Manaaki Whenua
Landcare Research

UNIVERSITY of OTAGO
Te Whare Wānanga o Otāgo

CRL Energy Ltd

UC
UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Framework overview and potential application

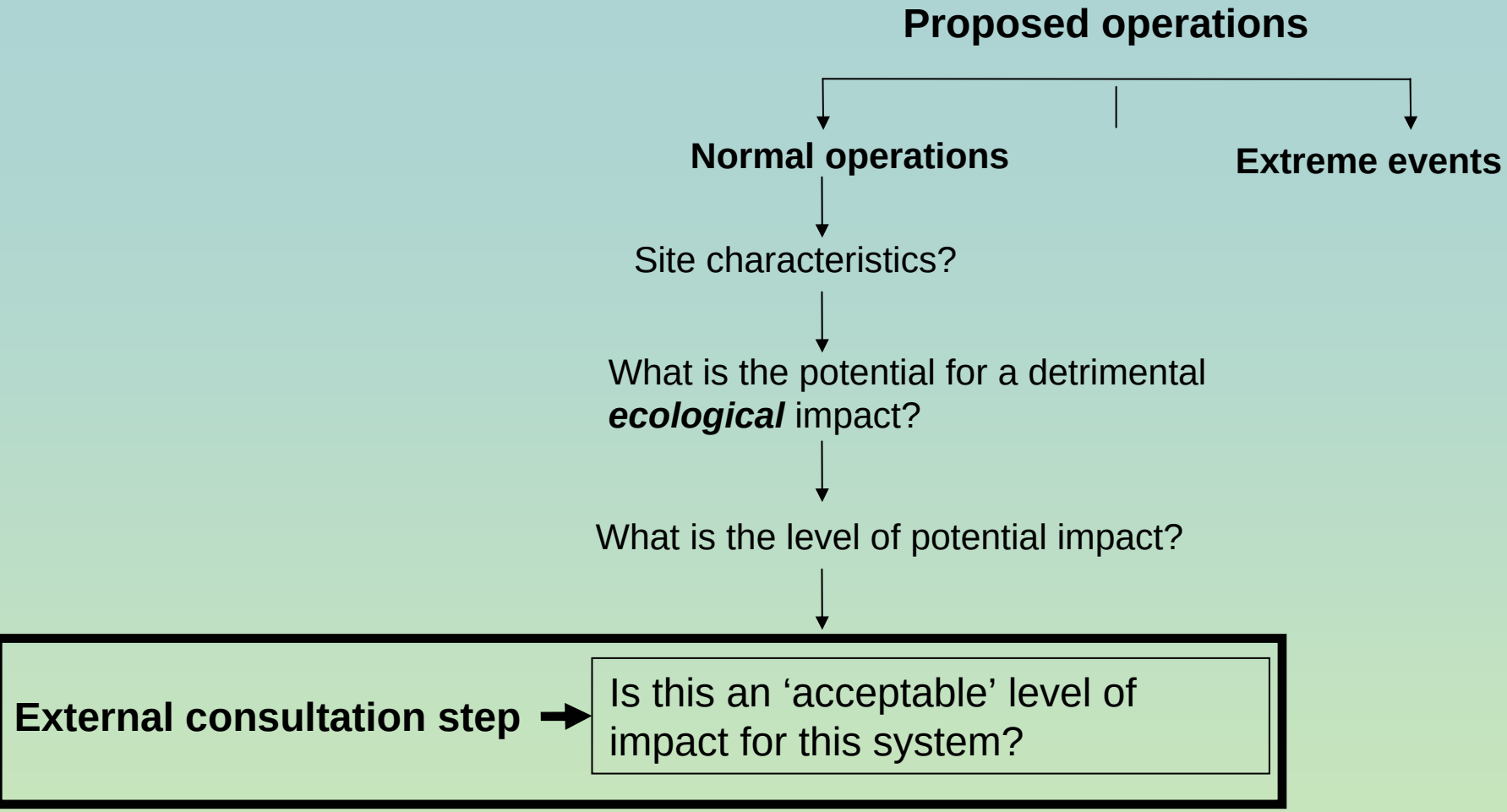
Jo Cavanagh
Landcare Research

Why have a framework?

- Our aims:
  - Provide science information to end-users in a useful manner
  - Facilitate consistency in decision-making, including information required
  - Assist with meeting requirements under RMA, specifically the resource consenting process
- **End-user feedback is critical to ensure a useful framework is developed**

What is the framework?

- A flow chart outlining a decision-making process
- Supporting information:
  - Data requirements
  - Guidance for on-going monitoring
  - Databases
- Format
  - Document available on-line


Proposed operations
Normal operations
Extreme events
Site characteristics?
What is the potential for a detrimental ecological impact?
What is the level of potential impact?
External consultation step
Is this an 'acceptable' level of impact for this system?

