

Dataset for Integrated Petrophysical Analysis and 3-D Geological Model Development of the Bakken Unconventional Reservoir (Sanish Field)

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1. Abstract

The Bakken Formation in the Williston Basin remains one of the most unconventional plays in North America, yet accurate reservoir characterization continues to be challenged by significant lithological heterogeneity, particularly within the Middle Bakken and Three Forks intervals. This study presents an integrated petrophysical analysis and 3-D geocellular model development for the Sanish field, covering approximately 157,060 acres in North Dakota. A comprehensive database comprising geophysical well logs from 100 wells, routine core analysis from 13 wells, and stratigraphic well tops was assembled to characterize the Upper, Middle, and Lower Bakken members and the Upper, Middle, and Lower Three Forks formations. Petrophysical properties, including shale volume, total and effective porosity, permeability, and water saturation, were estimated using neutron-density log methods and the modified Simandoux equation, with parameters calibrated against core measurements and validated through XRD and elemental capture spectroscopy data. Strong agreement was achieved between log-derived and core-measured properties in the Middle Bakken, while higher uncertainty persisted in the Three Forks owing to its complex dolostone-anhydrite mineralogy. Structural and stratigraphic surfaces were constructed using kriging interpolation, revealing average thicknesses of 14-24 ft for the Upper Bakken, 35-70 ft for the Middle Bakken, and 35-50 ft for the Lower Bakken, with the Three Forks intervals exhibiting greater

variability. A high-resolution geocellular grid ($50 \times 50 \times 2.5$ ft, 150 million cells) was populated using sequential Gaussian simulation to capture the spatial heterogeneity of reservoir properties. The resulting model provides a robust geological framework for subsequent reservoir simulation studies, including hydraulic fracture modeling, enhanced oil recovery evaluation, and CO₂ storage assessment in the Bakken unconventional system.

2. Introduction

The geological model development for the Sanish field study area involved constructing a geocellular model using a comprehensive database of geophysical well tops, well logs, well information, including well heads and trajectory survey, stratigraphy, and routine core data analysis. The constructed model incorporates the following activities.

3. Data Collection and Integration

The study covers an average area of 157,060 acres in the Sanish field. To map the structure and stratigraphy of the Bakken Formation, including the Upper Bakken (UB), Middle Bakken (MB), Lower Bakken (LB), Upper Three Forks (UTF), Middle Three Forks (MTF), and Lower Three Forks (LTF) formations, we used 100 wells with geophysical well logs from the North Dakota Industrial Commission (NDIC). The database comprised well logs, wellheads, well trajectories, and routine core analysis. The well tops were extracted from gamma-ray (GR), bulk density (RHOB), neutron porosity (NPHI), photoelectric effect (PEF), and resistivity markers. The complete well top data for all 100 wells are listed in **Appendix A**.

Routine core analysis (RCA) was available for only 13 wells. The full core analysis datasets for all 13 wells are tabulated in **Appendix B**. Consequently, petrophysical property analysis was conducted on the wells with available core data, while the remaining well logs were used for

structural and stratigraphy mapping. The geographical overview of the study area and well location used in the study are presented in **Figure 1**.

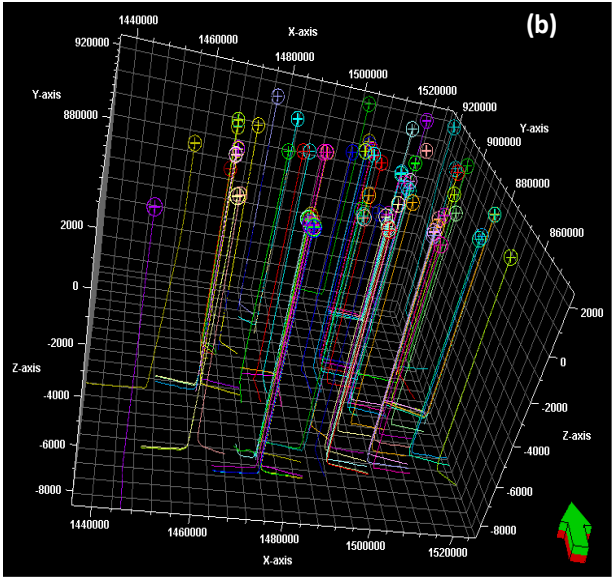
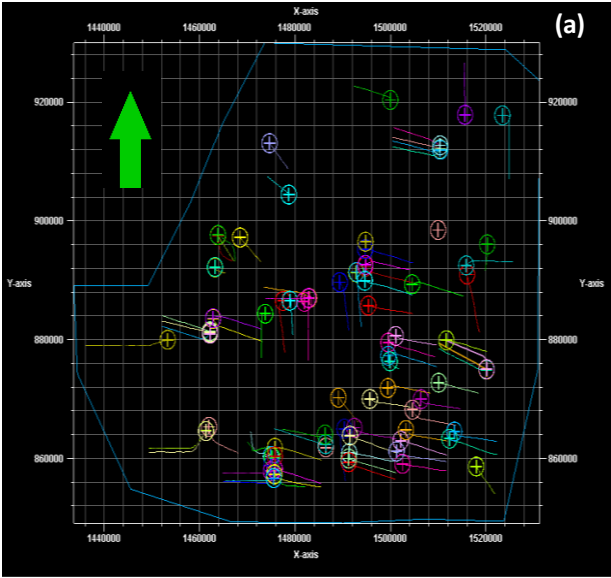
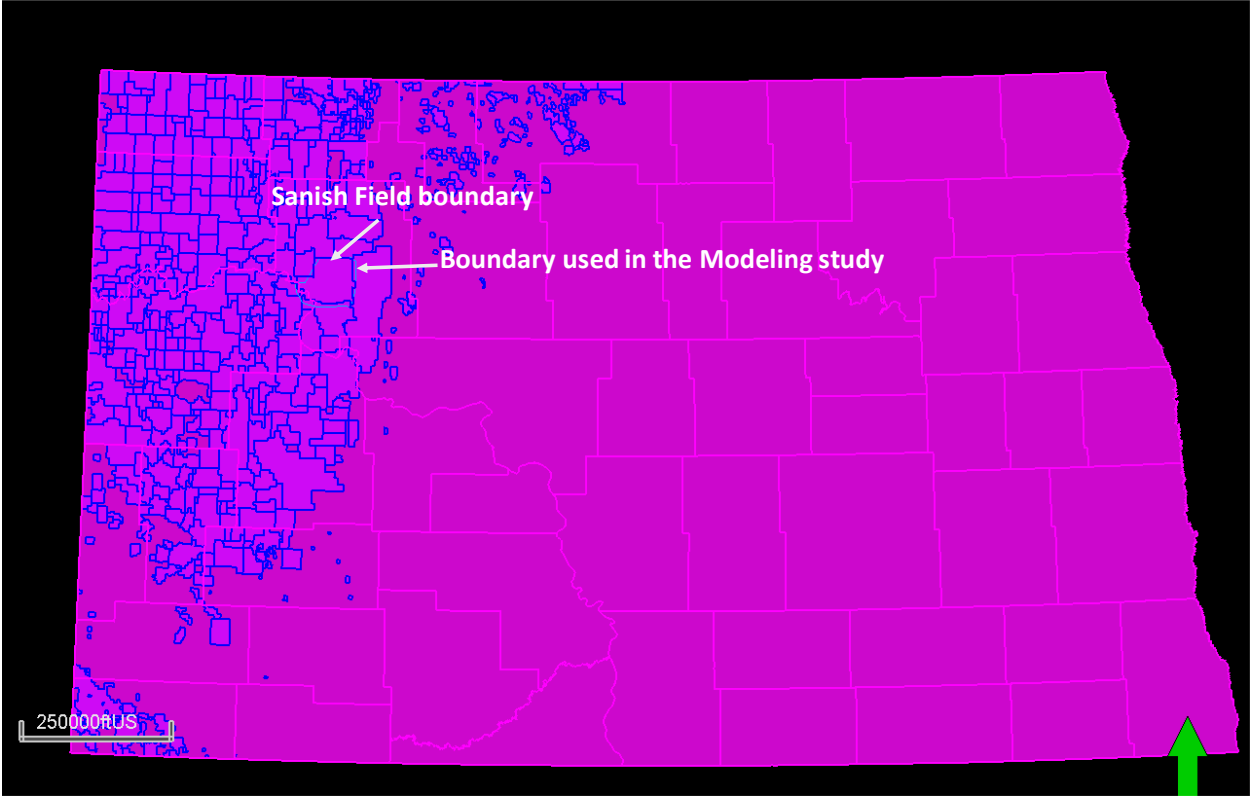


Figure.1: Displays the geographical field boundary in North Dakota State, including the Sanish field and the boundary of the study area (top figure), (a) and (b) show the well locations used in this study, and the 3D well trajectories, respectively.

4. Petrophysical Evaluation

Due to the lithologic heterogeneity of the Bakken Formations, particularly within the Middle Bakken (MB), Upper Three Forks (UTF), and Middle Three Forks (MTF) intervals, we developed a petrophysical log model to accurately characterize the reservoir properties such as total porosity (PHIT), effective porosity (PHIE), shale volume (Vsh), permeability (k), and water saturation (SW). The petrophysical model was applied to 13 wells with core data analysis, which included porosity, permeability, and SW data, to calibrate and match log data for petrophysical evaluation across these wells. Based on the lithological characteristics, the Middle Bakken is primarily composed of siliciclastic and carbonate lithofacies with minor clay, exhibiting porosities of 5-15% and permeabilities less than 0.01 mD [1]. In contrast, the Three Forks formations, including UTF and MTF, are more complex in lithology, featuring fine-grained to silty dolostone with interspersed dolomudstone and anhydrite, resulting in a high degree of heterogeneity in lithofacies and significant variability in porosity and permeability values (**Figure 2**).

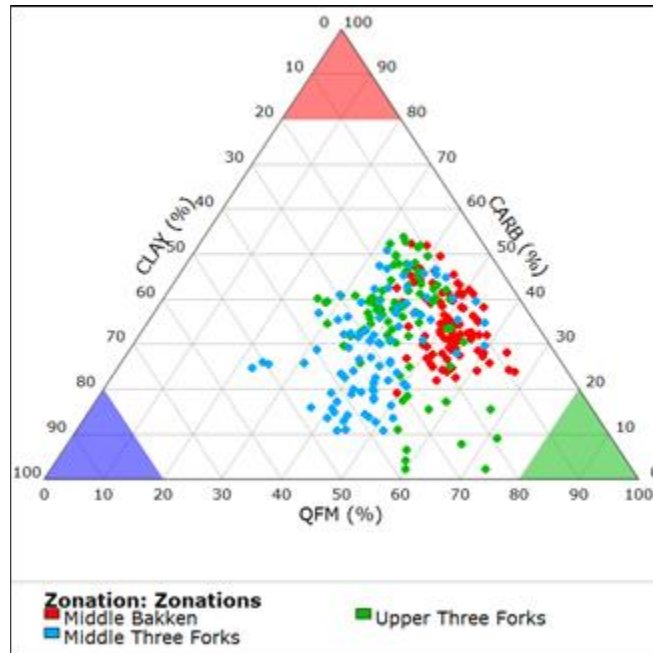


Figure.2: Ternary plot showing the , carbonates, and clay distribution of Middle Bakken (MB), Upper Three Forks (UTF), and Middle Three Forks (MTF).

4.1. Shale Volume

The shale volume in the target zone can be estimated by utilizing the normalized Gamma-Ray log with the neutron and density porosity logs, or a combination of many logs [2]. Estimating shale volume (V_{sh}) from gamma-ray (GR) measurements is a standard technique in petrophysical analysis using conventional logs. However, this method has several limitations. These include the presence of radioactive minerals in non-clay lithologies, which can lead to inaccuracies, the inadequacy of linear relationships that often overestimate shale volume, and the difficulty in obtaining clean shale and sandstone intervals for accurate calibration. In the present study, we used the Neutron Density logs to estimate the shale volume. Generally, the calculated shale volumes should correspond to the separation trend observed between the PHIN and density (RHOZ) curves: greater separation indicates higher shale volume. The mathematical **Equation 1** to compute the shale volume can be expressed as [3]:

$$V_{shND} = \frac{PHIN - PHID}{PHIN_{SH} - PHID_{SH}} \quad (1)$$

where: $PHIN$ is the neutron porosity, $PHID$ is the density porosity, $PHIN_{sh}$ is the neutron porosity of the shale, and $PHID_{sh}$ is the density porosity of the shale.

The estimated shale volumes were validated using X-ray diffraction (XRD) core analysis and elemental capture spectroscopy data. **Figures 3 and 4** present the shale volume estimates alongside the conventional logs, demonstrating the neutron-density method's effectiveness in capturing the shale volume in the target zones (MB, UTF, and MTF). Petrophysical interpretations for the remaining 11 wells are provided in **Appendix C (Figures C1–C11)**

4.2. Porosity

The integration of density and neutron logs is widely utilized to determine porosity, effectively reducing the influence of lithology. The total porosity using neutron and density logs can be calculated using the average of neutron and density porosities, which can be expressed as **(Equation 2)**:

$$PHIT = \frac{PHIN + PHID}{2} \quad (2)$$

where $PHIN$ is the neutron porosity obtained from the log, and $PHID$ is the density porosity calculated in the zone of interest using the following formula **(Equation 3)**:

$$PHID = \frac{RHOM - RHOB}{RHOM - RHOFLL} \quad (3)$$

where $RHOM$ is the density of the mineral matrix, and $RHOB$ is the bulk density obtained from the log, and $RHOFL$ is the density of the reservoir fluid.

When clays are present in the formation matrix, the measured neutron porosity exceeds the true formation porosity. This discrepancy arises because the neutron log detects hydrogen not only in the pore spaces but also in the clay's structure and the water bound to the clay. Effective porosity ($PHIE$) is defined as the interconnected pore volume in a rock that facilitates fluid flow or permeability within a reservoir. It does not include isolated pores or the water pore volume adsorbed on clay minerals or other grains. The effective porosity is calculated using the neutron density logs corrected to shale volume [3], which can be expressed as (**Equation 4**):

$$PHIE = \frac{PHIN_{SH} \times PHID - PHID_{SH} \times PHIN}{PHIN_{SH} - PHID_{SH}} \quad (4)$$

where $PHID_{SH}$ = Density porosity in shale, $PHIN$ = Neutron porosity (from log), and $PHIN_{SH}$ is Neutron porosity reading from 100% shale.

The estimated porosities were validated using laboratory core analysis measurements and independently verified with NMR log data. Matrix parameters were heuristically adjusted to closely approximate the core data. Where necessary, formations were subdivided, and parameters were fine-tuned to maintain consistency across all wells. **Figures 3 and 4** present the estimated total porosity and effective porosity along with the conventional logs. Petrophysical interpretations for the remaining 11 wells are provided in **Appendix C (Figures C1–C11)**

4.3. Water Saturation

According to Ross Crain, the modified Simandoux equation [4], a commonly used robust petrophysical model, estimates water saturation in hydrocarbon-bearing formations containing

shale [5]. This equation takes into account the total formation resistivity (R_t), the resistivity of the shale (R_{sh}), and the resistivity of the formation water (R_w). This is done so that the clay conductivity doesn't change the overall resistivity measurement; hence, the modified Simandoux model was used to estimate the water saturation (S_w) (**Equation 5**) [6].

$$\frac{1}{R_t} = \frac{PHIE^m S_w^n}{a R_w (1 - V_{sh})} + \frac{V_{sh} * S_w}{R_{sh}} - \frac{1}{R_t} \quad (5)$$

where R_t represents formation resistivity, $PHIE$ is the effective porosity, R_w denotes formation water resistivity, a , m , and n are constants from the Archie equation [7], R_{sh} is the resistivity of shale, and V_{sh} indicates the shale fraction.

According to Alexeyev et al. (2017), we assume formation water resistivity of 0.015-0.03 ohm/m and a , m , and n of 1, 2, and 2, respectively [8]. The estimated water saturations, along with the conventional logs, are displayed in **Figures 3** and **4** for the MB and Three Forks formations (UTF and MTF), respectively. An excellent match is observed between the estimated S_w and core-derived values in the Middle Bakken member. However, in the Three Forks formation, due to its lithological complexity and heterogeneity, the estimations exhibit higher uncertainty. Previous studies indicate that estimating S_w in the Three Forks formations remains highly uncertain, even when multiminerall analysis is used in conjunction with advanced facies analysis [9]. It should be noted that we used a heuristic approach to estimate the petrophysical parameters to match core-derived analyses. The Bakken and Three Forks formations were divided into layers based on variations in petrophysical facies. The parameters were adjusted for each layer to improve the accuracy of our estimations when validated against the core data. These calibrated parameters were then consistently applied to all wells where core data were unavailable, ensuring uniformity in our

analysis. Petrophysical interpretations for the remaining 11 wells are provided in **Appendix C** (Figures C1–C11)

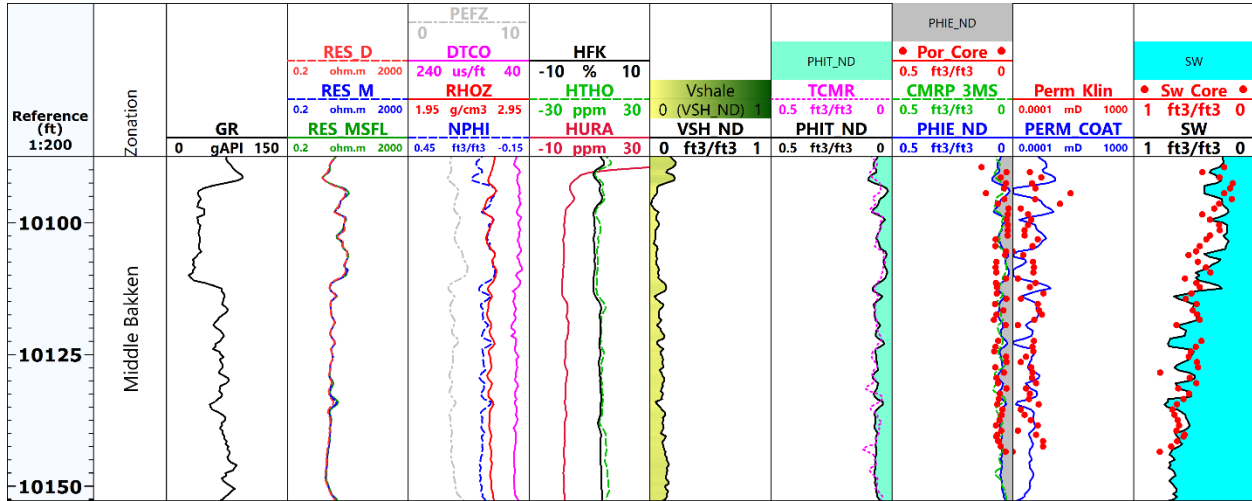


Figure 3: Estimated Petrophysical parameters for the Middle Bakken Formation along with the core analysis results. Track 1: Gamma Ray (GR). Track 2: Deep and shallow resistivity logs (RT, RES_D, RES_S) for fluid saturation estimation. Track 3: Density (RHOB) and neutron porosity (NPHI) for porosity evaluation. Track 4: Spectral gamma ray logs Potassium (HFK), Thorium (HTHO), and Uranium (HURA), used for mineralogical and clay type differentiation. Track 5: Shale Volume. Track 6-7: Effective porosity (PHIE) computed from density-neutron cross plot and compared with core-derived porosity (Por Core). Track 9: Log-derived permeability overlaid with core permeability data (Perm Core). Track 9: Water saturation (S_w) estimated from logs and compared to core water saturation (S_w Core).

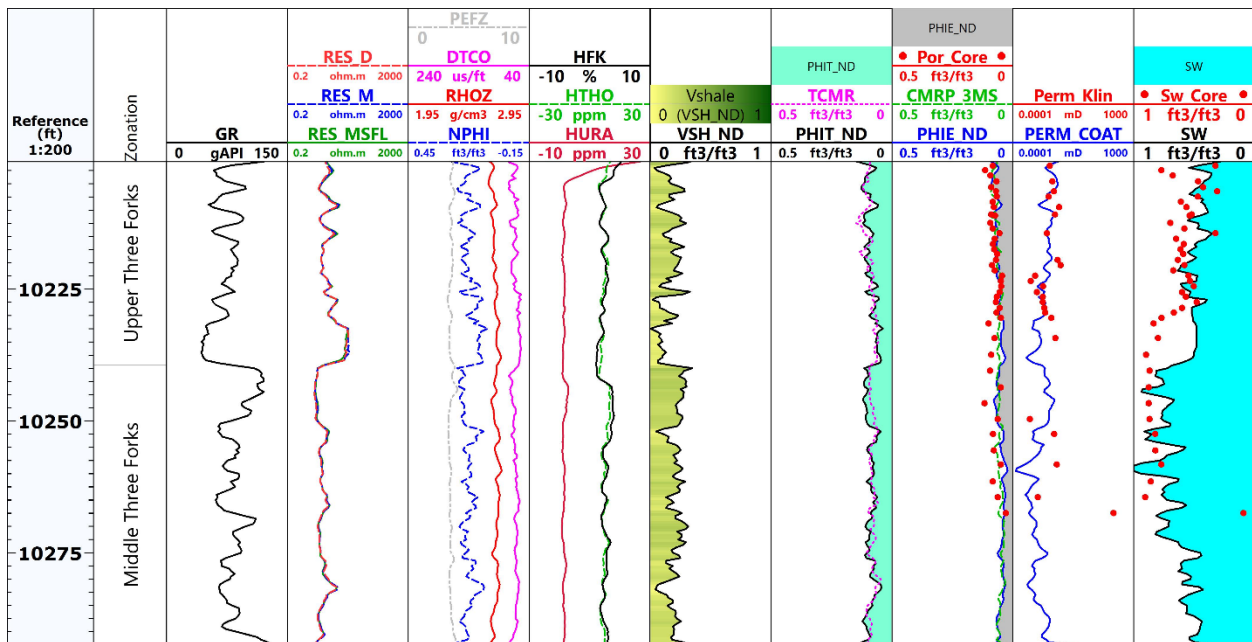


Figure 3: Estimated Petrophysical parameters for the Upper Three Forks and Middle Three Forks Formations along with the core analysis results. Track 1: Gamma Ray (GR). Track 2: Deep and shallow resistivity logs (RT, RES_D, RES_S) for fluid saturation estimation. Track 3: Density (RHOB) and neutron porosity (NPHI) for porosity evaluation. Track 4: Spectral gamma ray logs Potassium (HFK), Thorium (HTHO), and Uranium (HURA), used for mineralogical and clay type differentiation. Track 5: Shale Volume. Track 6-7: Effective porosity (PHIE) computed from density-neutron crossplot and compared with core-derived porosity (Por Core). Track 9: Log-derived permeability overlaid with core permeability data (Perm Core). Track 9: Water saturation (SWE) estimated from logs and compared to core water saturation (Sw Core).

5. Geocellular Model Construction

After importing well logs from SLB Techlog into SLB Petrel version 2018.1, well tops were identified based on formation zones, using the GR log as a reference to distinguish between the zones. Surfaces were created for the UB, MB, LB, and Three Forks formations (including the UTF, MTF, and LTF layers). Kriging interpolation [10] was utilized to construct structural and stratigraphic maps for each formation, as this method yields smoother and less heterogeneous results compared to stochastic interpolation [11]. The formation's thickness necessitated the use of a vertical exaggeration (Z-scale) to highlight minor variations in relief, despite the potential underestimation of the true vertical scale. **Figure 5 (a, c, and e)** displays the Z-scale contour map for the UB, MB, and LB, respectively. **Figure 5 (b, d, and f)** presents the thickness (isochore) maps and the variograms across UB, MD, and LB, offering insights into the geological variability and the stratigraphic thickness across each formation. The study reveals that the average thickness of the UB ranges from 14 to 24 ft. Conversely, the LB exhibits a thicker profile with an average thickness between 35 and 50 ft, and the MB displays a broader range from 35 to 70 ft, highlighting the significance of the LB as a source rock, significantly contributing to hydrocarbon generation and migration into the overlying MB.

Figure 6 (a, c, and e) illustrates the contour Z-scale map for the Three Forks Formation, including UTF, MTF, and LTF, respectively. **Figure 6 (b, d, and f)** shows the thickness (isochore) maps and the variograms across UTF, MTF, and LTF. The maps indicate that the UTF has an

average thickness ranging from 20 to 45 ft. In contrast, the MTF exhibits a thicker profile with an average thickness in the range of 45 - 60 ft. The LTF shows the most considerable variation, with thickness ranging from 25 to 175 ft. The overestimation of the LTF thickness was due to the lack of logs with sufficient depth reaching the LTF formation. The overestimation of the LTF formation thickness occurred due to the lack of well logs that reached the depths of the LTF formation. This limitation in data depth contributed to challenges in accurately assessing the formation's true thickness and may impact the geological interpretations and resource estimations derived from these measurements.

