



March 18, 2019

# Air injection and displacement for recovery with oil horizontal (AIDROH) project

Approval #11618  
Performance presentation

# Advisory

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# AIDROH\* introduction and overview

This presentation was prepared in accordance with AER Directive 054 - Performance presentations, auditing, and surveillance of in-situ oil sands schemes

Subsurface issues related to resource evaluation and recovery

- Directive 054, Section 3.1.1

Surface operations, compliance, and issues not related to resource evaluation and recovery

- Directive 054, Section 3.1.2

# **AER Directive 054 Section 3.1.1**

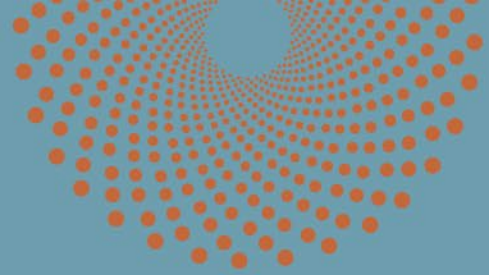
Subsurface issues related to resource evaluation and recovery

# Subsurface issues: table of contents

- Background
- Geology/geoscience
- Drilling and completion
- Artificial lift
- Instrumentation
- Scheme performance
- Future plans

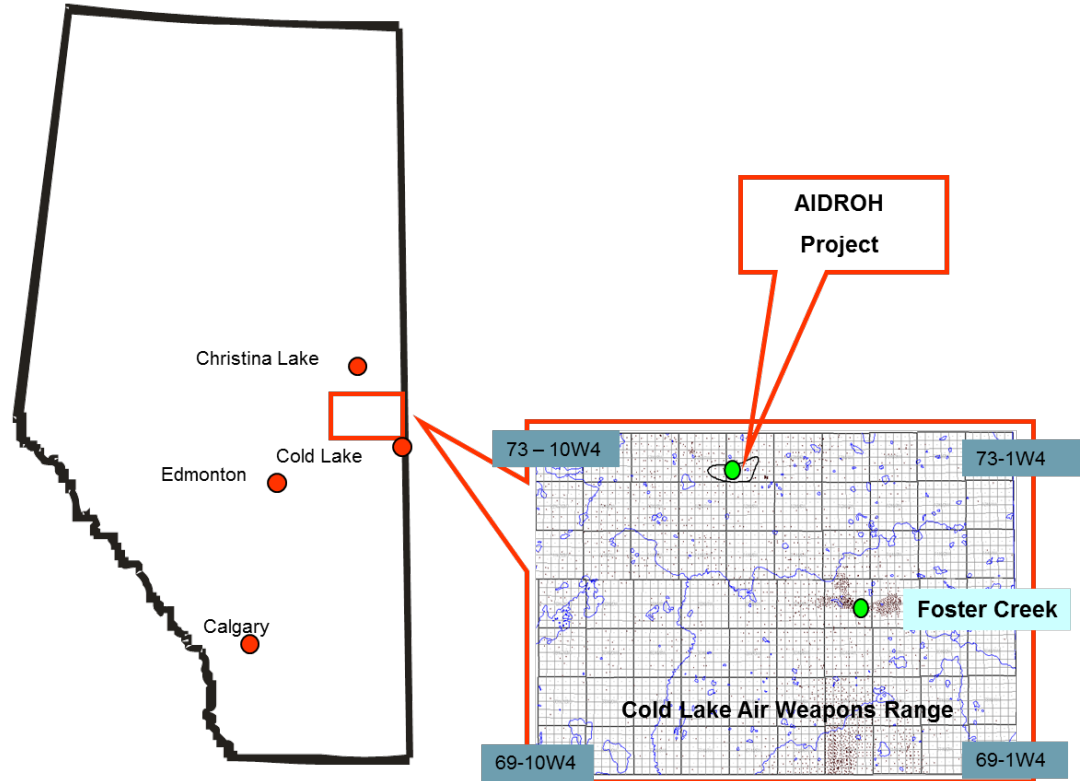
# Scheme background

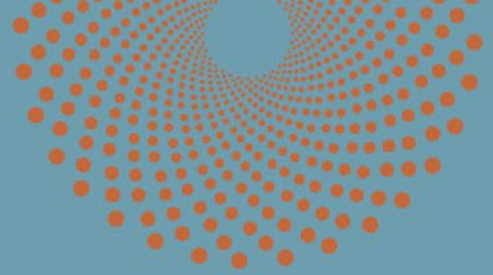
Subsurface section 1



# Background

The AIDROH project uses gravity drainage as a bitumen recovery process to recover bitumen that has been passively heated by the Cenovus EnCAID combustion project





