



# Petrel Gas Field

Bonaparte Basin Australia, Development Plan and Potential Upside Resource  
Following Recent Broad Band 3D Seismic Survey Acquisition and Interpretation

SEAPEX Conference, 6<sup>th</sup> – 10<sup>th</sup> March 2023

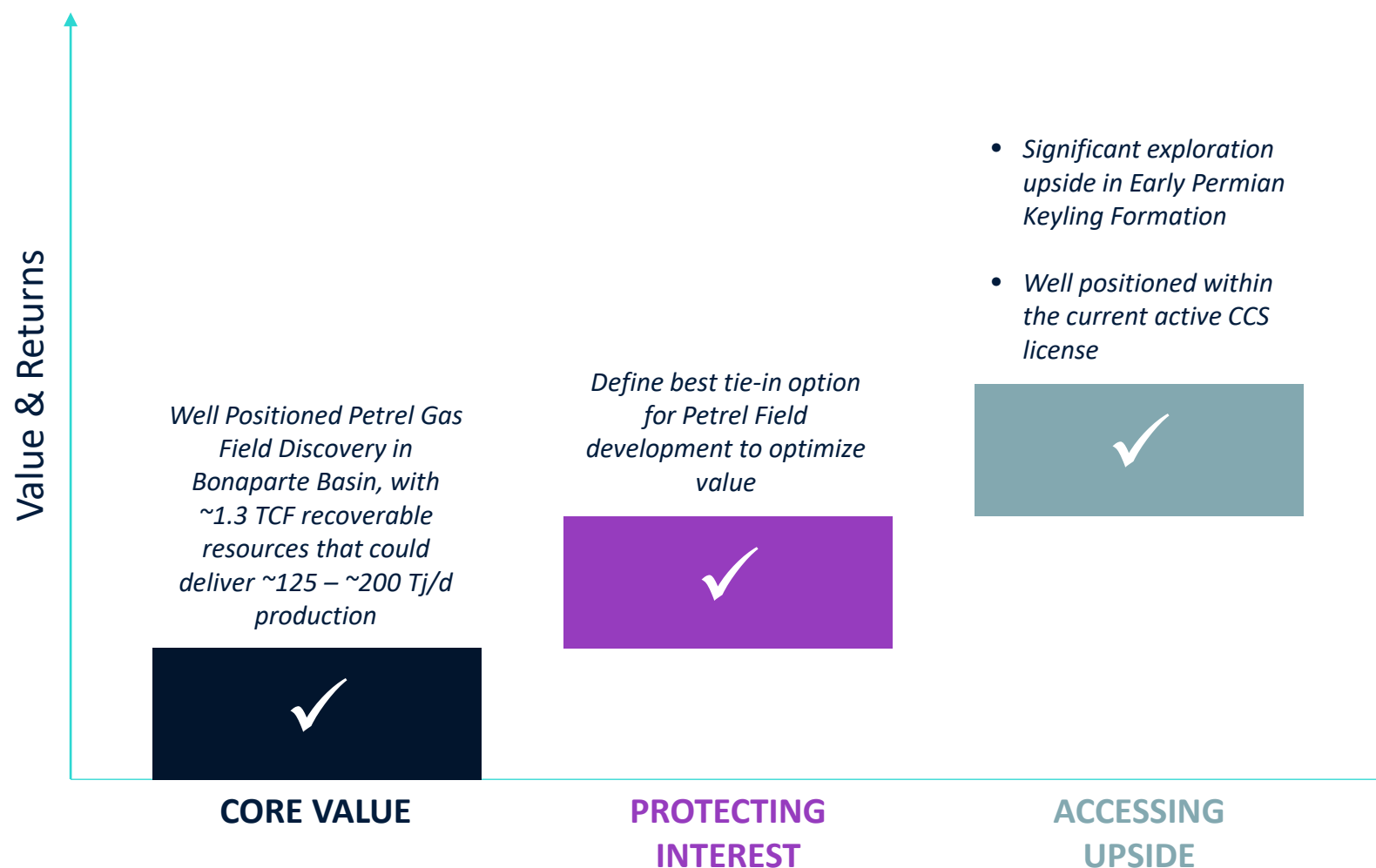
Janet Hann, Dave Wheller, Phil Woods, Francois Renard, Maylis Dupouy, David Ginger, Gilang Airlangga, Eko Lumadyo



Material Petrel Gas Field Discovery complemented by World Class Exploration Upsides



# Petrel Gas Field, Bonaparte Basin, Australia





# Overview

## Appraised field with material volumes

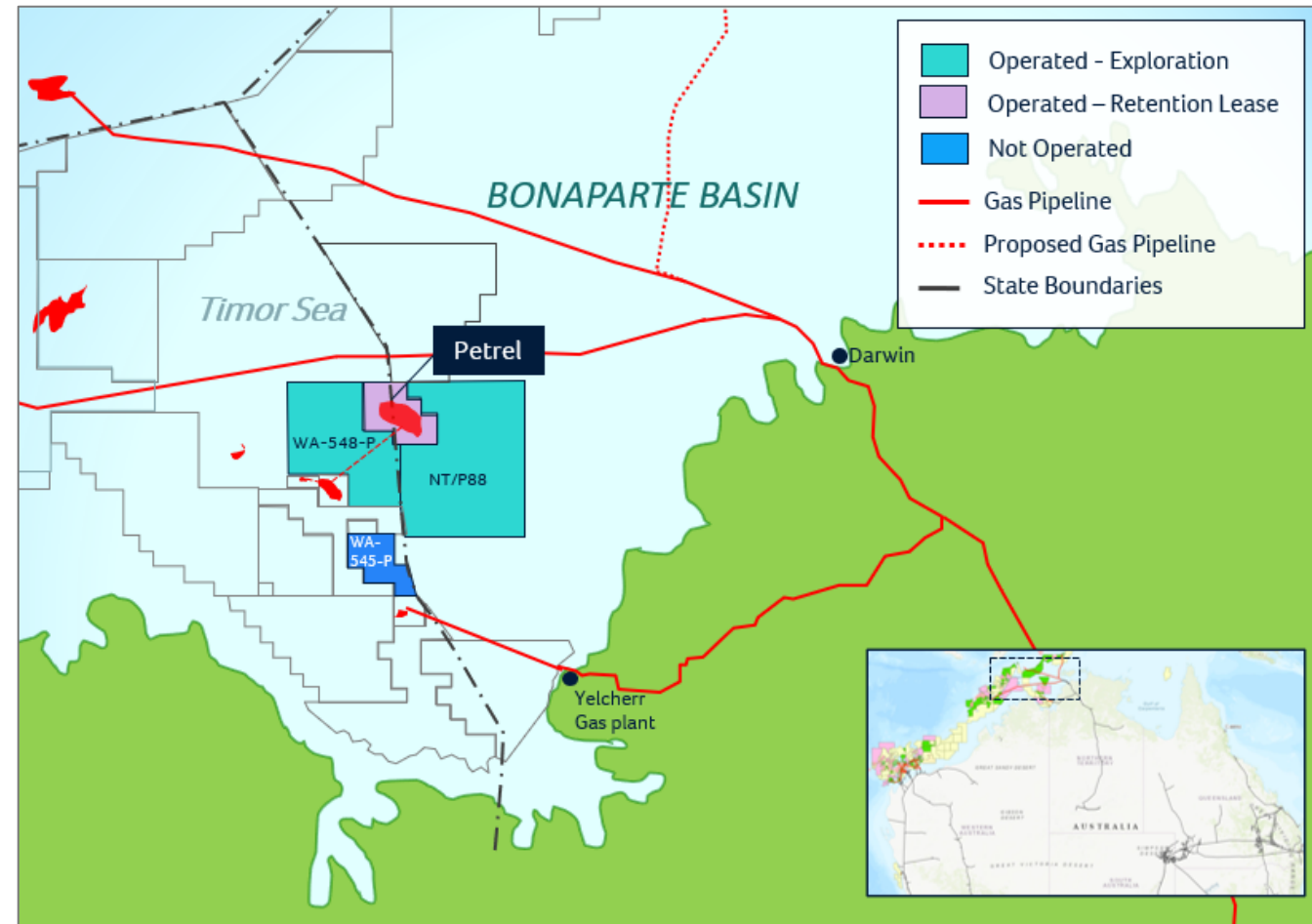
- 8 wells (Petrel-1 1969 to Petrel-7 2011)
- Recent 3D seismic acquired (2019-20)
- Cape Hay Late Permian Gas Field
- Mid case estimate 1.3 TCF recoverable
- Upside case estimate up to 2 TCF recoverable

## Significant exploration upside

- 2022-3 programme to mature exploration upside
- Late Permian Cape Hay Prospects
- Early Permian Keyling Formation
- Adjacent exploration permits operated by Neptune (WA-548-P & NT/P88)