Government Agencies

Industry

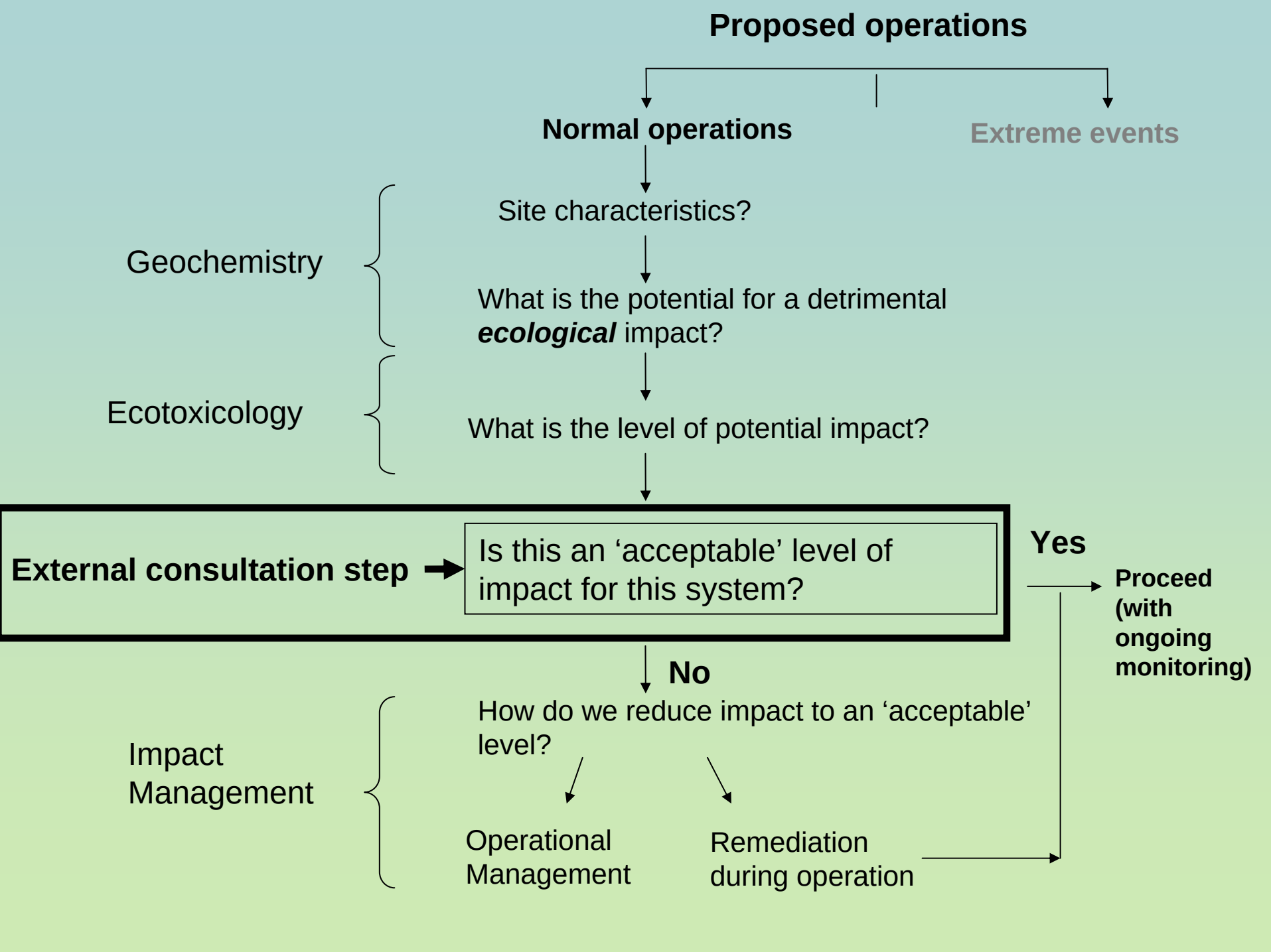
Councils

‘Acceptable’ level of impact….