# Geological/geoscience

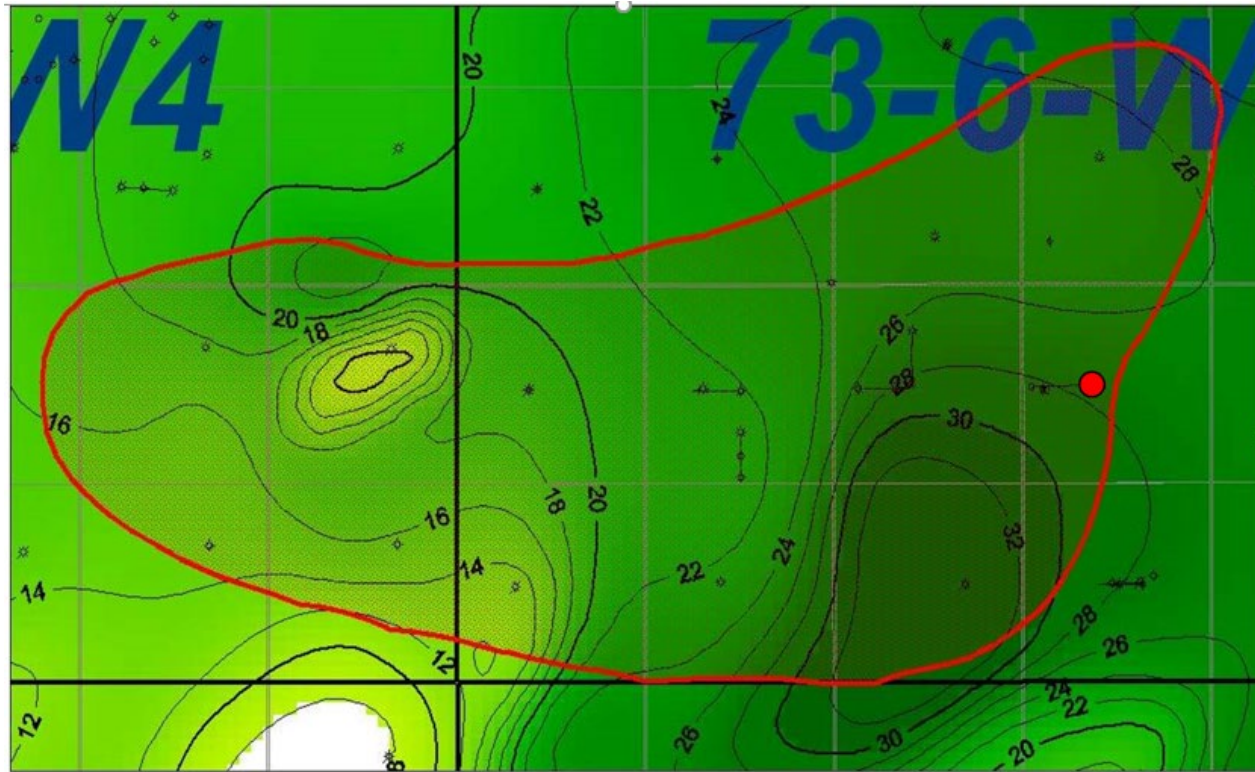
Subsurface section 2



# Summary of reservoir properties

Depth	465m TVD
Thickness	25-30m
Average porosity	35%
Average bitumen saturation	65%
Average permeability	1,350mD
Oil viscosity     @ 13C @ 60C	~25,000 cP ~600 cP
API oil gravity	10.3 - 10.8

