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Constructing a 1 Km River through Brownfield Sites: Risk Based Strategy, Maximized Soil Treatment and Reuse, Environmental Protection and Land Use

Meggen Janes, Director Soil and Groundwater
Waterfront Toronto

Toronto Port Lands Flood Protection Project

The Port Lands area, immediately east of downtown Toronto, were created through decades of infilling of historic wetlands and has historically been used for heavy industry.

The project will flood protect 240 hectares of land in the Port Lands and surrounding communities by building a new one kilometer river channel and two new river outlets to convey flood waters. New parks, roads and bridge network will complete the public realm around the river channel that will become catalysts for a range of memorable activities and experiences and will unlock a 22 hectare area for revitalization.



Presentation Overview

- Risk based approach and characterization tools
- Land Use Controls and risk management measures
- Soil Management
- Environmental Protection and Construction Status



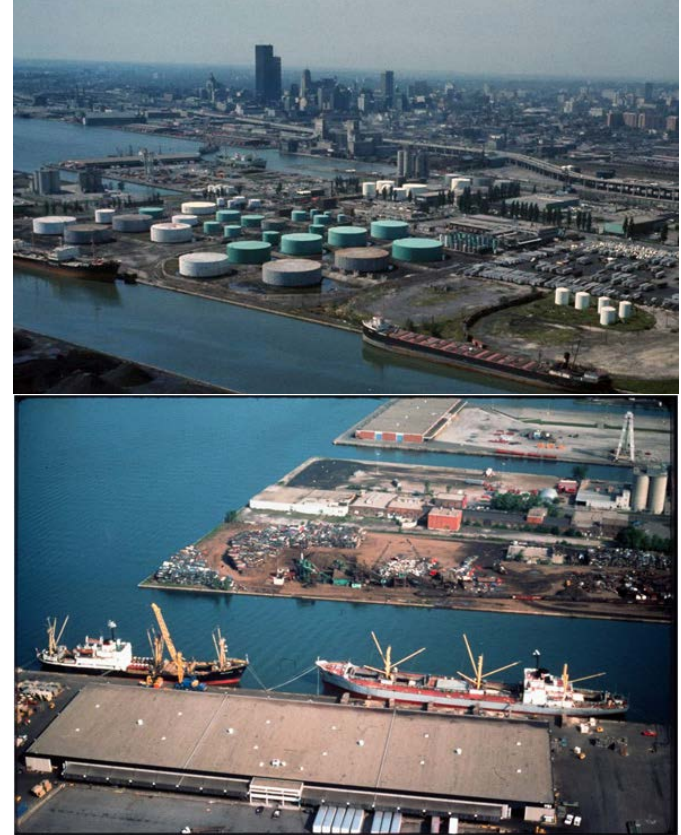
Upon Completion in 2024 and Beyond



Risk Assessment

Risk Assessment

- No current environmental regulatory approval process in Ontario for a project of this nature – creating a river through a brownfield
- Used to identify and evaluate the risks to human health and the environment, and develop effective measures to mitigate or remove those risks
- Allows for the development of a comprehensive strategy for treating and reusing soil within the project area – meaning that soils can be moved, treated and placed across the entire site

