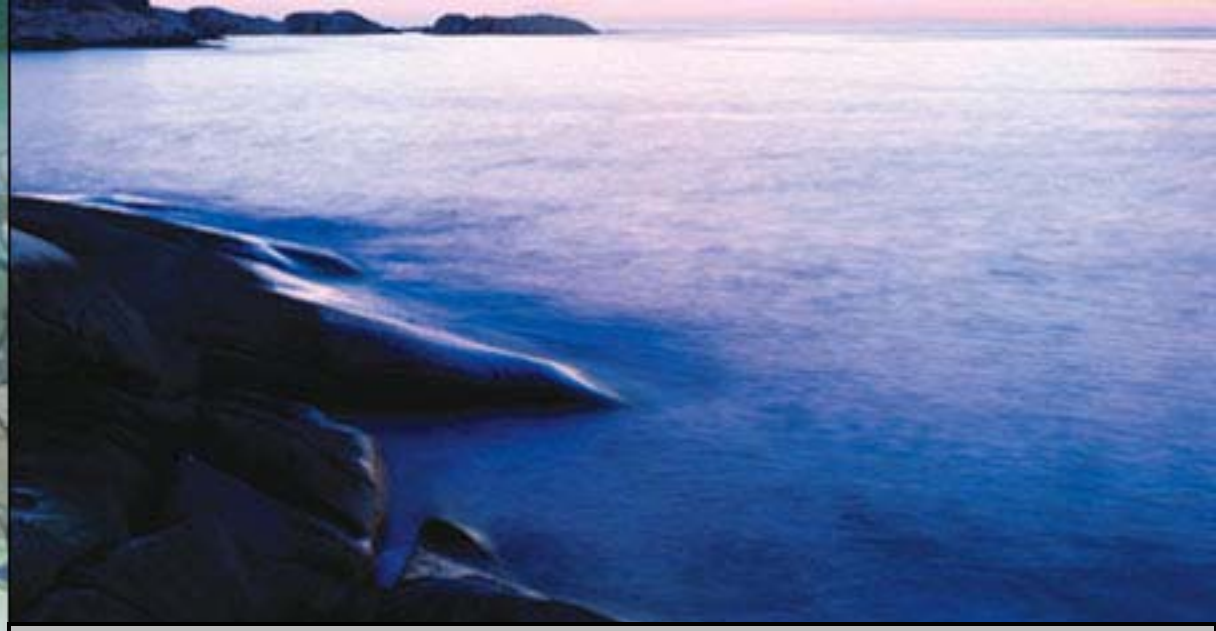

Sea to Sky
Acid Rock Drainage

Presented by: Neil Mallen

Golder Associates Ltd.

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Agenda

- Environmental Assessment Context
- Location
- Environmental Setting
- Impact Assessment
- Mitigation
- Conclusions

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EA Context

- Project involves discontinuous upgrades from Horseshoe Bay to Whistler, ~75 km
- Project is being reviewed as a harmonized CEAA / BCEAA
- Numerous local firms involved
- Golder provided assistance in managing waste rock, cultural heritage coordination

