



# Giant Mine Remediation Project

**Giant Mine Joint Interim Remediation Project Office**

- Canada and GNWT are co-proponents of Remediation Plan
- Giant Mine Remediation Project Team was formed in 1999
- Other Participants:
  - Technical Advisor (since 2000)
  - Independent Peer Review Panel (2002)
  - Federal Contaminated Sites Action Plan expert departments:
    - Health Canada, Environment Canada, Department of Fisheries and Oceans and PWGSC



- Giant Mine
  - Operated from 1948 - 2004
  - 7.6 million ounces gold
  - Processing of gold ore by roasting resulted in 237,000 tonnes arsenic trioxide dust now stored underground
  - Arsenic contamination on surface
- Mine now under the care of INAC/PWGSC
- Mineral rights withdrawn
- Surface lands administered by GNWT, MACA



# Giant Mine Yellowknife NT Canada

Giant Mine  
Reserve  
846ha



Site is on:

- Commissioner's Land
- Within Yellowknife City Limits
- Traditional Akaitcho lands
- TliCho Monfwi economic measures

Con Mine

Image © 2008 DigitalGlobe

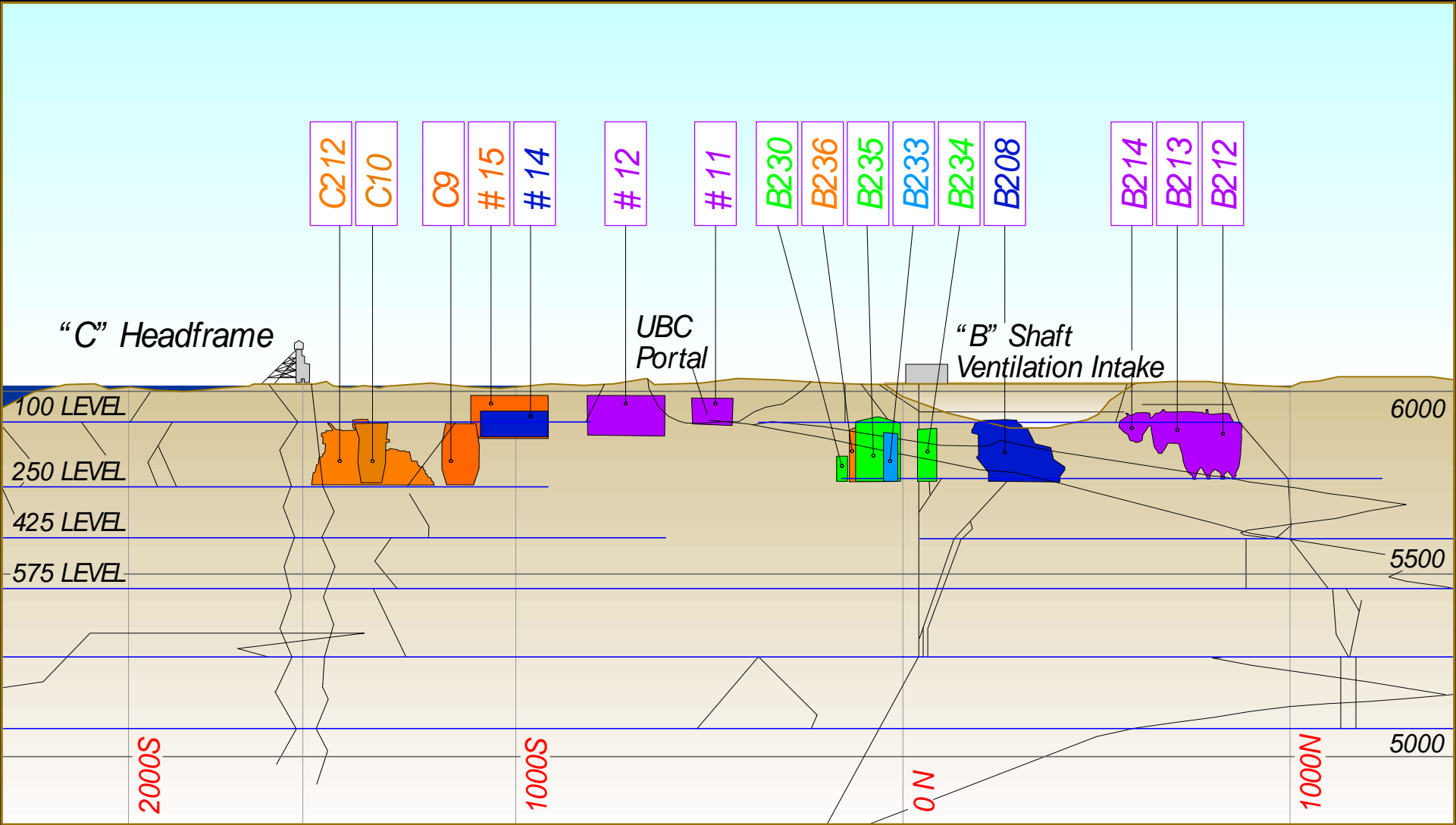
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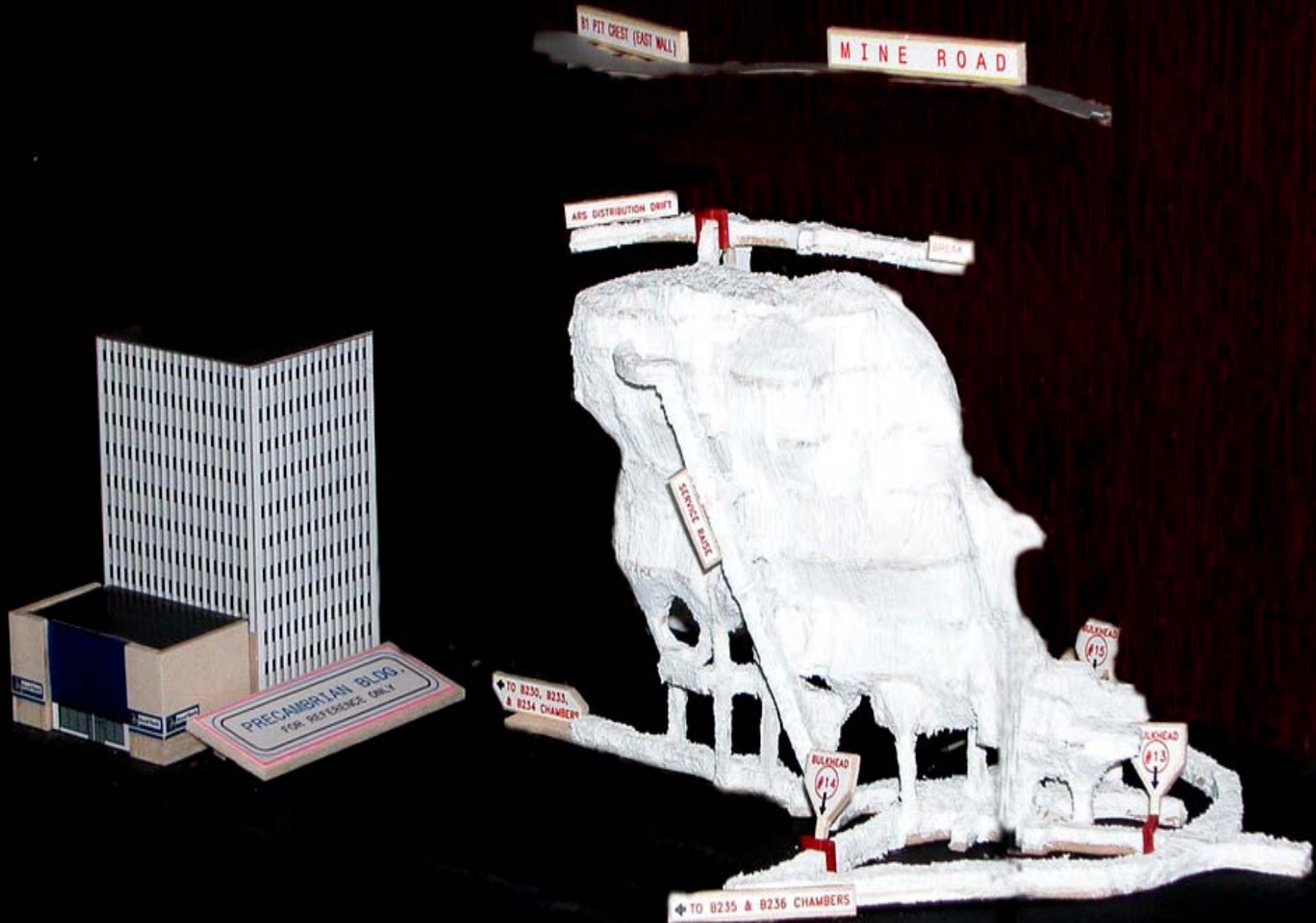
Giant Mine Looking North

