

2024 AER Directive 054 Scheme Performance Report

Hangingsstone Expansion SAGD Project

**Scheme Approval No. 11910, as amended
EPEA Approval No. 153105, as amended**



GREEN FIRE
RESOURCES



Disclaimer



Advisory

This presentation contains information in compliance with AER Directive 054 - Performance Presentations, Auditing, and Surveillance of In Situ Oil Sands Schemes. This document contains forward-looking information prepared and submitted pursuant to Alberta regulatory requirements and is not intended to be relied upon for any other purposes, including without limitation, to make investment decisions or to purchase, hold or sell any securities of Greenfire Resources Ltd. Additional information with respect to the risks and uncertainties associated with forward-looking information is contained in Greenfire's annual information form for the year ended on December 31, 2024, available on SEDAR+ at www.sedarplus.ca/, which is also included in Greenfire's Annual Report on Form 40-F filed on EDGAR at www.sec.gov and on the website (www.greenfireres.com).

Oil & Gas Financial Information

The estimates of reserves were prepared effective December 31, 2024. All estimates of reserves were prepared by independent qualified reserves evaluators based on definitions contained in the Canadian Oil and Gas Evaluation Handbook and in accordance with National Instrument 51-101 Standards of Disclosure for Oil and Gas Activities. Additional information with respect to pricing and additional reserves and other oil and gas information, including the risks and uncertainties associated with reserves estimates, is contained in Greenfire's annual information form for the year ended December 31, 2024 available on SEDAR+ at www.sedarplus.ca, which is also included in Greenfire's Annual Report on Form 40-F filed on EDGAR at www.sec.gov and on the website (www.greenfireres.com).

Table of Contents



1.0 Background

- 1.1 Background
- 1.2 Location

2.0 Subsurface

- 2.1 Lifespan Production
- 2.2 Field NCG & WSR (2024)
- 2.3 Field NCG & WSR (2019-2024)
- 2.4 Net Pay/Drainage Pattern/Seismic
- 2.5 Geomechanical Summary
- 2.6 Cross Section
- 2.7 Original Bitumen in Place
- 2.8 Well Patterns
- 2.9 Co-Injection Summary
- 2.10 Co-Injection Well Locations

3.0 Surface

- 3.1 Infrastructure
- 3.2 CPF Modifications
- 3.3 Bitumen/Steam Rates

4.0 Historical & Upcoming Activity

- 4.1 Suspension/Abandonments
- 4.2 Operational/Regulatory Changes
- 4.3 Successes & Challenges
- 4.4 Compliance History
- 4.5 Future Plans

