



*Approach Applied and Lessons Learned in Optimizing
Soil Reuse for Large Redevelopment Projects*



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Approach Applied and Lessons Learned in Optimizing Soil Reuse for Large Redevelopment Projects



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Outline

1. Case Study
2. Strategy
 - Regulation/Guidance
 - Technology
 - Metrics for Decisioning
3. Implementation
 - Implications
 - Data Management
4. Conclusions

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Acknowledgements

Strategy

Jacobs

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Implementation

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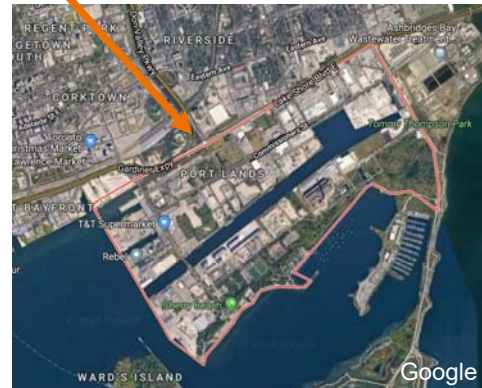
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Toronto Port Lands

Case Study

Don River



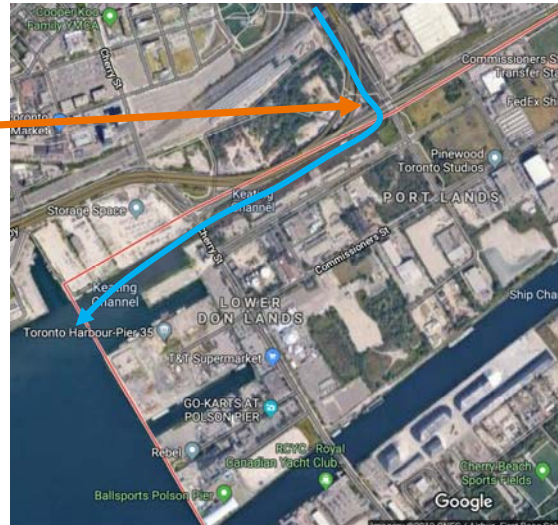
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Case Study

Toronto Port Lands

Don River



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Case Study

Port Lands Flood Projection

Regional Flood Event
(e.g., Hurricane
Hazel) would
affect ~240
hectares of
land



From: <https://portlandsto.ca/wp-content/uploads/FINAL-PLFP-background-November2018.pdf>



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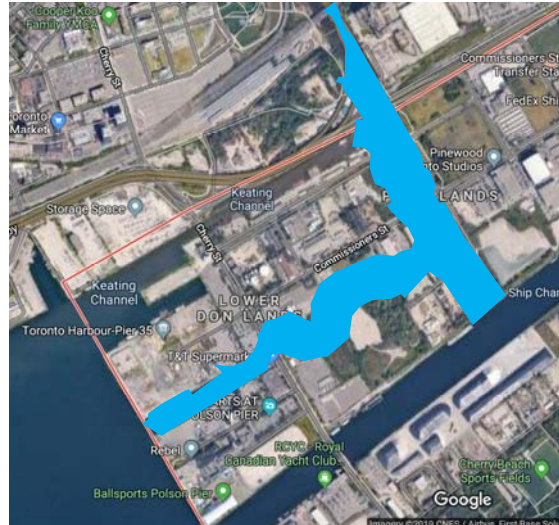
Case Study

Port Lands Flood Protection Project (PLFP)

- Renaturalize mouth of Don River
- Raise grades
- Update infrastructure



Lift flood-related development restrictions and unlock development potential



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Case Study

Port Lands Flood Protection Project (PLFP)

- River excavation to produce >1 million cubic metres of soil
- Soil needed to raise grade by an average of 2 metres through project area
- Sustainability objective is 85% reuse of soil



Image from: <https://www.thestar.com/news/gta/2020/01/04/how-do-you-build-an-island-in-toronto.html>



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Case Study

Port Lands Flood Protection Project (PLFP)

Soil reuse complicated by contamination left by historic industrial use of the Port Lands



Images from http://www.blogto.com/city/2012/02/what_the_port_lands_used_to_look_like/



