

# CANADIAN CONSULTING ENGINEERING AWARDS

## SYDNEY TAR PONDS AND COKE OVEN SITES REMEDIATION



## PROJECT SUMMARY

The process of turning coal into coke for over a century had left behind by-products that contaminated the soil and sediments with polynuclear aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs), mercury and other heavy metals. What remained in the heart of Sydney was one million tonnes of contaminated soil and sediment spread over three major sites—the North Pond, the South Pond, and the former Coke Oven sites—spanning a total of 100 hectares. In particular, the Sydney Tar Ponds contained approximately 750,000 m<sup>3</sup> of coal tar contaminated sediment within a complex marine and estuarine environment.

In 2001, the province of Nova Scotia closed the steel plant and, together with the federal government through Public Works and Government Services Canada (PWGSC), created the framework for the project which included the province forming the Sydney Tar Ponds Agency (STPA) to manage the cleanup of the Tar Ponds and Coke Oven Sites. The STPA is comprised of highly skilled contract managers and project implementers with engineering and environmental backgrounds, backed by trained financial and administrative personnel.

PWGSC was assigned by the Government of Canada as their lead for the project with responsibility for project governance, the implementation of financial and environmental controls, risk management initiatives and project quality assurance. The Nova Scotia Department of Transportation and Infrastructure Renewal is the province's lead and co-manages the administration of the project with PWGSC.

In 2004, the STPA selected an AECOM led team with partners CBCL Limited to provide overall project management support, remedial design, cost estimation, construction oversight and administration, technology review and CEAA process support for the cleanup.

**Remedial approaches and functional elements of the detailed design include:**

- handling, stabilization, in-situ solidification, and capping of PCB and PAH contaminated sediments;
- creek restoration and channel creation;
- groundwater collection and treatment systems;
- barrier wall creation;
- capping of a 70-hectare Coke Oven site;
- material removal, handling, and decontamination facility;
- road infrastructure;
- landfill; and
- site-wide restoration.

Project Delivery had two distinct phases: design and construction oversight. There was significant overlap due to the multiple contract approach undertaken on this project. The AECOM team successfully transitioned from the Design Phase to the Construction Phase while maintaining on-time, high quality, and significant project deliverables.

Project delivery was coordinated with multiple design teams and construction oversight teams for delivery to external entities including the client, regulators, independent engineer and contractors. Several Master Project Plans, common to design and construction phases, have been prepared and maintained. These include a Project Implementation Plan (PIP); Master Health and Safety Plan (MHASP); Environmental Management Plan (EMP); Environmental Protection Plan (EPP); Quality Management Plan (QMP); and Construction Oversight Plan (COP).

AECOM provided support to the client during the tender period by responding to tender queries, chairing and organizing bidders meetings and site tours, providing addenda, evaluating technical and price bid submissions, and providing a recommendation of award based on that evaluation.

Brownfield development of the site is underway and the STPA plans to transform it into urban parkland that includes public art, walking trails, bike paths, a sports field, an amphitheatre and several lookout points by late 2013.



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## INNOVATION AND TECHNICAL EXCELLENCE

The remediation of the Sydney Tar Ponds and Coke Oven Sites successfully implemented the world's largest marine application of solidification and stabilization technology to a large tidal estuary with complex, heterogeneous contamination that included coal tar, PAHs, PCBs, sanitary sewage and metals. In 2008, the Discovery Channel produced a feature story on the Tar Pond's technical pilot program for the solidification and stabilization design. This story was voted the "Discovery Channel's feature story of the year."

The technical excellence, creativity and innovative aspects of the solidification and stabilization design solution, which was supported through remedial technology assessments, and bench and in-situ pilot testing, are demonstrated through the following accomplishments:

