

*Knight Piésold*

## Mount Polley Project

### Tailings Facility Summary



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## Overview of Presentation

- ❖ General Information
- ❖ Project Background
- ❖ On-going Operations and Monitoring
- ❖ Test Heap Leach Pad Overview

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## General Information

- ❖ Mount Polley Project, 2006 Air photo



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## General Information

- ❖ Production started June 1997
- ❖ Care and Maintenance status October 2001 to March 2005
- ❖ Regular inspections
- ❖ Start up March 2005
- ❖ Stage 4 Tailings Storage Facility (TSF) construction per existing permits to El. 948m from May 2005 October 2006
- ❖ Additional Mines Branch permits required for on-going expansion of TSF
- ❖ Stage 4 raise was an upstream cap
- ❖ Stage 5 raise is a modified centerline construction process
- ❖ Stage 5 crest to be constructed to El. 951m
- ❖ Stage 6 upstream cap to be constructed to El. 954 m

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## Recent TSF Technical Reviews

- ❖ Nick Rose - MEMPR
- ❖ Dam Safety Review - AMEC
- ❖ MEMPR - Chris Carr comments
  - ❖ closure arrangement
  - ❖ Dam Consequence Classification
  - ❖ Lacustrine strength & Main Embankment buttress.
  - ❖ Tailings Beaches

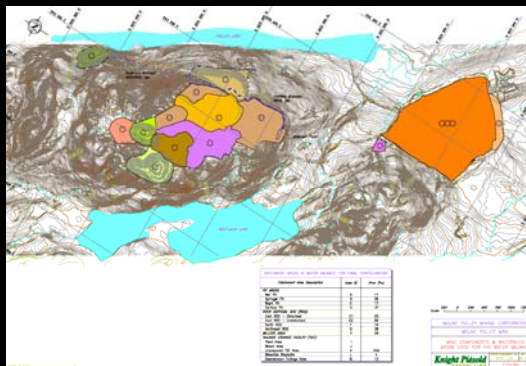
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## Project Background - Hydrometeorology (Update Required)

- ❖ Mean annual precipitation of 755mm at TSF
- ❖ 24 HR Probable Maximum Precipitation (PMP) is 203mm
- ❖ 72 HR Probable Maximum Precipitation (PMP) is approximately 320mm



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## Project Background - Hydrometeorology (PMP & PMF)

- ❖ The PMP, or Probable Maximum Precipitation, is theoretically, the greatest depth of precipitation for a given duration that is physically possible over a given size storm area at a particular geographical location at a certain time of the year.
  - 24 Hr. PMP of 203 mm: 679,000 m<sup>3</sup> → 0.40 m
  - 72 Hr. PMP of 320 mm: 1,070,000 m<sup>3</sup> → 0.63 m
- ❖ The PMF, or Probable Maximum Flood, is the flood that can be expected from the most severe combination of critical meteorologic (i.e. PMP) and hydrologic conditions (i.e. snowpack) that are reasonably possible in a region.
  - The average annual snowfall runoff for the area is 304 mm
    - 24 Hr. PMF (203mm + 304 mm): 1,696,000 m<sup>3</sup> → 1.00 m
    - 72 Hr. PMF (320mm + 304 mm): 2,087,000 m<sup>3</sup> → 1.23 m
  - The 1:10 year snowfall runoff for the area is 629 mm.
    - 24 Hr. PMF (203mm + 629 mm): 2,783,000 m<sup>3</sup> → 1.63 m
    - 72 Hr. PMF (320mm + 629 mm): 3,174,000 m<sup>3</sup> → 1.87 m

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## Project Background - Water Management

- ❖ Site Water Management (Wight pit not shown)