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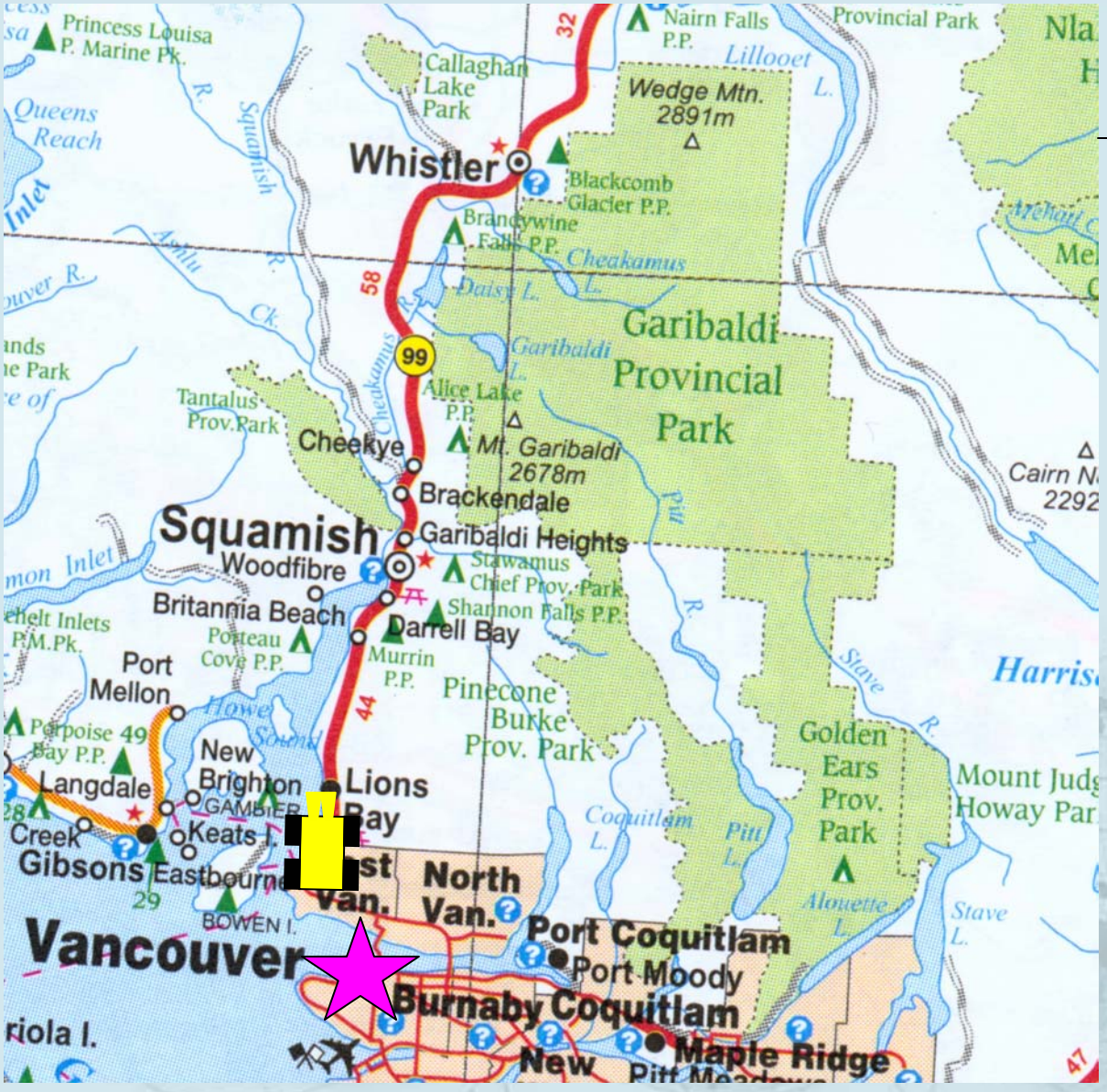
Location



