Industrial Project Implementation and Boreal Water Bodies – Cradle to Grave BMP considerations

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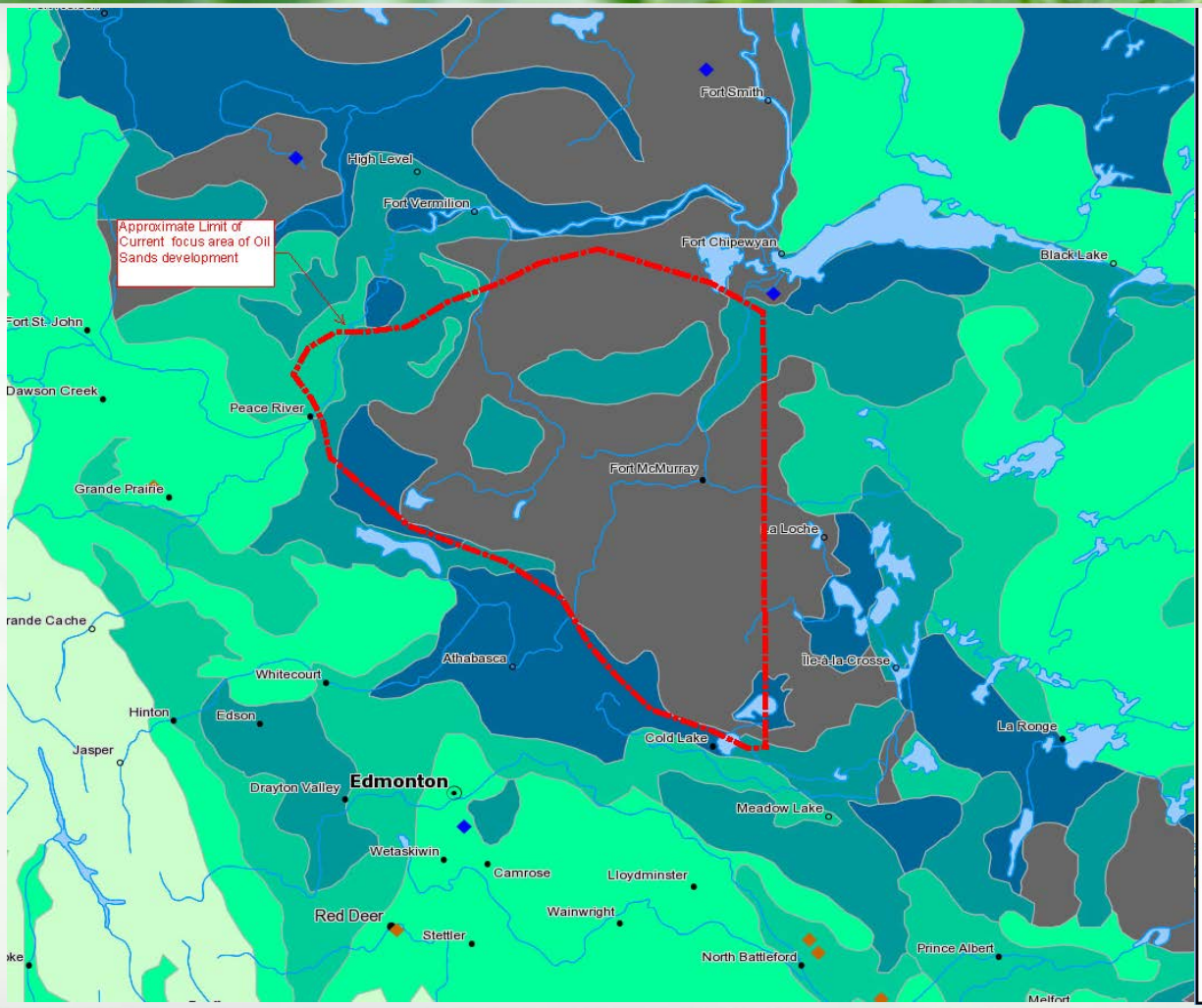
Overview

- Water bodies versus wetlands
- Water body distribution/predominant type
- Hydrology overview and challenges
- Industrial major project implementation
- Current BMP’s
- BMP enhancement considerations
- BMP development opportunities
- Closing remarks

Water Bodies Defined – Alberta Water Act

"***water body***" means any location where water flows or is present, whether or not the flow or the presence of water is continuous, intermittent or occurs only during a flood, and includes but is not limited to ***wetlands and aquifers.***

