

# **Relinquishment Report**

**Licence P2435**

**UKCS Blocks 47/10d & 48/06c**

**Blackadder**

**December 2022**

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### 1 Licence Information

- Licence Number: P2435
- Start Date: 1<sup>st</sup> Oct 2018
- Block Number(s): 47/10d & 48/06c
- Working Interests: Parkmead (E&P) Limited (75%),  
Deltic Energy PLC (25%)
- Licence Round: 30
- Licence Type: Innovate Phase A
- License Expiry Date: 30<sup>th</sup> Sept 2022

### 2 Licence Synopsis

License P2435 consists of two blocks, 47/10d and 48/06c located in the Southern North Sea of the UKCS (**Figure 1**). The primary prospectivity on the license consists of the Teviot discovery and Blackadder prospect, both reservoirised in the Lower Permian Rotliegendes Leman sandstone (**Figure 2**).

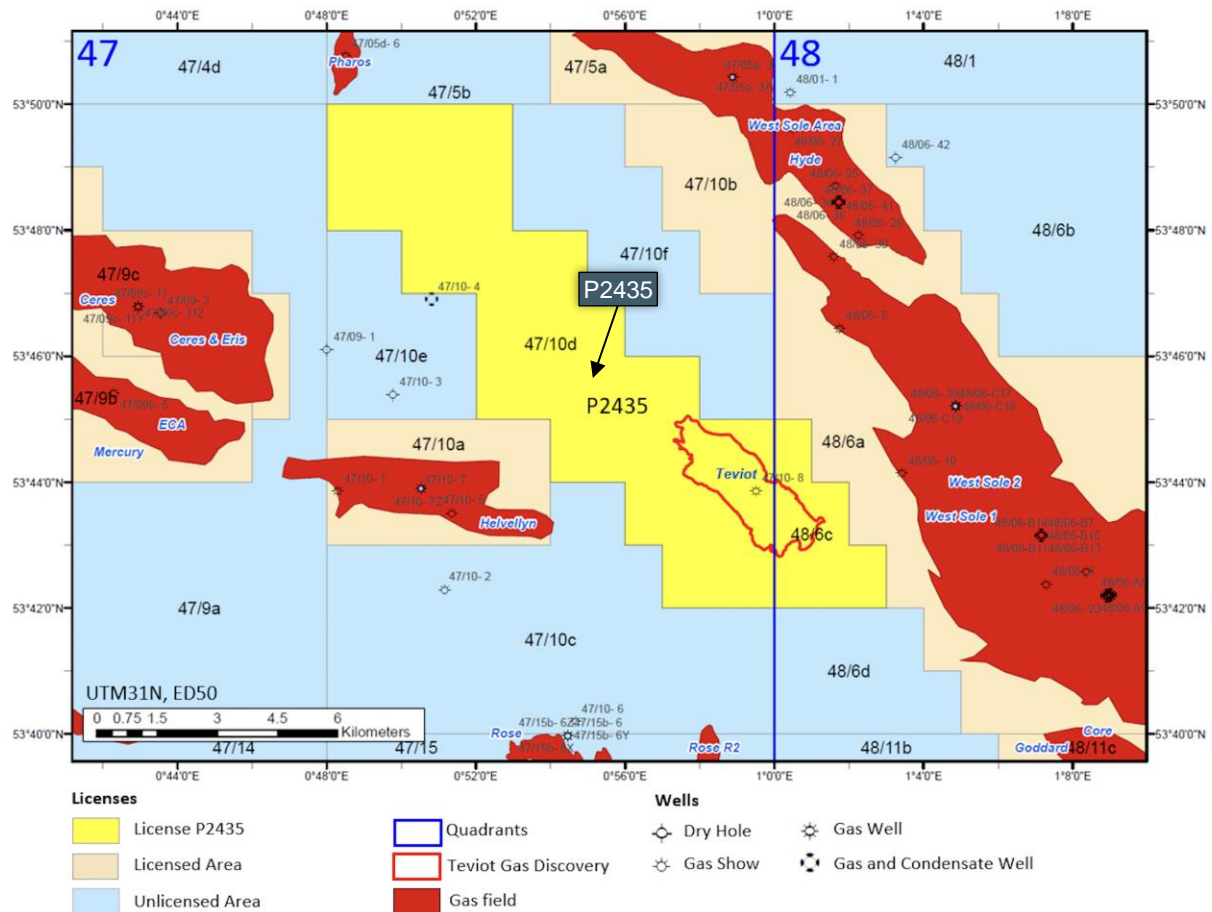
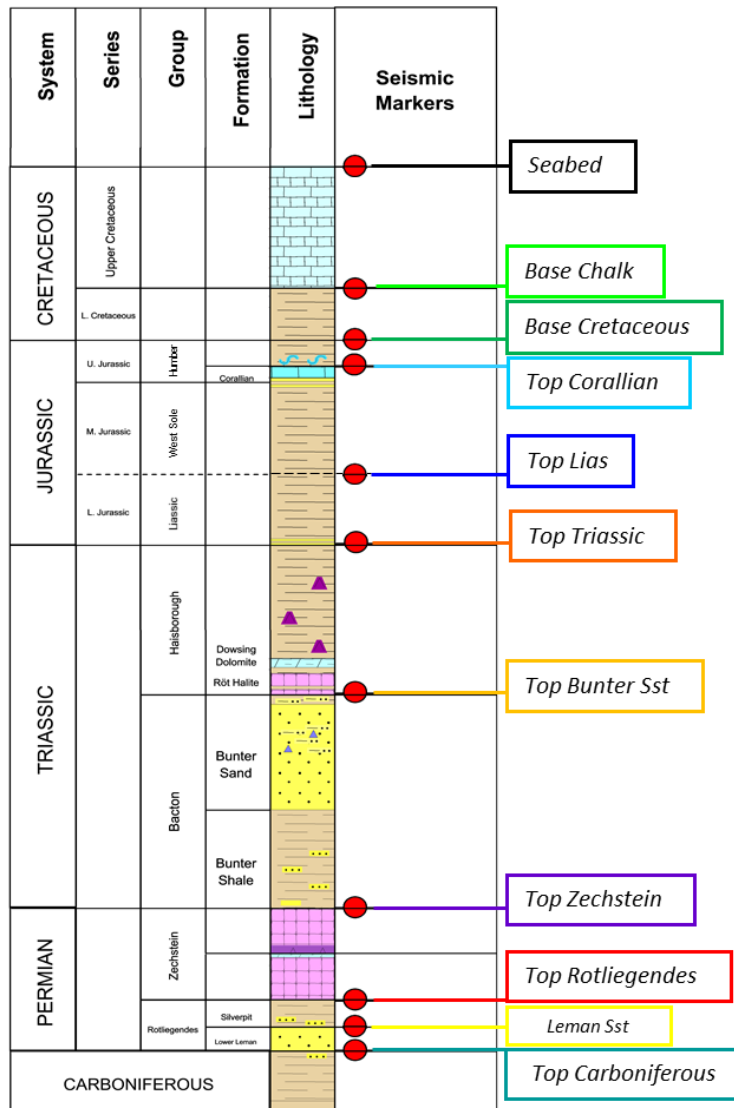


Figure 1: Location map.

Licence P2435 (Block 47/10d & 48/06c) was awarded on the 1<sup>st</sup> October 2018 as a 30<sup>th</sup> Round Innovate licence to Parkmead (E&P) Limited (75%) and Deltic Energy (25%). The work programme consisted of undertaking structural history, structural mapping, depth conversion, reservoir quality and fracture studies.

All prospectivity identified in the application, remains. However, despite Blackadder having a robust structural trap, several on-structure faults may cause the prospect to be compartmentalised and may affect ultimate gas recovery. Reservoir quality in the area is moderate to poor. This combined with the structural complexity indicate that multiple wells may be required to access modest potential resources. Teviot is a small discovery with a level of resource uncertainty due to the discovery well not encountering GWC. Attempts were made to reduce risk exposure by farming-out the licence. Despite marketing and holding discussions with all the key players in the area, there was no interest from any potential farminee to pursue these opportunities. Licence P2435 was therefore relinquished at the end of the initial term (end Innovate Phase A).



**Figure 2:** Schematic Stratigraphy of the Southern North Sea

### 3 Work Programme Summary

Work programmes for the initial terms on P2435 were as follows:

#### Phase A

Firm commitments

- Undertake structural history, structural mapping, depth conversion, reservoir quality and fracture studies.

There is no Phase B

#### Phase C

Drill-or-Drop provision

- Drill one well to 3000m or 50m into the Carboniferous, whichever is the shallower, or:
- Determine the License before the end of the initial Term.

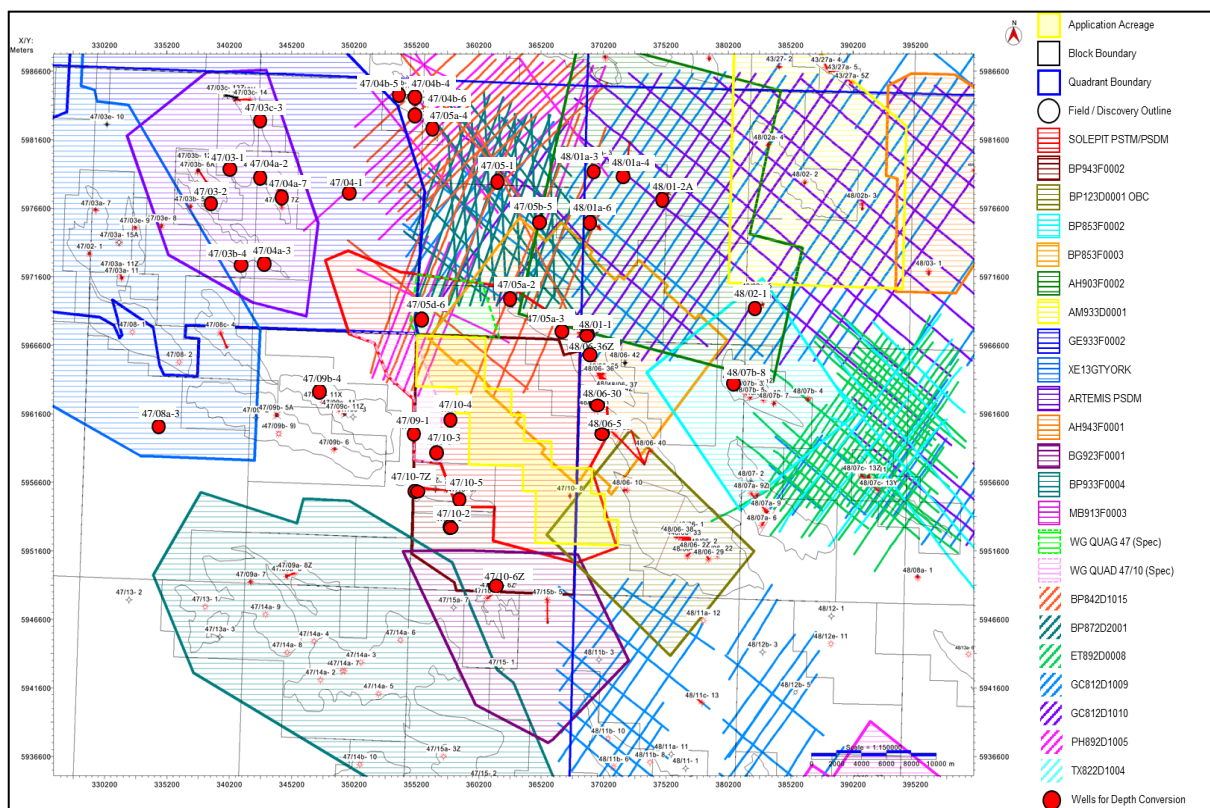
Parkmead completed Phase A of the work programme and was given approval from NSTA and the JV partner to relinquish P2435. Without a farminee, Parkmead and its JV partner believe there is too much uncertainty to justify entering Phase C and drilling a well.

#### 4 Database

Several seismic surveys and reprocessed seismic products were used in the evaluation of blocks 47/10d & 48/06c and the surrounding region. Only one proprietary survey covers the entirety of the two blocks (BP 1994 BP943F0002 survey). Several other proprietary 3D surveys exist in the surrounding area and were obtained and interpreted as part of a regional study; these surveys are detailed in **Table 1** and **Figure 3**.

The majority of seismic interpretation for license P2435 was made using the Western Geco 2012 Solepit PSTM/PSDM products. This reprocessing project was undertaken by Western Geco on a speculative basis to create a multi-client product. It used the BP943F0002 survey as well as several other proprietary surveys along with existing Western Geco owned Speculative data ('Q47' and '47/10' surveys) as data inputs to the reprocessing.

Where 3D is lacking regionally, 2D has been obtained to infill and tie wells where possible.