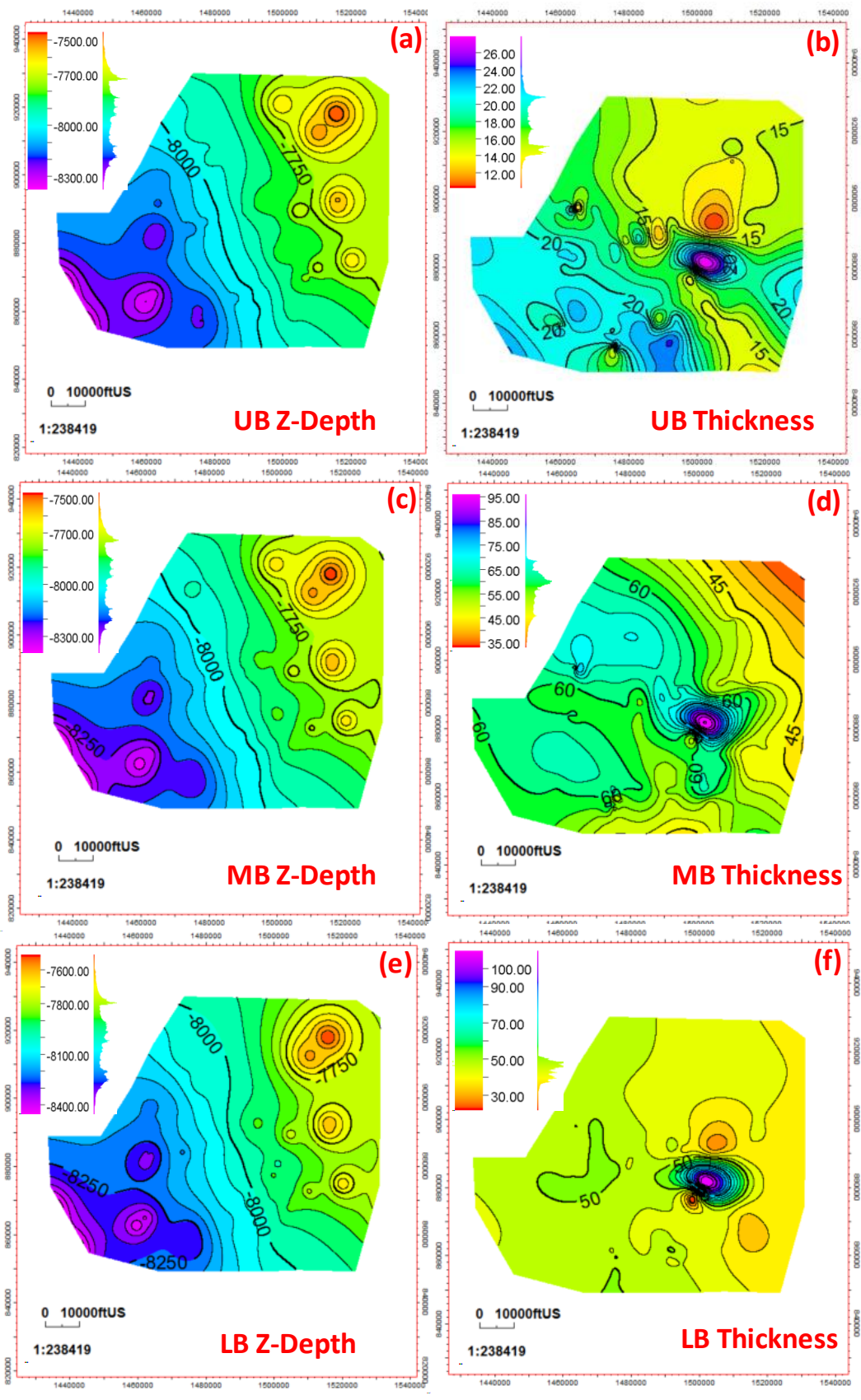


Figure 4: Contour Z-Scale (a, c, and e) and thickness (b, d, and f) (isochore) maps highlighting the geological variability and thickness distribution across the UB, MB, and LB Formations.

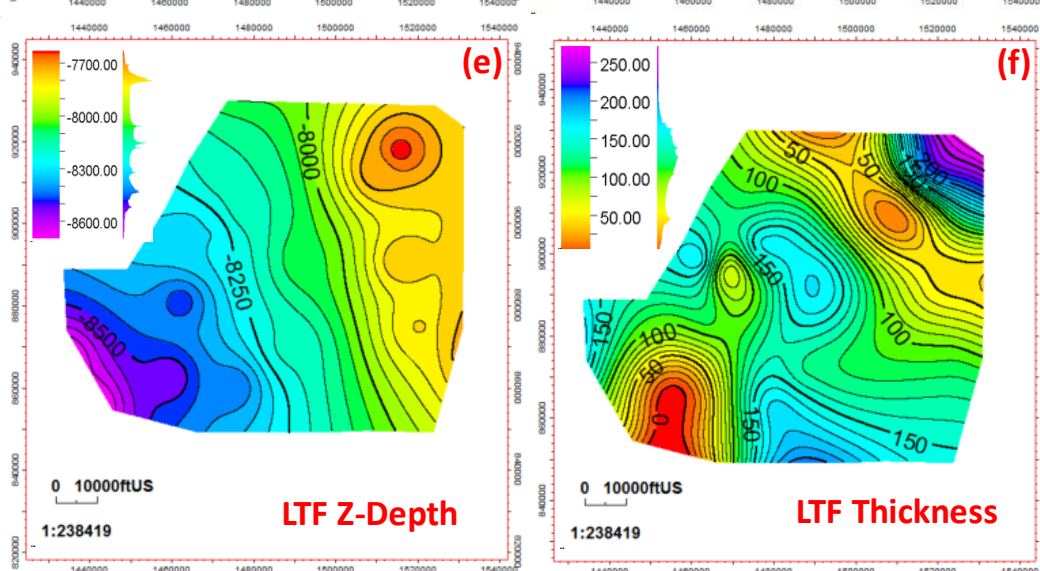
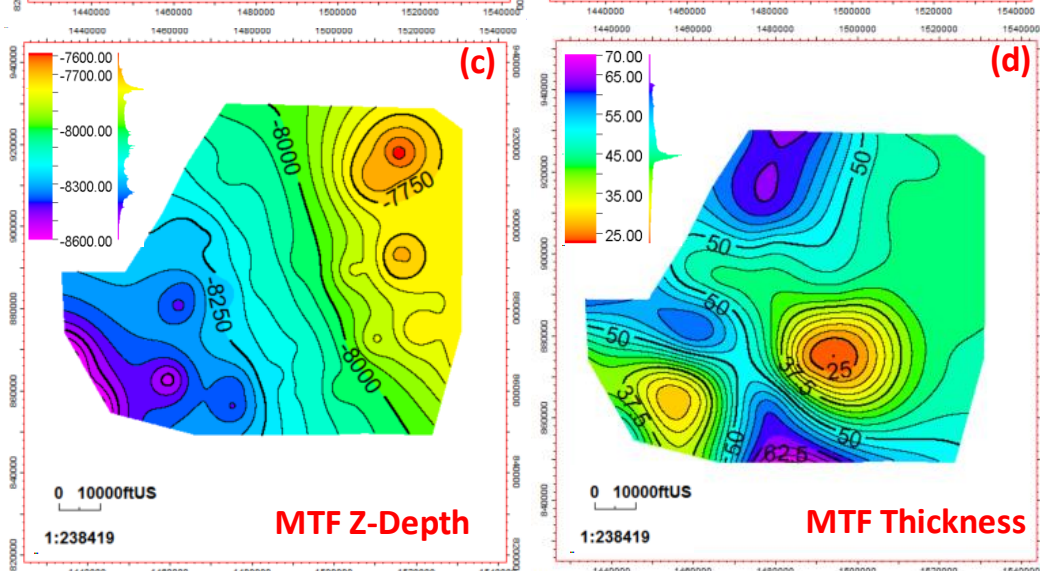
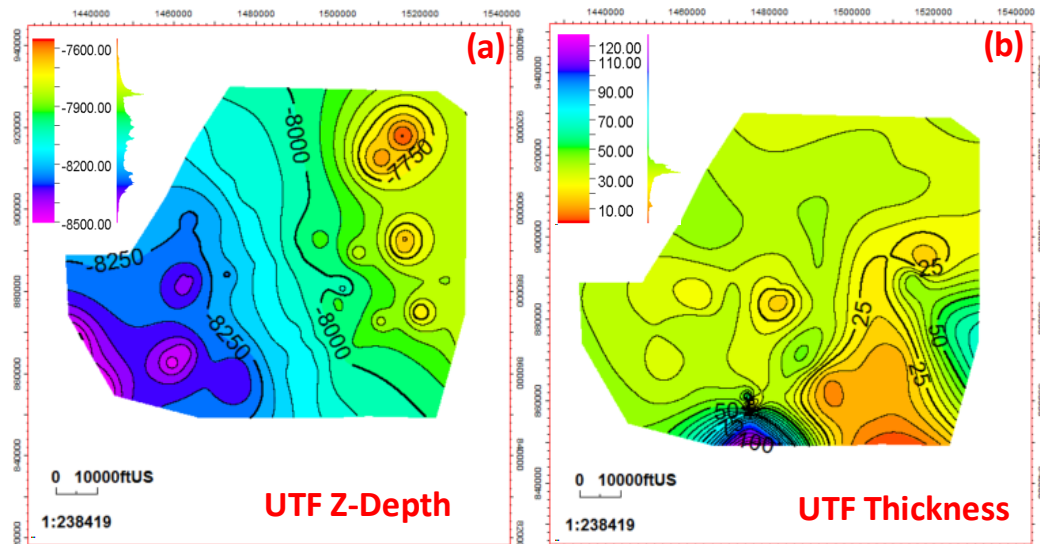


Figure 5: Contour Z-Scale (a, c, and e) and thickness distribution (b, d, and f) (isochore) maps of the UB, MB, and LB Formations.

The zones were then divided into 20 layers, each represented by a grid cell measuring 50×50 ft in the I and J directions. In the vertical direction k, the grid cells had an average size of 2 - 2.5 ft, resulting in 150 million grid cells. In our study, we conducted a grid sensitivity analysis to determine the optimal grid resolution to more accurately capture fluid flow dynamics, especially around hydraulic fractures. While typical Bakken simulations utilize grid sizes between 100 and 200 ft, we evaluated a finer grid size of 50 ft. The 50-ft grid provided enhanced detail in modeling saturation and pressure gradients near fractures, leading to more precise simulation outcomes.

The well logs were incorporated into the structural model, and petrophysical properties were first upscaled to match the simulation grid resolution ($50 \times 50 \times 2.5$ ft) using Petrel's static property upscaling workflow. Specifically, permeability was upscaled using the harmonic average, suitable for low-permeability formations where the smallest values control flow. Porosity was upscaled using the arithmetic average, as it is an additive volumetric property. For water saturation, a volume-weighted average was applied to ensure an accurate representation of fluid distribution based on local pore volume.

Following upscaling, a thorough data analysis was conducted to generate variograms for the major, minor, and vertical intervals, which measured 40417, 40417, and 2.5 ft, respectively [12]. The presence of small variogram limits indicates significant heterogeneity in both the model's horizontal and vertical dimensions. The geostatistical technique of sequential Gaussian simulation (SGS), [13]. was employed to allocate petrophysical attributes such as water saturation, effective porosity, and permeability within the structural model (**Table 1**) [11]. The petrophysical distributions were executed within the Middle Bakken (MB) (**Figure 7**), Upper Three Forks (UTF)

(**Figure 8**), and Middle Three Forks (MTF) formations (**Figure 9**). This approach successfully captured the spatial variability of these properties, reflecting the natural variability observed within the field data.

Table 1: Average petrophysical property distribution and grid size of Middle Bakken, Upper Three Forks, and Middle Three Forks formations: well Logs vs. upscaled data

Formation	Cell Size I, J, and K (ft)	Shale Volume, %		Porosity, fraction		Permeability, mD		Sw, fraction	
		Well Logs	Upscaled	Well Logs	Upscaled	Well Logs	Upscaled	Well Logs	Upscaled
Middle Bakken (MB)	50×50×2	12.35	12.63	0.0499	0.0501	0.0405	0.0398	0.362	0.349
Upper Three Forks (UTF)	50×50×2	19.43	19.54	0.0561	0.0559	0.0395	0.0419	0.424	0.421
Middle Three Forks (MTF)	50×50×2	26.18	26.46	0.0411	0.0406	0.006	0.0061	0.718	0.731

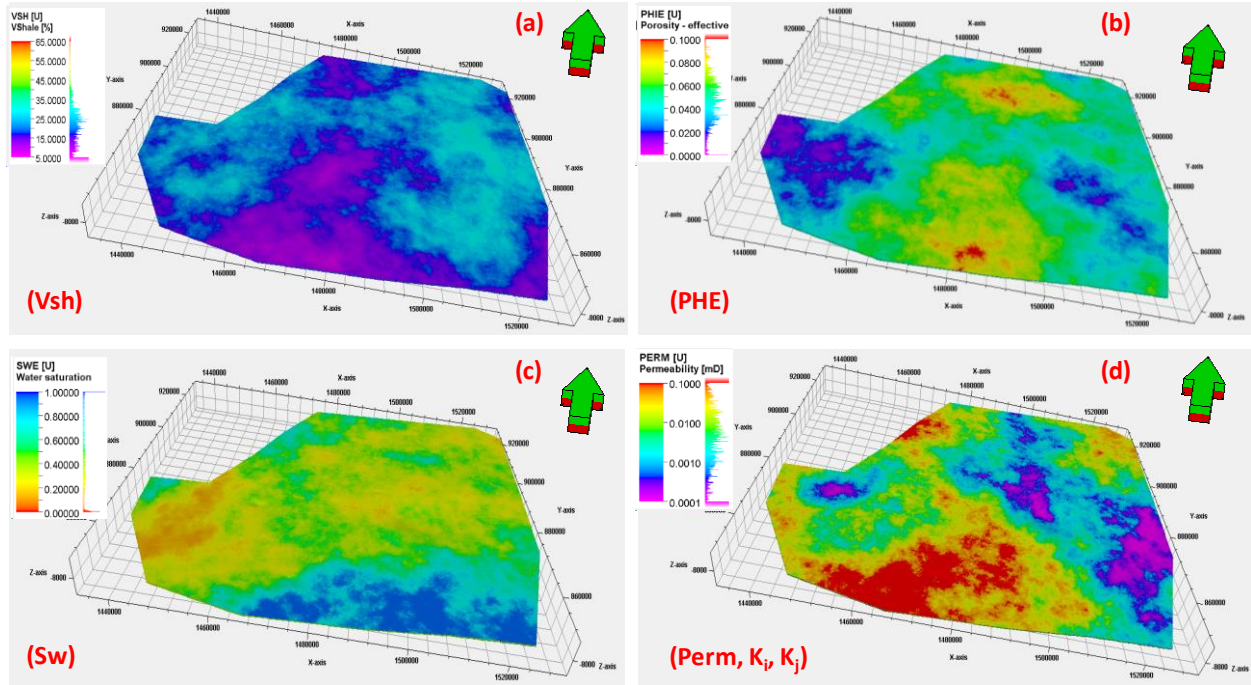


Figure 6: Sequential Gaussian Simulation of 3D petrophysical distribution in the MB, (a) shale volume (Vsh), (b) effective porosity (PHE), (c) water saturation (S_w), and (d) permeability ($K_i=K_j$)

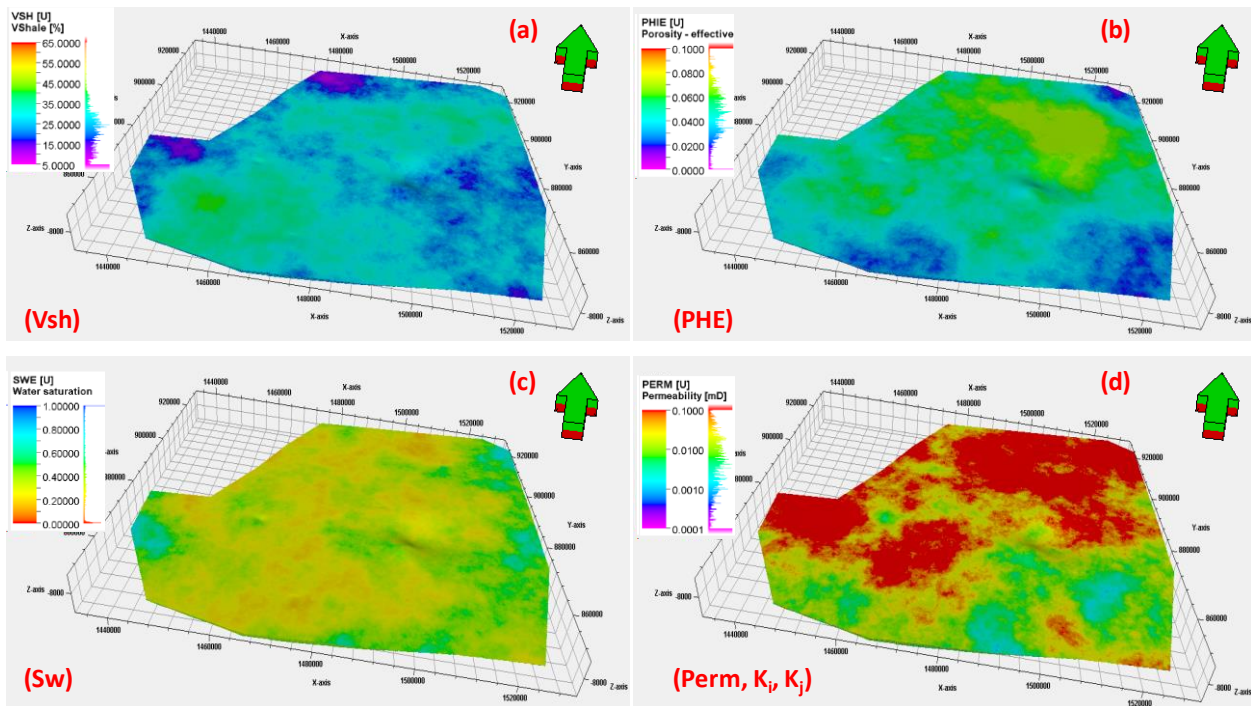


Figure 7: 3D petrophysical distribution modeling via Sequential Gaussian Simulation in the UTF, (a) shale volume (Vsh), (b) effective porosity (PHE), (c) water saturation (S_w), and (d) permeability ($K_i=K_j$).

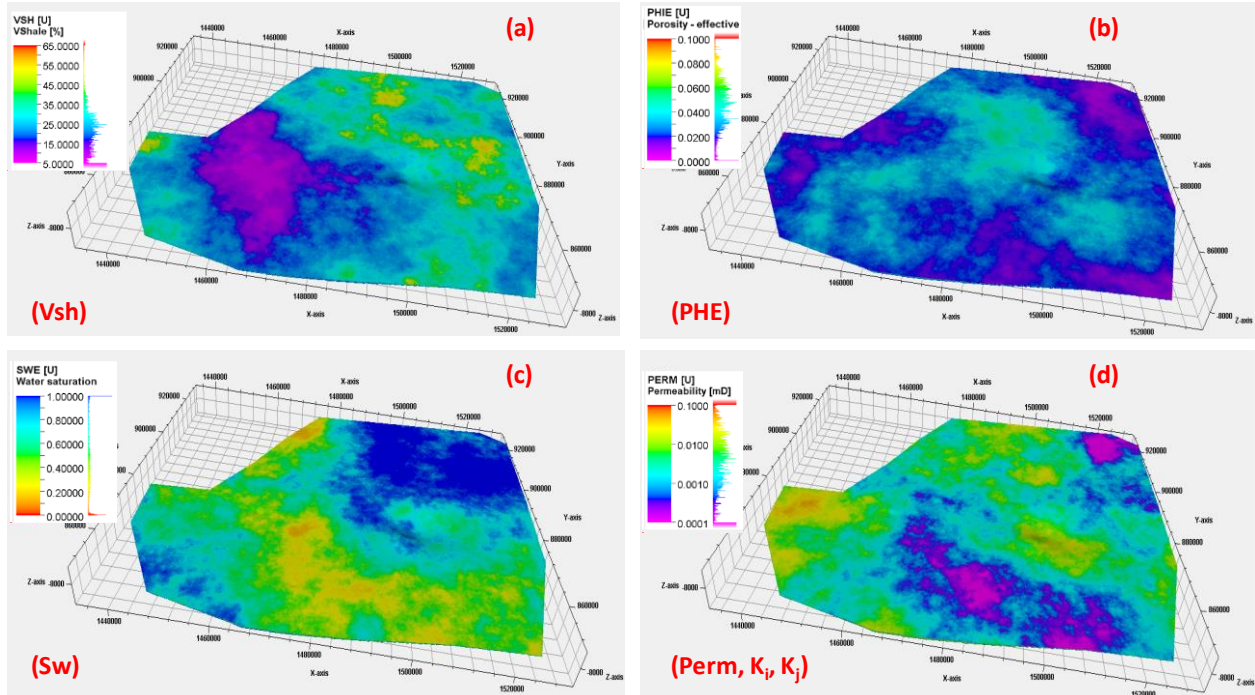


Figure 8: Application of Sequential Gaussian Simulation for 3D Petrophysical Characterization in the MTF, (a) shale volume (V_{sh}), (b) effective porosity (PHE), (c) water saturation (S_w), and (d) permeability ($K_i=K_j$).

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Appendix A

Bakken and Three Forks well tops

NDIC Well No	Formation	Top (ft)	Bottom (ft)	Thickness (ft)	Target Formations
16068	Upper Bakken	10212.04	10233.26	21.22	Middle Bakken
	Middle Bakken	10233.26	10288.23	54.98	
	Lower Bakken	10288.23	10336.94	48.71	
	Upper Three Forks	10336.94	10367.80	30.86	
	Middle Three Forks	10367.80	10403.97	36.17	

16586	Upper Bakken	9779.92	9793.67	13.75	Middle Bakken
	Middle Bakken	9793.67	9853.25	59.58	
	Lower Bakken	9853.25	9896.17	42.92	
	Upper Three Forks	9896.17	9929.08	32.92	
	Middle Three Forks	9929.08	9979.08	50.00	
	Lower Three Forks	9979.08	10055.33	76.25	
16841	Upper Bakken	10071.53	10086.72	15.19	Middle Bakken
	Middle Bakken	10086.72	10155.29	68.58	
	Lower Bakken	10155.29	10200.43	45.14	
	Upper Three Forks	10200.43	10239.50	39.06	
	Middle Three Forks	10239.50	10292.45	52.95	
	Lower Three Forks	10292.45	10451.30	158.85	
16876	Upper Bakken	10139.49	10157.28	17.80	Middle Bakken
	Middle Bakken	10157.28	10223.25	65.97	
	Lower Bakken	10223.25	10273.63	50.38	
	Upper Three Forks	10273.63	10313.01	39.38	
	Middle Three Forks	10313.01	10358.43	45.42	
	Lower Three Forks	10358.43	10442.87	84.44	
17023	Upper Bakken	9864.95	9879.65	14.70	Middle Bakken
	Middle Bakken	9879.65	9935.51	55.86	
	Lower Bakken	9935.51	9973.61	38.10	
	Upper Three Forks	9973.61	10009.60	35.99	
	Middle Three Forks	10009.60	10054.05	44.45	
	Lower Three Forks	10054.05	10114.74	60.68	
17351	Upper Bakken	10059.85	10075.99	16.15	Middle Bakken
	Middle Bakken	10075.99	10131.72	55.73	
	Lower Bakken	10131.72	10178.60	46.87	
	Upper Three Forks	10178.60	10210.37	31.77	
	Middle Three Forks	10210.37	10266.10	55.73	
	Lower Three Forks	10266.10	10299.43	33.33	

NDIC Well No	Formation	Top (ft)	Bottom (ft)	Thickness (ft)	Target Formations
18247	Upper Bakken	9714.15	9729.25	15.11	Middle Bakken
	Middle Bakken	9729.25	9776.21	46.96	
	Lower Bakken	9776.21	9818.68	42.47	
	Upper Three Forks	9818.68	9855.03	36.34	
	Middle Three Forks	9855.03	9899.54	44.51	
	Lower Three Forks	9899.54	9930.16	30.63	

18905	Upper Bakken	10551.90	10575.86	23.96	Three Forks
	Middle Bakken	10575.86	10632.63	56.77	
	Lower Bakken	10632.63	10677.94	45.31	
	Upper Three Forks	10677.94	10723.77	45.83	
	Middle Three Forks	10723.77	10774.81	51.04	
	Lower Three Forks	10774.81	10835.75	60.94	
21378	Upper Bakken	9474.45	9490.07	15.62	Middle Bakken
	Middle Bakken	9490.07	9530.70	40.62	
	Lower Bakken	9530.70	9565.07	34.37	
	Upper Three Forks	9565.07	9608.30	43.23	
	Middle Three Forks	9608.30	9661.42	53.12	
	Lower Three Forks	9661.42	9724.97	63.54	
21928	Upper Bakken	9808.21	9823.14	14.93	Middle Bakken
	Middle Bakken	9823.14	9865.68	42.53	
	Lower Bakken	9865.68	9906.91	41.23	
	Upper Three Forks	9906.91	9941.37	34.46	
	Middle Three Forks	9941.37	9986.34	44.97	
	Lower Three Forks	9986.34	10145.19	158.85	
22532	Upper Bakken	10249.18	10269.39	20.21	Three Forks
	Middle Bakken	10269.39	10330.95	61.56	
	Lower Bakken	10330.95	10382.10	51.15	
	Upper Three Forks	10382.10	10416.89	34.79	
	Middle Three Forks	10416.89	10475.64	58.75	
	Lower Three Forks	10475.64	10577.30	101.67	
23285	Upper Bakken	10445.92	10466.76	20.83	Three Forks
	Middle Bakken	10466.76	10545.75	78.99	
	Lower Bakken	10545.75	10600.44	54.69	
	Upper Three Forks	10600.44	10639.50	39.06	
	Middle Three Forks	10639.50	10684.64	45.14	
	Lower Three Forks	10684.64	10858.25	173.61	

NDIC Well No	Formation	Top (ft)	Bottom (ft)	Thickness (ft)	Target Formations
23565	Upper Bakken	9783.59	9802.86	19.27	Middle Bakken
	Middle Bakken	9802.86	9850.78	47.92	
	Lower Bakken	9850.78	9890.26	39.48	
	Upper Three Forks	9890.26	9935.68	45.42	
	Middle Three Forks	9935.68	9979.95	44.27	
	Lower Three Forks	9979.95	10087.24	107.29	

24779	Upper Bakken	10202.04	10218.53	16.49	Middle Bakken
	Middle Bakken	10218.53	10282.33	63.80	
	Lower Bakken	10282.33	10328.77	46.44	
	Upper Three Forks	10328.77	10368.27	39.50	
	Middle Three Forks	10368.27	10412.11	43.84	
	Lower Three Forks	10412.11	10577.90	165.80	
24814	Upper Bakken	10575.86	10597.56	21.70	Three Forks
	Middle Bakken	10597.56	10655.29	57.73	
	Lower Bakken	10655.29	10697.82	42.53	
	Upper Three Forks	10697.82	10740.79	42.97	
	Middle Three Forks	10740.79	10779.42	38.63	
	Lower Three Forks	10779.42	10927.86	148.44	
25688	Upper Bakken	10638.50	10661.07	22.57	Three Forks
	Middle Bakken	10661.07	10723.57	62.50	
	Lower Bakken	10723.57	10779.99	56.42	
	Upper Three Forks	10779.99	10830.34	50.35	
	Middle Three Forks	10830.34	10918.01	87.67	
	Lower Three Forks	10918.01	11024.79	106.77	
26661	Upper Bakken	9349.46	9366.34	16.87	Middle Bakken
	Middle Bakken	9366.34	9403.32	36.98	
	Lower Bakken	9403.32	9435.09	31.77	
	Upper Three Forks	9435.09	9476.55	41.46	
	Middle Three Forks	9476.55	9521.34	44.79	
	Lower Three Forks	9521.34	9675.19	153.85	
26990	Upper Bakken	10316.41	10337.68	21.27	Three Forks
	Middle Bakken	10337.68	10379.35	41.67	
	Lower Bakken	10379.35	10403.65	24.31	
	Upper Three Forks	10403.65	10435.77	32.12	
	Middle Three Forks	10435.77	10495.23	59.46	
	Lower Three Forks	10495.23	10593.75	98.52	

