BRITISH COLUMBIA
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Ministry of Environment

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Meadow Avenue
Former Wood Treatment Facility, Burnaby, BC

Overview

The Meadow Avenue site in Burnaby operated for 50 years as a wood preservation facility owned by Koppers International Canada Ltd. Contamination resulted when creosote used in the preservation operations was lost to the environment. As a dense nonaqueous phase liquid (DNAPL), the creosote contamination permeated soil, groundwater, and sediment far below the site's surface and in the nearby Fraser River. This site represents the early use of a risk management strategy to address contamination issues in British Columbia.

Innovations

The remediation strategy used at this site involved isolating the contaminated areas from the surrounding environment. The purpose of the design was to provide long-term hydraulic/constituent control through the combined effects of physical impedance, flow diversion, and natural attenuation processes. This approach ensured that organisms were unable to access affected areas, and it helped the site owner avoid the extensive cost and time expenditures associated with removal and disposal of large volumes of contaminated sediment – up to six metres deep in the Fraser River. Other benefits of the strategy included less waste to be dealt with, and less time before the area could be used for further construction.

To prevent the migration of contaminants, a number of on- and offshore sheet pile walls were installed to isolate contaminated sediments and control groundwater. Connecting the walls was an innovative "cap," consisting of a protective sand and gravel layer, over which was a low permeability layer of clay-like material called Aquablok, and finally another

Wharf area

Marshland area


Marshland area

sand and gravel layer. The cap acted as the foundation for a constructed marshland area, and a shoreline extension was developed into a riparian habitat. Structural features included offshore densification piles for seismic resistance and both onshore and offshore berms to provide stability and erosion protection.

The containment method used at this site ensured that groundwater contamination would be attenuated to below risk-based criteria before it could reach the Fraser River. Site-specific toxicity reference values (TRVs) represented the acceptable concentrations for constituents discharging to the river bed from upland source areas and from sediments between the sheet pile walls. Innovative computer modelling was developed and used to simulate long-term trends for the migration of contaminants through groundwater. The results of substance fate and transport studies were then used in building the previously described remedial infrastructure at the site.

Monitoring and collection wells for DNAPL were also installed, as were six discharge zone groundwater monitoring wells. These wells ensure that the continued effectiveness of the contamination containment system can be verified.

Key lessons learned

The risk-based approach used in this project was a very successful method of remediation. In addition to being a sound remedial strategy in terms of financial and time expenditures, the wharf area formed by the cap added economic potential to the property by providing access to the Fraser River. The new marsh and riparian areas also replaced the original industrial foreshore, adding ecological diversity to the area.


Marshland, riparian zone, and wharf area

The implementation of post-remediation monitoring was another important aspect of this project. The ongoing monitoring of groundwater wells in the Fraser River provides valuable information regarding both the migration and attenuation of contaminants. The cost versus necessity of continued environmental monitoring of contaminated groundwater is an issue of ongoing discussion at this site.

Because the remediation approach was novel, monitoring long-term effectiveness remains a high priority. Features of the site's long-term Performance Monitoring Plan include annual reports for 10 years on each of the site's main remedial features: hydraulic control, sheet pile, engineered cap, habitat compensation and DNAPL collection. In addition, annual reports are provided to the federal Department of Fisheries and Oceans on the intertidal marsh and riparian habitat that was constructed onsite.

Many stakeholders and regulators were involved in this project from the early stages, and the initial remediation order underwent a number of amendments. These revisions were developed based on dialogue between the ministry, site owners, and interested third parties and their respective experts. These parties debated the risks associated with the contamination at the site, the necessity for remediation, and the best remedial approach.


Treatment plant


Marshland area

Together, project participants developed a new solution to the problem of contaminated sediments – an appropriate and cost-effective alternative to dredging and removing affected material. This unique solution may act as a model for other projects of this nature.

Timeline

1931–1983: Wood treatment facility operated on the site
1983: Conditional ministry approval to Koppers International Canada Ltd.'s cleanup plan, contingent on further groundwater monitoring
1987: Monitoring activities cease
1995: Investigations reveal significant discharges of creosote into the Fraser River
1997: Remediation order issued under the new contaminated sites legislation
2002: Groundwater treatment starts
2003: Containment system erected, groundwater treatment ceases
2004: Groundwater monitoring starts
2007: Post monitoring of discharge concentrations continues


Marshland area

Note: This summary is solely for the convenience of the reader. Site investigation/remediation reports and ministry file records should be consulted for complete information.

For more information, contact the Environmental Management Branch at site@gov.bc.ca.