Water Body Distribution



The Atlas of Canada / L'Atlas du Canada
atlas.gc.ca
Since 1906 / Depuis 1906

Atlas of Canada 6th Edition
(archival version)

Distribution of Freshwater — Wetlands

Wetlands are lands permanently or temporarily submerged or permeated by water, and characterized by plants adapted to saturated-soil conditions. Wetlands are the only ecosystem designated for conservation by international convention because they absorb the impact of hydrologic events, filter sediments and toxic substances, supply food and essential habitat for many species, provide products for food, energy, and building material, and are valuable recreational areas. Some wetlands help recharge groundwater, while others receive groundwater discharge. Wetlands are vulnerable to climatic variations and extreme events. Wetlands occur across most of Canada. Their location usually depends on local factors of drainage, topography, and surface material.

0 150 300 450 600 km

Lambert Conformal Conic Projection. Standard Parallels 49°N and 77°N

Protected Areas
- RAMSAR Sites
- Migratory Bird Sanctuary

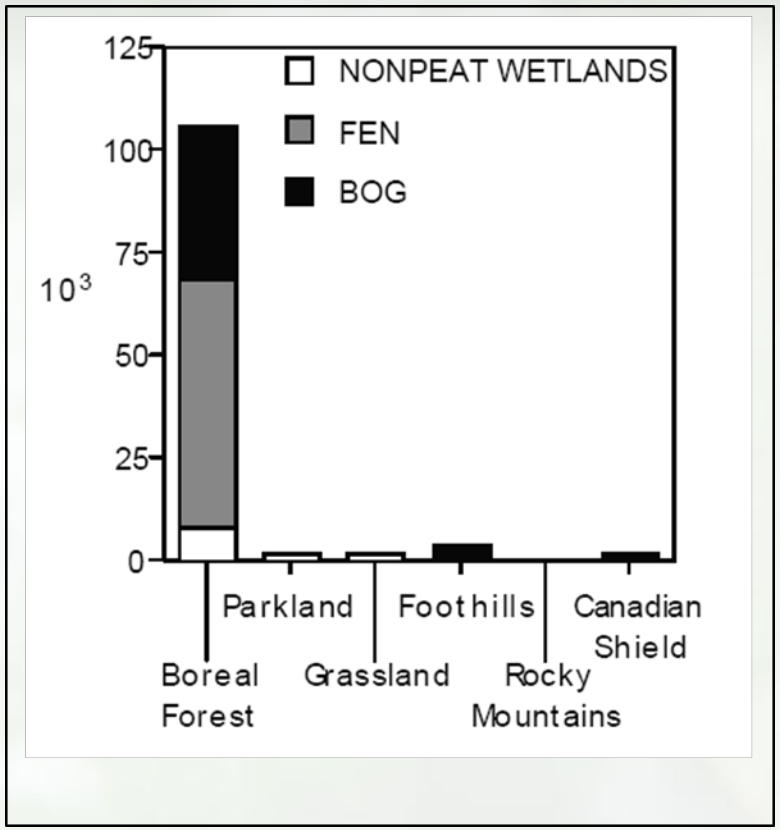
Wetland regions
- < 5%
- 5% - 10%
- 10% - 25%
- 25% - 40%
- 40% - 65%
- > 65%
- Regions outside Canada

Populated Places
- 1 - 4999
- 5 000 - 49 999
- 50 000 - 99 999
- 100 000 and greater
- Provincial and Territorial Capital
- National Capital

Boundaries
- International
- Canada / Kalaallit Nunaat dividing line
- EEZ (200 mile)

Source(s):
Migratory Bird Sanctuaries
Environment Canada. 2005. Migratory Bird Sanctuaries (MBS). Canadian Wildlife Service.
RAMSAR sites
Environment Canada. 2005. RAMSAR sites. Canadian Wildlife Service.
Wetland Regions
The percentage of wetlands within polygons which are representative of wetland concentration, developed by integration of data from several thematic specific sources. It was prepared for use by Environment Canada (1997) to provide first order measures of wetlands distribution and conservation. Data sets used: 1. The 1995 AVHRR land cover classification. 2. The old ecodistrict (circa 1985) database of Canada. 3. The Soil Landscapes of Canada. 4. The Peatlands of Canada. 5. Ducks Unlimited and other provincial agencies.