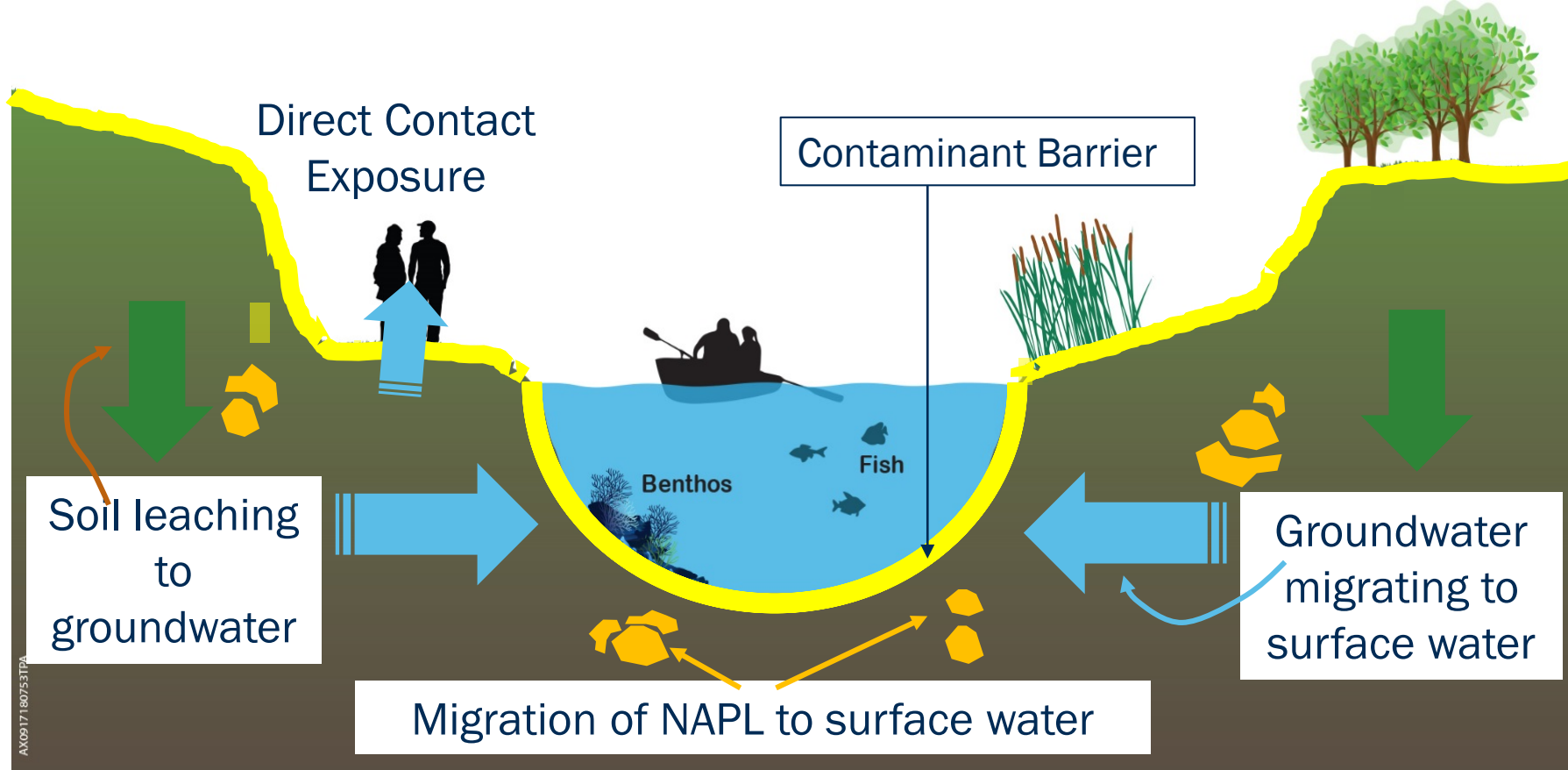


Characterization Tools

- Traditional soil and groundwater sampling
- Traditional COCs plus additional testing for PFAS
- LIF Sampling (over 150 points)
- Advanced web app for location information to support construction
- Advanced lab testing for NAPL mobility
- Advanced lab testing for ecotoxicity
- Several 3-D models: groundwater, soil (environmental), soil (geotechnical)
- Ongoing investigation to continue optimizing and support environmental permits

