Annual Performance Presentation

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

March 14, 2018

Premium Value | Defined Growth | Independent

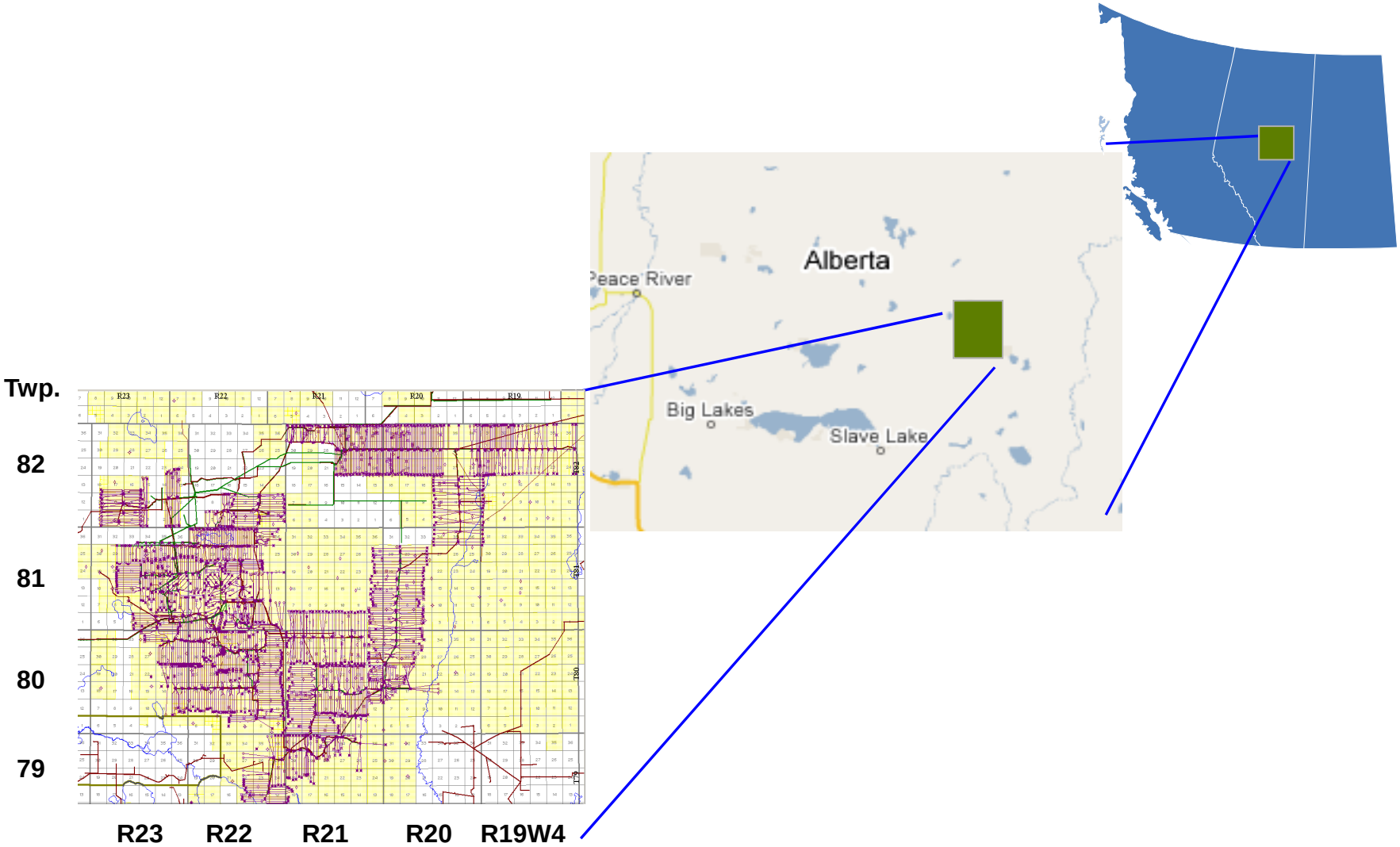
Canadian Natural

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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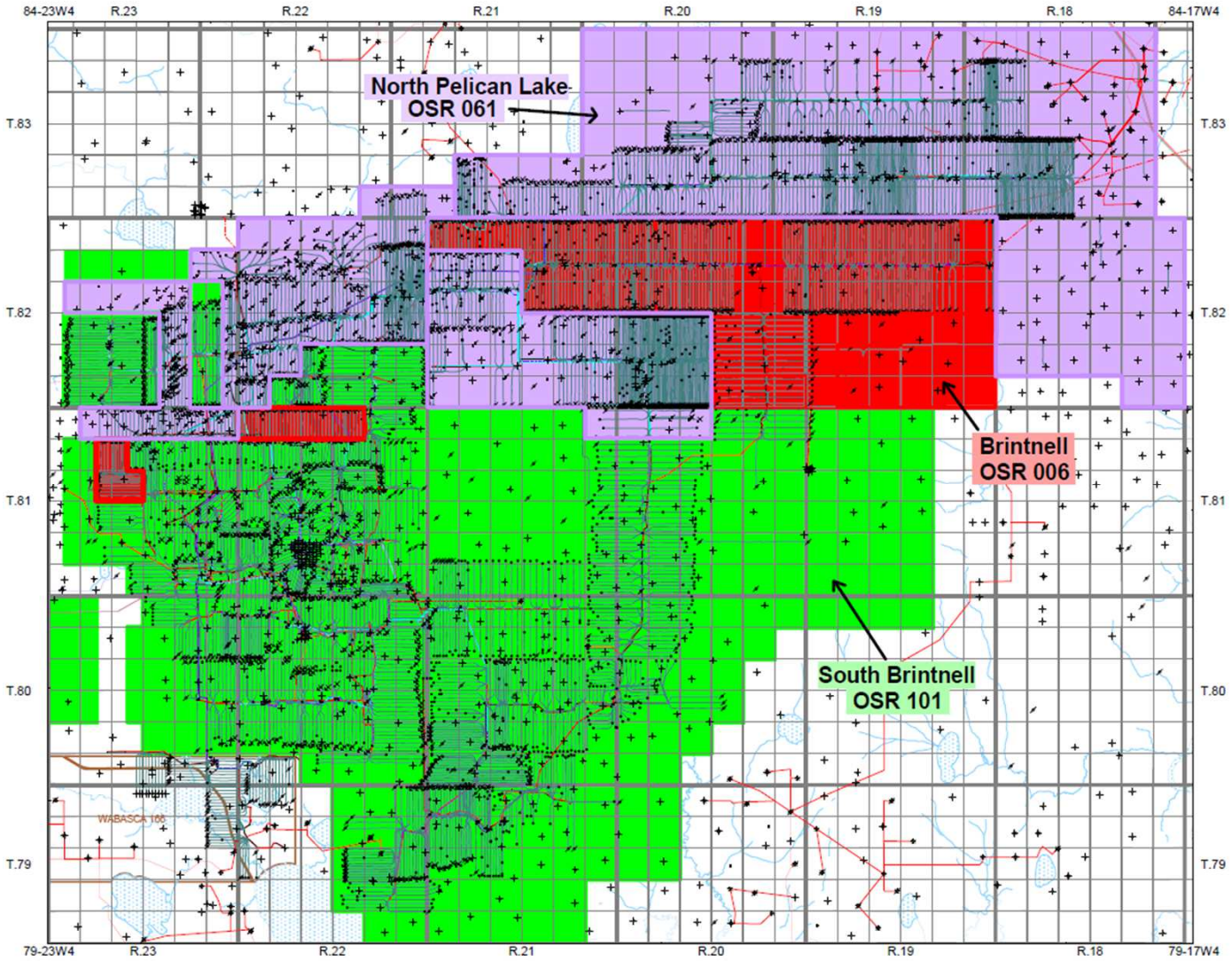


Primary and Enhanced Approval Regions

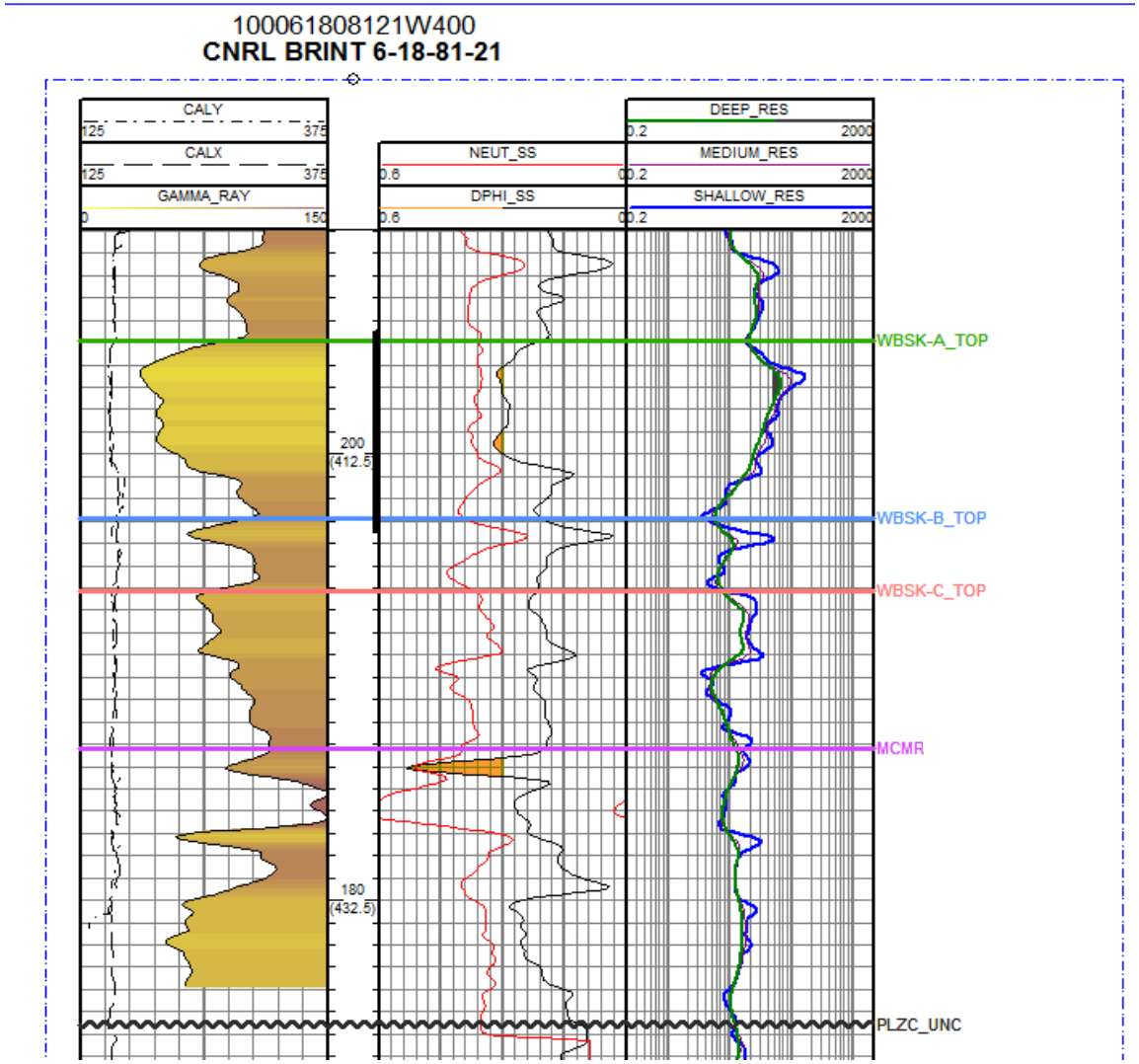
Enhanced Recovery Schemes

- 10147
- 9673
- 10787
- 10423
- 9404 (previously Cenovus)

Primary Recovery Schemes

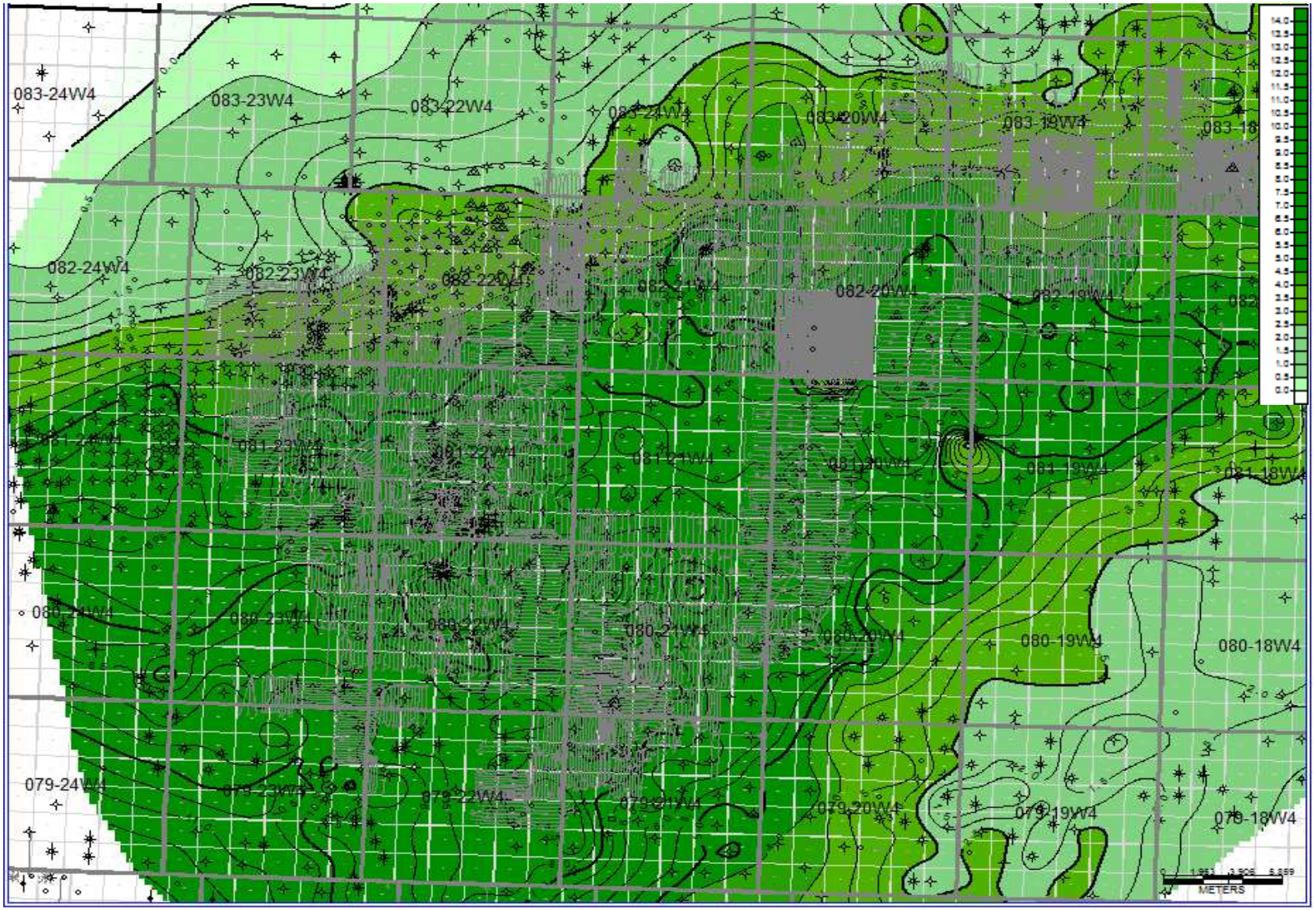
- 6619
- 9466
- 9884

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



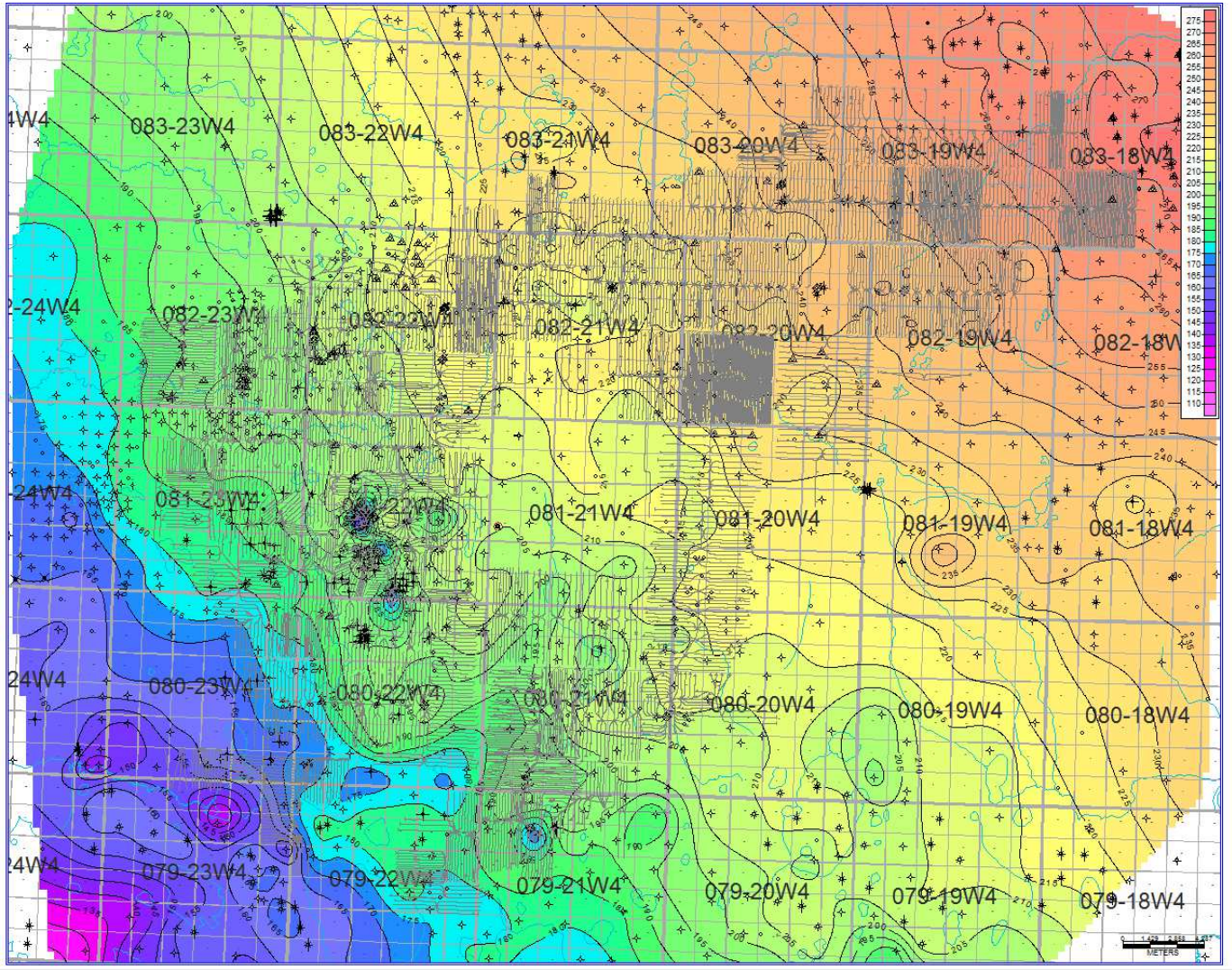
Wabiskaw ‘A’ Net Pay Map

Canadian Natural

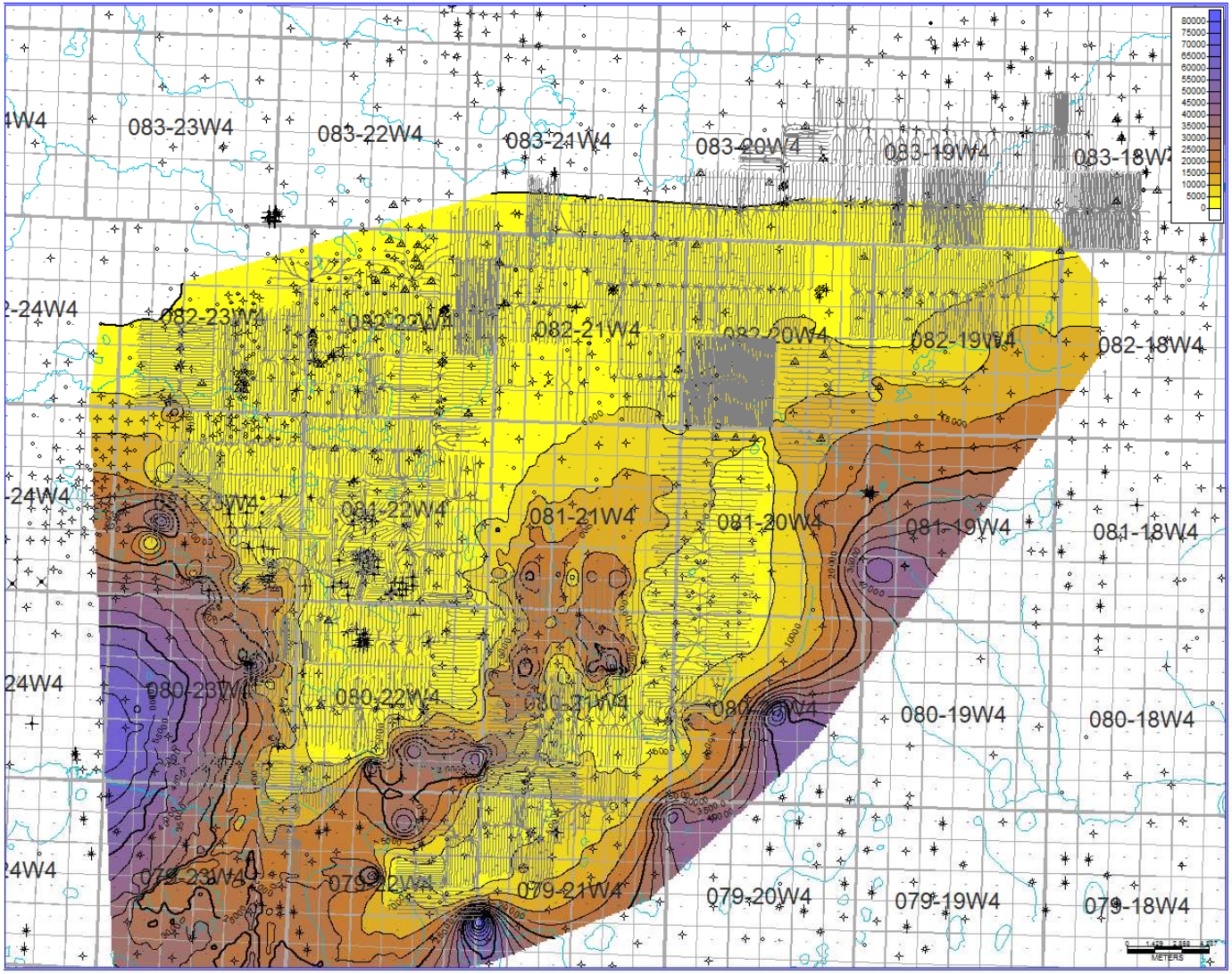


Wabiskaw Structure Map

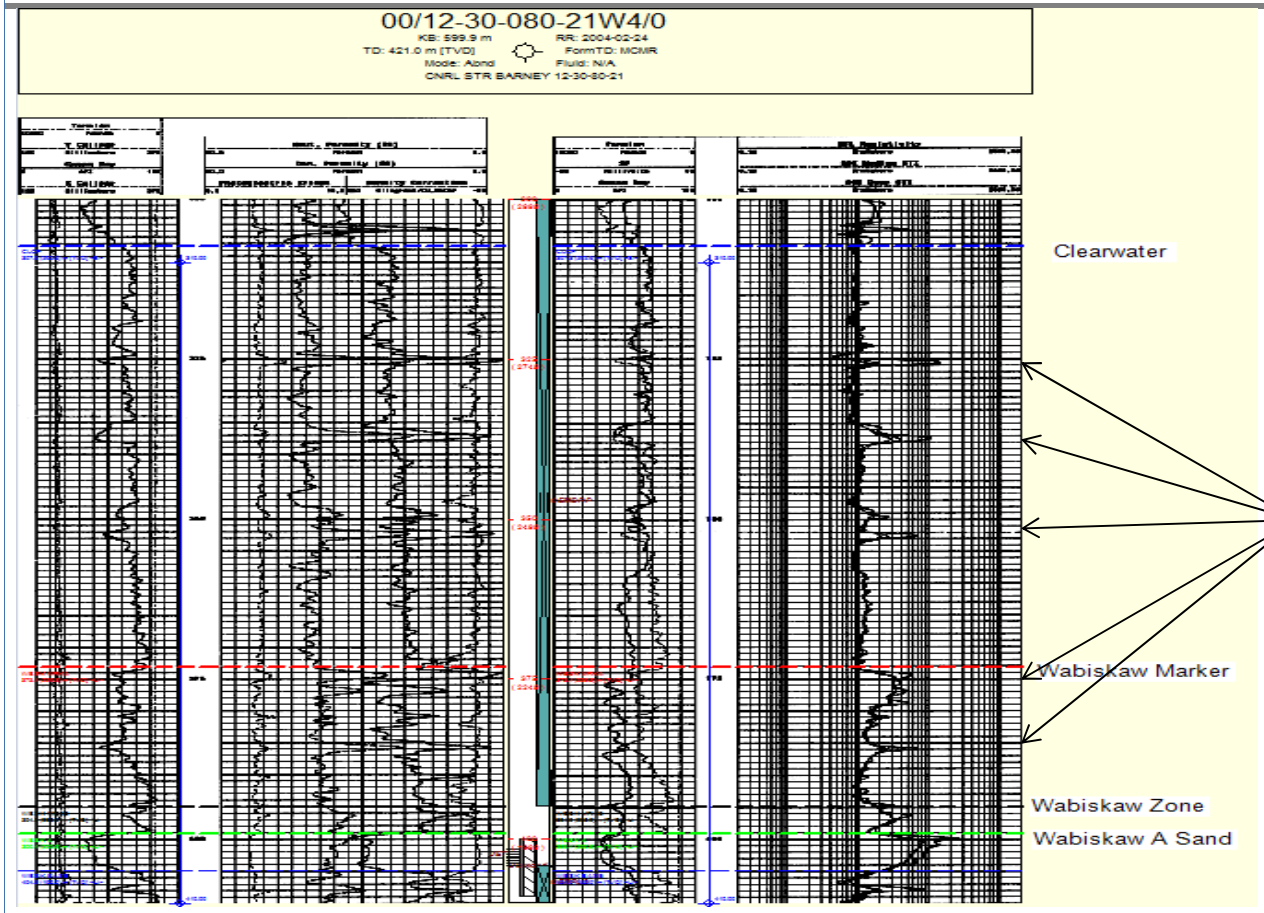
Canadian Natural



Produced Oil Viscosity Map



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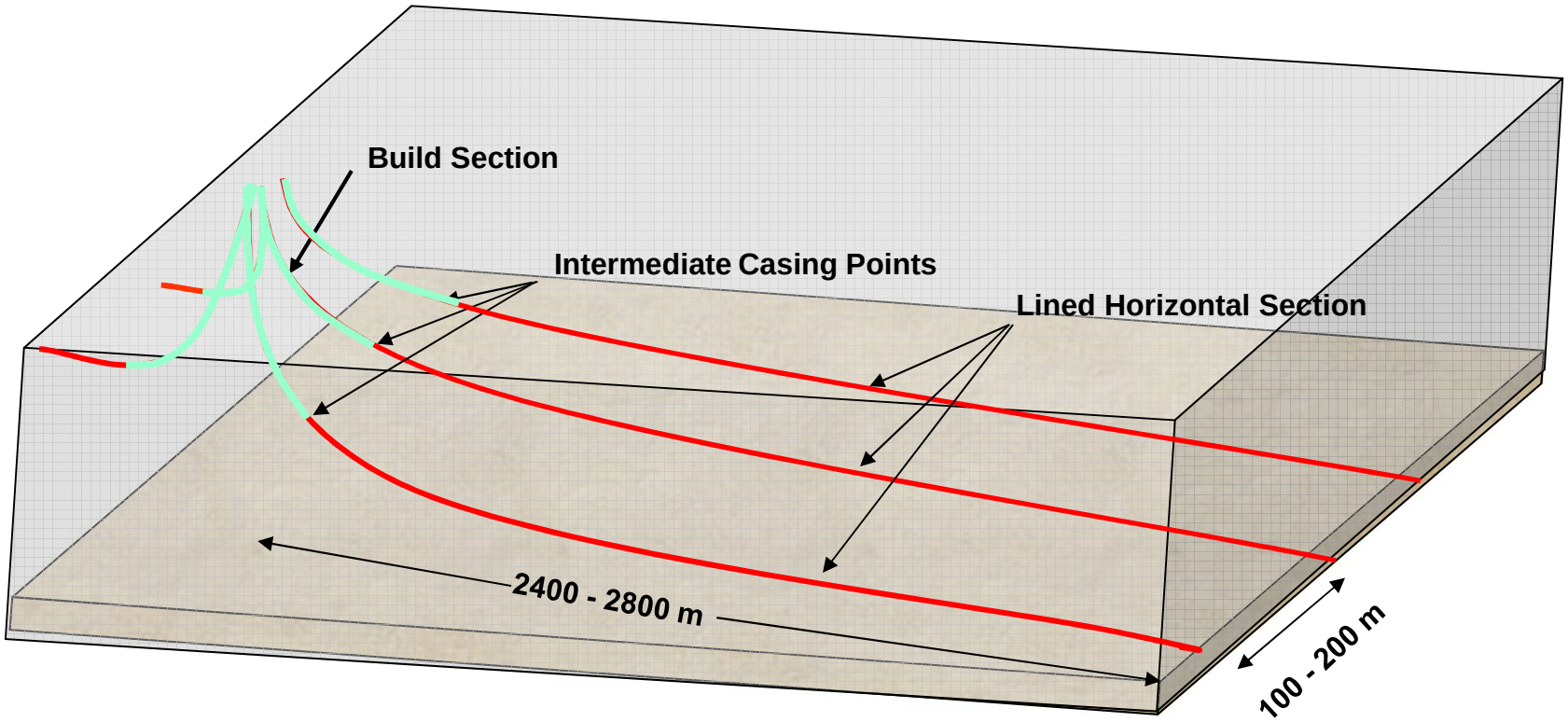
- **Upper Wabiskaw Sand**
  - Depth of 300-425m TVD
  - Net Pay Range 1 – 9m
  - Porosity 28 – 32%
  - Permeability 300 – 3000md
  - Temperature 13-17 deg. C
  - Water Saturation 30 – 40%
  - Oil Viscosity (dead oil) 800 – 80,000cp @ 15 deg. C
  - Initial Reservoir Pressure 1900 – 2600kpa

