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AER certified liability closure with site-specific risk assessment (SSRA)

The Odyssey

Presented by

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Rem Tech 2026

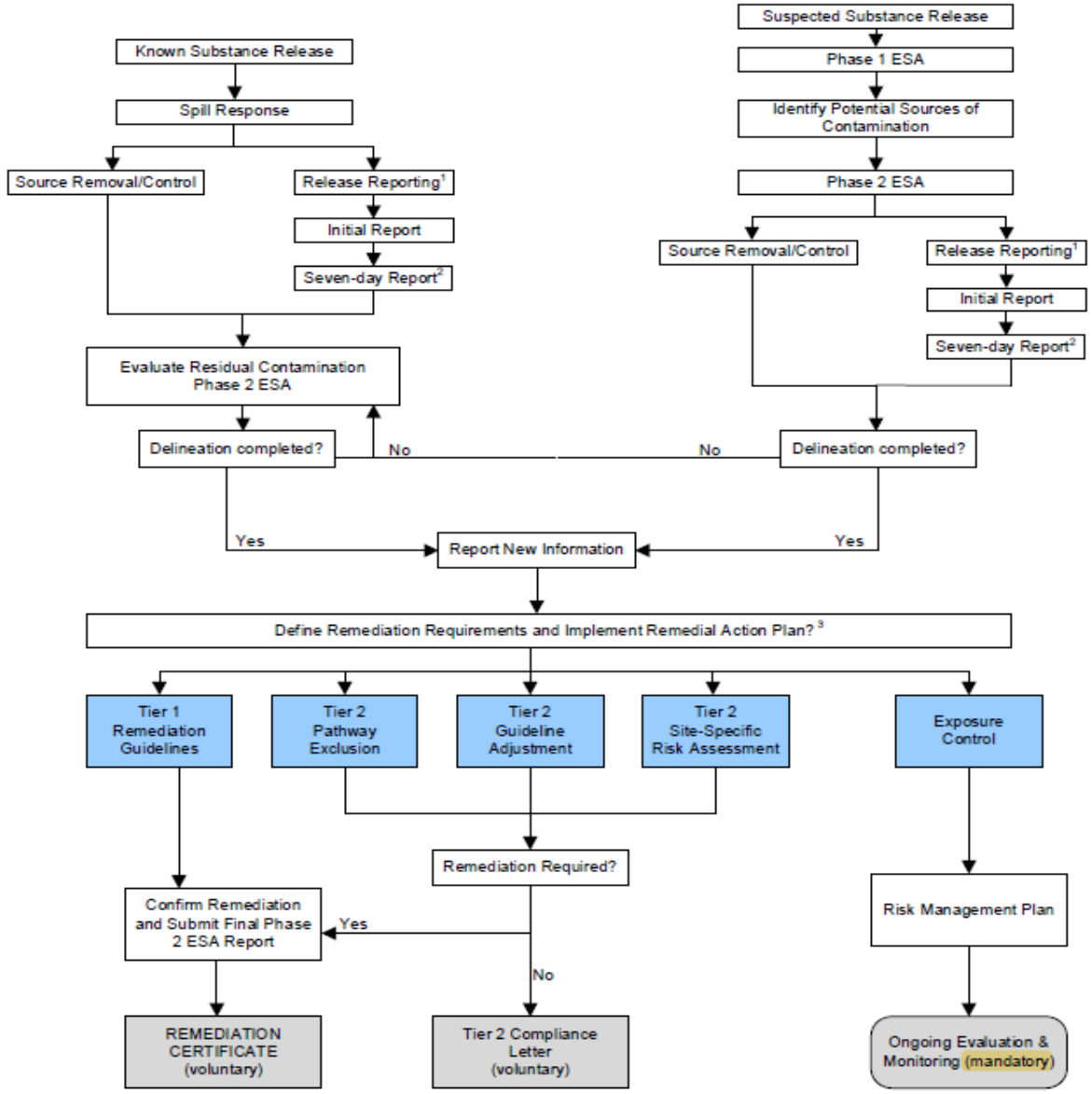
CELEBRATING 115 years in Canada


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1
Foundational policy
Site-specific risk assessment path to closure
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AB EPA land policy (2023): Framework for contaminated sites management

Tier 2 SSRA with source remediation can lead to Remediation Certification.

Tier 2 Compliance Letter
Sites meeting Tier 2 without remediation.



