



# **Mount Polley Mine Tailings Embankment Breach – Update on Remediation and Rehabilitation**

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## ■ Presentation Contributors

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# Mount Polley – Remediation and Rehabilitation

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- Background
- TSF Update
- Risk Assessment
- Approach to Remediation and Rehabilitation
- Monitoring the Rehabilitation
- Acknowledgements





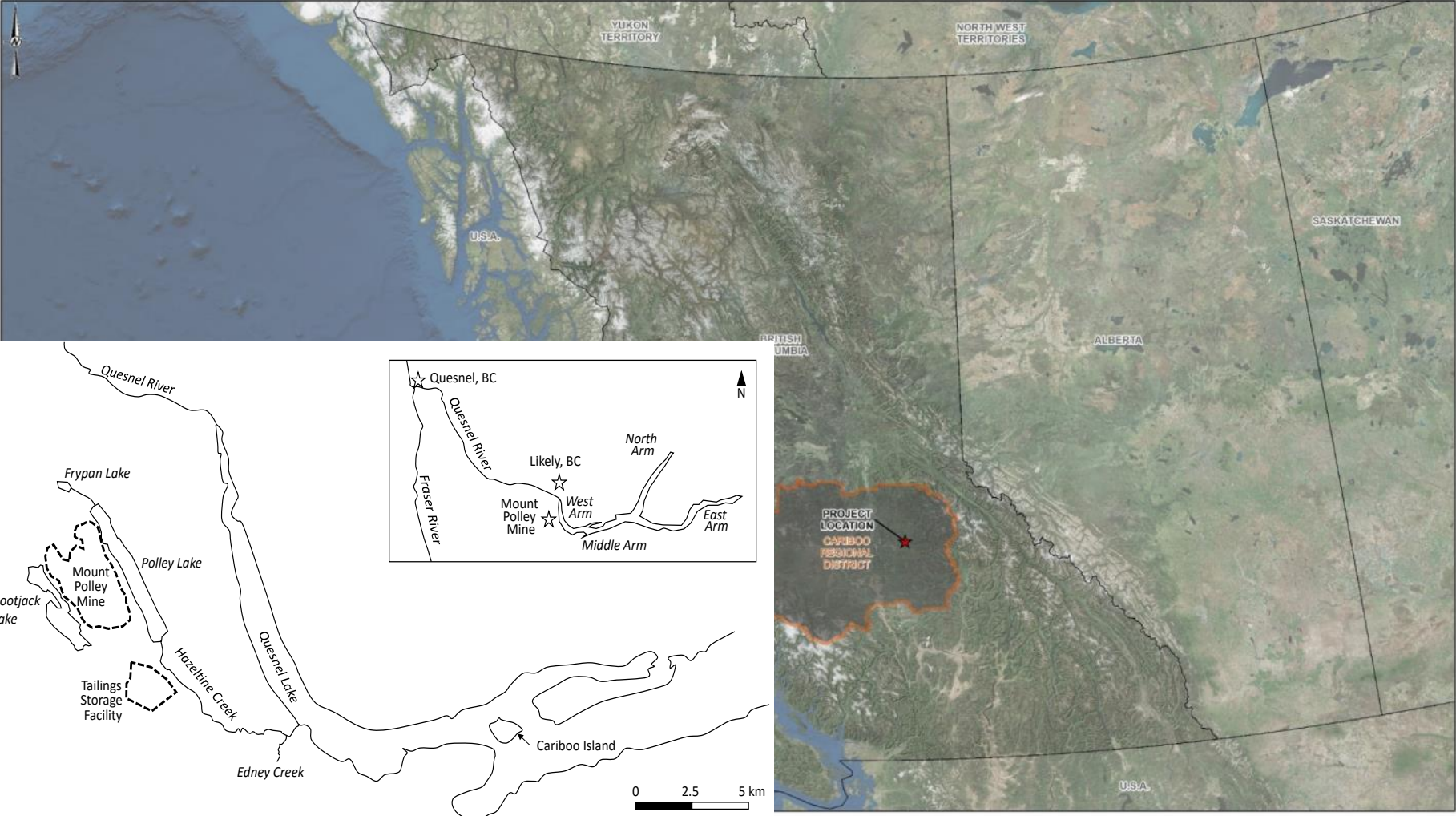
# Mount Polley Mine - Location

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# Mount Polley Mine TSF Breach



