

PROPOSED SINCLAIR UNIT NO. 23

Application for Enhanced Oil Recovery Waterflood Project

Middle Bakken/Three Forks Formations

Bakken – Torquay Pool (01 62A)

Daly Sinclair Field, Manitoba

August 9, 2019
Tundra Oil and Gas Partnership

INTRODUCTION

The Sinclair portion of the Daly Sinclair Oil Field is located in Ranges 28 and 29 W1 in Townships 7 and 8 (Figure 1). Since discovery in 2004, the main oilfield area was developed with vertical and horizontal wells at 40 acre spacing on Primary Production. Since early 2009, a significant portion of the main oilfield has been unitized and placed on Secondary Waterflood (WF) Enhanced Oil Recovery (EOR) Production, mainly from the Lyleton A & B members of the Three Forks Formation. Tundra Oil and Gas (Tundra) currently operates and continues to develop Sinclair Units 1-3, 5-8, 10-14 and 18-21.

In the southern part of the Sinclair field, potential exists for incremental production and reserves from a Waterflood EOR project in the Three Forks and Middle Bakken oil reservoirs. The following represents an application by Tundra to establish Sinclair Unit No. 23 (Section 19-8-29W1) and implement a Secondary Waterflood EOR scheme within the Three Forks and Middle Bakken formations as outlined on Figure 2.

The proposed project area falls within the existing designated 01-62A Bakken-Torquay Pool of the Daly Sinclair Oilfield (Figure 3).

SUMMARY

1. The proposed Sinclair Unit No. 23 will include 12 vertical and 2 horizontal wells within 16 Legal Sub Divisions (LSD) of the Middle Bakken/Three Forks producing reservoir. The project is located west of Sinclair Unit No. 1, north of Sinclair Unit No. 10 and south of Ebor Unit No. 3 (**Figure 2**).
2. Total Net Original Oil in Place (OOIP) in Sinclair Unit No. 23 has been calculated to be **1,390** e³m³ (8,741 Mbbl) for an average of **86.9** net e³m³ (546.4 Mbbl) OOIP per 40 acre LSD based on a 0.5 md cutoff.
3. Cumulative production to the end of April 2019 from the 14 wells within the proposed Sinclair Unit No. 23 project area was **47.2** e³m³ (297.0 Mbbl) of oil, and **53.6** e³m³ (337.0 Mbbl) of water, representing a **3.4%** Recovery Factor (RF) of the Net OOIP.
4. **Figure 4** shows the production from Sinclair Unit No. 23 peaked in November 2007 at 24.7 m³ of oil per day (OPD). As of April 2019, production was 3.11 m³ OPD, 1.69 m³ of water per day (WPD) and a 35.2% watercut. Decline analysis of the well primary production data forecasts total oil to continue to decline at an annual rate of approximately 30%.
5. Estimated Ultimate Recovery (EUR) of Primary Proved Producing oil reserves in the proposed Sinclair Unit No. 23 project area has been calculated to be **59.4** e³m³ (373.7 Mbbl), with **11.8** e³m³ (74.3 Mbbl) remaining as of the end of April 2019.
6. Ultimate oil recovery of the proposed Sinclair Unit No. 23 OOIP, under the current Primary Production method, is forecasted to be **4.3%**.
7. Estimated Ultimate Recovery (EUR) of proved oil reserves under Secondary WF EOR for the proposed Sinclair Unit No. 23 has been calculated to be **95.0** e³m³ (597.5 Mbbl), with **35.3** e³m³ (223.7 Mbbl) remaining. An incremental **35.6** e³m³ (223.7 Mbbl) of proved oil reserves, or **2.6%**, are forecasted to be recovered under the proposed Unitization and Secondary EOR production vs the existing Primary Production method.
8. Total RF under Secondary WF in the proposed Sinclair Unit No. 23 is estimated to be **6.8%**.
9. Based on the waterflood response in the adjacent main portion of the Sinclair field, the Three Forks and Middle Bakken Formations in the proposed project area are believed to be suitable reservoirs for WF EOR operations.
10. Existing horizontal wells, with multi-stage hydraulic fractures, will be converted to injection wells (**Figure 5**) within the proposed Sinclair Unit A, to complete waterflood patterns with effective 20 acre spacing similar to Sinclair Unit No. 10 Section 18-8-29W1.

DISCUSSION

The proposed Sinclair Unit No. 23 project area is located within Township 8, Range 29 W1 of the Daly Sinclair Oil Field. The proposed Sinclair Unit No. 23 currently consists of 12 vertical and 2 horizontal wells, within an area covering 16 LSDs in Section 19-008-29W1 (Figure 2). A project area well list complete with recent production statistics is attached as Table 3.

Tundra believes that the waterflood response in the adjacent main portion of the Sinclair field demonstrates potential for incremental production and reserves from a WF EOR project in the subject Middle Bakken and/or Three Forks oil reservoirs.

Geology

Stratigraphy:

The stratigraphy of the reservoir section for the proposed unit is shown on the structural cross-section attached as Appendix 1. The section runs SE to NW through the proposed Unit area. The producing sequence in descending order consists of the Upper Bakken Shale, Middle Bakken Siltstone, Lyleton A Siltstone (broken into Upper and Lower members), the Red Shale Marker, Lyleton B Siltstone and the Torquay Silty Shale. The reservoir units are represented by the Middle Bakken, Lyleton A and Lyleton B Siltstones. The Upper Bakken Shale is a black, organic rich, platy shale which forms the top seal for the underlying Middle Bakken and Lyleton reservoirs. The reservoir units in the proposed unit are analogous to the Bakken / Lyleton producing reservoirs that have been approved adjacent to the proposed unit (Sinclair Unit 1, Sinclair Unit 10, Sinclair Unit 3, and Ebor Unit 3) as noted on the Offsetting Units Map at Appendix 1.

Sedimentology:

The Middle Bakken reservoir consists of fine to coarse grained grey siltstone to fine sandstone which may be subdivided on the basis of lithologic characteristics into upper and lower units. The upper portion is very often heavily bioturbated and is generally non-reservoir. These bioturbated beds often contain an impoverished fauna consisting of well-worn brachiopod, coral and occasional crinoid fragments suggesting deposition in a marginal marine environment. The lower part of the Middle Bakken is generally finely laminated with alternating light and dark laminations with occasional bioturbation. Reservoir quality is highly variable within the Unit area. Within the proposed unit, the Middle Bakken thickness ranges from 0.2m to 2.7m (Appendix 4).

The Lyleton A reservoir within the proposed unit area consists of buff to tan medium to coarse siltstone (occasionally fine sandstone) made up of quartz, feldspar and detrital dolomite with minor mica and clay mostly in the form of clay clasts or chips. Clays do not generally occur as pore filling material, but rather as discrete grains within the siltstone. The Upper part is generally well bedded and shows evidence of parallel lamination with occasional wind ripples. The coarser siltstones are interbedded with finer grained grey-green siltstone similar in composition to the reservoir siltstone, but generally with lower permeability (i.e. < 0.1mD). These finer grained siltstones show evidence of haloturbation producing

smeared siltstone clasts floating in a fine grained grey-green siltstone matrix. The lower part of the Lyleton A generally shows a greater proportion of the grey-green fine-grained siltstone than the Upper and is generally a poorer reservoir. It also tends to exhibit greater amounts of haloturbation and pseudo-breccia of siltstone clasts in a finer grained siltstone matrix. Because of the fine grained matrix in this pseudo-breccia the connectivity between the clasts is much lower than the bedded siltstone and the Lower part of the Lyleton A is generally a poorer reservoir than the Upper part of the Lyleton A. Within the proposed unit area, the Upper Lyleton A ranges from over 0m, cropping out entirely, up to 4.8m (Appendix 5). The Lower Lyleton A in the proposed unit area ranges from 2.3m to 4.2m (Appendix 6).

The Red Shale Marker lies between the overlying Middle Bakken / Lyleton A and the underlying Lyleton B reservoir. It consists of brick red dolomitic siltstone which is highly water soluble and has low permeability. The Red Shale Marker is fairly consistent throughout the proposed unit area at about 3.5m thickness. The effectiveness of the Red Shale Marker unit as a permeability barrier is significantly decreased by induced hydraulic fracturing. As such, the Red Shale Marker is not an effective barrier to flow between the Middle Bakken and the Lyleton B over the proposed unit area.

The Lyleton B reservoir consists of buff to tan fine grained siltstone (occasionally very fine siltstone) made up of quartz, feldspar and detrital dolomite with minor mica and clay mostly in the form of clay clasts or chips. The Lyleton B is generally well bedded and shows evidence of parallel lamination with occasional wind ripples. The coarser siltstones are interbedded with dark grey-green or red very fine grained siltstone which is generally non-reservoir. The Lyleton B is between 4.9m-5.7m thick within the proposed unit (Appendix 7).

The Torquay (Three Forks) forms the base of the reservoir sequence and is a brick red or mint green dolomitic very fine siltstone similar to the Red Shale Marker and it forms a good basal seal to the Lyleton B reservoir.

Structure:

The structure within the proposed unit area is relatively consistent, dipping toward a low feature to the North, interpreted as being caused by dissolution of the underlying Prairie Evaporites (Appendix 3). Structural variations caused by dissolution are common in the Sinclair Field but do not appear to represent continuous barriers to lateral fluid flow within the reservoir as they do not appear to interrupt the lateral continuity of the reservoir beds (see cross-section Appendix 2).

Reservoir Continuity:

Lateral continuity of the reservoir units is an essential requirement of a successful waterflood. As demonstrated by the cross section and the isopach maps, all reservoir formations, the Middle Bakken, Lyleton A, and Lyleton B, are continuous throughout the proposed unit area. The upper portion of the Lyleton A does sub-crop but not the lower portion.

Vertical continuity between the Middle Bakken and underlying Lyleton A reservoir exists throughout the proposed unit as they are in direct contact. Vertical continuity between the Middle Bakken and Lyleton

A to the underlying Lyleton B reservoir is broken by the Red Shale marker in this area. This break in vertical continuity will not impede waterflood or production as induced hydraulic fracturing allows flow across the Red Shale.

Gross OOIP Estimates

Total volumetric OOIP for the Middle Bakken Lyleton A and Lyleton B within the proposed unit has been calculated to be **1,390 e³m³ (8,741 Mbbl)** using Tundra internally created maps. Maps used were generated from core data from wells available in the greater Sinclair area (**Appendix 8**).

An average net to gross ratio was calculated for each reservoir formation using pressure decay profile permeameter data (PDPK) with a cut off of 0.5mD on surrounding cored wells. To determine net pay these ratios are then applied to each formation thickness from isopach maps based on logs. Porosity is calculated in the same way, using an average for each formation, from surrounding core data after a 0.5mD cutoff.

Tabulated parameters for each LSD from the calculations can be found in **Table 4**.

OOIP values were calculated using the following volumetric equation:

$$OOIP = \frac{Area * Net Pay * Porosity * (1 - Water Saturation)}{Initial Formation Volume Factor of Oil}$$

or

$$OOIP(m3) = \frac{A * h * \phi * (1 - Sw)}{Bo} * \frac{10,000m2}{ha}$$

or

$$OOIP(Mbbl) = \frac{A * h * \phi * (1 - Sw)}{Bo} * 3.28084 \frac{ft}{m} * 7,758.367 \frac{bbl}{acre * ft} * \frac{1Mbbl}{1,000bbl}$$

where

OOIP	= Original Oil in Place by LSD (Mbbl, or m3)
A	= Area (40acres, or 16.187 hectares, per LSD)
h * ϕ	= Net Pay * Porosity, or Phi * h (ft, or m)
Bo	= Formation Volume Factor of Oil (stb/rb, or sm ³ /rm ³)
Sw	= Water Saturation (decimal)

The initial oil formation volume factor was adopted from PVT information taken from the 100/02-17-009-29W1 and 100/13-19-009-28W1 Bakken wells and is thought to be representative of the fluid characteristics in the reservoir.

Historical Production

A historical group production history plot for the proposed Sinclair Unit No. 23 is shown as **Figure 4**. Oil production commenced from the proposed Unit area in July 2005 and peaked during November 2007 at 24.7 m³ (OPD). As of April 2019, production was 3.11 m³ OPD, 1.69 m³ of water per day (WPD) and a 35.2% watercut.

From peak production in November 2007, oil production is declining at an annual rate of **approximately 30%** under the current Primary Production method.

The remainder of the field's production and decline rates indicate the need for pressure restoration and maintenance. Waterflooding is deemed to be the most efficient means of secondary recovery to introduce energy back into the system and provide areal sweep between wells.

UNITIZATION

Unitization and implementation of a Waterflood EOR project is forecasted to increase overall recovery of OOIP from the proposed project area.

Unit Name

Tundra proposes that the official name of the new Unit shall be Sinclair Unit No. 23.

Unit Operator

Tundra Oil and Gas (Tundra) will be the Operator of record for Sinclair Unit No. 23.

Unitized Zone

The Unitized zone(s) to be waterflooded in Sinclair Unit No. 23 will be the Middle Bakken and Three Forks formations.

Unit Wells

The 12 vertical and 2 horizontal wells to be included in the proposed Sinclair Unit No. 23 are outlined in Table 3.

Unit Lands

The Sinclair Unit No. 23 will consist of 16 LSDs as follows:

Section 19 of Township 8, Range 29, W1M

The lands included in the 40 acre tracts are outlined in Table 1.

Tract Factors

The proposed Sinclair Unit No. 23 will consist of 16 Tracts based on the 40 acre LSDs containing the existing 12 vertical and 2 horizontal wells.

