Ponts
JACQUES CARTIER +
CHAMPLAIN
Bridges

Canada

Solution Bonaventure

Environmental project to protect the St. Lawrence River

TECHNICAL MEDIA BRIEFING
June 10, 2016

#OurProjects

Background

Former landfill on the river shore

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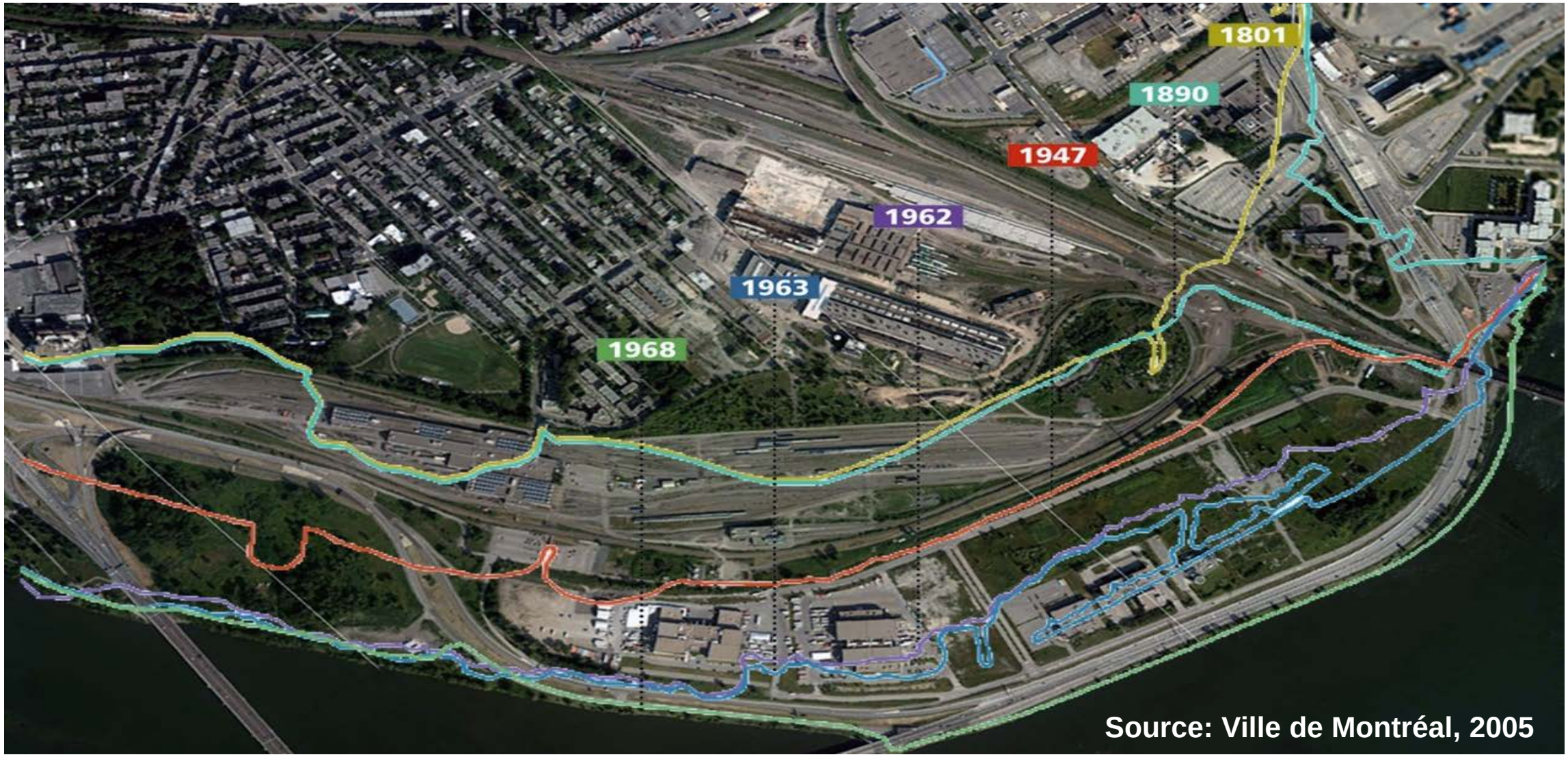
A century of pollution

- River shore used as a landfill site for industrial and domestic waste from 1866 to 1966
- Area filled in for the site development
- Bonaventure Expressway surrounds the site
- Major contamination problem from groundwater migrating into the river

