November 2025

Click to edit Master text styles

PetroQuest Africa 1

PSA 131 Leopard Prospect

Focused on International Offshore and onshore projects

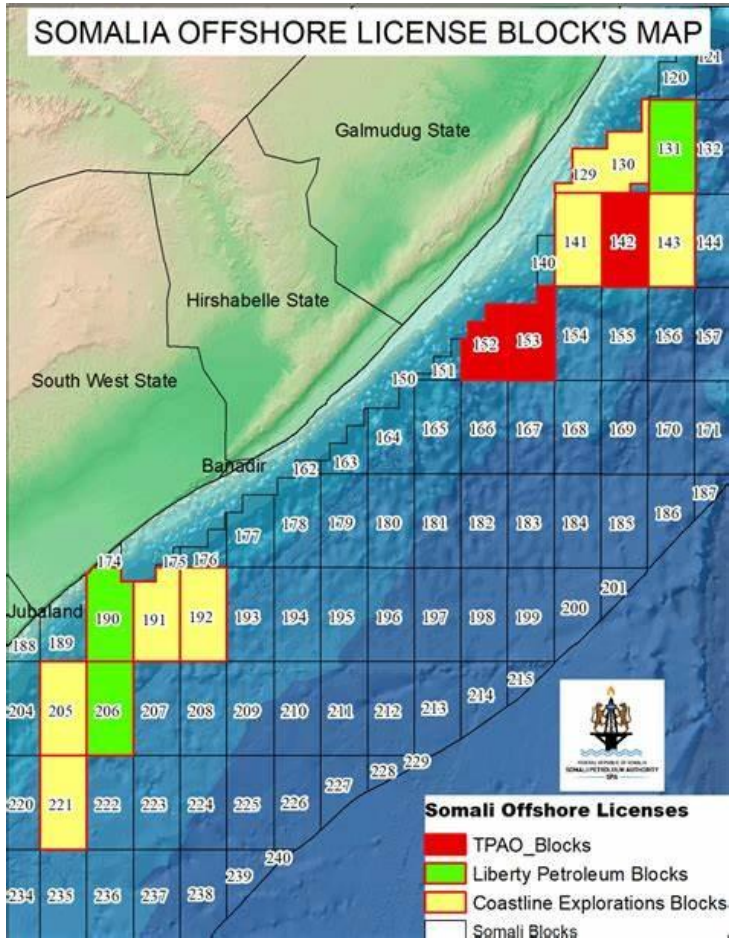
LIBERTY PETROLEUM CORPORATION

PETROQUEST AFRICA-1&2

Agenda: PetroQuest Africa 1

PETROQUEST AFRICA – 1&2

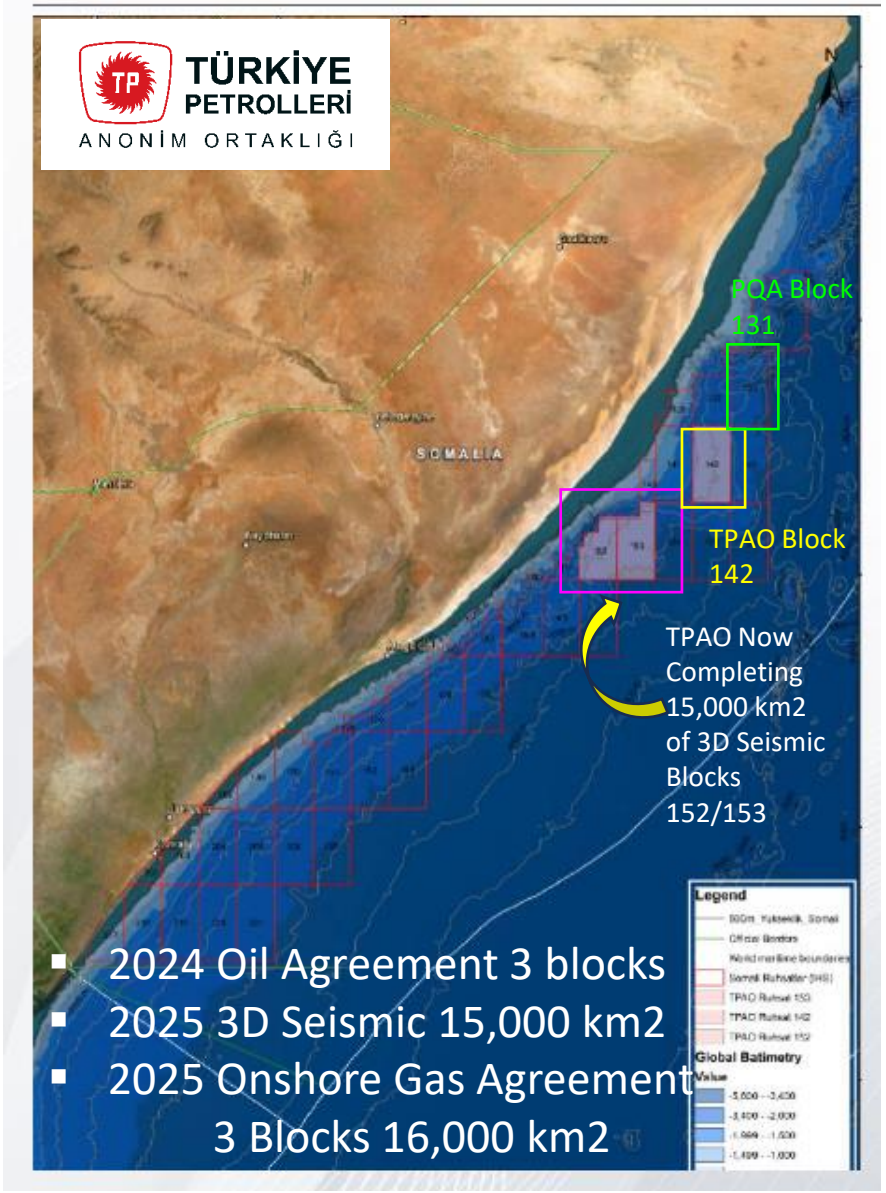
1. *Introduction, Stratigraphy and Tectono-stratigraphy*
2. *What's New & Above Ground Risk Improvements*
3. *East African Source Rock Geochemistry & Petroleum Geology*
4. *Source Rocks & New Oil Story For The Offshore Somali Basin*
5. *USGS Regional Study and Oil & Gas Volumes*
6. *Existing Wells & TGS 2D Seismic (2014 & 2015)*
7. *Mid Somalia High – Stacked Play Types*
8. *Leopard Prospect & Zakum Super Giant Oil –Field Analogue*
9. *Prospectivity Summary – Other PSAs*
10. *Forward Work Program (SPA)*
11. *3D Seismic, Design, Planning & Timing (In Progress)*
12. *3D Seismic Cost Comparisons & Regulator Approvals*
13. *Summary*



Turkish Petroleum (TPAO) – 15,000 km2 of 3D Seismic Blocks 152 &153

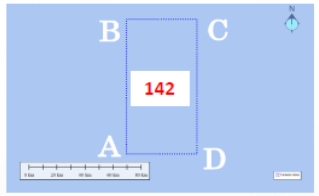
Going 'All In Somalia' Both Offshore (Oil Deal) & Onshore (Gas Deal)!

PETROQUEST AFRICA – 1&2



https://hiiraan.com/news4/2025/Apr/201072/t%C3%BCrkiye_somalia_sign_onshore_oil_and_gas_deal_as_offshore_surveys_near_completion.aspx

Seismic Vessel ***Oruc Reis***



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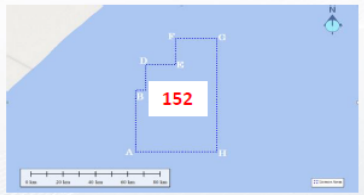
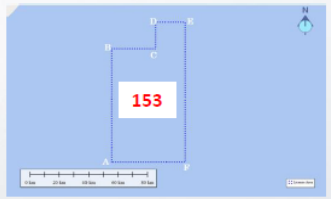
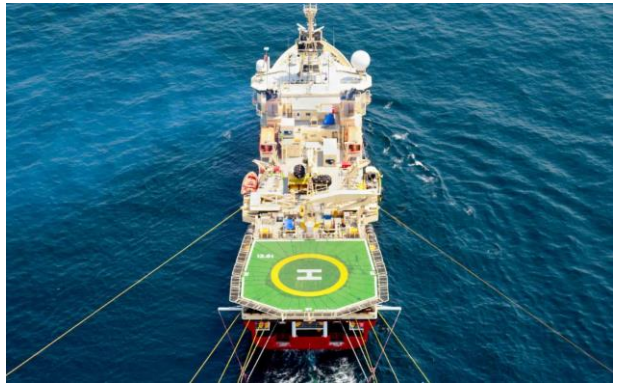
A	940000.050	424999.990
B	940000.043	525000.013
C	990000.009	525000.001
D	990000.017	425000.041



Point	Easting	Northing
A	789999.975	325000.017
B	790000.0	368854.58
C	796263.38	368892.61
D	796212.196	387335.37
E	814745.346	387389.711
F	814688.296	405834.988
G	840000.050	405921.086



Point	Easting	Northing
A	840000.038	324999.972
B	840000.050	405921.086
C	870294.466	406026.643
D	870229.601	425000.052
E	890000.034	425000.004
F	889999.985	325000.029



Seismic Vessel ***Oruc Reis*** Deployed Offshore Somalia

Somalia – Ever Reducing Above Ground Risks

Positive Developments – Somali Pricay Almost Eliminated Compared to 2008-2012

- The government of the Republic of Somalia has recently developed a licensing system and legal framework for explorers that is demonstrably working! **The peak in Somalia Piracy 2008-2012**

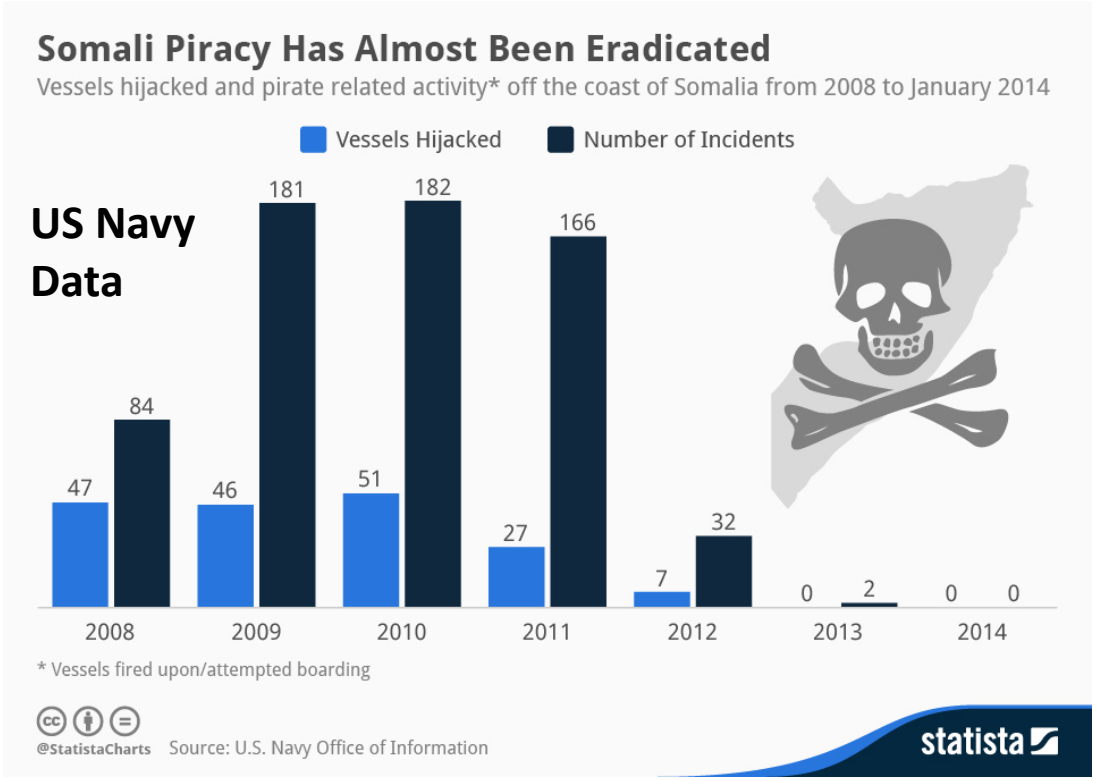
- Spectrum Seismic, TGS and TPAO have all proven that it is possible to consistently and safely acquire a large seismic volumes offshore Somalia 40,000 CDP km of 2D and 15,000 km2 of 3D Seismic.

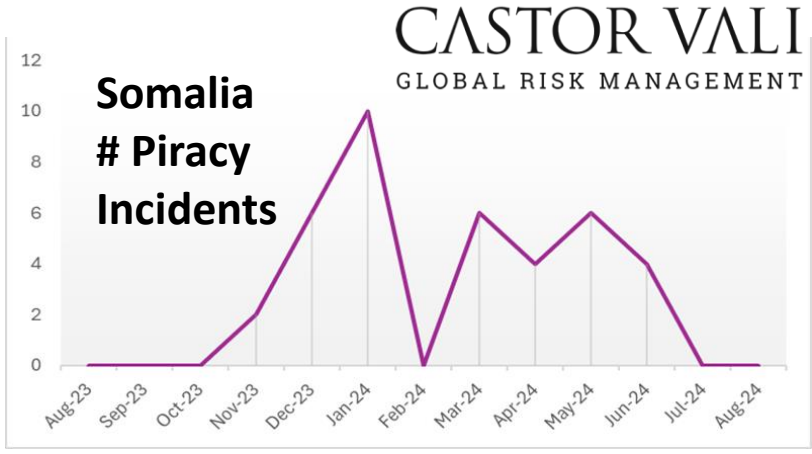
- These regulatory changes along with the availability of high quality MC2D has attracted sophisticated Operators such as Turkish Petroleum (TPAO), who were awarded three PSAs, for Blocks 142, 152 and 153. Block 142 adjoins PQA's Block 131.