- When: Early morning August 4, 2014
- What: A breach occurred at the Perimeter Embankment of the Mine's Tailings Storage Facility (TSF)
- Why: Failure of an underlying glacial lacustrine layer that was not appropriately characterized
- Materials Released:
  - Supernatant water – 10.6M m<sup>3</sup>
  - Tailings solids (7.3M m<sup>3</sup>) and interstitial water (6.5M m<sup>3</sup> )
  - Construction materials – 0.6M m<sup>3</sup>



# TSF Breach Repair & Buttressing



## Failure Investigations

- MPMC (Golder)



endent Panel



rogram (Golder)

2015



2015 Freshet Embankment



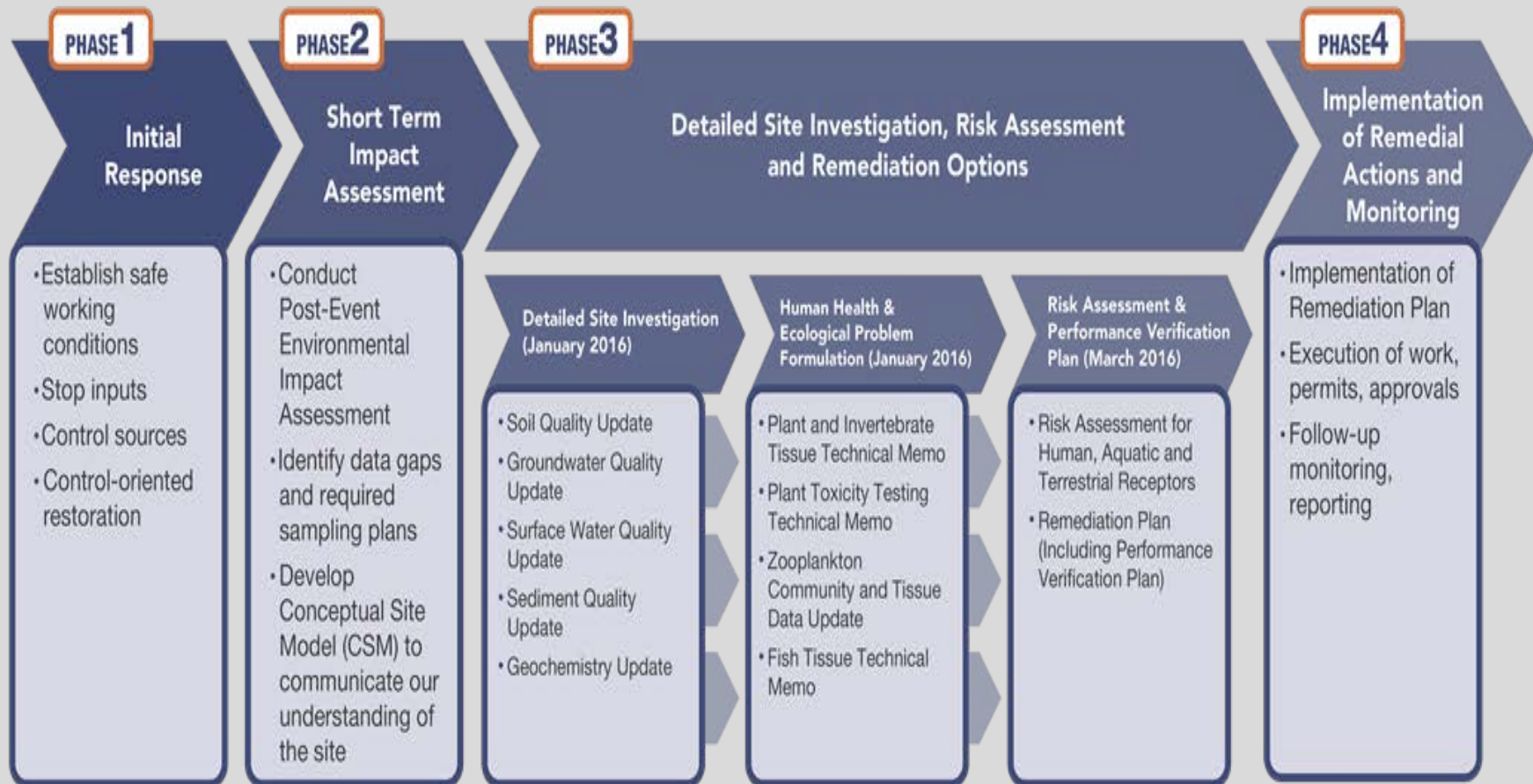
# Embankment Repaired

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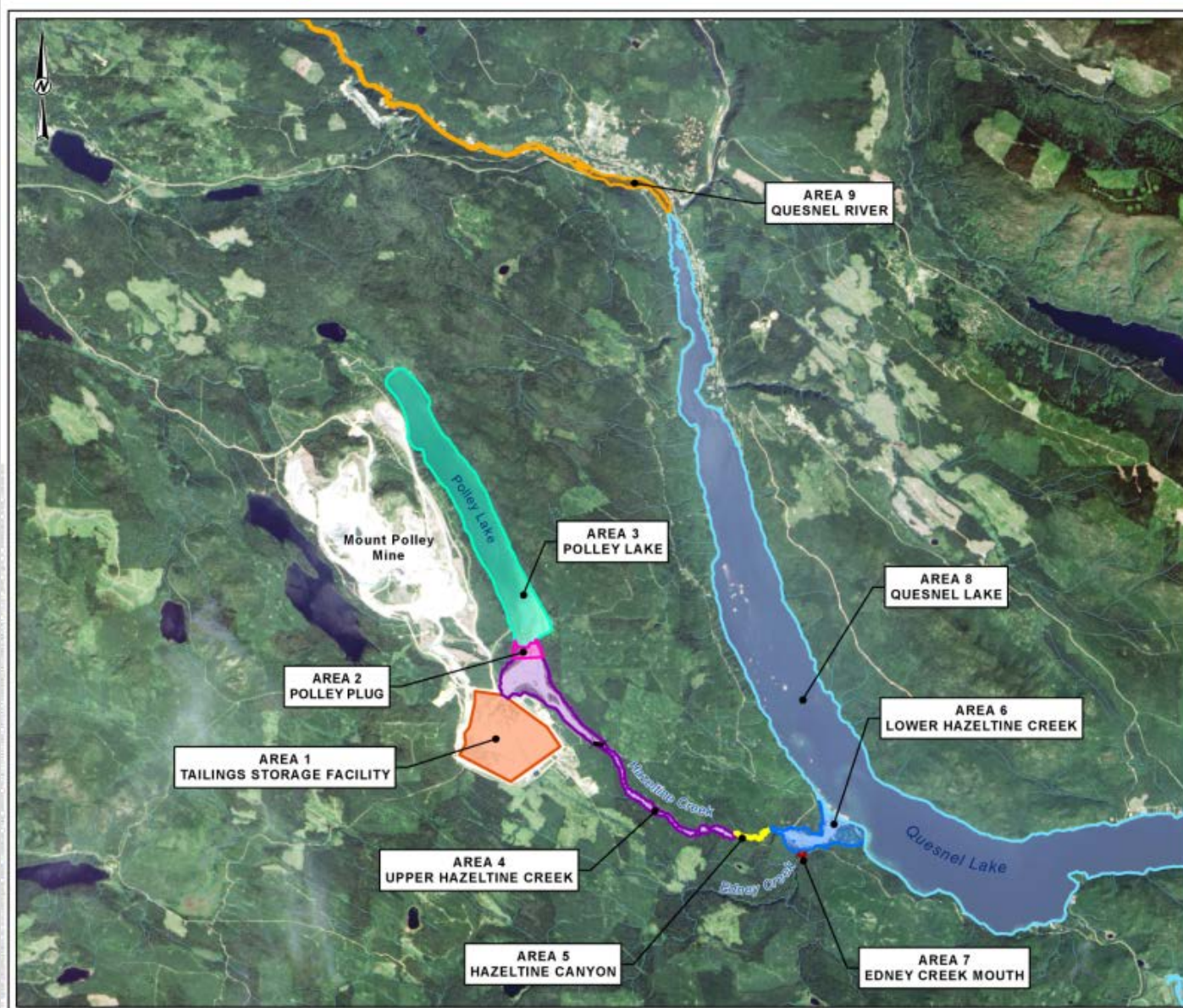