Section 1.0 – Background



GREENFIRE
RESOURCES

1.1 Background

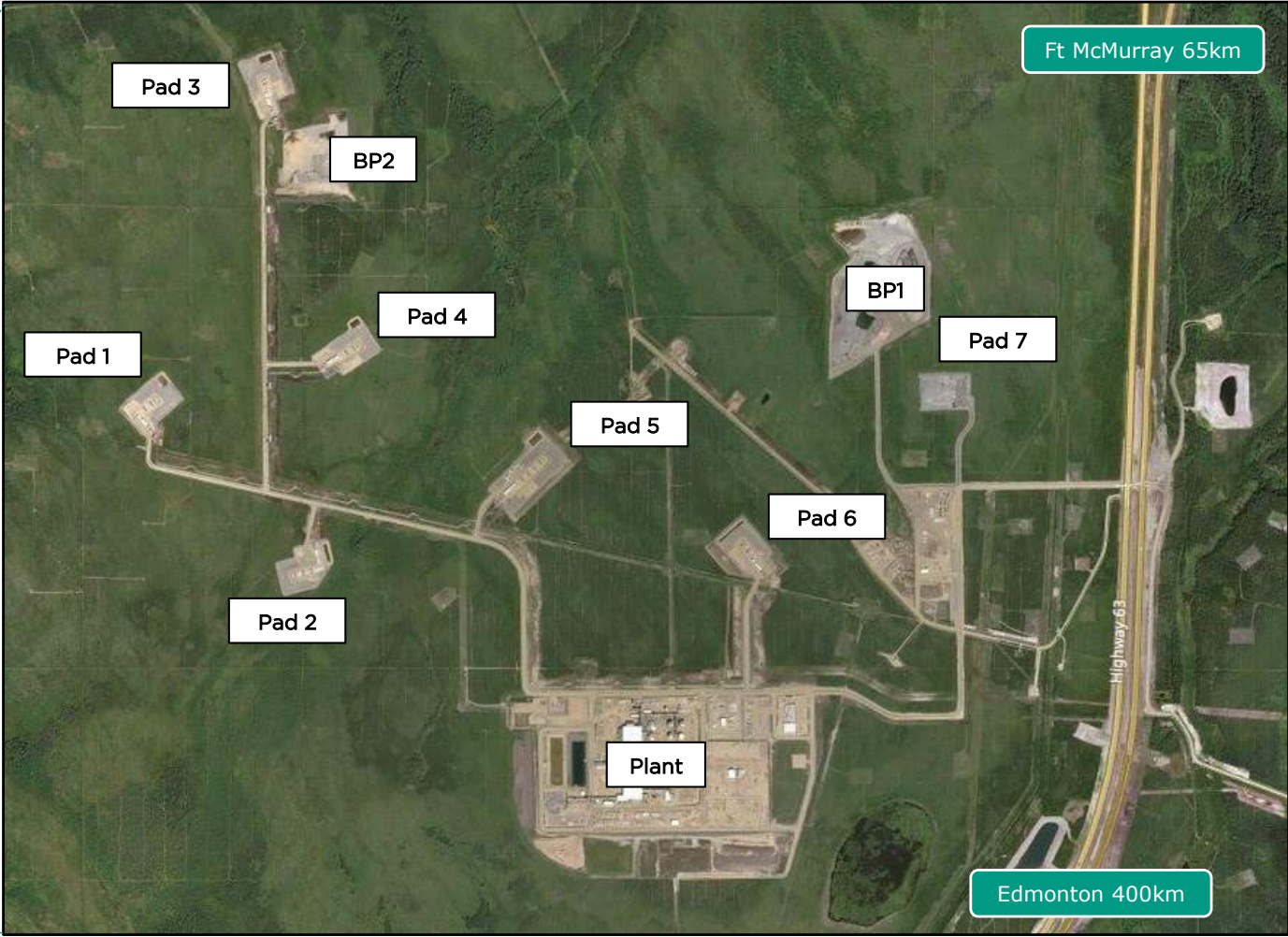
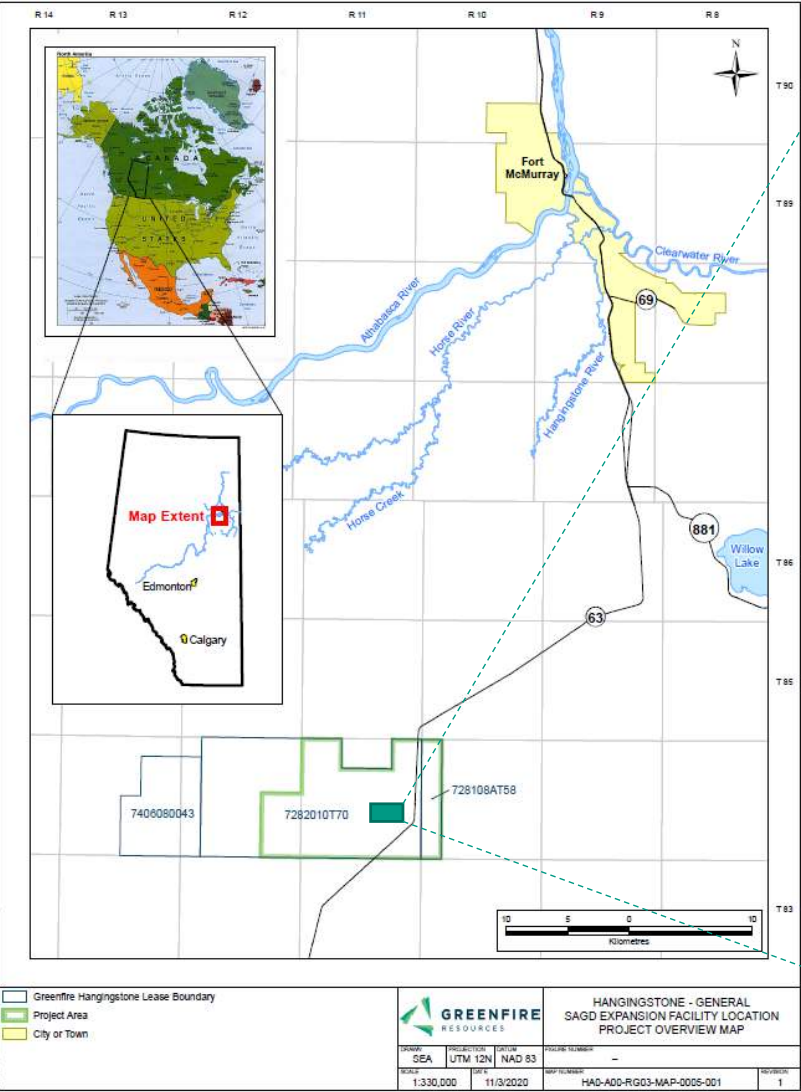


- Hangingstone Expansion Project (the "Project") has been in operation since 2017, with an approved production capacity of 4,800 m³/day (~30,000 bbl/day)
- Alberta Energy Regulator ("AER") Approvals:
 - EPEA Approval No. 153105, as amended
 - Scheme Approval No. 11910, as amended
- Project Operational History
 - First Steam – April 2017
 - First Production – August 2017
 - Transfer of Ownership to Greenfire – September 2021

Note: The subject report includes information from January 1, 2024, to December 31, 2024, and is noted as the "reporting period" throughout.

