Husky Oil Operations Limited

Tucker Thermal Project

Commercial Scheme No. 9835

Annual Performance Presentation

Alberta Energy Regulator

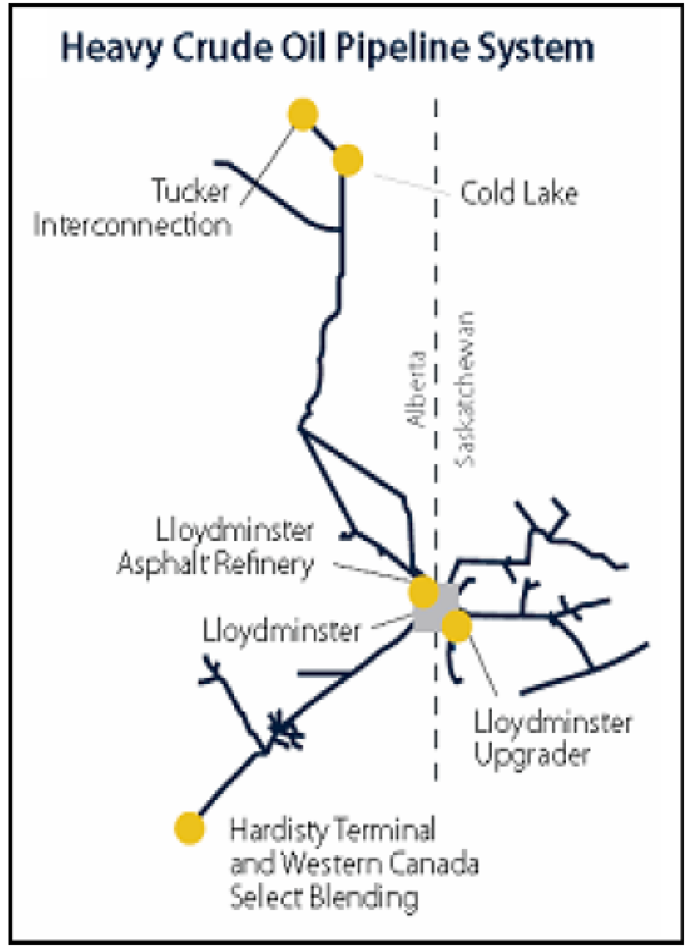
September 15, 2015

3.1.1. Subsurface Issues – Table of Contents

1. Brief Background

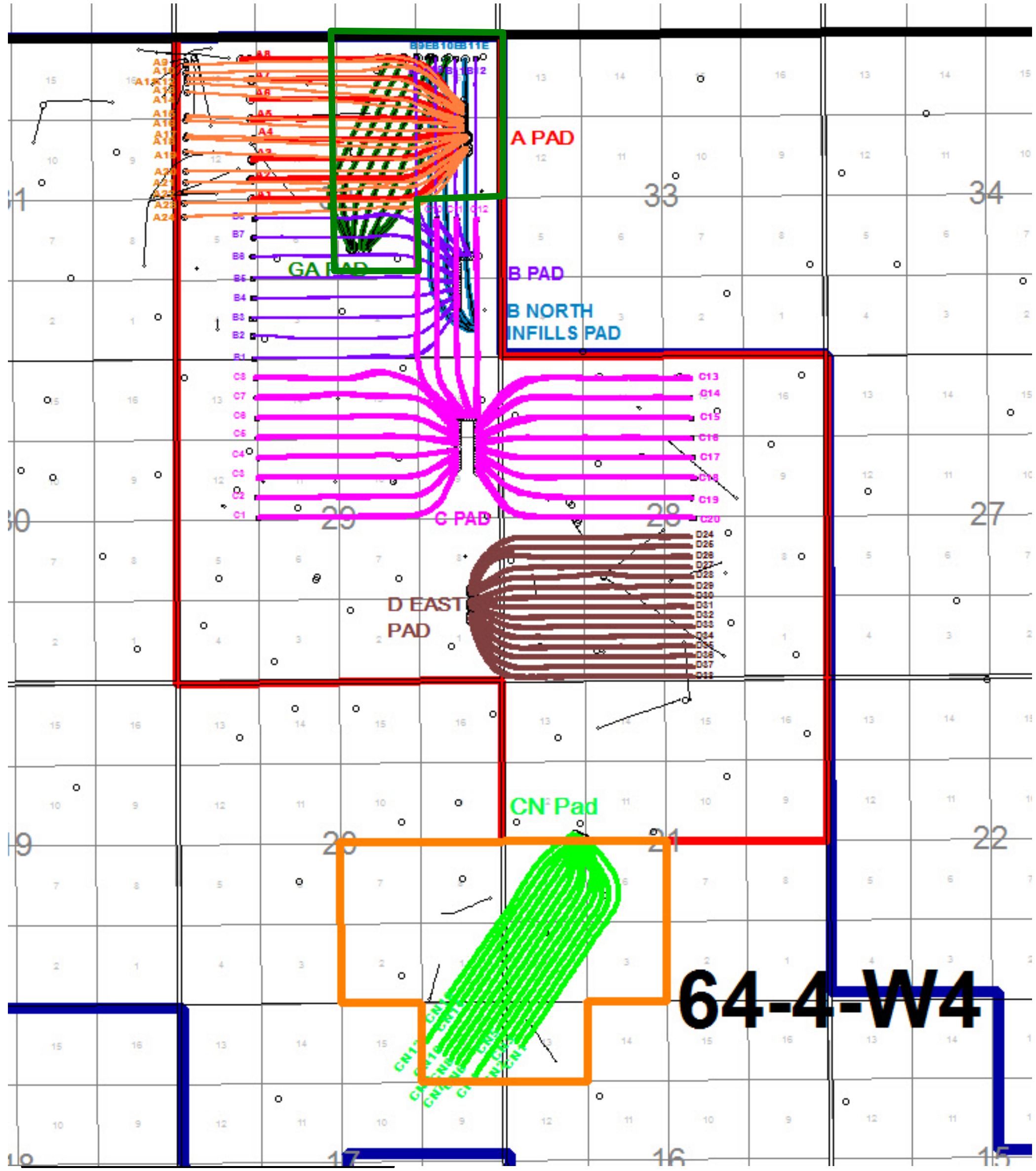
Project Overview

- AER Commercial Scheme Approval No. 9835
- 30,000 BOPD SAGD Project
- Clearwater and Grand Rapids Reservoirs
- 9-10º API Bitumen
- Integrated with Husky Pipeline & Upgrader
- Project completed in 24 months
- First Steam August 20, 2006
- First Production November 29, 2006



Husky Tucker Project Development Area

- Approval Area:
  - Sections 28, 29, 32 and N/2 of 21 in 064-04 W4M
  - SE ¼ Section 23, SW ¼ Section 21, Section 17 LSD 16 and Section 16 LSD 13
- Initial SAGD development area (Clearwater):
  - Pads A, B, and C
- Project Life Development:
  - Over 140 well pairs
  - 35 year life
- Lower Grand Rapids (LGR):
  - Pad GA - 6 well pairs
- Pad D East:
  - Completed drilling remaining 10 well pairs
  - 15 well pairs in total
- Pad Colony (CN):
  - Completed drilling 6 SAGD well pairs and 7 infill producers



Site Overview

- 86 horizontal well pairs:
  - 32 original well pairs
  - 8 well pairs added in Pad C East 2007
  - 3 well pairs added in Pad B Infills 2009-2010
  - 16 well pairs added in Pad A Infills & Replacements (2010/2011) 1 well pair added in Pad GA 2011
  - 5 well pairs added in Pad GA 2012-2013
  - 15 well pairs added in Pad D East 2014
  - 6 well pairs added in Pad CN 2015
- 7 infill producers added to Pad CN in 2015
- Field Facilities – six well pads, infield pipelines & central pump station
- Central Plant:
  - Emulsion treating
  - Water Treatment – 120,000 bbl/day
  - Steam Generation – 90,000 bbl/day CWE
  - Utilities and Offsites
- Water Source & Disposal Wells
- Metering and Export Pipelines to Cold Lake Terminal

2. Geology / Geosciences

Average Reservoir Characteristics and OBIP

CLEARWATER	OBIP ($X10^6$ m^3)	Thickness (m)	Φ	So	Original Pressure (kPa)	Original Temperature (°C)	Depth (m)	Vertical Permeability (mD)	Horizontal Permeability (mD)
Approval area	72	45	0.31	0.57	3,200	16	440	1800	3000
Operating portion	27	45	0.31	0.56	3,200	16	440	1800	3000

LOWER GRAND RAPIDS	OBIP ($X10^6$ m^3)	Thickness (m)	Φ	So	Original Pressure (kPa)	Original Temperature (°C)	Depth (m)	Vertical Permeability (mD)	Horizontal Permeability (mD)
GA Approval Area	3.7	33	0.29	0.55	2,600	14	370	1300	1800

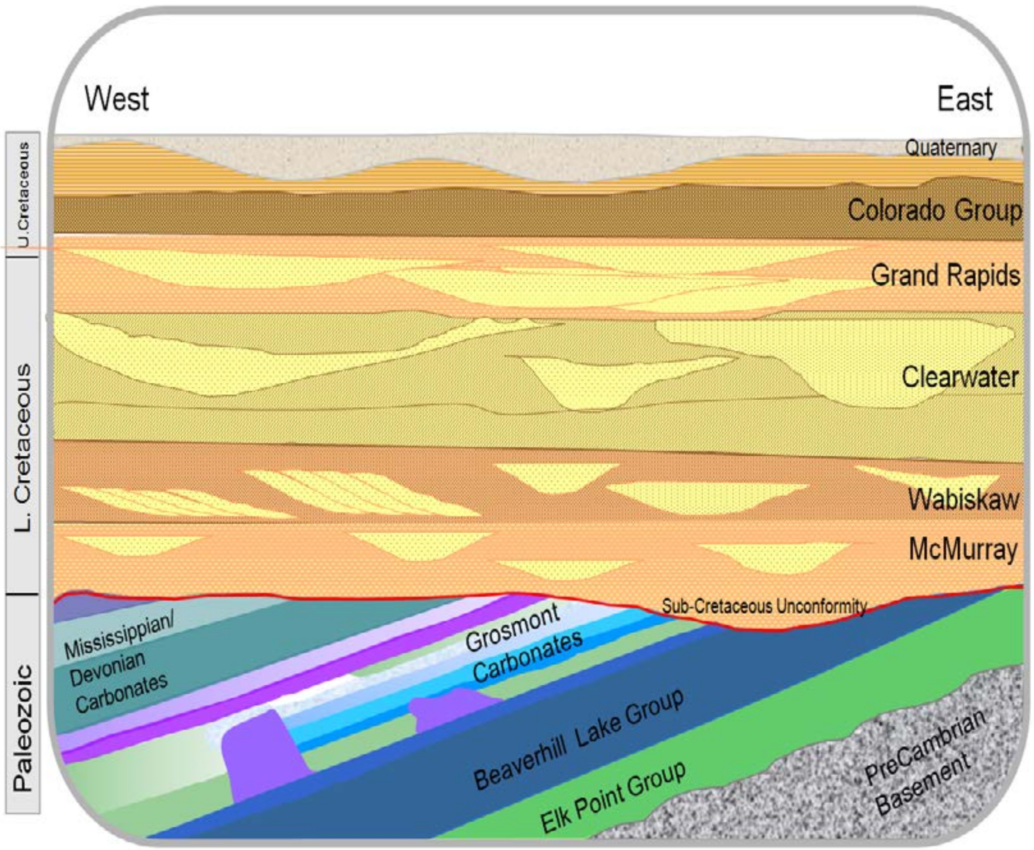
COLONY	OBIP ($X10^6$ m^3)	Thickness (m)	Φ	So	Estimated Initial Pressure (kPa)	Original Temperature (°C)	Depth (m)	Vertical Permeability (mD)	Horizontal Permeability (mD)
CN Approval Area	2.8	10	0.3	0.79	2,600*	12	305	2400	4000

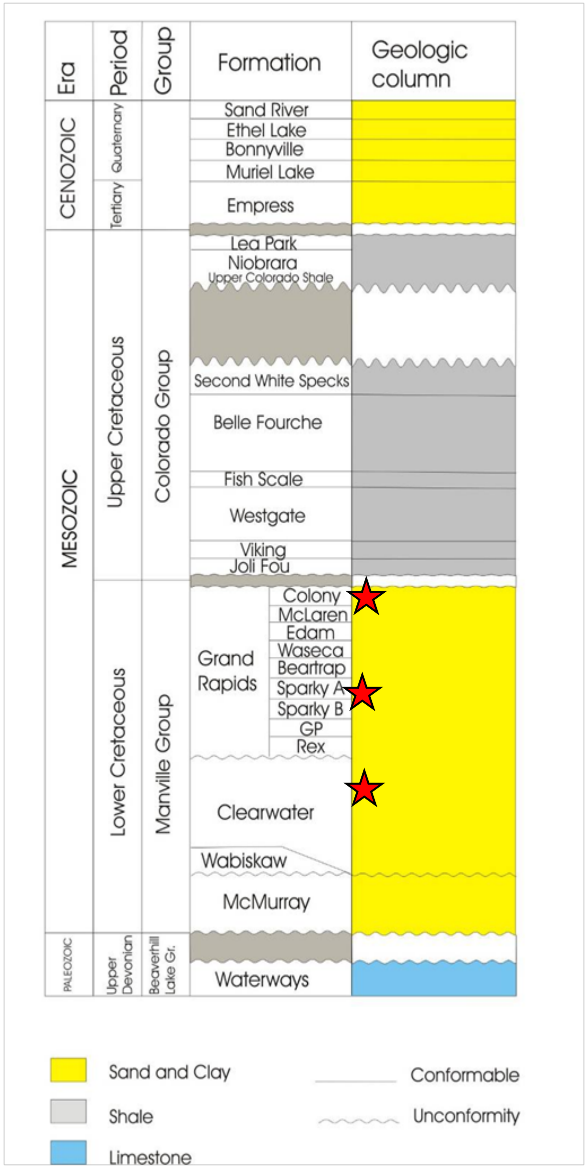
Notes:
** - Original pressure pending installation of downhole instrumentation (completion scheduled Q4 2015)*

Calculation: OBIP interval: Top of Formation → oil water contact
OBIP = Area x Thickness x Φ x S_o

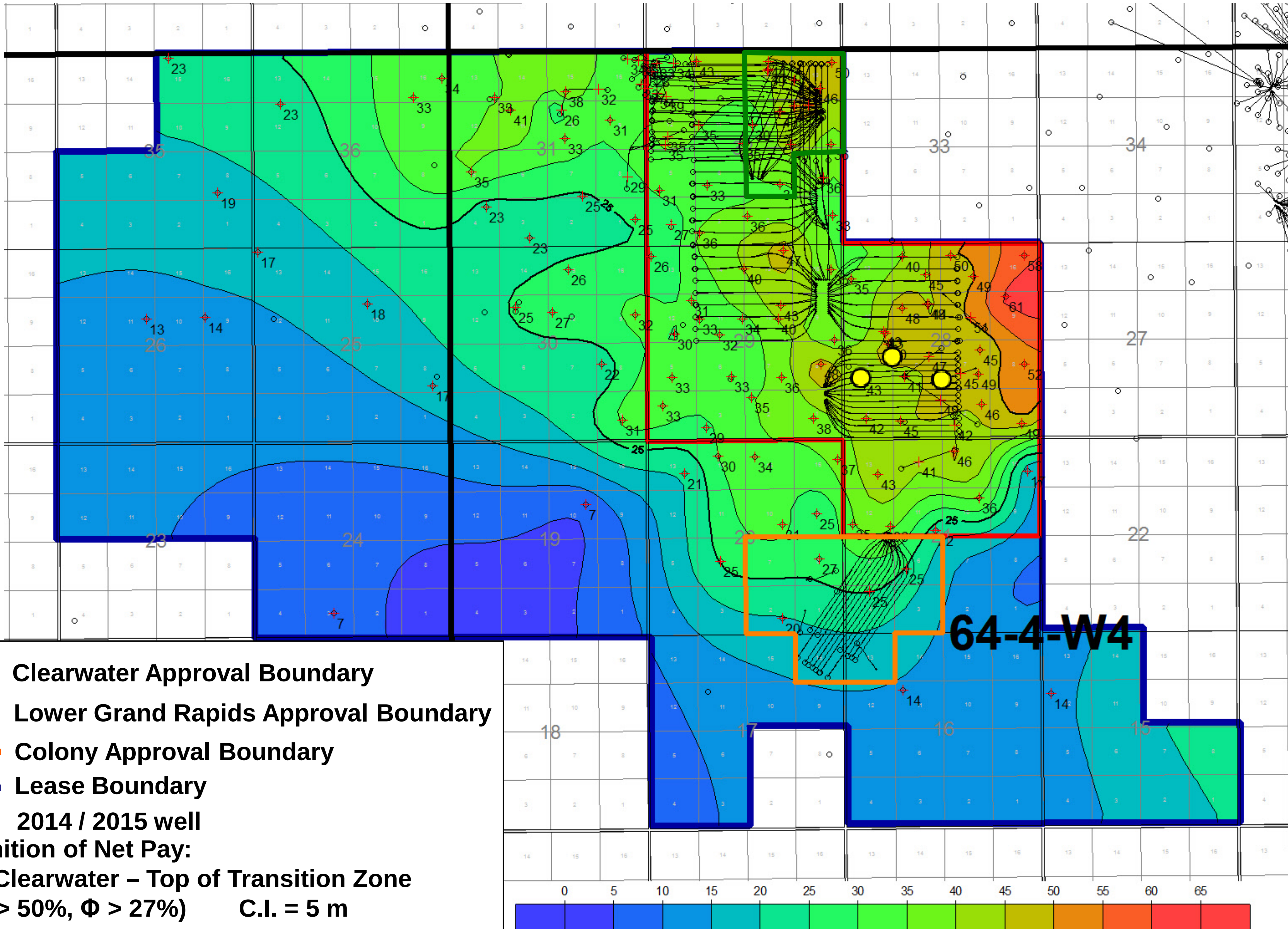
Regional Stratigraphy

- Marginal marine deposits consisting of stacked incised valley and shoreface deposits





Isopach Map of Clearwater SAGD Net Pay



Clearwater Approval Boundary

Lower Grand Rapids Approval Boundary

Colony Approval Boundary

Lease Boundary

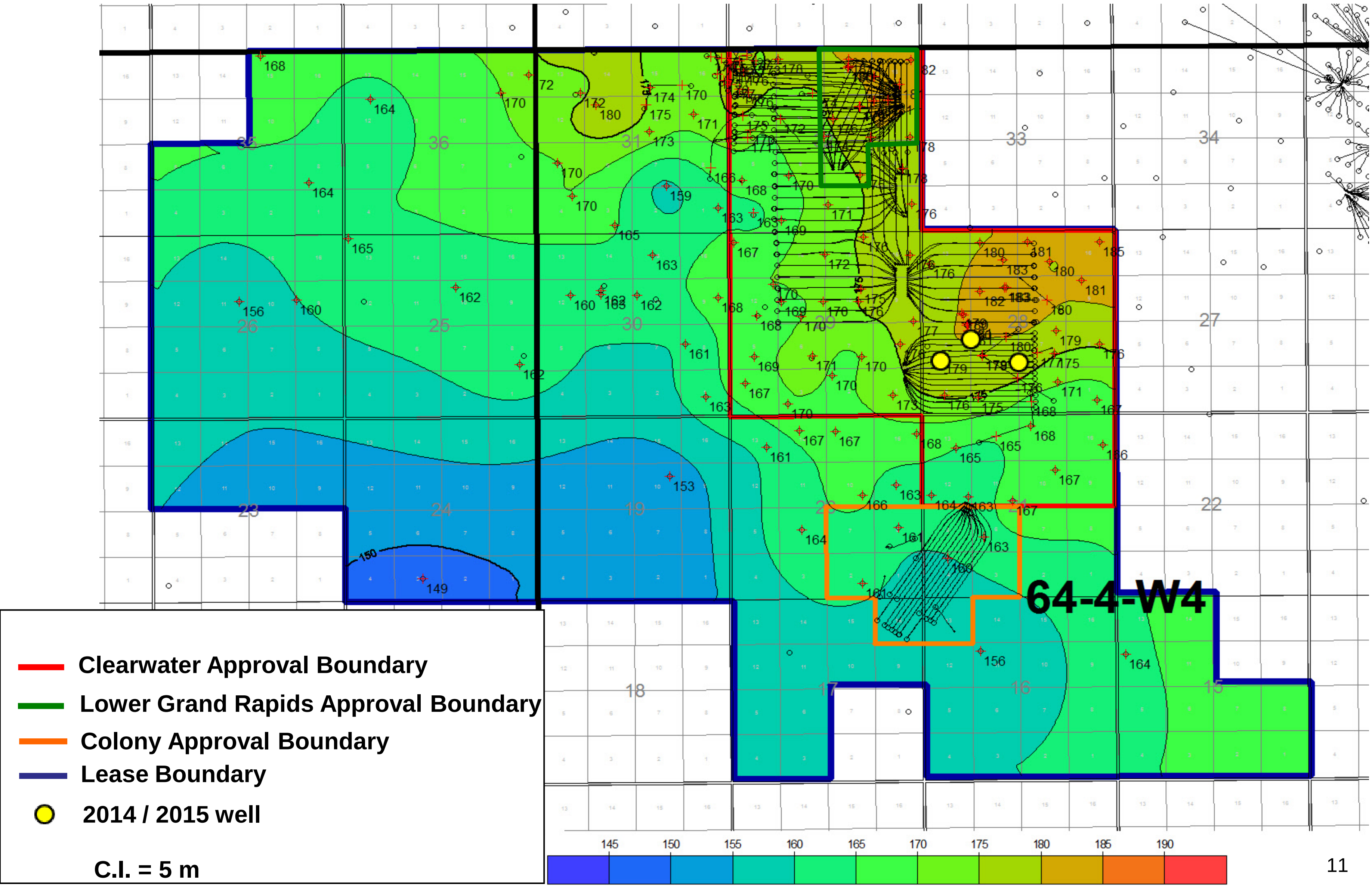
2014 / 2015 well

Definition of Net Pay:

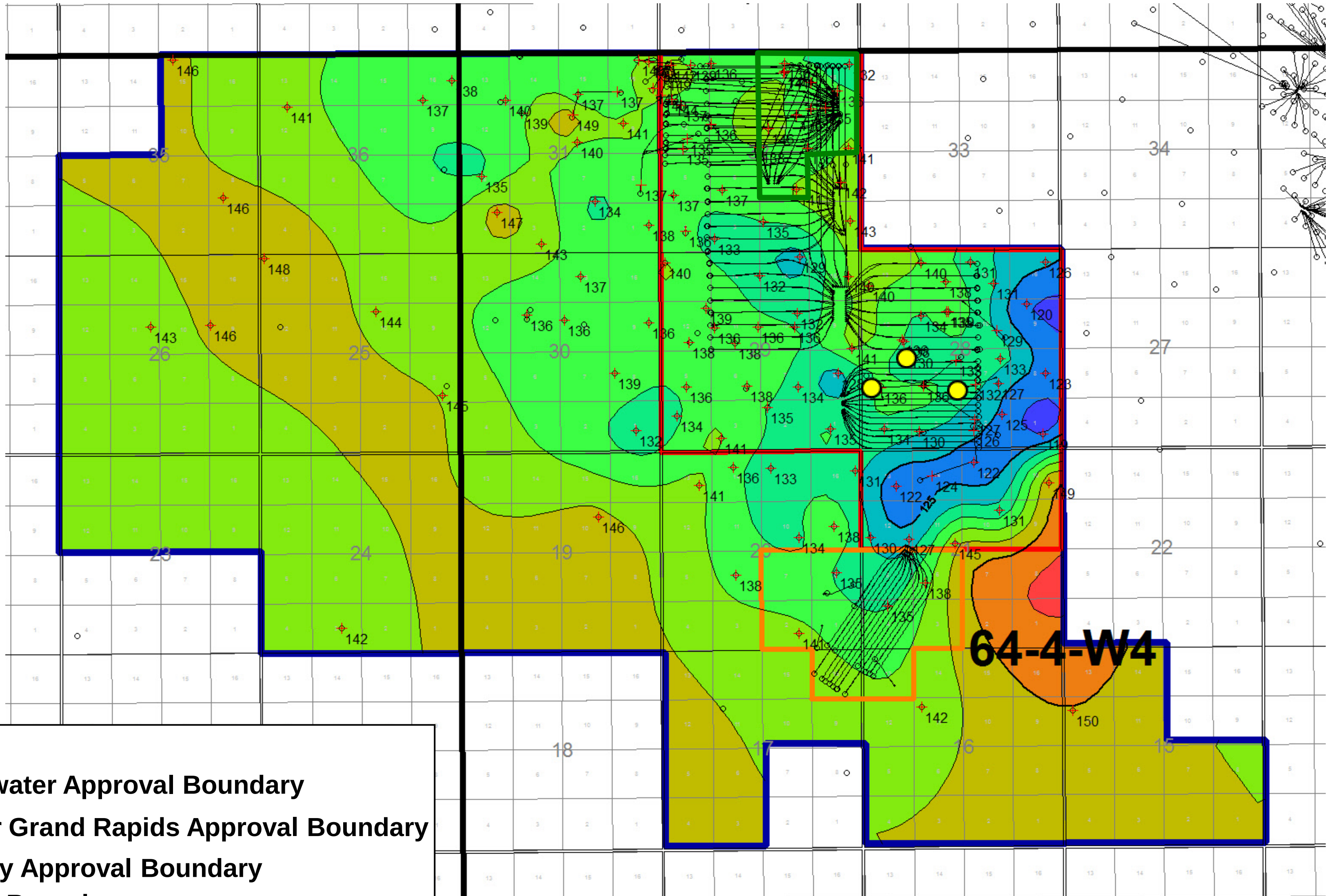
Top Clearwater – Top of Transition Zone

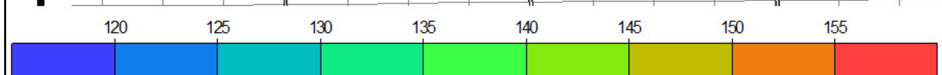
(So > 50%, Φ > 27%) C.I. = 5 m

Structure Map of the Clearwater Top of Net Pay



Structure Map of the Clearwater Base of Net Pay

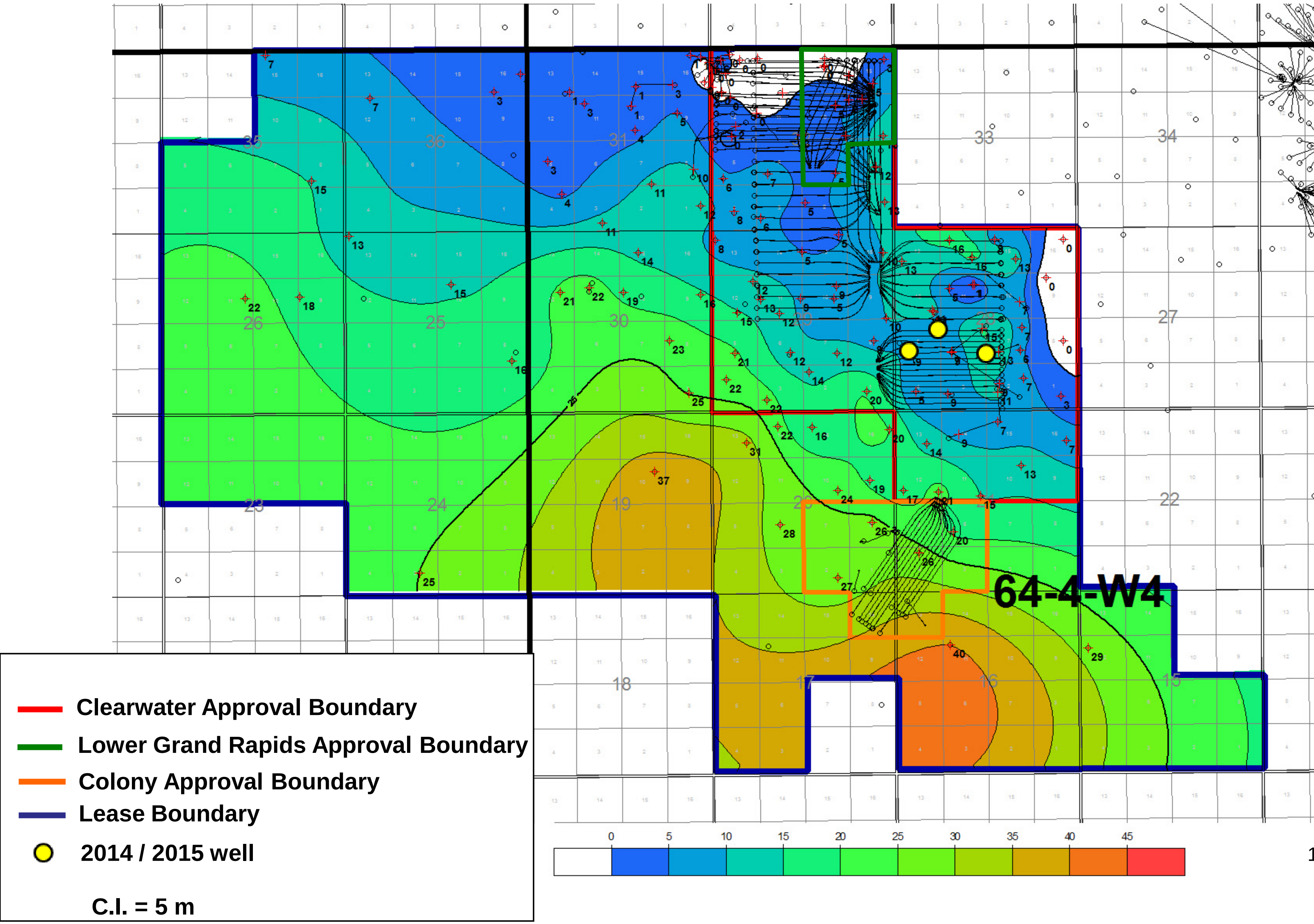




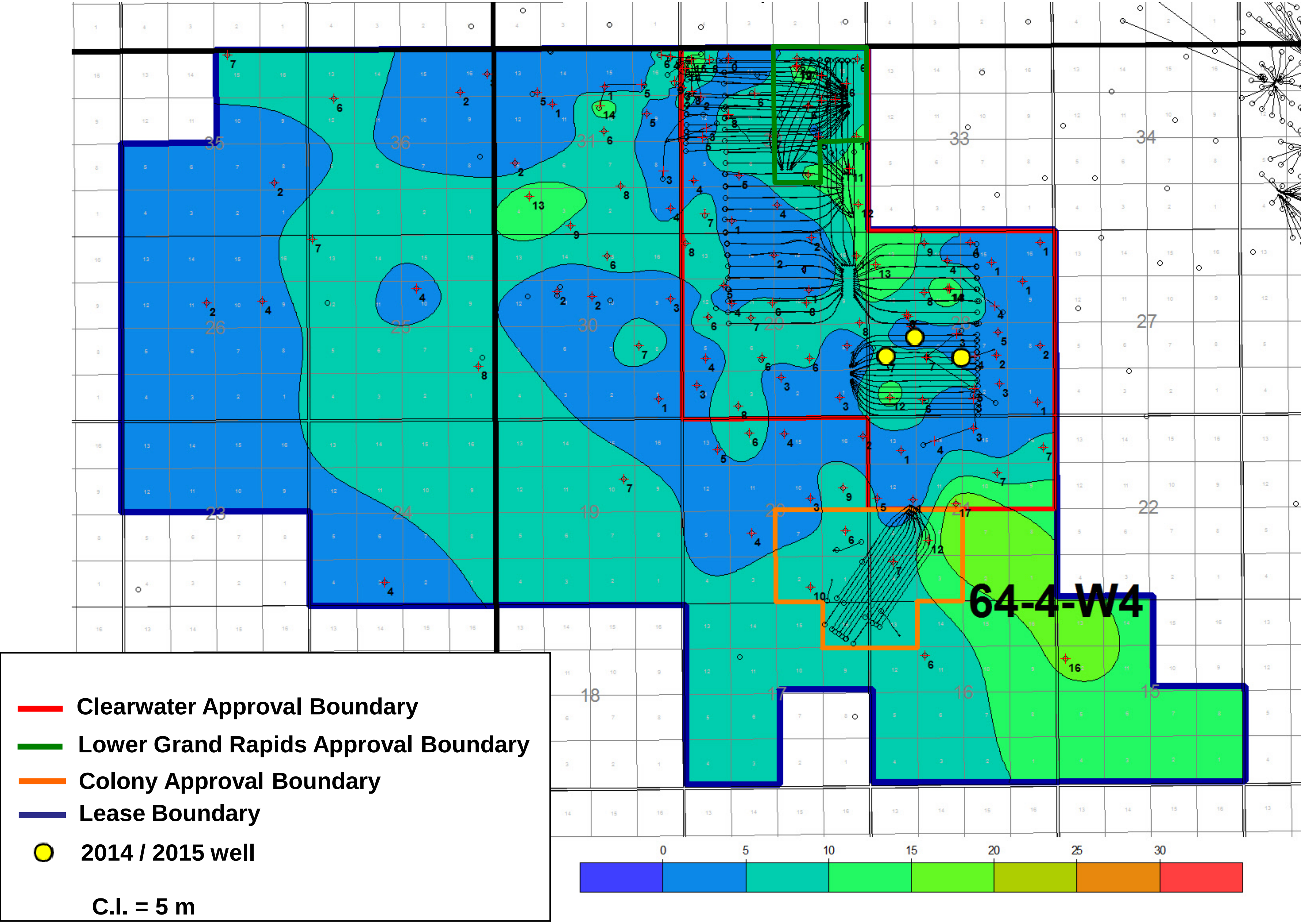
- Clearwater Approval Boundary
- Lower Grand Rapids Approval Boundary
- Colony Approval Boundary
- Lease Boundary
- 2014 / 2015 well