Photo Credit  
Paul Vecsei

Arsenic trioxide dust in underground storage is enclosed completely in rock – all access drifts sealed by cement bulkheads



Arsenic Chambers Long Section: 10 Chambers & 5 Stopes



# Arsenic Trioxide Alternatives Project - Technical Advisor

- January 2000 – June 2003
  - History of arsenic trioxide production & storage
  - Investigations of dust and storage areas
  - HHERA for current and possible future releases
  - Assessed over 56 methods for managing the dust
  - Initial report with 17 supporting documents (May 2001)





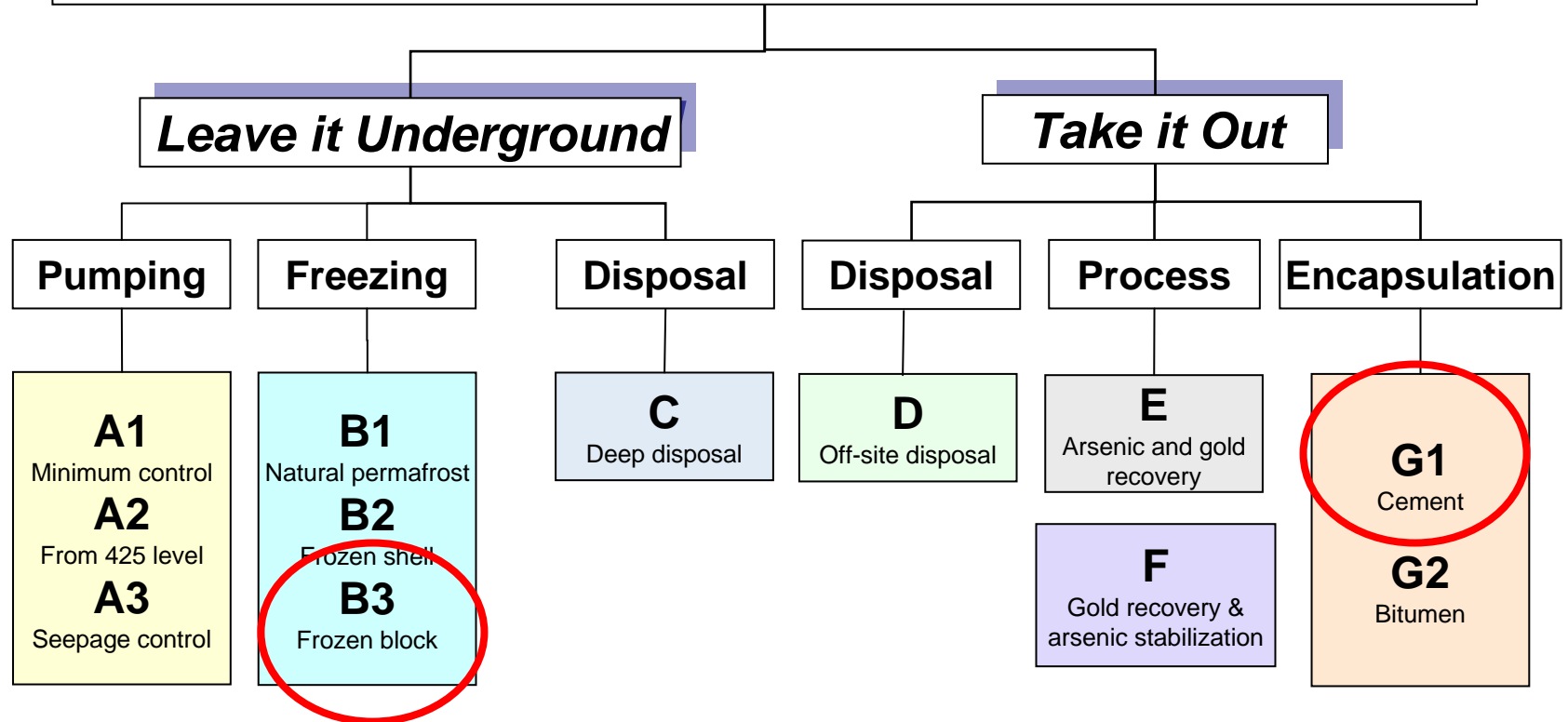
# Arsenic Trioxide Alternatives Project

- Detailed assessment of 12 alternatives
- Comprehensive report with 19 supporting documents (December 2002)
- Independent Peer Review
- Major public workshops plus about 25 presentations to community groups
- Recommended two options for public consideration



