



Kyalla 117 N2-1

*Well Completion Report
(Interpretive)*

*EP 117
Beetaloo Sub-basin
Northern Territory*

Origin Energy Resources Ltd

Table of Contents

Figures.....	3
Tables.....	3
Glossary.....	4
1 WELL SUMMARY SHEET	5
2 INTRODUCTION.....	7
2.1 WELL OBJECTIVES.....	8
3 GEOLOGY.....	10
3.1 BEETALOO SUB-BASIN STRATIGRAPHY	10
3.2 PROSPECT DESCRIPTION	12
4 RESULTS OF DRILLING	14
4.1 INTERSECTED STRATIGRAPHY AND PROGNOSIS.....	14
4.2 LITHOSTRATIGRAPHY	15
4.3 RESERVOIR DESCRIPTION AND DEPOSITIONAL ENVIRONMENT.....	17
4.3.1 Kyalla Formation	17
4.3.2 Hayfield Formation	18
4.4 RESERVOIR PROPERTIES ANALYSIS	19
4.4.1 Core Analysis.....	19
4.4.2 Drill Cuttings Analysis.....	19
4.4.3 Gas Analysis	19
4.5 GEOCHEMICAL INTERPREATION	19
4.6 PETROPHYSICAL INTERPRETATION	20
4.7 HYDROCARBON INDICATIONS	23
4.7.1 GAS DETECTION WHILST DRILLING.....	23
4.7.2 FLUORESCENCE	24
4.8 TRAP INTEGRITY	25
4.9 Seismic Well Tie Update.....	26
5 WELL EVALUATION	28
5.1 WIRELINE LOGGING	28
5.2 MUDLOGGING.....	28
5.3 LOGGING WHILE DRILLING (LWD) / MEASUREMENTS WHILE DRILLING (MWD)	29
6 FORMATION SAMPLING.....	29
6.1 DRILL CUTTINGS	29
6.2 CONVENTIONAL CORE	30



6.3	SIDEWALL CORES	30
6.4	MUD GAS.....	32
7	FORMATION TESTING	32
7.1	Formation Integrity Test (FIT)	32
7.2	Diagnostic Fracture Injection Test (DFIT).....	33
	REFERENCES.....	38
	APPENDICES	38

Figures

Figure 1.	Kyalla 117 N2-1 Well Location and Permit Map	9
Figure 2.	Beetaloo Sub-Basin Stratigraphy	11
Figure 3.	Post-drill structural map showing the near top of the Lower Kyalla Shale mTVDSS.....	13
Figure 4 -	Petrophysical model for the Upper Kyalla Shale. D.....	21
Figure 5 -	Petrophysical model for the Middle and Lower Kyalla Shales.....	22
Figure 6 -	Interpreted Seismic section from Kyalla 117 N2-1	26
Figure 7 -	Kyalla 117 N2-1 Seismic well tie	27
Figure 8.	FIT Results	32
Figure 9.	DFIT 3, Injection Cycle A.....	34
Figure 10.	DFIT 3, Injection Cycle B.....	34
Figure 11.	DFIT 4, Injection Cycle A.....	35
Figure 12.	DFIT 4, Injection Cycle B.....	35
Figure 13.	DFIT 5, Injection Cycle A.....	36
Figure 14.	DFIT 5, Injection Cycle B.....	36
Figure 15.	DFIT 6, Injection Cycle A.....	37
Figure 16.	DFIT 6, Injection Cycle B.....	37

Tables

Table 6.	Kyalla 117 N2-1 prognosed vs. actual Formation Top depths	14
Table 10.	Kyalla 117 N2 1 Summary of Wireline Logs.....	28
Table 11.	Kyalla 117 N2 1 Summary of LWD / MWD logs.....	29
Table 7.	Kyalla 117 N2 1 Drill Cuttings Interval and Sampling Rate Summary.....	29
Table 8.	Kyalla 117 N2 1 Coring Summary	30
Table 9.	Kyalla 117 N2 1 Summary of Rotary Sidewall Coring recovery and depths	32

Glossary

BHA	Bottom Hole Assembly
BOP	Blow Out Preventer
CVT	Constant Volume Trap
DF	Drill Floor
DFIT	Diagnostic Fracture Injection Test
DST	Drill Stem Test
EMW	Estimated Mud Weight
EP	Exploration Permit
FIT	Formation Integrity Test
Fm	Formation
ft	Feet
GVR	Geo-Vision Resistivity
HF	Hydraulic Fracturing
ID	Inner Diameter
JV	Joint Venture
KB	Kelly bushing
LOP	Leak Off Pressure
LOT	Leak Off Test
LWD	Logging While Drilling
m	Metre
MD	Measured Depth
mMD	metres, measured depth
mRT	Meters, Rotary table
mMDRT	Meters, measured depth, rotary table
MW	Mud Weight
MWD	Measurement While Drilling
OD	Outer Diameter
PDC	Polycrystalline Diamond Compact
POOH	Pull Out Of Hole
ppg	Pounds per Gallon
psi	pounds per square inch
RCJB	Reverse Circulation Junk Basket
RIH	Run in Hole
RSS	Rotary Steerable System
RT	Rotary Table
ST	Sidetrack
TD	Total Depth
WBM	Water based mud
XLOT	Extended Leak Off Test

1 WELL SUMMARY SHEET

Well Name	Kyalla 117 N2 1		Petroleum Title	EP117	Basin	McArthur Basin (Beetaloo Sub-basin)		
Well Purpose	Exploration / Appraisal		Status	Plugged and Abandoned	Parent Well Name, if any	N/A		
Spud Date	08/10/2019		TD Date	14/11/2019	End of Well Date	28/11/2019		
Primary Objective			lower Kyalla shale		Rig(s) Name	Ensign 963		
Secondary Objective			upper Kyalla shale		100K Map Sheet	Warramban (5664)		
Total Depth	Driller	mMDRT	mTVDSS	Side-Track Kick- off Depth, if applicable	Drill Datum <input type="checkbox"/> DF <input checked="" type="checkbox"/> RT <input type="checkbox"/> KB	NA GL Elevation: 269.92m Elevation Datum: Mean Sea Level Drill Datum Elevation: 277.15m		
	Logger	1865.2	-1588.05					
Location (GDA94 Datum with GRS80 Ellipsoid using MGA94 Grid)	Coordinates	Surface	Bottom Hole	Seismic Station, if applicable	Survey / Line	Inline	Xline	
	Latitude	16°50' 29.29" S	16° 50' 29.288" S		Mc92 –			
Zone	Longitude	133°39' 06.752" E	133°39' 06.693" E		123.			
53	Easting	356 370.07	356 368.31		Ma91 –			
	Northing	8 137 492.64	8 137 492.69		294.			

Well Summary

Ensign Rig 963 spudded Kyalla 117 N2-1 at 19:00 hours on October 8, 2019. The 22" conductor hole was drilled with casing (DwC) to a section total depth (TD) of 194mMDRT reached on October 10, 2019.

The 17 ½" bottom hole assembly (BHA) was run in hole (RIH) and the 22" hole was logged through the 18 5/8" casing with logging while drilling (LWD) tools from 145m MDRT to 176mMDRT. Cement was tagged on October 12, 2019 at 176m MDRT and the shoe track was drilled out from 176mMDRT to 194mMDRT. New formation was encountered on October 13, 2019 and the 17 ½" surface hole was drilled ahead until a section TD of 548mMDRT was reached on 19 October 2019. The BHA was pulled out of the hole (POOH) and the 13 3/8" casing was RIH on October 20, 2019. The cement head was rigged up and the first stage of the cement job was pumped before launching the stage tool. Waited on cement to reach 500psi. Attempted to inflate Annulus Casing Packer (ACP) without success. RIH with 5" drill pipe and washed down and tagged shut off plug at 207.86mRT. Indication the shut off plug was hung up in the stage tool. RIH with 5" drill pipe to 513mRT with no obstructions. Washed down from 513mRT to 519mRT. An increase in pump pressure was observed indicating the shut off plug was on the float collar. POOH with the 5" drill pipe, retrieved the wear bushing and landed out the landing joint on the casing head. The ACP was inflated but the stage tool failed to open due to pressure decrease in the casing string. RIH with 5" drill pipe and pumped a cement plug on top of the casing float collar. Waited on cement to reach 500psi before successfully performing stage #2 cement job with cement returns to surface.

Drilled out the stage tool and cement plug along with two meters of new formation to 550mMDRT. A Formation Integrity Test (FIT) was conducted to test a minimum required estimated mud weight (EMW) of 16.5ppg (with 9.0ppg MW) with a surface pressure of 697 psi. This test was achieved successfully. Schlumberger wireline tools were rigged up and a Cement Bond Log (CBL-USIT) was performed.

Drilling of the 12 ¼" intermediate hole section commenced on 29 October 2019. The section drilled ahead from 550mMDRT to core point #1 at 1035.3mMDRT. The Baker Hughes coring assembly was RIH and coring run #1 commenced from 1035.3mMDRT to 1080.3mMDRT. Core #1 was at surface on November 03, 2019 and laid out by the Ensign crew, before being prepared for processing and transport by ALS. Drilling of the intermediate vertical section continued from 1080.33m MDRT to core point #2 at 1740m MDRT reached on 09 November 2019. The Baker Hughes coring assembly was used to core from 1740mMDRT to 1785mMDRT. Core #2 was at surface on 12 November 2019 and laid out by the Ensign crew, before being prepared for processing and transport by ALS. The intermediate hole section was drilled ahead to TD. The section and well TD of 1865.2mMDRT was reached on 14 November 2019 at 02:45.



Hole and Casing Design (Drillers Depths)						Drilling Fluid	
Casing String	Hole Size (inches)	Casing Depth Range (mMDRT)	Casing Size (inches)	Casing Shoe Depth (mMDRT)	Casing Shoe Depth (mTVDSS)	Hole Size (inches)	Drilling Fluid Description
Civil Conductor/ Stove Pipe	NA	7.23-19	30"	NA	NA	NA	NA
Conductor	22"	19-194	18 3/8"	193.7	83.45	22"	KCl polymer water-based drilling fluid
Surface	17 1/2"	194-548	13 3/8"	544.65	-267.5	17 1/2"	KCl polymer water-based drilling fluid
Intermediate	12 1/4"	548-1865.2				12 1/4"	KCl polymer water-based drilling fluid

Stratigraphy – Formation Tops (Loggers Depths)					Formation Evaluation			
Formation	Depth				Suite/ Run	Measurement	Depth Interval	
	mMDRT	mTVDRT	mTVDGL	mTVDSS			From (mMDRT)	To (mMDRT)
Undifferentiated Cretaceous	7.23	7.23	0	269.92	1/1	CBL-USIT	15	535
Anthony Lagoon Formation	70	70	-62.77	207.1	2/1	FMI-HRLA-PPC-ADT-PEX-HNGS-SP	Surface	1865
Gum Ridge Formation	191.4	191.4	-184.17	85.7	2/2	UBI-SSCAN-PPC-GPIT-GR	Surface	1865
Antrim Plateau Volcanics	399.5	399.5	-392.27	-122.4	2/3	PPC-CMR-NEXT-HNGS	Surface	1865
Bukalara Sandstone	499	499	-491.77	-221.9	2/4	XL ROCK-GR	1595.9	1825.6
Hayfield Formation	506.7	506.7	-499.47	-229.6	2/5	XL ROCK-GR	630.8	1595.9
Jamison Sandstone	891.3	891.3	-883.77	-614.2	2/6	UBI-GPIT-GR	1025	1830
Kyalla Formation	989	989	-981.77	-711.9				
Moroak Sandstone	1851.8	1851.7	-1844.47	-1574.55				
Total Depth	1865.2	1865.1	-1857.97	-1588.1				

Mud Logging	Formation Testing (DST)	DFIT	
Standard service including constant volume trap chromatograph mud gas analysis, drill cuttings collection, drill gas sampling with Isotubes™, headspace gas sampling with Isojars™	NIL		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
		Hydraulic Fracturing	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Conventional Coring	Hydrocarbon Shows		
Core #1 1035 – 1080 mMDRT Core #2 1740 – 1785 mMDRT	Hayfield sandstone member Jamison Sandstone Kyalla Formation		
Completion			
Plugged and Abandoned			

2 INTRODUCTION

Kyalla 117 N2-1 was drilled within Exploration Permit 117(R) in the Northern Territory, Australia by the Origin Energy Resources Ltd and Falcon Oil and Gas Joint Venture (“JV”). The well is the second well to be drilled within the permit by the JV, and the first of a two well exploration and appraisal campaign pertaining to Year 4 of the permit commitments. The primary objective of the well was to test the unconventional prospectivity of the organically enriched Kyalla Formation as a potential source rock reservoir.

