JACOS
Japan Canada Oil Sands Limited

Thermal In-Situ Scheme Progress Report for 2020
Japan Canada Oil Sands Limited

Approval No. 11910 (Hangingstone Expansion Facility)

June 2021

Japan Canada Oil Sands Limited

Contents

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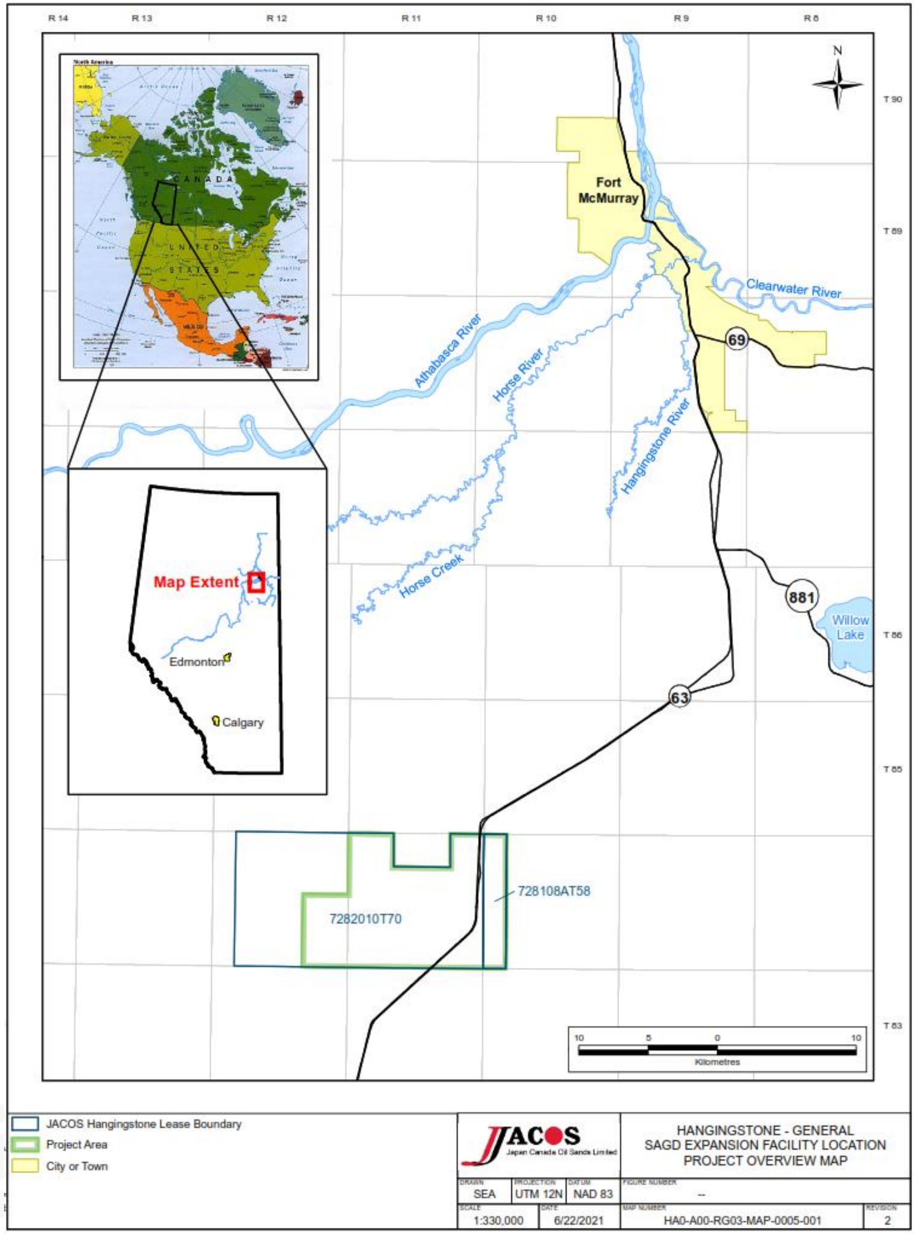
Section 4.1: Introduction

Scheme Approval No. 11910 Setting and Background

Japan Canada Oil Sands Limited (JACOS) operates the Hangingstone SAGD Expansion Facility **("HE")** under *Oil Sands Conservation Act (OSCA)* Scheme Approval No. 11910H. The approved crude bitumen production volume for HE is 4,800 m^3/d (30,000 bbl/d) on an annual average basis.

HE is located about 50 km southwest of Fort McMurray and 25 km west of the community of Anzac, as shown in the figure on the right. It is a joint venture with JACOS holding a 75% interest as the operator and CNOOC International holding a 25% interest.

Operations commenced in 2017, with first steam injection to SAGD wells occurring in April 2017 and first bitumen production in August 2017.



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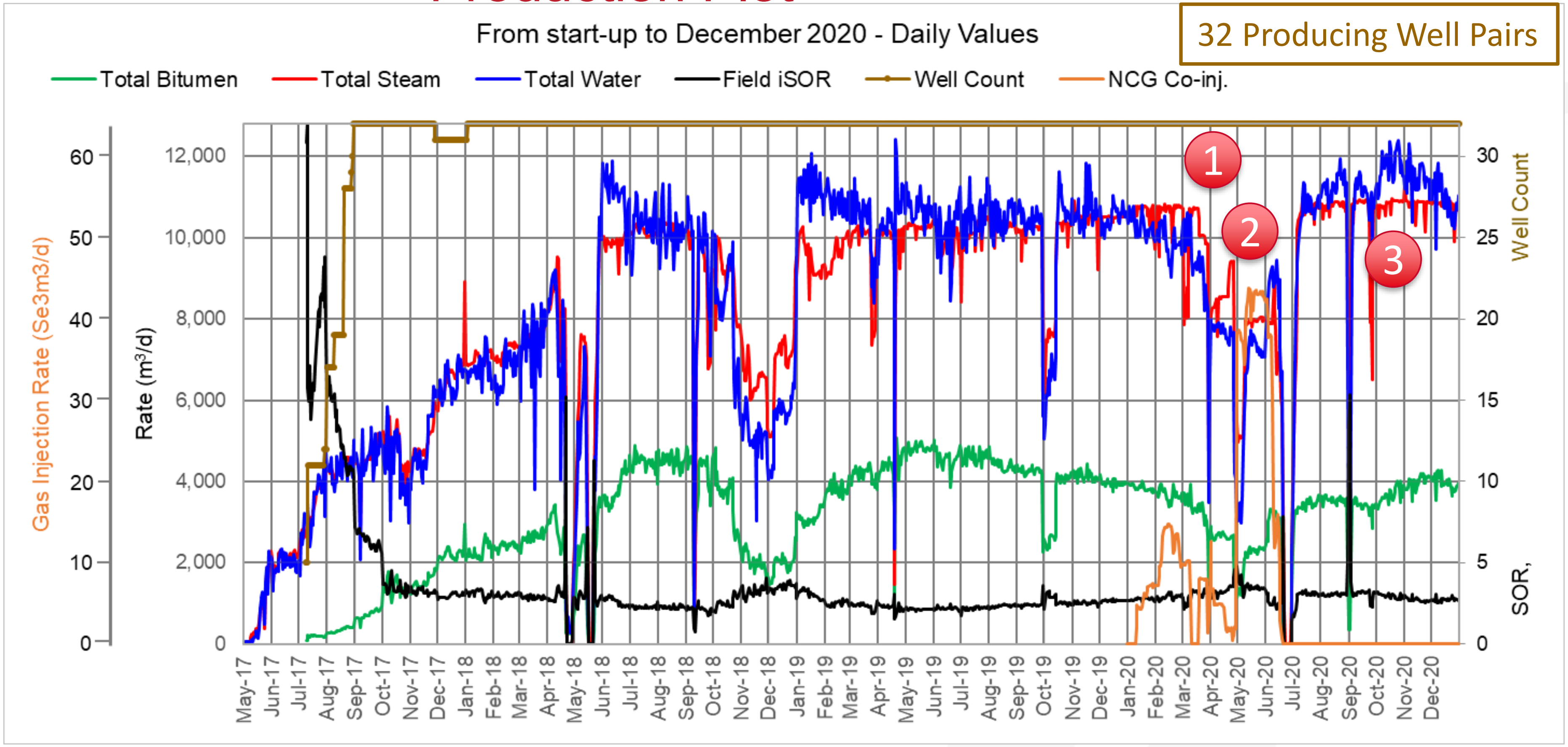
Section 4.2: Subsurface

