SANTOS – FRONTIER OIL AND GAS

COMPILED FOR

SANTOS LIMITED

(A.B.N. 80 007 550 923)

DUKAS 1 / DUKAS 1 ST1

BASIC WELL COMPLETION REPORT

EP 112 / NORTHERN TERRITORY

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DUKAS 1 / DUKAS 1 ST1
BASIC WELL COMPLETION REPORT

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List Of Abbreviations

ADR	Automated Drilling Rig
API	American Petroleum Institute
ASCII	American Standard Code for Information Interchange
Azi,AZI	Azimuth
bbls	Barrels (unit of volume = 42 US gallons)
BHA	Bottom Hole Assembly
BG	Background Gas
BU, B/U	Bottoms Up
CAL	Caliper
CAST	Circumferential Acoustic Scanning Tool
CBL	Cement Bond Log
CBU	Circulate Bottoms Up
CG	Connection Gas
CSV	Comma Separated Values ASCII file (*.csv)
CO2	Carbon Dioxide
DEN	Density
DLL	Dual Lateral Log
ECD	Effective Circulating Density
EMW	Equivalent Mud Weight
FG	Formation Gas
FID	Flame Ionizatin Detector
FIT	Formation Integrity Test
Ftklb, ft-klb	ft kilo pounds (measurement of torque)
GEM	Gamma Elemental Minerology
gpm	US gallons per minute
GR	Gamm Ray
hi vis	High Viscosity Mud Sweep
hrs	Hours
HSE	Health, Safety and Environment
IL	InLine
KCl	Potassium Chloride
Klbs	Kilo pounds
LAS	Log ASCII Standard data file (*.LAS)
LOT	Leak Off Test
M/LWD	Measurement and Logging While Drilling
MFT	Pressure testing wireline tool
mMDRT	Measured Depth Below Rotary Table (rig floor) in metres
MSFL	Micro Spherical Focused Log
MSL	Mean Sea Level (AMSL – above mean sea level)
mTVDRT	True Vertical Depth Below Rotary Table (rig floor) in metres
NB	New Bit
Neut	Neutron
PDC	Polycrystalline Diamond Cutters
PDF	Portable Document Format
pH	Potential Hydrogen
PJSM	Pre Job Safety Meeting POOH,
POH	Pull Out Of Hole (trip out)
ppg	pounds per gallon (measurement of mud density)
psi	pounds per square inch
QGM	Quantitative Gas Measurement
RES	Resistivty
RIH	Run in hole
RPM	Revolutions pre minute
ROP	Rate of Penetration
RR	Re-run
SDL	Surface Data Logging (Mudlogging)
SGR	Spectral Gamma Ray
SP	Spontaneous Potential
SPP	Stand Pipe Pressure
SS	Subsea
ST	Side Track
SWC	Sidewall Cores
TD	Total Depth
TG	Trip Gas
TOC	Total Organic Content
TVD	True Vertical Depth
UBD	Underbalanced Drilling
VSP	Vertical Seismic Profile
WBM	Water based mud
WOB	Weight on bit
XL	Xline
XO,X/O	Cross over
xLOT	Extended Leak Off Test
XRMI	X-tended Range Micro Imager
YP	Yield Point

1 Introduction and Summary

Dukas 1 / Dukas 1 ST1 was drilled by the Ensign 965 rig in permit EP 112 onshore Northern Territory.

Dukas 1 is a Heavitree-Gillen conventional play in the Southern Amadeus Basin. Of the 38 exploration wells drilled in the basin, only Magee 1 and Mt Kitty 1 intersected the pre-salt section. Magee 1 is the only well to intersect the target Heavitree Formation. The Magee 1 and Mt Kitty 1 wells flowed gas from the Heavitree Formation and fractured basement respectively, proving the presence of a working sub-salt petroleum system on the eastern margin of the basin.

The offset well Magee 1 flowed 0.063 MMscf/D from 5.3 m of Heavitree Formation (~9% porosity) and Mt Kitty 1 flowed 0.53 MMscf/D from fractured basement. The thin Heavitree reservoir in Magee 1 (the 5.3 m of proven reservoir cannot be associated with a mappable seismic unit) and its absence in Mt Kitty 1 has been attributed to the location of these wells on the onlapping south-eastern flank of the basin.

The Dukas Prospect was first identified as a lead by the AMSAN13 regional seismic survey and Frogtech SEEBASETM regional basement map. Follow up seismic acquired in two rounds between December 2016 and April 2018 has delineated a number of sub-salt closures on a large regional high, optimally located to receive charge from the interpreted Neoproterozoic depocentre. The most material mapped closure is the Dukas Prospect with a lowest closing contour area of 544 km2.

