

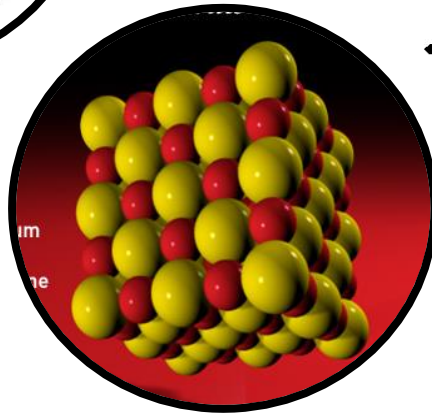


The Trouble with Salt – Case Studies and Lessons Learned

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What does Salt mean to you?



What Salt means – in BC

BC Contaminated Sites Regulation (CSR)
has standards for salt in Groundwater
and Soil

Drinking Water
is the real challenge for
landowners



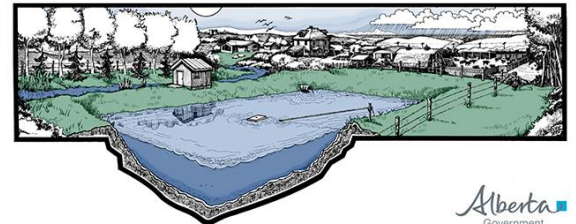
What Salt means – in Alberta

Under AB Tier I/II:

- Na and Cl regulated in groundwater
- SAR and EC regulated in soil (AL sites only)
- Policy decision - to delineate Cl in soil to 100 mg/kg (for SST to be used)

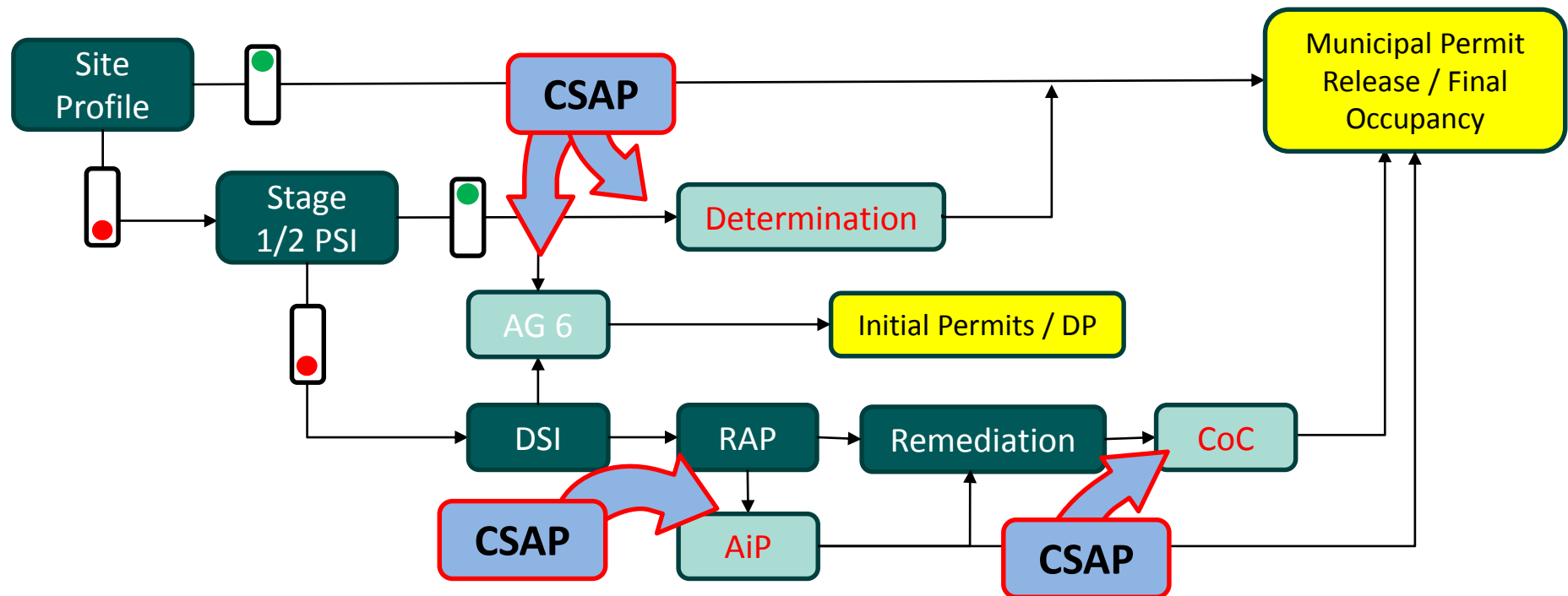
Irrigation Water (Dugouts)
often the governing
pathway

