Upstream Oil and Gas Site-Specific Risk Assessments in Alberta

Supplemental Guidance for Site-Specific Risk Assessments in Alberta

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Risk Based Closure

Alberta's closure regime aims to prevent an adverse effect on human and environmental health, while providing various options to tailor closure to site-specific scenarios.

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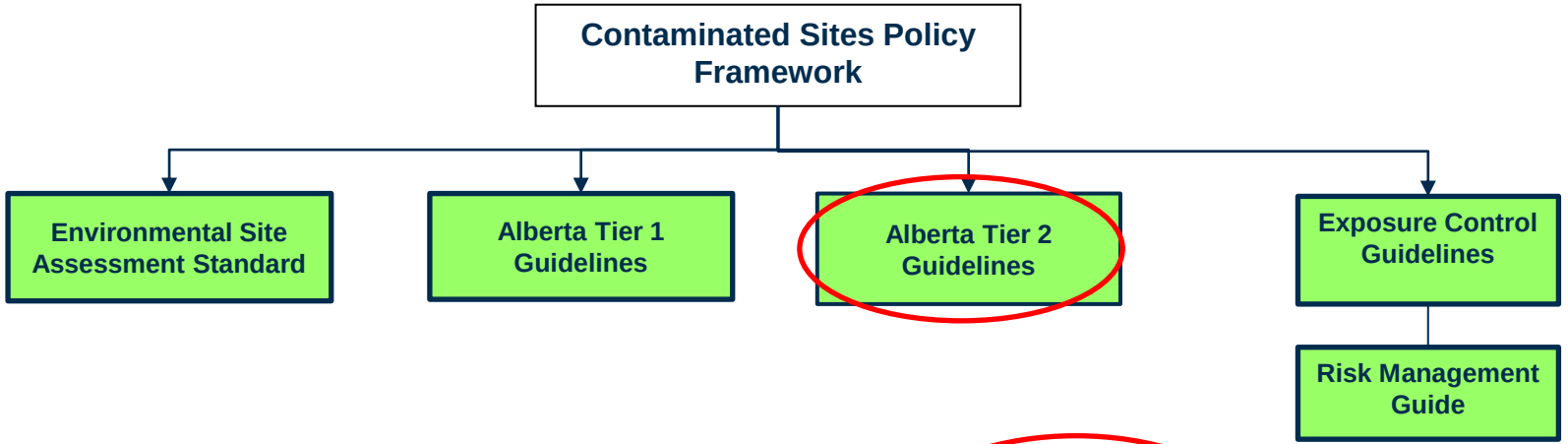
Outline

1. Contaminated Sites Overview
2. When to use Tier 2
3. Types of Tier 2 Applications
4. Site-Specific Risk Assessments (SSRA) Overview
    a. Types of SSRA
    b. SSRA vs Exposure Control

Contaminated Sites Overview



Examples

- Subsoil Petroleum Hydrocarbon Guidelines for Remote Forested Sites in the Green Area
- Guide to Excluding the Domestic Use Aquifer Based on Municipal Bylaws
- Supplemental Guidance on Site Specific Risk Assessments
- Native Prairie Protocol for Reclamation Certification of Salt-Affected Wellsites
- Subsoil Salinity Tool
- Guidance for Selecting Toxicity Reference Values for Alberta Tier 1 and Tier 2 Soil and Groundwater Remediation Guidelines

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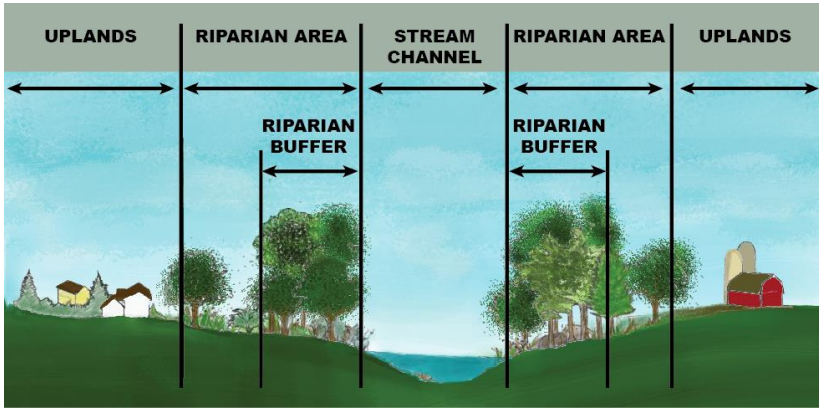
When to use Tier 2

