

AENV Tier 2 Guidelines in Remediation Planning

RemTech 2008

Miles Tindal – Axiom Environmental



AENV Tier 2 Guidelines in Remediation Planning

Or . . .

“What Can Tier 2 Do for My Site”

RemTech 2008

Miles Tindal – Axiom Environmental



Talk Objectives



- Review the Three Levels of Tier 2
- Identify Main Contaminant Groups
- Explore What Tier 2 Can (or Can't) Do for Each
- Take Home:
 - Ability to assess contaminants for Tier 2 Potential

August 2008 – New AENV Documents:

**ALBERTA TIER 1
SOIL AND GROUNDWATER
REMEDIATION GUIDELINES**



**ALBERTA TIER 2
SOIL AND GROUNDWATER
REMEDIATION GUIDELINES**



AENV Management Levels

Management Levels

**Exposure
Control**

Tier 2

Tier 1

AENV Management Levels

Management Levels

Exposure
Control

Tier 2

Tier 1

AENV Management Levels

Management Levels

Exposure
Control

Administrative/Physical
Controls Employed

Site-Specific Risk Assessment
(no restrictions)

Tier 2

“Guideline Modification”

“Pathway Exclusion”

Tier 1

Application of Tier 1



AENV Management Levels

Management Levels

Exposure
Control

Administrative/Physical
Controls Employed

Site-Specific Risk Assessment
(no restrictions)

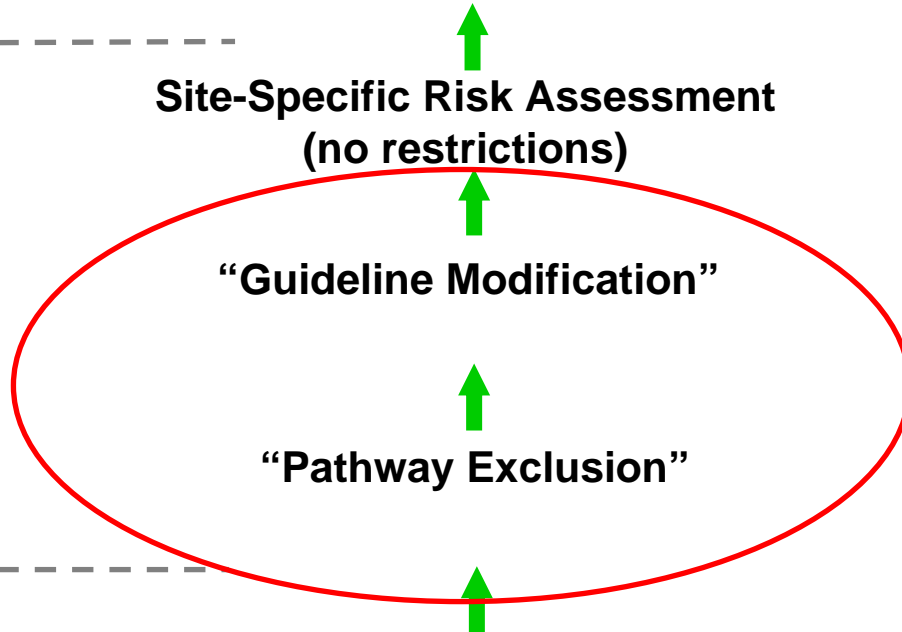
Tier 2

“Guideline Modification”

“Pathway Exclusion”

Tier 1

Application of Tier 1



The Real Question

- Will Tier 2 Help With My Site?

General Principles

- **Straightforward Tier 2 Options Most Likely to be Available when:**
 - Limiting exposure pathway
 - For the limiting contaminant
 - Is an indirect pathway
 - (e.g., groundwater, vapour)

Limiting Contaminant

- Limiting Contaminants:
 - Are only those that drive remedial decisions
- Many or Most Sites can be Reduced to a Single Limiting Contaminant
- Few Sites Have More than 2-4

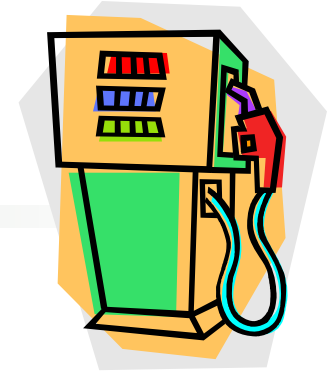
Contaminant Groups Discussed

- BTEX and F1
- F2 and F3
- Metals
- Chlorinated Solvents
- Salts

Disclaimer

- Everything in This Presentation is:
 - A generalization;
 - A simplification; or
 - Both.