# Rehabilitation Approach



# Rehabilitation Approach



# Phase 2 - Short-term Impact Assessment



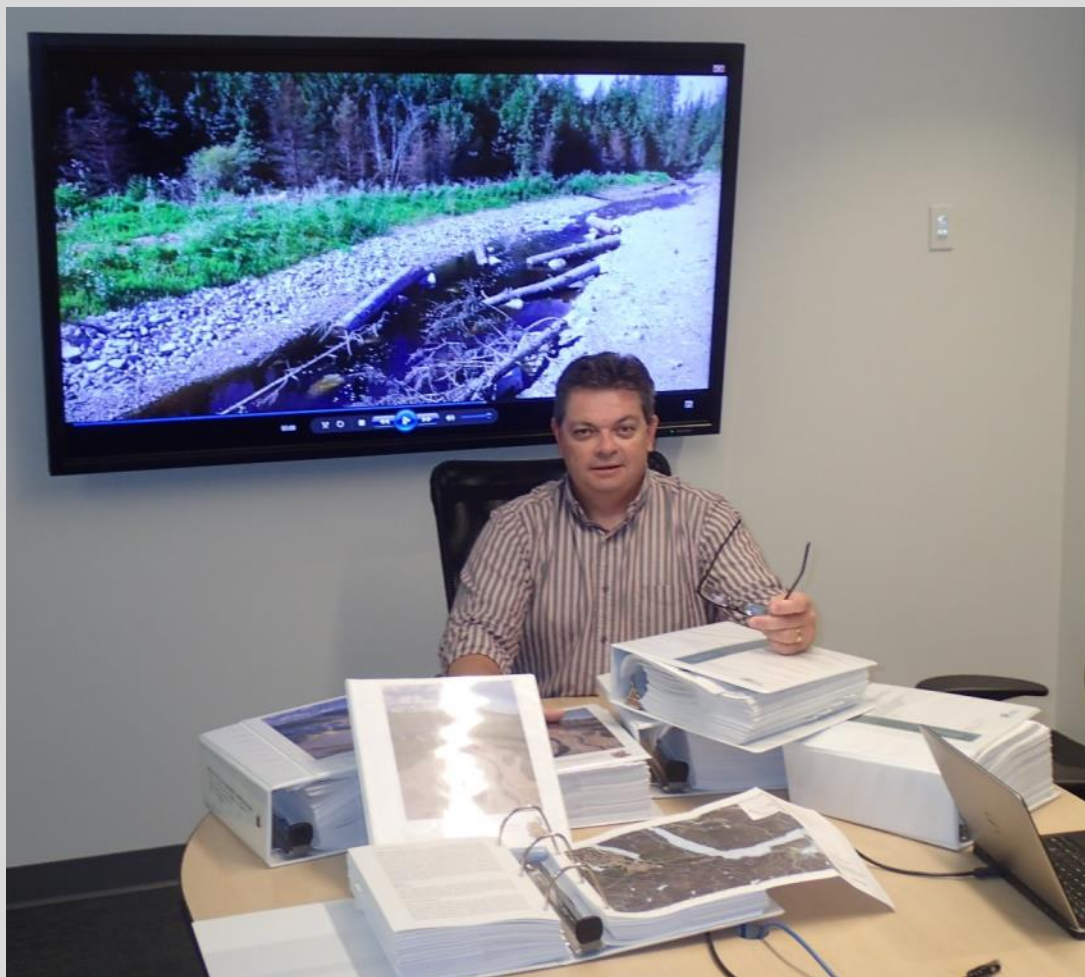
- Environmental monitoring commenced August 5, 2014
- Assessment of the physical, chemical and biological effects
  - Water quality
  - Limnology (Quesnel Lake hydrodynamic model)
  - Sediment and soil quality
  - Aquatic toxicology
  - Fish and fish habitat
  - Geochemistry
  - Geomorphology
  - Terrestrial wildlife
  - Vegetation