**Figure 3:** Seismic database map and wells used for regional depth conversion.

Survey (CS9)	Year	Contractor	Comments	Current Owner
GC812D1009	1981	SSL	2D	Shell
GC812D1010	1981	SSL	2D	Shell
TX822D1004	1982	SSL	2D, 2.4 km cable	Chevron
BP842D1015	1984	WesternGeophysical	2D, 2.85 km cable	BP
BP853F0002	1985	WesternGeophysical	2.7 km cable	BP
BP853F0003	1985	WesternGeophysical	2.7 km cable	BP
BP872D2001	1987	WesternGeophysical	2D, 2.85 km cable	BP
ET892D0008	1989	SSL	2D, 2 km cable	Shell
PH892D1005	1989	SSL	2D, 3 km cable	ConocoPhillips
AH903F0002	1990	HGS	3 km cable	HESS
MB913F0003	1991	SSL	2 km cable	Perenco
BG923F0001	1992	Geco-Prakla	2.4 km cable	Centrica
AM933D0001	1993	Geco-Prakla		Premier
GE933F0002	1993	Geco-Prakla	2.4 km cable	Perenco
BP933F0004	1993	GECO	2.4 km cable	BP
WG Quad 47 (GE933F0003)	1993	Geco-Prakla	Spec	Schlumberger
BP943F0002	1994	Geco-Prakla	2 km cable	BP
AH943F0001	1994	GECO		HESS
WG Quad 47/10 (GE943F0018)	1994	Geco-Prakla	Spec	Schlumberger
ARTEMIS PSDM	2008	WesternGeco	BG, Reprocessed GE933F0002	BP
BP123D0001	2012	WesternGeco	OBC	BP
SOLEPIT PSTM/PSDM	2012	WesternGeco	WG, Reprocessed, multi-survey	Schlumberger
XE13GT YORK	2013	Dolphin	3 km+ cable	Centrica

**Table 1:** Seismic Database.

Parkmead has access to all the released exploration and appraisal wells within the area.

A total of 40 wells were assessed regionally and well-ties were performed where velocity and sonic data allowed. Synthetics were initially performed using a 25hz Ricker wavelet before extracting a wavelet for individual wells. 11 wells are present within the Western Geco 2012 PSTM/PSDM seismic area, however one, being the 47/10-8 (Teviot) well has no time-depth data (checkshots, velocity log etc.) available to allow for a good quality well-tie.

Depth conversion was performed using a layer cake interval velocity model (**Table 2**). Interval velocity functions were derived from the time-depth data of a series of regional offset wells; 39 wells were assessed and used in the final depth conversion, 10 of which were within the Western Geco 2012 PSTM/PSDM seismic area.

TWT Horizons in Interval	Layer	# Wells	Model Function
(Seafloor Depth from wells)	SEAFLR_Z (water column)	39	Depth Grid from Seafloor top @ wells (TVDSS)
Seafloor - Base Chalk	SEAFLR_BCHLK (Tertiary + Chalk)	15	Interval Velocity = dTWT/dZ dZ (m) = 1484 * dTWT(s) (R <sup>2</sup> = 0.99) Few wells in the PSDM/application area have chalk
Base Chalk – Base Cretaceous	BCHLK_BCRET (L. Cretaceous)	25	Interval Velocity = kZ <sub>mid</sub> + V <sub>0</sub> <b>k = 0.34 V<sub>0</sub> = 2118 m/s</b> Where B_CHLK absent grid merge with SEAFLR
Base Cretaceous – Top Triassic	BCRET_TTRI (Jurassic)	37	Interval Velocity = kZ <sub>mid</sub> + V <sub>0</sub> <b>k = 0.69 V<sub>0</sub> = 2213 m/s</b>
Top Triassic - Top Bunter	TTRI_TBUNT (U. Triassic)	36	Interval Velocity = kZ <sub>mid</sub> + V <sub>0</sub> <b>k = 0.31 V<sub>0</sub> = 3317 m/s</b>
Top Bunter - Top Zechstein	TBUNT_TZECH (Bunter)	28	Interval Velocity = kZ <sub>mid</sub> + V <sub>0</sub> <b>k = 0.64 V<sub>0</sub> = 2766 m/s</b> <b>uplift model used</b>
Top Zechstein - Top Rotliegendes	TZECH_TROT (Zechstein)	34	Average velocity 4675 m/s (unless dTWT ≤ 0.1s, then use 5000m/s)
Top Rotliegendes – Top Leman	TROT_TLEMAN (Silverpit)	28	Average velocity 4900 m/s
Top Leman - BPU	TLEMAN_BPU (Leman)	35	Average velocity 4480 m/s

**Table 2:** Parkmead 30<sup>th</sup> Licence Round Application Base Case Depth Conversion Methodology

Alternative depth conversion scenarios were also run by Parkmead and are discussed within this report.

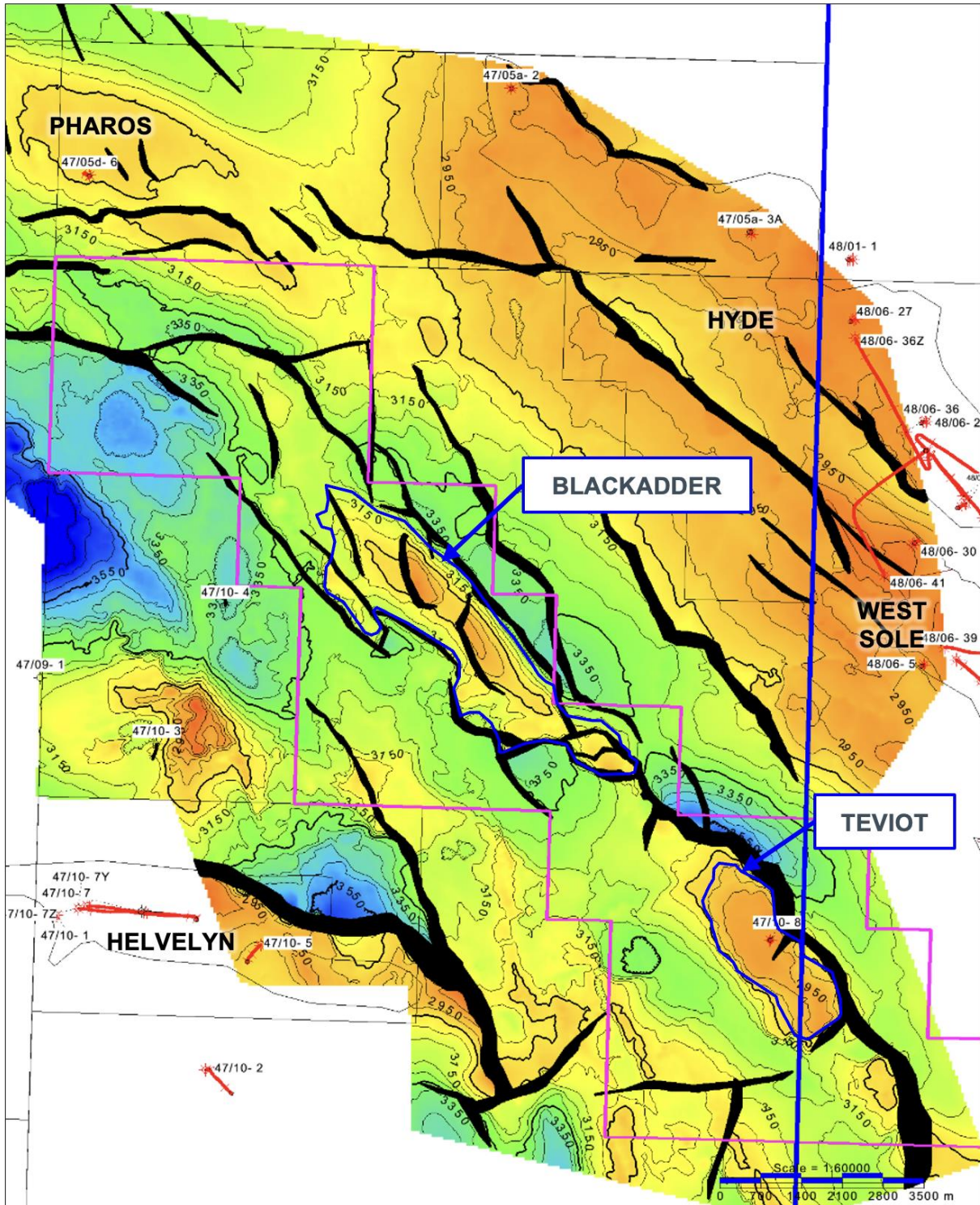
Nine wells have been drilled in the entirety of Block 47/10 (**Table 3**); there are no wells in block 48/06c although the Hyde and West Sole fields are present in the remainder of Block 48/06. Key information is also available to Parkmead from the adjacent Block 47/05d (where Parkmead Group were a 30.8% partner), where the Pharos discovery has been drilled. Well 47/10-8 is the Teviot discovery well. Most of the other wells in Block 47/10 are related to the Helvellyn Field, which produces from a Rotliegendes reservoir.

Well	Year	TD (m)	Operator	Comments
47/10-1	1984	3175.7	BP	P&A gas discovery for Helvellyn; Rotliegend and Carboniferous reservoir
47/10-2	1987	3449	BP	P&A with a very thin gas column in the Leman
47/10-3	1987	2508	BP	P&A dry; TD in the target Bunter Sandstone
47/10-4	1989	2358	BP	Abandoned dry; TD in the Zechstein
47/10-5	1990	3057	BP	Abandoned, gas shows in Leman and Carboniferous
47/10-6	1998	2904	BG	P&A, Leman gas discovery; TD in Carboniferous
47/10-7	2002	2603	ATP	Appraisal/development well for Helvellyn
47/10-7y,z	2003	2791	ATP	Development well for Helvellyn
47/10-8	2005	3159	Newfield	Teviot discovery well; Leman reservoir
47/5d-6	2013	3150	Dana	Pharos discovery well; Leman reservoir (only has 298m of sonic data covering the Zechstein and Rotliegendes sections)

**Table 3:** key offset wells.

## 5 Prospectivity Update

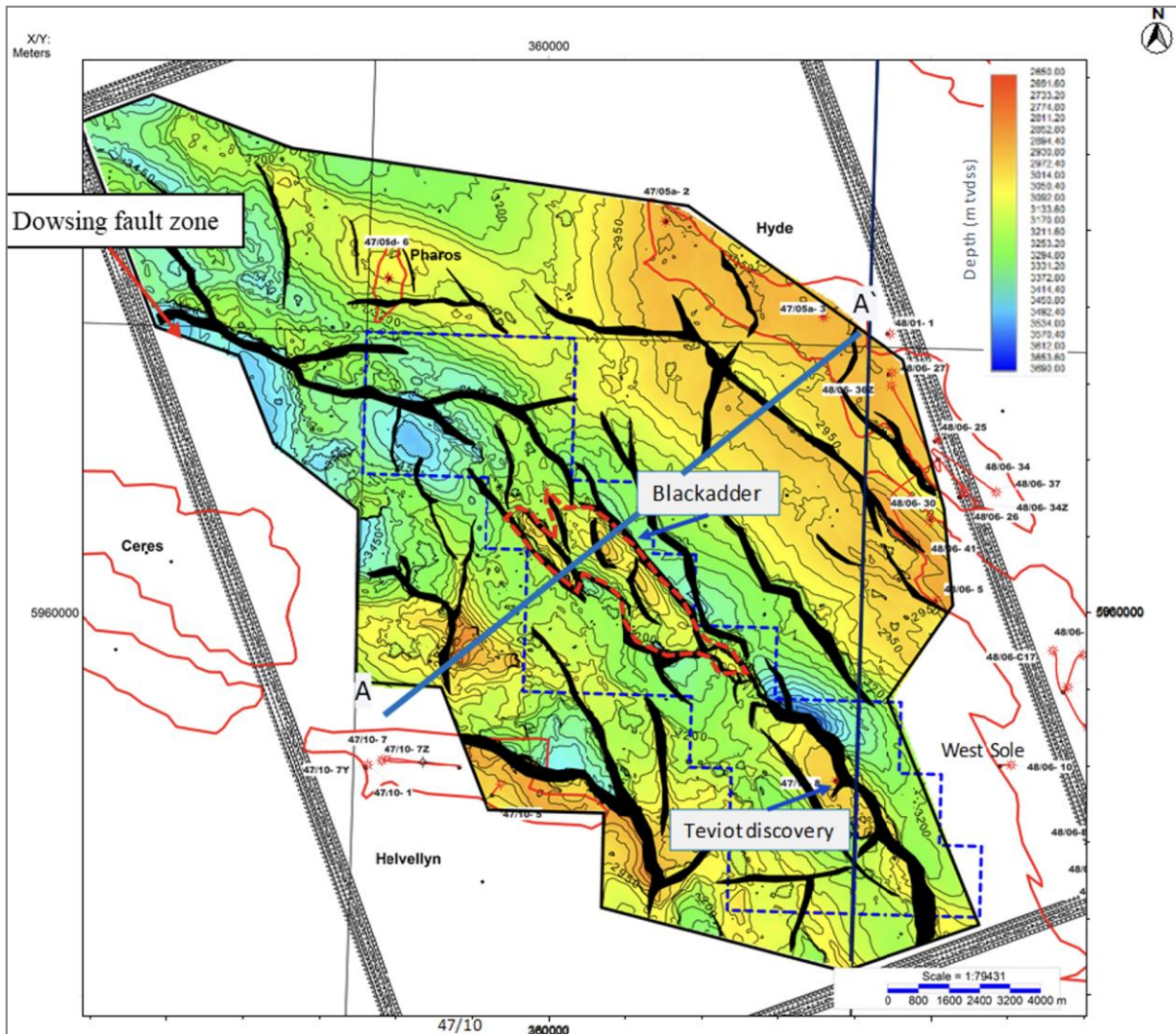
At the time of application for License P2435 a single prospect named Blackadder and a single discovery named Teviot (formerly Bob, formally Newark) were identified at Base Permian level on Blocks 47/10d & 48/06d (Figure 4).