# Alternatives A through G

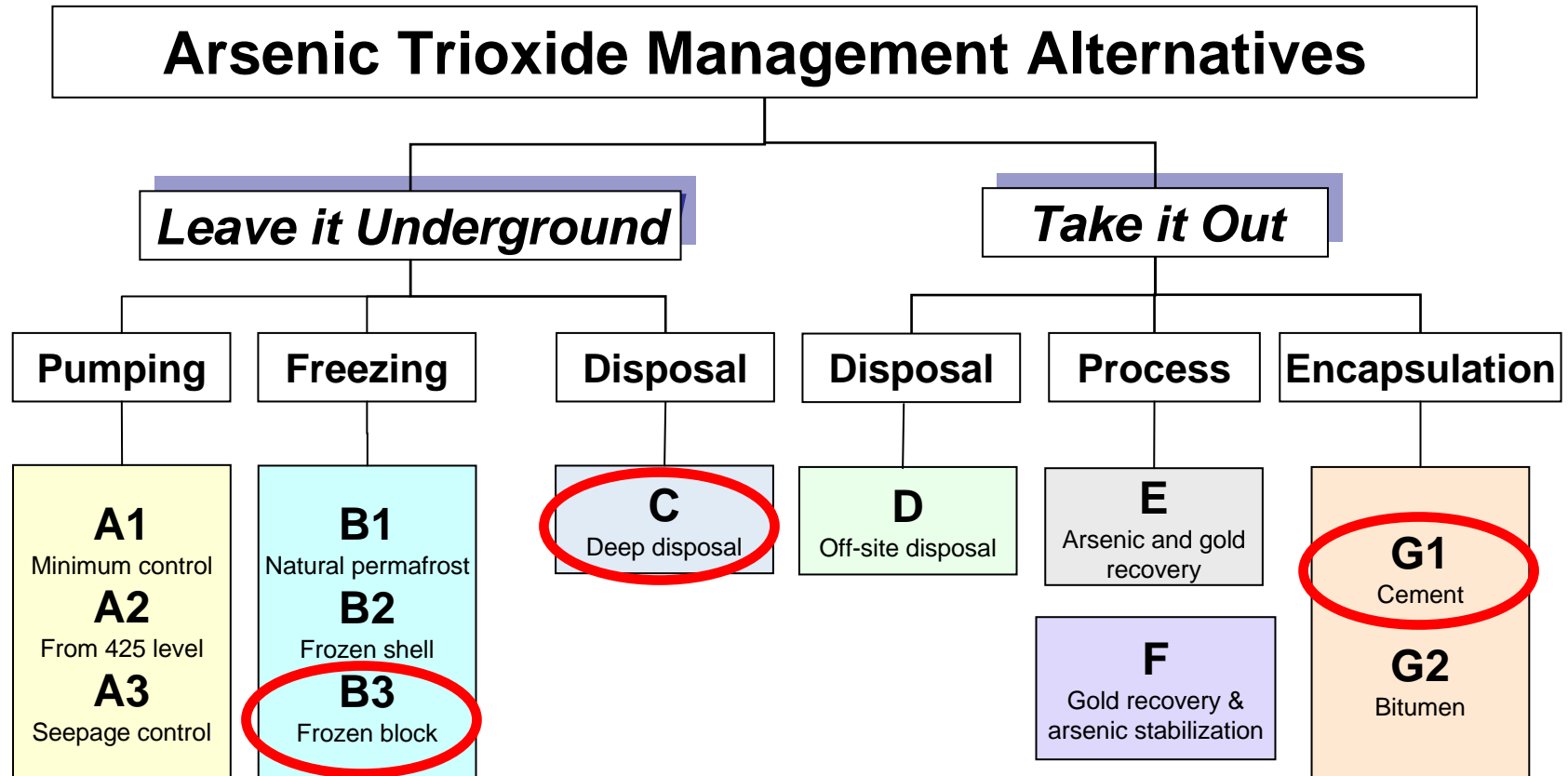
## Arsenic Trioxide Management Alternatives



# Assessments of Risks

Alternative	Probability of Significant Arsenic Release		Worker Health & Safety Risk
	Short Term	Long Term	
A1. Water Treatment with Minimum Control	Low	High	Low
A2. Water Treatment with Drawdown	Low	Moderate	Low
A3. Water Treatment with Seepage Control	Low	Moderate	Low
B2. Frozen Shell	Very Low	Low	Low
B3. Frozen Block	Very Low	Low	Low
C. Deep Disposal	Low	Very Low	Moderate
D. Removal & Surface Disposal	High	Very Low	Moderate
F. Removal, Gold Recovery and Arsenic Stabilization	Moderate	Very Low	Moderate
G1. Removal & Cement Encapsulation	Moderate	Low	Moderate

# Results of Public Consultation



# Giant Mine Remediation Plan



Indian and Northern  
Affairs Canada



- INAC announces plans to proceed with frozen block option in February 2004
- Comprehensive Remediation Plan
  - Reviewed by IPRP January 2005
- Cooperation Agreement March 2005
- Complete draft Remediation Plan reviewed by:
  - GNWT
  - FCSAP expert federal departments
- Final review of revised plan by:
  - IPRP – December 2005
  - GNWT March 2006
  - FCSAP expert IWG and INAC Regional Departments – May 2006