The Tract Factor contribution for each of the LSD's within the proposed Sinclair Unit No. 23 was calculated as follows:

- Gross OOIP by LSD, minus cumulative production to date for the LSD as distributed by the LSD specific Production Allocation (PA) % in the applicable producing horizontal or vertical well (to yield Remaining Gross OOIP)
- Tract Factor by LSD = the product of Remaining Gross OOIP by LSD as a % of total proposed Unit Remaining Gross OOIP

Tract Factor calculations for all individual LSDs based on the above methodology are outlined within Table 2.

Working Interest Owners

Table 1 outlines the working interest (WI) for each recommended Tract within the proposed Sinclair Unit No. 23. Tundra Oil and Gas Partnership holds a 100% WI ownership in all the proposed Tracts.

Tundra Oil and Gas Partnership will have a 100% WI in the proposed Sinclair Unit No. 23.

WATERFLOOD EOR DEVELOPMENT

Technical Studies

The waterflood performance predictions for the proposed Sinclair Unit No. 23 Bakken project are based on internal engineering assessments. Project area specific reservoir and geological parameters were utilized and then compared to Sinclair Unit No. 1 & Sinclair Unit No. 10 parameters, yielding the WF EOR response observed there to date.

Reserves Recovery Profiles and Production Forecasts

The primary waterflood performance predictions for the proposed Sinclair Unit No. 23 are based on oil production decline curve analysis, and the secondary predictions are based on internal engineering analysis performed by the Tundra reservoir engineering group using Sinclair Unit No. 1 and Sinclair Unit No. 10 as an analogy because it is developed with a similar waterflood pattern design of a horizontal injector with offsetting vertical producers at 20 acre spacing.

Primary Production Forecast

Cumulative production in the Sinclair Unit No. 23 project area, to the end of April 2019 from 14 wells, is **47.2 e³m³** of oil and **53.6 e³m³** of water for a recovery factor of **3.4%** of the calculated Net OOIP.

Ultimate Primary Proved Producing oil reserves recovery for Sinclair Unit No. 23 has been estimated to be **59.4 e³m³**, or an **4.3%** Recovery Factor (RF) of OOIP. Remaining Producing Primary Reserves has been estimated to be **11.8 e³m³** to end of April 2019.

The expected production decline and forecasted cumulative oil recovery under continued Primary Production is shown in **Figures 7 and 8**.

Pre-Production Schedule/Timing for Conversion of Horizontal Wells to Water Injection

Tundra will plan an injection conversion schedule to allow for the most expeditious development of the waterflood within the proposed Sinclair Unit No. 23, while maximizing reservoir knowledge.

Criteria for Conversion to Water Injection Well

Three (3) water injection wells are required for this proposed unit as shown in **Figure 5**.

Tundra will monitor the following parameters to assess the best timing for the horizontal well to be converted from primary production to water injection service.

- Measured reservoir pressures at start of and/or through primary production
- Fluid production rates and any changes in decline rate
- Any observed production interference effects with adjacent vertical and horizontal wells
- Pattern mass balance and/or oil recovery factor estimates
- Reservoir pressure relative to bubble point pressure

The above allows for the proposed Sinclair Unit No. 23 project to be developed equitably and efficiently. It also provides the Unit Operator flexibility to manage the reservoir conditions and response to help ensure maximum ultimate recovery of OOIP.

Secondary EOR Production Forecast

The proposed project oil production profile under Secondary Waterflood has been developed based on the response observed to date in the Sinclair Unit No. 1 and Sinclair Unit No. 10 Waterfloods (Figure 6).

Secondary Waterflood plots of the expected oil production forecast over time and the expected oil production vs. cumulative oil are plotted in Figures 9 & 10, respectively. Total Secondary EUR for the proposed Sinclair Unit No. 23 is estimated to be $95.0 \text{ e}^3\text{m}^3$ with $35.3 \text{ e}^3\text{m}^3$ remaining, representing a total secondary recovery factor of **6.8%** for the proposed Unit area. An incremental $35.3 \text{ e}^3\text{m}^3$ of oil, or a **2.6%** recovery factor, are forecasted to be recovered under the proposed Unitization and Secondary EOR production scheme vs. the existing Primary Production method.

In the attached development plan (Figure 5), the injection well shown in grey is a potential location contingent on the response of the other producers in the pattern. The potential waterflood response from this contingent injector was not included in the secondary EOR production forecast. It is important for Tundra to include LSDs 4,5,12, and 13-19-8-29W1 within the unit as there is potential to initiate a waterflood to support the 3-19-8-29W1 and 4-19-8-29W1 horizontal producers.

Estimated Fracture Pressure

Completion data from the existing producing wells within the project area indicate an actual fracture pressure gradient range of 18.0 to 22.0 kPa/m true vertical depth (TVD).

WATERFLOOD OPERATING STRATEGY

Water Source

The injection water for the proposed Sinclair Unit No. 23 will be supplied from the existing Sinclair 3-4-8-29W1 Battery source and injection water system. All existing injection water is obtained from the Mannville formation in the 103/12-04-8-29W1 (103/12-04) licensed water source well. Mannville water from the 103/12-04 source well is pumped to the main Sinclair Units Water Plant at 3-4-8-29W1, filtered, and pumped up to injection system pressure. A diagram of the Sinclair water injection system and new pipeline connection to the proposed Sinclair Unit No. 23 project area injection wells is shown as Figure 11.

Produced water is not currently used for any water injection in the Tundra operated Sinclair Units due to technical and economic factors that limit Tundra's ability to filter down to the necessary particle size for this tight formation. Therefore, there are no current plans to use produced water as a source supply for Sinclair Unit No. 23.

Since all producing Middle Bakken/Three Forks wells in the Daly Sinclair areas, whether vertical or horizontal, have been hydraulically fractured, produced waters from these wells are inherently a mixture of Three Forks and Bakken native sources. This mixture of produced waters has been extensively tested for compatibility with 102/16-32 source Mannville water, by a highly qualified third party, prior to implementation by Tundra. All potential mixture ratios between the two waters, under a range of temperatures, have been simulated and evaluated for scaling and precipitate producing tendencies. Testing of multiple scale inhibitors has also been conducted and minimum inhibition concentration requirements for the source water volume determined. At present, continuous scale inhibitor application is maintained into the source water stream out of the Sinclair injection water facility. Review and monitoring of the source water scale inhibition system is also part of an existing routine maintenance program.

Injection Wells

The water injection wells for the proposed Sinclair Unit No. 23 will be current producing wells configured downhole for injection as shown in **Figure 12**. The horizontal injection well will have been stimulated by multiple hydraulic fracture treatments to obtain suitable injection. Tundra has extensive experience with horizontal fracturing in the area, and all jobs are rigorously programmed and monitored during execution. This helps ensure optimum placement of each fracture stage to prevent, or minimize, the potential for out-of-zone fracture growth and thereby limit the potential for future out-of-zone injection.

Wellhead injection pressures will be maintained below the least value of either:

- the area specific known and calculated fracture gradient, or
- the licensed surface injection Maximum Allowable Pressure (MOP)

Tundra has a thorough understanding of area fracture gradients. A management program will be utilized to set and routinely review injection target rates and pressures vs. surface MOP and the known area formation fracture pressures.

All new water injection wells are surface equipped with injection volume metering and rate/pressure control. An operating procedure for monitoring water injection volumes and meter balancing will also be utilized to monitor the entire system measurement and integrity on a daily basis.

The proposed Sinclair Unit No. 23 horizontal water injection well rate is forecasted to average **10 - 30 m³** WPD, based on expected reservoir permeability and pressure.

Reservoir Pressure

No recent or representative initial pressure surveys are currently available for the producing wells within the proposed Sinclair Unit No. 23 project area in the Bakken formation. The long shut-in and build-up times required to obtain any possible representative surveys from the producing wells are economically prohibitive. Tundra will make all attempts to capture a reservoir pressure survey in the proposed horizontal injection wells during the completion of the wells and prior to injection or production.

Reservoir Pressure Management during Waterflood

Tundra expects it will take 2-4 years to re-pressurize the reservoir due to cumulative primary production voidage and pressure depletion. Initial monthly Voidage Replacement Ratio (VRR) is expected to be approximately 1.25 to 2.00 within the patterns during the fill up period. As the cumulative VRR approaches 1, target reservoir operating pressure for waterflood operations will be 75-90% of original reservoir pressure.

Waterflood Surveillance and Optimization

Sinclair Unit No. 23 EOR response and waterflood surveillance will consist of the following:

- Regular production well rate and WCT testing
- Daily water injection rate and pressure monitoring vs target
- Water injection rate/pressure/time vs. cumulative injection plot
- Reservoir pressure surveys as required to establish pressure trends
- Pattern VRR
- Potential use of chemical tracers to track water injector/producer responses
- Use of some or all of: Water Oil Ratio (WOR) trends, Log WOR vs Cum Oil, Hydrocarbon Pore Volumes Injected, Conformance Plots

The above surveillance methods will provide an ever-increasing understanding of reservoir performance, and provide data to continually control and optimize the Sinclair Unit No. 23 waterflood operation. Controlling the waterflood operation will significantly reduce or eliminate the potential for out-of-zone injection, undesired channeling or water breakthrough, or out-of-Unit migration. The monitoring and surveillance will also provide early indicators of any such issues so that waterflood operations may be altered to maximize ultimate secondary reserves recovery from the proposed Sinclair Unit No. 23.

On Going Reservoir Pressure Surveys

Any pressures taken during the operation of the proposed unit will be reported within the Annual Progress Reports for Sinclair Unit No. 23 as per Section 73 of the Drilling and Production Regulation.

Economic Limits

Under the current Primary recovery method, existing wells within the proposed Sinclair Unit No. 23 will be deemed uneconomic when the net oil rate and net oil price revenue stream becomes less than the current producing operating costs. With any positive oil production response under the proposed Secondary recovery method, the economic limit will be significantly pushed out into the future. The actual economic cut off point will then again be a function of net oil price, the magnitude and duration of production rate response to the waterflood, and then current operating costs. Waterflood projects generally become uneconomic to operate when Water Oil Ratios (WOR's) exceed 100.

WATER INJECTION FACILITIES

The Sinclair Unit No. 23 waterflood operation will utilize the existing Tundra operated source well supply and water plant (WP) facilities located at 3-4-8-29W1 Battery. Injection wells will be connected to the existing high pressure water pipeline system supplying other Tundra-operated Waterflood Units.

A complete description of all planned system design and operational practices to prevent corrosion related failures is shown in **Figure 13**.

NOTIFICATION OF MINERAL AND SURFACE RIGHTS OWNERS

Tundra is in the process of notifying all mineral rights and surface rights owners of this proposed EOR project and formation of Sinclair Unit No. 23. Copies of the notices and proof of service, to all surface and mineral rights owners will be forwarded to the Petroleum Branch when available to complete the Sinclair Unit No. 23 Application.

Sinclair Unit No. 23 Unitization, and execution of the formal Sinclair Unit No. 23 Agreement by affected Mineral Owners, is expected during Q3 2019. Copies of same will be forwarded to the Petroleum Branch, when available, to complete the Sinclair Unit No. 23 Application.

Should the Petroleum Branch have further questions or require more information, please contact Eric Fraser at 587.747.5363 or by email at eric.fraser@tundraoilandgas.com.

TUNDRA OIL & GAS PARTNERSHIP

Original Signed by Eric Fraser, August 9, 2019 in Calgary, AB

Proposed Sinclair Unit No. 23

Application for Enhanced Oil Recovery Waterflood Project

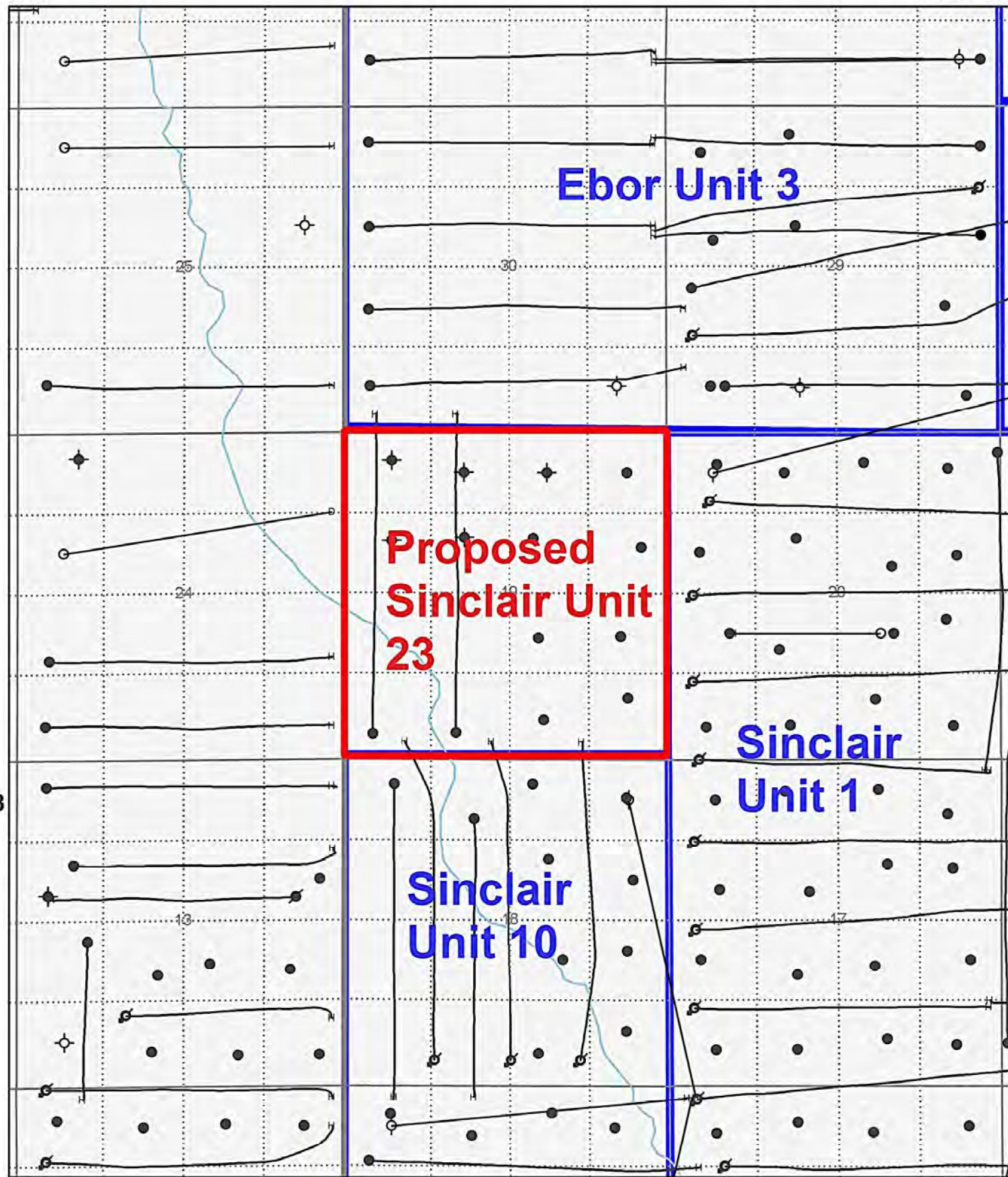
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Appendix 5	Sinclair Unit No. 23 – Upper Lyleton A Isopach
Appendix 6	Sinclair Unit No. 23 – Lower Lyleton A Isopach
Appendix 7	Sinclair Unit No. 23 – Lyleton B Isopach
Appendix 8	Core PDPK Data