Quality **FARM**
DUGOUTS



Alberta
Government

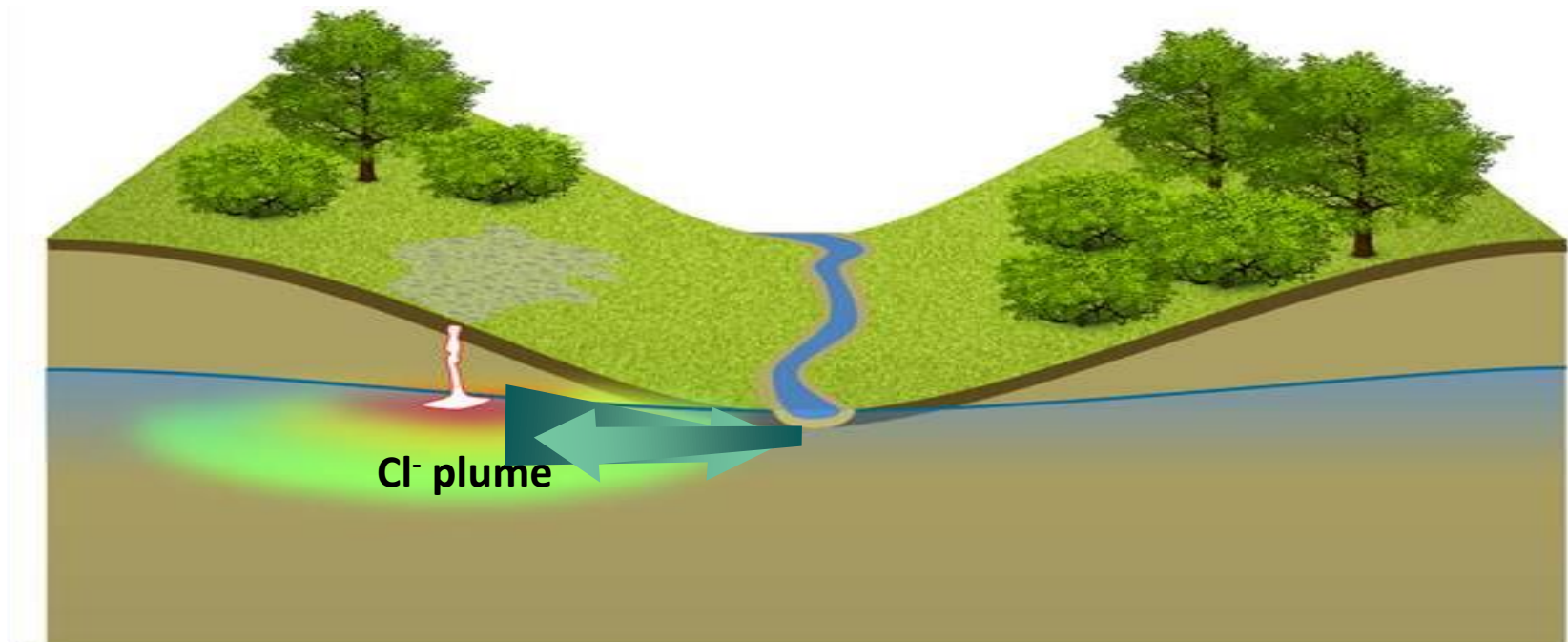
BC Regulatory Landscape



BC	Stage 1 / 2 PSI	DSI	Remediation	MOE Instrument
Alberta	Phase 1 / 2 ESA	Supplemental Phase 2	SST or Remediation	Remediation Certificate

AB - Sub-Surface Salinity Tool (SST)

BC - predict future concentrations at receptor, compare to CSR standards: is future concentration > AW?