## Development concepts extensively studied

- Tie-back onshore to Yelcherr or standalone direct-to-Darwin (Domestic Supply)
- 125 – 200 TJ/d production rate range evaluated







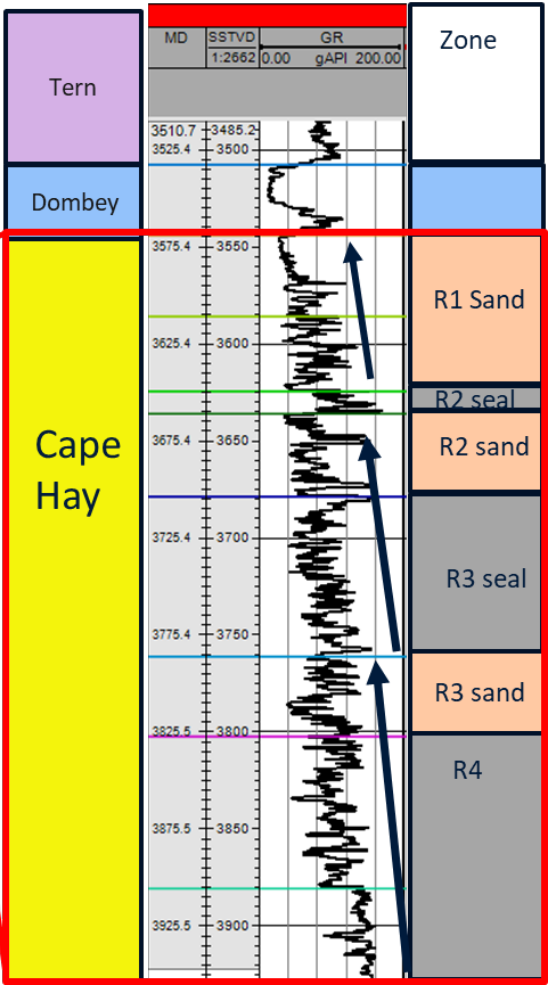
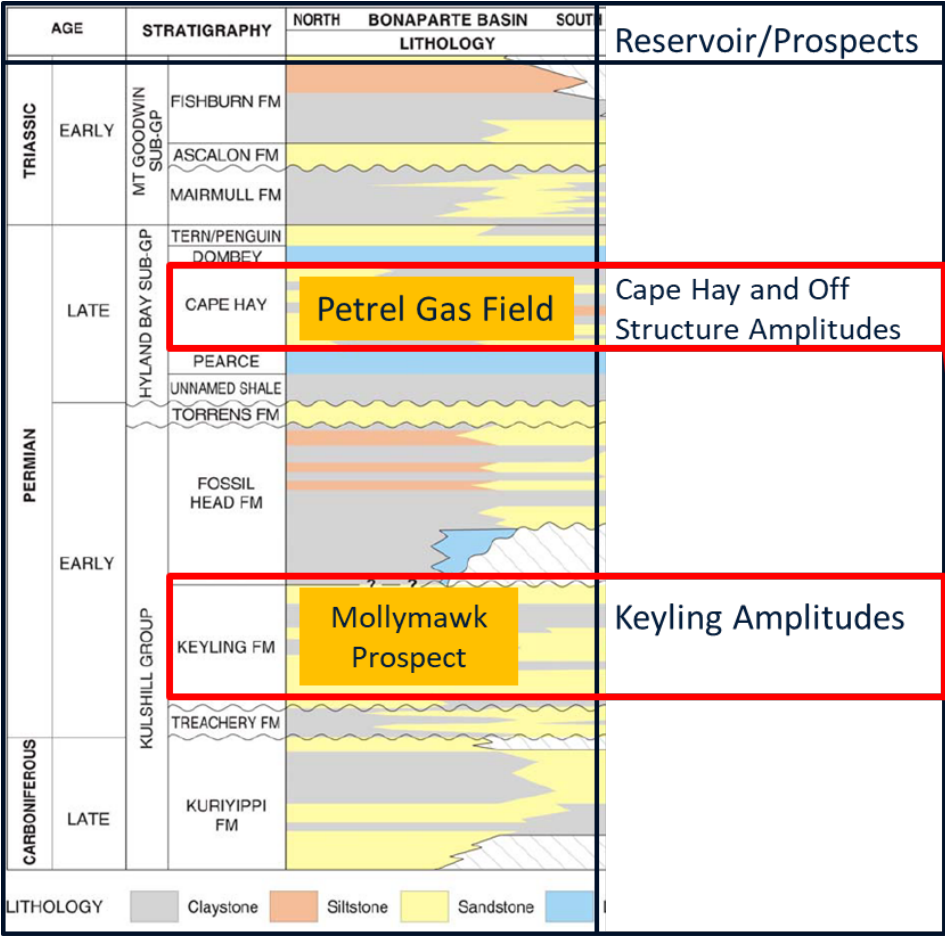
# Petrel Gas Field

Cape Hay Reservoir





# Southern Bonaparte Stratigraphic Column and Petrel Cape Hay Reservoir Type Log



## Cape Hay Reservoir Summary

### Formation:

Cape Hay Formation, Hyland Bay Sub-Group, Late Permian

### Zones:

Coarsening up pattern, reservoir divided into 4 zones, R1 main reservoir

### Deposition Environment:

Tidal Delta, Estuarine

### Fluid Character:

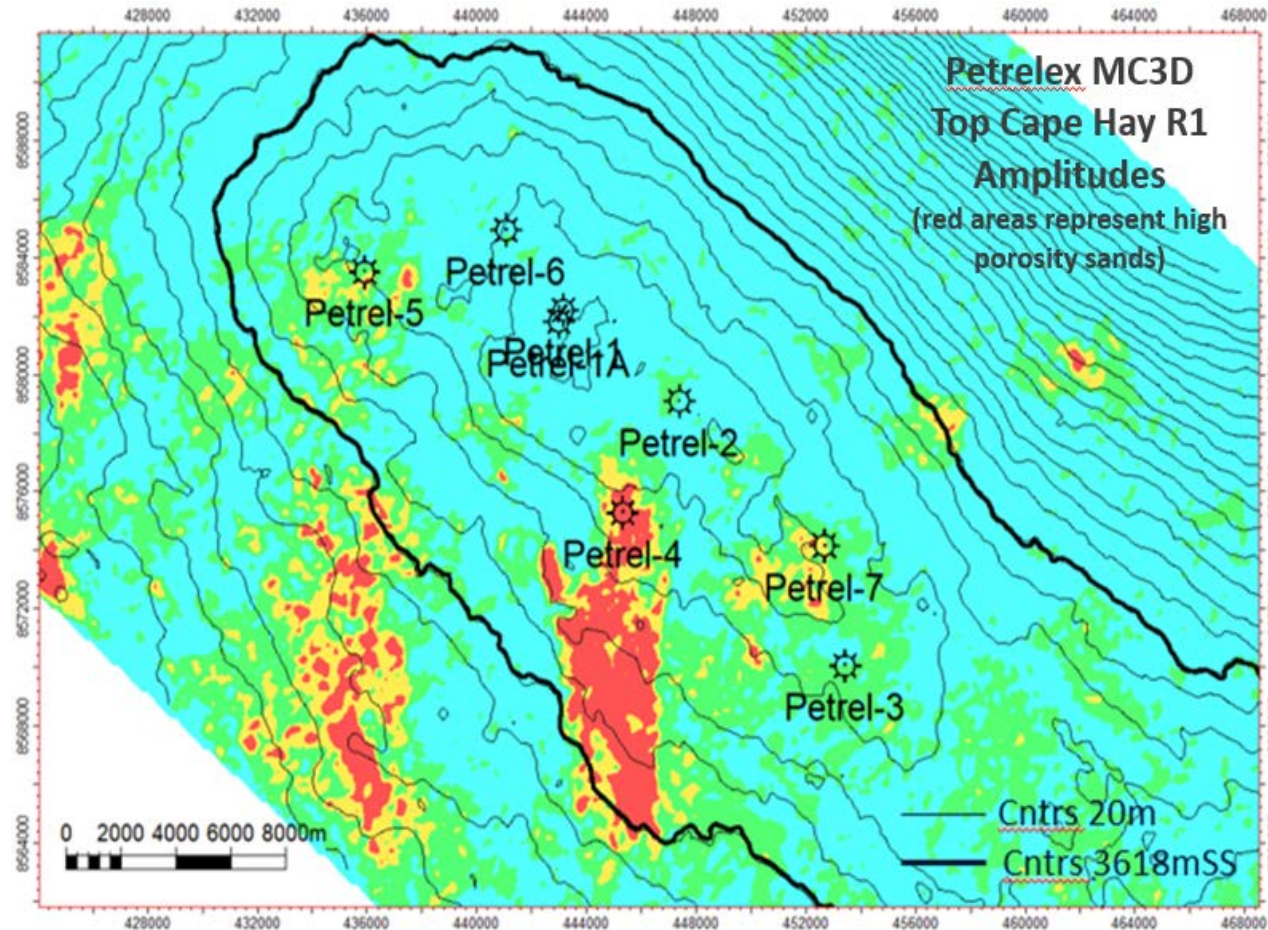
Dry Gas, low CO<sub>2</sub>

### Petrophysics Ave:

Highly variable quality due to Qtz cementation due to depth of burial, porosity preservation with chlorite rims observed for best zones