# Wabiskaw bitumen thickness

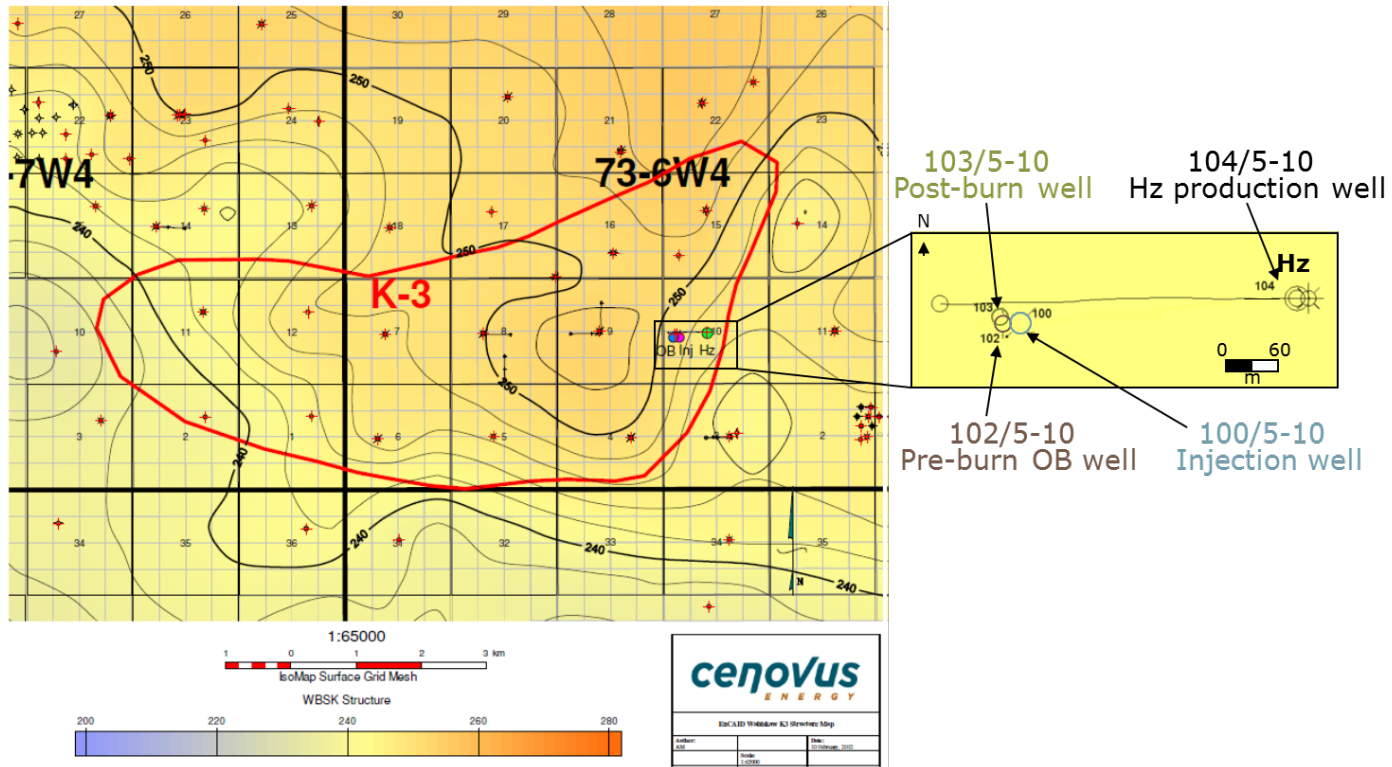


## Type log cut offs:-

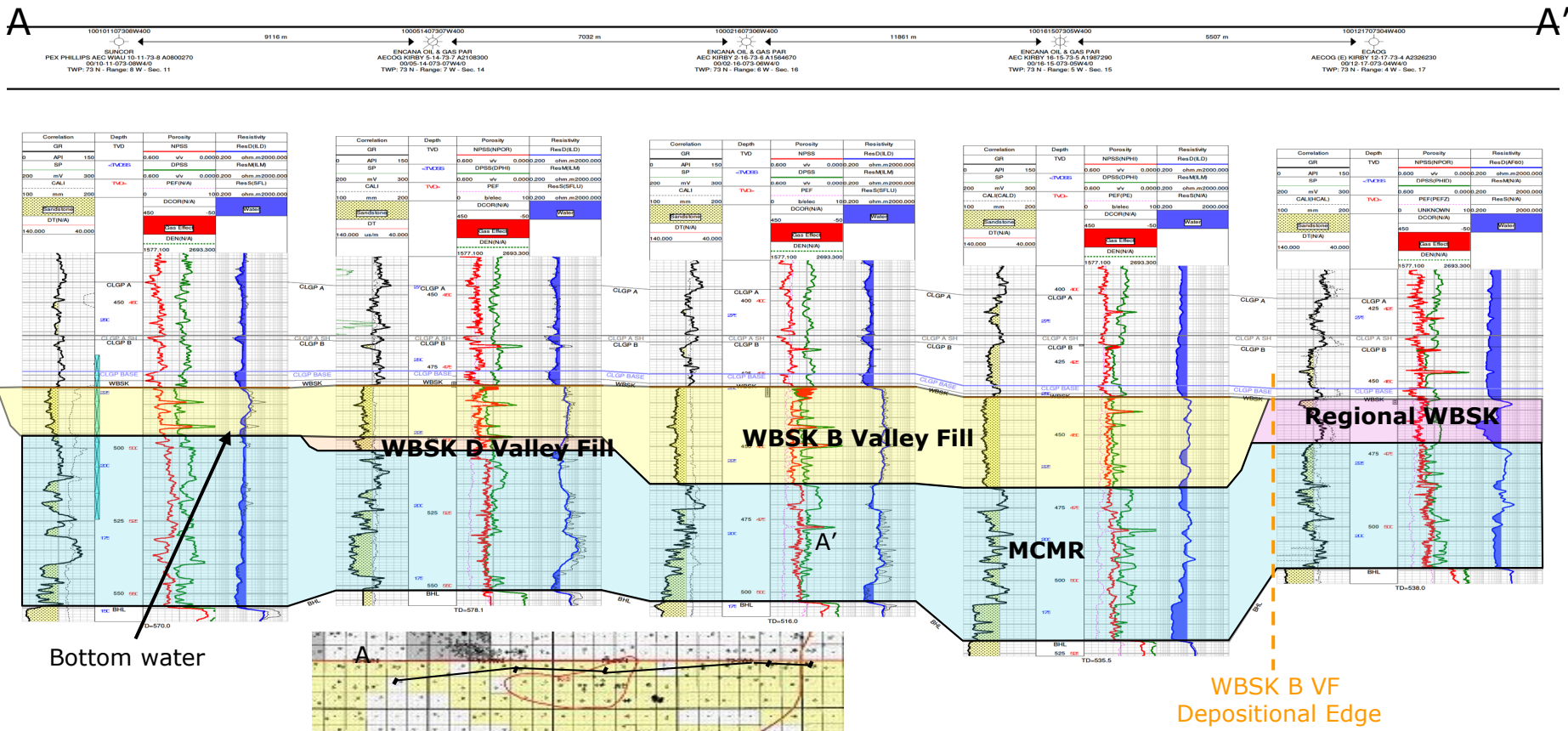
- <75 api gamma ray
- >20 ohm resistivity
- >27% porosity