1.2 Location

The Project is located approximately 65 km south of Fort McMurray, Alberta

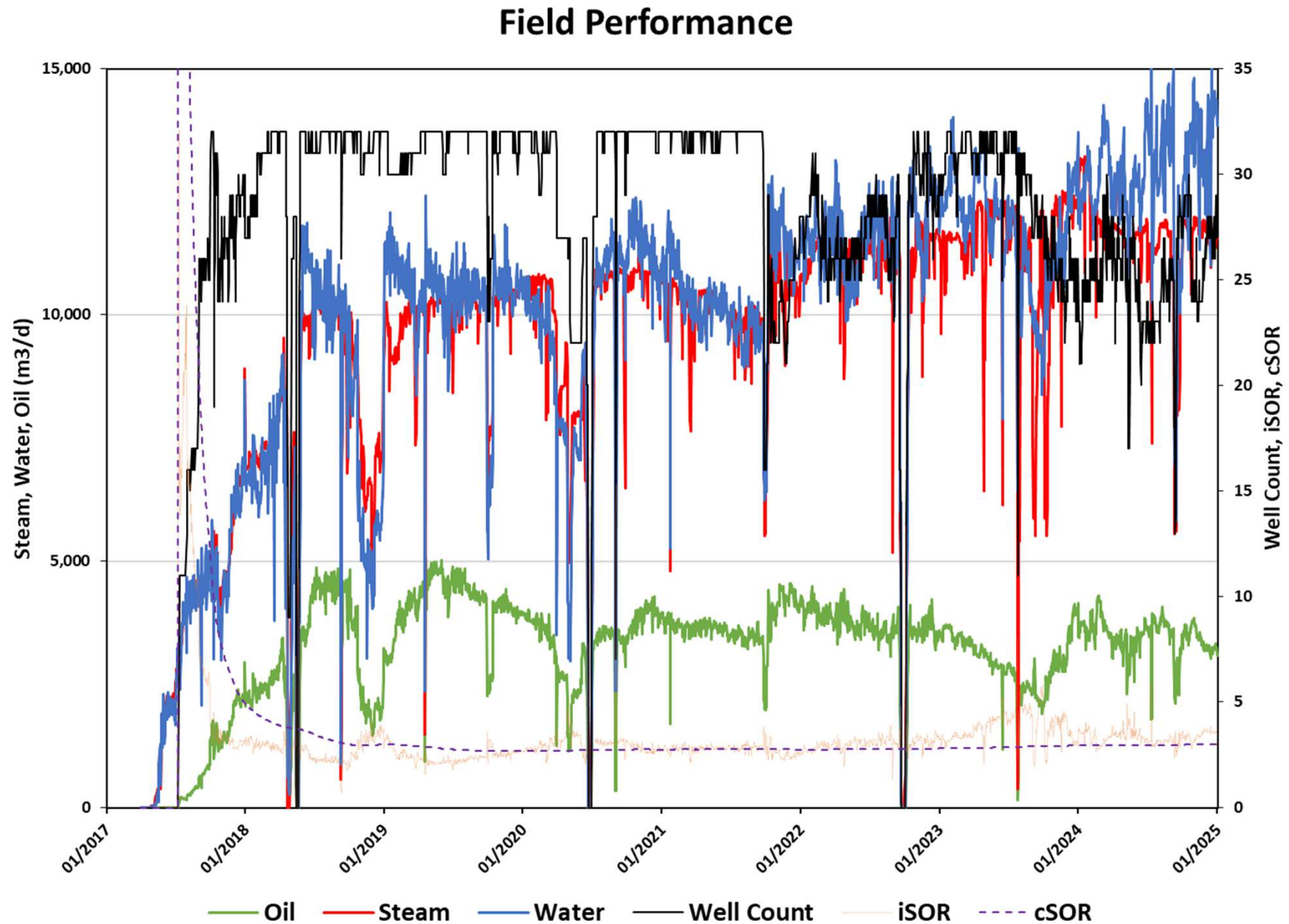


Section 2.0 – Subsurface

