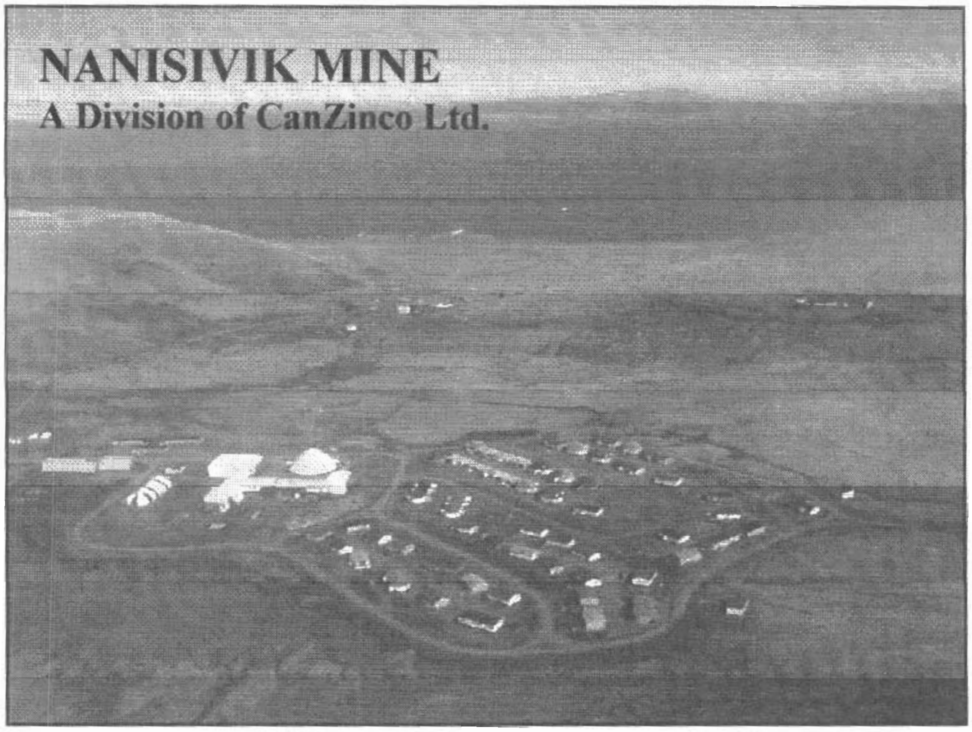
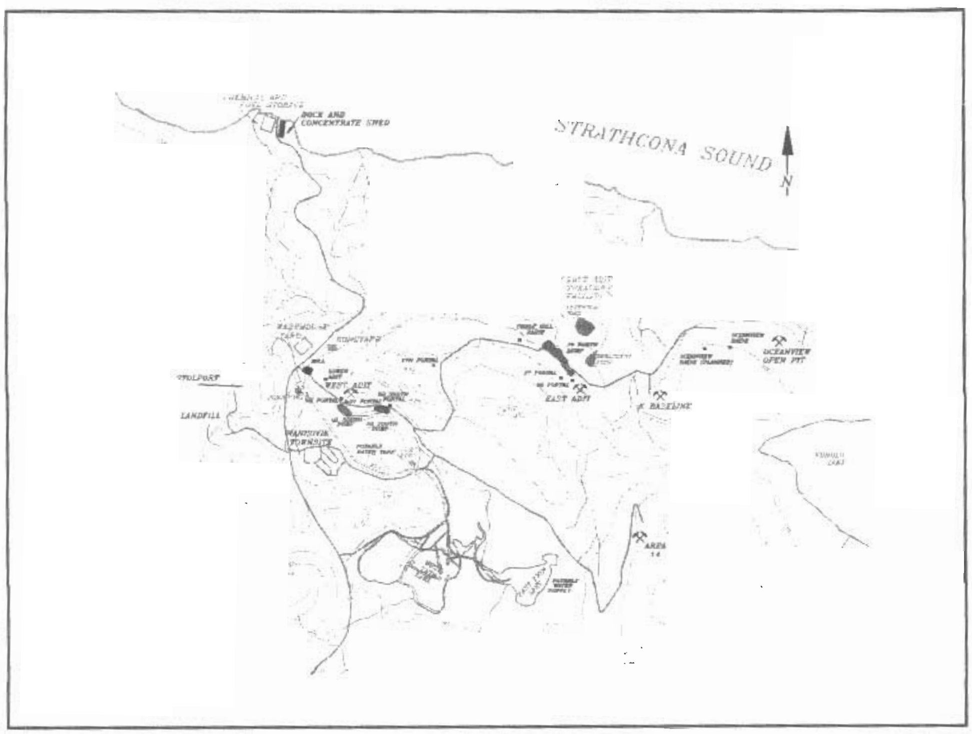
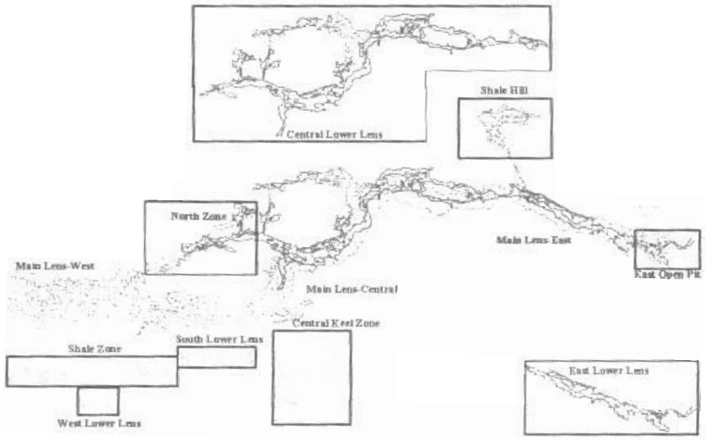

NANISIVIK MINE
A Division of CanZinco Ltd.

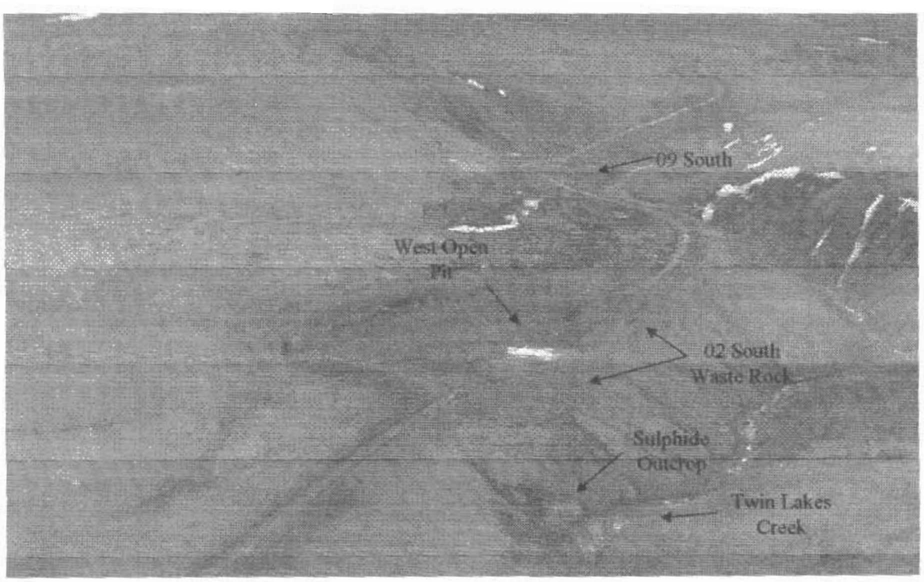

DOCK AND CONCENTRATE SHED
STRATHCONA SOUND
N
WEST ADIT
EAST ADIT
OCEANVIEW OPEN PIT
BASELINE
LANDFILL
NANISIVIK TOWNSITE
AREA 14

MINING



- Primarily an underground mine with separate satellite areas
- Upon approval of the Closure and Reclamation Plan it is intended that solid waste will be taken into the mine and placed in abandoned stopes before the mine entrances are permanently closed.