● AIDROH

# Wabiskaw structural map



# Wabiskaw stratigraphic cross-section



# Horizontal production well 104/5-10

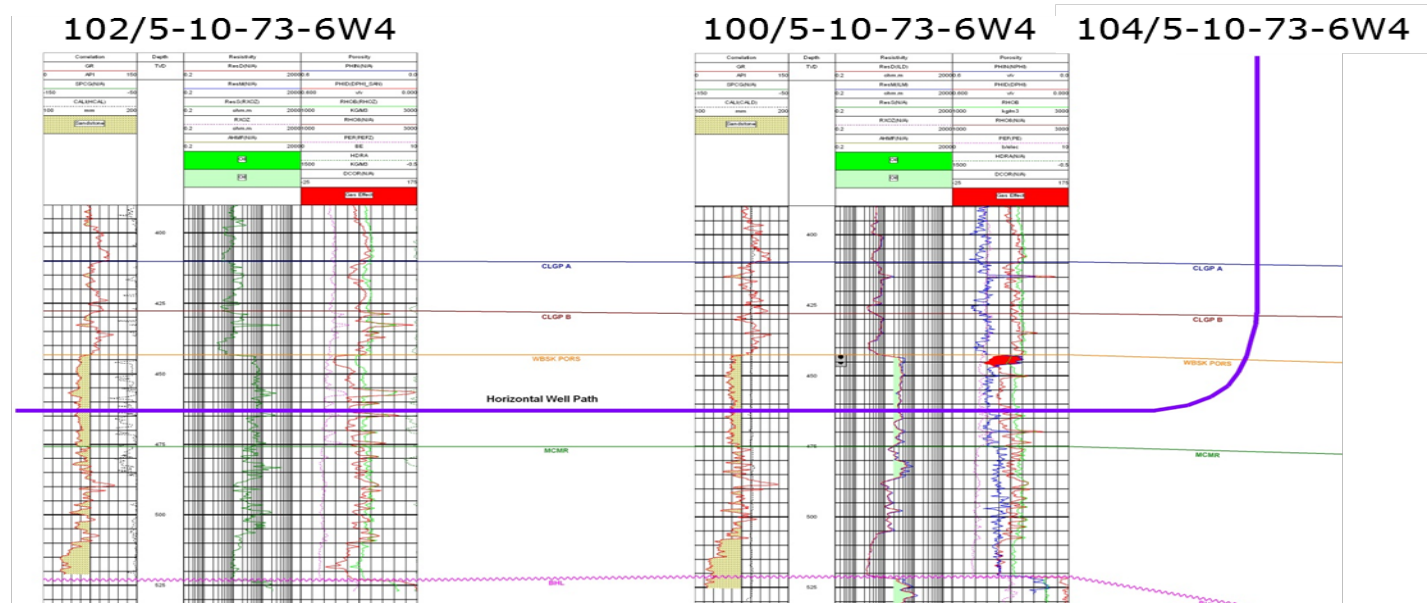


## Producer drilled 15m below G/B interface:

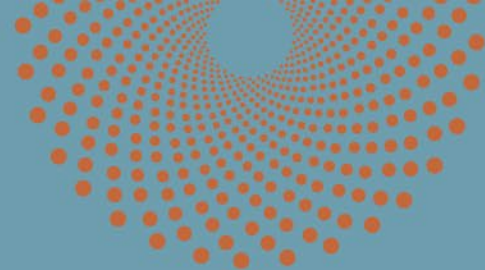
- avoid hitting concretion
- avoid missing heated zone

## Learnings:

- drill lower to optimize reserves recovery



Drilled in 2011 east of injector well at surface location 6-10  
300m of horizontal leg landed 30m north of injector well and  
~15m into heated zone