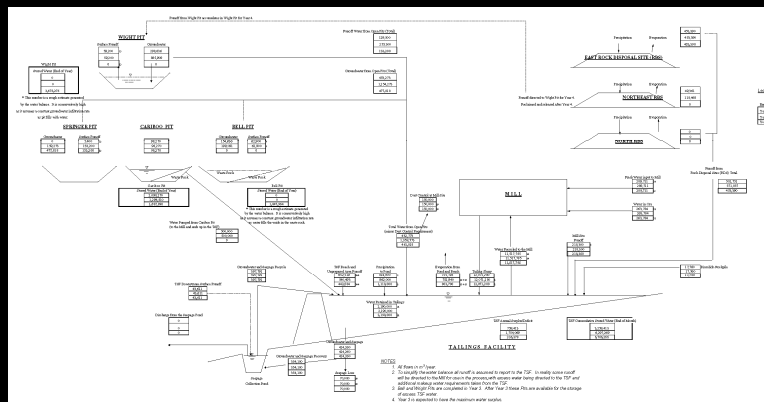
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## Project Background - Water Balance (Update Required)

- ❖ Typical water balance calculations for Wight Pit expansion:



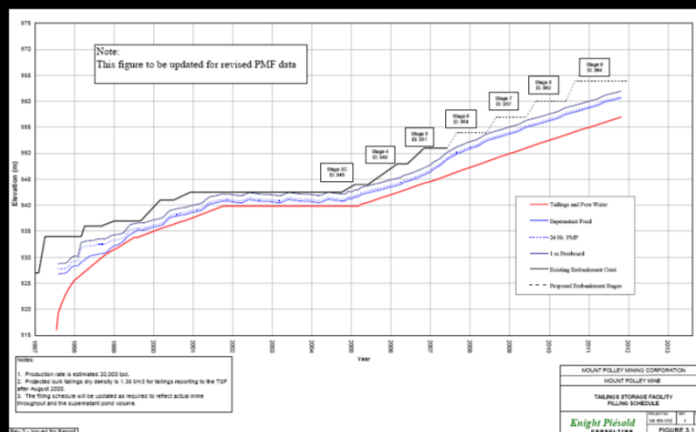
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## TSF - Staged Development

- ❖ Proposed On-going Stages

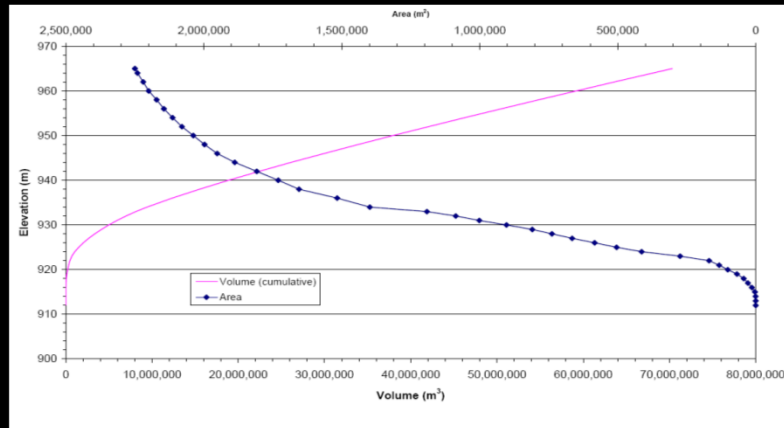


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## TSF - Depth Area Capacity Curve



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## Tailings Storage Facility

### ❖ Tailings Storage Facility (TSF) layout:

- Pond El. as of Feb 20, 2007: 945.46 m
- Estimated rate of rise for the pond level during the next 4 months: 1.9 m



2006 Air Photo

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## TSF - Stage 5 Estimated Percent Complete

- ❖ All estimations are based on quantities placed to complete stage 5, not time to place.
- ❖ Perimeter Embankment
  - ♦ Zone U: 0%
  - ♦ Zone S: 0%
  - ♦ Zone F: 0%
  - ♦ Zone T: 0%
  - ♦ Zone C: 40%
  - ♦ Total Embankment: 10%
- ❖ Main Embankment
  - ♦ Zone U: 0%
  - ♦ Zone S: 60%
  - ♦ Zone F: 50%
  - ♦ Zone T: 50%
  - ♦ Zone C: 95%
  - ♦ Total Embankment: 75%
- ❖ South Embankment
  - ♦ Zone U: 0%
  - ♦ Zone S: 25%
  - ♦ Zone F: 0%
  - ♦ Zone T: 40%
  - ♦ Zone C: 0%
  - ♦ Total Embankment: 15%

