

Memorandum

Date: March 29, 2022

Project #: 1301136

File #: 1301136

To: Ben Worth, The Municipal Infrastructure Group Ltd.
From: Babak Mirabzadeh, Sarah Sipak
cc: Steve Hollingworth
Re: Preliminary Excess Soil Review
Mill Pond Park, Richmond Hill, Ontario

1. Introduction

Palmer was retained by The Municipal Infrastructure Group Ltd. (the 'Client') to conduct a Preliminary Excess Soil Review to support the Mill Pond Park Stormwater Environmental Assessment (hereinafter referred to as the 'Project') for the Mill Pond Park in Richmond Hill, Ontario (hereinafter referred to as the 'Project Area'). **Figure 1** below depicts the location of the Mill Pond Park and related waterbodies that are included as part of the proposed rehabilitation project.

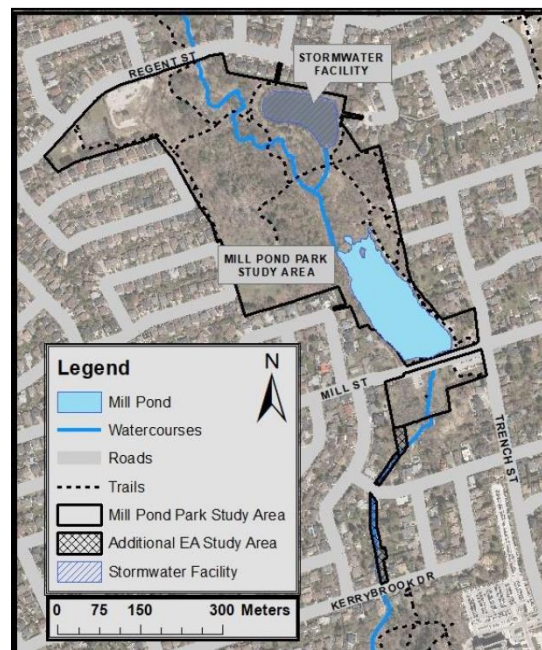


Figure 1. Mill Pond Park Site Map

It is Palmer's understanding that the Project Area consists of land owned by two (2) parties, including the Toronto Region Conservation Authority, and the City of Richmond Hill. Due to numerous parties being involved with ownership of land within the Project Area, an agreement must be in-place to identify the party (Project Leader) that will be responsible for filing the notice on the Registry with regards to excess soil. The Project Leader is considered to be the party that is ultimately responsible to make decisions associated with the Project Area and will be responsible for all work to be completed in accordance with O. Reg. 406/19 and the Rules for Soil Management and Excess Soil Quality Standards. The excess soil planning requirements including the filing of a notice on the Registry (Section 8 of O. Reg. 406/19) will only be required if excess soil will require re-use off-Site or if any of the grouped circumstances set under Schedule 2 of O. Reg. 406/19 apply. Should filing of a notice on the Registry be required, the Project Leader will be responsible to file the notice on the Registry and sign all declarations in support of the filing.

It is also Palmer's understanding that the purpose of this Preliminary Excess Soil Review is to assist the Client, Municipality, and their Contractor to comply with the requirements of O. Reg 406/19 before removing excess soil from the Project Area during the construction phase, if necessary. Palmer also understands that as part of the Project, the Client and Municipality will be assessing options to manage the pond sediment as part of pond cleanout activities that will occur in the near future. A pre-screening of analytical data collected from previous investigations was conducted in order to identify suitable Re-Use Sites as a preliminary action for the excess soil that will be generated during construction activities.

1.1 Background Information

It is Palmer's understanding that The Municipal Infrastructure Group Ltd. (hereinafter referred to as TMIG) was retained by The City of Richmond Hill to the supply of water resources, environmental, and supporting civil engineering consulting services for Mill Pond Park.

The following key details were identified as part of the Environmental Assessment (EA):

- Mill Pond Park covers a total area of 19 hectares;
- The original Master Plan was created in 1970 as a means of enhancing resident's experience with the water's edge; and,
- Since 1970, Mill Pond Park has been developed in the following stages:
 - In the mid-to late 1980s, the Mill Street and Mill Pond weir structure was reconstructed, and the Upper Mill Pond Park/Polish park was developed;
 - In the mid-1990s, a gazebo and washroom structure were constructed;
 - In the early 2000s, trails and amenities along the east side of Mill Pond were constructed; and
 - Most recently, a playground and parking lot were constructed at Mill Street and Wood Lane, invasive species management and tree removal/replacement projects have been completed, and the land at 71 Regent Street was acquired by the City.

As per TMIG's Interim Draft Mill Pond Park Rehabilitation Project File Report (May 2021), the following volumes of sediment will require removal during the pond rehabilitation project:

- Approximately 2,000 m³ of sediment may potentially be removed from the stormwater management facility (SWMF); and
- Approximately 16,000 m³ of sediment may potentially be removed from Mill Pond.

2. Excess Soil Regulatory Framework

As of January 1, 2021, the On-Site and Excess Soil Management Regulation (O. Reg. 406/19) partially came into effect as a means of maximizing the reuse of excess soil within the Project Area where soil and/or crushed rock is to be excavated in order to decrease the hauling of soil to waste receiving sites, landfills, and/or dumps.

In order to meet the requirements under O. Reg. 406/19, the Rules for Soil Management and Excess Soil Quality Standards (ESQS), and Best Management Practices (BMPs) as part of the Mill Pond and the SWMF clean-out, the following will need to be followed prior to and/or during the handling of excess material.

Soil that is excavated within the Project Area that remains within the Project Area or is re-used within the Project Area is not considered excess soil. Therefore, the excess soil planning requirements would not need to be met unless excess soil is hauled off-Site and outside of the Project Area boundaries for re-use and/or disposal. A Record of Site Condition (RSC) has been filed for the Project Area (71 Regent Street), and any excavated soil that is to be re-used within the RSC property (71 Regent Street) must meet the applicable site condition standards of O. Reg. 153/04 that were applied at the time of filing.

2.1 Excess Soil Re-Use Planning

As noted in Section 2 above, the excess soil planning requirements are only required if excess soil is hauled outside of the Project Area boundaries for re-use and/or disposal, or if the circumstances outlined in O. Reg. 406/19, Schedule 2, are not met. If sediment remains within the Project Area and is not considered excess soil, the excess soil planning requirements will not be required. However, if the material is left untreated, appropriate measures to mitigate any risks to human health and/or ecological risk receptors must be implemented upon the placement of the material within the Project Area.

As of January 1, 2022, the excess soil planning and management requirements, if required, would include:

- Preparation of an Assessment of Past Uses (Section B(1) of the Rules document)
 - This assessment is conducted to identify any areas of potential environmental concern (APEC) within the Project Area and to determine if any location where soil is to be excavated could have been affected by a potentially contaminating activity (PCA).
 - This assessment includes a historical record review, interviews, a Site reconnaissance, a review and evaluation of the information gathered, and preparation of a report.
 - **As per, O. Reg. 406/19, Section 11 (2)(1), an Assessment of Past Uses would not be required for this Project Area, as the project relates to the excavation of soil at a stormwater management pond.**

