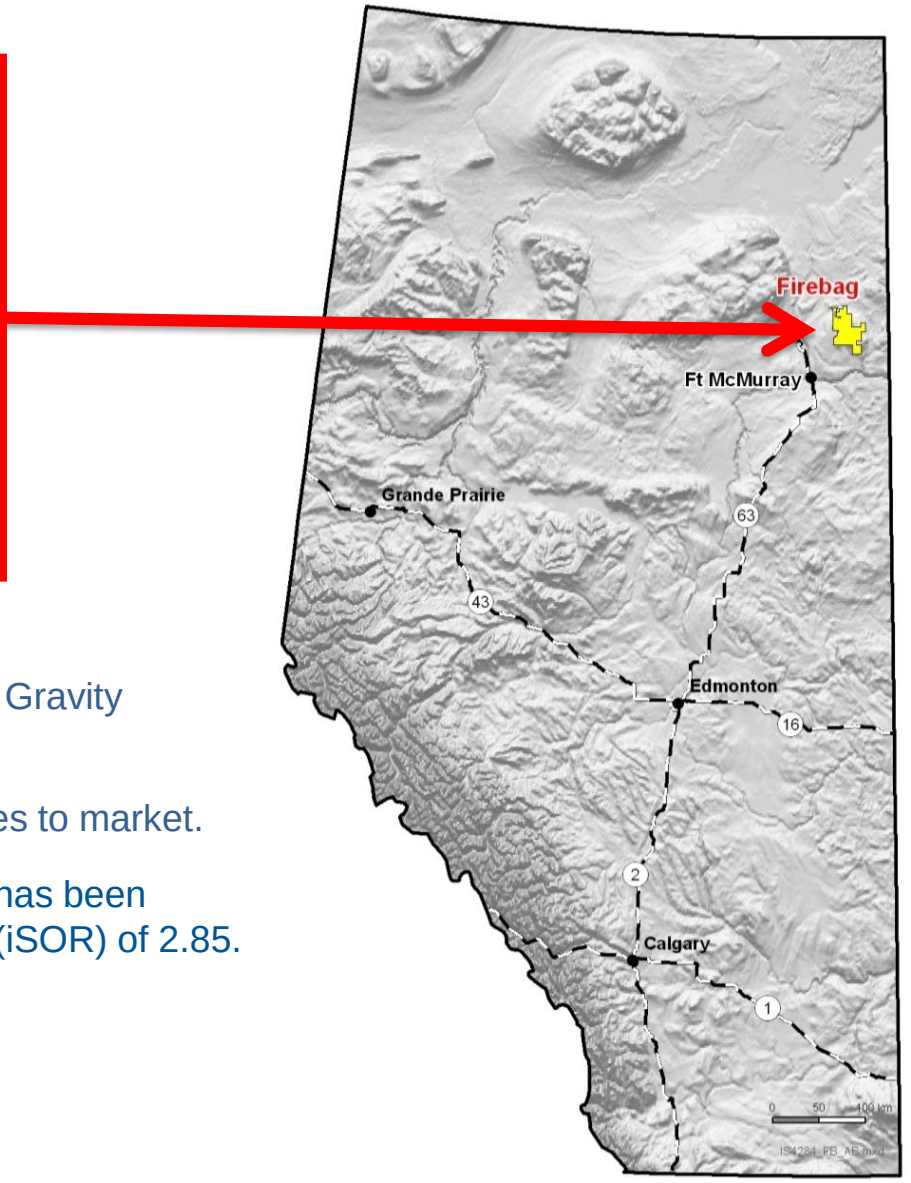
Suncor Firebag
2020 AER Scheme Performance Report
Commercial Scheme Approval No. 8870

Reporting Period:
March 1, 2019 to May 31, 2020

Introduction

4.1

Firebag Project Overview

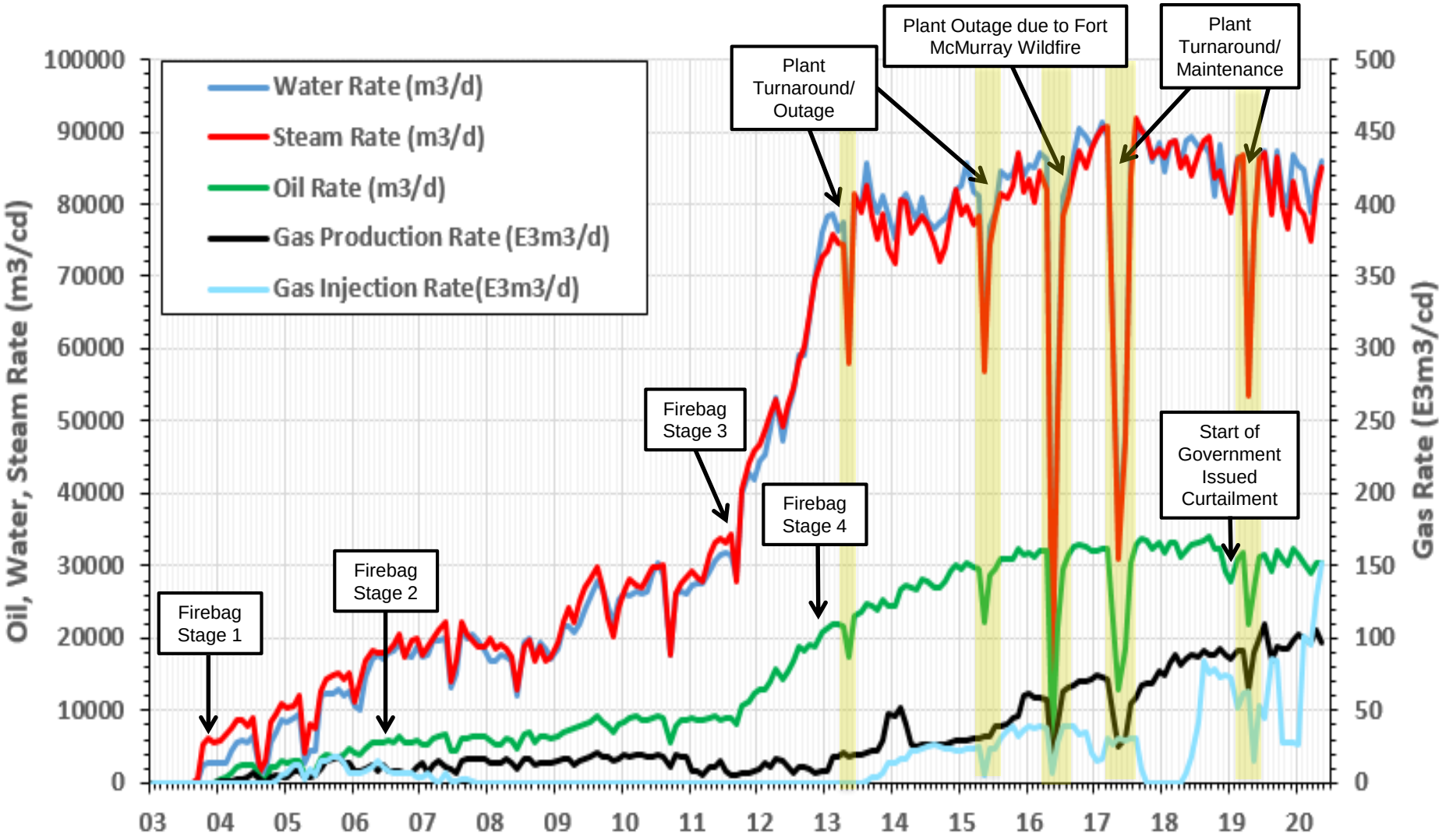


- The Firebag Project is a commercial Steam Assisted Gravity Drainage (SAGD) scheme.
- Supplies bitumen to the Oil Sands Upgrader and sales to market.
- Average bitumen production for the reporting period has been 29,816 m^3/d (187,004 bbl/d) with a steam to oil ratio (iSOR) of 2.85.

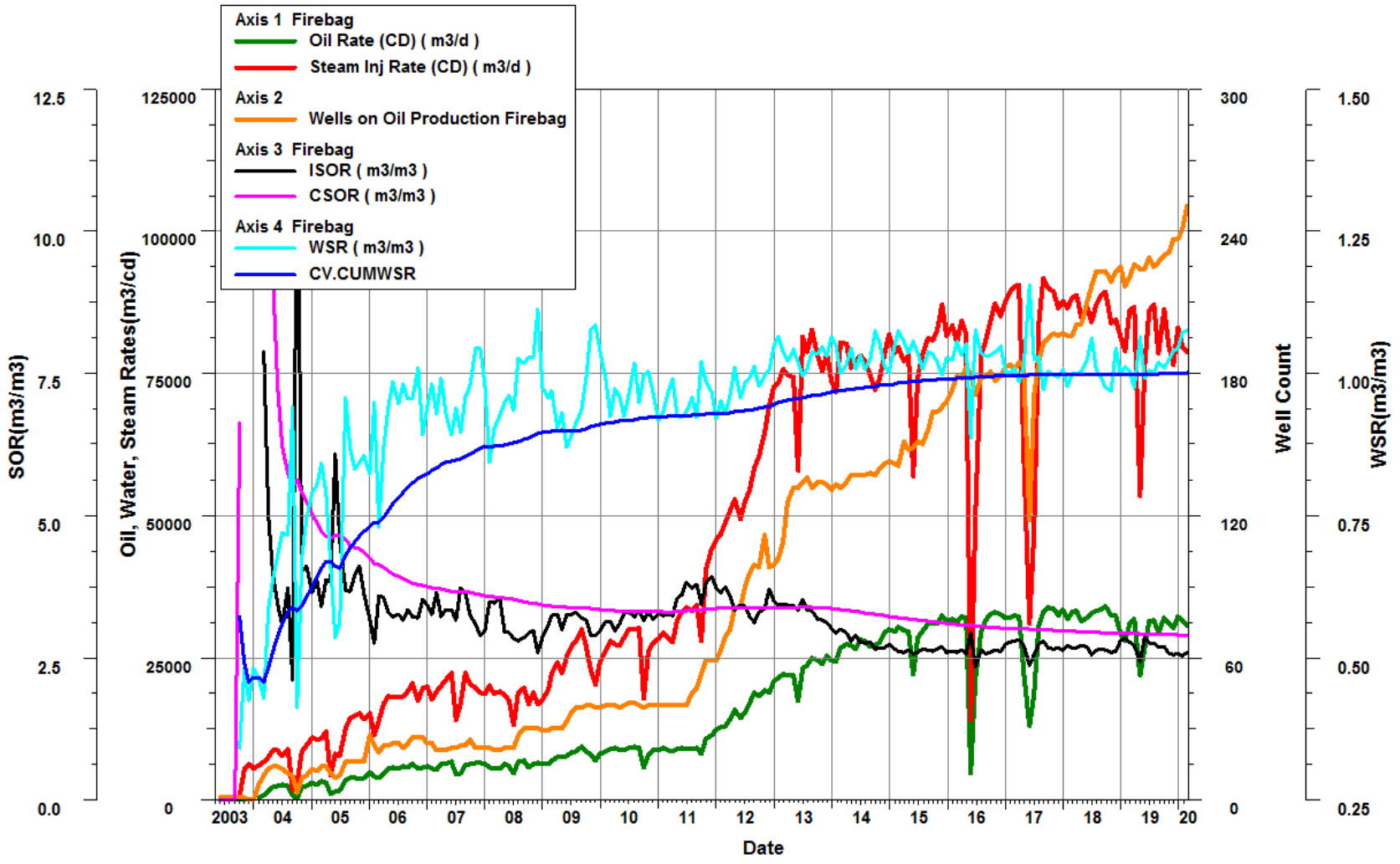
Subsurface

4.2

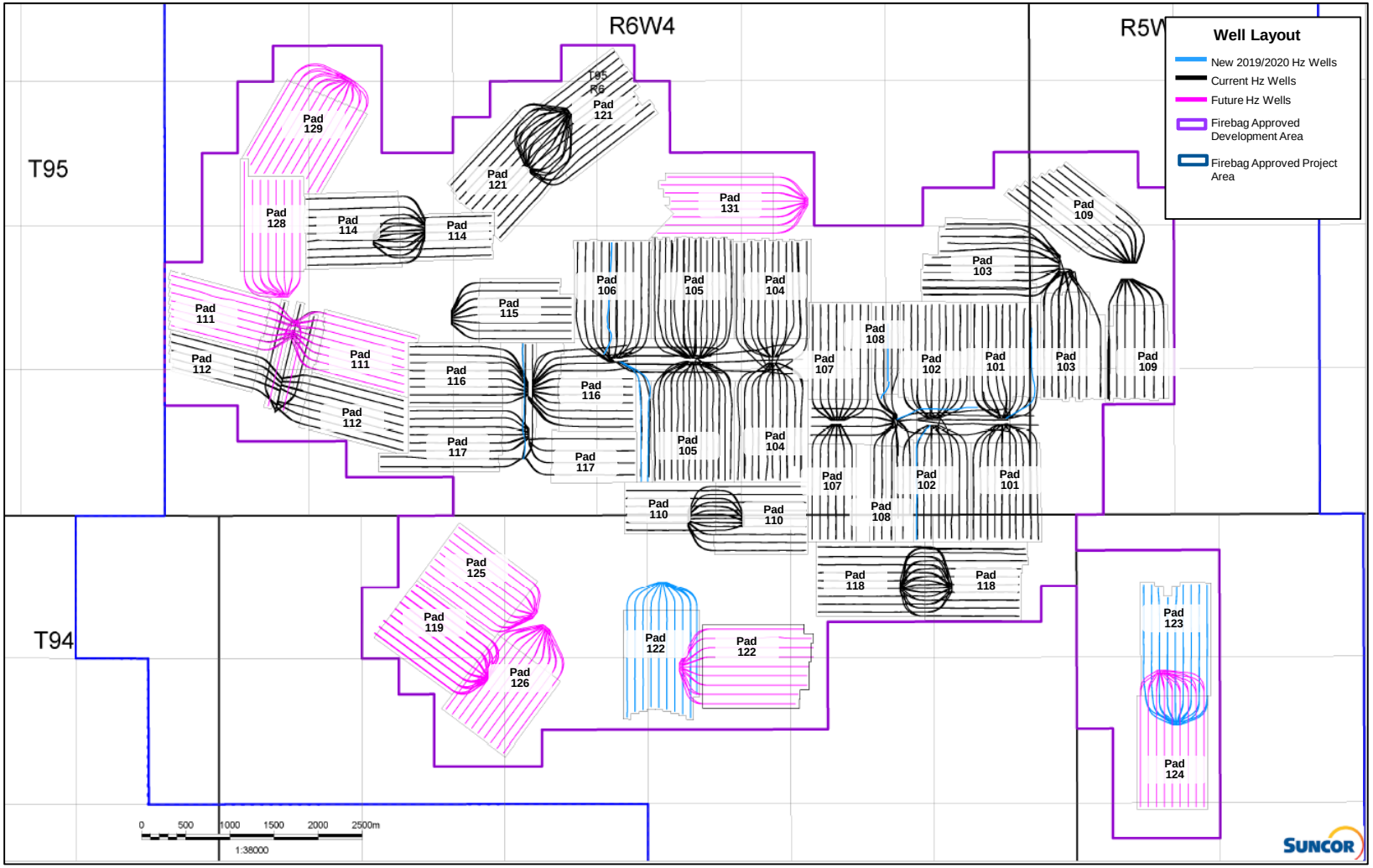
Scheme Performance – Well Production History