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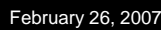
## Tailings Storage Facility

- ❖ Currently Permitted:
  - ♦ Stage 1a/1b constructed to El. 934m in 1996/1997 - reviewed by Fred Matich
  - ♦ Stage 2a/2b constructed to El. 937m in 1998 - reviewed by Chuck Brawner
  - ♦ Stage 3a/3b constructed to El. 942.5m in 2000/2001 - reviewed by Chris Carr
  - ♦ Stage 3c constructed to El. 945m in 2004/2005 - reviewed by Chris Carr
  - ♦ Stage 4 construction to El. 948m on embankments- Approved by Chris Carr
  - ♦ Stage 5 construction to El. 951m on embankments in progress - Approved by Chris Carr
- ❖ Pending Permits:
  - ♦ Stage 6 construction to El. 954m on embankments
    - ♦ Design and permitting to be completed
  - ♦ On-going design and expansions to El. 965m

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## A wide river with a large sandbar in the middle, under a blue sky with clouds.

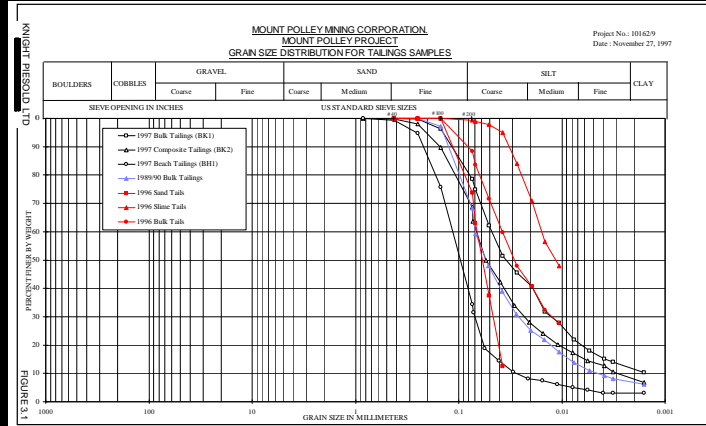
- ◆ Seepage water quality: **Ron Martel**
  - Elevated sulphate levels now occurring in TSF

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## Project Background - Tailings Properties

- ❖ Tailings PSA summary :



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## TSF - Stage 5 Design

- ❖ Estimated waste rock used for haul road was approximately 2,675,000 tonnes.
- ❖ Estimated waste rock placed at the TSF was approximately 3,000,000 tonnes.
- ❖ Estimated percentage complete for waste rock as of stage 5 is approximately 85% to 90%



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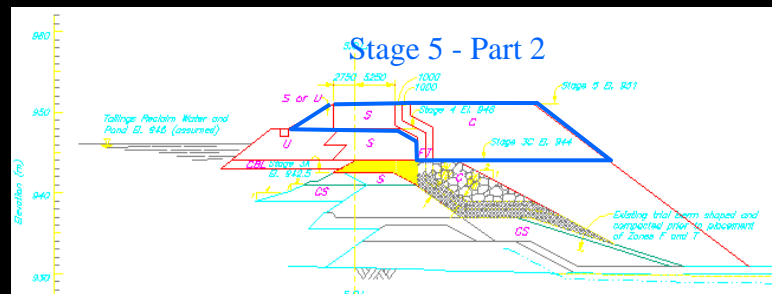
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## Tailings Storage Facility

### ❖ Perimeter Embankment:

Raise Zone C, S, F and T to El. 951 m. Zone C can be temporarily placed at the angle of repose.



