

AMEC Earth & Environmental



Solutions Without Boundaries

Generic (Tier 1) Criteria Development in Alberta

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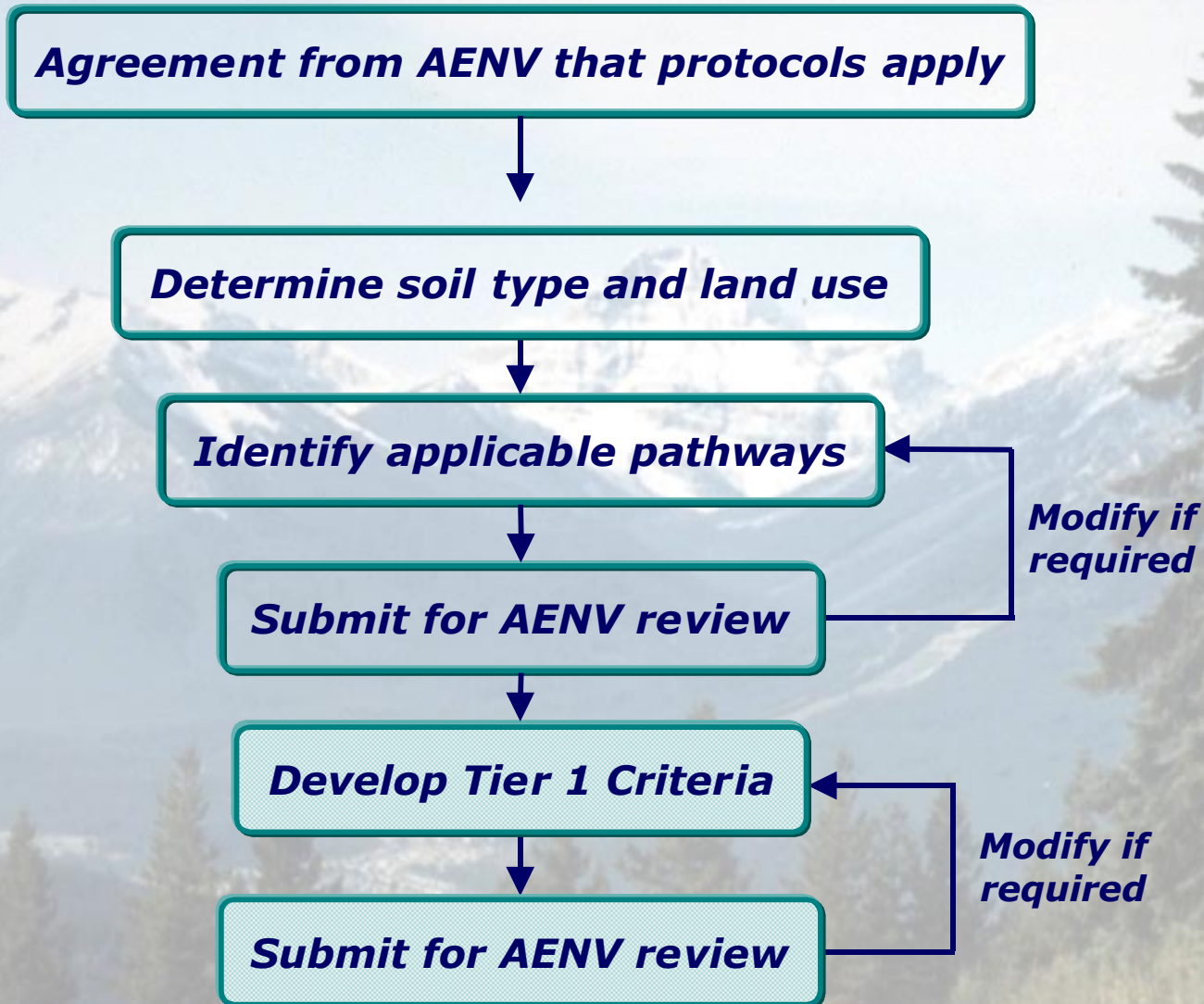
Problem

- Commercial/industrial land use.
- Vinyl chloride on and off site in soil and groundwater.
- Client required remedial closure from Alberta Environment (AENV).
- No Alberta criteria available.

Solution

- Develop commercial/industrial remediation criteria for vinyl chloride in soil and groundwater.
- Utilize Canadian and Alberta specific protocols to develop Tier 1 Criteria.