MINING

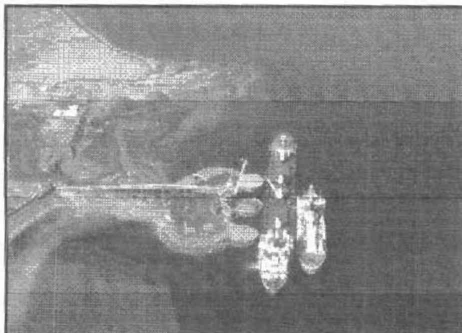


OPEN PITS

- West Open Pit, East Open Pit, and Ocean View.
- Sulphides will remain in the pit floors and will be covered with overburden or clean fill to promote the development of permafrost.
- When mining is completed, overburden will be pushed back into the pit and contoured to prevent pooling of surface water.
- Thermocouples will be installed to monitor temperatures within the covered pits and confirm that the cover design has been effective.
- Reclamation of these areas has begun in some areas.

MILL

- The Mill Complex is made up of several key features including: power plant; concentrator; garage; administration offices; laboratory; lunchroom; warm storage and cold storage buildings; warehouse yard; compressor house; DMS Plant; and, various other small buildings.
- If alternate uses cannot be found it is intended to remove equipment and infrastructure for sale or disposal underground.

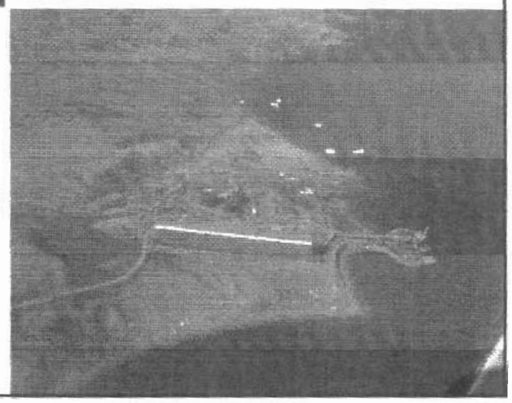


DOCK AREA

- Ship loader and associated equipment will be removed.
- Extent of impacted soil is being delineated as part of the Phase II ESA.

CONCENTRATE STORAGE SHED AND TANK FARM

- Intent is to ensure that infrastructure such as the tank farm and concentrate storage shed will continue to be used.
- Remove tank farm and concentrate storage shed and dispose underground.
- Identify and reclaim impacted areas.

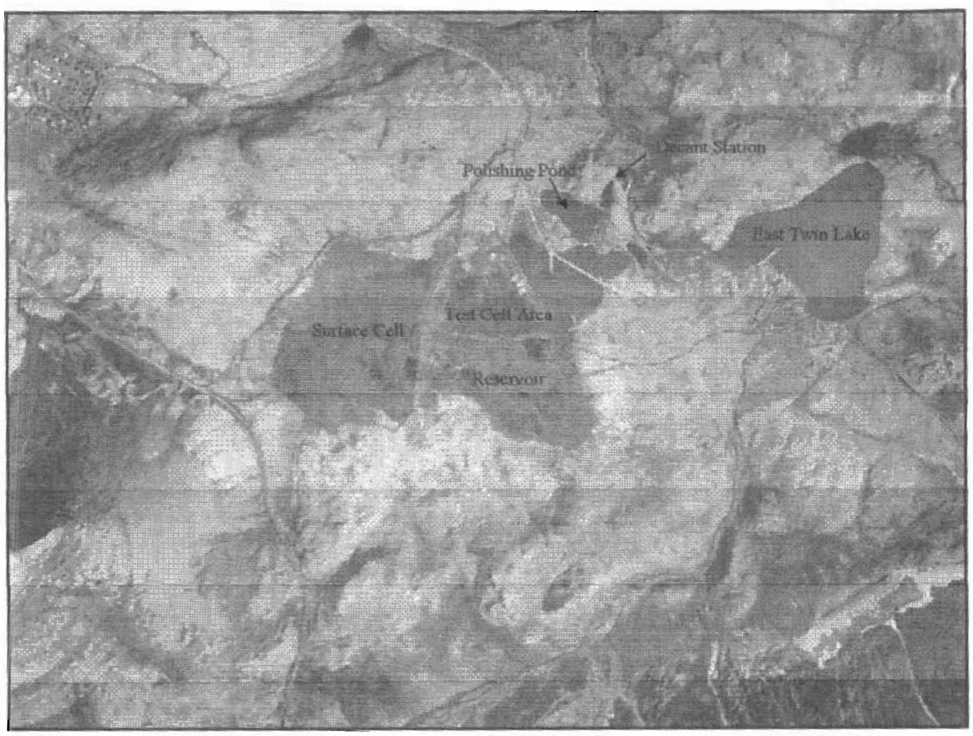


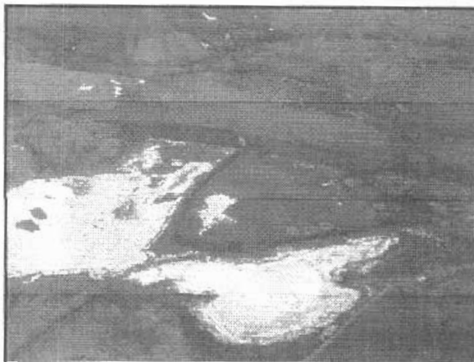
TOWN SITE

- Some of the town site falls under the responsibility of the Government of Nunavut.
- Demolition of Nanisivik owned equipment and infrastructure remains as the method of reclamation if no alternate uses can be found.

LANDFILL SITE

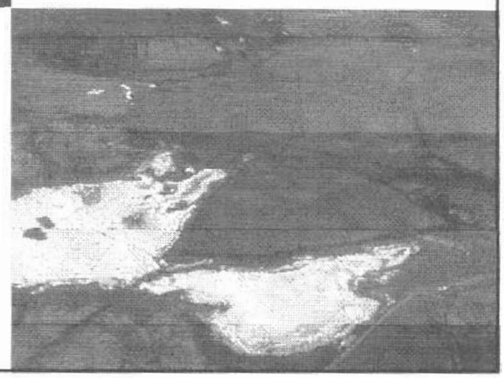
- Will remain active until all operations and activities have been completed on-site.
- Site will be covered to raise the active layer of permafrost above the waste.
- Area will be contoured to prevent erosion and pooling of seasonal runoff.
- Thermocouples will be installed to monitor temperatures within the waste and designed cover





COVER DESIGN

- Artistic rendering of what the West Twin Lake will look like after the designed cover has been applied.



MAJOR ISSUES:

1. Underground Disposal
2. Acid Rock Drainage
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5. Stability of Structures
6. Monitoring Period
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Discussion on Underground Storage Areas and ARD in the Open Pits of the Nanisivik Mine

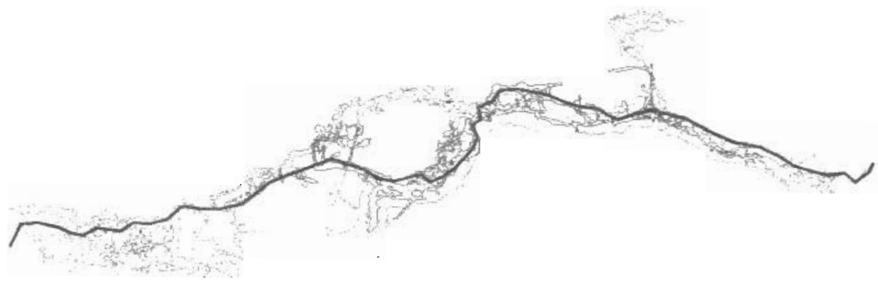
Underground Storage Areas

"Final retreat mining of the central access ramp pillar is likely to preclude future access in much of the mine workings. Any waste not disposed of in the workings as part of the retreat mining will have to be disposed of elsewhere." *(J. Brodie, Section 3.4, Page 3)*

Underground Storage Areas

- Misconception is that access to much of the mine workings will be lost.
- The area without access is in the Main Lens from 12 block east to 39 block at the East Open Pit
- A permanent roadway exists through the West Zone of the Main Lens and down through the Lower Lens areas out to the East Open Pit.

