

# Characterizing dissolved methane in groundwater in the Peace Region, Northeast BC, using a regional, dedicated groundwater monitoring well network

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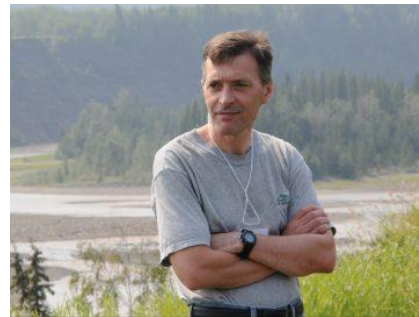
CNC-SNC



Max Goetz, UBC



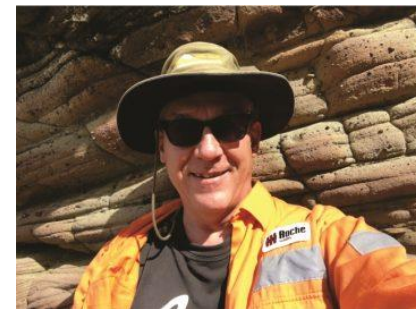
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# Goals

1. Determine groundwater quality on a regional scale
  - Emphasis on determining distribution, concentration and origin of dissolved methane in shallow groundwater
  - Assess potential impacts from oil & gas development
2. Provide groundwater monitoring infrastructure to the region as a legacy, and a platform for future research activities



# Baseline and proximal wells

- 29 Monitoring stations installed in Peace Region
- “Baseline” monitoring wells
  - Confirm and augment understanding of baseline groundwater conditions.
  - > 1km from nearest energy well
- “Proximal” monitoring wells
  - Near existing and future O & G development
  - < 400m from nearest energy well
- Project technical advisory committee
  - Well locations, project strategy and oversight



# Well installation

Drilling campaign	Dates	EERI wells completed	Drilling Methods
1	August 2018	1 to 4	Sonic
2	February 2019	5 to 6	Air Rotary
3	June/July 2019	7 to 14	Sonic, Air Rotary, Diamond HQ
4	August 2019	15 to 23	Sonic, Air Rotary, Diamond HQ
5	September 2019	24 to 29	Sonic, Air Rotary