Community, incl IWI

Other

OUTSIDE FRST programme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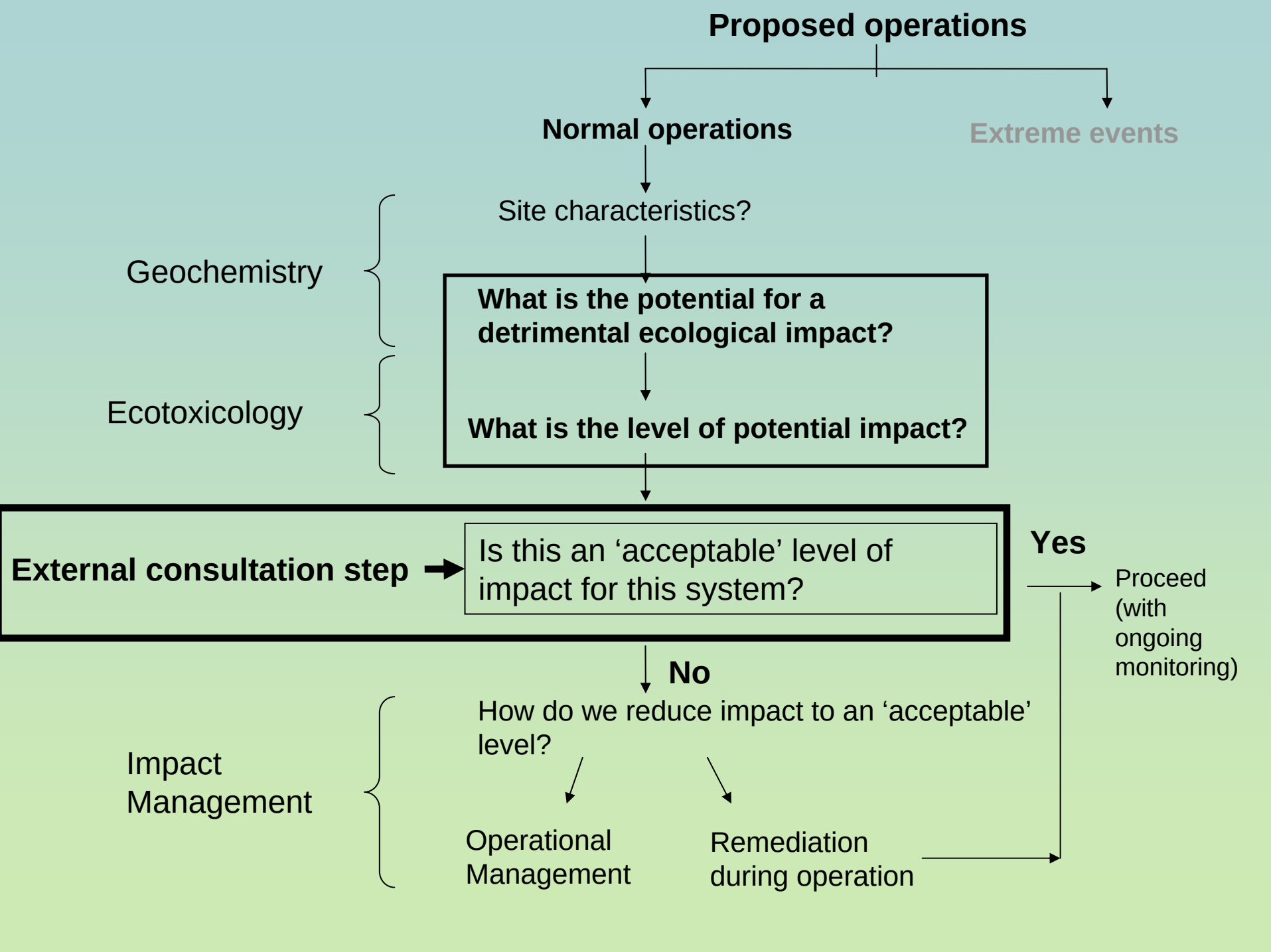