EP117 is one of three permits held by the JV in which Origin Energy is the operator. The permits are located within the Beetaloo Sub-basin (“Beetaloo”) of the greater McArthur Basin. Recent studies regarding the hydrocarbon potential of the Beetaloo have indicated that the organically enriched source rock intervals within the Mesoproterozoic Kyalla Formation have potential as regional shale plays. The location of the Kyalla 117 N2 1 well was selected with the intent to intersect the thickest and deepest preserved section of the target Kyalla Formation within the JV permits, between known penetrations of prospective Kyalla Formation.

Kyalla 117 N2-1 is located approximately 70 km southeast of the town of Daly Waters (Figure 1). The well was spudded at 19:00 hours on 08 October 2019 and reached TD of 1865.2 mMDRT at 02:45 hrs on 14 November 2019. The well was plugged back on 28 November 2019 at 19:45. End of well was confirmed after tagging the kick-off plug on 29 November 2019 at 12:00.

2.1 WELL OBJECTIVES

The primary aim of Kyalla 117 N2-1 was to evaluate the shale potential of the lower Kyalla shale (primary target), upper Kyalla shale (secondary target) and the Hayfield sandstone member (tertiary target). The well successfully met all of its well objectives, which included;

1. Confirming the presence and reservoir quality of the Kyalla Formation within the permit
2. Cutting and retrieving two 5 ¼" diameter conventional cores over the upper Kyalla Shale and lower Kyalla Shale.
3. Cutting of rotary side wall cores throughout the Kyalla Formation and targets of interest for calibration of petrophysical and geomechanical models
4. Capturing a comprehensive wireline suite for petrophysical evaluation of the reservoir

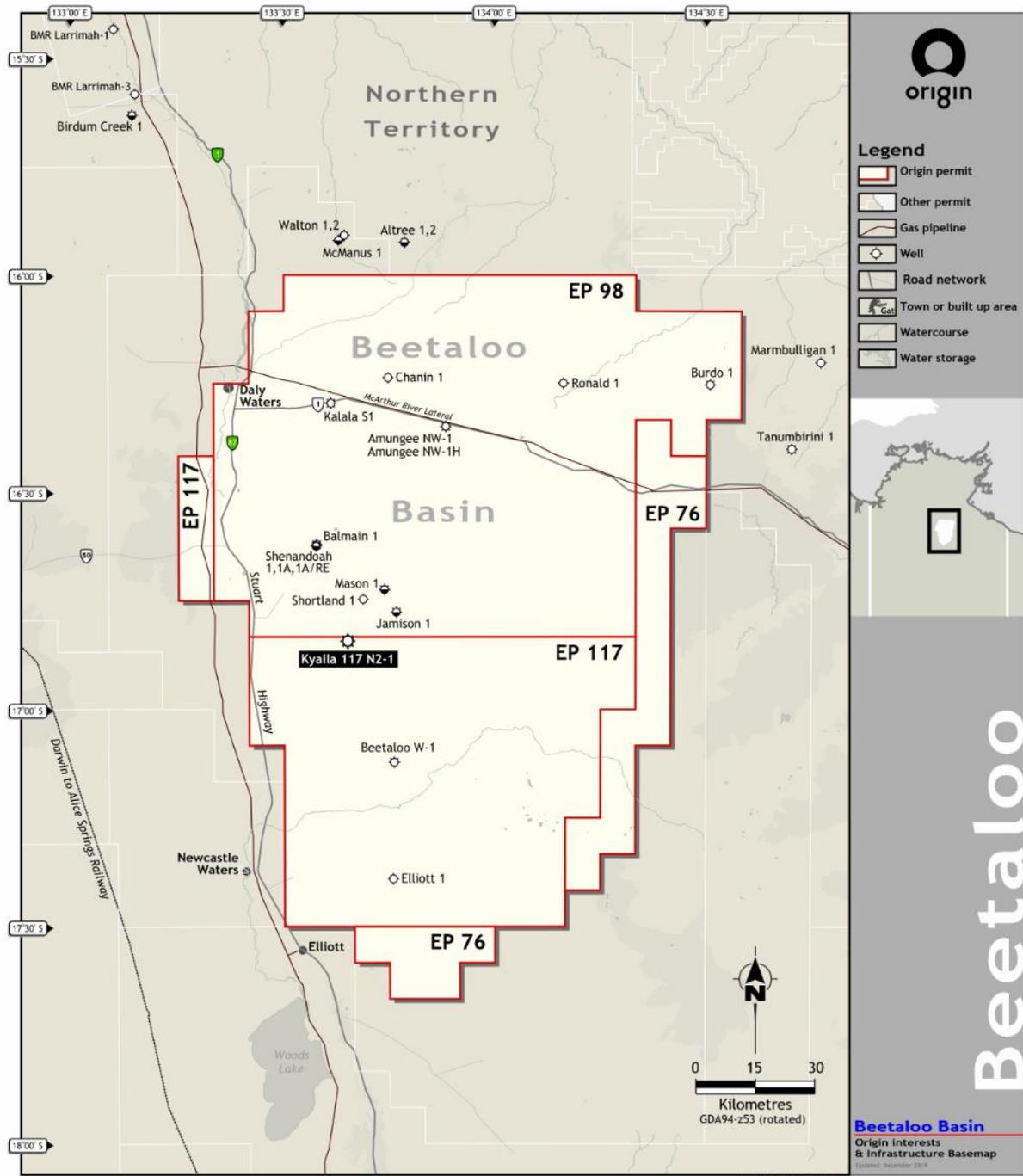


Figure 1. Kyalla 117 N2-1 Well Location and Permit Map

3 GEOLOGY

3.1 BEETALOO SUB-BASIN STRATIGRAPHY

The Beetaloo Sub-Basin of the Greater McArthur Basin contains thick, preserved intervals of Mesoproterozoic aged Roper Group sediments that were deposited in an interpreted large epeiric sea dubbed the Roper Seaway (Cox et al, 2016).

The Mesoproterozoic Roper Group (Figure 2) comprises progradational cycles of mudstone and sandstone units reaching thickness' greater than 3000 m with averages of 1500 m away from major depocenters (Abbott and Sweet, 2000). Even though the succession has yet to be fully penetrated in the deepest depocenters, individual formations show remarkable consistency in thickness and lateral continuity in seismic profiles enabling them to be traced across the basin (Munson, 2014). The first detailed stratigraphic study of the Roper Group was presented by Jackson et al. (1988) and furthered by detailed investigations from Jackson and Raiswell (1991) and Warren et al. (1998) who supplemented the pre-existing framework with additional regional and local stratigraphic, sedimentological and geochemical information. The Roper Group succession was deposited in a variety of settings within shallow-marine, and nearshore to shelf environments (Powell et al., 1987; Jackson et al., 1988; Abbott and Sweet, 2000) with organic enrichment confined to the Velkerri and Kyalla formations. Several units within the sequence have been recognised as having excellent hydrocarbon potential.

Detailed descriptions of stratigraphy intersected in Kyalla 117 N2-1 is discussed in Section 4.2.

3.2 PROSPECT DESCRIPTION

The Roper Group is often interpreted as having excellent potential for unconventional hydrocarbon production due to the presence of several organic-rich shale units. Currently, the intervals with the greatest recognised potential are the Velkerri and Kyalla Formations (Altmann et al, 2018). Within the area of the Beetaloo JV permits (EP117, EP98 and EP76) thick intervals of organically enriched Velkerri (4-8% ave. TOC %wt) and Kyalla (2-5% ave. TOC %wt) Formation source rocks are present and are currently being explored for unconventional hydrocarbon resources. The target reservoir for Kyalla 117 N2-1 was the Kyalla Formation.

The Kyalla Formation is dominated by grey and black siltstone and mudstone, with regionally variable sandstone content. The unit conformably overlies the Moroak Sandstone, and exhibits a sharp, erosional and disconformable contact with the overlying Neoproterozoic Jamison sandstone (Figure 2).

Although dispersed organic matter exists throughout the Kyalla Formation, there are three known and identified intervals of organically enriched mudstone which have been historically (Karajas & Flavelle 1995) and more recently (Altmann et al 2018) considered as potential reservoir target shale plays. From deepest to shallowest, these three intervals have been informally named by Origin Energy as the lower, middle and upper Kyalla shales (Figure 2). Of these three intervals, the lower Kyalla shale has been identified as having the greatest hydrocarbon storage capability due to its regionally consistent reservoir thickness and quality (Altmann et al 2018). Historic exploration in the Beetaloo Sub-basin has observed oil bleeds and gas shows, good shale reservoir properties, and minor gas to surface from the Kyalla Formation which support the model for a shale resource play.

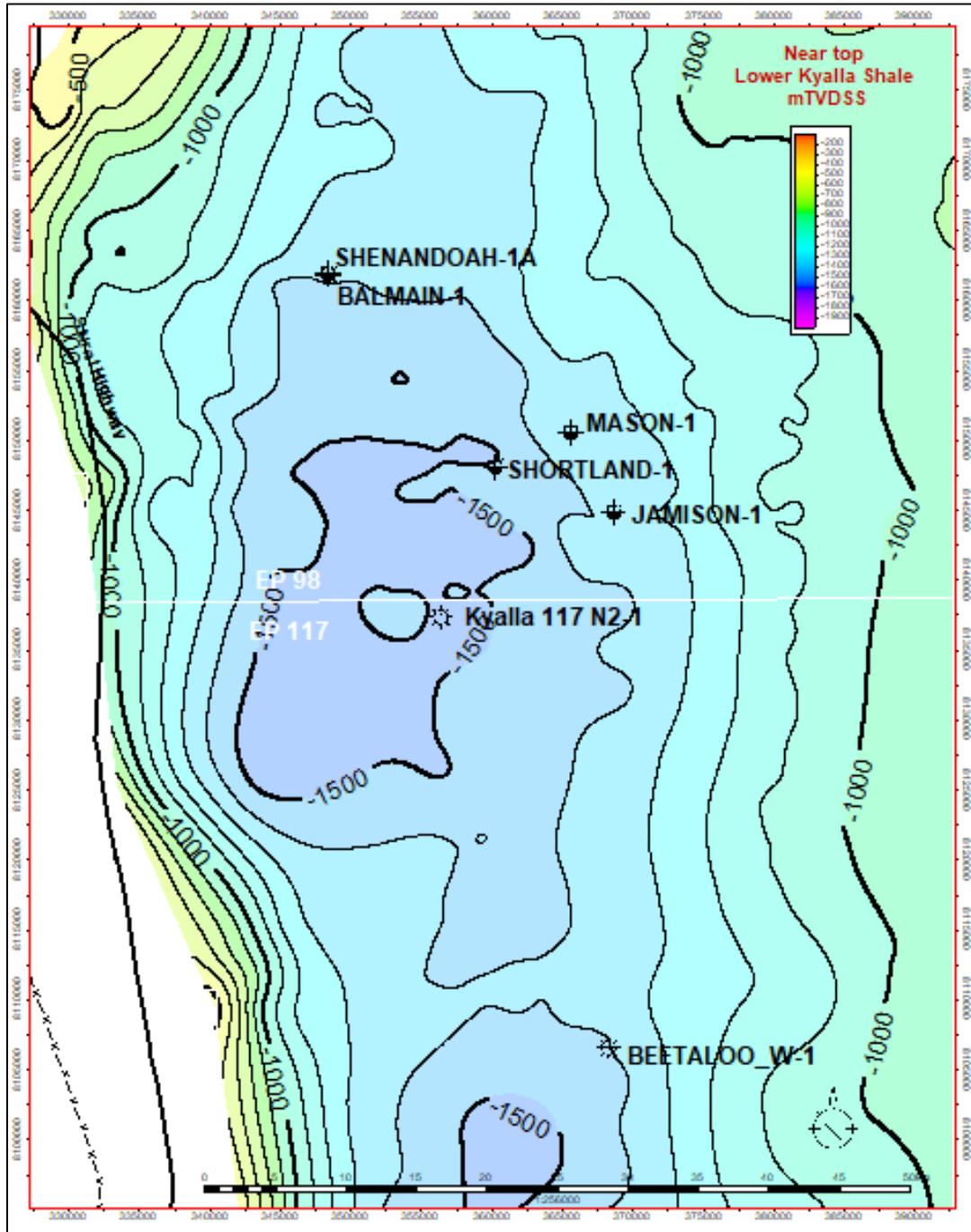


Figure 3. Post-drill structural map showing the near top of the Lower Kyalla Shale mTVDSS. Contour interval is 100m. Location of Kyalla 117 N2-1 in EP 117 is shown.