# Consultation & Public Information

- Public Workshops to develop, evaluate and select preferred options for long term management of arsenic trioxide
- Focus Groups
- Information Sessions
- Mail out newsletters
- Information brochures
- Site Tours
  - underground and surface
- Giant Mine Community Alliance (9)
  - Regular meetings with project team
  - Open Houses



# Site Tours



# Impact of the Yellowknife Giant Gold Mine on the Yellowknives Dene

## A Traditional Knowledge Report

Prepared by the Yellowknives Dene First Nation  
Land and Environment Committee

Prepared for the Department of Indian and Northern Affairs  
Giant Mine Remediation Project office  
Yellowknife, Northwest Territories  
October 13, 2005



Indian and Northern  
Affairs Canada





# Remediation Plan Elements

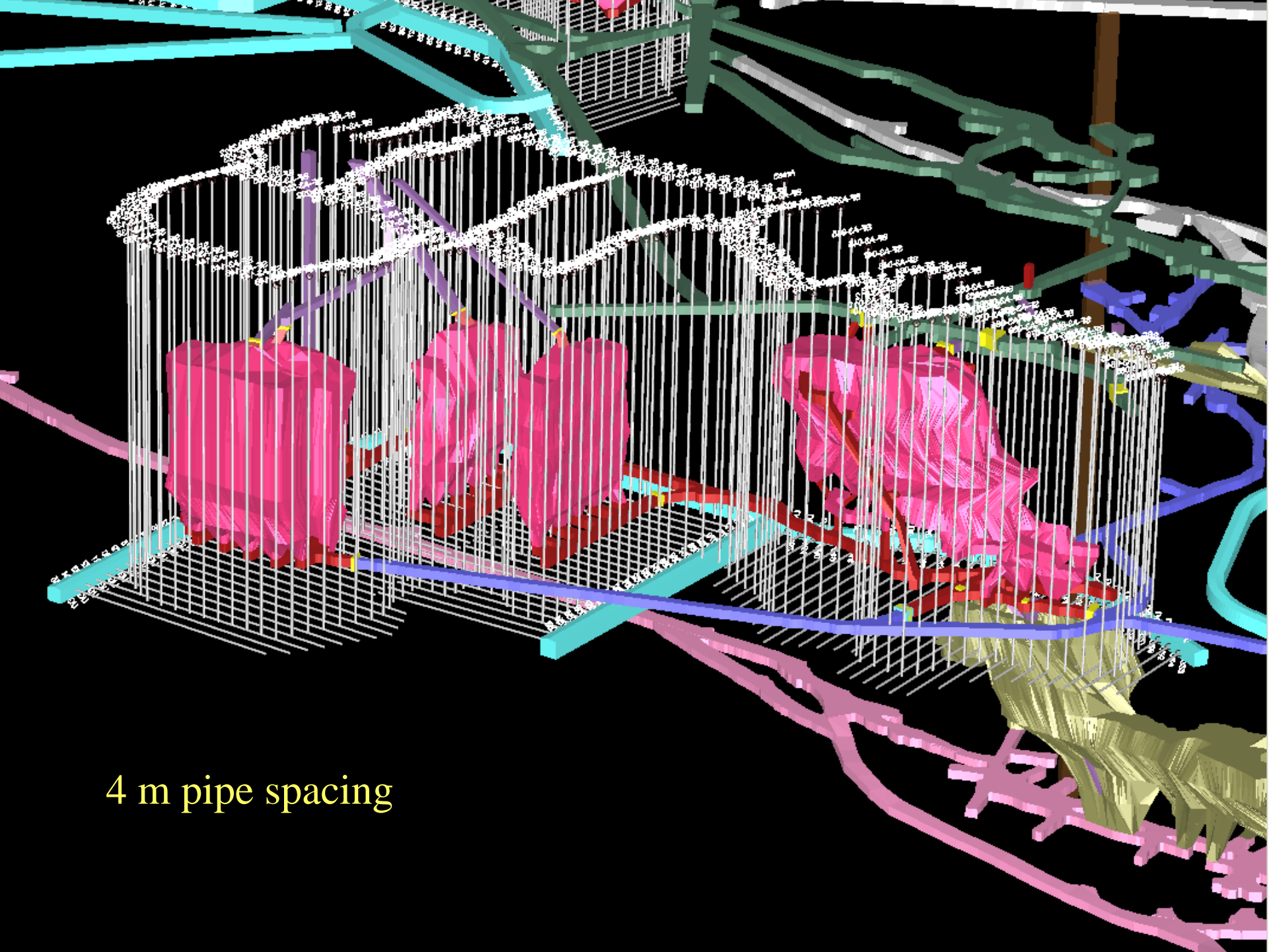
## ➤ Underground

- 237,000 tonnes toxic arsenic trioxide dust stored in sealed rock chambers – in situ freezing (Frozen Block)

