Annual Performance Presentation

In Situ Oil Sands Schemes
9673 / 10147 / 10423 / 10787 / 9404

March 2019

Premium Value I Defined Growth I Independent

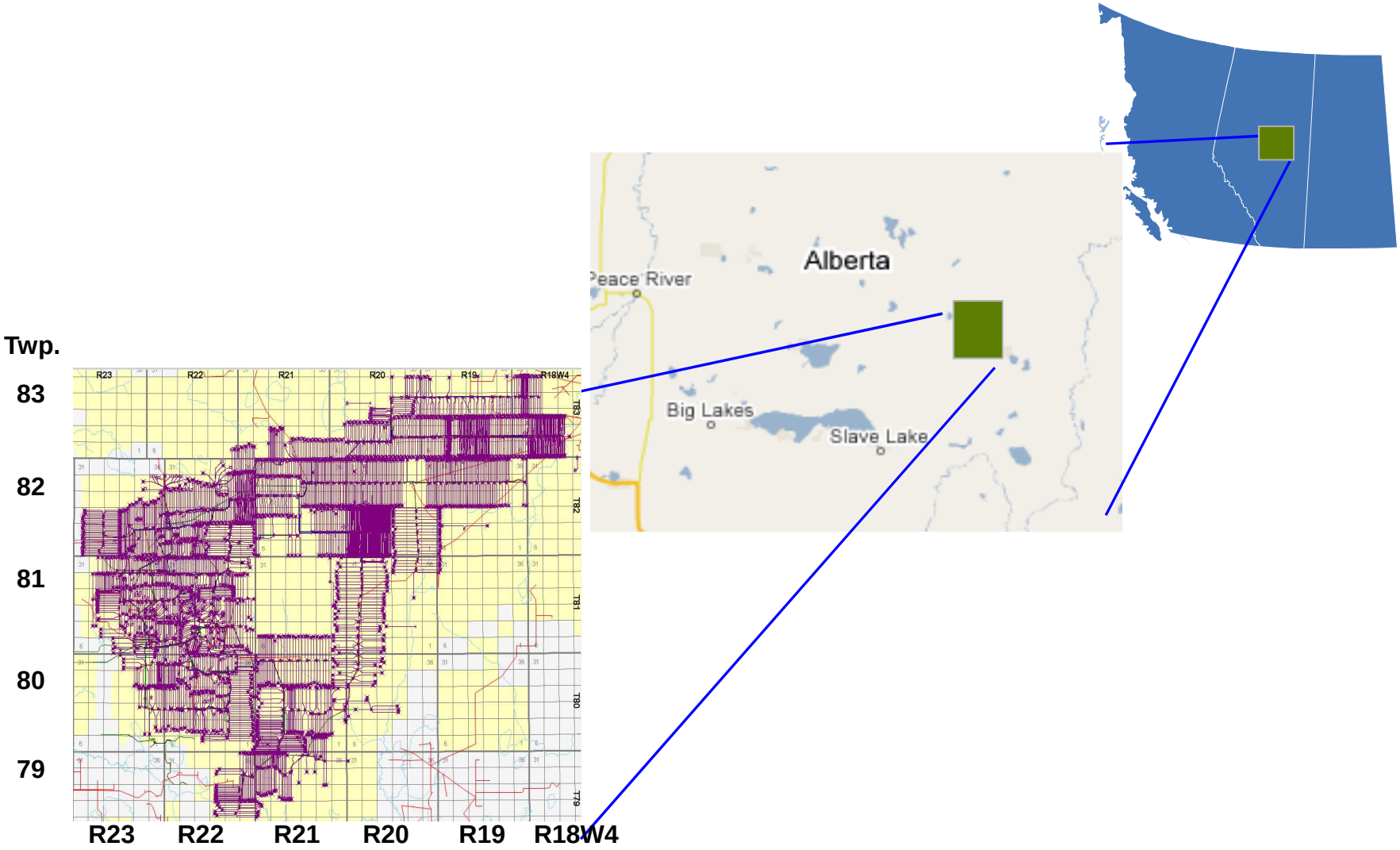
Canadian Natural

Agenda

Canadian Natural

- Current Approvals
- Geological Overview
- Drilling, Completions, and Artificial Lift
- Field Performance and Surveillance
- Cap Rock Integrity & Monitoring
- Future Development Plans
- Facilities
- Measuring & Reporting
- Water Use, Conservation & Disposal
- AER Compliance
- Conclusions

Brintnell Location



Oil Sands Royalties (OSRs 101/006/061)

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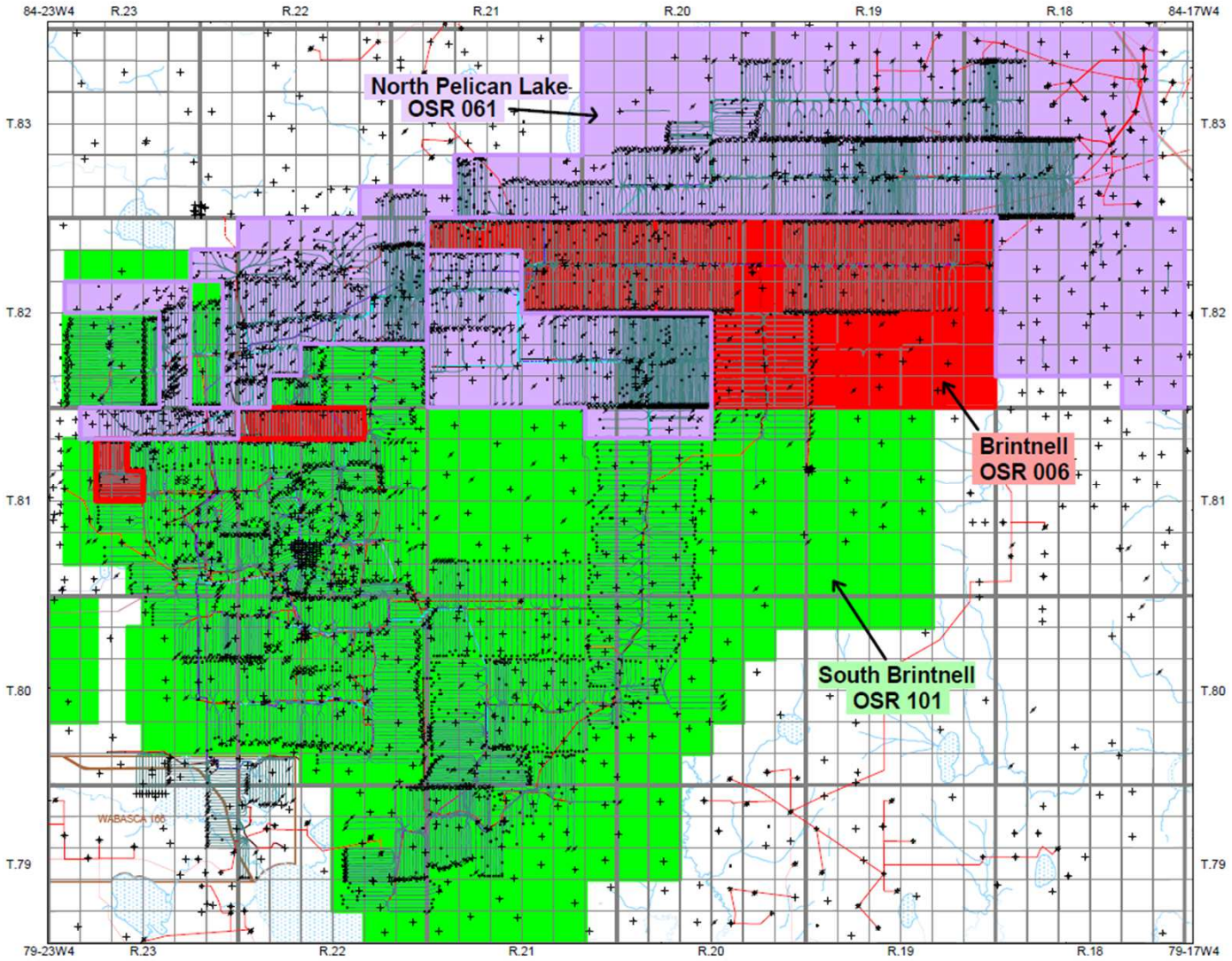
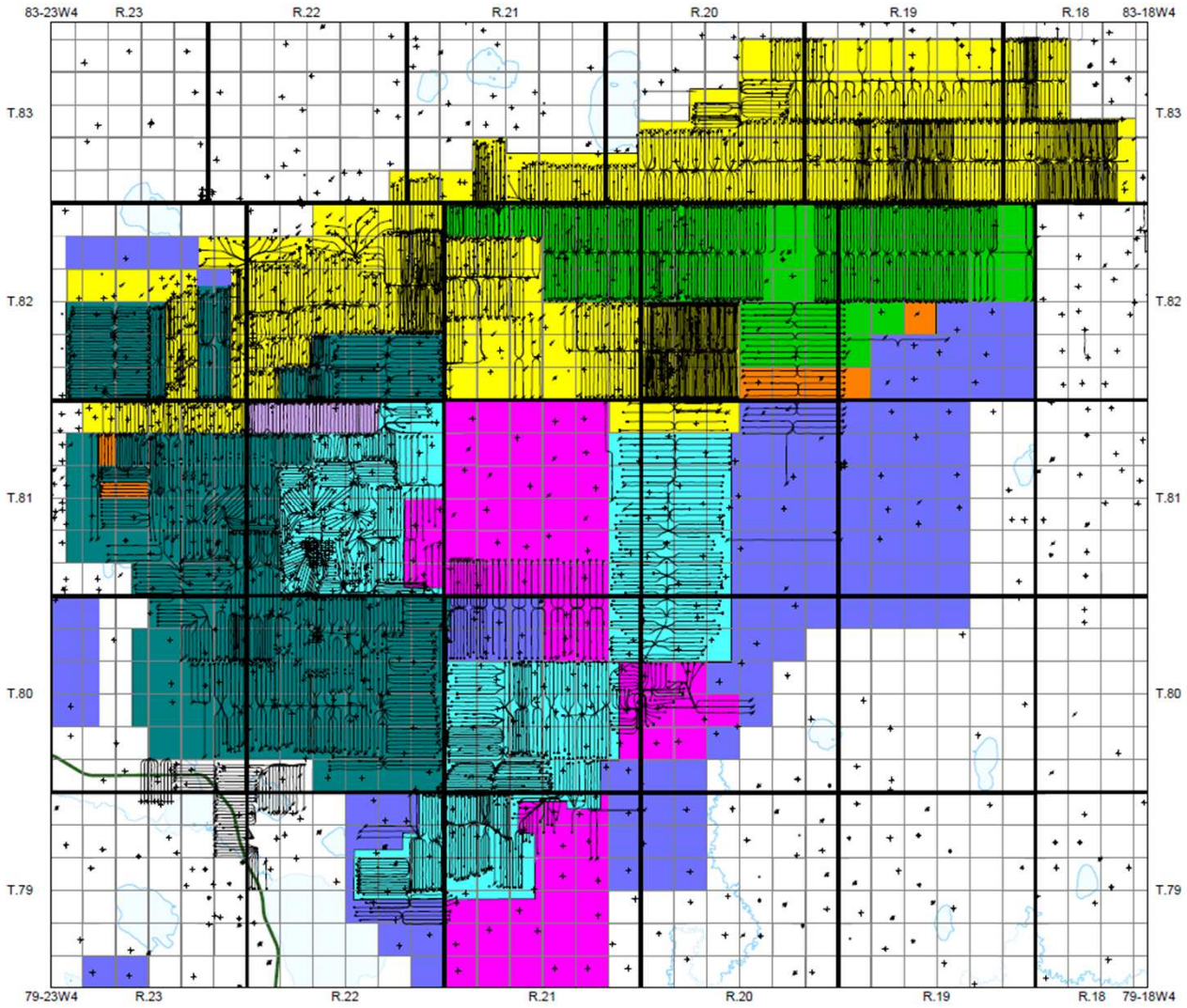


Primary and Enhanced Approval Regions



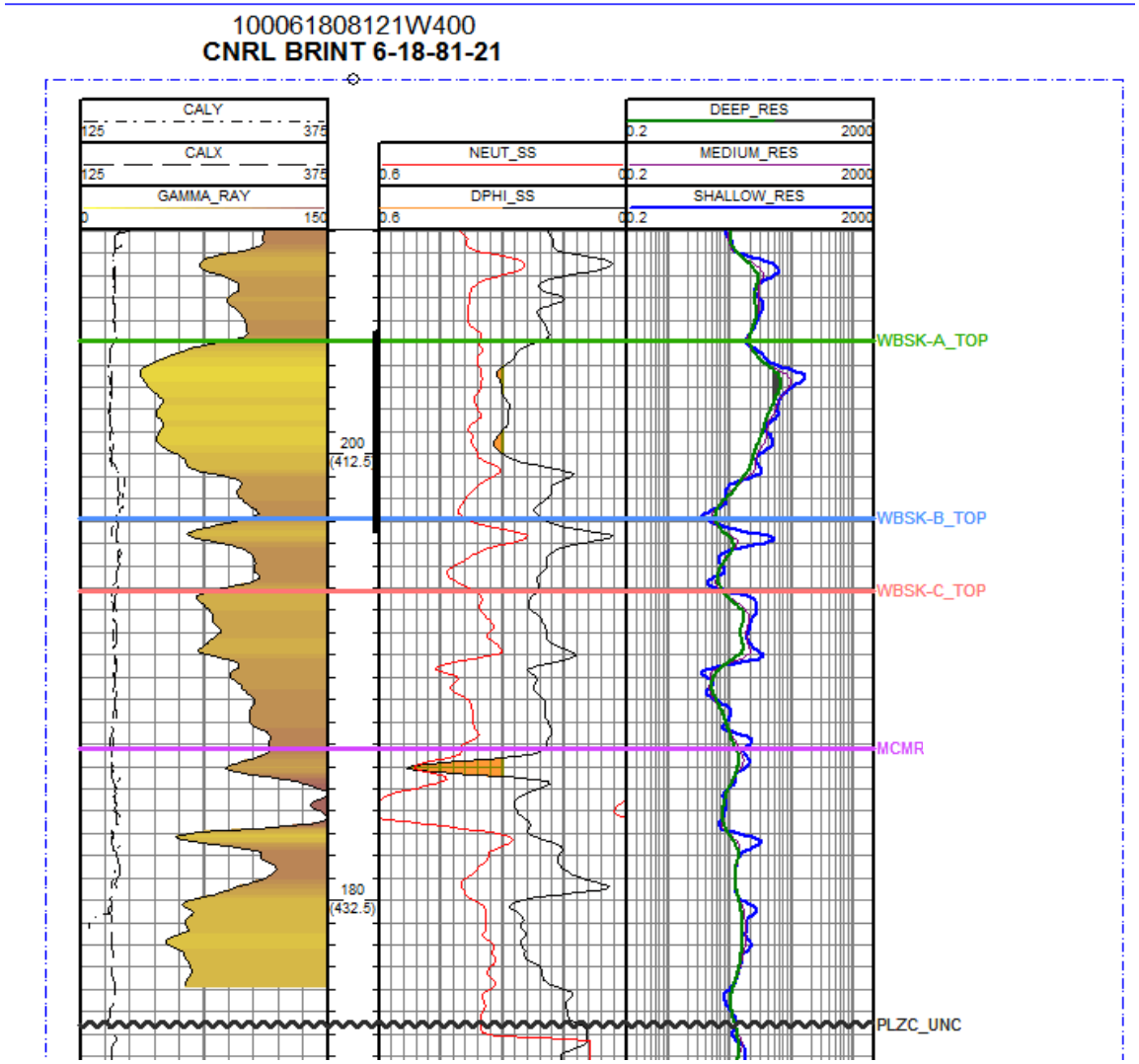
Enhanced Recovery Schemes

- 10147 (Central Brintnell)
- 9673 (North Brintnell)
- 10787 (Central Brintnell)
- 10423 (South and West Brintnell)
- 9404 (Pelican Lake)

Primary Recovery Schemes

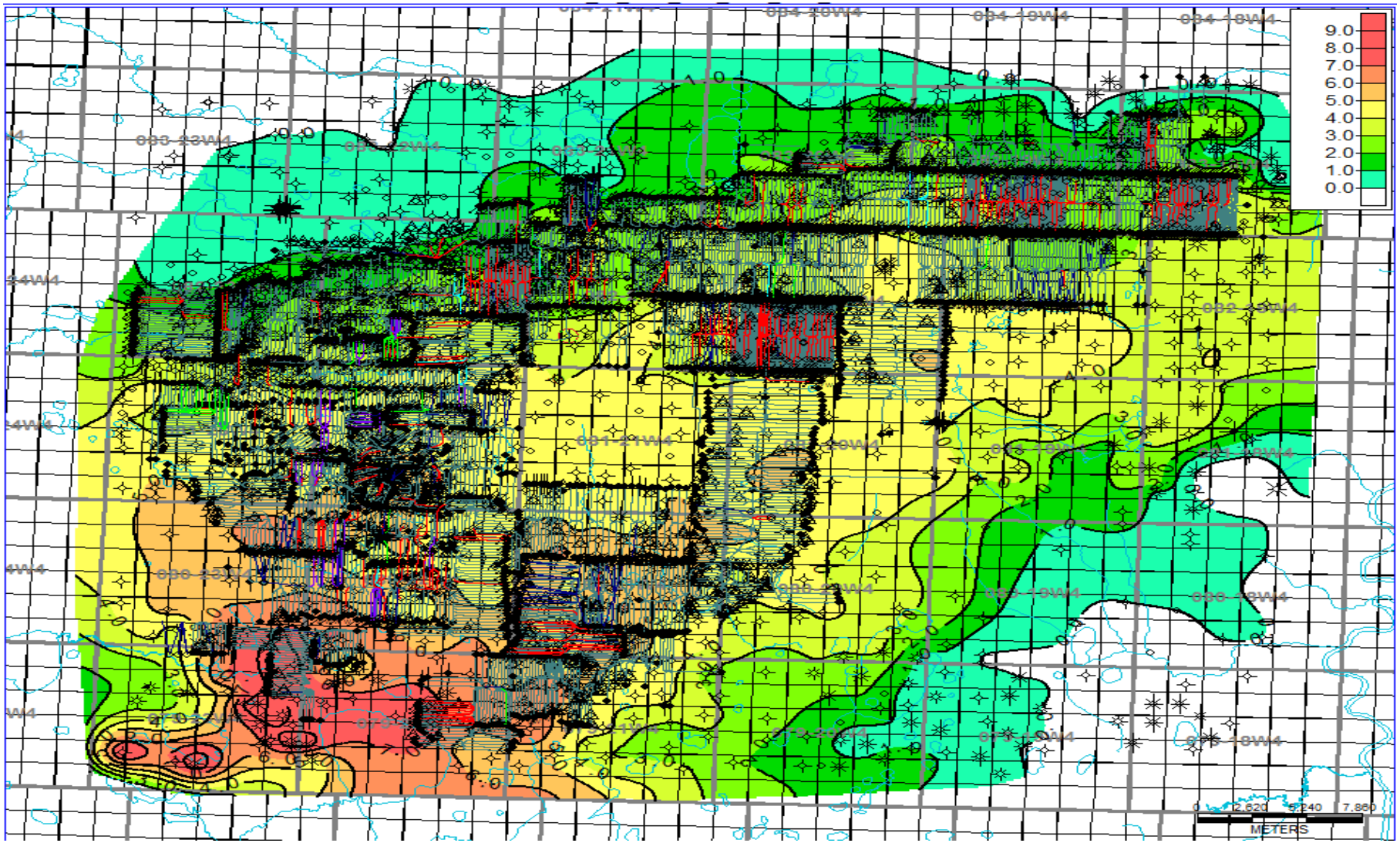
- 6619 (Central Brintnell)
- 9466 (Brintnell)
- 9884 (West and North Brintnell)

CNRL Brint 6-14-81-21 W4M Type Log



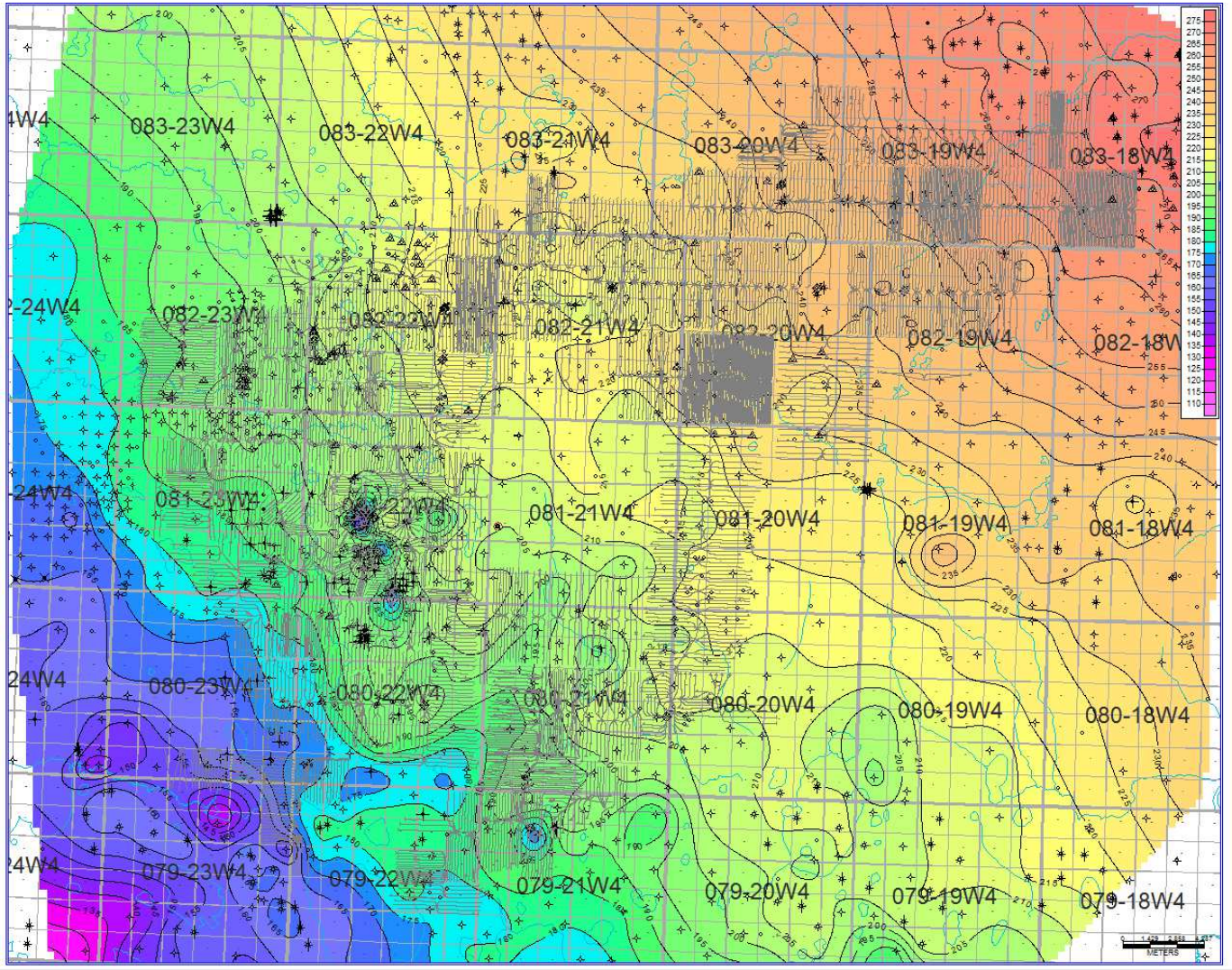
Wabiskaw ‘A’ Net Pay Map

Canadian Natural



Wabiskaw Structure Map

Canadian Natural



Produced Oil Viscosity Map

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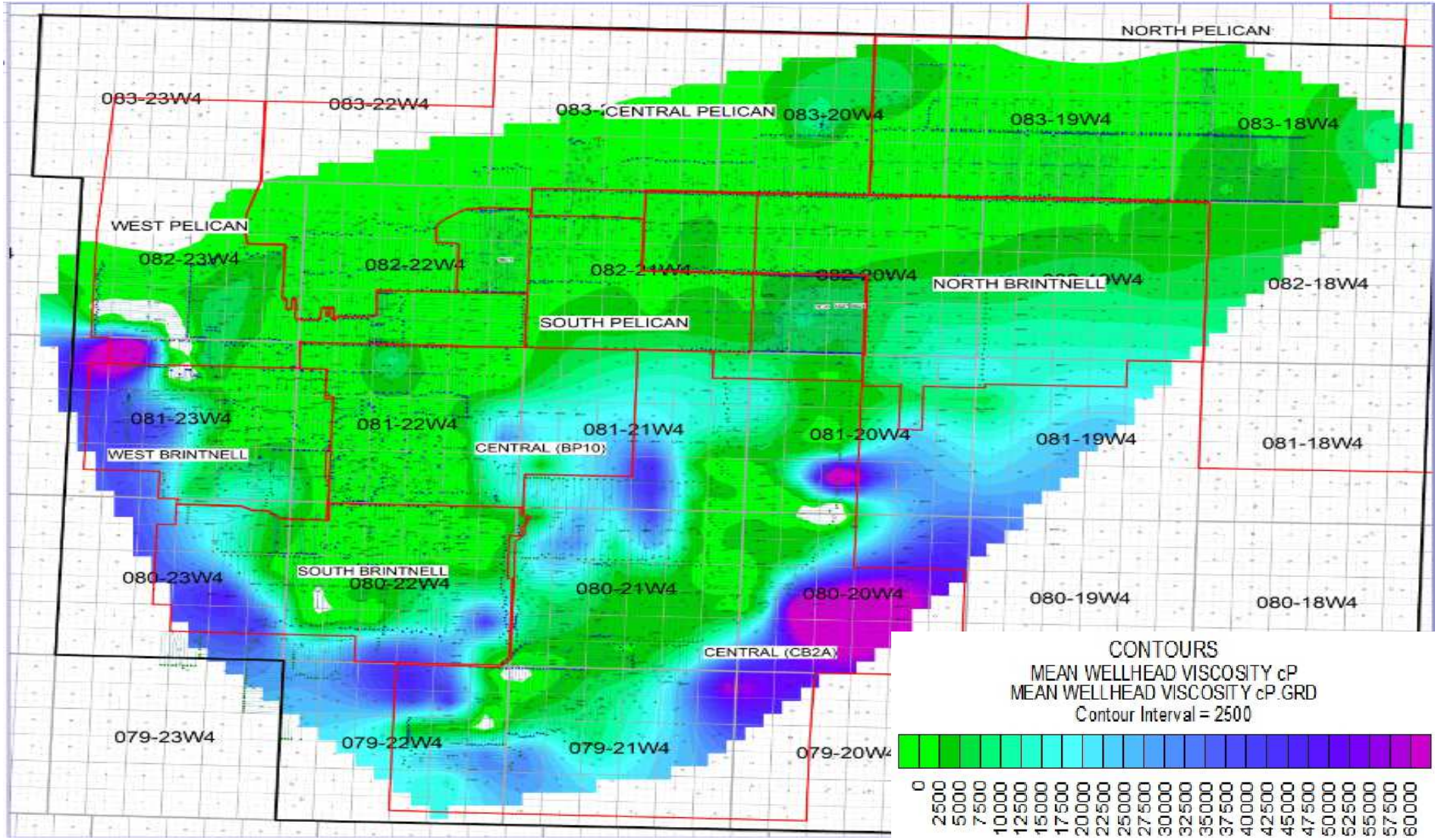
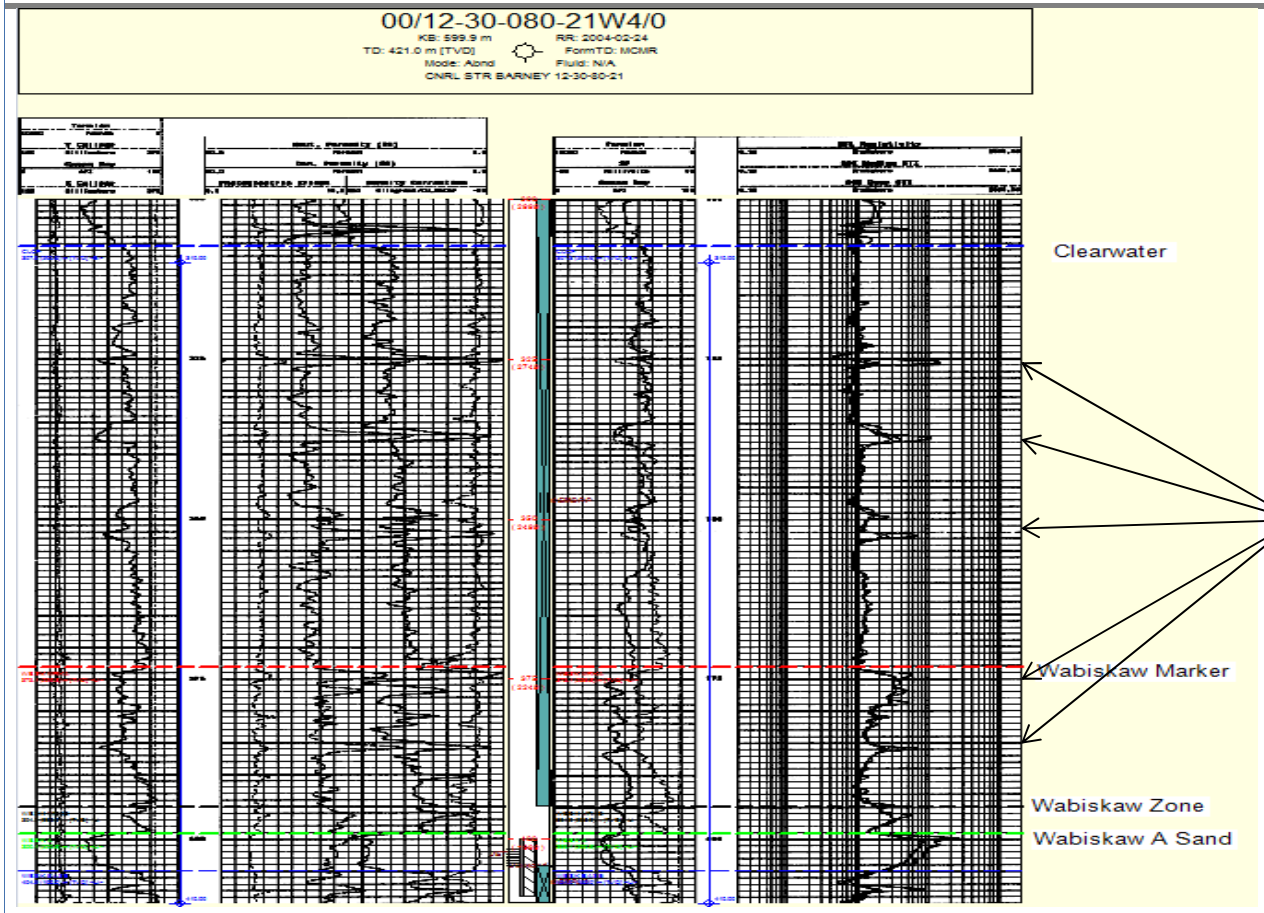


Type Log Clearwater Isopach/Tight Streaks



The cap rock comprises the Clearwater Shales, Wabiskaw Marker and the Wabiskaw zone (which ranges in thickness from 80 to 95 meters) and over lies the Wabiskaw A Sand.

Contained within this isopach are numerous tight streaks ranging from 1.5 - 4 meters in thickness throughout this interval; they are found in both the Clearwater shale interval the Wabiskaw marker interval, as illustrated in the accompanying log.