4 RESULTS OF DRILLING

4.1 INTERSECTED STRATIGRAPHY AND PROGNOSIS

The prognosed vs. actual stratigraphic sequence intersected in Kyalla 117 N2-1 is summarized in Table 1. Stratigraphy was generally intersected deeper than prognosed from the top of the Anthony Lagoon Formation (13m deeper) to the Undefined Cambrian Sandstone (10m deeper) and shallower than prognosed from the top of the Hayfield formation (2.3m shallower) to the top of the Moroak Sandstone (82.2m shallower). Complete lithological descriptions of the intersected stratigraphy within Kyalla 117 N2-1 are summarized in Appendix 5. Lithological Cuttings Descriptions.

Table 1. Kyalla 117 N2-1 prognosed vs. actual formation top depths

Formation			Prognosed Depth (m)		Actual Depth (m)		Difference DEEPER (+) / SHALLOWER (-)
			mTVDSS	mMDRT	mTVDSS	mMDRT	
Undifferentiated Cretaceous			269.9	7	270	7.23	
Anthony Lagoon Formation			199.5	77	187.15	90	+13
Gum Ridge Formation			145.5	131	86	191.4	+60.4
Antrim Plateau Volcanics			-89.5	366	-122.4	399.5	+33.5
Undefined Cambrian Sandstone			-212.5	489	-221.9	499	+10
			-232.5	509	-229.6	506.7	-2.3
Hayfield formation	Hayfield Sandstone member	Top	-610.5	887	-546	823.43	-63.57
		Base	-623.5	890	-559	836.09	-53.91
Jamison Sandstone			-678.5	955	-614.2	891.3	-63.7
Kyalla Formation	Top Kyalla Formation		-780.5	1057	-712	988.97	-68.03
	Upper Kyalla Shale	Top	-810.5	1087	-756	1033.3	-53.7
		Base	-885.5	1162	-840	1117.3	-44.7
	Middle Kyalla Shale	Top	-1296.5	1573	-1276	1552.62	-20.38
		Base	-1349.5	1626	-1321	1598.44	-27.56
	Lower Kyalla Shale	Top	-1507.5	1784	-1480	1757.1	-26.9
Base		-1555.5	1832	-1520	1797.3	-34.7	
Moroak Sandstone			-1657.5	1934	-1574.7	1851.8	-82.2
Total Depth			-1605.5	1882	-1588.1	1865.2	+17.4

4.2 LITHOSTRATIGRAPHY

Kyalla 117 N2-1 was spudded into weathered, **undifferentiated Cretaceous** sediments predominantly consisting of interbedded pinkish-red (haematite) and yellowish-orange (goethite) mudstones with minor tan coloured siltstone. The base of the sequence was identified at 90mMDRT after intersecting a 20m thick quartzose sandstone. The sandstone consisted of translucent greyish-orange to pink, loose, sub-rounded, well sorted grains with good inferred porosity.

Unconformably underlying the undifferentiated cretaceous sequence the **Anthony Lagoon Formation** was intersected from 90 mMDRT. The upper part of the sequence, from 100 to 130mMDRT, was comprised of dark yellowish-orange to light brown claystones with minor interbedded reddish-brown siltstone, greyish-orange-pink sandstone and light grey sandstone. Trace pale orange chert was also observed and interpreted as occurring as thin bands or lenses within sandstone facies. Circulation was lost and total losses to formation occurred from 130mMDRT until the setting of the 22" conductor casing at 194mMDRT. As such the sediments of the lower Anthony Lagoon Formation along with the Anthony Lagoon Formation and Gum Ridge Formation contact was not observed through cuttings in this location. The top of the Gum Ridge Formation was interpreted at 191.4m from evaluation of wireline logs and correlation with offset well data.

The 17.5" hole section commenced drilling at the top of the **Gum Ridge Formation**. The formation primarily consisted of massive pale orange to pale yellow-brown limestones/ dolomites which contained trace claystone and siltstone interbeds that increased towards the base of the formation. In Kyalla 117 N2-1 the Gum Ridge Formation was 208.1m thick.

Massive flood basalts of the **Antrim Plateau Volcanics** were intersected at 399.5mMDT and drilled down to 574mMDRT. The sharp contact of the basalt with the overlying formation was readily identifiable in cuttings due to the immediate and prominent appearance of basalt within samples. The basalt was described as greyish-black to black, olive-black, and dark brownish-red with a fine to medium crystalline groundmass, common black and greenish grey phenocrysts, minor pyrite nodules, minor calcite and very hard. A short drilling break from 5.23m/h to 18.88m/hr occurred from 420 to 423mMDRT. In cuttings, the only discernible change in lithology that occurred within this interval was the appearance (and disappearance) of common to abundant pinkish-red quartz. This may be an indication of quartz veining or crystallised vesicles within the basalt. Consistent low rates of penetration through the remainder of the volcanics suggesting that no other notable vesicular flow tops were identified. A sharp decrease in basalt and increase in sandstone was observed in drill cuttings between 500 and 505mMDRT, marking the base of the Antrim Plateau Volcanics.

In addition to being evident in drill cuttings the top of the **Undefined Cambrian Sandstone** was discernible in wireline logs by a decrease in gamma ray at 499mMDRT. The thin unit (7.7m) comprised loose, poorly sorted, fine to coarse grained, light brownish grey and clear to translucent quartz. The Sandstone was considered porous and permeable due to limited cementation.

The **Hayfield formation** was intersected at 506.7mMDRT displaying a sharp contact with the overlying Bukalara Sandstone. The upper sequence comprised 80 to 100% medium dark grey to olive black hard siltstone providing a competent formation for the 17 ½" surface casing seat at 548mMDRT. The 12 ¼" section drilled ahead in the Hayfield Formation through interbedded light greenish grey and medium reddish-brown siltstones and claystones. At 823mMDRT a sharp decrease in gamma ray was coupled

with an increase in sandstone within drill cuttings, marking the top of the tertiary reservoir target, the **Hayfield sandstone**. Although no fluorescence was observed in ditch cuttings samples, moderate patchy to pinpoint blue-white to yellow-blue fluorescence was noted on a side wall core taken at 826mMDRT. Wireline log evaluation indicated that the sandstone was 12.66m thick and water saturated at this location. The remainder of the Hayfield formation comprised interbedded light bluish-grey, light blue-green and reddish-brown argillaceous siltstones and silty claystones. The total thickness of the Hayfield Formation was 384.4m in Kyalla 117 N2-1.

Conformably underlying the Hayfield Formation, the **Jamison Sandstone** was intersected at 890mMDRT and consisted of variably very-fine to coarse-grained quartz sandstone, with minor thin green-grey mica-rich claystone interbeds. In the top 45m of the interval, minor light to medium grey siltstone interbeds were also present. Trace to 5% pale yellow even fluorescence was noted within several sandstone samples. The base of the unit exhibits an unconformable contact with the underlying Kyalla Formation which was intersected at 988mMDRT. Total unit thickness of the Jamison Sandstone in Kyalla 117 N2-1 was approximately 97.6m.

The **Kyalla Formation** contains the primary reservoir targets for Kyalla 117 N2-1. A full stratigraphic section of the formation was intersected in the well, reaching a total thickness of approximately 862.8m. The top interval of the Kyalla Formation (top of Kyalla Formation to top of Upper Kyalla shale) comprised light to medium grey argillaceous shale with minor interbedded very fine, light grey to medium greyish-brown sandstone.

Intersection of the top of the **Upper Kyalla Shale** at 1033.3mMDRT was identifiable in cuttings samples through a colour change of shale into a medium brownish-grey to dark grey. Organically enriched, micaceous mudstone was penetrated from 1033.3 to 1117.3 mMDRT. Although not distinguishable by a gamma ray signature, the top of the interval can be identified by an increase in mudgas.

The interval from the base of the upper Kyalla shale to the top of the middle Kyalla shale was distinguishable by a colour change back to light grey to medium dark grey shales with minor interbeds of very fine sandstone. A distinct change in sandstone mineralogy occurred between 1230 – 1311mMDRT where interbeds consisted of very light grey to white, clear to translucent, very fine quartz. No fluorescence was observed in samples.

The **Middle Kyalla shale** was intersected from 1552.62 to 1598.44mMDRT. The unit comprised interbedded medium light grey, medium grey and dark grey shale and siltstone with minor sandstone. An increase in drilling gas was also observed when drilling this unit. No fluorescence was observed in samples.

From 1597 to 1613mMDRT a package of light grey very fine grained quartzose sandstone was intersected. The unit, informally referred to as the **Kyalla sandstone**, marked the base of the middle Kyalla shale in the well. The base of the Kyalla sandstone to top lower Kyalla shale was comprised of interbedded medium light grey, medium grey and medium dark grey shale and siltstone with minor sandstone interbeds. Mudgas steadily increased over the base 25m of the interval, assisting in the identification of the top lower Kyalla shale.

The **lower Kyalla shale** was approximately 40m thick and comprised dark grey to greyish-black shales with minor interlaminated to thinly interbedded siltstone and very-fine grained sandstone. Shale

cuttings were highly carbonaceous and contained trace amounts of pyrite. The medium to dark grey siltstones were described as hard, argillaceous and commonly micaceous. A strong increase in drill gas was observed when drilling the unit. No fluorescence was observed in sandstone cuttings.

The contact between the lower Kyalla Formation and the underlying Moroak Sandstone is gradational over several meters and is marked by a down-section decrease in mudstone with thinly interbedded fine-grained sandstones and siltstones, and an increase in sandstone.

Kyalla 117 N2-1 reached a total depth of 1865.2mMDRT after intersecting the top of the Moroak Sandstone at 1851.8mMDRT. The 14m of intersected formation comprised light grey, fine to very-fine sandstone with minor interbedded medium grey argillaceous siltstone and dark grey shale. Grain boundaries were commonly obscured by quartz overgrowth and silica cement influencing in the interpretation of poor visual porosity within the sandstone facies.

4.3 RESERVOIR DESCRIPTION AND DEPOSITIONAL ENVIRONMENT

4.3.1 Kyalla Formation

The Kyalla Formation is a silty mudstone with thin planar interbeds of siltstone and sandstone. Intervals of fine to medium grained sandstone, up to 70 m thick have also been recorded in the lower half of the formation (Lanigan et al, 1994) with southern and eastern well penetrations (Beetaloo W-1, Elliott-1, Tanumbirini-1) to date indicating better developed intra-formational sands. This variation has been hypothesised to be associated to differences in well proximity to the paleo-sediment source at the time of Kyalla deposition. Prospective horizons within the Kyalla Formation consist of organically enriched shale intervals, with three identified prospective intervals informally referred to by Origin as the lower, middle and upper Kyalla shales.