This is a frontier exploration well with very little offset well control. Coupled with variable seismic imaging over the prospect and structural complexity, this results in considerable uncertainty in the well prognosis.

The well was to be evaluated to determine reservoir presence/deliverability and gas composition to assess commercial development potential. The Heavitree Formation was the primary reservoir target, fractured basement was the secondary reservoir target.

The Amadeus Basin covers ~170,000km2 in Central Australia, and is part of the Neoproterozoic Centralian Superbasin. Sedimentation began in the Neoproterozoic continuing until the late Devonian/Early Carboniferous. The structural framework is controlled by post depositional contraction and salt tectonics during the Peterman and Alice Springs orogenies, resulting in complex subsurface structures. These orogenies formed intracratonic fold-thrust belts that shaped the Amadeus Basin.

In the Southern Amadeus Basin conventional plays are being targeted, particularly the Heavitree Formation, which is the main focus of the AMSAN16 2D seismic survey. The Southern Amadeus Basin is currently largely underexplored.

Five petroleum systems have currently been identified;

1. Early Neoproterozoic Heavitree Formation to Gillen Formation. Proven petroleum system hydrocarbon gas and helium in Magee 1.
2. Middle Neoproterozoic Loves Creek Member to Pioneer Sandstone; proven gas in Ooraminna 1.
3. Late Neoproterozoic Pertatataka Formation to Julie Formation.
4. Latest Neoproterozoic – middle Cambrian Arumbera sandstone to Chandler Formation. Proven gas in Dingo.

5. Ordovician part of the Larapinta Group. Proven, gas in Mereenie and Palm Valley, oil in Surprise.

The Heavitree Formation and its interpreted south-western equivalent the Dean Quartzite, is the basal unit of the Amadeus Basin. It outcrops on the northern and south-western margins of the Amadeus Basin, where thicknesses can range from 100 m to 400 m. Outcrops comprise massive, thick quartzite beds with rare mudstones and conglomerates. It is heavily silicified in the thrusts observed in outcrop along the MacDonnell Ranges, but much less silicified in the Limbla Cliffs near the north-east basin margin. This suggests that silicification could be related to fluid movement through faults (Lindsay, 1999). It is thought that silicification may decrease towards the south and at depth.

The Heavitree Formation (Reservoir) was deposited in intertidal and fluviatile environments (Lindsay, 1999). Conformably overlying the Heavitree Formation is a thin unit of grey to black shales and siltstones (base Gillen Formation, Source) followed by a thick succession of dolostones interbedded with halite and anhydrite (Gillen Formation, Seal). A 15 m pyritic black shale interval at the base of the Gillen Formation was discovered in a mineral hole (BL002) in the north-east part of the Amadeus Basin, proving that conditions were suitable for the accumulation of organic rich rocks. TOC values average 3.12% over the 15 m black shale, with a maximum value of 7.5%. The black shale is over mature and original TOC values would have averaged 6% over the interval. Hydrocarbons in the Magee 1 and Mt Kitty 1 gas flows clearly prove that sub-evaporite source rocks have generated hydrocarbons in the past. Only the proximal evaporitic succession has been sampled down to basement. Anoxic conditions associated with high organic productivity in the centre of the restricted evaporitic basin were possible, producing more effective source rocks as demonstrated by the BL002 mineral hole.

Two regional passive phases of sedimentation separated by three major deformational events (Alice Springs and Petermann orogenies, as well as an older Albany-Fraser orogeny that pre-dates sedimentation) characterised by their own structural orientations have been identified in the Amadeus Basin. The Petermann and Alice Springs orogenies may have reactivated the original basement structure formed during the Albany-Fraser Orogeny and makes it difficult to predict long-lived basement highs. Our interpretations suggest that the SW-NE Mt Kitty structure was a pre-existing basement high at the time of Heavitree Formation deposition, resulting in non-deposition over the crest of the structure. The limited thickness (5.3 m) of Heavitree Formation reservoir in Magee 1 on the south-eastern flank of the Amadeus Basin might also be due to the proximal position of this well to the Fregon East depositional margin. Gentle pre-existing basement highs fully buried by distal and thicker Heavitree sands, Heavitree closures formed by the Petermann deformational event, or a combination of both, are attractive targets in the Amadeus Basin. Alternatively north-west trending basement structures may be the result of extension that commenced near the end of Bitter Springs Group deposition, related to the breakup of the Rodinia Supercontinent.

Heavitree-Gillen Play:

Primary Reservoir = Heavitree Formation
Secondary Reservoir = Fractured Basement
Source = Basal Gillen Formation black shales
Seal = Gillen Formation evaporites
Trap = Faulted four way dip closure

1) The main objectives of the Dukas-1 well are to:
   - Evaluate primary Heavitree Formation reservoir*
   - Flow to surface from Heavitree Formation

- Fluid sampling to determine composition
- Evaluate the Heavitree Formation reservoir with open hole wireline logs (porosity, gas saturation, natural fractures etc).

