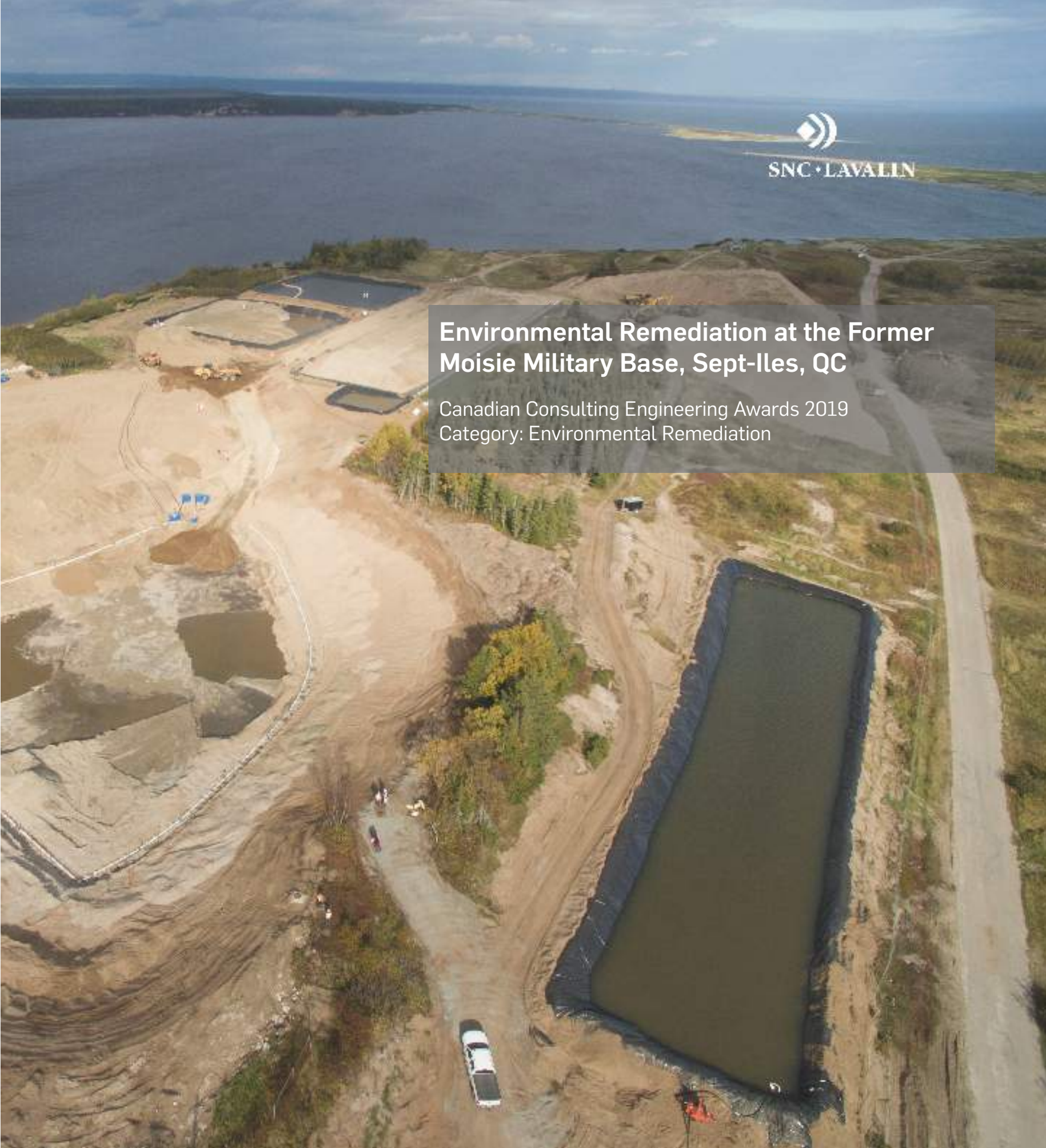

SNC·LAVALIN

Environmental Remediation at the Former Moisie Military Base, Sept-Iles, QC

Canadian Consulting Engineering Awards 2019
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Introduction

The former Moisie military base, near Sept-Îles (QC), was one of the 98 Canadian radar stations in the Pinetree Line, which was in operation from 1953 to 1988. It was part of the North American Aerospace Defense Command (NORAD) system linked to other lines such as DEW and Mid-Canada. The site is located on a sandy point between the Saint Lawrence Gulf and the mouth of the Moisie River, a renowned salmon river.

Activities at the base left the soil and groundwater contaminated with petroleum hydrocarbons (fuel oil and waste oil). After the station was dismantled and some surface decontamination work was carried out, the Department of National Defence conducted characterization studies on the deeper strata.

These studies revealed the presence of about 10,600 m^3 of contaminated soil up to 10 m deep, including nearly 4,000 m^3 beneath the water table.

Defence Construction Canada launched a call for proposals in 2015 to remediate the site within three years, based on applicable provincial or federal guidelines.

SNC-Lavalin's original approach of off-site treatment (through excavation and biotreatment) made it the lowest compliant bidder and earned the contract.

Innovation

Given the depth of the contamination (10 m), the presence of a long building (former curling building) located above the contaminated area and the sandiness of the soil, several firms opted for an in situ approach (with no excavation). In light of the uncertainty of this approach and the risk of not achieving the remediation objectives across the entire site by the deadline, however, SNC-Lavalin chose an ex situ approach (by excavation) and onsite biotreatment, to provide a better guarantee of the outcome.