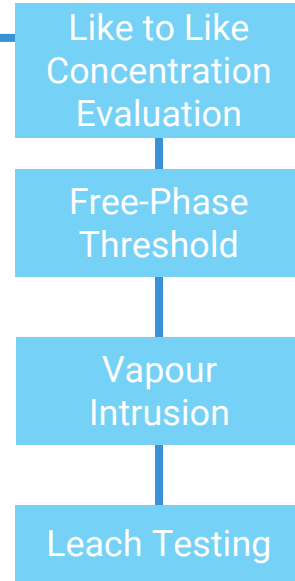
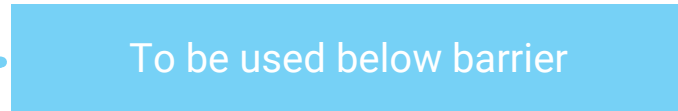
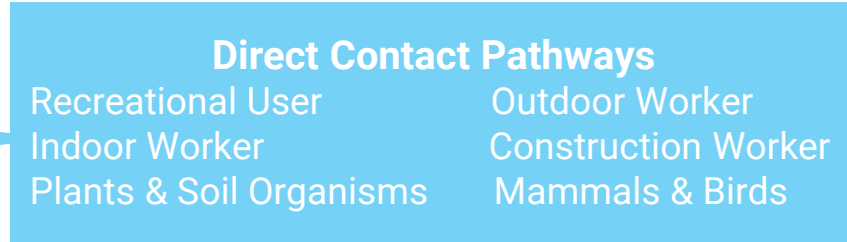
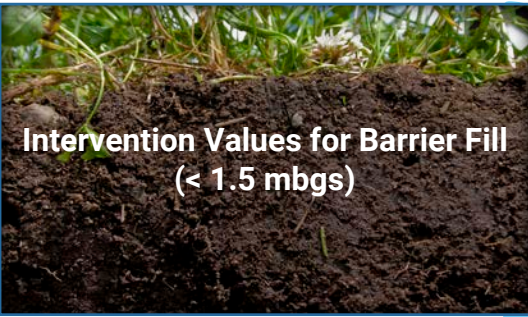


