Evolution of BC’s Water Act and Regulations - Implications to Shale Gas Industry

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Presentation Overview

- GW vs SW: Drivers for new regulations
- Shale gas industry and water demand
- Water regulations – Updates to current
- Evolving regulations relevant to O&G
- Current work in Horn River Basin
- GW management *Best Practices*
- Closure (Q&A)
B.C. Groundwater Regulation

WaterTech (2010) → “only jurisdiction in Canada that does not regulate groundwater use.”

WaterTech (2011) → OGC begins to regulate drilling and use of water source wells

WaterTech (2012) → Latest groundwater studies in Horn River and OGAA changes (water source wells for use in hydraulic fracturing operations)
Driver for GW Legislation in BC

- Regulations mostly apply to SW
- GW extraction does not require licensing
- Over 1 million people in B.C. drink GW
  - Expected to increase
- Regulation of SW and GW not integrated
- Emerging O&G industry in B.C. has public attention
B.C. Shale Gas Plays

- Key areas:
  - Horn River Basin
  - Liard Basin
  - Cordova Embayment
  - Montney

- New, rapidly developing market

- NO WATER = NO GAS
Horn River Basin

- 1.3 million hectares
- ~ 20 companies currently operating
- Huge water needs:
  - Camps: 200-400 people
  - 40-80 lgpm (1,200 L/person/day)
- Drilling and Fracturing
  - 40,000 m$^3$ per well for fracturing over several days
- Currently: water use = SW, shallow non-saline GW, Saline Debolt Water
Horn River Basin

- 2012: > 500 Horizontal gas/experimental wells drilled to date
- Up to 50,000 gas wells may be developed in the Basin
- Shallow non-saline and deep saline GW will likely be required
- Need water management systems to ensure sustainability of both SW and GW
Energy Wells - Horn River Basin
B.C. Water Regulators

- B.C. MOE (mandated to develop the Water Sustainability Act)
- Forest Lands and Natural Resource Operations (mandated to administer Water Act)
- B.C. Ministry of Health
- OGC – specific to O&G industry
B.C. – Water Laws

- Water Act (1909, 1939, 1960, 1979…)
- Water Protection Act (1995)
- Fish Protection Act (1997)
- Drinking Water Protection Act (2001)
- Environmental Assessment Act (2002)
- Water Utility Act/Utility Commission Act
- Oil and Gas Activities Act
B.C. Water Act - Surface Water

- Diversion and use of all surface water in B.C. must be authorized under *Water Act*
  - “first in time first in right” (FITFIR)
    - Priority based on license date not on water use
  - “use it or lose it principle”
  - Although the Water Act does not apply to groundwater FITFIR may set a precedent
B.C. – Ground Water Protection Regulation

- 2004 – Phase I of Water Act Modernization
- Set standards for drilling, alteration, maintenance and closure of wells
- Applies only to camp wells
- No requirement for drillers to submit well logs... Problem for hydrogeologists
B.C. – Fish Protection Act (1997)

- Fish habitat protection from water allocations
- Temporarily reduce SW/GW use (drought)
- Where groundwater extraction may affect fish habitat or base flow (temp/volume)
- Not fully implemented, minimal enforcement, post complaint
B.C. Environmental Assessment Act

- 2002, last amended 2010
- Reviewable Project Regulation for Large Groundwater Extraction Projects:
  - >75 L/s (1,000 lgpm; 6,500 m³/day)
  - EA may be required (assessment of all GW users, potential cumulative effects, etc)
  - Applicability to saline groundwater?

Waterline Nanaimo contracted by MOE to develop guideline for waiver application to EAO for use of Saline Debolt water (May 2012)
B.C. - Water Act Modernization...