Drilling, Completions, and Artificial Lift

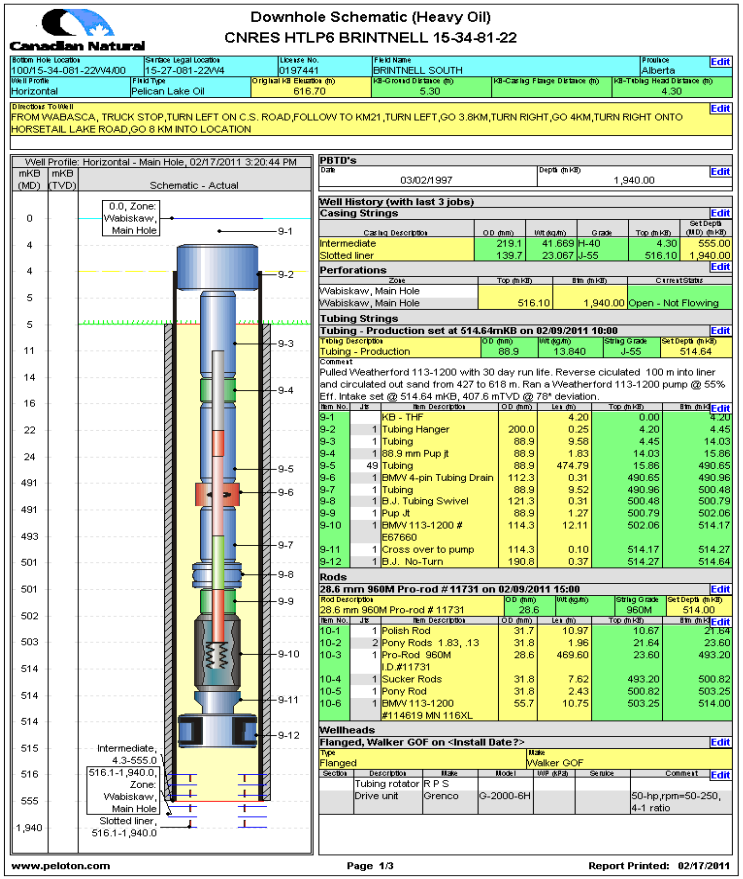
Typical Drilling Configuration



- **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?>

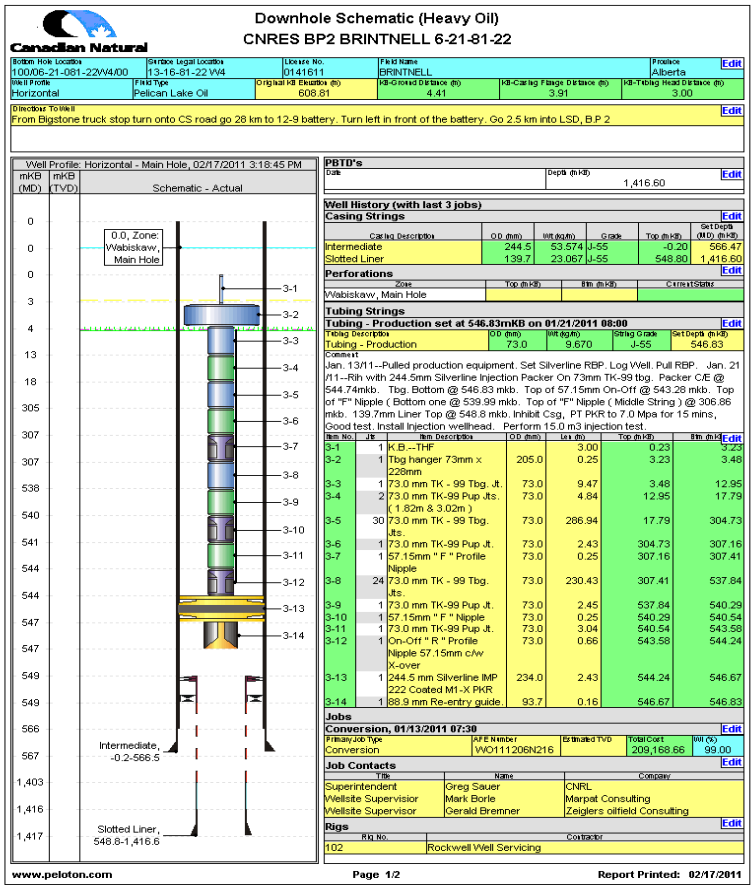
Type	Make
Flanged	Walker GOF

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

www.peloton.com Page 1/3 Report Printed: 02/17/2011

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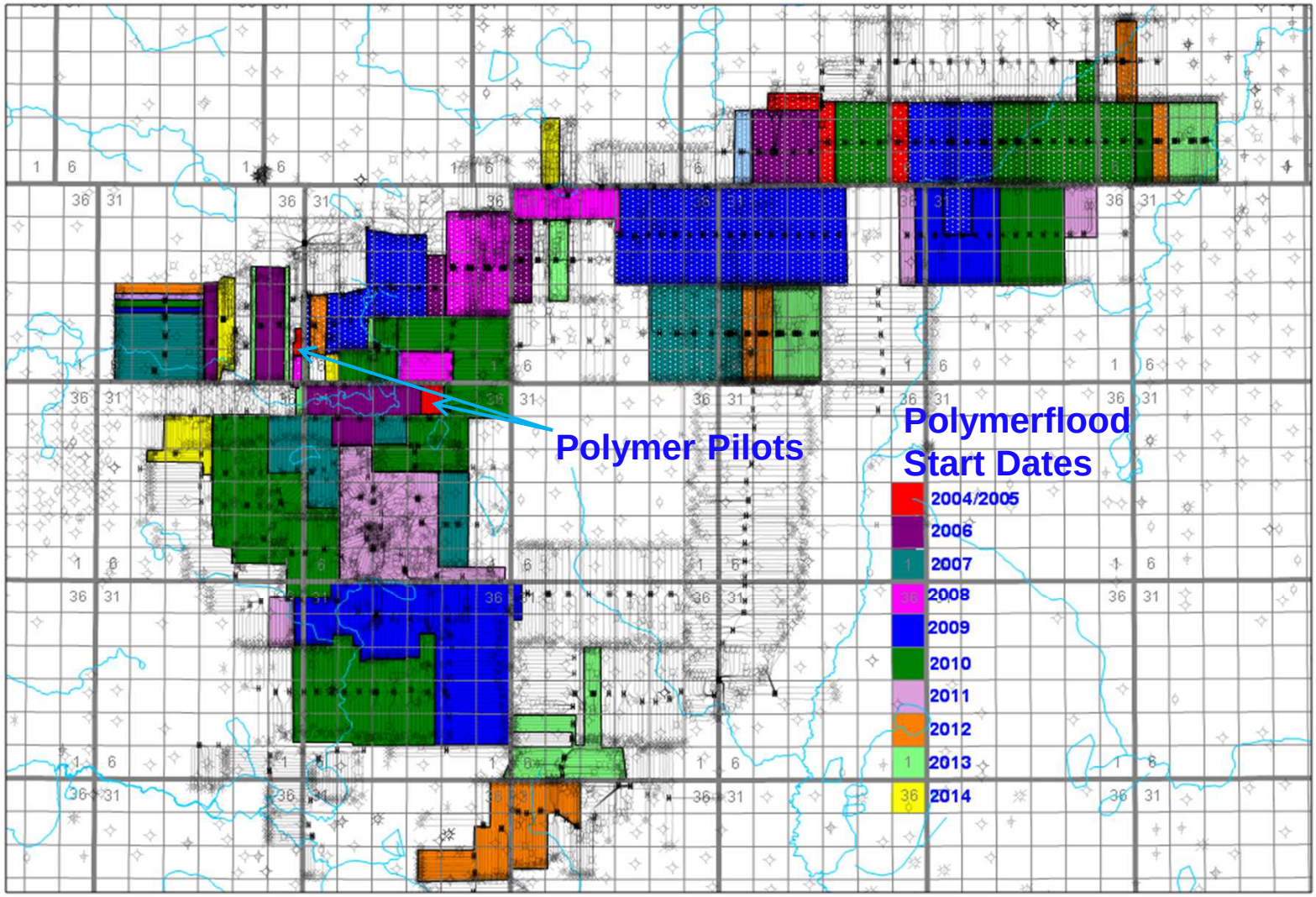
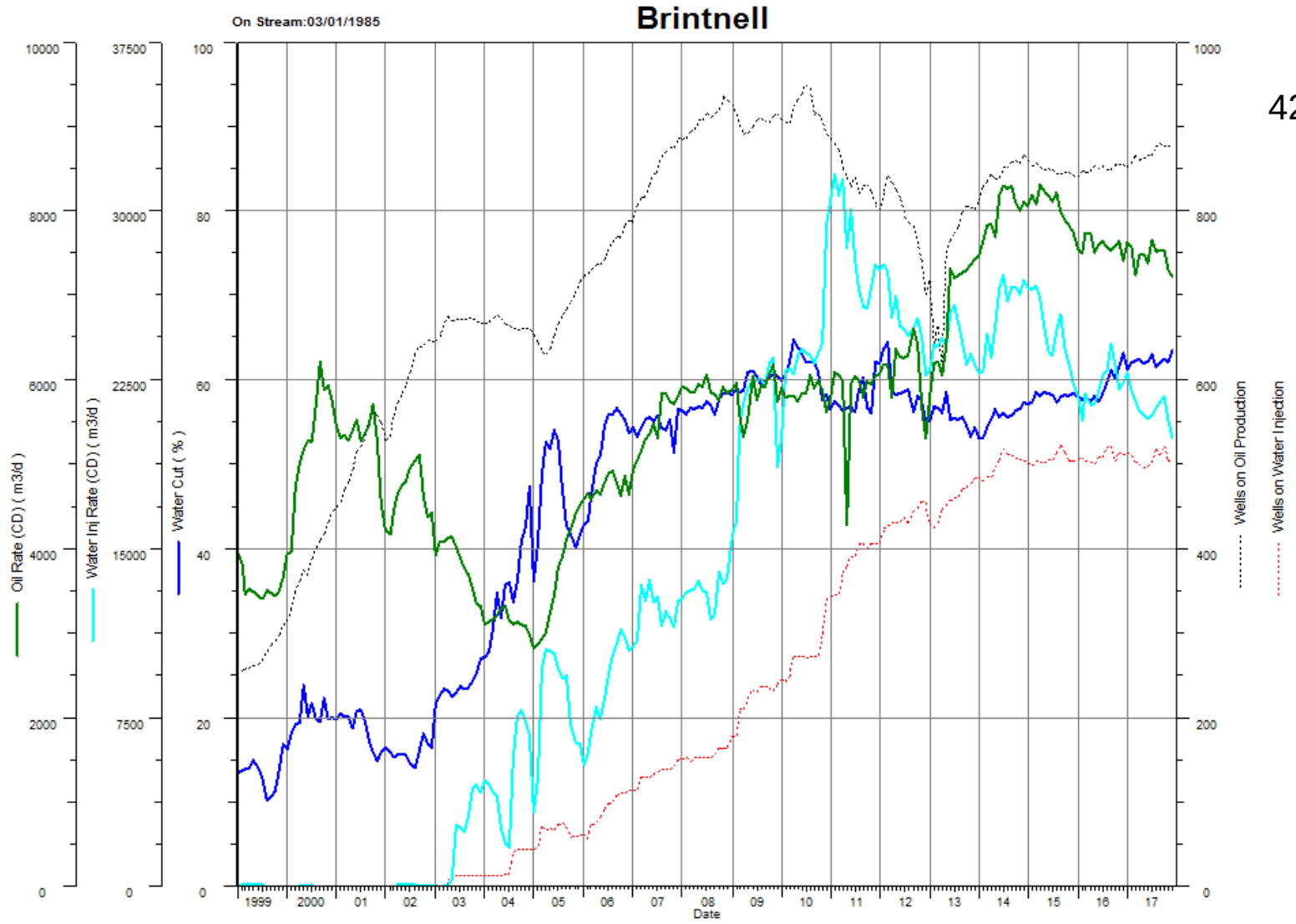
- **Intermediate Casing landed in Wabiskaw sand (producers and injectors).**

EOR History and Current Approvals

Polymerflood Development



Legacy Field Overview

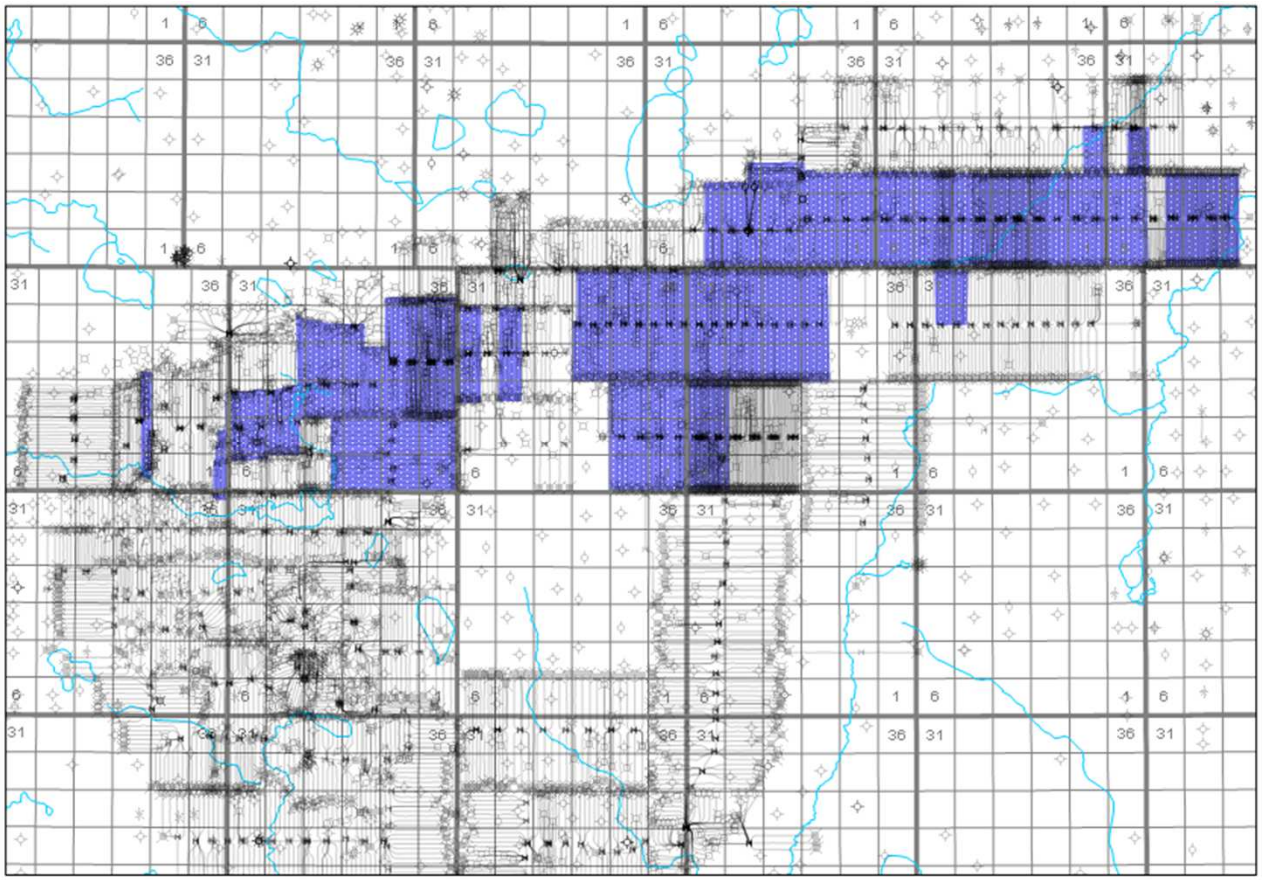


Cum. oil:
42,477 E3m3

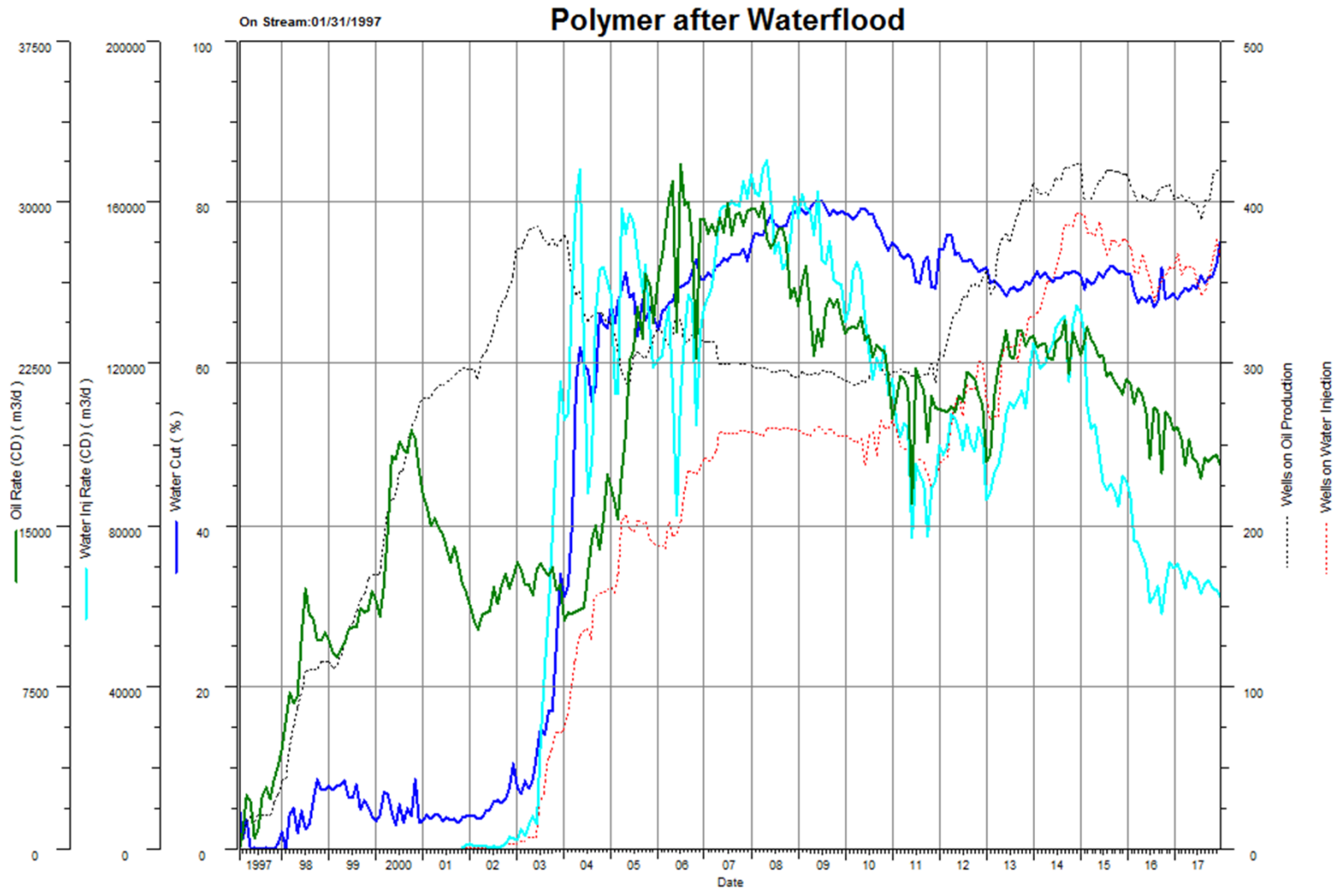
Approximately 63% of the legacy approved EOR scheme areas are currently developed and under flood as of the end of 2017

