

B.C.'S STORY

Effectively regulating natural gas and oil



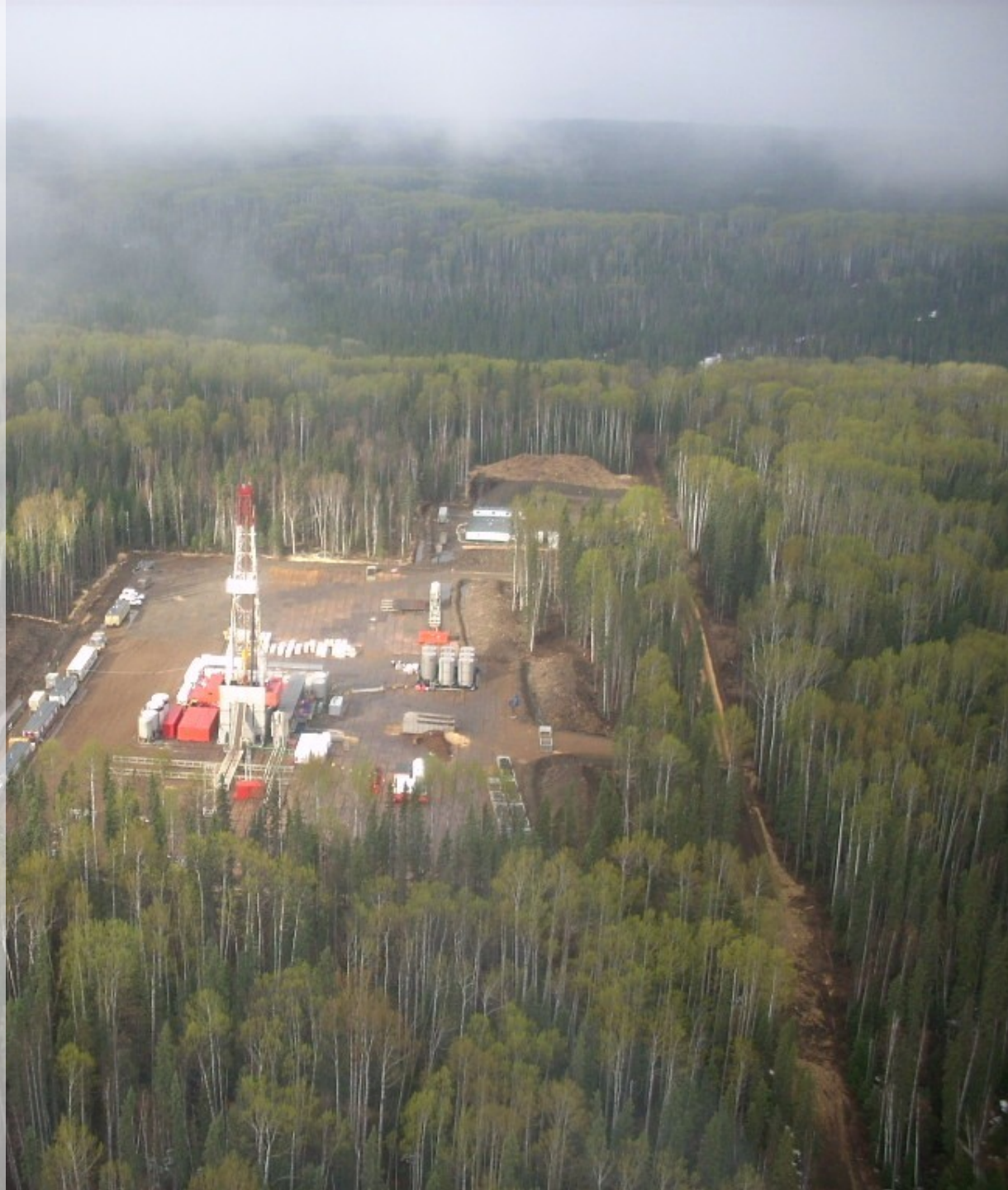
Paul Jeakins

Commissioner and CEO

PAUL.JEAKINS@BCOGC.CA

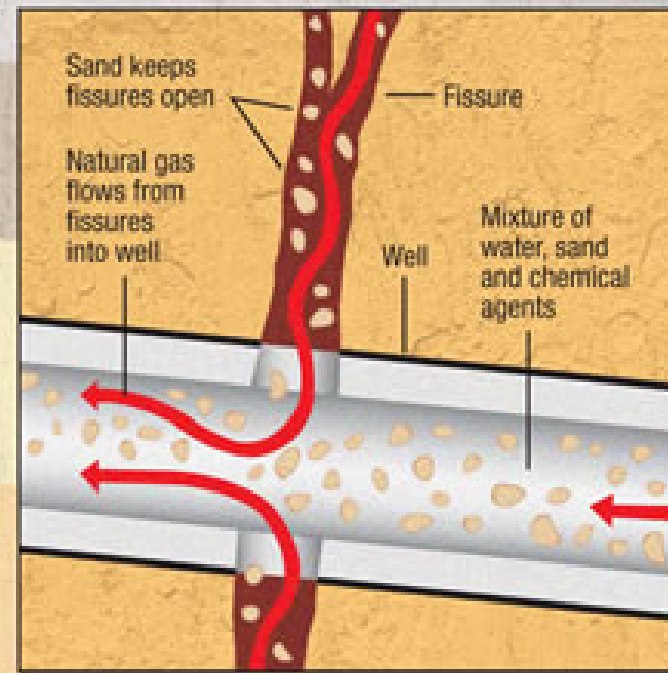
Five years ago,
15% of wells
drilled in B.C.
targeted
unconventional
sources.

Now, over
90% do.



NATURAL GAS FLOWS OUT OF WELL

HYDRAULIC FRACTURING, commonly referred to as "fracing," is the process of creating small cracks, or fractures, in deeply buried geological formations to allow natural gas to flow into the wellbore. The natural gas can then flow to the surface under controlled conditions through the wellhead is collected for processing and distribution.