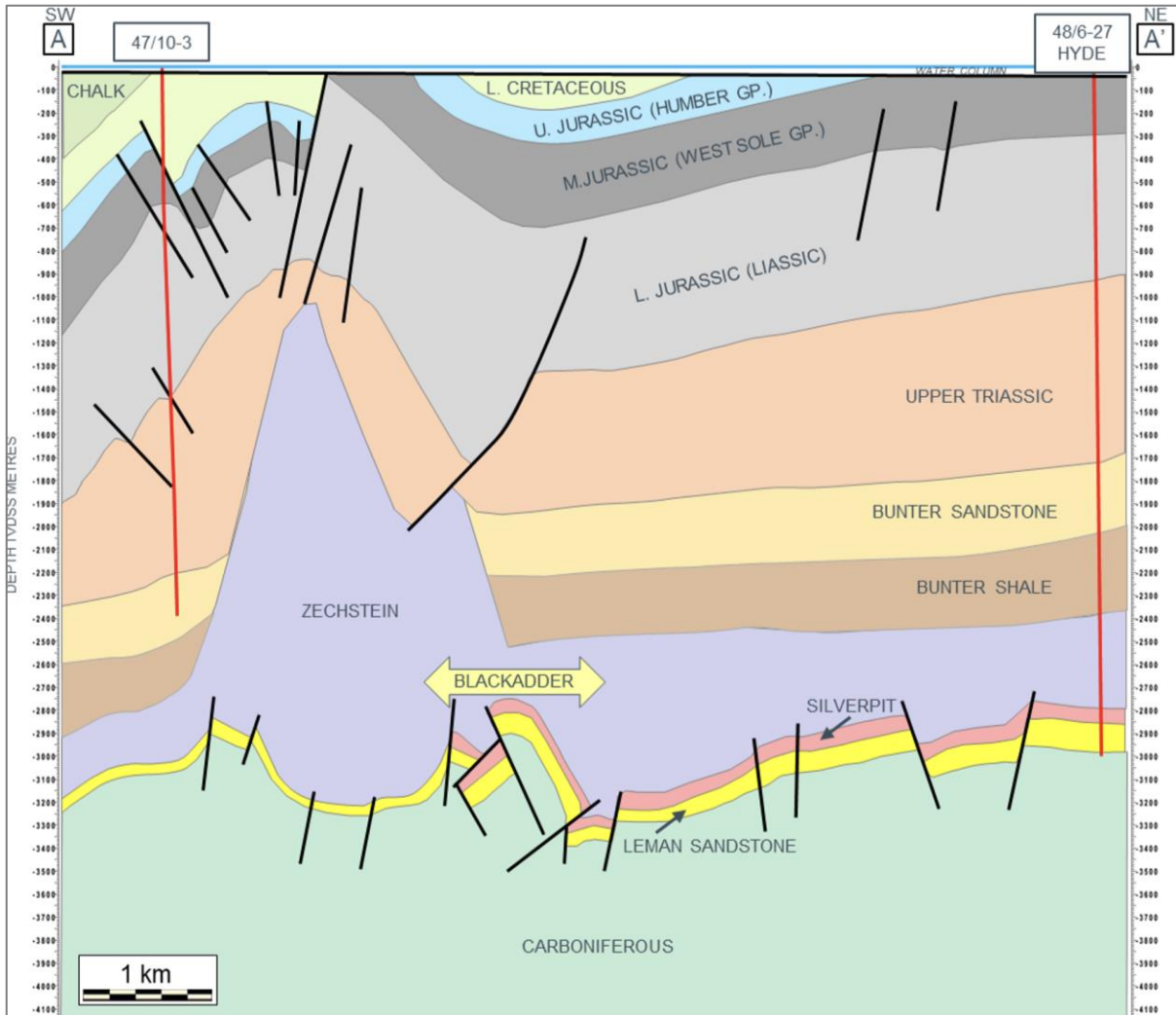
**Figure 4:** Top Leman Depth Map (TVDSS m) 50m contour interval showing Blackadder prospect and Teviot discovery.

## Blackadder Prospect

The Blackadder Prospect is a heavily faulted Base Permian structural closure with Rotliegendes (Leman) reservoir (**Figure 5**). The feature is structurally robust and appears to have formed as a pop-up feature on a transpressional restraining bend of the Dowsing Fault Zone (**Figure 6**). The geological overburden is geometrically simple, with the complex geology of the Triassic and Zechstein salt movements, common in the area, being localised to the west of Blackadder. Despite being a robust structural trap, the faulting may cause the prospect to be compartmentalised and affect ultimate gas recovery.



**Figure 5:** Blackadder Top Leman depth map (TVDSS m) 50m contour interval and location of cross-section line (A-A').



**Figure 6:** North East - South West Blackadder geoseismic cross-section (A-A').

The prospect lies to the east of the Dowsing Fault Zone and is thus predicted to lie within the main depocentre for relatively clean aeolian facies of the Lemman Sandstone. Clean aeolian sands are well developed in adjacent wells and fields (e.g. West Sole, Hyde and Pharos). However, the nearby Pharos discovery well (47/05d-6) encountered a significant thickness of aeolian Lemman sands with extremely low permeabilities. The well was cored over almost the entire Lemman section and provides a good data set for understanding the reservoir potential of Pharos. Average core analysis porosity is 12.6%, while the corresponding core permeability (Klinkenberg corrected at 800 psi overburden) is only 0.19mD; almost all permeabilities are <1mD (**Figure 7**).

Burial history modelling by Midland Valley (2016) suggests the Lemman sands at Blackadder may have been buried as deeply as those at Pharos, increasing the risk that authigenic illite will have severely reduced reservoir potential. However, Blackadder does not lie beneath an area of salt withdrawal like Pharos. Areas of salt withdrawal and point loading onto the underlying Rotliegendes result in anomalously poor reservoir quality as demonstrated by Hoetz et. al. (2011) in the Netherlands. While the depth of burial is likely to have had an adverse effect on reservoir quality in Blackadder this should not be as extreme as Pharos and subsequent inversion has the potential to develop an open fracture system. Such fracture networks play an

important role in the economic viability of Leman reservoirs in the adjacent West Sole (e.g. Winter and King, 1991) and Hyde Fields.

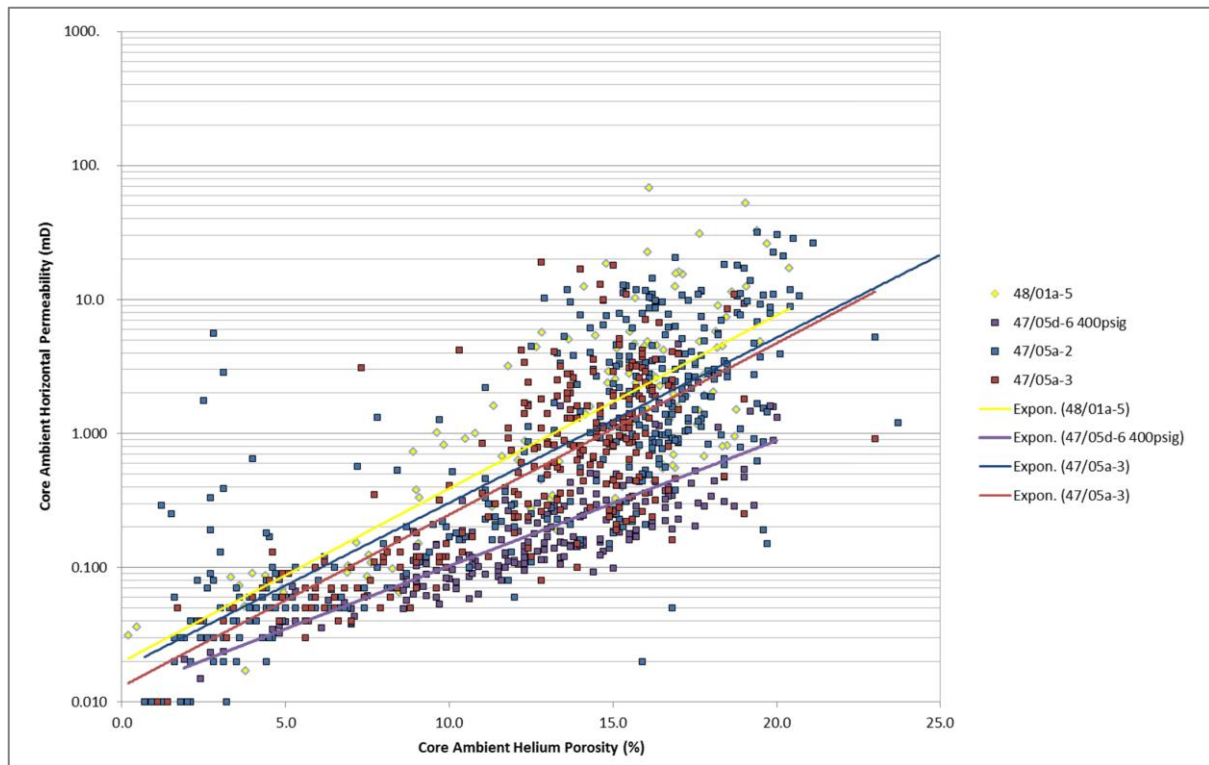
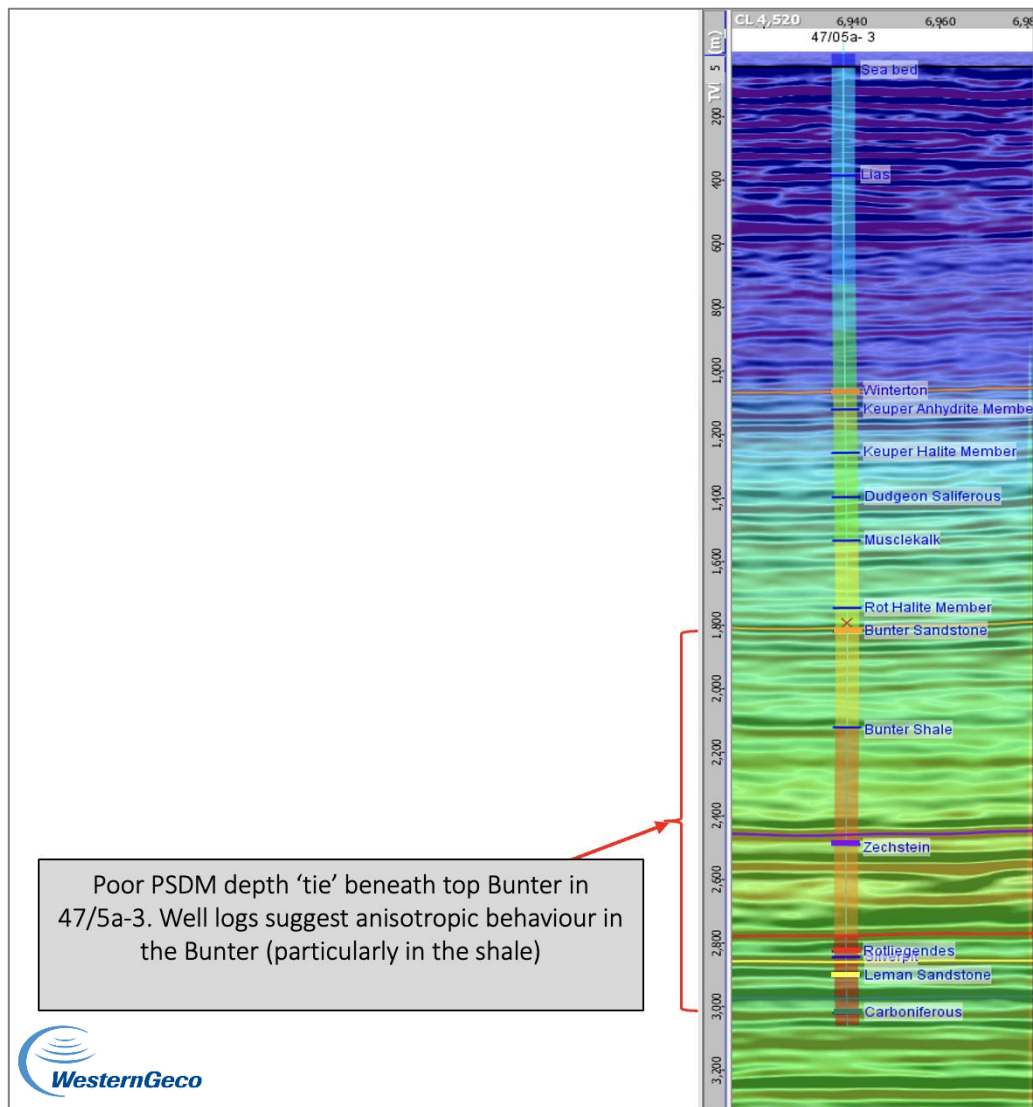


Figure 7: Reservoir quality variation in fields adjacent to P2435.