NDIC Well No	Formation	Top (ft)	Bottom (ft)	Thickness (ft)	Target Formations
27026	Upper Bakken	10189.89	10211.76	21.87	Three Forks
	Middle Bakken	10211.76	10270.62	58.85	
	Lower Bakken	10270.62	10317.49	46.87	
	Upper Three Forks	10317.49	10369.05	51.56	
	Middle Three Forks	10369.05	10426.35	57.29	
	Lower Three Forks	10426.35	10572.18	145.83	

28036	Upper Bakken	9723.54	9737.29	13.75	Middle Bakken
	Middle Bakken	9737.29	9786.88	49.58	
	Lower Bakken	9786.88	9828.13	41.25	
	Upper Three Forks	9828.13	9864.79	36.67	
	Middle Three Forks	9864.79	9896.04	31.25	
29062	Upper Bakken	10197.08	10214.16	17.08	Three Forks
	Middle Bakken	10214.16	10278.33	64.17	
	Lower Bakken	10278.33	10327.49	49.17	
	Upper Three Forks	10327.49	10367.91	40.42	
	Middle Three Forks	10367.91	10413.74	45.83	
	Lower Three Forks	10413.74	10557.08	143.33	
22647	Upper Bakken	10265.34	10299.71	34.38	Middle Bakken
	Middle Bakken	10299.71	10398.67	98.96	
	Lower Bakken	10398.67	10538.77	140.10	
	Upper Three Forks	10538.77	10658.56	119.79	
22648	Upper Bakken	10302.85	10341.91	39.06	Middle Bakken
	Middle Bakken	10341.91	10452.33	110.42	
	Lower Bakken	10452.33	10592.43	140.10	
	Upper Three Forks	10592.43	10680.46	88.02	
	Middle Three Forks	10680.46	10768.48	88.02	
22671	Upper Bakken	9870.34	9893.77	23.44	Middle Bakken
	Middle Bakken	9893.77	9977.97	84.20	
	Lower Bakken	9977.97	10068.25	90.28	
	Upper Three Forks	10068.25	10110.35	42.10	
	Middle Three Forks	10110.35	10159.40	49.05	
22867	Upper Bakken	10288.32	10318.01	29.69	Middle Bakken
	Middle Bakken	10318.01	10413.84	95.83	
	Lower Bakken	10413.84	10514.88	101.04	
	Upper Three Forks	10514.88	10560.72	45.83	
	Middle Three Forks	10560.72	10615.92	55.21	

NDIC Well No	Formation	Top (ft)	Bottom (ft)	Thickness (ft)	Target Formations
22971	Upper Bakken	10199.52	10218.62	19.10	Middle Bakken
	Middle Bakken	10218.62	10316.71	98.09	
	Lower Bakken	10316.71	10410.90	94.18	
	Upper Three Forks	10410.90	10493.80	82.90	
	Middle Three Forks	10493.80	10577.56	83.77	
23327	Upper Bakken	10331.96	10361.96	30.00	Middle Bakken

	Middle Bakken	10361.96	10462.38	100.42	
	Lower Bakken	10462.38	10570.29	107.92	
	Upper Three Forks	10570.29	10678.63	108.33	
	Middle Three Forks	10678.63	10717.38	38.75	
23329	Upper Bakken	10330.03	10361.81	31.77	Middle Bakken
	Middle Bakken	10361.81	10462.33	100.52	
	Lower Bakken	10462.33	10581.08	118.75	
	Upper Three Forks	10581.08	10725.35	144.27	
23569	Upper Bakken	10357.61	10382.35	24.74	Middle Bakken
	Middle Bakken	10382.35	10469.16	86.81	
	Lower Bakken	10469.16	10561.60	92.45	
	Upper Three Forks	10561.60	10640.60	78.99	
	Middle Three Forks	10640.60	10691.81	51.22	
23582	Upper Bakken	10092.32	10115.75	23.44	Middle Bakken
	Middle Bakken	10115.75	10223.39	107.64	
	Lower Bakken	10223.39	10343.18	119.79	
	Upper Three Forks	10343.18	10414.80	71.61	
	Middle Three Forks	10414.80	10518.97	104.17	
23689	Upper Bakken	10284.10	10302.33	18.23	Middle Bakken
	Middle Bakken	10302.33	10427.33	125.00	
	Lower Bakken	10427.33	10536.70	109.37	
	Upper Three Forks	10536.70	10623.16	86.46	
23873	Upper Bakken	9973.91	9997.24	23.33	Middle Bakken
	Middle Bakken	9997.24	10082.66	85.42	
	Lower Bakken	10082.66	10175.58	92.92	
	Upper Three Forks	10175.58	10283.08	107.50	
24263	Upper Bakken	10474.13	10508.85	34.72	Middle Bakken
	Middle Bakken	10508.85	10633.85	125.00	
	Lower Bakken	10633.85	10785.76	151.91	
	Upper Three Forks	10785.76	10871.70	85.94	

NDIC Well No	Formation	Top (ft)	Bottom (ft)	Thickness (ft)	Target Formations
24539	Upper Bakken	10058.79	10087.43	28.65	Middle Bakken
	Middle Bakken	10087.43	10215.04	127.60	
	Lower Bakken	10215.04	10334.83	119.79	
	Upper Three Forks	10334.83	10443.34	108.51	
24556	Upper Bakken	10100.93	10126.97	26.04	Middle Bakken
	Middle Bakken	10126.97	10260.66	133.68	

	Lower Bakken	10260.66	10403.02	142.36	
	Upper Three Forks	10403.02	10496.77	93.75	
24828	Upper Bakken	10240.25	10267.60	27.34	Middle Bakken
	Middle Bakken	10267.60	10377.41	109.81	
	Lower Bakken	10377.41	10467.25	89.84	
	Upper Three Forks	10467.25	10599.63	132.38	
24829	Upper Bakken	10211.36	10239.48	28.12	Middle Bakken
	Middle Bakken	10239.48	10367.09	127.60	
	Lower Bakken	10367.09	10491.57	124.48	
	Upper Three Forks	10491.57	10563.96	72.40	
25104	Upper Bakken	10232.05	10257.22	25.17	Middle Bakken
	Middle Bakken	10257.22	10388.30	131.08	
	Lower Bakken	10388.30	10519.37	131.08	
	Upper Three Forks	10519.37	10576.67	57.29	
25105	Upper Bakken	10214.32	10235.15	20.83	Middle Bakken
	Middle Bakken	10235.15	10341.92	106.77	
	Lower Bakken	10341.92	10454.77	112.85	
	Upper Three Forks	10454.77	10564.15	109.38	
25216	Upper Bakken	10260.80	10288.40	27.60	Middle Bakken
	Middle Bakken	10288.40	10404.55	116.15	
	Lower Bakken	10404.55	10527.47	122.92	
	Upper Three Forks	10527.47	10585.80	58.33	
25495	Upper Bakken	10296.71	10323.62	26.91	Middle Bakken
	Middle Bakken	10323.62	10423.45	99.83	
	Lower Bakken	10423.45	10564.07	140.63	
	Upper Three Forks	10564.07	10821.89	257.81	

NDIC Well No	Formation	Top (ft)	Bottom (ft)	Thickness (ft)	Target Formations
26103	Upper Bakken	9935.88	9960.36	24.48	Middle Bakken
	Middle Bakken	9960.36	10052.03	91.67	
	Lower Bakken	10052.03	10164.53	112.50	
	Upper Three Forks	10164.53	10278.07	113.54	
	Middle Three Forks	10278.07	10444.74	166.67	
26268	Upper Bakken	10274.70	10301.78	27.08	Middle Bakken

	Middle Bakken	10301.78	10377.30	75.52	
	Lower Bakken	10377.30	10455.95	78.65	
	Upper Three Forks	10455.95	10666.36	210.42	
	Middle Three Forks	10666.36	10842.41	176.04	
26391	Upper Bakken	10906.84	10980.59	73.75	Middle Bakken
	Middle Bakken	10980.59	11132.26	151.67	
26392	Upper Bakken	10634.94	10658.81	23.87	Middle Bakken
	Middle Bakken	10658.81	10748.22	89.41	
	Lower Bakken	10748.22	10834.16	85.94	
	Upper Three Forks	10834.16	10927.48	93.32	
	Middle Three Forks	10927.48	11067.23	139.76	
	Lower Three Forks	11067.23	11122.35	55.12	
26411	Upper Bakken	10316.30	10353.28	36.98	Middle Bakken
	Middle Bakken	10353.28	10469.42	116.15	
	Lower Bakken	10469.42	10579.32	109.90	
	Upper Three Forks	10579.32	10705.88	126.56	
27017	Upper Bakken	10242.36	10273.17	30.82	Middle Bakken
	Middle Bakken	10273.17	10384.72	111.55	
	Lower Bakken	10384.72	10505.81	121.09	
	Upper Three Forks	10505.81	10591.75	85.94	
27617	Upper Bakken	10207.27	10231.23	23.96	Middle Bakken
	Middle Bakken	10231.23	10342.16	110.94	
	Lower Bakken	10342.16	10460.91	118.75	
	Upper Three Forks	10460.91	10516.12	55.21	
27670	Upper Bakken	10420.72	10447.81	27.08	Middle Bakken
	Middle Bakken	10447.81	10531.56	83.75	
	Lower Bakken	10531.56	10616.14	84.58	
	Upper Three Forks	10616.14	10723.64	107.50	
	Middle Three Forks	10723.64	10812.39	88.75	

NDIC Well No	Formation	Top (ft)	Bottom (ft)	Thickness (ft)	Target Formations
28129	Upper Bakken	10373.41	10401.02	27.60	Middle Bakken
	Middle Bakken	10401.02	10492.16	91.15	
	Lower Bakken	10492.16	10603.62	111.46	
	Upper Three Forks	10603.62	10751.02	147.40	
28221	Upper Bakken	10347.39	10418.22	70.83	Middle Bakken
	Middle Bakken	10418.22	10542.18	123.96	
28222	Upper Bakken	10286.37	10315.45	29.08	Middle Bakken

	Middle Bakken	10315.45	10406.16	90.71	
	Lower Bakken	10406.16	10506.85	100.69	
	Upper Three Forks	10506.85	10588.45	81.60	
29061	Upper Bakken	10234.00	10259.52	25.52	Middle Bakken
	Middle Bakken	10259.52	10351.71	92.19	
	Lower Bakken	10351.71	10428.27	76.56	
	Upper Three Forks	10428.27	10603.79	175.52	
29063	Upper Bakken	10236.52	10255.27	18.75	Middle Bakken
	Middle Bakken	10255.27	10353.70	98.44	
	Lower Bakken	10353.70	10443.81	90.10	
	Upper Three Forks	10443.81	10549.02	105.21	
29355	Upper Bakken	10369.91	10402.03	32.12	Middle Bakken
	Middle Bakken	10402.03	10527.89	125.87	
	Lower Bakken	10527.89	10666.78	138.89	
	Upper Three Forks	10666.78	10778.76	111.98	
29490	Upper Bakken	10288.08	10316.73	28.65	Middle Bakken
	Middle Bakken	10316.73	10448.67	131.94	
	Lower Bakken	10448.67	10571.94	123.26	
	Upper Three Forks	10571.94	10695.20	123.26	
30258	Upper Bakken	10354.92	10378.88	23.96	Middle Bakken
	Middle Bakken	10378.88	10481.49	102.60	
	Lower Bakken	10481.49	10580.97	99.48	
	Upper Three Forks	10580.97	10775.24	194.27	

NDIC Well No	Formation	Top (ft)	Bottom (ft)	Thickness (ft)	Target Formations
30292	Upper Bakken	10010.30	10029.05	18.75	Middle Bakken
	Middle Bakken	10029.05	10120.72	91.67	
	Lower Bakken	10120.72	10219.68	98.96	
	Upper Three Forks	10219.68	10295.72	76.04	
31470	Upper Bakken	10466.86	10492.46	25.61	Middle Bakken
	Middle Bakken	10492.46	10594.46	102.00	
	Lower Bakken	10594.46	10710.78	116.32	
	Upper Three Forks	10710.78	10808.00	97.22	

	Middle Three Forks	10808.00	10948.19	140.19	
33417	Upper Bakken	10285.66	10315.18	29.51	Middle Bakken
	Middle Bakken	10315.18	10417.61	102.43	
	Lower Bakken	10417.61	10526.12	108.51	
	Upper Three Forks	10526.12	10608.58	82.47	
37031	Upper Bakken	10472.43	10496.39	23.96	Middle Bakken
	Middle Bakken	10496.39	10579.72	83.33	
	Lower Bakken	10579.72	10670.34	90.62	
	Upper Three Forks	10670.34	10776.59	106.25	
	Middle Three Forks	10776.59	10813.05	36.46	
16833	Upper Bakken	10371.02	10390.31	19.29	Middle Bakken
	Middle Bakken	10390.31	10444.53	54.23	
	Lower Bakken	10444.53	10488.69	44.15	
	Upper Three Forks	10488.69	10532.20	43.51	
	Middle Three Forks	10532.20	10561.35	29.15	
	Lower Three Forks	10561.35	10691.32	129.98	
16877	Upper Bakken	10207.86	10224.36	16.49	Middle Bakken
	Middle Bakken	10224.36	10290.76	66.41	
	Lower Bakken	10290.76	10337.64	46.87	
	Upper Three Forks	10337.64	10375.40	37.76	
	Middle Three Forks	10375.40	10437.46	62.07	
	Lower Three Forks	10437.46	10552.48	115.02	
25218	Upper Bakken	10212.84	10239.92	27.08	Middle Bakken
	Middle Bakken	10239.92	10333.15	93.23	
	Lower Bakken	10333.15	10435.76	102.60	
	Upper Three Forks	10435.76	10571.69	135.94	
29072	Upper Bakken	10118.06	10163.38	45.31	Middle Bakken
	Middle Bakken	10163.38	10225.35	61.98	

Table. Well Heads

NDIC Well No	latitude	longitude	kb	TD
16068	48.007903	-102.5152	1987	16771
16068	48.007903	-102.5152	1987	16771
16586	48.340566	-102.5464	2319	14926
16833	48.036276	-102.4594	2375	16150
16841	48.129309	-102.5054	2129	15330
16845	48.006373	-102.3403	2113	15555
16876	48.108761	-102.5464	2055	15941
16877	48.152744	-102.5228	2285	15842

17023	48.094907	-102.3512	2299	19678
17173	48.006572	-102.4494	2212	20180
17351	48.225086	-102.5251	2320	19900
17364	48.20977	-102.4162	2277	15500
17603	48.108647	-102.4387	2393	19954
18247	48.15416	-102.3764	2190	19653
18252	48.109128	-102.3344	2284	14093
18446	47.990908	-102.6354	1989	20210
18792	47.933585	-102.4793	1915	14460
18882	48.014557	-102.4696	2279	21157
18905	47.991431	-102.6595	1993	20695
19860	48.018886	-102.4488	2269	20515
19992	48.079201	-102.4353	2457	19380
20041	48.090612	-102.4388	2394	20440
20280	48.01889	-102.3636	2131	20112
20283	48.062426	-102.4175	2333	20034
20374	48.105193	-102.4389	2372	20313
20452	48.017312	-102.4054	2123	19812
20466	48.00379	-102.5155	1996	19922
20677	48.002555	-102.5127	1996	20148
20949	48.01309	-102.4692	2264	21177
21378	48.0365	-102.2575	2078	16254
21758	48.022258	-102.3596	2153	19027
21890	48.064284	-102.3679	2257	18570
21928	48.168602	-102.3556	2357	18395
22026	48.012205	-102.513	1992	20022

NDIC Well No	latitude	longitude	kb	TD
22027	48.008312	-102.5128	2004	20090
22532	48.063915	-102.5705	1999	20700
22647	48.010849	-102.4492	2201	20140
22648	48.008353	-102.4496	2218	20239
22671	48.044569	-102.3738	2124	18427
22867	48.022598	-102.4452	2252	19340
22971	48.089665	-102.3982	2447	21039
23285	48.239634	-102.6645	2396	20930
23327	48.071082	-102.5681	2051	20281
23329	48.070835	-102.5681	2022	20814

23565	48.051232	-102.333	2181	20342
23569	48.081839	-102.4861	2339	20100
23582	48.012272	-102.4086	2152	20379
23689	48.089594	-102.4602	2336	18568
23873	48.006642	-102.4035	2049	19085
24263	48.094542	-102.5674	2206	20237
24539	48.036734	-102.3887	2189	18565
24556	48.022227	-102.401	2154	18478
24779	48.094456	-102.4463	2355	10709
24814	48.022582	-102.6874	2023	21735
24828	48.056337	-102.4174	2350	20452
24829	48.053814	-102.416	2337	20390
25104	48.097095	-102.4385	2372	20585
25105	48.097918	-102.4385	2372	19820
25216	48.036137	-102.4323	2274	18710
25218	48.065543	-102.4114	2375	18915
25495	47.998064	-102.625	2037	20942
25688	48.16858	-102.6814	2350	20800
26103	48.099143	-102.3521	2323	20215
26268	47.998201	-102.5133	2041	20576
26391	48.018834	-102.5721	1934	21508
26392	48.018944	-102.5721	1934	21160
26393	48.019053	-102.5722	1934	21160
26394	48.019163	-102.5723	1934	21142
26395	48.019272	-102.5724	1934	20914

NDIC Well No	latitude	longitude	kb	TD
26396	48.019396	-102.5724	1934	21029
26398	48.019642	-102.5724	1934	20996
26411	48.020877	-102.5696	1929	18260
26661	48.094167	-102.2128	2202	10180
26990	47.993189	-102.7661	2215	20482
27017	48.008368	-102.5161	1986	16497
27026	48.008263	-102.5162	1986	17034
27026	48.008263	-102.5162	1986	17034
27617	48.041405	-102.4172	2287	19117

27670	48.019077	-102.4702	2317	19248
28036	48.152409	-102.3763	2192	19810
28129	48.022048	-102.4537	2263	19333
28221	47.999831	-102.5128	2034	17330
28222	47.999954	-102.5128	2034	20038
29061	48.109439	-102.5653	2077	16013
29062	48.109541	-102.5654	2072	15790
29063	48.109639	-102.5655	2072	16082
29072	48.174458	-102.4199	2354	17715
29355	48.080111	-102.5086	2220	19240
29490	48.094592	-102.4459	2355	19400
30258	48.080323	-102.5027	2260	16227
30292	48.031791	-102.3957	2167	19445
31470	48.08003	-102.4903	2354	20480
31674	48.060464	-102.6065	2216	25322
33417	48.001328	-102.5158	2023	20337
34664	48.064401	-102.2214	2160	10440
35945	48.115079	-102.3767	2378	19725
36905	48.168823	-102.3235	2347	20305
37031	48.073966	-102.5235	2267	17861
37082	48.094786	-102.5674	2206	20059
37336	48.081839	-102.4867	2340	19440

Appendix B

Routine Core Analysis Results: Well 16068

Vacuum oven dried at 221 °F and Net Confining Stress: 800 psi

Depth (ft)	Permeability (mD)		Porosity (%)		Density gm/cc	Saturation (%)		
	to Air	Klinkenberg	Ambient	NCS		Water	Oil	Total
10228.3	16.8	13.6	7.1	7	2.74	61.3	13.5	74.8
10229.3	6.46	5.01	6.3	6.2	2.74	55.1	22.8	77.9
10230.5	0.0044	0.0012	3.5	3.4	2.74	37.1	48.5	85.5
10231.3	0.023	0.0099	6.3	6.1	2.75	37.9	46.1	84
10232.4	0.014	0.0053	5	4.9	2.76	21.2	48.4	69.6
10233.5	4.82	3.7	6.9	6.7	2.75	40.3	43.3	83.6
10234.4	0.046	0.023	6.3	6.2	2.75	56.4	23.4	79.8
10235.4	0.155	0.096	6.8	6.6	2.75	47.6	27.7	75.3

10236.4	10.6	8.44	7.5	7.4	2.76	58.8	24.3	83.1
10237.3	0.112	0.066	7.8	7.7	2.73	44.5	36.5	80.9
10238.3	0.0063	0.002	2.2	2	2.71	35.9	45.6	81.6
10239.3	0.015	0.0061	2.8	2.6	2.7	37.4	48.7	86.1
10240.5	0.195	0.125	2.2	2	2.71	44.9	44.8	89.7
10241.6	0.0054	0.0016	2	1.8	2.7	48.9	50.9	99.8
10242.6	0.033	0.015	10	9.8	2.7	29.4	47.6	76.9
10243.1	0.0051	0.0015	1.8	1.6	2.7	39.8	48.5	88.2
10244.7	0.053	0.027	6.5	6.3	2.7	34.1	48.8	82.9
10245.2	0.047	0.024	6.1	6	2.7	38.5	45.9	84.4
10246.3	0.057	0.03	6.8	6.7	2.71	32.8	52.1	84.9
10247.3	0.0014	0.0003	2.2	2	2.69	47.7	49	96.8
10248.7	0.076	0.042	6.4	6.3	2.71	40.7	34.7	75.3
10249.5	0.044	0.022	5	4.9	2.7	43.6	34	77.5
10250.2	0.035	0.017	6.5	6.3	2.71	40.1	35.3	75.4
10251.2	0.023	0.01	6.7	6.6	2.72	31.9	44.2	76.2
10252.6	0.0067	0.0021	2.6	2.5	2.71	41.4	41.4	82.8
10254.4	0.0021	0.0005	2.4	2.3	2.71	39.8	41.9	81.7
10256.3	0.0074	0.0024	2.5	2.4	2.7	44.9	40.2	85.1
10258.2	0.064	0.034	6.4	6.2	2.72	37.7	42.4	80.1
10260.6	0.017	0.0069	6.5	6.4	2.71	39.4	48.2	87.6
10262.3	0.031	0.015	8	7.8	2.74	33.6	34.5	68.1
10264.6	0.0054	0.0016	2.9	2.7	2.7	58.1	37.5	95.6
10266.5	0.0097	0.0034	5.6	5.5	2.69	38.7	45	83.7
10268.6	0.005	0.0014	2.7	2.5	2.7	55.8	29.7	85.5
10270.5	0.0062	0.0019	3.1	2.9	2.7	42.5	32.8	75.3
10272.6	0.024	0.01	4.9	4.7	2.7	48.3	33.9	82.3
10274.7	0.017	0.0069	6	5.9	2.72	57.6	19.4	77.1
10276.4	0.015	0.006	4.8	4.7	2.71	53.6	29.9	83.5
10278.4	0.016	0.0063	4.8	4.7	2.71	56.1	21.2	77.3

Routine Core Analysis Results: Well 16841

Vacuum oven dried at 180 °F and Net Confining Stress: 2700 psi

Depth (ft)	Permeability (mD)		Porosity (%)		Density gm/cc	Saturation (%)		
	to AIR	Klinkenberg	Ambient	NCS		Water	Oil	Total
10079.5	0.011	0.0038	6.3	6	2.75	57.4	28.3	85.8
10080.5	0.017	0.007	6.7	6.4	2.74	58.1	25.5	83.6
10081.55	0.041	0.021	6.9	6.6	2.74	60.6	23.8	84.4
10082.5	0.0094	0.0033	8	7.7	2.76	60.6	25.3	86
10083.5	0.137	0.083	8.2	7.9	2.74	69.7	18.9	88.6

10084.5	0.046	0.023	5.9	5.7	2.7	37.7	33.8	71.4
10085.5	0.0022	0.0005	2.5	2.3	2.7	41.6	33.4	75.1
10086.5	0.0021	0.0004	2.5	2.2	2.72	54.4	21.4	75.9
10089.55			12.8		2.68	25	43.8	68.7
10090.5	0.0037	0.001	2.9	2.6	2.7	43.2	40.9	84.1
10091.5	0.012	0.0045	5.2	4.9	2.7	29	42.3	71.3
10092.6	0.0047	0.0013	3.1	2.8	2.7	18	60.5	78.4
10093.55	0.0066	0.0021	3.9	3.7	2.7	20.1	56	76.1
10094.5	0.335	0.229	11.3	11	2.69	25	36.8	61.8
10095.6	0.0065	0.002	3.8	3.5	2.7	18.8	49.9	68.7
10096.5	0.096	0.055	6.5	6.2	2.7	29.1	35.7	64.8
10097.4	0.0014	0.0003	2	1.7	2.7	33.2	42.4	75.6
10098.5	0.0031	0.0008	2.2	1.9	2.7	43.1	28.7	71.8
10099.5	0.0044	0.0012	2.6	2.3	2.7	36.9	36.3	73.3
10100.5	0.0033	0.0008	2.3	2	2.74	29.1	40.9	70
10101.5	0.0024	0.0005	2.2	1.9	2.7	28.8	44	72.8
10102.5	0.0024	0.0005	2.3	2.1	2.7	36.8	40.6	77.4
10103.2	0.0084	0.0028	7.3	7	2.7	39.8	30.4	70.3
10104.5	0.0049	0.0014	7.5	7.2	2.7	45.2	30.5	75.7
10105.5	0.0008	0.0001	3	2.7	2.71	48.2	35.8	84
10106.2	0.002	0.0004	3.4	3.1	2.7	54.6	29.6	84.2
10107.5	0.0052	0.0015	6.9	6.7	2.71	46.9	28.4	75.3
10108.55	0.0056	0.0017	7.3	7	2.71	40.4	32.4	72.8
10109.5	0.0055	0.0016	7	6.8	2.71	36.5	31.2	67.7
10110.65	0.0013	0.0002	3.1	2.8	2.7	57.4	30.1	87.5
10111.5	0.0067	0.0021	7.1	6.9	2.71	48.1	27	75.1
10112.25	0.0038	0.001	6.8	6.5	2.71	45.1	29.7	74.8
10113.5	0.015	0.006	6.9	6.6	2.71	52.1	29.9	82
10114.5	0.0016	0.0003	2.9	2.6	2.7	57	30.1	87.1
10115.5	0.0084	0.0028	7.6	7.3	2.71	47.8	33.4	81.3
10116.7	0.0098	0.0035	4.1	3.8	2.7	50.9	29.9	80.7
10117.5	0.013	0.0049	7.1	6.8	2.72	47.3	29.5	76.8
10118.5	0.0058	0.0018	8	7.7	2.71	45.3	31.6	76.9
10119.5	0.0011	0.0002	3.2	2.9	2.7	64.6	25.1	89.7
10122.5	0.0056	0.0017	6.3	6	2.71	44	30.2	74.2
10123.6	0.0049	0.0014	7.5	7.2	2.7	48.6	30.2	78.8
10124.5	0.0053	0.0016	7.8	7.6	2.7	52.7	33.5	86.2
10125.5	0.0024	0.0006	3	2.7	2.69	54.3	35.7	90
10126.5	0.0015	0.0003	2.9	2.6	2.7	47.6	49.8	97.5
10127.5	0.0044	0.0012	7.5	7.2	2.7	46.5	38	84.5
10128.5	0.0048	0.0014	4	3.7	2.7	78	14.2	92.1