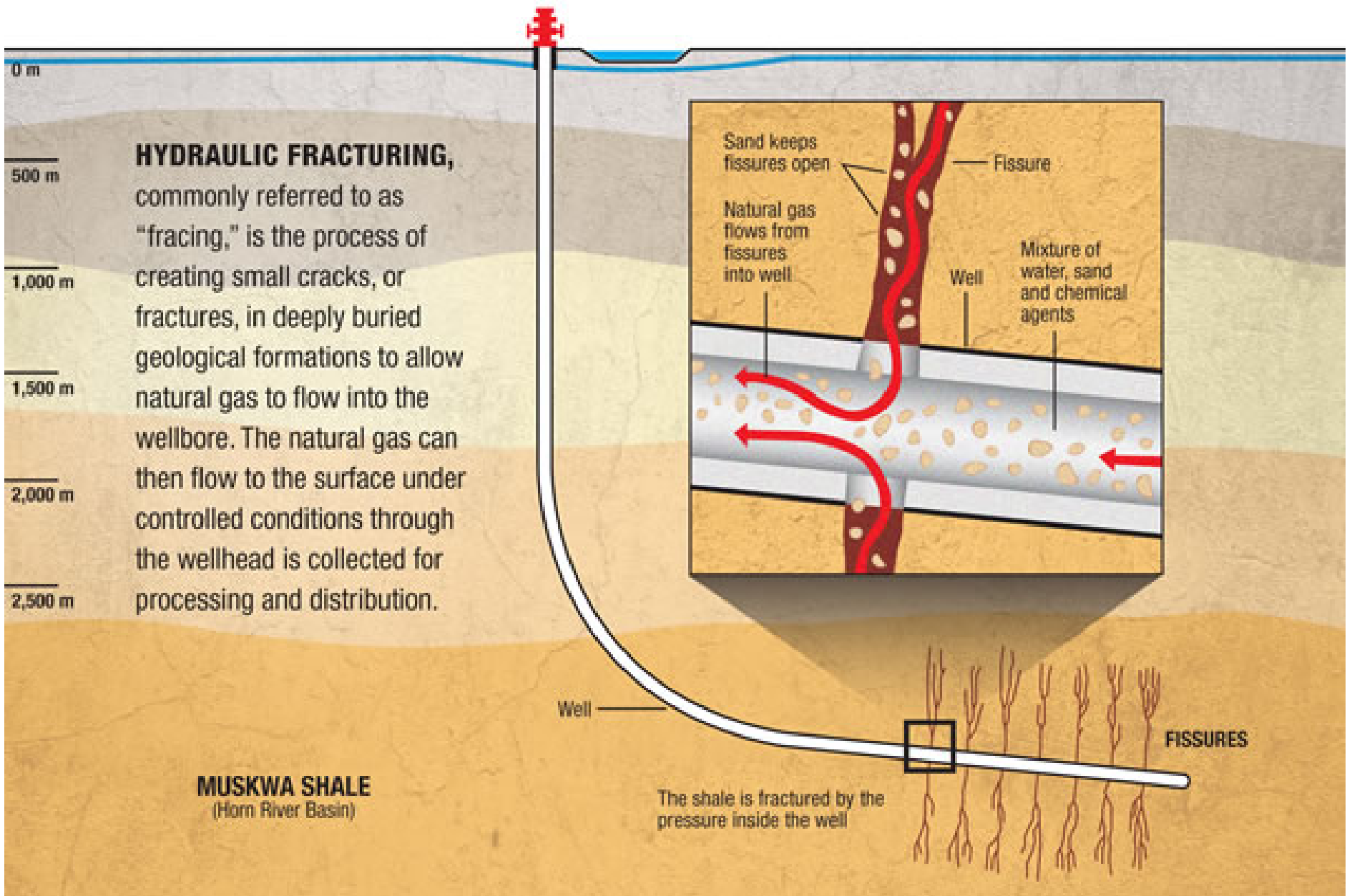
Well

MUSKWA SHALE
(Horn River Basin)

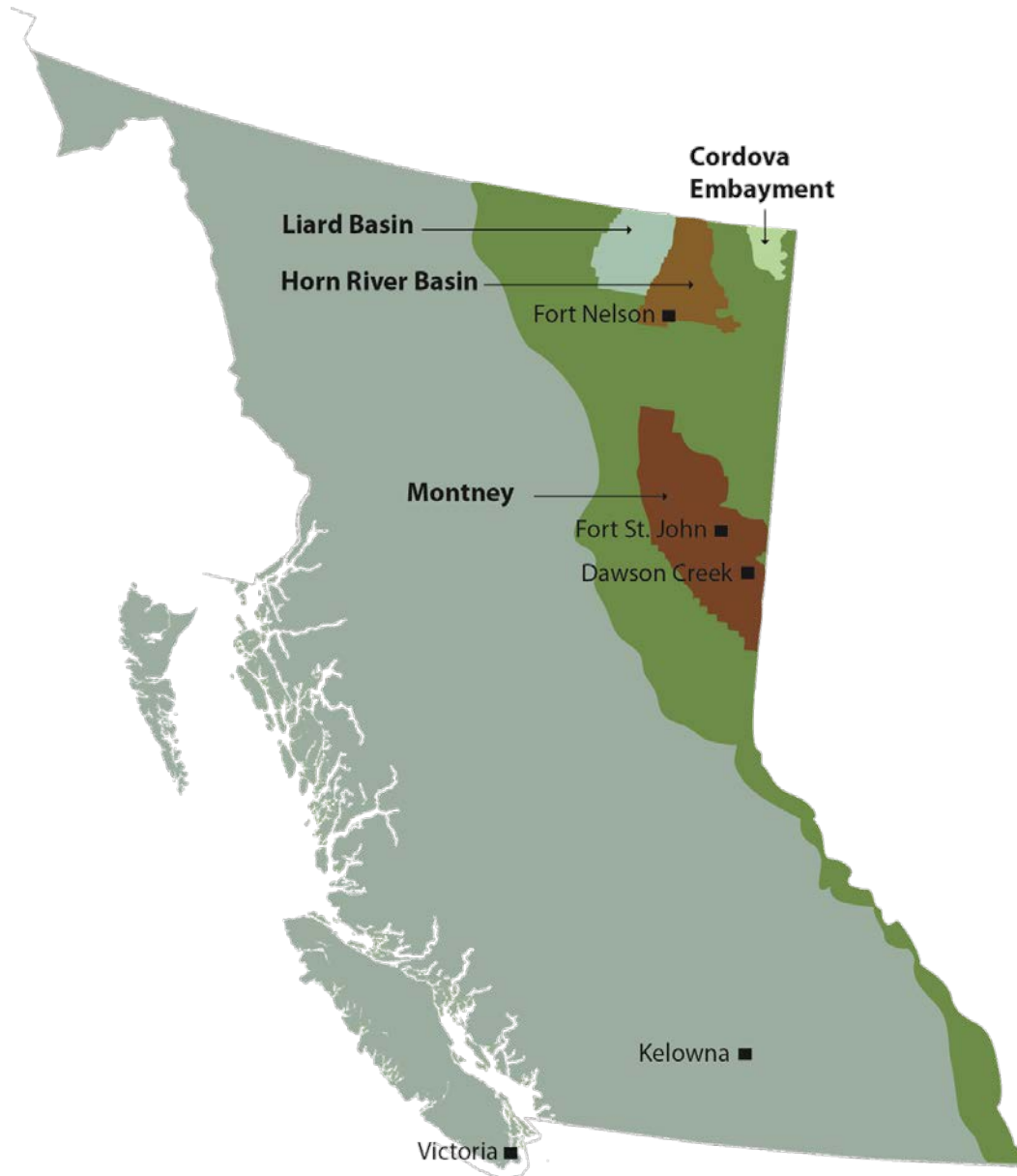
The shale is fractured by the pressure inside the well

FISSURES

0 m
500 m
1,000 m
1,500 m
2,000 m
2,500 m



RESOURCES



2,900+ TCF

Total Gas-In-Place Estimate
for Shale Gas Regions

Montney – 1,965 TCF

Horn River Basin – 448 TCF

Liard Basin – >200 TCF

Cordova – 200 TCF



Created in
1998.

Responsible for
regulating oil
and gas
activities in B.C.

Regulator, not
advocate.

