Deloro Mine Site Clean-up Project

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Toronto, Ontario

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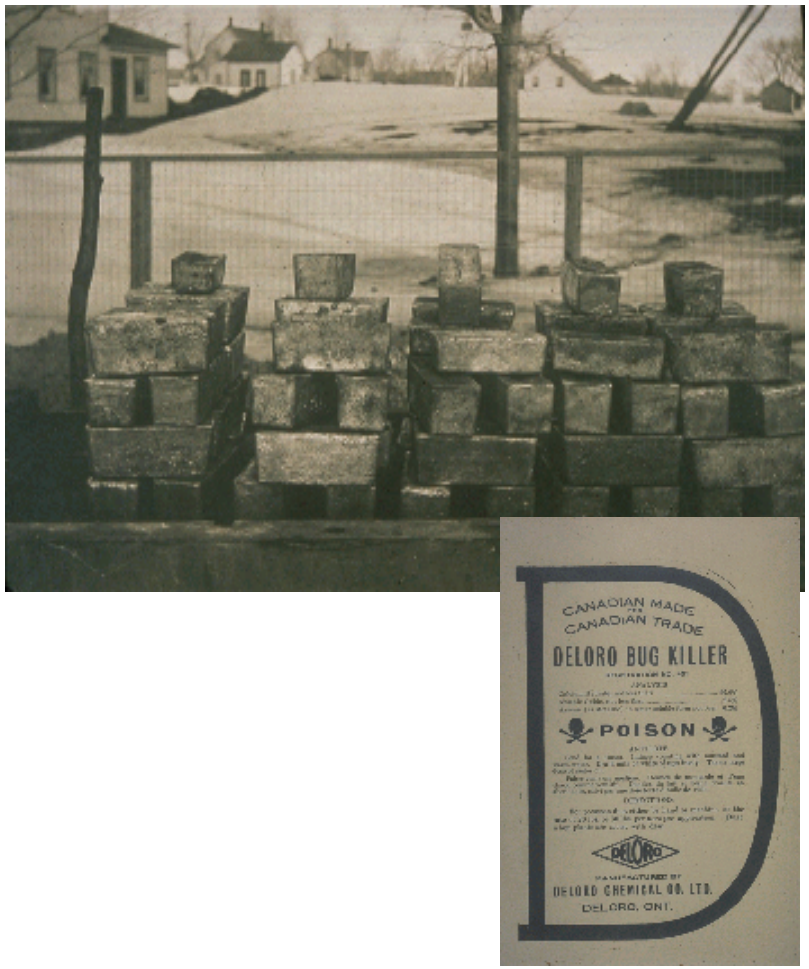
Ministry of Environment

Deloro Industrial Highlights



- Part of the Madoc Gold Rush (first discovery of gold in Ontario)
- Major producer of arsenic-based pesticides on North American continent
- World's first commercial producer of cobalt metal
- Significant producer/ supplier of Stellite during WW I and II