Photo from 1959

The shoreline over time

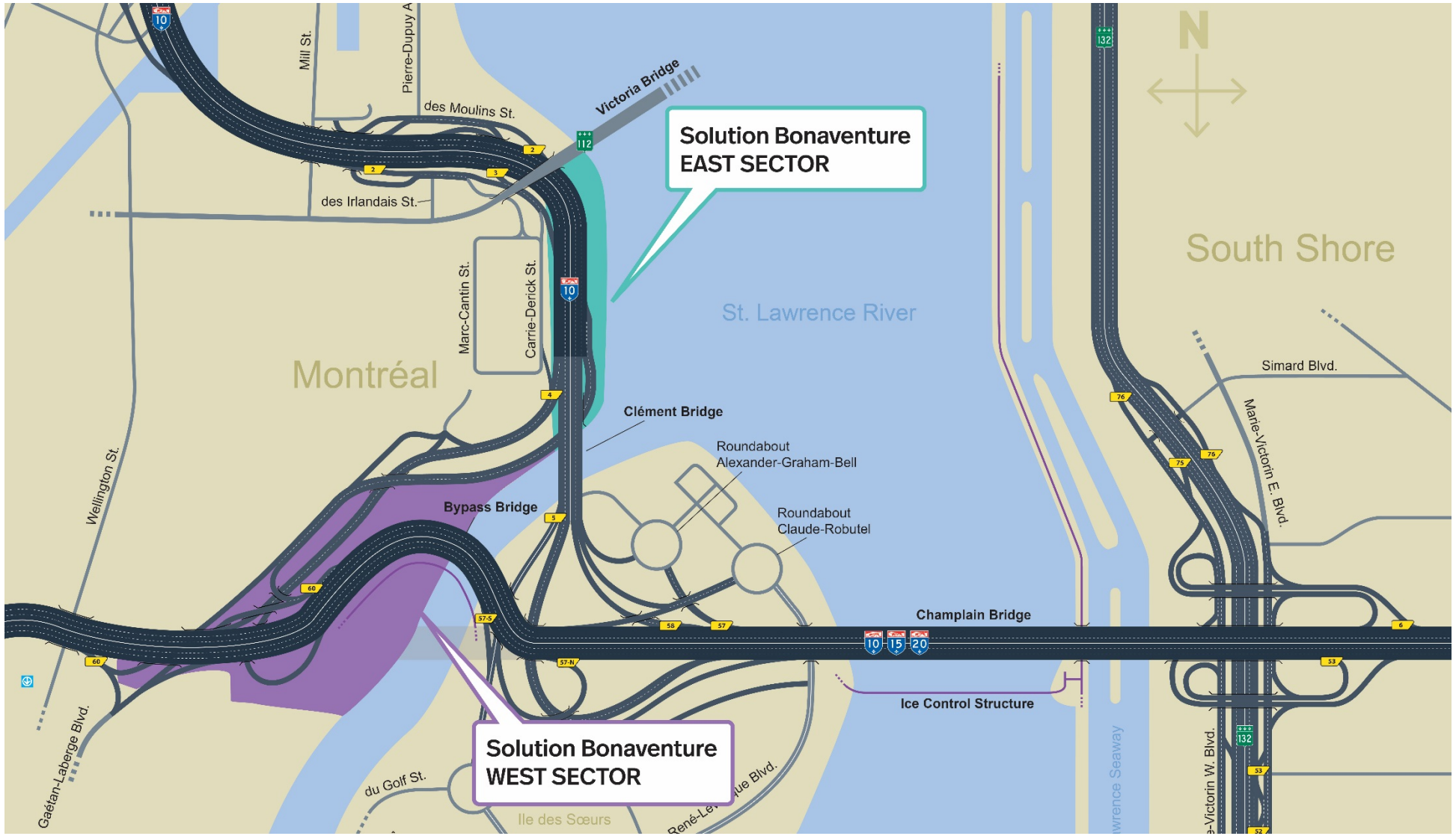


Project overview

GOAL: Protect the St. Lawrence River

- **Project:** An innovative environmental project to protect the St. Lawrence River from groundwater contaminants
- **Challenge:** Identify an integrated solution to the environmental problem for the entire site (east and west sectors)
- **Joint effort:**
  - The Jacques Cartier and Champlain Bridges Incorporated (JCCBI)
  - Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques (MDDELCC)
  - Ville de Montréal

Location


Solution Bonaventure
EAST SECTOR
Solution Bonaventure
WEST SECTOR
Montréal
South Shore
St. Lawrence River
Victoria Bridge
Clément Bridge
Bypass Bridge
Champlain Bridge
Ice Control Structure
Roundabout
Alexander-Graham-Bell
Roundabout
Claude-Robutel
Mill St.
Pierre-Dupuy A
des Moulins St.
des Irlandais St.
Marc-Cantin St.
Carrie-Derick St.
Wellington St.
Gaétan-Laberge Blvd.
du Golf St.
Ile des Sœurs
Simard Blvd.
Marie-Victorin E. Blvd.
Marie-Victorin W. Blvd.
N

West sector

CONTAMINANTS

- Ammonia nitrogen
- Polycyclic aromatic hydrocarbons (PAHs)
- Dissolved metals

SOLUTION

- Groundwater containment and treatment system

East sector

CONTAMINANTS

- Petroleum hydrocarbons (diesel) contaminated with polychlorinated biphenyls (PCBs)

SOLUTION

- Retaining wall and hydrocarbon capture system

Site specific issues

- Vast amount of land under the responsibility of three levels of government
- Complex environmental problem that is different for each sector
- Coordination and adaptation for the construction of the bypass bridge and the new Île-des-Sœurs bridge for the New Champlain Bridge Corridor project
- Traffic flow maintained