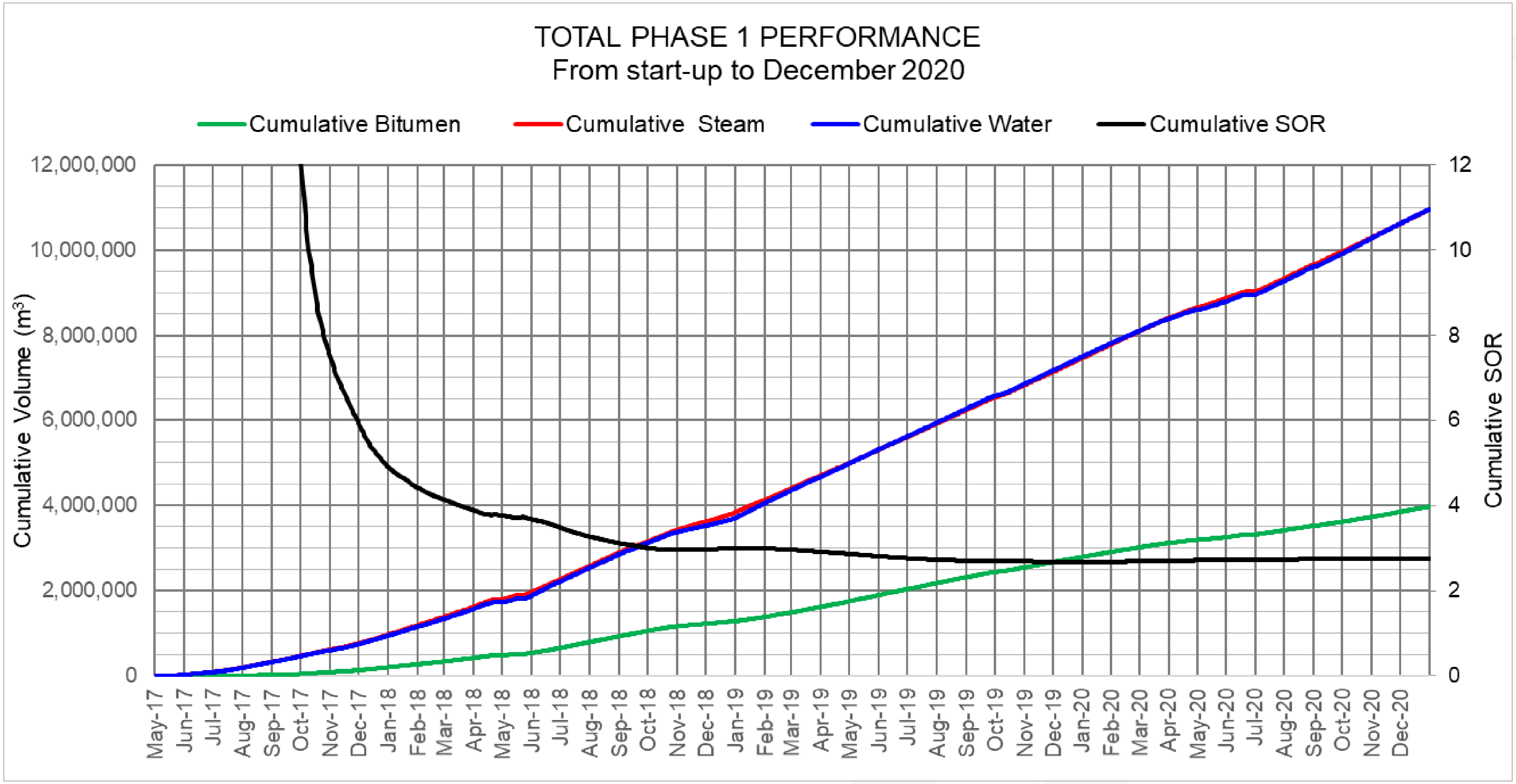
2) Scheme-level Lifespan Production Plot