Framework for contaminated site management in Alberta

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2 Timeline

1950s to 2026



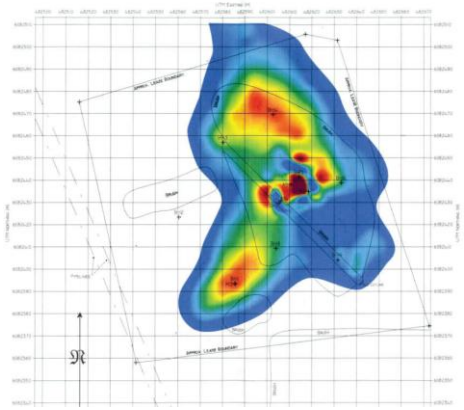
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Timeline

1950s

Battery Operation

Poorly Managed Produced Brine into Flare Pit – Surface Overflow



2014

Phase 2 ESAs & Monitoring



2000

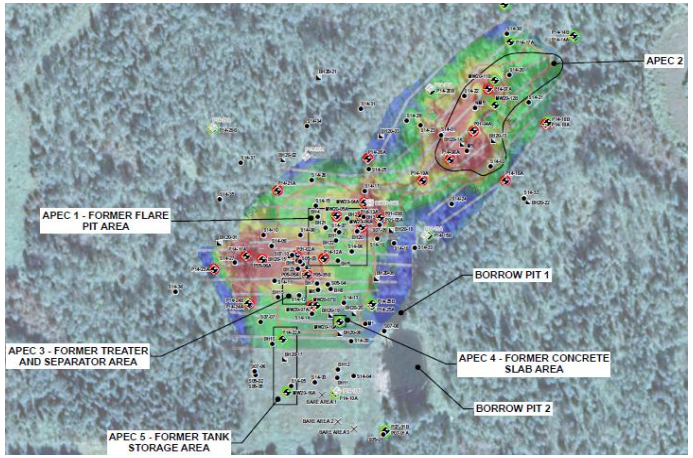
Assessment & Remediation

EM Survey and Remediation (Hydrocarbons)



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Timeline

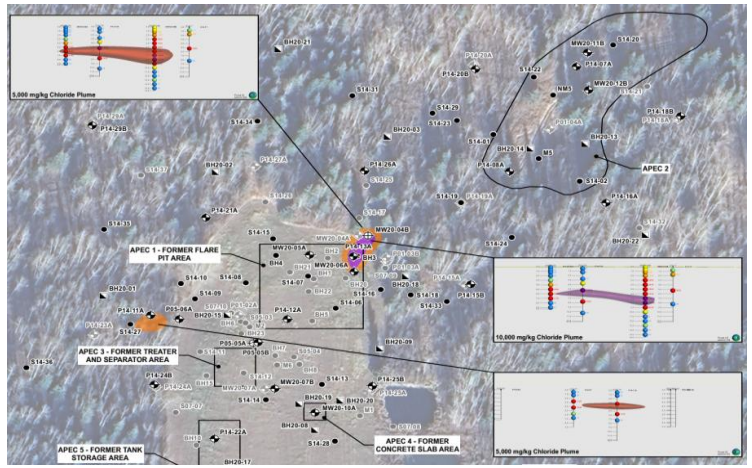


2023

AER Feedback on SSRA

Source control, delineation, future rooting zone concerns, exposure in wetland

RAP Requested



2021

SSRA

Multi-lines of evidence: SST, DSA & Wetland Assessment Biology show lack of adverse effects.

Alberta Energy Regulator

2024

RAP & Remediation

Target deep salt sources over management limits.
Backfill with site soils at depth and clean overburden.

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Timeline



2025

Addendum SSRA

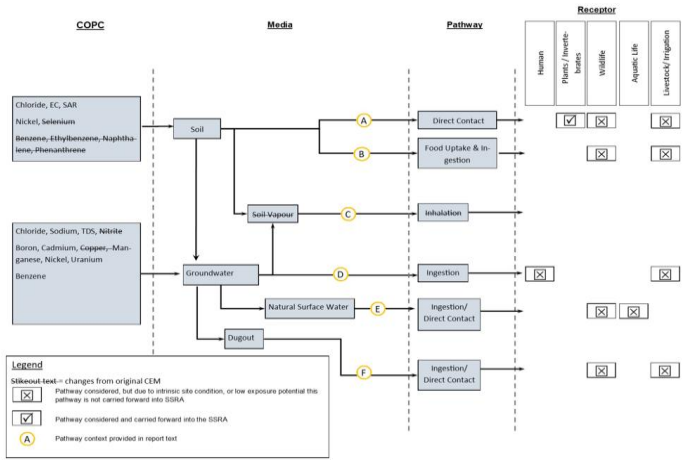
Delineation in GW declared using soil;
Characterize wetland invertebrates.