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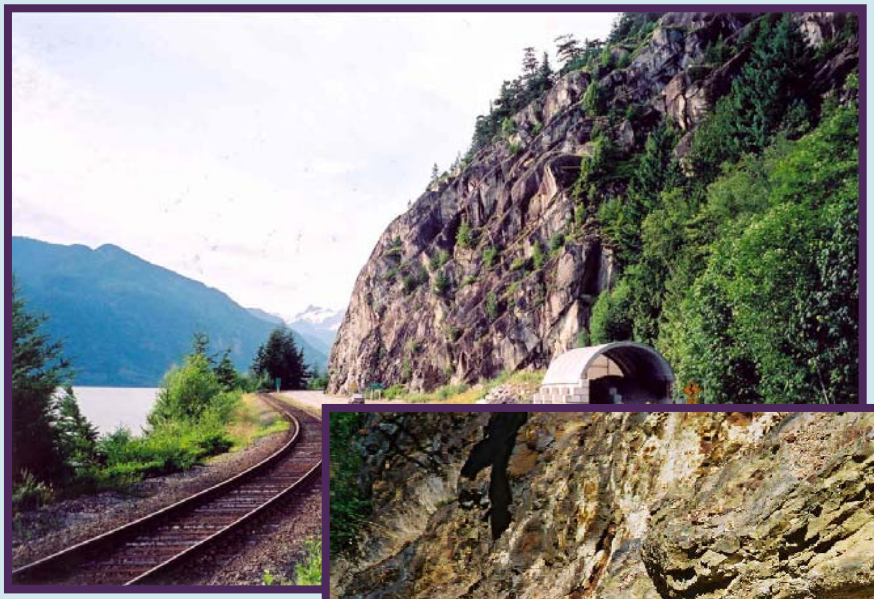
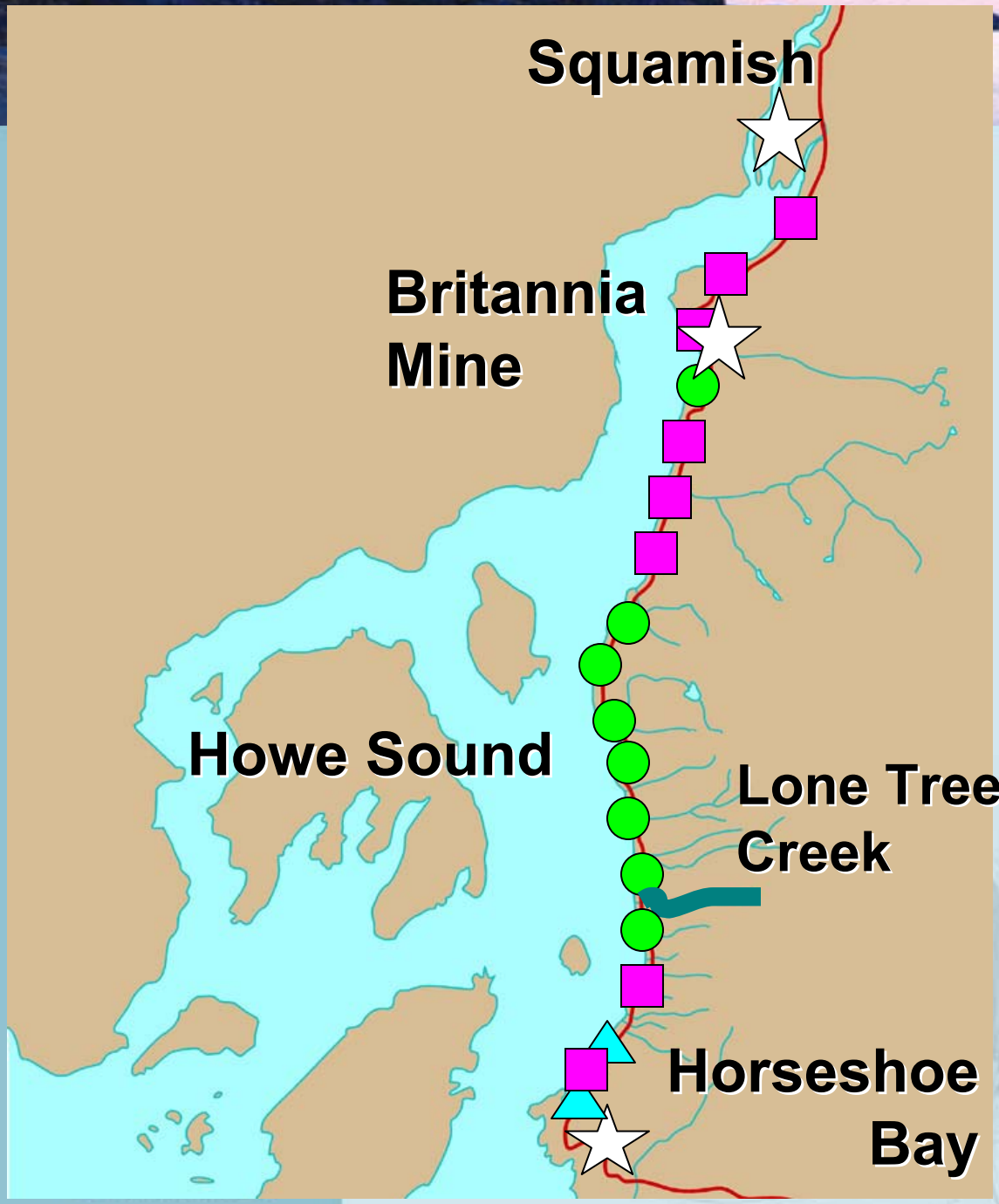
Location