- Land and water use that does not conform to Tier 1 generic categories
- Site-specific factors invalidate Tier 1 modelling
- Greater exposure than considered at Tier 1
- More sensitive receptors than Tier 1



When to use Tier 2

- Contamination within 30 cm of building foundation
- Presence of unusual structural features (e.g. earthen floors)
- Groundwater flow to stagnant surface water body
- Contamination within 10 m of surface water body
- Very coarse sediments (e.g. gravel)
- Fractured bedrock
- Source length >10 m and volume >300 m^3
- Inorganic contaminants in organic soil

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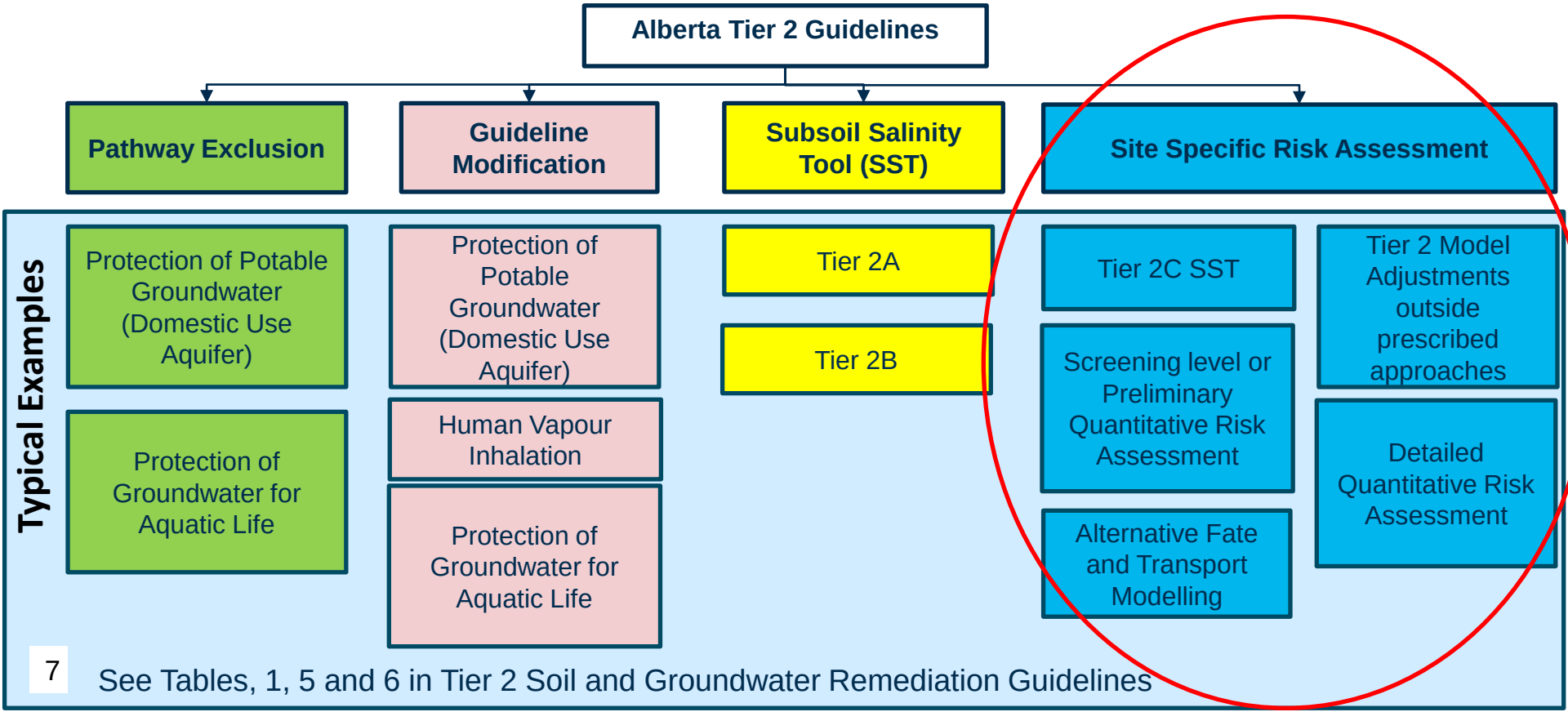
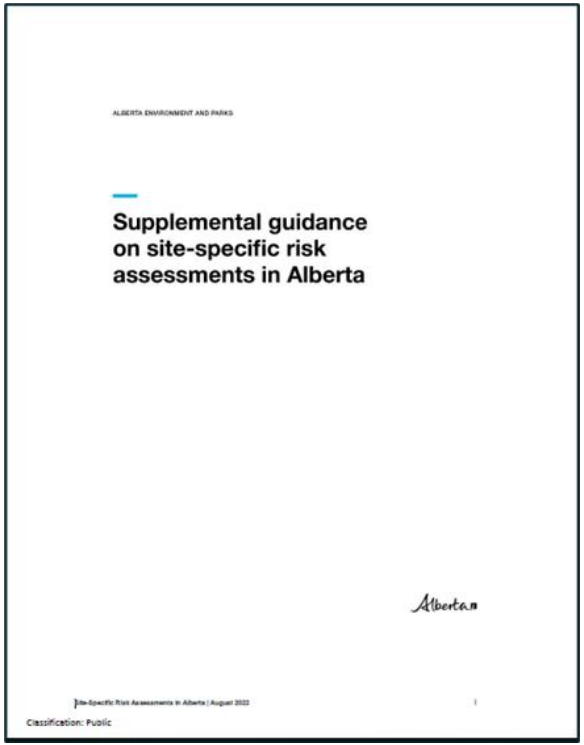
Types of Tier 2 Applications