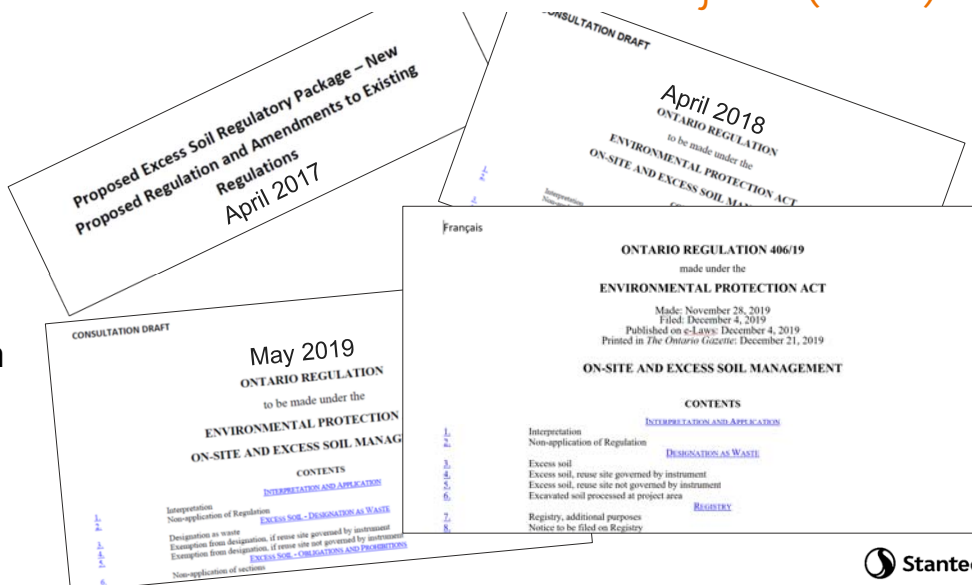
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Case Study

Port Lands Flood Protection Project (PLFP)

Soil reuse also complicated by evolving regulations in Ontario



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PLFP Soil Management Strategy

Strategy	
Regulation/Guidance	• Regulatory structure and significance for soil reuse
Technology	• Investigative, modeling, analytical and risk assessment tools
Metrics	• Reuse decisioning
Implementation	
Implications	• Management and construction oversight
Data Management	• Requirements and tools

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Objective

Reuse that soil across multiple properties, with as much flexibility as possible



Soil excavated from multiple properties that may exceed generic standards

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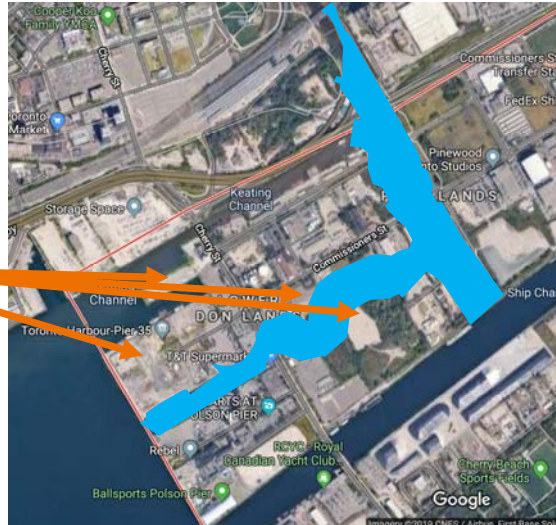


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Strategy

Objective

Some reuse areas require Records of Site Condition (RSCs)



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Strategy

Regulation/Guidance

Not all require an RSC

Brownfields (153/04)

- Reuse within a "property"
- Development of site-specific and risk-based standards

Community Based Risk Assessment (CBRA)

- Process for multiple properties, outside regulation

- Legally defined property per a Municipal Plan
- "Phase Two property" means the property that is the subject of a Phase Two Environmental Site Assessment (ESA)
 - "Risk Assessment (RA) property" means a property that is the subject of an RA;
- "RSC property", in relation to a record of site condition, means the property in respect of which the record of site condition is submitted for filing or is filed;

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Strategy

Regulation/Guidance

Brownfields (153/04)

- Reuse within a “property”
- Development of site-specific and risk-based standards

Community Based Risk Assessment (CBRA)

- Process for multiple properties, outside regulation

Waste (347)

- Soil and soil mixed with rock as inert fill or excess soil
- Excess soil is removed from project area
- Waste when removed from site?

“Site” is one or more adjoining property parcels owned or leased by same party, where passage between properties involves crossing (but not travelling along) public roads

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Strategy

Regulation/Guidance

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2014 Best Management Practices (BMP)

- Encourages reuse of excavated soil at source site
- “Like to Like” concept

Excess Soil (406/19)

- Excess to Project Area
- Site-specific risk-based values for reuse via a Site-specific instrument

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Regulation/Guidance

Strategy

Brownfields (153/04)

- Reuse within a "property"
- Development of site-specific and risk-based standards

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Waste (347)

- Soil and soil mixed with rock as inert fill or excess soil
- Excess soil is removed from project area
- Waste when removed from site?