HE Initial Development Scheme Lifespan Production Plot



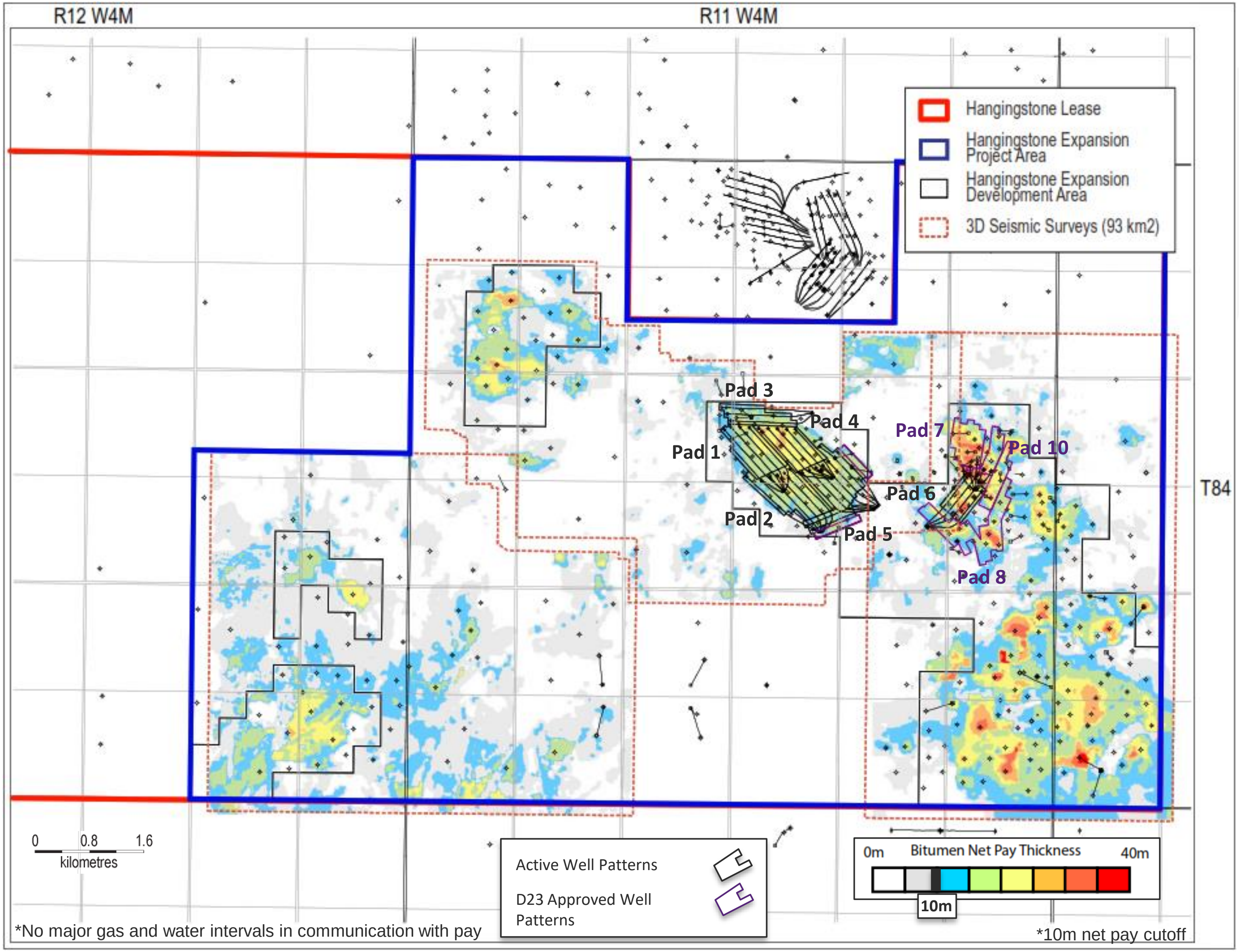
1. Rate reduction taken in response to poor market conditions from March-June 2020
2. Non-condensable gas (NCG) co-injection from January-June 2020 for pressure maintenance
3. Ramping production back up after June 2020 turnaround

HE Initial Development Lifespan Cumulative Volumes



3) Updated Maps of the Development Area

HE Development Area Map – Net Pay



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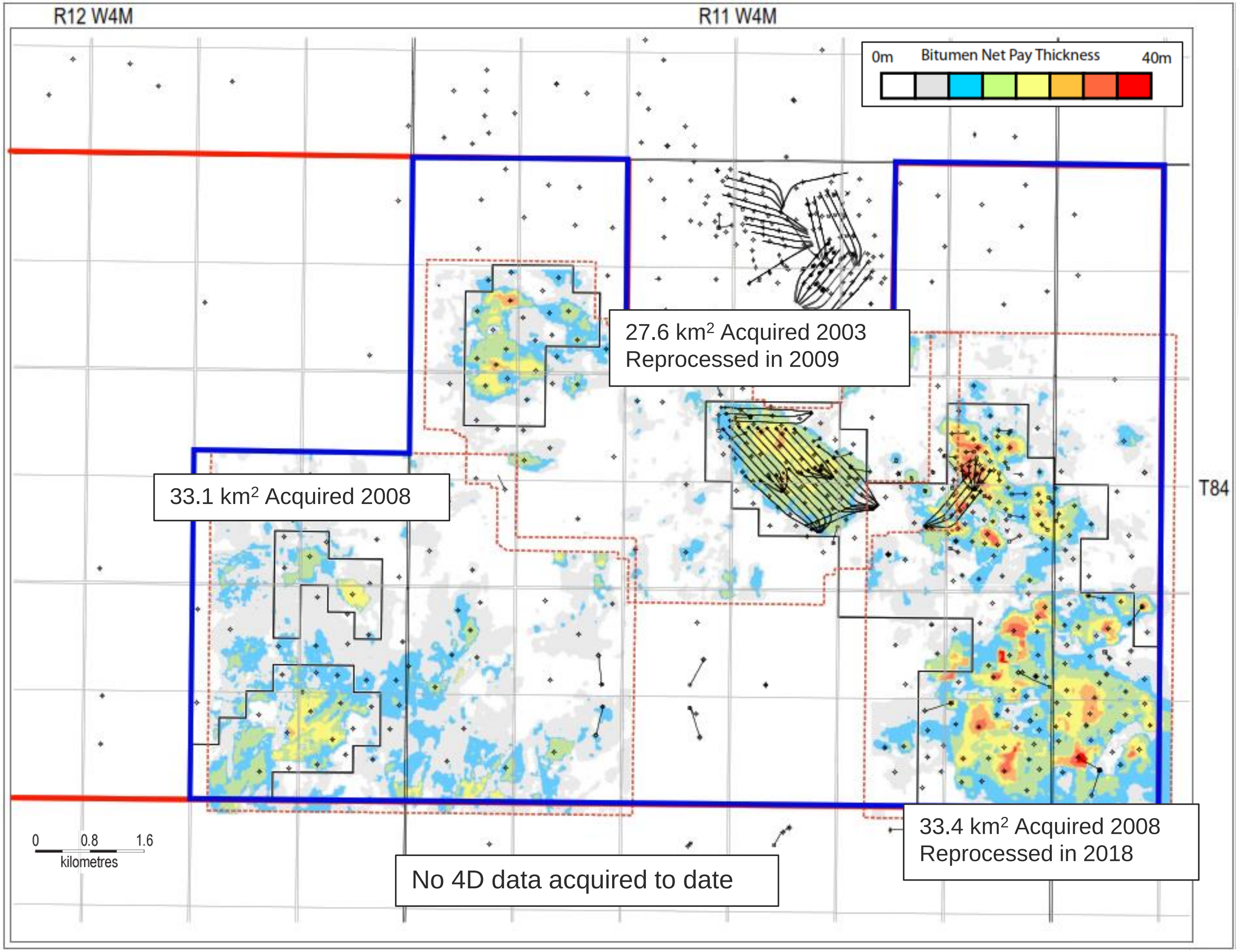
HE Development Area Map - 3D Seismic Data



