Evaluation of Innovative Technologies

for Groundwater Treatment

in the Area between the Champlain and Victoria Bridges, along the St-Lawrence River

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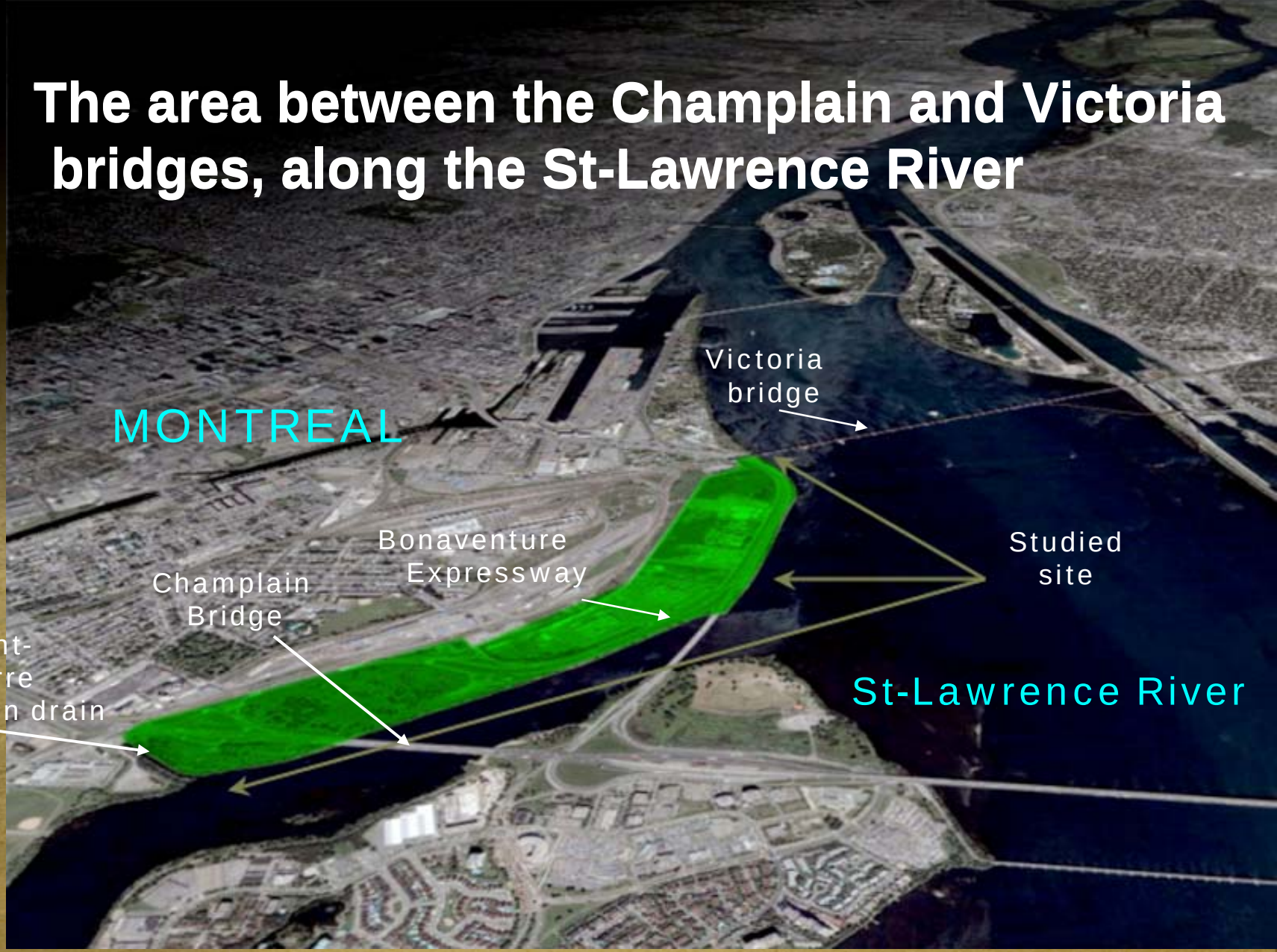
Outline of Presentation