SINGLE WINDOW / FULL CYCLE

Consultation and notification by industry

Industry application to Commission

Commission First Nations consultation

Commission application review and assessment

Decision by Commission w/ terms and conditions

Industry exploration commences

Commission compliance and inspection

Application for production – activity commences

Commission enforcement

Site reclamation and restoration

Commission is involved at every step

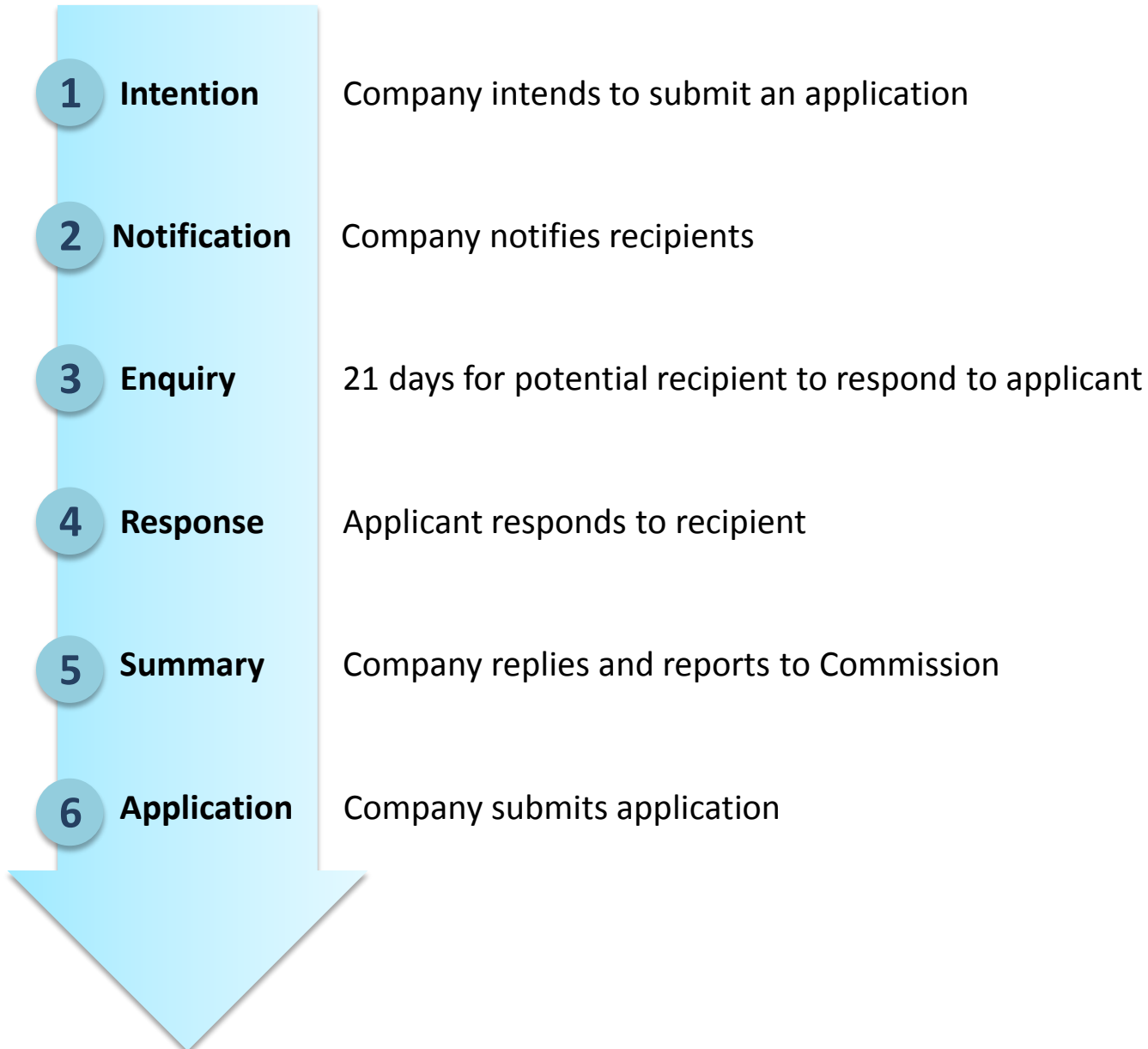


The Commission consults with First Nations on behalf of the Crown.

Negotiated agreements with northeast B.C. First Nations.

Follow provincial consultation guidelines for rest of province.