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.**

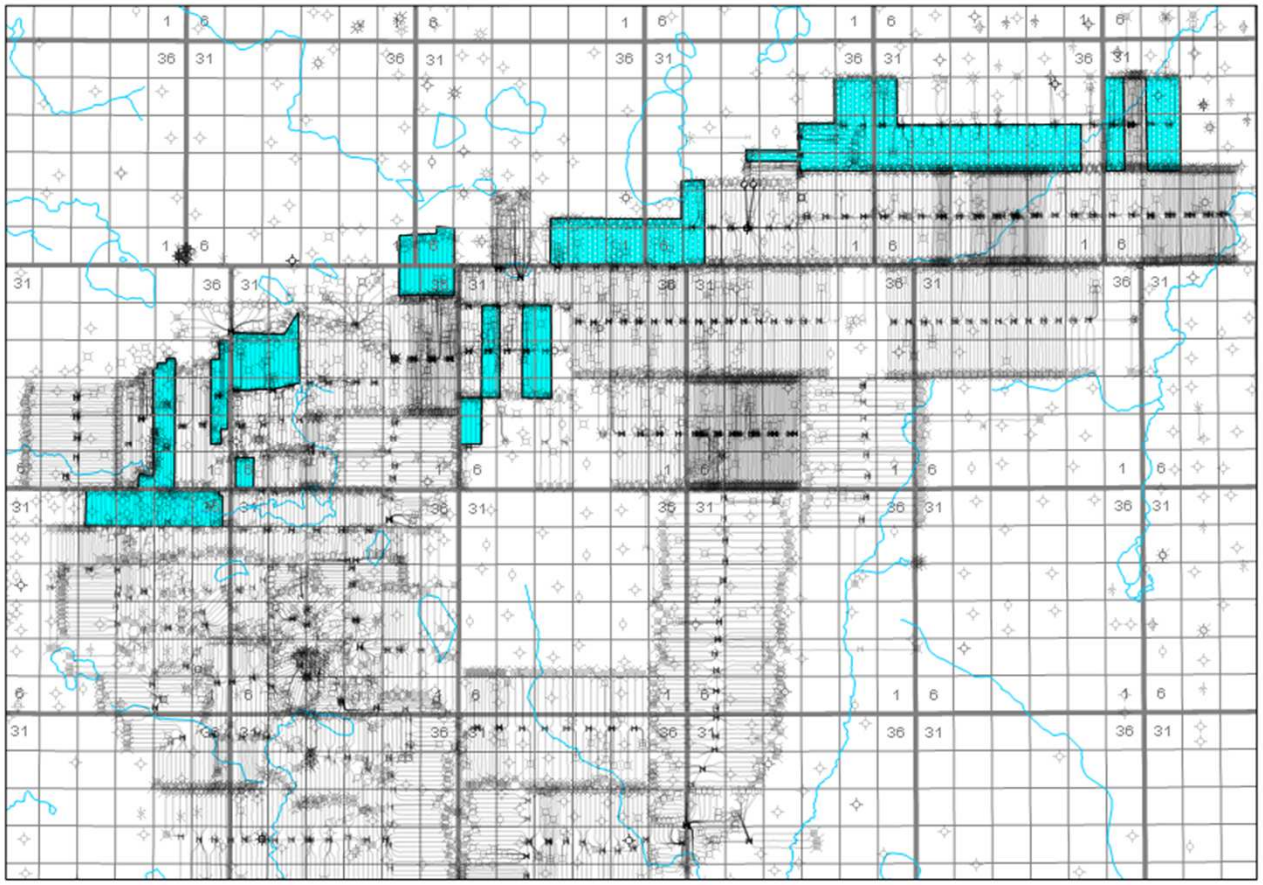


Polymerflood after Waterflood

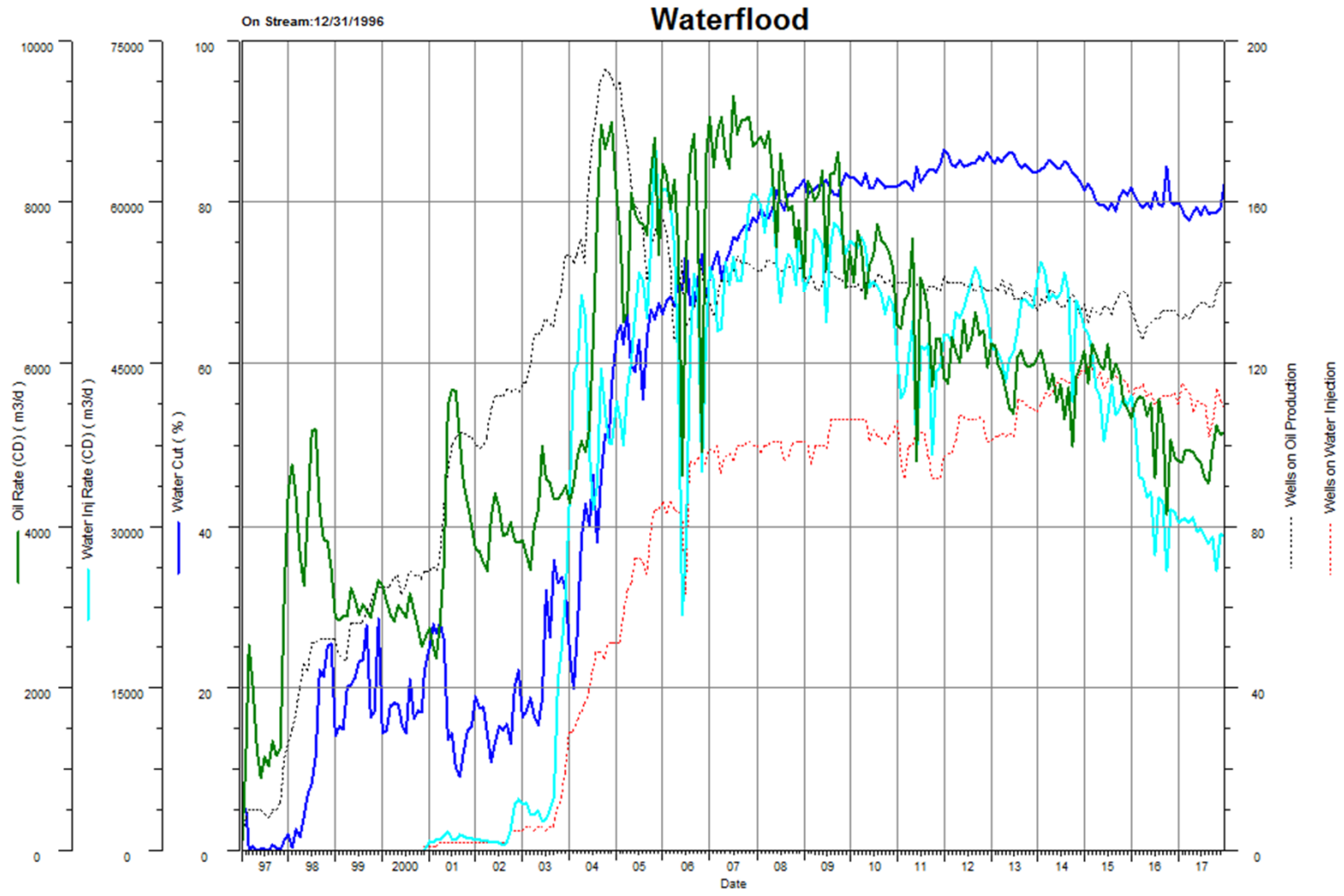


Waterflood

- **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


Waterflood
On Stream:12/31/1996
Oil Rate (CD) (m3/d)
Water Inj Rate (CD) (m3/d)
Water Cut (%)
Wells on Oil Production
Wells on Water Injection
Date
10000
8000
6000
4000
2000
0
75000
60000
45000
30000
15000
0
100
80
60
40
20
0
200
160
120
80
40
0
97
98
99
2000
01
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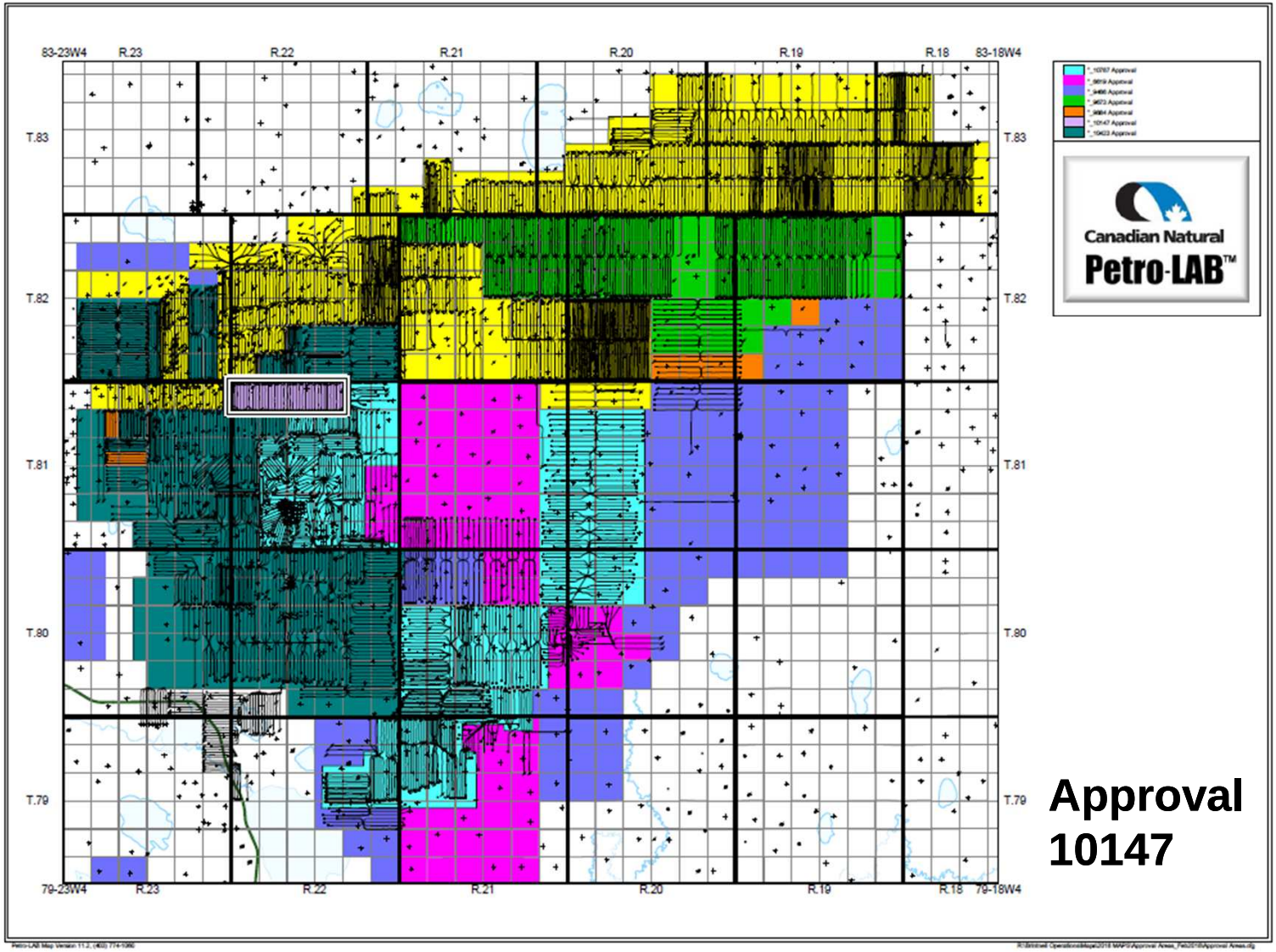
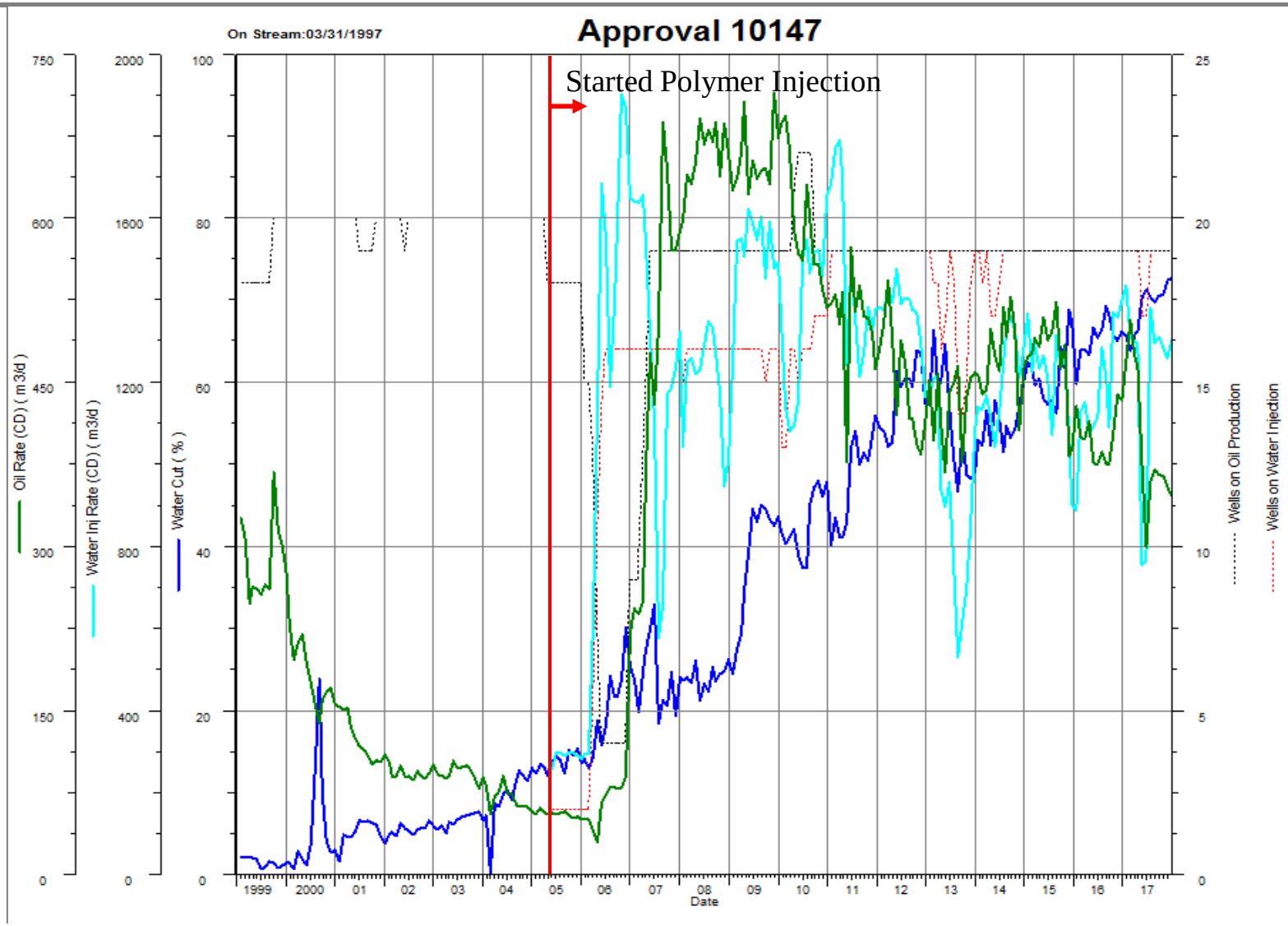
Field Performance and Surveillance

Approval 10147



Approval 10147 Production Update



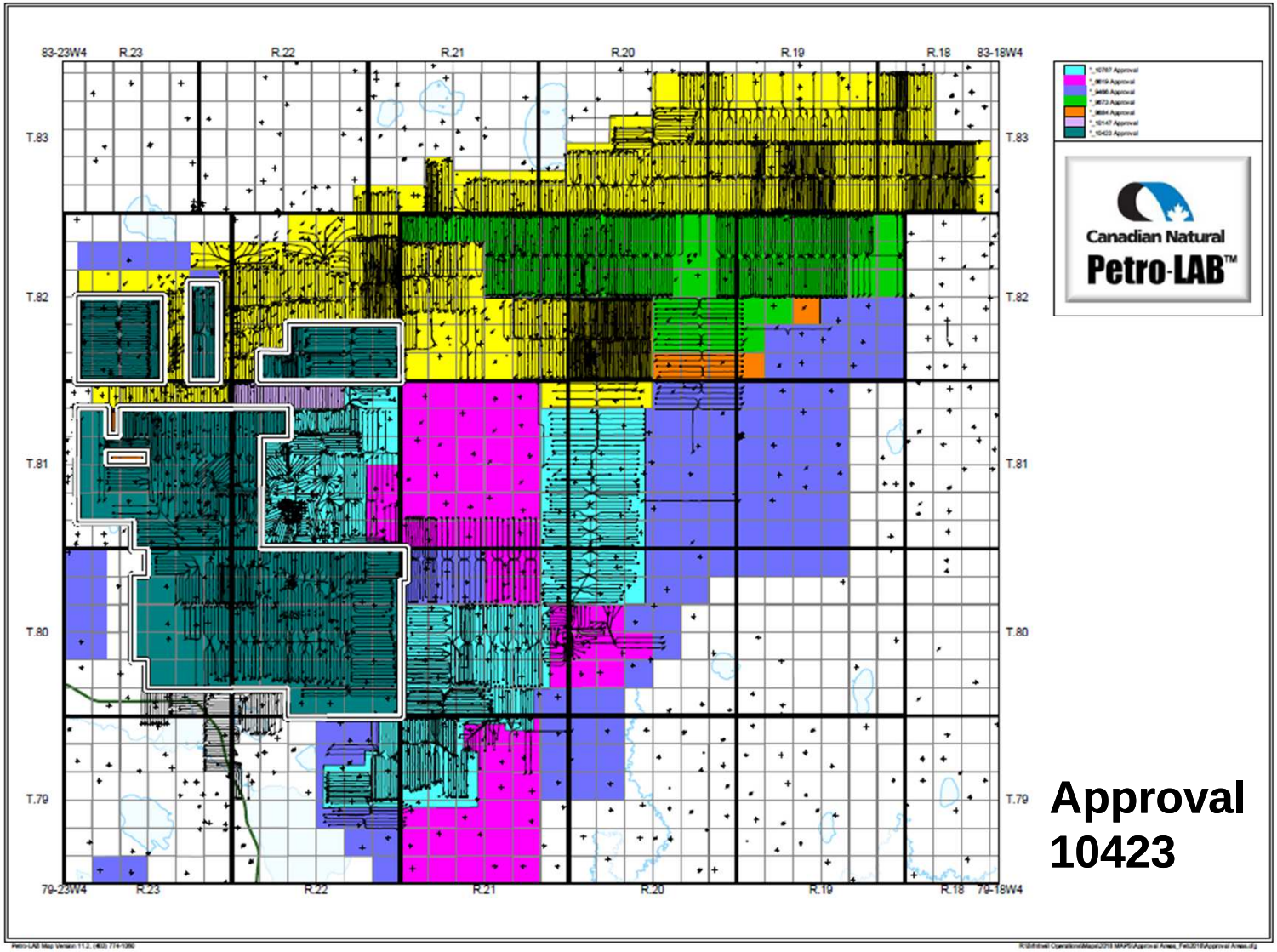
Cum oil: 2,627 E3m3 Cum water: 2,161 E3m3 Cum injection: 5,611 E3m3

Approval 10147 Discussion

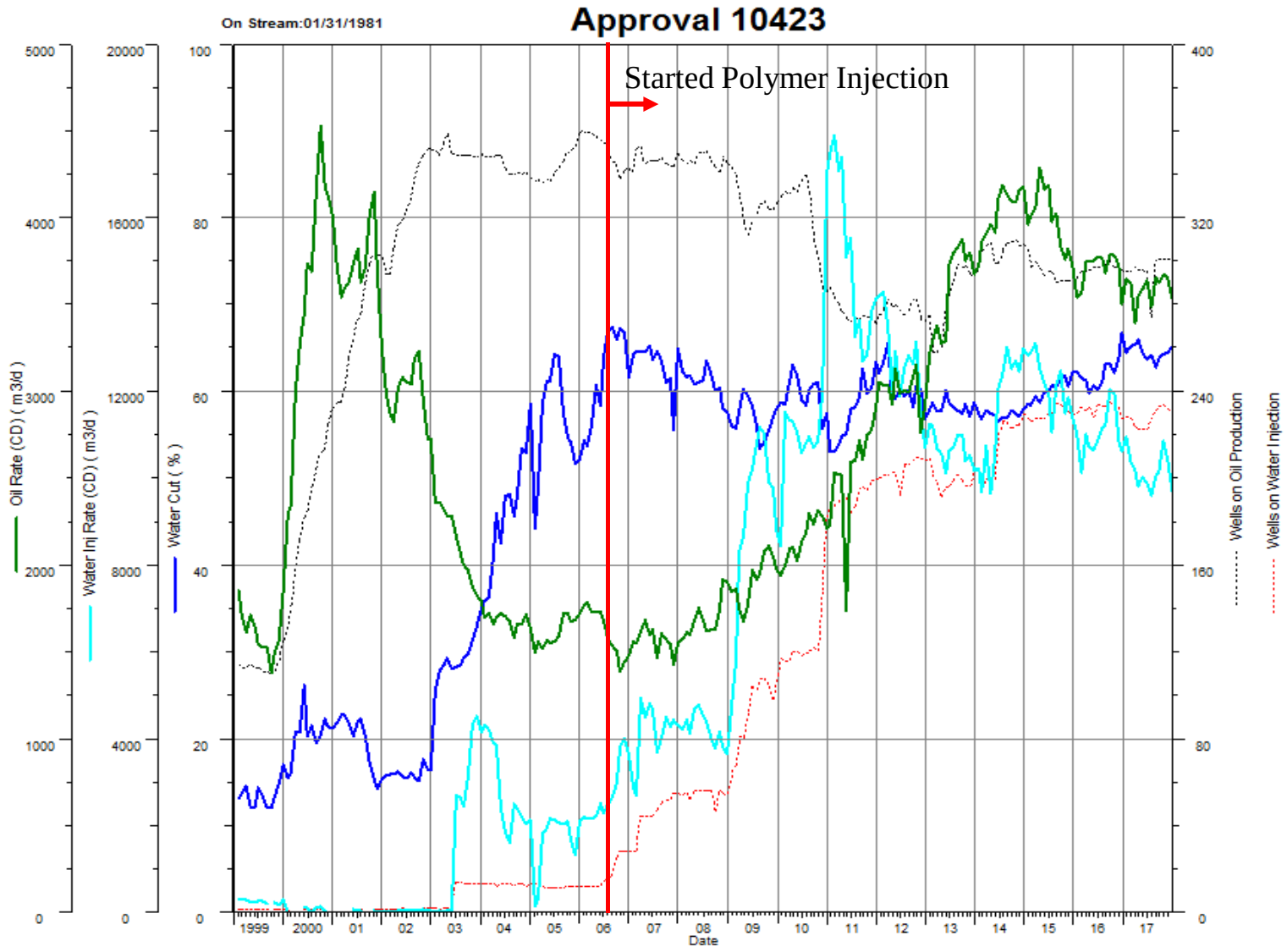
Canadian Natural

- 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 due to the maturity of the flood.
- Water cut averaged roughly 69% during 2017.
- Oil viscosity ranges from 1,300 cp to 2,800 cP.

Approval 10423



Approval 10423 Production Update



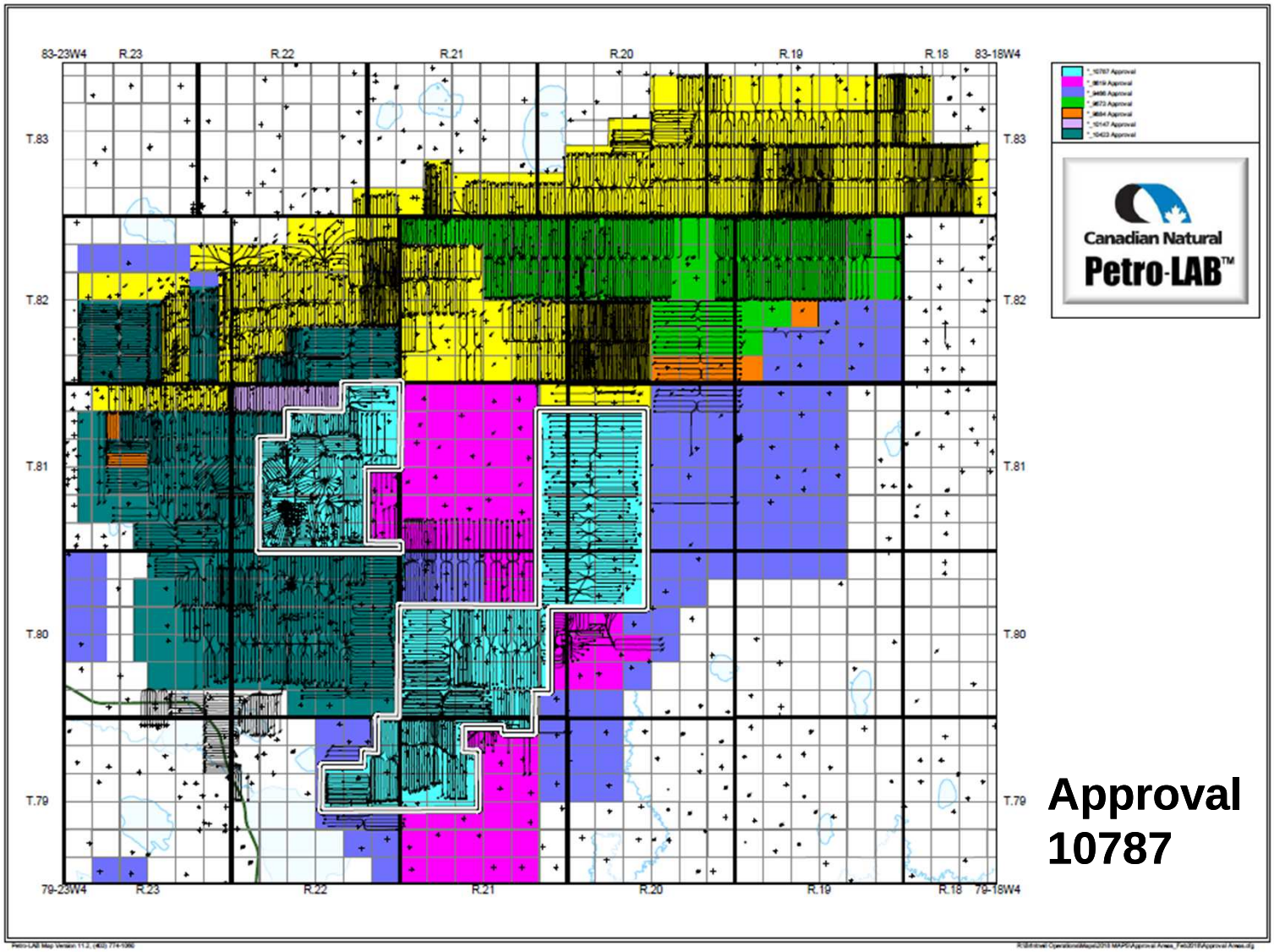
Cum oil: 20,507 E3m3 Cum water: 21,451 E3m3 Cum injection: 44,450 E3m3

Approval 10423 Discussion

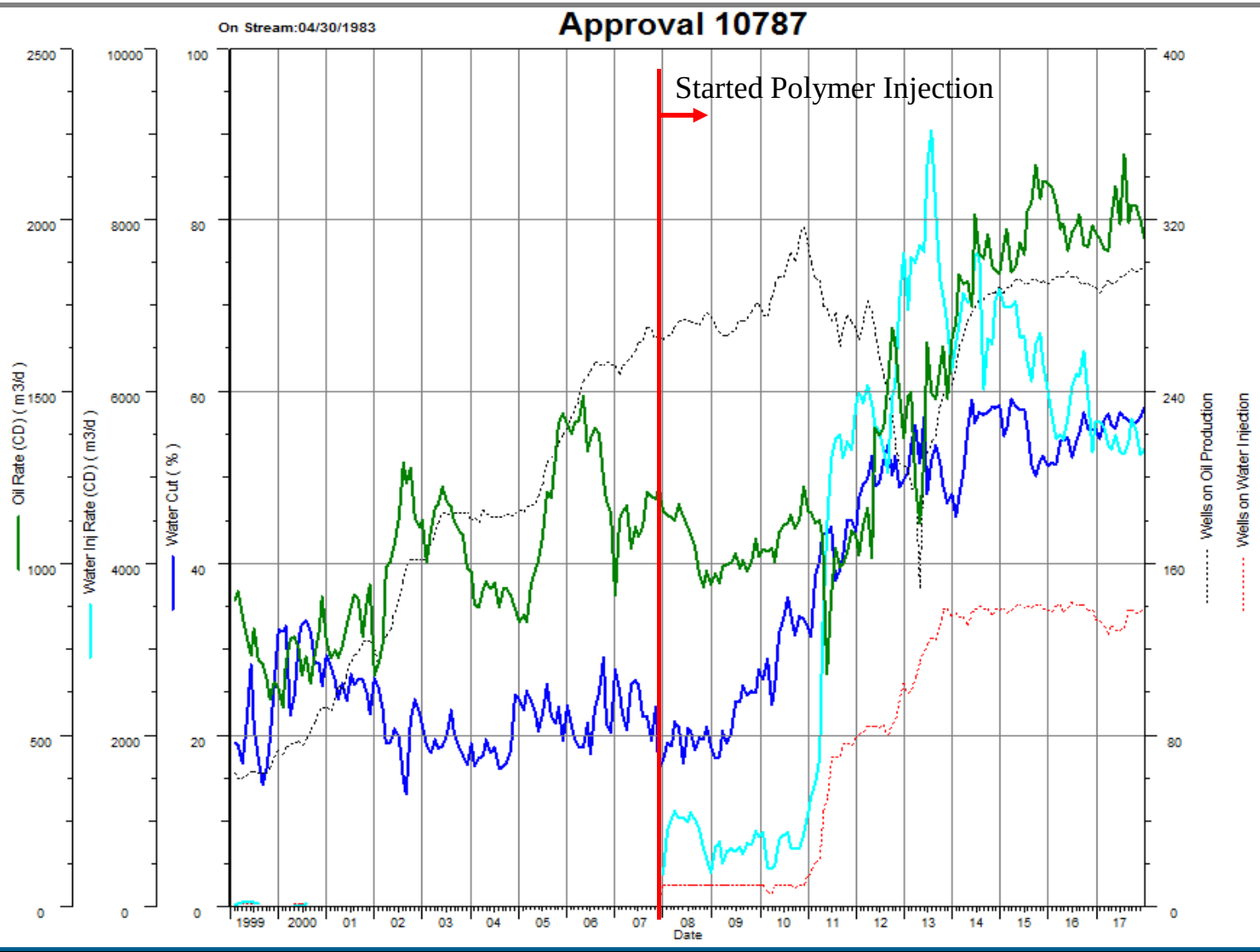
Canadian Natural

- 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 2017 approximately 64%. 10 re-drills in late 2016 & 2017.

Approval 10787



Approval 10787 Production Update



Cum oil: 9,767 E3m3 Cum water: 6,500 E3m3 Cum injection: 16,410 E3m3

Approval 10787 Discussion

Canadian Natural

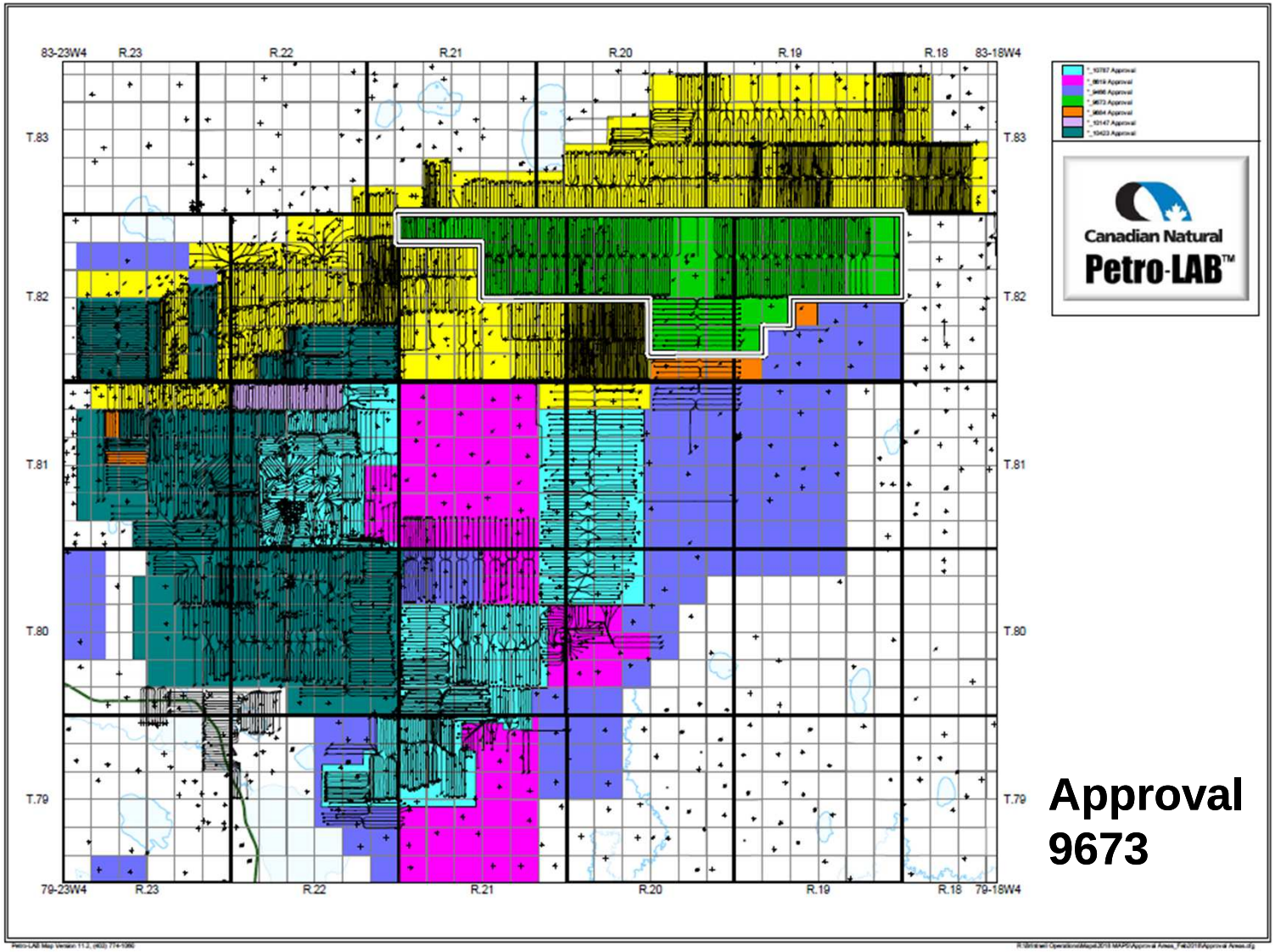
- Polymer flood started in Dec 2007 covering roughly 4% of the approval area split into 2 small groups. There were no expansions until 2010, since then there has been an expansion completed in every year including 2013. Currently 45% of the approval area is under flood.
- First polymer response in Nov 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 2017 increased oil, tempered WCT increase (average 57%).
- Oil viscosity ranges from 1,100 cp to 14,400 cp.

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

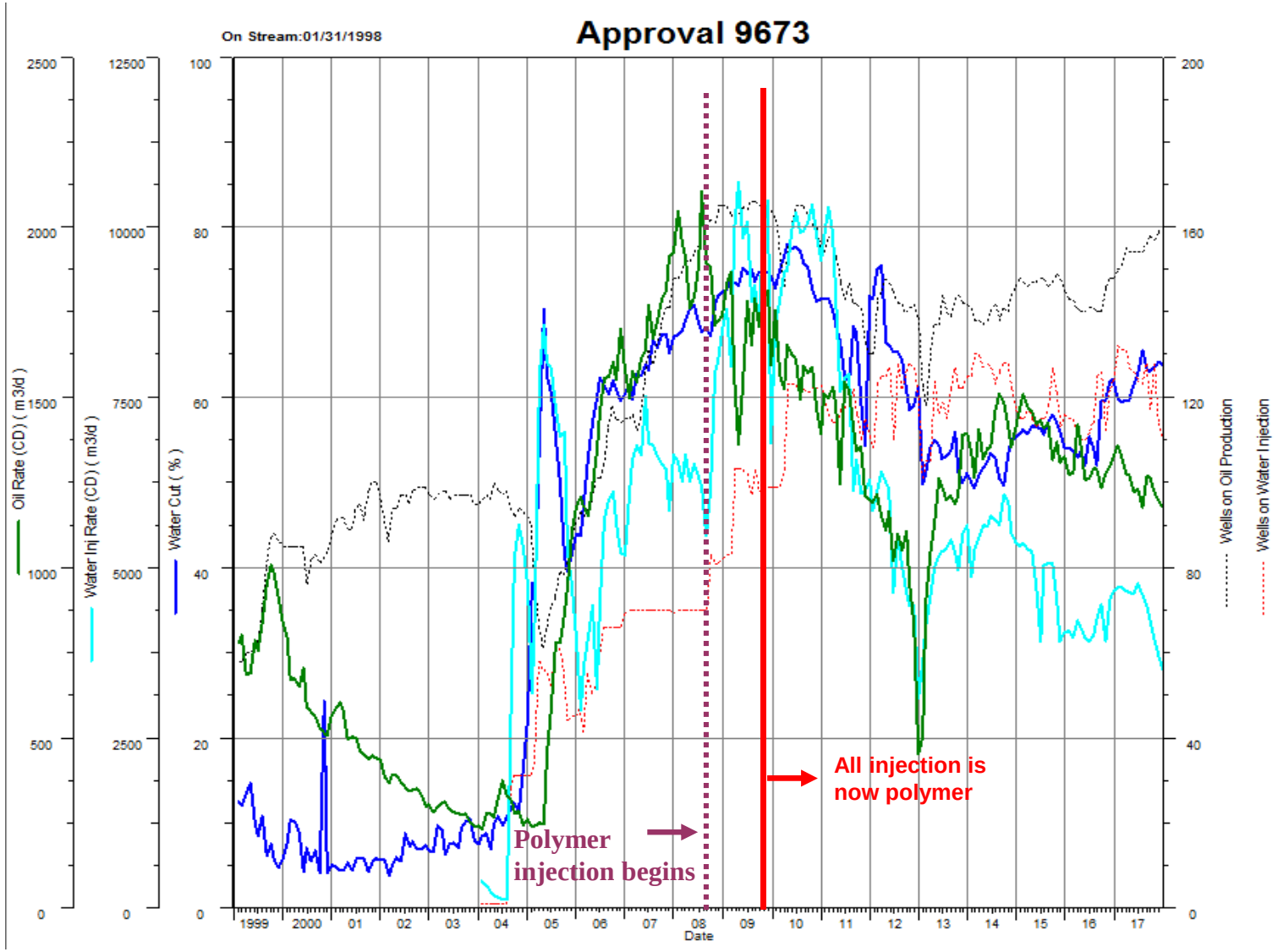
Canadian Natural

- 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 2015-2017.
  - The pressure was measured in October 2017 to be 456 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



Cum oil: 7,764 E3m3 Cum water: 12,167 E3m3 Cum Injection: 30,034 E3m3

Approval 9673 Discussion

Canadian Natural

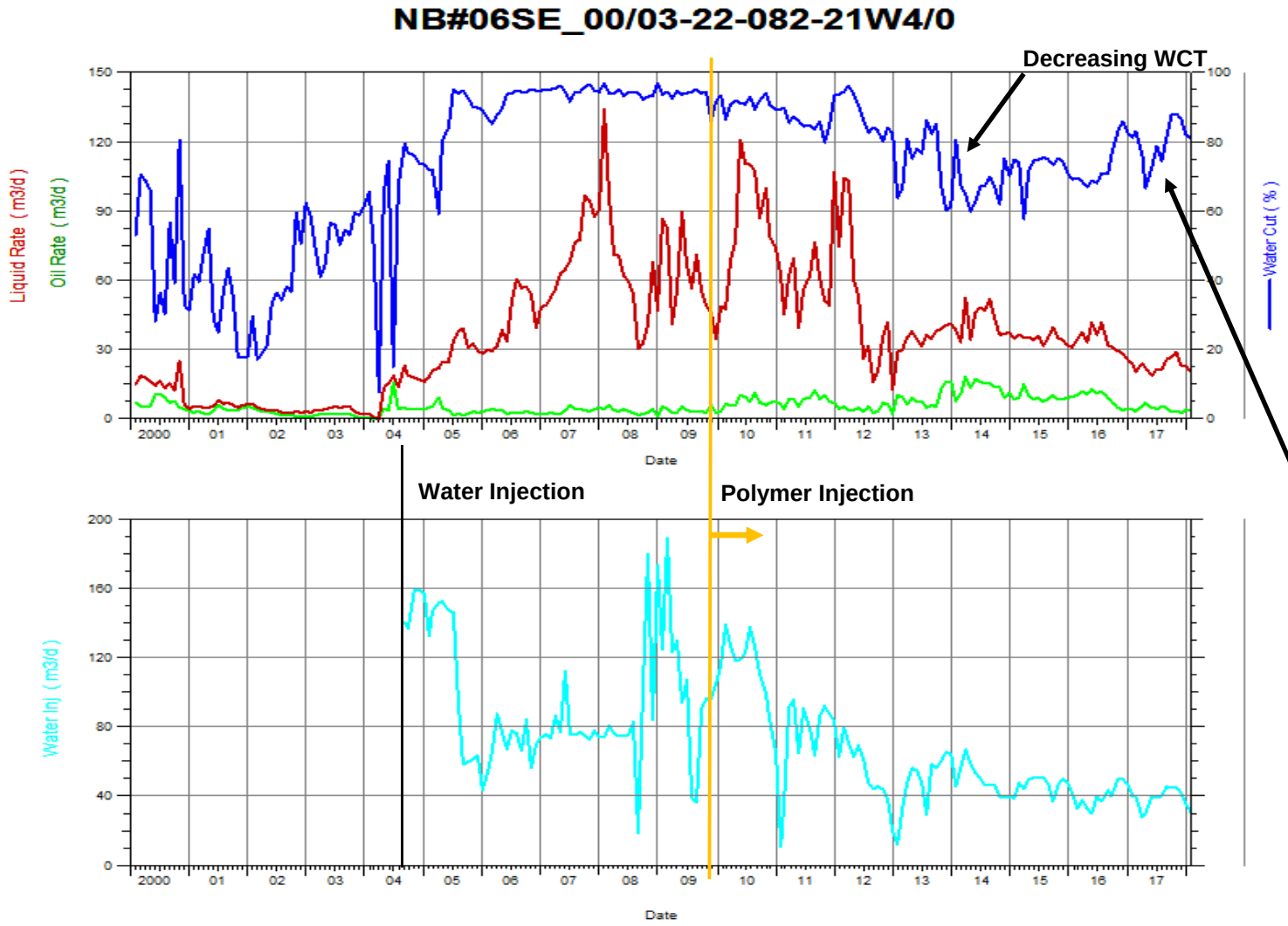
- Originally approved for waterflood in 2004; waterflood was expanded in 2005/2006 to cover roughly 40% of the current approval area.
- Waterflood peak production occurred from late 2007 to early 2009 at 1850 m3/d oil.
- Polymerflood began in Sept 2008 covering 6% of approval area. Existing waterflood 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.
- First polymer response occurred in Sept 2009 but due to declining production from the waterflood areas, have only recently started to see a ramp up in oil volumes from the polymer 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 2017 watercut averaged about 62%, increasing due to the reactivation of high WCT wells.
- Oil viscosity ranges from 600 cp to 13,000 cp.