# Drilling and completion

Subsurface section 3



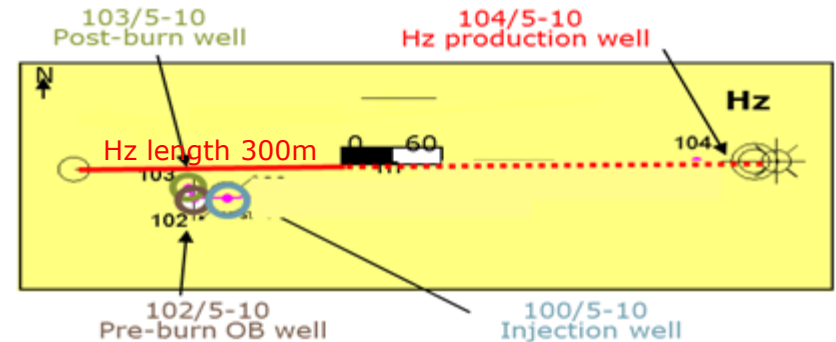
# Well layout

## Drilled 103/5-10-73-6W4 post burn vertical well September 2011

- Drilled 11m northwest of 102/5-10-73-6W4
- Successfully cored 44m from top Wabiskaw to top of McMurray – no lot core
  - extensive core and oil analysis program completed
  - core routine core analysis, SEM, XRD
  - oil API, viscosity, composition

## Drilled 104/5-10-73-6W4 horizontal producer well September 2011

- Drilled 300m east-west horizontal section, landed 30m north of 100/5-10-73-6W4 injector well and 15m below Wabiskaw gas/bitumen interface
- Well equipped with 20 thermocouples in horizontal length



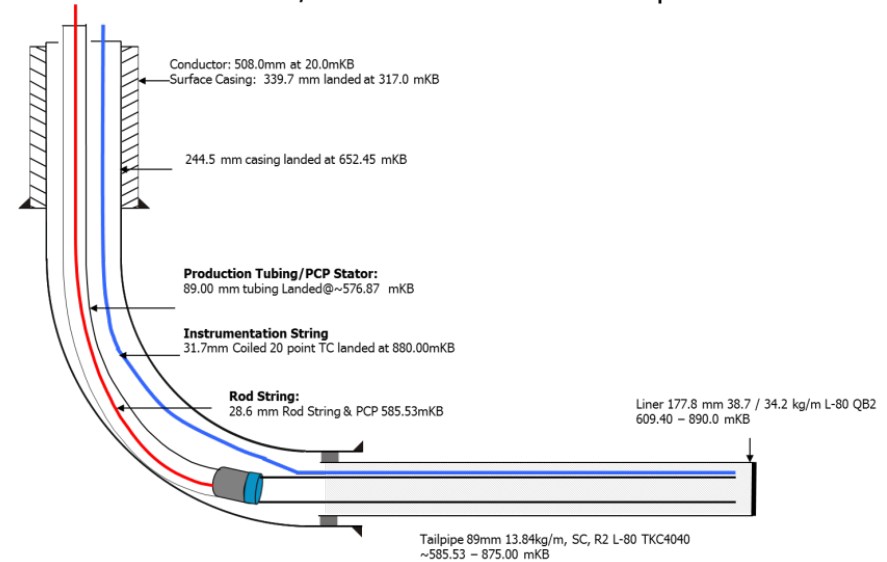
# Completion

## Installed tail pipe to toe

- divert hot crude to toe
- encourage warming near toe



### AiDROH 104/05-10-073-06W4M Recompletion



Requirements under subsection 3.1.1 3c – wellbore schematics are included in the appendix



# Artificial lift

Subsurface section 4

# Artificial lift

## Artificial lift technology information

- Progressive cavity pump (PCP), temperature tolerance of elastomer 150°C
- Lift capacity range: 34-50 m<sup>3</sup>/D
- Operating temperature range 44°C to 108°C