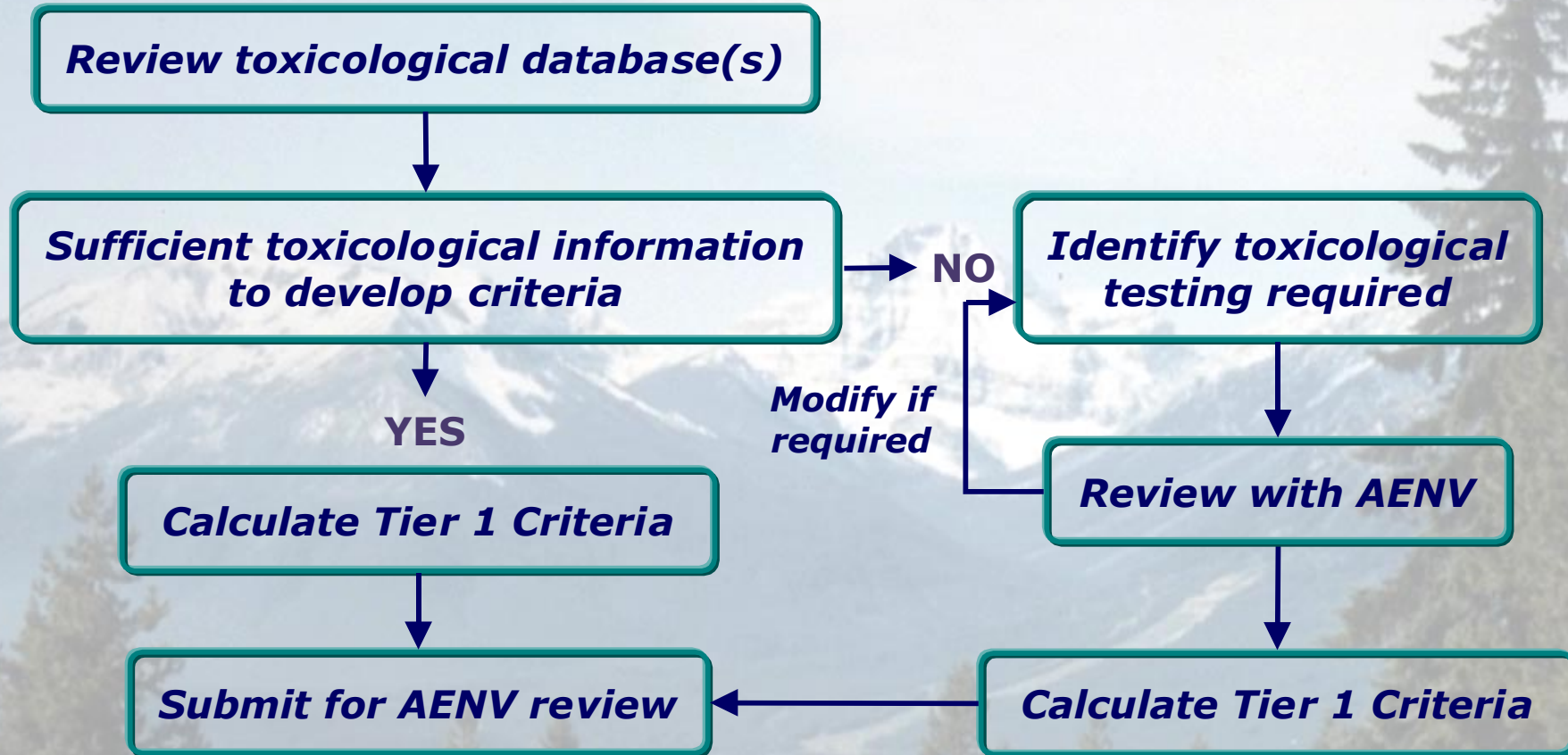
Regulatory Process



Applicable Criteria Pathways

Pathway Considered	Regulatory Justifications
Aquatic Life Protection	Applicable based on the freshwater body within 300 m of impacted soils.
Ecological Soil Contact	Applicable for all land use zones.
Human Inhalation of Indoor Air	Applicable for industrial and commercial zoning.
Human Soil Ingestion	Applicable for industrial and commercial zoning.
Human Dermal Contact	Applicable for industrial and commercial zoning.