Is this an 'acceptable' level of impact for this system?
Yes
Proceed (with ongoing monitoring)
No
How do we reduce impact to an 'acceptable' level?
Impact Management
Operational Management
Remediation during operation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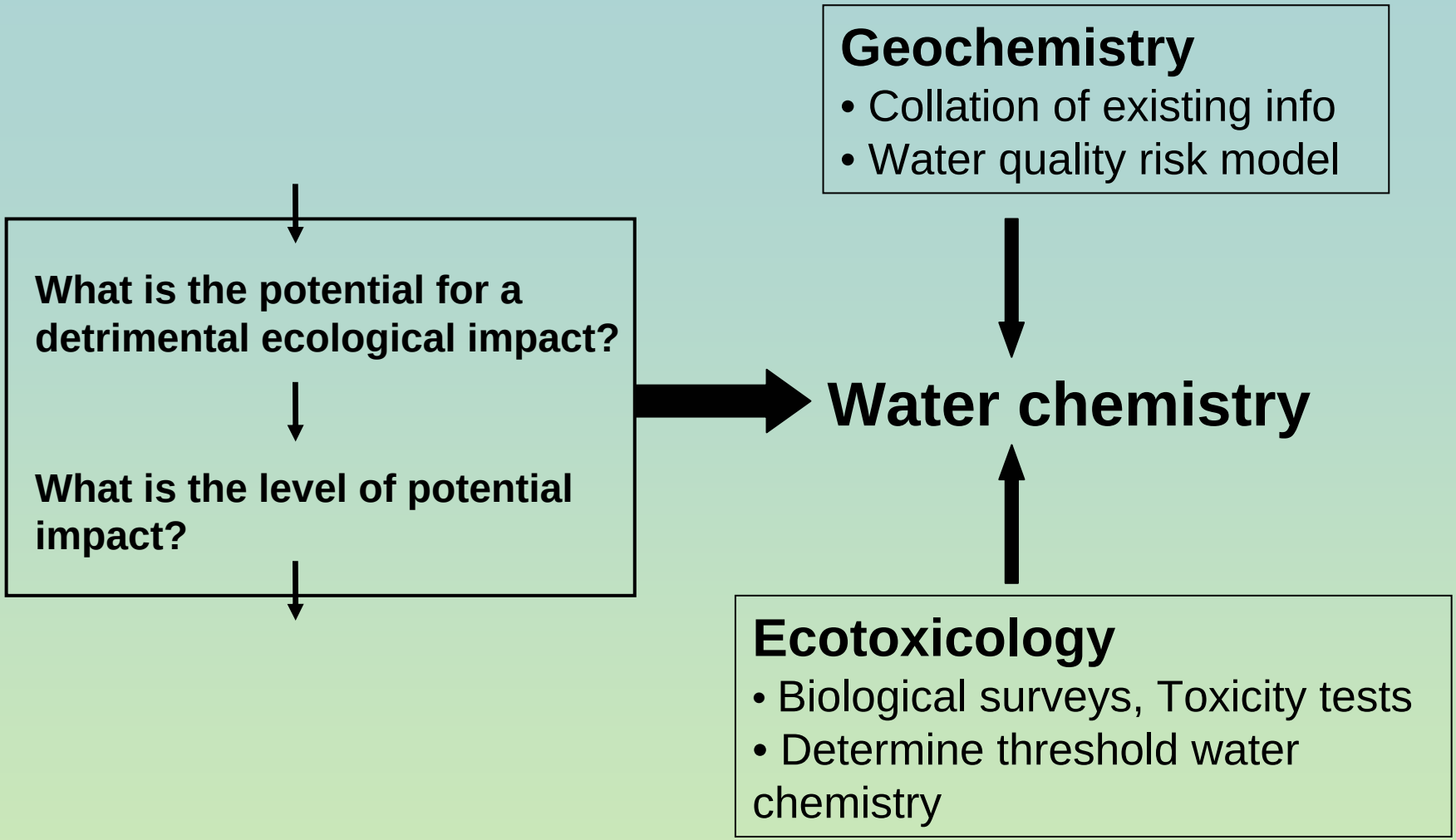