Scheme Performance – Well Production History

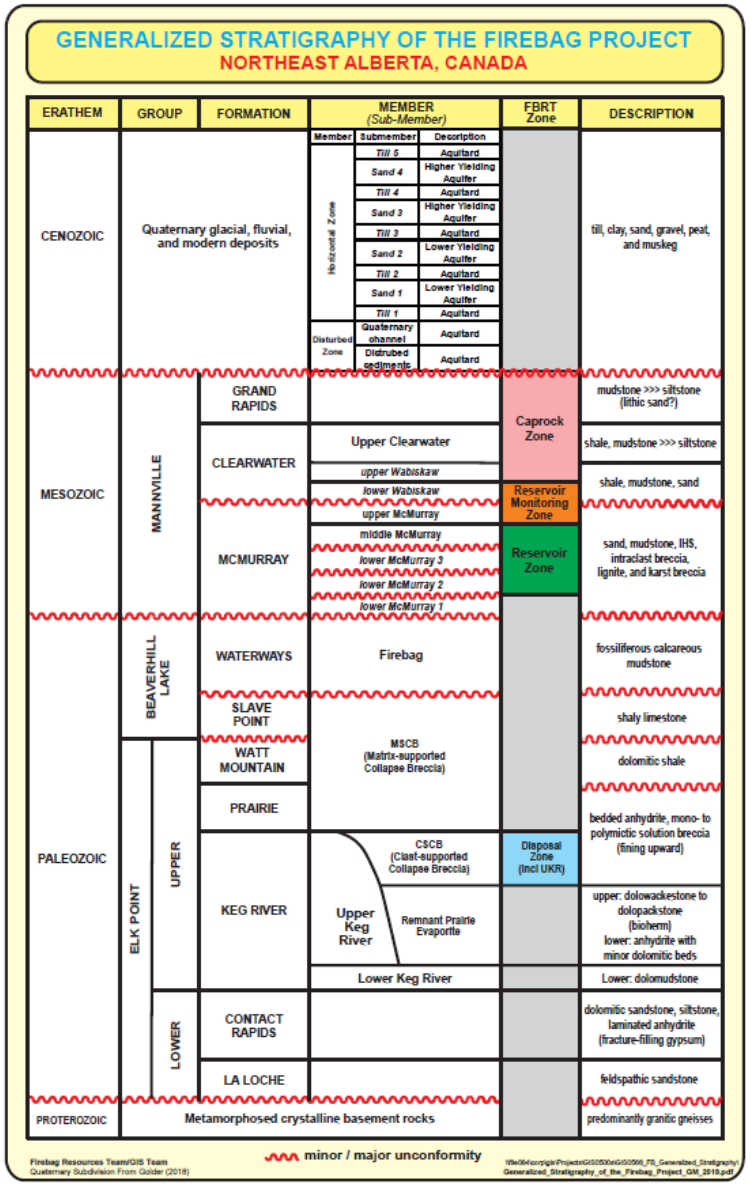


AER Project & Approved Development Areas

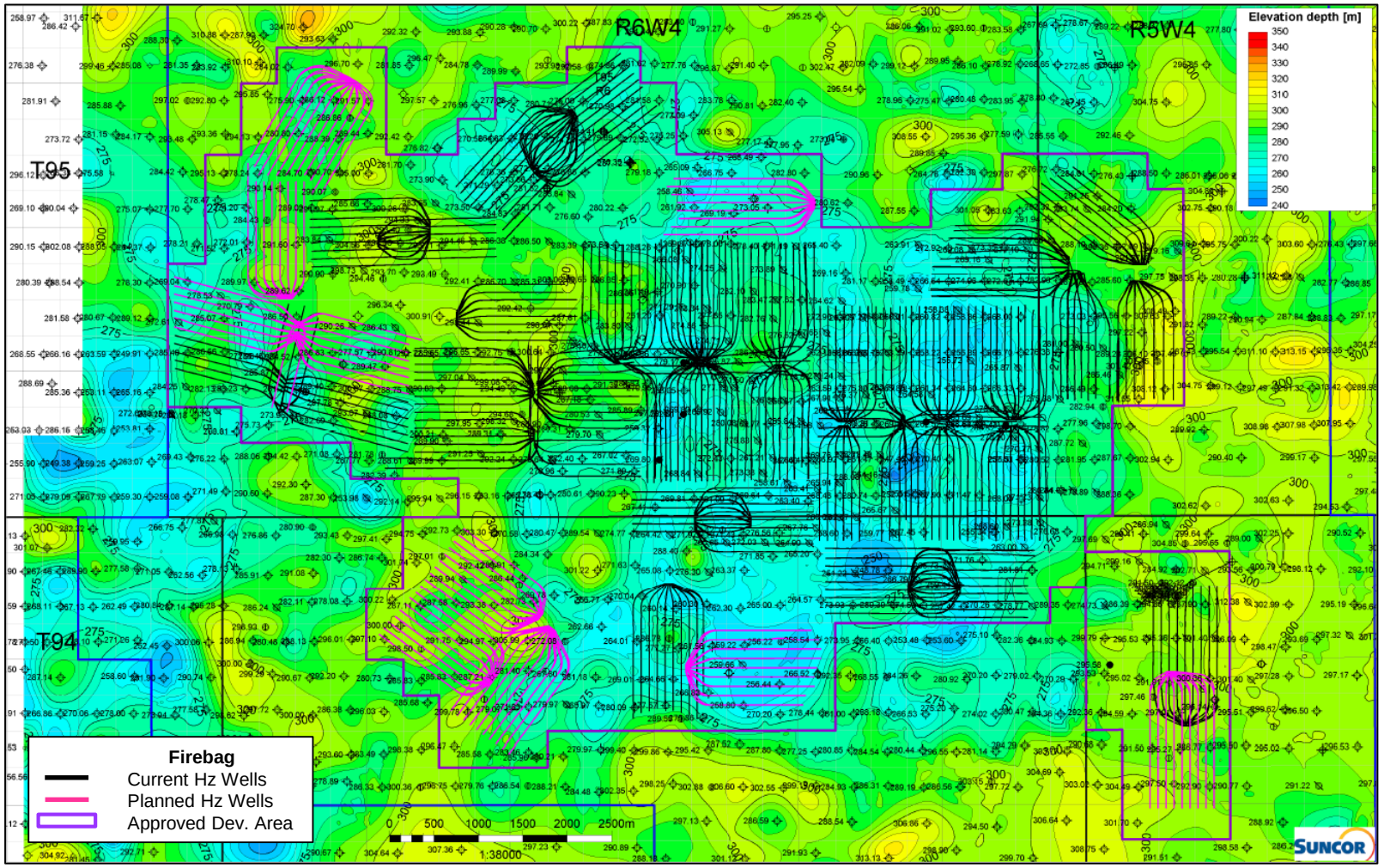


Firebag Approval 8870 as of May 2020

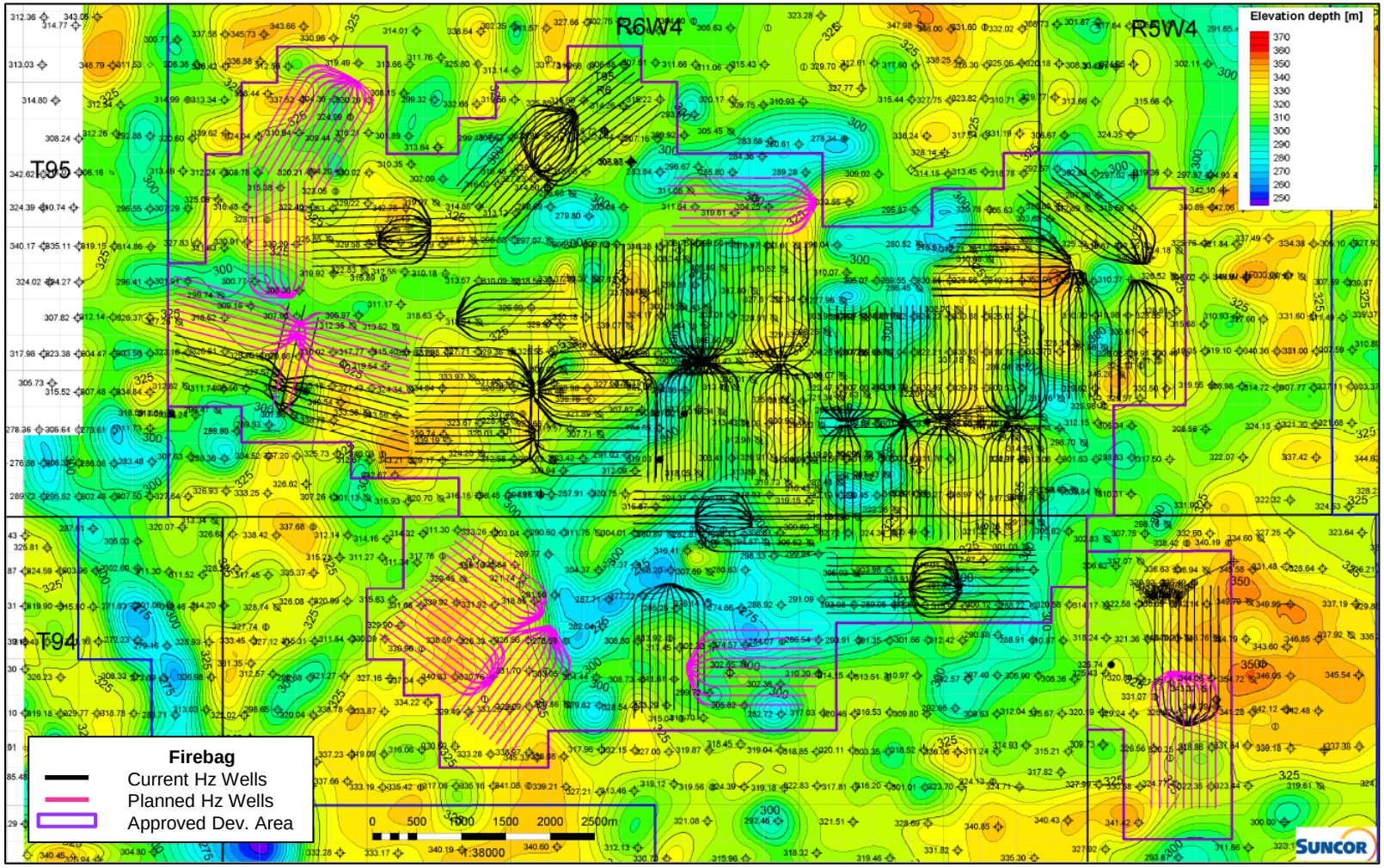
Firebag Stratigraphic Chart



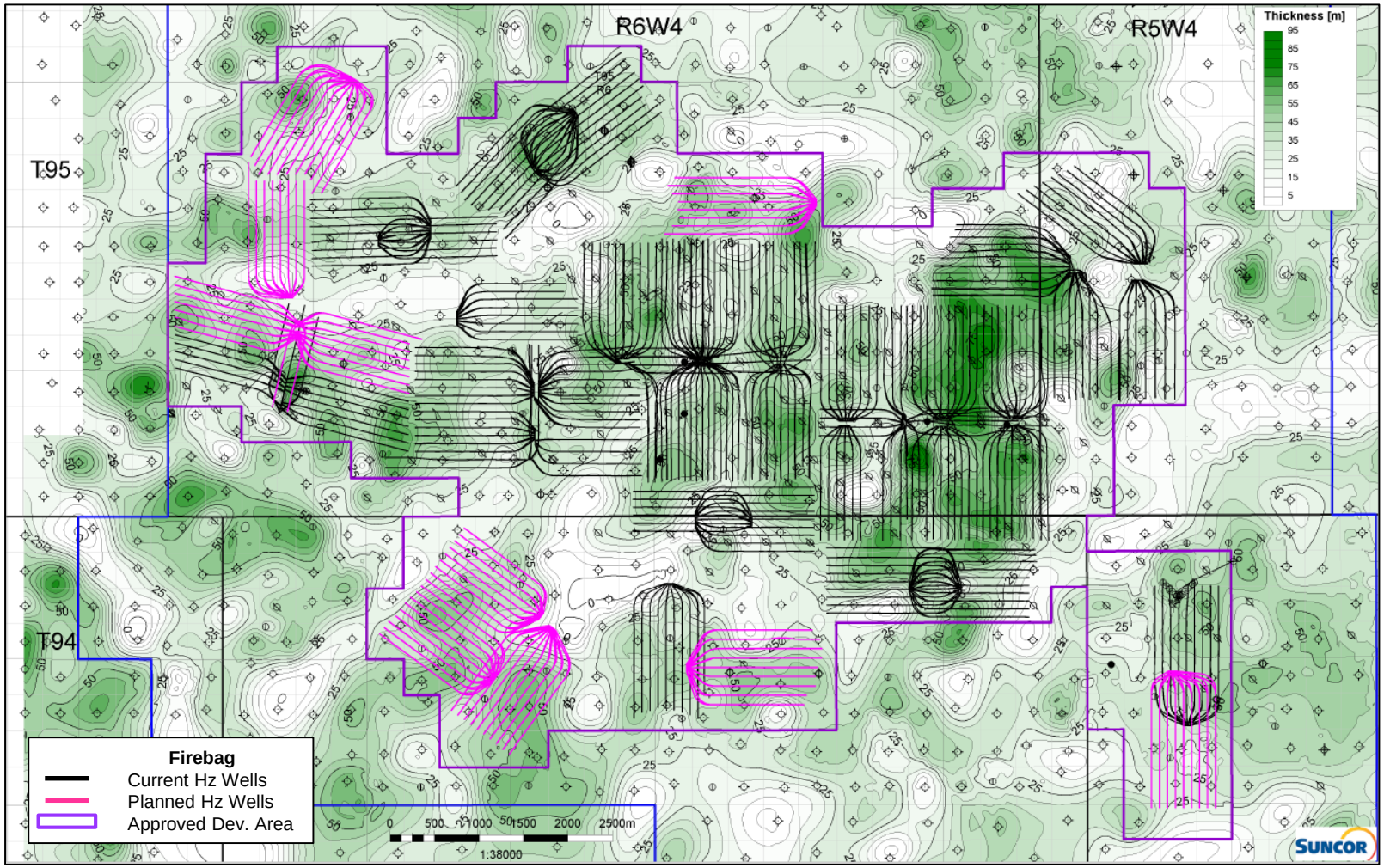
Structure Map of Base Continuous Reservoir