# Cape Hay Seismic Amplitude Map and Existing Well Locations



## Structure Trap:

Large Anticline, no faults

## Structure Area:

Length ~36km, Width ~16km, Max Column ~90m

Gas Field not closed to the South East with GDT in well tests deeper than closure, GWC not observed

## Recent 3D Seismic acquisition:

indicates seismic amplitudes correlate to high porosity sands

7 of the 8 wells drilled on 2D seismic,  
only 1 well has optimally drilled into the high amplitude sands  
(Petrel-4)

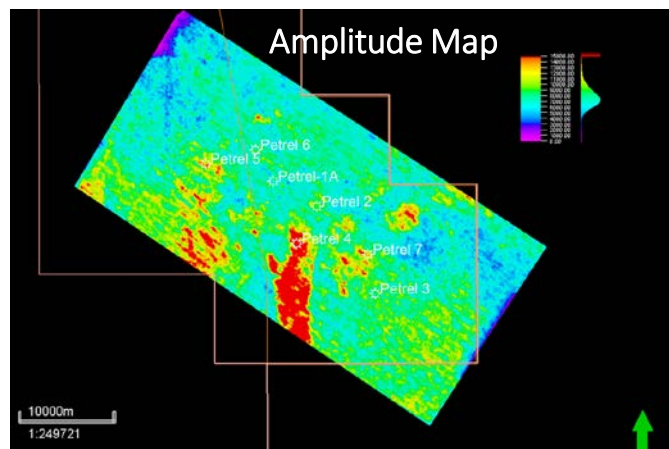


Improvement Delivered by New Seismic Data Set

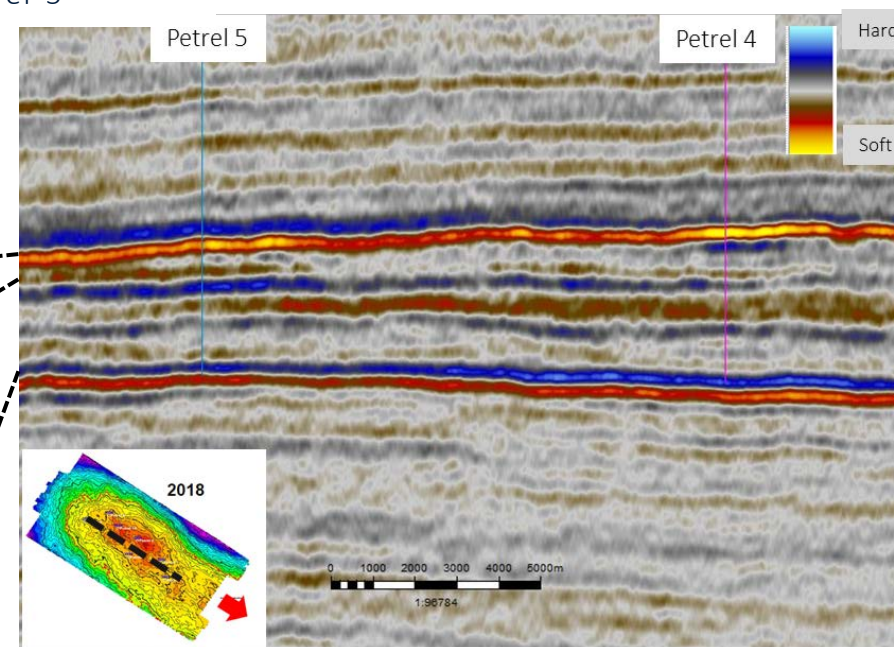
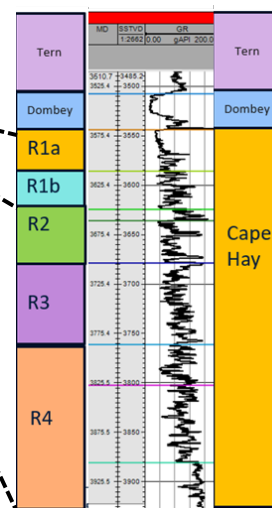
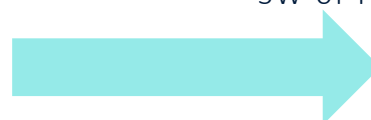
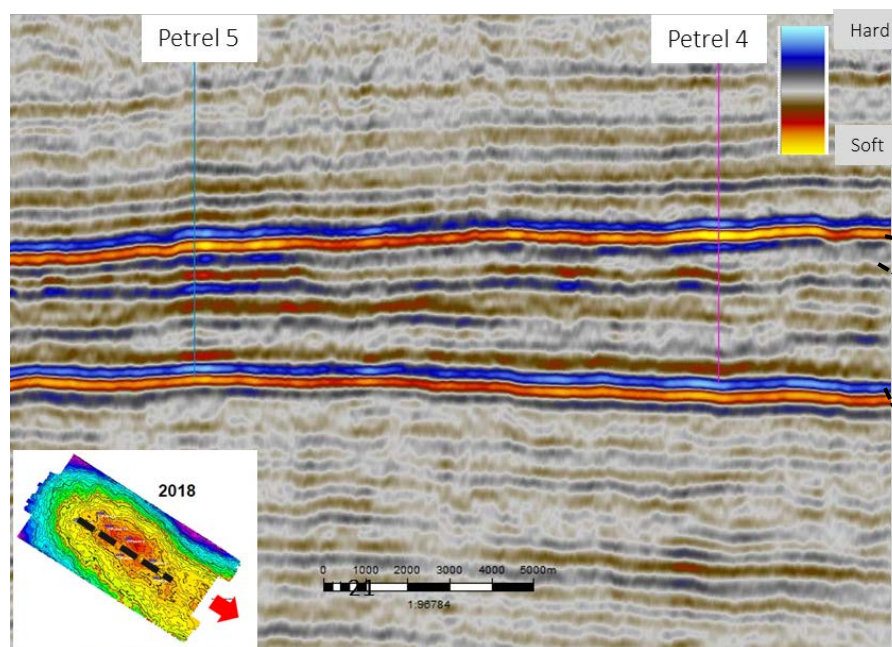
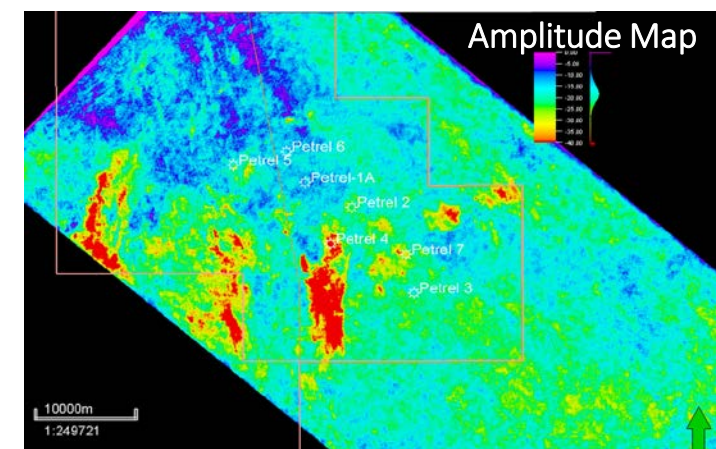
# New Petrelex MC3D Seismic Data



Legacy Data (2007)



- Limited extension of the 3D seismic legacy dataset
- Noisy final products
- Unknown southern extension of main geobodies (sand bars South of Petrel-4 and South of Petrel-5)
- New data provides detailed depth imaging to reduce structural uncertainty
- High amplitudes South of Petrel-4 (proved high porosity sands) better delineated on new data
- New Off-structure amplitude prospects SW of Petrel-5