West sector project

Containment and treatment of contaminated groundwater

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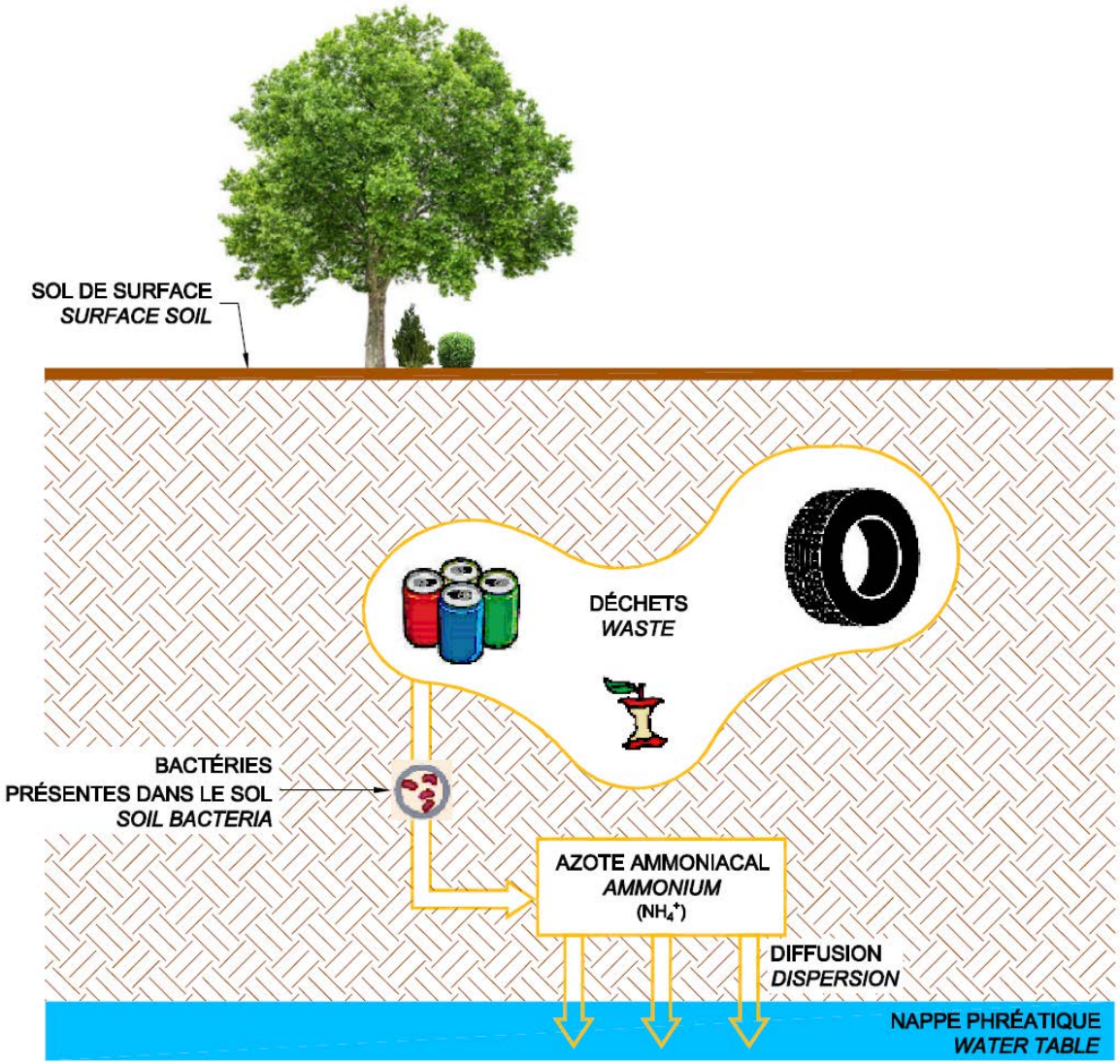
Problem