## Depth Conversion

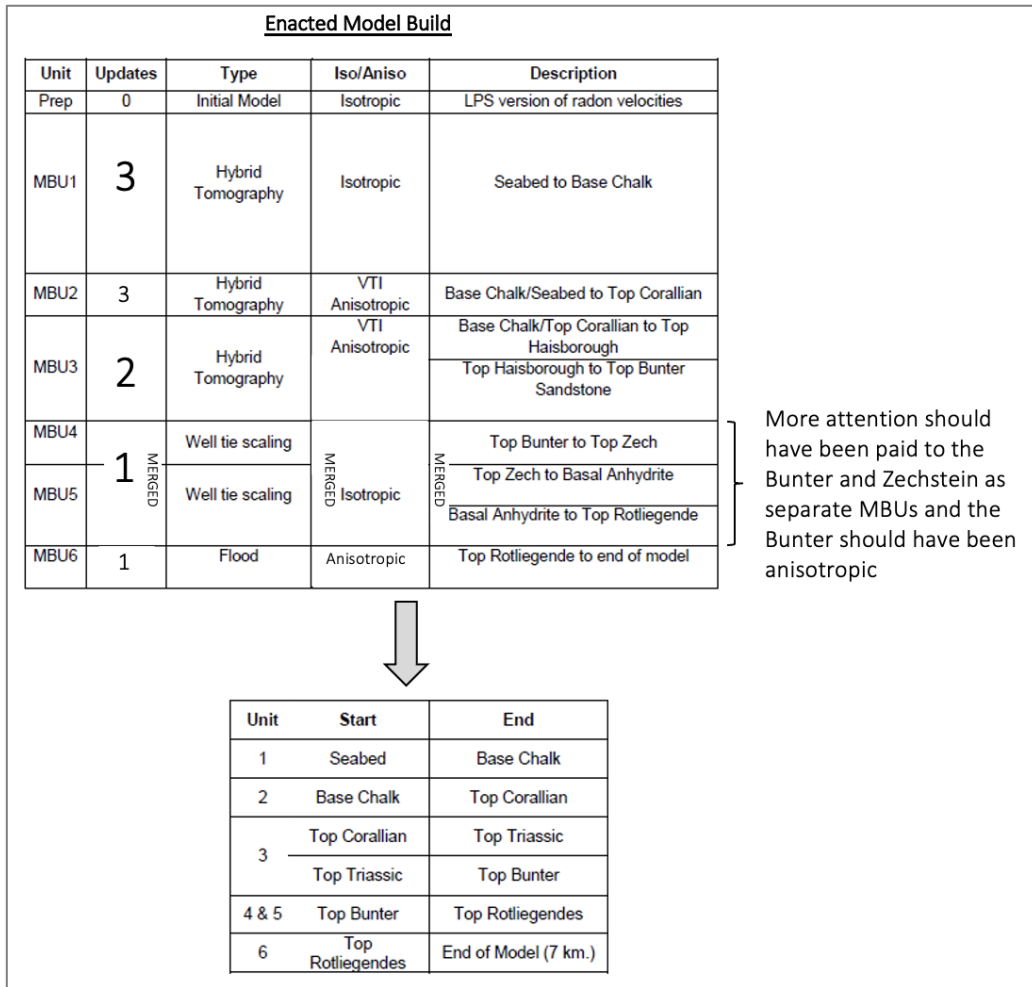
The Depth Conversion study was undertaken to address the depth mapping uncertainties in the area. Western Geco 2012 Solepit PSTM and PSDM imaging over the area is moderate to good quality, particularly where the overburden is simple. 11 horizons were picked in both time and depth (**Figure 2**). Top Leman and BPU can be picked and show conformance to well-generated isopach methods. Some picks are occasionally more difficult due to subsurface complexity (e.g. salt thickness variation, salt withdrawal and salt related absence of younger sections) and lack of well data causing interpretation uncertainty in some areas.

In some areas the PSDM depth volume, calibrated with residual shifts at well ties is sufficiently reliable to be used directly. However, in places, WG 2012 PSDM velocities appear to be inconsistent with known geology (e.g, 47/05a-3 (**Figure.8**)). Optimisation of the PSDM velocities by reflection tomography failed to improve the velocities due to the structural complexity of the area.

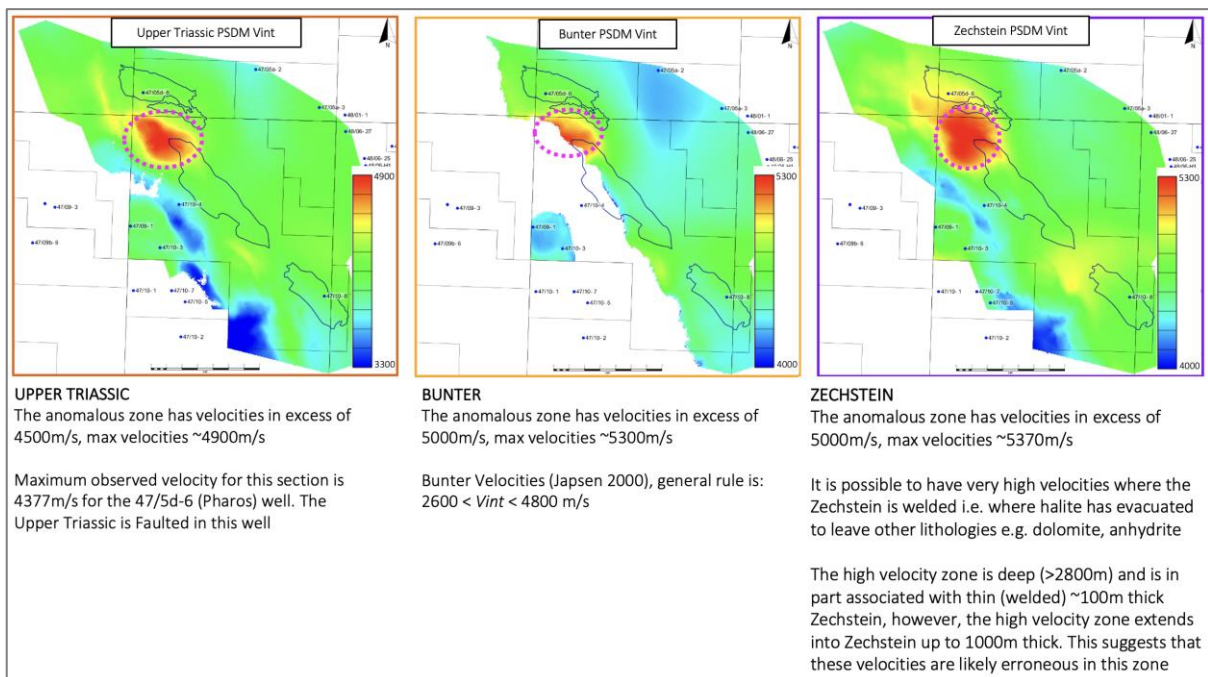


**Figure 8:** Western Geco 2012 PSDM TWT with velocity model overlay showing tie to well 47/05a-3.

The velocity model building scheme for WG 2012 PSDM shows model building units (MBU) four (Top Bunter to Top Zechstein) and five (Top Zechstein to Top Rotliegendes) were grouped together (**Figure 9**). This was not appropriate as these formations have quite different geological properties and velocity behaviour. **Figure 10** shows likely PSDM Vintage anomalies for Upper Triassic, Bunter and Zechstein horizons.



**Figure 9: Enacted model build for WG 2012 PSDM with comment.**

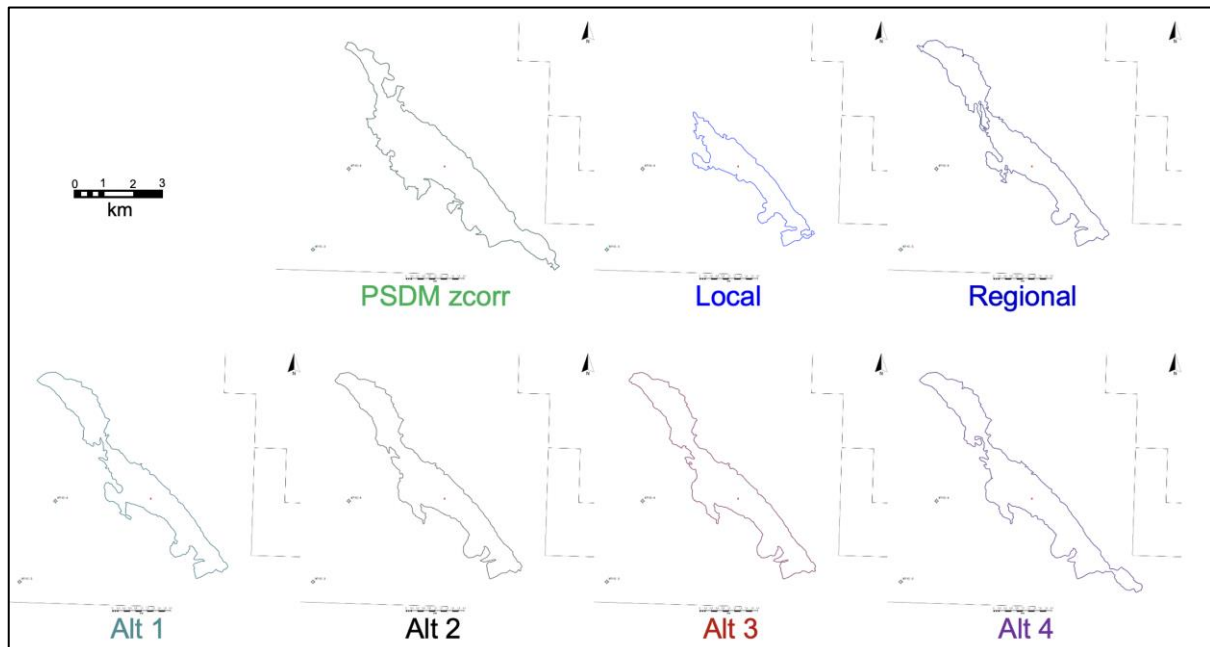


**Figure 10: PSDM Vintage likely anomalies.**

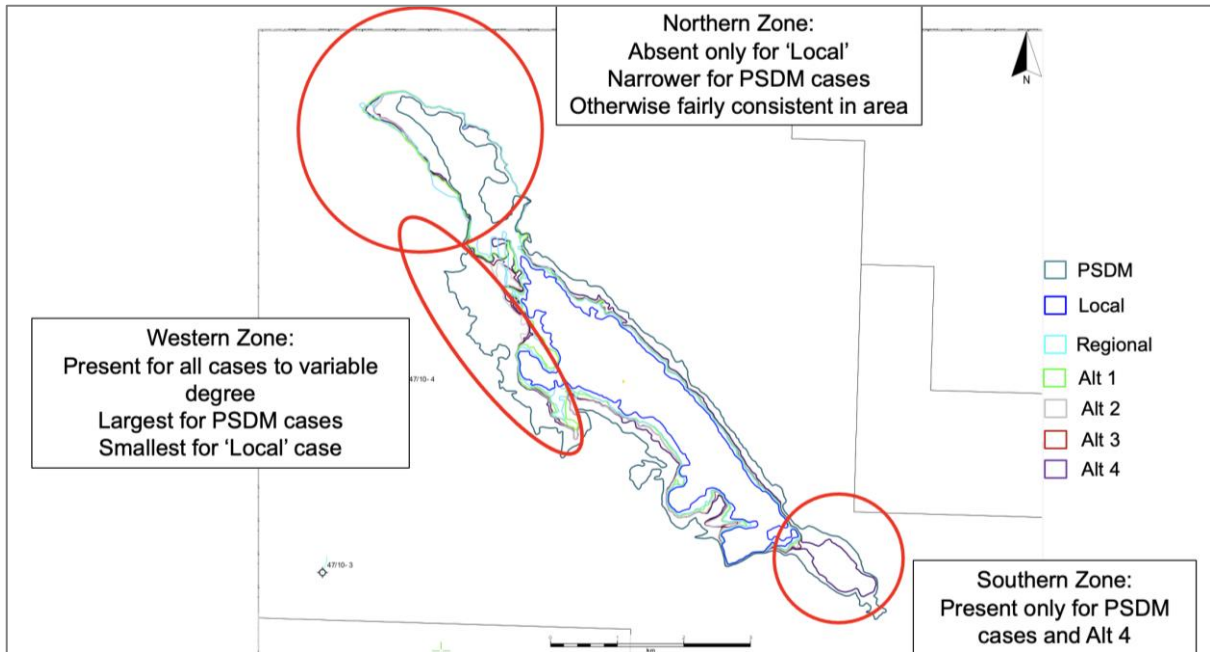
Parkmead revisited a depth conversion model previously conducted by Hansa, with similar results. However, the Hansa study assumes the PSDM depths are correct to Top Solling, which is questionable away from wells. Therefore, a full Seabed to Top Reservoir depth conversion was carried out using a suitable layer-cake model to explore depth conversion uncertainty.

Six different depth conversions (**Table 4**) were used in addition to the well calibrated PSDM depth case (**Figures 11 & 12**). The PSDM depth model case produces the largest Blackadder GRV. In the other depth model cases, the Blackadder GRV ranges from 270MM m<sup>3</sup> (Local case) to 569MM m<sup>3</sup> (Alt 4) (**Table 5**). Taking the below reservoir properties this results in a deterministic GIIP range of 140Bcf to 295Bcf.

- Porosity: 0.129
- Net to gross: 0.86
- S<sub>g</sub>: 0.55
- FVF: 241



**Figure 11: Blackadder Tied Polygons from Depth Conversion.**



**Figure 12: All Tied Polygons with commentary.**

Case	Description	Summary
Zcorr PSDM	Original model including Bunter and Zechstein grouping in one MBU.	Likely inaccuracies particularly to the North West of Blackadder.
Local	Using wells only within the seismic area. For some horizons additional wells located within 4km or less of the area were used.	Blackadder is reduced in size in comparison to the PSDM case. Blackadder becomes larger when tied to wells.
Regional (bunter revised)	Additional more regional wells which may have more representative geology used to create velocity functions. (42/27b-2 & 48/17a-9 are the wells furthest afield at ~35km from the seismic area, chosen due to their representative geology)	On the whole errors are similar to those for the Local case, however regional trends tend to show a lower intercept value (V0) and an increased (steeper) gradient value (K)
Alternative 1	Additional U Jurassic & M-L Jurassic Layers (instead of single Jurassic layer) using Corallian pick – Depth Conversion from Seabed	The standard deviation on Top Rotliegendes depth errors at the wells is lower for the Alt-1 than the regional. Top Rotliegendes depth errors for Alt-1 are smaller at all wells except for 47/09-1.
Alternative 2	Depth Conversion begins at uncorrected PSDM Top Corallian pick. The depth conversion beneath the Top Corallian is the same as for the Alt 1 case	This case does not seem to be any more or less valid than the regional case. Results plot between the shallow Local case and the deep PSDM case.
Alternative 3	Depth Conversion begins at corrected PSDM Top Corallian pick. The depth conversion beneath the Top Corallian is the same as for the Alt 1 case. The MSL to Top Corallian uses the PSDM velocity profile.	Results plot between the shallow Local case and the deep PSDM case and Alt 2 is generally shallower than Alt 3.
Alternative 4	As Alt 1 but using revised M-L Jurassic function.	Standard deviation of Top Leman depth errors at the wells is higher with Alt-4 than Alt-1, which suggests that Alt-1 better honours the well data.

