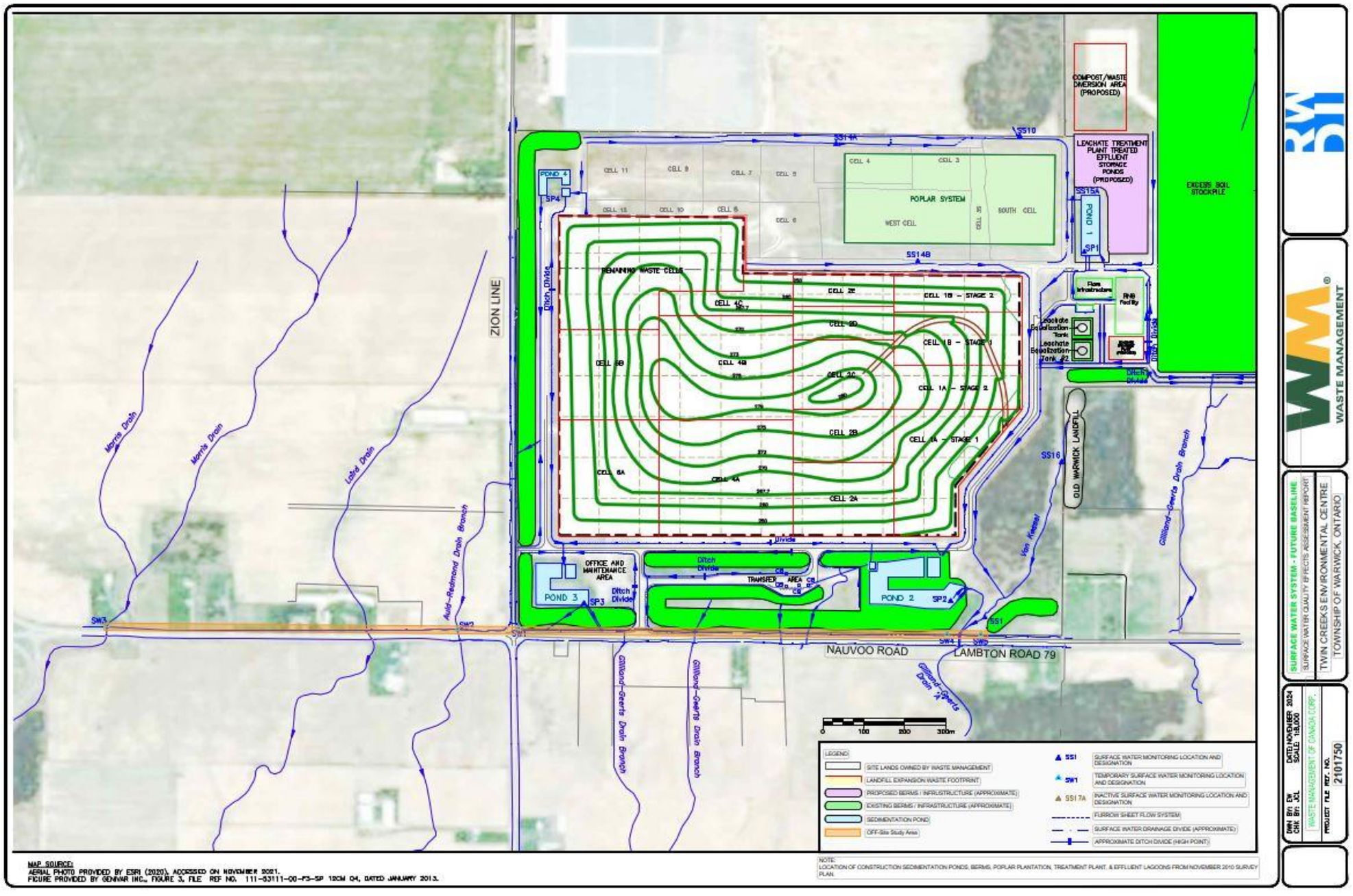
There are no predicted net effects to Surface Water Quality in the Off-Site Study Area, from ASR track out, under Future Baseline Conditions based on the findings of the Surface Water Quality Existing Conditions Report (RWDI, 2024). Notwithstanding this observation, as a further level of Surface Water Quality protection off-site, as it relates to ASR track out, WM has, since 2022, WM has implemented a rigorous routine inspection and where warranted, cleanup of track out ASR. On-site and off-site ASR cleanup efforts are completed as needed and consist of sweeping, scraping with light equipment, hand raking/picking, along the roadways, road shoulders, and within the ditches. It is noted that the vegetative growth within Nauvoo Road's roadside ditch is cut as part of cleanup activities such that ASR does not remain entangled in tall vegetation in ditches.

The above noted inspection and cleanup of ASR track out, would continue under Future Baseline Conditions, but would eventually cease upon landfill closure as ASR

would no longer be brought to site and the ASR that had been brought to the site would be covered with the final cap and would not have the potential to track out.

Therefore, under Existing Conditions and Future Baseline Conditions, an evaluation of off-site Surface Water Quality as it relates to potential effects from ASR track out is not warranted. Also, as there are no expected significant changes to landfill operations and the existing approved waste disposal footprint area under Future Baseline Conditions, no other TCEC sources are identified that would be anticipated to have an impact on the Off-Site Study Area.

Figure 3-2: Off-Site Study Area – Future Baseline Conditions



3.1.3 Source Water Protection

As outlined in Section 4.2.4 of the Surface Water Quality Existing Conditions Report (RWDI, 2024), under the *Clean Water Act* (2006), the TCEC is situated within the St. Clair Region Source Water Protection Area within the Thames-Sydenham Regional Drinking Water Source Protection Area.

Based on available Source Water Protection mapping provided by the St. Clair Region Conservation Authority (SCRCA), the eastern portion of the southern half of the TCEC's lands are located within an area designated by the SCRCA as a significant groundwater recharge area (SGRA) whereby groundwater recharge rates are predicted to be typically greater than the surrounding areas average annual groundwater recharge rates. The outlined SGRA coincides with lands that border Brown Creek/Kersey Drain. **Figure 3-3** shows the area designated as the SGRA, which overlays a portion of the TCEC's southeastern lands.

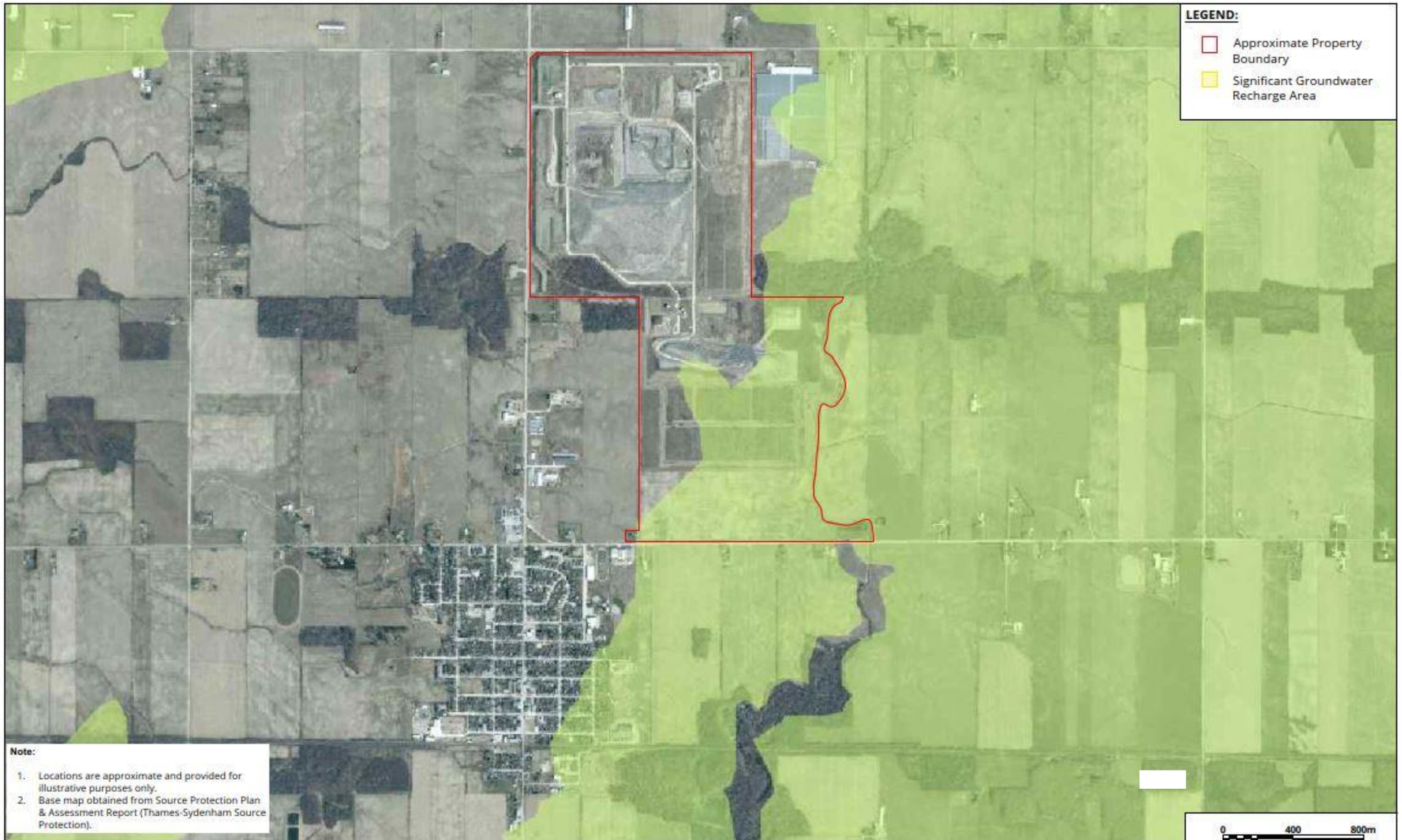
Though a portion of the TCEC is identified to be within a SGRA, there are no identified on-site activities within the SGRA as defined by SCRCA mapping that has the potential to cause adverse effects to Surface Water Quality and therefore the underlying aquifer (e.g., groundwater takings). Under Future Baseline Conditions, there will also not be any on-site activities within the SGRA.

Moreover, the TCEC is adequately monitored and is expected to continue to be adequately monitored under Future Baseline Conditions, such that any threat to drinking water resources would be identified and drinking water protection is thus inherently achieved at the TCEC.

The fine-textured condition of the natural soils in the area limit surface water infiltration into the shallow soil of the Southern Till. The Southern Till also acts as an aquiclude, which significantly slows the migration of groundwater and subsequently the transport of contaminants within the subsurface. Therefore, the quality of surface water has a low potential to affect the quality of the underlying groundwater. Conversely, there is a low potential for groundwater to affect the surface water.

In summary, under Future Baseline Conditions, any groundwater contribution to the Kersey Drain remains negligible. Notwithstanding the above, groundwater quality monitoring is ongoing, and is anticipated to continue into Future Baseline Conditions.

Figure 3-3: St. Clair Region Source Water Protection Area



3.1.4 Environmental Quality Evaluations

A detailed evaluation of historical environmental quality data pertaining to leachate and Surface Water Quality was undertaken as part of the Existing Conditions evaluation effort for Surface Water Quality.

The monitoring programs as it relates to Surface Water Quality evaluations under Existing Conditions were re-evaluated for suitability to evaluate potential leachate impacts under Future Baseline Conditions. This evaluation is discussed in the following sub-sections.

3.1.4.1 Surface Water Quality Monitoring Program Re-Evaluation

As outlined in Section 4.3.1 of the Surface Water Quality Existing Conditions Report (RWDI, 2024), the initial part of the evaluation of a surface water monitoring program effectiveness to assess for potential leachate impacts is to review both the leachate and the surface water chemical quality characteristics for eventual comparison between each other.

Expansion Landfill Leachate Quality

As outlined in Section 4.2.4.1 of the Surface Water Quality Existing Conditions Report (RWDI, 2024), historical constituent concentrations (up to the end of 2022) within the leachate of the Expansion Landfill at each PS1 (Cell 1), PS3 (Cell 2), and PS5 (Cell 4) show variable individual trends, as well as between each waste filling area that are either increasing, decreasing, or remaining relatively constant as summarized below in **Table 3-1**, which was derived from the historical leachate chemical data contained in **Appendix A**. Annual monitoring (in the month of May) for leachate quality at PS7 (Cell 6) did not begin until 2023 as the operation of PS7 did not begin until September 2022 after it was commissioned.

Notwithstanding the below trends, it was determined that leachate quality for the Expansion Landfill under Existing Conditions had not yet attained the predicted strength that was assessed as part of the previous EA undertaking (2008 D&O, Henderson Paddon, 2008). This was expected as the predicted leachate strength in 2008 was based on Future Baseline Conditions when the Expansion Landfill would reach its currently approved capacity (e.g., 2031) and was conservative.

As the waste mound is not fully constructed there is less waste contributing chemical loading to the percolating rainwater that becomes leachate. In other words, as the Expansion Landfill has not yet reached its peak volume, the observation that leachate strength has yet to reach its 2008 predicted concentrations is logical in the current lifecycle of the waste mound. It is expected that the leachate quality will increase in strength for the Expansion Landfill as it progresses towards Future Baseline Conditions.

Table 3-1. Expansion Landfill Leachate Constituent Concentration Trends

Parameter	Pumping Station PS1	Pumping Station PS3	Pumping Station PS5
Chloride	I	I	I
Nitrate	I	I	I
Boron	I	I	I
Alkalinity	I/C	I/C	C
Ammonia	I/C	I	C
Barium	F	F	C
Cadmium	F	F	C
Calcium	F	F	C
Electrical Conductivity	I/C	I/C	C
Dissolved Organic Carbon (DOC)	F	I	C
Iron	F	F	C
Lead	F	F	C
Magnesium	F	F	C
pH	F	F	F
Potassium	I/C	I/C	I
Sodium	I	I	I
Sulphate	F	F	C
Total Dissolved Solids (TDS)	F	F	F
Phenols	F	F	F
Arsenic	F	F	C
COD	F	F	D
Chromium	I	D/C	D
Copper	F	F	C
Total Kjeldahl Nitrogen (TKN)	I	I	I
Manganese	F	F	C
Nickel	F	F	C
Phosphorous	I/F	D/F	D
Zinc	F	F	C
Unionized Ammonia	I	I	C
Nitrite	C	C	C
Mercury	C	C	I

Notes:

1) I = Increasing Trend; D = Decreasing Trend; C = Constant Trend; F = Fluctuating Trend; n/a = Not applicable

2) Trends are based on historical constituent concentrations up to the end of 2022

As noted above, several constituent concentrations continue to show an increasing trend into 2023, where others appear to have increased in concentration initially, but have either peaked in concentration and remained constant, or slightly fluctuate over time at a stable

concentration range. For leachate quality at monitoring station PS5, there are only three (3) datasets, and the trends noted are very short-term and not necessarily indicative of the leachate quality trend in the long-term for this monitoring location.

Under Future Baseline Conditions, it is anticipated that the trends shown above would generally be similar until they approach/reach their peak predicted concentration, which is likely to occur approximately 5 years post closure. Additionally, over time there would be less variability in the constituent concentrations between waste fill areas of the Expansion Landfill as the waste matures post closure.

Existing Landfill Leachate Quality

As outlined in Section 4.3.1.2 of the Surface Water Quality Existing Conditions Report (RWDI, 2024), leachate quality for the purposes of evaluating the Existing Landfill is assessed from samples collected as part of the ongoing compliance monitoring program per the 2007 EMP at the TCEC. Therefore, the Existing Landfill's leachate quality considered leachate samples as follows:

- South Fill Area (MH18);
- West Central Fill Area (Sump); and
- Central Fill Area (Composite of MH3, MH4, MH5, MH6, MH7, MH9, MH11).

In general, the leachate strength in each the South Fill Area and the West Central Fill Area is greater in strength than noted for the Central Fill Area. This pattern is due to the types of waste disposed in the aforementioned cells, which correspondingly impacts the leachate strength for those cells. For example, the South Fill Area has elevated boron in the leachate, which is a result of a large amount of fibre glass insulation waste present in that cell. For reference, the historical leachate chemical data are contained in **Appendix A**.

Overall Leachate Quality Evaluation

As outlined in the Surface Water Quality Existing Conditions Report (RWDI, 2024), chemical constituent concentrations within the leachate of the Expansion Landfill are stronger that those of the Existing Landfill.

Under Future Baseline Conditions, with the approved waste volume added to the Expansion Landfill, it is anticipated that the average leachate constituent concentrations of the Expansion Landfill will be greater than that of the Existing Landfill. This difference will dominantly be because of the increased waste mass contributing chemical loading to the percolating precipitation that becomes leachate within the Expansion Landfill after it infiltrates into the waste. Conversely, as the Existing Landfill is closed to the receipt of waste, the aging/decaying waste will contribute less chemical loading to the percolating precipitation that becomes leachate after it infiltrates into the waste.

Also, as outlined in the Surface Water Quality Existing Conditions Report (RWDI, 2024), as the Expansion Landfill leachate constituent concentrations are anticipated to approach/reach the predicted peak leachate values tabulated within Table 6-9 of

the 2008 D&O Report, the selected Leachate Indicator Lists (PLIL and SLIL) parameters for evaluating potential leachate effects on Surface Water Quality outlined in the 2007 EMP remain relevant. In other words, the greater the parameter concentration in leachate relative to surface water, the better the parameter is as a leachate indicator.

As outlined in Section 4.3.1.4 of the Surface Water Quality Existing Conditions Report (RWDI, 2024), a group of parameters indicative of landfill leachate, referred to as the PLIL, was selected based on the following:

- Elevated concentrations in leachate;
- Mobility and stability in surface water;
- Representative of larger chemical groupings (e.g., boron for metals); and
- Applicable PWQO.

The PLIL for Surface Water Quality evaluations at the TCEC is summarized in **Table 3-2**.

Table 3-2: Primary Leachate Indicator List Compounds for Surface Water

Primary Leachate Indicator List (PLIL)
Chloride
Ammonia (unionized)
Phenols
Boron
Nickel
Chromium (total)
Zinc

As summarized in **Table 3-2**, of the PLIL parameters, chloride, boron, and ammonia (which would impact unionized ammonia results in surface water) show increasing concentration trends at each of PS1, PS3, and PS5. This overarching concentration trend indicates that these parameters remain good leachate indicators, when present at elevated concentrations together in surface water. Phenols, although fluctuating in concentration, also remains a reliable leachate indicator parameter due to the magnitude of concentration difference detected in leachate relative to surface water. Nickel, chromium, and zinc, although not showing dominant increasing trend concentrations in leachate, also continue to be useful as parameters for evaluating potential leachate effects in surface water when considered with chloride, boron, unionized ammonia, and/or phenols concentrations. As discussed in more detail in the following sub-section, nickel, chromium, and zinc are very useful in assessing for landfill operational effects to surface water quality as it relates to soil erosion.

Overall Surface Water Quality Evaluation

As outlined in Section 4.3.3.1 of the Surface Water Quality Existing Conditions Report (RWDI, 2024) the Surface Water Quality at the TCEC was evaluated for trends over

time since the Expansion Landfill began construction in 2008. For reference, the historical surface water quality chemical data are contained in **Appendix B**.

In the Surface Water Quality Existing Conditions Report (RWDI, 2024) it was assessed that the Surface Water Quality at the TCEC can potentially be impacted by on-going and intermittent operational effects that can cause one or more of the PLIL parameters to become elevated, sometimes greater than their respective trigger concentrations, but not as a result of leachate effects.

The observations were as follows:

- Chloride concentrations within the surface water at compliance monitoring stations have shown a slightly increasing trend since 2018, which was attributable to road salting influences associated with increased vehicular traffic to the Site with the increased annual tonnage rate that was approved in late 2017. The increased vehicular traffic did not necessarily increase on-site road snow management maintenance, but rather introduced additional road salt tracked onto the Site by trucks/trailers. Concentrations, though slightly elevated relative to pre-2018, continue to satisfy the established chloride trigger concentration. The chloride concentration trends observed since 2018 are expected to continue into Future Baseline Conditions.
- Beginning in 2021, an intermittence of elevated boron concentrations was observed at SS1 and SP2 as a result of short-term effects from the temporary storage of crushed glass (used as an aggregate bedding for landfill gas piping) near the southeast corner of Sedimentation Pond 2. During precipitation events, boron is inferred to have leached from the micro-shards (or dust) of glass into the surface water runoff at this location. Although the crushed glass pile has been moved and glass will no longer be stored in this area, under Future Baseline Conditions the boron concentration trend observed since 2021 is expected to continue in the short-term until this location is fully flushed.
- Overall, Surface Water Quality appeared to show the most prominent intermittent impacts (elevated soil-related metal parameters) due to erosional effects. This was assessed in detail as presented in Section 4.4.2 of the Surface Water Quality Existing Conditions Report (RWDI, 2024). This erosion related surface water effect was not necessarily limited to the results of larger/more intense precipitation events, but also during significant construction milestones where these former activities can leave large areas of exposed clayey soil surfaces that are more readily subject to erosional processes than maturely vegetated areas. Therefore, the metal-related parameters (e.g., zinc, chromium, nickel, etc.), when elevated in surface water without elevated chloride, boron, un-ionized ammonia, and phenols concentrations, are attributed to soil erosion and not likely attributable to landfill leachate and need to be interpreted accordingly.

The ongoing and intermittent effects to Surface Water Quality are important to understand in order to correctively identify the root-cause of the observed chemical quality and therefore, be able to implement the appropriate corrective action(s) (mitigative measure(s)).

Notwithstanding the above-discussed trend observations, there is also a supplemental group of parameters, termed the SLIL. The SLIL is used for quality assurance of the chemical database, for input to establish trigger concentrations, and for further data analyses in the event of PLIL trigger concentration exceedances. The SLIL parameters are summarized in **Table 3-3**.

Table 3-3. Secondary Leachate Indicator List Compounds for Surface Water

Secondary Leachate Indicator List (SLIL)	
Alkalinity Sulphate Calcium Magnesium Potassium Sodium Iron	Nitrate TKN Phosphorus (total) TDS pH Conductivity Turbidity Dissolved Oxygen

Under Future Baseline Conditions, the surface water leachate indicator lists (e.g., PLIL and SLIL) continue to be appropriately selected for the duration of the Expansion Landfill operations and will provide valuable chemical quality information as it pertains to assessing for potential erosional and/or leachate effect impacts.

Other parameters not necessarily identified as a PLIL or SLIL parameter, such as select organic compounds (e.g., Benzene, Toluene, Ethylbenzene, Xylene (BTEX), are also expected to continue to be elevated within the leachate under Future Baseline Conditions. As such, these other parameters are important to evaluate in consideration of the PLIL and SLIL parameter concentrations. As such these parameters also included in the Surface Water Quality monitoring programs as discussed in **Sections 3.1.6** and **3.1.7** for the Future Baseline Conditions.

Trigger Mechanism Assessment

As outlined in Section 4.3.1.5 of the Surface Water Quality Existing Conditions Report (RWDI, 2024), the trigger concentrations utilized to assess for potential landfill effects on Surface Water Quality as an initial first step, are based on the 90th percentile of background surface water quality historical data from background stations SS10 and SS16, or the PWQO, whichever is greatest. It is noted that for SP1 the Surface Water Quality has an established boron trigger concentration of 0.39 mg/L. Water quality data from the previous calendar year is added to the historical database to calculate a triggering concentration value for the upcoming monitoring calendar year. During assessment monitoring, where a PLIL constituent concentration is noted to be above its trigger concentration, verification monitoring is required.

Verification monitoring, where completed, also includes biological testing (for both ditches and ponds), such that if biological testing results are acceptable, the Surface Water Quality is deemed of acceptable quality and not impacted by landfill leachate.

The current MECP-approved Surface Water Quality Trigger Mechanism Assessment assumes that if any one of the PLIL parameters is detected above its respective

Trigger Concentration, then that surface water monitoring station has the potential to be impacted by landfill leachate. The surface water monitoring station is then reassessed (e.g., verification monitoring/sampling and completing the alternate source evaluation) for the potential for a landfill leachate impact. When it is assessed that there is not the potential for a landfill leachate effect, then there is no further corrective action required under the Waste and Sewage ECAs. Conversely, if it is assessed that there is a potential landfill leachate effect, additional assessment and/or remedial options would be implemented, as per the 2007 EMP and/or the *Surface Water Contingency and Remedial Action Plan Warwick Landfill Site*, dated April 29, 2008 (Jagger Hims Limited) and may require MECP approval.

For example, during a reassessment of an elevated PLIL soil-related metal(s) (zinc, chromium, and/or nickel) concentration(s), when it is the only PLIL parameter(s) detected at an elevated concentration(s), and through the evaluation of TSS concentrations decerns that the occurrence is not a leachate effect, then no further corrective action is required. In this case, Surface Water Quality, although not impacted by landfill leachate, is being negatively impacted by soil erosion and appropriate corrective mitigative measures would be implemented, accordingly.

Under Future Baseline Conditions, specifically during post-closure when the landfill cap is completed with seasonally mature vegetation, the probability of erosional effects to Surface Water Quality is lessened in comparison to operational years but is not reduced to zero.

Therefore, to address intermittent effects, most specifically as it relates to soil-related metals erosional effects, the Trigger Mechanism Assessment should be improved under Future Baseline Conditions, as outlined in **Section 3.1.9.**

3.1.5 Surface Water Monitoring Event Initiation Mechanism

On-site Surface Water Quality at the TCEC is evaluated for compliance with established MECP approved site-specific criteria before it is discharged to a receiver and/or ultimately off-site.

Under Future Baseline Conditions, the initiation mechanism for Surface Water Quality response monitoring would continue per Existing Conditions. The initiation mechanism occurs when 10 mm or more of precipitation in a 24-hour period from 08:00 to 08:00 is measured at the TCEC. Flowing conditions permitting, the surface water stations, would continue to be sampled within a 24-hour window following confirmation of the initiation mechanism, at their prescribed frequency. It is noted that there is also storm event monitoring ($\geq$25 mm/24-hr), during periods of irrigation, for the Poplar System monitoring program.

Most commonly, surface water is sampled once per calendar quarter as part of the Surface Water Quality monitoring for the TCEC. If a monitoring station does not produce sufficient runoff to conduct sampling (or is dry), then the next precipitation event of 10 mm or more in a 24-hour period would trigger the re-assessment of that station(s). This response monitoring would continue throughout that quarterly monitoring period until the relevant station(s) has been sampled, or the quarter ends,

at which time monitoring of all the compliance stations reset for the next quarterly monitoring period. It is noted, where frequencies differ from quarterly, the similar principle would be applied (e.g., month to month during irrigation).

For the Compost and Waste Diversion Area, the proposed monitoring would be on an as-needed batch discharge frequency, such that the area's retention pond can be discharged at a frequency necessary to manage stormwater runoff with consideration toward its designed freeboard volume for the 100-year return storm event.

3.1.6 Surface Water Monitoring Program Descriptions

Under Future Baseline Conditions, Surface Water Quality monitoring is expected to be, divided into four (4) programs:

1. Compliance monitoring;
2. Poplar System monitoring;
3. Poplar Plantation monitoring; and
4. Compost and Waste Diversion Area monitoring.

A brief summary of the purpose of the monitoring programs is detailed in the following sub-sections.

3.1.6.1 Compliance Surface Water Monitoring Program

Historical Surface Water Quality trends with flow around the TCEC were evaluated to understand the Existing Conditions and how the observations from the evaluation can be applied to predict Future Baseline Conditions. As discussed, the two (2) most prominent key effects that requiring evaluation for potential impacts on Surface Water Quality under Future Baseline Conditions at the TCEC are: 1) erosion effects; and 2) leachate seeps. These two (2) key effects are explained in more detail below. The associated mitigative measures for these key effects are discussed in **Section 3.1.10**.

Erosional Effects

Erosional effects to Surface Water Quality at the TCEC have been well documented and the Surface Water Quality Existing Conditions Report (RWDI, 2024) details the correlation between elevated TSS and metals constituent concentrations in surface water. Moreover, some of the highest metal concentrations were typically noted during landfill development construction milestones and intermittent surface disturbances as part of operations. Under Future Baseline Conditions, construction activities will have ceased and thus, Surface Water Quality as it relates to elevated metals concentrations due to erosional effects would expectedly improve once the landfill cap is completed with mature vegetation.

Leachate Seeps

To evaluate potential Expansion Landfill effects (e.g., operational and/or leachate) to Surface Water Quality, consideration was also given to the timing of when the

constructed exterior sideslopes first began extending above ground surface elevations. The interpretation is that, as the waste mound rises above surrounding ground surface, the potential for a landfill effect to surface water (e.g., from leachate seeps) increases. The risk for a landfill leachate impact to surface water as the landfill continues to increase in height above the surrounding grade is expected to increase with the increased cap surface area. However, the exposure pathway to surface water remains the same regardless of the height attained because should a seep occur, it would runoff into the same ditching/pond flow path regardless of waste mound height.

At Future Baseline Conditions, the landfill would reach its full height elevation and waste would be above grade across all around the landfill footprint. Compared to Existing Conditions, there would be a fully developed waste footprint above ground surface and though the risk for seeps is the same across the finished landfill, a risk for seep into stormwater runoff to the north would be realized at Future Baseline Conditions as this part of the Expansion Landfill is not yet constructed to above grade conditions under Existing Conditions.

Under Future Baseline Conditions, the compliance Surface Water Quality monitoring for the Expansion Landfill waste mound will be completed as outlined in **Sections 3.1.5** through **3.1.9**.

3.1.6.2 Poplar System Surface Water Quality Monitoring Program

The Poplar System surface water monitoring program provides an understanding of Surface Water Quality within the perimeter ditches around the Existing Landfill. The Poplar System Surface Water Quality monitoring program evaluates for potential effects of the Poplar System's operation to Surface Water Quality within the perimeter ditch of the Existing Landfill.

Poplar System surface water monitoring stations will be monitored as outlined in **Sections 3.1.5** through **3.1.9**, under Future Baseline Conditions, so long as the Poplar System continues to operate.

3.1.6.3 Poplar Plantation Surface Water Quality Monitoring

At Future Baseline Conditions, the Poplar Plantation would be operational and liquid that meets the Sewage ECA Effluent Trigger Concentration will be irrigated to the trees. Surface Water Quality for the Poplar Plantation would be monitored as outlined in **Sections 3.1.5** through **3.1.9**.

3.1.6.4 Compost and Waste Diversion Area

If the Compost and Waste Diversion Area was constructed and operational, Surface Water Quality monitoring would occur at an established surface water monitoring station (SS19) as outlined in **Sections 3.1.5** through **3.1.9**, under Future Baseline Conditions.

3.1.7 Surface Water Monitoring Station Details

Each of the following four (4) Surface Water Quality programs have designated monitoring stations, as outlined below:

1. Compliance monitoring;
2. Poplar System monitoring;
3. Poplar Plantation monitoring; and
4. Compost and Waste Diversion Area monitoring,

There will continue to be two (2) types of surface water monitoring stations at the TCEC. The first type of station consists of an open ditch where surface water flows unimpeded and as such, the collection of water while flowing conditions exists is dependent on precipitation (collected within the open ditch). The second type of station consists of Sedimentation Ponds (e.g., 'SP' monitoring stations), where flowing conditions are managed (controlled release from the Site).

If the Compost and Waste Diversion Area is built, runoff from this area would be directed to a retention pond, which is a closed pond. Discharge from this retention pond would occur after evaluation for batch discharge through Pond 1 or as outlined in **Section 3.1.9.2**.

The surface water monitoring station designation and short descriptions for the Compliance, Poplar System, Poplar Plantation, as well as Compost and Waste Diversion Area Monitoring Programs are detailed in **Table 3-4** and are graphically represented on **Figure 2-2**.

Table 3-4. On-Site Study Area Surface Water Monitoring Program Summary

Program	Monitoring Station Designations	Monitoring Station Description
Compliance Surface Water Monitoring Program	SS1	Downstream of landfill on WM property, 60 m east of Lambton County Road 79 (Nauvoo Road) – Compliance Point
	SS10	Off-site flow into East Ditch of the Existing Landfill – Background Surface Water Quality
	SS16	Flow onto site from lands located to the south – Background Surface Water Quality
	SP1	Outlet Weir of Sedimentation Pond 1 – Internal assessment location
	SP2	Outlet Weir of Sedimentation Pond 2 – Compliance Point
	SP3	Outlet Weir of Sedimentation Pond 3 – Compliance Point
	SP4	Outlet Weir of Sedimentation Pond 4 – Compliance Point
Poplar System Surface Water Monitoring Program	SS14A	On-site flow within East Ditch of the Existing Landfill, upstream of Poplar System – Internal assessment location
	SS14B	On-site flow within West Ditch of the Existing Landfill, downstream of Poplar System as of June 2011 – Internal assessment location
	SS15A	South Ditch of the Existing Landfill and inlet point to Sedimentation Pond 1. Downstream of Poplar System – Internal assessment location

Program	Monitoring Station Designations	Monitoring Station Description
Poplar Plantation Surface Water Monitoring Program	SS17A	On-site flow from western portion of Poplar Plantation, northwest corner - Compliance Point when plantation is active
	SS17B	On-site flow from western portion of Poplar Plantation, southwest corner - Compliance Point when plantation is active
	SS18A	On-site flow from eastern portion of Poplar Plantation, north end of stormwater control berm plantation - Compliance Point when plantation is active
	SS18B	On-site flow from eastern portion of Poplar Plantation, south end of stormwater control berm plantation - Compliance Point when plantation is active
Compost & Waste Diversion Area Surface Water Monitoring Program	SS19	If built, runoff to a retention pond, that would be anticipated to be constructed southeast of Pond 1.

3.1.8 Surface Water Monitoring Programs' Details

The four (4) surface water monitoring programs introduced above in **Section 3.1.6** are expected to continue to adhere to the relevant Waste and Sewage ECAs, as amended, under Future Baseline Conditions. Exceptions to this are discussed below and summarized in **Section 3.1.9**.

- To evaluate erosional effects and input to the associated corrective measures in an ongoing manner, TSS monitoring is proposed to be added to each surface water monitoring station for each monitoring event.
- How the PLIL parameters are assessed to differentiate potential erosional effects verses potential leachate seep effects along with the associated response action (e.g., verification monitoring and/or corrective measures implementation).
- The evaluation of runoff water from the Compost and Waste Diversion Area, if built, is proposed to be managed as surface water or as outlined in **Section 3.1.9.2**, rather than automatically managed as leachate.

The monitoring details (frequency and assessment analyses) for each surface water monitoring program discussed in **Section 3.1.5** during Future Baseline Conditions is summarized in **Table 3-5** below, as presented by station identification.

Table 3-5. Surface Water Monitoring Programs' Details

Monitoring Station	Assessment	Frequency
Background Stations		
SS10, SS16	Flow Rates	Quarterly after 10 mm precipitation events. Greater than 1 month intervals between sampling.
	PLIL-SW, SLIL-SW, nitrite, TSS	
	LS-SW	Spring Precipitation Event
	Biomonitoring	Spring Precipitation Event

Monitoring Station	Assessment	Frequency
Sedimentation Ponds (Discharge Points)		
SP1, SP2, SP3, SP4	Flow Rates	Quarterly after greater than 10 mm precipitation events. Greater than 1 month intervals between sampling.
	PLIL-SW, SLIL-SW, nitrite, TSS	
	LS-SW, volatiles, semi-volatiles	Quarterly after greater than 10 mm precipitation events. Greater than 1 month intervals between sampling.
	Biomonitoring	Spring Precipitation Event
Western Site Boundary Compliance Point		
SS1	Flow Rates	Quarterly after greater than 10 mm precipitation events. Greater than 1 month intervals between sampling.
	PLIL-SW, SLIL-SW, nitrite, TSS	
	LS-SW, volatiles, semi-volatiles	Quarterly after greater than 10 mm precipitation events. Greater than 1 month intervals between sampling.
	Biomonitoring	Spring Precipitation Event
Poplar System		
SS14A, SS14B, SS15A	Flow Rates	Quarterly after greater than 10 mm/24-hr precipitation events. Greater than 1 month intervals between sampling. Two (2) events during the Poplar System irrigation season and after storm events (25 mm precipitation events).
	SW-P, BTEX, TSS	Quarterly after greater than 10 mm/24-hr precipitation events. Greater than 1 month intervals between sampling.
	Nitrate, Nitrite, TKN, Ammonia (total), Phosphorus, Heavy Metals, BTEX, Chloride, pH, Dissolved Oxygen.	Two (2) events during the Poplar System irrigation season and after storm events (25 mm/24-hr or greater precipitation events).
Poplar Plantation Land Application Area		
SS17A, SS17B, SS18A, SS18B	Flow Rates	Monthly after greater than 10 mm/24-hr precipitation events from May 1 to October 15
	PLIL-SW, SLIL-SW, nitrite, TSS	
	LS-SW, volatiles, semi-volatiles	
	Biomonitoring	Spring Precipitation Event
Compost & Waste Diversion Area (if constructed)		
SS19	PLIL-SW, SLIL-SW, nitrite, BOD_5, TSS, Total Coliform, Fecal Coliform, E. Coli	Per event prior to discharge

Notes:

1) PLIL-SW indicates: chloride, ammonia (total and unionized), phenols, boron, nickel, chromium (total), zinc.
2) SLIL-SW indicates: alkalinity, sulphate, calcium, magnesium, potassium, sodium, total phosphorus, iron, nitrate, TKN, TDS, pH, conductivity. Field parameters of temperature, pH, conductivity, turbidity, DO.
3) LS-SW indicates: arsenic, barium, cadmium, copper, lead, mercury, nitrite, TSS, BOD_5, COD.
4) Volatiles should include the following at a minimum: benzene, 1,4-dichlorobenzene, dichloromethane, toluene, ethylbenzene, xylenes, and vinyl chloride.
5) Semi-volatiles should include the following at a minimum: 1,2,4-trichlorobenzene, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, hexachlorobenzene, diethylphthalate, dimethylphthalate, di-n-butyl phthalate, phenol, benzo(a)pyrene, 2,4,6-trichlorophenol, 2,4-dichlorophenol, pentachlorophenol.
6) Biomonitoring indicates toxicity testing for Rainbow Trout and *Daphnia Magna*.
7) QA/QC includes one (1) blind duplicate for each 15 samples or once per event, whichever is greater.
8) Surface water samples shall be collected in a downstream to upstream sequence.
9) Spring denotes: April, May, and June.

10) Monitoring stations that are currently idle until 2 months prior to irrigation to the Poplar Plantation, include stations SS17A, SS17B, SS18A, SS18B.

11) SW-P denotes: chloride, ammonia (un-ionized), sulphate, phenols, nitrate, alkalinity, TOC, B, Ni, Cr, Zn, Ca, Mg, K, Na, and Fe; as well as Field Parameters: pH, conductivity, temperature, turbidity, and dissolved oxygen.

3.1.9 Surface Water Quality Assessment Process

As introduced above in **Section 3.1.4.1** regarding the Trigger Mechanism Assessment for the TCEC, the current MECP-approved Surface Water Quality Assessment process per the Waste ECA and Sewage ECA should be improved under Future Baseline Conditions to address intermittent effects, most specifically as it relates to soil-related metals erosional effects. Additionally, under Future Baseline Conditions, it is proposed that if the Compost and Waste Diversion Area is built, that the water collected in the retention pond would be batch sampled for Surface Water Quality (e.g. PLIL and SLIL parameters) as outlined in **Section 3.1.9.2**.

3.1.9.1 Compliance, Poplar System, and Poplar Plantation Surface Water Quality Assessment

As discussed above in **Section 3.1.4.1** under the Overall Surface Water Quality Evaluation it was assessed that the Surface Water Quality at the TCEC can be potentially impacted by on-going and intermittent operational effects that can cause one or more of the PLIL parameters to become elevated, sometimes greater than their respective trigger concentrations, but not as a result of leachate effects.

The observations are re-summarized here as follows:

- On-going periodic effects of chloride concentrations within the surface water at monitoring stations as a result of road salt from incoming truck traffic. This periodic effect is observed at SP1, SP3, and SS14B.
- An intermittence of elevated boron concentrations was observed at SS1 and SP2 as a result of crush glass residue from former crushed glass storage near the southeastern portion of Sedimentation Pond 2.
- Overall, Surface Water Quality showing intermittent impacts (elevated soil-related metal parameters nickel, chromium, and zinc) due to erosional effects primarily at monitoring locations SS14B and SS1.

The ongoing and intermittent effects to Surface Water Quality are important to identify such that the appropriate corrective action(s) (mitigative measure(s)) can be implemented.

As the Trigger Mechanism for verification monitoring and alternate source evaluation per the current MECP-approved process (e.g., Waste and Sewage ECAs) is well developed, this process will not alter, but rather it is the initial assessment of the PLIL Trigger Concentrations that are proposed to be improved as noted below.

- In general, the Surface Water Quality PLIL parameters chloride, boron, unionized ammonia, and phenols, when detected by themselves, are not attributable to a leachate effect, but some other non-leachate related occurrence, as outlined above. Therefore, to improve the interpretation of a probable leachate effect to

Surface Water Quality, it is proposed that if any two (2) of these above listed parameters are detected together at the same monitoring station at the same time and are each above their respective Trigger Concentrations, then verification monitoring is implemented.

- Similarly, in consideration of potential leachate effects to Surface Water Quality when assessing the other PLIL parameters chromium, nickel, and zinc, that if any one of these metal parameters, as well as any one of either chloride, boron, unionized ammonia, or phenols, are detected above their trigger concentrations, and TSS concentrations at the sampling station are less than 120 mg/L, then verification monitoring is implemented.
- In line with the above point, when assessing PLIL parameters chromium, nickel, and zinc, and all three (3) are detected above their trigger concentrations for the same event at the same sampling station, and TSS concentrations at the sampling station are less than 120 mg/L, then verification monitoring is implemented.
- To account for erosional effects, when assessing PLIL parameters chromium, nickel, and zinc, that if all three (3) are detected above their trigger concentrations for the same event at the same sampling station, and TSS concentrations at the sampling station are greater than 120 mg/L, then an alternate source evaluation be completed such that mitigative measures can be implemented in a reasonable timeframe. Verification monitoring would not be required.
    - The mitigative measures would be implemented on a case-by-case scenario and may include, but not necessarily be limited to, adding new straw bale check dams and/or cleaning the sediment build-up from within an affected conveyance ditch or sedimentation pond. Mitigative measures will be implemented promptly and evaluated for their effectiveness.

In addition to the above, per the current Surface Water Quality Assessment Process, the Surface Water Quality monitoring also includes an assessment of SLIL parameters and other tested chemical parameters such that Surface Water Quality is evaluated in a holistic manner in consideration of both the per event assessment data and historical data at the TCEC. This Surface Water Quality Assessment Process will continue under Future Baseline Conditions.

3.1.9.2 Compost and Waste Diversion Area Surface Water Quality Assessment

If built, Under Future Baseline Conditions, it is proposed that water that collects in the retention pond for the Compost and Waste Diversion Area be batch sampled for Surface Water Quality (e.g., PLIL and SLIL parameters) as outlined below.

- Upon verification of acceptable Surface Water Quality:
    - Batch-discharged through Sedimentation Pond 1.
- When acceptable Surface Water Quality is not verified, then the management of the water from the retention pond can completed as noted below:

- Utilized as irrigation liquid to the Poplar Plantation so long as the water quality of the retention pond satisfies the Sewage ECA Effluent Trigger Concentration Criteria.
- Managed as leachate (either through the Poplar System, the LTP, or hauled off-site).

The frequency of the batch sampling would be such that the retention pond can be discharged at a frequency necessary to account for the design consideration freeboard volume for the 100-year return storm event. This provides room within the pond for a 100-year storm event to occur during the Surface Water Quality evaluation process.

3.1.10 On-Site Mitigative Measures

Based on the Surface Water Quality Assessment Process discussed in **Section 3.1.9**, On-site Mitigative Measures would potentially be required for the following indicator:

- Predicted effects on Surface Water Quality on-site prior to off-site discharge.
  - Erosional effects on TSS and heavy metal concentrations in surface water; and
  - Leachate seep impacts to Surface Water Quality.

3.1.10.1 On-Site Soil Erosion Reduction Actions

As outlined in Section 4.4.3 of the Surface Water Quality Existing Conditions Report (RWDI, 2024), WM has implemented several controls to help mitigate sediment loading to the surface drainage network at the TCEC during and post cell construction activities, which will continue to be maintained or replaced under Future Baseline Conditions. Under Future Baseline Conditions, sediment loading and erosional controls (e.g., sediment ditch barriers such as straw bales, silt fencing, add vegetative controls, etc.) are expected to continue to be implemented at the TCEC post landfill closure. Eventually over time, these controls and measures would require less maintenance and/or replacement as the vegetation maturely establishes itself on the landfill cap and drainage ditch network.

Sediment buildup evaluations for the Sedimentation Ponds are expected to continue into Future Baseline Conditions. However, sediment removal maintenance from these ponds is expected to decrease, and likely will no longer be required, over time as sediment loading to the ditch network decreases with the establishment of a maturely vegetated landfill cap and drainage ditch network.

3.1.10.2 On-Site Leachate Seep Identification and Mitigative Actions

Routine site inspections (e.g., weekly during operation, monthly during post closure) are expected to be completed to identify and, if confirmed, mitigate leachate seepage from the landfill cap.

Seep Identification

The identification of leachate seeps along the landfill cap typically consists of making observations and looking for evidence of seepage consisting of, but not necessarily limited to, the following:

- Stressed or abnormally green vegetation (especially during the fringe months (March/April and October/November) of the growing season).
- Visible settlement or cap subsidence.
- Newly developed erosion rills.
- Wet and/or saturated surface areas indicative of sustained seepage.
- Stained cap/vegetation (typically rusty or black).
- Odours typical of decaying waste.
- Landfill gas 'bubbles' at surface within ponded liquid.

Routine Surface Water Quality monitoring, as outlined in **Sections 3.1.6** and **3.1.7**, may require the completion of verification monitoring based on triggering criteria to verify the original findings of the routine monitoring. During verification monitoring, an alternate source evaluation, that may include, but is not limited to, a supplemental landfill cap inspection for leachate seeps, may be completed to determine a potential source for the original triggering event.

Leachate seepage more commonly occurs through daily and/or interim cover as these soil layers are thinner compared to the final landfill cap thickness. At Future Baseline Conditions, with the placement of the final landfill cap, the probability, which is low, for leachate seepage through the cap is expected to be the same across the waste mound.

Seep Mitigation

As is currently completed at the TCEC, upon identification of a leachate seep, crews are mobilized to the affected area of the landfill cap and repairs (e.g. replace and/or add clay soil material) are typically completed in less than a day.

3.1.11 Off-Site Study Area Surface Water Quality Evaluation

As discussed in **Section 3.1.2,** under Existing Conditions and Future Baseline Conditions, an evaluation of off-site Surface Water Quality as it relates to potential effects from ASR track out is not warranted.

3.1.12 Off-Site Mitigative Measures

Based on the Off-Site Study Area Surface Water Quality Evaluation discussed in **Section 3.1.11,** off-site Mitigative Measures would continue to be required for the following indicator:

- Predicted effects from PAHs, in ASR, on Surface Water Quality within the roadside ditch of the northbound lane of Nauvoo Road from the TCEC to Hwy 402 in the Off-Site Study Area.

Notwithstanding the observation provided in **Section 3.1.2**, as a further level of Surface Water Quality protection off-site as it relates to ASR track out, a rigorous routine inspection has been implemented since 2022 and cleanup of track out ASR has been completed where warranted. This inspection and cleanup of ASR track out, would continue under Future Baseline Conditions, but would eventually cease upon landfill closure as ASR would no longer be brought to site and the ASR that had been brought to the site would be covered with the final cap and would not have the potential to track out.

3.1.13 Summary of Future Baseline Conditions

The following conclusions are provided as a summary of the findings from this Surface Water Quality Future Baseline Conditions evaluation for the TCEC.

- Under Future Baseline Conditions, Surface Water Quality monitoring is expected to be, divided into four (4) programs: 1) compliance monitoring; 2) the Poplar System monitoring; 3) the Poplar Plantation monitoring; and 4) the Compost and Waste Diversion Area monitoring.
    - The selected Leachate Indicator List parameters, for evaluating potential leachate effects on Surface Water Quality as outlined in the 2007 EMP, remain relevant based on leachate constituent concentrations remaining below the predicted peak leachate values tabulated within Table 6-9 of the 2008 D&O Report and overall Surface Water Quality Existing Conditions.
    - Historical Surface Water Quality monitoring data is well understood and has indicated that Surface Water Quality is generally not negatively impacted by the TCEC. Minor deviations in surface water quality do occur over time that primarily relate to erosional effects from exposed soil surfaces during periods of construction activity (e.g., infrastructure construction, waste cell excavation, soil and material movement, etc.) since 2008.
    - The shortlisted PLIL parameter concentrations generally satisfy the Trigger Mechanisms that form part of the Surface Water Quality evaluation procedures for the TCEC. As a result, the Surface Water Quality routinely satisfies the triggering mechanisms for acceptable off-site discharge.
    - As the Trigger Mechanism for verification monitoring and alternate source evaluation per the current MECP-approved process (e.g., Waste and Sewage ECAs) is well developed, this process will not alter, but rather it is the initial assessment of the PLIL Trigger Concentrations that are proposed to be improved as outlined in **Section 3.1.9.1**. The improvements discern intermittent operation effects from erosional effects and further for leachate effects more effectively than currently evaluated under Existing Conditions.

- Under Existing Conditions and Future Baseline Conditions, an evaluation of off-site Surface Water Quality as it relates to potential effects from ASR track out is not warranted as long as mitigation measures continue to be carried out.

3.2 Alternative Method 1

There are changes that will occur at the TCEC if it is developed to the proposed design of Alternative Method 1, as outlined in **Section 1.1.1**.

The evaluation of Surface Water Quality under Alternative Method 1 considers the same considerations applied to evaluation of the TCEC under the Future Baseline Conditions as presented in **Section 3.1**.

As it relates to Surface Water Quality, Alternative Method 1 is predicted to potentially have an effect because of the following.

- Increased erosional effects in consideration of steeper sideslopes, exposed sideslopes during construction, and larger surface area of the finished landfill cap.
- Increased waste mound height increases the cap surface area and probability for leachate seeps to occur as a result of perched leachate scenarios. Also, removal of interim clayey soil cap for Landfill Optimization along the sideslopes also increases the potential for perched leachate related effects to Surface Water Quality while this area of the waste mound is not completed with interim or final cap.
- Increased waste mound height, thereby increasing landfill operational life, increases the duration of ASR disposal and management at the TCEC, which increases the potential for ASR to be tracked off-site along the north bound lane of Nauvoo Road to Highway 402.

The assessment of effects for Alternative Method 1 is described below for the environmental criteria and indicators of Surface Water Quality and is summarized in **Table 3-6**.

3.2.1 On-Site Study Area

3.2.1.1 Surface Water Physical Setting

Since the footprint of the Expansion Landfill under Alternative Method 1 will not expand laterally beyond that of the Future Baseline Conditions, the surface water physical setting detailed for the Future Baseline Conditions, as presented in **Section 3.1.1**, remains the same under Alternative Method 1.

3.2.2 Off-Site Study Area Surface Water Physical Setting

There are no expected significant changes to landfill operations and the existing approved waste disposal footprint area under Alternative Method 1 and there are no other TCEC sources identified that would be anticipated to have an impact on the Off-Site Study Area. Therefore, under Alternative Method 1, there will be no changes to

the off-site surface water physical setting described for the Future Baseline Conditions in **Section 3.1.2**.

3.2.3 Source Water Protection

As the footprint of the Expansion Landfill under Alternative Method 1 will not expand laterally beyond that of the Future Baseline Conditions, the considerations for source water protection for the Future Baseline Conditions, as presented in **Section 3.1.3**, remains the same under Alternative Method 1.

3.2.4 Environmental Quality Evaluations

As the footprint of the Expansion Landfill under Alternative Method 1 will not expand laterally beyond that of the Future Baseline Conditions, the rationale to review the effectiveness of the Surface Water Quality programs to assess for potential landfill leachate impacts remains the same as detailed for the Future Baseline Conditions as outlined in **Section 3.1.4**.

However, with the increased amount of soil management related to daily and/or interim landfill cap stripping and landfill cap height increase, under Alternative Method 1 relative to Existing Conditions and Future Baseline Conditions there is increased risk to Surface Water Quality from: erosional effects; and leachate seeps.

Notwithstanding this increased duration of time for the understood risk under Alternative Method 1 relative to Future Baseline Conditions, the Surface Water Quality Assessment Process detailed in **Section 3.2.9** will be effective to protect surface water resources on-site.

3.2.5 Surface Water Monitoring Event Initiation Mechanism

As the footprint of the Expansion Landfill under Alternative Method 1 will not expand laterally beyond that of the Future Baseline Conditions, the Surface Water Monitoring Event Initiation Mechanism presented for the Future Baseline Conditions in **Section 3.1.5**, remains similar as under Alternative Method 1.

3.2.6 Surface Water Monitoring Program Descriptions

As the footprint of the Expansion Landfill under Alternative Method 1 will not expand laterally beyond that of the Future Baseline Conditions, the Surface Water Monitoring Program Descriptions presented for the Future Baseline Conditions in **Section 3.1.6**, remains the same under Alternative Method 1.

3.2.7 Surface Water Monitoring Station Details

As the footprint of the Expansion Landfill under Alternative Method 1 will not expand laterally beyond that of the Future Baseline Conditions, the Surface Monitoring Programs' Station Details presented for the Future Baseline Conditions in **Section 3.1.7**, remains the same under Alternative Method 1.

3.2.8 Surface Water Monitoring Programs' Details

The Surface Water Monitoring Programs' Details for the Expansion Landfill under Alternative Method 1 are not expected to change from Future Baseline Conditions as presented in **Section 3.1.8**.

3.2.9 Surface Water Quality Assessment Process

The Surface Water Quality Assessment Process for the Expansion Landfill under Alternative Method 1 is not expected to change from Future Baseline Conditions as presented in **Section 3.1.9**.

3.2.10 On-Site Mitigative Measures

Based on the Surface Water Quality Assessment Process discussed in **Section 3.2.9**, on-site Mitigative Measures would potentially be required for the following indicator:

- Predicted effects on Surface Water Quality on-site prior to off-site discharge.
    - Erosional effects on TSS and heavy metal concentrations in surface water; and
    - Leachate seep impacts to Surface Water Quality.

The on-site Mitigative Measures for the TCEC under Alternative Method 1 are not expected to change from Future Baseline Conditions as presented in **Section 3.1.9.**

3.2.10.1 Soil Erosion Reduction Actions

The Soil Erosion Reduction Actions for the Expansion Landfill under Alternative Method 1 are not expected to change from Future Baseline Conditions as presented in **Section 3.1.10.1**.

3.2.10.2 Leachate Seep Identification and Mitigative Actions

The Leachate Seep Identification and Mitigative Actions for the Expansion Landfill under Alternative Method 1 are not expected to change from Future Baseline Conditions as presented in **Section 3.1.10.2**.

3.2.11 Off-Site Study Area Surface Water Quality Evaluation

The Off-Site Study Area Surface Water Quality Evaluation for the TCEC under Alternative Method 1 is not expected to change from Future Baseline Conditions as presented in **Section 3.1.11**.

3.2.12 Off-Site Mitigative Measures

Based on the Off-Site Study Area Surface Water Quality Evaluation discussed in **Section 3.2.11**, off-site Mitigative Measures would continue to be required for the following indicator:

- Predicted effects from PAHs, in ASR, on Surface Water Quality within the roadside ditch of the northbound lane of Nauvoo Road from the TCEC to Hwy 402 in the Off-Site Study Area

The off-site Mitigative Measures for the TCEC under Alternative Method 1 are not expected to change from Future Baseline Conditions as presented in **Section 3.1.12**.

3.2.13 Summary

A summary of the effects assessment of Alternative Method 1 is summarized below in **Table 3-6**.

Table 3-6. Net Effects Assessment – Alternative Method 1

Evaluation Criteria	Indicator	Key Design Considerations and Assumptions	Potential Effects	Mitigation Measures	Net Effects
Surface Water Quality	Predicted effects on Surface Water Quality on-site prior to off-site discharge (Erosional effects on TSS and heavy metal concentrations in surface water)	Key Design Considerations: • Slope grading and cap surface area proposed for the vertical expansion of the Expansion Landfill with consideration toward the potential of increased erosional effects to Surface Water Quality. • No proposed changes to the landfill base design as well as leachate collection and management for the Expansion Landfill. • The existing TCEC property boundaries and buffer width will remain the same. Key Assumptions: • Under Alternative Method 1, the slight alterations to the surface water management infrastructure (e.g., swales, ditching, and sedimentation ponds)) are not considered to significantly impact Surface Water Quality as flow rates and volumes are similar to the approved Future Baseline Conditions. • Sedimentation Ponds 1 to 4 current designs are sufficient to manage Future Baseline flow conditions, as well as each Alternative Method even when considering climate change (Section 5.1.1 of the CDR), thus, the sedimentation ponds' capacities to attenuate chemical constituents are not expected to change. • Stormwater is currently, and will continue to be, managed on-site through swales and sedimentation ponds prior to off-site discharge. • Landfilling operational conditions are expected to remain the same under Alternative Method 1 and be consistent with current-approved Future Baseline operational requirements.	• Potential effects to Surface Water Quality (e.g., elevated TSS and select heavy metals) resulting from precipitation-induced erosion of exposed clayey soil on-site.	• Continue to operate and monitor Surface Water Quality at the TCEC in accordance with the relevant Conditions of the Waste and Sewage ECAs. • Install/maintain sediment control measures (e.g., straw bale/rock check dams, silt fencing, add vegetative controls, etc.) at various locations within the surface water drainage network. As-required sediment control measure placements and replacements based on Site conditions. • Supplement the northern component of the drainage network with erosion control measures as the landfill expands north prior to initiating Expansion Landfill Optimization. • Complete as-required sediment removal where sediment builds up in the surface water drainage network (e.g., at check dams, silt fencing, retention ponds, etc.). • Place topsoil and seed over areas of the Expansion Landfill side slopes completed with interim cover, where appropriate (e.g., 2 years). • Inspect areas of soil stockpiling for erosion. Where necessary, erosion control measures would be installed to protect the drainage network from unacceptable sediment loading (e.g., silt fencing, straw bales, rock check dams, add vegetative controls, etc.).	• Presuming the mitigation measures presented herein are implemented and maintained as required, the risk for impacts to Surface Water Quality due to erosional effects will be effectively managed.
Surface Water Quality	Predicted effects on Surface Water Quality on-site prior to off-site discharge (Leachate seep impacts to Surface Water Quality)	Key Design Considerations: • Increase in waste mound height and the associated cap surface area as it relates to leachate seep probability. • No proposed changes to the landfill base design as well as leachate collection and management for the Expansion Landfill. • The existing TCEC property boundaries and buffer width will remain the same. Key Assumptions: • Within the Expansion Landfill, leachate mounding is not expected to develop based on the landfill's design. • Landfilling operational conditions are expected to remain the same under Alternative Method 1 and be consistent with current-approved Future Baseline operational requirements. • The approach to managing (disposing) leachate generated at the TCEC will remain the same as that presented for Future Baseline Conditions.	• In the short-term, there is the potential for perched leachate conditions to be encountered during interim cap stripping. • In the long-term, the probability of leachate seepage is proportional to the increase in cap surface area and landfill height (e.g., more cap/height, more chances of leachate seepage).	• Continue to operate and monitor Surface Water Quality at the TCEC in accordance with the relevant Conditions of the Waste and Sewage ECAs. • Seep repairs, when identified, should be repaired immediately and if possible, prior to seepage entering and/or running off landfill sideslopes and into the surface water drainage network. • Routine inspections (e.g., monthly during post-closure) of the landfill surface are expected to provide sufficient frequency to identify and, if necessary, address leachate seepage.	• There is no expected net effect to Surface Water Quality from leachate impacts with the implementation of a seepage monitoring and repair program under Alternative Method 1.
Surface Water Quality	Predicted effects from polyaromatic hydrocarbons (PAHs) on Surface Water Quality within the roadside ditch of the northbound lane of Nauvoo Road from the Site to Hwy 402 in the off-Site Study Area	Key Design Considerations: • No proposed changes to the landfill base design as well as leachate collection and management for the Expansion Landfill. • The existing TCEC property boundaries and buffer width will remain the same. Key Assumptions: • Landfilling operational conditions are expected to remain the same under Alternative Method 1 and be consistent with current-approved Future Baseline operational requirements.	• There are no predicted net effects to Surface Water Quality in the Off-Site Study Area, from ASR track out as long as mitigation measures continue to be carried out.	• WM actively implements a rigorous routine inspection and where warranted, cleanup of ASR track out. On-site and off-site ASR cleanup efforts are completed as needed and consist of sweeping, scraping with light equipment, hand raking/picking, along the roadways, road shoulders, and within the ditches. It is noted that the vegetative growth within Nauvoo Road's roadside ditch is cut as part of cleanup activities such that ASR does not remain entangled in tall vegetation in ditches.	• None (as long as the Mitigation Measures continue to be carried out).

3.3 Alternative Method 2

There are changes that will occur at the TCEC if it is developed to the proposed design of Alternative Method 2, as outlined in **Section 1.1.2**.

The evaluation of Surface Water Quality under Alternative Method 2 considers the same considerations applied to evaluation of the TCEC under the Future Baseline Conditions as presented in **Section 3.1**.

Similar to Alternative Method 1, as it relates to Surface Water Quality, Alternative Method 2 is predicted to potentially have an effect because of the following.

- Increased erosional effects in consideration of steeper sideslopes, exposed sideslopes during construction, and larger surface area of the finished landfill cap.
- Increased waste mound height increases the cap surface area and probability for leachate seeps to occur as a result of perched leachate scenarios. Also, removal of interim clayey soil cap for Landfill Optimization along the sideslopes also increases the potential for perched leachate related effects to Surface Water Quality while this area of the waste mound is not completed with interim or final cap.
- Increased waste mound height, thereby increasing landfill operational life, increases the duration of ASR disposal and management at the TCEC, which increases the potential for ASR to be tracked off-site along the north bound lane of Nauvoo Road to Highway 402.

The assessment of effects for Alternative Method 2 is described below for the environmental criteria and indicators of Surface Water Quality and is summarized in **Table 3-7**.

3.3.1 On-Site Study Area

3.3.1.1 Surface Water Physical Setting

Since the footprint of the Expansion Landfill under Alternative Method 2 will not expand laterally beyond that which is understood for the Future Baseline Conditions, the surface water physical setting detailed for the Future Baseline Conditions, as presented in **Section 3.1.1**, remains the same under Alternative Method 2.

3.3.2 Off-Site Study Area Surface Water Physical Setting

There are no expected significant changes to landfill operations and the existing approved waste disposal footprint area under Alternative Method 2 and there are no other TCEC sources identified that would be anticipated to have an impact on the Off-Site Study Area. Therefore, under Alternative Method 2, there will be no changes to the off-site surface water physical setting described for the Future Baseline Conditions in **Section 3.1.2**.

3.3.3 Source Water Protection

As the footprint of the Expansion Landfill under Alternative Method 2 will not expand laterally beyond that which is understood for the Future Baseline Conditions, the considerations for source water protection for the Future Baseline Conditions, as presented in **Section 3.1.3**, remains the same under Alternative Method 2.

3.3.4 Environmental Quality Evaluations

As the footprint of the Expansion Landfill under Alternative Method 2 will not expand laterally beyond that which is understood for the Future Baseline Conditions, the rationale to review the effectiveness of the Surface Water Quality programs to assess for potential landfill leachate impacts remains the same as detailed for the Future Baseline Conditions as outlined in **Section 3.1.4**.

However, with the increased amount of soil management related to daily and/or interim landfill cap stripping and landfill cap height increase, under Alternative Method 2 relative to Existing Conditions and Future Baseline Conditions there is increased risk to Surface Water Quality from: erosional effects; and leachate seeps.

Notwithstanding this increased duration of time for the understood risk under Alternative Method 2 relative to Future Baseline Conditions, the Surface Water Quality Assessment Process detailed in **Section 3.3.9** will be effective to protect surface water resources on-site.

3.3.5 Surface Water Monitoring Event Initiation Mechanism

As the footprint of the Expansion Landfill under Alternative Method 2 will not expand laterally beyond that which is understood for the Future Baseline Conditions, the Surface Water Monitoring Event Initiation Mechanism presented for the Future Baseline Conditions in **Section 3.1.5**, remains similar under Alternative Method 2.

3.3.6 Surface Water Monitoring Program Descriptions

As the footprint of the Expansion Landfill under Alternative Method 2 will not expand laterally beyond that which is understood for the Future Baseline Conditions, the Surface Water Monitoring Program Descriptions presented for the Future Baseline Conditions in **Section 3.1.6**, remains the same under Alternative Method 2.

3.3.7 Surface Water Monitoring Station Details

As the footprint of the Expansion Landfill under Alternative Method 2 will not expand laterally beyond that which is understood for the Future Baseline Conditions, the Surface Monitoring Programs' Station Details presented for the Future Baseline Conditions in **Section 3.1.7**., remains the same under Alternative Method 2.

3.3.8 Surface Water Monitoring Programs' Details

As the footprint of the Expansion Landfill under Alternative Method 2 will not expand laterally beyond that which is understood for the Future Baseline Conditions, the

Surface Water Monitoring Programs' Details presented for the Future Baseline Conditions in **Section 3.1.8**, remains the same under Alternative Method 2.

3.3.9 Surface Water Quality Assessment Process

The future Surface Water Quality Assessment Process for the Expansion Landfill under Alternative Method 2 are not expected to change from Future Baseline Conditions as presented in **Section 3.1.9**.

3.3.10 On-Site Mitigative Measures

Based on the Surface Water Quality Assessment Process discussed in **Section 3.3.9**, on-site Mitigative Measures would potentially be required for the following indicator:

- Predicted effects on Surface Water Quality on-site prior to off-site discharge.
    - Erosional effects on TSS and heavy metal concentrations in surface water; and
    - Leachate seep impacts to Surface Water Quality.

The on-site Mitigative Measures for the TCEC under Alternative Method 2 are not expected to change from Future Baseline Conditions as presented in **Section 3.1.9.**

3.3.10.1 Soil Erosion Reduction Actions

The Soil Erosion Reduction Actions for the Expansion Landfill under Alternative Method 2 are not expected to change from Future Baseline Conditions as presented in **Section 3.1.10.1**.

3.3.10.2 Leachate Seep Identification and Mitigative Actions

The Leachate Seep Identification and Mitigative Actions for the Expansion Landfill under Alternative Method 2 are not expected to change from Future Baseline Conditions as presented in **Section 3.1.10.2**.

3.3.11 Off-Site Study Area Surface Water Quality Evaluation

The Off-Site Study Area Surface Water Quality Evaluation for the TCEC under Alternative Method 2 is not expected to change from Future Baseline Conditions as presented in **Section 3.1.11**.

3.3.12 Off-Site Mitigative Measures

Based on the Off-Site Study Area Surface Water Quality Evaluation discussed in **Section 3.3.11**, off-site Mitigative Measures would continue to be required for the following indicator:

- Predicted effects from PAHs, in ASR, on Surface Water Quality within the roadside ditch of the northbound lane of Nauvoo Road from the TCEC to Hwy 402 in the Off-Site Study Area.

The Off-Site Mitigative Measures for the TCEC under Alternative Method 2 are not expected to change from Future Baseline Conditions as presented in **Section 3.1.12**.

3.3.13 Summary

A summary of the effects assessment of Alternative Method 2 is summarized below in **Table 3-7**.

Table 3-7. Net Effects Assessment – Alternative Method 2

Evaluation Criteria	Indicator	Key Design Considerations and Assumptions	Potential Effects	Mitigation Measures	Net Effects
Surface Water Quality	Predicted effects on Surface Water Quality on-site prior to off-site discharge (Erosional effects on TSS and heavy metal concentrations in surface water)	Key Design Considerations: • Slope grading and cap surface area proposed for the vertical expansion of the Expansion Landfill with consideration toward the potential of increased erosional effects to Surface Water Quality. • No proposed changes to the landfill base design as well as leachate collection and management for the Expansion Landfill. • The existing TCEC property boundaries and buffer width will remain the same. Key Assumptions: • Under Alternative Method 2, the slight alterations to the surface water management infrastructure (e.g., swales, ditching, and sedimentation ponds)) are not considered to significantly impact Surface Water Quality as flow rates and volumes are similar to the approved Future Baseline Conditions. • Sedimentation Ponds 1 to 4 current designs are sufficient to manage Future Baseline flow conditions, as well as each Alternative Method even when considering climate change (Section 5.1.1 of the CDR), thus, the sedimentation ponds' capacities to attenuate chemical constituents are not expected to change. • Stormwater is currently, and will continue to be, managed on-site through swales and sedimentation ponds prior to off-site discharge. • Landfilling operational conditions are expected to remain the same under Alternative Method 2 and be consistent with current-approved Future Baseline operational requirements.	• Potential effects to Surface Water Quality (e.g., elevated TSS and select heavy metals) resulting from precipitation-induced erosion of exposed clayey soil on-site .	• Continue to operate and monitor Surface Water Quality at the TCEC in accordance with the relevant Conditions of the Waste and Sewage ECAs. • Install/maintain sediment control measures (e.g., straw bale/rock check dams, silt fencing, add vegetative controls, etc.) at various locations within the surface water drainage network. As-required sediment control measure placements and replacements based on Site conditions. • Supplement the northern component of the drainage network with erosion control measures as the landfill expands north prior to initiating Expansion Landfill Optimization. • Complete as-required sediment removal where sediment builds up in the surface water drainage network (e.g., at check dams, silt fencing, retention ponds, etc.). • Place topsoil and seed over areas of the Expansion Landfill side slopes completed with interim cover, where appropriate (e.g., 2 years). • Inspect areas of soil stockpiling for erosion. Where necessary, erosion control measures would be installed to protect the drainage network from unacceptable sediment loading (e.g., silt fencing, straw bales, rock check dams, add vegetative controls, etc.).	• Presuming the mitigation measures presented herein are implemented and maintained as required, the risk for impacts to Surface Water Quality due to erosional effects will be effectively managed.
Surface Water Quality	Predicted effects on Surface Water Quality on-site prior to off-site discharge (Leachate seep impacts to Surface Water Quality)	Key Design Considerations: • Increase in waste mound height and the associated cap surface area as it relates to leachate seep probability. • No proposed changes to the landfill base design as well as leachate collection and management for the Expansion Landfill. • The existing TCEC property boundaries and buffer width will remain the same. Key Assumptions: • Within the Expansion Landfill, leachate mounding is not expected to develop based on the landfill's design. • Landfilling operational conditions are expected to remain the same under Alternative Method 2 and be consistent with current-approved Future Baseline operational requirements. • The approach to managing (disposing) leachate generated at the TCEC will remain the same as that presented for Future Baseline Conditions.	• In the short-term, there is the potential for perched leachate conditions to be encountered during interim cap stripping. • In the long-term, the probability of leachate seepage is proportional to the increase in cap surface area and landfill height (e.g., more cap/height, more chances of leachate seepage).	• Continue to operate and monitor Surface Water Quality at the TCEC in accordance with the relevant Conditions of the Waste and Sewage ECAs. • Seep repairs, when identified, should be repaired immediately and if possible, prior to seepage entering and/or running off landfill sideslopes and into the surface water drainage network. • Routine inspections (e.g., monthly during post-closure) of the landfill surface are expected to provide sufficient frequency to identify and, if necessary, address leachate seepage.	• There is no expected net effect to Surface Water Quality from leachate impacts with the implementation of a seepage monitoring and repair program under Alternative Method 2.
Surface Water Quality	Predicted effects from polyaromatic hydrocarbons (PAHs) on Surface Water Quality within the roadside ditch of the northbound lane of Nauvoo Road from the Site to Hwy 402 in the Off-Site Study Area	Key Design Considerations: • No proposed changes to the landfill base design as well as leachate collection and management for the Expansion Landfill. • The existing TCEC property boundaries and buffer width will remain the same. Key Assumptions: • Landfilling operational conditions are expected to remain the same under Alternative Method 2 and be consistent with current-approved Future Baseline operational requirements.	• There are no predicted net effects to Surface Water Quality in the Off-Site Study Area, from ASR track out as long as mitigation measures continue to be carried out.	• WM actively implements a rigorous routine inspection and where warranted, cleanup of ASR track out. On-site and off-site ASR cleanup efforts are completed as needed and consist of sweeping, scraping with light equipment, hand raking/picking, along the roadways, road shoulders, and within the ditches. It is noted that the vegetative growth within Nauvoo Road's roadside ditch is cut as part of cleanup activities such that ASR does not remain entangled in tall vegetation in ditches.	• None (as long as the Mitigation Measures continue to be carried out).

3.4 Alternative Method 3

There are changes that will occur at the TCEC if it is developed to the proposed design of Alternative Method 3, as outlined in **Section 1.1.3**.

The evaluation of Surface Water Quality under Alternative Method 3 considers the same considerations applied to evaluation of the TCEC under the Future Baseline Conditions as presented in **Section 3.1**.

Similar to Alternative Methods 1 and 2, as it relates to Surface Water Quality, Alternative Method 3 is predicted to potentially have an effect because of the following.

- Increased erosional effects in consideration of steeper sideslopes, exposed sideslopes during construction, and larger surface area of the finished landfill cap.
- Increased waste mound height increases the cap surface area and probability for leachate seeps to occur as a result of perched leachate scenarios. Also, removal of interim clayey soil cap for Landfill Optimization along the sideslopes also increases the potential for perched leachate related effects to Surface Water Quality while this area of the waste mound is not completed with interim or final cap.
- Increased waste mound height, thereby increasing landfill operational life, increases the duration of ASR disposal and management at the TCEC, which increases the potential for ASR to be tracked off-site along the north bound lane of Nauvoo Road to Highway 402.

The assessment of effects for Alternative Method 3 is described below for the environmental criteria and indicators of Surface Water Quality and is summarized in **Table 3-8**.

3.4.1 On-Site Study Area

3.4.1.1 Surface Water Physical Setting

Since the footprint of the Expansion Landfill under Alternative Method 3 will not expand laterally beyond that which is understood for the Future Baseline Conditions, the surface water physical setting detailed for the Future Baseline Conditions, as presented in **Section 3.1.1**, remains the same under Alternative Method 3.

3.4.2 Off-Site Study Area Surface Water Physical Setting

There are no expected significant changes to landfill operations and the existing approved waste disposal footprint area under Alternative Method 3 and there are no other TCEC sources identified that would be anticipated to have an impact on the Off-Site Study Area. Therefore, under Alternative Method 3, there will be no changes to the off-site surface water physical setting described for the Future Baseline Conditions in **Section 3.1.2**.

3.4.3 Source Water Protection

As the footprint of the Expansion Landfill under Alternative Method 3 will not expand laterally beyond that which is understood for the Future Baseline Conditions, the considerations for source water protection for the Future Baseline Conditions, as presented in **Section 3.1.3**, remains the same under Alternative Method 3.

3.4.4 Environmental Quality Evaluations

As the footprint of the Expansion Landfill under Alternative Method 3 will not expand laterally beyond that which is understood for the Future Baseline Conditions, the rationale to review the effectiveness of the Surface Water Quality programs to assess for potential landfill leachate impacts remains the same as detailed for the Future Baseline Conditions as outlined in **Section 3.1.4**.

However, with the increased amount of soil management related to daily and/or interim landfill cap stripping and landfill cap height increase, under Alternative Method 3 relative to Existing Conditions and Future Baseline Conditions there is increased risk to Surface Water Quality from: erosional effects; and leachate seeps.

Notwithstanding this increased duration of time for the understood risk under Alternative Method 3 relative to Future Baseline Conditions, the Surface Water Quality Assessment Process detailed in **Section 3.4.9** will be effective to protect surface water resources on-site.

3.4.5 Surface Water Monitoring Event Initiation Mechanism

As the footprint of the Expansion Landfill under Alternative Method 3 will not expand laterally beyond that which is understood for the Future Baseline Conditions, the Surface Water Monitoring Event Initiation Mechanism presented for the Future Baseline Conditions in **Section 3.1.8**, remains similar under Alternative Method 3.

3.4.6 Surface Water Monitoring Program Descriptions

As the footprint of the Expansion Landfill under Alternative Method 3 will not expand laterally beyond that which is understood for the Future Baseline Conditions, the Surface Water Monitoring Program Descriptions presented for the Future Baseline Conditions in **Section 3.1.4**, remains the same under Alternative Method 3.

3.4.7 Surface Water Monitoring Station Details

As the footprint of the Expansion Landfill under Alternative Method 3 will not expand laterally beyond that which is understood for the Future Baseline Conditions, the Surface Monitoring Programs' Station Details presented for the Future Baseline Conditions in **Section 3.1.7**, remains the same under Alternative Method 3.

3.4.8 Surface Water Monitoring Programs' Details

As the footprint of the Expansion Landfill under Alternative Method 3 will not expand laterally beyond that which is understood for the Future Baseline Conditions, the

Surface Water Monitoring Programs' Details presented for the Future Baseline Conditions in **Section 3.1.8**, remains the same under Alternative Method 3.

3.4.9 Surface Water Quality Assessment Process

As the footprint of the Expansion Landfill under Alternative Method 3 will not expand laterally beyond that which is understood for the Future Baseline Conditions, the Surface Water Quality Assessment Process presented for the Future Baseline Conditions in **Section 3.1.9**, remains the same under Alternative Method 3.

3.4.10 On-Site Mitigative Measures

Based on the Surface Water Quality Assessment Process discussed in **Section 3.4.9**, on-site Mitigative Measures would potentially be required for the following indicator:

- Predicted effects on Surface Water Quality on-site prior to off-site discharge.
    - Erosional effects on TSS and heavy metal concentrations in surface water; and
    - Leachate seep impacts to Surface Water Quality.

The on-site Mitigative Measures for the TCEC under Alternative Method 3 are not expected to change from Future Baseline Conditions as presented in **Section 3.1.9.**

3.4.10.1 Soil Erosion Reduction Actions

The soil erosion reduction actions for the Expansion Landfill under Alternative Method 3 are not expected to change from Future Baseline Conditions as presented in **Section 3.1.10.1**.

3.4.10.2 Leachate Seep Identification and Mitigative Actions

The leachate seep identification and mitigative actions for the Expansion Landfill under Alternative Method 3 is not expected to change from Future Baseline Conditions as presented in **Section 3.1.10.2**.

3.4.11 Off-Site Study Area Surface Water Quality Evaluation

The Off-Site Study Area Surface Water Quality evaluation for the TCEC under Alternative Method 3 is not expected to change from Future Baseline Conditions as presented in **Section 3.1.11**.

3.4.12 Off-Site Mitigative Measures

Based on the Off-Site Study Area Surface Water Quality Evaluation discussed in **Section 3.4.11**, off-site Mitigative Measures would continue to be required for the following indicator:

- Predicted effects from PAHs, in ASR, on Surface Water Quality within the roadside ditch of the northbound lane of Nauvoo Road from the TCEC to Hwy 402 in the Off-Site Study Area.

The Off-Site Mitigative Measures for the TCEC under Alternative Method 3 are not expected to change from Future Baseline Conditions as presented in **Section 3.1.12**.

3.4.13 Summary

A summary of the effects assessment of Alternative Method 3 is summarized below in **Table 3-8**.

Table 3-8. Net Effects Assessment – Alternative Method 3

Evaluation Criteria	Indicator	Key Design Considerations and Assumptions	Potential Effects	Mitigation Measures	Net Effects
Surface Water Quality	Predicted effects on Surface Water Quality on-site prior to off-site discharge (Erosional effects on TSS and heavy metal concentrations in surface water)	Key Design Considerations: • Slope grading and cap surface area proposed for the vertical expansion of the Expansion Landfill with consideration toward the potential of increased erosional effects to Surface Water Quality. • No proposed changes to the landfill base design as well as leachate collection and management for the Expansion Landfill. • The existing TCEC property boundaries and buffer width will remain the same. Key Assumptions: • Under Alternative Method 3, the slight alterations to the surface water management infrastructure (e.g., swales, ditching, and sedimentation ponds)) are not considered to significantly impact Surface Water Quality as flow rates and volumes are similar to the approved Future Baseline Conditions. • Sedimentation Ponds 1 to 4 current designs are sufficient to manage Future Baseline flow conditions, as well as each Alternative Method even when considering climate change (Section 5.1.1 of the CDR), thus, the sedimentation ponds' capacities to attenuate chemical constituents are not expected to change. • Stormwater is currently, and will continue to be, managed on-site through swales and sedimentation ponds prior to off-site discharge. • Landfilling operational conditions are expected to remain the same under Alternative Method 3 and be consistent with current-approved Future Baseline operational requirements.	• Potential effects to Surface Water Quality (e.g., elevated TSS and select heavy metals) resulting from precipitation-induced erosion of exposed clayey soil on-site.	• Continue to operate and monitor Surface Water Quality at the TCEC in accordance with the relevant Conditions of the Waste and Sewage ECAs. • Install/maintain sediment control measures (e.g., straw bale/rock check dams, silt fencing, add vegetative controls, etc.) at various locations within the surface water drainage network. As-required sediment control measure placements and replacements based on Site conditions. • Supplement the northern component of the drainage network with erosion control measures as the landfill expands north prior to initiating Expansion Landfill Optimization. • Complete as-required sediment removal where sediment builds up in the surface water drainage network (e.g., at check dams, silt fencing, retention ponds, etc.). • Place topsoil and seed over areas of the Expansion Landfill side slopes completed with interim cover, where appropriate (e.g., 2 years). • Inspect areas of soil stockpiling for erosion. Where necessary, erosion control measures would be installed to protect the drainage network from unacceptable sediment loading (e.g., silt fencing, straw bales, rock check dams, add vegetative controls, etc.).	• Presuming the mitigation measures presented herein are implemented and maintained as required, the risk for impacts to Surface Water Quality due to erosional effects will be effectively managed.
Surface Water Quality	Predicted effects on Surface Water Quality on-site prior to off-site discharge (Leachate seep impacts to Surface Water Quality)	Key Design Considerations: • Increase in waste mound height and the associated cap surface area as it relates to leachate seep probability. • No proposed changes to the landfill base design as well as leachate collection and management for the Expansion Landfill. • The existing TCEC property boundaries and buffer width will remain the same. Key Assumptions: • Within the Expansion Landfill, leachate mounding is not expected to develop based on the landfill's design. • Landfilling operational conditions are expected to remain the same under Alternative Method 3 and be consistent with current-approved Future Baseline operational requirements. • The approach to managing (disposing) leachate generated at the TCEC will remain the same as that presented for Future Baseline Conditions.	• In the short-term, there is the potential for perched leachate conditions to be encountered during interim cap stripping. • In the long-term, the probability of leachate seepage is proportional to the increase in cap surface area and landfill height (e.g., more cap/height, more chances of leachate seepage).	• Continue to operate and monitor Surface Water Quality at the TCEC in accordance with the relevant Conditions of the Waste and Sewage ECAs. • Seep repairs, when identified, should be repaired immediately and if possible, prior to seepage entering and/or running off landfill sideslopes and into the surface water drainage network. • Routine inspections (e.g., monthly during post-closure) of the landfill surface are expected to provide sufficient frequency to identify and, if necessary, address leachate seepage.	• There is no expected net effect to Surface Water Quality from leachate impacts with the implementation of a seepage monitoring and repair program under Alternative Method 3.
Surface Water Quality	Predicted effects from polyaromatic hydrocarbons (PAHs) Surface Water Quality within the roadside ditch of the northbound lane of Nauvoo Road from the Site to Hwy 402 in the off-Site Study Area	Key Design Considerations: • No proposed changes to the landfill base design as well as leachate collection and management for the Expansion Landfill. • The existing TCEC property boundaries and buffer width will remain the same. Key Assumptions: • Landfilling operational conditions are expected to remain the same under Alternative Method 3 and be consistent with current-approved Future Baseline operational requirements.	• There are no predicted net effects to Surface Water Quality in the Off-Site Study Area, from ASR track out as long as mitigation measures continue to be carried out.	• WM actively implements a rigorous routine inspection and where warranted, cleanup of ASR track out. On-site and off-site ASR cleanup efforts are completed as needed and consist of sweeping, scraping with light equipment, hand raking/picking, along the roadways, road shoulders, and within the ditches. It is noted that the vegetative growth within Nauvoo Road's roadside ditch is cut as part of cleanup activities such that ASR does not remain entangled in tall vegetation in ditches.	• None (as long as the Mitigation Measures continue to be carried out).

4 Comparative Evaluation of Net Effects and Identification of the Preferred Alternative

The comparative evaluation of the net effects of each Alternative Method and the identification of a Preferred Alternative were carried out in accordance with the methods described in **Section 2.2**. The three (3) Alternative Methods were comparatively assessed and evaluated using the criteria and indicators to determine the Preferred Alternative. The evaluation of the differences in the potential environmental effects remaining following the implementation of potential mitigation/management measures (e.g., net effects) were used to identify and compare each Alternative Method. The comparative evaluation of the Alternative Methods for Surface Water Quality is provided in **Table 4-1**, below, which denotes there is no substantial difference between the Alternative Methods for Surface Water Quality and no Preferred Alternative is identified.

Table 4-1. Comparative Evaluation of the Net Effects of the Alternative Methods for Surface Water Quality

Evaluation Criteria	Indicator	Net Effects of Alternative Methods		
		Alternative Method 1	Alternative Method 2	Alternative Method 3
Surface Water Quality	Predicted effects on Surface Water Quality on-site prior to off-site discharge (Erosional effects on TSS and heavy metal concentrations in surface water)	Presuming the mitigation measures presented herein are evaluated to be required to be implemented and maintained as required, the risk for potential impacts to Surface Water Quality due to erosional effects will be effectively managed. Therefore, there is not expected net effects to Surface Water Quality. **No Substantial Difference**	Presuming the mitigation measures presented herein are evaluated to be required to be implemented and maintained as required, the risk for potential impacts to Surface Water Quality due to erosional effects will be effectively managed. Therefore, there is not expected net effects to Surface Water Quality. **No Substantial Difference**	Presuming the mitigation measures presented herein are evaluated to be required to be implemented and maintained as required, the risk for potential impacts to Surface Water Quality due to erosional effects will be effectively managed. Therefore, there is not expected net effects to Surface Water Quality. **No Substantial Difference**
	Predicted effects on Surface Water Quality on-site prior to off-site discharge (Leachate seep impacts to Surface Water Quality)	There is no expected net effect to Surface Water Quality from potential leachate impacts with the implementation of a seepage monitoring and repair program. **No Substantial Difference**	There is no expected net effect to Surface Water Quality from potential leachate impacts with the implementation of a seepage monitoring and repair program. **No Substantial Difference**	There is no expected net effect to Surface Water Quality from potential leachate impacts with the implementation of a seepage monitoring and repair program. **No Substantial Difference**
	Predicted effects from polyaromatic hydrocarbons (PAHs) Surface Water Quality within the roadside ditch of the northbound lane of Nauvoo Road from the Site to Hwy 402 in the Off-Site Study Area	None (as long as the Mitigation Measures continue to be carried out). **No Substantial Difference**	None (as long as the Mitigation Measures continue to be carried out). **No Substantial Difference**	None (as long as the Mitigation Measures continue to be carried out). **No Substantial Difference**
	Criteria Rating & Rationale	***There is no substantial difference between the Alternative Methods for Surface Water Quality.*** If necessary, with the implementation of the on-site mitigative measures to control erosion effects and/or prevent leachate seep effects to Surface Water Quality, there are no resulting net effects in any of the three (3) Alternative Methods. There are no predicted net effects to Surface Water Quality in the Off-Site Study Area, from ASR track out as long as mitigation measures continue to be carried out. Therefore, with no net effects, there is no preferred Alternative Method as it relates to Surface Water Quality.		
Preferred Alternative: There is no substantial difference between Alternative Methods as it relates to Surface Water Quality.				

There is no substantial difference between the Alternative Methods as it relates to Surface Water Quality and no Preferred Alternative is identified.

5 Effects Assessment of the Preferred Alternative

As discussed within this Effects Assessment Report, as it relates to Surface Water Quality, there is no substantial difference between the Alternative Methods based on the interpretation based on the interpretation that adequate mitigation measures are in place for each of the proposed approaches toward Expansion Landfill Optimization. Consequently, no Preferred Alternative is identified.

The effects of the Landfill Optimization are those identified for Alternative Methods 1, 2, and 3 in **Sections 3.2**, **3.3**, and **3.4**, respectively, as summarized below:

- Surface Water Quality:
- If necessary, with the implementation of the on-site mitigative measures to control erosion effects and/or prevent leachate seep effects to Surface Water Quality, there are no resulting net effects in any of the three (3) Alternative Methods. There are no predicted net effects to Surface Water Quality in the Off-Site Study Area, from ASR track out as long as mitigation measures continue to be carried out. Therefore, with no net effects, there is no preferred Alternative Method as it relates to Surface Water Quality.

5.1 Climate Change Considerations

With potentially more frequent and intense inclement weather patterns, peak stormwater flows could increase at the TCEC and affect erosion rates across the surface watercourse network. TSS concentrations could potentially increase, thereby increasing other constituent concentrations associated with erosional effects such as heavy metals (e.g., zinc, nickel, and chromium). The correlation between TSS and soil-related metals constituents within the surface water has already been well documented at the TCEC as discussed in the Surface Water Quality Existing Conditions Report (RWDI, 2024).

