THE CHESTNUT FIELD

OPPORTUNITY AMID UNCERTAINTY

DEVEX 2020

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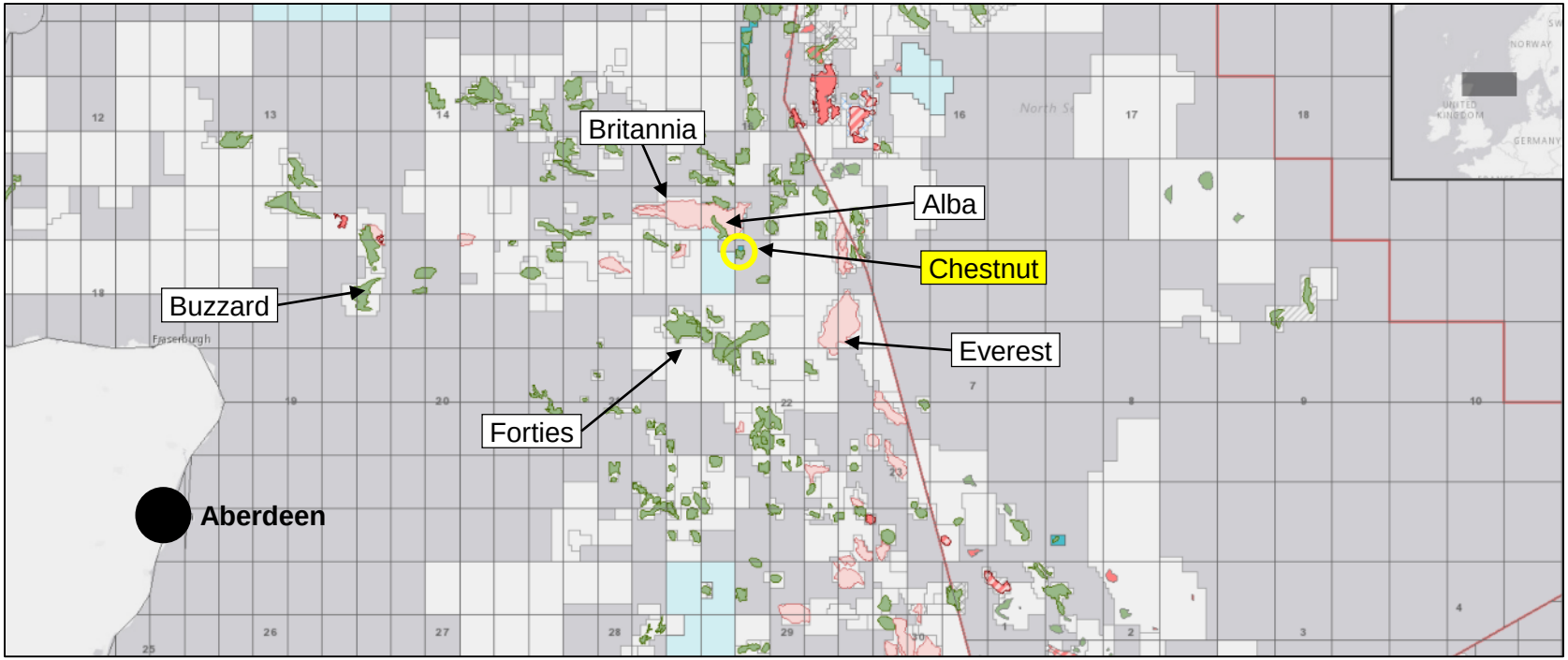
SPIRIT ENERGY

OUTLINE

- Field background - opportunity amid uncertainty
- Subsurface overview of Chestnut injectite field
- Reservoir imaging challenges and improvements
- Iterative reservoir modelling - where is the sand?
- Unlocking new resources through progressive infill drilling

LOCATION

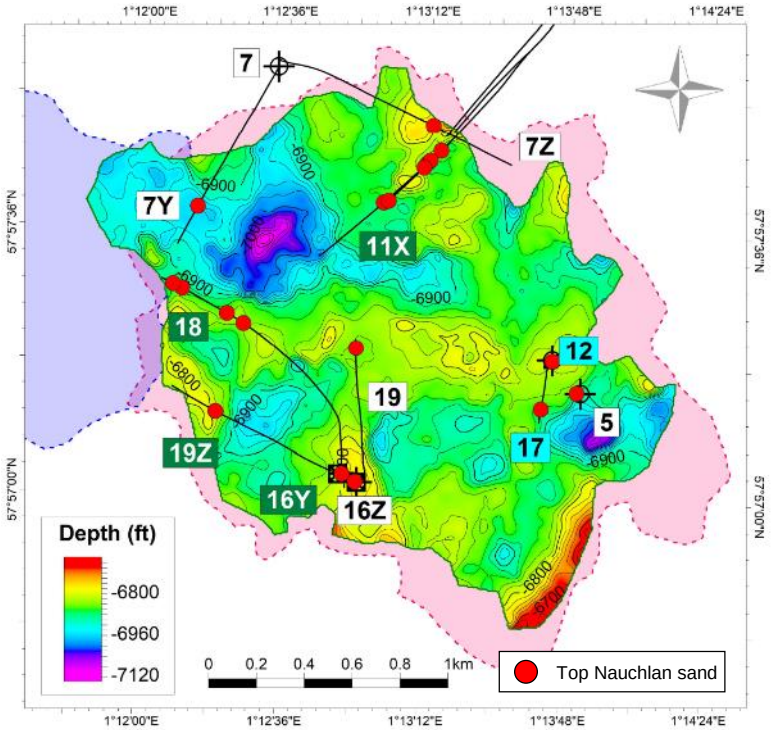


Chestnut field is ~220 km northeast of Aberdeen in 390 ft of water

FIELD BACKGROUND

Block No (Licence)	22/02a (P354)
Partnership	Spirit Energy 82.206% Dana Petroleum 17.794%
Export Route	Oil produced through FPSO
First oil	September 2008 (EWT 2001)
FDP resources	7 mmbbls
Cum. production (August 2020)	26.1 mmbbls
Wells	13 wells + sidetracks (4 producers, 2 injectors)
Reservoir	Nauchlan sands (injectites)