Brintnell Regional Reservoir Properties

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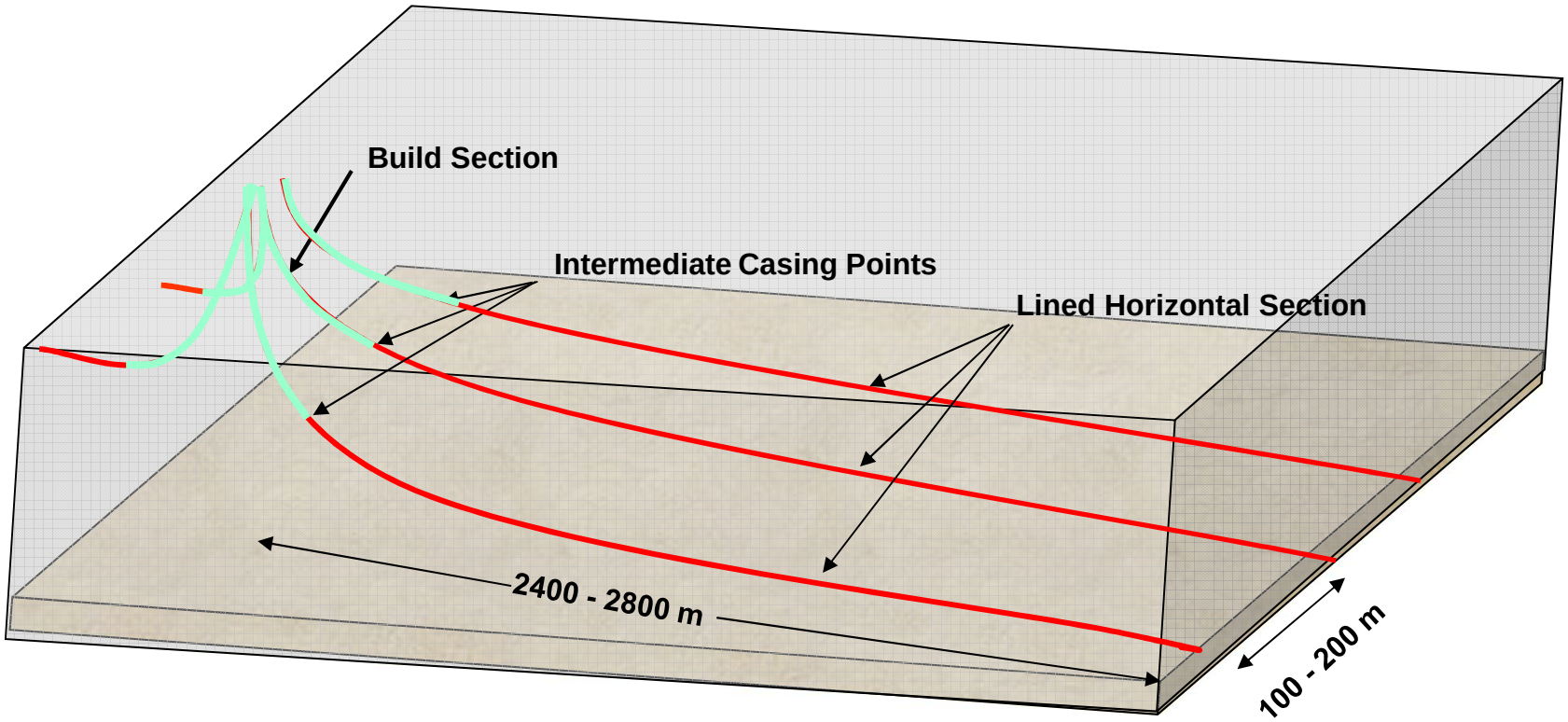
- **Upper Wabiskaw Sand**
  - Depth of 300-425m TVD
  - Net Pay Range 1 – 9m
  - Porosity 28 – 32%
  - Permeability 300 – 3000md
  - Temperature 13-17 deg. C
  - Water Saturation 30 – 40%
  - Oil Viscosity (dead oil) 800 – 80,000cp @ 15 deg. C
  - Initial Reservoir Pressure 1900 – 2600kpa

Drilling, Completions, and Artificial Lift

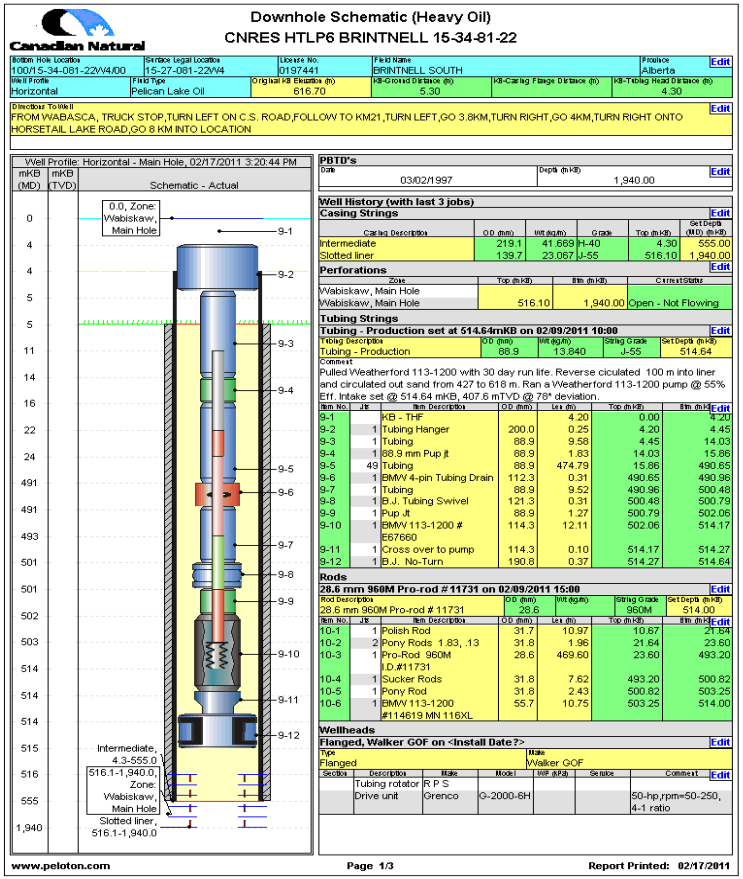
Typical Drilling Configuration



- **CNRL lands the intermediate casing within the Wabiskaw formation.**

Typical Well Configurations

- **Producer**



Downhole Schematic (Heavy Oil)
CNRES HTLP6 BRINTNELL 15-34-81-22

Bottom Hole Location	Surface Legal Location	License No.	Field Name	Province
100/15-34-081-22W4/00	15-27-081-22W4	0197441	BRINTNELL SOUTH	Alberta

Well Profile	Field Type	Original KB Elevation (m)	KB-Ground Distance (m)	KB-Casing Flange Distance (m)	KB-Tbg Head Distance (m)
Horizontal	Pelican Lake Oil	616.70	5.30		4.30

Directions To Well
FROM WABASCA, TRUCK STOP,TURN LEFT ON C.S. ROAD,FOLLOW TO KM21,TURN LEFT,GO 3.8KM,TURN RIGHT,GO 4KM,TURN RIGHT ONTO HORSETAIL LAKE ROAD,GO 8 KM INTO LOCATION

Well Profile: Horizontal - Main Hole, 02/17/2011 3:20:44 PM
Schematic - Actual

PBTD's

Date	Depth (mKB)
03/02/1997	1,940.00

Well History (with last 3 jobs)
Casing Strings

Casing Description	OD (mm)	Wt (kg/m)	Grade	Top (mKB)	Set Depth (MD) (mKB)
Intermediate	219.1	41.669	H-40	4.30	555.00
Slotted liner	139.7	23.067	J-55	516.10	1,940.00

Perforations

Zone	Top (mKB)	Btm (mKB)	Current Status
Wabiskaw, Main Hole			
Wabiskaw, Main Hole	516.10	1,940.00	Open - Not Flowing

Tubing Strings
Tubing - Production set at 514.64mKB on 02/09/2011 10:00

Tubing Description	OD (mm)	Wt (kg/m)	String Grade	Set Depth (mKB)
Tubing - Production	88.9	13.840	J-55	514.64

Comment
Pulled Weatherford 113-1200 with 30 day run life. Reverse ciculated 100 m into liner and circulated out sand from 427 to 618 m. Ran a Weatherford 113-1200 pump @ 55% Eff. Intake set @ 514.64 mKB, 407.6 mTVD @ 78° deviation.

Item No.	Jts	Item Description	OD (mm)	Len (m)	Top (mKB)	Btm (mKB)
9-1		KB - THF		4.20	0.00	4.20
9-2	1	Tubing Hanger	200.0	0.25	4.20	4.45
9-3	1	Tubing	88.9	9.58	4.45	14.03
9-4	1	88.9 mm Pup jt	88.9	1.83	14.03	15.86
9-5	49	Tubing	88.9	474.79	15.86	490.65
9-6	1	BMV 4-pin Tubing Drain	112.3	0.31	490.65	490.96
9-7	1	Tubing	88.9	9.52	490.96	500.48
9-8	1	B.J. Tubing Swivel	121.3	0.31	500.48	500.79
9-9	1	Pup jt	88.9	1.27	500.79	502.06
9-10	1	BMW 113-1200 # E67660	114.3	12.11	502.06	514.17
9-11	1	Cross over to pump	114.3	0.10	514.17	514.27
9-12	1	B.J. No-Turn	190.8	0.37	514.27	514.64

Rods
28.6 mm 960M Pro-rod # 11731 on 02/09/2011 15:00

Rod Description	OD (mm)	Wt (kg/m)	String Grade	Set Depth (mKB)
28.6 mm 960M Pro-rod # 11731	28.6		960M	514.00

Item No.	Jts	Item Description	OD (mm)	Len (m)	Top (mKB)	Btm (mKB)
10-1	1	Polish Rod	31.7	10.97	10.67	21.64
10-2	2	Pony Rods 1.83, .13	31.8	1.96	21.64	23.60
10-3	1	Pro-Rod 960M I.D.#11731	28.6	469.60	23.60	493.20
10-4	1	Sucker Rods	31.8	7.62	493.20	500.82
10-5	1	Pony Rod	31.8	2.43	500.82	503.25
10-6	1	BMW 113-1200 #114619 MN 116XL	55.7	10.75	503.25	514.00

Wellheads
Flanged, Walker GOF on <Install Date?>

Type	Make
Flanged	Walker GOF

Section	Description	Make	Model	WP (kPa)	Service	Comment
	Tubing rotator	R P S				
	Drive unit	Grenco	G-2000-6H			50-hp,rpm=50-250, 4-1 ratio

0.0, Zone: Wabiskaw, Main Hole
Intermediate, 4.3-555.0
516.1-1,940.0, Zone: Wabiskaw, Main Hole
Slotted liner, 516.1-1,940.0

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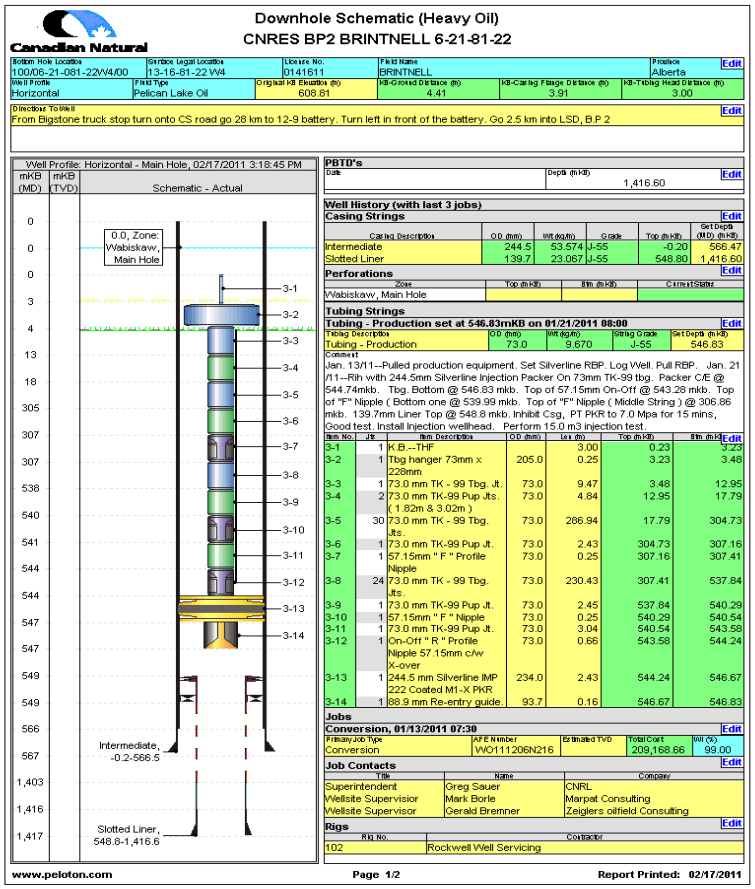
- **Injector**



Downhole Schematic (Heavy Oil)
CNRES BP2 BRINTNELL 6-21-81-22

Bottom Hole Location	Surface Legal Location	License No.	Field Name	Province
100/06-21-081-22W4/00	13-16-81-22 W4	0141611	BRINTNELL	Alberta

Well Profile	Field Type	Original KB Elevation (m)	KB-Ground Distance (m)	KB-Casing Flange Distance (m)	KB-Tbg Head Distance (m)
Horizontal	Pelican Lake Oil	608.81	4.41	3.91	3.00

Directions To Well
From Bigstone truck stop turn onto CS road go 28 km to 12-9 battery. Turn left in front of the battery. Go 2.5 km into LSD, B.P 2

Well Profile: Horizontal - Main Hole, 02/17/2011 3:18:45 PM
Schematic - Actual

PBTD's

Date	Depth (mKB)
	1,416.60

Well History (with last 3 jobs)
Casing Strings

Casing Description	OD (mm)	Wt (kg/m)	Grade	Top (mKB)	Set Depth (MD) (mKB)
Intermediate	244.5	53.574	J-55	0.20	566.47
Slotted Liner	139.7	23.067	J-55	548.80	1,416.60

Perforations

Zone	Top (mKB)	Btm (mKB)	Current Status
Wabiskaw, Main Hole			

Tubing Strings
Tubing - Production set at 546.83mKB on 01/21/2011 08:00

Tubing Description	OD (mm)	Wt (kg/m)	String Grade	Set Depth (mKB)
Tubing - Production	73.0	9.670	J-55	546.83

Comment
Jan. 13/11--Pulled production equipment. Set Silverline RBP. Log Well. Pull RBP. Jan. 21 /11--Rih with 244.5mm Silverline Injection Packer On 73mm TK-99 tbg. Packer C/E @ 544.74mkb. Tbg. Bottom @ 546.83 mkb. Top of 57.15mm On-Off @ 543.28 mkb. Top of "F" Nipple (Bottom one @ 539.99 mkb. Top of "F" Nipple (Middle String) @ 306.86 mkb. 139.7mm Liner Top @ 548.8 mkb. Inhibit Csg, PT PKR to 7.0 Mpa for 15 mins, Good test. Install Injection wellhead. Perform 15.0 m3 injection test.

Item No.	Jts	Item Description	OD (mm)	Len (m)	Top (mKB)	Btm (mKB)
3-1	1	K.B.--THF		3.00	0.23	3.23
3-2	1	Tbg hanger 73mm x 228mm	205.0	0.25	3.23	3.48
3-3	1	73.0 mm TK - 99 Tbg. Jt.	73.0	9.47	3.48	12.95
3-4	2	73.0 mm TK-99 Pup Jts. (1.82m & 3.02m)	73.0	4.84	12.95	17.79
3-5	30	73.0 mm TK - 99 Tbg. Jts.	73.0	286.94	17.79	304.73
3-6	1	73.0 mm TK-99 Pup Jt.	73.0	2.43	304.73	307.16
3-7	1	57.15mm " F " Profile Nipple	73.0	0.25	307.16	307.41
3-8	24	73.0 mm TK - 99 Tbg. Jts.	73.0	230.43	307.41	537.84
3-9	1	73.0 mm TK-99 Pup Jt.	73.0	2.45	537.84	540.29
3-10	1	57.15mm " F " Nipple	73.0	0.25	540.29	540.54
3-11	1	73.0 mm TK-99 Pup Jt.	73.0	3.04	540.54	543.58
3-12	1	On-Off " R " Profile Nipple 57.15mm c/w X-over	73.0	0.66	543.58	544.24
3-13	1	244.5 mm Silverline IMP 222 Coated M1-X PKR	234.0	2.43	544.24	546.67
3-14	1	88.9 mm Re-entry guide.	93.7	0.16	546.67	546.83

Jobs
Conversion, 01/13/2011 07:30

Primary Job Type	AFE Number	Estimated TVD	Total Cost	WI (%)
Conversion	WO111206N216		209,168.66	99.00

Job Contacts

Title	Name	Company
Superintendent	Greg Sauer	CNRL
Wellsite Supervisor	Mark Borle	Marpat Consulting
Wellsite Supervisor	Gerald Bremner	Zeiglers oilfield Consulting

Rigs

Rig No.	Contractor
102	Rockwell Well Servicing

Intermediate, -0.2-566.5
Slotted Liner, 548.8-1,416.6

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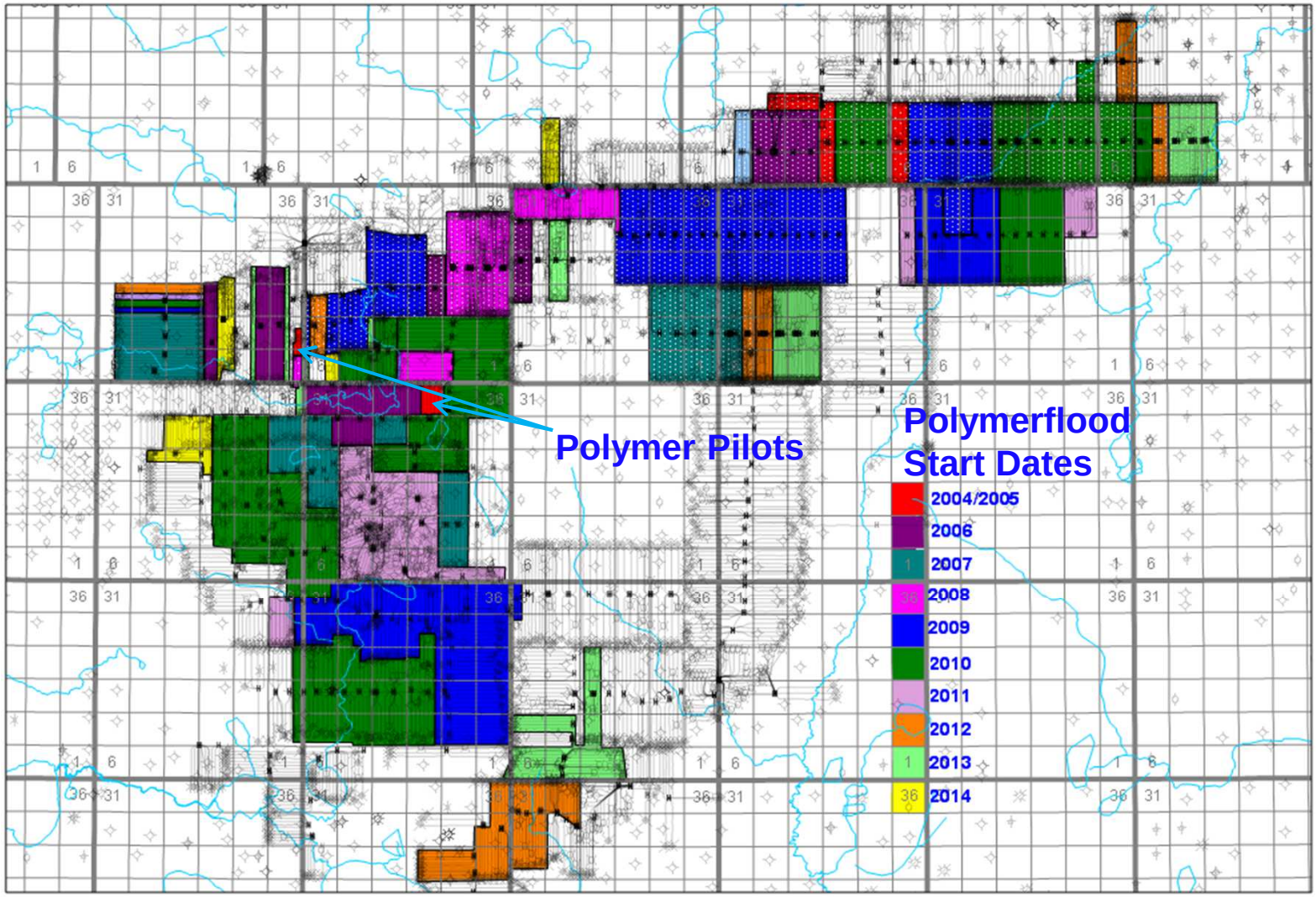
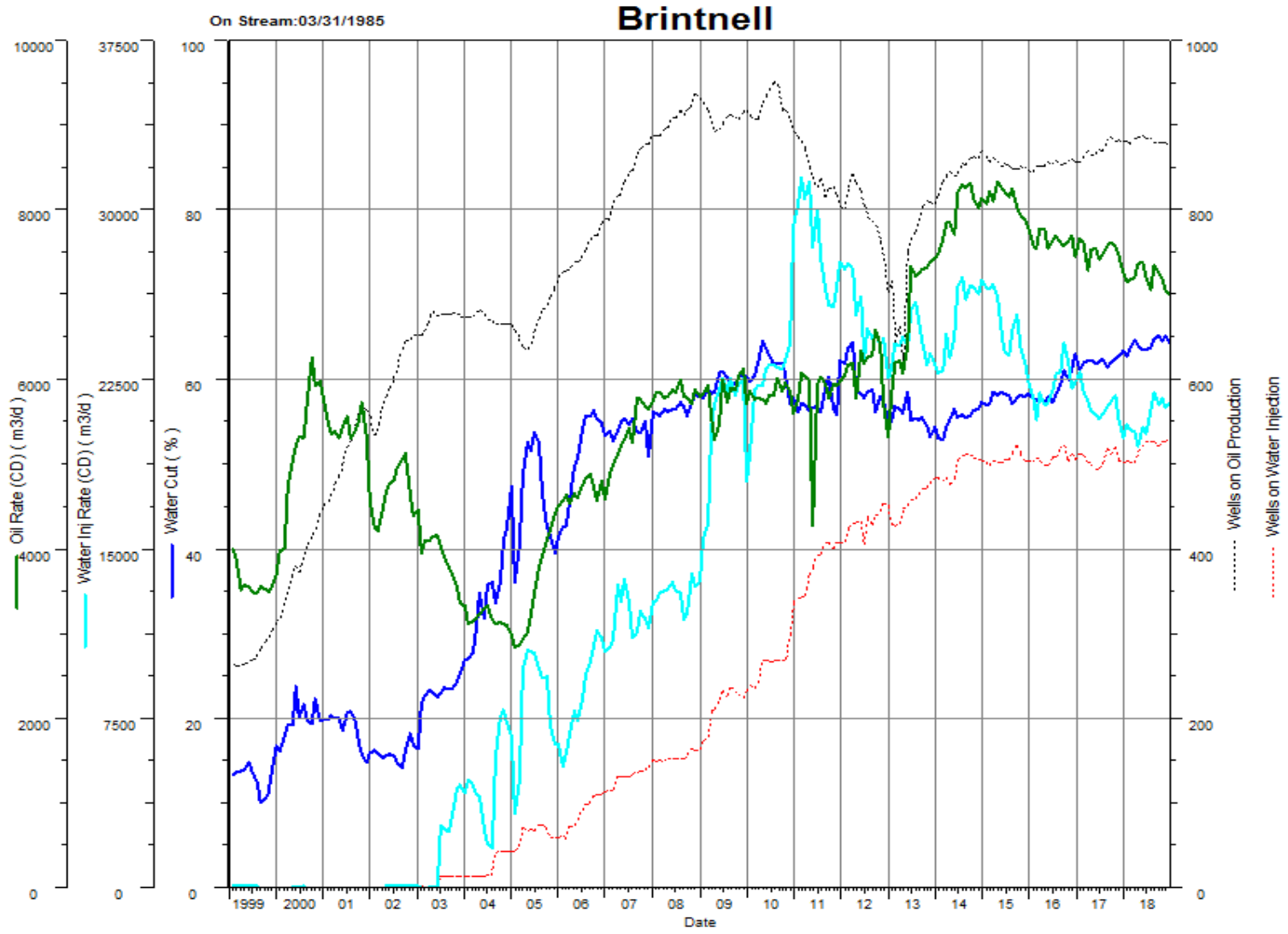
- **Intermediate Casing landed in Wabiskaw sand (producers and injectors).**

EOR History and Current Approvals

Polymerflood Development



Legacy Field Overview

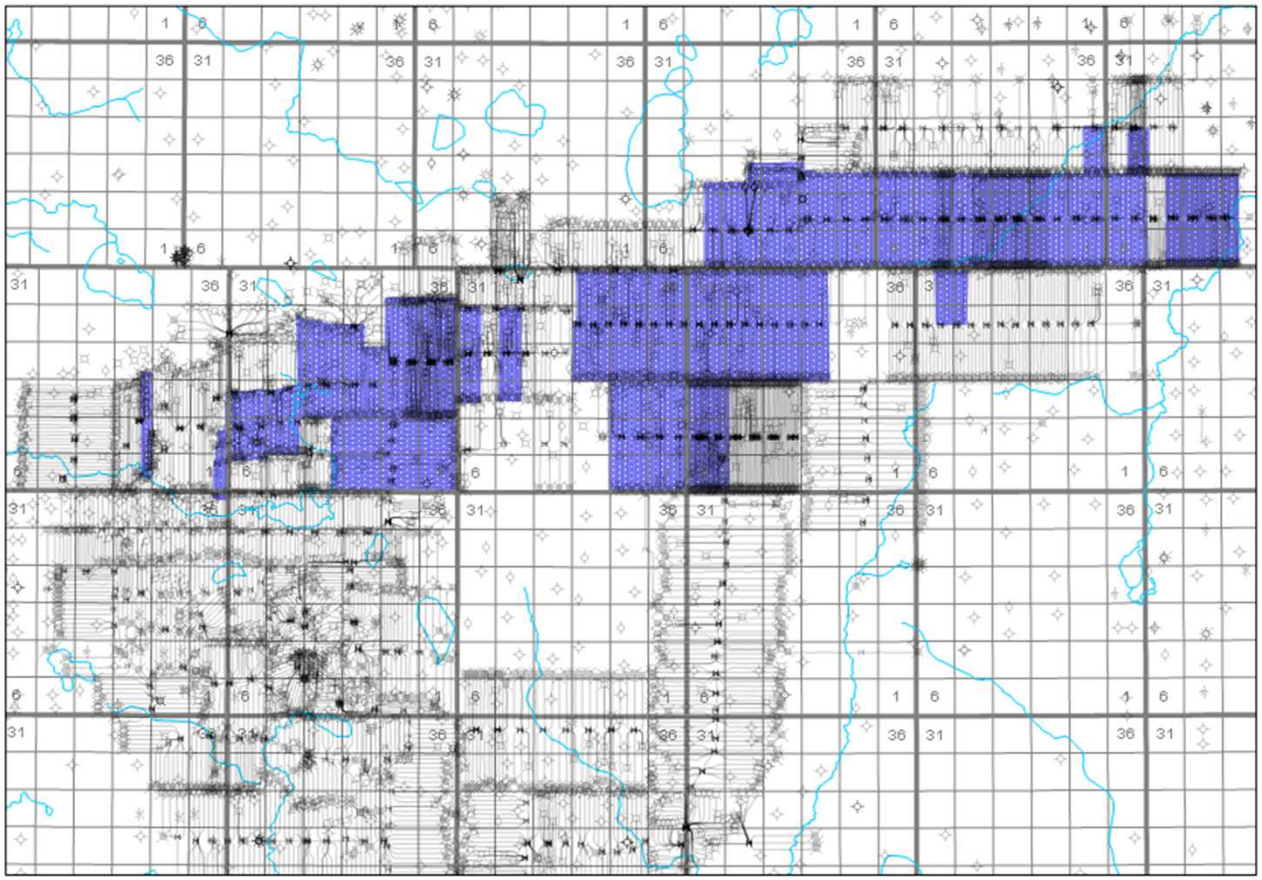


Cum. oil:
45,103 E3m3

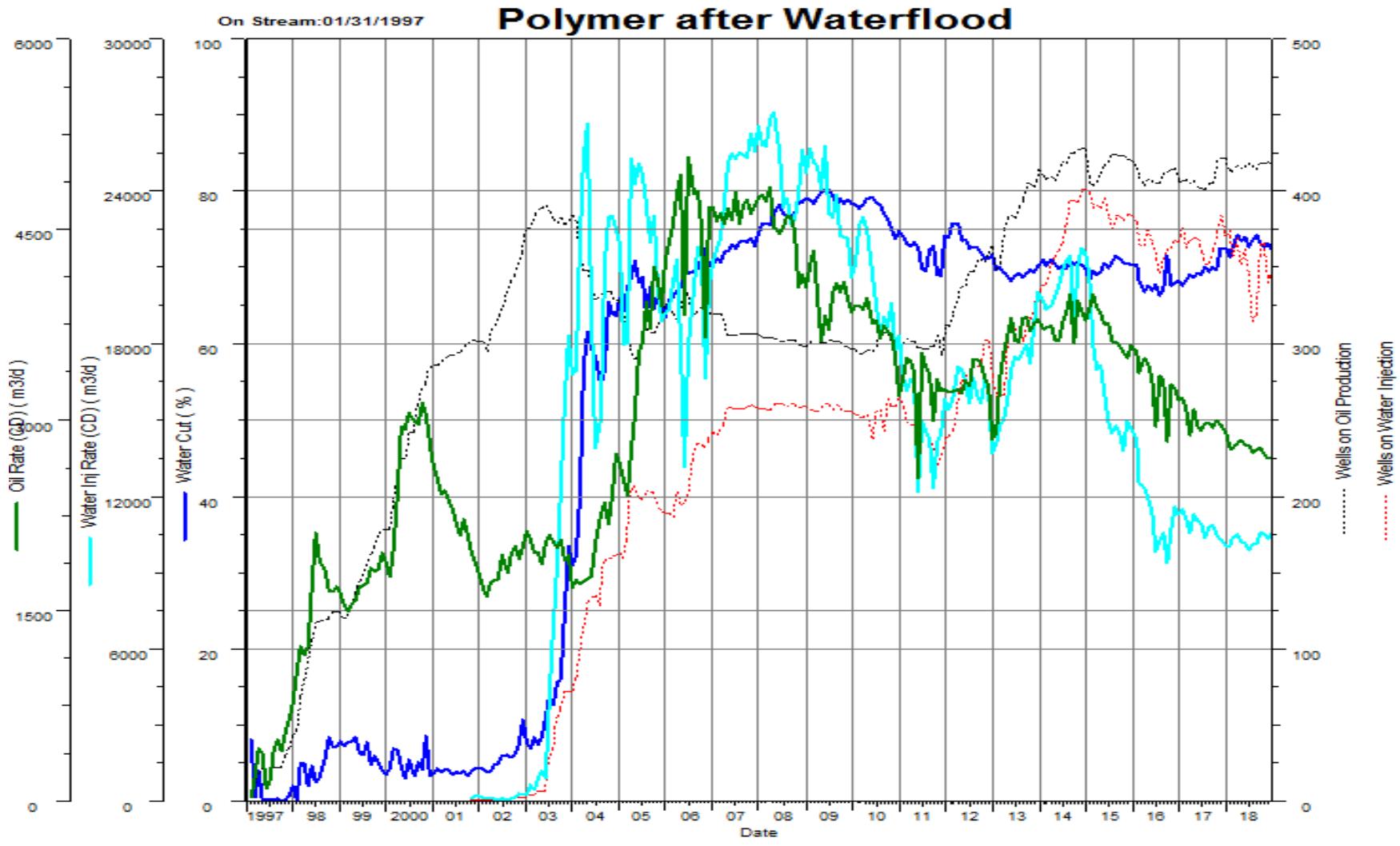
Approximately 63% of the legacy approved EOR scheme areas are currently developed and under flood as of the end of 2018

Polymerflood after Waterflood

- **With the inclusion of Approval 9404 area, the polymer after waterflood area is significantly larger but still concentrated in the Northern half of the field, generally corresponding to lower in-situ oil viscosity.**

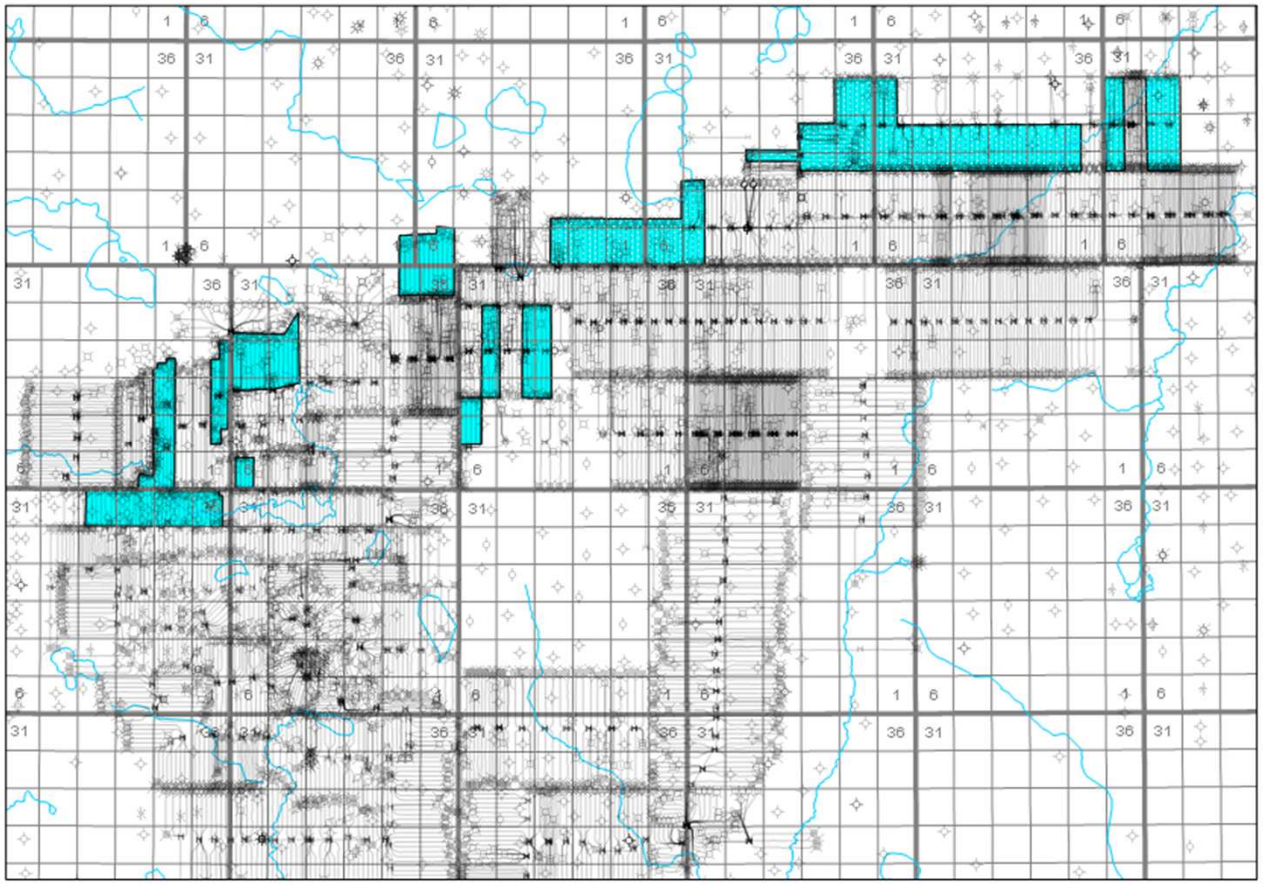


Polymerflood after Waterflood

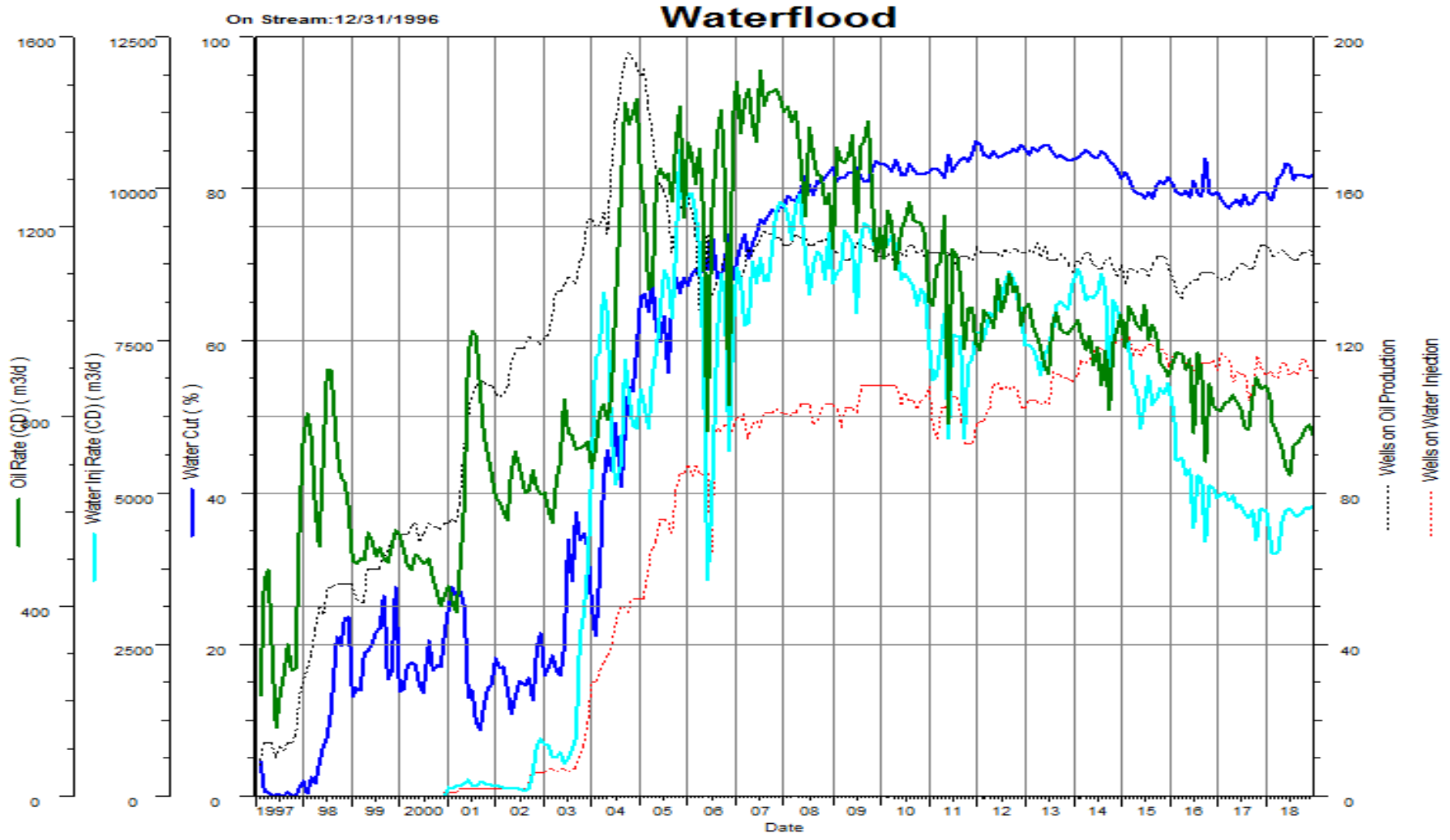


Waterflood

- **Current waterflood patterns are all contained in Approval 9404 area. The majority of these patterns have been under waterflood since the mid-2000s, conversion to polymerflood is under evaluation.**