2) Evaluate secondary reservoir*

- Flow to surface from fractured basement reservoir.
- Fluid sampling to determine composition.
- Evaluate fractured basement reservoir with logs (porosity, gas saturation, natural fractures etc).

*Note: Reservoir evaluation priority order assumed under-balanced drilling.

The well is focused on addressing the key uncertainties and risks, which are reservoir presence/deliverability and gas composition, which will have the biggest impact on commerciality.

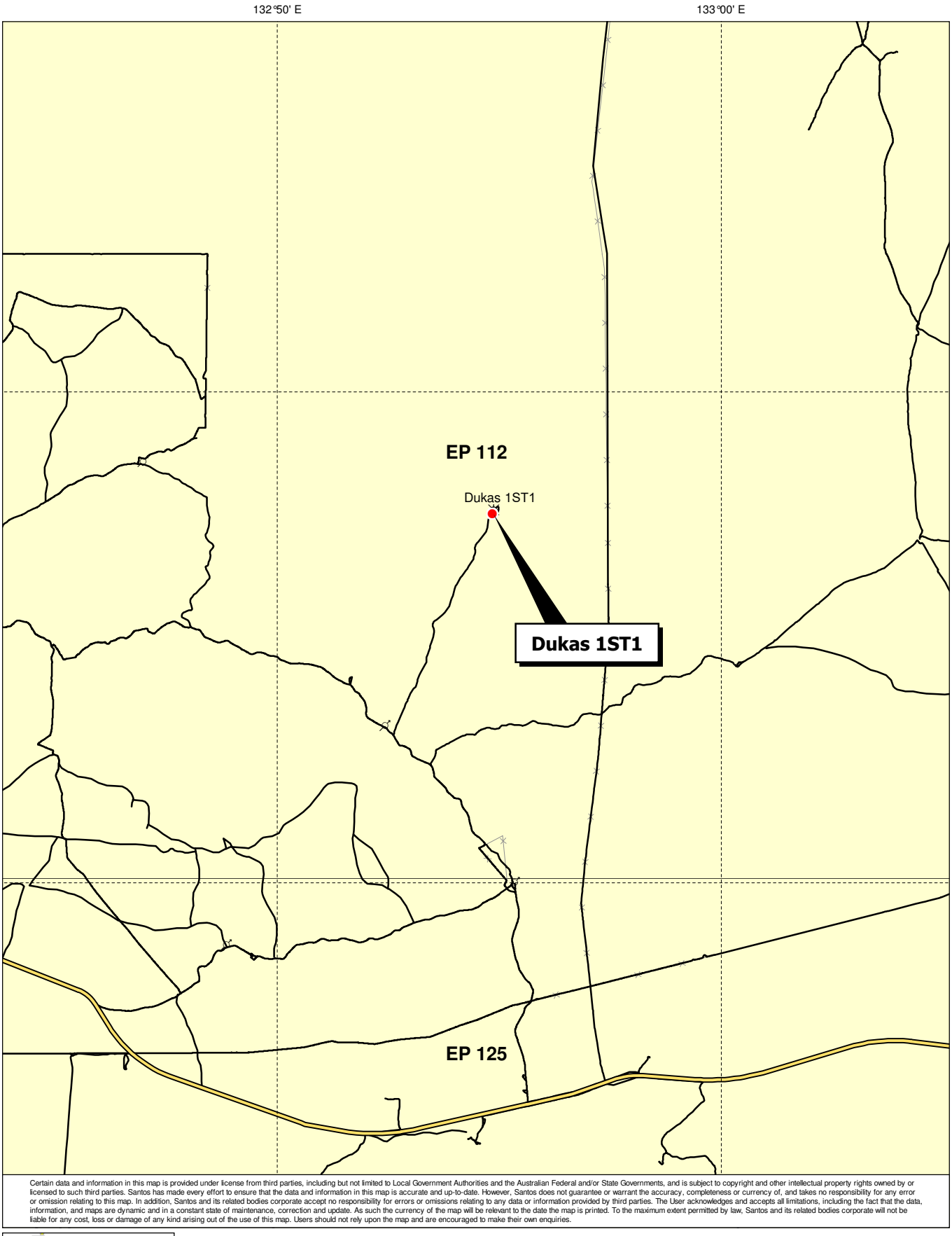
The critical risks associated with the Dukas 1 well were:

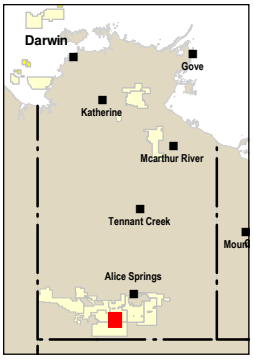
Reservoir – Presence: The thin Heavitree reservoir in Magee 1 (the 5.3 m of proven reservoir cannot be associated with a mappable seismic unit) and its absence in Mt Kitty 1 has been attributed to the location of these wells on the onlapping south-eastern flank of the basin.

