West Mereenie 26

Well Completion Report (Interpretative) Revision 3

22 May 2018 – 28 June 2018

OL4

Amadeus Basin

Northern Territory

Submission Date

9 August 2019

CONTENTS

List of Figures

List of Tables

List of Appendicies

LIST OF ABBREVIATIONS

Abbreviation	Full Text	Abbreviation	Full Text
Az	Azimuth	mGL	Metres ground level
AHD	Australian Height Datum	mRT	Metres Rotary Table
bbls/hr	Barrels per hour	msl	Metres sea level
bbls	Barrels	mV	Millivolts
BTC	Buttress connection	MWD	Measurements while drilling
CBL	Cement Bond Log	m BRT	Metres Below Rotary Table
DP	Drill Pipe	NA	Not Applicable
EMW	Estimated Mud Weight	o	Degrees
FIT	Formation Integrity Test	OL4	Operating Licence 4
Fm	Formation	ppf	Pounds per foot
ft3/sk	Cubic feet per sack	ppg	Pounds per gallon
GL	Ground Level	psi	Pounds per square inch
GOC	Gas-Oil Contact	QTY	Quantity
Hrs	Hours	Slts	Siltstone
In	Inches	Sst	Sandstone
Inc	Inclination	TD	Total Depth
KCL	Potassium Chlorite	TVD	True Vertical Depth
kg	Kilogram	TVT	True Vertical Thickness
km	Kilometres	TWT	Two-way Time
lb/ft	Pounds per foot	WBM	Water Based Mud
LCM	Loss control materials	WM15	West Mereenie 15
LS2	Lower Stairway 2 Sandstone	WM21	West Mereenie 21
m	Metres	WM26	West Mereenie 26
MD	Measured Depth	Xline	Crossline

1 INTRODUCTION AND SUMMARY

The Mereenie Oil and Gas Field is situated within the Amadeus Basin approximately 230 km west-southwest of Alice Springs. It is a doubly plunging anticline with surface expression and an anticlinal structural axis that can be traced for over 30 km. The discovery well, Mereenie 1, was drilled in 1965, and since then 70 additional wells have been drilled. The field has a gas cap and an oil rim, with a field wide gas-oil-contact (GOC) at -649.2 msl.

Current production at Mereenie is from high porosity/permeability Pacoota 1 and Pacoota 3 Sandstones, at depths of up to 1,600 m below the surface. The West Mereenie 26 (WM26) well targeted gas in the Stairway Sandstone which lies above the Pacoota Sandstone and the Horn Valley Siltstone (Figure 1). The Stairway Sandstone has undergone diagenesis which has decreased porosity and permeability, this has led to uneconomic flow rates in the previously drilled vertical wells. However, natural fractures within the Stairway Sandstone have been encountered while drilling and on production from the vertical WM15 well.

Natural fractures at the Mereenie Oil and Gas Field are fold and fault related so that their orientation, distribution and intensity can be predicted. Fold related fractures are related to bedding orientation with the fractures predominantly oriented at a high angle to bedding. To maximise well deliverability and performance, the WM26 well trajectory incorporated a lateral section parallel to bedding in order to increase number of fractures penetrated. The Stairway Sandstone has previously been penetrated and flow tested at the Mereenie field, however, only contingent resources are currently recognised. The drilling of WM26 was to demonstrate productivity from the Lower Stairway Sandstone and convert resources to reserves. The WM26 well will also drill the reservoir section with air/mist to avoid fluid damage, as well, a downhole deployment valve will allow for the reservoir section to remain fluid free upon tripping and upon completion.

The geological rational behind choosing the well location was to intersect the Lower Stairway 2 Sandstone (LS2) sub-parallel to bedding within a zone of predicted high fracture density. The surface location of the target is approximately 200 m northwest of WM21 (Figure 2). As such, the well consisted of an inclined section that targets areas of increased natural fracture density parallel to bedding in the LS2 (Figure 3). The production section of the well was drilled with air to limit formation damage from fluids.

WM26 was spudded on May 25th, 2018 and was suspended with a bridge plug and rig released on July 5th, 2018 after intersecting the LS2 and observing uneconomic flows of gas.

