



**Nunavut Water Board Public Hearing
Doris Project Water Licence Amendment
2AM-DOH1323**

September 13-14, 2016 – Cambridge Bay, NU



TMAC Resources Inc. is a publicly traded, Canadian-based company.

Our Vision and sole focus is to explore, develop and mine the Hope Bay Greenstone Belt in the Kitikmeot Region of Nunavut with the support of our landowner and community partners.

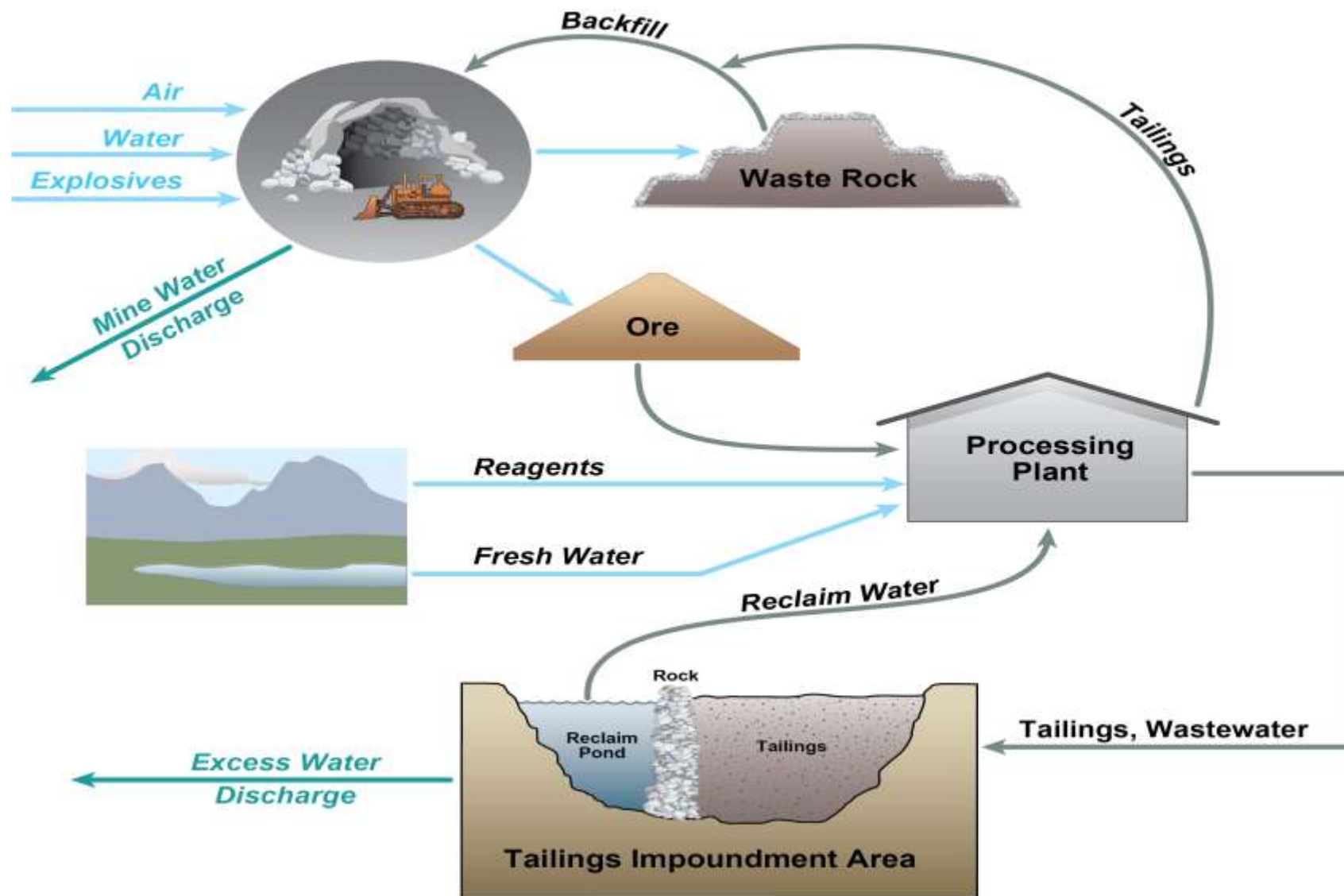
TMAC operates with a deep respect for the land and the people of Nunavut.