Waterflood


On Stream:12/31/1996
Waterflood
Oil Rate (CD) (m3/d)
Water Inj Rate (CD) (m3/d)
Water Cut (%)
Wells on Oil Production
Wells on Water Injection
Date
1997
98
99
2000
01
02
03
04
05
06
07
08
09
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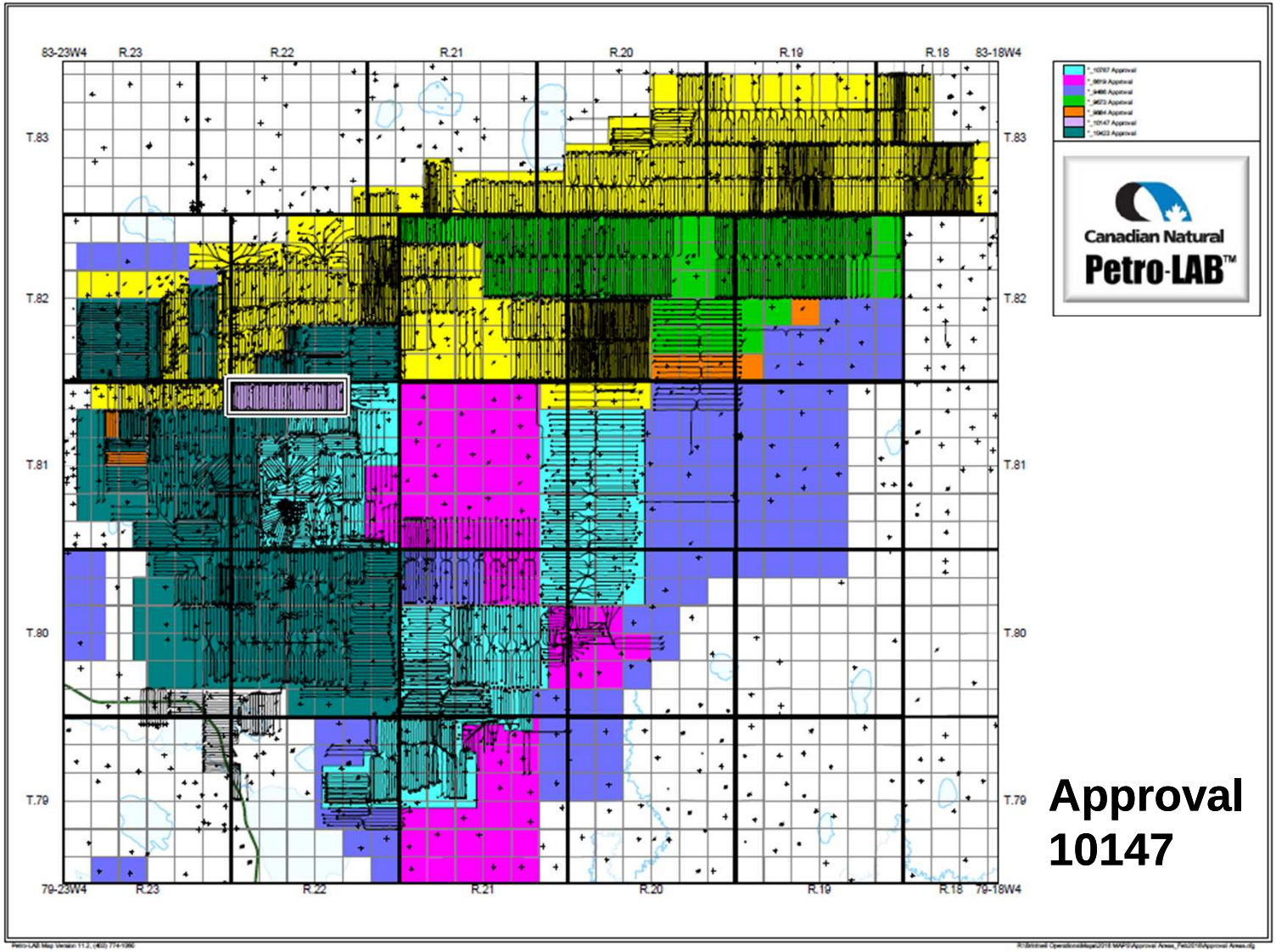
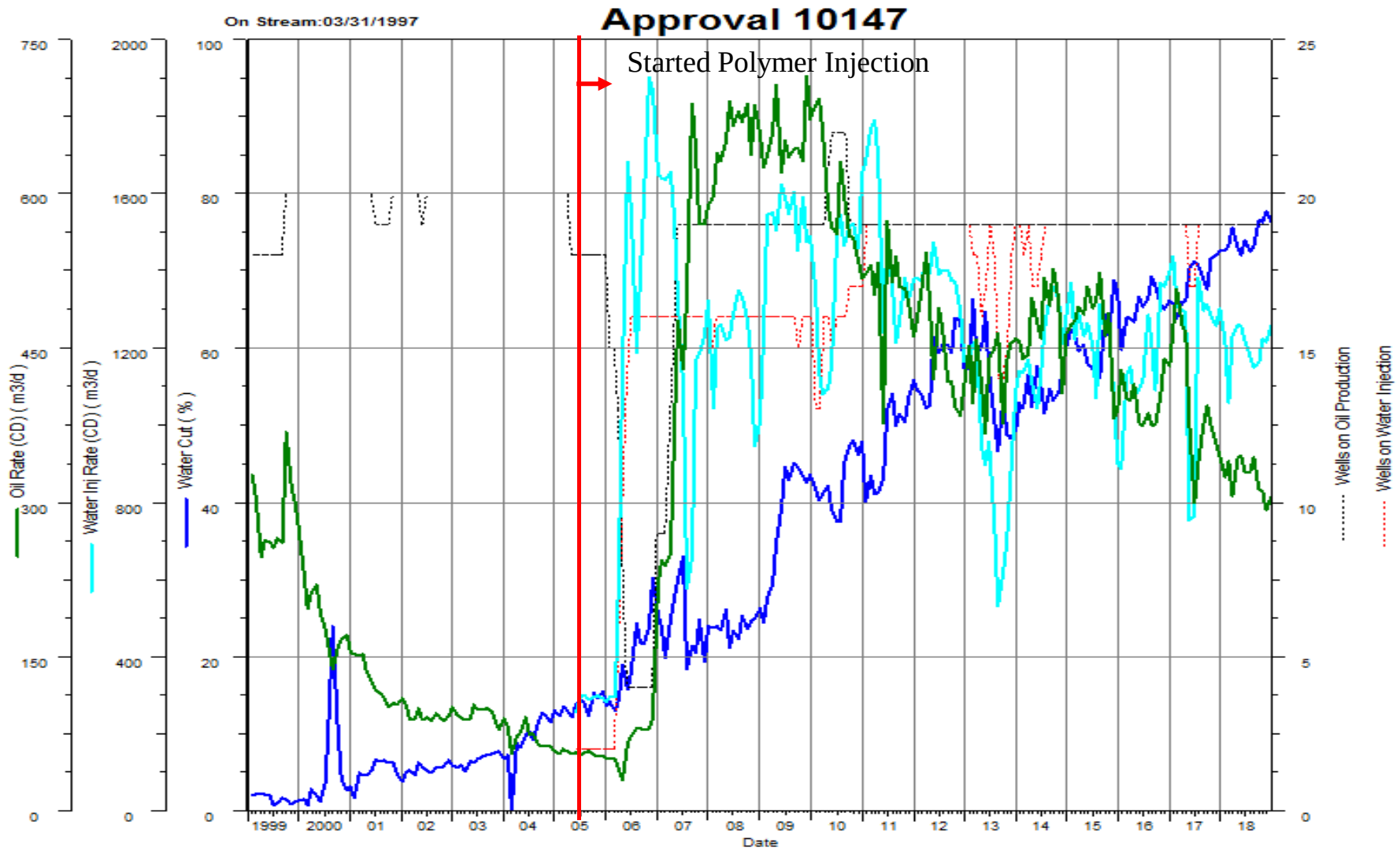
18

Field Performance and Surveillance

Approval 10147



Approval 10147 Production Update



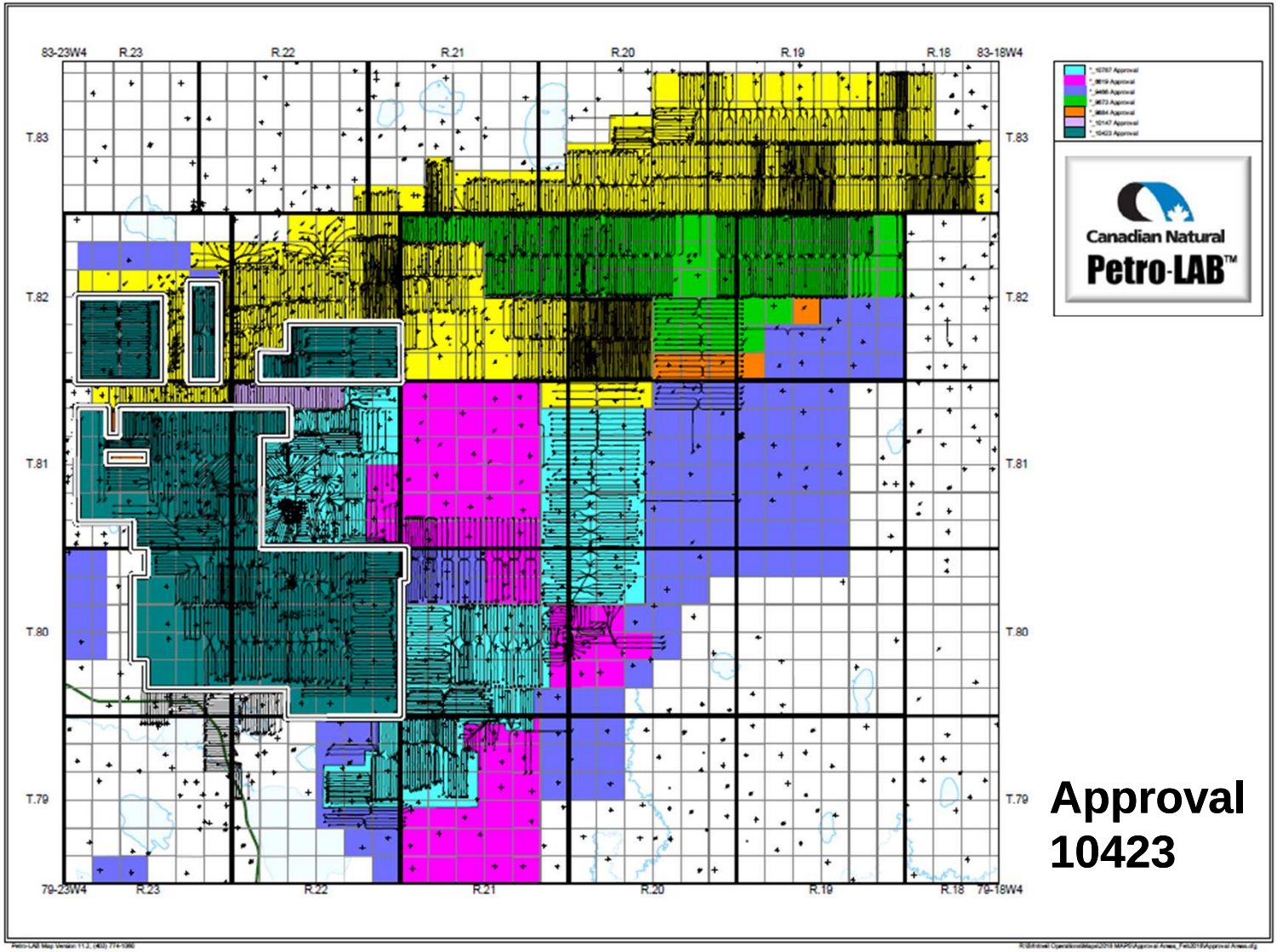
Cum oil: 2,746 E3m3 Cum water: 2,504 E3m3 Cum injection: 6,051 E3m3

Approval 10147 Discussion

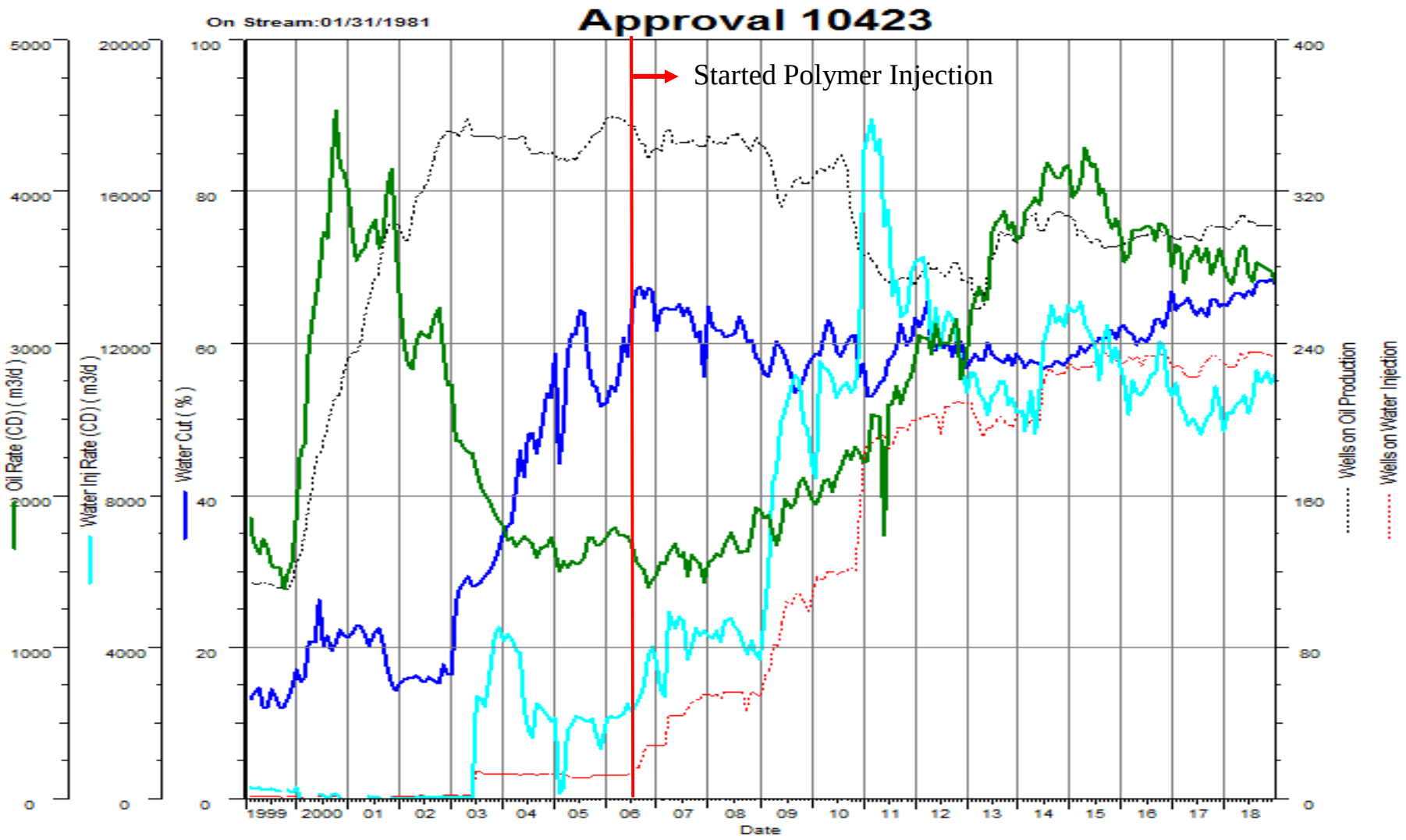
Canadian Natural

- Contains the most mature polymer flood patterns including the original CNRL pilot area which began flooding in 2005.
- First Polymer Response in April 2006 from the HTL6 Pilot area.
- Peak production occurred from mid 2007 to early 2010 at 650 m3/d oil.
- Injection returned to normal in 2014-2015 following a significant reduction in 2013 for offset drilling.
- Increased water cut was observed in 2017 and 2018 due to the maturity of the flood.
- Water cut averaged roughly 74% during 2018.
- Oil viscosity ranges from 1,300 cp to 2,800 cP.

Approval 10423



Approval 10423 Production Update



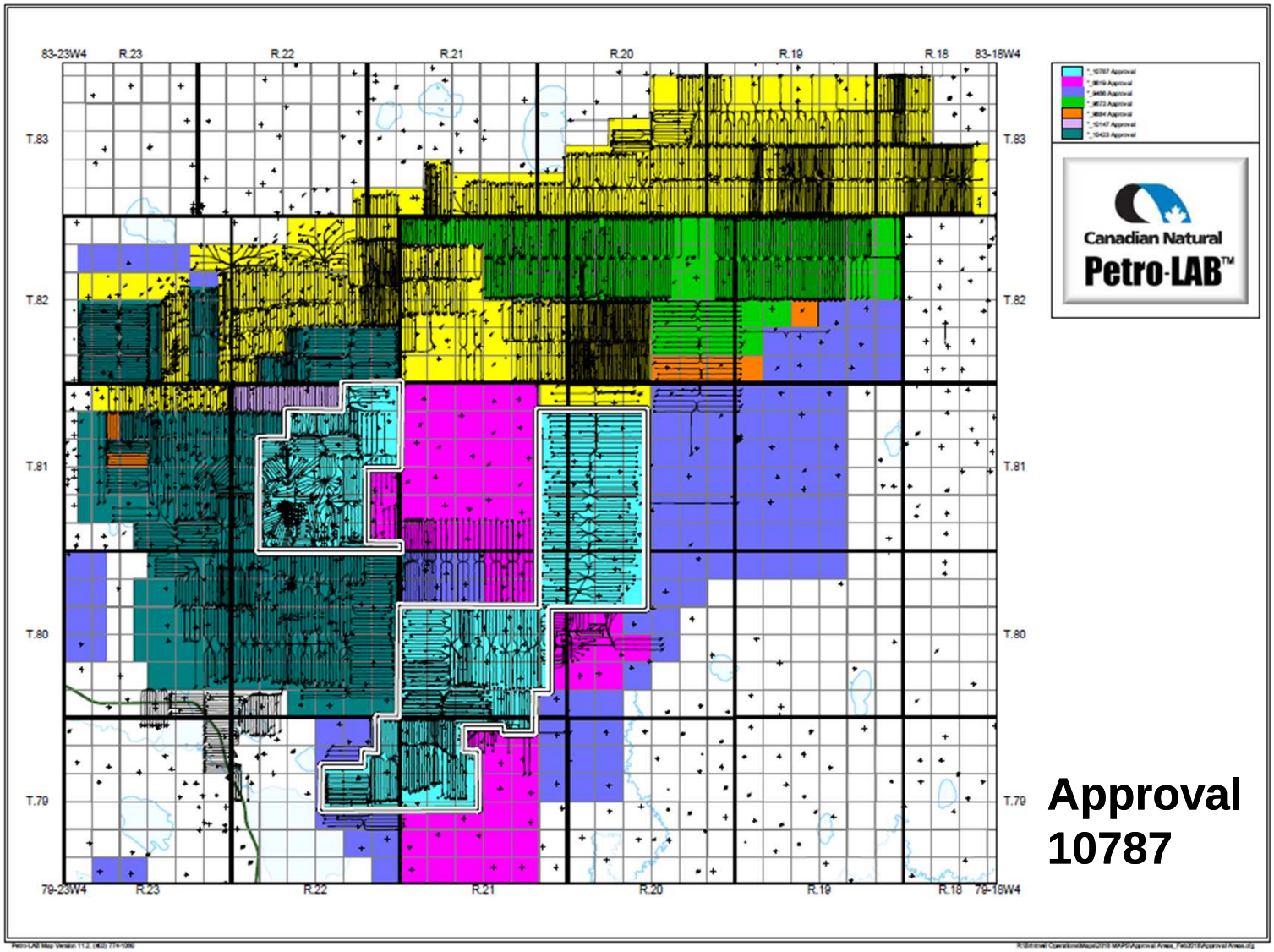
Cum oil: 21,769 E3m3 Cum water: 24,070 E3m3 Cum injection: 48,320 E3m3

Approval 10423 Discussion

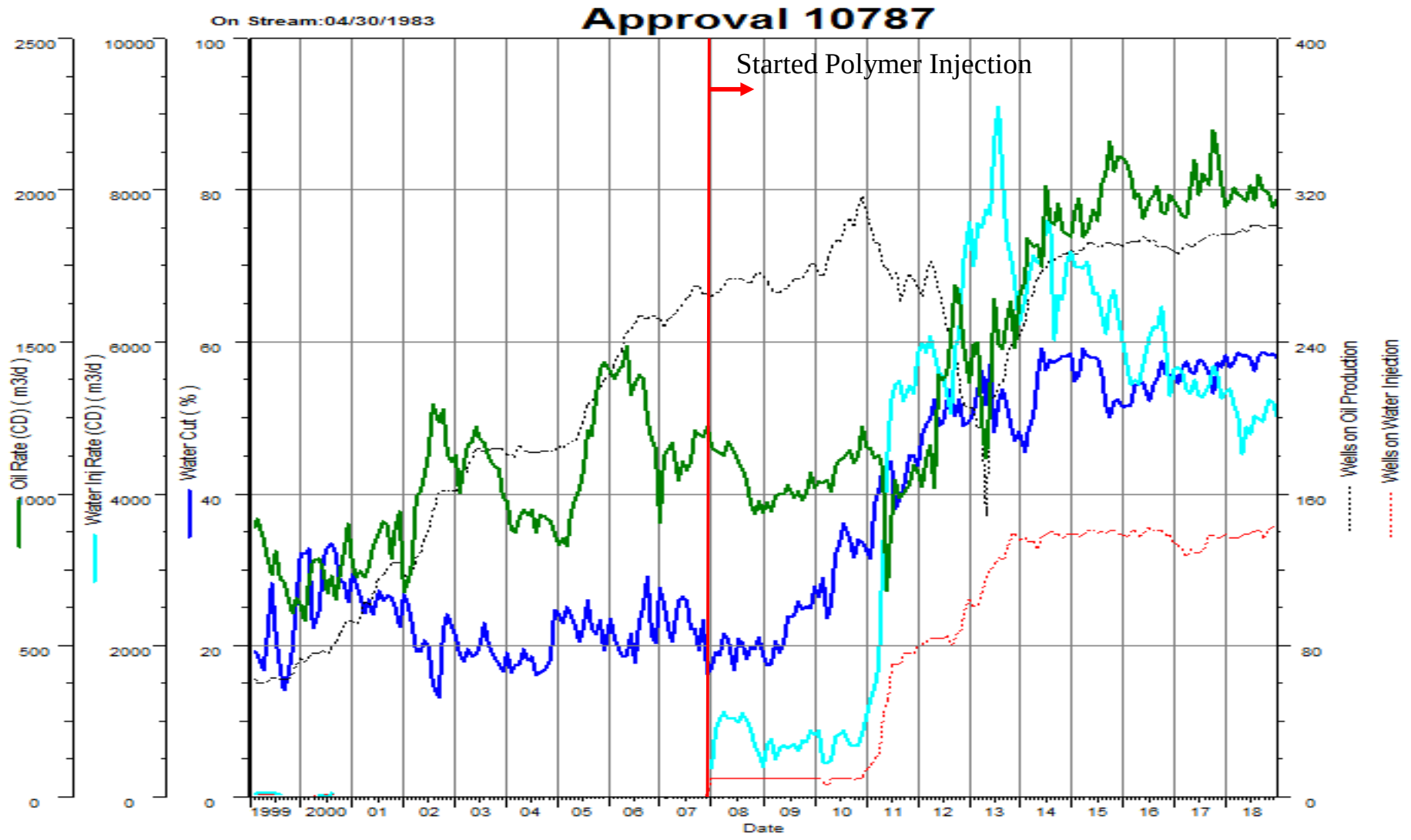
Canadian Natural

- Polymerflood started in 2006 covering roughly 5% of the approval area split between 3 small groups. The flood was expanded every year up to 2010. In 2012, small area from PRSA 9884 was added to the approval.
- Currently 73% of the approval area is under flood.
- Small portion of approval area under waterflood starting in 2003. This area was converted to polymer in 2008 and 2010.
- First polymer response in July 2007 but due to the size and staged flood expansion, did not see a ramp up in oil volumes until early 2009.
- Portions of the approval area are affected by higher in-situ water saturation and/or oil viscosity. Response in these regions has been more delayed and erratic when compared to other portions of the pool.
- Oil viscosity ranges from 1,100 cp to 50,000 cp.
- 14 producers in WB 14 converted to injection in 2014. 6 producers in WB32 area converted to injection in 2015.
- Average WCT in 2018 approximately 67%. 10 re-drills in late 2016 & 2017 and 10 re-drills in 2018.

Approval 10787



Approval 10787 Production Update



Cum oil: 10,497 E3m3 Cum water: 7,495 E3m3 Cum injection: 18,250 E3m3

Approval 10787 Discussion

Canadian Natural

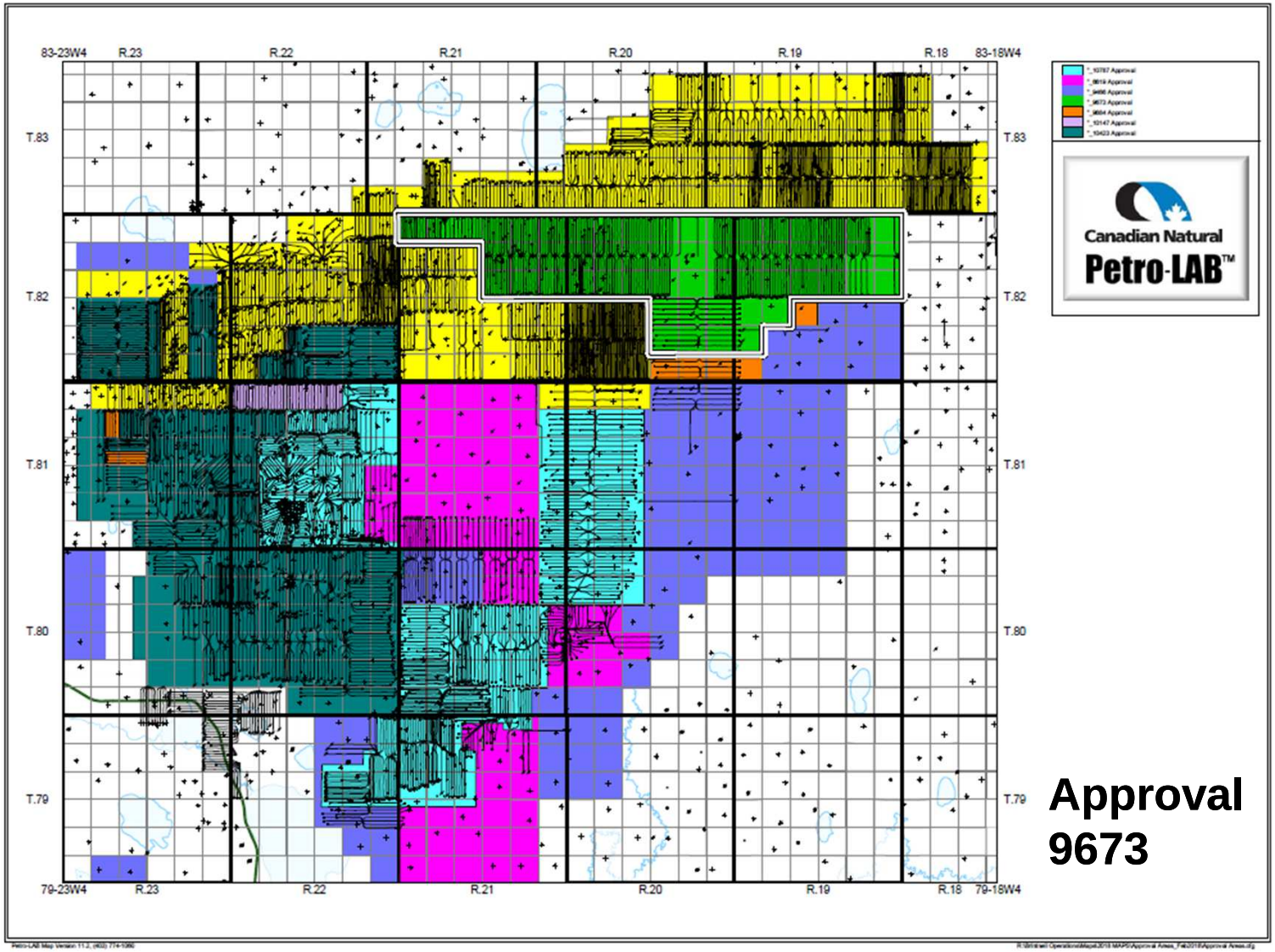
- Polymer flood started in Dec 2007 covering roughly 4% of the approval area split into 2 small groups. There were no expansions until 2010, since then there has been an expansion completed in every year including 2013. Currently 45% of the approval area is under flood.
- First polymer response in Nov 2008 but due to the size and staged flood expansion, did not see a ramp up in oil volumes until mid 2012.
- Oil production increased in the late part of 2013 and early 2014, mostly due to new well activations.
- Polymer injection was commenced in the Peerless and Sandy Lake portions of the area in 2013, with the majority of wells exhibiting some form of polymer flood response.
- Infill drills in 2018 maintained oil, tempered WCT increase (average 67%).
- Oil viscosity ranges from 1,100 cp to 14,400 cp.

Approval 10787 – 04/01-24-079-22W4 Monitoring

Canadian Natural

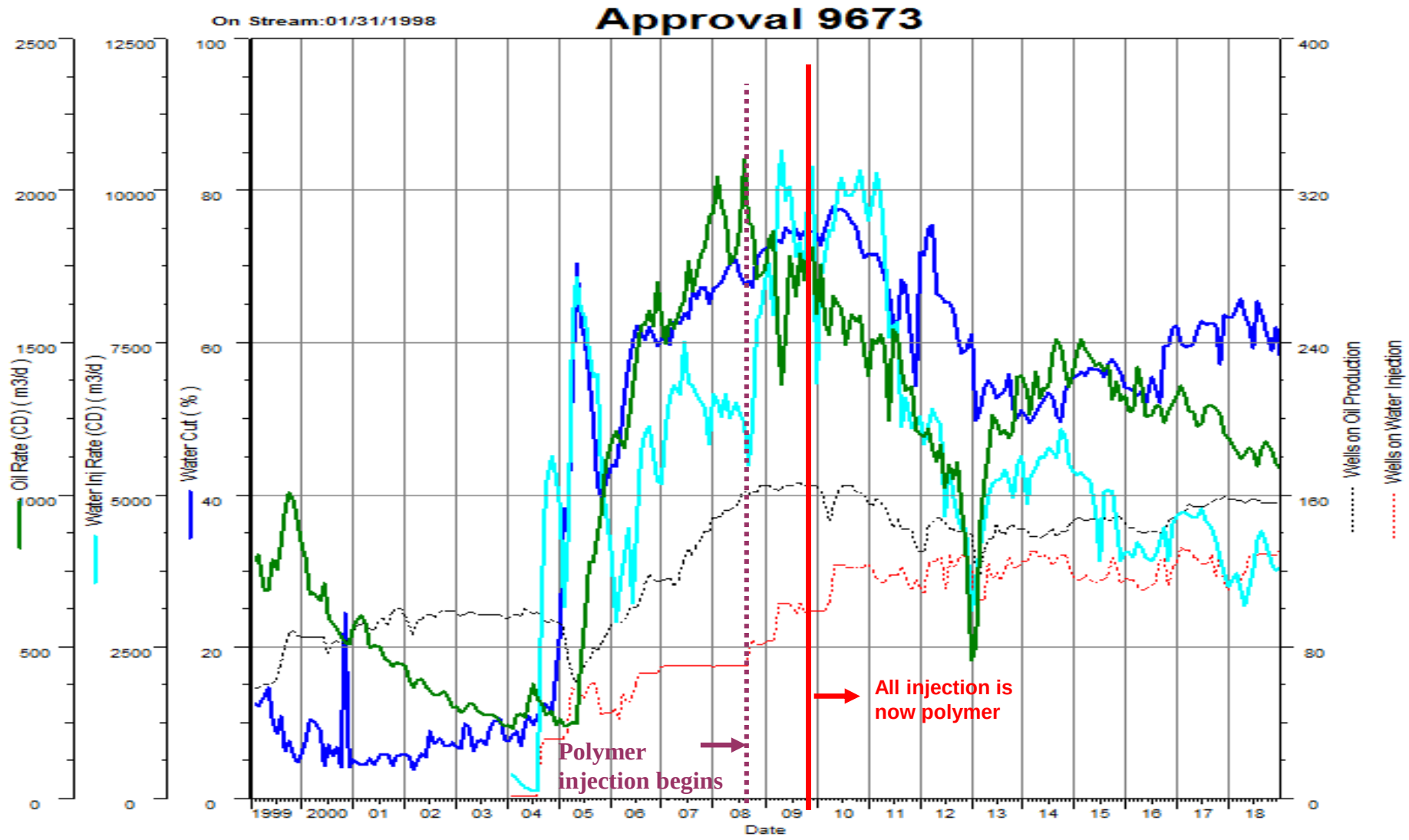
- In May 2012, the 03/16-36-079-22W4 well intersected the 00/01-24-079-22W4 wellbore while drilling
- Numerous attempts were made to repair the 00/01-24 well but ultimately the wellbore could not be returned to service. A non-routine abandonment was conducted on 00/01-24 in March 2013. The 04/01-24-079-22W4 observation well was drilled in September 2013 to monitor the polymer flood near the 00/01-24 offset following consultations with the AER (Approval 10787K).
- 04/01-24-079-22W4 Monitoring Program:
  - Produced water has been monitored continuously since Q4 2013. Through 2016, the well has not produced enough water to obtain a representative water analysis.
  - The bottomhole reservoir pressure was measure quarterly in 2013/2014 and yearly from 2015-2018.
  - The pressure was measured in October 2018 to be 449 kPa; this is comparable to measurements taken in previous years and in line with expectations for the Wabiskaw reservoir under primary depletion.
  - CNRL will continue to monitor the produced watercut and take yearly pressure measurements on this well.