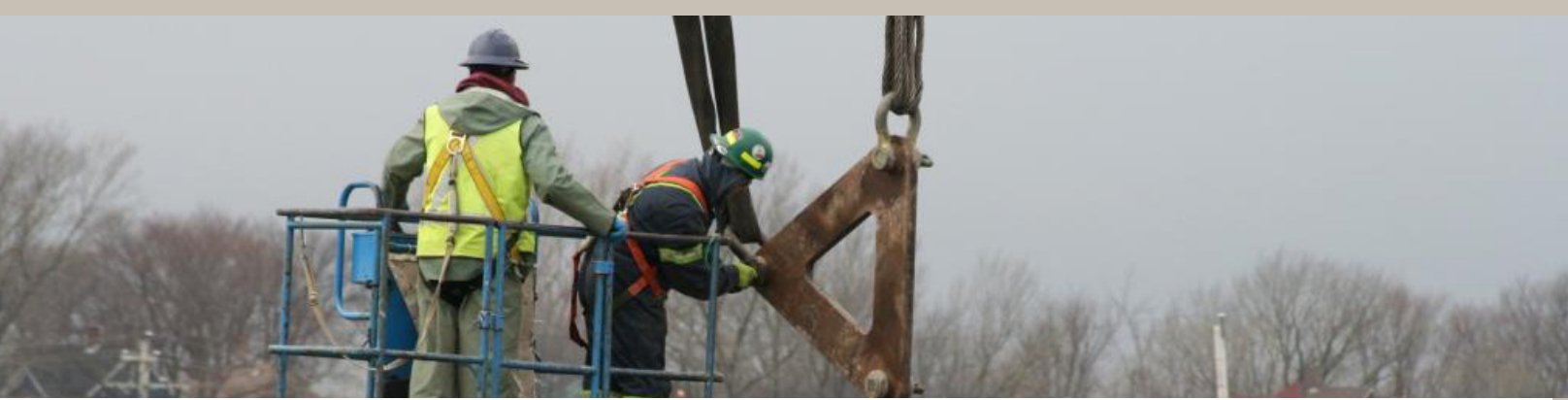
- design of customized solidification/stabilization mixture and amendments to meet site specific environmental, health and safety, sustainability, structural and constructability criteria within a complex, heterogeneous, depth variable contaminant medium;
- site specific leachate criteria, as assessed through development and approval of customized leachate toxicity testing procedures, were achieved;
- compressive strength parameters in the resulting solidification were developed and assessed to

ensure the remediated site would meet future land use, building and development criteria; and

- the development of hydraulic conductivity through intensive modeling of ground and surface waters at the site was required to ensure preferential deflection of site ground waters.

This remediation project also included the largest water control and management system of any other previous remediation. It has been designed to allow treatment of coal tar contaminated sediments in the dry and to control any water intrusion from the ocean through Sydney Harbour, and capture/pump incoming streams sequentially around the working areas.

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## A COMPLEX AND CHALLENGING PROJECT

The Sydney Tar Ponds and Coke Oven Sites make up the largest and most complex urban contaminated site in Canada. Prior to the current remediation project, there had been two failed attempts to design and implement a remedial solution. The core of the project site involved remediation and treatment of approximately 750,000 tonnes of coal tar contaminated sediment in the Sydney Tar Ponds, a marine estuarine environment connected to the greater Sydney Harbour.

The selected remedial approach of solidification and stabilization included critical design complexities and challenges that were met through the following solutions:

- This high profile and visible project required rigorous management of stakeholder and community relations. Stakeholders included federal and provincial governments, as well as local governments, organizations, businesses and members of the community. Comprehensive public and project specific websites were developed. A community liaison committee was formed along with other technical committees that provided guidance and oversight to the project team. Workshops, open houses, progress meetings, media placements, technical presentations and tours were also implemented.
- Controlling air and odour emissions resulting from working of PAH, PCB and coal tar contaminated materials required high rate treatment and processing. A comprehensive odour monitoring and management program was developed. The program incorporated short term, medium term and long term odour suppression methods and materials. A “dust budget” with pre-defined limits was implemented for each contractor and was used to initiate work stoppages if limits were exceeded.
- Given the site’s history and community concerns surrounding the ability to successfully remediate the land, extensive quality control and quality assurance measures, coupled with stringent environmental and Occupational Health and Safety monitoring requirements were implemented. The project-wide and element specific quality program includes monthly quality control and quality assurance reports.
- Carefully designed and properly sequenced construction plans were developed to deliver the numerous contracts including the creation of new rehabilitated creek channels, the capping of solidified areas, road and infrastructure development, water collection and treatment, material recovery, decontamination and reuse/ recycle of materials. Physical constructability issues on a large site of approximately 100 hectares, with variable depth of material and high levels of debris blended into wastes with variable chemical and moisture content also needed to be managed.



# ECONOMIC & SOCIAL BENEFITS

## ECONOMIC

In addition to the remediation, one of the project's goals was to grow the local economy. Economic benefits were monitored, modeled and optimized during the design and implementation of the remedial solution.