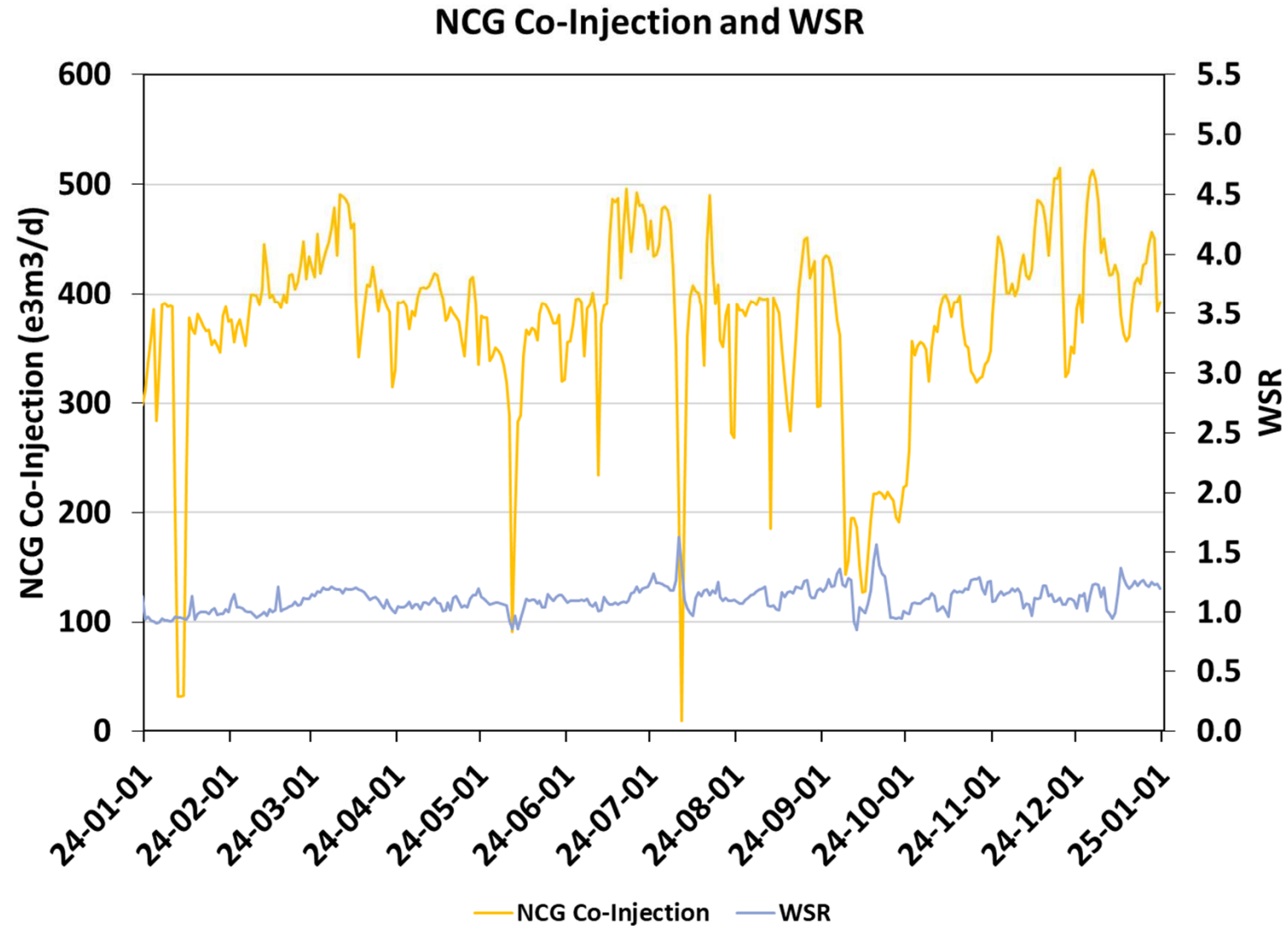


GREENFIRE
RESOURCES

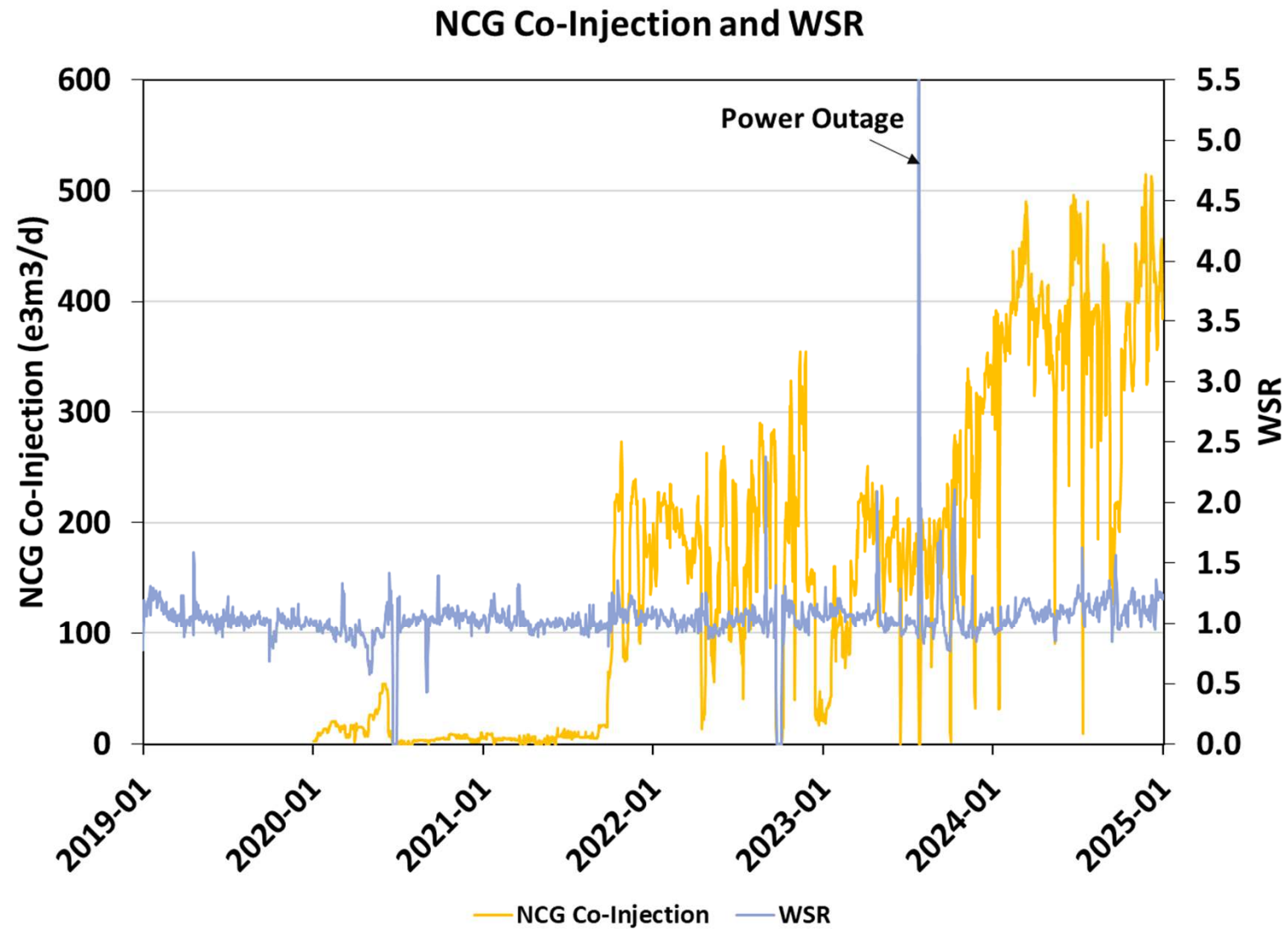
2.1 Lifespan Production: Field Performance