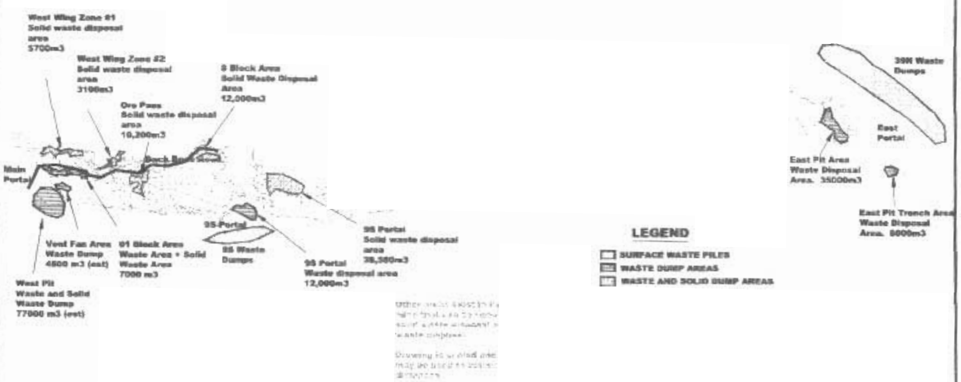
Nanisivik Mine Footprint – All Areas



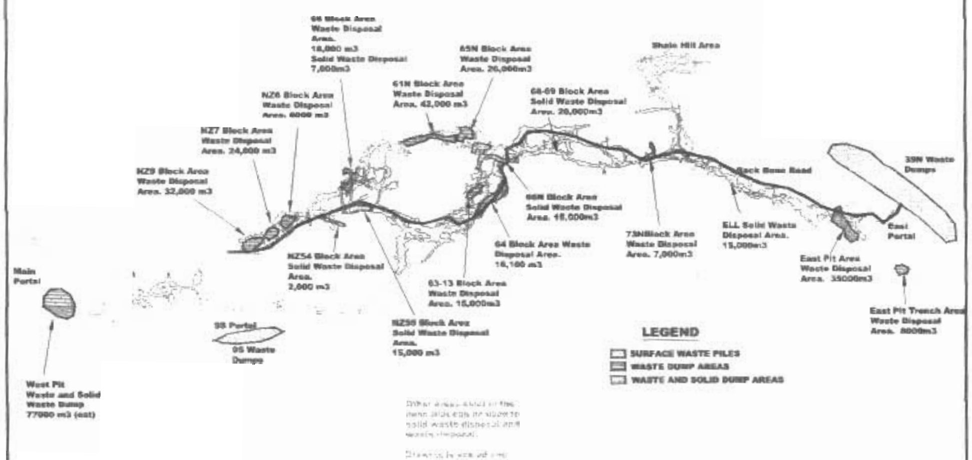
Underground Storage Areas

- Total volume of identified areas for deposition of waste rock in the open pits is 120,000m^3.
- Total volume of identified areas for deposition of waste rock within the underground mine is 220,700m^3.
- Total volume of identified areas for deposition of solid waste within the underground mine is 95,000m^3.
- Total available volume is 435,700m^3.

Nanisivik Mine Footprint – Main Lens



Nanisivik Mine Footprint – Lower Lenses



Underground Storage Areas

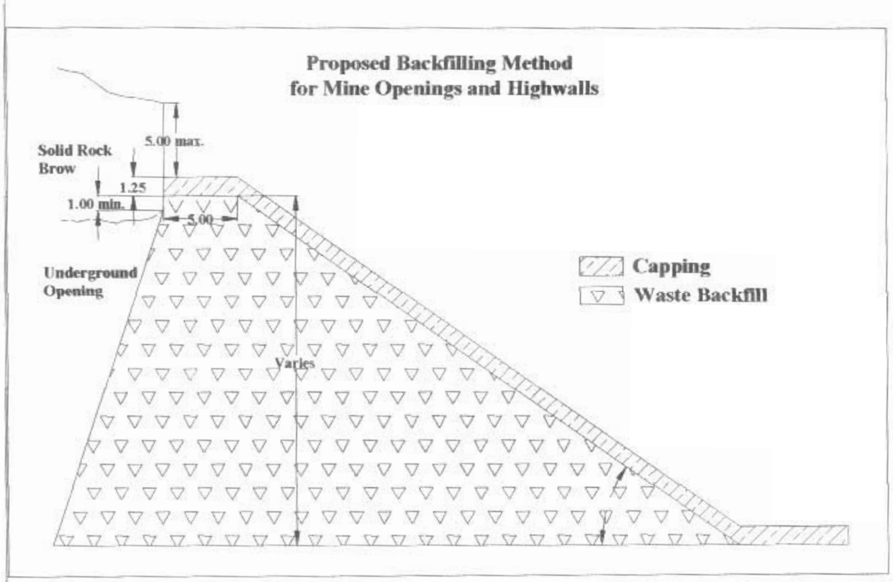
- Total volume of identified waste rock to be deposited in the open pits is 120,000m^3, as the areas are to be completely filled and contoured.
- Total volume of identified waste rock to be deposited in the underground mine is 125,000m^3.
- Total volume of identified solid material for deposition in the underground mine is 47,500m^3.
- Total required volume is 292,500m^3.
- An excess capacity of <u>143,200m^3</u>.