C.I. = 5 m

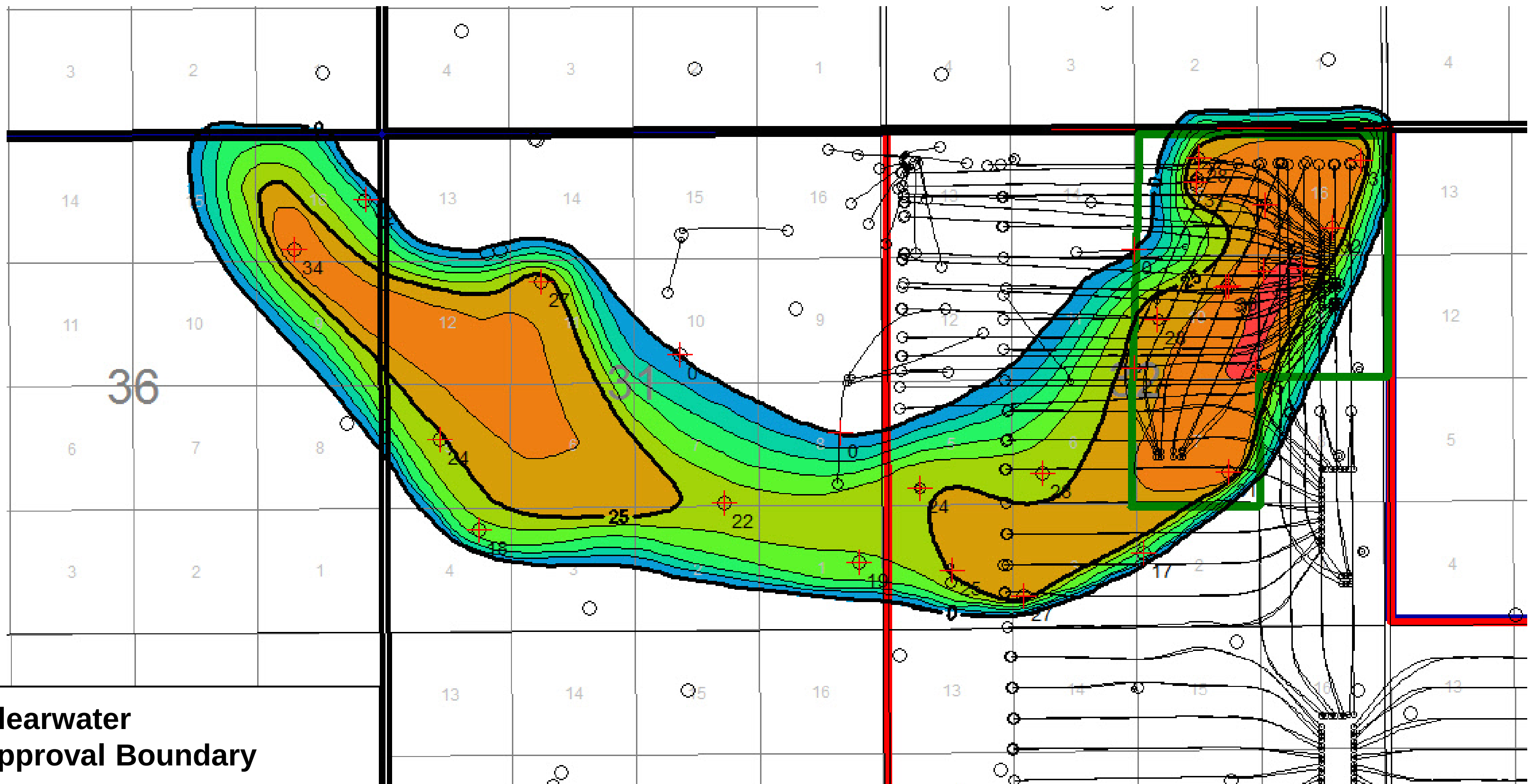
Isopach of Clearwater Bottom Water



Isopach of Clearwater Transition zone



Isopach Map of Lower Grand Rapids SAGD Net Pay



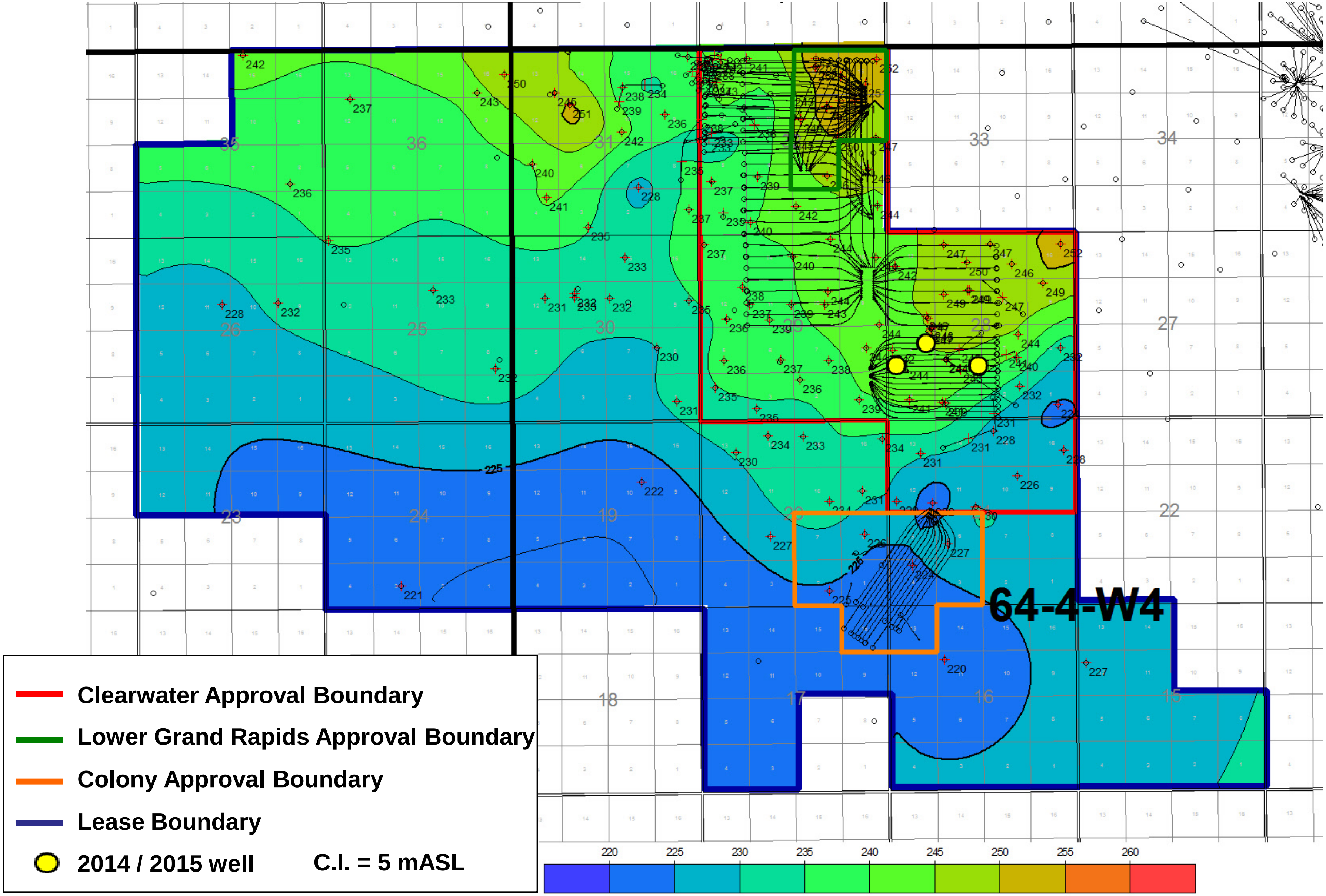
Clearwater Approval Boundary

Lower Grand Rapids Approval Boundary

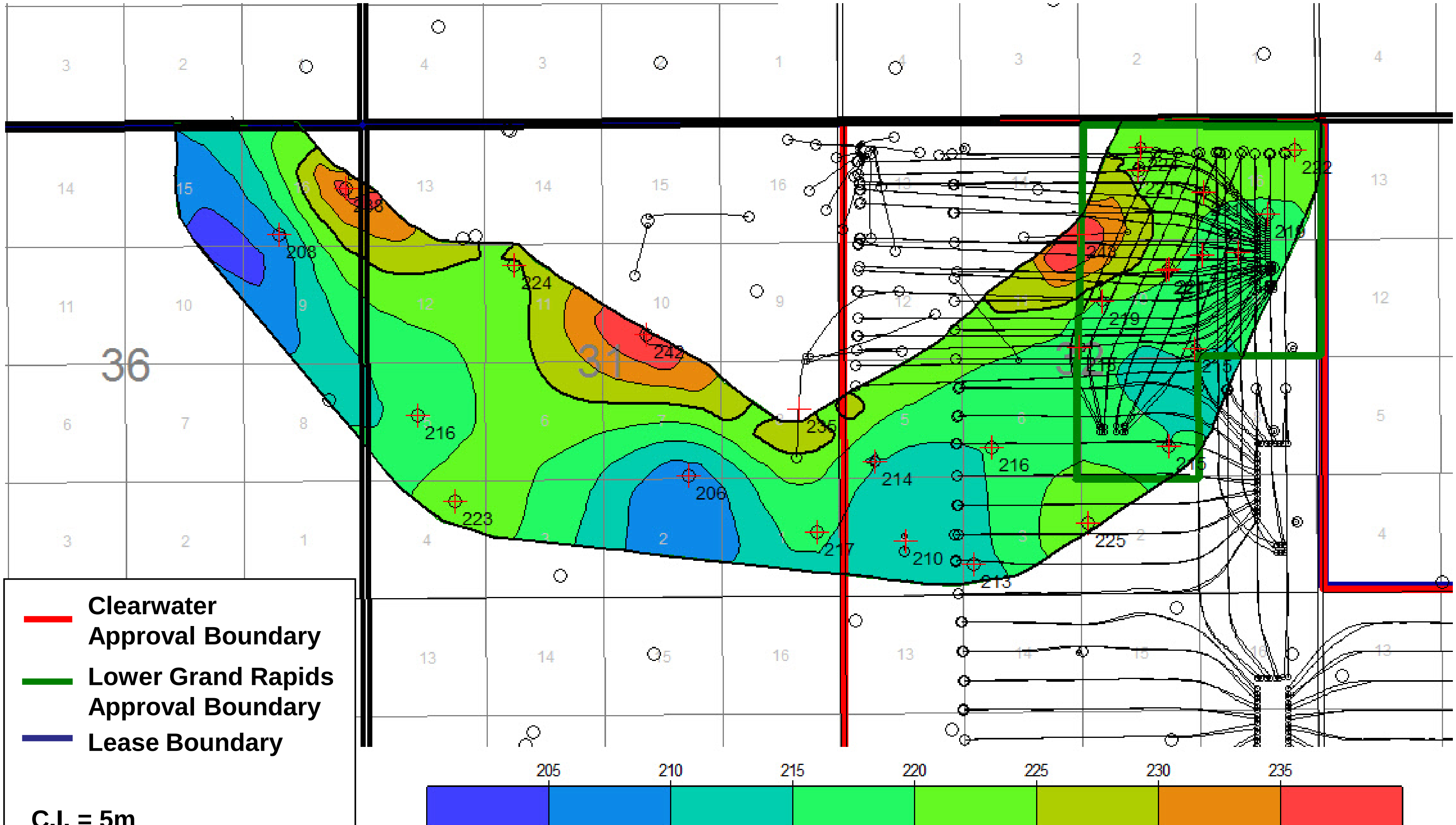
Lease Boundary

Definition of Net Pay:
Top Sparky – Base of Pay
(So >50%, Φ >27%)
C.I. = 5 m

Structure Map of the Lower Grand Rapids



Structure Map of the Lower Grand Rapids Base of Net Pay



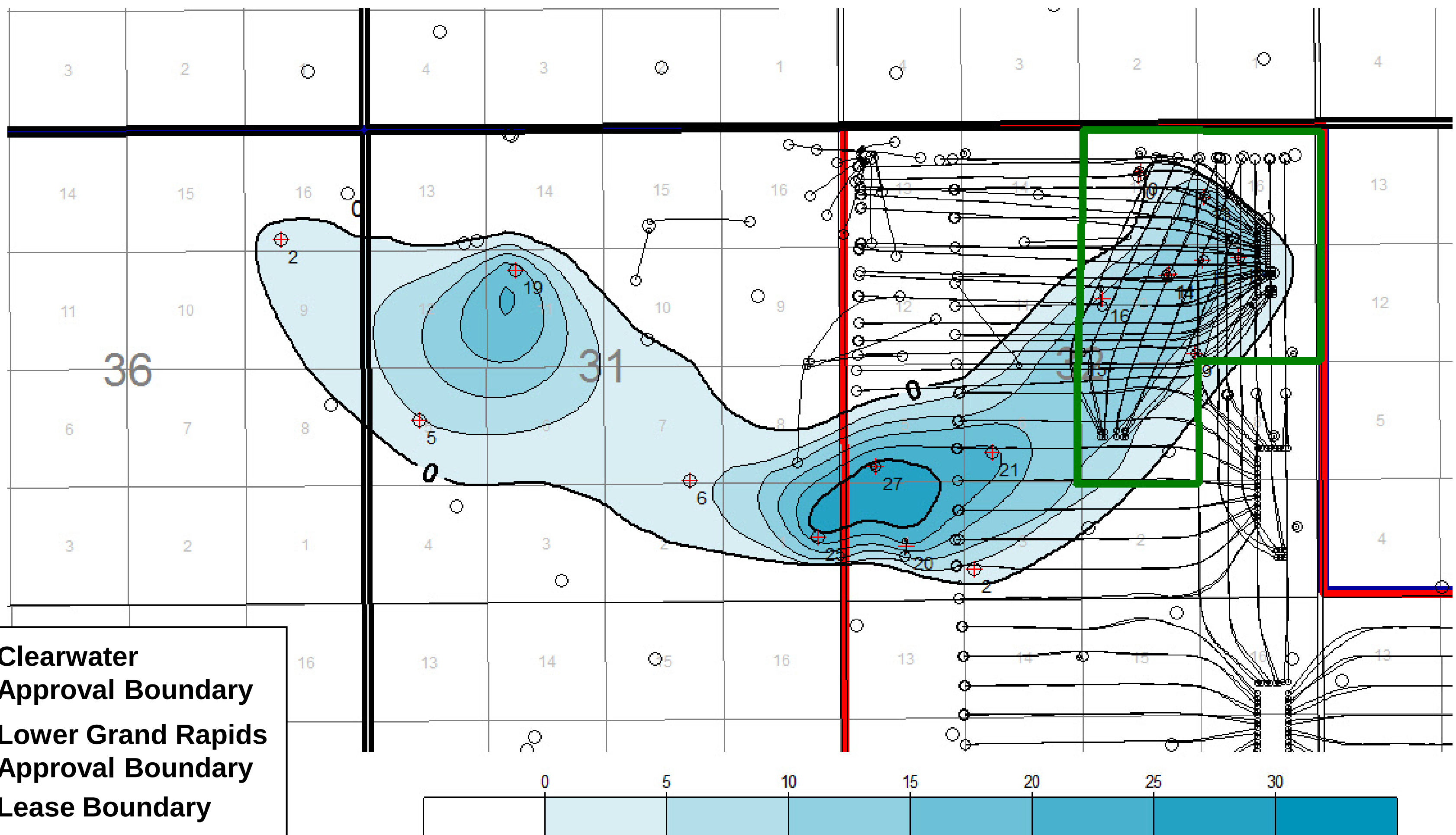
Clearwater Approval Boundary

Lower Grand Rapids Approval Boundary

Lease Boundary

C.I. = 5m

Isopach Lower Grand Rapids Bottom Water



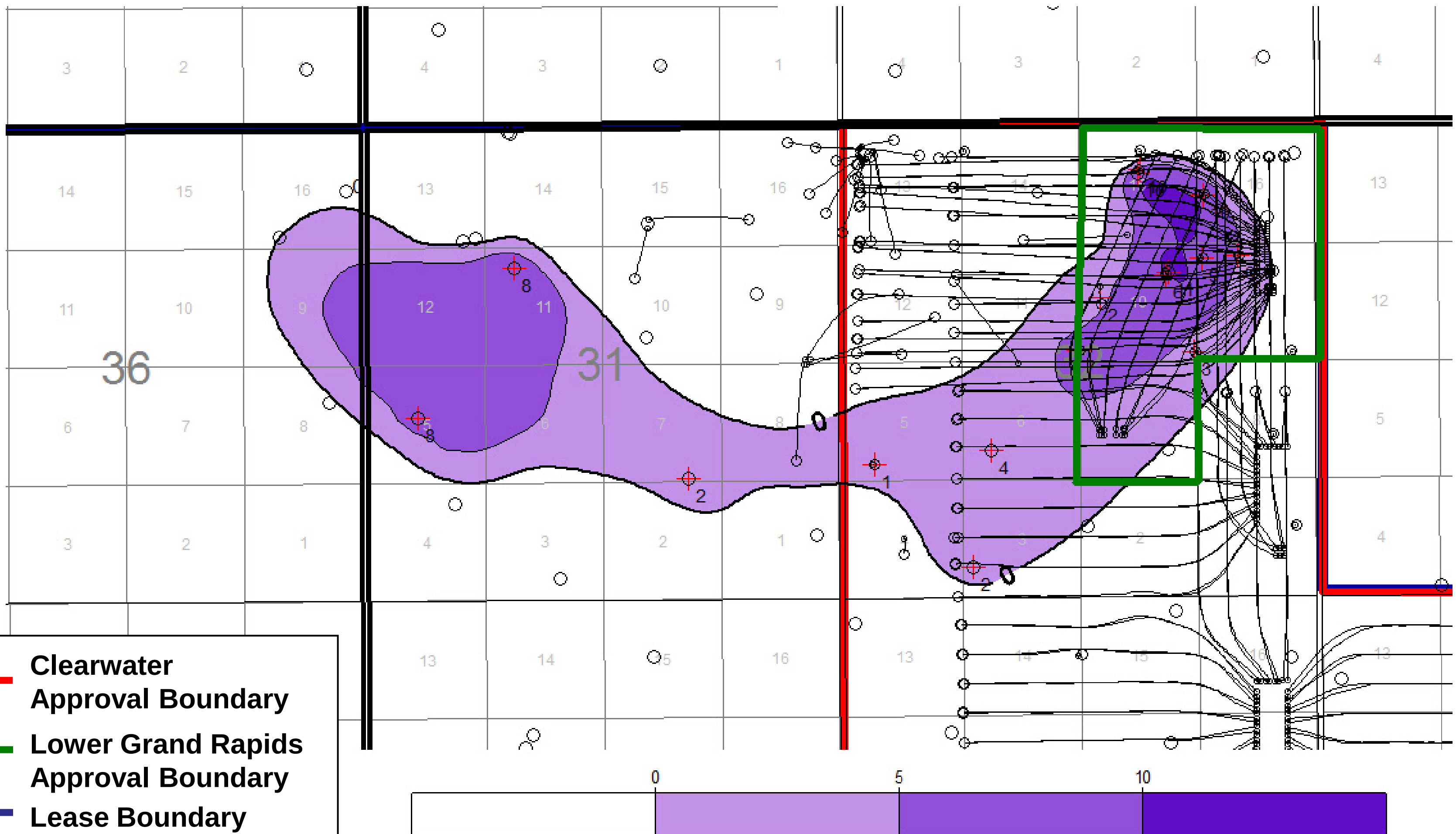
Clearwater Approval Boundary

Lower Grand Rapids Approval Boundary

Lease Boundary

C.I. = 5m

Isopach Lower Grand Rapids Transition Zone



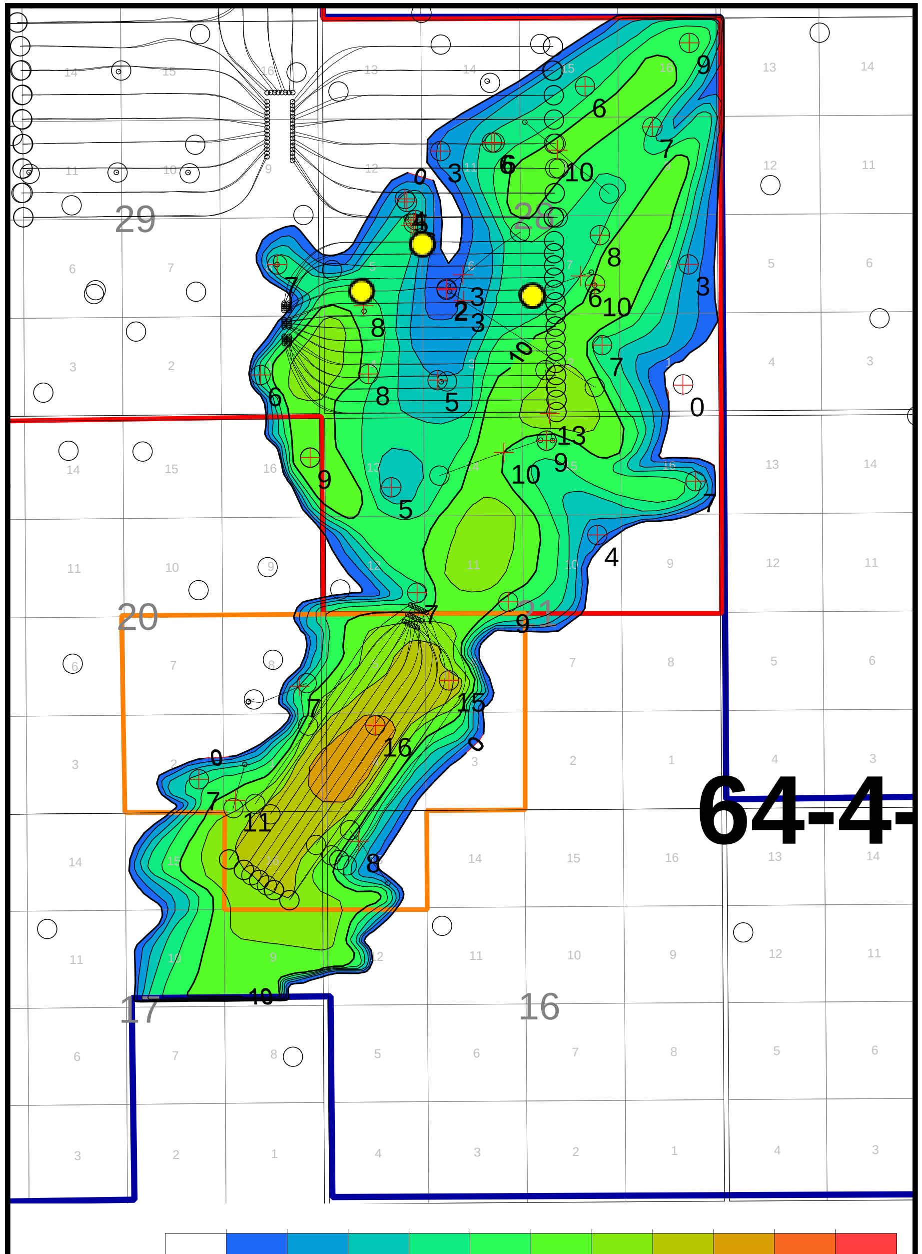
Clearwater Approval Boundary

Lower Grand Rapids Approval Boundary

Lease Boundary

C.I. = 5m

Isopach Map of Colony SAGD Net Pay



Clearwater Approval Boundary

Colony Approval Boundary

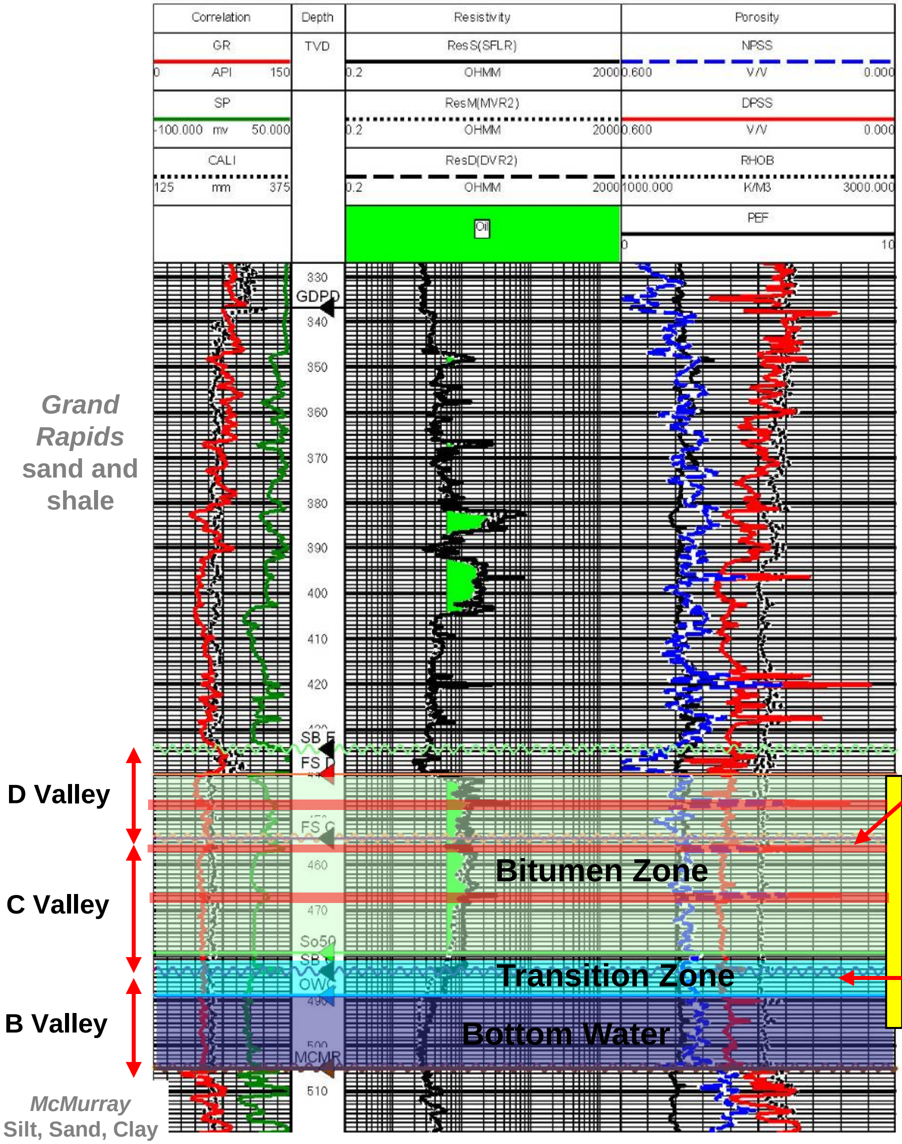
Lease Boundary

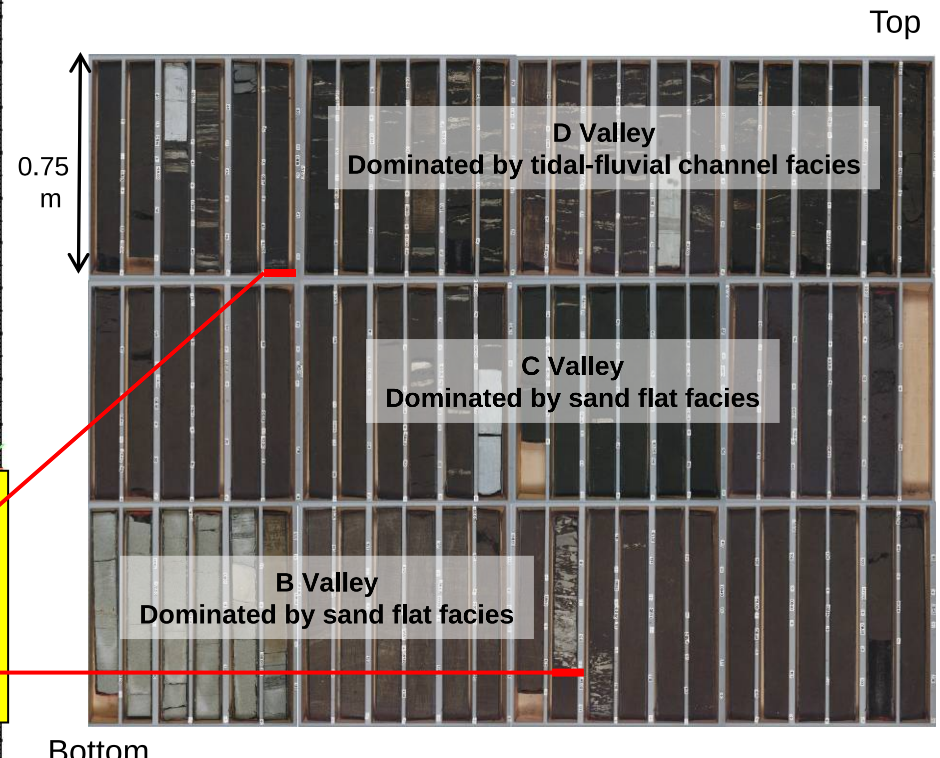
2014 / 2015 well

Definition of Net Pay:
Colony Top Pay– Colony Channel Base Pay (So >50%, Φ>27%)
C.I. = 2 m

Clearwater Formation Type Log

100/14-28-064-4W400
KB 619.5m

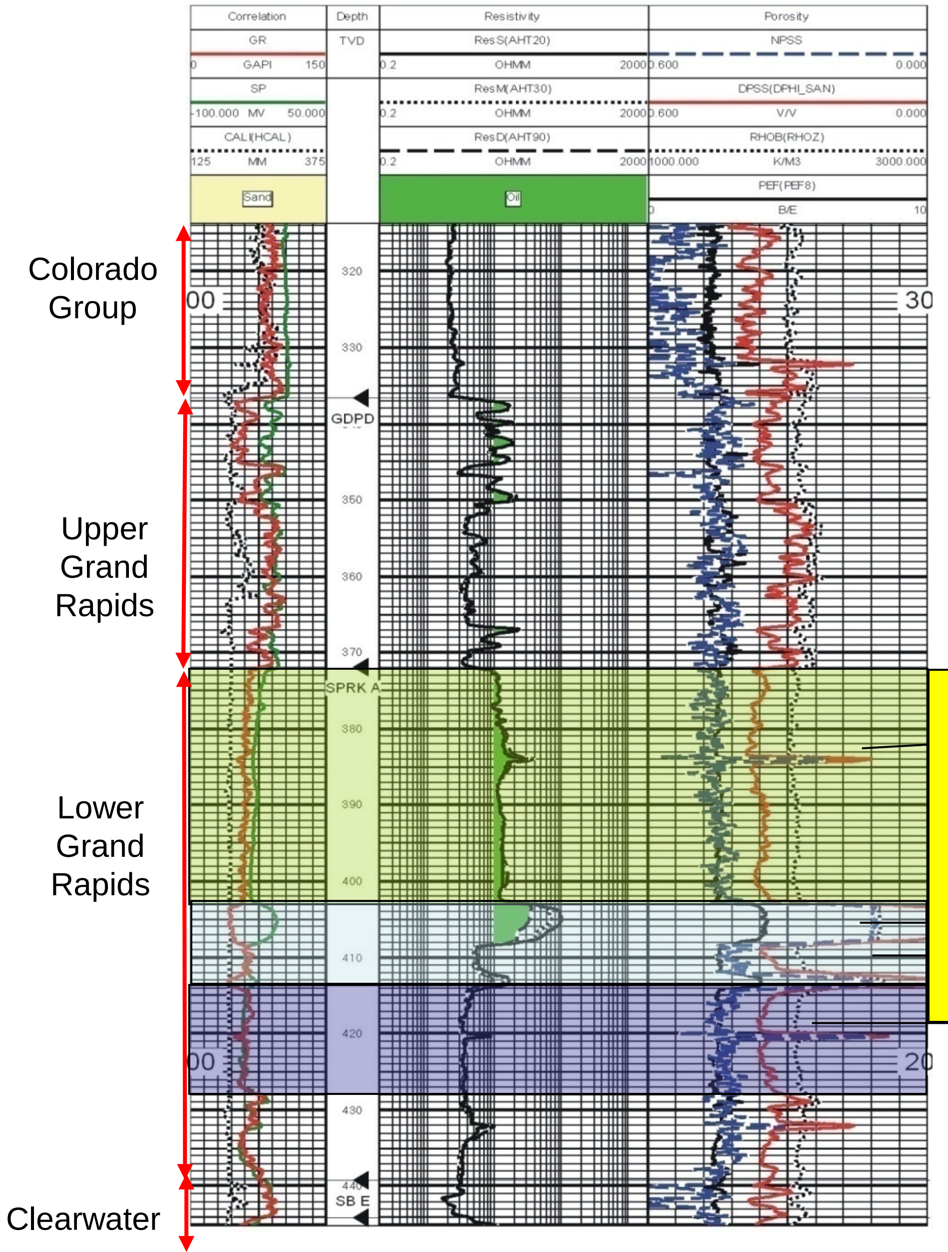




Cored Interval

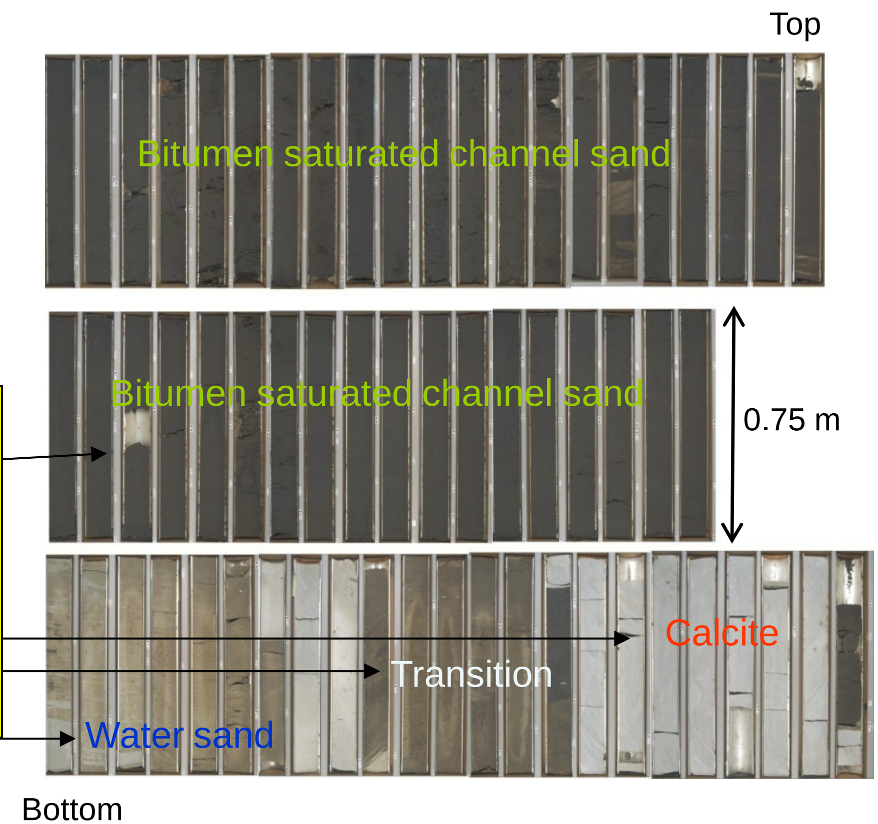
Calcite cemented zones

Sparky Formation Type Log



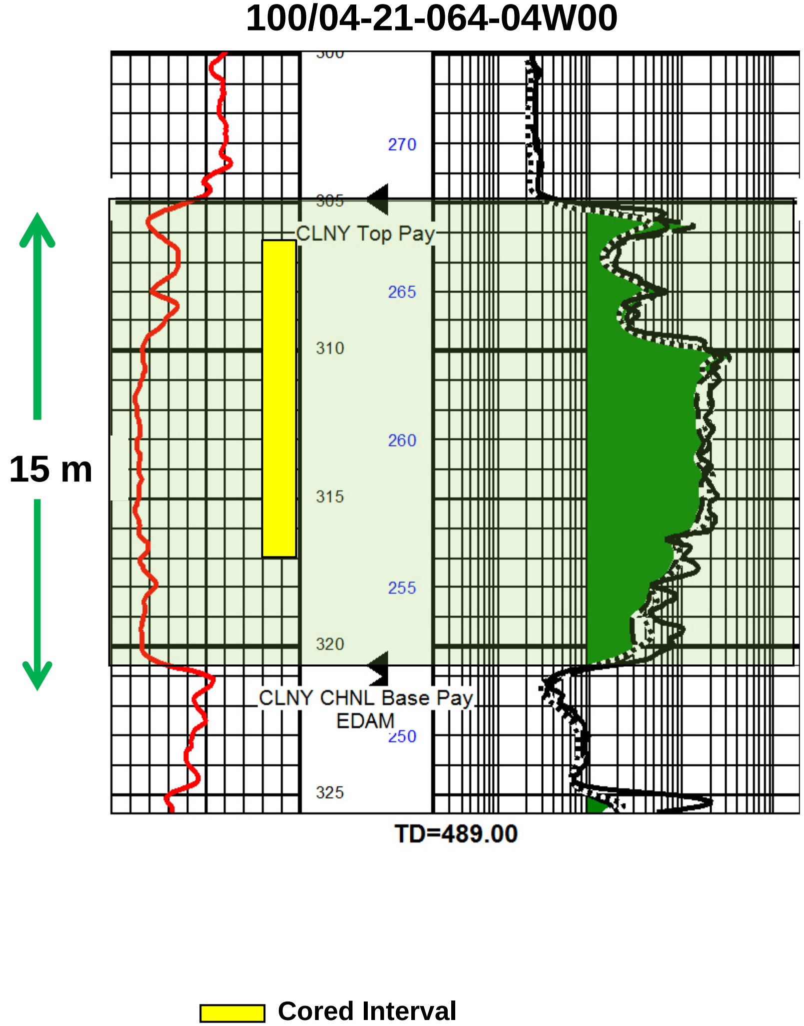
103/10-32-064-04W400

KB = 623.7 m

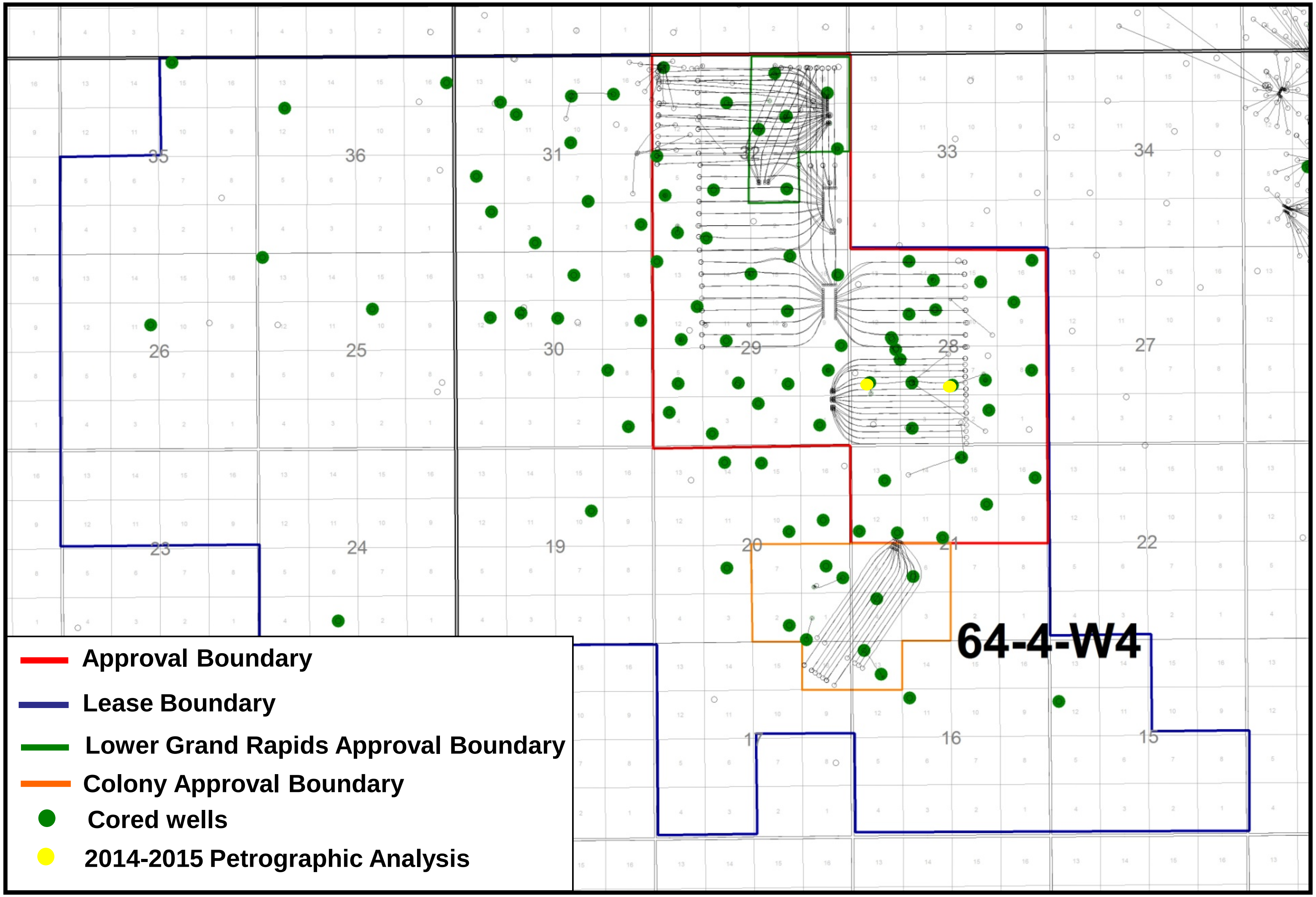


Cored Interval

Colony Formation Type Log

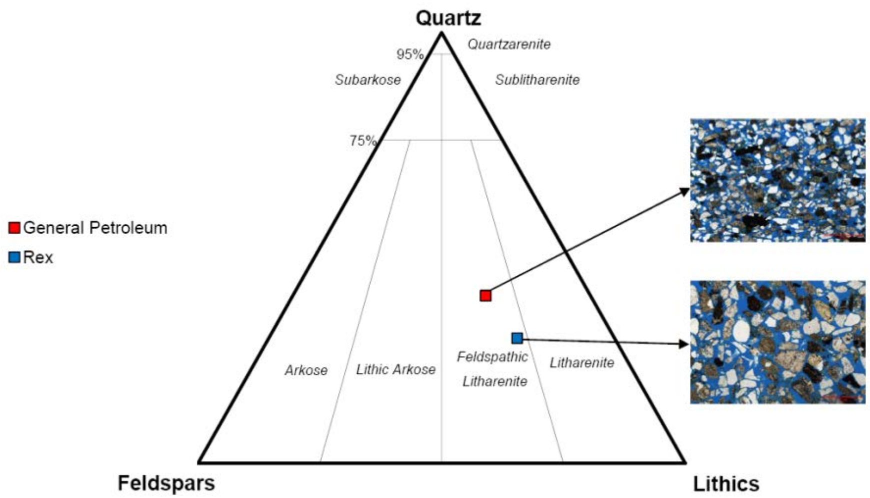


Cored Wells & Special Core Analysis

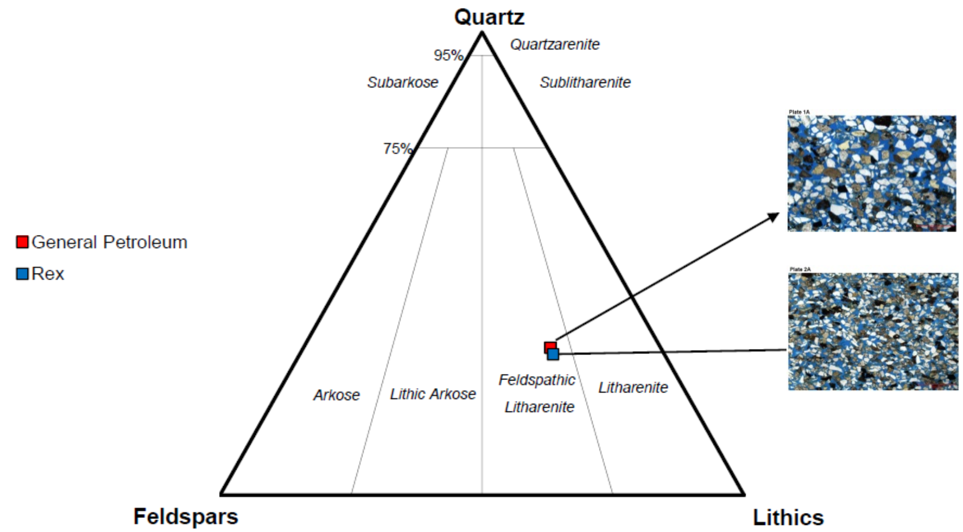


Petrographic Analysis – 2015 Update

102/05-28-064-04W4



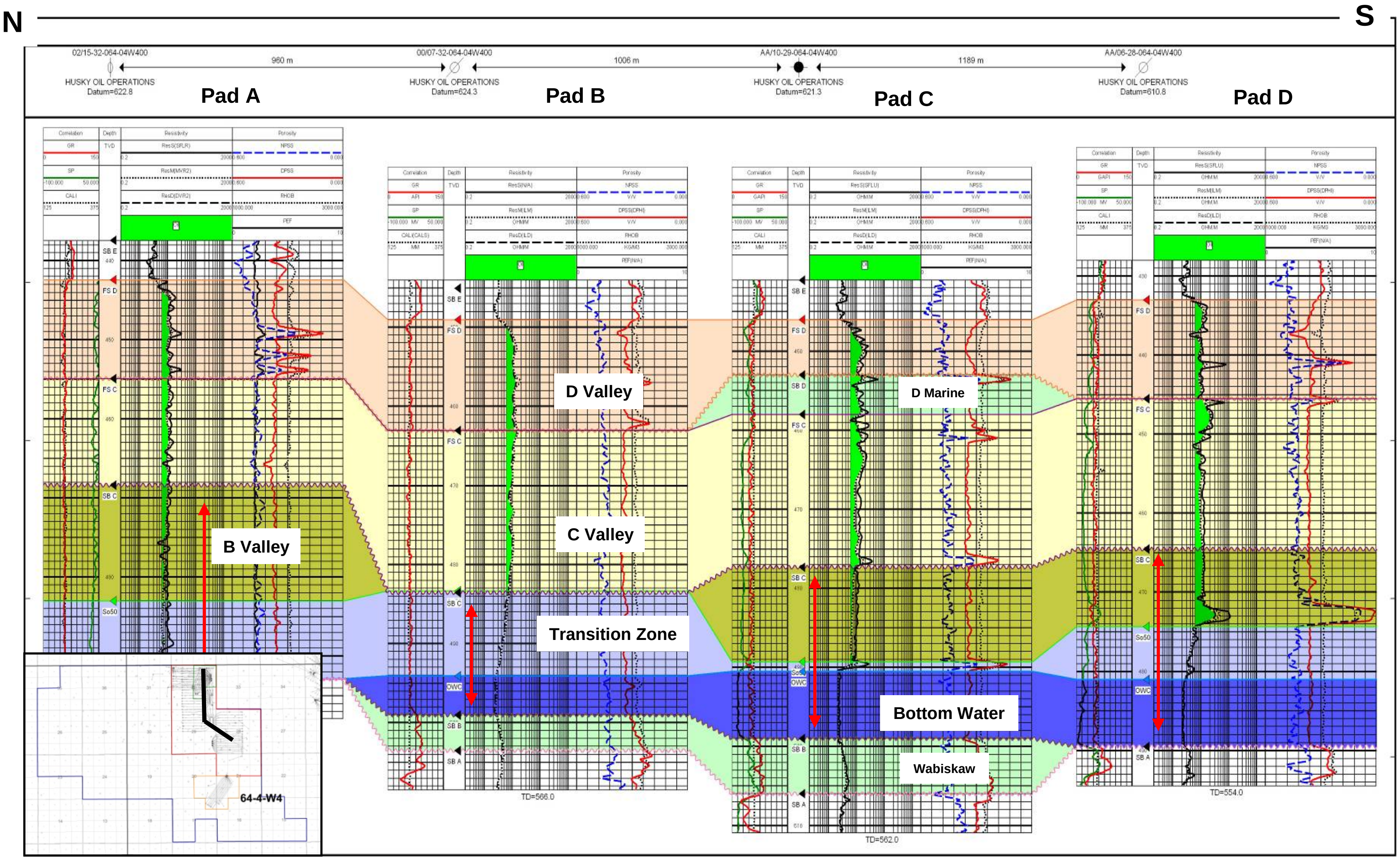
118/07-28-064-04W4



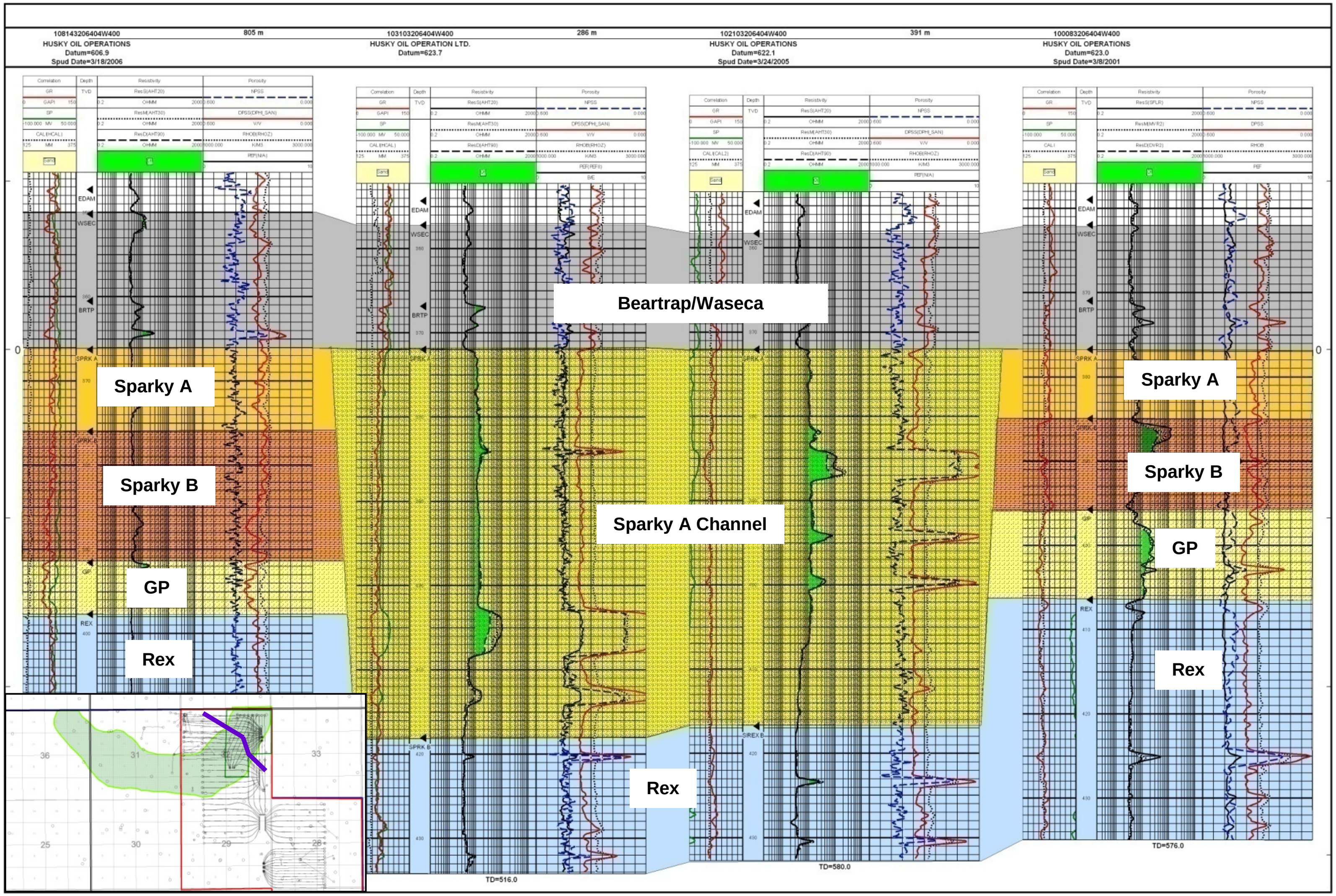
- General Petroleum Formation is a massive, poorly consolidated, moderately sorted, fine grained feldspathic litharenite with subangular to rounded grains and point-short grain contacts

- Rex Formation is a massive, unconsolidated, moderately sorted, fine grained feldspathic litharenite with subangular to rounded grains and point-short grain contacts