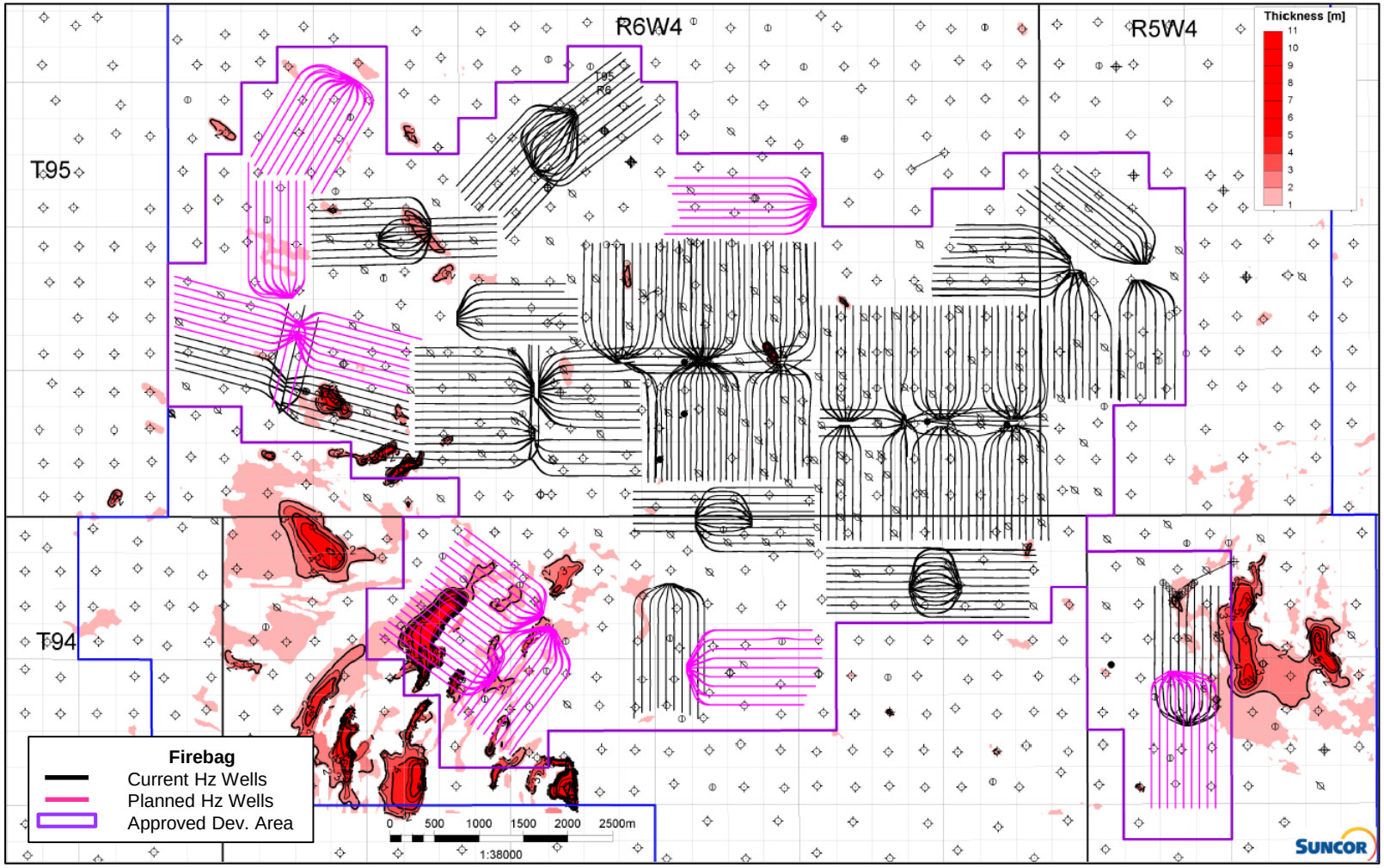
Structure Map of Top Continuous Reservoir



Isopach Map of Continuous Reservoir



Reservoir Zone Gas Isopach



Gas zones shown above are inconsequential to SAGD operations at Firebag but are included for reference.

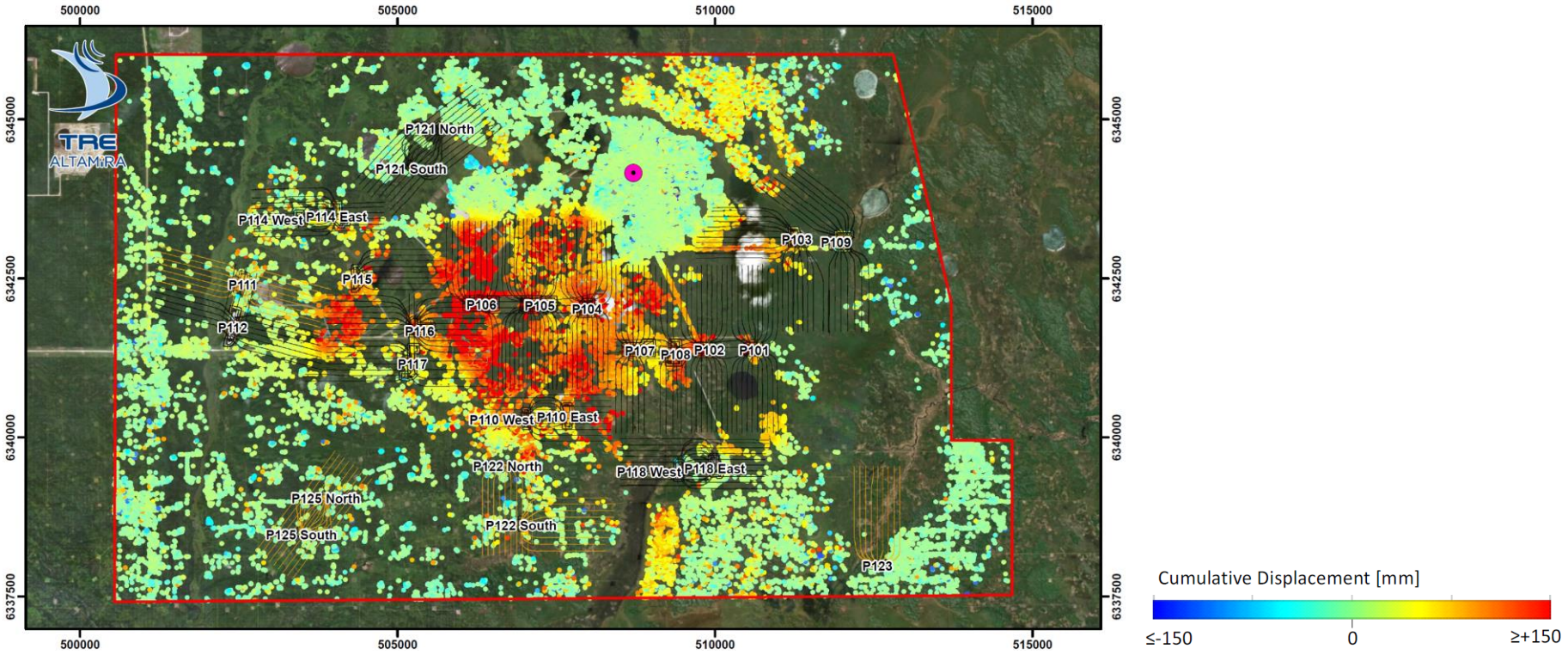
Water and Lean Zones

- No top or bottom water zones have been identified within the Firebag development area.

- Upper lean and middle lean are present in some parts of the Firebag development area. Thief zone potential is unknown at this time but is actively being investigated.

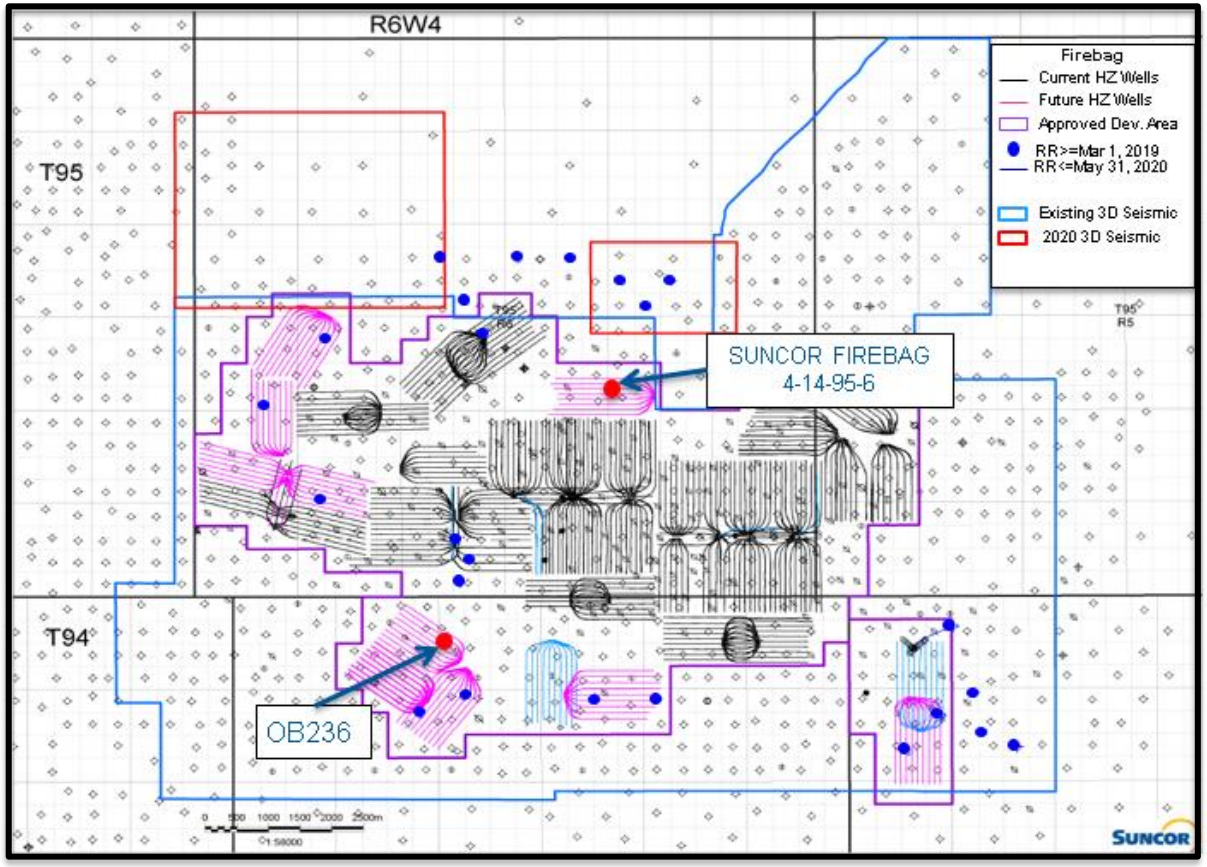
- For more information on lean zones, refer to applications 1875472 (Approval # 8870MMM) and 1925410 (Approval # 8870HHHH).

Firebag InSAR Cumulative Heave May 2013 - Oct 2019



- There are no geomechanical anomalies in the Firebag development area.
- Maximum heave of 316 mm observed at Pad 106
- Heave data is used to:
  - Calibrate geomechanical models
  - Monitor subsurface safety and flag areas that appear anomalous

Caprock Integrity Assurance



- **One new micro-frac test:**
  - SUNCOR FIREBAG 4-14-95-6 to assess the Clearwater
- **One new caprock core collected:**
  - OB 236 to assess natural fracture characterization
- Geomechanical simulations are developed to assess all new pad startups.
- These activities confirm that operating at the approved MOP does not impact Firebag caprock integrity.