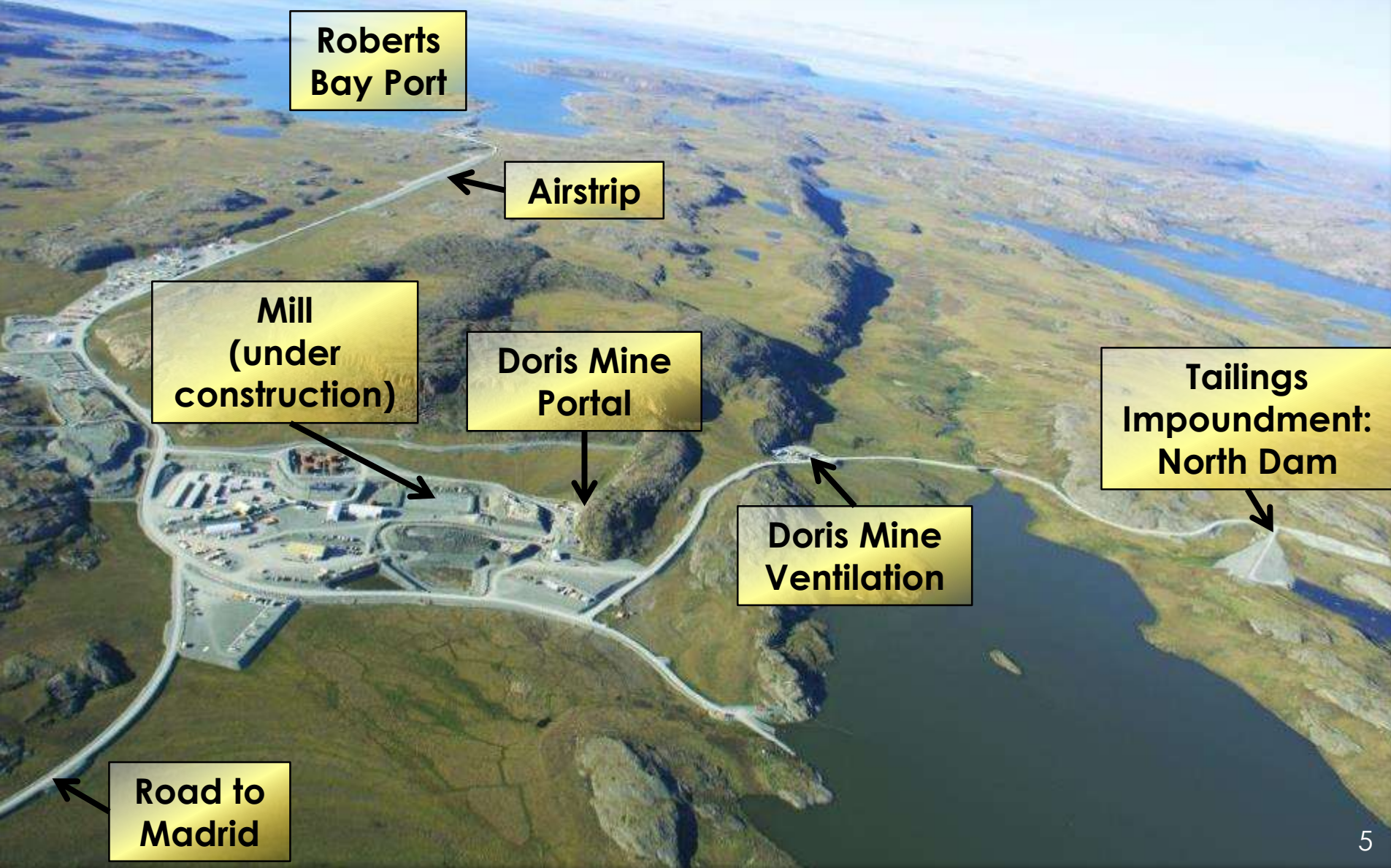
Doris Gold



Doris Mine



Doris Mine Site



Doris Mine & TMAC



1988 - 1999

- Explored



1999 - 2007

- Permitted



2007 - 2013

- Built



2013 - 2016

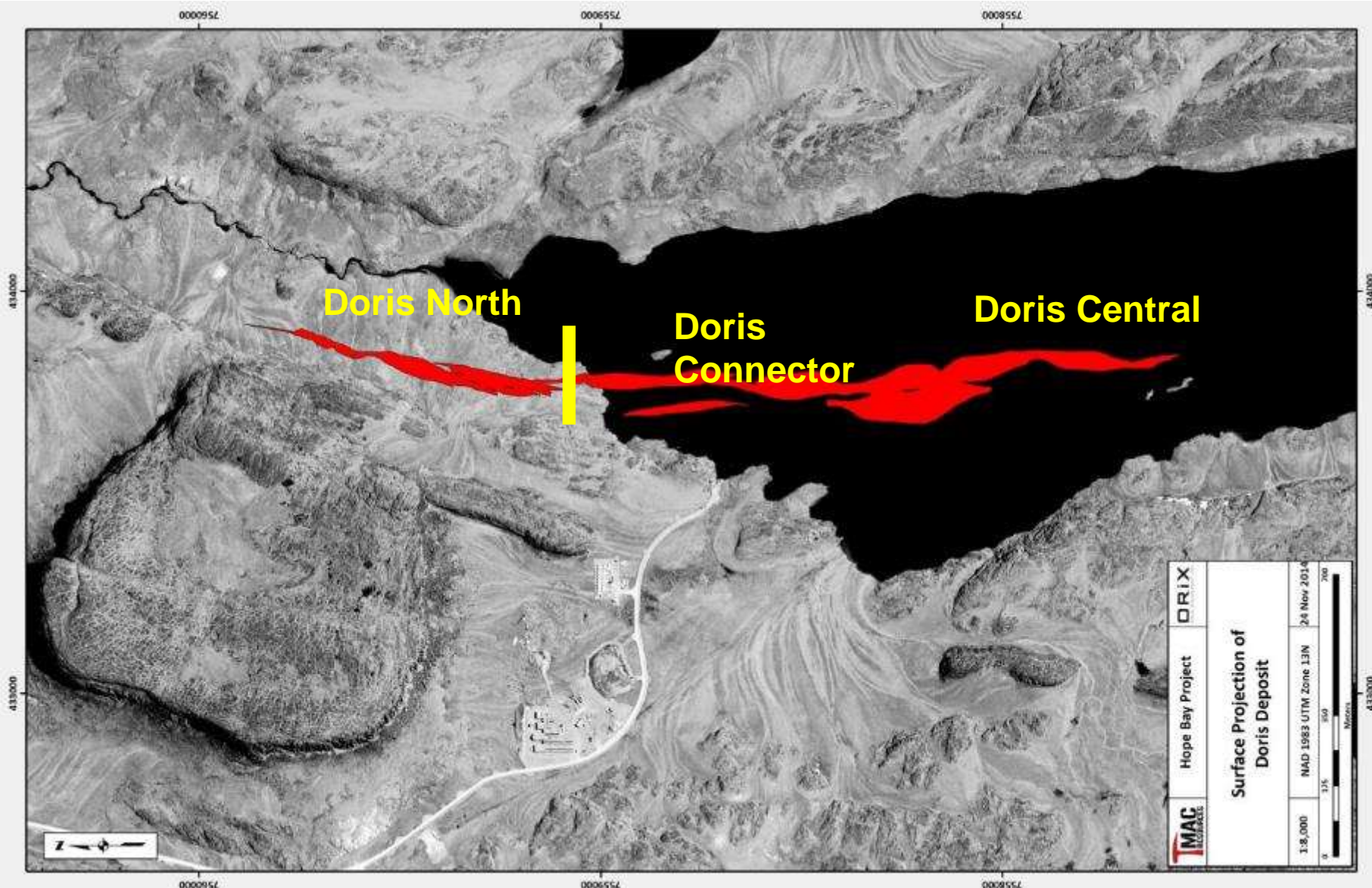
- ***Build & Operate***

TMAC Project History



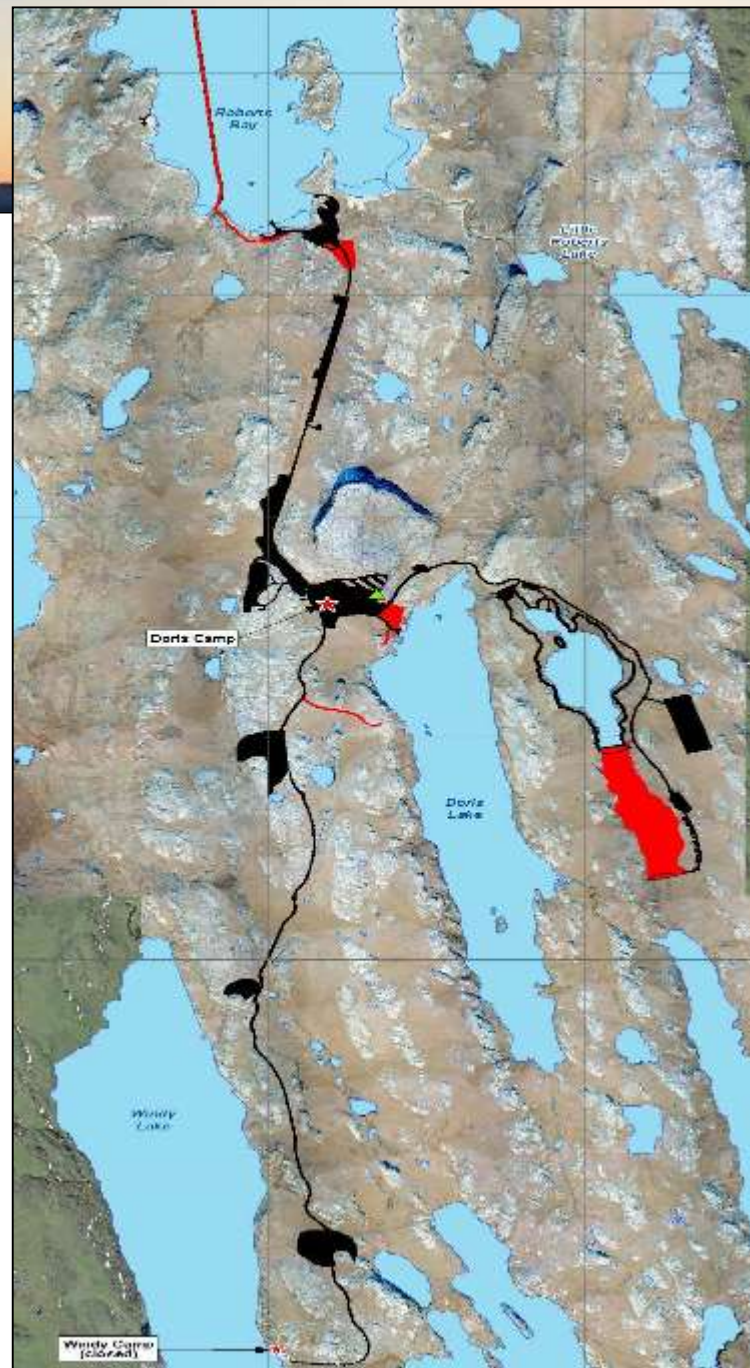
March 2013	TMAC purchased the Hope Bay Project
August 2013	Type A Water Licence renewal No. 2AM-DOH1323 (Doris North)
November 2013	NWB Type A Water Licence amendment application NIRB Project Certificate amendment application
April 2014	TMAC request to suspend review of NIRB and NWB amendment applications
June 2015	Filed updated Project Certificate and Type A Water Licence amendment applications
November 2015	NIRB and NWB commence technical review of the application
January 2016	NIRB and NWB Technical Meetings
2016	Commence activities requiring Project Certificate and Water Licence Amendment upon receipt
Jan 2017	Target for production-pour first gold
April 2017	Target for commercial production