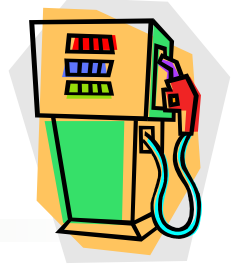
BTEX and F1



- Soil Guidelines:
 - Residential, Fine Soil, mg/kg

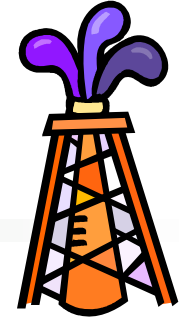
Pathway	Benzene
Human Contact	78
Vapour Inhalation	1.6
Protection of DUA	0.046
Direct Contact (Eco)	60
Prot. of Aquatic Life	73

BTEX and F1



- Benzene Typically (but not Always) Limiting
- Lots of Tier 2 Options:
 - Eliminate or Modify DUA Pathway
 - Modify Vapour Inhalation Pathway
 - Eliminate or Modify Freshwater Aquatic Life

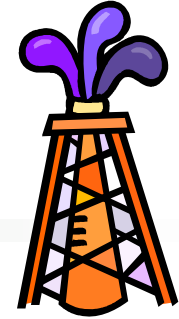
F2 and F3



- Soil Guidelines:
 - Agricultural, Fine Soil, mg/kg

Pathway	F2	F3
Human Contact	6,800	15,000
Vapour Inhalation	3,100	-
Protection of DUA	1,500	-
Direct Contact (Eco)	150	1,300
Prot. of Aquatic Life	-	-
Wildlife Soil and Food	9,800	16,000

F2 and F3 – Tier 2 Opportunities



- Eco-Contact is Always Limiting
- Only Option is Based on Toxicity Testing
- Cost likely in the range \$25K-\$100K
- Likelihood of Success?
 - Poor for untreated diesel or crude
 - Better for thoroughly biotreated material

Metals



2 Groups of Metals:

- Human Health Limited
 - Arsenic, lead, cadmium, mercury,
 - Check for elevated background As (especially BC)
 - Otherwise, no realistic options at Tier 2
- Limited by Plant Health
 - Chromium, copper, nickel, zinc
 - Toxicity testing may be worth considering

Metals



3 Special Cases:

■ Barite-barium

- Revised AENV guideline expected soon
- New SQG expected to be order of 10,000 mg/kg
- But will require total Ba analysis by fusion-ICP or fusion-XRF

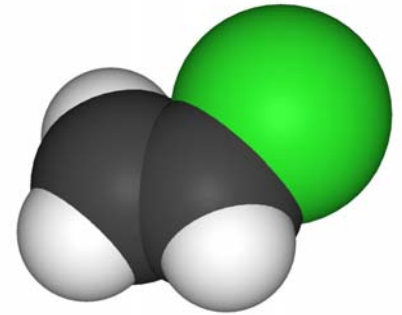
■ Boron

- Existing SQG is 2 mg/kg for hot water soluble (HWS) Boron
- Ongoing PTAC project may offer some help
- Saturated paste B may be better than HWS Boron

■ Selenium

- SQG is 1 mg/kg, detection limit is 0.2 mg/kg
- Background Se seems very variable in Alberta, sometimes > SQG

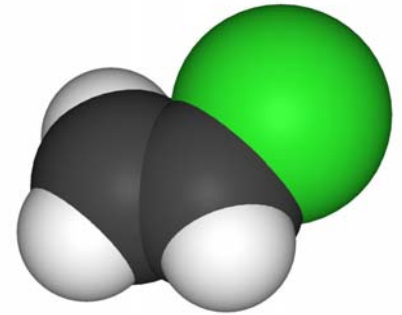
Chlorinated Solvents



- Soil Guidelines:
 - Residential, Fine Soil, mg/kg

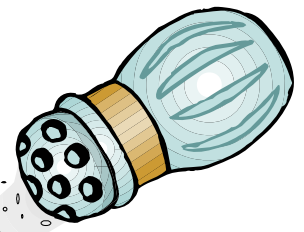
Pathway	Vinyl Chloride
Human Contact	71
Vapour Inhalation	0.008
Protection of DUA	0.014
Direct Contact (Eco)	-
Prot. of Aquatic Life	-

Chlorinated Solvents – Tier 2 Opportunities



- Typical Limiting Contaminant:
 - VC
 - TCE
 - PCE
 - (cis-1,2-DCE)
- Lots of Tier 2 Options:
 - Eliminate or Modify DUA Pathway
 - Modify Vapour Inhalation Pathway
 - Eliminate or Modify Freshwater Aquatic Life

Salts



- AENV Tier 1 SQG Based on Plant Toxicity
- No Easy Solutions at Tier 2
- Consider Using PTAC Subsoil Salinity Tool
 - Develop stratified remediation plan
 - Would be considered Site-Specific Risk Assessment

Summary



- Soluble and/or Volatile Organics:
 - Typically limited by indirect pathways
 - Lots of Tier 2 options
 - BTEX, F1, chlorinated solvents
- Insoluble, Non-Volatile Organics; Inorganics:
 - Typically limited by direct pathways
 - Few or more difficult Tier 2 options
 - F2, F3, metals, salts