- Castor Vali has recorded a significant drop in 'security incidents' offshore Somalia. This drop off in activity by bad actors may be linked to the deployment of a Turkish Navy Frigate to the Offshore area.

- April 2025 Somalia and Turkey sign a gas deal across three onshore blocks (16,000 km2).

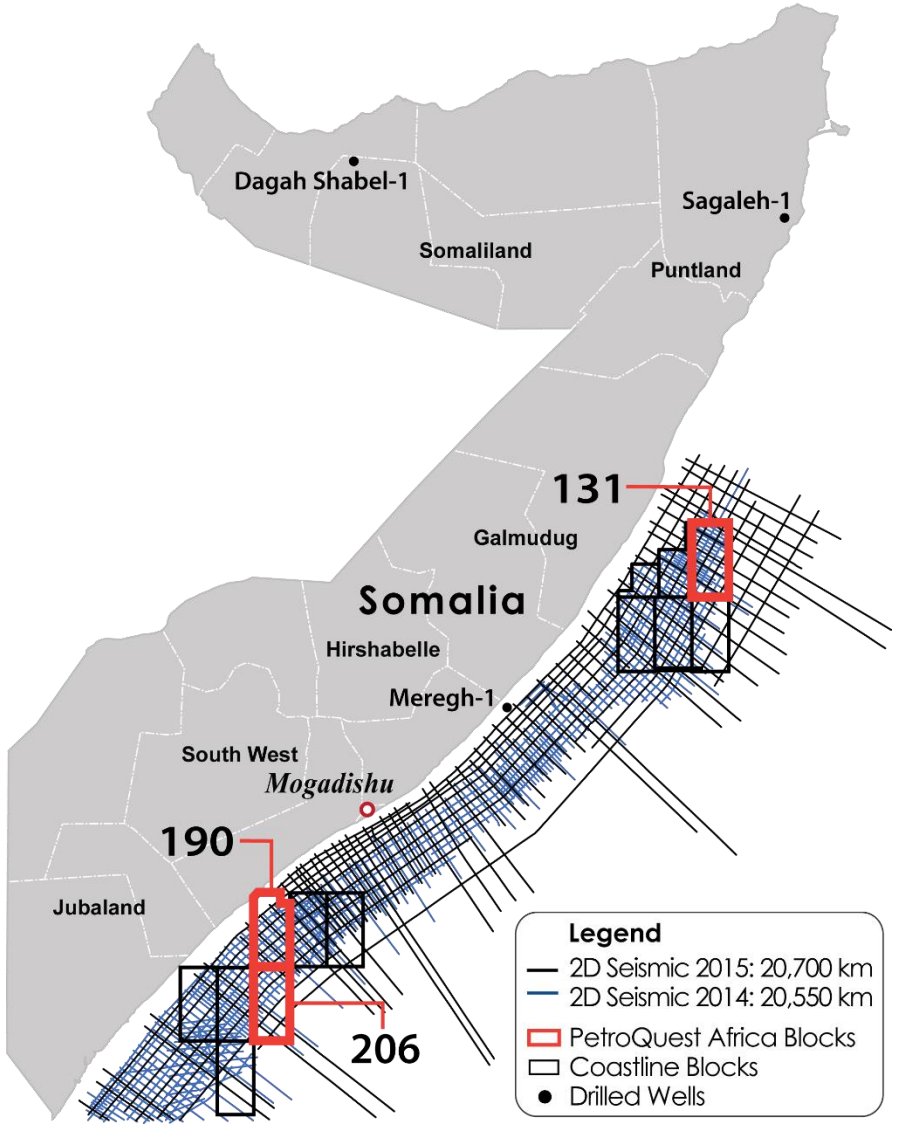
- Economic development is ongoing across the county and with the increased velocity of money, lots of good things are happening and with this people are less interested in destabilising the status quo.





PetroQuest Africa 1 & 2: (**PQA 1&2)** (PSA's 131,190 & 206)

Introduction Offshore Somalia



- On March 7th 2024, PSA's 131, 190 and 206 were ratified by Oil Minister
- PSA 131 (Northern Area) PQA 1.
- PSA 190 & 206 (Southern Area) PQA 2.
- PetroQuest Africa 1 & 2 are Affiliates of Liberty Petroleum Corporation.
- Extensive Play Fairways with abundant 'Running Room'
- Proven Analogue Plays (UAE, Saudi Arabia, Mozambique & Namibia)
- Material Volumes Mapped – Billions of Barrels in place (RPS).
- Seismic data can be readily used to de-risk plays/prospects.
- 3D Seismic is required to promote Leads & Prospects to drill status.
- PSC in good standing with all bills paid to-date.

Note

PQA 1 131 = PetroQuest Africa 1 (131 PSA)

PQA 2 190 & 206 = PetroQuest Africa 2 (190 & 206 PSA's).

PSA = **P**roduction **S**haring **A**greement (Ratified).

Stratigraphy: East African Margin (EA)

Two Geological Terrains; Offshore Tanzania/Kenya & Somalia.

LPC has been active in EA since;
A) Seychelles Project, 2000 -2012 and B) our Somalia Venture 2013-2024.

Somalia Petroleum Geology: A Tale of Two Provinces!

To the South, Discovered (clastic) gas provinces;

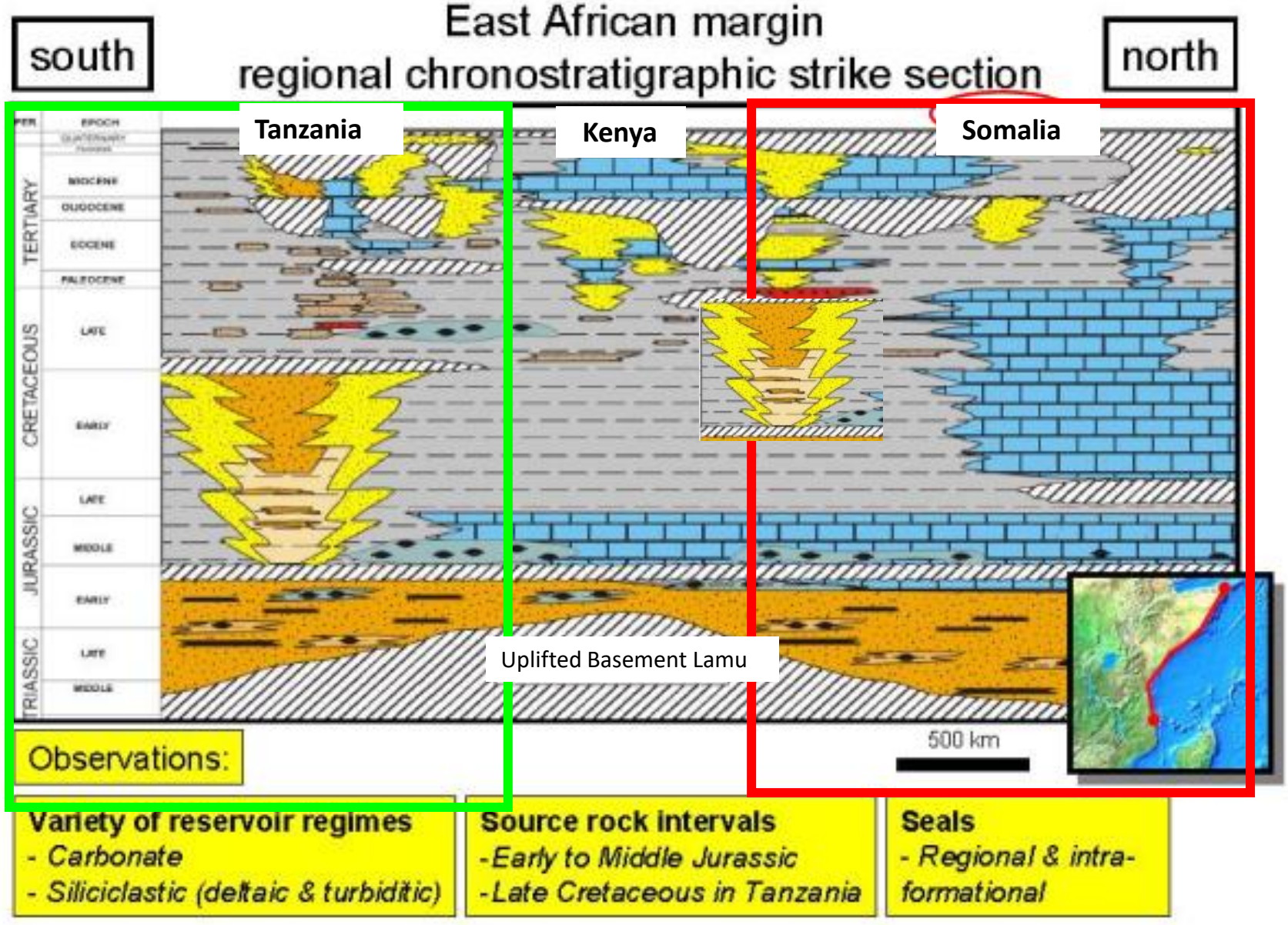
1) Rovuma Basin: Anadarko.
2) Mozambique Channel - Ophir Energy.

a) Lacustrine (Rift System) Permo-Triassic
b) Marine (Drift System) Jurassic

To the North, we see an exciting confluence of two Regional Petroleum Systems:

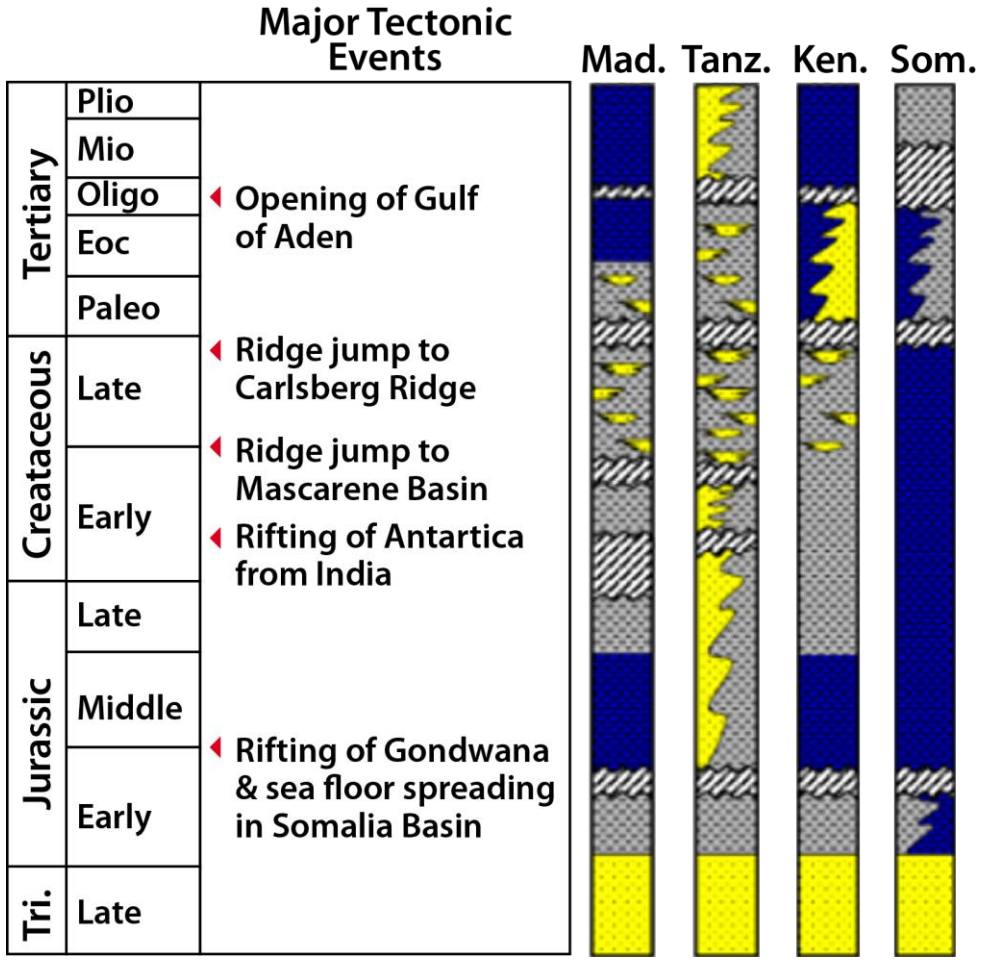
1) EA geology (Jubba Basin)
2) Persian Gulf geology (Mid Somalia)

