Risk Management of Mercury Contamination during Oceanfront Park Development

SQUAMISH OCEANFRONT

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RemTech 2011

Presentation Overview

- About SODC
- SODC's long-term vision for redevelopment
- The current site setting and landscape
- Site history, operations, and remediation
- Current regulatory status and approvals
- Construction of the Oceanfront Park
- Risk-management for sediment, groundwater, and soil
- Q & A

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SODC…

- The Squamish Oceanfront Development Corporation (SODC) is wholly owned by the District of Squamish
- SODC is financed independently through the Oceanfront land asset and the ongoing current and future development activity
  - BF Renewal Funding Program: $230,000 (2010); $121,500 (2011)
  - GMF BF Grants: $43,000 (2011); $102,800 (2011)
- **SODC's Vision:** to deliver a vibrant, innovative, sustainable, world-class "work-live-recreate" community showcasing the spirit, cultural heritage and values of the people of Squamish

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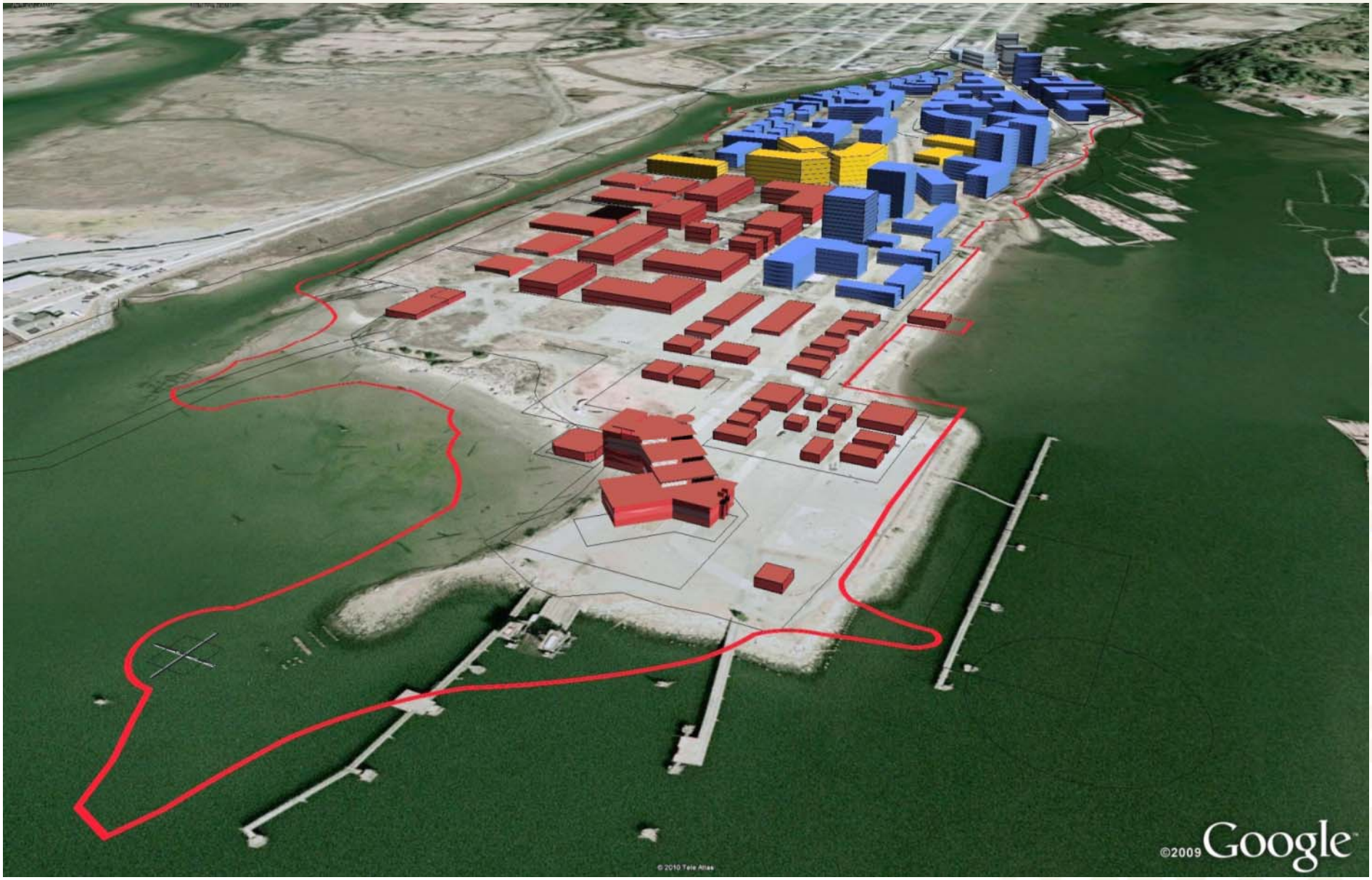
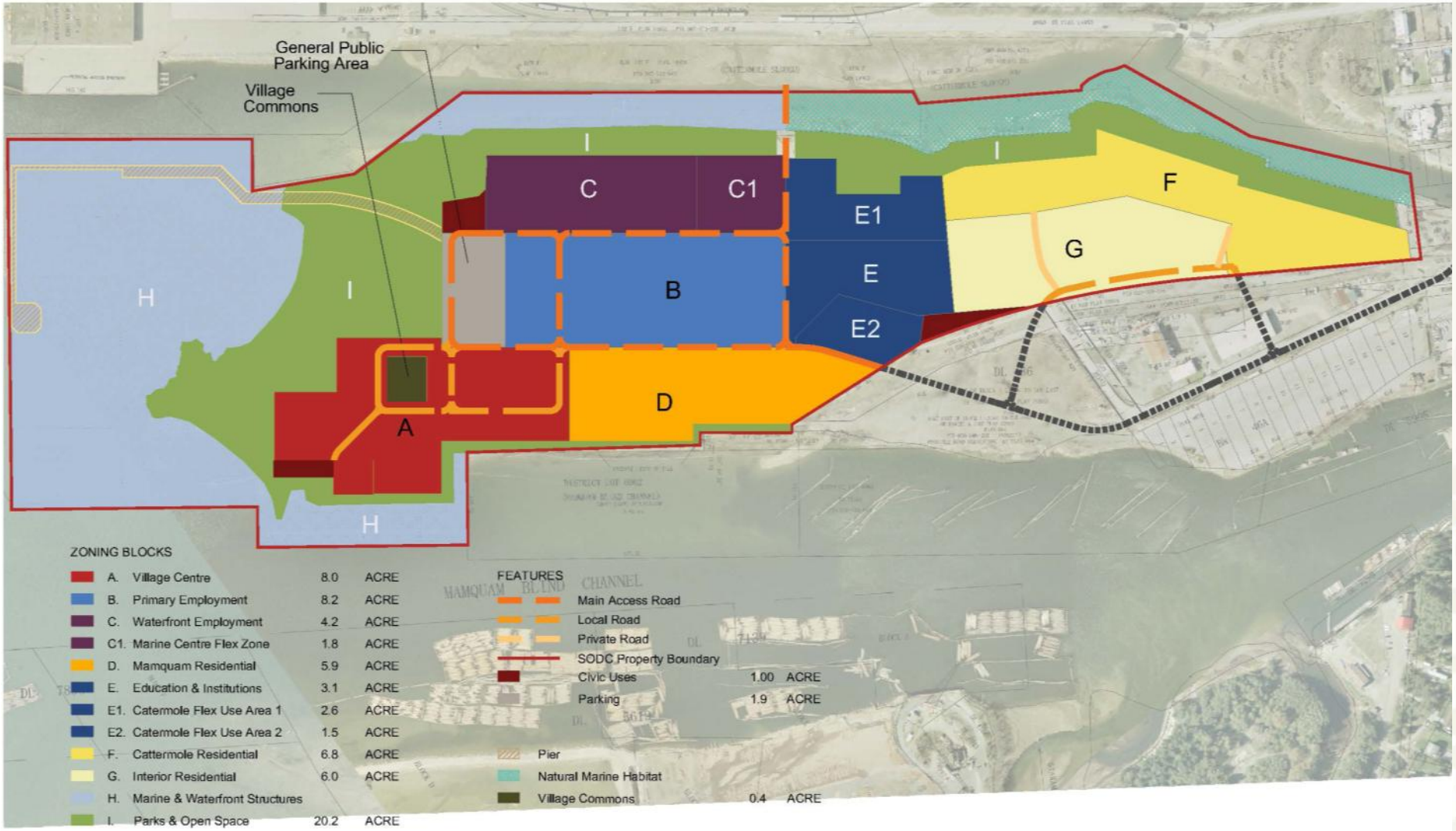
SODC's Development Vision



SODC's Land Use Plan



SODC's Public Use Vision

The Former Landscape

Plant process area, soil-holding and treatment area, and strip excavations in the Old Lagoon