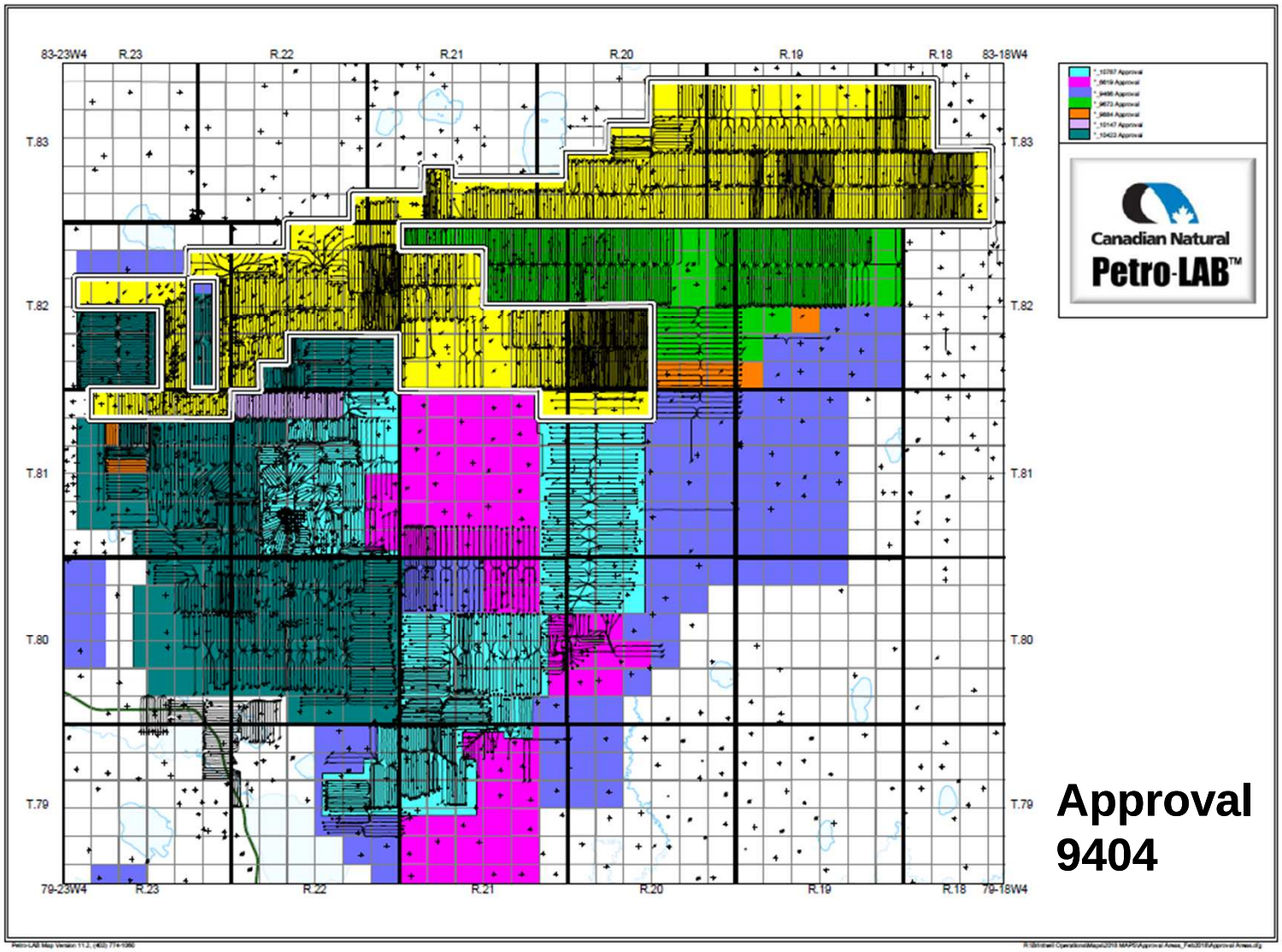
Approval 9673 Discussion: Polymer after Waterflood Example



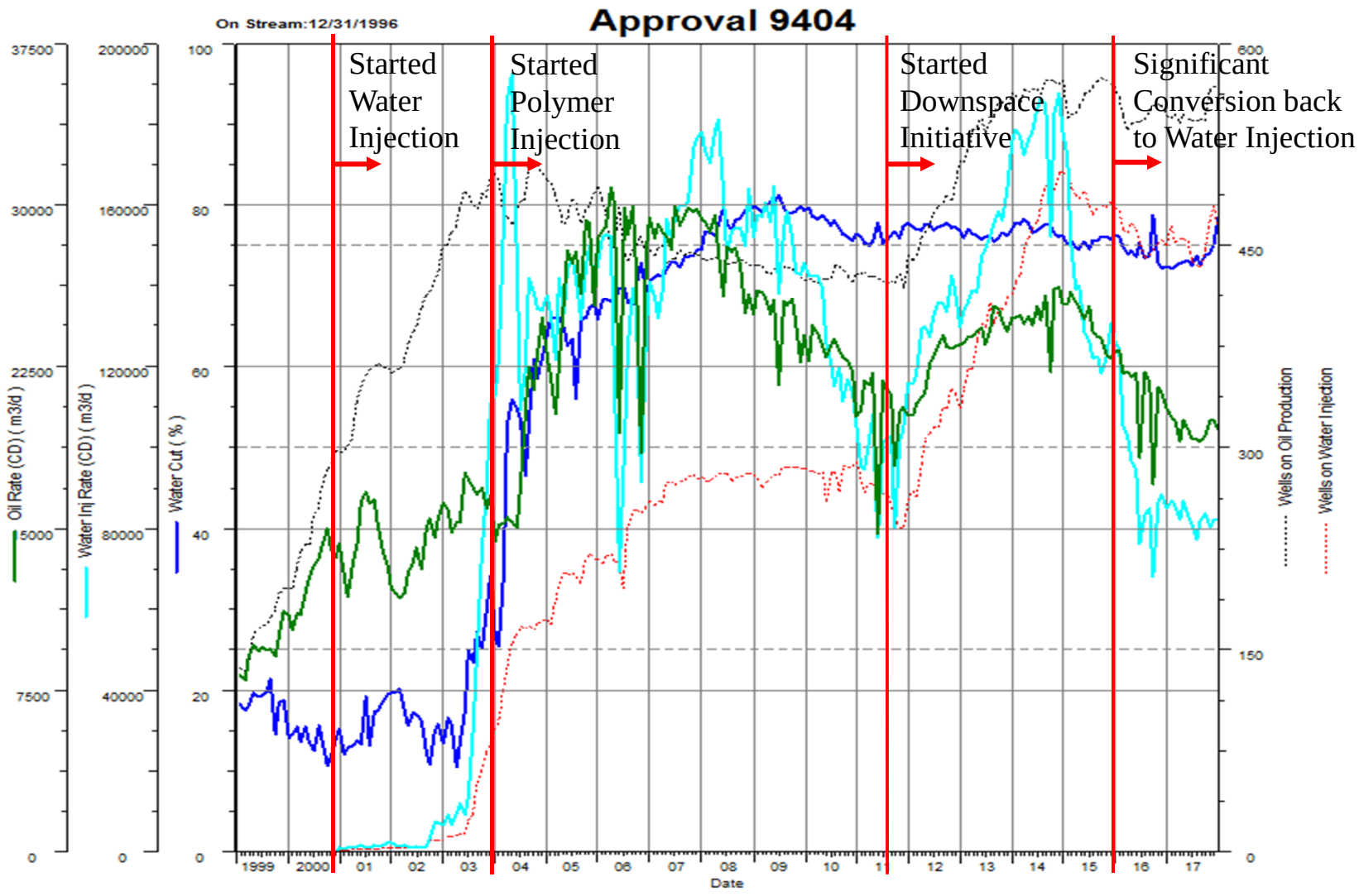
Results from polymer flood after waterflood areas vary by pattern but do show substantial polymer flood response on both oil and WCUT.

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

Approval 9404

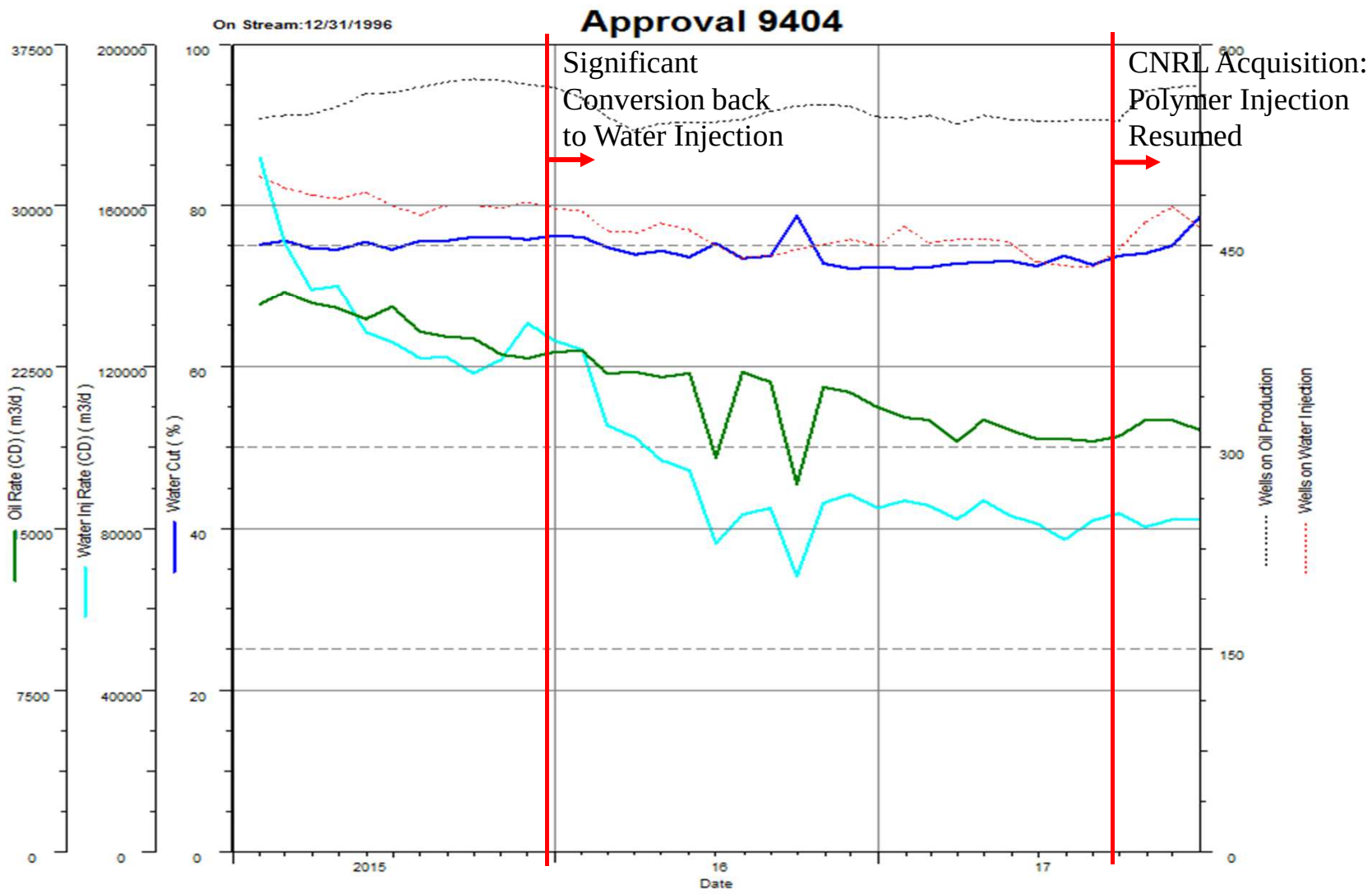


Approval 9404 Production Update



Cum oil: 24,200 E3m3 Cum water: 58,000 E3m3 Cum injection: 111,400 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

- 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.
- 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: 9%
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: 10%
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: 28%
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: 11%
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: 14%
EURF: 23-29%

*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

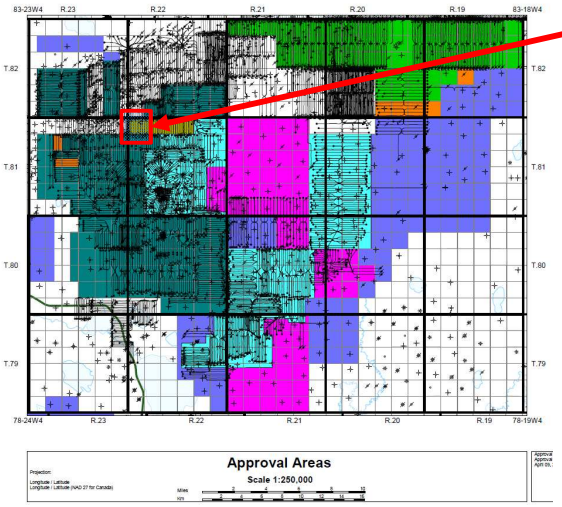
- **HTL1 100/15-31 Pattern**
  - **Well list and allocation factors:**

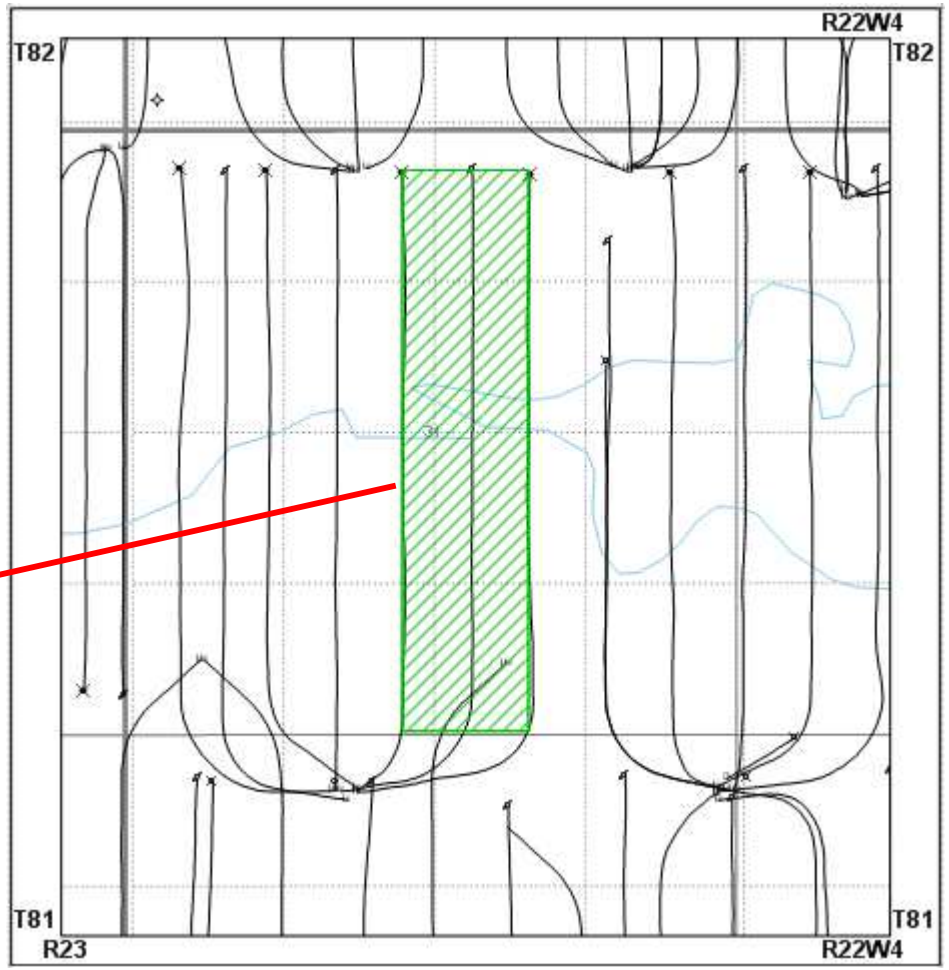
Injectors

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

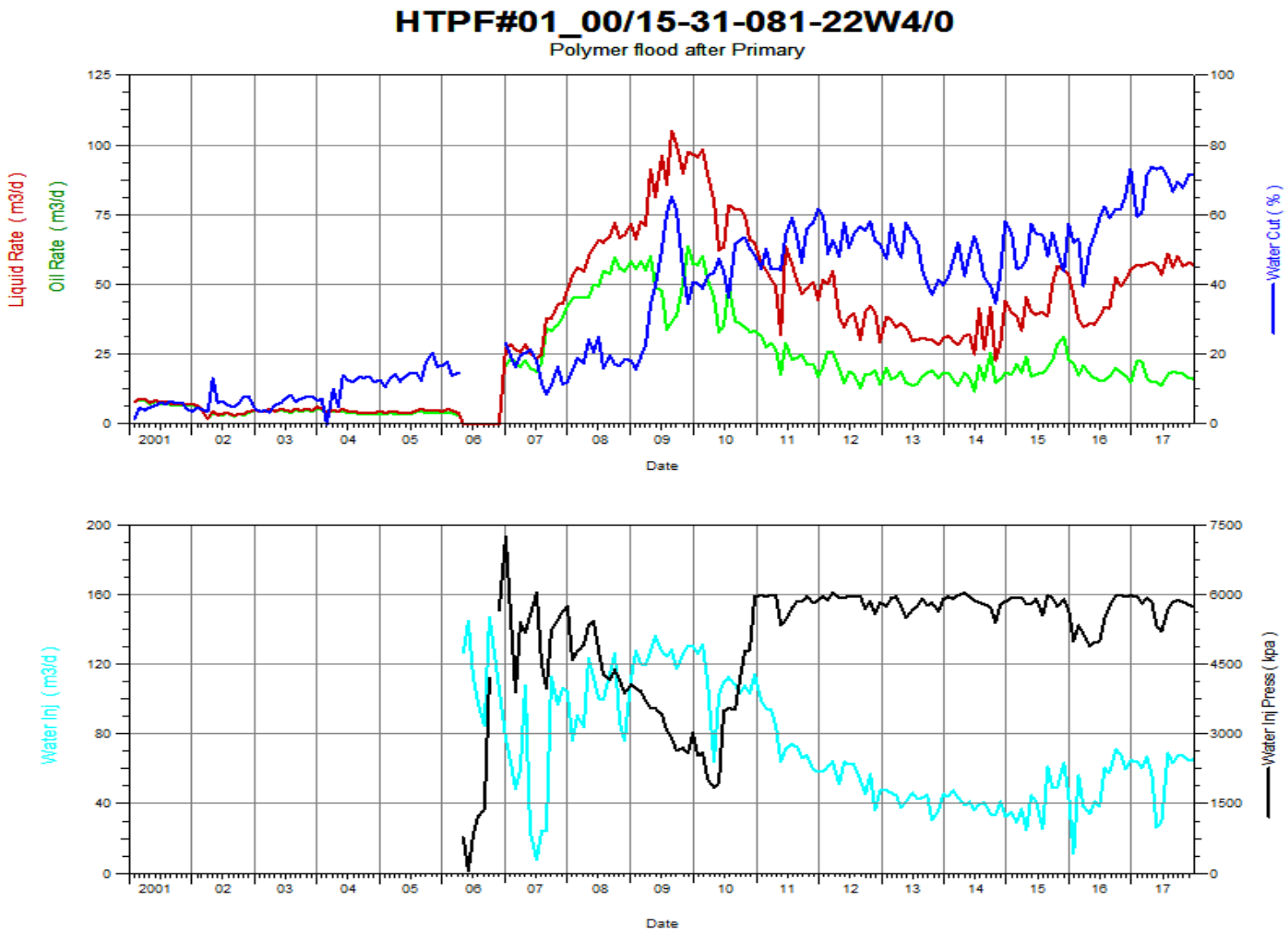
Producers

- 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:**

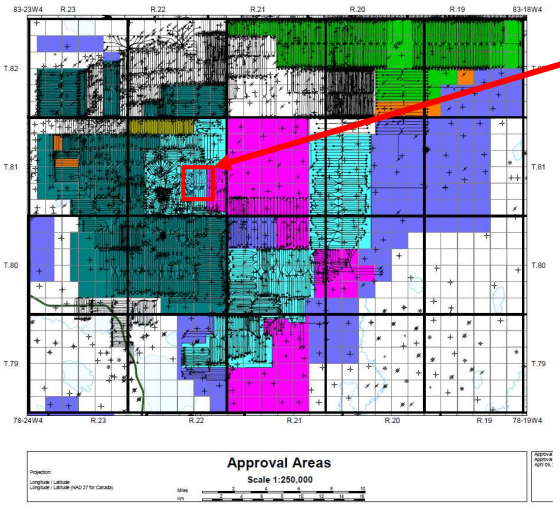
    Injectors

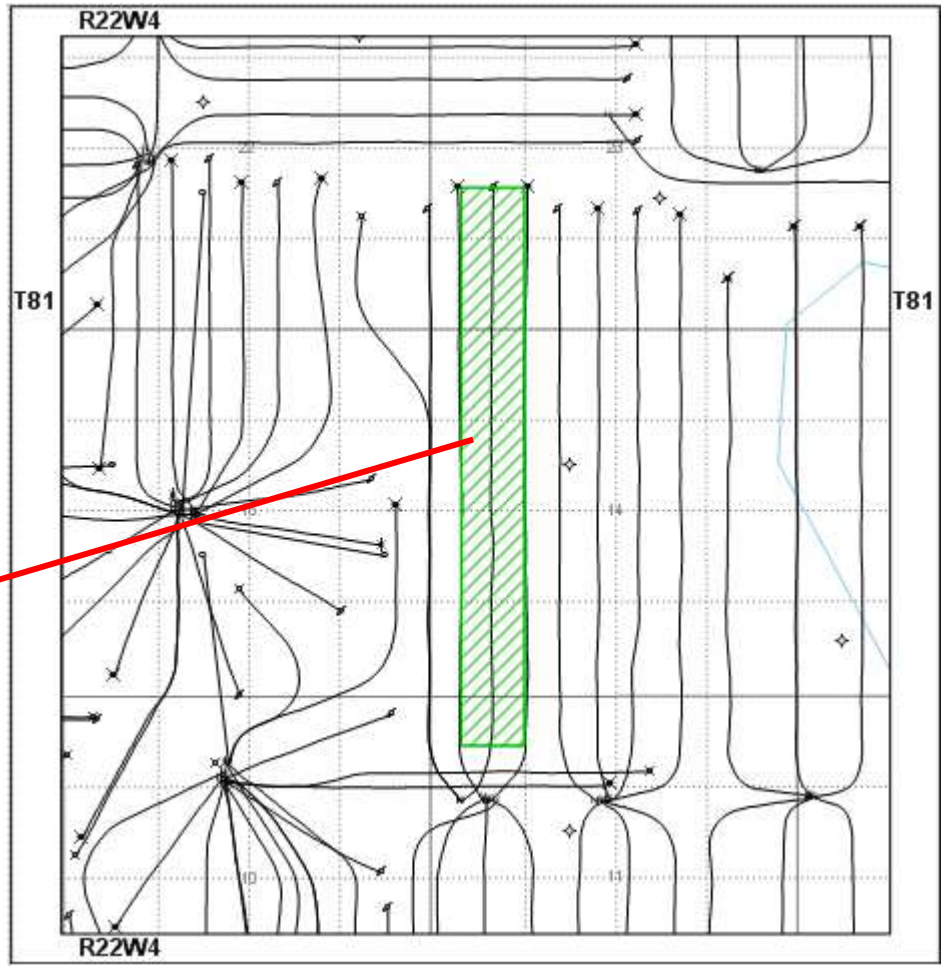
    ➢**100/05-23-081-22W4/0 (100%)**

    Producers:

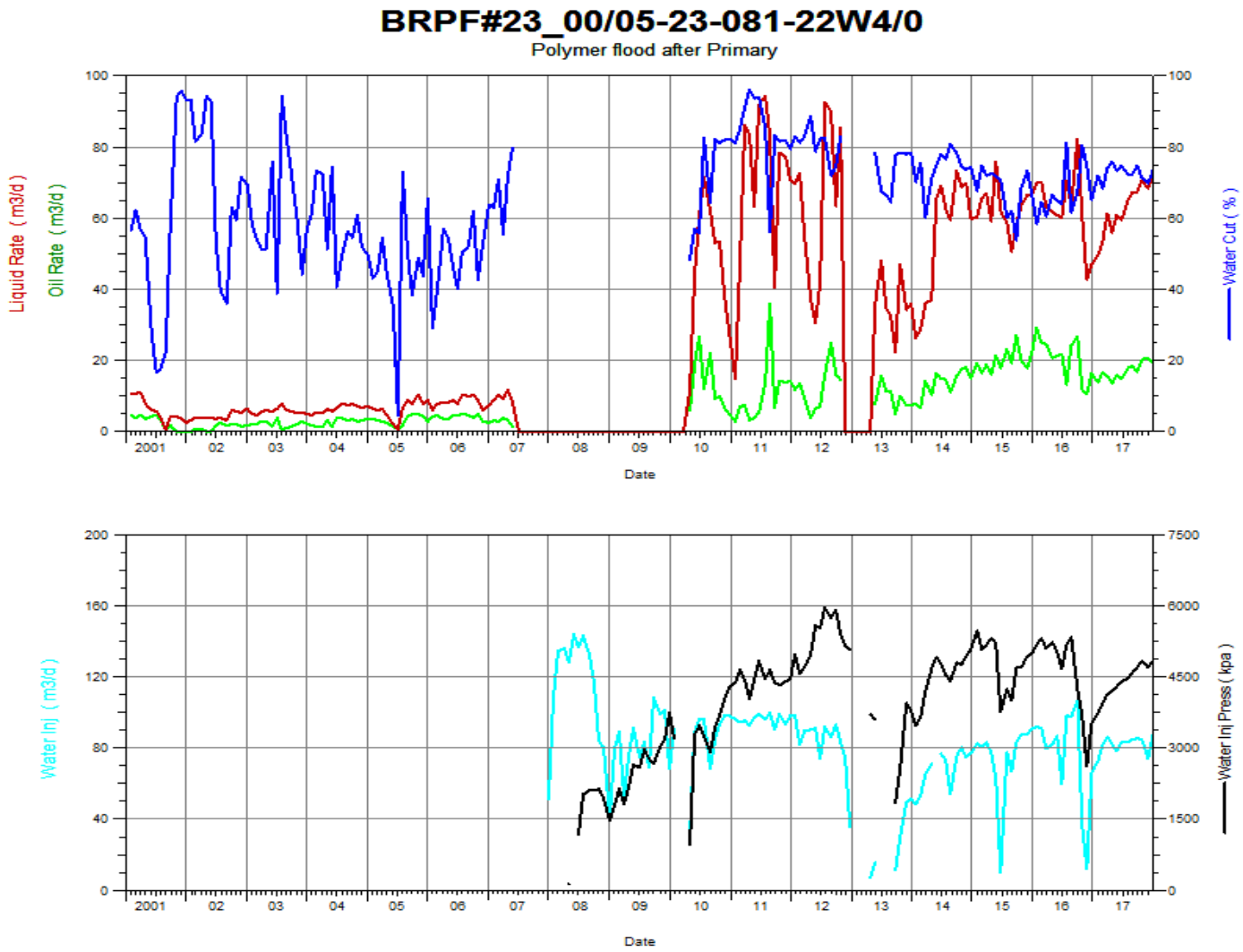
    ➢**102/05-23-081-22W4/0 (50%)**

    ➢**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:**

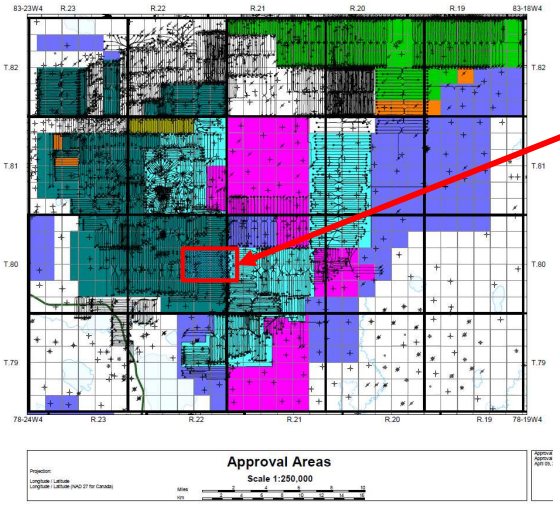
    Injector

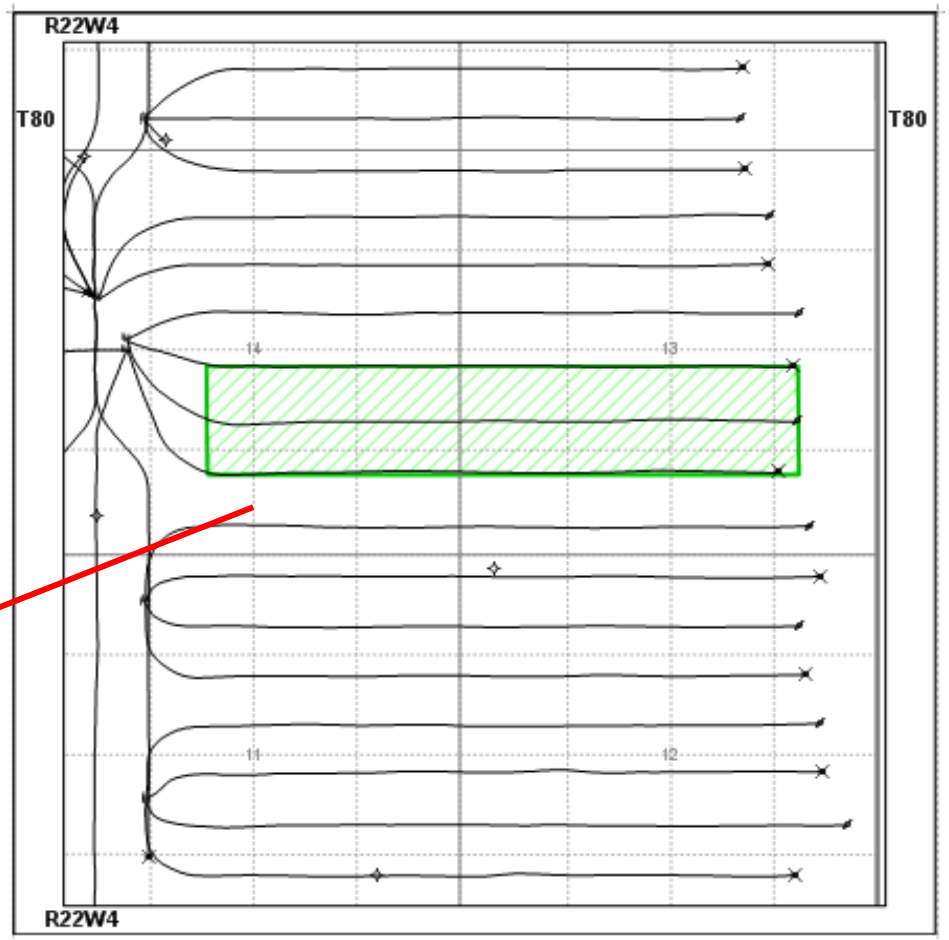
    ➢ **102/08-13-080-22W4/0 (100%)**

    Producers

    ➢ **100/01-13-080-22W4/0 (50%)**

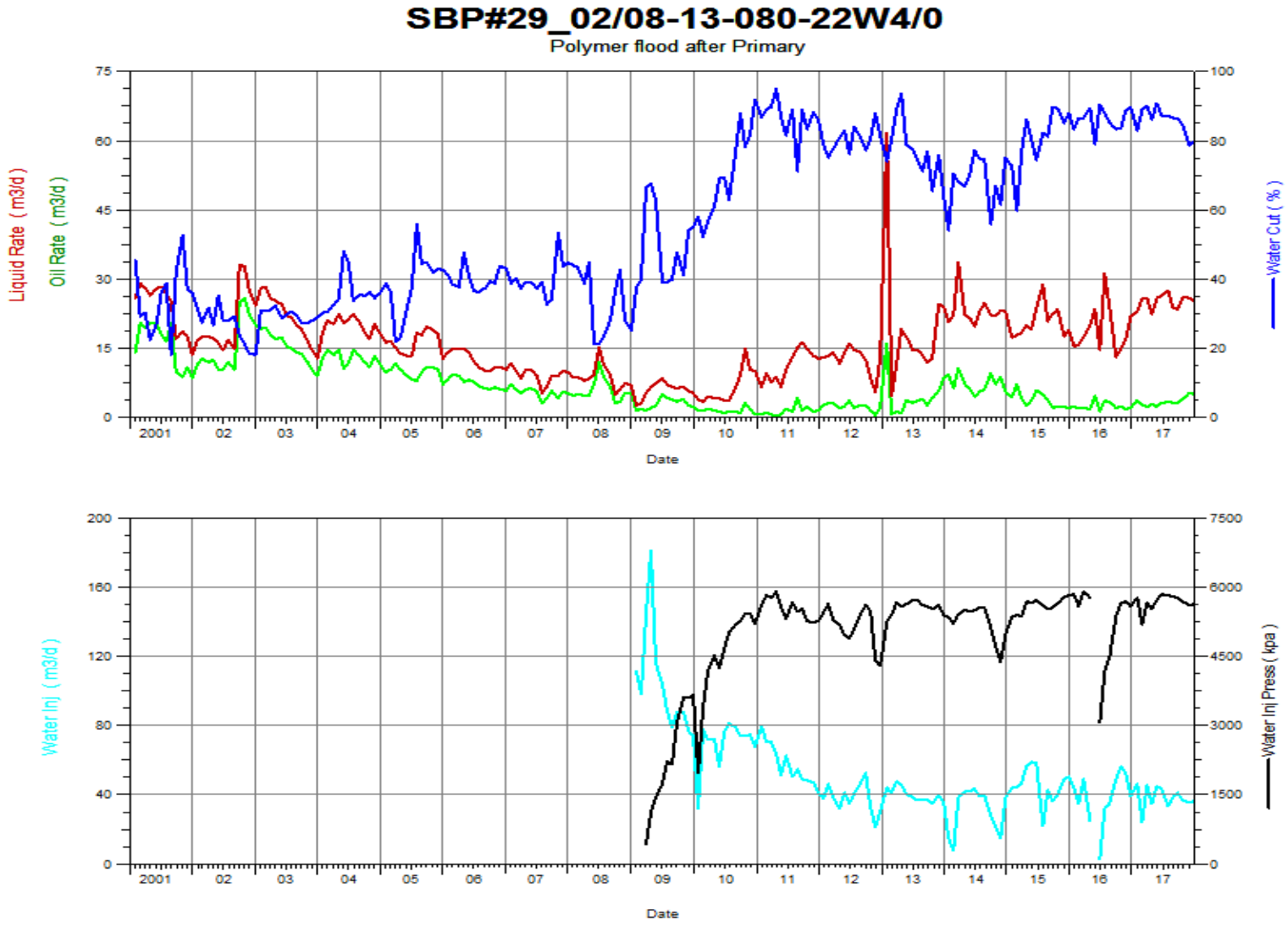
    ➢ **100/08-13-080-22W4/0 (50%)**



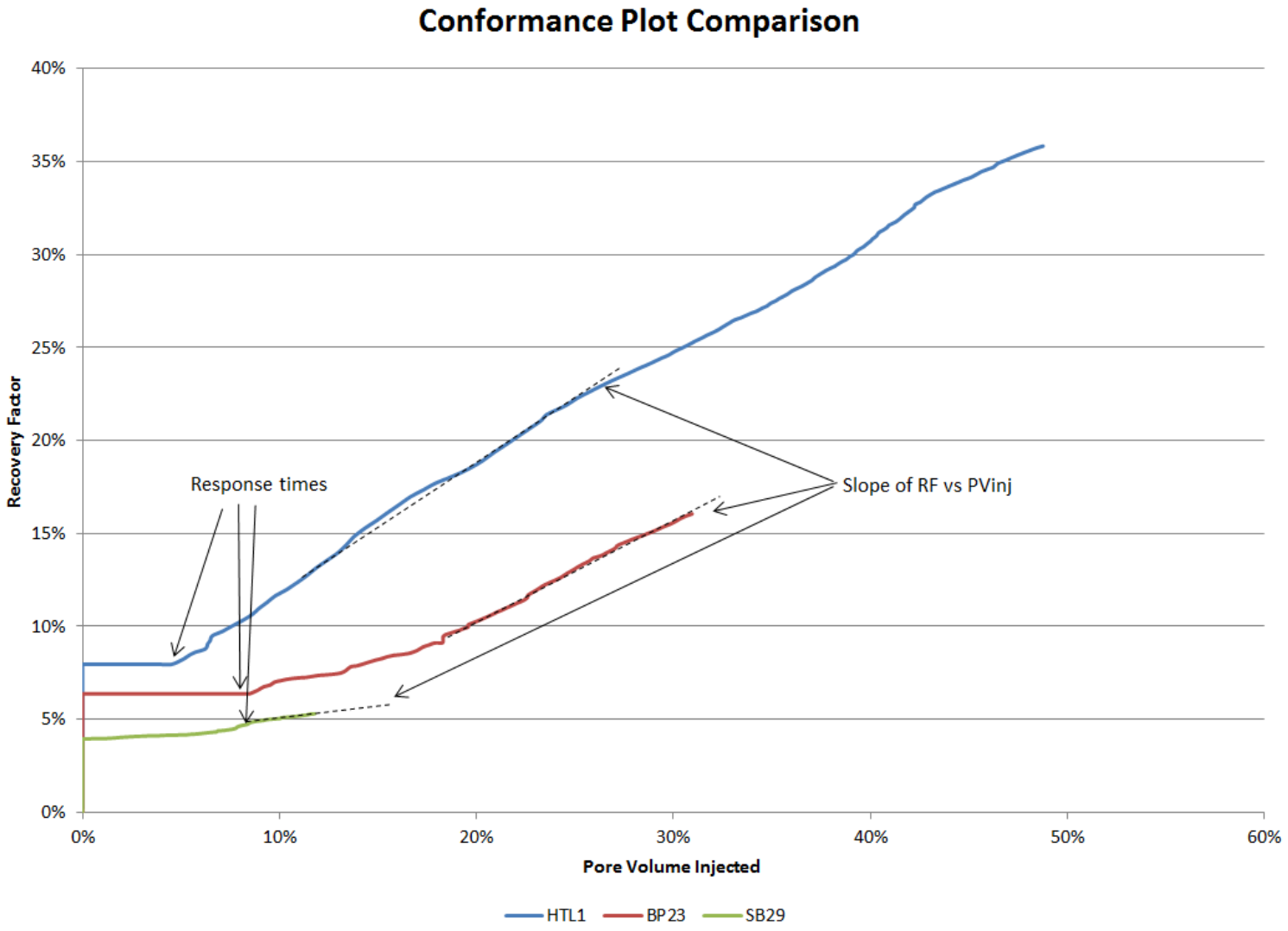


Below Average Performance – SB 29 (Approval 10423)

Canadian Natural



Summary of Good/Average/Poor Areas



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:**

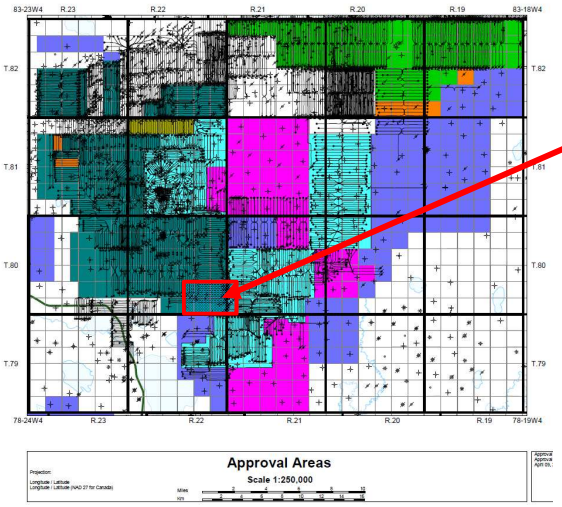
    Injectors

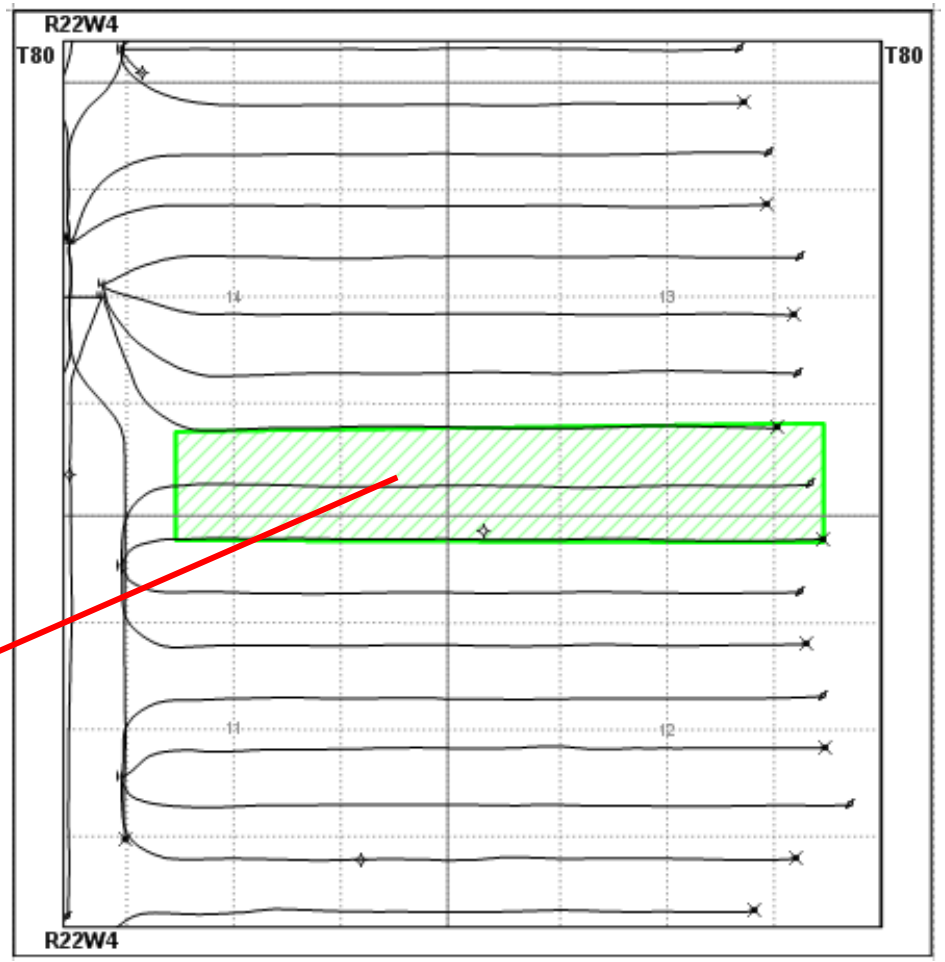
    ➢ **102/01-13-080-22W4/0 (100%)**

    Producers

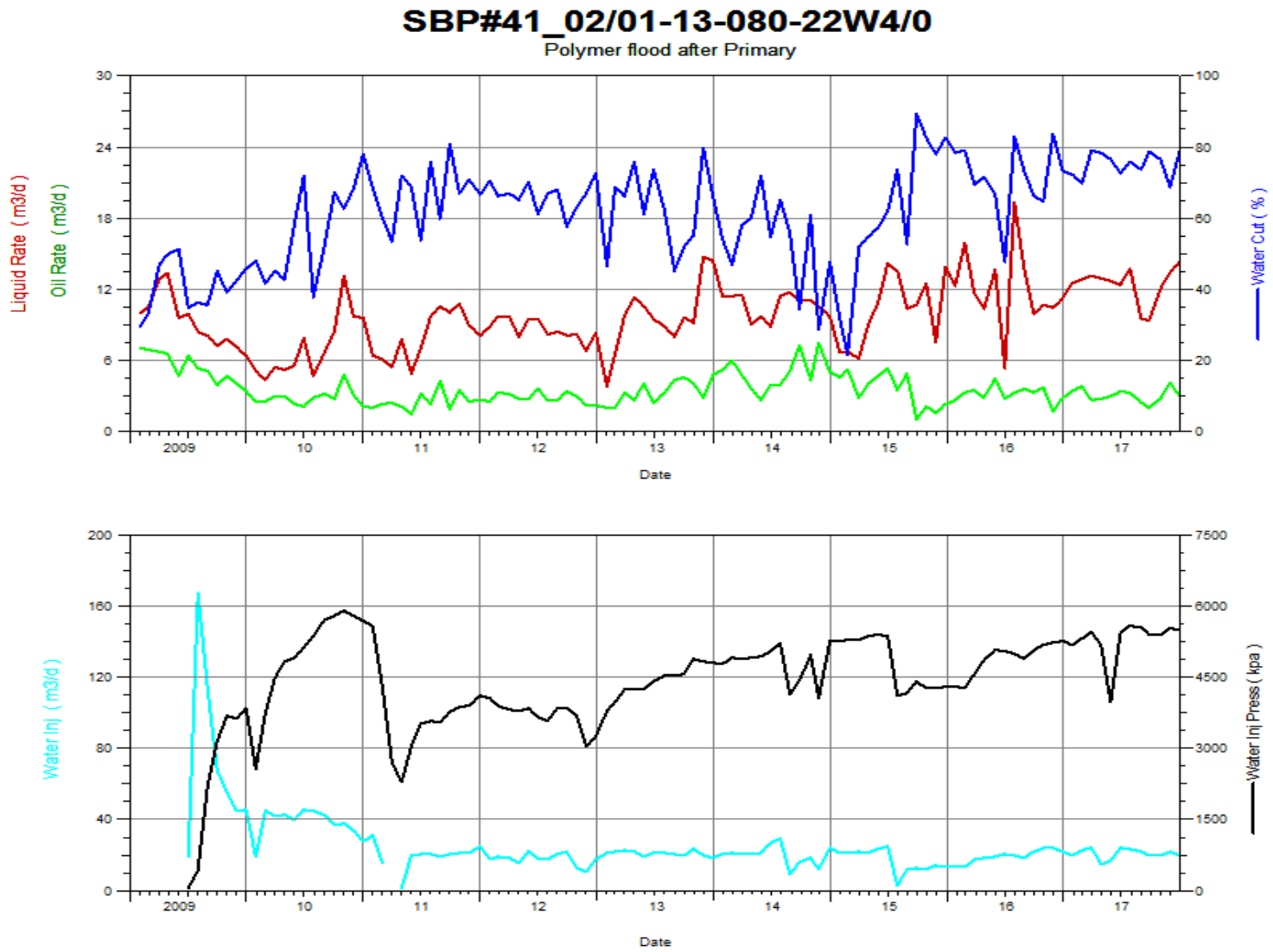
    ➢ **100/01-13-080-22W4/0 (50%)**

    ➢ **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

- **2017 Anomalies (6 in total)**

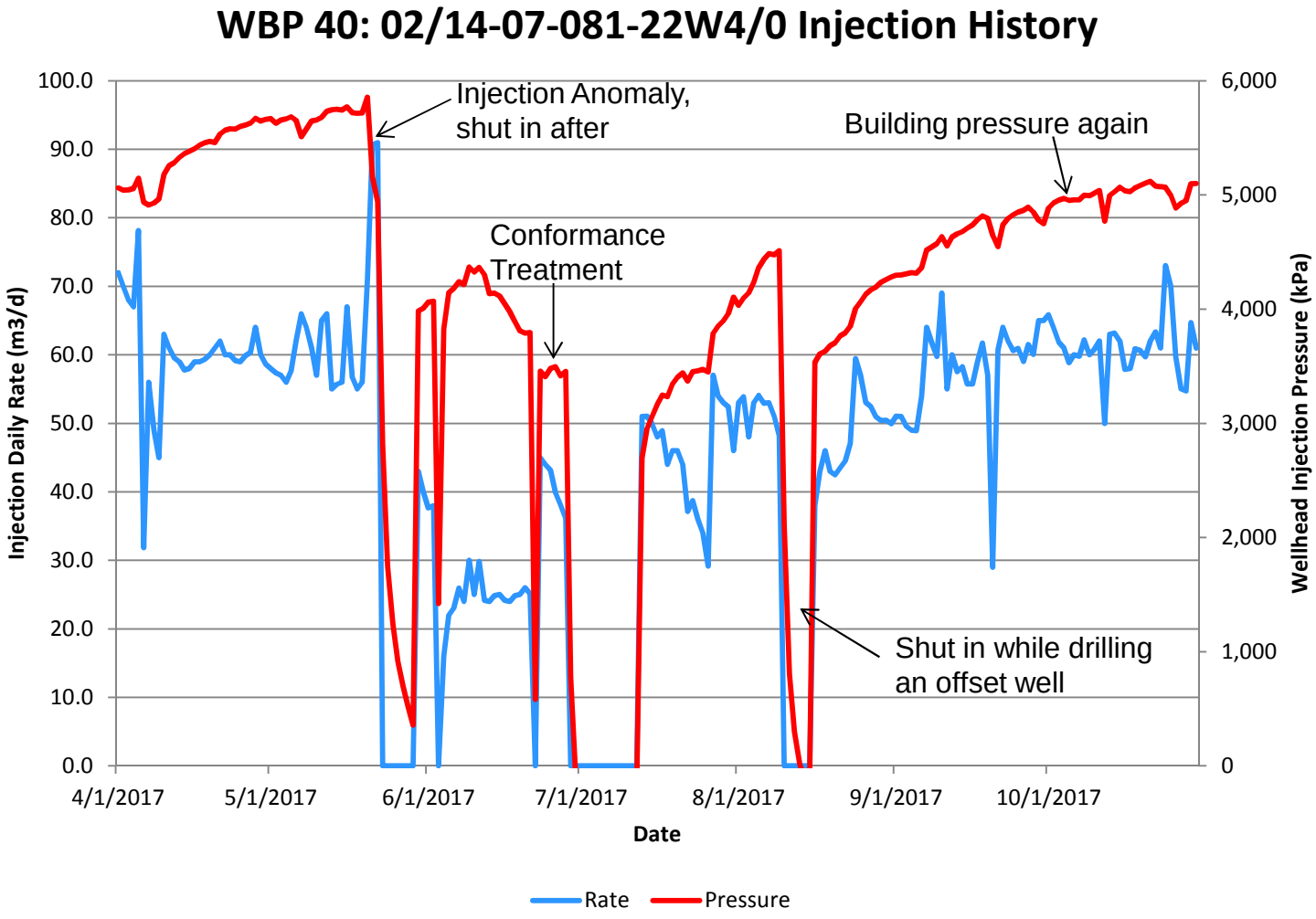
Date of Event	Location	Cause of Alarm	Operations Review of Injection Well	Initial Injection Pressure	Anomalous Pressure	Initial Injection Rate	Anomalous Rate	Cause of Anomaly
(MM/DD/YYYY)	(Pad Name and UWI)			(kPag)	(kPag)	(m3/d)	(m3/d)	
February 8, 2017	NBP 8: 03/04-23-082-21W4/0	Drop in injection pressure/injection rate increase	Surface facilities and instrumentation checked and found to be working properly	5376	4403	45	90	Dilation within the Wabiskaw sand
May 20, 2017	WBP 40: 02/14-07-081-22W4/0	Drop in injection pressure	Surface facilities and instrumentation checked and found to be working properly	5938	4917	56	118	Dilation within the Wabiskaw sand
July 2, 2017	BP 4 00/03-17-081-22W4/0	Drop in injection pressure/injection rate increase	Surface facilities and instrumentation checked and found to be working properly	5020	3942	41	82	Flood accessing new higher permeablility reservoir
July 12, 2017	WBP 41 03/14-07-081-22W4/0	Drop in injection pressure/injection rate increase	Surface facilities and instrumentation checked and found to be working properly	4550	3800	54	70	Dilation within the Wabiskaw sand
July 31, 2017	BP 19 02/06-03-081-22W4/0	Drop in injection pressure	Surface facilities and instrumentation checked and found to be working properly	4804	4234	61	79	Flood accessing new higher permeablility reservoir
October 18, 2017	NBP 7 02/03-22-082-21W4/3	Drop in injection pressure/injection rate increase	Surface facilities and instrumentation checked and found to be working properly	6000	5400	50	70	Dilation within the Wabiskaw sand

- **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 six 2017 anomalies were fully investigated. All injectors are back on-stream under normal operating conditions and have regained pressure following the event.

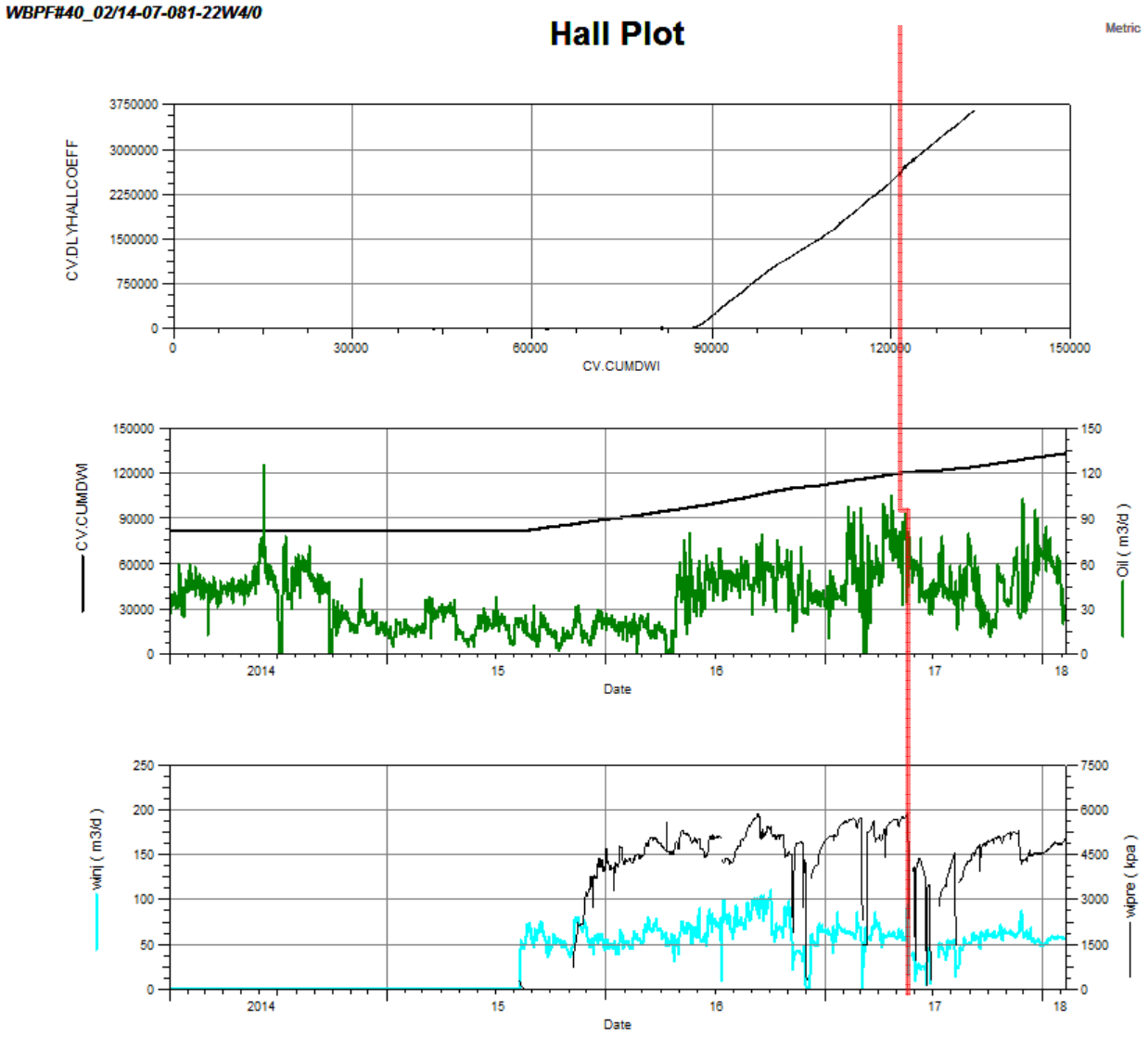
Cap Rock Integrity – WBP40: 02/14-07

Canadian Natural



02/14-07-081-22W4: Injector was shut in immediately after anomaly. Conformance treatment was performed end of Jun 2017; rate & pressure have built up since then.