The Kyalla Formation is extensive across the Beetaloo Sub-Basin but has been variably eroded by the base Jamison Sandstone (Base Neoproterozoic) unconformity across the broad anticlinal Arnold Arch structure and towards the edges of the Beetaloo Sub-basin. The formation is shown from 2D seismic lines and well penetrations to be best preserved within current day Beetaloo Sub-basin deeps where the least base Neoproterozoic erosion has taken place. Prior to Kyalla 117 N2-1 the thickest penetrations to date within these Basin deeps have been intersected at Tanumbirini-1 (835 m) and Beetaloo W-1 (796.6 m). The Kyalla Formation was 808 m thick at Kyalla 117 N2-1, with the formation intersected from 989 to 1851 mMDRT. The Kyalla Formation conformably overlies the Moroak Sandstone (Fulton and Knapton, 2015).

The Kyalla Formation is interpreted to have been deposited in a storm-dominated, marine shelf environment (Munson, 2016). This interpretation is supported through the presence of interbedded and interlaminated mudstone, siltstone and very fine sandstone along with the identification of tool marks, gutter casts, flute casts, and hummocky and swaley cross-stratification in exposures of the unit within road cuttings and open cut mines.

4.3.2 Hayfield Formation

The Hayfield Formation represents a sequence of massive to fissile silty mudstone and claystone, containing variable intervals of fine to very fine sandstone. The formation reaches a maximum penetrated thickness of 569 m at Tanumbirini-1 and 450 m at Balmain-1 and Shenandoah-1A (wells offset by ~120 m). The formation thins radically toward the basin margins as a result of pre-Georgina Basin erosion. The Hayfield Formation unconformably underlies the Undefined Cambrian Sandstone and where absent, the flood basalts of the Antrim Plateau Volcanics or carbonates of the Gum Ridge Formation (Fulton and Knapton, 2015). The Hayfield Formation conformably overlies the Jamison Sandstone.

While sandstone beds are typically on a centimetre to decimetre scale, vertical amalgamation exists over select stratigraphic intervals, with one such interval being the informally named Hayfield sandstone member. Prospective intervals within the Hayfield sandstone consist of fine to very fine-grained sandstone, with high porosity (ave. 12%) but low permeability (ave. 0.1 - 0.2mD).

The Hayfield Formation was 369 m thick at Kyalla 117 N2-1.

The Hayfield Formation is interpreted to have been deposited in a subtidal shallow marine setting (Munson, 2016).

4.4 RESERVOIR PROPERTIES ANALYSIS

4.4.1 Core Analysis

Both Side wall core and conventional core underwent a comprehensive analysis suite which was undertaken by Schlumberger labs in North America, in addition to the University of Calgary. Results from the analysis can be found in Appendix 12.

Core analysis was aimed at providing critical constraining data sets to aid in petrophysical interpretation of wireline logs by providing definitive mineralogical, geochemical, and rock property measurements that can be used as comparisons and direct inputs into petrophysical models generated from wireline logs.

4.4.2 Drill Cuttings Analysis

Cuttings analysis was aimed at trialling the applicability of bulk mineralogical or rock property determination from drill cuttings such that mineralogical or rock property models could be determined and applied along lateral wells within the Kyalla Shale targets. Results from the lab analysis can be found in Appendix 12.

4.4.3 Gas Analysis

Gas analysis was aimed at providing a controlled lab analysis constraining points for continuous drill gas analysis data that was collected at the wellsite. Analysis also yielded a C6+ component which is not available from the wellsite gas chromatograph that was run at Kyalla 117 N2-1. This C6+ component provides an indication of the condensate fraction of gases.

In addition to gas chromatographic analysis, carbon and deuterium isotopic analysis was undertaken on gas samples in order to give insight into maturity and reservoir gas history.

Results from the lab analysis can be found in Appendix 12.

4.5 GEOCHEMICAL INTERPREATION

The organic matter contained within the Lower, Middle and Upper Kyalla shales is interpreted to be composed of cyanobacteria (blue-green algae) based on organic petrological analysis of core and cutting samples. The organic matter is interpreted to be highly oil prone when immature, with Immature hydrogen indexes of >700 interpreted based on rock pyrolysis results. Significant gas potential late gas cracking of kerogen and intermediary bitumen products, along with wet gases and oils is also interpreted based on drill gas carbon isotopic analysis results.

The source rocks of the Lower Kyalla Shale are interpreted to have reached a maximum maturity of 1.6% Vitrinite Reflectance Equivalent, indicating a late wet gas to early dry gas generative maturity.

The source rocks of the Middle Kyalla Shale are interpreted to have reached a maximum maturity of 1.3% Vitrinite Reflectance Equivalent, indicating a wet gas generative maturity.

The source rocks of the Lower Kyalla Shale are interpreted to have reached a maximum maturity of 0.9% Vitrinite Reflectance Equivalent, indicating a late oil generative maturity.

4.6 PETROPHYSICAL INTERPRETATION

Wireline logs were analysed and modelled internally by Origin Energy along with the geological sample analysis to produce a petrophysical model over the Kyalla 117 N2-1 wellbore.

The modelling had a high degree of covariance with geological sample data. The results are summarised below in Table 2 and in Figure 4 and Figure 5.

Table 2. Kyalla 117 N2-1 Petrophysical Model Summary. Digital copy of the model can be found in Appendix 13.

Reservoir Unit	Lithology	Hydrocarbon Phase	Total Organic Carbon Content Range (%wt)	Total Porosity Range (%BV)	Water Saturation Range (%PV)
Upper Kyalla Shale	Interbedded mudstone, siltstone, sandstone	Oil	1 - 4	2 - 8	50 - 70
Middle Kyalla Shale	Interbedded mudstone, siltstone, sandstone	Gas	1 – 3.5	4 - 8	20 - 100
Lower Kyalla Shale	Interbedded mudstone, siltstone, sandstone	Gas	3.5 - 4	5 - 10	35 - 60

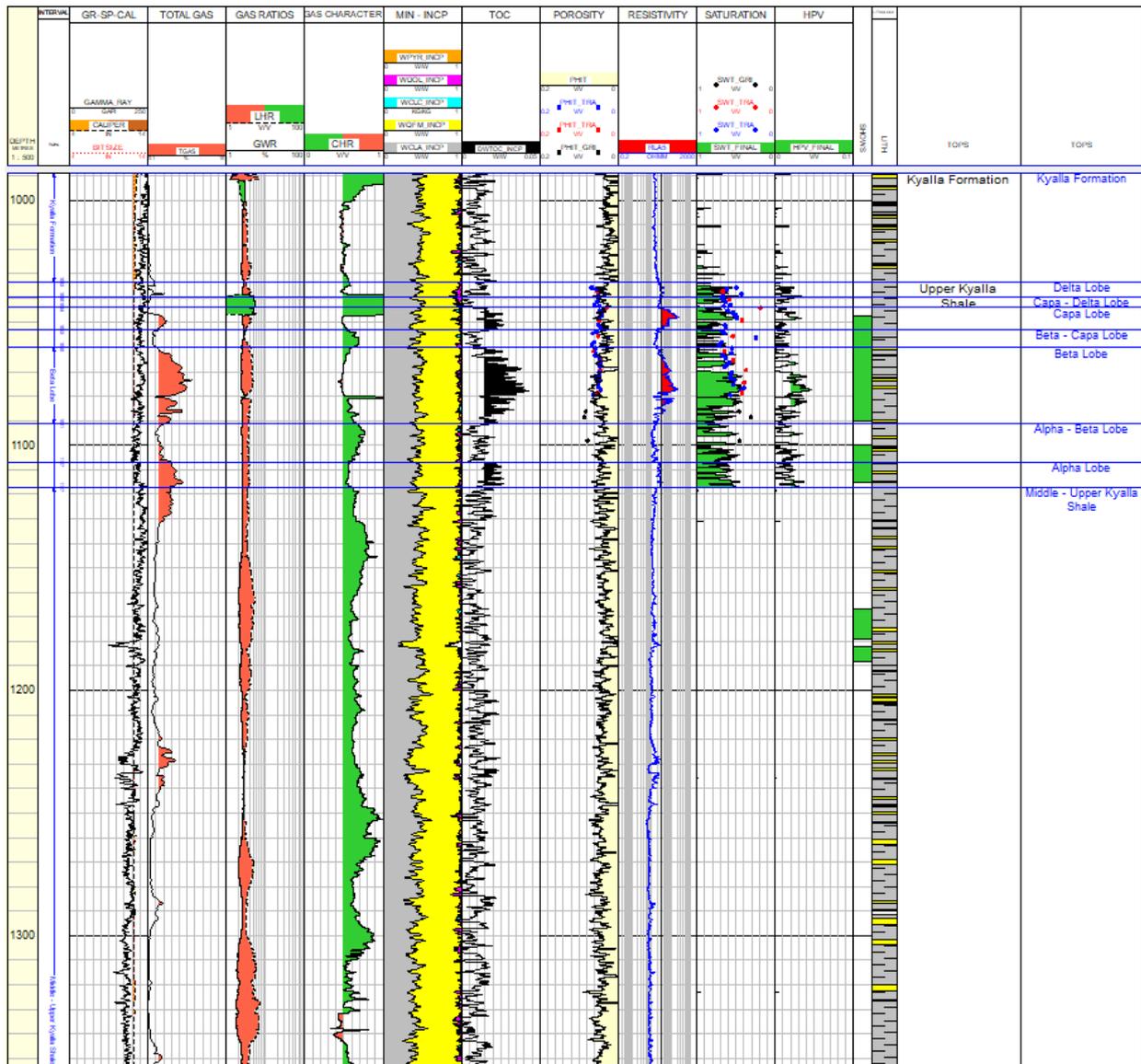


Figure 4 - Petrophysical model for the Upper Kyalla Shale. Digital copy of the petrophysical model can be found in Appendix 13.

