

Remediation of an Abandoned Gold Mine in the Northwest Territories Colomac Mine

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Colomac

112

Mine

ON THE JOB

**BEGINSHERE** 

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# Welcome to Colomac Mine

Project Background Project Objectives

#### Major Work Items

100

- Remediation of Petroleum Hydrocarbon Contamination
- Building Demolition and Debris
- Drainage Channel Restoration
- Long Term Monitoring

Project Challenges Colomac and the Community Questions

#### **Project Background**



- Located 220 km north of Yellowknife, NWT
- Open pit mine
- In operation from 1990 and abandoned in 1999
  - Aboriginal Affairs and Northern
    Development Canada (AANDC) took
    responsibility of site
  - A Remedial Action Plan was completed in 2004
- AECOM hired in 2009 to complete design drawings and specification documents
- Final Remediation Contract awarded to Tlicho Engineering and Environmental Services in partnership with Aboriginal Engineering Ltd. (TEES-AEL)



#### **Project Objectives**

- Address the environmental and physical hazards to humans, wildlife and the environment
- Minimize environmental impacts during remediation
- Return site to original condition or provide an alternative productive ecosystem
- Create a safer and healthier environment for the Tlicho people and all northerners.





#### Petroleum Hydrocarbon Contamination



- An estimated 30,000 litres of fuel was spilled during mine operations
- Over 17,000 m<sup>3</sup> of contaminated soil was excavated and treated in an onsite landfarm.





#### Petroleum Hydrocarbon Contamination



- Free product was present within the fractured bedrock and presence of free product was monitored in a network of over 240 monitoring wells across the site.
- Identified free product was extracted using a Multi-Phase Extraction System (MPE).





#### **Steeves Lake Sediment Cap**

- Contaminated sediments in the lake were isolated by constructing a sediment cap.
- The cap was 750 m long and covered over 15,000 m<sup>2</sup>.

#### Constructed from:

- 6,700 m<sup>3</sup> of natural silty till
- 3,500 m<sup>3</sup> of organic material
- 22,000 m<sup>3</sup> of rock fill
- 6,500 m<sup>2</sup> of geotextile

#### Steeves Lake Sediment Cap – Initial Conditions



Contaminated Sediments



#### Steeves Lake Sediment Cap – Armour Stone Berm



Armour Stone Berm

Contaminated Sediments



#### Steeves Lake Sediment Cap – Fish Salvage



Impermeable Silt Curtain

, Armour Stone Berm





#### Steeves Lake Sediment Cap – Fish Salvage





## Steeves Lake Sediment Cap – Rock Fill, Geotextile, Silty Till and Organics Placement





## Steeves Lake Sediment Cap – Rock Fill, Geotextile, Silty Till and Organics Placement



Silt Curtain Geotextile Organics

#### Steeves Lake Sediment Cap – Seepage Collection Systems





#### Steeves Lake Sediment Cap – Revegetation





#### Steeves Lake Sediment Cap – Revegetation





#### **Building Demolition and Debris Removal**

Buildings and infrastructure presented a hazard to humans, wildlife and the environment

Four large buildings, the camp and office complex, five above ground conveyors, two underground conveyors, 21 large tanks and all related infrastructure was demolished.

#### **Building Demolition – Decontamination**



- Cyanide contaminated dust was present in the mill complex
- Dust was removed with large vacuums with HEPA filters
- Cyanide contaminated materials were disposed of in a disposal cell in the existing Tailings Containment Area









#### **Building Demolition – Decontamination**

- Twelve leach tanks were on site and were part of the cyanide leaching process
- 7,750,000 litres of liquid was present in the tanks.
- The liquid was pumped into an open pit on site





### **Building Demolition - Before**









### **Building Demolition**







#### **Debris Removal**

- Debris was placed in an on-site nonhazardous waste landfill
- The landfill was constructed within one of the open pits left behind by mining operations.
- The landfill was contained on 3 sides by the walls of the pit and by an engineered berm on the fourth side.









## Drainage Restoration

#### **Drainage Restoration**

- Eight drainage restorations were completed on the site
- Erosion and sediment control, fish salvage and re-vegetation work was completed in conjunction with drainage restoration work
- Created over 2,200 m<sup>2</sup> of new fish bearing habitat and over 3,400 m<sup>2</sup> of riparian habitat



![](_page_25_Picture_5.jpeg)

### **Drainage Restoration**

![](_page_26_Picture_1.jpeg)

![](_page_26_Picture_2.jpeg)

![](_page_26_Picture_3.jpeg)

#### AHMP and Long Term Monitoring

![](_page_27_Picture_1.jpeg)

- Short term post-remediation monitoring program
- Initiated in 2011, will continue until 2015
- Components of the AHMP will form the basis of the Long Term Monitoring for PHCs at Colomac

![](_page_27_Picture_5.jpeg)

![](_page_27_Picture_6.jpeg)

![](_page_27_Picture_7.jpeg)

#### AHMP and Long Term Monitoring

![](_page_28_Picture_1.jpeg)

![](_page_28_Picture_2.jpeg)

- AHMP components include:
  - Monitor groundwater quality and flow regimes
  - Monitor surface water quality
  - Collect thermistor and meteorological data
  - Monitor Steeves Lake shoreline
  - Free-product recovery
- Result used to determine potential impact of remaining PHCs on the surrounding environment, and to identify potential monitoring end points

![](_page_28_Picture_10.jpeg)

![](_page_28_Picture_11.jpeg)

![](_page_28_Picture_12.jpeg)

#### **Project Challenges**

Transportation and Logistics

![](_page_29_Picture_2.jpeg)

![](_page_29_Picture_3.jpeg)

![](_page_29_Picture_4.jpeg)

![](_page_29_Picture_5.jpeg)

#### Colomac and the Community

![](_page_30_Picture_1.jpeg)

- Incorporated local and traditional knowledge provided by local Elders and project staff from the surrounding communities.
- A site blessing ceremony and commemorative plaque unveiling was held at the close of remediation activities.

- Removal of hazards was beneficial to the people who continue to use the land for food sources, recreation and cultural identity.
- Hazards remaining on site were identified and were mitigated through barriers and warnings.

![](_page_30_Picture_6.jpeg)

![](_page_30_Picture_7.jpeg)

#### Acknowledgements

![](_page_31_Picture_1.jpeg)

Aboriginal Affairs and Northern Development Canada

Affaires autochtones et Développement du Nord Canada

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Public Works and Government Services Canada Travaux publics et Services gouvernementaux Canada

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