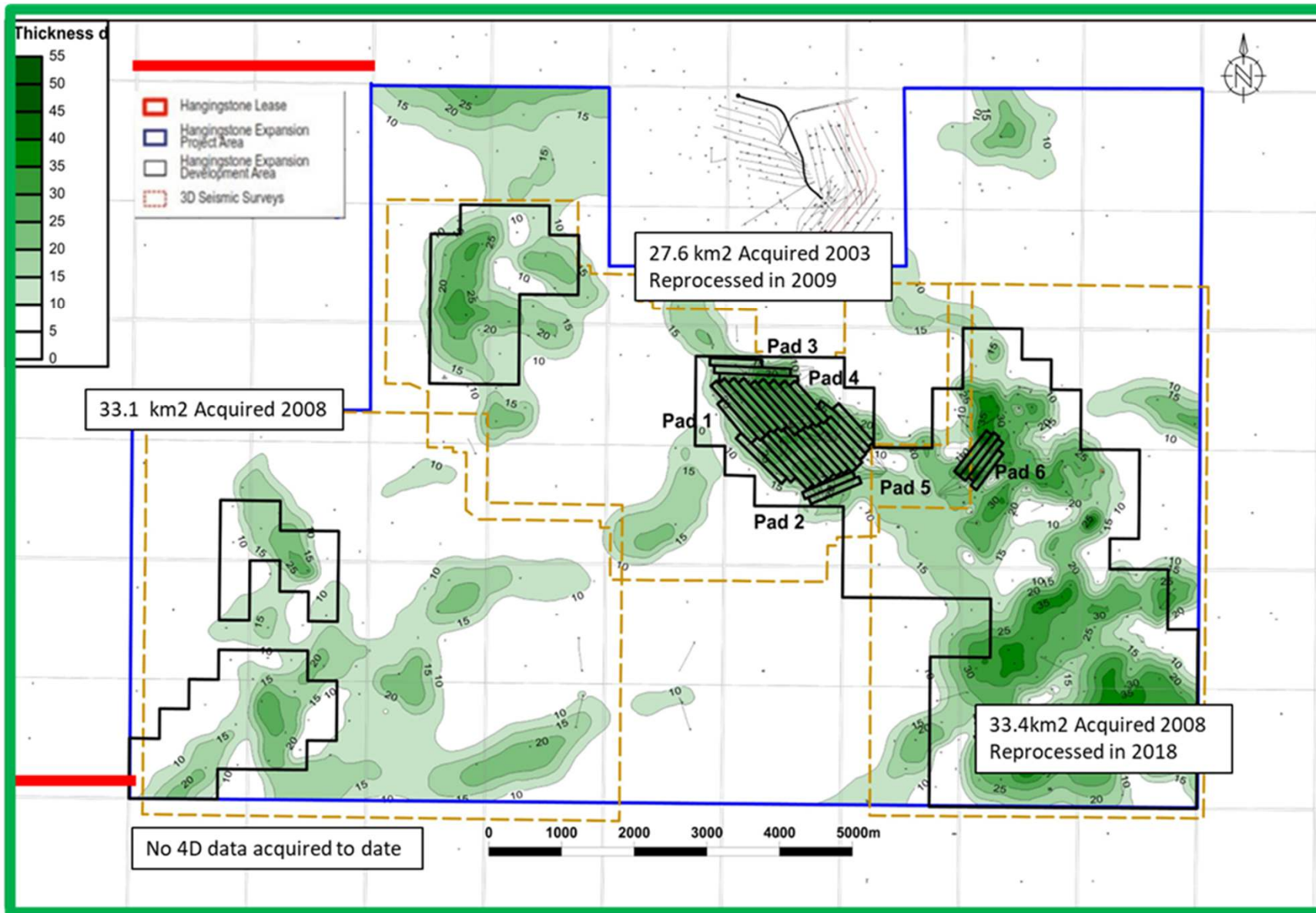
2.2 2024 Field NCG Co-Injection & WSR



2.3 2019-2024 Field NCG Co-Injection & WSR



2.4 Net Pay/Drainage Pattern/Seismic



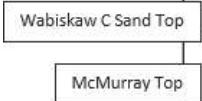
McMurray Net Pay Criteria:

- < 60API Gamma Ray
- > 27% Porosity
- > 20 ff·m Rt (>50% So)
- < 30% Vshale
- < 1m thick Muds

2.5 Geomechanical Summary

- Original injection pressures determined by mini-frac tests in the 1980's
- The Project conducted mini-frac testing in 2010 and exhibited consistent results to the original data
- Reservoir pressure is monitored through blanket gas pressure readings in the casing annulus

Formation/Lithology	Depth TVD (m)	Min. Stress		Vertical Stress		Stress Regime
		MPa	kPa/m	MPa	kPa/m	
Clearwater Shale	272.0	5.39	19.82	5.73	21.07	Horizontal Fracture
Wabiskaw Shale	297.0	6.17	20.77	6.26	21.08	Horizontal Fracture
McMurray Shale	314.5	5.55	17.65	6.64	21.11	Vertical Fracture
McMurray Sand	327.0	5.59	17.09	6.91	21.13	Vertical Fracture



2.7 Original Bitumen in Place (OBIP)

Reservoir Parameter	Value
Initial Oil Saturation (%)	81
Porosity (%)	33
Average SAGD pay Thickness (m)	22
Average Vertical Permeability (mD)	4,050
Average Horizontal Permeability (mD)	5,800

OBIP Calculation Method	
$\text{OBIP} = R_v \times \phi \times (1 - S_w) \times \text{FVF}$	
Where	
OBIP =	Original bitumen in place
R_v =	Rock Volume
ϕ =	Porosity
S_w =	Initial water saturation
FVF =	Formation volume factor (1.001)

Area	OBIP (e ⁶ m ³)	Cumulative Production (e ⁶ m ³)	Recovery Factor (Based on OBIP) (%)
Operating Area	15.5	9.0	57.9 %
Development Area	64.7		13.9%
Project Area	248.0		3.6%