Reservoir – Quality: Petrophysically interpreted average Heavitree Formation porosity is 8.2% at Magee 1. For a low side outcome, porosity values at Dukas 1 could be significantly lower than at Magee 1, as the Heavitree Formation was expected to be ~1350m deeper. An average porosity less than the P99 4% was possible.

Charge: a critical risk, given a well-developed basal Gillen Formation source rock has only been intersected in the BL002 mineral hole on the north-eastern margin of the basin.

Figure 1: Dukas 1 location map





Santos Exploration Permit

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EP 112 - Amadeus Basin

Dukas 1ST1

Location Map

0 2 4 6 8 10 Km

Scale: 1:200,000

7 November 2019, File No. AMDEUS 186

GDA

2 Well Summary Sheet

Well Name:	Dukas 1 / Dukas 1 ST1
Classification:	Exploration
Permit:	EP112 / Northern Territory
Well Path:	Sidetracked
Location:	Amadeus Basin / Northern Territory Latitude: 25° 02’ 24.20” South (GDA94) Longitude: 132° 54’ 52.78” East Northing: 7 228 996m Easting: 289 607m
Offset Well:	Magee-1 located >100km E; Mt Kitty-1 located >50km S; Murphy-1 located ~ 40km SW; Erldunda-1 located ~40km SE
Seismic Control:	AMSAN16 2D; IL DK203, XL CSP08-07
Elevation:	494.44m AHD (GL)
RT Elevation:	501.60m
Kick off Depth:	1156.0m MDRT
Total Depth Driller:	1275.0m MDRT (Dukas 1)
Total Depth Logger:	N/A (Dukas 1)
Total Depth Driller:	3704.0m MDRT (Dukas 1 ST1)
Total Depth Logger:	3705.0m MDRT (Dukas 1 ST1)
Casing:	Conductor 1: 26" at 25m MDRT Conductor 2: 17-1/2" at 764m MDRT Surface: 12-1/4" at 2604m MDRT Intermediate: 9-1/2" at 3704m MDRT
Spud:	07:15 hours on 16th April, 2019
Reached TD:	08:30 hours on 2nd August 2019
Rig Released:	23:59 hours on 21st August 2019
Well Status:	Plugged and Suspended Gas Well (PSG)
Suspended:	23:59 hours on 21st August 2019
PBTD:	2557m MDRT

Permit Interests (Voting / Investment):	Santos QNT Pty Ltd 100.0 / 70.0% Frontier Oil and Gas Pty Ltd 0.0 / 30.0%
Rig Name/Type:	Ensign 965 / Land-Onshore
Drilling Contractor:	Ensign

3 Drilling

3.1 Summary of drilling and related operations

Dukas 1:
The well was spudded at 07:15hrs on 16th April, 2019 with the drilling rig Ensign 965. The 17-1/2" deep conductor hole in this well was drilled from 25m to 764m, with the 13-3/8" deep conductor set at 759.3m. A Formation Integrity Test (FIT) was performed to 21.0ppg EMW. 12-1/4" surface hole was then drilled to 1100m. Drilling operations changed from mud to air drilling from 1100m to 1275m.

The drill string became stuck at 1273m after a connection. After attempting to free the string, performing a blind back off and subsequently only being able to recover some of the fish, a decision was made to plug back and abandon Dukas 1. A kick-off BHA was made up and time drilling with mud occurred from 1130.3m to 1156m at which point 100% formation was observed, Dukas 1 was side tracked to Dukas 1 ST1 at 18:30hrs on 16th May, 2019.

Dukas 1 ST1:
Mud drilling of the 12-1/4" surface hole proceeded from kick-off point at 1156m to 2162m. Wireline Suite 1, Run 1: XRMI-X Dipole Sonic-GR and Run 2: QuadCombo-GEM was performed at this time. Following wireline Suite 1, drilling resumed with 12-1/4" surface hole drilled ahead from 2162m to surface casing point at 2604m.

10-3/4" casing was set at 2601m and a Leak Off Test (LOT) performed to 23.6ppg EMW. 9-1/2" intermediate hole was then drilled to 2997m with mud. At this point the top drive was changed out due to a failed gearbox. Drilling resumed from 2997m to 3391m.