## ➤ Surface

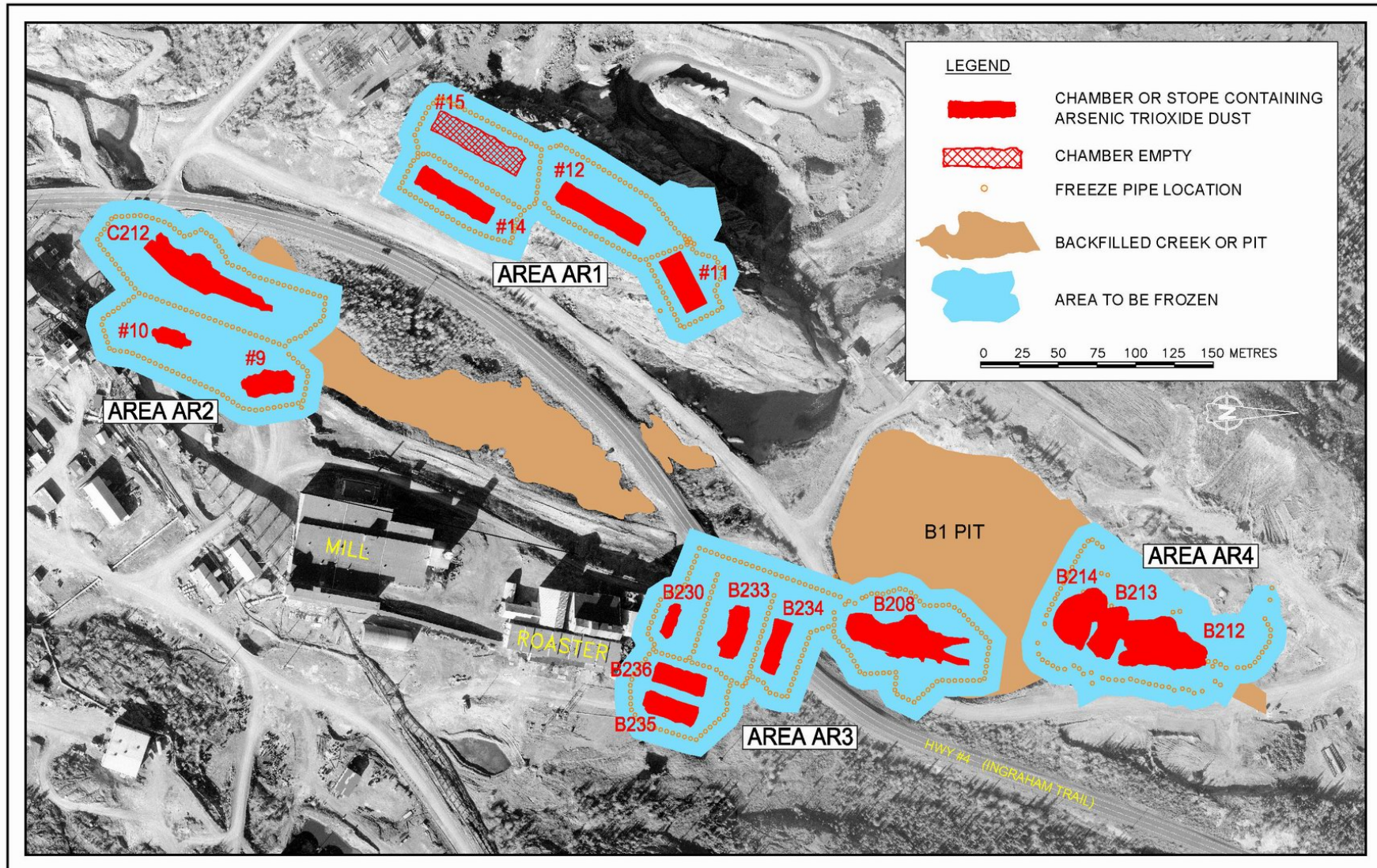
- Pits and Underground mine openings
- Tailings impoundments, sludge pond
- Contaminated surficial materials (arsenic and hydrocarbon)
- Contamination in Baker Creek – reach realignment
- Decaying mine infrastructure and buildings with severe arsenic contamination, asbestos insulation
- Water treatment

## ➤ Monitoring



4 m pipe spacing

# Four Separate Arsenic Trioxide Storage Areas to be Frozen



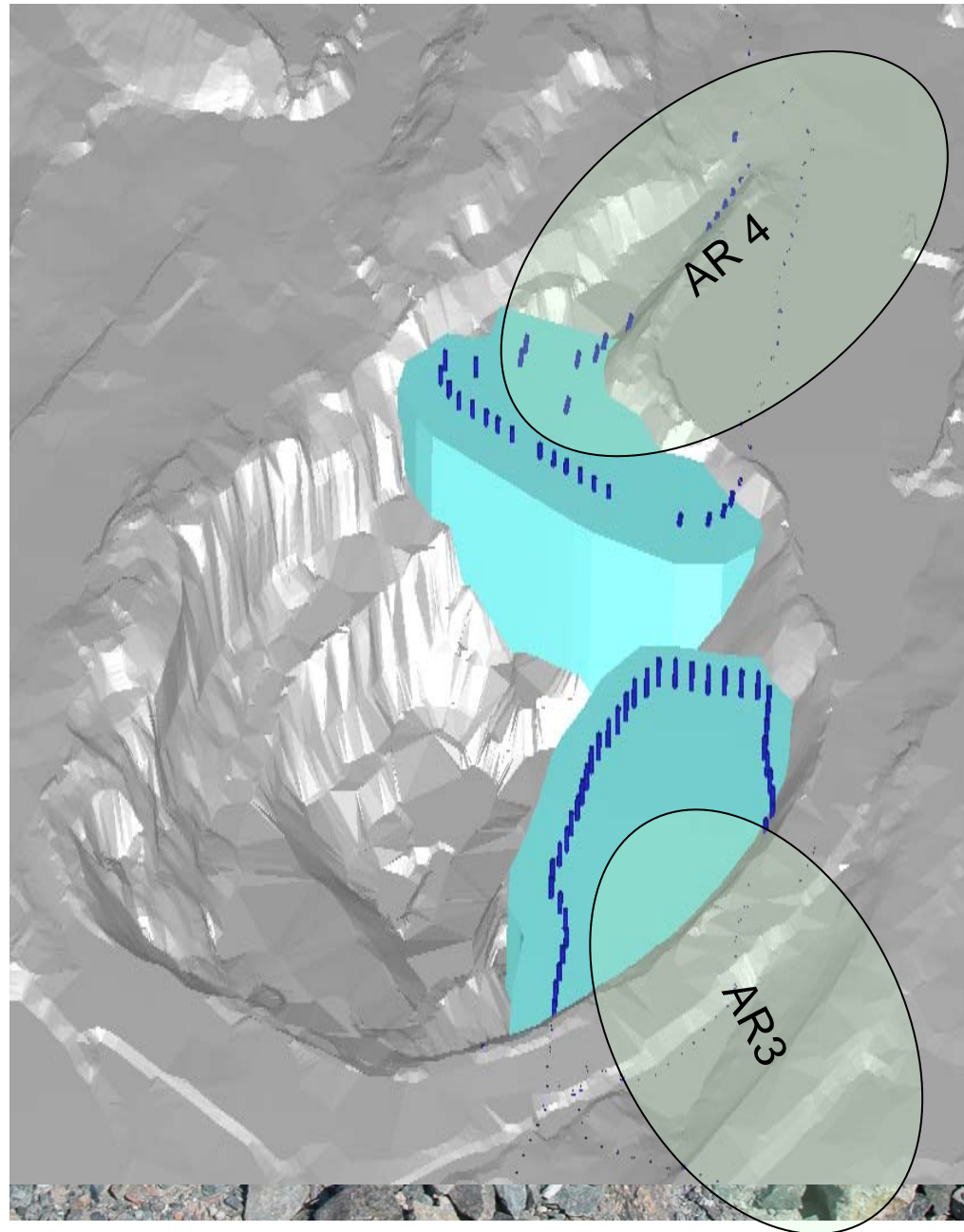


**Giant Mine Remediation Plan - Surface**  
2002 Air Photograph



# B1 Pit

- Requires backfill to construct drill platform for freezing AR3 & AR4 areas
- Platform - 60,000 m<sup>3</sup> of contaminated surficial material, >340 mg/kg As to be frozen
- 330,000 m<sup>3</sup> of fill needed to fill pit
- 270,000 m<sup>3</sup> will consist of waste rock, quarry rock or clean demolition debris