Approval 9673



Approval 9673 Production Update

Canadian Natural



Cum oil: 8,185 E3m3 Cum water: 12,838 E3m3 Cum Injection: 31,415 E3m3

Approval 9673 Discussion

Canadian Natural

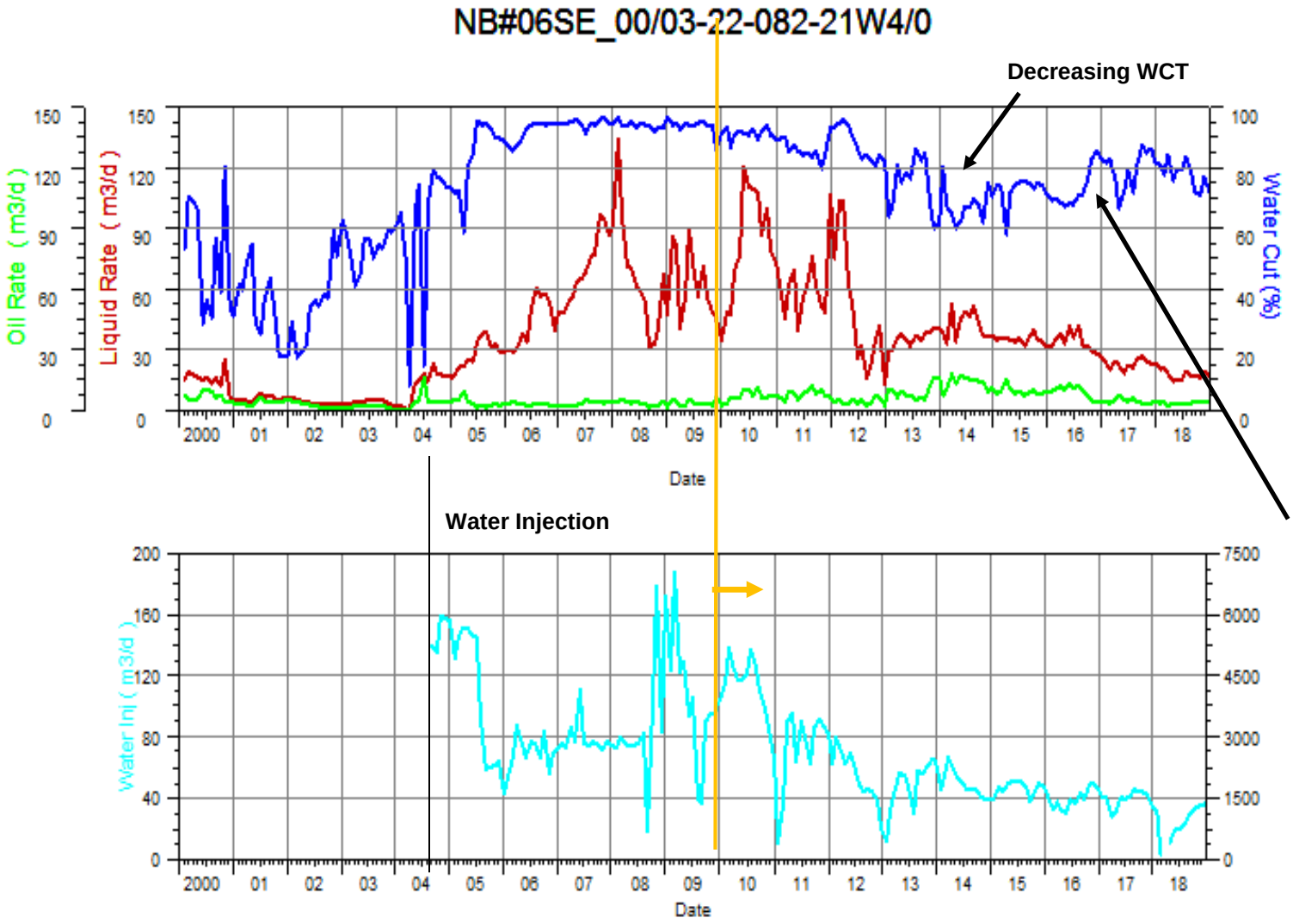
- Originally approved for waterflood in 2004; waterflood was expanded in 2005/2006 to cover roughly 40% of the current approval area.
- Waterflood peak production occurred from late 2007 to early 2009 at 1850 m3/d oil.
- Polymerflood began in Sept 2008 covering 6% of approval area. Existing waterflood patterns remained unchanged at this time.
- In 2009 all waterflood areas were converted to polymer and a small expansion area from primary was added; additional small expansions from primary were conducted in each year from 2010 to 2012. Currently 70% of the approval area is under flood.

Approval 9673 Discussion

Canadian Natural

- The conversion from water to polymer has had a dramatic effect on the conformance of the flood. Within two years of conversion for most areas, watercuts declined.
- In 2018 watercut averaged about 62%, steady with 2017, following an increase due to the reactivation of high WCT wells.
- Oil viscosity ranges from 600 cp to 13,000 cp.

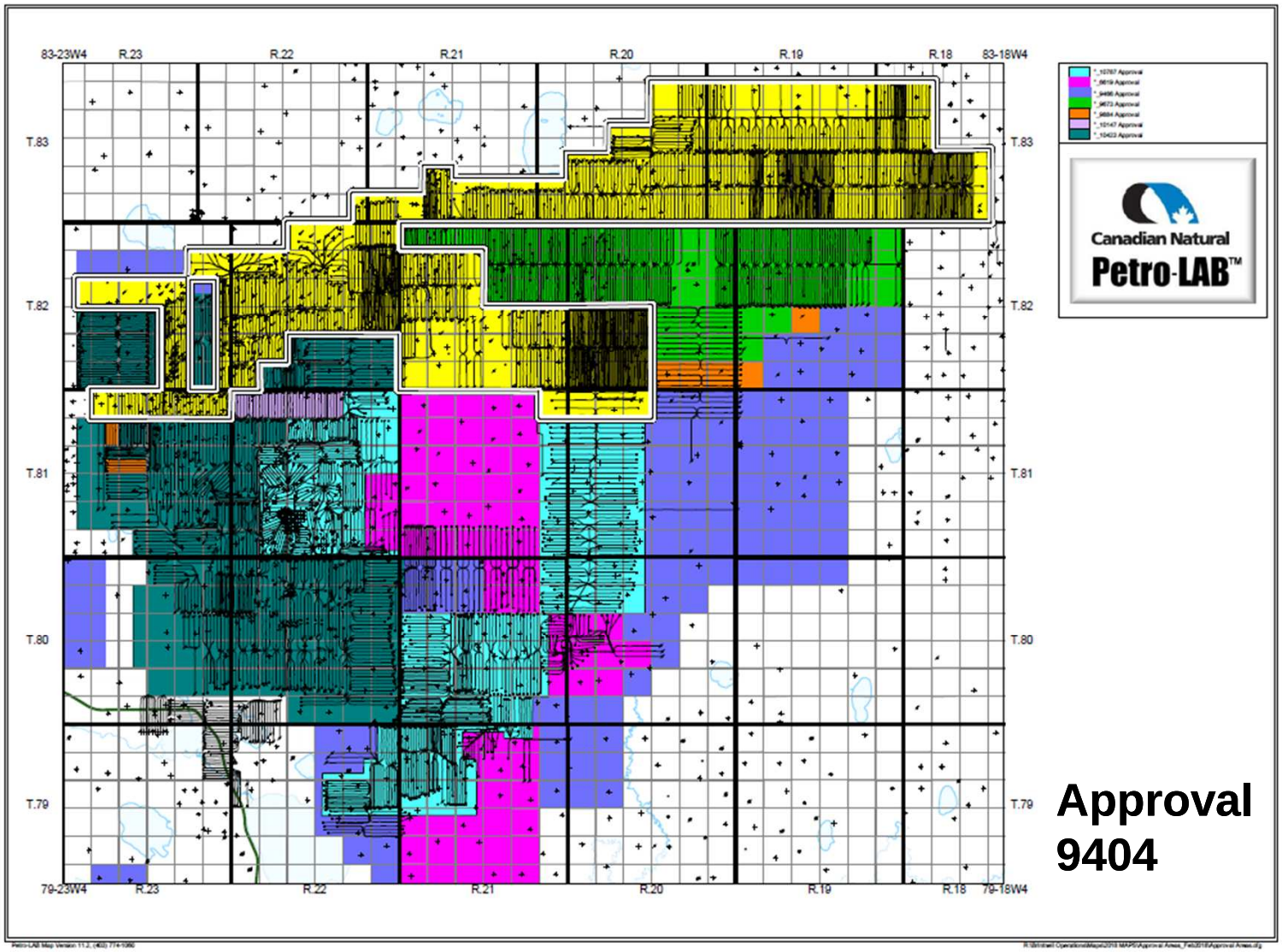
Approval 9673 Discussion: Polymer after Waterflood Example



Results from polymer flood after waterflood areas vary by pattern but do show substantial polymer flood response on both oil and WCUT.

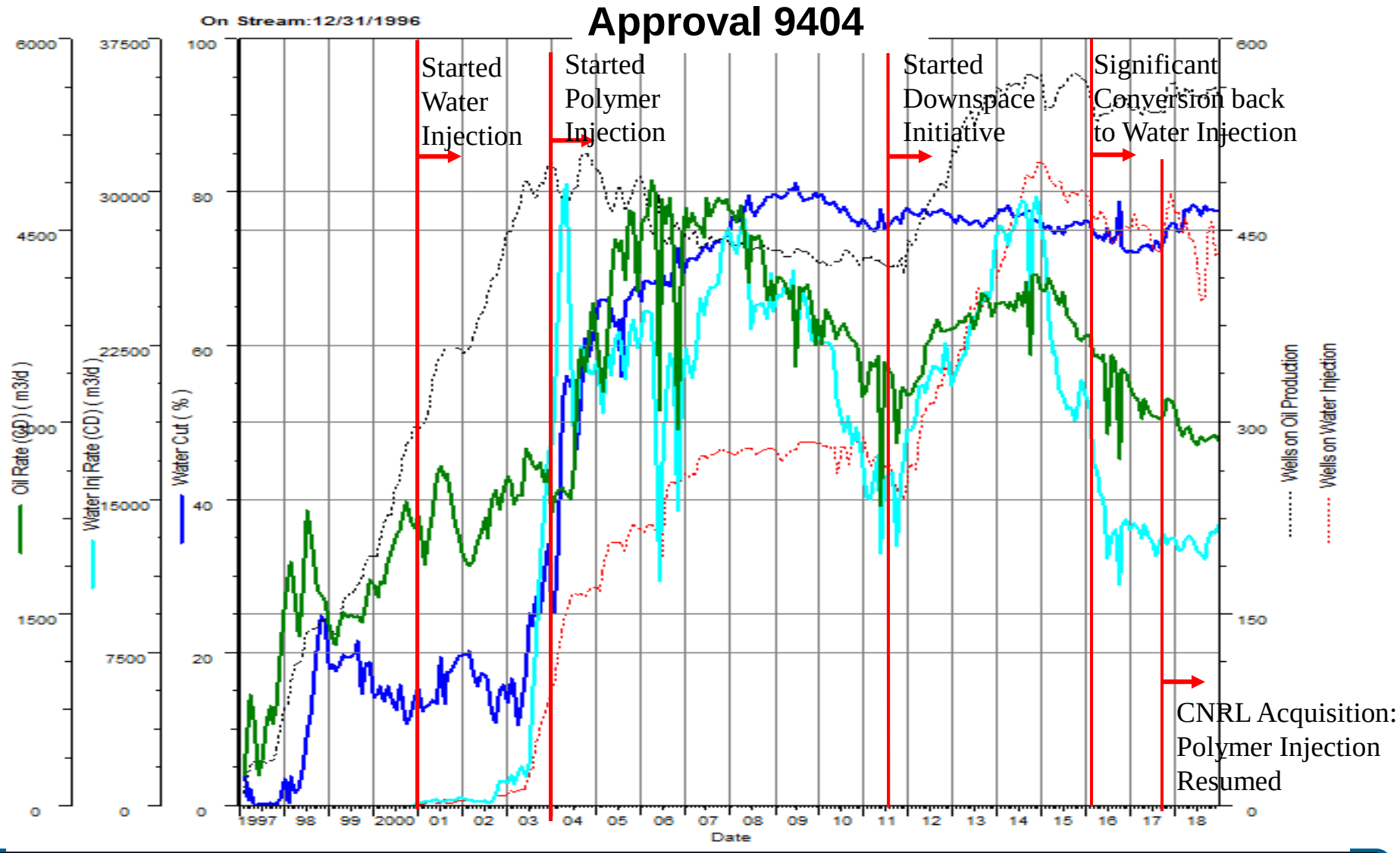
Starting at the end of 2016, WCTs have been rising, showing sensitivity of area.

Approval 9404



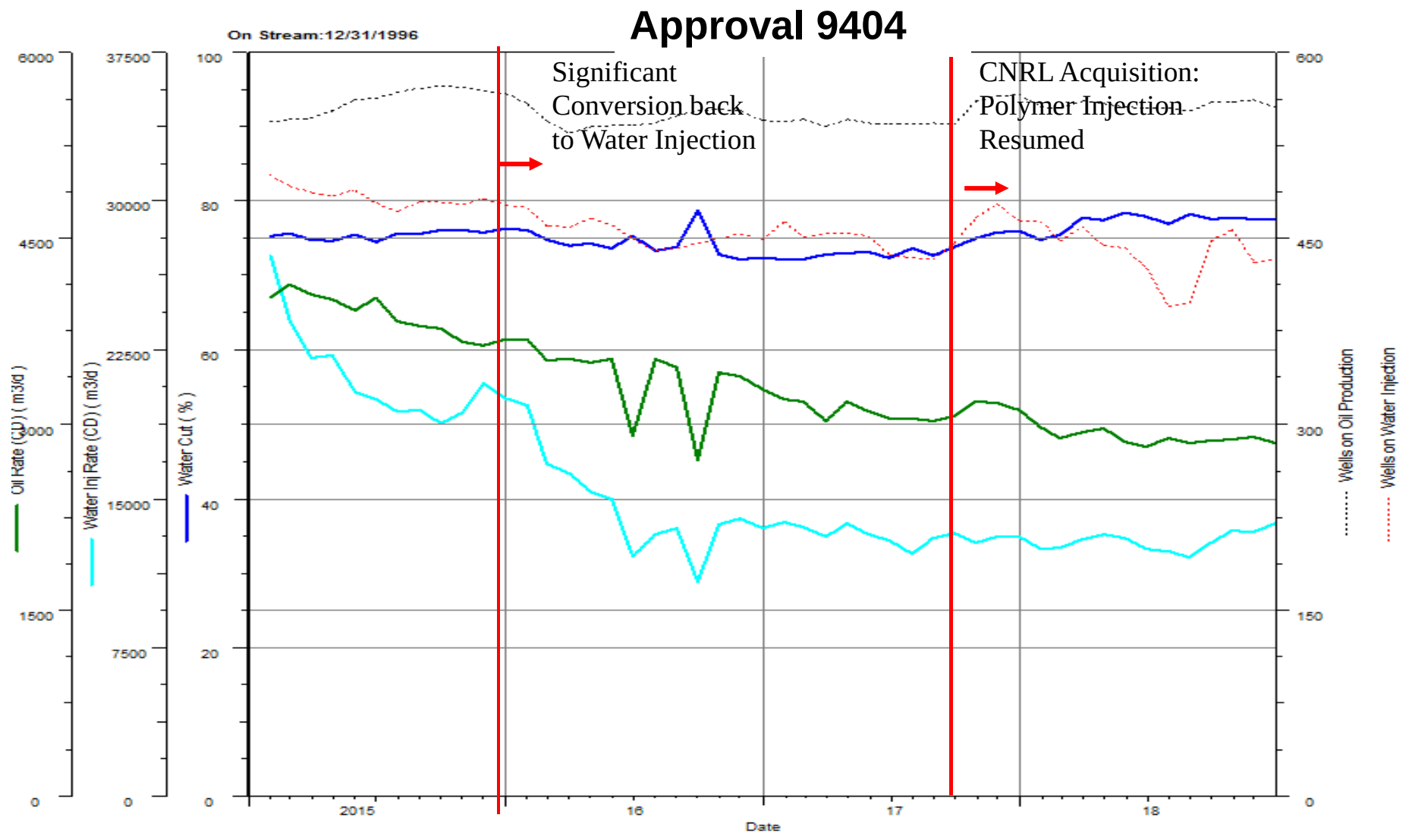
Approval 9404 Production Update

Canadian Natural



Cum oil: 25,208 E3m3 Cum water: 61,480 E3m3 Cum injection: 115,776 E3m3

Approval 9404 Production Update



Approval 9404 Discussion

Canadian Natural

- Waterflood initiated on SE09 in Nov 2000. Waterflood expansion began in 2002 in the SW region and spread throughout the field covering over 65% of the approval area. Majority of waterflood expansion occurred from 2002-2007.
- Oil response to waterflood was substantial, nearly doubling primary production rates, but water breakthrough progressed rapidly with watercuts as high as 90% within the first two years.
- To help address breakthrough, the first polymer conversion was initiated on SW08 in Dec 2003. Polymer expansion progressed steadily until 2014 covering over 45% of the approval area.
- The majority of injectors were converted from water to polymer, but a small percentage were completed directly to polymer from primary.

Approval 9404 Discussion

Canadian Natural

- Downspacing initiative was undertaken from 2011-2014. This increased the injector count by 50% and resulted in higher reservoir throughput.
- Through 2015 and 2016 injection rates were reduced significantly and about 75% of the polymerflood was converted back to water.
- CNRL acquired the approval area in September 2017 and has worked to resume polymer injection, by year end 2017 approximately 33% of the shut-in polymerflood area was reactivated.
- As of the end of 2018, 98% of previously polymer flooded area has been returned to polymer injection.
- Focus has been on re-establishing consistent polymerflood patterns.

Estimated Ultimate Recovery Factors (EURF) for Flooded Areas

Approval 9673
Total area OBIP 97.4 E^6m^3
OBIP under flood: 78.4 E^6m^3
Primary RF: 3%
RF to date: 10%
EURF: 15-19%

Approval 10787
Total area OBIP 205.2 E^6m^3
OBIP under flood: 81.4 E^6m^3
Primary RF: 5%
RF to date: 13%
EURF: 21-28%

Approval 10147
Total area OBIP 8.98 E^6m^3
OBIP under flood: 8.98 E^6m^3
Primary RF: 5%
RF to date: 31%
EURF: 34-38%

Approval 10423
Total area OBIP 229.0 E^6m^3
OBIP under flood: 163.8 E^6m^3
Primary RF: 6%
RF to date: 13%
EURF: 22-27%

Approval 9404
Total area OBIP 170.1 E^6m^3
OBIP under flood: 144.7 E^6m^3
Primary RF: 5%
RF to date: 17%
EURF: 26-28%

*RF to-date represents the RF from the active flood areas only. EURF range represents RF from areas recognized for EOR reserves by reserve auditor.

Good Performance – HTL1 (Approval 10147)

Canadian Natural

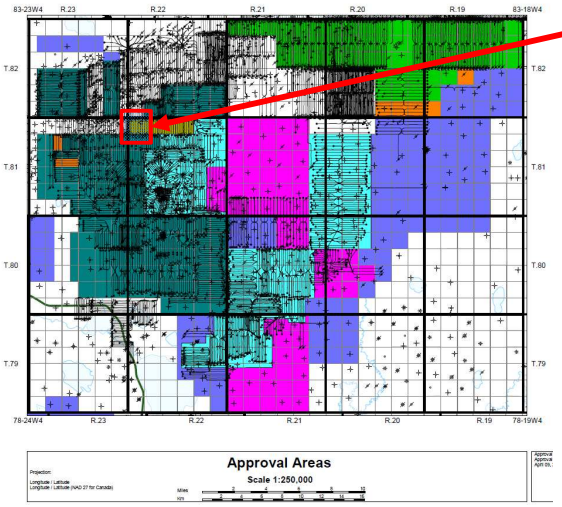
- **HTL1 100/15-31 Pattern**
  - **Well list and allocation factors:**

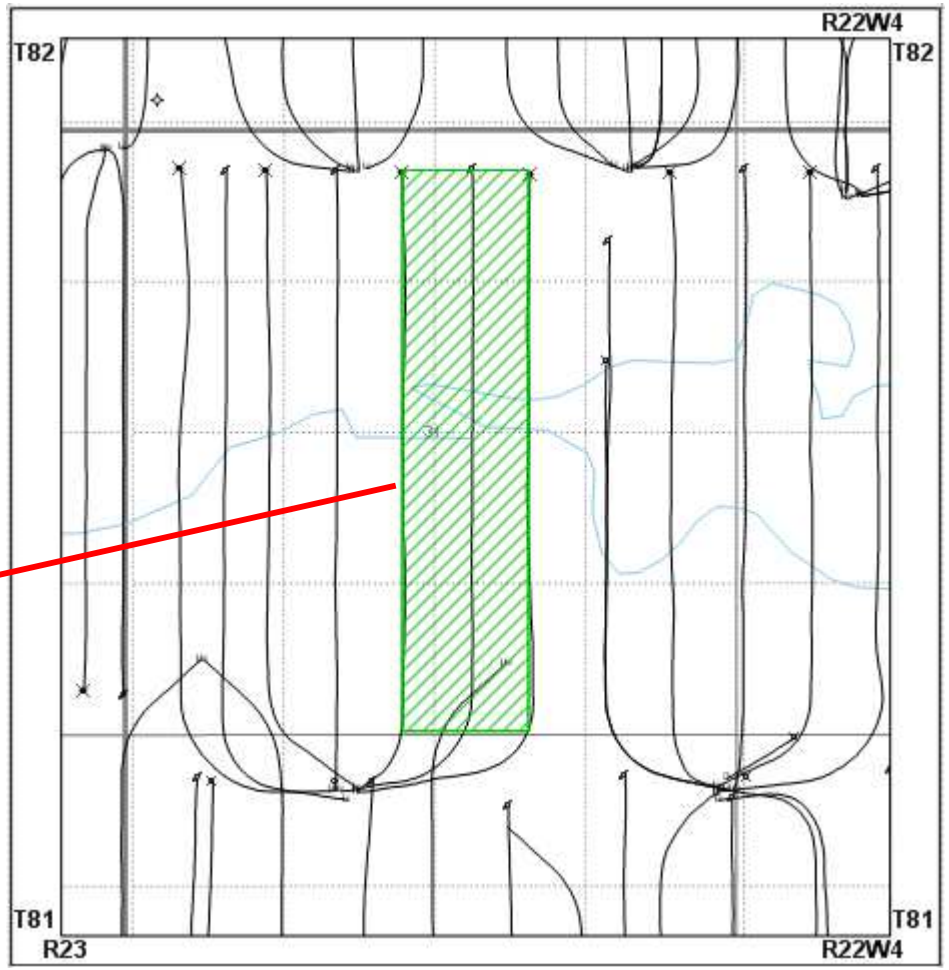
Injectors

- 100/15-31-081-22W4/0 (100%)

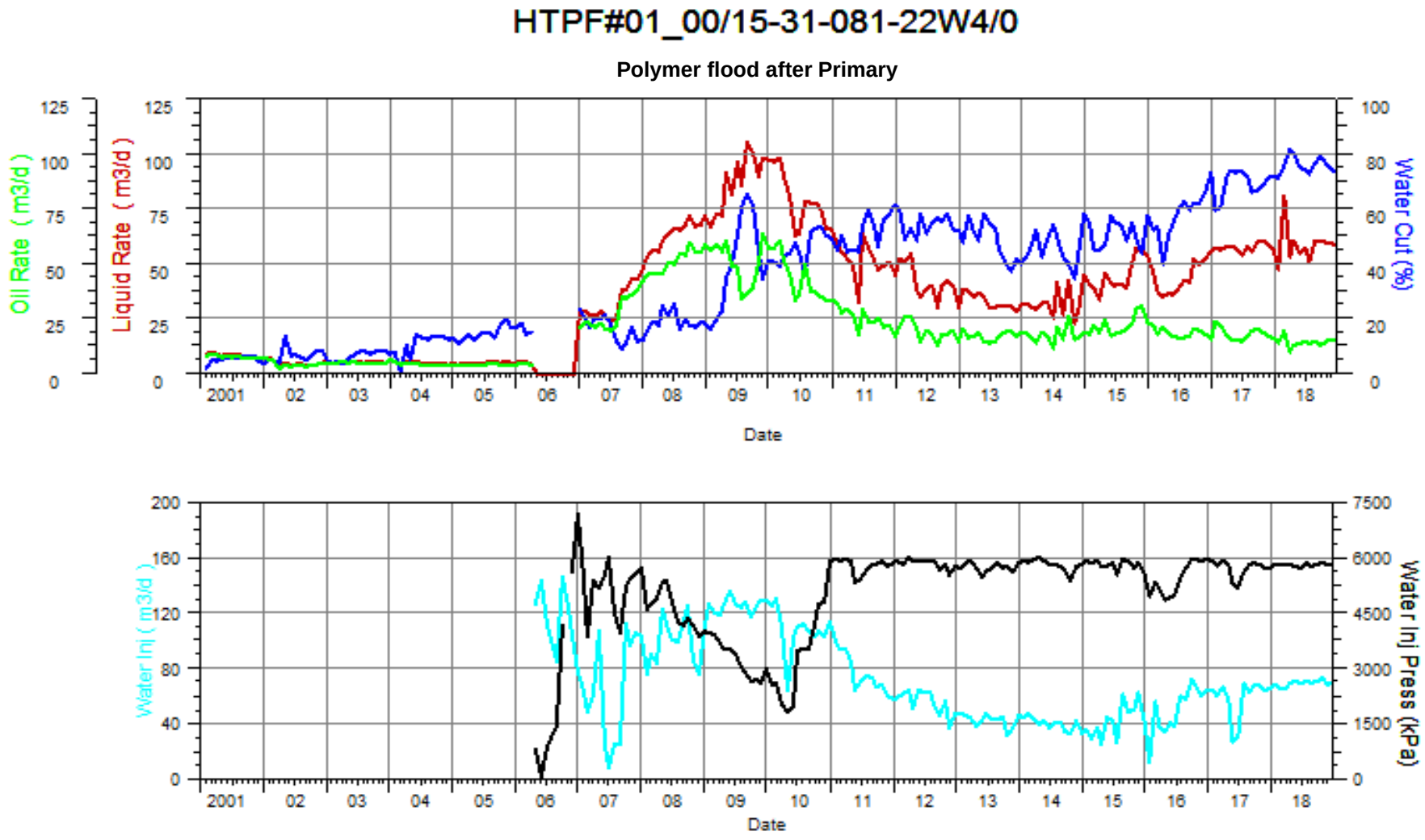
Producers

- 102/14-31-081-22W4/0 (50%)
- 102/15-31-081-22W4/0 (50%)





Good Performance – HTL1 (Approval 10147)



Average Performance – BP23 (Approval 10787)

- **BP23 100/05-23 Pattern**
  - **Well List and allocation factors:**

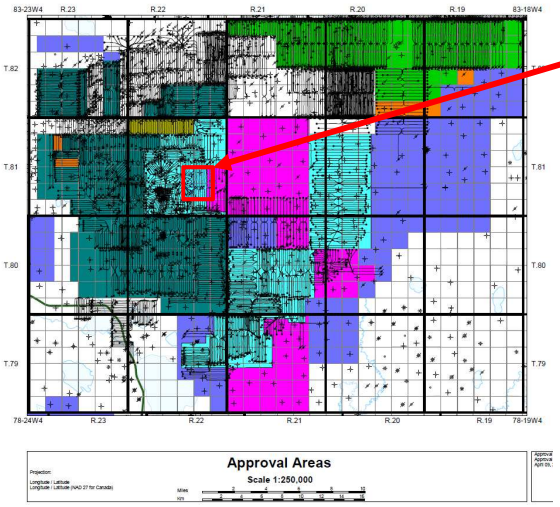
    Injectors

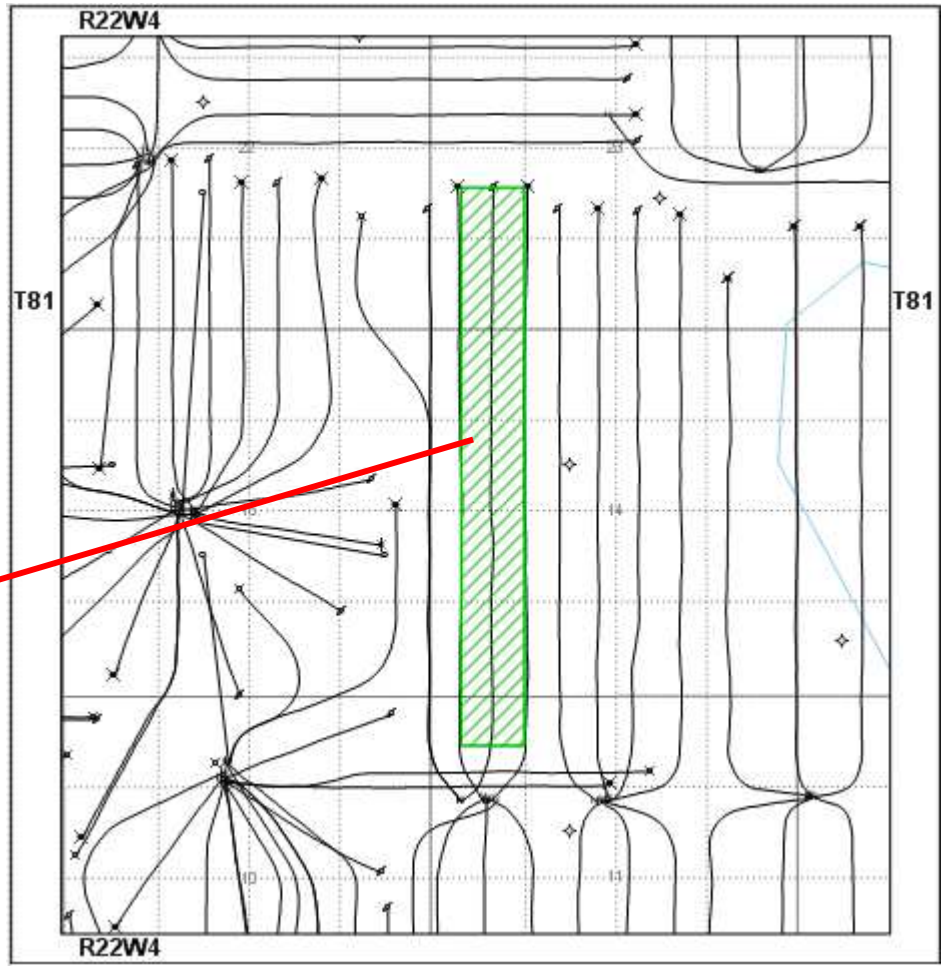
    ➢**100/05-23-081-22W4/0 (100%)**

    Producers:

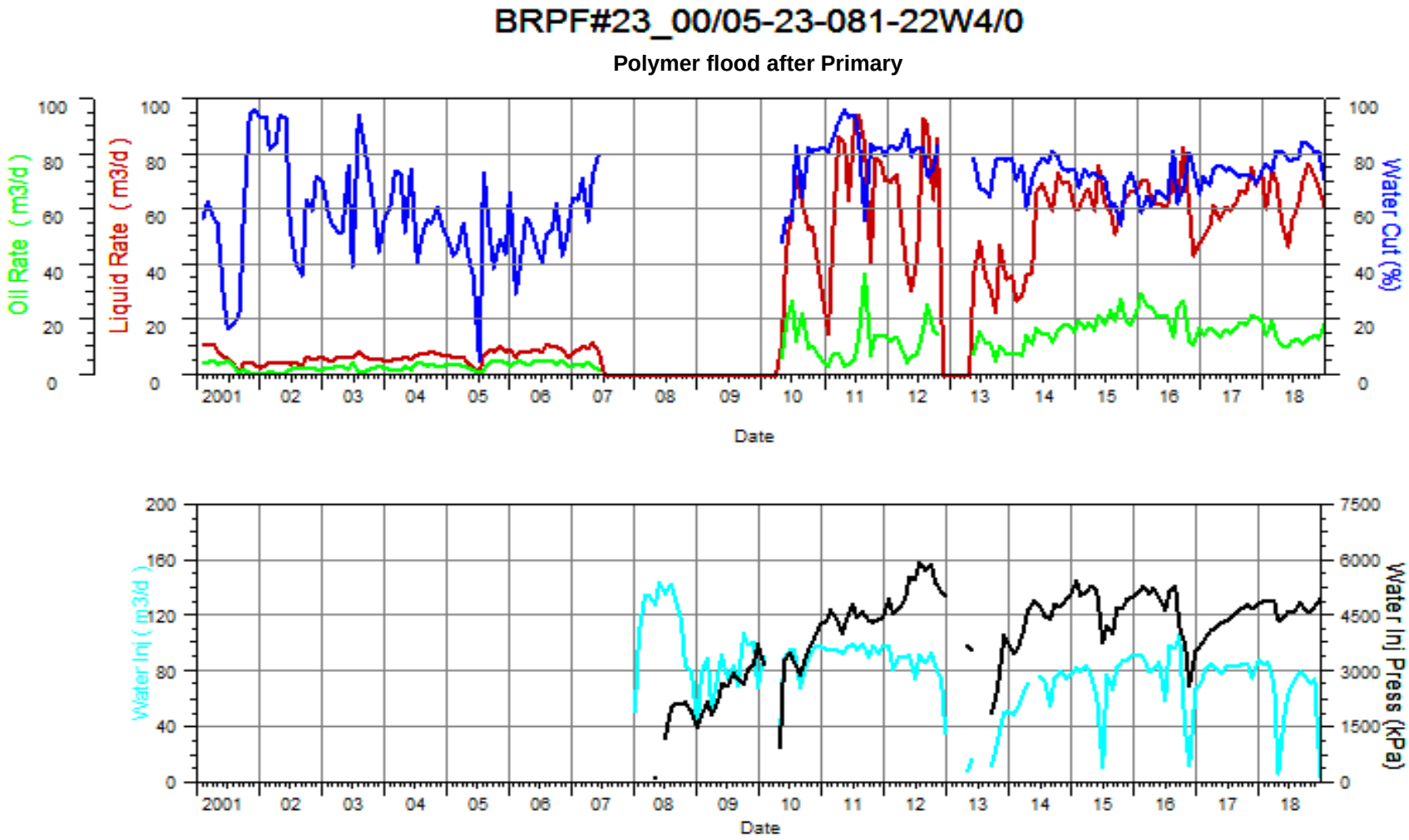
    ➢**102/05-23-081-22W4/0 (50%)**

    ➢**102/06-23-081-22W4/0 (50%)**





Average Performance – BP23 (Approval 10787)