Doris Underground Mine



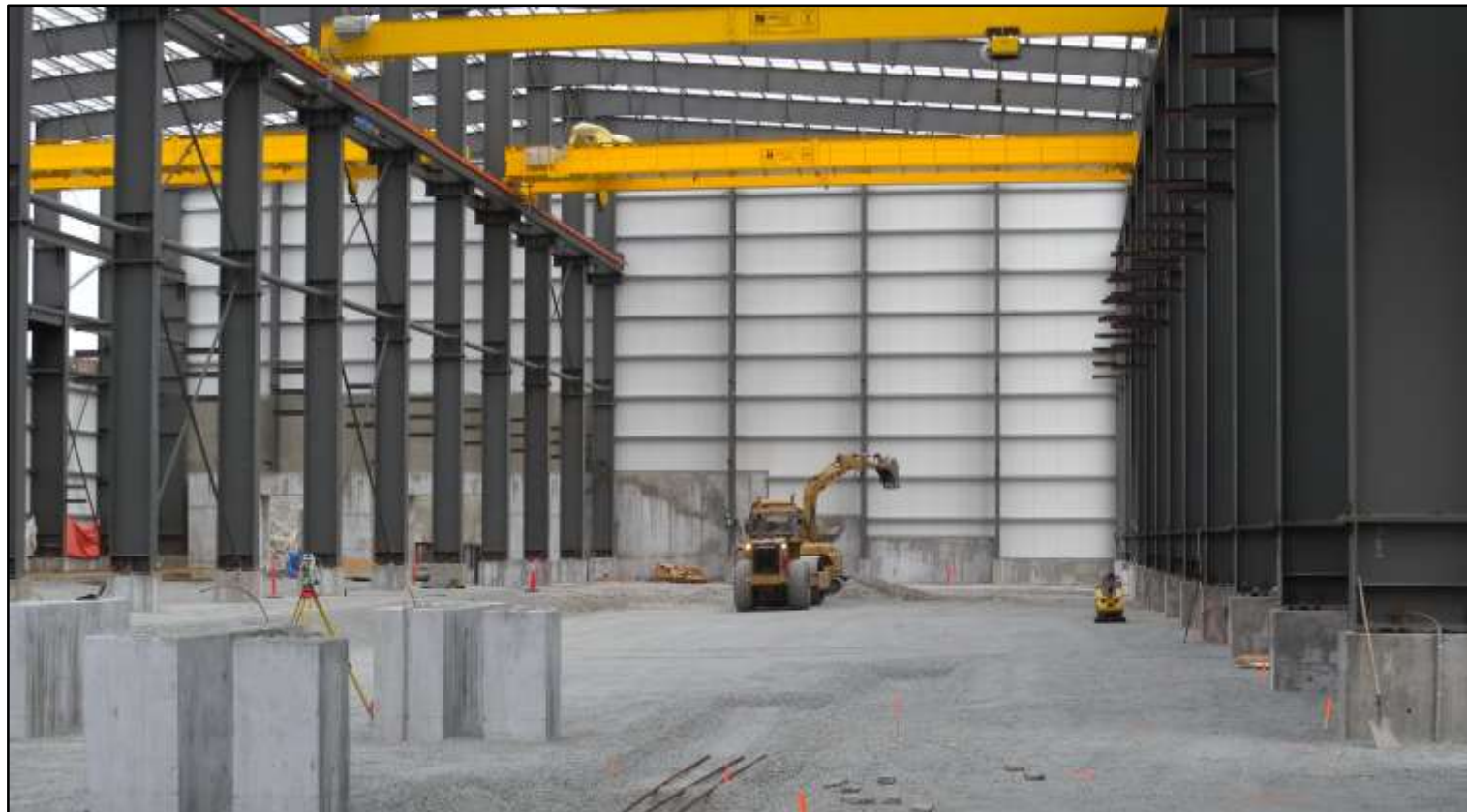
Amendment Purpose

- Amend the Doris North Type A Water Licence and Project Certificate
- Increased ore reserves means changes to:
 - mine plan
 - waste water management
 - tailings deposition strategy
- Reduce the risk to the environment
- Provide approvals that are practical and can be implemented



Summary of Project Changes

- **Mine**
 - Mine life
 - Ore
 - Ventilation
- **Mill**
 - New mill
 - Cyanide removal