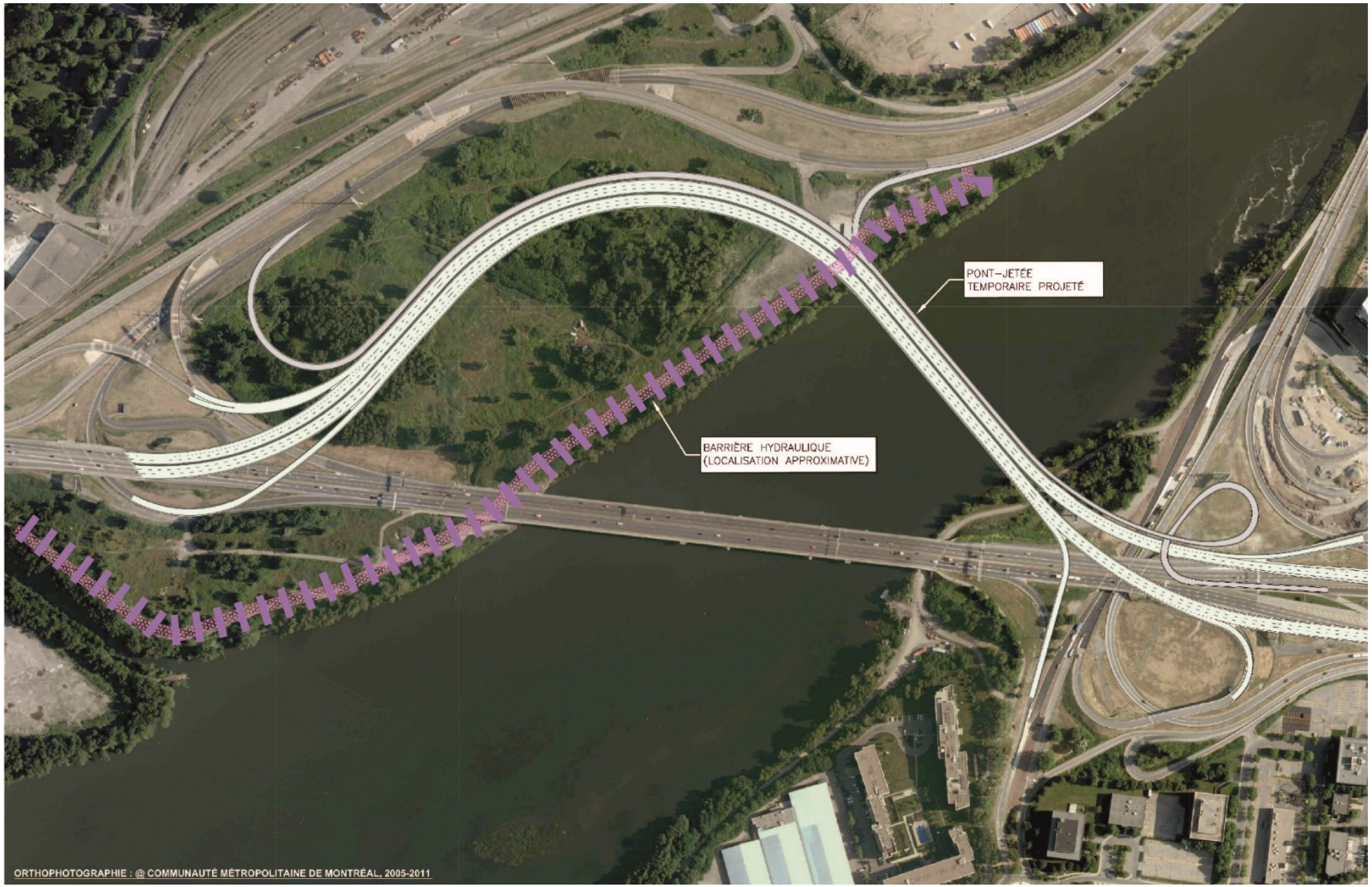
Groundwater contaminated with ammonia nitrogen, polycyclic aromatic hydrocarbons (PAHs) and dissolved metals



Technical solution

1. Installation of a hydraulic barrier made up of a series of wells along the shore
   - Number of wells: 33
   - Well depth: about 15 metres
   - Wells located at the edge of the river and installed in well bores 300 mm wide
   - 92 observation wells installed further upstream

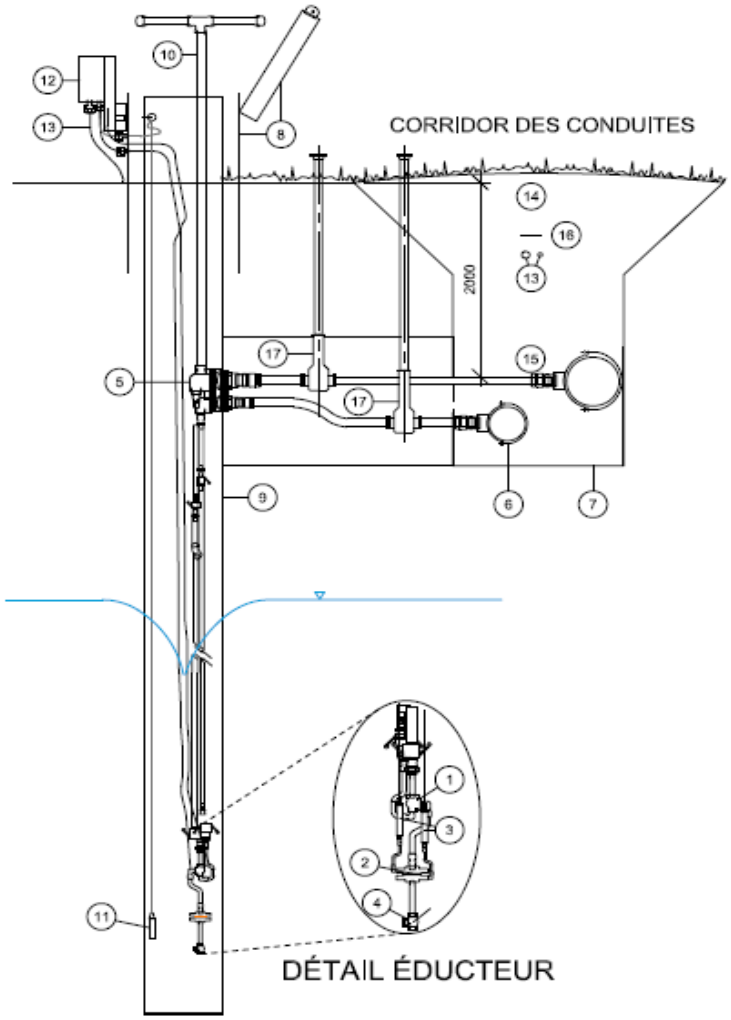
Technical solution



Technical solution

2. Pumping of contaminated groundwater

- Flow rate: 1,5 à 35 m^3/jour
- Total pumping rate: 240 m^3/day



Technical solution

3. Treatment of contaminated water

- Pre-treatment (oxidation, flotation and filtration)
- Biological treatment
- Ion-exchange resin treatment
- Discharge system (underground outlet)

Implementation

Project conducted jointly with the MDDELCC

Private-public partnership contract awarded to Sanexen Services Environnementaux Inc.