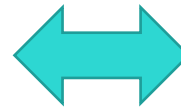
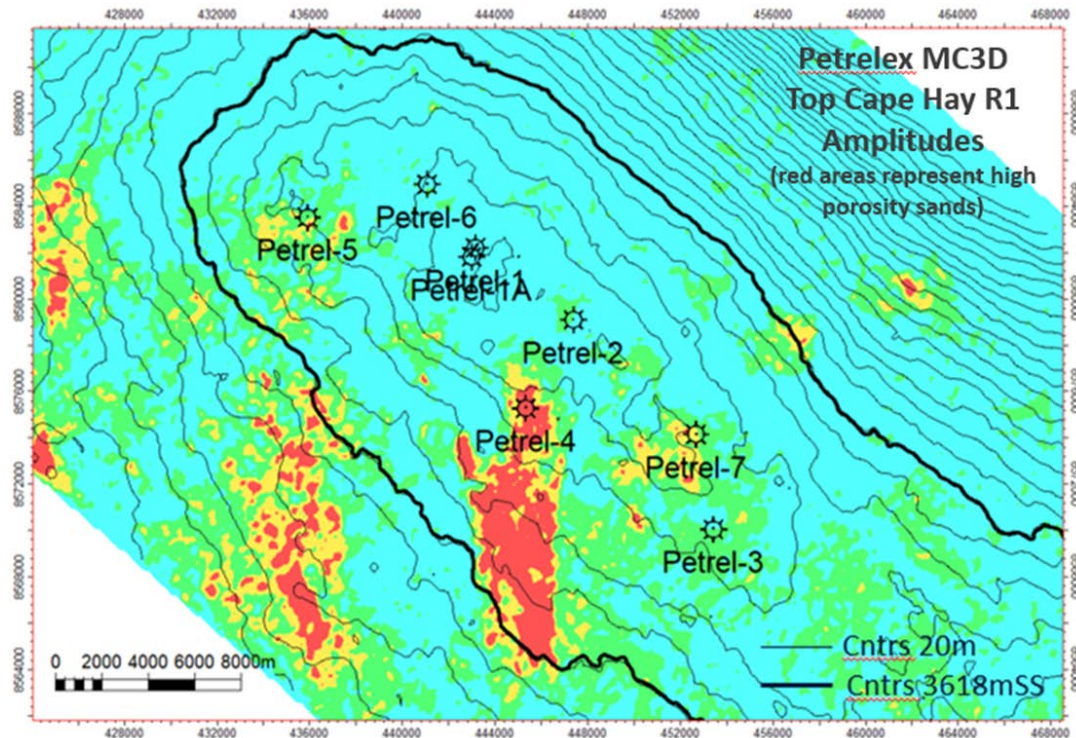
Petrelex 3D (2020)



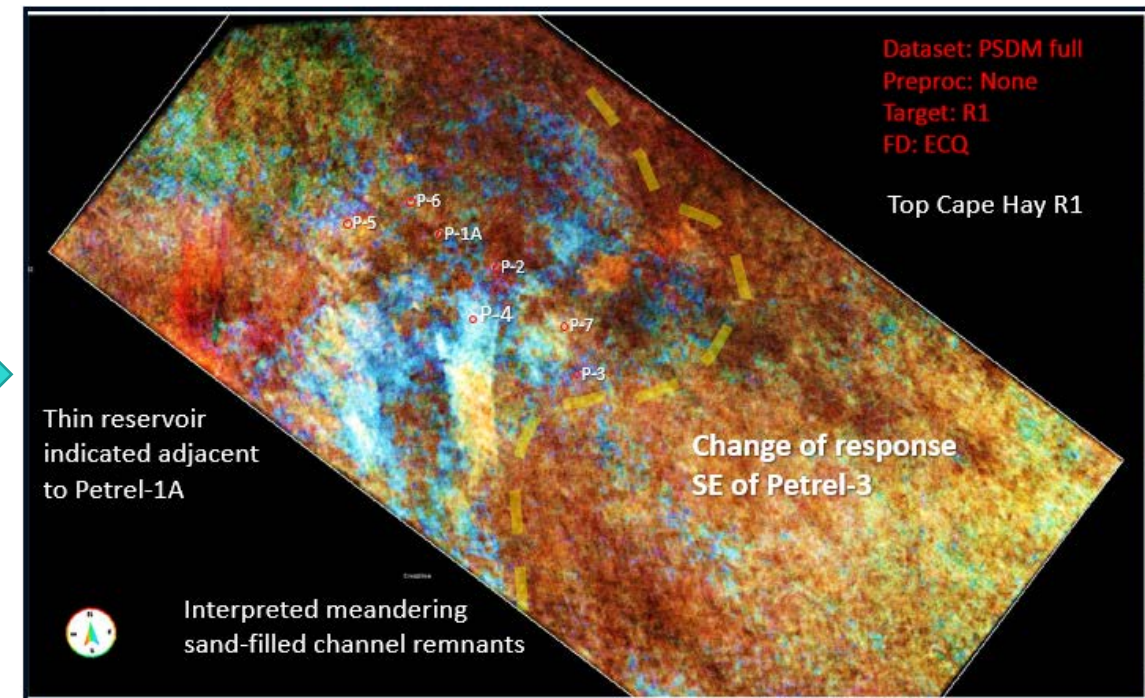


# New Petrelex MC3D Provides Better Imaging for High Porosity Sandstone in R1 Zone

R1 Seismic Amplitude Extraction



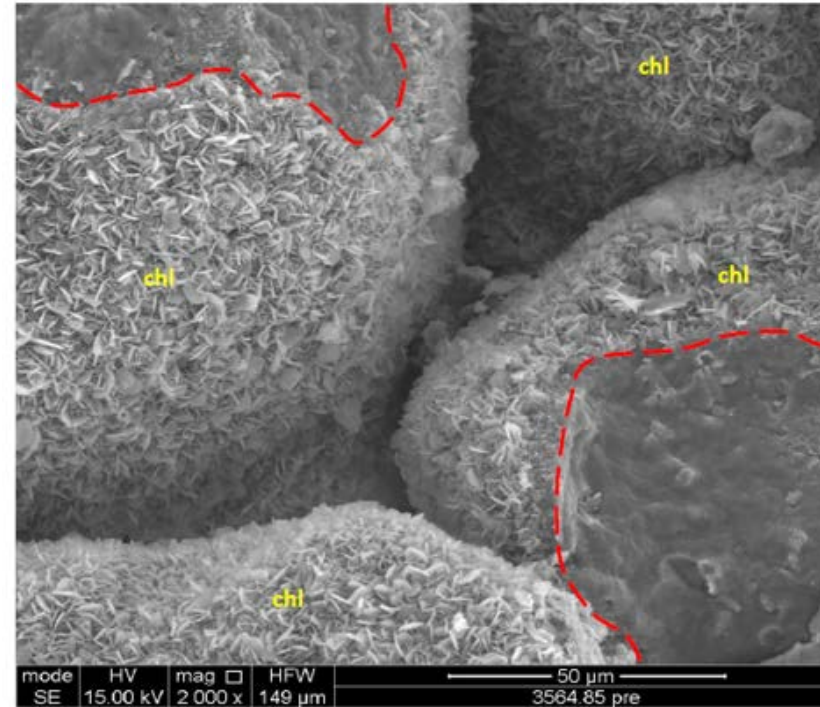
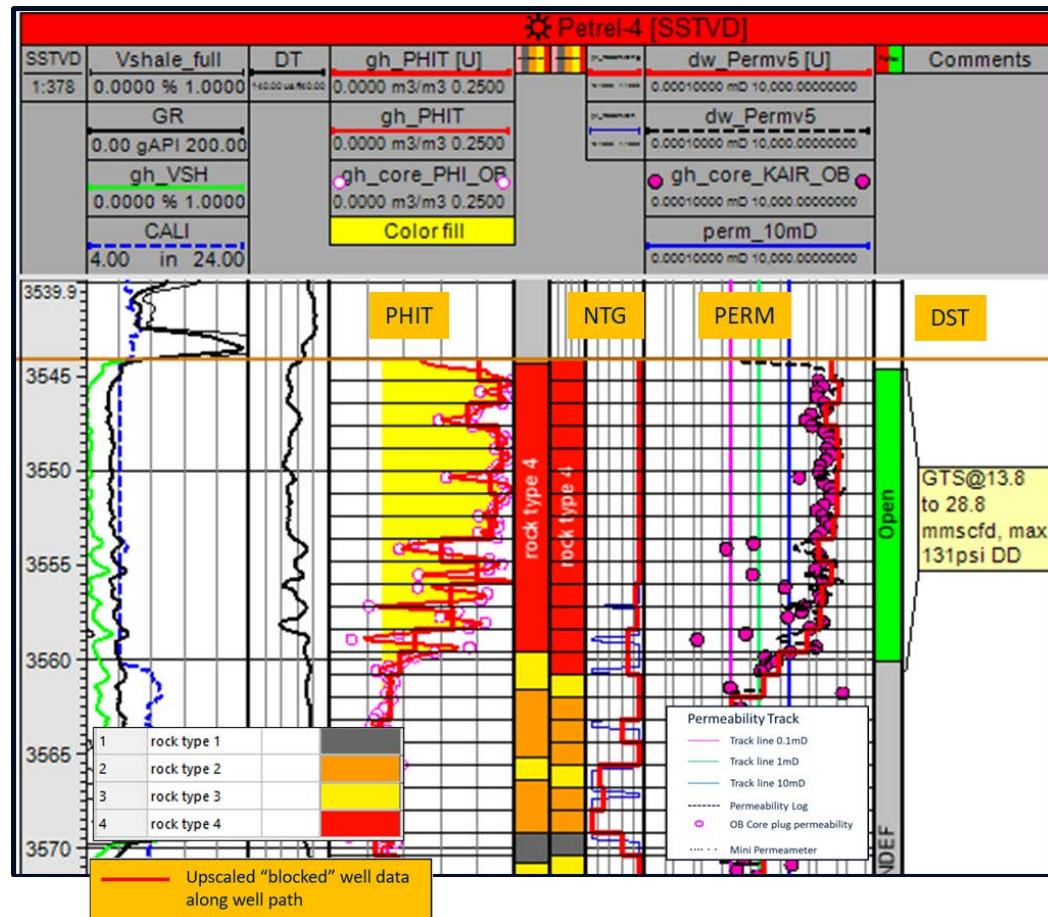
Spectral Decomposition Filtering – Top Cape Hay R1