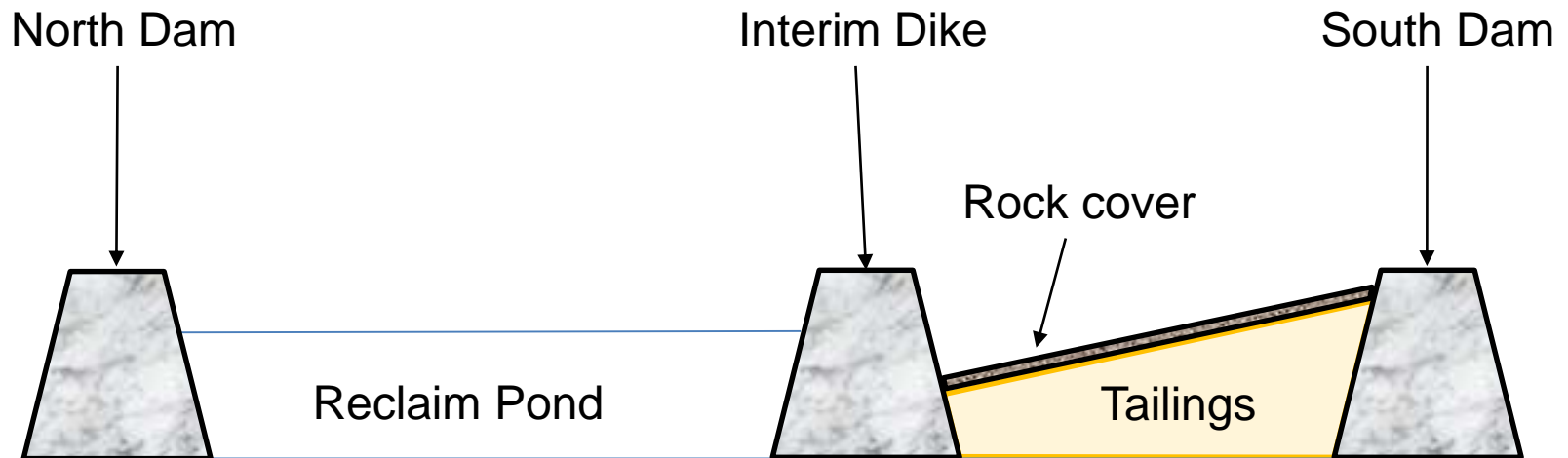
Summary of Project Changes

- **Tailings**

- Volume
- Placement
- Containment

- **Waste Rock**

- Volume
- Disposal



Summary of Project Changes



Summary of Project Changes

- **Water Management**
 - Surface and groundwater
 - Collection
 - Disposal
- **Waste Management**
 - Landfill



Summary of Project Changes

- **Laydown**
 - Work Area
- **Camp**
 - Size
- **Explosives**
 - Storage
- **Closure**
 - Cost estimate



Benefits for Kitikmeot & Inuit

- IIBA with KIA
- Jobs onsite
- Inuit Employment Targets
- \$550 million to be spent
- Preferred Kitikmeot-based businesses
- Royalties and fees paid to KIA & NTI
- Taxes paid to the GN & Canada



Water Licence Changes

- **Update**

- Mine plan
- Tailings deposition strategy
- Effluent discharge strategy
- Monitoring program
- Correct errors
- Add ability to modify management plans
- Approve new & revised Plans
- Quantum of security

- **Remove**

- Terms & Conditions already fulfilled



Application Package

Package

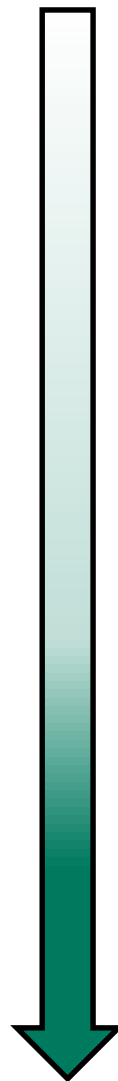
Content

- 1 Project summary and outline of Application package
- 2 Description of the proposed changes to the Project as currently authorized
- 3 NIRB, NWB and NPC Applications
- 4 Outlines the existing conditions, project interactions and potential effects
- 5 Revised Management Plans
- 6 Design details for the proposed changes
- 7 Proponent information

TMAC, the NWB, Parties and the Public



- **TMAC** conducts studies
- **TMAC** submits Application
 - Project changes
 - Effects of changes
- **NIRB** and **Parties** review, NIRB makes recommendation to issue Project Certificate
- **TMAC**, **NWB** and **Parties** discuss water, waste management and closure issues, work together to resolve
- **TMAC**, **NWB** and **Parties** discuss remaining issues with the Public
- **NWB** decision regarding water licence



- TMAC talking with the NWB, Parties and the Public

Issues Presented in NWB Process

Categories

Water

Waste

Issues Raised

- Site-wide water and load balance
- Groundwater quality and volume
- Roberts Bay discharge
- Aquatic monitoring
- Effluent discharge criteria
- Marine water quality objectives
- Water and sewage treatment
- Doris Lake and Outflow water levels
- Water crossings

- Tailings management and monitoring
- Interim Dike filter
- Dust suppression at Tailings Area
- Waste rock use
- Underground disposal of impacted materials

Issues Presented in NWB Process

Categories

Closure

**Management
Plans**

Issues Raised

- Tailings area water quality
- Groundwater quality
- Tailings cover
- Security cost estimate
- Interim Closure and Reclamation Plan

- Aquatic Effects Monitoring Plan
- Groundwater Management Plan
- Tailings Management Plan
- Water Management Plan
- Waste Rock and Ore Management Plan

Issues Presented in NWB Process

Categories

Water

Issues Raised

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SITE-WIDE WATER AND LOAD BALANCE

- **Revised to consider**
 - 75th percentile input values
 - Additional parameters (cyanide, mercury, selenium)
 - Site-specific variable hydrology
 - Maximum Reclaim Pond concentrations

RESOLVED

WATER AND SEWAGE TREATMENT

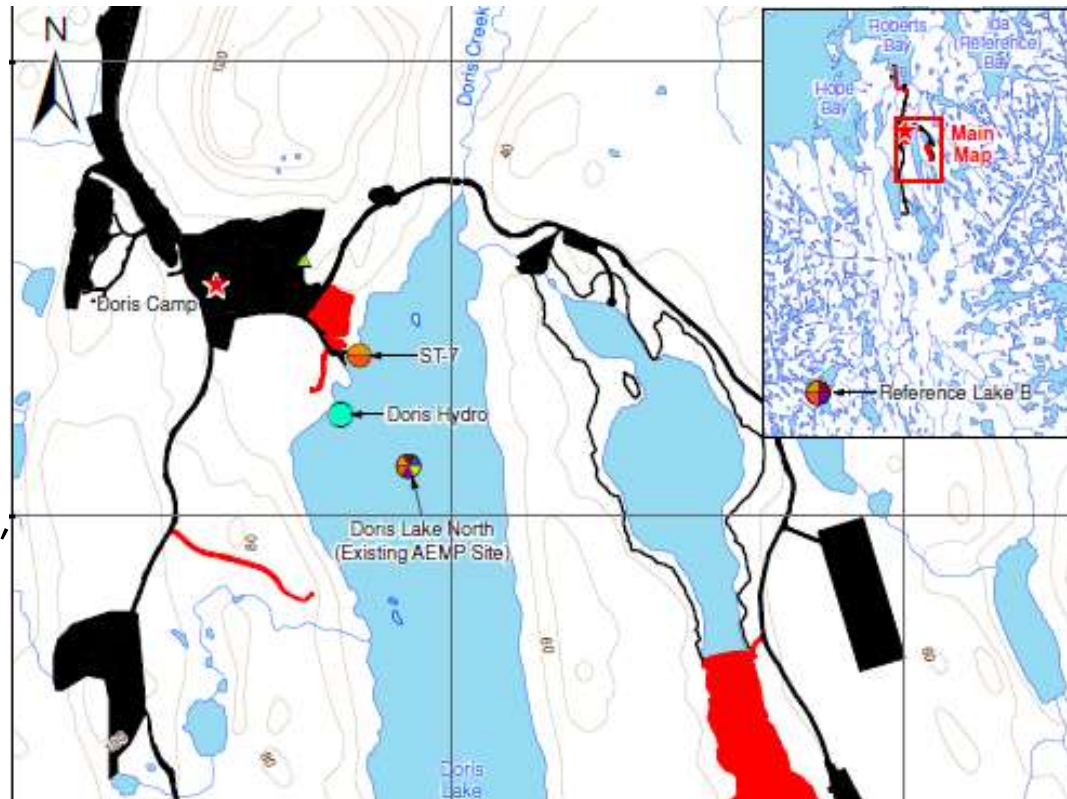
- **Existing sewage treatment plant replaced**
 - NWB notified, routine update to management plan submitted
- **No need for other water treatment**

