Regional Risk Assessment of Salinity Impacts on Wellsites in Southeastern Alberta

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The Medicine Hat Region

- Brown Soil Zone
- Dry Mixed Grass Ecoregion
- Primarily native prairie, some cultivated
- Rare species
- Natural sulphates, natural chlorides, presence of hypersaline lakes
- Low groundwater table
Beautiful...
The Medicine Hat Region
The Medicine Hat Region

Chappice Lake
Sam Lake
Many Island Lake
The Medicine Hat Region
The Medicine Hat Region
Rationale for the Project

- **Sites**: high density; shallow gas wellsites
- **Impacts**: salinity related, low to moderate, but prevalent
- **High degree of similarity**: region, sites, impact type, assessment type
Project Goals

- Use a consistent approach, acceptable to AER
- Minimize assessment and remediation costs
- Remain protective of the environment, but reduce unnecessary remediation
Project Initiation

- Group of 17 sites; chosen from a much larger pool
- Applied following approach
  - Pool background data
  - Assess each site for closure
  - Create decision tree to assess applicability and appropriateness
  - Use generic Tier 2 assessments to categorize sites
Background Soil Data

- Collected regionally
- Eventually compared to and combined with site-specific
- Baseline of data
  - Background chloride
  - Background EC and SAR with depth (SCARG guidelines)
Site Assessments

- Conducted to generic SST standards, except:
  - Use of modified background chloride
  - Less background
  - Select sites chosen for baseline groundwater assessment
Decision Tree

- Stepwise approach to assess and categorize sites
- Assesses appropriateness (cost, applicability)
- Assess pertinent / sensitive site characteristics
  - Distance to FAL
  - Plume dimensions
  - Separation between impacts and groundwater
End Result

- A scheme to assess appropriateness and applicability
- Regional SCARG guidelines
- Regional SST classification scheme
Benefits

- Reduction in Tier 2 assessment costs
- Reduction in reporting costs
- Reduction in unnecessary landfill disposal
- Protection of the environment (native prairie)
Challenges

- Background chloride
- Use of statistics
- Validation / definition of the regional concept
- Regulatory
Challenges: Background Chloride

- **Origin:**
  - Surficial deposits of marine origin
  - Slowly being leached downwards – significant change at 1 mbgs

- **Issues:**
  - Delineation
  - Modelling parameters
  - Calculation of appropriate regional background value
Challenges: Use of Statistics

- **Initially**: primary means of validating assumptions
- **Going forward**: a single line of evidence supporting natural science arguments
- **Improvements**: plain language communication, documentation and transparency
- **Not going away**: still required for various comparisons, calculations and tests
Challenges: Regional Concept

- Defining of a region
  - Climate
  - Soils
  - Geology
  - Physical geography

- Discerning ‘domains’; subsets of the region which may correlate / predict background
Regulatory Concerns
Project Status

- **Feedback**: third iteration
- **Revised methodology**: end of year
- **Feedback**: ongoing, Q1–2016
- **Client**: still supportive, encouraged, looking for opportunities to expand and cost share
Replication and Cost Sharing
Questions?