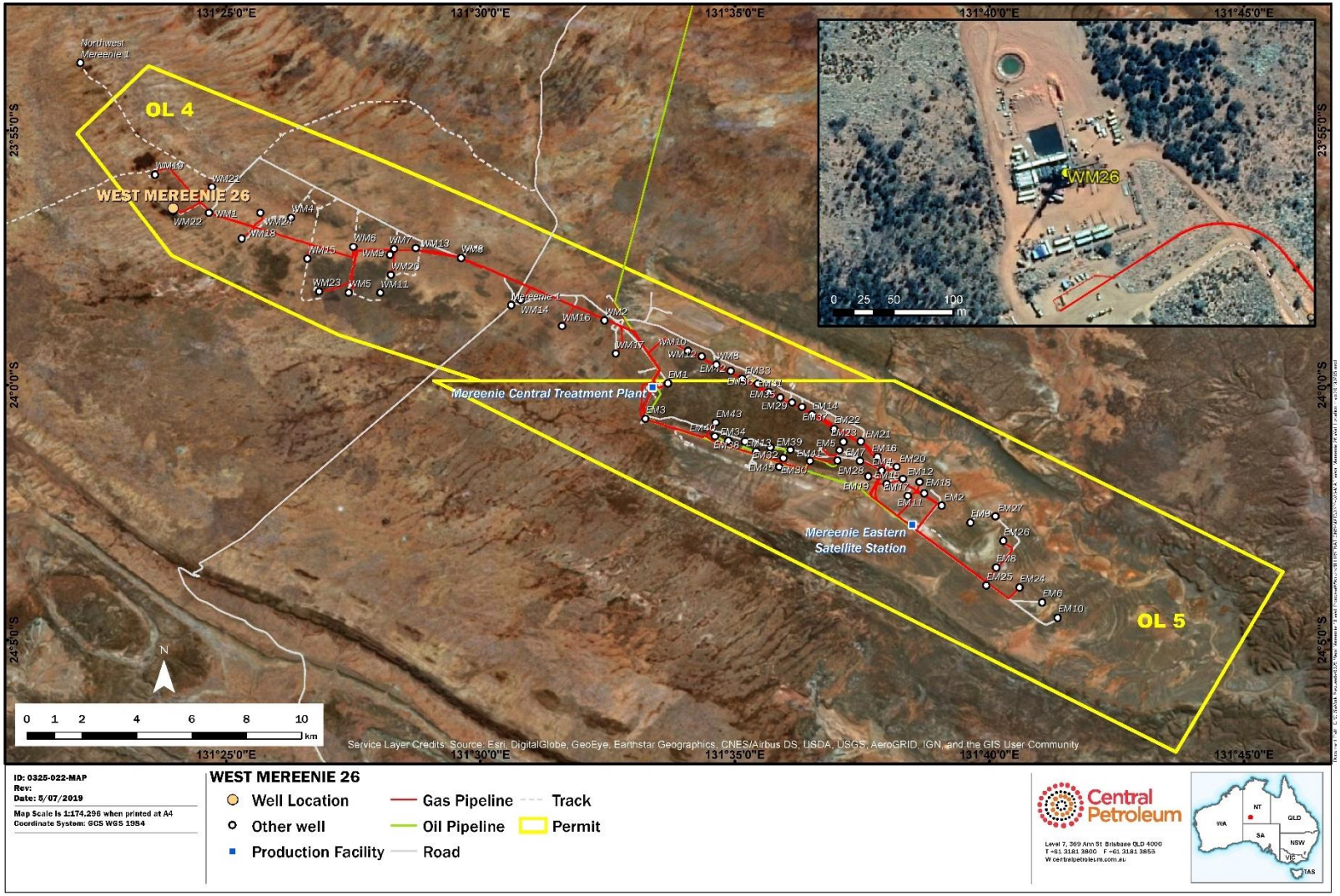

Figure 1 — WM26 locality map

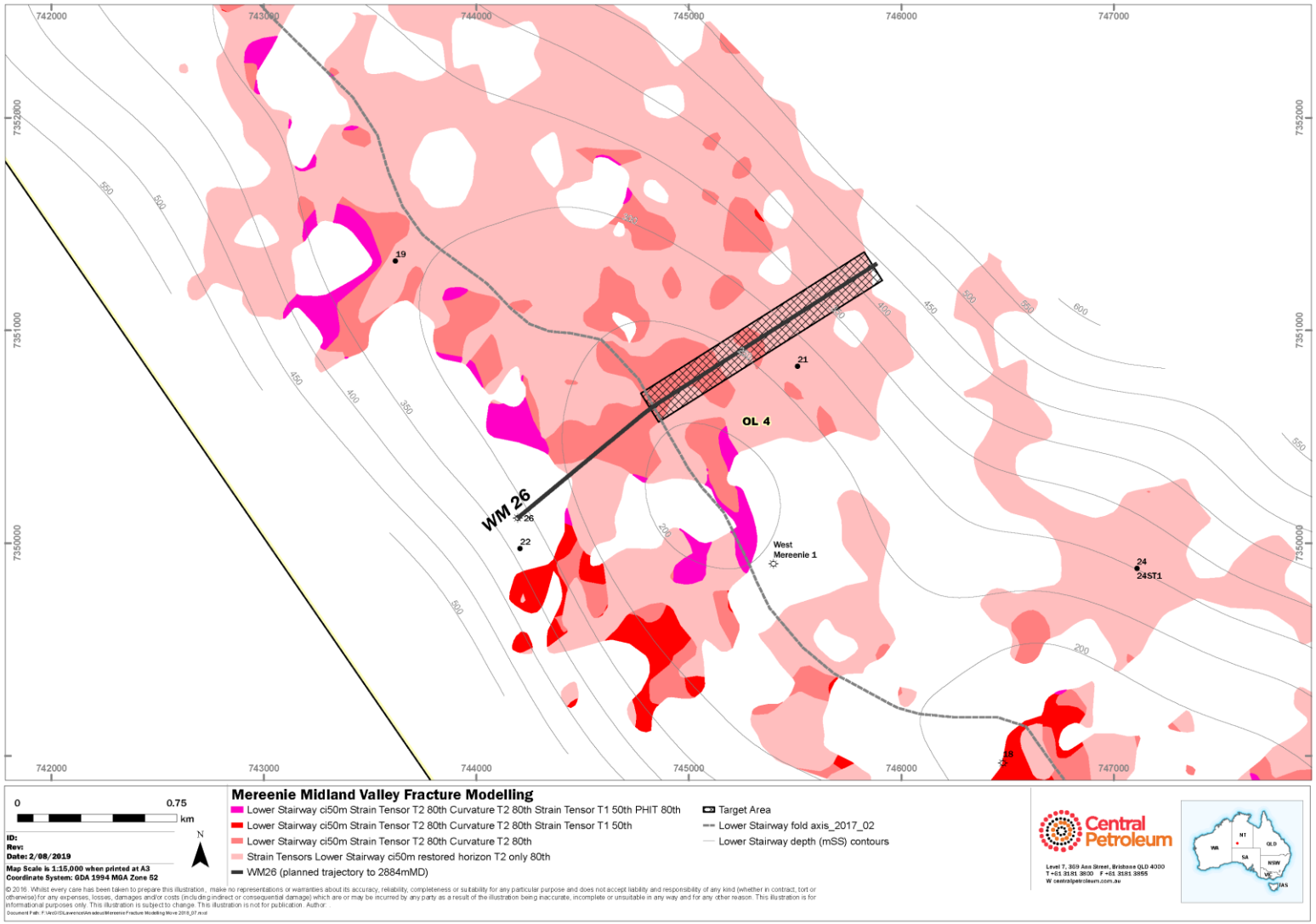

Figure 2 — The primary target for WM26 is a zone of predicted high fracture density within the LS2, approximately 1000 m northwest of WM21 at a depth of ~1000 mGL. Wells positioned at surface location