- **Situation Scenario**
- MCEBR approach
- Environmental context
- Technologies tested
- In conclusion…

Situation Scenario

- 1866-1966 Municipal + industrial waste into the river or marshes (now 92 hectares)
- 1966 leveling and covering with aggregates for parking lot Expo 67 - biogases
- Early 70's short range airport
- Early 90's Industrial park – dynamic compaction- biogases recuperation
- Mid 1990- floating phase noticed leaking into the St-Lawrence – Evaluation 4-8 millions liters with 1-2 tons PCB
- Actual and historical marshaling yard/train repair shop: mid 90's pumping wall hydrocarbons
- 2004 Bentonite wall (167m.) non-anchered to capt floating phases
- Early 2000's Issue rising about dissolved toxicity in underground water

The area between the Champlain and Victoria bridges, along the St-Lawrence River



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A five-Phase Approach

Traitability | **Feasability**

1 **Exploratory studies**

2 **Call for letters of intent**

3 **Treatability tests**

4 **Pilot demonstrations**

5 **Findings and recommandations**

Phase 1

Exploratory Studies

(November 2005 – July 2006)

- Assessment of contamination
- Treatability test strategies
- Organization / QC-QA

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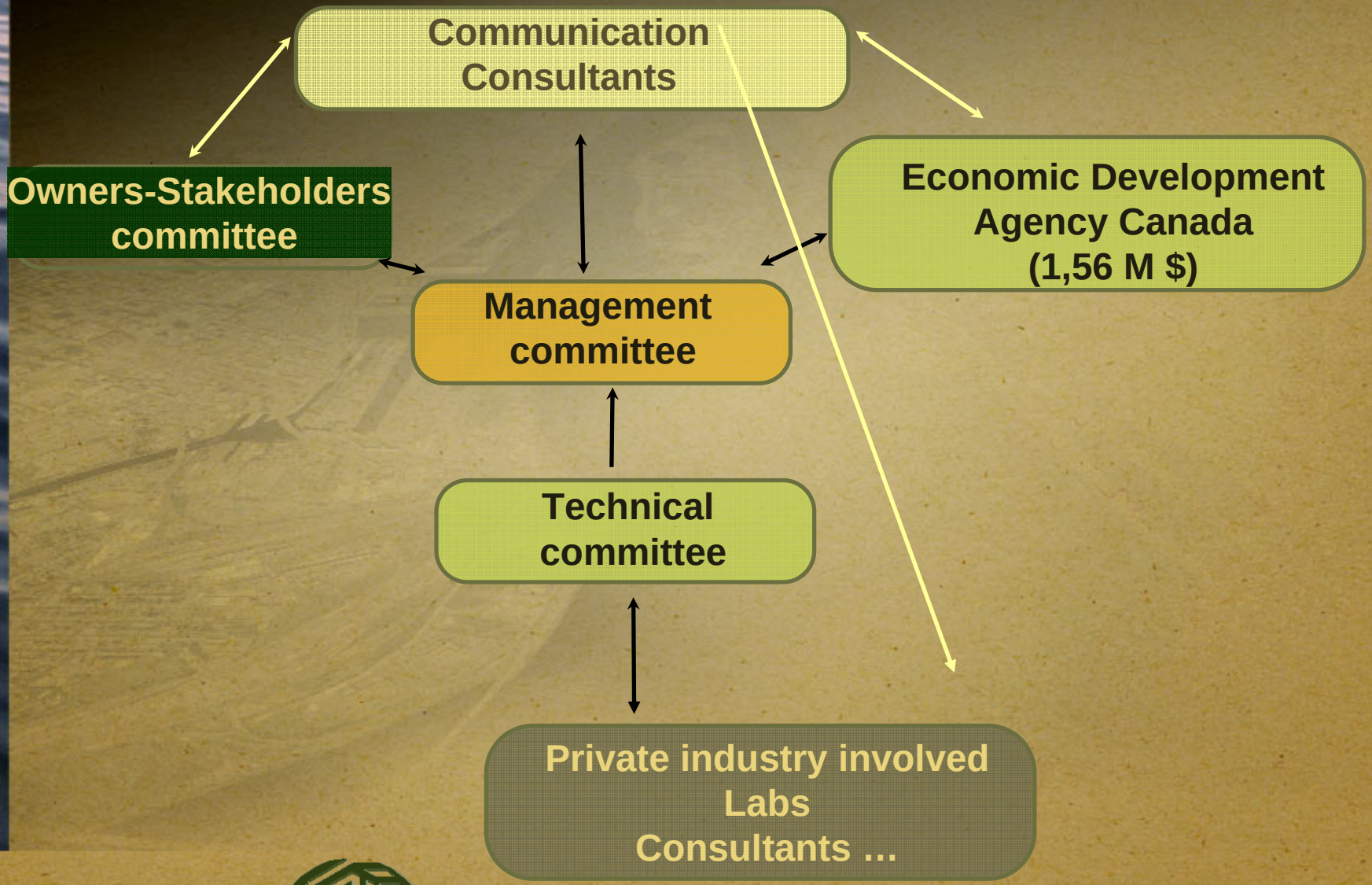
Governance