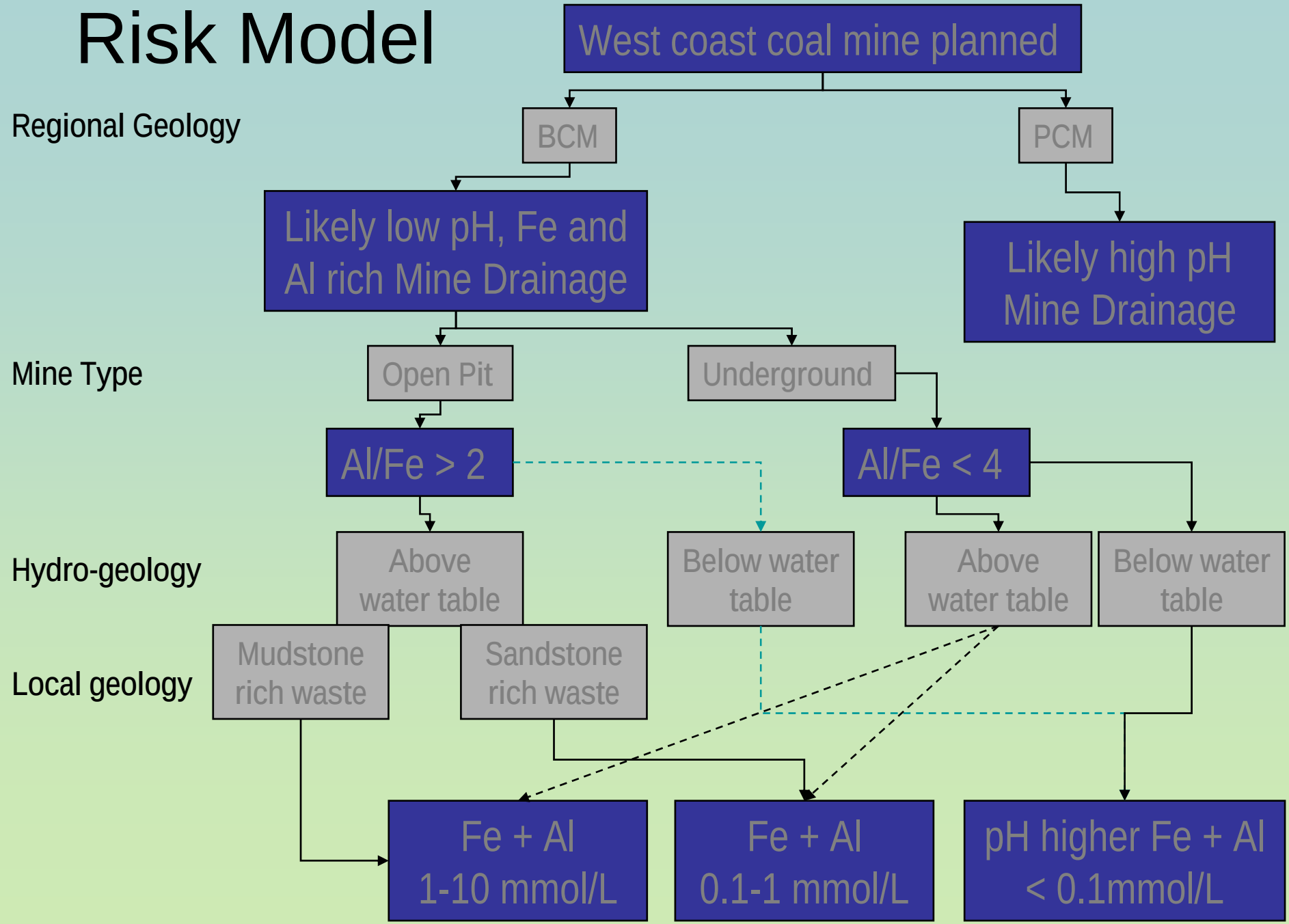
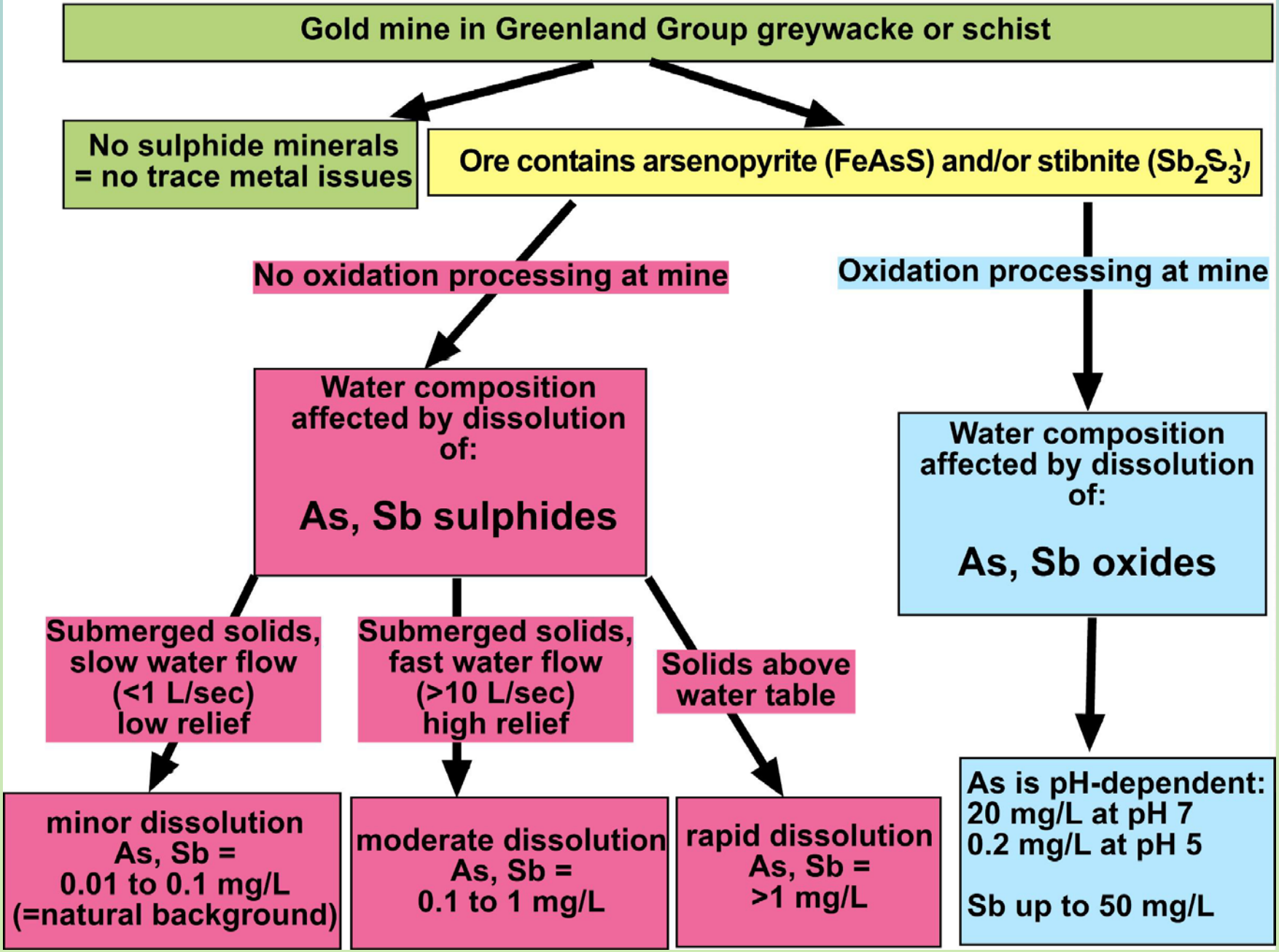
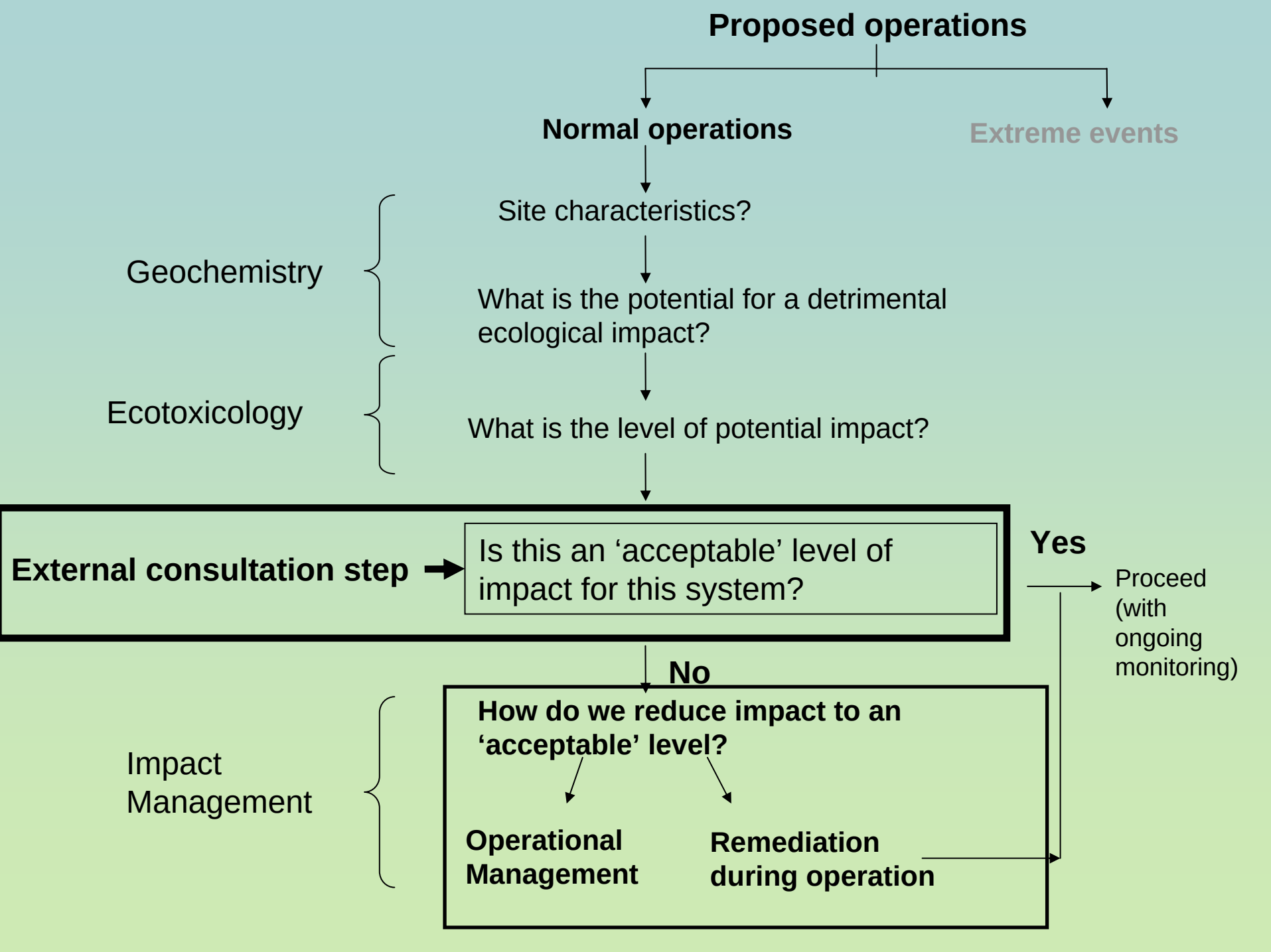