With respect to sediment control measures, their implementation and maintenance may need to adapt to changing climate conditions, such as, but not limited to, enlarging check dams, more frequent replacement of sediment capture dams, more frequent sediment removal either from ditching or sedimentation ponds, ditch and swale reshaping due to flow scouring, etc.

With the large cap surface area, under Future Baseline Conditions or any of the Alternative Methods, there is the increased area for probable leachate seeps to occur after potentially more frequent and intense rain events. As such the Surface Water

Quality events and monthly inspections will continue to be valuable to assess for these potential occurrences at an ongoing regular frequency.

There are no proposed modifications or changes to the currently proposed monitoring program under Future Baseline and/or any of the Alternative Methods presented herein, in consideration of climate change.

As further monitoring is completed at the TCEC over time, changes to the Surface Water Quality monitoring programs that may be required to adapt to changing climatic conditions could be considered and implemented through regulatory approval.

6 Comparison of the Preferred Alternative against the 'Do Nothing' Alternative

As no Preferred Alternative is identified for Surface Water Quality, the effects of the three (3) Alternative Methods are compared against the predicted effects of the currently approved Expansion Landfill based on similar environmental criteria and indicators, with the understanding that the criteria and indicators used in the current Effects Assessment may differ from those used for the effects assessment of the Expansion Landfill. The effects are compared against each other in terms of magnitude, extent, and duration below. The advantages and disadvantages of any of the Alternative Methods compared to the 'Do Nothing' Alternative are discussed below.

6.1 Effects of the 'Do Nothing' Alternative

The net effects of the 'Do Nothing' Alternative are considered negligible as it relates to Surface Water Quality at the TCEC, as described in the Future Baseline Conditions assessment in **Section 3.1,** and summarized in **Section 3.1.13**.

6.2 Comparison of the Preferred Alternative against the 'Do Nothing' Alternative

Since no Preferred Alternative is identified for Surface Water Quality, the net effects of the three (3) Alternative Methods are compared against the 'Do Nothing' Alternative. As it relates to Surface Water Quality, given that the Expansion Landfill footprint and leachate management practices are not proposed to be altered under any of the Alternative Methods nor under the 'Do Nothing' Alternative (which leads to Future Baseline Conditions), and, with adequate mitigative measures in place to manage sediment buildup, leachate seepage, and ASR trackout (see **Sections 3.2**, **3.3**, and **3.4**), there are no substantial differences in expected net effects to Surface Water Quality at the TCEC between any of the Alternative Methods.

When considering the implementation of any of the Alternative Methods, the period of landfill construction activities would extend beyond that of the 'Do Nothing' Alternative.

This implies that the potential risk to Surface Water Quality impacts from construction activities would continue for a longer period than they would for the 'Do Nothing' Alternative. The net effects, however, between the 'Do Nothing' and any of the Alternative Methods would remain unsubstantial, given that adequate mitigative measures would be in place to manage sediment buildup, as discussed in herein.

6.3 Advantages and Disadvantages of the Preferred Alternative

The differences in net effects between the three (3) Alternative Methods and the 'Do Nothing Alternative' were evaluated to determine the advantages and disadvantages of the Alternative Methods. As the interpretation of net effects for any of the Alternative Methods shows that there would be no difference in the net effects between each Alternative Method, they would have the same advantages and disadvantages compared with the 'Do Nothing' Alternative as it relates to Surface Water Quality. The advantages and disadvantages of the Alternative Methods as it relates to Surface Water Quality are summarized in **Table 6-1**.

Table 6-1. Advantages and Disadvantages of the Preferred Alternative

Evaluation Criteria	Advantages	Disadvantages
Surface Water Quality	• There are no advantages of any of the Alternative Methods over the 'Do Nothing' Alternative as they relate to Surface Water Quality	• There are no disadvantages of any of the Alternative Methods over the 'Do Nothing' Alternative as they relate to Surface Water Quality

7 Commitments and Monitoring

To confirm that the commitments related to Surface Water Quality are carried out, and that the proposed mitigation measures will address the predicted effects for Surface Water Quality, monitoring for Surface Water Quality, as outlined herein, will be undertaken to confirm that the Landfill Optimization complies with the commitments and mitigation measures identified in the Effects Assessment, where relevant.

The commitments associated with Surface Water Quality are listed in **Section 7.1**. The proposed environmental effects monitoring is provided in **Section 7.2**. Surface Water Quality Monitoring is described in **Section 7.3**.

7.1 Surface Water Quality Commitments

7.1.1 On-Site Study Area Commitments

On-site Study Area Commitments would be required for the following indicator:

- Predicted effects on Surface Water Quality on-site prior to off-site discharge.
    - Erosional effects on TSS and heavy metal concentrations in surface water; and

- Leachate seep impacts to Surface Water Quality

On-Site Study Area commitments would continue to consist of the Routine Monthly Site Inspections for locations of clayey soil erosion and locations of leachate seeps, as detailed in **Section 3.1.10.**

With the implementation of the Surface Water Quality monitoring and repair/maintenance program to address the buildup of sediment within the surface water network ditches and detention ponds and potential leachate seeps under any of the Alternative Methods, including the 'Do Nothing' Alternative, there is not an expected net effect difference between any of the Alternatives as it relates to Surface Water Quality at the TCEC.

The Surface Water Quality monitoring program as detailed within **Section 3.1.5** and **3.1.9** will provide an overview of the status of Surface Water Quality conditions at the TCEC and whether mitigation measures should be implemented such that surface water that discharges from the TCEC is of suitable quality as outlined herein.

7.1.2 Off-Site Study Area Commitments

Off-site Study Area Commitments would continue to be required for the following indicator:

- Predicted effects from PAHs, in ASR, on Surface Water Quality within the roadside ditch of the northbound lane of Nauvoo Road from the TCEC to Hwy 402 in the Off-Site Study Area.

The off-Site Study Area commitments would consist of the rigorous routine inspection that has been implemented since 2022 involving the cleanup of track out ASR where warranted, as detailed in **Section 3.1.12.**

Under any of the Alternative Methods, including the 'Do Nothing' Alternative, there are no predicted net effects to Surface Water Quality in the Off-Site Study Area, from ASR track out, as long as there is a commitment to implement mitigation measures as discussed herein. Therefore, with no net effects, there is no preferred Alternative Method as it relates to Surface Water Quality.

7.2 Environmental Effects Monitoring for Surface Water Quality

Monitoring plans are developed as part of the detailed effects assessments carried out for the Alternative Methods to confirm:

- The net effects are as predicted;
- Unanticipated negative effects are addressed; and
- The effectiveness of the proposed mitigation measures.

Table 7-1 contains the environmental effects monitoring that can be applied to any of the Alternative Methods as it relates to Surface Water Quality.

7.3 Surface Water Quality Monitoring

Surface Water Quality monitoring will be undertaken to confirm that the construction, operation, and maintenance of the Landfill Optimization, during operation and post-closure, are carried out in accordance with the mitigation measures and commitments identified in the Effects Assessment. The Surface Water Quality monitoring is summarized in **Table 7-1** with referencing to the appropriate Sections of this Effects Assessment Report. The results of the Surface Water Quality monitoring, including details of the effectiveness of mitigation measures, will be provided to the MECP through the MECP-approved process (e.g. current quarterly and annual monitoring reports), which would be detailed and updated in the future within documentation similar to that, which are presented in **Section 8**.

Table 7-1. Environmental Effects and Quality Monitoring for Any Alternative Method

Evaluation Criteria	Potential Effect	Commitment for Mitigation	Commitment for Monitoring	Quality Monitoring

Surface Water Quality	• Potential effects to Surface Water Quality (e.g., elevated TSS and select heavy metals) resulting from precipitation-induced erosion of exposed clayey soil on-site.	• Continue to operate and monitor Surface Water Quality at the TCEC in accordance with the relevant Conditions of the Waste and Sewage ECAs and as improved as outlined in **Sections 3.1.5** through **3.1.9**.
		• Install/maintain sediment control measures (e.g., straw bale/rock check dams, silt fencing, add vegetative controls, etc.) at various locations within the surface water drainage network. As-required sediment control measure placements and replacements based on Site conditions.
		• Complete as-required sediment removal where sediment builds up in the surface water drainage network (e.g., at check dams, silt fencing, detention ponds, etc.).
		• Inspect areas of soil stockpiling for erosion. Where necessary, erosion control measures would be installed to protect the drainage network from unacceptable sediment loading (e.g., silt fencing, straw bales, rock check dams, add vegetation control, etc.).
			• Routine Monthly Site inspections	• Routine and verification monitoring to be completed at established surface water monitoring stations as outlined in **Sections 3.1.5** through **3.1.9**, for the following Surface Water Quality monitoring programs.
				  • Compliance
				  • Poplar System
				  • Poplar Plantation
				  • Compost and Waste Diversion Area

Surface Water Quality	• In the short-term, there is the potential for perched leachate conditions to be encountered during interim cap stripping. • In the long-term, the probability of leachate seepage is proportional to the increase in cap surface area and landfill height (e.g., more cap/height, more chances of leachate seepage).	• Continue to operate and monitor Surface Water Quality at the TCEC in accordance with the relevant Conditions of the Waste and Sewage ECAs and as improved as outlined in **Sections 3.1.5** through **3.1.9**.	• Routine Monthly Site inspections	• Routine and verification monitoring to be completed at established surface water monitoring stations as outlined in **Sections 3.1.5** through **3.1.9**, for the following Surface Water Quality monitoring programs.

Table 7-1. Environmental Effects and Quality Monitoring for Any Alternative Method

Evaluation Criteria	Potential Effect	Commitment for Mitigation	Commitment for Monitoring	Quality Monitoring
		• Seep repairs, when identified, should be repaired immediately and if possible, prior to seepage entering and/or running off landfill sideslopes and into the surface water drainage network. • Routine inspections (e.g., monthly during post-closure) of the landfill surface are expected to provide sufficient frequency to identify and, if necessary, address leachate seepage.		• Compliance • Poplar System • Poplar Plantation • Compost and Waste Diversion Area
Surface Water Quality	There are no predicted net effects to Surface Water Quality in the Off-Site Study Area, from ASR track out as long as mitigation measures continue to be carried out.	• WM actively implements a rigorous routine inspection and where warranted, cleanup of ASR track out. On-site and off-site ASR cleanup efforts are completed as needed and consist of sweeping, scraping with light equipment, hand raking/picking, along the roadways, road shoulders, and within the ditches. It is noted that the vegetative growth within Nauvoo Road's roadside ditch is cut as part of cleanup activities such that ASR does not remain entangled in tall vegetation in ditches.	• None (as long as the Mitigation Measures continue to be carried out).	• None (as long as the Mitigation Measures continue to be carried out).

8 Surface Water Quality Approvals

In addition to EA approval and under the current monitoring program during the Future Baseline and/or any of the Alternative Methods, the following regulatory approvals would require amendment to reflect the Surface Water Quality monitoring and assessment outlined herein:

- An amendment to the Waste ECA with respect to updating the 2007 EMP for the TCEC as outlined herein.
- An amendment to the Sewage ECA with respect to updating the 2007 EMP as outlined herein and which includes a component for the management of

stormwater runoff, including monitoring program sampling and chemical testing details.

- As part of the amendments for both the Waste and Sewage ECAs, the following documents would need to be amended.
  - The 2007 EMP for the TCEC would need to be amended to reflect the monitoring and assessment process discussed in **Sections 3.1.5** through **3.1.9**.
  - The D&O for the TCEC would need to be amended to reflect the amendment of the 2007 EMP.
  - The *Surface Water Contingency and Remedial Action Plan Warwick Landfill Site*, dated April 29, 2008 (Jagger Hims Limited) would need to be amended to account for the mitigative measures presented in Section **3.1.10**.

9 References

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Henderson, Paddon Environmental Inc.

1997 Development & Operations Report, Canadian Waste Services Inc., Warwick Landfill, Warwick Township. Prepared for Canadian Waste Services Inc. (1997 D&O)

2008 Development and Operations Plans, Warwick Landfill Expansion Volumes 1 to 3, Prepared for Waste Management of Canada Corporation (2008 D&O)

Jagger Hims Limited

2005 Warwick Landfill Expansion, Environmental Assessment, Hydrogeological Assessment Volumes 1 to 3, Prepared for Waste Management of Canada Corporation

2007 Environmental Monitoring Plan, Warwick Landfill Expansion, Township of Warwick, Ontario, Prepared for Waste Management of Canada Corporation (2007 EMP)

2008 Surface Water Contingency and Remedial Action Plan Warwick Landfill Site, dated April 29, 2008, Prepared for Waste Management of Canada Corporation

Ministry of the Environment and Energy

1994 Water management: Polices, Guidelines, Provincial Water Quality Objectives. Reprinted 1995 (PWQO)

Ministry of the Environment

2012 *Request for Modification of Surface Water Quality Trigger Concentration Level, Twin Creeks Landfill*, Letter dated May 18, 2012. Prepared for Waste Management of Canada Corporation (MECP 2012 Letter)

2014 *Request for Modification to Surface Water Monitoring/Assessment Process at Twin Creeks Landfill*, Letter dated February 27, 2014. Prepared for Waste Management of Canada Corporation (MECP 2014 Letter)

RWDI AIR Inc.

2019 2019 Sediment and Vegetation Assessment – Sedimentation Ponds, Twin Creeks Environmental Centre, Township of Warwick, Ontario, Prepared for Waste Management of Canada Corporation

2020a 2019 Fourth Quarter and Annual Monitoring Report, Twin Creeks Environmental Centre, Township of Warwick, Ontario, Prepared for Waste Management of Canada Corporation

2020b 2020 Sediment and Vegetation Assessment – Sedimentation Ponds, Twin Creeks Environmental Centre, Township of Warwick, Ontario, Prepared for Waste Management of Canada Corporation

2021a 2020 Fourth Quarter and Annual Monitoring Report, Twin Creeks Environmental Centre, Township of Warwick, Ontario, Prepared for Waste Management of Canada Corporation

2021b 2021 Sediment and Vegetation Assessment – Sedimentation Ponds, Twin Creeks Environmental Centre, Township of Warwick, Ontario, Prepared for Waste Management of Canada Corporation

2022a 2021 Fourth Quarter and Annual Monitoring Report, Twin Creeks Environmental Centre, Township of Warwick, Ontario, Prepared for Waste Management of Canada Corporation

2022b 2022 Sediment and Vegetation Assessment – Sedimentation Ponds, Twin Creeks Environmental Centre, Township of Warwick, Ontario, Prepared for Waste Management of Canada Corporation

2023 2022 Fourth Quarter and Annual Monitoring Report, Twin Creeks Environmental Centre, Township of Warwick, Ontario, Prepared for Waste Management of Canada Corporation

2023 Draft Surface Water Quality Existing Conditions Report, Twin Creeks Environmental Centre Landfill Optimization Project Environmental Assessment, Prepared for WM Canada

A

Leachate Chemical Results

Table A-1
Leachate - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	D&O Anticipated Raw Leachate Quality		Min	Max	Arithmetic Mean	Geomean	Sump (Central Fill Area)	Sump (Central Fill Area)	Sump (Central Fill Area)	Sump (Central Fill Area)	Sump (Central Fill Area)	Sump (Central Fill Area)	Sump (Central Fill Area)	Sump (Central Fill Area)	Sump (Central Fill Area)	Sump (Central Fill Area)
Date		Warwick Landfill Peak Value Including Recirculation	Warwick Landfill Anticipated Phase 1 Raw Leachate Design Quality					23-May-08	21-May-09	20-May-10	10-May-11	08-May-12	07-May-13	07-May-14	19-May-15	30-May-16	26-May-17
Laboratory								Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Alkalinity (Total as CaCO3)	mg/L		4500	290	7060	3847	2997	5770	6480	7060	4570	4300	940	5600	4700	4600	3900
Conductivity	umho/cm			880	16400	10265	8254	13100	15000	16400	10800	12000	2600	14000	13000	15000	11000
Dissolved Chloride (Cl)	mg/L	8625	2500	68	2600	1285	949	1300	1500	1800	1100	1400	200	1500	1800	2600	1500
Dissolved Organic Carbon	mg/L	13312	1500	25	462	230	176	435		462	265	273	49	330	330	300	230
Dissolved Sulphate (SO4)	mg/L	483	200	0.5	81	36	18	*10*	81	*5*	59	54	78	72	*0.5*	*10*	39
Mercury (Hg)	mg/L	0.021	0.005	0.00005	0.0001	0.00006	0.00005	<0.0002	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.0001	<0.0001
Nitrate (N)	mg/L			0.05	1.85	0.47	0.31	<0.1	<1	<1	<1	<2.0	<0.10	<0.50	<1.0	<1.0	<0.50
Nitrite (N)	mg/L			0.005	0.265	0.068	0.049	0.03	<0.1	<0.1	<0.1	<0.20	<0.010	<0.050	<0.10	<0.10	0.055
pH	units		7.2	7.3	8.0	7.7	7.7	7.6	8.0	7.7	7.6	7.7	7.5	7.8	7.8	7.5	7.6
Phenols-4AAP	mg/L	8.63	1	0.0018	0.1	0.05	0.03	0.10	0.07	0.08	0.06	0.05	0.01	0.08	0.05	0.07	<0.20
Total Ammonia-N	mg/L	2944	800	11.1	857	469	336	576	724	857	558	529	100	795	592	560	512
Total Arsenic (As)	mg/L	<0.11	<0.11	0.002	0.01	0.006	0.005	0.007	0.010	0.007	0.006	<0.01	0.003	0.010	0.010	<0.01	0.006
Total Barium (Ba)	mg/L	0.966	0.966	0.049	0.29	0.18	0.16	0.19	0.19	0.20	0.20	0.19	0.11	0.23	0.23	0.29	0.17
Total BOD	mg/L	27600	1750	5	200	77	51	200	140	200	74	81	14	94	60	88	63
Total Boron (B)	mg/L	7.13	50	1.3	70	28.1	17.0	70	58	56	28	20	2.0	17	43	49	25.0
Total Cadmium (Cd)	mg/L	0.12	0.12	0.00005	0.0005	0.00021	0.00014	<0.0001	<0.0001	<0.0005	<0.0005	<0.001	<0.0001	<0.0001	<0.0005	<0.001	<0.0001
Total Calcium (Ca)	mg/L	3795	200	76	150	108	106	100	100	85	110	140	96	130	110	130	95
Total Chemical Oxygen Demand (COD)	mg/L	50600	3500	63	1400	734	567	1200	1200	1400	850	860	180	1000	950	980	660
Total Chromium (Cr)	mg/L	0.92	0.5	0.006	1.6	0.61	0.25	1.5	1.2	1.1	0.4	0.4	0.0	0.3	1.6	1.5	0.56
Total Copper (Cu)	mg/L	0.064	0.1	0.001	0.01	0.006	0.005	<0.002	0.002	<0.01	<0.01	<0.02	0.005	<0.01	<0.02	<0.02	0.003
Total Dissolved Solids	mg/L		5200	525	9960	5176	4013	8000	9410	9960	6320	5110	1200	6210	6360	7400	4640
Total Iron (Fe)	mg/L	1150	8	2.2	54	10	6	7.9	5.2	5.2	3.5	2.9	5.9	5.1	7.4	24.0	3.4
Total Kjeldahl Nitrogen (TKN)	mg/L	3450	960	11	930	502	351	720	810	930	570	600	100	860	630	580	530
Total Lead (Pb)	mg/L	1.38	1.38	0.0011	0.064	0.0101	0.0054	0.0082	0.0094	0.0080	0.0040	<0.005	0.0022	0.0034	0.0150	0.0640	0.0047
Total Magnesium (Mg)	mg/L	1380	350	22	390	222	177	240	390	340	300	290	60	330	270	310	210
Total Manganese (Mn)	mg/L	22.8	1	0.053	0.37	0.23	0.20	0.37	0.37	0.23	0.26	0.33	0.25	0.24	0.34	0.23	0.098
Total Nickel (Ni)	mg/L	1.84	0.5	0.011	1.1	0.48	0.27	1.10	0.96	0.93	0.44	0.42	0.05	0.35	0.96	0.92	0.360
Total Phosphorus	mg/L	18.61	3	0.24	5.8	2.1	1.5	3.5	5.2	5.8	2.3	1.8	<0.6	2.4	3.1	2.4	1.60
Total Potassium (K)	mg/L	2852	300	12	620	328	243	340	520	520	500	440	89	620	390	380	340
Total Sodium (Na)	mg/L	6578	500	57	2100	1122	822	1600	1800	1700	1200	1200	180	1300	1700	2100	1100
Total Suspended Solids	mg/L		150	12	270	73	44	20	14	15	64	20	120	29	12	97	20
Total Zinc (Zn)	mg/L	11.27	0.3	0.01	0.1	0.04	0.03	0.10	0.08	0.05	<0.05	<0.1	0.02	0.04	<0.05	<0.1	0.02
Un-ionized Ammonia	mg/L			0.028	29	5.53	2.19	3.3	5.4	8.2	2.4	9.7	0.2	29.0	12.0	2.3	3.10
Ion Percentage	mg/L			3.75	15.98	9.50	8.43	11.5	7.1	15.8	5.2	7.5	6.0	11.5	6.2	5.2	14.8

Notes: 1) Blank denotes parameter not analysed.
2) < denotes parameter concentration is below the laboratory method reporting limit (MRL).
3) µmho/cm denotes micro-ohms per centimetre.
NTU denotes nephelometric turbidity unit.
mg/L denotes milligrams per litre.
4) Maxxam denotes Maxxam Analytics Inc.
5) *Italics* denotes parameter concentration is presented as half the laboratory RDL for Ion Percentage calculation.
6) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table A-1
Leachate - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	D&O Anticipated Raw Leachate Quality		Min	Max	Arithmetic Mean	Geomean	Sump (Central Fill Area)	Sump (Central Fill Area)	Sump (Central Fill Area)	Sump (Central Fill Area)	Sump (Central Fill Area)					
Date		Warwick Landfill Peak Value Including Recirculation	Warwick Landfill Anticipated Phase 1 Raw Leachate Design Quality					11-May-18	16-May-19	12-May-20	18-May-21	06-May-22					
Laboratory								Maxxam	Maxxam	Bureau Veritas	Bureau Veritas	Bureau Veritas					
Alkalinity (Total as CaCO3)	mg/L		4500	290	7060	3847	2997	2800	290	2900	2900	900					
Conductivity	umho/cm			880	16400	10265	8254	7700	880	11000	8900	2600					
Dissolved Chloride (Cl)	mg/L	8625	2500	68	2600	1285	949	860	68	1900	1500	240					
Dissolved Organic Carbon	mg/L	13312	1500	25	462	230	176	150	25	180	140	52					
Dissolved Sulphate (SO4)	mg/L	483	200	0.5	81	36	18	40	58	23	0.5	15					
Mercury (Hg)	mg/L	0.021	0.005	0.00005	0.0001	0.00006	0.00005	<0.0001	<0.0001	<0.00010	<0.00010	<0.0002					
Nitrate (N)	mg/L			0.05	1.85	0.47	0.31	<1.0	<0.10	1.85	<0.50	0.37					
Nitrite (N)	mg/L			0.005	0.265	0.068	0.049	<0.10	0.137	0.085	<0.050	0.265					
pH	units		7.2	7.3	8.0	7.7	7.7	7.6	7.8	7.6	7.3	8.0					
Phenols-4AAP	mg/L	8.63	1	0.0018	0.1	0.05	0.03	<0.080	<0.0040	0.085	<0.020	0.0018					
Total Ammonia-N	mg/L	2944	800	11.1	857	469	336	354	11.1	416	349	94.9					
Total Arsenic (As)	mg/L	<0.11	<0.11	0.002	0.01	0.006	0.005	<0.005	0.002	<0.01	<0.005	0.003					
Total Barium (Ba)	mg/L	0.966	0.966	0.049	0.29	0.18	0.16	0.11	0.05	0.2	0.24	0.063					
Total BOD	mg/L	27600	1750	5	200	77	51	43	5	49	37	7					
Total Boron (B)	mg/L	7.13	50	1.3	70	28.1	17.0	7.4	1.3	23	18	3.1					
Total Cadmium (Cd)	mg/L	0.12	0.12	0.00005	0.0005	0.00021	0.00014	<0.0005	<0.0001	<0.001	<0.0005	<0.0001					
Total Calcium (Ca)	mg/L	3795	200	76	150	108	106	95	76	120	150	80					
Total Chemical Oxygen Demand (COD)	mg/L	50600	3500	63	1400	734	567	480	63	570	450	160					
Total Chromium (Cr)	mg/L	0.92	0.5	0.006	1.6	0.61	0.25	0.11	0.01	0.19	0.12	0.015					
Total Copper (Cu)	mg/L	0.064	0.1	0.001	0.01	0.006	0.005	<0.01	0.006	<0.02	<0.01	0.006					
Total Dissolved Solids	mg/L		5200	525	9960	5176	4013	3050	525	4870	3560	1030					
Total Iron (Fe)	mg/L	1150	8	2.2	54	10	6	4.5	2.2	13	54	5.1					
Total Kjeldahl Nitrogen (TKN)	mg/L	3450	960	11	930	502	351	330	11	420	340	96					
Total Lead (Pb)	mg/L	1.38	1.38	0.0011	0.064	0.0101	0.0054	<0.003	0.0011	0.019	0.006	0.0026					
Total Magnesium (Mg)	mg/L	1380	350	22	390	222	177	140	22	200	170	54					
Total Manganese (Mn)	mg/L	22.8	1	0.053	0.37	0.23	0.20	0.110	0.053	0.18	0.29	0.11					
Total Nickel (Ni)	mg/L	1.84	0.5	0.011	1.1	0.48	0.27	0.130	0.011	0.280	0.180	0.038					
Total Phosphorus	mg/L	18.61	3	0.24	5.8	2.1	1.5	0.97	0.24	1.00	1.20	0.36					
Total Potassium (K)	mg/L	2852	300	12	620	328	243	260	12	220	210	74					
Total Sodium (Na)	mg/L	6578	500	57	2100	1122	822	640	57	1100	930	220					
Total Suspended Solids	mg/L		150	12	270	73	44	41	52	88	270	230					
Total Zinc (Zn)	mg/L	11.27	0.3	0.01	0.1	0.04	0.03	<0.05	0.01	<0.10	<0.05	0.02					
Un-ionized Ammonia	mg/L			0.028	29	5.53	2.19	1.10	0.03	0.92	0.69	4.7					
Ion Percentage	mg/L			3.75	15.98	9.50	8.43	16.0	3.8	14.1	13.9	3.9					

Notes: 1) Blank denotes parameter not analysed.
2) < denotes parameter concentration is below the laboratory method reporting limit (MRL).
3) µmho/cm denotes micro-ohms per centimetre.
NTU denotes nephelometric turbidity unit.
mg/L denotes milligrams per litre.
4) Maxxam denotes Maxxam Analytics Inc.
5) *Italics* denotes parameter concentration is presented as half the laboratory RDL for Ion Percentage calculation.
6) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table A-1
Leachate - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	D&O Anticipated Raw Leachate Quality		Min	Max	Arithmetic Mean	Geomean	MH18 (South Fill Area)	MH18 (South Fill Area)	MH18 (South Fill Area)	MH18 (South Fill Area)	MH18 (South Fill Area)	MH18 (South Fill Area)	MH18 (South Fill Area)	MH18 (South Fill Area)	MH18 (South Fill Area)
Date		Warwick Landfill Peak Value Including Recirculation	Warwick Landfill Anticipated Phase 1 Raw Leachate Design Quality					23-May-08	20-May-09	20-May-10	10-May-11	08-May-12	07-May-13	07-May-14	19-May-15	30-May-16	26-May-17
Laboratory								Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Alkalinity (Total as CaCO3)	mg/L		4500	160	18300	5555	1637	18300	189	160	186	270	850	17000	240	16000	13000
Conductivity	umho/cm			501	31100	10060	3897	31100	640	501	653	950	2400	30000	660	27000	23000
Dissolved Chloride (Cl)	mg/L	8625	2500	11	850	269	118	850	22	11	21	34	110	700	18	600	540
Dissolved Organic Carbon	mg/L	13312	1500	8.3	1480	297	86	1480.0	70.3	8.9	12.0	12.2	94.0	64.0	8.3	1100.0	810
Dissolved Sulphate (SO4)	mg/L	483	200	10	230	107	68	*10*	97	78	110	170	230	*10*	72	*10*	20
Mercury (Hg)	mg/L	0.021	0.005	0.00005	0.015	0.00121	0.00013	<0.03	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.0015	<0.00010	<0.002	<0.0001
Nitrate (N)	mg/L			0.05	1.44	0.56	0.43	<1.0	0.6	0.1	0.5	0.74	<0.10	<1.0	1.44	<1.0	<1.0
Nitrite (N)	mg/L			0.005	0.51	0.109	0.056	0.10	0.37	0.03	0.04	0.51	<0.010	<0.10	0.03	<0.10	<0.10
pH	units		7.2	7.6	8.2	7.9	7.9	7.80	7.60	8.00	7.99	8.01	8.05	7.81	8.24	7.78	7.8
Phenols-4AAP	mg/L	8.63	1	0.0005	0.6	0.11	0.02	0.60	0.03	<0.001	<0.001	0.0012	0.024	0.35	0.001	0.37	<0.20
Total Ammonia-N	mg/L	2944	800	8	3540	899	187	2860.0	13.7	8.0	11.5	29.0	164.0	3540.0	13.5	2550.0	1720
Total Arsenic (As)	mg/L	<0.11	<0.11	0.0005	0.16	0.029	0.008	0.110	0.002	0.001	0.001	0.002	0.006	0.160	<0.001	<0.1	0.04
Total Barium (Ba)	mg/L	0.966	0.966	0.01	0.71	0.16	0.08	0.350	0.027	0.037	0.023	0.038	0.066	0.710	0.010	<0.5	0.31
Total BOD	mg/L	27600	1750	1	1800	402	52	1800	59	<2	<2	22	120	1500	<2.0	1300	720
Total Boron (B)	mg/L	7.13	50	0.67	560	107.5	19.3	260.0	0.9	0.7	1.0	2.1	12.0	560.0	1.1	290.0	210
Total Cadmium (Cd)	mg/L	0.12	0.12	0.00005	0.005	0.0005	0.0001	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.01	<0.0005
Total Calcium (Ca)	mg/L	3795	200	19	110	66	60	19	61	56	65	79	80	58	62	31	40
Total Chemical Oxygen Demand (COD)	mg/L	50600	3500	20	4400	1106	273	4400	34	33	41	33	310	3700	20	3600	1900
Total Chromium (Cr)	mg/L	0.92	0.5	0.0025	0.51	0.10	0.02	0.290	<0.005	0.006	<0.005	<0.005	0.014	0.510	<0.005	<0.5	0.18
Total Copper (Cu)	mg/L	0.064	0.1	0.001	0.1	0.016	0.007	0.030	0.003	0.004	0.004	<0.002	0.004	<0.1	0.003	<0.2	<0.01
Total Dissolved Solids	mg/L		5200	334	20000	4485	1861	20000	412	334	416	494	1150	11600	360	10900	8740
Total Iron (Fe)	mg/L	1150	8	0.14	5	2	1	1.0	1.7	3.3	2.3	1.3	1.9	<1.0	0.1	<10.0	<0.5
Total Kjeldahl Nitrogen (TKN)	mg/L	3450	960	11	3500	965	199	3500	14	11	12	33	160	3500	16	2500	2200
Total Lead (Pb)	mg/L	1.38	1.38	0.00025	0.028	0.006	0.002	0.0280	0.0013	0.0015	0.0011	0.0007	0.0013	0.0200	<0.0005	<0.05	0.006
Total Magnesium (Mg)	mg/L	1380	350	19	450	109	67	220	21	19	22	28	40	450	21	220	170
Total Manganese (Mn)	mg/L	22.8	1	0.005	0.33	0.12	0.07	0.030	0.089	0.036	0.030	0.073	0.080	0.050	0.005	<0.2	0.03
Total Nickel (Ni)	mg/L	1.84	0.5	0.002	0.46	0.10	0.03	0.300	0.004	0.005	0.005	0.004	0.017	0.460	0.002	0.200	0.17
Total Phosphorus	mg/L	18.61	3	0.12	7.8	2.0	0.8	4.30	0.12	<0.3	0.17	0.18	<0.6	7.80	0.94	5.40	4.50
Total Potassium (K)	mg/L	2852	300	6.7	1100	218	63	540.0	7.9	7.0	6.7	14.0	31.0	1100.0	7.0	540.0	400
Total Sodium (Na)	mg/L	6578	500	19	6300	1254	306	3200	26	19	28	48	200	6300	25	3100	2400
Total Suspended Solids	mg/L		150	3	66	23	18	66	22	25	16	18	30	21	3	6	18
Total Zinc (Zn)	mg/L	11.27	0.3	0.005	0.5	0.06	0.02	0.10	<0.01	0.02	<0.01	<0.01	<0.01	<0.1	<0.01	<1	<0.05
Un-ionized Ammonia	mg/L			0.09	220	35.42	4.56	110.00	0.41	0.23	0.09	0.22	3.40	220.00	0.62	77.00	45
Ion Percentage	mg/L			0.96	29.99	14.23	9.74	30.0	3.6	8.6	4.5	1.0	12.6	7.5	1.9	24.1	26.6

Notes: 1) Blank denotes parameter not analysed.
2) < denotes parameter concentration is below the laboratory method reporting limit (MRL).
3) µmho/cm denotes micro-ohms per centimetre.
NTU denotes nephelometric turbidity unit.
mg/L denotes milligrams per litre.
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5) *Italics* denotes parameter concentration is presented as half the laboratory RDL for Ion Percentage calculation.
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Table A-1
Leachate - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	D&O Anticipated Raw Leachate Quality		Min	Max	Arithmetic Mean	Geomean	MH18 (South Fill Area)	MH18 (South Fill Area)	MH18 (South Fill Area)	MH18 (South Fill Area)	MH18 (South Fill Area)					
Date		Warwick Landfill Peak Value Including Recirculation	Warwick Landfill Anticipated Phase 1 Raw Leachate Design Quality					11-May-18	16-May-19	12-May-20	18-May-21	06-May-22					
Laboratory								Maxxam	Maxxam	Bureau Veritas	Bureau Veritas	Bureau Veritas					
Alkalinity (Total as CaCO3)	mg/L		4500	160	18300	5555	1637	6800	960	3700	5000	670					
Conductivity	umho/cm			501	31100	10060	3897	13000	2600	7700	9000	1700					
Dissolved Chloride (Cl)	mg/L	8625	2500	11	850	269	118	450	140	240	250	46					
Dissolved Organic Carbon	mg/L	13312	1500	8.3	1480	297	86	290	70	170	240	22					
Dissolved Sulphate (SO4)	mg/L	483	200	10	230	107	68	84	230	200	100	180					
Mercury (Hg)	mg/L	0.021	0.005	0.00005	0.015	0.00121	0.00013	<0.0001	<0.0001	<0.00010	<0.0015	<0.0002					
Nitrate (N)	mg/L			0.05	1.44	0.56	0.43	<2.0	<0.10	<0.50	<0.50	1.00					
Nitrite (N)	mg/L			0.005	0.51	0.109	0.056	<0.20	0.031	<0.050	<0.050	0.223					
pH	units		7.2	7.6	8.2	7.9	7.9	7.8	8.0	8.0	8.1	8.2					
Phenols-4AAP	mg/L	8.63	1	0.0005	0.6	0.11	0.02	<0.20	<0.020	0.056	0.078	0.0016					
Total Ammonia-N	mg/L	2944	800	8	3540	899	187	935	112	638	826	61.8					
Total Arsenic (As)	mg/L	<0.11	<0.11	0.0005	0.16	0.029	0.008	0.02	<0.01	0.02	0.02	0.002					
Total Barium (Ba)	mg/L	0.966	0.966	0.01	0.71	0.16	0.08	0.21	0.12	0.09	0.06	0.042					
Total BOD	mg/L	27600	1750	1	1800	402	52	190	6	130	180	6					
Total Boron (B)	mg/L	7.13	50	0.67	560	107.5	19.3	97	34	61	75	8.1					
Total Cadmium (Cd)	mg/L	0.12	0.12	0.00005	0.005	0.0005	0.0001	<0.001	<0.001	<0.001	<0.001	<0.0001					
Total Calcium (Ca)	mg/L	3795	200	19	110	66	60	100	110	75	44	110					
Total Chemical Oxygen Demand (COD)	mg/L	50600	3500	20	4400	1106	273	930	130	650	750	57					
Total Chromium (Cr)	mg/L	0.92	0.5	0.0025	0.51	0.10	0.02	0.09	<0.05	0.06	0.06	0.005					
Total Copper (Cu)	mg/L	0.064	0.1	0.001	0.1	0.016	0.007	<0.02	<0.02	<0.02	<0.02	<0.002					
Total Dissolved Solids	mg/L		5200	334	20000	4485	1861	4540	1280	3230	3070	745					
Total Iron (Fe)	mg/L	1150	8	0.14	5	2	1	2.0	3.0	1.0	<1	1.4					
Total Kjeldahl Nitrogen (TKN)	mg/L	3450	960	11	3500	965	199	870	99	670	830	60					
Total Lead (Pb)	mg/L	1.38	1.38	0.00025	0.028	0.006	0.002	<0.005	<0.005	<0.005	<0.005	<0.0005					
Total Magnesium (Mg)	mg/L	1380	350	19	450	109	67	130	77	94	82	38					
Total Manganese (Mn)	mg/L	22.8	1	0.005	0.33	0.12	0.07	0.32	0.33	0.25	0.07	0.27					
Total Nickel (Ni)	mg/L	1.84	0.5	0.002	0.46	0.10	0.03	0.10	0.04	0.07	0.08	0.007					
Total Phosphorus	mg/L	18.61	3	0.12	7.8	2.0	0.8	2.80	0.31	1.70	1.7	0.2					
Total Potassium (K)	mg/L	2852	300	6.7	1100	218	63	220	80	140	150	20					
Total Sodium (Na)	mg/L	6578	500	19	6300	1254	306	1200	450	810	900	100					
Total Suspended Solids	mg/L		150	3	66	23	18	24	57	12	13	11					
Total Zinc (Zn)	mg/L	11.27	0.3	0.005	0.5	0.06	0.02	<0.1	<0.1	<0.1	<0.1	<0.01					
Un-ionized Ammonia	mg/L			0.09	220	35.42	4.56	7	3	20	43	1.3					
Ion Percentage	mg/L			0.96	29.99	14.23	9.74	25.6	15.9	16.8	26.7	8.0					

Notes: 1) Blank denotes parameter not analysed.
2) < denotes parameter concentration is below the laboratory method reporting limit (MRL).
3) µmho/cm denotes micro-ohms per centimetre.
NTU denotes nephelometric turbidity unit.
mg/L denotes milligrams per litre.
4) Maxxam denotes Maxxam Analytics Inc.
5) *Italics* denotes parameter concentration is presented as half the laboratory RDL for Ion Percentage calculation.
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Table A-1
Leachate - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	D&O Anticipated Raw Leachate Quality		Min	Max	Arithmetic Mean	Geomean	CFA-Comp	CFA-Comp	CFA-Comp	CFA-Comp	CFA-Comp	CFA-Comp	CFA-Comp	CFA-Comp	CFA-Comp	CFA-Comp
Date		Warwick Landfill Peak Value Including Recirculation	Warwick Landfill Anticipated Phase 1 Raw Leachate Design Quality					23-May-08	21-May-09	20-May-10	10-May-11	08-May-12	07-May-13	07-May-14	19-May-15	30-May-16	26-May-17
Laboratory								Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Alkalinity (Total as CaCO3)	mg/L		4500	1300	4520	3085	2932	4100	4520	2930	4330	4100	3400	3000	2300	2300	3400
Conductivity	umho/cm			3600	10800	7809	7451	10400	10800	8730	10800	10000	8900	7100	6400	6000	8000
Dissolved Chloride (Cl)	mg/L	8625	2500	250	1000	675	621	1000	980	850	960	1000	720	580	440	470	680
Dissolved Organic Carbon	mg/L	13312	1500	64	935	295	215	793	935	305	467	268	440	180	150	110	190
Dissolved Sulphate (SO4)	mg/L	483	200	53	410	189	166	292	*100*	410	190	260	150	120	130	280	53
Mercury (Hg)	mg/L	0.021	0.005	0.00005	0.0001	0.00006	0.00005	<0.0002	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.0001	<0.0001
Nitrate (N)	mg/L			0.05	6.7	1.28	0.66	<0.1	<1	<1	<1	<2.0	<1.0	<0.5	2.9	6.7	<1.0
Nitrite (N)	mg/L			0.005	1.73	0.289	0.115	<0.01	<0.1	<0.1	<0.1	<0.20	<0.10	<0.05	1.73	0.44	0.100
pH	units		7.2	7.6	7.9	7.7	7.7	7.70	7.60	7.80	7.71	7.83	7.62	7.77	7.87	7.59	7.7
Phenols-4AAP	mg/L	8.63	1	0.004	0.36	0.11	0.05	0.360	0.072	0.210	0.200	0.093	0.240	0.038	0.018	<0.020	<0.080
Total Ammonia-N	mg/L	2944	800	150	724	404	380	411	724	385	521	495	512	380	381	264	396
Total Arsenic (As)	mg/L	<0.11	<0.11	0.0025	0.018	0.009	0.008	0.014	0.014	0.017	0.011	0.010	0.012	0.008	0.008	<0.005	0.006
Total Barium (Ba)	mg/L	0.966	0.966	0.098	0.26	0.20	0.19	0.19	0.19	0.23	0.22	0.25	0.26	0.24	0.19	0.17	0.20
Total BOD	mg/L	27600	1750	28	1700	329	129	1200	1700	330	480	120	600	130	63	35	76
Total Boron (B)	mg/L	7.13	50	3	15	7.8	7.1	6.4	7.7	6.6	8.2	15.0	14.0	6.9	5.5	6.2	7.9
Total Cadmium (Cd)	mg/L	0.12	0.12	0.00005	0.0018	0.00043	0.00025	0.0018	0.0014	0.0004	<0.0005	<0.001	0.0003	0.0001	<0.0005	<0.0005	<0.0001
Total Calcium (Ca)	mg/L	3795	200	110	380	207	191	380	370	360	230	200	220	190	140	160	110
Total Chemical Oxygen Demand (COD)	mg/L	50600	3500	180	2500	925	671	2400	2500	1100	1600	910	1700	570	460	340	550
Total Chromium (Cr)	mg/L	0.92	0.5	0.013	0.21	0.06	0.04	0.070	0.100	0.059	0.070	0.050	0.057	0.032	0.040	<0.03	0.039
Total Copper (Cu)	mg/L	0.064	0.1	0.003	0.08	0.014	0.009	0.080	0.025	0.033	0.010	<0.02	0.008	<0.01	<0.01	<0.01	0.003
Total Dissolved Solids	mg/L		5200	1450	6930	3864	3469	6670	6930	5540	6420	4630	4140	3120	2590	2690	3280
Total Iron (Fe)	mg/L	1150	8	2.4	33	12	8	27.0	26.0	33.0	17.0	8.0	19.0	7.4	3.2	3.5	2.4
Total Kjeldahl Nitrogen (TKN)	mg/L	3450	960	140	810	426	394	530	810	400	550	490	580	410	410	250	460
Total Lead (Pb)	mg/L	1.38	1.38	0.001	0.02	0.006	0.004	0.0180	0.0083	0.0200	0.0050	0.0050	0.0060	0.0025	0.0040	<0.003	0.001
Total Magnesium (Mg)	mg/L	1380	350	95	400	224	204	310	350	340	320	400	240	200	150	170	180
Total Manganese (Mn)	mg/L	22.8	1	0.2	3.3	0.93	0.62	3.30	2.50	2.30	1.10	0.74	0.74	0.35	0.32	0.31	0.20
Total Nickel (Ni)	mg/L	1.84	0.5	0.029	0.25	0.13	0.11	0.240	0.210	0.180	0.220	0.250	0.120	0.110	0.087	0.064	0.110
Total Phosphorus	mg/L	18.61	3	0.5	5.2	1.6	1.4	1.0	5.2	2.5	2.3	1.5	2.2	1.2	1.5	<1.5	1.20
Total Potassium (K)	mg/L	2852	300	68	390	222	198	320	340	250	350	390	260	220	180	150	210
Total Sodium (Na)	mg/L	6578	500	270	1400	709	639	960	1000	830	1100	1400	740	700	490	460	660
Total Suspended Solids	mg/L		150	8	830	104	46	86	78	830	21	8	18	86	46	26	17
Total Zinc (Zn)	mg/L	11.27	0.3	0.02	17	1.4	0.1	17.00	2.40	0.37	0.88	0.20	0.27	0.07	0.10	0.07	0.03
Un-ionized Ammonia	mg/L			0.55	8.9	4.08	3.13	5.5	5.4	6.1	2.9	6.1	6.0	8.9	7.6	1.9	2.20
Ion Percentage	mg/L			1.4	24.57	8.63	6.67	2.9	1.4	5.2	3.1	6.6	5.7	3.9	7.0	10.0	15.9

Notes: 1) Blank denotes parameter not analysed.
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Table A-1
Leachate - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	D&O Anticipated Raw Leachate Quality		Min	Max	Arithmetic Mean	Geomean	CFA-Comp	CFA-Comp	CFA-Comp	CFA-Comp	CFA-Comp					
Date		Warwick Landfill Peak Value Including Recirculation	Warwick Landfill Anticipated Phase 1 Raw Leachate Design Quality					11-May-18	16-May-19	12-May-20	18-May-21	06-May-22					
Laboratory								Maxxam	Maxxam	Bureau Veritas	Bureau Veritas	Bureau Veritas					
Alkalinity (Total as CaCO3)	mg/L		4500	1300	4520	3085	2932	2800	1300	3200	2900	1700					
Conductivity	umho/cm			3600	10800	7809	7451	6800	3600	9100	6300	4200					
Dissolved Chloride (Cl)	mg/L	8625	2500	250	1000	675	621	450	250	850	590	300					
Dissolved Organic Carbon	mg/L	13312	1500	64	935	295	215	140	64	200	110	70					
Dissolved Sulphate (SO4)	mg/L	483	200	53	410	189	166	230	220	93	190	110					
Mercury (Hg)	mg/L	0.021	0.005	0.00005	0.0001	0.00006	0.00005	<0.0001	<0.0001	<0.00010	<0.00010	<0.0002					
Nitrate (N)	mg/L			0.05	6.7	1.28	0.66	<1.0	1.55	2.54	0.13	1.12					
Nitrite (N)	mg/L			0.005	1.73	0.289	0.115	0.240	0.163	0.422	0.095	0.821					
pH	units		7.2	7.6	7.9	7.7	7.7	7.6	7.7	7.8	7.6	7.8					
Phenols-4AAP	mg/L	8.63	1	0.004	0.36	0.11	0.05	<0.080	<0.0080	<0.040	<0.020	0.042					
Total Ammonia-N	mg/L	2944	800	150	724	404	380	412	150	495	302	233					
Total Arsenic (As)	mg/L	<0.11	<0.11	0.0025	0.018	0.009	0.008	<0.005	0.003	<0.01	0.018	0.005					
Total Barium (Ba)	mg/L	0.966	0.966	0.098	0.26	0.20	0.19	0.17	0.10	0.22	0.22	0.11					
Total BOD	mg/L	27600	1750	28	1700	329	129	38	38	62	38	28					
Total Boron (B)	mg/L	7.13	50	3	15	7.8	7.1	5.0	3.0	12	8.6	3.4					
Total Cadmium (Cd)	mg/L	0.12	0.12	0.00005	0.0018	0.00043	0.00025	<0.0005	<0.0001	<0.001	<0.0005	<0.0001					
Total Calcium (Ca)	mg/L	3795	200	110	380	207	191	140	140	150	180	130					
Total Chemical Oxygen Demand (COD)	mg/L	50600	3500	180	2500	925	671	430	180	610	330	200					
Total Chromium (Cr)	mg/L	0.92	0.5	0.013	0.21	0.06	0.04	0.030	0.013	0.21	0.05	0.019					
Total Copper (Cu)	mg/L	0.064	0.1	0.003	0.08	0.014	0.009	<0.01	0.004	<0.02	0.01	0.003					
Total Dissolved Solids	mg/L		5200	1450	6930	3864	3469	2530	1630	3940	2400	1450					
Total Iron (Fe)	mg/L	1150	8	2.4	33	12	8	2.5	2.5	8.0	11	3.4					
Total Kjeldahl Nitrogen (TKN)	mg/L	3450	960	140	810	426	394	350	140	470	300	240					
Total Lead (Pb)	mg/L	1.38	1.38	0.001	0.02	0.006	0.004	<0.003	0.001	0.009	0.005	0.0013					
Total Magnesium (Mg)	mg/L	1380	350	95	400	224	204	120	110	200	170	95					
Total Manganese (Mn)	mg/L	22.8	1	0.2	3.3	0.93	0.62	0.63	0.30	0.42	0.46	0.26					
Total Nickel (Ni)	mg/L	1.84	0.5	0.029	0.25	0.13	0.11	0.078	0.029	0.16	0.089	0.03					
Total Phosphorus	mg/L	18.61	3	0.5	5.2	1.6	1.4	0.87	0.50	1.80	1.2	0.63					
Total Potassium (K)	mg/L	2852	300	68	390	222	198	140	75	220	150	68					
Total Sodium (Na)	mg/L	6578	500	270	1400	709	639	400	270	820	540	270					
Total Suspended Solids	mg/L		150	8	830	104	46	20	23	77	180	46					
Total Zinc (Zn)	mg/L	11.27	0.3	0.02	17	1.4	0.1	<0.05	0.02	<0.1	<0.05	0.03					
Un-ionized Ammonia	mg/L			0.55	8.9	4.08	3.13	1.30	0.55	4	1.9	0.9					
Ion Percentage	mg/L			1.4	24.57	8.63	6.67	24.6	4.6	8.5	14.4	15.6					

Notes: 1) Blank denotes parameter not analysed.
2) < denotes parameter concentration is below the laboratory method reporting limit (MRL).
3) µmho/cm denotes micro-ohms per centimetre.
NTU denotes nephelometric turbidity unit.
mg/L denotes milligrams per litre.
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Table A-1
Leachate - General Analytical Results - Compliance Monitoring
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Parameter	Units	D&O Anticipated Raw Leachate Quality		Min	Max	Arithmetic Mean	Geomean	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank
Date		Warwick Landfill Peak Value Including Recirculation	Warwick Landfill Anticipated Phase 1 Raw Leachate Design Quality					02-Mar-10	31-May-10	21-Sep-10	19-Nov-10	28-Feb-11	10-May-11	10-Aug-11	09-Nov-11	01-Mar-12	15-May-12
Laboratory								Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Alkalinity (Total as $CaCO_3$)	mg/L		4500	1820	10000	7158	5907		1820		3090		5460		3360		5500
Conductivity	umho/cm			2000	26000	16750	13287		4390		7220		13000		8020		15000
Dissolved Chloride (Cl)	mg/L	8625	2500	330	3400	1906	1539		330		510		1300		750		1800
Dissolved Organic Carbon	mg/L	13312	1500	170	4500	775	929	308	958	547	2430	3110	3020	1250	762	634	468
Dissolved Sulphate (SO_4)	mg/L	483	200	10	220	48	24		<20		<50		*25*		*10*		<20
Mercury (Hg)	mg/L	0.021	0.005	0.00005	0.0015	0.00023	0.00009		<0.0001		<0.0001		<0.0001		<0.0001		<0.00010
Nitrate (N)	mg/L			0.05	2.5	0.98	0.57		<0.1		<0.1		<1		<1		<1.0
Nitrite (N)	mg/L			0.02	0.25	0.112	0.077		0.03		0.02		<0.1		<0.1		<0.10
pH	units		7.2	7.0	8.1	7.8	7.7	7.00	7.50	7.30	7.37	7.60	7.44	7.38	7.34	7.53	7.74
Phenols-4AAP	mg/L	8.63	1	0.076	3.9	0.38	0.51		0.80		1.00		3.90		1.31		0.55
Total Ammonia-N	mg/L	2944	800	57	2000	1077	728		57		128		489		368		663
Total Arsenic (As)	mg/L	<0.11	<0.11	0.006	0.54	0.140	0.060		0.006		0.012		0.032		0.022		0.044
Total Barium (Ba)	mg/L	0.966	0.966	0.21	0.75	0.34	0.34		0.25		0.60		0.51		0.25		0.27
Total BOD	mg/L	27600	1750	46	8200	484	790	370	920	650	3800	1600	3800	2400	1100	460	350
Total Boron (B)	mg/L	7.13	50	1.3	28	14.3	8.5		1.3		1.3		4.8		3.3		7.7
Total Cadmium (Cd)	mg/L	0.12	0.12	0.0001	0.0025	0.00040	0.00038		0.0001		0.0002		0.0005		0.0002		0.0008
Total Calcium (Ca)	mg/L	3795	200	79	1400	136	243		530		1000		1000		460		180
Total Chemical Oxygen Demand (COD)	mg/L	50600	3500	250	14000	2188	3162		2600		14000		12000		2400		1900
Total Chromium (Cr)	mg/L	0.92	0.5	0.036	0.76	0.39	0.24		0.048		0.036		0.190		0.100		0.14
Total Copper (Cu)	mg/L	0.064	0.1	0.005	0.35	0.073	0.023		0.005		0.008		<0.01		0.010		0.020
Total Dissolved Solids	mg/L		5200	2720	13600	7093	7077		2720		4010		7410		4540		7170
Total Iron (Fe)	mg/L	1150	8	1.6	120	4	6		9.5		12.0		5.7		4.2		2.8
Total Kjeldahl Nitrogen (TKN)	mg/L	3450	960	26	2700	1318	779	26	66	70	140	400	580	330	330	520	700
Total Lead (Pb)	mg/L	1.38	1.38	0.0013	0.011	0.006	0.003		0.0013		0.0020		<0.003		0.0022		0.0030
Total Magnesium (Mg)	mg/L	1380	350	130	530	224	278		200		250		460		230		490
Total Manganese (Mn)	mg/L	22.8	1	0.1	14	0.46	0.79		3.3		8.1		4.8		1.5		0.19
Total Nickel (Ni)	mg/L	1.84	0.5	0.029	0.79	0.30	0.26		0.029		0.074		0.190		0.110		0.28
Total Phosphorus	mg/L	18.61	3	0.13	23	7.0	5.2	0.79	2.70	1.10	7.00	6.00	5.50	2.50	2.40	4.60	4.0
Total Potassium (K)	mg/L	2852	300	81	900	547	481		81		150		500		270		590
Total Sodium (Na)	mg/L	6578	500	270	2700	1667	1385		270		410		1200		670		1600
Total Suspended Solids	mg/L		150	13	420	85	73		56		76		67		39		56
Total Zinc (Zn)	mg/L	11.27	0.3	0.1	3.6	0.3	0.3		0.14		0.16		0.24		0.15		0.36
Un-ionized Ammonia	mg/L			0.07	63	24.46	9.10		0.07		0.17		5.80		1.50		6.7
Ion Percentage	mg/L			1.78	31.06	20.00	11.34		19.0		17.8		10.1		1.8		1.9

Notes: 1) Blank denotes parameter not analysed.
2) < denotes parameter concentration is below the laboratory method reporting limit (MRL).
3) µmho/cm denotes micro-ohms per centimetre.
NTU denotes nephelometric turbidity unit.
mg/L denotes milligrams per litre.
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Leachate - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	D&O Anticipated Raw Leachate Quality		Min	Max	Arithmetic Mean	Geomean	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank
Date		Warwick Landfill Peak Value Including Recirculation	Warwick Landfill Anticipated Phase 1 Raw Leachate Design Quality					01-Aug-12	05-Nov-12	22-Feb-13	13-May-13	21-Aug-13	13-Nov-13	11-Mar-14	05-May-14	28-Jul-14	19-Nov-14
Laboratory								Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Alkalinity (Total as $CaCO_3$)	mg/L		4500	1820	10000	7158	5907		6500		6500		6500		4900		5300
Conductivity	umho/cm			2000	26000	16750	13287		2000		15000		18000		13000		16000
Dissolved Chloride (Cl)	mg/L	8625	2500	330	3400	1906	1539		1600		1900		2400		1300		1900
Dissolved Organic Carbon	mg/L	13312	1500	170	4500	775	929	234	1070	460	450	550	530	2200	3000	3700	1900
Dissolved Sulphate (SO_4)	mg/L	483	200	10	220	48	24		88		*10*		*10*		*25*		*20*
Mercury (Hg)	mg/L	0.021	0.005	0.00005	0.0015	0.00023	0.00009		<0.00010		<0.00010		<0.00010		<0.00010		<0.00010
Nitrate (N)	mg/L			0.05	2.5	0.98	0.57		<2.0		<1.0		<1.0		<2.0		<1.0
Nitrite (N)	mg/L			0.02	0.25	0.112	0.077		<0.20		<0.10		<0.10		<0.20		0.13
pH	units		7.2	7.0	8.1	7.8	7.7	7.45	7.67	7.50	7.80	7.76	7.94	7.28	7.70	7.53	7.70
Phenols-4AAP	mg/L	8.63	1	0.076	3.9	0.38	0.51		0.81		0.13		0.19		1.00		1.10
Total Ammonia-N	mg/L	2944	800	57	2000	1077	728		715		859		924		676		772
Total Arsenic (As)	mg/L	<0.11	<0.11	0.006	0.54	0.140	0.060		0.040		0.040		0.046		0.050		0.05
Total Barium (Ba)	mg/L	0.966	0.966	0.21	0.75	0.34	0.34		0.37		0.22		0.31		0.75		0.28
Total BOD	mg/L	27600	1750	46	8200	484	790	460	1600	480	240	200	120	5200	5500	7500	3300
Total Boron (B)	mg/L	7.13	50	1.3	28	14.3	8.5		6.5		6.5		8.3		9.7		9.6
Total Cadmium (Cd)	mg/L	0.12	0.12	0.0001	0.0025	0.00040	0.00038		0.0002		<0.001		<0.0005		*<0.001*		*<0.001*
Total Calcium (Ca)	mg/L	3795	200	79	1400	136	243		300		110		79		1400		480
Total Chemical Oxygen Demand (COD)	mg/L	50600	3500	250	14000	2188	3162		4900		1600		1800		12000		5800
Total Chromium (Cr)	mg/L	0.92	0.5	0.036	0.76	0.39	0.24		0.18		0.15		0.20		0.45		0.29
Total Copper (Cu)	mg/L	0.064	0.1	0.005	0.35	0.073	0.023		0.013		<0.02		<0.01		0.030		*<0.02*
Total Dissolved Solids	mg/L		5200	2720	13600	7093	7077		7860		7280		8460		8430		8620
Total Iron (Fe)	mg/L	1150	8	1.6	120	4	6		5.2		2.2		2.0		120.0		14
Total Kjeldahl Nitrogen (TKN)	mg/L	3450	960	26	2700	1318	779	300	760	730	910	1000	1100	660	770	1000	1000
Total Lead (Pb)	mg/L	1.38	1.38	0.0013	0.011	0.006	0.003		0.0023		<0.005		<0.003		0.0090		*<0.005*
Total Magnesium (Mg)	mg/L	1380	350	130	530	224	278		420		390		370		530		250
Total Manganese (Mn)	mg/L	22.8	1	0.1	14	0.46	0.79		0.71		0.10		0.10		14.00		3.4
Total Nickel (Ni)	mg/L	1.84	0.5	0.029	0.79	0.30	0.26		0.33		0.32		0.34		0.79		0.34
Total Phosphorus	mg/L	18.61	3	0.13	23	7.0	5.2	1.8	5.2	3.3	3.3	5.7	4.8	10.0	23.0	9.5	7.6
Total Potassium (K)	mg/L	2852	300	81	900	547	481		520		620		670		760		590
Total Sodium (Na)	mg/L	6578	500	270	2700	1667	1385		1700		1600		1800		2000		1600
Total Suspended Solids	mg/L		150	13	420	85	73		27		22		13		360		190
Total Zinc (Zn)	mg/L	11.27	0.3	0.1	3.6	0.3	0.3		0.20		0.20		0.15		3.60		0.60
Un-ionized Ammonia	mg/L			0.07	63	24.46	9.10		5.1		6.6		25.0		19.0		9.5
Ion Percentage	mg/L			1.78	31.06	20.00	11.34		5.1		12.5		14.1		31.1		3.7

Notes: 1) Blank denotes parameter not analysed.
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mg/L denotes milligrams per litre.
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Twin Creeks Environmental Centre

Parameter	Units	D&O Anticipated Raw Leachate Quality		Min	Max	Arithmetic Mean	Geomean	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank
Date		Warwick Landfill Peak Value Including Recirculation	Warwick Landfill Anticipated Phase 1 Raw Leachate Design Quality					05-Mar-15	27-May-15	30-Jul-15	18-Nov-15	15-Mar-16	30-May-16	25-Jul-16	03-Nov-16	27-Mar-17	30-May-17
Laboratory								Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Alkalinity (Total as $CaCO_3$)	mg/L		4500	1820	10000	7158	5907		7700		7000		8100		6100		8200
Conductivity	umho/cm			2000	26000	16750	13287		20000		19000		18000		14000		20000
Dissolved Chloride (Cl)	mg/L	8625	2500	330	3400	1906	1539		2300		2200		1900		1400		2300
Dissolved Organic Carbon	mg/L	13312	1500	170	4500	775	929	1800	4500	4400	1000	2000	2000	830	1000	480	710
Dissolved Sulphate (SO_4)	mg/L	483	200	10	220	48	24		*50*		*50*		*10*		*25*		50
Mercury (Hg)	mg/L	0.021	0.005	0.00005	0.0015	0.00023	0.00009		<0.0020		*<0.00010*		<0.0002		<0.0002		<0.0002
Nitrate (N)	mg/L			0.05	2.5	0.98	0.57		<5.0		<5.0		<2.0		*<1.0*		<5.0
Nitrite (N)	mg/L			0.02	0.25	0.112	0.077		<0.50		<0.50		<0.20		<0.10		<0.50
pH	units		7.2	7.0	8.1	7.8	7.7	7.41	7.87	7.61	7.42	7.73	7.71	7.60	7.80	7.74	8.03
Phenols-4AAP	mg/L	8.63	1	0.076	3.9	0.38	0.51		2.40		1.50		1.92		0.660		0.233
Total Ammonia-N	mg/L	2944	800	57	2000	1077	728		1130		1130		939		821		1150
Total Arsenic (As)	mg/L	<0.11	<0.11	0.006	0.54	0.140	0.060		0.05		0.06		0.05		0.048		0.080
Total Barium (Ba)	mg/L	0.966	0.966	0.21	0.75	0.34	0.34		0.37		0.31		0.33		0.27		0.44
Total BOD	mg/L	27600	1750	46	8200	484	790	3700	7600	8200	6300	3600	3900	960	1600	440	350
Total Boron (B)	mg/L	7.13	50	1.3	28	14.3	8.5		11.0		11.0		10.0		6.7		11.0
Total Cadmium (Cd)	mg/L	0.12	0.12	0.0001	0.0025	0.00040	0.00038		<0.001		<0.0005		<0.001		<0.005		<0.001
Total Calcium (Ca)	mg/L	3795	200	79	1400	136	243		960		800		480		270		110
Total Chemical Oxygen Demand (COD)	mg/L	50600	3500	250	14000	2188	3162		14000		9400		7000		3400		2500
Total Chromium (Cr)	mg/L	0.92	0.5	0.036	0.76	0.39	0.24		0.37		0.35		0.28		0.19		0.33
Total Copper (Cu)	mg/L	0.064	0.1	0.005	0.35	0.073	0.023		0.12		<0.02		0.05		0.04		0.35
Total Dissolved Solids	mg/L		5200	2720	13600	7093	7077		13600		12000		10700		7030		8580
Total Iron (Fe)	mg/L	1150	8	1.6	120	4	6		25		28		12		7.1		4.0
Total Kjeldahl Nitrogen (TKN)	mg/L	3450	960	26	2700	1318	779	920	1200	1400	1200	840	1000	1000	1200	1000	1200
Total Lead (Pb)	mg/L	1.38	1.38	0.0013	0.011	0.006	0.003		0.006		<0.003		<0.005		<0.003		0.009
Total Magnesium (Mg)	mg/L	1380	350	130	530	224	278		380		380		380		300		340
Total Manganese (Mn)	mg/L	22.8	1	0.1	14	0.46	0.79		7.8		5.6		3.0		1.10		0.18
Total Nickel (Ni)	mg/L	1.84	0.5	0.029	0.79	0.30	0.26		0.45		0.45		0.38		0.27		0.39
Total Phosphorus	mg/L	18.61	3	0.13	23	7.0	5.2	7.5	10.0	11.0	7.4	5.0	5.8	6.5	4.0	5.9	8.1
Total Potassium (K)	mg/L	2852	300	81	900	547	481		680		700		630		460		630
Total Sodium (Na)	mg/L	6578	500	270	2700	1667	1385		1900		1800		1800		1300		2000
Total Suspended Solids	mg/L		150	13	420	85	73		110		420		240		56		70
Total Zinc (Zn)	mg/L	11.27	0.3	0.1	3.6	0.3	0.3		0.80		0.41		0.30		0.21		0.40
Un-ionized Ammonia	mg/L			0.07	63	24.46	9.10		26.0		13.0		10.0		11.0		21.0
Ion Percentage	mg/L			1.78	31.06	20.00	11.34		2.8		2.3		10.0		12.9		18.3

Notes: 1) Blank denotes parameter not analysed.
2) < denotes parameter concentration is below the laboratory method reporting limit (MRL).
3) µmho/cm denotes micro-ohms per centimetre.
NTU denotes nephelometric turbidity unit.
mg/L denotes milligrams per litre.
4) Maxxam denotes Maxxam Analytics Inc.
5) *Italics* denotes parameter concentration is presented as half the laboratory RDL for Ion Percentage calculation.
6) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table A-1
Leachate - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	D&O Anticipated Raw Leachate Quality		Min	Max	Arithmetic Mean	Geomean	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank
Date		Warwick Landfill Peak Value Including Recirculation	Warwick Landfill Anticipated Phase 1 Raw Leachate Design Quality					10-Aug-17	20-Oct-17	22-Mar-18	28-May-18	17-Aug-18	08-Nov-18	08-Jan-19	11-Apr-19	23-Jul-19	07-Nov-19
Laboratory								Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Bureau Veritas	Bureau Veritas
Alkalinity (Total as $CaCO_3$)	mg/L		4500	1820	10000	7158	5907		5100		7900		6200		9900		3900
Conductivity	umho/cm			2000	26000	16750	13287		12000		19000		14000		21000		10000
Dissolved Chloride (Cl)	mg/L	8625	2500	330	3400	1906	1539		1400		2600		1500		2600		1200
Dissolved Organic Carbon	mg/L	13312	1500	170	4500	775	929	880	530	290	820	1000	650	670	890	1000	550
Dissolved Sulphate (SO_4)	mg/L	483	200	10	220	48	24		38		<20		60		72		220
Mercury (Hg)	mg/L	0.021	0.005	0.00005	0.0015	0.00023	0.00009		<0.0002		<0.0004		<0.0002		<0.0002		<0.0002
Nitrate (N)	mg/L			0.05	2.5	0.98	0.57		<0.10		<2.0		<1.0		<5.0		0.061
Nitrite (N)	mg/L			0.02	0.25	0.112	0.077		0.039		<0.20		<0.10		<0.50		<0.10
pH	units		7.2	7.0	8.1	7.8	7.7	7.78	7.84	7.92	7.81	8.04	7.94	7.88	7.86	7.99	7.47
Phenols-4AAP	mg/L	8.63	1	0.076	3.9	0.38	0.51		0.790		0.110		0.430		0.240		0.077
Total Ammonia-N	mg/L	2944	800	57	2000	1077	728		700		1300		970		1200		620
Total Arsenic (As)	mg/L	<0.11	<0.11	0.006	0.54	0.140	0.060		0.540		0.100		0.062		0.11		0.07
Total Barium (Ba)	mg/L	0.966	0.966	0.21	0.75	0.34	0.34		0.29		0.46		0.23		0.32		0.28
Total BOD	mg/L	27600	1750	46	8200	484	790	410	540	170	240	610	620	220	330	210	520
Total Boron (B)	mg/L	7.13	50	1.3	28	14.3	8.5		14.0		18.0		14.0		12.0		6.8
Total Cadmium (Cd)	mg/L	0.12	0.12	0.0001	0.0025	0.00040	0.00038		<0.0005		<0.001		<0.0005		<0.0005		<0.001
Total Calcium (Ca)	mg/L	3795	200	79	1400	136	243		140		96		96		91		280
Total Chemical Oxygen Demand (COD)	mg/L	50600	3500	250	14000	2188	3162		1700		2300		1900		2800		1200
Total Chromium (Cr)	mg/L	0.92	0.5	0.036	0.76	0.39	0.24		0.20		0.45		0.24		0.45		0.26
Total Copper (Cu)	mg/L	0.064	0.1	0.005	0.35	0.073	0.023		0.06		0.05		0.08		0.12		0.07
Total Dissolved Solids	mg/L		5200	2720	13600	7093	7077		5330		6850		6300		8410		5010
Total Iron (Fe)	mg/L	1150	8	1.6	120	4	6		5.6		4.0		3.0		4.2		5.0
Total Kjeldahl Nitrogen (TKN)	mg/L	3450	960	26	2700	1318	779	1400	630	970	1300	1400	980	1300	1400	1800	600
Total Lead (Pb)	mg/L	1.38	1.38	0.0013	0.011	0.006	0.003		0.003		<0.005		0.007		0.007		0.006
Total Magnesium (Mg)	mg/L	1380	350	130	530	224	278		180		290		200		230		140
Total Manganese (Mn)	mg/L	22.8	1	0.1	14	0.46	0.79		0.26		0.18		0.24		0.22		1.70
Total Nickel (Ni)	mg/L	1.84	0.5	0.029	0.79	0.30	0.26		0.19		0.37		0.23		0.31		0.23
Total Phosphorus	mg/L	18.61	3	0.13	23	7.0	5.2	10.0	4.7	5.1	8.4	7.2	3.7	0.1	8.9	11.0	4.0
Total Potassium (K)	mg/L	2852	300	81	900	547	481		340		680		460		670		380
Total Sodium (Na)	mg/L	6578	500	270	2700	1667	1385		1100		2200		1400		2000		1100
Total Suspended Solids	mg/L		150	13	420	85	73		83		100		47		120		70
Total Zinc (Zn)	mg/L	11.27	0.3	0.1	3.6	0.3	0.3		0.13		0.20		0.55		0.31		0.30
Un-ionized Ammonia	mg/L			0.07	63	24.46	9.10		7.7		28.0		19.0		24.0		4.2
Ion Percentage	mg/L			1.78	31.06	20.00	11.34		21.9		17.3		20.5		29.4		9.8

Notes: 1) Blank denotes parameter not analysed.
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Leachate - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	D&O Anticipated Raw Leachate Quality		Min	Max	Arithmetic Mean	Geomean	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank
Date		Warwick Landfill Peak Value Including Recirculation	Warwick Landfill Anticipated Phase 1 Raw Leachate Design Quality					22-Jan-20	12-May-20	11-Aug-20	11-Nov-20	12-Jan-21	19-May-21	11-Aug-21	04-Nov-21	19-Jan-22	24-May-22
Laboratory								Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas
Alkalinity (Total as $CaCO_3$)	mg/L		4500	1820	10000	7158	5907		9300		4600		10000		6400		9000
Conductivity	umho/cm			2000	26000	16750	13287		26000		12000		21000		13000		19000
Dissolved Chloride (Cl)	mg/L	8625	2500	330	3400	1906	1539		3400		1300		2200		970		2000
Dissolved Organic Carbon	mg/L	13312	1500	170	4500	775	929	1200	1500	1500	540	750	800	850	760	580	760
Dissolved Sulphate (SO_4)	mg/L	483	200	10	220	48	24		*25*		*10*		*10*		*25*		*25*
Mercury (Hg)	mg/L	0.021	0.005	0.00005	0.0015	0.00023	0.00009		<0.0002		<0.0002		<0.003		<0.0002		<0.0002
Nitrate (N)	mg/L			0.05	2.5	0.98	0.57		<1.0		<1.0		<1.0		<0.50		<1.0
Nitrite (N)	mg/L			0.02	0.25	0.112	0.077		0.12		<0.10		<0.10		<0.050		0.11
pH	units		7.2	7.0	8.1	7.8	7.7	7.60	7.90	7.98	8.07	7.5	7.8	7.84	7.70	7.63	7.86
Phenols-4AAP	mg/L	8.63	1	0.076	3.9	0.38	0.51		1.000		0.11		0.26		0.87		0.08
Total Ammonia-N	mg/L	2944	800	57	2000	1077	728		2000		830		1800		705		666
Total Arsenic (As)	mg/L	<0.11	<0.11	0.006	0.54	0.140	0.060		0.16		0.08		0.12		0.077		0.14
Total Barium (Ba)	mg/L	0.966	0.966	0.21	0.75	0.34	0.34		0.41		0.21		0.38		0.36		0.42
Total BOD	mg/L	27600	1750	46	8200	484	790	1500	1200	1300	230	510	410	240	790	170	170
Total Boron (B)	mg/L	7.13	50	1.3	28	14.3	8.5		18.0		7.8		24		8.2		28
Total Cadmium (Cd)	mg/L	0.12	0.12	0.0001	0.0025	0.00040	0.00038		<0.001		<0.001		<0.0005		<0.0005		<0.001
Total Calcium (Ca)	mg/L	3795	200	79	1400	136	243		150		85		89		210		82
Total Chemical Oxygen Demand (COD)	mg/L	50600	3500	250	14000	2188	3162		4600		1400		2600		2300		250
Total Chromium (Cr)	mg/L	0.92	0.5	0.036	0.76	0.39	0.24		0.76		0.36		0.53		0.22		0.46
Total Copper (Cu)	mg/L	0.064	0.1	0.005	0.35	0.073	0.023		0.08		<0.02		<0.01		0.01		<0.02
Total Dissolved Solids	mg/L		5200	2720	13600	7093	7077		11700		4910		8280		6500		7710
Total Iron (Fe)	mg/L	1150	8	1.6	120	4	6		4.0		2		3.2		1.6		2
Total Kjeldahl Nitrogen (TKN)	mg/L	3450	960	26	2700	1318	779	1000	2700	2700	940	1400	1500	1700	930	1400	2000
Total Lead (Pb)	mg/L	1.38	1.38	0.0013	0.011	0.006	0.003		0.011		<0.005		0.005		0.004		0.005
Total Magnesium (Mg)	mg/L	1380	350	130	530	224	278		280		130		280		210		250
Total Manganese (Mn)	mg/L	22.8	1	0.1	14	0.46	0.79		0.55		0.22		0.17		0.48		0.16
Total Nickel (Ni)	mg/L	1.84	0.5	0.029	0.79	0.30	0.26		0.46		0.21		0.35		0.2		0.3
Total Phosphorus	mg/L	18.61	3	0.13	23	7.0	5.2	7.0	12.0	9.5	5.1	6.8	9.5	10	4.6	6.4	9.7
Total Potassium (K)	mg/L	2852	300	81	900	547	481		900		390		660		400		600
Total Sodium (Na)	mg/L	6578	500	270	2700	1667	1385		2700		1200		2000		1100		1800
Total Suspended Solids	mg/L		150	13	420	85	73		270		29		45		44		37
Total Zinc (Zn)	mg/L	11.27	0.3	0.1	3.6	0.3	0.3		0.20		0.1		0.23		0.34		0.20
Un-ionized Ammonia	mg/L			0.07	63	24.46	9.10		63.0		40		32		5.6		31
Ion Percentage	mg/L			1.78	31.06	20.00	11.34		18.0		18.0		25.9		20.7		26.1

Notes: 1) Blank denotes parameter not analysed.
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mg/L denotes milligrams per litre.
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Leachate - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	D&O Anticipated Raw Leachate Quality		Min	Max	Arithmetic Mean	Geomean	Equalization Tank	Equalization Tank								
Date		Warwick Landfill Peak Value Including Recirculation	Warwick Landfill Anticipated Phase 1 Raw Leachate Design Quality					25-Jul-22	07-Nov-22								
Laboratory								Bureau Veritas	Bureau Veritas								
Alkalinity (Total as $CaCO_3$)	mg/L		4500	1820	10000	7158	5907		5400								
Conductivity	umho/cm			2000	26000	16750	13287		14000								
Dissolved Chloride (Cl)	mg/L	8625	2500	330	3400	1906	1539		1400								
Dissolved Organic Carbon	mg/L	13312	1500	170	4500	775	929	170	730								
Dissolved Sulphate (SO_4)	mg/L	483	200	10	220	48	24		25								
Mercury (Hg)	mg/L	0.021	0.005	0.00005	0.0015	0.00023	0.00009		<0.0002								
Nitrate (N)	mg/L			0.05	2.5	0.98	0.57		<5.0								
Nitrite (N)	mg/L			0.02	0.25	0.112	0.077		<0.50								
pH	units		7.2	7.0	8.1	7.8	7.7	7.70	7.71								
Phenols-4AAP	mg/L	8.63	1	0.076	3.9	0.38	0.51		0.34								
Total Ammonia-N	mg/L	2944	800	57	2000	1077	728		983								
Total Arsenic (As)	mg/L	<0.11	<0.11	0.006	0.54	0.140	0.060		0.14								
Total Barium (Ba)	mg/L	0.966	0.966	0.21	0.75	0.34	0.34		0.27								
Total BOD	mg/L	27600	1750	46	8200	484	790	46	400								
Total Boron (B)	mg/L	7.13	50	1.3	28	14.3	8.5		9.9								
Total Cadmium (Cd)	mg/L	0.12	0.12	0.0001	0.0025	0.00040	0.00038		<0.001								
Total Calcium (Ca)	mg/L	3795	200	79	1400	136	243		200								
Total Chemical Oxygen Demand (COD)	mg/L	50600	3500	250	14000	2188	3162		2700								
Total Chromium (Cr)	mg/L	0.92	0.5	0.036	0.76	0.39	0.24		0.39								
Total Copper (Cu)	mg/L	0.064	0.1	0.005	0.35	0.073	0.023		0.03								
Total Dissolved Solids	mg/L		5200	2720	13600	7093	7077		5530								
Total Iron (Fe)	mg/L	1150	8	1.6	120	4	6		10								
Total Kjeldahl Nitrogen (TKN)	mg/L	3450	960	26	2700	1318	779	460	910								
Total Lead (Pb)	mg/L	1.38	1.38	0.0013	0.011	0.006	0.003		0.007								
Total Magnesium (Mg)	mg/L	1380	350	130	530	224	278		160								
Total Manganese (Mn)	mg/L	22.8	1	0.1	14	0.46	0.79		1.2								
Total Nickel (Ni)	mg/L	1.84	0.5	0.029	0.79	0.30	0.26		0.29								
Total Phosphorus	mg/L	18.61	3	0.13	23	7.0	5.2	2.1	7.5								
Total Potassium (K)	mg/L	2852	300	81	900	547	481		450								
Total Sodium (Na)	mg/L	6578	500	270	2700	1667	1385		1400								
Total Suspended Solids	mg/L		150	13	420	85	73		110								
Total Zinc (Zn)	mg/L	11.27	0.3	0.1	3.6	0.3	0.3		0.2								
Un-ionized Ammonia	mg/L			0.07	63	24.46	9.10		18								
Ion Percentage	mg/L			1.78	31.06	20.00	11.34		14.1								

Notes: 1) Blank denotes parameter not analysed.
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Leachate - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	D&O Anticipated Raw Leachate Quality		Min	Max	Arithmetic Mean	Geomean	PS1	PS1	PS1	PS1	PS1	PS1	PS1	PS1	PS1	
Date		Warwick Landfill Peak Value Including Recirculation	Warwick Landfill Anticipated Phase 1 Raw Leachate Design Quality					07-May-14	19-May-15	31-May-16	26-May-17	11-May-18	15-May-19	12-May-20	18-May-21	10-May-22	
Laboratory								Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Bureau Veritas	Bureau Veritas	Bureau Veritas	
Alkalinity (Total as CaCO3)	mg/L		4500	1600	11000	6084	6435	1600	4300	11000	6600	8600	8400	8300	7800	8100	
Conductivity	umho/cm			4800	25000	15261	17753	4800	11000	23000	19000	25000	25000	24000	23000	22000	
Dissolved Chloride (Cl)	mg/L	8625	2500	440	3500	1984	2210	440	1100	2800	2700	3000	3300	3500	3300	3000	
Dissolved Organic Carbon	mg/L	13312	1500	110	1000	987	647	590	110	730	630	930	1000	950	890	850	
Dissolved Sulphate (SO4)	mg/L	483	200	10	310	68	67	*10*	160	10	100	310	150	50	50	150	
Mercury (Hg)	mg/L	0.021	0.005	0.00005	0.0015	0.00029	0.00019	<0.00010	<0.00010	<0.002	<0.0001	<0.0001	<0.002	<0.00010	<0.0015	<0.003	
Nitrate (N)	mg/L			0.25	11.7	1.44	1.18	<0.50	<1.0	<2.0	<5.0	<5.0	<2.0	<1.0	<2.0	11.7	
Nitrite (N)	mg/L			0.025	0.35	0.113	0.136	<0.050	0.16	<0.20	<0.50	<0.50	<0.20	0.18	<0.20	0.35	
pH	pH		7.2	7.5	8.1	7.6	7.8	7.5	8.0	7.7	7.9	7.8	8.1	7.9	7.6	8.0	
Phenols-4AAP	mg/L	8.63	1	0.046	0.57	0.64	0.18	0.480	0.390	0.570	<0.40	<0.20	<0.040	<0.040	0.046	0.064	
Total Ammonia-N	mg/L	2944	800	379	1780	947	1187	559	379	1590	1240	1610	1520	1650	1780	1560	
Total Arsenic (As)	mg/L	<0.11	<0.11	0.04	3.1	0.533	0.596	0.04	1.30	0.94	0.39	0.49	0.32	1.6	0.64	3.1	
Total Barium (Ba)	mg/L	0.966	0.966	0.63	13	2.15	2.15	0.6	9.7	2.3	0.9	1.2	0.9	3.6	1.5	13	
Total BOD	mg/L	27600	1750	260	3800	1315	860	1800	840	760	260	560	390	1100	940	3800	
Total Boron (B)	mg/L	7.13	50	6	18	9.2	12.3	8	6	16	12	14	18	15	13	14	
Total Cadmium (Cd)	mg/L	0.12	0.12	0.0005	0.031	0.0052	0.0045	<0.001	0.028	0.007	0.002	0.002	0.002	0.010	0.003	0.031	
Total Calcium (Ca)	mg/L	3795	200	170	17000	1710	790	1100	17000	480	170	230	190	960	380	4900	
Total Chemical Oxygen Demand (COD)	mg/L	50600	3500	1700	9800	5676	5502	7700	1700	7300	9800	6100	5000	9400	4100	4200	
Total Chromium (Cr)	mg/L	0.92	0.5	0.37	27	2.41	1.70	0.37	4.60	1.20	0.60	0.91	0.87	1.80	2.5	27	
Total Copper (Cu)	mg/L	0.064	0.1	0.03	3.8	0.48	0.30	0.03	3.80	0.33	0.10	0.18	0.08	0.64	0.23	2.7	
Total Dissolved Solids	mg/L		5200	4080	11900	7583	8616	4080		9390	8600	9030	11800	11900	8920	8150	
Total Iron (Fe)	mg/L	1150	8	100	4200	645	563	100	4200	1200	310	330	130	1000	250	3400	
Total Kjeldahl Nitrogen (TKN)	mg/L	3450	960	440	2500	870	1375	650	440	1700	1400	1600	1400	2100	2200	2500	
Total Lead (Pb)	mg/L	1.38	1.38	0.007	2	0.21	0.12	0.007	2.000	0.180	0.044	0.072	0.035	0.280	0.091	0.91	
Total Magnesium (Mg)	mg/L	1380	350	220	4200	648	506	430	4200	330	230	220	270	520	300	1700	
Total Manganese (Mn)	mg/L	22.8	1	0.85	92	9.95	4.86	12.00	92.00	3.00	0.90	1.20	0.85	5.60	2.8	32	
Total Nickel (Ni)	mg/L	1.84	0.5	0.57	8.9	1.51	1.57	0.63	7.40	2.10	0.78	0.85	0.57	1.50	1.2	8.9	
Total Phosphorus	mg/L	18.61	3	11	150	24.1	47.1	11	53	26	29	51	130	150	65	40	
Total Potassium (K)	mg/L	2852	300	600	980	604	751	640	600	850	600	710	980	920	760	800	
Total Sodium (Na)	mg/L	6578	500	890	2900	1667	2023	1700	890	2400	1800	2200	2900	2700	2400	2100	
Total Suspended Solids	mg/L		150	42	190000	16365	5447	42	190000	1300	8800	6200	6000	1500	18000	46000	
Total Zinc (Zn)	mg/L	11.27	0.3	1.1	20	3.3	4.0	2.9	9.6	7.2	1.6	2.6	1.1	7.6	2	20	
Un-ionized Ammonia	mg/L			17	130	29.53	42.38	17	66	39	46	26	130	54	25	48	
Ion Percentage	mg/L			0.26	84.8	21.10	16.17	65.0	84.8	18.2	20.7	23.1	11.7	0.3	13.4	39.1	

Notes: 1) Blank denotes parameter not analysed.
2) < denotes parameter concentration is below the laboratory method reporting limit (MRL).
3) µmho/cm denotes micro-ohms per centimetre.
NTU denotes nephelometric turbidity unit.
mg/L denotes milligrams per litre.
4) Maxxam denotes Maxxam Analytics Inc.
5) *Italics* denotes parameter concentration is presented as half the laboratory RDL for Ion Percentage calculation.
6) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table A-1
Leachate - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	D&O Anticipated Raw Leachate Quality		Min	Max	Arithmetic Mean	Geomean	PS3	PS3	PS3	PS3	PS3	PS3	PS3	PS3	PS3	
Date		Warwick Landfill Peak Value Including Recirculation	Warwick Landfill Anticipated Phase 1 Raw Leachate Design Quality					07-May-14	27-May-15	31-May-16	26-May-17	11-May-18	15-May-19	12-May-20	19-May-21	10-May-22	
Laboratory								Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Bureau Veritas	Bureau Veritas	Bureau Veritas	
Alkalinity (Total as CaCO3)	mg/L		4500	4400	16000	9420	10712	4400	8000	12000	11000	9800	16000	14000	14000	13000	
Conductivity	umho/cm			12000	31000	20867	22861	12000	24000	23000	22000	21000	31000	31000	20000	29000	
Dissolved Chloride (Cl)	mg/L	8625	2500	840	3600	2269	2375	840	3000	2000	2100	2000	2900	3200	3600	3400	
Dissolved Organic Carbon	mg/L	13312	1500	420	4400	1873	976	840	760	4400	490	420	810	1100	1200	1300	
Dissolved Sulphate (SO4)	mg/L	483	200	0.1	1000	157	62	380	1000	10	100	140	0.1	50	170	320	
Mercury (Hg)	mg/L	0.021	0.005	0.00005	0.0048	0.00071	0.00044	0.0048	<0.0020	<0.002	<0.0001	<0.0001	<0.002	<0.00010	<0.0015	<0.003	
Nitrate (N)	mg/L			0.25	2.5	1.28	1.05	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<5.0	<5.0	
Nitrite (N)	mg/L			0.025	51.4	3.602	0.224	<0.05	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	1.12	51.4	
pH	pH		7.2	6.1	8.2	7.6	7.6	6.1	7.5	7.2	7.8	7.9	7.7	7.9	8.1	8.2	
Phenols-4AAP	mg/L	8.63	1	0.07	3.3	1.05	0.26	1.90	0.09	3.30	1.39	<0.20	<0.20	0.09	0.07	0.097	
Total Ammonia-N	mg/L	2944	800	449	2790	1445	1604	449	1460	1320	1400	1410	2210	2690	2790	2480	
Total Arsenic (As)	mg/L	<0.11	<0.11	0.05	1.9	0.264	0.215	1.90	0.24	0.70	0.07	0.05	0.15	0.18	0.19	0.17	
Total Barium (Ba)	mg/L	0.966	0.966	0.1	17	1.80	0.50	17.00	1.30	5.40	0.14	0.14	0.32	0.2	0.14	0.1	
Total BOD	mg/L	27600	1750	160	13000	3742	588	7700	240	13000	260	160	540	340	230	200	
Total Boron (B)	mg/L	7.13	50	8	23	12.2	13.0	8	14	8	11	9.2	16	16	23	20	
Total Cadmium (Cd)	mg/L	0.12	0.12	0.0005	0.03	0.0034	0.0013	0.030	0.003	0.010	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Total Calcium (Ca)	mg/L	3795	200	94	24000	2474	535	24000	1000	6600	210	210	350	130	120	94	
Total Chemical Oxygen Demand (COD)	mg/L	50600	3500	1500	23000	7887	4595	22000	2700	23000	2100	1500	3300	3400	4400	4300	
Total Chromium (Cr)	mg/L	0.92	0.5	0.26	6.8	1.08	0.94	6.80	0.86	2.70	0.32	0.26	0.72	0.70	1.0	0.87	
Total Copper (Cu)	mg/L	0.064	0.1	0.03	5.5	0.55	0.15	5.50	0.34	1.80	0.06	0.05	0.10	0.04	0.03	0.04	
Total Dissolved Solids	mg/L		5200	7590	16900	10997	11320	8680	11200	16900	9600	7590	12500	12600	13600	11900	
Total Iron (Fe)	mg/L	1150	8	64	6800	700	272	6800	420	2400	190	92	170	94	64	66	
Total Kjeldahl Nitrogen (TKN)	mg/L	3450	960	1100	3400	1497	1889	1100	1700	1400	1400	1300	2100	3400	2900	3100	
Total Lead (Pb)	mg/L	1.38	1.38	0.013	3	0.279	0.071	3.000	0.170	0.850	0.026	0.022	0.045	0.023	0.013	0.014	
Total Magnesium (Mg)	mg/L	1380	350	290	5600	849	680	5600	520	1700	690	520	470	390	330	290	
Total Manganese (Mn)	mg/L	22.8	1	0.39	140	15.29	2.99	140.0	6.1	42.0	1.5	1.3	1.9	0.6	0.58	0.39	
Total Nickel (Ni)	mg/L	1.84	0.5	0.81	10	1.66	1.49	10.00	1.30	5.60	1.00	0.90	0.92	0.81	0.88	0.85	
Total Phosphorus	mg/L	18.61	3	4.8	130	20.2	15.7	130.0	12.0	110.0	5.8	4.8	15.0	12.0	9.7	6.8	
Total Potassium (K)	mg/L	2852	300	680	1200	821	923	780	900	680	850	690	1100	1200	1200	1100	
Total Sodium (Na)	mg/L	6578	500	1000	3500	2120	2228	1000	2500	1400	2300	1900	2900	2900	3500	3000	
Total Suspended Solids	mg/L		150	870	210000	17930	4219	210000	1000	43000	1500	2400	5200	1200	2400	870	
Total Zinc (Zn)	mg/L	11.27	0.3	2.4	18	3.8	4.6	18.0	7.5	2.9	4.6	2.8	5.4	4.7	2.4	3.1	
Un-ionized Ammonia	mg/L			13	370	68.17	59.14	78	14	80	13	18	64	87	210	370	
Ion Percentage	mg/L			2.07	88.83	20.84	19.42	88.8	2.1	37.6	11.5	17.1	23.4	23.6	20.9	25.0	