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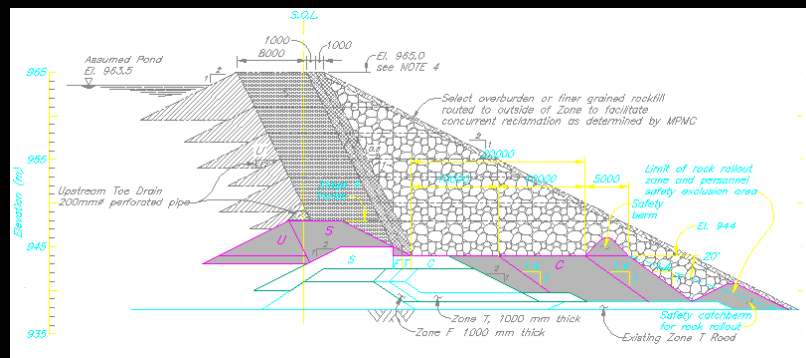
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## Tailings Storage Facility

### ❖ Perimeter Embankment:

Zone C configuration options.



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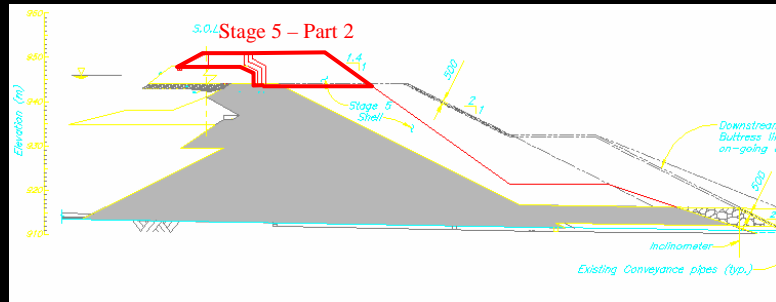
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## Tailings Storage Facility

### ✦ Main Embankment:

Raise Zone C, S, F and T to El. 951 m. Zone C can be temporarily placed at the angle of repose.



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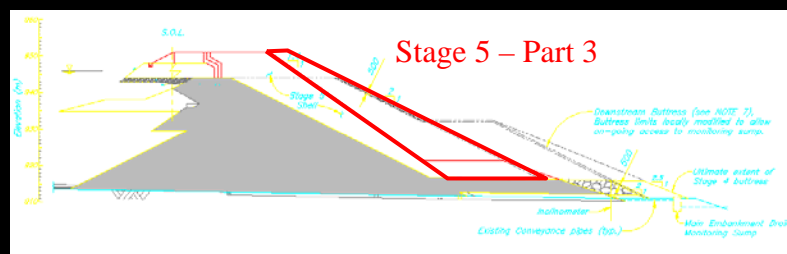
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## Tailings Storage Facility

### ✦ Main Embankment:

Place Zone C at 2:1



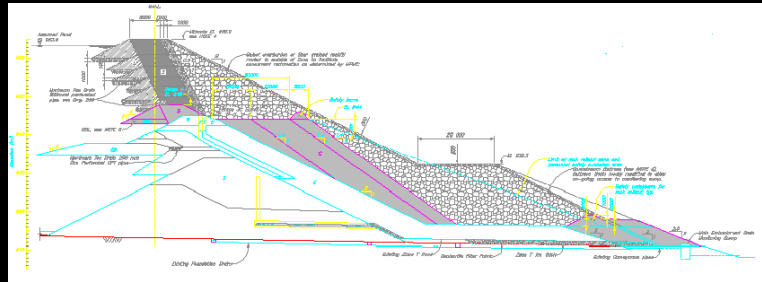
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# Tailings Storage Facility

## ❖ Main Embankment X-section



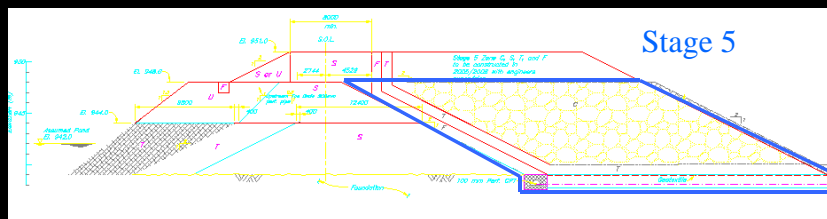
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# Tailings Storage Facility