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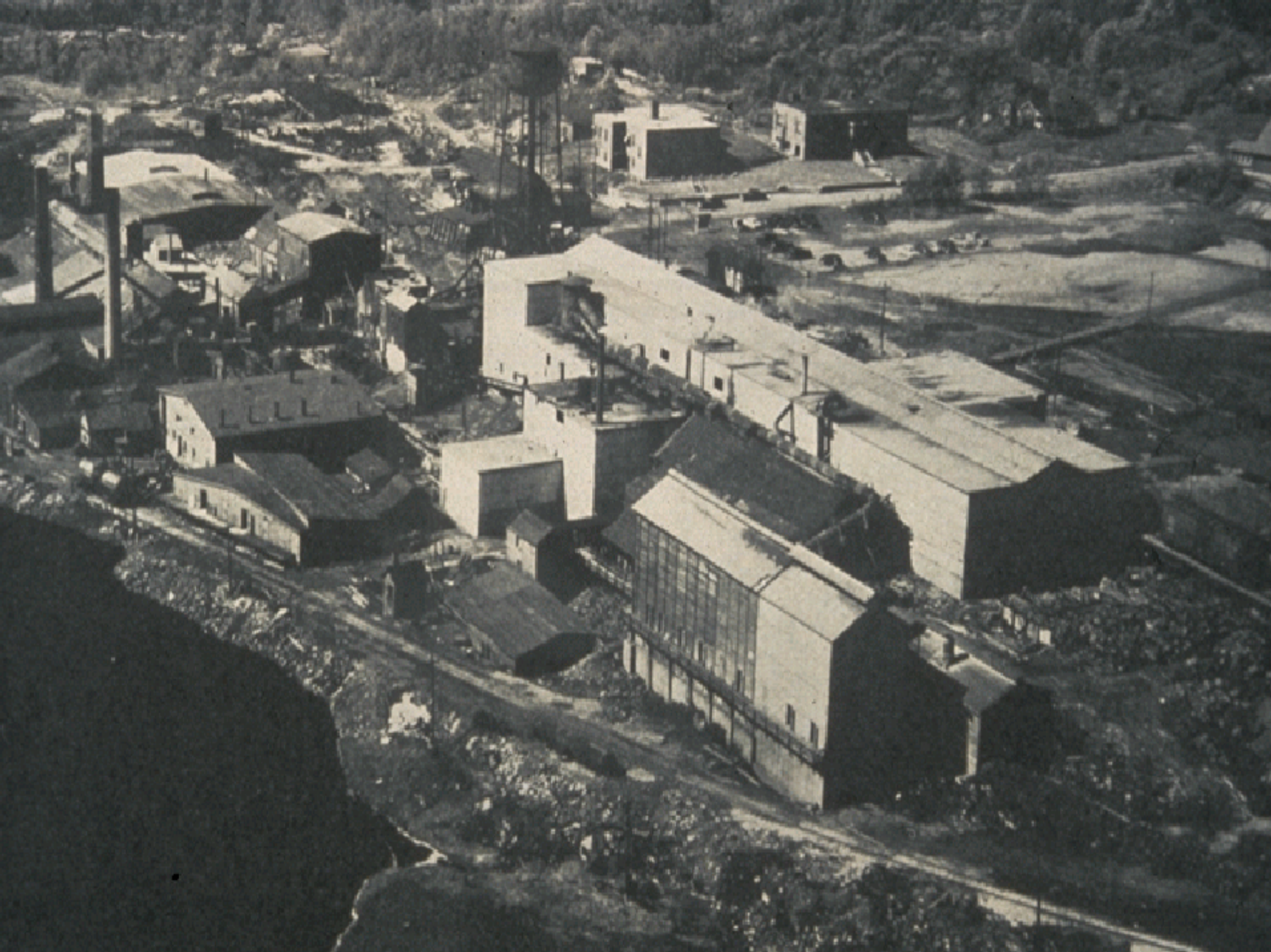


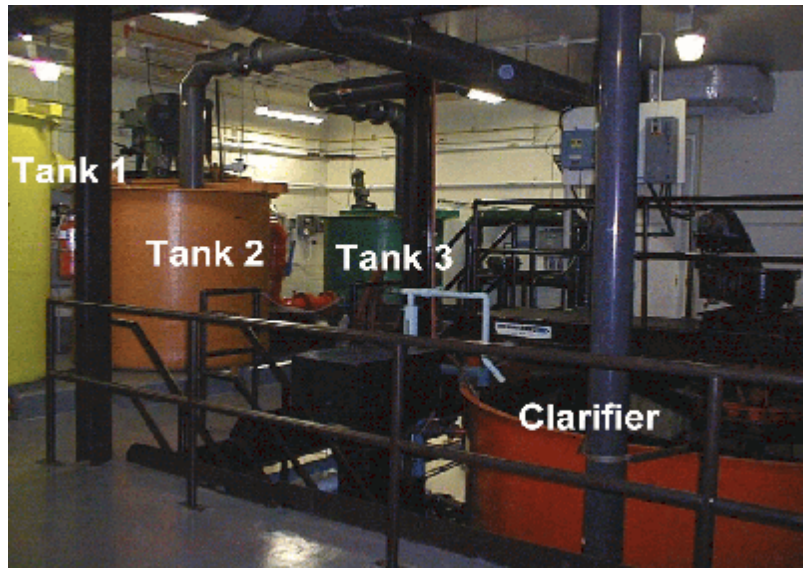
MOE Accomplishments

$32 million spent on the project so far

= 80% reduction in amount of arsenic going into the Moira River

MOE Accomplishments

- Built Arsenic Treatment Plant to remove arsenic and other metals from groundwater