## Legend

Energy well density per 10km<sup>2</sup>

0

1

1 - 5

5 - 10

10 - 20

20 - 30

>30

□ MWIP boundary

▤ Regional resource play

■ City/town

★ EERI monitoring well

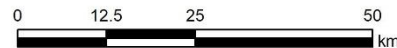
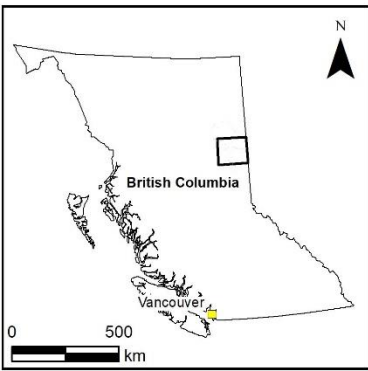
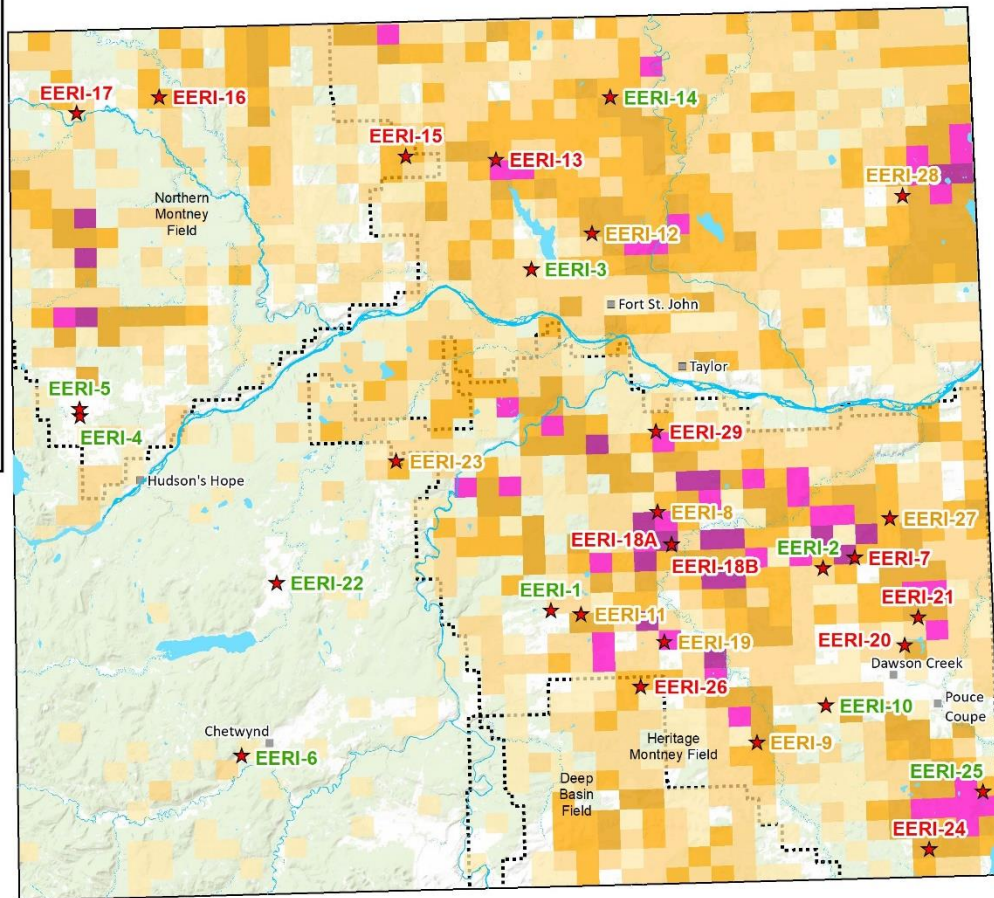
Proximity to nearest energy well