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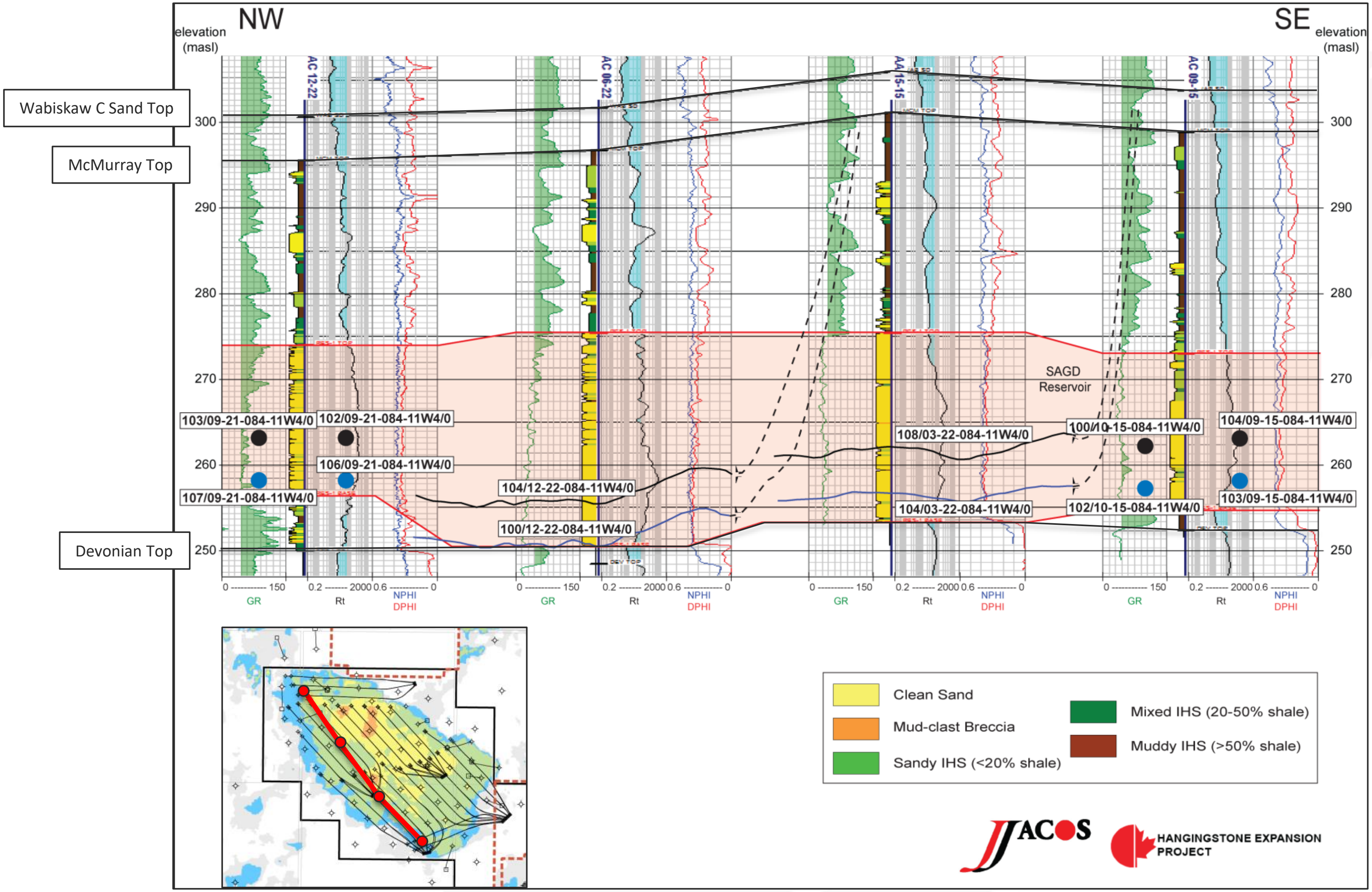
4) Representative Well Cross-section of the Active Development Area

HE Initial Development Scheme Cross-Section (1)



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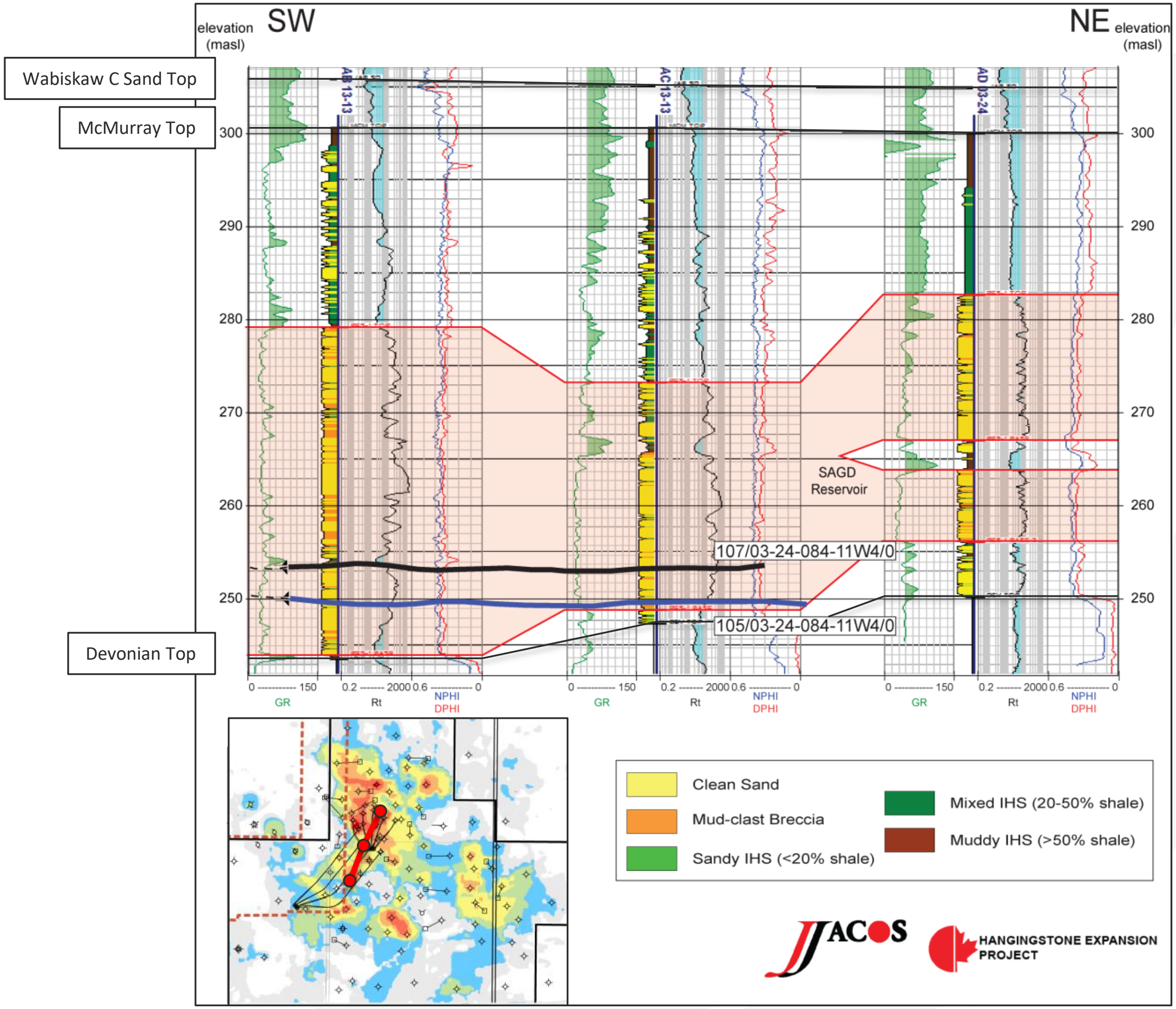
HE Initial Development Scheme Cross-Section (2)