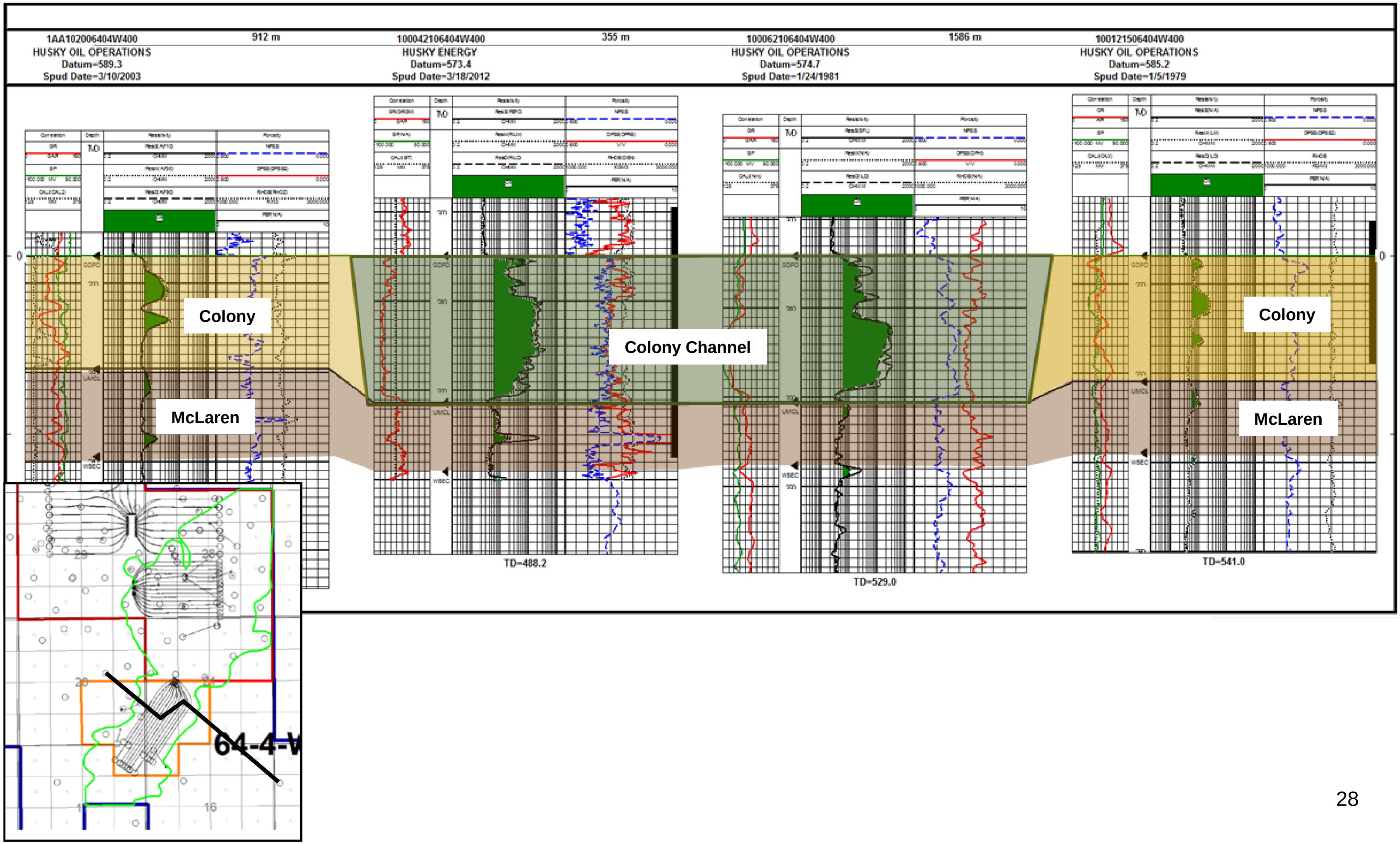
Representative Structural N-S Cross-section through the Approval Area



Representative Strike Cross-section through the Sparky Channel



Representative Strike Cross-section through the Colony Channel



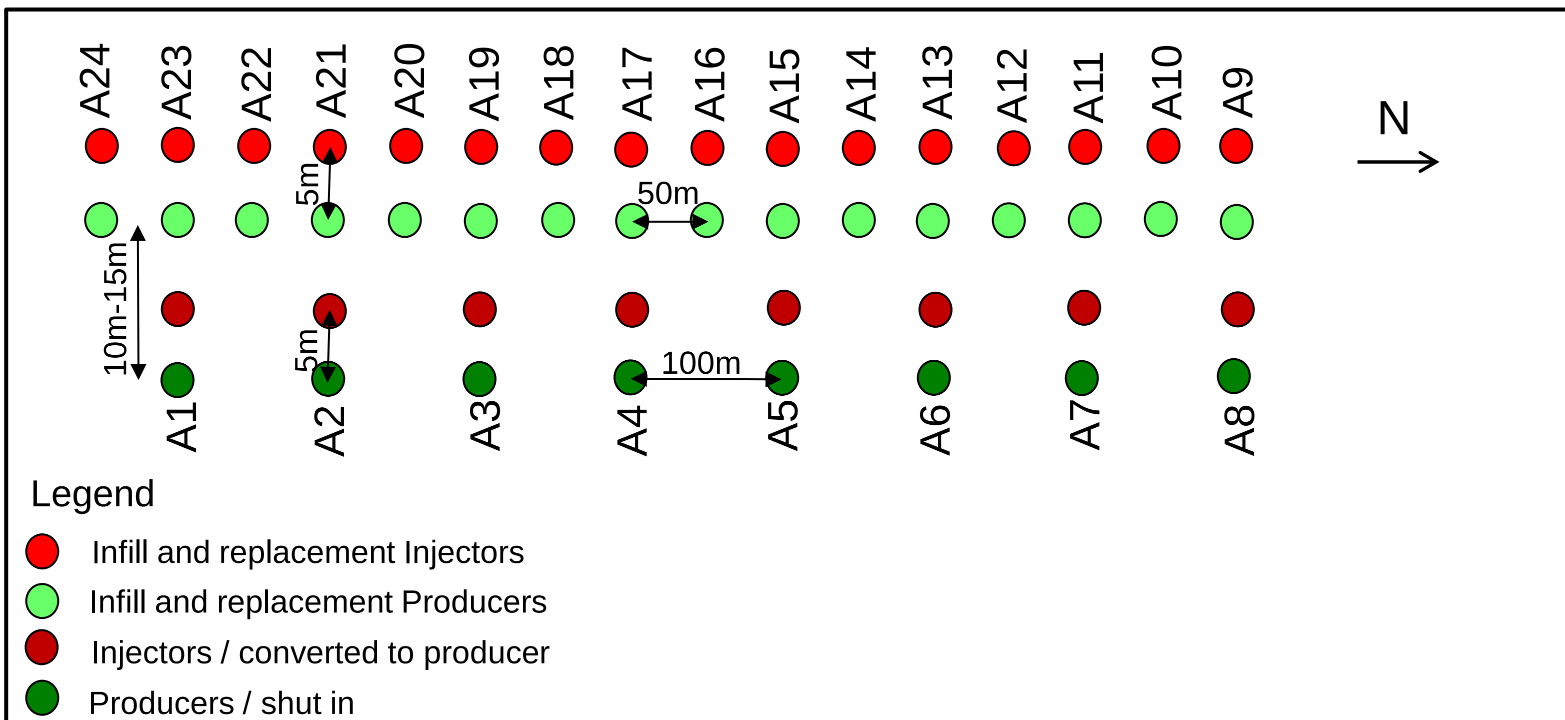
Surface/Subsurface Geomechanical Data/Analysis

Capping Shale Properties						
Pad	Capping Shale Issues to date	Capping shale Fracture Pressure Exceeded	Shale Depth (m)	Measured Fracture Gradient (kPa/m)	Measured Fracture Pressure (kPa)	Fracture Regime
Colony	First Steam Q1 2016		305	17.0	6,100	Horizontal
Lower Grand Rapids	No	No	357	19.9	7,120	Horizontal
Clearwater	No	No	426	21.8	9,280	Horizontal

Sand Properties				
Pad	Sand Depth (m)	Measured Fracture Gradient (kPa/m)	Measured Fracture Pressure (kPa)	Fracture Regime
Lower Grand Rapids	375	17.0	6,360	Vertical
Clearwater	446	16.0	7,140	Vertical

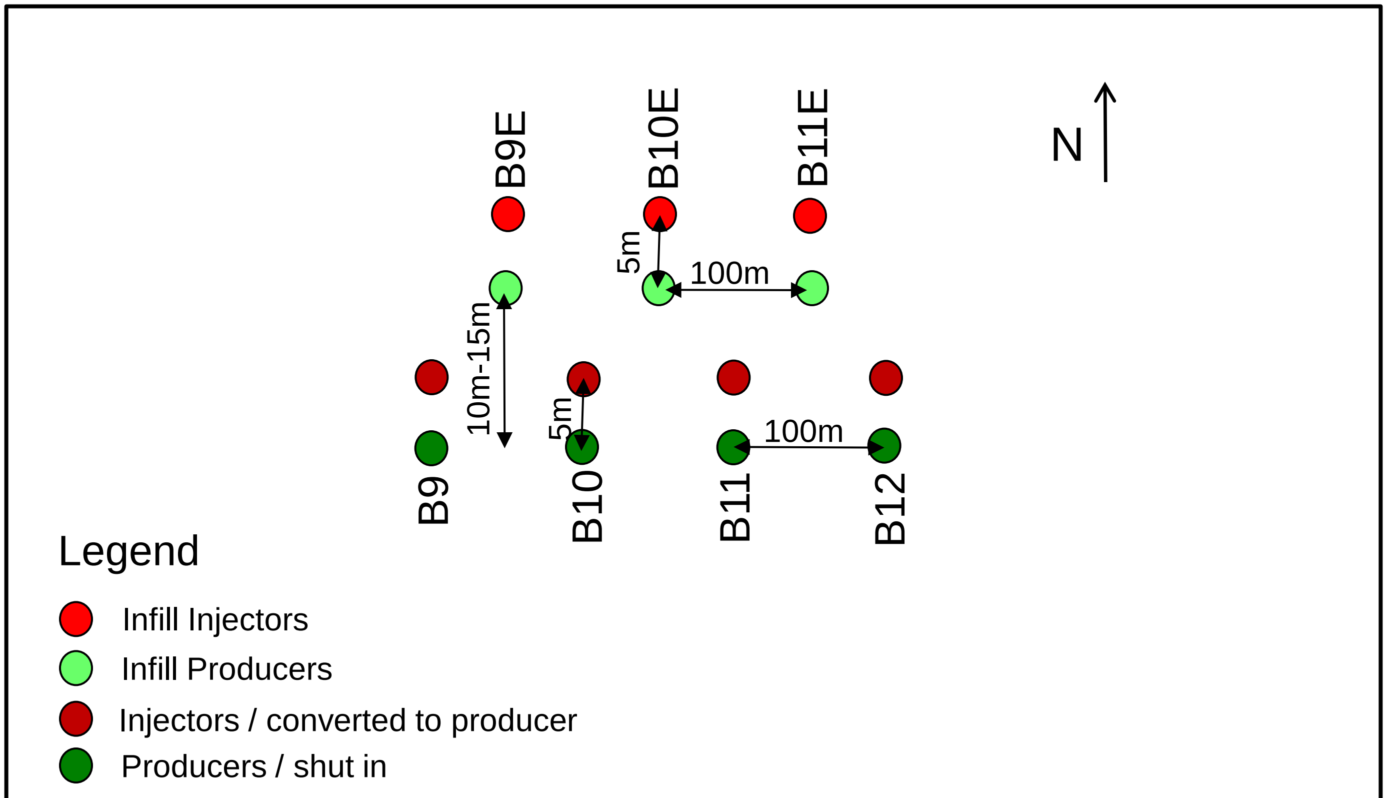
Pad A Well Spacing Schematic - Cross Section

- Pad A original (A1 – A8 drilled 2005) injectors were converted into producers in 2015
- Pad A replacement producers (A9 – A24 drilled 2010/2011) are 10m - 15m directly above Pad A original producers
- Pad A infill producers are 10m - 15m above and mid distance from Pad A original producers



Pad B North Well Spacing Schematic - Cross Section

- Pad B North injectors (B9 – B12 drilled 2005/2006) converted into producers in 2014
- Pad B North infill producers (B9 – B11 drilled 2009/2010) are 10m - 15m above and mid distance from Pad B North



Pad Interwell Spacing

Pad	Interwell Spacing (m)
A Original	100
A Infills and Replacements	50
B West	100
B North	100
B North Infills	100
C North	100
C West	100
C East	100
D East	50
GA (LGR)	75
Colony (SAGD)	75
Colony Infills	37.5*

* Spacing to SAGD producer

Surface Heave Monitoring Programs

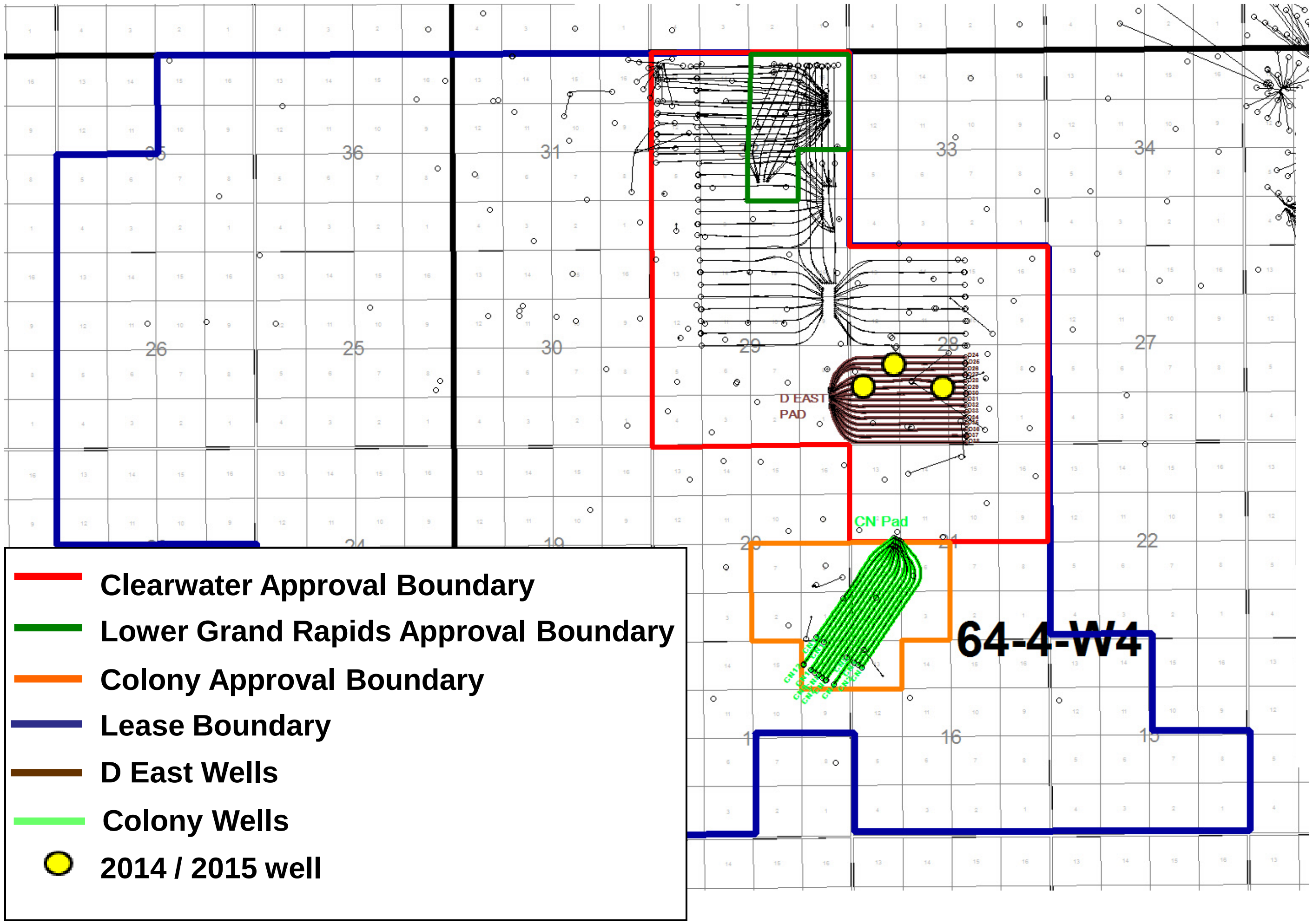
- No surface heave monitoring programs have been conducted
- Operating near reservoir pressure, therefore unlikely to be any surface heave
- Husky is committed to further investigate the possible extent of surface heave if a change in operating conditions warrant

3D Seismic Data

- No New Seismic Data in 2014 - 2015

3. Drilling and Completions

2014/2015 Drilling Results



Pad D East:

- Remaining 10 SAGD well pairs drilled Q4 2014
- 3 Pad D East observations wells drilled Q4 2014 and Q1 2015

Pad CN:

- 6 SAGD well pairs and 7 Producer infills drilled Q2 2015

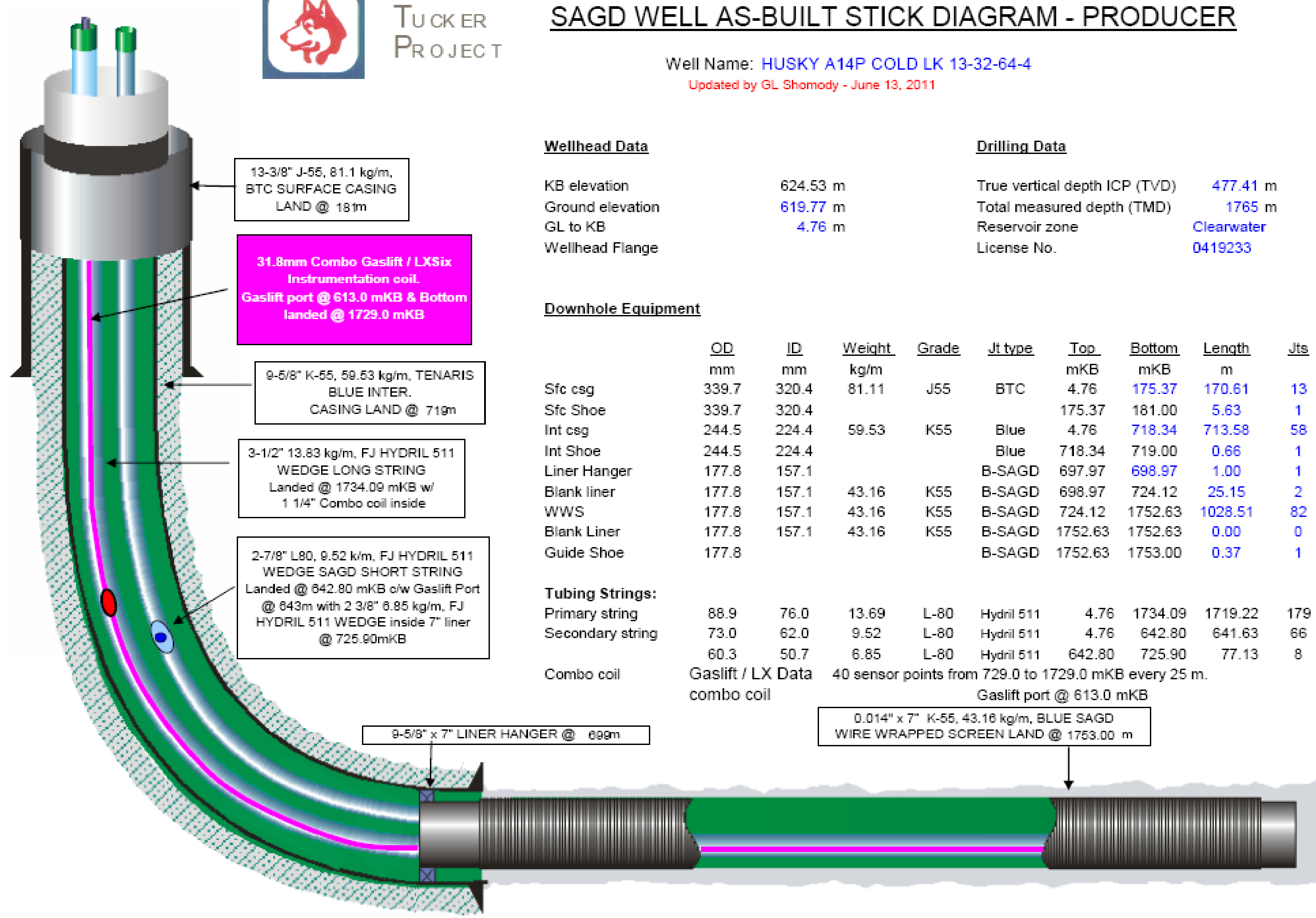
SAGD Well As-Built Diagram: Producer

Tucker Project

SAGD WELL AS-BUILT STICK DIAGRAM - PRODUCER

Well Name: HUSKY A14P COLD LK 13-32-64-4

Updated by GL Shomody - June 13, 2011



Wellhead Data

KB elevation	624.53 m
Ground elevation	619.77 m
GL to KB	4.76 m
Wellhead Flange	

Drilling Data

True vertical depth ICP (TVD)	477.41 m
Total measured depth (TMD)	1765 m
Reservoir zone	Clearwater
License No.	0419233

Downhole Equipment

	OD	ID	Weight	Grade	Jt type	Top	Bottom	Length	Jts
	mm	mm	kg/m			mKB	mKB	m	
Sfc csg	339.7	320.4	81.11	J55	BTC	4.76	175.37	170.61	13
Sfc Shoe	339.7	320.4				175.37	181.00	5.63	1
Int csg	244.5	224.4	59.53	K55	Blue	4.76	718.34	713.58	58
Int Shoe	244.5	224.4			Blue	718.34	719.00	0.66	1
Liner Hanger	177.8	157.1			B-SAGD	697.97	698.97	1.00	1
Blank liner	177.8	157.1	43.16	K55	B-SAGD	698.97	724.12	25.15	2
WWS	177.8	157.1	43.16	K55	B-SAGD	724.12	1752.63	1028.51	82
Blank Liner	177.8	157.1	43.16	K55	B-SAGD	1752.63	1752.63	0.00	0
Guide Shoe	177.8				B-SAGD	1752.63	1753.00	0.37	1

Tubing Strings:

	OD	ID	Weight	Grade	Jt type	Top	Bottom	Length	Jts
Primary string	88.9	76.0	13.69	L-80	Hydril 511	4.76	1734.09	1719.22	179
Secondary string	73.0	62.0	9.52	L-80	Hydril 511	4.76	642.80	641.63	66
	60.3	50.7	6.85	L-80	Hydril 511	642.80	725.90	77.13	8

Combo coil — Gaslift / LX Data combo coil — 40 sensor points from 729.0 to 1729.0 mKB every 25 m. Gaslift port @ 613.0 mKB

For more information, please refer to WellView.

Husky Energy Oilsands D&C 6/14/2011

SAGD Well As-Built Diagram: Injector

TUCKER PROJECT

SAGD WELL AS-BUILT STICK DIAGRAM - INJECTOR

Well Name: HUSKY A12S TUCKLK 13-32-64-4

Updated by GL Shomody - June 12, 2011

Wellhead Data

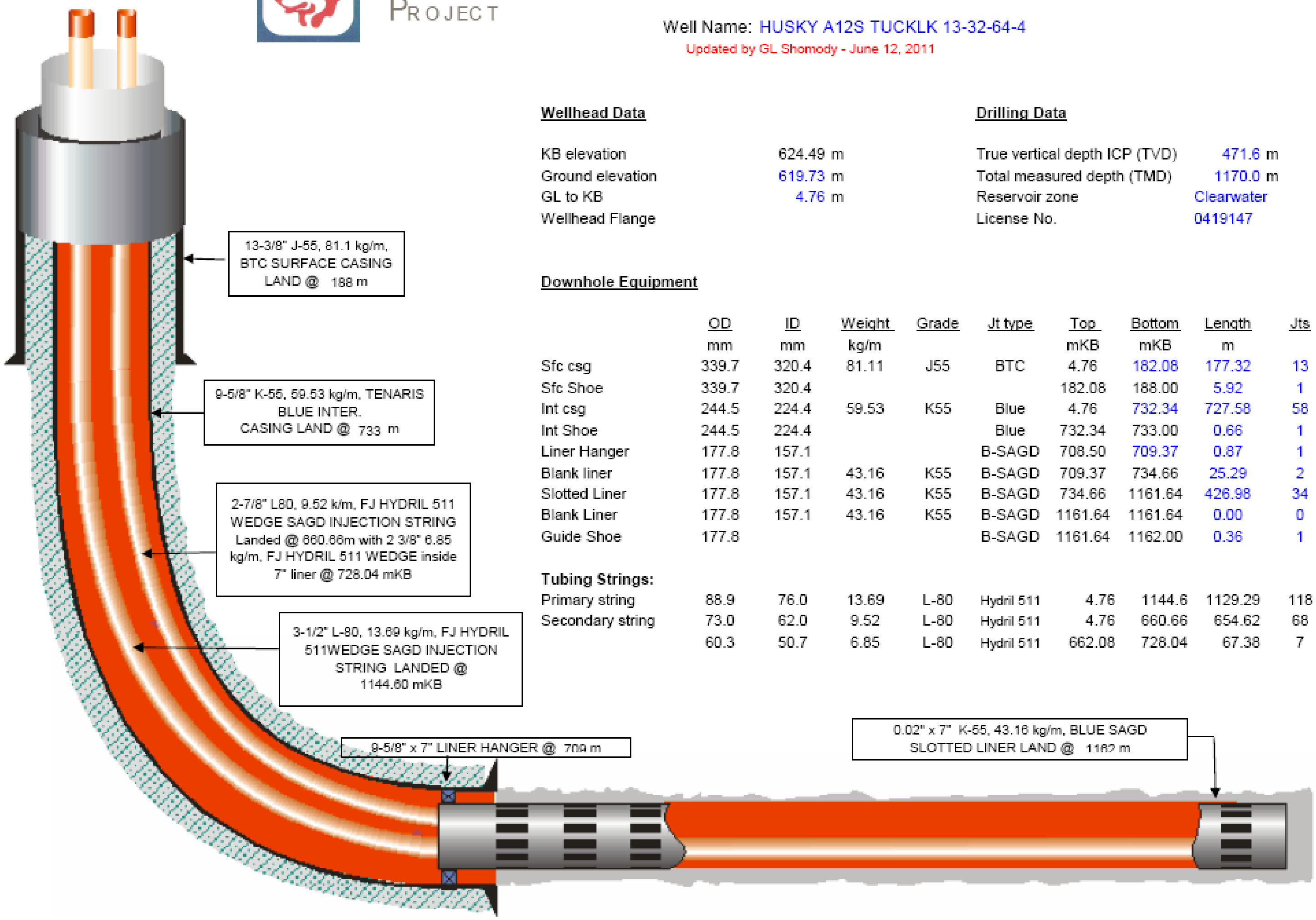
KB elevation	624.49 m
Ground elevation	619.73 m
GL to KB	4.76 m
Wellhead Flange	

Drilling Data

True vertical depth ICP (TVD)	471.6 m
Total measured depth (TMD)	1170.0 m
Reservoir zone	Clearwater
License No.	0419147

Downhole Equipment

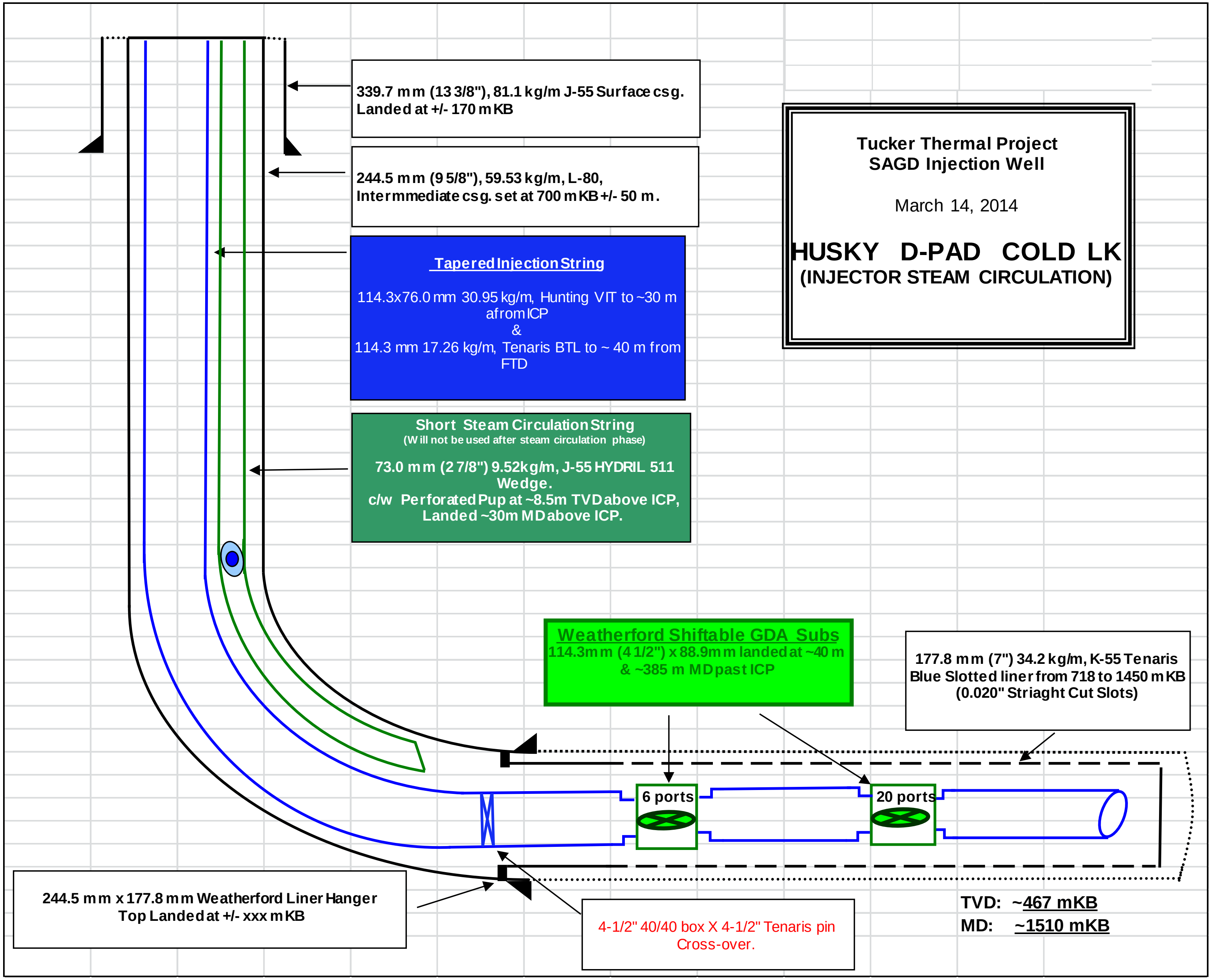
	OD mm	ID mm	Weight kg/m	Grade	Jt type	Top mKB	Bottom mKB	Length m	Jts
Sfc csg	339.7	320.4	81.11	J55	BTC	4.76	182.08	177.32	13
Sfc Shoe	339.7	320.4				182.08	188.00	5.92	1
Int csg	244.5	224.4	59.53	K55	Blue	4.76	732.34	727.58	58
Int Shoe	244.5	224.4			Blue	732.34	733.00	0.66	1
Liner Hanger	177.8	157.1			B-SAGD	708.50	709.37	0.87	1
Blank liner	177.8	157.1	43.16	K55	B-SAGD	709.37	734.66	25.29	2
Slotted Liner	177.8	157.1	43.16	K55	B-SAGD	734.66	1161.64	426.98	34
Blank Liner	177.8	157.1	43.16	K55	B-SAGD	1161.64	1161.64	0.00	0
Guide Shoe	177.8				B-SAGD	1161.64	1162.00	0.36	1
Tubing Strings:									
Primary string	88.9	76.0	13.69	L-80	Hydril 511	4.76	1144.6	1129.29	118
Secondary string	73.0	62.0	9.52	L-80	Hydril 511	4.76	660.66	654.62	68
	60.3	50.7	6.85	L-80	Hydril 511	662.08	728.04	67.38	7



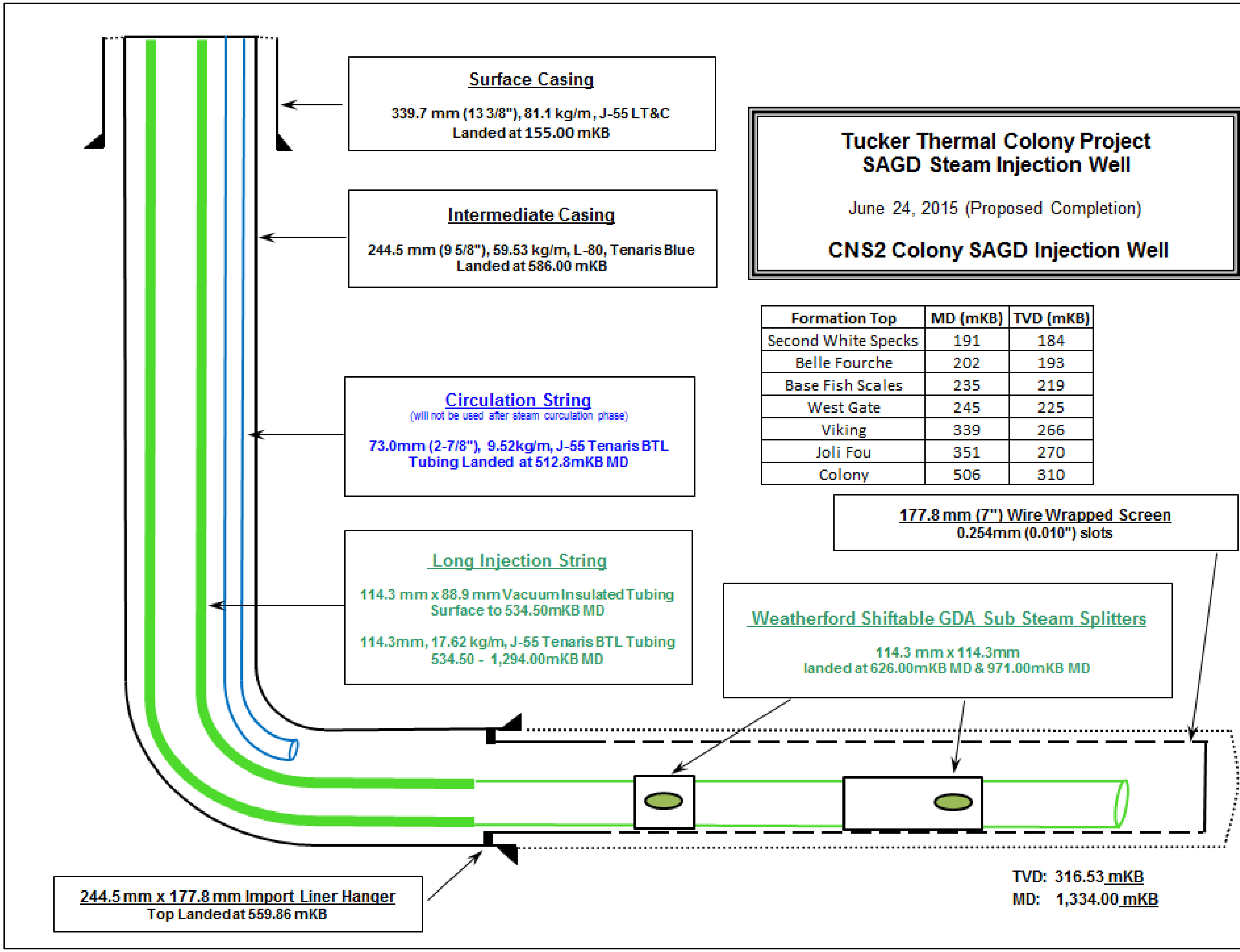
For more information, please refer to WellView.

Husky Energy Oilsands D&C 6/14/2011

SAGD Well As-Built Diagram: Injector with VIT

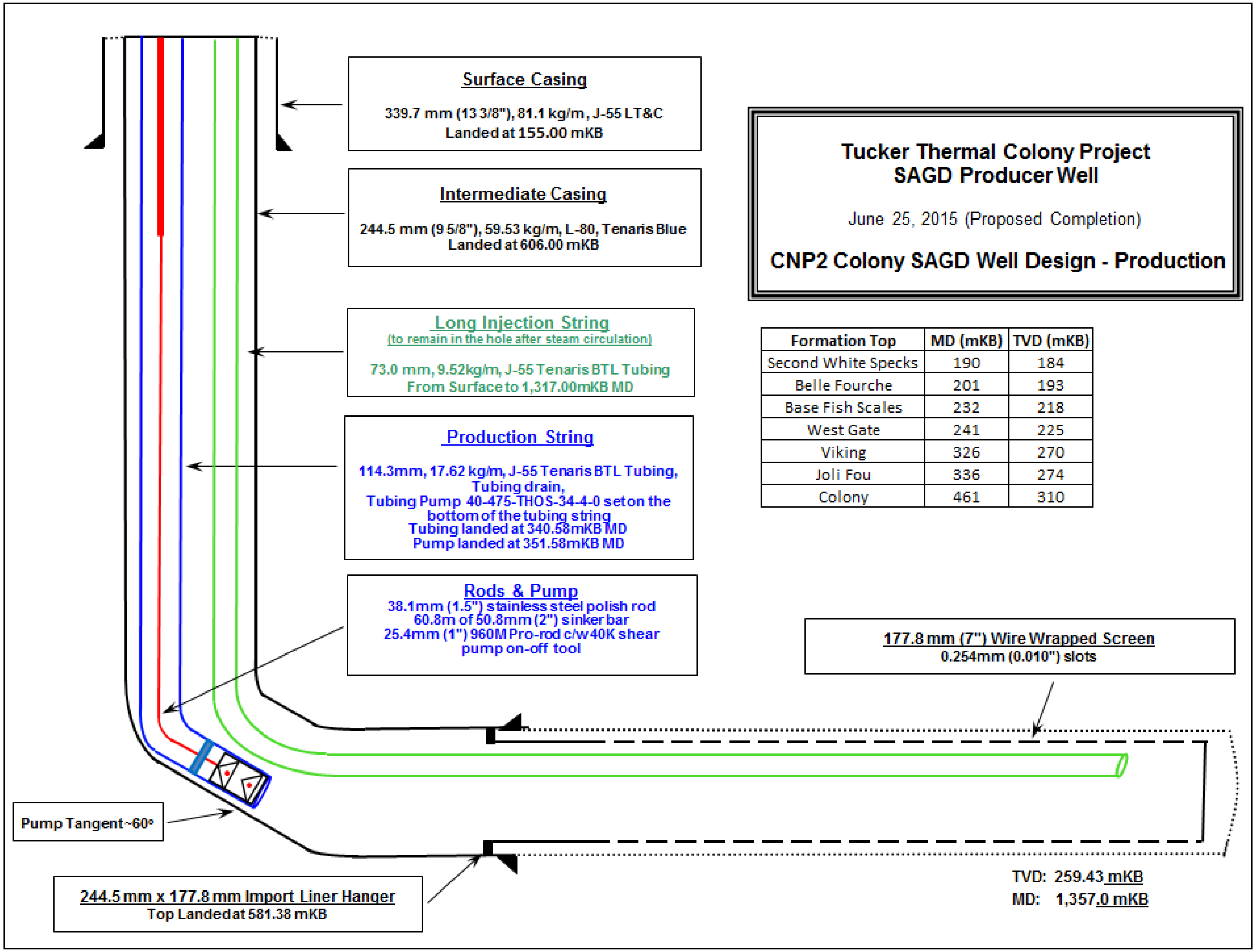


Proposed Colony Completion – SAGD Injector



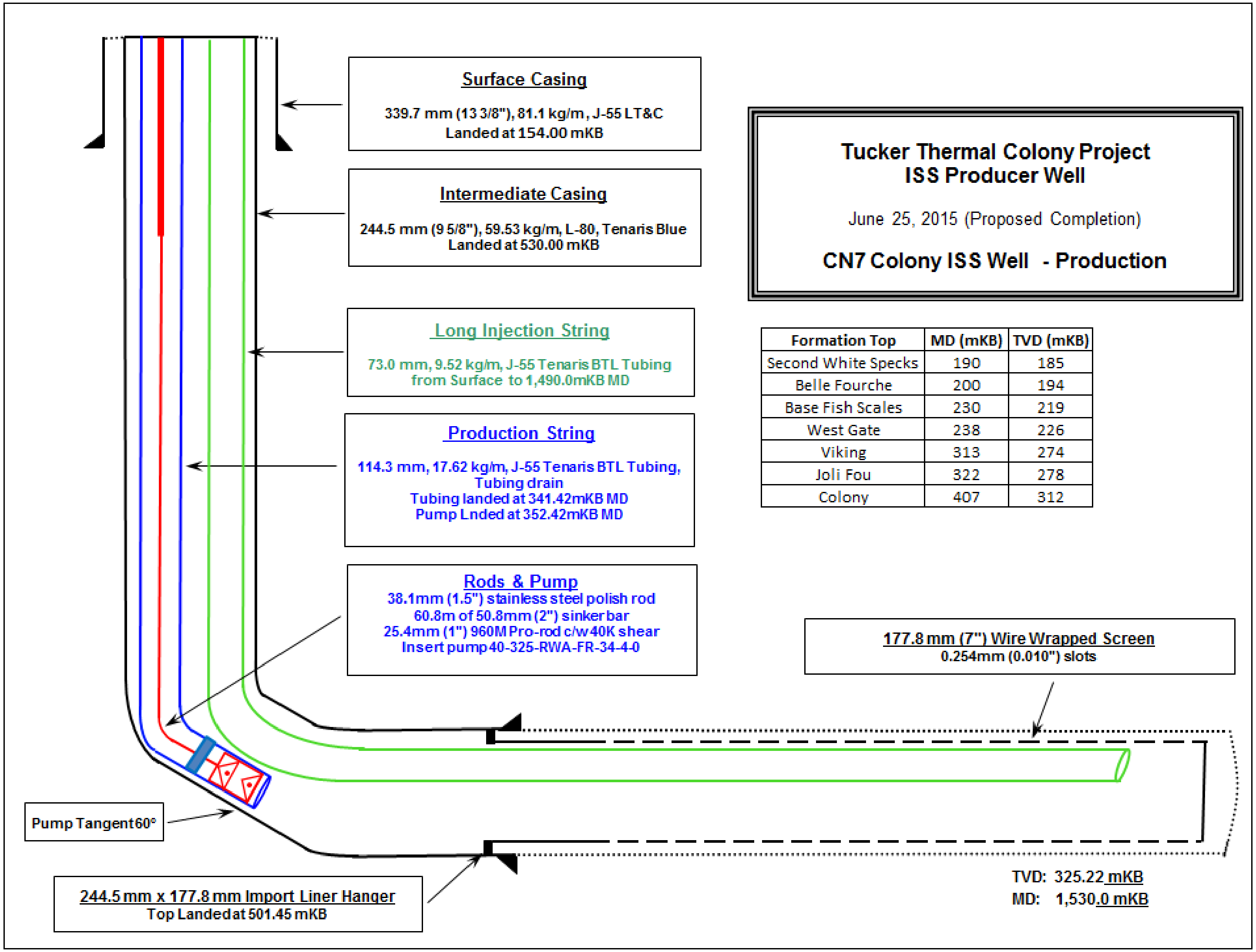
Formation Top	MD (mKB)	TVD (mKB)
Second White Specks	191	184
Belle Fourche	202	193
Base Fish Scales	235	219
West Gate	245	225
Viking	339	266
Joli Fou	351	270
Colony	506	310