Alberta Energy Regulator

2025

Reclamation

Soil and landscape DSA
Tame pasture seeding at landowner request



2026

Rem Certificate Application

ESA, Phase 1 and 2, Remediation Report, SSRA, Addendum SSRA.

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Site-specific risk assessment
Multiple lines of evidence
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Domestic use aquifer

Natural intrinsic geological properties (fine grained) ideal for a landfill (k~ 10^{-9} m/sec)

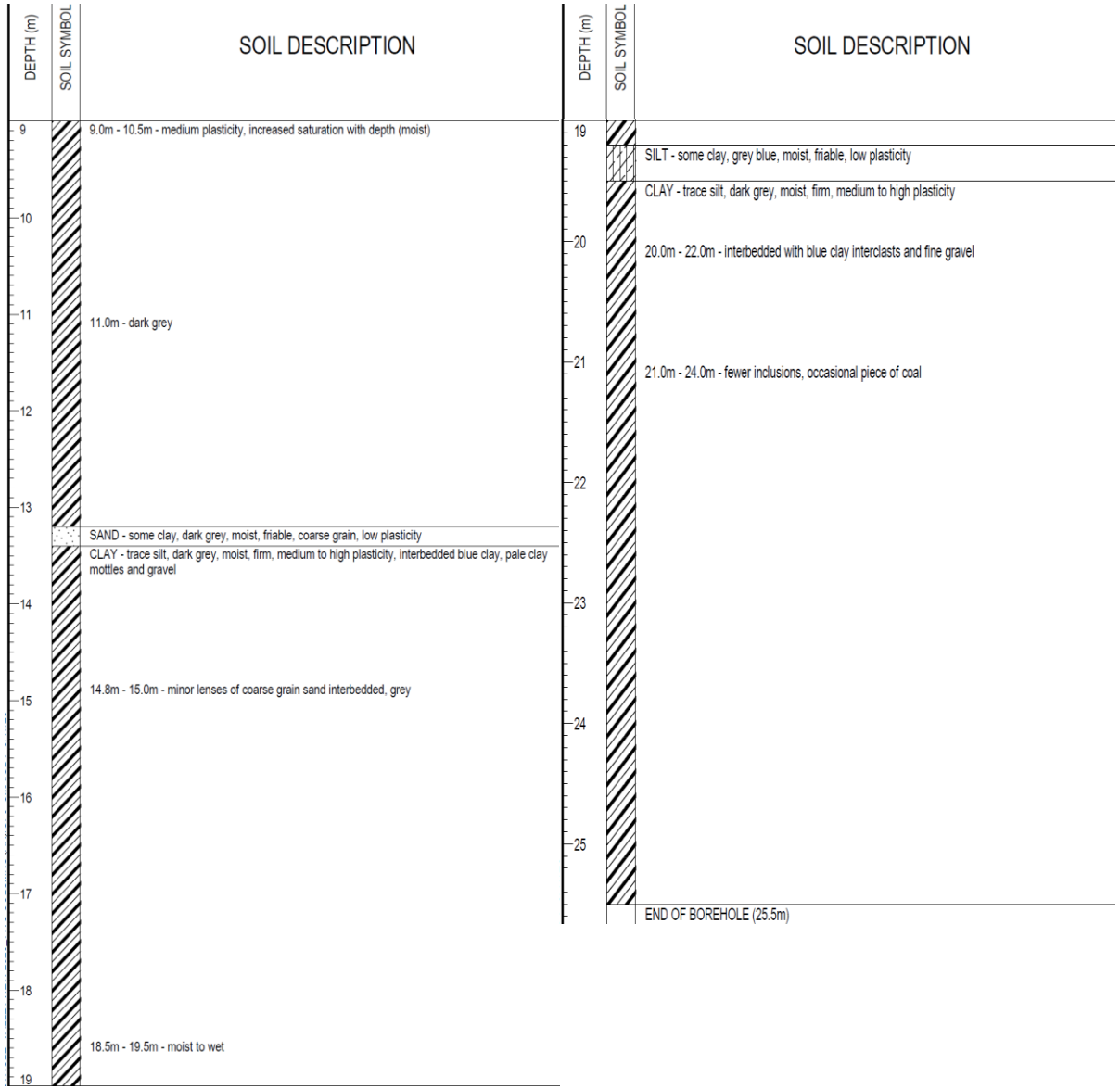
Local user

Most domestic wells into bedrock Wapiti Fm. Within 300 m radius, 3 domestic wells screened between 67-76 m below grade.