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5) Table Showing OBIP, Cumulative % Bitumen Recovery and Average Reservoir Parameters for Development Area

Hangingstone Expansion Project Original Bitumen in Place (OBIP)

*10m net pay cutoff

OBIP = RV * Por * So * FVF

where:
RV = Rock Volume
Por = Average Porosity
So = Average Oil Saturation
FVF = Formation Volume Factor (1.001)

Avg. Kv: 4050 mD
Avg. Kh: 5800 mD
Avg. Depth: 340 m

	Avg. Porosity (%)	Avg. So (%)	OBIP* (e^6m^3)	Cumulative Bitumen Recovery (%)
Active Well Pattern Area	33	81	15.5	25.7
Development Area	33	81	64.7	6.1
Project Area	33	81	108.9	3.6

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6) Table of Well Patterns

HE Initial Development Area – 2020 Well Pad Recoveries

Pad	Well	Area (m3)	Avg Net Pay (m)	Porosity (%)	Initial Water Saturation (%)	OBIP (MMm^3)	Cum Bitumen (Mm3)	Ultimate Recovery (%) *1	Current Recovery (%)
Pad 1	W01-01 W01-02 W01-03 W01-04 W01-05	445,154	21.5	33.0	19.0	2.56	763.9	56.3	29.9
Pad 2	W02-01 W02-02 W02-03 W02-04 W02-05 W02-06	526,091	21.8	33.0	19.0	3.07	760.9	46.6	24.8
Pad 3	W03-01 W03-02 W03-03	295,421	17.5	33.0	19.0	1.39	118.6	37.3	8.5
Pad 4	W04-01 W04-02 W04-03 W04-04 W04-05	412,779	24.9	33.0	19.0	2.74	710.3	48.2	25.9
Pad 5	W05-01 W05-02 W05-03 W05-04 W05-05 W05-06 W05-07 W05-08 W05-09	671,778	20.1	33.0	19.0	3.62	1,285.7	55.3	35.5
Pad 6	W06-01 W06-02 W06-03 W06-04	254,952	30.6	33.0	19.0	2.08	332.0	48.9	15.9
Total		-	-	-	-	15.5	3,972	50.0	25.7

*1 : Ultimate Recovery (%) was calculated in Proved case (1P case)

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7) Co-injection Information

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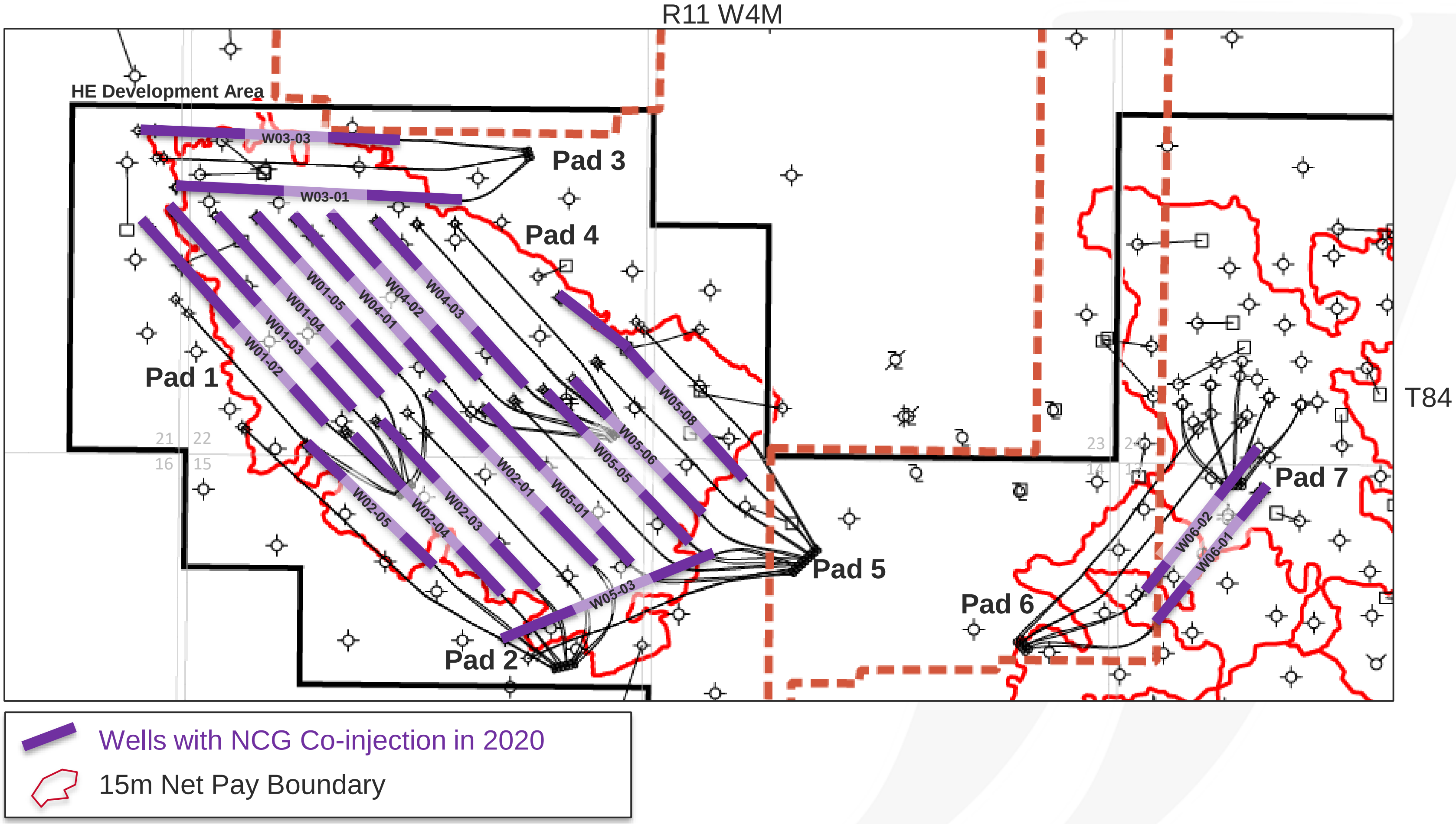
Non-condensable Gas (NCG) Co-Injection by Well