The Current Landscape

Site History and Operations

- 1965 – 1992: Chlor-alkali plant produced caustic soda, hydrochloric acid, and chlorine for the pulp and paper industry
- Manufactured using mercury cell electrolysis
- Losses of mercury to the environment via plant exhaust, sludges, and process wastewater effluent
- Southern six hectares became heavily contaminated with mercury at hazardous waste levels in leachate disposal lagoon
- At peak produced 150 tons chlorine per day
- 1999 – MoE issued a remediation order

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Site Remediation

- 1999 – 2003: Site was remediated by Nexen ($40M+)
  - Soil stabilization technology used to ensure Hg not leachable
  - 24,000 T of soil washed and backfilled
  - 10,000 T of soil was stabilized for offsite disposal
  - 150,000 T of mercury-contaminated soil and sludge was shipped offsite for disposal
  - 3 T of mercury metal was recovered and recycled
  - Water treatment plant installed for groundwater remediation
- 2004: Special Environmental Award presented to Nexen by the Minister of Environment

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Current Regulatory Status

- 2004 MoE issued AiP (CL/IL land use) for the Chlor-alkali southern portion with two recent amendments:
  - 2008 modifications to gdw monitoring program
  - 2010 decommission main groundwater treatment plant (maintain smaller groundwater treatment plant on standby)
- 2005 MoE issued CoC (RL land use) for Chlor-alkali northern portion

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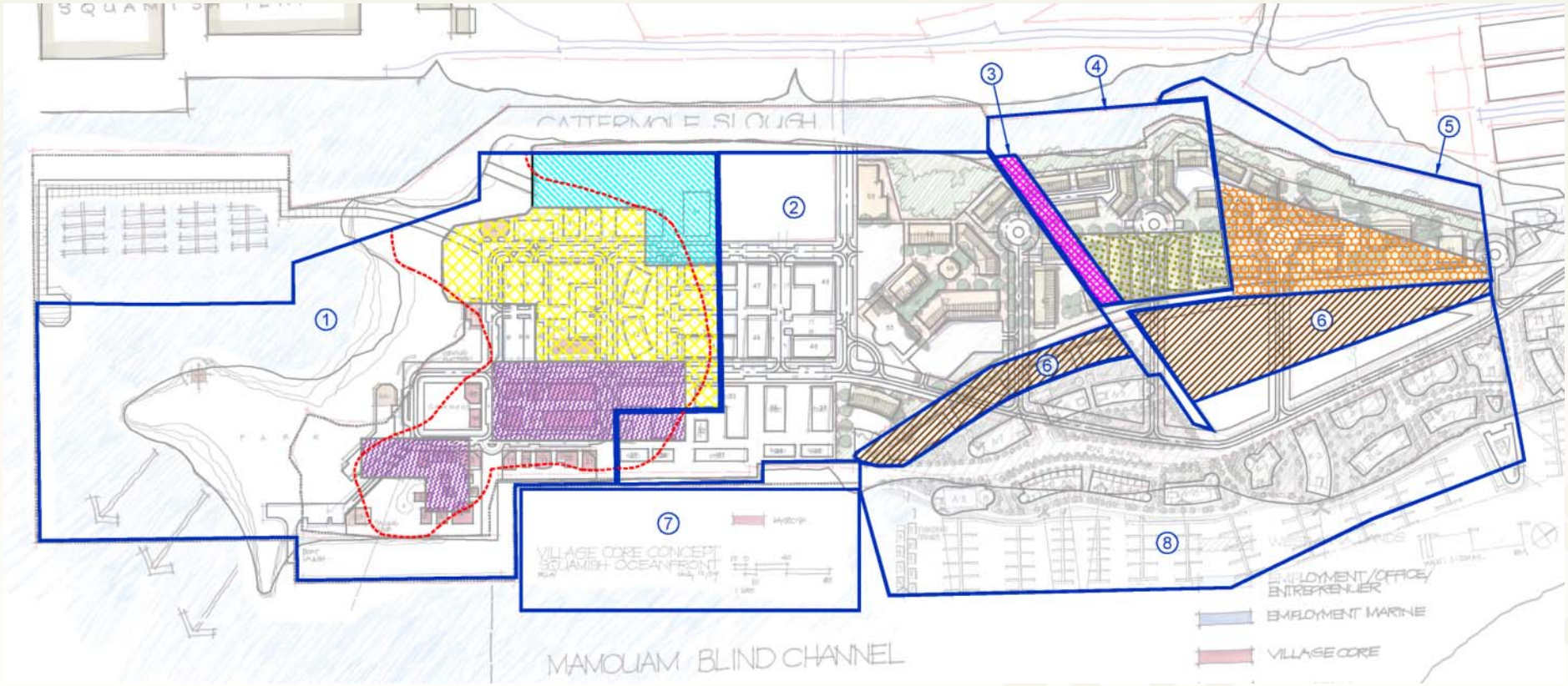
Current Regulatory Status