- Preparation and Implementation of a Sampling and Analysis Plan (Section B(2) of Rules document)
 - This plan is developed to identify each location where material is to be excavated that will be subject to sampling and analysis based on the APECs identified during the Assessment of Past Uses and to ensure that an appropriate level of sampling and analysis is conducted to determine the concentrations of contaminants (if any) in the excavated material to identify suitability for reuse and to characterize the distribution of contaminants in stockpiles of SWMF sediment.
 - Once SWMF sediment is removed from the SWMF, it must be segregated into stockpiles by zone (i.e., zone 1- inlet, zone 2- centre, zone 3- outlet), and physically dewatered prior to stockpile sampling. If wet SWMF sediment is to be solidified through the addition of a stabilizing agent (such as natural non-polymer additives or synthetic polymers), additional requirements will apply. Refer to *Section 2.2* below.
 - If the SWMF sediment is removed without regard for the different zones within the ponds (i.e., all SWMF sediment is mixed together and not segregated), the sampling frequencies set out in Table 2 of Schedule E, to O. Reg. 153/04, Minimum Stockpile Sampling Frequency apply. (Section B2(3)(17iv) of the Rules document).
 - Based on the contaminants present in sediment, the mixing of the soil must not be carried out to dilute the concentration of contaminants in the soil. By segregating stockpiles during excavation, a suitable re-use site can be identified for individual stockpile and determine which stockpile may be reused within the project area, with or without processing at the project area, and which excess soil may be deposited at a Class 1 soil management site or at a landfill or dump; and the potential reuse sites at which excess soil from the project area may be deposited for final placement. In addition, if the soil is to remain within the Project Area and is not considered excess soil, appropriate measures to mitigate any risks to human health and/or ecological risk receptors must be implemented upon the placement of the material within the Project Area.
 - At a minimum, SWMF sediment must be analyzed for the following parameters as per Section B2(17) of the Soil Rules:
 - Petroleum Hydrocarbon (PHC) Fractions F1 to F4, including Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX);
 - Metals, including hydride-forming metals (Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Cobalt, Copper, Lead, Molybdenum, Nickel, Selenium, Silver, Thallium, Uranium, Vanadium, and Zinc);
 - Polycyclic Aromatic Hydrocarbons (PAHs);
 - Electrical Conductivity (EC), Sodium Adsorption Ratio (SAR), Cyanide, and pH; and
 - Leachate analysis for Metals (including hydride-forming metals) using the Synthetic Precipitation Leaching Procedure (mSPLP) is required for stormwater ponds, as per Part I, Section B (2)(5) of the Rules document. The Leachate Screening Level tables in Appendix 2 of the Rules document also identify the leachate parameters that are subject to leachate testing (denoted by an 'a'). Sample analysis and associated parameters required to be analyzed will need to be assessed based on where the excess soil will be finally placed for re-use (property use type and ground water conditions).

- Once SWMF sediment has been removed, segregated, and dewatered or solidified, the sampling frequencies are as follows:
 - A minimum of three (3) samples must be analyzed if less than 600 m³ of soil will be excavated;
 - If more than 600 m³ of soil will be excavated, at least one (1) sample shall be analyzed for each 200 m³ of soil for the first 10,000 m³ of soil to be excavated;
 - At least one (1) sample shall be analyzed for each additional 450 m³ after the first 10,000 m³ of soil to be excavated;
 - At least one (1) sample shall be analyzed for each additional 2,000 m³ after the first 40,000 m³ of soil to be excavated; and,
 - Three (3) samples plus 10% of the required number of soil samples (as detailed in the line items above) must be collected for leachate (mSPLP) analysis.
- If sediment remains within the Project Area and is not considered excess soil, the excess soil planning requirements are not required, including the soil characterization. However, sampling should be done in accordance with O. Reg. 153/04 Table 2, Minimum Stockpile Sampling Frequency, at a minimum, to identify chemical quality of sediment. This will assist the Qualified Person (QP) to determine potential remedial measures required should the sediment remain within the Project Area and/or risk management measures that would need to be implemented to mitigate any risks to human health or ecological receptors.
- Sediment can be stockpiled within the base (limits of the SWMF) of the pond(s) to allow for sampling post dewatering activities. In-situ sampling can also occur; however, results may be biased due to high levels of moisture associated with wet samples (as seen in the sampling program previously completed by others).
- Sampling frequencies are based on the total volume of sediment to be excavated per zone. If the SWMF sediment is removed without regard for the different zones within the pond (i.e., all sediment is mixed together and not segregated), the sampling frequencies set out in Table 2 of Schedule E of O. Reg. 153/04, Minimum Stockpile Sampling Frequency apply. Sampling by zone, including the collection of QA/QC and mSPLP samples that would be required, will likely result in a higher volume of samples to be collected, than if samples were collected in accordance with O. Reg 153/04 stockpile sampling frequencies from one mixed stockpile.
- Preparation of a Soil Characterization report (Section B(3) of the Rules document)
 - This assessment is conducted to verify and/or refute the presence of any potential contaminants of concern (PCOC) associated with any APECs.
 - Soil must be adequately characterized and logged, and a sampling program must be conducted based on the proposed volume of soil to be excavated during construction activities.
 - Laboratory analytical results must be reviewed and evaluated.
 - In-situ sampling should be conducted prior to construction to characterize the excess soil. Ex-situ (stockpile sampling) would likely be conducted during construction. If ex-situ sampling is conducted, a delay to the construction schedule should be anticipated, as laboratory results will need to be obtained prior to hauling sediment off-site for re-use.

- If sampling cannot be conducted within the Project Area due to limitations and constraints, excess material can be hauled to an interim site (Class 2 Soil Management Site or Local Waste Transfer Facility). Only dry soil (dewatered and/or solidified soil) is to be hauled to these interim sites. Sampling must be conducted immediately upon receipt at the interim site and a written notice is to be provided to the MECP. There are limits and setbacks with regards to the amount of soil that can be placed at an interim site at one time (O. Reg. 406/19 s.21). Once analytical results are obtained and soil is hauled to the re-use site, a notice must be provided to the MECP and the project is not considered complete until the excess soil is transferred to the final placement destination.
- Preparation of an Excess Soil Destination Report (Section B4 of the Rules document)
 - This report identifies the volume and quality of soil to be removed from the project area as excess soil, characterizes the reuse and/or management site, and identifies any contingency measures that are to be implemented.
- Development and Implementation of a Track System (Section B5 of the Rules document)
 - This report identifies the system that will be used to track the movement of each load of excess soil that leaves the project area.
- Registry (O. Reg 406/19 – Section 8)
 - **The excess soil planning requirements including the filing of a notice on the Registry will only be required if excess soil will require re-use off-Site or if any of the grouped circumstances set under Schedule 2 of O. Reg. 406/19 apply. However, the MECP has indicated that filing a notice on the Registry is voluntary, even if an exemption applies.**
 - Submission on the Environmental Site Registry allows the Ministry of Environment, Conservation and Parks (MECP) to review and acknowledge the Soil Management Plan that is proposed for the project area.
- Soil Management Plan (Management of Excess Soil - A Guide for Best Management Practices)
 - When tendering contracts that may include the management or movement of excess soil, municipalities, government ministries and agencies and others who procure services related to excess soil management, should consider incorporating the best management practices as requirements (Ontario MECP, Management of Excess Soil – A Guide For Best Management Practices, 2019). Procurement documents should specify the need for a Soil Management Plan at a Source Site (the Project Area), and the need to identify the appropriateness of Receiving Site(s) based on a Fill Management Plan.
 - Provides guidance to the Contractor and outlines how the excess soil is to be handled during construction.
 - The owner/operator of a Source Site should retain the services of a QP to develop a Soil Management Plan.

- Fill Management Plan(Management of Excess Soil - A Guide for Best Management Practices)
 - Provides guidance to the Contractor and outlines how imported soil is to be brought to the Project Area for reuse and how it is to be handled prior to and during reuse.
 - When excess soil is removed from the Source Site and transported to a Receiving Site each load should be accompanied by documentation signed by the Source Site QP that includes appropriate and representative soil analyses from the soil at the Source Site confirming the soil quality is acceptable for the intended Receiving Site in accordance with the Receiving Site's Fill Management Plan.