AB – how high do source concentrations have to be to result in concentrations greater than guidelines? – compare to maximum concentration – “Guideline adjustment”

Today's Case Studies



“South Block” site in Victoria



Works Yard



Finding client-oriented solutions to salt-driven environmental challenges

Case Study #1 - “South Block”



Summer 2015: Salt Found at South Block

On-site Cl and Na concentrations in GW > DW



300 m away

Why??



It's a Parking Lot



MOE Consultation



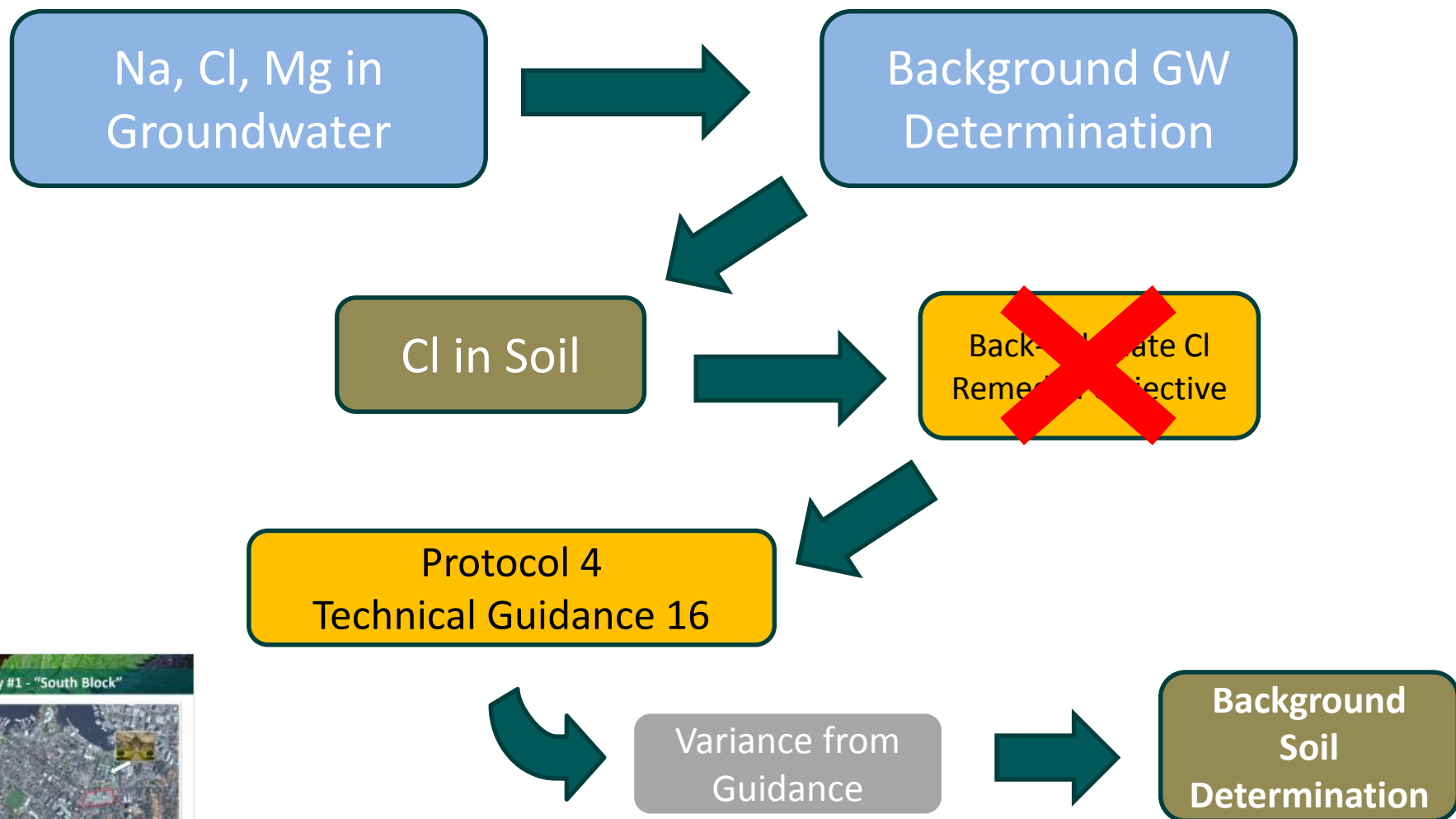
Off-Site Drilling



Off-Site Investigation Program



South Block - Salt Issues



Case Study #1 - "South Block"