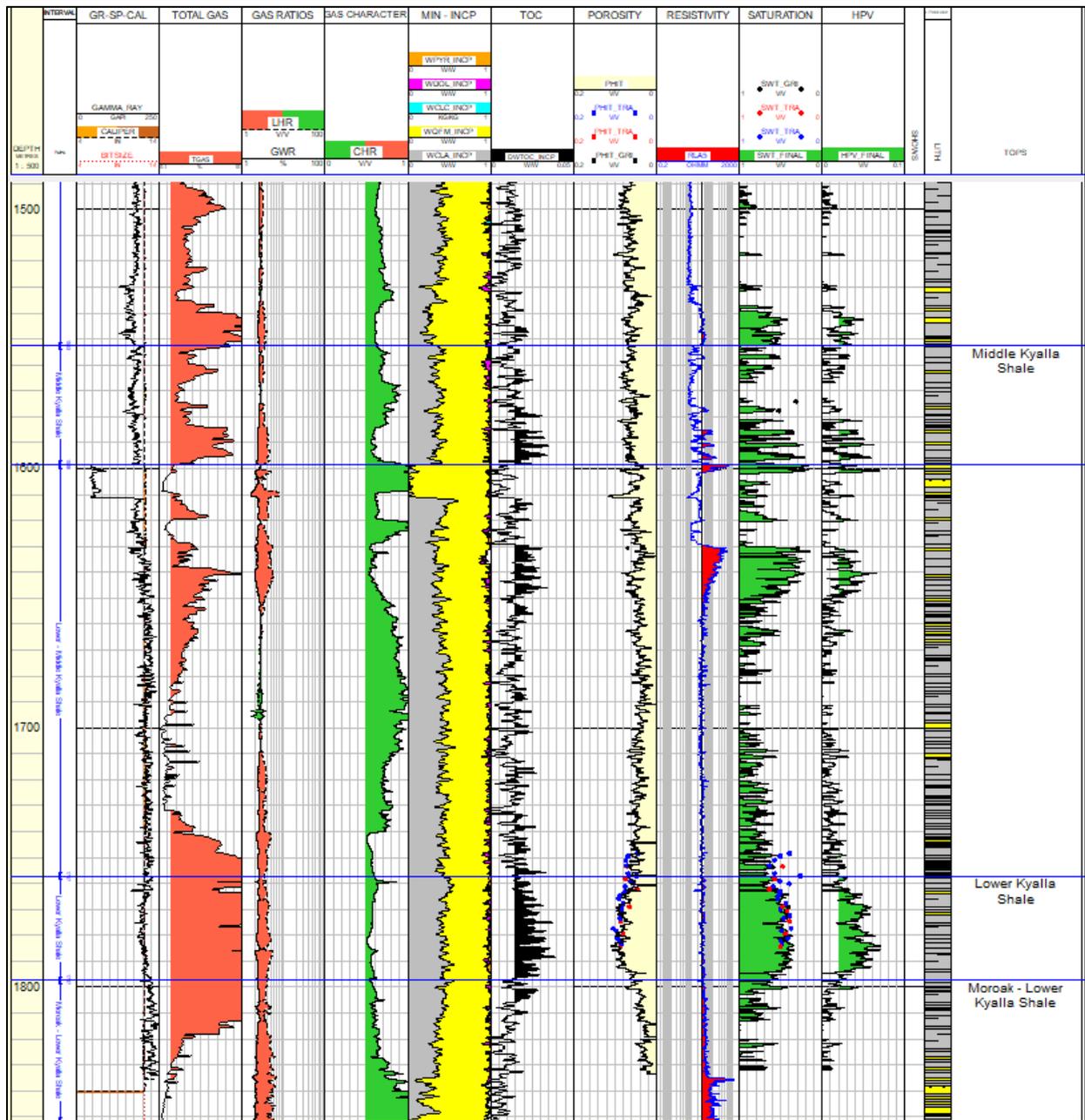


Figure 5 - Petrophysical model for the Middle and Lower Kyalla Shales. Digital copy of the petrophysical model can be found in Appendix 13.

4.7 HYDROCARBON INDICATIONS

4.7.1 GAS DETECTION WHILST DRILLING

Continuous Mud Gas monitoring and chromatographic breakdown of hydrocarbon gases (C₁ – C₅, CO₂ H₂S) were performed by Geoservices in Kyalla 117 N2-1. A summary of notable gas peaks whilst drilling is shown in Table 3.

Table 3. Summary of mud gas peaks recorded while drilling Kyalla 117 N2-1

GAS TYPE	Depth (mMDRT)	Peak (TGAS%)	Background (TGAS%)	C1	C2	C3	C4	C5
Formation	878.5	2.6	0.3	60	17	13	6	4
Formation	949	0.6	0.1	43	6	3	12	36
Formation	954.5	0.7	0.1	36	7	4	13	40
Formation	968	1.8	0.1	34	8	5	17	36
Formation	1033.5	0.9	0.1	51	26	15	6	2
Formation	1035	1.1	0.1	52	24	16	6	2
Formation	1038.2	2.04	0.3	56	25	12	5	2
Formation	1049.8	2.5	0.3	54	26	13	5	2
Formation	1061.2	1.55	0.7	54	25	13	5	2
Formation	1063.6	3.1	0.7	57	25	12	4	2
Formation	1065	3.24	0.7	55	26	12	5	2
Formation	1068.8	4.36	3.3	57	25	12	4	2
Formation	1073.2	6.42	3.9	59	25	11	4	1
Formation	1074	5.46	4.3	59	25	11	4	1
Formation	1076.4	4.96	3.5	56	26	12	4	2
Formation	1083	3.82	0.52	56	25	13	5	2
Formation	1115	4.51	0.52	55	25	13	5	2
Formation	1165	1.4	0.9	59	22	12	5	2
Formation	1179	1.6	0.75	59	22	12	5	2
Formation	1225	3.1	0.63	52	24	15	6	3
Formation	1228.5	3.5	1.98	50	24	16	7	3
Formation	1286	1.53	0.7	54	23	14	6	2
Formation	1287	2.06	0.7	54	24	14	6	2
Formation	1346	1.21	0.3	57	22	13	5	2
Formation	1350	1.78	0.3	55	23	14	6	2
Formation	1369	4.1	0.7	54	24	15	6	1
Formation	1410	2.9	1.9	53	22	15	7	3
Formation	1437.5	5.3	2	52	23	15	7	3
Formation	1445	5.8	3.4	52	23	15	7	3
Formation	1471	5.9	2.5	52	23	15	7	3
Formation	1478	6.4	4.3	52	23	15	7	3
Formation	1482	6.2	4.1	53	23	15	6	3
Formation	1500	8	2.8	53	23	15	6	3
Formation	1523	5.9	3.1	55	22	14	6	3
Formation	1537	6.6	2.1	53	22	15	7	3
Formation	1595	8.83	1.9	57	24	12	5	2
Formation	1610	2.68	0.6	70	18	7	3	1

Formation	1618.5	6.03	0.9	57	25	11	5	2
Formation	1631	4.5	0.88	62	23	10	4	1
Formation	1641	10.1	1.93	63	22	10	4	1
Formation	1654	5.6	3.13	54	24	13	6	3
Formation	1663	4.8	3.24	54	24	13	6	3
Formation	1690	3.3	1.23	48	22	15	10	5
Formation	1694	3.3	1.1	49	23	15	8	5
Formation	1699	4.1	0.62	51	23	14	8	4
Formation	1707.5	3	0.45	51	22	14	8	5
Formation	1713.5	4.69	0.8	55	23	13	6	3
Formation	1715.5	1.85	0.7	57	23	12	6	3
Formation	1718.5	2.39	0.7	57	23	12	6	3
Formation	1732.5	1.98	0.6	57	23	12	6	3
Formation	1737	3.24	1.74	54	24	13	6	3
Formation	1738.5	4.36	3.1	55	23	13	6	3
Formation	1745	7.6	1.83	57	24	12	5	2
Formation	1754	14.5	6.71	56	24	13	5	2
Formation	1761.2	12.8	7.18	53	24	14	7	2
Formation	1764.8	14.6	6.48	56	24	13	5	2
Formation	1771	18.47	9.6	57	24	12	5	2
Formation	1773.4	19.12	9.6	55	24	13	6	2
Formation	1780.4	23.69	9.6	60	23	11	4	1
Formation	1791.5	22.9	9.4	58	23	12	5	2
Formation	1796.5	36.8	18.1	56	23	13	6	2
Formation	1800	20.04	9.5	56	23	13	6	2
Formation	1804.5	18.21	11.76	55	24	13	6	2
Formation	1808.5	12.52	11.41	55	24	13	6	2
Formation	1812.5	13.17	11.4	55	24	13	6	2

4.7.2 FLUORESCENCE

Cuttings samples were examined for hydrocarbon fluorescence using a fluoroscope UV box. Fluorescence descriptions are summarised in Table 4.

Within the Hayfield formation and Jamison Sandstone very dull yellow- green fluorescence with a thin ring residue was observed in sandstone cuttings.

Rock chips collected from the end of core barrels during the retrieval of Core #1 over the Upper Kyalla Shale were also examined under the wellsite UV fluoroscope. Bright yellow-green fluorescence was observed in the thin siltstone interbeds within the Kyalla shales, with a very slow crushed cut, and faint residual ring.

Table 4. Kyalla 117 N2-1 Fluorescence show summary

Depth Range (mMDRT)		Lithology	% Fluor in Lith.	Direct Fluorescence (UV)			Cut (UV Light)					Ring Residue				Odour	Rating
From	To			Intensity	Colour	Distribution	Rate	Intensity	Colour	Habit	Type	Thickness	Intensity	Colour	Habit		
876	882	SS	tr	v. dull	Yellow-green	even	v. slow	-	-	-	crush	thin	-	-	-	-	poor
920	922	ss	tr	v. dull	Pale yellow	even	v. slow	-	-	-	crush	thin	-	-	-	-	poor
949	949	ss	Tr.	-	Pale yellow	-	slow	-	-	-	crush	thin	-	-	-	-	poor
950	955	ss	Tr.	-	Pale yellow	-	slow	-	-	-	crush	thin	-	-	-	-	poor
968	968	ss	5	-	Pale yellow	-	mod	-	-	-	crush	med	-	-	-	-	poor
1047	1057	ss	Tr.	v. dull	yellow	even	v. slow	-	Green-yellow	-	direct	thin	-	Green-yellow	-	-	poor
1057	1074	ss	Tr.	v. dull	yellow	even	v. slow	-	Green-yellow	-	direct	thin	-	Green-yellow	film	-	poor
1074	1080	ss	tr	v. dull	yellow	even	v. slow	-	Green-yellow	-	direct	thin	-	Green-yellow	-	-	poor
1080	1090	ss	tr	v. dull to mod bright	yellow	even	v. slow	-	Green-yellow	-	direct	thin	-	Green-yellow	-	-	poor
1100	1115	ss	?	v. dull	yellow	even	v. slow	-	Green-yellow	-	direct	thin	-	Green-yellow	-	-	poor
1167	1179	SS	tr	mod bright	yellow	even	v. slow	-	yellow	-	direct	v. thin	-	yellow	-	-	poor
1182	1188	ss	tr	mod bright	yellow	even	v. slow	-	yellow	-	direct	v. thin	-	yellow	-	-	poor

4.8 TRAP INTEGRITY

The Kyalla Formation is an unconventional shale play. As such trap integrity is not applicable to this type of petroleum system.

4.9 Seismic Well Tie Update

There was no fundamental pre to post-drill change in seismic interpretation based on well data and findings from Kyalla 117 N2-1. See Figure 6 for post drill interpretation of north to south composite section of 2D seismic lines MC92-123 and ME91-123. See Figure 7 for final detailed Kyalla 117 N2-1 seismic well tie.

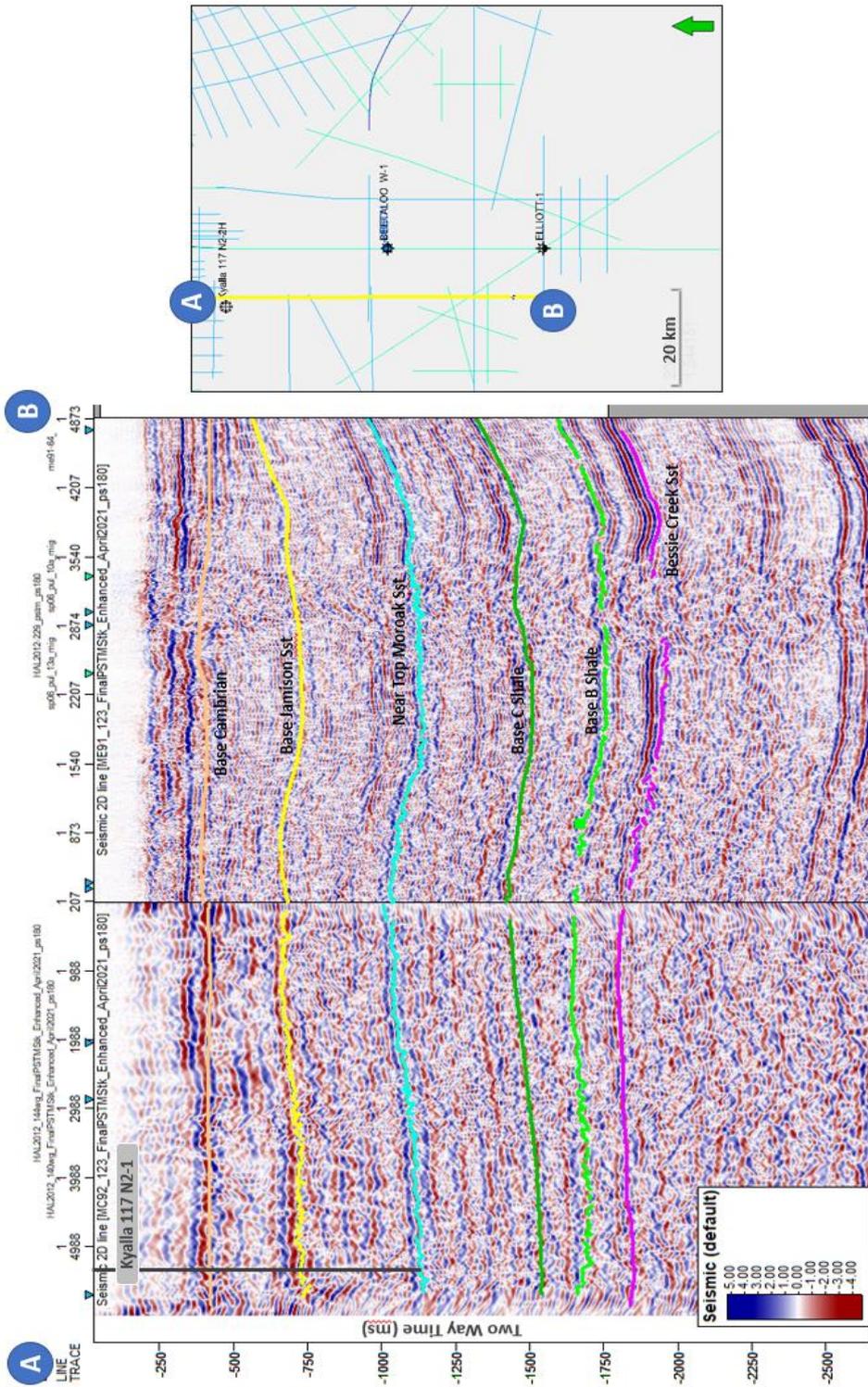


Figure 6 - Interpreted Seismic section from Kyalla 117 N2-1 (projected onto line)