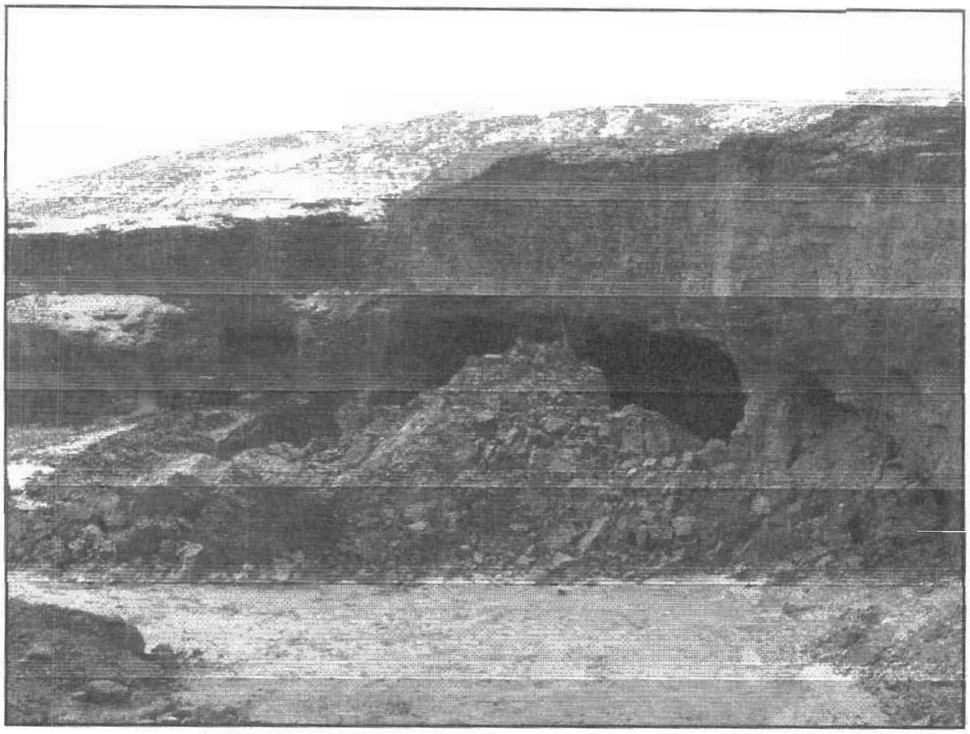
Underground Storage Areas

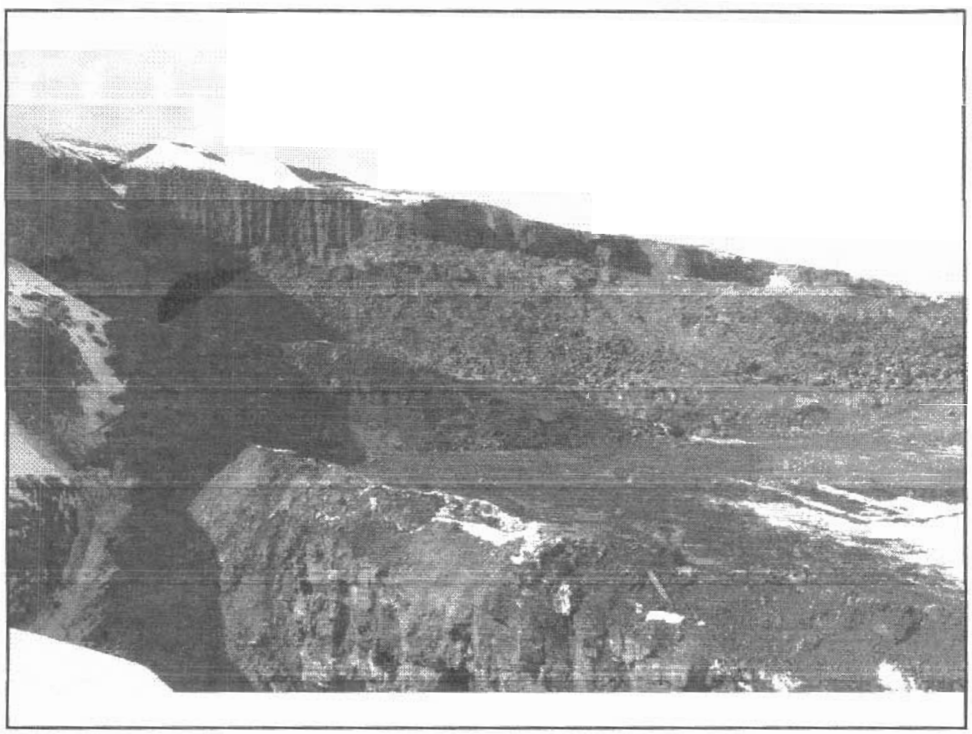
- The Backbone Road is permanent and will allow access to numerous storage areas.
- Estimated volumes for storage capacity are extremely conservative.
- Estimated volumes of material to be moved to the storage areas are the worst case scenario.

ARD in Open Pits

- Backfilling of the open pits follows the same principles as for tailings.
- Final contouring will be done to channel all water flow off of the recovered area.
- Orebody sulphides originally outcropped in all three pit areas prior to the onset of mining.







SUMMARY

- Filling will be carried out to a point no more than 5 meters below the ultimate pit wall.
- Waste backfill will be covered with a cap of 1 metre of shale and 0.25 metres of armour.
- No sulphides will be left exposed in any of the open pit areas.
- Any voids will fill with ice over time.

ACID ROCK DRAINAGE

- There has been extensive sampling and characterization of rock types at Nanisivik
- 1997 sampling program collected 164 samples from 17 areas on the property.
  - Waste rock sampling: 85 samples (12 of road material)
  - Open pit walls: 18 samples
  - Tailings impoundment: 10 samples (7 from the dike and 3 tailings samples)
  - Borrow areas (shale): 31 samples
  - Soil and Till: 19 samples
- Additional Static and Kinetic testing has been preformed on tailings and shale from the WT dike.

ACID ROCK DRAINAGE

•Closure plan has taken into account the results of this testing and we are reclaiming waste rock stockpiles, open pits, and the WTDA ensure that ARD will not be an issue for future generations to contend with.

•Additional investigations are being conduced by Gartner Lee Limited in the Phase II ESA to identify areas of concern along the pipeline right of way, roadways, and other areas that may have been adversely affected by industrial activities at Nanisivik.

MAJOR ISSUES:

1. Underground Disposal
2. Acid Rock Drainage
3. Cover Thickness
4. Soil Contamination
5. Stability of Structures
6. Monitoring Period
7. Closure and Reclamation Costs
8. Infrastructure

Engineered Cover

- "*... the adequacy of the proposed depth of cover..*"
- Proposal is to cover the surface tailings, open pits, any waste rock residuals and the landfill with 1.0 metre of shale plus 0.25 metres of armour surfacing ("sand and gravel") – total of 1.25 metres.

Objectives

1. To mitigate any potential impacts from the covered materials (i.e. waste rock, tailings, landfill waste).
2. Provide surface land use comparable to the natural surroundings.

Design Basis Considerations

1. Evaluation of Cover Options
2. Geotechnical Properties
3. Geochemical Properties
4. Field Testing
5. Geothermal Modeling (Global Warming)

1. Evaluation of Cover Options

- Water Cover (tailings specific)
  + proven prevention technology for acid mine wastes
  – incompatible with the dyke design – not intended as a water retaining "dam" on closure
- Geosynthetics
  + effective barrier against water and oxygen infiltration
  – increased environmental risk associated with tearing or breeching of the material
  – not a "natural" solution

1. Evaluation of Cover Options

- Natural Materials (fine grained)
  1. Marine silty clay
  2. Glacial till
  3. "Twin Lakes Sand and Gravel"
  4. "Airport" sand
  5. Shale

2. Geotechnical Properties

- Golder Associates conducted a geotechnical assessment of the cover materials in 1998
- Sieve analysis
- Relative absorption
- Specific gravity
- Los Angeles Abrasion rating
- Slake durability index
- Freeze/thaw durability
- Petrographic analysis

2. Geotechnical Properties

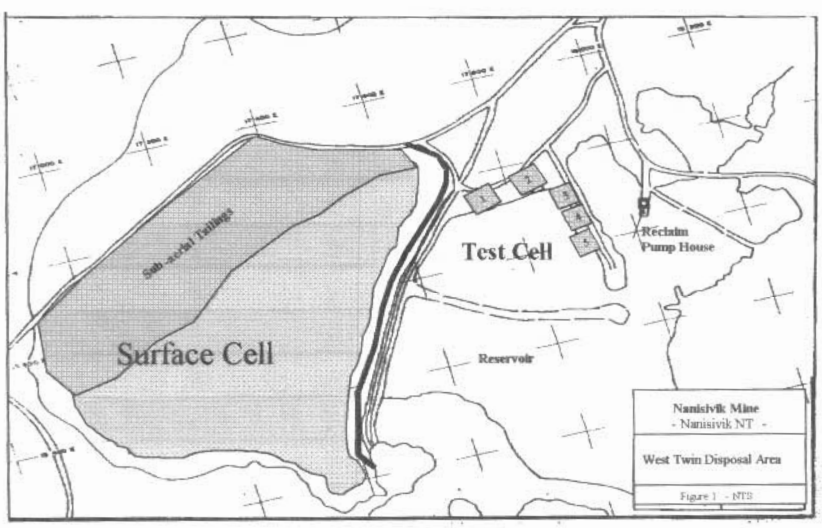
- Slope Stability assessment
  - Determines frictional values of the materials
  - Limits of stability before risk of slippage
  - Frictional values range from 20 to 33°
  - Tailings deposit is < 3°

3. Geochemical Properties

- Potential for Acid Generation
  - *"Acid Generation of Tailings and Shale Cover" (Lorax, 1999)*
  - *Acid base accounting and kinetic testing*
- Rate of oxidation
  - Rate of sulphide oxidation decreases at low temperatures (MEND)
  - Dr. Elberling demonstrated that sulphide oxidation rate is controlled by oxygen diffusivity not reaction kinetics – supported our design of a diffusive barrier layer