Below Average Performance – SB 29 (Approval 10423)

Canadian Natural

- **SB 29 102/08-13 Pattern**
  - **Well List and allocation factors:**

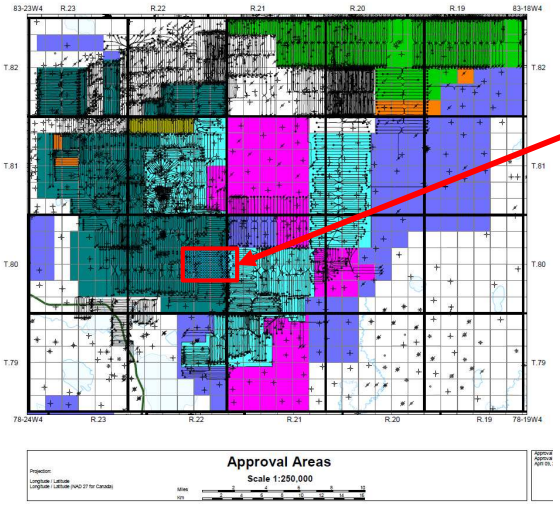
    Injector

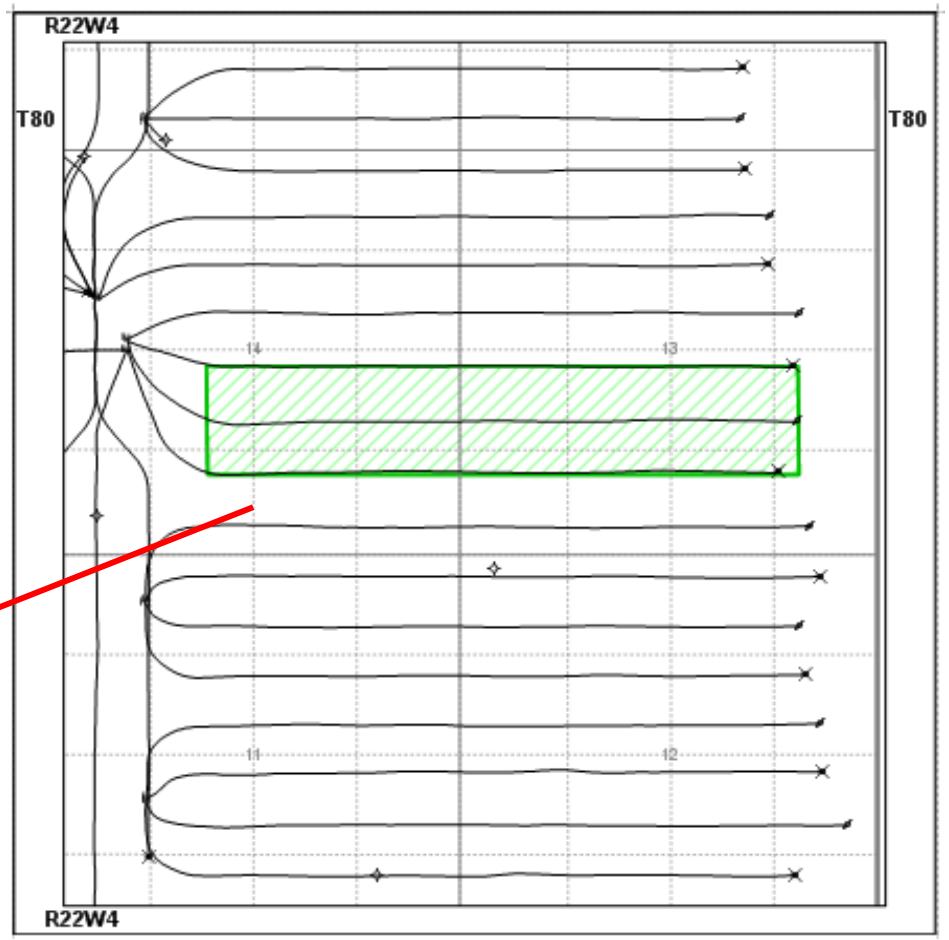
    ➢ **102/08-13-080-22W4/0 (100%)**

    Producers

    ➢ **100/01-13-080-22W4/0 (50%)**

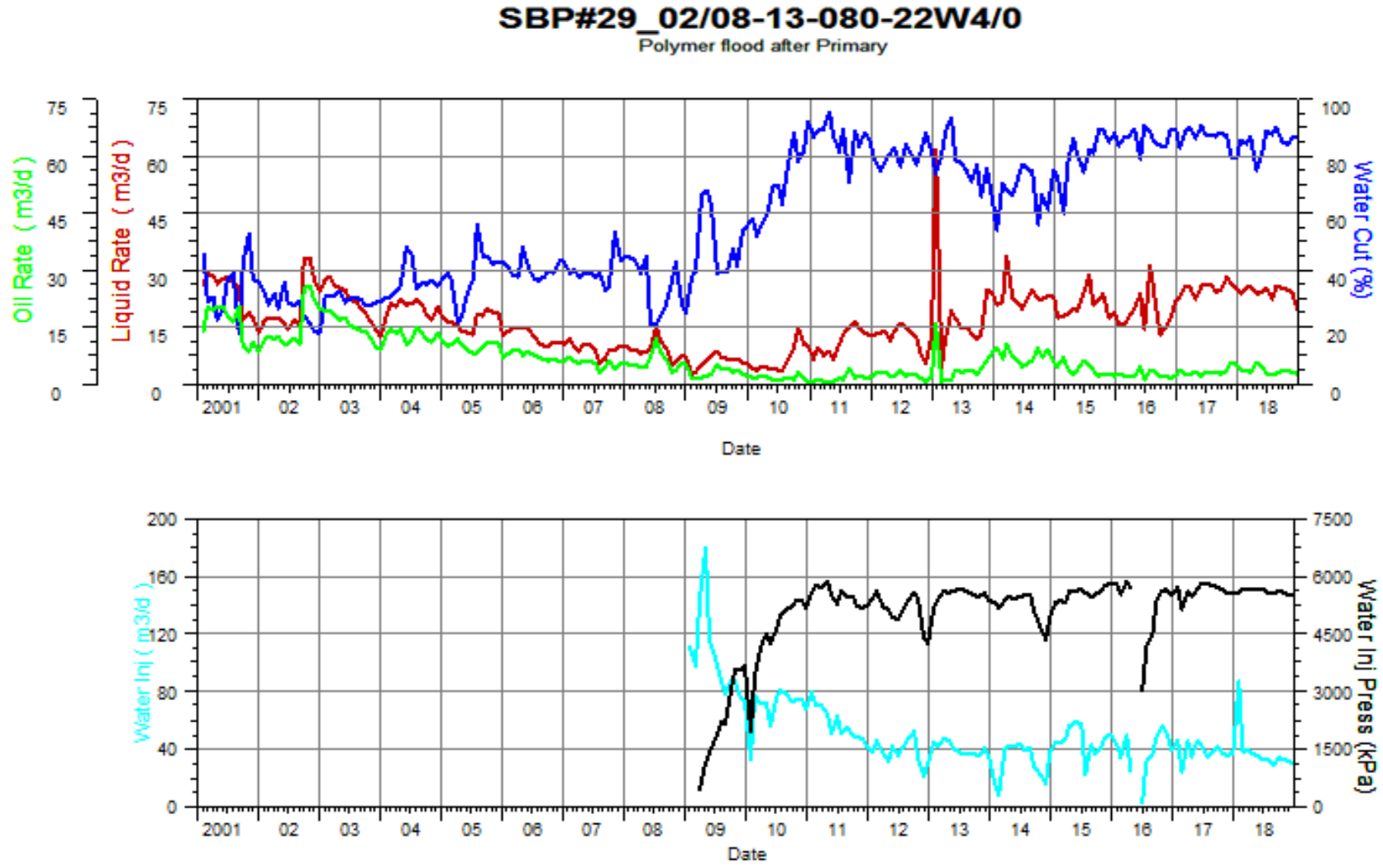
    ➢ **100/08-13-080-22W4/0 (50%)**





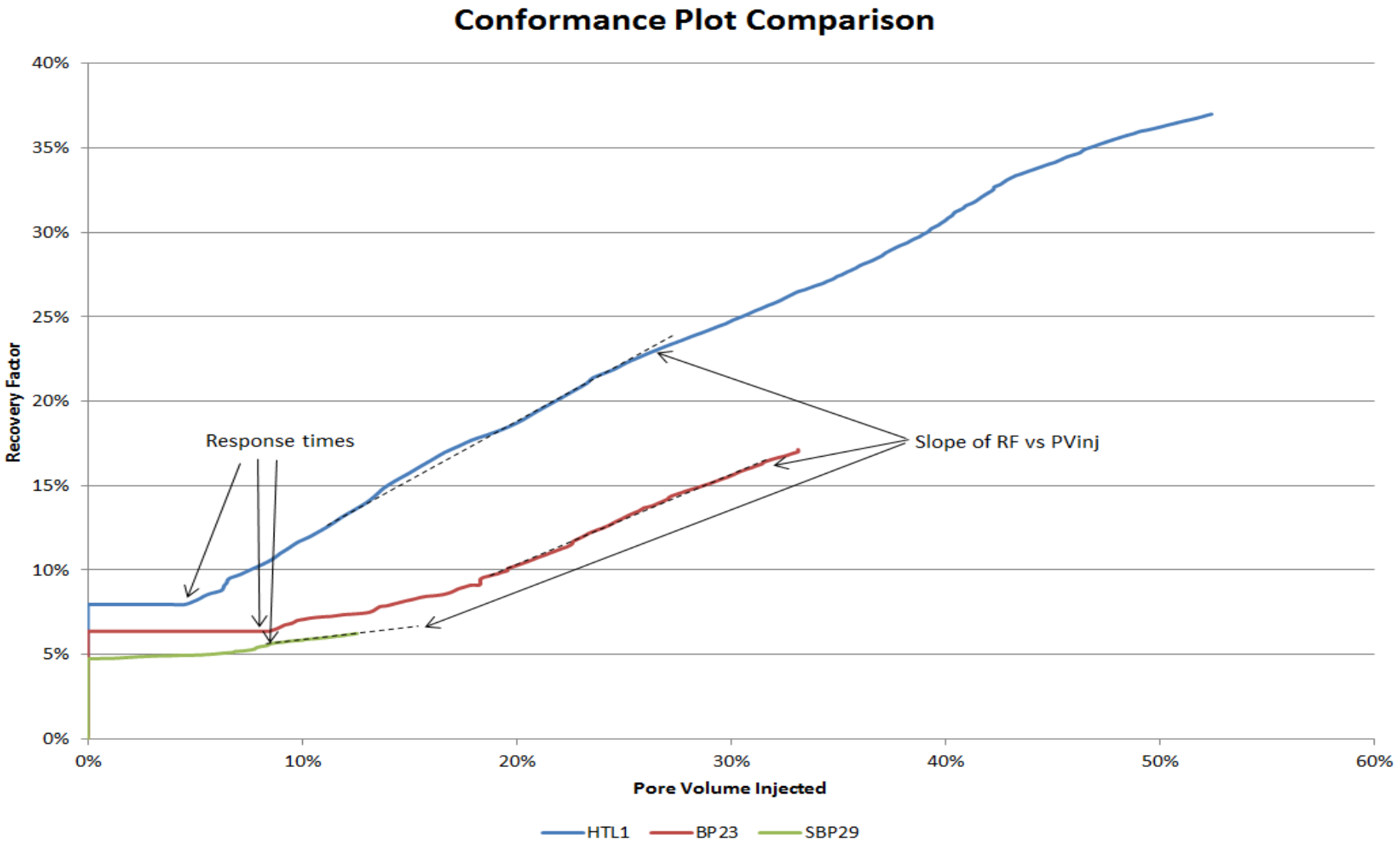
Below Average Performance – SB 29 (Approval 10423)

Canadian Natural



Summary of Good/Average/Poor Areas

Canadian Natural



Plot showing Recovery Factor (RF) versus Pore Volume (PF) Injected. Indicates effectiveness and performance of the flood.

High Viscosity Performance – SB 41 (Approval 10423)

- **SB 41 102/01-13 Pattern**
  - **Well list and allocation factors:**

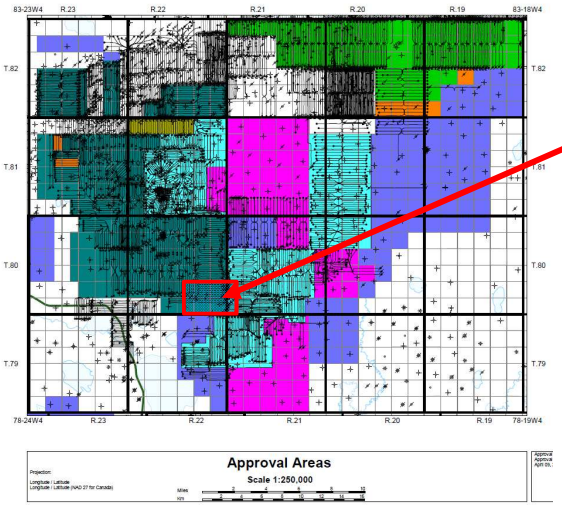
    Injectors

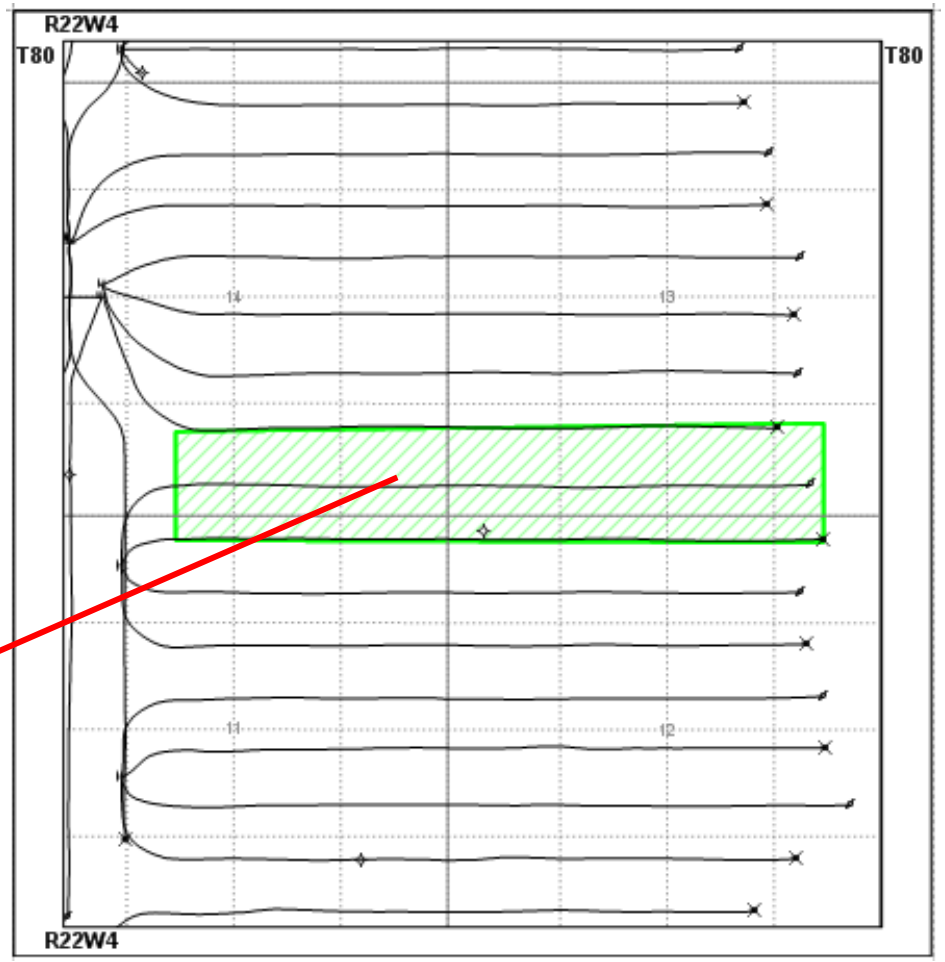
    ➢ **102/01-13-080-22W4/0 (100%)**

    Producers

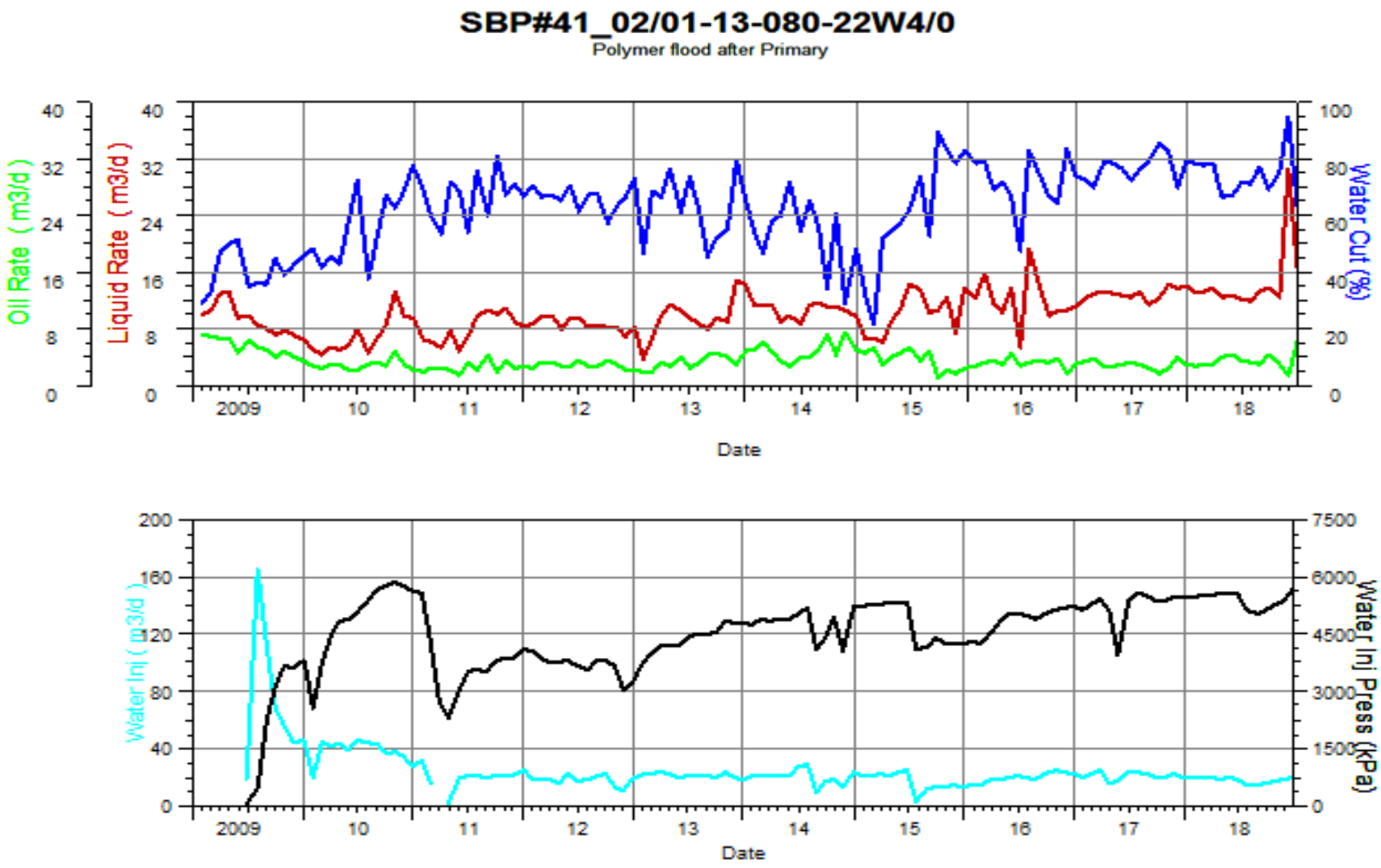
    ➢ **100/01-13-080-22W4/0 (50%)**

    ➢ **102/16-12-080-22W4/0 (50%)**





High Viscosity Performance – SB 41 (Approval 10423)



High Viscosity Performance – SB 41 (Approval 10423)

Canadian Natural

- **Experience with higher viscosity flooding has been varied but indications are that response is to be expected but is harder to predict**
  - **In the example total production from pattern has doubled in response to polymer flooding**
  - **Water cut response has been muted compared to lower viscosity examples**
- **Lower injection rates and slower response characteristic of polymer flooding higher viscosity oil.**

Cap Rock Integrity

Cap Rock Integrity

Canadian Natural

- **2018 Anomalies (5 in total)**

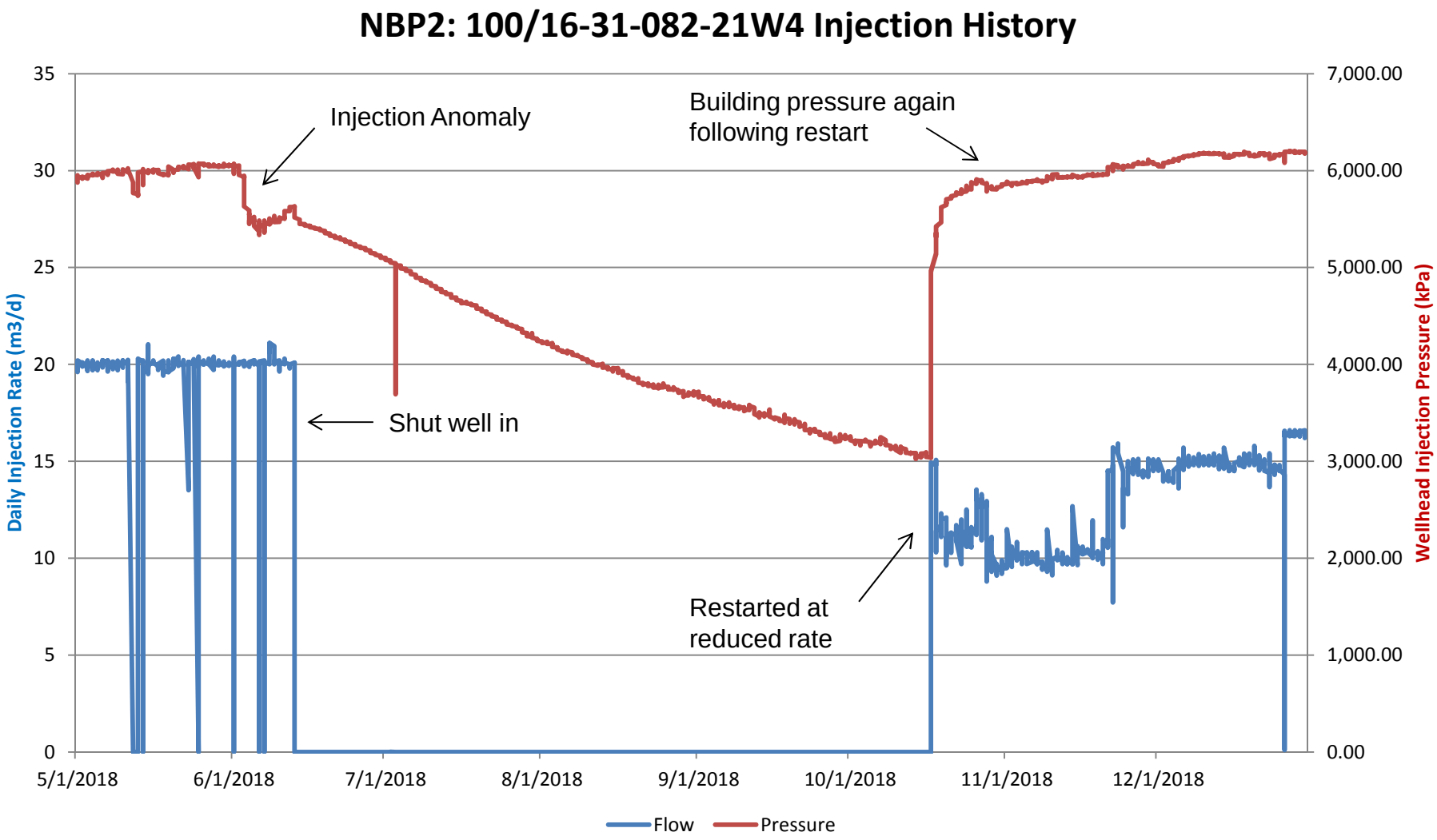
Date of Event	Location	Cause of Alarm	Operations Review of Injection Well	Initial Injection Pressure	Anomalous Pressure	Initial Injection Rate	Anomalous Rate	Cause of Anomaly
(MM/DD/YYYY)	(Pad Name and UWI)			(kPag)	(kPag)	(m3/d)	(m3/d)	
February 10, 2018	SE11 104/05-18-082-21W4	Drop in injection pressure/injection rate increase	Pressure transmitter on the water line seems to have a similar fluctuating trend suggesting meters could be freezing due to extreme temperatures.	4826	3000	45	45	Meter error
February 28, 2018	NW06 100/04-17-083-20W4	Drop in injection pressure/injection rate increase	Surface facilities and instrumentation were checked and have been found to be working properly	5775	4250	40	40	Dilation within Wabasca sand.
June 13, 2018	NBP1 102/14-31-082-21W4	Drop in injection pressure/injection rate increase	Surface facilities and instrumentation were checked and have been found to be working properly	5,850	5,280	30	45	Dilation within Wabasca sand.
June 3, 2018	NBP2 100/16-31-082-21W4	Drop in injection pressure/injection rate increase	Surface facilities and instrumentation were checked and have been found to be working properly	6,060	5,460	20	20	Dilation within Wabasca sand.
December 3, 2018	BP21 104/03-26-081-22W4	Drop in injection pressure/injection rate increase	Surface facilities and instrumentation were checked and have been found to be working properly	5750	5100	75	70	Dilation within Wabasca sand.

- **6 anomalies in 2017, 7 anomalies in 2016, 5 anomalies in 2015, 7 anomalies in 2014, 4 anomalies in 2013, 9 anomalies in 2012; 18 anomalies in 2011**

All five 2018 anomalies were fully investigated. All injectors are back on-stream under normal operating conditions and have regained pressure following the event.

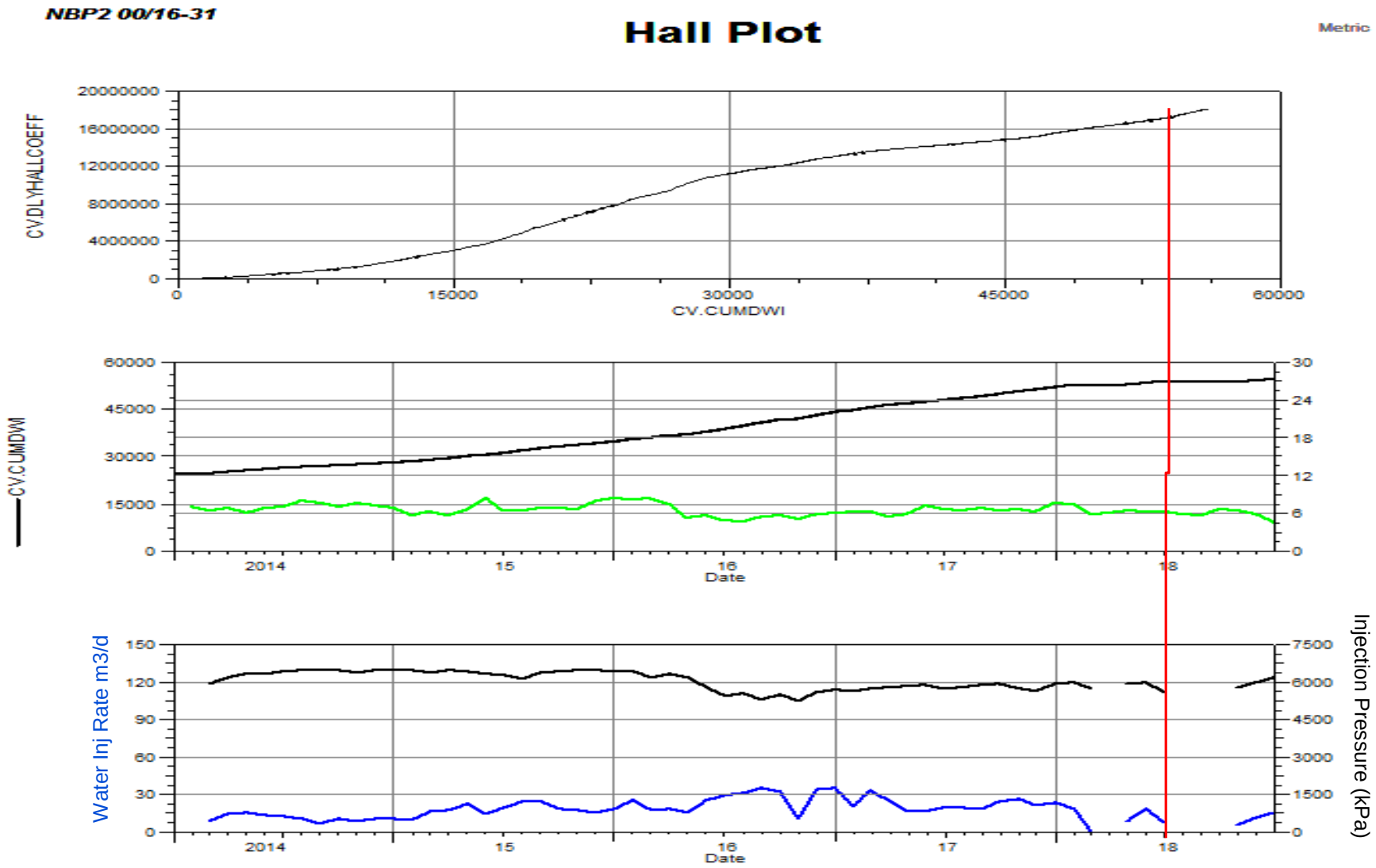
Cap Rock Integrity – NBP2: 00/16-31

Canadian Natural



00/16-31-082-21W4: Injector was shut in shortly after anomaly to allow time for the dilation to "heal". Restarted at a reduced rate and found pressure has built back up to pre-dilation levels.

Cap Rock Integrity – NBP2: 00/16-31



Hall plots are reviewed regularly to investigate potential cap rock breaches. A sudden change in the Hall Plot slope may indicate a potential issue.