10129.5	0.0045	0.0013	7	6.7	2.71	53.6	32.3	85.8
10130.5	0.0071	0.0023	6.4	6.1	2.7	48	36.7	84.7
10131.5	0.0025	0.0006	2.9	2.6	2.7	63	31.3	94.3
10132.5	0.0039	0.001	5.6	5.3	2.7	54.1	30.4	84.5
10133.5	0.0035	0.0009	6	5.7	2.7	58.6	24.6	83.2
10134.5	0.0093	0.0032	6.6	6.3	2.71	64	26.7	90.7
10135.5	0.0017	0.0003	4.5	4.2	2.72	67.8	21.6	89.4
10136.5	0.0024	0.0005	4.8	4.5	2.71	66.2	24.9	91.1
10137.5	0.0041	0.0011	5.8	5.5	2.71	63.5	25.7	89.2
10138.5	0.0086	0.0029	7.1	6.9	2.71	62.4	19.5	81.9
10139.5	0.0012	0.0002	5	4.7	2.7	64.5	25.3	89.8
10140.3	0.0071	0.0023	6.5	6.3	2.72	57.8	18.8	76.6
10140.6			7	6.8	2.73	58.8	20.8	79.6
10141.5	0.015	0.0057	6.2	5.9	2.72	64.1	19.7	83.8
10142.5	0.014	0.0057	5.3	5	2.72	68.8	16.8	85.6
10143.5	0.0007	0.0001	3.2	2.9	2.7	78.2	19.1	97.4
10192.5	0.012	0.0044	10.1	9.8	2.81	36	40.5	76.5
10193.4	+		9.5	9.3	2.79	43.8	30.8	74.5
10194.5	0.01	0.0036	9.7	9.4	2.79	41.2	31.6	72.8
10195.5	0.011	0.0037	9.9	9.6	2.78	39.1	31.1	70.1
10196.5	0.041	0.021	10.1	9.8	2.79	45.9	30	75.9
10197.5	+			11.1	2.78	73.5	17.5	91.1
10198.5	+		10.1	9.8	2.87	41.1	38.6	79.7
10200.65	0.01	0.0036	5.4	5.2	2.79	18.8	42.2	61
10201.65	0.03	0.014	8.5	8.2	2.79	32.4	34.1	66.5
10202.5	+			11.4	2.78	77.2	10.2	87.4
10203.5	+		9.5	9.2	2.78	67.7	17.5	85.2
10204.6	0.041	0.02	6.9	6.7	2.84	46.5	32.4	78.9
10205.7	+		9.1	8.8	2.77	42.4	31.6	74
10206.5	0.047	0.024	7.2	6.9	2.81	30.8	34	64.8
10207.5	0.026	0.012	6.9	6.6	2.79	46.9	28.4	75.3
10208.5	+		8.6	8.3	2.79	60.8	21.5	82.3
10209.5	0.087	0.049	8	7.8	2.8	56.4	26.2	82.6
10210.9	0.054	0.028	9.1	8.8	2.8	51.9	28	79.9
10211.1	+		7.6	7.3	2.78	53.6	27.1	80.7
10212.5	+		9.5	9.2	2.83	69.6	14.5	84.1
10213.55	+			8.3	2.79	58	21.4	79.4
10214.45	0.022	0.0095	5.8	5.5	2.79	32.4	37.4	69.8
10215.5	+		7.7	7.4	2.78	64.8	20.4	85.2
10216.5	+		8.3	8.1	2.79	58.5	23.6	82.1
10217.5	+		7.9	7.7	2.78	61.2	23.9	85

10218.4	+		6.7	6.4	2.76	58.9	20.3	79.2
10219.5	0.073	0.04	7.2	6.9	2.75	63.2	16.9	80.1
10220.5	0.101	0.059	8.8	8.5	2.77	57.9	12.8	70.7
10221.5	+		7.7	7.4	2.8	67.1	5.7	72.8
10222.5	0.0065	0.002	4.6	4.4	2.79	54.5	34.1	88.6
10223.5	0.0041	0.0011	5	4.8	2.79	53.4	29.4	82.8
10224.5	0.015	0.0057	4.9	4.7	2.78	50.2	30.6	80.8
10225.6	0.0076	0.0025	5.5	5.3	2.79	59.8	20.1	79.9
10226.5	0.014	0.0055	6.8	6.6	2.78	56.7	21.4	78.2
10227.5	0.014	0.0055	7.1	6.9	2.79	47.8	36.9	84.7
10228.6	0.017	0.0068	5.6	5.4	2.78	59.9	23.4	83.2
10229.5	0.018	0.0074	6.9	6.7	2.79	66.8	16.8	83.6
10230.5	0.036	0.017	5.1	4.9	2.79	76.9	12.4	89.3
10231.55	+			9.9	2.81	83.3	7.9	91.2
10234.35	0.055	0.029	7.7	7.5	2.79	79.8	16	95.8
10237.5	+		9	8.8	2.75	89.6	8	97.6
10240.5	+		9.5	9.3	2.75	86.7	13.3	100
10243.65	+		5	4.8	2.76	87.6	6.5	94.1
10246.65	+			11.6	2.73	87.5	7	94.5
10249.7	0.0038	0.001	6.4	6.2	2.79	86.9	13.1	100
10252.5	0.049	0.025	8.3	8.1	2.78	82.2	10.6	92.8
10255.6	+		8	7.8	2.78	82	16.9	98.9
10258.3	0.067	0.036	5.1	4.9	2.78	77.1	19	96
10261.5	+			8.2	2.76	85.9	5.1	91
10264.5	0.0086	0.0029	6.5	6.2	2.74	90.5	7.1	97.6

Routine Core Analysis Results: Well 17023

Vacuum oven dried at 180 °F and Net Confining Stress: 2150 psi

Depth (ft)	Permeability (mD) Klinkenberg	Porosity (%)		Saturation (%) Water
		NCS	Ambient	
9845.5	0.012	1.1	1.1	**
9846.5		1.5	1.5	**
9847.5		1.6	1.7	**
9848.5			4.8	32.4
9849.5	0.069	3.2	3.2	
9850		1.2	1.2	**
9851.5			3.5	17.5
9852.5	2.1	2.7	2.1	
9853.5		2.4	2.5	4.4
9854		2.2	2.3	4.8

9854.5	0.484	1.8	1.8	**
9855.5		2.1	2.2	9.7
9856		2.5	2.5	14.3
9856.5		2.4	2.4	9.6
9857	0.0018	1.7	1.7	**
9857.5	<0.0001	1.7	1.7	5.5
9858	0.117	3.4	3.5	48.3
9858.5	<0.0001	2.9	3	7.1
9859	0.0062	2.1	2.1	0
9859.5	0.0002	3.6	3.6	30.3
9871	0.315	3.4	3.5	8.5
9872	1.18	12.2	12.4	0.8
9873	2.21	11.7	11.8	0.8
9873.5	0.0003	5.5	5.6	36.6
9874	0.0005	6.3	6.4	42.6
9874.5	0.0001	7.7	7.8	22.1
9875	0.459	7.2	7.3	20
9875.5	0.0017	7.6	7.7	22.3
9876.3	0.074	6.8	6.9	11.6
9876.7	0.141	7.9	8	23.3
9877	0.0006	5.4	5.5	
9877.5	0.409	7.5	7.6	47.5
9878.2	0.0092	5.5	5.5	27.5
9878.6	0.0002	8.4	8.5	13.4
9879	0.0002	6.2	6.3	41.1
9879.5	0.566	8.5	8.6	30.2
9879.9	0.0001	8.7	8.8	11.9
9880.5	<0.0001	7.7	7.8	11.5
9881	<0.0001	6.7	6.7	15.7
9881.5	<0.0001	6.5	6.6	23
9882.6		4.3	4.4	29.1
9882.6	<0.0001	7.2	7.3	19.9
9883	<0.0001	5.8	5.9	20.3
9883.4	0.0004	8.5	8.6	18.7
9884	<0.0001	9.5	9.6	11.8
9884.5	0.0002	7.8	7.9	28.8
9885	<0.0001	5.2	5.3	4
9885.5	0.011	4.9	4.9	13.3
9886	0.026	6.5	6.6	9.9
9886.5	0.019	5.9	6	11.2
9887	0.356	4	4.1	7

9887.4	0.205	7.5	7.6	12.6
9888.1	0.018	5.9	6	1.6
9888.5	7.01	7	7.1	8.1
9889	0.048	6	6.1	14.1
9889.5	0.155	4.5	4.5	12.6
9890	4.95	7.1	7.2	11.9
9890.5	0.168	7.2	7.3	0
9891	0.0008	3.5	3.5	
9892	0.0011	2.7	2.8	
9892.5	0.0002	2.2	2.3	
9893	0.0025	10.1	10.3	13.6
9893.4	0.0021	8	8.1	0
9894	0.0018	9.1	9.2	17.4
9894.5	0.0001	5.8	5.9	10
9895	0.0081	8.8	8.9	17.9
9895.5	0.00079	8	8.1	17.1
9896	0.003	4.6	4.6	**
9896.5	0.0001	2.9	3	* *
9897	0.0002	2.8	2.8	**
9897.5	0.0005	7.7	7.8	29.8
9898	0.0022	7.9	8.1	22.9
9898.5	0.0005	6.9	7	26.7
9899	0.0003	7.4	7.5	21.6
9899.5	0.0003	2.9	2.9	
9900	0.0009	8.2	8.4	15.5
9900.5	0.0026	7.9	8	18.8
9901	0.0009	7.6	7.7	0
9901.5	0.0006	6.9	7	0
9902	<0.0001	8.5	8.6	19.2
9902.5	0.0014	3.2	3.2	
9903	0.0012	7.5	7.6	2.8
9903.5	0.056	7.4	7.5	12.9
9904	0.0007	7.8	7.9	16
9904.5	0.0002	2.9	2.9	
9905	0.0023	7.9	8	12.8
9905.5	0.0011	7.7	7.8	18.8
9906	0.0007	7.1	7.2	0
9906.5	0.0004	7.1	7.2	22.3
9907	0.0002	2.7	2.7	
9907.5	0.0005	7.2	7.3	9.8
9908.1	0.0007	7.3	7.5	0

9908.5	0.0007	7.9	8	6.1
9909	0.0001	2.6	2.7	
9909.5	0.0002	7.2	7.3	21.7
9910	0.0005	7.2	7.3	6.8
9910.5	0.0003	7.5	7.6	0
9911	0.0004	7.6	7.7	17.4
9911.5	0.0003	7.3	7.4	3.3
9912		6.8	6.9	1.9
9912.4	0.0003	6.7	6.8	14.2
9913	<0.0001	2.2	2.2	**
9913.5	0.0008	6.7	6.8	21.4
9914	0.0007	5.5	5.5	18.6
9915	0.0002	6.7	6.8	35.8
9915.5	0.0004	6.5	6.5	22.3
9916	0.0003	6.7	6.8	20.9
9916.5	0.0003	7.3	7.4	21.3
9917	0.0001	7.4	7.5	46.7
9917.5	0.0002	4.2	4.3	
9918	0.0002	7.1	7.2	6.4
9918.5	0.0003	7	7.1	23.7
9919	0.0002	6.1	6.2	24.9
9919.5	<0.0001	6.8	6.9	15.4
9920	0.0004	6.9	7	29
9920.5	<0.0001	4.9	4.9	21.1
9921	0.005	6	6.1	4.4
9921.5	0.0006	5.9	6	26.5
9922	0.0002	7.5	7.6	6.5
9922.5	0.0052	5.4	5.5	25.6
9923	0.0019	6.9	7	27
9923.5	0.0001	5.2	5.2	22
9924	0.0013	6.1	6.2	26.6
9924.5	<0.0001	6.3	6.4	16.5
9925	0.002	5.7	5.8	27.6
9925.5	0.0028	6.2	6.3	34.2
9926	<0.0001	3.2	3.2	
9926.5	0.0004	4.2	4.2	
9927	0.0001	5.9	6	17.8
9927.5	0.0004	5.6	5.7	0
9928	0.0012	5.4	5.5	0
9928.5	0.0014	5.4	5.4	19.8
9929	0.0007	5.7	5.7	8.4

9929.5	0.0001	5.6	5.7	43.2
9930	0.058	5.5	5.5	8.4
9930.5	0.0008	5.7	5.8	9.3
9931		3.4	3.5	
9931.5	+	8.4		18.3
9967.3	0.515	8.2	8.3	48.8
9968.6		2.2	0.066	3.45
9969.2	0.744	7.7	7.8	50.4
9970.2	0.735	8.3	8.4	31.3
9971	0.021	7.4	7.5	20.6
9971.5	0.178	10.1	10.3	53.8
9972	0.027	9.1	9.3	29.1
9972.5	<0.0001	9.5	9.6	12.1
9973	<0.0001	10.8	11	26.2
9973.5	<0.0001	10.3	10.4	24.4
9974	<0.0001	10.4	10.6	38.5
9974.5	0.0025	8.3	8.4	22.2
9975	0.0052	8.5	8.7	12.1
9975.5	+	9.6	9.7	38.1
9976	0.025	7.5	7.7	29.6
9976.5	0.0053	8	8.1	22.6
9977	0.111	7.6	7.8	68.4
9977.5	0.535	8.2	8.4	38.7
9978	+		6.2	
9978.5	+		9.5	51.4
9979	1.59	9.5	9.7	76.2
9979.5	1.2	9.8	9.9	75.8
9980	0.38	10.5	10.7	61.6
9980.5	0.033	9	9.2	31.5
9981	0.0078	5.5	5.6	34.9
9981.5	+		7.9	37
9983	0.0088	5.9	6	26
9983.5	0.037	7.3	7.4	47.7
9984	+		7.3	80.9
9984.5	+		7.9	82
9985	0.054	7.1	7.2	49.1
9985.6	0.0038	8.7	8.9	40.5
9986	0.172	8.7	8.9	64.6
9986.5	+		8.7	65.6
9987	0.204	8.3	8.4	68.8
9987.6	+		8.9	60.3

9988	0.446	9.6	9.8	40.9
9988.4	0.017	7.2	7.3	39
9988.9	0.492	7.2	7.3	36.2
9989.6	0.0024	8.3	8.4	61.7
9990	0.015	7	7.1	38.9
9990.5	0.014	7.4	7.5	37.1
9991	0.593	7	7.1	71.9
9992	1.25	7.9	8.1	38.8
9992.5	+		4.3	0
9993	2.5	9.4	9.5	43.9
9993.5	+		5.7	
9994	+		4	33.8
9994.5	0.0004	4	4.1	12.6
9995	0.182	6.1	6.2	29.9
9995.5	+		8.6	54.2
9996	0.028	5.4	5.5	32.2
9996.5	0.018	5.5	5.6	9.3
9997	4.9	7.6	7.7	40.4
9998	0.03	7.9	8	45.4
9998.5	0.0045	5	5	0
9999	0.0003	4.3	4.4	19.1
9999.5	0.0013	4.5	4.5	20.6
10000	0.011	5.1	5.2	19.1
10000.5	0.0011	4.2	4.3	24.9
10001	0.024	6.9	7	46.4
10001.5	0.018	6.9	7	46.3
10002	0.0045	7.8	7.9	41.6
10002.5	0.017	6.1	6.2	63.4
10003	0.037	7.2	7.3	28.7
10003.5	0.613	7.5	7.6	58.5
10004	0.186	7.5	7.6	36.4
10004.5	0.0015	5.9	5.9	44.3
10005	0.0013	5.4	5.5	56.5
10005.5	4.68	8.1	8.2	81.4
10006	0.251	9	9.1	78.6
10006.5	+		7.4	61.9
10007	0.02	6.8	6.9	64.5
10007.5	0.0007	6.9	7	59.1
10008	0.0003	6.5	6.6	68.8
10008.5	0.0005	8.1	8.2	67.6
10009	+		7.8	59.3

10009.5	5.19	7.6	7.7	80.1
10010	11.6	8.9	9	67.4
10011.5	0.557	9.5	9.7	67
10012.5	0.0093	7.4	7.5	70
10013.5	+		9.7	75.7
10018.2	<0.0001	7.1	7.2	82.2
10019.5	+		4.1	59
10020.5		2	2	

Routine Core Analysis Results: Well 18247

Depth (ft)	Permeability (mD) IKlinkenberg	Porosity (%) NCS	Saturation (%) Water
9720	0.001	6.22	71.8
9720.5	0.001	7.24	61.8
9721	0.0002	1.95	85
9723	0.029	7.5	17.4
9723.5	0.001	6.21	36.7
9724	0.001	6.41	45.4
9725.2	0.002	7.37	3.1
9726	0.001	6.64	36.6
9726.6	0.001	5.19	34.9
9727	0.001	7.62	41.2
9727.5	0.006	8.1	40.5
9728	0.038	7.95	49.5
9728.5	0.005	8.15	49.4
9729	0.008	8.12	55.7
9729.5	0.024	8.92	51.1
9730	0.008	9.16	48
9730.5	0.06	9.5	51.8
9731	0.064	10.6	30.5
9731.5	0.076	11.58	39.9
9732	0.127	11.49	13.8
9732.5	0.001	2.51	70.3
9733	0.001	2.36	66.3
9733.6	0.004	8.45	10.7
9734	0.005	9.14	29.7
9734.5	0.004	8.78	37.7
9735	0.001	2.84	82.6
9735.5	0.003	7.99	39

9736	0.002	6.78	24.9
9736.5	0.001	2.77	57.3
9737	0.001	2.24	59.3
9737.5	0.002	3.03	30.1
9738	0.012	10.31	17.5
9738.5	0.01	9.81	9.2
9739	0.006	9.21	22.2
9739.5	0.001	2.93	30.4
9740	0.002	6.12	30.2
9741	0.003	7.99	5.7
9741.5	0.004	6.36	10.8
9742	0.004	7.49	12
9742.5	0.002	6.2	14.6
9743	0.001	3.09	32.3
9743.5	0.001	2.58	13.9
9744	0.004	8.84	15.6
9744.5	0.002	6.69	17.1
9745	0.119	8.46	6.4
9745.5	0.002	4.67	20.4
9746	0.001	3.09	19.1
9746.5	0.002	7.65	11.8
9747	0.019	8.69	10.4
9747.5	0.001	5.17	17.6
9748	0.002	4.42	31.6
9748.5	0.002	7.51	12
9749	0.002	7.15	13.5
9749.5	0.002	6.38	10.5
9750	0.002	4.93	35.1
9750.5	0.002	7.07	26
9751	0.003	4.8	39.8
9751.5	0.078	4.68	25.8
9752	0.003	4.8	29.9
9752.5	0.001	3.57	41
9753	0.025	7.7	12.9
9753.5	0.005	7.63	24.9
9754	0.001	3.93	31.8
9754.5	0.002	6.91	20
9755	0.039	7.84	25.3
9756	0.009	7.61	23.3
9757	0.007	7.47	22.2
9757.5	0.001	2.54	20.5

9758	0.004	5.03	28.8
9758.5	0.002	4.74	11.6
9759	0.01	6.2	26.2
9759.5	0.001	5.06	16.6
9760	0.004	7.05	18.1
9760.5	0.002	4.48	18.4
9761	0.004	8.17	26.4
9761.5	0.001	3.05	27.4
9762	0.003	6.09	33.7
9762.5	0.005	6.47	29
9762.9	0.003	6.55	11.7
9764	0.004	6.66	32.5
9764.5	0.011	7.25	28
9765	0.001	5.89	14.9
9765.5	0.0004	3.56	40
9766	0.001	5.08	14.3
9766.5	0.003	6.71	34.5
9767	0.006	6.13	30.9
9767.5	0.001	2.64	48.1
9768	0.0003	1.96	47.4
9768.5	0.001	3.23	32
9769	0.005	5.71	24.8
9769.5	0.001	3.57	34
9770	0.022	5.9	26.6
9770.5	0.016	6.92	49.5
9813.5	0.078	9.22	32
9814	0.019	12.04	43.4
9814.5	0.024	10.86	33.9
9815	0.02	11.6	24.1
9815.5	0.263	13.45	44.4
9816	0.088	11.62	37
9816.5	0.094	11.82	38.7
9817	0.001	3.49	12.6
9817.5	0.001	5.19	12.5
9818	0.009	7.39	17.8
9818.5	0.1	7.87	33.3
9818.9	0.001	4.1	10.2
9819.5	0.037	10.82	32.9
9821	0.068	10.07	14.2
9821.5	0.08	11.54	42
9822.5	0.082	7.58	18.4

9823	0.002	4.81	15.8
9823.5	0.028	8	15.5
9824	0.308	10.57	40.6
9824.5	0.253	9.38	36
9825.5	0.077	9.78	31.2
9826.5	0.043	9.79	13.6
9827	0.043	11.24	41.2
9828	0.016	9.67	18.1
9828.9	0.004	7.59	16.9
9829.5	0.019	10.06	16.7
9829.9	0.115	11.84	11.9
9830.5	0.004	7.64	21.5
9831	0.014	8.81	25.9
9831.5	0.003	3.87	9.4
9831.7	0.02	4.28	13.2
9832	0.046	5.37	27.7
9833	0.007	10.5	33.2
9833.5	0.043	9.47	34.9
9834	0.002	9.17	69.2
9834.5	0.002	3.65	6.9
9835.6	0.015	8.07	30.6
9836	0.025	7.29	19.3
9836.5	0.011	6.36	16.5
9837	0.008	5.46	8.3
9837.5	0.039	8.22	10.7
9838	0.031	9.62	17.5
9838.5	0.007	10	46.3
9839	0.015	5.59	17.2
9839.5	0.002	3.49	10.6
9840.5	0.008	4.16	11.7
9840.9	0.023	5.13	14.8
9841.4	0.01	5.17	4.6
9842	0.008	5.2	7.2
9842.5	0.016	5.95	7.5
9843	0.008	5.28	9.7
9843.5	0.003	4.13	3.1
9844	0.045	6.69	12.7
9844.5	0.005	6.53	18.4
9845	0.026	6.1	7.9
9845.5	0.007	5.04	10.5
9846	0.017	5.13	9.3

9846.5	0.011	4.59	29.9
9847	0.051	5.6	27.2
9847.5	0.007	4.68	43.4
9847.9	0.005	5.81	37.5
9848.4	0.002	3.13	85.1
9865.5	0.034	6.94	92.7
9866.9	0.007	6.27	93.2
9868.5	0.079	8.2	89.9
9871.9	0.003	7.23	96.1
9872.9	0.001	4.49	96.1
9873.5	0.353	6.16	92.9
9889.5	0.001	4.28	95.1
9892.8	0.001	3.65	91.4

Routine Core Analysis Results: Well 21928

Depth (ft)	Permeability (mD)	Porosity (%)		Saturation (%)
	IKlinkenberg	NCS	Ambient	Water
9785.3	0.13	3.8	3.8	20.6
9792.9	0.13	3.6	3.6	21.9
9801.2	0.02	2.2	2.2	13.2
9817.4	0.02	4.8	4.8	44.5
9820.6	0.01	6	6	16.3
9822.2	0.02	6	6	24
9824.8	0.02	6.1	6.1	26.3
9826.2	0.01	7.9	7.9	32.6
9829.2	0.04	7.6	7.6	15.5
9830.8	0.01	4.4	4.4	21.1
9832	0.02	7.6	7.6	21.1
9833.5	0.02	6.9	6.9	23.7
9835.3	0.01	3.5	3.5	22
9836.3	0.03	7.7	7.7	16.2
9839.2	0.02	5.9	5.9	22.7
9841.5	<0.01	5.2	5.2	11
9843.4	<0.01	5.9	5.9	11.4
9845.9	0.01	5.2	5.2	19.7
9848.8	<0.01	18.8	6.3	9.6
9850.8	<0.01	10.7	5.1	23.3
9853.1	0.01	5.8	5.8	27.4
9855.2	0.02	5.2	5.2	27.6
9858	<0.01	4.6	4.6	29.9

9860.1	<0.01	2.9	2.9	31.7
9901.2	*	8.3	8.3	54.5
9903.1	*	10.7	10.7	75.7
9905.7	*	5.7	5.7	36.1
9907.9	*	10.4	10.4	71.6
9910.8	*	6.5	6.5	26.1
9913.7	*	7.8	7.8	38.3
9915.5	0.19	8.4	8.4	74
9917.5	*	7.7	7.7	32.5
9919.9	*	6.6	6.6	34
9920.9	0.07	3.6	3.6	46.9
9922.2	*	8.3	8.3	71.1
9923.3	0.06	3.5	3.5	23.3
9925.7	0.14	5.1	5.1	26.2
9927.4	0.15	6.1	6.1	25.7
9929.2	0.03	3.2	3.2	49.4
9931	0.05	6.5	6.5	65.9
9933.4	0.06	7.1	7.1	65.3
9934.8	0.02	2	2	35.1
9935.9	*	7.3	7.3	86.2
9938.7	<0.01	6.8	6.8	36.6
9941.2	*	8.2	8.2	78.3
9943.2	*	8.6	8.6	72.9
9946.2	0.01	7.3	7.3	74.4
9949.5	0.07	4.8	4.8	12.5
9950.9	0.03	5.5	5.5	77.9
9957.6	<0.01	6.3	6.3	79.8

Routine Core Analysis Results: Well 22532

Vacuum oven dried at 180 °F and Net Confining Stress: 2358 psi

Depth (ft)	Permeability (mD)	Porosity (%)	Saturation (%)
	IKlinkenberg	NCS	Water
10265.3	0.052	8.4	48.2
10266	0.568	8.72	62.9
10266.8	0.002	7.6	19.9
10269.5	0.009	9.12	14.2
10271.9	0.008	7.98	43.2
10273.1	0.004	8.43	40.4
10275.1	0.002	3.6	11.2
10275.5	0.001	3.35	12