Geology

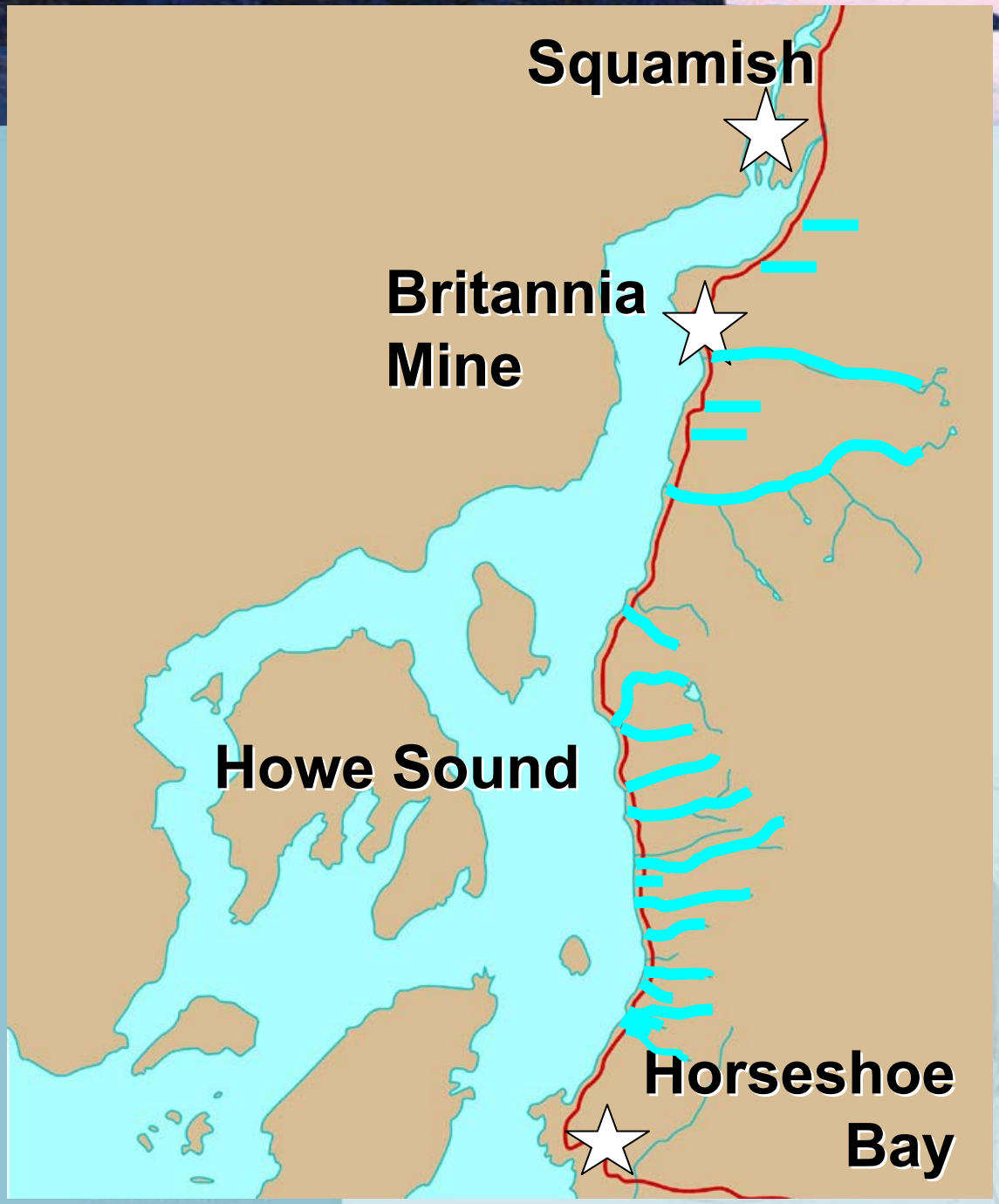


Twin Island Group (PJT)