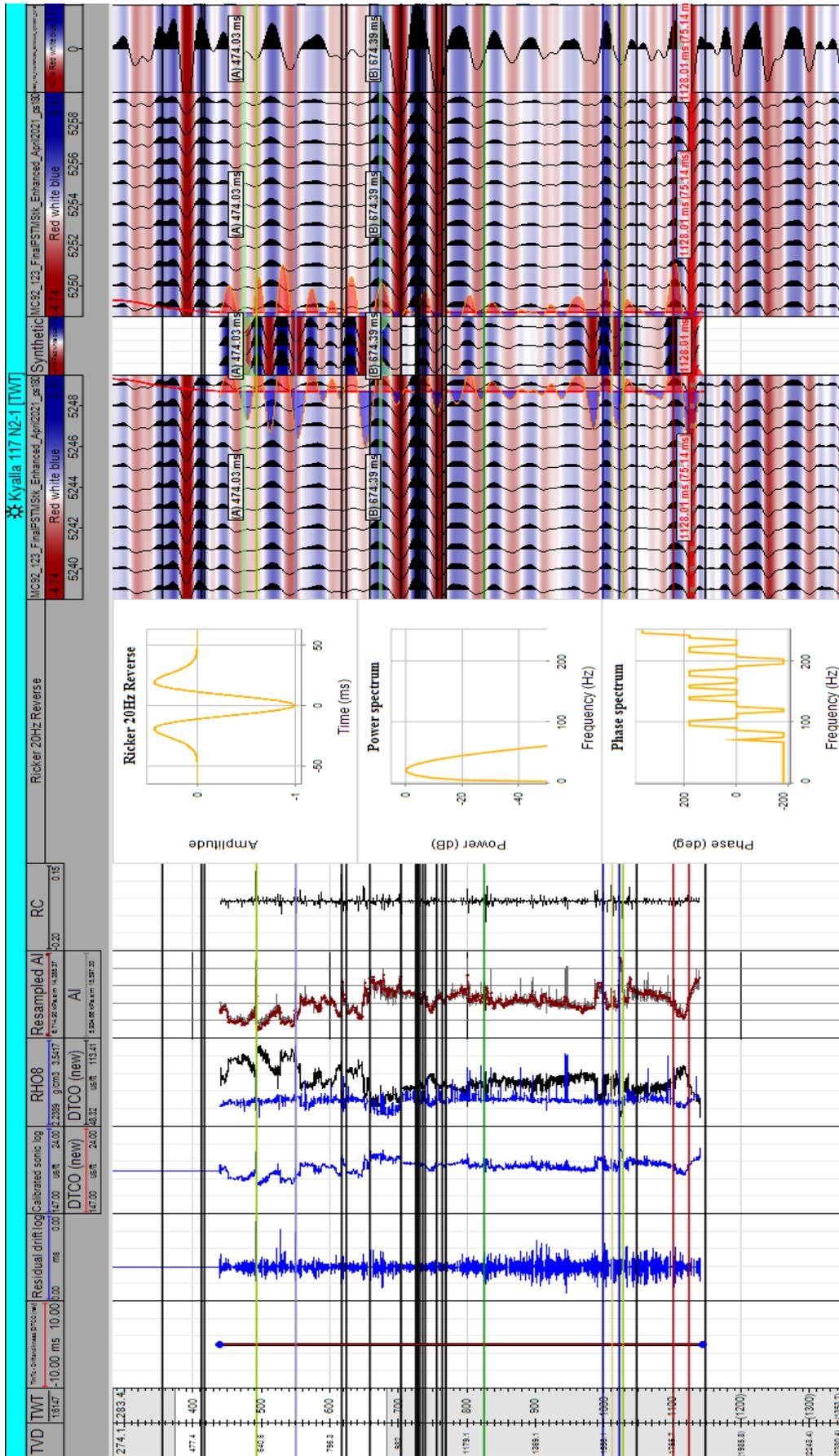


Figure 7 - Kyalla 117 N2-1 Seismic well tie

5 WELL EVALUATION

5.1 WIRELINE LOGGING

Table 5 summarizes the wireline logs that were run by Schlumberger (SLB) at Kyalla 117 N2-1. Field data, processed data, deviation survey and log displays for all wireline logs are provided in Appendix 9. A complete composite log of Kyalla 117 N2-1 is provided in Appendix 14.

WIRELINE LOGGING					
SUITE/ RUN #	Depth (mMDRT)		Description	Operator	Remarks
	From	To			
1/1	15	535	CBL-USIT	SLB	
2/1	SURFACE	1865	FMI-HRLA-PPC-ADT-PEX-HNGS-SP	SLB	
2/2	SURFACE	1865	UBI-MAST-SSCAN-PPC-GPIT-GR	SLB	
2/3	SURFACE	1865	PPC-CMR-NEXT-HGNS	SLB	
2/4	1595.9	1825.6	XL ROCK-GR	SLB	After indications the cores were not breaking off POOH to check tool was cutting and breaking off SWC efficiently, tool was OK so RIH
2/5	630.8	1595.9	XL ROCK-GR	SLB	
2/6	1025	1830	UBI-GPIT-GR	SLB	Post DFIT UBI run

Table 5. Kyalla 117 N2 1 Summary of Wireline Logs

5.2 MUDLOGGING

Geoservices (Schlumberger) provided mudlogging services for the drilling of Kyalla 117 N2-1. These included standard mud logging service, constant volume trap (CVT) mud gas chromatographic analysis (C₁-C₅, CO₂, H₂S) and monitoring, real time and lagged data acquisition and live streaming from wellsite, data storage and transmission and digital imaging of cuttings over the interval from 20 to 1865.2 mMDRT. Mudlogging data, log displays, and the mudlogging data are enclosed in Appendix 8.

5.3 LOGGING WHILE DRILLING (LWD) / MEASUREMENTS WHILE DRILLING (MWD)

Summary of LWD / MWD acquired at Kyalla 117 N2-1 can be found in Table 6. Field data, processed data and log displays for all LWD / MWD logs are provided in Appendix 10. The Final Geodetic Survey Report is also attached in Appendix 10.

Depth (mMDRT)		Description	Logging Company	Remarks
From	To			
120	1865	RT-XEM-GR	Pathfinder	
120	1865	RT-Powerdrive-GR-Telescope-GR	Pathfinder	

Table 6. Kyalla 117 N2 1 Summary of LWD / MWD logs.

6 FORMATION SAMPLING

6.1 DRILL CUTTINGS

Drill cutting samples were collected over the interval from 20 to 1865.2 mMDRT (Driller's TD).

Sampling intervals are summarised in Table 7 below. Detailed drill cuttings lithological descriptions are enclosed in Appendix 5.

Cuttings Interval		Sample Rate (m)	Comments
From (mMDRT)	To (mMDRT)		
20	130	5	Sample returns to Cellar
130	195	NIL	No returns to surface
200	800	5	
800	840	3	
840	1035	5	
1035	1080	1 and 2	During coring; dependent on ROP
1080	1115	5	
1115	1865.2	3	

Table 7. Kyalla 117 N2 1 Drill Cuttings Interval and Sampling Rate Summary

6.2 CONVENTIONAL CORE

Two conventional cores were cut in Kyalla 117 N2-1 (Table 8). The well was continuously cored in the upper Kyalla shale from 1035-1080 mMDRT for a total section of 45m with 100% recovery. The well was also continuously cored in the lower Kyalla shale from 1740-1785m for a total of 45m (100% recovery). The 5 ¼" diameter conventional core were cut utilising a 5 ¼" (ID) gauge Core Head, 54 m of 7 ⅝" (ID) heavy duty core barrel and full-moon 5 ½" (ID) aluminium liners.

The ALS Core Photography Report is enclosed in Appendix 6.

Core Number	Core Width	Interval (mMDRT)		Cut (m)	Recovery %	Comments
		From	To			
1	5 ¼"	1035	1080	45	100	
2	5 ¼"	1740	1785	45	100	

Table 8. Kyalla 117 N2 1 Coring Summary

6.3 SIDEWALL CORES

Schlumberger's rotary sidewall coring tool 'XL Rock' (core size 1.5" x 2.5") was run over the interval from 1827 to 630 mMDRT recovering 51 cores from a total of 53 attempted. Table 9 provides an overview of sidewall core recovery. A detailed summary of sidewall core depths and natural light photography are enclosed in Appendix 7.

Wireline Run #	CORE NUMBER	CORE DEPTH (mMDRT)	RECOVERED (mm)	COMMENT
4	1	1827.6	67	
4	2	1812.6	64	
4	3	1800.4	60	
4	4	1791.2	70	
4	5	1787.7	70	
4	6	1779.2	67	
4	7	1769.1	64	
4	8	1724.1	70	
4	9	1674.1	10	
4	9A	1674	70	Re-try of #9 after assumed that #9 did not break off
4	10	1640.7	74	
4	11	1630.9	57	



Wireline Run #	CORE NUMBER	CORE DEPTH (mMDRT)	RECOVERED (mm)	COMMENT
4	12	1618.8	75	
4	13	1610.8	66	
4	14	1604.74	45	
4	15	1598.9	65	
4	16	1595.9	71	After indications the cores were not breaking off POOH to check tool was cutting and breaking off SWC efficiently, tool was OK so RIH
5	17	1592.2	75	
5	18	1590.9	69	
5	19	1586.2	0	Core did not break off
5	20	1577.8	59	
5	21	1574.3	70	
5	22	1550.8	73	
5	23	1548	74	
5	24	1544.2	74	
5	25	1537.9	0	Core did not break off
5	26	1499.7	20	
5	27	1411.3	60	
5	28	1309	65	
5	29	1208.3	70	
5	30	1125.4	73	
5	31	1115.7	69	
5	32	1108.07	72	
5	33	1098.5	74	
5	34	1088.7	78	
5	35	1086.4	55	
5	36	1082.2	73	
5	37	1072	62	
5	38	1050.4	73	
5	39	967.7	65	
5	40	934.3	70	
5	41	922.7	67	
5	42	916.8	74	
5	43	877.8	67	
5	44	840.78	74	
5	45	830	63	
5	46	826	71	
5	47	824.5	62	
5	48	818.3	75	

Wireline Run #	CORE NUMBER	CORE DEPTH (mMDRT)	RECOVERED (mm)	COMMENT
5	49	743.2	72	
5	50	630.8	72	
5	51	882.2	74	
5	52	880	76	

Table 9. Kyalla 117 N2 1 Summary of Rotary Sidewall Coring recovery and depths

6.4 MUD GAS

A total of 72 drill cutting headspace gas samples sampled in Isojars™ and 88 drill gas samples taken in Isotubes™ were collected for Kyalla 117 N2-1. A detailed summary of gas sample collection depths is enclosed in Appendix 8.