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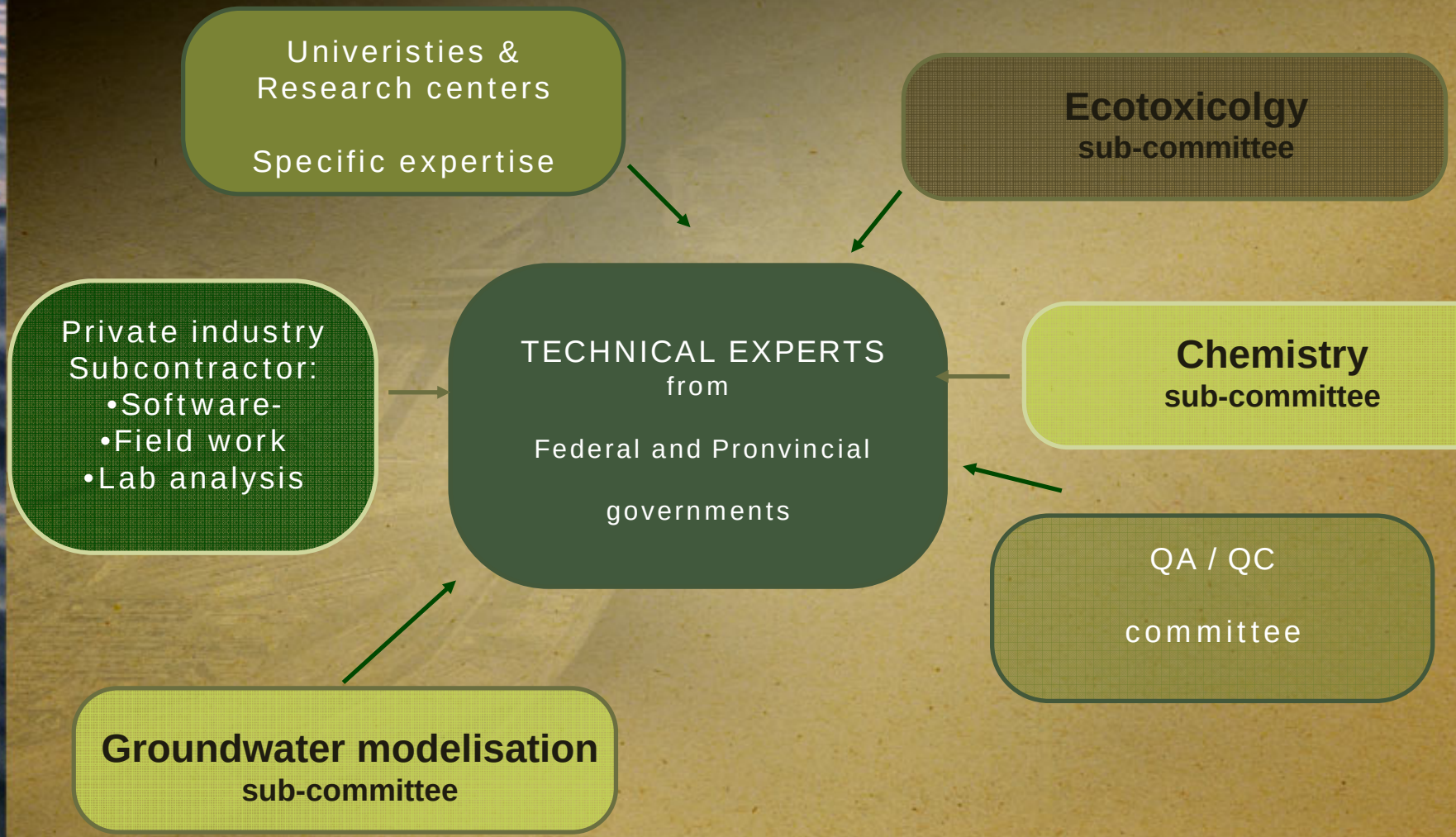
MCEBR TECHNICAL COMMITTEE