Gambier Group (IKG)

Coast Plutonics (CP)

Streams



- 23 creeks
- Exceedances of aquatic freshwater criteria identified
  - pH < 6.5
  - Aluminum
  - Copper

Static Testing

- Acid Base Accounting (ABA)
- Mineralogy (XRD)
- Whole Rock Analysis
- Shake Flask Extraction (SFE)
- Wall Washing

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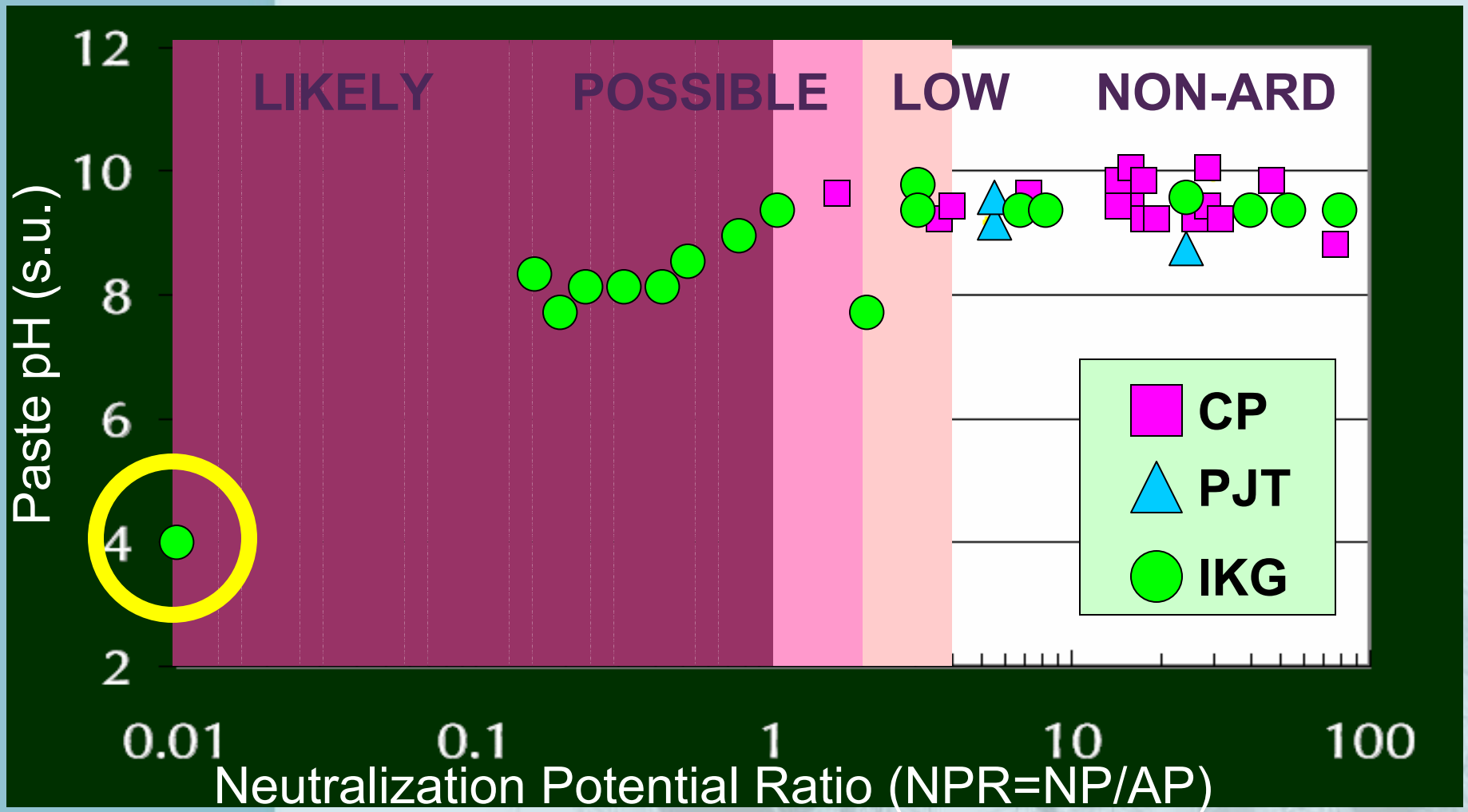
ARD Potential