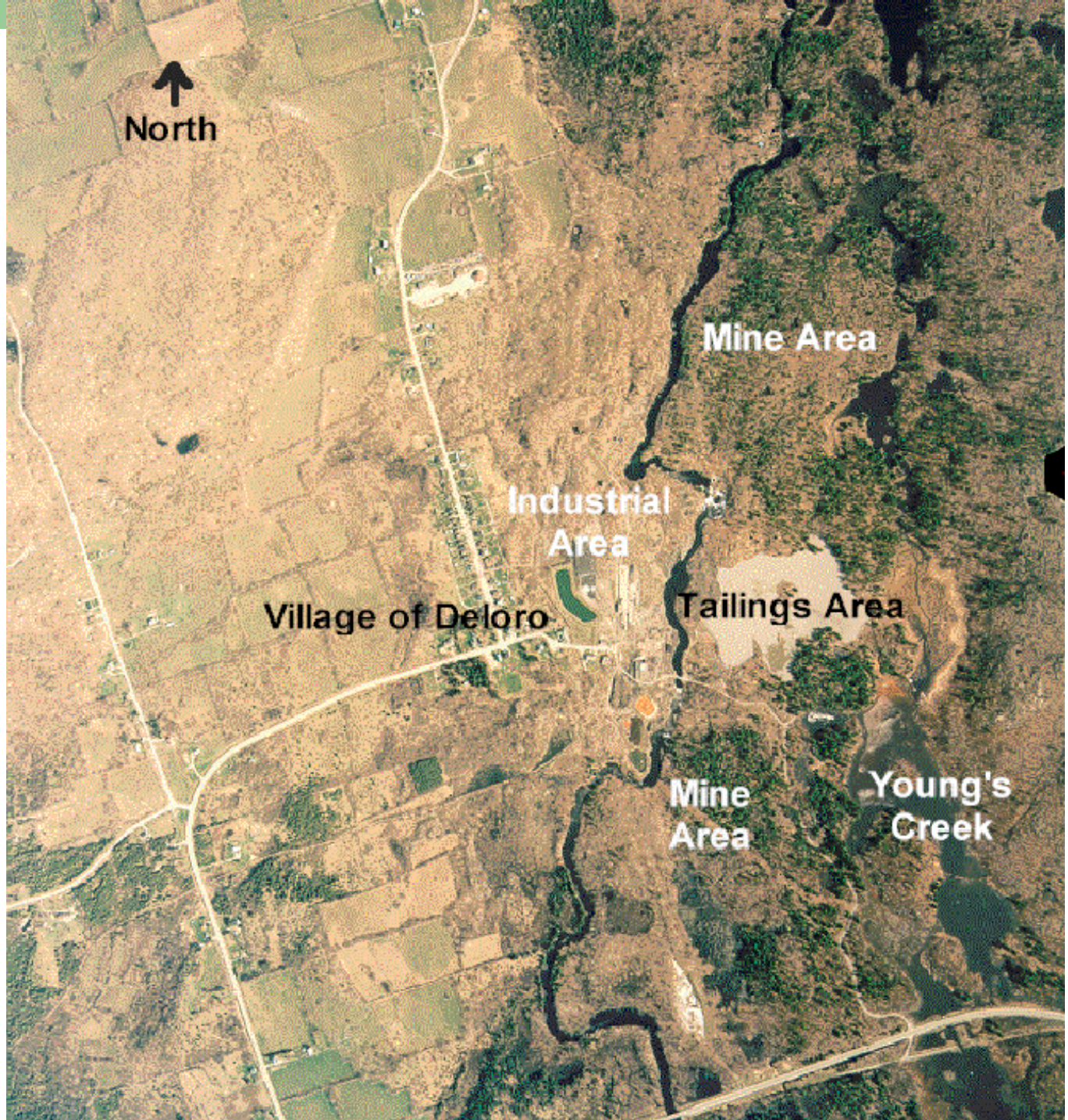


MOE Accomplishments

- Covered eight hectares of tailings with half a metre of crushed limestone

MOE Accomplishments

- Located and sealed abandoned mine shafts
- Completed two off-site assessments


North
Mine Area
Industrial Area
Village of Deloro
Tailings Area
Mine Area
Young's Creek

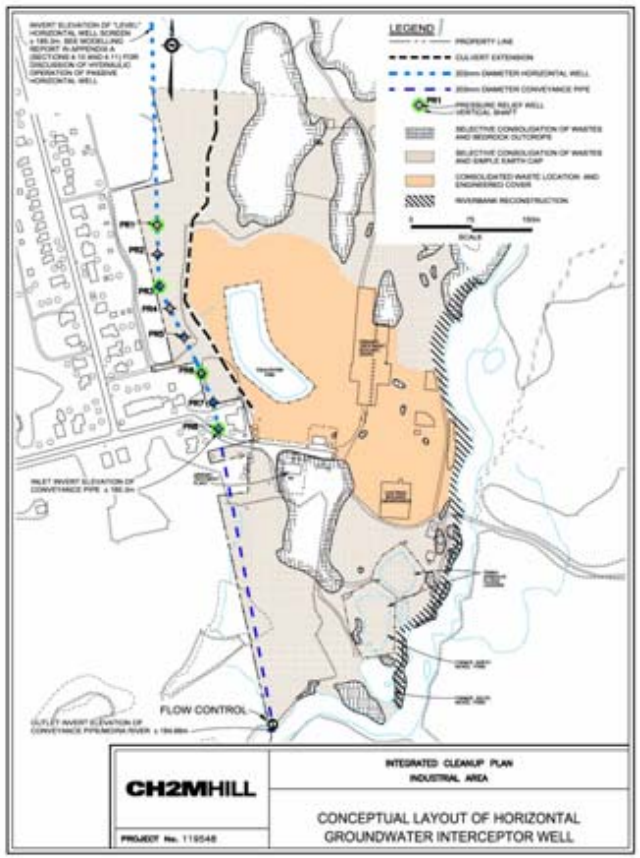
Cleanup Plan Objective

- To finish the cleanup of this abandoned mining and industrial complex by:
  - isolating and containing wastes,
  - and engineering the site to be safe for people and the environment for hundreds of years.