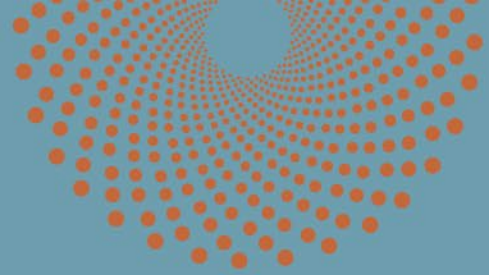
# Artificial lift performance

No production activity during 2018 reporting period

- Well suspended on February 13, 2015

# Instrumentation

Subsurface section 5



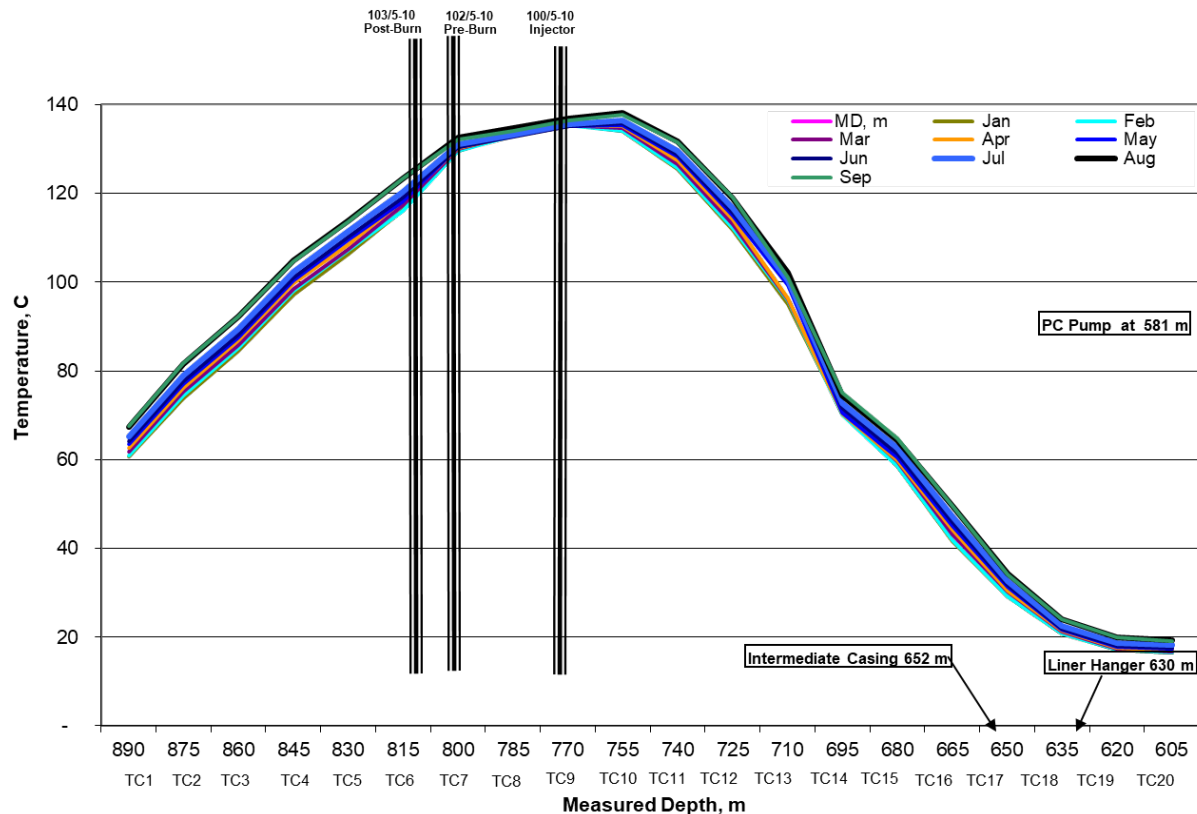
# Instrumentation in wells

104/05-10-73-6W4/00

- Equipped with 20 thermocouples

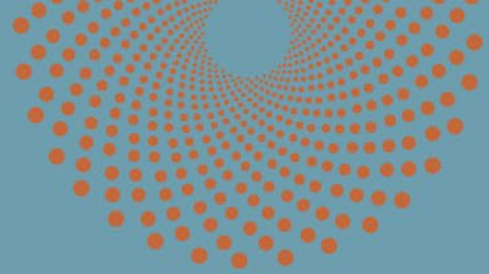
Requirements under subsection 3.1.1 5a – wellbore schematics 5c and 5d are included in the appendix

# Thermocouple temperature vs. depth



# Scheme performance

Subsurface section 7



# Production history

No production activity during 2018 reporting period



# Heated oil volume

Calculated using analytical geometry-based method

Combustion front heats bitumen by conduction in the shape of a sphere cap

- Thermally affected radius  $\sim 290\text{m}$

Chemically affected

- $64,000\text{m}^3$

Thermal affected\*

- $750,000\text{m}^3$

\* Based on horizontal well depth 15m below gas/bitumen interface

# Historical oil quality

Original oil ~45,000 cP at reservoir conditions (dead)

No oil quality analysis undertaken during 2018 reporting period

# Basic Sediment & Water

No production activity during 2018 reporting period

# Subsurface key learnings

No production activity during 2018 reporting period

EnCAID conductive heating effects observed following suspension of well operations from 2015

- TC 1-5      ~17°C temperature increase
- TC 6-11     ~20°C temperature increase
- TC 12-15    ~11°C temperature increase

# Future plans

Subsurface section 8

# Future plans

Cenovus divested the AIDROH well and facilities effective September 2018. Cenovus plans to cancel the scheme approval for AIDROH.