RESOLVED

Issues-Water

AQUATIC MONITORING

- Aquatic Effects Monitoring Plan revised based on party feedback and Working Group engagement
- Doris Lake (2 stations), Reference
 - Water quality, sediment, benthos, chlorophyll *a*, ice thickness
- Includes response framework
 - Action levels based on monitoring results



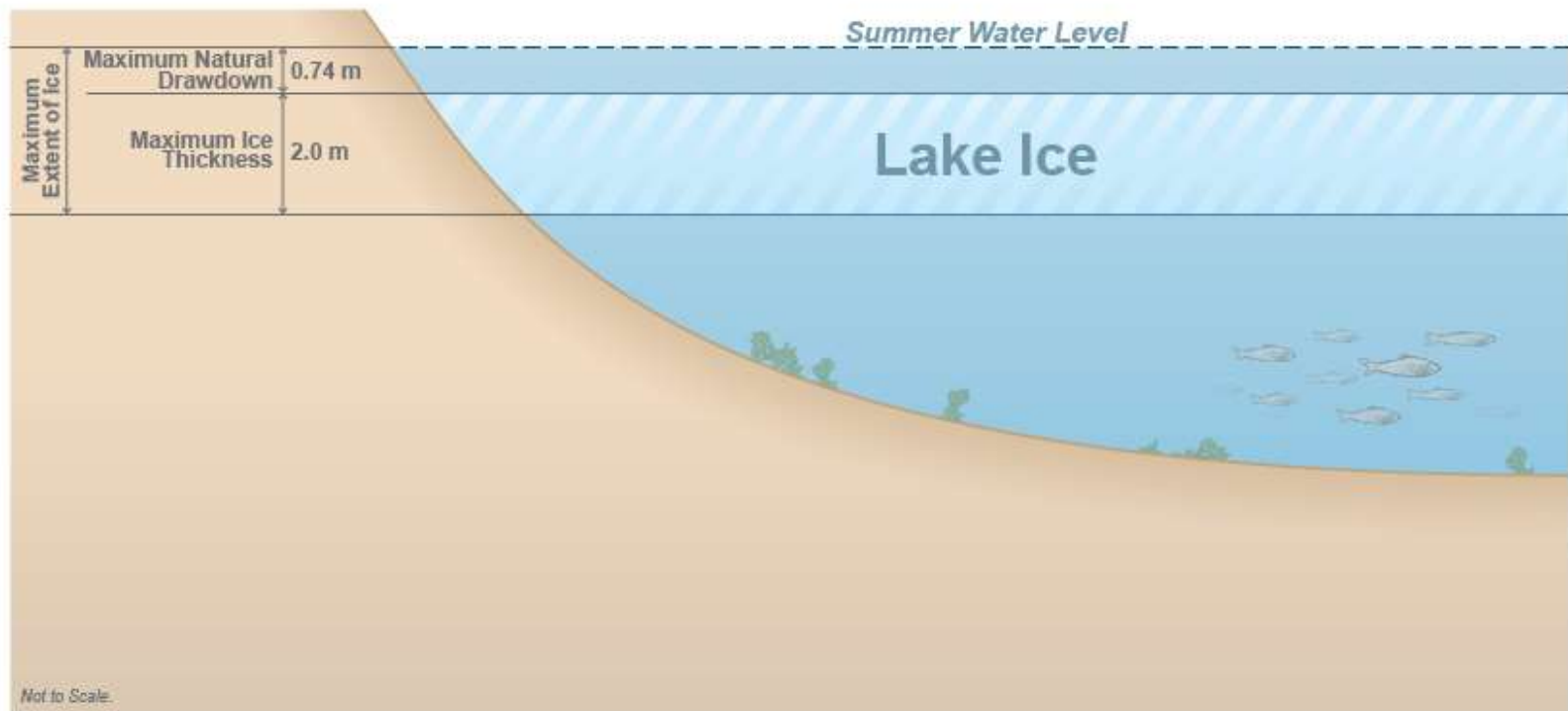
RESOLVED pending approval of revised Aquatic Effects Monitoring Plan

Issues-Water

DORIS LAKE AND OUTFLOW WATER LEVELS

- Monitored under Aquatic Effects Monitoring Plan
- Continuous monitoring of Lake level
- Calculate stream level from Lake level

RESOLVED pending approval of revised Aquatic Effects Monitoring Plan



Issues-Water

ROBERTS BAY DISCHARGE

- Outside NWB jurisdiction
- Construction and operation reviewed by INAC under Land Lease
- Monitoring and reporting to ECCC under *Metal Mining Effluent Regulations*

RESOLVED

EFFLUENT DISCHARGE CRITERIA

- *Metal Mining Effluent Regulations*

RESOLVED



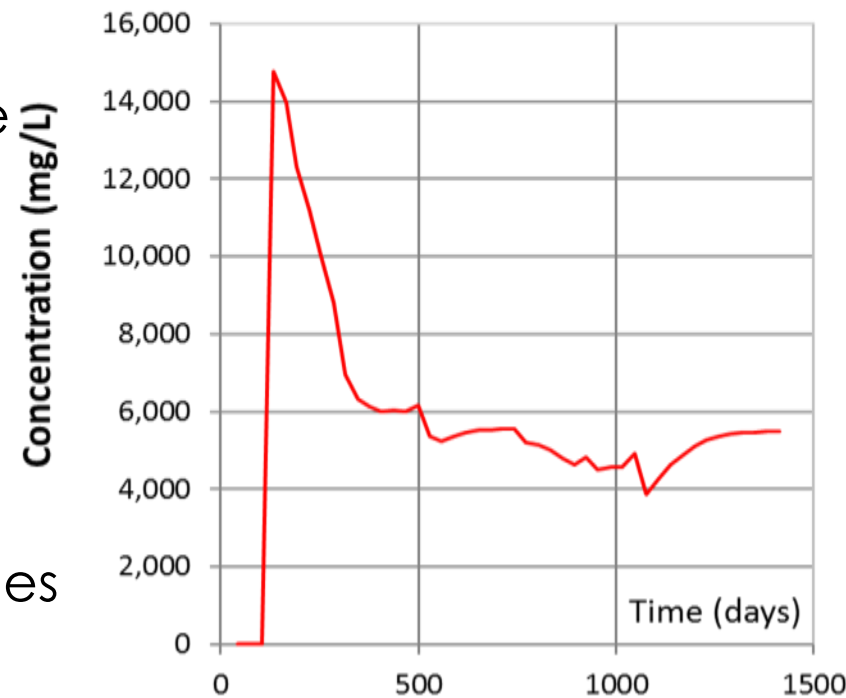
MARINE WATER QUALITY OBJECTIVES

- Additional monitoring agreed upon with ECCC through NIRB process
- Addressed in Project Certificate