Cap Rock Integrity – WBP40 – 102/14-07



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.
- Since acquisition, CNRL has been utilizing a very conservative approach to monitoring that flags all pressure deviations of more than 250 kPa. This system was put in place temporarily while the SCADA systems are integrated into the CNRL framework.
- In early 2018, CNRL will implement a monitoring system in 9404 that has the same parameters and setpoints as the legacy injection system.

Future Development Plans

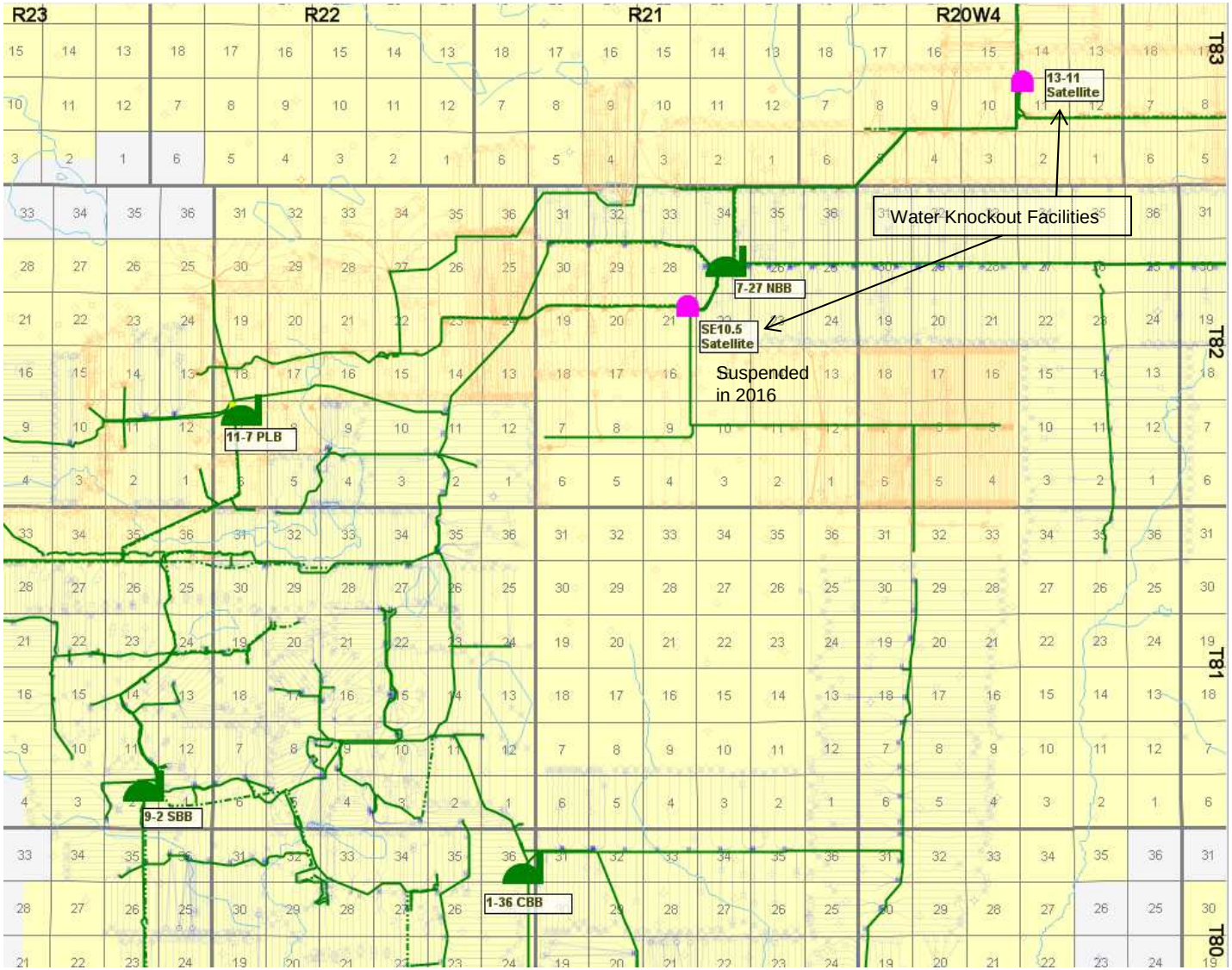
Future Development Plans

Canadian Natural

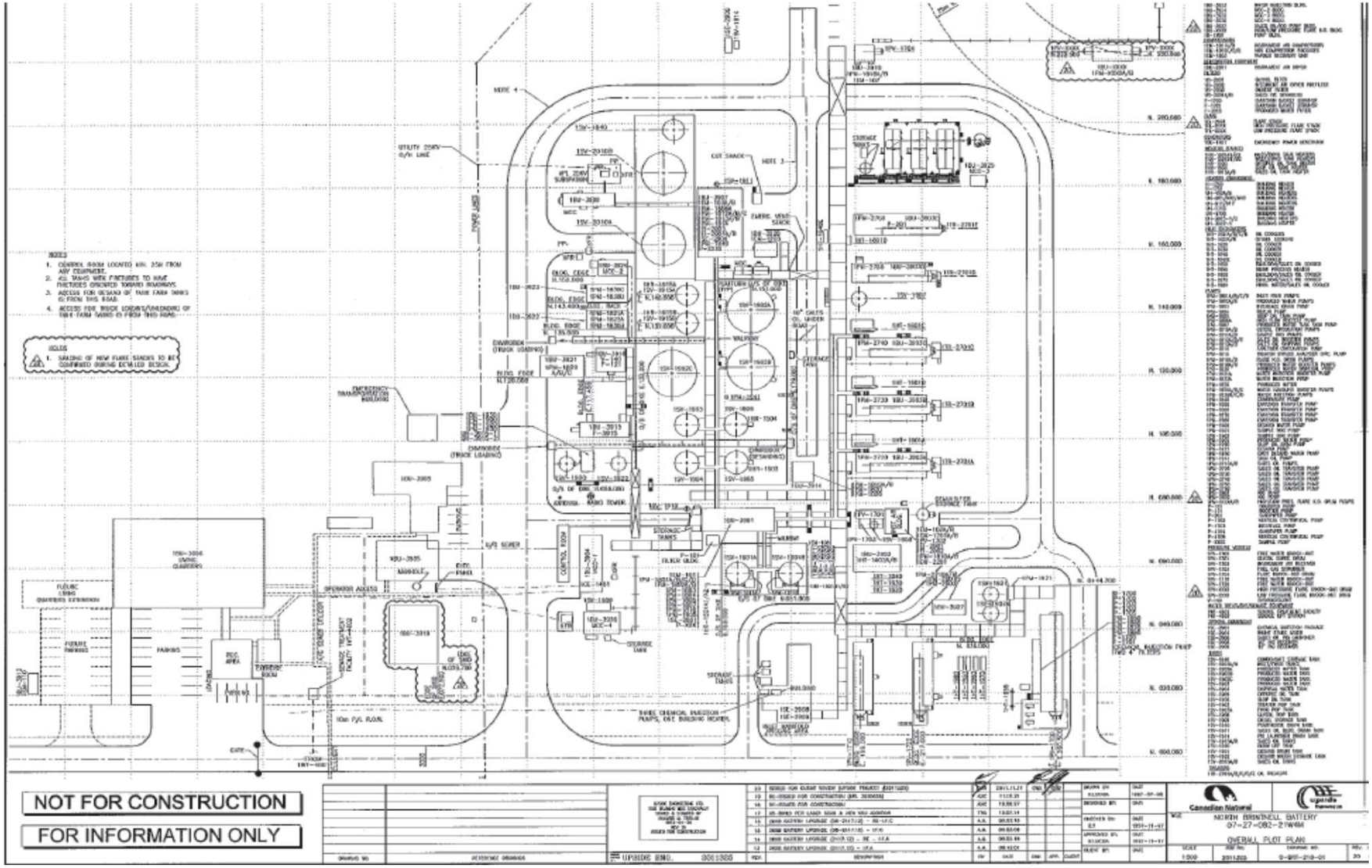
- Canadian Natural plans to continue with the expansion of the polymer flood at Brintnell over the next several years. Expansion will push the flood to the southeastern and western edges of the pool.
- The focus of this year's capital program will be infill drilling and polymer flood optimization of 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

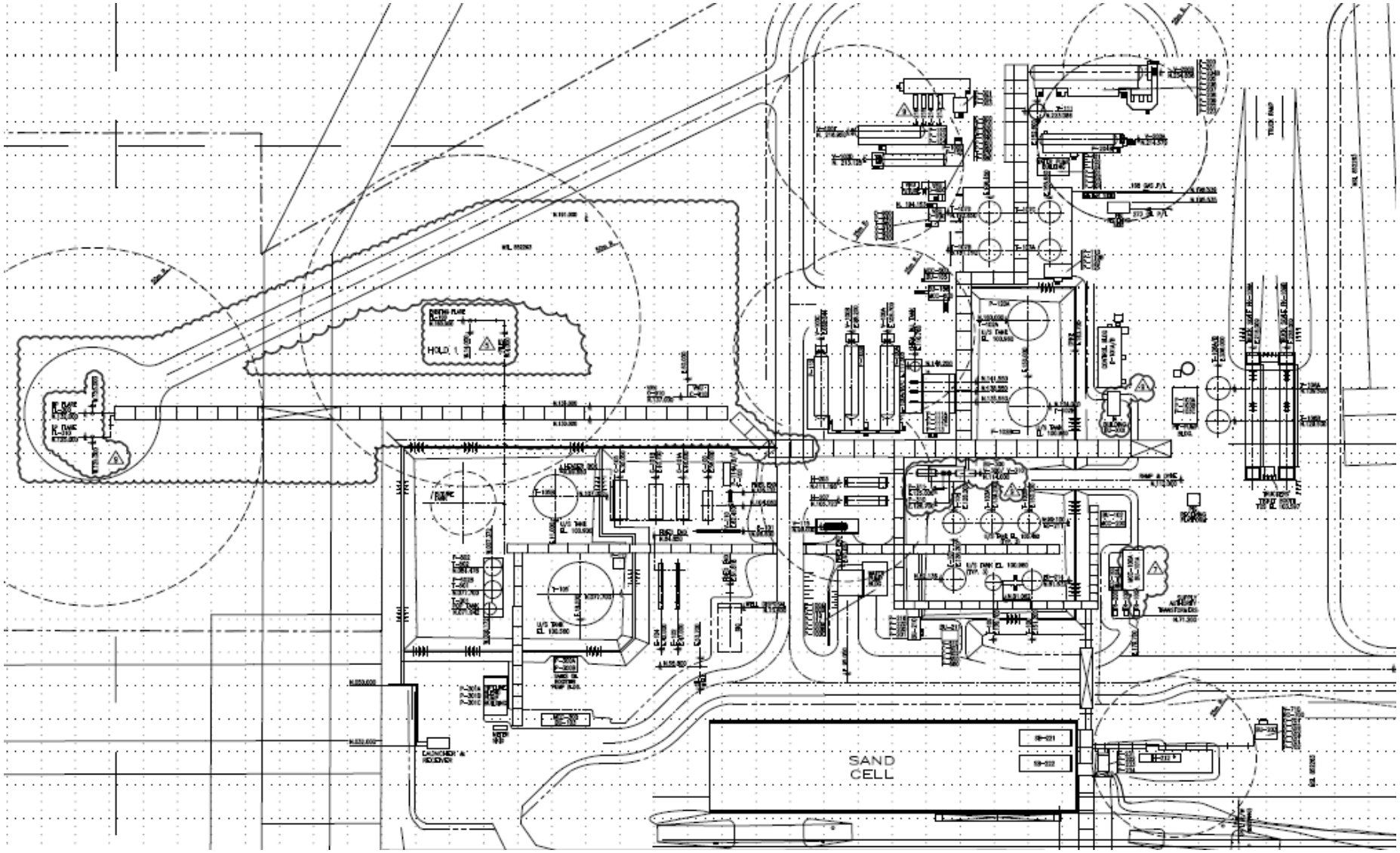


Facility: NBB 07-27-82-21W4 Battery Plot Plan

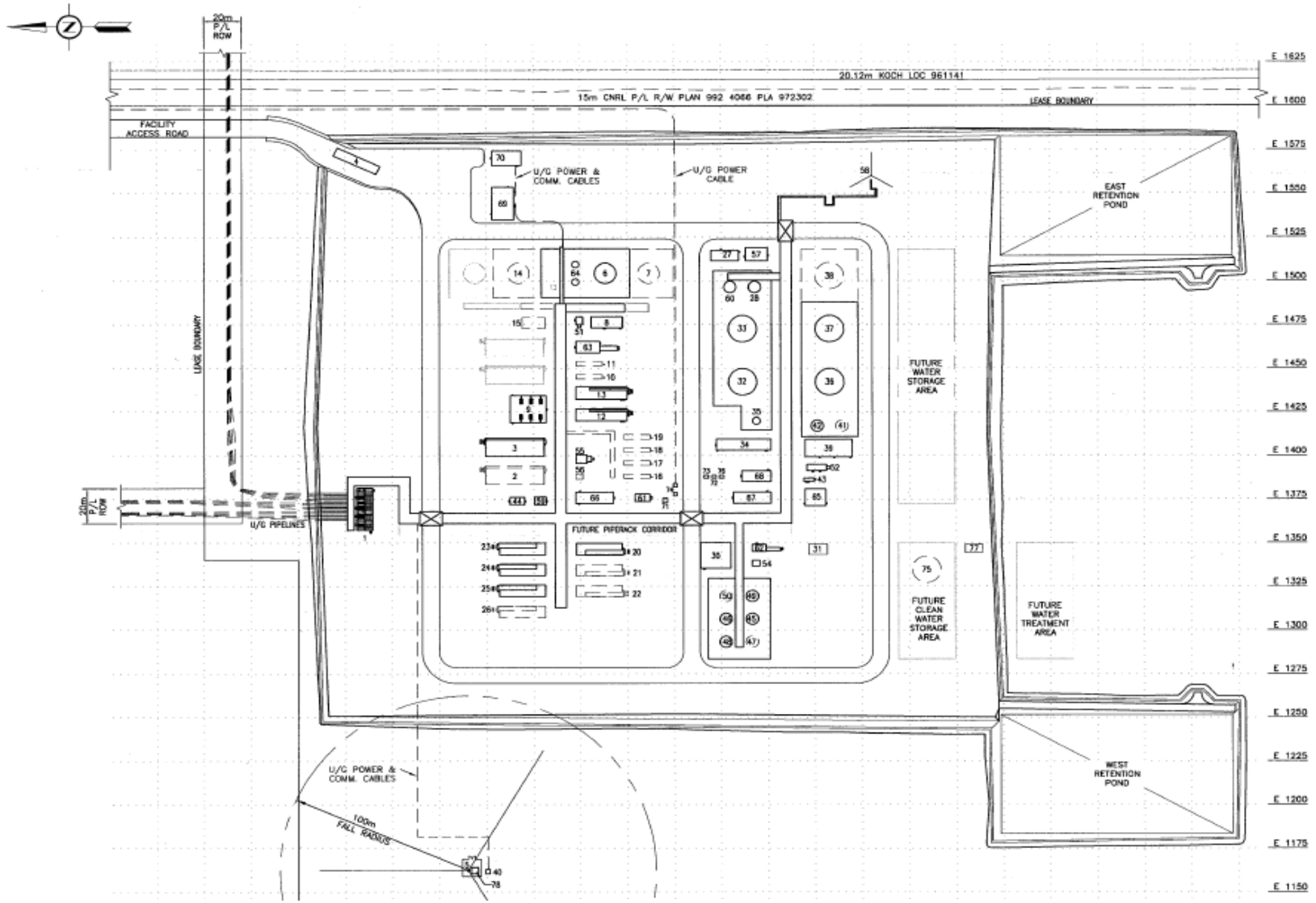


Facility: SBB 09-02-81-23W4 Battery Plot Plan

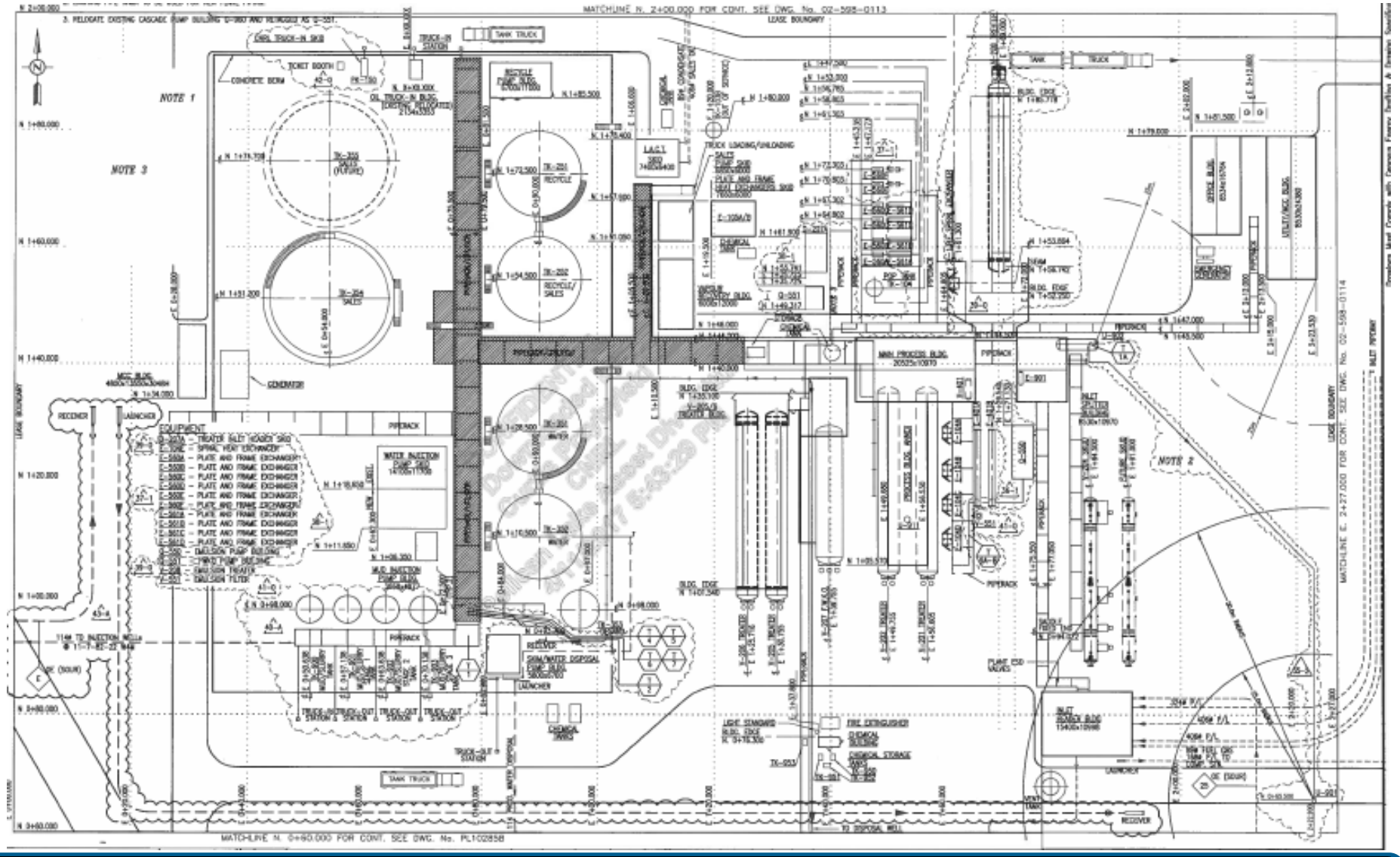
Canadian Natural



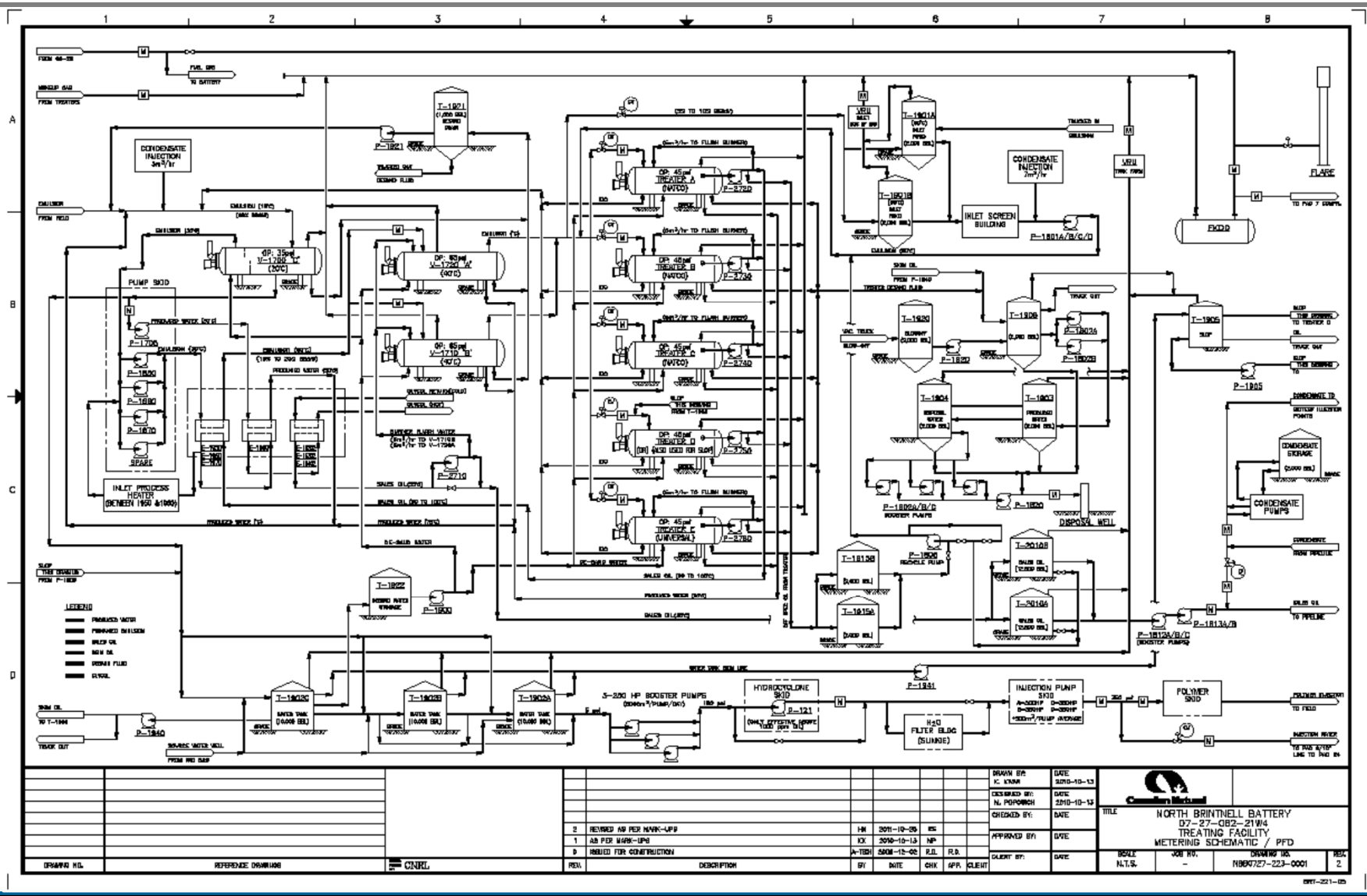
Facility: CBB 01-36-80-22W4 Battery Plot Plan



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



Facility: Typical Brintnell Battery PFD



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

Facility Future Plans

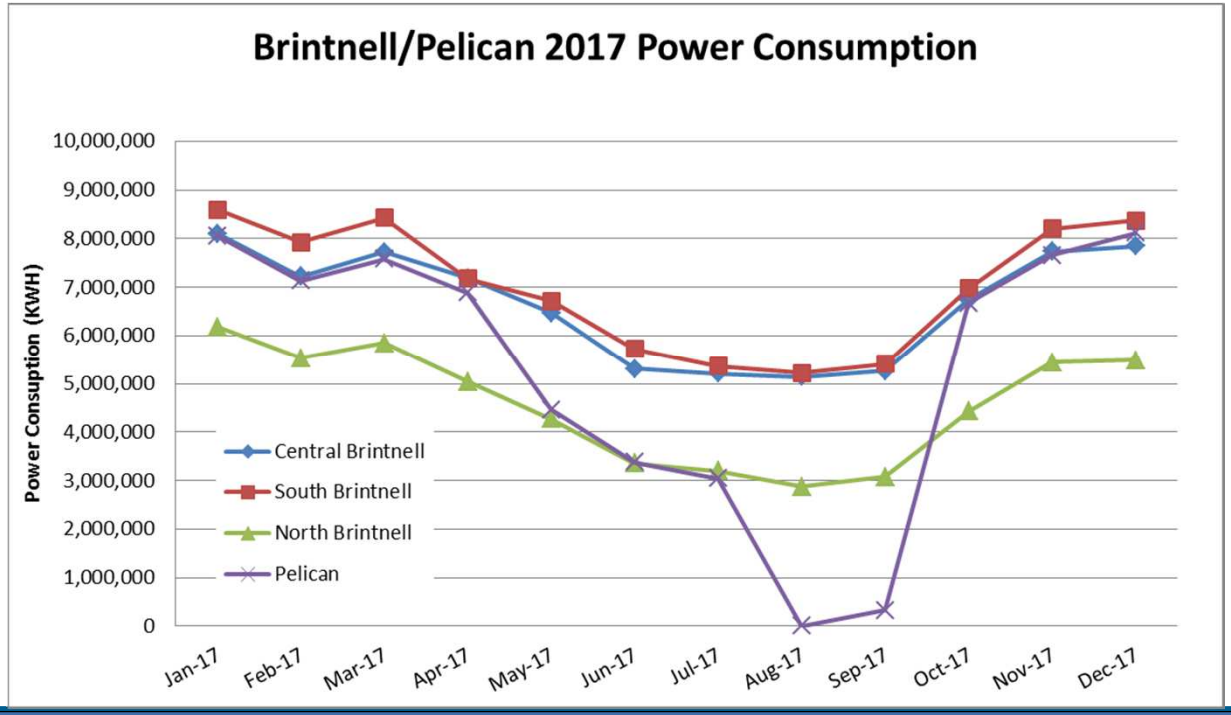
Canadian Natural

- **Major Activities:**
  - Reactivate SE10.5 Satellite
  - Potential Battery Rationalization
  - Pad Rebuilds Continued
  - Future Polymer Expansions
  - Water Management Plan

Brintnell/Pelican Lake Power Consumption

Canadian Natural

Power Consumption - kWh													
	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Total
Central Brintnell	8,104,327	7,225,866	7,722,955	7,193,910	6,472,625	5,312,574	5,216,344	5,143,245	5,264,312	6,744,797	7,737,133	7,847,311	79,985,399
South Brintnell	8,597,355	7,929,304	8,433,938	7,175,503	6,723,138	5,721,139	5,364,656	5,226,292	5,413,765	6,979,150	8,202,301	8,368,654	84,135,195
North Brintnell	6,188,147	5,534,855	5,850,848	5,039,808	4,277,452	3,359,802	3,199,841	2,872,942	3,075,088	4,424,236	5,447,968	5,485,232	54,756,219
Pelican	8,055,213	7,128,136	7,580,590	6,887,337	4,457,104	3,377,178	3,046,049	no record	332,824	6,673,636	7,657,394	8,113,265	63,308,726
Total	30,945,042	27,818,161	29,588,331	26,296,558	21,930,319	17,770,693	16,826,890	13,242,479	14,085,989	24,821,819	29,044,796	29,814,462	282,185,539



Battery Performance - Brintnell

Canadian Natural

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
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	644,768	670,070
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
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
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%
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
Average Disposal Rates (m3/d)	423	-11	107	148	153	85	25	22	0	0	0	172
Central Brintnell 12-09												
Oil Produced (m3)	568,076	603,657	569,149	533,178	528,267	492,495	546,580	237,914	*Battery converted to trucked in facility May 15, 2013*			
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				
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)	*Battery Commissioned May 2014 - first oil May 15, 2013*							584,297	780,513	951,411	1,298,572	1,161,176
Produced Water (m3)								638,159	1,946,244	2,347,871	2,570,249	2,475,657
Recycle Rates (m3)								565,099	1,615,263	1,908,506	2,150,738	2,028,121
Produce Recycle								88.6%	83.0%	81.3%	83.7%	**81.9%**
Average Daily Recycle (m3/d)								2,457	4,425	5,229	5,876	5,556
Average Disposal Rates (m3/d)								318	907	1,204	1,146	1,340
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
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
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
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%**
Average Daily Recycle (m3/d)	0	62	473	561	474	2,255	3,861	3,793	2,990	3,212	3,207	3,768
Average Disposal Rates (m3/d)	934	1,071	897	931	1,652	525	253	303	312	289	726	524
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	2,784,338	2,718,438
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
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
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
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
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
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%**
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
Average Daily Disposal (m3/d)	1,817	1,517	1,300	1,168	1,863	735	477	748	1,219	1,493	1,870	2,036

Battery Performance – Pelican Lake

Canadian Natural

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
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
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
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
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%
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
Average Disposal Rates (m3/d)	1901	3629	2310	2310	1066	364	677	659	458	358	356	341

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.
- **2017 Field Proration Factors:**
  - Meets directive 17 requirements
    - Brintnell:
      - Oil – 0.86, Water – 1.10
    - Pelican Lake:
      - Oil – 0.87, Water – 0.86