APPENDIX 1

R30

R29W1

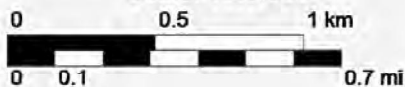


R30

R29W1

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Scale: 1:28,350



Proposed Sinclair Unit 23
Offsetting Bakken Units

00/01-19-008-29W1/0
KB: 543.4 m RR: 2007-07-23
TD: 1036.0 m [TVD] FormTD: TORQUAY
Mode: Prod Fluid: Oil
TUNDRA SINCLAIR 1-19-8-29(WPM)

934.7m to next well >

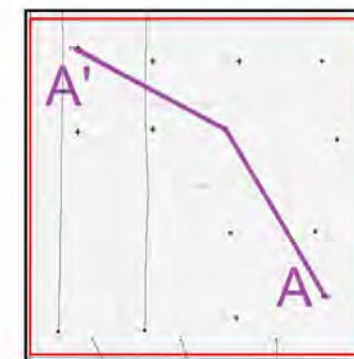
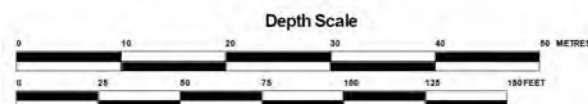
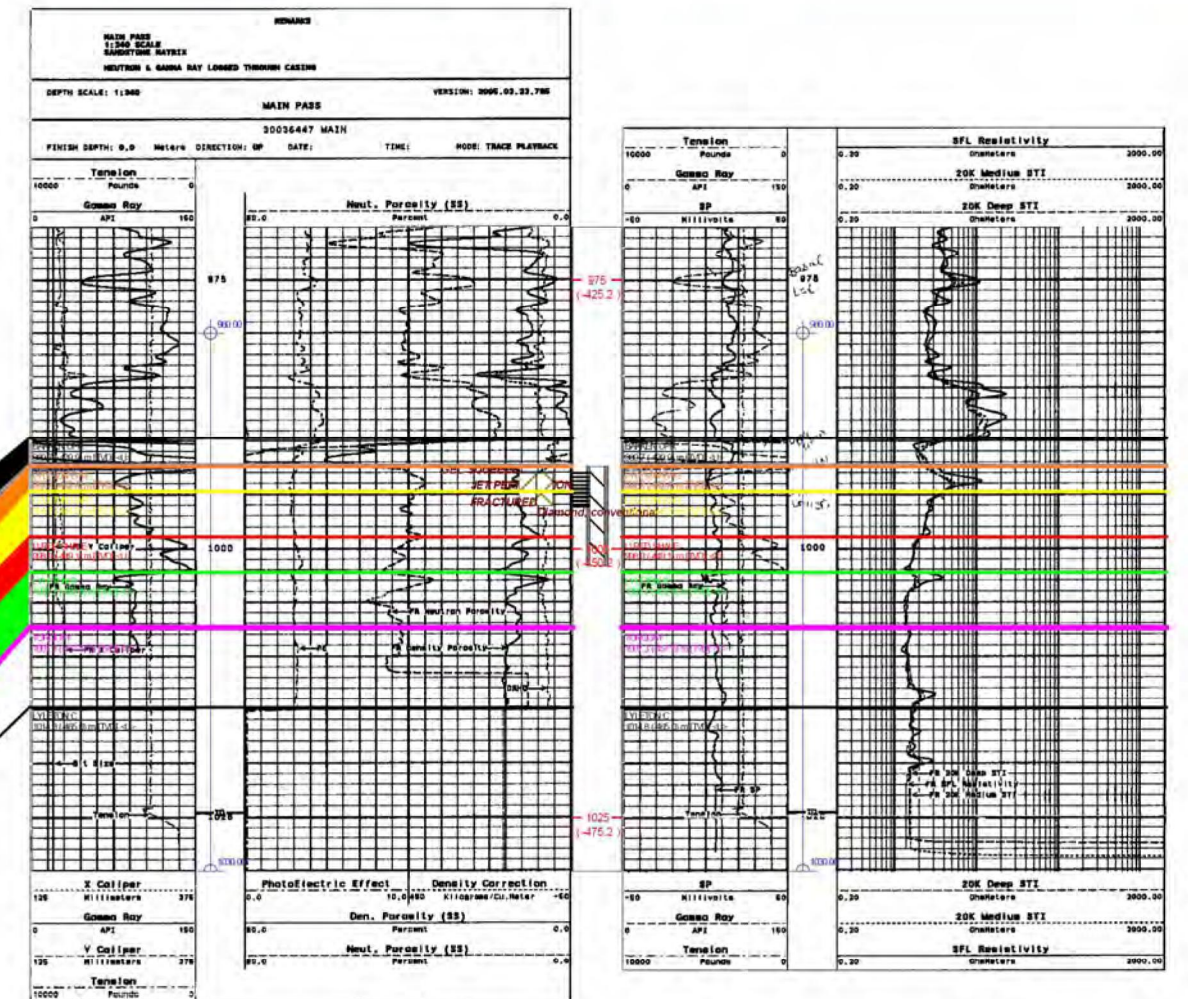
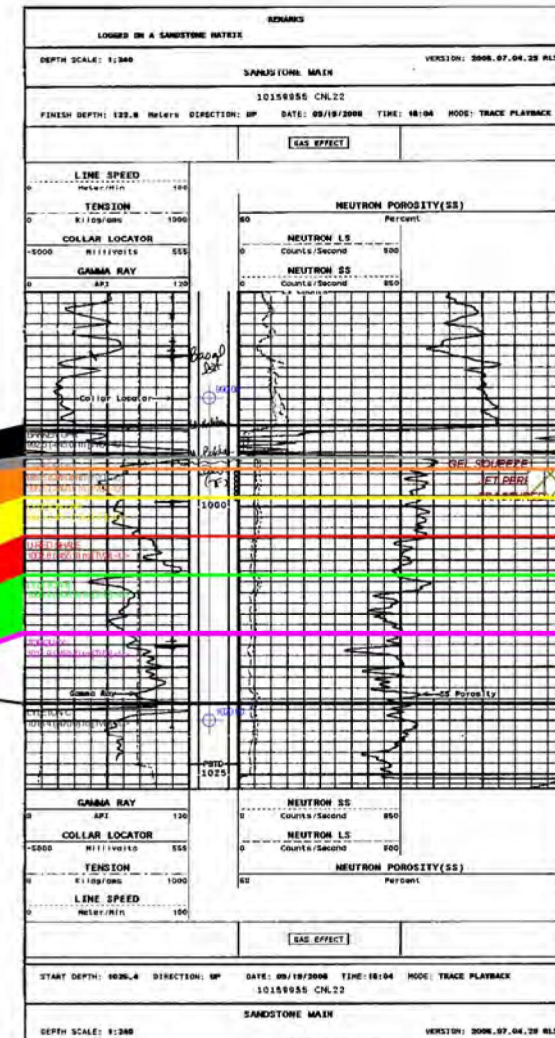
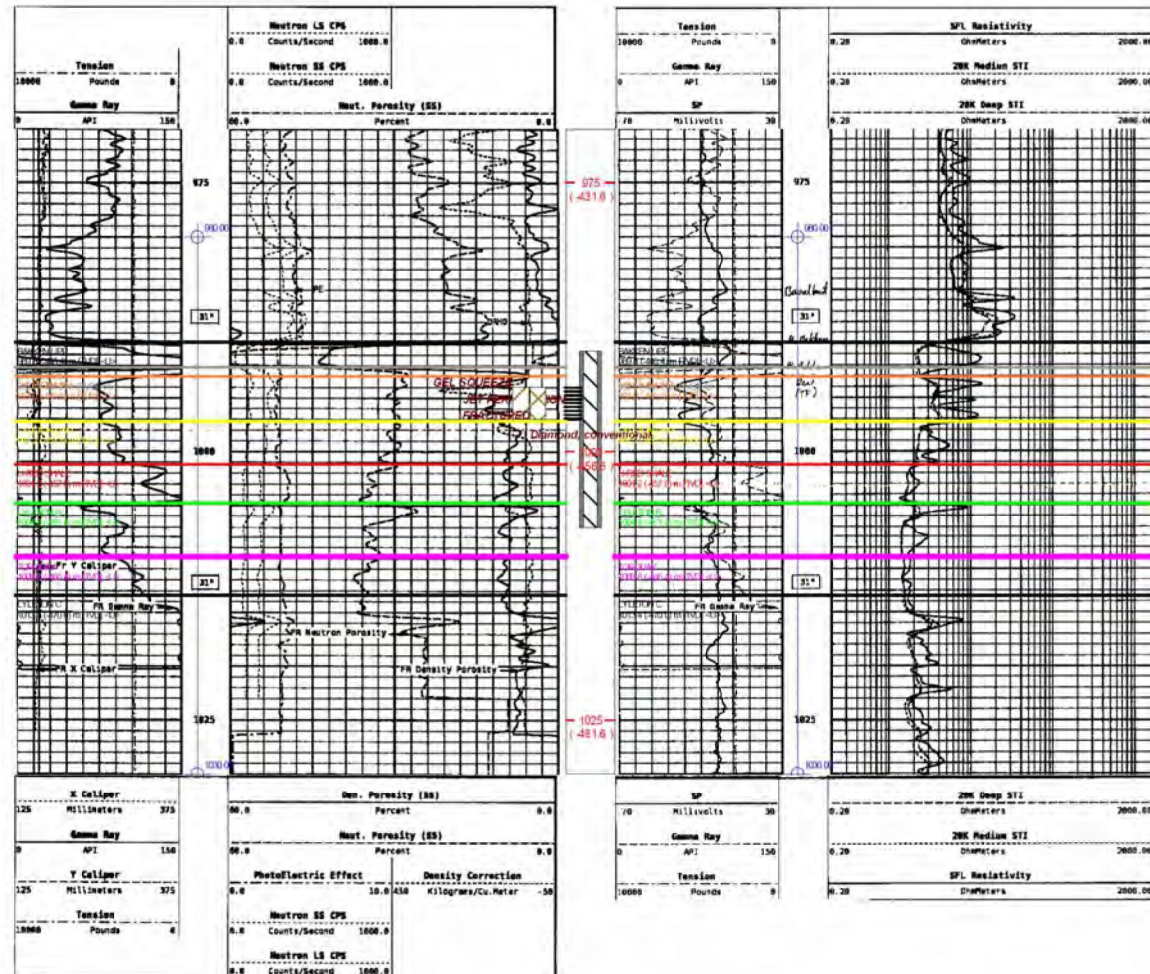
00/10-19-008-29W1/0
KB: 547.5 m RR: 2006-09-13
TD: 1031.0 m [TVD] FormTD: TORQUAY
Mode: Prod Fluid: Oil
TUNDRA SINCLAIR 10-19-8-29(WPM)

< 934.7m to previous well

817.0m to next well >

00/13-19-008-29W1/0
KB: 549.8 m RR: 2005-08-16
TD: 1025.0 m [TVD] FormTD: TORQUAY
Mode: Abd Zone Fluid: Oil
TUNDRA SINCLAIR 13-19-8-29(WPM)