# Tailings Containment Areas 95 hectares



NW Pond

North Pond

Central Pond

South Pond

# Tailings Cover Design – 2 Layer

Bottom layer of broken rock has 4 functions:

1. Physical Barrier to prevent contact with the tailings by humans or animals
2. Prevents erosion (ATV's, Dirt Bikes)
3. Prevent upward wicking of arsenic slats through to cover
4. Helps prevent roots from penetrating tailings

Upper layer of locally borrowed silt and silty clay will:

1. Act as clean surface to shed runoff
2. Allow vegetation to establish
3. Reduce water infiltration
4. Allow for future recreational and/or traditional use
5. Eliminate airborne tailings fines on windy days

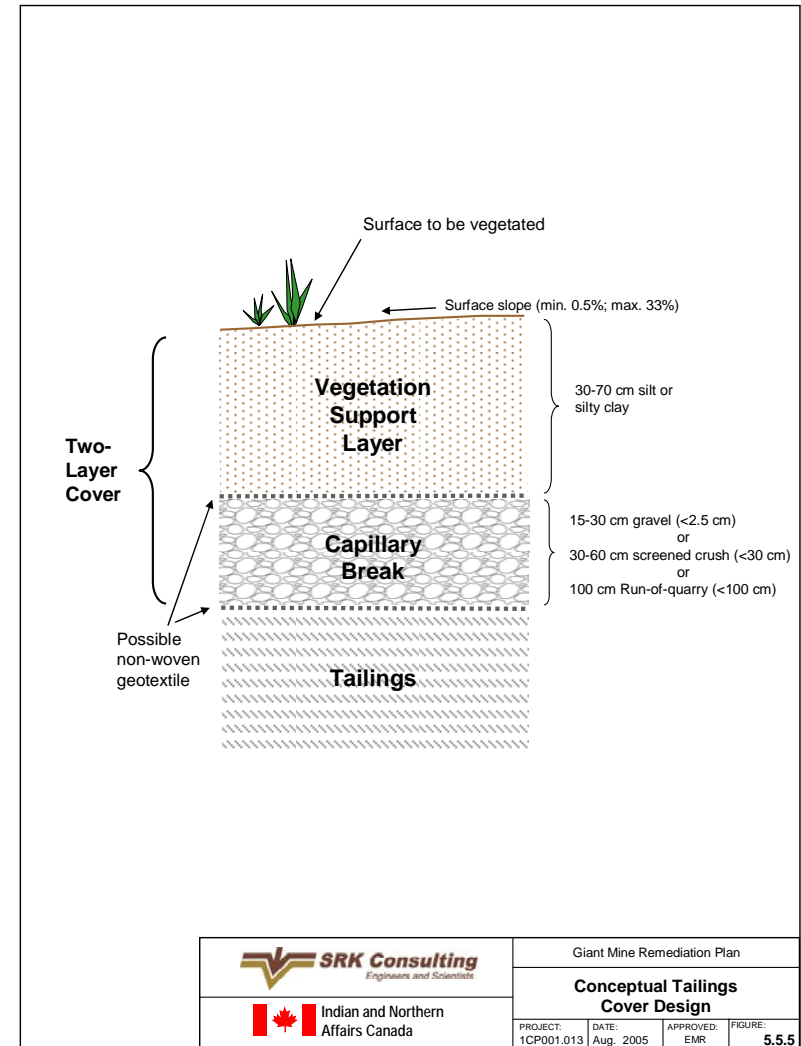


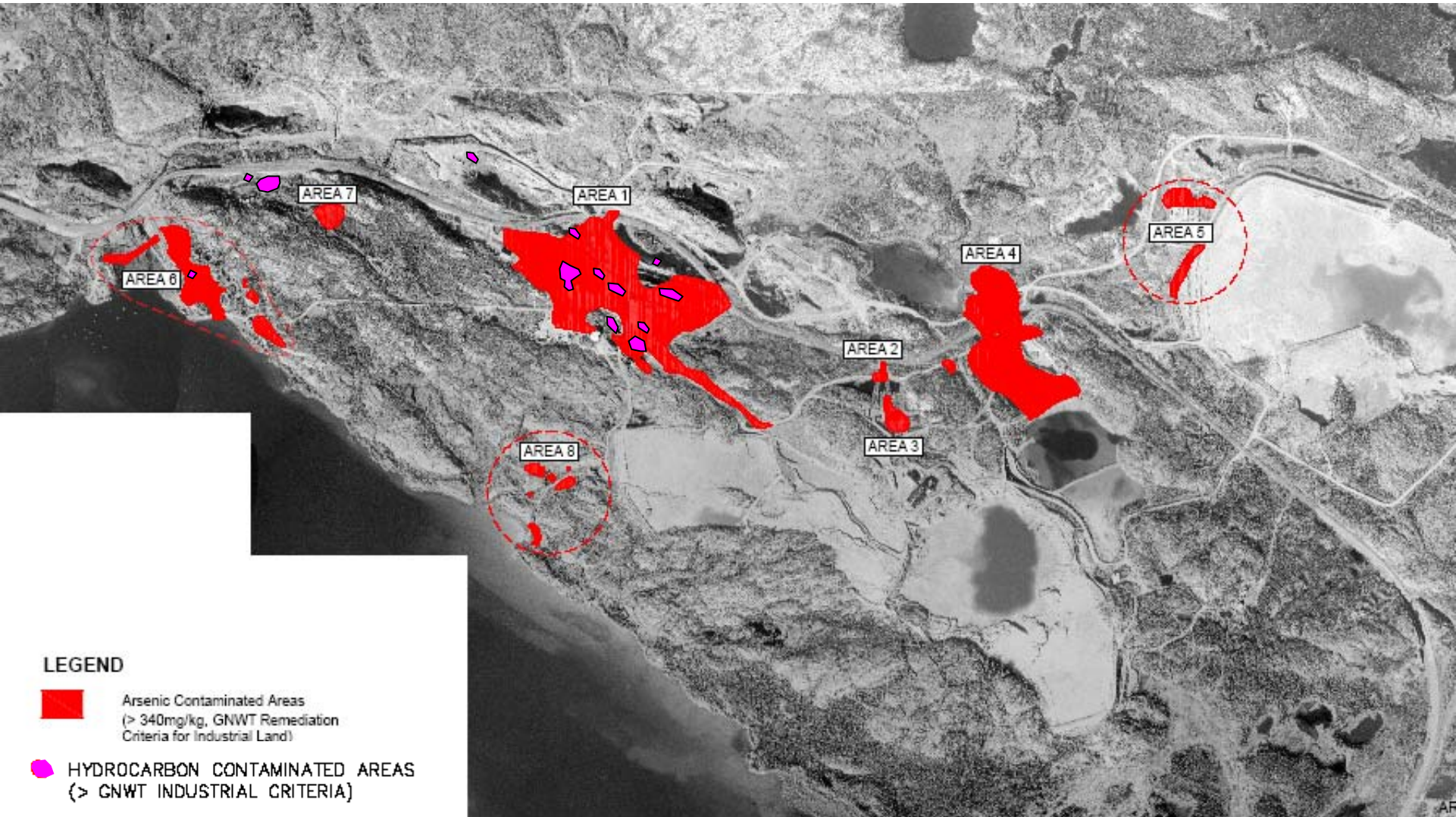
Fig 5.5.5\_5.5.6-Conceptual Tailings Cover Design.ppt