c) Carbonate Platform (Drift) Jurassic



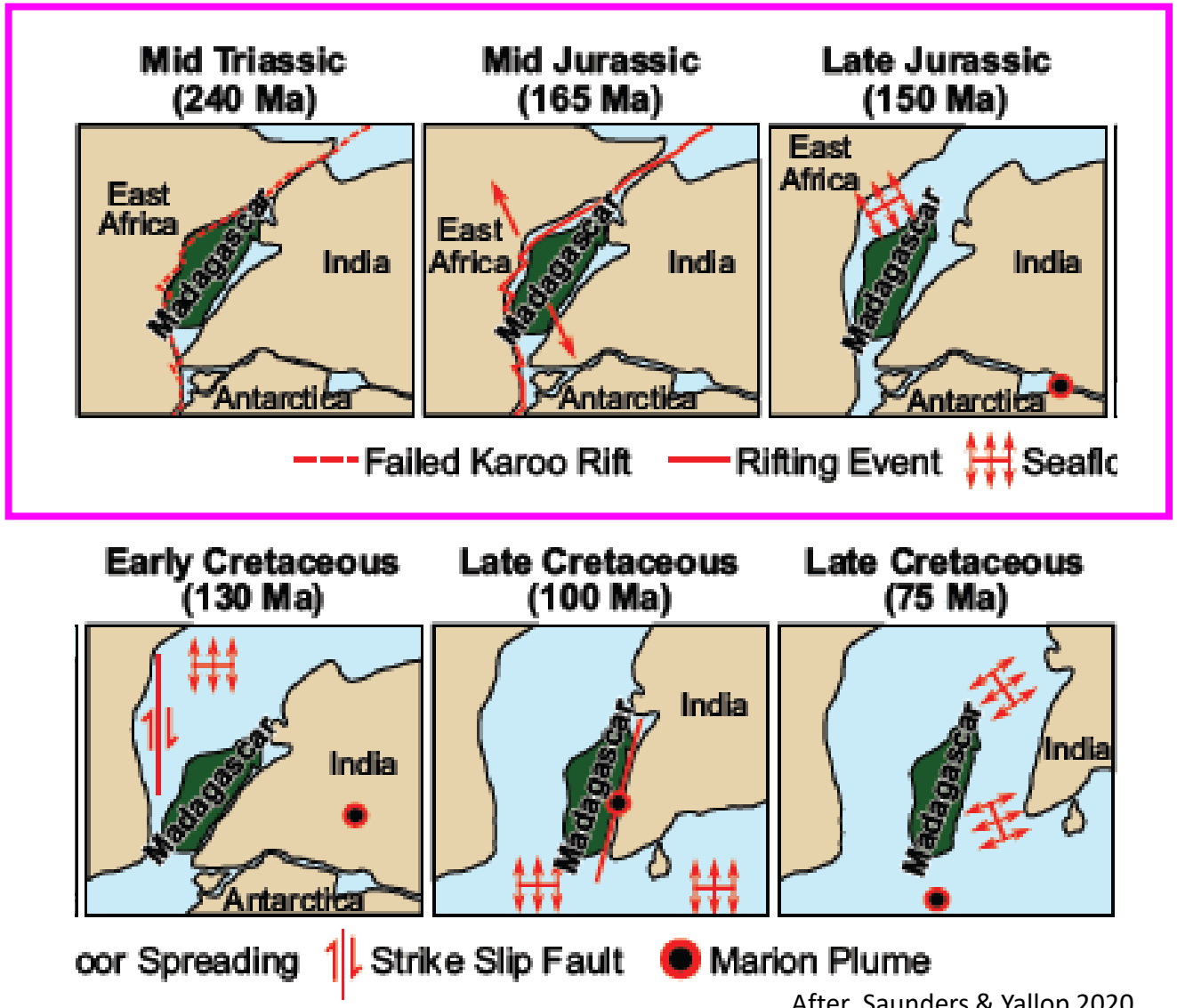
Tectono-Stratigraphy

East African Passive Margin



1st & 2nd Order Events

Pre-Rift – Syn-Rift – Post-Rift



After Saunders & Yallop 2020

East African Source Rock Geochemistry

Regional Sampling –Safari East Africa!

After Pereira et al 2013 and Matchette-Downes 2004

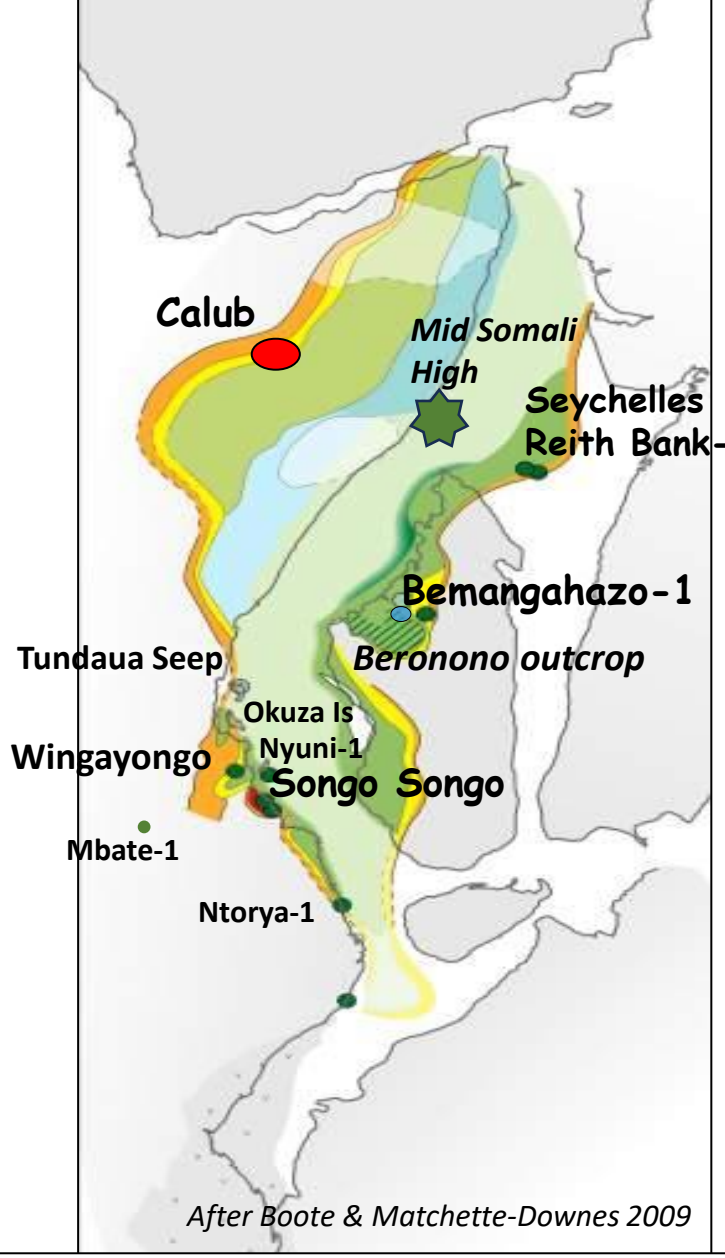
Oil-soaked reservoir sand, Wingayongo oil seep, Rufiji Trough, August 2004

Oil soaked sand, Tundaua oil seep, western Pemba Island, August 2003

Tarballs from foreshore of Nyuni, and Okuza Islands, June 2003.

Ntorya-1 flaring gas with condensate at sunset, Ruvuma Basin, Southern Tanzania, June 2012

- Since 2000 we've been collaborating with East African geochemists to unravel the complex story of the East African Passive Margin.
- We've come to understand the importance of geochemical typing of source rock extracts, oil stains, tar balls and produced liquids.
- GCMS & Carbon Isotope work is necessary to build a catalogue of oil families and we looked at this data, in Tanzania, Seychelles and Madagascar.



LOWER JURASSIC
Sinemurian-Aalenian paleogeography
oil families and source facies

Petroleum Systems Of East Africa

Key Hydrocarbon Occurrences East African Passive Margin

Calub Gas Field: Permo-Trias (Calub Fm) and Lower Jurassic (Adigrat Fm) clastic reservoirs, >0.35BCF reserves

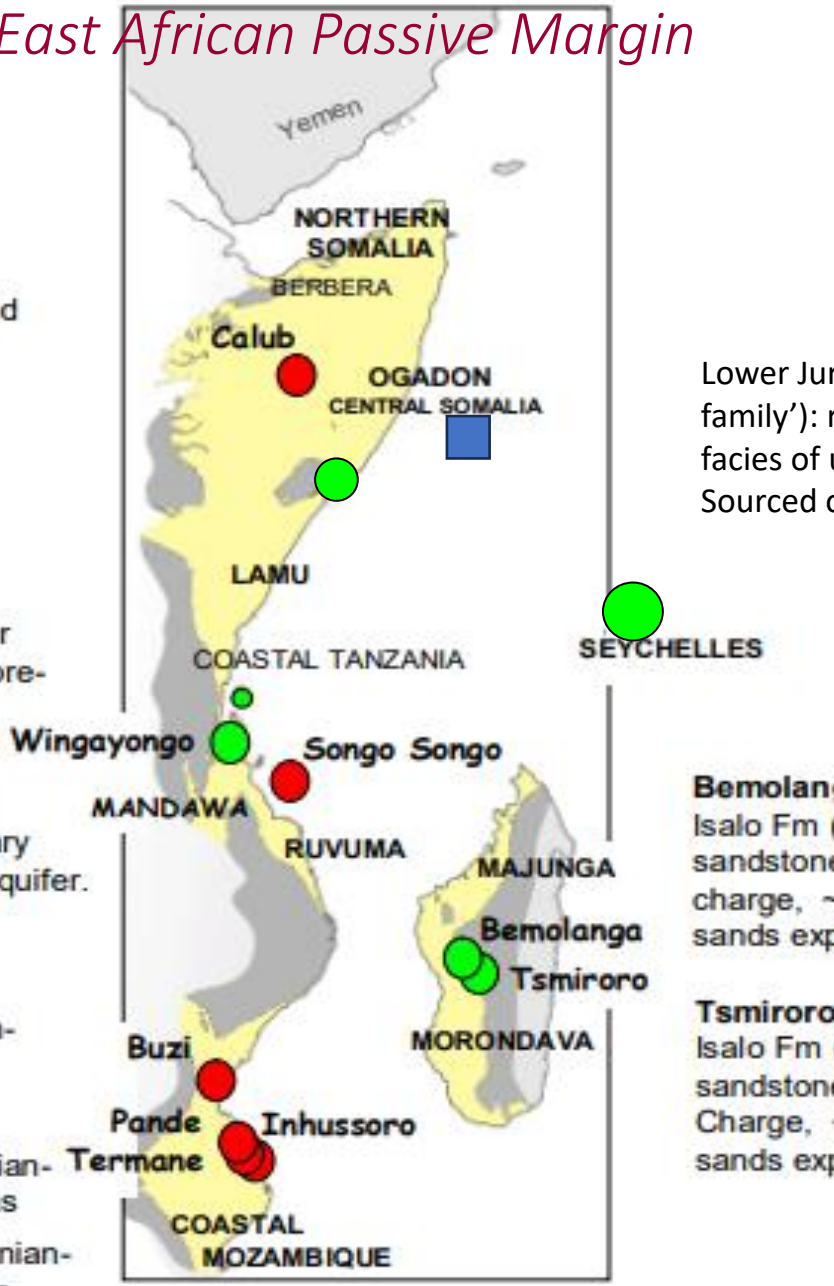
Wingayongo paleo-oil field: Kapatimu Fm (Neocomian-Aptian) clastic reservoir ~ 45m tar impregnated sandstone (= paleo oil column? / pre-Tertiary charge?) now exposed in outcrop.

Songo Songo Gas Field: Kapatimu Fm (Neocomian-Aptian) deltaic and transgressive Albian sandstone reservoirs, syn-tectonic Tertiary charge? ~0.7-0.9TCF reserves, fresh water aquifer.

Buzi Gas Field: Lower Grudja Fm (Campanian-Maastrichtian) clastic reservoir.

Pande Gas Field: Lower Grudja Fm (Campanian-Maastrichtian) clastic reservoir ~2.6TCF dry gas

Temane Gas Field: Lower Grudja Fm (Campanian-Maastrichtian) clastic reservoir ~1.8TCF dry gas



Lower Jurassic (Seychelles ‘‘southern family’): restricted marine / saline marl source facies of uncertain quality and extent. Sourced oil shows in RB-1 and tar balls

Bemolanga paleo-oil field: Upper Isalo Fm (Late Triassic - Liassic) sandstone reservoir, pre-Turonian charge, ~ +/-2.5B bbls bitumen/tar sands exposed at surface.

Tsmiroro paleo-oil field: Upper Isalo Fm (Late Triassic - Liassic) sandstone reservoir, pre-Turonian Charge, ~ +/- 4.0 B bbls bitumen/tar sands exposed at surface.