Notes: 1) Blank denotes parameter not analysed.
2) < denotes parameter concentration is below the laboratory method reporting limit (MRL).
3) µmho/cm denotes micro-ohms per centimetre.
NTU denotes nephelometric turbidity unit.
mg/L denotes milligrams per litre.
4) Maxxam denotes Maxxam Analytics Inc.
5) *Italics* denotes parameter concentration is presented as half the laboratory RDL for Ion Percentage calculation.
6) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table A-1
Leachate - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	D&O Anticipated Raw Leachate Quality		Min	Max	Arithmetic Mean	Geomean	PS5	PS5	PS5							
Date		Warwick Landfill Peak Value Including Recirculation	Warwick Landfill Anticipated Phase 1 Raw Leachate Design Quality					12-May-20	19-May-21	10-May-22							
Laboratory								Bureau Veritas	Bureau Veritas	Bureau Veritas							
Alkalinity (Total as CaCO3)	mg/L		4500	6400	7700	7000	6980	6400	7700	6900							
Conductivity	umho/cm			15000	16220	15407	15396	15000	16220	15000							
Dissolved Chloride (Cl)	mg/L	8625	2500	860	1400	1187	1161	860	1400	1300							
Dissolved Organic Carbon	mg/L	13312	1500	280	4100	1593	771	4100	280	400							
Dissolved Sulphate (SO4)	mg/L	483	200	10	89	51	37	89	10	55							
Mercury (Hg)	mg/L	0.021	0.005	0.00005	0.0015	0.00053	0.00016	<0.00010	<0.00010	<0.003							
Nitrate (N)	mg/L			0.25	0.5	0.42	0.40	<0.50	<1.0	<1.0							
Nitrite (N)	mg/L			0.025	0.05	0.042	0.040	<0.050	<0.10	<0.10							
pH	pH		7.2	7.4	8.0	7.7	7.7	7.4	7.6	8.0							
Phenols-4AAP	mg/L	8.63	1	0.03	4.33	1.47	0.17	4.33	0.04	0.03							
Total Ammonia-N	mg/L	2944	800	1040	1080	1060	1060	1060	1080	1040							
Total Arsenic (As)	mg/L	<0.11	<0.11	0.04	0.07	0.057	0.055	0.04	0.06	0.07							
Total Barium (Ba)	mg/L	0.966	0.966	0.31	0.49	0.38	0.37	0.49	0.31	0.33							
Total BOD	mg/L	27600	1750	63	230	147	120	>8500	230	63							
Total Boron (B)	mg/L	7.13	50	5.8	9	7.4	7.3	5.8	7.5	9.0							
Total Cadmium (Cd)	mg/L	0.12	0.12	0.0005	0.0005	0.0005	0.0005	<0.001	<0.001	<0.001							
Total Calcium (Ca)	mg/L	3795	200	98	730	319	210	730	130	98							
Total Chemical Oxygen Demand (COD)	mg/L	50600	3500	1400	12000	5000	2996	12000	1600	1400							
Total Chromium (Cr)	mg/L	0.92	0.5	0.09	0.12	0.11	0.11	0.09	0.11	0.12							
Total Copper (Cu)	mg/L	0.064	0.1	0.01	0.01	0.01	0.01	<0.02	<0.02	<0.02							
Total Dissolved Solids	mg/L		5200	5210	9980	6900	6592	9980	5510	5210							
Total Iron (Fe)	mg/L	1150	8	24	30	26	26	30	24	25							
Total Kjeldahl Nitrogen (TKN)	mg/L	3450	960	1000	1600	1300	1277	1300	1000	1600							
Total Lead (Pb)	mg/L	1.38	1.38	0.007	0.01	0.008	0.008	0.007	0.007	0.01							
Total Magnesium (Mg)	mg/L	1380	350	380	400	390	390	390	380	400							
Total Manganese (Mn)	mg/L	22.8	1	0.27	3.4	1.33	0.67	3.4	0.33	0.27							
Total Nickel (Ni)	mg/L	1.84	0.5	0.22	0.38	0.31	0.30	0.22	0.32	0.38							
Total Phosphorus	mg/L	18.61	3	5.4	6.3	5.9	5.9	6.3	5.9	5.4							
Total Potassium (K)	mg/L	2852	300	420	590	507	502	420	510	590							
Total Sodium (Na)	mg/L	6578	500	960	1500	1287	1263	960	1400	1500							
Total Suspended Solids	mg/L		150	190	740	403	340	740	280	190							
Total Zinc (Zn)	mg/L	11.27	0.3	0.2	0.7	0.5	0.4	0.2	0.7	0.6							
Un-ionized Ammonia	mg/L			4.3	13	10.10	8.99	4.3	13	13							
Ion Percentage	mg/L			3.08	18.81	11.12	8.72	3.1	18.8	11.5							

Notes: 1) Blank denotes parameter not analysed.
2) < denotes parameter concentration is below the laboratory method reporting limit (MRL).
3) µmho/cm denotes micro-ohms per centimetre.
NTU denotes nephelometric turbidity unit.
mg/L denotes milligrams per litre.
4) Maxxam denotes Maxxam Analytics Inc.
5) *Italics* denotes parameter concentration is presented as half the laboratory RDL for Ion Percentage calculation.
6) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

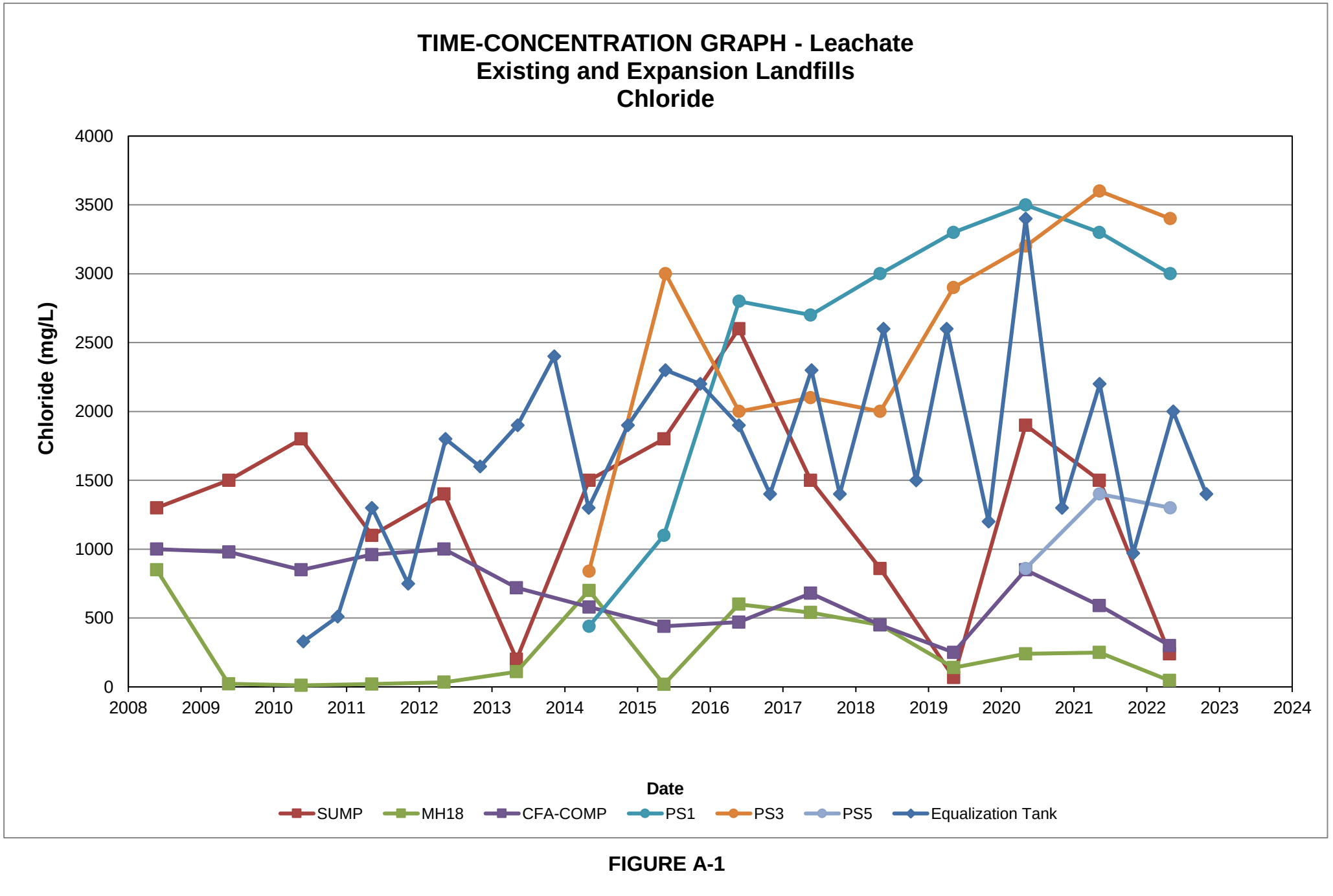
TIME-CONCENTRATION GRAPH - Leachate
Existing and Expansion Landfills
Chloride
Chloride (mg/L)
4000
3500
3000
2500
2000
1500
1000
500
0
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
Date
SUMP
MH18
CFA-COMP
PS1
PS3
PS5
Equalization Tank

FIGURE A-1

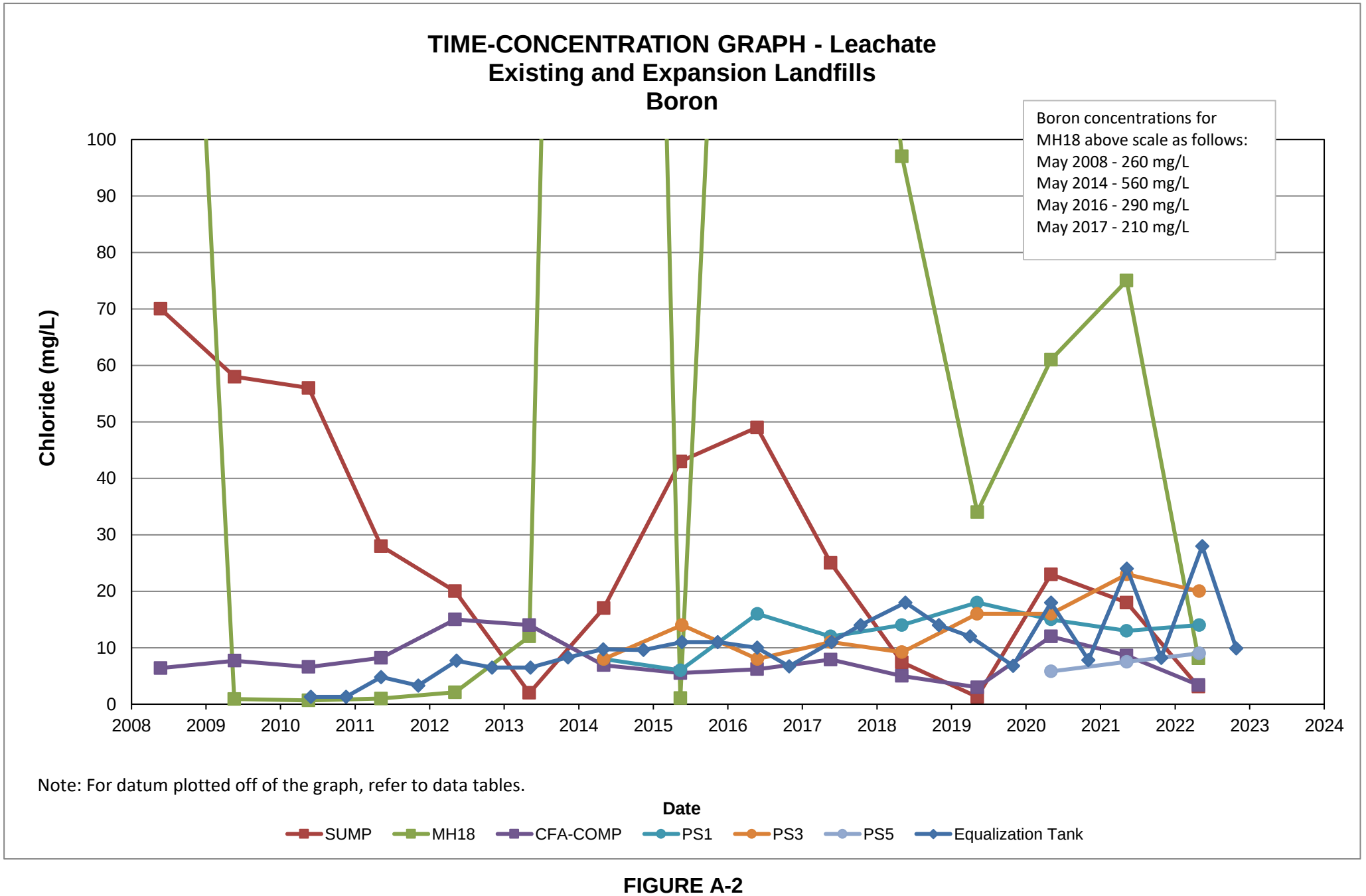
TIME-CONCENTRATION GRAPH - Leachate
Existing and Expansion Landfills
Boron
Boron concentrations for
MH18 above scale as follows:
May 2008 - 260 mg/L
May 2014 - 560 mg/L
May 2016 - 290 mg/L
May 2017 - 210 mg/L
Chloride (mg/L)
100
90
80
70
60
50
40
30
20
10
0
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
Note: For datum plotted off of the graph, refer to data tables.
Date
SUMP
MH18
CFA-COMP
PS1
PS3
PS5
Equalization Tank

FIGURE A-2

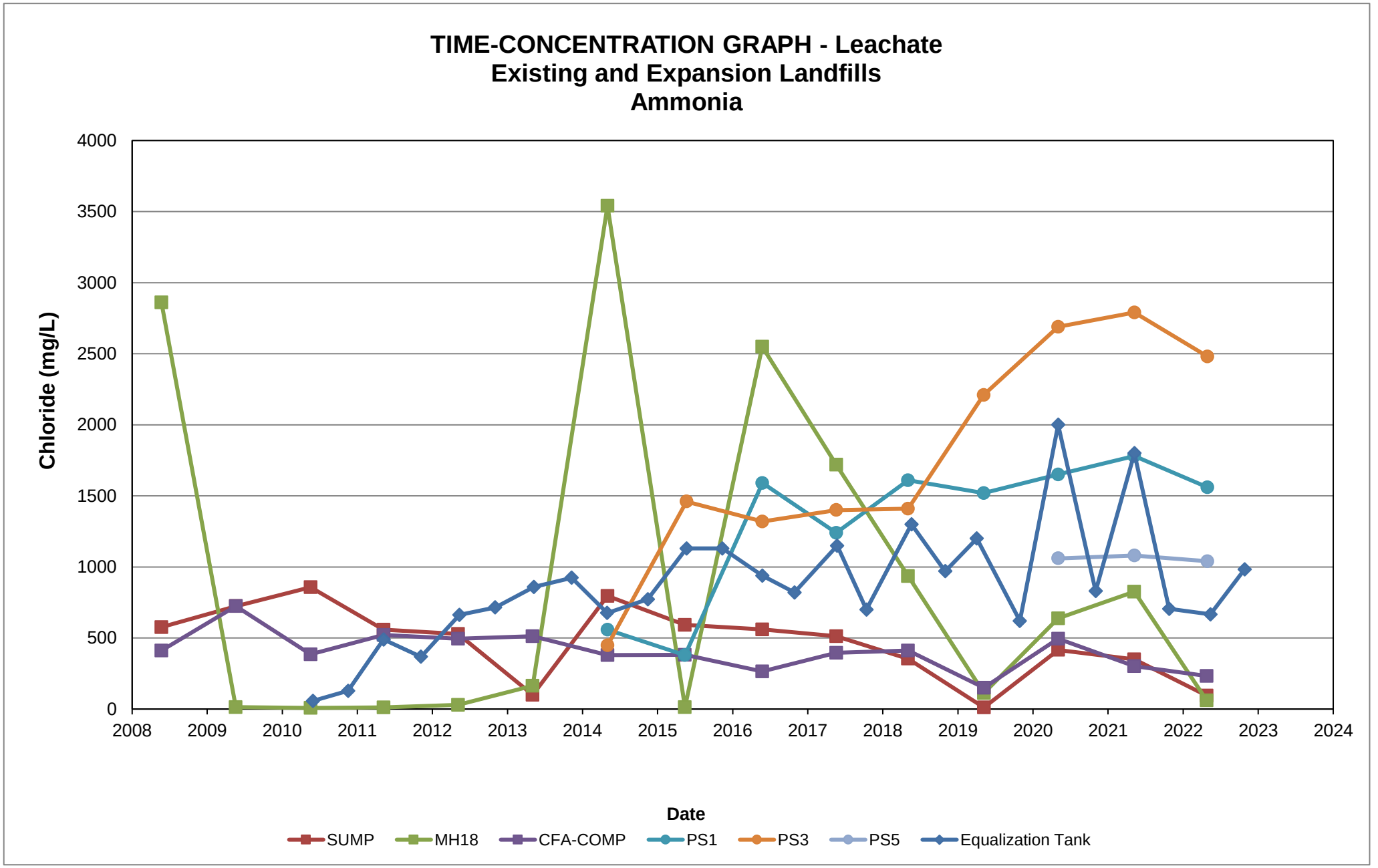
TIME-CONCENTRATION GRAPH - Leachate
Existing and Expansion Landfills
Ammonia
Chloride (mg/L)
4000
3500
3000
2500
2000
1500
1000
500
0
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
Date
SUMP
MH18
CFA-COMP
PS1
PS3
PS5
Equalization Tank

FIGURE A-3

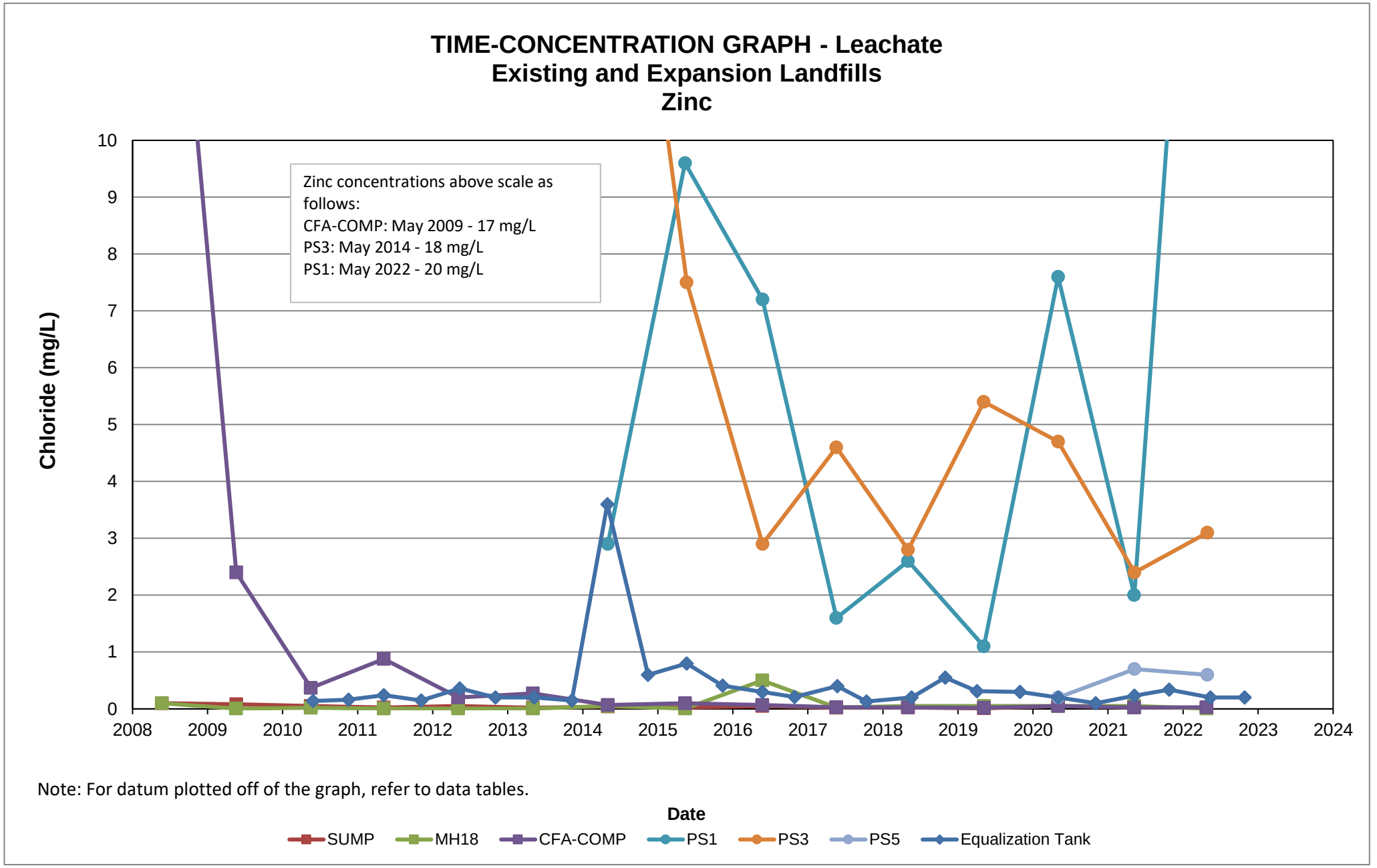
TIME-CONCENTRATION GRAPH - Leachate
Existing and Expansion Landfills
Zinc
Zinc concentrations above scale as follows:
CFA-COMP: May 2009 - 17 mg/L
PS3: May 2014 - 18 mg/L
PS1: May 2022 - 20 mg/L
Chloride (mg/L)
10
9
8
7
6
5
4
3
2
1
0
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
Note: For datum plotted off of the graph, refer to data tables.
Date
SUMP
MH18
CFA-COMP
PS1
PS3
PS5
Equalization Tank

FIGURE A-4

Table A-2
Leachate - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	Sump (Central Fill Area)	Sump (Central Fill Area)	Sump (Central Fill Area)	Sump (Central Fill Area)	Sump (Central Fill Area)	Sump (Central Fill Area)	Sump (Central Fill Area)	Sump (Central Fill Area)	Sump (Central Fill Area)	Sump (Central Fill Area)	Sump (Central Fill Area)	Sump (Central Fill Area)
Date		25-May-04	06-Apr-05	27-Mar-06	04-Apr-07	23-May-08	21-May-09	20-May-10	10-May-11	08-May-12	07-May-13	07-May-14	19-May-15
Laboratory		Accutest	Accutest	Accutest	Accutest	MAXXAM	MAXXAM	MAXXAM	MAXXAM	MAXXAM	MAXXAM	MAXXAM	MAXXAM
Benzo(a)pyrene	µg/L					<2	<1	<1	<0.8	<2	<0.8	<2	<1.0
1,2-Dichlorobenzene	µg/L					<5	<3	<3	<2	<5	<2	<5	<2.5
1,3-Dichlorobenzene	µg/L					<5	<3	<3	<2	<5	<2	<5	<2.5
1,4-Dichlorobenzene	µg/L					<5	<3	<3	3	<5	<2	<5	<2.5
Hexachlorobenzene	µg/L					<5	<3	<3	<2	<5	<2	<5	<2.5
1,2,4-Trichlorobenzene	µg/L					<5	<3	<3	<2	<5	<2	<5	<2.5
2,4-Dichlorophenol	µg/L					<3	<2	<2	<1	<3	<1	<3	<1.5
Pentachlorophenol	µg/L					<10	<5	<5	<4	<10	<4	<30	<5.0
Phenol	µg/L					<5	<3	<3	<2	<5	<2	<5	13
2,4,6-Trichlorophenol	µg/L					<5	<3	<3	<2	<5	<2	<5	<2.5
Di-N-butyl phthalate	µg/L					<20	<10	<10	<8	<20	<8	<20	<10
Diethyl phthalate	µg/L					16.0	8.0	7.0	6.0	<10	<4	<10	7.7
Dimethyl phthalate	µg/L					<10	<5	<5	<4	<10	<4	<10	<5.0
Benzene	µg/L	361	96	30	50	87	58	58	41	49	<5.0	34	100
1,4-Dichlorobenzene	µg/L					<20	<20	<10	<20	<10	<10	<4.0	<10
Ethylbenzene	µg/L	318.0	40.3	103.0	171.0	200.0	86.0	180.0	71.0	140.0	<5.0	17.0	160.0
Methylene Chloride(Dichloromethane)	µg/L					<50	<50	<30	<50	<25	<25	<10	<25
Toluene	µg/L	782	<32	15	32	110	<20	27	<20	29	<10	12	50
Vinyl Chloride	µg/L					<20	<20	<10	<20	<10	<10	<4.0	<10
p+m-Xylene	µg/L	1990.0	916.0	339.0	607.0	880.0	520.0	680.0	280.0	520.0	9.1	200.0	640.0
o-Xylene	µg/L	1140.0	493.0	160.0	329.0	430.0	260.0	330.0	200.0	250.0	<5.0	130.0	300.0
Xylene (Total)	µg/L					1300.0	780.0	1000.0	480.0	770.0	9.1	340.0	940.0

Parameter	Units	Sump (Central Fill Area)	Sump (Central Fill Area)	Sump (Central Fill Area)	Sump (Central Fill Area)	Sump (Central Fill Area)	Sump (Central Fill Area)	Sump (Central Fill Area)					
Date		30-May-16	26-May-17	11-May-18	16-May-19	12-May-20	18-May-21	06-May-22					
Laboratory		MAXXAM	MAXXAM	MAXXAM	MAXXAM	Bureau Veritas	Bureau Veritas	Bureau Veritas					
Benzo(a)pyrene	µg/L	<0.80	<1.6	<0.80	<0.20	<20	<0.80	<0.80					
1,2-Dichlorobenzene	µg/L	<2.0	<4.0	<2.0	<0.50	<50	<2.0	<2.0					
1,3-Dichlorobenzene	µg/L	<2.0	<4.0	<2.0	<0.50	<50	<2.0	<2.0					
1,4-Dichlorobenzene	µg/L	<2.0	<4.0	<2.0	<0.50	<50	2.2	<2.0					
Hexachlorobenzene	µg/L	<2.0	<4.0	<2.0	<0.50	<50	<2.0	<2.0					
1,2,4-Trichlorobenzene	µg/L	<2.0	<4.0	<2.0	<0.50	<50	<2.0	<2.0					
2,4-Dichlorophenol	µg/L	<1.2	<2.4	<1.2	<0.30	<30	<1.2	<1.2					
Pentachlorophenol	µg/L	<10	<8.0	<28	<6.0	<100	<4.0	<4.0					
Phenol	µg/L	<2.0	<4.0	<2.0	<0.50	<50	<2.0	<2.0					
2,4,6-Trichlorophenol	µg/L	<2.0	<4.0	<2.0	<0.50	<50	<2.0	<2.0					
Di-N-butyl phthalate	µg/L	<8.0	<16	<8.0	<2.0	<200	<8.0	<8.0					
Diethyl phthalate	µg/L	5.0	<8.0	<4.0	<1.0	<100	<4.0	<4.0					
Dimethyl phthalate	µg/L	<4.0	<8.0	<4.0	<1.0	<100	<4.0	<4.0					
Benzene	µg/L	21.0	<2.5	<10	<0.20	110	64	3.2					
1,4-Dichlorobenzene	µg/L	<20	<5.0	<2.0	<0.50	7.8	<20	<2.0					
Ethylbenzene	µg/L	<10	<2.5	<10	0.34	190	110	3.8					
Methylene Chloride(Dichloromethane)	µg/L	<50	<13	<100	<2.0	<20	<100	<10					
Toluene	µg/L	21.0	<5.0	<10	<0.20	220	<10	<1.0					
Vinyl Chloride	µg/L	<20	<5.0	<10	<0.20	<2.0	<10	<1.0					
p+m-Xylene	µg/L	740.00	82.00	18.00	0.81	1500	120	15					
o-Xylene	µg/L	93	<2.5	<10	<0.20	620	23	4.9					
Xylene (Total)	µg/L	830.00	82.00	18.00	0.81	2100	140	20					

Notes: 1) µg/L denotes micrograms per litre.
2) Accutest denotes chemical analytical testing was completed by Accutest Laboratories.
3) MAXXAM denotes chemical analytical testing was completed by Maxxam Analytics Inc.

Table A-2
Leachate - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	MH-18 (South Fill Area)	MH-18 (South Fill Area)	MH-18 (South Fill Area)	MH-18 (South Fill Area)	MH18 (South Fill Area)	MH18 (South Fill Area)	MH18 (South Fill Area)	MH18 (South Fill Area)	MH18 (South Fill Area)	MH18 (South Fill Area)	MH18 (South Fill Area)	MH18 (South Fill Area)
Date		25-May-04	06-Apr-05	27-Mar-06	04-Apr-07	23-May-08	20-May-09	20-May-10	10-May-11	08-May-12	07-May-13	07-May-14	19-May-15
Laboratory		Accutest	Accutest	Accutest	Accutest	MAXXAM	MAXXAM	MAXXAM	MAXXAM	MAXXAM	MAXXAM	MAXXAM	MAXXAM
Benzo(a)pyrene	µg/L					<2	<0.2	<0.2	<0.2	<0.2	<0.8	<8	<0.20
1,2-Dichlorobenzene	µg/L					<5	<0.5	<0.5	<0.5	<0.5	<2	<20	<0.50
1,3-Dichlorobenzene	µg/L					<5	<0.5	<0.5	<0.5	<0.5	<2	<20	<0.50
1,4-Dichlorobenzene	µg/L					<5	<0.5	<0.5	<0.5	<0.5	<2	<20	<0.50
Hexachlorobenzene	µg/L					<5	<0.5	<0.5	<0.5	<0.5	<2	<20	<0.50
1,2,4-Trichlorobenzene	µg/L					<5	<0.5	<0.5	<0.5	<0.5	<2	<20	<0.50
2,4-Dichlorophenol	µg/L					<3	<0.3	<0.3	<0.3	<0.3	<1	<10	<0.30
Pentachlorophenol	µg/L					<10	<1	<1	<1	<1	<4	<100	<1.0
Phenol	µg/L					89	<0.5	<0.5	<0.5	<0.5	<2	34	<0.50
2,4,6-Trichlorophenol	µg/L					<5	<0.5	<0.5	<0.5	<0.5	<2	<20	<0.50
Di-N-butyl phthalate	µg/L					<20	<2	<2	<2	<2	<8	<80	<2.0
Diethyl phthalate	µg/L					25	<1	<1	<1	<1	<4	<40	<1.0
Dimethyl phthalate	µg/L					<10	<1	<1	<1	<1	<4	<40	<1.0
Benzene	µg/L	12.0	5.4	9.0	<0.5	9.0	0.3	<0.1	<0.1	<0.10	<5.0	<10	<0.10
1,4-Dichlorobenzene	µg/L					<10	<0.2	<0.2	<0.2	<0.20	<10	<20	0.45
Ethylbenzene	µg/L	891.0	257.0	41.0	<0.5	52.0	0.8	<0.1	<0.1	0.3	<5.0	46.0	<0.10
Methylene Chloride(Dichloromethane)	µg/L					<30	<0.5	<0.5	<0.5	<0.50	<25	<50	<0.50
Toluene	µg/L	90.5	23.3	343.0	<0.5	550.0	8.7	<0.2	<0.2	0.3	<10	450.0	<0.20
Vinyl Chloride	µg/L					14.0	<0.2	<0.2	<0.2	<0.20	<10	<20	<0.20
p+m-Xylene	µg/L	200.0	68.7	135.0	<1.0	190.0	2.6	<0.1	<0.1	1.9	<5.0	140.0	<0.10
o-Xylene	µg/L	97.4	28.0	53.0	<0.5	66.0	1.0	<0.1	<0.1	0.6	<5.0	60.0	<0.10
Xylene (Total)	µg/L					250.0	3.6	<0.1	<0.1	2.5	<5.0	200.0	<0.10

Parameter	Units	MH18 (South Fill Area)	MH18 (South Fill Area)	MH18 (South Fill Area)	MH18 (South Fill Area)	MH18 (South Fill Area)	MH18 (South Fill Area)	MH18 (South Fill Area)					
Date		30-May-16	26-May-17	11-May-18	16-May-19	12-May-20	18-May-21	06-May-22					
Laboratory		MAXXAM	MAXXAM	MAXXAM	MAXXAM	Bureau Veritas	Bureau Veritas	Bureau Veritas					
Benzo(a)pyrene	µg/L	<0.80	<1.6	<2.0	<0.20	<20	<0.80	<0.80					
1,2-Dichlorobenzene	µg/L	<2.0	<4.0	<5.0	<0.50	<50	<2.0	<2.0					
1,3-Dichlorobenzene	µg/L	<2.0	<4.0	<5.0	<0.50	<50	<2.0	<2.0					
1,4-Dichlorobenzene	µg/L	2.1	<4.0	<5.0	<0.50	<50	<2.0	<2.0					
Hexachlorobenzene	µg/L	<2.0	<4.0	<5.0	<0.50	<50	<2.0	<2.0					
1,2,4-Trichlorobenzene	µg/L	<2.0	<4.0	<5.0	<0.50	<50	<2.0	<2.0					
2,4-Dichlorophenol	µg/L	<1.2	<2.4	<3.0	<0.30	<30	<1.2	<1.2					
Pentachlorophenol	µg/L	<10	<8.0	<70	<6.0	<100	<4.0	<4.0					
Phenol	µg/L	17.0	16.0	8.8	<0.50	<50	11	<2.0					
2,4,6-Trichlorophenol	µg/L	<2.0	<4.0	<5.0	<0.50	<50	<2.0	<2.0					
Di-N-butyl phthalate	µg/L	<8.0	<16	<20	<2.0	<200	<8.0	<8.0					
Diethyl phthalate	µg/L	11.0	21.0	11.0	<1.0	<100	6.6	<4.0					
Dimethyl phthalate	µg/L	<4.0	<8.0	<10	<1.0	<100	<4.0	<4.0					
Benzene	µg/L	10.0	10.0	<10	0.2	3.4	<10	<1.0					
1,4-Dichlorobenzene	µg/L	<10	<25	<5.0	<0.50	<4.0	<20	<2.0					
Ethylbenzene	µg/L	49.0	58.0	25.0	0.6	17	14	<1.0					
Methylene Chloride(Dichloromethane)	µg/L	<25	<100	<100	<2.0	<20	<100	<10					
Toluene	µg/L	520.0	500.0	230.0	<0.20	150	140	<1.0					
Vinyl Chloride	µg/L	17.0	19.0	<16	0.4	3.1	<10	<1.0					
p+m-Xylene	µg/L	160.0	170.0	73.0	<0.20	53	40	<1.0					
o-Xylene	µg/L	60.0	70.0	30.0	0.7	20	15	<1.0					
Xylene (Total)	µg/L	220.0	240.0	100.0	0.7	73	55	<1.0					

Notes: 1) µg/L denotes micrograms per litre.
2) Accutest denotes chemical analytical testing was completed by Accutest Laboratories.
3) MAXXAM denotes chemical analytical testing was completed by Maxxam Analytics Inc.

Table A-2
Leachate - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	CFA-Comp	CFA-Comp	CFA-Comp	CFA-Comp	CFA-Comp	CFA-Comp	CFA-Comp	CFA-Comp	CFA-Comp	CFA-Comp	CFA-Comp	CFA-Comp
Date		23-May-08	21-May-09	20-May-10	10-May-11	08-May-12	07-May-13	07-May-14	19-May-15	30-May-16	26-May-17	11-May-18	16-May-19
Laboratory		Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Benzo(a)pyrene	µg/L	<2	<1	<1	<4	<2	<0.8	<1	<1.0	<0.80	<0.80	<0.20	<0.20
1,2-Dichlorobenzene	µg/L	<5	<3	<3	<10	<5	<2	<3	<2.5	<2.0	<2.0	<0.50	<0.50
1,3-Dichlorobenzene	µg/L	<5	<3	<3	<10	<5	<2	<3	<2.5	<2.0	<2.0	<0.50	<0.50
1,4-Dichlorobenzene	µg/L	<5	<3	<3	<10	<5	<2	<3	<2.5	<2.0	<2.0	1.1	<0.50
Hexachlorobenzene	µg/L	<5	<3	<3	<10	<5	<2	<3	<2.5	<2.0	<2.0	<0.50	<0.50
1,2,4-Trichlorobenzene	µg/L	<5	<3	<3	<10	<5	<2	<3	<2.5	<2.0	<2.0	<0.50	<0.50
2,4-Dichlorophenol	µg/L	<3		<2	<6	<3	<1	<2	<1.5	<1.2	<1.2	<0.30	<0.30
Pentachlorophenol	µg/L	<10	<5	<5	<20	<10	<4	<10	<5.0	<10	<4.0	<7.0	<6.0
Phenol	µg/L	76.0	110.0	32.0	22.0	6.0	23.0	<3	<2.5	<2.0	<2.0	<0.50	<0.50
2,4,6-Trichlorophenol	µg/L	<5	<3	<3	<10	<5	<2	<3	<2.5	<2.0	<2.0	<0.50	<0.50
Di-N-butyl phthalate	µg/L	<20	<10	<10	<40	<20	<8	<10	<10	<8.0	<8.0	<2.0	<2.0
Diethyl phthalate	µg/L	12.0	23.0	9.0	<20	<10	9.0	<5	<5.0	<4.0	<4.0	<1.0	<1.0
Dimethyl phthalate	µg/L	10.0	<5	<5	<20	<10	<4	<5	<5.0	<4.0	<4.0	<1.0	<1.0
Benzene	µg/L	3.0	4.0	2.0	<3	3.1	3.1	2.3	1.8	<1.0	<2.0	<10	1.3
1,4-Dichlorobenzene	µg/L	<4	<4	<4	<5	3.3	<2.0	<2.0	1.3	<2.0	<4.0	1.1	0.7
Ethylbenzene	µg/L	25.0	23.0	19.0	17.0	22.0	21.0	22.0	15.0	<1.0	<2.0	<10	1.2
Methylene Chloride(Dichloromethane)	µg/L	25.0	39.0	<10	<10	<5.0	<5.0	<5.0	<2.5	<5.0	<10	<100	<2.0
Toluene	µg/L	43.0	49.0	53.0	60.0	27.0	39.0	5.9	5.0	<2.0	<4.0	<10	0.8
Vinyl Chloride	µg/L	<4	<4	<4	<5	<2.0	<2.0	<2.0	<1.0	<2.0	<4.0	<10	<0.20
p+m-Xylene	µg/L	51.0	50.0	34.0	34.0	49.0	36.0	38.0	25.0	7.7	7.9	<10	3.6
o-Xylene	µg/L	18.0	17.0	13.0	20.0	24.0	17.0	16.0	14.0	<1.0	6.5	<10	1.9
Xylene (Total)	µg/L	69.0	67.0	47.0	54.0	72.0	53.0	54.0	39.0	7.7	14.0	<10	5.5

Parameter	Units	CFA-Comp	CFA-Comp	CFA-Comp	CFA-Comp	CFA-Comp	CFA-Comp	CFA-Comp	CFA-Comp	CFA-Comp	CFA-Comp	CFA-Comp	CFA-Comp
Date		12-May-20	18-May-21	06-May-22									
Laboratory		Bureau Veritas	Bureau Veritas	Bureau Veritas									
Benzo(a)pyrene	µg/L	<20	<0.80	<0.80									
1,2-Dichlorobenzene	µg/L	<50	<2.0	<2.0									
1,3-Dichlorobenzene	µg/L	<50	<2.0	<2.0									
1,4-Dichlorobenzene	µg/L	<50	<2.0	<2.0									
Hexachlorobenzene	µg/L	<50	<2.0	<2.0									
1,2,4-Trichlorobenzene	µg/L	<50	<2.0	<2.0									
2,4-Dichlorophenol	µg/L	<30	<1.2	<1.2									
Pentachlorophenol	µg/L	<100	<4.0	<4.0									
Phenol	µg/L	<50	<2.0	5.7									
2,4,6-Trichlorophenol	µg/L	<50	<2.0	<2.0									
Di-N-butyl phthalate	µg/L	<200	<8.0	<8.0									
Diethyl phthalate	µg/L	<100	<4.0	<4.0									
Dimethyl phthalate	µg/L	<100	<4.0	<4.0									
Benzene	µg/L	<2.0	<10	3.4									
1,4-Dichlorobenzene	µg/L	<4.0	<20	<2.0									
Ethylbenzene	µg/L	<2.0	<10	7.6									
Methylene Chloride(Dichloromethane)	µg/L	<20	<100	<10									
Toluene	µg/L	<2.0	<10	6.9									
Vinyl Chloride	µg/L	<2.0	<10	<1.0									
p+m-Xylene	µg/L	14	<10	21									
o-Xylene	µg/L	8.8	<10	9.6									
Xylene (Total)	µg/L	23	<10	30									

Notes: 1) µg/L denotes micrograms per litre.
2) MAXXAM denotes chemical analytical testing was completed by Maxxam Analytics Inc.

Table A-2
Leachate - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank
Date		02-Mar-10	31-May-10	21-Sep-10	19-Nov-10	28-Feb-11	10-May-11	10-Aug-11	09-Nov-11	01-Mar-12	15-May-12	01-Aug-12	05-Nov-12
Laboratory		Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Benzo(a)pyrene	µg/L		<8		<20		<40		<4		<2		<8
1,2-Dichlorobenzene	µg/L		<20		<50		<100		<10		<5		<20
1,3-Dichlorobenzene	µg/L		<20		<50		<100		<10		<5		<20
1,4-Dichlorobenzene	µg/L		<20		<50		<100		<10		<5		<20
Hexachlorobenzene	µg/L		<20		<50		<100		<10		<5		<20
1,2,4-Trichlorobenzene	µg/L		<20		<50		<100		<10		<5		<20
2,4-Dichlorophenol	µg/L		<10		<30		<60		<6		<3		<10
Pentachlorophenol	µg/L		<40		<100		<200		<20		<10		<40
Phenol	µg/L		150		340		1100		180		<20		110
2,4,6-Trichlorophenol	µg/L		<20		<50		<100		<10		<5		<20
Di-N-butyl phthalate	µg/L		<80		<200		<400		<40		<20		<80
Diethyl phthalate	µg/L		<40		<100		<200		<20		<10		<40
Dimethyl phthalate	µg/L		<40		<100		<200		<20		<10		<40
Benzene	µg/L	1.6	2.0	1.1	<10	<1	<30	2.7	<5	6.9	5.3	7.7	6.0
Ethylbenzene	µg/L	9.0	10.0	6.0	<10	9.0	<30	11.0	13.0	15.0	11.0	20.0	15.0
o-Xylene	µg/L	10.0	9.0	6.4	<10	7.0	<30	8.7	10.0	12.0	6.7	16.0	11.0
p+m-Xylene	µg/L	27.0	24.0	19.0	11.0	20.0	<30	27.0	29.0	32.0	21.0	46.0	32.0
Toluene	µg/L	85.0	76.0	180.0	53.0	88.0	92.0	160.0	270.0	330.0	270.0	230.0	97.0
Dichloromethane	µg/L		160.0		85.0		<100		<30		<13		<25
Vinyl Chloride	µg/L		<2		<20		<50		<10		<5.0		<10

Parameter	Units	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank
Date		22-Feb-13	13-May-13	21-Aug-13	13-Nov-13	11-Mar-14	05-May-14	28-Jul-14	14-Nov-14	05-Mar-15	27-May-15	30-Jul-15	18-Nov-15
Laboratory		Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Benzo(a)pyrene	µg/L		<0.8		<0.8		<40		<20		<100		<80
1,2-Dichlorobenzene	µg/L		<2		<2		<100		<50		<250		<200
1,3-Dichlorobenzene	µg/L		<2		<2		<100		<50		<250		<200
1,4-Dichlorobenzene	µg/L		<2		<2		<100		<50		<250		<200
Hexachlorobenzene	µg/L		<2		<2		<100		<50		<250		<200
1,2,4-Trichlorobenzene	µg/L		<2		<2		<100		<50		<250		<200
2,4-Dichlorophenol	µg/L		<1		<1		<60		<30		<150		<120
Pentachlorophenol	µg/L		<4		<4		<500		<100		<500		<400
Phenol	µg/L		<5		<8		300		110		510		280
2,4,6-Trichlorophenol	µg/L		<2		<2		<100		<50		<250		<200
Di-N-butyl phthalate	µg/L		<8		<8		<400		<200		<1000		<800
Diethyl phthalate	µg/L		6		<4		<200		<100		<500		<400
Dimethyl phthalate	µg/L		<4		<4		<200		<100		<500		<400
Benzene	µg/L	5.5	7.9	8.2	6.6	3.4	3.0	1.2	2.5	3.0	<10	2.0	<10
Ethylbenzene	µg/L	11.0	16.0	18.0	14.0	14.0	13.0	3.4	6.6	11.0	<10	4.3	<10
o-Xylene	µg/L	8.1	11.0	14.0	12.0	13.0	14.0	3.7	6.7	13.0	<10	4.6	<10
p+m-Xylene	µg/L	23.0	35.0	41.0	36.0	36.0	40.0	7.5	16.0	27.0	16.0	10.0	13.0
Toluene	µg/L	47.0	57.0	40.0	20.0	73.0	120.0	25.0	61.0	110.0	67.0	30.0	66.0
Dichloromethane	µg/L		<13		<13		100		<13		<50		<50
Vinyl Chloride	µg/L		<5.0		<5.0		<4.0		<5.0		<20		<20

Notes: 1) µg/L denotes micrograms per litre.
2) MAXXAM denotes chemical analytical testing was completed by Maxxam Analytics Inc.

Table A-2
Leachate - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank
Date		15-Mar-16	30-May-16	25-Jul-16	03-Nov-16	27-Mar-17	30-May-17	10-Aug-17	20-Oct-17	22-Mar-18	28-May-18	17-Aug-18	08-Nov-18
Laboratory		Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Benzo(a)pyrene	µg/L		<0.80		<80		<4.0		<40		<40		<20
1,2-Dichlorobenzene	µg/L		<2.0		<200		<10		<100		<100		<50
1,3-Dichlorobenzene	µg/L		<2.0		<200		<10		<100		<100		<50
1,4-Dichlorobenzene	µg/L		<2.0		<200		<10		<100		<100		<50
Hexachlorobenzene	µg/L		<2.0		<200		<10		<100		<100		<50
1,2,4-Trichlorobenzene	µg/L		<2.0		<200		<10		<100		<100		<50
2,4-Dichlorophenol	µg/L		<1.2		<120		<6.0		<60		<60		<30
Pentachlorophenol	µg/L		<10		<400		<20		<200		<200		<100
Phenol	µg/L		230		<200		14.0		<100		<100		<50
2,4,6-Trichlorophenol	µg/L		<2.0		<200		<10		<100		<100		<50
Di-N-butyl phthalate	µg/L		<8.0		<800		<40		<400		<400		<200
Diethyl phthalate	µg/L		5.6		<400		<20		<200		<200		<100
Dimethyl phthalate	µg/L		<4.0		<400		<20		<200		<200		<100
Benzene	µg/L	1.5	<5.0	4.0	<5.0	3.5	<5.0	3.3	<5.0	<10	3.8	3.3	2.0
Ethylbenzene	µg/L	3.7	5.1	8.6	<5.0	6.4	10.0	8.7	<5.0	<10	10.0	10.0	8.0
o-Xylene	µg/L	5.3	6.1	6.4	<5.0	7.5	11.0	10.0	5.1	<10	11.0	11.0	6.8
p+m-Xylene	µg/L	11.0	14.0	20.0	8.5	17.0	27.0	24.0	11.0	16.0	26.0	24.0	15.0
Toluene	µg/L	84.0	110.0	120.0	210.0	63.0	56.0	56.0	23.0	33.0	51.0	65.0	20.0
Dichloromethane	µg/L		<25		<25		<25				<2.0		<4.0
Vinyl Chloride	µg/L		<10		<10		<10				1.5		<0.40

Parameter	Units	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank
Date		08-Jan-19	11-Apr-19	23-Jul-19	07-Nov-19	22-Jan-20	15-May-20	11-Aug-20	11-Nov-20	12-Jan-21	19-May-21	11-Aug-21	04-Nov-21
Laboratory		Maxxam	Maxxam	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas
Benzo(a)pyrene	µg/L		<20		<2.0		<20		<2.0		<2.0		<2.0
1,2-Dichlorobenzene	µg/L		<50		<5.0		<50		<5.0		<5.0		<5.0
1,3-Dichlorobenzene	µg/L		<50		<5.0		<50		<5.0		<5.0		<5.0
1,4-Dichlorobenzene	µg/L		<50		<5.0		<50		<5.0		<5.0		<5.0
Hexachlorobenzene	µg/L		<50		<5.0		<50		<5.0		<5.0		<5.0
1,2,4-Trichlorobenzene	µg/L		<50		<5.0		<50		<5.0		<5.0		<5.0
2,4-Dichlorophenol	µg/L		<30		<3.0		<30		<3.0		<3.0		<3.0
Pentachlorophenol	µg/L		<100		<10		<100		<10		<10		<10
Phenol	µg/L		<50		9.7		69		21		7.1		39
2,4,6-Trichlorophenol	µg/L		<50		<5.0		<50		<5.0		<5.0		<5.0
Di-N-butyl phthalate	µg/L		<200		<20		<200		<20		<20		<20
Diethyl phthalate	µg/L		<100		<10		<100		<10		<10		<10
Dimethyl phthalate	µg/L		<100		13.0		<100		<10		<10		<10
Benzene	µg/L	3.4	4.6	4.9	2.6	<10	6.1	3.5	2.4	6.5	<10	<10	6.1
Ethylbenzene	µg/L	8.5	16.0	13.0	7.4	17.0	16	9.8	6.6	21	18	13	18
o-Xylene	µg/L	9.2	15.0	15.0	9.3	18.0	21.0	9.7	8.0	22	17	13	16
p+m-Xylene	µg/L	21.0	32.0	35.0	22.0	42.0	45.0	22.0	17.0	48	41	30	39
Toluene	µg/L	34.0	56.0	70.0	57.0	90.0	73.0	93.0	78.0	910	2400	160	200
Dichloromethane	µg/L		<20		94		<20		<20		<100		<20
Vinyl Chloride	µg/L		<2.0		<2.0		<2.0		<2.0		<10		2.6

Notes: 1) µg/L denotes micrograms per litre.
2) MAXXAM denotes chemical analytical testing was completed by Maxxam Analytics Inc.

Table A-2
Leachate - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	Equalization Tank	Equalization Tank	Equalization Tank	Equalization Tank								
Date		19-Jan-22	24-May-22	25-Jul-22	07-Nov-22								
Laboratory		Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas								
Benzo(a)pyrene	µg/L		<2.0		<8.0								
1,2-Dichlorobenzene	µg/L		<5.0		<20								
1,3-Dichlorobenzene	µg/L		<5.0		<20								
1,4-Dichlorobenzene	µg/L		<5.0		<20								
Hexachlorobenzene	µg/L		<5.0		<20								
1,2,4-Trichlorobenzene	µg/L		<5.0		<20								
2,4-Dichlorophenol	µg/L		<3.0		<12								
Pentachlorophenol	µg/L		<10		<40								
Phenol	µg/L		<5.0		<20								
2,4,6-Trichlorophenol	µg/L		<5.0		<20								
Di-N-butyl phthalate	µg/L		<20		<80								
Diethyl phthalate	µg/L		<10		<40								
Dimethyl phthalate	µg/L		<10		<40								
Benzene	µg/L	<10	5.2	2.6	<10								
Ethylbenzene	µg/L	16	17	<1.0	11								
o-Xylene	µg/L	13	18	1.1	12								
p+m-Xylene	µg/L	27	40	2.5	27								
Toluene	µg/L	71	49	4.2	55								
Dichloromethane	µg/L		<2.0		<100								
Vinyl Chloride	µg/L		1.7		<10								

Notes: 1) µg/L denotes micrograms per litre.
2) MAXXAM denotes chemical analytical testing was completed by Maxxam Analytics Inc.

Table A-2
Leachate - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PS1	PS1	PS1	PS1	PS1	PS1	PS1	PS1	PS1			
Date		07-May-14	19-May-15	31-May-16	26-May-17	11-May-18	15-May-19	12-May-20	18-May-21	10-May-22			
Laboratory		Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Bureau Veritas	Bureau Veritas	Bureau Veritas			
Benzo(a)pyrene	µg/L	<8	<4.0	<4.0	<2.0	<4.0	<4.0	<20	<0.80	<2.0			
1,2-Dichlorobenzene	µg/L	<20	<10	<10	<5.0	<10	<10	<50	<2.0	<5.0			
1,3-Dichlorobenzene	µg/L	<20	<10	<10	<5.0	<10	<10	<50	<2.0	<5.0			
1,4-Dichlorobenzene	µg/L	<20	<10	<10	<5.0	<10	<10	<50	<2.0	<5.0			
Hexachlorobenzene	µg/L	<20	<10	<10	<5.0	<10	<10	<50	<2.0	<5.0			
1,2,4-Trichlorobenzene	µg/L	<20	<10	<10	<5.0	<10	<10	<50	<2.0	<5.0			
2,4-Dichlorophenol	µg/L	<10	<6.0	<6.0	<3.0	<6.0	<6.0	<50	<1.2	<3.0			
Pentachlorophenol	µg/L	<100	<50	<50	<10	<14	<120	<30	<4.0	<10			
Phenol	µg/L	170	<10	<10	<5.0	16.0	<10	<100	7.2	<5.0			
2,4,6-Trichlorophenol	µg/L	<20	<10	<10	<5.0	<10	<10	<50	<2.0	<5.0			
Di-N-butyl phthalate	µg/L	<80	<40	<40	<20	<40	<40	<50	<8.0	<20			
Diethyl phthalate	µg/L	<40	<20	<20	<10	<20	<20	<200	<4.0	<10			
Dimethyl phthalate	µg/L	<40	<20	<20	<10	<20	<20	<100	<4.0	<10			
Benzene	µg/L	<2.0	<0.50	2.8	<10	<10	<2.0	<2.0	<10	2.5			
Ethylbenzene	µg/L	4.9	<0.50	5.5	<10	11.0	2.8	2.4	<10	3.2			
o-Xylene	µg/L	<2.0	<0.50	6.3	<10	12.0	2.6	2.5	<10	2.8			
p+m-Xylene	µg/L	2.8	<0.50	15	<10	25.0	9.0	6.3	<10	5.2			
Toluene	µg/L	20.0	5.0	37.0	12.0	44.0	7.7	6.3	16	11			
Dichloromethane	µg/L	40.0	<2.5	<13	<100	<100	<20	<20	<100	<20			
Vinyl Chloride	µg/L	<4.0	<1.0	<5.0	<10	<10	<2.0	<2.0	<10	<2.0			

Parameter	Units	PS3	PS3	PS3	PS3	PS3	PS3	PS3	PS3	PS3			
Date		07-May-14	27-May-15	31-May-16	26-May-17	11-May-18	15-May-19	12-May-20	19-May-21	10-May-22			
Laboratory		Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Bureau Veritas	Bureau Veritas	Bureau Veritas			
Benzo(a)pyrene	µg/L	<3	<10	<4.0	<2.0	<2.0	<0.80	<20	<2.0	<2.0			
1,2-Dichlorobenzene	µg/L	<8	<25	<10	<5.0	<5.0	<2.0	<50	<5.0	<5.0			
1,3-Dichlorobenzene	µg/L	<8	<25	<10	<5.0	<5.0	<2.0	<50	<5.0	<5.0			
1,4-Dichlorobenzene	µg/L	<8	<25	<10	<5.0	<5.0	<2.0	<50	<5.0	<5.0			
Hexachlorobenzene	µg/L	<8	<25	<10	<5.0	<5.0	<2.0	<50	<5.0	<5.0			
1,2,4-Trichlorobenzene	µg/L	<8	<25	<10	<5.0	<5.0	<2.0	<50	<5.0	<5.0			
2,4-Dichlorophenol	µg/L	<5	<15	<6.0	<3.0	<3.0	<1.2	<30	<3.0	<3.0			
Pentachlorophenol	µg/L	<20	<50	<50	<10	<70	<25	<100	<10	<10			
Phenol	µg/L	290.0	<25	490.0	<5.0	<5.0	<2.0	<50	<5.0	<5.0			
2,4,6-Trichlorophenol	µg/L	<8	<25	<10	<5.0	<5.0	<2.0	<50	<5.0	<5.0			
Di-N-butyl phthalate	µg/L	<30	<100	<40	<20	<20	<8.0	<200	<20	<20			
Diethyl phthalate	µg/L	43.0	<50	24.0	<10	<10	<4.0	<100	<10	<10			
Dimethyl phthalate	µg/L	<20	<50	<20	<10	<10	<4.0	<2.0	<10	<10			
Benzene	µg/L	<5.0	4.9	<25	<10	<10	4.3	<2.0	<10	<10			
Ethylbenzene	µg/L	<5.0	9.3	<25	<10	<10	3.6	<2.0	<10	<10			
o-Xylene	µg/L	6.6	12.0	<25	<10	<10	3.7	<2.0	<10	<10			
p+m-Xylene	µg/L	13.0	24.0	26.0	<10	<10	7.2	<2.0	<10	<10			
Toluene	µg/L	120.0	52.0	180.0	<10	<10	68.0	2.4	<10	<10			
Dichloromethane	µg/L	470.0	<5.0	<130	<100	<100	<20	<20	<100	<100			
Vinyl Chloride	µg/L	<10	3.4	<50	<10	<10	<2.0	<2.0	<10	<10			

Notes: 1) µg/L denotes micrograms per litre.
2) MAXXAM denotes chemical analytical testing was completed by Maxxam Analytics Inc.

Table A-2
Leachate - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PS5	PS5	PS5									
Date		12-May-20	19-May-21	10-May-22									
Laboratory		Bureau Veritas	Bureau Veritas	Bureau Veritas									
Benzo(a)pyrene	µg/L	<20	<0.20	<2.0									
1,2-Dichlorobenzene	µg/L	<50	<0.50	<5.0									
1,3-Dichlorobenzene	µg/L	<50	<0.50	<5.0									
1,4-Dichlorobenzene	µg/L	<50	<1.0	<5.0									
Hexachlorobenzene	µg/L	<50	<0.50	<5.0									
1,2,4-Trichlorobenzene	µg/L	<50	<0.50	<5.0									
2,4-Dichlorophenol	µg/L	<30	<0.30	<3.0									
Pentachlorophenol	µg/L	<100	<1.0	<10									
Phenol	µg/L	800	<3.0	<5.0									
2,4,6-Trichlorophenol	µg/L	<50	<0.50	<5.0									
Di-N-butyl phthalate	µg/L	<200	<2.0	<20									
Diethyl phthalate	µg/L	<100	1	<10									
Dimethyl phthalate	µg/L	<100	<1.0	<10									
Benzene	µg/L	2.5	4.3	<2.0									
Ethylbenzene	µg/L	7.3	10	<2.0									
o-Xylene	µg/L	9.2	9.2	2.3									
p+m-Xylene	µg/L	19	22	6.3									
Toluene	µg/L	87	1700	6.1									
Dichloromethane	µg/L	<20	<20	<20									
Vinyl Chloride	µg/L	<2.0	2.2	<2.0									

Notes: 1) µg/L denotes micrograms per litre.
2) MAXXAM denotes chemical analytical testing was completed by Maxxam Analytics Inc.

B

Surface Water Chemical Results

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Downstream of Landfill 60 m East of Lambton Rd. 79 - SS1									
Date						4-Apr-03	13-Jun-03	15-Oct-03	3-Nov-03	30-Dec-03	3-May-04	31-Jul-04	1-Dec-04	2-Apr-05	9-Nov-05
Laboratory						Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest
Routine/Verification Event															
Alkalinity (as $CaCO_3$)	mg/L	<25%***	55	270	118	71	138	134	112	109	170	222	184	125	182
Conductivity	umho/cm		225	1500	492										
Dissolved Chloride (Cl)	mg/L		4	180	17	14	35	168	15	10	7	24	17	12	24
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001										
Dissolved Sulphate (SO_4)	mg/L		19	660	90	74	53	23	109	94	107	151	122	43	156
Nitrate (N)	mg/L		0.005	23.6	0.38	6.82	0.61	0.28	2.94	1.75	<0.10	23.60	2.02	<0.10	1.94
Nitrite (N)	mg/L		0.005	0.27	0.0127										
pH	(pH units)	6.5-8.5	6.8	8.3	7.9										
Phenols-4AAP	mg/L	0.001	0.0005	0.01	0.0007	0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Ammonia-N	mg/L		0.01	3.21	0.099	0.09	0.07	0.07	0.03	0.03	0.09	0.07	0.03	0.06	0.13
Total Arsenic (As)	mg/L	0.100*	0.0005	0.28	0.0025										
Total Barium (Ba)	mg/L		0.014	3	0.057										
Total BOD	mg/L		1.0	5.0	1.5										
Total Boron (B)	mg/L	0.200	0.010	1.2	0.135	0.08	0.12	0.03	0.16	0.18	0.19	**0.28**	0.12	0.11	**0.24**
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.0040	0.00007										
Total Calcium (Ca)	mg/L		30	2900	78	52	59	44	63	58	71	116	99	51	120
Total Chemical Oxygen Demand (COD)	mg/L		2	300	23										
Total Chromium (Cr)	mg/L	0.0089	0.0005	1.10	0.0058	<0.005	<0.005	0.006	0.002	0.004	<0.005	<0.001	0.002	0.001	<0.001
Total Copper (Cu)	mg/L	0.0050	0.0010	0.880	0.0082										
Total Dissolved Solids	mg/L		84	715	320										
Total Iron (Fe)	mg/L	0.300	0.050	1200	3.38	**0.53**	**0.89**	**0.89**	**1.01**	**0.51**	**0.53**	**0.42**	0.24	**0.39**	0.22
Total Kjeldahl Nitrogen (TKN)	mg/L		0.34	14	0.83										
Total Lead (Pb)	mg/L	0.005	0.0003	0.420	0.002										
Total Magnesium (Mg)	mg/L		8	650	23	13	15	8	17	16	19	30	23	13	25
Total Nickel (Ni)	mg/L	0.025	0.00050	1.60	0.0076	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total Phosphorus	mg/L	0.02*	0.04	16.0	0.18										
Total Potassium (K)	mg/L		1.9	110	6.2	5	9	9	4	6	3	7	6	3	3.0
Total Sodium (Na)	mg/L		2.8	128	13	8	22	128	10	10	11	18	12	10	17.0
Total Suspended Solids	mg/L		4	32000	106										
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.08	0.004	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Total Zinc (Zn)	mg/L	0.020	0.0025	2.7	0.016	<0.005	<0.005	**0.06**	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01
Ion Percentage	%		0.001	47.5	3.0	5.5	2.7	2.3	0.7	2.1	0.8	2.9	3.0	2.7	4.1

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" Denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Downstream of Landfill 60 m East of Lambton Rd. 79 - SS1									
Date						18-Jan-06	9-Mar-06	5-Oct-06	17-Nov-06	2-Mar-07	9-Jan-08	19-Mar-08	11-Apr-08	12-May-08	14-Jun-08
Laboratory						Accutest	Accutest	Accutest	Accutest	Accutest	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Routine/Verification Event															
Alkalinity (as $CaCO_3$)	mg/L	<25%***	55	270	118	105	56	177	150	162		90	180	256	254
Conductivity	umho/cm		225	1500	492							298		661	700
Dissolved Chloride (Cl)	mg/L		4	180	17	18	15	35	25	18	26	13	22	18	22
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001							<0.0002	<0.0002	<0.0002	<0.0002
Dissolved Sulphate (SO_4)	mg/L		19	660	90	102	40	122	78	64	98	41	84	75	95
Nitrate (N)	mg/L		0.005	23.6	0.38	3.09	2.79	<0.10	1.31	1.76	6.70	1.50	<0.1	0.40	<0.1
Nitrite (N)	mg/L		0.005	0.27	0.0127							0.02	<0.01	<0.01	<0.01
pH	(pH units)	6.5-8.5	6.8	8.3	7.9							8.1		8.2	8.1
Phenols-4AAP	mg/L	0.001	0.0005	0.01	0.0007	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	**0.003**
Total Ammonia-N	mg/L		0.01	3.21	0.099	0.04	0.28	0.03	0.05	0.69		0.09	<0.05	<0.15	<0.15
Total Arsenic (As)	mg/L	0.100*	0.0005	0.28	0.0025							0.002	0.001	<0.001	0.003
Total Barium (Ba)	mg/L		0.014	3	0.057							0.052	0.037	0.042	0.037
Total BOD	mg/L		1.0	5.0	1.5							<2	<2	3	3
Total Boron (B)	mg/L	0.200	0.010	1.2	0.135	0.18	0.05	**0.21**	**0.26**	0.11	0.19	0.10	**0.23**	**0.23**	**0.36**
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.0040	0.00007							<0.0001	<0.0001	<0.0001	<0.0001
Total Calcium (Ca)	mg/L		30	2900	78	54	30	93	69	68	65	38	82	90	100
Total Chemical Oxygen Demand (COD)	mg/L		2	300	23							26		41	45
Total Chromium (Cr)	mg/L	0.0089	0.0005	1.10	0.0058	0.002	0.002	0.002	0.001	0.001	**0.009**	**0.010**	<0.005	<0.005	<0.005
Total Copper (Cu)	mg/L	0.0050	0.0010	0.880	0.0082							**0.006**	0.002	0.003	0.002
Total Dissolved Solids	mg/L		84	715	320							204	355	440	444
Total Iron (Fe)	mg/L	0.300	0.050	1200	3.38	**0.36**	**0.78**	0.23	**0.38**	**0.38**	**3.60**	**5.00**	**1.00**	**1.00**	**0.4**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.34	14	0.83							1.1	0.8	2.0	<1
Total Lead (Pb)	mg/L	0.005	0.0003	0.420	0.002							0.004	0.0007	0.0007	<0.0005
Total Magnesium (Mg)	mg/L		8	650	23	15	8	22	19	18	17	10	21	25	24
Total Nickel (Ni)	mg/L	0.025	0.00050	1.60	0.0076	<0.005	<0.005	<0.005	<0.005	<0.005	0.007	0.008	0.002	0.003	0.003
Total Phosphorus	mg/L	0.02*	0.04	16.0	0.18							**0.13**	**0.08**		**0.14**
Total Potassium (K)	mg/L		1.9	110	6.2	3.0	5.0	7.0	5.0	5.0	4.3	3.3	4.1	8.6	4.3
Total Sodium (Na)	mg/L		2.8	128	13	12.0	9.0	19.0	17.0	15.0	16.0	7.7	17.0	17.0	19.0
Total Suspended Solids	mg/L		4	32000	106							67.0	14.0	34.0	4
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.08	0.004	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Total Zinc (Zn)	mg/L	0.020	0.0025	2.7	0.016	<0.01	0.01	<0.01	<0.01	<0.01	0.02	**0.03**	<0.01	<0.01	<0.01
Ion Percentage	%		0.001	47.5	3.0	1.3	3.1	1.4	2.5	2.8	16.4	1.0	2.9	1.2	0.7

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" Denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Downstream of Landfill 60 m East of Lambton Rd. 79 - SS1									
Date						17-Jun-08	28-Jun-08	23-Jul-08	4-Nov-08	5-Dec-08	12-Feb-09	8-Mar-09	6-Apr-09	26-Apr-09	9-May-09
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Routine/Verification Event															
Alkalinity (as $CaCO_3$)	mg/L	<25%***	55	270	118		242	196	68	170	88	83	75	168	97
Conductivity	umho/cm		225	1500	492		629	469	268	424	229	225	254	367	274
Dissolved Chloride (Cl)	mg/L		4	180	17	30	24	15	4	5	7	6	5	6	4
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001		<0.0002	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002
Dissolved Sulphate (SO_4)	mg/L		19	660	90		72	30	50	44	27	27	45	27	44
Nitrate (N)	mg/L		0.005	23.6	0.38		<0.1	<0.1	1.7	0.3	0.7	0.8	0.7	0.3	0.9
Nitrite (N)	mg/L		0.005	0.27	0.0127		<0.01	<0.01	0.02	<0.01	0.01	0.02	0.01	0.02	0.03
pH	(pH units)	6.5-8.5	6.8	8.3	7.9	8.0	8.2	8.2	8.0	8.0	7.7	7.1	7.5	8.0	6.8
Phenols-4AAP	mg/L	0.001	0.0005	0.01	0.0007	**0.006**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Ammonia-N	mg/L		0.01	3.21	0.099		<0.15	<0.15	0.55	<0.15	0.16	<0.15	<0.15	<0.15	0.36
Total Arsenic (As)	mg/L	0.100*	0.0005	0.28	0.0025		0.003	0.002	**0.190**	0.001	0.007	0.004	0.018	0.009	0.002
Total Barium (Ba)	mg/L		0.014	3	0.057		0.030	0.026	2.400	0.051	0.095	0.057	0.240	0.110	0.630
Total BOD	mg/L		1.0	5.0	1.5		<2	2	<2	<2	<2	<2	<2	<2	<2
Total Boron (B)	mg/L	0.200	0.010	1.2	0.135		**0.28**	**0.2**	**0.4**	0.07	0.07	0.06	0.06	0.06	0.09
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.0040	0.00007		<0.0001	<0.0001	**0.003**	<0.0001	0.0001	<0.0001	**0.0003**	**0.0001**	**0.0011**
Total Calcium (Ca)	mg/L		30	2900	78		82	59	970	61	45	34	120	76	380
Total Chemical Oxygen Demand (COD)	mg/L		2	300	23		41	37	300	16	16	16	40	35	130
Total Chromium (Cr)	mg/L	0.0089	0.0005	1.10	0.0058		<0.005	<0.005	**0.67**	0.008	**0.023**	**0.012**	**0.071**	**0.028**	**0.061**
Total Copper (Cu)	mg/L	0.0050	0.0010	0.880	0.0082		0.002	<0.002	**0.550**	0.003	**0.020**	**0.010**	**0.047**	**0.022**	**0.086**
Total Dissolved Solids	mg/L		84	715	320		415	310	180	280	142	150	165	230	180
Total Iron (Fe)	mg/L	0.300	0.050	1200	3.38		**0.9**	**0.9**	**690.0**	**4.0**	**23.0**	**13.0**	**70.0**	**27.0**	**140.0**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.34	14	0.83		1.3	1.3	14.0	0.5	1.8	1.3	3.0	1.8	8.0
Total Lead (Pb)	mg/L	0.005	0.0003	0.420	0.002		0.001	<0.0005	**0.260**	0.002	**0.010**	0.004	**0.024**	**0.010**	**0.067**
Total Magnesium (Mg)	mg/L		8	650	23		22	19	280	16	14	9.2	35	21	83
Total Nickel (Ni)	mg/L	0.025	0.00050	1.60	0.0076		0.003	0.002	**0.90**	0.005	**0.030**	0.017	**0.091**	**0.037**	**0.130**
Total Phosphorus	mg/L	0.02*	0.04	16.0	0.18		**0.10**	**0.22**	**9.30**	<0.15	**0.31**	**0.22**	**0.79**	**0.48**	**3.2**
Total Potassium (K)	mg/L		1.9	110	6.2		3.4	3.8	84.0	4.2	5.7	4.3	9.7	6.4	13.0
Total Sodium (Na)	mg/L		2.8	128	13		17.0	13.0	10.0	5.5	5.4	4.4	2.8	5.2	4.9
Total Suspended Solids	mg/L		4	32000	106		19	19	13000	45	330	300	1400	630	8400
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.08	0.004		<0.02	<0.02	**0.03**	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Total Zinc (Zn)	mg/L	0.020	0.0025	2.7	0.016		<0.01	<0.01	**1.60**	0.01	**0.06**	**0.03**	**0.15**	**0.60**	**0.26**
Ion Percentage	%		0.001	47.5	3.0	50.0	1.2	1.1	48.3	1.5	10.8	3.8	29.5	9.9	40.9

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" Denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Downstream of Landfill 60 m East of Lambton Rd. 79 - SS1									
Date						9-Aug-09	10-Oct-09	25-Jan-10	6-Apr-10	16-Jul-10	14-Oct-10	6-Nov-10	28-Feb-11	20-Apr-11	9-Aug-11
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Routine/Verification Event															
Alkalinity (as $CaCO_3$)	mg/L	<25%***	55	270	118	86	139	94	104	141	109	104	114	132	144
Conductivity	umho/cm		225	1500	492	447	578	479	917	700	484	455	490	526	545
Dissolved Chloride (Cl)	mg/L		4	180	17	7	11	31	180	35	32	17	45	29	33
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Dissolved Sulphate (SO_4)	mg/L		19	660	90	120	120	88	78	160	79	92	50	90	81
Nitrate (N)	mg/L		0.005	23.6	0.38	3.0	4.9	1.7	2.0	0.3	<0.1	<0.1	0.8	<0.1	<0.1
Nitrite (N)	mg/L		0.005	0.27	0.0127	0.10	0.01	0.03	0.02	0.04	<0.01	0.02	0.01	0.01	<0.01
pH	(pH units)	6.5-8.5	6.8	8.3	7.9	7.8	7.8	7.9	7.9	7.9	7.9	8.0	7.9	8.1	8.0
Phenols-4AAP	mg/L	0.001	0.0005	0.01	0.0007	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001
Total Ammonia-N	mg/L		0.01	3.21	0.099	<0.15	<0.15	0.17	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
Total Arsenic (As)	mg/L	0.100*	0.0005	0.28	0.0025	0.002	<0.001	0.001	0.001	0.001	0.003	0.001	<0.001	0.001	0.002
Total Barium (Ba)	mg/L		0.014	3	0.057	0.045	0.033	0.045	0.050	0.044	0.083	0.028	0.044	0.033	0.038
Total BOD	mg/L		1.0	5.0	1.5	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Boron (B)	mg/L	0.200	0.010	1.2	0.135	0.07	0.07	0.13	0.07	0.19	0.07	0.09	0.06	0.19	0.090
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.0040	0.00007	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Calcium (Ca)	mg/L		30	2900	78	58	74	54	98	100	65	62	56	67	72
Total Chemical Oxygen Demand (COD)	mg/L		2	300	23	20	16	14	30	31	19	21	19	23	22
Total Chromium (Cr)	mg/L	0.0089	0.0005	1.10	0.0058	<0.005	<0.005	0.006	<0.005	<0.005	**0.013**	<0.005	<0.005	<0.005	<0.005
Total Copper (Cu)	mg/L	0.0050	0.0010	0.880	0.0082	0.005	0.004	0.004	0.003	**0.006**	**0.006**	0.003	0.002	0.003	0.005
Total Dissolved Solids	mg/L		84	715	320	290	370	315	600	450	300	282	284	306	382
Total Iron (Fe)	mg/L	0.300	0.050	1200	3.38	**4.1**	**1.7**	**3.8**	**2.0**	**0.7**	**7.3**	**2.2**	**1.4**	**1.8**	**1.9**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.34	14	0.83	1.0	1.0	1.1	1.1	0.9	0.8	0.9	0.9	1.1	0.9
Total Lead (Pb)	mg/L	0.005	0.0003	0.420	0.002	0.001	0.001	0.002	0.001	<0.0005	0.003	0.001	0.001	0.001	0.001
Total Magnesium (Mg)	mg/L		8	650	23	15	18	18	25	22	15	19	14	20	15
Total Nickel (Ni)	mg/L	0.025	0.00050	1.60	0.0076	0.007	0.002	0.006	0.002	0.002	0.009	0.004	0.003	0.004	0.003
Total Phosphorus	mg/L	0.02*	0.04	16.0	0.18	**0.09**	**0.09**	**0.10**	**0.07**	**0.08**	**0.20**	**0.08**	**0.05**	**0.07**	**0.10**
Total Potassium (K)	mg/L		1.9	110	6.2	3.4	2.4	5.4	4.7	3.6	9.3	3.1	3.6	3.6	4.5
Total Sodium (Na)	mg/L		2.8	128	13	6.6	6.5	18.0	51.0	19.0	16.0	14.0	23.0	20.0	20
Total Suspended Solids	mg/L		4	32000	106	90	32	65	37	16	38	36	15	35	33
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.08	0.004	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Total Zinc (Zn)	mg/L	0.020	0.0025	2.7	0.016	<0.01	<0.01	0.01	0.01	<0.01	0.02	0.02	<0.01	0.01	<0.01
Ion Percentage	%		0.001	47.5	3.0	0.4	0.4	2.7	1.5	2.0	3.6	4.6	2.4	2.8	1.4

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" Denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Downstream of Landfill 60 m East of Lambton Rd. 79 - SS1									
Date						20-Oct-11	23-Nov-11	6-Dec-11	13-Mar-12	22-Jun-12	30-Oct-12	21-Dec-12	13-Jan-13	30-Jan-13	10-Apr-13
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Routine/Verification Event															
Alkalinity (as $CaCO_3$)	mg/L	<25%***	55	270	118	149	116	121	120	150	110	140	93	95	94
Conductivity	umho/cm		225	1500	492	408	423	406	490	590	470	660	380	330	360
Dissolved Chloride (Cl)	mg/L		4	180	17	17	17	12	20	29	18	25	13	14	17
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Sulphate (SO_4)	mg/L		19	660	90	37	68	61	99	100	87	160	75	55	60
Nitrate (N)	mg/L		0.005	23.6	0.38	<0.1	0.7	0.3	0.5	<0.10	0.48	0.36	0.64	0.51	0.54
Nitrite (N)	mg/L		0.005	0.27	0.0127	<0.01	0.01	<0.01	<0.010	<0.010	<0.010	<0.010	<0.010	0.075	0.026
pH	(pH units)	6.5-8.5	6.8	8.3	7.9	8.0	8.0	7.9	8.0	8.0	7.4	7.8	7.7	7.5	7.9
Phenols-4AAP	mg/L	0.001	0.0005	0.01	0.0007	**0.002**	<0.001	**0.004**	**0.0013**	<0.0010	<0.0010	<0.0010	<0.0010	**0.004**	<0.0010
Total Ammonia-N	mg/L		0.01	3.21	0.099	<0.15	<0.15	<0.15	<0.15	<0.15	0.29	<0.15	<0.15	0.29	<0.15
Total Arsenic (As)	mg/L	0.100*	0.0005	0.28	0.0025	0.002	0.003	0.004	0.002	0.002	0.026	0.002	0.003	0.003	0.004
Total Barium (Ba)	mg/L		0.014	3	0.057	0.032	0.057	0.110	0.053	0.041	0.320	0.047	0.059	0.048	0.058
Total BOD	mg/L		1.0	5.0	1.5	2	3	5	<2.0	<2.0	2.0	<2.0	<2.0	4	<2.0
Total Boron (B)	mg/L	0.200	0.010	1.2	0.135	0.040	0.160	**0.220**	0.190	0.170	0.170	0.180	0.140	0.120	0.080
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.0040	0.00007	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	**0.0004**	<0.0001	<0.0001	<0.0001	<0.0001
Total Calcium (Ca)	mg/L		30	2900	78	53	60	55	63	75	310	90	56	57	58
Total Chemical Oxygen Demand (COD)	mg/L		2	300	23	28	32	25	27	39	90	22	28	22	34
Total Chromium (Cr)	mg/L	0.0089	0.0005	1.10	0.0058	<0.005	0.010	**0.025**	0.007	<0.005	**0.13**	0.005	**0.012**	**0.010**	**0.0130**
Total Copper (Cu)	mg/L	0.0050	0.0010	0.880	0.0082	0.005	**0.009**	**0.008**	**0.007**	**0.006**	**0.091**	0.005	**0.009**	**0.011**	**0.013**
Total Dissolved Solids	mg/L		84	715	320	298	258	286	378	398	296	348	332	256	288
Total Iron (Fe)	mg/L	0.300	0.050	1200	3.38	**2.6**	**9.6**	**12**	**7.0**	**1.3**	**120.0**	**4.3**	**11.0**	**9.5**	**13.0**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.34	14	0.83	1.0	2.0	2.0	1.3	0.9	2.3	1.2	1.9	1.6	1.9
Total Lead (Pb)	mg/L	0.005	0.0003	0.420	0.002	0.001	0.004	0.004	0.003	0.001	**0.047**	0.002	0.005	0.004	**0.006**
Total Magnesium (Mg)	mg/L		8	650	23	12	16	18	19	18	77	29	17	16	14
Total Nickel (Ni)	mg/L	0.025	0.00050	1.60	0.0076	0.004	0.013	0.015	0.009	0.003	**0.18**	0.007	0.014	0.014	0.021
Total Phosphorus	mg/L	0.02*	0.04	16.0	0.18	**0.20**	**0.30**	**0.30**	**0.19**	**0.05**	**2.20**	**0.10**	**0.24**	**0.29**	**0.45**
Total Potassium (K)	mg/L		1.9	110	6.2	6.0	8.0	11.0	4.9	4.7	17.0	5.3	5.5	7.1	7.9
Total Sodium (Na)	mg/L		2.8	128	13	12	11	11	15	21	15	20	11	9.8	7.2
Total Suspended Solids	mg/L		4	32000	106	39	120	100	75	20	2200	65	170	180	1900
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.08	0.004	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Total Zinc (Zn)	mg/L	0.020	0.0025	2.7	0.016	0.010	**0.030**	**0.030**	**0.030**	0.010	**0.300**	0.020	**0.040**	**0.040**	**0.050**
Ion Percentage	%		0.001	47.5	3.0	0.5	4.5	5.8	2.2	1.5	34.6	3.6	6.3	8.6	6.2

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" Denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Downstream of Landfill 60 m East of Lambton Rd. 79 - SS1									
Date						**29-May-13**	**5-Jul-13**	**12-Sep-13**	**7-Oct-13**	**11-Jan-14**	**8-Apr-14**	**30-Apr-14**	**7-Jul-14**	**6-Sep-14**	**25-Dec-14**
Laboratory						**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**
Routine/Verification Event										**Routine**	**Routine**	**Verification**	**Routine**	**Verification**	**Routine**
Alkalinity (as $CaCO_3$)	mg/L	<25%***	55	270	118	61	94	120	140	94	160	140	100	88	120
Conductivity	umho/cm		225	1500	492	330	300	470	480	250	460	460	580	400	470
Dissolved Chloride (Cl)	mg/L		4	180	17	10	24	20	18	8	18	13	20	15	15
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Sulphate (SO_4)	mg/L		19	660	90	81	40	81	77	19	48	76	170	81	91
Nitrate (N)	mg/L		0.005	23.6	0.38	0.18	<0.10	<0.10	<0.10	0.64	0.14	0.84	<0.10	0.79	1.35
Nitrite (N)	mg/L		0.005	0.27	0.0127	<0.010	<0.010	<0.010	<0.010	0.015	0.024	0.012	<0.010	0.038	0.017
pH	(pH units)	6.5-8.5	6.8	8.3	7.9	7.9	8.2	8.0	8.0	8.1	8.2	8.1	7.7	7.8	7.9
Phenols-4AAP	mg/L	0.001	0.0005	0.01	0.0007	<0.0010	<0.0010	<0.0010	<0.0010	0.0012	**0.0032**	<0.0010	**0.0016**	<0.0010	<0.001
Total Ammonia-N	mg/L		0.01	3.21	0.099	<0.15	<0.15	<0.15	<0.15	0.26	<0.15	<0.15	<0.15	0.15	<0.15
Total Arsenic (As)	mg/L	0.100*	0.0005	0.28	0.0025	0.002	0.004	0.003	0.002	<0.001	0.001	0.001	0.002	0.004	0.003
Total Barium (Ba)	mg/L		0.014	3	0.057	0.024	0.062	0.033	0.041	0.014	0.027	0.038	0.048	0.064	0.100
Total BOD	mg/L		1.0	5.0	1.5	<2.0	2.0	<2.0	3.0	3.0	<2.0	<2.0	<2.0	2.0	3.0
Total Boron (B)	mg/L	0.200	0.010	1.2	0.135	0.190	0.080	**0.330**	**0.270**	<0.02	0.070	0.180	0.110	0.190	0.13
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.0040	0.00007	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Calcium (Ca)	mg/L		30	2900	78	40	55	54	58	32	63	67	74	60	61
Total Chemical Oxygen Demand (COD)	mg/L		2	300	23	26	25	32	28	25	29	28	21	27	23
Total Chromium (Cr)	mg/L	0.0089	0.0005	1.10	0.0058	<0.005	**0.0140**	<0.005	<0.005	<0.005	<0.005	<0.005	0.0050	**0.0120**	**0.0190**
Total Copper (Cu)	mg/L	0.0050	0.0010	0.880	0.0082	0.005	**0.020**	0.004	0.002	<0.002	0.003	**0.013**	**0.009**	**0.011**	**0.010**
Total Dissolved Solids	mg/L		84	715	320	206	312	286	282	84	326	324	392	294	354
Total Iron (Fe)	mg/L	0.300	0.050	1200	3.38	**2.50**	**14.0**	**1.70**	**1.40**	**0.38**	**2.00**	**3.40**	**5.20**	**12.0**	**11.0**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.34	14	0.83	0.8	1.6	2.0	1.2	1.1	1.5	1.2	1.2	1.3	1.20
Total Lead (Pb)	mg/L	0.005	0.0003	0.420	0.002	0.001	**0.011**	0.001	0.001	<0.0005	0.001	0.002	0.002	0.004	0.004
Total Magnesium (Mg)	mg/L		8	650	23	16	13	21	18	9.5	16	18	16	19	20
Total Nickel (Ni)	mg/L	0.025	0.00050	1.60	0.0076	0.005	0.022	0.005	0.004	<0.001	0.004	0.012	0.008	0.016	0.013
Total Phosphorus	mg/L	0.02*	0.04	16.0	0.18	**0.09**	**0.64**	**0.17**	**0.10**	**0.20**	**0.07**	**0.11**	**0.21**	**0.25**	**0.22**
Total Potassium (K)	mg/L		1.9	110	6.2	1.9	9.4	6.9	6.5	7.0	3.9	4.8	6.0	8.0	11.0
Total Sodium (Na)	mg/L		2.8	128	13	11.0	16.0	17.0	16.0	4.1	12.0	12.0	16.0	11.0	8.1
Total Suspended Solids	mg/L		4	32000	106	51	710	37	29	6	24	45	98	260	180
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.08	0.004	<0.02	<0.0092	<0.0053	<0.0019	0.0044	<0.0023	<0.003	<0.0051	0.0039	<0.0034
Total Zinc (Zn)	mg/L	0.020	0.0025	2.7	0.016	<0.01	**0.100**	<0.01	<0.01	<0.01	0.010	0.010	0.010	**0.040**	**0.030**
Ion Percentage	%		0.001	47.5	3.0	4.7	9.0	3.6	1.7	2.5	2.0	3.7	1.2	7.9	3.2