NCG Co-Injection Information

- NCG co-injection was used for pressure maintenance:
  - Pad 6 from January to March
  - Field-wide from March-June to help maintain reservoir bottom hole pressure (BHP) higher than 3,900kPa during the production cutback period
  - NCG was co-injected with steam ranging from 0.5-5mol % of total injection in 17 wells, with the majority of wells being <1mol %
- Low volume injection is expected to have minimal impact on bitumen recovery while providing some improvement to GHG intensity
  - Production decrease seen during the months where NCG co-injection was utilized was due to production cutback from poor market conditions
- Increased produced gas rates observed from NCG co-injection
  - Estimated NCG recovery as of 12/31/2020 is 27%

Section 4.3: Surface

8) Surface Details

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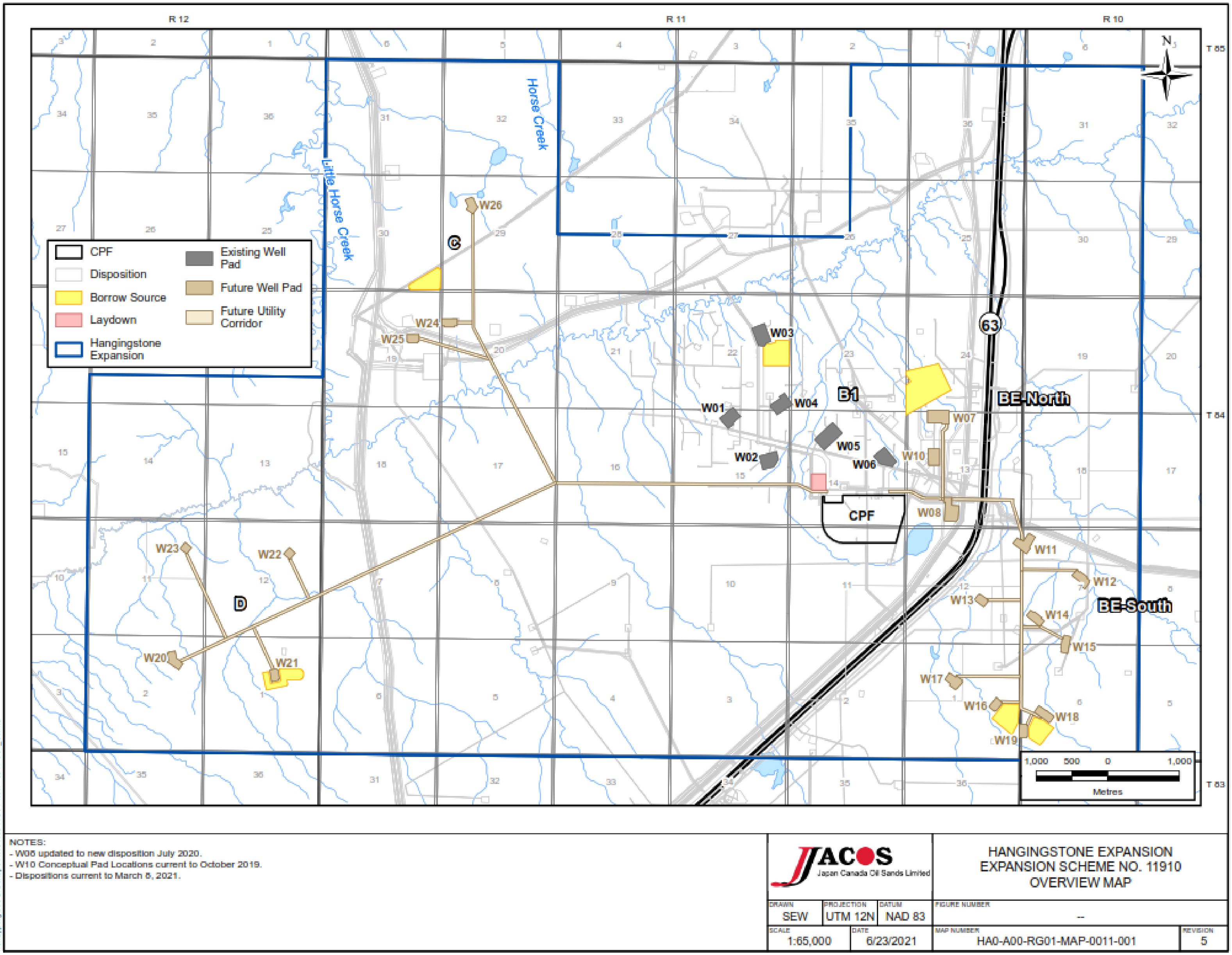
HE Development Area Map