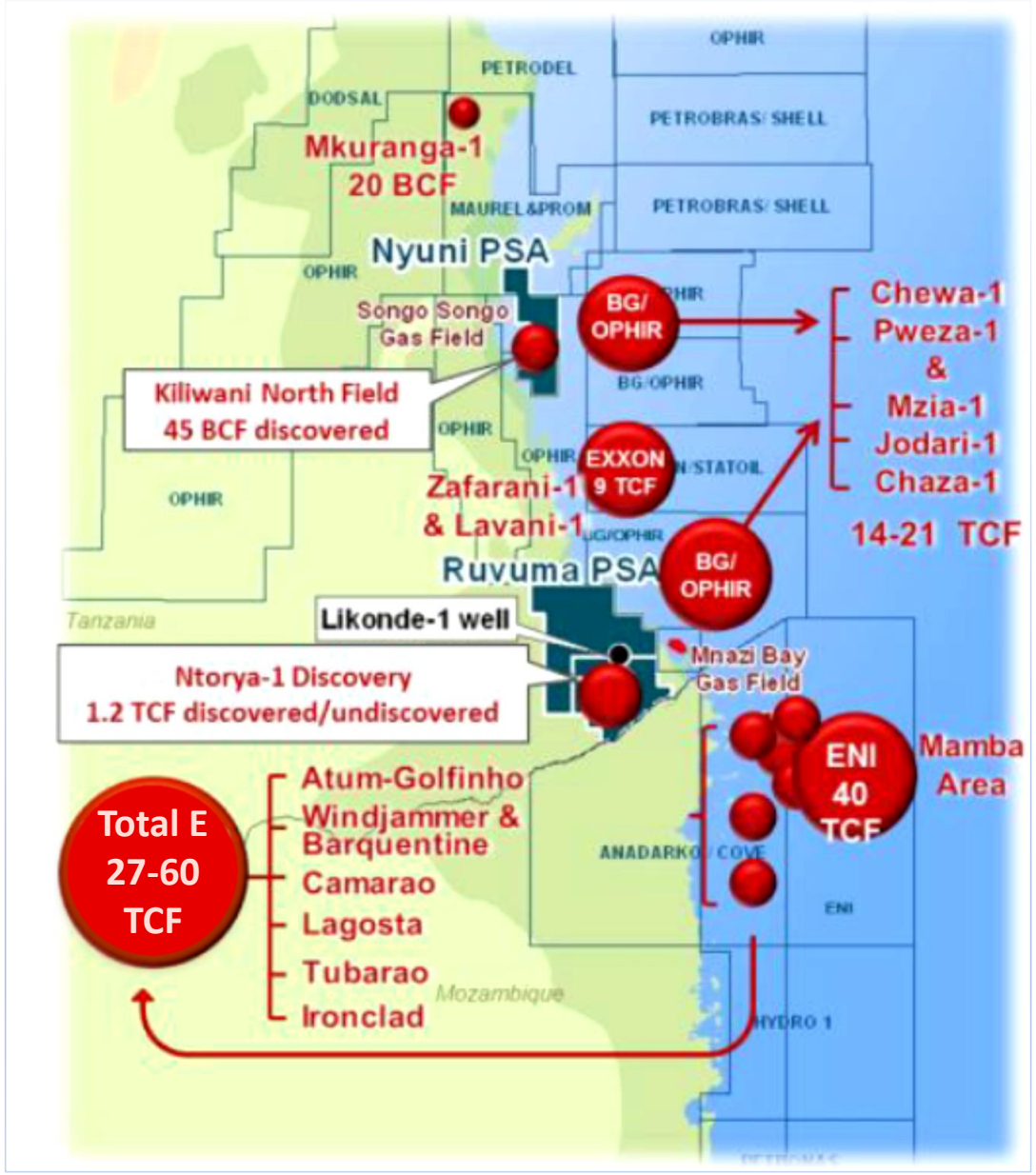
After Boote & Matchette-Downes 2009

Somali Basin Oil Prone or Gas Prone?

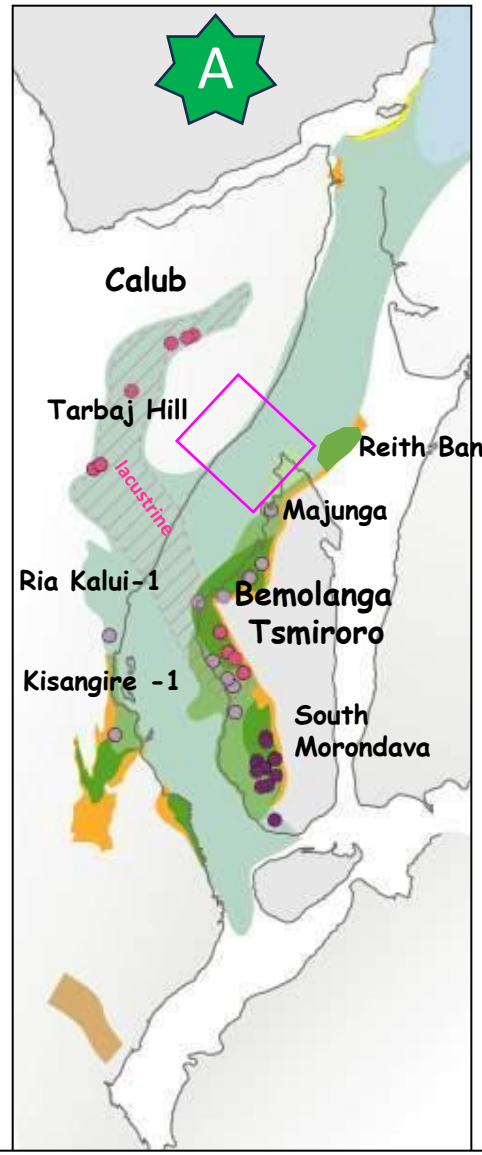
We need to ask some hard questions!

PETROQUEST AFRICA – 1&2

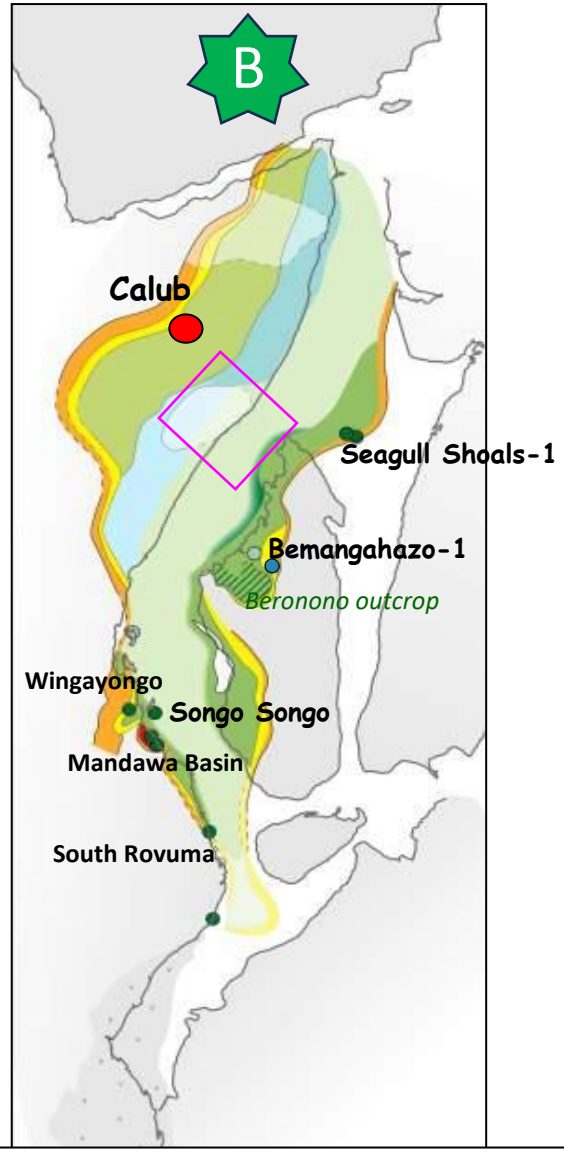
- Why is there so much gas offshore Tanzania and Mozambique?
- What is the source rock for all this gas (> 60 Tcf)?
- What is the source rock for oil seeps onshore Tanzania?
- Why do we see Tar Balls washed up along the beaches of East Africa and what does this say about potential source rocks?
- What emphasis should we place on SAR based oil slick observations offshore East Africa?
- Is the Somali Basin Oil or Gas Prone?



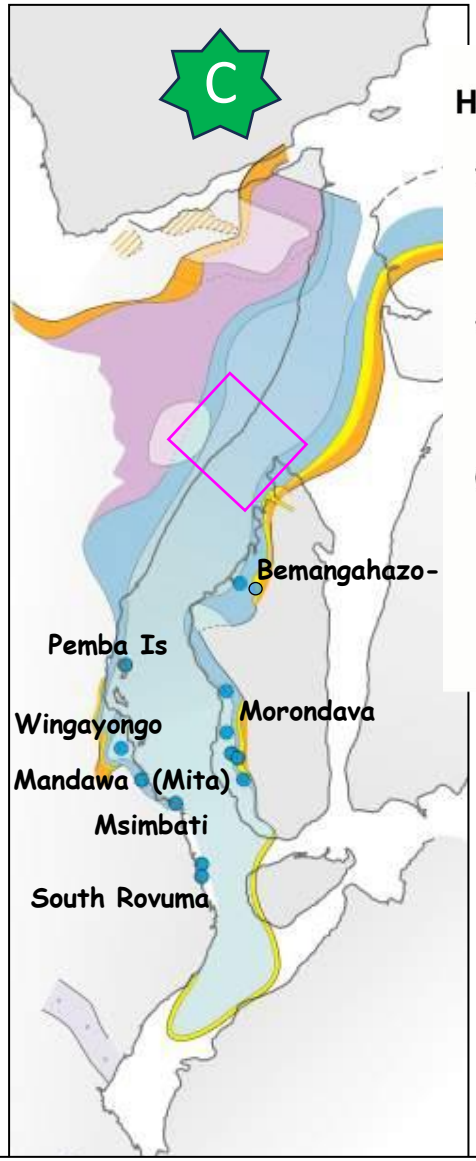
Important East African Oil Families- Distribution!



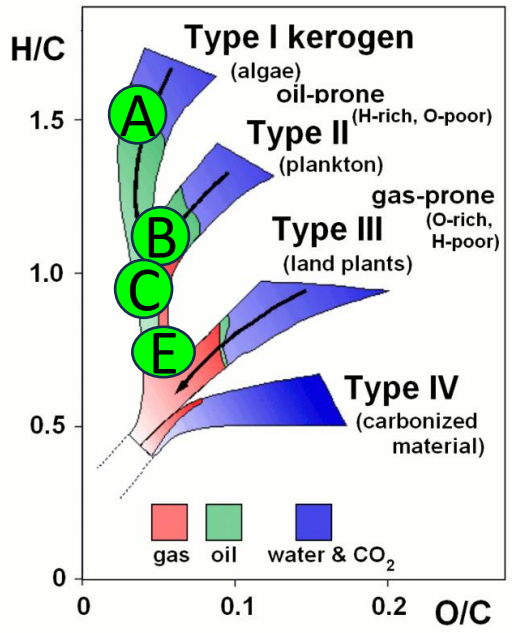
PERMO-TRIASSIC
Changhaingian-Induan Paleogeography
Source facies and associated oil & gas



LOWER JURASSIC
Sinemurian-Aalenian paleogeography
oil families and source facies



MIDDLE JURASSIC
Bathonian-Callovian paleogeography
oil families and source facies