Risk Assessment Conclusions

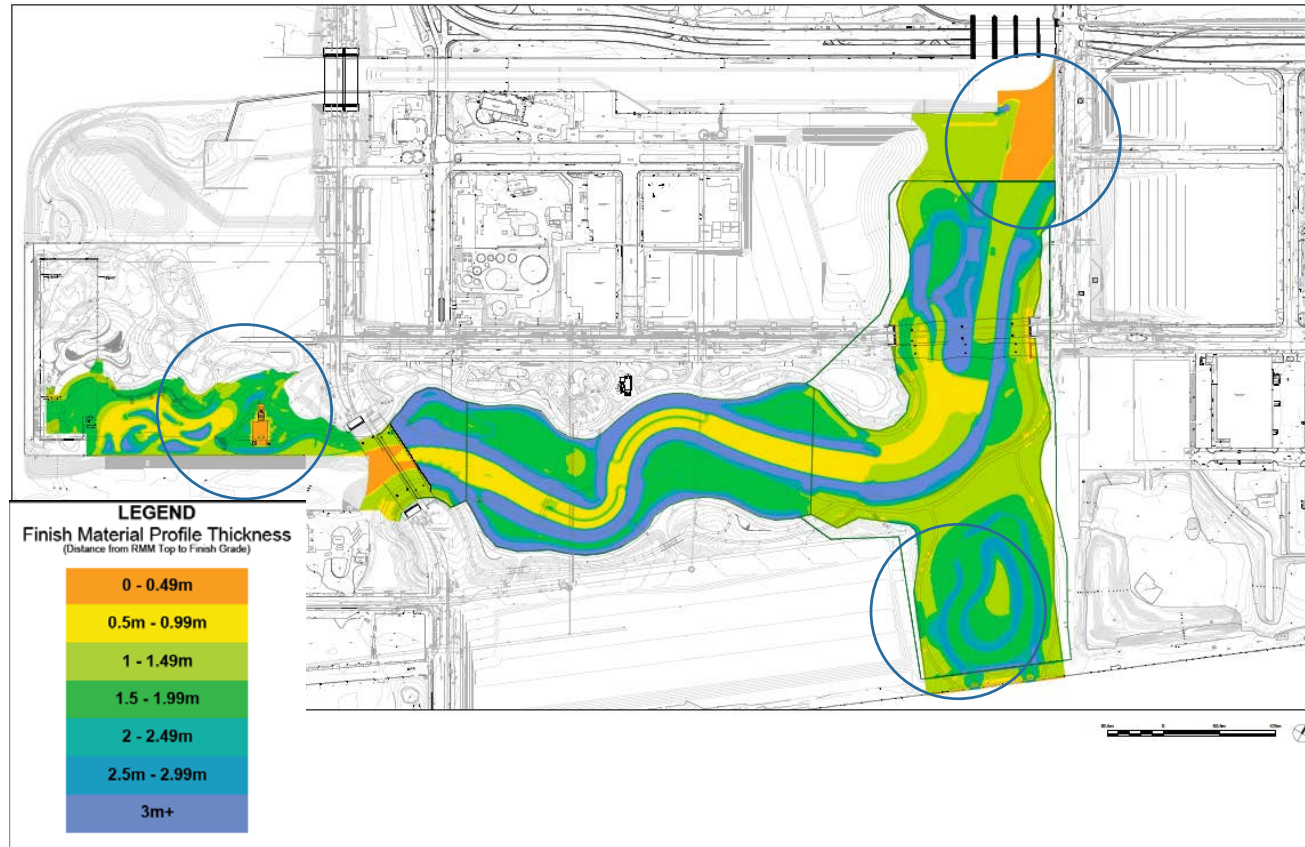


Risk Management/Land Use Controls

Risk Management Barrier – Direct Contact Barrier

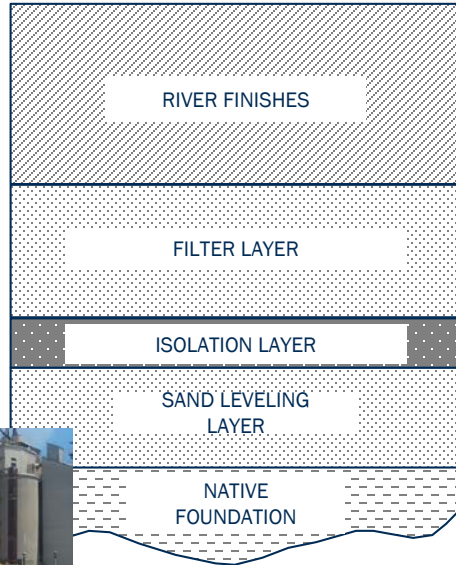


Risk Management: Horizontal and Cutoff Walls

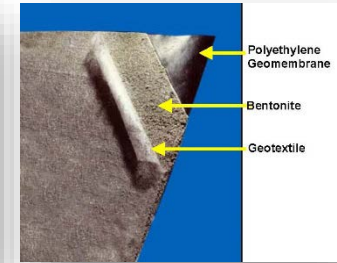
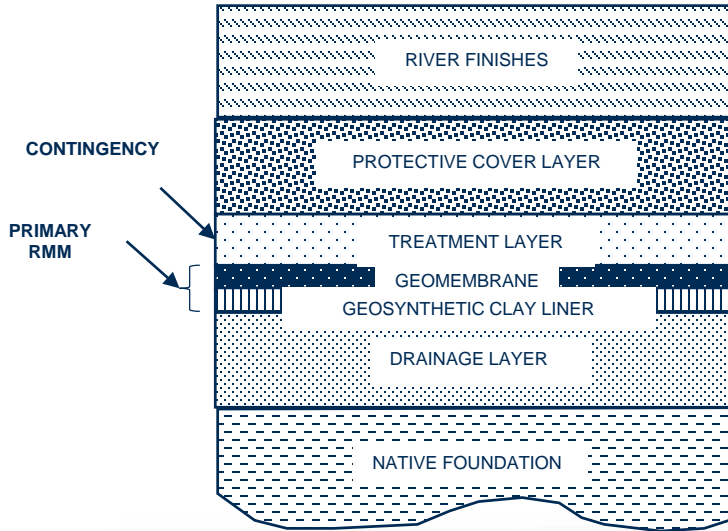