2.2 Soil Management Requirements

Soil management requirements include:

- Soil Storage Rules for Liquid Soil (Section C(1)(2) of the Rules document)
 - Liquid soil that is stored at a Project Area or at a local waste transfer facility must be managed in accordance with the following:
 - All storage and processing locations of liquid soil, processed, or dewatered/solidified soil and process residues shall be readily accessible for inspection by a provincial officer;
 - No more than 10,000 m³ of liquid soil, processed, or dewatered/solidified soil and process residues may be present at the Project Area at any one (1) time; and,
 - All liquid soil, processed, or dewatered/solidified soil and process residues that are liquid shall be stored in a leakproof container on an impermeable surface in a manner sufficient to contain and prevent the material from escaping into the natural environment.
- Requirements for Processing Excess Soil (Section C(5) of the Rules document.)
 - The following requirements apply for the mixing of a material with liquid soil for the purpose of dewatering or solidifying the liquid soil at a Project Area or a local waste transfer facility:
 - Mixing is not for the purpose of encapsulating or reducing exposure to or mobility of contaminants;
 - Soil being mixed for dewatering/solidification must originate from the Project Area;
 - Material that is being mixed for dewatering/solidification is not a waste for which this processing would not be permitted (e.g., hazardous waste);
 - Amount of material mixed with the soil is limited to that required to enable transportation to another Site or to be reused within the Project Area and does not exceed the amount recommended by the project manufacturer or distributor;
 - For mixing with natural non-polymer additives:
 - Material being used for dewatering/solidifying is a natural substance, such as untreated woodchips/sawdust (e.g., not a pressure treated wood product) or mineral substances (e.g., bentonite); and

- Sampling and analysis of this material during the soil characterization program can be completed after the mixing process, if the Qualified Person (QP) is of the opinion that the effect of the material mixed with the soil will not change the outcome of the characterization with respect to the applicable Excess Soil Quality Standards (ESQS).
- For mixing with natural polymer or synthetic polymer additives:
 - Material being used for dewatering/solidifying are mineral based compounds that have binding properties;
 - A QP has determined the appropriateness of the material and has developed procedures for the use of the material used for dewatering/solidifying liquid soil;
 - Sampling and analysis of this material during the soil characterization program must be completed prior to the mixing process, if the QP is of the opinion that mixing with these additives will change the outcome of the characterization with respect to the applicable ESQS of the dewatered/solidified soil;
 - Sampling and analysis of this material during the soil characterization program can be completed after the mixing process, if the Qualified Person (QP) is of the opinion that the effect of the material mixed with the soil will not change the outcome of the characterization with respect to the applicable ESQS of the dewatered/solidified soil; and,
 - Unless the soil mixture is to be transported from the Project Area or local waste transfer facility directly to a waste disposal site that is permitted to accept the soil mixture, the QP must be in the opinion that the polymer and any potential break down products will not result in an adverse impact to human health or the environment.

2.3 Re-Use Rules for Specific Circumstances

Requirements associated with specific rules for reuse sites include:

- Dewatered/Solidified Soil (Section D(1)(2) of the Rules document)
 - Soil that has been mixed with a material for the purpose of dewatering/solidifying may be reused at the Re-Use Site if the following conditions are met:
 - Material used for dewatering/solidifying is a material applicable for mixing and reuse in accordance with the Rules for Soil Management and ESQS; and,
 - If the soil was dewatered/solidified with natural or synthetic polymer additives, the mixture shall be finally placed at a Reuse Site in a location that is at least 30 metres away from a water body.
- Salt-Impacted Excess Soil (Section D(1)(3) of the Rules document)
 - Impacted soil (EC and SAR) resulting solely from the use of a substance for the safety of vehicular/pedestrian traffic applied under conditions of snow, ice, or both are deemed to meet the applicable ESQS and can be reused at one (1) of the following locations:

- Where it is reasonable to expect that the soil will continue to be affected by the same chemicals as a result of continued application of a substance for the safety of vehicular/pedestrian traffic under the conditions of snow and/or ice;
 - At an industrial/commercial property use where non-potable standards apply; and
 - Soil is applied for reuse greater than 1.5 metres below ground surface (mbgs).
 - EC and SAR impacted soil cannot be reused at any of the following locations:
 - Within 30 m of a waterbody;
 - Within 100 m of a potable water well or within an area where potable standards apply; and
 - A location that is used for growing crops or pasturing livestock (such as community garden), unless the excess soil is placed greater than 1.5 mbgs.
 - EC and SAR impacted soil can be reused at a Re-Use Site if the Project Leader has informed the Re-Use Site Owner/Operator of the EC and SAR impacts present in the excess soil, analytical results are provided to the Re-Use Site Owner/Operator (including the Soil Characterization Report), and any potential risks to surface water and ground water identified/communicated to the Re-Use Site Owner/Operator.
- Acceptable pH Range (Section D(1)(4) of the Rules document)
 - If excess soil or soil at the re-use site has pH levels outside of the acceptable pH range (5-9 for surface soil and 5-11 for subsurface soil), the excess soil and leachate analyses must meet the Table 1 ESQS and Table 1 Leachate Screening Levels.
 - If excess soil or soil at the re-use site has pH levels outside of the acceptable pH range, before any excess soil is deposited at a Re-Use Site, the Owner/Operator of the Re-Use Site must ensure that a QP completed an assessment of the potential impacts of the placement of this excess soil at the Re-Use Site and confirms that it will not cause an adverse effect.

2.4 Rules for Specific Types of Re-Use Sites

Due to the presence of wetland and woodland within the Project Area, the Project Area is deemed an environmentally sensitive area. Therefore, excess soil shall only be finally placed within an environmentally sensitive area if the excess soil meets the Table 1 ESQS and the results of any required leachate analysis meets the Table 1 Leachate Screening Levels.

2.5 Beneficial Re-Use Assessment Tool (BRAT)

The BRAT allows for the development of site-specific excess soil quality standards (ESQS) for a Re-Use Site where concentrations may exceed the existing ESQS derived by the Ministry of Environment, Conservation and Parks (MECP). This process is very similar to the Risk Assessment (RA) process, where site-specific standards are calculated to allow the impacted soil to be reused where mitigation measures (i.e., hard cap barrier) will be implemented to minimize any adverse effects to human health and/or ecological receptors. The MECP has provided the BRAT that is to be completed by a QP and reviewed by a QP that has experience with the completion of RAs.

This process involves the review of analytical data and completion of a spreadsheet model that has been developed by the MECP that determines the site-specific standards that are to be applied and risk management measures that may be required upon placement of the excess soil. The application of the BRAT is suitable for re-use sites where impacted soil can remain in-place followed by the installation and management of applicable mitigation measures. Costs to complete the BRAT are anticipated to be a minimum of \$5,000.

As noted in Section 2.4 above, the Project Area is deemed an environmentally sensitive area. Therefore, the BRAT cannot be applied at this Site (Section D(3)(4) of the Rules document). As the BRAT cannot be applied, a RA conducted in accordance with O. Reg. 153/04 can be conducted for the Site should the soil remain within the Project Area and not be hauled off-site as excess soil for re-use.

2.6 Excess Soil Quality Standards (ESQS)

The MECP has developed tables of ESQS for the purpose of determining the applicable ESQS that apply to a Re-Use Site. The excess soil must meet the applicable ESQS in order to be deemed suitable for reuse at the Re-Use Site.

To determine which table of ESQS apply to the deposit of excess soil at a Reuse Site, the following factors must be considered:

- The type of property use for the Re-Use Site (e.g., residential);
- The volume of excess soil to be placed at the Re-Use Site;
- Characteristics of the Re-Use Site (e.g., shallow soil Site);
- Distance of the Re-Use Site to a waterbody; and,
- Whether the Re-Use Site is in an area serviced by municipal drinking water.

The following provides an overview of the ESQS tables that are available for use under O. Reg. 406/19:

Table	Small Volume (up to 350 m3)	Volume Independent
Full Depth, Background	Table 1	Table 1
Full Depth, Potable	Table 2	Table 2.1
Full Depth, Non-Potable	Table 3	Table 3.1
Stratified, Potable	Table 4	Table 4.1
Stratified, Non-Potable	Table 5	Table 5.1
Full Depth, Shallow Soil, Potable	Table 6	Table 6.1
Full Depth, Shallow Soil, Non-Potable	Table 7	Table 7.1
Full Depth, Within 30 m of a Waterbody, Potable	Table 8	Table 8.1
Full Depth, Within 30 m of a Waterbody, Non-Potable	Table 9	Table 9.1

Note: Table 1 ESQS is the same standards as provided in Ontario Regulation 153/04 Table 1 Site Condition Standards

The MECP has also incorporated leachate analysis as a mandatory component to confirm acceptable soil quality when soil to ground water component values are not derived within the development of ESQS and when a soil standard for a contaminant is identified as having analytical limitations. Leachate screening levels are to correspond with the selected applicable ESQS used for chemical analysis comparison (e.g., if Table 2.1 for residential use is the appropriate ESQS, then leachate screening levels of Table 2.1 for residential use is to be applied). Leachate analysis is only required when Metal and Volatile Organic Compound (VOC) concentrations are in exceedance of the ESQS.