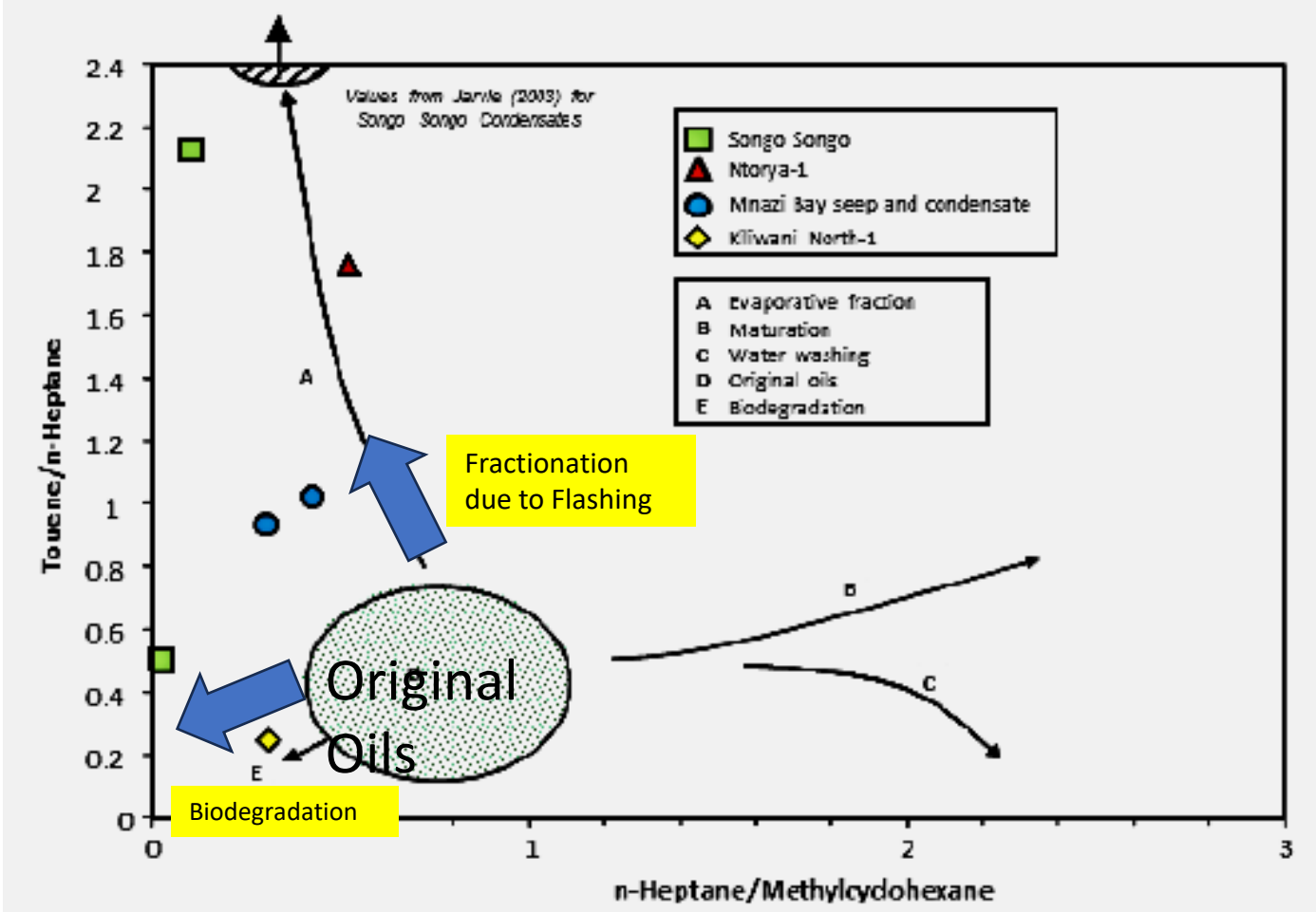


Oil Families A,B & C
Source Rock Quality

Regional East African Gas Proneness- Oil Flashing

Migration Model: Flushing & Flashing

- East African condensates show evidence of fractionation.
- A cross-plot of Methylcyclohexane vs Toluene. Some condensates have ratios > 1 and others <1, indicating fractionation and biodegradation pathways respectively.
- Condensates from, Songo Songo-1, Ntorya-1 and Mnazi Bay, all display evaporative fractionation, due to depressurization/***Flashing***.
- These 'Pressure Reduction' mechanisms, associated with Pliocene inversion, along both the Mozambique Channel and the Rovuma Basin, are likely important for widespread oil fractionation.
- Maturity modelling of hydrocarbon sees evidence of gas flushing from the deeper lacustrine sources and oil flashing to gas from the shallower Jurassic source rocks in both the Mozambique Channel and Rovuma Basin.



Cross Plot Methylcyclohexane vs Toluene.

Note From basic Physical Chemistry (Kinetics); high pressures that form during subsidence and increasing burial will actively restrict gas generation.

After Pereira et al 2013

Somali Basin Oil Prone vs Gas Prone?

A new paradigm of thinking For The EA Passive Margin?

PETROQUEST AFRICA-1&2

- Why so much gas offshore Tanzania and Mozambique?

Mozambique Channel has thick Jurassic source rocks present and due to both late gas flushing and oil flashing, traps are preferentially filled by gas.

- What is the source rock for all this gas (> 60 Tcf)?

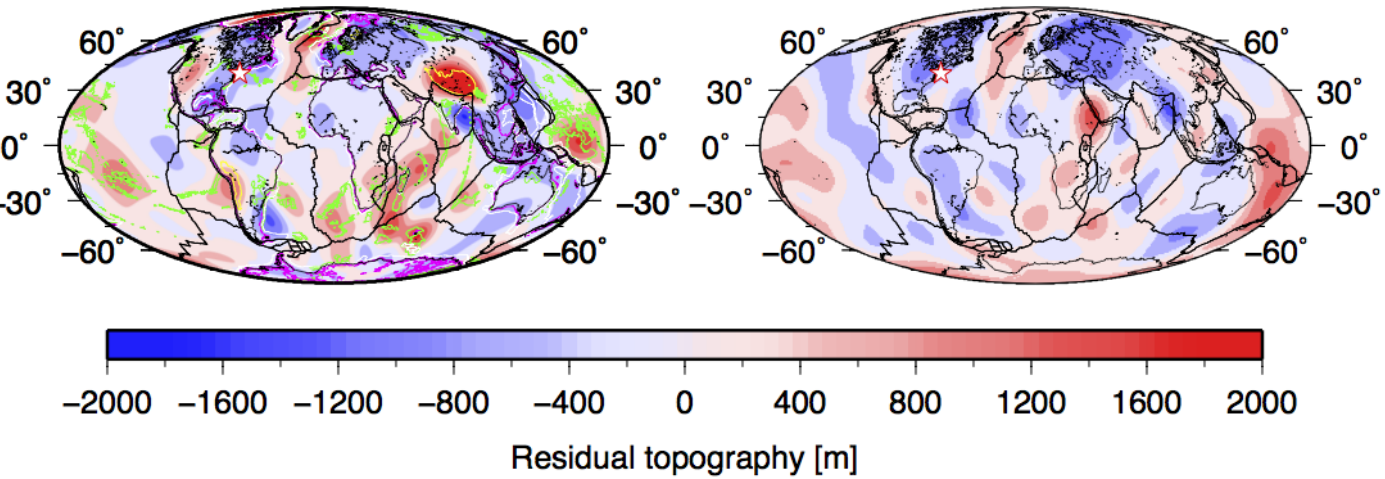
GCMS and Carbon isotope analyses, suggest three key oil families are present, a deep Permo/Triassic lacustrine source and shallower oil prone Lower Jurassic and-Middle Jurassic marine shales.

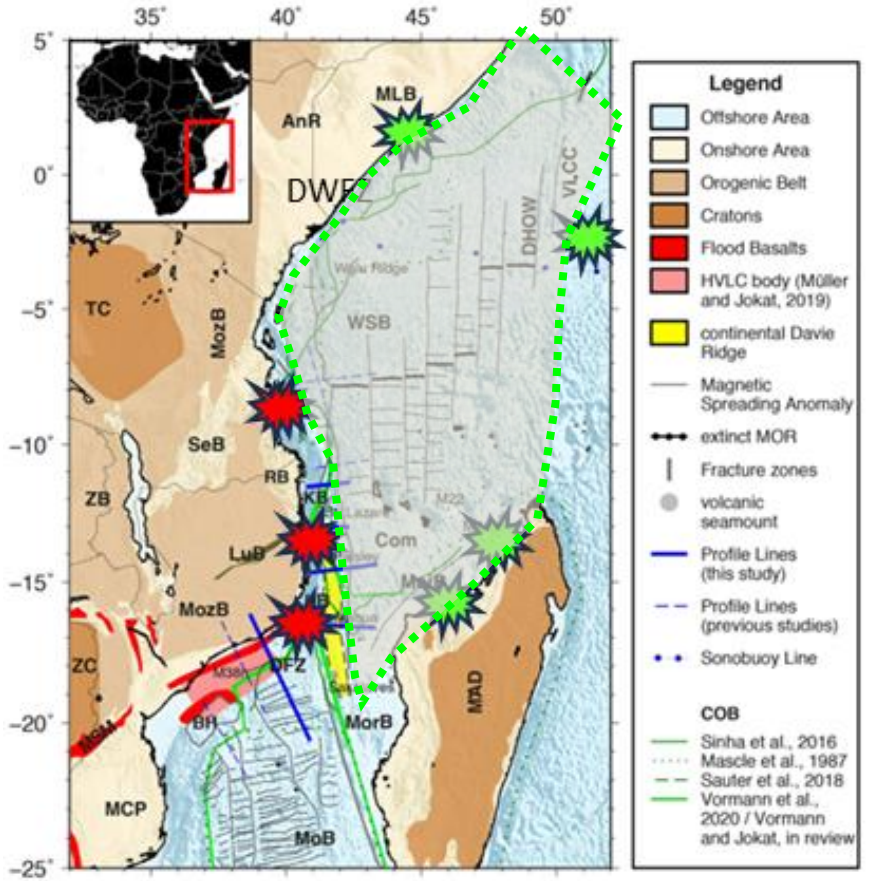
- Is the Somali Basin Oil or Gas Prone?

Based on our regional understanding, the Somali Basin, being north and east of the DWFZ, is likely to be oil prone as suggested by the conjugate margin (ie Madagascar).

- Residual Mantle topography may help explain the difference!

There is positive residual topography offshore Mozambique and Tanzania and negative topography in the offshore Somali Basin (Steinburger 2007).





- Has oil flowed in Somalia?

Yes, in two onshore wells in the Coriole basin, Coriole-1 (1960) 100 bopd (36 API) and Afgooye-1, 42 bopd (1965). (Eocene, Palaeocene and Cretaceous).

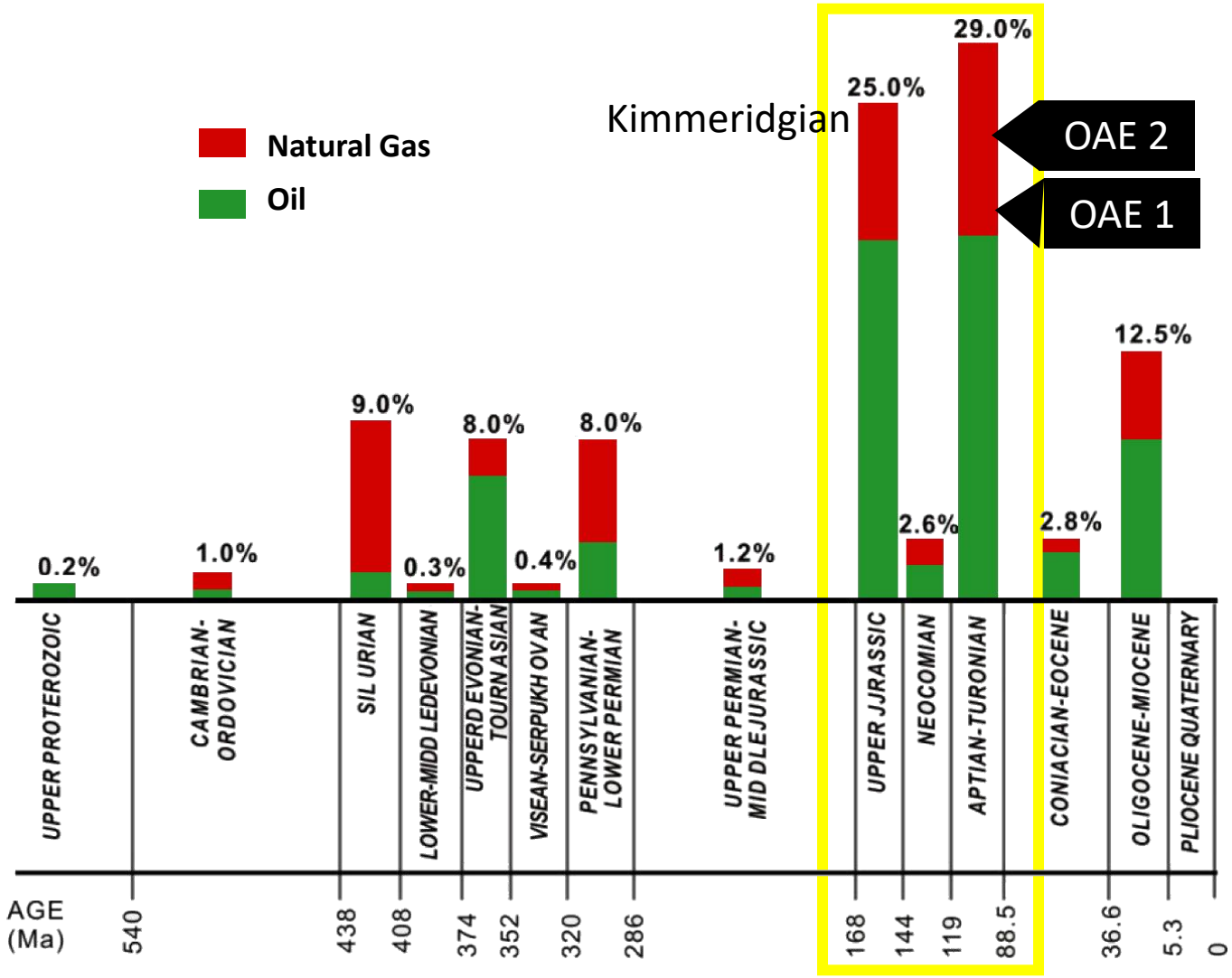
Key Source Rocks: Offshore Somalia

Global Occurrence of Source Rocks vs Geological Time

PETROQUEST AFRICA-1&2

Source Rocks - OAE (Oceanic Anoxic Events)

- Lower Jurassic oil source rocks are known in the Majunga Basin offshore Madagascar, a conjugate margin to Somalia in the earliest Jurassic.
- Main source rock generative period was the upper Jurassic Oxfordian/Kimmeridgian with excellent source rocks deposited in the Persian Gulf, North Sea and Western Siberia.
- Globally, there are two main Cretaceous source rock generative events known as, OAE1 and OAE2
- OAE1 (Aptian) lasted for 1-1.3 Million years and OAE2 (Cenomanian) lasted for 0.8-1.0 Million years
- Both OAE1 and OAE 2 source rocks are believed to be present and actively transforming offshore Somalia.
- Both OAE 1 and OAE 2 are believed to be present offshore E. Africa