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-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Total
DIFF	0	0	0	0	0	0	0	0	0	0	0	0	0
DISP	4,164	3,833	4,128	4,005	4,116	3,822	3,914	3,769	3,721	3,911	3,634	3,518	46,535
FLARE	192	82.2	135	86.1	97.6	92.7	122.2	79	71.6	90.5	97.1	166	1,312
FUEL	3,878	3,404	3,696	3,337	3,055	2,658	2,776	2,829	2,878	3,010	3,012	3,227	37,760
PROD	4,749	4,383	4,646	4,558	4,720	4,439	4,663	4,477	4,422	4,481	4,072	4,101	53,712
REC	3,967	3,361	3,650	3,175	2,874	2,456	2,492	2,542	2,591	2,885	2,935	3,067	35,994
VENT	482	424	337	305	326	323	343	342	342	355	263	257	4,098

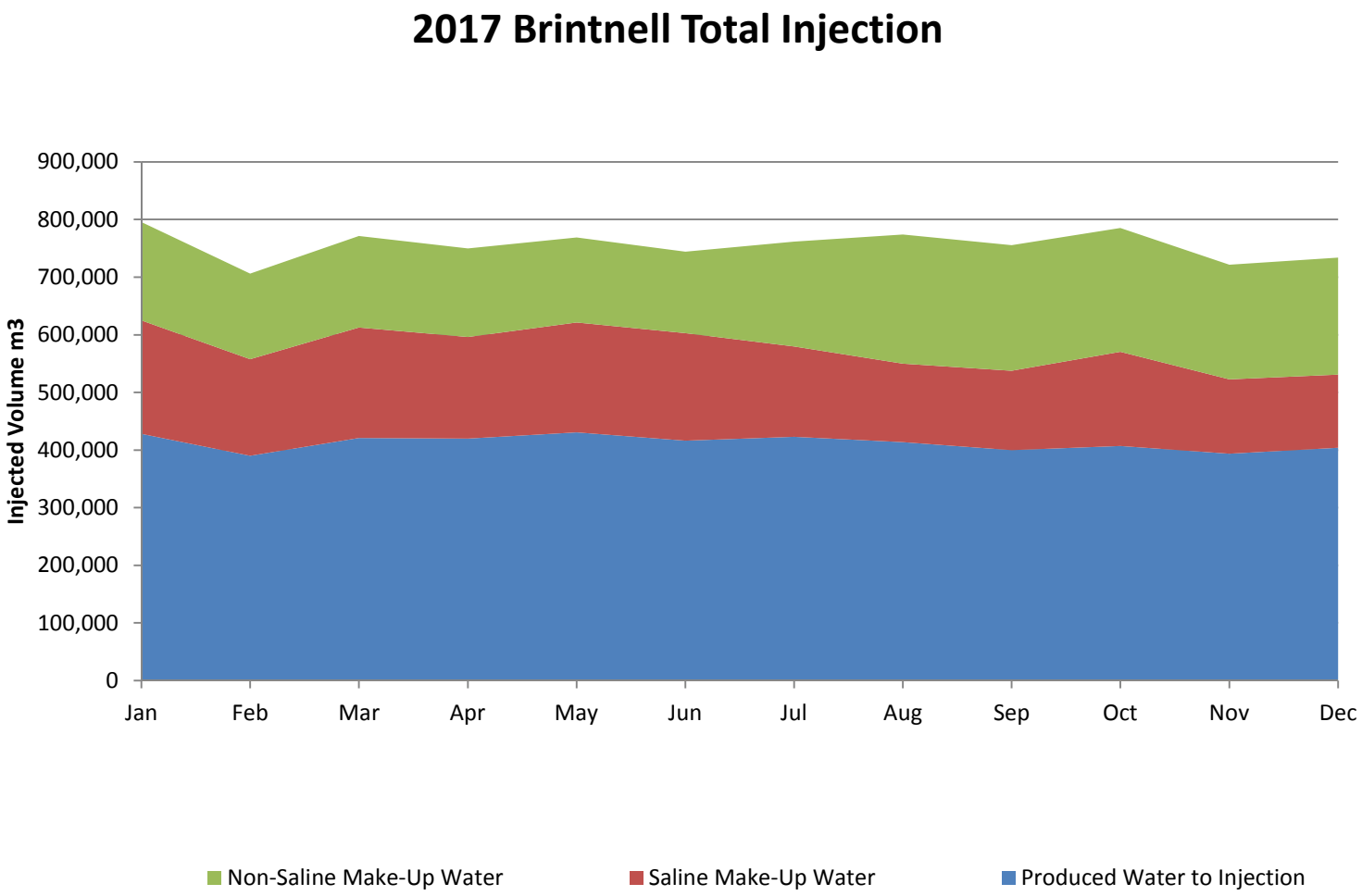
Pelican Lake

Gas Volumes (e3m3)	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Total
DIFF	0	19.4	0	10.9	0	0	0	0	0	0	0	0	30.3
DISP	27		20		6	8	9	5	5	2		3	84
FLARE	25.6	26	29.9	26.7	29.5	30.9	21.7	14.4	28.4	41.2	34.7	35.4	344
FUEL	1,663	1,423	1,573	1,505	1,641	1,437	1,182	1,417	1,497	1,451	1,444	1,519	17,752
PROD	1,024	876	932	940	954	930	666	932	959	980	864	890	10,946
REC	890.7	771	888.9	796.6	914.3	729	735.5	691.8	764	723.6	807.2	870.6	9,583
VENT	199.7	179.1	197.2	194.4	191.4	182.9	188.6	188	192.6	209.8	192	202.8	2,319

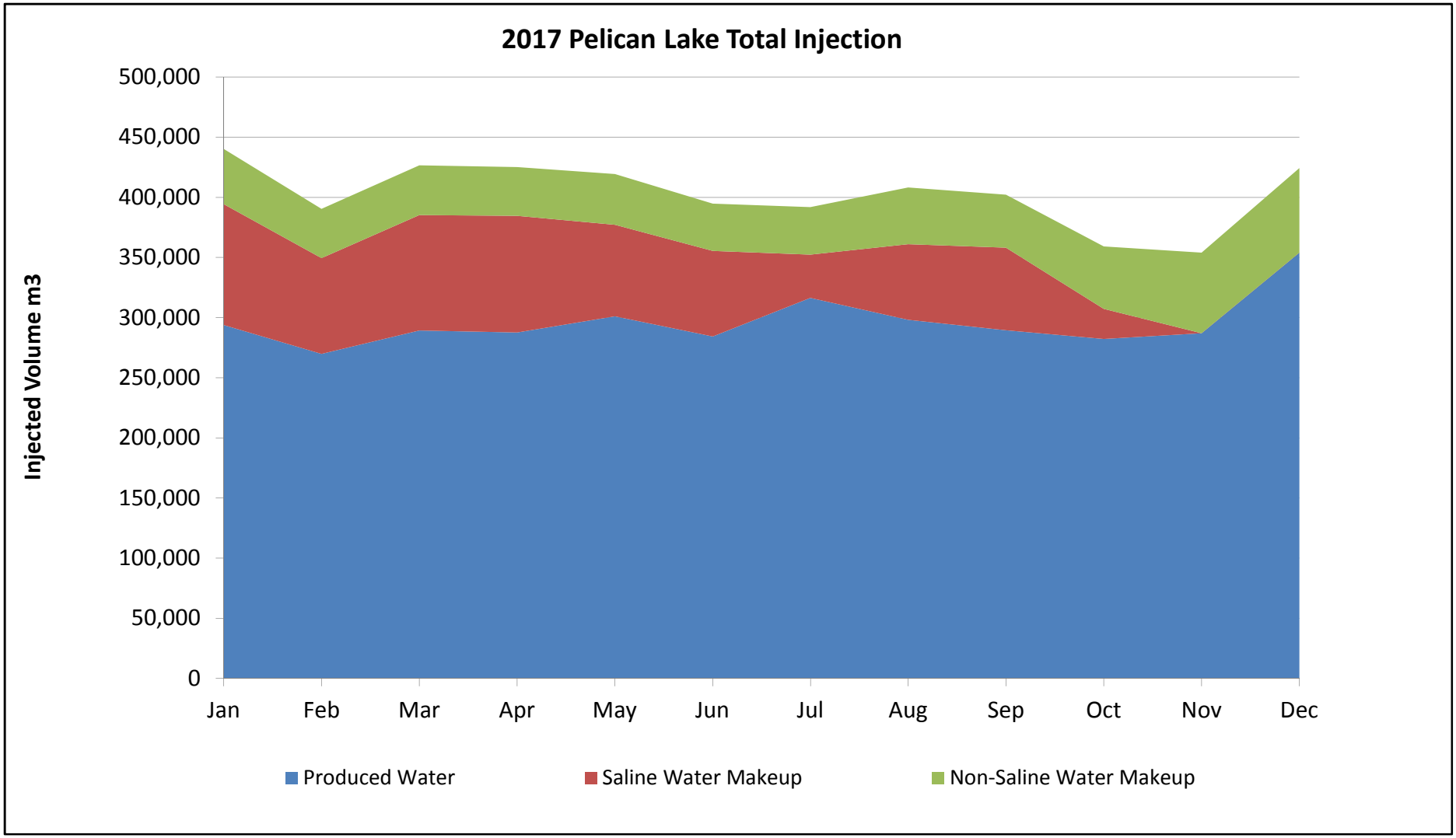
- Produced gas is captured, processed and used throughout the field as consumable fuel gas.
- Venting only occurs at the well leases when D-60 requirements have been approved by the AER. No sour gas vented.

Water Use

Brintnell Total Injection



Pelican Lake Total Injection



2017 Injection Water Summary

Canadian Natural

Brintnell

2017 Polymer Injection Volumes (m³)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Produced Water to Injection	427,993	390,145	421,061	419,765	430,428	416,361	422,710	413,733	400,075	407,243	393,597	403,756
Non-Saline Make-Up Water	170,178	148,622	158,995	154,137	147,578	141,500	181,681	224,434	218,204	215,124	198,876	203,356
Saline Make-Up Water	197,176	167,590	191,555	176,143	191,059	186,438	157,098	135,971	137,342	162,986	129,263	126,886
Total	795,346	706,357	771,611	750,045	769,065	744,299	761,489	774,138	755,621	785,353	721,736	733,998

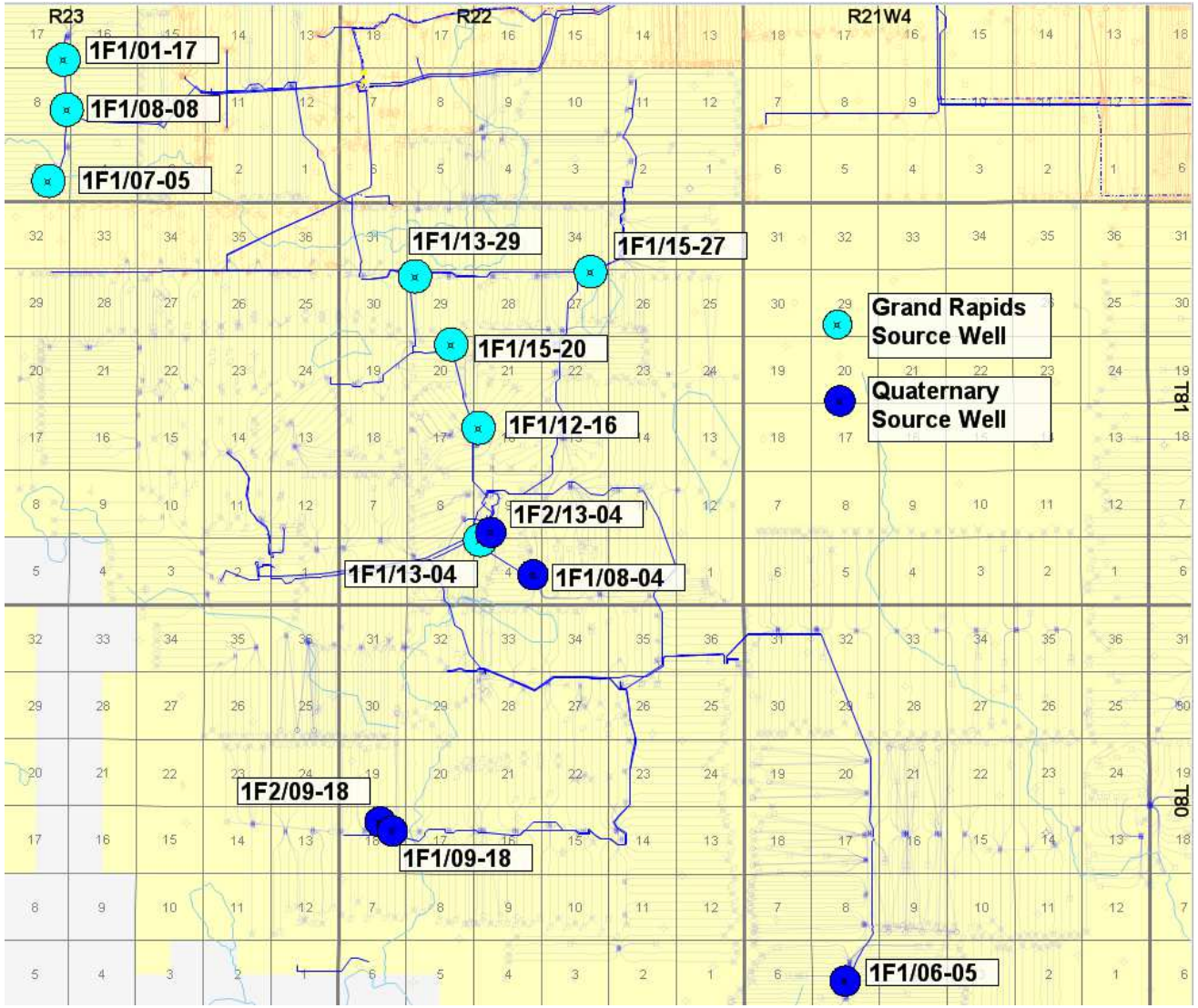
Total Injection Volumes (m³)	2010		2011		2012		2013		2014		2015		2016		2017	
Produced Water to Injection	3,485,267	39%	2,901,838	27%	3,388,006	34%	3,522,671	38%	4,390,618	44%	4,617,604	48%	4,507,036	52%	4,946,868	55%
Non-Saline Make-Up Water	1,553,045	17%	1,479,780	14%	1,876,840	19%	2,041,938	22%	2,028,731	20%	1,937,567	20%	1,916,943	22%	2,162,684	24%
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%
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	

Pelican Lake

2017 Injection Volumes (m³)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Produced Water to Injection	293,784	269,796	289,323	287,526	300,987	284,313	316,403	298,156	289,555	282,248	287,079	354,079
Non-Saline Make-Up Water	45,787	40,936	41,416	40,530	42,098	39,390	39,339	47,275	44,130	51,925	66,960	70,246
Saline Make-Up Water	100,626	79,660	95,945	97,200	76,260	71,130	36,053	62,868	68,550	24,986	0	0
Total	440,197	390,392	426,684	425,256	419,345	394,833	391,795	408,299	402,235	359,159	354,039	424,325

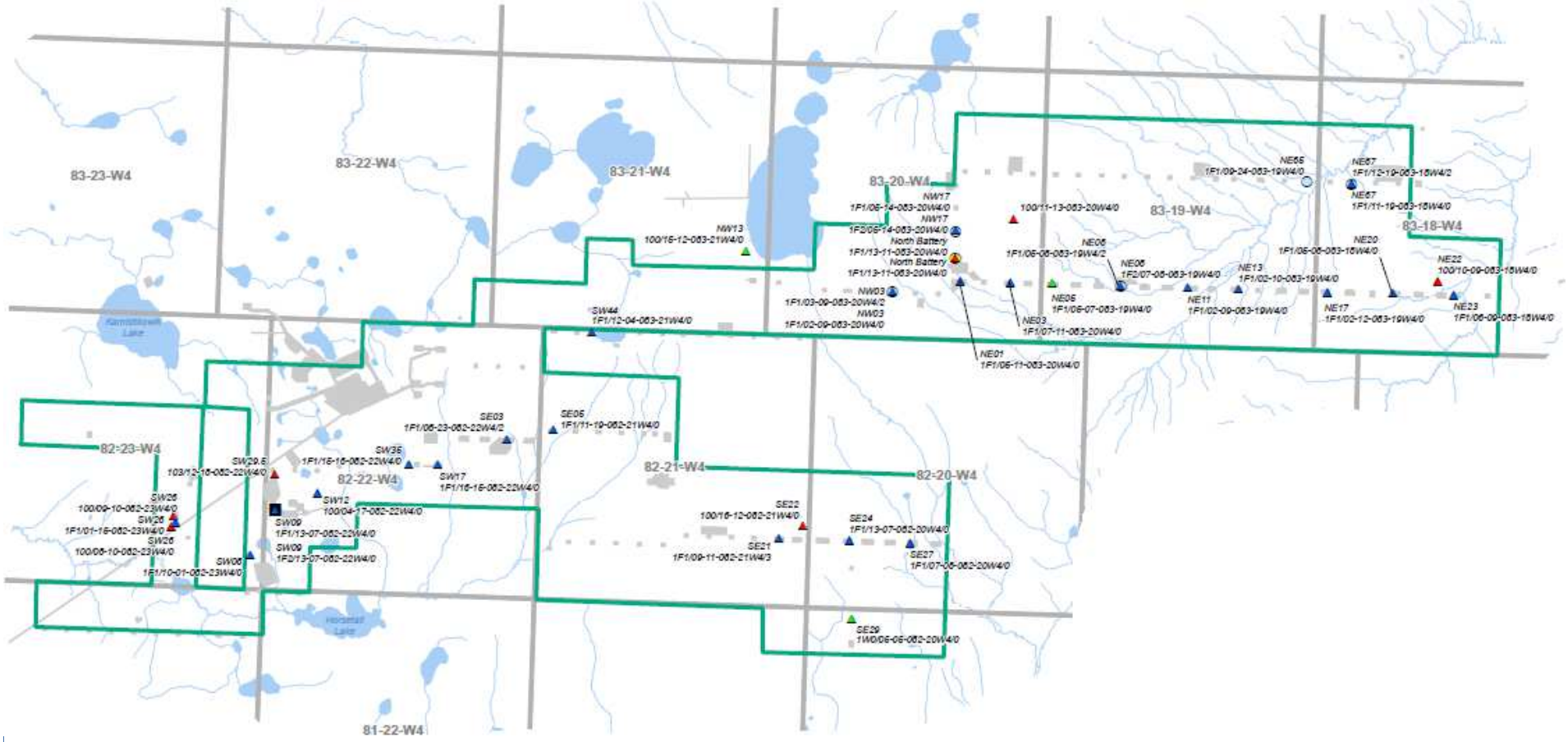
Total Injection Volumes (m³)	2010		2011		2012		2013		2014		2015		2016		2017	
Produced Water to Injection	4,256,039	60%	3,684,090	64%	4,188,103	56%	4,256,695	49%	4,753,603	44%	4,381,028	57%	3,711,085	70%	3,428,883	73%
Non-Saline Make-Up Water	684,010	10%	803,000	14%	953,380	13%	1,132,595	13%	1,369,845	20%	1,078,575	14%	571,955	11%	570,130	12%
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%
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	

Non-Saline Well Locations - Brintnell



Non-Saline Well Locations – Pelican Lake

Canadian Natural



Source Wells
- Grand Rapids A
- Grand Rapids B

Observation Wells
- Empress (monitored but not required by Licence condition)
- Grand Rapids A (monitored as required by Licence condition)
- Grand Rapids A (monitored but not required by Licence condition)
- Grand Rapids B (monitored as required by Licence condition)
- Grand Rapids B (monitored but not required by Licence condition)

Wabiskaw Scheme Approval Boundary

Non-Saline Water Use - Brintnell

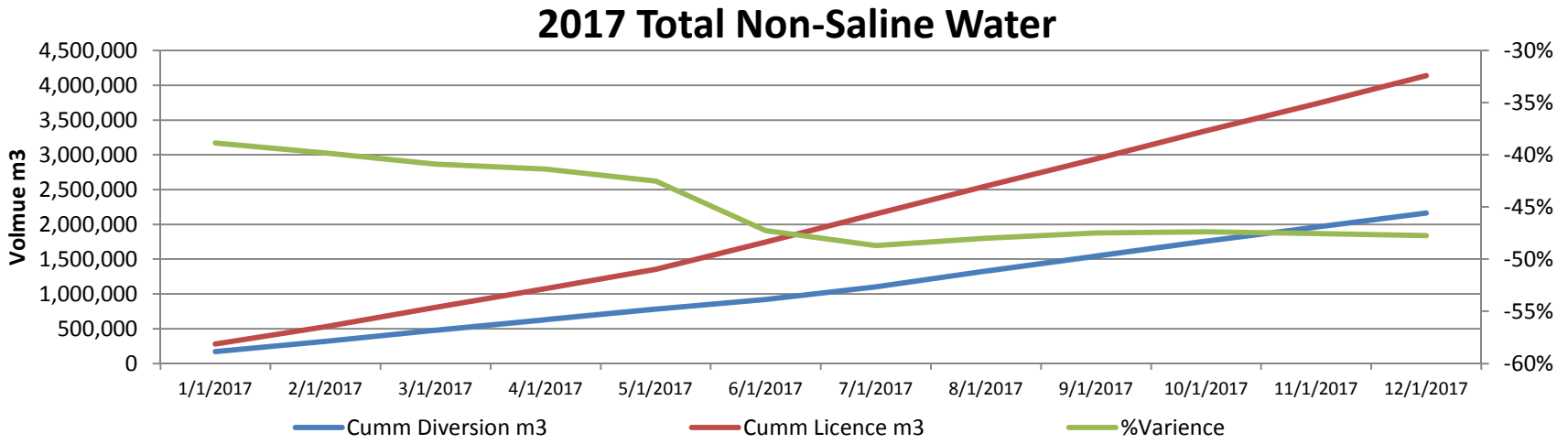
- Canadian Natural currently has two licenses with Alberta Energy Regulator for the diversion of non-saline water for injection
  - 00249595-00-00. 2,151,310 m3 with expiry date of 2019-01-25
  - 00329572-00-00. 1,460,000 m3 with expiry date of 2019-05-25
- Working to optimize the use of non-saline water 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/d)	2016 Average Diversion Volumes (m3/d)
WSW BP25 - QUAT	100/08-04-081-22W4/00	53.3-65.2	818	247,470	451
WSW BP11 - QUAT	1F2/13-04-081-22W4/00	34.3-38.8	1200	153,300	425
WSW BP2 - GR	1AA/12-16-081-22W4/02	270.6-317.6	1200		717
WSW BP11 - GR	1F1/13-04-081-22W4/00	258.5-315.9	812		720
WSW HTP2 - GR	1F1/13-29-081-22W4/00	265.8-326.8	2250		1,276
WSW HTP6 - GR	1F1/15-27-081-22W4/00	264.8-317.8	468	1,750,540	386
WSW NHTP16 - GR	1F1/01-17-082-23W4/00	253.0-310.0	933		451
WSW WBP30 - GR	100/15-20-081-22W4/00	260-315	750		235
WSW NHP13 - GR	100/07-05-082-23W4/00	232-302	325		242
WSW NHP15 - GR	100/08-08-082-23W4/00	243-305	225		108
WSW 1F1/06-05	1F1/06-05-080-21 W4M	160.0 - 166.0	1340		770
WSW 1F2/09-18	1F2/09-18-080-22 W4M	206.7 - 215.4	1340	1,460,00	739
WSW 1F3/09-18	1F3/09-18-080-22 W4M	152.3 - 161.0	1340		8

1,509,221

333,702



Pelican Lake Non-Saline Water

- **In 2017, Cenovus and CNRL used 17% of the total licensed volume. Low utilization was a result of less water being required for polymer hydration with Cenovus' decision to scale back the polymer flood.**

	Grand Rapids 'A'	Grand Rapids 'B'	Total
Annual Licensed Diversion (m3)	341,458	2,814,692	3,156,150
Annual Diversion (m3)	53,159	490,699	543,858
Actual % License Used	16%	17%	17%

- **Grand Rapids 'A'**
  - **2017, water diverted from 1 of 5 source wells**
- **Grand Rapids 'B'**
  - **2017, water diverted from 13 of 21 source wells**

Water Chemistry - Brintnell

Canadian Natural

- **Non-Saline Water Source Wells**

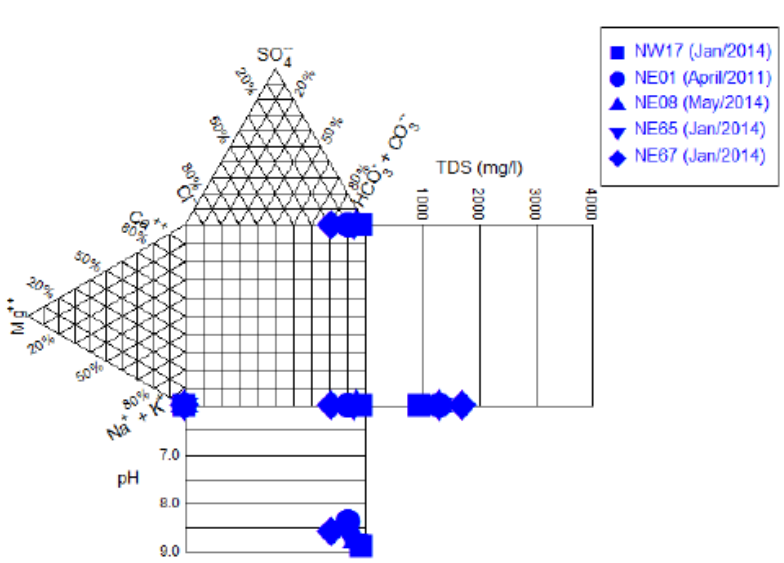
Monitoring Well	Sample Date	Lab pH	Lab EC µS/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	T-Alkalinity mg/L	HCO_3 mg/L	CO_3 mg/L	SO_4 mg/L	NO_2-N mg/L	NO_3-N mg/L	NO_2-N+NO_3-N mg/L	Hardness mg/L	TDS mg/L
WSW HTP 2 - GR	25-Jul-15	*8.95*	2600	2.05	1.41	*608*	3.64	82.6	1270	1340	104	<0.60	<0.020	<0.040	<0.045	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*

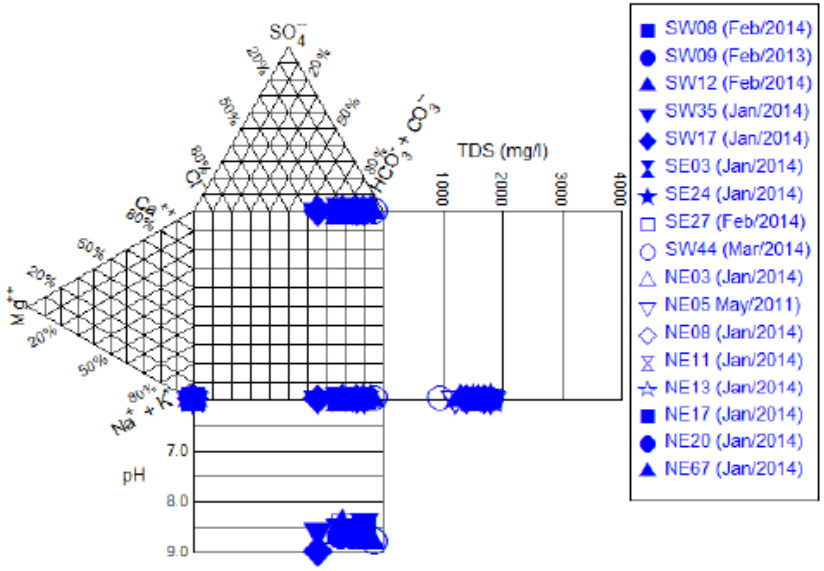
- **Saline Water Source Wells – Grosmont**
  - **Typical TDS range – 22,000-35,000 mg/L**

Water Chemistry – Pelican Lake

Durov Plot Grand Rapids ‘A’

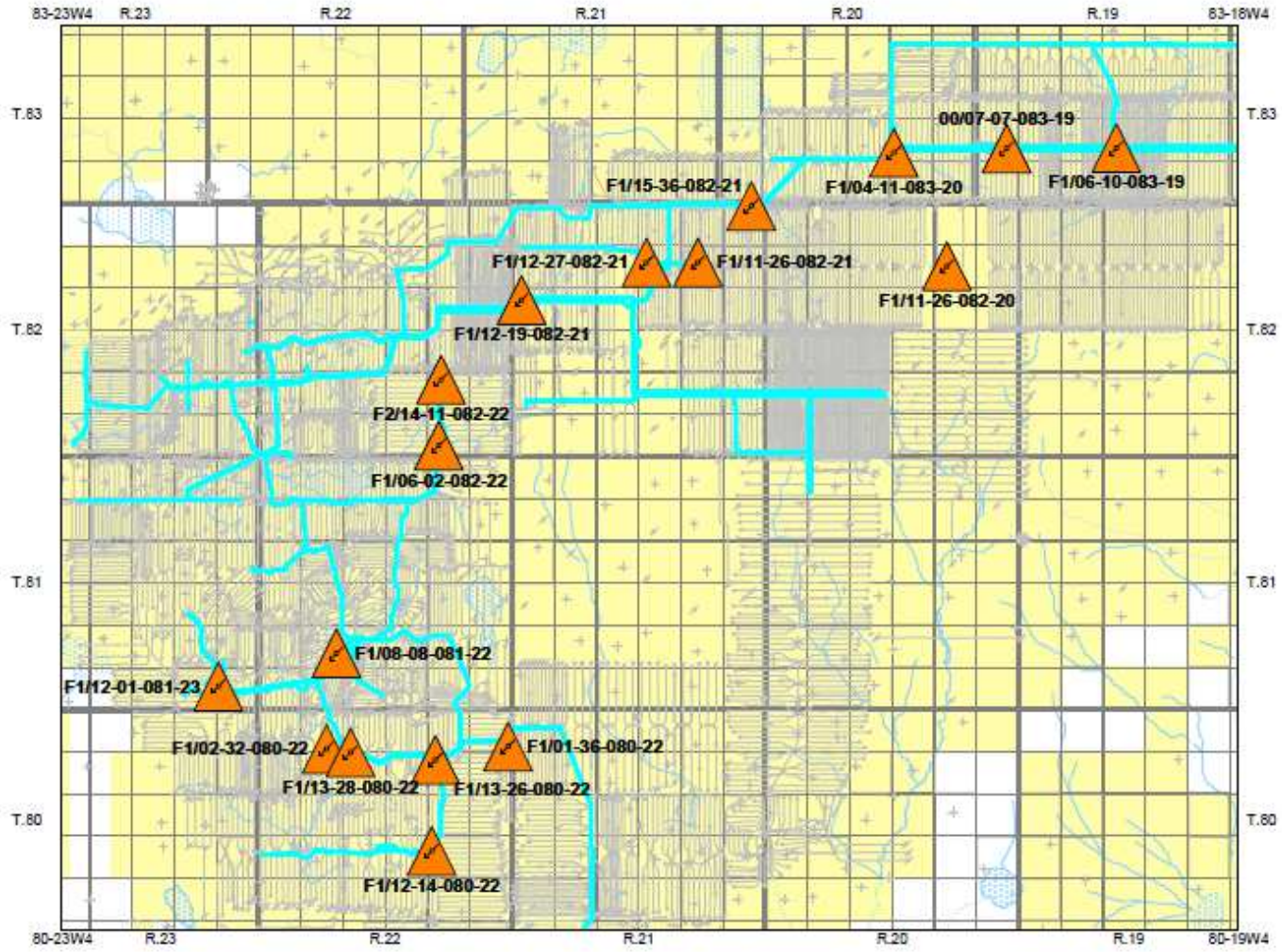


Durov Plot Grand Rapids ‘B’