While out of the hole, shut in casing pressure was observed. The drill string was stripped in hole to 3383m, circulating 13.1ppg kill mud at 300m intervals. The mud weight was then raised to 13.3ppg.

Intermediate hole drilling resumed from 3391m to what was intended as the 9-1/2" section TD at 3515m. Wireline Suite 2, Run 1: TripleCombo-GEM and Run 2: CAST-XRMI-X Dipole Sonic was performed at this time. The 8-5/8" intermediate liner was run and the liner packer prematurely set at 23m while being run in hole on drill pipe. The liner was subsequently cut free, at which point it dropped to bottom and was then successfully fished out of hole.

Following setting a cement plug and pressure testing the casing, the plug was then drilled out. Drilling of the 9-1/2" hole resumed from 3515m to 3704m with 12.2ppg mud. A visual flow check showed a 3bbl gain over 20 minutes, the well was shut in. The well was killed with 16.1ppg mud and the mud weight was then raised to 16.4ppg. It was decided there would be no further drilling in Dukas 1 ST1, TD was reached at 08:30hrs, 2nd August, 2019 - the primary target was not intersected. A total of 8 bit runs were performed in Dukas 1 ST1.

Wireline Suite 3 was conducted: Run 1: QuadCombo (cable head fault while running in hole at

2100m); Run 2: QuadCombo; Run 3: XCT SWC, 26 cores attempted, 21 full cores recovered (plus 3 rubble). A cement plug was then set from 3704m to 3453.5m. Wireline Suite 3 continued, Run 4: VSP (zero offset and 500m offset).

While drilling Dukas 1 / Dukas 1 ST1, Measurement While Drilling (MWD) surveys were taken at regular intervals to ensure that the well stayed within the specified 300m tolerance. At total depth, it is estimated that the well was within an 184m radius of the well centre.

No oil fluorescence shows were encountered during drilling operations at Dukas 1 / Dukas 1 ST1. Several poor gas shows were observed in Dukas 1 ST1, with total gas peaks of up to 17 units over a background of 3 units (98/2/Tr %).

Dukas 1 ST1 has been plugged and suspended for possible future re-entry, Plug 1A: 3704m-3453.5m; Plug 1B: 3453.5m-3204m; Plug 1C: 3204m-2954m; Plug 1D: 2954m-2704m; Plug 1E: 2704m-2557m; Plug 1F: 2531m-2297m; Plug 2: 1220m-1142.4m; Plug 3: 250m-103.3m. The rig was released at 23:59 hours, 21-08-2019.

3.2 Drilling equipment installed in or on the well

The drilling rig Ensign 965 is an ADR 1500 type, top drive rig, with a cantilever triple mast.

Details of drilling equipment related to Ensign 965 is enclosed in Appendix 1.

3.3 Casing and equipment installed in or on the well

The following table summarises casing sizes, depths and cementing details for Dukas 1 / Dukas 1 ST1.

Table 1: Casing sizes, depths and cementing details

BIT SIZE	DEPTH	CASING SIZE	CASING DEPTH	JNTS	CASING TYPE	CEMENT
17 -1/2”	764m	13-3/8”	759.3m	65	68lb/ft L80 BTC	552.4 barrels (1284 sacks) of 11.8-15.8ppg Class ‘G’ cement plus additives
12-1/4”	2604m	10-3/4”	2601m	223	55.5 lb/ft P110 HUNT	459 barrels (1041 sacks) of 11.8-15.8ppg Class ‘G’ cement plus additives
9-1/2”	3704m	-	-	-	-	Plugged and Suspended (Plugs: 1A-1F, 2, 3)

3.4 Cementing operations carried out

The following table summarises plug cementing details for Dukas 1 ST1.

Table 2: Plug cementing details

PLUG	CEMENT TYPE	CEMENT ADDITIVES	VOLUME (bbls)	DENSITY (ppg)	DEPTHS (m MDRT)
#1A	HTB	D Air 3000L; Halad-413; Latex 3000; CFR-3; SCR-100	86.1	16.8	3704m-3453.5m

#1B	HTB	D Air 3000L; Halad-413; Latex 3000; CFR-3; SCR-100	83.9	16.8	3453.5m-3204m
#1C	Class 'G'	D Air 3000L; Halad-413; Latex 3000; CFR-3; SCR-100	92.1	16.8	3204m-2954m
#1D	Class 'G'	D Air 3000L; Halad-413; Latex 3000; CFR-3; SCR-100	97.2	16.8	2954m-2704m
#1E	Class 'G'	D Air 3000L; Halad-413; Latex 3000; CFR-3; SCR-100	67.3	16.8	2704m-2557m
#1F	Class 'G'	D Air 3000L; Halad-413; Latex 3000; CFR-3; SCR-100	72.5	15.8	2531m-2297m
#2	HTB	D Air 3000L; Halad-413; Latex 3000; CFR-3; SCR-100	31.7	15.8	1220m-1142.4m
#3	Class 'G'	D Air 3000L; Halad-413; Latex 3000; CFR-3; SCR-100	45.5	15.9	250m-103.3m

3.5 Bit Records

The following table summarises bit run details for Dukas 1 / Dukas 1 ST1, bit details are also available in appendix 1.