Fall 2017: Protocol 21 Updated

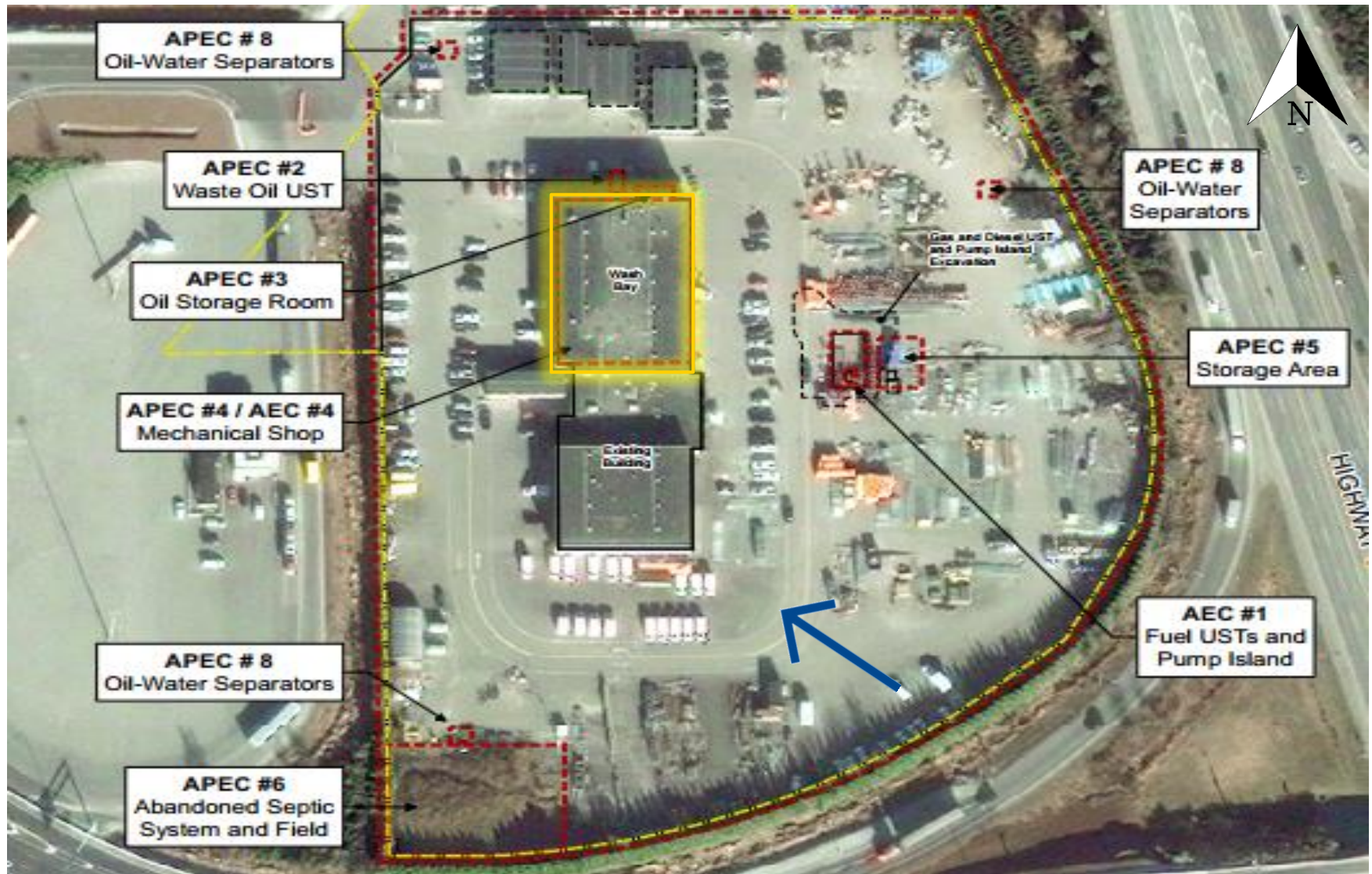
Saturated geological units that:

- are located within and below filled former marine and estuarine foreshore; or
- are located **within 500 m** of a marine and estuarine foreshore; and
- contain **naturally-occurring chloride *and* sodium** concentrations greater than the DW standards

are **unsuitable** to be used for a domestic water supply.