SST – Tier 2B

DUA assumed at full depth of drilling, 25 m, with default parameters.

- DUA management limits (> 10,000 mg Cl/ kg)



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Freshwater aquatic life

Wetlands 320 m downgradient supporting aquatic receptors.

SST – Tier 2B

- FAL 320 m NE with groundwater velocities between 0.017-0.021 m/year\
- FAL management limits (> 10,000 mg Cl/ kg)

.





Off-site wet meadow and treed swamp treated as a terrestrial rather than aquatic.

Soil invertebrates are dominated by mites and springtails, no different from an upland mixed wood forest.

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Terrestrial eco-contact: Rooting zone

SST Tier 2B

- Dry mixedwood with slightly dry/ semi arid climate category
- Downward gradient 0.01 and root zone drainage 1 mm/ year
- Background salinity: 95th percentile EC (3.2) and SAR (4.1), *n* = 25
- Assuming backfill to 1.5 m with average EC of 1.5, lowest subsoil guideline = **2400 mg Cl/ kg**

Detailed site assessment (June 2021)

Herbaceous dominated by marsh reed, showy aster, fireweed, dewberry, bunchberry.

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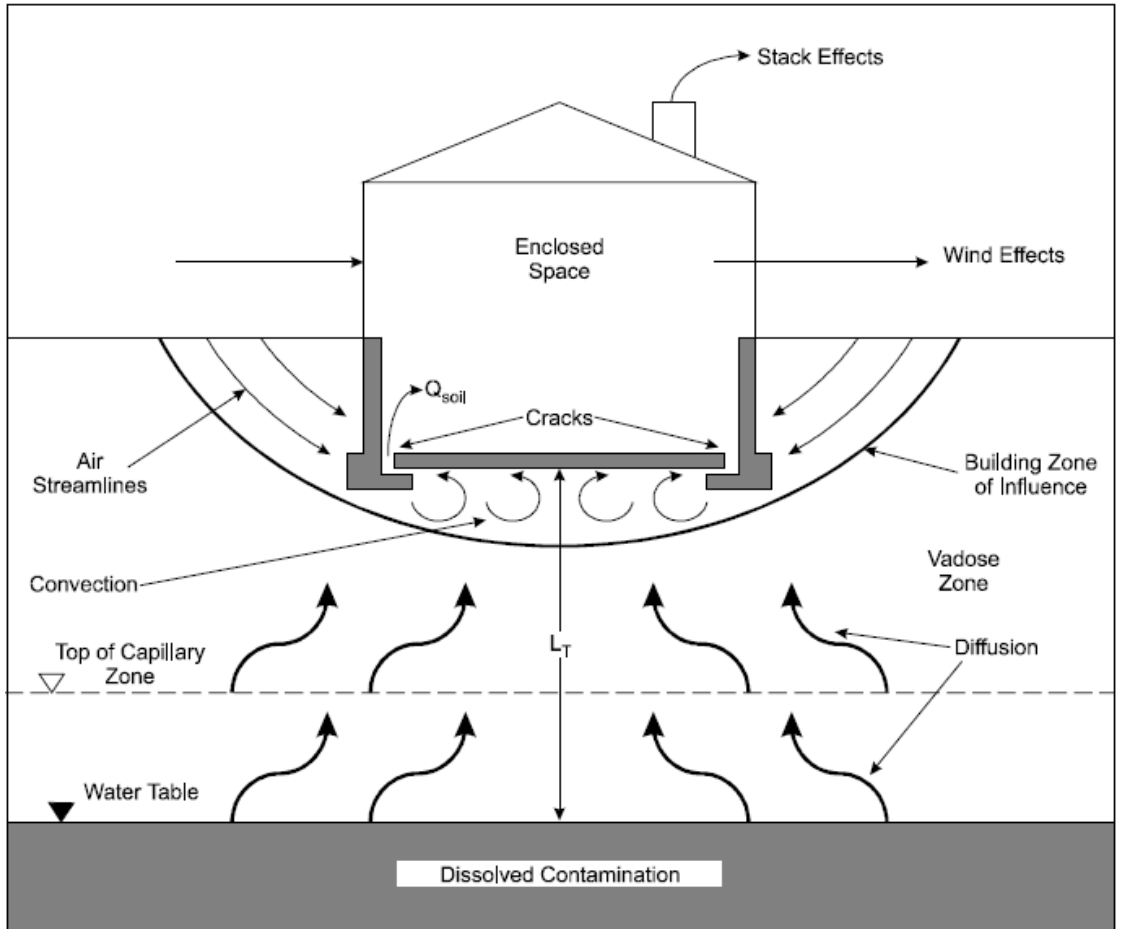
Livestock/ irrigation watering