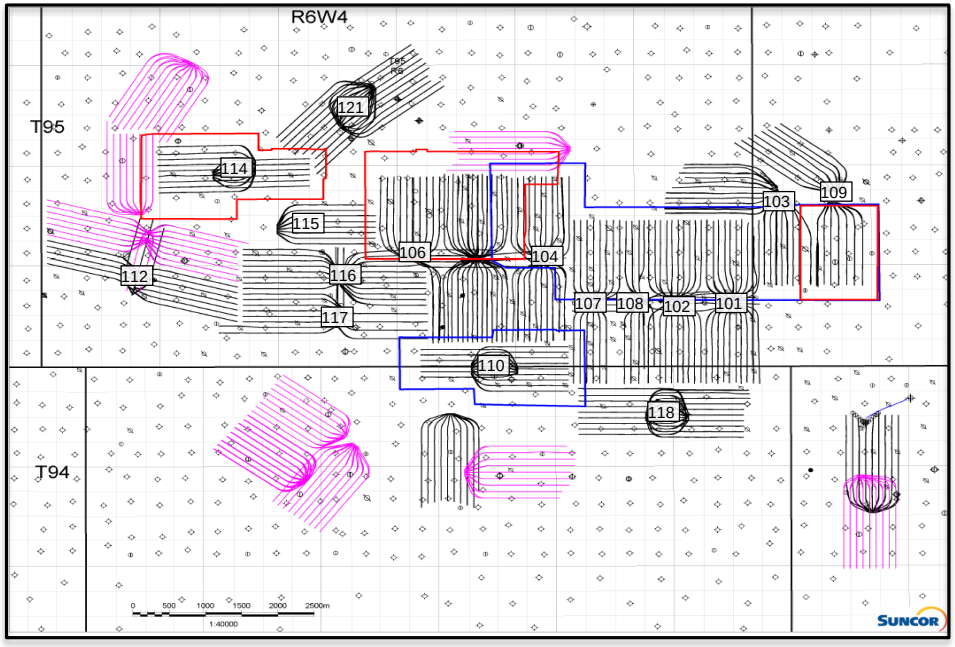
Reservoir Fracture Closure Gradients

Date	Well	Well Alias	TVD Perforated Interval (mKB)	Target	Minimum Stress (kPaa)	Fracture Closure Gradient (kPag/mGL)
15-Mar-12	01-16-095-06W4	OB134	297-298	lower McMurray 3 sand	5238.9	17.6
17-Mar-12	09-09-095-06W4	OB135	263-264	middle McMurray sand	5106.1	19.3
13-Mar-12	11-10-095-06W4	OB136	268-269	middle McMurray sand	4835.6	18.0
23-Feb-14	16-07-095-05W4	OB205	273-274	lower McMurray 3 sand	4319.7	15.7
11-Feb-15	05-07-095-06W4	OB147	255-258	middle McMurray sand	3868.3	15.1
10-Feb-16	15-26-094-06W4	OB140	296-299	middle McMurray sand	6171.9	20.6
8-Jan-19	03-32-094-06W4	OB145	272-275	middle McMurray sand	5330.4	19.5
16-Mar-12	01-16-095-06W4	OB134	277-278	middle McMurray mudstone	5398.7	19.4
18-Mar-12	09-09-095-06W4	OB135	247.5-248.5	middle McMurray mudstone	4020.2	16.1
13-Mar-12	11-10-095-06W4	OB136	257-258	middle McMurray mudstone	4910.0	19.0
24-Feb-14	16-07-095-05W4	OB205	247-248	middle McMurray IHS	4407.6	17.7
12-Feb-15	05-07-095-06W4	OB147	227-228	middle McMurray mudstone	4111.5	18.0
10-Feb-16	15-26-094-06W4	OB140	276-277	middle McMurray mudstone	4731.0	16.9
16-Mar-12	01-16-095-06W4	OB134	253.5-254.5	Wabiskaw/lower Clearwater	5482.5	21.6
18-Mar-12	09-09-095-06W4	OB135	231-232	Wabiskaw/lower Clearwater	5060.2	21.9
14-Mar-12	11-10-095-06W4	OB136	238-239	Wabiskaw/lower Clearwater	4532.7	19.0
5-Mar-13	01-09-095-06W4	OB182	232.5-233.5	Wabiskaw/lower Clearwater	5237.2	22.5
25-Feb-14	16-07-095-05W4	OB205	225.5-226.5	Wabiskaw/lower Clearwater	4952.2	22.0
12-Feb-15	05-07-095-06W4	OB147	209.5-210.5	Wabiskaw/lower Clearwater	4679.0	22.3
11-Feb-16	15-26-094-06W4	OB140	250.5-251.5	Wabiskaw/lower Clearwater	5434.6	22.3
16-Feb-17	07-31-094-05W4	OB184	225.5-226.5	Wabiskaw/lower Clearwater	4915.9	22.2
10-Jan-19	03-32-094-06W4	OB145	229.0-230.0	Wabiskaw/lower Clearwater	5464.9	23.8
3-Feb-19	04-17-095-06W4	OB148	219.5-220.5	Wabiskaw/lower Clearwater	4993.3	22.7
6-Feb-20	04-14-095-06W4	N/A	256.0-257.0	Wabiskaw/lower Clearwater	5335.2	20.8
Note - Suncor limits Fracture Closure Gradient to Overburden Gradient (~21.5 kPag/mGL)						

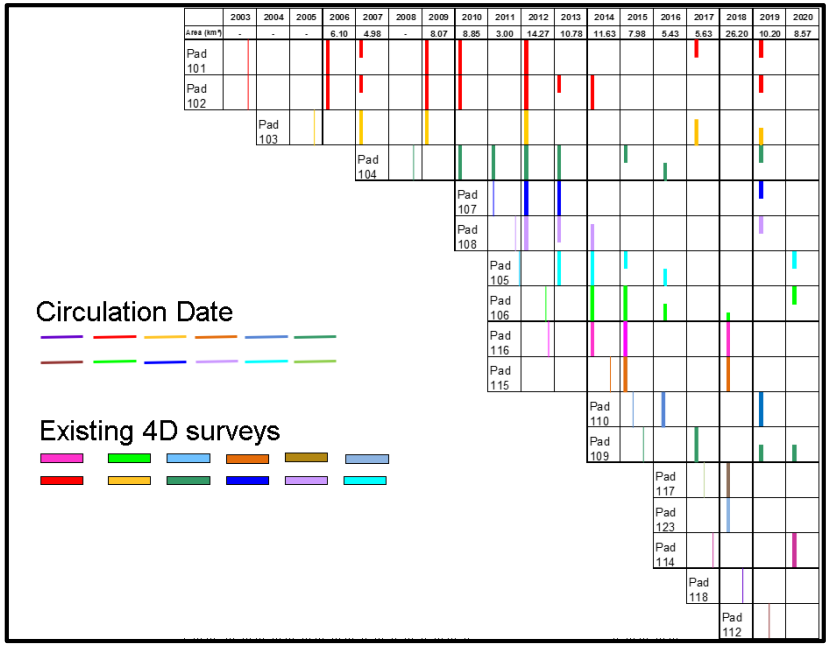
- 1 new well (SUNCOR FIREBAG 4-14-95-6)
- No changes are recommended to be made to the Firebag injection pressures that are currently approved.
  - 4,040 kPag start-up MOP based on an 80% safety factor (where overburden is based on closure pressure)
  - 3,570 kPag MOP during production phase

4D Seismic Survey Outlines

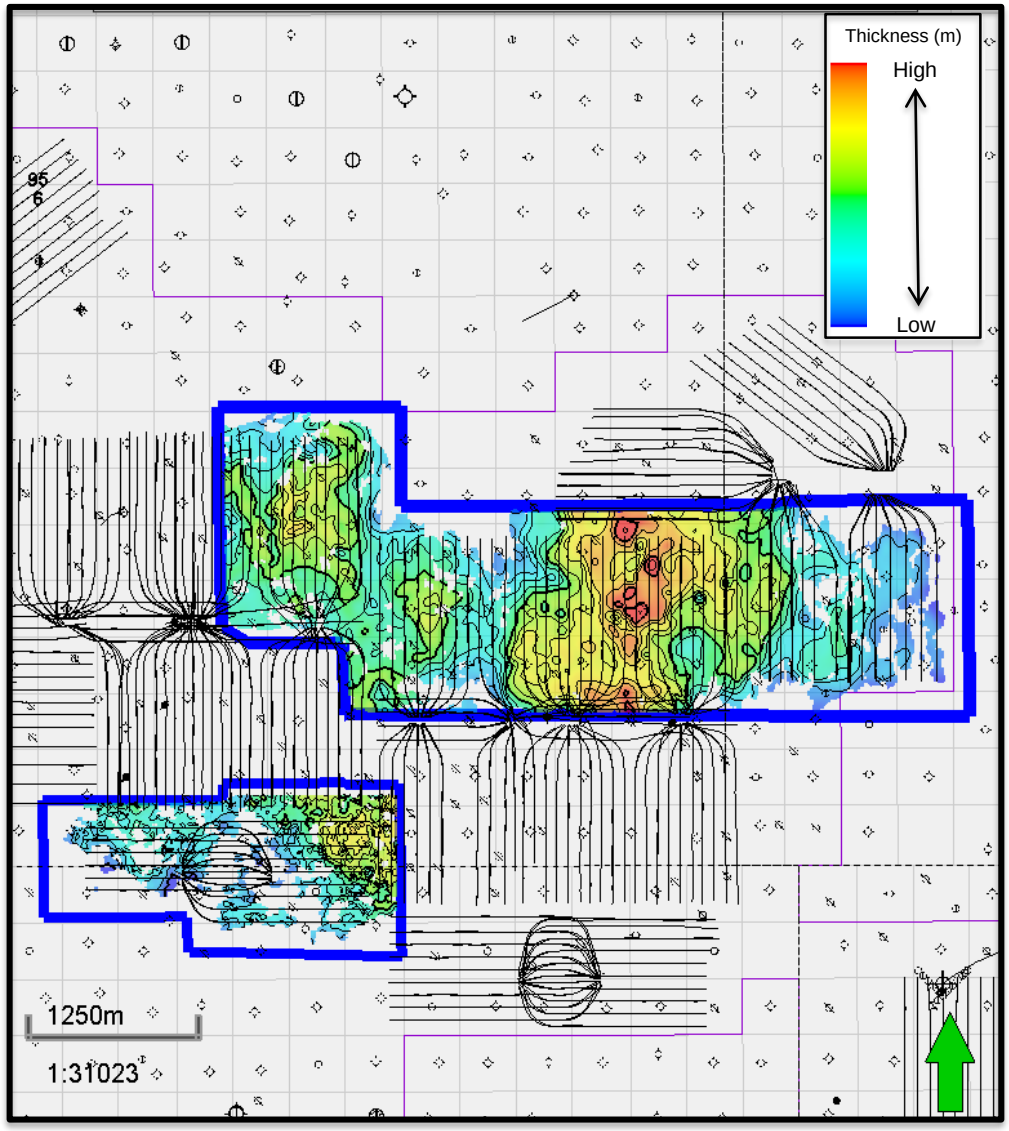
- Data was collected in the year indicated, while the associated interpretation is reported the following year. This is to allow for required processing and interpretation time.



Current Horizontal Wells
Planned Horizontal Wells
2019 4D Seismic
2020 4D Seismic



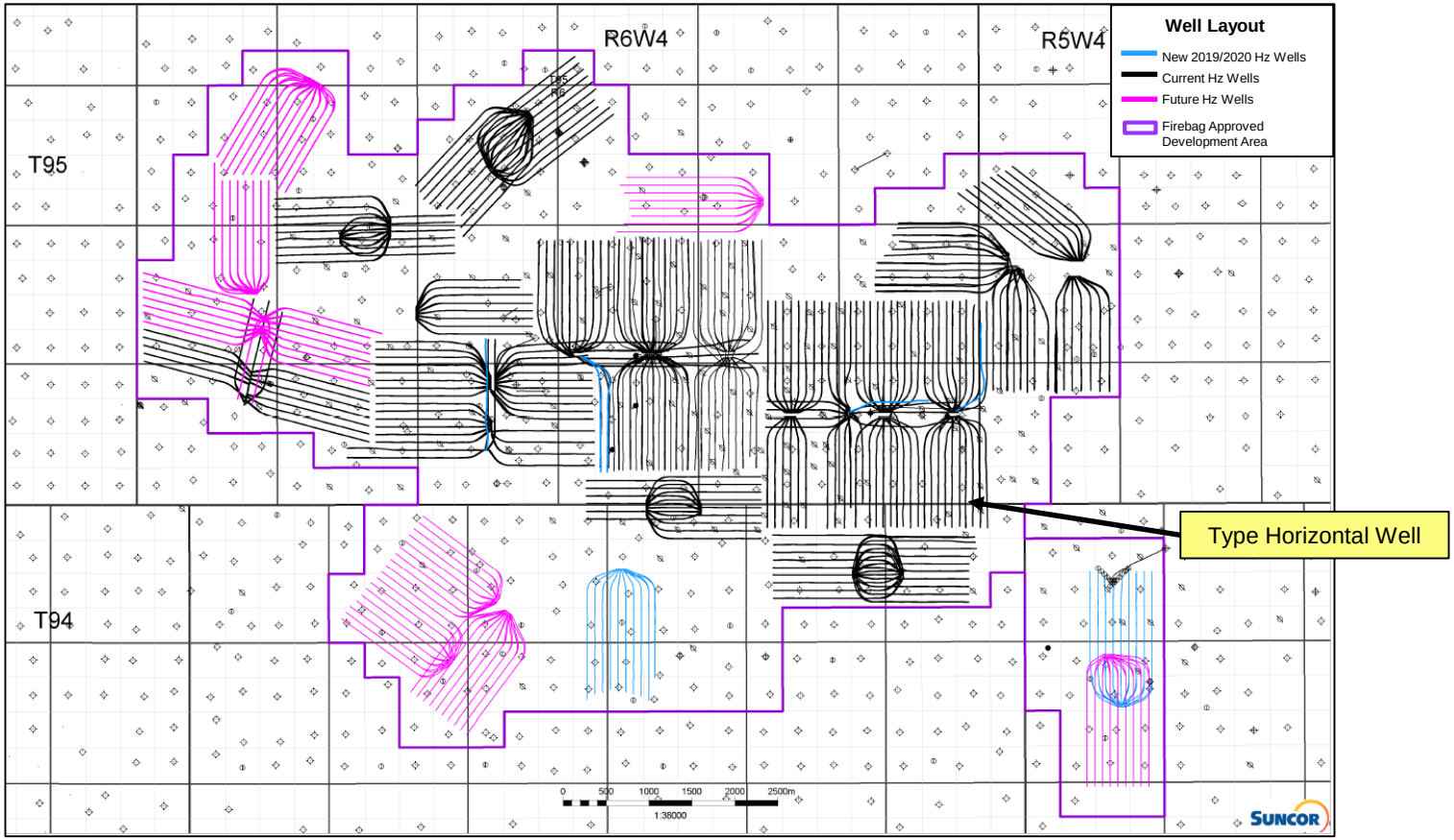
2019 4D Seismic – Steam Chamber Thickness Map