REQUIRED LANDOWNER C&N



Environment

Air Quality

Water protection

Social

First Nations

Local communities

Public

Technical

Hydraulic Fracturing

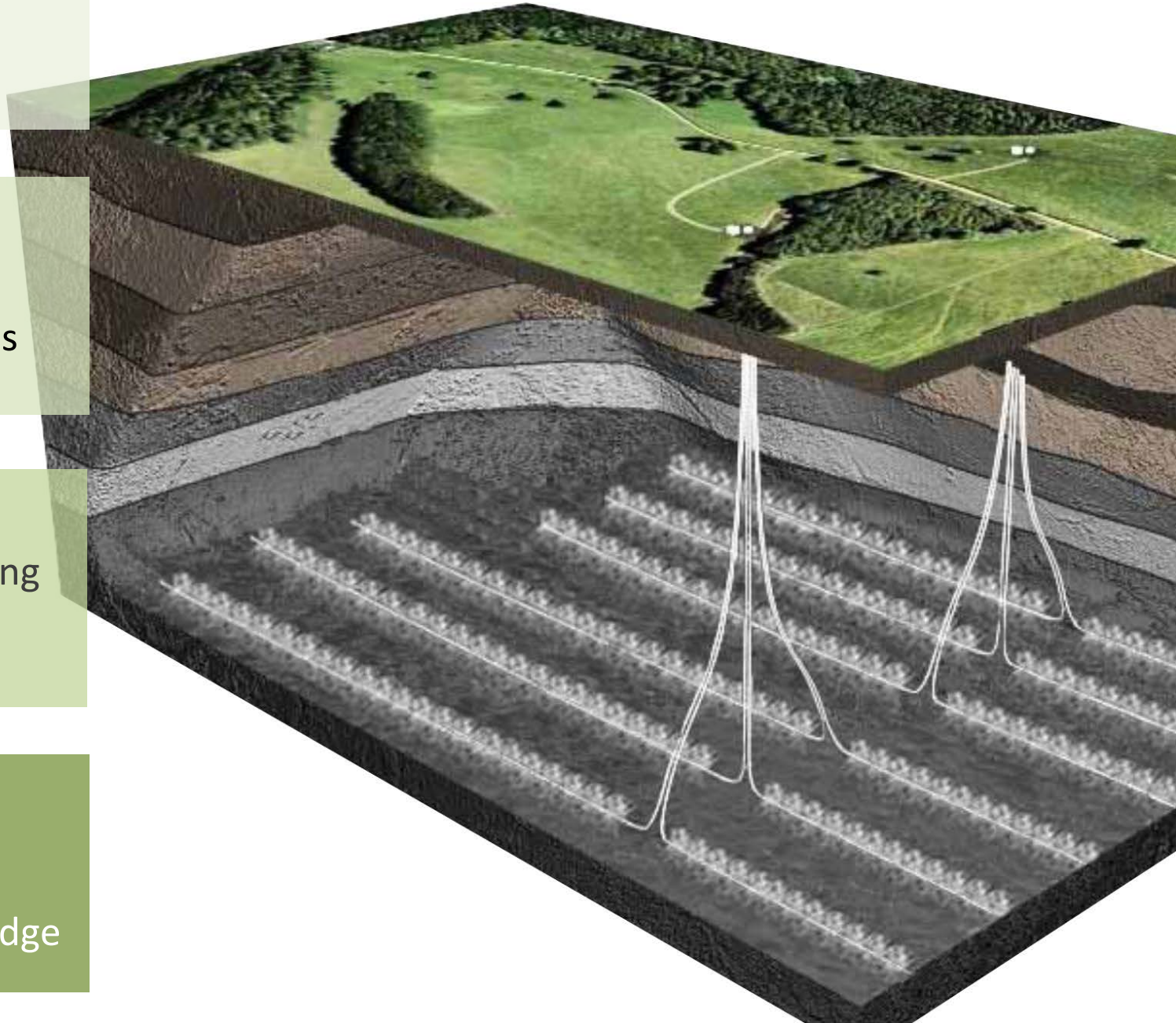
Pipelines

LNG

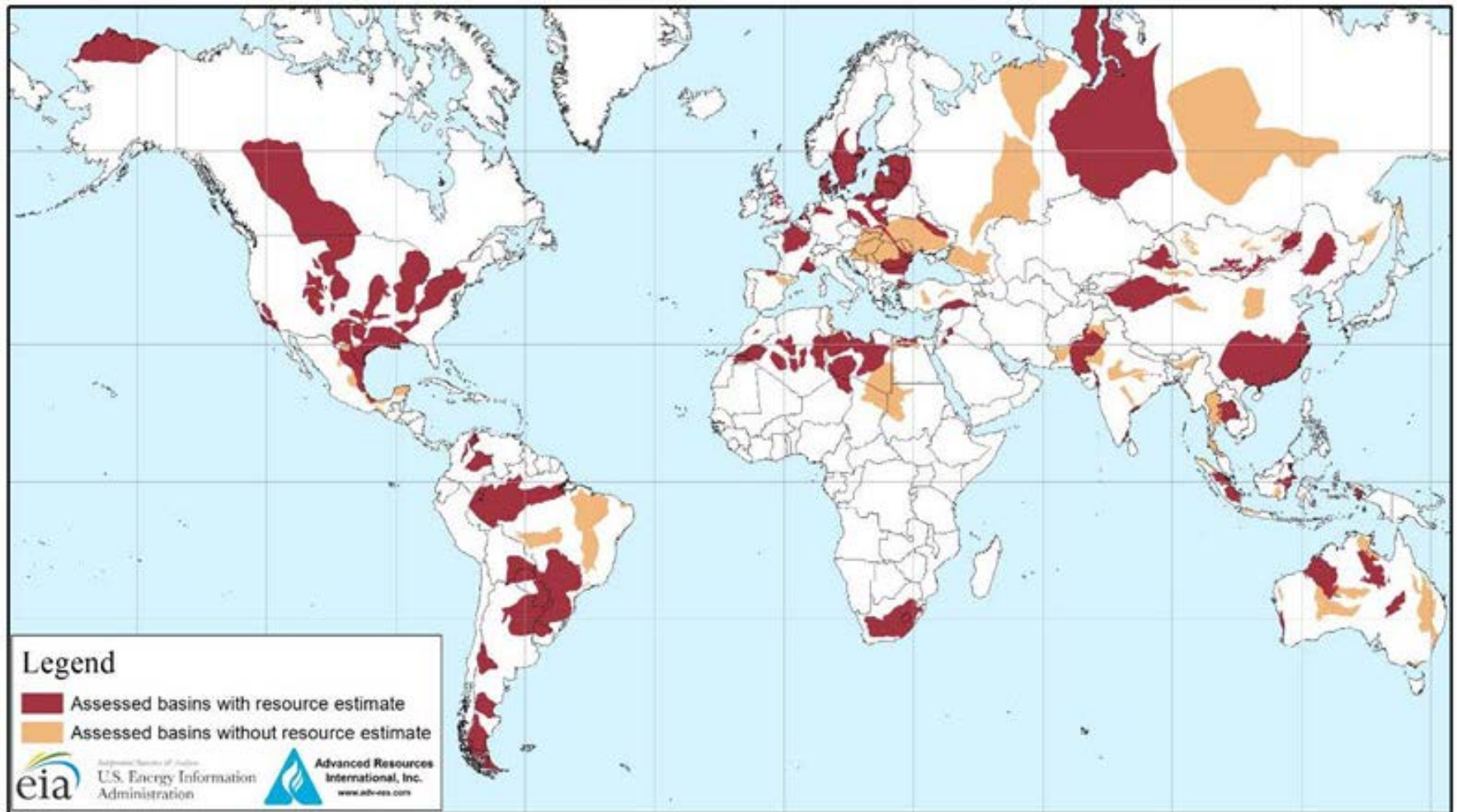
Geological

Rising reserves

Increased knowledge



LEARNING INTERNATIONALLY





WELL PERMIT APPLICATION FORM
Physical Address: 6534 Airport Road,
Fort St. John, B. C. V1J 4M6
Mailing Address: OGC, Bag 2, Fort St. John,
B. C. V1J 2B0
Phone: (250) 794-5200

Commission File No.:
Application No.:
Well Classification:
Applicant Name:

WA No.:
 R

COMMISSION USE ONLY

FOR INSTRUCTIONS REFER TO THE WELL PERMIT APPLICATION FORM
Date Received: _____
THIS IS AN AUDITABLE DOCUMENT

Document:
Application Fee: \$
Objective Field Code:

Phone:
Phone:

If Application with new area
Commission File No.:

Yes No

Section 75(1)(b)?

D



only
ha
ha

charged against the title? Yes No



Inputs and Outputs



Strategic Direction

(Government)

Geographic Scale: North Eastern British Columbia - 10 million ha
Temporal Scale: > 10 years
Inputs: First Nations, stakeholders, public and industry
Outputs: Legislation (OGAA), laws, land use plans, policy guidance, strategic land and resource objectives

Area-based Analysis

(Commission led analysis)

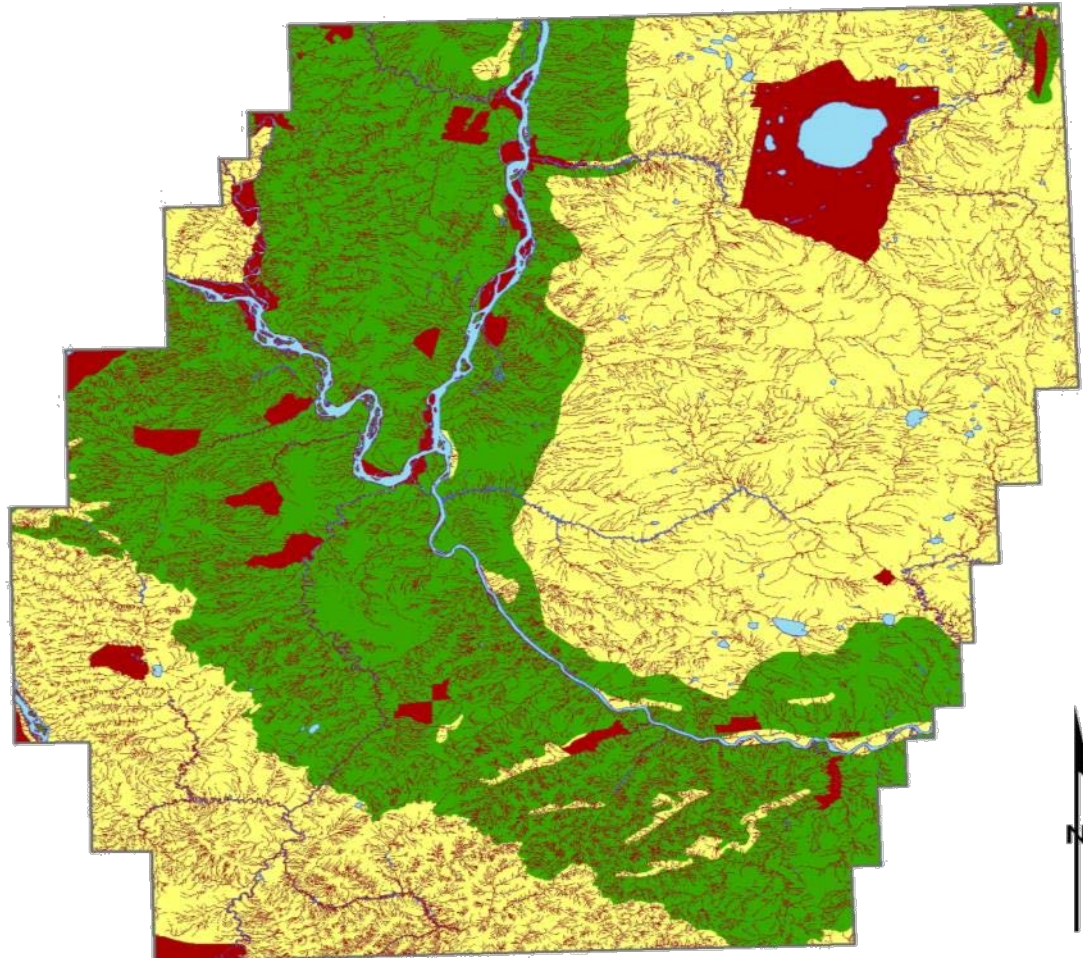
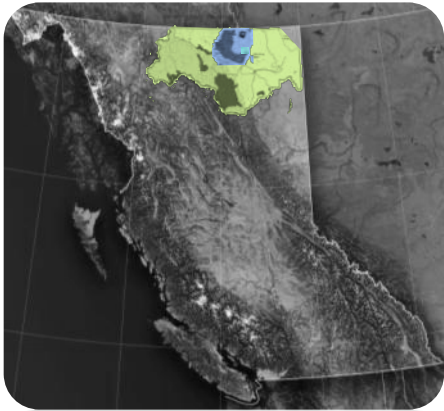
Geographic Scale: Basin - 1 million ha, specific to basin
Temporal Scale: 5-10 years
Inputs: Government agencies, Industry, First Nations and stakeholders
Outputs: Basin specific tactical analysis, footprint analysis, monitoring plan, required best practices and increased knowledge and expertise within the Commission

Operational




(Regulatory decisions made by the Commission)

Geographic Scale: up to 600 ha
Temporal Scale: 1 year +
Inputs: Industry, First Nations and stakeholders
Outputs: Statutory decisions with regards to applications, strengthened regulatory framework and greater transparency in reporting

AREA-BASED ANALYSIS



Legend

-  Restricted or No Development
-  Develop with additional practice requirements and targets
-  Develop with standard practices requirements

NORTHEAST WATER TOOL



- Supports decision-making process for water permits and licences.
- Public-facing application available to all British Columbians.

Section 8 Approval

File # 9634499

Company: ENCANACORPORATION

Effective Date: 5/16/2012

End Date: 5/15/2013

Northing: 6592210

Easting: 541822

Point-of-Diversion #: 822

Source Name: c-51-K/94-O-8

Source Type: Water Source Dugout

Approval Volume (m³)

Day: 300

Year: 4200

NEWT Tools

- Search by Location
- Search by UTM Coordinates

x1 y1
x2 y2...