Cleanup plan must:

- Manage waste over the smallest possible area
- Secure the site for the long-term
- Reduce loading of contaminants to the Moira River
- Minimize long-term operation and maintenance of site facilities
- Restore the site to reflect its natural surroundings

Industrial Area

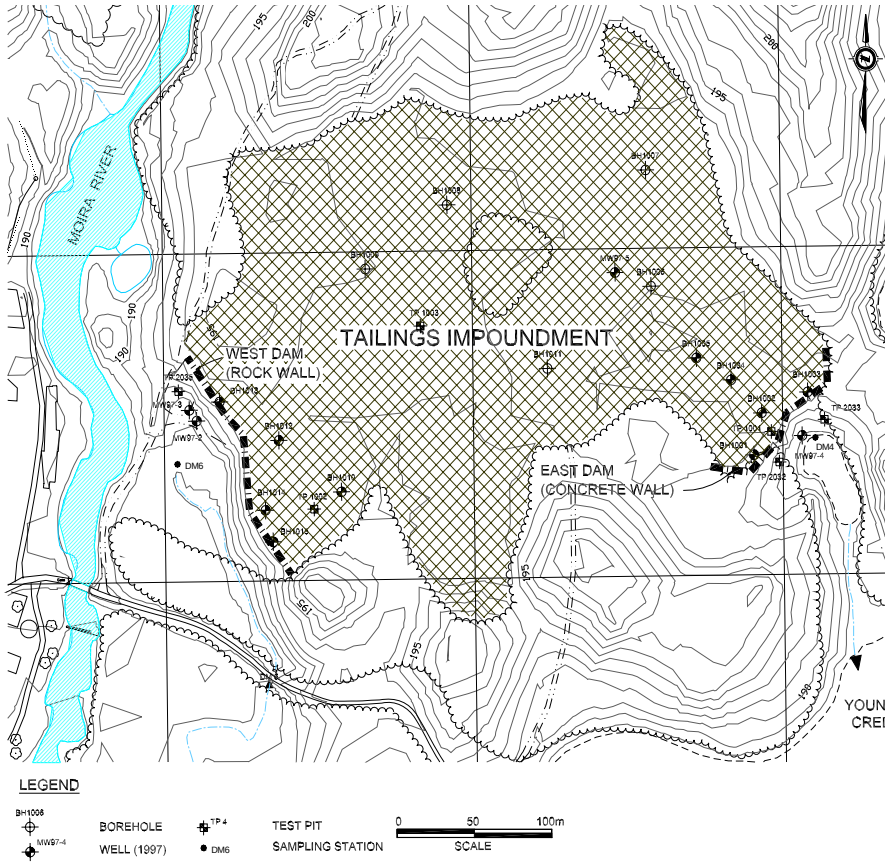


- **Area:** 25 hectares
- **Contaminants of Concern:** Calcium arsenate/arsenite, low-level radioactive material, slag and gold mine tailings contaminated with arsenic, cobalt, copper, lead, mercury, nickel
- **Volume of Waste:** Approximately 305,500 cubic metres

Industrial Area Cleanup Strategy

- **Consolidation of waste and capping**
  - The most highly contaminated waste will be placed in a waste consolidation area and capped with an engineered cover 1.55 metres thick
- **Ground and surface water diversion**
  - Groundwater and surface water flow will be diverted away from contaminated materials