Results published June 2015 and June 2016  
(available on the Imperial Metals website)



# Environmental Impacts

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- Thousands of pages of detailed physical, biological, chemical and geochemical studies – openly available on Imperials Metals' website
- Countless Public Meetings, mail outs, progress videos
- Full transparency



# Summary of PEEIAR Key Findings



- **Physical Impacts** - Available evidence to date indicates physical effects to Polley Lake, Hazeltine Creek and valley, Edney Creek, Quesnel Lake. Loss or reduction of lower trophic level habitats in affected terrestrial and aquatic environments. Restoration underway, with some re-colonizing taking hold
- **Chemical Impacts** – Concentrations of copper and vanadium in soil/tailings were greater than BC CSR standard. SRK found tailings are not acid-generating and have low leaching potential
- **Biological Impacts** – Loss of soil and sediment communities in affected areas; limited evidence of metal toxicity, plants growing through tailings

Parameter	Tailings (Avg)	Background (Avg)	CSR Std
Copper (mg/kg)	869	36	150
Vanadium (mg/kg)	187	70	200



# Phase 3 – Detailed Site Investigation, Risk Assessment, and Remediation Operations



## POTENTIAL EXPOSURE PATHWAYS

### Human Receptors

Soil: Incidental ingestion, dermal contact, dust inhalation  
Surface water: Ingestion, dermal contact  
Vegetation/Game: Ingestion



### Terrestrial Wildlife Receptors

Soil: Incidental ingestion, dermal contact  
Surface water: Ingestion, dermal contact  
Vegetation/Prey: Ingestion



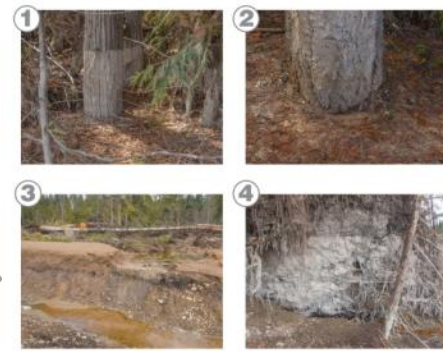
### Terrestrial Soil Invertebrate and Plant Receptors