10277.35	0.051	5.82	9.5
10278.5	0.007	6.21	20.6
10281.1	0.001	3.89	31.5
10282	0.001	2.25	41.4
10283.9	0.001	3.48	40.3
10286.1	0.002	6.68	30.9
10287.2	0.002	7.37	28.5
10290	0.004	6.78	37
10291.85	0.001	3.09	53
10296	0.004	6.7	41.7
10299.2	0.01	6.89	39.7
10302.05	0.094	2.66	56
10303.9	0.002	5.8	29.4
10306.5	0.001	6.79	36.9
10310	0.001	6.82	24.9
10311.5	0.002	6.24	41.5
10314	0.001	5.16	27.4
10317.4	0.014	6.79	41.2
10320	0.001	5.32	46.3
10323.2	0.002	5.72	36.7
10325.05	0.002	5.79	44.5
10380.45	0.361	8.54	19
10383.6	0.16	8.62	30.1
10391.3	0.0003	4.48	21.9
10392.15	0.035	7.04	20.8
10401.9	0.096	7.84	44
10413.05	0.0003	1.92	36.1
10416.7	0.002	4.14	15.1
10422	0.002	7.87	53.2
10434.4	0.001	8.25	50.9
10439.85	0.001	6.82	62.6
10446	0.001	7.65	60.1
10449.9	1.59	6.37	45
10452.6	0.007	7.36	52.2
10453.45	0.003	8.14	51
10458.2	0.001	6.6	54.3
10463.85	0.015	7.76	66
10479.2	0.004	9.76	53.5
10487.4	0.001	6.55	54.2
10494.5	0.002	8.86	50.8
10495.5	0.131	6.58	64.4

Routine Core Analysis Results: Well 23565

Vacuum oven dried at 180 °F and Net Confining Stress: 1500, 2000, 3000, 3500, and 4000 psi

Depth (ft)	Stress (psig)	Porosity (%)	Permeability		Saturation		Grain
			Klinkenberg (md)	Kair (md)	Oil %	Water %	Density g/cm ³
9796.1	ambient	7.5	***	***	33.4	39.2	2.758
9796.1	1500	6.99	0.005	0.017			2.758
9797.4	ambient	8.59	***	***	11.6	60	2.772
9797.4	1500	7.87	0.776	0.895			2.772
9797.4	2000	7.51	0.258	0.417			2.772
9797.4	2500	***	***	***	***		
9797.4	3000	***	***	***	***		
9797.4	3500	***	***	***	***		
9797.4	4000	***	***	***	***		
9798.55	ambient	4.69	***	***	39.5	25.5	2.748
9798.55	1500	4.5	0.0003	0.002			2.748
9800.5	ambient	9.13	***	***	34.8	36.1	2.762
9800.5	1500	8.89	0.023	0.035			2.762
9802.1	ambient	4.25	***	***	47	22.3	2.735
9802.1	1500	4.21	0.0005	0.003			2.735
9804.2	ambient	8.76	***	***	36.7	33.5	2.766
9804.2	1501	6.94	0.031	0.045			2.766
9804.2	ambient	9.34	***	***	46.6	29.2	2.771
9804.2	1500	9.11	0.467	0.556			2.771
9805.1	ambient	10.62	***	***	34.4	24.5	2.76
9805.1	1500	9.83	0.006	0.02			2.76
9806.4	ambient	10.44	***	***	47.8	15.9	2.706
9806.4	1500	10.03	0.009	0.026			2.706
9807.6	ambient	9.65	***	***	53.9	15.3	2.736
9807.6	1500	9.46	0.0059	0.0197			2.736
9807.6	2000	8.95	0.0052	0.0178			2.736
9807.6	2500	8.9	0.0049	0.0171			2.736
9807.6	3000	8.84	0.0046	0.016			2.736
9807.6	3500	8.8	0.0045	0.0157			2.736
9807.6	4000	8.75	0.0044	0.0156			2.736
9809.65	ambient	8.2	***	***	38.9	23.2	2.727
9809.65	1500	7.87	0.001	0.007			2.727
9811	ambient	3.47	***	***	40	26.4	2.705
9811	1500	3.31	0.004	0.016			2.705

9811	ambient	3.55	***	***	38.4	25.4	2.705
9811	1500	3.25	0.02	0.028			2.705
9812.1	ambient	3.2	***	***	34.6	29.4	2.712
9812.1	1500	3.09	0.0006	0.003			2.712
9813.1	ambient	2.97	***	***	36.4	30.8	2.707
9813.1	1500	2.39	0.001	0.006			2.707
9813.1	ambient	3.18	***	***	37.9	28.6	2.71
9813.1	1500	3.02	1.58	1.84			2.71
9814.15	ambient	9.91	***	***	37.5	24.6	2.722
9814.15	1500	9.83	0.004	0.014			2.722
9815.35	ambient	3.76	***	***	27.4	37.4	2.714
9815.35	1500	3.63	0.0009	0.005			2.714
9816.7	ambient	7.25	***	***	48.2	16.4	2.716
9816.7	1500	6.76	0.0009	0.004			2.716
9818.4	ambient	8.69	***	***	46.3	21.5	2.709
9818.4	1500	8.34	0.0013	0.006			2.709
9818.4	2000	8.19	0.0012	0.0056			2.709
9818.4	2500	8.01	0.0011	0.0054			2.709
9818.4	3000	7.87	0.00097	0.00473			2.709
9818.4	3500	7.81	0.00095	0.00472			2.709
9818.4	4000	7.75	0.00096	0.00471			2.709
9818.4	ambient	8.59	***	***	54.2	13.6	2.709
9818.4	1500	8.58	0.0016	0.0071			2.709
9818.4	2000	8.38	0.00148	0.0067			2.709
9818.4	2500	8.33	0.00135	0.0062			2.709
9818.4	3000	8.26	0.00122	0.0056			2.709
9818.4	3500	8.22	0.00118	0.0055			2.709
9818.4	4000	8.2	0.00112	0.0053			2.709
9819.85	ambient	3.4	***	***	10.7	41.9	2.709
9819.85	1500	3.34	0.002	0.008			2.709
9821.4	ambient	8.17	***	***	47	23.1	2.72
9821.4	1500	7.65	0.321	0.502			2.72
9822.55	ambient	7.29	***	***	34.6	23	2.718
9822.55	1500	6.8	0.0008	0.004			2.718
9824.4	ambient	3.02	***	***	36.3	31.1	2.705
9824.4	1500	2.94	0.0004	0.002			2.705
9825.8	ambient	7.39	***	***	45.9	19.3	2.721
9825.8	1500	7.22	0.0021	0.0086			2.721
9825.8	2000	7.15	0.0017	0.0075			2.721
9825.8	2500	7.1	0.0016	0.0069			2.721
9825.8	3000	7.05	0.0015	0.0067			2.721

9825.8	3500	7.02	0.0014	0.0064			2.721
9825.8	4000	6.9	0.0013	0.0058			2.721
9827.5	ambient	7.5	***	***	47.1	20.4	2.715
9827.5	1500	7.35	0.021	0.053			2.715
9828.8	ambient	3.79	***	***	45.7	21.1	2.711
9828.8	1500	3.66	0.001	0.005			2.711
9830.1	ambient	7.44	***	***	54.8	16.7	2.717
9830.1	1500	7.25	0.022	0.032			2.717
9830.1	ambient	7.67	***	***	44.7	24.6	2.72
9830.1	1500	7.46	0.044	0.068			2.72
9830.4	ambient	3.52	***	***	19.2	36.6	2.711
9830.4	1500	3.49	0.027	0.051			2.711
9833.65	ambient	8.01	***	***	30	30.7	2.729
9833.65	1500	7.95	0.056	0.085			2.729
9834.6	ambient	7.65	***	***	43.5	26	2.72
9834.6	1500	7.14	0.00087	0.004			2.72
9835.8	ambient	7.9	***	***	47.3	20.2	2.72
9835.8	1500	7.83	0.0016	0.0069			2.72
9835.8	2000	7.6	0.0015	0.0066			2.72
9835.8	2500	7.58	0.0013	0.006			2.72
9835.8	3000	7.5	0.0012	0.0056			2.72
9835.8	3500	7.43	0.0011	0.0053			2.72
9835.8	4000	7.3	0.001	0.0051			2.72
9837.5	ambient	7.42	***	***	42.1	26.4	2.719
9837.5	1500	7.2	0.128	0.231			2.719
9838.7	ambient	3.74	***	***	49.2	17	2.71
9838.7	1500	2.89	0.0002	0.001			2.71
9840	ambient	7.5	***	***	39.2	24.9	2.746
9840	1500	7.11	0.029	0.07			2.746
9842	ambient	5.12	***	***	28.6	30.7	2.715
9842	1500	4.94	0.002	0.007			2.715
9843.5	ambient	4.14	***	***	32.4	30	2.717
9843.5	1500	3.99	0.001	0.007			2.717
9863.45	ambient	8.86	***	***	45.6	18.8	2.327
9885.3	ambient	9.95	***	***	38.7	47.8	2.789
9885.3	1500	9.74	0.002	0.008			2.789
9886.8	ambient	12.33	***	***	15.4	65.6	2.813
9886.8	1500	11.68	0.022	0.047			2.813
9888.2	ambient	10.53	***	***	24.4	48.5	2.791
9888.2	1500	10.42	0.184	0.313			2.791
9889.7	ambient	10.47	***	***	23.5	48.4	2.793

9889.7	1500	10.13	0.142	0.251			2.793
9891.8	ambient	9.32	***	***	22	48.4	2.788
9891.8	1500	9.16	0.109	0.163			2.788
9891.8	2000	9.09	0.083	0.127			2.788
9891.8	2500	9.07	0.064	0.1			2.788
9891.8	3000	9.05	0.052	0.082			2.788
9891.8	3500	8.98	0.04	0.062			2.788
9891.8	4000	8.92	0.036	0.055			2.788
9893.4	ambient	9.18	***	***	11.3	70.9	2.786
9893.4	1500	8.34	0.01	0.016			2.786
9895.9	ambient	6.81	***	***	33.7	26.6	2.791
9895.9	1500	6.32	0.001	0.005			2.791
9897.6	ambient	7.86	***	***	16.5	43	2.811
9897.6	1500	7.45	0.098	0.135			2.811
9902.5	ambient	5.43	***	***	11.1	39.4	2.779
9902.5	1500	5.37	0.861	0.892			2.779
9910.1	ambient	7.86	***	***	26.8	42.5	2.807
9910.1	1500	7.8	0.024	0.06			2.807
9910.1	2000	7.77	0.02	0.051			2.807
9910.1	2500	7.73	0.018	0.043			2.807
9910.1	3000	7.71	0.016	0.037			2.807
9910.1	3500	7.69	0.014	0.033			2.807
9910.1	4000	7.64	0.012	0.029			2.807
9912.7	ambient	2.66	***	***	8.4	67.6	2.773
9912.7	1500	2.57	0.0005	0.003			2.773
9915	ambient	3.36	***	***	4.4	55.3	2.788
9915	1500	3.09	0.0009	0.005			2.788
9919.6	ambient	7.93	***	***	16.4	58.6	2.783
9919.6	1500	7.59	0.273	0.38			2.783
9919.6	2000	7.55	0.208	0.272			2.783
9919.6	2500	7.44	0.153	0.221			2.783
9919.6	3000	7.4	0.117	0.171			2.783
9919.6	3500	7.38	0.095	0.138			2.783
9919.6	4000	7.37	0.078	0.114			2.783
9920.6	ambient	4.37	***	***	3.5	63	2.797
9920.6	1500	3.83	0.001	0.006			2.797
9923	ambient	6.81	***	***	24.5	48.1	2.791
9923	1500	6.65	0.016	0.043			2.791
9924.1	ambient	6.32	***	***	7.7	77	2.793
9924.1	1500	5.99	0.009	0.031			2.793
9925.65	ambient	5.85	***	***	6.5	71.5	2.794

9925.65	1500	5.53	0.102	0.166			2.794
9927.3	ambient	6.14	***	***	6.8	73.3	2.794
9927.3	1500	5.89	0.009	0.024			2.794
9932.2	ambient	9.63	***	***	5.3	72.9	2.76
9932.2	1500	9.47	0.018	0.035			2.76
9936.7	ambient	10.33	***	***	0	95	2.784
9936.7	1500	10.25	0.048	0.063			2.784
9941.6	ambient	5.76	***	***	0	85.7	2.793
9941.6	1500	5.59	0.612	0.691			2.793
9946.3	ambient	6.8	***	***	5.7	76	2.775
9946.3	1500	6.66	1.29	1.36			2.775
9947.7	ambient	7.5	***	***	6.6	69.2	2.812
9947.7	1500	6.73	0.134	0.201			2.812
9955	ambient	5.6	***	***	0	83.8	2.799
9955	1500	5.32	0.006	0.021			2.799
9965.7	ambient	6.25	***	***	5.8	55.2	2.792
9965.7	1500	5.07	0.105	0.18			2.792
9967.7	ambient	6.75	***	***	4.7	80.4	2.782
9967.7	1500	6.48	0.001	0.006			2.782
9972.1	ambient	6.09	***	***	4.7	71.7	2.806
9972.1	1500	5.93	0.005	0.015			2.806
9979.5	ambient	7.47	***	***	0	92.1	2.788
9979.5	1500	7.33	0.004	0.009			2.788
9991.5	ambient	9.33	***	***	0	93.7	2.812
9991.5	1500	9.18	0.0009	0.004			2.812

Routine Core Analysis Results: Well 24779

Vacuum oven dried at 180 °F and Net Confining Stress: 800 psi, and 2150 psi

Depth (ft)	Stress (psig)	Porosity (%)	Permeability		Saturation		Grain Density g/cm ³
			Klinkenberg (md)	Kair (md)	Oil %	Water %	
10224.2	800	8.14	0.001	0.005	23.3	44.3	2.76
10224.2	2150	8.05	0.001	0.003	***	***	2.76
10225.8	800	4.32	0.005	0.012	33	18.4	2.705
10225.8	2150	4.07	0.002	0.008	***	***	2.705
10226.15	800	3.81	0.004	0.014	42.3	7.4	2.709
10226.15	2150	3.53	0.002	0.007	***	***	2.709
10227.3	800	2.67	0.001	0.007	21.6	31.3	2.696

10227.3	2150	2.24	0.001	0.003	***	***	2.696
10228.65	800	3.58	0.003	0.011	39.4	15.7	2.713
10228.65	2150	3.39	0.001	0.006	***	***	2.713
10228.75	800	4.34	0.025	0.043	32.5	18.7	2.699
10228.75	2150	4.1	0.007	0.022	***	***	2.699
10229.45	800	5.37	0.03	0.071	31.8	15.1	2.701
10229.45	2150	5.11	0.016	0.039	***	***	2.701
10230.2	800	5.02	0.008	0.027	36.4	16.1	2.7
10230.2	2150	4.66	0.008	0.014	***	***	2.7
10231.8	800	3.8	0.003	0.011	36.1	14.2	2.701
10231.8	2150	3.44	0.001	0.006	***	***	2.701
10232.15	800	6.8	0.015	0.04	20	19.4	2.701
10232.15	2150	6.52	0.01	0.027	***	***	2.701
10233.1	800	5.35	0.004	0.015	38.1	10.1	2.703
10233.1	2150	4.97	0.002	0.009	***	***	2.703
10234.4	800	3.5	0.002	0.008	38.1	15.5	2.704
10234.4	2150	3.07	0.001	0.004	***	***	2.704
10235.65	800	2.66	0.001	0.006	13.9	40.6	2.693
10235.65	2150	2.28	0.001	0.003	***	***	2.693
10236.9	800	2.35	0.001	0.005	15.1	36.6	2.699
10236.9	2150	1.98	0.0004	0.003	***	***	2.699
10237.45	800	2.27	0.001	0.006	20.1	35.9	2.698
10237.45	2150	1.81	0.0004	0.003	***	***	2.698
10238.15	800	8.55	0.004	0.014	29.6	27	2.71
10238.15	2150	8.31	0.003	0.011	***	***	2.71
10239.65	800	3.13	0.001	0.003	10.9	43	2.709
10239.65	2150	2.48	0.0002	0.001	***	***	2.709
10240.15	800	7.36	0.001	0.007	35.5	25.8	2.72
10240.15	2150	7.16	0.001	0.004	***	***	2.72
10241.1	800	6.64	0.109	0.164	29.4	30.8	2.718
10241.1	2150	6.43	0.044	0.064	***	***	2.718
10242.1	800	6.74	0.013	0.037	23.7	33.9	2.718
10242.1	2150	6.62	0.008	0.024	***	***	2.718
10243.1	800	6.01	0.158	0.24	26.6	39.6	2.721
10243.1	2150	5.76	0.05	0.089	***	***	2.721
10244.2	800	2.97	0.001	0.006	8.6	46.8	2.705
10244.2	2150	***	***	***	***	***	2.705
10245.1	800	2.93	0.001	0.005	33.8	38	2.704
10245.1	2150	2.69	0.001	0.003	***	***	2.704
10246.05	800	6.9	0.001	0.007	36.7	33.4	2.715
10246.05	2150	6.53	0.001	0.004	***	***	2.715

10247.15	800	2.77	0.001	0.003	11.9	50.2	2.704
10247.15	2150	2.08	0.0002	0.001	***	***	2.704
10248.15	800	5.6	0.001	0.006	36	32.4	2.72
10248.15	2150	5.14	0.001	0.004	***	***	2.72
10249.7	800	7.34	0.012	0.031	29.1	31.7	2.716
10249.7	2150	7.11	0.008	0.021	***	***	2.716
10250.15	800	6.75	0.013	0.036	16.9	42.1	2.715
10250.15	2150	6.61	0.008	0.024	***	***	2.715
10251.1	800	4.17	0.002	0.008	25.5	39.7	2.71
10251.1	2150	4.06	0.001	0.005	***	***	2.71
10252.05	800	7.79	0.001	0.006	39.9	33.9	2.718
10252.05	2150	7.47	0.001	0.004	***	***	2.718
10253.15	800	3.21	0.001	0.004	13	54.7	2.706
10253.15	2150	2.81	0.0003	0.002	***	***	2.706
10254.1	800	7.95	0.002	0.007	31.1	30.4	2.715
10254.1	2150	7.45	0.001	0.004	***	***	2.715
10255.2	800	7.53	0.002	0.007	30.4	29.1	2.726
10255.2	2150	6.99	0.001	0.004	***	***	2.726
10256.35	800	2.53	0.001	0.003	13	61.6	2.707
10256.35	2150	1.92	0.0002	0.001	***	***	2.707
10257.1	800	5.76	0.001	0.006	19.8	44.9	2.709
10257.1	2150	5.39	0.001	0.003	***	***	2.709
10258.1	800	8.01	0.003	0.013	21.1	39.8	2.709
10258.1	2150	7.78	0.002	0.009	***	***	2.709
10259.65	800	6.93	0.01	0.026	27.5	34	2.71
10259.65	2150	6.72	0.006	0.018	***	***	2.71
10260.25	800	6.61	0.001	0.006	28.8	35.7	2.711
10260.25	2150	6.03	0.001	0.003	***	***	2.711
10260.8	800	3.17	0.001	0.003	5.3	51.8	2.707
10260.8	2150	2.57	0.0002	0.001	***	***	2.707
10262.35	800	4.05	0.001	0.005	25.8	44.3	2.707
10262.35	2150	3.64	0.001	0.003	***	***	2.707
10263.5	800	6.59	0.002	0.008	27.9	38.4	2.722
10263.5	2150	6.22	0.001	0.005	***	***	2.722
10264.1	800	7.28	0.004	0.015	19.2	37.7	2.713
10264.1	2150	6.93	0.003	0.01	***	***	2.713
10265.15	800	4.88	0.003	0.012	26.6	41.9	2.707
10265.15	2150	4.56	0.002	0.008	***	***	2.707
10266.1	800	6	0.001	0.007	29.8	42.8	2.718
10266.1	2150	5.69	0.001	0.004	***	***	2.718
10267.35	800	6.85	0.002	0.007	30.7	40.5	2.715

10267.35	2150	6.49	0.001	0.005	***	***	2.715
10268.45	800	4.17	0.001	0.004	20.7	56.1	2.711
10268.45	2150	3.51	0.0003	0.002	***	***	2.711
10269.65	800	6.36	0.146	0.176	18.5	47.4	2.722
10269.65	2150	6.05	0.091	0.111	***	***	2.722
10270.55	800	7.29	0.001	0.006	21.8	41.6	2.728
10270.55	2150	6.89	0.001	0.003	***	***	2.728
10271.15	800	6.04	0.001	0.006	23.8	38.7	2.719
10271.15	2150	5.87	0.001	0.003	***	***	2.719
10272.1	800	5.58	0.001	0.004	13	49.3	2.726
10272.1	2150	5.01	0.0003	0.002	***	***	2.726
10273.15	800	5.08	0.001	0.005	27.5	45	2.714
10273.15	2150	4.71	0.0004	0.003	***	***	2.714
10274.15	800	5.6	0.001	0.007	19.8	44.3	2.723
10274.15	2150	5.25	0.001	0.004	***	***	2.723
10275.1	800	2.77	0.0003	0.002	10.2	63.7	2.717
10275.1	2150	2.31	0.0001	0.001	***	***	2.717
10276.15	800	2.57	0.0003	0.002	1.5	73.4	2.715
10276.15	2150	1.82	0.0001	0.001	***	***	2.715
10277.1	800	5.13	0.005	0.012	9.9	45	2.719
10277.1	2150	4.94	0.002	0.008	***	***	2.719
10278.15	800	5.86	0.015	0.022	23.1	32.1	2.712
10278.15	2150	5.73	0.005	0.018	***	***	2.712
10278.8	800	4.65	0.259	0.418	6.2	56.3	2.782
10278.8	2150	4.54	0.048	0.103	***	***	2.782
10324.35	800	9.15	0.164	0.324	31.8	27.1	2.919
10324.35	2150	8.98	0.071	0.13	***	***	2.919
10325.2	800	10.12	0.003	0.011	27.5	36.1	2.797
10325.2	2150	9.95	0.002	0.008	***	***	2.797
10326.1	800	9.33	0.034	0.093	29.7	24.1	2.81
10326.1	2150	9.17	0.02	0.053	***	***	2.81
10327.25	800	9.54	0.009	0.02	31.6	23.4	2.807
10327.25	2150	9.4	0.004	0.015	***	***	2.807
10328.75	800	10.4	0.022	0.036	20.4	45	2.794
10328.75	2150	10.25	0.013	0.022	***	***	2.794
10329.65	800	10.84	1.95	1.99	20.2	56.3	2.799
10329.65	2150	10.19	0.467	0.553	***	***	2.799
10330.75	800	10.14	0.108	0.214	22.2	46.4	2.798
10330.75	2150	9.94	0.022	0.031	***	***	2.798
10331.85	800	9.65	0.257	0.311	23.9	55.8	2.807
10331.85	2150	9.5	0.08	0.107	***	***	2.807

10332.7	800	8.26	0.036	0.074	28.3	36.5	2.793
10332.7	2150	7.97	0.011	0.022	***	***	2.793
10333.7	800	7.53	5.5	6.35	37.7	20.3	2.786
10333.7	2150	7.15	0.01	0.031	***	***	2.786
10334.2	800	5.77	0.003	0.007	30.1	19.8	2.804
10334.2	2150	5.47	0.001	0.005	***	***	2.804
10336.8	800	10.11	0.023	0.058	20.6	48.2	2.794
10336.8	2150	9.86	0.014	0.034	***	***	2.794
10337.4	800	8.83	0.003	0.011	32.5	34.7	2.792
10337.4	2150	8.71	0.002	0.007	***	***	2.792
10338.15	800	7.5	0.0042	0.009	29.8	15.2	2.784
10338.15	2150	7.36	0.0035	0.014	***	***	2.784
10338.9	800	7.66	0.041	0.093	27.3	29.2	2.796
10338.9	2150	7.39	0.02	0.035	***	***	2.796
10339.3	800	8.55	3.02	3.68	15	48.4	2.82
10339.3	2150	7.99	0.522	0.613	***	***	2.82
10341.2	800	8.04	1.28	1.69	4.7	52.2	2.812
10341.2	2150	7.52	0.093	0.177	***	***	2.812
10342	800	8.66	0.006	0.021	10.1	55	2.803
10342	2150	8.37	0.004	0.014	***	***	2.803
10344.2	800	7.17	0.001	0.004	3.2	76.4	2.78
10344.2	2150	6.45	0.0003	0.002	***	***	2.78
10345.2	800	8.91	0.231	0.297	12.5	49.7	2.787
10345.2	2150	8.67	0.061	0.091	***	***	2.787
10347	800	7.18	0.156	0.213	12.8	54.4	2.794
10347	2150	7.02	0.065	0.089	***	***	2.794
10347.6	800	6.18	0.002	0.009	25.6	22.6	2.787
10347.6	2150	5.84	0.001	0.005	***	***	2.787
10348.25	800	4.54	0.003	0.011	23	13.8	2.811
10348.25	2150	4.31	0.001	0.006	***	***	2.811
10350.85	800	3.5	0.001	0.006	19.2	23.8	2.788
10350.85	2150	3.13	0.0004	0.003	***	***	2.788
10351.05	800	6.92	1.44	1.55	24.9	28.4	2.8
10351.05	2150	6.53	0.35	0.506	***	***	2.8
10352.75	800	7.15	0.015	0.033	14.5	42.1	2.774
10352.75	2150	7.03	0.005	0.018	***	***	2.774
10353.25	800	4.48	0.004	0.012	8.4	27.7	2.788
10353.25	2150	4.24	0.001	0.007	***	***	2.788
10354.1	800	6.48	1.99	2.19	18.5	21.3	2.841
10354.1	2150	6.14	0.769	0.875	***	***	2.841
10355.25	800	3.85	0.002	0.008	10.6	21.5	2.79