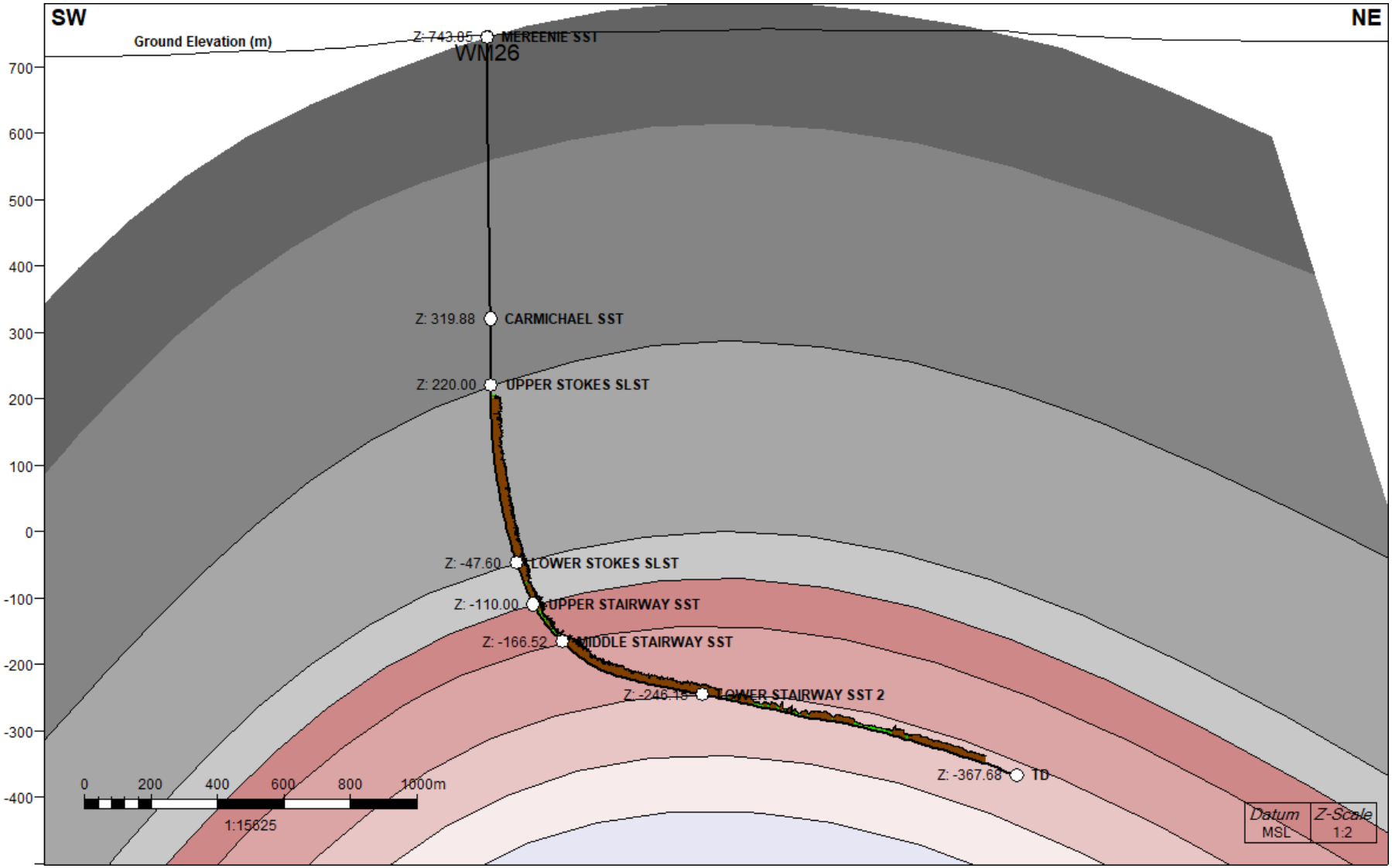

Figure 3 — Cross-section of WM26 planned trajectory and horizons.

2 GENERAL DATA

Table 1: West Mereenie 26 Well Index Sheet

Well Name	West Mereenie 26	Petroleum Title	OL4	Basin	Amadeus
Well Purpose	Appraisal	Status	Suspended	Parent Well Name, if any	
Spud Date	22/05/2018	TD Date	28/06/2018	Rig Release Date	05/07/2018

Primary Objective	Lower Stairway 2 Sandstone			Rig(s) Name	Ensign 932
Secondary Objective	NA			100K Map Sheet	Tarawera 5150
Total Depth		MD	TVD	Side-Track Kick-off Depth, if applicable	NA
	Driller	2388.00	1116.75		
	Logger	2388.00	1116.75	Drill Datum ■ DF ❑ RT ❑ KB	Elevation Datum: AHD GL Elevation: 742.99m Drill Datum Elevation: 748.84m
Location *(GDA94 Datum with GRS80 Ellipsoid using MGA94 Grid)*	Coordinates	Surface	Bottom Hole		
	Latitude	23°56'31.2590" S	23°55'59.9252" S		
	Longitude	131°23'57.5314" E	131°24'42.4581" E		
Zone	Easting	744194.246	745481.36		
52	Northing	7350117.320	7351059.86		

Seismic Station, if applicable	Survey	Inline	Xline
	M87		04
	Shot point		311

Well Summary

The West Mereenie 26 well was spudded on 22 May 2018 targeting gas in the Lower Stairway 2 Sandstone in an area of predicted high natural fracture density. The well was drilled with water-based mud and drilled directionally into the Middle Stairway Sandstone where a 7" intermediate liner was cemented. Gas shows were observed in the Upper Stairway Sandstone while drilling with mud. The well was then drilled out with air/foam into the Lower Stairway 2 Sandstone with the aim to penetrate the Lower Stairway 2 Sandstone sub-parallel to bedding and therefore maximize connection with any natural fractures. Gas shows were observed while drilling with air/foam, however, no flow rate was obtained upon reaching TD of 2388.00m MD. The well was then suspended with a bridge plug and the rig was released on 5 July 2018.