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Development – Oceanfront Park

1. ocean front beach
2. wind sports beach
3. dune grass area
4. land's end monument
5. crushed rock pathways
6. native shoreline planting
7. intertidal habitat
8. future phase park
9. hotel, commercial and retail
10. planted back shore dune habitat
11. existing vegetation

Development – Oceanfront Park

- Designs for the 11-acre park are complete (2011)
- EA triggered (>2.2 ha shoreline modification, and Fisheries Act Authorization)—under review (2011)
- To be constructed in three phases:
  1) Focus on the sub-tidal and inter-tidal elements (2012); construction of the eastern (main) headland, intertidal wetland, and the environmental upland features
  2) Focus on construction of the western shoreline (2013); complete the remaining intertidal wetland and upland riparian in that area
  3) Finish the coastal riparian habitat planting and upland park landscaping

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Regulatory Status – AiP Conditions

- AiP valid for CL land use and Marine Aquatic Life
- Management of groundwater through compliance monitoring and operation of groundwater P&T (if site-specific trigger levels are exceeded)
- Work to be performed in accordance with three existing Risk Management Plans:
  1) Protocol for Excavation and Soil Management
  2) Post Remediation Monitoring Program
  3) Management of Mercury Contaminated Sediment
- Restrictive Development Covenant
  - no lands may be developed unless a CoC or 'satisfactory instrument' is issued and work must comply with the risk management plans