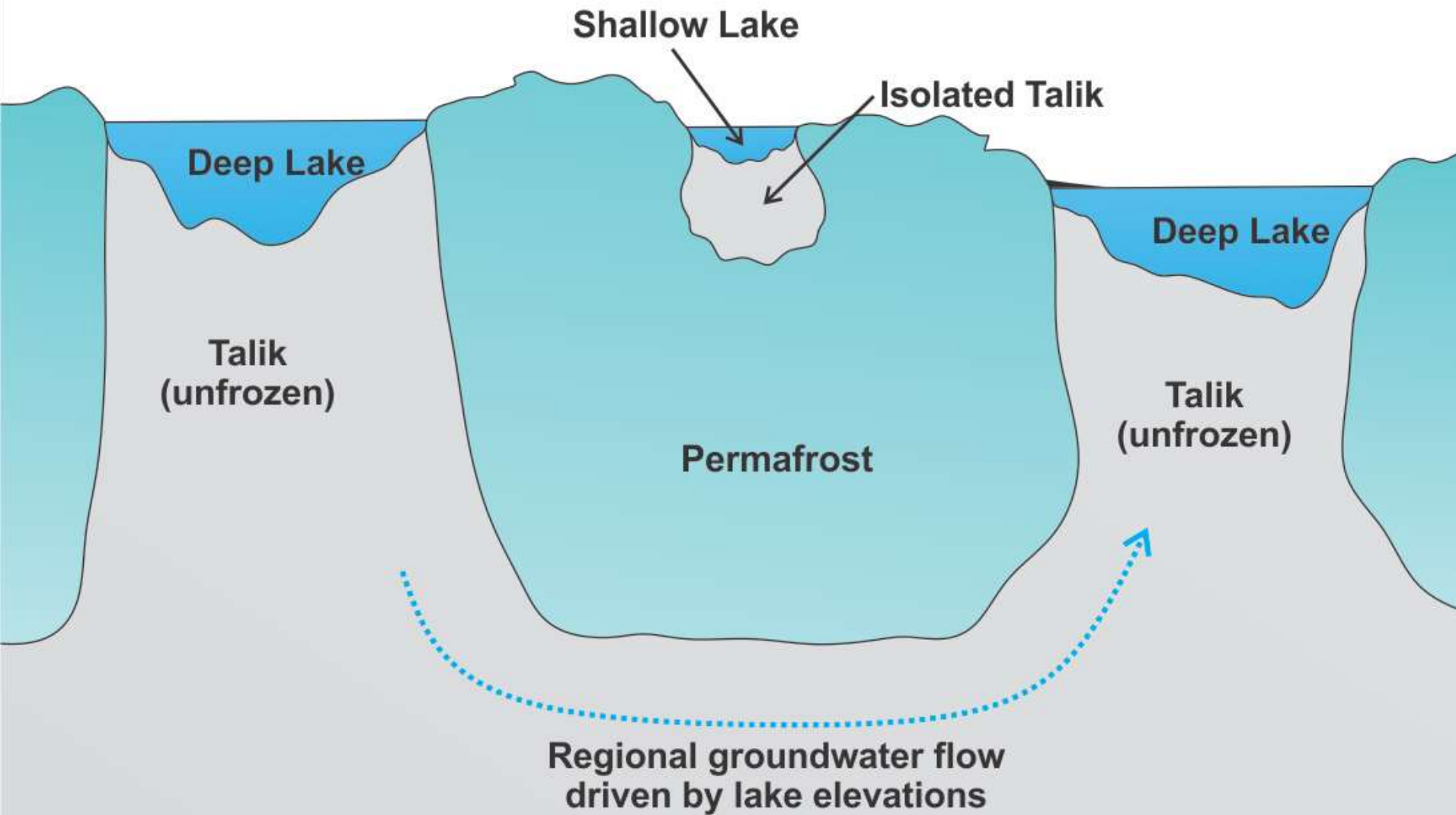
RESOLVED

GROUNDWATER QUALITY AND VOLUME

- **Hydrogeological model**
 - Volumes flowing in
 - Quality of inflow
 - Expected flow back to Doris Lake post-closure
- **Surrounding rock (30%) and Doris Lake (70%)**
 - Very salty at first, then more freshwater inflow
- **Validated predictions**
 - Compared to other Northern mines
- **Collect in mine sumps, discharge to**
 - tailings area (temporary)
 - Roberts Bay (all year)



Issues-Water



GROUNDWATER QUALITY AND VOLUME (CONTINUED)

- **Interim Water Management Strategy**
 - Discharge groundwater to tailings area until protocols are revised to allow for substitution of species for toxicity testing
- **Groundwater Management Plan**
 - Managing water while mining
 - Risk zone mapping
 - Inflow exclusion or control measures
 - Specific indicators, performance thresholds and responses
 - Monitor quality and quantity
 - Contingency for quality and quantity
 - Temporary storage in mine or discharge to tailings area



RESOLVED pending approval of Groundwater Management Plan

WATER CROSSINGS

- **Roberts Bay Access Road**
 - Culvert design considers flows and allows for fish passage
 - Submitted Request for Review to DFO
 - Review underway
- **Connector Vent Raise Access Road**
 - Conducted field assessment
 - Determined no fish use in the vicinity of the crossing



RESOLVED. Matters are addressed separately with DFO.

Issues Presented in NWB Process



Categories

Waste

Issues Raised

- Tailings management and monitoring
- Interim Dike filter
- Dust suppression at Tailings Area
- Waste rock use
- Underground disposal of impacted materials