Top Nauchlan depth map



13 reservoir penetrations in a field with small areal extent and complex sand geometry

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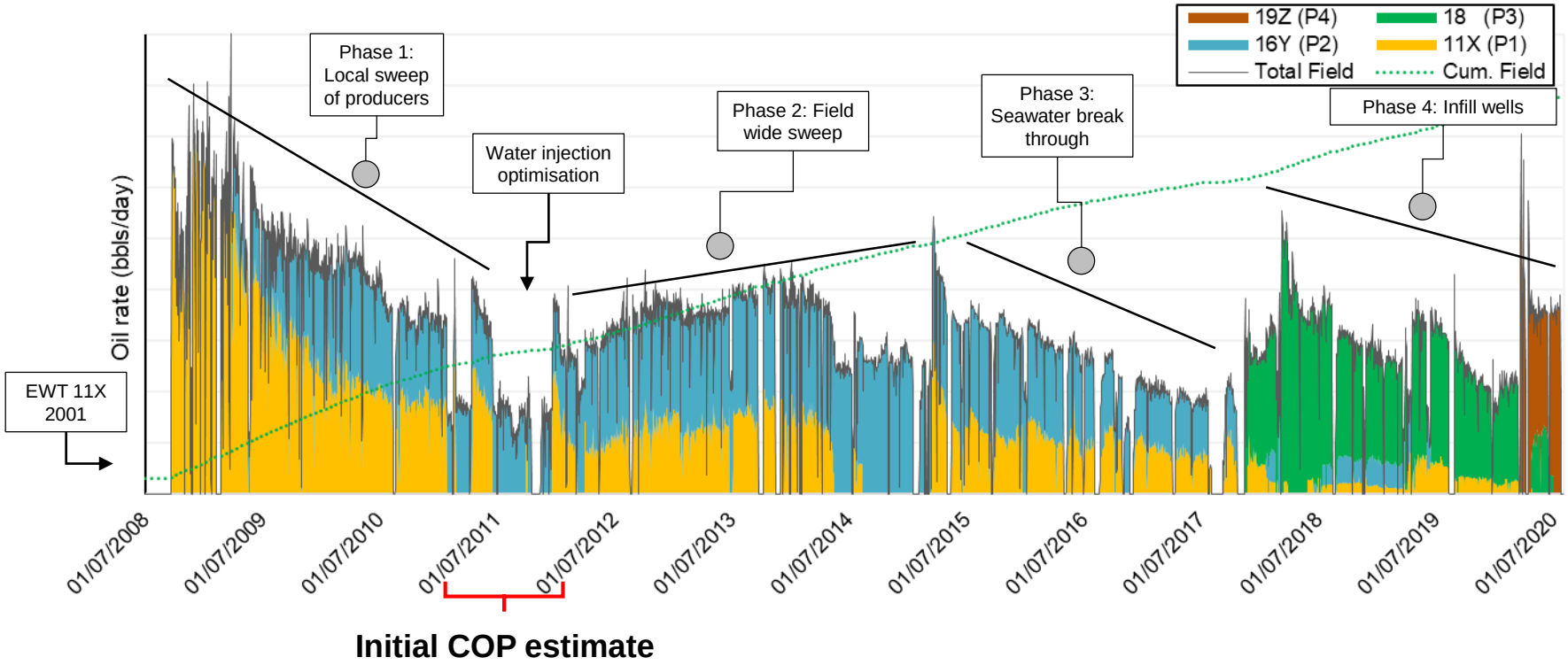
Sanctioned resources at FDP: 7 mmbbls
Expected field life: 2-3 years



Production continues well after initial COP estimate

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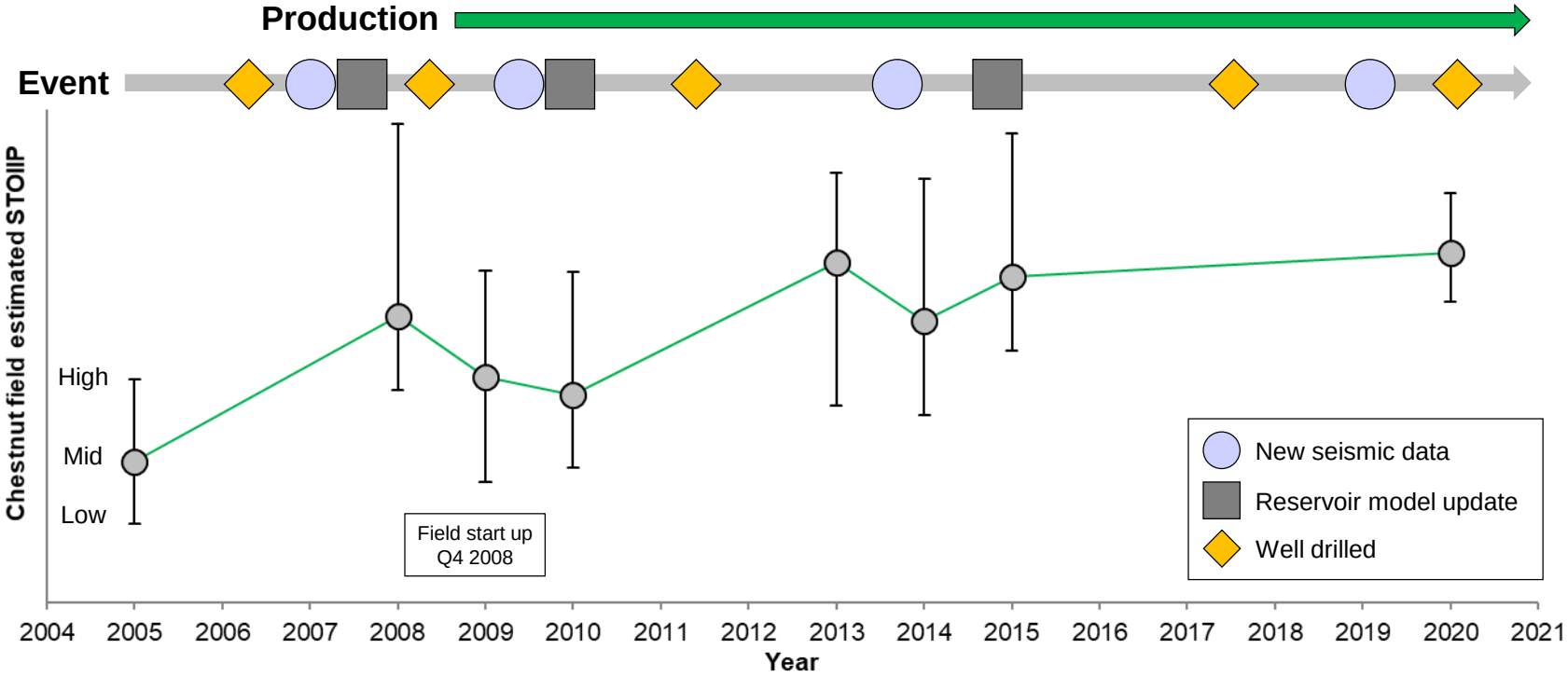
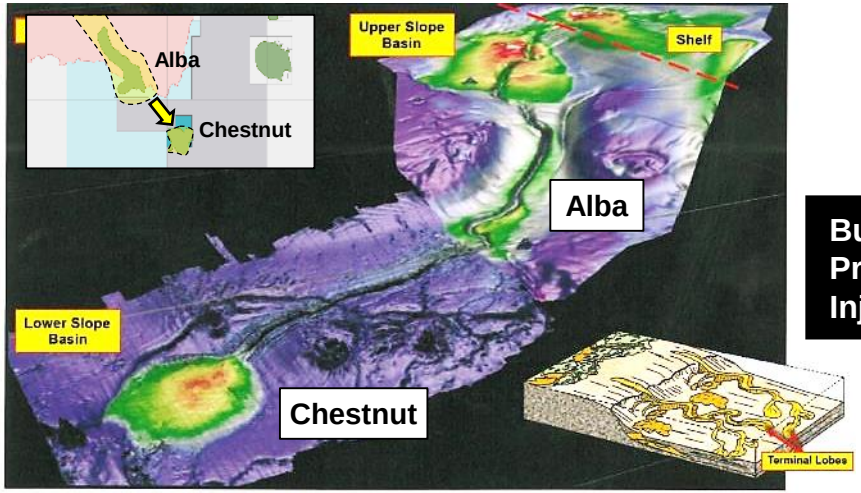