Table 3: Bit run details

BIT #	MAKE	TYPE / MODEL		SIZE	HOURS	METERS	CONDITION
1	Baker	Kymera	KTX636T	17-1/2"	88.0	739	1-1-BT/CT-A-0-In-WT/PN-TD
2	Baker	Kymera	KMX525T	12-1/4"	15.6	67	2-6-RO-S-0-In-BT-PR
3	Baker	Kymera	KMX525T	12-1/4"	44.7	164	2-2-BT-A-0-I-CR-TQ/PR
4	Baker	Kymera	KTX525T	12-1/4"	34.1	105	8-5-CR-C-0-I-WT-PR
5	Smith	Hammer	H141D+V7RPD	12-1/4"	15.7	175	Lost In Hole
6	Baker	TCI	GX-44GDX	12-1/4"	32.9	78	2-2-CT-S-E-1-NO-PR
7	Baker	Kymera	KMX525T	12-1/4"	101.8	704	2-6-BT-S-E-I-CT-HR
8	Baker	Kymera	KMX525T	12-1/4"	27.7	224	1-2-BT-S-E-I-NO-LOG
9RR	Baker	Kymera	KMX525T	12-1/4"	56.9	442	1-4-BT-S-E-I-CT-TD
10	Baker	Kymera	KMX525	9-1/2"	56.5	249	1-2-WT-S-E-I-NO-HR
11	Baker	Kymera	KMX525	9-1/2"	68.8	538	3-3-BT-N-5-1-LT-HR
12	Baker	Kymera	KMX525	9-1/2"	33.0	124	1-1-WT-G-X-I-NO-TD
13	Baker	Kymera	KMX525	9-1/2"	41.3	189	1-1-CT-G-X-I-NO-TD

3.6 Drilling Fluids

The following table summarises drilling fluid details for Dukas 1.

Table 4: Drilling fluid details for Dukas 1

Hole/Bit Size		**17-1/2"**
Interval		**25m – 764m**
Drilling Fluid	Mud Type	KCl/Polymer
	Mud Weight	9.75 – 9.6
	Funnel vis	40 - 44
	PV	6 - 8
	YP	10 - 16
	pH	8.5 – 9.0
	API fluid loss	3.0 – 5.9

	Chlorides	26000 - 36000
	KCL %	5.3 – 7.0
Hole/Bit Size		**12-1/4”**
Interval		**764m – 1100m**
Drilling Fluid	Mud Type	KCl/Polymer
	Mud Weight	9.0 – 10.1
	Funnel vis	39 - 41
	PV	6 - 9
	YP	8 - 14
	pH	8.8 – 10.0
	API fluid loss	4.0 – 6.4
	Chlorides	20000 - 118000
	KCL %	4.2 – 5.0
Hole/Bit Size		**12-1/4”**
Interval		**1100m – 1275m**
Drilling Fluid	Mud Type	Air / Mist / Foam
	Mud Weight	-
	Funnel vis	-
	PV	-
	YP	-
	pH	-
	API fluid loss	-
	Chlorides	-
	KCL %	-

The following table summarises drilling fluid details for Dukas 1 ST1.

Table 5: Drilling fluid details for Dukas 1 ST1

Hole/Bit Size		**12-1/4”**
Interval		**1156m – 2604m**
Drilling Fluid	Mud Type	KCl/Polymer
	Mud Weight	9.05 – 10.9
	Funnel vis	36 - 44
	PV	7 - 20
	YP	21 - 25
	pH	8.5 – 9.3
	API fluid loss	2.8 – 5.4
	Chlorides	56000 - 200000
	KCL %	5.0 – 5.4
Hole/Bit Size		**9-1/2”**
Interval		**2604m – 3704m**
Drilling Fluid	Mud Type	KCl/Polymer
	Mud Weight	10.7 – 13.3
	Funnel vis	40 - 49
	PV	12 - 24
	YP	15 - 25
	pH	8.8 – 9.8

	API fluid loss	2.7 – 5.8
	Chlorides	189000 - 203600
	KCL %	5.0 – 5.5

4 Geology

4.1 Formation Tops

The following table summarises formation tops for Dukas 1 / Dukas 1 ST1.