Tailings Area

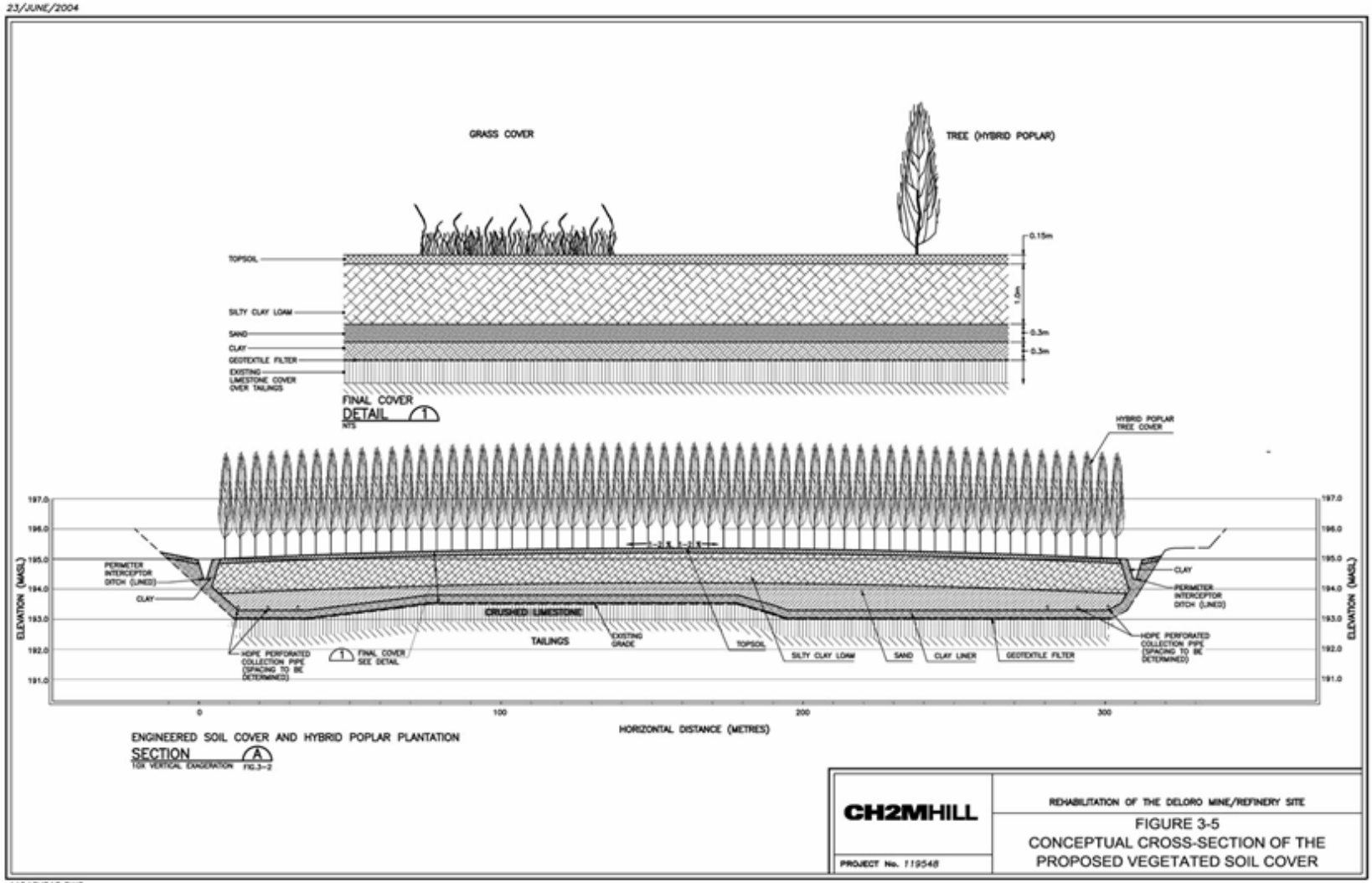


- **Area:**
  - 8.5 hectares
- **Contaminants of Concern**:
  - Arsenic, cobalt, copper, nickel, and low-level radioactive materials
- **Volume of Waste:**
  - Approximately 145,000 cubic metres

Tailings Area Cleanup Strategy

- Cover tailings with an engineered soil cover
- Collection/treatment of groundwater and upstream surface water flow diversion

Tailings Area surface looking East/Northwest


23/JUNE/2004
GRASS COVER
TREE (HYBRID POPLAR)
TOPSOIL
SILTY CLAY LOAM
SAND
CLAY
GEOTEXTILE FILTER
EXISTING LIMESTONE COVER OVER TAILINGS
0.15m
1.0m
0.3m
0.3m
FINAL COVER DETAIL 1
NTS
HYBRID POPLAR TREE COVER
PERIMETER INTERCEPTOR DITCH (LINED)
CLAY
CRUSHED LIMESTONE
TAILINGS
EXISTING GRADE
TOPSOIL
SILTY CLAY LOAM
SAND
CLAY LINER
GEOTEXTILE FILTER
HDPE PERFORATED COLLECTION PIPE (SPACING TO BE DETERMINED)
1 FINAL COVER SEE DETAIL
ELEVATION (MASL)
197.0
196.0
195.0
194.0
193.0
192.0
191.0
0
100
200
300
HORIZONTAL DISTANCE (METRES)
ENGINEERED SOIL COVER AND HYBRID POPLAR PLANTATION
SECTION A
10X VERTICAL EXAGERATION FIG.3-2
CH2MHILL
PROJECT No. 119548
REHABILITATION OF THE DELORO MINE/REFINERY SITE
FIGURE 3-5
CONCEPTUAL CROSS-SECTION OF THE PROPOSED VEGETATED SOIL COVER
44246VC1D.DWG