Increase in STOIIP as datasets improved; seismic + wells/production

SUBSURFACE OVERVIEW

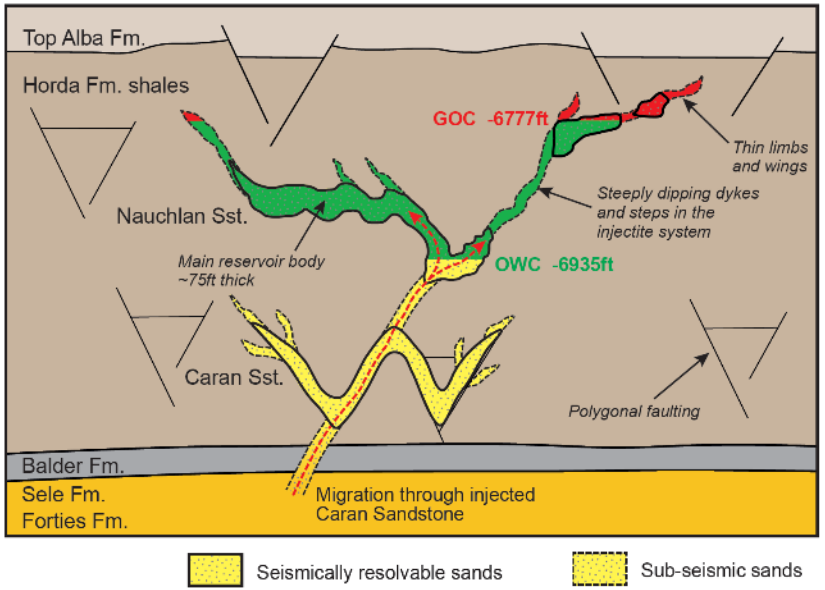
Terminal lobe in a mud-rich turbidite system (Eocene)



Modified from Pirmez et al. 2000

Burial Pressure Injection

Remobilized and injected sands - complex geometry

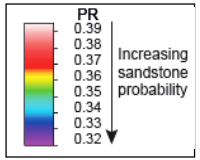


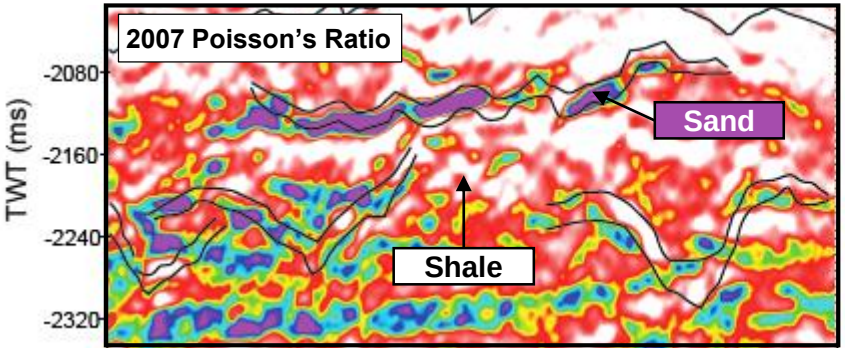
Van Oorschot et al. 2019

- Nauchlan sand injectite: Porosity ~ 30%, permeability ~1-2 Darcy
- Hydrocarbons: Light oil (28.5° API, GOR 580-640 scf/stb)