Predominant Water Body Type



Wetland area (in 10^3 km2) for the six ecological regions of Alberta (Halsey 2007)

Boreal Forest and Bog – Canadian Encyclopedia

Surficial water inputs – Stagnant Flow

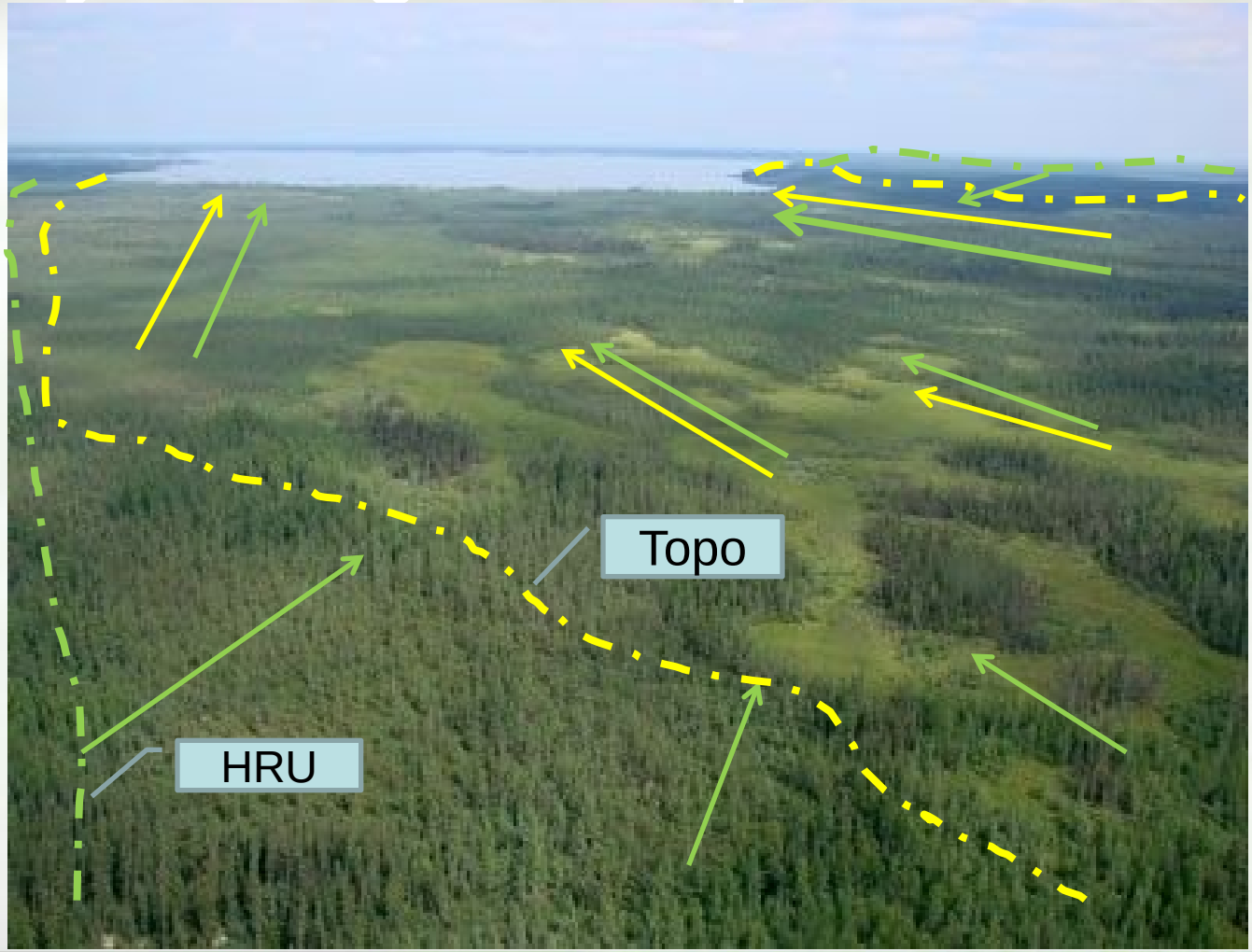
2007-07-28 Fen - McClelland Lake - Photo Credit: Diana Horton

Ground water inputs - Slow lateral flow

Boreal Hydrology at a glance

- Complex and more than meets the eye
- Control factors ***(climate, bedrock and surficial geology, soil type and depth and topography and drainage networks)*** for conceptual water cycling and delineation of catchment units, (Devito et al., 2005a)
- Water inputs are primarily driven through rainfall versus snow melt
- Water moves both vertically and laterally
- Wetlands can provide water flow year round supporting base flow in streams and sustain lake levels.
- Watershed primarily based on ground water and supported by surficial flow.
- Hydrologic Response Unit (HRU)