# Chlorite Rim Coating and Reservoir Quality in Cape Hay Formation



Chlorite rim coating has preserved the porosity of the Cape Hay Formation by inhibiting quartz overgrowth

Reservoir quality in these zones is in the 100mD+ range





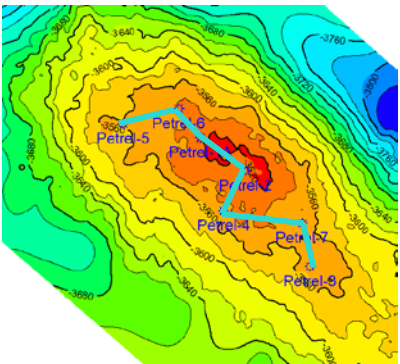
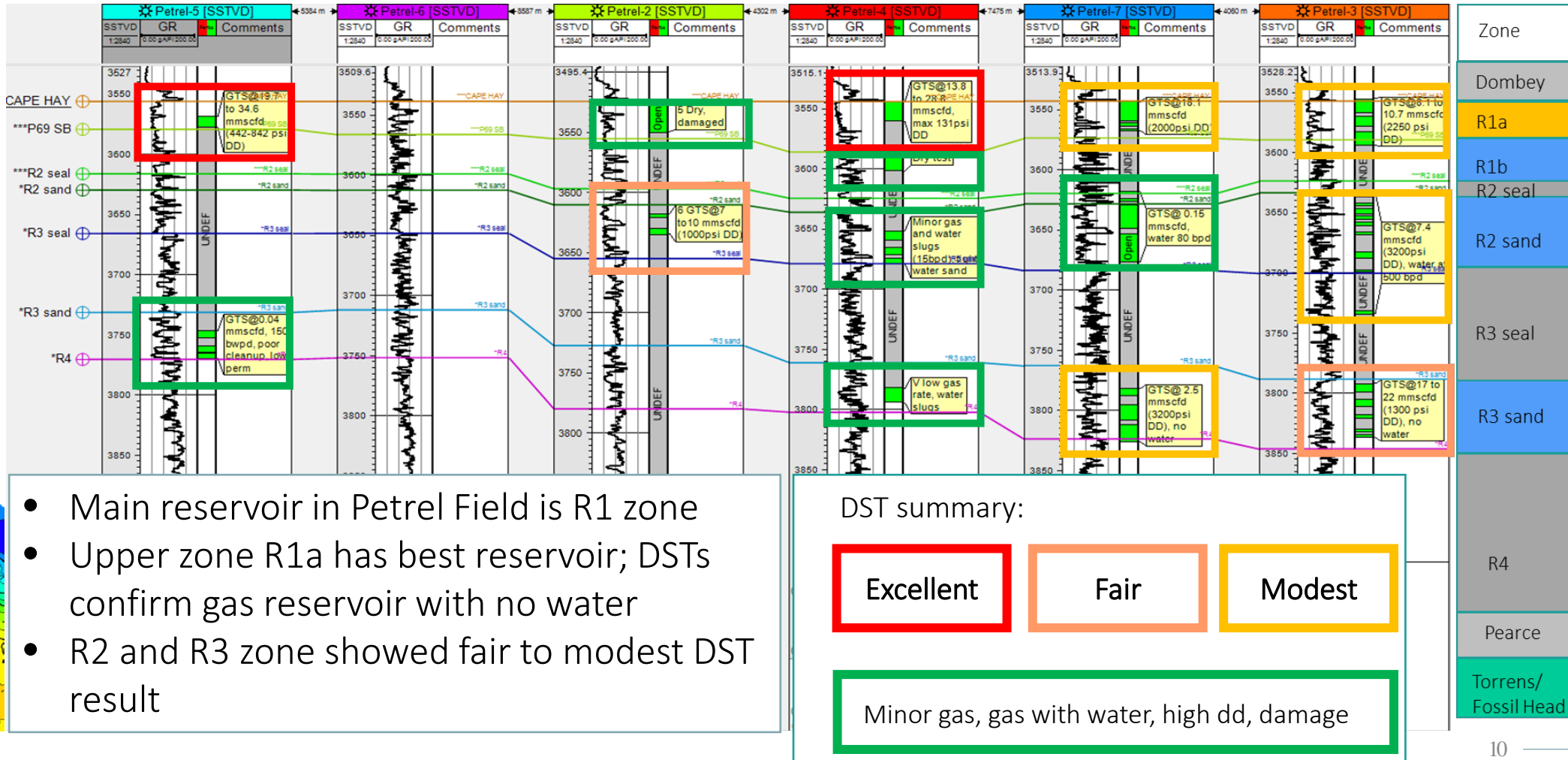
# DST Result Confirms Excellent to Fair Gas Flow in Petrel Main Reservoir - R1 Zone

## Petrel-4

~28 mmscfd with  
~131 psi  
drawdown

## Petrel-5

~34.8 mmscfd  
with ~442 - 842  
psi drawdown



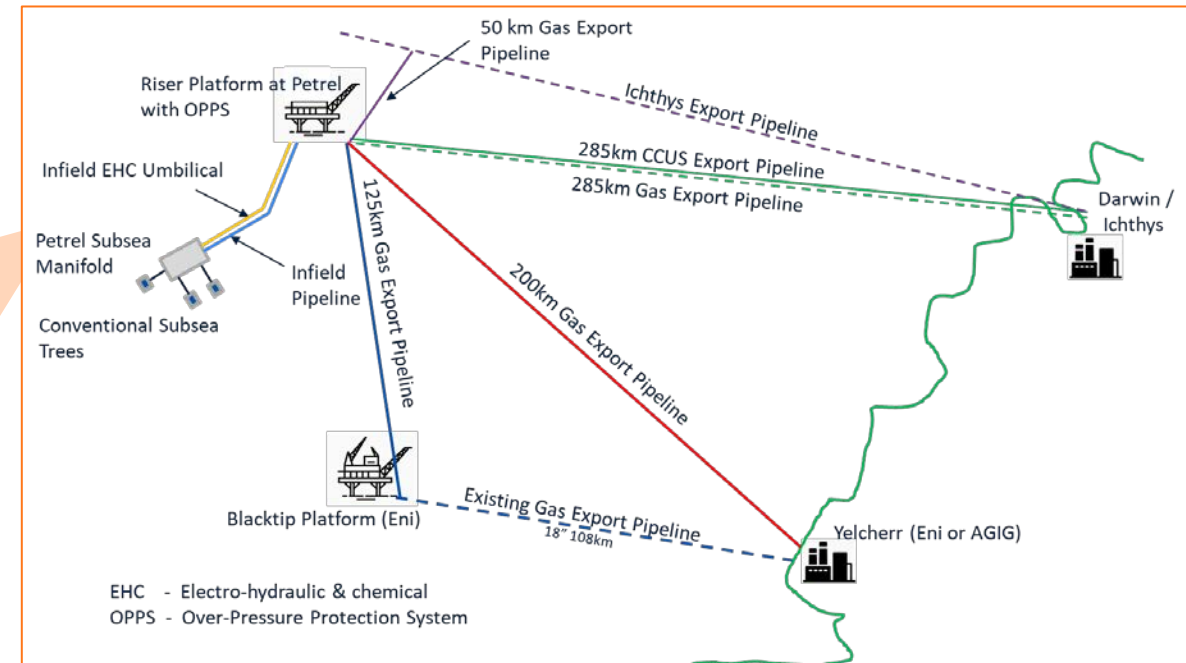
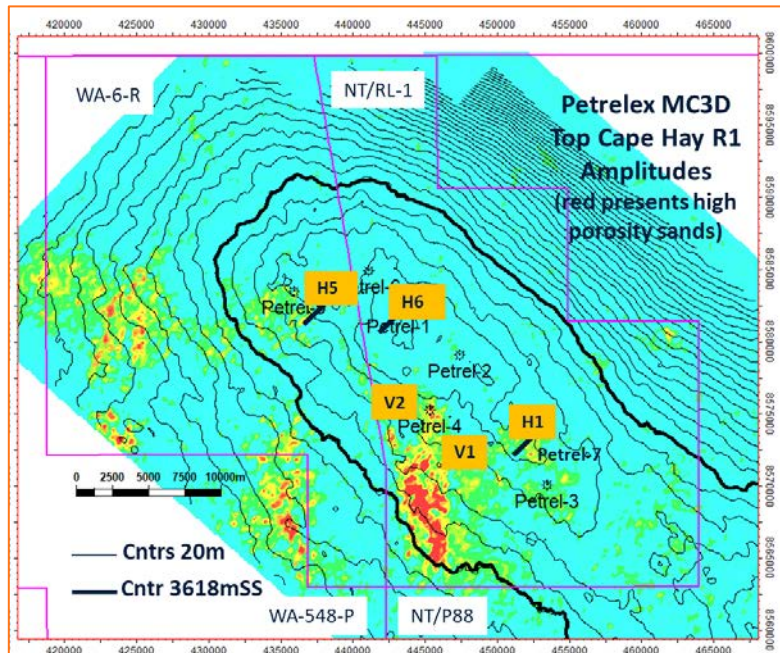
- Main reservoir in Petrel Field is R1 zone
- Upper zone R1a has best reservoir; DSTs confirm gas reservoir with no water
- R2 and R3 zone showed fair to modest DST result