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ARD/ML Results

- ARD Potential
  - Coast Plutonics – None
  - Twin Island Group – None
  - Gambier Group – Likely to Possible
- ML Potential
  - Copper and aluminum from all rock types

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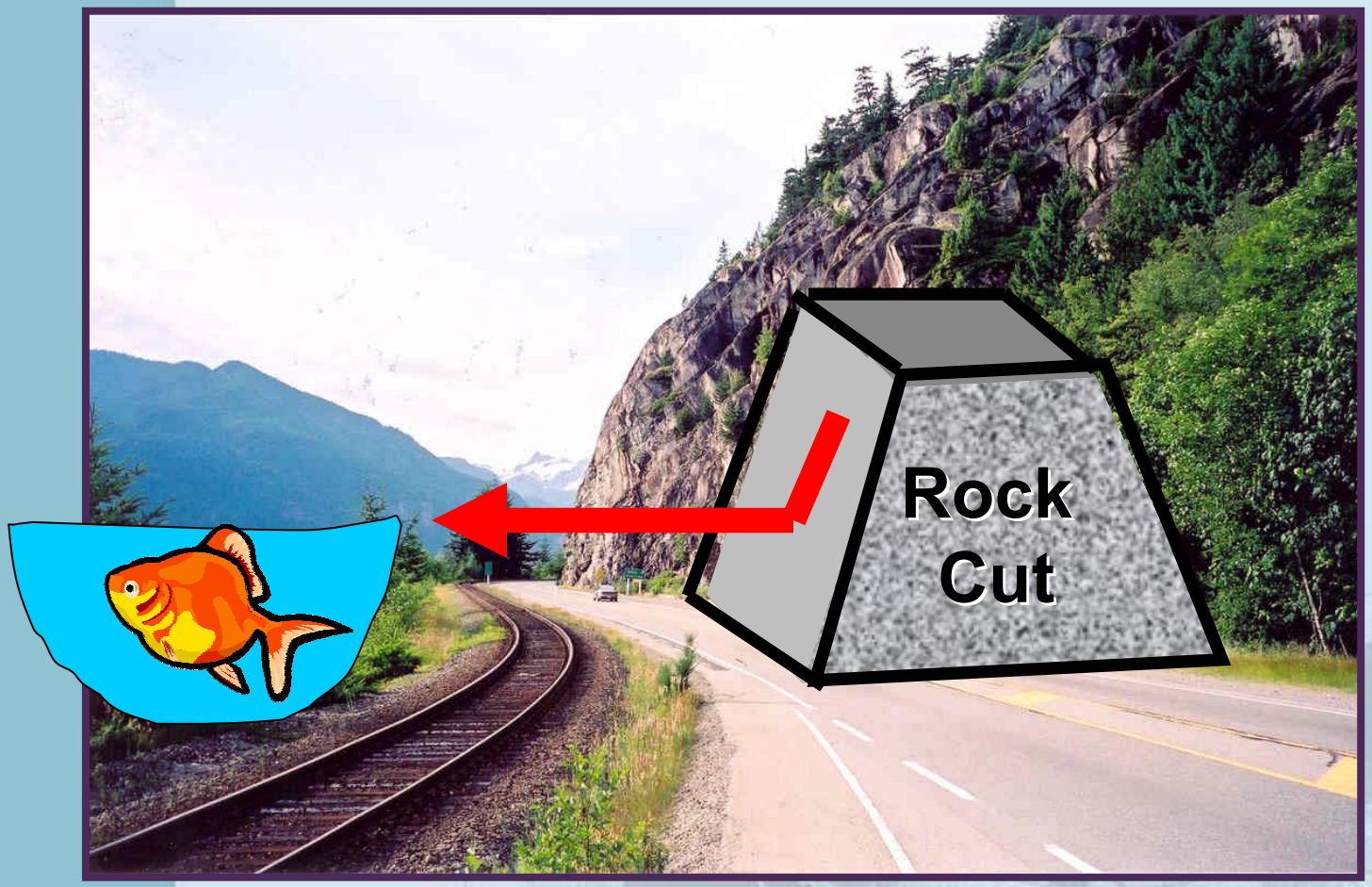
Impact Assessment