Criteria Development Process



Status of Toxicological Databases

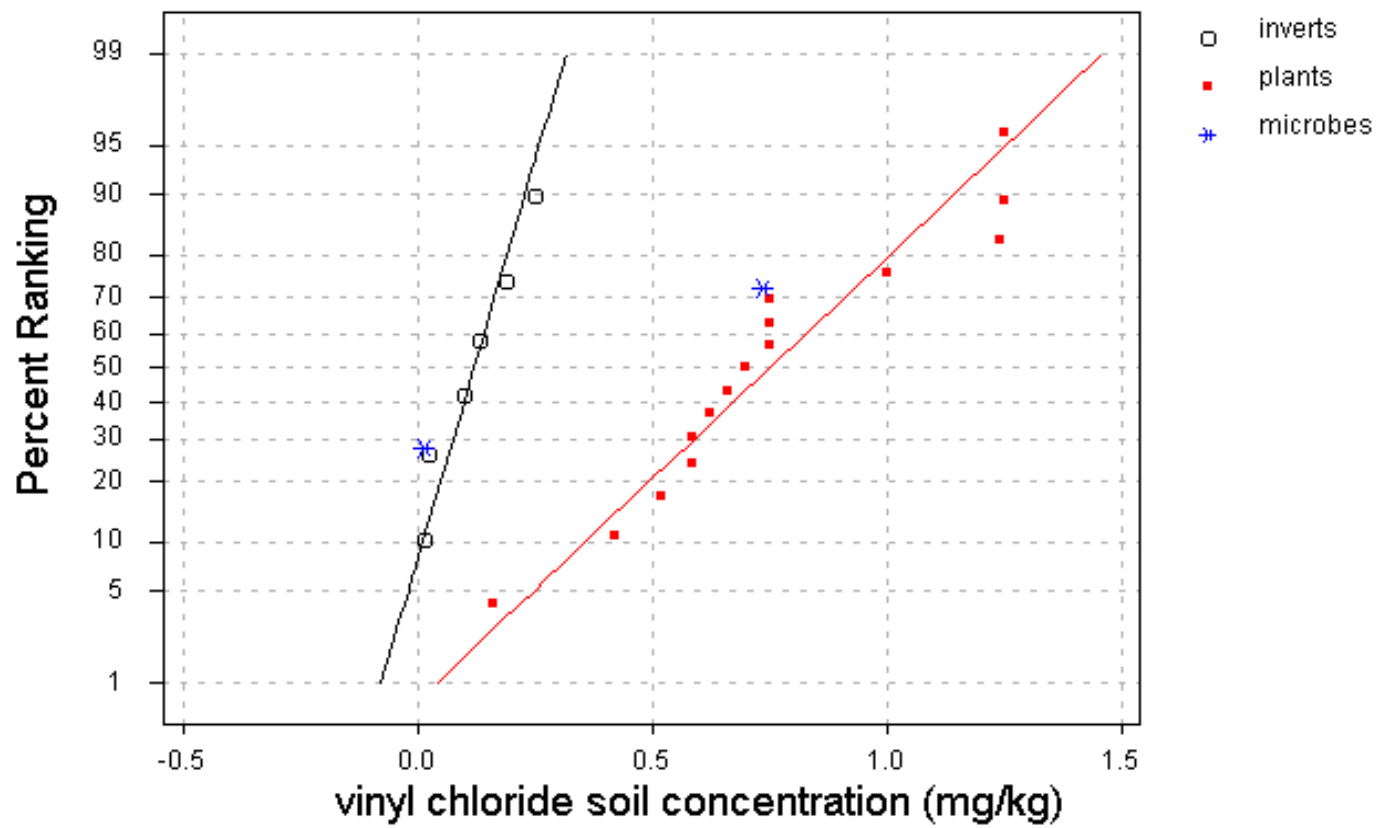
Receptor/Pathway	Toxicological Database		
	> sufficient	sufficient	< sufficient
Human ingestion	✓		
Human dermal	✓		
Human inhalation	✓		
Aquatic life		✓	
Ecological soil contact			✓

Soil Toxicity Tests Conducted

Toxicity Test	Endpoint
Microbial toxicity testing	NOEC, LOEC, EC10%, EC50%
Earthworm survival and growth	Survival : NOEC, LOEC, LC50% Growth: NOEC, LOEC, TEC
Springtail test of survival	NOEC, LOEC, EC50%
Lettuce seed germination (survival) and root elongation (growth)	Survival : NOEC, LOEC, EC50% Growth: NOEC, LOEC, IC50%, IC10%
Alfalfa seed germination and root elongation test	Survival : NOEC, LOEC, EC50% Growth: NOEC, LOEC, IC50%, IC10%
Timothy seed germination and root elongation test	Survival : NOEC, LOEC, EC50% Growth: NOEC, LOEC, IC50%, IC10%