## ✚ South Embankment X-section:



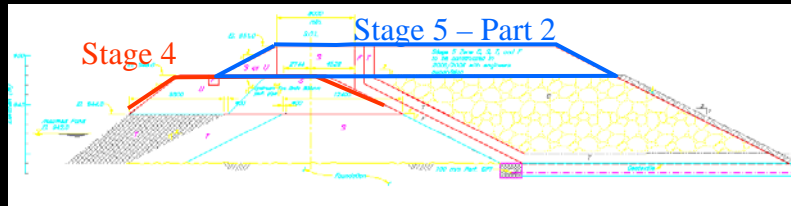
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## Tailings Storage Facility

- ❖ South Embankment X-section:



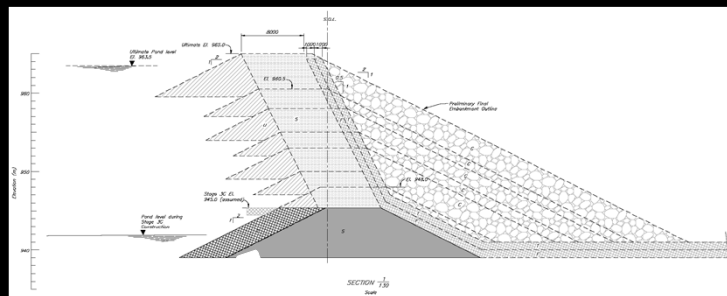
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## TSF - Ultimate Design

- ❖ Draft South Embankment X-section



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## TSF - Surface Runoff Ditch

- ❖ The existing runoff ditch is located on the upstream side of the access road. The lowest elevations are between 949 m and 950 m near the SE.
- ❖ The proposed ditch will run along the new access road at an approximate elevation of 965 m.



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## TSF - Ultimate Design

### ❖ Design Criteria

<b>Design Operation Life</b>	7 years
<b>Hazard rating:</b> During Operations After Closure	HIGH by CDA Consequence Classification HIGH by CDA Consequence Classification
<b>Design Earthquakes:</b> Operations DBE MDE After Closure MCE	1 in 475 year event ( $M = 6.5$ , $A_{max} = 0.037 g$ ) 50% of the 1 in 2000 year event or MCE ( $M = 6.5$ , $A_{max} = 0.065 g$ ) 1 in 2000 year event
<b>Embankment Crest Width: (Final Width)</b>	8 m
<b>Design Tonnage</b>	7,300,000 tpy (20,000 tpd)
<b>Freeboard:</b> Operations/Closure	24 Hr. PMF event (679,000 m <sup>3</sup> ) + wave height → 0.40 m + 0.60 m = 1.00 m 72 Hr. PMF event (1,070,000 m <sup>3</sup> ) + wave height → 0.63 m + 0.60 m = 1.23 m 24 Hr. PMF 1:10 yr. event (2,783,000 m <sup>3</sup> ) + wave height → 1.63 m + 0.60 m = 2.23 m 72 Hr. PMF 1:10 yr. event (3,174,000 m <sup>3</sup> ) + wave height → 1.87 m + 0.60 m = 2.47 m
<b>Storage Capacity:</b>	76,000,000 tonnes

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## TSF - Total Freeboard

### ❖ Wave height calculation

- Maximum wind speed: 25 km/hr
- Direction bearing: 335 degrees
- Maximum fetch: 1.6 km
- From table 6.7 given in the United States Department of Interior's "Design of Small Dams," the predicted wave height would be 0.6 m.