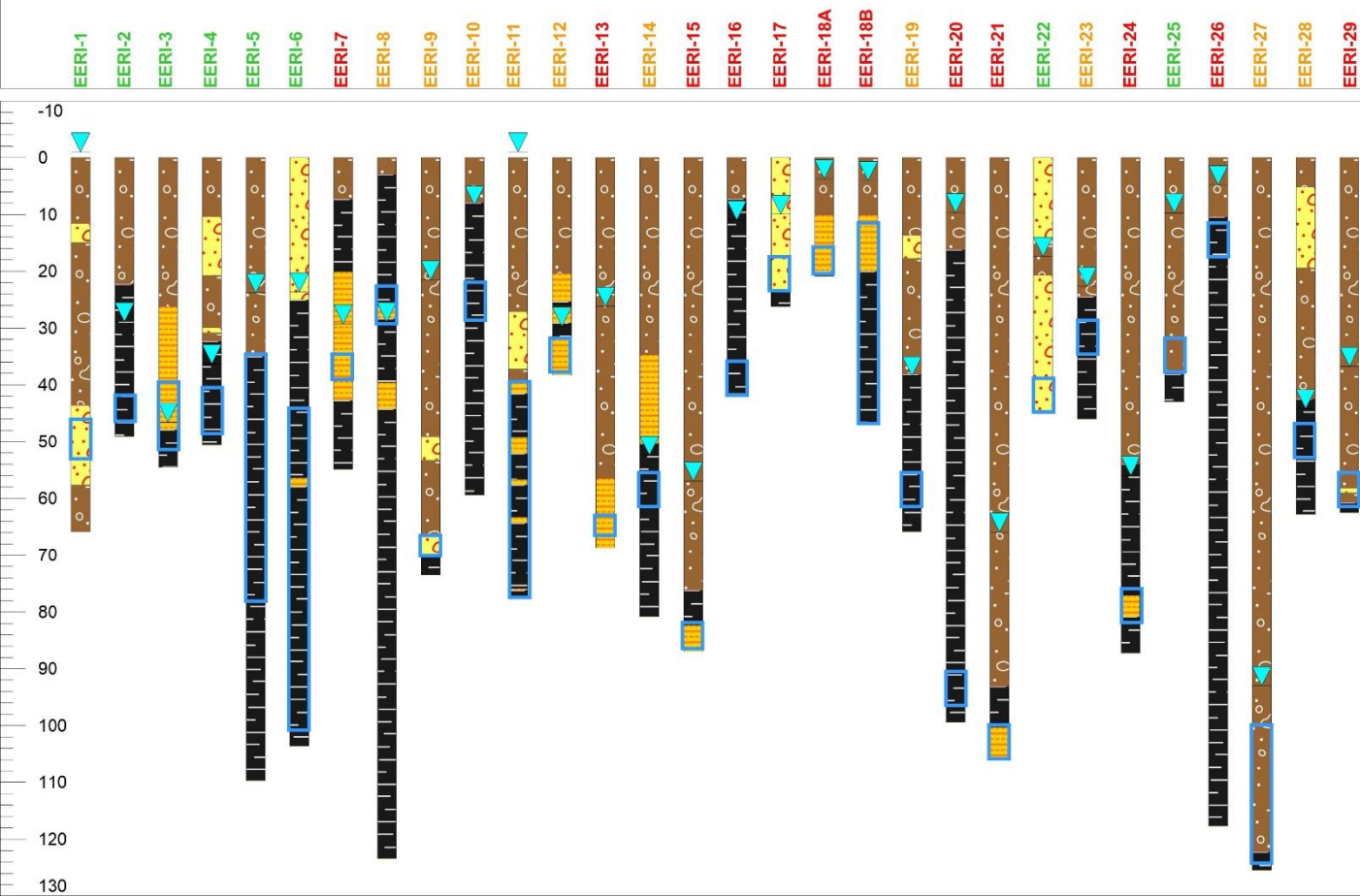
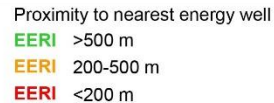
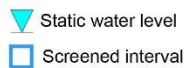
EERI >500 m

EERI 200-500 m

EERI <200 m

7579 energy wells within MWIP boundary





# Westbay multilevel installation

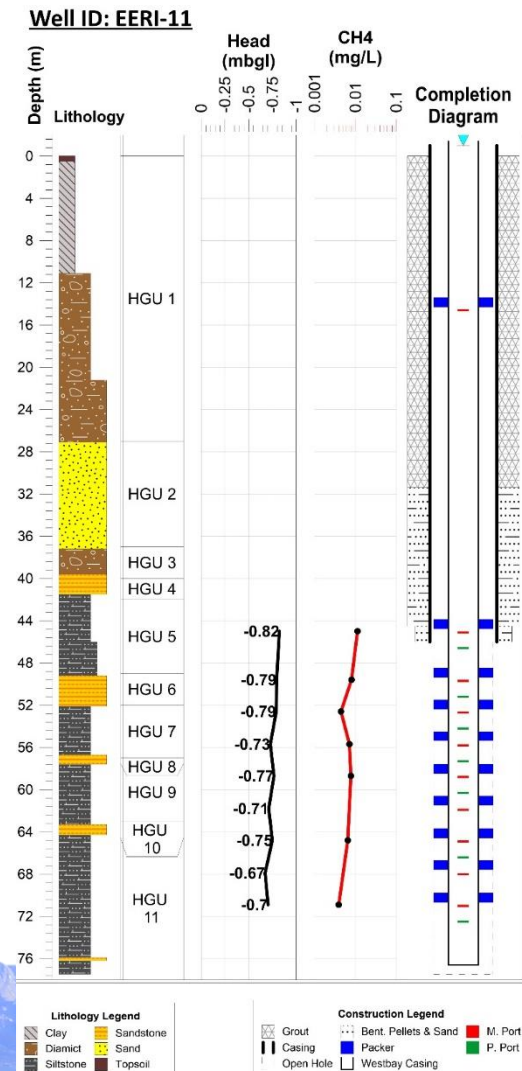
- Instrument at multiple depths in single borehole
  - installed in EERI-11, EERI-18B
- ➔ Characterize vertical flow directions
- ➔ Detailed geochemical profile