2.8 Well Patterns



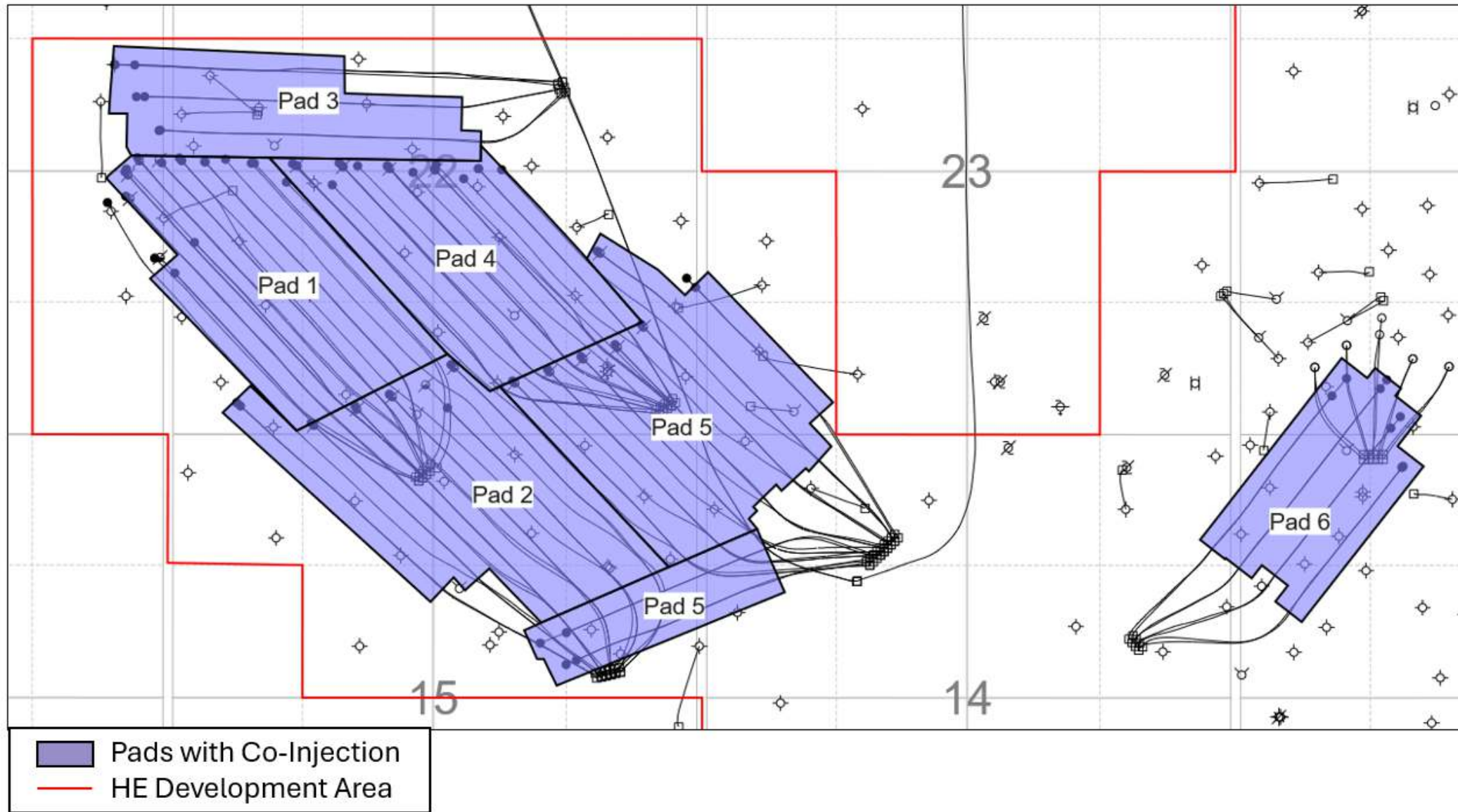
Pad	Area (m²)	Average Net Pay (m)	Porosity (%)	Oil Saturation (%)	Vertical Perm. (mD)	Horizontal Perm. (mD)	OBIP (e³m³)	PBIP (e³m³)	Cumulative Prod. (e³m³)	Current OBIP RF (%)	Current PBIP RF (%)	Est. Ultimate RF (Based on OBIP) (%)
1, 2,4,5	445,154	21.5	33	81	4,050	5,800	11,990	11,348	7,880	66	69	70-80
3	295,421	17.5	33	81	4,050	5,800	1,390	1,295	291	21	23	55-65
6	254,952	30.6	33	81	4,050	5,800	2,080	1,937	795	38	41	60-70
Operating Area	2,606,175	22.7	33	81	4,050	5,800	15,460	14,580	8,967	58	61	65-75

2.9 Co-Injection Summary

- The Project is approved for full field NCG co-injection (pipeline fuel gas) up to 25 e³m³/d per well
- The table provides NCG co-injection carried rates for January to December 2024 by pad:
 - Average project injection for 2024 was 374 e³m³/d
 - Cumulative co-injection for 2024 was 136,786 e³m³/d
- Greenfire intends to continue with NCG co-injection to assist with reservoir pressure maintenance, pending market conditions, as it helps to keep pressure in the reservoir while allocating steam around the field

Pad	Average Injection by Well (e ³ m ³ /d)	Cumulative Injection (e ³ m ³)
1	15.8	28,874
2	4.6	10,101
3	6.1	6,721
4	9.2	16,815
5	18.6	61,203
6	9.0	13,072