Note:

Minimizing infiltration is NOT a primary objective, but the two layer design will reduce infiltration

# Contaminated Surficial Materials

Site will be remediated to GNWT industrial standards 340 ppm





- All existing infrastructure with no future use will be demolished



# Minewater management

- Minewater is expected to require treatment for an extended period of time after remediation measures have been implemented
- Current water treatment system
  - Issues with age of plant and seasonal treatment

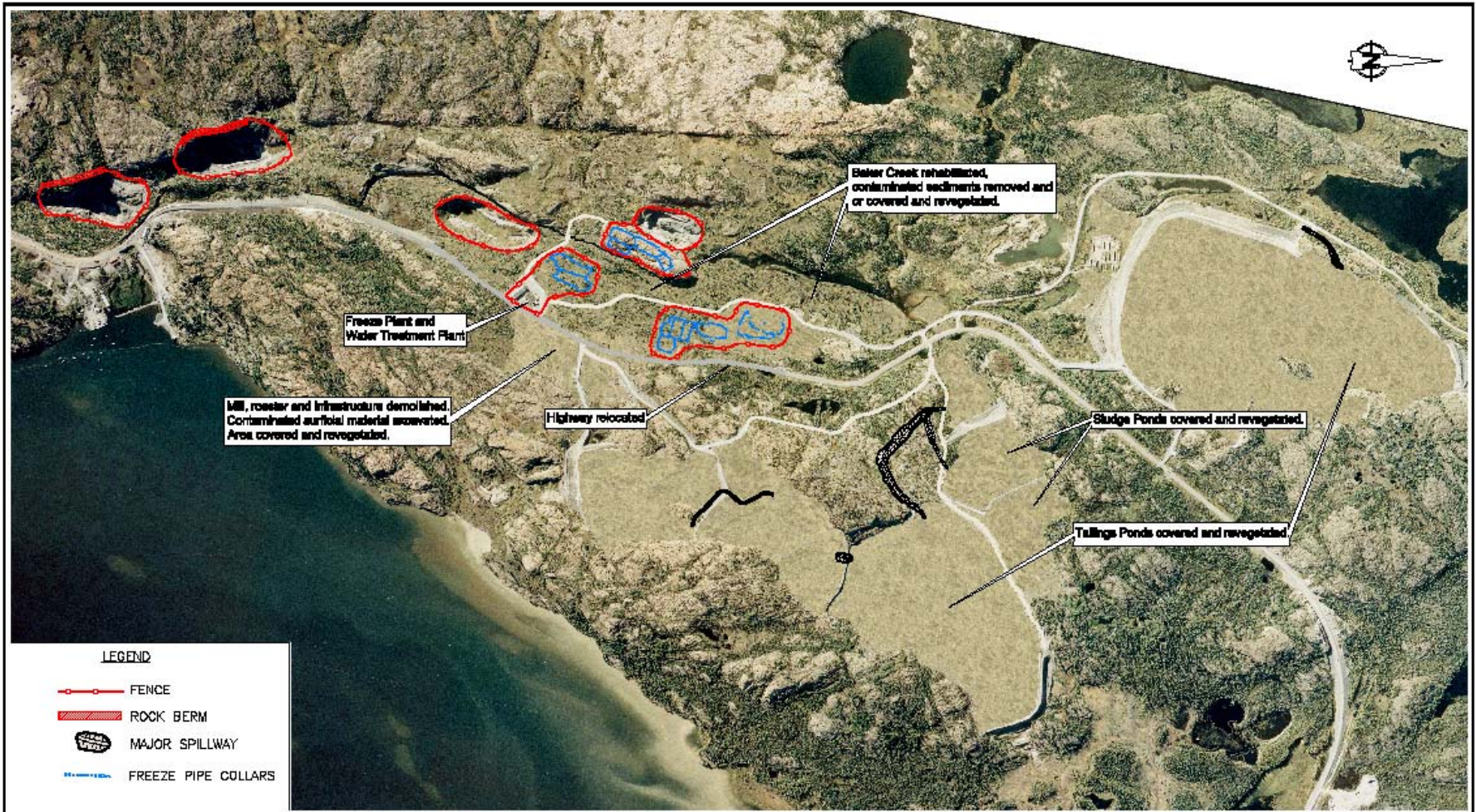


# Remediation Plan - Site Water Management


- Construct a new Best Available Technology (BAT) water treatment plant
- Plant will be located near the C-Shaft
- Change operating procedure from a seasonal discharge to a year round discharge
- Design includes holding pond and monitoring
- Change discharge point from Baker Creek to Yellowknife Bay
- All surface runoff from the tailings pond will be directed to the underground until it has reached acceptable quality for direct discharge to environment