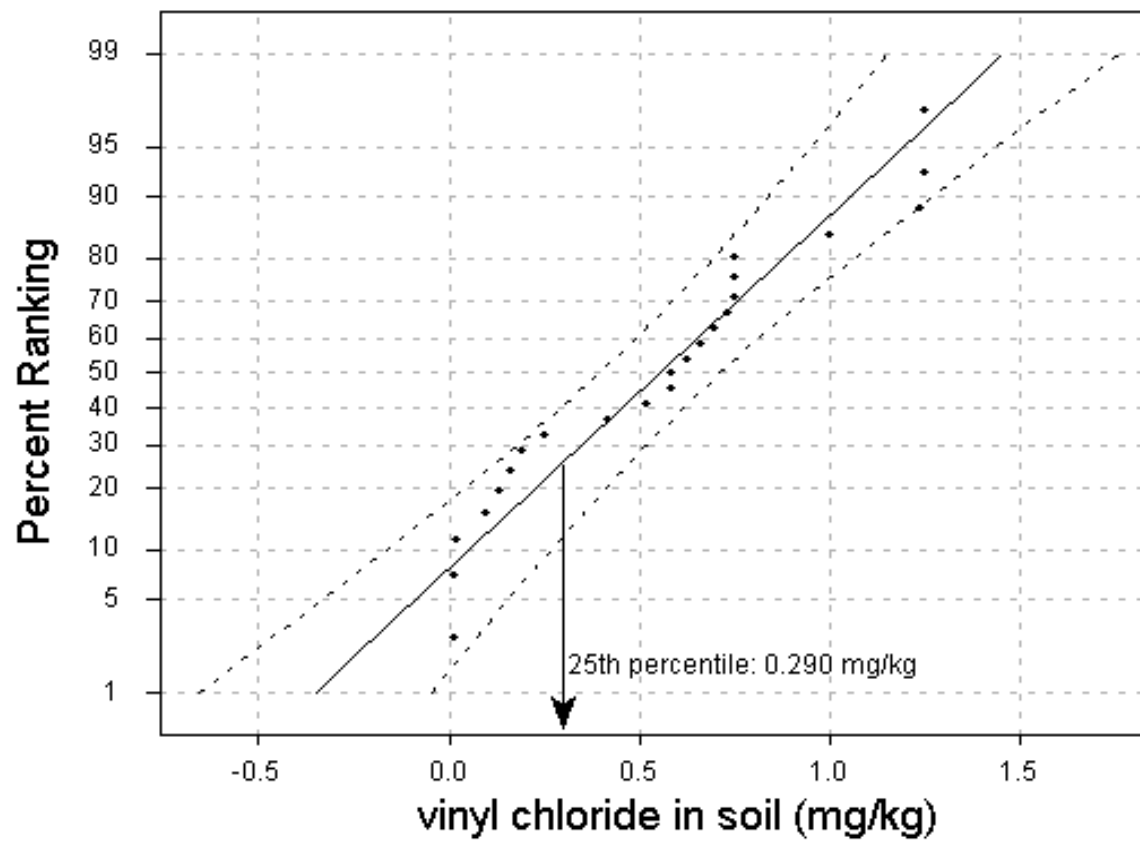
Ecological Effects Data – Taxon Sensitivity

Figure E3: Normal Probability Plots



Ecological Effects Data – Combined

Figure E4: Normal Probability Plot for Combined Data



Vinyl Chloride Criteria

Exposure Pathway	Symbol	Units	Criteria Magnitude
Human Health (indoor vapour inhalation)	SQG _{HH}	mg/kg soil	10 ⁻¹
Freshwater Aquatic Life	SQG _{AL}	mg/kg soil	10
Ecological Soil Contact	SQG _{SC}	mg/kg soil	10 ⁻¹
Human Health (indoor vapour inhalation)	GWQG _{HH}	mg/L groundwater	10 ⁰
Freshwater Aquatic Life (>10m)	GWQG _{AL}	mg/L groundwater	10
Freshwater Aquatic Life (<10m)	GWQG _{AL}	mg/L groundwater	0.6

Outcome

- Alberta specific vinyl chloride Tier 1 Criteria in the final review stages.
- Following the establishment numerical criteria, remediation planning can proceed.
- Significant remediation cost savings with a high level of human and environmental protection achieved.

Tier 1 Process versus Site Specific Risk Assessment

- Tier 1 process achieves regulatory closure.
- Tier 1 Criteria apply broadly across similar land use and soil type settings.

Up Next...

Regulatory Process for Tier
3A Criteria Development.

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