Proposed Colony Completion – SAGD Producer



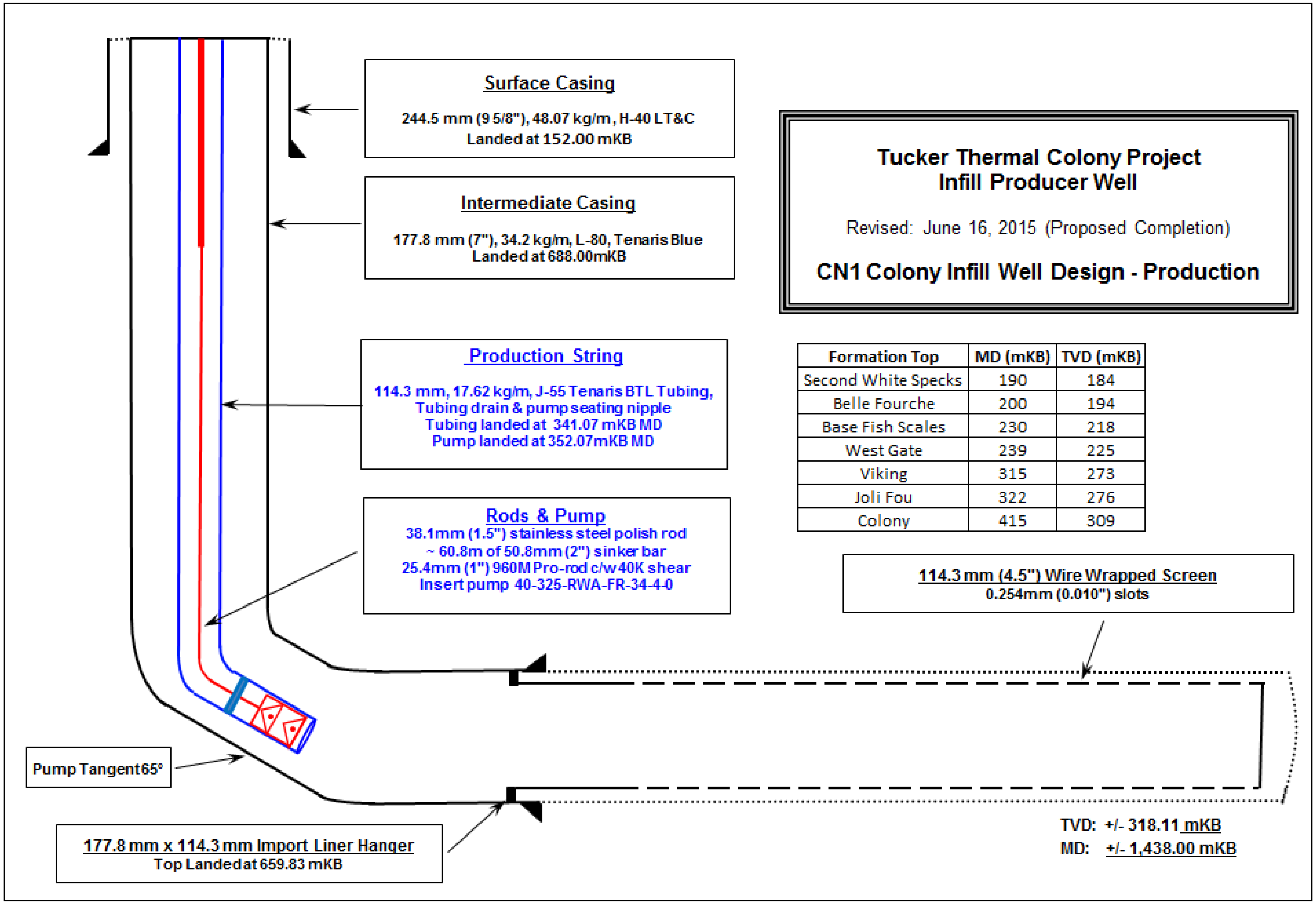
Formation Top	MD (mKB)	TVD (mKB)
Second White Specks	190	184
Belle Fourche	201	193
Base Fish Scales	232	218
West Gate	241	225
Viking	326	270
Joli Fou	336	274
Colony	461	310

Proposed Colony Completion – ISS Producer



Formation Top	MD (mKB)	TVD (mKB)
Second White Specks	190	185
Belle Fourche	200	194
Base Fish Scales	230	219
West Gate	238	226
Viking	313	274
Joli Fou	322	278
Colony	407	312

Proposed Colony Completion – Infill Producer



Formation Top	MD (mKB)	TVD (mKB)
Second White Specks	190	184
Belle Fourche	200	194
Base Fish Scales	230	218
West Gate	239	225
Viking	315	273
Joli Fou	322	276
Colony	415	309

Colony Completion – Additional Information

- Two infill producers (CN11 and CN13) completed with semi-premium verses premium couplings in the intermediate casing
- These infill producers are placed at the bottom of the reservoir, adjacent to SAGD well pairs
- As per Directive 020, thermal cement used and cement bond logs show good to very good cement bond
- Tenaris verified the casing is appropriate for service:
  - Thread cut & quality of semi-premium couplings are identical to premium couplings
  - Semi-premium couplings have moderate to high seal-ability verses premium couplings which have the highest seal-ability due to the metal-to-metal radial connection
  - Torque records reviewed and coupling make-up for wells determined to be good
- Noetic Engineering 2008 Inc. verified the strength of the casing:
  - The semi-premium coupling connections have 100% structural strength for thermal stress cycling in both compression and tension
  - The semi-premium couplings meet IRP 3 strength efficiency requirements and have a low probability to fail due to strength
  - The semi-premium couplings are not considered a strength risk
- The Directive 051 application was submitted August 27, 2015 with the additional information noted above

4. Artificial Lift

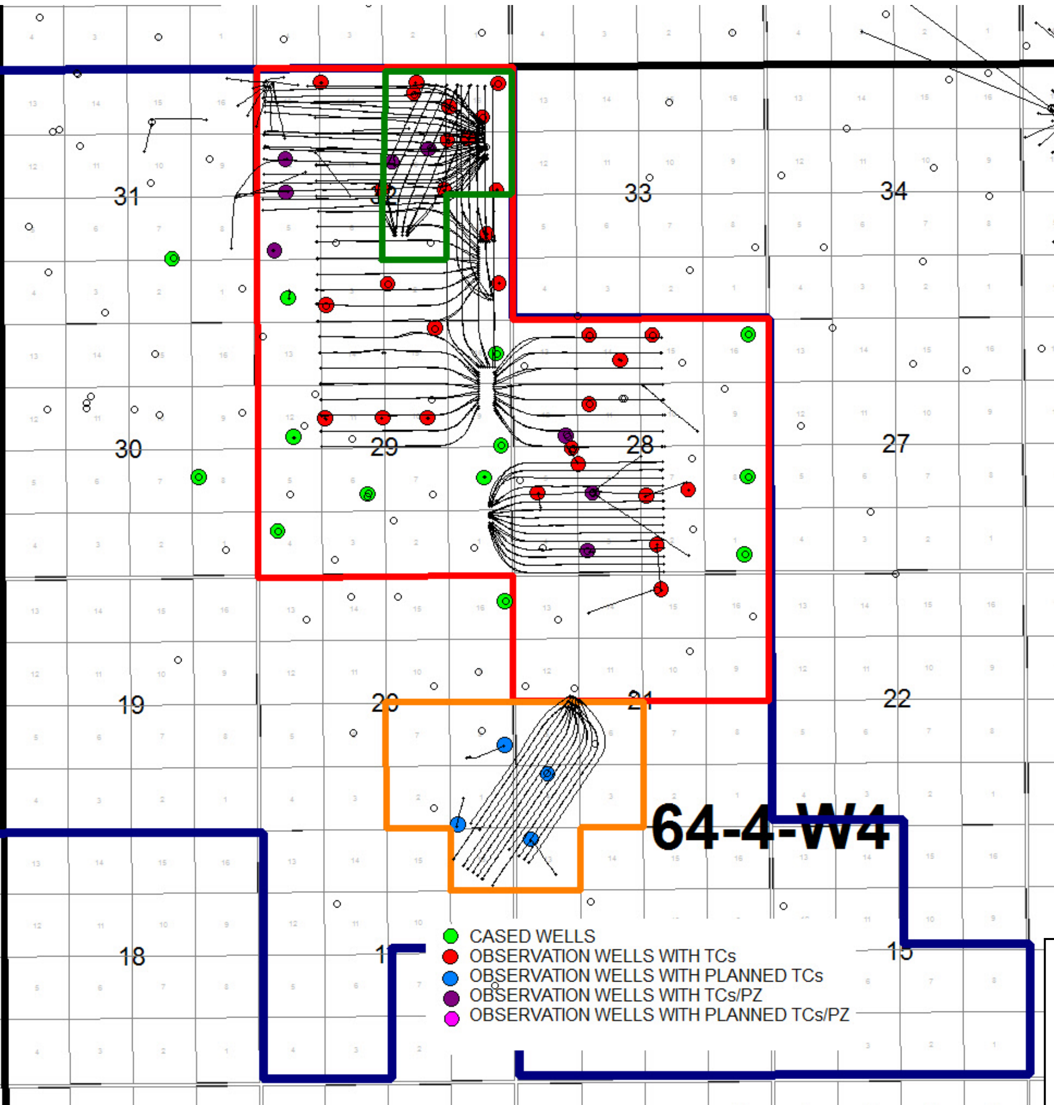
Artificial Lift

- All producer wells equipped with gas lift:
  - Gas-lift operational parameters:
    - Pressure: 2,400 kPa – 4,000 kPa
    - Bottom hole temperature: 200 – 240 ºC
    - Gas injection rate: 1,200 – 10,800 m^3/day

- Future producers:
  - Rod pumps planned for Colony

5. Instrumentation in Wells

Instrumentation – Observation Wells Map



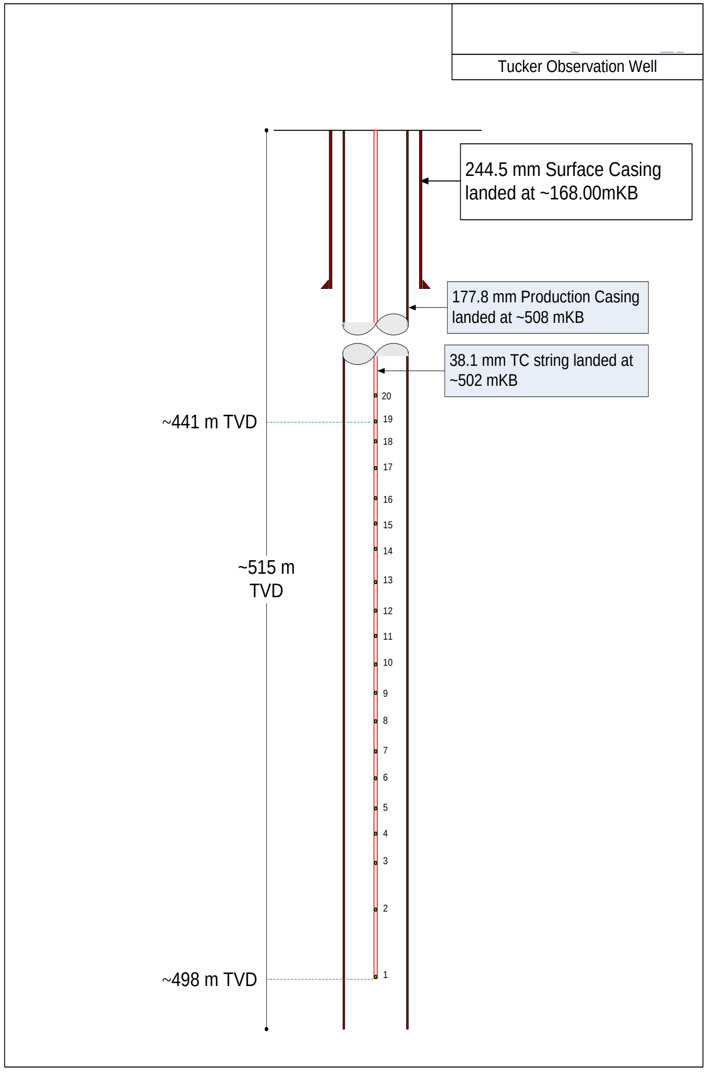
42 OBS wells within approved area:

- 38 OBS Wells with Instrumentation
- 4 Planned OBS Wells in 2015/2016 (converting existing wells)

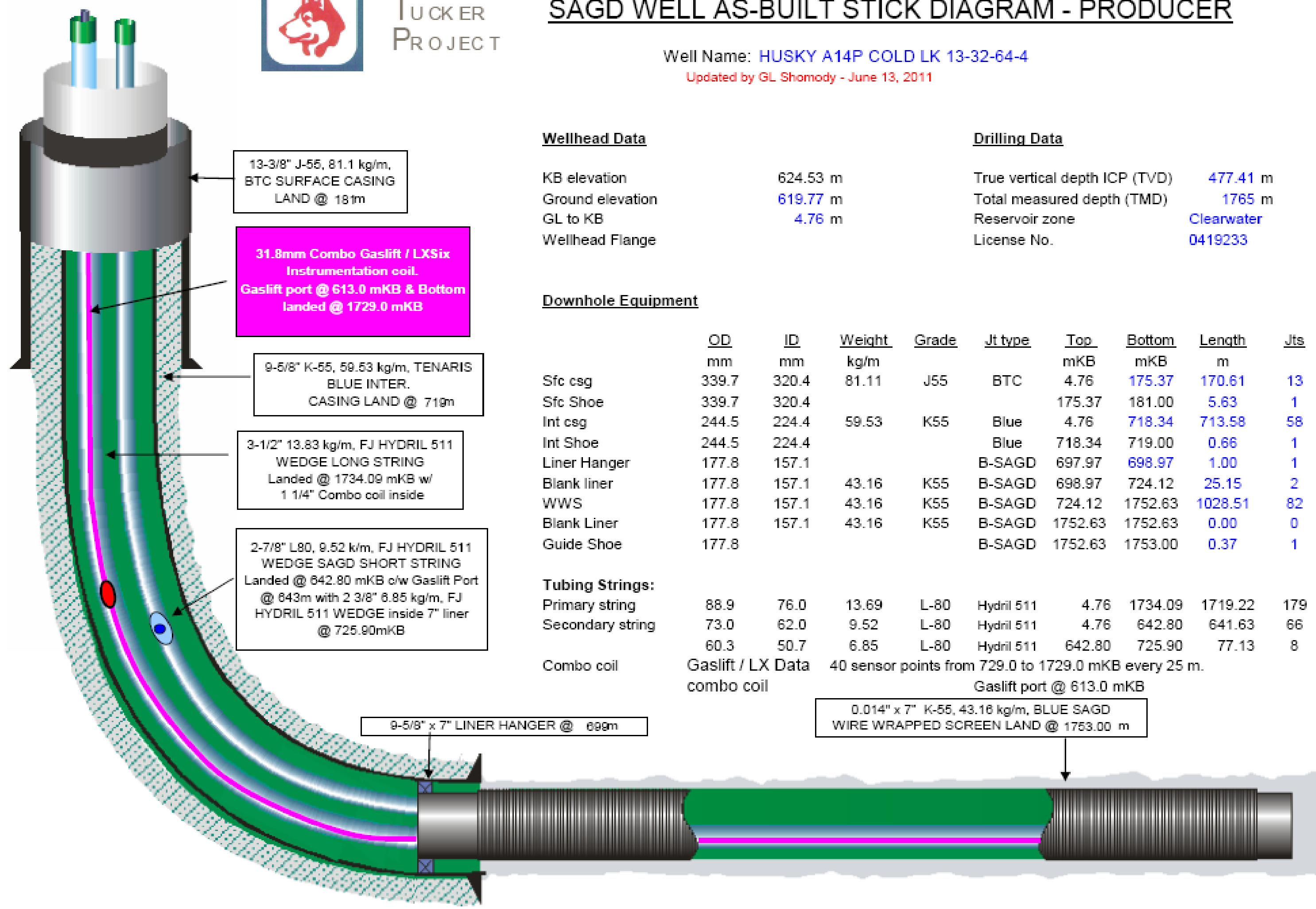
Clearwater Approval Boundary
Lower Grand Rapids Approval Boundary
Colony Approval Boundary
Lease Boundary

Instrumentation in OBS & SAGD Wells

- 38 OBS Wells with Instrumentation:
  - 30 Wells: thermocouple only
  - 8 Wells: both thermocouple & piezometer
- 4 Planned OBS Wells (convert existing wells):
  - 4 Wells for Colony – thermocouple only
- SAGD Injectors – wells use blanket gas to measure pressure and for insulation
- SAGD Producers – equipped with combo instrumentation coil (gas lift & thermocouple or fiber)
  - a combo coil is installed in the long production string to measure temperature



SAGD Well As-Built Diagram: Producer



TUCKER PROJECT

SAGD WELL AS-BUILT STICK DIAGRAM - PRODUCER

Well Name: HUSKY A14P COLD LK 13-32-64-4

Updated by GL Shomody - June 13, 2011

Wellhead Data

KB elevation	624.53 m
Ground elevation	619.77 m
GL to KB	4.76 m
Wellhead Flange	

Drilling Data

True vertical depth ICP (TVD)	477.41 m
Total measured depth (TMD)	1765 m
Reservoir zone	Clearwater
License No.	0419233

Downhole Equipment

	OD	ID	Weight	Grade	Jt type	Top	Bottom	Length	Jts
	mm	mm	kg/m			mKB	mKB	m	
Sfc csg	339.7	320.4	81.11	J55	BTC	4.76	175.37	170.61	13
Sfc Shoe	339.7	320.4				175.37	181.00	5.63	1
Int csg	244.5	224.4	59.53	K55	Blue	4.76	718.34	713.58	58
Int Shoe	244.5	224.4			Blue	718.34	719.00	0.66	1
Liner Hanger	177.8	157.1			B-SAGD	697.97	698.97	1.00	1
Blank liner	177.8	157.1	43.16	K55	B-SAGD	698.97	724.12	25.15	2
WWS	177.8	157.1	43.16	K55	B-SAGD	724.12	1752.63	1028.51	82
Blank Liner	177.8	157.1	43.16	K55	B-SAGD	1752.63	1752.63	0.00	0
Guide Shoe	177.8				B-SAGD	1752.63	1753.00	0.37	1
Tubing Strings:									
Primary string	88.9	76.0	13.69	L-80	Hydril 511	4.76	1734.09	1719.22	179
Secondary string	73.0	62.0	9.52	L-80	Hydril 511	4.76	642.80	641.63	66
	60.3	50.7	6.85	L-80	Hydril 511	642.80	725.90	77.13	8

Combo coil — Gaslift / LX Data combo coil — 40 sensor points from 729.0 to 1729.0 mKB every 25 m. Gaslift port @ 613.0 mKB

6. 4D Seismic

4D Seismic Data 2015

- No 4D seismic in 2014 - 2015

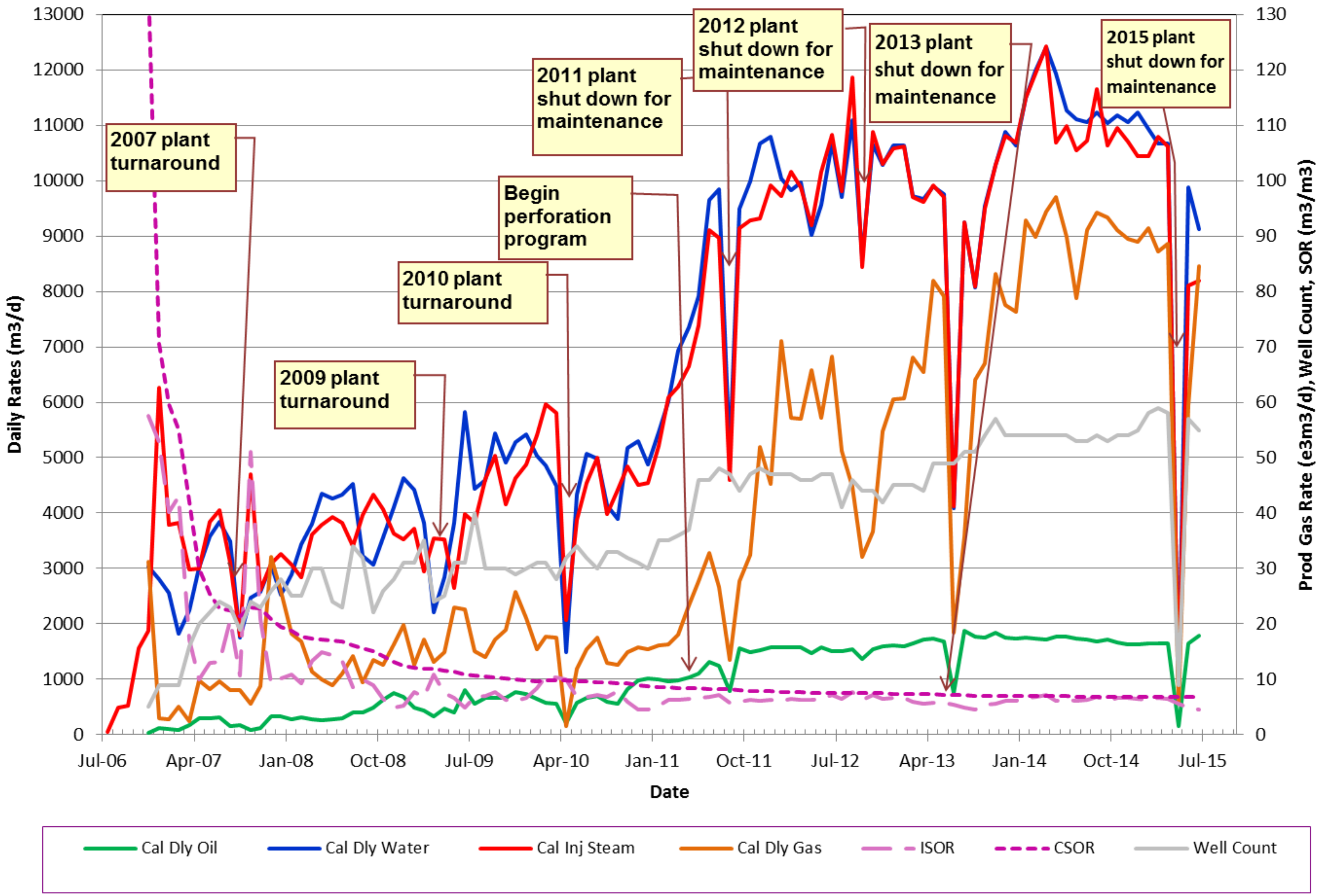
7. Scheme Performance

Scheme Performance Prediction Methodology

Current performance prediction built on:

- Observation of actual performance
- Analysis of analogous SAGD projects
- Updated geological model supplemented with simulation and analytical models

Production and Injection History



Production vs. Approval Capacity Variance

- 32 Original well pairs had poor performance due to:
  - Placement in the transition zone where oil saturation is low
  - Poor start-up strategy
  - Variable steam chamber development

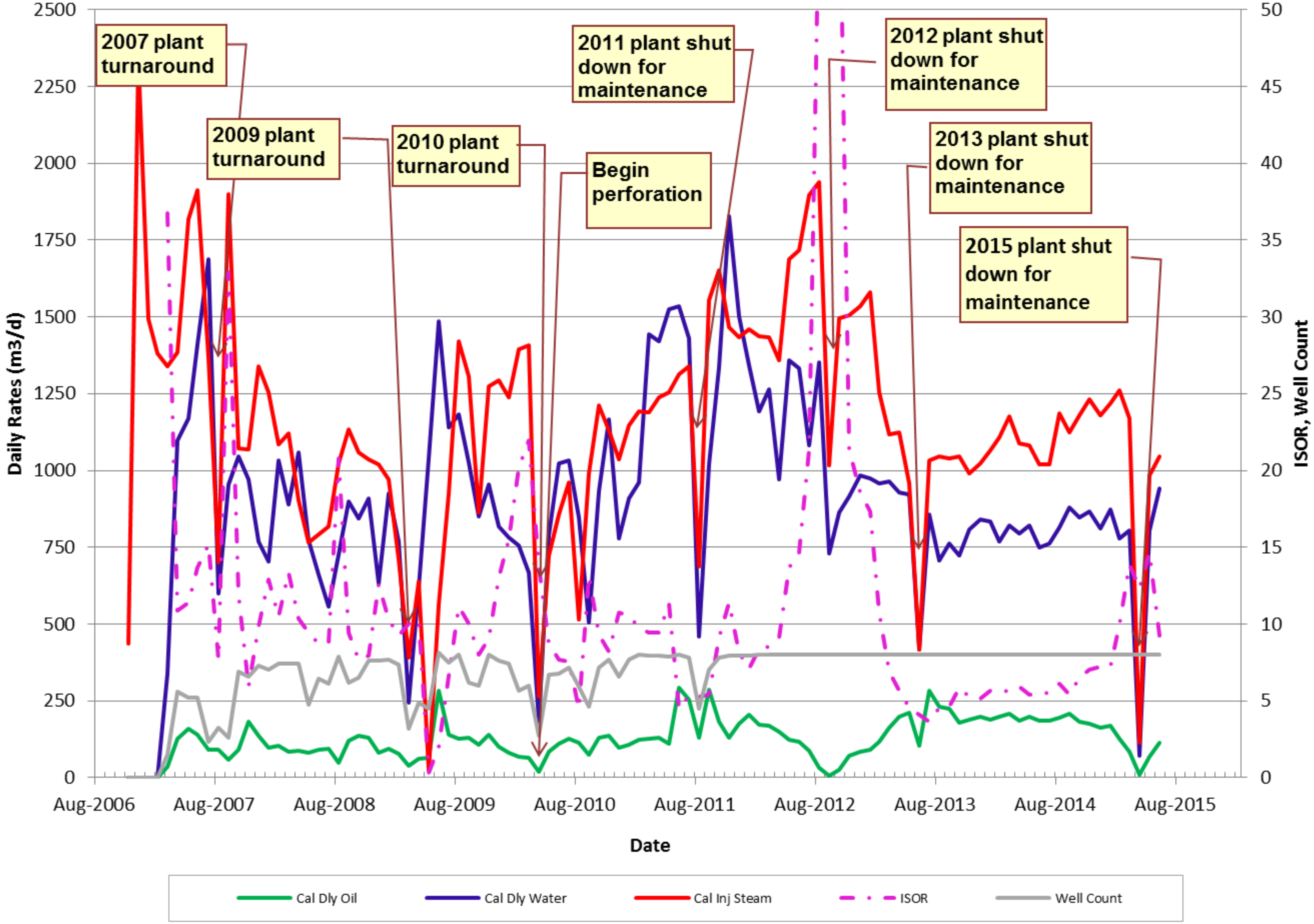
- All new well pairs drilled to the base of SAGD net pay
  - Pad C East
  - Pad B North Infill
  - Pad A Infills and Replacement Wells
  - Pad GA
  - Pad D East
  - Pad CN

- Initial startup strategy (bull-heading) was not adequate
  - All new wells were circulated

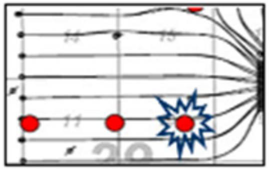
Production vs. Approval Capacity Variance

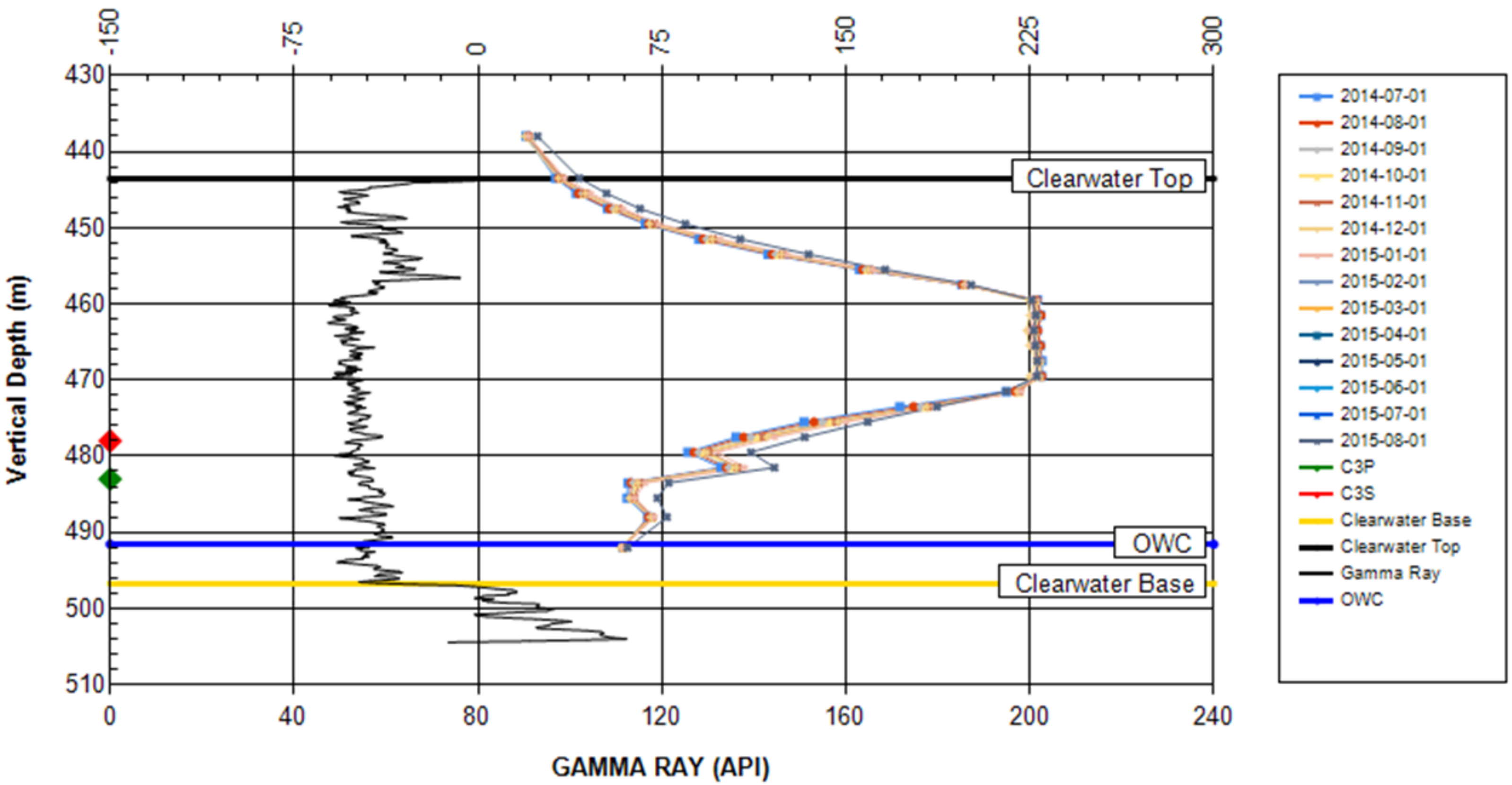
- Revised completion of new wells
  - Dual string completions in both injector and producer
  - Injectors completed with VITs and steam splitters for Pads D East and CN
  - Wire-wrapped screens for all new producers to increase open area
  - Blanket gas installed on all wells to provide
    - Insulation
    - Casing protection
    - Down hole pressure measurement

Pad C West Performance - Low Recovery Example

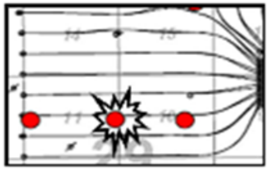


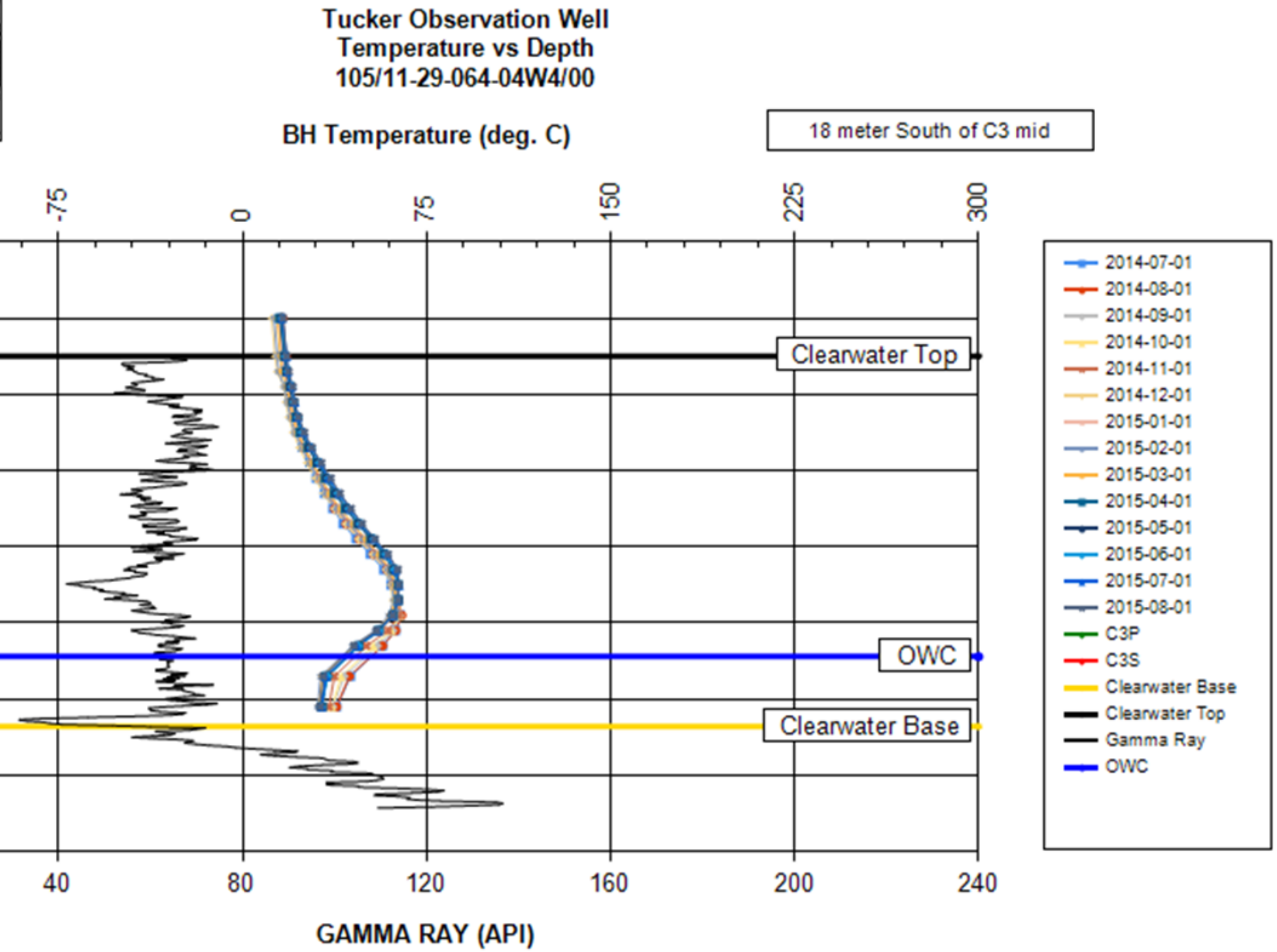
Pad C West Heel Observation Well



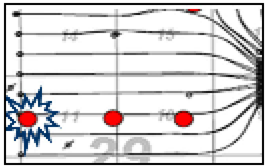


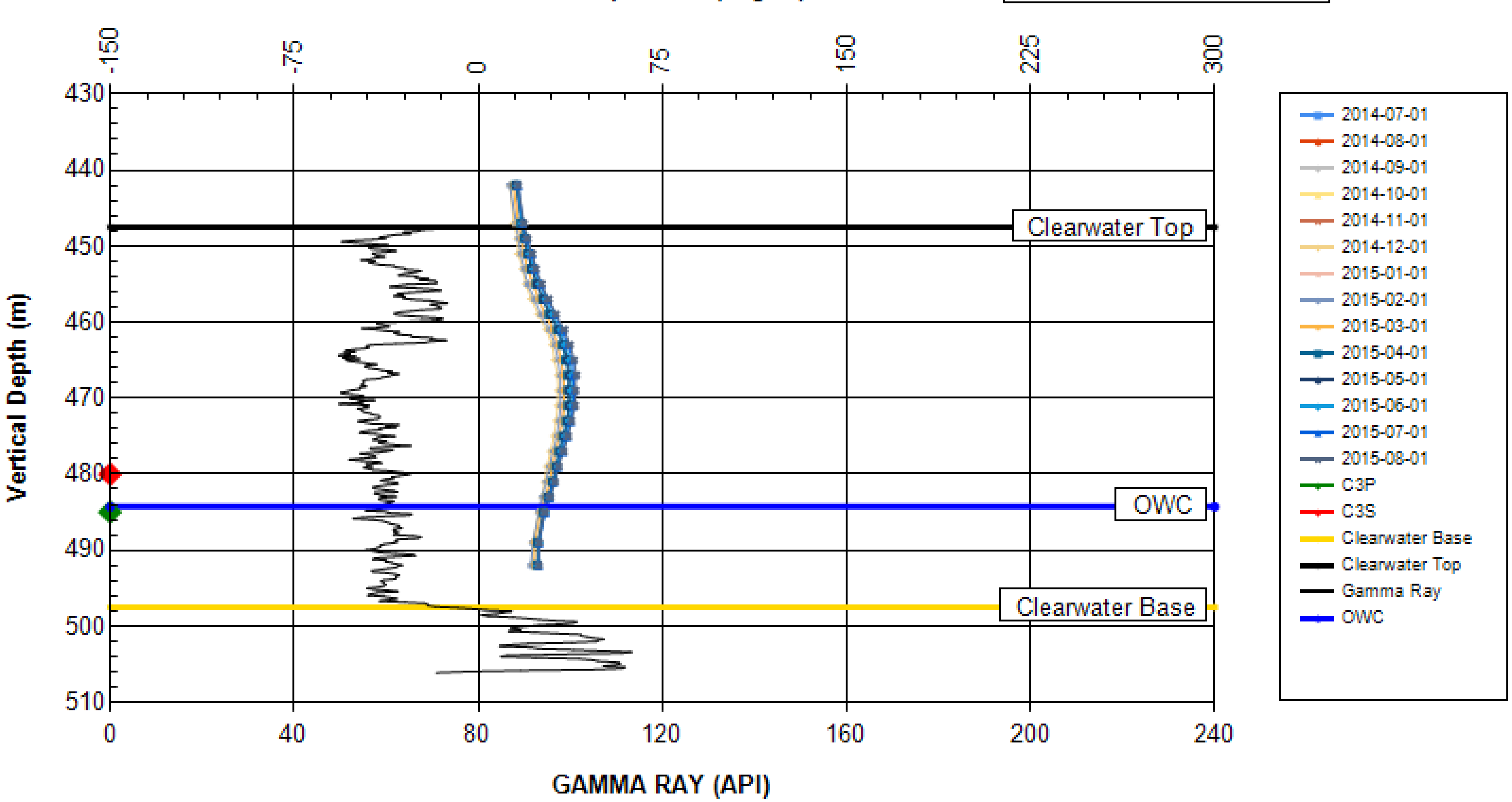
Pad C West Mid Observation Well





Pad C West Toe Observation Well





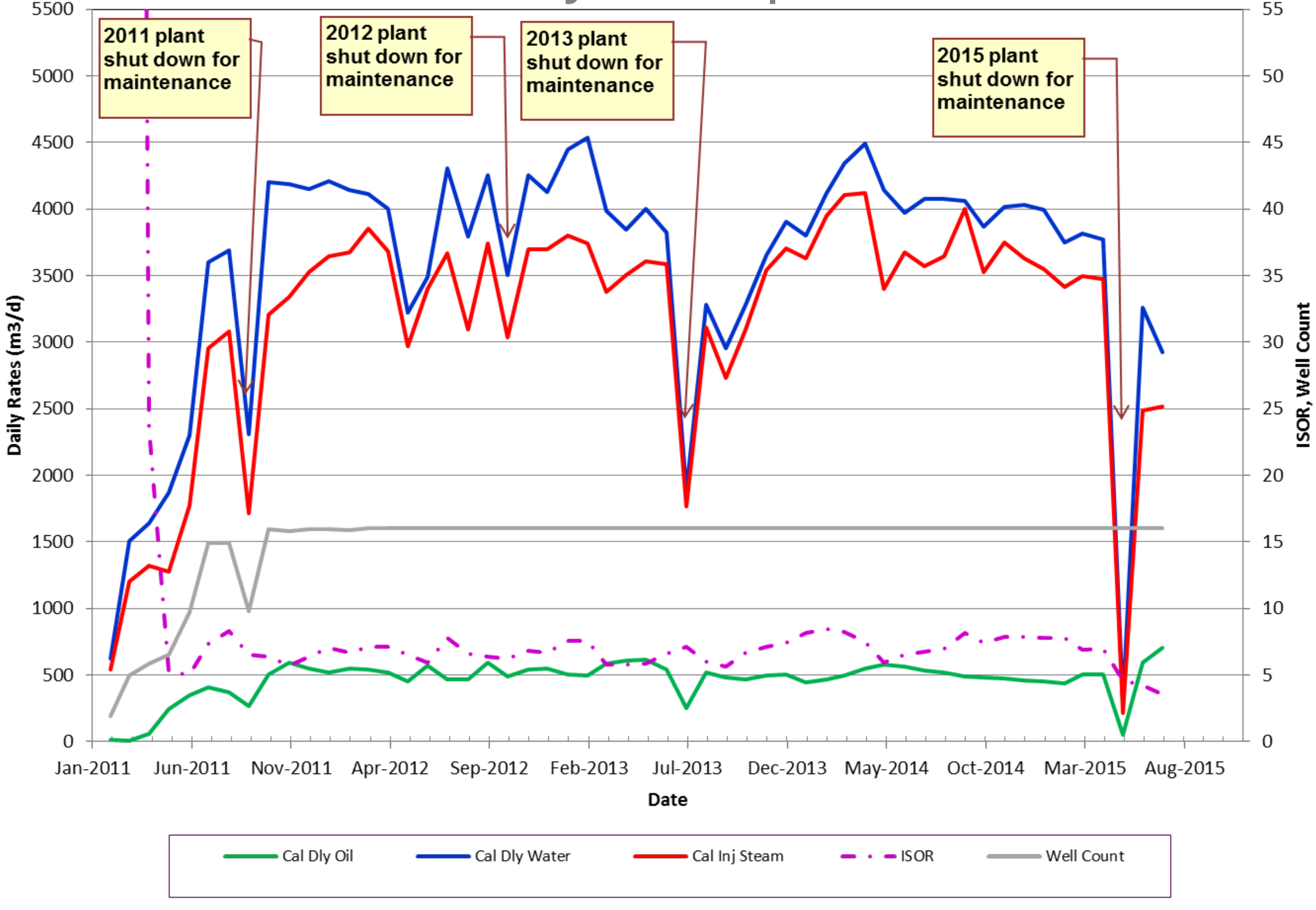
Discussion of Pad C West Performance

- The OBS well 22 m south of C3 Heel showing good steam chamber development

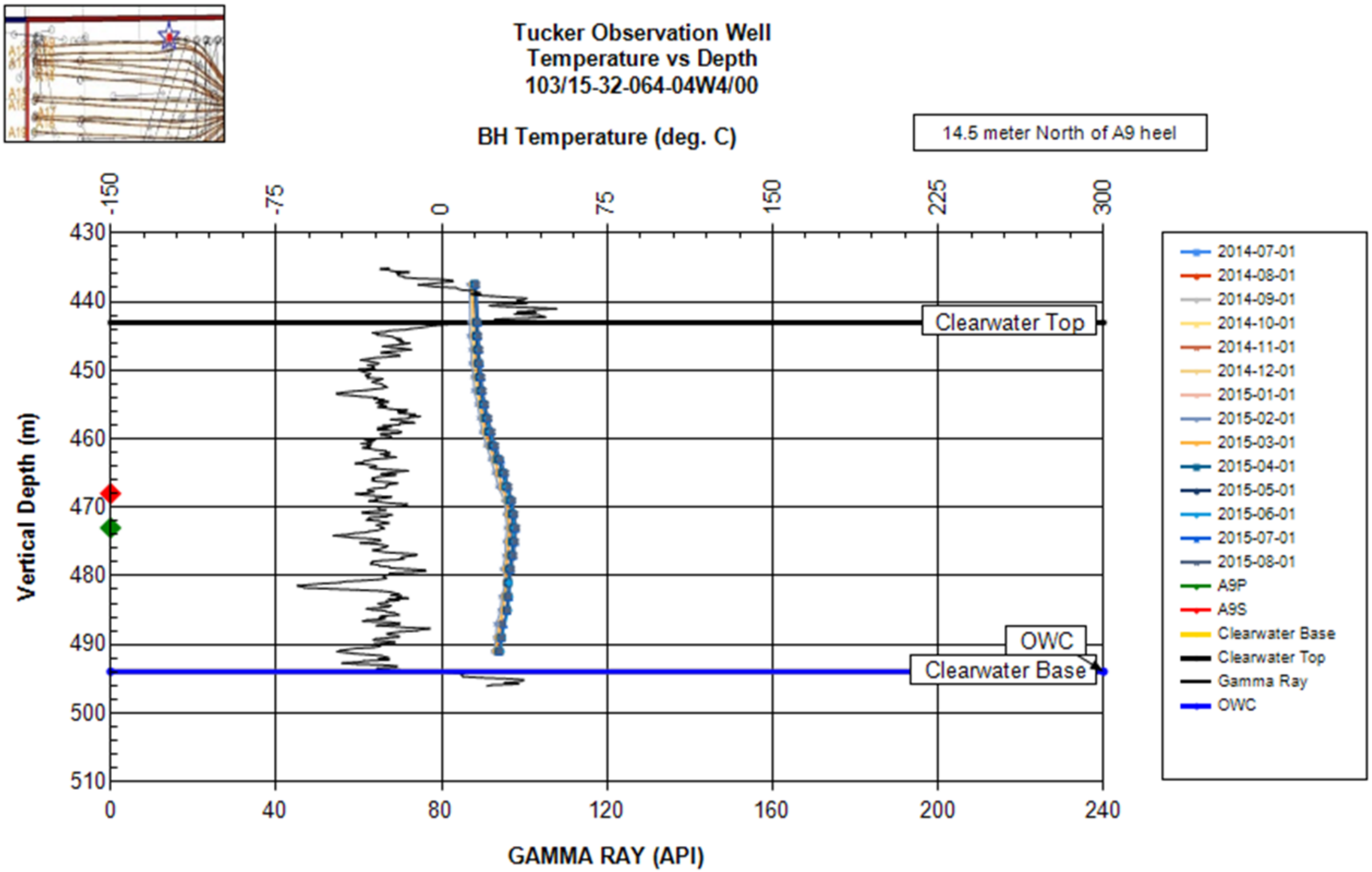
- Pad C West performance indicators as of July 31, 2015:
  - Cum. Oil: 397,940 m^3
  - Cum. Steam Injected: 3,644,524 m^3
  - Cum. Water Produced: 2,833,320 m^3
  - CSOR: 9.2