2.10 Co-Injection Well Locations

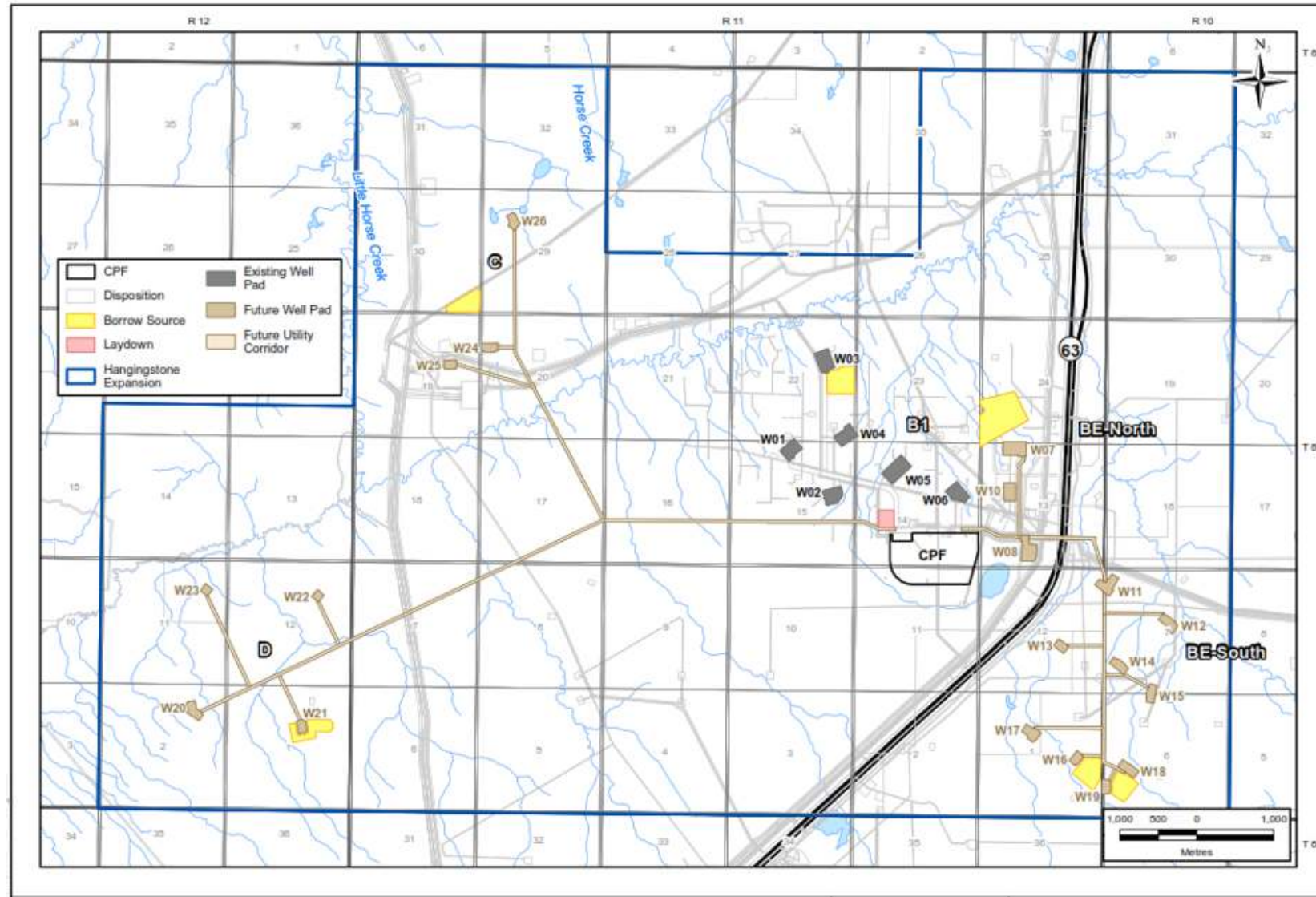


Section 3.0 – Surface



GREENFIRE
RESOURCES

3.1 Infrastructure



Note: The Hangingstone Expansion project's previous operator planned future well pads and utility corridors as shown in the figure above. Greenfire is evaluating these plans and may adjust them if deemed necessary.