### ❖ Total Freeboard

- 24 Hr. PMP event  $\rightarrow 0.40 \text{ m} + 0.60 \text{ m} = 1.00 \text{ m}$
- 72 Hr. PMP event  $\rightarrow 0.63 \text{ m} + 0.60 \text{ m} = 1.23 \text{ m}$
- 24 Hr. PMF event (10 yr. snow pack)  $\rightarrow 1.63 \text{ m} + 0.60 \text{ m} = 2.23 \text{ m}$
- 72 Hr. PMF event (10 yr. snow pack)  $\rightarrow 1.87 \text{ m} + 0.60 \text{ m} = 2.47 \text{ m}$

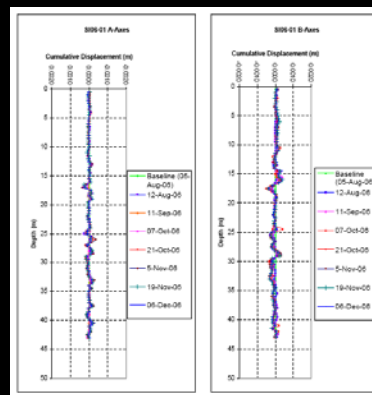
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## TSF - Monitoring

### ❖ Inclinator readings



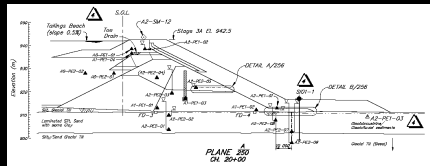
Typical inclinometer reading

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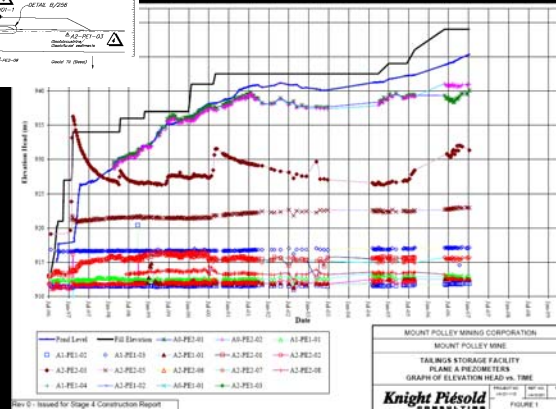
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## TSF - Monitoring



❖ Typical piezometer readings (to date)



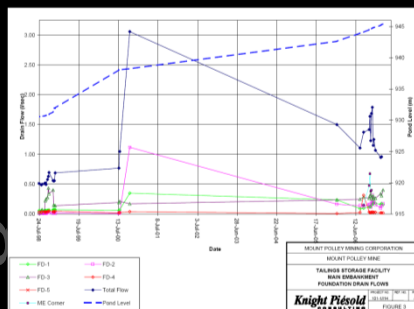
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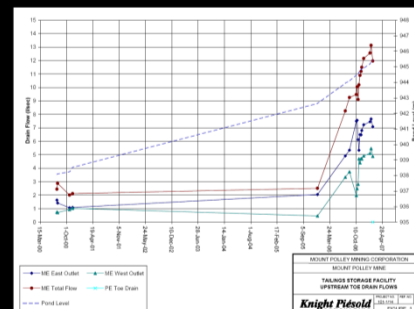
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## TSF - Monitoring

❖ Typical Drain Flow



Typical foundation drain flow readings



Typical upstream toe drain flow readings

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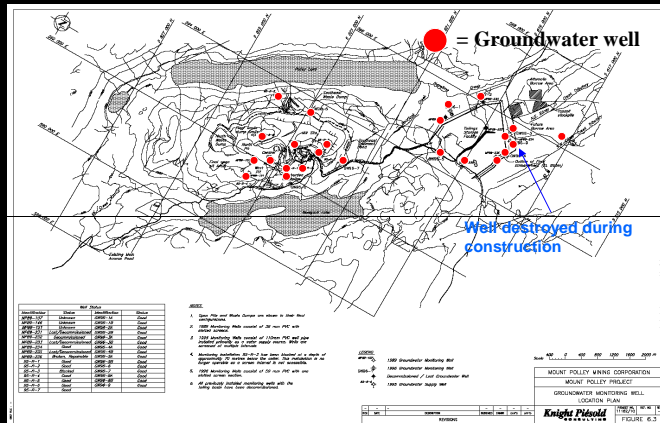
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## TSF - Monitoring