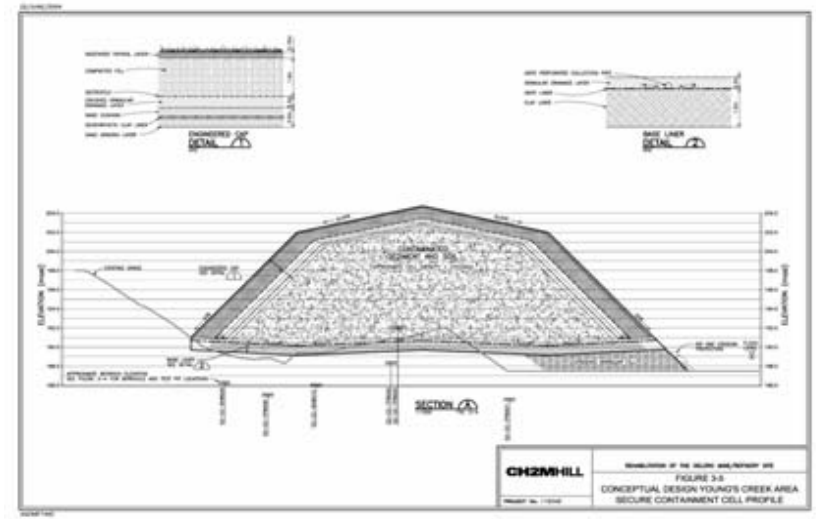
Young's Creek Area

- **Area:**
  - Onsite – 47 hectares
  - Offsite (south of Highway #7) – 19 hectares
- **Contaminants of Concern**:
  - Onsite – Arsenic, cobalt, copper, nickel, and low-level radioactive material
  - Offsite –arsenic, cobalt, copper, nickel, no radioactivity
- **Volume of Waste**:
  - Onsite – 200,000 cubic metres contaminated sediment and soil
  - Offsite – about 68,000 cubic metres of contaminated sediments

Young's Creek southeast of Tailings Area

Young's Creek Area Cleanup Strategy

- Full depth excavation of onsite sediment
- Shallow depth excavation of offsite sediment
- Disposal of contaminated sediment in a new onsite engineered containment facility
- Creek rehabilitation



Young's Creek Area Cleanup Strategy

- **Wetland reconstruction**
  - Areas of wetland removed by excavation will be reconstructed
  - Area is part of a provincially significant wetland

VE Study
December, 2009

- *Objective*

  Improve value of project through efficiencies, cost reduction, etc…

- *Constraints*

  Timing, regulatory, budget, material availability, etc…

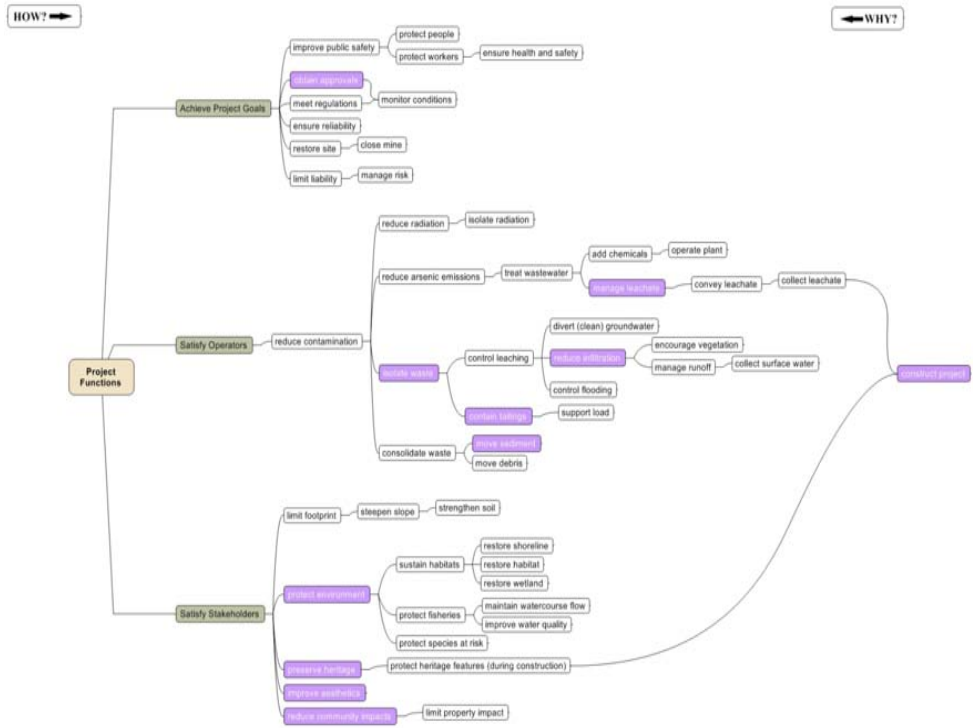
VE Attendees

- *MOE Deloro Team*
- *Consultant Design Team*
- *12 Subject Matter Experts*

  Mining Geo-mechanics, Hydrogeology, Radiation Protection, Fisheries, Water Quality, Landfill Engineering, Construction, Surface Water, Remediation