< 817.0m to previous well

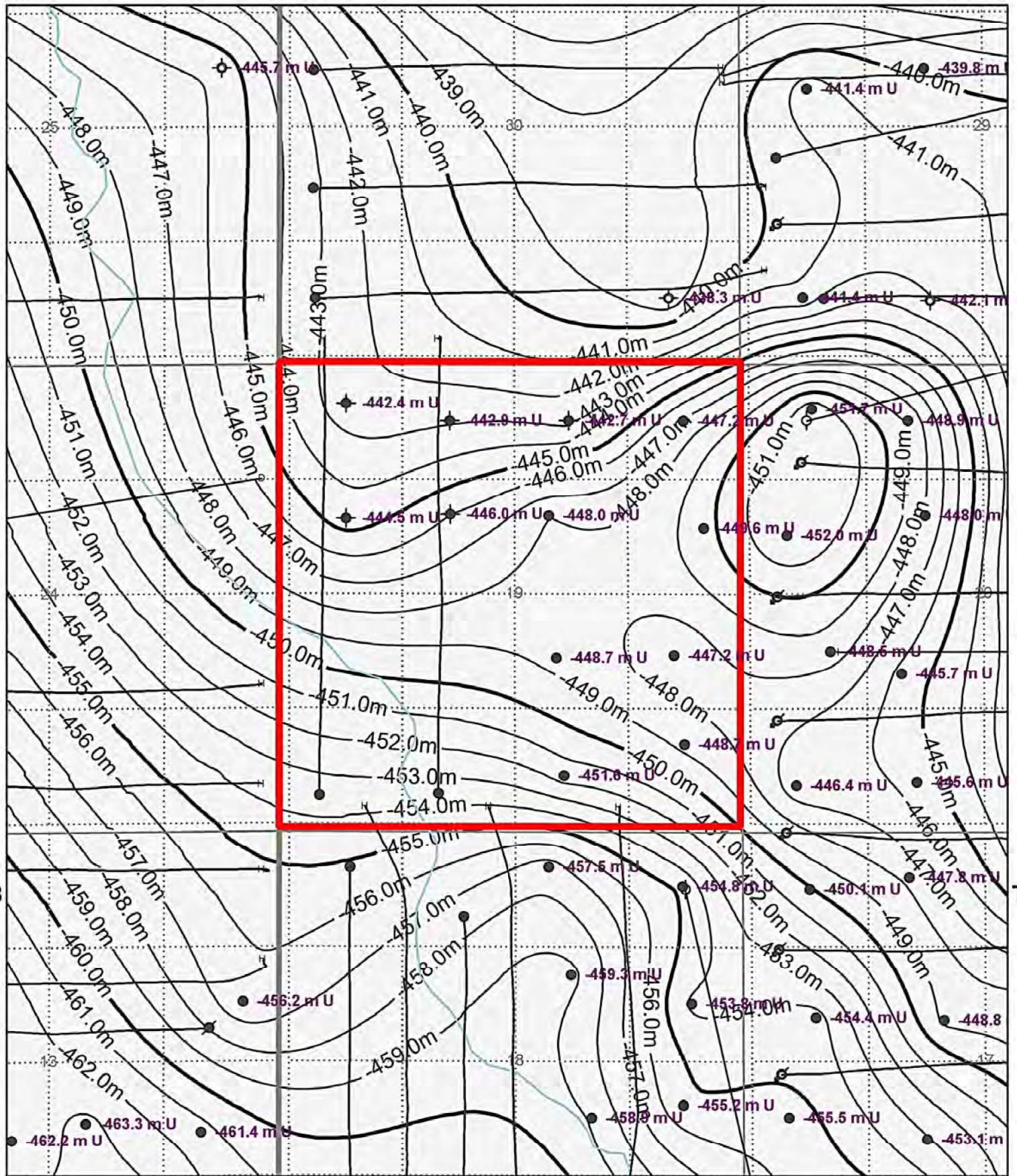


Proposed Sinclair Unit 23

Structural Cross Section
-South East to North West-
Through Proposed Unit Area

R30

R29W1

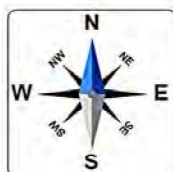
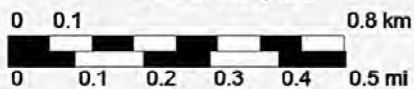


R30

R29W1

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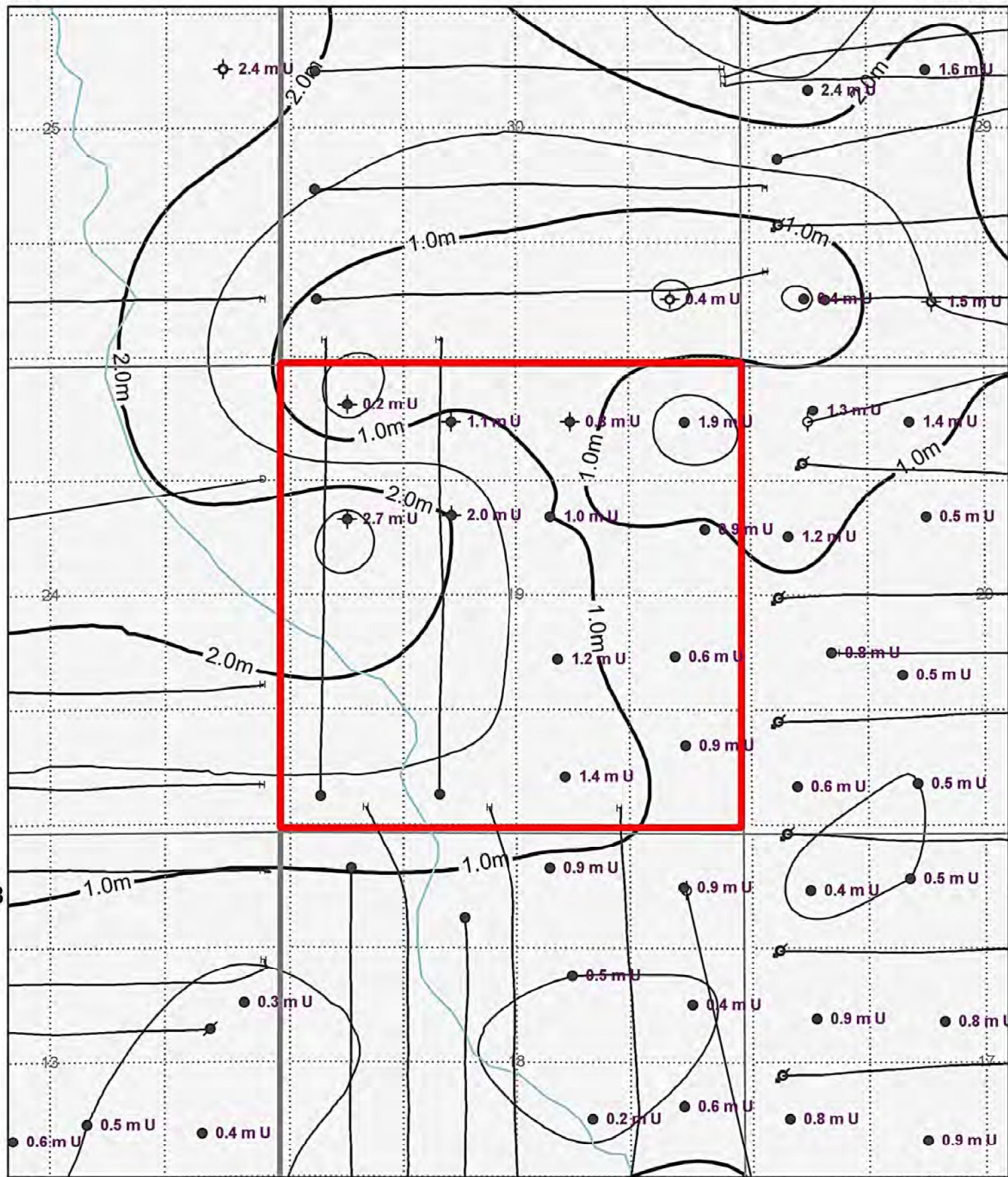


Proposed Sinclair Unit 23
Middle Bakken Structure
(mSS)

APPENDIX 4

R30

R29W1

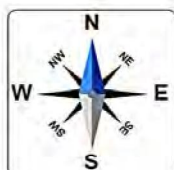
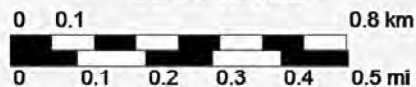


R30

R29W1

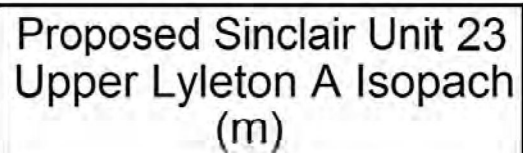
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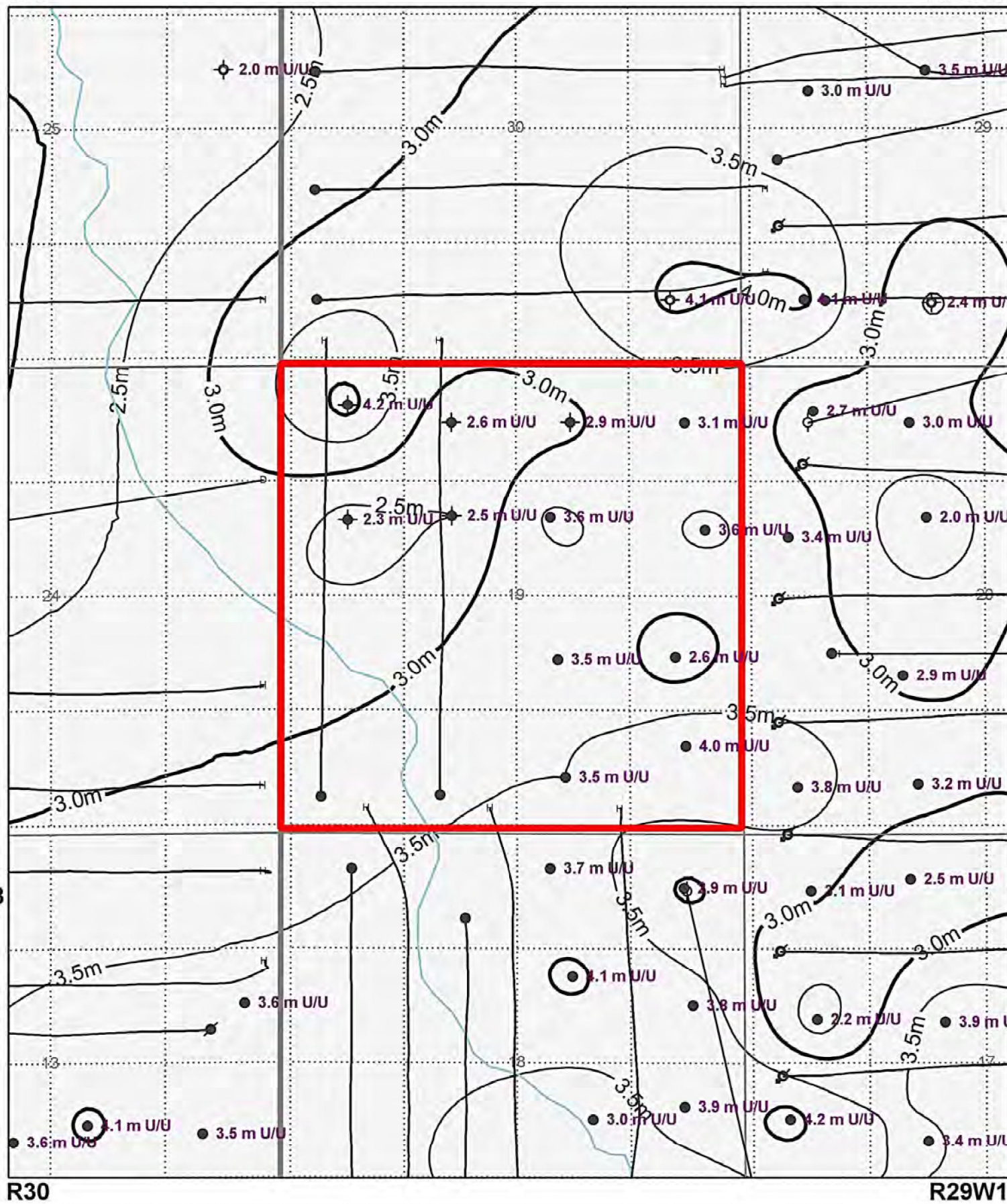


Proposed Sinclair Unit 23
Middle Bakken Isopach
(m)