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" Denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Downstream of Landfill 60 m East of Lambton Rd. 79 - SS1									
Date						**4-Jan-15**	**10-Apr-15**	**1-Jun-15**	**3-Aug-15**	**22-Dec-15**	**25-Feb-16**	**7-Apr-16**	**14-Jul-16**	**3-Nov-16**	**27-Dec-16**
Laboratory						**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**
Routine/Verification Event						**Routine**	**Routine/ Verification**	**Verification**	**Routine**	**Routine**	**Routine**	**Routine**	**Routine**	**Routine**	**Verification**
Alkalinity (as $CaCO_3$)	mg/L	<25%***	55	270	118	130	100	95	100	170	110	130	110	160	120
Conductivity	umho/cm		225	1500	492	460	310	480	510	840	450	400	600	560	440
Dissolved Chloride (Cl)	mg/L		4	180	17	12	9	12	21	36	9.6	6.1	13	12	11.0
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	*<0.00010*
Dissolved Sulphate (SO_4)	mg/L		19	660	90	86	45	120	130	220	95	69	170	100	83
Nitrate (N)	mg/L		0.005	23.6	0.38	0.84	1.02	<0.10	<0.10	1.33	1.20	0.59	0.018	0.34	0.87
Nitrite (N)	mg/L		0.005	0.27	0.0127	0.018	0.023	<0.010	<0.010	0.024	<0.010	<0.010	0.270	0.027	0.024
pH	(pH units)	6.5-8.5	6.8	8.3	7.9	8.3	7.0	7.9	7.8	8.1	8.1	7.9	7.9	8.0	8.0
Phenols-4AAP	mg/L	0.001	0.0005	0.01	0.0007	**0.0058**	**0.0012**	<0.0010	<0.0010	**0.0015**	<0.0010	<0.0010	<0.0040	<0.0040	*<0.004*
Total Ammonia-N	mg/L		0.01	3.21	0.099	0.16	<0.15	0.15	<0.15	<0.15	<0.15	<0.15	<0.15	3.21	1.42
Total Arsenic (As)	mg/L	0.100*	0.0005	0.28	0.0025	<0.001	0.007	0.001	0.002	<0.001	0.002	0.003	0.001	0.003	0.002
Total Barium (Ba)	mg/L		0.014	3	0.057	0.032	0.110	0.027	0.038	0.035	0.077	0.048	0.047	0.037	0.044
Total BOD	mg/L		1.0	5.0	1.5	3.0	2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0
Total Boron (B)	mg/L	0.200	0.010	1.2	0.135	0.06	0.11	0.10	0.07	0.05	0.13	0.10	0.10	**1.2**	**0.500**
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.0040	0.00007	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Calcium (Ca)	mg/L		30	2900	78	61	54	60	69	100	60	63	79	60	44
Total Chemical Oxygen Demand (COD)	mg/L		2	300	23	21	24	22	13	25	22	34	22	31	26
Total Chromium (Cr)	mg/L	0.0089	0.0005	1.10	0.0058	<0.005	**0.0250**	<0.005	<0.005	<0.005	**0.0130**	**0.0090**	<0.005	0.0050	0.0070
Total Copper (Cu)	mg/L	0.0050	0.0010	0.880	0.0082	0.003	**0.017**	0.005	**0.007**	0.004	**0.006**	**0.008**	**0.006**	**0.007**	0.005
Total Dissolved Solids	mg/L		84	715	320	292	240	342	360	510	262	272	418	404	296
Total Iron (Fe)	mg/L	0.300	0.050	1200	3.38	**0.95**	**24.0**	**1.40**	**3.00**	**0.90**	**7.30**	**7.80**	**2.40**	**4.80**	**4.10**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.34	14	0.83	0.83	1.30	0.86	0.34	0.68	0.48	0.49	<0.7	3.60	2.1
Total Lead (Pb)	mg/L	0.005	0.0003	0.420	0.002	0.001	**0.010**	0.001	0.001	<0.0005	0.003	0.003	0.001	0.002	0.002
Total Magnesium (Mg)	mg/L		8	650	23	19	17	18	15	30	18	17	21	21	15
Total Nickel (Ni)	mg/L	0.025	0.00050	1.60	0.0076	0.002	**0.032**	0.004	0.005	0.002	0.009	0.011	0.004	0.009	0.006
Total Phosphorus	mg/L	0.02*	0.04	16.0	0.18	**0.10**	**0.47**	**0.10**	**0.09**	**0.04**	**0.16**	**0.21**	**0.15**	**0.08**	**0.14**
Total Potassium (K)	mg/L		1.9	110	6.2	7.4	6.4	2.4	6.1	6.3	7.7	4.7	8.4	9.0	7.5
Total Sodium (Na)	mg/L		2.8	128	13	7.4	5.3	11.0	15.0	30.0	7.5	6.6	13.0	24.0	11.0
Total Suspended Solids	mg/L		4	32000	106	13	220	26	54	20	78	130	160	150	78
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.08	0.004	0.004	<0.0031	0.0049	<0.0053	<0.003	<0.0013	<0.0005	<0.0052	**0.082**	0.0053
Total Zinc (Zn)	mg/L	0.020	0.0025	2.7	0.016	<0.01	**0.060**	<0.01	<0.01	<0.01	0.020	0.020	<0.01	0.010	0.010
Ion Percentage	%		0.001	47.5	3.0	2.1	9.1	1.4	0.8	0.3	3.0	4.3	1.3	1.7	2.2

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" Denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Downstream of Landfill 60 m East of Lambton Rd. 79 - SS1									
Date						**12-Jan-17**	**8-Feb-17**	**6-Apr-17**	**13-Jul-17**	**19-Nov-17**	**23-Jan-18**	**4-Apr-18**	**8-Aug-18**	**26-Sep-18**	**2-Oct-18**
Laboratory						**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**
Routine/Verification Event						**Routine**	**Verification**	**Routine**	**Routine**	**Routine**	**Routine**	**Routine**	**Routine**	**Verification**	**Routine**
Alkalinity (as $CaCO_3$)	mg/L	<25%***	55	270	118	110	120	140	110	100	120	130	93	88	270
Conductivity	umho/cm		225	1500	492	430	440	490	320	620	440	500	400	470	530
Dissolved Chloride (Cl)	mg/L		4	180	17	12.0	9.6	9.7	11.0	11.0	9.0	7.4	16.0	11.0	6.3
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	*<0.00010*	*<0.00010*	*<0.00010*	*<0.0001*	*<0.0001*	*<0.0001*	*<0.0001*	*<0.0001*	*<0.0001*	*<0.0001*
Dissolved Sulphate (SO_4)	mg/L		19	660	90	78	81	91	43	190	74	43	83	130	25
Nitrate (N)	mg/L		0.005	23.6	0.38	0.80	0.90	0.52	<0.10	2.14	1.87	0.87	<0.10	<0.10	<0.10
Nitrite (N)	mg/L		0.005	0.27	0.0127	0.046	0.018	0.015	<0.010	0.011	0.022	0.013	<0.010	0.011	<0.010
pH	(pH units)	6.5-8.5	6.8	8.3	7.9	7.9	7.7	8.1	7.8	8.0	7.9	8.1	7.8	8.1	8.2
Phenols-4AAP	mg/L	0.001	0.0005	0.01	0.0007	*<0.0040*	*<0.0040*	*<0.0040*	*<0.020*	***0.0023***	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Total Ammonia-N	mg/L		0.01	3.21	0.099	1.12	0.37	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
Total Arsenic (As)	mg/L	0.100*	0.0005	0.28	0.0025	0.006	0.002	0.002	0.003	0.001	0.003	0.003	0.026	0.003	<0.001
Total Barium (Ba)	mg/L		0.014	3	0.057	0.140	0.040	0.046	0.049	0.035	0.046	0.053	0.300	0.027	0.027
Total BOD	mg/L		1.0	5.0	1.5	5.0	<2.0	<2.0	5.0	<2.0	<2.0	<2	<2	3.0	<2
Total Boron (B)	mg/L	0.200	0.010	1.2	0.135	**0.400**	0.160	0.150	0.080	0.120	0.100	0.130	0.130	0.170	0.030
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.0040	0.00007	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	**0.0003**	<0.0001	<0.0001
Total Calcium (Ca)	mg/L		30	2900	78	58	52	75	55	86	66	70	180	46	78
Total Chemical Oxygen Demand (COD)	mg/L		2	300	23	36	15	25	40	10	17	13	17	21	29.0
Total Chromium (Cr)	mg/L	0.0089	0.0005	1.10	0.0058	**0.0300**	0.0060	0.0060	**0.0130**	<0.005	**0.0110**	**0.0100**	**0.0900**	<0.005	<0.005
Total Copper (Cu)	mg/L	0.0050	0.0010	0.880	0.0082	**0.014**	0.004	**0.007**	**0.039**	**0.006**	**0.010**	**0.009**	**0.076**	0.004	0.003
Total Dissolved Solids	mg/L		84	715	320	290	294	316	280	285	255	225	270	345	275
Total Iron (Fe)	mg/L	0.300	0.050	1200	3.38	**18.0**	**3.50**	**6.10**	**9.60**	**3.20**	**9.30**	**9.40**	**92.0**	**1.00**	**0.3**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.34	14	0.83	1.9	0.9	0.6	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7
Total Lead (Pb)	mg/L	0.005	0.0003	0.420	0.002	**0.007**	0.002	0.003	**0.016**	0.001	0.004	0.004	**0.031**	0.001	<0.0005
Total Magnesium (Mg)	mg/L		8	650	23	21	16	21	12	26	20	22	45	20	18
Total Nickel (Ni)	mg/L	0.025	0.00050	1.60	0.0076	0.024	0.006	0.010	0.018	0.006	0.013	0.013	**0.120**	0.003	0.001
Total Phosphorus	mg/L	0.02*	0.04	16.0	0.18	**0.34**	**0.09**	**0.15**	**0.30**	**0.08**	**0.18**	**0.17**	**1.10**	**0.04**	**0.10**
Total Potassium (K)	mg/L		1.9	110	6.2	16.0	6.4	5.4	9.0	5.2	5.6	5.2	16.0	4.2	3.5
Total Sodium (Na)	mg/L		2.8	128	13	9.4	6.3	8.2	9.4	12.0	8.0	9.4	13.0	9.8	6.2
Total Suspended Solids	mg/L		4	32000	106	340	75	110	190	81	170	170	2100	26	6
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.08	0.004	0.0027	0.0008	<0.0012	<0.0047	<0.0029	<0.0025	<0.0005	<0.0005	<0.001	<0.00073
Total Zinc (Zn)	mg/L	0.020	0.0025	2.7	0.016	0.050	0.010	0.020	**0.160**	0.010	0.030	**0.030**	**0.210**	<0.01	<0.01
Ion Percentage	%		0.001	47.5	3.0	7.3	0.1	4.8	6.8	3.1	6.8	12.0	28.4	1.8	1.7

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" Denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Downstream of Landfill 60 m East of Lambton Rd. 79 - SS1									
Date						**24-Jan-19**	**17-Apr-19**	**2-Oct-19**	**27-Oct-19**	**11-Jan-20**	**29-Mar-20**	**18-May-20**	**15-Nov-20**	**26-Nov-20**	**26-Mar-21**
Laboratory						**Maxxam**	**Maxxam**	**Bureau Veritas**	**Bureau Veritas**	**Bureau Veritas**	**Bureau Veritas**	**Bureau Veritas**	**Bureau Veritas**	**Bureau Veritas**	**Bureau Veritas**
Routine/Verification Event						**Routine**	**Routine**	**Routine**	**Verification**	**Routine**	**Verification**	**Routine**	**Routine**	**Verification**	**Routine**
Alkalinity (as $CaCO_3$)	mg/L	<25%***	55	270	118	100	130	69	120	120	180	140	110	120	65
Conductivity	umho/cm		225	1500	492	430	610	520	550	570	610	510	440	890	640
Dissolved Chloride (Cl)	mg/L		4	180	17	17.0	19.0	8.5	15.0	24.0	20.0	22.0	28	24	22
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	*<0.0001*	*<0.0001*	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Sulphate (SO_4)	mg/L		19	660	90	73	140	160	130	140	170	93	72	300	230
Nitrate (N)	mg/L		0.005	23.6	0.38	0.74	0.54	0.34	0.23	0.65	0.54	0.17	<0.10	1.09	0.86
Nitrite (N)	mg/L		0.005	0.27	0.0127	0.025	<0.010	<0.010	<0.010	0.014	0.053	<0.010	<0.010	0.031	<0.010
pH	(pH units)	6.5-8.5	6.8	8.3	7.9	7.7	8.2	8.0	8.1	8.0	7.9	8.1	7.9	8.0	8.0
Phenols-4AAP	mg/L	0.001	0.0005	0.01	0.0007	*<0.0010*	*<0.0010*	**0.0012**	<0.0010	<0.0010	<0.0010	<0.0010	*0.0012*	<0.0010	<0.0010
Total Ammonia-N	mg/L		0.01	3.21	0.099	0.50	<0.15	0.19	<0.15	<0.15	0.15	<0.15	<0.15	<0.15	<0.15
Total Arsenic (As)	mg/L	0.100*	0.0005	0.28	0.0025	<0.001	<0.001	0.040	0.002	0.003	0.037	0.002	0.005	0.003	**0.28**
Total Barium (Ba)	mg/L		0.014	3	0.057	0.022	0.026	0.560	0.022	0.062	0.390	0.0350	0.06	0.053	3.0
Total BOD	mg/L		1.0	5.0	1.5	3.0	<2	<2	<2	<2	<2	3.0	5	<2	3
Total Boron (B)	mg/L	0.200	0.010	1.2	0.135	0.090	0.140	**0.300**	0.180	0.140	**0.210**	0.090	0.11	0.17	**0.7**
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.0040	0.00007	<0.0001	<0.0001	<0.001	<0.0001	0.0001	**0.0006**	<0.0001	0.0001	<0.0001	**0.004**
Total Calcium (Ca)	mg/L		30	2900	78	42	66	450	62	87	480	60	63	110	2900
Total Chemical Oxygen Demand (COD)	mg/L		2	300	23	18.0	21.0	5.6	18.0	10.0	<4.0	38.0	38	14	<4.0
Total Chromium (Cr)	mg/L	0.0089	0.0005	1.10	0.0058	<0.005	<0.005	**0.190**	<0.005	**0.012**	**0.160**	<0.005	**0.014**	**0.010**	**1.1**
Total Copper (Cu)	mg/L	0.0050	0.0010	0.880	0.0082	0.003	0.004	**0.130**	0.004	**0.023**	**0.130**	**0.009**	**0.024**	**0.009**	**0.88**
Total Dissolved Solids	mg/L		84	715	320	270	365	345	335	385	465	340	360	580	390
Total Iron (Fe)	mg/L	0.300	0.050	1200	3.38	**0.800**	**0.700**	**180**	**1.7**	**8.9**	**150**	**3.1**	**12.0**	**7.4**	**1200**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.34	14	0.83	1.0	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	0.8
Total Lead (Pb)	mg/L	0.005	0.0003	0.420	0.002	0.0005	<0.0005	**0.066**	0.0007	**0.009**	**0.063**	0.002	**0.009**	0.0031	**0.42**
Total Magnesium (Mg)	mg/L		8	650	23	14	26	120	26	32	110	19.0	21	46	650
Total Nickel (Ni)	mg/L	0.025	0.00050	1.60	0.0076	0.002	0.003	**0.260**	0.005	0.015	0.240	0.0	0.019	0.012	**1.6**
Total Phosphorus	mg/L	0.02*	0.04	16.0	0.18	**0.09**	**0.05**	**2.80**	**0.07**	**0.29**	**2.90**	**0.11**	**0.53**	**0.16**	**16**
Total Potassium (K)	mg/L		1.9	110	6.2	6.9	4.2	44.0	5.2	8.4	18.0	4.9	15	8.6	110
Total Sodium (Na)	mg/L		2.8	128	13	8.9	13.0	13.0	15.0	17.0	16.0	15.0	12	23	27
Total Suspended Solids	mg/L		4	32000	106	20	18	3200	30	270	6000	150	230	220	32000
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.08	0.004	<0.00061	<0.0079	0.016	<0.013	<0.0052	0.007	<0.0034	<0.00061	<0.00076	<0.00089
Total Zinc (Zn)	mg/L	0.020	0.0025	2.7	0.016	<0.01	<0.01	**0.40**	<0.01	**0.09**	**0.38**	0.02	**0.09**	0.02	**2.7**
Ion Percentage	%		0.001	47.5	3.0	1.4	0.1	38.7	2.1	7.2	32.5	0.2	6.8	2.9	47.5

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" Denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Downstream of Landfill 60 m East of Lambton Rd. 79 - SS1									
Date						**9-Apr-21**	**3-Jun-21**	**9-Jul-21**	**30-Jul-21**	**4-Oct-21**	**15-Oct-21**	**17-Feb-22**	**4-May-22**	**16-May-22**	**4-Aug-22**
Laboratory						**Bureau Veritas**	**Bureau Veritas**	**Bureau Veritas**	**Bureau Veritas**	**Bureau Veritas**	**Bureau Veritas**	**Bureau Veritas**	**Bureau Veritas**	**Bureau Veritas**	**Bureau Veritas**
Routine/Verification Event						**Verification**	**Routine**	**Routine**	**Verification**	**Routine**	**Verification**	**Routine**	**Routine**	**Verification**	**Routine**
Alkalinity (as $CaCO_3$)	mg/L	<25%***	55	270	118	200	110	87	75	70	110	90	160	110	110
Conductivity	umho/cm		225	1500	492	800	860	730	590	670	700	312	730	810	922
Dissolved Chloride (Cl)	mg/L		4	180	17	46	35	40	31	20	34	19	29	30	18
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Sulphate (SO_4)	mg/L		19	660	90	150	310	220	180	250	200	58	180	340	390
Nitrate (N)	mg/L		0.005	23.6	0.38	<0.10	<0.010	<0.10	0.21	0.44	0.45	0.58	0.45	0.46	1.07
Nitrite (N)	mg/L		0.005	0.27	0.0127	<0.010	0.24	0.012	0.02	0.026	0.023	0.045	0.012	0.035	0.043
pH	(pH units)	6.5-8.5	6.8	8.3	7.9	8.1	8.0	8.1	7.9	7.8	7.9	8.0	8.3	7.4	8.1
Phenols-4AAP	mg/L	0.001	0.0005	0.01	0.0007	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	<0.0010	<0.0010	<0.0010
Total Ammonia-N	mg/L		0.01	3.21	0.099	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	1.17	<0.15	0.26	<0.15
Total Arsenic (As)	mg/L	0.100*	0.0005	0.28	0.0025	0.002	0.001	0.003	0.003	<0.001	0.002	0.007	0.002	0.007	0.002
Total Barium (Ba)	mg/L		0.014	3	0.057	0.047	0.043	0.030	0.024	0.023	0.031	0.083	0.04	0.1	0.038
Total BOD	mg/L		1.0	5.0	1.5	5	<2	<2	2.0	<2	2	3	<2	3	<2
Total Boron (B)	mg/L	0.200	0.010	1.2	0.135	**0.25**	0.1	**0.26**	**0.26**	**0.22**	**0.47**	0.08	**0.36**	0.19	0.11
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.0040	0.00007	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001
Total Calcium (Ca)	mg/L		30	2900	78	90	110	63	50	64	72	75	80	140	140
Total Chemical Oxygen Demand (COD)	mg/L		2	300	23	46	8.1	26	28	10	29	27	23	29	11
Total Chromium (Cr)	mg/L	0.0089	0.0005	1.10	0.0058	<0.005	0.006	<0.005	<0.005	<0.005	<0.005	**0.026**	<0.005	**0.019**	<0.005
Total Copper (Cu)	mg/L	0.0050	0.0010	0.880	0.0082	**0.009**	0.005	0.003	0.002	0.002	0.005	**0.023**	0.005	**0.02**	**0.007**
Total Dissolved Solids	mg/L		84	715	320	530	645	485	385	420	360	230	370	695	715
Total Iron (Fe)	mg/L	0.300	0.050	1200	3.38	**3.5**	**3**	1	<0.1	0.2	**2.1**	**26**	**4.4**	**21**	3.1
Total Kjeldahl Nitrogen (TKN)	mg/L		0.34	14	0.83	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	2.0	<0.7	<0.7	<0.7
Total Lead (Pb)	mg/L	0.005	0.0003	0.420	0.002	0.0018	0.0012	<0.0005	<0.0005	<0.0005	0.0009	**0.011**	0.0017	**0.0077**	0.0012
Total Magnesium (Mg)	mg/L		8	650	23	31	35	35	29	31	33	23	34	52	51
Total Nickel (Ni)	mg/L	0.025	0.00050	1.60	0.0076	0.008	0.006	0.005	0.003	0.002	0.006	**0.039**	0.009	**0.032**	0.006
Total Phosphorus	mg/L	0.02*	0.04	16.0	0.18	**0.12**	**0.05**	**0.04**	**0.07**	**0.04**	**0.08**	**0.48**	**0.088**	**0.30**	**0.054**
Total Potassium (K)	mg/L		1.9	110	6.2	5.7	4.9	3.4	4.0	4.7	7.6	9.6	5.1	8	5
Total Sodium (Na)	mg/L		2.8	128	13	30	27	31	24	21	30	11	26	28	26
Total Suspended Solids	mg/L		4	32000	106	74	73	35	39	16	49	660	95	1200	98
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.08	0.004	<0.0016	<0.0023	<0.0025	<0.0061	<0.0019	<0.0084	0.0089	<0.0047	0.0028	<0.0074
Total Zinc (Zn)	mg/L	0.020	0.0025	2.7	0.016	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.07	0.01	0.05	0.01
Ion Percentage	%		0.001	47.5	3.0	0.1	0.1	0.1	0.6	1.6	1.5	15.1	0.8	5.6	3.4

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
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4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" Denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Downstream of Landfill 60 m East of Lambton Rd. 79 - SS1									
Date						**18-Oct-22**	**28-Nov-22**								
Laboratory						**Bureau Veritas**	**Bureau Veritas**								
Routine/Verification Event						**Routine**	**Verification**								
Alkalinity (as $CaCO_3$)	mg/L	<25%***	55	270	118	55	110								
Conductivity	umho/cm		225	1500	492	700	1500								
Dissolved Chloride (Cl)	mg/L		4	180	17	23	29								
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	<0.00010	<0.00010								
Dissolved Sulphate (SO_4)	mg/L		19	660	90	290	660								
Nitrate (N)	mg/L		0.005	23.6	0.38	0.41	2.06								
Nitrite (N)	mg/L		0.005	0.27	0.0127	0.037	0.022								
pH	(pH units)	6.5-8.5	6.8	8.3	7.9	7.9	7.9								
Phenols-4AAP	mg/L	0.001	0.0005	0.01	0.0007	<0.0010	<0.0010								
Total Ammonia-N	mg/L		0.01	3.21	0.099	0.47	<0.15								
Total Arsenic (As)	mg/L	0.100*	0.0005	0.28	0.0025	0.016	0.001								
Total Barium (Ba)	mg/L		0.014	3	0.057	0.19	0.043								
Total BOD	mg/L		1.0	5.0	1.5	5	2								
Total Boron (B)	mg/L	0.200	0.010	1.2	0.135	0.13	0.08								
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.0040	0.00007	**0.0003**	<0.0001								
Total Calcium (Ca)	mg/L		30	2900	78	270	160								
Total Chemical Oxygen Demand (COD)	mg/L		2	300	23	16	19								
Total Chromium (Cr)	mg/L	0.0089	0.0005	1.10	0.0058	0.062	<0.005								
Total Copper (Cu)	mg/L	0.0050	0.0010	0.880	0.0082	**0.053**	**0.006**								
Total Dissolved Solids	mg/L		84	715	320	390	1020								
Total Iron (Fe)	mg/L	0.300	0.050	1200	3.38	64	3.0								
Total Kjeldahl Nitrogen (TKN)	mg/L		0.34	14	0.83	<0.7	<0.7								
Total Lead (Pb)	mg/L	0.005	0.0003	0.420	0.002	**0.026**	0.0010								
Total Magnesium (Mg)	mg/L		8	650	23	61	85								
Total Nickel (Ni)	mg/L	0.025	0.00050	1.60	0.0076	0.092	0.005								
Total Phosphorus	mg/L	0.02*	0.04	16.0	0.18	**0.94**	**0.048**								
Total Potassium (K)	mg/L		1.9	110	6.2	12	8.6								
Total Sodium (Na)	mg/L		2.8	128	13	15	39								
Total Suspended Solids	mg/L		4	32000	106	1400	70								
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.08	0.004	0.017	<0.00051								
Total Zinc (Zn)	mg/L	0.020	0.0025	2.7	0.016	**0.17**	<0.01								
Ion Percentage	%		0.001	47.5	3.0	21.7	0.0								

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" Denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Off-Site Flow Into East Ditch Line (Background Surface Water Quality) - SS10									
Date						4-Apr-03	13-Jun-03	15-Oct-03	3-Nov-03	30-Dec-03	3-May-04	31-Jul-04	1-Dec-04	2-Apr-05	9-Nov-05
Laboratory						Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest
Routine/Verification Event															
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	22	203	67	33	105	83	74	40	76	86	41	55	57
Conductivity	umho/cm		62	1200	229										
Dissolved Chloride (Cl)	mg/L		1	46	6	3	1	8	6	2	5	5	3	3	24
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.0001	0.0001										
Dissolved Sulphate (SO_4)	mg/L		0.5	220	16	33	51	51	42	14	47	59	14	11	23
Nitrate (N)	mg/L		0.05	102	0.98	4.47	0.11	23.50	13.80	2.75	5.84	15.40	5.55	0.45	10.50
Nitrite (N)	mg/L		0.005	3.98	0.0213										
pH	(pH units)	6.5-8.5	6.7	8.7	7.7										
Phenols-4AAP	mg/L	0.001	0.0005	0.007	0.0007	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Ammonia-N	mg/L		0.02	18.4	0.099	0.06	0.07	<0.02	0.03	0.02	0.16	0.11	0.02	0.09	0.15
Total Arsenic (As)	mg/L	0.100*	0.000500	0.01000	0.00176										
Total Barium (Ba)	mg/L		0.01	0.36	0.040										0.080
Total BOD	mg/L		1	4	1										
Total Boron (B)	mg/L	0.200	0.0100	0.480	0.0756	<0.05	0.12	0.19	0.17	0.08	0.15	**0.39**	0.06	0.070	0.160
Total Cadmium (Cd)	mg/L	0.000	0.00005	0.0014	0.00009										<0.001
Total Calcium (Ca)	mg/L		5.4	170	34	22	32	84	46	17	38	60	29	22	52
Total Chemical Oxygen Demand (COD)	mg/L		18	110	47										
Total Chromium (Cr)	mg/L	0.0089	0.0005	0.0800	0.0054	<0.005	<0.005	0.004	0.002	0.003	<0.005	<0.001	0.002	0.0010	**0.0170**
Total Copper (Cu)	mg/L	0.0050	0.002	0.039	0.0054										**0.009**
Total Dissolved Solids	mg/L		26	1010	192										
Total Iron (Fe)	mg/L	0.300	0.250	79	3.67	**0.79**	**0.74**	**1.53**	**1.05**	**1.07**	**0.81**	**0.48**	**0.88**	**0.700**	**12.400**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	33	1.25017										
Total Lead (Pb)	mg/L	0.005	0.0003	0.024	0.002										<0.01
Total Magnesium (Mg)	mg/L		1.6	33	8	6	7	13	8	4	7	10	5	5.0	8.0
Total Nickel (Ni)	mg/L	0.025	0.0005	0.097	0.0068	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.015
Total Phosphorus	mg/L	0.02*	0.03	1.60	0.25										
Total Potassium (K)	mg/L		1	17	4.5	2	3	5	2	1	2	3	2	1.0	4.0
Total Sodium (Na)	mg/L		0.49	20	3	3	<2	6	3	2	3	4	4	2.0	<2
Total Suspended Solids	mg/L		13	980	82										
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.12	0.005	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Total Zinc (Zn)	mg/L	0.020	0.0025	0.200	0.0144	<0.005	<0.005	0.010	<0.01	<0.01	<0.01	<0.01	0.020	<0.01	**0.04**
Ion Percentage	%		0.67	30.37	5.47	7.6	4.8	18.3	8.4	6.6	3.1	9.6	16.8	7.6	12.2

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" Denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Off-Site Flow Into East Ditch Line (Background Surface Water Quality) - SS10									
Date						18-Jan-06	9-Mar-06	5-Oct-06	17-Nov-06	2-Mar-07	9-Jan-08	19-Mar-08	11-Apr-08	14-Jun-08	23-Jul-08
Laboratory						Accutest	Accutest	Accutest	Accutest	Accutest	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Routine/Verification Event															
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	22	203	67	41	34	124	68	31	203	34	97	90	31
Conductivity	umho/cm		62	1200	229							89		194	89
Dissolved Chloride (Cl)	mg/L		1	46	6	4	3	40	9	5	24	4	4	2	4
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.0001	0.0001									<0.0002	
Dissolved Sulphate (SO_4)	mg/L		0.5	220	16	13	8	41	16	9	203	10	11	3	2
Nitrate (N)	mg/L		0.05	102	0.98	0.58	1.14	45.60	1.34	2.24	0.50	0.40	<0.1	0.1	0.4
Nitrite (N)	mg/L		0.005	3.98	0.0213							<0.01	<0.01	<0.01	0.02
pH	(pH units)	6.5-8.5	6.7	8.7	7.7							7.6	7.0	8.0	7.5
Phenols-4AAP	mg/L	0.001	0.0005	0.007	0.0007	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001
Total Ammonia-N	mg/L		0.02	18.4	0.099	0.04	0.17	0.08	0.02	0.22		0.08	0.06	<0.15	0.17
Total Arsenic (As)	mg/L	0.100*	0.000500	0.01000	0.00176							<0.001		0.001	
Total Barium (Ba)	mg/L		0.01	0.36	0.040	0.020	0.020	0.360	0.030	0.010	0.083	0.023		0.017	
Total BOD	mg/L		1	4	1									4	
Total Boron (B)	mg/L	0.200	0.0100	0.480	0.0756	0.050	0.030	**0.210**	0.090	0.030	**0.480**	0.040	0.120	0.150	0.060
Total Cadmium (Cd)	mg/L	0.000	0.00005	0.0014	0.00009	<0.0001	<0.0001	**0.0014**	<0.0001	<0.0001	<0.0001	<0.0001		**0.0003**	
Total Calcium (Ca)	mg/L		5.4	170	34	15	14	120	27	16	110	13	36	29.0	9.8
Total Chemical Oxygen Demand (COD)	mg/L		18	110	47									48	
Total Chromium (Cr)	mg/L	0.0089	0.0005	0.0800	0.0054	0.0010	<0.001	0.0050	<0.001	<0.001	**0.0110**	<0.005	0.0080	<0.005	<0.005
Total Copper (Cu)	mg/L	0.0050	0.002	0.039	0.0054	0.002	0.002	**0.014**	0.003	0.002	**0.006**	0.002		0.004	
Total Dissolved Solids	mg/L		26	1010	192							59	151	134	60
Total Iron (Fe)	mg/L	0.300	0.250	79	3.67	**0.540**	**0.530**	**3.040**	**0.360**	0.250	**4.400**	**2.100**	**3.900**	**1.700**	**1.600**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	33	1.25017							0.8	1.1	<4	1.9
Total Lead (Pb)	mg/L	0.005	0.0003	0.024	0.002	<0.001	0.001	**0.012**	0.002	<0.001	0.002	0.001		0.0008	
Total Magnesium (Mg)	mg/L		1.6	33	8	3.0	2.0	20.0	6.0	3.0	33.0	3.3	8.5	5.8	2.5
Total Nickel (Ni)	mg/L	0.025	0.0005	0.097	0.0068	<0.005	<0.005	**0.028**	<0.005	<0.005	0.008	0.003	0.005	0.003	0.002
Total Phosphorus	mg/L	0.02*	0.03	1.60	0.25							<0.06	**0.15**	**<0.15**	**0.34**
Total Potassium (K)	mg/L		1	17	4.5	2.0	3.0	5.0	3.0	2.0	6.0	2.3	5.7	3.7	7.7
Total Sodium (Na)	mg/L		0.49	20	3	<2	<2	11.0	3.0	3.0	20.0	0.9	2.3	2.0	0.8
Total Suspended Solids	mg/L		13	980	82									18	
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.12	0.005	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Total Zinc (Zn)	mg/L	0.020	0.0025	0.200	0.0144	<0.01	<0.01	**0.04**	<0.01	0.02	0.02	<0.01	0.01	<0.01	<0.01
Ion Percentage	%		0.67	30.37	5.47	1.2	5.3	16.3	3.9	8.0	0.7	4.2	8.7	2.7	5.7

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" Denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Off-Site Flow Into East Ditch Line (Background Surface Water Quality) - SS10									
Date						4-Nov-08	12-Feb-09	6-Apr-09	9-Aug-09	3-Dec-09	25-Jan-10	6-Apr-10	17-Nov-10	28-Feb-11	20-Apr-11
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Routine/Verification Event															
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	22	203	67	157	38	52	82	94	27	62	64	50	78
Conductivity	umho/cm		62	1200	229	410	110	147	625	202	65	400	541	164	197
Dissolved Chloride (Cl)	mg/L		1	46	6	21	5	5	23	2	1	1	46	4	9
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.0001	0.0001			<0.0001				<0.0001			<0.0001
Dissolved Sulphate (SO_4)	mg/L		0.5	220	16	21	12	7	220	10	3	9	27	10	8
Nitrate (N)	mg/L		0.05	102	0.98	0.9	1.2	3.0	0.6	0.3	0.5	29.0	24.0	3.6	2.4
Nitrite (N)	mg/L		0.005	3.98	0.0213	1.3	0.05	0.04	0.04	0.03	0.02	0.40	0.06	0.020	0.020
pH	(pH units)	6.5-8.5	6.7	8.7	7.7	7.8	7.3	7.1	7.3	7.8	7.2	7.7	7.6	7.5	7.8
Phenols-4AAP	mg/L	0.001	0.0005	0.007	0.0007	0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.001	<0.001	<0.001
Total Ammonia-N	mg/L		0.02	18.4	0.099	0.21	<0.15	<0.15	<0.15	<0.15	0.18	18.40	0.17	<0.15	<0.15
Total Arsenic (As)	mg/L	0.100*	0.000500	0.01000	0.00176	0.007		0.005				0.010			0.006
Total Barium (Ba)	mg/L		0.01	0.36	0.040	0.130		0.085				0.220			0.120
Total BOD	mg/L		1	4	1			<2				<2			<2
Total Boron (B)	mg/L	0.200	0.0100	0.480	0.0756	0.130	0.050	0.060	0.090	0.090	0.030	0.070	0.150	0.050	0.100
Total Cadmium (Cd)	mg/L	0.000	0.00005	0.0014	0.00009	0.0002		0.0001				0.0004			0.0002
Total Calcium (Ca)	mg/L		5.4	170	34	67.0	17.0	25.0	70.0	34.0	8.3	41.0	75.0	25.0	35.0
Total Chemical Oxygen Demand (COD)	mg/L		18	110	47	62		37				110.000			55
Total Chromium (Cr)	mg/L	0.0089	0.0005	0.0800	0.0054	**0.0250**	**0.0200**	**0.0200**	<0.005	**0.0260**	<0.005	**0.0560**	**0.0410**	0.005	**0.024**
Total Copper (Cu)	mg/L	0.0050	0.002	0.039	0.0054	**0.019**		**0.012**				0.029			**0.039**
Total Dissolved Solids	mg/L		26	1010	192	270	68	90		130	43	260	348	98	110
Total Iron (Fe)	mg/L	0.300	0.250	79	3.67	**27.000**	**19.000**	**20.000**	**3.900**	**26.000**	**3.000**	**55.000**	**20.000**	**5.500**	**23.000**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	33	1.25017	5	2	<4	1	4	1.7	33	4	2.0	2.7
Total Lead (Pb)	mg/L	0.005	0.0003	0.024	0.002	**0.008**		**0.007**				0.024			**0.009**
Total Magnesium (Mg)	mg/L		1.6	33	8	15.0	6.4	8.9	25.0	11.0	2.3	18.0	17.0	5.7	11.0
Total Nickel (Ni)	mg/L	0.025	0.0005	0.097	0.0068	**0.029**	0.021	0.024	0.007	**0.030**	0.004	**0.067**	0.021	0.007	**0.027**
Total Phosphorus	mg/L	0.02*	0.03	1.60	0.25	**1.20**	**0.28**	**0.35**	**0.07**	**0.64**	**0.16**	**1.60**	**0.50**	**0.23**	**0.53**
Total Potassium (K)	mg/L		1	17	4.5	9.8	5.2	4.9	4.6	7.4	3.7	9.2	17	3.2	6.6
Total Sodium (Na)	mg/L		0.49	20	3	3.3	1.2	1.5	13	1.6	0.6	1.7	3.7	2.0	1.9
Total Suspended Solids	mg/L		13	980	82	270		240	410			980			240
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.12	0.005	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	**0.06**	<0.02	<0.02	<0.02
Total Zinc (Zn)	mg/L	0.020	0.0025	0.200	0.0144	**0.07**	**0.04**	**0.06**	0.01	**0.06**	<0.01	**0.15**	**0.05**	0.02	**0.06**
Ion Percentage	%		0.67	30.37	5.47	4.9	8.5	13.4	2.7	8.1	4.1	24.8	16.0	9.7	10.5

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" Denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Off-Site Flow Into East Ditch Line (Background Surface Water Quality) - SS10									
Date						20-Oct-11	30-Oct-12	13-Jan-13	10-Apr-13	5-Jul-13	7-Oct-13	11-Jan-14	8-Apr-14	30-Apr-14	7-Jul-14
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Routine/Verification Event												Routine	Routine	Verification	Routine
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	22	203	67	88	69	45	40	70	78	22	69	66	64
Conductivity	umho/cm		62	1200	229	190	230	120	110	350	190	62.0	170	150	400
Dissolved Chloride (Cl)	mg/L		1	46	6	3	11	9	2	4	4	2	6	3	6
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.0001	0.0001				<0.00010				<0.00010	<0.00010	
Dissolved Sulphate (SO_4)	mg/L		0.5	220	16	6	13	12	2	82	9	1	9	1	120
Nitrate (N)	mg/L		0.05	102	0.98	<0.1	6.1	<0.10	0.74	2.2	<0.10	0.55	<0.10	<0.10	1.33
Nitrite (N)	mg/L		0.005	3.98	0.0213	<0.01	<0.010	<0.010	0.035	0.051	<0.010	0.016	<0.010	<0.010	0.109
pH	(pH units)	6.5-8.5	6.7	8.7	7.7	7.8	6.9	7.3	7.3	7.6	7.7	7.9	8.2	7.7	7.8
Phenols-4AAP	mg/L	0.001	0.0005	0.007	0.0007	**0.006**	<0.0010	<0.0010	<0.0010	<0.0010	**0.003**	<0.0010	**0.007**	**0.002**	**0.002**
Total Ammonia-N	mg/L		0.02	18.4	0.099	<0.15	0.25	<0.15	<0.15	<0.15	0.15	0.61	<0.15	<0.15	2.31
Total Arsenic (As)	mg/L	0.100*	0.000500	0.01000	0.00176				0.002				0.001	<0.001	
Total Barium (Ba)	mg/L		0.01	0.36	0.040				0.046				0.013	0.02	
Total BOD	mg/L		1	4	1				<2.0				3.0	3.0	
Total Boron (B)	mg/L	0.200	0.0100	0.480	0.0756	0.090	0.180	0.060	0.070	0.130	0.090	<0.02	0.070	0.060	**0.300**
Total Cadmium (Cd)	mg/L	0.000	0.00005	0.0014	0.00009				<0.0001				<0.0001	<0.0001	
Total Calcium (Ca)	mg/L		5.4	170	34	35.0	32.0	19.0	18.0	49.0	28.0	5.4	25.0	24	63
Total Chemical Oxygen Demand (COD)	mg/L		18	110	47				44				48	55	
Total Chromium (Cr)	mg/L	0.0089	0.0005	0.0800	0.0054	**0.020**	**0.067**	**0.012**	0.008	<0.005	**0.013**	<0.005	<0.005	<0.005	**0.016**
Total Copper (Cu)	mg/L	0.0050	0.002	0.039	0.0054				**0.007**				0.0029	0.003	
Total Dissolved Solids	mg/L		26	1010	192	122	604	194	288	258	216	26.0	192	142	524
Total Iron (Fe)	mg/L	0.300	0.250	79	3.67	**20.000**	**26.000**	**11.000**	**8.800**	**3.800**	**6.900**	0.320	**1.400**	**1.500**	**15.000**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	33	1.25017	3.0	2.7	1.8	2.1	1.5	2.2	1.6	1.6	1.60	3.10
Total Lead (Pb)	mg/L	0.005	0.0003	0.024	0.002				0.004				0.001	0.001	
Total Magnesium (Mg)	mg/L		1.6	33	8	10.0	10.0	5.8	5.1	12.0	7.3	1.6	5.0	5.0	15.0
Total Nickel (Ni)	mg/L	0.025	0.0005	0.097	0.0068	0.025	**0.048**	0.014	0.011	0.006	0.008	<0.001	0.002	0.003	0.020
Total Phosphorus	mg/L	0.02*	0.03	1.60	0.25	**0.50**	**0.85**	**0.27**	**0.27**	**0.12**	**0.36**	**0.36**	**0.14**	**0.12**	**0.33**
Total Potassium (K)	mg/L		1	17	4.5	7.0	12.0	4.9	4.3	5.2	9.7	4.8	4.7	4.2	6.3
Total Sodium (Na)	mg/L		0.49	20	3	1.3	1.7	1.1	1.3	5.1	1.2	0.5	1.5	1.4	7.2
Total Suspended Solids	mg/L		13	980	82				55				28	19	
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.12	0.005	<0.02	<0.02	<0.02	<0.02	<0.0089	0.0021	0.0064	<0.0021	<0.00074	**0.12**
Total Zinc (Zn)	mg/L	0.020	0.0025	0.200	0.0144	**0.05**	**0.10**	**0.03**	0.02	0.01	0.02	<0.01	<0.01	<0.01	**0.04**
Ion Percentage	%		0.67	30.37	5.47	9.9	10.1	3.7	13.9	4.2	6.2	1.8	1.7	6.3	5.3

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" Denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Off-Site Flow Into East Ditch Line (Background Surface Water Quality) - SS10									
Date						15-Oct-14	24-Nov-14	4-Jan-15	10-Apr-15	25-Oct-15	7-Apr-16	12-Jan-17	6-Apr-17	13-Jul-17	28-Oct-17
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Routine/Verification Event						Routine	Verification	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	22	203	67	79	43	30	51	79	49	120	160	48	71
Conductivity	umho/cm		62	1200	229	250	120	98	130	560	110	360	340	370	470
Dissolved Chloride (Cl)	mg/L		1	46	6	8	3	4	4	30	1.2	13	3.7	4.6	8.8
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.0001	0.0001				<0.00010		<0.00010		<0.00010		
Dissolved Sulphate (SO_4)	mg/L		0.5	220	16	34	11	12	15	150	1	35	19	80.0	130.0
Nitrate (N)	mg/L		0.05	102	0.98	<0.10	<0.10	<0.10	<0.10	0.59	<0.10	0.48	<0.10	12.90	3.78
Nitrite (N)	mg/L		0.005	3.98	0.0213	0.016	<0.010	0.029	0.011	0.049	<0.010	0.021	<0.010	0.017	0.015
pH	(pH units)	6.5-8.5	6.7	8.7	7.7	7.7	7.3	8.2	6.7	7.8	7.1	7.9	8.1	7.7	8.0
Phenols-4AAP	mg/L	0.001	0.0005	0.007	0.0007	<0.001	<0.001	**0.005**	**0.002**	<0.0010	<0.0010	<0.0040	<0.0040	*<0.0080*	*<0.0010*
Total Ammonia-N	mg/L		0.02	18.4	0.099	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	0.25	<0.15	<0.15	<0.050
Total Arsenic (As)	mg/L	0.100*	0.000500	0.01000	0.00176				<0.001		0.001				
Total Barium (Ba)	mg/L		0.01	0.36	0.040				0.015		0.027				
Total BOD	mg/L		1	4	1				<2.0		<2.0		<2.0		
Total Boron (B)	mg/L	0.200	0.0100	0.480	0.0756	0.070	0.060	0.030	0.060	0.100	0.040	0.040	0.040	0.080	0.050
Total Cadmium (Cd)	mg/L	0.000	0.00005	0.0014	0.00009				<0.0001		<0.0001				
Total Calcium (Ca)	mg/L		5.4	170	34	39	17	14	20	63	17	45	61	69	71
Total Chemical Oxygen Demand (COD)	mg/L		18	110	47				40		44		34		
Total Chromium (Cr)	mg/L	0.0089	0.0005	0.0800	0.0054	**0.011**	**0.012**	<0.005	<0.005	<0.005	0.007	0.005	0.008	**0.0320**	**0.0060**
Total Copper (Cu)	mg/L	0.0050	0.002	0.039	0.0054				0.003		0.004				
Total Dissolved Solids	mg/L		26	1010	192	288	296	96	128	382	156	194	222	294	420
Total Iron (Fe)	mg/L	0.300	0.250	79	3.67	**10.000**	**12.000**	**1.300**	**2.000**	**1.500**	**4.900**	**3.600**	**6.700**	**32.000**	**3.400**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	33	1.25017	4.10	2.20	0.75	0.57	0.60	0.41	0.90	<0.7	<0.7	0.8
Total Lead (Pb)	mg/L	0.005	0.0003	0.024	0.002				0.001		0.002				
Total Magnesium (Mg)	mg/L		1.6	33	8	11.0	5.7	2.8	4.7	15.0	4.5	12.0	15.0	18	14
Total Nickel (Ni)	mg/L	0.025	0.0005	0.097	0.0068	0.014	0.014	0.002	0.003	0.004	0.007	0.005	0.010	**0.042**	0.005
Total Phosphorus	mg/L	0.02*	0.03	1.60	0.25	**0.91**	**0.37**	**0.18**	**0.12**	**0.066**	**0.15**	**0.32**	**0.16**	**0.51**	**0.10**
Total Potassium (K)	mg/L		1	17	4.5	15.0	7.1	4.9	3.2	11.0	3.2	12.0	4.7	5.6	2.8
Total Sodium (Na)	mg/L		0.49	20	3	1.5	0.9	0.6	1.5	16.0	1.1	4.1	4.0	3.2	3.6
Total Suspended Solids	mg/L		13	980	82				13		16		160		
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.12	0.005	<0.0036	*<0.024*	<0.0021	<0.0096	<0.0028	<0.0005	0.0007	<0.00051	<0.013	*<0.00066*
Total Zinc (Zn)	mg/L	0.020	0.0025	0.200	0.0144	**0.03**	**0.03**	<0.01	<0.01	0.01	0.01	0.02	0.02	**0.070**	*<0.01*
Ion Percentage	%		0.67	30.37	5.47	7.7	7.7	3.3	1.6	1.0	7.5	1.8	5.8	16.0	3.0

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" Denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Off-Site Flow Into East Ditch Line (Background Surface Water Quality) - SS10									
Date						23-Jan-18	4-Apr-18	8-Aug-18	2-Oct-18	24-Jan-19	17-Apr-19	2-Oct-19	11-Jan-20	18-May-20	15-Nov-20
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas
Routine/Verification Event						Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	22	203	67	42	150	64	190	50	200	80	55	84	96
Conductivity	umho/cm		62	1200	229	130	300	1200	650	140	720	390	114	190	420
Dissolved Chloride (Cl)	mg/L		1	46	6	5.5	3.0	25.0	26.0	3.8	22.0	10.0	1.6	2.1	29
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.0001	0.0001		<0.00010				<0.00010			<0.00010	
Dissolved Sulphate (SO_4)	mg/L		0.5	220	16	15.0	8.9	67.0	120.0	7.3	160.0	72.0	1.2	*0.5*	29
Nitrate (N)	mg/L		0.05	102	0.98	0.89	<0.10	102.00	2.33	0.47	<0.10	6.03	0.17	61	9.51
Nitrite (N)	mg/L		0.005	3.98	0.0213	0.011	<0.010	3.980	0.014	0.014	0.013	0.024	0.084	0.012	0.078
pH	(pH units)	6.5-8.5	6.7	8.7	7.7	7.4	8.0	7.4	8.2	7.4	8.5	7.9	**8.7**	7.9	7.5
Phenols-4AAP	mg/L	0.001	0.0005	0.007	0.0007	**0.003**	*<0.0010*	*<0.0010*	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001
Total Ammonia-N	mg/L		0.02	18.4	0.099	0.050	0.056	0.094	<0.050	0.190	<0.050	0.100	0.084	0.13	0.53
Total Arsenic (As)	mg/L	0.100*	0.000500	0.01000	0.00176		0.003				<0.001			0.002	
Total Barium (Ba)	mg/L		0.01	0.36	0.040		0.048				0.028			0.03	
Total BOD	mg/L		1	4	1		<2				<2			4	
Total Boron (B)	mg/L	0.200	0.0100	0.480	0.0756	0.040	0.020	0.140	**0.290**	<0.02	**0.240**	0.090	0.070	0.06	0.06
Total Cadmium (Cd)	mg/L	0.000	0.00005	0.0014	0.00009		<0.0001				<0.0001			<0.0001	
Total Calcium (Ca)	mg/L		5.4	170	34	19	54	170	87	15	95	60	39	29	51
Total Chemical Oxygen Demand (COD)	mg/L		18	110	47		18				81			38	
Total Chromium (Cr)	mg/L	0.0089	0.0005	0.0800	0.0054	**0.0090**	**0.0090**	<0.005	<0.005	<0.005	<0.005	0.0050	**0.08**	0.006	0.007
Total Copper (Cu)	mg/L	0.0050	0.002	0.039	0.0054		**0.007**				0.003			0.005	
Total Dissolved Solids	mg/L		26	1010	192	140	135	1010	450	115	460	275	630	185	300
Total Iron (Fe)	mg/L	0.300	0.250	79	3.67	**7.800**	**8.900**	**3.100**	**3.800**	**0.600**	**0.900**	**4.800**	**79**	**5.0**	**5.7**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	33	1.25017	<0.7	<0.7	<5	0.7	0.8	<0.7	0.9	<0.7	<0.7	1.6
Total Lead (Pb)	mg/L	0.005	0.0003	0.024	0.002		0.003				<0.0005			0.0022	
Total Magnesium (Mg)	mg/L		1.6	33	8	5.2	13	29	27	3.6	33	11	21	6.8	13
Total Nickel (Ni)	mg/L	0.025	0.0005	0.097	0.0068	0.010	0.012	0.006	0.007	0.001	0.003	0.007	**0.097**	0.007	0.009
Total Phosphorus	mg/L	0.02*	0.03	1.60	0.25	**0.19**	**0.27**	**0.13**	**0.16**	**0.14**	**0.05**	**0.20**	**1.40**	**0.21**	**0.80**
Total Potassium (K)	mg/L		1	17	4.5	3.2	4.6	5.0	7.0	5.0	4.5	2.8	11.0	2.9	13
Total Sodium (Na)	mg/L		0.49	20	3	1.2	3.9	14.0	15.0	1.1	15.0	4.1	1.1	1.5	5.8
Total Suspended Solids	mg/L		13	980	82		310				14			95	
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.12	0.005	0.0038	<0.0005	0.0013	<0.00061	<0.00061	<0.0008	0.0056	0.0056	0.014	0.014
Total Zinc (Zn)	mg/L	0.020	0.0025	0.200	0.0144	0.020	**0.030**	<0.01	0.010	<0.01	<0.01	0.010	**0.2**	0.02	**0.04**
Ion Percentage	%		0.67	30.37	5.47	4.0	5.9	28.1	1.3	0.8	0.8	5.3	30.4	5.7	6.3

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" Denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Off-Site Flow Into East Ditch Line (Background Surface Water Quality) - SS10									
Date						26-Mar-21	9-Jul-21	4-May-22							
Laboratory						Bureau Veritas	Bureau Veritas	Bureau Veritas							
Routine/Verification Event						Routine	Routine	Routine							
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	22	203	67	65	160	96							
Conductivity	umho/cm		62	1200	229	290	740	200							
Dissolved Chloride (Cl)	mg/L		1	46	6	8.9	16	2.5							
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.0001	0.0001			<0.00010							
Dissolved Sulphate (SO_4)	mg/L		0.5	220	16	41	180	0.5							
Nitrate (N)	mg/L		0.05	102	0.98	5.04	8.24	0.3							
Nitrite (N)	mg/L		0.005	3.98	0.0213	0.046	0.03	0.016							
pH	(pH units)	6.5-8.5	6.7	8.7	7.7	7.8	8.0	8.3							
Phenols-4AAP	mg/L	0.001	0.0005	0.007	0.0007	<0.0010	<0.0010	<0.0010							
Total Ammonia-N	mg/L		0.02	18.4	0.099	0.097	<0.15	<0.15							
Total Arsenic (As)	mg/L	0.100*	0.000500	0.01000	0.00176			0.003							
Total Barium (Ba)	mg/L		0.01	0.36	0.040			0.048							
Total BOD	mg/L		1	4	1			<2							
Total Boron (B)	mg/L	0.200	0.0100	0.480	0.0756	0.07	0.14	0.07							
Total Cadmium (Cd)	mg/L	0.000	0.00005	0.0014	0.00009			0.0001							
Total Calcium (Ca)	mg/L		5.4	170	34	42	110	33.0							
Total Chemical Oxygen Demand (COD)	mg/L		18	110	47			42							
Total Chromium (Cr)	mg/L	0.0089	0.0005	0.0800	0.0054	**0.019**	0.008	**0.010**							
Total Copper (Cu)	mg/L	0.0050	0.002	0.039	0.0054			**0.007**							
Total Dissolved Solids	mg/L		26	1010	192	160	535	140.0							
Total Iron (Fe)	mg/L	0.300	0.250	79	3.67	**17**	**5.5**	**9.7**							
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	33	1.25017	<0.7	0.8	<0.7							
Total Lead (Pb)	mg/L	0.005	0.0003	0.024	0.002			0.0034							
Total Magnesium (Mg)	mg/L		1.6	33	8	12	25	8.3							
Total Nickel (Ni)	mg/L	0.025	0.0005	0.097	0.0068	0.022	0.008	0.013							
Total Phosphorus	mg/L	0.02*	0.03	1.60	0.25	**0.34**	**0.25**	**0.22**							
Total Potassium (K)	mg/L		1	17	4.5	4.7	3.8	3.6							
Total Sodium (Na)	mg/L		0.49	20	3	4.1	9.2	2.1							
Total Suspended Solids	mg/L		13	980	82			94							
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.12	0.005	0.00082	<0.0027	<0.031							
Total Zinc (Zn)	mg/L	0.020	0.0025	0.200	0.0144	**0.04**	0.02	0.02							
Ion Percentage	%		0.67	30.37	5.47	9.0	2.1	6.4							

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" Denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Off-Site Flow From Township Land to South (Background Surface Water Quality) - SS16									
Date						19-Mar-08	11-Apr-08	12-May-08	23-Jul-08	4-Nov-08	12-Feb-09	6-Apr-09	10-Oct-09	25-Jan-10	6-Apr-10
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Routine/Verification Event															
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	40	228	116	50	152	228	50	118	77	102	138	65	181
Conductivity	umho/cm		109	620	310	123		478	109	305	190	231	409	212	389
Dissolved Chloride (Cl)	mg/L		1.2	20	5	3	7	9	2	6	4	6	4	11	7
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001			<0.0002				<0.0001			<0.0001
Dissolved Sulphate (SO_4)	mg/L		0.5	220	22	12	22	15	2	35	11	14	58	21	20
Nitrate (N)	mg/L		0.05	1.5	0.14	0.3	<0.1	<0.1	<0.1	1.0	0.6	0.8	1.5	1.0	<0.1
Nitrite (N)	mg/L		0.005	0.059	0.0078	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.01	<0.01	0.02	0.02
pH	(pH units)	6.5-8.5	7.4	8.4	7.9	7.7	8.3	8.1	7.8	8.0	7.7	7.6	7.9	7.8	8.0
Phenols-4AAP	mg/L	0.001	0.0005	0.0078	0.0008	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Ammonia-N	mg/L		0.025	0.3	0.076	0.05	0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
Total Arsenic (As)	mg/L	0.100*	0.000500	0.00500	0.00167			0.002		0.005		0.003			0.001
Total Barium (Ba)	mg/L		0.027	0.072	0.040			0.04		0.072		0.059			0.038
Total BOD	mg/L		1	4	1			<2				<2			3
Total Boron (B)	mg/L	0.200	0.0100	0.400	0.0374	<0.02	0.040	0.050	0.030	0.030	0.020	0.030	0.040	<0.02	0.040
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.00013	0.00006			0.0001		0.0001		0.0001			<0.0001
Total Calcium (Ca)	mg/L		13	1300	55	17	53	82	15	44	27	38	64	28	62
Total Chemical Oxygen Demand (COD)	mg/L		18	51	33			36		36		33			45
Total Chromium (Cr)	mg/L	0.0089	0.0025	0.5200	0.0057	<0.005	<0.005	0.006	<0.005	**0.0140**	0.0080	**0.0130**	**0.0120**	<0.005	0.0060
Total Copper (Cu)	mg/L	0.005	0.002	0.012	0.0049			0.004		**0.012**		**0.009**			0.003
Total Dissolved Solids	mg/L		50	720	213	84	238	290	70	200	120	142	265	135	250
Total Iron (Fe)	mg/L	0.300	0.050	540	4.28	**1.800**	**1.000**	**3.700**	**1.900**	**16.000**	**7.900**	**12.000**	**10.000**	**2.800**	**2.900**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.31	7.2	0.82549	<0.7	0.7	1.0	1.7	2.0	1.0	<4	2.2	0.7	1.0
Total Lead (Pb)	mg/L	0.005	0.0007	0.006	0.002			0.003		**0.006**		0.004			0.001
Total Magnesium (Mg)	mg/L		2.4	290	14	4.6	12.0	22.0	3.3	13.0	7.1	11.0	14.0	7.4	15.0
Total Nickel (Ni)	mg/L	0.025	0.0005	0.790	0.0067	0.002	0.001	0.006	0.003	0.019	0.009	0.016	0.013	0.004	0.004
Total Phosphorus	mg/L	0.02*	0.03	13.00	0.18	<0.06	**0.06**		**0.22**	**0.50**	*<0.15*	*<0.15*	**0.27**	**0.10**	**0.15**
Total Potassium (K)	mg/L		3.1	60	5.9	3.1	3.2	4.2	4.8	8.8	4.2	5.3	4.7	4.3	5.4
Total Sodium (Na)	mg/L		1.1	18	5	2.3	8.6	14.0	2.6	3.2	4.2	4.6	4.6	6.1	6.4
Total Suspended Solids	mg/L		21	2100	79			40		200		150			37
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.01	0.003	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Total Zinc (Zn)	mg/L	0.020	0.0050	1.200	0.0155	0.010	<0.01	0.020	0.010	**0.040**	0.020	**0.030**	**0.030**	0.010	0.010
Ion Percentage	%		0.55	47.20	3.87	5.3	6.9	11.1	8.3	6.5	8.5	10.0	6.9	7.1	7.5

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
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Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Off-Site Flow From Township Land to South (Background Surface Water Quality) - SS16									
Date						17-Nov-10	28-Feb-11	20-Apr-11	20-Oct-11	13-Mar-12	4-May-12	13-Jan-13	10-Apr-13	5-Jul-13	12-Sep-13
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Routine/Verification Event															
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	40	228	116	82	100	140	123	140	200	84	87	99	130
Conductivity	umho/cm		109	620	310	254	256	323	314	310	410	220	220	250	470
Dissolved Chloride (Cl)	mg/L		1.2	20	5	6	5	7	7	6	4	3	5	8	20
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001			<0.0001			<0.00010		<0.00010		
Dissolved Sulphate (SO_4)	mg/L		0.5	220	22	36	21	21	30	20	<1	23	19	31	80
Nitrate (N)	mg/L		0.05	1.5	0.14	<0.1	0.5	<0.1	<0.1	<0.10	<0.10	0.3	0.5	0.1	<0.10
Nitrite (N)	mg/L		0.005	0.059	0.0078	<0.01	0.01	<0.01	<0.01	<0.010	<0.010	<0.010	0.027	<0.010	<0.010
pH	(pH units)	6.5-8.5	7.4	8.4	7.9	7.9	7.7	8.1	7.9	8.0	8.1	7.5	7.9	7.8	7.8
Phenols-4AAP	mg/L	0.001	0.0005	0.0078	0.0008	0.001	0.001	<0.001	**0.005**	**0.002**	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Ammonia-N	mg/L		0.025	0.3	0.076	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
Total Arsenic (As)	mg/L	0.100*	0.000500	0.00500	0.00167			0.001			0.002		0.003		
Total Barium (Ba)	mg/L		0.027	0.072	0.040			0.028			0.055		0.054		
Total BOD	mg/L		1	4	1			<2			3		<2.0		
Total Boron (B)	mg/L	0.200	0.0100	0.400	0.0374	0.040	0.020	0.020	0.030	0.030	0.050	0.020	0.040	0.170	**0.320**
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.00013	0.00006			<0.0001			0.0001		<0.0001		
Total Calcium (Ca)	mg/L		13	1300	55	34	38	52	46	47	61	31	39	320	55
Total Chemical Oxygen Demand (COD)	mg/L		18	51	33			32			51		32		
Total Chromium (Cr)	mg/L	0.0089	0.0025	0.5200	0.0057	**0.0140**	<0.005	<0.005	<0.005	0.0050	0.0080	0.0060	**0.0090**	**0.2000**	<0.005
Total Copper (Cu)	mg/L	0.005	0.002	0.012	0.0049			0.002			0.0045		**0.010**		
Total Dissolved Solids	mg/L		50	720	213	168	156	192	236	248	264	238	236	264	300
Total Iron (Fe)	mg/L	0.300	0.050	540	4.28	**8.000**	**0.900**	**2.600**	**2.100**	**4.500**	**4.500**	**5.200**	**11.000**	**200.000**	**1.300**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.31	7.2	0.82549	1.00	0.80	0.80	1.00	3.50	1.40	1.00	1.50	7.20	1.40
Total Lead (Pb)	mg/L	0.005	0.0007	0.006	0.002			0.001			0.003		0.004		
Total Magnesium (Mg)	mg/L		2.4	290	14	9.1	9.0	12.0	9.9	11.0	16.0	7.5	9.2	85.0	20.0
Total Nickel (Ni)	mg/L	0.025	0.0005	0.790	0.0067	0.009	0.002	0.004	0.003	0.006	0.006	0.007	0.015	0.27	0.006
Total Phosphorus	mg/L	0.02*	0.03	13.00	0.18	**0.24**	**0.07**	**0.10**	**0.30**	**0.13**	**0.17**	**0.15**	*<0.3*	**3.10**	**0.17**
Total Potassium (K)	mg/L		3.1	60	5.9	8.6	3.4	3.2	6.1	4.4	5.6	4.3	5.3	25.0	6.9
Total Sodium (Na)	mg/L		1.1	18	5	3.8	4.0	5.8	4.4	4.6	5.1	3.1	3.5	5.0	17.0
Total Suspended Solids	mg/L		21	2100	79			27			55		81		
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.01	0.003	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.0054	<0.0037
Total Zinc (Zn)	mg/L	0.020	0.0050	1.200	0.0155	0.020	<0.01	0.010	0.010	0.020	0.020	0.020	**0.030**	**0.400**	<0.01
Ion Percentage	%		0.55	47.20	3.87	2.7	3.1	3.6	1.4	1.4	3.7	1.9	7.3	39.9	2.4

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Off-Site Flow From Township Land to South (Background Surface Water Quality) - SS16									
Date						**7-Oct-13**	**11-Jan-14**	**8-Apr-14**	**30-Apr-14**	**7-Jul-14**	**6-Sep-14**	**15-Oct-14**	**24-Nov-14**	**25-Dec-14**	**4-Jan-15**
Laboratory						**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**
Routine/Verification Event							**Routine**	**Routine**	**Verification**	**Routine**	**Verification**	**Routine**	**Verifcation**	**Verification**	**Routine**
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	40	228	116	160	74	120	170	100	160	140	120	170	100
Conductivity	umho/cm		109	620	310	490	270	280	350	590	490	610	320	400	280
Dissolved Chloride (Cl)	mg/L		1.2	20	5	5	15	5	4	20	9	5	10	7	7
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001			<0.00010	<0.00010						
Dissolved Sulphate (SO_4)	mg/L		0.5	220	22	78	29	22	27	170	83	160	44	32	33
Nitrate (N)	mg/L		0.05	1.5	0.14	<0.10	1.30	0.22	0.12	<0.10	<0.10	<0.10	0.15	<0.50	0.12
Nitrite (N)	mg/L		0.005	0.059	0.0078	<0.010	0.035	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.059	0.041
pH	(pH units)	6.5-8.5	7.4	8.4	7.9	8.0	8.0	7.4	8.1	8.0	8.0	7.8	7.8	7.9	7.9
Phenols-4AAP	mg/L	0.001	0.0005	0.0078	0.0008	**0.002**	0.001	**0.004**	<0.0010	0.001	<0.0010	<0.001	<0.001	<0.001	**0.008**
Total Ammonia-N	mg/L		0.025	0.3	0.076	<0.15	0.19	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
Total Arsenic (As)	mg/L	0.100*	0.000500	0.00500	0.00167			0.001	0.002						
Total Barium (Ba)	mg/L		0.027	0.072	0.040			0.030	0.046						
Total BOD	mg/L		1	4	1			<2.0	<2.0						
Total Boron (B)	mg/L	0.200	0.0100	0.400	0.0374	0.040	0.030	0.020	0.030	0.140	0.050	0.050	0.090	0.020	0.030
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.00013	0.00006			<0.0001	<0.0001						
Total Calcium (Ca)	mg/L		13	1300	55	71	27	44	63	100	89	89	200	56	41
Total Chemical Oxygen Demand (COD)	mg/L		18	51	33			32	42						
Total Chromium (Cr)	mg/L	0.0089	0.0025	0.5200	0.0057	<0.005	<0.005	<0.005	0.0060	**0.0140**	<0.005	<0.005	**0.0790**	<0.005	<0.005
Total Copper (Cu)	mg/L	0.005	0.002	0.012	0.0049			0.004	**0.0053**						
Total Dissolved Solids	mg/L		50	720	213	320	134	284	304	410	316	442	166	354	178
Total Iron (Fe)	mg/L	0.300	0.050	540	4.28	**2.900**	0.300	**4.300**	**6.200**	**13.000**	**4.900**	**3.000**	**76.000**	<0.10	**1.800**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.31	7.2	0.82549	1.2	1.4	1.2	1.6	1.3	0.9	1.5	3.8	1.2	0.58
Total Lead (Pb)	mg/L	0.005	0.0007	0.006	0.002			0.0016	0.003						
Total Magnesium (Mg)	mg/L		2.4	290	14	19.0	8.7	11.0	14.0	22.0	19.0	27.0	49.0	14.0	11.0
Total Nickel (Ni)	mg/L	0.025	0.0005	0.790	0.0067	0.004	0.001	0.005	0.01	0.018	0.008	0.004	**0.110**	<0.001	0.003
Total Phosphorus	mg/L	0.02*	0.03	13.00	0.18	**0.15**	**0.25**	**0.12**	**0.18**	**0.23**	**0.24**	**0.21**	**1.20**	**0.12**	**0.12**
Total Potassium (K)	mg/L		3.1	60	5.9	6.5	12.0	5.4	4.6	8.1	5.1	11.0	17.0	4.8	8.1
Total Sodium (Na)	mg/L		1.1	18	5	7.1	6.1	3.5	5.1	18.0	9.0	8.3	5.0		2.6
Total Suspended Solids	mg/L		21	2100	79			33	120						
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.01	0.003	<0.0038	0.0029	<0.00072	<0.0012	<0.0038	<0.0073	<0.0061	*<0.027*	<0.0014	<0.0011
Total Zinc (Zn)	mg/L	0.020	0.0050	1.200	0.0155	<0.01	<0.01	0.010	0.020	**0.040**	0.010	0.010	**0.180**	<0.01	0.010
Ion Percentage	%		0.55	47.20	3.87	3.1	1.3	3.3	3.5	6.1	6.0	3.9	31.1	1.3	3.4

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Off-Site Flow From Township Land to South (Background Surface Water Quality) - SS16									
Date						10-Apr-15	1-Jun-15	25-Feb-16	7-Apr-16	12-Jan-17	6-Apr-17	13-Jul-17	19-Nov-17	23-Jan-18	4-Apr-18
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Routine/Verification Event						Routine	Verification	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	40	228	116	160	220	140	170	91	170	45	150	80	150
Conductivity	umho/cm		109	620	310	330	510	330	440	220	350	380	440	170	300
Dissolved Chloride (Cl)	mg/L		1.2	20	5	4.0	5.0	4.0	4.2	4.3	3.1	1.2	4.2	2.9	4.1
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	<0.00010			<0.00010		<0.00010				<0.00010
Dissolved Sulphate (SO_4)	mg/L		0.5	220	22	27	41	33	47	19	18	120	69	1.0	17
Nitrate (N)	mg/L		0.05	1.5	0.14	<0.10	<0.10	0.15	0.38	0.27	<0.10	0.74	<0.10	<0.10	<0.10
Nitrite (N)	mg/L		0.005	0.059	0.0078	<0.010	0.015	<0.010	<0.010	0.012	<0.010	<0.010	<0.010	<0.010	0.014
pH	(pH units)	6.5-8.5	7.4	8.4	7.9	7.4	8.0	8.0	8.0	8.0	8.1	7.8	8.0	7.7	8.0
Phenols-4AAP	mg/L	0.001	0.0005	0.0078	0.0008	**0.002**	<0.0010	<0.0010	<0.0010	<0.0040	<0.0040	<0.0040	**0.002**	**0.002**	<0.0010
Total Ammonia-N	mg/L		0.025	0.3	0.076	<0.15	0.17	<0.15	<0.15	<0.15	<0.15	<0.15	<0.050	0.066	0.058
Total Arsenic (As)	mg/L	0.100*	0.000500	0.00500	0.00167	0.001			0.002						0.003
Total Barium (Ba)	mg/L		0.027	0.072	0.040	0.032			0.039						0.057
Total BOD	mg/L		1	4	1	<2.0			<2.0		<2.0				<2
Total Boron (B)	mg/L	0.200	0.0100	0.400	0.0374	0.040	0.050	0.030	0.120	0.060	0.040	**0.400**	0.030	<0.02	0.030
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.00013	0.00006	<0.0001			<0.0001						<0.0001
Total Calcium (Ca)	mg/L		13	1300	55	56	77	50	62	150	61	1300	66	24	60
Total Chemical Oxygen Demand (COD)	mg/L		18	51	33	26			28		36				18
Total Chromium (Cr)	mg/L	0.0089	0.0025	0.5200	0.0057	<0.005	<0.005	0.0070	0.0060	0.0470	0.0070	0.5200	<0.005	<0.005	**0.0100**
Total Copper (Cu)	mg/L	0.005	0.002	0.012	0.0049	0.0035			**0.006**						**0.012**
Total Dissolved Solids	mg/L		50	720	213	246	364	212	720	164	254	188	180	140	130
Total Iron (Fe)	mg/L	0.300	0.050	540	4.28	**3.100**	**1.700**	**3.300**	**5.600**	**47.000**	**6.100**	**540.000**	**3.700**	**1.000**	**9.800**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.31	7.2	0.82549	0.55	0.97	0.31	0.39	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7
Total Lead (Pb)	mg/L	0.005	0.0007	0.006	0.002	0.002			0.002						0.004
Total Magnesium (Mg)	mg/L		2.4	290	14	12.0	20.0	12.0	20.0	33.0	15.0	290.0	16.0	4.8	14.0
Total Nickel (Ni)	mg/L	0.025	0.0005	0.790	0.0067	0.005	0.003	0.004	0.008	**0.067**	0.009	**0.790**	0.006	0.002	0.013
Total Phosphorus	mg/L	0.02*	0.03	13.00	0.18	**0.12**	**0.09**	**0.09**	**0.15**	**1.00**	**0.20**	**13.00**	**0.11**	**0.09**	**0.19**
Total Potassium (K)	mg/L		3.1	60	5.9	4.2	4.5	5.0	10.0	13.0	4.6	60.0	5.1	3.8	4.7
Total Sodium (Na)	mg/L		1.1	18	5	4.5	7.5	4.4	6.7	2.0	4.1	8.0	4.9	1.4	3.8
Total Suspended Solids	mg/L		21	2100	79	45			94		140				2100
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.01	0.003	<0.0013	0.0058	<0.0017	<0.0005	<0.0005	<0.0012	<0.015	<0.0005	0.0019	<0.0005
Total Zinc (Zn)	mg/L	0.020	0.0050	1.200	0.0155	0.010	<0.01	0.010	0.010	0.110	0.020	**1.200**	0.010	<0.01	**0.030**
Ion Percentage	%		0.55	47.20	3.87	1.4	2.5	1.5	4.4	33.8	4.7	47.2	2.2	0.9	6.7

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
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4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Off-Site Flow From Township Land to South (Background Surface Water Quality) - SS16									
Date						**24-Jan-19**	**17-Apr-19**	**2-Oct-19**	**11-Jan-20**	**18-May-20**	**26-Mar-21**	**17-Feb-22**	**4-May-22**		
Laboratory						**Maxxam**	**Maxxam**	**Bureau Veritas**	**Bureau Veritas**	**Bureau Veritas**	**Bureau Veritas**	**Bureau Veritas**	**Bureau Veritas**		
Routine/Verification Event						**Routine**	**Routine**	**Routine**	**Routine**	**Routine**	**Routine**	**Routine**	**Routine**		
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	40	228	116	96	200	91	74	170	120	40	190		
Conductivity	umho/cm		109	620	310	290	400	620	221	190	290	224	370		
Dissolved Chloride (Cl)	mg/L		1.2	20	5	9.2	3.9	2.1	2.7	3.4	7.0	3.0	3.3		
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001		<0.00010			<0.00010			<0.00010		
Dissolved Sulphate (SO_4)	mg/L		0.5	220	22	34	10	220	30	1.9	29	*0.5*	9.4		
Nitrate (N)	mg/L		0.05	1.5	0.14	0.53	<0.10	0.30	0.15	0.23	0.21	0.29	<0.10		
Nitrite (N)	mg/L		0.005	0.059	0.0078	0.021	<0.010	0.014	0.026	<0.010	<0.010	0.012	<0.010		
pH	(pH units)	6.5-8.5	7.4	8.4	7.9	7.7	8.2	7.9	8.4	7.9	7.8	7.6	8.2		
Phenols-4AAP	mg/L	0.001	0.0005	0.0078	0.0008	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010		
Total Ammonia-N	mg/L		0.025	0.3	0.076	0.300	<0.050	0.210	<0.050	<0.050	0.078	0.16	<0.15		
Total Arsenic (As)	mg/L	0.100*	0.000500	0.00500	0.00167		<0.001			0.002			0.001		
Total Barium (Ba)	mg/L		0.027	0.072	0.040		0.028			0.031			0.027		
Total BOD	mg/L		1	4	1		<2			4			<2		
Total Boron (B)	mg/L	0.200	0.0100	0.400	0.0374	0.02	0.03	0.05	0.03	0.06	0.03	<0.02	0.04		
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.00013	0.00006		<0.0001			<0.0001			<0.0001		
Total Calcium (Ca)	mg/L		13	1300	55	36	64	97	32	49	45	13	56		
Total Chemical Oxygen Demand (COD)	mg/L		18	51	33		25			39			31		
Total Chromium (Cr)	mg/L	0.0089	0.0025	0.5200	0.0057	**0.0090**	<0.005	0.0060	0.006	<0.005	<0.005	<0.005	<0.005		
Total Copper (Cu)	mg/L	0.005	0.002	0.012	0.0049		0.003			0.005			0.003		
Total Dissolved Solids	mg/L		50	720	213	255	240	425	190	200	195	50	190		
Total Iron (Fe)	mg/L	0.300	0.050	540	4.28	**7.0**	**1.5**	**5.8**	**5.3**	**5.0**	**2.9**	**0.5**	**2.7**		
Total Kjeldahl Nitrogen (TKN)	mg/L		0.31	7.2	0.82549	0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7		
Total Lead (Pb)	mg/L	0.005	0.0007	0.006	0.002		0.001			0.0022			0.0012		
Total Magnesium (Mg)	mg/L		2.4	290	14	10	14	25	8	12	10	2.4	12		
Total Nickel (Ni)	mg/L	0.025	0.0005	0.790	0.0067	0.011	0.003	0.009	0.008	0.007	0.004	0.001	0.005		
Total Phosphorus	mg/L	0.02*	0.03	13.00	0.18	**0.22**	**0.07**	**0.22**	**0.20**	**0.21**	**0.15**	**0.10**	**0.08**		
Total Potassium (K)	mg/L		3.1	60	5.9	8.6	3.1	6.0	6.7	3.3	4.6	3.3	3.4		
Total Sodium (Na)	mg/L		1.1	18	5	4.5	4.2	7.3	1.6	2.4	3.4	1.1	3.1		
Total Suspended Solids	mg/L		21	2100	79		21			95			40		
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.01	0.003	<0.00061	<0.0018	0.0062	<0.0023	0.014	<0.00061	<0.00061	<0.0026		
Total Zinc (Zn)	mg/L	0.020	0.0050	1.200	0.0155	0.02	<0.01	0.02	0.02	0.01	0.01	<0.01	<0.01		
Ion Percentage	%		0.55	47.20	3.87	1.4	1.8	3.3	4.0	0.7	1.1	2.6	0.6		

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Sedimentation Pond Surface Water Quality - SP1									
Date						23-Nov-11	6-Dec-11	10-Jan-12	13-Mar-12	27-Mar-12	22-Jun-12	15-Aug-12	14-Oct-12	13-Jan-13	10-Apr-13
Laboratory						Maxxam	Maxxam	Lambton Sci	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Routine/Verification Event															
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	39	190	95	106	116		120	110	50	57	140	80	96
Conductivity	umho/cm		180	930	474	408	396		470	460	360	350	530	380	420
Dissolved Chloride (Cl)	mg/L		2.1	48	13	16	11	11	14	13	11	11	11	10	13
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	<0.0001	<0.0001		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Sulphate (SO_4)	mg/L		29	350	107	71	61		110	110	120	99	110	85	85
Nitrate (N)	mg/L		0.013	2.66	0.31	0.80	0.30		0.75	<0.10	<0.10	<0.10	<0.10	0.91	0.78
Nitrite (N)	mg/L		0.005	0.17	0.0126	0.02	<0.01		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.032
pH	(pH units)	6.5-8.5	7.0	9.6	8.1	8.0	8.0		8.0	8.4	**9.2**	**9.2**	7.7	7.6	7.9
Phenols-4AAP	mg/L	0.001	0.0005	0.004	0.0007	<0.001	**0.004**		**0.002**	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Ammonia-N	mg/L		0.025	7.98	0.117	<0.15	<0.15		<0.15	<0.15	<0.15	0.21	<0.15	<0.15	<0.15
Total Arsenic (As)	mg/L	0.100*	0.000500	0.00900	0.00203	0.004	0.004		0.003	0.001	0.003	0.003	0.004	0.001	0.003
Total Barium (Ba)	mg/L		0.009	0.14	0.037	0.069	0.130		0.066	0.034	0.024	0.013	0.038	0.033	0.063
Total BOD	mg/L		1	4	2	4.00	<2		4.00	4.00	<2.0	<2.0	3.00	<2.0	<2.0
Total Boron (B)	mg/L	0.200	0.0700	2.300	0.2190	0.170	**0.220**	0.160	**0.210**	**0.240**	0.190	**0.210**	0.190	0.120	0.200
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.0002	0.00005	<0.0001	<0.0001		0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Calcium (Ca)	mg/L		22	110	53	61	52		63	52	35	28	52	46	57
Total Chemical Oxygen Demand (COD)	mg/L		9	40	23	33	27		27	32	34	25	35	20	37
Total Chromium (Cr)	mg/L	0.0089	0.0025	0.0360	0.0044	**0.0130**	**0.0270**	<0.005	**0.0110**	<0.005	<0.005	<0.005	<0.005	0.0060	**0.0110**
Total Copper (Cu)	mg/L	0.005	0.001	0.026	0.0037	**0.010**	**0.009**		**0.008**	0.003	0.003	0.002	<0.002	0.004	**0.010**
Total Dissolved Solids	mg/L		116	585	315	262	296		328	294	248	262	334	316	344
Total Iron (Fe)	mg/L	0.300	0.270	35	2.71	**13.000**	**14.000**		**11.000**	**1.300**	**1.200**	**1.300**	**2.700**	**4.400**	**12.000**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	9.9	0.79615	2.00	2.00		1.70	1.10	0.93	0.59	1.30	1.20	2.00
Total Lead (Pb)	mg/L	0.005	0.0003	0.015	0.001	0.005	0.005		0.005	0.001	0.001	0.001	0.001	0.002	0.005
Total Magnesium (Mg)	mg/L		8	56	22	17	17		20	20	18	21	25	15	17
Total Nickel (Ni)	mg/L	0.025	0.0005	0.048	0.0054	0.017	0.016	<0.01	0.014	0.003	0.003	0.003	0.006	0.006	0.017
Total Phosphorus	mg/L	0.02*	0.01	0.78	0.10	**0.40**	**0.30**		**0.25**	**0.08**	**0.05**	**0.06**	**0.10**	**0.13**	**0.25**
Total Potassium (K)	mg/L		0.81	12	4.8	8.2	11.0		5.1	3.9	1.7	3.5	3.5	4.2	5.6
Total Sodium (Na)	mg/L		3.6	36	12	10.0	9.7		13.0	13.0	13.0	14.0	13.0	9.6	11.0
Total Suspended Solids	mg/L		7	530	57	200	120		130	34	25	26	60	73	170
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.61	0.004	<0.02	<0.02	<0.003	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Total Zinc (Zn)	mg/L	0.020	0.0025	0.090	0.0096	**0.030**	**0.040**	0.012	**0.030**	<0.01	<0.01	<0.01	<0.01	0.010	**0.040**
Ion Percentage	%		0.01	23.35	2.52	5.9	4.9		1.9	0.2	0.0	2.0	0.6	2.6	4.7

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" denotes Bureau Veritas laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Sedimentation Pond Surface Water Quality - SP1									
Date						**29-Apr-13**	**5-Jul-13**	**7-Oct-13**	**11-Jan-14**	**8-Apr-14**	**30-Apr-14**	**7-Jul-14**	**24-Nov-14**	**15-Dec-14**	**4-Jan-15**
Laboratory						**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**
Routine/Verification Event									**Routine**	**Routine**	**Verification**	**Routine**	**Routine**	**Verification**	**Routine**
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	39	190	95	120	50	130	190	130	130	65	110	110	130
Conductivity	umho/cm		180	930	474	430	260	460	720	470	480	260	430	420	560
Dissolved Chloride (Cl)	mg/L		2.1	48	13	9	5	18	25	16	14	7	16	13	13
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Sulphate (SO_4)	mg/L		29	350	107	83	65	71	140	79	94	52	76	73	140
Nitrate (N)	mg/L		0.013	2.66	0.31	<0.10	<0.10	0.14	0.9	0.44	1.34	<0.10	1.66	0.47	1.64
Nitrite (N)	mg/L		0.005	0.17	0.0126	<0.010	<0.010	0.020	0.020	<0.010	0.025	<0.010	0.012	0.013	0.025
pH	(pH units)	6.5-8.5	7.0	9.6	8.1	8.3	**8.5**	8.0	8.1	8.1	8.1	**9.6**	7.8	8.1	7.7
Phenols-4AAP	mg/L	0.001	0.0005	0.004	0.0007	<0.0010	<0.0010	<0.0010	<0.0010	**0.002**	<0.0010	0.0013	<0.001	<0.001	**0.004**
Total Ammonia-N	mg/L		0.025	7.98	0.117	<0.15	<0.15	<0.15	0.41	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
Total Arsenic (As)	mg/L	0.100*	0.000500	0.00900	0.00203	<0.001	0.003	0.003	<0.001	0.002	0.002	0.005	0.003	<0.001	0.001
Total Barium (Ba)	mg/L		0.009	0.14	0.037	0.030	0.014	0.06	0.061	0.037	0.052	0.023	0.068	0.036	0.048
Total BOD	mg/L		1	4	2	<2.0	<2.0	4.0	4.0	2.0	<2.0	<2.0	3.0	<2.0	3.0
Total Boron (B)	mg/L	0.200	0.0700	2.300	0.2190	**0.220**	0.180	**0.320**	**0.290**	0.170	**0.260**	**0.230**	0.140	0.100	0.120
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.0002	0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001
Total Calcium (Ca)	mg/L		22	110	53	50	23	55	110	63	71	22	59	50	77
Total Chemical Oxygen Demand (COD)	mg/L		9	40	23	37	18	34	32	30	30	40	33	10	25
Total Chromium (Cr)	mg/L	0.0089	0.0025	0.0360	0.0044	<0.005	<0.005	<0.005	<0.005	<0.005	0.0070	<0.005	**0.0100**	<0.005	<0.005
Total Copper (Cu)	mg/L	0.005	0.001	0.026	0.0037	0.003	<0.002	0.002	0.003	0.004	**0.006**	<0.002	**0.009**	0.003	0.003
Total Dissolved Solids	mg/L		116	585	315	278	164	290	478	372	344	164	338	276	404
Total Iron (Fe)	mg/L	0.300	0.270	35	2.71	**0.670**	**0.380**	**3.000**	0.270	**3.400**	**6.300**	**0.590**	**9.900**	**0.970**	**1.600**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	9.9	0.79615	1.10	0.75	1.60	1.30	1.20	1.20	1.30	1.90	0.79	0.87
Total Lead (Pb)	mg/L	0.005	0.0003	0.015	0.001	<0.0005	<0.0005	0.0015	<0.0005	0.0013	0.0028	<0.0005	0.004	0.0005	0.0008
Total Magnesium (Mg)	mg/L		8	56	22	18	14	17	32	18	21	14	19	16	26
Total Nickel (Ni)	mg/L	0.025	0.0005	0.048	0.0054	0.002	<0.001	0.006	0.003	0.006	0.010	0.002	0.014	0.002	0.003
Total Phosphorus	mg/L	0.02*	0.01	0.78	0.10	**0.06**	**0.03**	**0.08**	**0.06**	**0.14**	**0.18**	**0.07**	**0.24**	**0.05**	**0.06**
Total Potassium (K)	mg/L		0.81	12	4.8	3.7	0.8	7.1	10.0	4.3	5.8	2.0	8.5	5.1	7.5
Total Sodium (Na)	mg/L		3.6	36	12	11.0	8.8	15.0	21.0	11.0	14.0	12.0	6.8	7.2	9.6
Total Suspended Solids	mg/L		7	530	57	21	9	85	7	68	82	15	150	21	33
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.61	0.004	<0.02	<0.097	<0.0085	0.0073	<0.0042	<0.0028	*<0.022*	<0.012	<0.012	<0.00079
Total Zinc (Zn)	mg/L	0.020	0.0025	0.090	0.0096	<0.01	<0.01	<0.01	<0.01	0.01	0.02	<0.01	**0.03**	<0.01	<0.01
Ion Percentage	%		0.01	23.35	2.52	0.9	1.9	2.1	8.2	5.4	7.5	4.7	6.9	3.8	5.0

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" denotes Bureau Veritas laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Sedimentation Pond Surface Water Quality - SP1									
Date						10-Apr-15	30-Apr-15	3-Aug-15	25-Feb-16	7-Apr-16	1-Aug-16	3-Nov-16	24-Nov-16	12-Dec-16	12-Jan-17
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Routine/Verification Event						Routine	Verification	Routine	Routine	Routine	Routine	Assessment	Assessment	Assessment	Routine
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	39	190	95	98	110	68	110	120	39	190			110
Conductivity	umho/cm		180	930	474	310	410	330	420	420	460	620			410
Dissolved Chloride (Cl)	mg/L		2.1	48	13	14	8	5.4	8.5	6	2.3	13	13	11	11
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010			<0.00010
Dissolved Sulphate (SO_4)	mg/L		29	350	107	54	78	86	78	74	180	100			74
Nitrate (N)	mg/L		0.013	2.66	0.31	1.23	<0.10	<0.10	1.29	0.65	0.013	0.21			0.86
Nitrite (N)	mg/L		0.005	0.17	0.0126	0.03	<0.010	<0.010	0.013	<0.010	0.17	0.053			0.045
pH	(pH units)	6.5-8.5	7.0	9.6	8.1	7.0	8.1	8.1	8.0	7.7	8.8	8.1			7.9
Phenols-4AAP	mg/L	0.001	0.0005	0.004	0.0007	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0040	<0.0040	<0.0010	<0.0010	<0.0040
Total Ammonia-N	mg/L		0.025	7.98	0.117	0.15	<0.15	<0.15	<0.15	<0.15	<0.15	7.98	6.30	4.20	1.26
Total Arsenic (As)	mg/L	0.100*	0.000500	0.00900	0.00203	0.009	<0.001	0.005	0.002	0.003	0.003	0.004			0.003
Total Barium (Ba)	mg/L		0.009	0.14	0.037	0.140	0.025	0.052	0.068	0.050	0.020	0.037			0.088
Total BOD	mg/L		1	4	2	<2.0	<2.0	4.0	<2.0	<2.0	<2.0	3.0			4.0
Total Boron (B)	mg/L	0.200	0.0700	2.300	0.2190	0.130	0.130	0.130	0.120	0.110	0.130	**2.300**	**2.200**	**1.900**	**0.410**
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.0002	0.00005	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001
Total Calcium (Ca)	mg/L		22	110	53	64	43	34	54	60	45	46			47
Total Chemical Oxygen Demand (COD)	mg/L		9	40	23	31	20	33	21	29	9.8	40			36
Total Chromium (Cr)	mg/L	0.0089	0.0025	0.0360	0.0044	**0.0360**	<0.005	0.0070	**0.0130**	**0.0090**	<0.005	<0.005	<0.005	<0.005	**0.0160**
Total Copper (Cu)	mg/L	0.005	0.001	0.026	0.0037	**0.026**	0.003	**0.006**	0.005	0.007	<0.002	0.003			**0.008**
Total Dissolved Solids	mg/L		116	585	315	262	238	284	292	282	390	432			300
Total Iron (Fe)	mg/L	0.300	0.270	35	2.71	**35.000**	**0.870**	**6.700**	**6.000**	**8.400**	**1.100**	**2.700**			**8.900**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	9.9	0.79615	0.87	0.50	0.57	0.50	0.52	0.45	9.90			2.00
Total Lead (Pb)	mg/L	0.005	0.0003	0.015	0.001	**0.015**	<0.0005	0.0034	0.0023	0.0035	0.0005	0.0012			0.0034
Total Magnesium (Mg)	mg/L		8	56	22	21	16	19	16	17	24	24			17
Total Nickel (Ni)	mg/L	0.025	0.0005	0.048	0.0054	**0.048**	0.002	0.010	0.007	0.012	<0.001	0.006	0.004	0.003	0.012
Total Phosphorus	mg/L	0.02*	0.01	0.78	0.10	**0.78**	**0.05**	**0.21**	**0.14**	**0.22**	**0.04**	**0.11**			0.30
Total Potassium (K)	mg/L		0.81	12	4.8	7.3	3.4	2.9	7.4	4.5	2.7	9.0			12.0
Total Sodium (Na)	mg/L		3.6	36	12	5.9	6.8	6.9	6.2	6.4	10.0	36.0			8.8
Total Suspended Solids	mg/L		7	530	57	530	32	170	18	98	31	59			140
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.61	0.004	0.0059	<0.0005	*<0.074*	<0.00098	<0.0013	<0.00063	**0.610**	**0.290**	0.009	0.007
Total Zinc (Zn)	mg/L	0.020	0.0025	0.090	0.0096	**0.090**	<0.01	0.020	0.02	0.02	<0.01	<0.01	<0.005	0.006	0.020
Ion Percentage	%		0.01	23.35	2.52	13.4	1.5	4.4	2.5	4.0	0.5	0.9			2.4