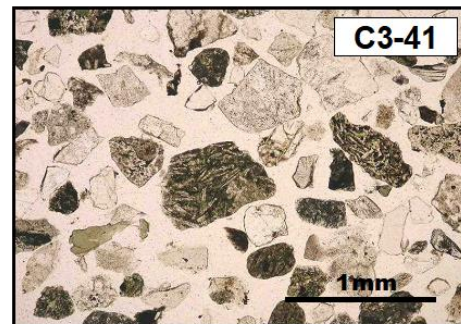
# EERI-11 Westbay

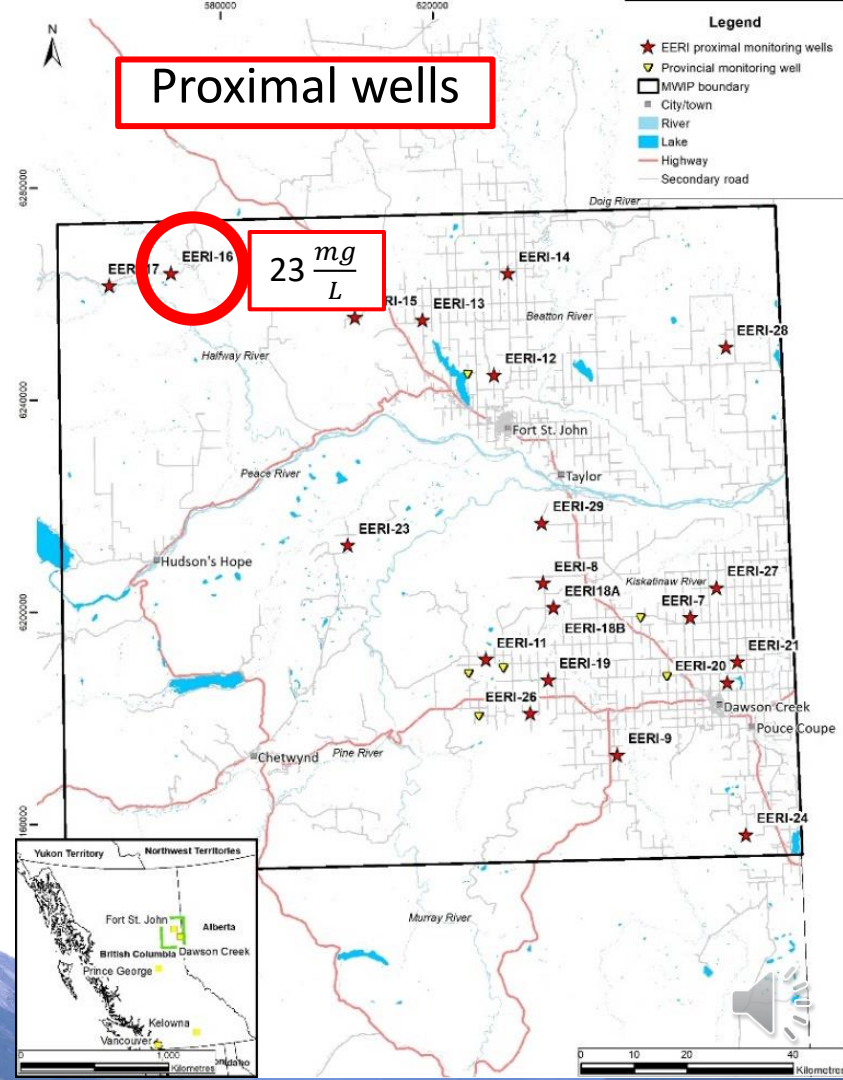
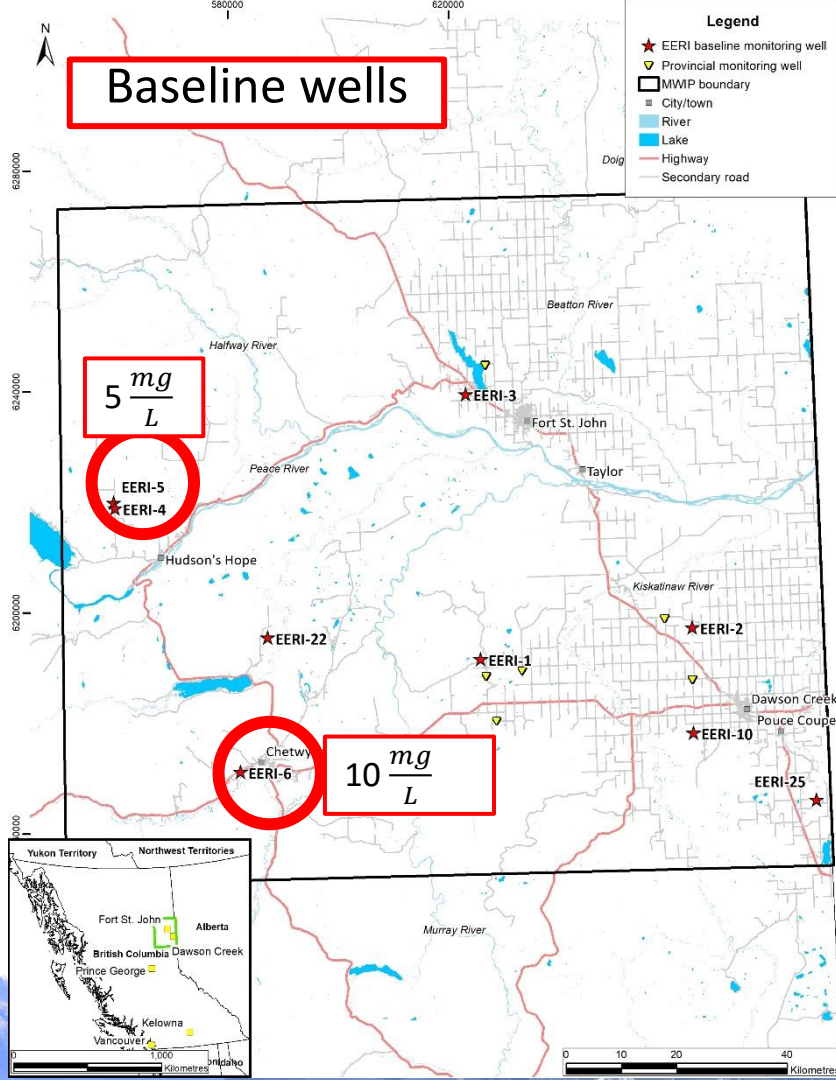
- 7 ports in top-of-bedrock fractured sandstone aquifer
- Artesian, slightly downward vertical gradient
- Low gas concentration in all ports
  - ~0.01 mg/L dissolved methane



# Analyses

- Sediment properties:
  - Mineralogy
  - Reactivity (seq. extractions)
  - Grain size dist.
  - Permeability (where possible)
- Water:
  - Dissolved gases
  - Dissolved metals, anions
  - Water isotopes (age)
  - Hydrocarbon isotopes (provenance)





# Thank you



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