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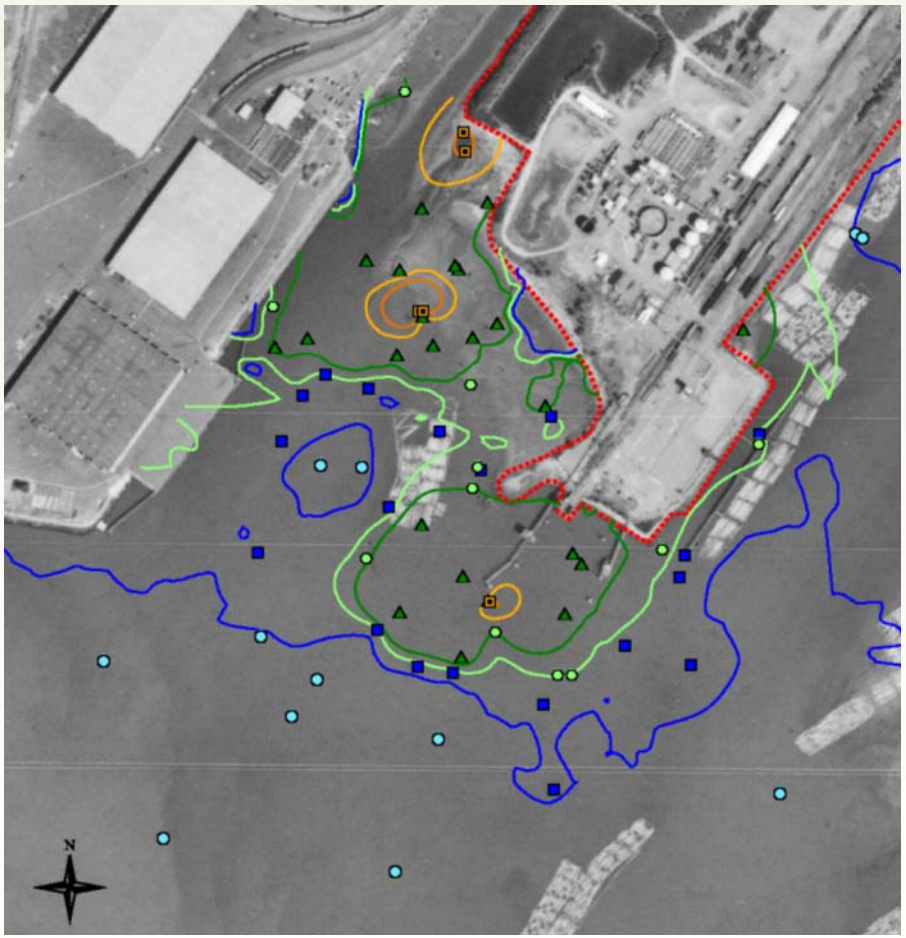
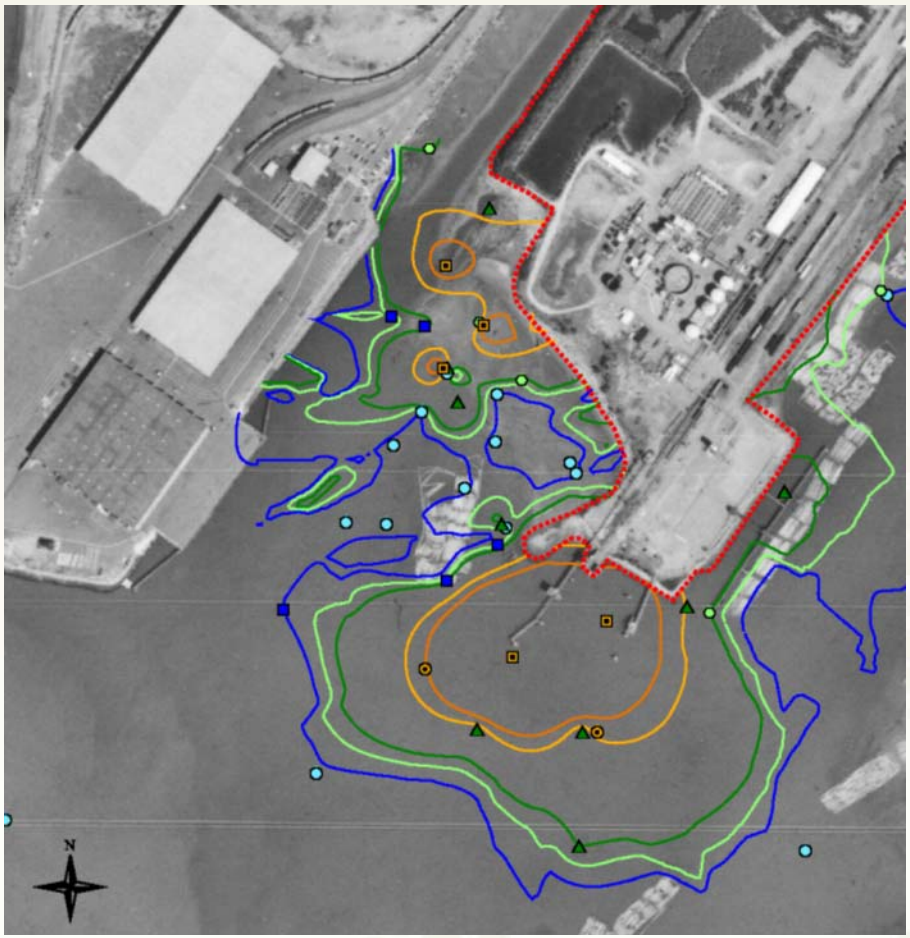
Management of Sediment