- Natural intrinsic geological properties limit water yields from the subsurface
- Upgradient flooded borrow (dugout) with several years of water quality monitoring showing negligible exposure
- SST Tier 2B defaults to management limits



Vapour intrusion: Future scenario

- Volatile hydrocarbons were remediated in the 2000 flare pit excavation
- Poor documentation on past remediation, but several 2014 soil investigation points supersede 2000 PHC suspect data
- 2001 monitoring well in flare pit showed persistent benzene (0.05 mg/L) up to 2021, then decommissioned for 2024 remediation
- Dissolved benzene observed was one order of magnitude lower than guideline protective of intrusion (0.57 mg/L)



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Common AER concerns
Technical and administrative
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Technical hurdles from a consultant's perspective

1

Source control

Management limits removed and shrinking or stable plume.

2

Future land use capacity

Reasonably unrestricted land use and balance between current biological observations and model predictions.

3

Delineation adequacy

Subjective and the consequences of this uncertainty need to be considered.

4

Contaminants of concern and background assessment

Rigour in this area is expected to vary among consultancies.

5

Biological observation vs. model prediction

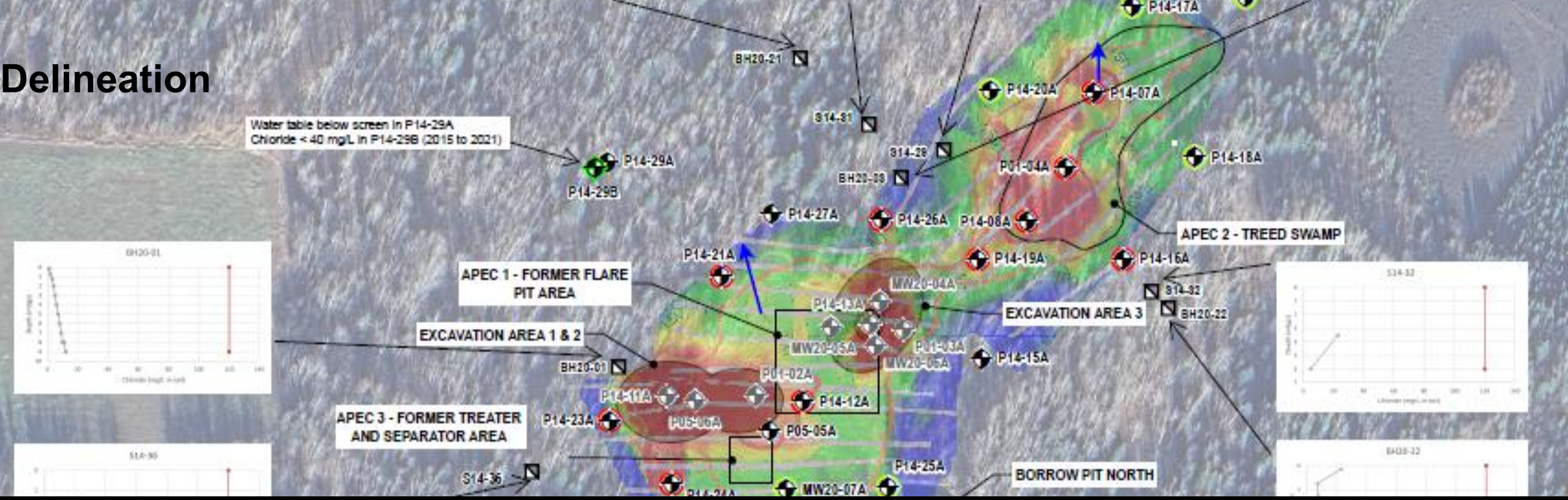
Regulatory emphasis perceived to be on models rather than on actual observations of adverse effects.

