BC Hydro Rock Bay Remediation Project

Management and Technical Achievements of a Major Remediation Program

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Overview

› Site History

› Tailored Project Management Approach

› Remediation History

› Key Technical Achievements
Location of Rock Bay

Rock Bay

Downtown Victoria
History of Rock Bay

1884 Shoreline

Rock Bay

Former MGP

Pembroke Street

Government Street
Project Management – Working Areas
Risk Register - Background

A **Risk Register** is a management tool for monitoring the risk management process within the project. It is used to identify, assess and manage risks down to acceptable levels*.

Risk Register – implemented due to project complexity and importance of overall project schedule.

* [https://www.simplilearn.com/risk-management-framework-article](https://www.simplilearn.com/risk-management-framework-article)
Risk Register - Implementation

- Regular ongoing review (every 2 – 3 months)
- Risks separated into 40 different categories
- Risk levels assigned based on probability and consequence severity

<table>
<thead>
<tr>
<th>Risk Level</th>
<th>Probability</th>
<th>Insignificant</th>
<th>Minor</th>
<th>Moderate</th>
<th>Major</th>
<th>Catastrophic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rare</td>
<td>Rare</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td>Unlikely</td>
<td>Low</td>
<td>Low</td>
<td>Medium</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Possible</td>
<td>Low</td>
<td>Medium</td>
<td>Medium</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Likely</td>
<td>Medium</td>
<td>Medium</td>
<td>High</td>
<td>High</td>
<td>Very high</td>
</tr>
<tr>
<td></td>
<td>Frequent</td>
<td>Medium</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>Very high</td>
</tr>
</tbody>
</table>
## Risk Register – “Shelf-Ready” Solutions

**REGULATORY: CSAP** requires more work to be done following review.
- Early review and engagement with CSAP. Potential concerns were brought forward early allowing them to be addressed.

**OFF-SITE PARTIES: Inability to conclude working agreements with off-site third parties.**
- BC Hydro Project Manager responsible for early communication and negotiation with third parties.

**SITE/GROUND/FACILITIES: DNAPL may be present at greater depth at SW corner of WA3**
- Excavation in this area to include all of weathered clay to ensure all DNAPL is removed.
Remedial Program – History

Rock Bay

2004/5
130,000 tonnes

2004/5
110,000 tonnes

2014/5
54,000 tonnes

2013
11,000 tonnes
Preservation of Heritage Buildings

Instrumentation Building

Rock Bay (Powerhouse) Building

Administration Building
Shoring Techniques

Project size and variability required multiple types of shoring

› Options considered based on depth of excavation, stratigraphy, access and presence of utilities
› Project team received input from contractors and BC Hydro construction team
Shoring Techniques – Secant Wall

Secant Wall

› Interlocking concrete piles with reinforcing H-piles
› Extended to design depth (15.0 m bgs) or keyed into bedrock
› Capable of drilling through 1 – 2 m diameter sections of rip rap
› Excavation to 8 m bgs without slot cutting
Shoring Techniques – Tar Well

- Identified during the excavation around the perimeter of the Former Instrumentation Building
- 1.9 m diameter / 14 m depth
- Estimated to contain 26,000 litres of coal tar NAPL
Shoring Techniques – Tar Well

› Overlapping unreinforced secant piles installed surrounding the tar well
› Tar stabilized in-situ with hog-fuel to satisfy treatment facility requirements
› Tar well void backfilled with CDF to encapsulate any residual contamination
Shoring Techniques – Sheet Pile

› Used where rip rap not present / removed mechanically and in areas of utilities
› Excavation to 4 to 5 m bgs without slot cutting
› Excavation to 8.1 m bgs with additional support and/or slot cutting
WA3 - Modified Sheet Pile

Excavation to the property line was required within HW area at WA3

› Sheet pile wall with backing steel plate installed
› Material within the void subsequently removed to the depth of excavation (hydrovac)
› Minimal water infiltration through sheet pile wall observed.
Hazardous Waste Transport

› Reduction of vapours / odours was achieved by wrapping the HW soil with poly
› Reduce potential for spillage during transport
Stockpile Soil Tracking

- Soil classified based on in-situ data
- Tracking system implemented to insure proper stockpiling of excavated material
- Coloured card provided to driver
- Material Movement Approval forms used

<table>
<thead>
<tr>
<th>Stockpile ID</th>
<th>Colour Code</th>
<th>Soil Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td></td>
<td>Class 1 Commercial/Industrial Soil (CL-) - re-useable as backfill</td>
</tr>
<tr>
<td>A2</td>
<td></td>
<td>Class 2 Commercial/Industrial Soil (CL-) - for off-site disposal.</td>
</tr>
<tr>
<td>B1</td>
<td></td>
<td>Contaminated Soil (CL+)</td>
</tr>
<tr>
<td>B2</td>
<td></td>
<td>Wood Waste</td>
</tr>
<tr>
<td>B3</td>
<td></td>
<td>Hazardous Waste (HW)</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td>Uncontaminated Clay</td>
</tr>
</tbody>
</table>
Purpose: to reduce the potential for residual contamination to negatively effect the post-remediation groundwater quality

- Excavation extended 0.5 m into the underlying weathered clay
- Within the HW area, excavation extended 1 - 2 m to remove weathered clay
WA3 - Storm Water Pipe Reroute

› 0.9 m diameter storm water discharge pipe - southern area of WA3 excavation
› Located in area of HW contamination requiring excavation to 8 m bgs
WA3 - Storm Water Pipe Reroute

› Contractor implemented design
› Two new manholes installed
› Utility rerouted in area previously excavated using a gravity feed system
› Former storm water pipe replaced
WA4 – Source of Contaminant

- MGP-contaminants migrated across the bay
- Contaminants deposited at bottom of unfilled Rock Bay and buried (primarily between 1884 to 1918) during the filling of portions of the bay;
- Buried sediments called Bay Bottom Sediment
WA4 - Approach

Risk Assessment of MGP-Sourced Contamination

Contamination
› Difference between pre and post-industrial era sediment quality
› Widespread contamination in present from surface to BBS
› MGP contaminant of concern in BBS - PAH and LEPH

CofC Approach
› BC Hydro only responsible for MGP sourced contamination
› Residual contamination (within the BBS) addressed by means of risk assessment
Rock Bay Achievements

› 16 Certificates of Compliance
› 2016 Environmental Managers Association of BC - Regulatory Challenge Award Recipient.
› 2017 Association of Consulting Engineering Companies BC – Awards for Engineering Excellence
› 2017 BROWNIE Award
› 2018 Engineers and Geoscientists Environmental Award
› Property ready for redevelopment
QUESTIONS?
Values that guide us

Our values keep us anchored and on track. They speak to how we run our business, how we express ourselves as a group, and how we engage with our stakeholders and inspire their trust.

**Teamwork & excellence**
We’re innovative, collaborative, competent and visionary.

**Customer focus**
Our business exists to serve and add long-term value to our customers’ organizations.

**Strong investor return**
We seek to reward our investors’ trust by delivering competitive returns.

**Health & safety, security and environment**
We have a responsibility to protect everyone who comes into contact with our organization.

**Ethics & compliance**
We’re committed to making ethical decisions.

**Respect**
We consistently demonstrate respect for all our stakeholders.