Cap Rock Monitoring

Canadian Natural

- **No cap rock anomalies were recorded in the Approval 9404 area by Cenovus or CNRL in 2017. Cenovus' 2017 data was reviewed and there were no anomalies identified. This is in line with the monitoring results since injection rates and pressures were reduced in 2015.**
- **In early 2018, CNRL implemented a monitoring system in 9404 that has the same parameters and setpoints as the legacy injection system.**

Future Development Plans

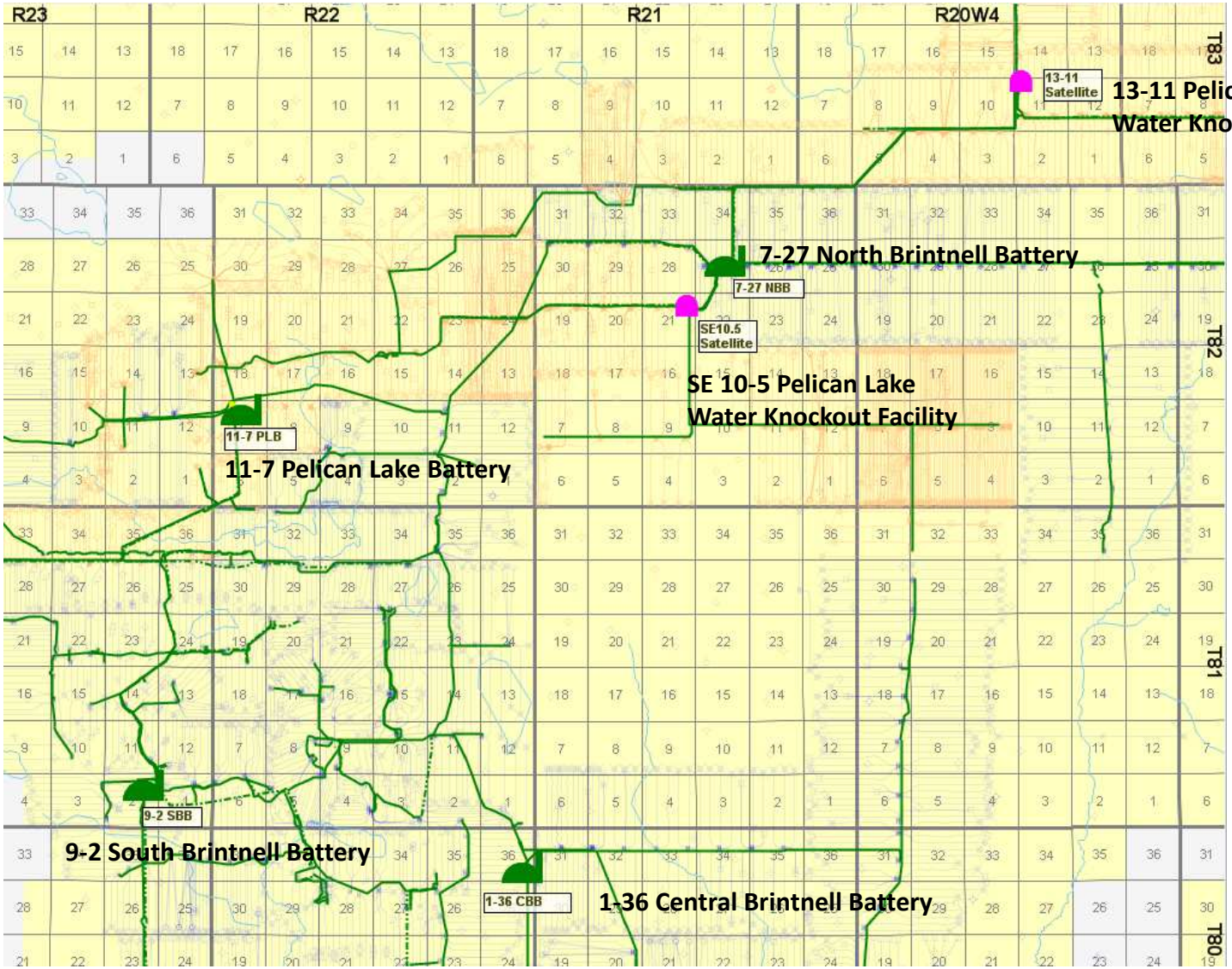
Future Development Plans

Canadian Natural

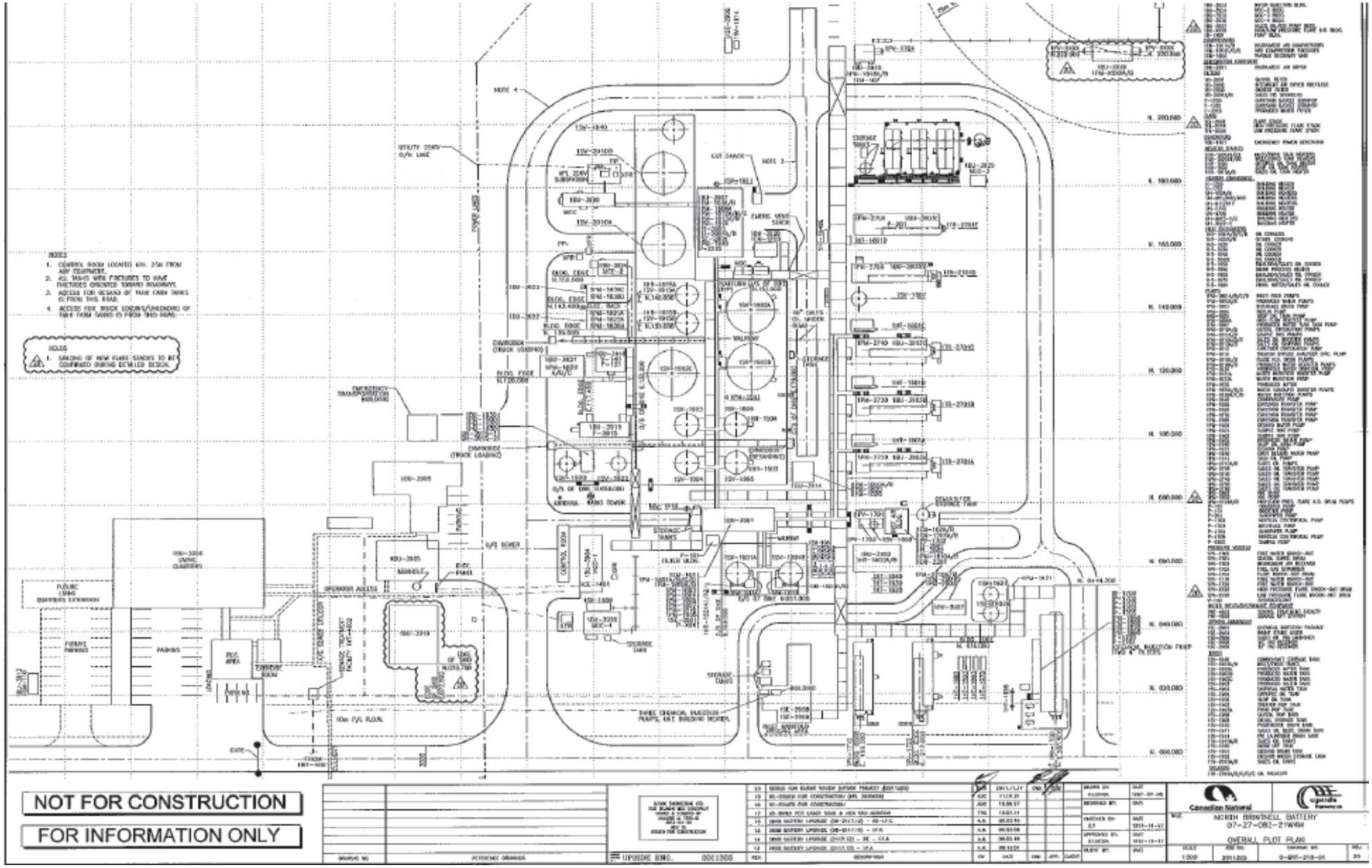
- Canadian Natural plans to continue with the expansion of the polymer flood at Brintnell over the next several years. Expansion will push the flood to the southeastern and western edges of the pool.
- The focus of this year's capital program will be infill drilling and polymer flood optimization of existing well patterns. Optimization will be achieved through continuous flood management to ensure balance and optimal recovery factor.
- CNRL received approval in 2012 to implement a surfactant pilot in the field. CNRL is not pursuing surfactant flooding at the present time.

Facilities

Brintnell / Pelican Lake Batteries

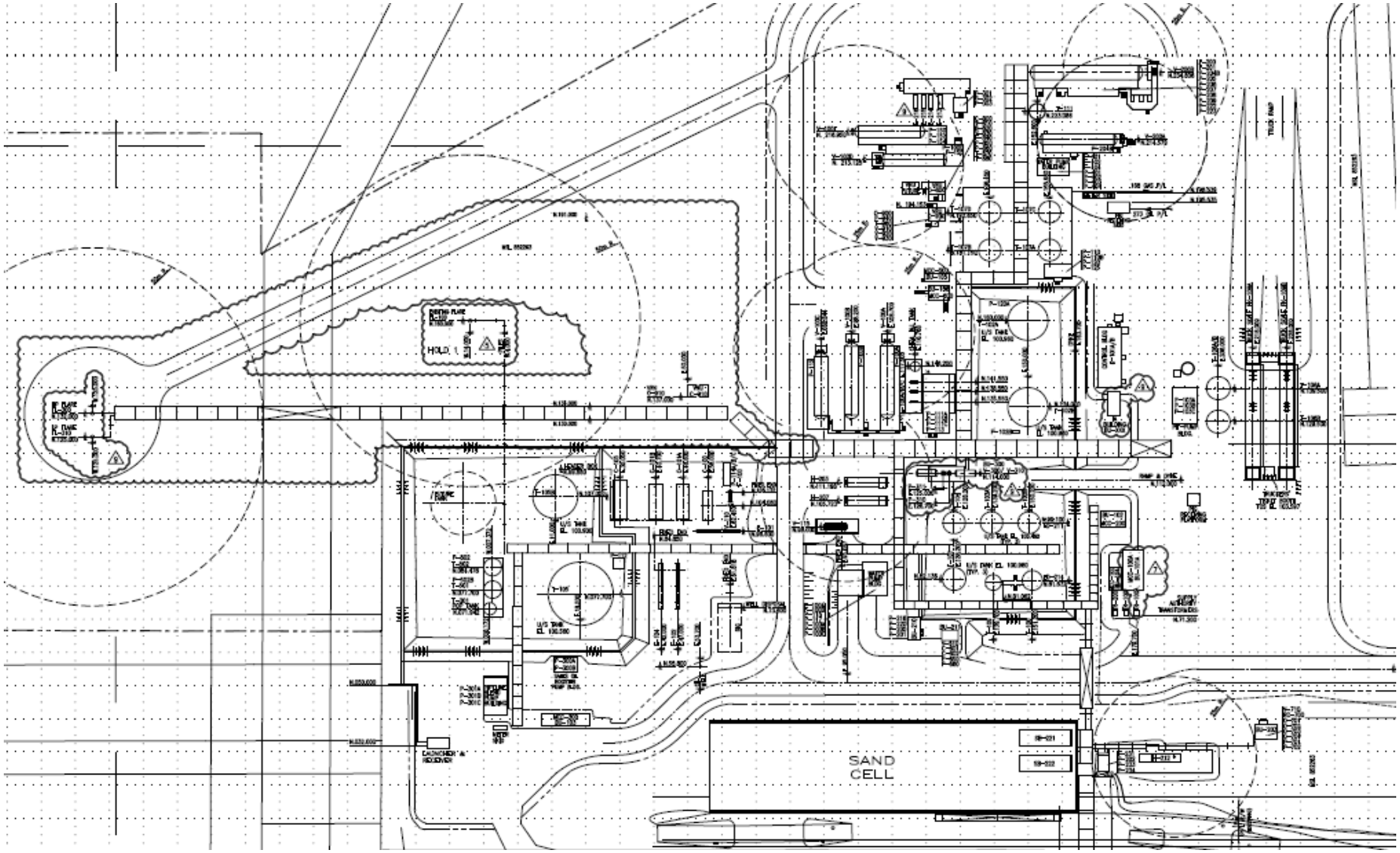


Facility: NBB 07-27-82-21W4 Battery Plot Plan

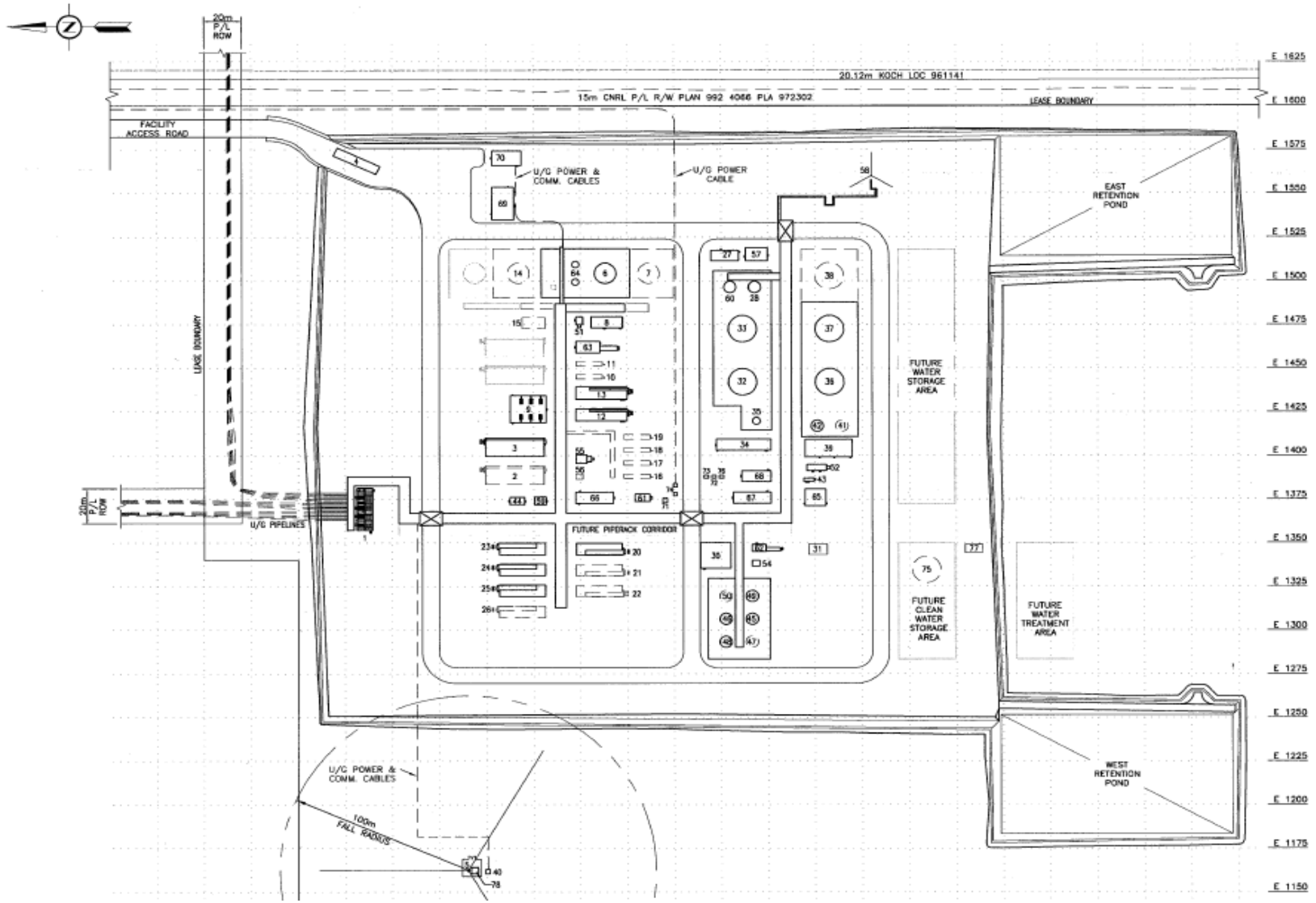


Facility: SBB 09-02-81-23W4 Battery Plot Plan

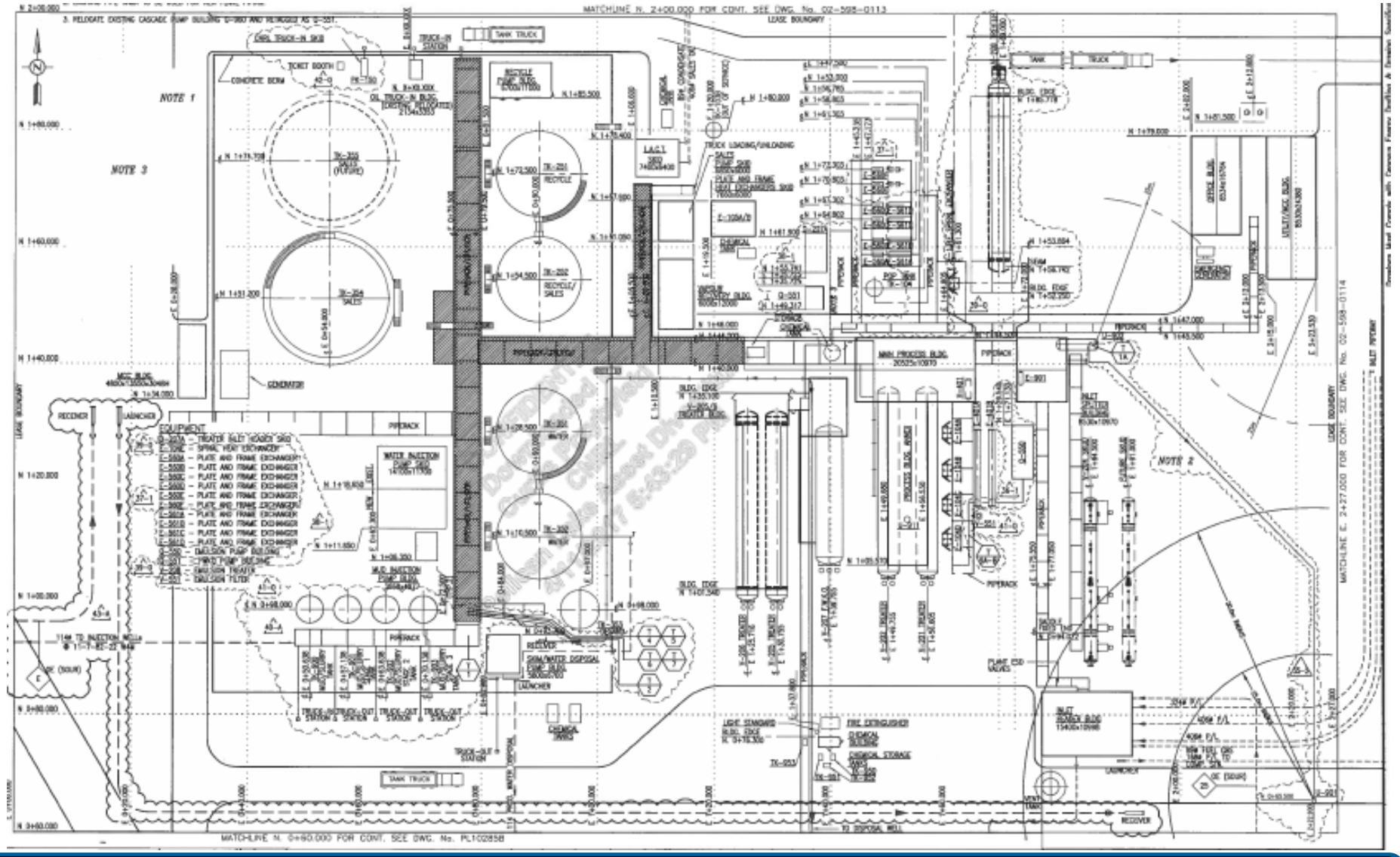
Canadian Natural



Facility: CBB 01-36-80-22W4 Battery Plot Plan

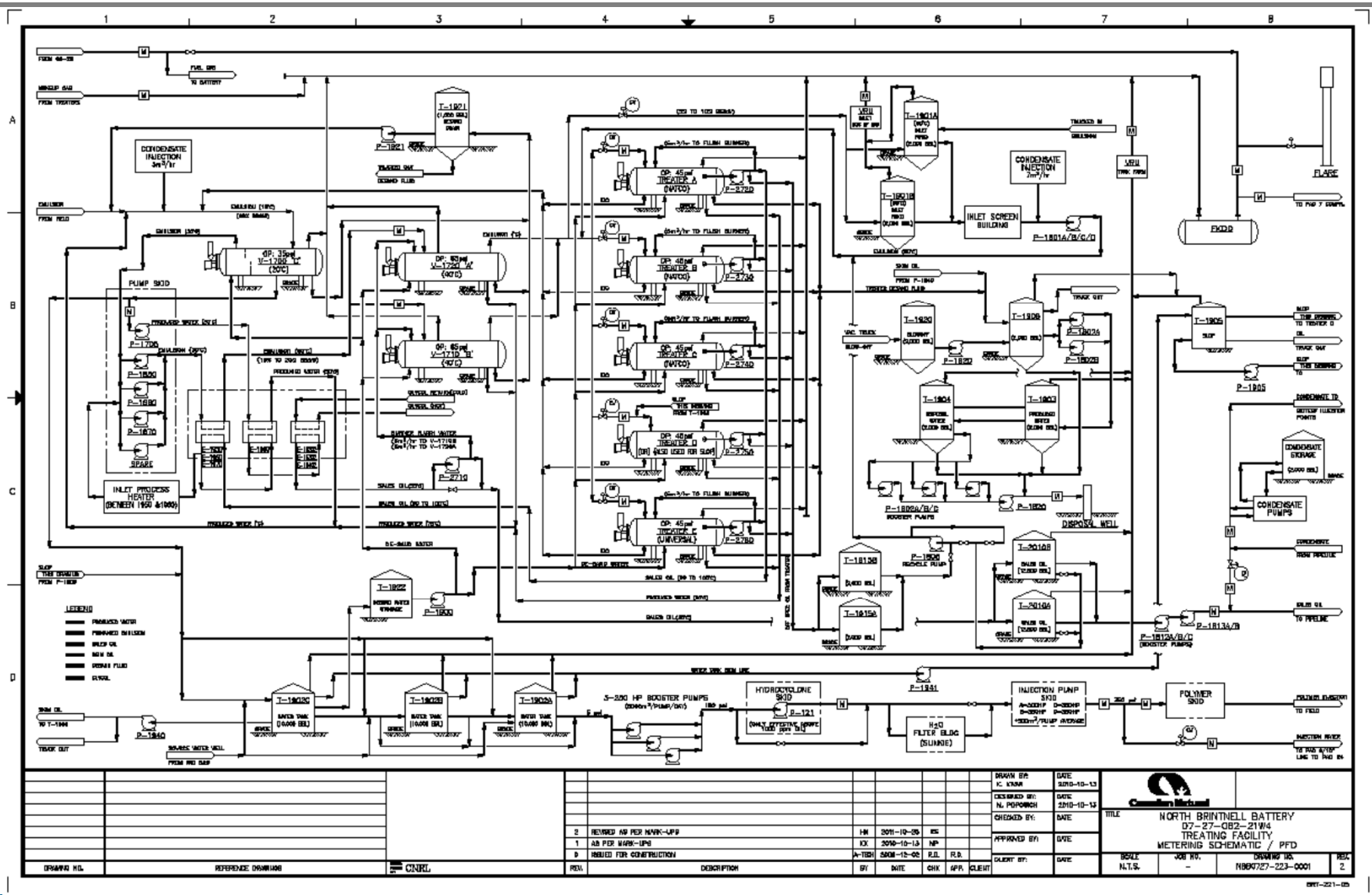


Facility: PLB 11-07-082-22W4 Battery Plot Plan



Facility: Typical Brintnell Battery PFD

Canadian Natural



Facility Modifications

- **Oil Treating:**
  - Heat integration: Install indirect heating projects to reduce OPEX.
- **Improve Water Quality:**
  - Looking at De-oiling and Filtration opportunities
- **Integrity:**
  - Continued implementing plan to rebuild existing flood areas; future flood areas to be rebuilt as the flood is expanded. Monitoring ongoing in order to prioritize.
  - Construction and routine monitoring ongoing. Working towards 2020 compliance.
  - All high risk sour pipelines have been lined as of Feb, 2014. Remaining unlined pipelines being routinely inspected.
- **Facility Interconnects:**
  - Pipeline construction underway connecting Pelican and Brintnell fields. Interconnects will allow us to offload and shut in NBB07-27 to further reduce OPEX across the Pelican and Brintnell fields.

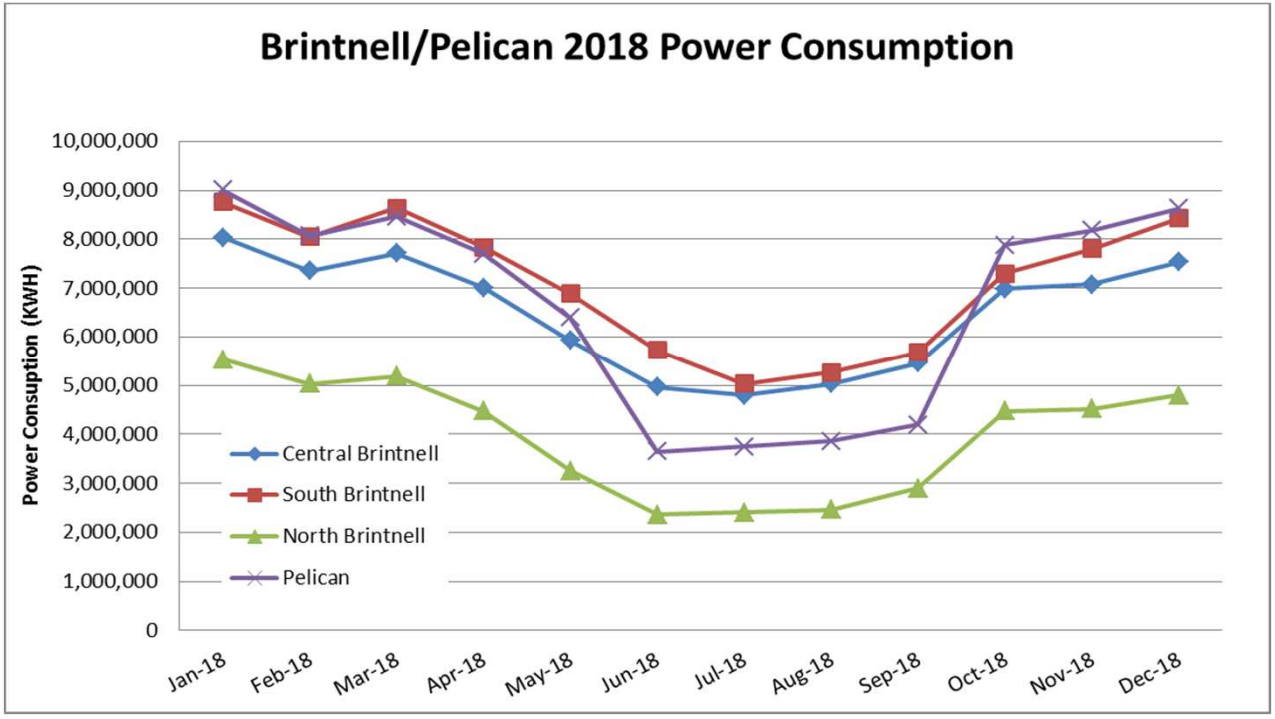
Facility Future Plans

- **Major Activities:**
  - Reactivated SE10.5 Satellite in 2018
  - Battery consolidation underway
  - Pad Rebuilds Continued
  - Future Polymer Expansions
  - Water Management Plan

Brintnell/Pelican Lake Power Consumption

Canadian Natural

Power Consumption - kWh													
	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	Total
Central Brintnell	8,034,124	7,355,753	7,712,181	7,014,212	5,927,211	4,967,581	4,798,801	5,036,468	5,453,810	6,991,731	7,074,059	7,532,757	77,898,688
South Brintnell	8,764,615	8,047,535	8,642,695	7,838,516	6,884,064	5,728,034	5,036,415	5,264,962	5,679,778	7,295,980	7,804,226	8,431,931	85,418,751
North Brintnell	5,540,393	5,026,908	5,193,101	4,473,700	3,250,620	2,366,000	2,409,364	2,457,444	2,902,414	4,476,190	4,513,006	4,793,535	47,402,675
Pelican	9,006,312	8,070,059	8,463,836	7,700,545	6,396,952	3,648,368	3,745,236	3,859,623	4,196,000	7,882,855	8,189,026	8,630,944	79,789,756
Total	31,345,444	28,500,255	30,011,813	27,026,973	22,458,847	16,709,983	15,989,816	16,618,497	18,232,002	26,646,756	27,580,317	29,389,167	290,509,870



Battery Performance - Brintnell

Canadian Natural

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
North Brintnell 7-27													
Oil Produced (m3)	705,917	809,627	959,335	988,448	957,855	835,263	1,075,836	1,027,258	937,154	900,340	644,767	670,070	599,394
Produced Water (m3)	1,374,731	1,775,300	2,096,258	2,292,879	2,386,085	1,484,277	1,795,440	1,567,398	1,772,860	1,618,804	1,325,432	1,669,135	1,411,728
Recycle Rates (m3)	1,220,482	1,779,160	2,057,161	2,238,740	2,330,418	1,453,371	1,786,316	1,559,325	1,772,860	1,618,804	1,325,432	1,606,228	1,383,084
Produce Recycle	88.8%	100.2%	98.1%	97.6%	97.7%	97.9%	99.5%	99.5%	100.0%	100.0%	100.0%	96.2%	**98.0%**
Average Daily Recycle (m3/d)	3,344	4,874	5,621	6,134	6,385	3,982	4,881	4,272	4,857	4,435	3,621	4,401	3,789
Average Disposal Rates (m3/d)	423	-11	107	148	153	85	25	22	0	0	0	172	78
Central Brintnell 12-09													
Oil Produced (m3)	568,076	603,657	569,149	533,178	528,267	492,495	546,580	237,914					
Produced Water (m3)	167,755	193,349	267,607	378,988	323,086	402,772	402,822	143,284					
Recycle Rates (m3)	0	26,826	159,288	346,418	301,720	357,025	329,781	104,583	**Battery converted to trucked in facility May 15, 2013**				
Produce Recycle	0.0%	13.9%	59.5%	91.4%	93.4%	88.6%	81.9%	**73.0%**					
Average Daily Recycle (m3/d)	0	73	435	949	827	978	901	775					
Average Disposal Rates (m3/d)	460	456	296	89	59	125	200	106					
Central Brintnell 01-36													
Oil Produced (m3)								584,297	780,513	951,411	1,298,572	1,161,176	1,115,119
Produced Water (m3)								638,159	1,946,244	2,347,871	2,570,249	2,475,657	2,471,567
Recycle Rates (m3)	**Battery Commissioned May 2013 - first oil May 15, 2013**							565,099	1,615,263	1,908,506	2,150,738	2,028,121	2,061,624
Produce Recycle								88.6%	83.0%	81.3%	83.7%	81.9%	**83.4%**
Average Daily Recycle (m3/d)								2,457	4,425	5,229	5,876	5,556	5,648
Average Disposal Rates (m3/d)								318	907	1,204	1,149	1,340	1,123
South Brintnell 9-02													
Oil Produced (m3)	441,942	575,306	620,631	602,897	645,053	782,847	1,080,977	1,055,952	1,220,367	1,100,589	840,998	887,192	801,084
Produced Water (m3)	341,034	413,480	501,318	544,390	776,095	1,014,789	1,505,539	1,494,985	1,205,459	1,278,060	1,438,774	1,566,380	1,773,319
Recycle Rates (m3)	0	22,465	173,011	204,727	173,120	823,109	1,412,965	1,384,546	1,091,455	1,172,557	1,173,748	1,375,245	1,411,632
Produce Recycle	0.0%	5.4%	34.5%	37.6%	22.3%	81.1%	93.9%	92.6%	90.5%	91.7%	81.6%	87.8%	**79.6%**
Average Daily Recycle (m3/d)	0	62	473	561	474	2,255	3,861	3,793	2,990	3,212	3,207	3,768	3,867
Average Disposal Rates (m3/d)	934	1,071	897	931	1,652	525	253	303	312	289	726	524	991
Total Volumes													
Oil Produced (m3)	1,715,934	1,988,589	2,149,115	2,124,523	2,131,175	2,110,605	2,703,393	2,905,421	2,938,034	2,952,339	2,784,337	2,718,438	2,515,597
Produced Water (m3)	1,883,520	2,382,129	2,865,183	3,216,258	3,485,267	2,901,838	3,703,800	3,843,826	4,924,563	5,244,736	5,334,455	5,711,173	5,656,613
Recycle Rates (m3)	1,220,482	1,828,451	2,389,460	2,789,885	2,805,257	2,633,505	3,529,061	3,613,553	4,479,577	4,699,867	4,649,918	5,009,594	4,856,340
Fresh Water (m3)	512,766	1,026,684	1,493,264	1,433,242	1,553,045	1,479,780	1,876,840	2,041,938	2,028,731	1,937,567	1,916,943	2,162,684	108,906
Brackish Water (m3) - Grosmont	1,438,110	1,661,989	764,664	2,963,684	3,999,848	6,274,361	4,780,011	3,800,437	3,666,120	3,133,047	2,276,529	1,959,507	21,860
Disposal Volume (m3)	663,038	553,678	475,723	426,373	680,010	268,333	174,739	222,200	464,554	544,868	684,537	743,035	743,035
Total Produce Recycle (%)	64.8%	76.8%	83.4%	86.7%	80.5%	90.8%	95.3%	94.0%	91.0%	89.6%	87.2%	87.7%	**85.9%**
Average Daily Recycle (m3/d)	3,344	5,009	6,529	7,644	7,686	7,215	9,642	9,900	12,273	12,876	12,705	13,725	13,305
Average Daily Disposal (m3/d)	1,817	1,517	1,300	1,168	1,863	735	477	748	1,219	1,493	1,875	2,036	2,193

Battery Performance – Pelican Lake

Canadian Natural

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Pelican Lake 11-07													
Oil Produced (m3)	1,596,488	1,701,363	1,598,118	1,443,895	1,340,247	1,185,437	1,311,462	1,407,459	1,446,857	1,416,547	1,228,548	1,158,641	1,152,186
Produced Water (m3)	3,557,361	4,558,956	5,654,792	5,653,441	4,645,123	3,816,945	4,435,326	4,497,339	4,920,892	4,511,525	3,841,121	3,553,250	4,060,672
Recycle Rates (m3)	2,863,450	3,234,277	4,811,599	4,810,249	4,256,039	3,684,090	4,188,103	4,256,695	4,753,603	4,381,028	3,711,085	3,428,883	3,953,812
Produce Recycle	80.5%	70.9%	85.1%	85.1%	91.6%	96.5%	94.4%	94.6%	96.6%	97.1%	96.6%	96.5%	97.4%
Average Daily Recycle (m3/d)	7,845	8,861	13,182	13,179	11,660	10,093	11,474	11,662	13,024	12,003	10,167	9,394	10,832
Average Disposal Rates (m3/d)	1901	3629	2310	2310	1066	364	677	659	458	358	356	341	293

Measuring and Reporting

Measurement and Reporting

Canadian Natural

- **Methods of Measurement:**
  - Oil and Water: flow meters and test tanks (Primary only)
  - Solution Gas: orifice meters/GOR Testing
- **Typical Well Testing:**
  - Frequency and duration: well testing as per Directive 17.
  - Meter installations have replaced test tanks (high volume and flood producers).
    - Part of all new pad expansions and rebuilds.
- **2018 Field Proration Factors:**
  - Meets directive 17 requirements
    - Brintnell:
      - Oil – 0.87, Water – 1.13
    - Pelican Lake:
      - Oil – 0.85, Water – 0.98

Measurement and Reporting – Continued

Canadian Natural

- **Optimization:**
  - Remove test tanks and install flow meters on pads/wells
    - Increase testing frequency and duration
    - Perform testing inline
    - Eliminates gas venting from tanks
    - Reduces fuel gas consumption
    - Reduces potential for spill
  - Standardize testing equipment across field
    - Reduce downtime and maintenance
    - Increase reliability in calibration
    - Improve & revise BS&W testing procedures for better accuracy

Gas Volumes - Update

Canadian Natural

Brintnell

Gas Volumes (e3m3)	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	2018 Total
DIFF	-	-	-	-	-	-	-	-	-	-	-	-	-
DISP	3,448	3,384	3,583	3,556	3,620	3,067	3,082	3,179	3,039	3,350	3,115	2,942	39,364
FLARE	126	114	95	48	46	50	69	96	87	73	50	82	937
FUEL	3,262	3,002	3,170	2,916	2,568	2,230	2,240	2,354	2,577	2,910	2,914	2,879	33,022
PROD	4,017	3,871	4,211	4,103	4,157	3,602	3,554	3,670	3,510	3,715	3,459	3,398	45,266
REC	3,087	2,867	2,900	2,688	2,347	2,005	2,101	2,221	2,449	2,878	2,870	2,826	31,238
VENT	268	237	264	270	270	260	265	262	256	259	249	321	3,181