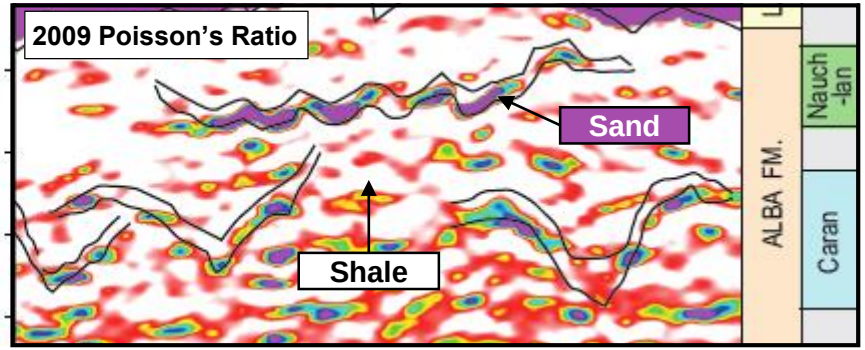
Remobilization creates uncertainty in reservoir geometry

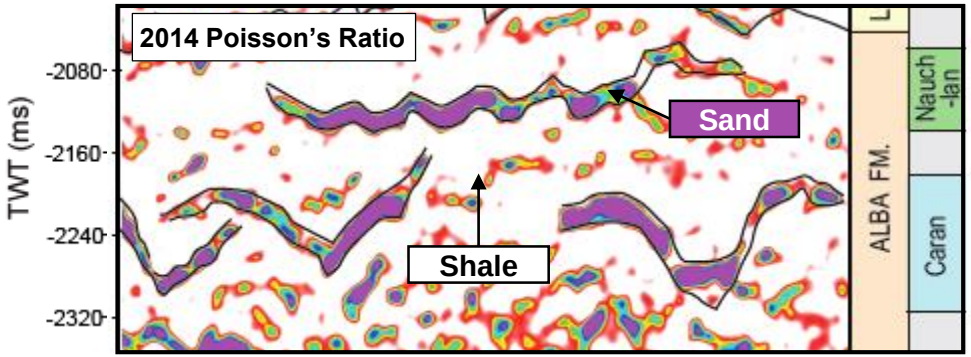
SEISMIC IMAGING CHALLENGES





Modified from Van Oorschot et al. 2019





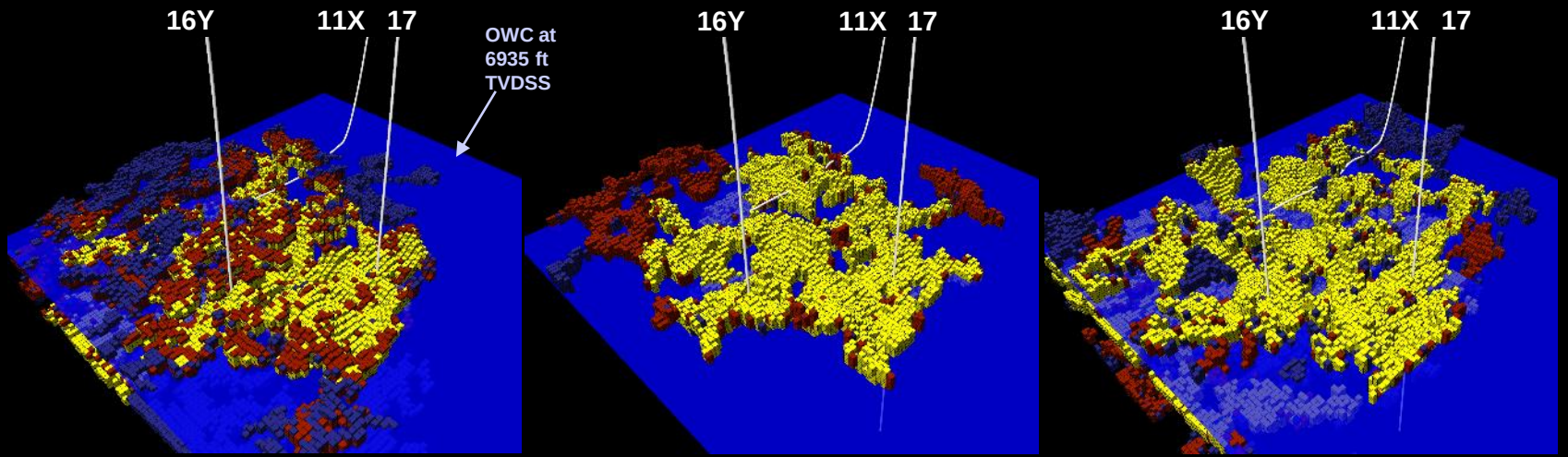
- Reservoir presents imaging challenges
- Different seismic vintages and inversions used over field life
- Each dataset gives a different picture of reservoir distribution and connectedness

Reservoir imaging challenges reflected in different seismic vintages

3D GEOMETRY CHALLENGES

Low
Mid
High

A sample set of images of sampled 3D geobody cubes from different seismic data:



2007 Poisson's Ratio

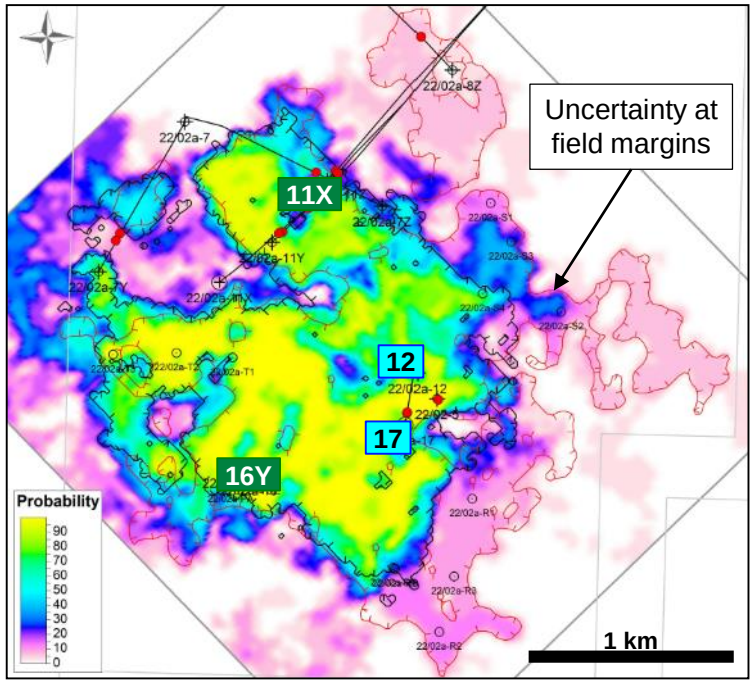
2009 Poisson's Ratio

2014 Poisson's Ratio

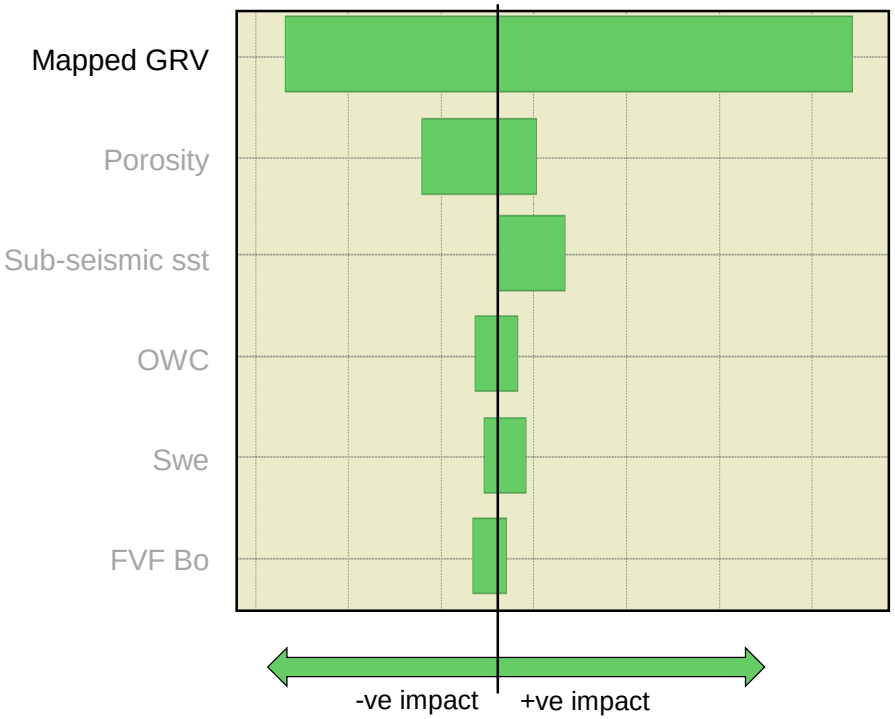
Alternative GRVs from different seismic data provides significant uncertainty

DEFINING SENSITIVITY AND UNCERTAINTY

Sand probability map



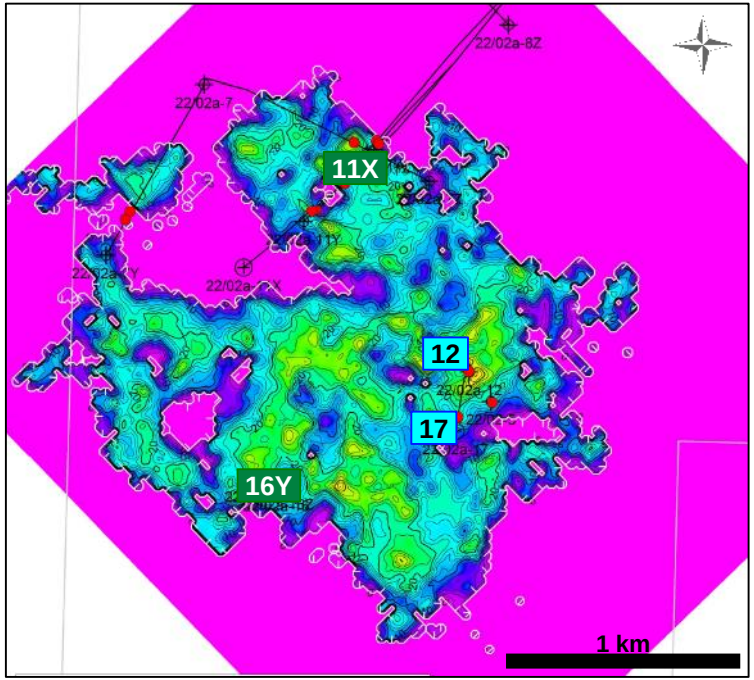
STOIIP sensitivity

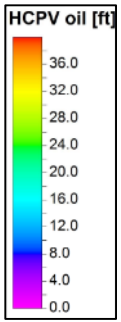


GRV and geometry are highest remaining static uncertainties

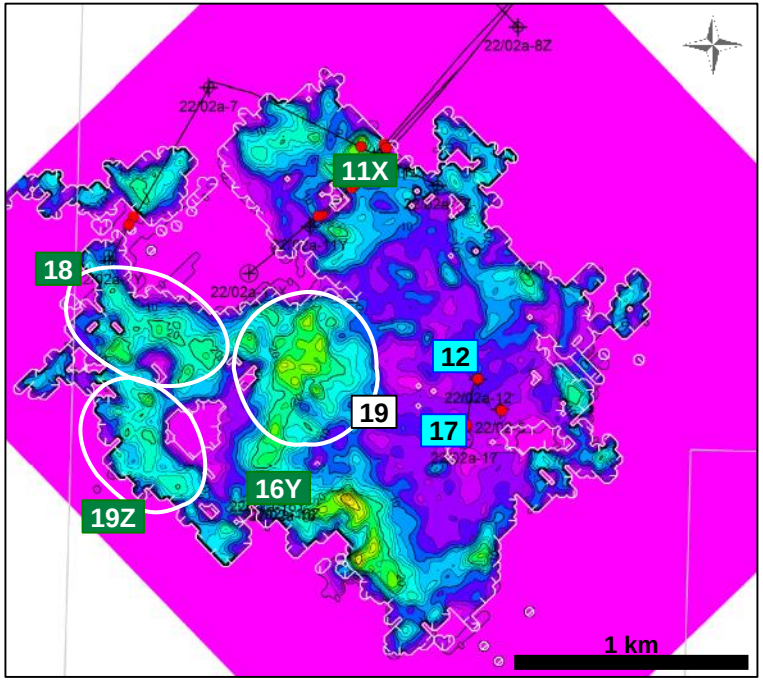
REMAINING OIL FROM DYNAMIC MODEL(S)