3. Pre-Screening of Existing Analytical Data

3.1 Previous Environmental Reports

Palmer was provided with the following environmental report for review:

Report Title: Mill Pond Park Municipal Class Environmental Assessment (MCEA) Schedule B, Town of Richmond Hill

Date: May 25, 2018

Prepared by: Groundwater Environmental Management Services Inc. (GEMS)

Prepared for: Mill Pond Park

GEMS collected sediment samples from Mill Pond and SWMF 17-3 on May 9, 2018. A ponar dredge sampler was used to collect the sediment samples. Six (6) samples from Mill Pond and three (3) samples from SWMF 17-3 were collected for laboratory analysis of PHC Fractions F2-F4, BTEX, Metals and Inorganics, VOCs, PAHs, and pH. One (1) Toxicity Characteristic Leachate Procedure (TCLP) sample was collected from both Mill Pond and SWMF 17-3 for waste characterization purposes.

In comparison with the O. Reg. 153/04 Table 1 Site Condition Standards (SCS), sediment samples were noted to exceed the following parameters:

- Mill Pond
 - SAR and EC exceeded SCS at all six (6) sampling locations;
 - Cyanide exceeded SCS at two (2) sampling locations
 - PHC Fractions F3 and F4 exceeded SCS at all six (6) sampling locations; and,
 - TCLP results indicated the soil was non-hazardous.
- SWMF 17-3
 - SAR exceeded SCS at two (2) sampling locations;
 - EC exceeded SCS at all three (3) sampling locations;
 - Cyanide exceeded SCS at two (2) sampling locations;
 - Metals (Antimony) exceeded SCS at one (1) sampling location;
 - PAHs (Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b/j)fluoranthene, Benzo(g,h,i)perylene, Fluoranthene, Indeno(1,2,3-cd)pyrene, and Pyrene) exceeded SCS at all three (3) sampling locations;
 - VOCs (Acetone) exceeded SCS at one (1) sampling location;
 - PHC Fractions F3 and F4 exceeded SCS at all three (3) sampling locations;
 - TCLP results indicated the soil was non-hazardous.

GEMS noted that the presence of SAR and EC are likely a result of surface runoff and de-icing activities surrounding both ponds.

As the material did not meet the Table 1 SCS, GEMS noted that the material is not suitable for backfill on the project site and should be hauled away and disposed of at an appropriate receiving site. As this report was prepared prior to the implementation of O. Reg. 406/19, suitability for re-use was not assessed as part of GEMS investigation.

Palmer noted that numerous reportable detection limits for parameters including PHC Fraction F2, Benzene, VOCs, and PAHs were elevated in comparison with the Table 1 ESQS (**Appendix A**); however, these elevated reportable detection limits were noted to be due to high moisture content of the sample. Therefore, these elevated reportable detection limits are not considered to be true exceedances.

3.2 Contaminant Concentrations Present in Soil

Palmer has reviewed the provided analytical results of the previously conducted sediment sampling program at the Project Area and has conducted a preliminary comparison to the Table 1, 2.1, and 3.1 ESQS in order to determine suitable Receiving Sites for the excess soil. **Table 1** to **Table 3** below list the exceedances in the analysed soil samples collected during GEMS investigation conducted in 2018. A summary of the analytical comparison is presented in **Appendix A**. Figures showing the location of contaminants in exceedance of the ESQS are presented in **Appendix B**.

Table 1. Soil Exceedances of Table 1 ESQS

Sample ID	Exceeding Parameters	Concentration	Unit	Table 1 ESQS for RPIICC Property Use
MP-S1	EC	2.5	mS/cm	0.57
	Cyanide	0.07	ug/g	0.051
	SAR	5.6	-	2.4
	PHC Fraction F3	520	ug/g	240
	PHC Fraction F4	300	ug/g	120
MP-S2	EC	2.4	mS/cm	0.57
	SAR	4.6	-	2.4
	PHC Fraction F3	430	ug/g	240
	PHC Fraction F4	290	ug/g	120
MP-S3	EC	2.4	mS/cm	0.57
	SAR	4.3	-	2.4
	PHC Fraction F3	540	ug/g	240
	PHC Fraction F4	360	ug/g	120
MP-S4	EC	2.3	mS/cm	0.57

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Sample ID	Exceeding Parameters	Concentration	Unit	Table 1 ESQS for RPIICC Property Use
	SAR	4.1	-	2.4
	PHC Fraction F3	510	ug/g	240
	PHC Fraction F4	330	ug/g	120
MP-S5	EC	2.0	mS/cm	0.57
	PHC Fraction F3	420	ug/g	240
	PHC Fraction F4	310	ug/g	120
MP-S6	EC	2.1	mS/cm	0.57
	Cyanide	0.07	ug/g	0.051
	SAR	3.2	-	2.4
	PHC Fraction F3	510	ug/g	240
	PHC Fraction F4	390	ug/g	120
SWMF-S1	EC	3.9	mS/cm	0.57
	Cyanide	0.11	ug/g	0.051
	SAR	11	-	2.4
	Benzo(a)pyrene	0.43	ug/g	0.3
	Benzo(b/j)fluoranthene	0.86	ug/g	0.47
	Fluoranthene	1.2	ug/g	0.56
	Indeno(1,2,3-cd)pyrene	0.48	ug/g	0.23
	PHC Fraction F3	1400	ug/g	240
	PHC Fraction F4	1000	ug/g	120
SWMF-S2	EC	2.9	mS/cm	0.57
	Cyanide	0.11	ug/g	0.051
	SAR	7.7	-	2.4
	Benzo(a)anthracene	0.59	ug/g	0.36
	Benzo(a)pyrene	0.74	ug/g	0.3
	Benzo(b/j)fluoranthene	1.4	ug/g	0.47
	Benzo(g,h,i)perylene	0.69	ug/g	0.68
	Fluoranthene	2.3	ug/g	0.56
	Indeno(1,2,3-cd)pyrene	0.71	ug/g	0.23
	Pyrene	1.6	ug/g	1
	PHC Fraction F3	1300	ug/g	240
	PHC Fraction F4	1100	ug/g	120

Sample ID	Exceeding Parameters	Concentration	Unit	Table 1 ESQS for RPI/ICC Property Use
SWMF-S3	EC	1.1	mS/cm	0.57
	Antimony	1.5	ug/g	1.3
	Benzo(a)anthracene	0.47	ug/g	0.36
	Benzo(a)pyrene	0.67	ug/g	0.3
	Benzo(b/j)fluoranthene	1.4	ug/g	0.47
	Fluoranthene	1.9	ug/g	0.56
	Indeno(1,2,3-cd)pyrene	0.68	ug/g	0.23
	Pyrene	1.4	ug/g	1
	PHC Fraction F3	1100	ug/g	240
	PHC Fraction F4	770	ug/g	120
	Acetone	1.0	ug/g	0.5

Note: Bold value indicates exceedance of Table 1 ESQS

Table 2. Soil Exceedances of Table 2.1 ESQS

Sample ID	Exceeding Parameters	Concentration	Unit	Table 2.1 ESQS for RPI Property Use	Table 2.1 ESQS for ICC Property Use
MP-S1	EC	2.5*	mS/cm	0.7	1.4
	Cyanide	0.07*	ug/g	0.051	0.051
	SAR	5.6	-	5	12
	PHC Fraction F3	520*	ug/g	240	240
MP-S2	EC	2.4*	mS/cm	0.7	1.4
	PHC Fraction F3	430*	ug/g	240	240
MP-S3	EC	2.4*	mS/cm	0.7	1.4
	PHC Fraction F3	540*	ug/g	240	240
MP-S4	EC	2.3*	mS/cm	0.7	1.4
	PHC Fraction F3	510*	ug/g	240	240
MP-S5	EC	2.0*	mS/cm	0.7	1.4
	PHC Fraction F3	420*	ug/g	240	240
MP-S6	EC	2.1*	mS/cm	0.7	1.4
	Cyanide	0.07*	ug/g	0.051	0.051
	PHC Fraction F3	510*	ug/g	240	240
SWMF-S1	EC	3.9*	mS/cm	0.7	1.4