# Site – Post Remediation



0 80 160 240 320 400 metres

 <p><b>SRK Consulting</b> Engineers and Scientists</p>	Giant Mine Remediation Plan			
	Post Remediation Site Conditions			
 <p>Indian and Northern Affairs Canada</p>	PROJECT NO.	DATE	APPROVED	FIGURE
	1C1001.013	Jan. 2006	MDR	6.1.1

# Human Health and Ecological Risk Assessments

- Arsenic releases from the project area to the environment will be reduced significantly
- There are off site sources of arsenic that will remain
- The Remediation Plan will prevent release of many thousands of kilograms of arsenic per year



# Human Health Risk Assessments

- People living in the region are unlikely to be at risk of adverse effects from arsenic exposure.
- Arsenic intakes are generally within the range of other Canadians. Estimated cancer risks arising from Giant Mine arsenic are well below the risks associated with other causes of cancer.
- To be cautious, there may need to be restrictions on the use of Baker Creek.



# Ecological Risk Assessment

- Aquatic plants and fish in Back Bay and Yellowknife Bay will not be at risk
- Due to existing sediment contamination and upstream sources, Baker Creek may take a long time to recover
- Mink and muskrat in Baker Creek could be at risk but field studies show healthy populations



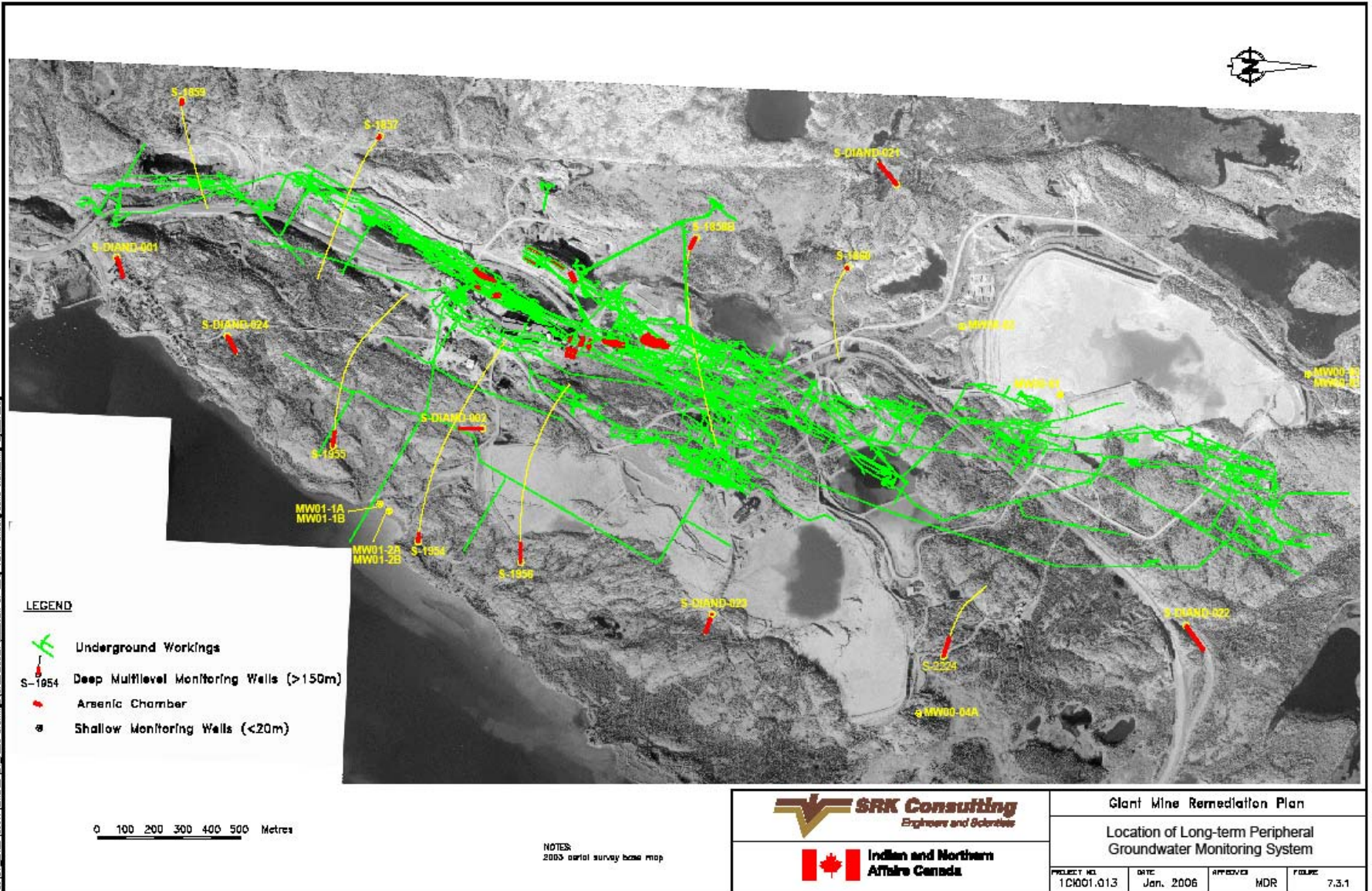
# Monitoring

- Surface Water monitoring –  
Surveillance Network Program
- Treated Water monitoring
- Minewater monitoring
- Groundwater monitoring
- Air monitoring
- Environmental Effects Monitoring under  
Metal Mining Effluent Regulations
- Frozen ground monitoring
- Inspections and maintenance





# Groundwater monitoring



C:\G1\_SITES\GANTY\Shared\01\_Aerial Drawings\Groundwater\Location of Long Term Underground Monitoring System.dwg

# Conclusion

- After eight years of study and consultation, INAC and GNWT believe that the proposed Remediation Plan will:
  - Protect human health
  - Improve the environment
  - Ultimately meet the approval of local stakeholders



# Giant Mine Remediation Project

<http://giant.gc.ca>

**Oct 6, 2007**  
**Vegetation**