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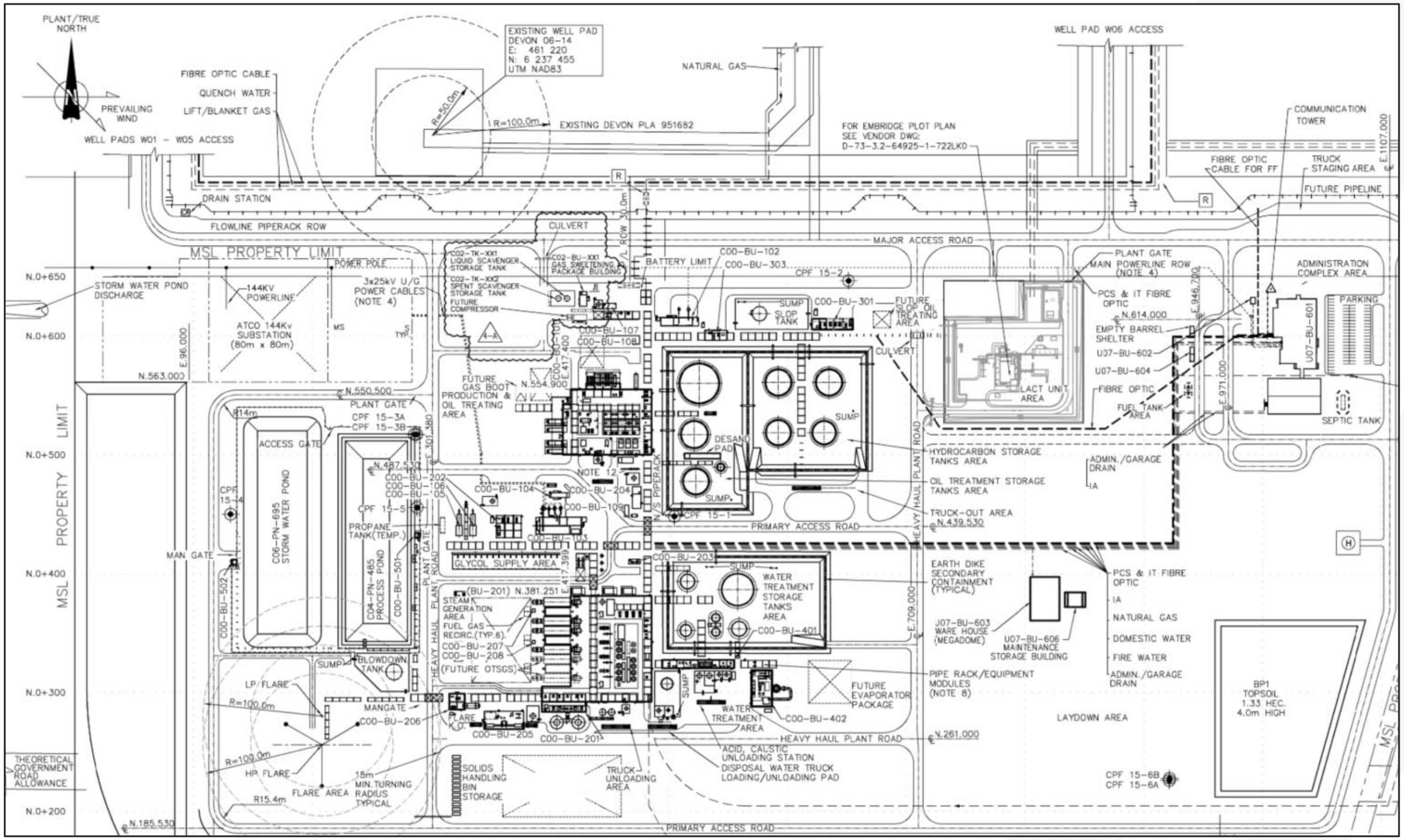
HE Central Processing Facility (CPF) Plot Plan



2020 Changes

No equipment changes

Glycol heater duty increase (no equipment modifications) per Application No. 006-153105 (August 2019) & Approval No. 153105-00-05 (October 2019)

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Design and Operational Annual Bitumen and Steam Rates

	Nameplate Design Capacity	2020 Average Throughput
Bitumen	4,760 m3/d	3,240 m3/d
Steam	11,400 m3/d*	9,557 m3/d**

*High pressure steam at CPF

** SAGD/injected steam at wellhead

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Section 4.4: Historical and Upcoming Activity

9) Summary of Suspension and Abandonment Activity

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Suspension and Abandonment Activity

- Nonroutine abandonment of Pipeline PLA951682 in 2020 because the line was no longer in service or needed for facility operations.
- Abandonment of the 100/01-12-84-11 W4M to facilitate future thermal developments in the area. The former gas well had not been in service (suspended) since 2015 prior to abandonment.
- No SAGD well patterns (well pads) are in active blow-down or ramp-down

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10) Summary of Recent Regulatory and Operational Changes

Regulatory and Operational Changes in 2020

Regulatory Approvals in 2020			
Application Number	**Description**	**Approval Date**	**Approval Number**
1929229	Well Pads 4 & 5 step out wells	08/20/2020	OSCA 11910F
1929738	Sustaining Well Pads 7, 8, 10	11/06/2020	OSCA 11910G
1930420	Sulphur Recovery Compliance Assurance Plan and ID2001-3 waiver extension to 12/31/2021	12/23/2020	OSCA 11910H
008-153105	Sulphur Recovery Compliance Assurance Plan and extension of 3.0 tonne/day temporary sulphur dioxide emission limit to 12/31/2021	12/23/2020	EPEA 153105-00-06
009-153105	Once-Through-Steam-Generator Duty Increase	02/01/2021	EPEA 153105-00-07

- Operational Changes & Events:
  - NCG co-injection for pressure maintenance (March – June)
  - Production cutback due to COVID price impact (May – June)
  - Well optimization to produce within sulphur constraints (starting late Q4)
- Pilots
  - No new technology pilots implemented in 2020

Summary of Key Learnings 2020

- NCG co-injection utilized from March–June helped maintain bottom hole pressure (BHP) during production cutback period in order to ensure natural lift.
- After June 2020 turnaround, with improving market conditions, production was ramped back up showing no detrimental effects from both the production cutback and NCG co-injection.
- Higher production rates achieved in late 2020 were influenced by flush production after ramping back up from reduced production period
- A clear correlation between reservoir BHP and SO_2 emissions was observed, indicating that higher pressures would yield higher SO_2 intensity. Although higher BHP can achieve higher bitumen rates, this creates a limitation for the SO_2. Slightly lower BHP was preferred to reduce SO_2 intensity while allowing for bitumen production to be optimized.

11) Compliance History

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Compliance History

Name	Date	Reference number	Legislation and Permit/Approval number	Description	Report submitted to regulator	Follow up questions from regulator?
Boundary of OSE Site Cleared Prior to Regulatory Approval (OSE Program)	03-Jan-20	362442	Public Lands Act	The boundary of the 12-01-84-11 W4M OSE lease site was cleared prior to the site being surveyed or the well licenced. Trespass with the GoA, within a road allowance and Crown land and a contravention from clearing a well prior to obtaining a well licence.	Yes	No
Improper Handling of Drilling Waste at 03-07-084-11 W4M (OSE Program)	21-Jan-20	363213	AER D050 and D058	Regulatory non-compliance and voluntary self disclosure from the placement of a drilling waste flocculation tank on the 03-07-84-10 W3M OSE lease site. AER requires a D50 variance approval before drilling waste can be stored on a remote location. In this case, drilling waste from the 06-06-084-10 W4M OSE well was being stored on the 03-07-84-10 W4M site without an approval to do so.	Yes	Required to apply for and receive approval (Alternative Waste Storage Approval) to store waste at this location. Conditions imposed by the AER for the storage of waste were implemented.
Logging waiver not obtained for directional well AA/03 -06-084-10W4 (OSE Program)	24-Jan-20	496140	AER D080, D056	The 2019-2020 OSE program originally contained 12 directional wells for which a Directive 80 logging waiver was obtained. 03-06-084-10 W4M was originally to be drilled as a vertical well but due to surface constraints was changed to a directional well on January 16, 2020. The wireline logging proceeded per standard procedure for directional wells but didn't have an intermediate section logging waiver as per the other original 12 directional wells. This non-compliance was discovered while interpreting the data in February 2020.	Yes	No
Alternative Storage Tank Out of Compliance (OSE Program)	14-Feb-20	496598	AER D050 and D058	JACOS was made aware of non-compliance with conditions of an Alternative Storage Approval for the temporary drilling waste storage tank located at 03-07-084-10 W4M.	Yes	Information on nature of non-compliance and tracking of waste associated with OSE drilling program
Temporary Diversion Licence Contravention (OSE Program)	06-Mar-20	364399	Water Act	OSE drilling program exceeded the Temporary Diversion Licence (TDL 451108) for Borrow Pit 1 by approximately 500m3, which covered OSE wells under OSE190029.	Yes	No