Initial STOIIP



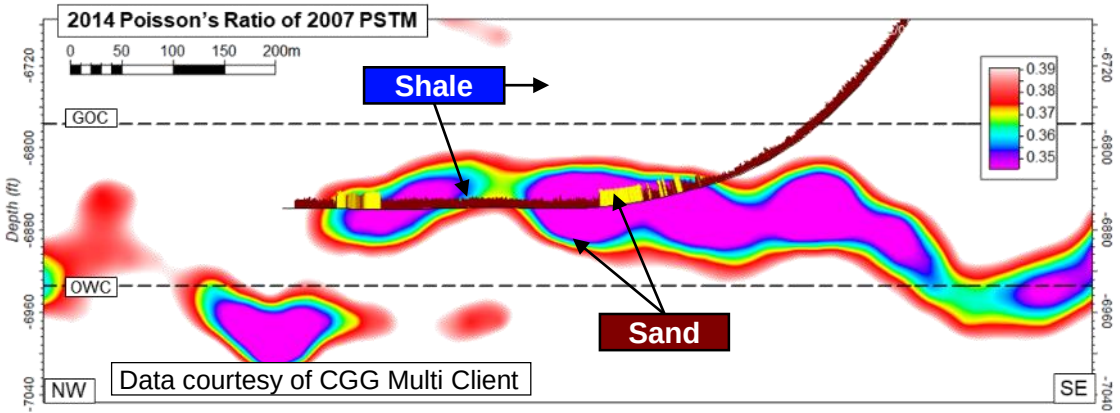


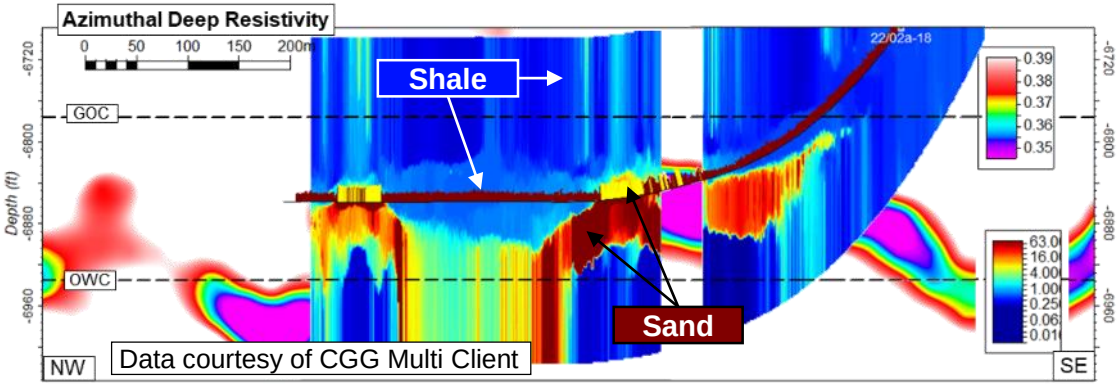
Remaining oil - April 2015

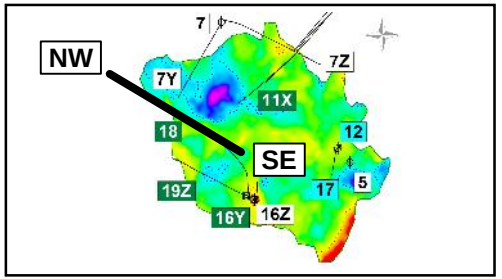


Water behaviour and sweep largest remaining dynamic uncertainty

22/02A-18 (2017 PRODUCER)