- Pad C West performance for the reported period:
  - Cum. Oil: 56,797 m^3
  - Oil Rate per Well: 19.5 m^3/day
  - SOR: 7.4

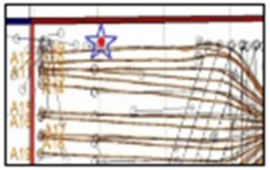
Pad A Infills and Replacement Wells Performance - Medium Recovery Example

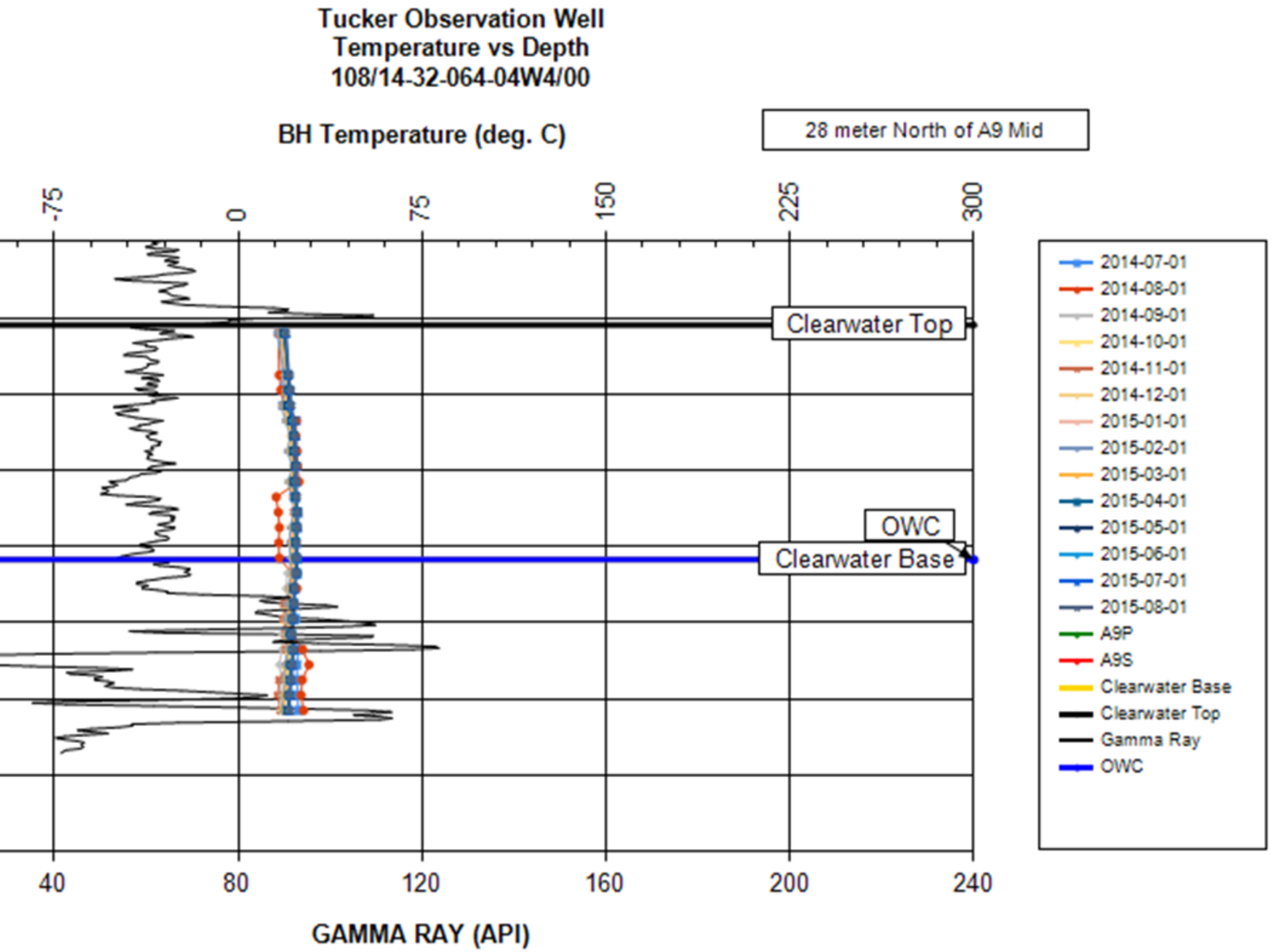


Pad A Infills and Replacement Wells Heel Observation Well



Pad A Infills and Replacement Wells Mid Observation Well





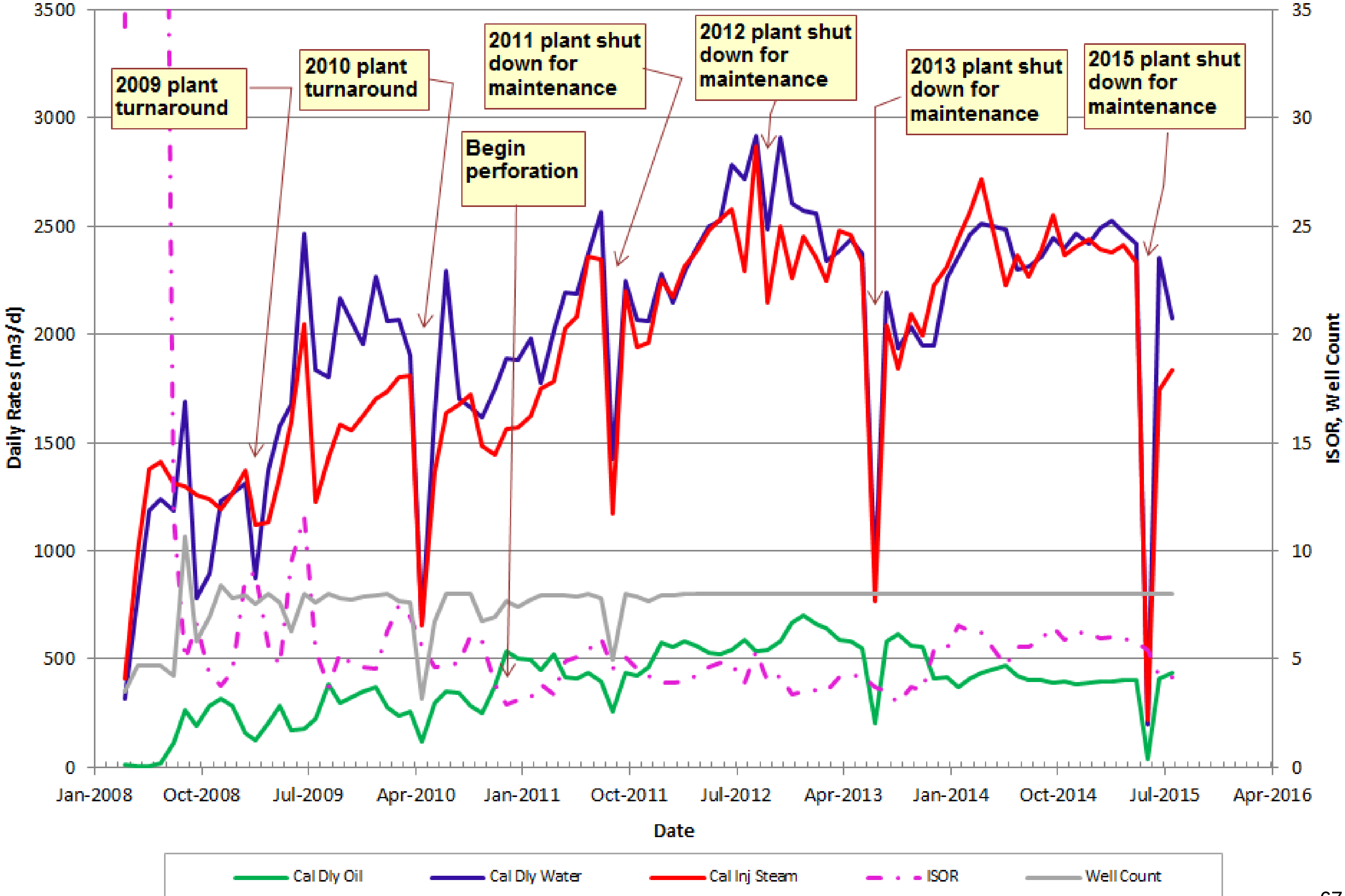
Discussion of Pad A Infills and Replacement Wells Performance

- The OBS well 14.5 m north of A9 heel showing minimal steam chamber development

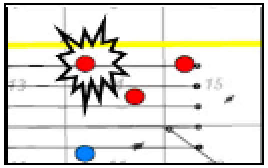
- Pad A performance indicators as of July 31, 2015:
  - Cum. Oil: 773,390 m^3
  - Cum. Steam Injected: 5,187,417 m^3
  - Cum. Water Produced: 5,879,223 m^3
  - CSOR: 6.7

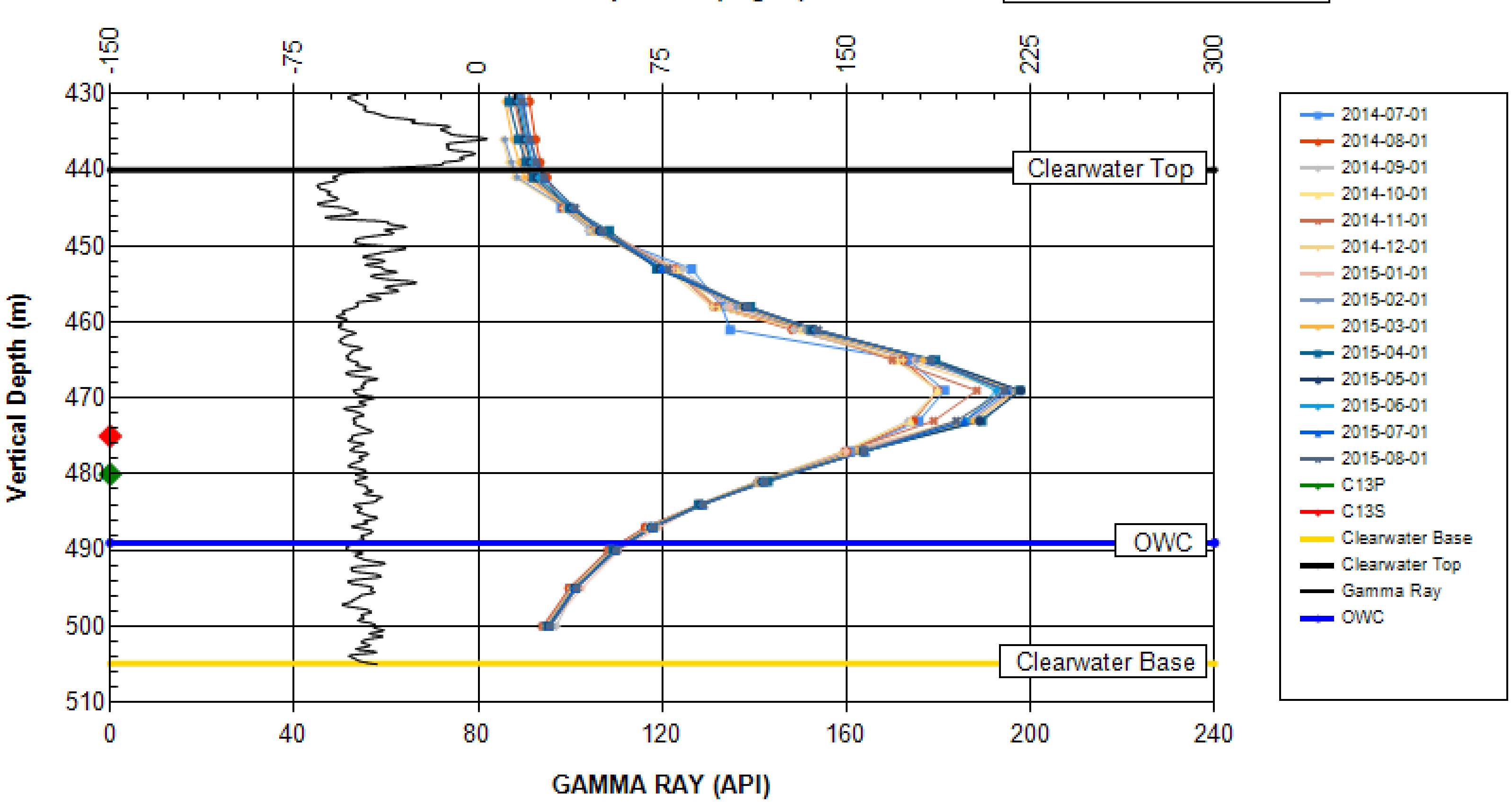
- Pad A performance for the reported period:
  - Cum. Oil: 189,061 m^3
  - Oil Rate per Well: 32.4 m^3/day
  - SOR: 6.6

Pad C East Performance – High Recovery Example

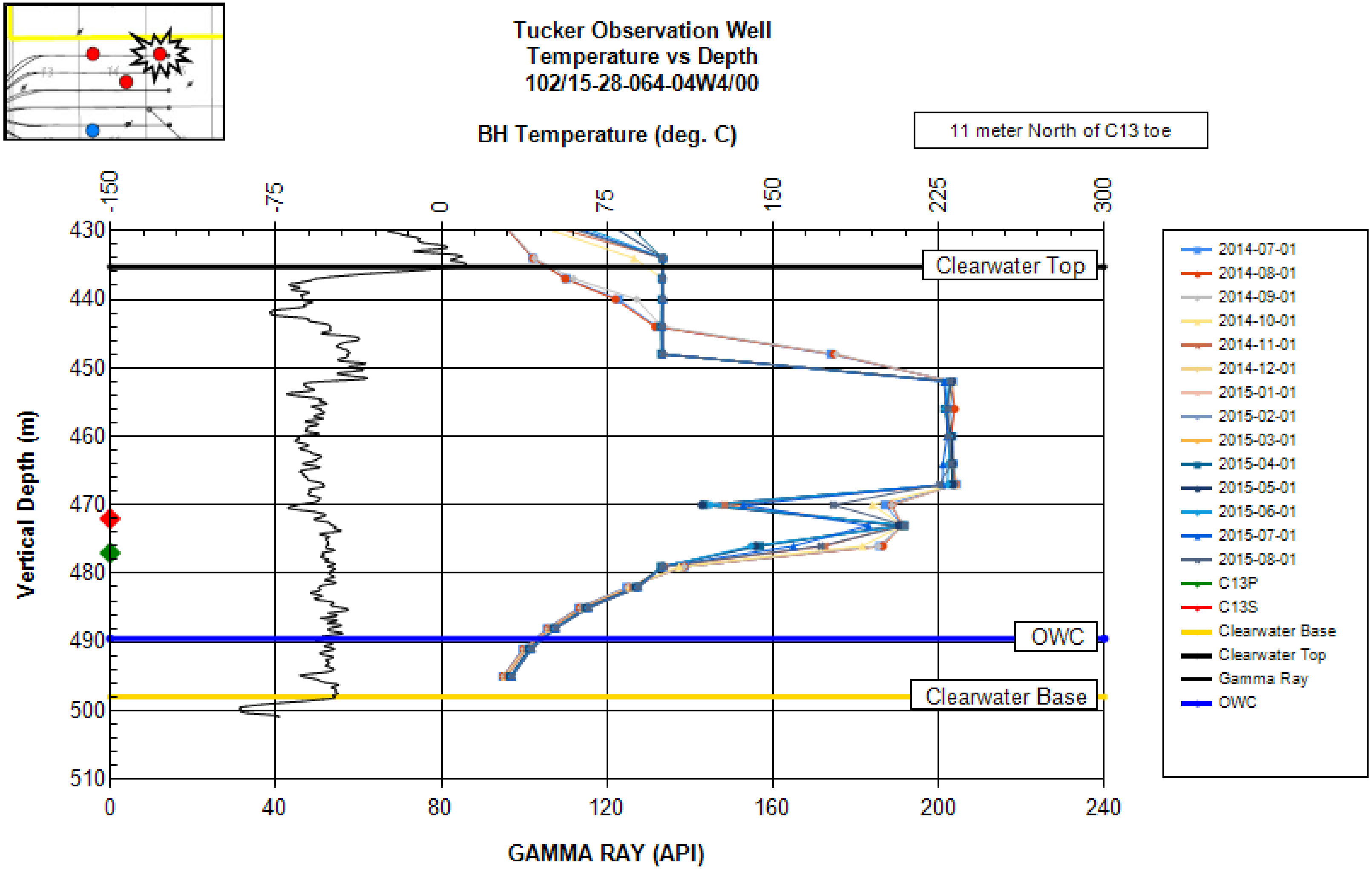


Pad C East Mid-Section Observation Well





Pad C East Toe Observation Well



Discussion of Pad C East Performance

- The OBS well 11 m north of C13 toe is showing very good steam chamber development in both horizontal and vertical directions

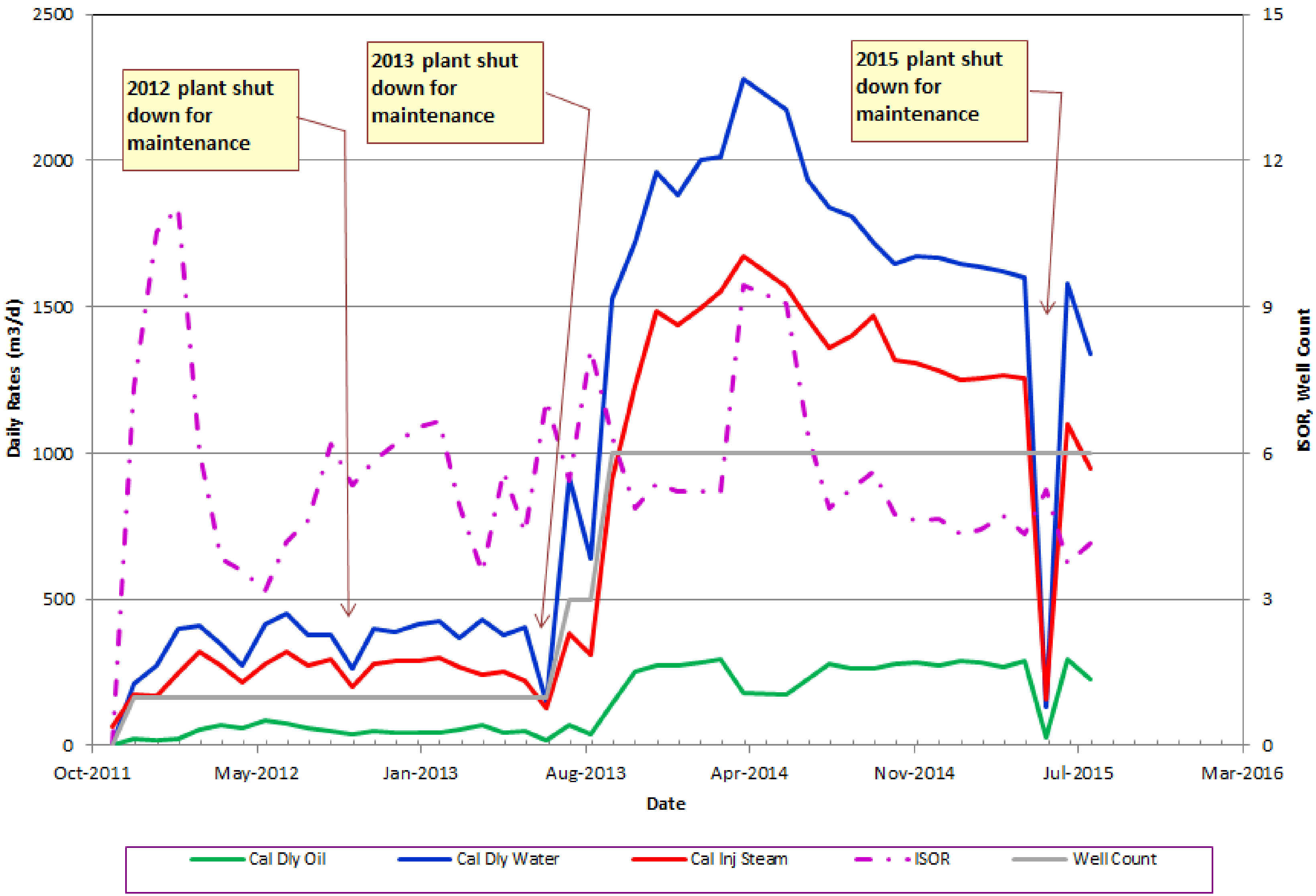
- Pad C East performance indicators as of July 31, 2015:
  - Cum. Oil: 1,036,277 m^3
  - Cum. Steam Injected: 5,053,815 m^3
  - Cum. Water Produced: 5,352,192 m^3
  - CSOR: 4.9

- Pad C East performance for the reported period:
  - Cum. Oil: 148,465 m^3
  - Oil Rate per Well: 46.9 m^3/day
  - SOR: 5.7

- The well placement was mainly above the transition zone

- Circulation start-up strategy was successfully implemented

Pad Lower Grand Rapids (LGR) Performance



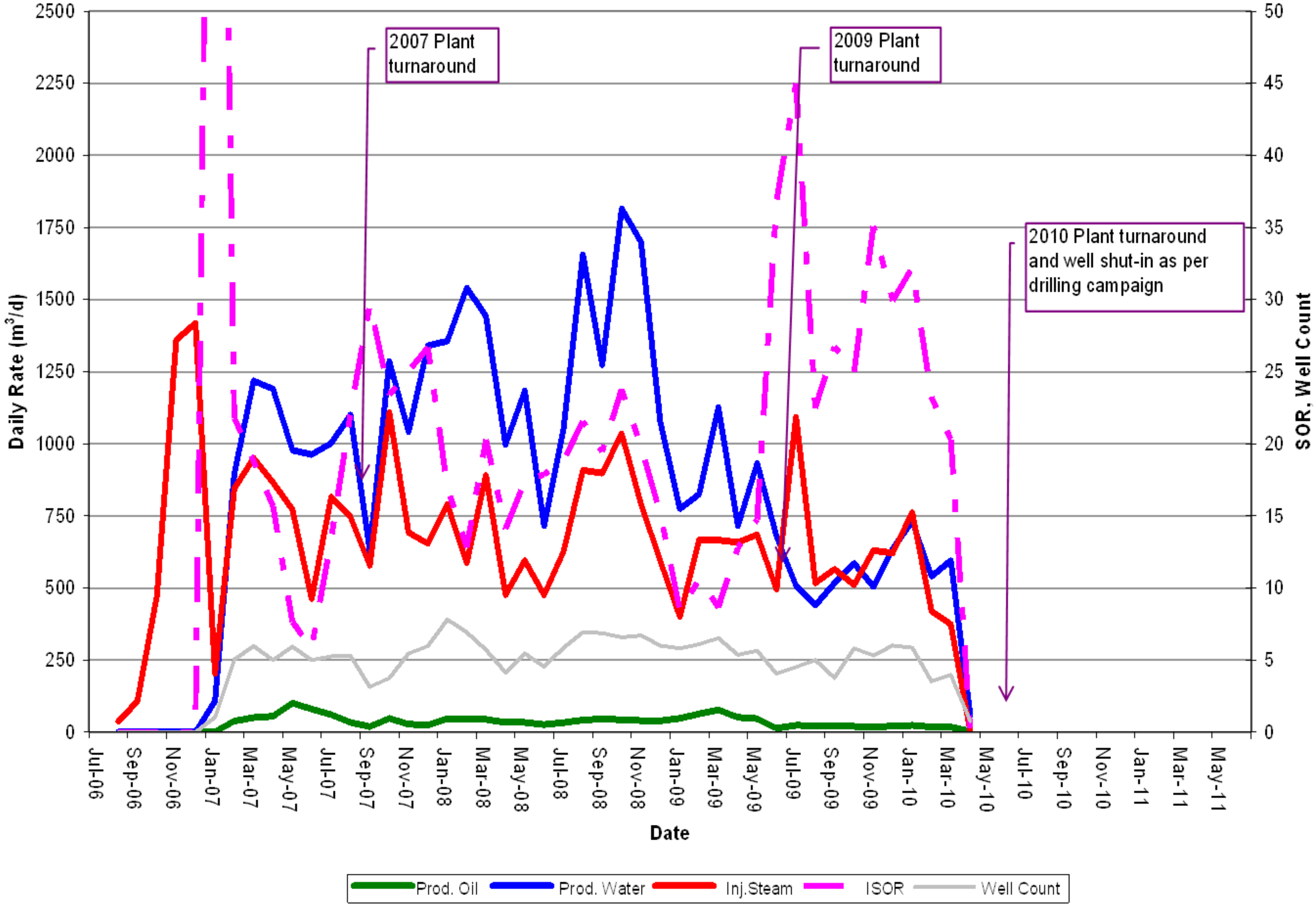
Discussion of Pad GA Performance

- Pilot well started in September 2011
- Remaining 5 Well Pairs started by September 2013

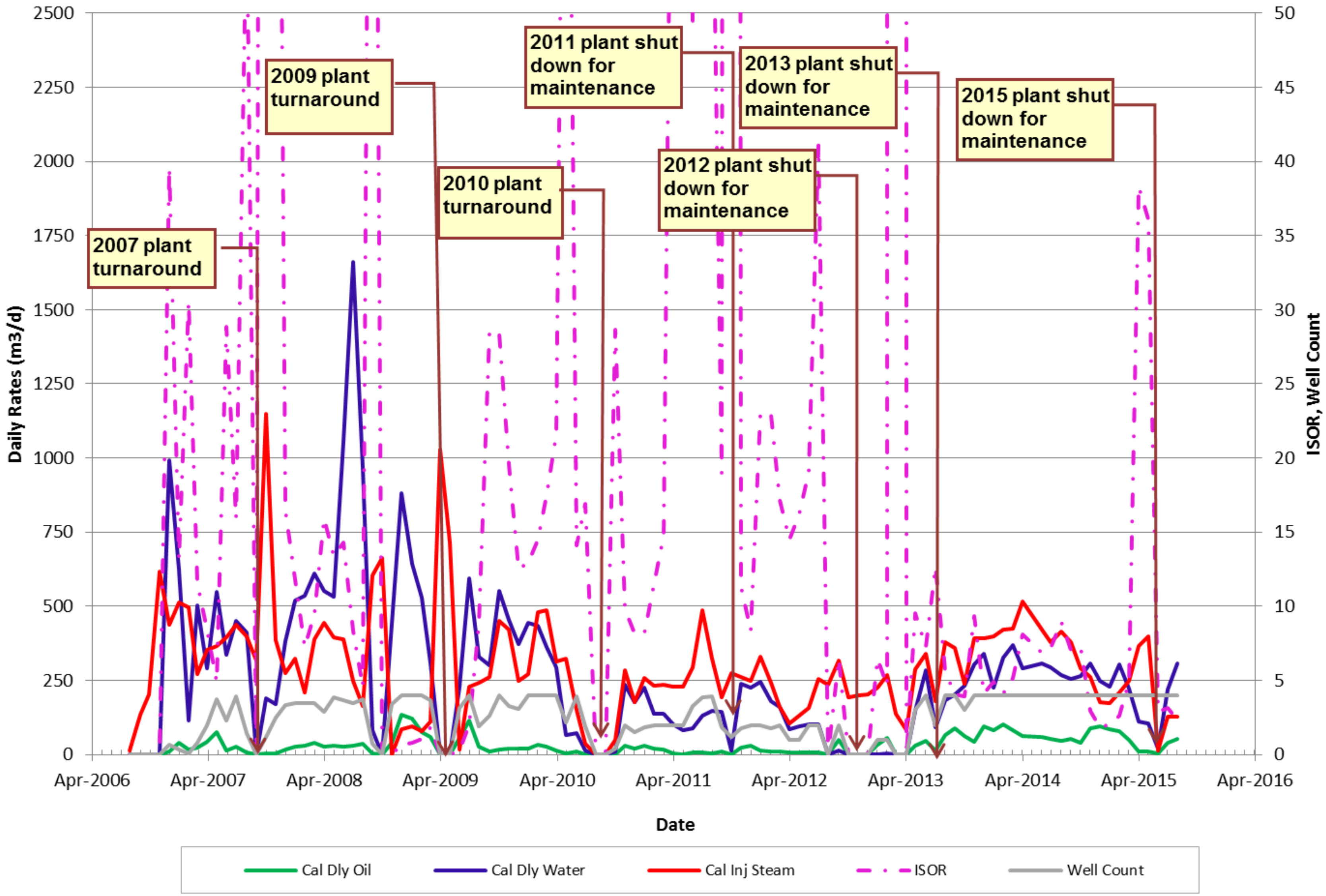
- Pad GA performance indicators as of July 31, 2015:
  - Cum. Oil: 198,823 m^3
  - Cum. Steam Injected: 1,036,651 m^3
  - Cum. Water Produced: 1,407,278 m^3
  - CSOR: 5.2

- Pad GA performance for the reported period:
  - Cum. Oil: 101,391 m^3
  - Oil Rate per Well: 42.7 m^3/day
  - SOR: 4.6

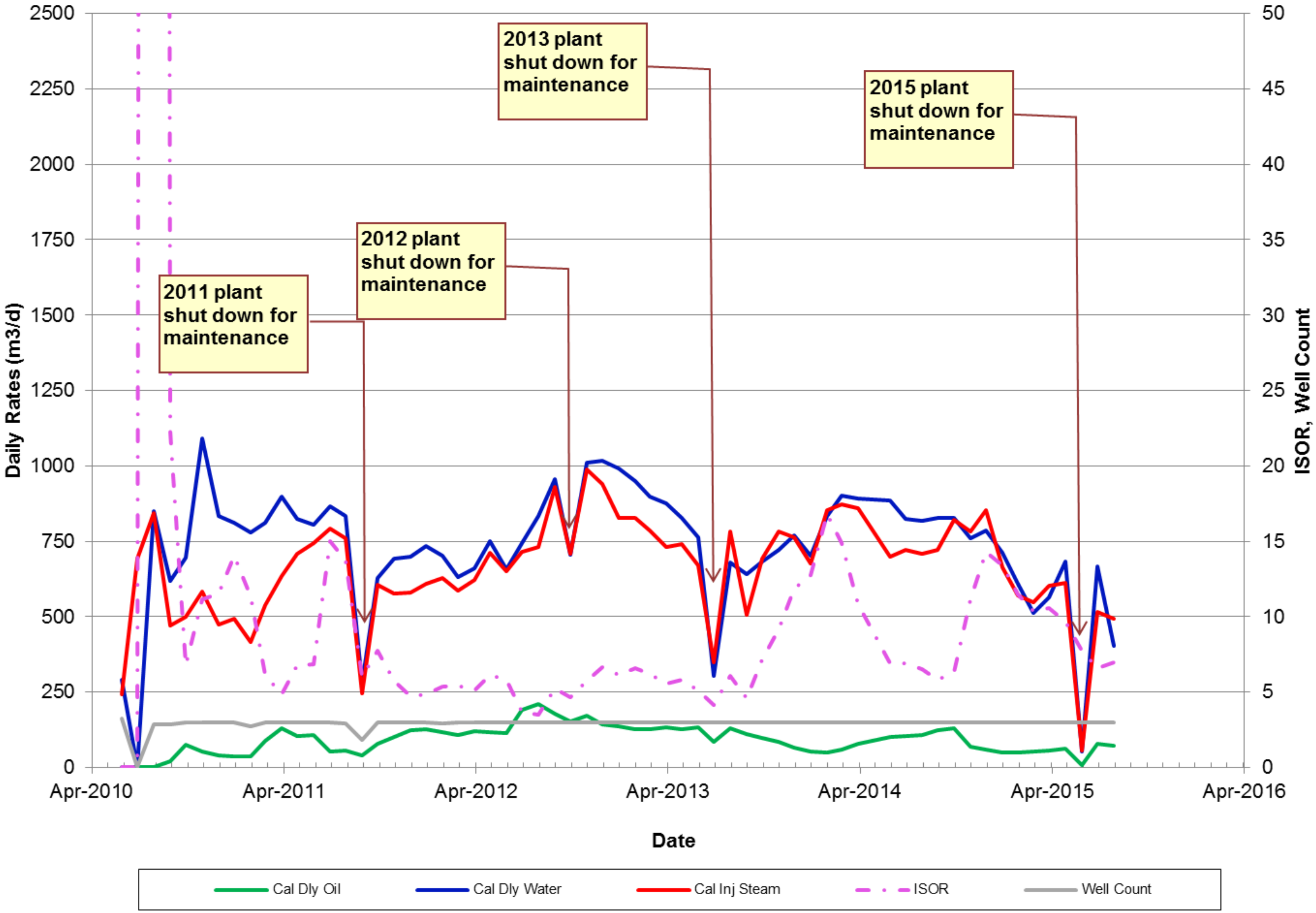
Original Pad A SAGD Performance



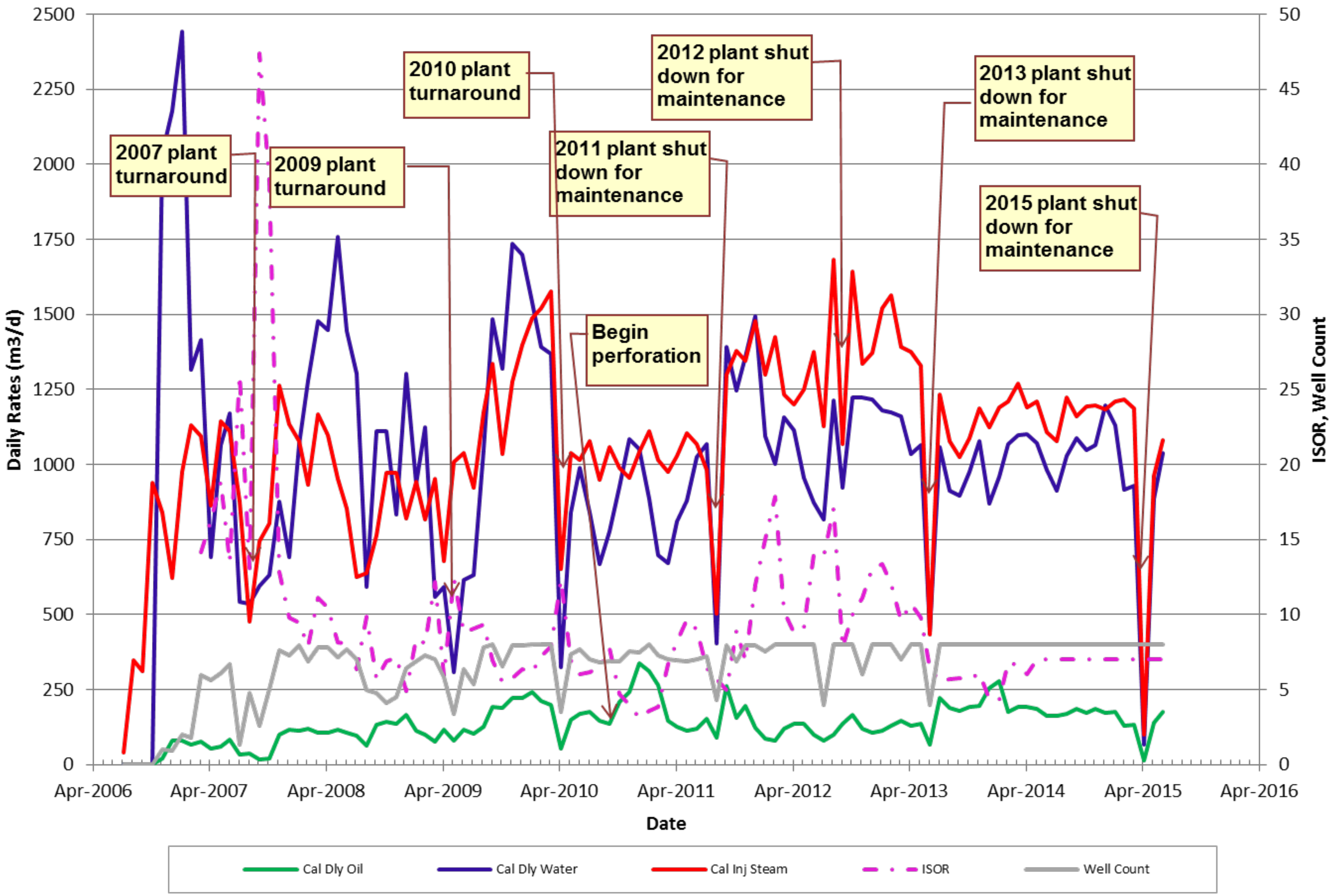
Pad B North Performance



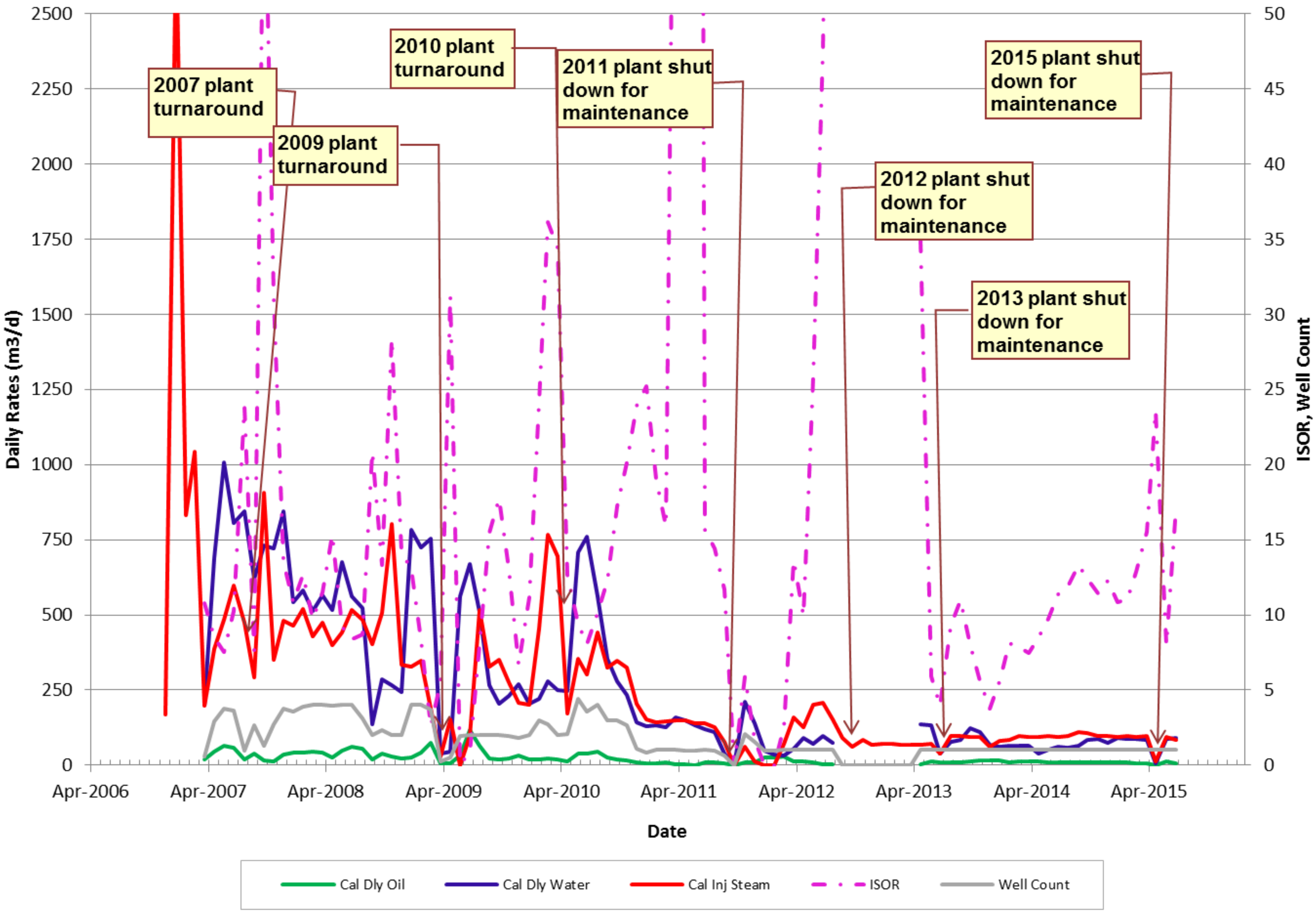
Pad B North Infill Performance



Pad B West Performance



Pad C North Performance



Pad B North and Original Pad A: Injectors Converted to Producers

- Pad B North Injectors Converted to Producers – B10, B11, B12:
  - AER Approval (No. 9835N) received August 18, 2014
- Original Pad A Injectors Converted to Producers - A01, A02, A03, A04, A05, A06, A07, A08:
  - AER Approval (No. 9835O) received December 19, 2014