RMM – Horizontal barriers – two types

Isolation Layer

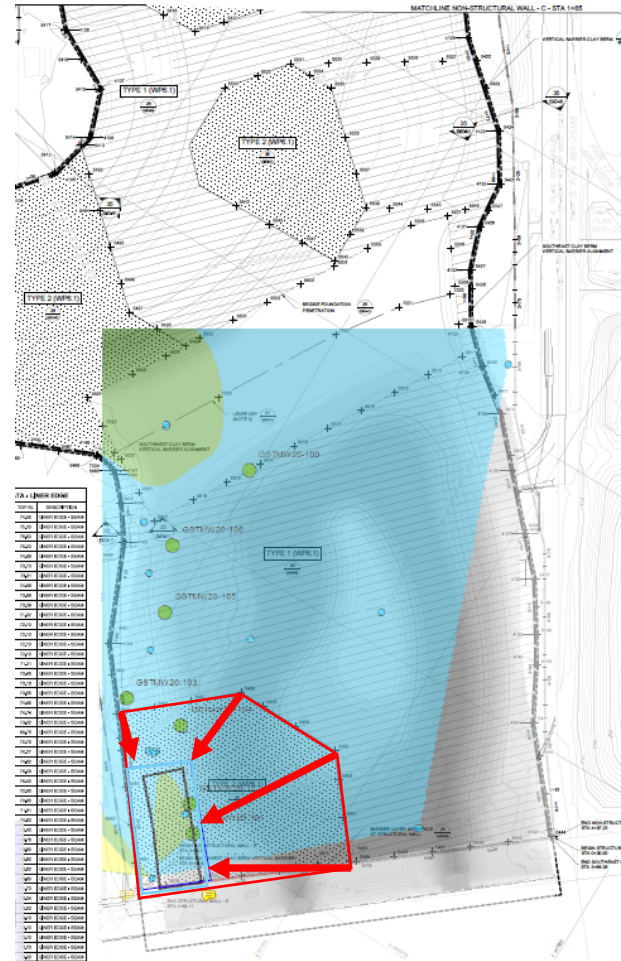


GCL/membrane



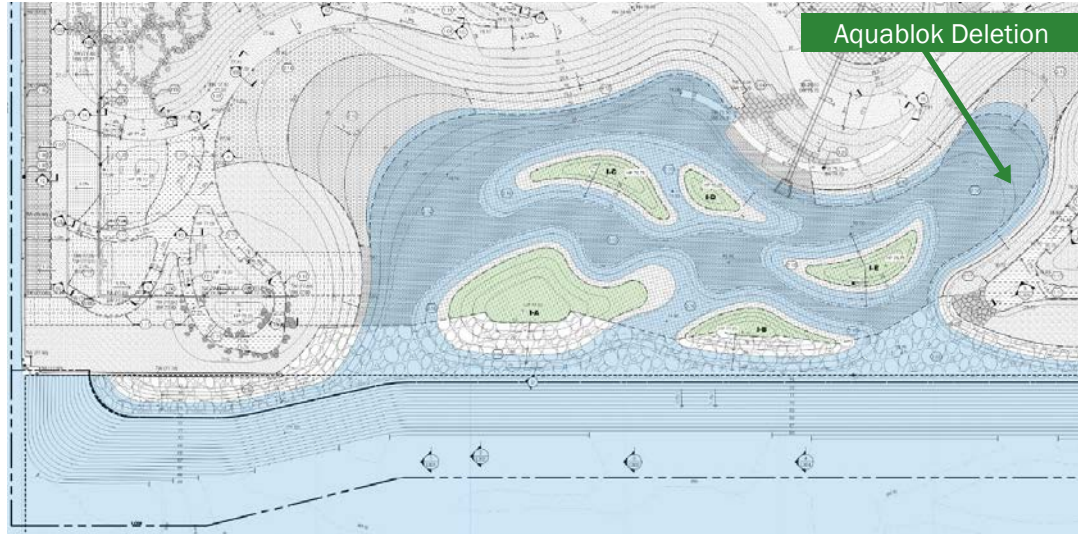
RMM Optimization

- Limited data driving horizontal RMM
- 7 additional groundwater samples (green dots) collected to delineate hot spot in south west corner driving need for GAC
- New data suggests reduction in RMM possible
 - No GAC required in spillway
 - GCL/geomembrane kept in place on new delineation of hot spot (~1,200m²)
 - GCL/geomembrane in other areas in spillway modified to less expensive hydraulic barrier (geomembrane only)
- Savings of \$1.3M