SURFACE



SUBSURFACE



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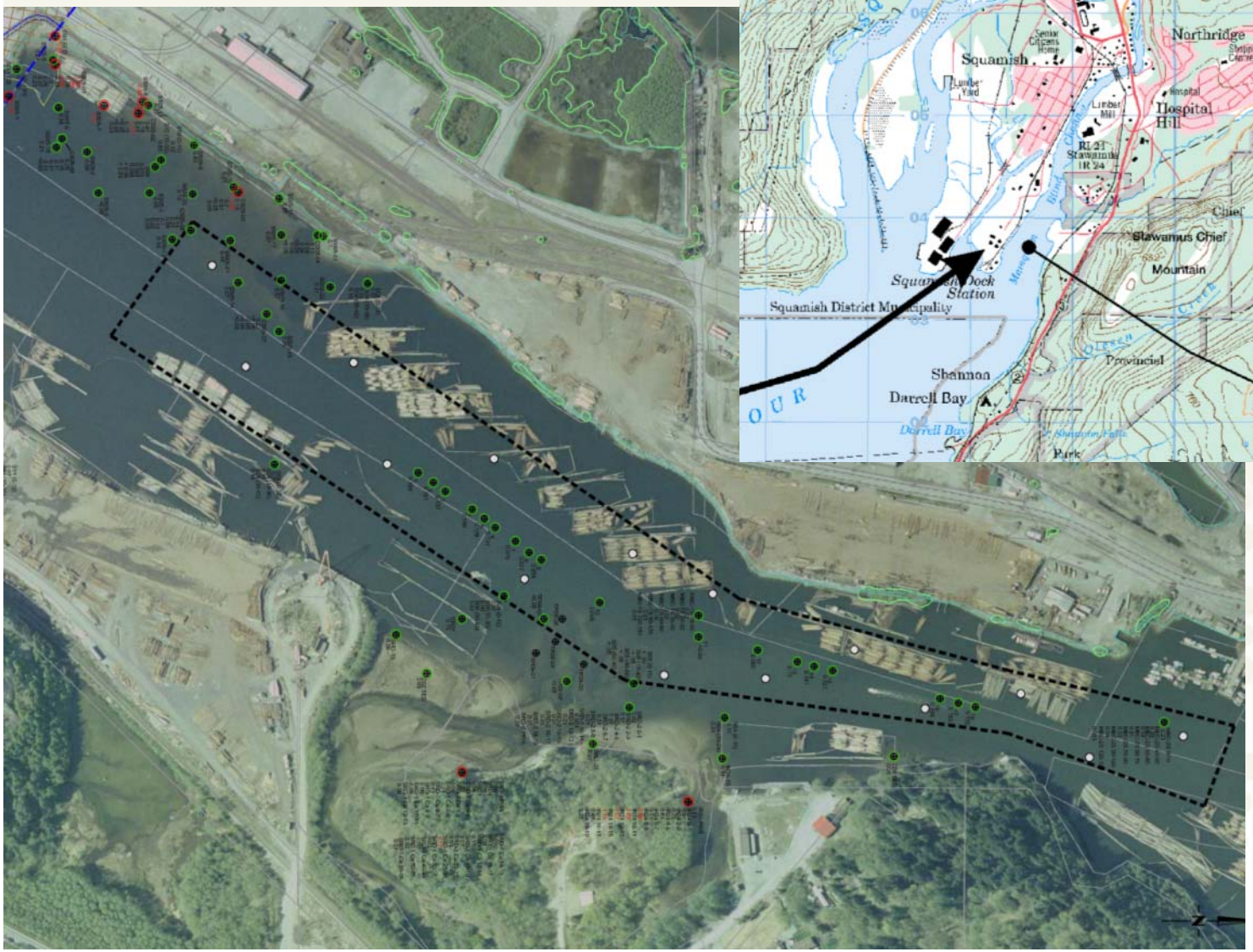