- Pad B North (Converted October 2014):
  - Cum. oil produced: 9,476 m^3
  - Average oil production per well: 20.7 m^3/d
  - Production range per well: 5 m^3/d to 50 m^3/d
  - Variable production rates due to challenging reservoir conditions

- Original Pad A (Converted January 2015):
  - Cum. oil produced: 11,898 m^3
  - Average oil production per well: 9.8 m^3/day
  - Production range per well: 1 m^3/d to 45 m^3/d
  - Initial rates showing good results

New Pads: D East and CN

- Pad D East (15 SAGD well pairs):
  - All injectors are equipped with VIT and steam splitters
  - All producers are completed with dual string
  - Circulation of the first 5 well pairs started on March 15, 2015
  - Circulation of remaining 10 well pairs started on June 1, 2015
  - The first 5 well pairs converted into SAGD operations on August 1, 2015
  - The remaining well pairs will be converted to SAGD by end of September 2015

- Pad CN (6 SAGD well pairs and 7 infill producers):
  - Drilling was completed in June 2015
  - Scheduled for startup in Q1 2016

OBIP and Recoveries by Pad

- OBIP for each pad is calculated from the formula:

$$OBIP = L \times W \times H \times (1-S_w) \times \Phi \times 1/B_o$$

Where

L = Effective Average Length of wells

W = Lateral Width covered by the wells

H = Thickness from the top of pay to the producer elevation

Φ = Average Porosity in the Pay zone

S_w = Average Water Saturation in the Pay zone

B_o = Oil Volume factor/Shrinkage factor (taken as 1)

OBIP and Recoveries by Pad

PAD	OBIP (10^6 m^3)	Recovery to date July 31, 2015 (10^3 m^3)	Recovery Factor %	Estimated Ultimate Recovery (10^6 m^3)	Ultimate RF %
A (24 wells)	5.6	831.2	15%	3.1	54%
B (15 wells)	7.1	713.5	10%	3.0	42%
C (20 wells)	11.6	1492.8	13%	5.3	46%
GA (6 wells)	2.0	198.8	10%	0.8	40%
Total	**26.3**	**3236.3**	**12%**	**12.2**	**47%**

5-Year Outlook of Expected Pad Abandonment

- No pad abandonment is anticipated in the next 5 years

Temperature, Pressure and Quality of Steam

- High pressure steam separator delivers steam at a 100% quality
- Steam quality losses are experienced during transportation to the pads
- Steam quality at the wellhead is estimated to be 95%

Composition of Other Injected/Produced Fluids

- Not applicable to Tucker Thermal Project

Summary of Key Learnings

- Well placement is a critical factor for well performance
- Circulation is the optimum startup procedure for establishing thermal communication in a SAGD process
- Wire-wrapped screens are better for avoiding scaling problem of the production liner
- Steady operating conditions are key to obtaining good steam chamber conformance
- Operating pressure should be constant and close to bottom water pressure to prevent water inflow and steady operations
- Pad A original injectors converted to producers were successful

8. Future Plans

Future Plans (2015/2016)

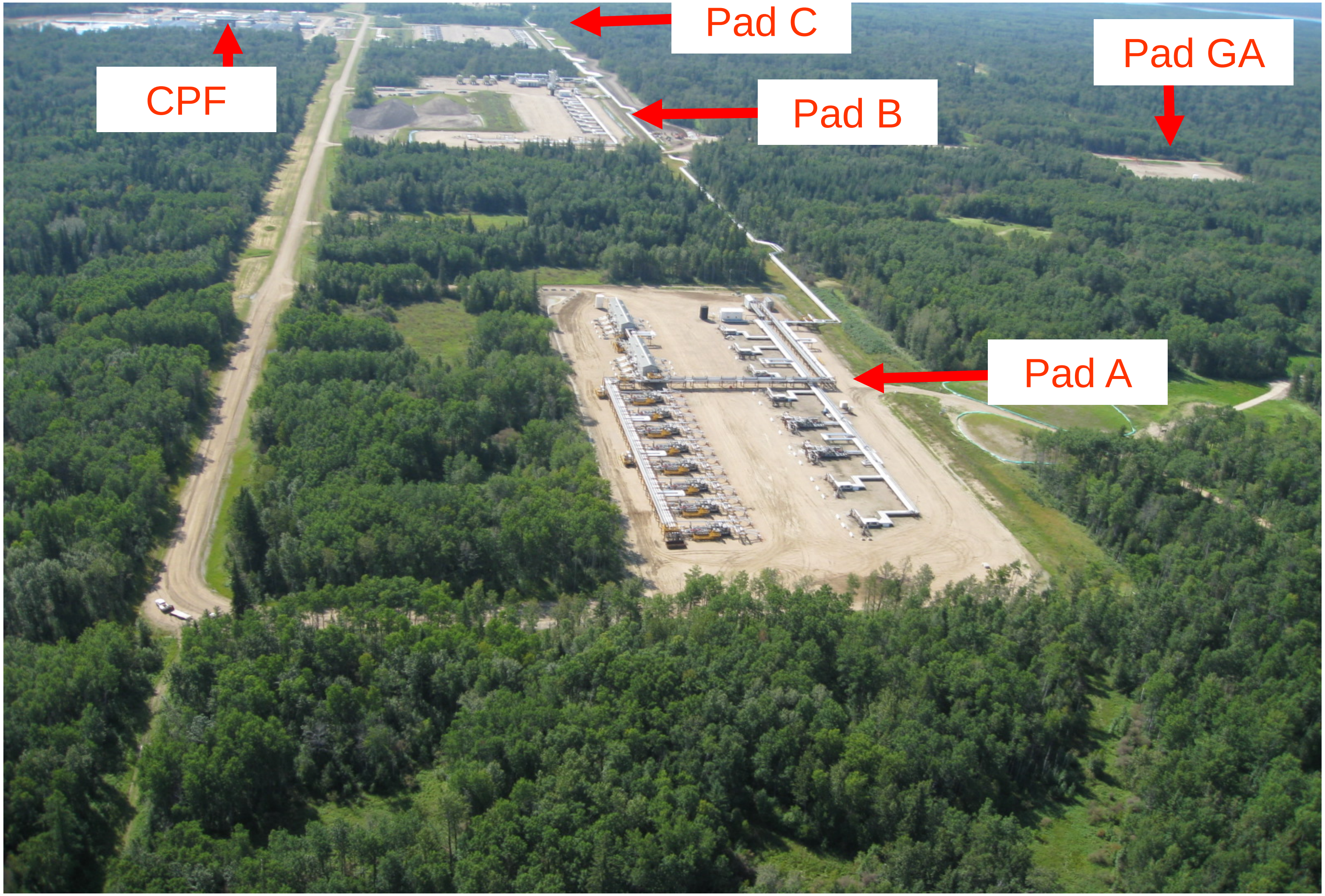
- Pad D East Development:
  - Complete circulation/start-up and commence SAGD operations
- Pad CN Development:
  - Commission & start-up facilities (Q1 2016)
  - Circulate/start-up and commence SAGD operations (Q2 2016)
- Pad C West Replacement Wells:
  - Drill & complete 3 replacement wells and tie-into existing facilities (Q1 2016)
  - Circulate/start-up and commence SAGD operations (Q2 2016)
- Pad D North Amendment:
  - Submit amendment to drill 8 SAGD pairs
- SAGD Operations:
  - Continue to optimize SAGD operations
  - Temperature surveillance
- OBS wells monitoring

- Pad C North Future Development:
  - Based on performance at Pads A infills and replacement wells, B North infill wells, B West and C West replacement wells
  - Evaluate and propose a development strategy for optimizing the resource recovery

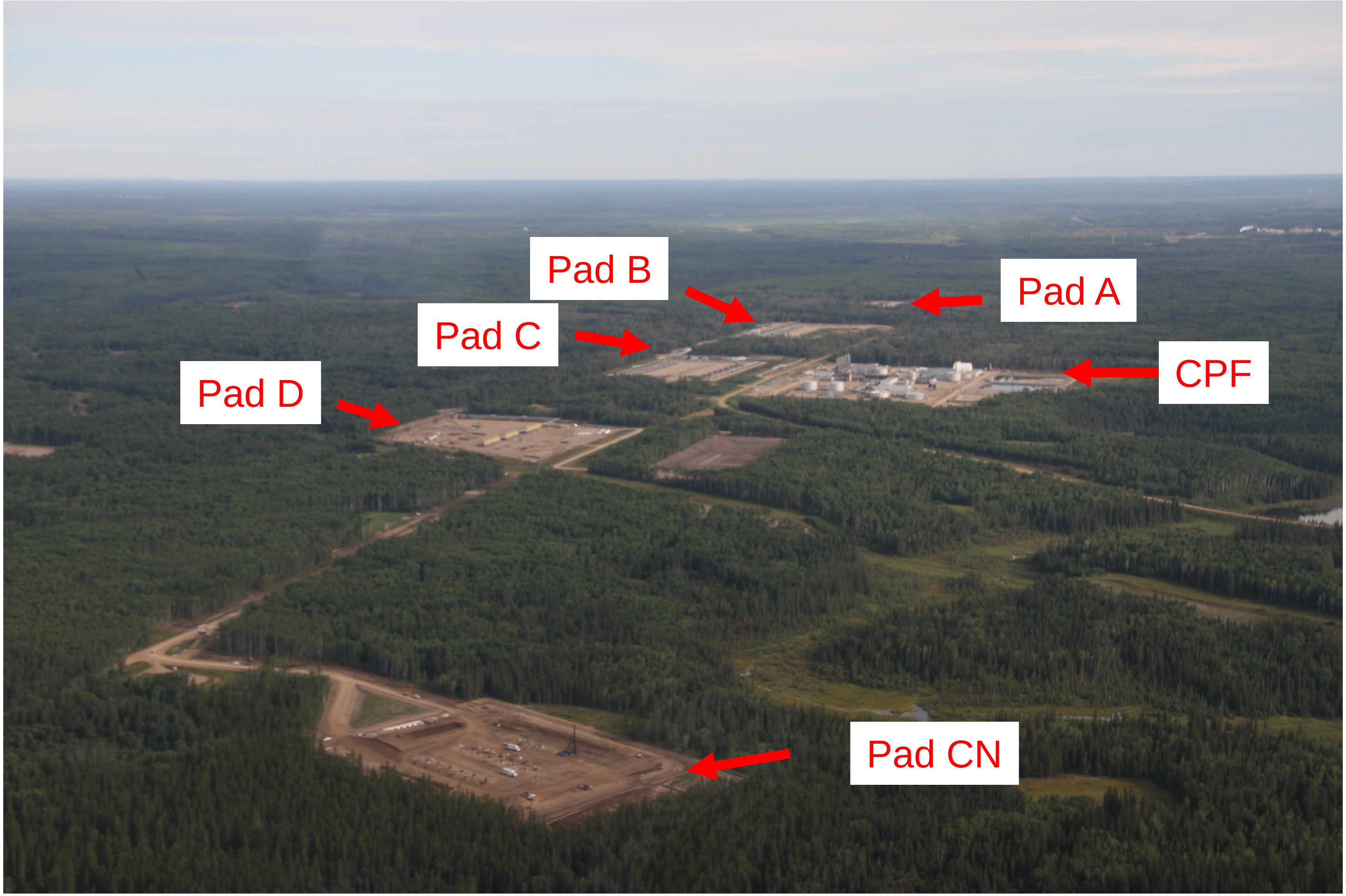
3.1.2. Surface Issues - Table of Contents

1. Facilities

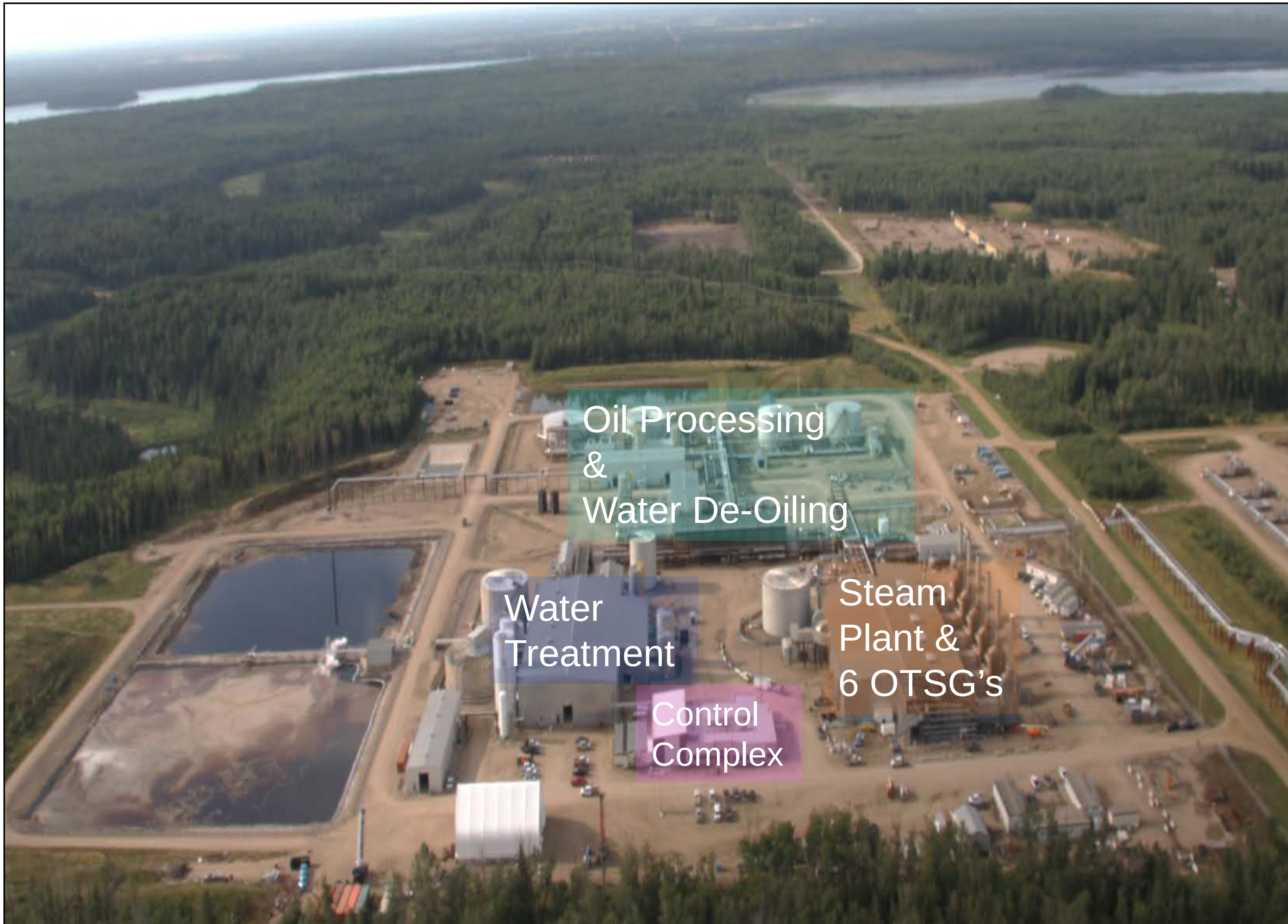
Layout (Looking South)



Layout (Looking North)

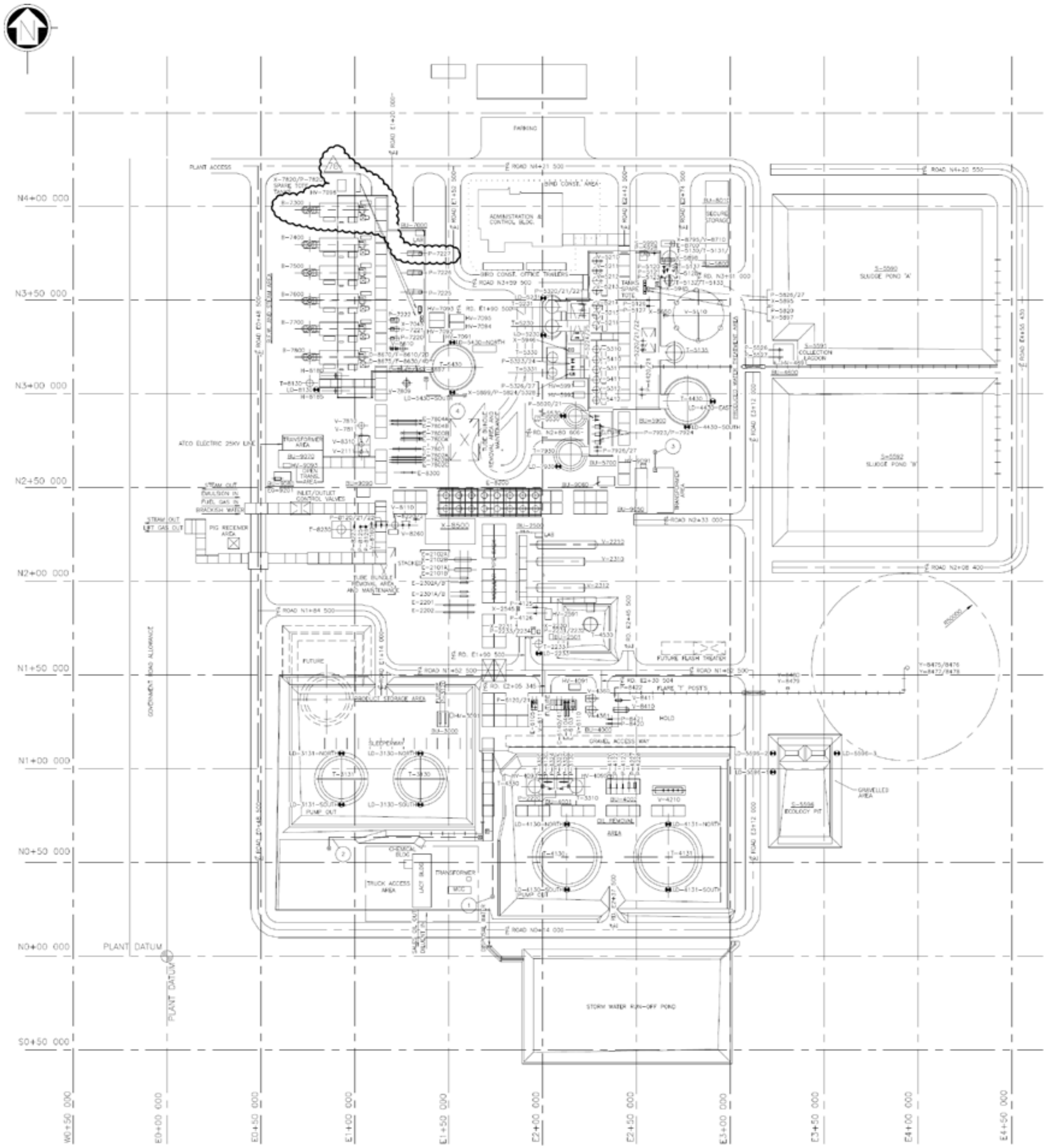


Central Processing Facility (CPF)

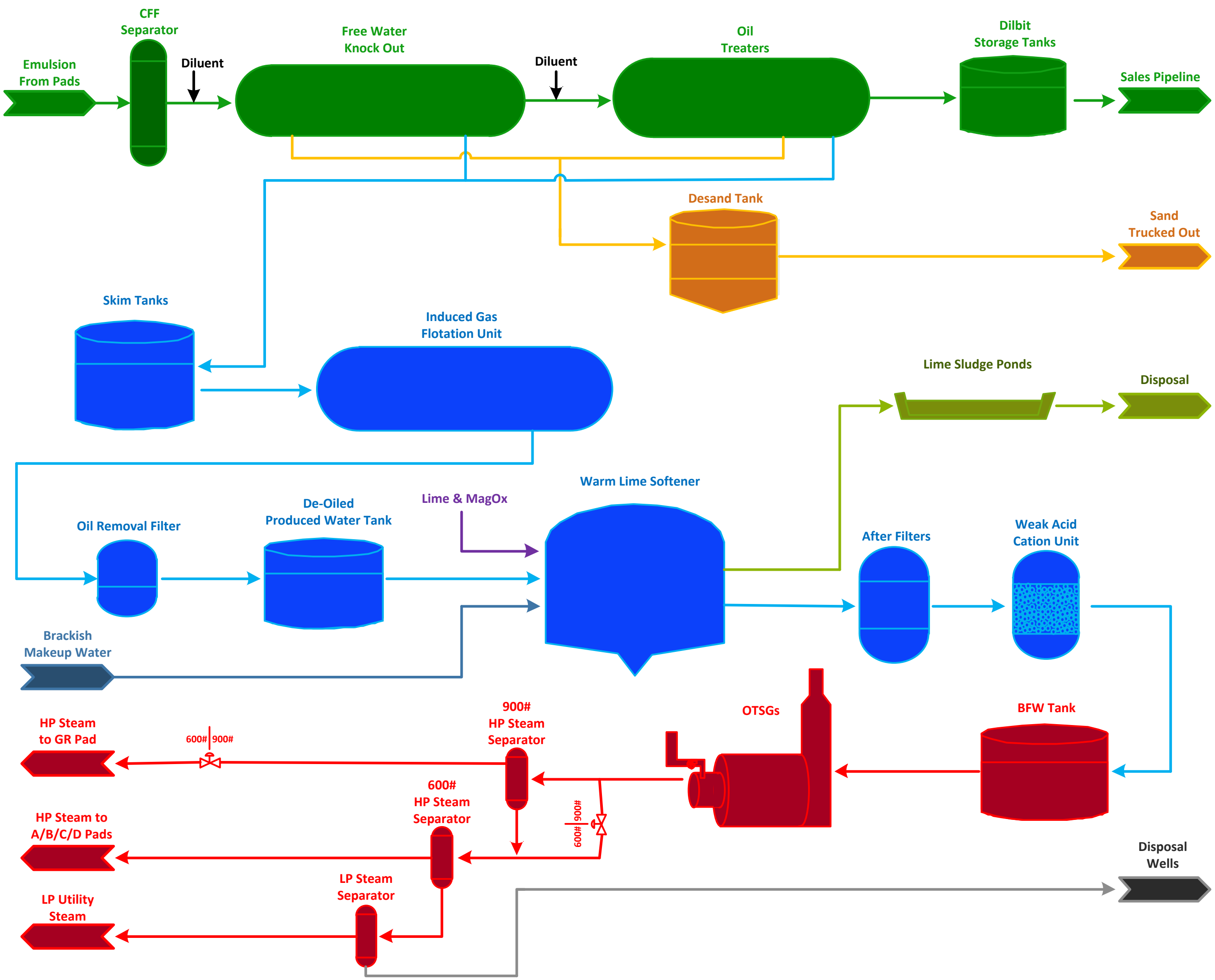


CFF (Located at Pad B)

Husky Tucker Facility Plot Plan (CPF)



Husky Tucker Facility Schematic

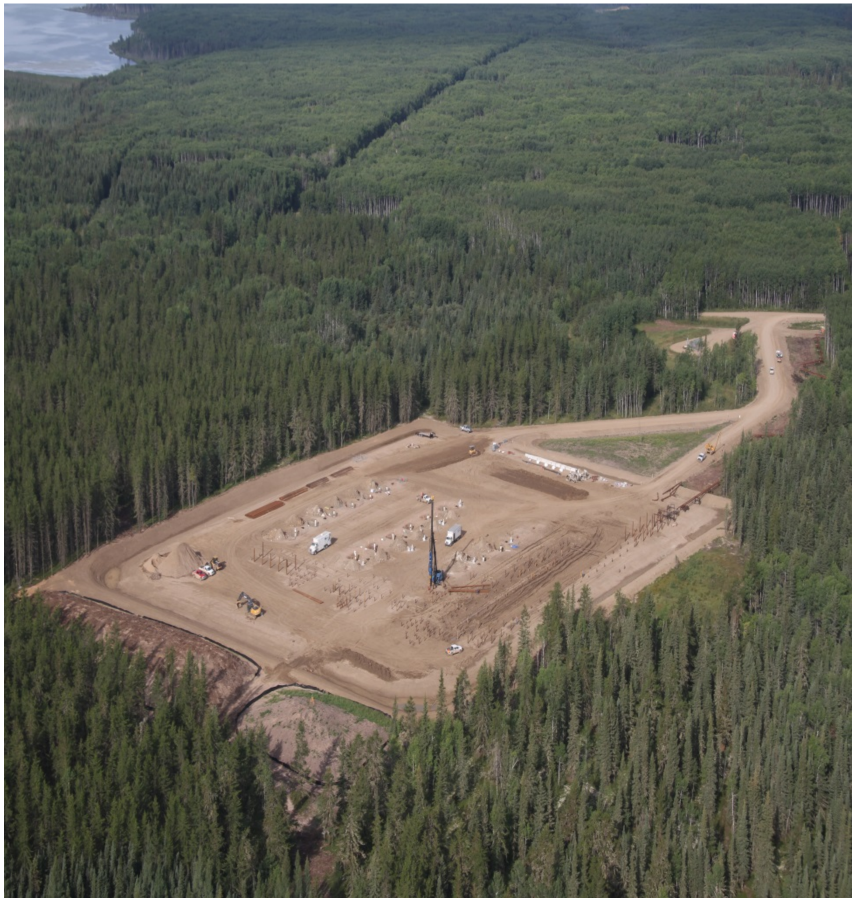


Facility Modifications

- Pad D East commissioning:
  - Commissioned in March 2015 with first steam to the pad on 14 March 2015
- Pad CN construction:
  - Drilling completed Q2 2015
  - Surface facility construction on-going with completion expected in Q1 2016
- Addition of a 6th OTSG:
  - Construction in the CPF started Q1 2015
  - Commissioning to begin Q4 2015
- Modifications to the WLS to increase throughput:
  - Adjustable weirs installed on the WLS outlet flow
  - Required to accommodate the 6th OTSG
- Outlet gas nozzle on CFF Emulsion Separator changed to 30” diameter
- Replacement of the Produced gas scrubber

Pad D

Pad CN and Pipeline to CPF



Facility Modifications – 6th OTSG Addition

2. Facilities Performance

Operating Issues

Operating issues:

- Facilities experienced corrosion under insulation (CUI) on two tank roofs, as well as on the underside of the tank floor. The corroded components have been repaired and long term solutions are being worked
- Two produced water disposal lines had liner failures. The liners were repaired and additional safeguards put in place to prevent further failures

Operating Limitations

Water Disposal Limitation:

- Proactively worked with AER to amend the disposal factors in Directive 081 to ensure compliance
- New factors were considered based upon the poor water chemistry of the brackish make-up and produced water
- Adjustments to produced water and brackish water disposal factors granted April 2015:

  Df = the disposal factor for fresh water = 0.03 (no change)

  Db = the disposal factor for brackish water = 0.525 (from 0.350)

  Dp = the disposal factor for produced water = 0.125 (from 0.100)

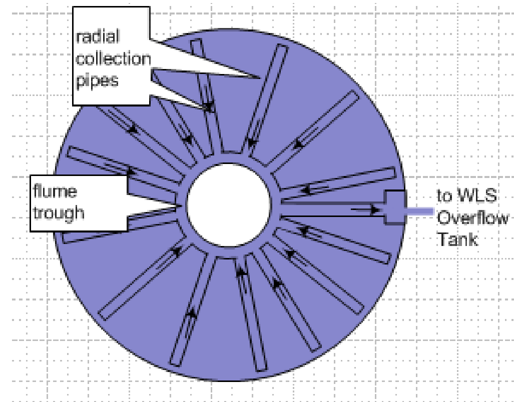
- Discussions with AER regarding Directive 081 compliance:
  - No fresh water consumed in steam production
  - Maximize recycle OTSG blow-down while maintaining operational stability and equipment limitations
  - Brackish water, high TDS (20,000+)
  - Historical and current WSR above 1.05
  - All produced water treated and used for steam generation
- Testing included:
  - Increased OTSG blow-down with limited brackish water = high pH in WLS, high alkalinity and turbidity
  - Increased brackish water to dilute blow-down to WLS = high TDS in BFW
- Testing concluded adjustments to OTSG blow-down recycle and brackish water could not sustain water process

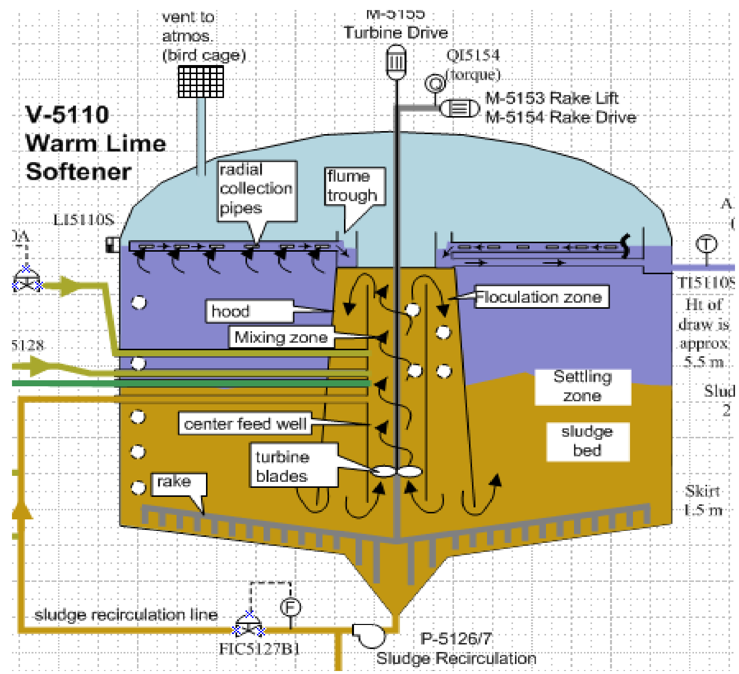
Process Water De-Oiling

- The de-oiling process consists of 2 Skim Tanks (in series), IGF and 2 Oil Removal Filters
- The performance of the de-oiling equipment has been close to spec and is performing well
- De-Oiling KPI's are:
  - FWKO – 1,000 ppm (average 441 ppm)
  - IGF Inlet – 100 ppm (average 92 ppm)
  - IGF Out – 40 ppm (average 53 ppm)
  - ORF Outlet – 20 ppm (average 27 ppm)

WLS - Warm Lime Softener

- Primary water treatment to produce boiler feedwater
- Feed sources:
  1. De-oiled produced water
  2. Brackish water make-up
  3. Sludge pond water
- Reduces water contaminants:
  1. Hardness - primarily Calcium and Magnesium
  2. Silica - main contaminant due to thermal recovery process
  3. Turbidity - suspended solids
- Produces sludge as waste product - stored in ponds
- Mechanical turbine, rake drives
- Main zones: Mixing, Reaction, Settling
- Produces water effluent with hardness ~20 ppm and silica ~50 ppm





WLS Chemistry

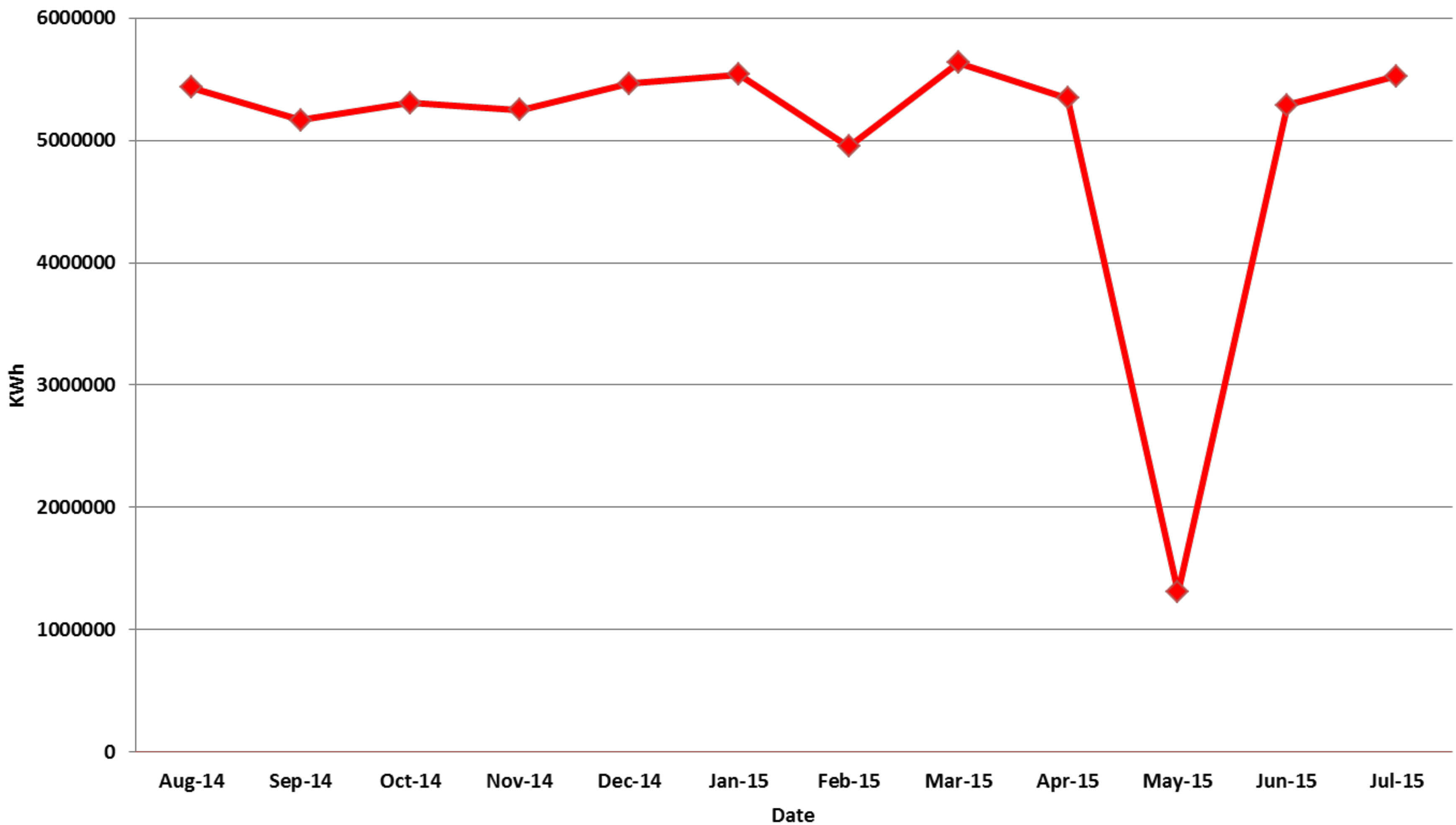
- Lime – primary hardness control
- Magnesium Oxide (MagOx) – primary silica reduction
- Caustic – water pH control, aids softening
- Sodium Carbonate (soda ash) – permanent hardness removal
- Polymer – coagulants and flocculants establish sludge bed control

WLS Performance

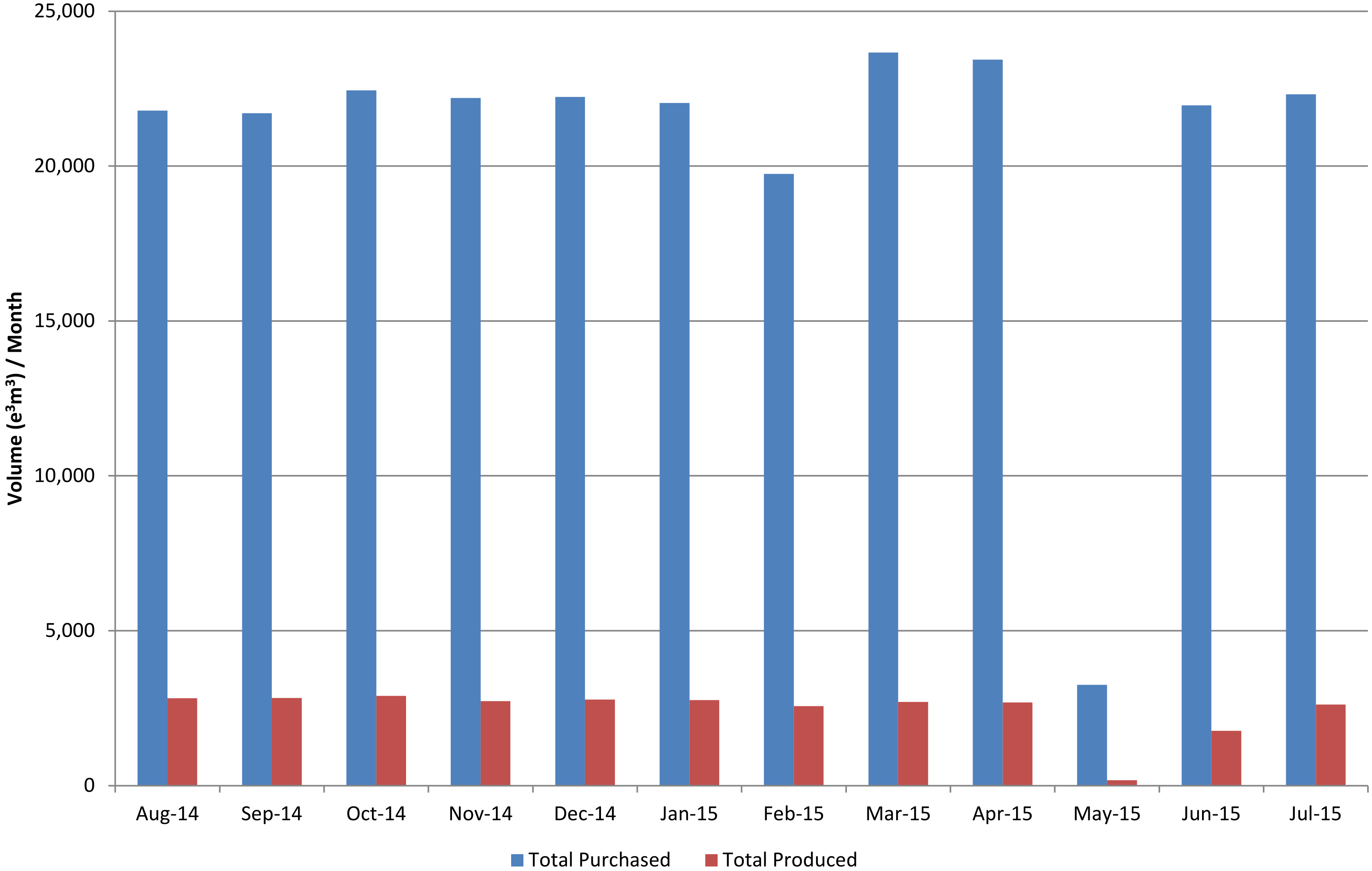
- The WLS has performed very well to date

- Key KPIs:
  - Soluble Hardness – 30 ppm (average 10 ppm)
  - Silica – 50 ppm (average 48 ppm)
  - Turbidity – 20 NTU (average 20 NTU)

Power Consumption



Gas Usage

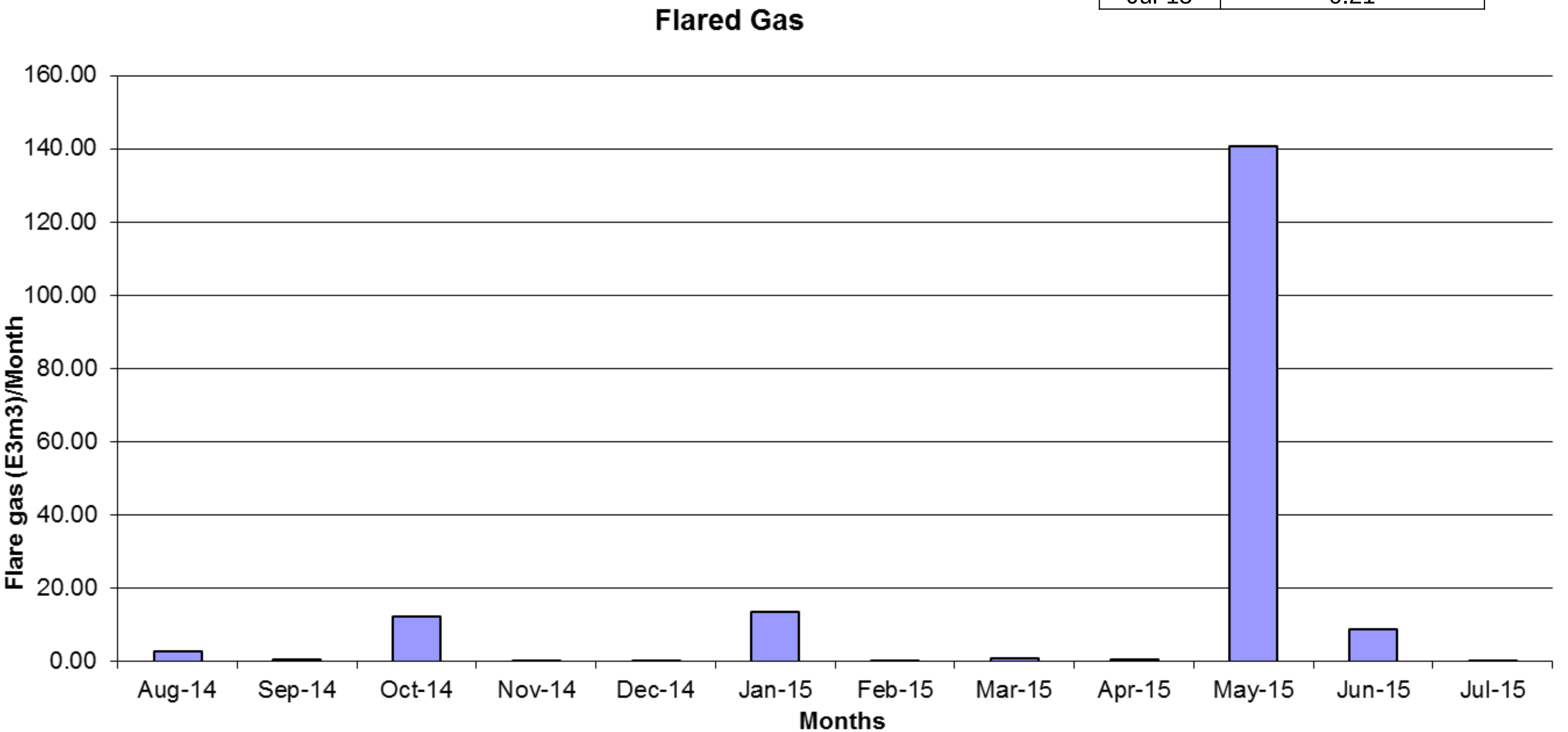


25,000
20,000
15,000
10,000
5,000
0
Volume (e³m³) / Month
Aug-14
Sep-14
Oct-14
Nov-14
Dec-14
Jan-15
Feb-15
Mar-15
Apr-15
May-15
Jun-15
Jul-15
Total Purchased
Total Produced