Sample

- Clear Selection
- Identify: Section 8 ▲
Water Licence ▲

Results:

Upstream for 540730, 6597401

Report title: Kiwigana River

Export to PDF | CSV

7.05 million m³

- Volume of water used for hydraulic fracturing in 2012.
- Volumes used by play:

Play	# of Wells	Mean (m ³ /well)	Total Water Use (m ³)
Horn River Basin	50	76,923	3,846,142
Montney – Heritage	193	6,760	1,304,619
Montney – North	138	9,792	1,351,341
Liard Basin	1	139	139
Cordova Embayment	15	36,704	550,563
Other	9	211	1,899
Total	406	17,376	7,054,704

TRANSPARENCY

Oil and Gas Land Use in Northeast British Columbia

August 2013 | BC Oil and Gas Commission



Investigation of Observed Seismicity in the Horn River Basin

BC Oil and Gas Commission - August 2012



2012 Pipeline Performance and Activity Report

BC Oil and Gas Commission



Water Use in Oil and Gas Activities

2012 Annual Report





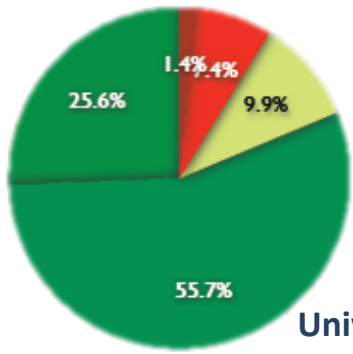
Social Attitudes Toward Hydrocarbon Development in British Columbia

Howard Harshaw
UBC Faculty of Forestry

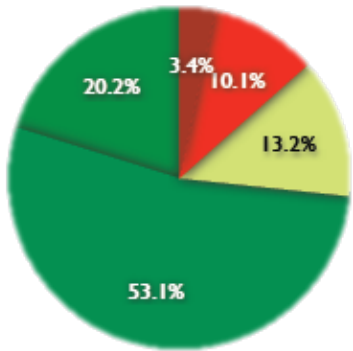
BC Oil and Gas Commission

Public Opinion Survey (UBC)

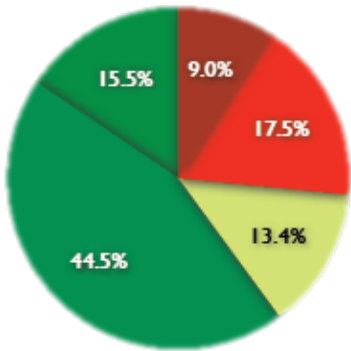
Trustworthiness of different sources of information about oil and gas development



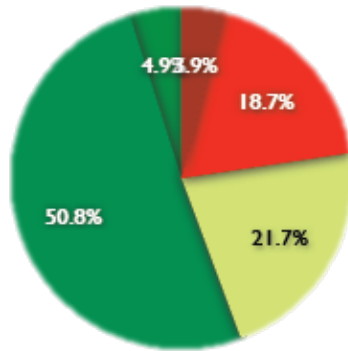
Universities/Colleges



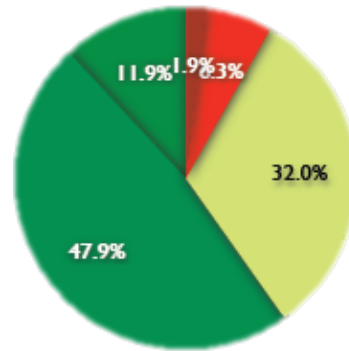
Experts



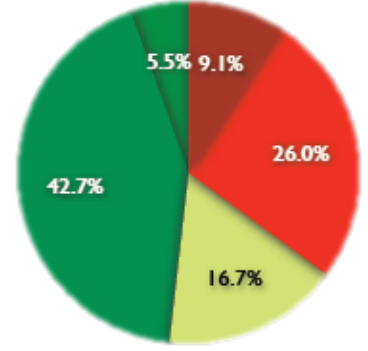
ENGOs



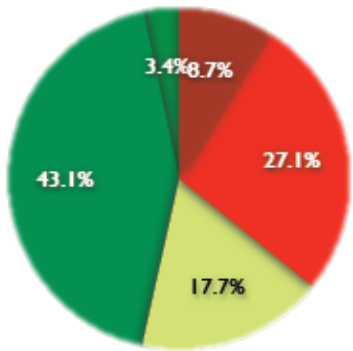
Internet



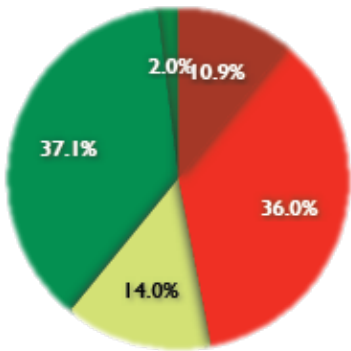
Friends



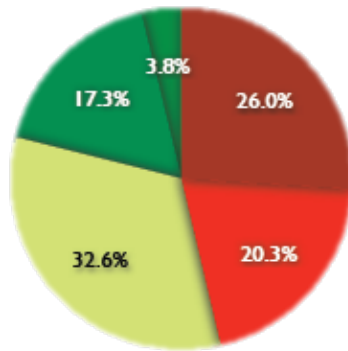
National Media



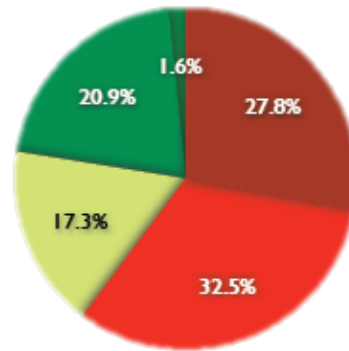
Local Media



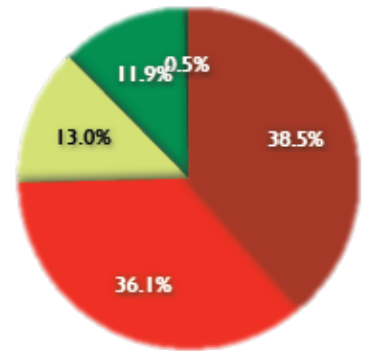
Local Leaders



Religious/Spiritual Leaders



Government



Politicians

● Strongly Distrust
 ● Somewhat Distrust
 ● Neither
 ● Somewhat Trust
 ● Strongly Trust

STUDIES

UNBC



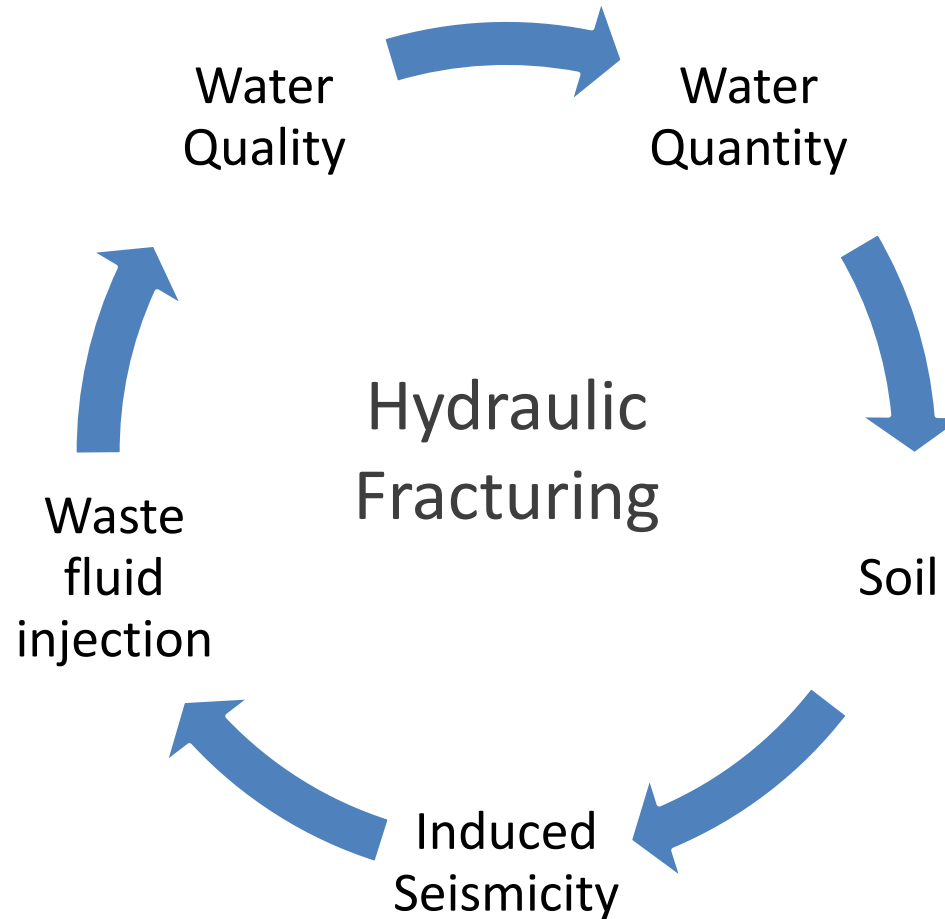
Emissions | Induced Seismicity | Public Opinion | Groundwater | Gas Migration