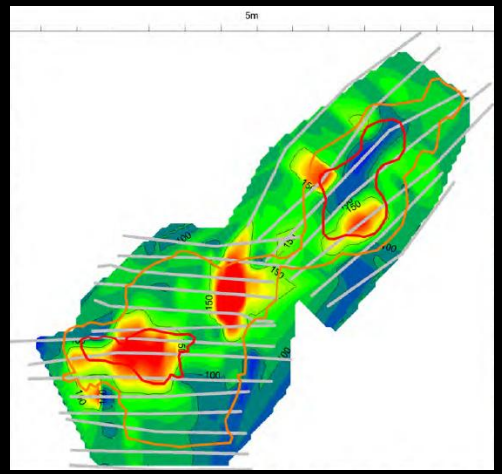
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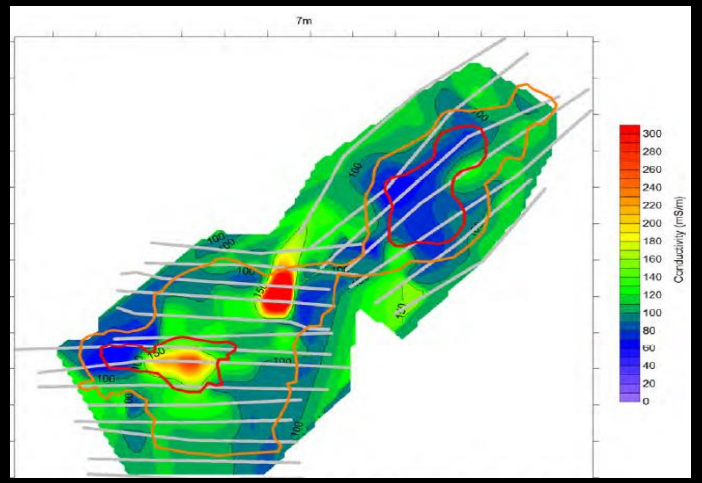
Treatment of wetlands

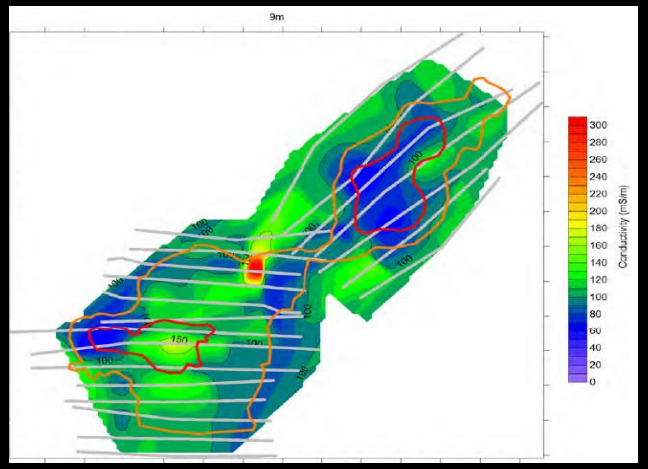
Wetland characteristics are highly variable; treating all as water bodies is not a "site-specific" approach.