Flaring and Venting

- After start up from the May 2015 turnaround, both the 4 hour duration and 30,000 m^3 volume were exceeded. Numerous problems during start up contributed to this. Discussion was held with the Bonnyville Field Center and a Notification was submitted in DDS
- No Venting

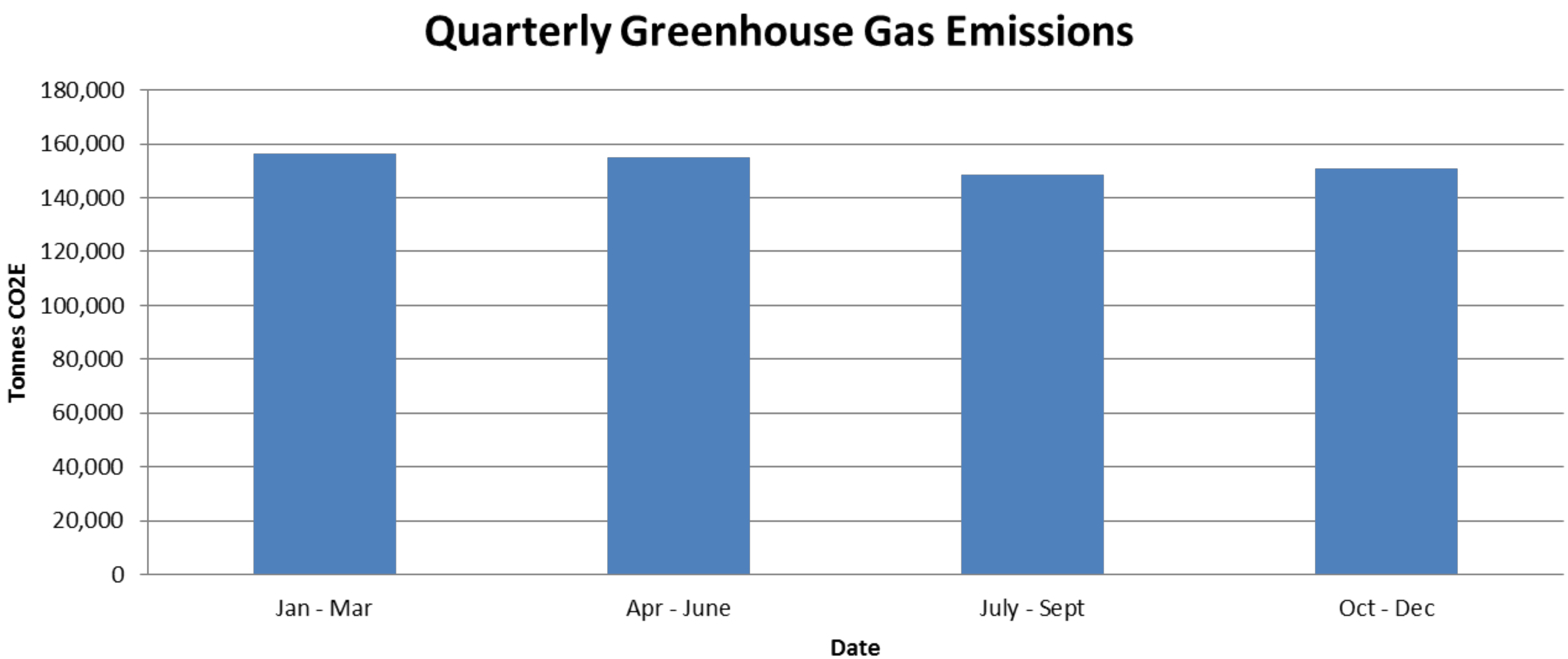
Date	Gas flare (e^3m^3)
Aug-14	2.80
Sep-14	0.49
Oct-14	12.31
Nov-14	0.27
Dec-14	0.06
Jan-15	13.51
Feb-15	0.19
Mar-15	0.96
Apr-15	0.39
May-15	140.85
Jun-15	8.60
Jul-15	0.21



Green House Gas (GHG)

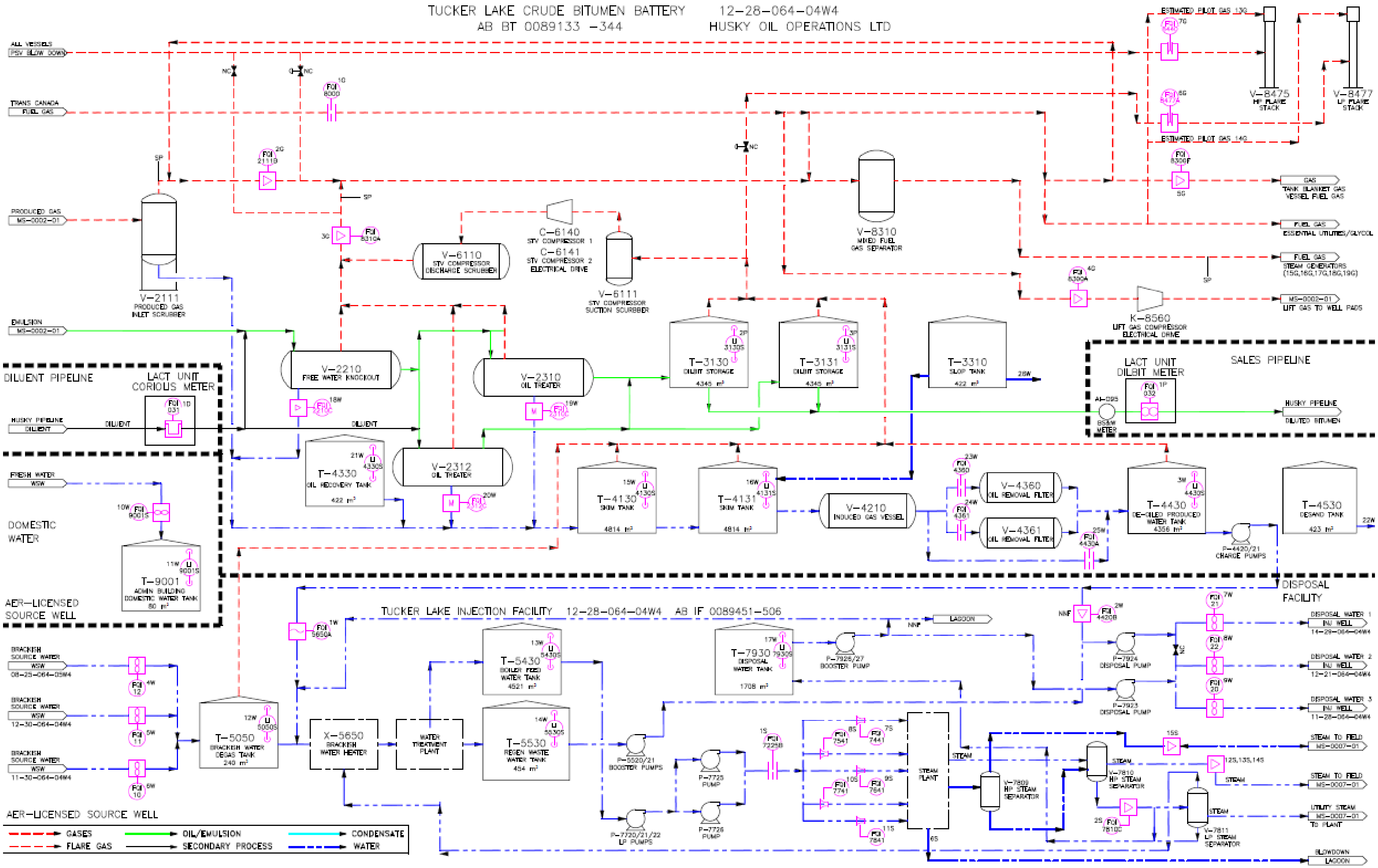
- Emission sources considered include stationary combustion associated with steam generators and glycol heaters, flaring, venting and fugitive emissions

- 610,708.91 tonnes of Carbon Dioxide Equivalent were emitted in 2014 (information taken from the Tucker Thermal 2014 report submitted to AESRD under the Specified Gas Emitters Regulation)

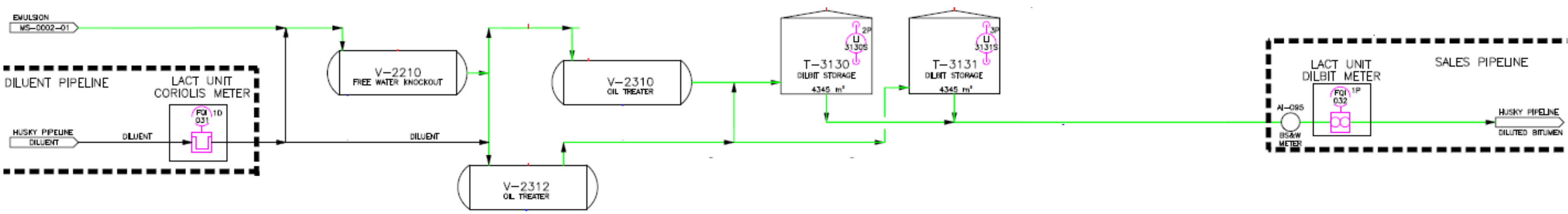


3. Measurement and Reporting

Measurement and Reporting Schematic



Measurement and Reporting – Oil



OIL & DILUENT METERING

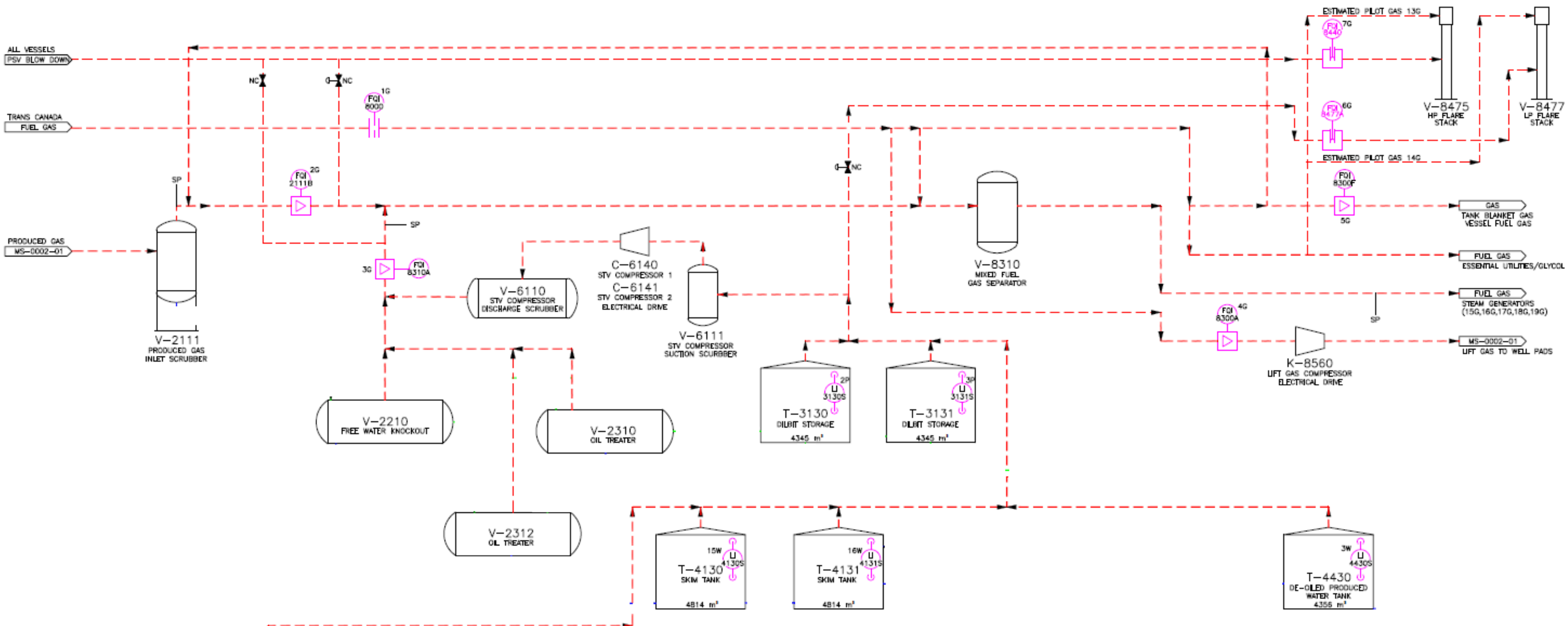
LABEL	TAG	P&ID#	DESCRIPTION
1P	FQI032		LACT DILBIT SALES FLOW TOTALIZER
2P	LI3130S	30MF02	DILBIT STORAGE TANK VOLUME
3P	LI3131S	30MF03	DILBIT STORAGE TANK VOLUME
1D	FQI031	30MF01	DILUENT TO PLANT FLOW TOTALIZER
2D			DILUENT FLASH VOLUME LOSS (CALCULATED)
3D			DILUENT SHRINKAGE VOLUME (CALCULATED)

OIL PRODUCTION TOTAL – (PIPELINE METER ± INVENTORY CHANGE)–NET DILUENT VOLUME ADDED+(SHRINKAGE AND FLASH VOLUME LOSS)
(1P*(1–(AI–095/100)))+(2P+3P)–1D+(2D+3D)

NOTE: OIL VOLUMES REPORTED TO THE AER ARE CORRECTED FOR SHRINKAGE AND FLASH IN ACCORDANCE WITH DIRECTIVE 17 SECTION 14.3 BY PRODUCTION ACCOUNTING

NOTE: AI–095 MEASURES SALES BS&W

Measurement and Reporting – Produced Gas



GAS METERING

LABEL	TAG	P&ID#	DESCRIPTION
1G	FQI8000	80MF16	TCPL PURCHASED GAS FLOW TOTALIZER
2G	FQI2111B	20MF01	GAS FROM FIELD FLOW TOTALIZER
3G	FQI8310A	80MF18	FWKO/TREATER/STVR GAS FLOW TOTALIZER
4G	FQI8300A	80MF16	GAS TO FIELD FACILITIES, LIFT GAS, TEST SEPARATORS, (OFF SEPARATOR) FLOW TOTALIZER
5G	FQI8300F	80MF21	TANKAGE BLANKET GAS, VESSEL FUEL GAS FLOW TOTALIZER
6G	FQI8477A	80MF26	LP FLARE METER FLOW TOTALIZER
7G	FQI8440	80MF26	HP FLARE METER FLOW TOTALIZER
10G			PURGE GAS TO FLARE SYSTEM MEASURED BY 6G AND 7G

T-5050
BRACKISH WATER
DEGAS TANK
240 m³

PRODUCED GAS = GAS FROM FIELD–GAS TO FIELD+ FWKO/TREATER/STVR GAS– TANKAGE BLANKET GAS, VESSEL FUEL GAS+ LP FLARE GAS
= 2G–4G+3G–5G+6G

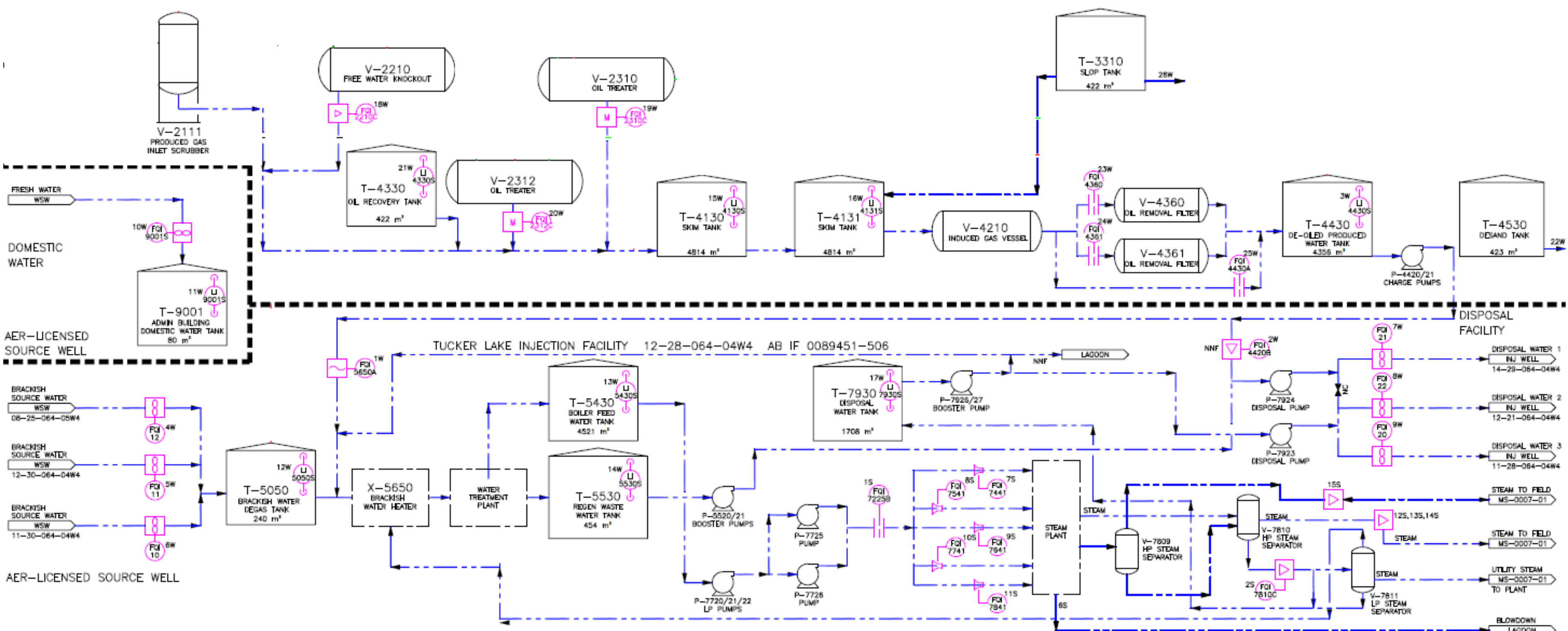
FLARED GAS = FLARE STACK METER TOTAL–FLARE SYSTEM PURGE GAS
= (6G+7G)–10G

FUEL GAS = PURCHASED GAS+PRODUCED GAS–FLARED GAS
= 1G+PRODUCED GAS–FLARED GAS

VENT GAS – THE TUCKER FACILITY WAS DESIGNED TO CAPTURE ALL GAS SOURCES FOR USE AS FUEL
IN THE EVENT GAS IS VENTED TO ATMOSPHERE THE VOLUME WILL BE ESTIMATED USING GENERALLY ACCEPTED ENGINEERING PRACTICE

NOTE: IF THE STVR COMPRESSOR IS NOT OPERATIONAL, TANKAGE PRODUCED GAS IS METERED BY 6G

Measurement and Reporting – Water and Steam



PRODUCED WATER

METHOD 1 – PRIMARY PRODUCED WATER MEASUREMENT
=PRODUCED WATER TO ORF ± CHANGE IN PRODUCED WATER INVENTORY + WATER TRUCKED OUT + WATER PIPELINED OUT
=(23W+24W+25W) ± CHANGE IN PRODUCED WATER INVENTORY (15W+16W+21W) + 22W + 26W + (1P*(AI–095/100))

NOTE 1: SLUDGE RECYCLE FLUSH COMES OFF UPSTREAM 1W THAT WILL NOT BE ACCOUNTED WHEN FLUSHING
NOTE 2: PUMP SEAL FLUSH ESTIMATED AS 24m^3/DAY/PUMP. TOTAL ESTIMATED VOLUME OF SERVICE WATER ADDED TO PRODUCED WATER 100m^3/DAY

METHOD 2 – SECONDARY PRODUCED WATER MEASUREMENT
=PRODUCED WATER TO WLS + PRODUCED WATER TO DISPOSAL ± CHANGE IN PRODUCED WATER INVENTORY + WATER TRUCKED OUT + WATER PIPELINED OUT
=1W + 2W + CHANGE IN PRODUCED WATER INVENTORY (15W+16W+21W) + 22W + 26W + (IP*(AI–095/100))

PROPOSED PRODUCED WATER MEASUREMENT

=FREE WATER KNOCKOUT WATER + OIL TREATER PRODUCED WATER + WATER PIPELINED OUT = 18W + 19W+ 20W + (1P * (AI–095/100))

STEAM TO FIELD

METHOD 1 – PRIMARY STEAM TO FIELD
= BOILER FEED WATER–STEAM SEPARATOR CONDENSATE–BLOW DOWN TO LAGOON
= 1S–2S–6S

METHOD 2 – SECONDARY STEAM TO FIELD
= ≥(BOILER FEED TO GENERATORS – STEAM SEPARATOR CONDENSATE – BLOWDOWN TO LAGOON)
= (7S + 8S + 9S + 10S + 11S) – 2S – 6S
OR:
= ≥(STEAM TO PAD A + STEAM TO PAD B + STEAM TO PAD C + STEAM TO GRAND RAPIDS PAD)
= 12S + 13S + 14S + 15S

NOTE 1: BLOWDOWN TO THE LAGOON DURING START UP AND SHUT DOWN IS ESTIMATED USING METERS 7S, 8S, 9S, 10S, AND 11S
NOTE 2: THE WELL TOE AND HEEL STEAM METERS ON EACH PAD ARE IDENTIFIED ON MEASUREMENT SCHEMATICS MS–0007–01

Measurement and Reporting – Pads GA & D Well Testing

AB BT 0089133 — WELL PAD GRAND RAPIDS

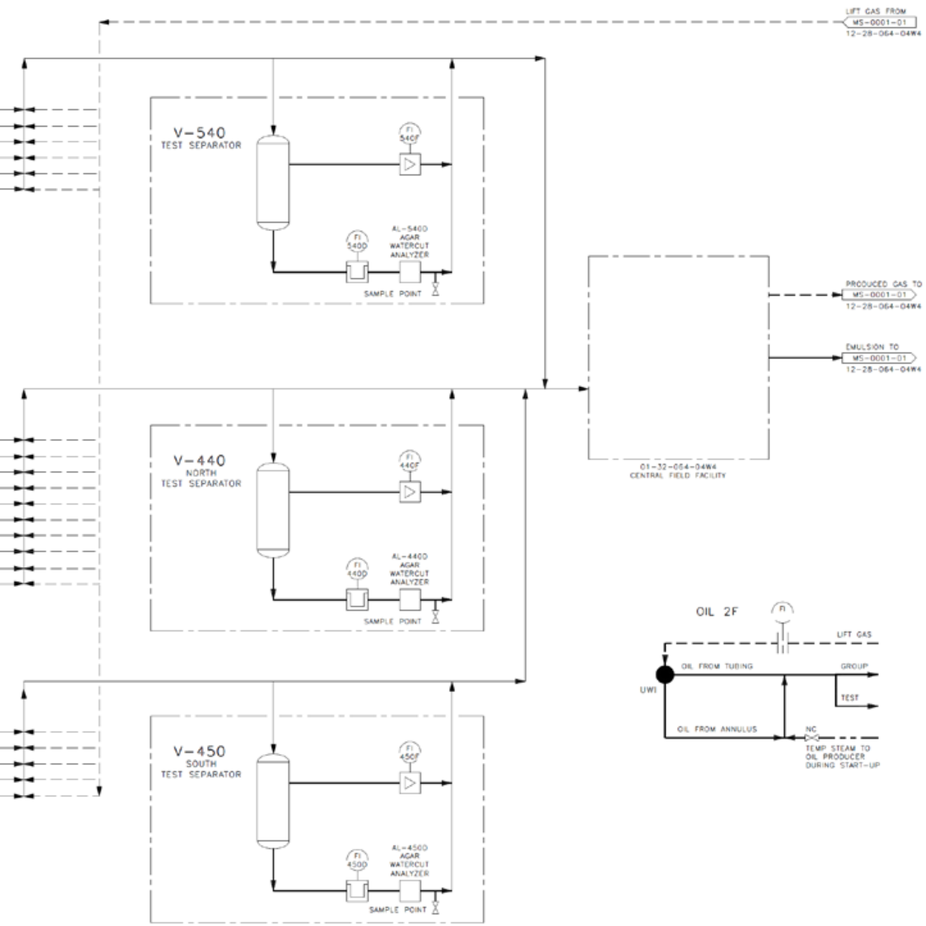
WELL NAME	UWI	LSD	LIC/OPER	DETAIL	STATUS	FUEL	TOE	HEEL
GA05P	105/15-32-064-04W4/00	07-32-064-04W4	HUSKY	OIL 2F	PRODUCING	–	FIC-505N	FIC-505P
GA06P	106/15-32-064-04W4/00	07-32-064-04W4	HUSKY	OIL 2F	PRODUCING	–	FIC-506N	FIC-506P
GA01P	119/16-32-064-04W4/00	07-32-064-04W4	HUSKY	OIL 2F	PRODUCING	–	FIC-501N	FIC-501P
GA02P	120/16-32-064-04W4/00	07-32-064-04W4	HUSKY	OIL 2F	PRODUCING	–	FIC-502N	FIC-502P
GA03P	121/16-32-064-04W4/00	07-32-064-04W4	HUSKY	OIL 2F	PRODUCING	–	FIC-503N	FIC-503P
GA04P	122/16-32-064-04W4/00	07-32-064-04W4	HUSKY	OIL 2F	PRODUCING	–	FIC-504N	FIC-504P

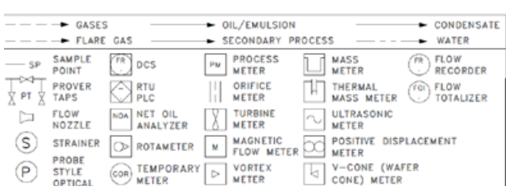
AB BT 0089133 — WELL PAD D NORTH

WELL NAME	UWI	LSD	LIC/OPER	DETAIL	STATUS	FUEL	TOE	HEEL
D24P	111/07-28-064-04W4/00	07-28-064-04W4	HUSKY	OIL 2F	PRODUCING	–	FIC-424N	FIC-424P
D25P	112/07-28-064-04W4/00	07-28-064-04W4	HUSKY	OIL 2F	PRODUCING	–	FIC-425N	FIC-425P
D26P	113/07-28-064-04W4/00	07-28-064-04W4	HUSKY	OIL 2F	PRODUCING	–	FIC-426N	FIC-426P
D27P	114/07-28-064-04W4/00	07-28-064-04W4	HUSKY	OIL 2F	PRODUCING	–	FIC-427N	FIC-427P
D28P	115/07-28-064-04W4/00	07-28-064-04W4	HUSKY	OIL 2F	PRODUCING	–	FIC-428N	FIC-428P
D29P	116/07-28-064-04W4/00	07-28-064-04W4	HUSKY	OIL 2F	CIRCULATION	–	FIC-429N	FIC-429P
D30P	104/02-28-064-04W4/00	02-28-064-04W4	HUSKY	OIL 2F	CIRCULATION	–	FIC-430N	FIC-430P
D31P	105/02-28-064-04W4/00	02-28-064-04W4	HUSKY	OIL 2F	CIRCULATION	–	FIC-431N	FIC-431P
D32P	106/02-28-064-04W4/00	02-28-064-04W4	HUSKY	OIL 2F	CIRCULATION	–	FIC-432N	FIC-432P
D33P	107/02-28-064-04W4/00	02-28-064-04W4	HUSKY	OIL 2F	CIRCULATION	–	FIC-433N	FIC-433P

AB BT 0089133 — WELL PAD D SOUTH

WELL NAME	UWI	LSD	LIC/OPER	DETAIL	STATUS	FUEL	TOE	HEEL
D34P	112/02-28-064-04W4/00	02-28-064-04W4	HUSKY	OIL 2F	CIRCULATION	–	FIC-434N	FIC-434P
D35P	111/02-28-064-04W4/00	02-28-064-04W4	HUSKY	OIL 2F	CIRCULATION	–	FIC-435N	FIC-435P
D36P	115/02-28-064-04W4/00	02-28-064-04W4	HUSKY	OIL 2F	CIRCULATION	–	FIC-436N	FIC-436P
D37P	108/02-28-064-04W4/00	02-28-064-04W4	HUSKY	OIL 2F	CIRCULATION	–	FIC-437N	FIC-437P
D38P	109/02-28-064-04W4/00	02-28-064-04W4	HUSKY	OIL 2F	CIRCULATION	–	FIC-438N	FIC-438P





REF DWG NO	REFERENCE DRAWING DESCRIPTION
MS-0000-01	AREA OVERVIEW
MS-0001-01 & 02	FACILITY DRAWING
MS-0002-01,02,03&05	GATHERING SYSTEM
MS-0007-01	STEAM INJECTION SYSTEM
MS-0010-01	LACT UNIT

NO	REVISION HISTORY	REV AUTHOR	REV DATE	ISSUED FOR
1	UPDATED PER MARK UPS SUPPLIED BY TIAN QIU	WDA	2012/02/01	AS BUILT
2	UPDATED PER MARK-UPS FROM ALLYSON HADLAND	DMW	2013/06/07	AS BUILT
3	UPDATED PER MARK UPS FROM ALLYSON HADLAND	SK	2014/08/20	AS BUILT
4	UPDATED FROM MARK UPS SUPPLIED BY ALLYSON HADLAND	BRW	2015/02/24	AS BUILT
5	UPDATED FROM MARK UPS SUPPLIED BY PETE CURRAN	BRW	2015/07/06	AS BUILT
6				
7				

22206

NO	CURRENT REVISION
6	UPDATED FROM MARK UPS SUPPLIED BY PETE CURRAN

Husky Oil Operations Limited

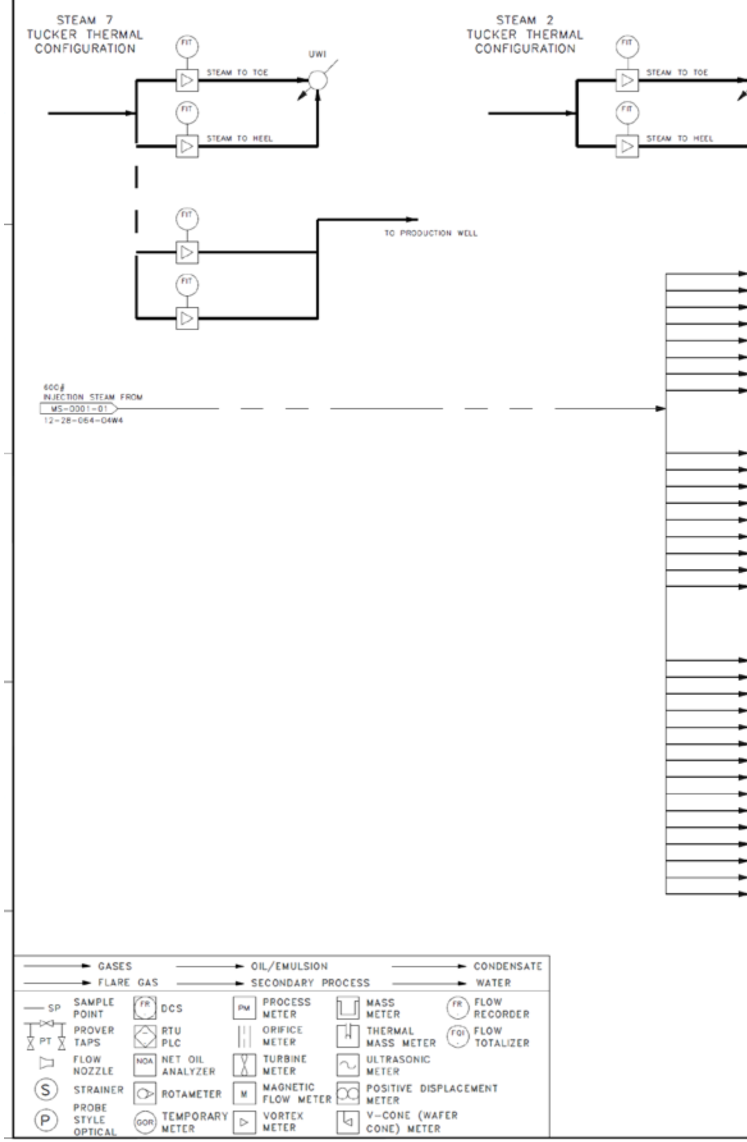
TUCKER CENTRAL PLANT 12-28-064-04W4

GATHERING SYSTEM
MEASUREMENT SCHEMATIC

ISSUED FOR	AS BUILT
DOC DATE	2015/07/27
DOC AUTHOR	BRM
SCALE	NTS
ALTERNATE IDENTIFIER	
SURFACE LSD	12-28-064-04W4
DOCUMENT IDENTIFIER	MS-0002-04

Measurement and Reporting – Steam Injection

AB IF 0089451
HUSKY 12-28-064-04W4
HUSKY TUCKER 12-28 INJECTION
IN-SITU OIL SANDS INJECTION
LICENSEE: UNKNOWN
OPERATOR: HUSKY OIL OPERATIONS LTD



AB IF 0089451 — WELL PAD C

WELL NAME	UWI	LSD	LIC/OPER	DETAIL	STATUS	FUEL	TOE	HEEL
C20S	105/07-28-064-04W4/00	09-29-064-04W4	HUSKY	STEAM 7	PRODUCING	–	FIC-320E	FIC-320F
C17S	103/10-28-064-04W4/00	09-29-064-04W4	HUSKY	STEAM 7	PRODUCING	–	FIC-317E	FIC-317F
C16S	105/10-28-064-04W4/00	09-29-064-04W4	HUSKY	STEAM 7	PRODUCING	–	FIC-316E	FIC-316F
C18S	107/10-28-064-04W4/00	09-29-064-04W4	HUSKY	STEAM 7	PRODUCING	–	FIC-318E	FIC-318F
C19S	108/10-28-064-04W4/00	09-29-064-04W4	HUSKY	STEAM 7	PRODUCING	–	FIC-319E	FIC-319F
C13S	104/15-28-064-04W4/00	16-29-064-04W4	HUSKY	STEAM 7	PRODUCING	–	FIC-313E	FIC-313F
C15S	106/15-28-064-04W4/00	09-29-064-04W4	HUSKY	STEAM 7	PRODUCING	–	FIC-315E	FIC-315F
C14S	108/15-28-064-04W4/00	16-29-064-04W4	HUSKY	STEAM 7	PRODUCING	–	FIC-314E	FIC-314F

AB IF 0089451 — WELL PAD C

WELL NAME	UWI	LSD	LIC/OPER	DETAIL	STATUS	FUEL	TOE	HEEL
C1S	100/12-29-064-04W4/00	09-29-064-04W4	HUSKY	STEAM 2	PRODUCING	–	FIC-301C	FIC-301D
C2S	104/12-29-064-04W4/00	09-29-064-04W4	HUSKY	STEAM 2	PRODUCING	–	FIC-302C	FIC-302D
C3S	107/12-29-064-04W4/00	09-29-064-04W4	HUSKY	STEAM 2	PRODUCING	–	FIC-303C	FIC-303D
C4S	108/12-29-064-04W4/00	09-29-064-04W4	HUSKY	STEAM 2	PRODUCING	–	FIC-304C	FIC-304D
C6S	106/13-29-064-04W4/00	09-29-064-04W4	HUSKY	STEAM 2	PRODUCING	–	FIC-306C	FIC-306D
C7S	107/13-29-064-04W4/00	16-29-064-04W4	HUSKY	STEAM 2	PRODUCING	–	FIC-307C	FIC-307D
C5S	108/13-29-064-04W4/00	09-29-064-04W4	HUSKY	STEAM 2	PRODUCING	–	FIC-305C	FIC-305D
C8S	109/13-29-064-04W4/00	16-29-064-04W4	HUSKY	STEAM 2	PRODUCING	–	FIC-308C	FIC-308D
C9S	104/07-32-064-04W4/00	16-29-064-04W4	HUSKY	STEAM 2	PRODUCING	–	FIC-309C	FIC-309D

AB IF 0089451 — WELL PAD D

WELL NAME	UWI	LSD	LIC/OPER	DETAIL	STATUS	FUEL	TOE	HEEL
D24S	106/07-28-064-04W4/00	07-28-064-04W4	HUSKY	STEAM 7	PRODUCING	–	FIC-424H	FIC-424H
D25S	107/07-28-064-04W4/00	07-28-064-04W4	HUSKY	STEAM 7	PRODUCING	–	FIC-425H	FIC-425H
D26S	108/07-28-064-04W4/00	07-28-064-04W4	HUSKY	STEAM 7	PRODUCING	–	FIC-426H	FIC-426H
D27S	109/07-28-064-04W4/00	07-28-064-04W4	HUSKY	STEAM 7	PRODUCING	–	FIC-427H	FIC-427H
D28S	110/07-28-064-04W4/00	07-28-064-04W4	HUSKY	STEAM 7	PRODUCING	–	FIC-428H	FIC-428H
D29S	117/07-28-064-04W4/00	07-28-064-04W4	HUSKY	STEAM 7	CIRCULATION	–	FIC-429H	FIC-429H
D30S	116/02-28-064-04W4/00	02-28-064-04W4	HUSKY	STEAM 7	CIRCULATION	–	FIC-430H	FIC-430H
D31S	114/02-28-064-04W4/00	02-28-064-04W4	HUSKY	STEAM 7	CIRCULATION	–	FIC-431H	FIC-431H
D32S	118/02-28-064-04W4/00	02-28-064-04W4	HUSKY	STEAM 7	CIRCULATION	–	FIC-432H	FIC-432H
D33S	119/02-28-064-04W4/00	02-28-064-04W4	HUSKY	STEAM 7	CIRCULATION	–	FIC-433H	FIC-433H
D34S	117/02-28-064-04W4/00	02-28-064-04W4	HUSKY	STEAM 7	CIRCULATION	–	FIC-434H	FIC-434H
D35S	120/02-28-064-04W4/00	02-28-064-04W4	HUSKY	STEAM 7	CIRCULATION	–	FIC-435H	FIC-435H
D36S	121/02-28-064-04W4/00	02-28-064-04W4	HUSKY	STEAM 7	CIRCULATION	–	FIC-436H	FIC-436H
D37S	110/02-28-064-04W4/00	02-28-064-04W4	HUSKY	STEAM 7	CIRCULATION	–	FIC-437H	FIC-437H
D38S	113/02-28-064-04W4/00	02-28-064-04W4	HUSKY	STEAM 7	CIRCULATION	–	FIC-438H	FIC-438H

NOTES

1. TWO METER INSTALLATION ONLY. ACCESS TO ROUTE STEAM TO PRODUCTION WELL NOT AVAILABLE.
2. FOUR METER INSTALLATION EXISTS AND FLOW METER USE IS DEPENDENT UPON THE WELL CONTROL MODE.