Phase 2

Call for Letters of Intent

(July 2006 - October 2006)

- **Public notice**
- **Candidate selection process**
- **Work plan and tracking protocol**

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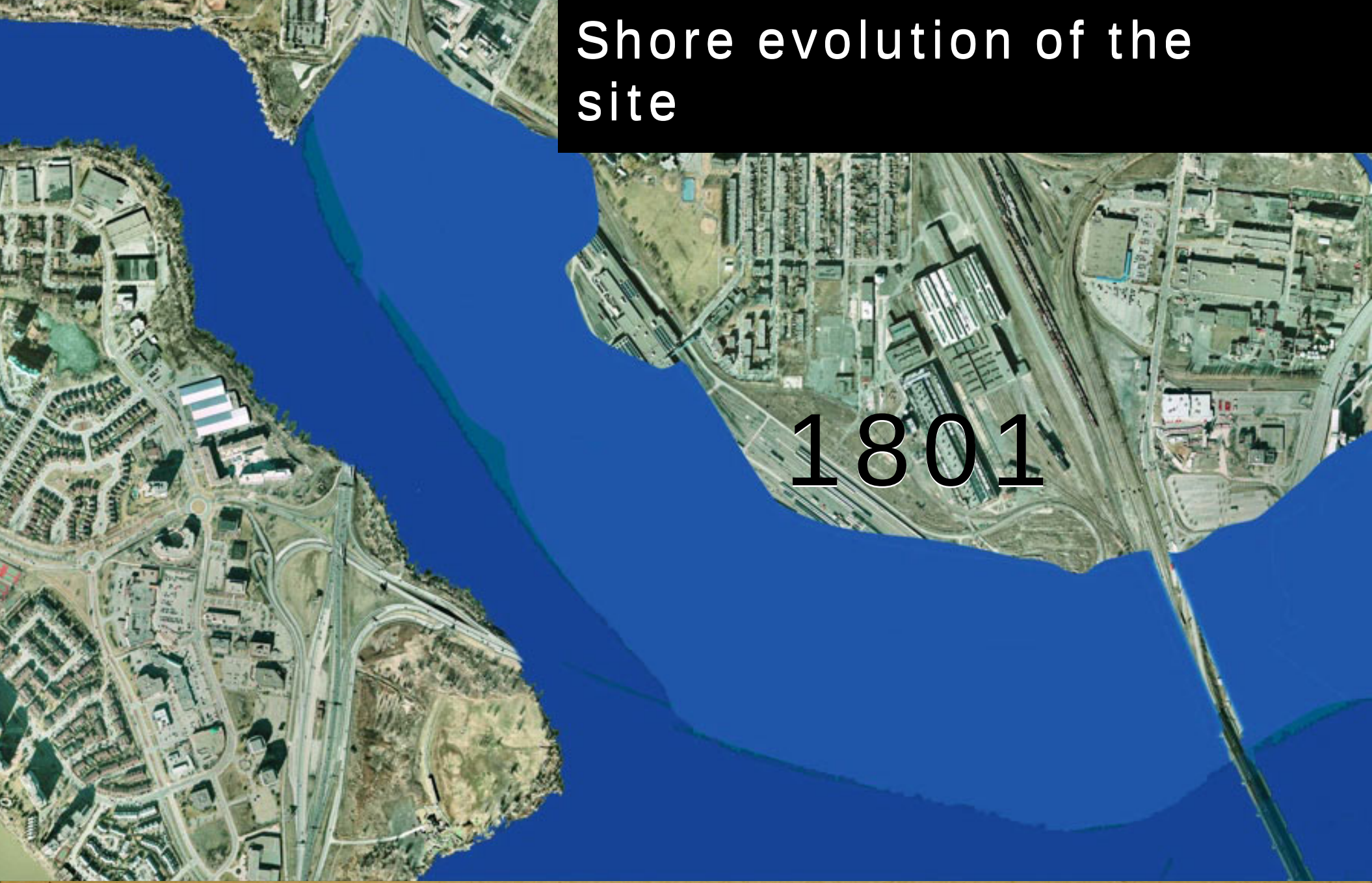
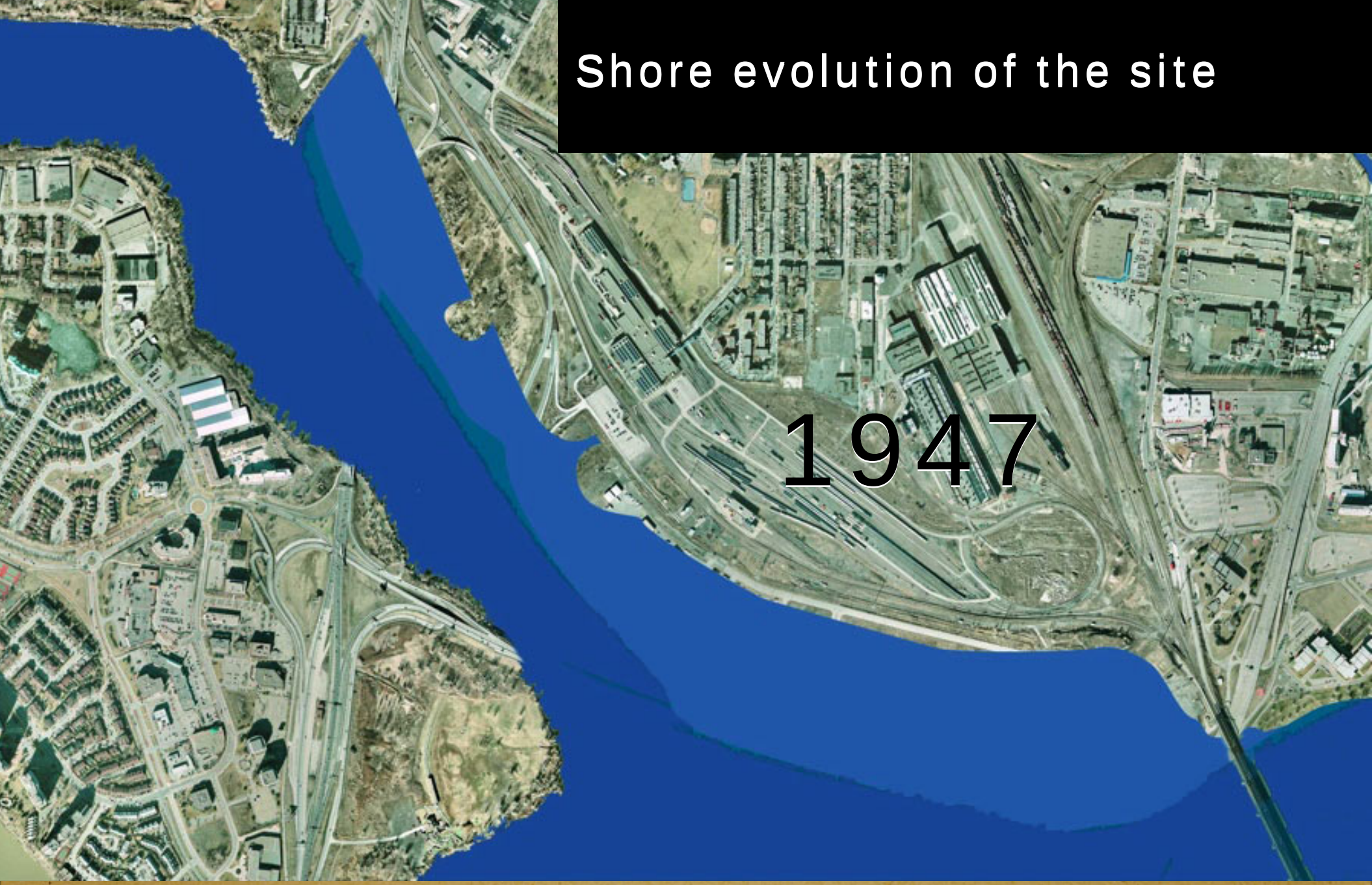
Shore evolution of the site