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
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4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" denotes Bureau Veritas laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Sedimentation Pond Surface Water Quality - SP1									
Date						24-Jan-17	6-Apr-17	13-Jul-17	23-Jan-18	4-Apr-18	27-Aug-18	2-Oct-18	24-Jan-19	19-Apr-19	27-Oct-19
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Bureau Veritas
Routine/Verification Event						Verification	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	39	190	95	55	130	49	110	120	46	190	81	140	120
Conductivity	umho/cm		180	930	474	180	490	360	450	480	460	650	320	610	560
Dissolved Chloride (Cl)	mg/L		2.1	48	13	4.2	8.7	2.1	13	9.5	9.2	26	14	18	20
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Sulphate (SO_4)	mg/L		29	350	107	29	96	120	98	120	150	120	44	150	130
Nitrate (N)	mg/L		0.013	2.66	0.31	0.31	0.50	<0.10	2.09	0.94	0.81	2.33	0.79	0.75	1.31
Nitrite (N)	mg/L		0.005	0.17	0.0126	0.016	0.040	<0.010	0.027	0.014	0.047	0.014	0.018	0.021	0.049
pH	(pH units)	6.5-8.5	7.0	9.6	8.1	7.7	8.1	8.1	7.7	8.1	8.7	8.2	7.6	8.2	8.2
Phenols-4AAP	mg/L	0.001	0.0005	0.004	0.0007	<0.0040	<0.0040	<0.0040	0.0025	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Ammonia-N	mg/L		0.025	7.98	0.117	0.590	<0.15	<0.15	0.160	0.110	0.064	<0.050	0.720	<0.050	<0.050
Total Arsenic (As)	mg/L	0.100*	0.000500	0.00900	0.00203	<0.001	0.002	0.004	0.003	0.004	0.002	0.003	<0.001	0.001	0.002
Total Barium (Ba)	mg/L		0.009	0.14	0.037	0.023	0.041	0.050	0.050	0.072	0.009	0.025	0.017	0.039	0.023
Total BOD	mg/L		1	4	2	<2.0	3.0	2.0	<2	<2	<2	<2	4.0	4.0	<2
Total Boron (B)	mg/L	0.200	0.0700	2.300	0.2190	0.130	0.150	**0.210**	0.110	0.150	0.160	0.180	0.070	0.200	**0.230**
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.0002	0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Calcium (Ca)	mg/L		22	110	53	27	69	43	61	74	43	52	32	77	58
Total Chemical Oxygen Demand (COD)	mg/L		9	40	23	12	13	15	20	15	15	23	25	26	18
Total Chromium (Cr)	mg/L	0.0089	0.0025	0.0360	0.0044	<0.005	<0.005	0.0050	**0.0100**	**0.0150**	<0.005	<0.005	<0.005	0.0050	<0.005
Total Copper (Cu)	mg/L	0.005	0.001	0.026	0.0037	0.003	0.005	0.005	0.008	**0.011**	0.003	0.004	0.003	0.005	<0.002
Total Dissolved Solids	mg/L		116	585	315	116	296	236	225	200	235	450	195	440	325
Total Iron (Fe)	mg/L	0.300	0.270	35	2.71	**1.700**	**4.500**	**4.100**	**8.600**	**14.000**	**0.800**	**1.900**	**1.000**	**3.300**	**1.000**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	9.9	0.79615	1.10	<0.70	0.49	0.35	0.35	0.40	0.70	1.40	0.57	0.50
Total Lead (Pb)	mg/L	0.005	0.0003	0.015	0.001	0.0007	0.0024	0.0017	0.0034	**0.0057**	<0.0005	0.0009	0.0007	0.0013	<0.0005
Total Magnesium (Mg)	mg/L		8	56	22	8	20	20	19	25	25	23	11	28	27
Total Nickel (Ni)	mg/L	0.025	0.0005	0.048	0.0054	0.002	0.007	0.007	0.012	0.018	0.003	0.005	0.002	0.006	0.004
Total Phosphorus	mg/L	0.02*	0.01	0.78	0.10	**0.10**	<0.15	**0.20**	**0.26**	**0.31**	**0.04**	**0.16**	**0.17**	**0.08**	**0.05**
Total Potassium (K)	mg/L		0.81	12	4.8	5.6	4.9	3.1	5.5	5.9	3.8	4.9	7.3	5.0	4.7
Total Sodium (Na)	mg/L		3.6	36	12	3.6	7.6	8.6	7.5	8.9	12.0	11.0	6.9	12.0	17.0
Total Suspended Solids	mg/L		7	530	57	15	120	120	160	320	35	58	29	70	29
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.61	0.004	0.004	<0.0005	<0.052	0.0015	<0.0005	0.0014	<0.00061	0.0013	<0.0036	<0.0069
Total Zinc (Zn)	mg/L	0.020	0.0025	0.090	0.0096	<0.01	0.01	0.01	0.02	**0.04**	<0.01	<0.01	0.01	<0.01	<0.01
Ion Percentage	%		0.01	23.35	2.52	6.4	3.5	4.5	2.5	5.1	2.8	8.7	0.5	1.4	1.3

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" denotes Bureau Veritas laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Sedimentation Pond Surface Water Quality - SP1									
Date						11-Jan-20	18-May-20	15-Nov-20	26-Mar-21	9-Jul-21	4-Oct-21	17-Feb-22	4-May-22	20-Jul-22	2-Aug-22
Laboratory						Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas
Routine/Verification Event						Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Verification
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	39	190	95	160	89	110	130	63	57	82	160	52	42
Conductivity	umho/cm		180	930	474	762	600	930	750	700	660	320	730	760	850
Dissolved Chloride (Cl)	mg/L		2.1	48	13	44	25	18	48	40	21	17	29	28	26
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Sulphate (SO_4)	mg/L		29	350	107	170	180	350	160	220	250	44	190	280	310
Nitrate (N)	mg/L		0.013	2.66	0.31	2.34	0.10	0.21	2.66	<0.10	0.60	0.56	0.46	<0.10	0.24
Nitrite (N)	mg/L		0.005	0.17	0.0126	0.024	<0.010	<0.010	0.032	<0.010	0.026	0.043	0.012	<0.010	<0.010
pH	(pH units)	6.5-8.5	7.0	9.6	8.1	8.3	8.1	8.0	8.0	8.3	8.2	7.8	8.2	**8.7**	8.2
Phenols-4AAP	mg/L	0.001	0.0005	0.004	0.0007	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	**0.0012**	<0.0010	<0.0010	<0.0010
Total Ammonia-N	mg/L		0.025	7.98	0.117	<0.050	<0.050	0.083	0.096	<0.15	<0.15	1.3	<0.15	<0.15	<0.15
Total Arsenic (As)	mg/L	0.100*	0.000500	0.00900	0.00203	0.002	0.001	0.003	0.003	0.004	0.001	0.004	0.001	0.002	0.001
Total Barium (Ba)	mg/L		0.009	0.14	0.037	0.053	0.016	0.043	0.061	0.037	0.020	0.05	0.037	0.026	0.022
Total BOD	mg/L		1	4	2	3	<2	<2	4	<2	2	3	<2	<2	<2
Total Boron (B)	mg/L	0.200	0.0700	2.300	0.2190	**0.32**	**0.25**	**0.23**	**0.39**	**0.27**	**0.25**	0.08	**0.37**	**0.43**	**0.35**
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.0002	0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Calcium (Ca)	mg/L		22	110	53	99	46	110	84	53	64	41	76	53	67
Total Chemical Oxygen Demand (COD)	mg/L		9	40	23	19	37	11	27	29	14	30	22	20	19
Total Chromium (Cr)	mg/L	0.0089	0.0025	0.0360	0.0044	0.0060	<0.005	**0.009**	**0.010**	<0.005	<0.005	**0.013**	<0.005	<0.005	<0.005
Total Copper (Cu)	mg/L	0.005	0.001	0.026	0.0037	**0.006**	0.003	**0.007**	**0.009**	0.002	0.003	**0.012**	0.004	<0.002	<0.002
Total Dissolved Solids	mg/L		116	585	315	530	395	585	465	470	450	195	375	510	545
Total Iron (Fe)	mg/L	0.300	0.270	35	2.71	**4.9**	**1.6**	**8.1**	**8.7**	**1.7**	**0.9**	**13**	**2.8**	**0.6**	**0.9**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	9.9	0.79615	0.45	0.61	0.4	0.5	<0.7	<0.7	2.2	<0.7	<0.7	<0.7
Total Lead (Pb)	mg/L	0.005	0.0003	0.015	0.001	0.002	0.0007	0.0032	0.0035	0.0007	<0.0005	**0.0052**	0.0011	<0.0005	<0.0005
Total Magnesium (Mg)	mg/L		8	56	22	35	32	56	32	35	33	14	34	45	48
Total Nickel (Ni)	mg/L	0.025	0.0005	0.048	0.0054	0.010	0.005	0.014	0.017	0.006	0.003	0.019	0.007	0.003	0.003
Total Phosphorus	mg/L	0.02*	0.01	0.78	0.10	**0.15**	**0.06**	**0.14**	**0.21**	**0.05**	**0.04**	**0.33**	**0.084**	0.015	0.009
Total Potassium (K)	mg/L		0.81	12	4.8	7.5	3.6	6.5	7.7	3.1	5.2	8.7	4.9	3.4	3.8
Total Sodium (Na)	mg/L		3.6	36	12	29	21	22	34	30	22	8.7	26	31	31
Total Suspended Solids	mg/L		7	530	57	150	42	250	220	46	39	250	19	13	81
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.61	0.004	<0.0015	<0.0069	0.0022	0.00098	<0.0068	<0.013	0.0076	<0.0015	<0.082	<0.075
Total Zinc (Zn)	mg/L	0.020	0.0025	0.090	0.0096	0.02	<0.01	0.02	**0.03**	<0.01	<0.01	**0.04**	<0.01	<0.01	<0.01
Ion Percentage	%		0.01	23.35	2.52	15.2	5.7	11.1	15.5	1.6	0.2	23.3	2.2	0.8	7.7

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" denotes Bureau Veritas laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Sedimentation Pond Surface Water Quality - SP1									
Date						**18-Oct-22**									
Laboratory						**Bueau Veritas**									
Routine/Verification Event						**Routine**									
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	39	190	95	65									
Conductivity	umho/cm		180	930	474	810									
Dissolved Chloride (Cl)	mg/L		2.1	48	13	24									
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	<0.00010									
Dissolved Sulphate (SO_4)	mg/L		29	350	107	320									
Nitrate (N)	mg/L		0.013	2.66	0.31	<0.10									
Nitrite (N)	mg/L		0.005	0.17	0.0126	<0.010									
pH	(pH units)	6.5-8.5	7.0	9.6	8.1	8.1									
Phenols-4AAP	mg/L	0.001	0.0005	0.004	0.0007	<0.0010									
Total Ammonia-N	mg/L		0.025	7.98	0.117	<0.15									
Total Arsenic (As)	mg/L	0.100*	0.000500	0.00900	0.00203	<0.001									
Total Barium (Ba)	mg/L		0.009	0.14	0.037	0.022									
Total BOD	mg/L		1	4	2	<2									
Total Boron (B)	mg/L	0.200	0.0700	2.300	0.2190	**0.33**									
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.0002	0.00005	<0.0001									
Total Calcium (Ca)	mg/L		22	110	53	65									
Total Chemical Oxygen Demand (COD)	mg/L		9	40	23	9.3									
Total Chromium (Cr)	mg/L	0.0089	0.0025	0.0360	0.0044	<0.005									
Total Copper (Cu)	mg/L	0.005	0.001	0.026	0.0037	<0.002									
Total Dissolved Solids	mg/L		116	585	315	510									
Total Iron (Fe)	mg/L	0.300	0.270	35	2.71	0.3									
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	9.9	0.79615	<0.7									
Total Lead (Pb)	mg/L	0.005	0.0003	0.015	0.001	<0.0005									
Total Magnesium (Mg)	mg/L		8	56	22	50									
Total Nickel (Ni)	mg/L	0.025	0.0005	0.048	0.0054	0.002									
Total Phosphorus	mg/L	0.02*	0.01	0.78	0.10	0.006									
Total Potassium (K)	mg/L		0.81	12	4.8	3.5									
Total Sodium (Na)	mg/L		3.6	36	12	30									
Total Suspended Solids	mg/L		7	530	57	9									
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.61	0.004	<0.0067									
Total Zinc (Zn)	mg/L	0.020	0.0025	0.090	0.0096	<0.01									
Ion Percentage	%		0.01	23.35	2.52	0.5									

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" denotes Bureau Veritas laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Sedimentation Pond Surface Water Quality - SP2									
Date						14-Sep-08	17-Oct-08	4-Nov-08	5-Dec-08	12-Feb-09	19-Feb-09	8-Mar-09	6-Apr-09	26-Apr-09	7-May-09
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Routine/Verification Event															
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	43	190	82	87	112	79	115	69		76	100	70	95
Conductivity	umho/cm		223	1100	591	339	436	282	422	223		239	389	223	310
Dissolved Chloride (Cl)	mg/L		7	93	30	14	11	10	14	7	14	7	22	9	11
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	<0.0002	<0.0002	<0.0002	<0.0001	<0.0001		<0.0001	0.0001	<0.0001	<0.0001
Dissolved Sulphate (SO_4)	mg/L		27	420	142	54	98	41	76	27		37	66	30	51
Nitrate (N)	mg/L		0.005	3.65	0.32	0.6	<0.1	1.6	1.0	1.1		1.2	1.2	1.1	0.7
Nitrite (N)	mg/L		0.01	0.34	0.0150	0.03	<0.01	0.01	0.01	0.02		0.01	0.01	0.03	0.03
pH	(pH units)	6.5-8.5	7.0	9.5	7.9	7.9	7.7	8.0	8.0	7.8		7.1	8.0	7.5	7.6
Phenols-4AAP	mg/L	0.001	0.0005	0.0043	0.0007	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Ammonia-N	mg/L		0.025	1.2	0.120	<0.15	<0.15	0.21	<0.15	<0.15		<0.15	<0.15	0.19	<0.15
Total Arsenic (As)	mg/L	0.100*	0.000500	0.02600	0.00173	0.006	0.002	0.015	0.001	0.008		0.002	0.026	0.011	<0.001
Total Barium (Ba)	mg/L		0.008	0.36	0.040	0.075	0.042	0.200	0.038	0.110		0.032	0.360	0.140	0.022
Total BOD	mg/L		1	29	2	<2	2	<2	<2	<2		<2	<2	<2	<2
Total Boron (B)	mg/L	0.200	0.0300	0.500	0.1158	0.120	0.110	0.060	0.150	0.080		0.030	0.190	0.100	0.130
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.0005	0.00005	<0.0001	<0.0001	**0.0003**	<0.0001	<0.0001		<0.0001	**0.0005**	0.0001	<0.0001
Total Calcium (Ca)	mg/L		26	320	65	48	43	60	51	46		42	320	49	39
Total Chemical Oxygen Demand (COD)	mg/L		9	99	19	30	12	26	16	12		20	99	28	18
Total Chromium (Cr)	mg/L	0.0089	0.0025	0.1000	0.0039	**0.0160**	0.0060	**0.0530**	0.0070	**0.0250**		<0.005	**0.1000**	**0.0370**	<0.005
Total Copper (Cu)	mg/L	0.005	0.001	0.086	0.0042	**0.014**	**0.006**	**0.041**	0.004	**0.021**		0.005	**0.086**	**0.029**	0.003
Total Dissolved Solids	mg/L		140	795	379	246	275	185	272	140		155	250	142	200
Total Iron (Fe)	mg/L	0.300	0.050	110	1.63	**16.000**	**5.100**	**54.000**	**2.800**	**26.000**		**3.800**	**110.000**	**36.000**	**0.400**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	6.3	0.87575	1.6	1.2	4.0	0.6	1.9		1.3	5.0	2.4	0.8
Total Lead (Pb)	mg/L	0.005	0.0003	0.047	0.001	**0.006**	0.002	**0.021**	0.002	**0.010**		0.002	**0.047**	**0.013**	<0.0005
Total Magnesium (Mg)	mg/L		11	87	26	15	23	21	16	14		13	87	18	11
Total Nickel (Ni)	mg/L	0.025	0.001	0.140	0.0055	0.022	0.008	**0.067**	0.004	**0.034**		0.006	**0.140**	**0.050**	0.002
Total Phosphorus	mg/L	0.02*	0.02	2.00	0.08	**0.32**	**0.26**	**1.30**	*<0.15*	**0.32**		*<0.15*	**2.00**	**0.57**	*<0.03*
Total Potassium (K)	mg/L		0.8	12	4.6	6.1	2.9	10.0	4.2	5.9		2.0	11.0	6.5	2.5
Total Sodium (Na)	mg/L		4.5	62	23	9.2	14.0	4.5	11.0	5.2		5.3	12.0	5.6	7.2
Total Suspended Solids	mg/L		4	5300	40	140	190	1100	<10	450		45	5300	380	15
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.13	0.005	<0.02	<0.02	<0.02	<0.02	<0.02		<0.02	<0.02	<0.02	<0.02
Total Zinc (Zn)	mg/L	0.020	0.0050	0.240	0.0093	**0.039**	0.018	**0.140**	0.013	**0.060**		<0.01	**0.240**	**0.080**	<0.01
Ion Percentage	%		0.03	36.92	2.21	8.9	3.1	18.3	3.7	17.2		11.2	36.9	18.4	2.7

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Sedimentation Pond Surface Water Quality - SP2									
Date						24-Oct-09	25-Jan-10	6-Apr-10	14-Oct-10	28-Feb-11	20-Apr-11	8-Aug-11	20-Oct-11	13-Mar-12	27-Mar-12
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Routine/Verification Event															
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	43	190	82	75	84	82	91	105	98	52	75	110	84
Conductivity	umho/cm		223	1100	591	574	543	487	509	510	472	428	417	620	640
Dissolved Chloride (Cl)	mg/L		7	93	30	28	34	35	22	32	35	25	18	60	61
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010
Dissolved Sulphate (SO_4)	mg/L		27	420	142	160	120	100	120	87	76	110	95	120	130
Nitrate (N)	mg/L		0.005	3.65	0.32	2.00	1.60	0.20	<0.1	1.10	0.50	<0.1	0.30	0.91	<0.10
Nitrite (N)	mg/L		0.01	0.34	0.0150	0.05	0.04	0.01	<0.01	0.03	0.01	<0.01	0.01	0.015	<0.010
pH	(pH units)	6.5-8.5	7.0	9.5	7.9	7.0	8.1	7.9	7.9	8.0	8.1	**9.3**	8.0	8.1	8.2
Phenols-4AAP	mg/L	0.001	0.0005	0.0043	0.0007	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001	**0.002**	<0.0010
Total Ammonia-N	mg/L		0.025	1.2	0.120	<0.15	<0.15	<0.15	<0.15	0.34	<0.15	<0.15	<0.15	<0.15	<0.15
Total Arsenic (As)	mg/L	0.100*	0.000500	0.02600	0.00173	<0.001	<0.001	<0.001	0.002	<0.001	0.001	0.004	0.003	0.001	0.001
Total Barium (Ba)	mg/L		0.008	0.36	0.040	0.032	0.025	0.026	0.040	0.027	0.037	0.008	0.046	0.037	0.034
Total BOD	mg/L		1	29	2	6.0	<2	<2	4.0	<2	<2	2.0	3.0	3.0	4.0
Total Boron (B)	mg/L	0.200	0.0300	0.500	0.1158	0.060	0.060	0.070	0.090	0.150	0.100	0.130	0.060	0.070	0.100
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.0005	0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Calcium (Ca)	mg/L		26	320	65	57	64	48	52	54	53	26	51	65	56
Total Chemical Oxygen Demand (COD)	mg/L		9	99	19	19	19	29	31	18	11	23	22	20	26
Total Chromium (Cr)	mg/L	0.0089	0.0025	0.1000	0.0039	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0060	<0.005	<0.005
Total Copper (Cu)	mg/L	0.005	0.001	0.086	0.0042	0.003	0.003	0.003	<0.002	0.003	0.003	<0.002	**0.008**	**0.006**	0.004
Total Dissolved Solids	mg/L		140	795	379	370	365	312	322	306	282	300	292	410	402
Total Iron (Fe)	mg/L	0.300	0.050	110	1.63	**1.300**	**1.000**	**1.000**	**0.800**	**0.900**	**2.300**	0.300	**6.200**	**3.600**	**1.300**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	6.3	0.87575	1.4	1.2	1.0	1.2	1.1	1.0	0.6	1.0	1.3	1.1
Total Lead (Pb)	mg/L	0.005	0.0003	0.047	0.001	0.001	<0.0005	0.001	0.001	<0.0005	0.001	<0.0005	0.003	0.002	0.001
Total Magnesium (Mg)	mg/L		11	87	26	24	22	18	23	19	17	23	17	22	26
Total Nickel (Ni)	mg/L	0.025	0.001	0.140	0.0055	0.003	0.003	0.002	0.002	0.006	0.004	0.002	0.010	0.006	0.003
Total Phosphorus	mg/L	0.02*	0.02	2.00	0.08	**0.09**	**0.05**	**0.05**	**0.08**	**0.03**	**0.06**	**0.04**	**0.19**	**0.06**	**0.07**
Total Potassium (K)	mg/L		0.8	12	4.6	3.8	4.1	3.5	3.4	4.1	3.7	2.4	4.9	4.0	4.0
Total Sodium (Na)	mg/L		4.5	62	23	14	23	24	17	24	24	23	13	39	43
Total Suspended Solids	mg/L		4	5300	40	30	18	18	19	8	27	9	150	69	30
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.13	0.005	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Total Zinc (Zn)	mg/L	0.020	0.0050	0.240	0.0093	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.02	0.010	<0.01
Ion Percentage	%		0.03	36.92	2.21	0.8	5.9	3.2	3.6	2.9	3.4	1.2	3.8	1.7	3.0

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Sedimentation Pond Surface Water Quality - SP2									
Date						30-Oct-12	15-Nov-12	13-Jan-13	10-Apr-13	5-Jul-13	7-Oct-13	11-Jan-14	28-Jan-14	8-Apr-14	30-Apr-14
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Routine/Verification Event												Routine	Verification	Routine	Verification
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	43	190	82	110	110	77	97	55	100	71	190	100	100
Conductivity	umho/cm		223	1100	591	620	650	410	590	350	520	310	960	410	530
Dissolved Chloride (Cl)	mg/L		7	93	30	35	31	21	61	23	18	32	93	24	31
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Sulphate (SO_4)	mg/L		27	420	142	140	150	79	88	81	120	29	170	55	100
Nitrate (N)	mg/L		0.005	3.65	0.32	0.79	2.00	1.90	0.78	<0.10	<0.10	0.92	0.27	0.34	0.86
Nitrite (N)	mg/L		0.01	0.34	0.0150	<0.010	0.078	<0.010	0.030	<0.010	<0.010	0.014	<0.010	<0.010	0.015
pH	(pH units)	6.5-8.5	7.0	9.5	7.9	7.2	7.8	7.7	7.9	8.4	7.9	8.0	7.3	8.0	8.0
Phenols-4AAP	mg/L	0.001	0.0005	0.0043	0.0007	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	**0.0013**	<0.0010	**0.002**	<0.0010
Total Ammonia-N	mg/L		0.025	1.2	0.120	0.36	0.25	<0.15	0.21	<0.15	0.18	0.45	0.52	0.17	0.17
Total Arsenic (As)	mg/L	0.100*	0.000500	0.02600	0.00173	0.021	<0.001	0.001	0.001	0.004	0.004	0.004	<0.001	0.001	0.002
Total Barium (Ba)	mg/L		0.008	0.36	0.040	0.280	0.041	0.027	0.035	0.018	0.062	0.050	0.053	0.030	0.037
Total BOD	mg/L		1	29	2	4.0	5.0	<2.0	<2.0	<2.0	4.0	3.0	3.0	2.0	<2.0
Total Boron (B)	mg/L	0.200	0.0300	0.500	0.1158	0.130	0.080	0.060	0.080	0.070	0.110	0.050	0.090	0.050	0.100
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.0005	0.00005	**0.0003**	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Calcium (Ca)	mg/L		26	320	65	200	73	48	60	34	63	37	100	50	61
Total Chemical Oxygen Demand (COD)	mg/L		9	99	19	74	22	17	10	11	32	13	20	18	18
Total Chromium (Cr)	mg/L	0.0089	0.0025	0.1000	0.0039	**0.0800**	<0.005	<0.005	<0.005	<0.005	0.0050	**0.0170**	<0.005	<0.005	<0.005
Total Copper (Cu)	mg/L	0.005	0.001	0.086	0.0042	**0.066**	0.002	0.005	**0.006**	0.003	0.004	**0.014**	0.004	0.004	**0.006**
Total Dissolved Solids	mg/L		140	795	379	410	402	274	374	196	316	234	578	282	338
Total Iron (Fe)	mg/L	0.300	0.050	110	1.63	**83.000**	**0.580**	**2.700**	**3.000**	**1.100**	**5.200**	**13.000**	**0.640**	**2.800**	**2.700**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	6.3	0.87575	6.3	1.0	1.2	1.5	1.0	2.0	<2.0	2.1	1.2	1.3
Total Lead (Pb)	mg/L	0.005	0.0003	0.047	0.001	**0.033**	<0.0005	0.0013	0.0014	0.0006	0.0024	**0.0056**	<0.0005	0.0013	0.0013
Total Magnesium (Mg)	mg/L		11	87	26	56	23	14	17	16	23	11	31	13	20
Total Nickel (Ni)	mg/L	0.025	0.001	0.140	0.0055	**0.110**	0.002	0.005	0.006	0.002	0.009	0.019	0.004	0.006	0.006
Total Phosphorus	mg/L	0.02*	0.02	2.00	0.08	**1.40**	**0.04**	**0.07**	**0.07**	**0.07**	**0.18**	**0.28**	**0.05**	**0.09**	**0.09**
Total Potassium (K)	mg/L		0.8	12	4.6	12.0	3.8	3.0	3.4	0.8	5.2	6.6	5.8	3.4	3.9
Total Sodium (Na)	mg/L		4.5	62	23	30	25	15	35	20	16	21	62	15	25
Total Suspended Solids	mg/L		4	5300	40	1600	18	38	61	24	150	52	13	47	44
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.13	0.005	<0.02	<0.02	<0.02	<0.02	<0.022	0.011	0.0056	0.0014	0.003	0.002
Total Zinc (Zn)	mg/L	0.020	0.0050	0.240	0.0093	**0.210**	<0.01	0.010	0.010	<0.01	0.010	**0.050**	0.020	<0.01	0.010
Ion Percentage	%		0.03	36.92	2.21	24.0	3.7	5.1	4.0	4.7	5.9	9.2	2.9	5.6	6.2

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Sedimentation Pond Surface Water Quality - SP2									
Date						7-Jul-14	24-Jul-14	24-Nov-14	15-Dec-14	4-Jan-15	10-Apr-15	30-Apr-15	3-Aug-15	25-Oct-15	25-Feb-16
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Routine/Verification Event						Routine	Verification	Routine	Verification	Routine	Routine	Verification	Routine	Routine	Routine
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	43	190	82	61	52	89	82	100	96	78	72	69	94
Conductivity	umho/cm		223	1100	591	360	520	630	630	660	470	520	570	760	580
Dissolved Chloride (Cl)	mg/L		7	93	30	29	20	34	20	29	30	36	22	36	21
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Sulphate (SO_4)	mg/L		27	420	142	69	170	160	200	190	100	110	180	270	150
Nitrate (N)	mg/L		0.005	3.65	0.32	<0.10	<0.10	0.90	0.59	1.31	1.24	<0.10	<0.10	<0.10	1.49
Nitrite (N)	mg/L		0.01	0.34	0.0150	<0.010	<0.010	0.026	0.022	0.047	0.104	<0.010	<0.010	<0.010	0.023
pH	(pH units)	6.5-8.5	7.0	9.5	7.9	**9.1**	**8.9**	7.8	8.2	7.7	7.0	7.8	7.9	7.5	8.0
Phenols-4AAP	mg/L	0.001	0.0005	0.0043	0.0007	**0.002**	<0.0010	<0.001	<0.001	**0.004**	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Ammonia-N	mg/L		0.025	1.2	0.120	<0.15	0.35	<0.15	0.26	0.24	0.58	<0.15	<0.15	<0.15	0.27
Total Arsenic (As)	mg/L	0.100*	0.000500	0.02600	0.00173	0.006	0.005	0.002	<0.001	0.001	0.004	<0.001	0.003	0.002	<0.001
Total Barium (Ba)	mg/L		0.008	0.36	0.040	0.028	0.020	0.040	0.029	0.038	0.051	0.031	0.059	0.075	0.026
Total BOD	mg/L		1	29	2	<2.0	<2.0	3.0	5.0	3.0	<2.0	<2.0	<2.0	10	<2.0
Total Boron (B)	mg/L	0.200	0.0300	0.500	0.1158	0.080	0.090	0.080	0.080	0.080	0.060	0.070	0.110	0.140	0.050
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.0005	0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Calcium (Ca)	mg/L		26	320	65	28	44	65	52	67	60	39	54	67	62
Total Chemical Oxygen Demand (COD)	mg/L		9	99	19	37	15	22	11	18	15	12	16	63	17
Total Chromium (Cr)	mg/L	0.0089	0.0025	0.1000	0.0039	<0.005	<0.005	<0.005	<0.005	<0.005	**0.0110**	<0.005	<0.005	<0.005	<0.005
Total Copper (Cu)	mg/L	0.005	0.001	0.086	0.0042	0.004	<0.002	**0.008**	0.003	0.004	**0.011**	0.002	0.002	0.002	0.003
Total Dissolved Solids	mg/L		140	795	379	270	388	410	416	420	290	318	428	550	342
Total Iron (Fe)	mg/L	0.300	0.050	110	1.63	**2.500**	**0.440**	**2.900**	0.290	**0.980**	**11.000**	**0.640**	**1.700**	**0.500**	**1.200**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	6.3	0.87575	1.20	0.88	1.30	1.20	1.00	1.60	0.43	0.46	1.30	0.81
Total Lead (Pb)	mg/L	0.005	0.0003	0.047	0.001	0.001	<0.0005	0.001	<0.0005	0.001	0.004	<0.0005	0.001	<0.0005	0.001
Total Magnesium (Mg)	mg/L		11	87	26	17	28	27	30	29	20	20	27	38	21
Total Nickel (Ni)	mg/L	0.025	0.001	0.140	0.0055	0.004	0.001	0.006	0.002	0.003	0.016	0.002	0.005	0.003	0.003
Total Phosphorus	mg/L	0.02*	0.02	2.00	0.08	**0.07**	0.02	**0.13**	**0.03**	**0.07**	**0.28**	**0.28**	**0.08**	**0.29**	**0.04**
Total Potassium (K)	mg/L		0.8	12	4.6	1.9	2.4	8.3	5.7	7.5	4.7	3.2	3.6	4.9	3.8
Total Sodium (Na)	mg/L		4.5	62	23	23	21	25	19	22	19	24	20	30	16
Total Suspended Solids	mg/L		4	5300	40	42	9	100	6	14	180	24	50	38	21
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.13	0.005	<0.0027	**0.060**	<0.01	**0.061**	0.001	**0.027**	<0.0019	*<0.039*	<0.0012	0.002
Total Zinc (Zn)	mg/L	0.020	0.0050	0.240	0.0093	<0.01	<0.01	0.010	<0.01	<0.01	**0.030**	<0.01	<0.01	<0.01	<0.01
Ion Percentage	%		0.03	36.92	2.21	4.2	2.4	4.1	0.2	1.8	5.5	0.8	1.4	0.6	0.0

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Sedimentation Pond Surface Water Quality - SP2									
Date						7-Apr-16	1-Aug-16	21-Oct-16	12-Jan-17	6-Apr-17	13-Jul-17	12-Oct-17	23-Jan-18	4-Apr-18	2-Oct-18
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Routine/Verification Event						Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	43	190	82	110	47	60	86	110	55	110	110	120	77
Conductivity	umho/cm		223	1100	591	540	710	800	470	670	580	800	680	670	680
Dissolved Chloride (Cl)	mg/L		7	93	30	22	27	26	21	23	17	27	47	33	21
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Sulphate (SO_4)	mg/L		27	420	142	130	260	320	100	190	190	270	130	100	250
Nitrate (N)	mg/L		0.005	3.65	0.32	1.03	0.03	<0.10	0.86	0.95	<0.10	<0.10	1.35	0.68	0.89
Nitrite (N)	mg/L		0.01	0.34	0.0150	0.028	0.340	<0.010	0.054	0.046	<0.010	<0.010	0.030	0.017	0.050
pH	(pH units)	6.5-8.5	7.0	9.5	7.9	7.7	7.8	7.9	7.8	7.9	8.6	8.0	7.8	8.1	8.1
Phenols-4AAP	mg/L	0.001	0.0005	0.0043	0.0007	<0.0010	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0010	0.0023	<0.0010	<0.0010
Total Ammonia-N	mg/L		0.025	1.2	0.120	0.18	<0.15	<0.15	0.54	0.22	<0.15	<0.050	0.44	0.27	0.11
Total Arsenic (As)	mg/L	0.100*	0.000500	0.02600	0.00173	0.002	0.002	0.002	0.003	0.002	0.004	0.003	<0.001	0.002	0.001
Total Barium (Ba)	mg/L		0.008	0.36	0.040	0.047	0.040	0.063	0.050	0.045	0.029	0.030	0.029	0.042	0.019
Total BOD	mg/L		1	29	2	<2.0	<2.0	3.0	4.0	3.0	<2.0	<2.0	<2	<2	<2
Total Boron (B)	mg/L	0.200	0.0300	0.500	0.1158	0.060	0.100	0.130	0.040	0.090	0.080	0.170	0.070	0.080	0.140
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.0005	0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Calcium (Ca)	mg/L		26	320	65	70	72	76	53	83	54	68	67	79	70
Total Chemical Oxygen Demand (COD)	mg/L		9	99	19	24	17	21	22	13	15	19	23	13	11
Total Chromium (Cr)	mg/L	0.0089	0.0025	0.1000	0.0039	0.0080	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total Copper (Cu)	mg/L	0.005	0.001	0.086	0.0042	**0.008**	0.003	<0.002	0.005	0.005	0.002	<0.002	**0.010**	**0.007**	0.003
Total Dissolved Solids	mg/L		140	795	379	298	606	562	236	414	380	570	335	305	405
Total Iron (Fe)	mg/L	0.300	0.050	110	1.63	**7.400**	**0.600**	**1.100**	**3.400**	**2.100**	**0.500**	**0.500**	**0.700**	**4.100**	**0.600**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	6.3	0.87575	0.69	0.65	0.64	1.30	0.80	0.41	0.41	0.95	0.71	0.36
Total Lead (Pb)	mg/L	0.005	0.0003	0.047	0.001	0.003	<0.0005	0.001	0.002	0.001	<0.0005	<0.0005	0.001	0.002	<0.0005
Total Magnesium (Mg)	mg/L		11	87	26	23	31	38	14	27	26	42	20	26	29
Total Nickel (Ni)	mg/L	0.025	0.001	0.140	0.0055	0.012	0.001	0.003	0.005	0.006	0.002	0.003	0.003	0.007	0.003
Total Phosphorus	mg/L	0.02*	0.02	2.00	0.08	**0.18**	**0.04**	**0.05**	**0.19**	**0.05**	**0.04**	**0.04**	**0.07**	**0.12**	**0.03**
Total Potassium (K)	mg/L		0.8	12	4.6	4.0	4.3	4.9	7.1	5.1	1.3	6.5	5.4	4.7	4.8
Total Sodium (Na)	mg/L		4.5	62	23	17	24	23	22	19	19	26	35	30	19
Total Suspended Solids	mg/L		4	5300	40	120	18	37	98	62	13	17	6.0	130	25
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.13	0.005	0.0018	<0.0005	<0.002	0.0009	0.0014	<0.061	<0.0005	0.0019	0.0017	0.002
Total Zinc (Zn)	mg/L	0.020	0.0050	0.240	0.0093	0.020	<0.01	<0.01	0.020	<0.01	<0.01	<0.01	<0.01	0.020	<0.01
Ion Percentage	%		0.03	36.92	2.21	3.0	0.5	1.9	3.0	1.8	0.5	1.5	1.6	8.4	2.0

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Sedimentation Pond Surface Water Quality - SP2									
Date						7-Feb-19	17-Apr-19	31-Oct-19	11-Jan-20	18-May-20	4-Jun-20	15-Nov-20	26-Nov-20	26-Mar-21	9-Apr-21
Laboratory						Maxxam	Maxxam	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas
Routine/Verification Event						Routine	Routine	Routine	Routine	Routine	Verification	Routine	Verification	Routine	Verification
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	43	190	82	120	95	86	130	95	48	60	63	100	73
Conductivity	umho/cm		223	1100	591	530	600	740	865	910	880	1100	1100	870	980
Dissolved Chloride (Cl)	mg/L		7	93	30	32	24	37	60	81	86	37	36	62	89
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Sulphate (SO_4)	mg/L		27	420	142	82	150	210	270	230	260	420	400	250	280
Nitrate (N)	mg/L		0.005	3.65	0.32	0.54	0.57	1.92	0.77	<0.10	<0.10	0.33	0.61	0.79	0.65
Nitrite (N)	mg/L		0.01	0.34	0.0150	0.056	0.020	0.136	0.024	<0.010	<0.010	<0.010	0.024	0.025	0.031
pH	(pH units)	6.5-8.5	7.0	9.5	7.9	7.7	8.1	7.9	7.9	8.1	**9.5**	7.7	7.9	8.0	7.9
Phenols-4AAP	mg/L	0.001	0.0005	0.0043	0.0007	0.003	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Ammonia-N	mg/L		0.025	1.2	0.120	1.2	0.2	0.2	0.3	<0.050	<0.050	0.051	<0.050	0.12	<0.050
Total Arsenic (As)	mg/L	0.100*	0.000500	0.02600	0.00173	<0.001	0.001	0.001	0.002	0.001	0.003	<0.001	<0.001	0.003	<0.001
Total Barium (Ba)	mg/L		0.008	0.36	0.040	0.024	0.030	0.050	0.049	0.016	0.022	0.029	0.028	0.053	0.027
Total BOD	mg/L		1	29	2	29	<2	<2	2	<2	<2	<2	<2	<2	<2
Total Boron (B)	mg/L	0.200	0.0300	0.500	0.1158	0.08	0.09	0.16	0.17	**0.24**	**0.43**	**0.22**	**0.22**	**0.21**	**0.33**
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.0005	0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Calcium (Ca)	mg/L		26	320	65	54	59	72	93	49	51	110	110	91	69
Total Chemical Oxygen Demand (COD)	mg/L		9	99	19	55.0	8.7	16.0	11.0	30	32	12	13	10	19
Total Chromium (Cr)	mg/L	0.0089	0.0025	0.1000	0.0039	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	**0.011**	<0.005
Total Copper (Cu)	mg/L	0.005	0.001	0.086	0.0042	**0.006**	0.003	0.003	**0.006**	0.002	<0.002	<0.002	<0.002	**0.010**	0.003
Total Dissolved Solids	mg/L		140	795	379	360	350	440	590	620	545	765	750	500	615
Total Iron (Fe)	mg/L	0.300	0.050	110	1.63	**0.700**	**0.700**	**0.900**	**3.600**	**0.500**	**0.400**	0.2	0.1	**9.7**	**0.5**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	6.3	0.87575	1.9	0.8	0.7	0.7	0.63	0.77	0.46	0.36	0.41	0.59
Total Lead (Pb)	mg/L	0.005	0.0003	0.047	0.001	0.0005	0.0007	<0.0005	0.002	<0.0005	<0.0005	<0.0005	<0.0005	0.0041	<0.0005
Total Magnesium (Mg)	mg/L		11	87	26	18	26	25	41	39	39	53	52	37	36
Total Nickel (Ni)	mg/L	0.025	0.001	0.140	0.0055	0.005	0.004	0.005	0.009	0.005	0.005	0.003	0.003	0.018	0.006
Total Phosphorus	mg/L	0.02*	0.02	2.00	0.08	**0.05**	**0.04**	**0.04**	**0.10**	**0.03**	**0.04**	0.018	**0.02**	**0.19**	**0.04**
Total Potassium (K)	mg/L		0.8	12	4.6	5.6	3.8	6.1	6.7	4.6	4.6	6.8	7.3	7	5.4
Total Sodium (Na)	mg/L		4.5	62	23	23	21	25	39	52	60	34	35	45	56
Total Suspended Solids	mg/L		4	5300	40	17	23	24	83	16	13	7	5	290	13
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.13	0.005	0.007	0.130	0.001	0.003	<0.0068	<0.058	0.0014	<0.00061	0.0012	<0.0017
Total Zinc (Zn)	mg/L	0.020	0.0050	0.240	0.0093	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	**0.03**	<0.01
Ion Percentage	%		0.03	36.92	2.21	1.5	1.6	1.0	0.2	3.0	1.1	1.0	1.8	2.0	2.4

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Sedimentation Pond Surface Water Quality - SP2									
Date						26-Jun-21	9-Jul-21	30-Jul-21	4-Oct-21	15-Oct-21	17-Feb-22	4-May-22	16-May-22	20-Jul-22	2-Aug-22
Laboratory						Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas
Routine/Verification Event						Routine	Verification	Routine	Routine	Verification	Routine	Routine	Verification	Routine	Verification
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	43	190	82	43	47	46	65	53	81	99	100	53	59
Conductivity	umho/cm		223	1100	591	1096	1000	870	710	890	570	1000	952	1000	1000
Dissolved Chloride (Cl)	mg/L		7	93	30	85	48	23	24	28	34	84	70	71	70
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Sulphate (SO_4)	mg/L		27	420	142	410	360	390	280	310	140	280	330	330	330
Nitrate (N)	mg/L		0.005	3.65	0.32	<0.010	<0.10	0.93	1.03	0.72	0.55	0.12	<0.10	<0.10	<0.10
Nitrite (N)	mg/L		0.01	0.34	0.0150	<0.10	<0.010	0.060	0.017	0.027	0.035	<0.010	<0.010	<0.010	<0.010
pH	(pH units)	6.5-8.5	7.0	9.5	7.9	8.1	7.8	7.8	8.0	7.6	7.9	8.1	7.9	8.0	8.0
Phenols-4AAP	mg/L	0.001	0.0005	0.0043	0.0007	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	**0.0011**	<0.0010	<0.0010	<0.0010	<0.0010
Total Ammonia-N	mg/L		0.025	1.2	0.120	<0.15	<0.15	<0.15	<0.15	<0.15	1.04	<0.15	<0.15	<0.15	<0.15
Total Arsenic (As)	mg/L	0.100*	0.000500	0.02600	0.00173	0.002	0.002	0.002	0.001	0.002	0.003	<0.001	0.001	0.002	0.003
Total Barium (Ba)	mg/L		0.008	0.36	0.040	0.043	0.034	0.038	0.026	0.044	0.043	0.032	0.033	0.028	0.025
Total BOD	mg/L		1	29	2	<2	<2	<2	<2	<2	2	<2	<2	<2	6
Total Boron (B)	mg/L	0.200	0.0300	0.500	0.1158	**0.31**	0.20	0.18	**0.26**	**0.30**	0.09	**0.39**	**0.50**	**0.40**	**0.39**
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.0005	0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Calcium (Ca)	mg/L		26	320	65	100	92	100	80	94	69	79	90	80	94
Total Chemical Oxygen Demand (COD)	mg/L		9	99	19	23	17	10	14	15	19	15	25	25	25
Total Chromium (Cr)	mg/L	0.0089	0.0025	0.1000	0.0039	<0.005	<0.005	<0.005	<0.005	0.005	**0.013**	<0.005	<0.005	<0.005	<0.005
Total Copper (Cu)	mg/L	0.005	0.001	0.086	0.0042	0.002	<0.002	0.006	0.004	0.004	**0.015**	0.004	0.004	<0.002	<0.002
Total Dissolved Solids	mg/L		140	795	379	795	700	590	500	595	280	465	720	725	630
Total Iron (Fe)	mg/L	0.300	0.050	110	1.63	**0.5**	<0.1	**3.7**	**1.3**	**3.1**	**12**	0.3	**0.4**	<0.1	<0.1
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	6.3	0.87575	<0.7	<0.7	<0.7	<0.7	<0.7	1.9	<0.7	<0.7	<0.7	<0.7
Total Lead (Pb)	mg/L	0.005	0.0003	0.047	0.001	<0.0005	<0.0005	0.0016	0.001	0.0014	0.0049	<0.0005	<0.0005	<0.0005	<0.0005
Total Magnesium (Mg)	mg/L		11	87	26	51	46	44	30	45	27	43	48	51	49
Total Nickel (Ni)	mg/L	0.025	0.001	0.140	0.0055	0.004	0.002	0.007	0.004	0.007	0.021	0.005	0.005	0.003	0.003
Total Phosphorus	mg/L	0.02*	0.02	2.00	0.08	**0.04**	**0.04**	**0.10**	**0.05**	0.015	**0.20**	**0.029**	**0.052**	0.016	**0.028**
Total Potassium (K)	mg/L		0.8	12	4.6	4.7	4.8	6.6	6	7.5	7.2	5.4	6	2.5	2
Total Sodium (Na)	mg/L		4.5	62	23	61	45	26	22	28	25	60	59	56	56
Total Suspended Solids	mg/L		4	5300	40	18	4	200	42	100	380	12	23	7	4
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.13	0.005	<0.0074	<0.0068	<0.0017	<0.054	<0.016	0.0058	<0.0078	<0.0076	<0.013	<0.085
Total Zinc (Zn)	mg/L	0.020	0.0050	0.240	0.0093	<0.01	<0.01	0.01	<0.01	<0.01	**0.04**	<0.01	<0.01	<0.01	<0.01
Ion Percentage	%		0.03	36.92	2.21	0.2	1.5	0.4	1.0	4.0	5.9	0.03	0.6	1.7	2.6

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Sedimentation Pond Surface Water Quality - SP2									
Date						**18-Oct-22**	**13-Jan-22**								
Laboratory						**Bureau Veritas**	**Bureau Veritas**								
Routine/Verification Event						**Routine**	**Verification**								
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	43	190	82	140	120								
Conductivity	umho/cm		223	1100	591	740	980								
Dissolved Chloride (Cl)	mg/L		7	93	30	34	56								
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	<0.00010	<0.00010								
Dissolved Sulphate (SO_4)	mg/L		27	420	142	210	320								
Nitrate (N)	mg/L		0.005	3.65	0.32	<0.10	3.65								
Nitrite (N)	mg/L		0.01	0.34	0.0150	0.012	0.052								
pH	(pH units)	6.5-8.5	7.0	9.5	7.9	8.1	8.0								
Phenols-4AAP	mg/L	0.001	0.0005	0.0043	0.0007	<0.0010	<0.0010								
Total Ammonia-N	mg/L		0.025	1.2	0.120	0.84	<0.15								
Total Arsenic (As)	mg/L	0.100*	0.000500	0.02600	0.00173	0.005	0.002								
Total Barium (Ba)	mg/L		0.008	0.36	0.040	0.14	0.049								
Total BOD	mg/L		1	29	2	2	<2								
Total Boron (B)	mg/L	0.200	0.0300	0.500	0.1158	0.18	**0.28**								
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.0005	0.00005	<0.0001	<0.0001								
Total Calcium (Ca)	mg/L		26	320	65	99	120								
Total Chemical Oxygen Demand (COD)	mg/L		9	99	19	11	20								
Total Chromium (Cr)	mg/L	0.0089	0.0025	0.1000	0.0039	0.016	<0.005								
Total Copper (Cu)	mg/L	0.005	0.001	0.086	0.0042	**0.013**	**0.008**								
Total Dissolved Solids	mg/L		140	795	379	375	620								
Total Iron (Fe)	mg/L	0.300	0.050	110	1.63	**15**	**3.3**								
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	6.3	0.87575	1.2	<0.7								
Total Lead (Pb)	mg/L	0.005	0.0003	0.047	0.001	**0.0063**	0.0018								
Total Magnesium (Mg)	mg/L		11	87	26	43	38								
Total Nickel (Ni)	mg/L	0.025	0.001	0.140	0.0055	0.025	0.008								
Total Phosphorus	mg/L	0.02*	0.02	2.00	0.08	**0.27**	**0.081**								
Total Potassium (K)	mg/L		0.8	12	4.6	8.4	6.6								
Total Sodium (Na)	mg/L		4.5	62	23	30	44								
Total Suspended Solids	mg/L		4	5300	40	440	160								
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.13	0.005	**0.035**	<0.0057								
Total Zinc (Zn)	mg/L	0.020	0.0050	0.240	0.0093	**0.04**	0.01								
Ion Percentage	%		0.03	36.92	2.21	5.3	1.2								

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Sedimentation Pond Surface Water Quality - SP3									
Date						4-Nov-08	12-Feb-09	8-Mar-09	6-Apr-09	26-Apr-09	7-May-09	24-Oct-09	25-Jan-10	8-Apr-10	16-Jul-10
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Routine/Verification Event															
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	43	160	96	61	48	54	83	94	97	117	101	90	43
Conductivity	umho/cm		137	900	416	389	137	144	233	206	209	396	338	364	221
Dissolved Chloride (Cl)	mg/L		2	71	22	11	6	5	6	2	2	7	12	41	22
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	<0.0002	*<0.0015*	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Dissolved Sulphate (SO_4)	mg/L		7	340	51	106	13	16	27	24	25	67	48	36	27
Nitrate (N)	mg/L		0.015	2.8	0.13	2.8	1.4	1.2	1.6	1.5	1.0	1.8	1.1	0.4	<0.1
Nitrite (N)	mg/L		0.005	0.05	0.0092	0.02	0.02	0.02	0.02	0.04	0.05	0.03	0.03	0.04	0.02
pH	(pH units)	6.5-8.5	6.8	9.9	8.1	7.9	7.9	7.0	7.4	6.8	7.7	7.5	8.1	8.0	**9.7**
Phenols-4AAP	mg/L	0.001	0.0005	0.0036	0.0007	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Ammonia-N	mg/L		0.025	0.6	0.090	<0.15	0.37	<0.15	<0.15	0.19	<0.15	<0.15	<0.15	<0.15	<0.15
Total Arsenic (As)	mg/L	0.100*	0.000500	0.02100	0.00178	0.001	0.021	0.005	0.006	0.011	<0.001	0.001	<0.001	0.002	0.003
Total Barium (Ba)	mg/L		0.0025	0.26	0.026	0.037	0.260	0.073	0.092	0.15	0.015	0.035	0.018	0.042	0.018
Total BOD	mg/L		1	8	1	<2	<2	<2	2	<2	<2	8	<2	<2	<2
Total Boron (B)	mg/L	0.200	0.0100	0.220	0.0351	0.02	0.05	<0.02	0.03	0.04	<0.02	0.02	<0.02	0.02	0.04
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.0005	0.00006	<0.0001	**0.0003**	<0.0001	0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Calcium (Ca)	mg/L		17	90	46	45	63	23	42	45	31	50	51	46	19
Total Chemical Oxygen Demand (COD)	mg/L		2	50	21	25	50	18	35	39	14	36	33	19	39
Total Chromium (Cr)	mg/L	0.0089	0.0025	0.0760	0.0033	<0.005	**0.076**	**0.015**	**0.024**	**0.042**	<0.005	<0.005	<0.005	0.008	<0.005
Total Copper (Cu)	mg/L	0.005	0.001	0.051	0.0022	0.004	**0.051**	**0.012**	**0.016**	**0.028**	0.002	0.003	0.003	**0.007**	0.002
Total Dissolved Solids	mg/L		30	695	249	250	87	94	155	118	30	255	220	250	140
Total Iron (Fe)	mg/L	0.300	0.050	75	0.90	**3.0**	**75.0**	**16.0**	**24.0**	**39.0**	**0.6**	**0.7**	**1.1**	**7.5**	**1.8**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.27	4	0.81	1.5	4.0	1.6	2.4	2.4	0.8	2.0	1.1	1.4	1.2
Total Lead (Pb)	mg/L	0.005	0.0003	0.028	0.001	0.001	**0.028**	**0.006**	**0.008**	**0.014**	<0.0005	<0.0005	0.001	0.003	0.001
Total Magnesium (Mg)	mg/L		6.2	54	16	14.0	24.0	6.7	13.0	15.0	6.2	16.0	14.0	13.0	9.2
Total Nickel (Ni)	mg/L	0.025	0.0005	0.096	0.0025	0.004	**0.096**	0.021	**0.030**	**0.052**	0.001	0.002	0.002	0.010	0.003
Total Phosphorus	mg/L	0.02*	0.01	0.99	0.06	**0.18**	**0.99**	**0.17**	**0.42**	*<0.15*	**0.04**	**0.10**	*<0.06*	**0.15**	*<0.15*
Total Potassium (K)	mg/L		0.3	12	3.7	3.6	9.3	3.8	4.9	6.7	1.9	2.5	2.4	3.6	1.3
Total Sodium (Na)	mg/L		1.4	45	15	5.3	2.2	1.4	2.3	2.0	1.9	5.7	7.3	21.0	14.0
Total Suspended Solids	mg/L		2	720	19	57	720	140	560	410	30	23	13	150	37
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.05	0.005	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Total Zinc (Zn)	mg/L	0.020	0.0050	0.170	0.0073	0.010	**0.170**	**0.040**	**0.060**	**0.090**	<0.01	<0.01	<0.01	0.020	<0.01
Ion Percentage	%		0.07	31.86	1.96	1.4	31.9	8.1	12.2	14.4	0.7	4.3	7.9	6.6	5.6

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Sedimentation Pond Surface Water Quality - SP3									
Date						6-Nov-10	28-Feb-11	20-Apr-11	29-Jul-11	20-Oct-11	9-Nov-11	13-Mar-12	27-Mar-12	21-Dec-12	13-Jan-13
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Routine/Verification Event															
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	43	160	96	129	69	115	66	136	136	120	120	140	78
Conductivity	umho/cm		137	900	416	454	236	380	211	372	362	350	360	500	280
Dissolved Chloride (Cl)	mg/L		2	71	22	33	13	23	21	21	18	14	14	22	11
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Sulphate (SO_4)	mg/L		7	340	51	44	26	40	9	21	23	47	40	78	40
Nitrate (N)	mg/L		0.015	2.8	0.13	0.30	0.40	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	0.45	0.33
Nitrite (N)	mg/L		0.005	0.05	0.0092	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.010	<0.010	<0.010	<0.010
pH	(pH units)	6.5-8.5	6.8	9.9	8.1	7.9	7.7	8.1	**9.5**	8.1	8.3	8.2	8.2	7.8	7.7
Phenols-4AAP	mg/L	0.001	0.0005	0.0036	0.0007	<0.001	<0.001	<0.001	<0.001	**0.003**	<0.001	**0.0020**	<0.0010	<0.0010	<0.0010
Total Ammonia-N	mg/L		0.025	0.6	0.090	0.18	0.17	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
Total Arsenic (As)	mg/L	0.100*	0.000500	0.02100	0.00178	0.002	<0.001	<0.001	0.005	0.002	0.001	<0.001	0.002	0.001	<0.001
Total Barium (Ba)	mg/L		0.0025	0.26	0.026	0.044	0.018	0.023	<0.005	0.017	0.005	0.009	0.007	0.032	0.019
Total BOD	mg/L		1	8	1	4.0	<2	<2	3.0	2.0	<2	<2.0	3.0	3.0	<2.0
Total Boron (B)	mg/L	0.200	0.0100	0.220	0.0351	0.03	<0.02	<0.02	0.02	0.03	0.05	<0.02	0.03	0.03	<0.02
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.0005	0.00006	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Calcium (Ca)	mg/L		17	90	46	55	31	55	24	50	50	49	49	65	37
Total Chemical Oxygen Demand (COD)	mg/L		2	50	21	43	15	17	39	31	27	26	30	25	19
Total Chromium (Cr)	mg/L	0.0089	0.0025	0.0760	0.0033	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total Copper (Cu)	mg/L	0.005	0.001	0.051	0.0022	0.005	**0.007**	<0.002	<0.002	<0.002	<0.002	0.002	<0.002	0.002	0.004
Total Dissolved Solids	mg/L		30	695	249	282	138	234	186	274	216	240	256	296	178
Total Iron (Fe)	mg/L	0.300	0.050	75	0.90	**5.80**	**1.20**	**1.10**	0.20	**0.80**	0.30	**1.00**	**0.72**	**0.48**	**1.60**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.27	4	0.81	2.3	0.8	0.9	1.5	1.0	0.8	0.83	0.9	1.1	1.0
Total Lead (Pb)	mg/L	0.005	0.0003	0.028	0.001	0.002	<0.0005	0.001	<0.0005	0.001	<0.0005	0.001	<0.0005	<0.0005	0.001
Total Magnesium (Mg)	mg/L		6.2	54	16	18.0	6.7	12.0	8.1	12.0	11.0	11.0	12.0	17.0	9.3
Total Nickel (Ni)	mg/L	0.025	0.0005	0.096	0.0025	0.008	0.002	0.002	<0.001	0.002	0.001	0.002	0.001	0.002	0.003
Total Phosphorus	mg/L	0.02*	0.01	0.99	0.06	**0.22**	**0.08**	**0.06**	**0.18**	**0.11**	**0.03**	**0.05**	**0.05**	**0.05**	**0.08**
Total Potassium (K)	mg/L		0.3	12	3.7	3.5	2.9	2.3	0.3	4.3	4.2	3.2	3.4	4.6	2.9
Total Sodium (Na)	mg/L		1.4	45	15	19.0	7.9	12.0	12.0	14.0	12.0	8.8	8.5	16.0	7.5
Total Suspended Solids	mg/L		2	720	19	150	3	32	14	9	4	15	11	11	19
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.05	0.005	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Total Zinc (Zn)	mg/L	0.020	0.0050	0.170	0.0073	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
Ion Percentage	%		0.07	31.86	1.96	6.8	2.5	3.5	3.5	3.0	2.2	0.3	1.8	2.0	2.8

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Sedimentation Pond Surface Water Quality - SP3									
Date						**10-Apr-13**	**5-Jul-13**	**7-Oct-13**	**11-Jan-14**	**8-Apr-14**	**30-Apr-14**	**7-Jul-14**	**15-Oct-14**	**4-Nov-14**	**4-Jan-15**
Laboratory						**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**
Routine/Verification Event									**Routine**	**Routine**	**Verification**	**Routine**	**Routine**	**Verification**	**Routine**
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	43	160	96	110	55	130	110	82	85	92	160	150	160
Conductivity	umho/cm		137	900	416	370	350	360	330	280	370	350	440	450	520
Dissolved Chloride (Cl)	mg/L		2	71	22	29	23	21	22	24	38	40	23	24	26
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Sulphate (SO_4)	mg/L		7	340	51	29	81	19	24	24	36	20	31	39	69
Nitrate (N)	mg/L		0.015	2.8	0.13	<0.10	<0.10	<0.10	0.68	<0.10	<0.10	<0.10	<0.10	<0.10	1.17
Nitrite (N)	mg/L		0.005	0.05	0.0092	0.027	<0.010	<0.010	0.017	<0.010	<0.010	<0.010	<0.010	<0.010	0.028
pH	(pH units)	6.5-8.5	6.8	9.9	8.1	7.9	**8.8**	8.1	8.1	8.2	7.8	8.1	8.1	8.1	**8.6**
Phenols-4AAP	mg/L	0.001	0.0005	0.0036	0.0007	<0.0010	<0.0010	<0.0010	<0.0010	**0.003**	<0.0010	**0.0011**	<0.001	<0.001	**0.003**
Total Ammonia-N	mg/L		0.025	0.6	0.090	<0.15	<0.15	<0.15	0.17	<0.15	<0.15	<0.15	0.17	0.35	<0.15
Total Arsenic (As)	mg/L	0.100*	0.000500	0.02100	0.00178	0.001	0.004	0.002	<0.001	0.001	0.002	0.007	0.002	0.001	0.001
Total Barium (Ba)	mg/L		0.0025	0.26	0.026	0.029	0.018	0.015	0.018	0.009	0.040	0.026	0.030	0.033	0.039
Total BOD	mg/L		1	8	1	<2.0	<2.0	3.0	4.0	2.0	<2.0	<2.0	3.0	<2.0	3.0
Total Boron (B)	mg/L	0.200	0.0100	0.220	0.0351	0.020	0.070	0.030	0.020	<0.02	<0.02	0.020	0.040	0.050	0.040
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.0005	0.00006	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.001
Total Calcium (Ca)	mg/L		17	90	46	45	34	42	45	34	39	30	60	53	71
Total Chemical Oxygen Demand (COD)	mg/L		2	50	21	16	11	24	27	21	34	36	21	20	27
Total Chromium (Cr)	mg/L	0.0089	0.0025	0.0760	0.0033	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total Copper (Cu)	mg/L	0.005	0.001	0.051	0.0022	0.003	0.003	<0.002	0.002	<0.002	0.003	<0.002	<0.002	<0.002	0.004
Total Dissolved Solids	mg/L		30	695	249	244	196	198	124	210	250	228	252	268	326
Total Iron (Fe)	mg/L	0.300	0.050	75	0.90	**1.700**	**1.100**	0.200	**0.310**	**0.850**	**2.200**	**1.400**	**0.380**	**0.390**	**0.750**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.27	4	0.81	1.10	0.98	1.20	1.30	1.00	1.20	1.10	0.91	0.94	1.10
Total Lead (Pb)	mg/L	0.005	0.0003	0.028	0.001	0.001	0.001	<0.0005	<0.0005	<0.0005	0.001	0.001	<0.0005	<0.0005	0.001
Total Magnesium (Mg)	mg/L		6.2	54	16	9.9	16.0	12.0	12.0	7.9	12.0	14.0	15.0	13.0	17.0
Total Nickel (Ni)	mg/L	0.025	0.0005	0.096	0.0025	0.002	0.002	<0.001	0.001	0.002	0.004	0.003	0.002	0.002	0.004
Total Phosphorus	mg/L	0.02*	0.01	0.99	0.06	**0.05**	**0.07**	**0.04**	**0.11**	**0.05**	**0.09**	**0.07**	**0.04**	**0.03**	**0.06**
Total Potassium (K)	mg/L		0.3	12	3.7	3.7	0.8	4.9	7.1	3.6	4.4	2.3	8.0	5.9	7.6
Total Sodium (Na)	mg/L		1.4	45	15	16	20	13	13	14	22	25	16	15	17
Total Suspended Solids	mg/L		2	720	19	20	24	6	7	20	44	34	7	7	13
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.05	0.005	<0.02	*<0.022*	<0.006	0.0029	<0.0045	<0.0005	<0.0019	0.011	**0.021**	<0.0057
Total Zinc (Zn)	mg/L	0.020	0.0050	0.170	0.0073	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ion Percentage	%		0.07	31.86	1.96	1.6	3.2	1.4	8.0	5.0	5.7	5.7	7.1	3.7	5.4

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Sedimentation Pond Surface Water Quality - SP3									
Date						**10-Apr-15**	**20-Aug-15**	**25-Oct-15**	**25-Feb-16**	**7-Apr-16**	**1-Aug-16**	**21-Oct-16**	**12-Jan-17**	**6-Apr-17**	**13-Jul-17**
Laboratory						**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**	**Maxxam**
Routine/Verification Event						**Routine**	**Routine**	**Routine**	**Routine**	**Routine**	**Routine**	**Routine**	**Routine**	**Routine**	**Routine**
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	43	160	96	120	82	160	120	130	100	110	160	130	74
Conductivity	umho/cm		137	900	416	330	240	450	530	380	350	340	510	420	220
Dissolved Chloride (Cl)	mg/L		2	71	22	26	23	29	41	21	38	35	36	22	17
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Sulphate (SO_4)	mg/L		7	340	51	31	7	27	61	40	13	12	35	42	14
Nitrate (N)	mg/L		0.015	2.8	0.13	0.29	<0.10	<0.10	1.21	0.59	0.015	<0.10	0.37	0.33	<0.10
Nitrite (N)	mg/L		0.005	0.05	0.0092	0.016	<0.010	0.011	0.020	0.015	<0.10	<0.010	0.036	0.022	<0.010
pH	(pH units)	6.5-8.5	6.8	9.9	8.1	7.1	8.1	8.0	8.1	7.9	8.1	8.6	7.9	8.2	8.7
Phenols-4AAP	mg/L	0.001	0.0005	0.0036	0.0007	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Total Ammonia-N	mg/L		0.025	0.6	0.090	<0.15	<0.15	0.60	<0.15	0.27	0.48	<0.15	0.31	<0.15	<0.15
Total Arsenic (As)	mg/L	0.100*	0.000500	0.02100	0.00178	0.001	0.004	0.004	<0.001	0.002	0.009	0.005	0.002	0.001	0.007
Total Barium (Ba)	mg/L		0.0025	0.26	0.026	0.026	0.008	0.045	0.029	0.035	0.023	0.017	0.048	0.027	0.007
Total BOD	mg/L		1	8	1	<2.0	<2.0	5.0	<2.0	<2.0	2.0	5.0	3.0	<2.0	3.0
Total Boron (B)	mg/L	0.200	0.0100	0.220	0.0351	0.020	0.020	0.060	0.020	0.020	0.030	0.050	0.040	0.020	<0.02
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.0005	0.00006	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Calcium (Ca)	mg/L		17	90	46	43	18	49	56	51	26	29	44	53	17
Total Chemical Oxygen Demand (COD)	mg/L		2	50	21	20	23	31	23	24	46	40	32	19	23
Total Chromium (Cr)	mg/L	0.0089	0.0025	0.0760	0.0033	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.006	<0.005	<0.005
Total Copper (Cu)	mg/L	0.005	0.001	0.051	0.0022	0.003	<0.002	0.003	0.002	0.005	<0.002	0.003	0.005	0.003	<0.002
Total Dissolved Solids	mg/L		30	695	249	214	146	244	292	224	240	216	242	226	132
Total Iron (Fe)	mg/L	0.300	0.050	75	0.90	**2.200**	0.300	**1.900**	**0.800**	**4.500**	**1.200**	**3.300**	**3.700**	**1.500**	**0.400**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.27	4	0.81	0.71	0.68	1.50	0.67	0.70	1.70	0.81	0.98	<0.7	0.66
Total Lead (Pb)	mg/L	0.005	0.0003	0.028	0.001	0.001	<0.005	0.001	<0.0005	0.002	0.001	0.002	0.002	0.001	<0.0005
Total Magnesium (Mg)	mg/L		6.2	54	16	11.0	9.5	15.0	14.0	12.0	12.0	13.0	12.0	12.0	9.0
Total Nickel (Ni)	mg/L	0.025	0.0005	0.096	0.0025	0.004	0.001	0.004	0.002	0.007	<0.001	0.006	0.006	0.003	0.001
Total Phosphorus	mg/L	0.02*	0.01	0.99	0.06	**0.08**	**0.04**	**0.10**	**0.06**	**0.13**	**0.11**	**0.10**	**0.16**	**0.05**	**0.06**
Total Potassium (K)	mg/L		0.3	12	3.7	4.2	3.3	7.2	4.8	3.7	4.3	3.4	12.0	4.0	1.0
Total Sodium (Na)	mg/L		1.4	45	15	15.0	14.0	18.0	26.0	14.0	26.0	24.0	4.1	15.0	15.0
Total Suspended Solids	mg/L		2	720	19	32	3	49	12	52	22	88	39	40	10
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.05	0.005	<0.0048	*<0.042*	0.02	<0.0015	0.0026	0.0031	<0.0005	0.001	<0.0012	<0.012
Total Zinc (Zn)	mg/L	0.020	0.0050	0.170	0.0073	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.02	<0.01	<0.01
Ion Percentage	%		0.07	31.86	1.96	3.6	3.0	0.4	1.9	1.4	1.4	1.6	8.3	8.3	0.1

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Sedimentation Pond Surface Water Quality - SP3									
Date						12-Oct-17	23-Jan-18	4-Apr-18	8-Aug-18	2-Oct-18	24-Jan-19	17-Apr-19	27-Oct-19	3-Dec-19	11-Jan-20
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Bureau Veritas	Bureau Veritas	Bureau Veritas
Routine/Verification Event						Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Verification	Routine
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	43	160	96	160	130	140	84	110	130	97	80	110	93
Conductivity	umho/cm		137	900	416	420	420	470	300	460	690	540	830	880	881
Dissolved Chloride (Cl)	mg/L		2	71	22	26	31	36	37	16	42	49	19	25	26
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Sulphate (SO_4)	mg/L		7	340	51	24.0	35.0	41.0	7.1	98.0	140.0	70.0	310.0	310.0	320.0
Nitrate (N)	mg/L		0.015	2.8	0.13	<0.10	0.50	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.12	0.18
Nitrite (N)	mg/L		0.005	0.05	0.0092	0.017	0.020	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
pH	(pH units)	6.5-8.5	6.8	9.9	8.1	8.1	7.9	8.1	8.4	8.2	8.1	8.5	8.2	8.1	8.4
Phenols-4AAP	mg/L	0.001	0.0005	0.0036	0.0007	<0.0010	0.0036	<0.0010	<0.0010	<0.0010	<0.0010	0.0013	<0.0010	<0.0010	<0.0010
Total Ammonia-N	mg/L		0.025	0.6	0.090	0.280	0.290	0.087	<0.050	<0.050	0.057	0.052	**0.280**	<0.050	<0.050
Total Arsenic (As)	mg/L	0.100*	0.000500	0.02100	0.00178	0.003	0.002	0.002	0.009	0.002	<0.001	<0.001	0.001	<0.001	<0.001
Total Barium (Ba)	mg/L		0.0025	0.26	0.026	0.042	0.043	0.046	0.010	0.024	0.025	0.022	0.035	0.031	0.032
Total BOD	mg/L		1	8	1	<2.0	4.0	<2	<2	<2	<2	<2	<2	<2	<2
Total Boron (B)	mg/L	0.200	0.0100	0.220	0.0351	0.050	0.030	0.030	0.030	0.070	0.030	0.030	0.100	0.090	0.090
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.0005	0.00006	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Calcium (Ca)	mg/L		17	90	46	43	51	59	19	44	59	46	81	90	87
Total Chemical Oxygen Demand (COD)	mg/L		2	50	21	30.0	30.0	13.0	40.0	7.7	14.0	15.0	8.5	<4.0	<4.0
Total Chromium (Cr)	mg/L	0.0089	0.0025	0.0760	0.0033	<0.005	0.0070	0.0060	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total Copper (Cu)	mg/L	0.005	0.001	0.051	0.0022	<0.002	**0.013**	**0.006**	<0.002	<0.002	0.003	<0.002	<0.002	<0.002	0.002
Total Dissolved Solids	mg/L		30	695	249	290	195	165	180	230	375	305	545	640	695
Total Iron (Fe)	mg/L	0.300	0.050	75	0.90	**0.400**	**5.900**	**4.600**	0.100	0.100	0.100	0.300	0.200	0.200	**0.900**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.27	4	0.81	1.00	0.68	0.31	1.10	0.27	0.37	0.35	0.29	0.44	0.31
Total Lead (Pb)	mg/L	0.005	0.0003	0.028	0.001	<0.0005	0.005	0.0021	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Total Magnesium (Mg)	mg/L		6.2	54	16	14	12	14	10	18	24	16	41	48	54
Total Nickel (Ni)	mg/L	0.025	0.0005	0.096	0.0025	0.002	0.010	0.006	<0.001	<0.001	0.001	0.001	0.001	0.002	0.003
Total Phosphorus	mg/L	0.02*	0.01	0.99	0.06	**0.07**	**0.26**	**0.10**	**0.04**	0.02	0.01	0.02	0.02	0.01	**0.03**
Total Potassium (K)	mg/L		0.3	12	3.7	5.3	6.1	5.5	3.6	3.6	4.1	2.3	4	4	4
Total Sodium (Na)	mg/L		1.4	45	15	21	21	23	25	17	30	35	25	27	30
Total Suspended Solids	mg/L		2	720	19	7	130	80	3	4	5	8	5	6	30
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.05	0.005	0.001	*0.0065*	<0.0005	<0.0005	<0.0014	<0.00061	0.015	**0.021**	<0.0034	<0.0019
Total Zinc (Zn)	mg/L	0.020	0.0050	0.170	0.0073	<0.01	**0.04**	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ion Percentage	%		0.07	31.86	1.96	0.6	2.4	3.1	0.6	1.2	1.6	2.1	0.1	0.8	2.3

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Sedimentation Pond Surface Water Quality - SP3									
Date						18-May-20	15-Nov-20	26-Mar-21	3-Jun-21	9-Jul-21	4-Oct-21	15-Oct-21	17-Feb-22	4-May-22	2-Aug-22
Laboratory						Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas
Routine/Verification Event						Routine	Routine	Routine	Routine	Routine	Routine	Verification	Routine	Routine	Routine
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	43	160	96	53	99	100	54	61	68	82	100	71	120
Conductivity	umho/cm		137	900	416	760	880	690	740	890	710	700	680	740	900
Dissolved Chloride (Cl)	mg/L		2	71	22	29	36	32	31	43	21	16	71	37	60
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Sulphate (SO_4)	mg/L		7	340	51	270	290	190	310	320	260	250	130	250	250
Nitrate (N)	mg/L		0.015	2.8	0.13	<0.10	<0.10	0.13	<0.10	<0.10	<0.10	<0.10	0.28	<0.10	<0.10
Nitrite (N)	mg/L		0.005	0.05	0.0092	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.02	<0.010	<0.010
pH	(pH units)	6.5-8.5	6.8	9.9	8.1	8.2	8.0	8.1	**9.9**	**9.1**	8.1	7.9	8.0	8.2	8.3
Phenols-4AAP	mg/L	0.001	0.0005	0.0036	0.0007	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Ammonia-N	mg/L		0.025	0.6	0.090	<0.050	0.056	<0.050	<0.050	<0.15	<0.15	<0.15	0.46	<0.15	<0.15
Total Arsenic (As)	mg/L	0.100*	0.000500	0.02100	0.00178	0.002	0.001	0.002	0.004	0.004	0.002	0.002	0.002	0.001	0.008
Total Barium (Ba)	mg/L		0.0025	0.26	0.026	0.016	0.054	0.04	0.028	0.03	0.02	0.03	0.041	0.021	0.041
Total BOD	mg/L		1	8	1	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Boron (B)	mg/L	0.200	0.0100	0.220	0.0351	0.11	0.1	0.07	0.13	0.14	**0.22**	0.20	0.06	0.11	0.18
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.0005	0.00006	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Calcium (Ca)	mg/L		17	90	46	44	86	60	48	58	74	77	64	58	61
Total Chemical Oxygen Demand (COD)	mg/L		2	50	21	22	11	14	18	22	18	15	20	8.8	37
Total Chromium (Cr)	mg/L	0.0089	0.0025	0.0760	0.0033	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.007	<0.005	<0.005
Total Copper (Cu)	mg/L	0.005	0.001	0.051	0.0022	<0.002	<0.002	0.003	<0.002	<0.002	<0.002	<0.002	**0.009**	<0.002	<0.002
Total Dissolved Solids	mg/L		30	695	249	560	515	395	490	635	480	435	325	420	560
Total Iron (Fe)	mg/L	0.300	0.050	75	0.90	0.300	**0.6**	**1.9**	<0.1	<0.1	0.20	0.30	**6.6**	0.3	0.2
Total Kjeldahl Nitrogen (TKN)	mg/L		0.27	4	0.81	0.48	0.33	0.35	0.47	<0.7	<0.7	<0.7	0.9	<0.7	0.8
Total Lead (Pb)	mg/L	0.005	0.0003	0.028	0.001	<0.0005	<0.0005	0.0009	<0.0005	<0.0005	<0.0005	<0.0005	0.0050	<0.0005	<0.0005
Total Magnesium (Mg)	mg/L		6.2	54	16	46	41	29	42	48	33	33	24	36	46
Total Nickel (Ni)	mg/L	0.025	0.0005	0.096	0.0025	0.002	0.002	0.004	0.002	0.001	0.001	0.002	0.012	0.002	0.002
Total Phosphorus	mg/L	0.02*	0.01	0.99	0.06	0.02	**0.03**	**0.06**	0.02	<0.030	0.02	0.02	**0.17**	0.02	**0.027**
Total Potassium (K)	mg/L		0.3	12	3.7	2	5.1	3.3	2.1	3.9	4.3	4.0	4.8	2.7	12
Total Sodium (Na)	mg/L		1.4	45	15	36	33	27	38	45	25	23	45	36	43
Total Suspended Solids	mg/L		2	720	19	8	19	60	11	2	3	8	95	12	10
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.05	0.005	<0.026	0.002	<0.00065	<0.055	<0.097	<0.031	<0.0068	0.003	<0.033	<0.045
Total Zinc (Zn)	mg/L	0.020	0.0050	0.170	0.0073	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**0.03**	<0.01	<0.01
Ion Percentage	%		0.07	31.86	1.96	0.1	0.4	1.0	2.9	0.77	0.6	1.1	1.9	0.8	1.0

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Sedimentation Pond Surface Water Quality - SP3									
Date						**18-Oct-22**									
Laboratory						**Bureau Veritas**									
Routine/Verification Event						**Routine**									
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	43	160	96	44									
Conductivity	umho/cm		137	900	416	840									
Dissolved Chloride (Cl)	mg/L		2	71	22	33									
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	<0.00010									
Dissolved Sulphate (SO_4)	mg/L		7	340	51	340									
Nitrate (N)	mg/L		0.015	2.8	0.13	<0.10									
Nitrite (N)	mg/L		0.005	0.05	0.0092	<0.010									
pH	(pH units)	6.5-8.5	6.8	9.9	8.1	**8.8**									
Phenols-4AAP	mg/L	0.001	0.0005	0.0036	0.0007	<0.0010									
Total Ammonia-N	mg/L		0.025	0.6	0.090	<0.15									
Total Arsenic (As)	mg/L	0.100*	0.000500	0.02100	0.00178	0.001									
Total Barium (Ba)	mg/L		0.0025	0.26	0.026	0.023									
Total BOD	mg/L		1	8	1	<2									
Total Boron (B)	mg/L	0.200	0.0100	0.220	0.0351	0.15									
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.0005	0.00006	<0.0001									
Total Calcium (Ca)	mg/L		17	90	46	73									
Total Chemical Oxygen Demand (COD)	mg/L		2	50	21	16									
Total Chromium (Cr)	mg/L	0.0089	0.0025	0.0760	0.0033	<0.005									
Total Copper (Cu)	mg/L	0.005	0.001	0.051	0.0022	<0.002									
Total Dissolved Solids	mg/L		30	695	249	525									
Total Iron (Fe)	mg/L	0.300	0.050	75	0.90	0.1									
Total Kjeldahl Nitrogen (TKN)	mg/L		0.27	4	0.81	<0.7									
Total Lead (Pb)	mg/L	0.005	0.0003	0.028	0.001	<0.0005									
Total Magnesium (Mg)	mg/L		6.2	54	16	46									
Total Nickel (Ni)	mg/L	0.025	0.0005	0.096	0.0025	0.001									
Total Phosphorus	mg/L	0.02*	0.01	0.99	0.06	0.008									
Total Potassium (K)	mg/L		0.3	12	3.7	4.9									
Total Sodium (Na)	mg/L		1.4	45	15	33									
Total Suspended Solids	mg/L		2	720	19	2									
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.05	0.005	*<0.06*									
Total Zinc (Zn)	mg/L	0.020	0.0050	0.170	0.0073	<0.01									
Ion Percentage	%		0.07	31.86	1.96	0.1									

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Sedimentation Pond Surface Water Quality - SP4									
Date						6-May-10	16-Jul-10	1-Dec-10	28-Feb-11	20-Apr-11	9-Aug-11	13-Oct-11	13-Mar-12	27-Mar-12	21-Dec-12
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Routine/Verification Event															
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	46	160	109	107	142	99	72	82	46	82	92	85	160
Conductivity	umho/cm		240	730	451	475	489	402	381	446	301	342	360	350	570
Dissolved Chloride (Cl)	mg/L		11	95	30	30	31	24	39	46	42	38	26	27	39
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010
Dissolved Sulphate (SO_4)	mg/L		19	150	57	85	62	62	42	55	23	19	54	45	62
Nitrate (N)	mg/L		0.005	0.61	0.12	0.2	<0.1	0.2	0.4	<0.1	<0.1	<0.1	<0.10	<0.10	0.22
Nitrite (N)	mg/L		0.005	0.05	0.0078	0.02	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.010	<0.010	<0.010
pH	(pH units)	6.5-8.5	7.0	9.7	8.1	7.9	8.0	8.0	7.8	7.9	**9.7**	8.3	8.1	8.2	8.0
Phenols-4AAP	mg/L	0.001	0.0005	0.005	0.0007	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001	**0.0017**	<0.0010	<0.0010
Total Ammonia-N	mg/L		0.025	1.05	0.078	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	0.15
Total Arsenic (As)	mg/L	0.100*	0.000500	0.00700	0.00159	0.002	0.002	<0.001	<0.001	<0.001	0.004	0.002	<0.001	0.001	0.001
Total Barium (Ba)	mg/L		0.0025	0.086	0.033	0.031	0.030	0.033	0.020	0.028	<0.005	0.005	0.019	0.015	0.048
Total BOD	mg/L		1	10	2	<2	<2	3	<2	<2	<2	<2	<2.0	<2.0	5.0
Total Boron (B)	mg/L	0.200	0.0100	0.110	0.0411	0.040	0.060	0.030	<0.02	0.020	0.020	0.040	0.020	0.030	0.050
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.00005	0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Calcium (Ca)	mg/L		18	77	50	56	48	50	38	42	18	26	38	34	63
Total Chemical Oxygen Demand (COD)	mg/L		5	48	22	25	31	22	15	20	20	26	14	17	16
Total Chromium (Cr)	mg/L	0.0089	0.0025	0.0120	0.0031	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total Copper (Cu)	mg/L	0.005	0.001	0.015	0.0028	0.004	0.003	0.003	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	0.002
Total Dissolved Solids	mg/L		126	456	272	300	310	274	234	262	220	224	222	234	294
Total Iron (Fe)	mg/L	0.300	0.050	12	1.84	**3.000**	**2.100**	**1.400**	**0.700**	**0.700**	<0.1	0.300	**0.370**	**0.390**	**1.100**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.32	2.5	0.66641	0.9	1.1	0.7	0.6	0.7	0.6	0.6	0.5	0.48	1.6
Total Lead (Pb)	mg/L	0.005	0.0003	0.006	0.001	0.001	0.001	0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.001
Total Magnesium (Mg)	mg/L		5	26	15	18.0	23.0	14.0	8.1	12.0	7.9	9.6	12.0	12.0	18.0
Total Nickel (Ni)	mg/L	0.025	0.0005	0.020	0.0038	0.005	0.004	0.003	0.002	0.002	<0.001	0.001	<0.001	0.001	0.003
Total Phosphorus	mg/L	0.02*	0.02	0.32	0.08	**0.13**	**0.09**	**0.06**	*<0.03*	**0.03**	**0.03**	**0.02**	0.02	0.02	**0.07**
Total Potassium (K)	mg/L		0.6	8.5	3.4	2.60	3.20	2.50	2.10	1.90	0.60	1.30	1.50	0.87	4.40
Total Sodium (Na)	mg/L		4.7	56	20	19	22	15	25	30	27	24	19	22	29
Total Suspended Solids	mg/L		2	360	42	50	60	30	3	16	2	5	9	3	32
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.25	0.003	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Total Zinc (Zn)	mg/L	0.020	0.0050	0.040	0.0083	0.02	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ion Percentage	%		0.09	9.80	1.64	4.3	4.5	5.1	2.1	2.1	1.4	0.4	0.3	1.9	1.8

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Sedimentation Pond Surface Water Quality - SP4									
Date						13-Jan-13	10-Apr-13	5-Jul-13	7-Oct-13	11-Jan-14	8-Apr-14	7-Jul-14	24-Nov-14	15-Dec-14	4-Jan-15
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Routine/Verification Event										Routine	Routine	Routine	Routine	Verification	Routine
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	46	160	109	69	130	110	100	120	87	130	110	64	98
Conductivity	umho/cm		240	730	451	240	450	360	430	470	330	590	730	360	600
Dissolved Chloride (Cl)	mg/L		11	95	30	12	33	33	25	26	19	72	95	36	68
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	<0.00010	<0.00010	<0.00010	0.00012	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Sulphate (SO_4)	mg/L		19	150	57	28	41	19	60	61	45	52	110	44	92
Nitrate (N)	mg/L		0.005	0.61	0.12	0.38	0.17	<0.10	0.44	0.61	0.45	<0.10	0.36	0.19	0.35
Nitrite (N)	mg/L		0.005	0.05	0.0078	<0.010	<0.010	<0.010	0.01	0.022	<0.010	<0.010	<0.010	0.013	0.012
pH	(pH units)	6.5-8.5	7.0	9.7	8.1	7.6	7.9	**8.9**	8.0	7.9	7.9	8.0	7.9	7.6	8.1
Phenols-4AAP	mg/L	0.001	0.0005	0.005	0.0007	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	<0.0010	<0.001	<0.001	**0.005**
Total Ammonia-N	mg/L		0.025	1.05	0.078	<0.15	<0.15	<0.15	<0.15	0.45	0.19	<0.15	<0.15	<0.15	<0.15
Total Arsenic (As)	mg/L	0.100*	0.000500	0.00700	0.00159	<0.001	0.001	0.005	0.004	0.002	0.002	0.007	0.002	<0.001	<0.001
Total Barium (Ba)	mg/L		0.0025	0.086	0.033	0.013	0.044	0.043	0.068	0.038	0.032	0.086	0.052	0.027	0.032
Total BOD	mg/L		1	10	2	<2.0	<2.0	<2.0	5.0	6.0	4.0	10.0	<2.0	<2.0	5.0
Total Boron (B)	mg/L	0.200	0.0100	0.110	0.0411	<0.02	0.030	0.060	0.050	0.030	0.020	0.070	0.040	0.030	0.040
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.00005	0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Calcium (Ca)	mg/L		18	77	50	23	58	37	57	59	47	64	74	46	59
Total Chemical Oxygen Demand (COD)	mg/L		5	48	22	42	20	35	30	24	20	44	21	8.7	24
Total Chromium (Cr)	mg/L	0.0089	0.0025	0.0120	0.0031	<0.005	<0.005	<0.005	0.0060	<0.005	<0.005	**0.0100**	0.0050	<0.005	<0.005
Total Copper (Cu)	mg/L	0.005	0.001	0.015	0.0028	<0.002	0.004	0.002	0.005	0.002	0.004	**0.007**	**0.008**	0.002	0.003
Total Dissolved Solids	mg/L		126	456	272	126	276	204	258	210	248	382	456	220	378
Total Iron (Fe)	mg/L	0.300	0.050	12	1.84	**0.450**	**2.400**	**3.100**	**6.600**	**1.800**	**4.100**	**10.000**	**4.900**	**0.460**	**0.610**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.32	2.5	0.66641	0.72	1.40	1.50	2.00	1.60	1.50	2.50	1.10	0.58	0.87
Total Lead (Pb)	mg/L	0.005	0.0003	0.006	0.001	0.001	0.002	0.002	0.004	0.001	0.002	**0.006**	0.002	<0.0005	<0.0005
Total Magnesium (Mg)	mg/L		5	26	15	5	13	13	15	14	10	19	20	12	16
Total Nickel (Ni)	mg/L	0.025	0.0005	0.020	0.0038	0.001	0.004	0.004	0.009	0.003	0.006	0.014	0.009	0.001	0.002
Total Phosphorus	mg/L	0.02*	0.02	0.32	0.08	**0.02**	**0.10**	**0.18**	**0.13**	**0.10**	**0.11**	**0.32**	**0.13**	**0.06**	**0.07**
Total Potassium (K)	mg/L		0.6	8.5	3.4	1.8	3.5	3.8	4.3	4.7	3.0	4.5	5.7	3.7	5.9
Total Sodium (Na)	mg/L		4.7	56	20	6.5	23.0	27.0	16.0	4.7	12.0	45.0	56.0	31.0	41.0
Total Suspended Solids	mg/L		2	360	42	4	68	52	150	39	73	260	99	61	21
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.25	0.003	<0.02	<0.02	*<0.49*	<0.011	0.0055	0.0035	<0.0014	*<0.034*	<0.017	<0.0033
Total Zinc (Zn)	mg/L	0.020	0.0050	0.040	0.0083	<0.01	0.01	**0.03**	0.02	<0.01	0.01	**0.03**	**0.02**	<0.01	<0.01
Ion Percentage	%		0.09	9.80	1.64	1.8	6.6	7.5	7.8	0.1	4.1	4.6	2.5	9.8	1.7