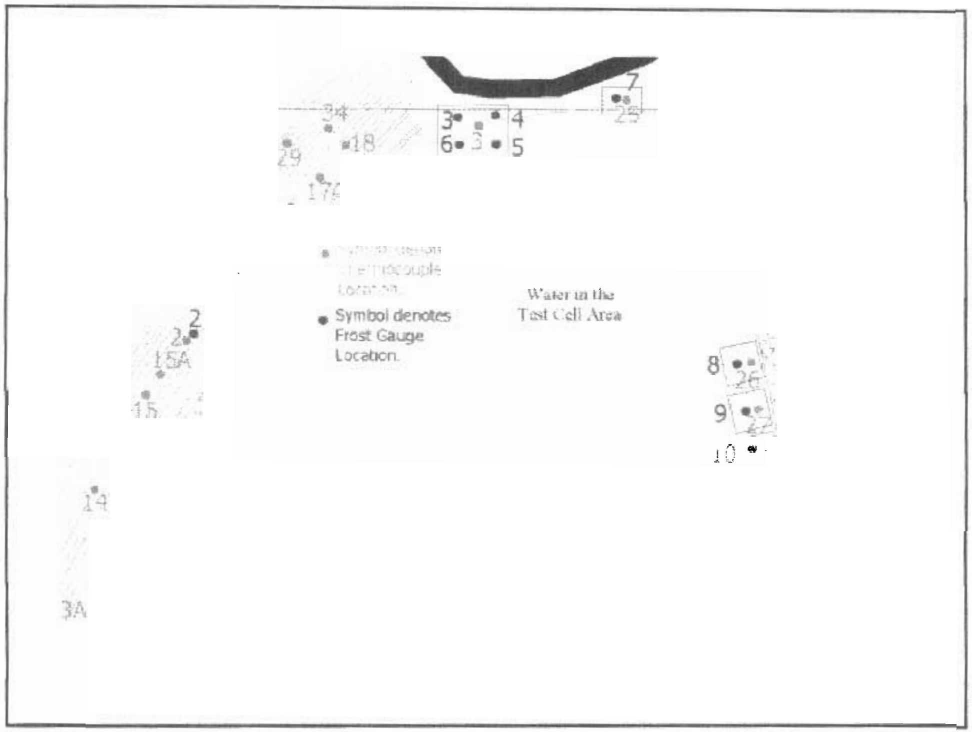
4. Field Testing

- Began field testing with a test cover of shale at Area 14 in 1988
- In 1990 five more "test pads" (test covers) were constructed on the tailings at WTL
- Different materials and construction methods were employed to measure performance of the covers



4. Field Testing

- The pads were instrumented with a combination of piezometers, frost gauges and thermocouple strings to measure:
  - Presence and quality of ground water
  - Subsurface temperatures
  - Thaw and freeze patterns.



4. Field Testing

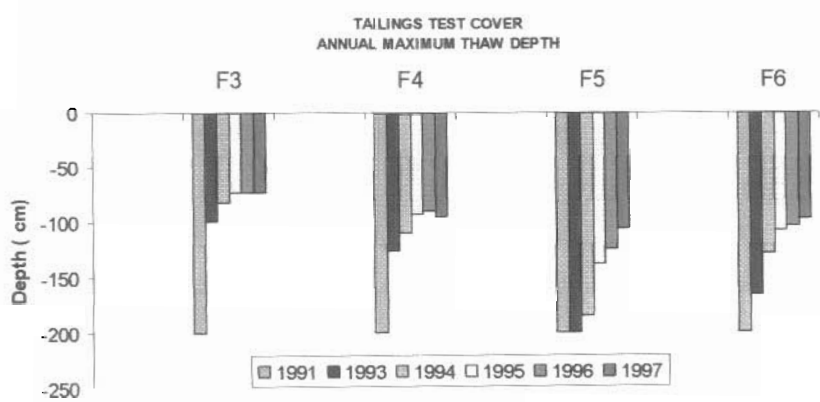
Observations

- Testing period ran for seven years.
- Ground temperatures and thaw activities were regularly recorded.
- Piezometer gauges were monitored for water level.

4. Field Testing

Findings

- No water was recorded in any of the piezometers throughout the period.
- The construction "recipe" which performed the best was the one used for Test Pad 1.
  - Constructed of bulk fill shale (no controlled compaction or saturation) with 10 cm of light coloured surfacing (sand).
- The four frost gauges in TP1 showed an annual decreasing trend in thaw over the 7 year observation period.
- An average value of **0.92 metres of thaw** was recorded in the last year.



- Average value recorded in final year was 0.92 metres of thaw.

5. Geothermal Modeling

- To account for the potential influence of global warming (BGC Engineering Ltd.).
- Baseline established - current climatic conditions were compiled using Nanisivik Airport data (AES) along with the Cdn Climate Normals for Resolute (longer term).
- Review of global warming estimates to determine potential effects at Nanisivik.

5. Geothermal Modeling

- Two sources were referenced:
  1. International Panel on Climate Change (IPCC)
  2. The Panel on Energy Research and Development (PERD) – report prepared by Environment Canada

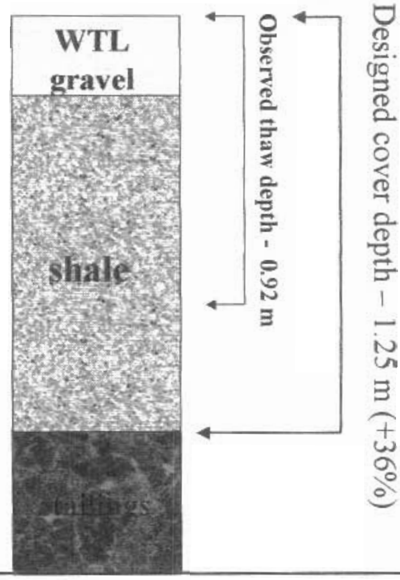
5. Geothermal Modeling

- IPCC estimates a global mean sensitivity between 1.5° and 4.5°C.
- PERD provides estimates for <u>high latitude</u> areas – establishes a "Best Estimate" case of 2.0° and a "High Sensitivity" (worse case) of 3.5°C.
- Nanisivik has used **5.5°C** for a worse case scenario and modeled based on this.

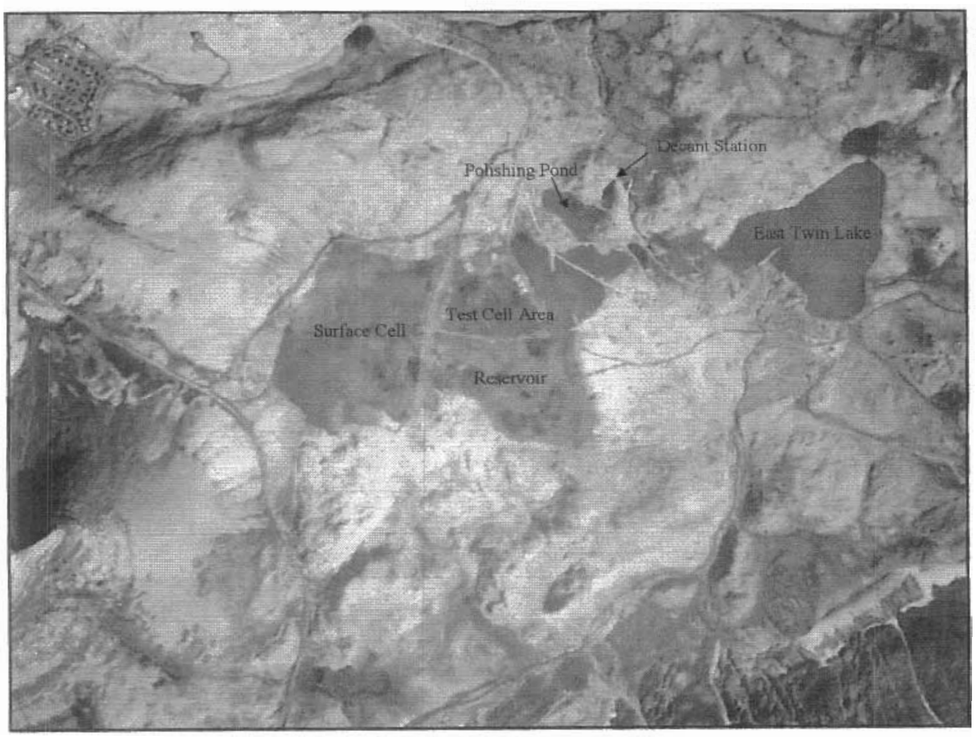
5. Geothermal Modeling

- Using the **5.5°C** worse case scenario projection, the modeling results indicate an additional 0.32 metres of shale would provide sufficient contingency protection in the event of global warming.