Issues-Waste

WASTE ROCK

-Use

- Construction
- Underground

-Underground disposal of impacted materials

- Hydrocarbons
- Spilled explosives

-Detoxified tailings

- Disposed of underground with waste rock

-Analyzed effects following reflooding of the mine post-closure

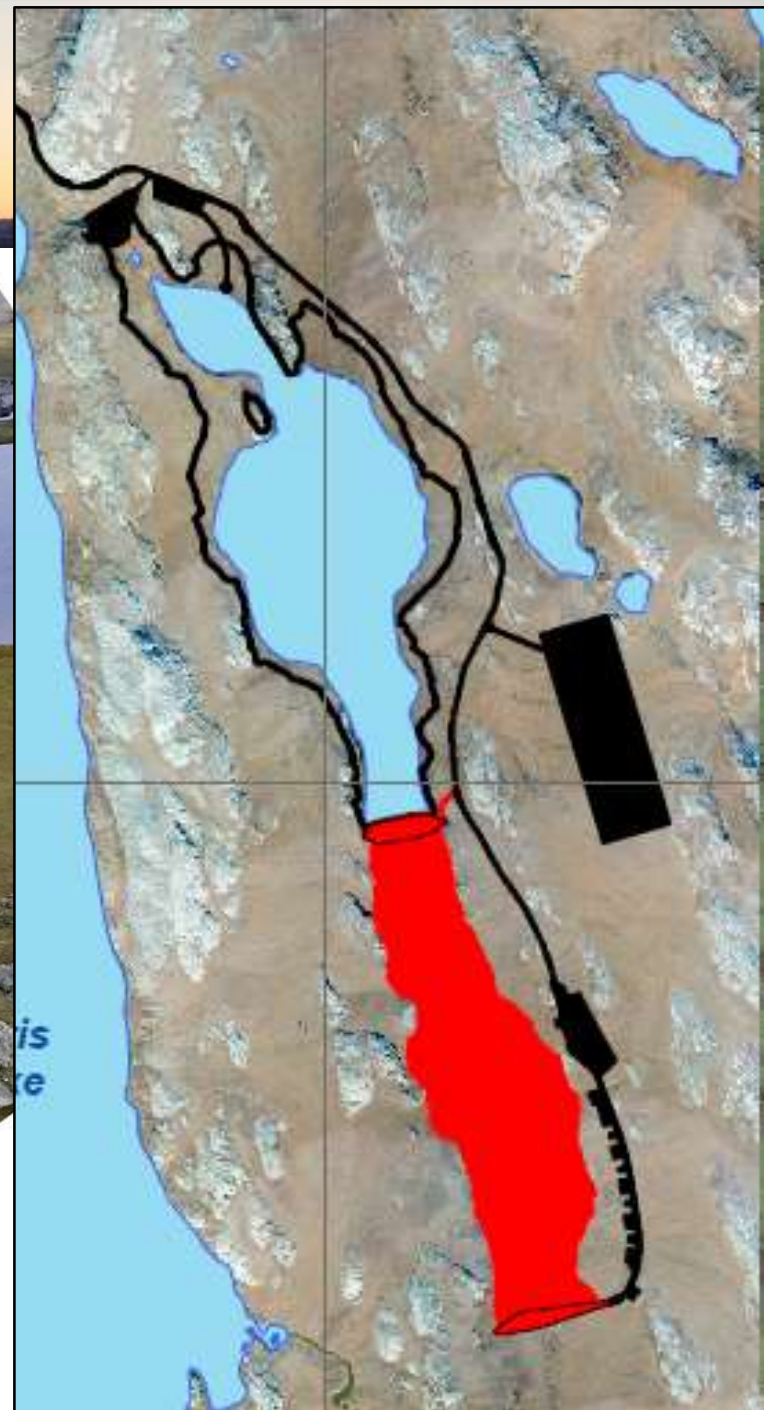
-Mine capacity sufficient to accommodate backfill

-Revised Waste Rock and Ore Management Plan

RESOLVED pending approval of Groundwater Management Plan

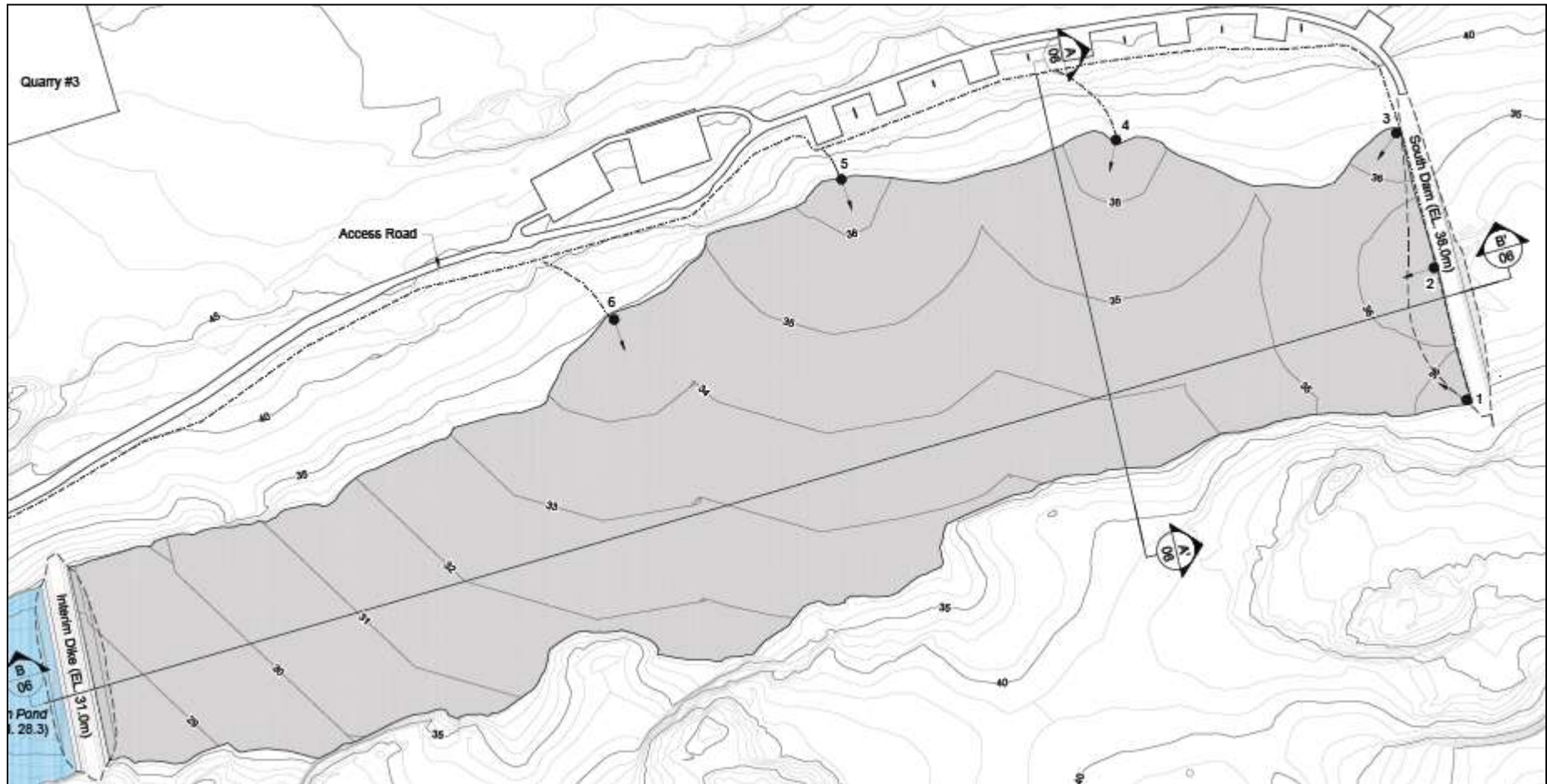


Issues-Waste



Issues-Waste

TAILINGS MANAGEMENT



TAILINGS MANAGEMENT

- Tailings Impoundment Area already approved for use
 - Flotation tailings deposited between Interim Dike and South Dam
 - Reclaim water between Interim Dike and North Dam (existing)
 - Tailings deposition over life of mine
 - Multiple spigots
 - Start at south end or east flank
 - Deposit against South Dam
 - Solids retained behind Interim Dike, liquids drain through Interim Dike to Reclaim Pond
 - At closure, tailings will be covered with rock
 - Tailings Area Operations, Maintenance and Surveillance Manual
 - Also known as Tailings Management Plan
- RESOLVED pending approval of Tailings Management Plan**

TAILINGS MONITORING

- Tailings geochemistry well known**

 - Considered exposure to water and air over time

- Amount and quality of tailings solids and liquids placed in tailings area monitored**