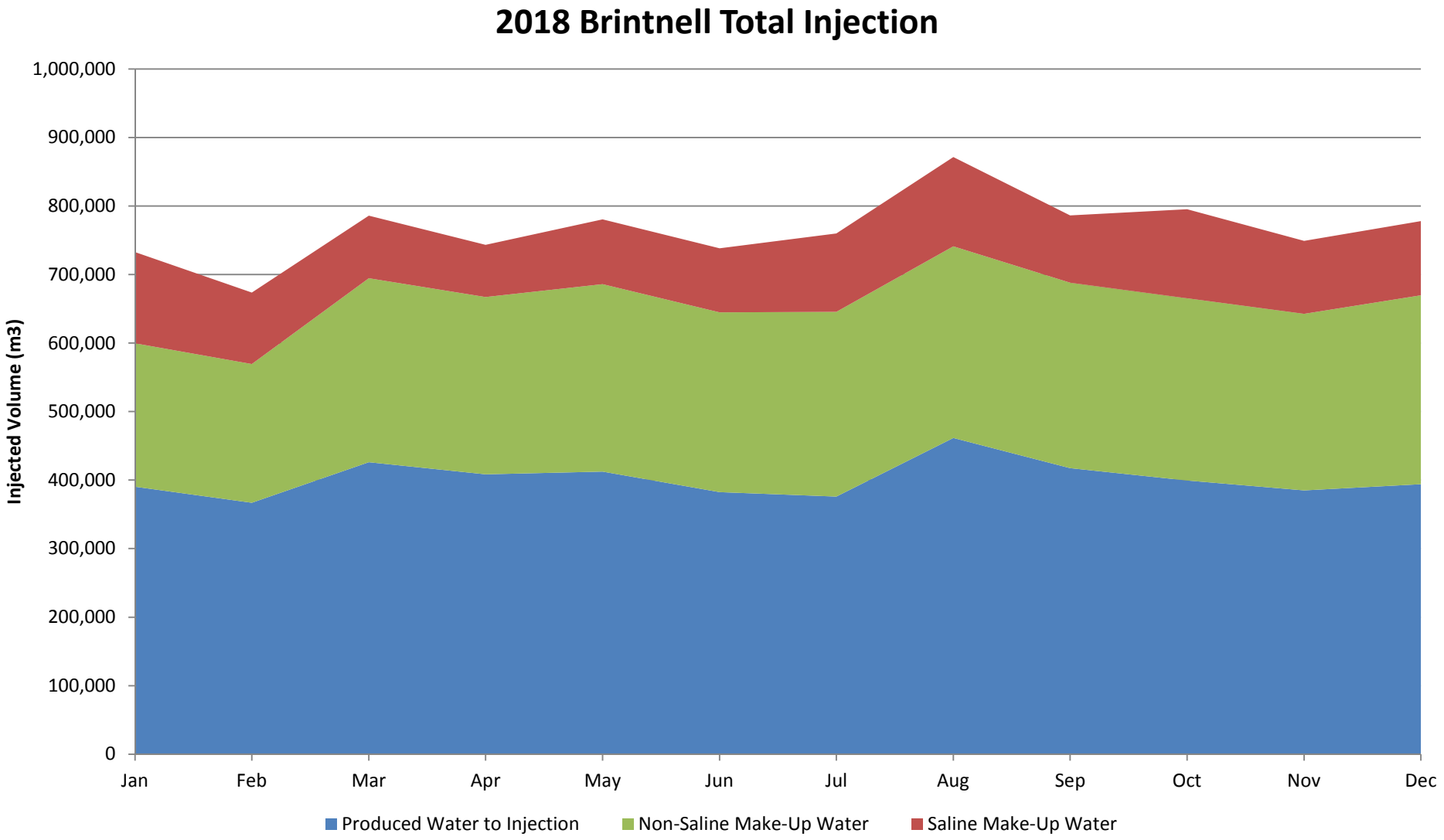
Pelican Lake

Gas Volumes (e3m3)	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	2018 Total
DIFF	-	-	-	-	-	-	-	-	-	-	-	-	-
DISP	4	4	3	2	1	1	1	1	2				19
FLARE	31	29	38	33	2	8	13	12	11	23	20	19	238
FUEL	1,429	1,238	1,477	1,439	1,439	1,391	1,238	1,133	1,197	1,499	1,532	1,689	16,699
PROD	778	675	795	873	950	763	806	685	777	1,222	1,199	1,144	10,666
PURREC						44	40	55	49	45	46	40	318
REC	883	752	897	769	666	761	575	576	557	502	496	812	8,245
VENT	197	157	175	169	174	166	169	171	171	247	190	288	2,272

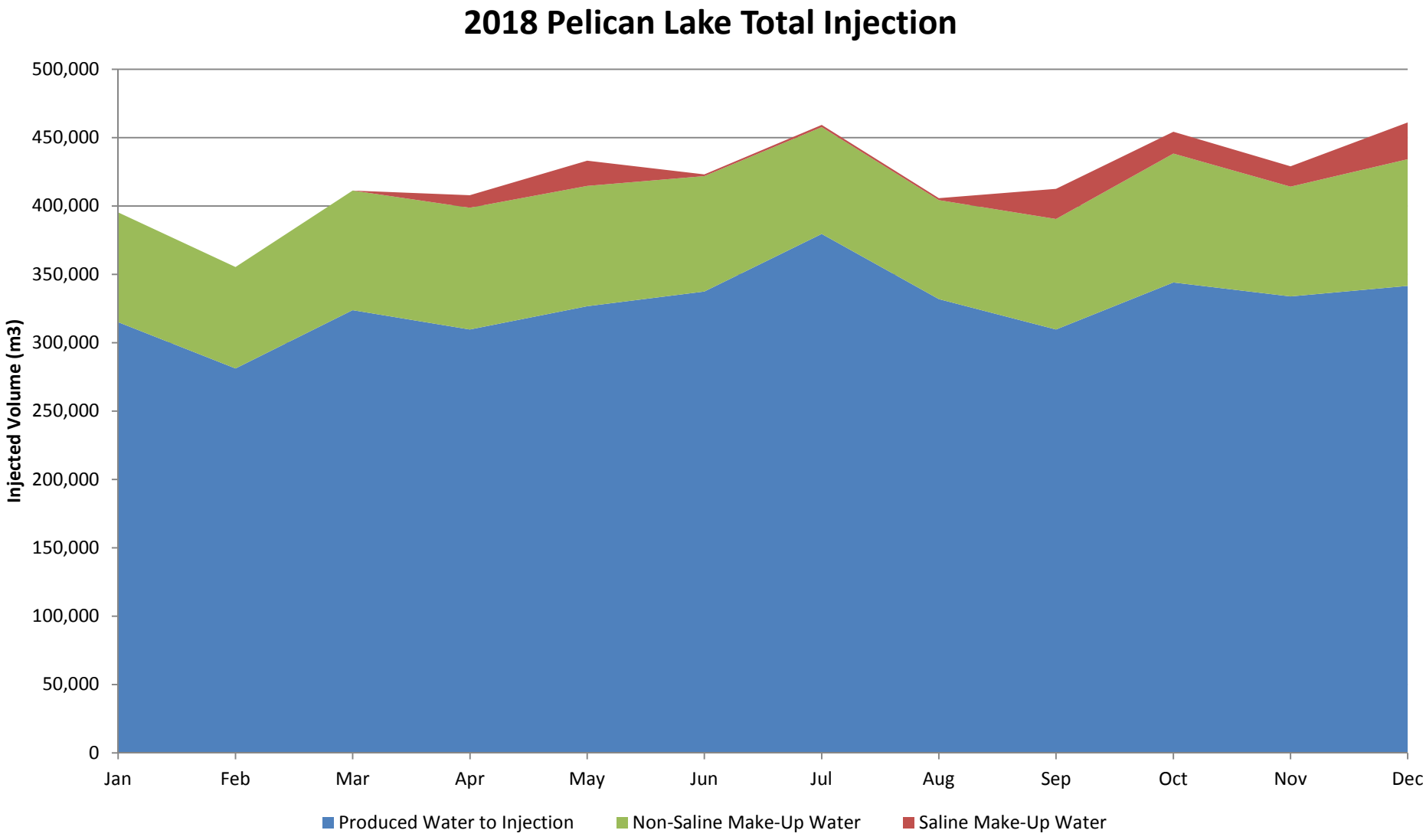
- Produced gas is captured, processed and used throughout the field as consumable fuel gas.
- Venting only occurs at the well leases when D-60 requirements have been approved by the AER. No sour gas vented.

Water Use

Brintnell Total Injection



Pelican Lake Total Injection



2018 Injection Water Summary

Canadian Natural

Brintnell

2018 Polymer Injection Volumes (m³)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Produced Water to Injection	390,276	367,046	426,191	408,556	412,257	382,476	375,844	461,317	417,611	399,509	384,853	393,998
Non-Saline Make-Up Water	209,426	202,158	268,214	258,584	273,575	262,183	269,804	279,749	270,515	265,977	257,714	275,714
Saline Make-Up Water	133,206	104,466	91,315	76,241	94,754	93,581	114,268	130,507	98,210	129,677	106,609	108,051
Total	732,908	673,670	785,721	743,381	780,586	738,239	759,916	871,573	786,336	795,163	749,176	777,763

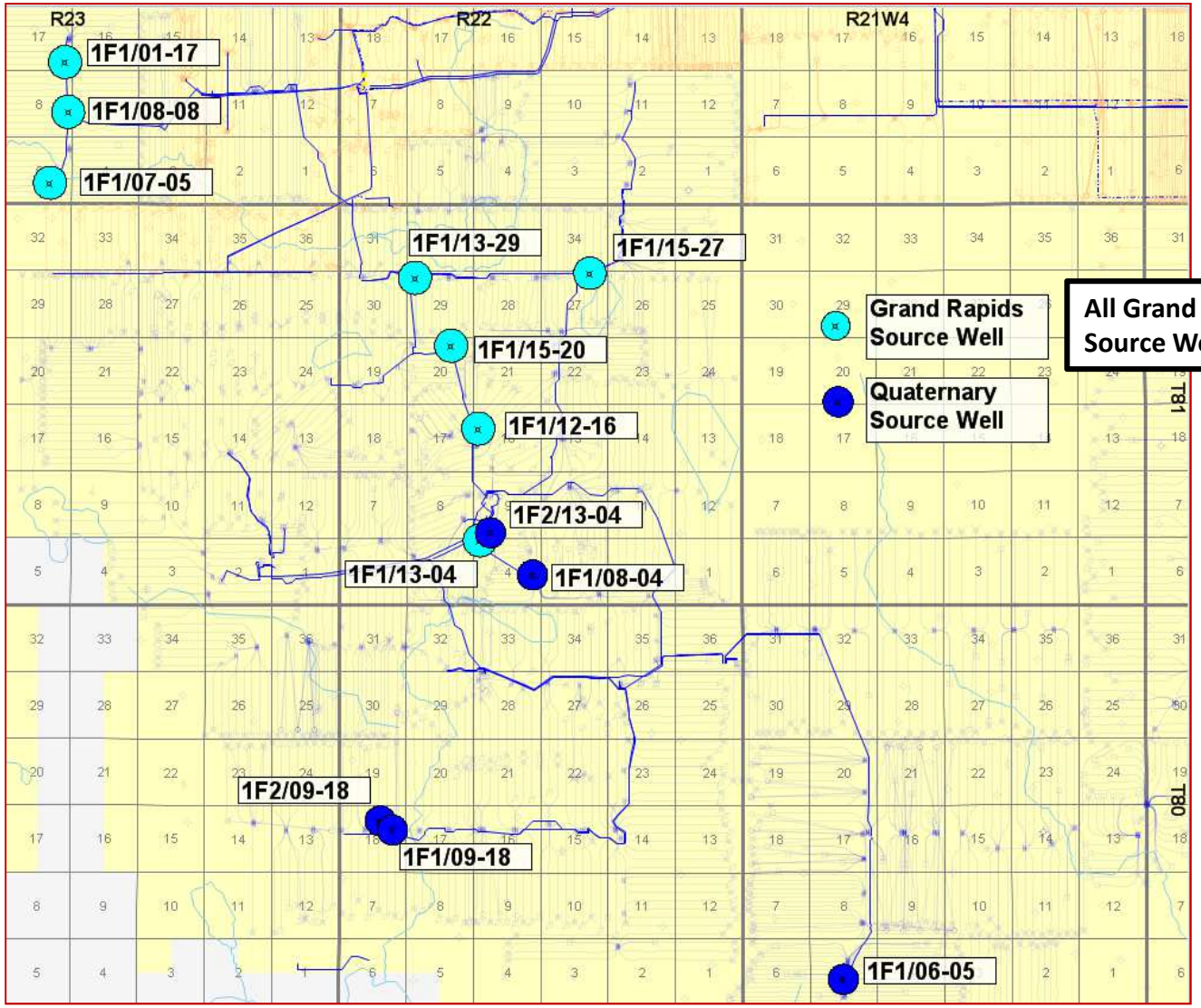
Total Injection Volumes (m³)	2010		2011		2012		2013		2014		2015		2016		2017		2018	
Produced Water to Injection	3,485,267	39%	2,901,838	27%	3,388,006	34%	3,522,671	38%	4,390,618	44%	4,617,604	48%	4,507,036	52%	4,946,868	55%	4,819,935	52%
Non-Saline Make-Up Water	1,553,045	17%	1,479,780	14%	1,876,840	19%	2,041,938	22%	2,028,731	20%	1,937,567	20%	1,916,943	22%	2,162,684	24%	3,093,614	34%
Saline Make-Up Water	3,999,848	44%	6,274,361	59%	4,780,011	48%	3,800,437	41%	3,666,120	36%	3,133,047	32%	2,276,529	26%	1,959,507	22%	1,280,884	14%
Total	9,038,160		10,655,979		10,044,856		9,365,047		10,085,470		9,688,218		8,700,507		9,069,059		9,194,433	

Pelican Lake

2018 Injection Volumes (m³)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Produced Water to Injection	314,939	281,190	323,735	309,569	326,618	337,353	379,491	331,874	309,571	343,961	333,722	341,571
Non-Saline Make-Up Water	80,339	74,087	87,396	89,131	88,077	84,454	78,202	72,277	80,897	94,270	80,275	92,661
Saline Make-Up Water	0	0	0	9,139	18,345	1,208	1,535	1,591	21,990	16,056	14,881	26,732
Total	395,277	355,277	411,131	407,840	433,040	423,016	459,228	405,742	412,458	454,287	428,879	460,964

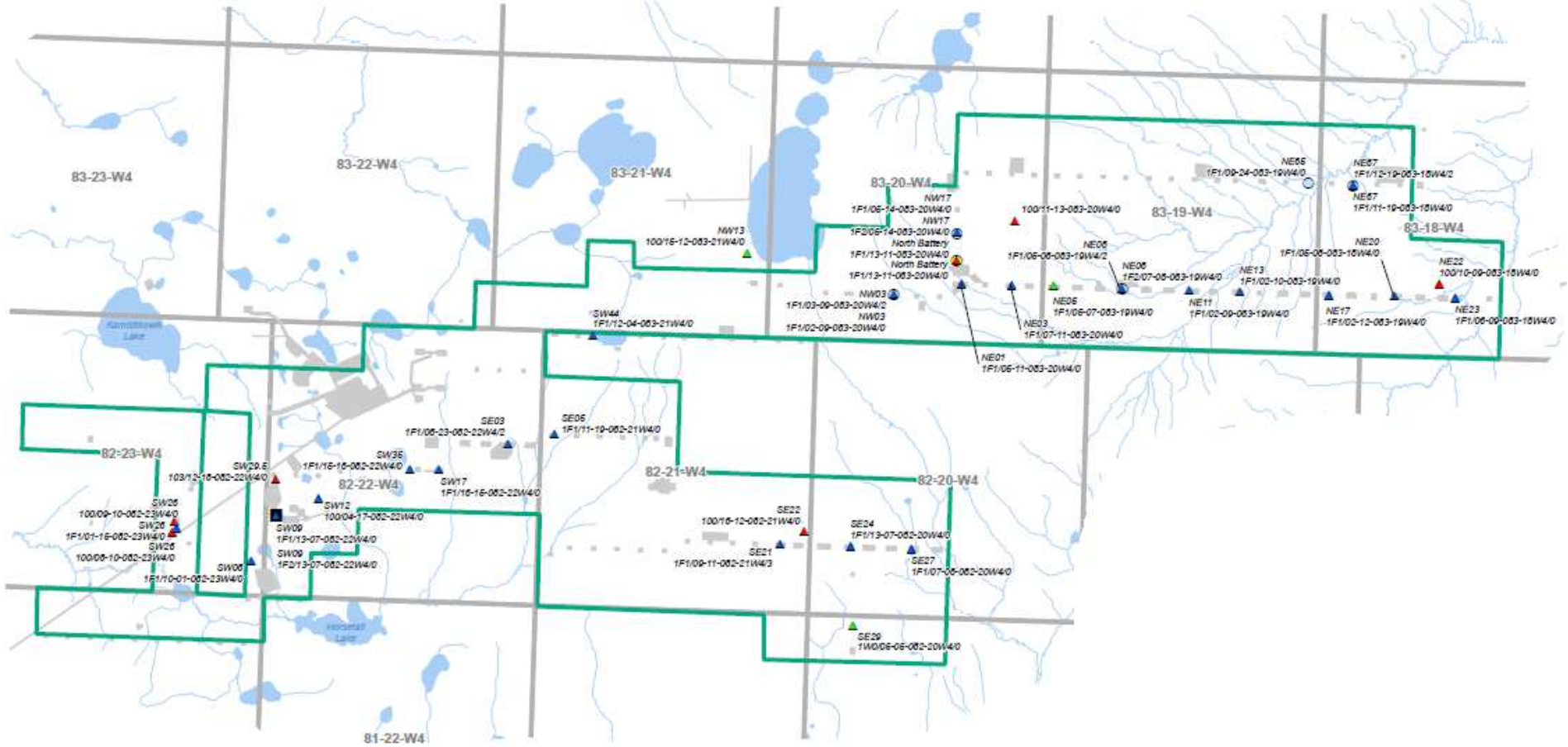
Total Injection Volumes (m³)	2010		2011		2012		2013		2014		2015		2016		2017		2018	
Produced Water to Injection	4,256,039	60%	3,684,090	64%	4,188,103	56%	4,256,695	49%	4,753,603	44%	4,381,028	57%	3,711,085	70%	3,428,883	73%	3,953,812	78%
Non-Saline Make-Up Water	684,010	10%	803,000	14%	953,380	13%	1,132,595	13%	1,369,845	20%	1,078,575	14%	571,955	11%	570,130	12%	1,001,925	20%
Saline Make-Up Water	2,207,885	31%	1,270,930	22%	2,403,890	32%	3,220,395	37%	4,163,555	36%	2,224,675	29%	1,027,475	19%	713,210	15%	111,325	2%
Total	7,147,934		5,758,020		7,545,373		8,609,685		10,085,470		7,684,278		5,310,515		4,712,223		5,067,062	

Non-Saline Well Locations - Brintnell



Non-Saline Well Locations – Pelican Lake

Canadian Natural



Non-Saline Water Use - Brintnell

Canadian Natural

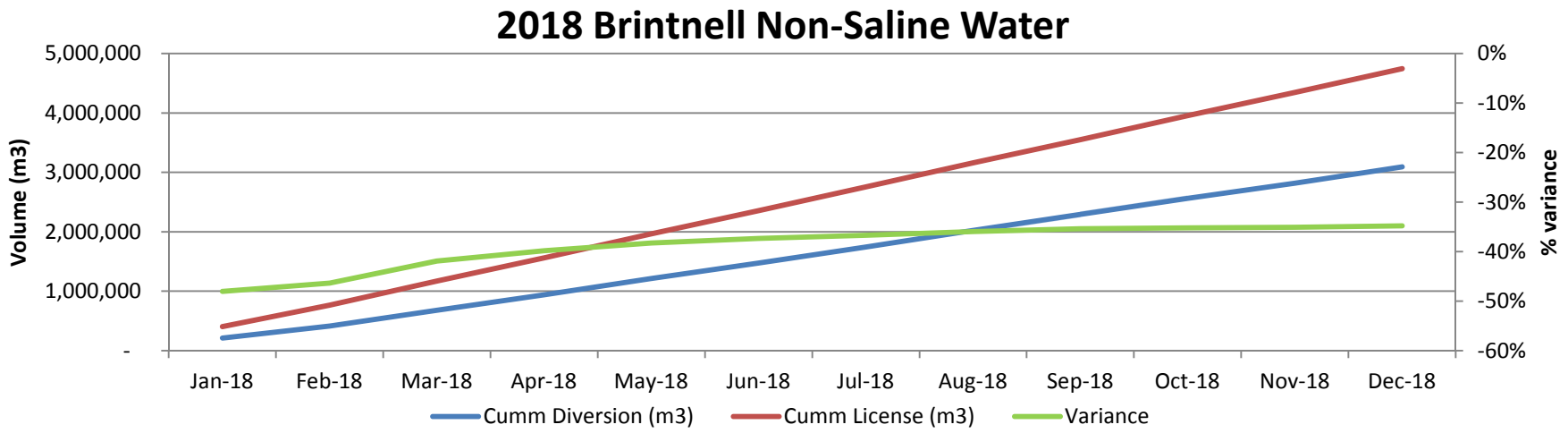
- Canadian Natural currently has two licenses with Alberta Energy Regulator for the diversion of non-saline water for injection
  - 00249595-02-00. 2,151,310 m3 with expiry date of 2024-01-25
  - 00329572-00-00. 1,460,000 m3 with expiry date of 2019-05-25
- Working to optimize the use of non-saline water for polymer hydration to maximize its benefit
- In Compliance with Alberta Environment and Water regarding monthly reporting, observation well monitoring, and all other terms of the License.

Brintnell Non-Saline Water Make up Wells

Well Name	UWI	Production Interval	Maximum Rate of Diversion (m3/d)	Maximum Annual Diversion Volume (m3)	2018 Average Diversion Volumes (m3/d)
WSW BP25 - QUAT	100/08-04-081-22W4	53.3-65.2	818	247,470	489
WSW BP11 - QUAT	1F2/13-04-081-22W4	34.3-38.8	1200	153,300	397
WSW BP2 - GR	1AA/12-16-081-22W4	270.6-317.6	1200	1,750,540	790
WSW BP11 - GR	1F1/13-04-081-22W4	258.5-315.9	812		732
WSW HTP2 - GR	1F1/13-29-081-22W4	265.8-326.8	2250		1350
WSW HTP6 - GR	1F1/15-27-081-22W4	264.8-317.8	468		321
WSW NHTP16 - GR	1F1/01-17-082-23W4	253.0-310.0	933		402
WSW WBP30 - GR	1F1/15-20-081-22W4	260-315	750		248
WSW NHP13 - GR	1F1/07-05-082-23W4	232-302	325		227
WSW NHP15 - GR	1F1/08-08-082-23W4	243-305	225		151
WSW CB2A - QUAT	1F1/06-05-080-21 W4	160.0 - 166.0	1340	1,460,00	965
WSW SBP36 - QUAT	1F2/09-18-080-22 W4	206.7 - 215.4	1340		1203
WSW SBP36 – QUAT	1F3/09-18-080-22 W4	152.3 - 161.0	1340		1202

1,540,032

1,230,231



Pelican Lake Non-Saline Water

At this time CNRL is evaluating the future potential to expand polymer to additional areas of the field. This would expand the water sourcing demands and use a higher portion of the available license. As more certainty is developed we would be in a better position to make long term adjustments to our licensed diversions.

- **In 2018, CNRL used 31.7% of the total licensed volume. This is up from 2017 rate of 17%.**
- **2017 had low utilization as a result of less water being required for polymer hydration with Cenovus' decision to scale back the polymer flood at that time. Polymer flood has since been ramped back up accounting for the increase in utilization for 2018**

	Grand Rapids 'A'	Grand Rapids 'B'	Total
Annual Licensed Diversion (m3)	290,723	2,647,022	2,937,745
Annual Diversion (m3)	29,038	961,758	990,796
Actual % License Used	10%	36.3%	33.7%

- **Grand Rapids 'A'**
  - **2018, water diverted from 1 of 4 source wells**
- **Grand Rapids 'B'**
  - **2018, water diverted from 15 of 20 source wells**

Water Chemistry - Brintnell

Canadian Natural

- **Non-Saline Water Source Wells**

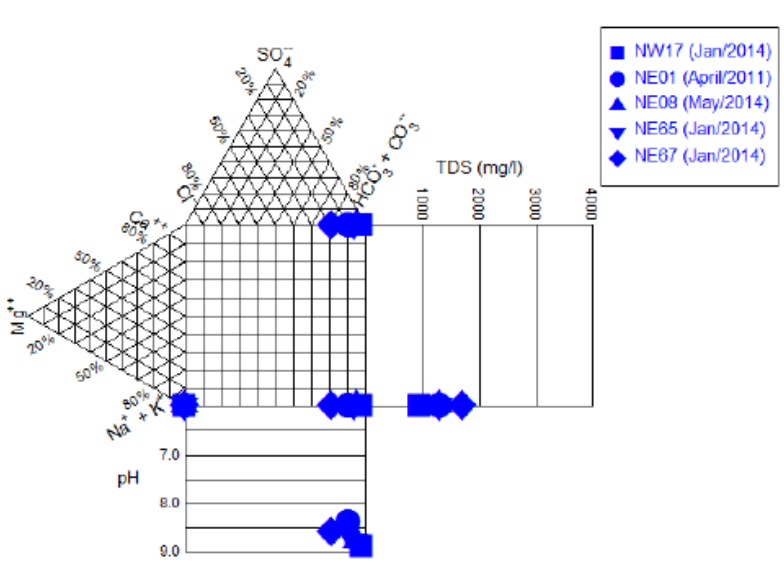
Monitoring Well	Sample Date	Lab pH	Lab EC µS/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	T-Alkalinity mg/L	HCO_3 mg/L	CO_3 mg/L	SO_4 mg/L	NO_2-N mg/L	NO_3-N mg/L	NO_2-N+NO_3-N mg/L	Hardness mg/L	TDS mg/L
WSW HTP 2 - GR	25-Jul-15	*8.95*	2600	2.05	1.41	*608*	3.64	82.6	1270	1340	104	<0.60	<0.020	<0.040	<0.045	10.9	*1460*
WSW HTP 6 - GR	25-Jul-15	*8.95*	2580	1.95	1.34	*602*	3.58	91.3	1250	1320	98.7	<0.60	<0.020	<0.040	<0.045	10.4	*1450*
WSW NHTP 13 - GR	26-Jul-15	*8.65*	2570	2.35	1.56	*603*	4.17	94.8	1260	1400	66.6	<0.60	<0.020	<0.040	<0.045	12.3	*1470*
WSW NHTP 15 - GR	26-Jul-15	*8.96*	2560	1.88	1.52	*610*	3.71	99.8	1230	1300	102	<0.60	<0.020	<0.040	<0.045	11	*1460*
WSW NHTP 16 - GR	26-Jul-15	*8.93*	2670	1.99	1.71	*637*	3.99	93.2	1350	1430	108	<1.5	<0.050	<0.10	<0.11	12	*1550*
WSW BP 2 - GR	25-Jul-15	*8.94*	2470	1.84	1.23	*609*	3.57	89	1210	1270	96.2	<0.60	<0.020	<0.040	<0.045	9.7	*1430*
WSW BP 11 - GR	25-Jul-15	*8.95*	2390	1.74	1.17	*595*	3.53	76	1210	1280	101	<0.60	<0.020	<0.040	<0.045	9.2	*1410*
WSW BP 11 - Quat	25-Jul-15	*8.54*	740	88	24.1	*53.8*	4.9	0.73	329	369	16.2	73.8	<0.010	0.062	0.062	319	*443*
WSW BP 25 - Quat	19-Jan-16	*7.59*	1600	129	39.4	*207*	6.32	1.52	487	594	<5.0	462	<0.010	<0.020	<0.050	484	*1140*
WB30 - GR	25-Jul-15	*9.01*	2610	2.22	1.37	*631*	3.74	98.3	1330	1380	116	<0.60	<0.020	<0.040	<0.045	11.2	*1540*

Monitoring Well	Sample Date	MSI Sample Number	Lab pH	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	SO_4 mg/L	Fe mg/L	NO_3-N mg/L	T-Alkalinity mg/L	HCO_3 mg/L	CO_3 mg/L	Hardness mg/L	TDS mg/L
1F1/06-05	16-Aug-17	03874170816X01	7.59	103	33	trace	266	20.6	339	*3*	0.4068	560.67	684	0	339.09	*1098*
1F2/09-18	16-Aug-17	03874170816X02	8.17	23	9	trace	470	82.3	6.9	trace	0.5198	916.33	1117.9	0	94.49	*1140*
1F3/09-18	16-Aug-17	03874170816X03	8.05	121	49	8	233	30.1	480	trace	0.452	507.5	619.2	0	503.92	*1225*

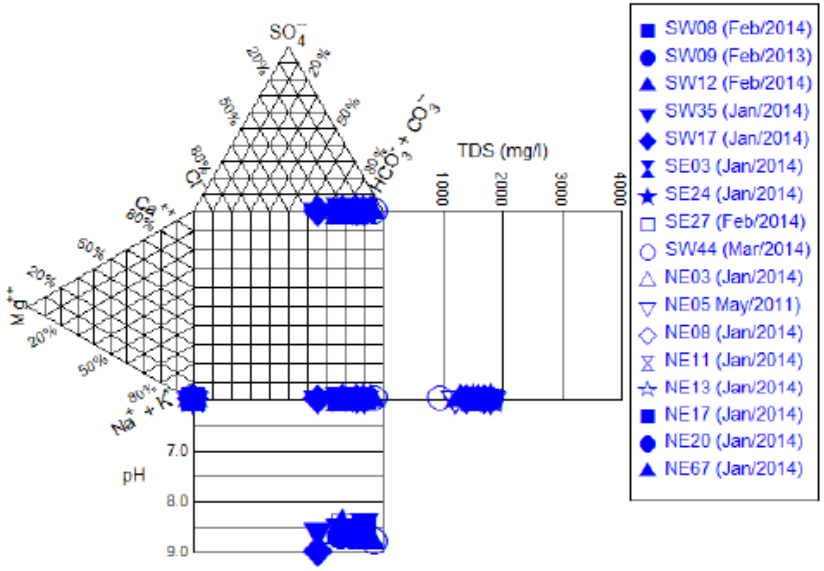
- **Saline Water Source Wells – Grosmont**
  - **Typical TDS range – 22,000-35,000 mg/L**

Water Chemistry – Pelican Lake

Durov Plot Grand Rapids ‘A’

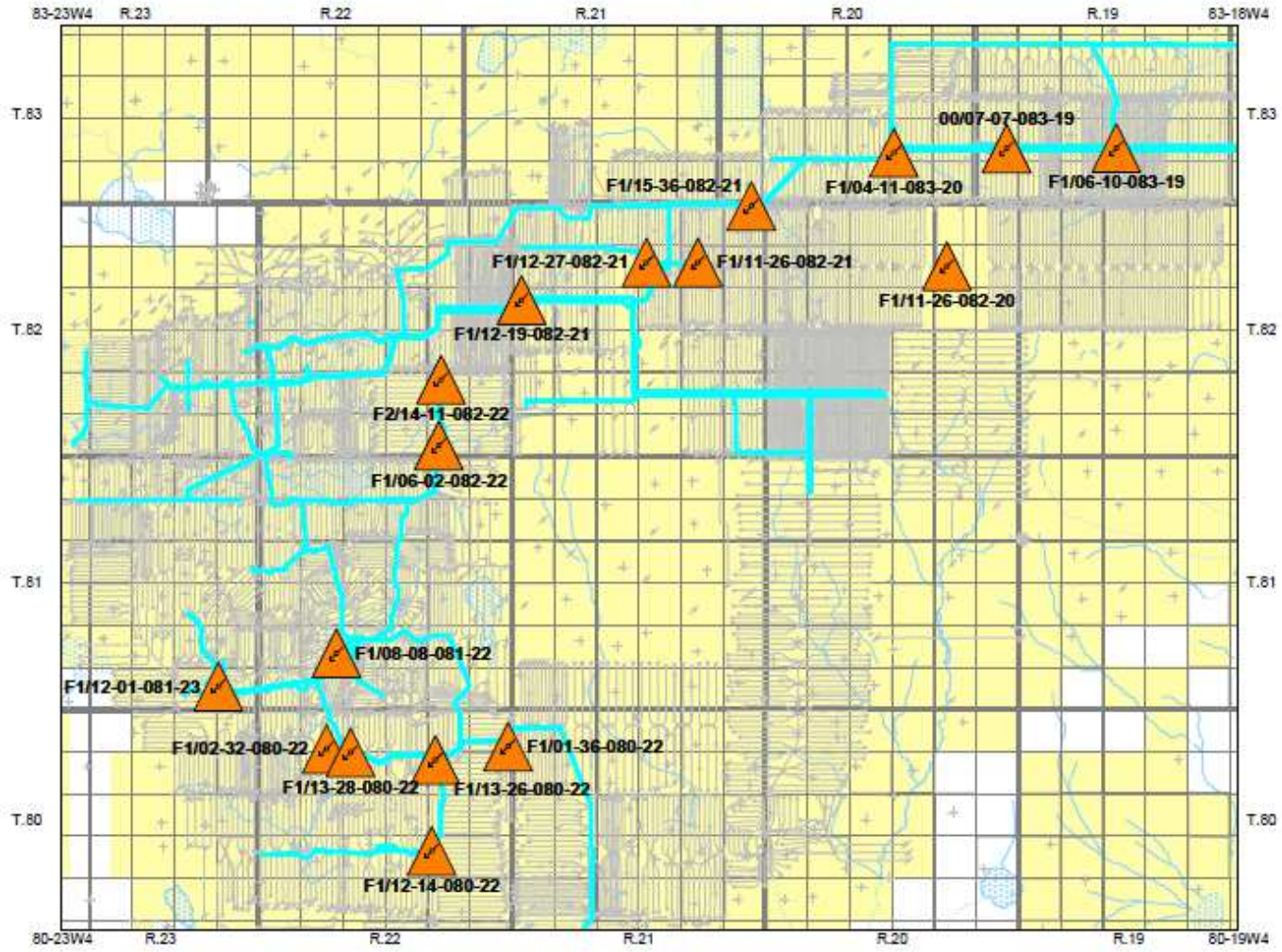


Durov Plot Grand Rapids ‘B’



TDS 900-2000 mg/L from Grand Rapids ‘A’ and ‘B’ aquifers.

Saline Water Source Map



2018 Saline Water Source Well Diversion Volumes (m^3)

Canadian Natural

Brintnell

Saline Wells	18-Jan	18-Feb	18-Mar	18-Apr	18-May	18-Jun	18-Jul	18-Aug	18-Sep	18-Oct	18-Nov	18-Dec	Totals
1F1/01-36-080-22W4/00	15,917	15,099	16,630	13,382	17,560	15,932	18,251	14,294	8,741	10,052	13,685	12,520	172,062
1F1/02-32-080-22W4/00	80	-	-	-	131	-	1,052	67,612	47,741	98,129	72,556	74,538	361,839
1F1/08-08-081-22W4/00	42,766	22,954	7,404	913	10,577	4,195	30,058	12,815	2,758	3,216	3,097	2,128	142,880
1F1/11-26-082-21W4/00	12,944	12,231	14,770	11,282	12,850	24,899	18,363	35,786	20,448	16,098	17,109	18,866	215,646
1F1/13-26-080-22W4/00	61,499	54,182	52,511	50,664	53,635	48,555	46,544	-	18,521	2,183	162	-	388,457
1F1/12-01-081-23W400	-	-	-	-	-	-	-	-	-	-	-	-	-
1F1/13-28-080-22W4/00	-	-	-	-	-	-	-	-	-	-	-	-	-
1F1/12-14-080-22W4/00	-	-	-	-	-	-	-	-	-	-	-	-	-
1F1/11-26-082-20W4/00	-	-	-	-	-	-	-	-	-	-	-	-	-
1F1/12-27-082-21W4/00	-	-	-	-	-	-	-	-	-	-	-	-	-
1F1/06-02-082-22W4/00	-	-	-	-	-	-	-	-	-	-	-	-	-
1F2/14-11-082-22W4/00	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL SALINE	133,206	104,466	91,315	76,241	94,754	93,581	114,268	130,507	98,210	129,677	106,609	108,051	1,280,884

Pelican Lake

Saline Wells	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	Totals
BR CAMP 27 1F1/04-11-083-20W4/00 SRC	0	0	0	9,139	18,345	1,208	1,535	1,591	21,990	16,056	14,881	26,732	111,478
BR PEL NE06 100/07-07-083-19W4/00 SRC	0	0	0	0	0	0	0	0	0	0	0	0	0
BR PEL NE11 1F1/06-10-083-19W4/00 SRC	0	0	0	0	0	0	0	0	0	0	0	0	0
BR PEL NW07 1F1/15-36-082-21W4/00 SRC	0	0	0	0	0	0	0	0	0	0	0	0	0
BR PEL SE05 1F1/12-19-082-21W4/00 SRC	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL SALINE	0	0	0	9,139	18,345	1,208	1,535	1,591	21,990	16,056	14881.45	26731.66	111,478

- Inactive wells above have been suspended and could be reactivated for future use.