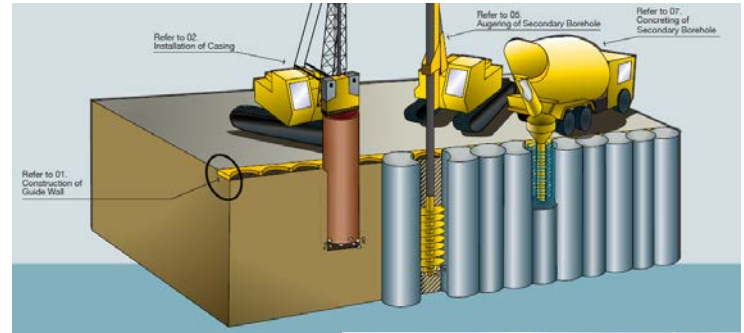
RMM Optimization

- Additional groundwater sampling determined that simple contact barrier would be sufficient
- Extra RMM removed from design at savings of \$1.2M



RMM: CutoffWalls – Two Types

- Concrete Secant Pile walls with over 1700 overlapping piles drilled into bedrock (20 to 40 metres deep)
- Bentonite Slurry Walls



Soil Management

Soil Management

Fill areas and cut areas, resulting in a soil cut-fill evaluation.

Cut: >1,000,000 m³ to be cut for new Don River

- 20% off-site disposal
- 30% reused as cap
- 50% reused to raise grades below cap

Fill: >700,000 m³ required for flood protection

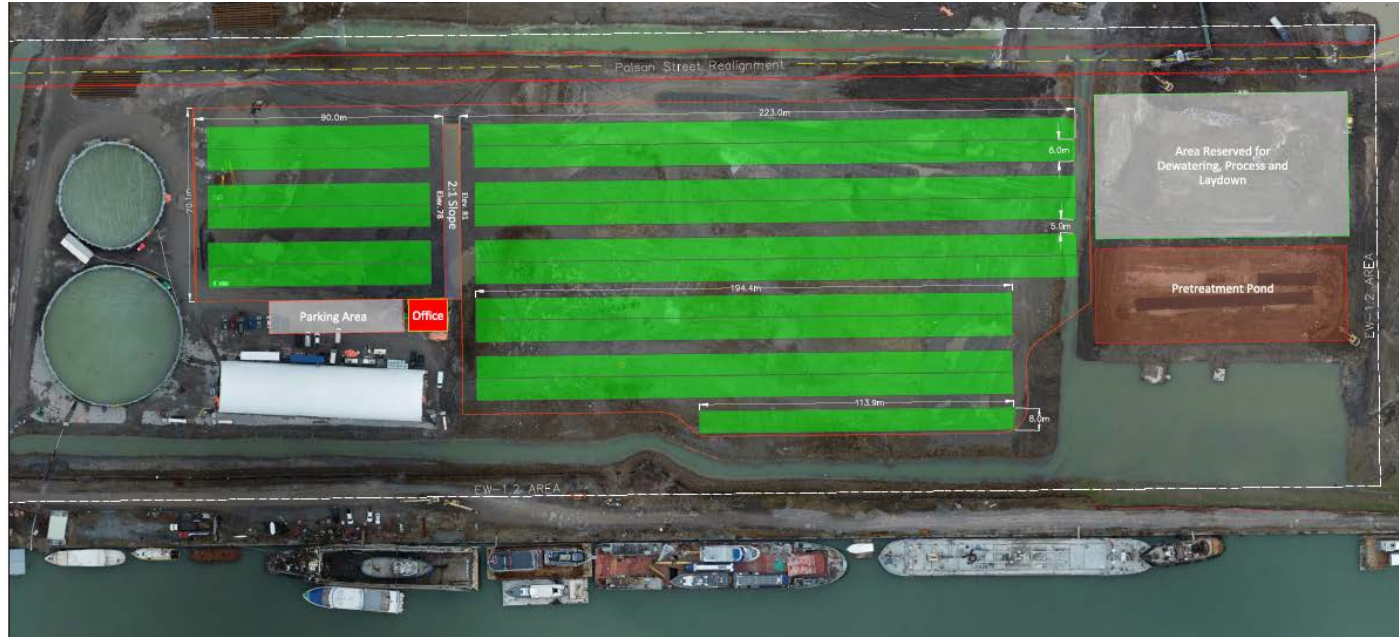


Soil Excavation



Soil Treatment

- Soil treatment through biopiling and STARx Smoldering Treatment (both of which were piloted in PLFP in 2017/2018)
- Approximately 300,000 m³ to be treated over two seasons (biopiling) and 18 months (STARx)
 - Up to 72,000m³ STARx
 - Up to 250,000m³ biopiling