Table 6: Formation tops

FORMATION	FORMATION TOPS				
	ACTUAL TOP		High / Low	PROGNOSED TOP	
	(MDmRT)	(TVDmSS)	Prognosis	(MDmRT)	(TVDmSS)
DUKAS 1					
Surficial Deposits	7.0	494.0	-	7.0	494
Pertnjara Group	22.0	479.6	0.4 H	22.0	480.0
Larapinta Group	379.0	123.2	14.8 H	364.0	138.0
Pertaoorta Group	508.0	-5.3	29.3 H	478.0	24.0
Areyonga Formation	520.0	-17.3	1225.7 H	1745.0	-1243.0
Wallara Formation	725.0	-221.7	1434.3 H	2158.0	-1656.0
Johnnys Creek Formation	835.0	-331.0	1404.0 H	2237.0	-1735.0
Loves Creek Formation	987.0	-480.9	1338.1 H	2321.0	-1819.0
DUKAS 1 ST1					
Gillen Formation	1180.0	-671.7	1315.3 H	2489.0	-1987.0
Upper Gillen Formation	1180.0	-671.7	1315.3 H	2489.0	-1987.0
Gillen Fm Evaporites	1375.0	-866.4	1395.6 H	2764.0	-2262.0
Total Depth	3704.0	-3191.2	-	3652.0	-3150.0

4.2 Reservoir and Prospective Horizons

Dukas 1 is a Heavitree-Gillen conventional play in the Southern Amadeus Basin. The Dukas Prospect was first identified as a lead by the AMSAN13 regional seismic survey and Frogtech SEEBASETM regional basement map. Follow up seismic acquired in two rounds between December 2016 and April 2018 has delineated a number of sub-salt closures on a large regional high, optimally located to receive charge from the interpreted Neoproterozoic depocentre.

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5. Ordovician part of the Larapinta Group. Proven, gas in Mereenie and Palm Valley, oil in Surprise.

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Basin, where thicknesses can range from 100 m to 400 m. Outcrops comprise massive, thick quartzite beds with rare mudstones and conglomerates. It is heavily silicified in the thrusts observed in outcrop along the MacDonnell Ranges, but much less silicified in the Limbla Cliffs near the north-east basin margin. This suggests that silicification could be related to fluid movement through faults (Lindsay, 1999). It is thought that silicification may decrease towards the south and at depth.

5 Formation Sampling

5.1 Drill Cuttings

The following tables summarises drilling cuttings samples for Dukas 1 and Dukas 1 ST1.

Table 7: Drilling cuttings samples for Dukas 1

DEPTH INTERVAL (m)	SAMPLING INTERVAL IN (m)	REMARKS
25 – 1102	3	WBM drilling
1102 – 1150	3	UBD (Air drilling)
1150 – 1270	6	UBD (Air drilling)
1270 – 1275 (TD)	5	UBD (Air drilling)

Table 8: Drilling cuttings samples for Dukas 1 ST1

DEPTH INTERVAL (m)	SAMPLING INTERVAL IN (m)	REMARKS
1156 – 2389	3	WBM drilling
2389 – 2467	6	WBM drilling / No sample catchers
2467 – 3004	3	WBM Drilling
3004 – 3392	6	WBM drilling / No sample catchers
3392 – 3704 (TD)	3	WBM drilling

Detailed drill cuttings lithological descriptions are enclosed in Appendix 2.

5.2 Mud gas

A total of 47 IsoTubes and 6 IsoJars were collected in Dukas 1 ST1. Onsite gas composition analysis was performed by PetroLab on Isotube samples collected from gas peaks while drilling and circulating. A detailed summary of samples is enclosed in Appendix 3.

6 Formation Evaluation

6.1 Mudlogging

Halliburton provided mudlogging services for the drilling of Dukas 1 / Dukas 1 ST1. This included conventional mudlogging, real time data monitoring, drilling analysis, and calcimetry analysis. Mudlogging data is enclosed in Appendix 4.

Mudlogging services were provided by Halliburton Unit 12229764 with the following parameters monitored:

1. Total Gas

2. Chromatographic Gas Breakdown (Chromatograph: C1-C5 in 60 seconds)
3. Hydrogen Sulphide Levels (3 sensors)
4. Depth/Rate of Penetration.
5. Pipe Speed/Block Position
6. Top drive RPM
7. Top drive Torque
8. Hook Load/Weight On Bit
9. Standpipe Pressure
10. Mud Pump Rate (2 pumps)
11. Mud Pit Levels (10 pits including the trip tank)
12. Mud flow paddle
13. CO_2 detection

6.2 MWD/LWD Logging

Logging While Drilling (LWD) data was acquired by Halliburton. LWD services consisted of Gamma Ray and Directional in the 17-1/2" and 12-1/4" hole sections from 54m to 2604m, and Gamma Ray, Resistivity and Directional in the 9-1/2" hole section from 2604m to total depth at 3704m. Field data, log displays and deviation survey are enclosed in Appendix 5.