Type Well Location Map

Type Horizontal Well

- Pad 101 Pair 7



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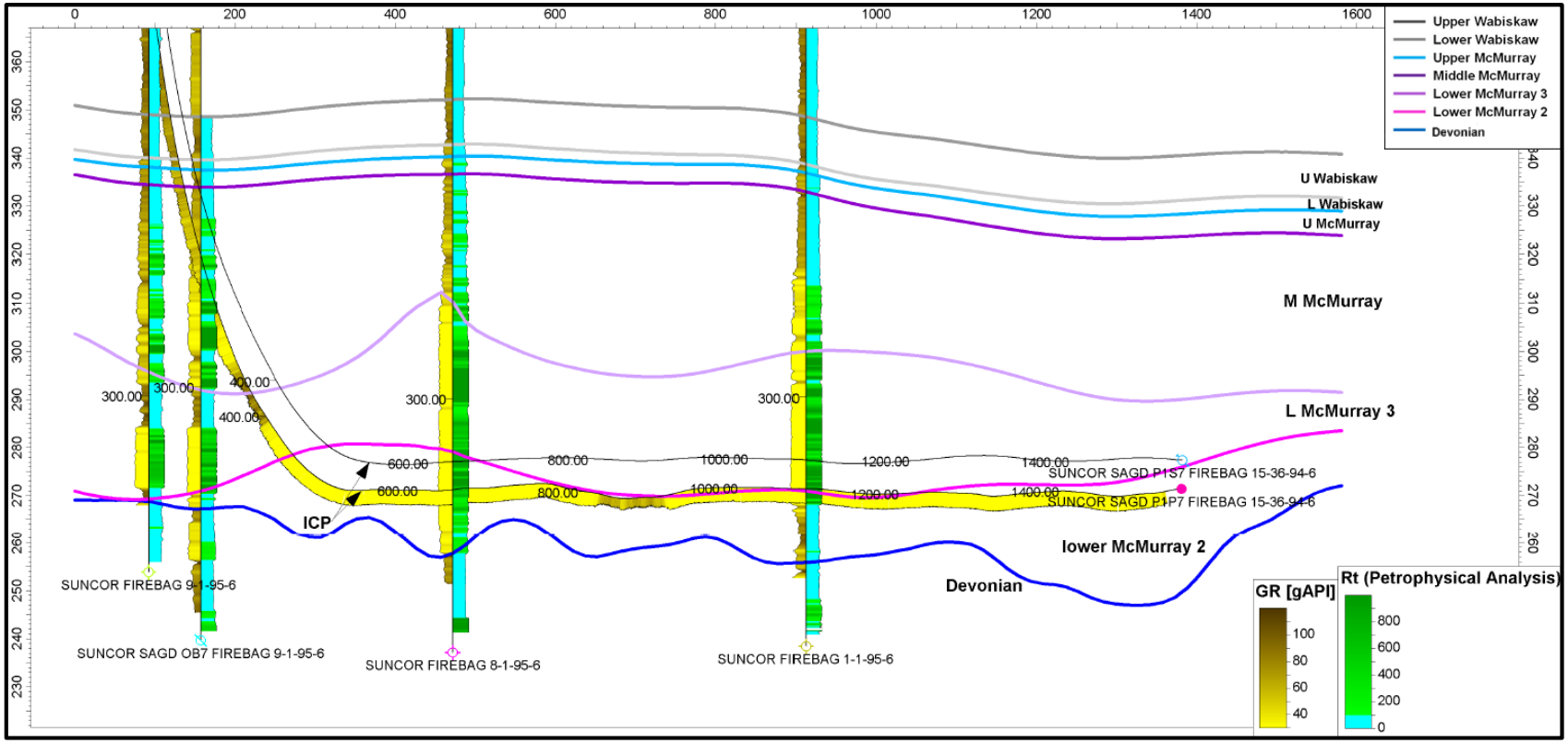
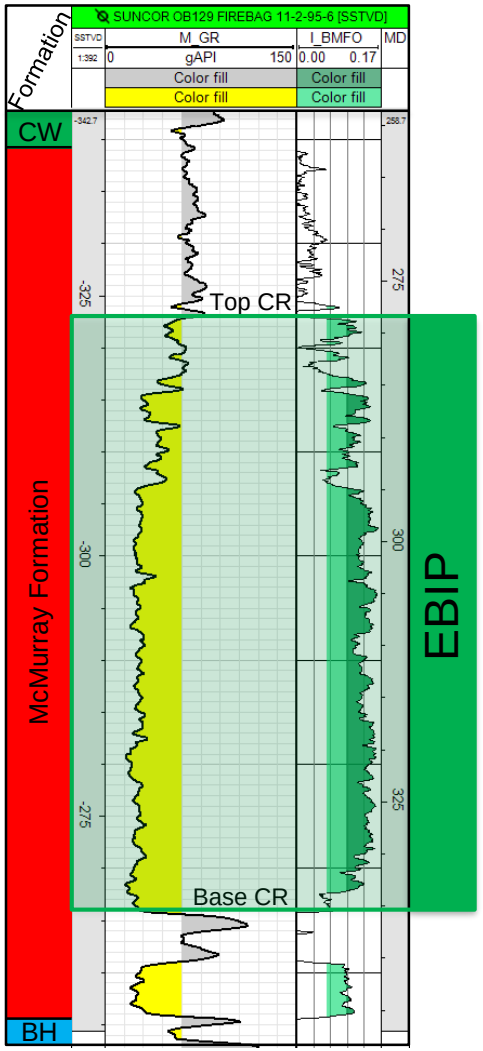
Structural Cross Section Example



Pad 101 Well Pair 7
*Coreholes are projected onto cross section

EBIP Methodology

- Exploitable Bitumen in Place (EBIP) is defined in each well by the top and base of Continuous Reservoir. It is selected at the base of a continuous sand unit either developed or most likely to be developed.
  - Continuous Reservoir base: lowest portion of the continuous reservoir sandstone with BMFO cut off of 6%, <3m of >50% mud/breccia in the lower portion.
  - Continuous Reservoir top: 2m of mudstone, no BMFO or porosity cut offs.
- Upper Lean, Middle Lean, and Gas Zones that are in pressure communication with the continuous reservoir are included with no thickness cutoffs.
- Observation wells and 4D seismic will take precedence over the geology pick.



CW: Clearwater Formation
BH: Beaverhill Lake Group

Exploitable Bitumen in Place & Average Reservoir Properties

	HC Area (m^2)	Continuous Reservoir Thickness (m)	Continuous Reservoir Volume (e^6m^3)	Porosity	Oil Saturation	Formation Volume Factor	EBIP [1] (e^6m^3)	EBIP [1] (MMbbl)
SAGD Pad 101	1,758,266	52.8	93	0.319	0.78	1	23.2	145.9
SAGD Pad 102	1,605,061	56.4	91	0.317	0.74	1	21.1	133.0
SAGD Pad 103	1,880,989	44.0	84	0.316	0.73	1	19.7	124.1
SAGD Pad 104	1,909,795	45.2	86	0.320	0.77	1	21.2	133.3
SAGD Pad 105	2,625,430	37.6	96	0.326	0.78	1	24.6	154.8
SAGD Pad 106	1,601,721	36.6	61	0.324	0.80	1	15.8	99.5
SAGD Pad 107	1,381,092	38.0	53	0.320	0.75	1	12.7	79.8
SAGD Pad 108	1,726,243	44.3	77	0.322	0.76	1	18.6	116.8
SAGD Pad 109	1,485,780	28.5	36	0.329	0.77	1	9.1	57.3
SAGD Pad 110	1,448,999	33.3	49	0.321	0.70	1	10.9	68.6
SAGD Pad 111	1,603,843	41.4	58	0.325	0.79	1	14.7	92.7
SAGD Pad 112	1,453,328	39.1	63	0.334	0.78	1	15.9	100.3
SAGD Pad 114	1,472,972	34.1	51	0.323	0.77	1	12.5	78.6
SAGD Pad 115	749,264	29.7	22	0.326	0.73	1	5.3	33.1
SAGD Pad 116	1,660,636	39.3	65	0.327	0.78	1	16.7	105.0
SAGD Pad 117	1,573,171	33.3	54	0.321	0.72	1	12.6	79.3
SAGD Pad 118	2,027,666	38.8	79	0.312	0.75	1	18.5	116.3
SAGD Pad 119	887,092	43	38	0.327	0.74	1	9.2	58.1
SAGD Pad 121	2,095,069	40.5	85	0.324	0.72	1	19.9	125.2
SAGD Pad 122	2,116,270	37.0	78	0.313	0.69	1	17.0	107.0
SAGD Pad 123	997,805	42.4	42	0.318	0.75	1	10.2	63.9
SAGD Pad 124	1,024,587	29.9	31	0.316	0.73	1	7.1	44.4
SAGD Pad 125	885,315	34.0	30	0.325	0.75	1	7.3	46.2
SAGD Pad 126	940,361	45.5	43	0.322	0.74	1	10.2	64.4
SAGD Pad 128	796,435	33.5	27	0.325	0.75	1	6.5	40.7
SAGD Pad 129	1,037,864	29.4	31	0.322	0.77	1	7.6	47.8
SAGD Pad 131	919,911	36.4	33	0.322	0.80	1	8.6	54.0
SAGD TOTAL	**39,664,963**	**38.7**	**1,556**	**0.322**	**0.75**	**1**	**376.9**	**2,370.1**
Firebag Approved Project Area	**193,456,235**	**30.3**	**5,857**	**0.319**	**0.71**	**1**	**1,321**	**8,309**

EBIP: Exploitable Bitumen in Place
HC: Hydrocarbon

Changes from last year reflect data from new coreholes, observation wells, time lapse seismic and some reinterpretation.
EBIP procedure remains unchanged.

Pad Recoveries

Pad	101	102	103	104	Stage 1 & 2 Totals
Recovery to Date (e3m3)	16,176	13,586	11,438	11,497	52,698
Recovery Factor to Date (%)	70%	64%	58%	54%	62%
Expected Ultimate Recovery (e3m3)	20,392	16,066	14,086	14,326	64,870
Expected Ultimate Recovery Factor (%)	88%	76%	71%	68%	76%
EBIP (e3m3)	23,205	21,146	19,741	21,191	85,283

Pad	105	106	107	108	109
Recovery to Date (e3m3)	11,374	6,879	6,516	5,347	2,080
Recovery Factor to Date (%)	46%	43%	51%	29%	23%
Expected Ultimate Recovery (e3m3)	17,471	9,567	9,028	9,251	5,225
Expected Ultimate Recovery Factor (%)	71%	60%	71%	50%	57%
EBIP (e3m3)	24,616	15,821	12,684	18,569	9,110

Pad	110	114	115	116	117	118	112	121	Stage 3 & 4 Totals
Recovery to Date (e3m3)	2,661	1,170	2,001	7,503	1,790	670	242	124	16,161
Recovery Factor to Date (%)	24%	9%	38%	45%	14%	4%	2%	1%	14%
Expected Ultimate Recovery (e3m3)	5,910	7,110	3,203	10,952	7,401	10,250	8,023	8,630	61,480
Expected Ultimate Recovery Factor (%)	54%	57%	61%	66%	59%	55%	50%	43%	55%
EBIP (e3m3)	10,900	12,504	5,258	16,697	12,611	18,493	15,946	19,911	112,318

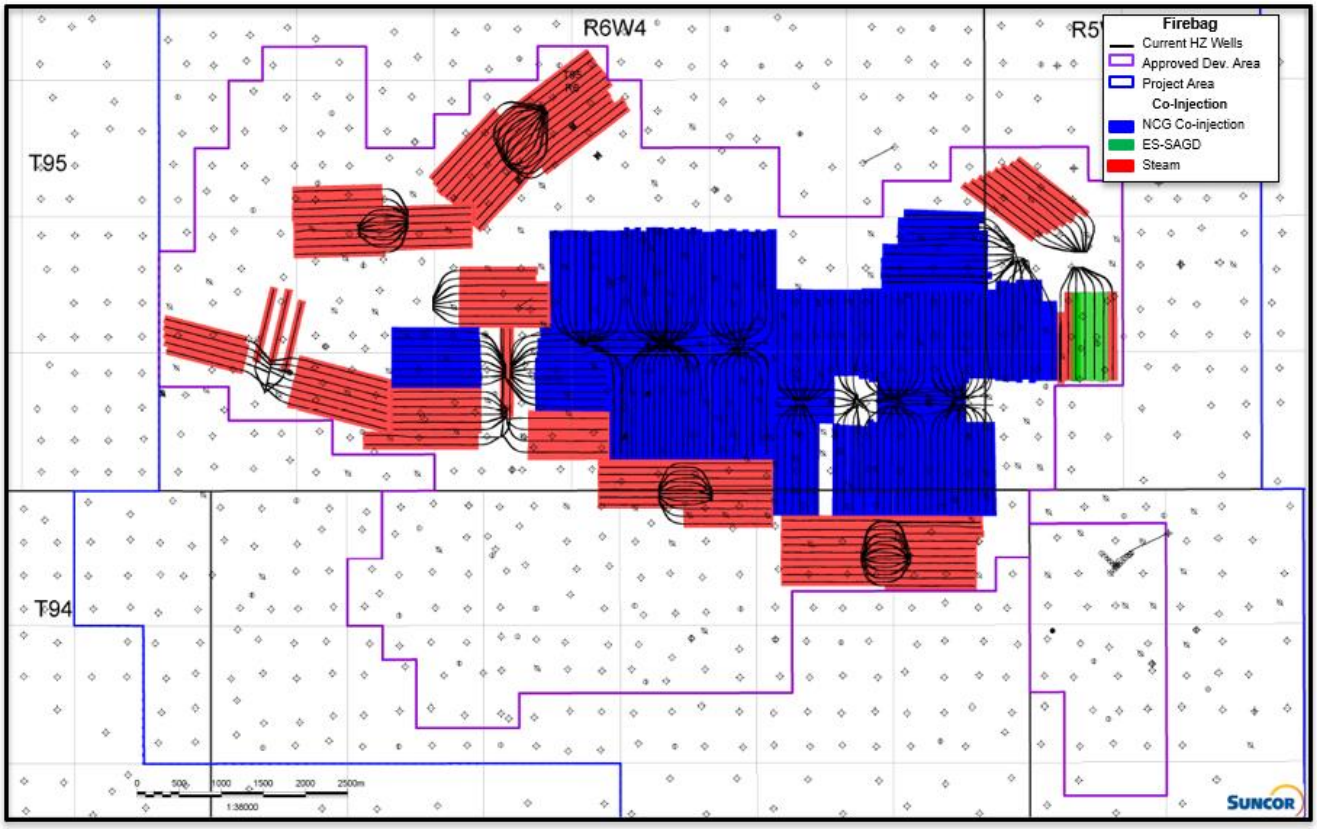
Expected Ultimate Recovery is estimated internally

Average Reservoir Properties

- Average reservoir properties for the operating portion of the scheme (Pads ***101-110, 112*** and Pads ***114-118, 121***)

  - Initial reservoir pressure: 800kPa
  - Initial reservoir temperature: 8°C
  - Average continuous reservoir: 39.6 m
  - Average porosity: 0.322
  - Average oil saturation: 0.75
  - Effective horizontal permeability: 3 to 4 D
  - Effective vertical permeability: 2 to 3 D
  - Viscosity: ~ 11-13.5 cp @ 215°C

Co-Injection Overview



Non-condensable gas (NCG) co-injection has been implemented on the following well pads at Firebag:

Phase 1
- Pad 101
- Pad 102
- Pad 103
- Pad 104
- Pad 107

Phase 2
- Pad 105
- Pad 106
- Pad 108
- Pad 116

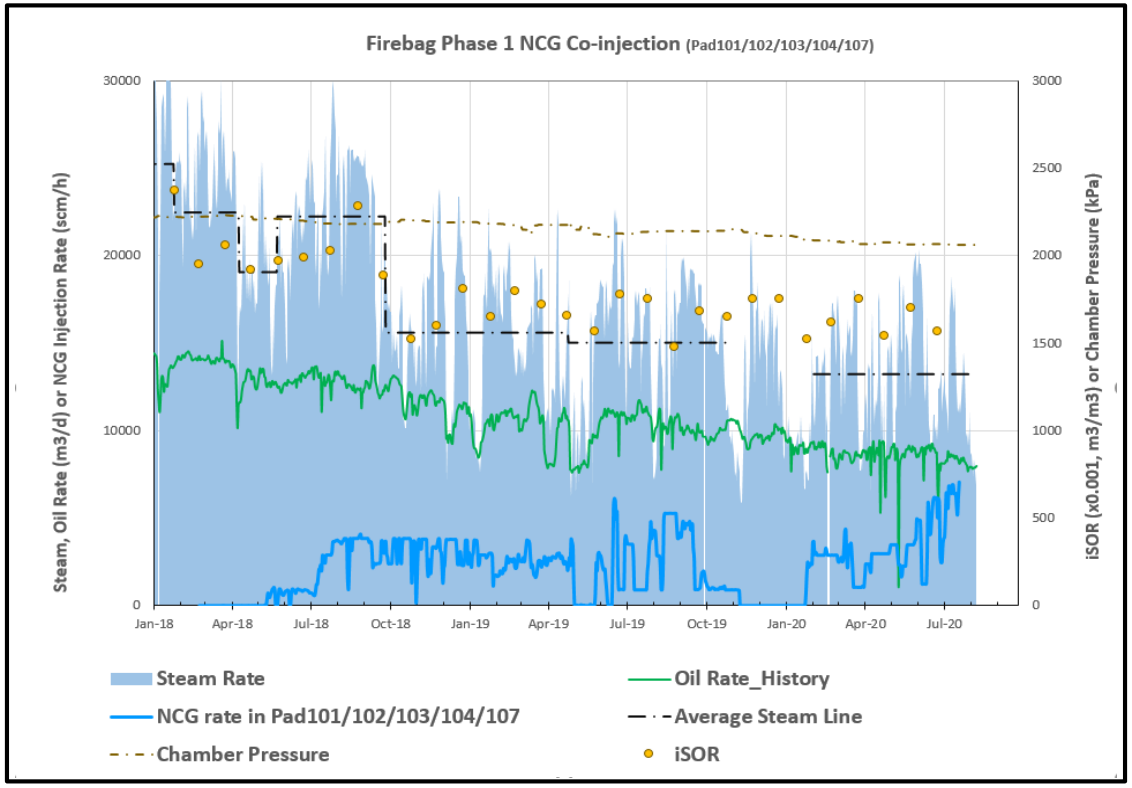
Co-Injection Strategy

- At Firebag, NCG (i.e. methane fuel gas) is co-injected with steam. Co-injection typically commences on a well pad when recovery has exceeded 50% through means of normal SAGD operations. Geological characteristics, production performance and optimization of surface infrastructure are also considered when evaluating timelines for NCG co-injection.
- Many factors are considered when determining target NCG injection rates:
  - Desired operating pressures
  - Field wide strategies for steam reallocation
  - Maturity of the subject steam chamber
  - Predicted leak off of injected NCG within the reservoir
- Key components of the NCG co-injection strategy at Firebag include:
  - Developing success criteria based on industry knowledge and analog data
  - Targeting specified KPI's
  - Collecting data that can be analyzed against the baseline to develop a better understanding of the extent of vertical and lateral NCG migration
  - Regular monitoring and adjustments to operational strategies where required depending on observed reservoir response

SUNCOR

Co-Injection Observations

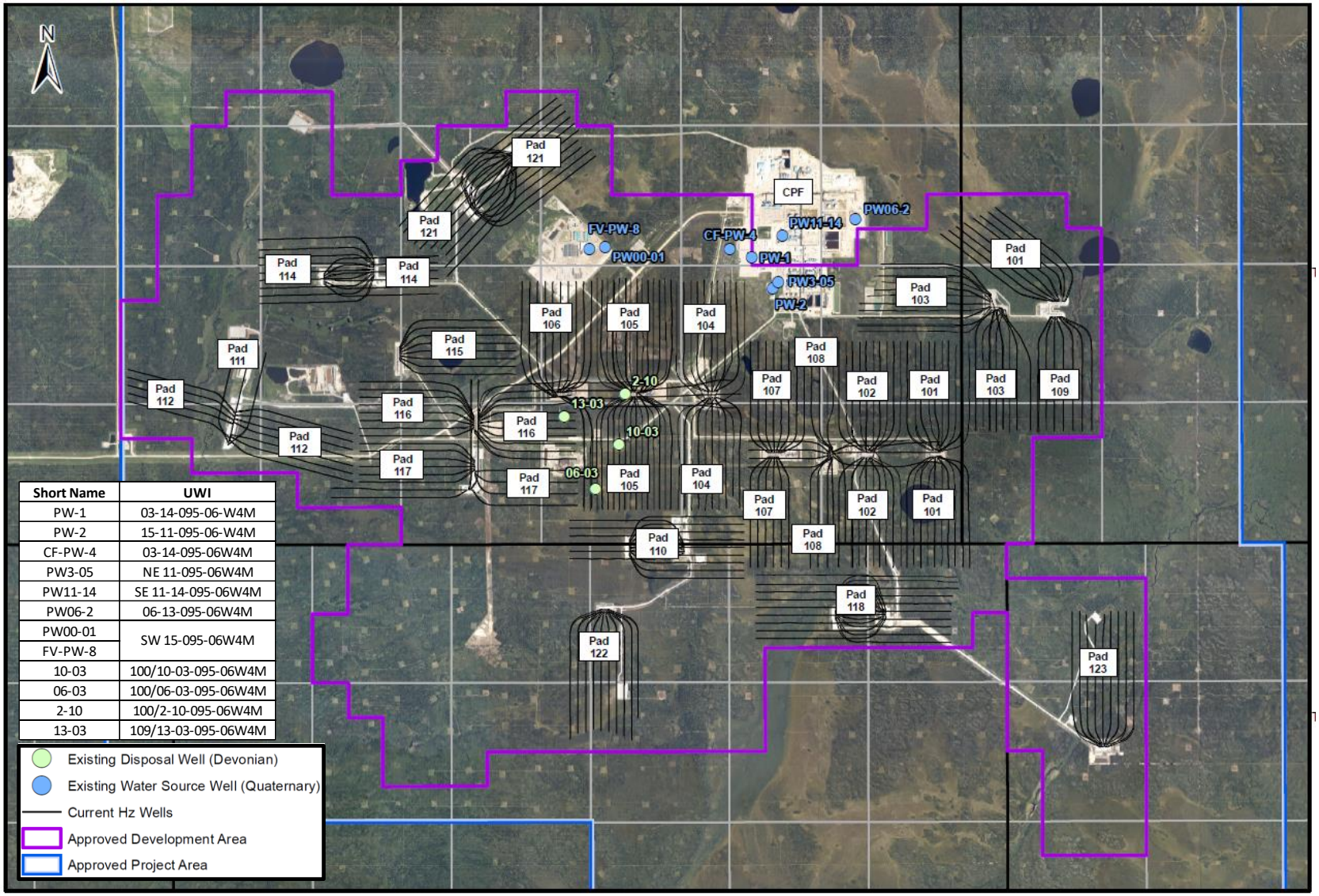
- NCG has been injected at average of 16,000 - 31,000 Sm^3/d (per well pad basis).
- Plant outages and other operational impacts have affected the ability to maintain continuous NCG co-injection.
- No negative impacts have been observed in relation to resource recovery, wellbore integrity or oil rates.
- Oil production has continued to follow forecasted natural decline trends while gas rates have been gradually increased.
- SOR has been reduced and field wide steam injection strategy has been optimized via reallocation to less mature SAGD pads.
- Reservoir pressure targets have been able to be maintained with NCG co-injection.
- No significant temperature reductions have been observed within steam chambers (via analysis of observation well data).
- Produced gas separators have shown slight increases in gas production. It is estimated that 10-13% of injected NCG is typically produced.



Surface

4.3

Overview of Surface Infrastructure (Aerial Photo)

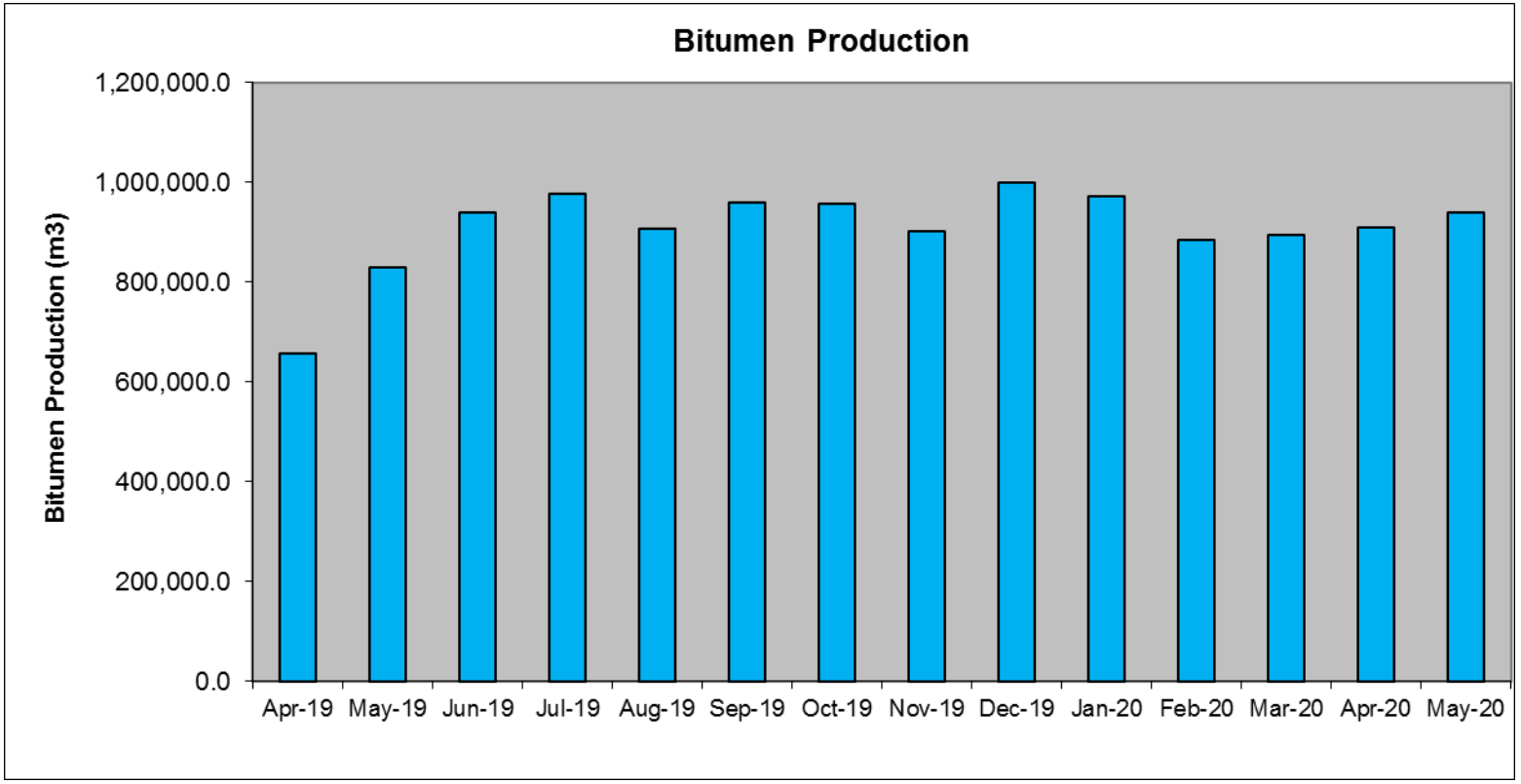


Short Name	UWI
PW-1	03-14-095-06-W4M
PW-2	15-11-095-06-W4M
CF-PW-4	03-14-095-06W4M
PW3-05	NE 11-095-06W4M
PW11-14	SE 11-14-095-06W4M
PW06-2	06-13-095-06W4M
PW00-01	SW 15-095-06W4M
FV-PW-8	
10-03	100/10-03-095-06W4M
06-03	100/06-03-095-06W4M
2-10	100/2-10-095-06W4M
13-03	109/13-03-095-06W4M

There have been no modifications to the Central Processing Plant (CPF) during the reporting period that have required an AER application approval.

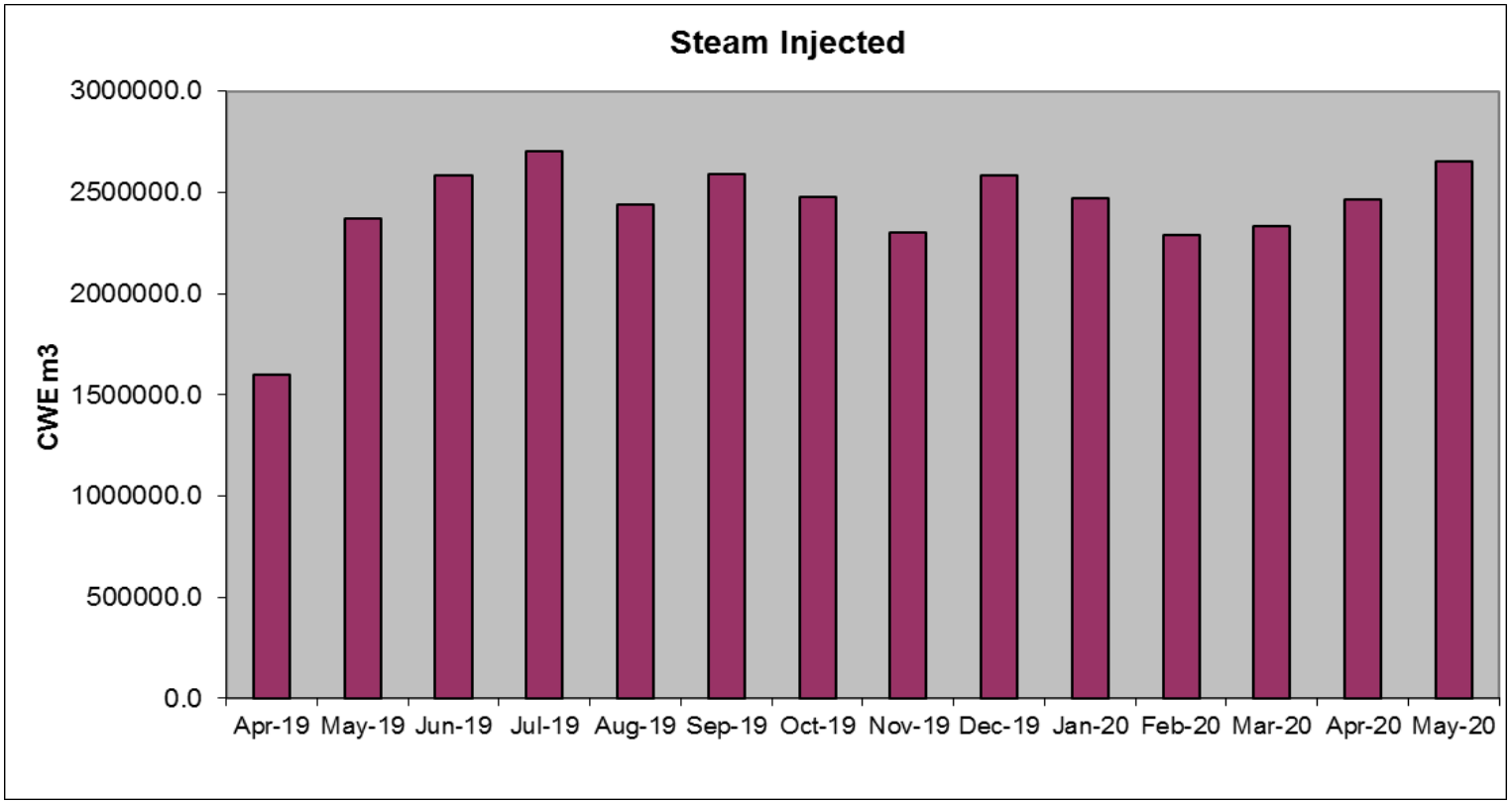
Annual Rates – Bitumen

- From April 2019 to May 2020, Firebag averaged 29,815.9 m^3/d (187,004.4 bbl/d) of bitumen production. The Design rate for Firebag is 203 kbbl/d at 2.8 SOR.