Work schedule

- SUMMER – FALL 2016
  Work to create the hydraulic barrier and construct a treatment system will start in summer 2016
- WINTER 2017
  System run-in
- SPRING 2017
  System start-up, for a period of 15 years

East sector project

Containment and capture of hydrocarbons

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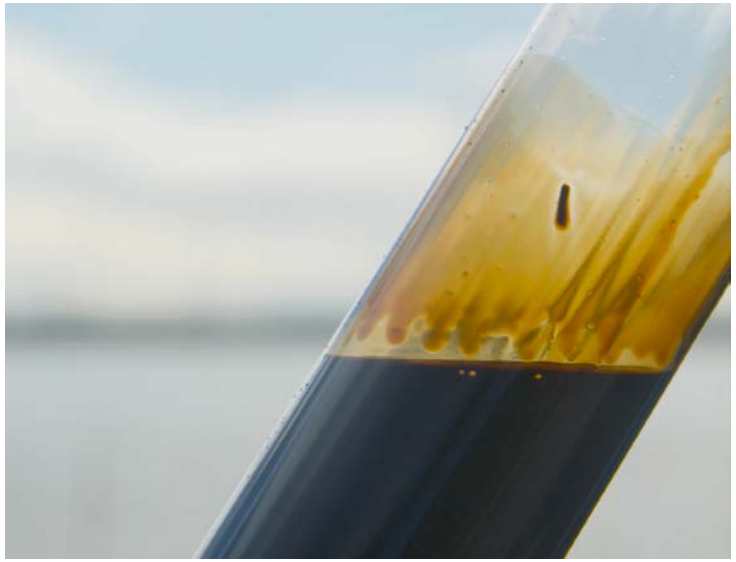
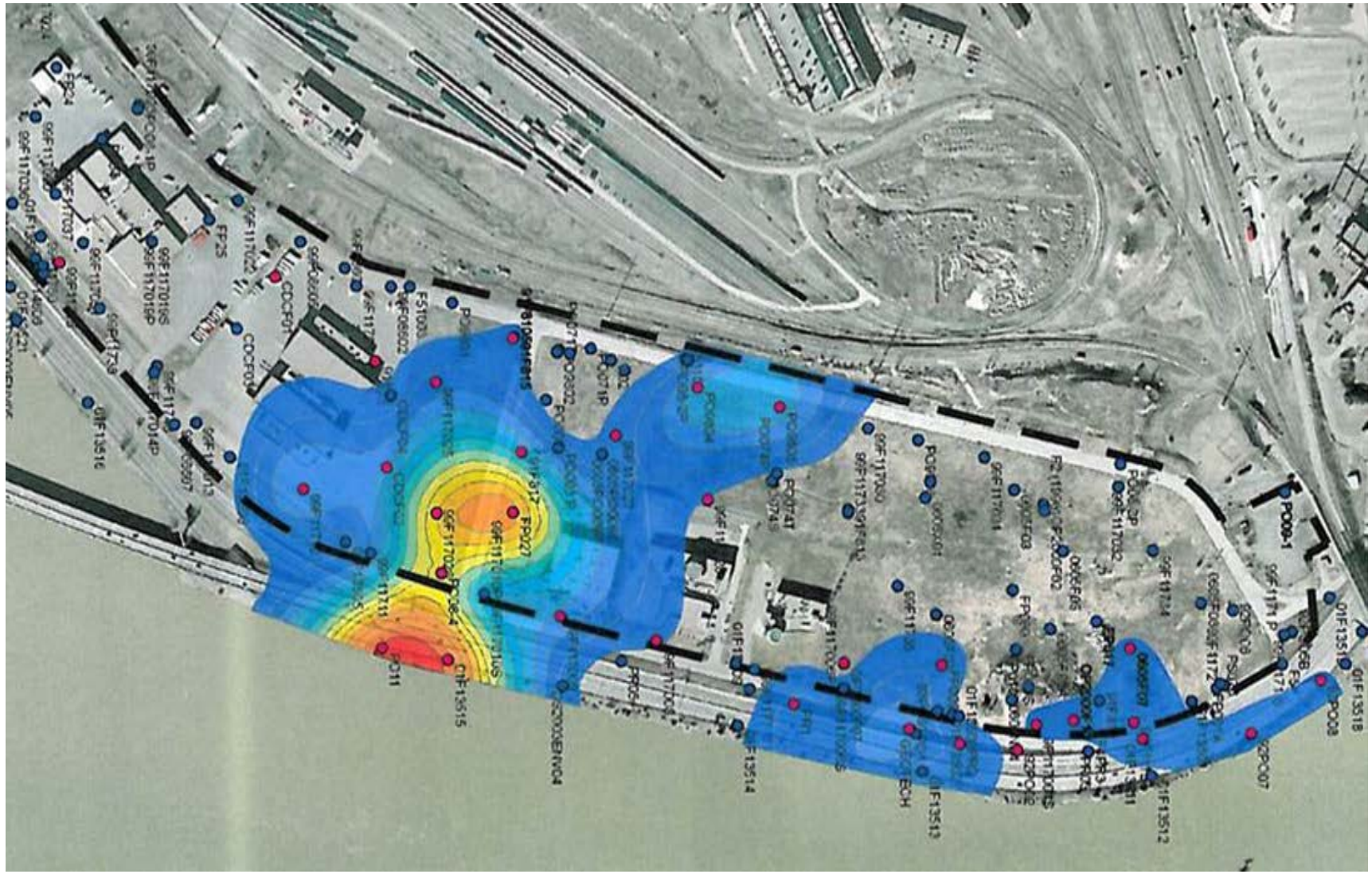
Problem