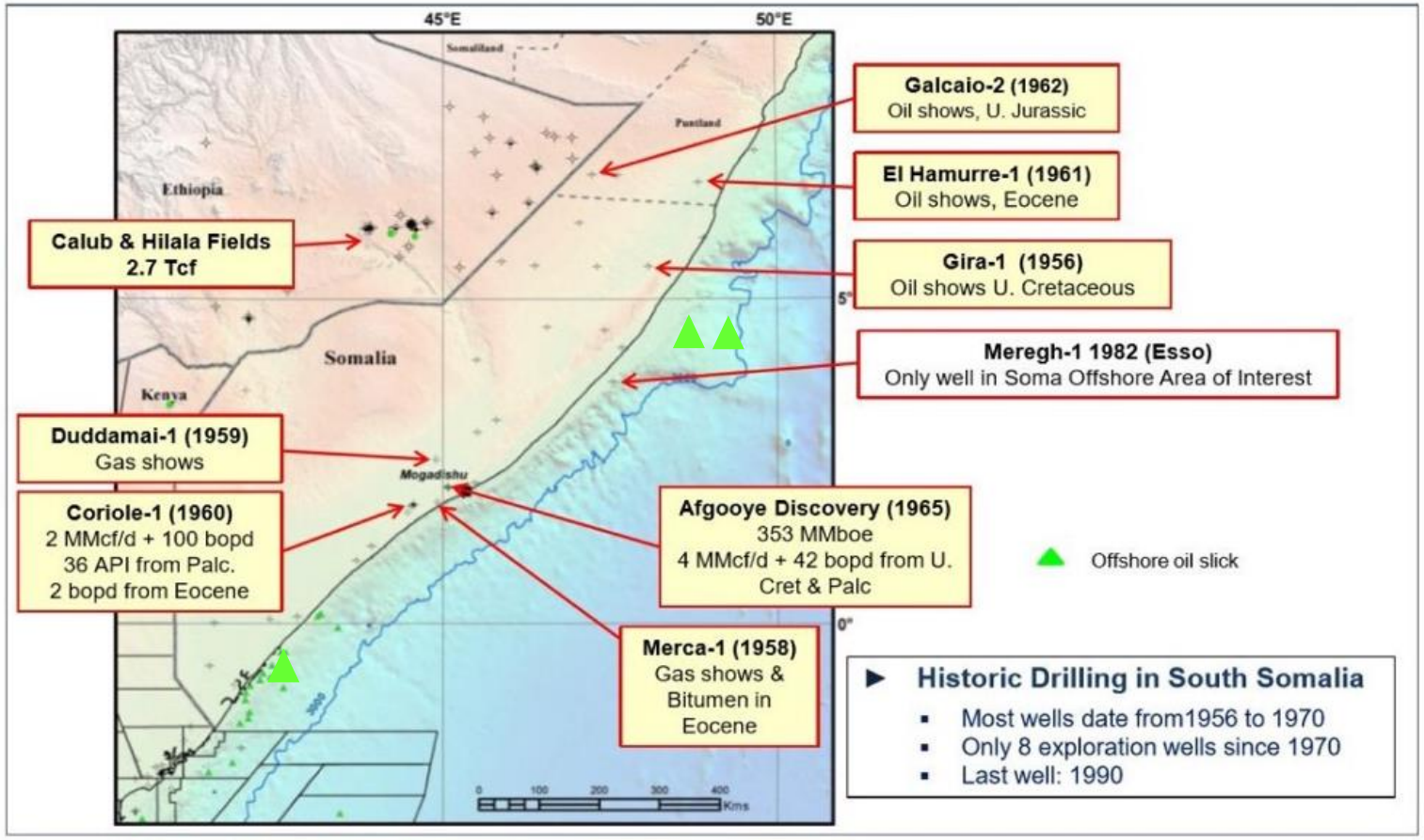


After Soua & Chihi 2014

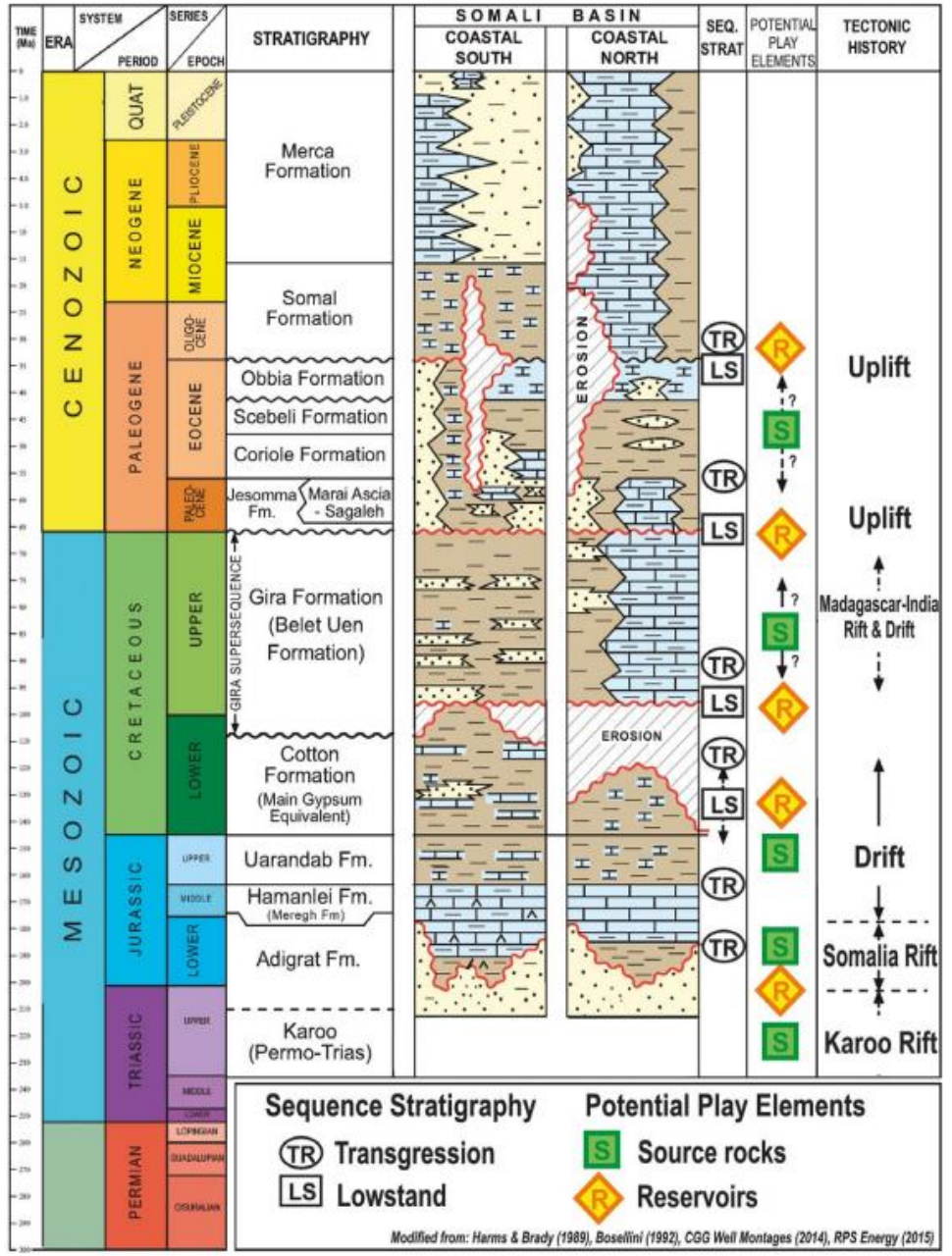
Key Source Rocks

Hydrocarbon Occurrences: Onshore Somalia

Oil and Gas has flowed under DST, Coastal Somalia!



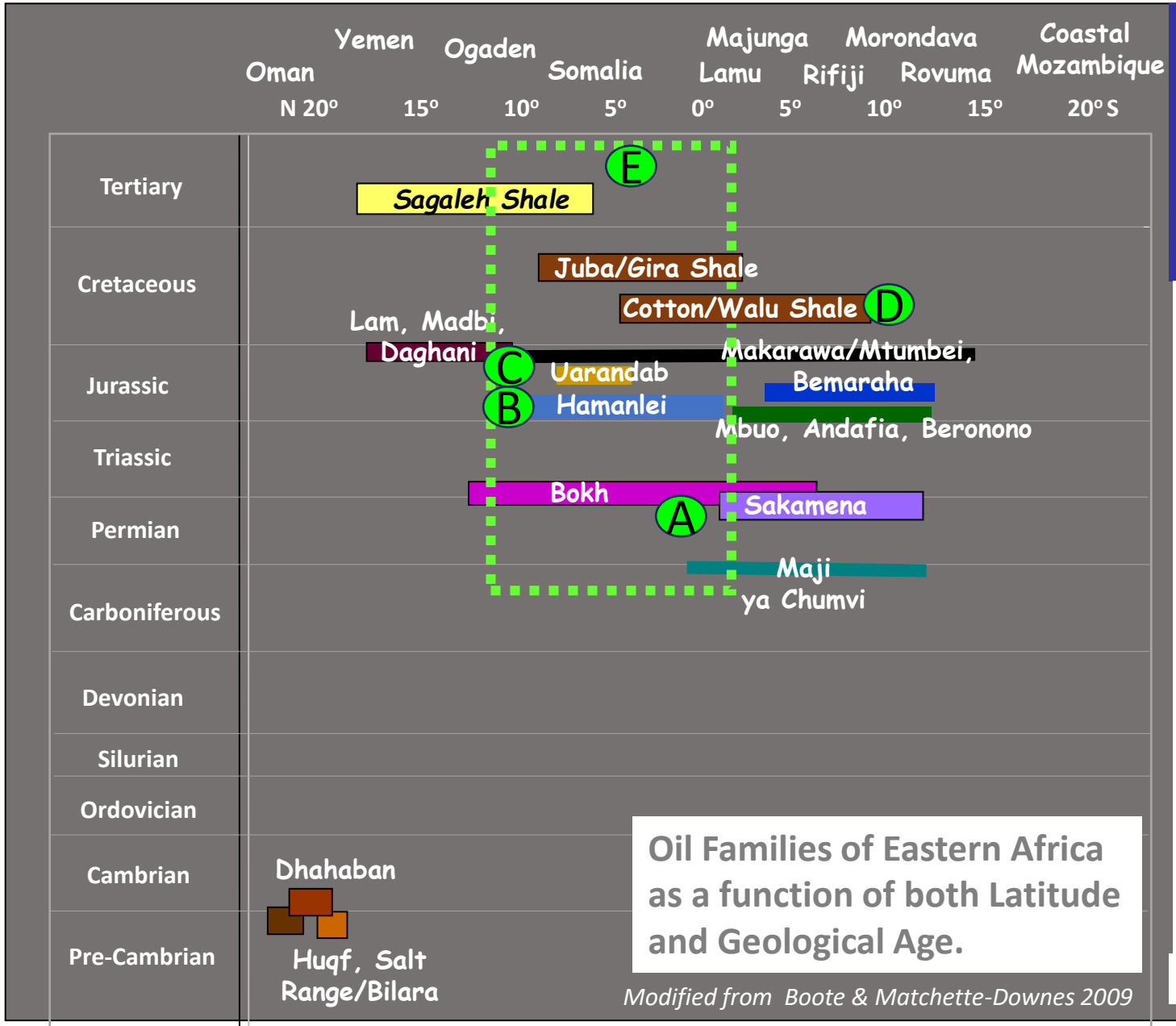
Regional stratigraphic column for the onshore and shallow offshore Somalia Basin



Summary of East African Oil Source Rock Candidates

Five Vertically Stacked Oil/Source Rock Families

PETROQUEST AFRICA – 1&2



Modified from Boote & Matchette-Downes 2009

Formation	Age	TOC (%)	Yield (kg/t)	Type
Beronomo Shale	Aal-Bajocian	10 - 19.7	37 - 97.9	I / II
	Toarcian	68 - 69.4	166.9 - 215.8	III
	Lias	2.3 - 23.6	0.3 - 112	II / III
Bemangahazo (Isalo II Basal Shale)	Lias	17.2 - 22.4	2.4 - 34.9	II / III

Source Rock Sniff Test (Liassic)

Basinal area of 900 x 250 km = 225,000 km2;
- 75 % of the area hosts source rocks = 168,750 km2.

- Average net thickness of 20 m.