Hole and Casing Design (Drillers Depths)						Drilling Fluid	
Type	Hole Size	Depth (mMD)	Casing Size	Shoe mMD	Shoe mTVD	Hole Size	Type
Conductor 1	24 inch	23.5	20 inch	23.5	23.5	24 inch	WBM – Gel
Conductor 2	17.5 inch	309.0	23.375 inch	306.1	306.0	17.5 inch	WBM – KCL/Gel
Surface	12.25 inch	548.0	9.625 inch	544.8	544.6	12.25 inch	WBM – KCL/Gel
Intermediate Liner	8.5 inch	1498.0	7 inch	1495.5	1002.0	8.5 inch	WBM – KCL/Gel
						6.125 inch	Air/Foam

Stratigraphy – Formation Tops (Loggers Depths)				Formation Evaluation			
Formation	Depth			Run	Measurement	Depth Interval	
	mMD	mTVD	mTVDGL			From (mMD)	To (mMD)
Mereenie Sandstone	6	6	0.15	1	CBL - 9.625" casing	0.00	523.80
Upper Stokes Siltstone	529	529	524.15	2	CBL – 7" liner	480.00	1450.00
Lower Stokes Siltstone	812	796.5	790.65	3	Gamma ray, caliper, temperature, shallow/deep resistivity, Neutron, Density,	1455.50	2380.35
Upper Stairway Sst	893	858.8	852.95	4			
Mid Stairway Sst	997	915.5	909.65				
Lower Stairway Sst 2	1430	995.1	989.25				

TOTAL DEPTH	2388	1116.75	1110.90		Photoelectric effect, Spontaneous potential		
					Cross Dipole Sonic	2318.00	2372.00
					Resistivity Image log	2256.08	2381.50

Mud Logging	Formation Testing (DST)	DFIT	☐ Yes ■ No
Total Gas and C1-C5 chromatograph from 0m MD to 2338.0 mMD	No DST's were run, however a flow test while drilling with air/foam at the end of the well was performed with rate too small to measure	HF	☐ Yes ■ No

Coring	Hydrocarbon Shows
NA	920mMD to 1000mMD – up to 1% mud gas while drilling with water-based mud within the Upper Stairway Sandstone 1800mMD to 2388mMD – up to 0.1% mud gas while drilling with air/foam in the Lower Stairway Sandstone

Completion
The well was suspended with a bridge plug set at 784mMD and the rig was released on 5 July 2018.

3 DRILLING

3.1 CASING AND DRILLING DETAILS

Table 2: WM26 casing details

FINAL WELL CONSTRUCTION									
Interval	Hole Specifications			Casing Specifications					
	Hole Size	From	To	OD	Weight	Grade	Thread	Casing Top	Shoe Depth
	[in]	[mRT]	[mRT]	[in]	[lb/ft]			[mRT]	[mRT]
Conductor – 1	24	5.85	23.5	20	94.0		Welded	5.85	23.5
Conductor – 2	17-1/2	23.5	309.0	13-3/8	54.5	K-55	BTC	5.85	306.1
Surface	12-1/4	309.0	548.0	9-5/8	36.0	K-55	BTC	5.85	
				9-5/8	43.5	N-80	BTC	476.4	544.8
Intermediate - Liner	8-1/2	548.0(MD) 548.0(TVD)	1498.0(MD) 1002.0(TVD)	7	26.0	P-110	BTC	490.5(MD) 490.5(TVD)	1495.5(MD) 1002.0(TVD)
Production	6-1/8	1498.0(MD) 1002.0(TVD)	2388.0(MD) 1116.8(TVD)	Open Hole: 1498.0 – 2388.0m (MD), 1002.0 – 1116.8m (TVD)					