Petroleum hydrocarbons (diesel) contaminated with PCBs found in the groundwater table in variable concentrations





Technical solution

Construction of a containment system to stop the migration of hydrocarbons

Technical solution

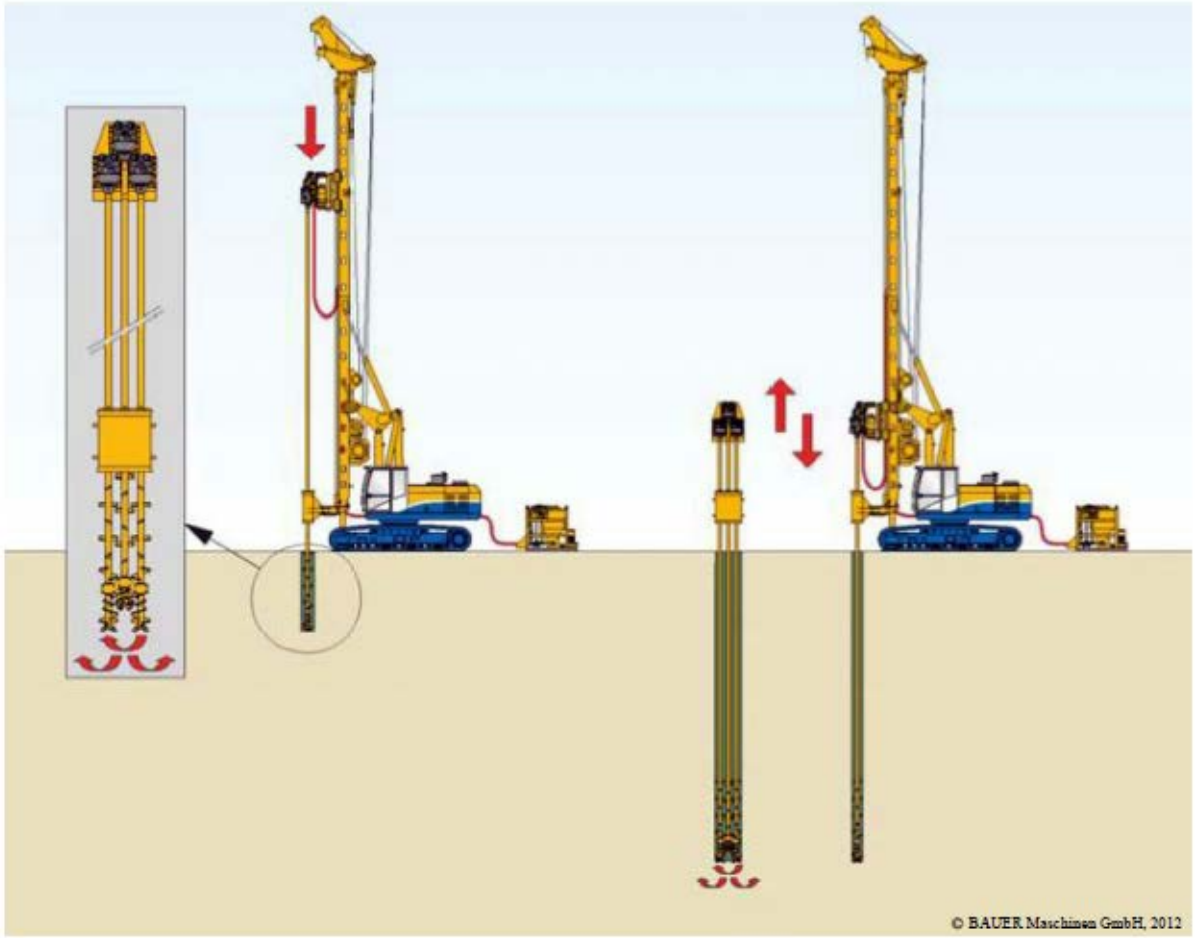
1. A retaining wall will be installed along the shore

- Length of 920 metres between Clément Bridge and Victoria Bridge
- Depth of about 12 metres
- Width of about 0.5 to 1.0 metre
- Lower section of the screen placed 2.5 metres below the average groundwater table level
- Exterior wall (surface facing the river) located about 1 metre from the river embankment
- Layout allows for the containment of petroleum hydrocarbons