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Sedimentation Pond Surface Water Quality - SP4									
Date						10-Apr-15	3-Aug-15	25-Oct-15	25-Feb-16	7-Apr-16	14-Jul-16	21-Oct-16	12-Jan-17	6-Apr-17	13-Jul-17
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Routine/Verification Event						Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	46	160	109	100	130	150	93	120	120	140	110	120	130
Conductivity	umho/cm		240	730	451	490	460	540	420	430	450	460	390	440	320
Dissolved Chloride (Cl)	mg/L		11	95	30	47	39	49	20	15	28	31	26	16	15
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Sulphate (SO_4)	mg/L		19	150	57	62	40	42	75	74	53	45	41	69	23
Nitrate (N)	mg/L		0.005	0.61	0.12	0.33	<0.10	<0.10	0.56	0.30	<0.010	<0.10	0.33	0.17	<0.10
Nitrite (N)	mg/L		0.005	0.05	0.0078	0.034	<0.010	0.023	0.025	<0.010	<0.10	<0.010	0.018	0.025	<0.010
pH	(pH units)	6.5-8.5	7.0	9.7	8.1	7.0	7.9	8.2	8.1	7.9	8.0	8.0	7.9	8.1	7.9
Phenols-4AAP	mg/L	0.001	0.0005	0.005	0.0007	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Total Ammonia-N	mg/L		0.025	1.05	0.078	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	0.16	<0.15	<0.15
Total Arsenic (As)	mg/L	0.100*	0.000500	0.00700	0.00159	0.004	0.004	0.003	<0.001	0.001	0.004	0.003	0.002	0.001	0.004
Total Barium (Ba)	mg/L		0.0025	0.086	0.033	0.058	0.064	0.057	0.022	0.034	0.056	0.054	0.055	0.035	0.045
Total BOD	mg/L		1	10	2	<2.0	3.0	<2.0	<2.0	<2.0	<2.0	<2.0	4.0	<2.0	2.0
Total Boron (B)	mg/L	0.200	0.0100	0.110	0.0411	0.040	0.060	0.060	0.020	0.040	0.060	0.050	0.040	0.030	0.050
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.00005	0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Calcium (Ca)	mg/L		18	77	50	58	55	54	49	60	50	54	45	59	41
Total Chemical Oxygen Demand (COD)	mg/L		5	48	22	20	28	29	13	21	48	23	29	20	30
Total Chromium (Cr)	mg/L	0.0089	0.0025	0.0120	0.0031	**0.0120**	0.0070	0.0050	<0.005	<0.005	<0.005	<0.005	**0.0090**	<0.005	<0.005
Total Copper (Cu)	mg/L	0.005	0.001	0.015	0.0028	**0.011**	0.005	0.004	0.003	0.005	0.004	0.003	**0.007**	0.005	0.003
Total Dissolved Solids	mg/L		126	456	272	292	332	256	222	264	328	272	210	272	188
Total Iron (Fe)	mg/L	0.300	0.050	12	1.84	**11.000**	**6.200**	**4.100**	**1.600**	**3.700**	**4.500**	**3.700**	**4.700**	**2.900**	**3.400**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.32	2.5	0.66641	1.40	0.50	0.77	0.33	0.44	<0.7	0.53	0.67	<0.7	0.48
Total Lead (Pb)	mg/L	0.005	0.0003	0.006	0.001	0.005	0.003	0.003	0.001	0.002	0.003	0.003	0.003	0.002	0.002
Total Magnesium (Mg)	mg/L		5	26	15	16	14	17	13	16	17	16	11	16	13
Total Nickel (Ni)	mg/L	0.025	0.0005	0.020	0.0038	0.016	0.010	0.008	0.003	0.006	0.008	0.006	0.007	0.005	0.006
Total Phosphorus	mg/L	0.02*	0.02	0.32	0.08	**0.24**	**0.20**	**0.15**	**0.05**	**0.10**	**0.20**	**0.13**	**0.18**	*<0.060*	**0.16**
Total Potassium (K)	mg/L		0.6	8.5	3.4	4.8	3.8	4.1	3.1	3.3	3.5	3.2	8.5	3.9	3.4
Total Sodium (Na)	mg/L		4.7	56	20	32	26	35	13	12	22	21	13	13	13
Total Suspended Solids	mg/L		2	360	42	180	180	110	31	67	140	110	120	73	100
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.25	0.003	<0.0057	<0.011	<0.0033	<0.0024	<0.0012	<0.014	<0.0025	<0.0005	<0.0005	<0.015
Total Zinc (Zn)	mg/L	0.020	0.0050	0.040	0.0083	**0.040**	0.020	<0.01	<0.01	0.010	0.010	<0.01	0.020	0.010	0.010
Ion Percentage	%		0.09	9.80	1.64	5.5	3.2	2.2	1.1	3.1	3.7	2.2	1.0	1.0	2.0

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
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7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Sedimentation Pond Surface Water Quality - SP4									
Date						12-Oct-17	23-Jan-18	4-Apr-18	8-Aug-18	31-Oct-18	24-Jan-19	19-Apr-19	2-Oct-19	11-Jan-20	18-May-20
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Bureau Veritas	Bureau Veritas	Bureau Veritas
Routine/Verification Event						Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	46	160	109	160	87	120	130	150	97	150	160	130	150
Conductivity	umho/cm		240	730	451	430	310	490	380	450	360	590	440	583	700
Dissolved Chloride (Cl)	mg/L		11	95	30	23	11	20	20	17	17	25	21	27	34
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Sulphate (SO_4)	mg/L		19	150	57	34	46	96	37	54	50	110	39	140	150
Nitrate (N)	mg/L		0.005	0.61	0.12	<0.10	0.46	0.24	<0.10	<0.10	0.47	0.33	<0.10	<0.10	<0.10
Nitrite (N)	mg/L		0.005	0.05	0.0078	<0.010	0.015	<0.010	<0.010	<0.010	0.014	<0.010	<0.010	<0.010	<0.010
pH	(pH units)	6.5-8.5	7.0	9.7	8.1	8.2	7.8	8.0	8.0	8.0	7.8	8.2	8.3	8.3	8.2
Phenols-4AAP	mg/L	0.001	0.0005	0.005	0.0007	<0.0010	0.0013	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Ammonia-N	mg/L		0.025	1.05	0.078	<0.050	0.260	0.062	<0.050	0.093	0.750	<0.050	0.051	<0.050	<0.050
Total Arsenic (As)	mg/L	0.100*	0.000500	0.00700	0.00159	0.002	<0.001	0.003	0.006	0.002	0.001	<0.001	0.004	<0.001	0.001
Total Barium (Ba)	mg/L		0.0025	0.086	0.033	0.053	0.025	0.058	0.063	0.045	0.027	0.034	0.045	0.042	0.047
Total BOD	mg/L		1	10	2	<2.0	<2	<2	<2	<2	5	8	4	<2	3
Total Boron (B)	mg/L	0.200	0.0100	0.110	0.0411	0.070	0.020	0.040	0.070	0.050	0.030	0.050	0.110	0.040	0.050
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.00005	0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Calcium (Ca)	mg/L		18	77	50	51	37	73	46	56	43	70	46	74	77
Total Chemical Oxygen Demand (COD)	mg/L		5	48	22	24	20	14	28	21	28	22	29	15	30
Total Chromium (Cr)	mg/L	0.0089	0.0025	0.0120	0.0031	*<0.005*	<0.005	**0.0090**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total Copper (Cu)	mg/L	0.005	0.001	0.015	0.0028	*<0.002*	**0.006**	**0.013**	0.003	0.003	**0.007**	0.004	<0.002	0.004	0.003
Total Dissolved Solids	mg/L		126	456	272	270	170	190	265	415	215	370	280	395	450
Total Iron (Fe)	mg/L	0.300	0.050	12	1.84	**1.800**	**2.300**	**8.800**	**3.900**	**2.000**	**2.400**	**0.900**	**2.300**	**1.300**	**2.200**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.32	2.5	0.66641	0.52	0.55	0.35	0.64	0.32	1.30	0.55	0.68	0.32	0.43
Total Lead (Pb)	mg/L	0.005	0.0003	0.006	0.001	0.001	0.002	**0.005**	0.003	0.002	0.002	0.001	0.003	0.001	0.0012
Total Magnesium (Mg)	mg/L		5	26	15	16	10	21	16	13	12	22	18	24	25
Total Nickel (Ni)	mg/L	0.025	0.0005	0.020	0.0038	0.004	0.004	0.012	0.006	0.004	0.005	0.003	0.004	0.003	0.004
Total Phosphorus	mg/L	0.02*	0.02	0.32	0.08	**0.09**	**0.10**	**0.21**	**0.19**	**0.08**	**0.11**	**0.05**	**0.12**	**0.04**	**0.09**
Total Potassium (K)	mg/L		0.6	8.5	3.4	3.9	3.4	5.2	3.8	4.0	7.2	4.7	3.0	4.8	3.7
Total Sodium (Na)	mg/L		4.7	56	20	17.0	7.2	14.0	16.0	10.0	9.1	16.0	18.0	17	23
Total Suspended Solids	mg/L		2	360	42	49	36	230	97	33	41	26	61	35	69
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.25	0.003	<0.0005	0.01	<0.0005	<0.0005	<0.00061	<0.00061	<0.0033	0.01	<0.0015	<0.0043
Total Zinc (Zn)	mg/L	0.020	0.0050	0.040	0.0083	*<0.01*	0.010	**0.030**	<0.01	<0.01	0.020	<0.01	<0.01	<0.01	<0.01
Ion Percentage	%		0.09	9.80	1.64	0.8	0.5	5.4	3.0	1.2	1.9	0.5	0.1	0.9	0.4

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-1
Precipitation Event Surface Water Quality - General Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Sedimentation Pond Surface Water Quality - SP4									
Date						15-Nov-20	26-Mar-21	3-Jun-21	9-Jul-21	4-Oct-21	17-Feb-22	4-May-22	18-Oct-22		
Laboratory						Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureaus Veritas		
Routine/Verification Event						Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine		
Alkalinity (Total as $CaCO_3$)	mg/L	<25%***	46	160	109	160	120	47	99	140	82	150	140		
Conductivity	umho/cm		240	730	451	550	540	450	570	500	570	650	570		
Dissolved Chloride (Cl)	mg/L		11	95	30	26	32	37	79	45	34	37	29		
Dissolved Mercury (Hg)	mg/L	0.0002	0.00005	0.05	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		
Dissolved Sulphate (SO_4)	mg/L		19	150	57	78	92	120	58	43	140	130	110		
Nitrate (N)	mg/L		0.005	0.61	0.12	<0.10	<0.10	<0.10	<0.10	<0.10	0.54	0.18	<0.10		
Nitrite (N)	mg/L		0.005	0.05	0.0078	<0.010	<0.010	<0.010	<0.010	<0.010	0.034	<0.010	<0.010		
pH	(pH units)	6.5-8.5	7.0	9.7	8.1	8.1	8.1	**9.6**	8.5	8.1	8.0	8.2	8.1		
Phenols-4AAP	mg/L	0.001	0.0005	0.005	0.0007	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	**0.0011**	<0.0010	<0.0010		
Total Ammonia-N	mg/L		0.025	1.05	0.078	0.058	<0.050	<0.050	<0.15	<0.15	1.05	<0.15	<0.15		
Total Arsenic (As)	mg/L	0.100*	0.000500	0.00700	0.00159	0.002	0.001	0.001	0.005	0.002	0.003	0.001	0.003		
Total Barium (Ba)	mg/L		0.0025	0.086	0.033	0.037	0.039	0.019	0.008	0.032	0.042	0.037	0.041		
Total BOD	mg/L		1	10	2	<2	<2	<2	3	6	2	2	3		
Total Boron (B)	mg/L	0.200	0.0100	0.110	0.0411	0.07	0.04	0.06	0.07	0.07	0.09	0.07	0.07		
Total Cadmium (Cd)	mg/L	0.0002	0.00005	0.00005	0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
Total Calcium (Ca)	mg/L		18	77	50	68	65	32	35	52	67	74	65		
Total Chemical Oxygen Demand (COD)	mg/L		5	48	22	19	17	21	42	47	20	21	5.1		
Total Chromium (Cr)	mg/L	0.0089	0.0025	0.0120	0.0031	<0.005	<0.005	<0.005	<0.005	<0.005	**0.012**	<0.005	<0.005		
Total Copper (Cu)	mg/L	0.005	0.001	0.015	0.0028	<0.002	0.004	<0.002	<0.002	<0.002	**0.015**	0.004	<0.002		
Total Dissolved Solids	mg/L		126	456	272	300	310	280	355	275	315	350	305		
Total Iron (Fe)	mg/L	0.300	0.050	12	1.84	**1.2**	**2.0**	**0.6**	**0.5**	**1.4**	**12**	**2**	**1.8**		
Total Kjeldahl Nitrogen (TKN)	mg/L		0.32	2.5	0.66641	0.44	0.32	0.95	<0.7	<0.7	1.9	<0.7	<0.7		
Total Lead (Pb)	mg/L	0.005	0.0003	0.006	0.001	0.0009	0.0013	<0.0005	<0.0005	0.00	0.0048	0.0011	0.0011		
Total Magnesium (Mg)	mg/L		5	26	15	17	17	19	19	13	26	26	20		
Total Nickel (Ni)	mg/L	0.025	0.0005	0.020	0.0038	0.003	0.004	0.003	0.002	0.003	0.020	0.006	0.004		
Total Phosphorus	mg/L	0.02*	0.02	0.32	0.08	**0.06**	**0.07**	**0.03**	**0.05**	**0.17**	**0.19**	**0.077**	**0.047**		
Total Potassium (K)	mg/L		0.6	8.5	3.4	3.5	4.1	1.7	2.6	5.5	6.9	4.7	4.1		
Total Sodium (Na)	mg/L		4.7	56	20	18	22	26	51	33	25	25	20		
Total Suspended Solids	mg/L		2	360	42	38	64	16	11	45	360	41	32		
Total Un-ionized Ammonia	mg/L	0.02	0.0003	0.25	0.003	0.002	<0.00061	<0.048	<0.03	<0.014	0.0019	<0.0054	<0.0034		
Total Zinc (Zn)	mg/L	0.020	0.0050	0.040	0.0083	*<0.01*	0.01	<0.01	<0.01	<0.01	**0.03**	<0.01	<0.01		
Ion Percentage	%		0.09	9.80	1.64	0.5	2.3	1.0	0.76	1.4	5.1	1.0	0.3		

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Unionized ammonia values are calculated based on field determined pH and temperature values.
5) mg/L denotes milligrams per litre.
6) umho/cm denotes microsiemens per centimeter.
7) BOD denotes biological oxygen demand.
8) COD denotes chemical oxygen demand.
9) Blank denotes parameter not analyzed.
10) **Bolded** text and shading denotes concentration exceeds PWQO.
11) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
12) "BV" denotes Bureau Veritas Laboratories
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

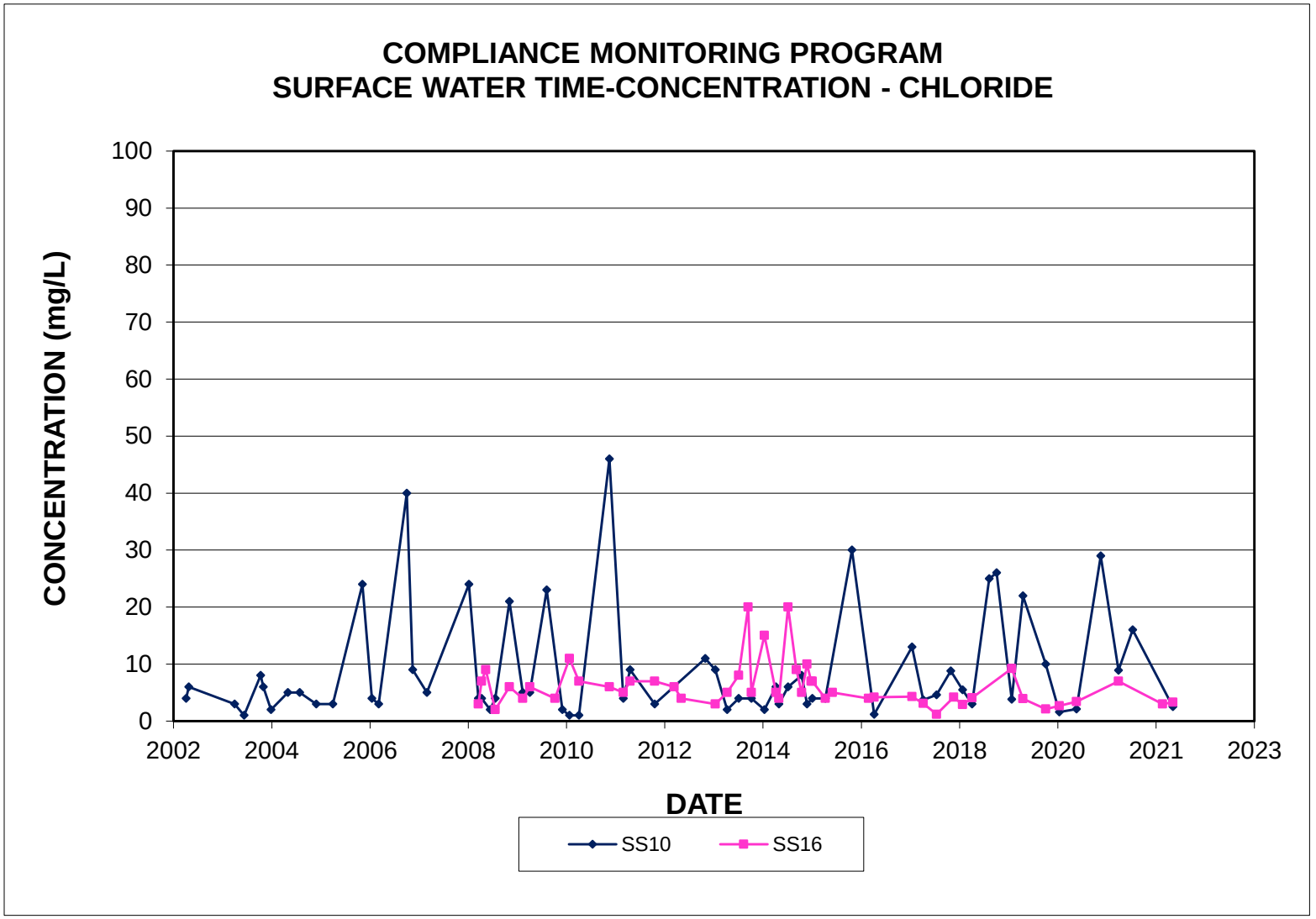
COMPLIANCE MONITORING PROGRAM
SURFACE WATER TIME-CONCENTRATION - CHLORIDE
CONCENTRATION (mg/L)
100
90
80
70
60
50
40
30
20
10
0
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2021
2023
DATE
SS10
SS16

FIGURE B-1

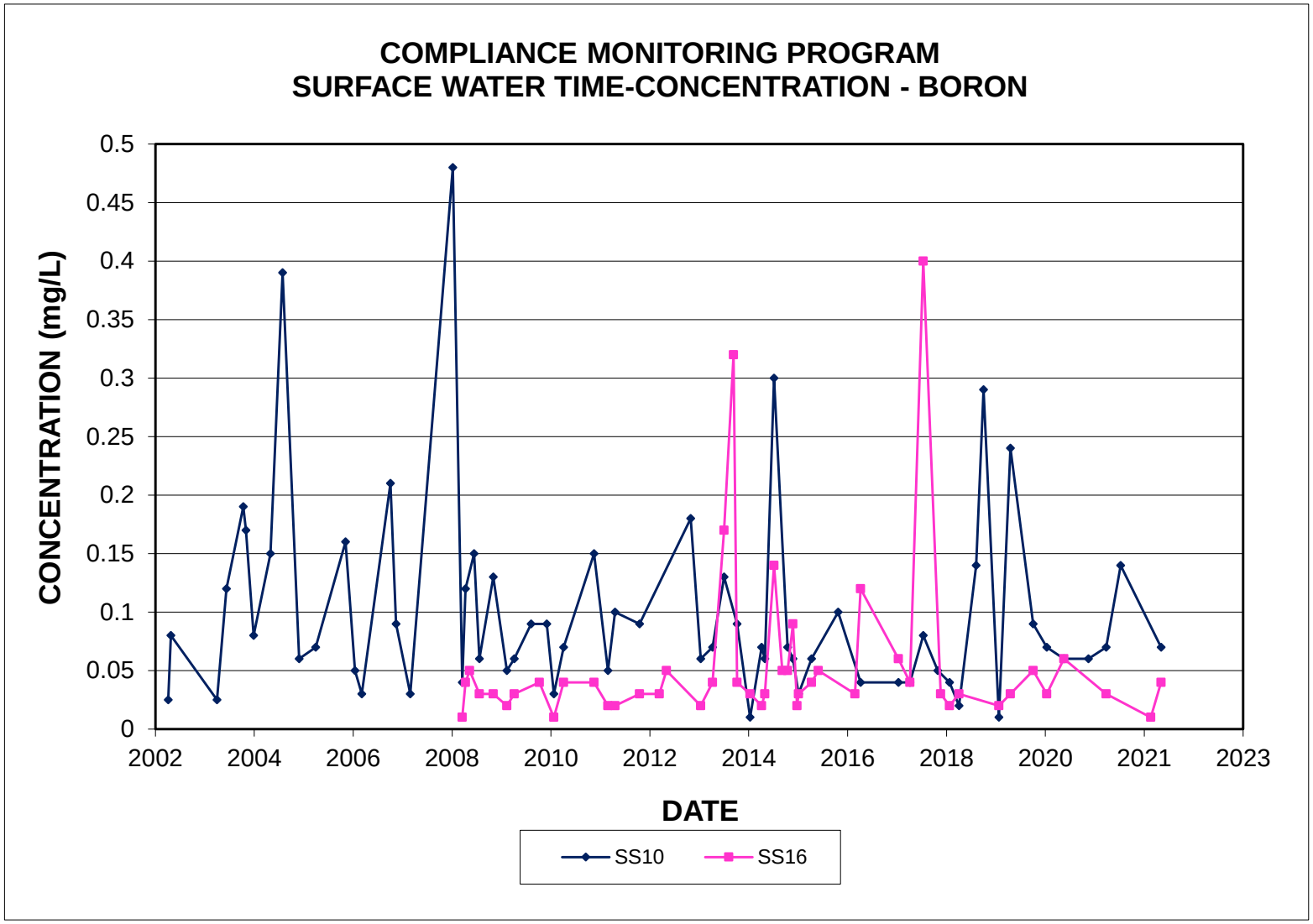
COMPLIANCE MONITORING PROGRAM
SURFACE WATER TIME-CONCENTRATION - BORON
CONCENTRATION (mg/L)
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2021
2023
DATE
SS10
SS16

FIGURE B-2

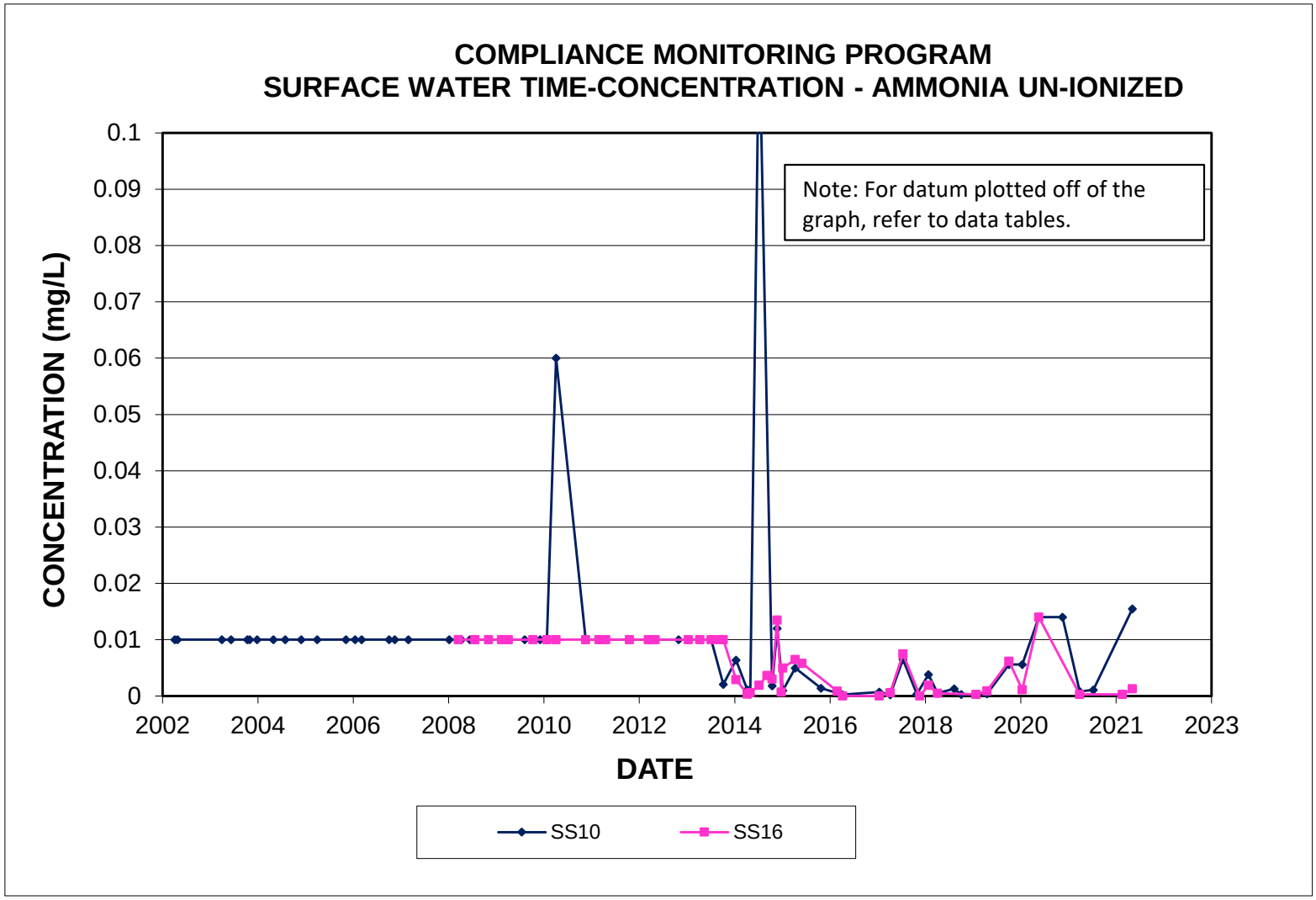
COMPLIANCE MONITORING PROGRAM
SURFACE WATER TIME-CONCENTRATION - AMMONIA UN-IONIZED
CONCENTRATION (mg/L)
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2021
2023
DATE
Note: For datum plotted off of the graph, refer to data tables.
SS10
SS16

FIGURE B-3

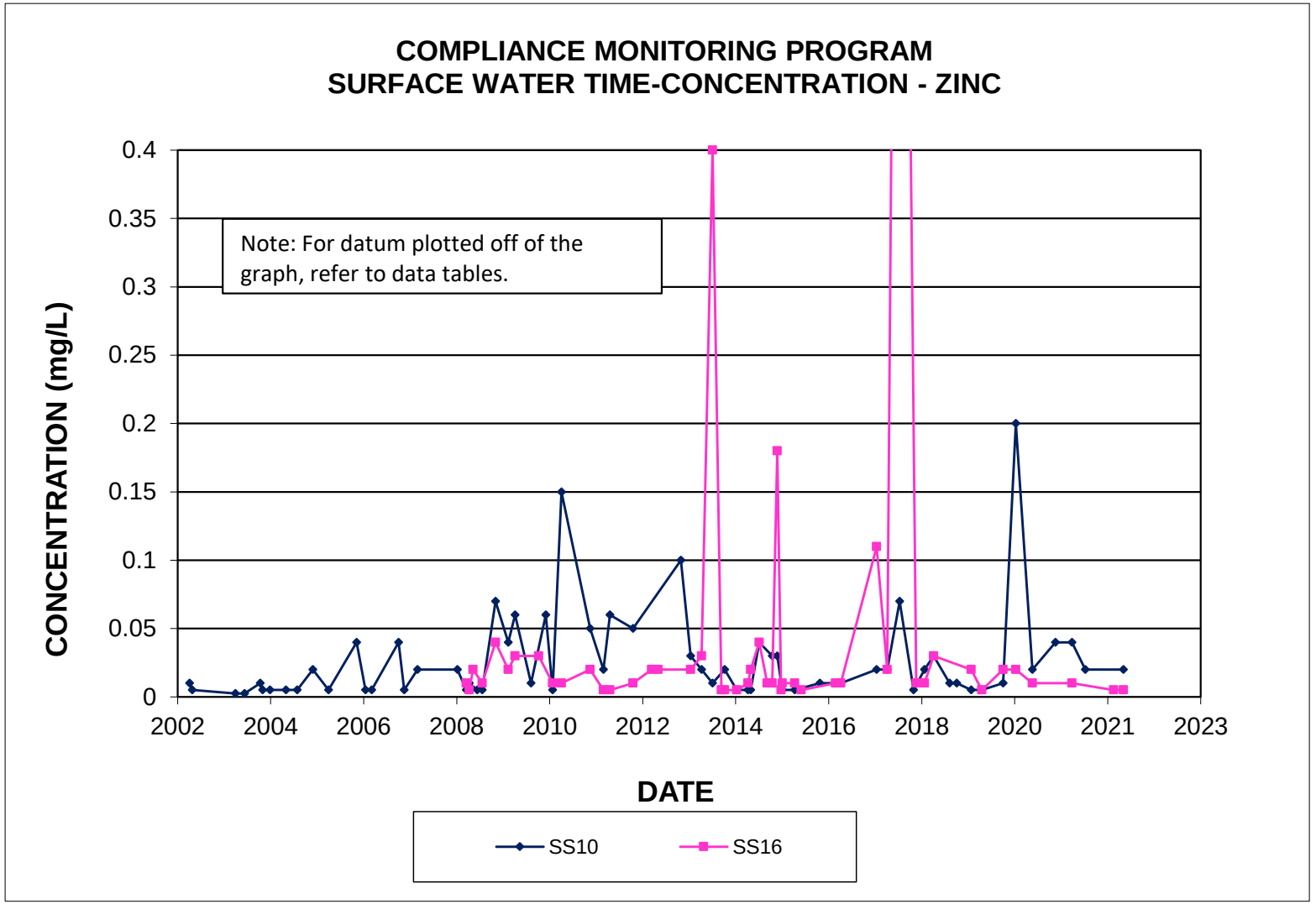
COMPLIANCE MONITORING PROGRAM
SURFACE WATER TIME-CONCENTRATION - ZINC
CONCENTRATION (mg/L)
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Note: For datum plotted off of the graph, refer to data tables.
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2021
2023
DATE
SS10
SS16

FIGURE B-4

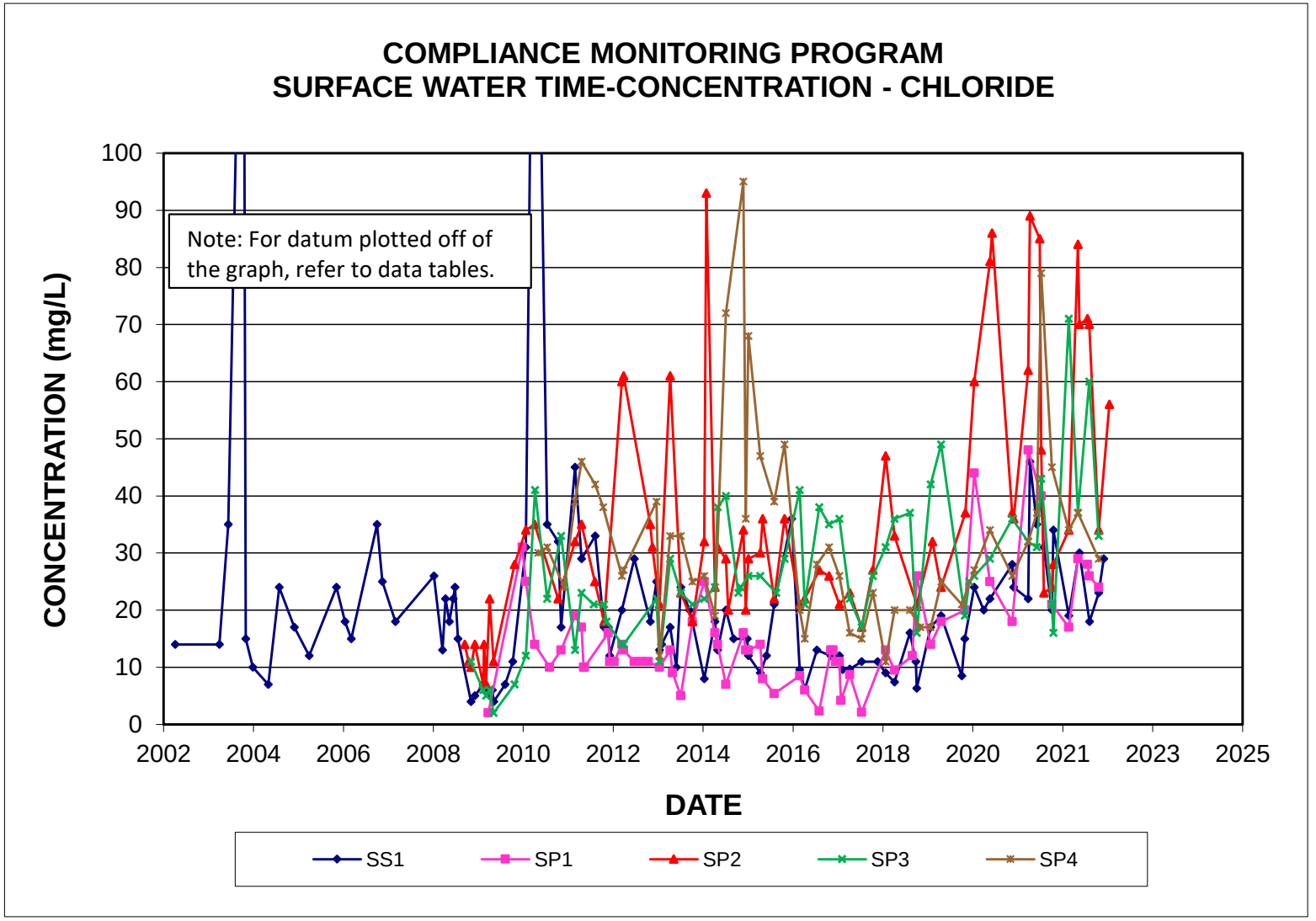
COMPLIANCE MONITORING PROGRAM
SURFACE WATER TIME-CONCENTRATION - CHLORIDE
CONCENTRATION (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Note: For datum plotted off of the graph, refer to data tables.
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2021
2023
2025
DATE
SS1
SP1
SP2
SP3
SP4

FIGURE B-5

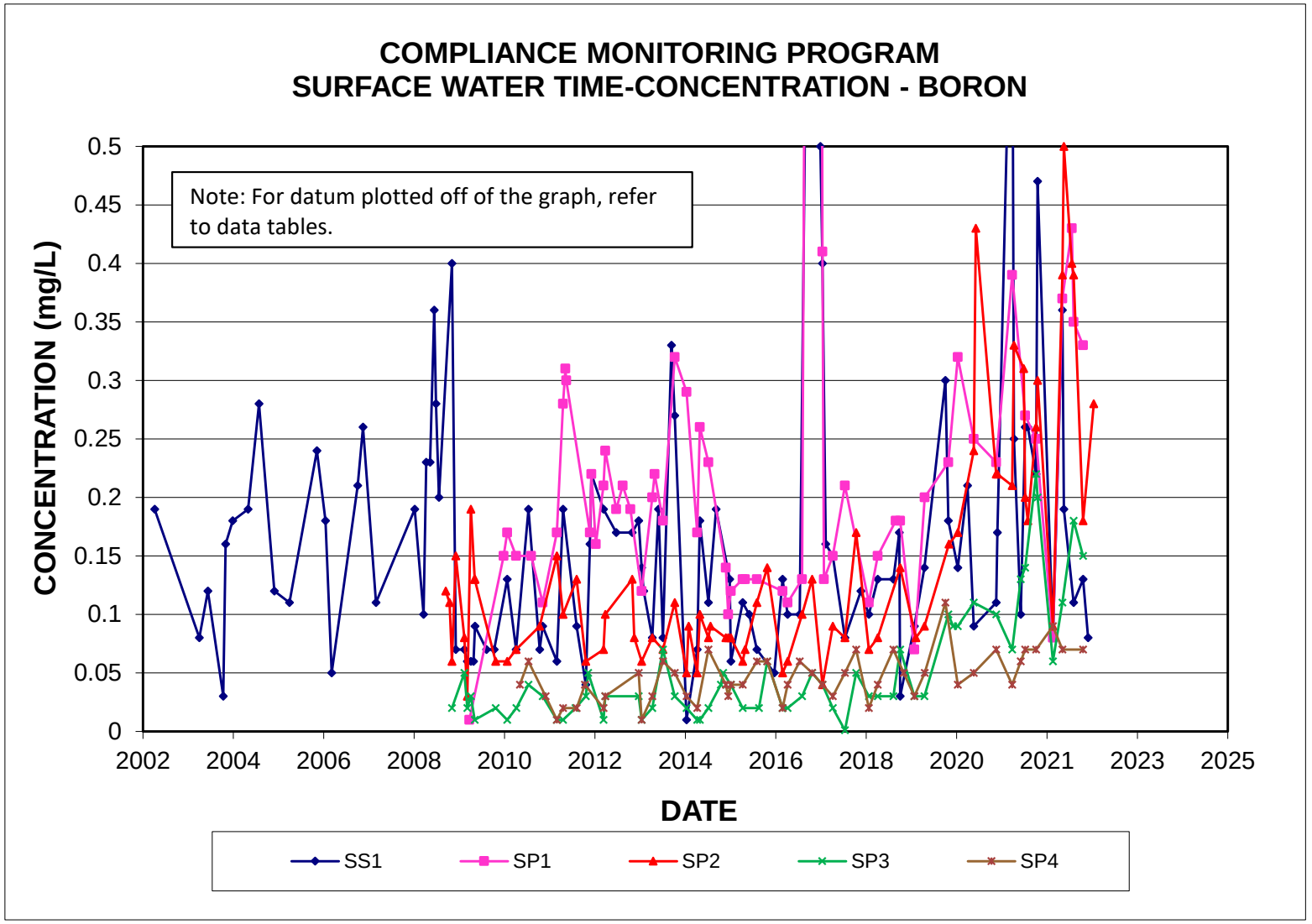
COMPLIANCE MONITORING PROGRAM
SURFACE WATER TIME-CONCENTRATION - BORON
Note: For datum plotted off of the graph, refer to data tables.
CONCENTRATION (mg/L)
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2021
2023
2025
DATE
SS1
SP1
SP2
SP3
SP4

FIGURE B-6

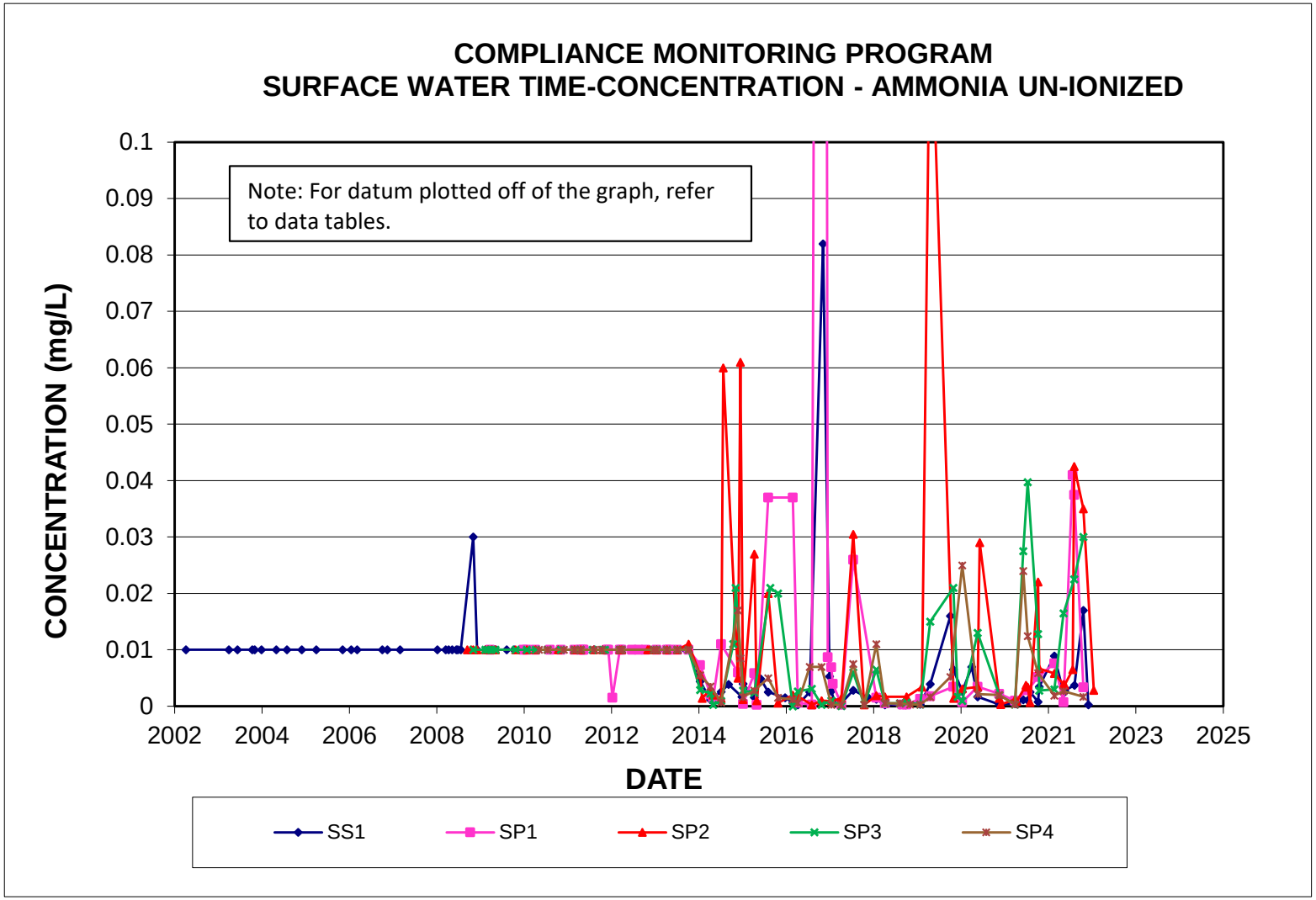
COMPLIANCE MONITORING PROGRAM
SURFACE WATER TIME-CONCENTRATION - AMMONIA UN-IONIZED
Note: For datum plotted off of the graph, refer to data tables.
CONCENTRATION (mg/L)
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2021
2023
2025
DATE
SS1
SP1
SP2
SP3
SP4

FIGURE B-7

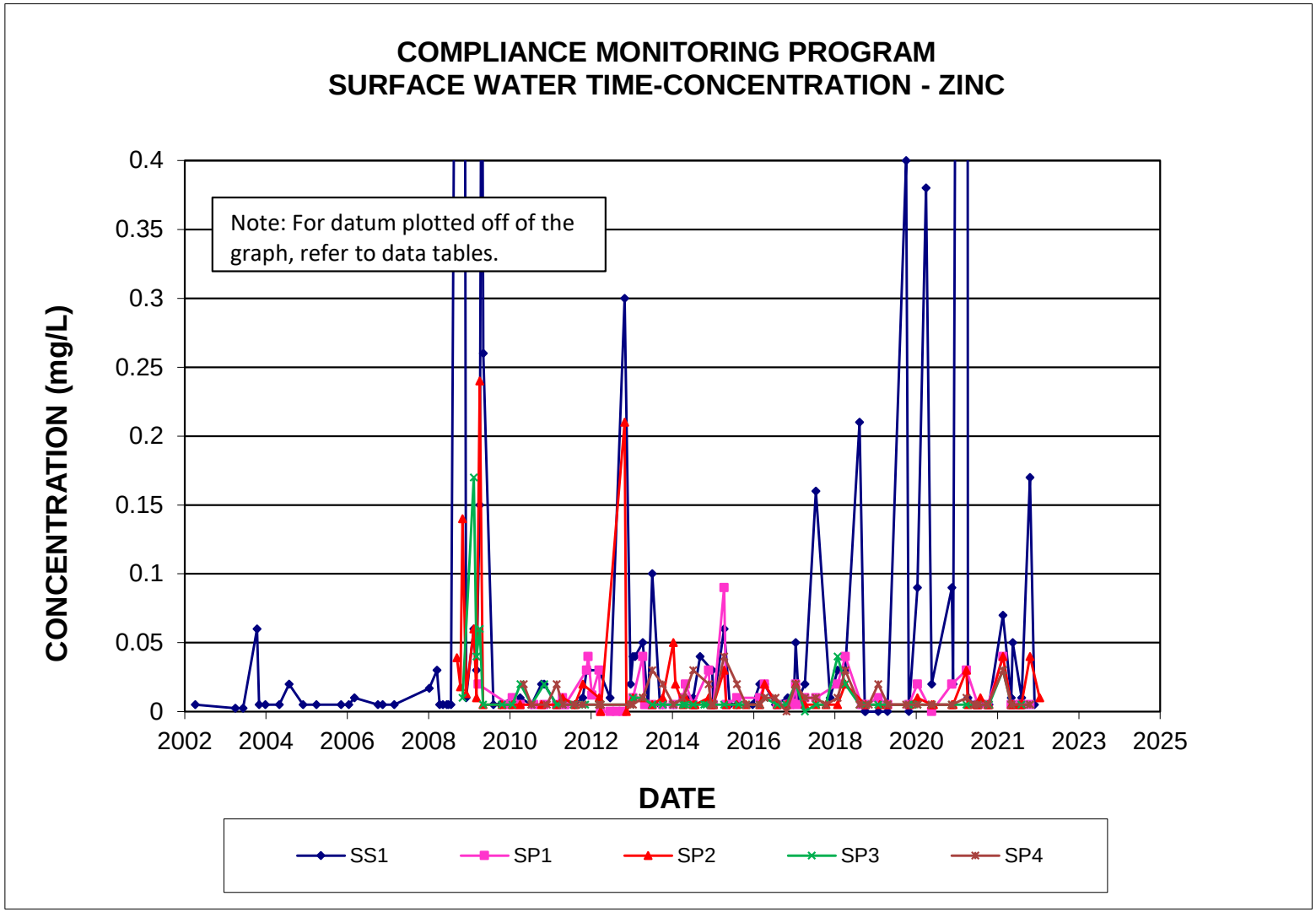
COMPLIANCE MONITORING PROGRAM
SURFACE WATER TIME-CONCENTRATION - ZINC
Note: For datum plotted off of the graph, refer to data tables.
CONCENTRATION (mg/L)
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2021
2023
2025
DATE
SS1
SP1
SP2
SP3
SP4

FIGURE B-8

Table B-2
Precipitation Event Surface Water Quality - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Downstream of Landfill 60m East of Lambton Rd 79 - SS1										
Date			19-Mar-08	11-Apr-08	12-May-08	14-Jun-08	29-Jun-08	23-Jul-08	4-Nov-08	5-Dec-08	12-Feb-09	8-Mar-09	6-Apr-09
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Semivolatile Organics													
Benzo(a)pyrene	µg/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2-Dichlorobenzene	µg/L	2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	µg/L	2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	µg/L	4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene	µg/L	0.0065	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*
1,2,4-Trichlorobenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-Dichlorophenol	µg/L	0.2	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*
Pentachlorophenol	µg/L	0.5	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*
Phenol	µg/L	5*	<0.5	<0.5	<0.5	**1.7**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4,6-Trichlorophenol	µg/L	18	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Di-N-butyl phthalate	µg/L	4	<2	<2		<2			<2	<2	<2	<2	<2
Diethyl phthalate	µg/L	0.2	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*
Dimethyl phthalate	µg/L	0.2	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*
Volatile Organics													
Benzene	µg/L	100*	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1,4-Dichlorobenzene	µg/L	4	<0.2	<0.2	<0.2	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Ethylbenzene	µg/L	8*	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dichloromethane	µg/L	100*	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	µg/L	0.8*	<0.2	<0.2	<0.2	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Vinyl Chloride	µg/L	600*	<0.2	<0.2	<0.2	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
p+m-Xylene	µg/L	32*	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
o-Xylene	µg/L	40*	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Xylene (Total)	µg/L		<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) µg/L denotes micrograms per litre.
4) Blank denotes parameter not analyzed.
5) **Bold** indicates select parameter was detected at concentration greater than the laboratory reportable detection limit (RDL).
6) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.

Table B-2
Precipitation Event Surface Water Quality - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Downstream of Landfill 60m East of Lambton Rd 79 - SS1										
Date			26-Apr-09	9-May-09	9-Aug-09	10-Oct-09	25-Jan-10	6-Apr-10	16-Jul-10	14-Oct-10	28-Feb-11	20-Apr-11	9-Aug-11
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Semivolatile Organics													
Benzo(a)pyrene	µg/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2-Dichlorobenzene	µg/L	2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	µg/L	2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	µg/L	4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene	µg/L	0.0065	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*
1,2,4-Trichlorobenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-Dichlorophenol	µg/L	0.2	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*
Pentachlorophenol	µg/L	0.5	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*
Phenol	µg/L	5*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4,6-Trichlorophenol	µg/L	18	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Di-N-butyl phthalate	µg/L	4	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Diethyl phthalate	µg/L	0.2	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*
Dimethyl phthalate	µg/L	0.2	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*
Volatile Organics													
Benzene	µg/L	100*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.3	<0.1	<0.2
1,4-Dichlorobenzene	µg/L	4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.5	<0.2	<0.4
Ethylbenzene	µg/L	8*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.3	<0.1	<0.2
Dichloromethane	µg/L	100*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<1
Toluene	µg/L	0.8*	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.5	<0.2	<0.4
Vinyl Chloride	µg/L	600*	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.5	<0.2	<0.4
p+m-Xylene	µg/L	32*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.3	<0.1	<0.2
o-Xylene	µg/L	40*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.3	<0.1	<0.2
Xylene (Total)	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.3	<0.1	<0.2

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) µg/L denotes micrograms per litre.
4) Blank denotes parameter not analyzed.
5) **Bold** indicates select parameter was detected at concentration greater than the laboratory reportable detection limit (RDL).
6) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.

Table B-2
Precipitation Event Surface Water Quality - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Downstream of Landfill 60m East of Lambton Rd 79 - SS1										
Date			20-Oct-11	23-Nov-11	6-Dec-11	13-Mar-12	22-Jun-12	30-Oct-12	21-Dec-12	13-Jan-13	30-Jan-13	10-Apr-13	29-May-13
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Semivolatile Organics													
Benzo(a)pyrene	µg/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2-Dichlorobenzene	µg/L	2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	µg/L	2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	µg/L	4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene	µg/L	0.0065	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*
1,2,4-Trichlorobenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-Dichlorophenol	µg/L	0.2	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*
Pentachlorophenol	µg/L	0.5	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*
Phenol	µg/L	5*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	6.1	<0.5	<0.5	<0.5
2,4,6-Trichlorophenol	µg/L	18	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Di-N-butyl phthalate	µg/L	4	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Diethyl phthalate	µg/L	0.2	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*
Dimethyl phthalate	µg/L	0.2	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*
Volatile Organics													
Benzene	µg/L	100*	<0.1	<0.5	<0.10	<0.20	<0.10	<0.10	<0.25	<0.10	<0.10	<0.10	<0.10
1,4-Dichlorobenzene	µg/L	4	<0.2	<1	<0.20	<0.40	<0.20	<0.20	<0.50	<0.20	<0.20	<0.20	<0.20
Ethylbenzene	µg/L	8*	<0.1	<0.5	<0.10	<0.20	<0.10	<0.10	<0.25	<0.10	<0.10	<0.10	<0.10
Dichloromethane	µg/L	100*	<0.5	<3	<0.50	<1.0	<0.50	<0.50	<1.3	<0.50	<0.50	<0.50	<0.50
Toluene	µg/L	0.8*	<0.2	<1	<0.20	<0.40	<0.20	<0.20	<0.50	<0.20	<0.20	<0.20	<0.20
Vinyl Chloride	µg/L	600*	<0.2	<1	<0.20	<0.40	<0.20	<0.20	<0.50	<0.20	<0.20	<0.20	<0.20
p+m-Xylene	µg/L	32*	<0.1	<0.5	<0.10	<0.20	<0.10	<0.10	<0.25	<0.10	<0.10	<0.10	<0.10
o-Xylene	µg/L	40*	<0.1	<0.5	<0.10	<0.20	<0.10	<0.10	<0.25	<0.10	<0.10	<0.10	<0.10
Xylene (Total)	µg/L		<0.1	<0.5	<0.10	<0.20	<0.10	<0.10	<0.25	<0.10	<0.10	<0.10	<0.10

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) µg/L denotes micrograms per litre.
4) Blank denotes parameter not analyzed.
5) **Bold** indicates select parameter was detected at concentration greater than the laboratory reportable detection limit (RDL).
6) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.

Table B-2
Precipitation Event Surface Water Quality - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Downstream of Landfill 60m East of Lambton Rd 79 - SS1										
Date			5-Jul-13	12-Sep-13	7-Oct-13	11-Jan-14	8-Apr-14	30-Apr-14	7-Jul-14	6-Sep-14	25-Dec-14	4-Jan-15	10-Apr-15
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Semivolatile Organics													
Benzo(a)pyrene	µg/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20	<0.20
1,2-Dichlorobenzene	µg/L	2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.50	<0.50	<0.50
1,3-Dichlorobenzene	µg/L	2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.50	<0.50	<0.50
1,4-Dichlorobenzene	µg/L	4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.50	<0.50	<0.50
Hexachlorobenzene	µg/L	0.0065	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.50*	*<0.50*	*<0.50*
1,2,4-Trichlorobenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	*<0.50*	*<0.50*	*<0.50*
2,4-Dichlorophenol	µg/L	0.2	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.30*	*<0.30*	*<0.30*
Pentachlorophenol	µg/L	0.5	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1.0*	*<1.0*	*<1.0*
Phenol	µg/L	5*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.50	<0.50	<0.50
2,4,6-Trichlorophenol	µg/L	18	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.50	<0.50	<0.50
Di-N-butyl phthalate	µg/L	4	<2	<2	<2	<2	<2	<2	<2	<2	<2.0	<2.0	<2.0
Diethyl phthalate	µg/L	0.2	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1.0*	*<1.0*	*<1.0*
Dimethyl phthalate	µg/L	0.2	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1.0*	*<1.0*	*<1.0*
Volatile Organics													
Benzene	µg/L	100*	<0.25	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
1,4-Dichlorobenzene	µg/L	4	<0.50	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Ethylbenzene	µg/L	8*	<0.25	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Dichloromethane	µg/L	100*	<1.3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Toluene	µg/L	0.8*	<0.50	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Vinyl Chloride	µg/L	600*	<0.50	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
p+m-Xylene	µg/L	32*	<0.25	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
o-Xylene	µg/L	40*	<0.25	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Xylene (Total)	µg/L		<0.25	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) µg/L denotes micrograms per litre.
4) Blank denotes parameter not analyzed.
5) **Bold** indicates select parameter was detected at concentration greater than the laboratory reportable detection limit (RDL).
6) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.

Table B-2
Precipitation Event Surface Water Quality - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Downstream of Landfill 60m East of Lambton Rd 79 - SS1										
Date			1-Jun-15	3-Aug-15	25-Feb-16	7-Apr-16	14-Jul-16	3-Nov-16	27-Dec-16	12-Jan-17	6-Apr-17	13-Jul-17	19-Nov-17
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Semivolatile Organics													
Benzo(a)pyrene	µg/L		<0.20	<0.20	<0.20	<0.20	<0.20	<0.80	<0.20	<0.80	<0.20	<0.20	<0.20
1,2-Dichlorobenzene	µg/L	2.5	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50	<2.0	<0.50	<0.50	<0.50
1,3-Dichlorobenzene	µg/L	2.5	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50	<2.0	<0.50	<0.50	<0.50
1,4-Dichlorobenzene	µg/L	4	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50	<2.0	<0.50	<0.50	<0.50
Hexachlorobenzene	µg/L	0.0065	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<2.0*	*<0.50*	*<2.0*	*<0.50*	*<0.50*	*<0.50*
1,2,4-Trichlorobenzene	µg/L	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	*<2.0*	*<0.50*	*<2.0*	*<0.50*	*<0.50*	*<0.50*
2,4-Dichlorophenol	µg/L	0.2	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<1.2*	*<0.30*	*<1.2*	*<0.30*	*<0.30*	*<0.30*
Pentachlorophenol	µg/L	0.5	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<4.0*	*<1.0*	*<4.0*	*<1.0*	*<1.0*	*<1.0*
Phenol	µg/L	5*	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50	<2.0	<0.50	<0.50	<0.50
2,4,6-Trichlorophenol	µg/L	18	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50	<2.0	<0.50	<0.50	<0.50
Di-N-butyl phthalate	µg/L	4	<2.0	<2.0	<2.0	<2.0	<2.0	<8.0	<2.0	<8.0	<2.0	<2.0	<2.0
Diethyl phthalate	µg/L	0.2	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<4.0*	*<1.0*	*<4.0*	*<1.0*	*<1.0*	*<1.0*
Dimethyl phthalate	µg/L	0.2	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<4.0*	*<1.0*	*<4.0*	*<1.0*	*<1.0*	*<1.0*
Volatile Organics													
Benzene	µg/L	100*	<0.10	<0.10	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
1,4-Dichlorobenzene	µg/L	4	<0.20	<0.20	<0.40	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.50	<0.20
Ethylbenzene	µg/L	8*	<0.10	<0.10	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Dichloromethane	µg/L	100*	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Toluene	µg/L	0.8*	<0.20	<0.20	<0.40	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Vinyl Chloride	µg/L	600*	<0.20	<0.20	<0.40	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
p+m-Xylene	µg/L	32*	<0.10	<0.10	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
o-Xylene	µg/L	40*	<0.10	<0.10	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Xylene (Total)	µg/L		<0.10	<0.10	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) µg/L denotes micrograms per litre.
4) Blank denotes parameter not analyzed.
5) **Bold** indicates select parameter was detected at concentration greater than the laboratory reportable detection limit (RDL).
6) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.

Table B-2
Precipitation Event Surface Water Quality - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Downstream of Landfill 60m East of Lambton Rd 79 - SS1										
Date			23-Jan-18	4-Apr-18	8-Aug-18	26-Sep-18	2-Oct-18	24-Jan-19	17-Apr-19	2-Oct-19	27-Oct-19	11-Jan-20	29-Mar-20
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas
Semivolatile Organics													
Benzo(a)pyrene	µg/L		<0.80	<0.20	<0.80	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
1,2-Dichlorobenzene	µg/L	2.5	<2.0	<0.50	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,3-Dichlorobenzene	µg/L	2.5	<2.0	<0.50	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,4-Dichlorobenzene	µg/L	4	<2.0	<0.50	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Hexachlorobenzene	µg/L	0.0065	*<2.0*	*<0.50*	*<2.0*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*
1,2,4-Trichlorobenzene	µg/L	0.5	<2.0	<0.50	<2.0	<0.50	<0.50	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*
2,4-Dichlorophenol	µg/L	0.2	*<1.2*	*<0.30*	*<1.2*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*
Pentachlorophenol	µg/L	0.5	*<4.0*	*<1.0*	*<4.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Phenol	µg/L	5*	<2.0	<0.50	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
2,4,6-Trichlorophenol	µg/L	18	<2.0	<0.50	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Di-N-butyl phthalate	µg/L	4	<8.0	<2.0	<8.0	<2.0	<2.0	**4.4**	<2.0	<2.0	<2.0	<2.0	<2.0
Diethyl phthalate	µg/L	0.2	*<4.0*	*<1.0*	*<4.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Dimethyl phthalate	µg/L	0.2	*<4.0*	*<1.0*	*<4.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Volatile Organics													
Benzene	µg/L	100*	<0.10	<0.10	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
1,4-Dichlorobenzene	µg/L	4	<0.20	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.40
Ethylbenzene	µg/L	8*	<0.10	<0.10	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Dichloromethane	µg/L	100*	<0.50	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Toluene	µg/L	0.8*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Vinyl Chloride	µg/L	600*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
p+m-Xylene	µg/L	32*	<0.10	<0.10	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
o-Xylene	µg/L	40*	<0.10	<0.10	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Xylene (Total)	µg/L		<0.10	<0.10	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) µg/L denotes micrograms per litre.
4) Blank denotes parameter not analyzed.
5) **Bold** indicates select parameter was detected at concentration greater than the laboratory reportable detection limit (RDL).
6) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.

Table B-2
Precipitation Event Surface Water Quality - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Downstream of Landfill 60m East of Lambton Rd 79 - SS1										
Date			18-May-20	15-Nov-20	26-Nov-20	26-Mar-21	9-Apr-21	3-Jun-21	9-Jul-21	30-Jul-21	4-Oct-21	15-Oct-21	17-Feb-22
Laboratory			Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas
Semivolatile Organics													
Benzo(a)pyrene	µg/L		<0.20	<0.20	<0.20	<0.80	<0.20	<0.80	<0.20	<0.20	<0.20	<0.20	<0.80
1,2-Dichlorobenzene	µg/L	2.5	<0.50	<0.50	<0.50	<2.0	<0.50	<2.0	<0.50	<0.50	<0.50	<0.50	<2.0
1,3-Dichlorobenzene	µg/L	2.5	<0.50	<0.50	<0.50	<2.0	<0.50	<2.0	<0.50	<0.50	<0.50	<0.50	<2.0
1,4-Dichlorobenzene	µg/L	4	<0.50	<0.50	<0.50	<2.0	<0.50	<2.0	<0.50	<0.50	<0.50	<0.50	<2.0
Hexachlorobenzene	µg/L	0.0065	*<0.50*	*<0.50*	*<0.50*	*<2.0*	*<0.50*	*<2.0*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<2.0*
1,2,4-Trichlorobenzene	µg/L	0.5	<0.50	<0.50	<0.50	*<2.0*	<0.50	*<2.0*	<0.50	<0.50	<0.50	<0.50	*<2.0*
2,4-Dichlorophenol	µg/L	0.2	*<0.30*	*<0.30*	*<0.30*	*<1.2*	*<0.30*	*<1.2*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<1.2*
Pentachlorophenol	µg/L	0.5	*<1.0*	*<1.0*	*<1.0*	*<4.0*	*<1.0*	*<4.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<4.0*
Phenol	µg/L	5*	<0.50	<0.50	<0.50	<2.0	**0.63**	<2.0	<0.50	<0.50	<0.50	<0.50	<2.0
2,4,6-Trichlorophenol	µg/L	18	<0.50	<0.50	<0.50	<2.0	<0.50	<2.0	<0.50	<0.50	<0.50	<0.50	<2.0
Di-N-butyl phthalate	µg/L	4	<2.0	<2.0	<2.0	*<8.0*	<2.0	<8.0	<2.0	<2.0	<2.0	<2.0	*<8.0*
Diethyl phthalate	µg/L	0.2	*<1.0*	*<1.0*	*<1.0*	*<4.0*	*<1.0*	*<4.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<4.0*
Dimethyl phthalate	µg/L	0.2	*<1.0*	*<1.0*	*<1.0*	*<4.0*	*<1.0*	*<4.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<4.0*
Volatile Organics													
Benzene	µg/L	100*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
1,4-Dichlorobenzene	µg/L	4	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Ethylbenzene	µg/L	8*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Dichloromethane	µg/L	100*	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Toluene	µg/L	0.8*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Vinyl Chloride	µg/L	600*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
p+m-Xylene	µg/L	32*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
o-Xylene	µg/L	40*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Xylene (Total)	µg/L		<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) µg/L denotes micrograms per litre.
4) Blank denotes parameter not analyzed.
5) **Bold** indicates select parameter was detected at concentration greater than the laboratory reportable detection limit (RDL).
6) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.

Table B-2
Precipitation Event Surface Water Quality - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Downstream of Landfill 60m East of Lambton Rd 79 - SS1										
Date			4-May-22	16-May-22	4-Aug-22	18-Oct-22	28-Nov-22						
Laboratory			Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas						
Semivolatile Organics													
Benzo(a)pyrene	µg/L		<0.20	<0.20	<0.20	<0.80	<0.80						
1,2-Dichlorobenzene	µg/L	2.5	<0.50	<0.50	<0.50	<2.0	<2.0						
1,3-Dichlorobenzene	µg/L	2.5	<0.50	<0.50	<0.50	<2.0	<2.0						
1,4-Dichlorobenzene	µg/L	4	<0.50	<0.50	<0.50	<2.0	<2.0						
Hexachlorobenzene	µg/L	0.0065	*<0.50*	*<0.50*	*<0.50*	*<2.0*	*<2.0*						
1,2,4-Trichlorobenzene	µg/L	0.5	<0.50	<0.50	<0.50	*<2.0*	<2.0						
2,4-Dichlorophenol	µg/L	0.2	*<0.30*	*<0.30*	*<0.30*	*<1.2*	*<1.2*						
Pentachlorophenol	µg/L	0.5	*<1.0*	*<1.0*	*<1.0*	*<4.0*	*<4.0*						
Phenol	µg/L	5*	<0.50	<0.50	<0.50	<2.0	<2.0						
2,4,6-Trichlorophenol	µg/L	18	<0.50	<0.50	<0.50	<2.0	<2.0						
Di-N-butyl phthalate	µg/L	4	<2.0	<2.0	<2.0	*<8.0*	<8.0						
Diethyl phthalate	µg/L	0.2	*<1.0*	*<1.0*	*<1.0*	*<4.0*	*<4.0*						
Dimethyl phthalate	µg/L	0.2	*<1.0*	*<1.0*	*<1.0*	*<4.0*	*<4.0*						
Volatile Organics													
Benzene	µg/L	100*	<0.20	<0.20	<0.20	<0.20	<0.20						
1,4-Dichlorobenzene	µg/L	4	<0.40	<0.40	<0.40	<0.40	<0.40						
Ethylbenzene	µg/L	8*	<0.20	<0.20	<0.20	<0.20	<0.20						
Dichloromethane	µg/L	100*	<2.0	<2.0	<2.0	<2.0	<2.0						
Toluene	µg/L	0.8*	<0.20	<0.20	<0.20	<0.20	<0.20						
Vinyl Chloride	µg/L	600*	<0.20	<0.20	<0.20	<0.20	<0.20						
p+m-Xylene	µg/L	32*	<0.20	<0.20	<0.20	<0.20	<0.20						
o-Xylene	µg/L	40*	<0.20	<0.20	<0.20	<0.20	<0.20						
Xylene (Total)	µg/L		<0.20	<0.20	<0.20	<0.20	<0.20						

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) µg/L denotes micrograms per litre.
4) Blank denotes parameter not analyzed.
5) **Bold** indicates select parameter was detected at concentration greater than the laboratory reportable detection limit (RDL).
6) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.

Table B-2
Precipitation Event Surface Water Quality - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Sedimentation Pond Surface Water Quality - SP1										
Date			25-Mar-09	26-Dec-09	25-Jan-10	6-Apr-10	5-Aug-10	6-Nov-10	28-Feb-11	20-Apr-11	9-May-11	16-May-11	23-Nov-11
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Semivolatile Organics													
Benzo(a)pyrene	µg/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2-Dichlorobenzene	µg/L	2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	µg/L	2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	µg/L	4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene	µg/L	0.0065	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*
1,2,4-Trichlorobenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-Dichlorophenol	µg/L	0.2	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*
Pentachlorophenol	µg/L	0.5	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*
Phenol	µg/L	5*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4,6-Trichlorophenol	µg/L	18	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Di-N-butyl phthalate	µg/L	4	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Diethyl phthalate	µg/L	0.2	*<1*	*<1*	*<1*	*<1*	*7*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*
Dimethyl phthalate	µg/L	0.2	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*
Volatile Organics													
Benzene	µg/L	100*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.3
1,4-Dichlorobenzene	µg/L	4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	<0.2	<0.2	<0.2	<0.5
Ethylbenzene	µg/L	8*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.3
Dichloromethane	µg/L	100*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<1
Toluene	µg/L	0.8*	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	<0.2	<0.2	<0.2	<0.5
Vinyl Chloride	µg/L	600*	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	<0.2	<0.2	<0.2	<0.5
p+m-Xylene	µg/L	32*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.3
o-Xylene	µg/L	40*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.3
Xylene (Total)	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.3

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) µg/L denotes micrograms per litre.
4) Blank denotes parameter not analyzed.
5) **Bold** indicates select parameter was detected at concentration greater than the laboratory reportable detection limit (RDL).
6) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.

Table B-2
Precipitation Event Surface Water Quality - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Sedimentation Pond Surface Water Quality - SP1										
Date			6-Dec-11	13-Mar-12	27-Mar-12	22-Jun-12	15-Aug-12	14-Oct-12	13-Jan-13	10-Apr-13	29-Apr-13	5-Jul-13	7-Oct-13
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Semivolatile Organics													
Benzo(a)pyrene	µg/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2-Dichlorobenzene	µg/L	2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	µg/L	2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	µg/L	4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene	µg/L	0.0065	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*
1,2,4-Trichlorobenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-Dichlorophenol	µg/L	0.2	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*
Pentachlorophenol	µg/L	0.5	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*
Phenol	µg/L	5*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**0.6**	<0.5
2,4,6-Trichlorophenol	µg/L	18	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Di-N-butyl phthalate	µg/L	4	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Diethyl phthalate	µg/L	0.2	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*
Dimethyl phthalate	µg/L	0.2	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*
Volatile Organics													
Benzene	µg/L	100*	<0.10	<0.10	<0.10	<0.10	<0.10	<0.25	<0.10	<0.10	<0.10	<0.10	<0.10
1,4-Dichlorobenzene	µg/L	4	<0.20	<0.20	<0.20	<0.20	<0.20	<0.50	<0.20	<0.20	<0.20	<0.20	<0.20
Ethylbenzene	µg/L	8*	<0.10	<0.10	<0.10	<0.10	<0.10	<0.25	<0.10	<0.10	<0.10	<0.10	<0.10
Dichloromethane	µg/L	100*	<0.50	<0.50	<0.50	<0.50	<0.50	<1.3	<0.50	<0.50	<0.50	<0.50	<0.50
Toluene	µg/L	0.8*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.50	<0.20	<0.20	<0.20	<0.20	<0.20
Vinyl Chloride	µg/L	600*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.50	<0.20	<0.20	<0.20	<0.20	<0.20
p+m-Xylene	µg/L	32*	<0.10	<0.10	<0.10	<0.10	<0.10	<0.25	<0.10	<0.10	<0.10	<0.10	<0.10
o-Xylene	µg/L	40*	<0.10	<0.10	<0.10	<0.10	<0.10	<0.25	<0.10	<0.10	<0.10	<0.10	<0.10
Xylene (Total)	µg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.25	<0.10	<0.10	<0.10	<0.10	<0.10

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) µg/L denotes micrograms per litre.
4) Blank denotes parameter not analyzed.
5) **Bold** indicates select parameter was detected at concentration greater than the laboratory reportable detection limit (RDL).
6) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.

Table B-2
Precipitation Event Surface Water Quality - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Sedimentation Pond Surface Water Quality - SP1										
Date			11-Jan-14	8-Apr-14	30-Apr-14	7-Jul-14	24-Nov-14	15-Dec-14	4-Jan-15	10-Apr-15	30-Apr-15	3-Aug-15	25-Feb-16
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Semivolatile Organics													
Benzo(a)pyrene	µg/L		<0.8	<0.2	<0.2	<0.2	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
1,2-Dichlorobenzene	µg/L	2.5	<2	<0.5	<0.5	<0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,3-Dichlorobenzene	µg/L	2.5	<2	<0.5	<0.5	<0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,4-Dichlorobenzene	µg/L	4	<2	<0.5	<0.5	<0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Hexachlorobenzene	µg/L	0.0065	*<2*	*<0.5*	*<0.5*	*<0.5*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*
1,2,4-Trichlorobenzene	µg/L	0.5	*<2*	<0.5	<0.5	<0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
2,4-Dichlorophenol	µg/L	0.2	*<1*	<0.3	*<0.3*	*<0.3*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*
Pentachlorophenol	µg/L	0.5	*<4*	<1	*<1*	*<1*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Phenol	µg/L	5*	<2	<0.5	<0.5	<0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
2,4,6-Trichlorophenol	µg/L	18	<2	<0.5	<0.5	<0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Di-N-butyl phthalate	µg/L	4	*<8*	<2	<2	<2	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Diethyl phthalate	µg/L	0.2	*<4*	*<1*	*<1*	*<1*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Dimethyl phthalate	µg/L	0.2	*<4*	*<1*	*<1*	*<1*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Volatile Organics													
Benzene	µg/L	100*	<0.10	<0.10	<0.10	<0.10	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
1,4-Dichlorobenzene	µg/L	4	<0.20	<0.20	<0.20	<0.20	<0.40	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Ethylbenzene	µg/L	8*	<0.10	<0.10	<0.10	<0.10	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Dichloromethane	µg/L	100*	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Toluene	µg/L	0.8*	<0.20	<0.20	<0.20	<0.20	<0.40	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Vinyl Chloride	µg/L	600*	<0.20	<0.20	<0.20	<0.20	<0.40	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
p+m-Xylene	µg/L	32*	<0.10	<0.10	<0.10	<0.10	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
o-Xylene	µg/L	40*	<0.10	<0.10	<0.10	<0.10	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Xylene (Total)	µg/L		<0.10	<0.10	<0.10	<0.10	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) µg/L denotes micrograms per litre.
4) Blank denotes parameter not analyzed.
5) **Bold** indicates select parameter was detected at concentration greater than the laboratory reportable detection limit (RDL).
6) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.

Table B-2
Precipitation Event Surface Water Quality - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Sedimentation Pond Surface Water Quality - SP1										
Date			7-Apr-16	1-Aug-16	3-Nov-16	12-Jan-17	8-Feb-17	6-Apr-17	13-Jul-17	23-Jan-18	4-Apr-18	27-Aug-18	2-Oct-18
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Semivolatile Organics													
Benzo(a)pyrene	µg/L		<0.20	<0.20	<0.80	<0.80	<0.20	<0.20	<0.20	<0.80	<0.20	<0.20	<0.20
1,2-Dichlorobenzene	µg/L	2.5	<0.50	<0.50	<2.0	<2.0	<0.50	<0.50	<0.50	<2.0	<0.50	<0.50	<0.50
1,3-Dichlorobenzene	µg/L	2.5	<0.50	<0.50	<2.0	<2.0	<0.50	<0.50	<0.50	<2.0	<0.50	<0.50	<0.50
1,4-Dichlorobenzene	µg/L	4	<0.50	<0.50	<2.0	<2.0	<0.50	<0.50	<0.50	<2.0	<0.50	<0.50	<0.50
Hexachlorobenzene	µg/L	0.0065	*<0.50*	*<0.50*	*<2.0*	*<2.0*	*<0.50*	*<0.50*	*<0.50*	*<2.0*	*<0.50*	*<0.50*	*<0.50*
1,2,4-Trichlorobenzene	µg/L	0.5	<0.50	<0.50	*<2.0*	*<2.0*	*<0.50*	<0.50	<0.50	<2.0	<0.50	<0.50	<0.50
2,4-Dichlorophenol	µg/L	0.2	*<0.30*	*<0.30*	*<1.2*	*<1.2*	*<0.30*	*<0.30*	*<0.30*	*<1.2*	*<0.30*	*<0.30*	*<0.30*
Pentachlorophenol	µg/L	0.5	*<1.0*	*<1.0*	*<4.0*	*<4.0*	*<1.0*	*<1.0*	*<1.0*	*<4.0*	*<1.0*	*<1.0*	*<1.0*
Phenol	µg/L	5*	<0.50	<0.50	<2.0	<2.0	<0.50	<0.50	<0.50	<2.0	<0.50	<0.50	<0.50
2,4,6-Trichlorophenol	µg/L	18	<0.50	<0.50	<2.0	<2.0	<0.50	<0.50	<0.50	<2.0	<0.50	<0.50	<0.50
Di-N-butyl phthalate	µg/L	4	<2.0	<2.0	*<8.0*	*<8.0*	*<2.0*	<2.0	<2.0	<8.0	<2.0	<2.0	<2.0
Diethyl phthalate	µg/L	0.2	*<1.0*	*<1.0*	*<4.0*	*<4.0*	*<1.0*	*<1.0*	*<1.0*	*<4.0*	*<1.0*	*<1.0*	*<1.0*
Dimethyl phthalate	µg/L	0.2	*<1.0*	*<1.0*	*<4.0*	*<4.0*	*<1.0*	*<1.0*	*<1.0*	*<4.0*	*<1.0*	*<1.0*	*<1.0*
Volatile Organics													
Benzene	µg/L	100*	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.20
1,4-Dichlorobenzene	µg/L	4	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.50	<0.20	<0.50	<0.50	<0.50
Ethylbenzene	µg/L	8*	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.20
Dichloromethane	µg/L	100*	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<2.0
Toluene	µg/L	0.8*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Vinyl Chloride	µg/L	600*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
p+m-Xylene	µg/L	32*	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.20
o-Xylene	µg/L	40*	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.20
Xylene (Total)	µg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.20

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) µg/L denotes micrograms per litre.
4) Blank denotes parameter not analyzed.
5) **Bold** indicates select parameter was detected at concentration greater than the laboratory reportable detection limit (RDL).
6) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.

Table B-2
Precipitation Event Surface Water Quality - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Sedimentation Pond Surface Water Quality - SP1										
Date			24-Jan-19	19-Apr-19	27-Oct-19	11-Jan-20	18-May-20	15-Nov-20	26-Mar-21	9-Jul-21	4-Oct-21	17-Feb-22	4-May-22
Laboratory			Maxxam	Maxxam	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas
Semivolatile Organics													
Benzo(a)pyrene	µg/L		<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.80	<0.20
1,2-Dichlorobenzene	µg/L	2.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50
1,3-Dichlorobenzene	µg/L	2.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50
1,4-Dichlorobenzene	µg/L	4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50
Hexachlorobenzene	µg/L	0.0065	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<2.0*	*<0.50*
1,2,4-Trichlorobenzene	µg/L	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	*<2.0*	<0.50
2,4-Dichlorophenol	µg/L	0.2	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<1.2*	*<0.30*
Pentachlorophenol	µg/L	0.5	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<4.0*	*<1.0*
Phenol	µg/L	5*	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50
2,4,6-Trichlorophenol	µg/L	18	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50
Di-N-butyl phthalate	µg/L	4	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	*<8.0*	<2.0
Diethyl phthalate	µg/L	0.2	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<4.0*	*<1.0*
Dimethyl phthalate	µg/L	0.2	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<4.0*	*<1.0*
Volatile Organics													
Benzene	µg/L	100*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
1,4-Dichlorobenzene	µg/L	4	<0.50	<0.50	<0.50	<0.50	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Ethylbenzene	µg/L	8*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Dichloromethane	µg/L	100*	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Toluene	µg/L	0.8*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Vinyl Chloride	µg/L	600*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
p+m-Xylene	µg/L	32*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
o-Xylene	µg/L	40*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Xylene (Total)	µg/L		<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) µg/L denotes micrograms per litre.
4) Blank denotes parameter not analyzed.
5) **Bold** indicates select parameter was detected at concentration greater than the laboratory reportable detection limit (RDL).
6) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.

Table B-2
Precipitation Event Surface Water Quality - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Sedimentation Pond Surface Water Quality - SP1											
Date			20-Jul-22	4-Aug-22	18-Oct-22									
Laboratory			Bureau Veritas	Bureau Veritas	Bureau Veritas									
Semivolatile Organics														
Benzo(a)pyrene	µg/L		<0.20	<0.20	<0.20									
1,2-Dichlorobenzene	µg/L	2.5	<0.50	<0.50	<0.50									
1,3-Dichlorobenzene	µg/L	2.5	<0.50	<0.50	<0.50									
1,4-Dichlorobenzene	µg/L	4	<0.50	<0.50	<0.50									
Hexachlorobenzene	µg/L	0.0065	*<0.50*	*<0.50*	*<0.50*									
1,2,4-Trichlorobenzene	µg/L	0.5	<0.50	<0.50	<0.50									
2,4-Dichlorophenol	µg/L	0.2	*<0.30*	*<0.30*	*<0.30*									
Pentachlorophenol	µg/L	0.5	*<1.0*	*<1.0*	*<1.0*									
Phenol	µg/L	5*	<0.50	<0.50	<0.50									
2,4,6-Trichlorophenol	µg/L	18	<0.50	<0.50	<0.50									
Di-N-butyl phthalate	µg/L	4	<2.0	<2.0	<2.0									
Diethyl phthalate	µg/L	0.2	*<1.0*	*<1.0*	*<1.0*									
Dimethyl phthalate	µg/L	0.2	*<1.0*	*<1.0*	*<1.0*									
Volatile Organics														
Benzene	µg/L	100*	<0.20	<0.20	<0.20									
1,4-Dichlorobenzene	µg/L	4	<0.40	<0.40	<0.40									
Ethylbenzene	µg/L	8*	<0.20	<0.20	<0.20									
Dichloromethane	µg/L	100*	<2.0	<2.0	<2.0									
Toluene	µg/L	0.8*	<0.20	<0.20	<0.20									
Vinyl Chloride	µg/L	600*	<0.20	<0.20	<0.20									
p+m-Xylene	µg/L	32*	<0.20	<0.20	<0.20									
o-Xylene	µg/L	40*	<0.20	<0.20	<0.20									
Xylene (Total)	µg/L		<0.20	<0.20	<0.20									

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) µg/L denotes micrograms per litre.
4) Blank denotes parameter not analyzed.
5) **Bold** indicates select parameter was detected at concentration greater than the laboratory reportable detection limit (RDL).
6) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.

Table B-2
Precipitation Event Surface Water Quality - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Sedimentation Pond Surface Water Quality - SP2										
Date			14-Sep-08	17-Oct-08	4-Nov-08	5-Dec-08	12-Feb-09	8-Mar-09	6-Apr-09	26-Apr-09	7-May-09	24-Oct-09	25-Jan-10
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Semivolatile Organics													
Benzo(a)pyrene	µg/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2-Dichlorobenzene	µg/L	2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	µg/L	2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	µg/L	4	<0.5	<0.5	<0.5	<0.5	<0.5	,0.5	,0.5	,0.5	,0.5	<0.5	<0.5
Hexachlorobenzene	µg/L	0.0065	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*
1,2,4-Trichlorobenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-Dichlorophenol	µg/L	0.2	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*
Pentachlorophenol	µg/L	0.5	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*
Phenol	µg/L	5*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4,6-Trichlorophenol	µg/L	18	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Di-N-butyl phthalate	µg/L	4	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Diethyl phthalate	µg/L	0.2	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*
Dimethyl phthalate	µg/L	0.2	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*
Volatile Organics													
Benzene	µg/L	100*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1,4-Dichlorobenzene	µg/L	4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Ethylbenzene	µg/L	8*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dichloromethane	µg/L	100*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	µg/L	0.8*	<0.2	<0.2	<0.2	<0.2	<.02	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Vinyl Chloride	µg/L	600*	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
p+m-Xylene	µg/L	32*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
o-Xylene	µg/L	40*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Xylene (Total)	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) µg/L denotes micrograms per litre.
4) Blank denotes parameter not analyzed.
5) **Bold** indicates select parameter was detected at concentration greater than the laboratory reportable detection limit (RDL).
6) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.

Table B-2
Precipitation Event Surface Water Quality - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Sedimentation Pond Surface Water Quality - SP2										
Date			6-Apr-10	14-Oct-10	28-Feb-11	20-Apr-11	8-Aug-11	20-Oct-11	13-Mar-12	27-Mar-12	30-Oct-12	15-Nov-12	13-Jan-13
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Semivolatile Organics													
Benzo(a)pyrene	µg/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2-Dichlorobenzene	µg/L	2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	µg/L	2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	µg/L	4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene	µg/L	0.0065	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*
1,2,4-Trichlorobenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-Dichlorophenol	µg/L	0.2	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*
Pentachlorophenol	µg/L	0.5	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*
Phenol	µg/L	5*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4,6-Trichlorophenol	µg/L	18	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Di-N-butyl phthalate	µg/L	4	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Diethyl phthalate	µg/L	0.2	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*
Dimethyl phthalate	µg/L	0.2	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*
Volatile Organics													
Benzene	µg/L	100*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10
1,4-Dichlorobenzene	µg/L	4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20	<0.20	<0.20	<0.20
Ethylbenzene	µg/L	8*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10
Dichloromethane	µg/L	100*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.50	<0.50	<0.50	<0.50	<0.50
Toluene	µg/L	0.8*	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20	<0.20	<0.20	<0.20
Vinyl Chloride	µg/L	600*	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20	<0.20	<0.20	<0.20
p+m-Xylene	µg/L	32*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10
o-Xylene	µg/L	40*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10
Xylene (Total)	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) µg/L denotes micrograms per litre.
4) Blank denotes parameter not analyzed.
5) **Bold** indicates select parameter was detected at concentration greater than the laboratory reportable detection limit (RDL).
6) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.

Table B-2
Precipitation Event Surface Water Quality - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Sedimentation Pond Surface Water Quality - SP2										
Date			10-Apr-13	5-Jul-13	7-Oct-13	11-Jan-14	28-Jan-14	8-Apr-14	30-Apr-14	7-Jul-14	24-Jul-14	24-Nov-14	15-Dec-14
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Semivolatile Organics													
Benzo(a)pyrene	µg/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20
1,2-Dichlorobenzene	µg/L	2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.50	<0.50
1,3-Dichlorobenzene	µg/L	2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.50	<0.50
1,4-Dichlorobenzene	µg/L	4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.50	<0.50
Hexachlorobenzene	µg/L	0.0065	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.50*	*<0.50*
1,2,4-Trichlorobenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.50	<0.50
2,4-Dichlorophenol	µg/L	0.2	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.30*	*<0.30*
Pentachlorophenol	µg/L	0.5	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1.0*	*<1.0*
Phenol	µg/L	5*	<0.5	**0.6**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.50	<0.50
2,4,6-Trichlorophenol	µg/L	18	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.50	<0.50
Di-N-butyl phthalate	µg/L	4	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2.0	<2.0
Diethyl phthalate	µg/L	0.2	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1.0*	*<1.0*
Dimethyl phthalate	µg/L	0.2	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1.0*	*<1.0*
Volatile Organics													
Benzene	µg/L	100*	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
1,4-Dichlorobenzene	µg/L	4	<0.2	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Ethylbenzene	µg/L	8*	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Dichloromethane	µg/L	100*	<0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Toluene	µg/L	0.8*	<0.2	<0.20	<0.20	**0.48**	<0.20	**0.29**	<0.20	<0.20	<0.20	<0.20	<0.20
Vinyl Chloride	µg/L	600*	<0.2	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
p+m-Xylene	µg/L	32*	<0.1	<0.10	<0.10	**0.12**	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
o-Xylene	µg/L	40*	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Xylene (Total)	µg/L		<0.1	<0.10	<0.10	**0.12**	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) µg/L denotes micrograms per litre.
4) Blank denotes parameter not analyzed.
5) **Bold** indicates select parameter was detected at concentration greater than the laboratory reportable detection limit (RDL).
6) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.

Table B-2
Precipitation Event Surface Water Quality - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Sedimentation Pond Surface Water Quality - SP2										
Date			4-Jan-15	10-Apr-15	30-Apr-15	3-Aug-15	25-Oct-15	25-Feb-16	7-Apr-16	1-Aug-16	21-Oct-16	12-Jan-17	6-Apr-17
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Semivolatile Organics													
Benzo(a)pyrene	µg/L		<0.20	<0.20	<0.20	<0.20	<1.0	<0.20	<0.20	<0.20	<0.20	<0.80	<0.20
1,2-Dichlorobenzene	µg/L	2.5	<0.50	<0.50	<0.50	<0.50	<2.5	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50
1,3-Dichlorobenzene	µg/L	2.5	<0.50	<0.50	<0.50	<0.50	<2.5	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50
1,4-Dichlorobenzene	µg/L	4	<0.50	<0.50	<0.50	<0.50	<2.5	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50
Hexachlorobenzene	µg/L	0.0065	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<2.5*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<2.0*	*<0.50*
1,2,4-Trichlorobenzene	µg/L	0.5	<0.50	<0.50	<0.50	<0.50	<2.5	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50
2,4-Dichlorophenol	µg/L	0.2	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<1.5*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<1.2*	*<0.30*
Pentachlorophenol	µg/L	0.5	<1.0	*<1.0*	*<1.0*	*<1.0*	*<5.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<4.0*	*<1.0*
Phenol	µg/L	5*	<0.50	<0.50	<0.50	<0.50	<2.5	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50
2,4,6-Trichlorophenol	µg/L	18	<0.50	<0.50	<0.50	<0.50	<2.5	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50
Di-N-butyl phthalate	µg/L	4	<2.0	<2.0	<2.0	<2.0	<10	**3.0**	<2.0	<2.0	<2.0	<8.0	<2.0
Diethyl phthalate	µg/L	0.2	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<5.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<4.0*	*<1.0*
Dimethyl phthalate	µg/L	0.2	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<5.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<4.0*	*<1.0*
Volatile Organics													
Benzene	µg/L	100*	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
1,4-Dichlorobenzene	µg/L	4	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Ethylbenzene	µg/L	8*	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Dichloromethane	µg/L	100*	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Toluene	µg/L	0.8*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Vinyl Chloride	µg/L	600*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
p+m-Xylene	µg/L	32*	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
o-Xylene	µg/L	40*	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Xylene (Total)	µg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) µg/L denotes micrograms per litre.
4) Blank denotes parameter not analyzed.
5) **Bold** indicates select parameter was detected at concentration greater than the laboratory reportable detection limit (RDL).
6) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.