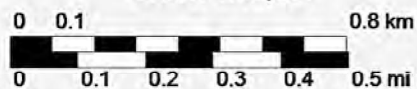
R29W1



R29W1



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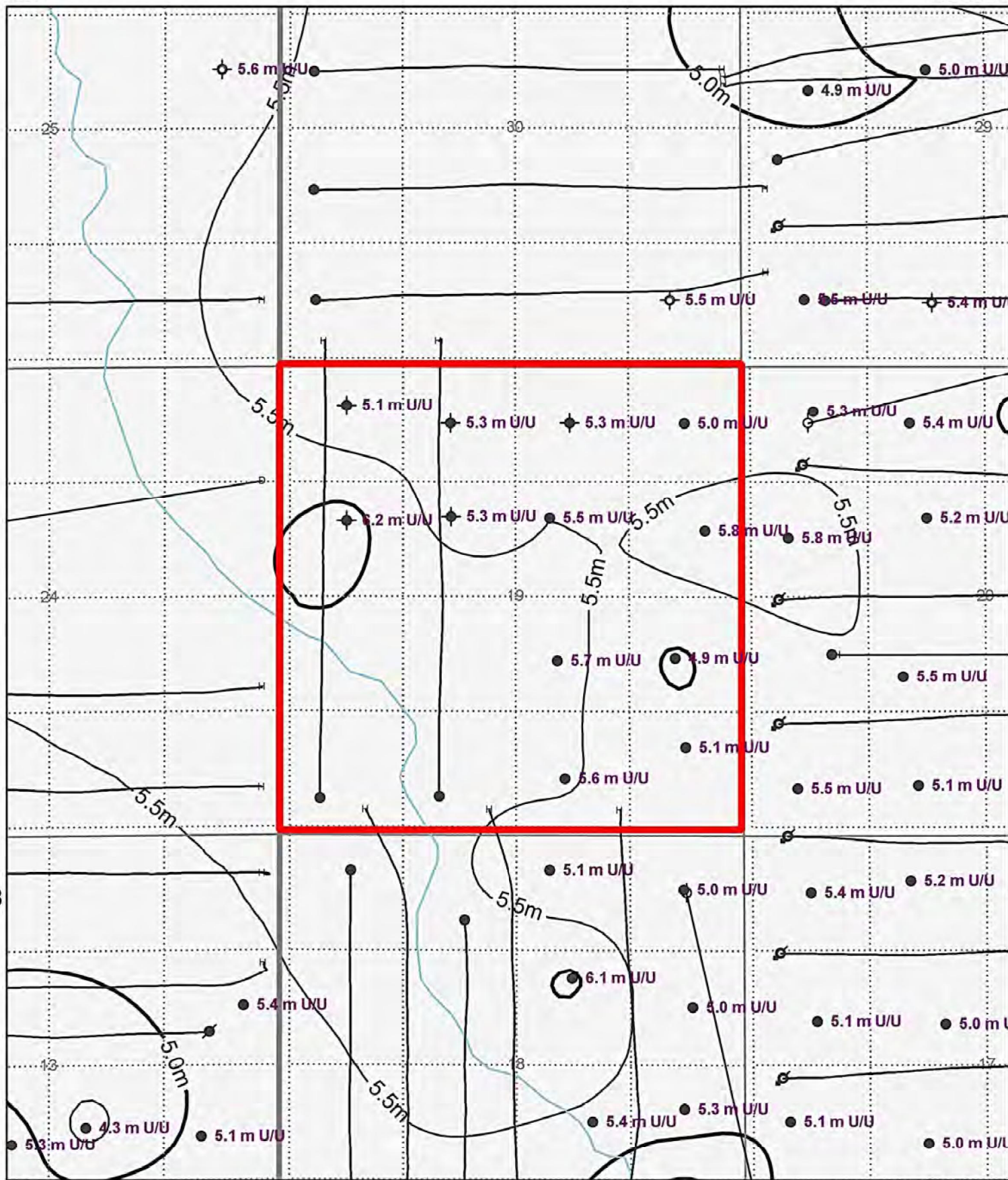


Proposed Sinclair Unit 23 Lower Lyleton A Isopach (m)

APPENDIX 7

R30

R29W1

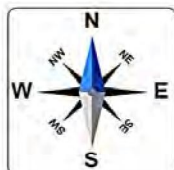
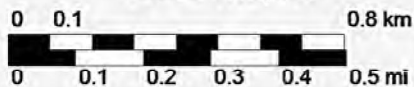


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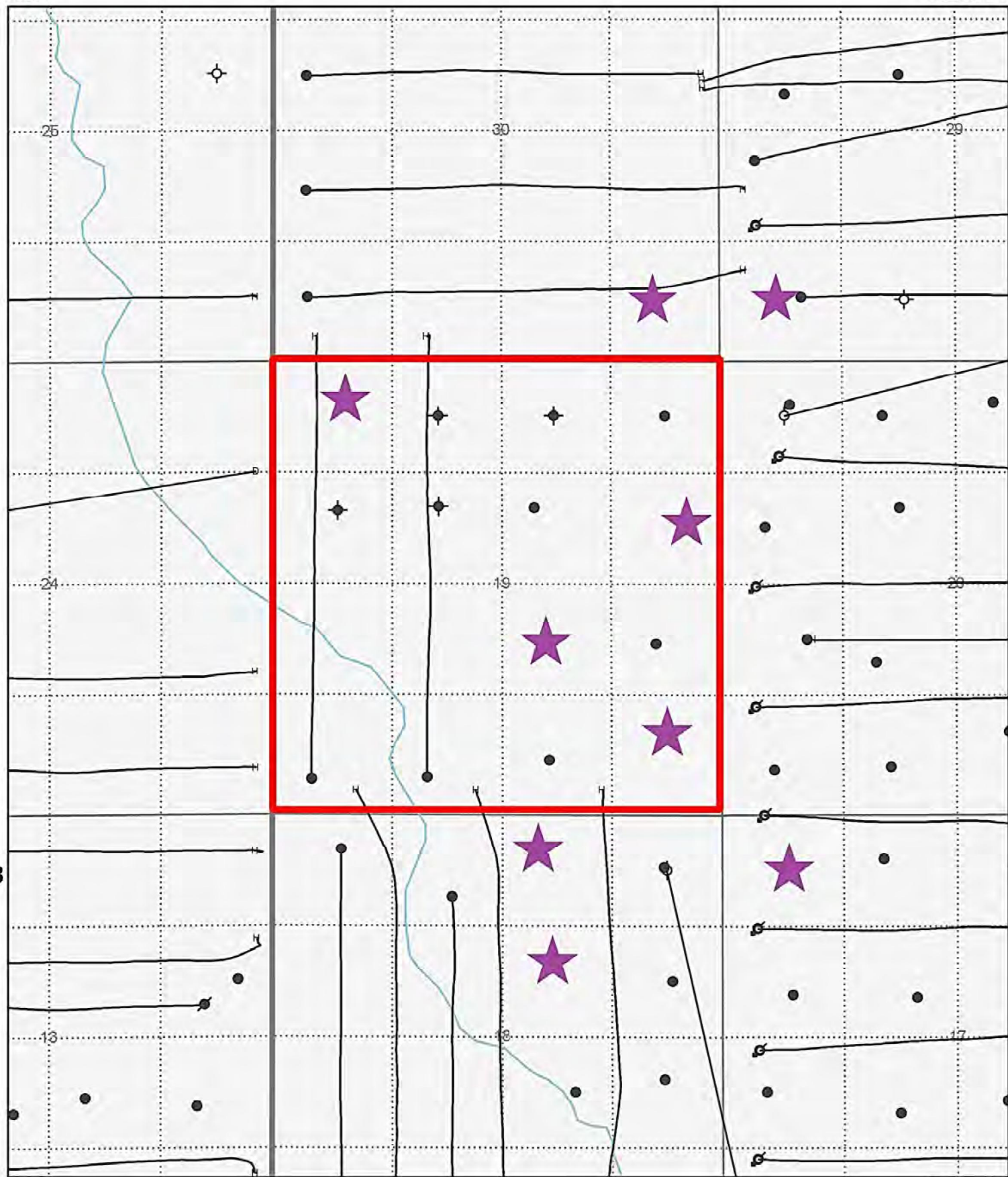


Proposed Sinclair Unit 23
Lyleton B Isopach
(m)

APPENDIX 8

R30

R29W1

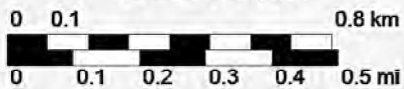


R30

R29W1

Center: 49.6726, -101.4057

Scale: 1:20,430



Proposed Sinclair Unit 23
Core Data Points

Proposed Sinclair Unit No. 23

Application for Enhanced Oil Recovery Waterflood Project

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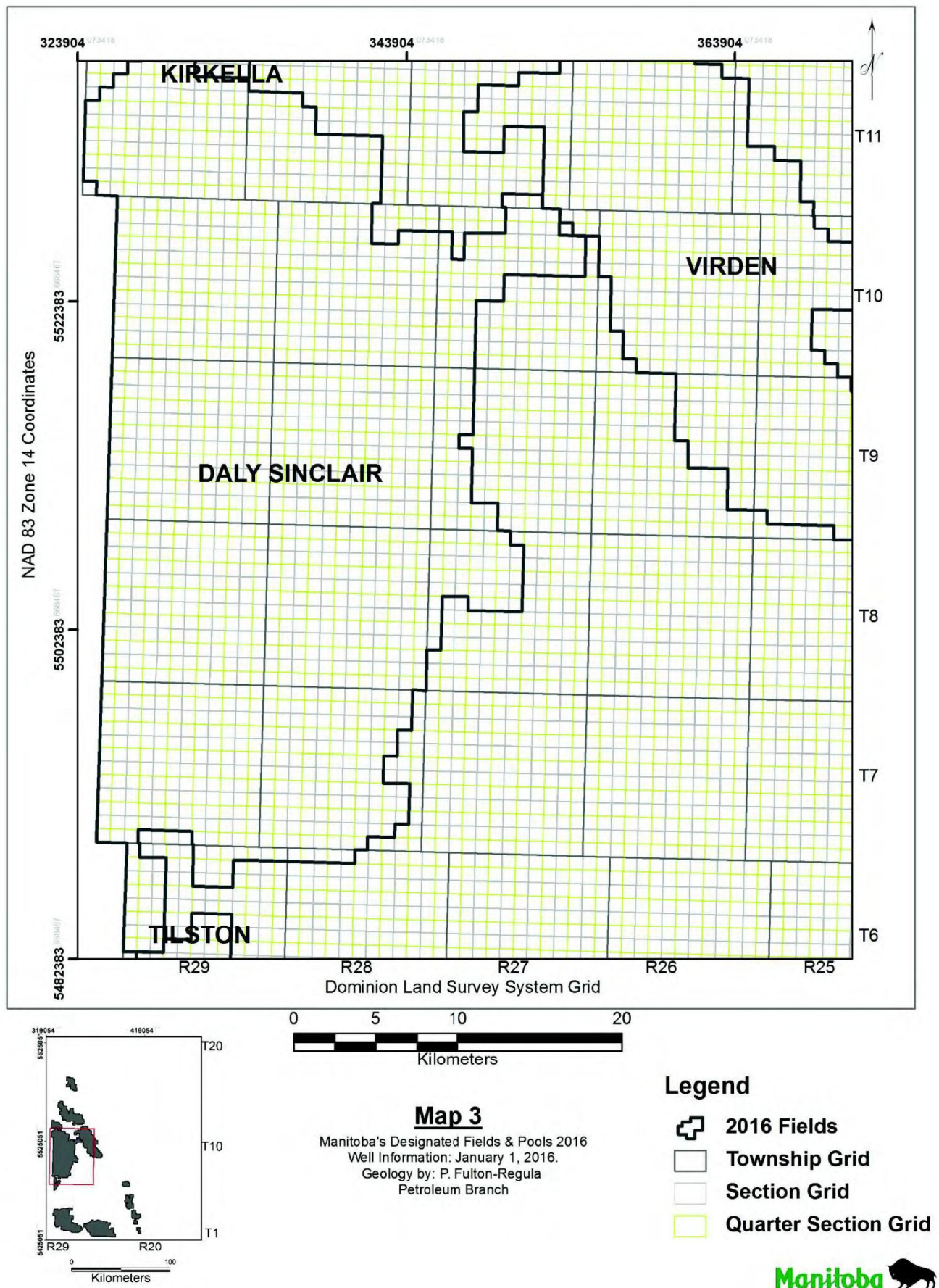