Technical solution

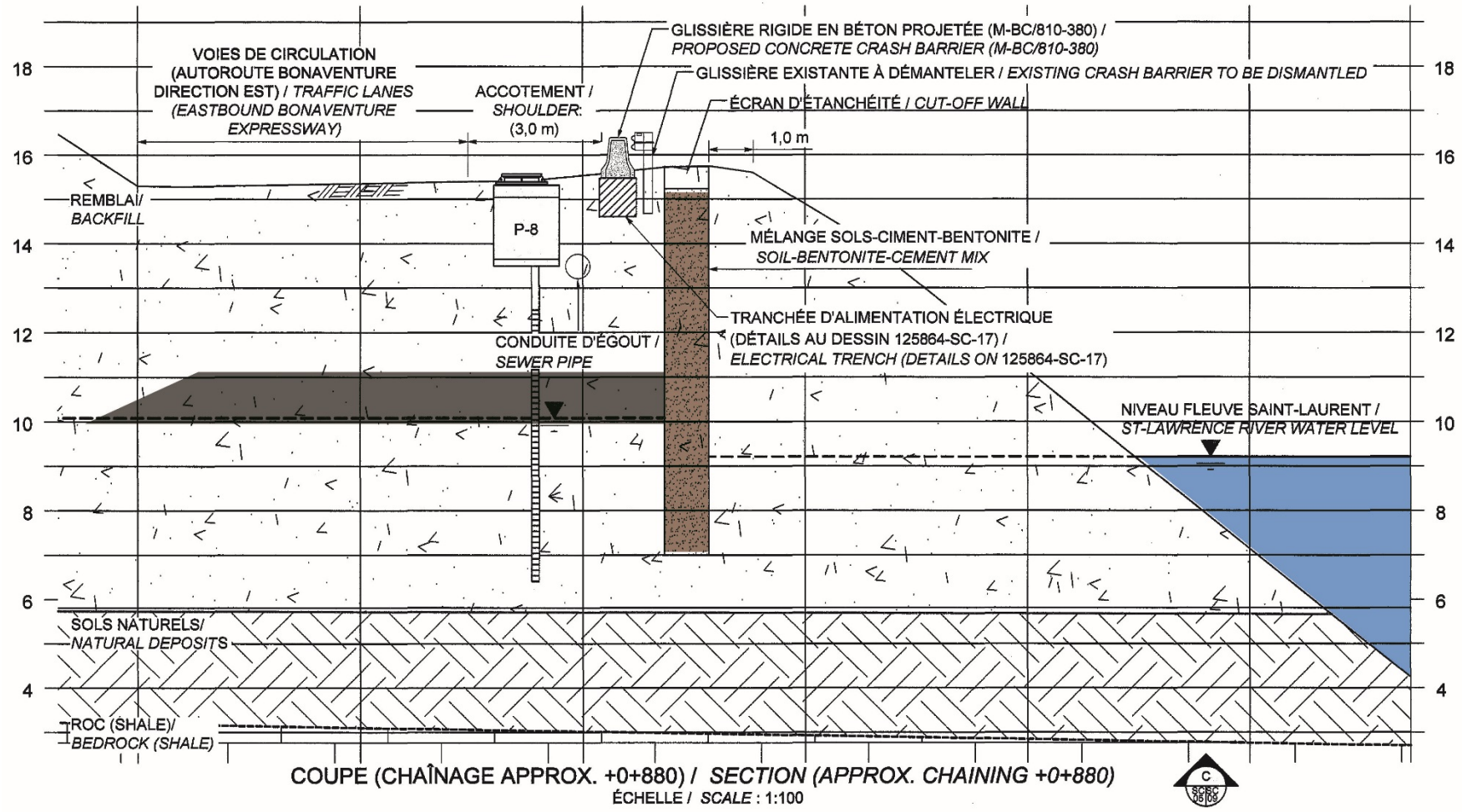
1. A retaining wall will be installed along the shore

- Deep soil mixing method
- Drilling to a depth of about 12 m
- Injection of cement-bentonite grout in the hollow core of the drilling auger
- Once set, the cement-bentonite grout blends with the soil and hardens to create the retaining wall
- Proven method for confined work sites