Soil Management Plan (SMP) for reuse across property boundaries

Program Approval

Best management Practices (BMP)

- Encourages reuse of excavated soil at source site
- "Like to Like" concept

Excess Soil (406/19)

- Excess to Project Area
- Site-specific risk-based values for reuse via a Site-specific instrument

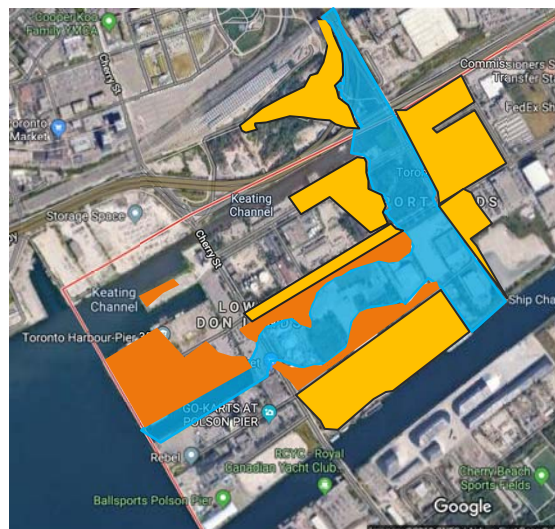
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Technology – Soil Quality Considerations

Strategy

- Various CBRA Fill Areas and RSC Fill Areas with different contaminants of concern (COCs)
- Fill will be placed at surface and at depth
- Fill Areas have different projected future uses (short- and long-term)
- COCs in excavated soil vary through river area



- Approximate RSC Fill Areas
- Approximate CBRA Fill Areas

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Strategy

Technology – Risk Assessment

- Applied RA approach to evolve alternate soil reuse criteria for each fill area
- Considered surface vs subsurface receptors
- Vapour intrusion (VI) and leaching not considered

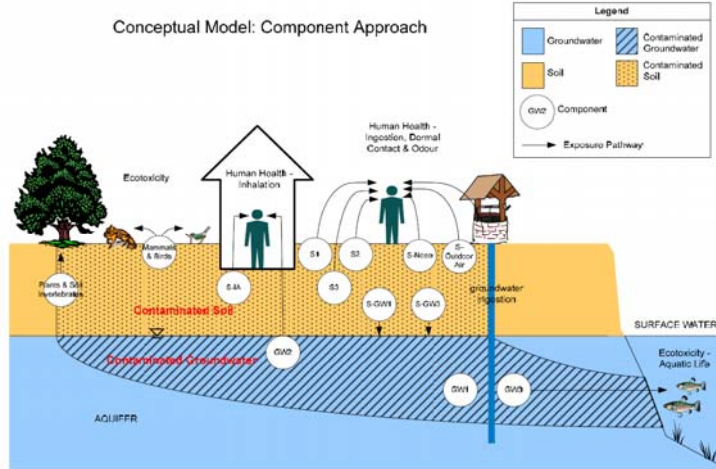


Image from document entitled *Rationale for the Development of Soil and Ground Water Standards for Use at Contaminated Sites in Ontario*, dated April 15, 2011.



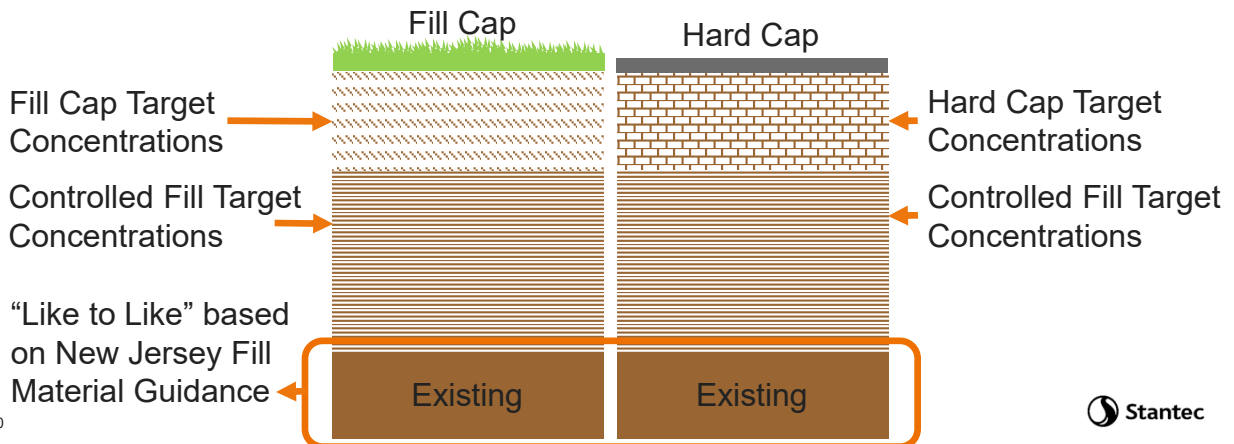
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Strategy

Technology – Risk Assessment

Multiple risk-based values evolved for each fill area placed on soil placement.