10355.25	2150	3.45	0.001	0.004	***	***	2.79
10355.9	800	4.8	0.009	0.017	19.2	11.4	2.811
10355.9	2150	4.45	0.002	0.01	***	***	2.811
10358.15	800	6.1	0.011	0.028	23.4	14	2.798
10358.15	2150	5.89	0.006	0.021	***	***	2.798
10359.15	800	7.52	0.019	0.045	22.6	21.3	2.798
10359.15	2150	7.25	0.014	0.032	***	***	2.798
10360.15	800	6.86	0.015	0.035	28.8	20.4	2.794
10360.15	2150	6.68	0.009	0.024	***	***	2.794
10361.15	800	6.01	0.029	0.081	17	27.3	2.792
10361.15	2150	5.74	0.016	0.041	***	***	2.792
10362.1	800	6.71	0.011	0.028	23.2	16.2	2.807
10362.1	2150	6.46	0.008	0.02	***	***	2.807
10363.05	800	5.3	0.006	0.02	12.1	37	2.794
10363.05	2150	5.12	0.003	0.012	***	***	2.794
10369.05	800	10.99	0.259	0.419	1.4	77.6	2.731
10369.05	2150	10.63	0.127	0.228	***	***	2.731
10371.6	800	7.83	0.012	0.026	0.2	77.6	2.767
10371.6	2150	7.4	0.002	0.008	***	***	2.767
10374.25	800	7.66	0.003	0.013	0	83.2	2.777
10374.25	2150	7.36	0.002	0.008	***	***	2.777
10375.2	800	7.61	0.001	0.004	1.2	76.4	2.79
10375.2	2150	7.17	0.0004	0.002	***	***	2.79
10376.45	800	6.37	0.001	0.006	4.8	66.6	2.821
10376.45	2150	6.08	0.001	0.003	***	***	2.821
10377.5	800	3.76	***	***	5.7	70.9	2.771
10377.5	2150	***	***	***	***	***	2.771
10378.35	800	6.88	0.949	0.98	3.9	52.1	2.789
10378.35	2150	6.21	0.869	1.098	***	***	2.789
10379.05	800	4.07	0.001	0.004	4.3	78.1	2.802
10379.05	2150	3.72	0.0002	0.001	***	***	2.802
10380.05	800	7.42	0.001	0.004	5.1	68.3	2.788
10380.05	2150	7.06	0.0003	0.002	***	***	2.788
10384.1	800	7.99	0.133	0.151	0.4	74.4	2.793
10384.1	2150	7.72	0.115	0.149	***	***	2.793
10385.15	800	8.39	0.005	0.017	0	72	2.798
10385.15	2150	8.16	0.002	0.008	***	***	2.798
10386.2	800	7.82	0.005	0.018	3.3	67.3	2.788
10386.2	2150	7.62	0.004	0.016	***	***	2.788
10387.1	800	9.17	0.004	0.014	1.9	74.4	2.776
10387.1	2150	8.84	0.002	0.007	***	***	2.776

10387.6	800	7.12	0.002	0.007	2	72.8	2.795
10387.6	2150	6.7	0.001	0.004	***	***	2.795
10388.1	800	5.97	0.001	0.004	4	75.3	2.794
10388.1	2150	5.62	0.0004	0.002	***	***	2.794
10389.05	800	7.34	0.003	0.011	8.6	69.9	2.798
10389.05	2150	7.07	0.001	0.005	***	***	2.798
10391.8	800	6.1	0.005	0.018	2	72.5	2.908
10391.8	2150	5.72	0.002	0.01	***	***	2.908
10392.6	800	7.63	0.006	0.02	2.9	69.9	2.798
10392.6	2150	7.19	0.003	0.01	***	***	2.798
10393.5	800	7.02	0.002	0.008	7.6	72.3	2.784
10393.5	2150	6.6	0.001	0.005	***	***	2.784
10396.3	800	7.53	0.014	0.04	0.4	78.5	2.797
10396.3	2150	7.38	0.006	0.022	***	***	2.797
10399.2	800	7.6	3.58	4.15	0	84	2.796
10399.2	2150	6.83	1.08	1.15	***	***	2.796
10400.05	800	8.05	0.224	0.371	0	92.8	2.786
10400.05	2150	7.79	0.125	0.226	***	***	2.786
10401.2	800	6.29	0.015	0.043	0	79.1	2.78
10401.2	2150	6.08	0.008	0.026	***	***	2.78
10402.15	800	6.82	0.005	0.018	1.8	69	2.781
10402.15	2150	6.64	0.003	0.012	***	***	2.781
10403.25	800	5.9	0.002	0.009	1	73.3	2.778
10403.25	2150	5.59	0.001	0.005	***	***	2.778
10404.1	800	7.46	0.004	0.016	0.7	64	2.775
10404.1	2150	7.18	0.002	0.009	***	***	2.775
10405.25	800	8.69	0.007	0.022	1.2	71.9	2.779
10405.25	2150	8.47	0.004	0.013	***	***	2.779
10406.1	800	8.55	0.005	0.011	5.9	59.5	2.787
10406.1	2150	8.26	0.002	0.009	***	***	2.787
10407.45	800	8.03	0.25	0.479	5.4	54.9	2.805
10407.45	2150	7.44	0.06	0.094	***	***	2.805
10408.9	800	6.24	0.116	0.242	0.4	66.4	2.781
10408.9	2150	5.96	0.057	0.114	***	***	2.781
10409.2	800	2.32	0.001	0.006	3.6	69.3	2.773
10409.2	2150	1.86	0.0004	0.002	***	***	2.773
10410.15	ambient	8.5	***	***	3.3	74.9	2.787
10411.35	800	7.14	0.257	0.415	9.8	68	2.792
10411.35	2150	6.89	0.12	0.177	***	***	2.792
10412.35	800	7.89	0.183	0.25	1.2	76.9	2.782
10412.35	2150	7.77	0.064	0.1	***	***	2.782

10413.35	800	7.89	0.51	0.676	7.8	72.2	2.783
10413.35	2150	7.68	0.22	0.3	***	***	2.783
10414.2	ambient	10.1	***	***	0	74.3	2.775
10416.15	800	10.68	0.048	0.101	0	75.8	2.776
10416.15	2150	10.59	0.024	0.05	***	***	2.776
10417.1	ambient	10.08	***	***	3.5	73.7	2.76
10418.05	ambient	6.25	***	***	3.2	61.6	2.793
10419.3	800	9.45	0.021	0.054	0	71.1	2.793
10419.3	2150	9.35	0.005	0.016	***	***	2.793
10420.1	800	10.11	***	***	0	74.4	2.797
10421.4	800	8.14	2.13	2.18	0	93.3	2.779
10421.4	2150	7.79	0.44	0.518	***	***	2.779
10422.1	800	8.04	0.083	0.116	0	92.2	2.78
10422.1	2150	7.76	0.022	0.031	***	***	2.78
10434.1	ambient	5.42	***	***	8.4	69.5	2.737
10438.4	800	6.86	0.538	0.73	3.3	67.5	2.765
10438.4	2150	6.37	0.322	0.407	***	***	2.765
10439.8	800	7.81	0.011	0.021	0.4	71.8	2.767
10439.8	2150	7.59	0.002	0.008	***	***	2.767
10440.05	800	4.96	0.001	0.007	4.6	68.2	2.751
10440.05	2150	4.7	0.001	0.004	***	***	2.751
10442.2	ambient	8.09	***	***	0	76.5	2.756
10443.1	800	4.49	0.001	0.005	7.2	75.6	2.747
10443.1	2150	4.21	0.001	0.003	***	***	2.747
10446.05	ambient	8.1	***	***	0	71	2.771
10447	800	7.67	0.005	0.018	4.2	78.7	2.776
10447	2150	7.49	0.002	0.01	***	***	2.776
10448.25	800	7.6	0.081	0.16	2.7	74.2	2.764
10448.25	2150	7.02	0.02	0.052	***	***	2.764
10449.15	800	5.72	0.014	0.024	0	78.2	2.842
10449.15	2150	5.59	0.005	0.017	***	***	2.842
10451.05	800	4.66	0.001	0.005	7.8	67.7	2.834
10451.05	2150	4.24	0.0004	0.002	***	***	2.834
10452.15	800	8.3	0.463	0.7	0	80.4	2.799
10452.15	2150	7.97	0.011	0.034	***	***	2.799
10453.8	800	7	0.011	0.028	0	70.7	2.793
10453.8	2150	6.8	0.005	0.017	***	***	2.793
10454.45	800	7.38	0.003	0.011	0	72.9	2.807
10454.45	2150	7.13	0.001	0.006	***	***	2.807
10455.25	800	9.12	***	***	0	75.1	2.784
10457.45	800	3.89	0.004	0.014	7.5	71	2.838

10457.45	2150	3.57	0.001	0.003	***	***	2.838
10458.6	800	4.56	0.002	0.008	7.4	68.6	2.821
10458.6	2150	4.45	0.001	0.004	***	***	2.821
10460.35	800	5.65	0.019	0.043	3.8	65.8	2.837
10460.35	2150	5.47	0.008	0.026	***	***	2.837
10479.65	800	9.33	0.11	0.147	0	67.9	2.827
10479.65	2150	9.16	0.027	0.037	***	***	2.827
10529.6	800	11.15	2.31	2.83	7.6	67.5	2.799
10529.6	2150	10.36	0.913	0.949	***	***	2.799
10536.5	ambient	10.31	***	***	3.1	70.4	2.782
10538.1	800	9.32	0.011	0.033	0	85.7	2.79
10538.1	2150	9.19	0.003	0.013	***	***	2.79
10541.6	800	3.33	1.08	1.11	7.9	73.2	2.865
10541.6	2150	2.85	0.156	0.275	***	***	2.865
10545.1	800	8.78	0.003	0.013	5.3	75.6	2.779
10545.1	2150	8.4	0.001	0.006	***	***	2.779
10555.1	800	8.73	0.878	1.04	1.7	72.8	2.778
10555.1	2150	8.2	0.19	0.217	***	***	2.778
10558.45	800	7.68	0.002	0.008	0	74	2.773
10558.45	2150	7.54	0.001	0.004	***	***	2.773
10561.35	800	8.15	0.014	0.041	1.5	70.8	2.768
10561.35	2150	7.97	0.008	0.023	***	***	2.768
10570.95	800	5.52	0.001	0.004	4.1	69.2	2.777
10570.95	2150	***	***	***	***	***	2.777
10580	800	2.64	0.001	0.006	8.8	63.9	2.879
10580	2150	2.37	0.001	0.003	***	***	2.879

Routine Core Analysis Results: Well 27026

Vacuum oven dried at 180 °F and Net Confining Stress: 2350 psi

Depth	Permeability		Porosity		Density	Saturaion		
	To Air	Klinkenberg	Ambient	NCS		Water	Oil	Total
(ft)	(mD)	(mD)	(%)	(%)	gm/cc	(%)	(%)	(%)
10576.75	0.019	0.0096	2.3	2.3	2.9	58.8	17.7	76.5
10578.7	0.0009	0.0002	0.7	0.6	2.76	**		
10580.2	<0.0001		0.2	0.2	2.94	**		
10582.8	1.17	0.95	14.2	14	2.84	61.1	0	61.2
10586.4	0.039	0.023	0.2	0.2	2.86	**		
10588.3	0.0012	0.0003	1.9	1.9	2.89	**		

10590.9	0.0021	0.0006	0.8	0.8	2.89	**		
10592.4	<0.0001		0.5		2.87	**		
10594.35	+		0.7		2.91	**		
10596.25	<0.0001		0.3		2.94	**		
10596.65	0.623	0.503	9.8	9.6	2.83	66.3	11.4	77.8
10598.4	2.13	1.72	16.8	16.6	2.83	49.1	25.7	74.8
10600.15	0.0051	0.002	2.3		2.79	38.3	27.6	65.9
10602.15	0.0013	0.0003	0.2	0.2	2.91	**		
10604.1	0.0053	0.002	0.1	0.1	2.92	**		
10606.15	0.0059	0.0024	4.1	4	2.84	87.9	0.6	88.5
10608.25	0.028	0.015	0.9		2.79	**		
10610.9	0.051	0.031	3.1	3	2.83	60	21.4	81.5
10612.35	+		0.8		2.71	**		
10614.1	+		1.6		2.8	**		
10616.35	0.491	0.386	1.1	1.1	2.72	**		
10618.15	0.235	0.172	6.4	6.3	2.85	50.9	0.1	50.9
10620.1	0.534	0.425	8.1	8	2.76	35.6	3	38.6
10622.15	4.28	3.47	11.1	10.9	2.76	19.6	12.4	31.9
10624.2	0.0006	0.0001	0.2	0.2	2.69	**		
10626.2	0.001	0.0003	0.4		2.7	**		
10628.1	+	0.8			2.7	**		
10630.9	7.4	6.06	12.2	12	2.81	38.6	10.8	49.3
10632.25	+		12.8		2.8	43.4	1.4	44.8
10634.15	14.8	12.3	14.8	14.5	2.83	32.2	4.6	36.8
10636.35	13.9	11.4	15	14.7	2.8	38.4	0	38.4
10638.2	0.023	0.012	4	4	2.75	46.9	0	46.9
10640.2	0.236	0.173	6.4		2.77	62.2	0	62.2
10642.2	+		4		2.76	58.1	0.1	58.2
10644.2	0.044	0.026	4.3	4.2	2.74	72	0.1	72.1
10646.2	0.0046	0.0017	2.8	2.8	2.74	67.1	2.7	69.8
10648.1	+		0.5		2.71	**		
10652.2	+		4.3		2.73	64.1	0.2	64.3
10654.2	0.503	0.398	4.9		2.77	56.9	10.8	67.7
10656.2	0.162	0.114	6.2		2.77	69.7	3	72.6
10658.2	+		3.7		2.72	73.1	4.9	78
10660.2	0.007	0.0029	3.2		2.73	74.4	9.4	83.8
10662.15	0.0022	0.0007	0.1	0.1	2.71	**		
10664.35	0.107	0.072	2.2	2.2	2.71	65.5	18.8	84.3
10666.2	0.0009	0.0002	1.7		2.72	**		
10668.6	0.0013	0.0003	0.6	0.6	2.73	**		
10670.35	0.0026	0.0008	0.5	0.5	2.73	**		

10672.25	0.0004	0.0001	0.4	0.4	2.72	**		
10674.2	0.07	0.045	1.4		2.73	**		
10676.3	0.03	0.017	0.8	0.8	2.72	**		
10678.2	0.004	0.0014	1.4	1.4	2.74	**		
10680.15	0.0087	0.0038	1.9	1.8	2.72	**		
10682.25	0.015	0.0073	2	2	2.75	60.2	0.2	60.4
10684.55	0.0027	0.0009	2.1	2	2.72	**		
10686.1	0.0025	0.0008	0.8	0.8	2.82	**		
10687.9	0.0035	0.0012	3.7	3.6	2.79	100	0	100
10690.2	+		1.1		2.81	**		
10692.4	+		1.6		2.81	**		
10694.35	+		2.4		2.81	93.2	0	93.3
10696.15	+		3.2		2.83	54.2	1.9	56.2
10698.2	<0.0001		0.1	0.1	2.87	**		
10701.9	<0.0001		1.3	1.3	2.84	**		
10704.15	0.0009	0.0002	0.1	0.1	2.87	**		
10706.25	0.0004	0.0001	0.2	0.2	2.95	**		
10708.2	0.0073	0.0031	0.7	0.7	2.89	**		
10710.3	<0.0001		2.6	2.6	2.84	77.3	21.4	98.7
10712.35	<0.0001		3.6	3.5	2.8	83.3	15.2	98.5
10713.7	0.034	0.02	7.4	7.3	2.86	65	10.7	75.7
10716.05	0.0054	0.0021	3.3	3.2	2.89	48.6	22	70.6
10718.5	+		1.9		2.76	**		
10720.1	0.016	0.0082	0.5	0.5	2.83	**		
10722.2	<0.0001		0.6	0.6	2.8	**		
10724.05	0.0013	0.0003	0.2	0.2	2.75	**		
10726.2	<0.0001		0.4	0.4	2.71	**		
10730.2	<0.0001		0.8	0.8	2.74	**		
10731.8	0.0065	0.0027	1.3	1.3	2.8	**		
10734.25	<0.0001		0.9	0.9	2.75	**		
10736.15	<0.0001		0	0	2.72	**		
10738.1	<0.0001		1.2	1.2	2.76	**		
10740.25	0.001	0.0002	0.1	0.1	2.81	**		
10742.55	0.0005	0.0001	0.1	0.1	2.88	**		
10744.5	0.005	0.0019	0.1	0.1	2.83	**		
10746.2	+		0.1		2.72	**		
10747.85	0.0049	0.0019	6.1	6	2.81	70.7	28	98.7
10749.6	<0.0001		0.5	0.5	2.88	**		
10750.25	<0.0001		0.2	0.2	2.88	**		
10752.2	0.0004	0.0001	0.9	0.9	2.84	**		
10754.25	<0.0001		1.2	1.2	2.85	**		

10756.25	<0.0001		0.1	0.1	2.86	**		
10758.2	0.0009	0.0002	0.1	0.1	2.94	**		
10760.35	<0.0001		0.1	0.1	2.93	**		
10762.25	0.0042	0.0016	0.2		2.73	**		

Routine Core Analysis Results: Well 28036

Vacuum oven dried at 180 °F and Net Confining Stress: 2000 psi

Depth (ft)	Permeability (mD)				Porosity (%)			Density gm/cc	Saturation (%) Water
	to Air		Klinkenberg		Ambient	800psi	2000psi		
	800psi	2000psi	800psi	2000psi					
9,618.90	+	+			2.2			2.71	**
9,620.50	+	+			1.9			2.72	**
9,621.75	+	+			1.6			2.71	**
9,623.40	0.352	0.101	0.268	0.068	1.5	1.5	1.5	2.71	**
9,626.70	+	+			3.3			2.7	**
9,628.75	0.0005	<0.0001	0.0001	<0.0001	1.5	1.5	1.5	2.7	**
9,630.80	0.051	0.019	0.031	0.01	1.8	1.8	1.8	2.73	**
9,632.85	<0.0001	<0.0001	<0.0001	<0.0001	1.4			2.72	**
9,634.85	0.0074	0.0041	0.0031	0.0015	2	2	1.9	2.72	**
9,637.80	0.0003	<0.0001	0.0001	<0.0001	0.1	0.1	0.1	2.63	**
9,638.30	0.0011	0.001	0.0003	0.0002	0.3	0.3	0.3	2.67	**
9,641.95	1.31	0.374	1.02	0.286	0.9	0.9	0.9	2.69	**
9,642.45	+	+			1.3			2.7	**
9,645.60	0.0007	0.0006	0.0001	0.0001	2.2	2.2	2.1	2.72	83.2
9,646.15	<0.0001	<0.0001	<0.0001	<0.0001	0.6	0.6	0.6	2.68	**
9,649.70	<0.0001	<0.0001	<0.0001	<0.0001	0.9	0.9	0.9	2.67	**
9,650.25	0.0004	<0.0001	0.0001	<0.0001	2			2.7	**
9,653.40	0.0009	0.0006	0.0002	0.0001	2.3	2.3	2.3	2.72	**
9,655.20	0.0005	<0.0001	0.0001	<0.0001	1.6	1.6	1.6	2.72	**
9,656.85	<0.0001	<0.0001	<0.0001	<0.0001	1.9	1.9	1.9	2.73	**
9,658.60	+	+	+	+	3.8			2.72	56.5
9,660.25	+	+	+	+	3.5			2.75	32.7
9,662.75	<0.0001	<0.0001	<0.0001	<0.0001	0.3	0.3	0.3	2.68	**
9,665.35	<0.0001	<0.0001	<0.0001	<0.0001	1	1	1	2.7	**
9,667.40	+	+	+	+	0.4			2.71	**
9,668.40	+	+			0.3			2.65	**
9,670.30	+	+			1.9			2.71	**
9,673.65	0.0026	0.0015	0.0008	0.0004	1.6	1.6	1.6	2.71	**
9,677.70	<0.0001	<0.0001	<0.0001	<0.0001	1	1	1	2.87	**
9,679.25	<0.0001	<0.0001	<0.0001	<0.0001		1	1	2.7	**

9,680.90	0.292	0.116	0.218	0.078	2.8	2.8	2.8	2.7	48.6
9,682.55	0.0004	<0.0001	0.0001	<0.0001	3.2	3.2	3.2	2.75	48.2
9,685.10	<0.0001	<0.0001	<0.0001	<0.0001	2	2	2	2.73	**
9,686.50	0.0007	0.0004	0.0001	0.0001	1.8	1.8	1.7	2.72	**
9,689.55	+	+	+	+	3.3			2.72	73
9,691.60	+	+	+	+	4.3			2.7	37.5
9,693.10	+	+	+	+	1.9			2.72	**
9,694.40	0.001	0.0004	0.0002	0.0001	1.4	1.4	1.3	2.71	**
9,696.50	0.0004	<0.0001	0.0001	<0.0001	1.8	1.8	1.7	2.72	**
9,699.30	+	+	+	+	5.3			2.74	62.6
9,700.40	+	+			6.3			2.72	65
9,703.40	0.0003	<0.0001	0.0001	<0.0001	3.3	3.3	3.2	2.74	**
9,706.55	<0.0001	<0.0001	<0.0001	<0.0001	1.1	1.1	1.1	2.72	**
9,708.50	+	+			4.7			2.73	14.4
9,713.50	+	+			2.5			2.73	**
9,717.40	0.033	0.019	0.019	0.0096	2.2	2.2	2.2	2.72	21.8
9,720.40	0.151	0.062	0.106	0.039	2	2	2	2.71	**
9,723.55	+	+			7.1			2.37	33.4
9,730.30	+	+			8.6			2.35	12.1
9,731.30	+	+	+	+	7.6			2.26	16.1
9,734.40	+	+			7.8			2.2	22.3
9,737.80	0.019	0.014	0.0096	0.007	7.4	7.3	7.2	2.74	44.3
9,740.30	2.77	0.889	2.2	0.705	5.6	5.6	5.5	2.76	14.1
9,741.40	0.004	0.0031	0.0015	0.001	7.5	7.5	7.3	2.75	33.8
9,742.30	0.057	0.023	0.035	0.013	6.9	6.9	6.8	2.74	43.1
9,744.40	0.0034	0.0032	0.0012	0.0011	8.3	8.3	8.1	2.77	33.6
9,748.35	0.013	0.01	0.006	0.0047	8.6	8.5	8.4	2.71	24.4
9,749.80	0.013	0.0091	0.0061	0.004	5	4.9	4.9	2.7	31.5
9,752.10	0.017	0.014	0.0084	0.0071	8.8	8.7	8.6	2.7	21.9
9,753.75	0.012	0.0098	0.0055	0.0044	8.6	8.6	8.4	2.73	23
9,755.30	0.0085	0.0072	0.0037	0.003	7.8	7.7	7.6	2.72	19.7
9,756.50	+	+			4.5			2.71	29.4
9,758.75	0.0074	0.0058	0.0031	0.0023	8	7.9	7.8	2.72	24.4
9,759.25	0.0054	0.0038	0.0021	0.0014	6.4	6.4	6.3	2.73	26.4
9,763.85	0.0063	0.0044	0.0026	0.0016	7.5	7.5	7.4	2.7	26.7
9,765.55	0.024	0.018	0.013	0.0092	4.3	4.2	4.2	2.69	38.8
9,768.10	0.0034	0.002	0.0012	0.0006	3.6	3.6	3.6	2.7	40.3
9,770.80	0.06	0.037	0.037	0.021	6	6	5.9	2.7	25.4
9,773.10	0.0067	0.0045	0.0028	0.0017	4.9	4.8	4.8	2.7	35.7
9,778.20	0.034	0.02	0.019	0.011	6.5	6.5	6.4	2.75	31.8
9,780.85	0.0082	0.0064	0.0035	0.0026	6.2	6.1	6	2.72	30.2

9,782.60	0.147	0.078	0.103	0.05	4.6	4.6	4.5	2.71	25.7
9,785.55	<0.0001	<0.0001	<0.0001	<0.0001	2.7			2.71	48.3
9,786.45	+	+			7.1			2.36	33.1
9,793.45	+	+	+	+	8.1			2.3	12.3
9,796.45	+	+			9.1			2.19	14.2
9,802.40	+	+			7.5			2.35	**
9,804.60	+	+			8.6			2.19	28.6
9,807.15	+	+			7.9			2.28	16
9,808.80	+	+			8.7			2.3	15.7
9,813.35	+	+			7.5			2.25	16.4
9,816.80	+	+	+	+	7.3			2.19	17.2
9,818.75	+	+			7.6			2.16	16.3
9,820.75	+	+			8.7			2.2	27.8
9,823.20	+	+	+	+	9			2.66	51.3
9,825.65	+	+			8.3			2.69	81.9
9,827.65	0.0049	0.004	0.0019	0.0014	7.3	7.3	7.2	2.93	38.1
9,829.60	0.057	0.035	0.035	0.02	9.8	9.7	9.6	2.78	78.2
9,831.60	0.101	0.069	0.068	0.044	7.1	7	6.9	2.84	87.1
9,832.50	+	+	+	+	8.5			2.78	69
9,834.40	0.268	0.146	0.199	0.102	9	8.9	8.8	2.77	79.4
9,836.90	+	+	+	+	7.6			2.8	33.6
9,839.25	1.05	0.461	0.843	0.362	7.9	7.8	7.7	2.76	67.9
9,841.75	+	+	+	+	9.3			2.78	59.4
9,843.85	0.018	0.012	0.0091	0.0057	7.6	7.5	7.4	2.78	85.4
9,845.45	+	+	+	+	8.2			2.77	84.4
9,846.45	+	+	+	+	9.4			2.77	81.6
9,848.80	+	+	+	+	7.5			2.78	92.6
9,850.35	0.013	0.0094	0.0059	0.0042	5.8	5.7	5.6	2.79	24.7
9,853.45	+	+	+	+	6.5			2.8	93
9,855.90	0.011	0.0065	0.0049	0.0027	4.3	4.2	4.2	2.77	**
9,857.85	+	+	+	+	5.9			2.77	54.7
9,858.65	0.014	0.0099	0.0065	0.0045	5.4	5.4	5.3	2.78	32.3
9,860.20	0.049	0.035	0.03	0.02	5.6	5.6	5.5	2.79	55.5
9,863.80	0.015	0.0089	0.0075	0.0039	7.4	7.4	7.2	2.77	87.8
9,865.50	0.488	0.22	0.376	0.16	8.1	8	7.9	2.79	82.1
9,867.60	0.002	0.0012	0.0006	0.0003	7.9	7.8	7.7	2.79	79.8
9,869.20	0.0017	0.0015	0.0005	0.0004	8.2	8.2	8	2.78	82.5
9,870.85	0.172	0.034	0.122	0.019	8.5	8.4	8.3	2.75	98.1
9,873.30	0.0036	0.0025	0.0013	0.0008	8.5	8.5	8.3	2.78	87.6
9,874.30	0.0013	0.001	0.0003	0.0002	8.2	8.2	8	2.78	82.6
9,876.30	0.0029	0.002	0.001	0.0006	4.7	4.7	4.6	2.79	38.2

9,878.20	0.036	0.023	0.021	0.012	5	5	4.9	2.78	89
9,879.30	0.0019	0.0011	0.0006	0.0003	7.8	7.7	7.6	2.78	72.1
9,881.30	0.436	0.215	0.337	0.157	6.6	6.5	6.4	2.77	83.7
9,882.30					6.8			2.79	75.8
9,883.60	0.0053	0.0029	0.002	0.001	8.1	8.1	7.9	2.78	86.9
9,884.35	0.0022	0.001	0.0007	0.0002	8	7.9	7.8	2.76	94.7
9,887.15	0.0053	0.0046	0.0021	0.0017	5.4	5.4	5.3	2.8	75.2
9,888.65	0.0057	0.0049	0.0022	0.0019	5.4	5.4	5.3	2.8	78.8
9,891.50					8.6			2.78	85.8
9,892.15					7.5			2.78	84.7