Sample ID	Exceeding Parameters	Concentration	Unit	Table 2.1 ESQS for RPI Property Use	Table 2.1 ESQS for ICC Property Use
	Cyanide	0.11*	ug/g	0.051	0.051
	SAR	11	-	5	12
	Benzo(a)pyrene	0.43*	ug/g	0.31	0.31
	Fluoranthene	1.2	ug/g	0.69	2.8
	Indeno(1,2,3-cd)pyrene	0.48	ug/g	0.38	0.76
	PHC Fraction F3	1400*	ug/g	240	240
SWMF-S2	EC	2.9*	mS/cm	0.7	1.4
	Cyanide	0.11*	ug/g	0.051	0.051
	SAR	7.7	-	5	12
	Benzo(a)anthracene	0.59	ug/g	0.5	0.92
	Benzo(a)pyrene	0.74*	ug/g	0.31	0.31
	Fluoranthene	2.3	ug/g	0.69	2.8
	Indeno(1,2,3-cd)pyrene	0.71	ug/g	0.38	0.76
	PHC Fraction F3	1300*	ug/g	240	240
SWMF-S3	EC	1.1	mS/cm	0.7	1.4
	Benzo(a)pyrene	0.67*	ug/g	0.31	0.31
	Fluoranthene	1.9	ug/g	0.69	2.8
	Indeno(1,2,3-cd)pyrene	0.68	ug/g	0.38	0.76
	PHC Fraction F3	1100*	ug/g	240	240
	Acetone	1.0*	ug/g	0.5	0.5

Note: Bold value indicates exceedance of Table 2.1 RPI ESQS

* indicates exceedance of Table 2.1 ICC ESQS

Table 3. Soil Exceedances of Table 3.1 ESQS

Sample ID	Exceeding Parameters	Concentration	Unit	Table 3.1 ESQS for RPI Property Use	Table 3.1 ESQS for ICC Property Use
MP-S1	EC	2.5*	mS/cm	0.7	1.4
	Cyanide	0.07*	ug/g	0.051	0.051
	SAR	5.6	-	5	12
	PHC Fraction F3	520	ug/g	300	1700
MP-S2	EC	2.4*	mS/cm	0.7	1.4
	PHC Fraction F3	430	ug/g	300	1700

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Sample ID	Exceeding Parameters	Concentration	Unit	Table 3.1 ESQS for RPI Property Use	Table 3.1 ESQS for ICC Property Use
MP-S3	EC	2.4*	mS/cm	0.7	1.4
	PHC Fraction F3	540	ug/g	300	1700
MP-S4	EC	2.3*	mS/cm	0.7	1.4
	PHC Fraction F3	510	ug/g	300	1700
MP-S5	EC	2.0*	mS/cm	0.7	1.4
	PHC Fraction F3	420	ug/g	300	1700
MP-S6	EC	2.1*	mS/cm	0.7	1.4
	Cyanide	0.07*	ug/g	0.051	0.051
	PHC Fraction F3	510	ug/g	300	1700
SWMF-S1	EC	3.9*	mS/cm	0.7	1.4
	Cyanide	0.11*	ug/g	0.051	0.051
	SAR	11	-	5	12
	Fluoranthene	1.2	ug/g	0.69	70
	Indeno(1,2,3-cd)pyrene	0.48	ug/g	0.38	0.76
	PHC Fraction F3	1400	ug/g	300	1700
SWMF-S2	EC	2.9*	mS/cm	0.7	1.4
	Cyanide	0.11*	ug/g	0.051	0.051
	SAR	7.7	-	5	12
	Benzo(a)anthracene	0.59	ug/g	0.5	1
	Benzo(a)pyrene	0.74*	ug/g	0.57	0.7
	Fluoranthene	2.3	ug/g	0.69	70
	Indeno(1,2,3-cd)pyrene	0.71	ug/g	0.38	0.76
	PHC Fraction F3	1300	ug/g	300	1700
SWMF-S3	EC	1.1	mS/cm	0.7	1.4
	Benzo(a)pyrene	0.67	ug/g	0.57	0.7
	Fluoranthene	1.9	ug/g	0.69	70
	Indeno(1,2,3-cd)pyrene	0.68	ug/g	0.38	0.76
	PHC Fraction F3	1100	ug/g	300	1700

Note: Bold value indicates exceedance of Table 3.1 RPI ESQS

* indicates exceedance of Table 3.1 ICC ESQS

3.3 Potential Re-Use Options

Based on the pre-screening and analytical data comparison, I/C/C property uses with a non-potable ground water condition (Table 3.1 ESQS) are deemed the most suitable type of reuse site for receiving soil from the Project Area with the exception of the Benzo(a)pyrene and Cyanide impacted material. The Benzo(a)pyrene and Cyanide impacted material in the vicinity of MP-S1, MP-S6, SWMF-1, SWMF-2, and SWMF-3, require disposal at a Class 1 Soil Management Site, landfill, or dump.

If a reuse site other than an I/C/C property use with a non-potable ground water condition is selected as a reuse site for the acceptable material, the Beneficial Reuse Assessment Tool (BRAT) or a Risk Assessment (RA) should be conducted for the reuse site prior to receiving the impacted soil from the Project Area. The development of site-specific excess soil quality standards during use of the BRAT or RA would be conducted to reassess the identified contaminant concentrations and calculate site-specific standards that would allow the reuse of the impacted soil at a Receiving Site to occur.

Road salt impacted soil (EC and SAR exceedances) is deemed suitable for reuse at Receiving Sites where road salt will continue to be applied in the area of reuse (i.e., roadway, parking lots, winter trail maintenance), at an industrial/commercial property use where non-potable standards (Table 3) applies and should be placed at depths greater than 1.5 mbgs.

3.3.1 Potential Re-Use Site 1: 71 Regent Street

The parkland located at 71 Regent Street has been evaluated as a potential excess soil re-use area which falls within the Project Area. Therefore, soil moved to this portion of the property would not be considered excess soil. A RSC has been filed for the Project Area (71 Regent Street), and any excavated soil that is to be re-used within the RSC property (71 Regent Street) must meet the applicable site condition standards of O. Reg. 153/04 that were applied at the time of the RSC filing. Road salt impacted soil (EC and SAR exceedances) is deemed suitable for use at 71 Regent Street as long as it is applied in areas where road salt will continue to be applied in the area of reuse (i.e., roadway, parking lots) and should be placed at depths greater than 1.5 mbgs.

3.4 Potential Interim Site

As per O. Reg. 406/19 the following interim sites have been identified:

1. A Class 1 soil management site is a waste disposal site, which includes soil banks and soil processing sites. These sites generally require a waste Environmental Compliance Approval (ECA).
2. A Class 2 soil management site is used for temporary storage or limited processing of dry soil. Sampling of soil can also be conducted at a Class 2 site if it is impractical to do so at the Project Area. This site must be operated by the Project Leader and an ECA is not required if less than 10,000 m³ is stored at one time, the soil is stored for less than 2 years, and notification is submitted to the Ministry. A project would not be considered complete until excess soil is removed from the Class 2 soil management site and taken to a final destination.

3. Local waste transfer facilities are recognized under Reg. 347 as a storage location for an organization that is not primarily a waste management operation. An example would be a site used primarily for equipment storage. This site would receive and temporarily store waste that is generated through field operations, such as construction and maintenance of a highway. Sampling of soil can also be conducted at a local waste transfer facility if it is impractical to do so at the Project Area. If a public works yard facility is used as a local waste transfer facility, the excess soil regulation enables specified types of processing. A project would also not be considered complete until excess soil is removed from the local waste transfer facility and taken to a final destination.

A municipal snow storage facility has been identified as a potential interim site that is owned by the Project Leader or public body. This property would be considered a local waste transfer facility. Written notice that identifies the facility and its location, along with quantities and types of wastes that are anticipated to be at the facility may be required to be given to the MECP prior to the establishment of the facility. In addition, excess soil storage rules including pile size limits, volume limits, and setbacks will apply at this type of facility.

4. Required Investigations to Support Design and Construction

In order to meet the requirements under O. Reg. 406/19, the Rules for Soil Management and Excess Soil Quality Standards, and Best Management Practices as part of the Mill Pond and stormwater management pond (SWMF) clean-out, the following investigations will need to be conducted during the design and/or construction phase of the project.

4.1 Design Phase

4.1.1 Assessment of Past Uses

The Assessment of Past Uses is not required for this project, as discussed in Section 2.1.