Case Study #2 – Works Yard



Works Yard – Salt Issue

Na and Cl plumes in GW > CSR

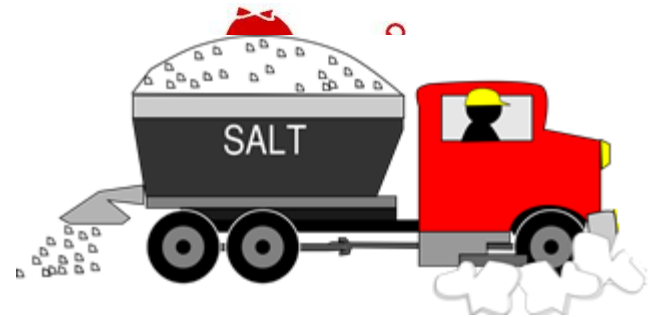
and

Widespread / undelineated Cl in soil > CSR



Not close to
ocean

Why??



Salt / Brine Truck

Groundwater - Sodium

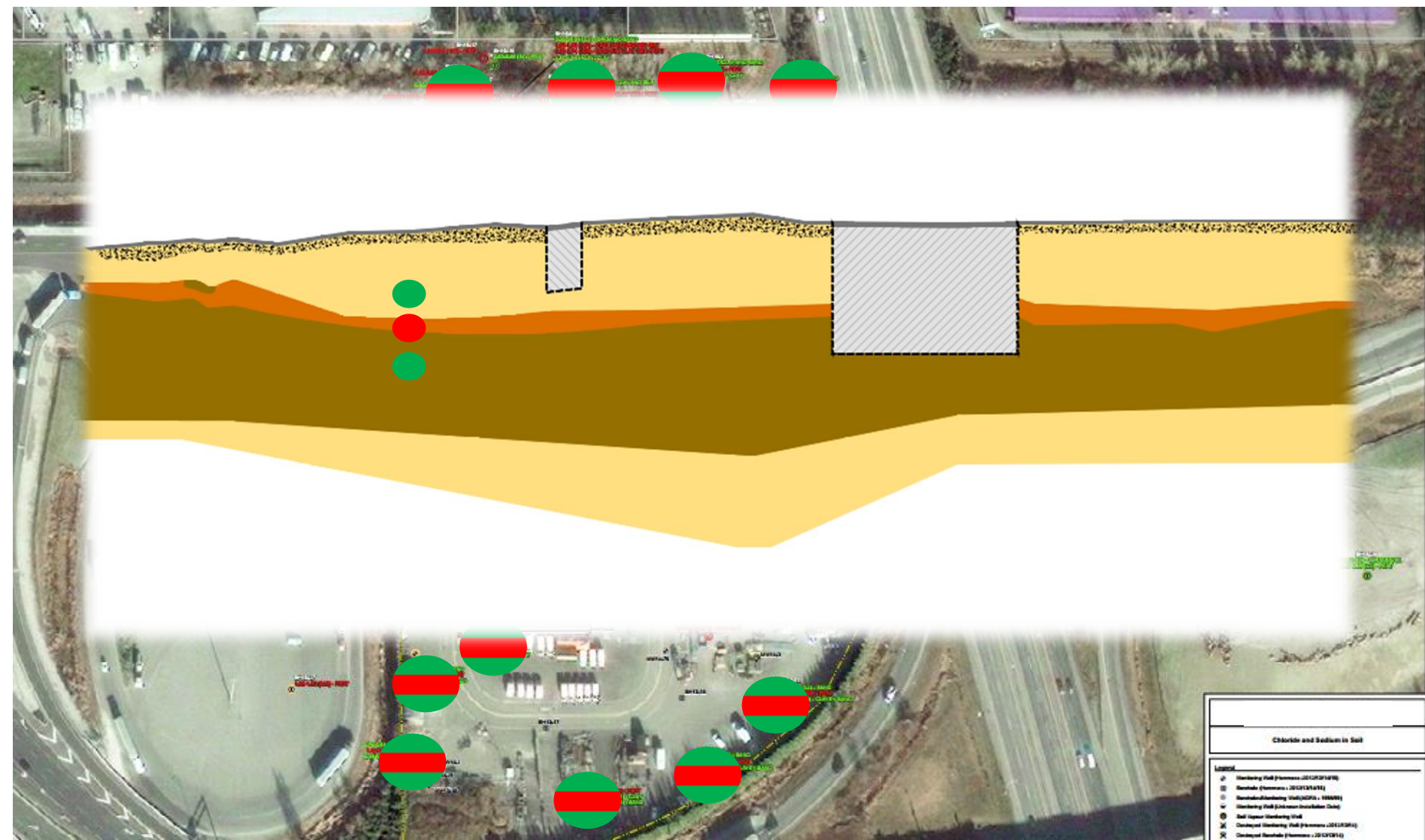


Groundwater - Chloride

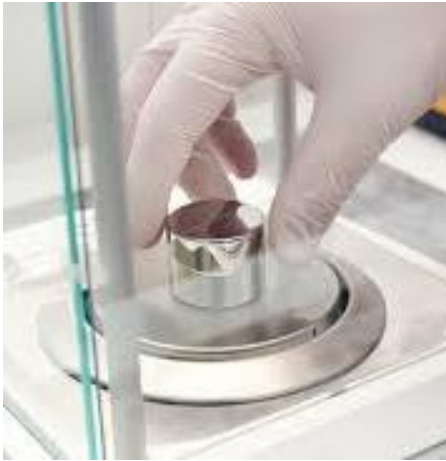




Soil – Chloride (widespread / undelineated)



Challenge - Analyzing for Salt in Soil



- Conversion of leachate results to dry weight results
- Corresponding standards were derived on different physical characteristics of mineral soils.

Result – Cl Fails in Peat!



Client Objective

Our Solution

A Certificate of Compliance

+ WISH LIST ...

1. Avoid Additional Drilling
2. Avoid Costly Background Determinations
3. Expedite Certificate

1. Issue Certificate of Compliance (in spite of undelineated CI)
2. Issue Approval in Principle for undelineated CI in peat, promising to:
 - a) delineate to **future** standards using **revised** methods OR to **current** standards using **current** analytical methods, and
 - b) support the RAP with an Evaluation of Risk.

Evaluation of Risk

3 Exposure Scenarios

- freshwater aquatic life
- humans via groundwater
- soil invertebrates and plants





And in the End ...

Certificate of Compliance issued

... AiP still not issued



Issues with Salt in Peat – BC versus AB