### ❖ Hydrogeology



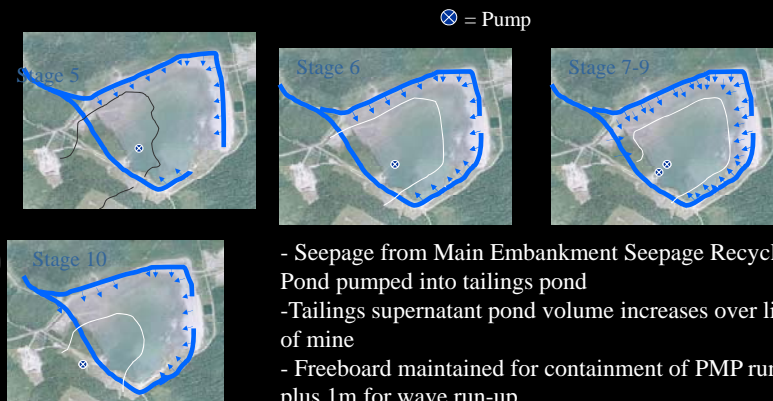
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## TSF - Tailings Deposition

### ❖ Water Management ❖ Tailings Deposition Strategy

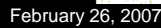


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Water Discharge locations

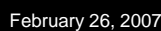


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## ❖ Proposed Closure Plan

- From Report on Cycloned sand Construction of Stage 3 and On-going Stages of The Tailings Storage Facility, 1999

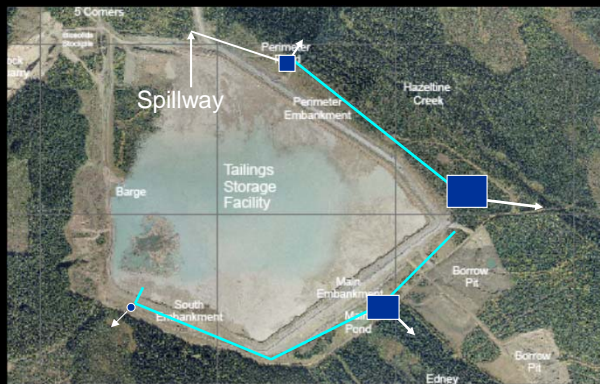


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## TSF - Potential Revised Closure Plan

### ❖ Water Discharge locations



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## Test Heap Leach Pad - Overview

- ❖ Constructed between August and November 2006.
- ❖ Hydrostatic Test was passed in December 2006,
- ❖ Items to complete:
  - ❖ Drainage pipe collection system
  - ❖ Protective drainage layer.



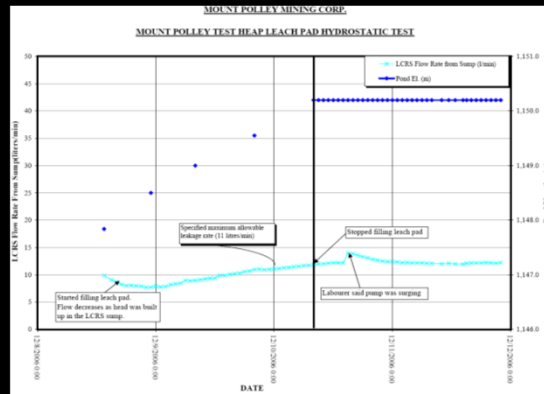
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## Test Heap Leach Pad - Hydrostatic Test

- ❖ Filled with water pumped from the Cariboo Pit.
- ❖ Test deemed complete when leakage rate stabilized at 12 l/min after 24 hours.



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## Test Heap Leach Pad - Location & Future Expansion

- ❖ As-built drawing
- ❖ Volume to crest of the test pad is approximately 55,000 m<sup>3</sup>



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## Questions on TSF?



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