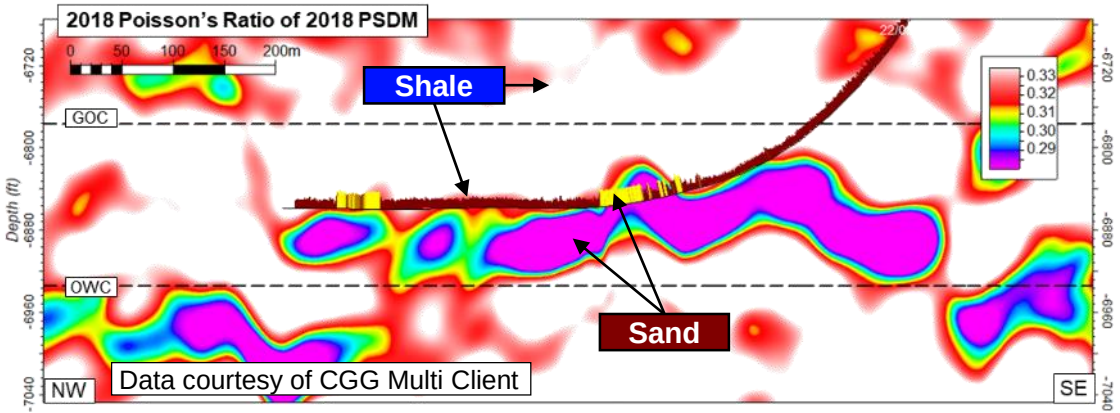


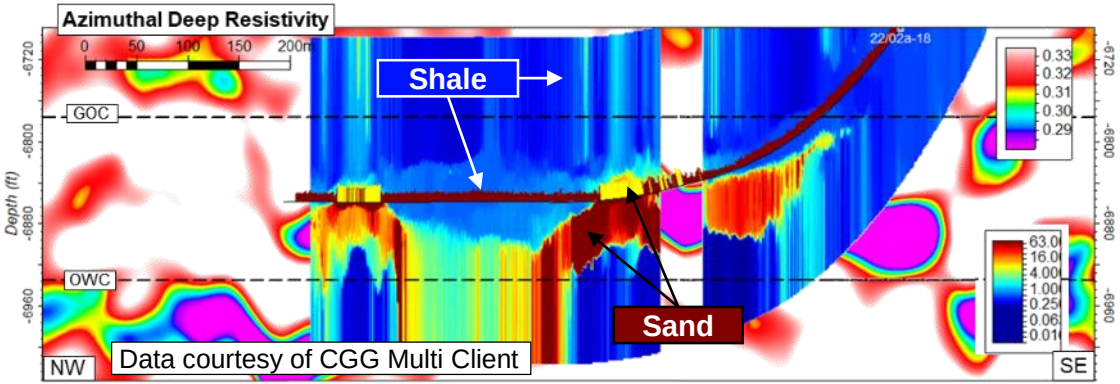


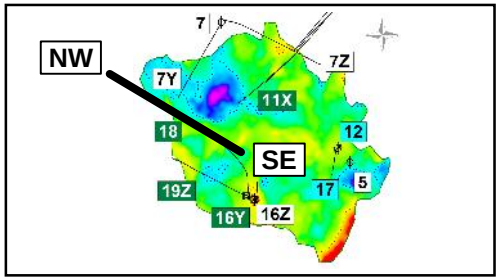
- > 300 ft high quality net pay encountered
- Deep resistivity highlighted seismic positioning uncertainty
- Geo-steering required to maximise sand penetration
- Prompted a new seismic reprocessing and inversion study undertaken in 2018

Successful infill producer, seismic positioning uncertainty was key learning

22/02A-18 (2017 PRODUCER)





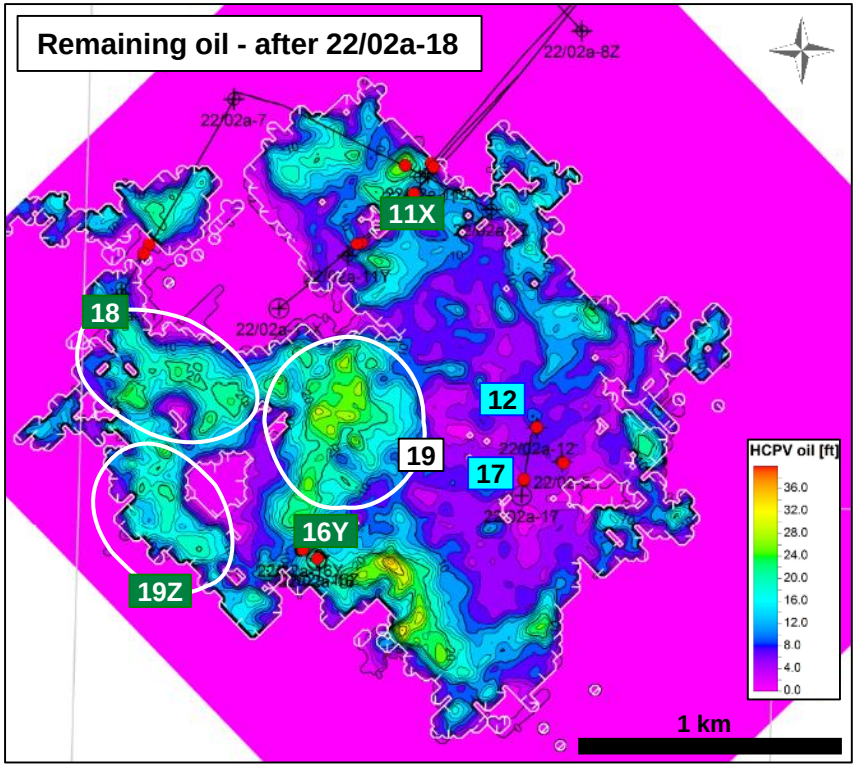


- High resolution PSDM reprocessing and Poisson's Ratio inversion completed
- Detailed velocity model built including multiple shallow gas layers
- Better imaging with reduced lateral and vertical positioning uncertainty seen through improved well ties