To reach the deeply buried contaminated soil, about 80,000 m^3 of uncontaminated soil had to be excavated and temporarily stored. Due to complications related to the use of adjacent land for the treatment facilities, it was decided to group everything together on the National Defence land, which required more authorizations and a new implementation plan. The order of the work had to be adjusted in consequence, a process that was facilitated by the flexibility of the technology used. For example, due to space restrictions on the site, the soil treatment system (biopile) was applied to a depth of soil 4 m thick, twice as thick as traditional systems, but had to be as effective in order to reach the decontamination objectives.

To excavate the deeper soil, the level of the water table had to be lowered. To combat the high hydraulic conductivity of the sandy environment near the river, powerful pumps and nearly 200 wellpoints were required. The following questions arose: How much water will have to be pumped out to sufficiently lower the water table? What should be done with this potentially contaminated water, which will be pumped out at high speed, in the order of 200,000 litres per hour? Treating water at this flow rate would demand the construction of a sizable treatment plant, which was economically impossible. A solution was therefore put forward: install retention lagoons. With a capacity of nearly 8,000 m3 (equal to three Olympic pools), these lagoons would hold the water for a few days, long enough to assess its quality and treat it, if necessary, with an biological process similar to the one used in aerated ponds for the treatment of municipal waste water. It was a done deal, at least theoretically.

It’s complicated

The project was managed as a performance-based contract, which means the payments were conditional on achieving the objectives. A strategy had to be implemented to deal with any unexpected events that would have to be covered by SNC-Lavalin. For example, the decontamination system would have to treat soil for which the level and type of contamination were not entirely known. The same was true of the groundwater: the quantity and quality of the water pumped out of the contaminated area were difficult to predict. Despite the complex features of the site, the hypotheses developed at the beginning of the project, based on interpolations and hydrogeological calculations, turned out to be accurate.

As for the old curling building standing on the excavation zone, a way had to be found to either support it, move it or replace it. Several discussions were held with the owners, and as they preferred to keep it, only options 1 and 2 were available. SNC-Lavalin decided to move the building, because the number of pillars required to support the building 10 m off the ground would have been a nuisance for the excavation and backfill work. As it is no small task to move a 50m–long building and put it back after the work without damaging it, SNC-Lavalin called on a specialized subcontractor.

Social and/or economic benefits

The work was to be carried out on government land, private land and ancestral lands of the local Innu nation. Social acceptability was an important factor for the outcome of the project.

A public meeting was held to answer the questions and concerns of the residents of the Moisie settlement and the local environmental groups. A presentation was made to the Uashat mak Mani-Utenam band council, followed by another public meeting with the Innu community.

After these information sessions, the project was modified based on the concerns expressed by the locals. Agreements were then concluded about the usage zones on the site, the work schedule, access roads, monitoring of the water quality in the river, archeological studies, anti-dust barriers and the replanting of trees. The adjustments satisfied the various regional organizations affected by the project.

Most of the work was carried out by local subcontractors, at a value of over $2 million, generating some twenty different jobs during the work period, including Innus from the region (machinery operators, labourers, electricians, telecommunications technicians).

By the end of the project, the Department of National Defence is in a position to erase the environmental liability associated with this site. The area is also now more accessible to the Innus for traditional activities on the banks of the Moisie River.

Environmental benefits

The soil decontamination approach using on-site biotreatment, rather than sending the soil to a regional treatment centre, avoided the truck transportation of 14,700 m³ of contaminated soil, or about 2,000 truck trips. The local community was pleased that there was no off-site truck transportation, which would have generated noise, dust, road washouts and safety risks in the region, not to mention significant greenhouse gases. In comparison to an in situ process, the ex situ approach left no chemical residue in the soil or uncertainty about the removal of all the contamination.

Although the remediation project did not directly target the complete remediation of the groundwater, the work carried out on the soil greatly improved its quality. The sources of contamination for the groundwater were removed, including free-phase hydrocarbons and the contaminated soil itself. The analytical results of the groundwater samples in fall 2018, drawn from ten observation wells around the site, show that the concentrations of petroleum hydrocarbons are below the laboratory detection limits in seven of the wells and range from 120 to 970 ug/L in the other three, below the MELCC's petroleum hydrocarbon quality criterion for groundwater resurgence in surface water (2,800 µg/L).

Now that it is remediated to federal and provincial standards, the site is no longer an environmental threat for this recreational area bordering one of the best salmon rivers in Québec.

Meeting Client's Needs

By not preselecting a remediation technology in the call for proposals, the client allowed the environmental industry to propose innovative solutions and also transferred the risks to the industry that would put forward its own technologies. The client received nine proposals representing different technologies, each one backed by its proponent. The client's objective was therefore achieved.

The uncertainties about the exact distribution of the contamination, the technical feasibility of the project and the guarantee of the results were important criteria for the client. The ex situ approach ensured that no contaminated soil would remain at the site, because every cubic metre would be excavated and verified. From a site where hydrocarbon concentrations exceeded 30,000 mg/kg in some places, the excavated soil was decontaminated using a biologicaltreatment to an average of 2,000 mg/kg, well below the established objective of 3,500 mg/kg.

The reconditioned site now complies with provincial and federal environmental regulations. It was reseeded and shrubs were planted to accelerate revegetation.

All the objectives of this remediation project, undoubtedly the largest one in the region for a long time, at $3.4 million, were achieved on time and on budget, to the satisfaction of the client and the other stakeholders.