Geochemistry
• Collation of existing info
• Water quality risk model
What is the potential for a detrimental ecological impact?
What is the level of potential impact?
Water chemistry
Ecotoxicology
• Biological surveys, Toxicity tests
• Determine threshold water chemistry

Risk Model


West coast coal mine planned
Regional Geology
BCM
PCM
Likely low pH, Fe and Al rich Mine Drainage
Likely high pH Mine Drainage
Mine Type
Open Pit
Underground
Al/Fe > 2
Al/Fe < 4
Hydro-geology
Above water table
Below water table
Above water table
Below water table
Local geology
Mudstone rich waste
Sandstone rich waste
Fe + Al 1-10 mmol/L
Fe + Al 0.1-1 mmol/L
pH higher Fe + Al < 0.1mmol/L

Trace metal risk, gold mining, Westland

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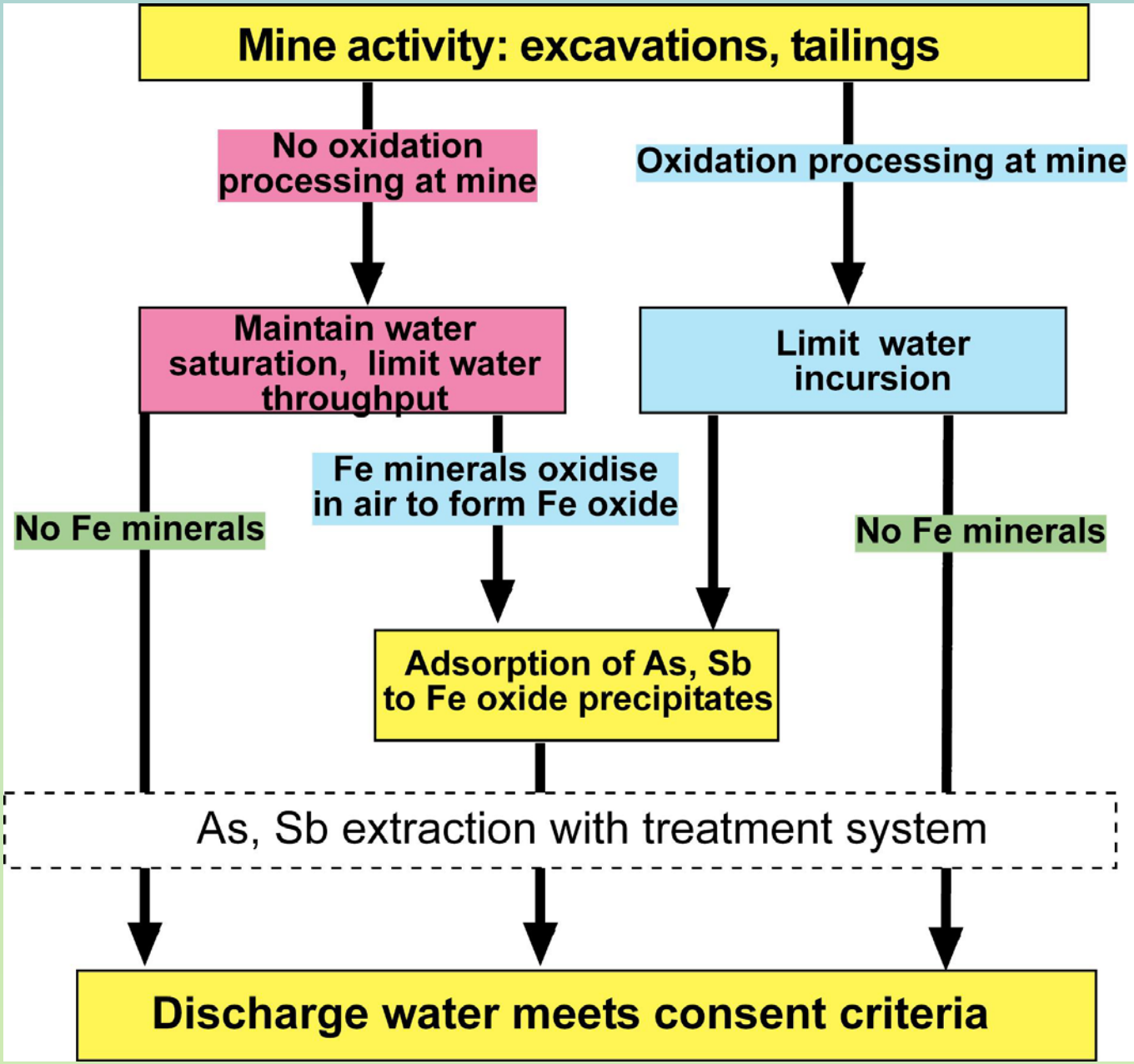
Impact management

- Operational management – overburden management
  - Prevention options/upstream controls
- Remediation during operation – treatment of water discharges
  - downstream controls
- Methodology to select appropriate options for mine operators to meet water-quality targets

Mitigation of trace metal risks for sustainable mining



Proposed operations

Normal operations

Extreme events

Risk of failure of management options

In the event of failure, what is the level of potential impact?