Figure No. 2

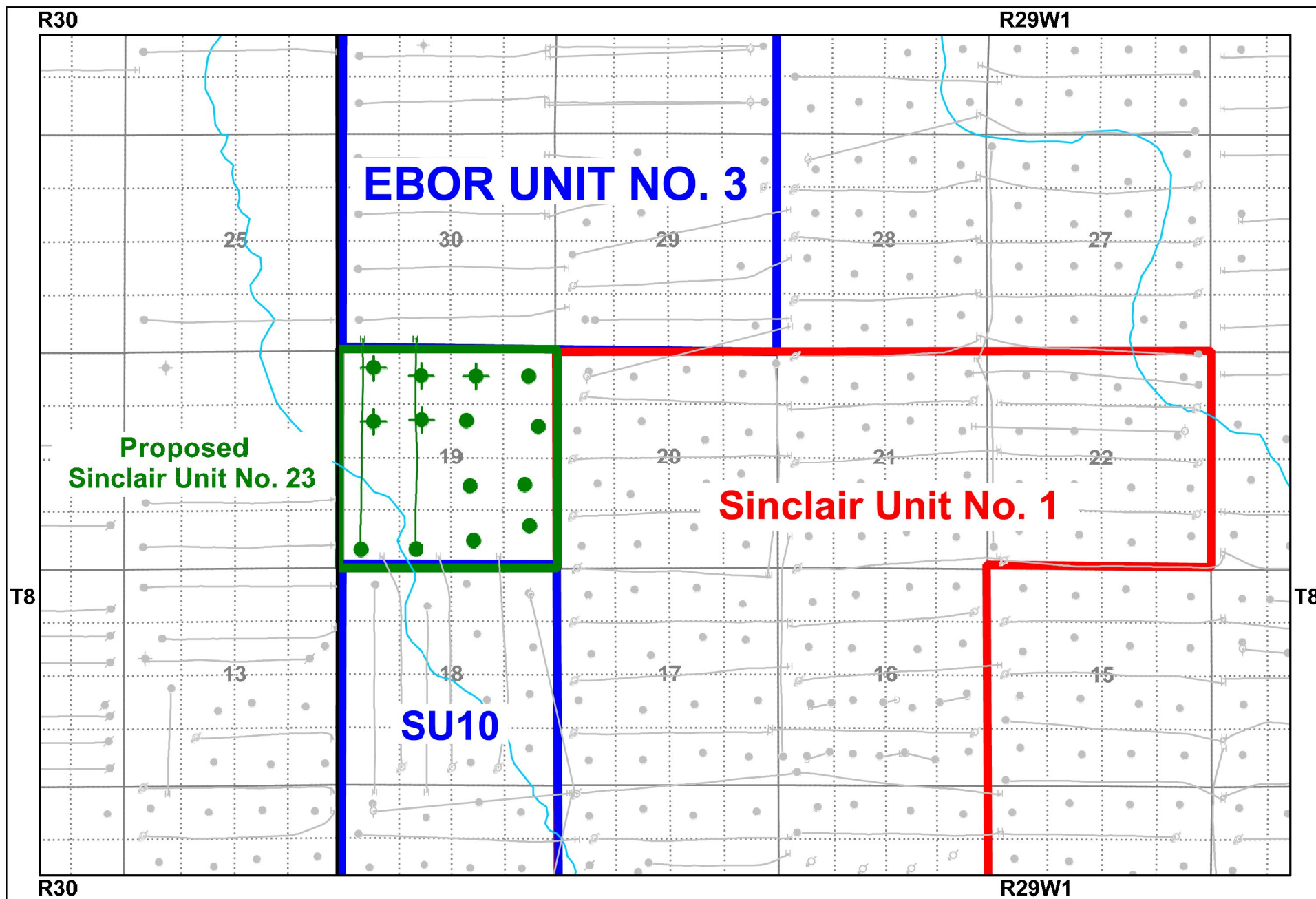
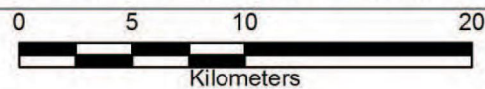
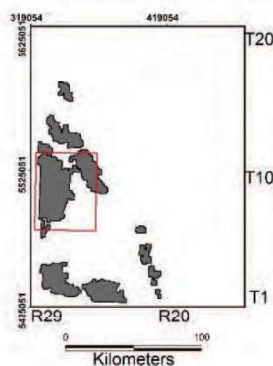
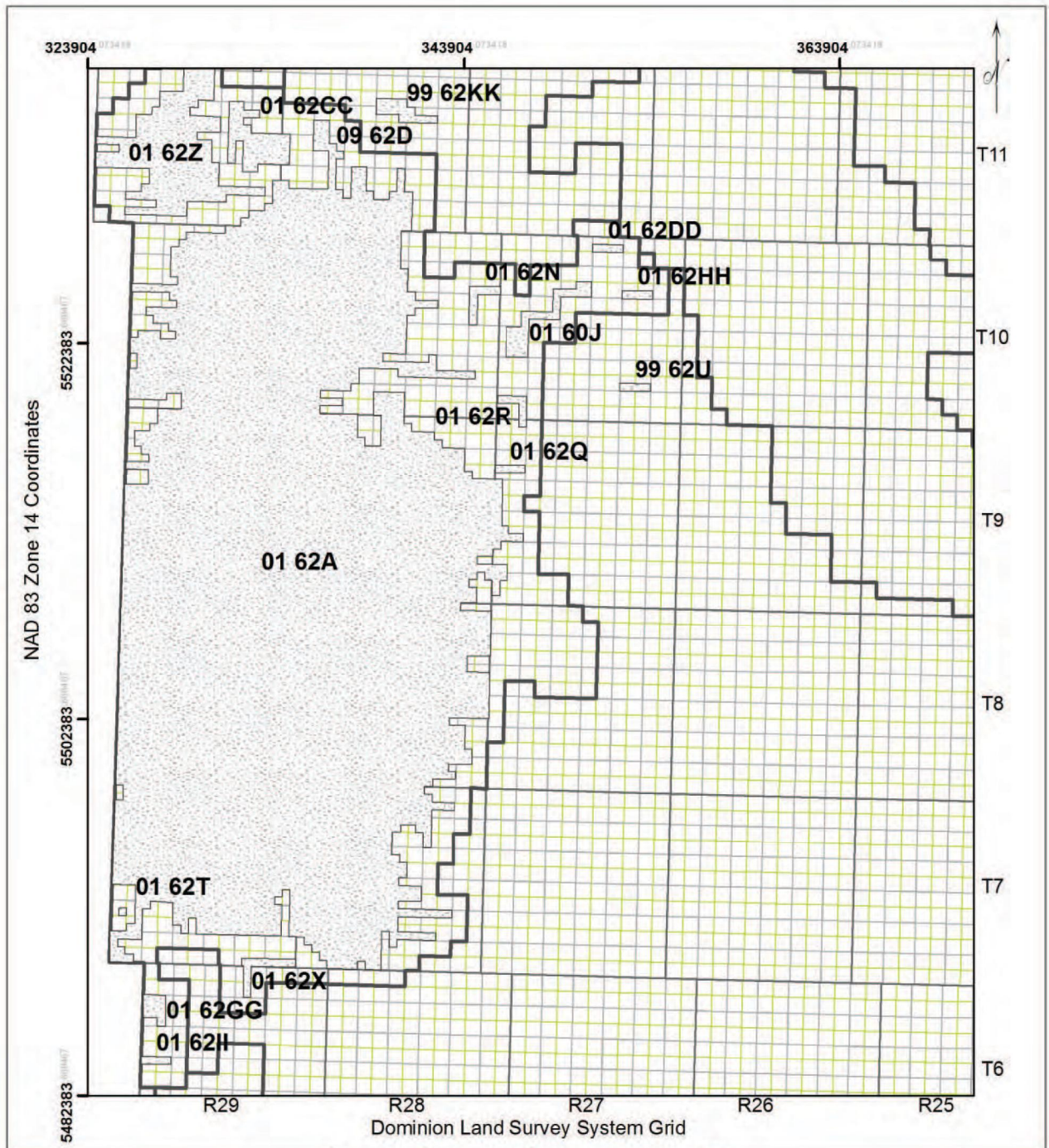


Figure No. 3



Map 3

Manitoba's Designated Fields & Pools 2016
Well Information: January 1, 2016.
Geology by: P. Fulton-Regula
Petroleum Branch

Legend

- 2016 Fields
- Oil Pools
- Township Grid
- Section Grid
- Quarter Section Grid



Bakken & Bakken Torquay Formation Pools (60 & 62)

Production Graph

Group: sinclair unit no. 23 well list.lwell
 # of Wells: 14
 Fluid: Oil
 Mode: Producing; Abandoned Zone

On Prod: 2005-07 to 2019-04
 Prod Form: BAKKEN; THREEFK; TORQUAY
 Field: DALY (MB1)
 Pool Code: MB000162A
 Unit Code:

Cum Oil: 47219.3 m3
 Cum Gas: 0.0 E3m3
 Cum Wtr: 53584.5 m3
 Cum Inj Oil: 0.0 m3
 Cum Inj Gas: 0.0 E3m3
 Cum Inj Wtr: 0.0 m3

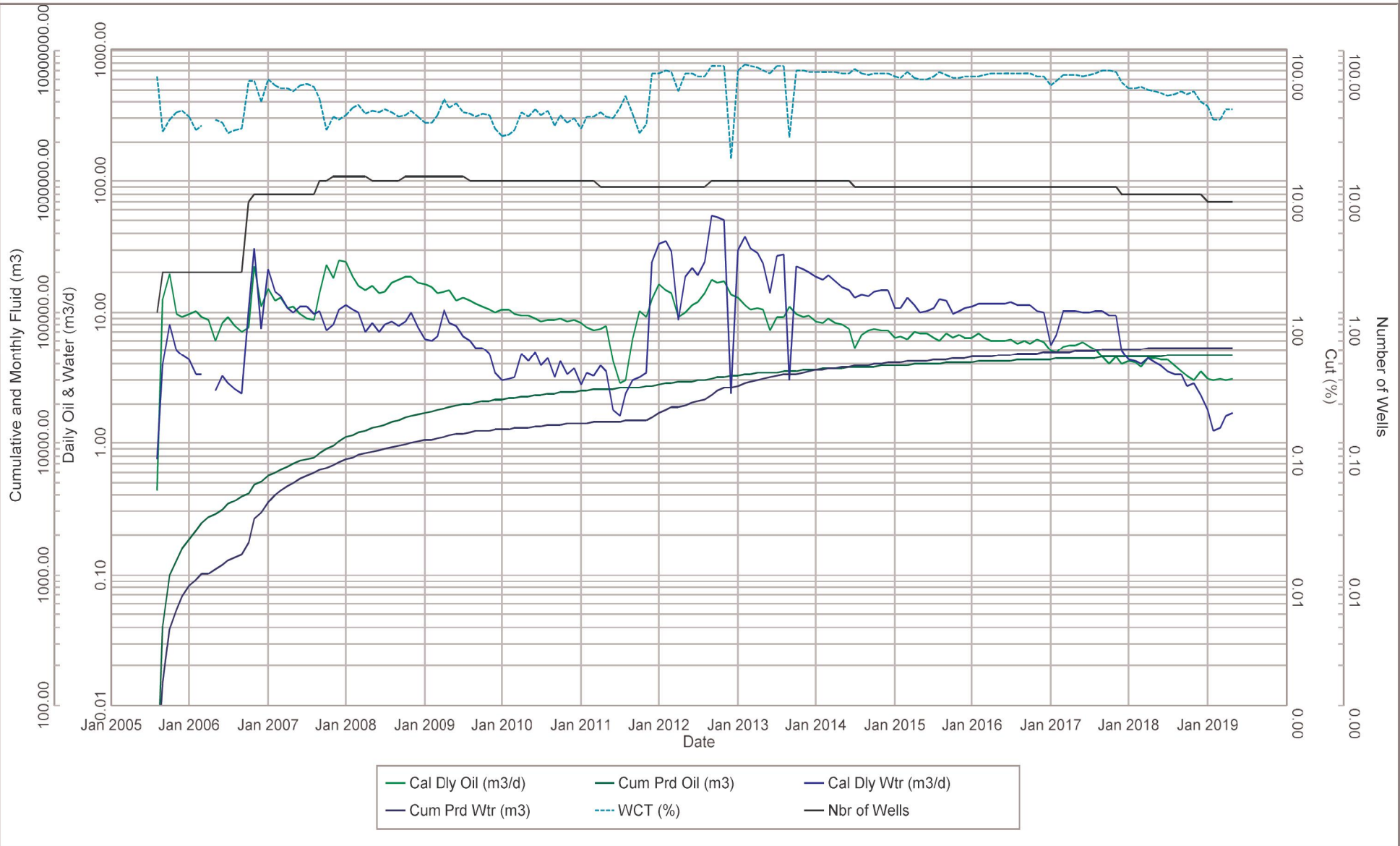
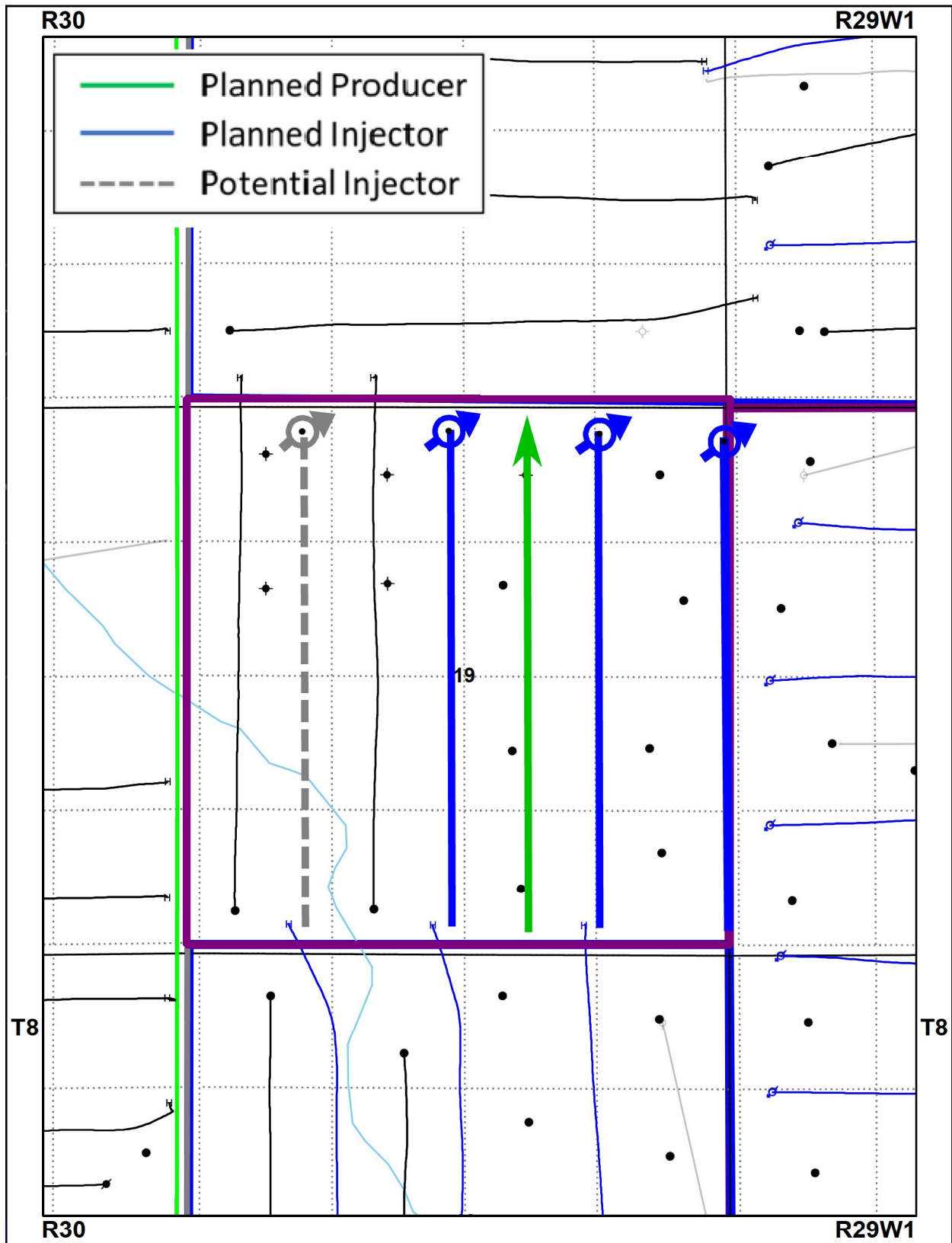