4.1.2 Sampling and Analysis Plan (Task 1)

The Sampling and Analysis Plan must be prepared by a Qualified Person (QP) only if the excess soil planning requirements apply (Section 8 of O. Reg. 406/19) and includes the following:

- Identifying areas within the Project Area that must be investigated using sampling. Sampling frequencies are outlined in Section 4.1.3 below;
- Identify all areas within the Project Area where excavations are planned that will not be subject to sampling; and,
- Determine the location, concentration and distribution of contaminants in the soil to be excavated within the Project Area and identify the sampling approach. Locations requiring sampling via stockpile sampling methods are outlined in Section 4.1.3 below.

This task would likely cost between \$2,000 to \$5,000 to prepare.

4.1.3 Soil Characterization (Task 2)

The Soil Characterization must be prepared by a QP only if the excess soil planning requirements apply (Section 8 of O. Reg. 406/19) and includes the following:

- Planning of the site investigation, including coordination of Sub-Contractors;
- SWMF sediment will need to be removed, segregated and dewatered/solidified;
- Based on the sediment volumes presented in *Section 1.1*, a minimum of sixty-three (63) stockpile samples and six (6) QA/QC samples will need to be collected for the material excavated from Mill Pond for analysis of PHC Fractions F1-F4, BTEX, Metals (including hydride-forming metals), PAHs, EC, SAR, Cyanide, and pH. In addition, a minimum of nine (9) samples for leachate mSPLP analysis for Metals will need to be collected.
- Based on the sediment volumes presented in *Section 1.1*, a minimum of ten (10) stockpile samples and one (1) QA/QC sample will need to be collected for the material excavated from the SWMF for analysis of PHC Fractions F1-F4, BTEX, Metals (including hydride-forming metals), PAHs, EC, SAR, Cyanide, and pH. In addition, a minimum of four (4) samples for leachate mSPLP analysis for Metals will need to be collected.
- If the stockpiled sediment is removed without regard for the different zones within the pond (i.e., all sediment is mixed together and not segregated), the following sampling frequencies apply:
 - Mill Pond: A minimum of sixty-nine (69) stockpile samples and seven (7) QA/QC samples for analysis of PHC Fractions F1-F4, BTEX, Metals (including hydride-forming metals), PAHs, EC, SAR, Cyanide, and pH. In addition, a minimum of ten (10) samples for leachate mSPLP analysis for Metals will need to be collected.
 - SWMF: A minimum of seventeen (17) stockpile samples and two (2) QA/QC samples for analysis of PHC Fractions F1-F4, BTEX, Metals (including hydride-forming metals), PAHs, EC, SAR, Cyanide, and pH. In addition, a minimum of three (3) samples for leachate mSPLP analysis for Metals will need to be collected.
- Measure combustible vapour concentrations in the headspace above the samples with a portable photoionization detector (PID). The observable soil conditions in the recovered samples will be logged in the field;
- Identify potential water levels based on moisture content of soil cores;
- Collect and submit additional soil samples for quality assurance and quality control (QA/QC) purposes, as outlined above;
- Samples will be placed in appropriate laboratory-prepared containers with preservatives as required for analyses. Samples will be placed in a cooler, on ice and sealed prior to delivery to the laboratory. A chain of custody form will be completed and will accompany the samples for quality control purposes;
- Collect soil samples for synthetic precipitation leaching procedure (SPLP) analysis of Metals, as outlined above;
- Submit all soil samples to a Canadian Association for Laboratory Accreditation Inc. (CALA) accredited analytical laboratory for analysis on a five (5) business day turnaround time;
- Compare soil analytical results to the applicable O. Reg. 406/19 standards;
- Conduct a thorough review and evaluation of the information gathered from the site investigation and laboratory analyses; and,
- Prepare a Soil Characterization report consistent with the detailed requirements in O. Reg. 406/19 and the Rules for Soil Management and Excess Soil Quality Standards. In the event that environmental liabilities are identified, further investigations may be recommended, and a scope of work will be provided.

This task would likely cost a minimum of \$20,000 to prepare.

4.1.4 Soil Management Plan (Task 3)

The Soil Management Plan must be prepared by a QP as per the best management practices and includes the following:

- An estimated volume of excess soil to be excavated on the Project Area and managed off-site;
- A detailed sampling and analysis plan for all excavated soil from the Source Site;
- A site plan that identifies all the areas to be excavated, with the estimated volume and soil type and quality of each area on the Source Site. Soil quality will be based on the chemical analyses conducted during the geotechnical investigation and all available previous chemical analyses from historical environmental investigations conducted on-Site;
- Detailed instructions to on-site contractors identifying the area and depth of soil to be excavated for off-site management;
- Provide guidelines for contractors using temporary soil storage site(s); and,
- A list of potential Receiving Site linked to excavated areas of the site plan.

This task would likely cost between \$2,000 to \$5,000 to prepare.

4.2 Construction Phase

4.2.1 Excess Soil Destination Assessment (Task 4)

The Excess Soil Destination Assessment will be the responsibility of a QP retained by the Contractor only if the excess soil planning requirements apply (Section 8 of O. Reg. 406/19) and includes the following:

- Estimate the volume and quality of soil to be removed from the project area as excess soil;
- Identify each reuse site and/or receiving site where the excess soil will be deposited;
- Compare soil analytical results to the applicable O. Reg. 406/19 criteria to confirm suitability and reuse of excess soil;
- Identify whether a fill management plan was developed for the receiving site;
- Identify contingency measures to be implemented in the event that the excess soil cannot be deposited at an intended reuse site; and
- Prepare an Excess Soil Destination Assessment report consistent with the detailed requirements in O. Reg. 406/19 and the Rules for Soil Management and Excess Soil Quality Standards.

This task would likely cost between \$2,000 to \$5,000 to prepare.

4.2.2 Fill Management Plan (Task 5)

The Fill Management Plan (if imported material other than aggregate from a raw source or engineered fill is required for backfilling purposes) will be the responsibility of a QP retained by the Contractor as per the best management practices and includes the following:

- Solicit information regarding municipal or Conservation Authority licenses/permits, provisions of provincial plans which apply to the Site and any requirements of provincial ministries;
- Identify appropriate soil quality and soil types for excess soil to be received at the Site;
- Identify measures to manage noise, dust, traffic, erosion control, and stormwater management;

- Identify a protocol for incoming excess soil;
- Identify a record keeping system to track incoming loads of excess soil; and,
- Identify audit sampling and soil placement/segregation protocols.

This task would likely cost a minimum of \$5,000 to prepare (including the collection of fill verification samples for laboratory analyses).

4.2.3 Tracking System (Task 6)

The tracking system task will be the responsibility of a QP retained by the Contractor only if the excess soil planning requirements apply (Section 8 of O. Reg. 406/19) and includes the following:

- Identify and define the tracking system that will be used to track each load of excess soil that is removed from the project area; and,
- Prepare a Tracking letter report documenting the tracking system that will be used during the duration of the project consistent with the detailed requirements in O. Reg. 406/19 and the Rules for Soil Management and Excess Soil Quality Standards.

This task would likely cost between \$2,000 to \$5,000 to prepare (not including purchase of tracking software and/or licences).

4.2.4 Excess Soil Registry (Task 7)

This task will be the responsibility of the Project Leader (or Authorized Person) only if the excess soil planning requirements apply (Section 8 of O. Reg. 406/19) and includes the following:

- An Excess Soil Management Plan will be prepared and filed on the Environmental Site Registry (ESR) with the MECP.

This task would likely cost between \$2,000 to \$5,000 to prepare (not including fees associated with filing on the Registry and submission of a notice). Fees associated with filing the notice will be the responsibility of the Project Leader and are flat fee or based on soil volumes. This task can only be completed once all excess soil has reached the final destination for re-use. If required, this should be completed prior to permit application submissions.

5. Conclusions and Recommendations

Maximizing on-site re-use should be considered during the design of the project to avoid requirements that may apply to excess soil leaving a project area. Soil that is excavated within the Project Area that remains within the Project Area or is re-used within the Project Area is not considered excess soil. Therefore, the excess soil planning requirements would not need to be met unless excess soil is hauled off-Site and outside of the Project Area boundaries for re-use and/or disposal.

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Based on the pre-screening and analytical data comparison, I/C/C property uses with a non-potable ground water condition (Table 3.1 ESQS) are deemed the most suitable type of reuse site for receiving soil from the Project Area with the exception of the Benzo(a)pyrene and Cyanide impacted material. The Benzo(a)pyrene and Cyanide impacted material require disposal at a Class 1 Soil Management Site, landfill, or dump.