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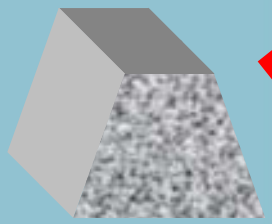
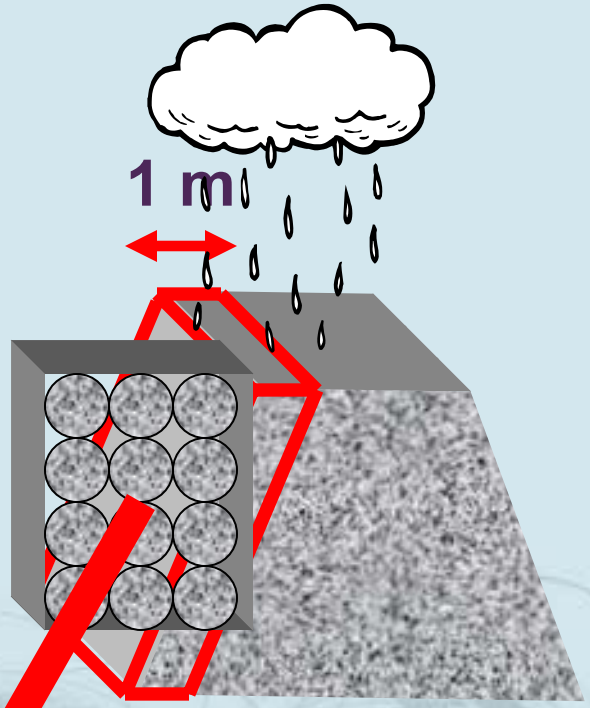
Metal Loading

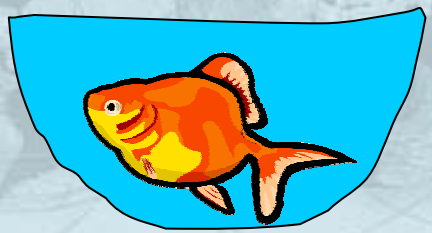


RATE
(kg/m^2)



LOAD
(kg of Cu)

Concentration
(mg/L of Cu)



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Copper Concentrations

Drainage	Background	CEQG	Rock Cut Drainage	Stream
	(mg/l)			
Sclufield	0.002	0.002	0.029	0.0021
Loggers	0.001		<0.001	0.00099
Britannia	0.044		0.021	0.0439