- Evaluation of gas migration in unconventional wells
- Cementing and surface casing vent flows
- Assessment of groundwater baseline sampling criteria
- Modelling hydraulic fracture propagation
- Induced seismicity
- Air quality impacts

WIDE RANGE OF EXPERTS

- Engineers, geologists, hydrologists, agrologists, biologists, foresters, natural resource specialists, inspectors, First Nations and landowner liaisons, lawyers and more from human resources to communications to application review specialists.

MONITORING HYDRAULIC FRACTURING

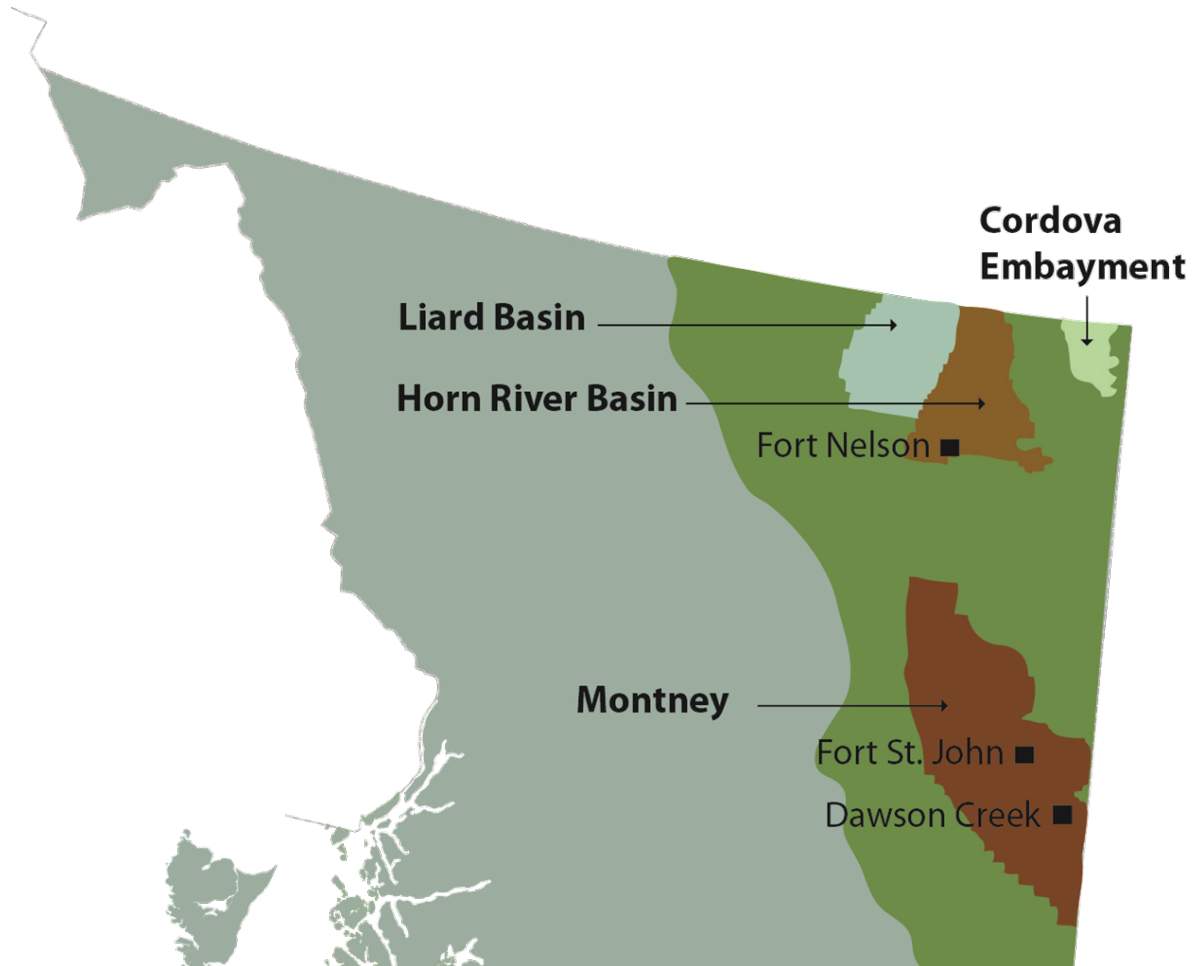


MONITORING HYDRAULIC FRACTURING

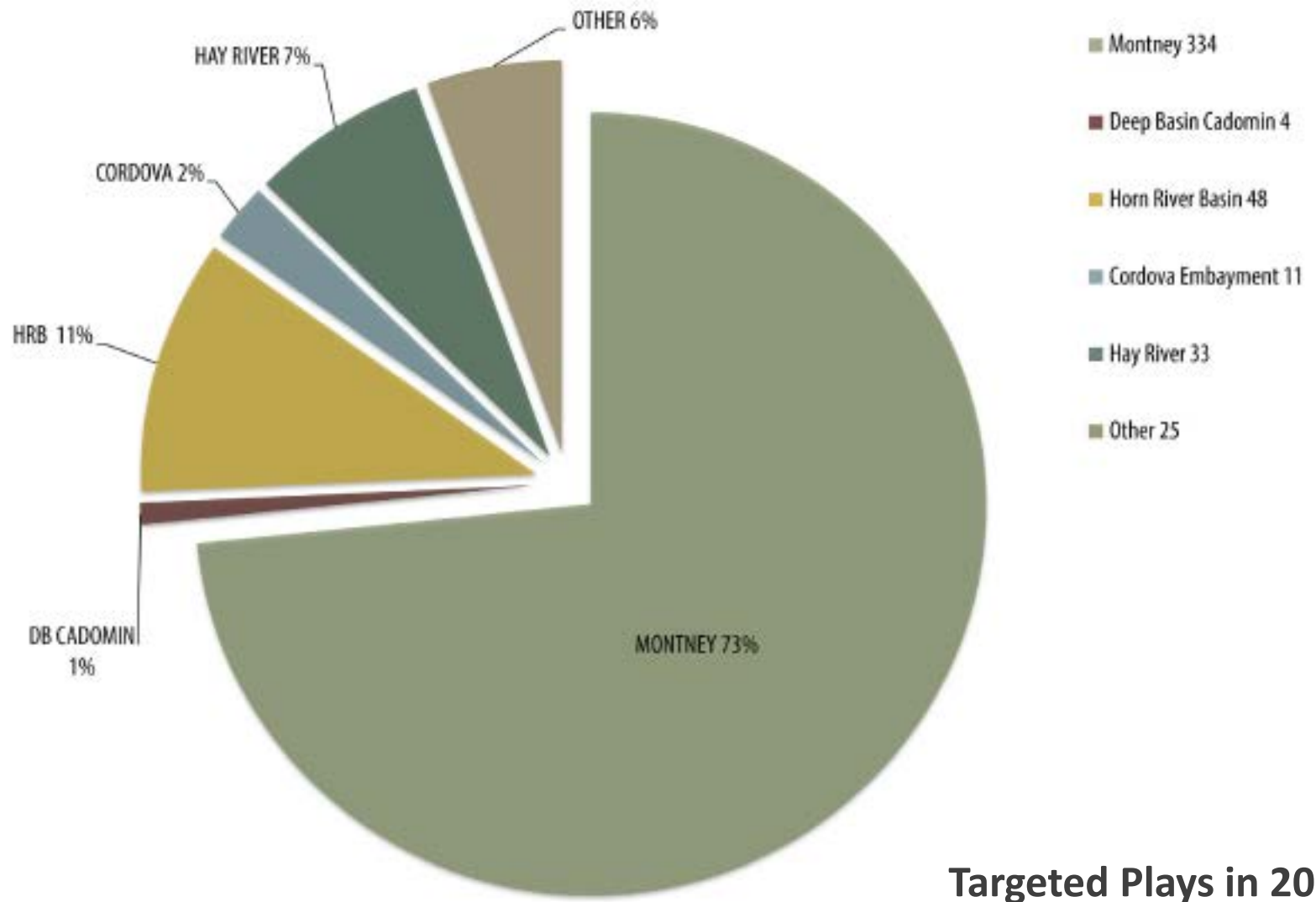