 - Water licence, Water Management Plan

- Facility operation (pumps, pipes, dams)**

 - National/best practice guidelines apply

 - Frequently inspected and reported on

 - Engineer of Record designed, inspects and reports

- Mitigation**

 - Based on inspection and monitoring results, additional measures if needed

RESOLVED pending approval of Tailings Management Plan

Issues-Waste

DUST SUPPRESSION AT TAILINGS AREA

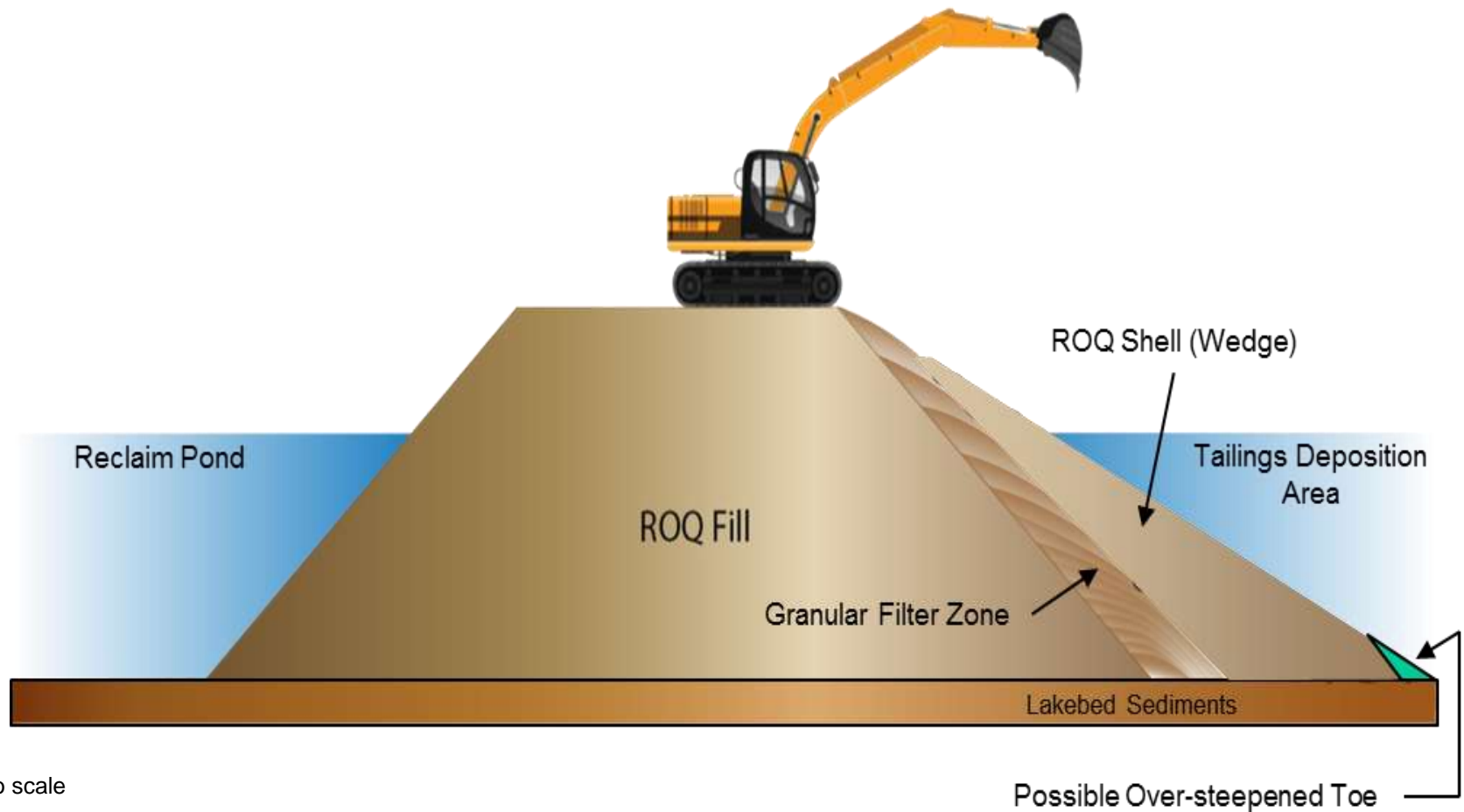
- Dustfall monitored to ensure no effects
- Dust suppressed using water or approved chemicals
- 3 chemical products listed in Tailings Management Plan
- Others can be used as approved by the NWB

RESOLVED



Issues-Waste

INTERIM DIKE



INTERIM DIKE

-Purpose

- Internal structure, within tailings area
- Confines tailings solids to a smaller area
- Facilitates easier and more cost effective closure

-Construction

- Underwater slopes and material placement
- Allow for settling
- In place before tailings deposition nearby (2.5 years)

-Filter on upslope side

- Allows water to flow through to Reclaim Pond
- 2 options considered, trade-off study conducted
 - Rock-preferred
 - Geotextile

RESOLVED

Issues Presented in NWB Process



Categories

Closure

Issues Raised

- Tailings area water quality
- Groundwater quality
- Tailings cover
- Security cost estimate
- Interim Closure and Reclamation Plan

Issues-Closure

TAILINGS COVER

- 0.3 m rock to prevent wind and water erosion
- Considered potential for and effects of frost heave and boils
- Submit final design prior to construction

RESOLVED

TAILINGS AREA WATER QUALITY

-Operations

- Inputs monitored under Water Management Plan
- Seasonal discharge to Roberts Bay

-Closure

- Discharge to Roberts Bay for 2 years
- Allow to naturally refill over 5 years
- Test to ensure meets criteria
- Breach dam, discharge to Tail Lake Outflow (Doris Lake, Doris Creek)

-Post-Closure

- Revisit monitoring frequency at time of water licence renewal (2023)

RESOLVED

Issues-Closure

GROUNDWATER QUALITY

- Permafrost areas will freeze, talik areas will reach steady-state with Doris Lake
- Minimal flow from Mine to Doris Lake
- No impacts to Doris Lake water quality expected

RESOLVED



Issues-Closure



SECURITY COST ESTIMATE

- TMAC estimate revised based on party comments and dialogue throughout process**
 - Ponding against pads
 - Interim Care and Maintenance
 - New equipment and camps for all phases

INTERIM CLOSURE AND RECLAMATION PLAN

- Revised plan to be submitted once security quantum is finalized**

SECURITY

- Land and water allocation**

Issues Presented in NWB Process



Categories

**Management
Plans**

Issues Raised

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Issues-Management Plans

MANAGEMENT PLANS AND REPORTS

- **Continue to implement existing measures**
- **Revised Plans submitted**
 - Aquatic Effects Monitoring Plan
 - Discharge to Roberts Bay
 - Waste Rock and Ore Management Plan
 - Disposal of detoxified tailings, impact rock underground
 - Water Management Plan
 - Addition of Interim Water Management Strategy, characterize tailings area inputs
- **New Plans submitted**
 - Groundwater Management Plan
 - Tailings Area Operations, Maintenance and Surveillance Manual
- **Reviewed by NWB and parties, revised based on discussion**

RESOLVED pending approval of Plans

Issues Remaining in NWB Process



Categories

Water

Waste

Outstanding Issues

Issues Remaining in NWB Process

Categories

Closure

Management
Plans

Outstanding Issues

- Security cost estimate
- Interim Closure and Reclamation Plan

- Approval of Plans

Next Steps

- NWB Public Hearing
- New Water Licence and Project Certificate granted
- Complete construction
- Pour first gold – Jan 2017



Thank You - Quana