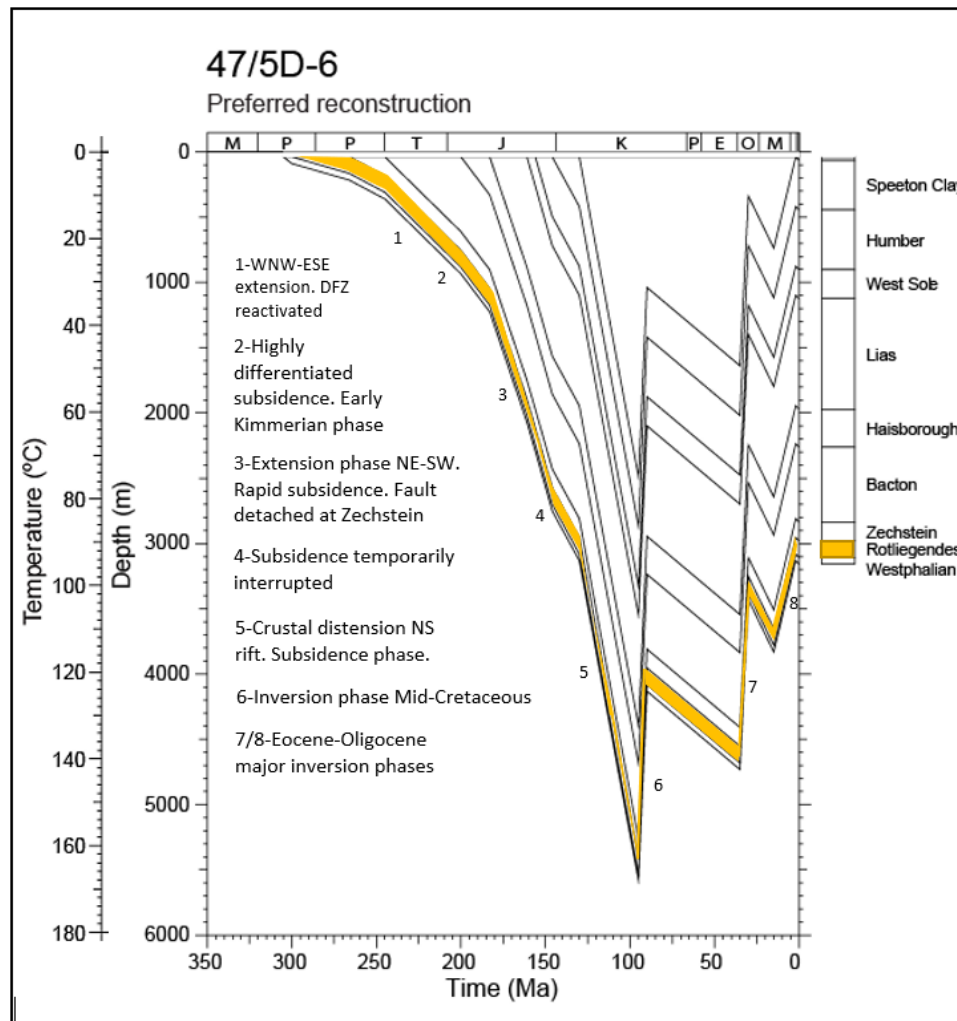
**Table 4: Depth Conversion Methods. All depth conversions are Seafloor to Top Rotliegendes unless otherwise stated (Alt 2 & Alt 3).**

case	closing contour m	area km <sup>2</sup>	volume km <sup>2</sup> .m	crest m	max height m
Zcorr PSDM	3188	11.84	709	2817	371
Local	3056	4.45	270	2806	250
Regional (bunter revised)	3078	7.90	483	2806	272
Alternative 1	3084	8.12	495	2812	272
Alternative 2	3043	8.83	536	2756	287
Alternative 3	3059	8.70	528	2775	284
Alternative 4	3125	9.33	569	2831	294

**Table 5: Depth Conversion Polygon Areas (Tied) for Blackadder.**

## Structural evolution

The review of the structural history of the area (Cuello, 2019) included apatite fission track analysis and vitrinite reflectance studies of well 47/05d-6 (Pharos) and thermo-burial history of wells 47/05d-6, 48/06-5 and 47/25-1 (**Figure 13**). Based on the thermo-burial reconstruction of the Pharos discovery, at the end of the major extension phase, the Rotliegend Group was buried 2500m more than the current depth (3000m).



**Figure 13:** Thermal history of the wells 47/05d-6, 48/06-5 and 47/25-1.

Three seismic lines crossing the structure (or associated fault) were interpreted (**Figure 14**) and sub-Zechstein reconstruction models created (**Figure 15a & 15b**). The Blackadder structure is less complex to the SE (section 2) than to the NW (section 1).

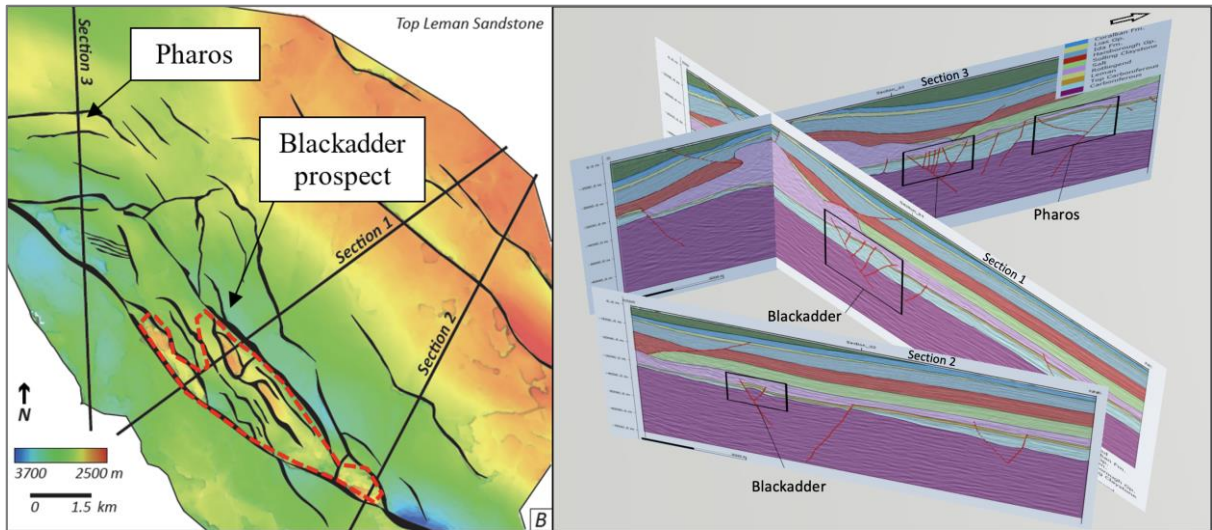


Figure 14: Location of the seismic lines that underwent reconstruction.

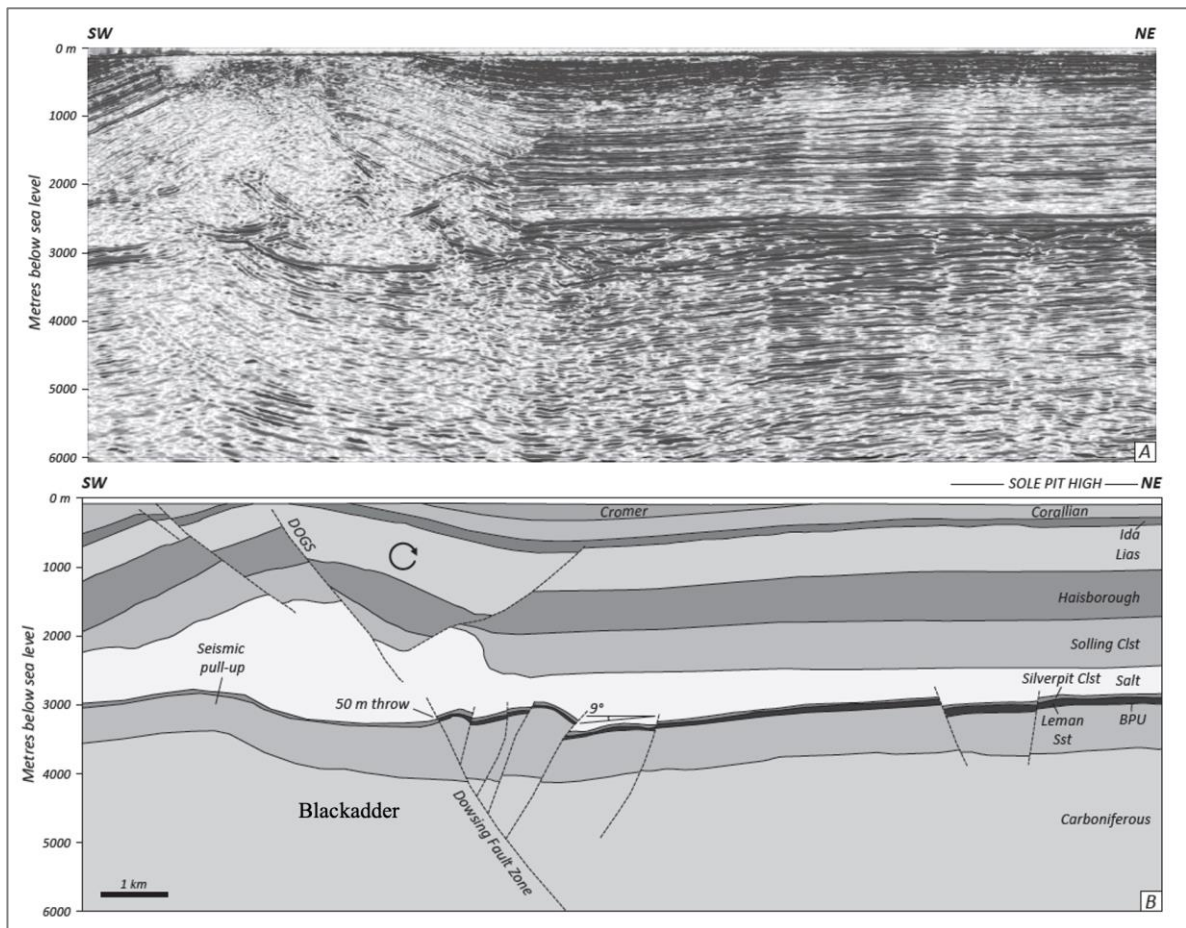
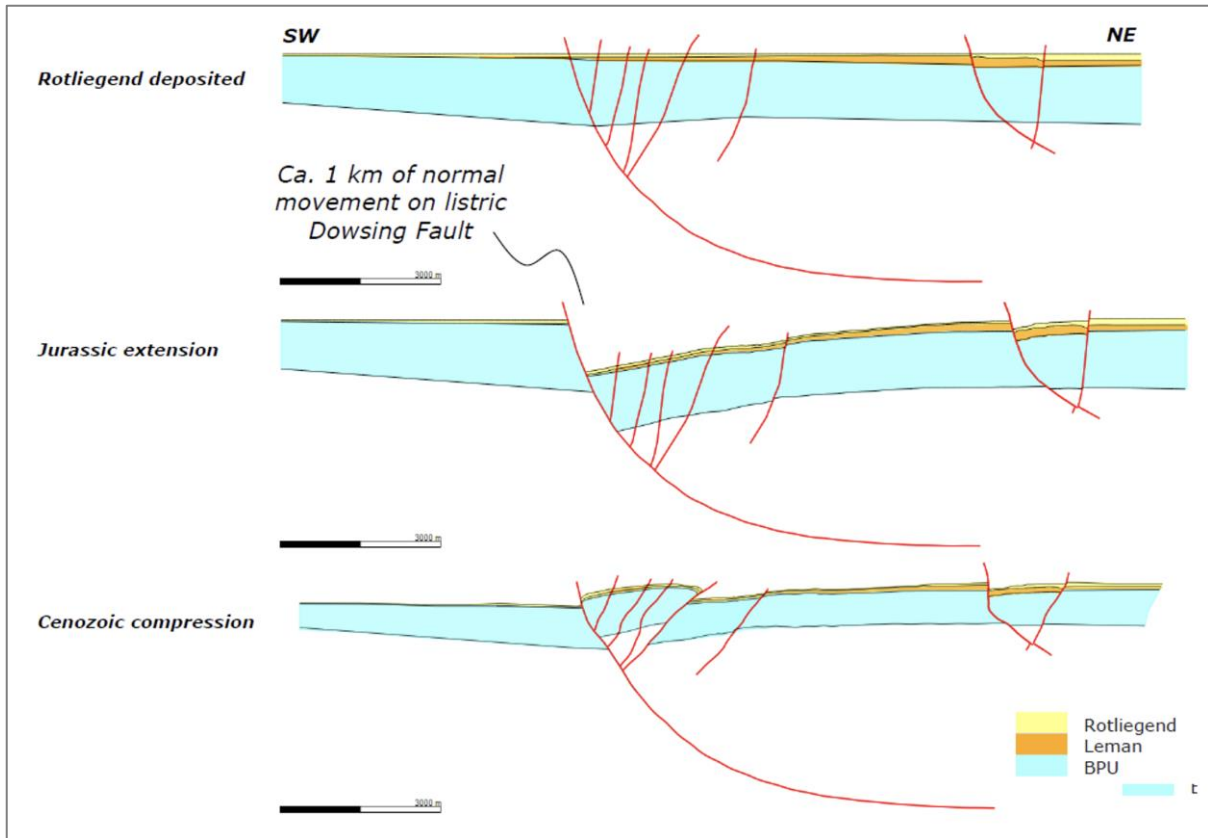


Figure 15a: Seismic section 1.