Longer Term: full resource recovery | vehicle traffic | noise | visual effects

B.C.'S BASINS

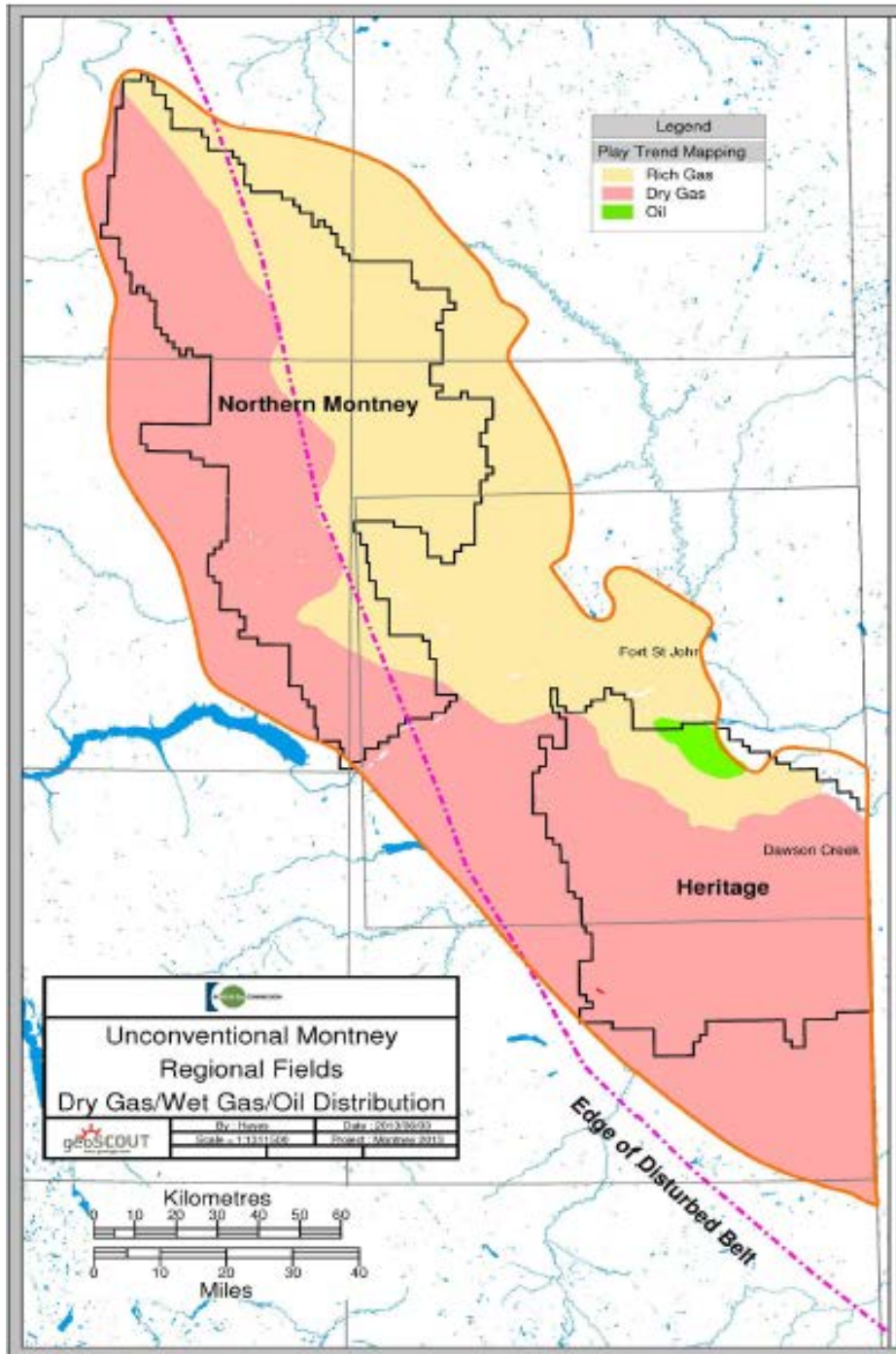


B.C.'S ACTIVITY



Targeted Plays in 2012

MONTNEY



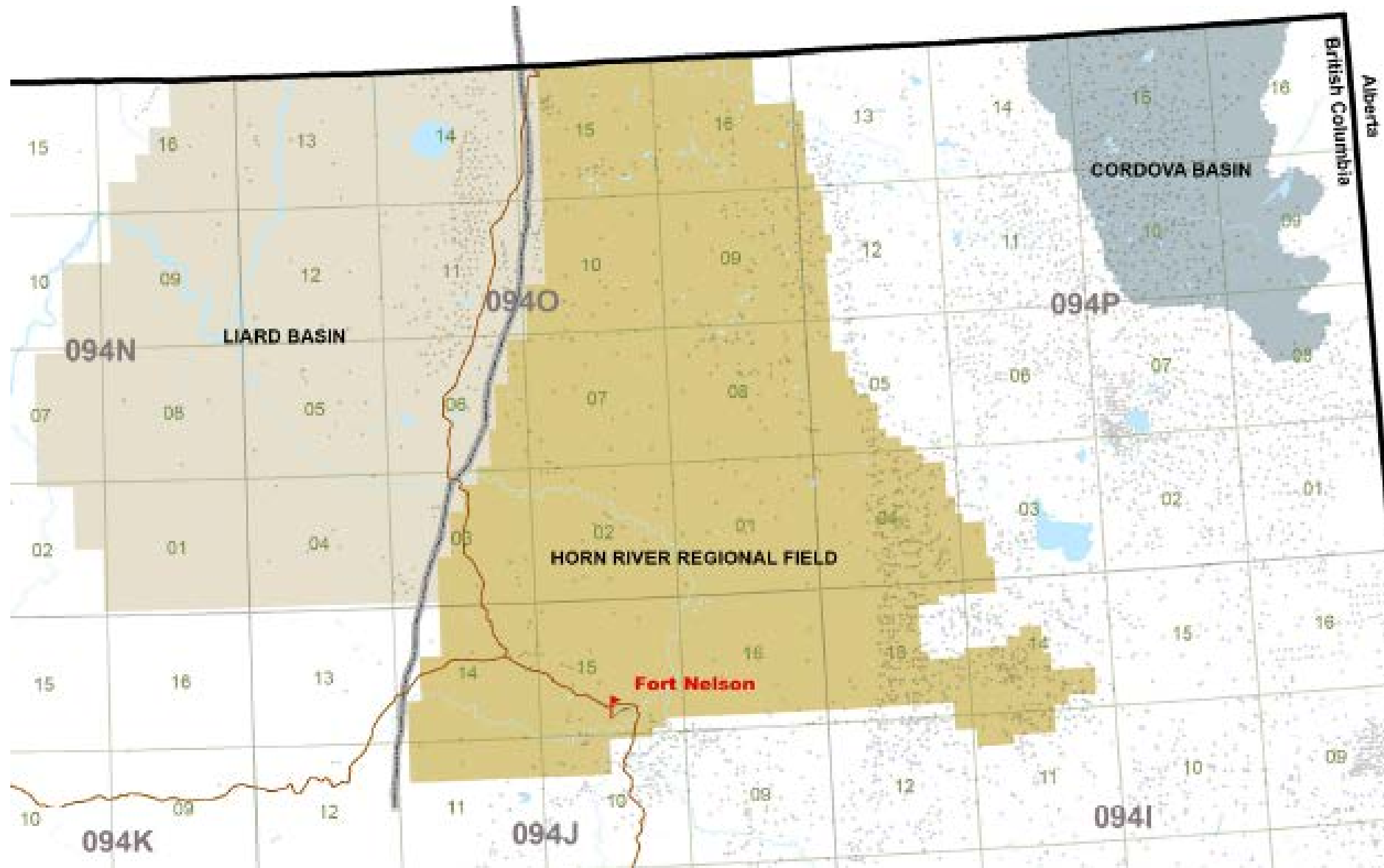
MONTNEY RESERVOIR PARAMETERS

Reservoir Data	Heritage	Northern Montney
Depth Range	1,800 – 3,200 m	2,000 – 2,400 m
Gross Thickness	30 – 300 m	30 – 300 m
TOC Range	~2%	~2%
Porosity	2 – 9%	2 – 9%
Water Saturation	25%	25%
Pressure	20 – 50 MPa	30 – 44 MPa
Pressure Regime	Over Pressure	Over Pressure
Temperature	60 – 100° C	60 – 75° C
H ₂ S	Less than 0.3%	Less than 0.3%
CO ₂	Less than 1% (max 5%)	Less than 1% (max 5%)