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

Saline Water Source Map



2017 Saline Water Source Well Diversion Volumes (m^3)

Canadian Natural

Brintnell

Saline Wells	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Totals
1F1/01-36-080-22W4/00	59,874	50,593	57,035	57,633	59,326	49,237	36,340	23,880	21,552	18,946	12,205.2	14,342	460,963
1F1/02-32-080-22W4/00	40,098	32,519	36,555	41,566	31,652	26,821	28,454	39,179	38,145	1,917	0	0	316,906
1F1/08-08-081-22W4/00	3,630	1,965	4,847	3,249	13,338	22,618	28,062	42,170	50,734.8	40,958	47,284	42,593	301,448
1F1/11-26-082-21W4/00	44,052	38,298	44,990	43,385	47,101	43,193	33,303	29,587.9	21,138	16,369	11,802	10,637	383,855
1F1/12-01-081-23W400	0	0	0	0	0	0	0	0	0	25430	1370	0	26,800
1F1/13-26-080-22W4/00	49,522	44,215	48,128	30,310	39,642	44,569	30,939	1,154	5,772	59,365	56,602	59,314	469,532
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	197,176	167,590	191,555	176,143	191,059	186,438	157,098	135,970	137,341	162,985	129,263	126,886	1,959,507

Pelican Lake

Saline Wells	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Totals
BR CAMP 27 1F1/04-11-083-20W4/00 SRC	23,719	0	7,991	94,648	23,246	0	1,100	62,866	55,826	25,001	0	0	294,398
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	4,682	0	0	0	12,736	0	0	0	17,418
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	7,6902	79,661	87,958	2,561	48,336	71,126	34,943	0	0	0	0	0	401,487
TOTAL SALINE	100,620	79,661	95,949	97,210	76,264	71,126	36,043	62,866	68,562	25,001	0	0	713,303

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

Water Usage and Disposal

Canadian Natural

Brintnell

Total Water Volumes	2009	2010	2011	2012	2013	2014	2015	2016	2017
Produced Water for Injection (m3)	3,216,258	3,485,267	2,901,838	3,703,800	3,522,671	4,390,618	4,617,604	4,507,036	4,946,868
Non-Saline Water (m3)	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
Brackish Water (m3) - Grosmont	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
Disposal Volume (m3)	426,373	680,010	268,333	174,739	222,200	464,554	544,868	684,537	764479.9
Total Produce Recycle (%)	86.70%	80.50%	90.80%	95.30%	94.00%	91.0%	89.6%	87.2%	**87.7%**
Average Daily Recycle (m3/d)	7,644	7,686	7,215	9,642	9,900	12,273	12,876	12,740	13,725

Pelican Lake

Total Water Volumes	2009	2010	2011	2012	2013	2014	2015	2016	2017
Produced Water for Injection (m3)	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
Non-Saline Water (m3)	517,205	684,010	803,000	953,380	1,132,595	1,369,845	1,078,575	571,955	570,130
Brackish Water (m3) - Grosmont	2,859,775	2,207,885	1,270,930	2,403,890	3,220,395	4,163,555	2,224,675	1,027,475	713,210
Disposal Volume (m3)	843,192	389,083	132,855	247,223	240,644	167,289	130,497	130,035	124,367
Total Produce Recycle (%)	85.09%	91.62%	96.52%	94.43%	94.65%	96.60%	97.11%	96.61%	96.50%
Average Daily Recycle (m3/d)	13,179	11,660	10,093	11,474	11,662	13,024	12,003	10,167	9,394

- **Continued to focus on maintaining high water recycling ratios.**
  - **2017 recycle at 87.7% for legacy Brintnell and 96.5% 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

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Non Saline Water (m3/day) - Quaternary and Grand Rapids	1,405	2,813	4,091	3,927	4,255	4,054	5,142	5,594	5,558	5,308	5,252	5,925
Saline Water (m3/day) - Grosmont	3,940	4,553	2,095	8,120	10,958	17,190	13,096	10,412	10,044	8,584	6,237	5,369
Total Source Water (m3/day)	5,345	7,366	6,186	12,046	15,213	21,244	18,238	16,007	15,602	13,892	11,489	11,294
Total Source Water per barrel of oil	1.1	1.4	1.1	2.1	2.6	3.7	3.0	2.3	2.0	1.7	1.5	1.5
Brackish Water per barrel of oil	0.8	0.8	0.4	1.4	1.9	3.0	2.1	1.5	1.3	1.1	0.8	0.7
Non-Saline Water per barrel of oil	0.3	0.5	0.7	0.7	0.7	0.7	0.8	0.8	0.7	0.7	0.7	0.8
Produced Water Recycle (m3/day)	3,344	5,009	6,546	7,644	7,686	7,215	9,669	9,900	12,273	12,876	12,740	13,725
Recycle Rates	64.8%	76.8%	83.4%	86.7%	80.5%	90.8%	95.3%	94.0%	91.0%	89.6%	87.2%	87.7%
Oil Produced (bbl/day)	29,570	34,269	37,035	36,612	36,726	36,372	38,656	42,934	50,194	50,877	47,982	46,847

Brintnell - Water Information 2017 Monthly

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Non-saline Water (m3/day) - Quaternary and Grand Rapids	5,490	4,873	5,213	5,054	4,839	4,639	5,957	7,358	7,154	7,053	6,521	6,667
Saline Water (m3/day) - Grosmont	6,361	5,495	6,280	5,775	6,264	6,113	5,151	4,458	4,503	5,344	4,238	4,160
Total Makeup Water (m3/day)	11,850	10,368	11,493	10,829	11,103	10,752	11,108	11,817	11,657	12,397	10,759	10,828
Total Makeup Water per barrel of oil	1.6	1.4	1.6	1.4	1.5	1.5	1.5	1.6	1.5	1.6	1.4	1.5
Brackish Water per barrel of oil	0.8	0.7	0.9	0.8	0.8	0.8	0.7	0.6	0.6	0.7	0.6	0.6
Non-saline Water per barrel of oil	0.7	0.6	0.7	0.7	0.6	0.6	0.8	1.0	0.9	0.9	0.9	0.9
Produced Water Recylce (m3/day)	14231	12979	14037	14053	14291	13856	14167	13775	13263	13697	13052	13389
Recycle Rates	96.93%	88.04%	88.02%	87.75%	87.21%	88.75%	87.92%	87.16%	86.34%	84.83%	84.89%	85.38%
Oil Produced (bbl/day)	48,065	47,691	45,460	46,976	46,942	46,329	46,623	47,271	47,375	47,352	46,716	45,422

Pelican Lake Water Information

Canadian Natural

Pelican Lake Water Information

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Fresh Water (m3/day) - Grand Rapids	335	542	813	1,417	1,874	2,200	2,612	3,103	3,753	2,955	1,567	1,562
Brackish Water (m3/day) - Grosmont	9,456	13,904	10,324	7,835	6,049	3,482	6,586	8,823	11,407	6,095	2,815	1,954
Total Source Water (m3/day)	9,791	14,446	11,137	9,252	7,923	5,682	9,198	11,926	15,160	9,050	4,382	3,516
Total Source Water per barrel of oil	2.2	3.1	2.5	2.3	2.2	1.7	2.6	3.1	3.8	2.3	1.3	1.1
Brackish Water per barrel of oil	2.2	3.0	2.4	2.0	1.6	1.1	1.8	2.3	2.9	1.6	0.8	0.6
Fresh Water per barrel of oil	0.1	0.1	0.2	0.4	0.5	0.7	0.7	0.8	0.9	0.8	0.5	0.5
Produced Water Recycle (m3/day)	7,845	8,861	13,182	13,179	11,660	10,093	11,474	11,662	13,024	12,003	10,167	9,394
Recycle Rates	80.5%	70.9%	85.1%	85.1%	91.6%	96.5%	94.4%	94.6%	96.6%	97.1%	96.6%	96.5%
Oil Produced (bbl/day)	27,512	29,319	27,540	24,882	23,096	20,428	22,600	24,255	24,934	24,411	21,171	19,967

Pelican Lake Water Information 2017 Monthly

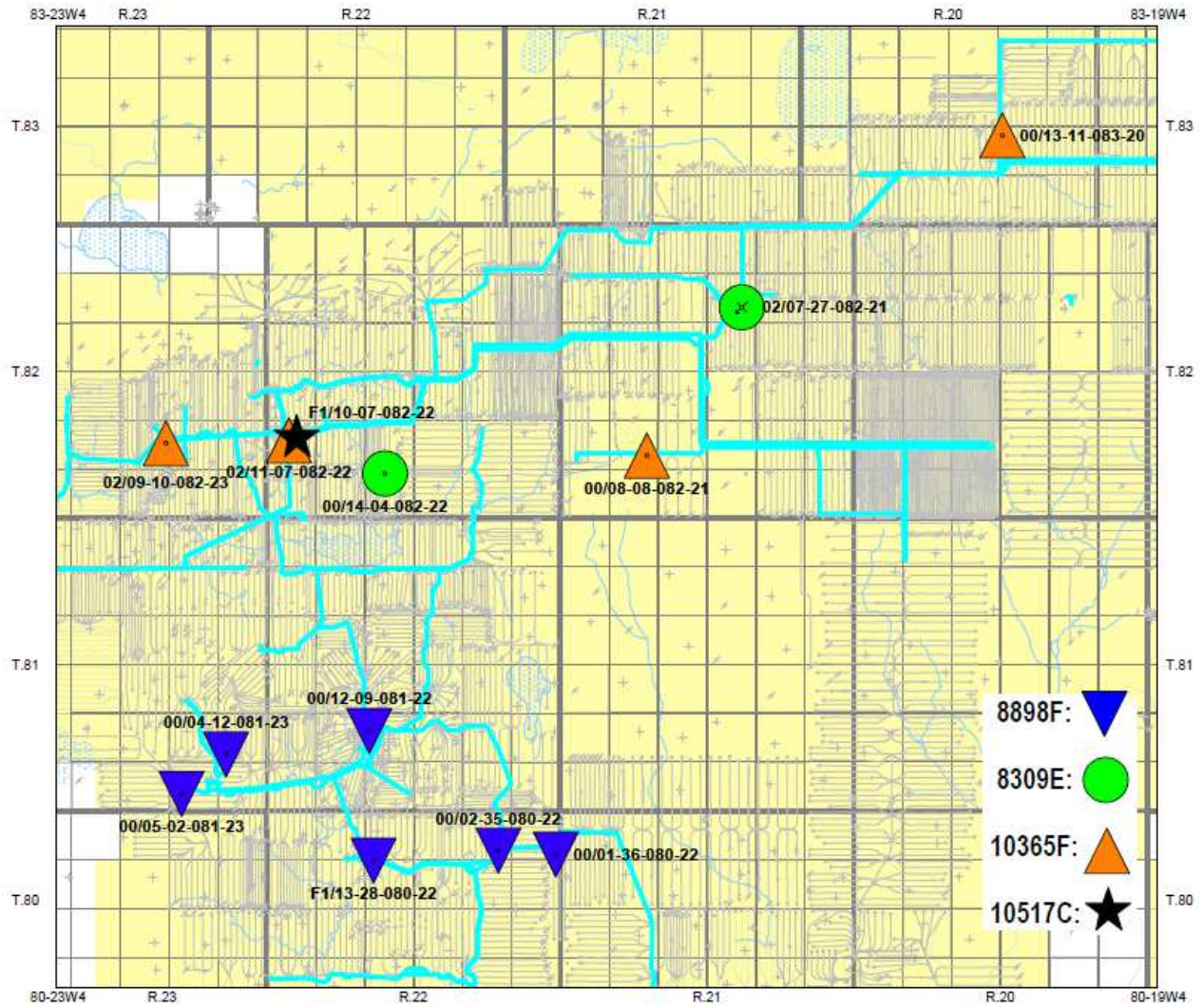
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fresh Water (m3/day) - Quaternary and Grand Rapids	1,477	1,462	1,336	1,351	1,358	1,313	1,269	1,525	1,471	1,675	2,232	2,266
Brackish Water (m3/day) - Grosmont	3,246	2,845	3,095	3,240	2,460	2,371	1,163	2,028	2,285	806	0	0
Total Makeup Water (m3/day)	4,723	4,307	4,431	4,591	3,818	3,684	2,432	3,553	3,756	2,481	2,232	2,266
Total Makeup Water per barrel of oil	0.6	0.6	0.6	0.6	0.5	0.5	0.3	0.5	0.5	0.3	0.3	0.3
Brackish Water per barrel of oil	0.4	0.4	0.4	0.4	0.3	0.3	0.1	0.3	0.3	0.1	0.0	0.0
Fresh Water per barrel of oil	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3
Produced Water Recylce (m3/day)	9,033	9,222	8,959	9,142	9,313	9,161	9,753	9,355	9,357	8,849	9,318	11,233
Recycle Rates	95.31%	95.71%	95.99%	95.39%	95.92%	96.67%	95.56%	97.26%	96.94%	97.19%	97.37%	98.35%
Oil Produced (bbl/day)	48,345	44,932	49,620	48,017	48,199	47,157	49,030	48,423	46,731	48,491	47,503	47,765

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

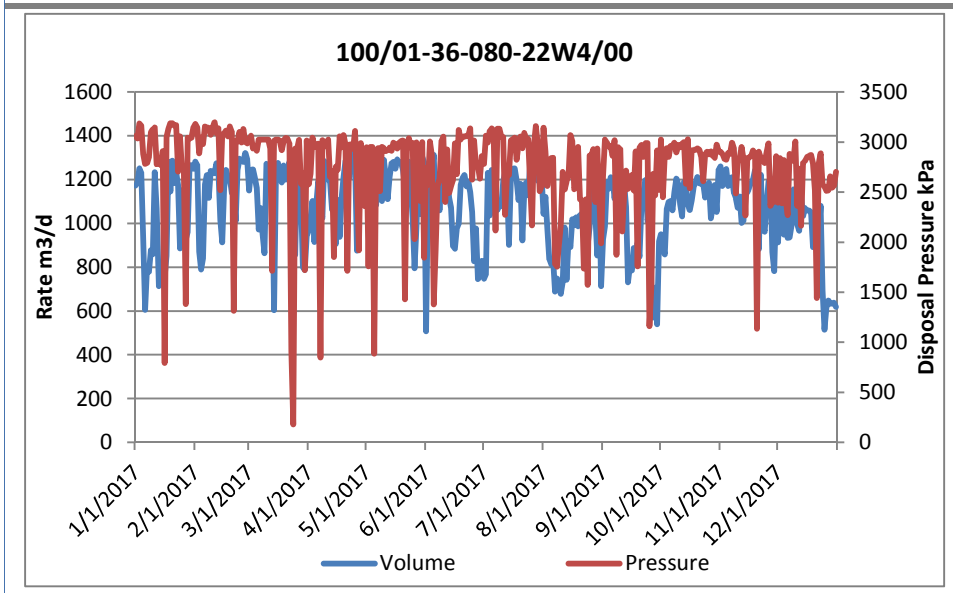
TABLE 1
APPROVAL NO. 10365F

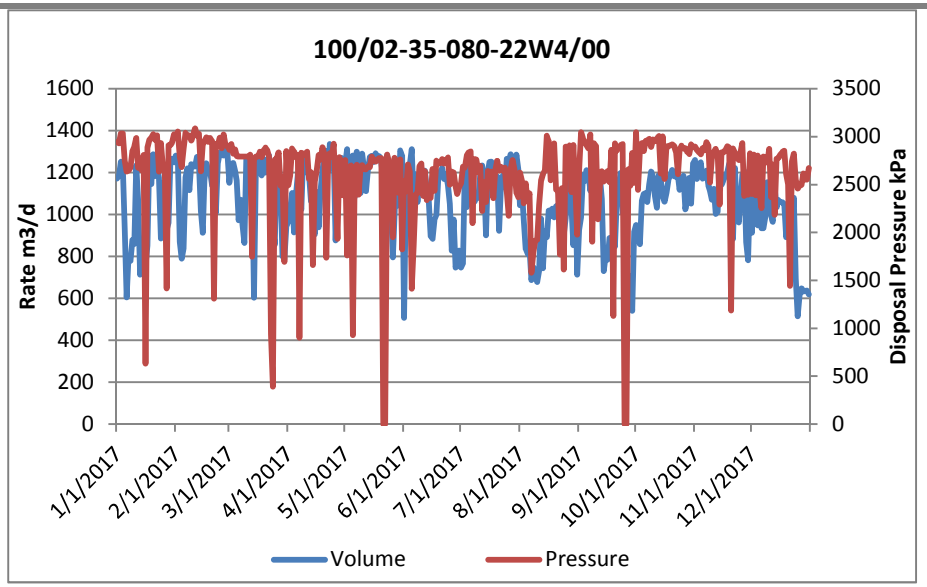
1	2	3	4	5
Unique Well Identifiers	Disposal Zone	Top of Injection Interval (Measured depth - metres KB)	Depth of Production Packer (Measured depth - metres KB)	Maximum Wellhead Injection Pressure (kilopascals gauge)
00/08-08-082-21W4/0	Grosmont	543.3	524.6	3300
02/11-07-082-22W4/0	Wabamum/Gramina/ Calmar/Nisku	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

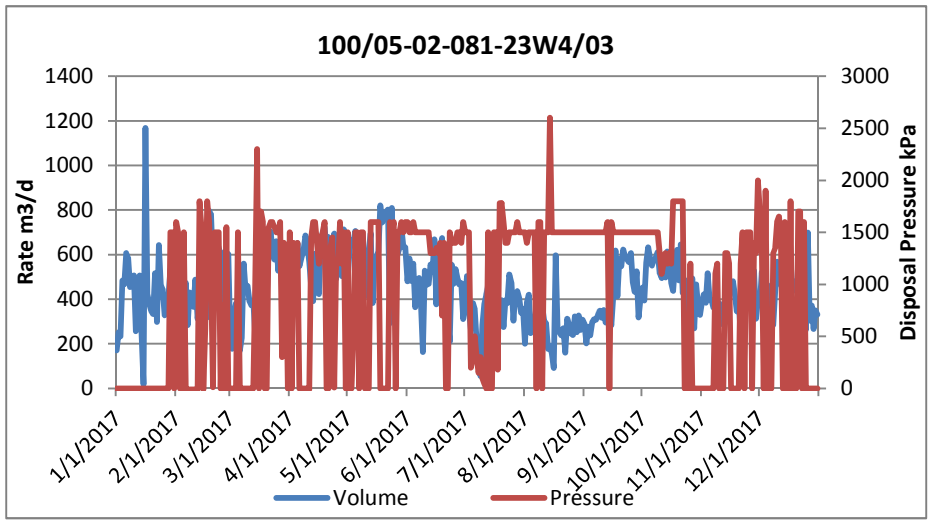
TABLE 1
APPROVAL NO. 10517C

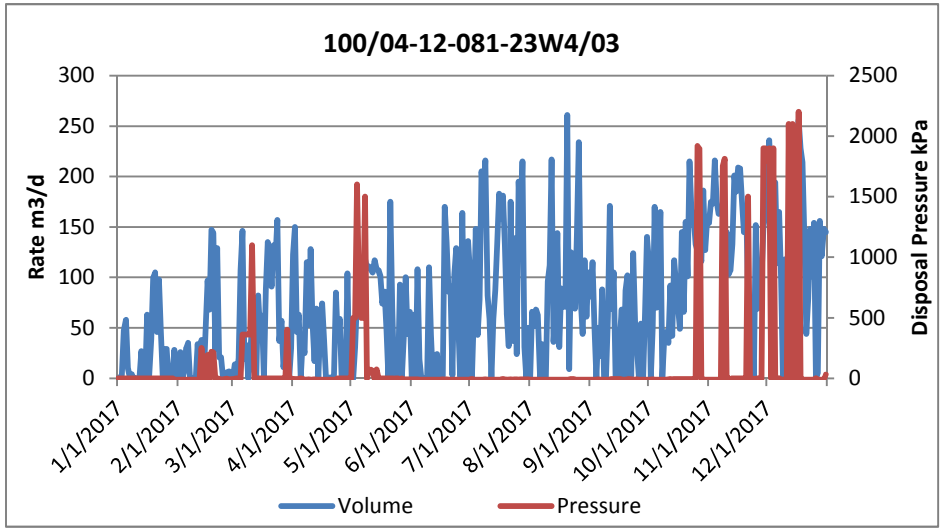
1	2	3	4	5
Unique Well Identifiers	Disposal Zone	Top of Injection Interval (Measured depth - metres KB)	Depth of Production Packer (Measured depth - metres KB)	Maximum Wellhead Injection Pressure (kilopascals gauge)
F1/10-07-082-22W4/0	Grosmont	596.1	584.9	3450

Disposal Well Data

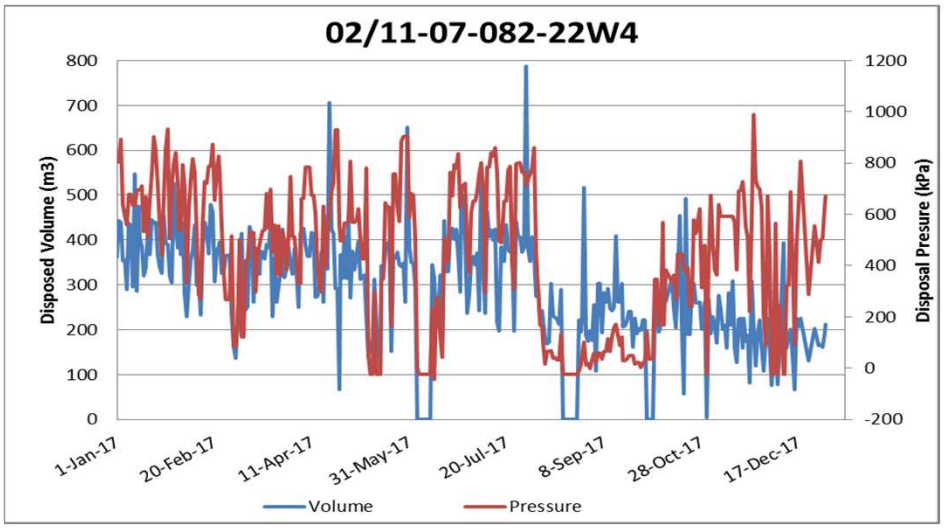


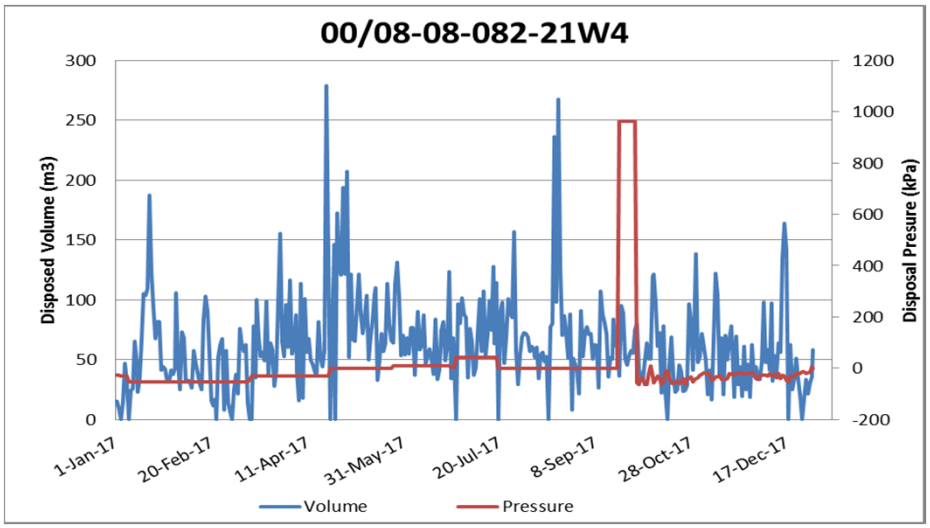


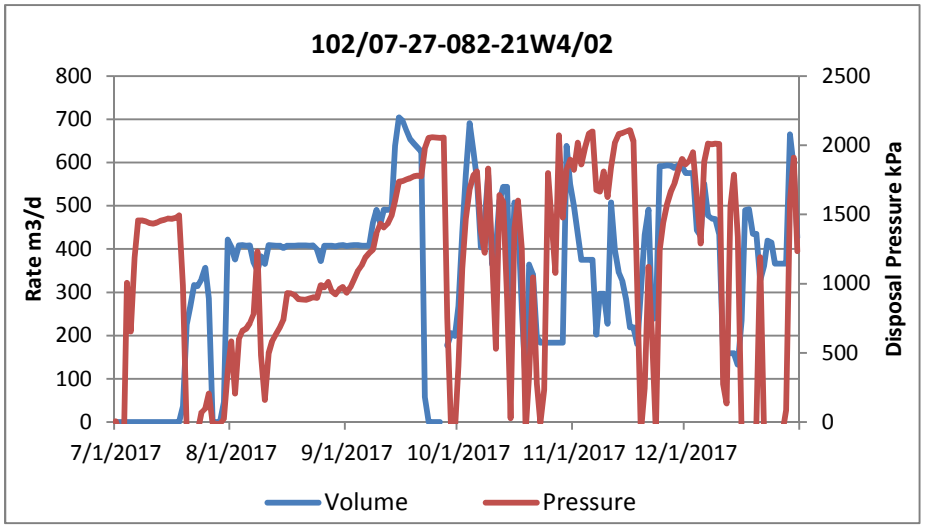


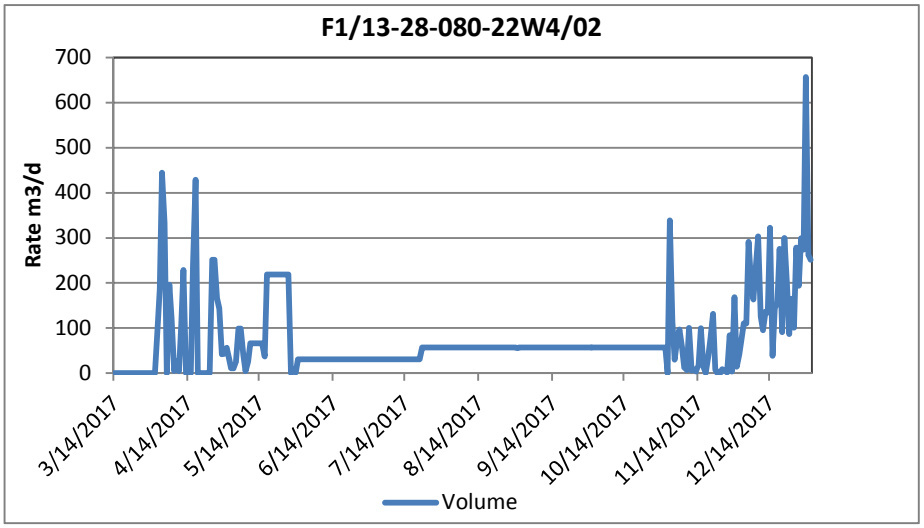


Disposal Well Data









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 Integrity

Canadian Natural

- **CNRL has identified the primary reasons for the casing failures within the Wabiskaw formation in the Brintnell field**
  - **Corrosion**
    - Historical use of non-degassed Grosmont source water is considered to be the primary driver of casing issues
    - **CNRL is mitigating this by minimizing the use of non-degassed Grosmont source**
  - **Casing Design**
    - Failures due to collapse have been encountered likely due to a combination of pressure conditions and weakened casing due to corrosion. This is more prevalent in areas with lighter weight casing in the 9404 approval area.
    - **All new drills are completed with casing rated well above the approved MWHIP to provide an additional margin**

Casing Integrity

- By implementing these measures, CNRL is working towards eliminating casing failures
- In cases where failures have already occurred, CNRL will be evaluating for either repair or replacement with the focus on re-establishing consistent flood patterns
- Casing repairs involve the installation of a concentric “stacked liner” inside of the damaged interval to re-establish access to the original slotted liner

- 2017 Repairs
  - 04/14-13-083-20W4 – June 2017, cemented stacked liner
  - 03/07-17-083-19W4 – Dec 2017, stacked liner

AER Compliance

Canadian Natural

- Canadian Natural Resources is not aware of any outstanding compliance issues regarding the current approvals.
- CNRL currently in compliance with other regulatory bodies (AER, AENV).
- Reclamation programs: Well and Pipeline abandonments as required by Directives 65 and 13.
- Inactive wells: currently compliant.
  - Long Term Inactives.
  - Review future flood areas to properly downhole suspend/abandon wells within a reasonable time of start of injection (some wells to be completed for flood monitoring).

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 2017 from observation wells

Outstanding Applications

Conclusion

Canadian Natural

- Canadian Natural continues to be committed to maximizing the value of the resource for the both itself and the Province of Alberta through it's Royalty Interest
  - 2017 – 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