Annual Rates – Steam

- From April 2019 to May 2020, Firebag injected an average of 79,227.6 m^3/d of steam (90,360 m^3/d, CWE).



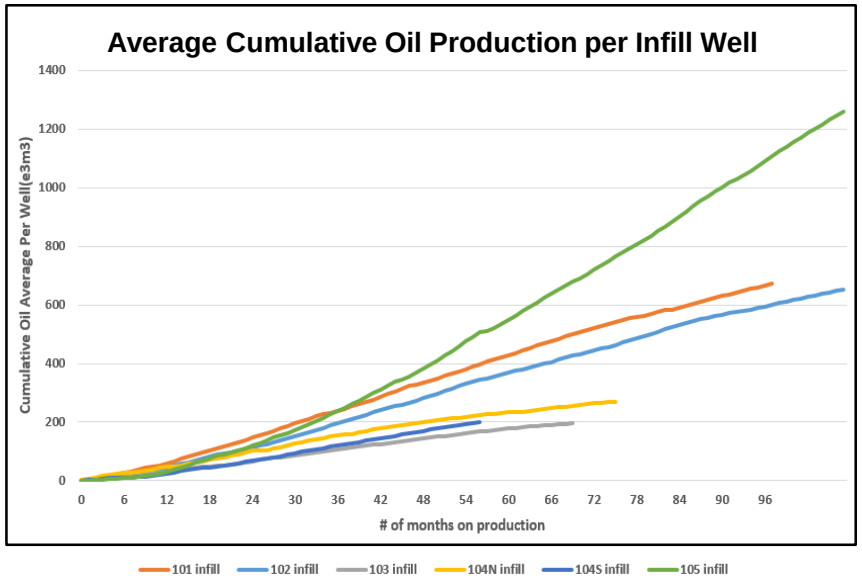
Historical and Upcoming Activity

4.4

Summary of Key Learnings

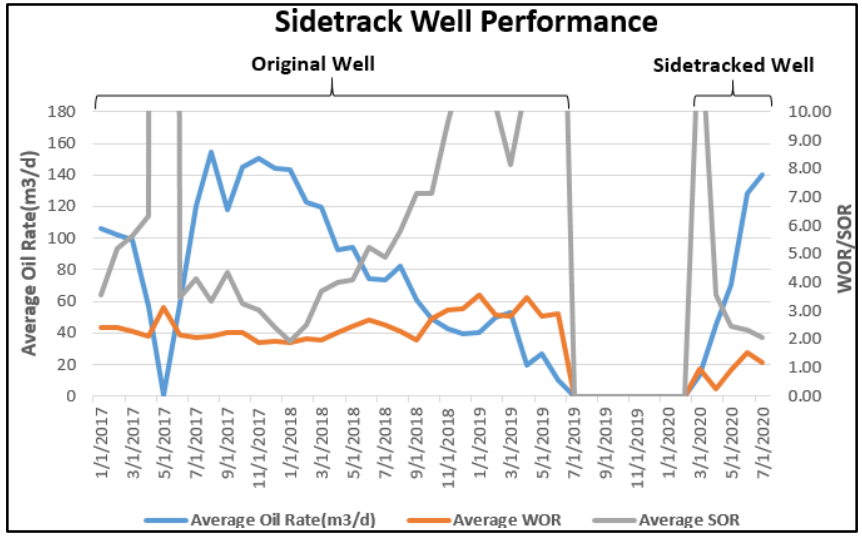
Infill Well Performance

- 51 infill wells are currently in operation at Firebag with average oil production of 826 bbl/d (131 m^3/d) per well.
- Infill well performance is optimized through effective management of infill and base well interactions at the steam chamber level.



Sidetrack Well Performance

- 5 sidetrack wells were drilled during the reporting period as a part of brownfield development program.
- These sidetrack wells are demonstrating beneficial WOR and SOR metrics as a result of their pre-heated steam chambers.



Summary of Key Learnings

Observation Well Monitoring

- Observation wells continue to be utilized for both caprock integrity monitoring and optimization in the current operating area at Firebag. They also continue to be incorporated into development planning and are drilled for new pads prior to first steam.
- Standard completion designs include a thermocouple string that spans the reservoir zone and into the caprock and/or individual pressure and temperature gauges in specific zones.
- Observation wells in the area of two new pad start ups (Pad 121 and Pad 112) were useful in assessing reservoir connectivity and mobility through the use of pressure monitoring gauges.

Pad Start Up

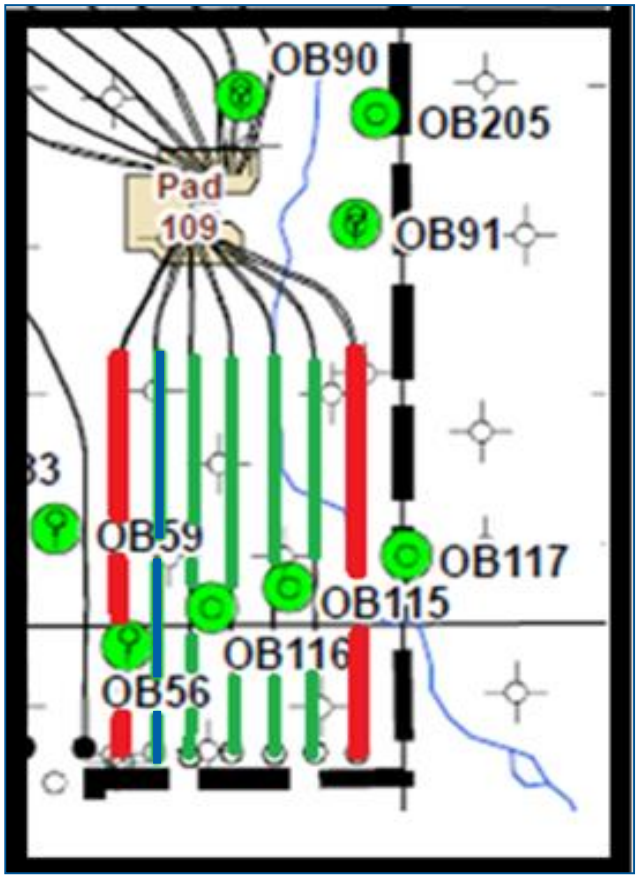
- Combined circulation and bullheading (i.e. without circulating a portion of the steam back to surface) methods have been applied to new pad start ups from Firebag Stage 3 onwards.
- 35 wells have been bullheaded during the reporting period of March 2019 – May 2020, while a total of 149 Firebag wells have been bullheaded since their respective first steam dates.
- Bullheading requires less cumulative steam to achieve the same reservoir heating as circulation. This reduces cSOR and emissions produced.

Advanced Reservoir Management for Improved Energy Efficiency

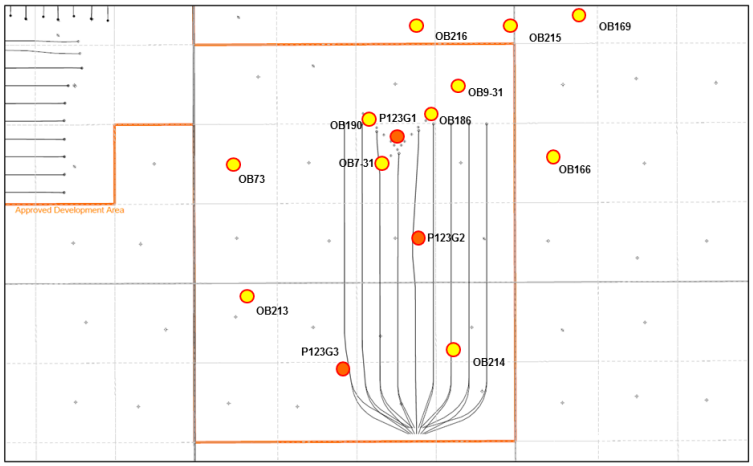
- Firebag is actively exploring opportunities that incorporate data analytics to further optimize steam allocation and subsequently energy efficiency.
- Regional optimization has proven successful in leak-off management strategies, which mitigate the loss of injected energy.
- Steam chamber pressures are balanced between pads to optimize heat efficiency.

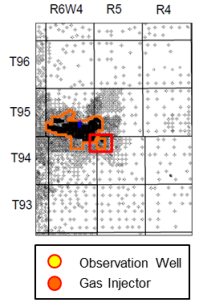
New Technology Update: Pad 109 South ES-SAGD (Hydrocarbon Co-Injection)

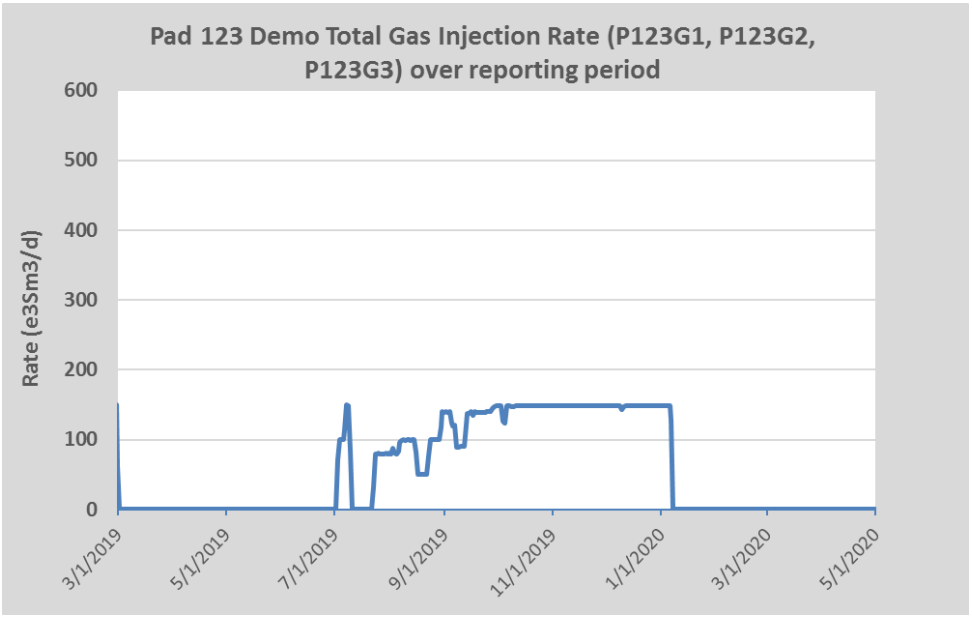
- Baseline data collection at Pad 109S started in July 2018, which included flow measurements and sample collection.
- A dedicated test separator has been operating since the beginning of the baseline at Pad 109S to enable enhanced surveillance of the demo.
- 4 out of 7 well pairs at Pad 109S were used for ES-SAGD, while edge wells were left in SAGD mode for control and pressure fencing. Continuous hydrocarbon co-injection started on April 3, 2019 and finished on May 1, 2020.
- Hydrocarbon co-injection concentration was achieved at 5-15%, within the approved limit.
- Injected hydrocarbon is a multicomponent diluent that is used at the Firebag CPF to dilute the bitumen for processing and transportation.
- Oil rate improvement was observed in the hydrocarbon co-injecting well pairs, while the edge SAGD well oil rates remained at the baseline level. A corresponding reduction in SOR has also been confirmed.
- Early diluent return trends have been established. Suncor continues the surveillance program to collect more data for ultimate diluent recovery factor forecasting.



New Technology Update: Pad 123 Gas Injection Demonstration







- Suncor started gas injection in Pad 123 on August 5, 2017 as per AER approval.
- Suncor has safely ramped up to the total injection rate of 480 e3Sm3/d of gas while adhering to the terms of the AER approval with respect to containment of gas in the McMurray zone.
- Firebag fuel gas (primarily methane) is used for the current injection scheme.
- All 3 gas injectors (P123G1, P123G2, P123G3) are utilized. Injection pressure has been monitored and kept below approved MOP during operation.
- Similar to 2019, Suncor has optimized the gas injection rate/pressure in accordance with long term steam chamber operation associated with Pad 123 SAGD.
- Optimized gas injection schedule is being implemented in preparation of Pad 123 start-up (first steam planned for November 2020).

Summary of Events

- The following horizontal wells were drilled during the reporting period:
  - Pad 122 North (10 well pairs)
  - Pad 123 (9 well pairs)
  - Sidetrack program (1P5, 6P15, 6P16, 8P1, 17P1)

- The following SAGD well pads were started up during the reporting period:
  - Pad 112: Q2 2019
  - Pad 121: Q4 2019

Suspension and Abandonment Activity

License	Well Type	Well Name	UWI	Spud Date	Activity	ABN/SUSP Date	Justification	Remaining Reserves
260969	SAGD	SUNCOR SAGD P1P5 FIREBAG 5-7-95-5	1W0/05-07-095-05W4/00	20-Sep-02	suspension	7-Dec-19	Sidetracked to access cellar oil	577,378 m3*
453109	observation	SUNCOR OB181 FIREBAG 7-31-94-5	105/07-31-094-05W4/0	19-Jan-13	suspension	12-Jan-20	Isolate prior to Pad 123 steaming	N/A
453093	observation	SUNCOR OB184 FIREBAG 7-31-94-5	100/07-31-094-05W4/00	31-Jan-13	abandonment	23-Mar-20	Isolate prior to Pad 123 steaming	N/A
296632	observation	Suncor Firebag 7-31-94-5	112/07-31-094-05W4	17-Jan-04	abandonment	20-Mar-20	Isolate prior to Pad 123 steaming	N/A
296643	observation	Suncor Firebag 9-31-94-5	100/09-31-094-05W4	1-Feb-04	abandonment	17-Mar-20	Isolate prior to Pad 123 steaming	N/A

* accessible via current sidetrack

- Suncor does not anticipate abandonment of any Firebag SAGD pads within the next 5 years.