Shore evolution of the site



Shore evolution of the site

165 monitoring wells

Stratigraphy

Up to 3 meters of fill

Stratigraphy

3 à 10 metres of waste fill

Stratigraphy

Up to 4 meters of till

Stratigraphy

Bedrock (black shale) to depth of 15 meters. First meter or two fractured.

Groundwater

Groundwater in waste fill, to a depth of 7 to 17 meters

Direction of flow: generally towards the rivers

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Main Contaminants

Ammonia,

metals,

chlorides,

hydrocarbons,

sulphides, …

Ecotoxicity

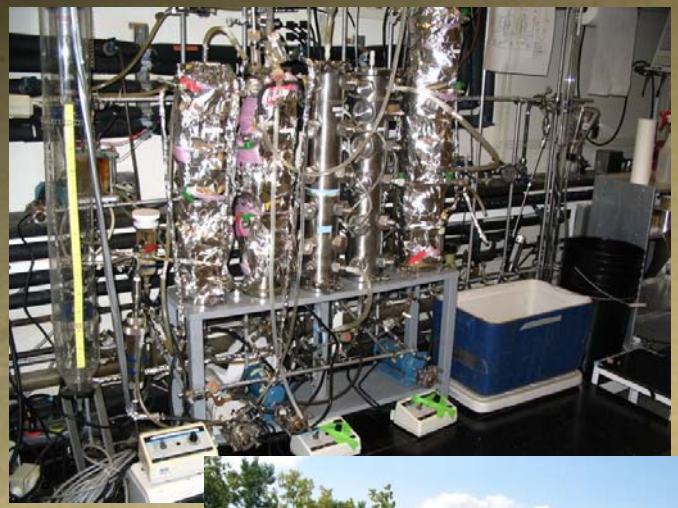
- 5 series of toxicity tests (micro-organisms, algae, fish) between 2002 et 2005
- Groundwater : potential toxicity for aquatic species
- Study to better determine the cause of ecotoxicity (TIE : Toxicity identification evaluation – Phase 1)

3 Sampling zones for the treatability tests

Phase 3

Treatability tests (October 2006 - May 2007)

- Treatability tests



- Additionnal Studies:
  - •Toxicity IdentificationEvaluation Phase 1 (Stantec)
  - •Groundwater flow model (Techorem)

- Analysis of findings and recommandations

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DESSAU SOPRIN

- 1- Nitrification (bed of volcanic rock underneath bed of peat)
- 2- Denitrification (optional)
- 3- Adsorption (optional)