**Figure 15b:** Example section 1 reconstruction.

## Fracture Analysis

The Rotliegend reservoir in Blackadder is expected to have low permeability and the presence of fractures is considered important for gas production at commercial rates. A combination of core data (17 wells) and drilling parameters (37 wells) were used in the fracture study (Cuello, 2019). **Figure 16** shows the fracture study methodology taken on analysing core data. Host rock lithology and cement composition were also looked at.

Mud losses were the best drilling parameter used to determine the presence of fractures in the Lower Lemman sandstone. **Figure 17** shows the integration of core and mud loss data. The type of fracture identified was then calibrated with extracted seismic attribute responses. Correlation of the 'mean curvature' seismic attribute with fracture type (**Figure 18**) suggests that the Blackadder area is likely to have partly-opened and opened fractures. DST results in the area also show a higher volume of gas produced in wells that have partly-opened and opened fractures.

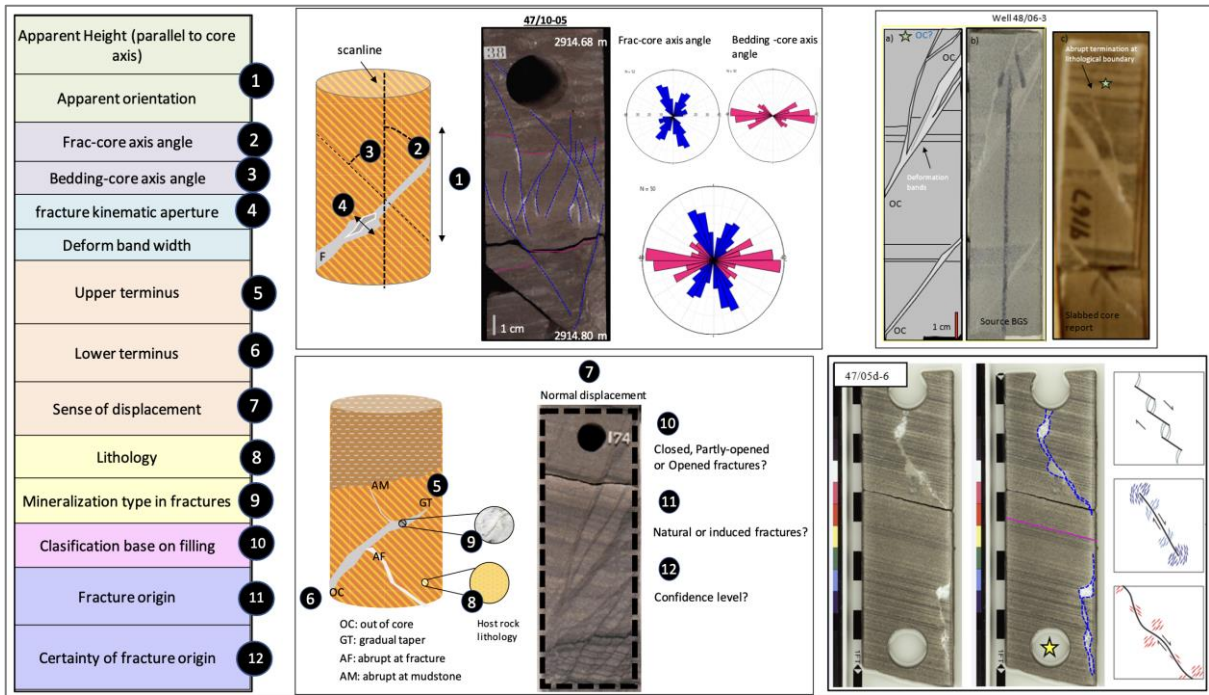


Figure 16: Core fracture study examples.

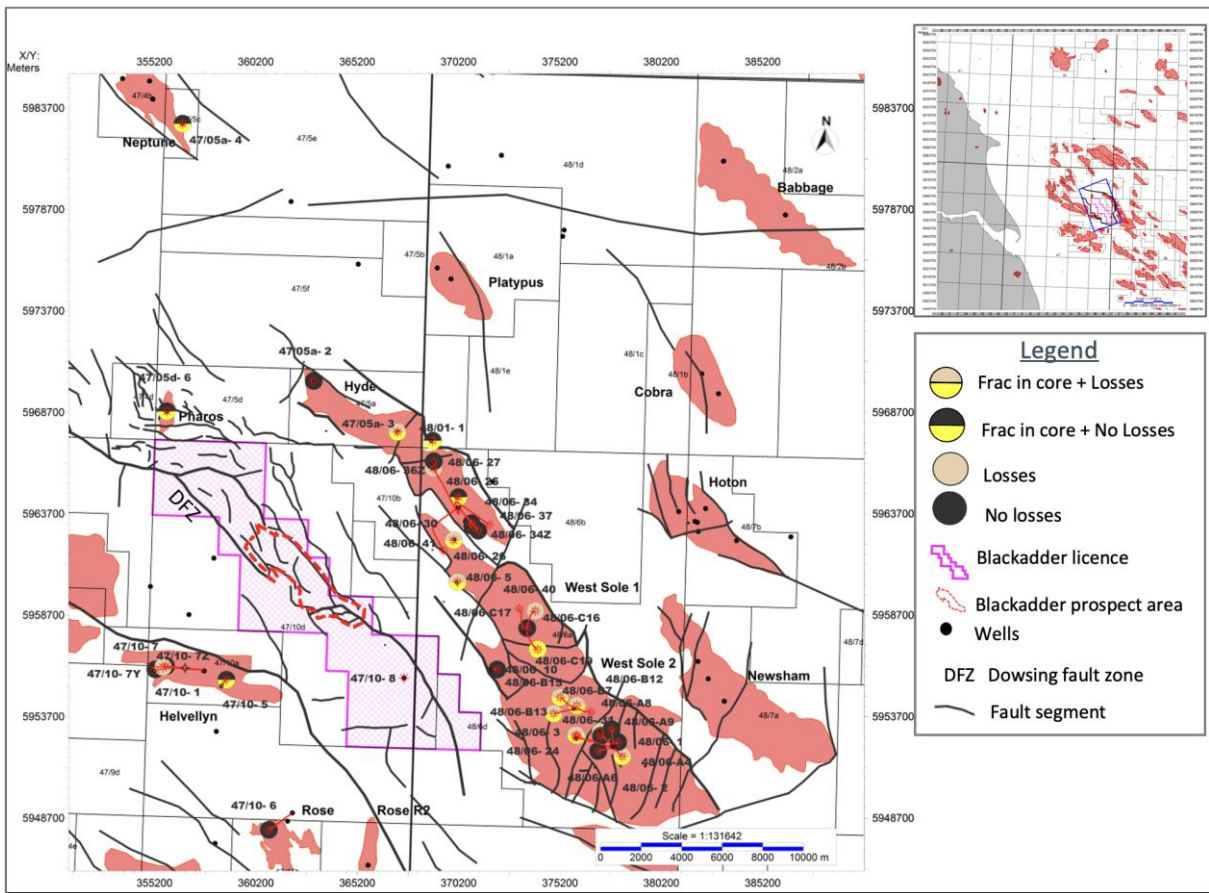
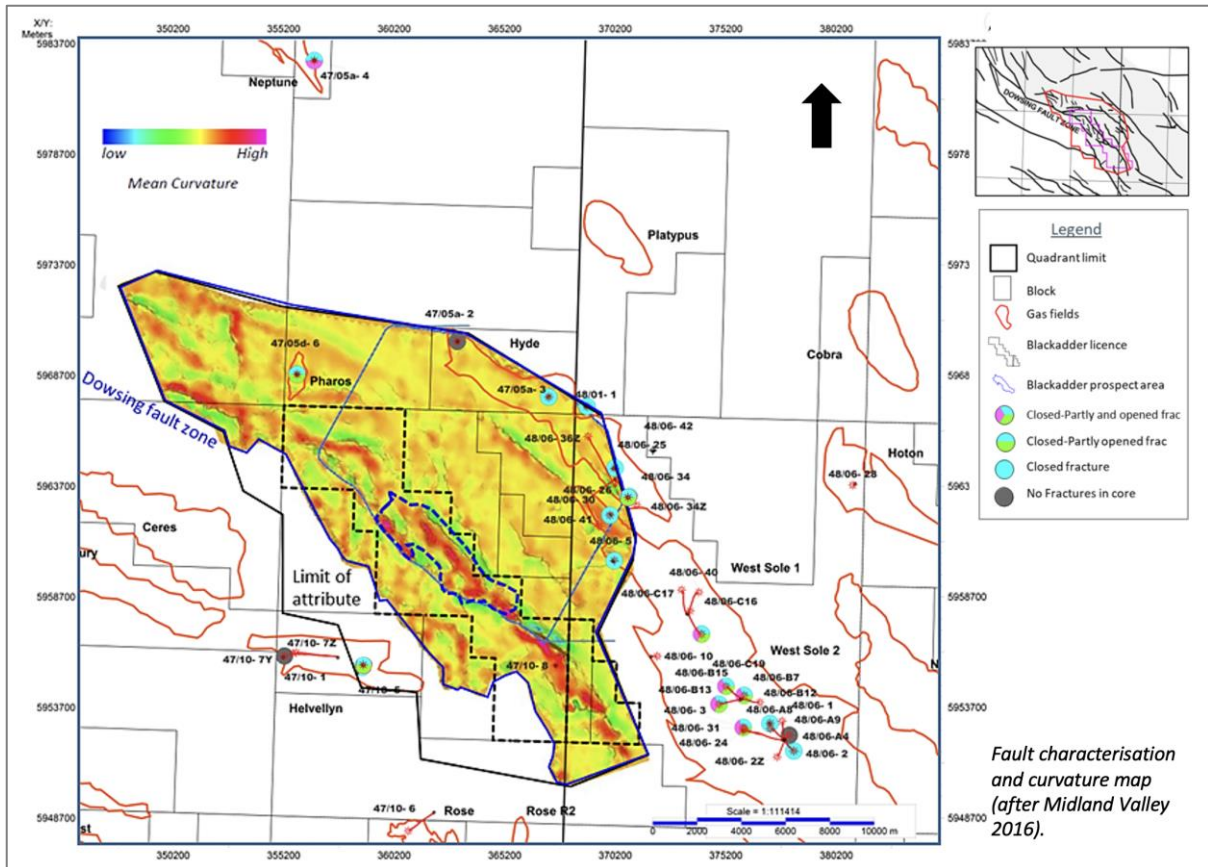


Figure 17: Integration of core and mud loss data map.



**Figure 18:** Fault characterisation and curvature map (after Midland Valley 2016) showing high mean curvature in Blackadder prospect area.

## Reservoir Quality

The facies in the Rottliegend reservoir in the area are expected to be aeolian Lower Lemn Sandstone. Based on the thermo-burial history of Pharos, the Lower Lemn sandstone was buried at favourable depths for the diagenetic precipitation of illite reducing the porosity and permeability in the prospect area. However, beyond burial depths of ~4600m (140°C), illite content does not appear to increase further. Therefore the remaining porosity and permeability is expected to be similar to that encountered at Pharos.

## Risk factors

Reservoir Effectiveness (quality) is the principal risk in Blocks 47/10d & 48/06c. The Blackadder prospect lies close to the West Sole and Hyde Fields which contain open natural fractures within the tight Rottliegendes reservoir which significantly enhance the reservoir permeability and enable commercial deliverability. The Blackadder structure is heavily faulted and is likely to have the similar open fractures to surrounding fields. However, the burial history is also similar and diagenetic degradation of the matrix permeability is expected therefore relying on fractures for commerciality. The same risks applied to Teviot, in spite of being a discovery, reservoir deliverability was not proven by a well test, and no core was taken to help define reservoir permeability. The specific risks for the Blackadder prospect and the Teviot discovery are detailed in **Table 6**.

Prospect/Lead	Source		Reservoir		Trap		cos
	Presence	Effectiveness	Presence	Effectiveness	Presence	Effectiveness	
Blackadder Prospect	1.0	1.0	1.0	0.5	0.9	1.0	0.45
Teviot Discovery	1.0	1.0	1.0	0.7	1.0	1.0	0.7

**Table 6:** Risk factors for Blackadder Prospect and Teviot discovery.

## Teviot Discovery

The Teviot discovery, well 47/10-8, was drilled by Newfield in 2005. The well targeted a robust upthrown (inverted) structural trap at Leman level (**Figure 4**). Gas was found in Upper and Lower Leman sands, which are only thinly developed compared to the main producing fields to the east (**Figure 19**). The well did not encounter a GWC so there is uncertainty on the FWL but a GDT of 2967m was established. The well was not drill stem tested but some indication of flow potential can be estimated from MDT data in the well. Most attempted tests failed but 6 samples were successful, with only low mobilities (ranging from 0.11 to 2.76 mD/cP). Reservoir quality of the gas-bearing sands is thus estimated to be poor. The difficulty in obtaining good pressure points means that a gas gradient in the well is not clearly defined. Plotting the available data against possible water gradients from the area allows for an approximation of the FWL for the discovery. The range of possibilities defined by these pressures (**Figure 20**) is consistent with a mapped structural spill point to the southeast of approximately 3030m. Reservoir properties for the Upper and Lower Leman intervals are summarised in **Table 7**. Net cut-offs are as follows:

- 5pu, 40% Vcl and 75% S<sub>w</sub>

Parameter	Upper Leman	Lower Leman
Gross (m)	19.8	10.1
Net (m)	11	8.8
NTG (%)	55	87
POR (%)	10.5	14.6
Sw (%)	51	38

**Table 7:** Reservoir properties, Teviot discovery (47/10-8).

Inputs for contingent resource estimate are summarised in **Table 8 & 9**.