3.2 WEST MEREENIE 26 TIME DEPTH CURVE

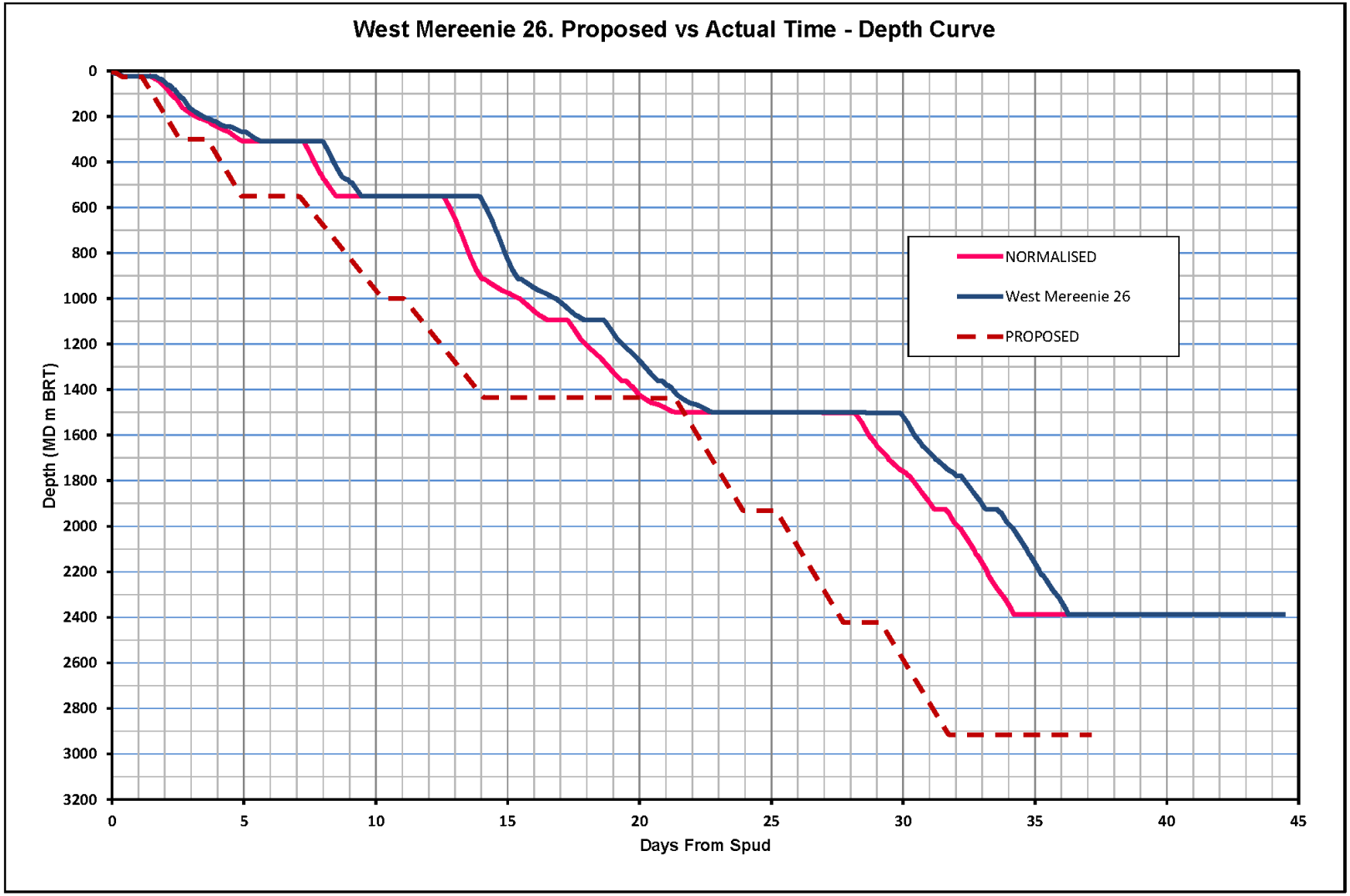

Figure 4 — West Mereenie 26 Time Depth curve

3.3 DEVIATION SURVEYS

Table 3: Deviation survey

DIRECTIONAL SURVEY			
MD	TVD	INC.	AZ.
(m)	(m)	(o)	(o)
0.00	0.00	0.00	0.00
205.00	205.00	1.25	
291.00	291.00	2.25	
528.00	528.00	0.75	
559.15	559.14	0.73	101.41
578.25	578.23	2.33	60.32
597.57	597.49	6.07	60.46
616.87	616.61	9.54	59.51
636.19	635.58	12.37	57.20
655.48	654.31	15.10	54.59
674.82	672.88	17.40	53.20
694.10	691.17	19.53	51.52
713.39	709.23	21.53	49.96
732.68	727.06	23.38	50.31
751.97	744.61	25.61	50.15
771.27	761.82	28.23	49.43
790.55	778.56	31.18	48.83
809.84	794.81	34.05	48.95
829.14	810.61	36.01	47.48
848.43	825.94	38.75	47.08
867.73	840.67	41.73	47.52
887.04	854.78	44.38	48.99
906.35	868.08	48.49	48.79
925.52	880.23	52.88	49.85
944.82	891.24	57.48	50.45
964.12	901.03	61.56	51.62
983.43	909.73	64.88	52.00
1002.75	917.95	64.75	52.12
1022.06	925.92	66.53	51.41
1041.21	933.36	67.72	50.36
1060.56	940.28	70.38	51.00
1079.86	946.39	72.72	51.16
1099.94	952.07	74.39	51.48
1119.24	956.76	77.51	50.96
1138.53	960.78	78.39	50.36
1157.83	964.44	79.74	49.59
1177.14	967.73	80.68	49.34
1196.45	970.66	81.84	48.83
1215.62	973.13	83.35	48.88
1234.92	975.34	83.54	49.22
1254.22	977.53	83.41	48.92
1273.53	979.69	83.75	48.96
1292.85	981.69	84.35	48.64

DIRECTIONAL SURVEY			
MD	TVD	INC.	AZ.
(m)	(m)	(o)	(o)
1312.16	983.61	84.25	48.19
1331.31	985.50	84.42	48.10
1350.66	987.45	83.98	48.95
1369.96	989.36	84.68	49.20
1389.26	991.17	84.58	49.87
1408.52	993.02	84.41	49.38
1428.19	994.95	84.28	50.52
1447.50	996.87	84.35	50.17
1466.81	998.75	84.45	51.20
1486.11	1000.62	84.45	51.03
1506.33	1002.81	83.10	51.56
1535.31	1006.04	84.11	51.42
1564.25	1009.02	84.08	52.44
1593.19	1012.15	83.49	54.73
1621.96	1015.27	84.06	54.38
1650.92	1018.32	83.83	56.74
1679.67	1021.52	83.41	60.07
1708.62	1025.10	82.38	59.04
1737.34	1028.99	82.04	60.96
1766.32	1031.29	88.85	60.19
1795.29	1033.08	84.08	59.10
1824.26	1035.43	86.62	58.01
1853.20	1037.65	84.57	57.34
1882.13	1040.93	82.41	56.59
1911.07	1044.22	84.52	57.42
1940.01	1047.56	82.22	58.70
1968.95	1050.88	84.63	59.96
1997.89	1054.64	80.43	58.03
2026.84	1059.06	81.99	57.37
2055.80	1063.09	82.01	57.09
2084.62	1067.25	81.40	55.74
2114.25	1072.05	79.96	55.44
2143.21	1076.15	83.76	55.13
2172.19	1079.97	81.09	56.06
2200.99	1084.63	80.28	56.20
2229.99	1089.43	80.66	56.64
2258.94	1093.96	81.37	56.18
2287.85	1098.46	80.71	56.95
2316.74	1103.47	79.29	56.74
2345.65	1109.11	78.23	56.86
2374.58	1114.50	80.31	57.65
2388.00	1116.75	80.31	57.65

3.4 CEMENTING OPERATIONS

CONDUCTOR-1

A 20” conductor pipe was cemented in place using Halliburton as a 3rd party cementer to a depth of 23.5mRT by spotting 3.0bbls of 15.8ppg cement slurry inside the 20” conductor from 23.5m – 21.0m and then pumping 17bbls of 15.8ppg SwiftCem cement down the annulus through a cement stinger welded to the outside of the conductor pipe. All surface samples of cement cured as per program and Central Petroleum was satisfied with the integrity of the cement and conductor.

CONDUCTOR-2

The API 5CT, 13-3/8” 54.5ppf K-55 conductor #2 string was cemented to surface by pumping 177bbls of 12.5ppg Lead cement slurry and 41.5bbls of 15.8ppg Tail cement slurry. The cementing operations were performed by a 3rd party (Halliburton). The cement was displaced with 152bbls of displacement fluid with full cement returns to surface after displacing 76 bbls with no top up cement job required. The cement plug was bumped at 400psi and the casing was successfully pressure tested to 1,530psi with floats holding post bleed down of pressure.

All surface samples of cement cured as per the cementing program for this section. With the satisfactory pressure test and cement pumping operations as per program, Central Petroleum was satisfied with the integrity of the cement and conductor.