Soil Treatment

- Highly contaminated soil through STARx – smouldering
- Successful Pilot Test
 - Initial PHC of 23,700 to 35,200 ug/g
 - PHC concentration reductions between approximately 95% and >99.7%
 - Remediation complete in 10 days
- Full Scale
 - 20 by 20 m containers, 250 m³ each
 - 8 containers; 72,000 m³ over 18 months



Soil Treatment

- Less contaminated soil through Enhanced Bioremediation
- Successful Pilot Test
 - 51 to 59% reduction in total PHCs in 8 weeks (enhanced and aerobic)
 - Remediation complete in 8 weeks
- Full Scale
- Long windrow bioremediation over two seasons; started late June.



Environmental Protection and Construction Status

Environmental Protection

Risk of Non-compliance with Regulatory Requirements

- Environmental Impact
- Liability
- Project Delays
- Financial Loss

- Environmental Protection Plans compliant with WT's Environmental Management Plan
- Near miss, Incident and Non-compliance Reviews
- Tracking/Review of MECP/TSSA Inspections, Notifications and Submissions
- Project risk register tracking, with mitigation and contingency plans
- Project Compliance Registers with Quarterly Audit

WT's Environmental Management Plan



- WT's EMP has 14 required EPPs
- Compliance Register

EPPs Required under WT EMP

Air Quality and Dust Management

Archaeological and Built Heritage Resources Management

Contaminated Soils Management

Erosion and Sediment Control

Fuel and Lubricants Management

Groundwater Management

Methane Control

Noise and Vibration Control

Project-related Waste Management

Stormwater / Surface Water Management

Traffic Management

Vegetation Management

Wildlife Management

Contingency and Emergency Response Plans

WT Environmental Management Plan (Aug 2013,

Erosion and Sediment Control

WT EMP Requirements

Compliance Status

Outline maintenance and monitoring program in project specification for construction manager/contractor

Design site layouts, gradient and length of exposed slopes, area and duration of exposed soil minimization and maintenance and regeneration of vegetative cover.

Construction manager/contractor must submit an Erosion and Sedimentation Control Plan to WT prior to work that describes: preventing loss of soil during construction by stormwater runoff or wind erosion; preventing sediment release to storm sewer/receiving streams, and preventing air pollution from dust and particulate matter (see list in WT EMP).

Install erosion control measures before initiation of work which may include diversion ditches, ditch checks and soil surface

Install sediment control measures before initiation of work which may include: erection of silt fences, protection of catch basins/manholes/other storm sewer features, and construction of stormwater management pond

Maintenance and monitoring on a regular schedule and before predicted storm events and immediately thereafter.

Program should include: inspection, repair, replacement on regular basis; removal of collected sediment on silt fencing and settlement ponds when retention capacity reaches 50%; and reinforcement of erosion control structures when significant rainfall events are forecasted.

Quarterly Update Report must summarize ESC activities undertaken, issues and mitigation measures including