# Petrel Field R1 Zone Conceptual Development

- ~0.7 – ~2 TCF recoverable resources range with ~1.3 TCF mean case from R1 Zone align with ERCE Competent Person's Report
- Developed through 5 wells drilled across Cape Hay R1 Reservoir
- Range of delivery rate at ~125 – 200 Tj/d (~5 - ~8 years of plateau)
- R2/R3 Zone and Exploration tie back Upside



- Yelcherr new BOO plant <sup>1</sup>
- Darwin direct line <sup>1</sup>
- Blacktip skinny tie-back <sup>1</sup>
- Darwin tie-back with Ichthys CCS capex synergy <sup>2</sup>
- Tie-in to Ichthys pipeline <sup>2</sup>

1. Concept Select Phase  
2. Preliminary Study

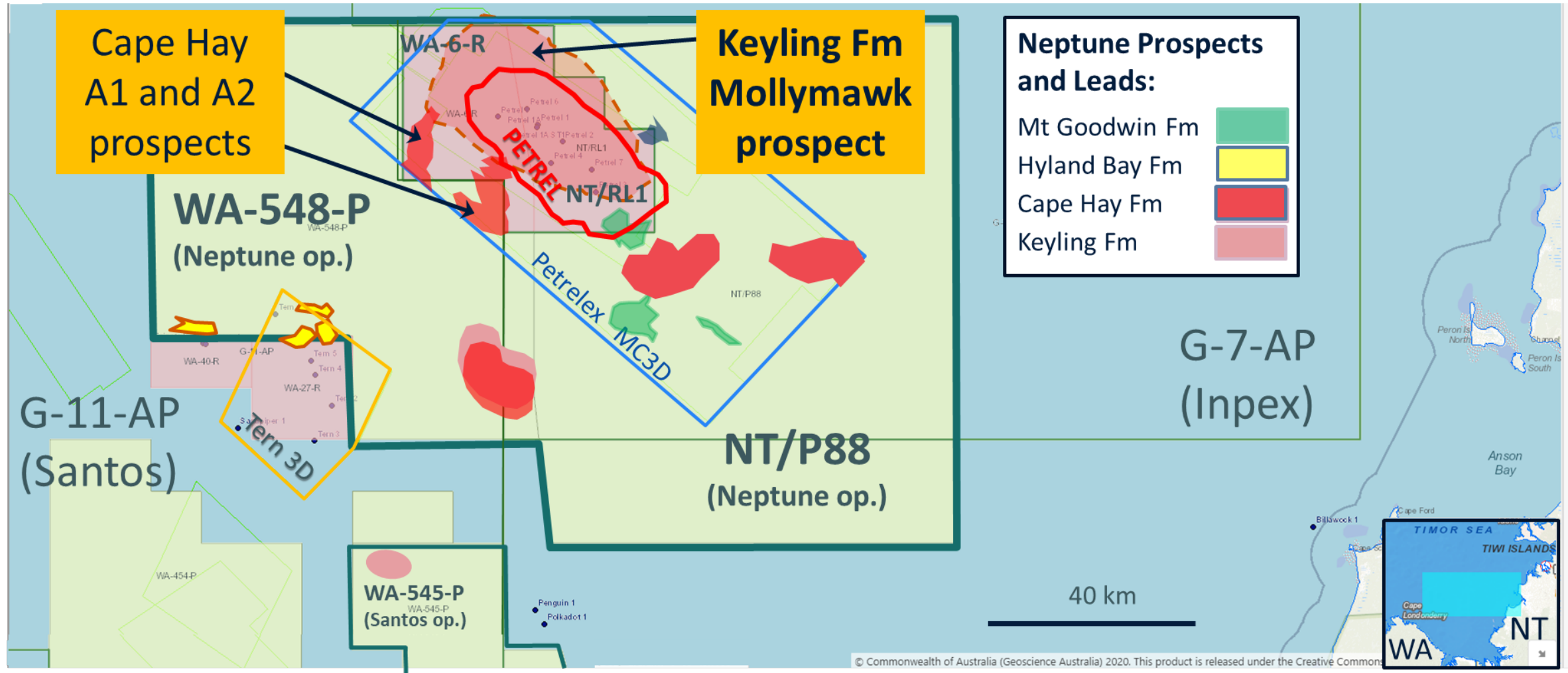




# Exploration Upside



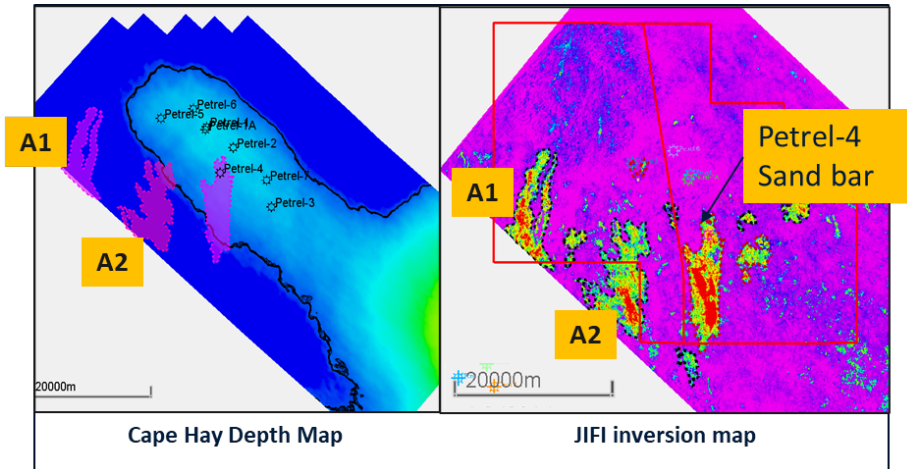
# Key Exploration Prospect







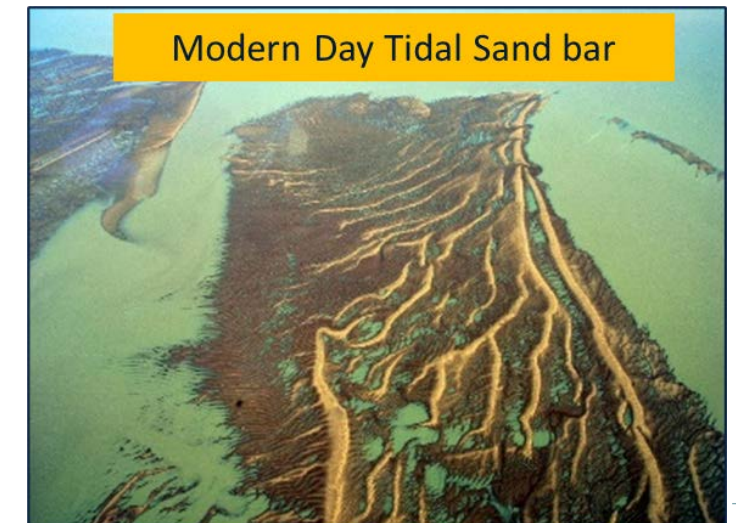
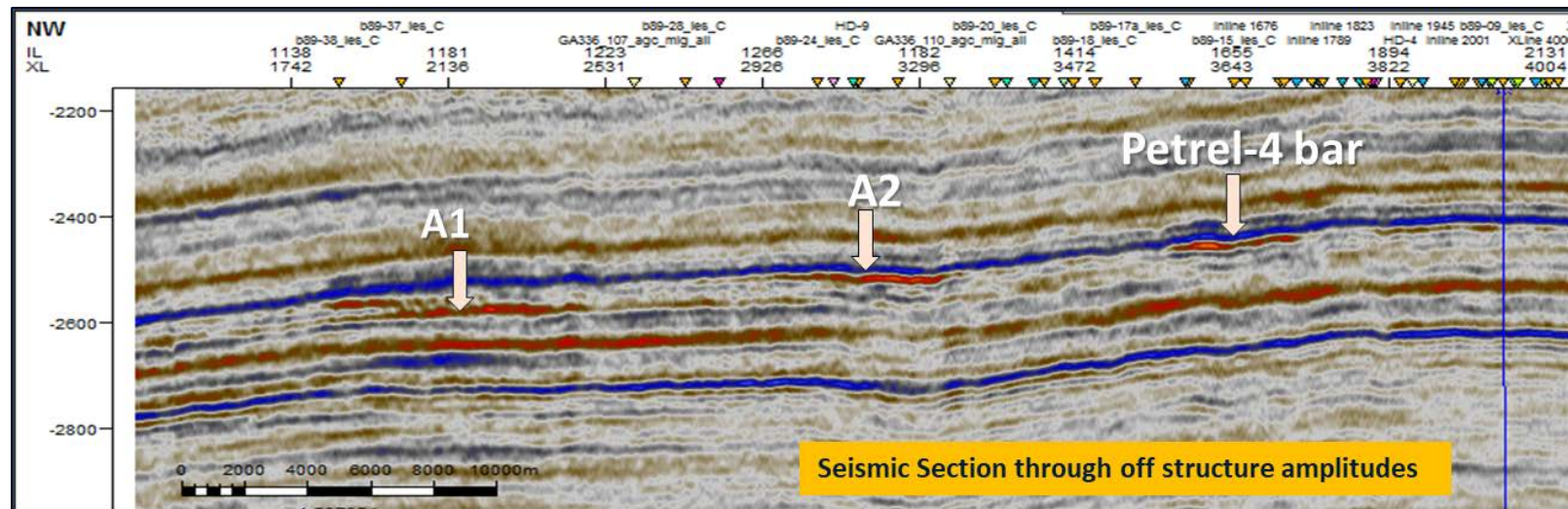
# Off-structure Amplitudes in the Cape Hay R1 Reservoir Section



## Cape Hay Fm: Off-structure amplitudes

The Petrel Field reference GWC is significantly below the structural spill point and the