Net source rock volume = 3,375 km3

- Yield (S2)=10 kg/tonne (TOC=2%, HI=500)

- 70 % transformation at maturity of 1 % R0

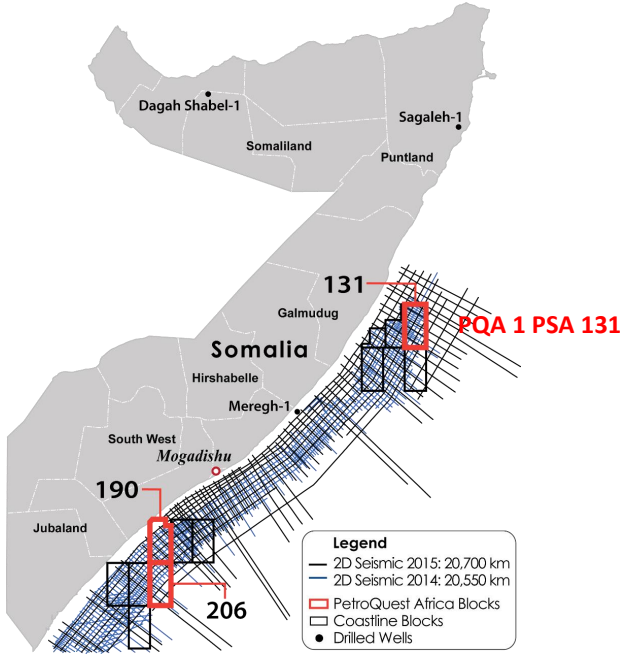
- Expulsion to trap efficiency = 10 %

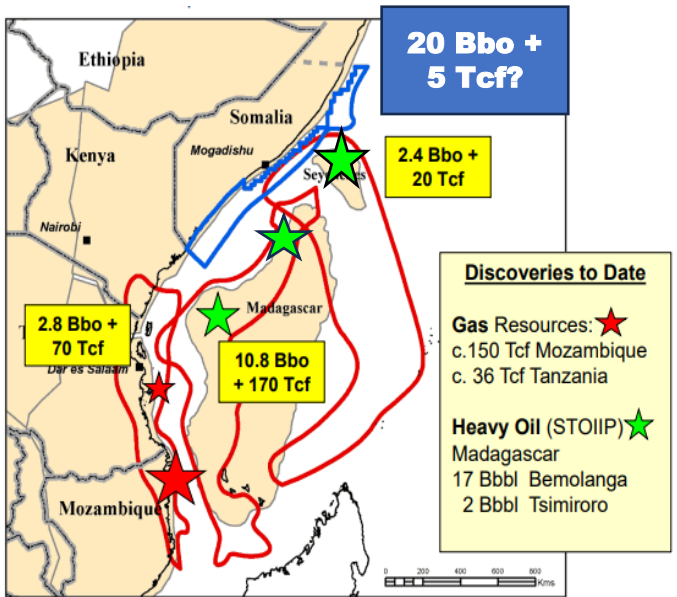
56 billion Barrels Possible!

After Pereira et al 2013 and Matchette-Downes 2004

PetroQuest Africa 1 & 2:(PSA's 131,190 & 206)

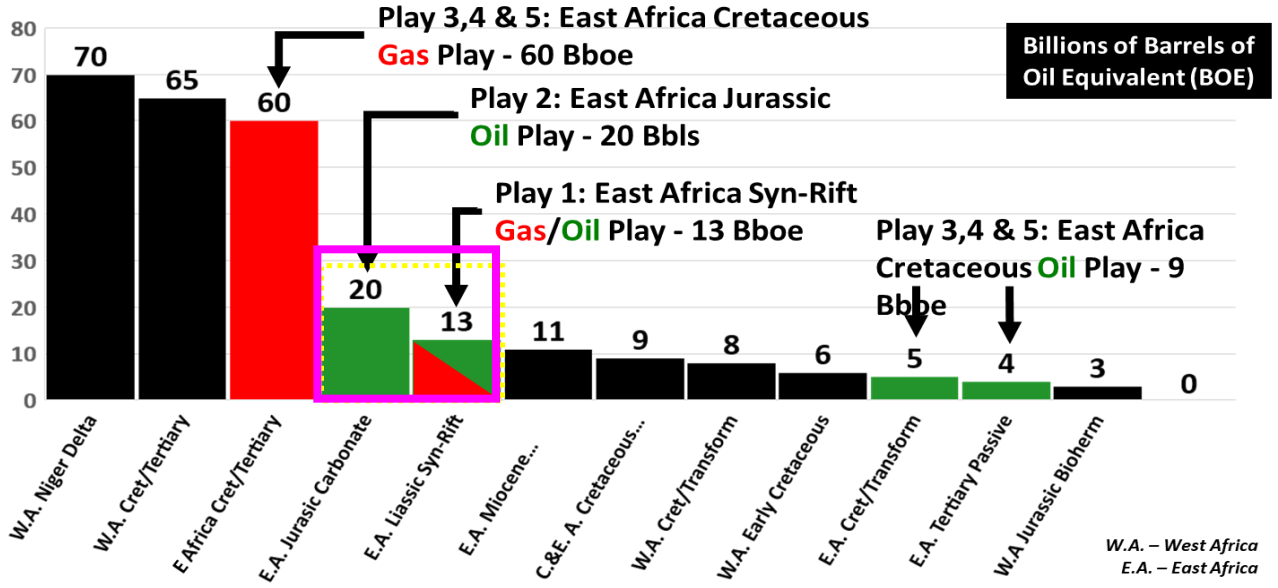
Focus on West Somali Basin : Un-Explored, a Final Frontier?





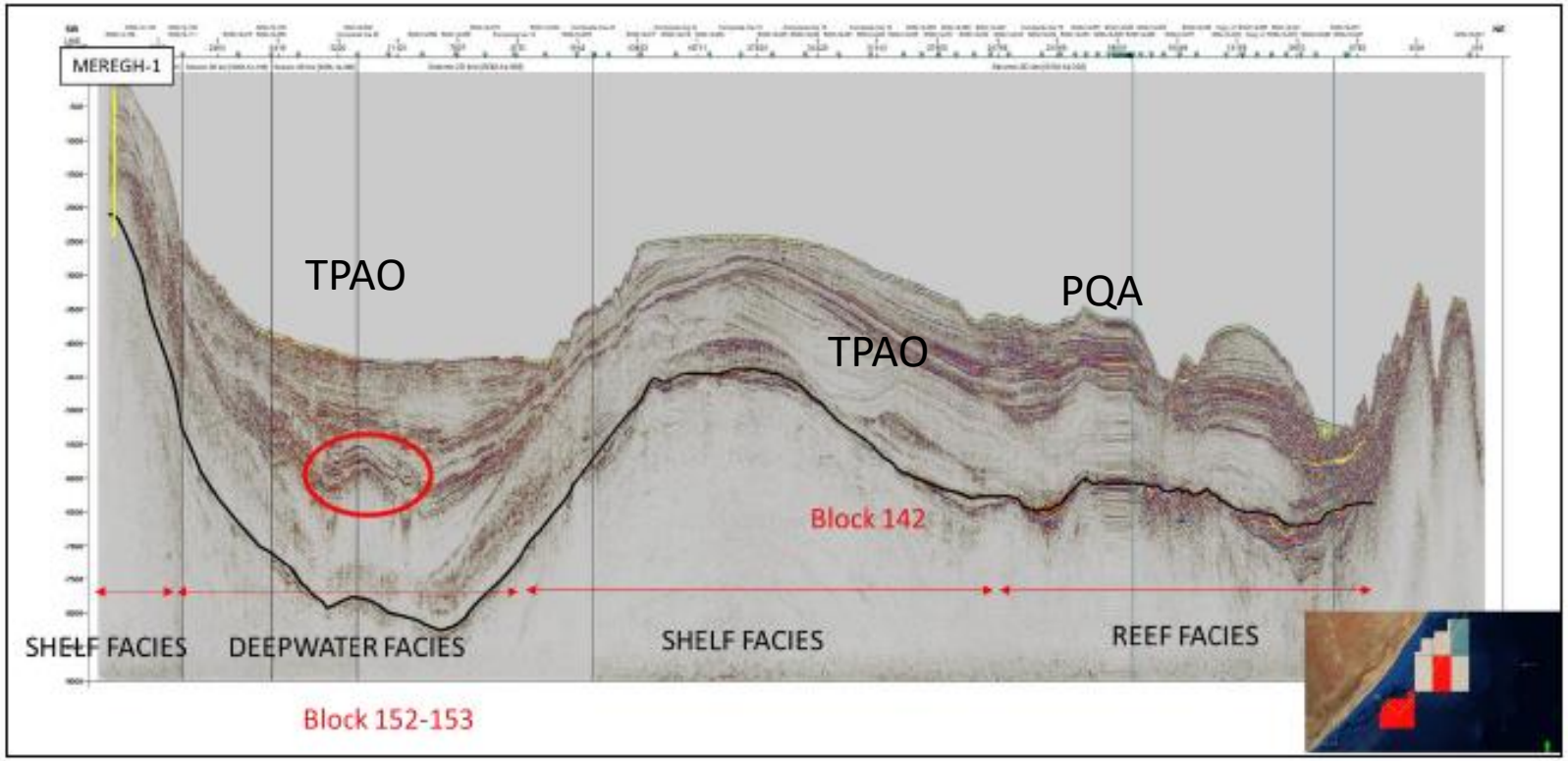
Offshore Somalia Oil Prospectivity Summary

- Five vertically stacked 'liquids Prone' Oil/Source Rock Families.
- Extensive Play Fairways with abundant 'Running Room'.
- Proven Analogue Plays (Abu Dhabi, Mozambique & Namibia).
- New Model For Oil Proneness, West & North of the DWFZ.
- Somali Deep & Ultra Deep-water - Totally Undrilled.
- TPAO successfully acquiring 3D with no security issues – completion Q2 '25
- The Prize is Big & Opportunities are Company Making!!



Meregh-1 (1980) Well Result

Not helpful for PQA 131 PSA



Correlation into deep water basin is complex

- Lwr Jurassic syn-rift absent at well, and poorly imaged in basin due to depth.
- Mid Jurassic thick on shelf and thins into basin.
- U. Jurassic & Lwr Cretaceous thickens into basin but deformed by gravity sliding and eroded at Mid Cretaceous onlaps basin slope and not represented in well.
- U. Cretaceous - Lwr Teritary absent on basin slope due to localized erosion.

Conclusions

- Stratigraphic age calibration into basin remains uncertain.
- Geology in the basin is different to the shelf.

Existing 2D Seismic Data Offshore Somalia

TGS Multi-Client

PETROQUEST AFRICA-1&2

SOMA-14

Survey Summary

Type: 2D
Size: 20,557.20 km
Vessel: MV Hawk Explorer,MV Northern
Acquisition Year: May 2014

Acquisition Parameters

Source Volume: 3220 cu in
Source Depth: 6 m
Shot Interval: 25 m
Record Length: 9 s
Streamer Length: 8100 m
Streamer Depth: 10 m
Group Interval: 12.5 m

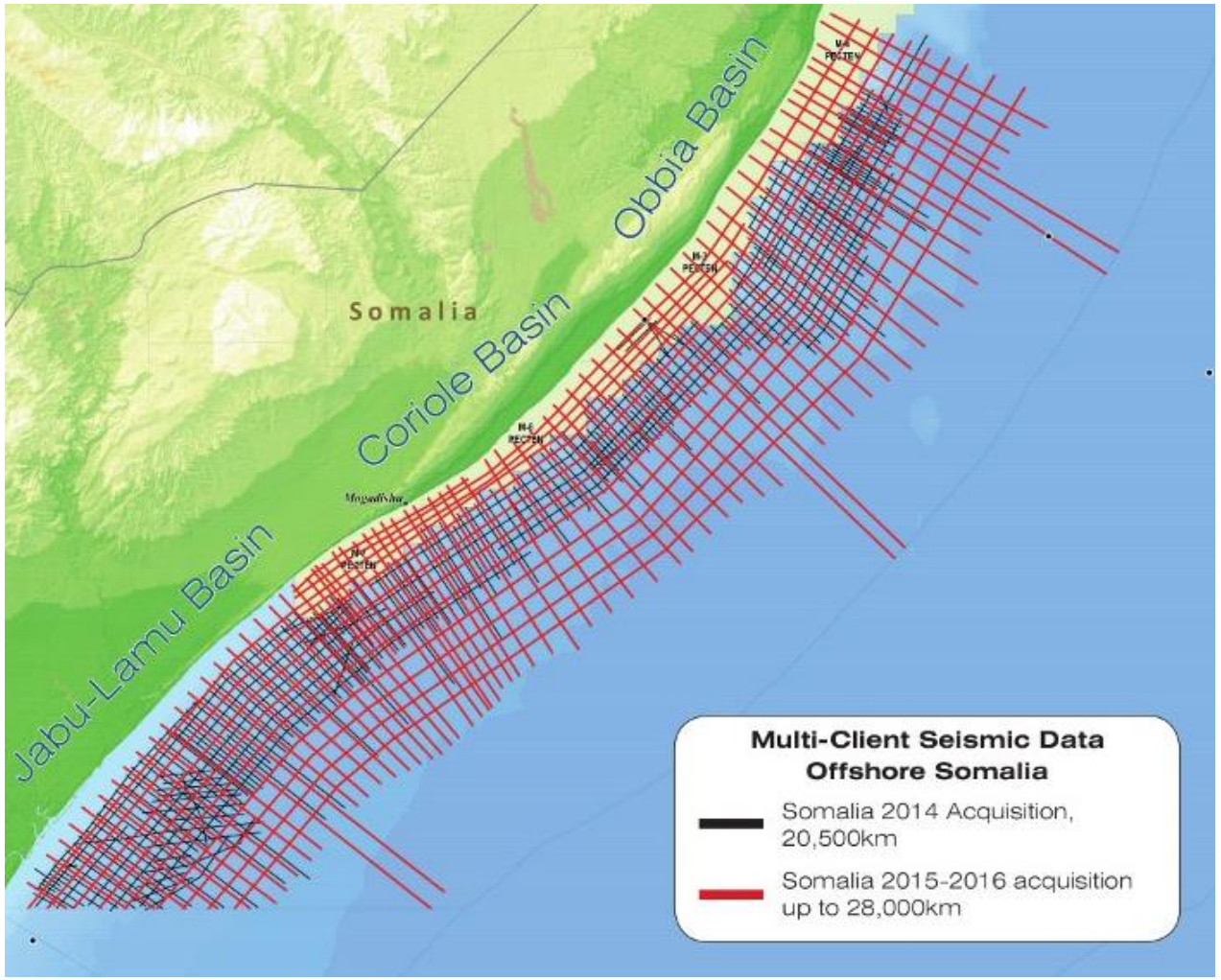
Somalia-15

Survey Summary

Type: 2D
Size: 20,698.43 km
Vessel: BGP Pioneer
Acquisition Year: April 2016

Acquisition Parameters

Source Volume: 4780 cu in
Source Depth: 8 m
Shot Interval: 37.5 m
Record Length: 20.05 s
Streamer Length: 10050 m
Streamer Depth: 15 m
Group Interval: 12.5 m