VE Study Tasks

- *Quality Model*
- *Function Analysis*
- *Cost/Worth Analysis*
- *Creative*
- *Ideas Shortlist*
- *Development*



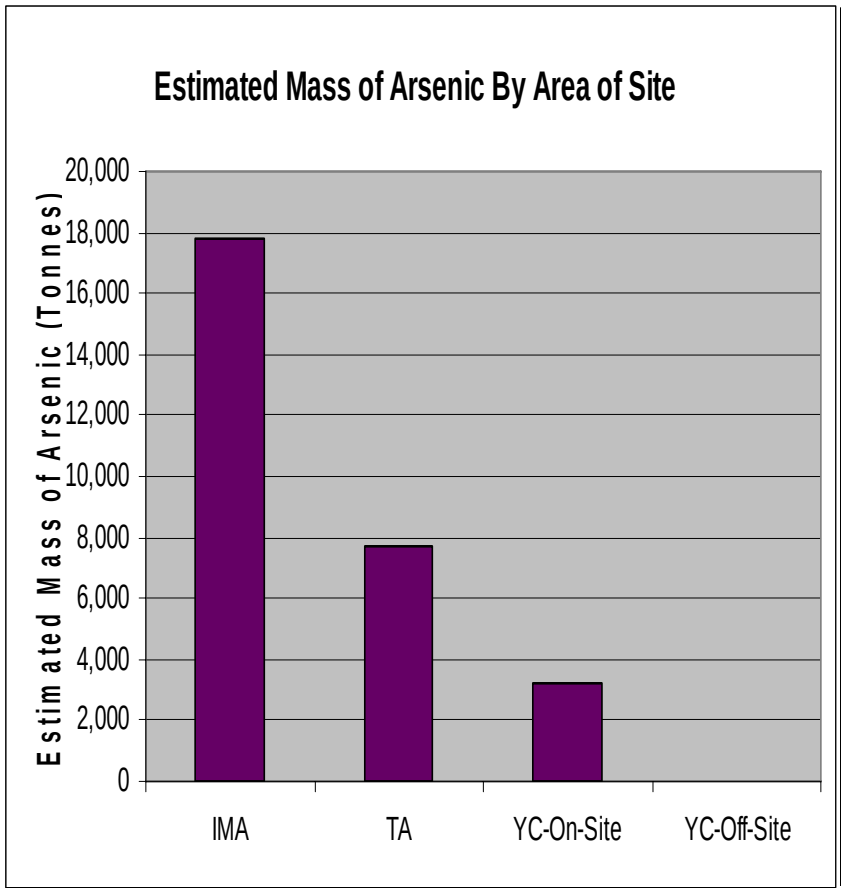
Value Added

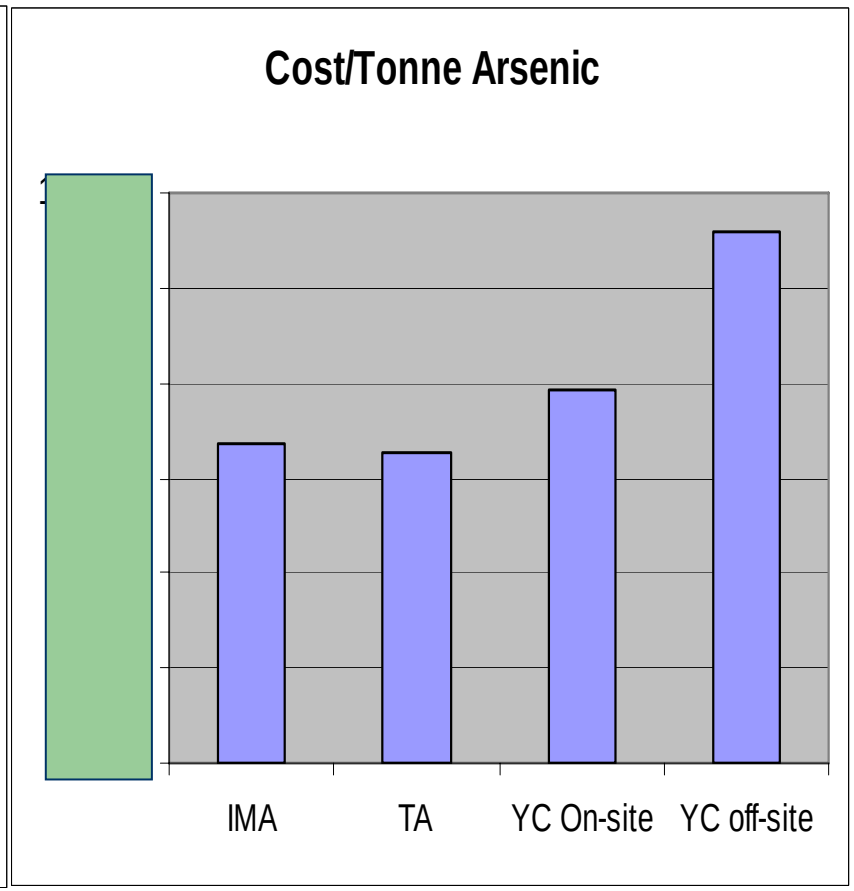
- *156 ideas to improve performance or reduce life cycle costs*