SURFACE CASING

The API 5CT, 9-5/8” 36/43.5ppf K-55/N-80 surface casing string was cemented to surface by pumping 112.3bbls of 12.5ppg Lead cement slurry and 33.8bbls of 16ppg Tail cement slurry. The cement was displaced with 135bbls displacement fluid with good cement returns to surface. The cement plug bumped at 700psi and the casing was pressure tested to 2,500psi. A top-up job was conducted by pumping 5.8bbls of 15.8ppg cement through a 15m stinger followed by mixing up an additional 14 x 20kg sacks of class “G” cement to top-up to surface.

The integrity of the surface casing and cement was verified utilising various techniques and interpretations as follows: The review of the Halliburton post job report on the cementing/pumping operations demonstrated that the surface cement samples cured, and the cement was pumped per program, the casing cement plugs were bumped, and the casing pressure tested to 2500 psi, verifying the integrity of the casing. A cement bond log was run on 4 June 2018 and reviewed by independent experts. The findings for this section were that typically with cement bond logs, free pipe is in the order of 50mV (El) while fully bonded casing would be +/ 1.5mV. The CBL for the Surface casing in WM26 shows that the majority of the well is below 20mV with the average (blue) trace in the 10mV range. The areas across porous sands show close to a perfect bond. It is common for the cement to set faster over porous intervals in the well due to water losses into these zones. There was no free pipe evident, and it showed that the cement has covered the entire casing interval from the shoe to surface.

Finally, after drilling out the shoe track, a FIT was performed to an equivalent mud weight of 12.6 ppg EMW.

PRODUCTION LINER

The API 5CT, 7" Liner 26ppf P-110 Liner was cemented to the top of the Versaflex Liner Hanger Assembly located at 490.5mRT. The Liner was cemented in place by pumping 54.8bbls of 13.5ppg Lead cement followed by 53.6bbls of 15.8ppg Tail cement. The cement was displaced with 133.2 displacement fluid. The cement plug was bumped at 900psi and the Liner was pressure tested to 1,500psi with the floats holding post bleed down of casing pressure.

After releasing from the liner hanger, the well excess cement was circulated out of the well ensuring full cement coverage from the shoe back to the liner hanger.

The integrity of the Production Liner and cement was verified utilising various techniques and interpretations as follows: The review of the Halliburton post job report on the cementing/pumping operations demonstrated that the surface cement samples cured, and the cement was pumped as per program, the casing cement plugs were bumped as per program and the casing pressure tested to 1500 psi verifying the integrity of the casing. The 7" liner hanger was run and tested. Verifying the integrity of the overlap from the 9 5/8" casing to the 7" liner, this was done with a 500 psi and a 2500 psi pressure test. The cement bond log was run on 18 June 2018 and reviewed by independent experts and the findings for this section were that typically with cement bond logs, free pipe is in the order of 50mV (El) while fully bonded casing would be +/ 1.5mV. The CBL for the 7" production liner in WM26 showed that the approximately 75% of the bond is less than 20mV with the average (blue) trace in the 10mV range. It shows that the cement has covered the entire casing interval from the shoe to the liner hanger. The CBL was performed 54 Hrs post cement placement and the cement would not have been at maximum strength. We would expect some further curing and strengthening of the cement post the CBL improving the cement bond results further.

Finally, after drilling out the shoe track and 2m of new formation, a FIT was performed with 9.0ppg mud in the hole and a pressure of 938psi applied returning a 14.5 ppg EMW.

Table 4: Cementing details

CEMENTING DETAILS			
	Conductor-2	**Surface**	**Liner**
Hole Size	17-1/2”	12-1/4”	8-1/2”
Casing Size	13-3/8”	9-5/8”	7”
Setting Depth	306.1mRT (MD)	544.8mRT (MD)	Top: 490.5mRT(MD) 490.5mRT(TVD) Shoe: 1495.5mRT(MD) 1002.0mRT(TVD)
Cement Type	Class G	Class G	Class G
Cement Top	Lead - Surface Tail – 257.0mRT	Lead - Surface Tail – 445.0mRT	Lead – 490.5mRT(MD) Tail – 966.0mRT(MD) 902.0mRT(TVD)
Yield	Lead - 2.15 ft3/sk Tail – 1.16 ft3/sk	Lead - 2.15 ft3/sk Tail – 1.13 ft3/sk	Lead – 1.72 ft3/sk Tail – 1.16 ft3/sk
Volume	Lead – 177.0bbls Tail – 41.5bbls	Lead – 112.3bbls Tail – 33.8bbls	Lead – 54.8bbls Tail – 53.6bbls
Slurry Density	Lead - 12.5 ppg Tail - 15.8 ppg	Lead - 12.5 ppg Tail – 16.0 ppg	Lead - 13.5 ppg Tail – 15.8 ppg
Bump Plug	400psi	700psi	975psi
Casing Pressure Test	1,530psi	2,500psi	1,500psi
Additives	D-Air 3000L Calcium Chloride Bentonite WellLife 734	D-Air 3000L Calcium Chloride Bentonite WellLife 734 Halad-344 CFR-3	D-Air 3000L Bentonite Halad-344 Halad-413 CFR-3 HR-5

3.5 DRILLING FLUIDS

Table 5: Drilling fluids

DRILLING FLUIDS				
Interval	Hole Size	From	To	Fluid System
	[in]	[mRT]	[mRT]	
Conductor – 1	24	5.85	23.5	WBM - Gel Spud Mud
Conductor – 2	17-1/2	23.5	309.0	WBM – KCl / Polymer/Gel
Surface	12-1/4	309.0	548.0	WBM – KCl / Polymer/Gel
Intermediate	8-1/2	548.0(MD) 548.0(MD)	1498.0(MD) 1002.0(TVD)	WBM – KCl / Polymer
Production	6-1/8	1498.0(MD) 1002.0(TVD)	2388.0(MD) 1116.8(TVD)	Air/Foam

FLUID LOSSES

Fluid losses during the drilling operations within the 17-1/2" Conductor-2 hole were observed within the Mereenie formation initially at 222.0m with fluid losses of 180bbls/hr. Drilling operations continued to 229.0m, where the losses increased to 280.0bbls/hr. A 10bbl LCM was spotted on bottom and drilling continued to 239.0m where fluid losses were reduced to 40.0-45.0bbls/hr. An additional 10bbl LCM was spotted and drilling continued to 243.0m; where the fluid losses were further reduced to 20.0 bbls/hr.