7 FORMATION TESTING

7.1 Formation Integrity Test (FIT)

FIT #1: Hayfield Formation

Test Date	Test Type	Test Depth (mRT)	Tested Formation	Fluid Density (ppg)	Fluid Type
28/10/2019	FIT	550	Hayfield Formation	9.0	WBM
Leak Off Pressure (psi)		Leak Off Equivalent Fluid Density (ppg)		Surface Pressure (psi)	
1540.6		16.44		697	

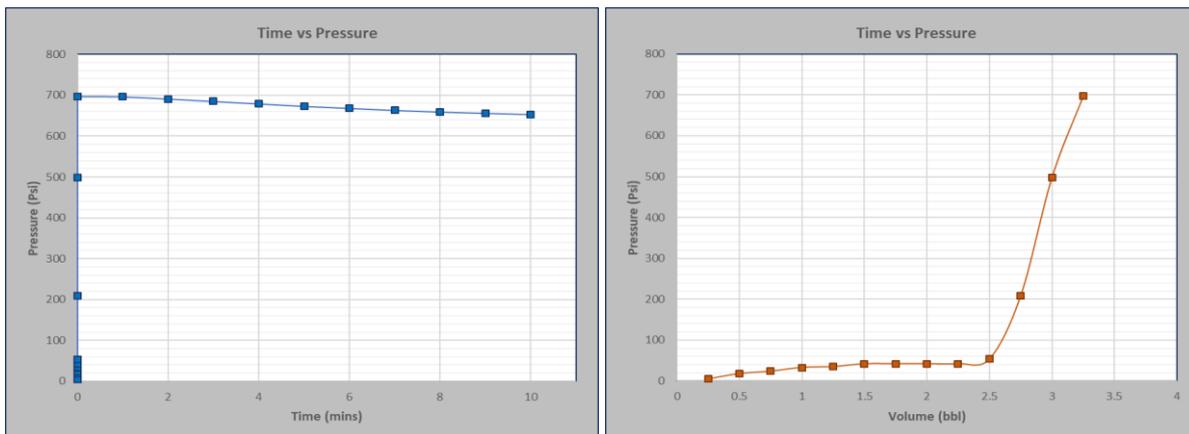


Figure 8. FIT Results

7.2 Diagnostic Fracture Injection Test (DFIT)

A total of six (6) Diagnostic Fracture Injection Tests (DFIT) were attempted on Kyalla 117 N2-1. The first two of these tests were unsuccessful due to equipment failure. The remaining four tests were successful. Operational details can be found in Appendix 11. Test depths and their associated pressure and pumping curves are summarised below.

DFIT #1- Kyalla Formation – Lower Kyalla Shale

Test Date	Test Type	Top Packer Depth (mRT)	Bottom Packer Depth (mRT)	Packer spacing (m)	Fluid Density (ppg)	Fluid Type	Successful DFIT
15/11/2019	Inflate straddle DFIT	1773	1792.98	24.88	8.3	Brine	No

DFIT #2- Kyalla Formation – Lower Kyalla Shale

Test Date	Test Type	Top Packer Depth (mRT)	Bottom Packer Depth (mRT)	Packer spacing (m)	Fluid Density (ppg)	Fluid Type	Successful DFIT
20/11/2019	Inflate straddle DFIT	1759	1800.31	24.88	8.3	Brine	No

DFIT #3- Kyalla Formation – Upper Kyalla Shale

Test Date	Test Type	Top Packer Depth (mRT)	Bottom Packer Depth (mRT)	Packer spacing (m)	Fluid Density (ppg)	Fluid Type	Successful DFIT
22/11/2019	Inflate straddle DFIT	1065	1089.88	24.88	8.3	Brine	Yes

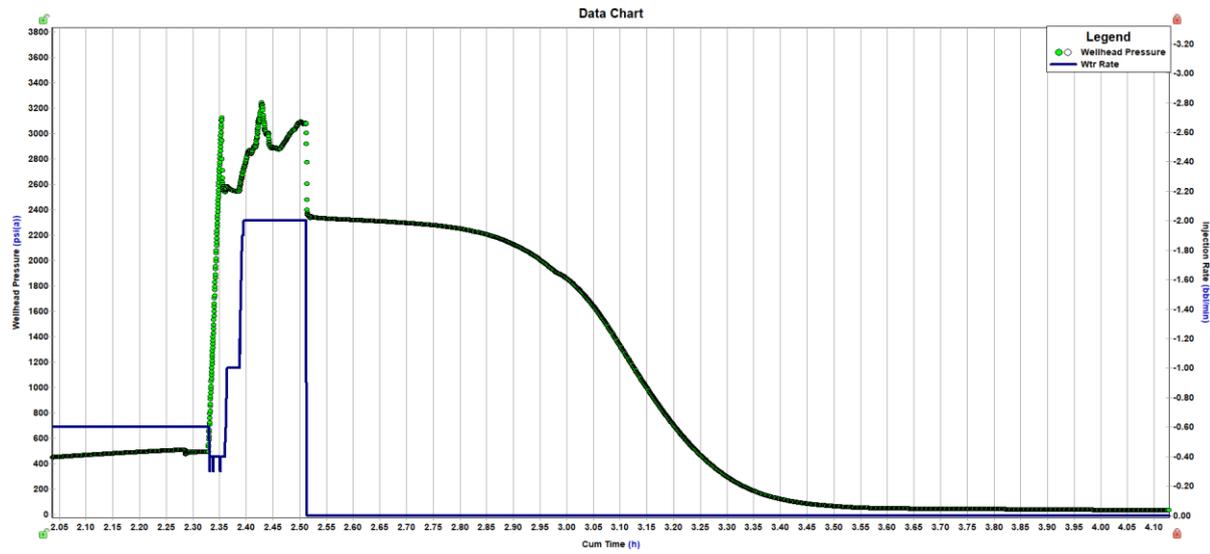


Figure 9. DFIT 3, Injection Cycle A

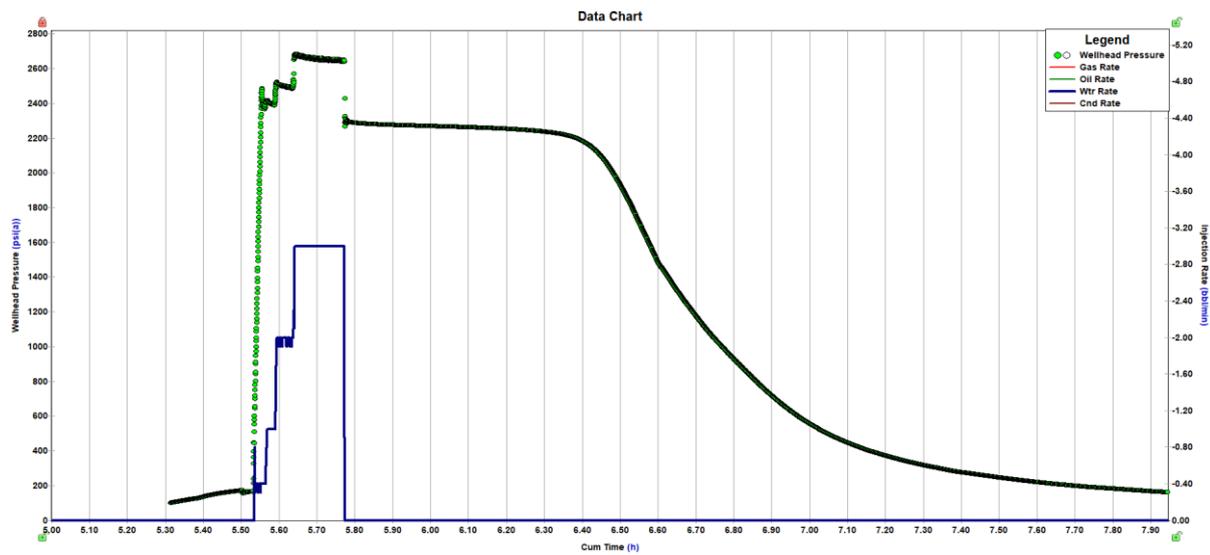


Figure 10. DFIT 3, Injection Cycle B

DFIT #4- Kyalla Formation – Lower Kyalla Shale

Test Date	Test Type	Top Packer Depth (mRT)	Bottom Packer Depth (mRT)	Packer spacing (m)	Fluid Density (ppg)	Fluid Type	Successful DFIT
23/11/2019	Inflate straddle DFIT	1765	1789.88	24.88	8.3	Brine	Yes

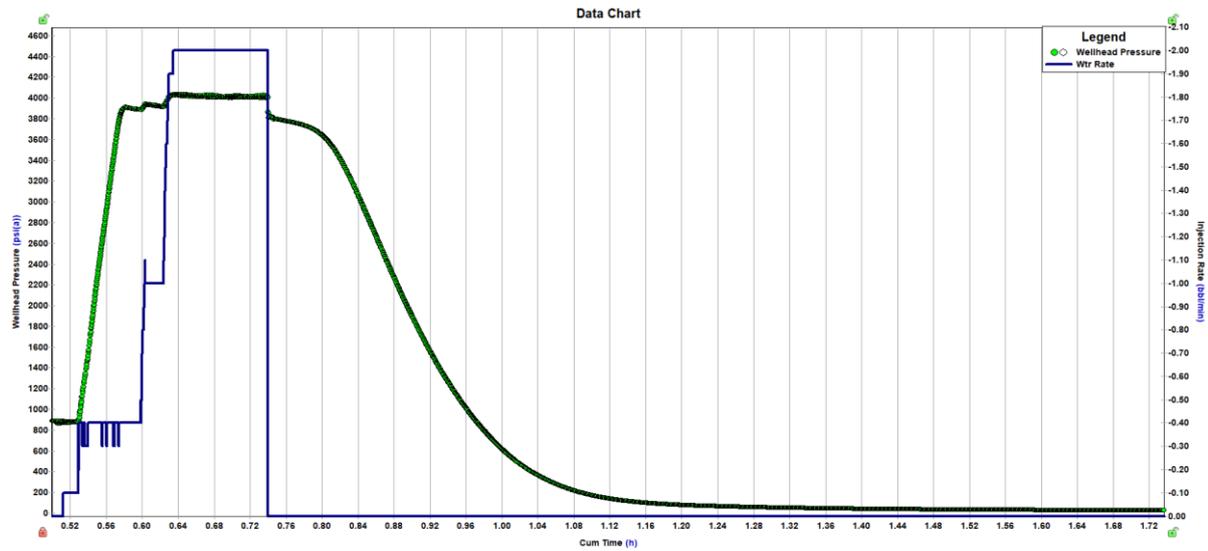


Figure 11. DFIT 4, Injection Cycle A

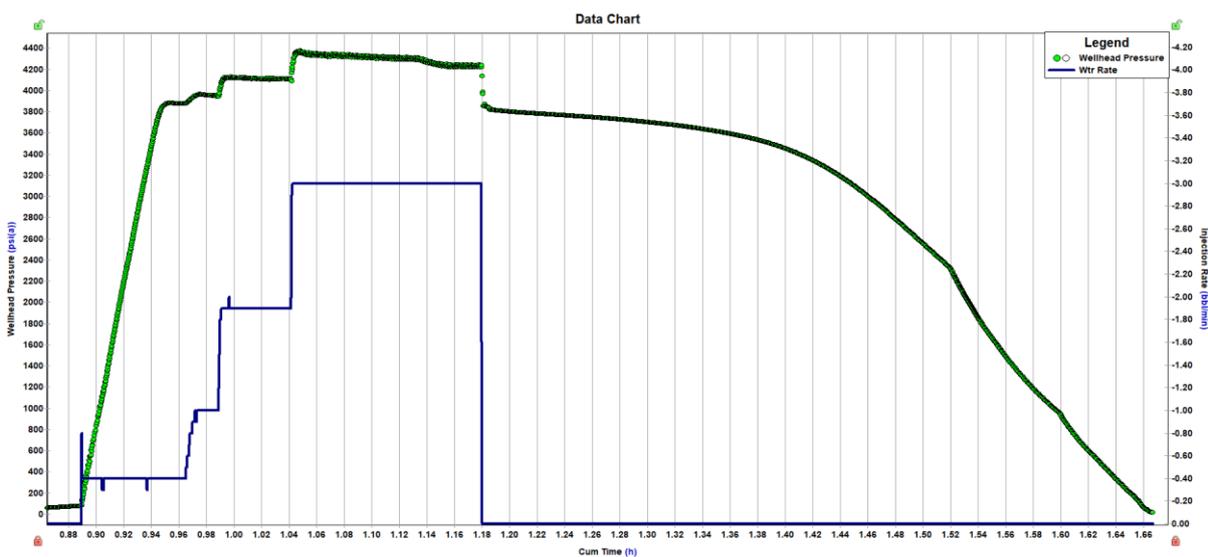


Figure 12. DFIT 4, Injection Cycle B

DFIT #5- Kyalla Formation – Middle Kyalla Shale

Test Date	Test Type	Top Packer Depth (mRT)	Bottom Packer Depth (mRT)	Packer spacing (m)	Fluid Density (ppg)	Fluid Type	Successful DFIT
24/11/2019	Inflate straddle DFIT	1552	1576.88	24.88	8.3	Brine	Yes