Soil: Direct contact, root uptake, soil neutralization, root suffocation



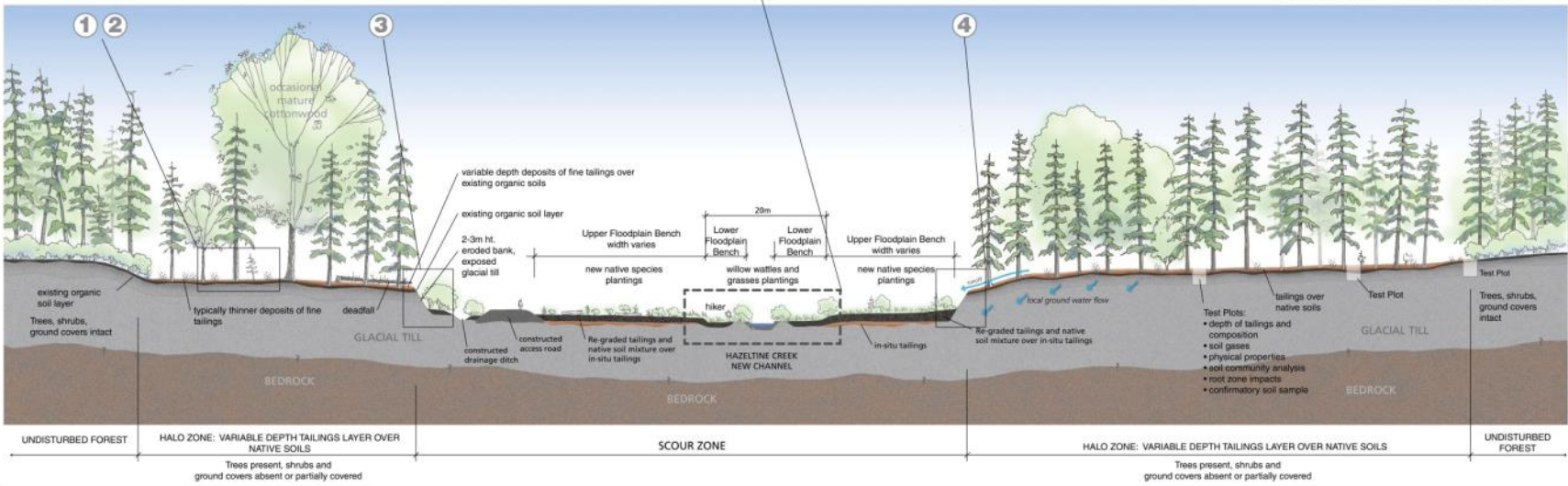
### Aquatic Wildlife Receptors

Sediment: Incidental ingestion, dermal contact  
Surface water: Ingestion, dermal contact  
Vegetation/Prey: Ingestion



INFORMATION NEEDED	
Confirmation of Remediation	Risk Assessment
• Survey elevation/ thickness of remaining tailings	• Plant tissue and soil sampling
• Volume estimates of remaining tailings	• Soil invertebrate and soil sampling
• Confirmatory soil sampling	• Confirmatory toxicity testing
• Photo documentation	• Survey of ecosystem health (test plots)
• Drawings by representative reach	• Oxygen profiles with depth in forest halo zone
• Groundwater assessment	• Dust assessment

Note: Drawings on this page are approximate to scale and are intended to illustrate general relationships and information as it is currently understood. Further studies may be required.