# **AER Directive 054 Section 3.1.2**

Surface operations, compliance and issues not related to  
resource evaluation and recovery

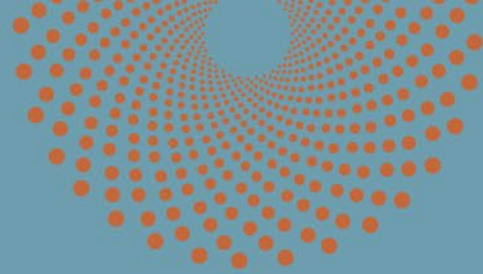
# Surface operations: table of contents

- Facility overview/modifications
- Measurement and reporting
- Water, water disposal well and landfill waste
- Sulphur production
- Environmental issues
- Compliance statement
- Non-compliance discussion
- Future plans

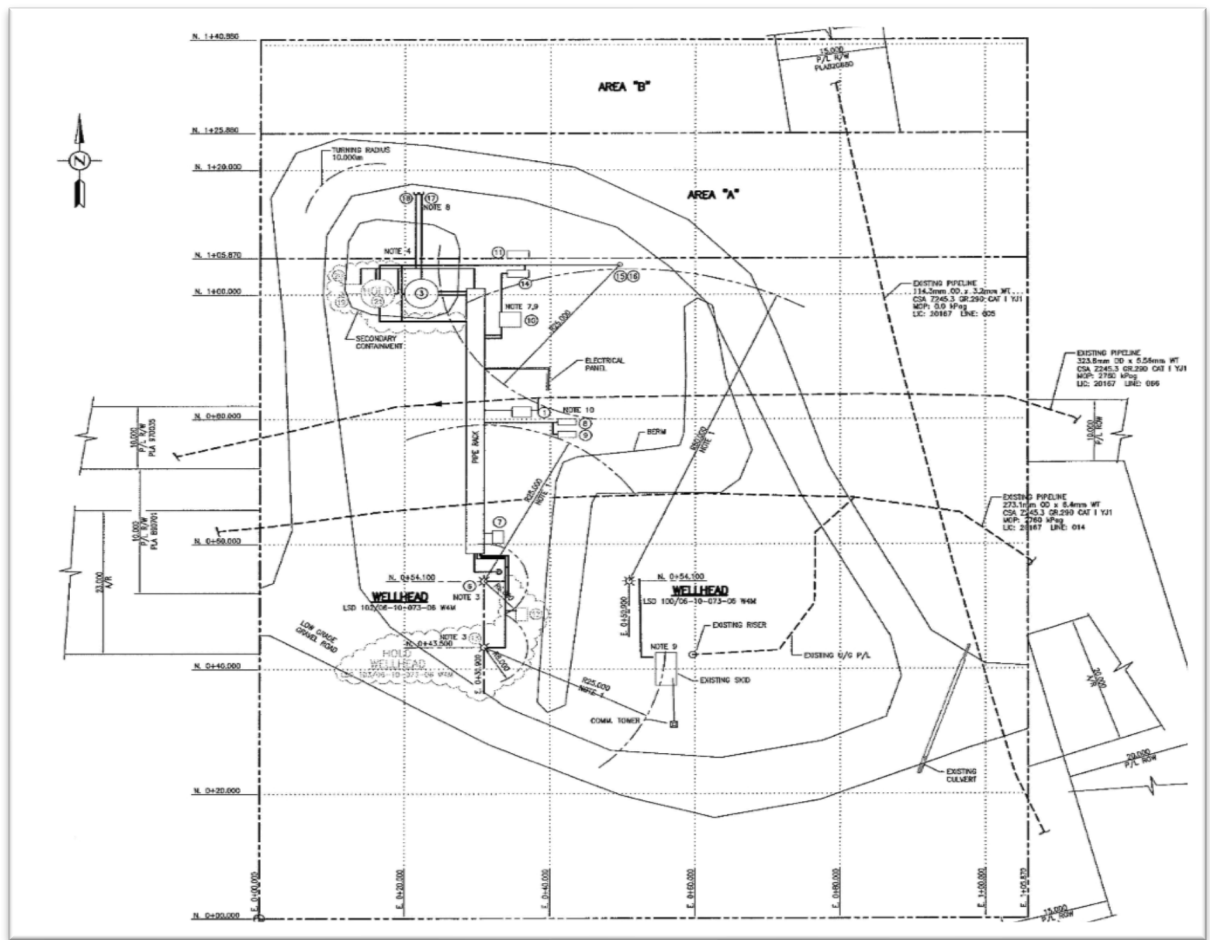


# Facilities Overview

Surface section 1



# Site layout



No changes to facility or process undertaken during 2018 reporting period



# Facility performance 2018

No production activity during 2018 reporting period

- Suspended facility February, 2015

# Gas usage

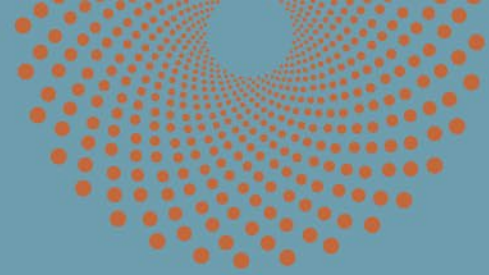
No gas usage activity during 2018 reporting period