Routine Core Analysis Results: Well 29062

Vacuum oven dried at 180 °F and Net Confining Stress: 2000 psi

Depth (ft)	Permeability (mD)		Porosity (%)		Density, gm/cc	Saturation (%)	
	To Air	Klinkenberg	Ambient	NCS		Water	Oil
10,171.40	+		0.7		2.65	**	
10,177.30	+		3.5		2.73	70.4	0.1
10,180.10	+		1.6		2.71	**	
10,183.55	0.0006	0.0001	1		2.69	**	
10,184.20	+		2.7		2.71	**	
10,188.50	+		6.5		2.59	41.2	29.8
10,191.20	<0.0001		1.2		2.71	**	
10,193.75	<0.0001		1.7	1.7	2.71	**	
10,195.75	+		2		2.7	**	
10,197.75	+		3.4		2.72	**	
10,199.50	0.0018	0.0005	2.4	2.3	2.71	**	
10,201.50	<0.0001		1.1		2.69	**	
10,202.90	+		2.6		2.71	**	
10,203.85	+		6.2		2.32	35.4	41.1
10,206.85	+		5.8		2.32	39.3	47.8
10,212.40	+		6.7		2.38	**	
10,214.85	+		6.8		2.22	21.6	51.1
10,216.25	+		6.5		2.22	18.6	44.6
10,219.70	+		6.1		2.26	**	
10,221.20	0.0045	0.0017	6.7	6.6	2.74	68.3	22.2
10,223.20	+		8.8		2.77	64.1	13
10,226.90	+		7.2		2.76	38.8	23.1
10,228.20	0.0011	0.0003	7.2		2.75	52.6	20.3
10,230.50	0.36	0.274	8.1		2.75	67.3	14.2
10,233.75	0.0015	0.0004	1.9	1.9	2.7	**	

10,235.60	+		2.7		2.7	43.8	24.9
10,237.75	0.0036	0.0012	2.6	2.6	2.7	52.3	27
10,238.70	0.0092	0.0041	3.2	3.1	2.69	39.7	35.2
10,241.20	+		2.1		2.7	**	
10,243.50	0.0012	0.0003	1.6	1.6	2.7	**	
10,245.50	0.003	0.001	3.4	3.3	2.69	86.7	2.5
10,247.30	0.0019	0.0005	5.8	5.7	2.71	53.7	27.9
10,249.10	0.0011	0.0003	6.6	6.5	2.71	59.3	15.8
10,250.80	0.002	0.0006	6.5		2.71	37.6	39.9
10,253.60	0.007	0.0029	6.6	6.4	2.72	40.3	41.5
10,254.90	0.0023	0.0007	4.8	4.7	2.71	63.3	14.8
10,257.20	0.0015	0.0004	2.6	2.6	2.7	83.2	0
10,259.50	0.0005	0.0001	2.2	2.1	2.7	63.4	24.1
10,261.50	+		3.3		2.71	38.8	16.3
10,262.70	0.0013	0.0003	3.4	3.3	2.7	**	
10,264.95	0.0029	0.001	5	4.9	2.71	**	
10,267.00	0.0013	0.0003	4.1	4.1	2.7	76.3	0.1
10,269.05	0.0026	0.0008	5.5	5.4	2.71	61.3	29.7
10,271.05	0.0098	0.0044	5.4	5.3	2.72	61	19.7
10,273.05	0.186	0.134	5.3	5.2	2.73	68.2	17.1
10,275.05	+		5.4		2.72	59.9	14.3
10,277.05	0.0003	0.0001	3.7	3.7	2.72	69.2	18.6
10,278.70	0.0022	0.0007	3.6	3.5	2.7	84.5	0
10,278.90	<0.0001		3.9	3.8	2.71	80.9	7.4
10,279.60	0.282	0.211	6.2		2.73	71.3	12.4
10,335.20	+		10.5		2.78	54.1	32.9
10,335.90	0.689	0.559	9.6	9.4	2.8	67.8	15.8
10,336.60	+		10		2.79	33.3	40.8
10,338.70	+		8.2		2.78	20.2	43.2
10,340.40	0.0077	0.0033	8.1	8	2.79	57.8	25.9
10,341.90	0.05	0.03	8.9		2.79	62.5	32.2
10,345.65	0.09	0.059	4.9		2.79	**	
10,349.25	+		5.1		2.79	**	
10,353.90	+		4.6		2.81	**	
10,355.70	+		7.9		2.75	82.5	4.2
10,358.10	+		7.4		2.77	57.9	38.8
10,362.25	0.0015	0.0004	2.2	2.1	2.78	26.5	37.5
10,365.55	0.063	0.04	5.8		2.75	23.8	70.3
10,367.90	0.031	0.018	6	5.9	2.8	43.1	33.2
10,369.80	+		7.2		2.86	35.7	46
10,371.85	+		8.5		2.82	89.6	4.9

10,372.40	+		7.1		2.79	24.8	37.1
10,374.60	+		5.1		2.8	39.4	35
10,375.25	0.0063	0.0025	5.7	5.6	2.79	44.3	35
10,377.60	0.094	0.062	3.7		2.83	**	
10,378.70	0.0029	0.001	7.7	7.6	2.77	91.8	6.2

Appendix C Petrophysical Analysis

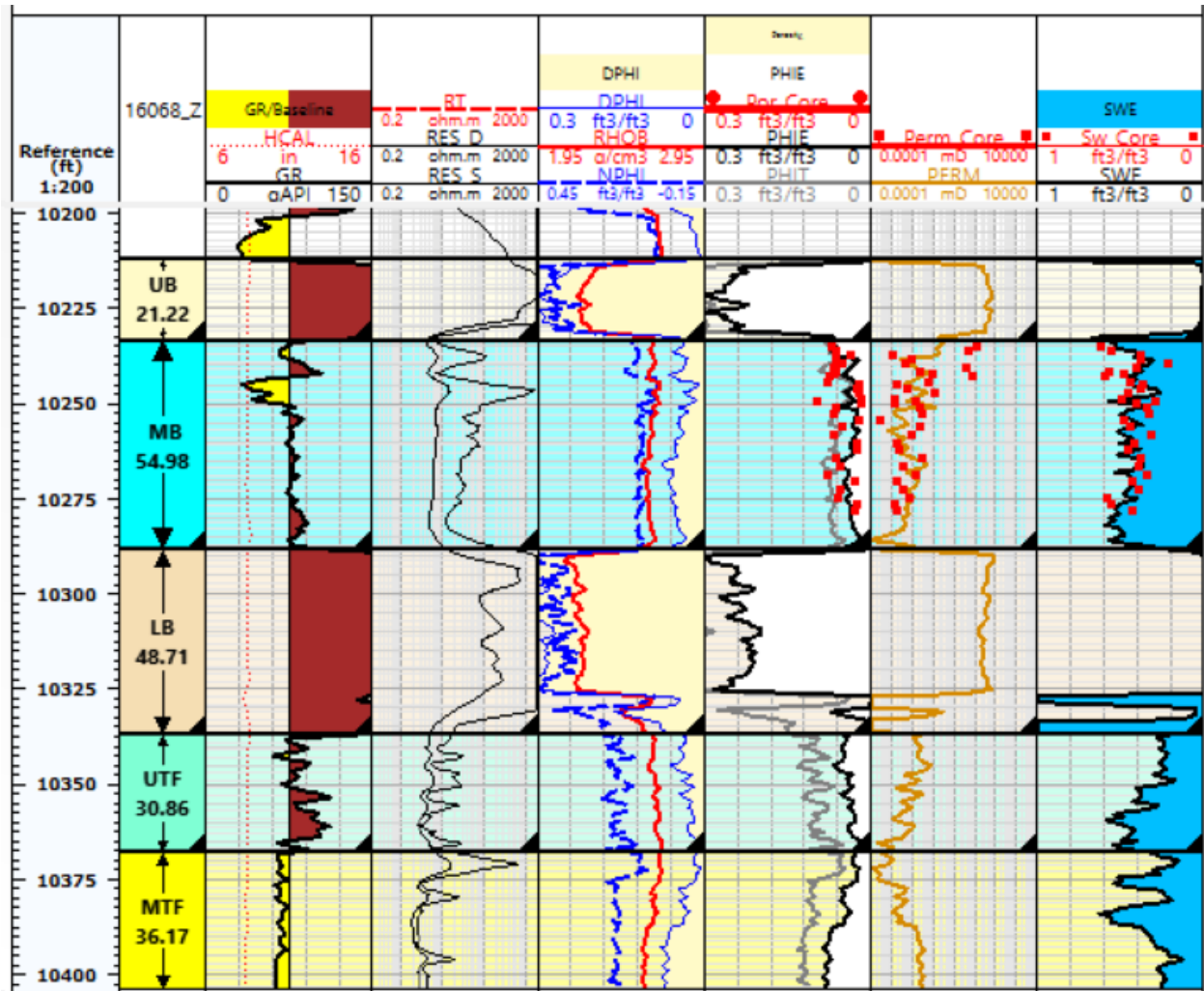


Figure C1. Petrophysical interpretation of Well 16068. Track 1: Gamma Ray (GR), Caliper (HCAL), and Baseline used to identify shale volume and borehole conditions. Track 2: Deep and shallow resistivity logs (RT, RES_D, RES_S) for fluid saturation estimation. Track 3: Density (RHOB) and neutron porosity (NPHI) for porosity evaluation. Track 4: Effective porosity (PHIE) computed from density-neutron crossplot and compared with core-derived porosity (Por Core). Track 5: Log-derived permeability overlaid with core permeability data (Perm Core). Track 6: Water saturation (SWE) estimated from logs and

compared to core water saturation (Sw Core). The log section spans Upper Bakken (UB), Middle Bakken (MB), Lower Bakken (LB), Upper Three Forks (UTF), and Middle Three Forks (MTF) formations.

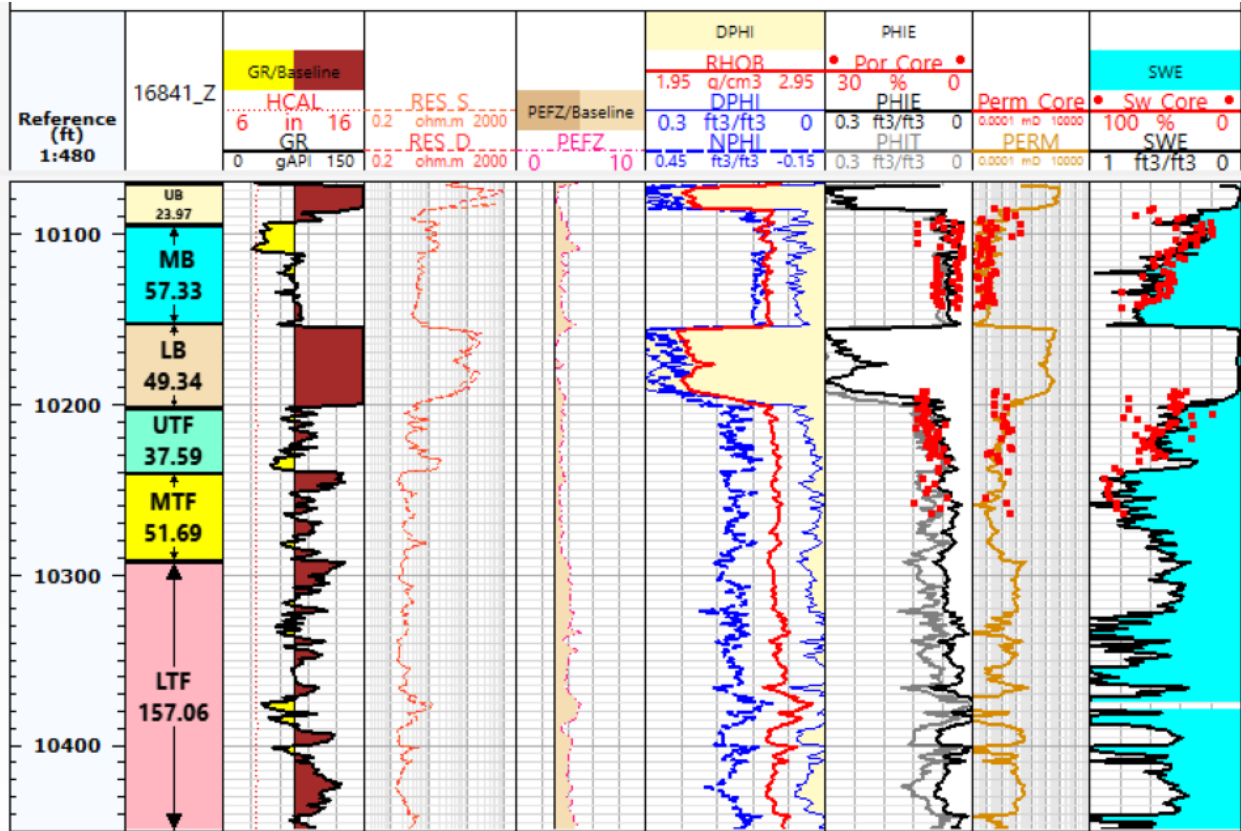


Figure. C2. Petrophysical evaluation of well 16841. Track 1: Gamma Ray (GR) and Caliper (HCAL) used for lithological differentiation and borehole quality assessment. Track 2: Deep and shallow resistivity logs (RES_D and RES_S) for hydrocarbon zone identification. Track 3: Density (RHOB) and neutron porosity (NPFI). Track 4: Effective porosity (PHIE) derived from combined log analysis and compared with core porosity measurements (Por Core). Track 5: Log-derived permeability compared with core-derived permeability (Perm Core). Track 6: Water saturation from log interpretation (SWE) compared with core-based water saturation (Sw Core). Formations include Upper Bakken (UB), Middle Bakken (MB), Lower Bakken (LB), Upper Three Forks (UTF), Middle Three Forks (MTF), and Lower Three Forks (LTF).

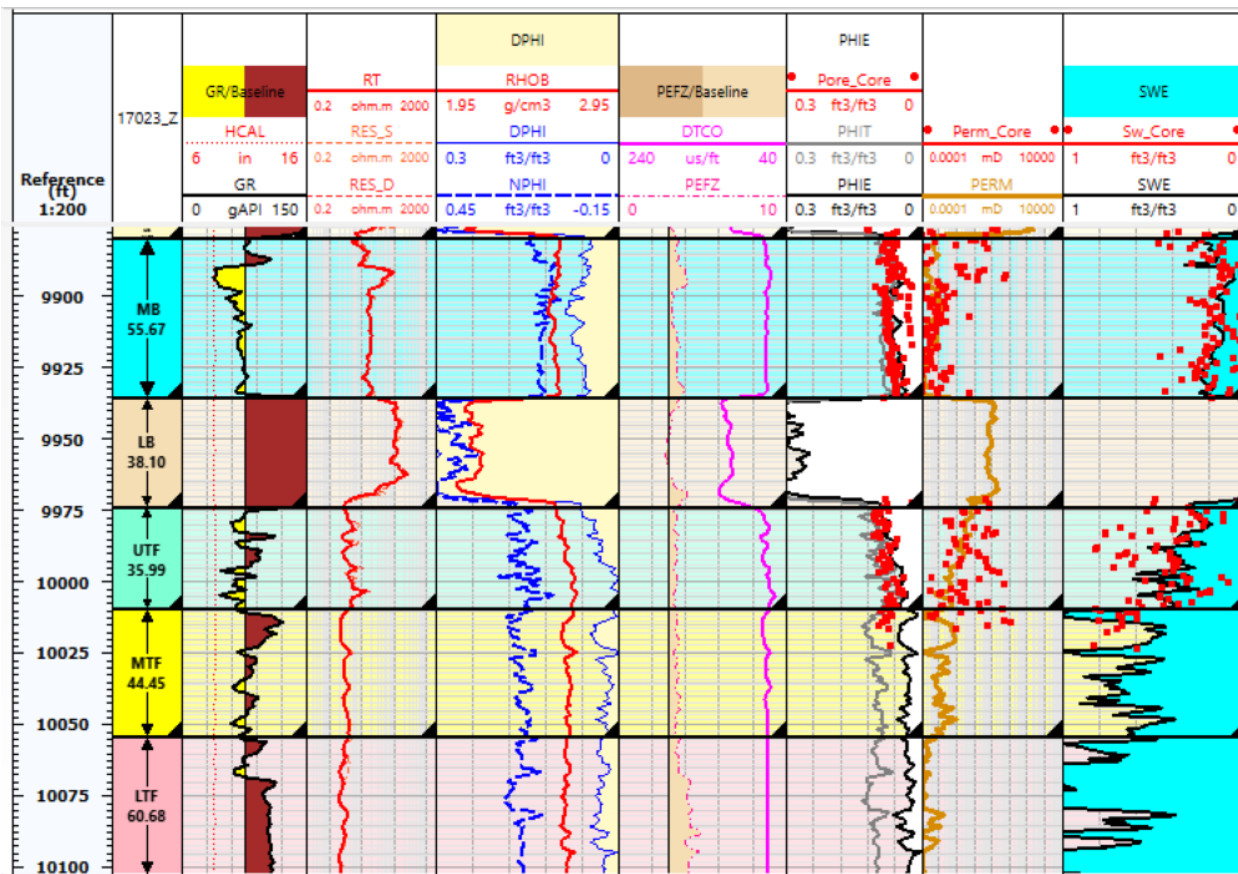


Figure C3. Petrophysical evaluation of well 17023. Track 1: Gamma Ray (GR) and Caliper (HCAL) logs for lithological identification and borehole condition. Track 2: Deep, shallow, and true resistivity (RES_D, RES_S, and RT) for hydrocarbon zone delineation. Track 3: Density (RHOB) and Neutron Porosity (NPHI). Track 4: Sonic (DTCO) and photoelectric factor (PEFZ) used to improve lithology differentiation. Track 5: Effective porosity (PHIE) compared with core porosity (Pore_Core). Track 6: Permeability log correlated with core measurements (Perm_Core). Track 7: Log-derived water saturation (SWE) compared with core-based saturation (Sw_Core). Formation tops identified include Middle Bakken (MB), Lower Bakken (LB), Upper Three Forks (UTF), Middle Three Forks (MTF), and Lower Three Forks (LTF).

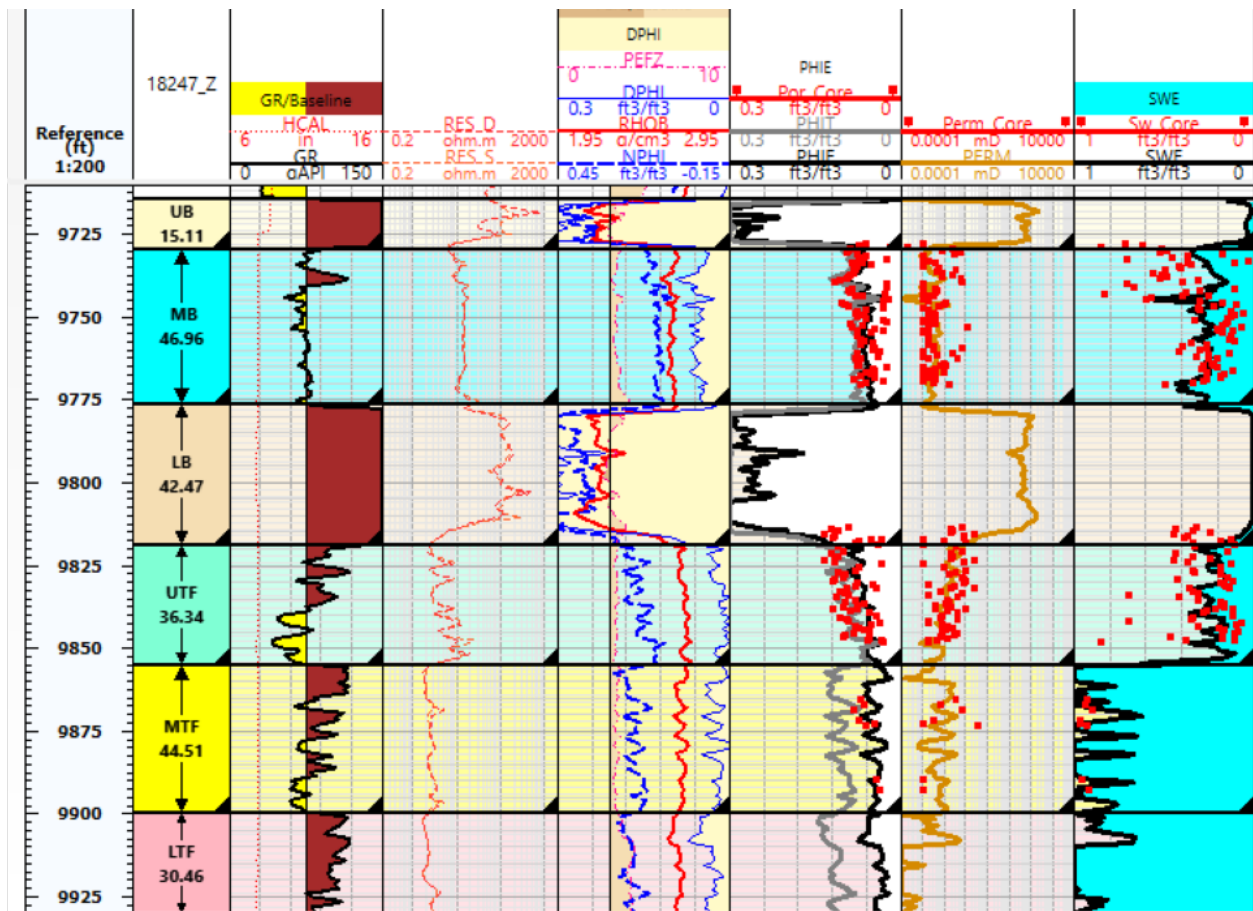


Figure C4. Petrophysical interpretation of well 18247. Track 1: Gamma Ray (GR) and Caliper (HCAL) logs indicating lithology and borehole quality. Track 2: Shallow and deep resistivity (RES_S and RES_D) curves used for hydrocarbon zone identification. Track 3: Density (RHOB), and Neutron Porosity (NPHI) logs used to calculate formation porosity. Track 4: Sonic log (DTCO) and photoelectric factor (PEFZ) to assist lithology interpretation. Track 5: Effective porosity (PHIE) compared against laboratory core porosity (Por_Core). Track 6: Log-derived permeability compared with core data (Perm_Core). Track 7: Water saturation (SWE) validated with core-based saturation measurements (Sw_Core). Formation intervals are marked: Upper Bakken (UB), Middle Bakken (MB), Lower Bakken (LB), Upper Three Forks (UTF), Middle Three Forks (MTF), and Lower Three Forks (LTF).

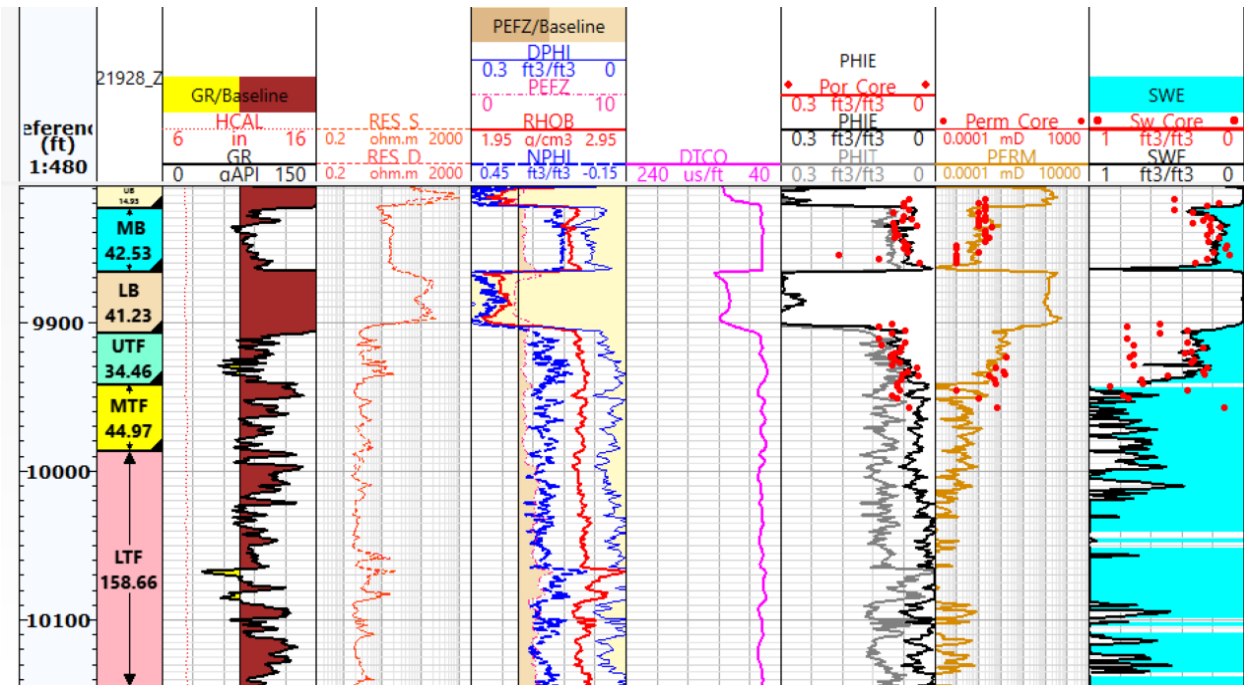


Figure C5. Petrophysical evaluation of well 21928. Track 1: Gamma Ray (GR) and Hole Caliper (HCAL) logs for lithology and borehole integrity assessment. Track 2: Shallow and deep resistivity logs (RES_S and RES_D) identifying fluid type and saturation zones. Track 3: Density (RHOB), Neutron Porosity (NPHI), and Density Porosity (DPHI) used for porosity and lithology evaluation. Track 4: Sonic transit time (DTCO) and Photoelectric effect (PEFZ) logs aiding mineralogical interpretation. Track 5: Effective porosity (PHIE) compared with core porosity measurements (Por_Core). Track 6: Permeability log calibrated against core permeability data (Perm_Core). Track 7: Water saturation (SWE) log compared to core-derived water saturation (Sw_Core). Reservoir zones include Middle Bakken (MB), Lower Bakken (LB), Upper Three Forks (UTF), Middle Three Forks (MTF), and Lower Three Forks (LTF), indicating vertical variability in petrophysical properties.