Based on the estimated volume of soil to be excavated (18,000 m³) during construction, additional soil sampling is required to meet the soil volume sampling criteria and reports should be prepared in accordance with O. Reg. 406/19.

A handwritten signature in black ink, appearing to read "B. Mirabzadeh".

Prepared By:

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Reviewed By:

A handwritten signature in black ink, appearing to read "Sarah Sipak".

Sarah Sipak, B.Sc., P.Geo (limited), QP_{ESA}
Environmental Geoscience Team Lead

References

- GEMS, Mill Pond Park Municipal Class Environmental Assessment, Schedule B, Town of Richmond Hill, May 25, 2018
- Ontario Ministry of Environment, Conservation and Parks, Management of Excess Soil – A Guide For Best Management Practices, 2019
- Ontario Ministry of Environment, Conservation and Parks, Rules for Soil Management and Excess Soil Quality Standards, 2020
- Ontario Regulation 406/19
- TMIG, Interim Draft Mill Pond Park Rehabilitation Project File Report, May 2021
- TMIG, Mill Pond EA Summary

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Appendix A

Analytical Data Summary Tables

Soil Characterization
Mill Pond and Heritage Estates Pond (SWMF 17-3)

Soil Analytical Results: Petroleum Hydrocarbons (PHCs) and Benzene, Toluene, Ethylbenzene, Xylenes (BTEX)

			PHCs					BTEX			
			F1 (C6-C10)	F1 (C6-C10) - BTEX*	F2 (C10-C16)	F3 (C16-C34)	F4 (C34-C50)	Benzene	Toluene	Ethylbenzene	Xylenes, Total (Xylene Mixture)
			µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g
O. Reg. 406/19 (On-Site and Excess Soil Management), Full Depth Background SCS, Res/Park/Inst/Ind/Com/Comm Property Use			25	25	10	240	120	0.02	0.2	0.05	0.05
Sample Location	Sample ID	Sample Date									
MP 1	MP-S1	09-May-18	<20	<20	30	520	300	<0.040	<0.040	<0.040	<0.040
MP 2	MP-S2	09-May-18	<20	<20	30	430	290	<0.040	<0.040	<0.040	<0.040
MP 3	MP-S3	09-May-18	<20	<20	30	540	360	<0.040	<0.040	<0.040	<0.040
MP 4	MP-S4	09-May-18	<20	<20	30	510	330	<0.040	<0.040	<0.040	<0.040
MP 5	MP-S5	09-May-18	<20	<20	30	420	310	<0.040	<0.040	<0.040	<0.040
MP 6	MP-S6	09-May-18	<20	<20	30	510	390	<0.040	<0.040	<0.040	<0.040
SWMF 1	SWMF-S1	09-May-18	<20	<20	30	1400	1000	<0.040	<0.040	<0.040	<0.040
SWMF 2	SWMF-S2	09-May-18	<20	<20	30	1300	1100	<0.040	<0.040	<0.040	<0.040
SWMF 3	SWMF-S3	09-May-18	<20	<20	30	1100	770	<0.040	<0.040	<0.040	<0.040

Notes:

1. - In guideline row(s) denotes no criteria for that parameter
2. - In data row(s) denotes parameter not analyzed
3. mbgs Denotes metres below ground surface
4. **BOLD** Denotes entries exceed the criteria
5. **BOLD** Denotes RDL (Reportable Detection Limit) exceed the criteria
6. Criteria is Ontario Regulation 406/19, Table 1 Full Depth Background Site Condition Standards for Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use
7. * F1 fraction does not include BTEX; however, the proponent has the choice as to whether or not to subtract BTEX from the analytical result

Soil Analytical Results: Metals and Inorganics

			Metals																			Inorganics					
			Antimony	Arsenic	Barium	Beryllium	Boron (total)	Boron (Hot Water Soluble)*	Cadmium	Chromium Total	Cobalt	Copper	Lead	Molybdenum	Nickel	Mercury	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc	Chromium VI	Electrical Conductivity (mS/cm)	Cyanide, Weak Acid Dissociable	Methyl Mercury**	Sodium Adsorption Ratio
			µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g
O. Reg. 406/19 (On-Site and Excess Soil Management), Full Depth Background SCS, Res/Park/Inst/Ind/Com/Commu Property Use			1.3	18	220	2.5	36	-	1.2	70	21	92	120	2	82	0.27	1.5	0.5	1	2.5	86	290	0.66	0.57	0.051	-	2.4
Sample Location	Sample ID	Sample Date																									
MP 1	MP-S1	09-May-18	0.62	2.5	170	0.55	9	0.46	0.5	28	6.7	36	24	0.57	18	0.16	0.74	<0.20	0.21	0.47	26	170	<0.2	2.5	0.07	-	5.6
MP 2	MP-S2	09-May-18	0.45	2.4	180	0.52	8.5	0.29	0.56	27	6.2	33	22	0.53	17	0.14	0.71	<0.20	0.17	0.47	24	150	<0.2	2.4	<0.04	-	4.6
MP 3	MP-S3	09-May-18	0.38	2.3	160	0.47	7.9	0.44	0.44	24	5.9	30	21	0.52	15	0.15	0.69	<0.20	0.17	0.52	21	140	<0.2	2.4	<0.04	-	4.3
MP 4	MP-S4	09-May-18	0.45	2.3	170	0.48	7.6	0.37	0.48	24	6.4	31	22	0.52	16	0.2	0.62	<0.20	0.18	0.5	22	150	<0.2	2.3	<0.04	-	4.1
MP 5	MP-S5	09-May-18	0.34	2.2	120	0.31	6.4	0.18	0.51	19	4.8	25	18	<0.50	11	0.21	0.69	<0.20	0.16	0.43	14	130	<0.2	2	<0.04	-	2.4
MP 6	MP-S6	09-May-18	0.4	2.2	140	0.4	6.4	0.22	0.47	21	5.5	29	21	<0.50	13	0.18	0.73	<0.20	0.16	0.47	18	140	<0.2	2.1	0.07	-	3.2
SWMF 1	SWMF-S1	09-May-18	1.2	3.1	98	0.39	6.4	0.33	0.6	28	5.4	71	23	0.83	15	0.069	0.61	<0.20	0.13	0.56	24	210	<0.2	3.9	0.11	-	11
SWMF 2	SWMF-S2	09-May-18	1.3	3.2	93	0.39	7.1	0.45	0.51	32	5.7	79	24	1	15	0.065	<0.5	<0.20	0.14	0.56	25	230	<0.2	2.9	0.11	-	7.7
SWMF 3	SWMF-S3	09-May-18	1.5	3.4	100	0.41	6.7	0.27	0.63	29	5.7	77	26	1	15	0.078	<0.5	0.23	0.14	0.56	24	220	<0.2	1.1	0.04	-	1.5

- In guideline row(s) denotes no criteria for that parameter
- In data row(s) denotes parameter not analyzed
- mbgs Denotes metres below ground surface
- BOLD** Denotes entries exceed the criteria
- BOLD** Denotes RDL (Reportable Detection Limit) exceed the criteria
- Criteria is Ontario Regulation 406/19, Table 1 Full Depth Background Site Condition Standards for Residential/Parkland/Insitutional/Industrial/Commercial/Community Property Use
- * Denotes the boron standards are for hot water soluble extract for all surface soils. For subsurface soils the standards are for total boron (mixed strong acid digest), as ecological criteria are not
- ** Denotes analysis for methyl mercury only applies when mercury (total) standard is exceeded

Memorandum

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Appendix B Figures



Sample-ID	Exceeding-Parameters	Concentration	Unit	Table-1-ESQS-for-RPIICC-Property-Use
SWMF-S2	EC	2.9	mS/cm	0.57
	Cyanide	0.11	ug/g	0.051
	SAR	7.7	-	2.4
	Benzo(a)anthracene	0.59	ug/g	0.38
	Benzo(a)pyrene	0.74	ug/g	0.3
	Benzo(b,j)fluoranthene	1.4	ug/g	0.47
	Benzo(g,h,i)perylene	0.69	ug/g	0.68
	Fluoranthene	2.3	ug/g	0.56
	Indeno(1,2,3-cd)pyrene	0.71	ug/g	0.23
	Pyrene	1.6	ug/g	1
	PHC-Fraction-F3	1300	ug/g	240
	PHC-Fraction-F4	1100	ug/g	120