- New Water Sustainability Act
- Living Water Smart: B.C.’s Water Plan
- Process started >20 years ago
B.C. - Water Act Modernization…

Four Main goals (by 2012)

- Protect stream health and aquatic environments
- Improve water governance arrangements
- Introduce more flexibility and efficiency in the water allocation system
- Regulate groundwater extraction and use

8 years later its still not complete...
MOE says more public engagement needed:

- Maybe 5 more years...
- Regulators say BC unique due to unresolved treaty rights
- Investment of O&G companies must be protected and eliminate uncertainty
- Need to move forward despite gridlock in BC
- Opportunity for O&G industry to set the template for sustainable groundwater management
B.C. - Oil and Gas Activities Act

- (OGAA) October 2010
- Consolidation of:
  - Oil and Gas Commission Act
  - Pipeline Act
  - Petroleum and Natural Gas Act
B.C. - Oil and Gas Activities Act

- OGC Water Permits (*Water Act*), addressing **surface water**:
  - Section 8, 9 and 26 permits

- Relevant to **groundwater**:
  - Drilling and Production Regulation
  - Water Source Well Permitting Process
Aquifer

“means a geological formation...that contains water with up to 4,000 milligrams per litre of total dissolved solids and is capable of storing, transmitting and yielding that water”

(Environmental Protection and Management Regulation 2010)

Non-saline Groundwater

“groundwater that contains less than 4000mg/L total dissolved solids.”

(Well Permit Application Manual, April 2012)
**Water Supply Well**

“...a class of well for extraction and using ground water but does not include a drainage well, dewatering well or remediation well.”

(Drilling and Production Reg./Ground Water Protection Reg.)

**Water Source Well**

“...used to obtain water for injection or fracture stimulation into an underground formation in connection with the production of petroleum or natural gas.”

(OCG Well Permit Application Manual v1.17, April 2012)
Drilling and Production Regulation – Operation of a Water Source Well

Cumulative Effects (domestic/agricultural)

- “A permit holder must not operate a water source well in a manner that injuriously affects the use of the water source for domestic or agricultural purposes”

Water Use Reporting

- “A well permit holder must report the quantity of water production from a water source well to the commission no later than 25 days after the end of the month in which the production occurred”
OGAA – Good Start, But…

- No reference in OGAA to potential interference between users (i.e., industrial users)
- Absence of monitoring of water levels and assessment cumulative impacts to aquifers
- No procedures provided to help determine sustainable practices to avoid “injurious effects”
- Defines aquifers in terms of TDS, not yield = ??
- OGC says: updates fall 2012 to address some
OGAA Well Permit Application

- Water Supply Well (camp/drilling supply well) – not OGAA regulated, falls under MOE
- Water Source Well (related to O&G recovery) – well permit required, falls under OGAA
- Well permit is required BEFORE drilling a water source well, including test wells ($10,000 per permit)

- Version 1.7 – March 2011
- Version 1.17 – April 2012
- Difficult to keep up with the changes...
Studies in the Horn River Basin

- Horn River Basin Subsurface Aquifer Project – Phase 1 by Petrel Robertson
  - Completed in 2008, update coming in 2012
  - Identification of deep saline aquifers (Debolt), water supply and disposal

- Horn River Basin Surface Water Modeling Study by Golder:
  - Completed in 2010
  - Surface water monitoring stations recommended
Geoscience BC Surface Water Study - Horn River Basin

Kerr Wood Leidal & Waterline
B.C. MOE Obs. Well Network Study

- Objective: Select 4 locations to install observation wells as part of Provincial Groundwater Monitoring Well Network (currently no GW monitoring wells in network)

- Waterline Nanaimo office developing conceptual hydrogeological model for shallow groundwater in the Horn River Basin:
  - Shallow glacial sand and gravel (<100m)
  - Buried glacial valleys (<150 m)
  - Fractured bedrock (100-200m)
Preliminary Results of MOE Obs Well Study – WW Driller Logs in the BC Wells Database
Preliminary Results of MOE Study

- WW drillers not required to submit logs to MOE (voluntary submission)
  - Data not captured in BC Wells Database
  - Camp well logs provided to health authority
- Drillers may submit logs to OGC for Well permit but OGC does not provide to MOE
- Difficult for hydrogeologists to develop groundwater exploration or protection strategies
- Valuable data is being lost
B.C. MOE Saline Groundwater (Debolt) EA Waiver Guideline Study

- Primary Focus: Submit information in “hydrogeology” format, not reservoir eng. format:
  - Water levels rather than reservoir pressure
  - K in m/s rather than K in millidarcies, etc...