Water Usage and Disposal

Canadian Natural

Brintnell

Total Water Volumes	2010	2011	2012	2013	2014	2015	2016	2017	2018
Produced Water for Injection (m3)	3,485,267	2,901,838	3,703,800	3,522,671	4,390,618	4,617,604	4,507,036	4,946,868	4,819,935
Non-Saline Water (m3)	1,553,045	1,479,780	1,876,840	2,041,938	2,028,731	1,937,567	1,916,943	2,162,684	3,093,614
Brackish Water (m3) - Grosmont	3,999,848	6,274,361	4,780,011	3,800,437	3,666,120	3,133,047	2,276,529	1,959,507	1,280,884
Disposal Volume (m3)	680,010	268,333	174,739	222,200	464,554	544,868	684,537	743,035	800,273
Total Produce Recycle (%)	80.50%	90.80%	95.30%	94.00%	91.0%	89.6%	87.2%	87.7%	85.9%
Average Daily Recycle (m3/d)	7,686	7,215	9,642	9,900	12,273	12,876	12,740	13,725	13,305

Pelican Lake

Total Water Volumes	2010	2011	2012	2013	2014	2015	2016	2017	2018
Produced Water for Injection (m3)	4,256,039	3,684,090	4,188,103	4,256,695	4,753,603	4,381,028	3,711,085	3,428,883	3,953,812
Non-Saline Water (m3)	684,010	803,000	953,380	1,132,595	1,369,845	1,078,575	571,955	570,130	1,001,925
Brackish Water (m3) - Grosmont	2,207,885	1,270,930	2,403,890	3,220,395	4,163,555	2,224,675	1,027,475	713,210	111,325
Disposal Volume (m3)	389,083	132,855	247,223	240,644	167,289	130,497	130,035	124,367	106,859
Total Produce Recycle (%)	91.6%	96.5%	94.4%	94.6%	96.6%	97.1%	96.6%	96.5%	97.4%
Average Daily Recycle (m3/d)	11,660	10,093	11,474	11,662	13,024	12,003	10,167	9,394	10,832

- **Continued to focus on maintaining high water recycling ratios.**
  - **2018 recycle at 85.9% for legacy Brintnell and 97.4% for Pelican Lake.**
- **CNRL continues to be in compliance with AENV water diversion license.**
- **CNRL Disposal injection in compliance with Directive 51 Guidelines and Approvals.**

Brintnell Legacy Water Information

Canadian Natural

Brintnell - Water Information

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Non-Saline Water (m3/day) - Quaternary and Grand Rapids	2,813	4,091	3,927	4,255	4,054	5,142	5,594	5,558	5,308	5,252	5,925	8,476
Brackish Water (m3/day) - Grossmont	4,553	2,095	8,120	10,958	17,190	13,096	10,412	10,044	8,584	6,237	5,369	3,509
Total Source Water (m3/day)	7,366	6,186	12,046	15,213	21,244	18,238	16,007	15,602	13,892	11,489	11,294	11,985
Total Source Water per barrel of oil	1.4	1.1	2.1	2.6	3.7	3.0	2.3	2.0	1.7	1.5	1.5	1.7
Brackish Water per barrel of oil	0.8	0.4	1.4	1.9	3.0	2.1	1.5	1.3	1.1	0.8	0.7	0.5
Non-Saline Water per barrel of oil	0.5	0.7	0.7	0.7	0.7	0.8	0.8	0.7	0.7	0.7	0.8	1.2
Produced Water Recycle (m3/day)	5,009	6,546	7,644	7,686	7,215	9,669	9,900	12,273	12,876	12,740	13,725	13,305
Recycle Rates	76.8%	83.4%	86.7%	80.5%	90.8%	95.3%	94.0%	91.0%	89.6%	87.2%	87.7%	85.9%
Oil Produced (bbl/day)	34,269	37,035	36,612	36,726	36,372	38,656	42,934	50,194	50,877	47,982	46,847	43,351

Brintnell - Water Information
2018 Monthly

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Non-Saline Water (m3/day) - Quaternary and Grand Rapids	6,756	7,220	8,652	8,619	8,825	8,739	8,703	9,024	9,017	8,580	8,590	8,894
Brackish Water (m3/day) - Grossmont	4,297	3,731	2,946	2,541	3,057	3,119	3,686	4,210	3,274	4,183	3,554	3,486
Total Makeup Water (m3/day)	11,053	10,951	11,598	11,161	11,882	11,859	12,389	13,234	12,291	12,763	12,144	12,380
Total Makeup Water per barrel of oil	1.6	1.6	1.6	1.5	1.7	1.9	2.0	1.8	1.7	1.9	1.9	1.9
Brackish Water per barrel of oil	0.6	0.5	0.4	0.3	0.4	0.5	0.6	0.6	0.5	0.6	0.5	0.5
Non-Saline Water per barrel of oil	0.9	1.0	1.2	1.2	1.2	1.4	1.4	1.2	1.3	1.3	1.3	1.4
Produced Water Recylce (m3/day)	13020	12249	14212	13521	13668	12649	12463	15223	13814	13244	12701	12982
Recycle Rates	87.6%	85.2%	85.1%	84.5%	84.2%	86.0%	87.8%	86.0%	85.7%	86.4%	86.2%	85.9%
Oil Produced (bbl/day)	44,789	44,239	44,883	45,986	44,736	39,581	39,911	45,753	45,284	42,651	41,108	41,314

Pelican Lake Water Information

Pelican Lake Water Information

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Non-Saline Water (m3/day) - Grand Rapids	542	813	1,417	1,874	2,200	2,612	3,103	3,753	2,955	1,567	1,562	2,745
Brackish Water (m3/day) - Grossmont	13,904	10,324	7,835	6,049	3,482	6,586	8,823	11,407	6,095	2,815	1,954	305
Total Source Water (m3/day)	14,446	11,137	9,252	7,923	5,682	9,198	11,926	15,160	9,050	4,382	3,516	3,050
Total Source Water per barrel of oil	3.1	2.5	2.3	2.2	1.7	2.6	3.1	3.8	2.3	1.3	1.1	1.0
Brackish Water per barrel of oil	3.0	2.4	2.0	1.6	1.1	1.8	2.3	2.9	1.6	0.8	0.6	0.1
Non-Saline Water per barrel of oil	0.1	0.2	0.4	0.5	0.7	0.7	0.8	0.9	0.8	0.5	0.5	0.9
Produced Water Recycle (m3/day)	8,861	13,182	13,179	11,660	10,093	11,474	11,662	13,024	12,003	10,167	9,394	10,832
Recycle Rates	70.9%	85.1%	85.1%	91.6%	96.5%	94.4%	94.6%	96.6%	97.1%	96.6%	96.5%	97.4%
Oil Produced (bbl/day)	29,319	27,540	24,882	23,096	20,428	22,600	24,255	24,934	24,411	21,171	19,967	19,855

Pelican Lake Water Information 2018 Monthly

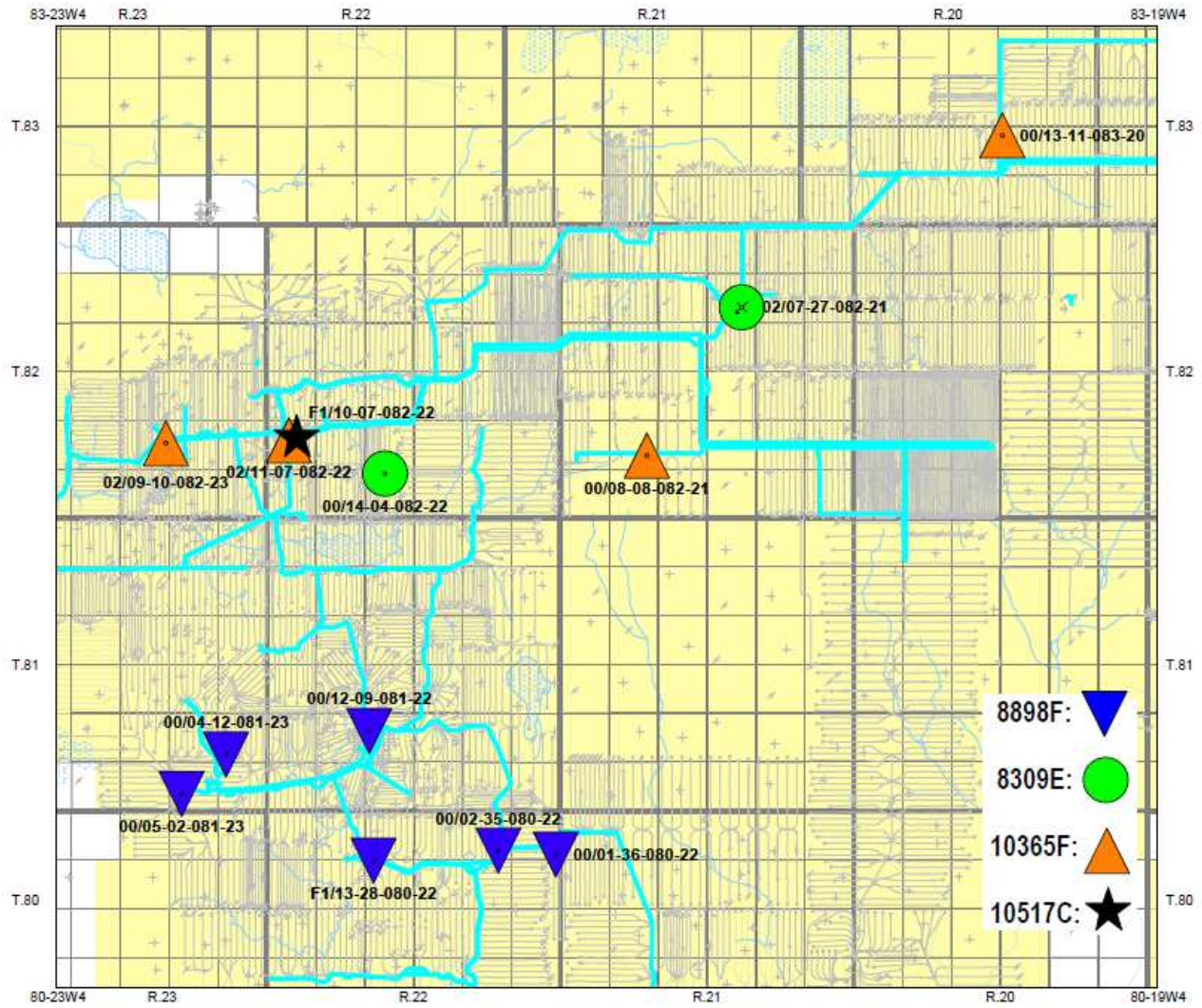
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Non-Saline Water (m3/day) - Grand Rapids	2,592	2,646	2,819	2,971	2,841	2,815	2,523	2,332	2,697	3,041	2,676	2,989
Brackish Water (m3/day) - Grossmont	0	0	0	305	592	40	50	51	733	518	496	862
Total Makeup Water (m3/day)	2,592	2,646	2,819	3,276	3,433	2,855	2,572	2,383	3,430	3,559	3,172	3,851
Total Makeup Water per barrel of oil	0.9	0.9	1.0	1.1	1.1	0.8	0.7	0.8	1.2	1.1	0.9	1.2
Brackish Water per barrel of oil	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.3	0.2	0.1	0.3
Non-Saline Water per barrel of oil	0.9	0.9	1.0	1.0	0.9	0.8	0.7	0.8	0.9	0.9	0.8	0.9
Produced Water Recylce (m3/day)	9033	10157	10499	10368	10605	11288	12290	10741	10364	11163	11153	11026
Recycle Rates	98.4%	98.0%	98.2%	98.0%	98.2%	93.7%	94.9%	97.4%	97.8%	98.0%	98.0%	98.7%
Oil Produced (bbl/day)	18,729	18,209	18,507	18,656	19,205	23,462	22,650	18,220	18,120	20,503	21,256	20,630

Brintnell/Pelican Lake Water Management Plan

Canadian Natural

- **Striving to improve field performance by increasing throughput through injectivity improvements**
- **Optimize polymer loading with the use of existing non-saline water volumes**
- **Additional water treatment processes previously piloted but not implemented – economics and operating limitations posed challenges**
  - **Disc Stack Centrifuge Pilot Nov 2016 – April 2017**
- **Additional Grosmont Source/Disposal options are being investigated as we plan the long-term water sourcing options.**
  - **2017 Approval for additional disposal at 1F1/13-28 which was converted from Grosmont source to disposal.**

Water and Oilfield Disposal Map



CNRL Brintnell Disposal Wells

Canadian Natural

TABLE 1
APPROVAL NO. 8898F

1	2	3	4	5
Unique Well Identifiers	Disposal Zone	Top of Injection Interval (Measured depth - metres KB)	Depth of Production Packer (Measured depth - metres KB)	Maximum Wellhead Injection Pressure (kilopascals gauge)
F1/13-28-080-22W4/2[1]	Nisku/Grosmont	467.0	462.0	3200
† 00/02-35-080-22W4/0	Nisku	475.0	473.0	3200
00/01-36-080-22W4/0	Nisku	458.1	454.0	3200
00/12-09-081-22W4/0	Nisku	487.5	478.9	6000
02/12-09-081-22W4/0	Grosmont	536.0	526.7	4325
† 00/05-02-081-23W4/3	Nisku	513.0	508.2	3300
00/04-12-081-23W4/3	Nisku	508.0	506.0	3450

CNRL Brintnell Disposal Wells

Canadian Natural

TABLE 1
APPROVAL NO. 8309E

1	2	3	4	5
Unique Well Identifiers	Disposal Zone	Top of Injection Interval (Measured depth - metres KB)	Depth of Production Packer (Measured depth - metres KB)	Maximum Wellhead Injection Pressure (kilopascals gauge)
02/07-27-082-21W4/2[1]	Grosmont	555.0	545.1	3450
00/14-04-082-22W4/0	Nisku/Graminia/ Blue Ridge/ Calmar	453.0	438.0	3500

CNRL Pelican Lake Disposal Wells

Canadian Natural

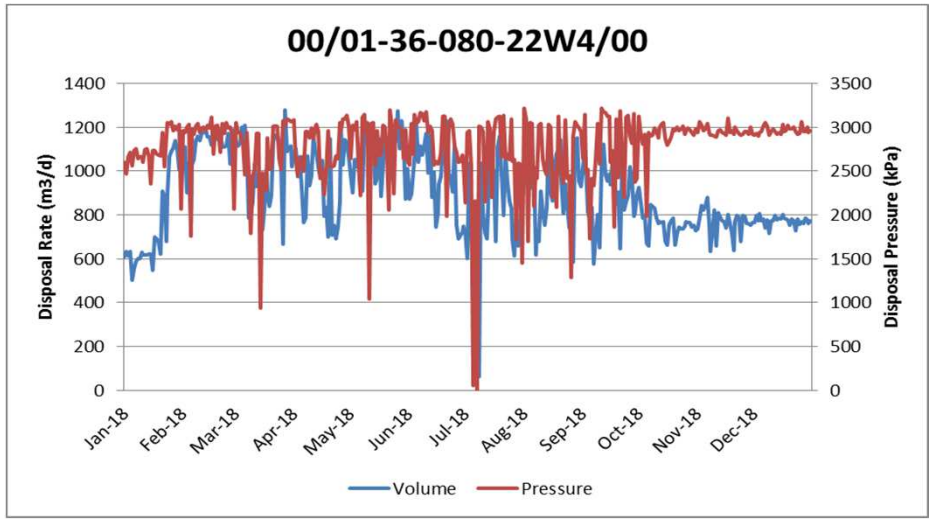
TABLE 1
APPROVAL NO. 10365F

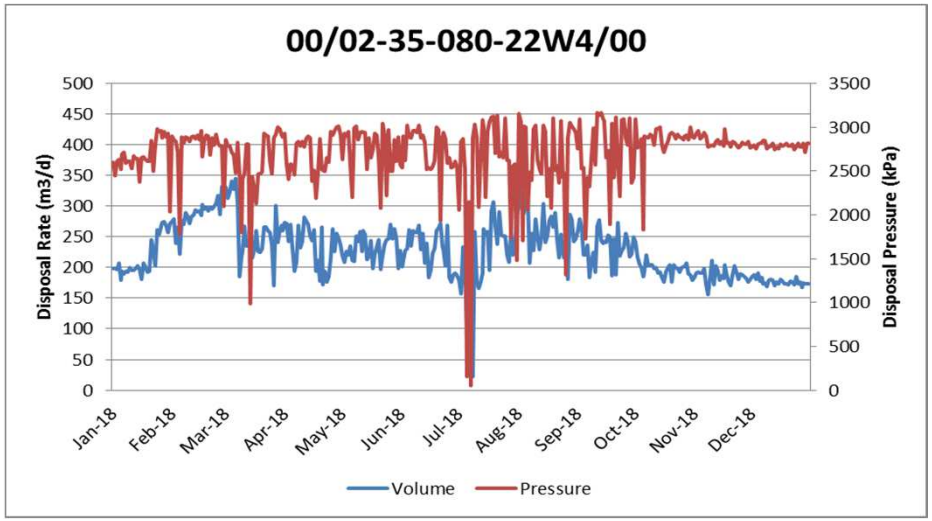
1	2	3	4	5
Unique Well Identifiers	Disposal Zone	Top of Injection Interval (Measured depth - metres KB)	Depth of Production Packer (Measured depth - metres KB)	Maximum Wellhead Injection Pressure (kilopascals gauge)
00/08-08-082-21W4/0	Grosmont	543.3	524.6	3300
02/11-07-082-22W4/0	Wabamum/Gramina/ Calmar/Nisku	450.7	431.0	3000
02/09-10-082-23W4/0 <rescinded[1]>	Nisku	511.0	503.37	3300
00/13-11-083-20W4/0	Nisku	390.7	374.5	2880

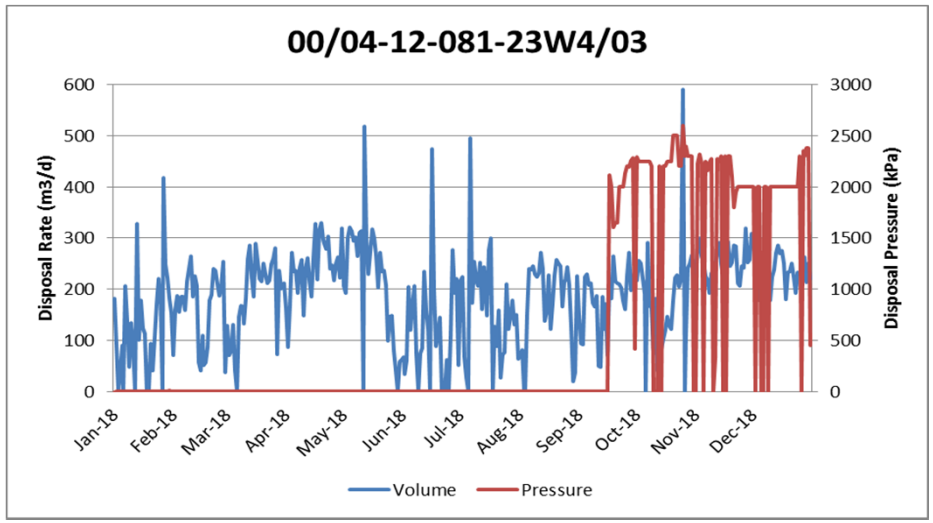
TABLE 1
APPROVAL NO. 10517C

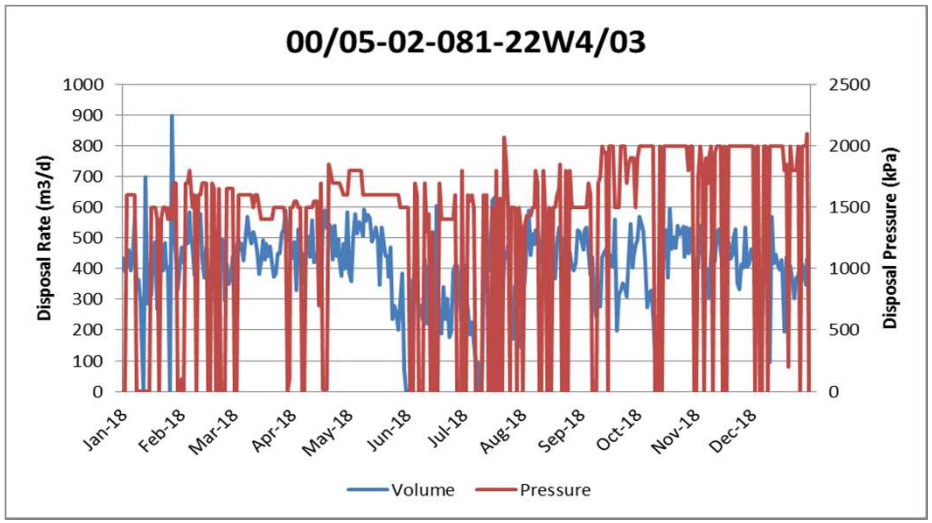
1	2	3	4	5
Unique Well Identifiers	Disposal Zone	Top of Injection Interval (Measured depth - metres KB)	Depth of Production Packer (Measured depth - metres KB)	Maximum Wellhead Injection Pressure (kilopascals gauge)
F1/10-07-082-22W4/0	Grosmont	596.1	584.9	3450

Brintnell Disposal Well Data

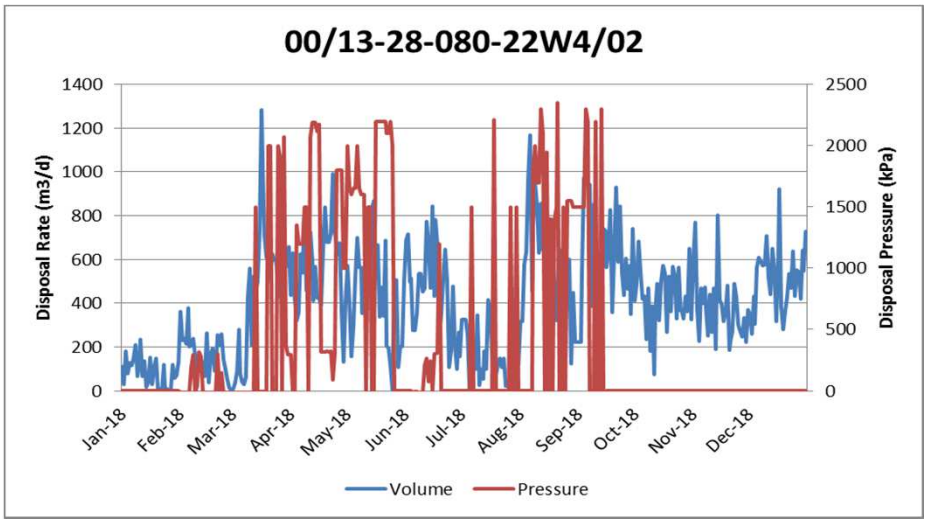


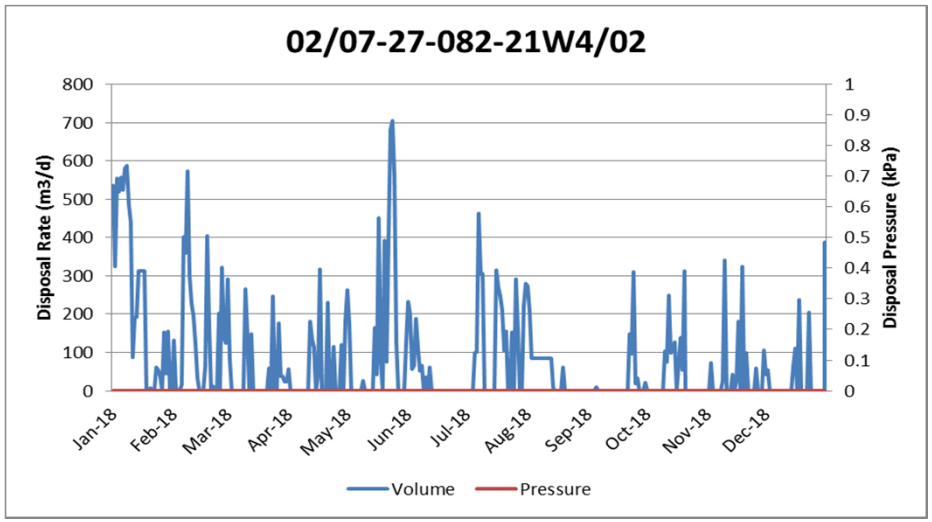




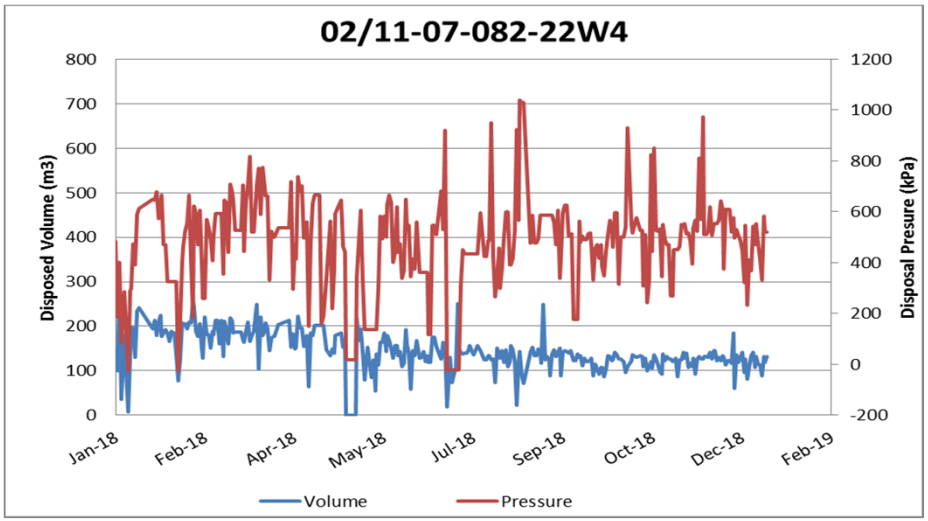


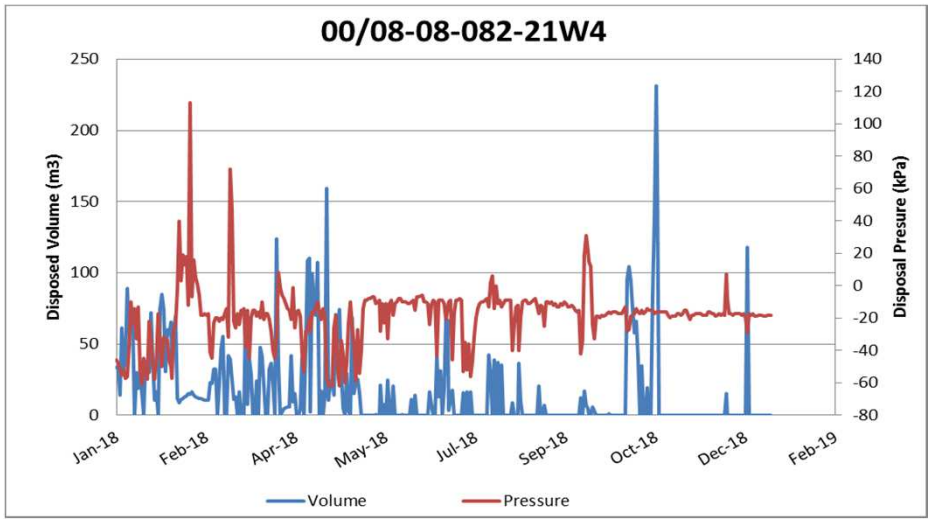
Brintnell Disposal Well Data

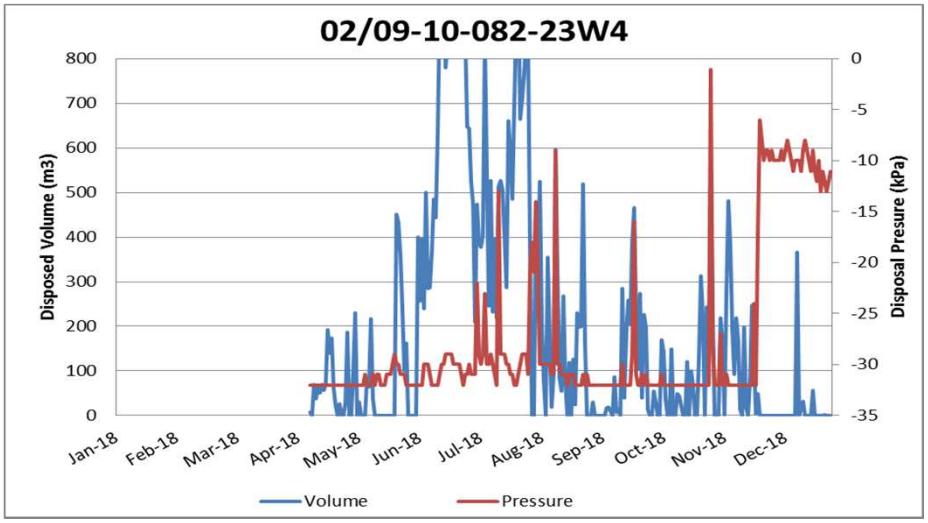




Pelican Lake Disposal Well Data







AER Compliance

Hydrogen Sulphide

Canadian Natural

- Souring of production to occur over time, Engineering and Construction, has and will continue to ensure compliance across the entire Field to handle sour production (<1% H2S).
- H2S produced at padsites and batteries is expected to be in low concentration and volume.
- CNRL collects solution gas at batteries and wellsites in a common solution gas gathering system.
- Gas to be sweetened in field and at major facility sites (emulsion batteries, compressor station).

AER Compliance

Canadian Natural

- **CNRL continues to work with AER regarding injection well integrity:**
  - **Formation/hydraulic isolation**
  - **Cement bond**
  - **Casing corrosion**
- **Process of upgrading existing wellsite facilities to meet current regulations and codes for the expected service (higher WCT, higher TDS, less than 1% H2S). Timeline to be completed over next 2-3 years throughout field (existing facilities met regulations at time of original construction).**
  - **Priority on areas where we have seen corrosion through inspections, and areas with high water cut**

Casing Failure Repairs

- 02/08-17-083-18W4/0 – May 2018. Failure in zone, stacked liner
- 02/04-06-083-18W4/0 – May 2018. Failure in zone, stacked liner
- 02/01-06-083-18W4/2 – May 2018. Casing patch
- 02/03-05-083-19W4/2 – May 2018. Failure in zone, stacked liner
- 03/02-05-083-19W4/0 – May 2018. Abandoned wellbore
- 02/01-05-083-19W4/0 – May 2018. Failure in zone, stacked liner
- 02/04-04-083-20W4/0 – June 2018. Failure in zone. To be re-drilled
- 03/04-03-083-20W4/0 – June 2018. Abandoned wellbore
- 03/01-01-083-20W4/0 – Nov 2018. Failure in zone. To be re-drilled
- CNRL will be evaluating additional candidates for either repair or redrill with the focus on re-establishing consistent flood patterns.

Casing Failure Repairs

- 02/01-06-083-18W4/2 – May 2018. Casing patch
  - YES, 4m3 producer water (during pressure testing casing)
- 02/03-05-083-19W4/2 – May 2018. Failure in zone, stacked liner
  - YES, 3m3, producer water (during pressure testing casing)
- 03/04-03-083-20W4/0 – June 2018. Abandoned wellbore
  - NO
- Remainder of casing failure repairs were within zone

AER Compliance

Canadian Natural

Currently there are no serious SCVF/GM issues.

EPEA approval (1706-02-00)

In regards to the EPEA approval 1706-02-00 CNRL recognizes that our internal processes did not catch the expiry until it was past due. Internal processes have been adjusted to flag this type of approval more prominently in our system to ensure there will not be any future issues. A renewal application is almost complete and will be submitted to the AER for review within the next 2 weeks.

Observation Wells

Canadian Natural

Wabiskaw

- Primary source of reservoir pressure data is from injector fall-off analysis collected using SCADA
- 17 observation wells in Approval 9404 connected to Scada
- 2 wells in legacy area: AA/14-10-081-22W4, 00/15-04-082-23W4

Grand Rapids/Quaternary

Legacy area non-saline water monitoring:

Source Well Name	Associated Obs Well
WSW BP25 - QUAT	OBS BP25 - QUAT (08-04-081-22W4)
WSW BP11 - QUAT	OBS BP11 - QUAT (13-04-081-22W4)
WSW BP2 - GR	OBS BP02 - GR (13-16-081-22W4)
WSW BP11 - GR	OBS BP11 - GR (13-04-081-22W4)
WSW HTP2 - GR	OBS HTP02 - GR (13-29-081-22W4)
WSW HTP6 - GR	OBS HTP06 - GR (15-27-081-22W4)
WSW NHTP16 - GR	OBS NHT16 - GR (01-17-082-23W4)
WSW WBP30 - GR	OBS WB30 - GR (15-20-081-22W4)
WSW NHP 13 - GR	OBS NHTP13 - GR (07-05-082-23W4)
WSW NHP 15 - GR	OBS NHTP15 - GR (08-08-082-23W4)
OBS 06-05	WSW 1F1/06-05 (06-05-080-21 W4M)
OBS 09-18 Q1	WSW 1F2/09-18 (09-18-080-22 W4M)
OBS 09-18 Q2	WSW 1F3/09-18 (09-18-080-22 W4M)

Approval 9404 area has 46 observation wells in the Grand Rapids

No indications of cap rock breach in 2018 from observation wells

Outstanding Applications

Conclusion

- Canadian Natural continues to be committed to maximizing the value of the resource for the both the Province of Alberta through it's Royalty Interest and itself.
  - 2018 – Stable production in low commodity price environment
- Results from the polymer flood continue to be encouraging
  - Continuing to evaluate the impacts of oil viscosity and water production on the ultimate performance and recovery under polymer flooding
- CNRL continues to optimize the operation of the flood and expand to new, more challenging areas
  - Injection management is a balance of OPEX, power consumption and flood management
- CNRL is working on an injection plan to maximize field throughput and thus ultimate recovery of the field. Several options are being investigated over the next several years.
- Compliance with all AER regulations, including cap rock integrity monitoring, and communication with the AER remains a top priority for CNRL.

THE FUTURE CLEARLY DEFINED

Premium Value I Defined Growth I Independent

Canadian Natural