# Greenhouse gas emissions

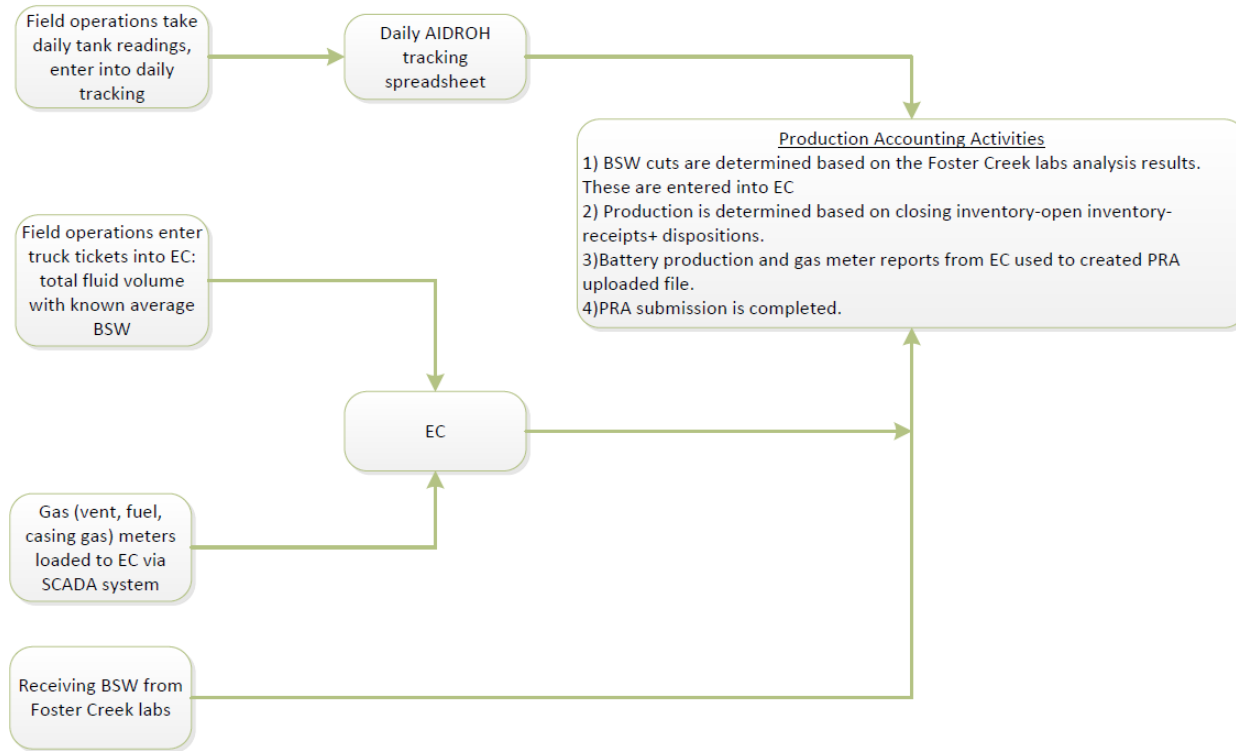
No production operations or gas usage activity during 2018 reporting period

# Measurement and reporting

Surface section 2



# Measurement reporting





# Water, water disposal and landfill waste

Surface section 5

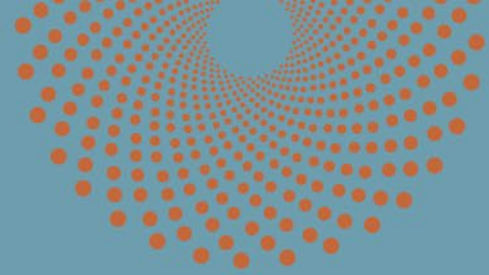
# Water and waste disposal

No production operations during 2018 reporting period

- No processing occurred at the site
- No produced water

# Sulphur production

Surface section 6



# Sulphur production

No production operations during 2018 reporting period

# Environmental issues

Surface section 7

# Environmental issues

No environmental issues related to the AIDROH occurred in 2018

# Compliance statement

Surface section 8

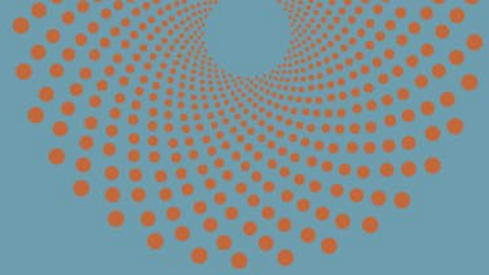
# Compliance confirmation

No non-compliance events related to the AIDROH occurred in 2018



# Non-compliance discussion

Surface section 9



# Non-compliance confirmation

No non-compliance events related to the AIDROH occurred in 2018

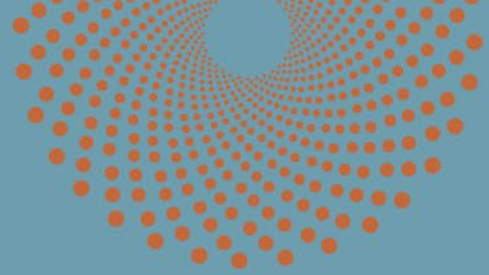
# Future plans

Surface section 10

# Future plans

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# Appendix



# Wellbore schematic