CONCEPTUAL SITE TAILINGS DISTRIBUTION AND EXPOSURE MODEL

REPRESENTATIVE SECTION: HAZELTINE CREEK - STATION 2+000

MAY 12/2015



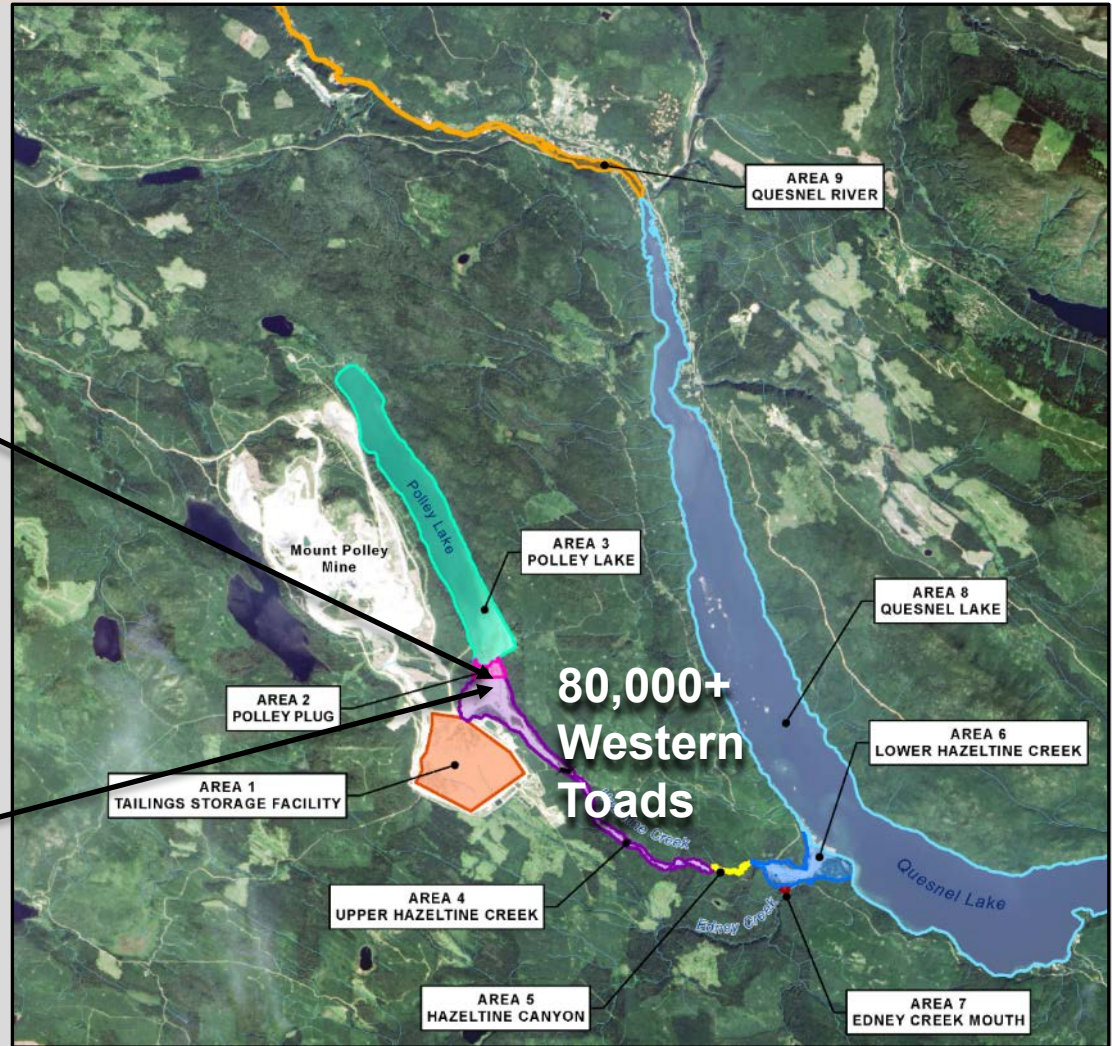
# Preliminary Conclusions



- Human health risk assessment found that there were no contaminants of concern for human health.
- Ecological risk assessment has indicated a loss of habitat and soil-dependent receptors in the immediate area of impact but chemical-related impacts appear to be low.
- Detailed geochemistry test results provided by SRK were a good predictor of bioavailability and toxicity of tailings to human and ecological receptors.



# Polley Lake and Polley Flats





**January 2015 to October 2016**  
**22 Months...**



# Hazeltine Creek Rehabilitation

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# Hazeltine Creek Rehabilitation

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# Hazeltine Creek Fish Habitat Features

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# Hazeltine Creek Fish Habitat Features

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# Creek Rehabilitation is working...



- Edney Creek Mouth was damaged in the debris flow
- Channel was rocked in and open by February 2015
- Fish habitat features were constructed in August 2015
- Edney Creek supported endangered Interior Coho Salmon and was rebuilt as a high priority



# Edney Creek – Reconstructed portion



Results of fish sampling in the rebuilt section of Edney Creek show that it is providing habitat, as intended:



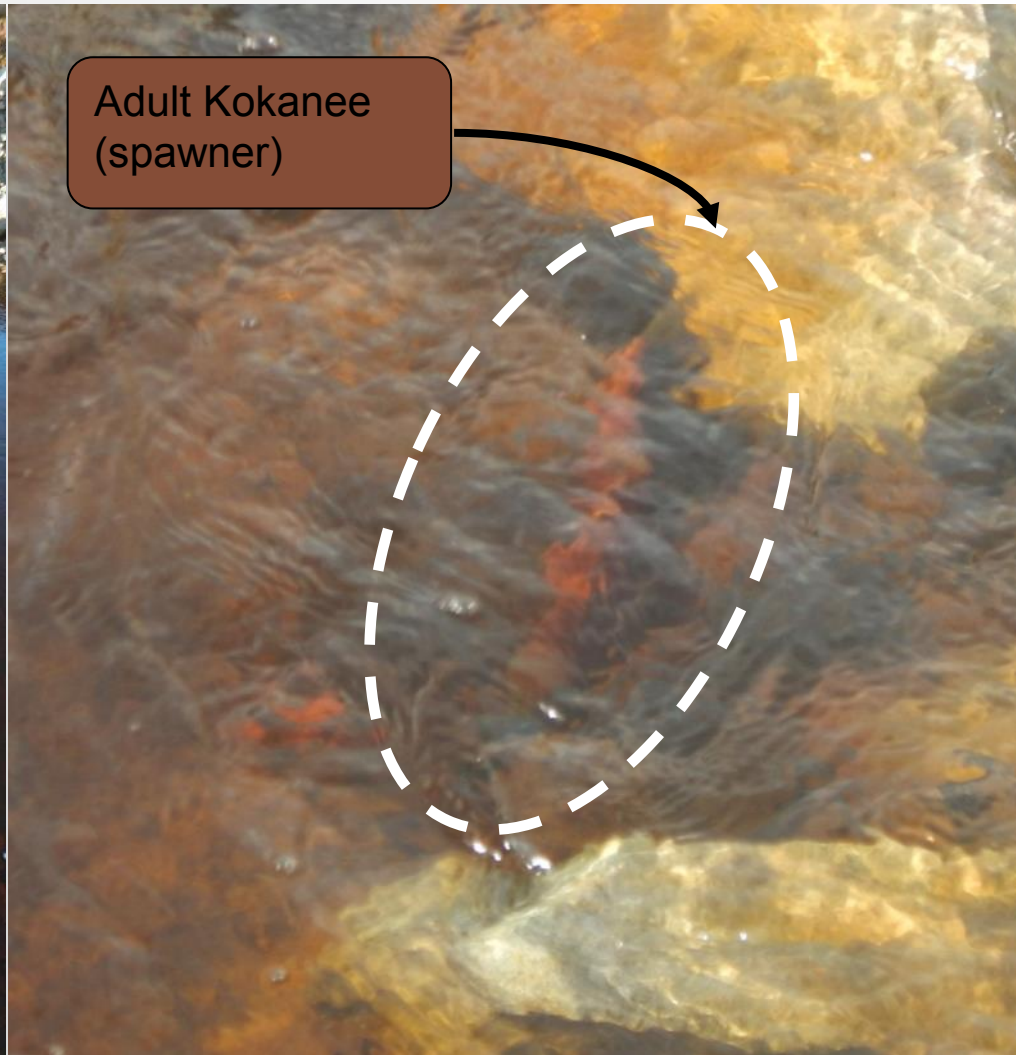
- Juvenile Interior Coho salmon (endangered race!)
- Rainbow trout
- Longnose dace
- Northern pike minnow
- Longnose sucker
- Redside shiner; and
- Burbot



# Edney Creek – November 2016



Adult Interior  
Coho (spawner)



Adult Kokanee  
(spawner)



# Tailings Management/Terrestrial Rehabilitation

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# Remediation Work

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# Monitoring Update – Remediation



Lower Hazeltine willow stakes and seedling (planted 2015)

- Ten (10) Survival plots – throughout the creek (modified silviculture plots)
- Twenty-nine (29) Terrestrial monitoring plots (HHERA)
- Monitoring the survival, percent cover per species, natural ingress, health and vigor.
- Information is included in the Risk Assessment and used to inform future species selection and planting densities.
- Daily tracking of planting and grass seeding





# Terrestrial Rehabilitation

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November 2014



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# Terrestrial Rehabilitation

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# What Worked Well?



- There were no fatalities or injuries during the response – deliberate health and safety procedures were followed – and they worked.
- Response Team – right people in the right roles, high trust, collectively extensive applicable experience.
- Strategy that anticipated regulatory requirements throughout the work and an approach to working with those requirements
  - Field engineered approach was enabled, allowing rapid construction
  - Adaptive management approach for incident response and regulatory requirements
- Participation by the local First Nations



# Acknowledgements



- Enormous gratitude to all at Mount Polley that stepped up and helped in an extraordinary way: environmental team, engineering team, warehouse, purchasing, mechanics, millwrights, human resources, equipment operators, shifters and lead-hands, etc.
- Thank you to all the people in Likely, Williams Lake and the surrounding communities that supported us and encouraged us to work toward re-opening the mine.
- Thank you to our First Nations partners for your patience and input
- Thank you to the government employees who have supported the adaptive response process.

# Further Acknowledgements



- The Environmental Team
  - Art Frye
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  - Katie McMahan
  - Gabriel Holmes
  - Sky Freeman
  - Shauna Litke
  - Valerie Holweck
  - Terena (T-Rex) Snodgrass



# Thank You

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Questions?