Remedial design, construction and other related contracts included mandatory local and aboriginal content requirements. In fact, the first "aboriginal set aside" was implemented on this project. According to the STPA, as of March 2012 the project had invested \$113.3 million into Cape Breton's local economy. Econometric models used on the project indicate that it created 866 full-time positions. Technical, engineering, science and math programs were promoted to local youth—young women in particular—and to aboriginals and African Nova Scotians through active recruiting and hiring, seminars, workshops, tours and guest presentations.

Local contractors involved in the cleanup have developed new skills in the area of large scale remediation and they have acquired experience in solidification and stabilization techniques. The project has provided practical experience for local engineers, technicians, technologists and managers in designing and implementing, managing and completing environmental remediation and heavy civil engineering activities on a \$400 million project. Over 90 engineering firms, labs, contractors, consultants and suppliers were involved—many of whom expanded their operations and grew their staff's experience in large projects.

The remedial design and future land use plans also enable and support the future commercial and industrial uses of the site and facilitate its integration into Sydney's urban development plan.







## SOCIAL

For over 100 years, the local heritage steel industry was the economic engine of the community and Sydney grew and developed around it. It became the centre of the city as well as its core identifier. However, the ensuing decline of the steel industry and the resulting legacy contamination problem soon became Sydney's core identifier.

A critical aspect of the remedial design and future land use plans was the establishment of a signature site that not only created a new and green site, but also re-profiled the community and enhanced its future legacy. While there is an improved quality of life through the removal of contaminants, the development of green spaces with numerous recreational uses and access to water creates a renewed and vibrant city core.

In an April 2012 Toronto Star article, Alastair MacLeod, chair of the project's community liaison committee said: "there is a sense of tremendous satisfaction among Sydney residents — and a sense of surprise — that after so many years of disputes and nearly 1,000 public meetings about the future of the tar ponds, the city is on the verge of getting its own Central Park."

This groundbreaking Canadian remediation is in the final stages of construction and is expected to be complete in August 2013.

# ENVIRONMENTAL IMPACTS

The Sydney Tar Ponds and Cove Oven Sites Remediation Project is an early example of sustainable remediation incorporating environmental, economic and social aspects in its design and implementation.

## ENVIRONMENTAL

Over and above the environmental benefit provided through clean up of the Sydney Tar Ponds, including in particular the immobilization and isolation of 750,000 tonnes of coal tar contaminated sediments, the remedial design was built around site specific, risk based environmental criteria that achieved additional environmental benefits:

- The in-situ remedial design solution of solidification/stabilization was intended to reduce the overall carbon footprint of the project through reduced material transfer, fewer vehicular/mechanical movements and loss of material;
- A project-wide Environmental Protection Plan and Individual Contractor Environmental Protection Plans were enforced to instruct the contractor on what issues need to be managed during construction. Environmental inspections are completed and reported every four hours.
- Rigorous water and soil conservation practices were implemented.
- Waste materials and debris were recycled or reused and building foundations were left in place;
- Local materials such as slag were used to create the solidification/stabilization solution; and
- A 25-year post remediation monitoring program has been developed.



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# MEETING CLIENT NEEDS

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The Sydney Tar Ponds and Coke Oven Sites Remediation project has proven itself as one of Canada's first Sustainable Remediation Projects. From the project's inception, a key goal was an integrated remedial design that included future land use and urban redevelopment plans. The design included clearly defined risk-based environmental criteria with desired outcomes, as well as predetermined, mandated, and regularly monitored social and local economic benefits.

The STPA Mission statement states: As we conduct the cleanup, the health and safety for the community and our workers will be our number one priority. We will provide economic benefits to the local area. We will engage high calibre expertise as we strive to achieve a successful cleanup and promote a knowledge and skill transfer to the community. Throughout the project, we will conduct ourselves ethically, with professional integrity, and communicate honestly and openly.

This broad mandate has been applied through every step of the project. In the previously mentioned April 2012 article in The Toronto Star, Tanya Collier MacDonald, STPA spokesperson said: “When the future land use plan becomes a reality, the downtown of Sydney will benefit immediately. Fences will come down, roads will open, and three communities once separated by their industrial past will reconnect....it’s a turning point and an opportunity for continuous growth.”

Later in 2012, The Sydney Tar Ponds and Coke Oven Sites Remediation Project was awarded the Best Overall Project at the Canadian Urban Institute's 2012 Canadian Brownfields Conference. This annual event celebrates and promotes excellence in brownfield redevelopment and contaminated site remediation. In early 2013, the Consulting Engineers of Ontario also recognized the Sydney Tar Ponds and Coke Oven Sites Remediation in their annual awards program.



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