Technical solution

1. A retaining wall will be installed along the shore



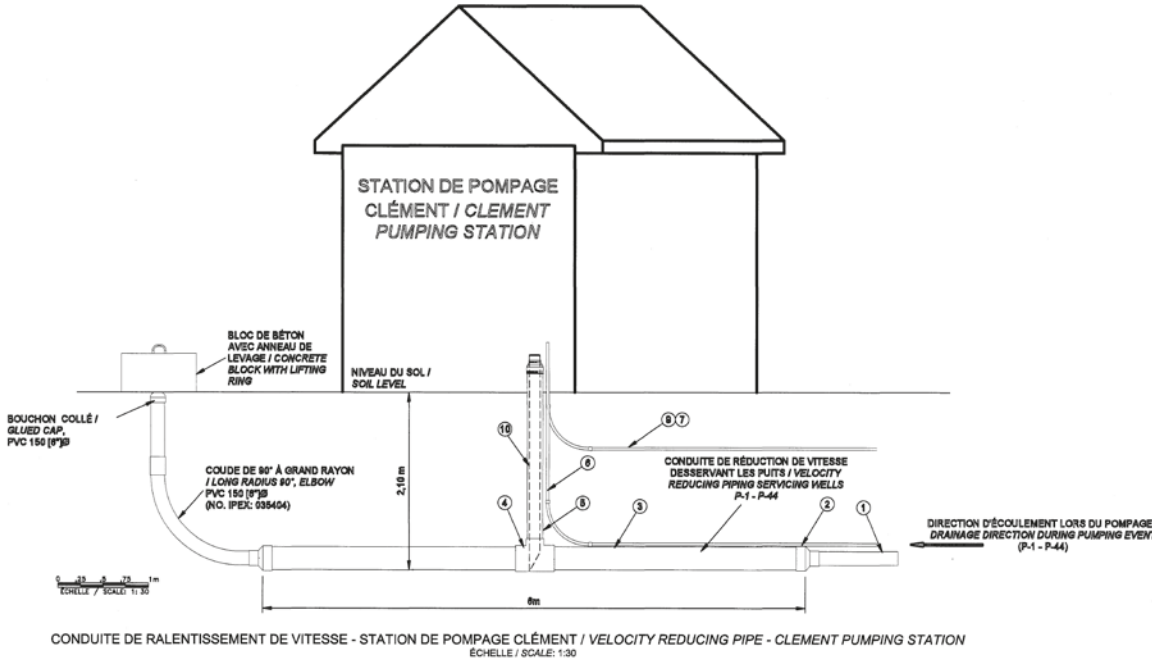
Technical solution

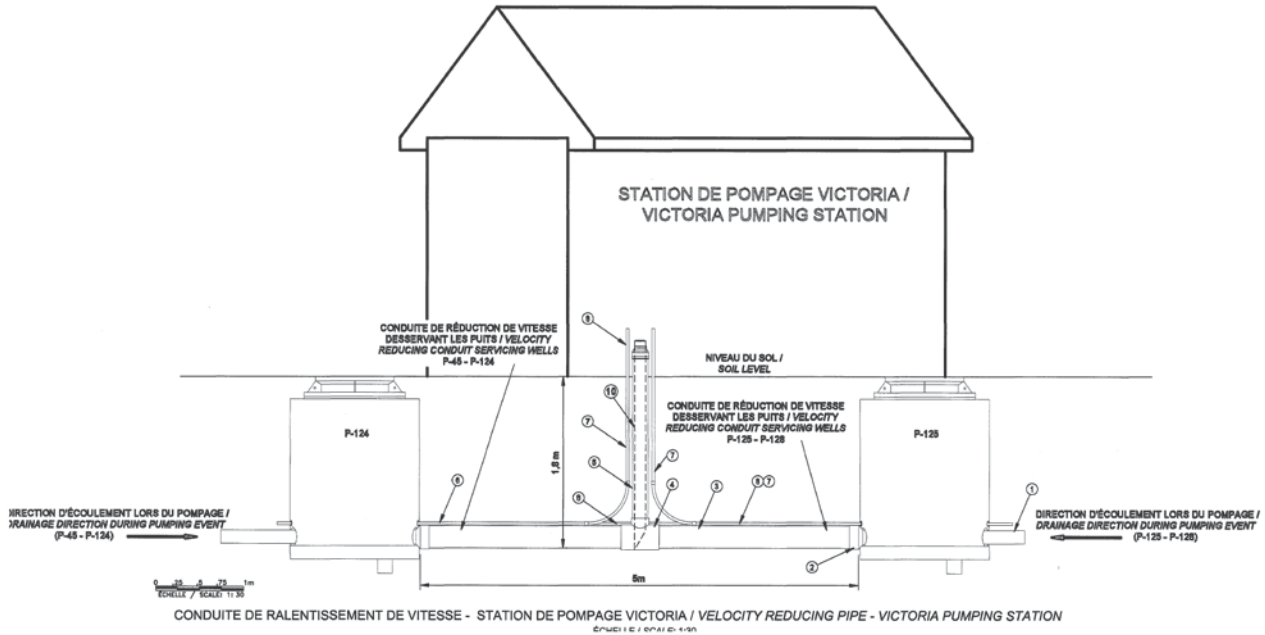
2. Creation of a capture system with 128 pumping wells

- Vacuum extraction of PAHs with a suction tube built into the recovery well
- The retaining wall prevents PAHs from migrating to the river; instead, they accumulate upstream from the screen and are recovered
- Capture system that includes:
  - Pumping wells 150 mm (6 in.) wide and 7 to 12 metres deep
  - Connecting lines laid down in a tight corridor on the shoulder of the Bonaventure Expressway

3. Construction of two hydrocarbon recovery stations

- Two pumping stations at the east and west ends of the containment area





Technical solution

4. Periodic recovery of hydrocarbons via both pumping stations

- Variable pumping frequency modified based on how deep PAH layers are (detected from periodic testing)
- Pumped volume of up to 10,000 L per load (mix of water and diesel)

Implementation

Project closely coordinated with the Ville de Montréal

Construction contract has gone to tender

Work schedule

- SUMMER – FALL 2016
  Work to build containment system
  Closure of one out of three lanes on the Bonaventure Expressway towards downtown
- WINTER 2017
  System start-up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