CEQG – Federal freshwater aquatic life standard

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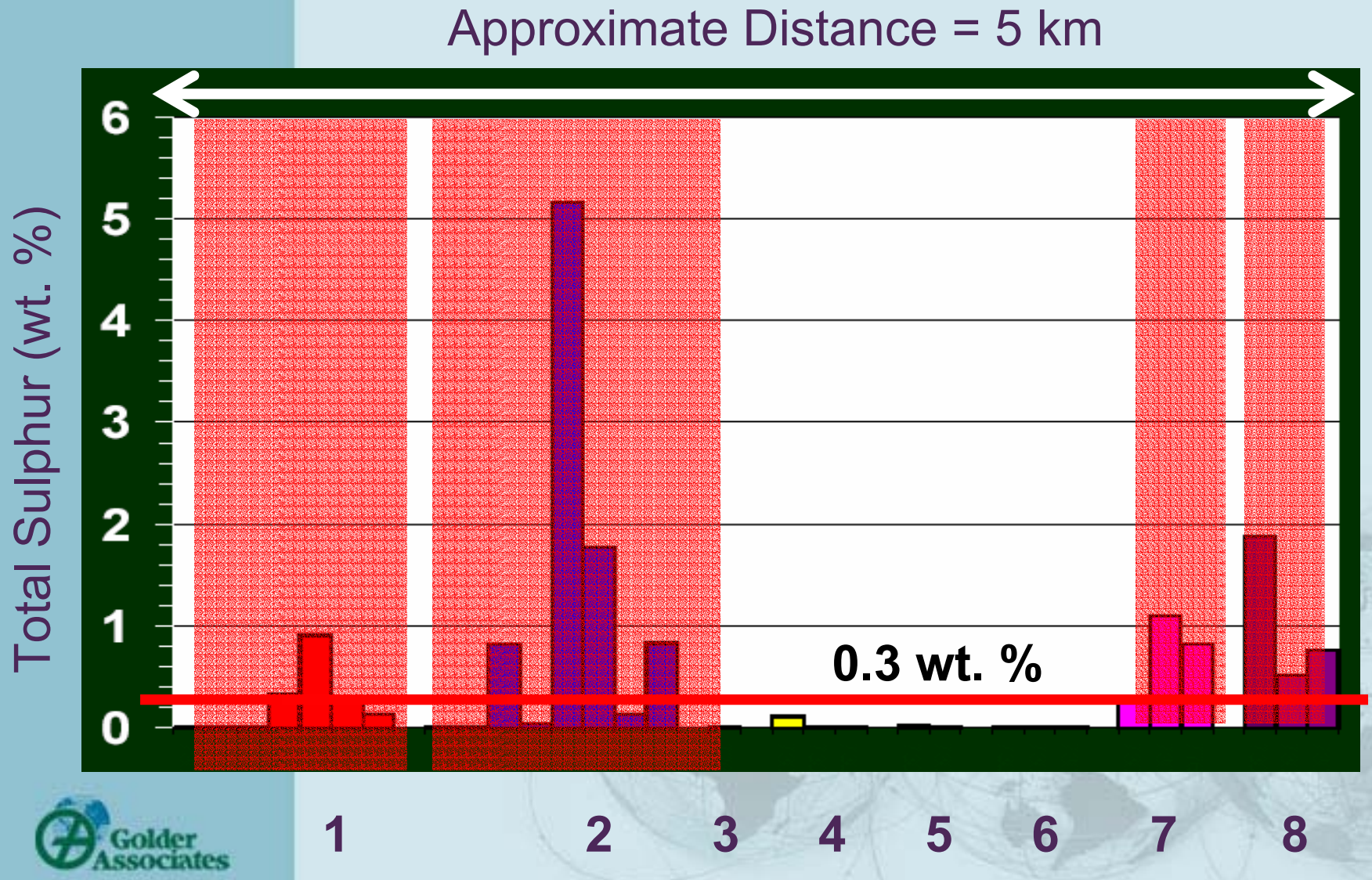
Gambier Group Cuts



Environmental Effects

- ML may result in Cu and Al exceedances in rock cut runoff
- Resultant stream concentrations remain below standards
- Metal loading to Howe Sound is predicted to be insignificant
  - 2 g Cu increase in Rundle drainage vs 5.7 kg loading from Britannia drainage
- Gambier Group andesites have potential to generate ARD

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Mitigation

- Segregate rock with ARD/ML potential
- Use / disposal:
  - Low potential: Rock berms / embankments, or upland containment
  - High potential: disposal at sea
- Monitor water quality

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Conclusions

- No significant residual effects anticipated
- Provided appropriate re-use / disposal method employed depending on ARD / ML potential
- Ongoing water quality monitoring program

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Sea to Sky ARD: Questions

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