Table 9: MWD/LWD run details

LOG (LWD)	SUITE/ RUN	INTERVAL (m)	COMMENTS
DUKAS 1			
LWD/MWD	1 / 1	54.0 – 764.0	GR-Directional Survey; 17-1/2" Section
LWD/MWD	1 / 2	764.0 – 831.0	GR-Directional Survey; 12-1/4" Section
LWD/MWD	1 / 3	831.0 – 995.0	GR-Directional Survey; 12-1/4" Section
LWD/MWD	1 / 4	995.0 – 1100.0	GR-Directional Survey; 12-1/4" Section
LWD/MWD	1 / 5	1100.0 – 1275.0	GR-Directional Survey; 12-1/4" Section
DUKAS 1ST1			
LWD/MWD	1 / 6	1156.0 – 1234.0	GR-Directional Survey; 12-1/4" Section
LWD/MWD	1 / 7	1234.0 – 1938.0	GR-Directional Survey; 12-1/4" Section
LWD/MWD	1 / 8	1938.0 – 2162.0	GR-Directional Survey; 12-1/4" Section
LWD/MWD	1 / 9	2162.0 – 2604.0	GR-Directional Survey; 12-1/4" Section
LWD/MWD	1 / 10	2604.0 – 2853.0	GR-RES-Directional Survey; 9-1/2" Section
LWD/MWD	1 / 11	2853.0 – 3391.0	GR-RES-Directional Survey; 9-1/2" Section
LWD/MWD	1 / 12	3391.0 – 3515.0	GR-RES-Directional Survey; 9-1/2" Section
LWD/MWD	1 / 13	3515.0 – 3704.0	GR-RES-Directional Survey; 9-1/2" Section

6.3 Wireline Logging

Three wireline logging suites consisting of a total of nine runs were conducted in Dukas 1 ST1. No wireline logging was conducted in Dukas 1.

Table 10: Wireline Logging

LOG (WIRELINE)	SUITE/ RUN	INTERVAL (m)	COMMENTS
SUITE 1			

RUN 1: XRMI-SONIC-GR	1/1		67.8°C/14.25hr @ 2160.6m
XRMI		749 - 2160	
X DIPOLE SONIC		750 - 2148	
GR		28 - 2140	
RUN 2: QUADCOMBO-GEM	1/2		67.2°C/29.75hr @ 2160.6m
SGR		33 - 2121	
DLL		749 - 2151	
MSFL		749 - 2156	
XY DEN		749 - 2137	
NEUTRON		749 - 2126	
GEM		588 - 2124	
6CAL		749 - 2143	
SP		749 - 2108	
SUITE 2			
RUN 1: QUADCOMBO-GEM	2/1		90°C/26.25hr @ 3514.7m
GR		2000 - 3487	
SGR		2590 - 3490	
DLL		2590 - 3509	
MSFL		2590 - 3514	
DEN		2590 - 3498	
NEUT		1980 - 3495	
SP		2590 - 3476	
GEM		2590 - 3497	
RUN 2: CAST-XRMI-SONIC	2/2		No thermometers
CAST		2589 - 3506	
XRMI		2590 - 3485	
X DIPOLE SONIC		2590 - 3493	
GR		2590 - 3478	
RUN 3: RDT-GR	2/3		Run abandoned Due to equipment failure
SUITE 3			
RUN 1: QUADCOMBO	3 / 1		Equipment failure
RUN 2: QUADCOMBO	3 / 2		90.5°C @ 3705m
GR		3671-3485	52 Hrs 45 Min
DLL		3399-3699	
MSFL		3399-3704	
DEN		3399-3672	
NEUT		3399-3669	
X DIPOLE SONIC		3399-3688	
6CAL		3399-3680	
SP		3399-3655	
RUN 3: XCT SWC	3 / 3		92°C @ 3700m
SWC		3125.3 – 3693	75 Hrs 45 Min 26 CUT / 21 (Plus 3 rubble) REC
RUN 4: VSP	3 / 4		
VSP		3360 – 15	No thermometers

6.4 Hydrocarbon Indications

6.4.1 Gas detection whilst drilling

Gas levels were monitored from the surface to TD, using an FID total gas detector and FID chromatograph. Total gas was monitored in gas units (1unit = 200ppm methane equivalent in air) and the chromatograph was calibrated to measure ppm (parts per million) concentrations of the alkane gasses methane, ethane, propane, butane and pentane.

A summary of Gas detection whilst drilling is enclosed in Appendix 6.