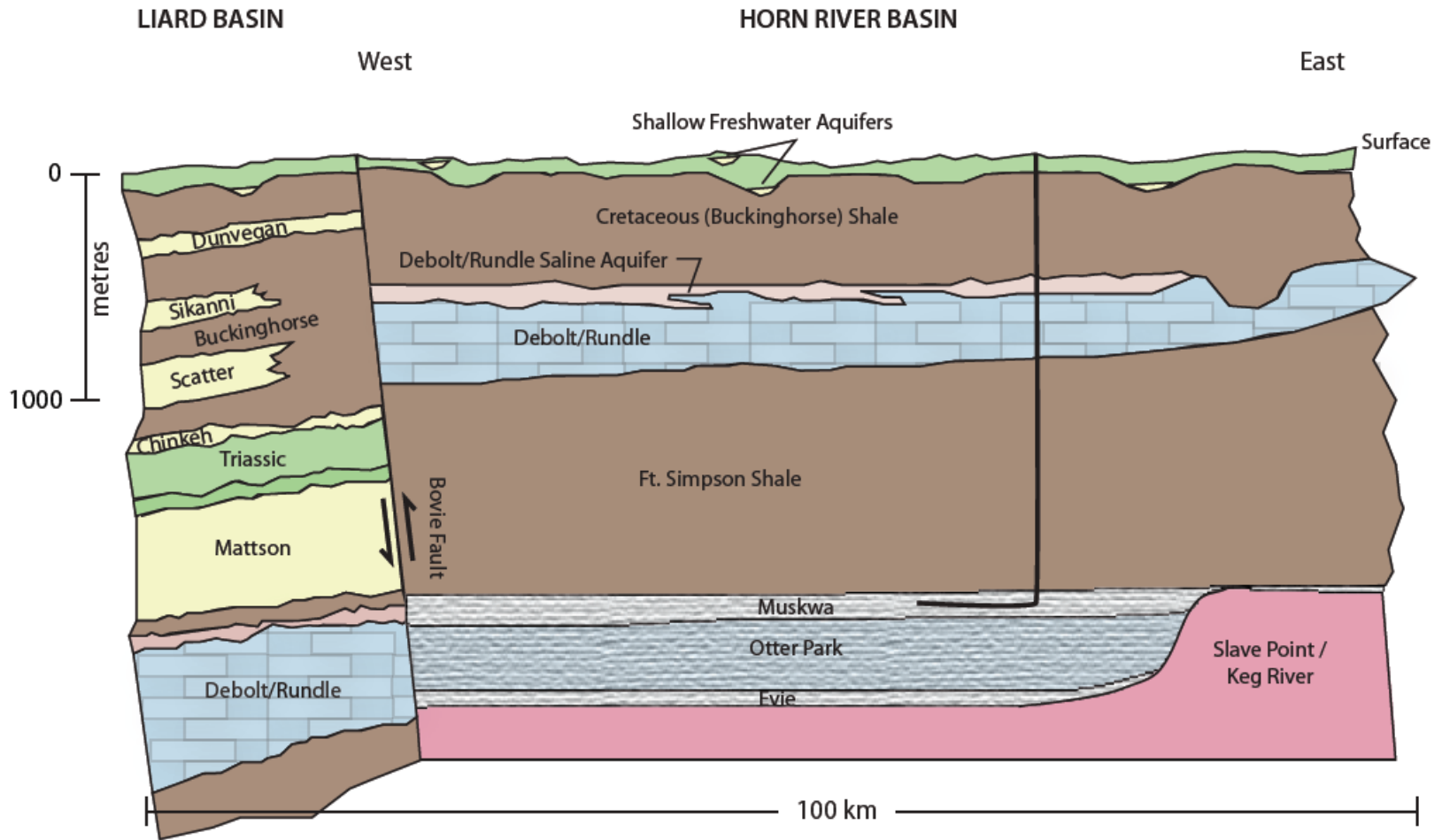
MONTNEY DRILLING/COMPLETIONS (2010-2012)

Drilling Data	
Wells/pad	Up to 20
Well density	Up to 16 wells per GSU, average 2.5 wells per GSU
HZ length	Up to 3,000 m, average ~1,600 m
Wellbore	75% Cased / 25% Open hole
Completion Data	
Number of stages	Up to 36, average 10
Fracture fluid	Slickwater, linear or cross-linked gel Energized or foam with CO ₂ and/or N ₂
Pump rate	2 – 15 m ³ per min, average 6 m ³ per min
Average water per well	<2,000 m ³ gel/foam; 9,000 m ³ slickwater
Average sand per well	1,300T

HORN RIVER BASIN



HORN RIVER BASIN/LIARD



HORN RIVER BASIN GAS COMPOSITION

Gas Composition, Avg (Min-Max) %	Muskwa-Otter Park	Evie
Methane (C ₁)	89 (71 – 95)	87 (75 – 98)
Ethane (C ₂)	0.2 (0.01 – 3)	0.2 (0.01 – 7)
NGLs (C ₃₊)	0.05 (0 – 4)	0.07 (0 – 4)
CO ₂	10 (4 – 22)	12 (0 – 19)
H ₂ S	0 (0 – 0.1)	0.07 (0 – 0.1)

HRB DRILLING/COMPLETIONS (2010-2012)

Drilling Data	
Wells per pad	Up to 16
Well spacing	100 – 600 m, average 300 m
HZ length	Up to 3,100 m, average ~1,500 m
Wellbore	Cased
Completion Data	
Completion method	Perf and plug
Fracture	Slickwater
Number of stages	Up to 31, average 18
Pump rate	8 – 16 m ³ per min
Water per well	Average 64,000 m ³
Sand per well	Average 3,700 T

WHAT GUIDES US?

- Legislation – OGAA and Regulations
- Policy – Government Agencies
- Input from First Nations others affected by activities
- Memoranda of Understandings
- Our commitment to being a credible regulator

Enacted
2010

Modernized
legislative
framework

Reviewed
and audited
for
effectiveness

Copyright (C) Queen's Printer,
Victoria, British Columbia, Canada

OIL AND GAS ACTIVITIES ACT
[SBC 2008] CHAPTER 36

Part 1 – Definitions
1 Definitions
2 Administration
Division 1 – Oil and Gas Commission
3 Corporation continued
4 Purposes
5 Commission as an agent of the government
6 Director and management of commission
7 Powers and powers of commissioner
8 Commission's responsibilities
9 Application

OIL AND GAS ACTIVITIES ACT

OGAA Regulations

Geophysical Exploration

Drilling & Production

Pipeline & LNG Facility

Consultation & Notification

Fee, Levy & Security

Cabinet Regulations

OGAA & General

PNGA General

Regulations Act Schedule

Environmental Protection & Mgmt

Administrative Penalties

SPECIFIED ENACTMENTS

Single-window

Land Act



Temporary Occupation of Crown Land
Licence of Occupation
Right-of-Way

Water Act



Water Permits and Licences
Changes in & About a Stream
Permits Over Crown Land

Forest Act



Master Licence to Cut

Other
Enactments



Heritage Conservation Act
Environmental Management Act

An effective
regulator.

Government's
role.

Industry's
role.



Thank you



Questions?