- Prove that Debolt (800 mbgl) is not in hydraulic connection with shallow non-saline aquifers:
  - Appears obvious (>200 m head difference)
  - Debolt = 25,000 mg/L TDS
  - Contains H2S

- Not intended to discourage proponents from using Saline Debolt water
Geoscience BC Montney Water Study

- Comprehensive inventory of water sources and potential for deep geological disposal sites (Collaboration between Foundry Geospatial, NHA, MEM, MOE, OGC 2011)

- Deep Aquifer Characterization in Support of Montney Gas Development (Petrel Robertson, 2010-2011)

Many studies being initiated by government and producers relating to groundwater monitoring

Coordination of studies may be useful
Groundwater Management Best Practices

- Proactive aquifer management
- Long-term monitoring (i.e., sustainable vs. mining)
- Regional approach and understanding
- Promotes sustainability
Water Management Planning

- Cumulative impacts from all projects
  - Aquatic ecosystems
  - Sustainability
  - Conservation measures, temporal use restrictions
- Climate change
- Path forward
  - Monitoring (flows, seasonal levels, use)
  - Water conservation, reuse, recycling
  - Restrictions on use during times of low flow
The Path Forward...

- Large investments by energy companies are contingent on water availability.
- Reg’s being developed in BC but water management tools needed now to ensure sustainable water supply for shale gas.
- Conflicts expected when gas prices move to higher levels and exploration/development activity increases.
- Opportunity for industry to lead sustainable water management in BC.
Closure

- Thank You
- Questions

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B.C. – Water Protection Act

- 1995
- Sustainable use of B.C.’s water resources for conservation of environment
- Prohibition of bulk export and major inter-basin transfers of water in B.C.
Well Permit Application – 2012 Update

- Water Source Well classification:
  - Development (located within a pool)
  - Exploratory Outpost (one spacing area or <7 km from a designated pool boundary)
  - Exploratory Wildcat (> 7 km from pool boundary)
- Confidential Status: Development Well (2 mo.), Exploratory Outpost Well (6 mo.), Wildcat Well (1 year)
- Applying O&G Regulations to manage shallow non-saline GW not appropriate...
Draft Oil and Gas Waste Regulation

- DOGWR issued March 2007;
  - Chlorides (as Cl) \( \leq 500 \text{ mg/L} \)
  - Hydrocarbons: No visible sheen
  - EC \( \leq 2 \text{ dS/m (2,000 uS/cm \sim 1,280 \text{ mg/L TDS})} \)
  - pH 6.5 – 8.5

- Intended for discharge of surface water runoff and flare pit precipitation to land, but......
Pumping Tests – Discharge to Surface

- OGC recommends DOGWR use for pumping tests of non-saline aquifers:
  - Shallow groundwater often exceeds 1,280 mg/L TDS
  - Reservoir/pits are not always available to contain water
  - Artesian flowing wells may pose problem as discharge may constitute a spill under DOGWR

- Well test defined in OGWR:
  “natural gas produced from a well for the purpose of determining production and reserve characteristics”...

- Does it really apply to water wells?... lots of confusion in BC
B.C. - Drinking Water Protection Act and Regulation

- 2001, updated to March 2011
- Regulates water systems other than single family dwellings:
  - Potability of drinking water
  - Treatment, construction, operation and monitoring of water systems
  - Public notification of non-potable water
  - GUDI
B.C. – Environmental Management Act

- 2004
- *Waste Discharge Regulation*
- Regulates discharge of waste to the environment, including to ground water
B.C. – Water Utility Act

- Certificate of Public Convenience and Necessity
- Requirements for “Private Utilities”:
  “Person/business delivering domestic water to 5 or more persons or corporation for compensation”
- Not applicable to bottled water company…
B.C. - Oil and Gas Commission

- OGC: Independent Regulator for Oil and Gas Activities in British Columbia
- Works with BC MOE to develop tools for SW and GW use for Oil and Gas
- Oil and Gas Activities Act
- Water Permitting Process
- New Regulations rapidly being developed…
March 2, 2011

Updated requirements for *Water Act* applications:

- Quarterly reporting of volume extraction
- Addition of dugouts as requiring permits for use as water source
OGC Surface Water Permitting Process

- *Water Act* (Section 8) – Application for Short Term Use of Water
- *Water Act* (Section 9) – Application for Changes to a Stream
- *Water Act* (Section 26) – Application to transfer water via temporary above-ground lines
- Routine and non-routine applications
British Columbia - Direction

- BC is looking to other jurisdictions for direction on updating their systems of water governance