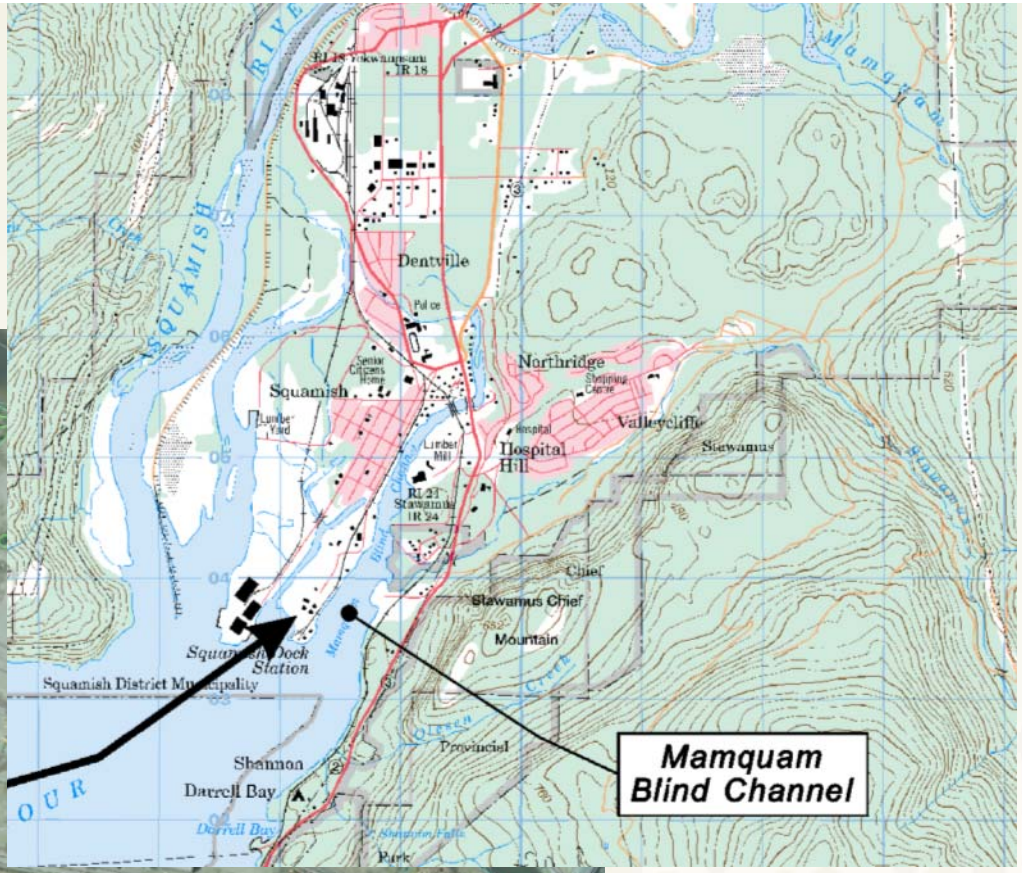
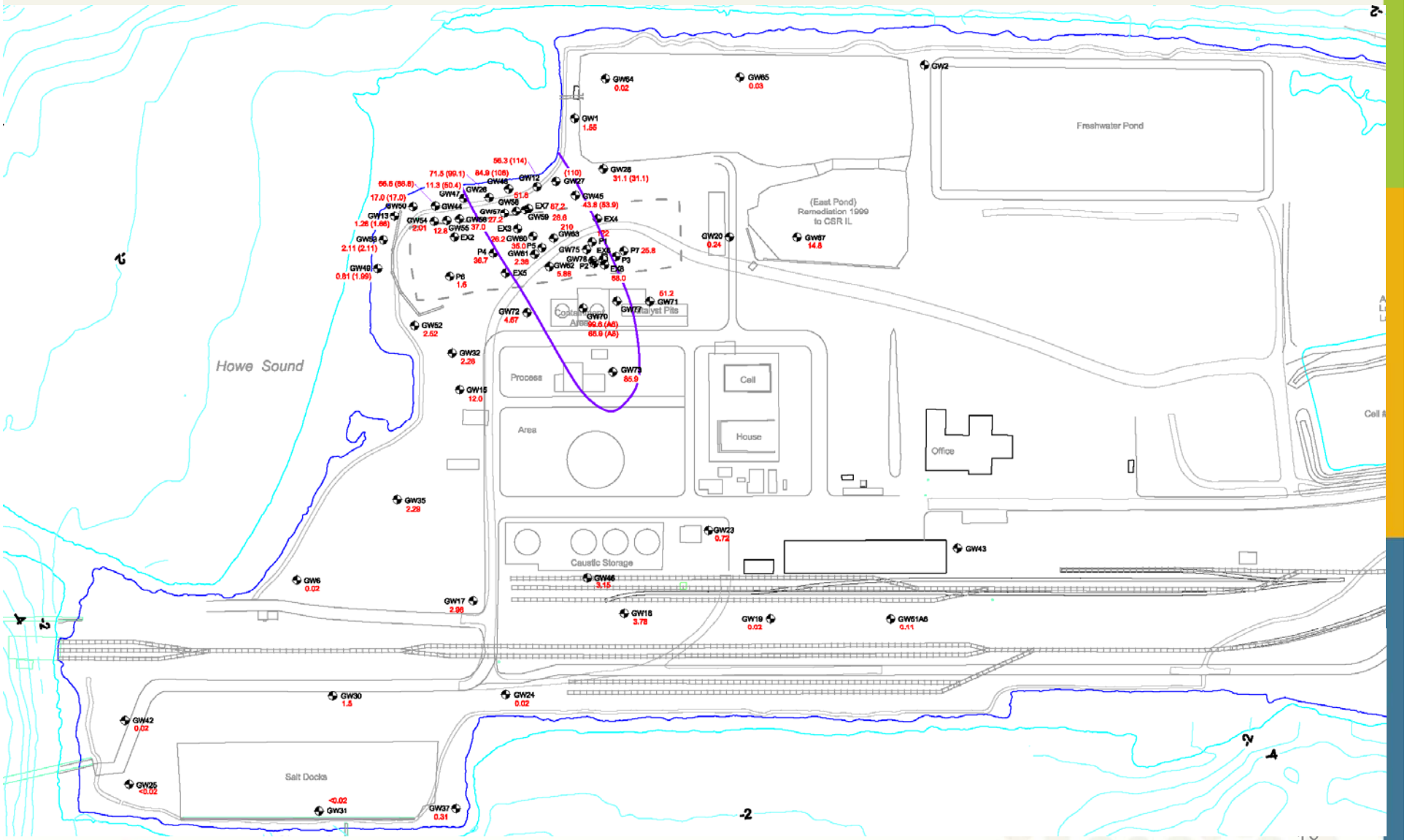
Management of Sediment