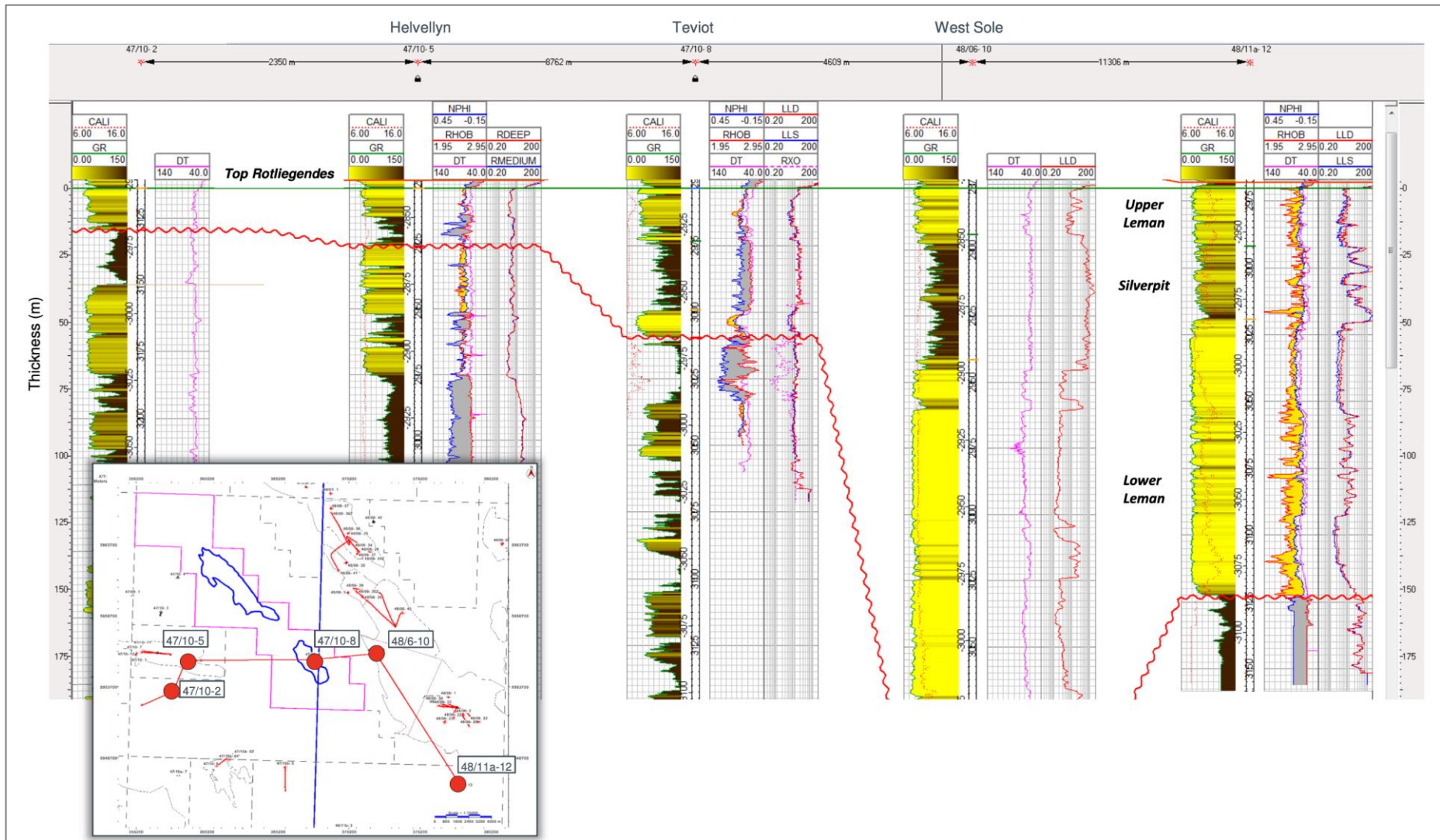


Figure 19: West-East correlation through the Teviot Discovery (47/10-8) showing the thinly developed Lower Leman sands compared to the thick section seen in West Sole.

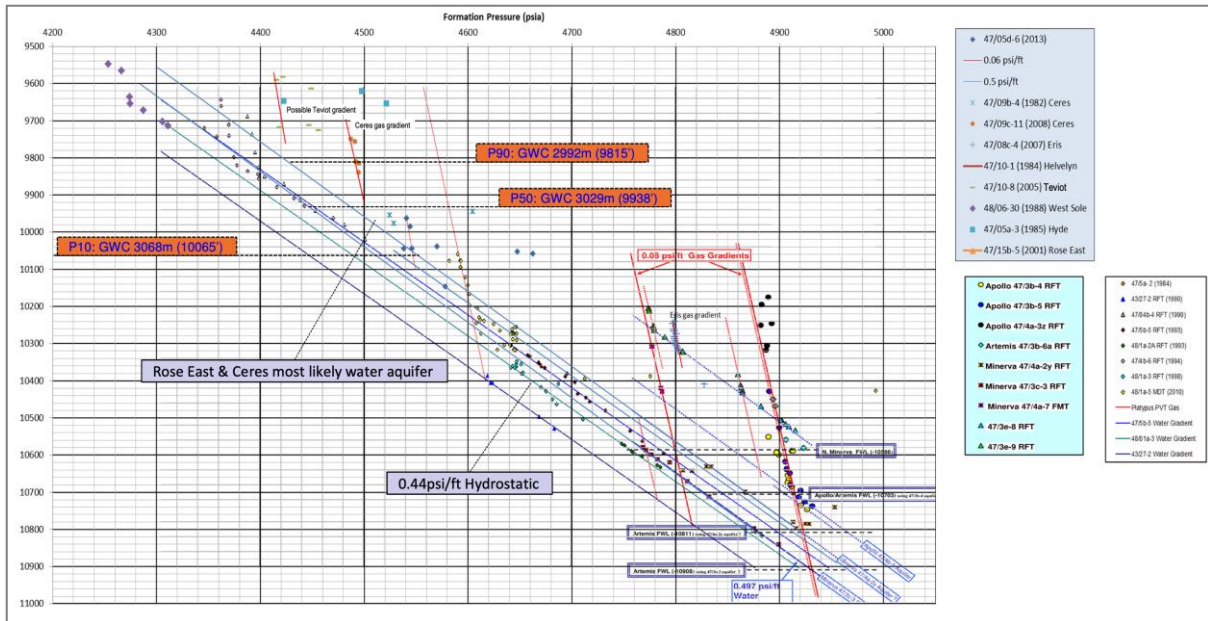


Figure 20: Pressures in Teviot Discovery and range of possible FWLs.

Units	Input	P90	P50	P10
m ss	Crest	2899	2899	2899
m	Column	93	115	137
km <sup>2</sup>	Area	2.8	3.3	4.3
MM m <sup>3</sup>	GRV	49.8	68.3	86.5
%	N/G	45	58	81
%	Porosity	6.7	10.5	14.6
%	1-Sw	38	49	69
	GEF	228	234	239
%	Recovery	60	70	80
Bcf	GIIP	8.7	16.6	30.6
Bcf	Resources	5.9	11.6	21.6

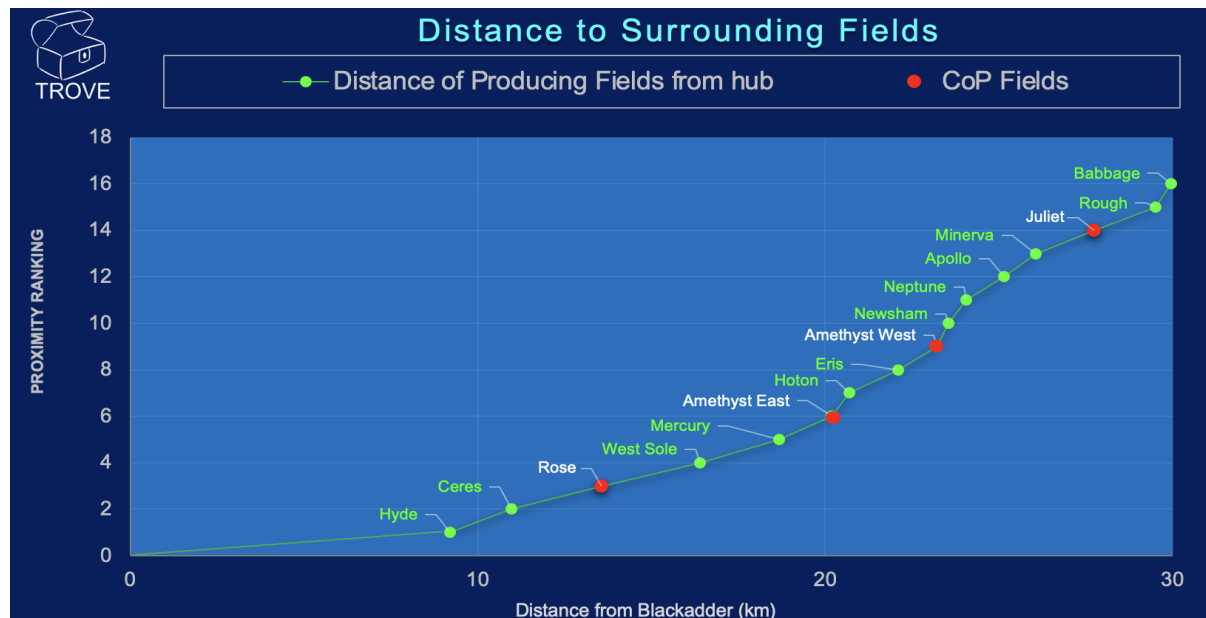
Table 8: Inputs for contingent resource estimate for Teviot discovery (Upper Leman).

Units	Input	P90	P50	P10
m ss	Crest	2944.5	2944.5	2944.5
m	Column	47.5	69.5	91.5
km <sup>2</sup>	Area	1.8	2.7	3.2
MM m <sup>3</sup>	GRV	14.2	23.6	36.5
%	N/G	72	88	97
%	Porosity	10.5	14.6	21.7
%	1-Sw	48.5	61.1	67.5
	GEF	228	234	239
%	Recovery	60	70	80
Bcf	GIIP	7.7	14.5	26.8
Bcf	Resources	5.3	10.1	19.0

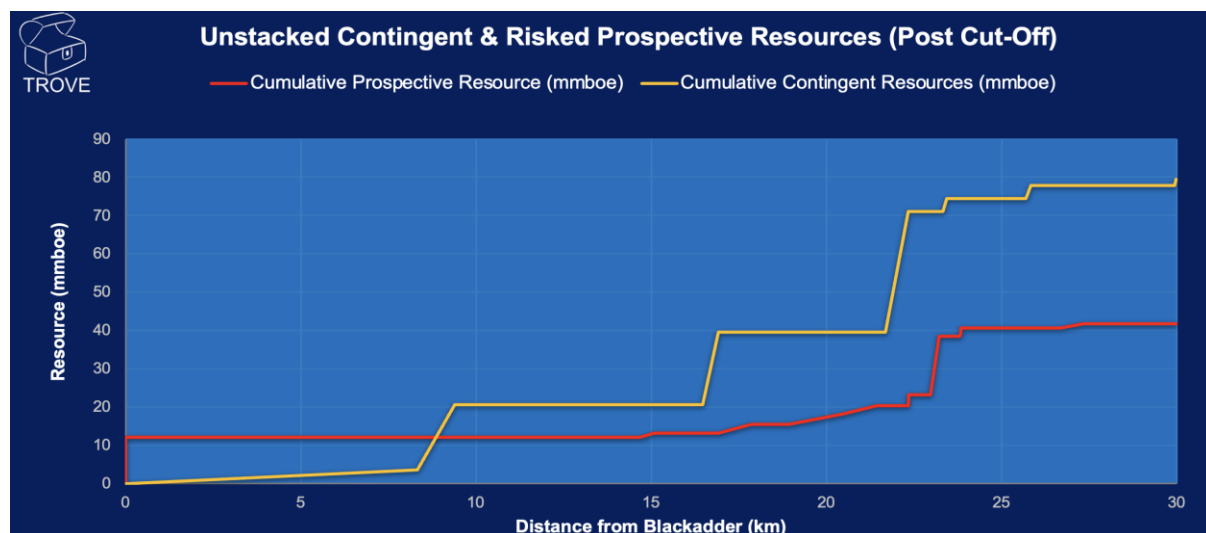
Table 9: Inputs for contingent resource estimate for Teviot discovery (Lower Leman).

## Further Technical Work Undertaken

To assist analysis into surrounding potential, 1<sup>st</sup> Subsurface conducted a Hub Analysis centred on Blackadder. There is substantial infrastructure still operational in the area. **Figure 21** shows nearby existing infrastructure with Hyde, Ceres and West Sole being the closest producing fields. Analysis also looked at surrounding prospective and contingent resources to assess potential upside.