- *37 ideas carried forward for development, analysis and costing*

Value Implementation

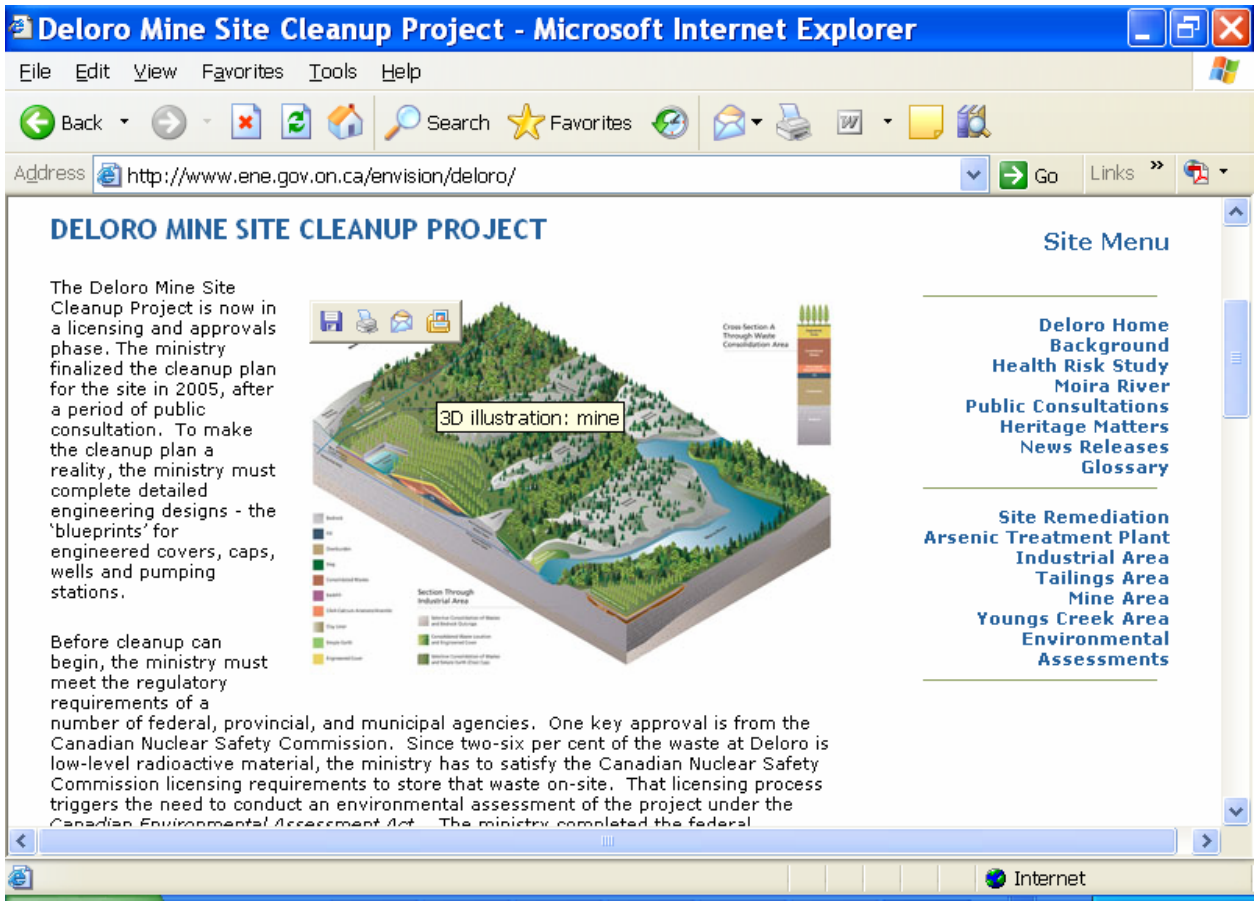
- *Efficiencies applied to design elements under development*
- *Conceptual design for YC revisited*
- *Potential savings > $10 M*


Estimated Mass of Arsenic By Area of Site
Estimated Mass of Arsenic (Tonnes)
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
IMA
TA
YC-On-Site
YC-Off-Site


Cost/Tonne Arsenic
IMA
TA
YC On-site
YC off-site

Deloro Project Website

www.ene.gov.on.ca/envision/deloro/



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