Figure No. 5



Map Title Datum: NAD27 Projection: Stereographic DLS Version AB: ATS 2.6, BC: PRB 2.0, SK: STS 2.5, MB: MLI07



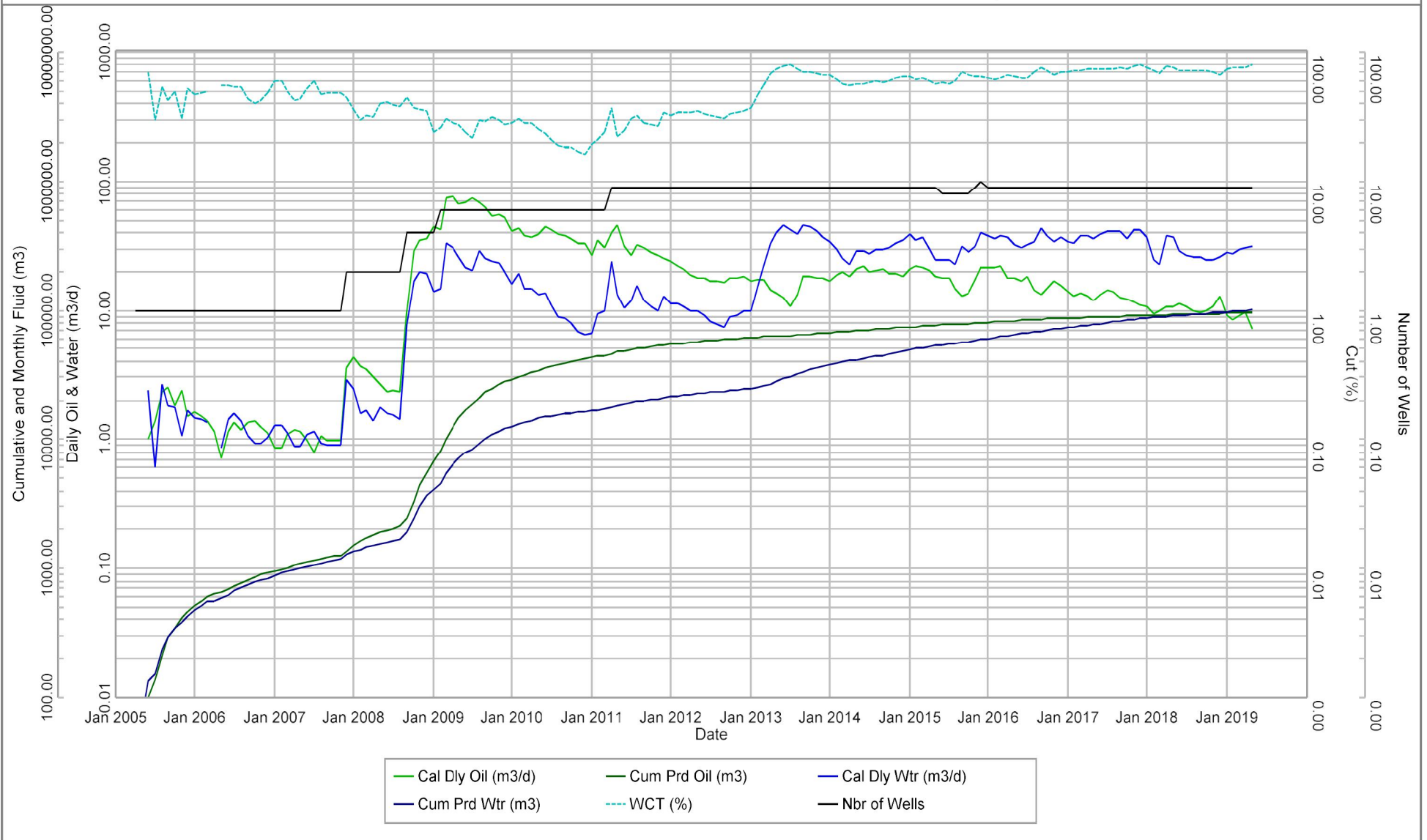
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Production Graph

Group: sinclair unit no. 5 well list.lwell
 # of Wells: 11
 Fluid: Oil; Water Injection
 Mode: Producing; Injection; Suspended

On Prod: 2005-03 to 2019-04
 Prod Form: BAKKENM; BAKKENU; TORQUAY;
 BAKKEN
 Field: DALY (MB1)
 Pool Code: MB000162A
 Unit Code: 162A5

Cum Oil: 96240.4 m3
 Cum Gas: 0.0 E3m3
 Cum Wtr: 100853.5 m3
 Cum Inj Oil: 0.0 m3
 Cum Inj Gas: 0.0 E3m3
 Cum Inj Wtr: 126505.9 m3



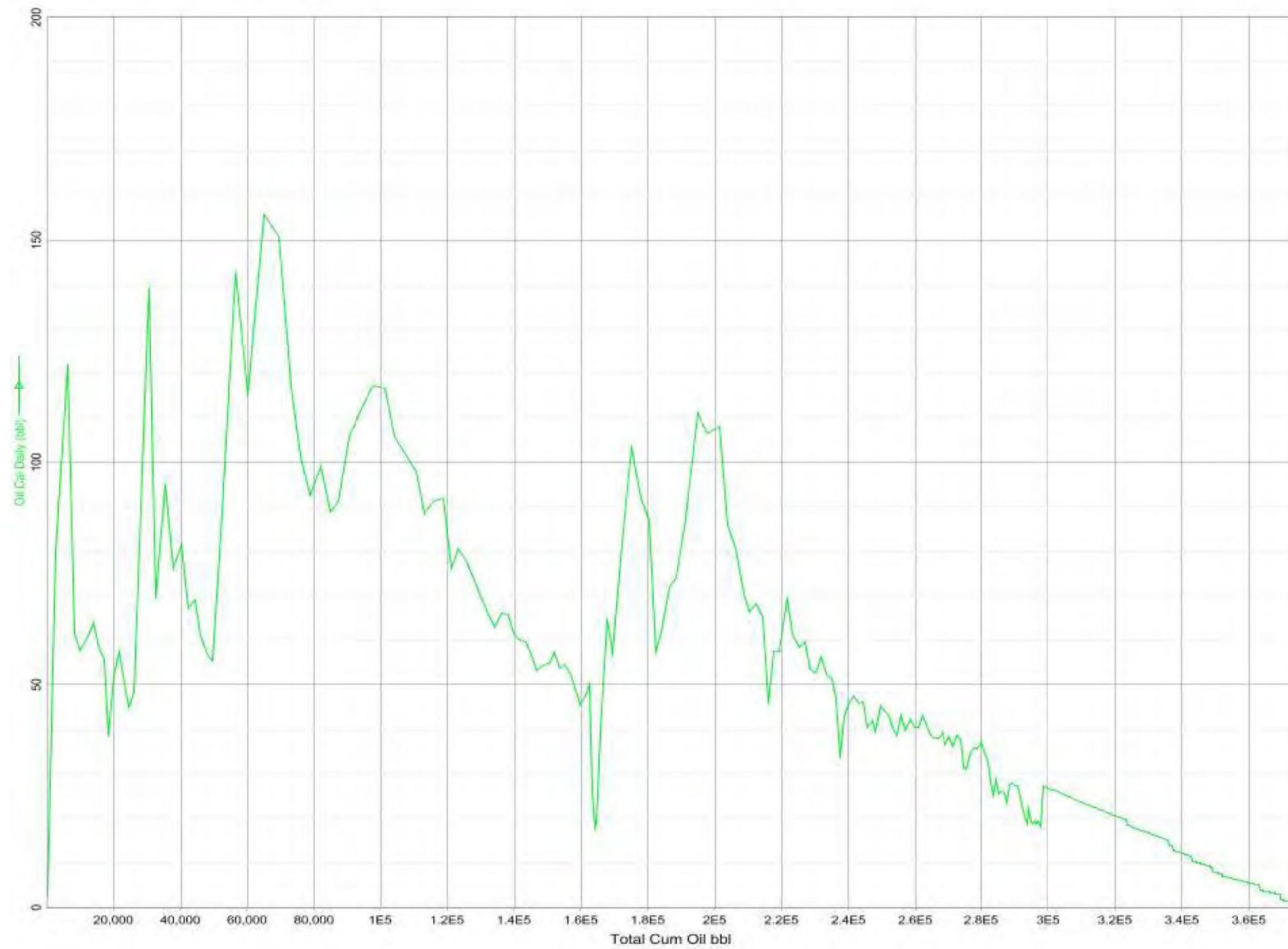
Primary Recovery - Rate vs Time

Figure No. 7



Primary Recovery - Rate vs Cum

Figure No. 8



Primary + Secondary Recovery - Rate vs Time

Figure No. 9



Primary + Secondary Recovery - Rate vs Cum

Figure No. 10

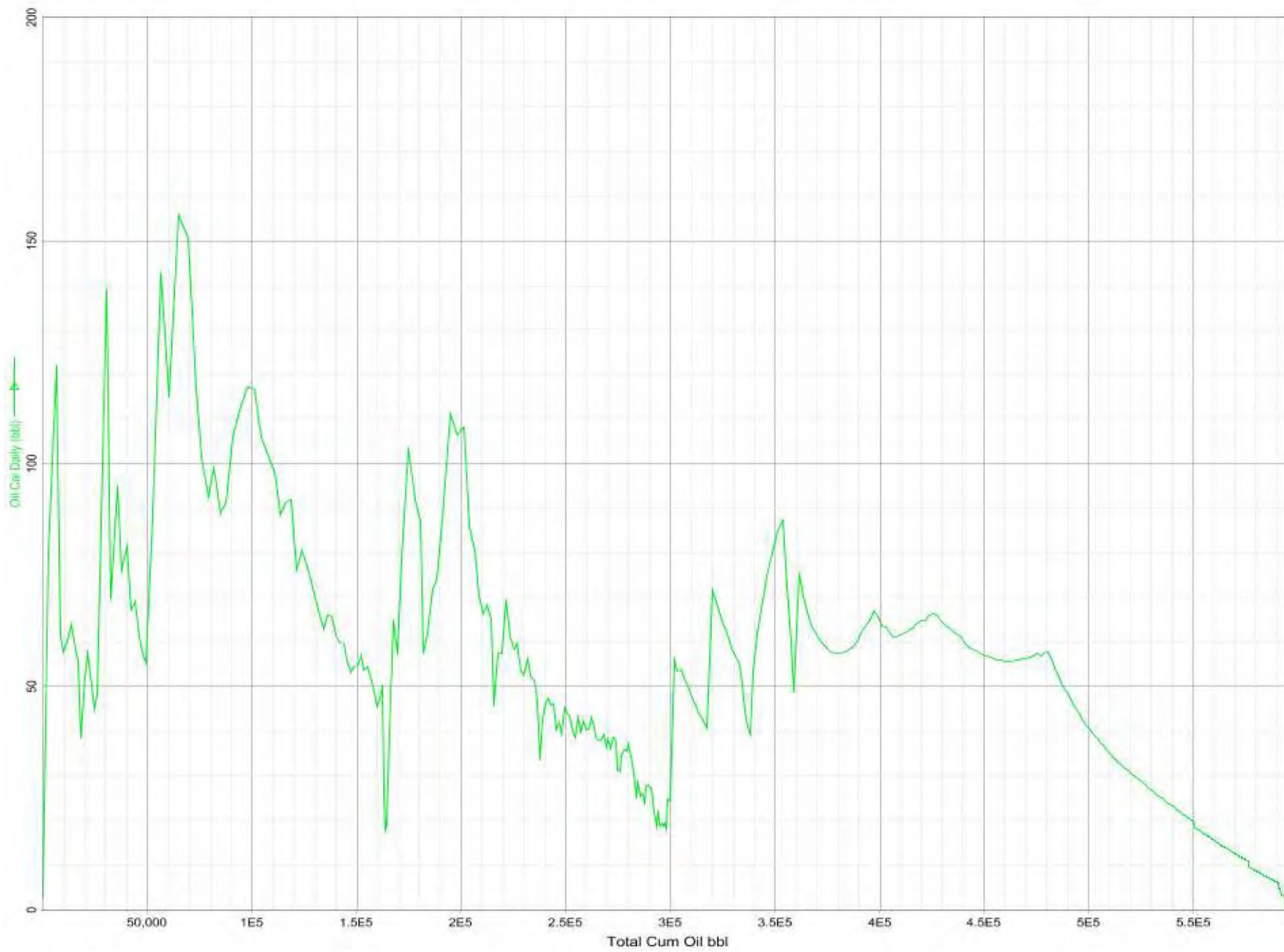
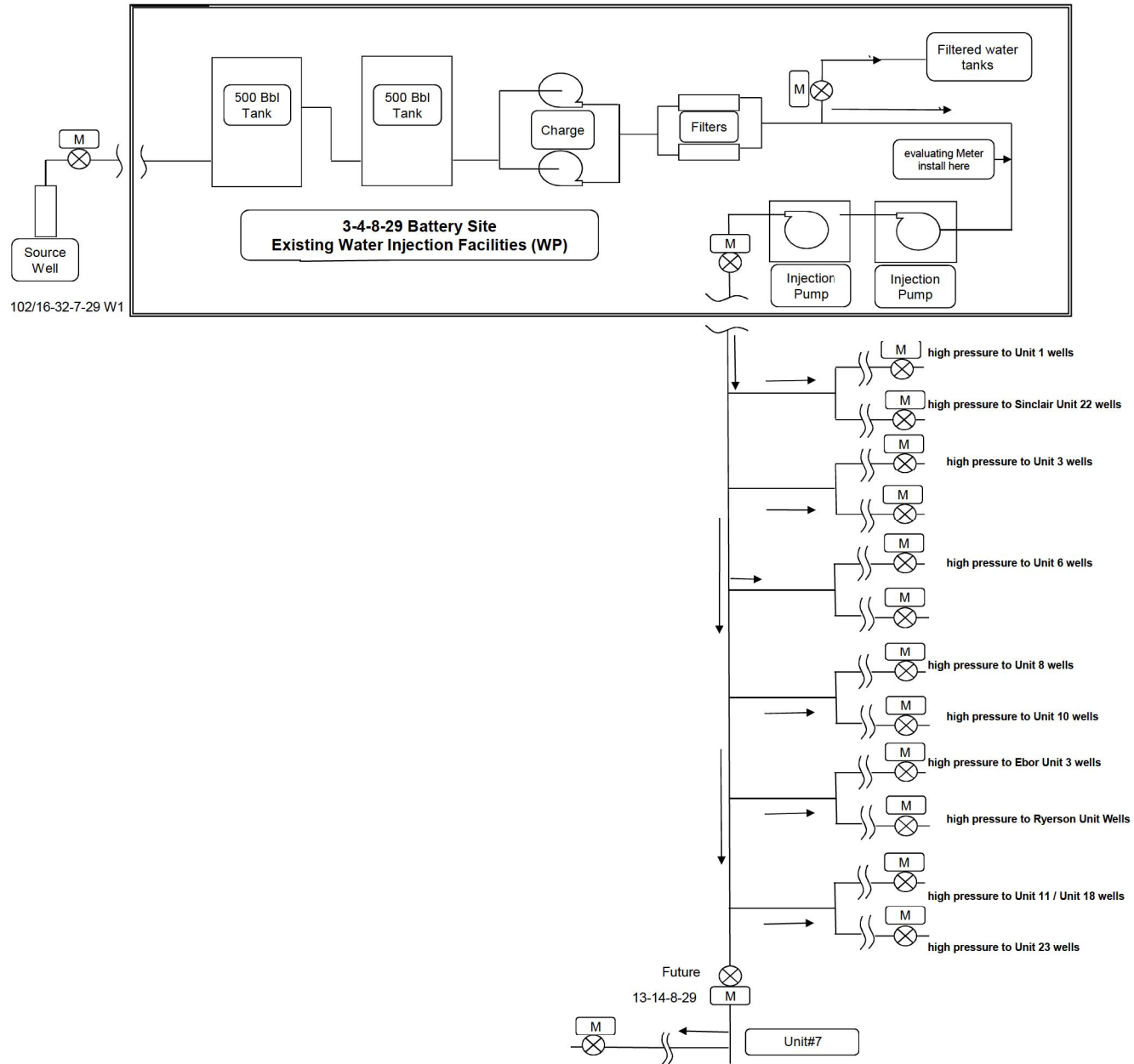