Fluid losses of 400.0 bbls/hr were also observed while drilling the 12-1/4" Surface hole from 463.0m- 477.0m and continued to increase to 500.0bbls/hr by 489.0m. Several 10bbl LCM pills were spotted while drilling through this section which reduced the loss circulation to 20.0bbls/hr. Drilling continued to section Total Depth of 548.0. Two 20bbl LCM pills were spotted over loss zone 463.0m to 489.0m reducing the fluid loss to 5.0 bbls/hr prior to pulling out of hole with the drill pipe.

Table 6: Fluid losses

FLUID LOSSES WHILE DRILLING			
Interval	Hole Size	Depth	Rate
	[in]	[mRT] (MD)	bbls/hr
Conductor – 2	17-1/2	222.0 - 243.0	20.0-280.0
Surface	12-1/4	463.0	400.0
Surface	12-1/4	489.0	500.0
Surface	12-1/4	504.0	50.0
Surface	12-1/4	548.0	20.0-5.0

4 FORMATION EVALUATION

4.1 WELL EVALUATION LOGS

For interpreted wireline log data and reporting, see appendix B-D

Table 7: Well evaluation logs

WELL EVALUATION LOGS		
Logging Suite	Top Logging Depth	Bottom Logging Depth
Mud logging (Total Gas and Gas Chromatograph)	0.00	2388.00
Cement bond log 9-5/8” casing	Surface	523.80
Cement bond log 7” liner	480.00	1450.00
Gamma Ray, Caliper, Temperature, Shallow/Deep Resistivity, Neutron, Density, Photoelectric effect, Spontaneous potential	1455.50	2380.35
Cross Dipole Sonic	2318.00	2372.00
Resistivity Image log	2256.08	2381.50

Note: Cross dipole sonic and resistivity image log run in memory mode and battery failure led to loss of data.

4.2 CORES AND SAMPLE DETAILS

No cores were cut in WM26. Cuttings samples were collected as follows:
Surface to 865mMD 15m interval
865m to 1498mMD 5m interval
1498m to 2388mMD 3m intervals

17 gas samples were retrieved in Isotubes from the mud gas line while drilling with WBM (Upper Stairway) and while drilling with air/foam in the Lower Stairway Sandstone. There are currently no plans to test the gas in the isotubes.

Table 8: Gas samples

GAS SAMPLES	
Depth (mMD)	Formation
953	Upper Stairway Sst
963	Upper Stairway Sst
973	Upper Stairway Sst
973.5	Upper Stairway Sst
986	Upper Stairway Sst
1548	Lower Stairway Sst
1692	Lower Stairway Sst
1778	Lower Stairway Sst
1923.7	Lower Stairway Sst
2213.79	Lower Stairway Sst
2271	Lower Stairway Sst
2300	Lower Stairway Sst
2329	Lower Stairway Sst
2358	Lower Stairway Sst
2388	TG-1500m
2388	TG-2386m
2388	TG-1511m

5 GEOLOGY

5.1 LITHOLOGY AND STRATIGRAPHY

Table 9: WM26 well tops

Well tops				
Age	**Formation Name**	**Actual Depth MD (m)**	**Actual Depth TVD (m)**	**Actual Thickness TVT (m)**
Late Silurian to Middle Devonian	Mereenie Sandstone	6	6	524
Middle to Late Ordovician	Upper Stokes Siltstone	529	529	267.5
Middle Ordovician	Lower Stokes Siltstone	812	796.5	62.3
Middle Ordovician	Upper Stairway Sst	893	858.8	56.7
Middle Ordovician	Mid Stairway Sst	997	915.5	79.6
Middle Ordovician	Lower Stairway Sst 2	1430	995.1	14.6
	TOTAL DEPTH	2388	1116.75	

The lithology and stratigraphy is well understood at the Mereenie Field due to the 70+ wells drilled on the structure. See Appendix E for Lithology Descriptions

Mereenie Sandstone (6m to 529m MD)

The formation consists of a massive sandstone sequence that was deposited in a shallow marine and aeolian environment. The Mereenie Sandstone is a permeable groundwater aquifer in this area.

Stokes Siltstone (529m to 893m MD)

The formation consists of a massive siltstone sequence, interbedded with minor sandstones. The formation was deposited in a predominantly shallow marine environment. The Stokes Siltstone forms the seal for the hydrocarbon accumulations at Mereenie.

Upper Stairway Sandstone (893m to 997m MD)

The Upper Stairway Sandstone is a dominantly sandstone unit with interbed siltstones and was deposited in a predominantly tidally influenced marine environment

Middle Stairway Sandstone (997m to 1430m MD)

The Middle Stairway Sandstone is a dominantly siltstone unit with interbedded sandstones and was deposited in a shallow marine environment.

Lower Stairway Sandstone (1430m to 2388m MD)

The Lower Stairway Sandstone is a dominantly sandstone unit with interbed siltstones and was deposited in a predominantly tidally influenced marine environment.

5.2 STRATIGRAPHIC PROGNOSIS

Formation tops were generally intersected slightly lower to prognosis, with increasing diversion between prognosed and actual figures with depth. The eventual target Lower Stairway 2 Sandstone was intersected 26m low to prognosis.

The data used to generate the prognosed depths were the depth-converted interpretation along seismic line M87-04. However, the geologic model showed closer agreement to the intersected top for Lower Stairway 2 Sandstone, with a discrepancy of less than 2m. The geologic model building process is generally configured to honour known depth points, i.e. existing well tops. The seismic data, however, generally influences the grid shape between these well tops rather than providing an absolute depth value, and slight variability from line to line due to processing differences are not preserved. This is particularly the case at WM26 where seismic coverage is interleaved by surveys of two different vintages (1983/87) and different processing flows, accounting for why the smooth geologic model was closer to actual depths than prognoses at seismic lines up to 275m out of the plane of the well path.

The prognosed and actual depths are listed in Table 10. The revised structure map and seismic section are shown in Appendix G.