Summary



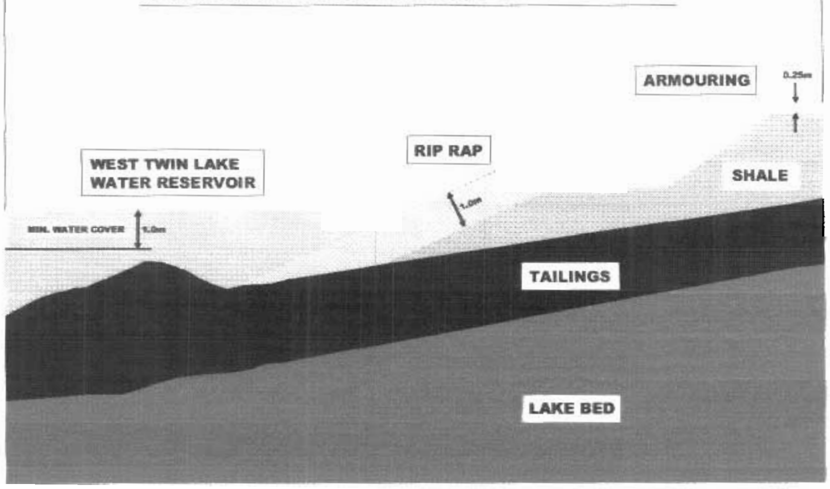
- When the worse case scenario global warming model is applied to the field observations, the depth of thaw will not exceed the proposed depth of cover.



PREDICTED METAL CONCENTRATIONS IN WATER COLUMN

Time (years)	Cd (ppb)	Pb (ppb)	Zn (ppb)
1	0.116	0.143	53.40
10	0.133	0.164	46.50
30	0.134	0.166	24.80
60	0.134	0.165	23.00
100	0.133	0.164	23.00
MMER (Lic.)	5.00	200	500

SECTION SHOWING SUBAQUEOUS TAILINGS



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ENVIRONMENTAL SITE ASSESSMENT (ESA)

- Purpose:
  - characterize and delineate contamination
  - standard protocols and Federal Guidelines
- Phases:
  - Phase 1: "Screening", APEC's
  - Phase 2: "Reconnaissance", field sampling
  - Phase 3: "Detailed Follow Up", if necessary

NANISIVIK INITIAL ESA

- Appendix A of the February 2002 Closure and Reclamation Plan:
  - initial environmental site assessment
  - review and summary of existing information
  - description of key mine reclamation issues
  - proposal for Phase 2 Investigations

NANISIVIK PHASE 2 ESA

- Timing:
  - initially scheduled for late August 2002 to take advantage of maximum thaw depth
  - re-scheduled to commence in July 2002 to provide initial information quickly
  - possible follow up investigations in late August 2002 after review of initial results

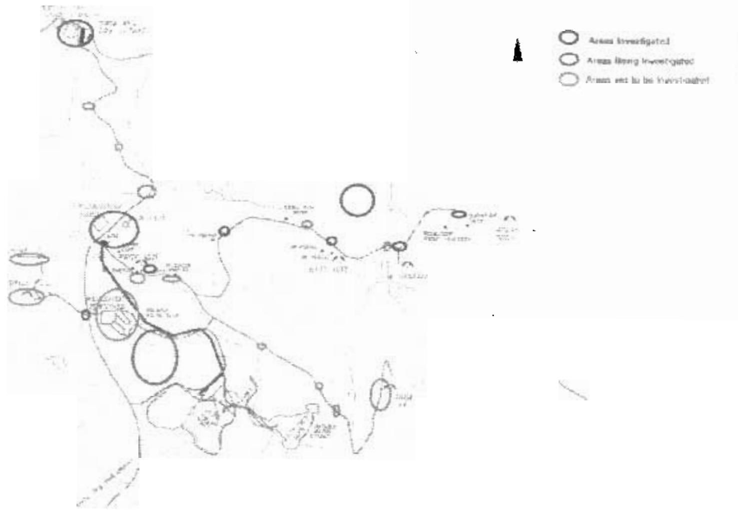
NANISIVIK PHASE 2 ESA

- Methods:
  - -- test pits sampled at various depths
  - -- groundwater sampling
  - -- dust samples
  - -- visual inspection
  - -- analyses for metals, hydrocarbons and other contaminants
  - -- field determinations of organic vapours

NANISIVIK PHASE 2 ESA

- Investigation Locations:
  - – per initial proposal plus comments from interventions
  - – dock area, roads, industrial complex, tailings pipeline, town, carpenter shop, landfill, STOLPORT, East Adit treatment facility, day tanks, ore stockpiles, Twin Lakes Creek, "saddle" SE of town
  - – marine sediments recently sampled by others

NANISIVIK PHASE 2 ESA



ECOLOGICAL AND HUMAN HEALTH RISK ASSESSMENT

- Purpose:
  - determine appropriate soil clean up criteria
  - standard protocols and Federal Guidelines
  - as proposed in the February 2002 Closure and Reclamation Plan

ECOLOGICAL AND HUMAN HEALTH RISK ASSESSMENT

- Procedure:
  - -- contaminant characterization (from ESA)
  - -- expected land use patterns (relates to potential on-going use versus complete tear down)
  - -- most sensitive receptors (eg. children, adults, wildlife)

ECOLOGICAL AND HUMAN HEALTH RISK ASSESSMENT

- Timing:
  - follows Phase 2 ESA
- Recent Northern Precedent:
  - Polaris Mine

MAJOR ISSUES:

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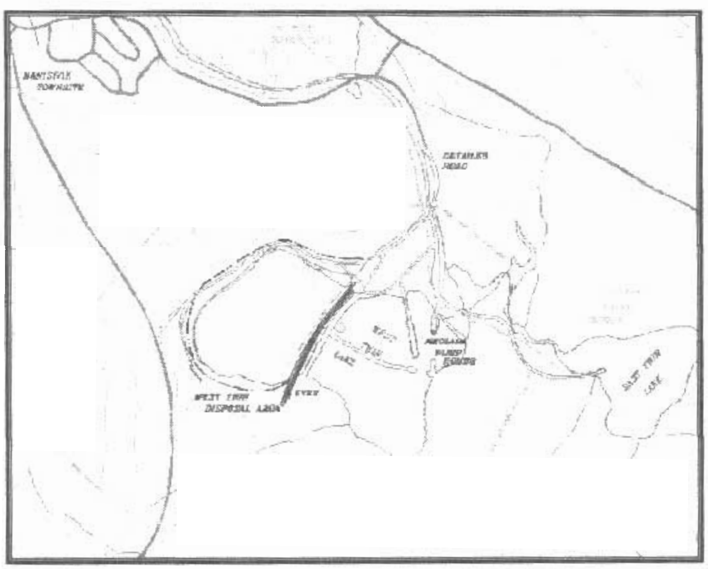
West Twin Dike Stability & Area Closure Issues