FIGURE 11

Sinclair Water Injection System



TYPICAL OPEN HOLE WATER INJECTION WELL (WIW) DOWNHOLE DIAGRAM

[illegible]

Sinclair Unit No. 23

EOR Waterflood Project

Planned Corrosion Control Program **

Source Well

- Continuous downhole corrosion inhibition
- Continuous surface corrosion inhibitor injection
- Downhole scale inhibitor injection
- Corrosion resistant valves and internally coated surface piping

Pipelines

- Source well to 3-4-8-29 Water Plant – Fiberglass
- New High Pressure Pipeline to the injection wells – 2000 psi high pressure Fiberglass

Facilities

- 3-4-8-29 Water Plant and New Injection Pump Station
 - Plant piping – 600 ANSI schedule 80 pipe, Fiberglass or Internally coated
 - Filtration – Stainless steel bodies and PVC piping
 - Pumping – Ceramic plungers, stainless steel disc valves
 - Tanks – Fiberglass shell, corrosion resistant valves

Injection Wellhead / Surface Piping

- Corrosion resistant valves and stainless steel and/or internally coated steel surface piping

Injection Well

- Casing cathodic protection where required
- Wetted surfaces coated downhole packer
- Corrosion inhibited water in the annulus between tubing / casing
- Internally coated tubing surface to packer
- Surface freeze protection of annular fluid
- Corrosion resistant master valve
- Corrosion resistant pipeline valve

Producing Wells

- Casing cathodic protection where required
- Downhole batch corrosion inhibition as required
- Downhole scale inhibitor injection as required

Figure 13

** subject to final design and engineering

Proposed Sinclair Unit No. 23

Application for Enhanced Oil Recovery Waterflood Project

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Table 2	Tract Factor Calculation
Table 3	Current Well List and Status
Table 4	Original Oil in Place and Recovery Factors

TABLE NO. 2: TRACT FACTOR CALCULATIONS FOR SINCLAIR BAKKEN UNIT NO. 23 APPLICATION
TRACT FACTORS BASED ON OIL-IN-PLACE (OOIP) - CUMULATIVE PRODUCTION TO APRIL 2019

LSD-SEC	Tract	OOIP (m3)	HZ Wells Alloc Cum Prodn (m3)	Vert Wells Cum Prodn (m3)	Sum HZ + Vert Alloc Cum Prodn	OOIP - Cum	Tract Factor (%)	Tract
01-19	01-19-008-29W1M	123,747	0.0	8,369.9	8,369.9	115,377	8.594567761%	01-19-008-29W1M
02-19	02-19-008-29W1M	109,075	0.0	2,834.2	2,834.2	106,241	7.913990667%	02-19-008-29W1M
03-19	03-19-008-29W1M	82,320	800.9	0.0	800.9	81,519	6.072424694%	03-19-008-29W1M
04-19	04-19-008-29W1M	70,115	555.4	0.0	555.4	69,559	5.181554330%	04-19-008-29W1M
05-19	05-19-008-29W1M	68,491	581.1	0.0	581.1	67,910	5.058672178%	05-19-008-29W1M
06-19	06-19-008-29W1M	81,024	851.3	0.0	851.3	80,173	5.972167097%	06-19-008-29W1M
07-19	07-19-008-29W1M	102,598	0.0	1,540.1	1,540.1	101,058	7.527954991%	07-19-008-29W1M
08-19	08-19-008-29W1M	120,526	0.0	8,876.9	8,876.9	111,649	8.316838801%	08-19-008-29W1M
09-19	09-19-008-29W1M	113,484	0.0	9,507.4	9,507.4	103,976	7.745325140%	09-19-008-29W1M
10-19	10-19-008-29W1M	97,841	0.0	4,234.8	4,234.8	93,606	6.972819339%	10-19-008-29W1M
11-19	11-19-008-29W1M	66,476	850.6	186.7	1,037.3	65,439	4.874616177%	11-19-008-29W1M
12-19	12-19-008-29W1M	65,016	581.0	199.6	780.6	64,235	4.784956384%	12-19-008-29W1M
13-19	13-19-008-29W1M	81,453	544.6	2,004.9	2,549.5	78,904	5.877620177%	13-19-008-29W1M
14-19	14-19-008-29W1M	69,356	815.3	206.0	1,021.3	68,335	5.090349475%	14-19-008-29W1M
15-19	15-19-008-29W1M	61,185	0.0	111.9	111.9	61,073	4.549390260%	15-19-008-29W1M
16-19	16-19-008-29W1M	76,955	0.0	3,566.8	3,566.8	73,388	5.466752529%	16-19-008-29W1M
		1,389,660	5,580.1	41,639.2	47,219.3	1,342,441	100.000000000%	

TABLE NO. 3 - Well List and Status

UWI	License Number	Type	Pool Name	Producing Zone	Mode	On Production Date	Prod Date	Cal Dly Oil (m3/d)	Monthly Oil (m3)	Cum Prd Oil (m3)	Cal Dly Water (m3/d)	Monthly Water (m3)	Cum Prd Water (m3)	WCT (%)
100/01-19-008-29W1/0	006254	Vertical	BAKKEN-THREE FORKS A	BAKKEN	Producing	8/20/2007	Apr-2019	0.67	20.20	8369.90	0.13	3.90	1798.10	16.18
100/02-19-008-29W1/0	006422	Vertical	BAKKEN-THREE FORKS A	BAKKEN	Producing	9/16/2008	Apr-2019	0.32	9.70	2834.20	0.09	2.80	1222.70	22.40
100/03-19-008-29W1/0	008307	Horizontal	BAKKEN-THREE FORKS A	BAKKEN,THREEFK	Producing	11/13/2011	Nov-2018	0.02	0.60	3318.10	0.39	11.70	17103.60	95.12
100/04-19-008-29W1/0	008628	Horizontal	BAKKEN-THREE FORKS A	BAKKEN	Producing	8/1/2012	Oct-2017	0.21	6.60	2262.00	4.41	136.70	16351.80	95.39
100/07-19-008-29W1/0	006423	Vertical	BAKKEN-THREE FORKS A	BAKKEN	Producing	10/31/2007	Apr-2019	0.07	2.00	1540.10	0.23	6.90	1886.30	77.53
100/08-19-008-29W1/0	006239	Vertical	BAKKEN-THREE FORKS A	BAKKEN	Producing	8/20/2007	Apr-2019	0.99	29.70	8876.90	0.30	9.10	1504.20	23.45
100/09-19-008-29W1/0	005510	Vertical	BAKKEN-THREE FORKS A	BAKKEN	Producing	7/31/2005	Apr-2019	0.48	14.30	9507.40	0.35	10.50	2128.10	42.34
100/10-19-008-29W1/0	006016	Vertical	BAKKEN-THREE FORKS A	BAKKEN	Producing	9/27/2006	Apr-2019	0.25	7.60	4234.80	0.34	10.20	1943.10	57.30
100/11-19-008-29W1/0	006017	Vertical	BAKKEN-THREE FORKS A	BAKKEN,TORQUAY	Abandoned Zone	9/26/2006	Oct-2011	0.00	0.00	186.70	0.45	14.10	1665.80	100.00
100/12-19-008-29W1/0	006018	Vertical	BAKKEN-THREE FORKS A	BAKKEN,TORQUAY	Abandoned Zone	9/26/2006	Jun-2009	0.01	0.30	199.60	0.39	11.80	1074.70	97.52
100/13-19-008-29W1/0	005532	Vertical	BAKKEN-THREE FORKS A	BAKKEN	Abandoned Zone	8/31/2005	May-2014	0.07	2.10	2004.90	0.04	1.30	2612.50	38.24
100/14-19-008-29W1/0	006019	Vertical	BAKKEN-THREE FORKS A	BAKKEN	Abandoned Zone	9/26/2006	Feb-2011	0.16	4.50	206.00	0.16	4.40	1343.60	49.44
100/15-19-008-29W1/0	006020	Vertical	BAKKEN-THREE FORKS A	BAKKEN	Abandoned Zone	9/28/2006	Mar-2008	0.05	1.50	111.90	0.36	11.30	842.80	88.28
100/16-19-008-29W1/0	006021	Vertical	BAKKEN-THREE FORKS A	BAKKEN	Producing	10/3/2006	Apr-2019	0.33	9.80	3566.80	0.24	7.30	2107.20	42.69
										47219.30	53584.50			

Table No. 4 : OOIP Calculation

LSD	Area (m^2)	Mid Bkn Iso (m)	Upr A Iso (m)	Lwr A Iso (m)	Lyl B Iso (m)	Mid Bkn OOIP (m^3)	Upr A OOIP (m^3)	Lwr A OOIP (m^3)	Lyl B OOIP (m^3)	Sum OOIP (m^3)	Sum OOIP (bbl)
01-19-008-29	160578	0.7	4.3	3.7	5.3	3108	60975	31796	27869	123,747	778,345
02-19-008-29	160478	1.2	3.1	3.6	5.5	5324	43931	30917	28903	109,075	686,060
03-19-008-29	160380	1.4	1.2	3.4	5.7	6207	16995	29182	29935	82,320	517,775
04-19-008-29	160277	1.6	0.4	3.2	5.7	7090	5661	27448	29916	70,115	441,008
05-19-008-29	160177	2.1	0.3	2.8	5.9	9299	4243	24002	30946	68,491	430,794
06-19-008-29	160280	1.7	1.2	3.1	5.7	7533	16985	26590	29916	81,024	509,626
07-19-008-29	160379	1.1	2.8	3.4	5.5	4877	39655	29181	28885	102,598	645,325
08-19-008-29	160478	0.7	4.6	2.9	5.2	3106	65188	24906	27326	120,526	758,083
09-19-008-29	160377	1.0	3.6	3.4	5.5	4434	50985	29181	28884	113,484	713,792
10-19-008-29	160271	1.0	2.5	3.4	5.5	4431	35383	29162	28865	97,841	615,400
11-19-008-29	160171	1.8	0.4	2.8	5.5	7970	5658	24001	28847	66,476	418,122
12-19-008-29	160074	2.3	0.2	2.4	6.0	10178	2827	20560	31451	65,016	408,937
13-19-008-29	159974	0.9	1.3	3.6	5.4	3980	18365	30820	28288	81,453	512,324
14-19-008-29	160071	1.1	0.9	2.8	5.3	4868	12722	23986	27781	69,356	436,238
15-19-008-29	160172	0.9	0.2	3.1	5.3	3985	2829	26572	27798	61,185	384,841
16-19-008-29	160277	1.5	1.1	3.2	5.2	6646	15569	27448	27292	76,955	484,031
										1,389,660	8,740,700

Boi	1.1
Porosity	0.157
Mid Bkn N/G	0.298
Upr A N/G	0.773
Lwr A N/G	0.536
Lyl B N/G	0.353
Mid Bkn Sw	0.35
Upr A Sw	0.2
Lwr A Sw	0.3
Lyl B Sw	0.35