Delineation







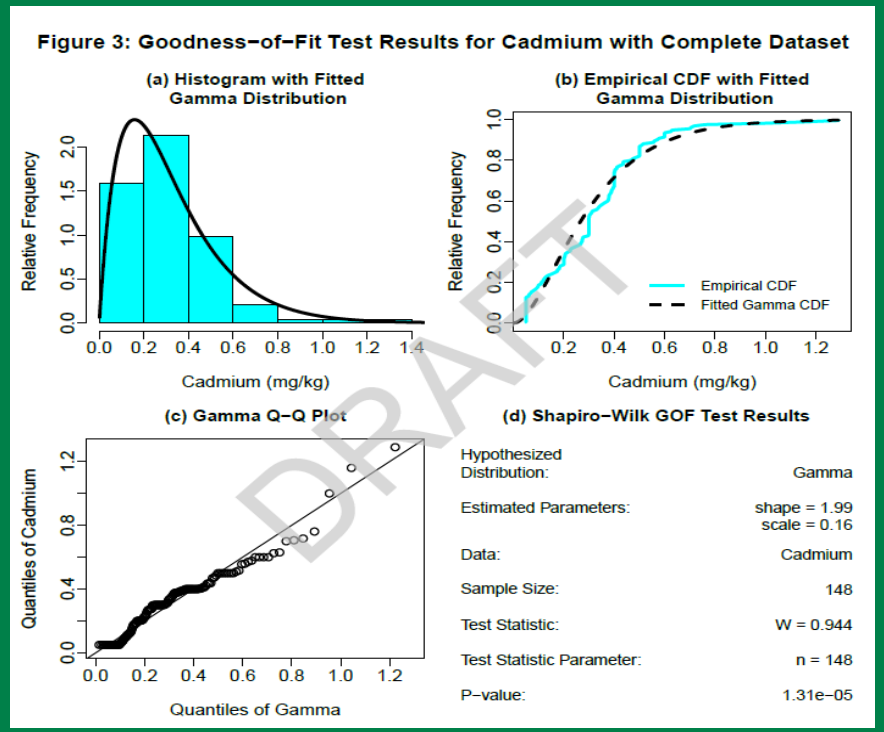


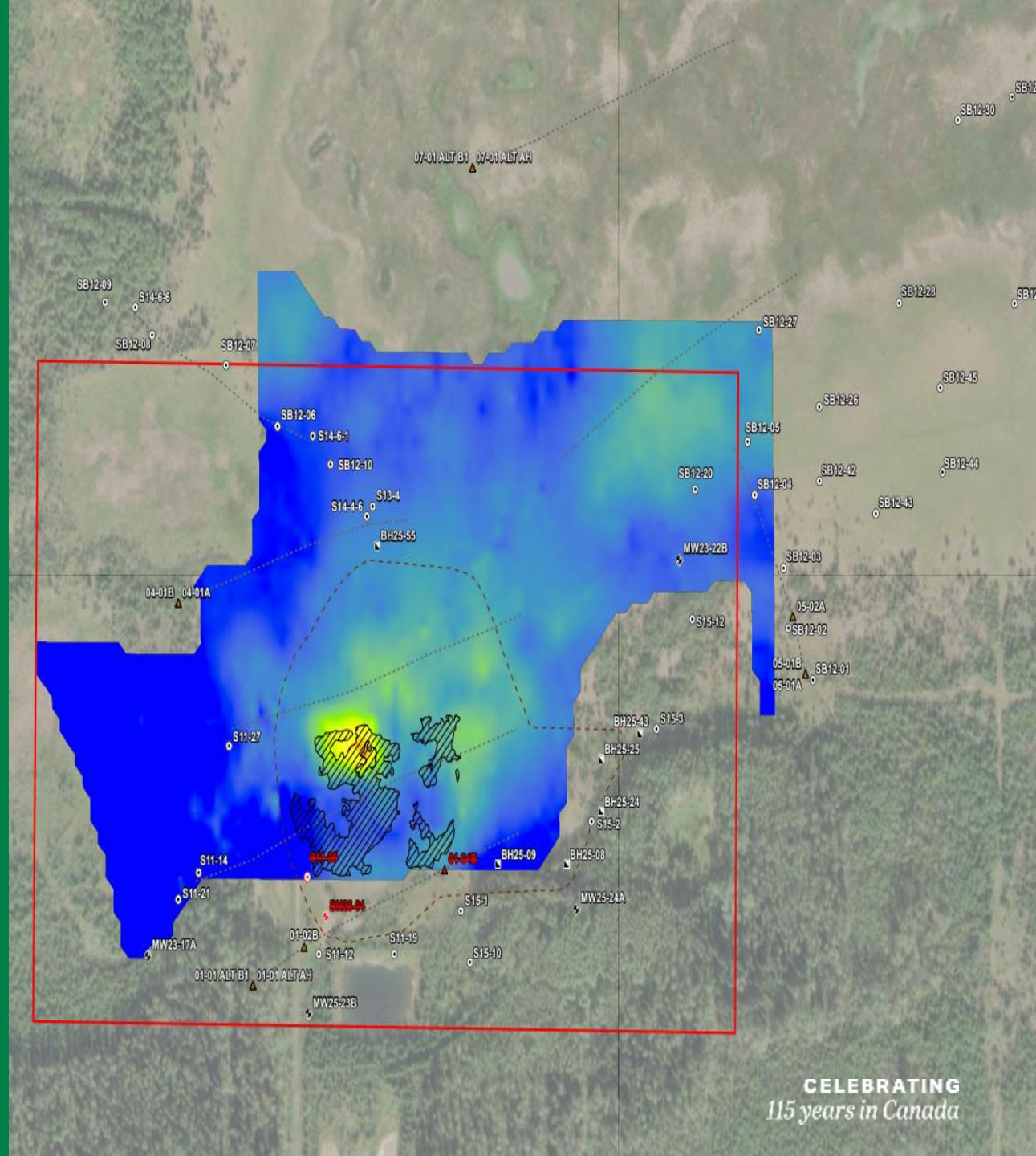
Increasing depth EM

Background best practice

Transparency | Data, statistics, documentation.

Rationale | Which data reflect the background, and why?