field is interpreted to be a combined structural and stratigraphic trap. Off-structure potential stratigraphic traps have been defined on the 2021 Petrelex MC3D.

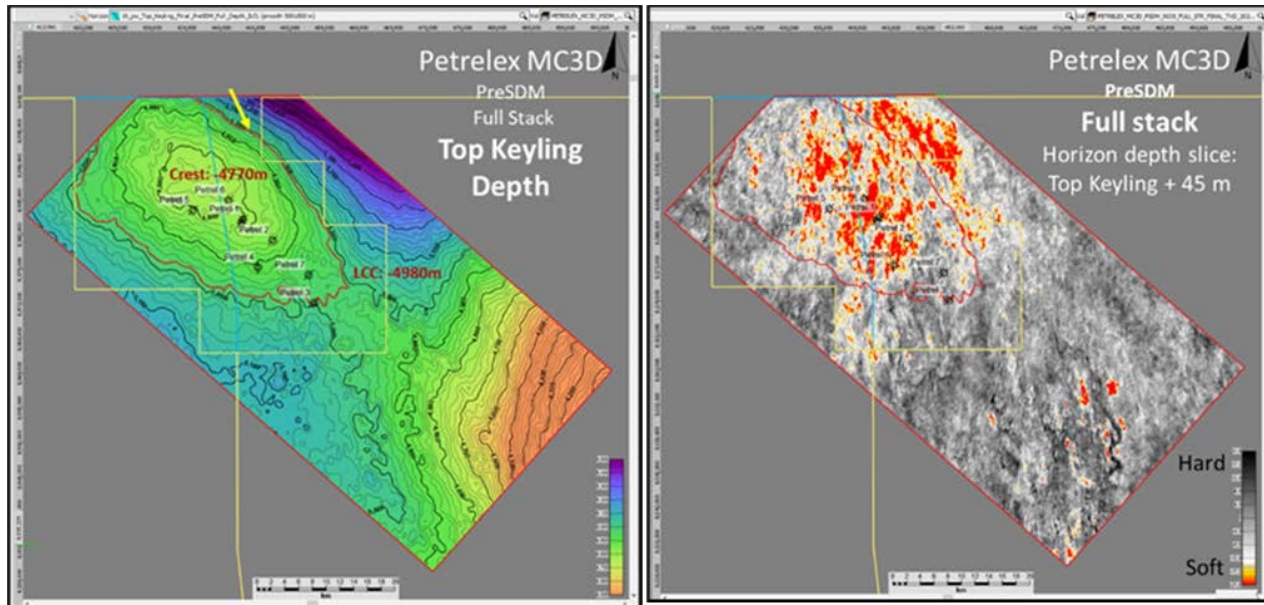
Seismic amplitude anomalies within the Petrel Field represent high porosity sandstones at the Petrel-4 well and the A1 and A2 anomalies have similar seismic amplitudes and form.







# “Mollymawk” Top Keyling Fm Prospect Located below the Petrel Field



## Potential Keyling giant multi-Tcf prospect

Large undrilled unfaulted anticlinal structural trap (713 km<sup>2</sup>, 220 m relief, *similar areal size to Singapore!*)

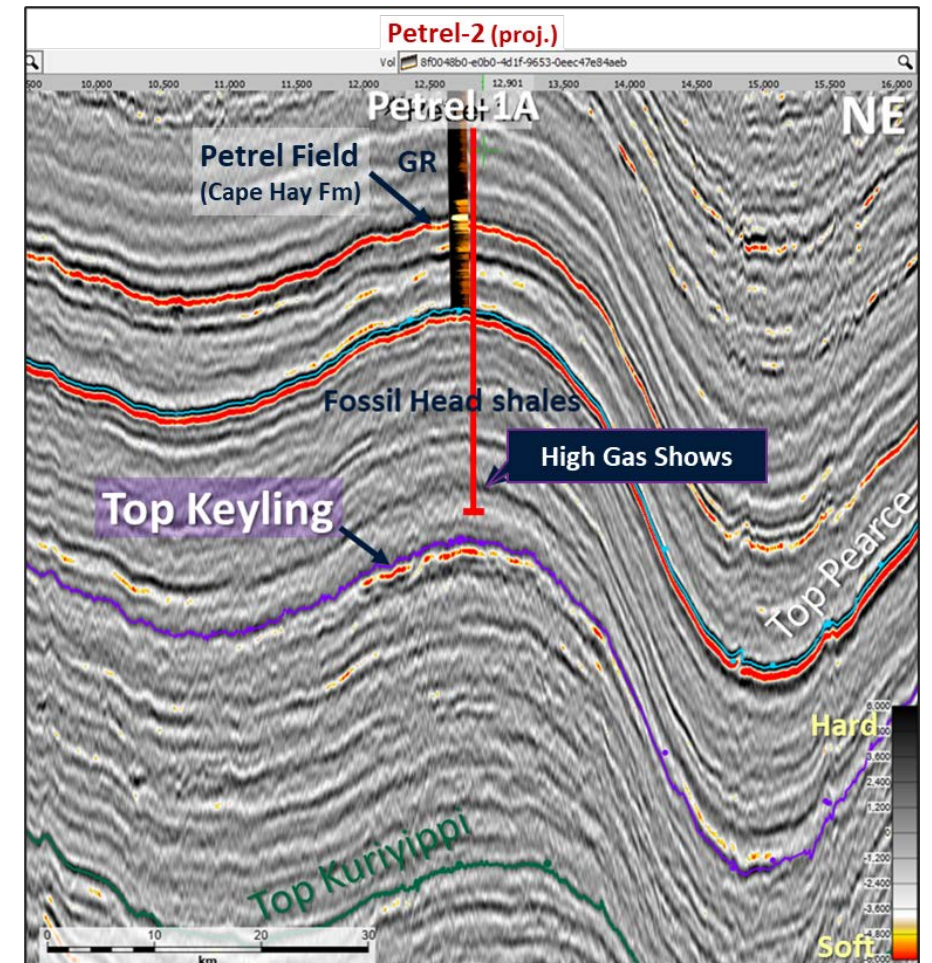
Undrilled deeper section below the Petrel Gas Field, significant gas shows in Petrel-2 (deepest well)

Significant seismic amplitude anomalies interpreted as preserved reservoir quality in the target gas sandstones

The Keyling play is also analogous to the recent success in the deep Permian Kingia Sandstone Play in the Perth Basin (Waitsia Field, West Erregulla, etc)