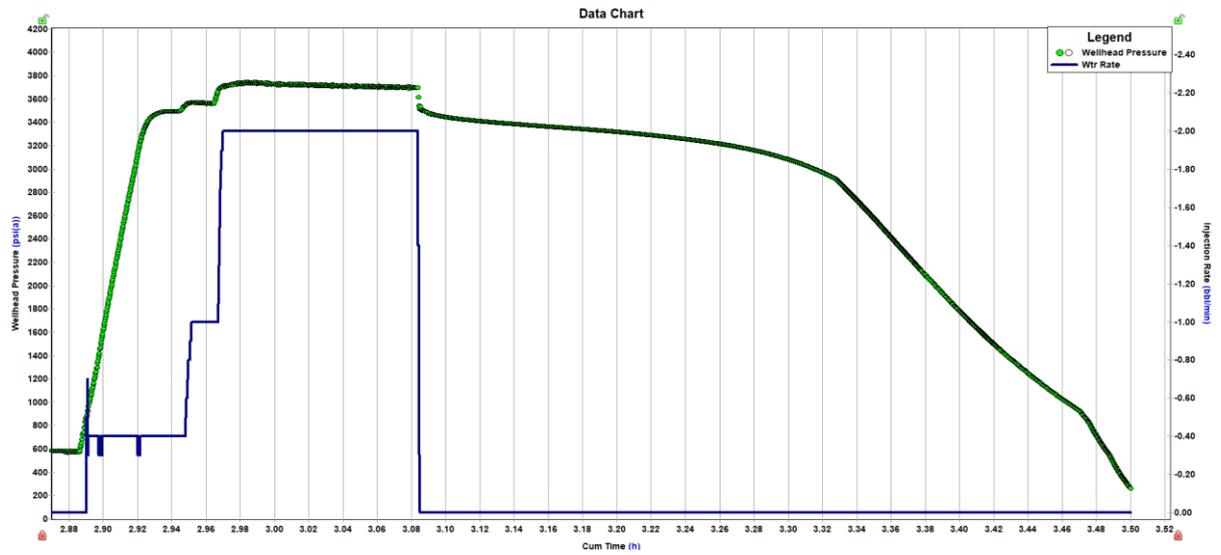


Figure 13. DFIT 5, Injection Cycle A

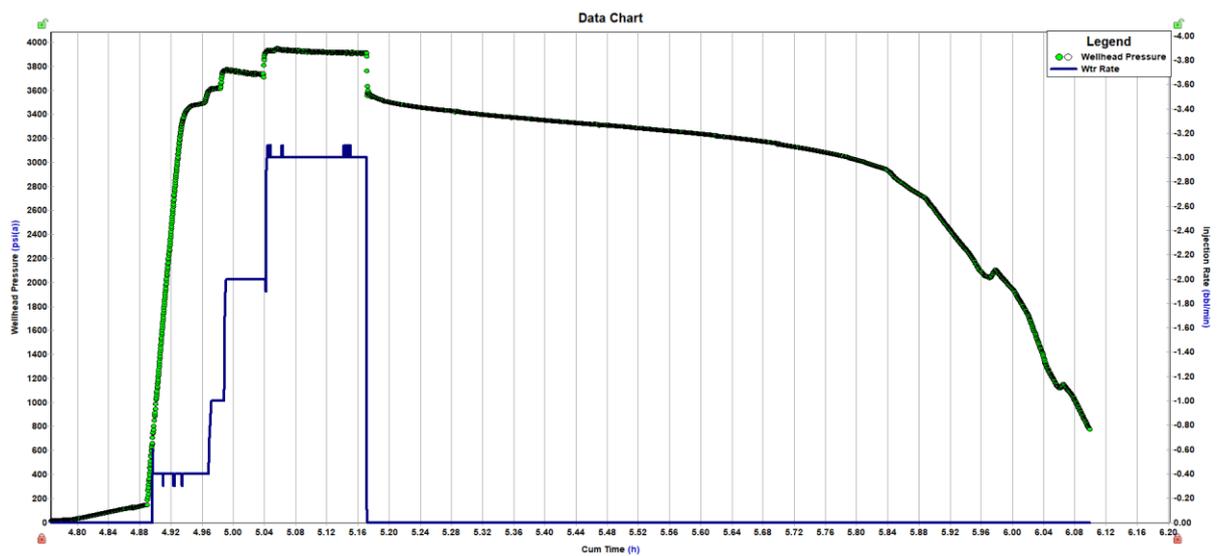


Figure 14. DFIT 5, Injection Cycle B

DFIT #6- Kyalla Formation

Test Date	Test Type	Top Packer Depth (mRT)	Bottom Packer Depth (mRT)	Packer spacing (m)	Fluid Density (ppg)	Fluid Type	Successful DFIT
24/11/2019	Inflate straddle DFIT	1065	1089.88	24.88	8.3	Brine	Yes

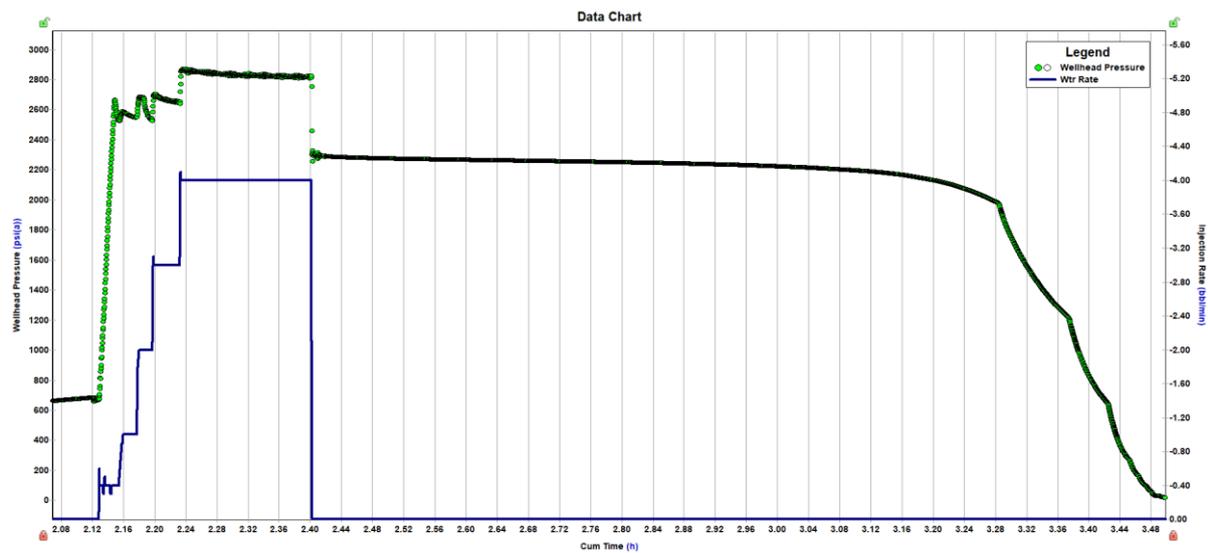


Figure 15. DFIT 6, Injection Cycle A

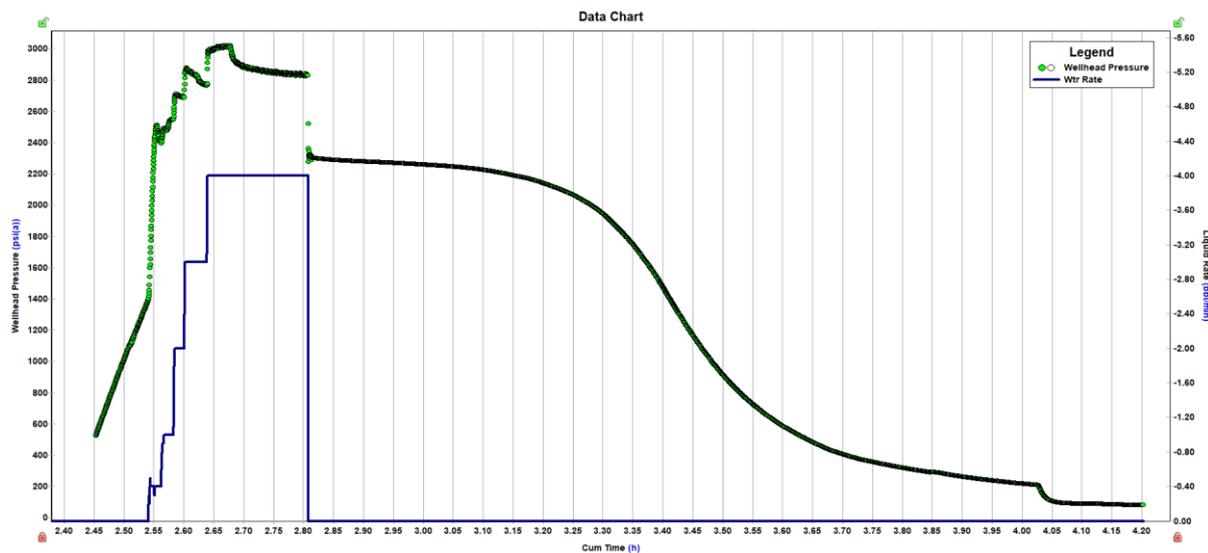


Figure 16. DFIT 6, Injection Cycle B

REFERENCES

Munson TJ (2016). Sedimentary characterisation of the Wilton package, greater McArthur Basin, Northern Territory. Northern Territory Geological Survey (NTGS) Record 2016-003. Darwin. Viewed 06 August 2021, <https://geoscience.nt.gov.au/gemis/ntgsjspui/handle/1/83806>

APPENDICES

- Appendix 1: Casing Reports
- Appendix 2: Cementing Reports
- Appendix 3: Bit Records
- Appendix 4: Halliburton Drilling Fluids Report
- Appendix 5: Lithological Cuttings Descriptions
- Appendix 6: ALS Core Photography Report
- Appendix 7: Sidewall Core Photos
- Appendix 8: Mudlogging
- Appendix 9: Wireline
- Appendix 10: LWD MWD Logs
- Appendix 11: FIT and DFIT Data
- Appendix 12: Geological Sample Analysis
- Appendix 13: Petrophysical Models
- Appendix 14: Composite Log