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Technology – Investigative, Analytical

Assessment	Comment
Bulk Testing	<ul style="list-style-type: none"> COCs for excavated soil; frequency based on volume

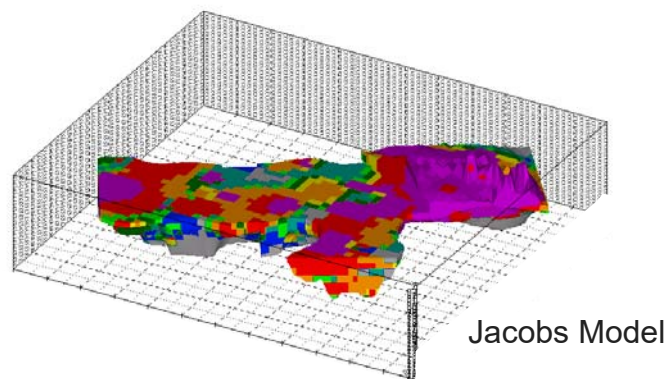
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Technology – EVS Modeling

Soil Quality Categorization

	Table 9 SCS
	Confined Fill
	Table 3 SCS
	RSC1 Fill Cap Standard
	CBRA1 Controlled Fill Standard
	CBRA2 Controlled Fill Standard
	CBRA3 Controlled Fill Standard
	Off-site Treatment (Organic)
	Off-site Treatment (Metal)



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SCS = Site Condition Standard

EVS = Environmental Visualization System



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Technology – Investigative, Analytical

Assessment	Comment
Bulk Testing	• COCs for excavated soil; frequency based on volume
Visual/Olfactory	• Segregation at excavation face
Leach Testing	<ul style="list-style-type: none"> • SPLP at pH 5; deionized water for VOCs, PHC F1, cyanide • Development of leachate screening levels using Beneficial Reuse Assessment Tool • Allowed exclusion of S-GW3 risk-based criteria in setting target concentrations
Compliance	• Single point (controlled fill, cap fill) vs statistical (cap fill)

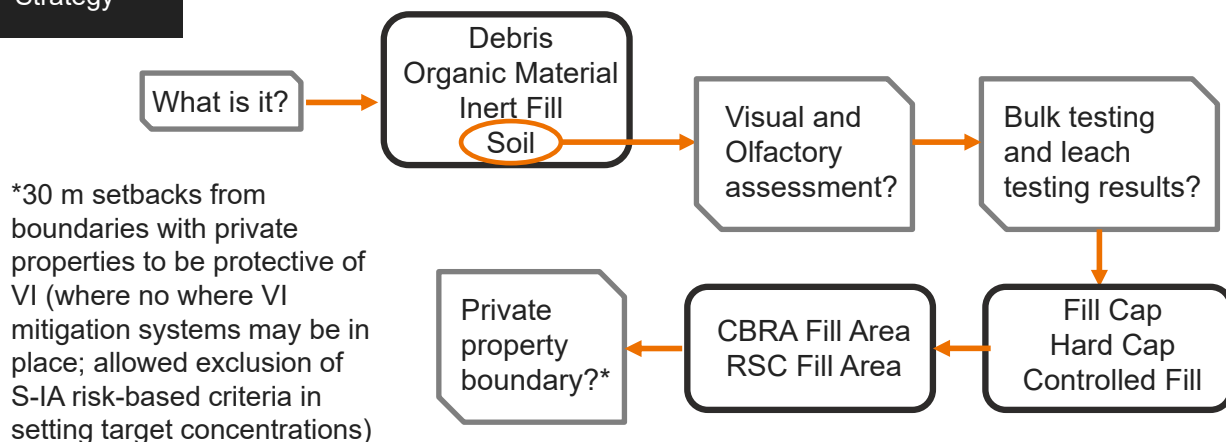
S-GW3 – Leaching from soil to groundwater that migrates to surface water



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Metrics for Decisioning - Placement



S-IA – Soil to indoor air

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Implications

- Full-time oversight for soil quality and placement (vertical, horizontal)
 - High-resolution drones
 - Field observations within GPS enabled iPad
 - Daily and weekly reporting based on ArcGIS Survey 123
- Tracking for interim and permanent placement
 - Interim stockpiling in future soil management area tracked via ground based and aerial (drones) process; **consideration of site capacity for storage/treatment**
 - Tracking system for permanent placement to be determined (TBD); potentially Equis based system



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Data Management

- Documents
 - Construction, design, environmental, other
 - Truck and excavation tracking
 - Manual
 - GIS based system; GPS on excavator buckets
 - Soil quality data
 - Pre- and post-treatment
 - Final prior to placement
- TBD for PLFP!**



KNOWLEDGE
MANAGEMENT
PORTAL
(KMP)

- GIS-based
- Multi-source information
- Data source agnostic
- Real-time access

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Conclusions

Programs for optimizing soil reuse must consider cost/benefit of implementing different layers of options, noting additional management costs and risks associated with each added option.

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Thank you – Questions

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