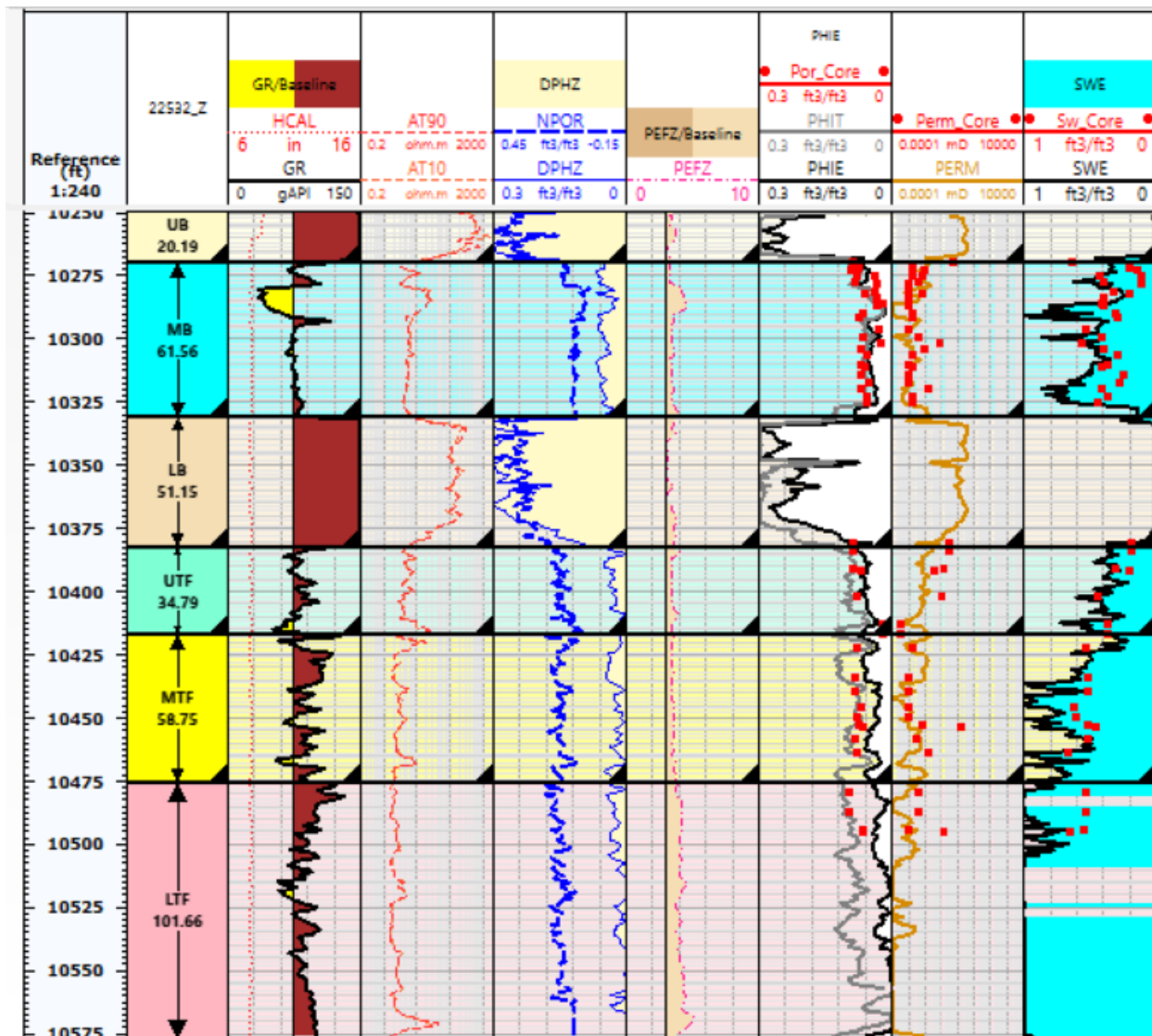


Figure C6. Comprehensive petrophysical interpretation for well 22532. Track 1: Gamma Ray (GR) and Hole Caliper (HCAL) logs for lithological differentiation and borehole condition. Track 2: Resistivity logs (AT90 and AT10) used to evaluate hydrocarbon presence and saturation zones. Track 3: Neutron Porosity (NPOR), Density Porosity (DPHZ), and their cross-plot responses used for porosity and lithology analysis. Track 4: Sonic transit time (PEFZ) aiding in mineralogical assessment. Track 5: Effective porosity (PHIE) compared with core-derived porosity (Por_Core). Track 6: Permeability (PERM) plotted against core permeability (Perm_Core) for calibration. Track 7: Water saturation (SWE) compared with Sw_Core data for validation. Reservoir zones include Upper Bakken (UB), Middle Bakken (MB), Lower Bakken (LB), Upper Three Forks (UTF), Middle Three Forks (MTF), and Lower Three Forks (LTF), showing vertical variations in petrophysical properties and reservoir potential.

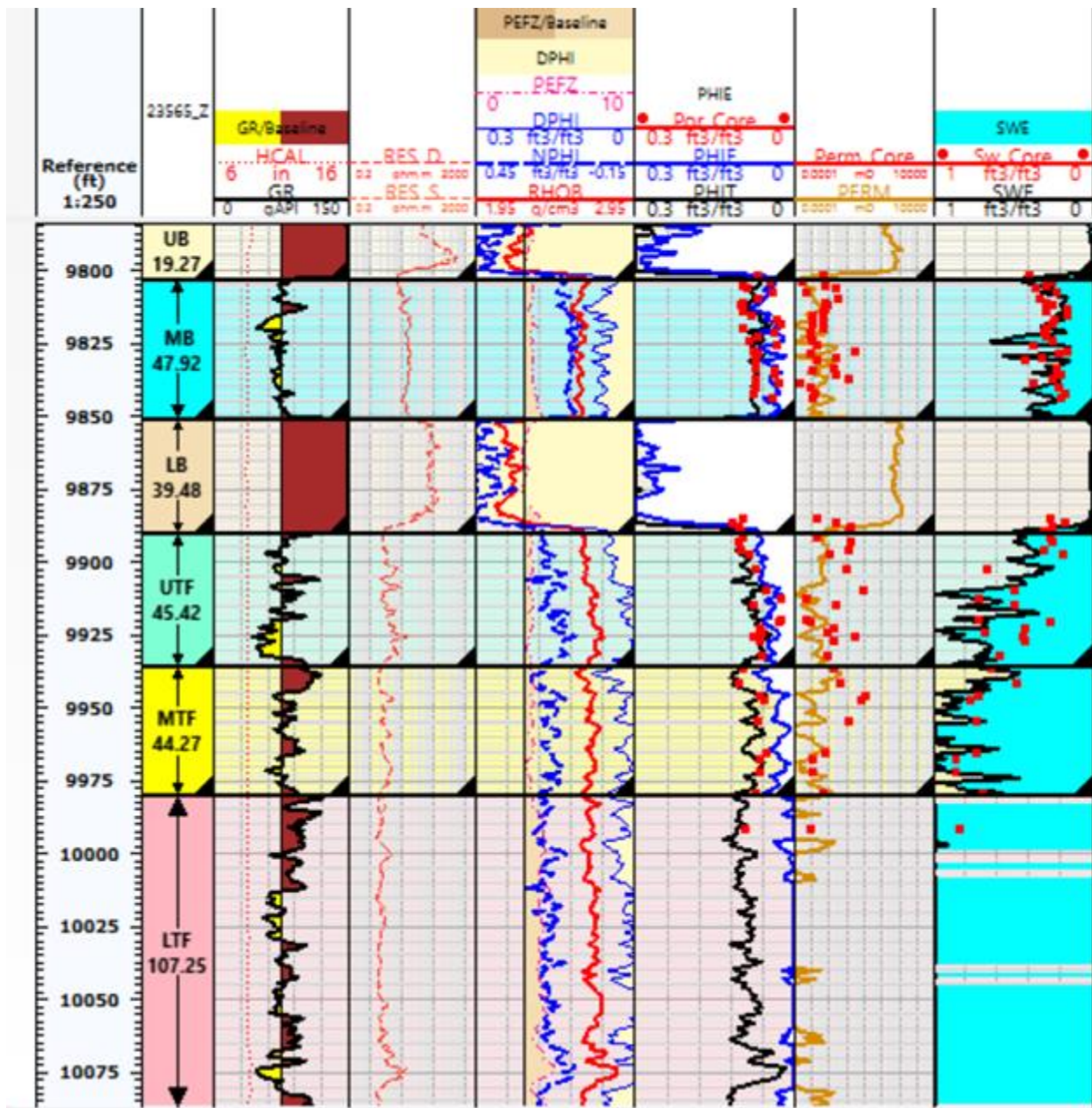


Figure C7. Petrophysical interpretation for well 23565 using triple combo and core-calibrated datasets. Track 1: Gamma Ray (GR) and Hole Caliper (HCAL) used to define lithology and borehole integrity. Track 2: Deep and shallow resistivity measurements (RES_D and RES_S) highlighting hydrocarbon zones. Track 3: Neutron Porosity (NPHI), Density Porosity (DPHI), and Bulk Density (RHOB) curves used for porosity evaluation and lithology estimation. Track 4: Sonic transit time (PEFZ) and cross-plotted porosity confirmation. Track 5: Effective porosity (PHIE) validated with Por_Core data. Track 6: Permeability (PERM) calibrated with core permeability (Perm_Core). Track 7: Water saturation (SWE) compared with core water saturation (Sw_Core). Formation tops include: Upper Bakken (UB), Middle Bakken (MB), Lower Bakken (LB), Upper Three Forks (UTF), Middle Three Forks (MTF), and Lower Three Forks (LTF).

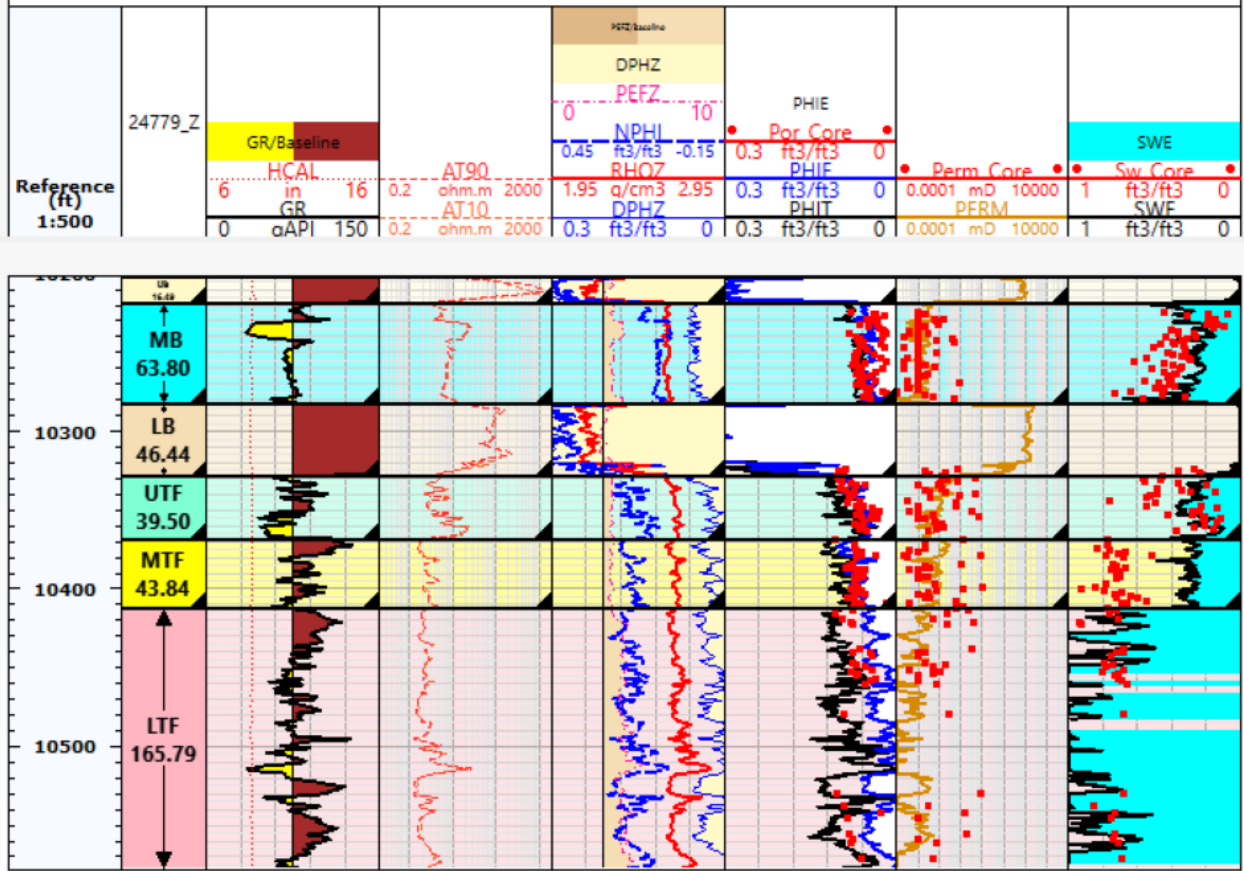


Figure C8. Petrophysical evaluation for well 24779. Track 1: Gamma Ray (GR) and Hole Caliper (HCAL) indicating lithology and borehole condition. Track 2: Shallow and deep resistivity (AT90, AT10) for fluid and saturation analysis. Track 3: Density (RHOB), Neutron (NPHI), and DPHI porosity logs used for total porosity interpretation. Track 4: Sonic log (PEFZ) used for lithology and porosity cross check. Track 5: Effective porosity (PHIE) compared with core porosity (Por_Core). Track 6: Core-calibrated permeability (Perm_Core) plotted with log-derived permeability (PERM). Track 7: Water saturation (SWE) validated against core-measured water saturation (Sw_Core). Formation divisions include: Middle Bakken (MB), Lower Bakken (LB), Upper Three Forks (UTF), Middle Three Forks (MTF), and Lower Three Forks (LTF), representing key intervals for CO₂ injection and storage analysis.

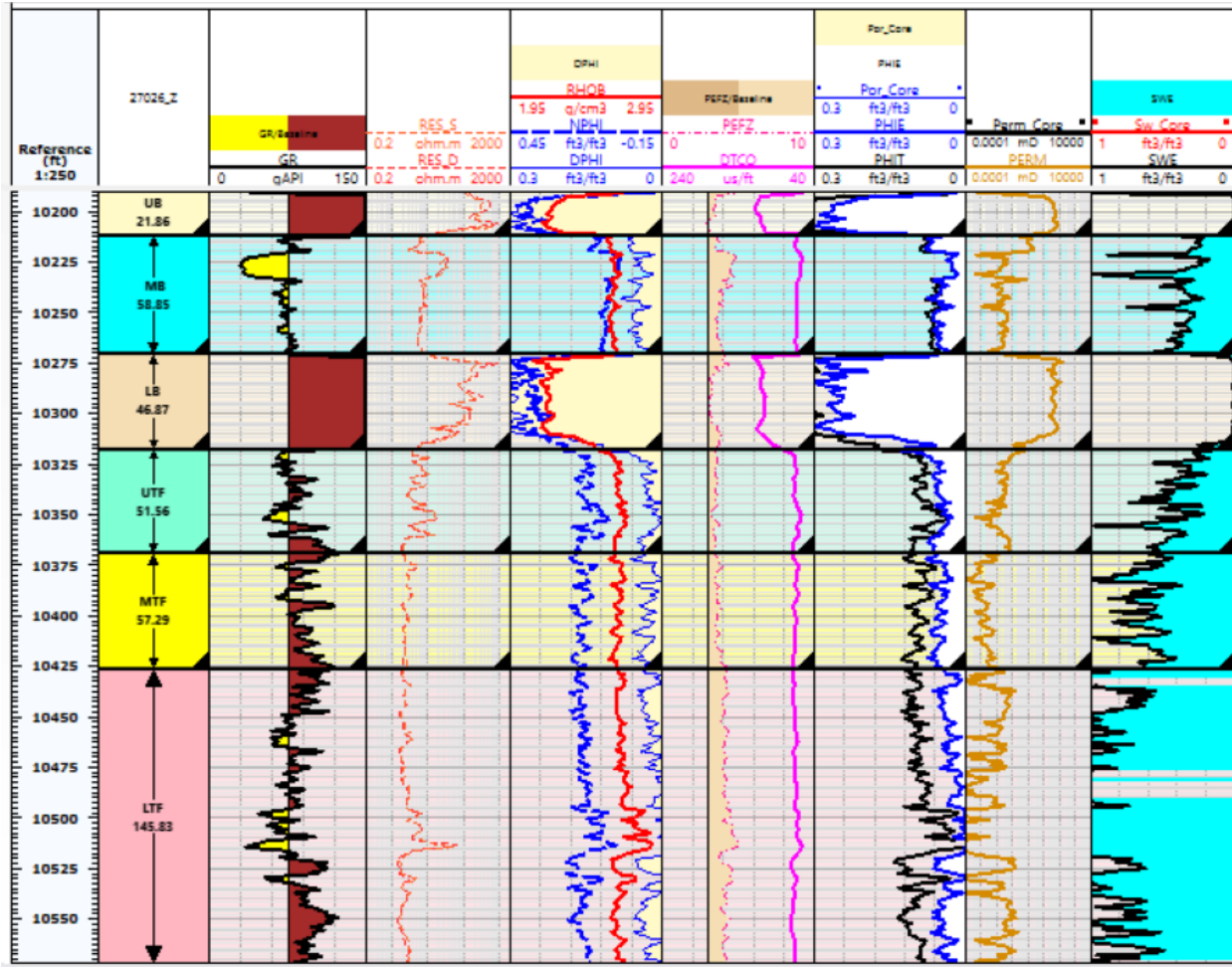


Figure C9. Petrophysical evaluation for well 27026. Track 1: Gamma Ray (GR) and Hole Caliper (HCAL) indicating lithology and borehole condition. Track 2: Shallow and deep resistivity (RES_S, RES_D) for fluid and saturation analysis. Track 3: Density (RHOB), Neutron (NPHI), and DPHI porosity logs used for total porosity interpretation. Track 4: Sonic log (DTCO) and Photoelectric Factor (PEFZ) used for lithology and porosity cross check. Track 5: Effective porosity (PHIE) compared with core porosity (Por_Core). Track 6: Core-calibrated permeability (Perm_Core) plotted with log-derived permeability (PERM). Track 7: Water saturation (SWE) validated against core-measured water saturation (Sw_Core). Formation divisions include: Middle Bakken (MB), Lower Bakken (LB), Upper Three Forks (UTF), Middle Three Forks (MTF), and Lower Three Forks (LTF), representing key intervals for CO₂ injection and storage analysis.

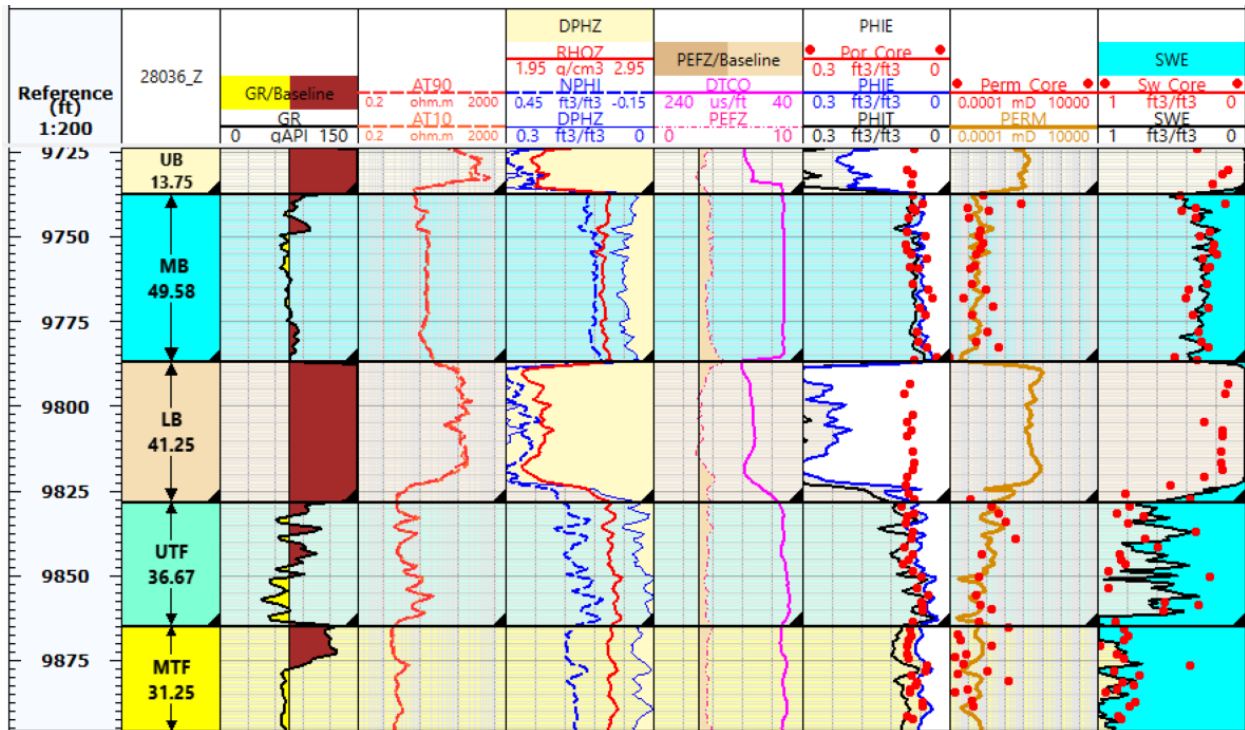


Figure C10. Petrophysical evaluation for well 28036. Track 1: Gamma Ray (GR) and Hole Caliper (HCAL) indicating lithology and borehole condition. Track 2: Shallow and deep resistivity (AT90, AT10) for fluid and saturation analysis. Track 3: Density (RHOB), Neutron (NPHI), and DPHZ porosity logs used for total porosity interpretation. Track 4: Sonic log (DTCO) and Photoelectric Effect (PEFZ) used for lithology and porosity cross-check. Track 5: Effective porosity (PHIE) compared with core porosity (Por_Core). Track 6: Core-calibrated permeability (Perm_Core) plotted with log-derived permeability (PERM). Track 7: Water saturation (SWE) validated against core-measured water saturation (Sw_Core). Formation divisions include: Upper Bakken (UB), Middle Bakken (MB), Lower Bakken (LB), Upper Three Forks (UTF), and Middle Three Forks (MTF).

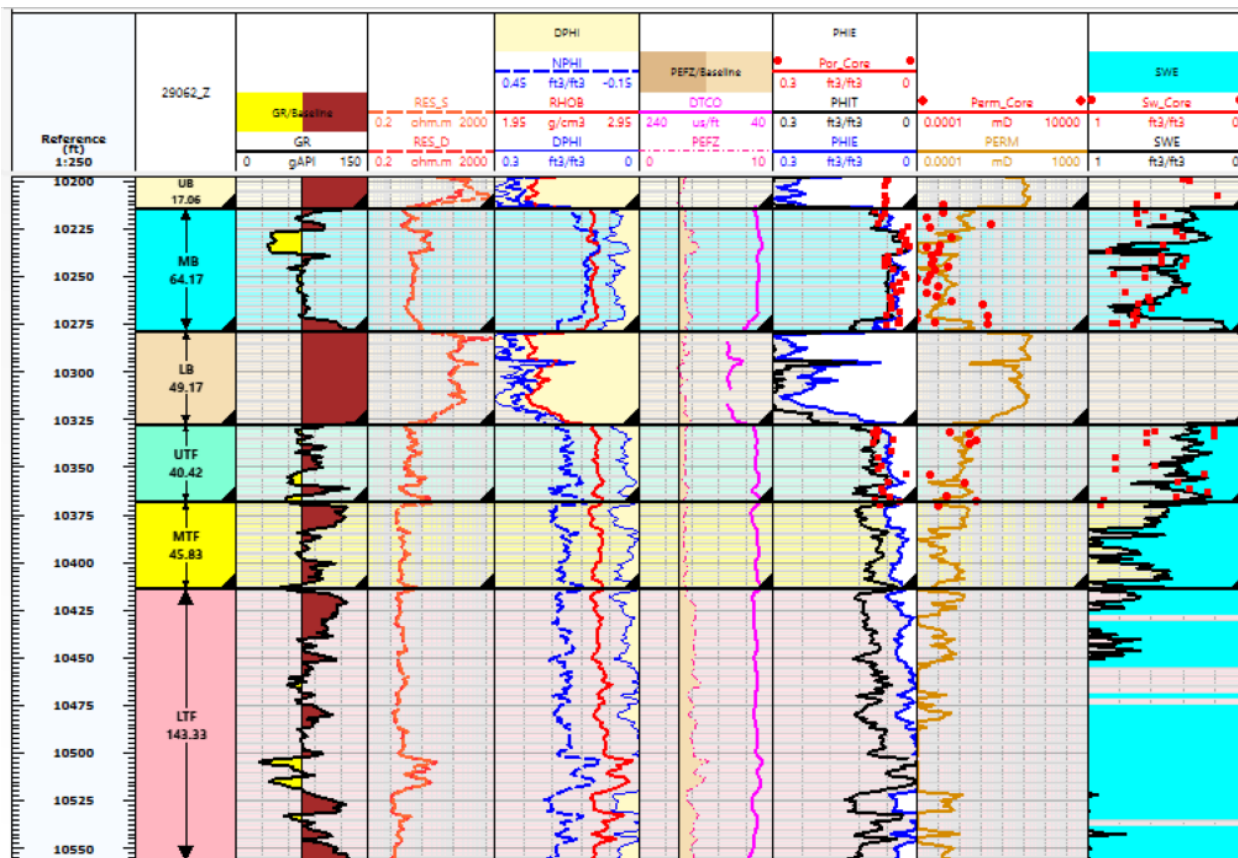


Figure C11. Petrophysical evaluation for well 29062. Track 1: Gamma Ray (GR) and Hole Caliper (HCAL) logs illustrating lithology variation and borehole stability. Track 2: Shallow and deep resistivity logs (RES_S, RES_D) providing insights into formation fluid and hydrocarbon saturation. Track 3: Density (RHOB), Neutron (NPHI), and total porosity (DPHI) logs used for porosity interpretation and lithology identification. Track 4: Sonic travel time (DTCO) and Photoelectric Factor (PEFZ) cross-checked for lithological calibration. Track 5: Effective porosity (PHIE) compared with core-measured porosity (Por_Core). Track 6: Core permeability (Perm_Core) plotted against log-derived permeability (PERM) for permeability estimation validation. Track 7: Water saturation (SWE) from logs calibrated with core-based water saturation (Sw_Core). Formation tops include: Upper Bakken (UB), Middle Bakken (MB), Lower Bakken (LB), Upper Three Forks (UTF), Middle Three Forks (MTF), and Lower Three Forks (LTF).

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