Governing Environmental Protection Plans

Governing Documents

Environmental Protection Plans

- Waterfront Toronto Environmental Management Plan

- Compliance Framework by Jacobs

- Community Based Risk Assessment

- Baseline Monitoring Plans

- Soil Management Plan

- Groundwater Management Plan

- Air Quality & Noise Monitoring Plan

- Odour Management Plan

- Surface Water Quality Monitoring Plan

- Spill Prevention & Contingency Plan

- Waste Management Plan

- Fuel Management Plan

- Erosion & Sediment Control Plan

- Stormwater Management Plan

- Air Quality and Dust Management Plan

- Methane Management Plan

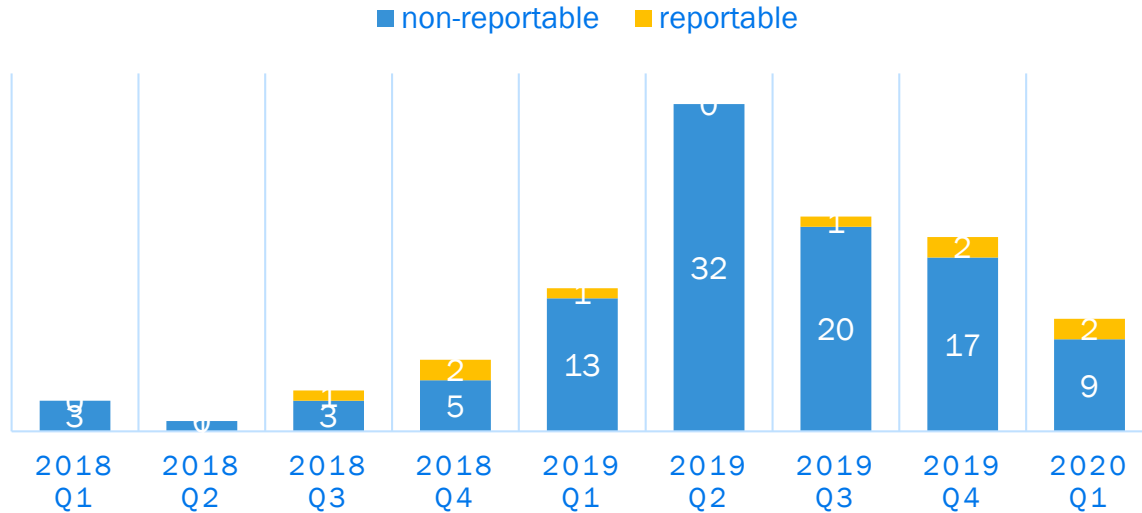
- Weather Monitoring and Reporting Plan

- Noise & Vibration Plan

Continuous Improvement – spills

- Spill documentation and spill frequency evaluated to look at trends
- Increasing trend in 2019 addressed through system evaluation, updates to tracking and inspection procedures, and communication on corrective actions.

SPILLS TRACKING



Reportable:

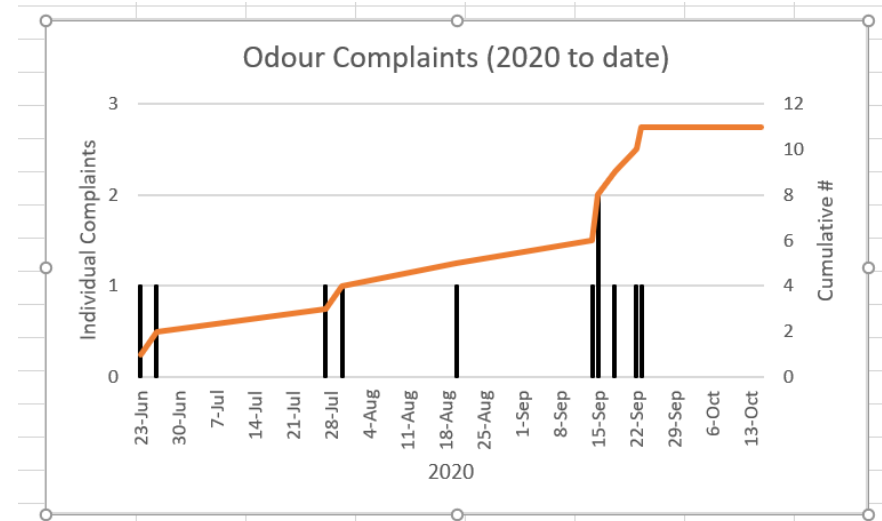
- 100 litres; or
- Direct to water; or
- Potential to discharge to water

Non-reportable:

- Any spill <100 litres

Continuous Improvement – Odour Management

- Full review of odour and VOC mitigation equipment and mitigation procedures including the VOC misters, VOC suppressing foam, Surfactants, and geographic placement of misters. For instance, the review helped provide guidance for what mitigation equipment should be used and how it should be deployed.
- Thorough reevaluation of the Plans to analyze existing data trends and recommend areas for improvement
- Greater feedback loop, response time and direction from the Air Quality Consultant to the Subcontractors.



Construction Progress



Thank you.

info@waterfrontoronto.ca

Waterfront Toronto
20 Bay Street, Suite 1310
Toronto, ON M5J 2N8
www.waterfrontoronto.ca

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