Indicated overpressure in the reservoir sandstones may preserve porosity

Seismic Section through Mollymawk prospect

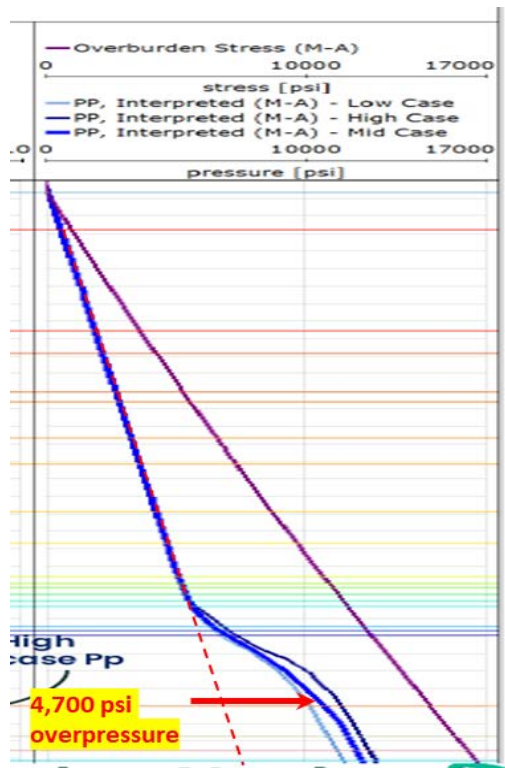






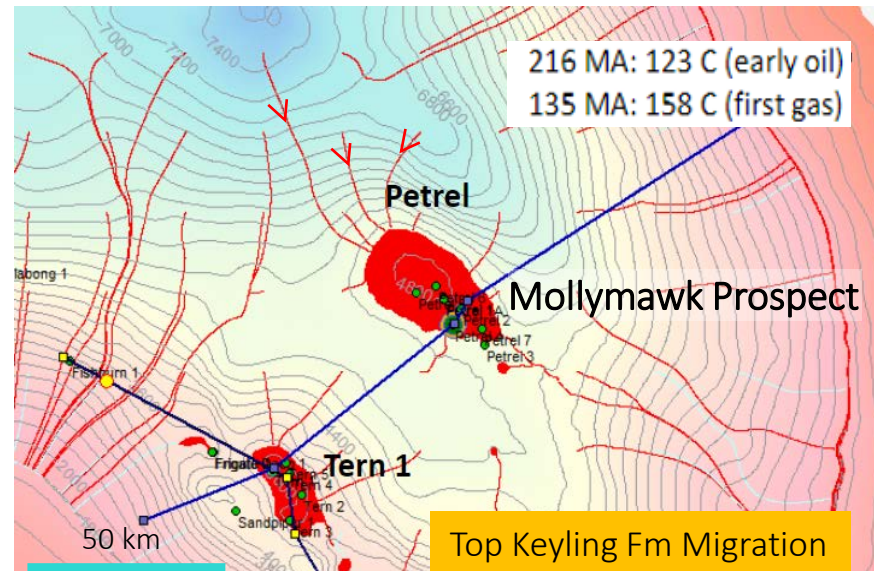
# Potential Mechanisms for Keyling Fm Porosity Preservation

## Overpressure



Pore pressure study indicates 4,700 psi overpressure in Early Permian

## Early Charge

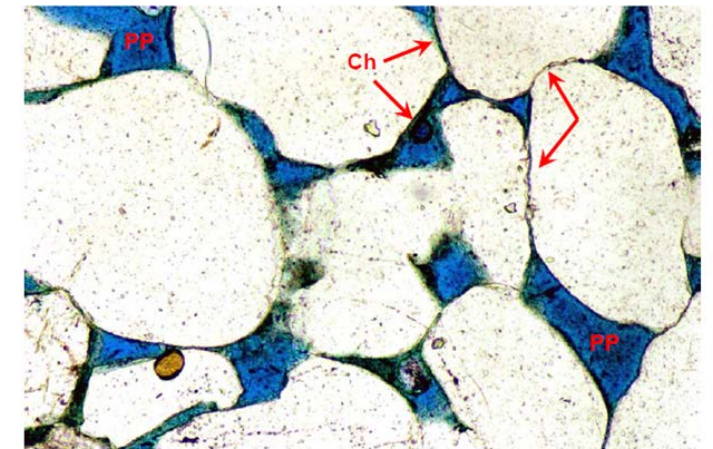


The Keyling Fm structure formed early at the Mollymawk prospect  
Basin modelling shows two stages of charge: Oil charge during the Late Triassic and Gas charge commencing in the Early Cretaceous

Presence of early structure and early charge may preserve porosity

## Grain Rim Coating

PLATE 24 #1 3008.05m Treachery Fm (A6 unit) (cont.)



Blacktip North-1 Well

0.2 mm

Some evidence of grain coating chlorite observed in the basin in both Early and Late Permian reservoirs  
Grain coatings are also observed in the good reservoirs of the Perth Basin analogues in Western Australia





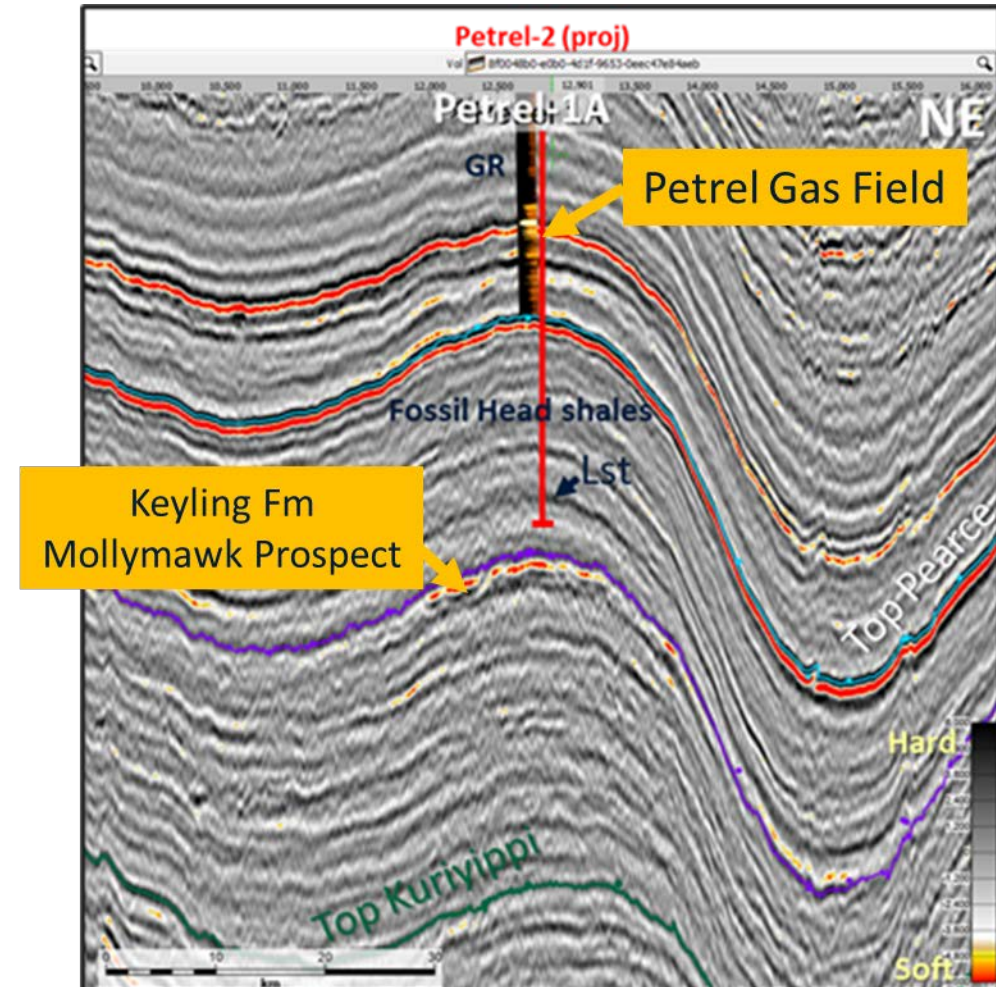
# Executive Summary





# Executive Summary

- Petrel Gas Field is a well-positioned large undeveloped gas field in Bonaparte Basin with ~1.3 to 2 TCF resources
- New Petrelex MC3D Seismic Data provide refinement to the subsurface understanding of Petrel R1/R2/R3 reservoir as well as deliver new multi TCF exploration prospects (Off-structure Cape Hay Amplitudes and Deeper Keyling Amplitudes “Mollymawk”)
- Possible value optimization for Petrel R1 development with possible tie-in options
- Successful appraisal or exploration drilling could lead to a different type of development, from currently planned “FEED ready” domestic scenario to an LNG development







Thank You !

On behalf of Joint Venture Parties:  
Neptune Energy Bonaparte Pty Ltd  
Santos Ltd