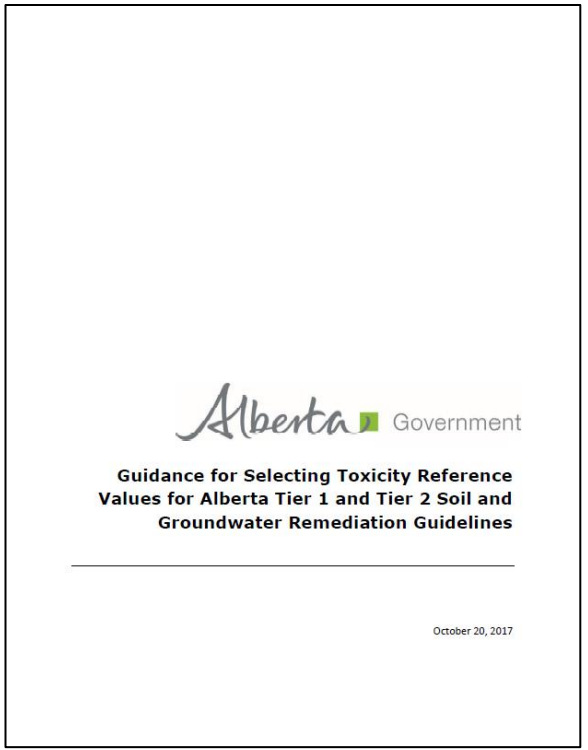


See Tables, 1, 5 and 6 in Tier 2 Soil and Groundwater Remediation Guidelines

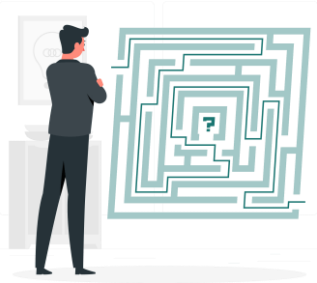
Site-Specific Risk Assessment Overview

- Builds on principles outlined in Alberta Tier 2 Soil and Groundwater Remediation Guidelines.





Site-Specific Risk Assessment Overview



Increase in SSRA Complexity

- Single, simple source
- 1 exposure pathway
- No groundwater impact/simple stratigraphy
- Monitoring data is extensive and precise

- Multiple substance releases
- >2 exposure pathways
- Complex hydrogeology
- Limited monitoring data

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Types of Site-Specific Risk Assessments

Tier 2 Model Adjustments

- **Outside** of the Illustrated ranges for **Tier 2 Guideline Modifications**.

Table C-1 Primary Tier 2 Adjustable Parameters and Illustrative Ranges

Parameter	Default	Illustrative Range
Measured Parameters		
Bulk Density (g/cm^3)	c/g: 1.7 f/g: 1.4	c/g: 1.5 - 1.8 f/g: 1.3 - 1.6
Moisture Content (gravimetric) (M_w/M_s)	c/g: 0.07 f/g: 0.12	c/g: 0.03 - 0.15 f/g: 0.07 - 0.16
Organic Carbon Fraction (g/g)	0.005	c/g: 0.0005 - 0.007 f/g: 0.0005 - 0.03
Soil Vapour Permeability (cm^2)	c/g: $6x10^{-8}$ f/g: 10^{-9}	c/g: 10^{-6} - 10^{-8} f/g: 10^{-8} - 10^{-12}