ENGINEERING COMPANY PERMIT STAMP | REGISTERED PROFESSIONAL ENGINEER STAMP

REFERENCE DRAWINGS

REF	DRAWING NUMBER	DRAWING TITLE
6		
5		
4		
3		
2	MS-0007-02	STEAM INJECTION SYSTEM
1	MS-0007-01	STEAM INJECTION SYSTEM

REVISION HISTORY

REV	DATE	DESCRIPTION	BY	CHK	ENG	APR
4	2015/07/27	UPDATED FROM MARK UPS SUPPLIED BY PETE CURRAN	BRM	PC	PC	PC
3	2015/07/06	UPDATED FROM MARK UPS SUPPLIED BY PETE CURRAN	BRM	PC	PC	PC
2	2015/02/24	UPDATED FROM MARK UPS SUPPLIED BY ALLYSON HADLAND	BRM	AH	AH	AH
1	2014/08/29	NOT REQUIRED FOR THIS REVISION	SK			

Husky Oil Operations Limited

TUCKER CENTRAL PLANT 12-28-064-04W4
"C" and "D" PADS

TITLE: STEAM INJECTION SYSTEM MEASUREMENT SCHEMATIC

SURFACE LOCATION	12-28-064-04W4		
ALTERNATE DWG NUMBER		REV NO	
HUSKY DWG NUMBER	12-28-064-04W4-MS-0007-02		4
VENDOR DWG NUMBER		SCALE	
AMU/FLOC NUMBER	OS-TT-001-00001		NTS
DCN NO		PROJECT NO	

Estimating Well Production

- Oil and Water Estimated by Well Test:
  - Battery level measurement prorated to wells based on the estimates

- Two Test Separator Designs (Well Tests):

  1. Blow-Case (Pads A Original, B, C East, C West):
     - Loadcell or level
     - Vortex for steam + natural gas
     - AGAR water-cut analyzer
     - Steam fraction calculated (from P_{sat} / P_{meas})

  2. Conventional (Pads B North, A Redrill & Replacement Wells, GA, D East):
     - Coriolis meter for liquid
     - Vortex for steam + natural gas
     - AGAR water-cut analyzer
     - Steam fraction calculated (from P_{sat} / P_{meas})

- Gas Measured at the Battery (proration = 1):
  - GOR for August 1, 2014 to July 31, 2015 = 48.1 m^3/m^3

- Steam Injection:
  - Heel and toe vortex meters per well
  - Total steam to field measured at the battery
  - Steam Proration = 1.020 m^3/m^3

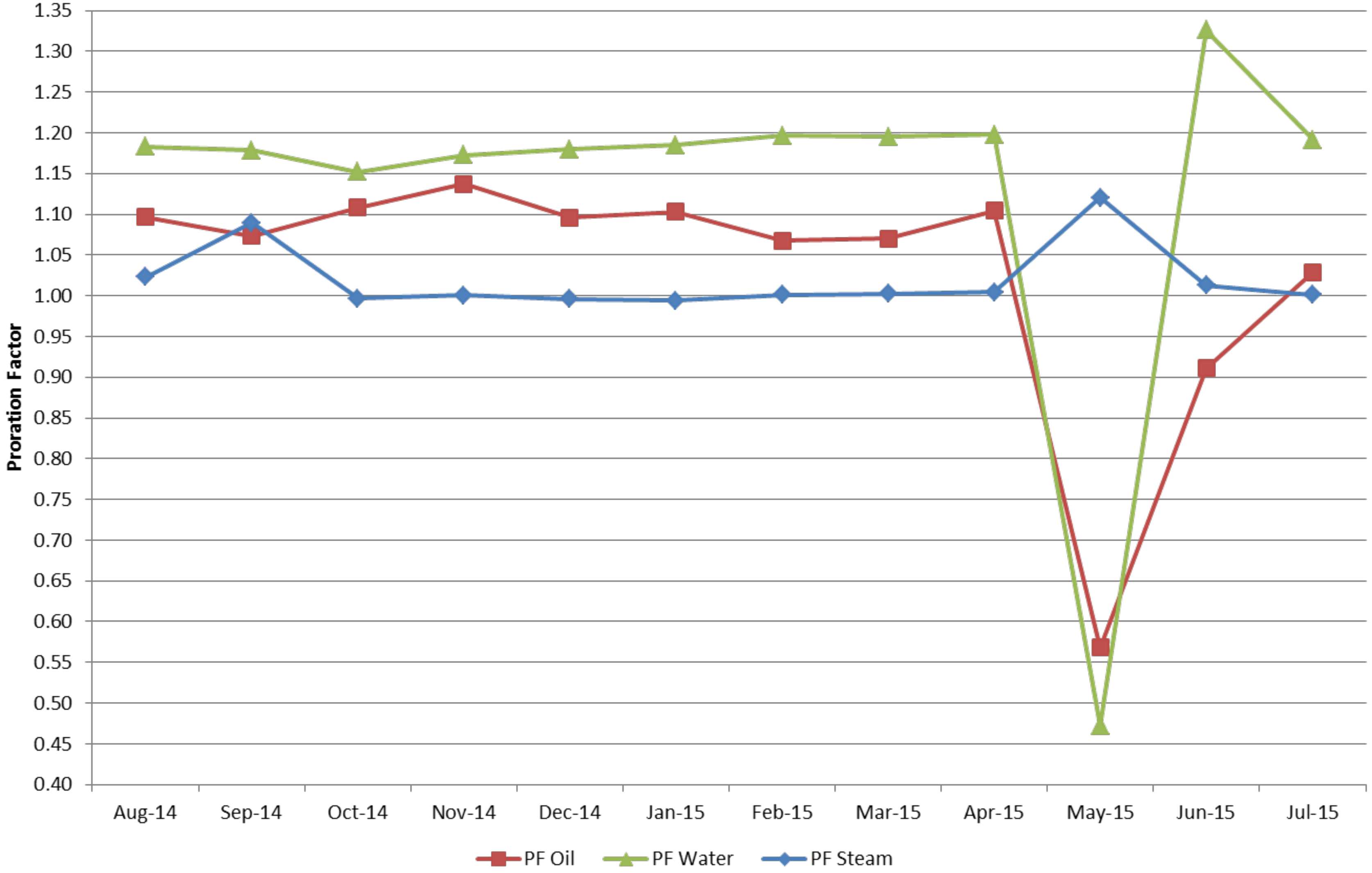
Water Balance

- Water Proration Factors (see next slide):
  - Average 12-Month Rolling Proration Factors
    - Water = 1.14
    - Oil = 1.03

- Water / Steam Meter Calibrations:
  - Metering equipment inspected / calibrated annually
  - Annual well steam injection meters inspection per Directive 017
  - AGAR water cut analyzer calibration program reviewed and updated
  - AER Directive 041 annual submission

- Metering Accuracy:
  - Accounting meters conform to Directive 017 single point measurement accuracy

Estimating Well Production – Proration Factors



Well Test Averages

Test Separator	Well Group	Average Test Duration (hours/test/month)	Average Test Frequency (well/month)
V-151/2	A9-16 (Aug - Dec) A1-8 (Jan - Apr)	4.3 4.9	13.7 8.2
V-251/2	B1-12	3.9	6.2
V-351/2	C1-9	4.2	9.1
V-391/2	C13-20	3.6	15.2
V-170	A9-16 (Jan - Jul) A17-20 (Aug - Dec) A17-20 (Jan - Jul)	4.5 9.2 5.5	7.8 19.5 11.1
V-171	A21-24	7.3	19.6
V-213A	B9EP	23.4	26.2
V-214A	B10EP	23.4	26.4
V-215A	B11EP	23.3	26.5
V-540	GR01-06	6.4	14.5
V-440	D24-28	5.1	8.6

Solvents and Condensable Gas

- Bitumen production accounts for diluent flash and volumetric shrinkage
- No solvent injection to reservoir
- There is no non-condensable gas injection

Measurement Initiatives – Continuous Improvement

- Measurement, Accounting and Reporting Plan (MARP) submitted with new primary produced water proposed

- No technical issues identified with measurement equipment:
  - Meter accuracy verified

- Implemented improvements:
  - Detailed review of measurement schematics to include:
    - Pad D East test separator and steam injection
    - Injectors Converted to Producers: Pads A1-8, B10-12
    - Steam injection schematics 600# and 900# steam
  - Produced water orifice plate bypass, new isolation valve installed during turnaround
  - Radar level detection on Dilbit sales tanks
  - Monthly ultrasonic meter servicing

- Future opportunities:
  - Produced water meter installation (magnetic flow tube upstream of WLS)
  - Detailed review of steam calculation in overhead test separator gas

4. Water Production, Injection and Uses

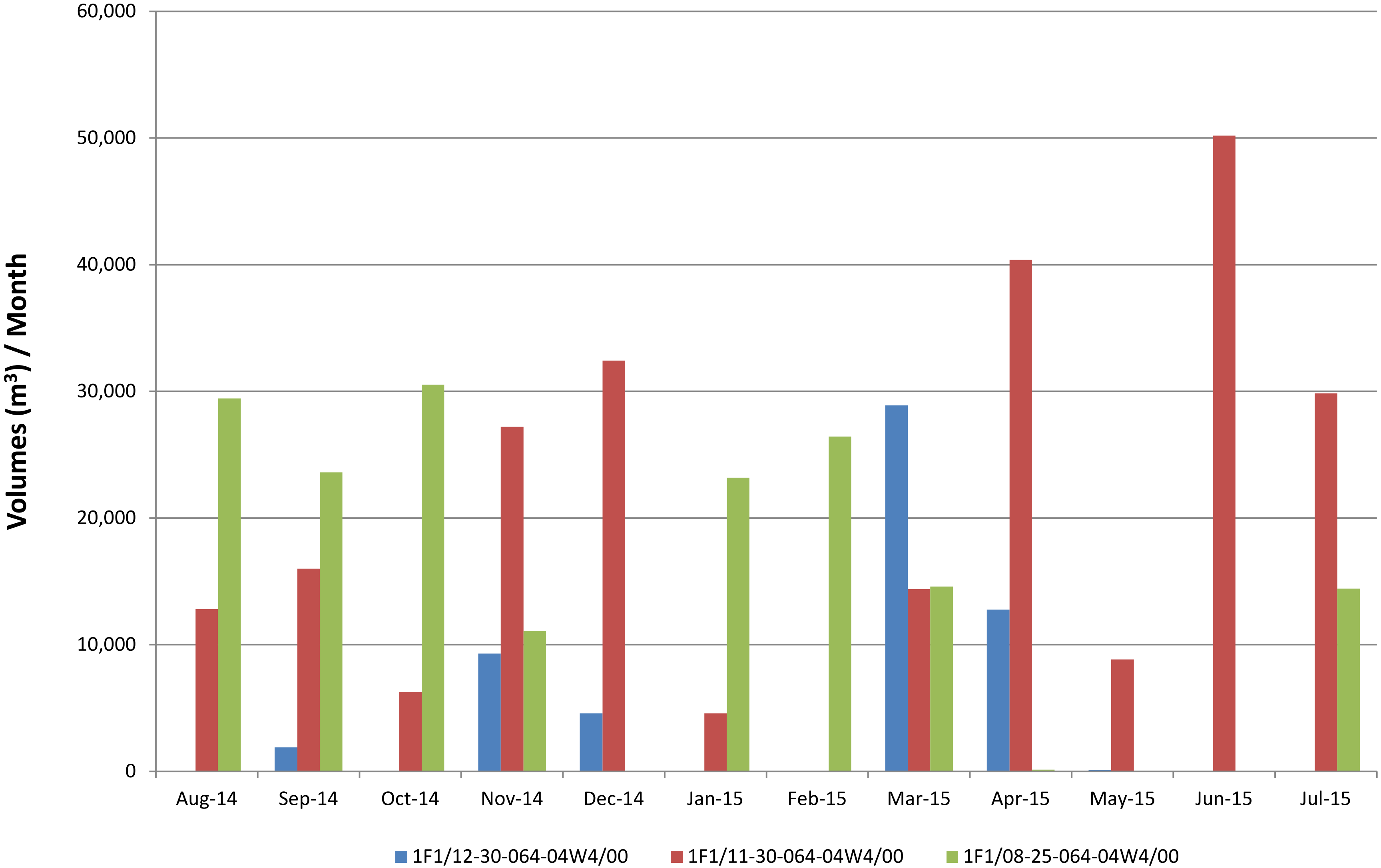
Brackish Water

- Make-up water for steam generation
- McMurray Formation
- 3 Source Wells:
  - 1F1/11-30-064-04 W4M
  - 100/12-30-064-04 W4M
  - 1F1/08-25-064-04 W4M

Water Usage

- Using brackish water ~20,000 ppm Total Dissolved Solids (TDS) for steam generation (when required)
- Normally no fresh water is used in our process
- Temporary fresh water license granted for start-up from turnaround:
  - License WTH-2006 #00365945
  - 4,118 m^3 used of 69,000 m^3 allowable
  - Used from May 1, 2015 to July 31, 2015

Brackish Water Consumption



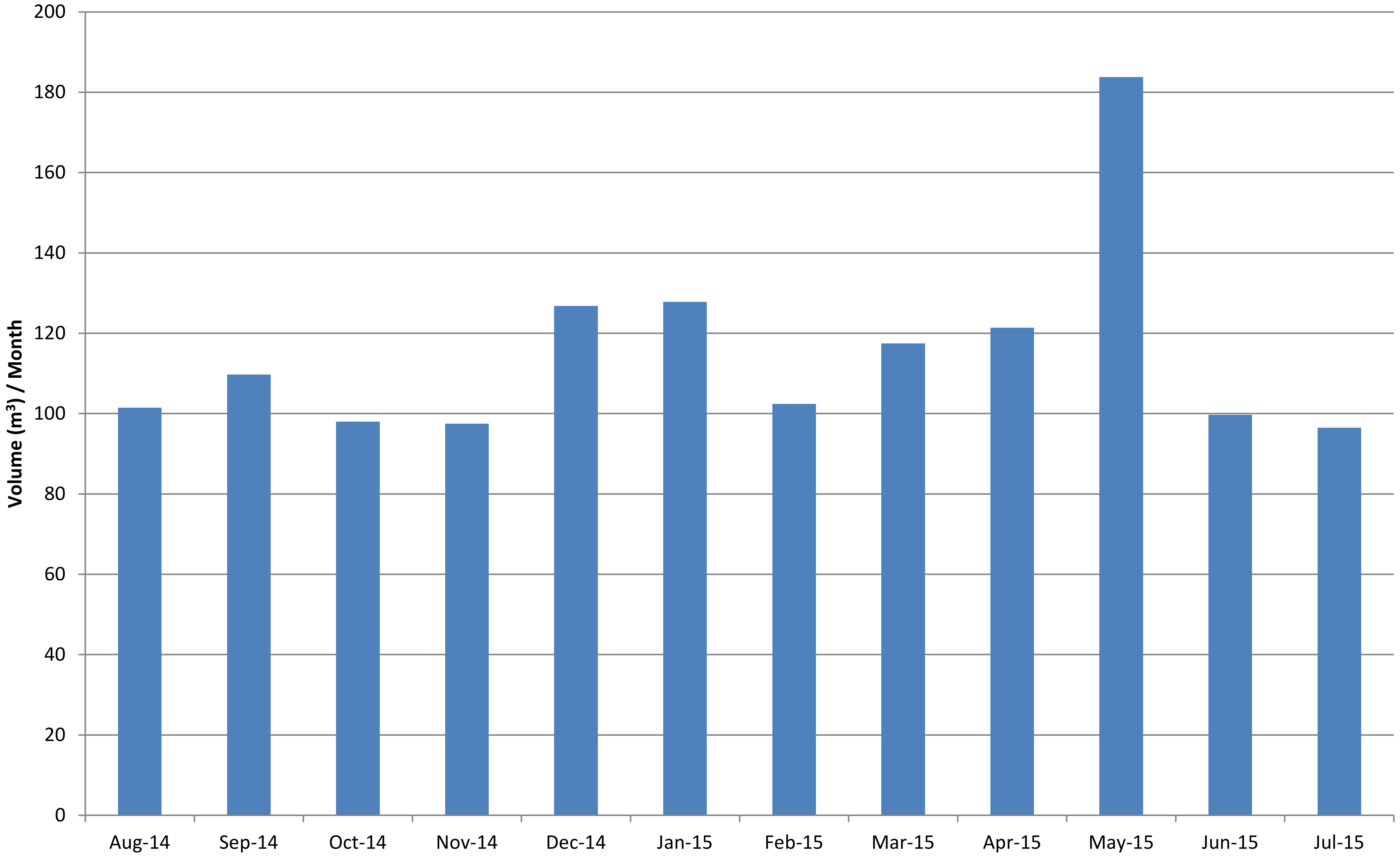
Fresh Water

- Domestic use only:
  - Safety showers / eye-wash stations
  - Cleaning water
  - Washroom / kitchen uses

- Bonnyville Aquifer

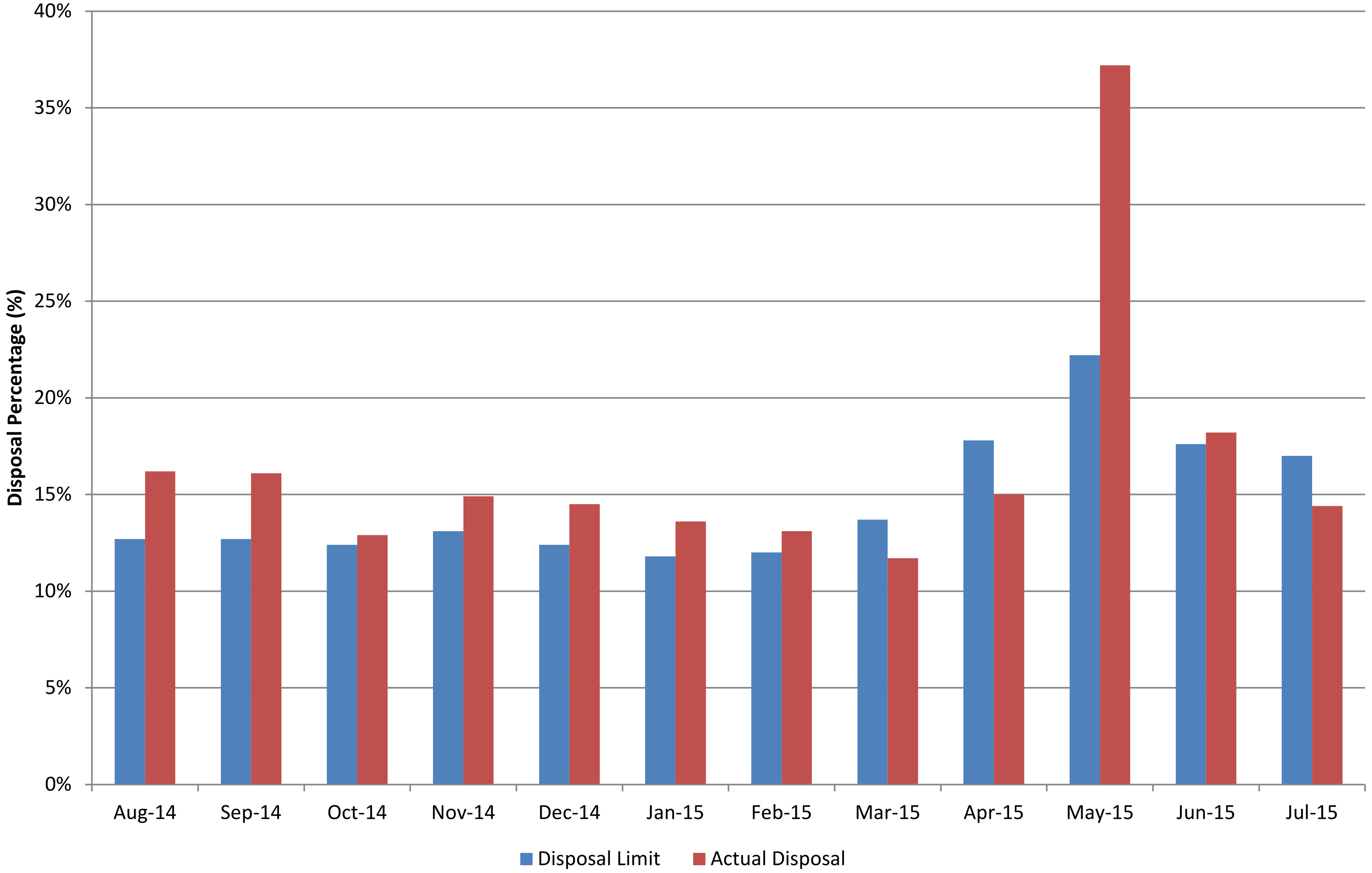
- 100/12-28-064-04-W4

Fresh Water Consumption

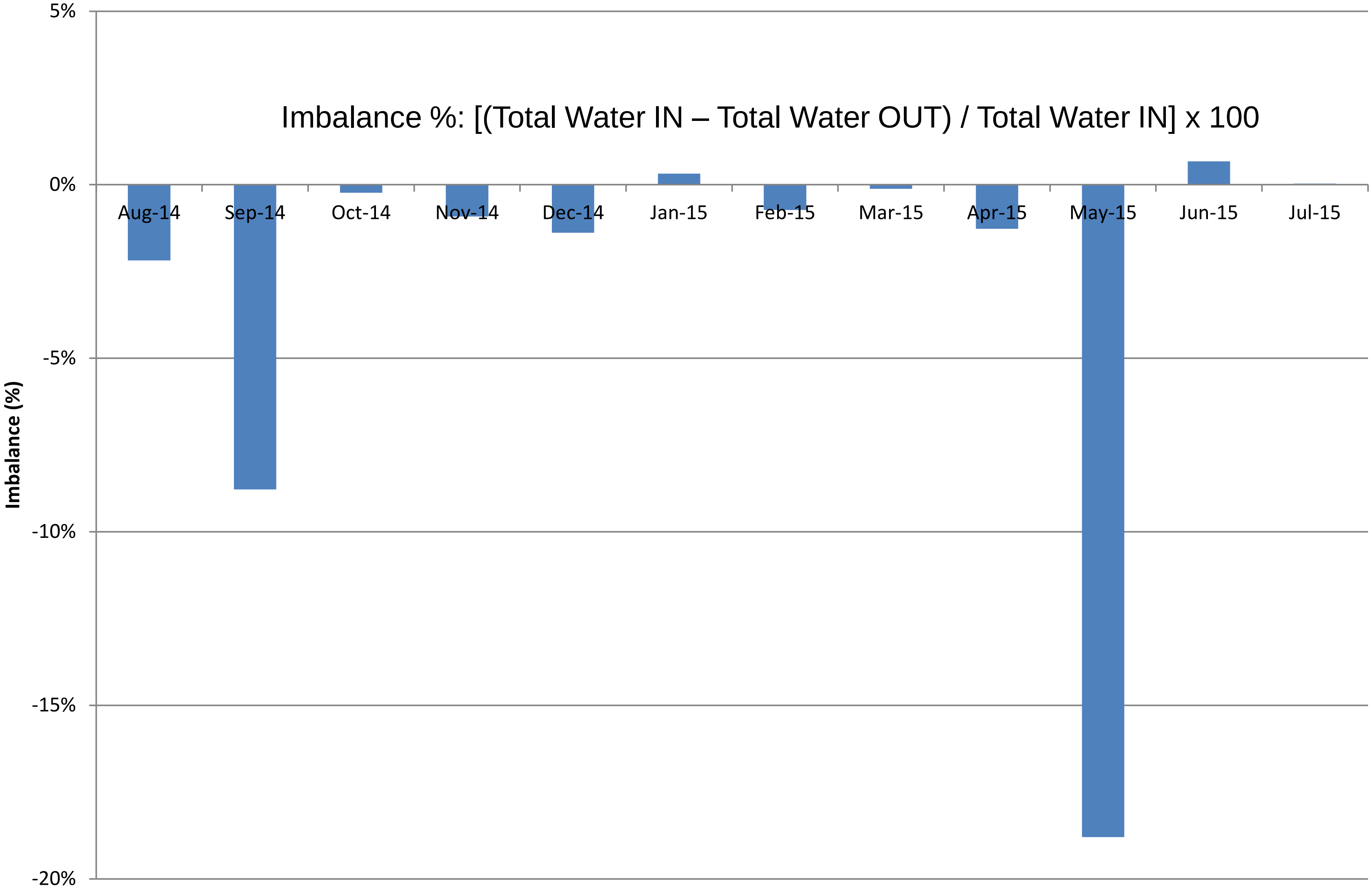


Produced Water & Steam Injected

Water Disposal Limits



Monthly Injection Water Balance



OTSG Blow-down Recycle

- OTSG blow-down is recycled to the Warm Lime Softener (WLS) at a percentage that allows the total dissolved solids, out of the OTSG, to remain below 50,000 uS/cm
- Brackish water make-up has a very high TDS and affects OTSG blow-down recycle
- Recycle approximately 41% of our blow-down back to the WLS

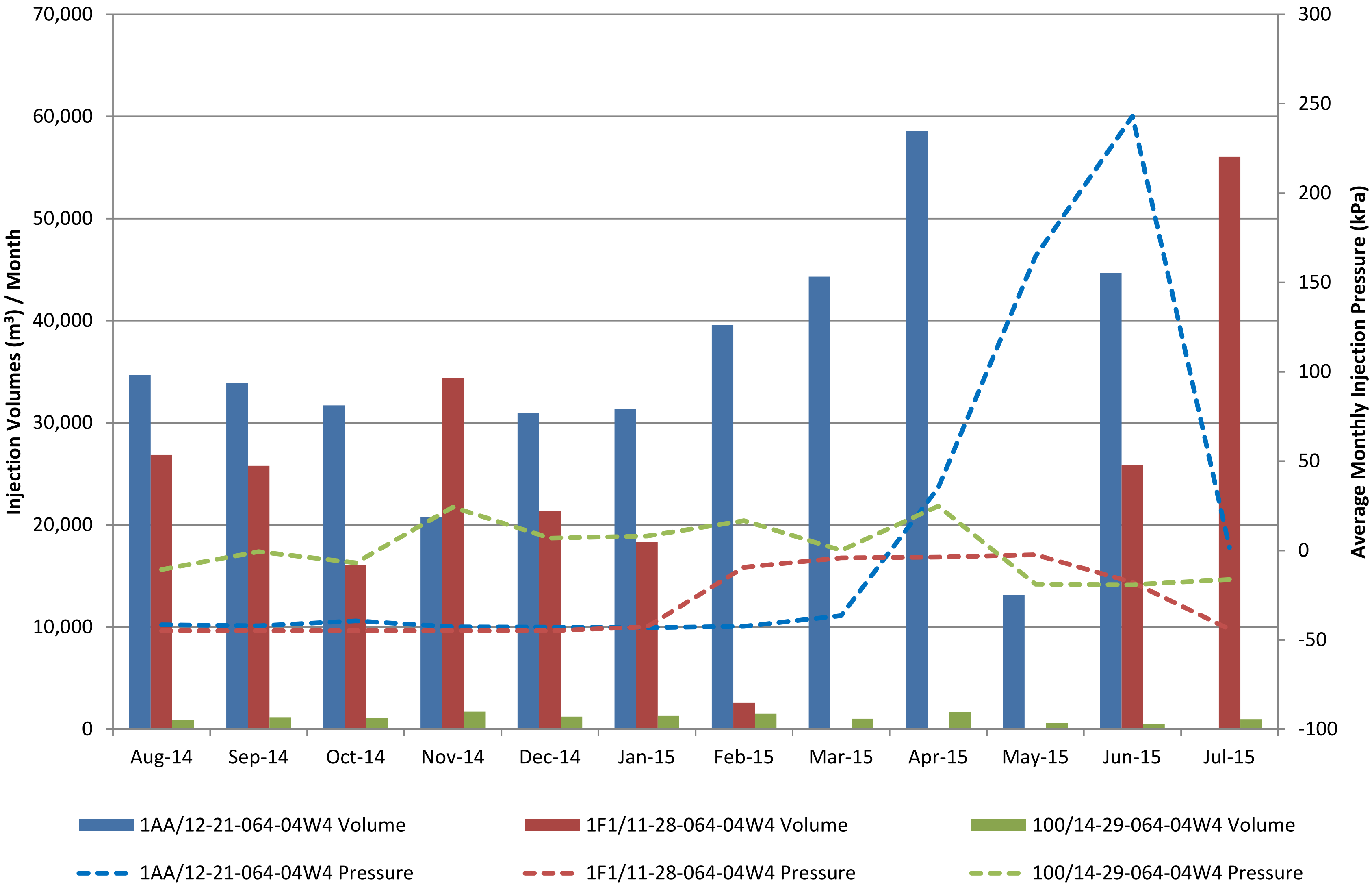
Disposal Wells

- AER Class 1 Wastewater Disposal Wells

- Boiler blow-down disposal:
  - AA/12-21-064-04 W4M (AER Approval 10591)
  - 1F1/11-28-064-04 W4M (AER Approval 10591)
  - 00/04-28-064-04W4/0 (AER Approval 10591A) – licensed

- Water treatment process disposal:
  - 00/14-29-064-04 W4M (AER Approval 10591)

Disposal Wellhead Injection Pressures & Volumes



Landfill Waste Handling

- No landfill within facility

- All landfill waste streams disposed offsite at licensed facilities

Waste Volumes

AER Waste Code	Waste Description	Location Sent To	Final Handling Method	Unit	Total
ACID	Acid Solutions (unneutralized)	Rbw Waste Management Ltd	Recycling Facility (excluding used oil)	0.002	m3
BATT	Batteries Wet and Dry Cell	Rbw Waste Management Ltd	Recycling Facility (excluding used oil)	1.405	m3
CAUS	Caustic Solutions Unneutralized, Spent	Rbw Waste Management Ltd	Other (specify)	0.04	m3
			Recycling Facility (excluding used oil)	0.002	m3
COEMUL	Condensate/Crude Oil Emulsions	Tervita - Lindbergh	Cavern	1715.42	m3
DOMWST	Garbage Domestic Waste	Rbw Waste Management Ltd	Recycling Facility (excluding used oil)	78.7	m3
EMTCON	Aerosol Cans Empty	Rbw Waste Management Ltd	Recycling Facility (excluding used oil)	0.41	m3
	Empty Container Plastic Drums (Non rbw)	Rbw Waste Management Ltd	Recycling Facility (excluding used oil)	2.255	m3
	Empty Container Plastic	Rbw Waste Management Ltd	Recycling Facility (excluding used oil)	21.305	m3
FILLUB	Filters Lube Oil	Rbw Waste Management Ltd	Recycling Facility (excluding used oil)	0.205	m3
FILOTH	Filters Other (Raw Fuel Gas, NGL's)	Rbw Waste Management Ltd	Recycling Facility (excluding used oil)	0.7	m3
FILWTT	Cav Filter (Media) Water Treatment	Tervita - Lindbergh	Cavern	57.33	m3
LUBOIL	Lubricating Oil Hydrocarbon & Synthetic	Rbw Waste Management Ltd	Recycling Facility (excluding used oil)	0.205	m3
NORM	Naturally Occurring Radioactive Materials NORMs	Rbw Waste Management Ltd	Recycling Facility (excluding used oil)	1.4	m3
OILABS	Absorbents	Rbw Waste Management Ltd	Recycling Facility (excluding used oil)	1.26	m3
OILRAG	Rags Oily	Rbw Waste Management Ltd	Recycling Facility (excluding used oil)	2.08	m3
ORGCHM	Chemicals Organic	Rbw Waste Management Ltd	Other (specify)	0.338	m3
PIGWST	Pigging Waste Liquid and Wax	Rbw Waste Management Ltd	Class Ia Landfill	0.205	m3
SAND	Stung Sand	Tervita - Lindbergh	Cavern	33.96	m3
SLGEML	Sludge - Cavern	Tervita - Lindbergh	Cavern	20.1	m3
SLGHYD	Sludge - Cavern	Tervita - Lindbergh	Cavern	636.9	m3
SLGLIM	Lime Sludge	Tervita - Bonnyville Landfill	Class II Landfill	23175.13	Tonnes
		Tervita - Lindbergh	Cavern	9.27	m3
SMETAL	Metal Scrap	Rbw Waste Management Ltd	Recycling Facility (excluding used oil)	0.42	m3
SOILCO	Contaminated Debris and Soil Crude Oil Condensate	Clean Harbors - Ryley Class Ia	Class Ia Landfill	4	m3
		Rbw Waste Management Ltd	Recycling Facility (excluding used oil)	2	m3
THPROT	Thread Protectors Casing Tubing	Clean Harbors - Ryley Class Ia	Class Ia Landfill	60	m3
		Rbw Waste Management Ltd	Recycling Facility (excluding used oil)	20	m3
WSHWTR	Cav Wash Fluid Water	Tervita - Lindbergh	Cavern	77.97	m3
WSTFLQ	Waste Flammable Liquid	Rbw Waste Management Ltd	Other (specify)	0.02	m3
WWOFLD	Waste Water	Tervita - Lindbergh	Cavern	20	m3

5. Sulphur Production

Sulphur Dioxide (SO_2) Sources

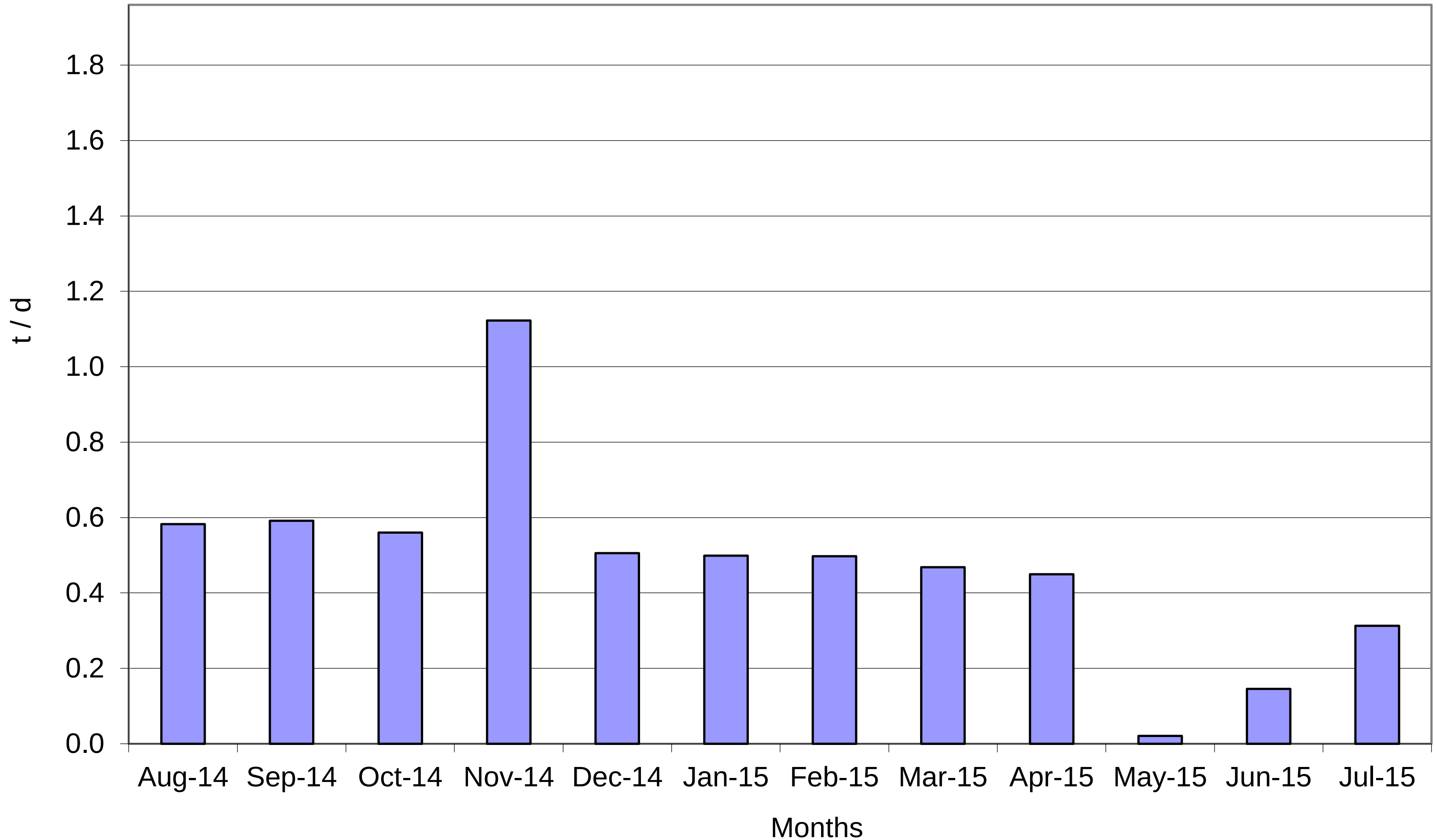
- Five Once-Through Steam Generators (OTSG)
- One High Pressure Flare Stack
- One Low Pressure Flare Stack

Quarterly SO_2 Emissions

Q3 2014 (August 2014 – October 2014)	53.17 tonnes
Q4 2014 (November 2014 – January 2015)	64.82 tonnes
Q1 2015 (February 2015 – April 2015)	41.91 tonnes
Q2 2015 (May 2015 – July 2015)	14.41 tonnes

SO_2 Emissions Trends

SO2 Emission Limit - 1.96 t / d



Peak and Average SO_2 Emissions

- August 1, 2014 to July 31, 2015:

SO_2 Emissions	
Average Daily (highest)	0.62 tonnes
Maximum Daily (highest)	0.76 tonnes

- Limit under EPEA Approval is 1.96 tonnes/day
- No exceedences

Ambient Air Monitoring

- Ambient air quality is currently monitored by the Lakeland Industry and Community Association (LICA) - Air Shed committee. LICA is under contract from the Alberta Environmental Monitoring, Evaluation and Reporting Agency (AEMERA) to provide these services.

- No exceedences were recorded during the last reporting period

- Airshed quality results available on LICA website or Clean Air Strategic Alliance (CASA) Data Warehouse

- http://www.lica.ca/

- http://www.casadata.org/

6. Environmental Issues

Environmental – Compliance to Approvals

- EPEA Approval:
  - No compliance issues during this reporting period

- AER:
  - No compliance issues during this reporting period

- DFO:
  - No compliance issues during this reporting period

Environmental - Amendments to EPEA Approval

- New EPEA approval 147753-01-00 was received July 24, 2015. This approval has an expiry date of June 30, 2025

Environmental – Wildlife

- As part of the regulatory approval, Husky has developed and implemented a Wildlife Monitoring Program (WMP) for:
  - Canadian toad distribution, abundance and population status
  - Above Ground Pipeline (AGP) monitoring to ensure wildlife can cross under the lines
  - Wildlife Habitat Enhancement Program (WHEP)

- Annual WMP report describes the observations and results collected during the previous year

Environmental - Industrial Wastewater

- Disposal Locations:
  - Boiler blow-down disposal 12-21-064-04W4M and 11-28-064-04W4M
  - Water treatment process disposal 14-29-064-04W4M
  - 316,985 m^3 was disposed

- Domestic Wastewater:
  - Domestic waste sludge is disposed of at the Cold Lake Municipal Treatment Facility or the Bonnyville Municipal Treatment Facility

- Industrial Run-off (from 2014 Annual Waste Water Report):
  - Total of five discharge locations (Pads: A, B, C, GA and run-off retention pond located on CPF)
  - A total of 42,047 m^3 surface water was discharged due to a very wet year
  - All discharges were in compliance with EPEA approval

Environmental - Soils

- The objective in 2014 was to delineate impacts identified as part of the 2013 soil monitoring program (SMP; Matrix 2014b) before developing a remediation plan for the site.

- The scope of work included:
  - Completing a thorough ground disturbance program to locate and mark all underground utilities and infrastructure within the subject areas prior to the start of the drilling program
  - Collecting soil samples from various locations at the site to assess soil conditions
  - Submitting soil samples to the laboratory for analysis of specified parameters
  - Preparing a report summarizing the program results

Environmental – Air

- Air related monitoring, reporting and studies are conducted by LICA under contract from AEMERA

- The LICA airshed monitoring network consists of 4 continuous monitoring stations, 26 passive monitoring stations, 2 volatile organic compound and polycyclic aromatic hydrocarbon samplers, and 2 soil acidification monitoring plots

Environmental – Ground Water

- Groundwater monitoring program includes:
  - CPF Groundwater: monitors shallow groundwater quality beneath the CPF
  - Pad Specific Groundwater: monitors possible impacts to groundwater quality
  - Regional Groundwater: monitors possible effects on regional groundwater quality between the project areas and the local lakes and streams

- 2015 Expansion to Groundwater Monitoring Program at the Pad Colony:
  - Addition of two new groundwater monitoring wells in the Bonnyville Unit 1 and Muriel Lake aquifers
  - No additional aquifers were present on the pad

Environmental – Initiatives

- Alberta Environmental Monitoring, Evaluation and Reporting Agency (AEMERA)

- Participation in the Lakeland Industry and Community Association (LICA)
  - Board of Directors
  - Beaver River Watershed Alliance (BRWA)
  - Airshed

- Participation in Alberta Biodiversity Monitoring Institute (ABMI)

  * Requirement of the new EPEA Approval

Environmental – Reclamation

- Objectives of the Annual Report (demonstrate and document):
  - Compliance with the development and reclamation approval
  - Site conditions and successful reclamation
  - General project development (surface disturbances) and reclamation activities
  - Problem areas and resolution

- Site Clearing and Timber Salvage:
  - Pipeline ROW for Pad Colony
  - Pad C to Pad D 10 m expansion
  - Pre Disturbance Assessment (PDA) completed for Pad C to Pad D 10 m expansion (December 17, 2014)

- Vegetation Monitoring:
  - Annual weed monitoring and control as per Husky's best practices

- Reclamation Activities:
  - No permanent reclamation activities were completed during the last reporting period

7. Compliance Statement

Compliance

- AER
  - All conditions of AER License F-32143 as well as all scheme approvals for the project were met during the past reporting period
  - All conditions of the EPEA approval 147753-00-00 and amendments were met during the last reporting period
  - New EPEA approval 147753-01-00 was effective July 24, 2015

Self Declarations

- No self declaration were made for this reporting period

8. Non-Compliance Events

Non-Compliance Issues

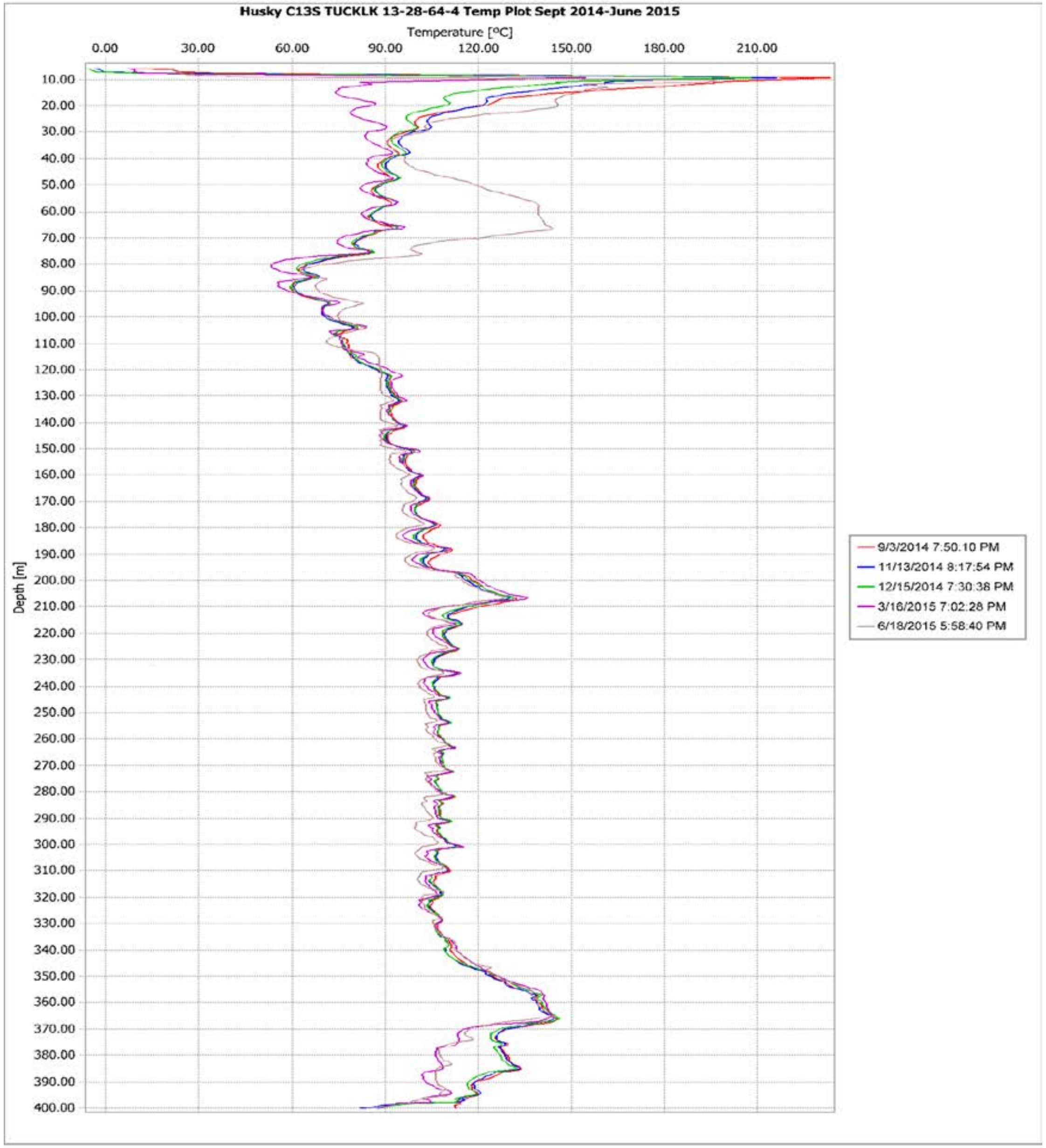
- Reportable Pipeline incident – Above ground Glycol pipeline release due to pin hole:
  - Reported August 3, 2014
  - Release contained in catch tray
    temporary clamp installed until replacement of failure during May 2015 turnaround
  - Final report to determine cause send to AER August 13, 2015
- Reportable spill – A18S well blowout when setting up for servicing work:
  - Reported May 2015
  - Cleanup complete June 30, 2015
- Reportable spill – tank overflow:
  - Reported June 9, 2015
  - Clean up complete June 10, 2015
  - Check valve failed causing fluid to flow into Warm Lime Softener Overflow tank
  - Roughly 10 m^3 release into containment
- Reportable release – 12-21 pipeline liner replacement:
  - Report June 24, 2015
  - Clean up complete June 24, 2015
  - During pigging operation surge occurred causing splashing of produced water out of containment

SCVF/GM Update – Summary

- No new SCVF/GM issues
- On-going, yearly monitoring of existing, non-serious vent flows
- C13S SCVF Update:
  - No SCVF
  - Monthly monitoring of H_2S and SCVF
  - Quarterly monitoring of temperature
  - Temperature log trend deviation in June 2015

  - Background Information:
    - Installation of VIT and temp monitoring, December 20, 2013
    - Resumed steaming to test remediation, December 24, 2013
    - Results: No SCVF nor H_2S since December 23, 2013
      - Update presentation to AER on May 29, 2014
      - Commitment:
        - » Monthly monitoring of H_2S and SCVF
        - » Quarterly monitoring of temperature
        - » Update in annual performance presentation

SCVF/GM Update – C13S Update Cont'd



- Temperature log trend deviation between 55-65 m and reached approx. 145 ºC
- No SCVF at C13S
- Increased temperature due to loss of insulation to a single joint in the VIT

Plan:

- Continue quarterly temperature monitoring and increase frequency of SCVF and H_2S monitoring to twice a month
- Next Temperature Log (September 2015)
- Husky will notify AER of any changes

8. Future Plans

Future Plans (2015/2016)

- Install, commission & start-up 6th OTSG and 3rd HP BFW pump
- Construct, commission & start-up Pad CN wells
- Construct, commission & start-up Pad C West replacement wells