Seismic reprocessing to PSDM improved imaging and well ties

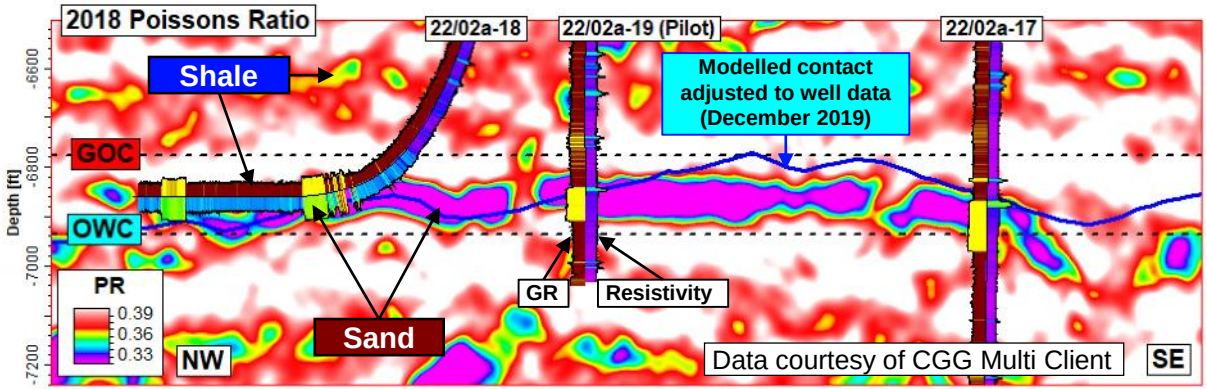
22/02A-19 CAMPAIGN DRILLING STRATEGY

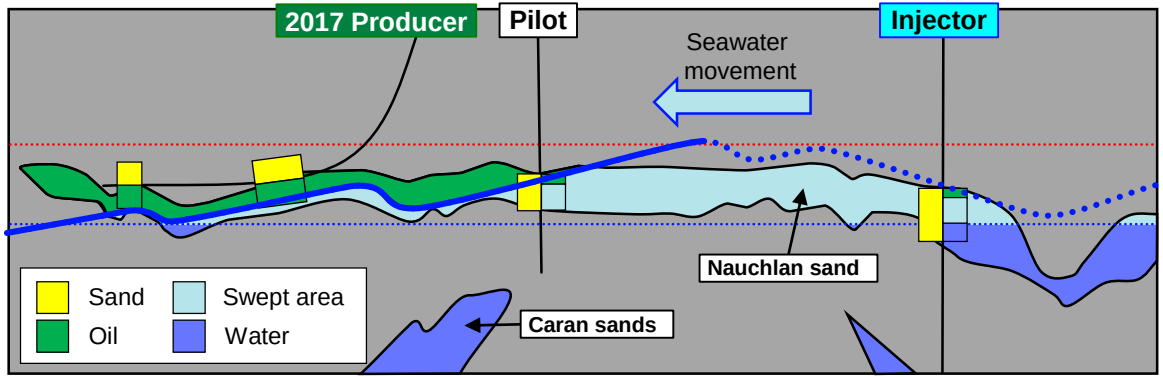
- Further targets identified for drilling infill well
- Main target; Central area (19)
  - Potential unswept area of the field with relatively high dynamic risk
- Sidetrack option; Southwest area (19Z)
  - Area on field margin
- Central target tested with a pilot well and encountered swept central area - proceeded to planned sidetrack at 19Z location

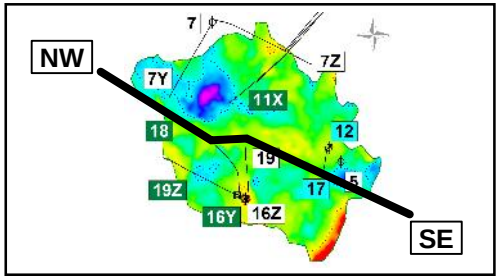


19 pilot tested sweep model - pre-defined criteria not met, proceeded to 19Z

22/02A-19 (PILOT)



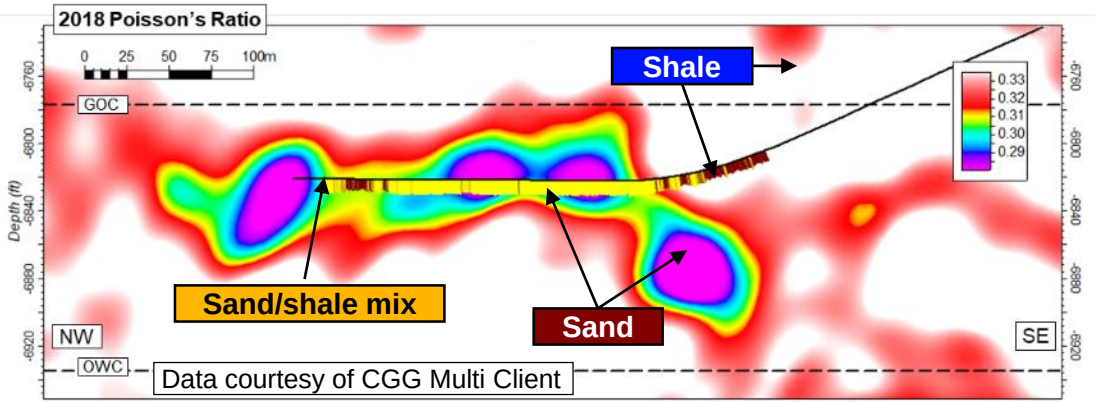


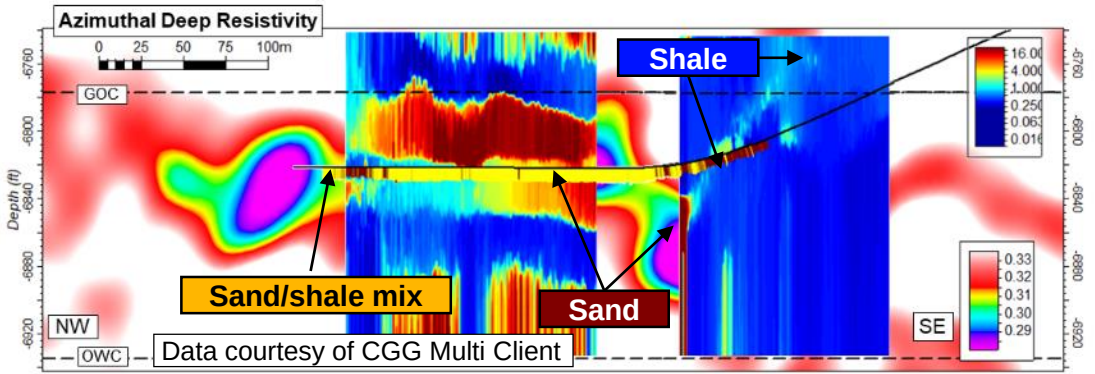


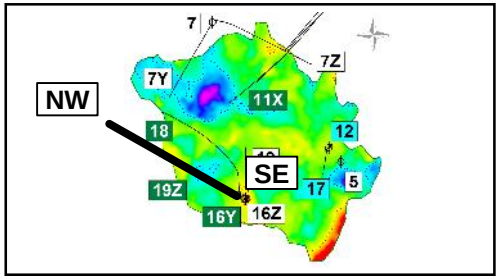
- Significantly improved well ties with 2018 reprocessed data
- Seismic inversion products (including Poisson's Ratio) resulted in higher confidence reservoir mapping
- Pilot well (22/02a-19) in central area proved good quality sand but water swept - volumes at low end of expectation
- Proceeded to planned sidetrack location (22/02a-19Z) in southwest on field margin

Estimated remaining oil in 19 well area at low end of expectations - proceeded to SW

22/02A-19Z (2020 PRODUCER)







- >650 ft high quality net pay encountered
- Good reservoir prognosis and no geo-steering or further side-tracks required due to improved 2018 seismic data
- Deep resistivity tool indicates some sub-seismic reservoir complexity at field margin - being evaluated for further infill targets
- Pilot well strategy resulted in a success drilling of infill producer

Longest net pay interval encountered through drilling well strategy

SUMMARY

- FDP assumed field life of 2-3 years but continues to produce 12 years after first oil
- Iterative seismic reprocessing and inversion, new wells and integrated reservoir modelling has increased confidence in STOIIP
- Opportunities identified for 2 agile infill well campaigns
- New wells and field production optimisation have arrested production decline and maximised value from the field

ACKNOWLEDGEMENTS

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Multiclient seismic data owner CGG

QUESTIONS?