12) Scheme's Future Plans

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Future Plans

Installation of Sulphur Recovery Unit

- Compliance Assurance Plan for the implementation of an SRU was submitted to the AER in November 2020.
- Design basis for the SRU is 75,000 Sm3/d of produced gas, with 99% sulphur removal and ability to achieve the minimum 70% removal of sulphur inlet in accordance with *ID2001-3*.
- A non-regenerative liquid scavenger technology has been selected because of proven performance in similar SAGD facilities.
- The target to complete the SRU commissioning and startup is December 2021.

OTSG Re-Rating

- An OTSG re-rating project has been initiated to optimize the OTSG's capacity in a phased manner.
- Nameplate BFW capacity per OTSG will be increased from 149,000 kg/h to 165,000 kg/h.
- Steam output (depending upon steam quality) will be between 11,800 T/d to 12,000 T/d after re-rating.

Subsurface Planned Development 2021-2025

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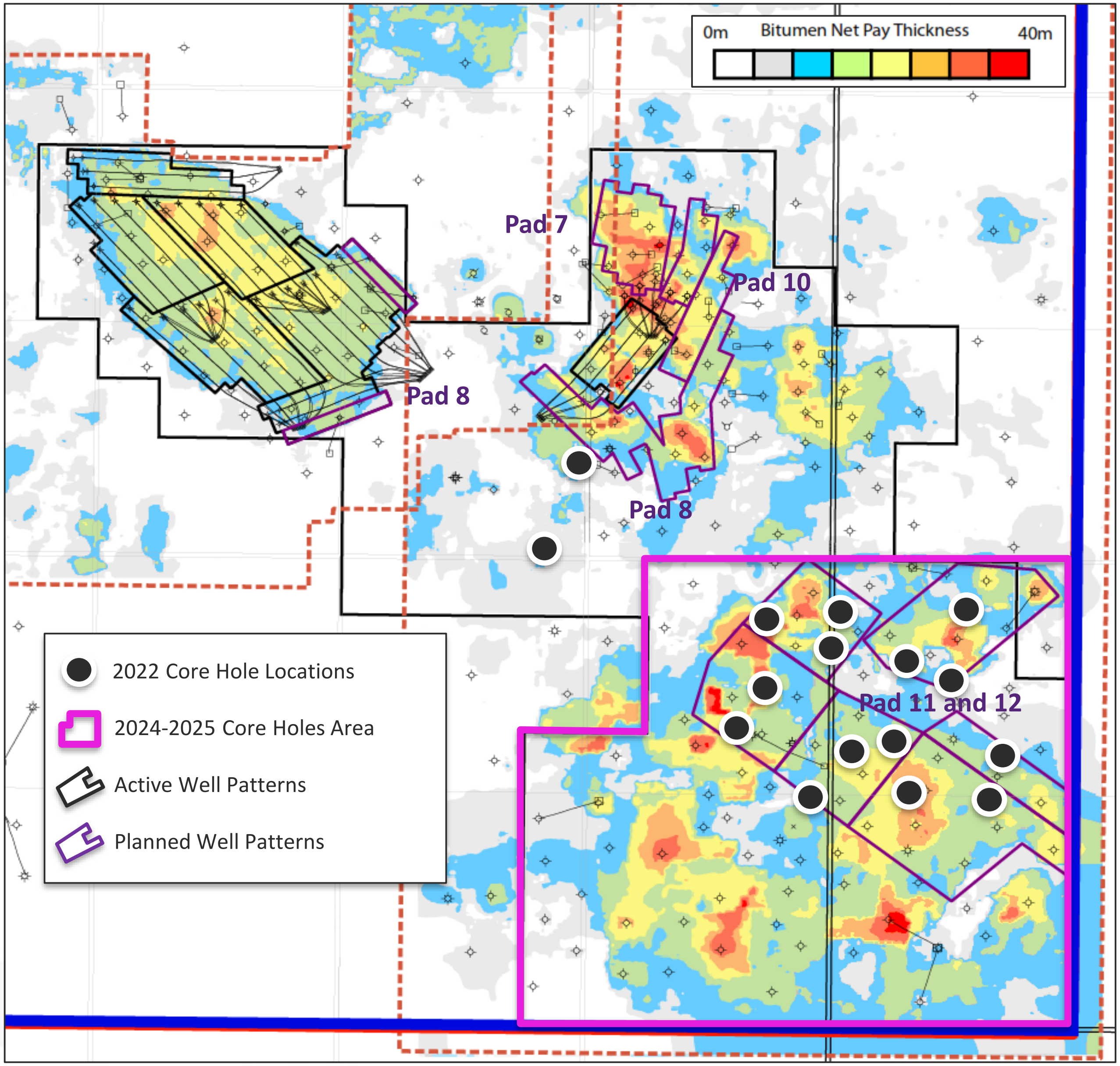
2022
- Up to 16 core hole wells for further resource evaluation and to support pattern layout planning in the southeast.
- Two step-out horizontal well pairs at Pad 5.
- Seven horizontal well pairs at Pad 7.

2023
- Horizontal well pairs at Pads 8, 10 and 11.

2024-2025
- Horizontal well pairs at Pad 12.
- Core hole wells for further resource evaluation and to support pattern planning in the southeast.



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Applications Expected in 2021

- D23/EPEA application to install sulphur recovery unit
- D23 application to amend well pads 4, 5 step out well approval
- D23 application to amend sustaining well pads 7, 8, 10 (“Phase 2”) approval
- D23 amendment application to approve Highway 63 crossing with high-pressure steam pipeline
- Possible D23 sustaining well pad application for initial well pads on east side of Highway 63