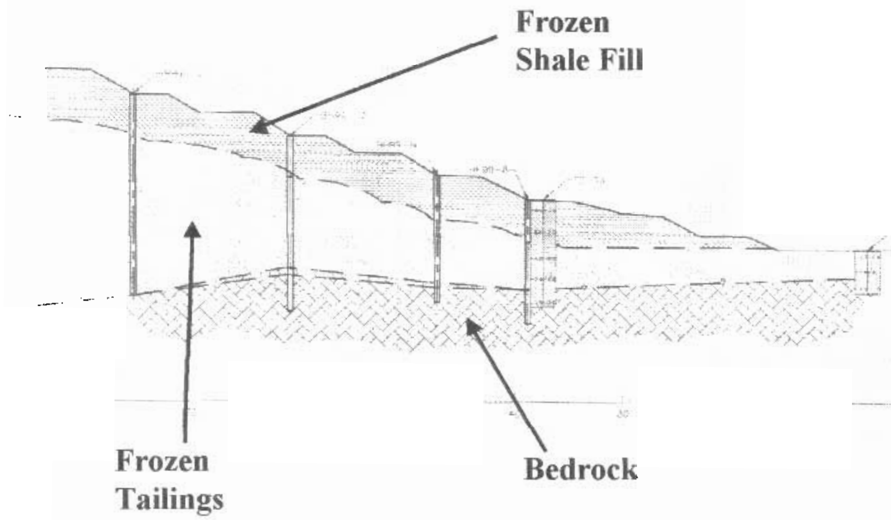
Outline of Issues Covered

- Potential Talik in the Surface Cell
- Dike Failure Consequence Classification
- Seismic Design Criteria According to Dam Safety Guidelines
- Seismic Stability Analyses
- West Twin Dike Spillway Design & Investigations
- West Twin Lake Hydrological Assessment
- Frost Heave of Cover Materials
- Quarry Material Evaluations

West Twin Disposal Area



West Twin Dike Section



Frozen Nature of Materials

- 22 thermocouples installed in the West Twin Dike – 17 currently monitored.
- 2 thermocouples installed in tailings of the Surface Cell.
- Information to-date indicates subzero tailings throughout the deposit.

Potential Talik in Surface Cell

- One deeper portion within the Surface Cell previously used for pumping of surface collected water.
- Given the deep water (~7 m) within the area, there is the potential that a talik (unfrozen zone) exists in the area within the frozen tailings.
- Center of area situated ~150 m upstream from dike.

Potential Talik Cont'd

- Recommendation within risk assessment to assess existence and extent of potential talik.
- Mine site staff drilled a borehole in May 2002, located 200 m upstream of dike.
- Info from site staff notes that 30 m of frozen tailings was encountered in the borehole.
- Potential for a talik does exist within the short term (until freeze back occurs).

Dam/Dike Failure Classification

- Within Canadian Dam Safety Guidelines, it is necessary to classify the potential consequences of a dam/dike into one of the following four:
  - Very High
  - High
  - Low
  - Very Low

Failure Consequence Classification

- Classification is based on two major consequence results:
  - Potential for fatalities.
  - Potential for environmental, financial and/or socio-economic consequences.
- Each aspect is evaluated separately and the higher of each consequence determines the classification used.

Consequence Assessment

- BGC Technical Memo of July 12th provides an assessment of the potential consequences of dike failure.
- Technical input/review provided by mine staff, Gartner Lee Ltd. and Golder Associates Ltd.
- Failure mode postulated leading to release of thawed tailings (talik zone) into the lower Reservoir.

Consequence Assess't Cont'd

- Reasonably determined that no fatalities would occur from failure of this dike.
- Expected costs for emergency response and rehabilitation estimated at ~ $0.9 million; "moderate" cost classification.
- Estimated environmental effects and fines estimated to be "moderate".

Consequence Assess't Cont'd

- No impacts to heritage or cultural aspects would be expected from a potential failure of the dike.
- Based on these estimated consequences, the failure consequence as outlined in Dam Safety Guidelines is classified as Low.

Dam Safety Criteria

- Canadian Dam Safety Guidelines provide criteria for design, based on the consequences of failure.
- For a Low consequence dam, the following two major criteria apply:
  - Seismic event; 1:100 to 1:1,000 year return period event (using probabilistic method).
  - Flood event; 1:100 to 1:1,000 year return period event.

Seismic Design Information

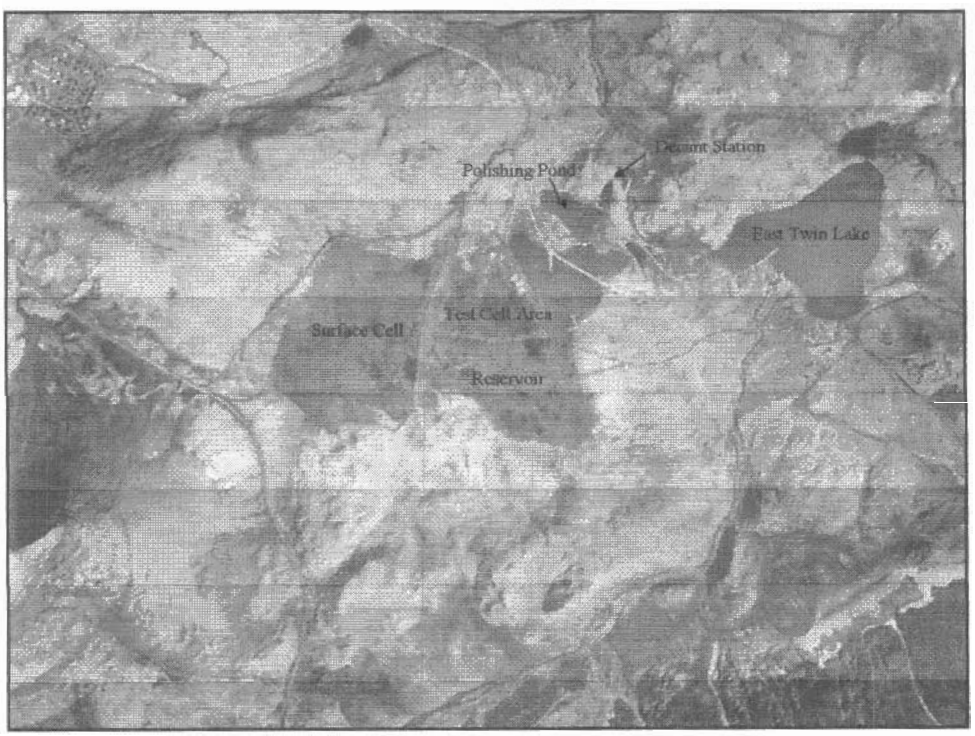
- Pacific Geoscience Centre (Geological Survey of Canada) provides the following values for Nanisivik:
  - 1:476 year return event = 0.076g
  - 1:1,000 year return event = 0.099g.
- Seismic acceleration values expressed as a portion of the acceleration of gravity.

Seismic Analyses Undertaken

- Pseudo-static seismic stability analyses undertaken for frozen slope (but assuming thawed frictional parameters).
- Non-circular block failures formulated and reviewed.
- Estimated frictional values for the tailings from 23° to 33°.
- For the lowest frictional value, the dike would be stable at 0.11g, an event just larger than the estimated 1:1,000 year event.

West Twin Dike Spillway

- At closure, a spillway will be required to direct surface water from the upper Surface Cell around the WT Dike.
- Preliminary engineering of the spillway has been completed in reports by BGC & Golder.
- Has been decided to design the spillway for Probable Maximum Flood (PMF), the most conservative assumption for design.



Spillway Design Cont'd

- Based on very limited survey and geotechnical information, two preliminary alignments selected from low area down to the Reservoir.
- Expected inlet elevation to spillway is 384 m in the low area upstream from the dike, towards it south abutment.
- Low point will be used to collect surface but no standing water will be ponded in the area.

Spillway Design Misconception

- "diversion ditch will be constructed around the tailings area." – No diversion ditch will be constructed. Water within the Surface Cell will be collected in the low talik area and then enter the spillway for drainage.