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Biogénie

- 1- Oxidation/filtration (aeration/silica sand)
- 2- Nitrification (calcareous sand bed)
- 3- Denitrification (calcareous sand bed)
- 4- Optionnal polishing (synthetic resin or activated carbon)

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GENIVAR
des gens constructifs

- Ozonation

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CONESTOGA-ROVERS & ASSOCIATES

- 1- Filtration
- 2- Chemical precipitation
- 3- Aerobic biotreatment (nitrification)
- 4- Anaerobic biotreatment (denitrification)

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SANEXEN

- 1- Sand filtration
- 2- Ultrasorption filter
- 3- Adsorption filter (mix of sphagnum moss, activated carbon and zeolites) / oxidation (H_2O_2)

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Jacques Whitford

Engineered Wetlands

1- Anaerobic bioreactor (denitrification) (mix of organic substrats, sand, wood chips and biosolids

2- Aerated marshes (nitrification) (limestones gravel underneath a bed of peat and common reeds)

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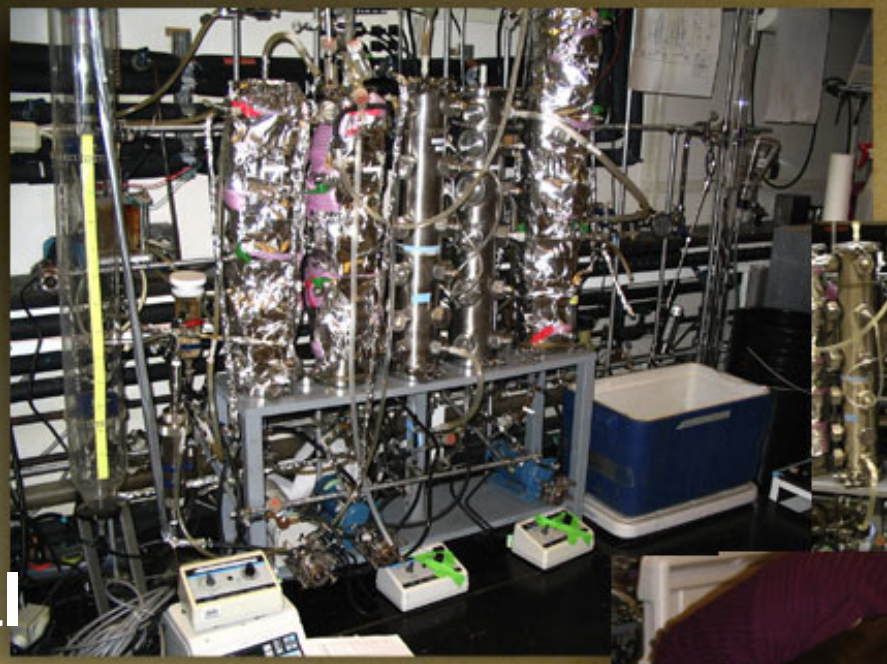

1- eMaMoC biological treatment (simultaneous aerobic /anaerobic process)

2- Activated carbon adsorption

HAYKA

- 1- Microfiltration
- 2- Nanofiltration
- 3- Ozonation/ oxidation
- 4- Atomization drying

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In conclusion ...

Post Mortem :

- ✓ **Exchange of knowledge/objectives between stakeholders**
- ✓ **Synergy within technical commitee/ sub committees and cooperation of various experts**
- ✓ **Strict tracking and water distribution/sampling protocols (QA-QC)**
- ✓ **Adequate time to carry out treatability**
- ✓ **Continuous cooperation between participants and MCEBR**

Thanks to :

Economic Development Agency

Environment Canada

Ministère du Développement durable, de l'Environnement et des Parcs

Centre d'expertise en analyse environnementale du Québec

Ville de Montréal

The Jacques-Cartier and Champlain Bridges inc.

Société du Havre de Montréal

National Research Council Canada – Biotechnology Research Institute

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