3.2 CPF Modifications

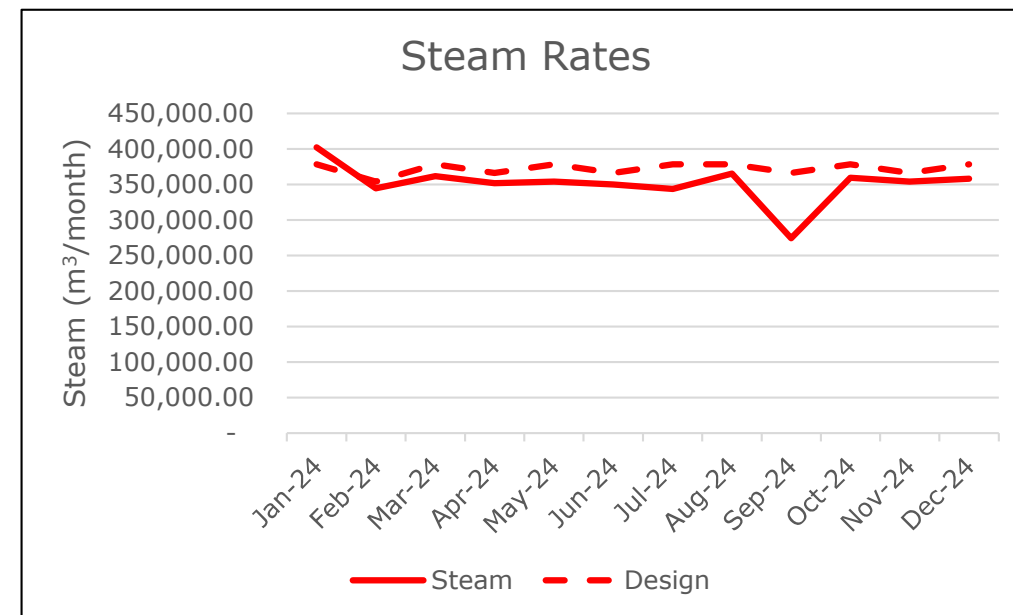
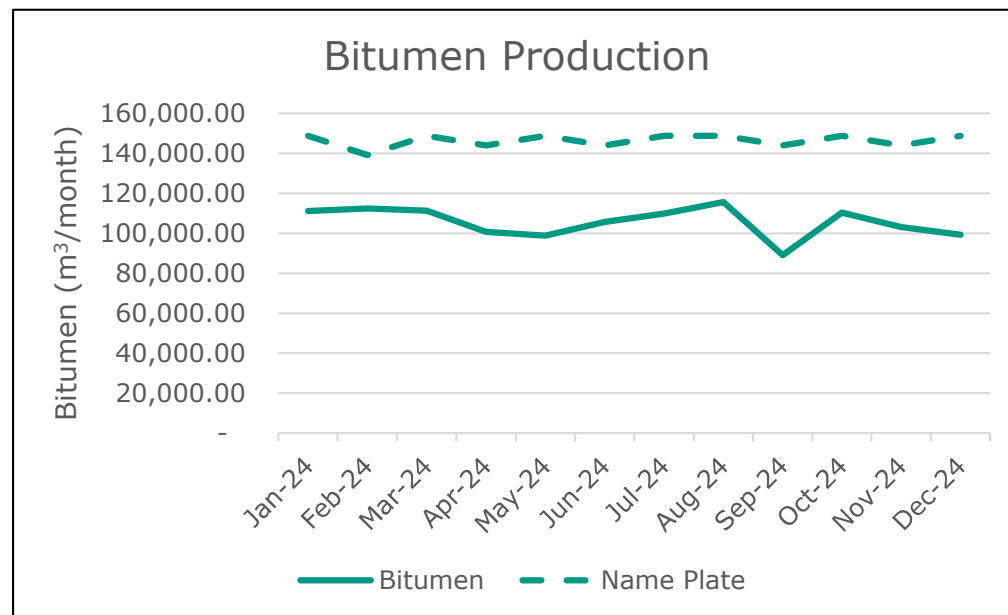


The modifications completed during the reporting period include:

- Tied-in second source water well
- Installed a dedicated quench water pipeline from the CPF to Pad 2
- Tie-in and operation of a second on-site disposal well

3.3 Bitumen/Steam Rates

The following are the steam and bitumen rates for the Project for the Reporting Period. The rates matched the forecasted profiles.



***Plant Turnaround in September/October 2024*

Licensed Nameplate = 4,800 m³/day

Steam Rate Design = 11,440 tonnes/day (80% quality)

Section 4.0 – Historical & Upcoming Activity



GREENFIRE
RESOURCES

4.1 Suspension & Abandonments



- There were no suspension or abandonment of production wells or patterns for the reporting period.
- There are no well patterns with active blow-down or ramp down.

4.2 Operational & Regulatory Changes

- Regulatory Approvals for the Reporting Period:
 - Commercial Scheme Approval No. 11910 amendments:
 - Application No. 1950249 – Installation of Open Loop System at Pad 5
 - Application No. 1952178 – Addition of Sustaining Pad 9
 - Application No. 1955763 – Pad 9 update
 - Disposal Scheme Approval No. 13122 amendments:
 - Application No. 1953890 – Grand Rapids Monitoring Plan update
 - Application No. 1954051 – Add second disposal well
 - Producer well redrill at Pad 1 & 4 (email approval)

Note:

- *There were no events for the reporting period that could materially affect scheme performance or energy or material balances (e.g., no phase expansions, no material changes in injection strategy, and no major infrastructure changes)*
- *Drilled the “Return” and “Supply” associated with the Pad 5 Open Loop Ground Source Heat Exchange Cooling System. Project was not operational during the reporting period*

4.3 Successes & Challenges



- Successes
 - Continued success of disposal operations
 - Consistent boiler feed water quality
 - Used mixed gas as a fuel source at all four Once Through Steam Generators
 - Maintained partial operations during a plant turnaround
- Challenges
 - Overall shortage of cooling at CPF
 - One OTSG steam production was impacted by higher back pressure in the convection box
 - repairs planned in 2025

4.4 Compliance History



- AER Reportable Incidents and Contraventions
 - Edge Ref. No. 0424679 – CEMS analyzer not performing temperature and zero span drift as required (twice/year). Resolved.
 - Edge Ref. No. 0427690 – Software issue with daily velocity (flow) calibration report for B-525 CEMS unit. Resolved.
 - Edge Ref. No. 0429196 – Data download issue with DQ05-05 groundwater monitoring well. Resolved.
 - Edge Ref. No. 0436287 – B-525 CEMS unit not meeting the monthly operational hour of 90%. Resolved.
 - Edge Ref. No. 0433539 – Process pond primary liner exceeded allowable leakage rate. Secondary liner integrity intact. No loss of containment, no environmental impacts. Resolved.

4.5 Future Plans



- 2025 Plans
 - Ongoing evaluation of various central processing facility and well pad debottlenecking opportunities that could improve the overall performance of the scheme
 - Operation of the second disposal well
 - Installation of a sulphur removal unit
 - Development of well pad 7
 - Winter delineation program to assist with sustaining pad development
- 5-Year Development Plan
 - Greenfire is evaluating various development strategies over the next five years aimed at optimizing resource production while minimizing environmental impacts and ensuring full compliance with regulatory obligations