Monitoring and Remediation options

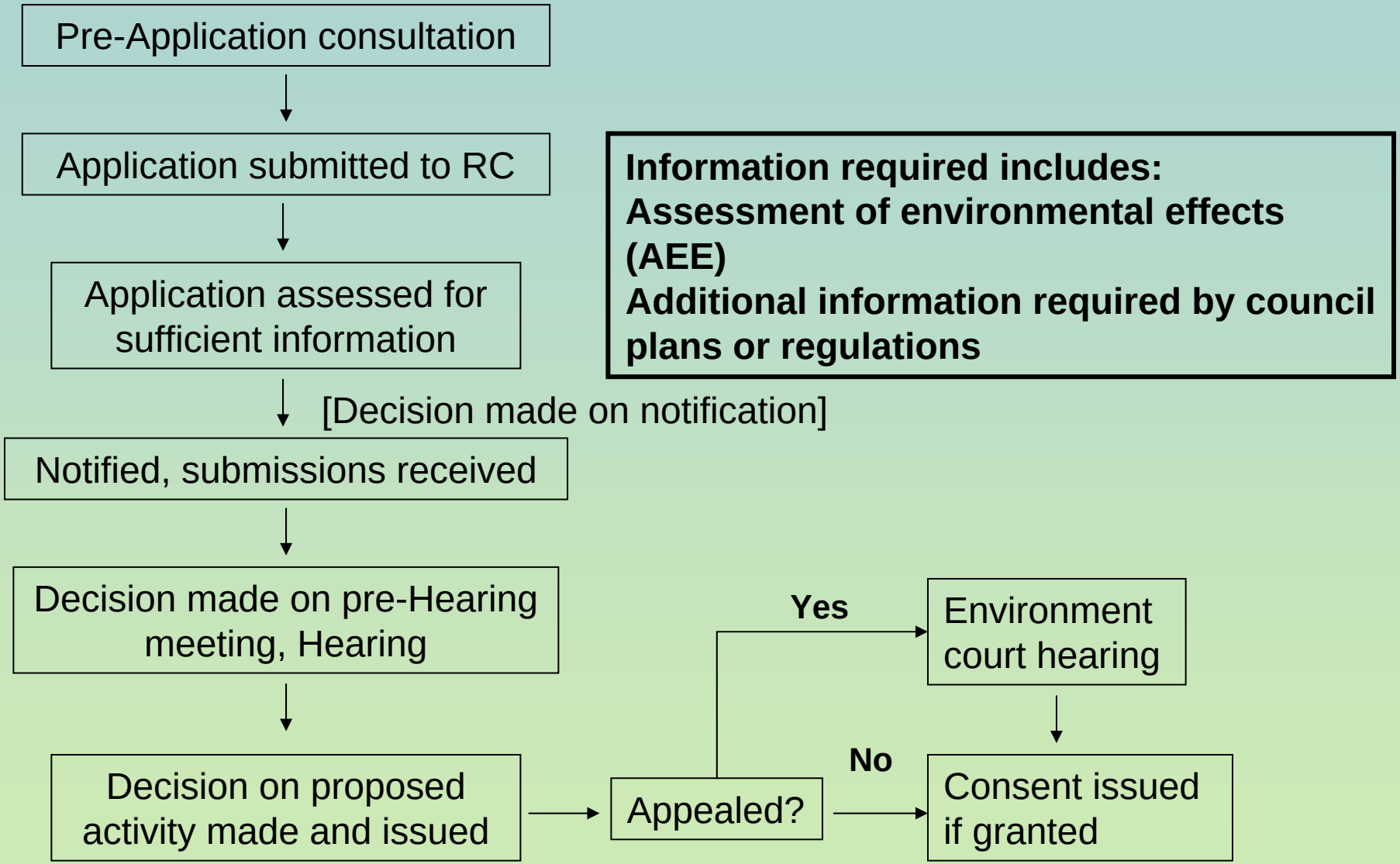
What do you think of as an ‘extreme event’?

What information would be useful for you?

Potential application

- Assistance with resource consenting process
- Development of regional or district plans

Resource Consent Process



Potential application