Table 10: WM26 well prognosed vs actual tops

Well Tops				
Formation Name	**Prog Depth TVD (m)**	**Actual Depth TVD (m)**	**Actual Depth SS (m)**	**High/Low To Prognosis**
Mereenie Sandstone	6	6	+742.84	0.15 m L
Upper Stokes Siltstone	531	529	+219.84	2 m H
Lower Stokes Siltstone	784	796.5	-47.66	12.5 m L
Upper Stairway Sst	836	858.8	-109.96	22.8 m L
Mid Stairway Sst	889	915.5	-166.66	26.5 m L
Lower Stairway Sst 2	973	995.1	-246.26	22.1 m L
Lower Stairway Sst 2 [target]	984	1009.7	-260.86	25.7 m L
TOTAL DEPTH	1209	1116.75	-367.91	

5.3 RESERVOIR PROPERTIES AND QUALITY

Upper Stairway Sandstone

	Latitude (GDA 94)	Longitude (GDA 94)	Easting (Zone 52)	Northing (Zone 52)
Upper Stairway Reservoir intersection in WM26	23° 56' 28.8158" S	131° 24' 00.6597" E	744284 m	7350191 m

The Upper Stairway Sandstone was intersected 22.5m lower than prognosis while drilling with water-based mud. Upon penetrating the lower section of the Upper Stairway Sandstone, gas readings from the well increased to a peak of ~1% of the fluid returns. The gas readings do show encouragement for gas potential, however, these gas readings are low compared to offset wells. Since the Upper Stairway Sandstone is not intersected sub-parallel to bedding in WM26, a subsequent sub-parallel sidetrack intersecting a high density of open natural fractures could lead to economic gas rates. Future wells will be drilled sub-parallel to bedding within the Upper Stairway Sandstone within the vicinity of historic vertical well that showed high flow rates in the Upper Stairway Sandstone.

Lower Stairway 2 Sandstone

	Latitude (GDA 94)	Longitude (GDA 94)	Easting (Zone 52)	Northing (Zone 52)
Lower Stairway 2 Reservoir intersection in WM26	23° 56' 17.0464" S	131° 24' 15.5391" E	744711 m	7350546 m

The Lower Stairway 2 Sandstone was intersected 22.1m lower than prognosis and sub-parallel to bedding while remaining within the Lower Stairway 2 Sandstone to TD. Upon drilling with air, limited gas readings of ~0.1% were observed from the fluid returns. Minor connection and trip gas were observed while drilling and for bit changes. A flow test of the well was completed at TD which recorded no flow. Following the flow test results, a suite of wireline logs was run to determine the reason for the flow test results. Due to a battery malfunction on the resistivity image log run, only ~130m MD of image log data was available for interpretation. The available image log data did reveal natural fractures over the last ~130m, however, due to the lack of flow, the natural fractures are most likely filled with minerals as seen in other offset wells. The prospectivity of the Lower Stairway 2 Sandstone is encouraging due to the presence of natural fractures. Future wells will be drilled sub-parallel to bedding within the Lower Stairway 2

Sandstone within the vicinity of historic vertical wells that showed high flow rates in the Lower Stairway 2 Sandstone.

5.4 GEOCHEMISTRY OF SOURCE ROCKS

No geochemistry samples were taken

5.5 HYDROCARBON INDICATORS

Table 11: Hydrocarbon indicators

GAS SAMPLES			
Depth (mMD)	Formation	Number of Samples	Hydrocarbon Indication
920-1000	Upper Stairway Sst	5	Up to 1% gas while drilling with mud
1800 – 2388	Lower Stairway Sst	13	Up to 0.1% gas while drilling with air/mist

WM26 targeted areas of higher natural fracture densities within the Lower Stairway Sandstone. It is interpreted that the well did not flow gas due to mineralisation of the natural fractures. Once TD had been confirmed at 2,388m MD, a flow test and build up was carried out. The well was blown dry and the drill string was pulled back to the 7" casing shoe. A flow meter with a 0.5' orifice was prepared, and the well was opened up to the flow meter. No flow was observed through the flow meter and the well was shut in to record a pressure build up. The pressure gauge recorded a pressure of under 1 psi over the build-up period.

6 CHANGES TO THE RESERVOIR MODEL AND IMPLICATIONS FOR FUTURE FIELD MANAGEMENT

6.1 CHANGES TO THE RESERVOIR MODEL FOLLOWING THE DRILLING OF WEST MEREENIE 26

WM26 was the first well drilled to specifically appraise the productivity of the Stairway Sandstone at the Mereenie field. Previous vertical wells drilled in the Mereenie field targeted the deeper Pacoota Sandstones, however, while drilling with air through the Stairway Sandstone, flow rates up to 7mmscfd were recorded. Due to these rates, a limited number of vertical wells were recompleted in the Stairway Sandstone. The recompletions indicated productivity was through natural fractures, however, a way of predicting natural fracture density and distribution was needed. Following the completion of natural fracture density models, the WM26 well was drilled sub-parallel to bedding in the Lower Stairway 2 Sandstone with intention to connect areas of predicted high natural fracture density. By connecting areas of predicted high natural fracture density, productivity could be increased and the resources assigned to the Stairway Sandstone could be converted to reserves. The WM26 well was drilled between two seismic lines of different vintage which resulted in the well tops being about ~20m lower than prognosis. Following the completion of the WM26 well, the well tops were used to update the Stairway Sandstone surfaces, which resulted in a

minor change to the surfaces around the WM26 well in the northwestern portion of the Mereenie field.

6.2 IMPLICATION FOR FUTURE FIELD MANAGEMENT

The WM26 well was a technically challenging well due to the requirement to drill the reservoir section without mud and allow for the well to be completed without fluid. From this success, Central has gained the knowledge to drill lateral wells within the Stairway Sandstone without damaging the formation with fluid. The WM26 did not flow at commercial gas rates most likely due to the mineralisation of the natural fractures. The imaging of natural fractures validated the fracture modelling work over the field and will lead to further appraisal in the future of the Stairway Sandstone. Future field management in the Stairway Sandstone may include recompletions of previous vertical wells in multiple Stairway Sandstone levels. Also, drilling sub-horizontal wells closer to previously completed/flowing wells which are assumed to be in regions of non-mineralised, open natural fractures. The fracture modelling will be utilised to determine the orientation and length of any lateral wells.

Please see the following appendices:

Appendix F for the West Mereenie 26 Composite Well Log

Appendix G for the revised structure maps and seismic sections