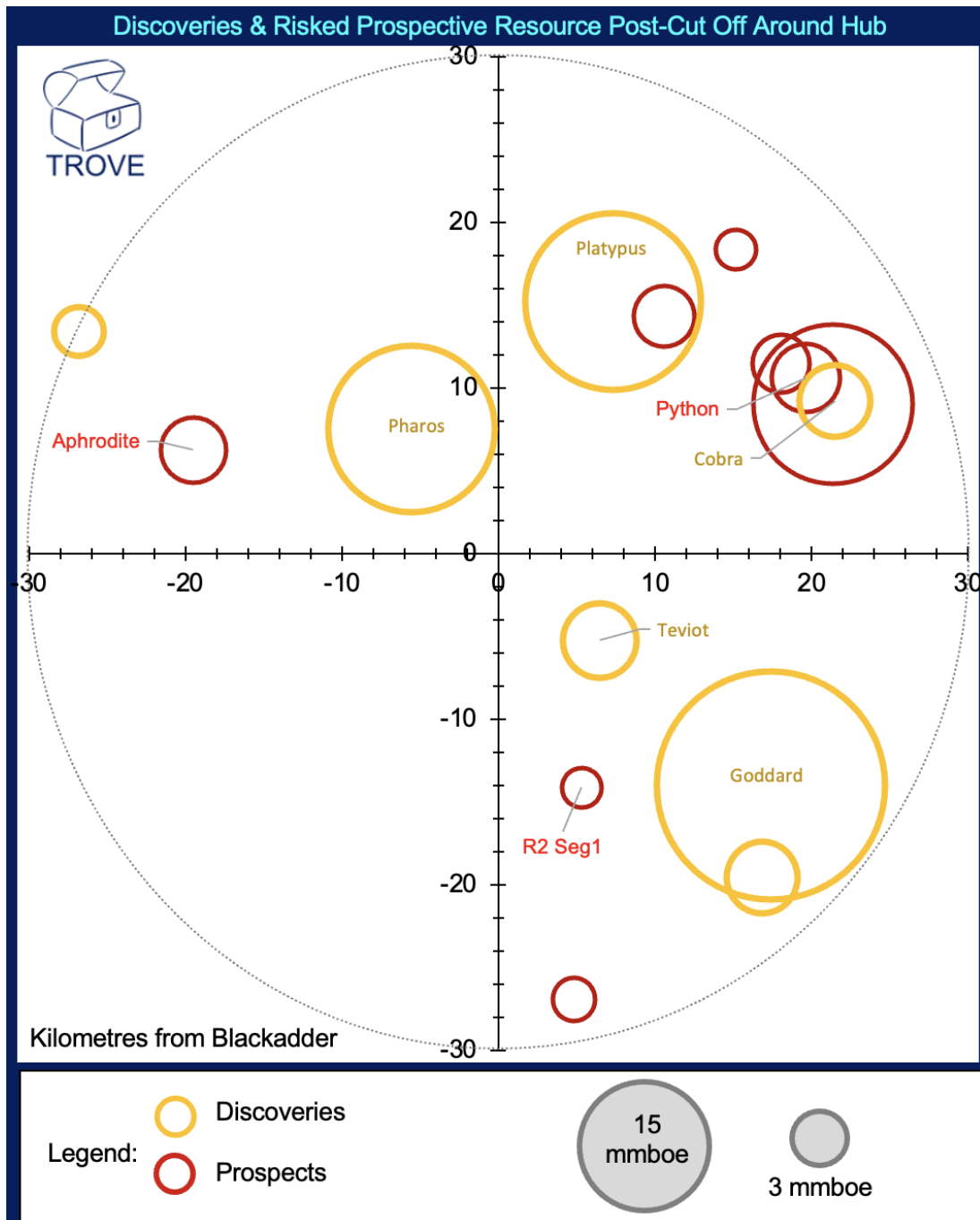
**Figure 21:** Distance from Blackadder to nearby fields, producing & CoP.



**Figure 22:** Cumulative prospective and contingent resources (unstacked) with distance from Blackadder. Prospective resource on a risked basis.

Contingent Resources (CR, orange) are limited with only seven discoveries within 30km of Blackadder with a quoted volume over 1mmboe in TROVE databases. The closest discovery surpassing this cut-off (other than Teviot) is Pharos with 17mmboe CR. Pharos lies just north of the P2435 area in adjacent block 40/05d.

Prospective Resources (PR, red) are limited within the vicinity of Blackadder, with only 40mmboe risked PR within 30km (including Blackadder volumes).



**Figure 23:** TROVE Hub Analysis centred on Blackadder showing undeveloped discoveries & undrilled prospects within 30km. Prospects shown on a risked resource basis. Resource cut-offs of 1mmboe (CR & PR) have been applied. Select prospects & discoveries have been labelled.

## 6 Resource and Risk Summary

Contingent resource volumes for P2435 are summarised in the table below (**Table 10**). The assessment of Teviot has not changed from the licence application stage. After concluding all elements of Phase A of the work programme, the volumes of Blackadder remained largely the same as at the time of application, with a marginally tighter GIIP range. No other opportunities are identified on this licence.

Prospect / Lead / Discovery Name	P L D	Reservoir		GIIP			Unrisked Recoverable Resources			Geological Chance of Success %
		Stratigraphic Level	Reservoir Depth (ft MSL)	Gas BCF			Gas BCF			
				Low	Mid	High	Low	Mid	High	
Teviot	D	Lower Permian	9,500	16	31	57	11	22	41	70
Blackadder	P	Rotliegendes Leman	10,000	140	208	295	72	113	169	45

**Table 10:** Summary of resources at the time of relinquishment.

## 7 Conclusions

The remaining prospectivity on P2435 is made up of the small Teviot discovery and the Blackadder prospect. The depth conversion carried out by Parkmead improved the certainty of seismic interpretation over Blackadder and the structural, fracture and reservoir studies improved understanding of the area. However, the size of Blackadder did not increase, nor did the risk of compartmentalisation reduce. Parkmead unsuccessfully attempted to farm-down the license and without a farminee deemed there was too much uncertainty to justify an exploration well entering Phase C of the licence. Parkmead have therefore elected to relinquish the license.

## 8 Clearance

Parkmead (E&P) Limited confirms that the NSTA is free to publish this report and that all 3rd party ownership rights (on any contained data and/or interpretations) have been considered and appropriately cleared for publication purposes.

## 9 References

1<sup>st</sup> Subsurface, 2022. TROVE Hub Analysis Study. Highlights included herein.

Cuello, M.J., 2019. Structural History, Fracture Study and Reservoir Quality of the Blackadder prospect. Parkmead supervised MSc Thesis, University of Aberdeen.

Hoetz, G., Steenbrink, J., Bekkers, N., Vogelaar, A., & Luthi, S., 2011. Salt-induced stress anomalies: an explanation for variations in seismic velocity and reservoir quality. *Petroleum Geoscience*, Vol 17, pp385-396.

Midland Valley. 2016. Blackadder and Pharos, Southern North Sea: Fault analysis and Fracture modelling. Proprietary study for Hansa Hydrocarbons and partners.

Winter, D. A. & King, B., 1991. The West Sole Field, Block 48/6, UK North Sea. In, Abbotts, I. L. (ed.), *United Kingdom Oil and Gas Fields, 25 Years Commemorative Volume*, Geological Society Memoir No. 14, pp. 517-523.

# 10 Appendix

Volumetrics presented below are from the application stage.

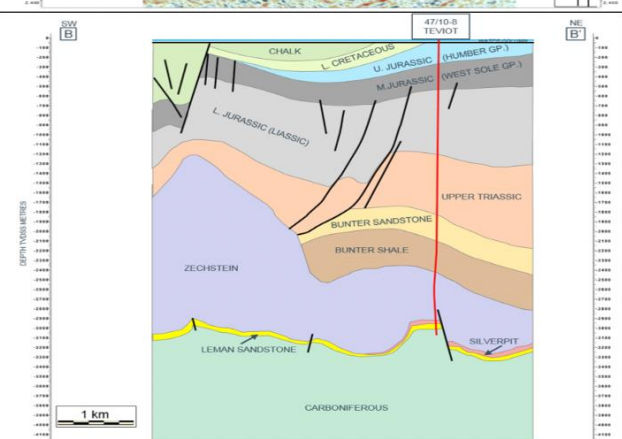
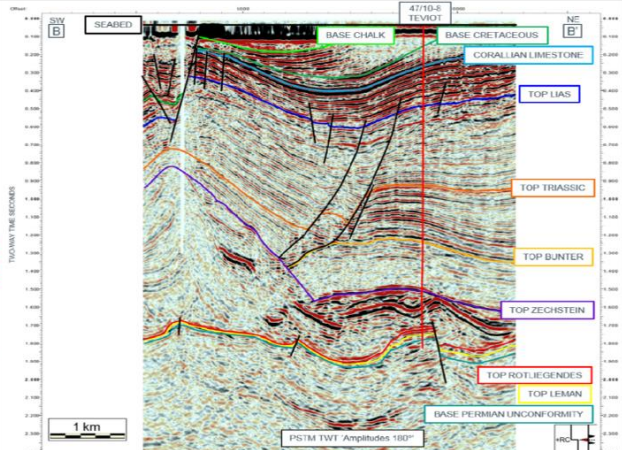
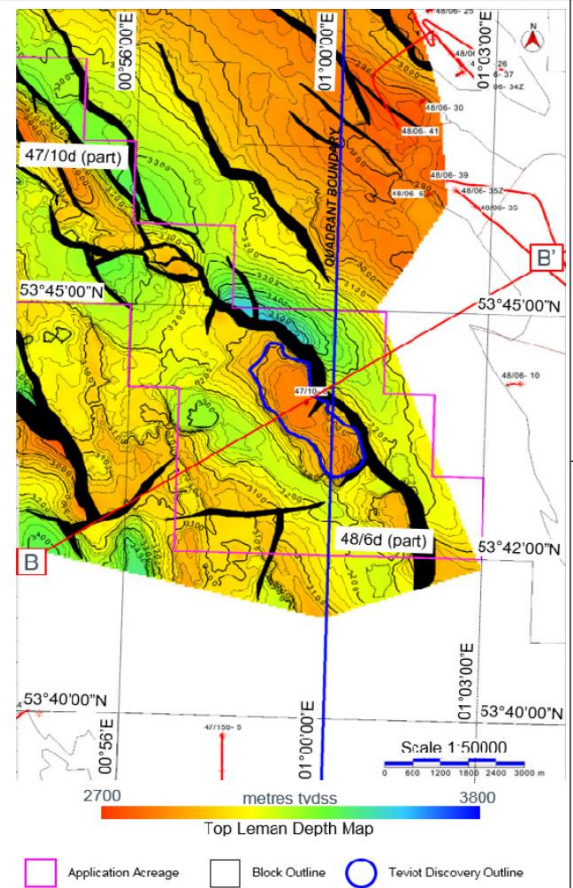
<b>SECTION 1</b>		<b>Lead/Prospect summary sheet</b>	
Proposed operator	Block	Name of lead, prospect, new play or discovery	
Parkmead (E&P) Limited	47/10d & 48/6d	Blackadder	
Brief description of lead, prospect, new play or discovery			
<b>Type:</b>	<b>Description</b>	<b>Key technical work needed</b>	
Prospect	Leman Structural Trap	Mapping and structural and reservoir quality studies	
<p>Top Leman Depth Map</p> <p>Scale 1:50000</p> <p>metres tvdss</p> <p>Application Acreage    Block Outline    Blackadder Prospect Outline</p>			
<b>Lead / prospect / new play / discovery volumes</b>			
<b>Input parameters</b>	<b>P90</b>	<b>P50</b>	<b>P10</b>
Area (km <sup>2</sup> )	7.9	10.6	12.8
Height of closure (m)	233	292	353
Net reservoir (m)	-	-	-
Net: gross (%)	71	86	96
Gross rock volume (MM m <sup>3</sup> )	305	420	536
Porosity (%)	10.7	12.9	14.8
Hydrocarbon saturation (%)	45	55	65
Gas Expansion Factor	239	241	244
Recovery factor (%)	45	55	65
Gas in place (bcf)	135	208	298
Oil/condensate in place (mmbo/mmboe)	-	-	-
Gas reserves (bcf)	71	113	170
<b>Estimated technical chance of success: 45%: source 100%, migration 100%, reservoir presence 100%, reservoir quality 50%, geometry 90%, seal 100%</b>			
Input parameters and volumes are probabilistic (P90, P50, P10).			

# SECTION 1

# Lead/Prospect Summary Sheet

Proposed operator	Block	Name of lead, prospect, new play or discovery
<b>Parkmead (E&amp;P) Limited</b>	<b>47/10d &amp; 48/6d</b>	<b>Teviot</b>
Brief description of lead, prospect, new play or discovery		

Type:	Description	Key technical work needed
Discovery	Leman structural trap	Structural and reservoir quality studies



Lead / prospect / new play / discovery volumes			
Input parameters	P90	P50	P10
Area (km <sup>2</sup> )	4.6	6.0	7.5
Height of closure (m)	-	-	-
Net reservoir (m)	-	-	-
Net: gross (%)	58	73	89
Gross rock volume (MM m <sup>3</sup> )	64	92	123
Porosity (%)	8.6	12.6	18.0
Hydrocarbon saturation (%)	44	55	68
Gas Expansion Factor	228	234	239
Recovery factor (%)	60	70	80
Gas in place (bcf)	16.4	31.1	57.4
Oil/condensate in place (mmbbl/mmbbl)	-	-	-
Gas reserves (bcf)	11.2	21.7	40.6
<b>Estimated technical chance of success: 70%: source 100%, migration 100%, reservoir presence 100%, reservoir quality 70%, geometry 100%, seal 100%</b>			
Input parameters and volumes are probabilistic (P90, P50, P10); added for separate Upper and Lower Leman.			