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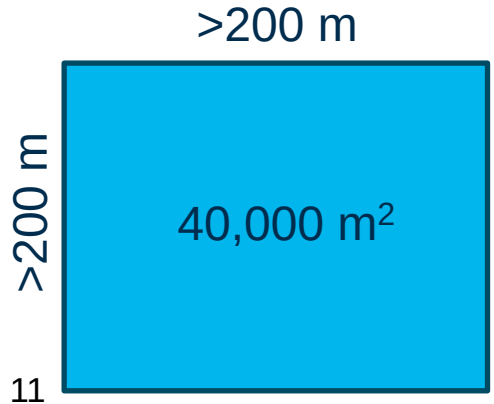
Types of Site-Specific Risk Assessments

- **Tier 2C Subsoil Salinity Tool**
  - Do not meet the default assumptions used in the SST for Tier 2A/2B.
- Examples:



Distance from source to Freshwater Aquatic Life (FAL)
<25 m - Total source dimensions ≤25 x 25 m
<50 m - Total source dimensions >25 x 25 m but <50 x 50 m
<100 m -Total source dimensions >50 x 50 m

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Types of Site-Specific Risk Assessments

- **Alternative Fate and Transport Modelling**
  - Model selection must consider:
    - applicability and relevance to the transport media and processes,
    - defensibility and regulatory acceptance of the model(s), and
    - availability of appropriate data.
  - Intake models used in the development of the Tier 1 Guidelines must be used in an SSRA
  - All deviations from Tier 1 models must be documented
  - Proprietary models are not recommended

Types of Site-Specific Risk Assessments

Screening Level or Preliminary Quantitative Risk Assessment (PQRA)

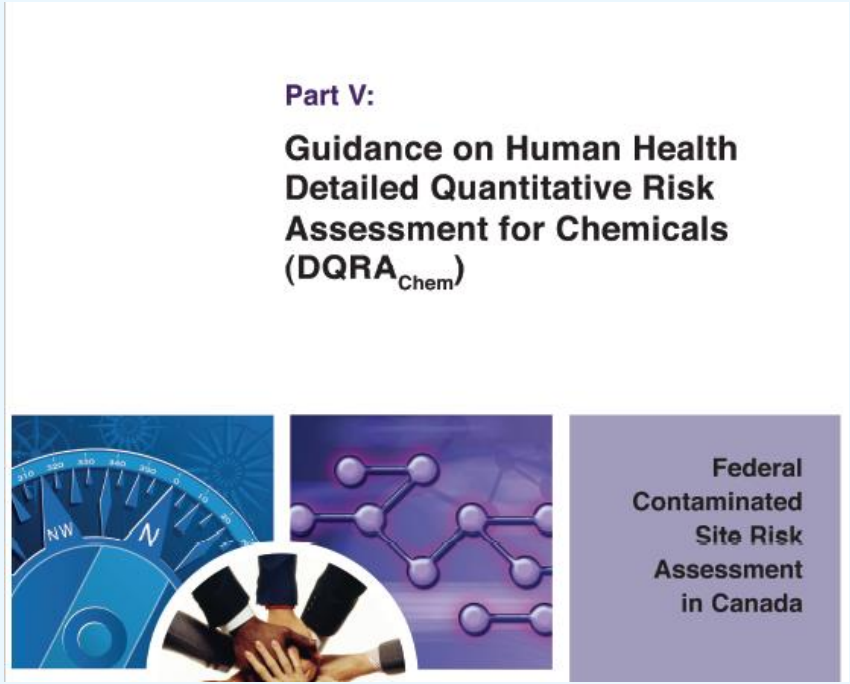
$$HQ = \frac{Exposure}{Threshold\ Effect\ Level}$$

- maximum contaminant concentration
- default parameters
- conservative assumptions related to contaminant exposure and transport
- use simple exposure models to obtain a conservative estimate of risks

Types of Site-Specific Risk Assessments

Detailed Quantitative Risk Assessment (DQRA)

- additional data collection
- refinement of conservative assumptions, input parameters and modelling methods



SSRA vs Exposure Control

Risk assessment **without** exposure control measures

Guides **selection** and **design** of exposure control measures

Risk Management Plan

Update risk assessment with additional scenarios

Demonstrates that proposed controls adequately address identified risks

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YOU MADE IT TO THE END!
WOOHOO!