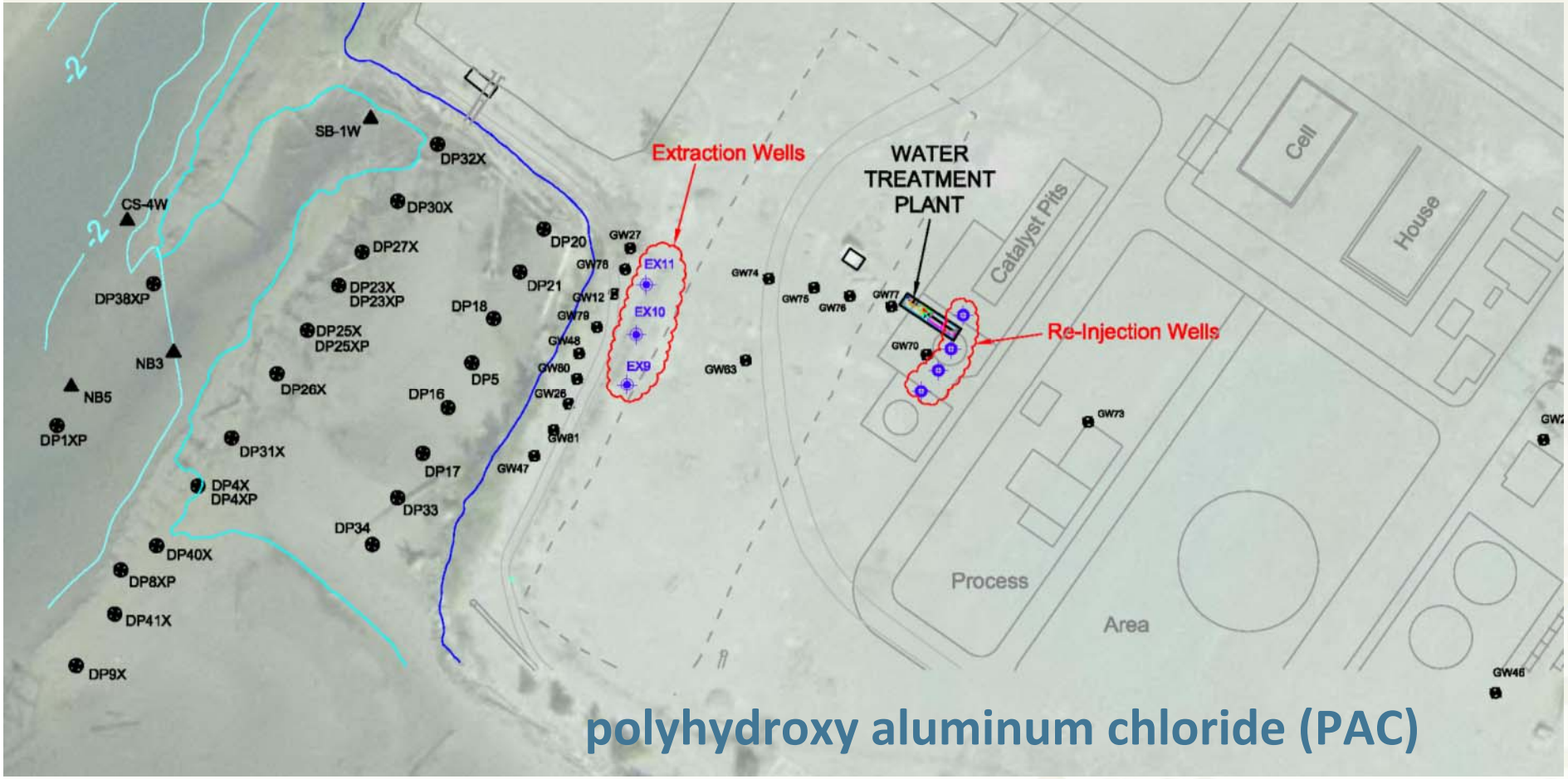




Management of Groundwater



Management of Groundwater



polyhydroxy aluminum chloride (PAC)

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Management of Soil

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Thank you for attending.

Any questions?