Final Design of Dike Spillway

- Work program for final design will include the following aspects:
  - Detailed topographic survey.
  - Drilling and test-pitting for geotechnical and permafrost conditions.
  - Evaluation of overburden, frost-shattered bedrock and competent bedrock conditions.
  - Assessment of side slopes in various materials and need for erosion protection (rip rap).
  - Thermal conditions relative to channel over tailings and in potential overburden permafrost.

West Twin Lake Hydrological Assessment

- Need to assess hydrology of West Twin Lake and hydraulic design of potential outflow structure.
- Proposal is in hand to undertake this work.
- Design constraint will be the need to provide a minimum water cover of 1 m in the lower Reservoir.
- Hydrological assessment will then route a PMF discharge through the WTDA system.

Hydrological Assessment Cont'd

- Based on the storage capacity of the system, the discharge amount and duration will need to be estimated.
- Following this determination, a design of a proposed outlet structure (e.g. spillway, rock weir, etc.) will be undertaken for a PMF event.
- Following potential geotechnical work, the structure design will be finalized and drawings/specifications produced.

Frost Heave Assessment of Cover

- Question arose with regards to frost heave of the cover layers over the tailings.
- When the cover shale layer is placed, the underlying tailings will be frozen and hence, any frost heave of that layer should have occurred.
- The shale layer is placed on the top and information (from the dike shale material) indicates a low susceptibility to frost heave.

Borrow Material Evaluations

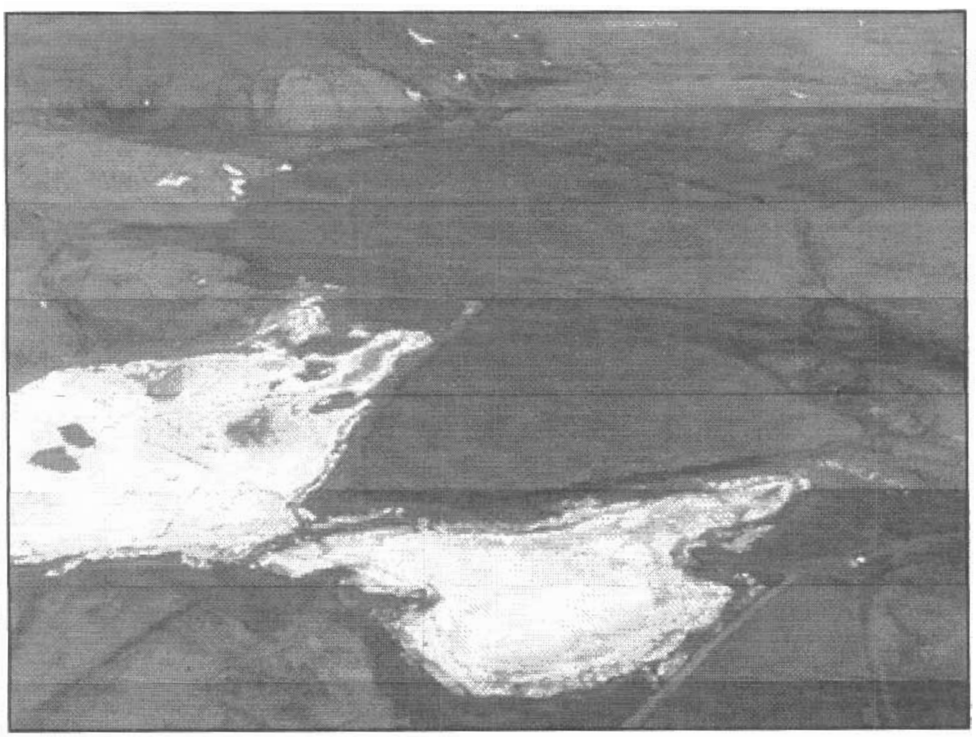
- For closure plan, weathered shale and armour rock (Twin Lake sands and gravels) will be required.
- Five main quarries are used for shale products:
  - Shale Hill / Mt. Fuji / Area 14 / E.T. Lake / W.T. Borrow Area
- Necessary to evaluate both the quantity and the quality of the shale within these currently permitted borrow sites.

Shale Borrow Sites

- Assessment report on these borrow sites to be prepared including the following info:
  - Visual inspection of material condition and distribution.
  - Compilation of existing geological information (boreholes) for both lithology and depth.
  - Potential additional investigative work (test pitting, drilling, sampling, etc.).
  - Correlation of borehole information with ABA testing completed to-date.
  - Development of borrow quantities and plans for borrow development and closure.

MAJOR ISSUES:

1. Underground Disposal
2. Acid Rock Drainage
3. Cover Thickness
4. Soil Contamination
5. Stability of Structures
6. Monitoring Period
7. Closure and Reclamation Costs
8. Infrastructure



WATER TREATMENT PLAN

Water Source	Water Treatment Period
Surface Cell (Sub Aerial)	During Closure
Reservoir (Sub Aqueous)	Not Required
East Adit Area	During Closure

Post Closure Monitoring

- Post closure monitoring has been proposed for a seven year period.
- The program has been set up so that all monitoring results as well as inspection observations will be provided to the NWB on an annual basis.
- These reports will include the prior years monitoring results for comparison and evaluation of reclamation performance.

Post Closure Monitoring

- If at any time there are indications that conditions at the site are not behaving as expected, an assessment of the issues will be made in conjunction with the appropriate regulatory agencies.
- The assessment may recommend:
  - additional monitoring or studies than those currently proposed in the plan
  - -- or monitoring for a longer duration than that currently proposed in the plan .

Post Closure Monitoring

- As sufficient post-closure data is collected, long term projections can be made on the expected behaviour of the site.
- In 2009, a review of all data will be conducted to confirm the "environmental stability" of the site in conjunction with the appropriate agencies.
- If the review demonstrates that the site is stable at that time, and is expected to stay stable in the long term, then the Surface Lease will be returned and CanZinco will have no further involvement with the site.

Post Closure Monitoring

- This program is consistent with the Part H, Item 1 of the Water License:

  The Licensee shall submit to the Board [an] Abandonment and Restoration Plan in accordance with the Northwest Territories Water Board's "Guidelines for Abandonment and Restoration Planning for Mines in the Northwest Territories, September 1990"

Post Closure Monitoring

- The Guidelines state:

  "*The monitoring program should be a joint effort between the operator and the regulator with the operator assuming the responsibility during the initial phases. As it becomes apparent that the program is achieving it objectives, and as the probability of long term problems and maintenance is lowered, the government may assume the bulk of the monitoring responsibilities.*"

SUMMARY OF COSTS

Capital Costs

COMPONENT TYPE		TOTAL COST	(CANZINCO)	
OPEN PIT		$303,656	$894,920	OPEN PIT & ROCK PILE
UNDERGROUND MINE		$25,000	$121,925	✓
TAILINGS		$5,742,848	$5,327,127	✓
ROCK PILE		$675,527	$0	
BUILDINGS AND EQUIPMENT		$2,342,727	$0	
CHEMICALS AND SOIL MANAGEMENT		$455,900	$370,800	✓
* INTERIM CARE & MAINTENANCE		$3,183,280	$21,513	WATER MANAGEMENT PROJECT SPREAD SHEET - in both Reports
(WATER MANAGEMENT)		$0	$0	
MOBILIZATION/DEMOBILIZATION		$1,055,240	$701,342	✓
** MONITORING AND MAINTENANCE		$290,400	$0	
POST-CLOSURE SITE MAINTENANCE		$6,945,291	$514,621	Includes *, **,
SUBTOTAL		$21,019,869	$7,952,248	
PROJECT MANAGEMENT	3 % of subtotal	$630,596	$238,567	
ENGINEERING	3 % of subtotall	$630,596	$238,567	
CONTINGENCY	25 % of subtotal	$5,254,967	$795,225	10% Contingency
GRAND TOTAL - CAPITAL COSTS		$27,536,028	$9,224,608	

MAJOR ISSUES:

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