Issue	Details	Tendency toward under- or over-prediction of exposure concentrations?	Important Issue for site assessment in -	
			BC ? (CI)	AB ? (EC)
Loss of water from sample matrix when sampling	<ul style="list-style-type: none"> - majority of salt ion mass occurs in aqueous phase, not sorbed to solids - loss of sample water during sampling will result in loss of analyte 	Can grossly under-estimate true salt concentration	Y	Y
Expression of standard/ guideline on dry weight basis (mg/kg, not mg/L)	<ul style="list-style-type: none"> - peat bulk soil density: $\sim 0.2 \text{ g/cm}^3$ - Sandy loam: $1.6 \text{ to } 2.0 \text{ g/cm}^3$ - Peat water holding capacity (WHC) often $\gg 100\%$ - Soil WHC typically $< 50\%$ 	Can grossly over-estimate true salt concentration	Y	N
Ecotoxicity data for agronomic plant and soil invert. spp. not applicable to wetland & wildlands taxa?	- Existing BC CSR salt matrix standards derived for soil ecosystem flora and fauna, not boreal peatlands	n/a	N	N



Things Are Improving!

In BC:

- ✓ Lab methods/standards are being adjusted to reflect different soil types
- ✓ If your site is near the ocean, DW standards may be dismissed: Protocol 21
- ✓ Certificate of Compliance still possible with undelineated salt in peat soil

In AB:

- ✓ SST Version 3.0 is coming

Thank you. Questions?

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