Sample-ID	Exceeding-Parameters	Concentration	Unit	Table-1-ESQS-for-RPIICC-Property-Use
SWMF-S1	EC	3.9	mS/cm	0.57
	Cyanide	0.11	ug/g	0.051
	SAR	11	-	2.4
	Benzo(a)pyrene	0.43	ug/g	0.3
	Benzo(b,j)fluoranthene	0.86	ug/g	0.47
	Fluoranthene	1.2	ug/g	0.56
	Indeno(1,2,3-cd)pyrene	0.48	ug/g	0.23
	PHC-Fraction-F3	1400	ug/g	240
PHC-Fraction-F4	1000	ug/g	120	



Sample-ID	Exceeding-Parameters	Concentration	Unit	Table-1-ESQS-for-RPIICC-Property-Use
SWMF-S3	EC	1.1	mS/cm	0.57
	Antimony	1.5	ug/g	1.3
	Benzo(a)anthracene	0.47	ug/g	0.38
	Benzo(a)pyrene	0.67	ug/g	0.3
	Benzo(b,j)fluoranthene	1.4	ug/g	0.47
	Fluoranthene	1.9	ug/g	0.56
	Indeno(1,2,3-cd)pyrene	0.68	ug/g	0.23
	Pyrene	1.4	ug/g	1
	PHC-Fraction-F3	1100	ug/g	240
	PHC-Fraction-F4	770	ug/g	120
Acetone	1.0	ug/g	0.5	

Figure 1

Sediment Sample Locations – Stormwater Management Facility 17-3

Legend

- ★ SWMF 1 – UTM 17.624139E.4859647N
- ★ SWMF 2 – UTM 17.624105E.4859691N
- ★ SWMF 3 – UTM 17.624049E.4859647N

Reference: GEMS 2018 Sediment Sampling Report

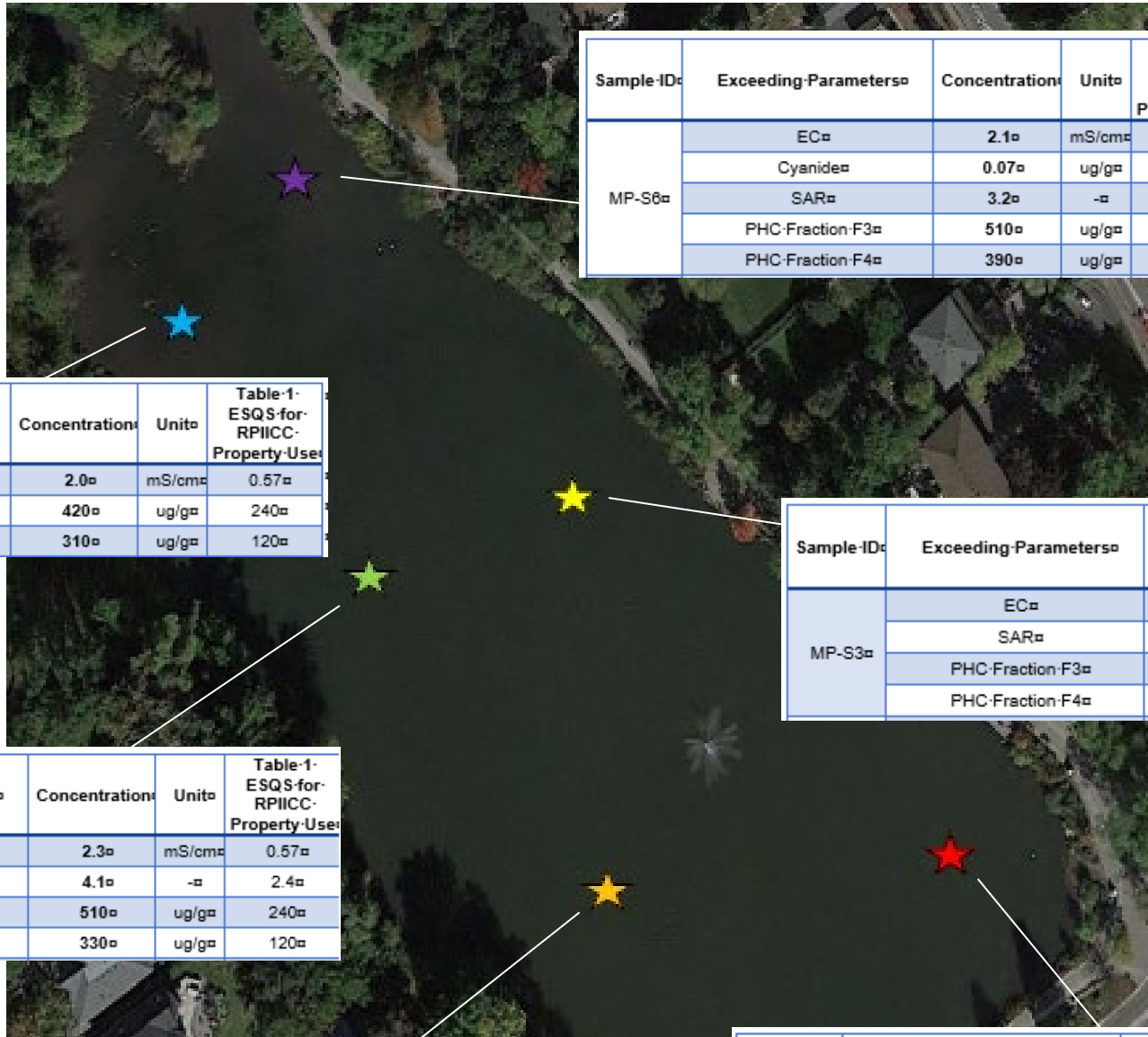


Figure 2

Sediment Sample Locations – Stormwater Management Facility 17-3

Legend

- ★ MP 1 – UTM 17.624336E.4859279N
- ★ MP 2 – UTM 17.624267E.4859284N
- ★ MP 3 – UTM 17.624727E.4859349N
- ★ MP 4 – UTM 17.624224E.4859351N
- ★ MP 5 – UTM 17.624202E.4859389N
- ★ MP 6 – UTM 17.624226E.4859418N



Sample-ID	Exceeding-Parameters	Concentration	Unit	Table-1-ESQS-for-RPIICC-Property-Use
MP-S6	EC	2.1	mS/cm	0.57
	Cyanide	0.07	ug/g	0.051
	SAR	3.2	-	2.4
	PHC-Fraction-F3	510	ug/g	240
	PHC-Fraction-F4	390	ug/g	120

Sample-ID	Exceeding-Parameters	Concentration	Unit	Table-1-ESQS-for-RPIICC-Property-Use
MP-S5	EC	2.0	mS/cm	0.57
	PHC-Fraction-F3	420	ug/g	240
	PHC-Fraction-F4	310	ug/g	120

Sample-ID	Exceeding-Parameters	Concentration	Unit	Table-1-ESQS-for-RPIICC-Property-Use
MP-S3	EC	2.4	mS/cm	0.57
	SAR	4.3	-	2.4
	PHC-Fraction-F3	540	ug/g	240
	PHC-Fraction-F4	360	ug/g	120

Sample-ID	Exceeding-Parameters	Concentration	Unit	Table-1-ESQS-for-RPIICC-Property-Use
MP-S4	EC	2.3	mS/cm	0.57
	SAR	4.1	-	2.4
	PHC-Fraction-F3	510	ug/g	240
	PHC-Fraction-F4	330	ug/g	120

Sample-ID	Exceeding-Parameters	Concentration	Unit	Table-1-ESQS-for-RPIICC-Property-Use
MP-S2	EC	2.4	mS/cm	0.57
	SAR	4.6	-	2.4
	PHC-Fraction-F3	430	ug/g	240
	PHC-Fraction-F4	290	ug/g	120

Sample-ID	Exceeding-Parameters	Concentration	Unit	Table-1-ESQS-for-RPIICC-Property-Use
MP-S1	EC	2.5	mS/cm	0.57
	Cyanide	0.07	ug/g	0.051
	SAR	5.6	-	2.4
	PHC-Fraction-F3	520	ug/g	240
	PHC-Fraction-F4	300	ug/g	120

Reference: GEMS 2018 Sediment Sampling Report