Table B-2
Precipitation Event Surface Water Quality - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Sedimentation Pond Surface Water Quality - SP2										
Date			13-Jul-17	12-Oct-17	23-Jan-18	4-Apr-18	2-Oct-18	7-Feb-19	17-Apr-19	31-Oct-19	11-Jan-20	18-May-20	4-Jun-20
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas
Semivolatile Organics													
Benzo(a)pyrene	µg/L		<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
1,2-Dichlorobenzene	µg/L	2.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,3-Dichlorobenzene	µg/L	2.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,4-Dichlorobenzene	µg/L	4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Hexachlorobenzene	µg/L	0.0065	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*
1,2,4-Trichlorobenzene	µg/L	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
2,4-Dichlorophenol	µg/L	0.2	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*
Pentachlorophenol	µg/L	0.5	<1.0	<1.0	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Phenol	µg/L	5*	<0.50	<0.50	<0.50	<0.50	<0.50	0.51	<0.50	<0.50	<0.50	<0.50	<0.50
2,4,6-Trichlorophenol	µg/L	18	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Di-N-butyl phthalate	µg/L	4	<2.0	<2.0	<2.0	<2.0	<2.1	<2.0	**4.9**	<2.0	<2.0	<2.0	<2.0
Diethyl phthalate	µg/L	0.2	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Dimethyl phthalate	µg/L	0.2	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Volatile Organics													
Benzene	µg/L	100*	<0.10	<0.10	<0.10	<0.10	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
1,4-Dichlorobenzene	µg/L	4	<0.50	<0.20	<0.20	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.40	<0.40
Ethylbenzene	µg/L	8*	<0.10	<0.10	<0.10	<0.10	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Dichloromethane	µg/L	100*	<0.50	<0.50	<0.50	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Toluene	µg/L	0.8*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Vinyl Chloride	µg/L	600*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
p+m-Xylene	µg/L	32*	<0.10	<0.10	<0.10	<0.10	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
o-Xylene	µg/L	40*	<0.10	<0.10	<0.10	<0.10	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Xylene (Total)	µg/L		<0.10	<0.10	<0.10	<0.10	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) µg/L denotes micrograms per litre.
4) Blank denotes parameter not analyzed.
5) **Bold** indicates select parameter was detected at concentration greater than the laboratory reportable detection limit (RDL).
6) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.

Table B-2
Precipitation Event Surface Water Quality - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Sedimentation Pond Surface Water Quality - SP2										
Date			15-Nov-20	26-Nov-20	26-Mar-21	9-Apr-21	26-Jun-21	9-Jul-21	30-Jul-21	4-Oct-21	15-Oct-21	17-Feb-22	4-May-22
Laboratory			Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas
Semivolatile Organics													
Benzo(a)pyrene	µg/L		<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.80	<0.80	<0.20
1,2-Dichlorobenzene	µg/L	2.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<2.0	<0.50
1,3-Dichlorobenzene	µg/L	2.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<2.0	<0.50
1,4-Dichlorobenzene	µg/L	4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<2.0	<0.50
Hexachlorobenzene	µg/L	0.0065	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<2.0*	*<2.0*	*<0.50*
1,2,4-Trichlorobenzene	µg/L	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	*<2.0*	*<2.0*	<0.50
2,4-Dichlorophenol	µg/L	0.2	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<1.2*	*<1.2*	*<0.30*
Pentachlorophenol	µg/L	0.5	<1.0	<1.0	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<4.0*	*<4.0*	*<1.0*
Phenol	µg/L	5*	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<2.0	<0.50
2,4,6-Trichlorophenol	µg/L	18	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<2.0	<0.50
Di-N-butyl phthalate	µg/L	4	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	*<8.0*	*<8.0*	<2.0
Diethyl phthalate	µg/L	0.2	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<4.0*	*<4.0*	*<1.0*
Dimethyl phthalate	µg/L	0.2	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<4.0*	*<4.0*	*<1.0*
Volatile Organics													
Benzene	µg/L	100*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
1,4-Dichlorobenzene	µg/L	4	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Ethylbenzene	µg/L	8*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Dichloromethane	µg/L	100*	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Toluene	µg/L	0.8*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Vinyl Chloride	µg/L	600*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
p+m-Xylene	µg/L	32*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
o-Xylene	µg/L	40*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Xylene (Total)	µg/L		<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) µg/L denotes micrograms per litre.
4) Blank denotes parameter not analyzed.
5) **Bold** indicates select parameter was detected at concentration greater than the laboratory reportable detection limit (RDL).
6) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.

Table B-2
Precipitation Event Surface Water Quality - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Sedimentation Pond Surface Water Quality - SP2										
Date			16-May-22	20-Jul-22	4-Aug-22	18-Oct-22	13-Jan-23						
Laboratory			Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas						
Semivolatile Organics													
Benzo(a)pyrene	µg/L		<0.20	<0.20	<0.20	<0.80	<0.80						
1,2-Dichlorobenzene	µg/L	2.5	<0.50	<0.50	<0.50	<2.0	<2.0						
1,3-Dichlorobenzene	µg/L	2.5	<0.50	<0.50	<0.50	<2.0	<2.0						
1,4-Dichlorobenzene	µg/L	4	<0.50	<0.50	<0.50	<2.0	<2.0						
Hexachlorobenzene	µg/L	0.0065	*<0.50*	*<0.50*	*<0.50*	*<2.0*	*<2.0*						
1,2,4-Trichlorobenzene	µg/L	0.5	<0.50	<0.50	<0.50	<2.0	<2.0						
2,4-Dichlorophenol	µg/L	0.2	*<0.30*	*<0.30*	*<0.30*	*<1.2*	*<1.2*						
Pentachlorophenol	µg/L	0.5	*<1.0*	*<1.0*	*<1.0*	*<4.0*	*<4.0*						
Phenol	µg/L	5*	<0.50	<0.50	<0.50	<2.0	<2.0						
2,4,6-Trichlorophenol	µg/L	18	<0.50	<0.50	<0.50	<2.0	<2.0						
Di-N-butyl phthalate	µg/L	4	<2.0	<2.0	<2.0	<8.0	<8.0						
Diethyl phthalate	µg/L	0.2	*<1.0*	*<1.0*	*<1.0*	*<4.0*	<4.0						
Dimethyl phthalate	µg/L	0.2	*<1.0*	*<1.0*	*<1.0*	*<4.0*	<4.0						
Volatile Organics													
Benzene	µg/L	100*	<0.20	<0.20	<0.20	<0.20	<0.20						
1,4-Dichlorobenzene	µg/L	4	<0.40	<0.40	<0.40	<0.40	<0.40						
Ethylbenzene	µg/L	8*	<0.20	<0.20	<0.20	<0.20	<0.20						
Dichloromethane	µg/L	100*	<2.0	<2.0	<2.0	<2.0	<2.0						
Toluene	µg/L	0.8*	<0.20	<0.20	<0.20	<0.20	<0.20						
Vinyl Chloride	µg/L	600*	<0.20	<0.20	<0.20	<0.20	<0.20						
p+m-Xylene	µg/L	32*	<0.20	<0.20	<0.20	<0.20	<0.20						
o-Xylene	µg/L	40*	<0.20	<0.20	<0.20	<0.20	<0.20						
Xylene (Total)	µg/L		<0.20	<0.20	<0.20	<0.20	<0.20						

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) µg/L denotes micrograms per litre.
4) Blank denotes parameter not analyzed.
5) **Bold** indicates select parameter was detected at concentration greater than the laboratory reportable detection limit (RDL).
6) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.

Table B-2
Precipitation Event Surface Water Quality - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Sedimentation Pond Surface Water Quality - SP3										
Date			4-Nov-08	12-Feb-09	8-Mar-09	6-Apr-09	17-Apr-09	26-Apr-09	7-May-09	24-Oct-09	25-Jan-10	8-Apr-10	16-Jul-10
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Semivolatile Organics													
Benzo(a)pyrene	µg/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2-Dichlorobenzene	µg/L	2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	µg/L	2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	µg/L	4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene	µg/L	0.0065	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*
1,2,4-Trichlorobenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-Dichlorophenol	µg/L	0.2	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*
Pentachlorophenol	µg/L	0.5	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*
Phenol	µg/L	5*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4,6-Trichlorophenol	µg/L	18	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Di-N-butyl phthalate	µg/L	4	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Diethyl phthalate	µg/L	0.2	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*
Dimethyl phthalate	µg/L	0.2	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*
Volatile Organics													
Benzene	µg/L	100*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1,4-Dichlorobenzene	µg/L	4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Ethylbenzene	µg/L	8*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dichloromethane	µg/L	100*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	µg/L	0.8*	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Vinyl Chloride	µg/L	600*	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
p+m-Xylene	µg/L	32*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
o-Xylene	µg/L	40*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Xylene (Total)	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) µg/L denotes micrograms per litre.
4) Blank denotes parameter not analyzed.
5) **Bold** indicates select parameter was detected at concentration greater than the laboratory reportable detection limit (RDL).
6) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.

Table B-2
Precipitation Event Surface Water Quality - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Sedimentation Pond Surface Water Quality - SP3										
Date			6-Nov-10	28-Feb-11	20-Apr-11	29-Jul-11	20-Oct-11	9-Nov-11	13-Mar-12	27-Mar-12	21-Dec-12	13-Jan-13	10-Apr-13
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Semivolatile Organics													
Benzo(a)pyrene	µg/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2-Dichlorobenzene	µg/L	2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	µg/L	2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	µg/L	4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene	µg/L	0.0065	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*
1,2,4-Trichlorobenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-Dichlorophenol	µg/L	0.2	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*
Pentachlorophenol	µg/L	0.5	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*
Phenol	µg/L	5*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4,6-Trichlorophenol	µg/L	18	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Di-N-butyl phthalate	µg/L	4	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Diethyl phthalate	µg/L	0.2	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*
Dimethyl phthalate	µg/L	0.2	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*
Volatile Organics													
Benzene	µg/L	100*	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10
1,4-Dichlorobenzene	µg/L	4	<0.2	<0.4	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20	<0.20	<0.20	<0.20
Ethylbenzene	µg/L	8*	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10
Dichloromethane	µg/L	100*	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.50	<0.50	<0.50	<0.50	<0.50
Toluene	µg/L	0.8*	<0.2	<0.4	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20	<0.20	<0.20	<0.20
Vinyl Chloride	µg/L	600*	<0.2	<0.4	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20	<0.20	<0.20	<0.20
p+m-Xylene	µg/L	32*	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10
o-Xylene	µg/L	40*	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10
Xylene (Total)	µg/L		<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) µg/L denotes micrograms per litre.
4) Blank denotes parameter not analyzed.
5) **Bold** indicates select parameter was detected at concentration greater than the laboratory reportable detection limit (RDL).
6) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.

Table B-2
Precipitation Event Surface Water Quality - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Sedimentation Pond Surface Water Quality - SP3										
Date			5-Jul-13	7-Oct-13	11-Jan-14	8-Apr-14	30-Apr-14	7-Jul-14	15-Oct-14	4-Nov-14	4-Jan-15	10-Apr-15	20-Aug-15
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Semivolatile Organics													
Benzo(a)pyrene	µg/L		<0.2	<0.2	<0.8	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20	<0.20
1,2-Dichlorobenzene	µg/L	2.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.50	<0.50	<0.50
1,3-Dichlorobenzene	µg/L	2.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.50	<0.50	<0.50
1,4-Dichlorobenzene	µg/L	4	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.50	<0.50	<0.50
Hexachlorobenzene	µg/L	0.0065	*<0.5*	*<0.5*	*<2*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.50*	*<0.50*	*<0.50*
1,2,4-Trichlorobenzene	µg/L	0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.50	<0.50	<0.50
2,4-Dichlorophenol	µg/L	0.2	*<0.3*	*<0.3*	*<1*	<0.3	<0.3	<0.3	*<0.3*	*<0.3*	*<0.30*	*<0.30*	*<0.30*
Pentachlorophenol	µg/L	0.5	*<1*	*<1*	*<4*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1.0*	*<1.0*	*<1.0*
Phenol	µg/L	5*	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.50	<0.50	<0.50
2,4,6-Trichlorophenol	µg/L	18	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.50	<0.50	<0.50
Di-N-butyl phthalate	µg/L	4	<2	<2	*<8*	<2	<2	<2	<2	<2	<2.0	<2.0	<2.0
Diethyl phthalate	µg/L	0.2	*<1*	*<1*	*<4*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1.0*	*<1.0*	*<1.0*
Dimethyl phthalate	µg/L	0.2	*<1*	*<1*	*<4*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1.0*	*<1.0*	*<1.0*
Volatile Organics													
Benzene	µg/L	100*	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
1,4-Dichlorobenzene	µg/L	4	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Ethylbenzene	µg/L	8*	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Dichloromethane	µg/L	100*	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Toluene	µg/L	0.8*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Vinyl Chloride	µg/L	600*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
p+m-Xylene	µg/L	32*	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
o-Xylene	µg/L	40*	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Xylene (Total)	µg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) µg/L denotes micrograms per litre.
4) Blank denotes parameter not analyzed.
5) **Bold** indicates select parameter was detected at concentration greater than the laboratory reportable detection limit (RDL).
6) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.

Table B-2
Precipitation Event Surface Water Quality - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Sedimentation Pond Surface Water Quality - SP3										
Date			25-Oct-15	25-Feb-16	7-Apr-16	1-Aug-16	21-Oct-16	12-Jan-17	6-Apr-17	13-Jul-17	12-Oct-17	23-Jan-18	4-Apr-18
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Semivolatile Organics													
Benzo(a)pyrene	µg/L		<0.20	<0.20	<0.20	<0.20	<0.20	<0.80	<0.20	<0.20	<0.20	<0.80	<0.20
1,2-Dichlorobenzene	µg/L	2.5	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50	<0.50	<0.50	<2.0	<0.50
1,3-Dichlorobenzene	µg/L	2.5	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50	<0.50	<0.50	<2.0	<0.50
1,4-Dichlorobenzene	µg/L	4	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50	<0.50	<0.50	<2.0	<0.50
Hexachlorobenzene	µg/L	0.0065	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<2.0*	*<0.50*	*<0.50*	*<0.50*	*<2.0*	*<0.50*
1,2,4-Trichlorobenzene	µg/L	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50	<0.50	<0.50	<2.0	<0.50
2,4-Dichlorophenol	µg/L	0.2	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<1.2*	*<0.30*	*<0.30*	*<0.30*	*<1.2*	*<0.30*
Pentachlorophenol	µg/L	0.5	*<1.0*	*<1.0*	*<1.0*	*<1.0*	<1.0	*<4.0*	*<1.0*	*<1.0*	*<1.0*	*<4.0*	*<1.0*
Phenol	µg/L	5*	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50	<0.50	<0.50	<2.0	<0.50
2,4,6-Trichlorophenol	µg/L	18	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50	<0.50	<0.50	<2.0	<0.50
Di-N-butyl phthalate	µg/L	4	<2.0	<2.0	<2.0	<2.0	<2.0	*<8.0*	<2.0	<2.0	<2.0	<8.0	<2.0
Diethyl phthalate	µg/L	0.2	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<4.0*	*<1.0*	*<1.0*	*<1.0*	*<4.0*	*<1.0*
Dimethyl phthalate	µg/L	0.2	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<4.0*	*<1.0*	*<1.0*	*<1.0*	*<4.0*	*<1.0*
Volatile Organics													
Benzene	µg/L	100*	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.25	<0.10
1,4-Dichlorobenzene	µg/L	4	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.50	<0.20	<0.50	<0.50
Ethylbenzene	µg/L	8*	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.25	<0.10
Dichloromethane	µg/L	100*	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.3	<0.50
Toluene	µg/L	0.8*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.50	<0.20
Vinyl Chloride	µg/L	600*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.50	<0.20
p+m-Xylene	µg/L	32*	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.25	<0.10
o-Xylene	µg/L	40*	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.25	<0.10
Xylene (Total)	µg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.25	<0.10

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) µg/L denotes micrograms per litre.
4) Blank denotes parameter not analyzed.
5) **Bold** indicates select parameter was detected at concentration greater than the laboratory reportable detection limit (RDL).
6) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.

Table B-2
Precipitation Event Surface Water Quality - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Sedimentation Pond Surface Water Quality - SP3										
Date			8-Aug-18	2-Oct-18	24-Jan-19	17-Apr-19	27-Oct-19	11-Jan-20	18-May-20	15-Nov-20	26-Mar-21	3-Jun-21	9-Jul-21
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas
Semivolatile Organics													
Benzo(a)pyrene	µg/L		<0.80	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.80	<0.20
1,2-Dichlorobenzene	µg/L	2.5	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50
1,3-Dichlorobenzene	µg/L	2.5	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50
1,4-Dichlorobenzene	µg/L	4	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50
Hexachlorobenzene	µg/L	0.0065	*<2.0*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<2.0*	*<0.50*
1,2,4-Trichlorobenzene	µg/L	0.5	*<2.0*	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50
2,4-Dichlorophenol	µg/L	0.2	*<1.2*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<1.2*	*<0.30*
Pentachlorophenol	µg/L	0.5	*<4.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<4.0*	*<1.0*
Phenol	µg/L	5*	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50
2,4,6-Trichlorophenol	µg/L	18	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50
Di-N-butyl phthalate	µg/L	4	<8.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<8.0	<2.0
Diethyl phthalate	µg/L	0.2	*<4.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<4.0*	*<1.0*
Dimethyl phthalate	µg/L	0.2	*<4.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<4.0*	*<1.0*
Volatile Organics													
Benzene	µg/L	100*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
1,4-Dichlorobenzene	µg/L	4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.40	<0.40	<0.40	<0.40	<0.40
Ethylbenzene	µg/L	8*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Dichloromethane	µg/L	100*	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Toluene	µg/L	0.8*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Vinyl Chloride	µg/L	600*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
p+m-Xylene	µg/L	32*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
o-Xylene	µg/L	40*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Xylene (Total)	µg/L		<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) µg/L denotes micrograms per litre.
4) Blank denotes parameter not analyzed.
5) **Bold** indicates select parameter was detected at concentration greater than the laboratory reportable detection limit (RDL).
6) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.

Table B-2
Precipitation Event Surface Water Quality - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	Oct-	Sedimentation Pond Surface Water Quality - SP3										
Date			4-Oct-21	15-Oct-21	17-Feb-22	4-May-22	4-Aug-22	18-Oct-22					
Laboratory			Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas					
Semivolatile Organics													
Benzo(a)pyrene	µg/L		<0.20	<0.20	<0.80	<0.20	<0.20	<0.20					
1,2-Dichlorobenzene	µg/L	2.5	<0.50	<0.50	<2.0	<0.50	<0.50	<0.50					
1,3-Dichlorobenzene	µg/L	2.5	<0.50	<0.50	<2.0	<0.50	<0.50	<0.50					
1,4-Dichlorobenzene	µg/L	4	<0.50	<0.50	<2.0	<0.50	<0.50	<0.50					
Hexachlorobenzene	µg/L	0.0065	*<0.50*	*<0.50*	*<2.0*	*<0.50*	*<0.50*	*<0.50*					
1,2,4-Trichlorobenzene	µg/L	0.5	<0.50	<0.50	*<2.0*	<0.50	<0.50	<0.50					
2,4-Dichlorophenol	µg/L	0.2	*<0.30*	*<0.30*	*<1.2*	*<0.30*	*<0.30*	*<0.30*					
Pentachlorophenol	µg/L	0.5	*<1.0*	*<1.0*	*<4.0*	*<1.0*	*<1.0*	*<1.0*					
Phenol	µg/L	5*	<0.50	<0.50	<2.0	<0.50	<0.50	<0.50					
2,4,6-Trichlorophenol	µg/L	18	<0.50	<0.50	<2.0	<0.50	<0.50	<0.50					
Di-N-butyl phthalate	µg/L	4	<2.0	<2.0	*<8.0*	<2.0	<2.0	<2.0					
Diethyl phthalate	µg/L	0.2	*<1.0*	*<1.0*	*<4.0*	*<1.0*	*<1.0*	*<1.0*					
Dimethyl phthalate	µg/L	0.2	*<1.0*	*<1.0*	*<4.0*	*<1.0*	*<1.0*	*<1.0*					
Volatile Organics													
Benzene	µg/L	100*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20					
1,4-Dichlorobenzene	µg/L	4	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40					
Ethylbenzene	µg/L	8*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20					
Dichloromethane	µg/L	100*	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0					
Toluene	µg/L	0.8*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20					
Vinyl Chloride	µg/L	600*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20					
p+m-Xylene	µg/L	32*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20					
o-Xylene	µg/L	40*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20					
Xylene (Total)	µg/L		<0.20	<0.20	<0.20	<0.20	<0.20	<0.20					

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) µg/L denotes micrograms per litre.
4) Blank denotes parameter not analyzed.
5) **Bold** indicates select parameter was detected at concentration greater than the laboratory reportable detection limit (RDL).
6) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.

Table B-2
Precipitation Event Surface Water Quality - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Sedimentation Pond Surface Water Quality - SP4										
Date			6-May-10	16-Jul-10	1-Dec-10	28-Feb-11	20-Apr-11	9-Aug-11	13-Oct-11	13-Mar-12	27-Mar-12	21-Dec-12	13-Jan-13
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Semivolatile Organics													
Benzo(a)pyrene	µg/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2-Dichlorobenzene	µg/L	2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	µg/L	2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	µg/L	4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene	µg/L	0.0065	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*
1,2,4-Trichlorobenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-Dichlorophenol	µg/L	0.2	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*	*<0.3*
Pentachlorophenol	µg/L	0.5	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*
Phenol	µg/L	5*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4,6-Trichlorophenol	µg/L	18	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Di-N-butyl phthalate	µg/L	4	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Diethyl phthalate	µg/L	0.2	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*
Dimethyl phthalate	µg/L	0.2	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*	*<1*
Volatile Organics													
Benzene	µg/L	100*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10
1,4-Dichlorobenzene	µg/L	4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20	<0.20	<0.20
Ethylbenzene	µg/L	8*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10
Dichloromethane	µg/L	100*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.50	<0.50	<0.50	<0.50
Toluene	µg/L	0.8*	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20	<0.20	<0.20
Vinyl Chloride	µg/L	600*	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20	<0.20	<0.20
p+m-Xylene	µg/L	32*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10
o-Xylene	µg/L	40*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10
Xylene (Total)	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) µg/L denotes micrograms per litre.
4) Blank denotes parameter not analyzed.
5) **Bold** indicates select parameter was detected at concentration greater than the laboratory reportable detection limit (RDL).
6) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.

Table B-2
Precipitation Event Surface Water Quality - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Sedimentation Pond Surface Water Quality - SP4										
Date			10-Apr-13	5-Jul-13	7-Oct-13	11-Jan-14	8-Apr-14	7-Jul-14	24-Nov-14	15-Dec-14	4-Jan-15	10-Apr-15	3-Aug-15
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Semivolatile Organics													
Benzo(a)pyrene	µg/L		<0.2	<0.2	<0.2	<0.8	<0.2	<1	<0.20	<0.20	<0.20	<0.20	<0.20
1,2-Dichlorobenzene	µg/L	2.5	<0.5	<0.5	<0.5	<2	<0.5	*<3*	<0.50	<0.50	<0.50	<0.50	<0.50
1,3-Dichlorobenzene	µg/L	2.5	<0.5	<0.5	<0.5	<2	<0.5	*<3*	<0.50	<0.50	<0.50	<0.50	<0.50
1,4-Dichlorobenzene	µg/L	4	<0.5	<0.5	<0.5	<2	<0.5	<3	<0.50	<0.50	<0.50	<0.50	<0.50
Hexachlorobenzene	µg/L	0.0065	*<0.5*	*<0.5*	*<0.5*	*<2*	*<0.5*	*<3*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*
1,2,4-Trichlorobenzene	µg/L	0.5	<0.5	<0.5	<0.5	*<2*	<0.5	*<3*	<0.50	<0.50	<0.50	<0.50	<0.50
2,4-Dichlorophenol	µg/L	0.2	*<0.3*	*<0.3*	*<0.3*	*<1*	*<0.3*	*<2*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*
Pentachlorophenol	µg/L	0.5	*<1*	*<1*	*<1*	*<4*	*<1*	*<5*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Phenol	µg/L	5*	<0.5	**0.6**	<0.5	<2	<0.5	<3	<0.50	<0.50	<0.50	<0.50	<0.50
2,4,6-Trichlorophenol	µg/L	18	<0.5	<0.5	<0.5	<2	<0.5	<3	<0.50	<0.50	<0.50	<0.50	<0.50
Di-N-butyl phthalate	µg/L	4	<2	<2	<2	*<8*	*<2*	*<10*	<2.0	<2.0	<2.0	<2.0	<2.0
Diethyl phthalate	µg/L	0.2	*<1*	*<1*	*<1*	*<4*	*<1*	*<5*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Dimethyl phthalate	µg/L	0.2	*<1*	*<1*	*<1*	*<4*	*<1*	*<5*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Volatile Organics													
Benzene	µg/L	100*	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.10	<0.10	<0.10	<0.10
1,4-Dichlorobenzene	µg/L	4	<0.2	<0.20	<0.20	<0.20	<0.20	<0.20	<0.40	<0.20	<0.20	<0.20	<0.20
Ethylbenzene	µg/L	8*	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.10	<0.10	<0.10	<0.10
Dichloromethane	µg/L	100*	<0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50
Toluene	µg/L	0.8*	<0.2	<0.20	<0.20	<0.20	**0.21**	<0.20	<0.40	<0.20	<0.20	<0.20	<0.20
Vinyl Chloride	µg/L	600*	<0.2	<0.20	<0.20	<0.20	<0.20	<0.20	<0.40	<0.20	<0.20	<0.20	<0.20
p+m-Xylene	µg/L	32*	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.10	<0.10	<0.10	<0.10
o-Xylene	µg/L	40*	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.10	<0.10	<0.10	<0.10
Xylene (Total)	µg/L		<0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.10	<0.10	<0.10	<0.10

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) µg/L denotes micrograms per litre.
4) Blank denotes parameter not analyzed.
5) **Bold** indicates select parameter was detected at concentration greater than the laboratory reportable detection limit (RDL).
6) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.
7) VOC's sampled on December 17, 2014 for SP4.

Table B-2
Precipitation Event Surface Water Quality - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Sedimentation Pond Surface Water Quality - SP4										
Date			25-Oct-15	25-Feb-16	7-Apr-16	14-Jul-16	21-Oct-16	12-Jan-17	6-Apr-17	13-Jul-17	12-Oct-17	23-Jan-18	4-Apr-18
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Semivolatile Organics													
Benzo(a)pyrene	µg/L		<0.20	<0.20	<0.20	<0.20	<0.20	<0.80	<0.20	<0.80	<0.20	<0.80	<0.20
1,2-Dichlorobenzene	µg/L	2.5	<0.50	<0.50	<0.50	<0.50	<0.50	*<2.0*	<0.50	<2.0	<0.50	<2.0	<0.50
1,3-Dichlorobenzene	µg/L	2.5	<0.50	<0.50	<0.50	<0.50	<0.50	*<2.0*	<0.50	<2.0	<0.50	<2.0	<0.50
1,4-Dichlorobenzene	µg/L	4	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50	<2.0	<0.50	<2.0	<0.50
Hexachlorobenzene	µg/L	0.0065	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<2.0*	*<0.50*	*<2.0*	*<0.50*	*<2.0*	*<0.50*
1,2,4-Trichlorobenzene	µg/L	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	*<2.0*	<0.50	*<2.0*	*<0.50*	<2.0	<0.50
2,4-Dichlorophenol	µg/L	0.2	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<1.2*	*<0.30*	*<1.2*	*<0.30*	*<1.2*	*<0.30*
Pentachlorophenol	µg/L	0.5	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<4.0*	*<1.0*	*<4.0*	*<1.0*	*<4.0*	*<1.0*
Phenol	µg/L	5*	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50	<2.0	<0.50	<2.0	<0.50
2,4,6-Trichlorophenol	µg/L	18	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50	<2.0	<0.50	<2.0	<0.50
Di-N-butyl phthalate	µg/L	4	<2.0	<2.0	<2.0	<2.0	<2.0	*<8.0*	<2.0	*<8.0*	*<2.0*	<8.0	<2.0
Diethyl phthalate	µg/L	0.2	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<4.0*	*<1.0*	<4.0	<1.0	*<4.0*	*<1.0*
Dimethyl phthalate	µg/L	0.2	*<1.0*	**1.2**	*<1.0*	*<1.0*	*<1.0*	*<4.0*	*<1.0*	<4.0	<1.0	*<4.0*	**1.3**
Volatile Organics													
Benzene	µg/L	100*	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
1,4-Dichlorobenzene	µg/L	4	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<2.0	<0.20	<0.20	<0.50
Ethylbenzene	µg/L	8*	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Dichloromethane	µg/L	100*	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Toluene	µg/L	0.8*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Vinyl Chloride	µg/L	600*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
p+m-Xylene	µg/L	32*	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
o-Xylene	µg/L	40*	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Xylene (Total)	µg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) µg/L denotes micrograms per litre.
4) Blank denotes parameter not analyzed.
5) **Bold** indicates select parameter was detected at concentration greater than the laboratory reportable detection limit (RDL).
6) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.

Table B-2
Precipitation Event Surface Water Quality - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Sedimentation Pond Surface Water Quality - SP4										
Date			8-Aug-18	31-Oct-18	24-Jan-19	19-Apr-19	2-Oct-19	11-Jan-20	18-May-20	15-Nov-20	26-Mar-21	3-Jun-21	9-Jul-21
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas
Semivolatile Organics													
Benzo(a)pyrene	µg/L		<0.80	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.80	<0.20
1,2-Dichlorobenzene	µg/L	2.5	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50
1,3-Dichlorobenzene	µg/L	2.5	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50
1,4-Dichlorobenzene	µg/L	4	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50
Hexachlorobenzene	µg/L	0.0065	*<2.0*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<2.0*	*<0.50*
1,2,4-Trichlorobenzene	µg/L	0.5	*<2.0*	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	*<0.50*	<0.50	<2.0	<0.50
2,4-Dichlorophenol	µg/L	0.2	*<1.2*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<0.30*	*<1.2*	*<0.30*
Pentachlorophenol	µg/L	0.5	*<4.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<4.0*	*<1.0*
Phenol	µg/L	5*	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	**3.7**	<0.50
2,4,6-Trichlorophenol	µg/L	18	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50
Di-N-butyl phthalate	µg/L	4	<8.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<8.0	<2.0
Diethyl phthalate	µg/L	0.2	*<4.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	<1.0	*<1.0*	*<4.0*	*<1.0*
Dimethyl phthalate	µg/L	0.2	*<4.0*	<1.0	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	<1.0	*<1.0*	*<4.0*	*<1.0*
Volatile Organics													
Benzene	µg/L	100*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
1,4-Dichlorobenzene	µg/L	4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.40	<0.40	<0.40	<0.40	<0.40
Ethylbenzene	µg/L	8*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Dichloromethane	µg/L	100*	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Toluene	µg/L	0.8*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Vinyl Chloride	µg/L	600*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
p+m-Xylene	µg/L	32*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
o-Xylene	µg/L	40*	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Xylene (Total)	µg/L		<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) µg/L denotes micrograms per litre.
4) Blank denotes parameter not analyzed.
5) **Bold** indicates select parameter was detected at concentration greater than the laboratory reportable detection limit (RDL).
6) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.

Table B-2
Precipitation Event Surface Water Quality - Organic Analytical Results - Compliance Monitoring
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Sedimentation Pond Surface Water Quality - SP4											
Date			4-Oct-21	17-Feb-22	4-May-22	18-Oct-22								
Laboratory			Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas								
Semivolatile Organics														
Benzo(a)pyrene	µg/L		<0.20	<0.80	<0.20	<0.80								
1,2-Dichlorobenzene	µg/L	2.5	<0.50	<2.0	<0.50	<2.0								
1,3-Dichlorobenzene	µg/L	2.5	<0.50	<2.0	<0.50	<2.0								
1,4-Dichlorobenzene	µg/L	4	<0.50	<2.0	<0.50	<2.0								
Hexachlorobenzene	µg/L	0.0065	*<0.50*	*<2.0*	*<0.50*	*<2.0*								
1,2,4-Trichlorobenzene	µg/L	0.5	<0.50	*<2.0*	<0.50	<2.0								
2,4-Dichlorophenol	µg/L	0.2	*<0.30*	*<1.2*	*<0.30*	*<1.2*								
Pentachlorophenol	µg/L	0.5	*<1.0*	*<4.0*	*<1.0*	*<4.0*								
Phenol	µg/L	5*	<0.50	<2.0	<0.50	<2.0								
2,4,6-Trichlorophenol	µg/L	18	<0.50	<2.0	<0.50	<2.0								
Di-N-butyl phthalate	µg/L	4	<2.0	*<8.0*	<2.0	<8.0								
Diethyl phthalate	µg/L	0.2	*<1.0*	*<4.0*	*<1.0*	*<4.0*								
Dimethyl phthalate	µg/L	0.2	*<1.0*	*<4.0*	*<1.0*	*<4.0*								
Volatile Organics														
Benzene	µg/L	100*	<0.20	<0.20	<0.20	<0.20								
1,4-Dichlorobenzene	µg/L	4	<0.40	<0.40	<0.40	<0.40								
Ethylbenzene	µg/L	8*	<0.20	<0.20	<0.20	<0.20								
Dichloromethane	µg/L	100*	<2.0	<2.0	<2.0	<2.0								
Toluene	µg/L	0.8*	<0.20	<0.20	<0.20	<0.20								
Vinyl Chloride	µg/L	600*	<0.20	<0.20	<0.20	<0.20								
p+m-Xylene	µg/L	32*	<0.20	<0.20	<0.20	<0.20								
o-Xylene	µg/L	40*	<0.20	<0.20	<0.20	<0.20								
Xylene (Total)	µg/L		<0.20	<0.20	<0.20	<0.20								

NOTE: 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) µg/L denotes micrograms per litre.
4) Blank denotes parameter not analyzed.
5) **Bold** indicates select parameter was detected at concentration greater than the laboratory reportable detection limit (RDL).
6) *Italics* denotes parameter concentration was below the laboratory reportable detection limit (RDL), where the RDL exceeds the relevant PWQO.

Table B-3
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	East Ditch Line (Poplar System) - SS14 / SS14A									
Date						4-Apr-03	13-Jun-03	15-Sep-03	3-May-04	31-Jul-04	23-Sep-05	9-Nov-05	18-Jan-06	9-Mar-06	3-Aug-06
Routine/Storm Monitoring						Routine	Routine	Routine	Routine	Routine	Storm	Routine	Routine	Routine	Storm
Laboratory						Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest
Alkalinity (as $CaCO_3$)	mg/L	<25%***	42	290	125	91	42	66	74	82	129	69	227	105	98
Chloride	mg/L		3	210	13	11	8	18	8	9	51	25	21	14	22
Sulphate	mg/L		14	443	126	193	443	340	426	178	244	103	163	78	318
Ammonia (as N)	mg/L		0.01	2.1	0.093	0.08	0.04	0	0.17	0.11	0.06	0.35	1.94	0.61	0.09
Ammonia Unionized	mg/L	0.02	0.00025	0.02	0.0037	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nitrate	mg/L		0.02	53.2	0.38	1.70	1.37	0.15	0.77	0.81	6.02	7.85	0.54	0.74	0.37
Nitrite	mg/L		0.005	0.3	0.021						0.18				<0.10
Phenols	mg/L	0.001	0.0005	0.015	0.00074	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	mg/L	0.200	0.030	1.500	0.145	0.12	0.08	**0.22**	0.14	0.17	**0.32**	0.16	**0.38**	0.14	**0.24**
Calcium	mg/L		25	670	82	74	119	116	112	65	102	66	94	46	106
Chromium	mg/L	0.0089	0.0005	0.2600	0.0047	<0.005	<0.005	<0.005	<0.005	0.003	0.002	**0.026**	0.003	0.002	0.005
Iron	mg/L	0.300	0.050	260.000	2.505	**1.24**	**0.93**	0.22	**1.97**	**1.21**	**0.64**	**19.4**	**0.66**	**0.83**	**3.08**
Magnesium	mg/L		6.9	160	25	27	58	33	53	22	32	21	32	15	38
Potassium	mg/L		0.004	41	5.25	3	3	6	3	5	6	4	5	4	5
Sodium	mg/L		1.8	120	11	12	21	21	20	13	17	9	19	10	21
Nickel	mg/L	0.025	0.0005	5.2	0.0067	<0.005	<0.005	<0.005	0.006	0.004	0.007	0.024	0.006	0.005	0.013
Zinc	mg/L	0.02	0.00	0.78	0.01	0.008	<0.005	<0.005	<0.01	<0.01	0.01	**0.06**	0.01	<0.01	0.02
pH	(pH units)	6.5-8.5	6.7	8.7	7.8						7.42	7.84	7.73	7.48	7.49
Total Organic Carbon	mg/L		5.80	33.30	10.79						13.3		9.4	5.8	11.2
Aluminum	mg/L	0.075*	0.23	40	2.93						**0.73**				**2.56**
Arsenic	mg/L	0.100*	0.0005	0.019	0.0020						0.001				0.003
Barium	mg/L		0.03	0.23	0.057						0.03				0.04
Beryllium	mg/L	1.100	0.000	0.002	0.000						<0.001				<0.001
Bismuth	mg/L		0.0005	0.0025	0.00069						<0.005				<0.005
Cadmium	mg/L	0.0002	0.00005	0.0003	0.000071						<0.0001				0.0002
Cobalt	mg/L	0.0009	0.00025	0.032	0.0018						0.0009				**0.0034**
Copper	mg/L		0.003	0.055	0.0077										
Lead	mg/L	0.005	0.00025	0.029	0.0017						<0.001				0.001
Molybdenum	mg/L	0.040*	0.0025	0.027	0.012						0.013				0.012
Selenium	mg/L	0.100	0.001	0.025	0.002						0.003				0.004
Silver	mg/L	0.0001	0.00005	0.0002	0.000077						<0.0001				<0.0001
Strontium	mg/L		0.086	0.627	0.34						0.491				0.627
Tin	mg/L		0.0005	0.005	0.0012						<0.01				<0.01
Titanium	mg/L		0.005	0.75	0.056						0.03				<0.01
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	11	1.18						1.35				0.74
Total Phosphorus	mg/L	0.02*	0.05	2.68	0.17						**0.20**				**2.68**
Vanadium	mg/L	0.006*	0.0005	0.079	0.0067						0.004				0.006
Ion Percentage	%		0.015	47.39	2.46	2.8	3.4	35.8	1.1	2.0	0.0	8.2	2.0	2.3	1.6
Benzene	ug/L		0.05	0.25	0.088										
Toluene	ug/L		0.05	0.5	0.13										
Ethylbenzene	ug/L		0.05	0.25	0.090										
o-Xylene	ug/L		0.05	0.25	0.11										
p+m-Xylene	ug/L		0.05	0.3	0.16										
Total Xylenes	ug/L		0.05	0.3	0.11										
Total Oil & Grease	mg/L		0.25	0.5	0.27										

NOTES:

1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Historic chemical anomalies retained in database.
5) Unionized ammonia values are calculated based on field determined pH and temperature values.
6) mg/L denotes milligrams per litre.
7) umho/cm denotes microsiemens per centimeter.
8) BOD denotes biological oxygen demand.
9) COD denotes chemical oxygen demand.
10) Blank denotes parameter not analyzed.
11) Bolded text and shading denotes concentration exceeds criterion.
12) Italics denotes parameter concentration was below the laboratory RDL, where the RDL exceeds the relevant PWQO.
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-3
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	East Ditch Line (Poplar System) - SS14 / SS14A									
Date						5-Oct-06	17-Nov-06	2-Mar-07	9-Jan-08	19-Mar-08	14-Jun-08	17-Jul-08	9-Sep-08	4-Nov-08	12-Feb-09
Routine/Storm Monitoring						Routine	Storm	Routine	Routine	Routine	Storm	Storm	Storm	Storm	Routine
Laboratory						Accutest	Accutest	Accutest	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Alkalinity (as $CaCO_3$)	mg/L	<25%***	42	290	125	117	56	121	239	129		78	98	145	139
Chloride	mg/L		3	210	13	52	19	9	26	10	23	27	17	24	5
Sulphate	mg/L		14	443	126	108	25	72	242	70		257	216	251	69
Ammonia (as N)	mg/L		0.01	2.1	0.093	0.02	0.07	0.66		0.41	0.075	0.075	0.075	0.17	0.11
Ammonia Unionized	mg/L	0.02	0.00025	0.02	0.0037	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nitrate	mg/L		0.02	53.2	0.38	53.2	7.24	1.72	0.05	0.6	0.05	0.1	0.2	1.8	1.3
Nitrite	mg/L		0.005	0.3	0.021	<0.10	<0.10			0.02	<0.01	0.04	0.02	0.03	0.03
Phenols	mg/L	0.001	0.0005	0.015	0.00074	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001
Boron	mg/L	0.200	0.030	1.500	0.145	**0.23**	0.09	0.11	**0.51**	**0.23**	**0.25**	0.15	0.16	**0.24**	0.13
Calcium	mg/L		25	670	82	130	32	56	130	58	130	100	100	98	66
Chromium	mg/L	0.0089	0.0005	0.2600	0.0047	0.002	<0.001	<0.001	**0.010**	**0.010**	**0.020**	0.008	**0.015**	**0.009**	**0.013**
Iron	mg/L	0.300	0.050	260.000	2.505	0.16	**0.47**	0.27	**4.6**	**5.6**	**20**	**7.8**	**10**	**4.7**	**13**
Magnesium	mg/L		6.9	160	25	38	10	17	39	19	45	37	36	35	20
Potassium	mg/L		0.004	41	5.25	7	4	4	5	5.2	6.9	5	8.5	8.4	4.8
Sodium	mg/L		1.8	120	11	20	7	10	20	11	22	21	16	15	6.6
Nickel	mg/L	0.025	0.0005	5.2	0.0067	<0.005	<0.005	<0.005	0.008	0.008	**0.032**	0.012	0.015	0.006	0.017
Zinc	mg/L	0.02	0.00	0.78	0.01	<0.01	<0.01	<0.01	0.02	0.02	**0.07**	**0.025**	**0.03**	0.02	**0.036**
pH	(pH units)	6.5-8.5	6.7	8.7	7.8	7.89	7.33	7.79	7.83	6.87	8.32	7.82	7.32	7.98	6.77
Total Organic Carbon	mg/L		5.80	33.30	10.79	8.9	7.7	7.1	10.0	7.4	13.5	9.7	6.1	12.5	9.4
Aluminum	mg/L	0.075*	0.23	40	2.93		**1.77**				**11**	**4.5**	**9.4**	**7.9**	
Arsenic	mg/L	0.100*	0.0005	0.019	0.0020		<0.001				0.007	0.004	0.004	0.002	
Barium	mg/L		0.03	0.23	0.057		0.05				0.098	0.05	0.085	0.063	
Beryllium	mg/L	1.100	0.000	0.002	0.000		<0.001				0.0007	<0.0006	<0.0006	<0.0006	
Bismuth	mg/L		0.0005	0.0025	0.00069		<0.005					<0.001	<0.001	<0.001	
Cadmium	mg/L	0.0002	0.00005	0.0003	0.000071		<0.0001				0.0002	<0.0001	<0.0001	<0.0001	
Cobalt	mg/L	0.0009	0.00025	0.032	0.0018		0.0008				**0.0088**	**0.0033**	**0.0044**	**0.0019**	
Copper	mg/L		0.003	0.055	0.0077		0.004				**0.020**	**0.009**	**0.009**	**0.006**	
Lead	mg/L	0.005	0.00025	0.029	0.0017		0.002				**0.011**	0.0038	0.0044	0.0018	
Molybdenum	mg/L	0.040*	0.0025	0.027	0.012		<0.005				0.025	0.027	0.023	0.011	
Selenium	mg/L	0.100	0.001	0.025	0.002		<0.001				<0.002	<0.05	<0.005	<0.005	
Silver	mg/L	0.0001	0.00005	0.0002	0.000077		<0.0001				**0.0002**		<0.0001	<0.0001	
Strontium	mg/L		0.086	0.627	0.34		0.086				0.52	0.44	0.50	0.43	
Tin	mg/L		0.0005	0.005	0.0012		<0.01				<0.001	<0.002	<0.002	<0.002	
Titanium	mg/L		0.005	0.75	0.056		<0.01				0.22		0.27	0.25	
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	11	1.18	0.92	1.91				3	1	0.8	1.5	
Total Phosphorus	mg/L	0.02*	0.05	2.68	0.17	**0.11**	**0.87**				**0.33**	**0.21**	**<0.15**	**0.15**	
Vanadium	mg/L	0.006*	0.0005	0.079	0.0067		0.002				**0.025**	**0.009**	**0.022**	**0.016**	
Ion Percentage	%		0.015	47.39	2.46	15.6	9.1	6.1	2.6	7.1		5.1	7.4	1.1	8.4
Benzene	ug/L		0.05	0.25	0.088						<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	ug/L		0.05	0.5	0.13						<0.2	<0.2	<0.3	<0.2	<0.3
Ethylbenzene	ug/L		0.05	0.25	0.090						<0.2	<0.2	<0.2	<0.2	<0.2
o-Xylene	ug/L		0.05	0.25	0.11						<0.2	<0.2	<0.3	<0.2	<0.3
p+m-Xylene	ug/L		0.05	0.3	0.16						<0.4	<0.4	<0.6	<0.4	<0.6
Total Xylenes	ug/L		0.05	0.3	0.11						<0.4	<0.4	<0.6	<0.4	<0.6
Total Oil & Grease	mg/L		0.25	0.5	0.27						<0.5	<0.5	<0.5	<0.5	

NOTES:

1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Historic chemical anomalies retained in database.
5) Unionized ammonia values are calculated based on field determined pH and temperature values.
6) mg/L denotes milligrams per litre.
7) umho/cm denotes microsiemens per centimeter.
8) BOD denotes biological oxygen demand.
9) COD denotes chemical oxygen demand.
10) Blank denotes parameter not analyzed.
11) Bolded text and shading denotes concentration exceeds criterion.
12) Italics denotes parameter concentration was below the laboratory RDL, where the RDL exceeds the relevant PWQO.
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-3
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	East Ditch Line (Poplar System) - SS14 / SS14A									
Date						6-Apr-09	9-Aug-09	10-Oct-09	24-Oct-09	25-Jan-10	6-Apr-10	6-Jun-10	14-Oct-10	28-Feb-11	20-Apr-11
Routine/Storm Monitoring						Routine	Routine	Storm	Routine	Routine	Routine	Storm	Storm	Routine	Routine
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Alkalinity (as $CaCO_3$)	mg/L	<25%***	42	290	125	153	80		120	126	91		95	122	179
Chloride	mg/L		3	210	13	13	22	32	31	8	8	9	18	11	17
Sulphate	mg/L		14	443	126	180	210		350	99	150		220	89	210
Ammonia (as N)	mg/L		0.01	2.1	0.093	0.075	0.075	0.075	0.075	0.075	0.270	0.230	0.075	0.570	0.075
Ammonia Unionized	mg/L	0.02	0.00025	0.02	0.0037	<0.02	<0.02		<0.02	<0.02	<0.02		<0.02	<0.02	<0.02
Nitrate	mg/L		0.02	53.2	0.38	1.1	0.5	0.9	0.3	1.3	0.7	0.7	0.05	2.3	0.3
Nitrite	mg/L		0.005	0.3	0.021			0.03					0.01		
Phenols	mg/L	0.001	0.0005	0.015	0.00074	<0.001	<0.001		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Boron	mg/L	0.200	0.030	1.500	0.145	0.16	0.08	0.14	0.10	0.12	**0.4**	0.14	0.09	0.17	**0.31**
Calcium	mg/L		25	670	82	130	66	120	130	64	670	180	95	60	100
Chromium	mg/L	0.0089	0.0005	0.2600	0.0047	**0.030**	<0.005	<0.005	<0.005	0.006	**0.26**	**0.073**	<0.005	<0.005	<0.005
Iron	mg/L	0.300	0.050	260.000	2.505	**29**	**1.8**	**1.0**	**1.4**	**3.0**	**260**	**76**	**2.5**	**1.5**	**3.6**
Magnesium	mg/L		6.9	160	25	43	22	40	44	19	160	48	23	20	34
Potassium	mg/L		0.004	41	5.25	7.2	3.9	4.3	7.1	5.0	41	11	7.7	4.6	4.2
Sodium	mg/L		1.8	120	11	13	12	19	20	7.3	16	9.1	11	8.3	15
Nickel	mg/L	0.025	0.0005	5.2	0.0067	**0.045**	0.004	<0.001	0.003	0.004	**0.36**	**0.11**	0.003	0.002	0.006
Zinc	mg/L	0.02	0.00	0.78	0.01	**0.097**	0.009	<0.01	**0.031**	0.012	**0.78**	**0.16**	0.010	0.012	0.019
pH	(pH units)	6.5-8.5	6.7	8.7	7.8	8.44	7.48	8.24	7.88	8.65	7.94	7.94	7.85	7.85	7.91
Total Organic Carbon	mg/L		5.80	33.30	10.79	17	6.9		8.2	5.8	14.8		10.7	6.0	13.2
Aluminum	mg/L	0.075*	0.23	40	2.93			**0.91**				**40**	**4.1**		
Arsenic	mg/L	0.100*	0.0005	0.019	0.0020			<0.001				0.019	0.001		
Barium	mg/L		0.03	0.23	0.057			0.039				0.23	0.048		
Beryllium	mg/L	1.100	0.000	0.002	0.000			<0.0006				0.0024	<0.0006		
Bismuth	mg/L		0.0005	0.0025	0.00069			<0.001				<0.001	<0.001		
Cadmium	mg/L	0.0002	0.00005	0.0003	0.000071			<0.0001				**0.0003**	<0.0001		
Cobalt	mg/L	0.0009	0.00025	0.032	0.0018			0.0005				**0.032**	0.0008		
Copper	mg/L		0.003	0.055	0.0077			0.003				**0.055**	0.003		
Lead	mg/L	0.005	0.00025	0.029	0.0017			<0.0005				**0.029**	0.0012		
Molybdenum	mg/L	0.040*	0.0025	0.027	0.012			0.014				0.022	0.008		
Selenium	mg/L	0.100	0.001	0.025	0.002			<0.005				<0.005	<0.005		
Silver	mg/L	0.0001	0.00005	0.0002	0.000077			<0.0001				<0.0001	<0.0001		
Strontium	mg/L		0.086	0.627	0.34			0.52				0.46	0.33		
Tin	mg/L		0.0005	0.005	0.0012			<0.002				<0.002	<0.002		
Titanium	mg/L		0.005	0.75	0.056			0.026				0.75	0.16		
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	11	1.18			0.9				5	1.2		
Total Phosphorus	mg/L	0.02*	0.05	2.68	0.17			**0.05**				**1.3**	**0.11**		
Vanadium	mg/L	0.006*	0.0005	0.079	0.0067			0.002				**0.079**	**0.009**		
Ion Percentage	%		0.015	47.39	2.46	12.0	2.4		2.4	4.6	40.9		2.4	2.7	0.2
Benzene	ug/L		0.05	0.25	0.088	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	ug/L		0.05	0.5	0.13	<0.3	<0.3	<0.2	<0.3	<0.3	<0.3	<0.2	<0.2	<0.3	<0.3
Ethylbenzene	ug/L		0.05	0.25	0.090	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-Xylene	ug/L		0.05	0.25	0.11	<0.3	<0.3	<0.2	<0.3	<0.3	<0.3	<0.2	<0.2	<0.3	<0.3
p+m-Xylene	ug/L		0.05	0.3	0.16	<0.6	<0.6	<0.4	<0.6	<0.6	<0.6	<0.4	<0.4	<0.6	<0.6
Total Xylenes	ug/L		0.05	0.3	0.11	<0.6	<0.6	<0.4				<0.4	<0.4		
Total Oil & Grease	mg/L		0.25	0.5	0.27			<0.5				<0.5	<1		

NOTES:

1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Historic chemical anomalies retained in database.
5) Unionized ammonia values are calculated based on field determined pH and temperature values.
6) mg/L denotes milligrams per litre.
7) umho/cm denotes microsiemens per centimeter.
8) BOD denotes biological oxygen demand.
9) COD denotes chemical oxygen demand.
10) Blank denotes parameter not analyzed.
11) Bolded text and shading denotes concentration exceeds criterion.
12) Italics denotes parameter concentration was below the laboratory RDL, where the RDL exceeds the relevant PWQO.
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-3
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	East Ditch Line (Poplar System) - SS14A									
Date						7-Jun-11	8-Aug-11	13-Oct-11	13-Mar-12	4-May-12	28-Jul-12	30-Oct-12	13-Jan-13	10-Apr-13	29-May-13
Routine/Storm Monitoring						Storm	Storm	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Storm
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Alkalinity (as $CaCO_3$)	mg/L	<25%***	42	290	125		132	176	140	92	92	74	150	130	
Chloride	mg/L		3	210	13	3	13	20	12	12	12	6	7	9	7
Sulphate	mg/L		14	443	126		290	210	170	250	190	94	120	120	
Ammonia (as N)	mg/L		0.01	2.1	0.093	0.150	0.075	0.075	0.075	0.075	0.075	0.200	0.075	0.075	0.150
Ammonia Unionized	mg/L	0.02	0.00025	0.02	0.0037		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
Nitrate	mg/L		0.02	53.2	0.38	0.02	0.05	0.7	1.6	1.8	0.99	2.4	0.56	1.0	0.17
Nitrite	mg/L		0.005	0.3	0.021	0.3	<0.01								0.032
Phenols	mg/L	0.001	0.0005	0.015	0.00074			**0.015**	**0.0013**	<0.0010	**0.0035**	<0.0010	<0.0010	<0.0010	
Boron	mg/L	0.200	0.030	1.500	0.145	0.13	**0.25**	0.20	0.19	0.18	**0.22**	0.093	0.14	0.14	**0.23**
Calcium	mg/L		25	670	82	51	120	120	88	100	95	51	79	80	87
Chromium	mg/L	0.0089	0.0005	0.2600	0.0047	**0.045**	<0.005	0.007	**0.013**	0.0051	**0.0094**	**0.026**	0.0064	0.0063	<0.005
Iron	mg/L	0.300	0.050	260.000	2.505	**45**	**0.8**	**5.6**	**11**	**3.2**	**9.0**	**25**	**6.1**	**3.3**	**1.2**
Magnesium	mg/L		6.9	160	25	18	27	28	26	26	24	18	23	21	22
Potassium	mg/L		0.004	41	5.25	7.5	6.7	13	6.6	4.7	5.1	8.2	5.0	5.8	5.1
Sodium	mg/L		1.8	120	11	4.3	14	14	10	12	12	5.9	8.7	8.5	9.4
Nickel	mg/L	0.025	0.0005	5.2	0.0067	**0.056**	0.002	0.011	0.015	0.005	0.013	**0.029**	0.0081	0.0051	0.004
Zinc	mg/L	0.02	0.00	0.78	0.01	**0.12**	<0.005	**0.044**	**0.032**	0.019	**0.030**	**0.061**	0.018	0.012	0.02
pH	(pH units)	6.5-8.5	6.7	8.7	7.8	7.23	7.35	7.10	7.92	8.12	7.22	7.69	7.82	7.00	
Total Organic Carbon	mg/L		5.80	33.30	10.79		11.1	33.3	16	23	14	9.4	10	9.5	
Aluminum	mg/L	0.075*	0.23	40	2.93	**28**	**0.72**								**0.80**
Arsenic	mg/L	0.100*	0.0005	0.019	0.0020	0.011	0.003								0.001
Barium	mg/L		0.03	0.23	0.057	0.17	0.053								0.035
Beryllium	mg/L	1.100	0.000	0.002	0.000	0.0014	<0.0005								<0.0006
Bismuth	mg/L		0.0005	0.0025	0.00069	<0.001	0.001								<0.0010
Cadmium	mg/L	0.0002	0.00005	0.0003	0.000071	**0.0003**	<0.0001								<0.0001
Cobalt	mg/L	0.0009	0.00025	0.032	0.0018	**0.016**	0.0007								0.0007
Copper	mg/L		0.003	0.055	0.0077	**0.028**	0.004								**0.007**
Lead	mg/L	0.005	0.00025	0.029	0.0017	**0.019**	<0.0005								0.001
Molybdenum	mg/L	0.040*	0.0025	0.027	0.012	0.010	0.019								0.011
Selenium	mg/L	0.100	0.001	0.025	0.002	<0.005	<0.002								<0.005
Silver	mg/L	0.0001	0.00005	0.0002	0.000077	<0.0001									<0.00010
Strontium	mg/L		0.086	0.627	0.34	0.16	0.44								0.29
Tin	mg/L		0.0005	0.005	0.0012	<0.002	<0.001								<0.002
Titanium	mg/L		0.005	0.75	0.056	0.51	0.021								0.017
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	11	1.18	11	1								1.3
Total Phosphorus	mg/L	0.02*	0.05	2.68	0.17	**0.10**	**0.10**								**0.093**
Vanadium	mg/L	0.006*	0.0005	0.079	0.0067	**0.053**	0.002								0.002
Ion Percentage	%		0.015	47.39	2.46		0.3	2.2	1.6	1.2	4.6	5.6	2.7	3.9	
Benzene	ug/L		0.05	0.25	0.088	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Toluene	ug/L		0.05	0.5	0.13	<0.2	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.20
Ethylbenzene	ug/L		0.05	0.25	0.090	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
o-Xylene	ug/L		0.05	0.25	0.11	<0.2	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.20
p+m-Xylene	ug/L		0.05	0.3	0.16	<0.4	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.40
Total Xylenes	ug/L		0.05	0.3	0.11	<0.4	<0.6								
Total Oil & Grease	mg/L		0.25	0.5	0.27	<0.5									

NOTES:

1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Historic chemical anomalies retained in database.
5) Unionized ammonia values are calculated based on field determined pH and temperature values.
6) mg/L denotes milligrams per litre.
7) umho/cm denotes microsiemens per centimeter.
8) BOD denotes biological oxygen demand.
9) COD denotes chemical oxygen demand.
10) Blank denotes parameter not analyzed.
11) Bolded text and shading denotes concentration exceeds criterion.
12) Italics denotes parameter concentration was below the laboratory RDL, where the RDL exceeds the relevant PWQO.
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-3
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	East Ditch Line (Poplar System) - SS14A									
Date						5-Jul-13	28-Aug-13	7-Oct-13	11-Jan-14	8-Apr-14	7-Jul-14	15-Oct-14	4-Jan-15	10-Apr-15	25-Oct-15
Routine/Storm Monitoring						Routine	Storm	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Alkalinity (as $CaCO_3$)	mg/L	<25%***	42	290	125	81		160	64		52	200	70	220	180
Chloride	mg/L		3	210	13	6	5	15	7	140	5	24	10	15	35
Sulphate	mg/L		14	443	126	130		110	37	190	23	96	37	110	250
Ammonia (as N)	mg/L		0.01	2.1	0.093	0.075	0.075	0.075	0.58	0.075	0.08	0.075	0.45	0.075	0.075
Ammonia Unionized	mg/L	0.02	0.00025	0.02	0.0037	<0.021		<0.0076	0.009	<0.0013	<0.0073	<0.0028	0.0051	<0.009	<0.00076
Nitrate	mg/L		0.02	53.2	0.38	0.05	0.05	0.05	1.4	0.05	0.31	0.05	1.22	0.05	0.1
Nitrite	mg/L		0.005	0.3	0.021		<0.010								
Phenols	mg/L	0.001	0.0005	0.015	0.00074	<0.0010		0.0012	**0.002**	**0.005**	**0.002**	**0.0097**	**0.0077**	<0.0010	<0.0010
Boron	mg/L	0.200	0.030	1.500	0.145	**1.5**	**0.49**	**0.39**	0.06	**1.5**	0.10	0.18	0.063	0.10	**0.54**
Calcium	mg/L		25	670	82	92	58	80	30	100	25	85	33	91	110
Chromium	mg/L	0.0089	0.0005	0.2600	0.0047	<0.005	0.006	<0.0050	<0.0050	<0.0050	**0.027**	<0.0050	<0.0050	<0.0050	<0.005
Iron	mg/L	0.300	0.050	260.000	2.505	**3.8**	**4.1**	**2.2**	**0.33**	0.21	**24.0**	**3.3**	**2.2**	**0.58**	**0.60**
Magnesium	mg/L		6.9	160	25	32	15	22	7.8	36	9	29	8.7	26	24
Potassium	mg/L		0.004	41	5.25	9	7.7	9.1	7.3	8.4	7.8	13	8.3	5.2	5.9
Sodium	mg/L		1.8	120	11	68	10	13	3.4	110	2	9.5	3.3	8.9	31
Nickel	mg/L	0.025	0.0005	5.2	0.0067	0.013	0.006	0.0041	<0.0010	0.01	**0.031**	0.0056	0.0033	0.002	0.002
Zinc	mg/L	0.02	0.00	0.78	0.01	0.016	0.01	0.01	0.0089	0.0059	**0.065**	**0.023**	0.013	0.006	<0.01
pH	(pH units)	6.5-8.5	6.7	8.7	7.8	8.37	8.33	8.21	8.07	7.73	7.97	7.85	7.99	8.45	7.46
Total Organic Carbon	mg/L		5.80	33.30	10.79	8.1		14	7.5	12	16	33	9.2	9.7	10
Aluminum	mg/L	0.075*	0.23	40	2.93		**6.1**								
Arsenic	mg/L	0.100*	0.0005	0.019	0.0020		0.003								
Barium	mg/L		0.03	0.23	0.057		0.061								
Beryllium	mg/L	1.100	0.000	0.002	0.000		<0.0006								
Bismuth	mg/L		0.0005	0.0025	0.00069		<0.0010								
Cadmium	mg/L	0.0002	0.00005	0.0003	0.000071		<0.0001								
Cobalt	mg/L	0.0009	0.00025	0.032	0.0018		**0.0017**								
Copper	mg/L		0.003	0.055	0.0077		**0.008**								
Lead	mg/L	0.005	0.00025	0.029	0.0017		0.0019								
Molybdenum	mg/L	0.040*	0.0025	0.027	0.012		0.017								
Selenium	mg/L	0.100	0.001	0.025	0.002		<0.005								
Silver	mg/L	0.0001	0.00005	0.0002	0.000077		<0.00010								
Strontium	mg/L		0.086	0.627	0.34		0.25								
Tin	mg/L		0.0005	0.005	0.0012		<0.002								
Titanium	mg/L		0.005	0.75	0.056		0.26								
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	11	1.18		1.3								
Total Phosphorus	mg/L	0.02*	0.05	2.68	0.17		**0.10**								
Vanadium	mg/L	0.006*	0.0005	0.079	0.0067		0.014								
Ion Percentage	%		0.015	47.39	2.46	20.1		2.8	2.5		8.0	2.6	2.7	0.3	2.4
Benzene	ug/L		0.05	0.25	0.088	<0.2	<0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	ug/L		0.05	0.5	0.13	<0.3	<0.20	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Ethylbenzene	ug/L		0.05	0.25	0.090	<0.2	<0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-Xylene	ug/L		0.05	0.25	0.11	<0.3	<0.20	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
p+m-Xylene	ug/L		0.05	0.3	0.16	<0.6	<0.40	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
Total Xylenes	ug/L		0.05	0.3	0.11										
Total Oil & Grease	mg/L		0.25	0.5	0.27										

NOTES:

1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Historic chemical anomalies retained in database.
5) Unionized ammonia values are calculated based on field determined pH and temperature values.
6) mg/L denotes milligrams per litre.
7) umho/cm denotes microsiemens per centimeter.
8) BOD denotes biological oxygen demand.
9) COD denotes chemical oxygen demand.
10) Blank denotes parameter not analyzed.
11) Bolded text and shading denotes concentration exceeds criterion.
12) Italics denotes parameter concentration was below the laboratory RDL, where the RDL exceeds the relevant PWQO.
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-3
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	East Ditch Line (Poplar System) - SS14A									
Date						25-Feb-16	7-Apr-16	21-Oct-16	12-Jan-17	6-Apr-17	13-Jul-17	28-Oct-17	23-Jan-18	4-Apr-18	8-Aug-18
Routine/Storm Monitoring						Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Alkalinity (as $CaCO_3$)	mg/L	<25%***	42	290	125	180	180	91	120	220	98	120	160	170	84
Chloride	mg/L		3	210	13	11	7.4	33	21	33	4.4	17	13	13	4.6
Sulphate	mg/L		14	443	126	160	93	290	56	160	26	200	150	110	97
Ammonia (as N)	mg/L		0.01	2.1	0.093	0.075	0.24	0.075	0.49	0.075	0.075	0.03	0.22	0.13	0.025
Ammonia Unionized	mg/L	0.02	0.00025	0.02	0.0037	<0.0021	0.0019	<0.0048	0.0014	<0.0005	<0.013	<0.0005	0.0061	<0.0005	<0.0005
Nitrate	mg/L		0.02	53.2	0.38	0.37	0.12	4.64	1.81	0.55	0.05	1.28	1.84	1.22	0.05
Nitrite	mg/L		0.005	0.3	0.021										
Phenols	mg/L	0.001	0.0005	0.015	0.00074	<0.0010	<0.0010	*<0.0040*	*<0.0040*	*<0.0040*	*<0.0040*	<0.0010	<0.0010	<0.0010	<0.0010
Boron	mg/L	0.200	0.030	1.500	0.145	0.16	0.10	0.07	0.13	0.19	0.1	0.09	0.11	**0.29**	0.07
Calcium	mg/L		25	670	82	89	73	120	120	110	53	86	79	83	57
Chromium	mg/L	0.0089	0.0005	0.2600	0.0047	<0.0050	**0.011**	<0.005	0.061	<0.005	0.016	<0.005	<0.005	**0.013**	**0.011**
Iron	mg/L	0.300	0.050	260.000	2.505	**0.32**	**6.2**	**0.90**	**58**	**1.8**	**18**	**1.8**	**3.3**	**13**	**9.2**
Magnesium	mg/L		6.9	160	25	26	22	27	34	34	11	23	27	26	14
Potassium	mg/L		0.004	41	5.25	4.1	5.8	3.7	17	7.5	6.2	6.3	4.4	5.9	0.014
Sodium	mg/L		1.8	120	11	11	8.2	16	7.1	18	7	10	9.6	12	6.1
Nickel	mg/L	0.025	0.0005	5.2	0.0067	0.0013	0.0078	0.006	0.077	0.004	0.028	0.003	0.006	0.016	**5.2**
Zinc	mg/L	0.02	0.00	0.78	0.01	0.0077	**0.027**	<0.01	0.15	0.02	0.14	0.02	<0.01	0.04	0.02
pH	(pH units)	6.5-8.5	6.7	8.7	7.8	8.21	7.72	8.24	7.40	7.19	8.17	7.25	8.4	7.21	7.06
Total Organic Carbon	mg/L		5.80	33.30	10.79	5.9	9.5	10	8.6	11	12	10	6.2	12	11
Aluminum	mg/L	0.075*	0.23	40	2.93										
Arsenic	mg/L	0.100*	0.0005	0.019	0.0020										
Barium	mg/L		0.03	0.23	0.057										
Beryllium	mg/L	1.100	0.000	0.002	0.000										
Bismuth	mg/L		0.0005	0.0025	0.00069										
Cadmium	mg/L	0.0002	0.00005	0.0003	0.000071										
Cobalt	mg/L	0.0009	0.00025	0.032	0.0018										
Copper	mg/L		0.003	0.055	0.0077										
Lead	mg/L	0.005	0.00025	0.029	0.0017										
Molybdenum	mg/L	0.040*	0.0025	0.027	0.012										
Selenium	mg/L	0.100	0.001	0.025	0.002										
Silver	mg/L	0.0001	0.00005	0.0002	0.000077										
Strontium	mg/L		0.086	0.627	0.34										
Tin	mg/L		0.0005	0.005	0.0012										
Titanium	mg/L		0.005	0.75	0.056										
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	11	1.18										
Total Phosphorus	mg/L	0.02*	0.05	2.68	0.17										
Vanadium	mg/L	0.006*	0.0005	0.079	0.0067										
Ion Percentage	%		0.015	47.39	2.46	0.4	0.9	0.5	20.3	1.7	11.1	1.1	0.1	3.6	2.7
Benzene	ug/L		0.05	0.25	0.088	<0.2	<0.2	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.25	<0.20
Toluene	ug/L		0.05	0.5	0.13	<0.3	<0.3	<0.10	<0.20	<0.20	<0.20	<0.10	<0.20	<0.50	<0.20
Ethylbenzene	ug/L		0.05	0.25	0.090	<0.2	<0.2	<0.20	<0.10	<0.10	<0.10	<0.20	<0.10	<0.25	<0.20
o-Xylene	ug/L		0.05	0.25	0.11	<0.3	<0.3	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.25	<0.20
p+m-Xylene	ug/L		0.05	0.3	0.16	<0.6	<0.6	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.25	<0.20
Total Xylenes	ug/L		0.05	0.3	0.11			<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.25	<0.20
Total Oil & Grease	mg/L		0.25	0.5	0.27										

NOTES:

1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Historic chemical anomalies retained in database.
5) Unionized ammonia values are calculated based on field determined pH and temperature values.
6) mg/L denotes milligrams per litre.
7) umho/cm denotes microsiemens per centimeter.
8) BOD denotes biological oxygen demand.
9) COD denotes chemical oxygen demand.
10) Blank denotes parameter not analyzed.
11) Bolded text and shading denotes concentration exceeds criterion.
12) Italics denotes parameter concentration was below the laboratory RDL, where the RDL exceeds the relevant PWQO.
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-3
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	East Ditch Line (Poplar System) - SS14A									
Date						8-Aug-18	31-Oct-18	7-Feb-19	17-Apr-19	2-Oct-19	2-Oct-19	11-Jan-20	18-May-20	15-Nov-20	26-Mar-21
Routine/Storm Monitoring						Storm	Routine	Routine	Routine	Routine	Storm	Routine	Routine	Routine	Routine
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas
Alkalinity (as $CaCO_3$)	mg/L	<25%***	42	290	125		140	190	230	150		120	170	170	150
Chloride	mg/L		3	210	13	4.7	13	13	15	6.3	6.9	8.6	5.6	210	14
Sulphate	mg/L		14	443	126		72	95	210	180		74	140	200	150
Ammonia (as N)	mg/L		0.01	2.1	0.093	0.025	0.057	0.025	0.025	0.025	0.025	0.025	0.078	0.064	0.025
Ammonia Unionized	mg/L	0.02	0.00025	0.02	0.0037		<0.00061	<0.00061	<0.0079	<0.0015		0.00048	0.0035	0.00083	<0.00055
Nitrate	mg/L		0.02	53.2	0.38	0.1	0.9	1.5	0.05	0.11	0.16	0.49	0.22	23.7	1.88
Nitrite	mg/L		0.005	0.3	0.021	<0.010					0.019				
Phenols	mg/L	0.001	0.0005	0.015	0.00074		<0.0010	<0.0010	<0.0010	0.001		0.0005	<0.0010	<0.0010	<0.0010
Boron	mg/L	0.200	0.030	1.500	0.145	0.07	0.06	0.06	0.1	0.16	0.15	0.03	0.06	**1.30**	0.05
Calcium	mg/L		25	670	82	58	60	74	110	87	86	55	72	130	83
Chromium	mg/L	0.0089	0.0005	0.2600	0.0047	**0.01**	<0.005	<0.005	<0.005	<0.005	0.0025	0.0025	<0.005	<0.005	<0.005
Iron	mg/L	0.300	0.050	260.000	2.505	**8.4**	**4.4**	<0.1	0.1	**1.6**	**1.6**	**2.5**	**1.9**	**1.8**	**1.2**
Magnesium	mg/L		6.9	160	25	14	18	26	43	28	29	17	22	42	26
Potassium	mg/L		0.004	41	5.25	6	11	5.5	4.9	4.4	4.4	0.004	3.5	18	7.4
Sodium	mg/L		1.8	120	11	5.2	4.3	7.5	13	10	10	4.4	6.8	120	8.7
Nickel	mg/L	0.025	0.0005	5.2	0.0067	0.012	0.007	0.001	0.001	0.004	0.004	0.004	0.004	0.017	0.003
Zinc	mg/L	0.02	0.00	0.78	0.01	0.02	0.02	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.01	<0.01
pH	(pH units)	6.5-8.5	6.7	8.7	7.8	7.06	6.72	7.85	**8.53**	7.86	8.0	8.2	8.2	7.8	7.8
Total Organic Carbon	mg/L		5.80	33.30	10.79		15	9.9	9.7	10		7.5	18.0	23	18
Aluminum	mg/L	0.075*	0.23	40	2.93	**5.3**					**1**				
Arsenic	mg/L	0.100*	0.0005	0.019	0.0020	0.003					0.001				
Barium	mg/L		0.03	0.23	0.057	0.045					0.043				
Beryllium	mg/L	1.100	0.000	0.002	0.000	<0.0006					<0.0006				
Bismuth	mg/L		0.0005	0.0025	0.00069	<0.001					<0.001				
Cadmium	mg/L	0.0002	0.00005	0.0003	0.000071	<0.0001					<0.0001				
Cobalt	mg/L	0.0009	0.00025	0.032	0.0018	**0.0034**					0.0008				
Copper	mg/L		0.003	0.055	0.0077	**0.01**					0.005				
Lead	mg/L	0.005	0.00025	0.029	0.0017	0.0035					0.001				
Molybdenum	mg/L	0.040*	0.0025	0.027	0.012	0.007					0.012				
Selenium	mg/L	0.100	0.001	0.025	0.002	<0.005					<0.005				
Silver	mg/L	0.0001	0.00005	0.0002	0.000077	*<0.0004*					*<0.0004*				
Strontium	mg/L		0.086	0.627	0.34	0.18					0.4				
Tin	mg/L		0.0005	0.005	0.0012	<0.002					<0.002				
Titanium	mg/L		0.005	0.75	0.056	0.075					0.021				
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	11	1.18	<0.7					<0.7				
Total Phosphorus	mg/L	0.02*	0.05	2.68	0.17	**0.18**					**0.088**				
Vanadium	mg/L	0.006*	0.0005	0.079	0.0067	**0.011**					0.003				
Ion Percentage	%		0.015	47.39	2.46	47.1	1.5	0.6	0.8	0.9	47.4	0.9	3.0	3.7	1.2
Benzene	ug/L		0.05	0.25	0.088	<0.20	<0.25	<0.20	<0.25	<0.50	<0.20	<0.10	<0.25	<0.25	<0.25
Toluene	ug/L		0.05	0.5	0.13	<0.20	<0.50	<0.40	<0.50	<1.0	<0.20	<0.20	<0.50	<0.50	<0.50
Ethylbenzene	ug/L		0.05	0.25	0.090	<0.20	<0.25	<0.20	<0.25	<0.50	<0.20	<0.10	<0.25	<0.25	<0.25
o-Xylene	ug/L		0.05	0.25	0.11	<0.20	<0.25	<0.20	<0.25	<0.50	<0.20	<0.10	<0.25	<0.25	<0.25
p+m-Xylene	ug/L		0.05	0.3	0.16	<0.20	<0.25	<0.20	<0.25	<0.50	<0.20	<0.10	<0.25	<0.25	<0.25
Total Xylenes	ug/L		0.05	0.3	0.11	<0.20	<0.25	<0.20	<0.25	<0.50	<0.20	<0.10	<0.25	<0.25	<0.25
Total Oil & Grease	mg/L		0.25	0.5	0.27										

NOTES:

1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Historic chemical anomalies retained in database.
5) Unionized ammonia values are calculated based on field determined pH and temperature values.
6) mg/L denotes milligrams per litre.
7) umho/cm denotes microsiemens per centimeter.
8) BOD denotes biological oxygen demand.
9) COD denotes chemical oxygen demand.
10) Blank denotes parameter not analyzed.
11) Bolded text and shading denotes concentration exceeds criterion.
12) Italics denotes parameter concentration was below the laboratory RDL, where the RDL exceeds the relevant PWQO.
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-3
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	East Ditch Line (Poplar System) - SS14A									
Date						23-Sep-21	23-Sep-21	26-Oct-21	17-Feb-22	4-May-22	28-Sep-22	28-Sep-22	19-Oct-22		
Routine/Storm Monitoring						Routine	Storm	Routine	Routine	Routine	Routine	Storm	Routine		
Laboratory						Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas		
Alkalinity (as $CaCO_3$)	mg/L	<25%***	42	290	125	170		290	84	270	130		120		
Chloride	mg/L		3	210	13	9.4	9.3	12	4.8	11	22	24	8.7		
Sulphate	mg/L		14	443	126	130		140	14	93	66		89		
Ammonia (as N)	mg/L		0.01	2.1	0.093	0.025	0.075	0.11	2.1	0.025	0.025	0.075	0.2		
Ammonia Unionized	mg/L	0.02	0.00025	0.02	0.0037	<0.0012		0.0008	0.0060	<0.0039	<0.0011		0.0027		
Nitrate	mg/L		0.02	53.2	0.38	0.05	0.05	0.22	0.35	0.05	0.05	0.05	<0.10		
Nitrite	mg/L		0.005	0.3	0.021		<0.010					<0.010			
Phenols	mg/L	0.001	0.0005	0.015	0.00074	<0.0010		<0.0010	<0.0010	<0.0010	<0.0010		**0.0018**		
Boron	mg/L	0.200	0.030	1.500	0.145	0.07	0.07	0.07	0.03	0.09	0.08	0.07	0.04		
Calcium	mg/L		25	670	82	80	79	110	26	94	70	64	55		
Chromium	mg/L	0.0089	0.0005	0.2600	0.0047	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005		
Iron	mg/L	0.300	0.050	260.000	2.505	**0.4**	**0.4**	**0.4**	**4.3**	**0.6**	**1.0**	**1.3**	**4.6**		
Magnesium	mg/L		6.9	160	25	24	23	35	6.9	32	21	17	16		
Potassium	mg/L		0.004	41	5.25	8.5	8.4	6.8	8.4	4.2	4.1	3.9	7.2		
Sodium	mg/L		1.8	120	11	7.4	7.1	8.9	2.3	9.2	9.7	8.5	5.8		
Nickel	mg/L	0.025	0.0005	5.2	0.0067	0.002	0.002	0.002	0.007	0.002	0.003	0.003	0.007		
Zinc	mg/L	0.02	0.00	0.78	0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	0.01	0.01		
pH	(pH units)	6.5-8.5	6.7	8.7	7.8	7.9	7.9	7.6	7.4	8.3	7.8	7.8	7.8		
Total Organic Carbon	mg/L		5.80	33.30	10.79	12		10	14	11	9.9		10		
Aluminum	mg/L	0.075*	0.23	40	2.93		**0.23**					**1.2**			
Arsenic	mg/L	0.100*	0.0005	0.019	0.0020		<0.001					<0.001			
Barium	mg/L		0.03	0.23	0.057		0.044					0.042			
Beryllium	mg/L	1.100	0.000	0.002	0.000		<0.0006					<0.0006			
Bismuth	mg/L		0.0005	0.0025	0.00069		<0.001					<0.001			
Cadmium	mg/L	0.0002	0.00005	0.0003	0.000071		<0.0001					<0.0001			
Cobalt	mg/L	0.0009	0.00025	0.032	0.0018		<0.0005					0.0007			
Copper	mg/L		0.003	0.055	0.0077		0.005					0.005			
Lead	mg/L	0.005	0.00025	0.029	0.0017		<0.0005					0.001			
Molybdenum	mg/L	0.040*	0.0025	0.027	0.012		0.008					0.009			
Selenium	mg/L	0.100	0.001	0.025	0.002		<0.005					<0.005			
Silver	mg/L	0.0001	0.00005	0.0002	0.000077		*<0.0004*					*<0.0004*			
Strontium	mg/L		0.086	0.627	0.34		0.32					0.24			
Tin	mg/L		0.0005	0.005	0.0012		<0.002					<0.002			
Titanium	mg/L		0.005	0.75	0.056		0.007					0.026			
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	11	1.18		0.8					<0.7			
Total Phosphorus	mg/L	0.02*	0.05	2.68	0.17		**0.091**					**0.067**			
Vanadium	mg/L	0.006*	0.0005	0.079	0.0067		<0.001					0.003			
Ion Percentage	%		0.015	47.39	2.46	0.5	46.1	0.4	1.0	0.6	5.8	38.3	0.1		
Benzene	ug/L		0.05	0.25	0.088	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10		
Toluene	ug/L		0.05	0.5	0.13	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20		
Ethylbenzene	ug/L		0.05	0.25	0.090	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10		
o-Xylene	ug/L		0.05	0.25	0.11	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10		
p+m-Xylene	ug/L		0.05	0.3	0.16	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10		
Total Xylenes	ug/L		0.05	0.3	0.11	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10		
Total Oil & Grease	mg/L		0.25	0.5	0.27										

NOTES:

1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Historic chemical anomalies retained in database.
5) Unionized ammonia values are calculated based on field determined pH and temperature values.
6) mg/L denotes milligrams per litre.
7) umho/cm denotes microsiemens per centimeter.
8) BOD denotes biological oxygen demand.
9) COD denotes chemical oxygen demand.
10) Blank denotes parameter not analyzed.
11) Bolded text and shading denotes concentration exceeds criterion.
12) Italics denotes parameter concentration was below the laboratory RDL, where the RDL exceeds the relevant PWQO.
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-3
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	West Ditch Line (Poplar System) - SS15 / SS14B									
Date						4-Apr-03	13-Jun-03	15-Sep-03	3-May-04	31-Jul-04	23-Sep-05	9-Nov-05	18-Jan-06	9-Mar-06	3-Aug-06
Routine/Storm Monitoring						Routine	Routine	Routine	Routine	Routine	Storm	Routine	Routine	Routine	Storm
Laboratory						Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest
Alkalinity (as $CaCO_3$)	mg/L	<25%***	49	330	120	89	148	76	166	84	131	75	141	97	102
Chloride	mg/L		6	150	30	13	16	20	8	10	48	26	14	11	32
Sulphate	mg/L		24	400	128	183	322	277	226	163	241	132	120	60	364
Ammonia (as N)	mg/L		0.025	2.4	0.119	0.07	0.06	0.03	0.35	0.08	0.05	0.11	0.39	0.60	0.03
Ammonia Unionized	mg/L	0.02	0.00025	0.081	0.0047	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	<0.02
Nitrate	mg/L		0.02	26.3	0.81	6.01	7.19	0.39	3.01	0.34	7.56	5.63	1.81	0.89	2.38
Nitrite	mg/L		0.005	0.915	0.035						0.14				<0.10
Phenols	mg/L	0.001	0.0005	0.0084	0.00074	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	mg/L	0.200	0.020	2.000	0.258	**0.21**	**0.51**	**0.35**	**0.37**	0.20	**0.63**	**0.26**	**0.37**	0.15	**0.26**
Calcium	mg/L		0.2	250	76	78	126	122	93	57	107	71	67	39	119
Chromium	mg/L	0.0089	0.0005	0.1100	0.0056	<0.005	<0.005	<0.005	<0.005	**0.012**	0.002	**0.074**	0.002	0.001	0.002
Iron	mg/L	0.300	0.100	110.000	3.495	**1.33**	**1.28**	**0.52**	**0.75**	**8.42**	**0.51**	**59.0**	**0.47**	**0.65**	0.21
Magnesium	mg/L		0.05	57	23	26	47	28	28	21	31	22	21	12	37
Potassium	mg/L		0.2	26	6.62	3	3	10	4	4	6	4	3	4	7
Sodium	mg/L		0.1	110	19	12	19	18	15	11	26	16	12	8	26
Nickel	mg/L	0.025	0.001	0.15	0.0100	<0.005	<0.005	<0.005	<0.005	**0.037**	0.009	**0.083**	<0.005	<0.005	0.005
Zinc	mg/L	0.020	0.00	0.45	0.02	0.012	**0.027**	<0.005	**0.03**	**0.34**	<0.01	**0.15**	0.01	<0.01	<0.01
pH	(pH units)	6.5-8.5	6.7	8.8	7.8						7.31	7.89	7.68	7.84	7.45
Total Organic Carbon	mg/L		0.40	27.00	9.62						12.4		7.7	5.5	8.3
Aluminum	mg/L	0.075*	0.2	18	2.77						**0.68**				**0.20**
Arsenic	mg/L	0.100*	0.0005	0.008	0.0021						0.001				0.001
Barium	mg/L		0.026	0.14	0.054						0.04				0.04
Beryllium	mg/L	1.100	0.000	0.001	0.000						<0.001				<0.001
Bismuth	mg/L		0.0005	0.0025	0.00071						<0.005				<0.005
Cadmium	mg/L	0.0002	0.00005	0.0005	0.000073						<0.0001				<0.0001
Cobalt	mg/L	0.0009	0.0005	0.011	0.0022						0.0009				0.0005
Copper			0.003	0.021	0.0084										
Lead	mg/L	0.005	0.0005	0.015	0.0023						<0.001				**0.006**
Molybdenum	mg/L	0.040*	0.0025	0.025	0.014						0.012				0.025
Selenium	mg/L	0.100	0.001	0.004	0.002						0.003				0.003
Silver	mg/L	0.0001	0.00005	0.0002	0.000085						<0.0001				<0.0001
Strontium	mg/L		0.16	0.57	0.35						0.461				0.533
Tin	mg/L		0.0005	0.005	0.0013						<0.01				<0.01
Titanium	mg/L		0.005	0.39	0.057						0.02				<0.01
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	5	1.13						1.29				0.73
Total Phosphorus	mg/L	0.02*	0.048	0.8	0.17						**0.19**				**0.07**
Vanadium	mg/L	0.006*	0.001	0.035	0.0062						0.003				0.001
Ion Percentage	%		0.115	54.13	3.67	4.1	3.6	4.7	0.1	0.5	1.9	6.7	2.3	2.0	0.3
Benzene	ug/L		0.05	0.25	0.082										
Toluene	ug/L		0.05	0.5	0.13										
Ethylbenzene	ug/L		0.05	0.25	0.085										
o-Xylene	ug/L		0.05	0.25	0.09										
p+m-Xylene	ug/L		0.05	0.3	0.12										
Total Xylenes	ug/L		0.05	0.3	0.09										
Total Oil & Grease	mg/L		0.25	0.25	0.25										

NOTES:

1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Historic chemical anomalies retained in database.
5) Unionized ammonia values are calculated based on field determined pH and temperature values.
6) mg/L denotes milligrams per litre.
7) umho/cm denotes microsiemens per centimeter.
8) BOD denotes biological oxygen demand.
9) COD denotes chemical oxygen demand.
10) Blank denotes parameter not analyzed.
11) Bolded text and shading denotes concentration exceeds criterion.
12) Downstream station SS15 redesignated as background station SS14B as a result of grading modifications in September 2009, and was further redesignated as a station
13) Italics denotes parameter concentration was below the laboratory RDL, where the RDL exceeds the relevant PWQO.
14) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-3
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	West Ditch Line (Poplar System) - SS15 / SS14B									
Date						5-Oct-06	17-Nov-06	2-Mar-07	9-Jan-08	19-Mar-08	14-Jun-08	17-Jul-08	9-Sep-08	4-Nov-08	12-Feb-09
Routine/Storm Monitoring						Routine	Storm	Routine	Routine	Routine	Storm	Storm	Storm	Storm	Routine
Laboratory						Accutest	Accutest	Accutest	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Alkalinity (as $CaCO_3$)	mg/L	<25%***	49	330	120	140	169	101	123	99		100	85	118	101
Chloride	mg/L		6	150	30	51	28	16	33	12	21	27	17	25	10
Sulphate	mg/L		24	400	128	111	139	68	145	59		216	192	173	48
Ammonia (as N)	mg/L		0.025	2.4	0.119	0.04	0.20	0.76		0.33	0.075	0.075	0.075	0.23	0.1
Ammonia Unionized	mg/L	0.02	0.00025	0.081	0.0047	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nitrate	mg/L		0.02	26.3	0.81	26.3	2.88	1.92	3.5	0.8	1.0	0.8	0.5	1.4	1.5
Nitrite	mg/L		0.005	0.915	0.035	<0.10	<0.10			0.02	0.03	0.04	0.03	0.03	0.02
Phenols	mg/L	0.001	0.0005	0.0084	0.00074	0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001
Boron	mg/L	0.200	0.020	2.000	0.258	**0.36**	**0.43**	0.16	**0.33**	0.18	0.19	0.19	0.14	**0.23**	0.16
Calcium	mg/L		0.2	250	76	110	80	48	73	45	79	95	88	79	48
Chromium	mg/L	0.0089	0.0005	0.1100	0.0056	0.002	0.001	<0.001	**0.017**	<0.005	**0.009**	<0.005	**0.017**	0.008	**0.02**
Iron	mg/L	0.300	0.100	110.000	3.495	**0.37**	**0.35**	0.27	**7.8**	**2.1**	**9.2**	**1.4**	**11**	**8.6**	**22**
Magnesium	mg/L		0.05	57	23	30	25	14	22	14	23	29	31	26	16
Potassium	mg/L		0.2	26	6.62	7	5	5	5	3.8	5.2	4.3	8.9	7.8	6
Sodium	mg/L		0.1	110	19	20	19	14	19	10	16	19	15	14	8.2
Nickel	mg/L	0.025	0.001	0.15	0.0100	<0.005	<0.005	<0.005	0.014	0.003	0.015	0.003	0.017	0.011	**0.026**
Zinc	mg/L	0.020	0.00	0.45	0.02	<0.01	<0.01	<0.01	**0.03**	0.01	**0.03**	0.008	**0.04**	**0.04**	**0.058**
pH	(pH units)	6.5-8.5	6.7	8.8	7.8	7.86	7.96	7.75	7.83	6.84	7.66	7.41	7.32	8.08	6.70
Total Organic Carbon	mg/L		0.40	27.00	9.62	10.5	9.8	7.7	10.6	7.1	8.2	7.6	6.9	11.1	12.7
Aluminum	mg/L	0.075*	0.2	18	2.77		**0.80**				**5.9**	**0.93**	**11**	**5.5**	
Arsenic	mg/L	0.100*	0.0005	0.008	0.0021		<0.001				0.004	0.001	0.004	0.003	
Barium	mg/L		0.026	0.14	0.054		0.04				0.058	0.04	0.088	0.055	
Beryllium	mg/L	1.100	0.000	0.001	0.000		<0.001				<0.0006	<0.0006	<0.0006	<0.0006	
Bismuth	mg/L		0.0005	0.0025	0.00071		<0.005					<0.001	<0.001	<0.001	
Cadmium	mg/L	0.0002	0.00005	0.0005	0.000073		<0.0001				**0.0005**	<0.0001	<0.0001	<0.0001	
Cobalt	mg/L	0.0009	0.0005	0.011	0.0022		0.0005				**0.0038**	0.0006	**0.0047**	**0.0033**	
Copper			0.003	0.021	0.0084		0.003				**0.010**	0.004	**0.010**	**0.008**	
Lead	mg/L	0.005	0.0005	0.015	0.0023		<0.001				0.0044	0.0007	0.005	0.0034	
Molybdenum	mg/L	0.040*	0.0025	0.025	0.014		<0.005				0.015	0.02	0.023	0.009	
Selenium	mg/L	0.100	0.001	0.004	0.002		<0.001				<0.002	<0.005	<0.005	<0.005	
Silver	mg/L	0.0001	0.00005	0.0002	0.000085		<0.0001				<0.0001		<0.0001	<0.0001	
Strontium	mg/L		0.16	0.57	0.35		0.291				0.30	0.39	0.42	0.31	
Tin	mg/L		0.0005	0.005	0.0013		<0.01				<0.001	<0.002	<0.002	<0.002	
Titanium	mg/L		0.005	0.39	0.057		0.01				0.10		0.39	0.096	
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	5	1.13	1.18	1.28				2	0.7	1	1.8	
Total Phosphorus	mg/L	0.02*	0.048	0.8	0.17	**0.13**	**0.20**				**0.21**	**0.07**	**0.23**	**0.78**	
Vanadium	mg/L	0.006*	0.001	0.035	0.0062		0.001				**0.012**	0.002	**0.025**	**0.011**	
Ion Percentage	%		0.115	54.13	3.67	10.0	2.2	5.1	1.9	5.4		3.9	7.1	2.5	9.2
Benzene	ug/L		0.05	0.25	0.082						<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	ug/L		0.05	0.5	0.13						<0.2	<0.2	<0.3	<0.2	<0.3
Ethylbenzene	ug/L		0.05	0.25	0.085						<0.2	<0.2	<0.2	<0.2	<0.2
o-Xylene	ug/L		0.05	0.25	0.09						<0.2	<0.2	<0.3	<0.2	<0.3
p+m-Xylene	ug/L		0.05	0.3	0.12						<0.4	<0.4	<0.6	<0.4	<0.6
Total Xylenes	ug/L		0.05	0.3	0.09						<0.4	<0.4	<0.6	<0.4	
Total Oil & Grease	mg/L		0.25	0.25	0.25						<0.5	<0.5	<0.5	<0.5	

NOTES:

1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Historic chemical anomalies retained in database.
5) Unionized ammonia values are calculated based on field determined pH and temperature values.
6) mg/L denotes milligrams per litre.
7) umho/cm denotes microsiemens per centimeter.
8) BOD denotes biological oxygen demand.
9) COD denotes chemical oxygen demand.
10) Blank denotes parameter not analyzed.
11) Bolded text and shading denotes concentration exceeds criterion.
12) Downstream station SS15 redesignated as background station SS14B as a result of grading modifications in September 2009, and was further redesignated as a station
13) Italics denotes parameter concentration was below the laboratory RDL, where the RDL exceeds the relevant PWQO.
14) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-3
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	West Ditch Line (Poplar System) - SS14B									
Date						6-Apr-09	7-Jun-11	9-Aug-11	29-Nov-11	13-Jan-13	10-Apr-13	5-Jul-13	28-Aug-13	7-Oct-13	11-Jan-14
Routine/Storm Monitoring						Routine	Storm	Storm	Routine	Routine	Routine	Routine	Storm	Routine	Routine
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Alkalinity (as $CaCO_3$)	mg/L	<25%***	49	330	120	111		56	98	200	110	130		250	60
Chloride	mg/L		6	150	30	16	6	28	28	110	48	85	21	130	7
Sulphate	mg/L		24	400	128	120		220	46	210	95	150		170	24
Ammonia (as N)	mg/L		0.025	2.4	0.119	0.075	0.15	0.075	0.075	0.075	0.21	0.075	0.075	0.075	0.83
Ammonia Unionized	mg/L	0.02	0.00025	0.081	0.0047	<0.02		<0.02	<0.02	<0.02	<0.02	<0.014		<0.0079	0.0075
Nitrate	mg/L		0.02	26.3	0.81	2.0	0.02	1.2	0.2	0.37	0.58	0.05	0.05	0.05	0.99
Nitrite	mg/L		0.005	0.915	0.035		0.3	<0.01					<0.010		
Phenols	mg/L	0.001	0.0005	0.0084	0.00074	<0.001		0.001	<0.001	<0.0010	<0.0010	<0.0010		<0.0010	**0.0024**
Boron	mg/L	0.200	0.020	2.000	0.258	0.20	0.16	**0.41**	**0.67**	**1.4**	**0.75**	**1.5**	**0.3**	**2.0**	0.042
Calcium	mg/L		0.2	250	76	86	52	74	30	110	250	92	77	120	26
Chromium	mg/L	0.0089	0.0005	0.1100	0.0056	**0.014**	**0.029**	<0.005	<0.005	<0.0050	**0.092**	<0.0050	**0.01**	<0.0050	<0.0050
Iron	mg/L	0.300	0.100	110.000	3.495	**14**	**30**	**3.2**	**4.3**	**0.86**	**94**	**3.8**	**7**	**1.8**	**3.3**
Magnesium	mg/L		0.05	57	23	27	16	23	11	35	57	21	19	36	6.2
Potassium	mg/L		0.2	26	6.62	4.9	6.3	5.4	6.2	8.3	13	9	9.8	10	8.4
Sodium	mg/L		0.1	110	19	13	4.7	31	34	100	45	68	18	110	2.3
Nickel	mg/L	0.025	0.001	0.15	0.0100	0.022	**0.039**	0.006	0.007	0.0080	**0.13**	0.013	0.011	0.012	0.005
Zinc	mg/L	0.020	0.00	0.45	0.02	**0.10**	**0.08**	0.008	**0.022**	0.0067	**0.45**	0.016	0.02	0.0077	0.018
pH	(pH units)	6.5-8.5	6.7	8.8	7.8	8.45	7.21	6.92	7.10	7.47	7.09	8.19	8.22	8.11	7.84
Total Organic Carbon	mg/L		0.40	27.00	9.62	17		7.8	8.2	11	7.9	16		17	9.3
Aluminum	mg/L	0.075*	0.2	18	2.77		**18**	**1.9**					**8.4**		
Arsenic	mg/L	0.100*	0.0005	0.008	0.0021		0.008	0.002					0.004		
Barium	mg/L		0.026	0.14	0.054		0.14	0.031					0.078		
Beryllium	mg/L	1.100	0.000	0.001	0.000		0.0010	<0.0005					<0.0006		
Bismuth	mg/L		0.0005	0.0025	0.00071		<0.001	<0.001					<0.0010		
Cadmium	mg/L	0.0002	0.00005	0.0005	0.000073		0.0002	<0.0001					<0.0001		
Cobalt	mg/L	0.0009	0.0005	0.011	0.0022		**0.011**	**0.0015**					**0.0039**		
Copper			0.003	0.021	0.0084		**0.021**	0.005					**0.01**		
Lead	mg/L	0.005	0.0005	0.015	0.0023		**0.015**	0.0013					0.0037		
Molybdenum	mg/L	0.040*	0.0025	0.025	0.014		0.009	0.02					0.016		
Selenium	mg/L	0.100	0.001	0.004	0.002		<0.005	0.004					<0.005		
Silver	mg/L	0.0001	0.00005	0.0002	0.000085		<0.0001						<0.00010		
Strontium	mg/L		0.16	0.57	0.35		0.16	0.36					0.39		
Tin	mg/L		0.0005	0.005	0.0013		<0.002	<0.001					<0.002		
Titanium	mg/L		0.005	0.39	0.057		0.34	0.047					0.2		
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	5	1.13		5	2					1.5		
Total Phosphorus	mg/L	0.02*	0.048	0.8	0.17		**0.8**	**0.092**					**0.18**		
Vanadium	mg/L	0.006*	0.001	0.035	0.0062		**0.035**	0.004					**0.017**		
Ion Percentage	%		0.115	54.13	3.67	10.3		2.0	2.2	3.0	28.3	4.0	41.6	3.5	3.0
Benzene	ug/L		0.05	0.25	0.082	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	ug/L		0.05	0.5	0.13	<0.3	<0.2	<0.3	<0.3	<0.3	<0.3	<0.3	<0.2	<0.3	<0.3
Ethylbenzene	ug/L		0.05	0.25	0.085	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-Xylene	ug/L		0.05	0.25	0.09	<0.3	<0.2	<0.3	<0.3	<0.3	<0.3	<0.3	<0.2	<0.3	<0.3
p+m-Xylene	ug/L		0.05	0.3	0.12	<0.6	<0.4	<0.6	<0.6	<0.6	<0.6	<0.6	<0.4	<0.6	<0.6
Total Xylenes	ug/L		0.05	0.3	0.09		<0.4	<0.6							
Total Oil & Grease	mg/L		0.25	0.25	0.25		<0.5								

NOTES:

1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Historic chemical anomalies retained in database.
5) Unionized ammonia values are calculated based on field determined pH and temperature values.
6) mg/L denotes milligrams per litre.
7) umho/cm denotes microsiemens per centimeter.
8) BOD denotes biological oxygen demand.
9) COD denotes chemical oxygen demand.
10) Blank denotes parameter not analyzed.
11) Bolded text and shading denotes concentration exceeds criterion.
12) Downstream station SS15 redesignated as background station SS14B as a result of grading modifications in September 2009, and was further redesignated as a station
13) Italics denotes parameter concentration was below the laboratory RDL, where the RDL exceeds the relevant PWQO.
14) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-3
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	West Ditch Line (Poplar System) - SS14B									
Date						8-Apr-14	7-Jul-14	4-Jan-15	10-Apr-15	25-Oct-15	7-Apr-16	14-Jul-16	21-Oct-16	12-Jan-17	6-Apr-17
Routine/Storm Monitoring						Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Alkalinity (as $CaCO_3$)	mg/L	<25%***	49	330	120		64	70	250	77	210	100	97	120	220
Chloride	mg/L		6	150	30	130	12	10	48	30	21	22	33	21	33
Sulphate	mg/L		24	400	128	180	120	38	250	150	130	110	310	62	160
Ammonia (as N)	mg/L		0.025	2.4	0.119	0.075	0.075	0.44	0.075	0.075	0.075	0.075	0.075	0.51	0.075
Ammonia Unionized	mg/L	0.02	0.00025	0.081	0.0047	<0.0034	<0.0013	0.0076	<0.0061	<0.0014	<0.0019	<0.0068	<0.0037	0.0013	<0.0014
Nitrate	mg/L		0.02	26.3	0.81	0.05	0.05	1.19	1.15	0.57	0.65	0.05	4.28	1.89	0.54
Nitrite	mg/L		0.005	0.915	0.035										
Phenols	mg/L	0.001	0.0005	0.0084	0.00074	**0.005**	**0.003**	**0.0084**	<0.0010	<0.0010	<0.0010	*<0.0040*	*<0.0040*	*<0.0040*	*<0.0040*
Boron	mg/L	0.200	0.020	2.000	0.258	**1.4**	**0.23**	0.064	**0.28**	0.10	0.15	0.13	0.08	0.14	0.20
Calcium	mg/L		0.2	250	76	100	80	33	150	62	94	64	130	110	120
Chromium	mg/L	0.0089	0.0005	0.1100	0.0056	<0.0050	**0.013**	<0.0050	0.0057	<0.005	<0.0050	0.007	<0.005	0.052	<0.005
Iron	mg/L	0.300	0.100	110.000	3.495	0.14	**12**	**2.2**	**5.2**	**1.4**	**1.6**	**3.5**	**1.7**	**52**	**2.4**
Magnesium	mg/L		0.05	57	23	33	19	9	48	15	27	16	28	31	35
Potassium	mg/L		0.2	26	6.62	8.1	5.9	8.3	5.5	11	4.2	9.9	4.7	15	6.7
Sodium	mg/L		0.1	110	19	100	13	3.3	29	16	14	12	16	6.7	18
Nickel	mg/L	0.025	0.001	0.15	0.0100	0.0096	0.018	0.0035	0.014	0.004	0.0029	0.006	0.004	0.072	0.005
Zinc	mg/L	0.020	0.00	0.45	0.02	<0.0050	**0.03**	0.012	**0.032**	0.020	0.011	0.010	<0.01	**0.14**	0.020
pH	(pH units)	6.5-8.5	6.7	8.8	7.8	8.12	7.16	8.14	8.27	7.71	8.02	7.93	8.09	7.36	7.81
Total Organic Carbon	mg/L		0.40	27.00	9.62	12	10	11	11	6.9	9.2	9.5	12	8.6	11
Aluminum	mg/L	0.075*	0.2	18	2.77										
Arsenic	mg/L	0.100*	0.0005	0.008	0.0021										
Barium	mg/L		0.026	0.14	0.054										
Beryllium	mg/L	1.100	0.000	0.001	0.000										
Bismuth	mg/L		0.0005	0.0025	0.00071										
Cadmium	mg/L	0.0002	0.00005	0.0005	0.000073										
Cobalt	mg/L	0.0009	0.0005	0.011	0.0022										
Copper			0.003	0.021	0.0084										
Lead	mg/L	0.005	0.0005	0.015	0.0023										
Molybdenum	mg/L	0.040*	0.0025	0.025	0.014										
Selenium	mg/L	0.100	0.001	0.004	0.002										
Silver	mg/L	0.0001	0.00005	0.0002	0.000085										
Strontium	mg/L		0.16	0.57	0.35										
Tin	mg/L		0.0005	0.005	0.0013										
Titanium	mg/L		0.005	0.39	0.057										
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	5	1.13										
Total Phosphorus	mg/L	0.02*	0.048	0.8	0.17										
Vanadium	mg/L	0.006*	0.001	0.035	0.0062										
Ion Percentage	%		0.115	54.13	3.67	12.2	10.5	2.7	2.6	1.1	0.4	1.8	0.6	17.7	3.2
Benzene	ug/L		0.05	0.25	0.082	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.10	<0.10	<0.10	<0.10
Toluene	ug/L		0.05	0.5	0.13	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.10	<0.10	<0.20	<0.20
Ethylbenzene	ug/L		0.05	0.25	0.085	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.20	<0.10	<0.10
o-Xylene	ug/L		0.05	0.25	0.09	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.10	<0.10	<0.10	<0.10
p+m-Xylene	ug/L		0.05	0.3	0.12	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.10	<0.10	<0.10	<0.10
Total Xylenes	ug/L		0.05	0.3	0.09							<0.10	<0.10	<0.10	<0.10
Total Oil & Grease	mg/L		0.25	0.25	0.25										

NOTES:

1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Historic chemical anomalies retained in database.
5) Unionized ammonia values are calculated based on field determined pH and temperature values.
6) mg/L denotes milligrams per litre.
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8) BOD denotes biological oxygen demand.
9) COD denotes chemical oxygen demand.
10) Blank denotes parameter not analyzed.
11) Bolded text and shading denotes concentration exceeds criterion.
12) Downstream station SS15 redesignated as background station SS14B as a result of grading modifications in September 2009, and was further redesignated as a station
13) Italics denotes parameter concentration was below the laboratory RDL, where the RDL exceeds the relevant PWQO.
14) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-3
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	West Ditch Line (Poplar System) - SS14B									
Date						13-Jul-17	28-Oct-17	23-Jan-18	4-Apr-18	8-Aug-18	8-Aug-18	2-Oct-18	7-Feb-19	19-Apr-19	2-Oct-19
Routine/Storm Monitoring						Routine	Routine	Routine	Routine	Routine	Storm	Routine	Routine	Routine	Routine
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Bureau Veritas
Alkalinity (as $CaCO_3$)	mg/L	<25%***	49	330	120	65	130	180	170	49		240	180	180	140
Chloride	mg/L		6	150	30	13	33	39	13	7.7	9.5	120	45	33	150
Sulphate	mg/L		24	400	128	98	240	70	120	63		180	84	93	240
Ammonia (as N)	mg/L		0.025	2.4	0.119	0.075	0.056	0.089	0.13	0.13	0.086	0.092	0.19	0.025	0.76
Ammonia Unionized	mg/L	0.02	0.00025	0.081	0.0047	<0.013	<0.0005	0.0021	0.0009	0.0025		0.0018	0.0019	<0.0024	**0.081**
Nitrate	mg/L		0.02	26.3	0.81	1.46	0.75	1.26	1.19	1.07	1.07	8.63	2.23	0.99	5.16
Nitrite	mg/L		0.005	0.915	0.035						0.026				
Phenols	mg/L	0.001	0.0005	0.0084	0.00074	*<0.0040*	<0.0010	0.0015	<0.0010	<0.0010		<0.0010	<0.0010	<0.0010	0.001
Boron	mg/L	0.200	0.020	2.000	0.258	0.1	0.09	0.46	**0.24**	0.06	0.06	0.02	0.16	0.11	**0.77**
Calcium	mg/L		0.2	250	76	200	100	66	83	45	44	0.2	80	160	130
Chromium	mg/L	0.0089	0.0005	0.1100	0.0056	0.11	<0.005	<0.005	**0.013**	0.008	0.007	0.005	<0.005	**0.052**	<0.005
Iron	mg/L	0.300	0.100	110.000	3.495	**110**	**0.7**	**1.5**	**12**	**6.6**	**6.2**	0.1	**0.8**	**51**	**1.4**
Magnesium	mg/L		0.05	57	23	51	27	16	26	16	16	0.05	24	41	40
Potassium	mg/L		0.2	26	6.62	26	5.5	6.9	5.7	4.1	3.9	0.2	5.5	10	10
Sodium	mg/L		0.1	110	19	9	19	30	12	7.6	7.6	0.1	21	17	63
Nickel	mg/L	0.025	0.001	0.15	0.0100	0.15	0.003	0.005	0.015	0.01	0.009	0.001	0.003	**0.072**	0.014
Zinc	mg/L	0.020	0.00	0.45	0.02	**0.4**	<0.01	0.01	**0.04**	0.01	0.01	0.01	<0.01	**0.14**	0.01
pH	(pH units)	6.5-8.5	6.7	8.8	7.8	8.16	7.35	8.32	7.71	7.5	7.5	7.67	7.96	8.43	8.43
Total Organic Carbon	mg/L		0.40	27.00	9.62	8.2	8.6	9.8	12	4.9		16	7.3	18	18
Aluminum	mg/L	0.075*	0.2	18	2.77						**4.4**				
Arsenic	mg/L	0.100*	0.0005	0.008	0.0021						0.002				
Barium	mg/L		0.026	0.14	0.054						0.038				
Beryllium	mg/L	1.100	0.000	0.001	0.000						<0.0006				
Bismuth	mg/L		0.0005	0.0025	0.00071						<0.001				
Cadmium	mg/L	0.0002	0.00005	0.0005	0.000073						<0.0001				
Cobalt	mg/L	0.0009	0.0005	0.011	0.0022						**0.0026**				
Copper			0.003	0.021	0.0084						**0.007**				
Lead	mg/L	0.005	0.0005	0.015	0.0023						0.0021				
Molybdenum	mg/L	0.040*	0.0025	0.025	0.014						0.018				
Selenium	mg/L	0.100	0.001	0.004	0.002						<0.005				
Silver	mg/L	0.0001	0.00005	0.0002	0.000085						*<0.0004*				
Strontium	mg/L		0.16	0.57	0.35						0.16				
Tin	mg/L		0.0005	0.005	0.0013						<0.002				
Titanium	mg/L		0.005	0.39	0.057						0.054				
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	5	1.13						<0.7				
Total Phosphorus	mg/L	0.02*	0.048	0.8	0.17						**0.087**				
Vanadium	mg/L	0.006*	0.001	0.035	0.0062						**0.009**				
Ion Percentage	%		0.115	54.13	3.67	30.8	1.2	0.3	2.7	11.7	43.7	54.1	1.5	16.2	1.5
Benzene	ug/L		0.05	0.25	0.082	<0.10	<0.10	<0.10	<0.25	<0.20	<0.20	<0.25	<0.10	<0.25	<0.50
Toluene	ug/L		0.05	0.5	0.13	<0.20	<0.10	<0.20	<0.50	<0.20	<0.20	<0.50	<0.20	<0.50	<1.0
Ethylbenzene	ug/L		0.05	0.25	0.085	<0.10	<0.20	<0.10	<0.25	<0.20	<0.20	<0.25	<0.10	<0.25	<0.50
o-Xylene	ug/L		0.05	0.25	0.09	<0.10	<0.10	<0.10	<0.25	<0.20	<0.20	<0.25	<0.10	<0.25	<0.50
p+m-Xylene	ug/L		0.05	0.3	0.12	<0.10	<0.10	<0.10	<0.25	<0.20	<0.20	<0.25	<0.10	<0.25	<0.50
Total Xylenes	ug/L		0.05	0.3	0.09	<0.10	<0.10	<0.10	<0.25	<0.20	<0.20	<0.25	<0.10	<0.25	<0.50
Total Oil & Grease	mg/L		0.25	0.25	0.25										

NOTES:

1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Historic chemical anomalies retained in database.
5) Unionized ammonia values are calculated based on field determined pH and temperature values.
6) mg/L denotes milligrams per litre.
7) umho/cm denotes microsiemens per centimeter.
8) BOD denotes biological oxygen demand.
9) COD denotes chemical oxygen demand.
10) Blank denotes parameter not analyzed.
11) Bolded text and shading denotes concentration exceeds criterion.
12) Downstream station SS15 redesignated as background station SS14B as a result of grading modifications in September 2009, and was further redesignated as a station
13) Italics denotes parameter concentration was below the laboratory RDL, where the RDL exceeds the relevant PWQO.
14) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-3
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	West Ditch Line (Poplar System) - SS14B									
Date						2-Oct-19	11-Jan-20	18-May-20	15-Nov-20	26-Mar-21	3-Jun-21	9-Jul-21	8-Sep-21	23-Sep-21	26-Oct-21
Routine/Storm Monitoring						Storm	Routine	Routine	Routine	Routine	Routine	Routine	Storm	Storm	Routine
Laboratory						Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas
Alkalinity (as $CaCO_3$)	mg/L	<25%***	49	330	120		150	200	130	160	72	120			330
Chloride	mg/L		6	150	30	150	49	94	140	130	41	94	33	130	120
Sulphate	mg/L		24	400	128		48	150	190	160	400	170			150
Ammonia (as N)	mg/L		0.025	2.4	0.119	0.93	0.11	0.62	0.17	0.19	0.09	0.025	0.075	0.075	0.025
Ammonia Unionized	mg/L	0.02	0.00025	0.081	0.0047		0.0026	**0.034**	0.0046	0.0020	0.0019	<0.0068			<0.0015
Nitrate	mg/L		0.02	26.3	0.81	5.15	6.15	6.00	12	9.91	0.48	0.05	0.30	2.64	0.15
Nitrite	mg/L		0.005	0.915	0.035	0.915							0.031	0.027	
Phenols	mg/L	0.001	0.0005	0.0084	0.00074		0.0005	<0.0010	<0.0010	<0.0010	**0.0011**	<0.0010			<0.0010
Boron	mg/L	0.200	0.020	2.000	0.258	**0.78**	**0.43**	**0.77**	**1**	**0.71**	0.14	**0.82**	0.13	**0.89**	**0.92**
Calcium	mg/L		0.2	250	76	130	120	100	110	110	120	75	85	160	130
Chromium	mg/L	0.0089	0.0005	0.1100	0.0056	<0.005	**0.041**	**0.012**	**0.009**	0.007	<0.005	0.005	<0.005	**0.017**	<0.005
Iron	mg/L	0.300	0.100	110.000	3.495	**1.3**	**41**	**11**	**6.2**	**6.4**	**2.1**	**4.2**	**2.0**	**16**	**0.9**
Magnesium	mg/L		0.05	57	23	40	32	33	35	34	43	27	31	46	38
Potassium	mg/L		0.2	26	6.62	10	14	10	21	13	4.4	8	5.7	11	9.3
Sodium	mg/L		0.1	110	19	62	37	63	86	72	28	58	21	76	74
Nickel	mg/L	0.025	0.001	0.15	0.0100	0.014	**0.06**	0.022	0.02	0.018	0.004	0.012	0.004	**0.030**	0.009
Zinc	mg/L	0.020	0.00	0.45	0.02	0.01	**0.14**	**0.04**	0.02	0.02	<0.01	0.01	<0.01	**0.04**	<0.01
pH	(pH units)	6.5-8.5	6.7	8.8	7.8	8.43	8.23	8.30	8.1	7.8	7.6	8.5	8.1	8.2	8.2
Total Organic Carbon	mg/L		0.40	27.00	9.62		7.1	0.4	27	22	5	13			13
Aluminum	mg/L	0.075*	0.2	18	2.77	**0.77**							**1.5**	**9.1**	
Arsenic	mg/L	0.100*	0.0005	0.008	0.0021	0.001							0.001	0.005	
Barium	mg/L		0.026	0.14	0.054	0.063							0.026	0.11	
Beryllium	mg/L	1.100	0.000	0.001	0.000	<0.0006							<0.0006	<0.0006	
Bismuth	mg/L		0.0005	0.0025	0.00071	<0.001							<0.001	<0.001	
Cadmium	mg/L	0.0002	0.00005	0.0005	0.000073	0.0002							<0.0001	0.0001	
Cobalt	mg/L	0.0009	0.0005	0.011	0.0022	**0.0022**							**0.0011**	**0.0074**	
Copper			0.003	0.021	0.0084	**0.01**							**0.006**	**0.019**	
Lead	mg/L	0.005	0.0005	0.015	0.0023	0.0009							0.0009	**0.0061**	
Molybdenum	mg/L	0.040*	0.0025	0.025	0.014	0.021							0.023	0.011	
Selenium	mg/L	0.100	0.001	0.004	0.002	<0.005							<0.005	<0.005	
Silver	mg/L	0.0001	0.00005	0.0002	0.000085	*<0.0004*							*<0.0004*	*<0.0004*	
Strontium	mg/L		0.16	0.57	0.35	0.56							0.43	0.57	
Tin	mg/L		0.0005	0.005	0.0013	<0.002							<0.002	<0.002	
Titanium	mg/L		0.005	0.39	0.057	0.018							0.025	0.13	
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	5	1.13	2.4							<0.7	1.3	
Total Phosphorus	mg/L	0.02*	0.048	0.8	0.17	**0.11**							**0.048**	**0.33**	
Vanadium	mg/L	0.006*	0.001	0.035	0.0062	0.002							0.003	**0.018**	
Ion Percentage	%		0.115	54.13	3.67	25.2	16.9	2.3	4.7	3.6	0.3	0.2	39.5	30.8	0.1
Benzene	ug/L		0.05	0.25	0.082	<0.20	<0.10	<0.25	<0.50	<0.25	<0.10	<0.10	<0.10	<0.10	<0.10
Toluene	ug/L		0.05	0.5	0.13	<0.20	<0.20	<0.50	<1.0	<0.50	<0.20	<0.20	<0.20	<0.20	<0.20
Ethylbenzene	ug/L		0.05	0.25	0.085	<0.20	<0.10	<0.25	<0.50	<0.25	<0.10	<0.10	<0.10	<0.10	<0.10
o-Xylene	ug/L		0.05	0.25	0.09	<0.20	<0.10	<0.25	<0.50	<0.25	<0.10	<0.10	<0.10	<0.10	<0.10
p+m-Xylene	ug/L		0.05	0.3	0.12	<0.20	<0.10	<0.25	<0.50	<0.25	<0.10	<0.10	<0.10	<0.10	<0.10
Total Xylenes	ug/L		0.05	0.3	0.09	<0.20	<0.10	<0.25	<0.50	<0.25	<0.10	<0.10	<0.10	<0.10	<0.10
Total Oil & Grease	mg/L		0.25	0.25	0.25										

NOTES:

1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Historic chemical anomalies retained in database.
5) Unionized ammonia values are calculated based on field determined pH and temperature values.
6) mg/L denotes milligrams per litre.
7) umho/cm denotes microsiemens per centimeter.
8) BOD denotes biological oxygen demand.
9) COD denotes chemical oxygen demand.
10) Blank denotes parameter not analyzed.
11) Bolded text and shading denotes concentration exceeds criterion.
12) Downstream station SS15 redesignated as background station SS14B as a result of grading modifications in September 2009, and was further redesignated as a station
13) Italics denotes parameter concentration was below the laboratory RDL, where the RDL exceeds the relevant PWQO.
14) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-3
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	West Ditch Line (Poplar System) - SS14B									
Date						17-Feb-22	4-May-22	30-Aug-22	28-Sep-22	18-Oct-22					
Routine/Storm Monitoring						Routine	Routine	Routine	Storm	Routine					
Laboratory						Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas					
Alkalinity (as $CaCO_3$)	mg/L	<25%***	49	330	120	120	300	68		58					
Chloride	mg/L		6	150	30	18	84	31	7.0	14					
Sulphate	mg/L		24	400	128	24	120	270		170					
Ammonia (as N)	mg/L		0.025	2.4	0.119	2.4	0.13	0.15	0.075	<0.050					
Ammonia Unionized	mg/L	0.02	0.00025	0.081	0.0047	0.0084	**0.03**	0.01		<0.0011					
Nitrate	mg/L		0.02	26.3	0.81	0.63	0.05	0.05	0.24	0.27					
Nitrite	mg/L		0.005	0.915	0.035				<0.010						
Phenols	mg/L	0.001	0.0005	0.0084	0.00074	**0.0012**	<0.0010	**0.0020**		<0.0010					
Boron	mg/L	0.200	0.020	2.000	0.258	**0.29**	**0.98**	0.20	0.05	0.09					
Calcium	mg/L		0.2	250	76	42	100	130	52	87					
Chromium	mg/L	0.0089	0.0005	0.1100	0.0056	<0.005	<0.005	**0.010**	**0.016**	**0.027**					
Iron	mg/L	0.300	0.100	110.000	3.495	**4.2**	**2.5**	**9.3**	**16**	**25**					
Magnesium	mg/L		0.05	57	23	11	32	38	19	28					
Potassium	mg/L		0.2	26	6.62	10	6.5	7.2	4.6	8					
Sodium	mg/L		0.1	110	19	13	61	19	5.9	10					
Nickel	mg/L	0.025	0.001	0.15	0.0100	0.008	0.011	0.015	0.022	**0.038**					
Zinc	mg/L	0.020	0.00	0.45	0.02	**0.03**	<0.01	0.02	**0.04**	**0.07**					
pH	(pH units)	6.5-8.5	6.7	8.8	7.8	7.5	**8.8**	8.1	8.1	8.1					
Total Organic Carbon	mg/L		0.40	27.00	9.62	16	13	10		7.7					
Aluminum	mg/L	0.075*	0.2	18	2.77				**9.1**						
Arsenic	mg/L	0.100*	0.0005	0.008	0.0021				0.005						
Barium	mg/L		0.026	0.14	0.054				0.056						
Beryllium	mg/L	1.100	0.000	0.001	0.000				<0.0006						
Bismuth	mg/L		0.0005	0.0025	0.00071				<0.001						
Cadmium	mg/L	0.0002	0.00005	0.0005	0.000073				<0.0001						
Cobalt	mg/L	0.0009	0.0005	0.011	0.0022				**0.006**						
Copper			0.003	0.021	0.0084				**0.013**						
Lead	mg/L	0.005	0.0005	0.015	0.0023				**0.0053**						
Molybdenum	mg/L	0.040*	0.0025	0.025	0.014				0.016						
Selenium	mg/L	0.100	0.001	0.004	0.002				<0.005						
Silver	mg/L	0.0001	0.00005	0.0002	0.000085				<0.0004						
Strontium	mg/L		0.16	0.57	0.35				0.22						
Tin	mg/L		0.0005	0.005	0.0013				<0.002						
Titanium	mg/L		0.005	0.39	0.057				0.1						
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	5	1.13				<0.7						
Total Phosphorus	mg/L	0.02*	0.048	0.8	0.17				**0.17**						
Vanadium	mg/L	0.006*	0.001	0.035	0.0062				**0.018**						
Ion Percentage	%		0.115	54.13	3.67	3.1	1.1	7.5	45.9	8.9					
Benzene	ug/L		0.05	0.25	0.082	<0.10	<0.10	<0.10	<0.10	<0.10					
Toluene	ug/L		0.05	0.5	0.13	<0.20	<0.20	<0.20	<0.20	<0.20					
Ethylbenzene	ug/L		0.05	0.25	0.085	<0.10	<0.10	<0.10	<0.10	<0.10					
o-Xylene	ug/L		0.05	0.25	0.09	<0.10	<0.10	<0.10	<0.10	<0.10					
p+m-Xylene	ug/L		0.05	0.3	0.12	<0.10	<0.10	<0.10	<0.10	<0.10					
Total Xylenes	ug/L		0.05	0.3	0.09	<0.10	<0.10	<0.10	<0.10	<0.10					
Total Oil & Grease	mg/L		0.25	0.25	0.25										

NOTES:

1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Historic chemical anomalies retained in database.
5) Unionized ammonia values are calculated based on field determined pH and temperature values.
6) mg/L denotes milligrams per litre.
7) umho/cm denotes microsiemens per centimeter.
8) BOD denotes biological oxygen demand.
9) COD denotes chemical oxygen demand.
10) Blank denotes parameter not analyzed.
11) Bolded text and shading denotes concentration exceeds criterion.
12) Downstream station SS15 redesignated as background station SS14B as a result of grading modifications in September 2009, and was further redesignated as a station
13) Italics denotes parameter concentration was below the laboratory RDL, where the RDL exceeds the relevant PWQO.
14) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-3
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Inlet Point to Sedimentation Pond 1 (Poplar System) - SS15A									
Date						3-Oct-09	10-Oct-09	25-Jan-10	6-Apr-10	6-Jun-10	5-Aug-10	14-Oct-10	28-Feb-11	20-Apr-11	7-Jun-11
Routine/Storm Monitoring						Routine	Storm	Routine	Routine	Storm	Routine	Storm	Routine	Routine	Storm
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Alkalinity (as $CaCO_3$)	mg/L	<25%***	51	220	115	118		101	116		167	88	115	160	
Chloride	mg/L		2.9	94	16	24	39	15	18	8	18	14	19	20	5
Sulphate	mg/L		23	900	105	260		73	180		230	180	91	140	
Ammonia (as N)	mg/L		0.0025	1.69	0.107	0.075	0.075	0.075	0.870	0.240	0.075	0.075	0.640	0.075	0.075
Ammonia Unionized	mg/L	0.02	0.00025	0.12	0.0033	<0.02		<0.02	<0.02		<0.02	<0.02	<0.02	<0.02	
Nitrate	mg/L		0.02	7.61	0.92	0.4	1.8	1.7	2.4	0.9	0.05	0.4	1.9	0.8	0.02
Nitrite	mg/L		0.005	0.3	0.041		0.02					0.01			0.3
Phenols	mg/L	0.001	0.0005	0.013	0.00092	<0.001		<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	
Boron	mg/L	0.200	0.060	0.910	0.226	0.11	**0.21**	0.17	**0.5**	0.15	**0.31**	0.16	**0.26**	**0.38**	0.14
Calcium	mg/L		26	530	75	100	94	50	530	150	120	250	56	88	48
Chromium	mg/L	0.0089	0.0025	0.3100	0.0070	<0.005	<0.005	<0.005	**0.31**	**0.057**	<0.005	**0.080**	<0.005	0.007	**0.030**
Iron	mg/L	0.300	0.200	310.000	5.413	**2.2**	**2.7**	**2.5**	**310**	**59**	**1.0**	**84**	**1.4**	**3.6**	**31**
Magnesium	mg/L		7.1	150	22	32	28	15	150	40	29	61	19	29	16
Potassium	mg/L		2.6	41	7.41	5.4	5.8	5.2	41	10	6.8	16	4.5	5.5	6.9
Sodium	mg/L		4	41	11	17	19	12	22	8.9	16	9.2	16	21	4.5
Nickel	mg/L	0.025	0.001	0.42	0.0100	0.004	0.004	0.004	**0.42**	**0.083**	0.002	**0.11**	0.003	0.011	**0.041**
Zinc	mg/L	0.020	0.00	0.76	0.02	0.006	<0.01	0.013	**0.76**	**0.13**	<0.005	**0.20**	0.012	**0.025**	**0.08**
pH	(pH units)	6.5-8.5	6.9	8.8	7.7	7.72	8.26	**8.83**	7.94	7.98	7.73	8.10	7.70	8.01	7.23
Total Organic Carbon	mg/L		6.40	42.00	12.36	6.6		6.5	16.7		13.2	9.3	6.5	14.0	
Aluminum	mg/L	0.075*	0.45	45	4.24		**2.0**			**32**		**45**			**19**
Arsenic	mg/L	0.100*	0.001	0.019	0.0029		0.001			0.015		0.019			0.009
Barium	mg/L		0.028	0.26	0.059		0.043			0.18		0.26			0.12
Beryllium	mg/L	1.100	0.000	0.002	0.000		<0.0006			0.0017		0.0022			0.0011
Bismuth	mg/L		0.0005	0.0005	0.00050		<0.001			<0.001		<0.001			<0.001
Cadmium	mg/L	0.0002	0.00005	0.0005	0.000076		<0.001			0.0002		**0.0005**			0.0002
Cobalt	mg/L	0.0009	0.00025	0.033	0.0026		**0.0010**			**0.025**		**0.033**			**0.012**
Copper	mg/L	0.005	0.004	0.054	0.0098		0.005			**0.044**		**0.054**			**0.021**
Lead	mg/L	0.005	0.00025	0.033	0.0024		0.0011			**0.022**		**0.033**			**0.014**
Molybdenum	mg/L	0.040*	0.006	0.02	0.010		0.009			0.020		0.017			0.008
Selenium	mg/L	0.100	0.001	0.003	0.002		<0.005			<0.005		<0.005			<0.005
Silver	mg/L	0.0001	0.00005	0.0002	0.000113		<0.0001			<0.0001		0.0001			<0.0001
Strontium	mg/L		0.15	0.47	0.27		0.39			0.39		0.47			0.15
Tin	mg/L		0.0005	0.001	0.0009		<0.002			<0.002		<0.002			<0.002
Titanium	mg/L		0.015	0.72	0.083		0.037			0.66		0.72			0.35
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	7	1.20		1.5			4		5			7
Total Phosphorus	mg/L	0.02*	0.066	1.6	0.21		**0.12**			**1.0**		**1.6**			**1.0**
Vanadium	mg/L	0.006*	0.0014	0.085	0.0091		0.004			**0.063**		**0.085**			**0.037**
Ion Percentage	%		0.195	46.63	3.77	1.4		5.1	36.9		3.6	26.6	2.2	4.1	
Benzene	ug/L		0.05	0.25	0.091	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	ug/L		0.05	0.5	0.14	<0.3	<0.2	<0.3	<0.3	<0.2	<0.3	<0.2	<0.3	<0.3	<0.2
Ethylbenzene	ug/L		0.05	0.25	0.095	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-Xylene	ug/L		0.05	0.3	0.11	<0.3	<0.2	<0.3	<0.3	<0.2	<0.6	<0.2	<0.3	<0.3	<0.2
p+m-Xylene	ug/L		0.05	0.3	0.15	<0.6	<0.4	<0.6	<0.6	<0.4	<0.3	<0.4	<0.6	<0.6	<0.4
Total Xylenes	ug/L		0.05	0.3	0.09	<0.6	<0.4			<0.4		<0.4			<0.4
Total Oil & Grease	mg/L		0.25	0.5	0.31		<0.5			<0.5		<1			<0.5

NOTES:

1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Historic chemical anomalies retained in database.
5) Unionized ammonia values are calculated based on field determined pH and temperature values.
6) mg/L denotes milligrams per litre.
7) umho/cm denotes microsiemens per centimeter.
8) BOD denotes biological oxygen demand.
9) COD denotes chemical oxygen demand.
10) Blank denotes parameter not analyzed.
11) Bolded text and shading denotes concentration exceeds criterion.
12) Italics denotes parameter concentration was below the laboratory RDL, where the RDL exceeds the relevant PWQO.
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-3
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Inlet Point to Sedimentation Pond 1 (Poplar System) - SS15A									
Date						9-Aug-11	13-Oct-11	13-Mar-12	4-May-12	28-Jul-12	30-Oct-12	13-Jan-13	10-Apr-13	29-May-13	5-Jul-13
Routine/Storm Monitoring						Storm	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Storm	Routine
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Alkalinity (as $CaCO_3$)	mg/L	<25%***	51	220	115	123	191	140	95	82	81	120	100		82
Chloride	mg/L		2.9	94	16	12	20	15	28	11	19	14	11	10	13
Sulphate	mg/L		23	900	105	310	140	130	200	120	84	87	79		110
Ammonia (as N)	mg/L		0.0025	1.69	0.107	0.075	0.075	0.075	0.075	0.075	0.20	0.075	0.075	0.70	0.075
Ammonia Unionized	mg/L	0.02	0.00025	0.12	0.0033	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		<0.015
Nitrate	mg/L		0.02	7.61	0.92	0.1	0.5	1.2	4.9	1.1	2.3	0.62	0.82	1.6	0.34
Nitrite	mg/L		0.005	0.3	0.041	0.03								0.11	
Phenols	mg/L	0.001	0.0005	0.013	0.00092		**0.012**	**0.0023**	<0.0010	**0.0041**	<0.0010	<0.0010	<0.0010		<0.0010
Boron	mg/L	0.200	0.060	0.910	0.226	**0.32**	**0.26**	**0.29**	**0.38**	**0.21**	0.18	0.20	**0.26**	**0.32**	**0.29**
Calcium	mg/L		26	530	75	130	93	78	86	73	56	59	110	59	60
Chromium	mg/L	0.0089	0.0025	0.3100	0.0070	<0.005	0.005	**0.012**	<0.0050	**0.015**	**0.027**	0.0073	**0.042**	<0.005	<0.0050
Iron	mg/L	0.300	0.200	310.000	5.413	**0.4**	**4.0**	**12**	**2.7**	**15**	**27**	**6.8**	**43**	**3.6**	**3.9**
Magnesium	mg/L		7.1	150	22	27	24	24	24	19	19	18	30	15	16
Potassium	mg/L		2.6	41	7.41	6.6	13	6.5	5.7	6.2	8.7	5.5	8.9	5.7	6.5
Sodium	mg/L		4	41	11	16	14	14	15	11	13	13	12	11	13
Nickel	mg/L	0.025	0.001	0.42	0.0100	0.002	0.016	0.016	0.005	0.021	**0.033**	0.0090	**0.059**	0.007	0.0065
Zinc	mg/L	0.020	0.00	0.76	0.02	<0.005	**0.021**	**0.031**	0.010	**0.039**	**0.070**	**0.021**	**0.11**	0.02	0.015
pH	(pH units)	6.5-8.5	6.9	8.8	7.7	8.16	6.87	8.28	7.39	7.36	7.65	7.88	7.16		8.2
Total Organic Carbon	mg/L		6.40	42.00	12.36	10.4	29.5	17	14.0	12.0	17	11	8.8		8.7
Aluminum	mg/L	0.075*	0.45	45	4.24	**0.45**								**2.6**	
Arsenic	mg/L	0.100*	0.001	0.019	0.0029	0.001								0.002	
Barium	mg/L		0.028	0.26	0.059	0.05								0.036	
Beryllium	mg/L	1.100	0.000	0.002	0.000	<0.0005								<0.0006	
Bismuth	mg/L		0.0005	0.0005	0.00050	<0.001								<0.0010	
Cadmium	mg/L	0.0002	0.00005	0.0005	0.000076	<0.0001								<0.0001	
Cobalt	mg/L	0.0009	0.00025	0.033	0.0026	<0.0005								**0.0015**	
Copper	mg/L	0.005	0.004	0.054	0.0098	0.005								**0.007**	
Lead	mg/L	0.005	0.00025	0.033	0.0024	<0.0005								0.0017	
Molybdenum	mg/L	0.040*	0.006	0.02	0.010	0.014								0.007	
Selenium	mg/L	0.100	0.001	0.003	0.002	<0.002								<0.005	
Silver	mg/L	0.0001	0.00005	0.0002	0.000113									<0.00010	
Strontium	mg/L		0.15	0.47	0.27	0.43								0.18	
Tin	mg/L		0.0005	0.001	0.0009	<0.001								<0.002	
Titanium	mg/L		0.015	0.72	0.083	0.015								0.045	
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	7	1.20	1.5								1.9	
Total Phosphorus	mg/L	0.02*	0.066	1.6	0.21	**0.086**								**0.10**	
Vanadium	mg/L	0.006*	0.0014	0.085	0.0091	0.0014								0.005	
Ion Percentage	%		0.195	46.63	3.77	0.7	0.9	2.9	0.7	6.9	7.0	2.8	19.3		4.0
Benzene	ug/L		0.05	0.25	0.091	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.2
Toluene	ug/L		0.05	0.5	0.14	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.20	<0.3
Ethylbenzene	ug/L		0.05	0.25	0.095	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.2
o-Xylene	ug/L		0.05	0.3	0.11	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.20	<0.3
p+m-Xylene	ug/L		0.05	0.3	0.15	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.40	<0.6
Total Xylenes	ug/L		0.05	0.3	0.09	<0.6									
Total Oil & Grease	mg/L		0.25	0.5	0.31										

NOTES:

1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Historic chemical anomalies retained in database.
5) Unionized ammonia values are calculated based on field determined pH and temperature values.
6) mg/L denotes milligrams per litre.
7) umho/cm denotes microsiemens per centimeter.
8) BOD denotes biological oxygen demand.
9) COD denotes chemical oxygen demand.
10) Blank denotes parameter not analyzed.
11) Bolded text and shading denotes concentration exceeds criterion.
12) Italics denotes parameter concentration was below the laboratory RDL, where the RDL exceeds the relevant PWQO.
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-3
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Inlet Point to Sedimentation Pond 1 (Poplar System) - SS15A									
Date						28-Aug-13	7-Oct-13	11-Jan-14	8-Apr-14	7-Jul-14	15-Oct-14	4-Jan-15	10-Apr-15	25-Oct-15	25-Feb-16
Routine/Storm Monitoring						Storm	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Alkalinity (as $CaCO_3$)	mg/L	<25%***	51	220	115		180	60		61	150	71	170	51	130
Chloride	mg/L		2.9	94	16	21	44	11	26	6	28	9	11	8.2	6.9
Sulphate	mg/L		23	900	105		110	46	120	68	56	33	60	900	92
Ammonia (as N)	mg/L		0.0025	1.69	0.107	0.075	1.69	0.58	0.075	0.19	0.075	0.27	0.075	0.35	0.08
Ammonia Unionized	mg/L	0.02	0.00025	0.12	0.0033		**0.12**	0.0055	<0.0019	0.0085	<0.0021	0.0031	<0.0057	0.0051	<0.0013
Nitrate	mg/L		0.02	7.61	0.92	0.05	0.42	1.60	0.79	0.47	0.05	1.02	0.35	1.67	1.00
Nitrite	mg/L		0.005	0.3	0.041	<0.010									
Phenols	mg/L	0.001	0.0005	0.013	0.00092		**0.0011**	**0.002**	**0.006**	**0.002**	**0.013**	**0.0083**	<0.0010	<0.0010	<0.0010
Boron	mg/L	0.200	0.060	0.910	0.226	**0.39**	**0.91**	0.095	**0.28**	0.19	0.19	0.099	0.12	0.13	0.11
Calcium	mg/L		26	530	75	63	78	30	80	41	67	32	63	250	63
Chromium	mg/L	0.0089	0.0025	0.3100	0.0070	<0.005	<0.0050	<0.0050	0.005	**0.033**	0.0057	<0.0050	<0.0050	<0.005	<0.0050
Iron	mg/L	0.300	0.200	310.000	5.413	**2.8**	**2.1**	**0.36**	**2.90**	**30**	**4.7**	**2.0**	**3.2**	0.20	**2.4**
Magnesium	mg/L		7.1	150	22	22	23	8.3	24	14	27	8.4	17	88	18
Potassium	mg/L		2.6	41	7.41	5.2	11	7.8	6.2	8.4	17	9.3	5.2	2.6	4.8
Sodium	mg/L		4	41	11	12	41	6.3	17	4.9	8.0	4	5.8	14	6.6
Nickel	mg/L	0.025	0.001	0.42	0.0100	0.005	0.0065	0.001	0.0078	**0.038**	0.0079	0.003	0.0047	0.002	0.0038
Zinc	mg/L	0.020	0.00	0.76	0.02	<0.01	0.011	0.012	0.011	**0.077**	**0.021**	0.014	0.010	<0.02	0.0069
pH	(pH units)	6.5-8.5	6.9	8.8	7.7	7.9	8.13	7.82	7.87	7.88	7.74	8.02	8.27	7.84	7.99
Total Organic Carbon	mg/L		6.40	42.00	12.36		15	7.4	10	18.0	42	11	9.9	7.6	6.4
Aluminum	mg/L	0.075*	0.45	45	4.24	**4.5**									
Arsenic	mg/L	0.100*	0.001	0.019	0.0029	0.002									
Barium	mg/L		0.028	0.26	0.059	0.054									
Beryllium	mg/L	1.100	0.000	0.002	0.000	<0.0006									
Bismuth	mg/L		0.0005	0.0005	0.00050	<0.0010									
Cadmium	mg/L	0.0002	0.00005	0.0005	0.000076	<0.0001									
Cobalt	mg/L	0.0009	0.00025	0.033	0.0026	**0.0012**									
Copper	mg/L	0.005	0.004	0.054	0.0098	**0.007**									
Lead	mg/L	0.005	0.00025	0.033	0.0024	0.0011									
Molybdenum	mg/L	0.040*	0.006	0.02	0.010	0.014									
Selenium	mg/L	0.100	0.001	0.003	0.002	<0.005									
Silver	mg/L	0.0001	0.00005	0.0002	0.000113	<0.00010									
Strontium	mg/L		0.15	0.47	0.27	0.33									
Tin	mg/L		0.0005	0.001	0.0009	<0.002									
Titanium	mg/L		0.015	0.72	0.083	0.16									
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	7	1.20	1.5									
Total Phosphorus	mg/L	0.02*	0.066	1.6	0.21	**0.2**									
Vanadium	mg/L	0.006*	0.0014	0.085	0.0091	0.01									
Ion Percentage	%		0.195	46.63	3.77		2.4	1.9		6.6	6.5	3.5	0.2	0.3	1.7
Benzene	ug/L		0.05	0.25	0.091	<0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	ug/L		0.05	0.5	0.14	<0.20	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Ethylbenzene	ug/L		0.05	0.25	0.095	<0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-Xylene	ug/L		0.05	0.3	0.11	<0.20	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
p+m-Xylene	ug/L		0.05	0.3	0.15	<0.40	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
Total Xylenes	ug/L		0.05	0.3	0.09										
Total Oil & Grease	mg/L		0.25	0.5	0.31										

NOTES:

1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Historic chemical anomalies retained in database.
5) Unionized ammonia values are calculated based on field determined pH and temperature values.
6) mg/L denotes milligrams per litre.
7) umho/cm denotes microsiemens per centimeter.
8) BOD denotes biological oxygen demand.
9) COD denotes chemical oxygen demand.
10) Blank denotes parameter not analyzed.
11) Bolded text and shading denotes concentration exceeds criterion.
12) Italics denotes parameter concentration was below the laboratory RDL, where the RDL exceeds the relevant PWQO.
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-3
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Inlet Point to Sedimentation Pond 1 (Poplar System) - SS15A									
Date						7-Apr-16	14-Jul-16	12-Jan-17	6-Apr-17	13-Jul-17	28-Oct-17	23-Jan-18	4-Apr-18	8-Aug-18	8-Aug-18
Routine/Storm Monitoring						Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Storm
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Alkalinity (as $CaCO_3$)	mg/L	<25%***	51	220	115	150	77	110	220	84	100	120	170	80	
Chloride	mg/L		2.9	94	16	5.8	8.4	13	33	2.9	15	10	12	7.6	7.4
Sulphate	mg/L		23	900	105	70	120	40	160	77	160	110	120	150	
Ammonia (as N)	mg/L		0.0025	1.69	0.107	0.075	0.075	0.42	0.075	0.55	0.03	0.13	0.16	0.025	0.025
Ammonia Unionized	mg/L	0.02	0.00025	0.12	0.0033	<0.0018	<0.0044	0.0009	<0.0016	0.04	<0.0005	0.0032	0.0006	<0.0005	
Nitrate	mg/L		0.02	7.61	0.92	0.37	1.15	1.23	0.52	1.04	2.73	3.14	1.22	5.28	4.83
Nitrite	mg/L		0.005	0.3	0.041										0.196
Phenols	mg/L	0.001	0.0005	0.013	0.00092	<0.0010	*<0.0040*	*<0.0040*	*<0.0040*	*<0.0040*	<0.0010	0.001	<0.0010	<0.0010	
Boron	mg/L	0.200	0.060	0.910	0.226	0.12	0.18	0.13	0.19	0.25	0.15	0.12	**0.26**	**0.33**	**0.34**
Calcium	mg/L		26	530	75	64	62	50	110	76	81	64	86	79	78
Chromium	mg/L	0.0089	0.0025	0.3100	0.0070	**0.013**	**0.009**	**0.027**	<0.005	0.037	0.008	0.008	**0.012**	0.008	**0.009**
Iron	mg/L	0.300	0.200	310.000	5.413	**6.6**	**7.9**	**23**	**2.00**	**38**	**5.5**	**7.7**	**12**	**7.3**	**7.3**
Magnesium	mg/L		7.1	150	22	19	14	16	33	21	22	21	27	19	18
Potassium	mg/L		2.6	41	7.41	6.3	4.6	12	6.8	7.6	5.6	4.5	5.6	6	6.4
Sodium	mg/L		4	41	11	6.7	8.0	4.8	18	5.8	10	7.8	12	9.9	9.4
Nickel	mg/L	0.025	0.001	0.42	0.0100	0.0086	0.012	**0.030**	0.004	**0.051**	0.008	0.01	0.015	0.0110	0.011
Zinc	mg/L	0.020	0.00	0.76	0.02	0.019	0.020	**0.060**	0.020	**0.10**	0.02	0.02	**0.04**	0.020	0.02
pH	(pH units)	6.5-8.5	6.9	8.8	7.7	7.98	7.76	7.29	7.81	8.1	7.05	8.31	7.49	7.1	7.1
Total Organic Carbon	mg/L		6.40	42.00	12.36	10	6.7	15	11	14	10	8.4	12	11	
Aluminum	mg/L	0.075*	0.45	45	4.24										**5.8**
Arsenic	mg/L	0.100*	0.001	0.019	0.0029										0.003
Barium	mg/L		0.028	0.26	0.059										0.052
Beryllium	mg/L	1.100	0.000	0.002	0.000										<0.0006
Bismuth	mg/L		0.0005	0.0005	0.00050										<0.001
Cadmium	mg/L	0.0002	0.00005	0.0005	0.000076										<0.0001
Cobalt	mg/L	0.0009	0.00025	0.033	0.0026										**0.0028**
Copper	mg/L	0.005	0.004	0.054	0.0098										**0.008**
Lead	mg/L	0.005	0.00025	0.033	0.0024										0.0029
Molybdenum	mg/L	0.040*	0.006	0.02	0.010										0.009
Selenium	mg/L	0.100	0.001	0.003	0.002										<0.005
Silver	mg/L	0.0001	0.00005	0.0002	0.000113										*<0.0004*
Strontium	mg/L		0.15	0.47	0.27										0.26
Tin	mg/L		0.0005	0.001	0.0009										<0.002
Titanium	mg/L		0.015	0.72	0.083										0.15
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	7	1.20										<0.7
Total Phosphorus	mg/L	0.02*	0.066	1.6	0.21										**0.18**
Vanadium	mg/L	0.006*	0.0014	0.085	0.0091										**0.012**
Ion Percentage	%		0.195	46.63	3.77	3.1	2.4	6.4	1.4	14.4	2.8	2.0	3.6	5.3	46.6
Benzene	ug/L		0.05	0.25	0.091	<0.2	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.20	<0.20
Toluene	ug/L		0.05	0.5	0.14	<0.3	<0.20	<0.20	<0.20	<0.10	<0.10	<0.20	<0.20	<0.20	<0.20
Ethylbenzene	ug/L		0.05	0.25	0.095	<0.2	<0.10	<0.10	<0.10	<0.20	<0.20	<0.10	<0.20	<0.20	<0.20
o-Xylene	ug/L		0.05	0.3	0.11	<0.3	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.20	<0.20
p+m-Xylene	ug/L		0.05	0.3	0.15	<0.6	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.20	<0.20
Total Xylenes	ug/L		0.05	0.3	0.09		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.20	<0.20
Total Oil & Grease	mg/L		0.25	0.5	0.31										

NOTES:

1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Historic chemical anomalies retained in database.
5) Unionized ammonia values are calculated based on field determined pH and temperature values.
6) mg/L denotes milligrams per litre.
7) umho/cm denotes microsiemens per centimeter.
8) BOD denotes biological oxygen demand.
9) COD denotes chemical oxygen demand.
10) Blank denotes parameter not analyzed.
11) Bolded text and shading denotes concentration exceeds criterion.
12) Italics denotes parameter concentration was below the laboratory RDL, where the RDL exceeds the relevant PWQO.
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-3
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Inlet Point to Sedimentation Pond 1 (Poplar System) - SS15A									
Date						26-Sep-18	2-Oct-18	24-Jan-19	17-Apr-19	2-Oct-19	2-Oct-19	11-Jan-20	18-May-20	15-Nov-20	26-Mar-21
Routine/Storm Monitoring						Storm	Routine	Routine	Routine	Routine	Storm	Routine	Routine	Routine	Routine
Laboratory						Maxxam	Maxxam	Maxxam	Maxxam	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas
Alkalinity (as $CaCO_3$)	mg/L	<25%***	51	220	115		180	77	210	120		120	170	100	130
Chloride	mg/L		2.9	94	16	7.9	28	12	28	24	24	24	41	35	48
Sulphate	mg/L		23	900	105		110	26	160	90		50	110	63	120
Ammonia (as N)	mg/L		0.0025	1.69	0.107	0.025	0.025	0.9	0.025	0.12	0.03	0.099	0.39	0.42	0.089
Ammonia Unionized	mg/L	0.02	0.00025	0.12	0.0033		<0.00061	0.00087	<0.008	0.01		0.003	0.014	0.008	<0.00061
Nitrate	mg/L		0.02	7.61	0.92	0.05	2.75	0.88	0.90	1.21	1.13	1.95	4.36	7.61	5.22
Nitrite	mg/L		0.005	0.3	0.041	<0.010					0.28				
Phenols	mg/L	0.001	0.0005	0.013	0.00092		<0.0010	**0.0014**	<0.0010	<0.0010		0.0005	<0.0010	<0.0010	<0.0010
Boron	mg/L	0.200	0.060	0.910	0.226	0.16	0.26	0.06	**0.29**	**0.34**	**0.33**	**0.21**	**0.56**	0.17	**0.42**
Calcium	mg/L		26	530	75	59	78	26	92	61	61	62	64	57	74
Chromium	mg/L	0.0089	0.0025	0.3100	0.0070	<0.005	<0.005	<0.005	<0.005	<0.0050	<0.0050	**0.037**	0.006	0.007	**0.016**
Iron	mg/L	0.300	0.200	310.000	5.413	**1.60**	3.8	**0.6**	**0.7**	**2.30**	**2.30**	**36.0**	**5.3**	**6.1**	**14**
Magnesium	mg/L		7.1	150	22	16	23	7.1	32	17	17	22	20	16	26
Potassium	mg/L		2.6	41	7.41	5.5	6.5	10	4.6	8.1	8.3	12.0	6.6	19	9.9
Sodium	mg/L		4	41	11	7.1	14	4.2	16	15	14	14.0	33	9.3	34
Nickel	mg/L	0.025	0.001	0.42	0.0100	0.003	0.007	0.001	0.003	0.005	0.005	**0.044**	0.012	0.01	0.023
Zinc	mg/L	0.020	0.00	0.76	0.02	<0.01	0.01	0.01	<0.01	0.010	0.010	**0.1**	**0.030**	**0.040**	**0.04**
pH	(pH units)	6.5-8.5	6.9	8.8	7.7	7.14	7.15	6.98	**8.63**	8.0	7.9	8.3	8.1	7.9	7.5
Total Organic Carbon	mg/L		6.40	42.00	12.36		13	12	10	11		9.7	20	34	25
Aluminum	mg/L	0.075*	0.45	45	4.24	**1**					**1.40**				
Arsenic	mg/L	0.100*	0.001	0.019	0.0029	0.001					0.002				
Barium	mg/L		0.028	0.26	0.059	0.028					0.035				
Beryllium	mg/L	1.100	0.000	0.002	0.000	<0.0006					<0.0006				
Bismuth	mg/L		0.0005	0.0005	0.00050	<0.001					<0.001				
Cadmium	mg/L	0.0002	0.00005	0.0005	0.000076	<0.0001					<0.0001				
Cobalt	mg/L	0.0009	0.00025	0.033	0.0026	0.0006					**0.0011**				
Copper	mg/L	0.005	0.004	0.054	0.0098	0.004					0.005				
Lead	mg/L	0.005	0.00025	0.033	0.0024	0.0007					0.001				
Molybdenum	mg/L	0.040*	0.006	0.02	0.010	0.007					0.009				
Selenium	mg/L	0.100	0.001	0.003	0.002	<0.005					<0.005				
Silver	mg/L	0.0001	0.00005	0.0002	0.000113	*<0.0004*					*<0.0004*				
Strontium	mg/L		0.15	0.47	0.27	0.22					0.22				
Tin	mg/L		0.0005	0.001	0.0009	<0.002					<0.002				
Titanium	mg/L		0.015	0.72	0.083	0.016					0.027				
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	7	1.20	<0.7					0.8				
Total Phosphorus	mg/L	0.02*	0.066	1.6	0.21	**0.066**					**0.11**				
Vanadium	mg/L	0.006*	0.0014	0.085	0.0091	0.003					0.003				
Ion Percentage	%		0.195	46.63	3.77	45.5	0.5	1.1	1.0	1.7	38.7	9.0	1.7	4.2	4.0
Benzene	ug/L		0.05	0.25	0.091	<0.20	<0.25	<0.25	<0.25	<0.50	<0.20	<0.10	<0.25	<0.50	<0.25
Toluene	ug/L		0.05	0.5	0.14	<0.20	<0.50	<0.50	<0.50	<1.0	<0.20	<0.20	<0.50	<1.0	<0.50
Ethylbenzene	ug/L		0.05	0.25	0.095	<0.20	<0.25	<0.25	<0.25	<0.50	<0.20	<0.10	<0.25	<0.50	<0.25
o-Xylene	ug/L		0.05	0.3	0.11	<0.20	<0.25	<0.25	<0.25	<0.50	<0.20	<0.10	<0.25	<0.50	<0.25
p+m-Xylene	ug/L		0.05	0.3	0.15	<0.20	<0.25	<0.25	<0.25	<0.50	<0.20	<0.10	<0.25	<0.50	<0.25
Total Xylenes	ug/L		0.05	0.3	0.09	<0.20	<0.25	<0.25	<0.25	<0.50	<0.20	<0.10	<0.25	<0.50	<0.25
Total Oil & Grease	mg/L		0.25	0.5	0.31										

NOTES:

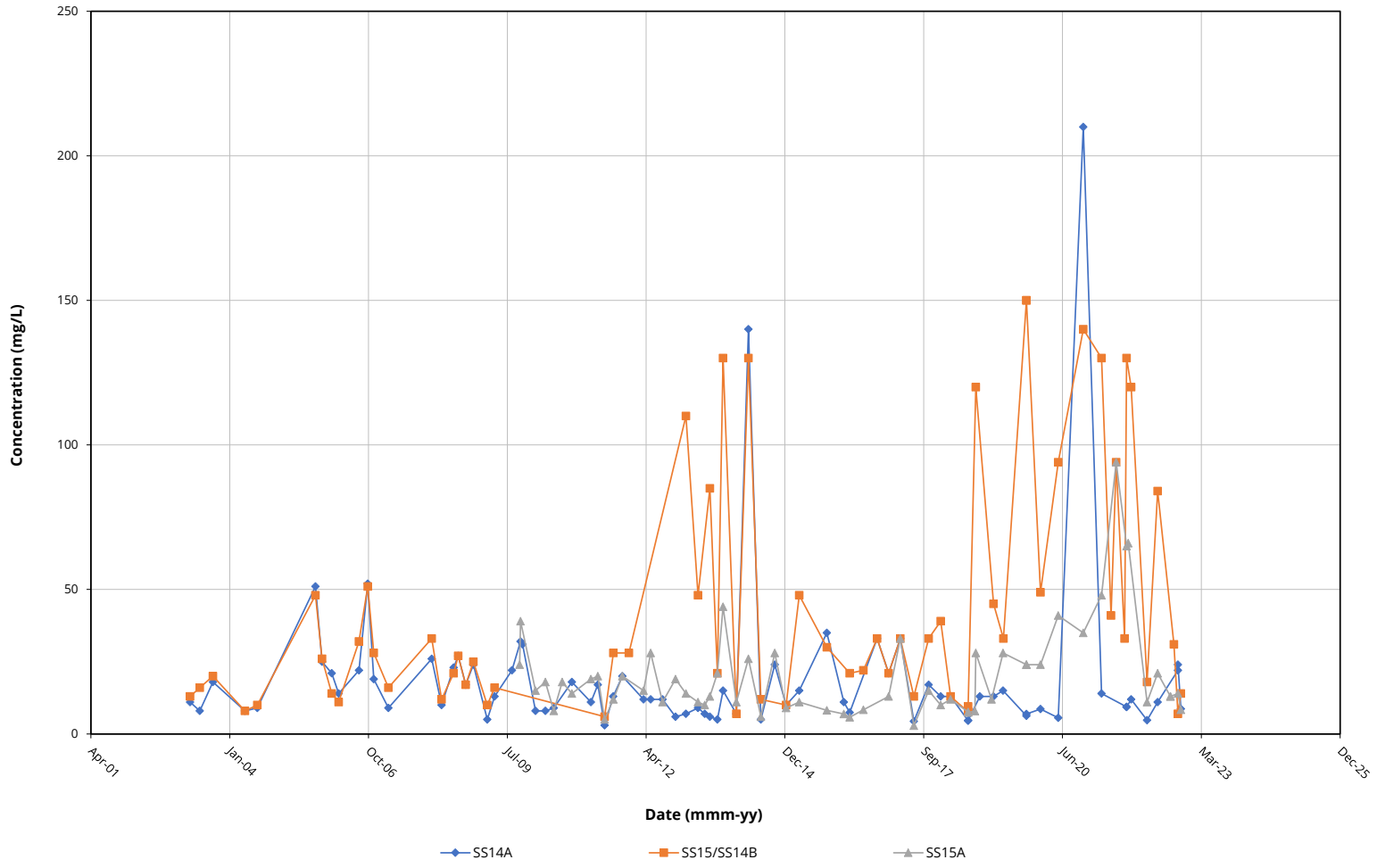
1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Historic chemical anomalies retained in database.
5) Unionized ammonia values are calculated based on field determined pH and temperature values.
6) mg/L denotes milligrams per litre.
7) umho/cm denotes microsiemens per centimeter.
8) BOD denotes biological oxygen demand.
9) COD denotes chemical oxygen demand.
10) Blank denotes parameter not analyzed.
11) Bolded text and shading denotes concentration exceeds criterion.
12) Italics denotes parameter concentration was below the laboratory RDL, where the RDL exceeds the relevant PWQO.
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.

Table B-3
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre

Parameter	Units	PWQO	Min	Max	Geomean	Inlet Point to Sedimentation Pond 1 (Poplar System) - SS15A								
Date						9-Jul-21	23-Sep-21	4-Oct-21	17-Feb-22	4-May-22	4-Aug-22	4-Aug-22	28-Sep-22	18-Oct-22
Routine/Storm Monitoring						Routine	Storm	Routine	Routine	Routine	Routine	Storm	Storm	Routine
Laboratory						Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas
Alkalinity (as $CaCO_3$)	mg/L	<25%***	51	220	115	160		190	85	200	88			76
Chloride	mg/L		2.9	94	16	94	65	66	11	21	13	13	14	8.4
Sulphate	mg/L		23	900	105	110		140	23	79	220			240
Ammonia (as N)	mg/L		0.0025	1.69	0.107	0.025	0.075	0.0025	1.3	0.12	0.074	0.075	0.075	<0.050
Ammonia Unionized	mg/L	0.02	0.00025	0.12	0.0033	<0.0011		<0.0013	0.0043	0.0052	0.002			<0.0011
Nitrate	mg/L		0.02	7.61	0.92	5.82	4.55	1.48	0.97	1.18	2.19	2.34	0.38	0.29
Nitrite	mg/L		0.005	0.3	0.041		0.023					0.153	0.011	
Phenols	mg/L	0.001	0.0005	0.013	0.00092	<0.0010		<0.0010	0.0010	<0.0010	0.0012			<0.0010
Boron	mg/L	0.200	0.060	0.910	0.226	**0.26**	**0.64**	**0.77**	0.07	**0.39**	**0.24**	**0.23**	0.15	0.1
Calcium	mg/L		26	530	75	81	76	92	33	70	180	90	49	87
Chromium	mg/L	0.0089	0.0025	0.3100	0.0070	<0.005	<0.005	<0.005	**0.020**	0.006	**0.023**	<0.005	**0.010**	0.006
Iron	mg/L	0.300	0.200	310.000	5.413	**1.5**	**2.5**	**1.8**	**20**	**5.5**	**23**	**4.3**	**9.4**	**5.7**
Magnesium	mg/L		7.1	150	22	21	22	26	11	23	39	21	13	26
Potassium	mg/L		2.6	41	7.41	5.9	8.8	11	7.3	4.9	9.4	6.9	6.9	6.3
Sodium	mg/L		4	41	11	14	38	40	4.5	20	12	12	6.8	8.5
Nickel	mg/L	0.025	0.001	0.42	0.0100	0.004	0.008	0.007	**0.027**	0.009	**0.033**	0.008	0.014	0.009
Zinc	mg/L	0.020	0.00	0.76	0.02	0.005	0.01	<0.01	**0.05**	0.02	**0.05**	0.01	**0.03**	0.02
pH	(pH units)	6.5-8.5	6.9	8.8	7.7	7.7	7.8	7.7	7.4	8.1	7.5	7.5	7.8	8.1
Total Organic Carbon	mg/L		6.40	42.00	12.36	12		15	17	12	11			8.4
Aluminum	mg/L	0.075*	0.45	45	4.24		**1.8**					**2.8**	**5.7**	
Arsenic	mg/L	0.100*	0.001	0.019	0.0029		0.001					0.002	0.003	
Barium	mg/L		0.028	0.26	0.059		0.046					0.036	0.039	
Beryllium	mg/L	1.100	0.000	0.002	0.000		<0.0006					<0.0006	<0.0006	
Bismuth	mg/L		0.0005	0.0005	0.00050		<0.001					<0.001	<0.001	
Cadmium	mg/L	0.0002	0.00005	0.0005	0.000076		<0.0001					<0.0001	<0.0001	
Cobalt	mg/L	0.0009	0.00025	0.033	0.0026		**0.0011**					**0.0023**	**0.0044**	
Copper	mg/L	0.005	0.004	0.054	0.0098		**0.006**					**0.007**	**0.010**	
Lead	mg/L	0.005	0.00025	0.033	0.0024		0.0009					0.0019	0.0040	
Molybdenum	mg/L	0.040*	0.006	0.02	0.010		0.006					0.01	0.007	
Selenium	mg/L	0.100	0.001	0.003	0.002		<0.005					<0.005	<0.005	
Silver	mg/L	0.0001	0.00005	0.0002	0.000113		*<0.0004*					*<0.0004*	*<0.0004*	
Strontium	mg/L		0.15	0.47	0.27		0.27					0.33	0.18	
Tin	mg/L		0.0005	0.001	0.0009		<0.002					<0.002	<0.002	
Titanium	mg/L		0.015	0.72	0.083		0.027					0.045	0.08	
Total Kjeldahl Nitrogen (TKN)	mg/L		0.35	7	1.20		1.2					<0.7	<0.7	
Total Phosphorus	mg/L	0.02*	0.066	1.6	0.21		**0.15**					**0.11**	**0.17**	
Vanadium	mg/L	0.006*	0.0014	0.085	0.0091		0.004					0.005	**0.011**	
Ion Percentage	%		0.195	46.63	3.77	5.7	30.4	0.5	4.4	0.6	16.1	45.0	41.0	0.8
Benzene	ug/L		0.05	0.25	0.091	<0.10	<0.10	<0.25	<0.10	<0.10	<0.25	<0.25	<0.10	<0.10
Toluene	ug/L		0.05	0.5	0.14	<0.20	<0.20	<0.50	<0.20	<0.20	<0.25	<0.25	<0.20	<0.20
Ethylbenzene	ug/L		0.05	0.25	0.095	<0.10	<0.10	<0.25	<0.10	<0.10	<0.50	<0.50	<0.10	<0.10
o-Xylene	ug/L		0.05	0.3	0.11	<0.10	<0.10	<0.25	<0.10	<0.10	<0.25	<0.25	<0.10	<0.10
p+m-Xylene	ug/L		0.05	0.3	0.15	<0.10	<0.10	<0.25	<0.10	<0.10	<0.25	<0.25	<0.10	<0.10
Total Xylenes	ug/L		0.05	0.3	0.09	<0.10	<0.10	<0.25	<0.10	<0.10	<0.25	<0.25	<0.10	<0.10
Total Oil & Grease	mg/L		0.25	0.5	0.31									

NOTES:

1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
2) * denotes interim PWQO.
3) *** denotes change from background concentrations.
4) Historic chemical anomalies retained in database.
5) Unionized ammonia values are calculated based on field determined pH and temperature values.
6) mg/L denotes milligrams per litre.
7) umho/cm denotes microsiemens per centimeter.
8) BOD denotes biological oxygen demand.
9) COD denotes chemical oxygen demand.
10) Blank denotes parameter not analyzed.
11) Bolded text and shading denotes concentration exceeds criterion.
12) Italics denotes parameter concentration was below the laboratory RDL, where the RDL exceeds the relevant PWQO.
13) The Geomean assumes that any value below the RDL is equal to half of the value of the RDL.



NOTES:

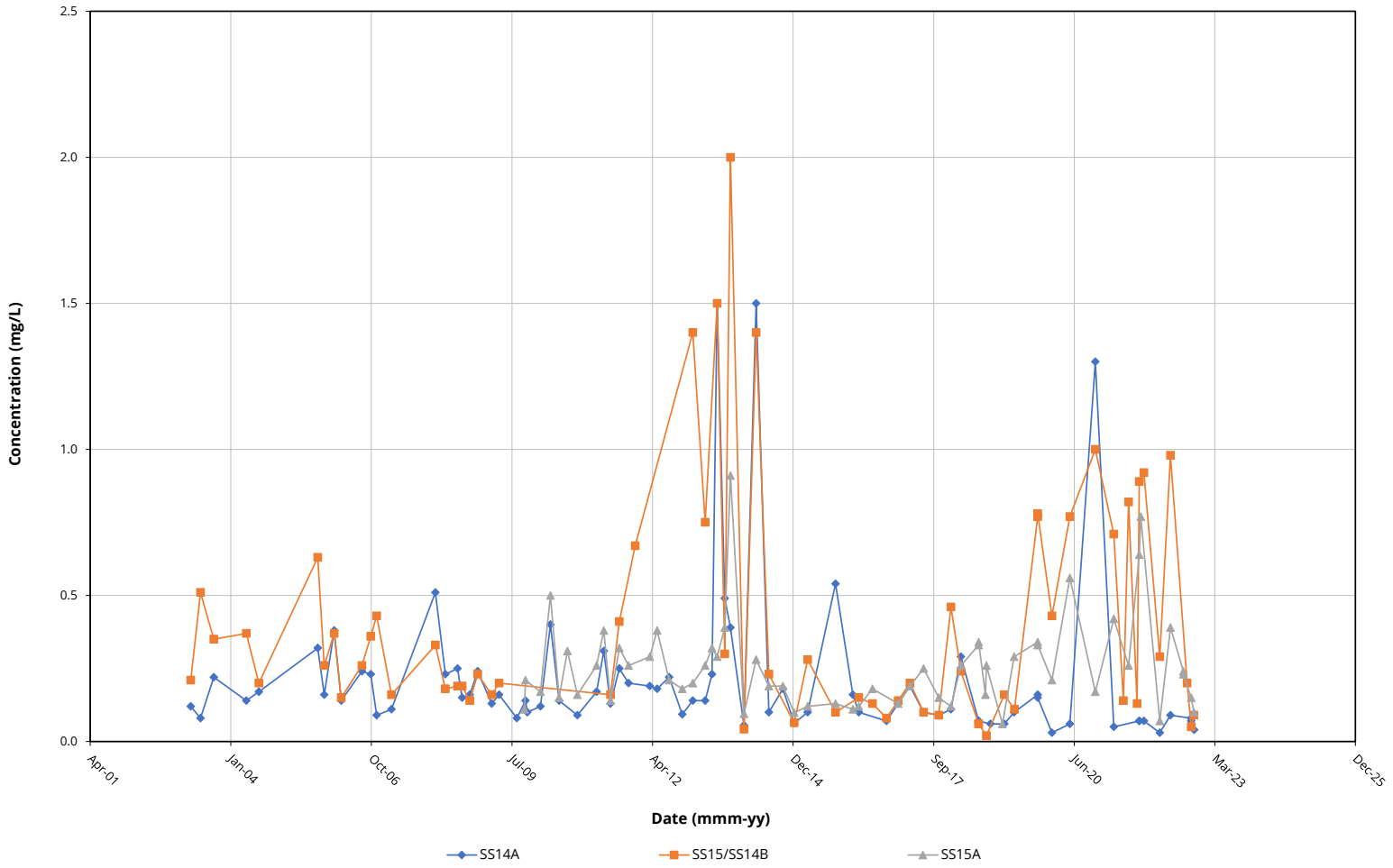
1. mg/L denotes milligrams per litre.
2. For datum plotted off of the graph, refer to data tables.

CONCENTRATION VS. TIME PLOT
Chloride

Landfill Optimization Environmental Assessment

TWIN CREEKS ENVIRONMENTAL CENTRE
WASTE MANAGEMENT OF CANADA CORPORATION

FIGURE NUMBER	PROJECT NUMBER
Figure B-9	2101750
DATE REVISED	**REVISED BY**
3-Nov-23	PEJ



NOTES:

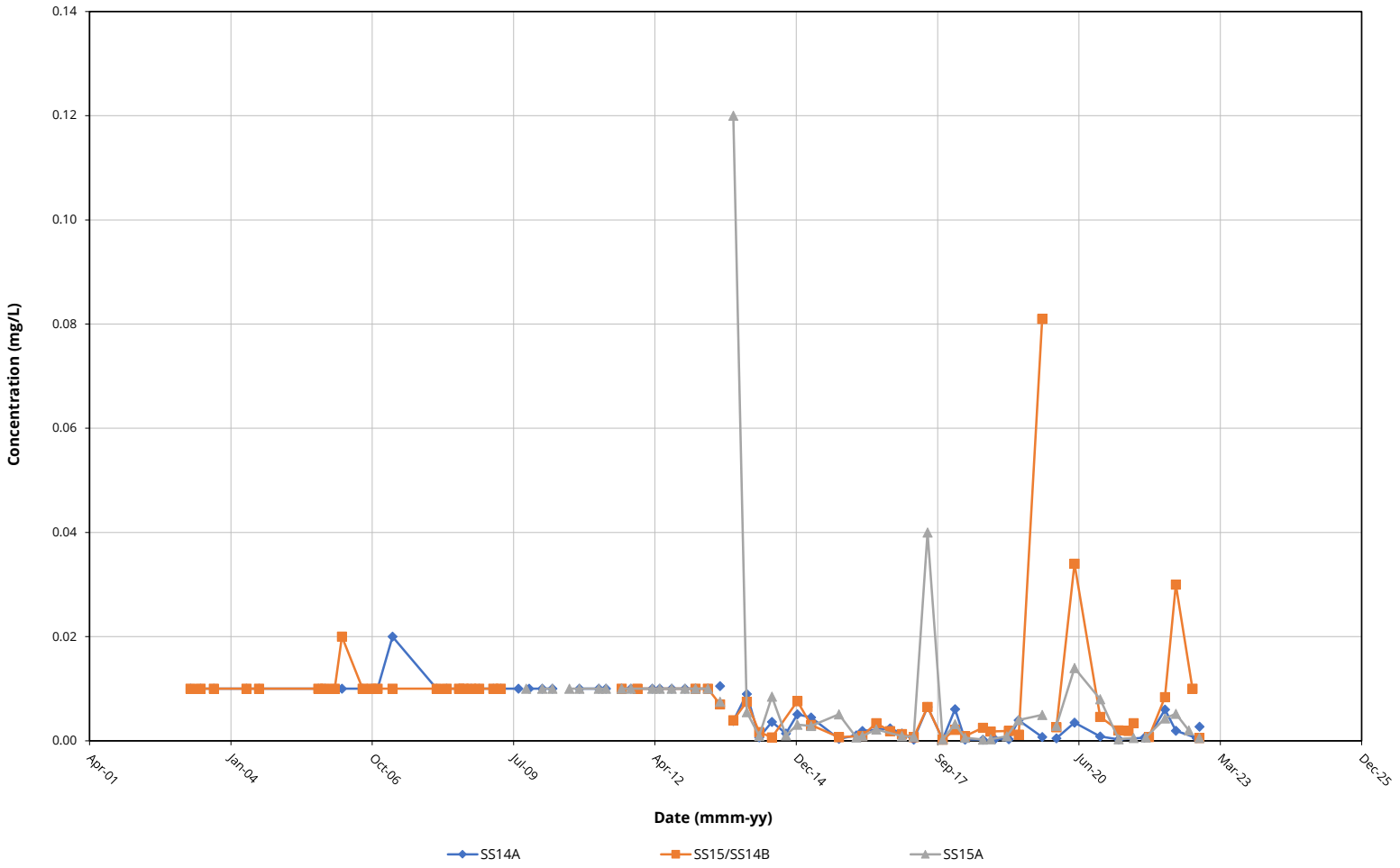
1. mg/L denotes milligrams per litre.
2. For datum plotted off of the graph, refer to data tables.

CONCENTRATION VS. TIME PLOT
Boron

Landfill Optimization Environmental Assessment

TWIN CREEKS ENVIRONMENTAL CENTRE
WASTE MANAGEMENT OF CANADA CORPORATION

FIGURE NUMBER	PROJECT NUMBER
Figure B-10	2101750
DATE REVISED	**REVISED BY**
3-Nov-23	PEJ



NOTES:

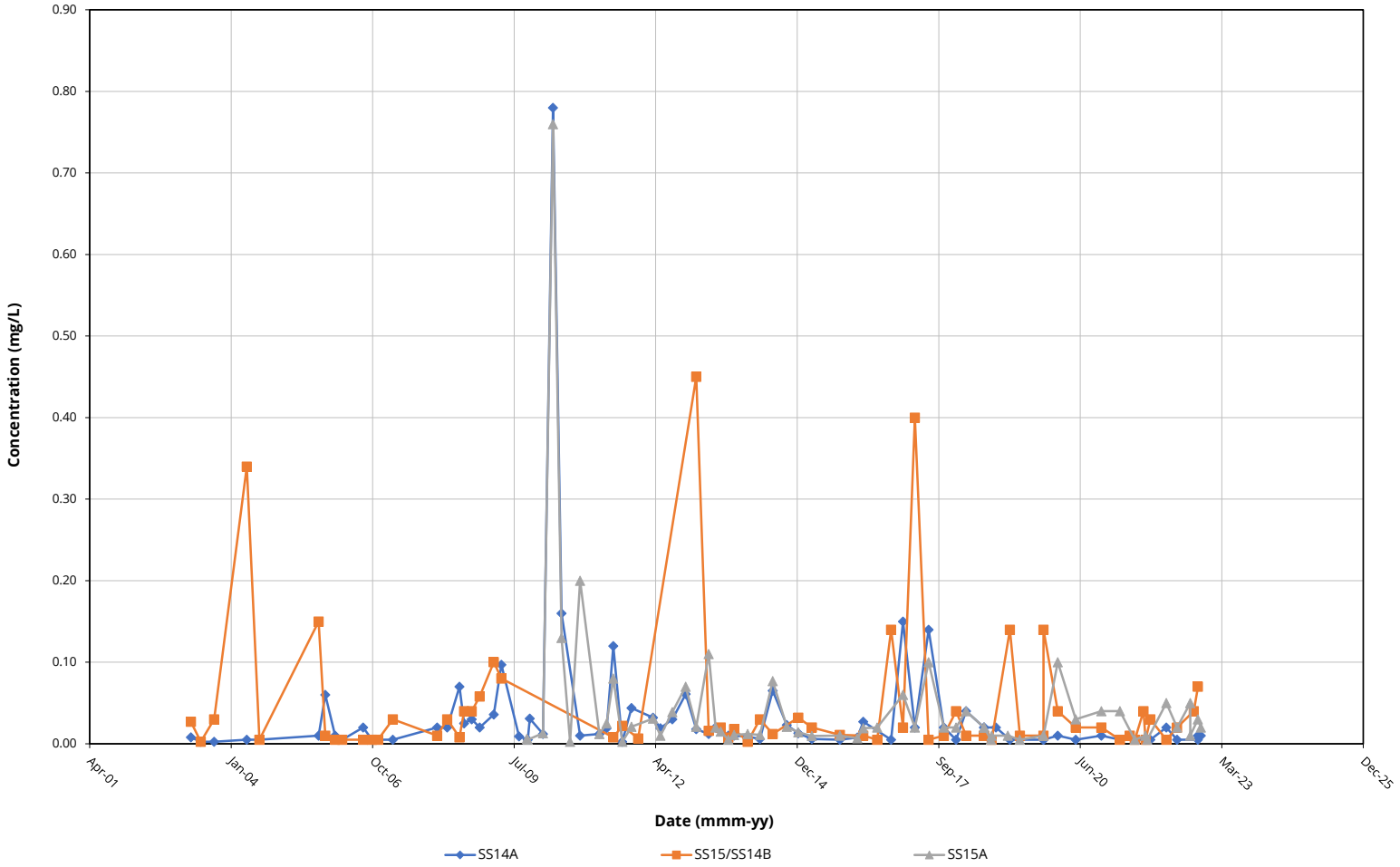
1. mg/L denotes milligrams per litre.
2. For datum plotted off of the graph, refer to data tables.

CONCENTRATION VS. TIME PLOT
Ammonia Un-ionized

Landfill Optimization Environmental Assessment

TWIN CREEKS ENVIRONMENTAL CENTRE
WASTE MANAGEMENT OF CANADA CORPORATION

FIGURE NUMBER	PROJECT NUMBER
Figure B-11	2101750
DATE REVISED	**REVISED BY**
3-Nov-23	PEJ



NOTES:

1. mg/L denotes milligrams per litre.
2. For datum plotted off of the graph, refer to data tables.

CONCENTRATION VS. TIME PLOT
Zinc

Landfill Optimization Environmental Assessment

TWIN CREEKS ENVIRONMENTAL CENTRE
WASTE MANAGEMENT OF CANADA CORPORATION

FIGURE NUMBER	PROJECT NUMBER
Figure B-12	2101750
DATE REVISED	**REVISED BY**
3-Nov-23	PEJ