Future Plans

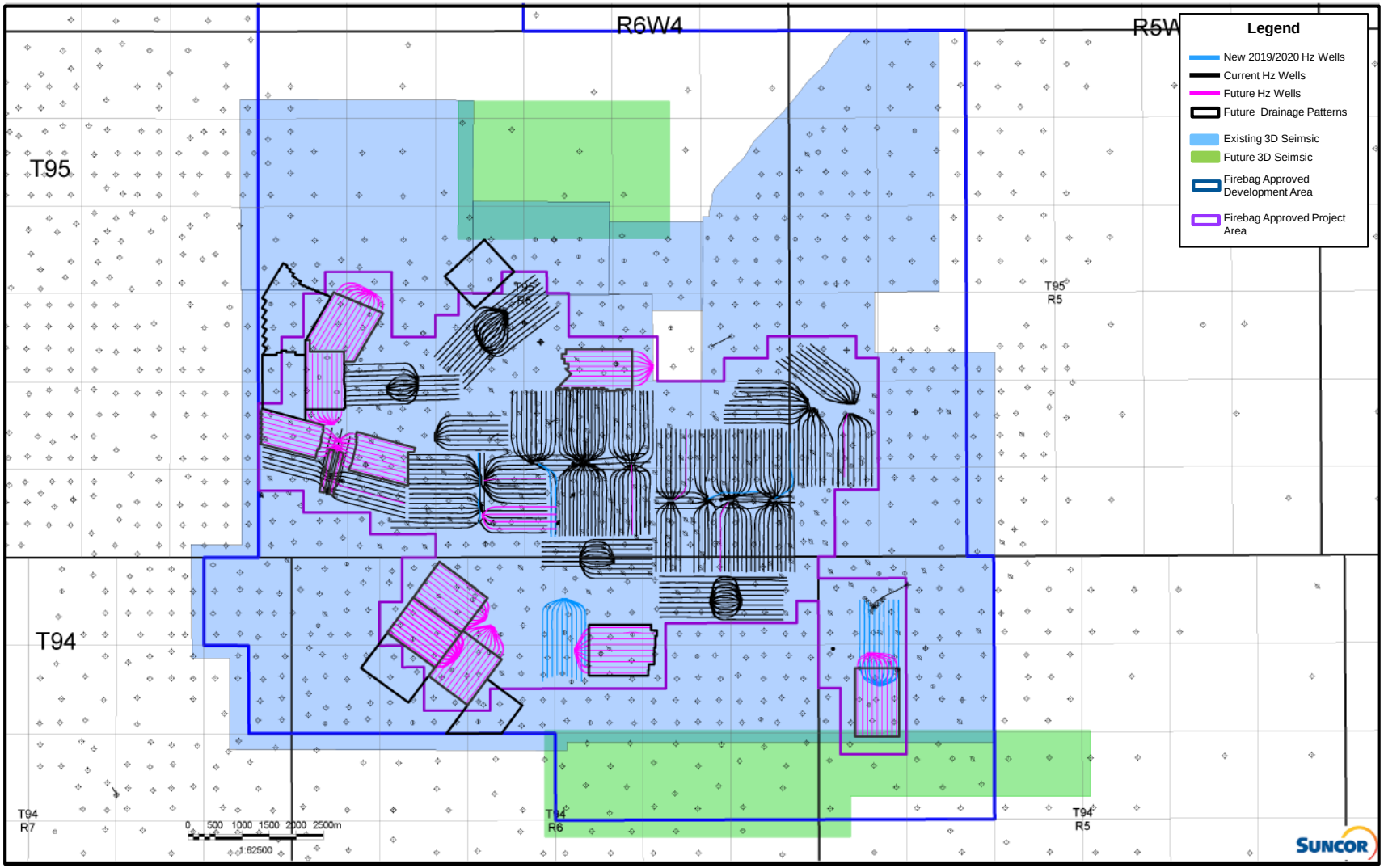
- The following horizontal drilling activities are expected to commence within the next year:
  - Pad 122 South (9 well pairs)
  - Pad 131 (8 well pairs)
  - Sidetrack Program (2P9B, 4P8, 7P7, 9P6, 12P7, 16P6)
  - Pad 117 Infills
  - Pad 125 (9 well pairs)

- The following first steam dates are planned to occur within the next year:
  - Pad 123: Q4 2020
  - Pad 122: Q2/Q3 2021
  - Pad 131: Q4 2021

- Coreholes and observation wells will be drilled as necessary to:
  - Adequately delineate the resource
  - Monitor SAGD operations
  - Further caprock integrity analysis
  - Conduct hydrogeology analysis
  - Conduct water disposal analysis
  - Allow land retention

- Development plans are evaluated annually and are therefore subject to change.

Future Plans



The above map highlights development activities that are planned at Firebag for the next 5 years. Development plans are evaluated annually and are therefore subject to change.

Regulatory Applications

Approved Applications:

AER Application No.	Application Name	Date Filed	Date Approved	Application Type
1920043	Pads 125,126 and 131	29-Mar-19	24-May-19	Directive 78- Category 2
1920447	Pads 128 and 129	12-Apr-19	11-Jun-19	Directive 78- Category 2
1924178	2019-2020 Injectitivity Tests	13-Sep-19	18-Sep-19	Directive 78- Category 2
1924879	Temporary Variance Waiver for ID-2001-3- Downtime	19-Oct-19	22-Nov-19	Directive 78- Category 2
1924932	6 Sidetrack Wells	17-Oct-19	23-Oct-19	Directive 78-Category 1
1925467	Pad 131 - Two additional well pairs	7-Nov-19	28-Nov-19	Directive 78- Category 2
1925410	Pad 124- Lean Zone Gas Repressuring	5-Nov-19	14-Jan-20	Directive 78- Category 2
1926342	Pad 119	13-Dec-19	5-Feb-20	Directive 78- Category 2
1926342	ES-SAGD at Pad 111, 131 and 125	15-Dec-19	12-Mar-20	Directive 78- Category 2

Future Applications:

- 2020 Sidetrack Wells Directive 78 (Filed on August 19, 2020)
- 2021 Injectivity Tests (Lean Zone and Disposal Exploration)
- Pad 130 and 132 Directive 78 Well Pad Applications
- Temporary Variance Waiver for ID-2001-3 for 2021
- Pad 117 Infill Well Directive 78 Application

Compliance History

April 1, 2019 - May 31, 2020	Number of Occurrences	Reference Number(s)	Date(s) of Occurrence	Details of Occurrence	Suncor Actions
NOx CEMS Exceedance	6	367965 368253 368086 367007 361503 357558	Various Dates	There were 6 incidents where the NOx limit was exceeded on various units including our steam generators and cogeneration units.	Many of the incidents included our cogenerations units going into extended lean-lean mode. The Extended Lean mode is essentially a safe mode with a more stable combustion but results in higher NOx emitted from the unit to the atmosphere.
Failure of Monitoring equipment - Disposal scheme 9487	1	N/A	18-Jun-19	Voluntary self-disclosure related to the failure of equipment in the 100/10-03-095-06W4/00 (10-03) disposal well	Suncor is requesting to waive the requirement for bottom hole pressure monitoring in the Elk Point formation at disposal injection wells (Approval No. 9487J, clause 4, received November 30, 2018).
Pad 112 drilling variance	1	N/A	28-Aug-19	Voluntary self-disclosure related to a variance in the actual drilling of two wells described in Alberta Energy Regulator (AER) Directive 23 Application No. 1749292	Suncor has met with Husky Energy to resolve this drilling variance.
SO2 CEMS Exceedance	0	N/A	N/A	N/A	N/A
PH exceedance to Disposal Scheme 9487	1	N/A	01-Oct-19	Voluntary self-disclosure related to a pH level limit exceedance in the disposal well fluids as described in clause 1h) of Approval No. 9487K	Suncor continues to monitor the PH with regular sampling
Venting	1	360192	19-Oct-19	There was 1 venting incident reported to the AER during this reporting period	At 8:52 pm on October 18th, the 92K-2975 Vapour Recovery Unit (VRU) compressor tripped on low pressure on 92PI-2005 Skim Tank.
Flaring	0	N/A	N/A	N/A	N/A

Compliance History

April 1, 2019 - May 31, 2020	Number of Occurrences	Reference Number(s)	Date(s) of Occurrence	Details of Occurrence	Suncor Actions
SRU Incinerator Stack Temperature Violation	5	352805 353018 353661 357623 363930	Various Dates	5 STT Violations during this reporting period	Suncor continues to address the number of STT incidents by identifying root causes and implementing corrective actions for each event to prevent future occurrences. Firebag had an above average (year on year) STT violations.
SF6 Release	1	362062	15-Dec-20	SF6 Gas Release on Pad 112 and 121	Two low level SF6 gas alarms from two new Pad's, one from Pad 121 on December 14th at 21:12 hours, and Pad 112 on December 15th at 12:59 hours. After the Transmission and Distribution (T & D) team responded on December 15, 2019 for the low level alarms, equipment was still functioning properly. Additional SF6 gas was required to be added to remove the two level alarms on the VFI switch gear. The VFI gear came with a minimum -50 C operational design, and the SF6 went into the red on the density gauge from green - normal operational range (See attached photo). The temperature has been hovering around sub -30 C within last couple of weeks. There is some probability that SF6 may have leaked out to the atmosphere.
Missing Water Level Measurement - Water Act License (License to Divert Water) 233808-01-00, Section 4.1 and 4.2.	1	353367	17-May-19	Water Act License (License to Divert Water) 233808-01-00, Section 4.1 and 4.2.	Operations shutdown Plant 91 for a preventative maintenance turnaround for ~ 25 day window. The groundwater well is located in Plant 91-3000. Operations determined without consultation that since Plant 91 was down then the requirement to continue to monitoring and record water levels in both the observation well (OW3-05) and production well (PW3-05) was not required. This is not the case as this well still provides utility/firewater for Plant 92. This led to the missed daily level measurements for these wells while the Plant 91 turnaround was taking place.
Flare Stack Pilot Flame	1	353293	13-May-19	Approval Number 80105-01-00, Schedule IV, Section 3	The Sulphur Recovery Unit (SRU) was down for turnaround resulting in steam being sent to the Plant 91 Flare Stack during vessel and piping purging activities. In addition, steam volume from several Well Pads that is normally routed through Plant 92 was sent to the Plant 91 Flare Stack since the gas portion of the flow could not be sent to the SRU for treatment. Due to the significant steam volume routed to the Plant 91 Flare Stack, the combined gas flow dropped below the minimum heating value of 12MJ/m3 resulting in the flame snuffing out at approximately 22:00 on May 13.

Compliance History

April 1, 2019 - May 31, 2020	Number of Occurrences	Reference Number(s)	Date(s) of Occurrence	Details of Occurrence	Suncor Actions
CEMS Availability Violation	1	353201	10-May-19	CEMS Code Section 5.4 Minimum System Availability Requirements and Approval Number 80105-01-00 Schedule III 2 (i) (D).	On May 10, 2019 at 4:00 AM, a controller card on CEMS NOx Analyzer 92AT-5553 failed resulting in the unit no longer collecting data. The replacement parts were immediately ordered but due to the lengthy delivery time, the unit was not be able to meet the 90% uptime requirement for the month of May.
Failure of Monitoring equipment - Disposal scheme 9487	1	N/A	May 1, 2020	Voluntary self-disclosure related to the failure of equipment in the 100/02-15-095-06W4/00 DS5 disposal monitoring well (Approval No. 9487K, clause 6,).	Suncor plans to deploy the field troubleshooting team when a critical mass of pending work is reached or in the case that a safety critical issue arises.
Ecopit Unapproved Fluids	1	367580	11-Jun-20	IAR 2027929_3572936 - Oilfield Waste Storage Component, known as the "Eco-Pit". Section 2 - Produced fluids/waste must be from within the same production system as the location NE 11-95-06W4M. Both the receiving and the originating site must have the same licensee or approval holder.	On June 11, 2020, a water truck was brought to the Firebag main gate and switched out with the onsite Unit 790479 water truck. Unit 790494 arrived with 16.3 m3 of raw water in its tank that had been loaded at RMWB water station in Fort McMurray. After switching units at the gate, the Clean Harbors Water Truck Operator drove the unit to the Clean Harbor's laydown yard, and parked the unit. This Operator then was given instructions by the Clean Harbors Supervisor to offload the raw water into the Eco-Pit.

Compliance with Daily Average Maximum Operating Pressure

- The following occurrences have taken place from March 1, 2019 – May 31, 2020 and are reported as per the daily average Maximum Well Head Injection Pressure (MWHIP) Approval (No. 8870LLL):

		Severity			
Equipment Description	**Date**	**Duration (min)**	**MWHIP Limit (kPag)**	**Peak Pressure (kPag)**	**Daily Average Injection Pressure (kPag)**
104S9 Injector Tubing	9/17/2019	1	3570	3795	3331
104S8 Injector Tubing	9/17/2019	1	3570	3681	3352
104S7 Injector Tubing	9/17/2019	1	3570	3723	2942
103S7 Injector Tubing	9/23/2019	1	3570	3577	3388
112P4 Producer BHP	9/25/2019	1.1	3840 (start-up mode)	3856	2063
112S4 Injector Casing	11/30/2019	1	3840 (start-up mode)	3856	3049
102S3 Injector Tubing	11/30/2019	1	3570	3575	2943
101S7 Injector Tubing	12/7/2019	1	3570	3590	3224
103S11 Injector Casing	2/8/2020	1	3570	3617	2236
103S5 Injector Casing	2/8/2020	1	3570	3642	2450

- No occurrences resulted in a daily average injection pressure above the specified MWHIP limit.
- All of the events were < 2 mins in duration. Corrective actions have been implemented to improve controller valve tuning to optimize valve response and decrease the likelihood of reoccurrence.
- When necessary, maintenance work has been completed to repair the affected equipment.

Update on Deferral Approval for 4P10 Repair of SCVF

- As per Nov 10, 2016 Approval, Suncor has drilled 3 Quaternary monitoring wells on Pad 104 to determine groundwater flow direction and monitor potential for groundwater impacts around the SCVF at 4P10.

- Based on Statistical and Geochemical analysis, results indicate increasing trends of a few parameters due to heating as opposed to SCVF gases (Firebag Groundwater Monitoring Thermal Report, Approval No. 0080105-01-00, March 2020).

- As per the requirements of the Directive for the Assessment of Thermally-Mobilized Constituents in Groundwater for Thermal In Situ Operations, additional wells at downgradient locations are currently being planned as part of Suncor's 2021 Firebag Winter Program.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