Future land use capacity: Does successful reclamation supersede models?

Upward transpiration component of SST model appears inaccurate

- 70 years post-release and biology suggesting a healthy rooting zone
- Downward vertical gradient in tame pasture (0.003 – 0.25 m/m) and likely wetter climate
- Salt vertical profile is downward

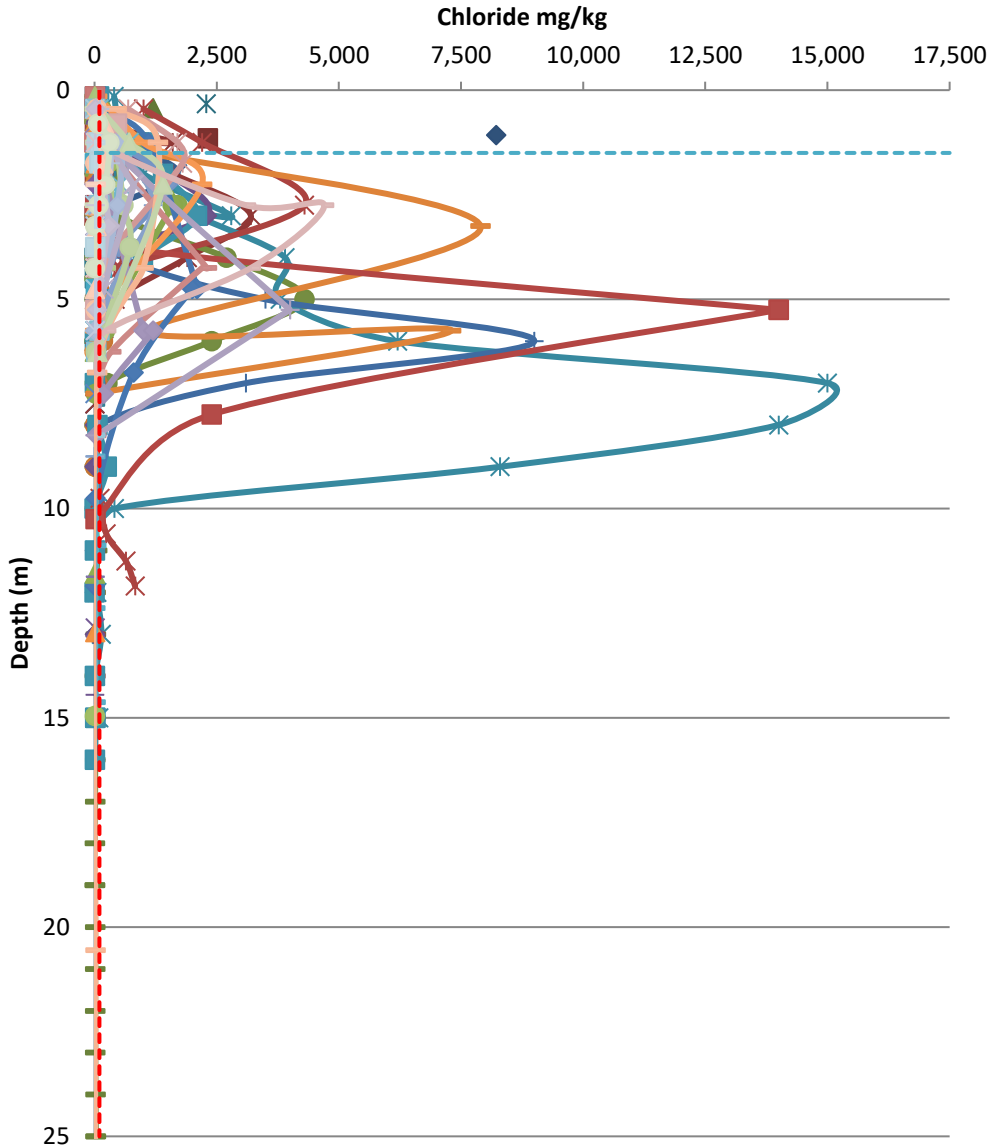
"What if" scenarios

Tame pasture changes to crops?

- Topsoil and subsoil root zone EC and SAR within background

Treed swamp cut down, filled and tilled?

- Subsoil root zone EC and SAR above background
- Healthy macroinvertebrate community



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How are other provinces tackling the uncertainty of SSRA?

British Columbia Contaminated Sites Regulation and BC Energy Regulator Risk AP

Saskatchewan Endpoint Selection Tier 3 QP



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End State Post Reclamation
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