Topographic Catchment Area
versus
Hydrologic Response Unit



Water Body Challenges

- Physical Disturbance
  - Permanent/temporary loss of area
  - Reclamation
- Functional Disturbance
  - Altered hydrology
  - Water quality

Oil Sands Major Project Infrastructure

Long Term Camp Facility

Oil Sands Major Project Infrastructure

Multi well pad

Central Processing Facility

Pig launching Site

Temporary Laydown Area

Oil Sands Major Project Support Supplies and Services

Envirofuel.ca

Remote fueling site

Devon Energy/Little Bear Environmental

Water withdrawal

123rf.com

Snow Removal

Fsjwater.com

Dust Control

Maintaining Water Flow Current BMP's

Project Planning

- Well pads, condensate and pigging stations siting governed by resource location, typography and/or engineering/fluid mechanics function requirements
- CPF and lodge siting's more flexible.
- Minimization of impacts – infrastructure siting and foot print
- Water flow maintenance achieved by open channels, road culverts or bridges. Design based to a greater extent on topographic watersheds.
- Operational environmental risks mitigated by engineered and administrative controls.
- Reclamation considerations for soil salvage as required by regulation.
- Ongoing research to guide final wetland reclamation. Project planning consideration constantly evolving.

Maintaining Water Quality Current BMP's

Context

- Site discharge quality limits defined within EPEA and associated regulatory approvals

Construction

- Contractor environmental performance requirements stipulated within Construction Environmental Control Plan (CECP). Performance is monitored and evaluated.
- Permanent and temporary erosion protection and control measures are to be implemented.
- All major SAGD plant sites have runoff control mechanisms in place (e.g. storm water, sediment and blowdown ponds).
- Well pads store runoff water on or within the well pad site.
- Water is tested to ensure conformance with release criteria prior to discharge.
- Spill reporting, investigation and corrective actions implemented.
- Emergency spill response plan and infrastructure are in place.
- Environmental awareness communication through print and presentation mediums (safety and tool box meetings).

Maintaining Water Quality Current BMP's

Operations

- **Company employees/contractors are guided and held accountable for the safe implementation of the '*defined*' environmental Standard Operating Procedures (SOP's)**
- Emergency Spill Response SOP and infrastructure are in place.
- Spill reporting, investigation and corrective actions implemented..
- Environmental awareness communication through print and presentation mediums (safety and tool box meetings).

Maintaining Water Quality Current BMP's

Decommissioning

- End of life infrastructure removal.
- All fixtures are cleaned, removed from site for recycling or disposal in accordance with waste management regulations.
- Where approved by regulation/code of practice, below ground fixtures may remain in situ.
- Site investigated for contamination and remediated if required.

Reclamation

- Reclaimed in accordance with the **2015 Reclamation Criteria for Wellsites and Associated Facilities for Peatlands October 2015. (effective for April 2016 applications)**
- Updated periodically as contributing science information is available.

Maintaining Water Quality Current BMP's

Construction/Operations/Decommissioning

Context

- High risk activities for release of hydrocarbons

Remote Site Fueling Services

- Compacted impermeable soil base preventing soil/ground water infiltration infiltration.
- Within plant sites/ permanent camps included as part of storm water protection systems.
- Variable protection in temporary locations.
- Enviro fueling systems BMP

Snow Removal

- Stored within storm water protection system area
- No storm water system, usually where most convenient within the site.
- Monitoring and temporary controls implemented as required.

Maintaining Water Quality Current BMP's

Construction/Operations/Decommissioning

Fresh Water Withdrawal

- Access pad graded away from water source where applicable.
- All trucks must carry emergency spill kits.
- Spill tray use variable.
- Opportunities to reduce fresh water use?

Dust Control

- Fresh water use for dust suppression.
- Other produced products used. Environmentally friendly?

Opportunities
BMP Enhancements

Document/review/refine current BMP variations by all industries

- Assumptions
- Science/expert information supporting BMP
- Monitoring, evaluation and adaptation requirements/plan
- Benefits
  - cost/budget
  - life cycle enviro performance
  - social license

Opportunities
BMP Development

- Prioritize development needs based on quantifiable environmental risk;
  - What are the activities resulting in physical and functional disturbance/loss?
  - Priority for BMP's
- Identify/quantify the benefits
  - Social
  - Environment
  - Economics
- Rewards
  - Sustainable Resource Development

Final Thoughts

- True commitment to enhance performance
- Continue to Encourage
  - innovation
  - learning culture
- Consider adoption strategies
- Shared responsibility amongst all
- Success?

BMP's evolve to Standard Operating Procedures

Thankyou

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