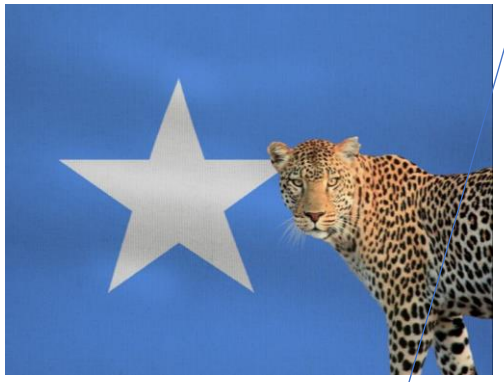


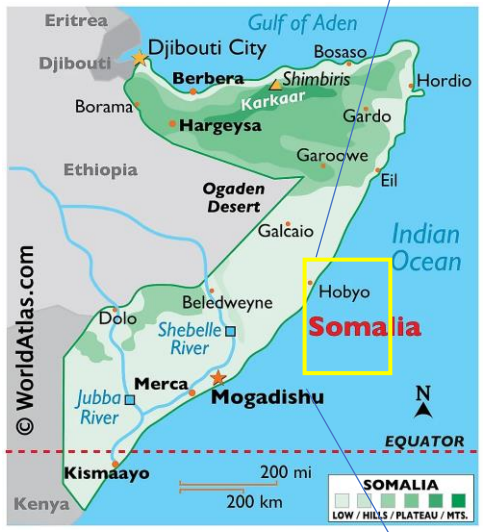
The *Leopard Prospect*: Offshore Somalia - **PQA 1** (PSA 131)

PETROQUEST AFRICA – 1 & 2

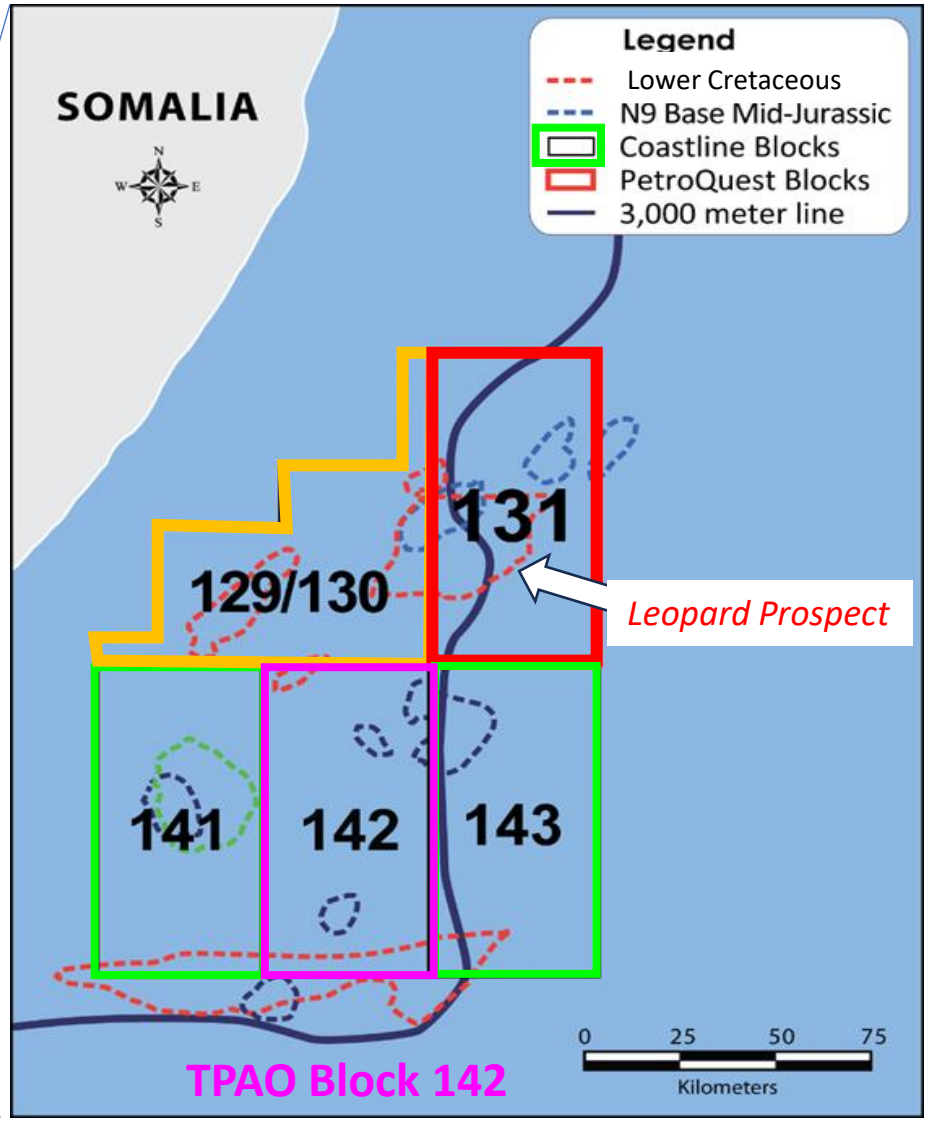
Liberty's (PQA 1) PSA 131 Hosts *The Leopard Prospect*

- ***Leopard*** is one of 21 mapped 'Prospects and Leads' on the Flanks of Mid-Somalia High, offshore Obbia Basin.
- Large four-way structures can be mapped at ***Leopard*** on high-quality 2D seismic data.
- As mapped, ***Leopard*** is the largest mapped four-way independent closure offshore Somalia.
- ***Leopard*** comprises three levels, with closure mapped at Lower Jurassic, Middle Jurassic and Lower-Mid Cretaceous.
- Upper Cretaceous and Middle Jurassic carbonate reefs and shoals can be readily mapped on the 2D seismic
- Oil mature Lower Jurassic source rocks are proven offshore East Africa and can provide the fill volumes in the kitchen areas on PSA 131.





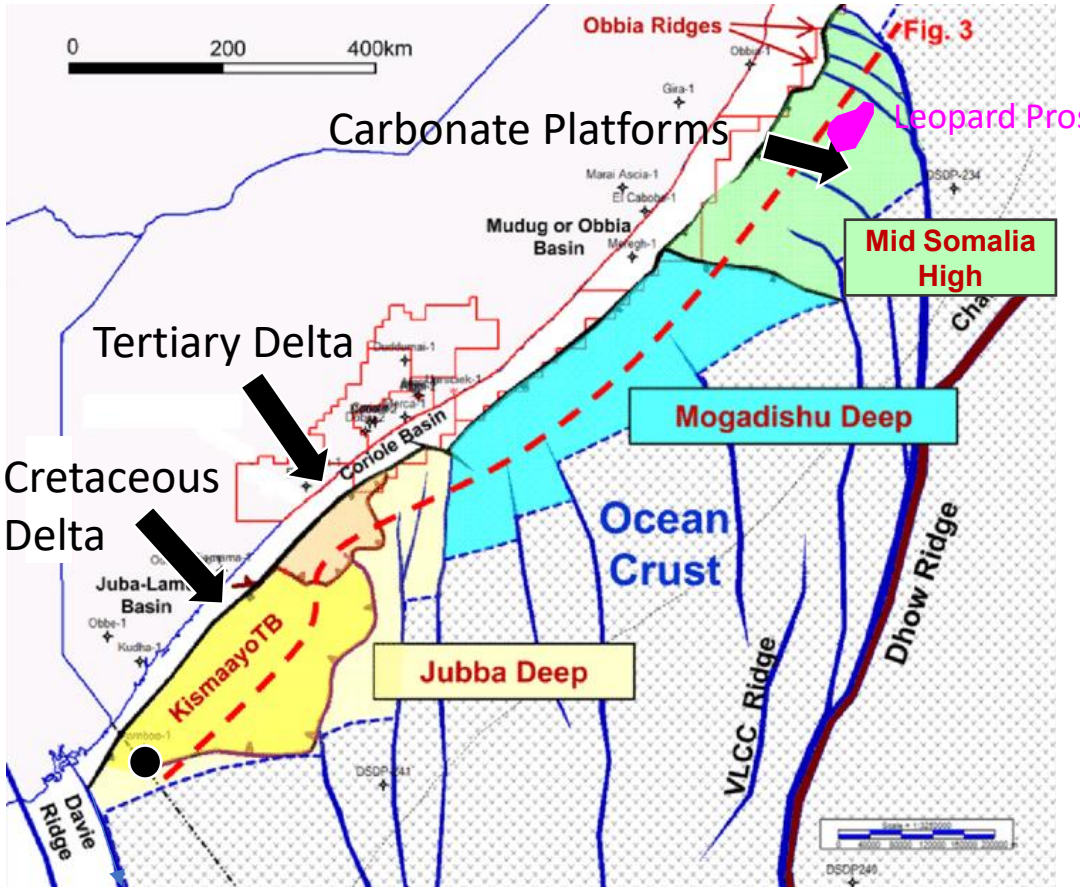
Republic of Somalia

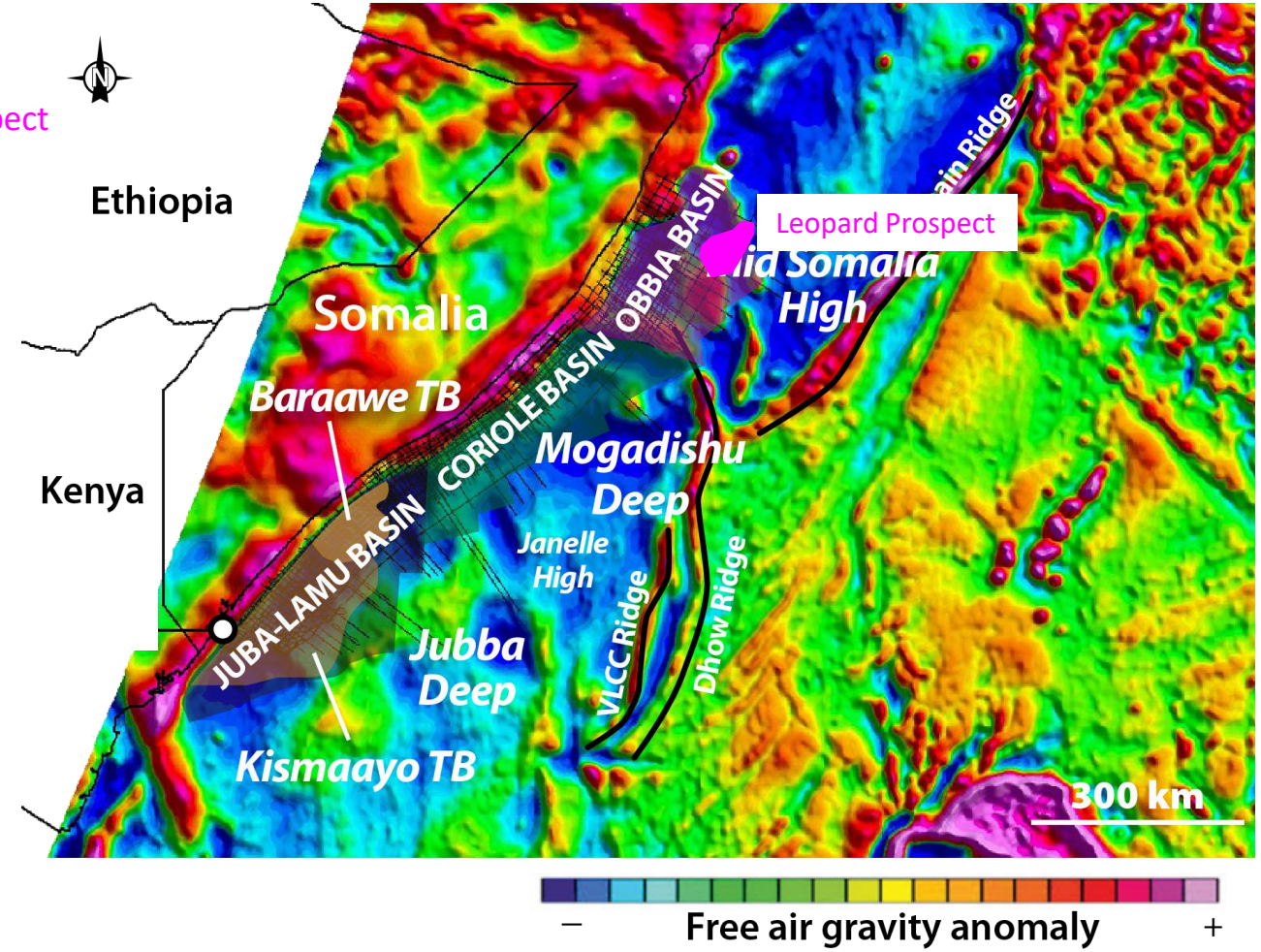


Location *Leopard Prospect* ((MSH) Continental Crust))

Mid Somalia High - NE Flank

PETROQUEST AFRICA-1&2



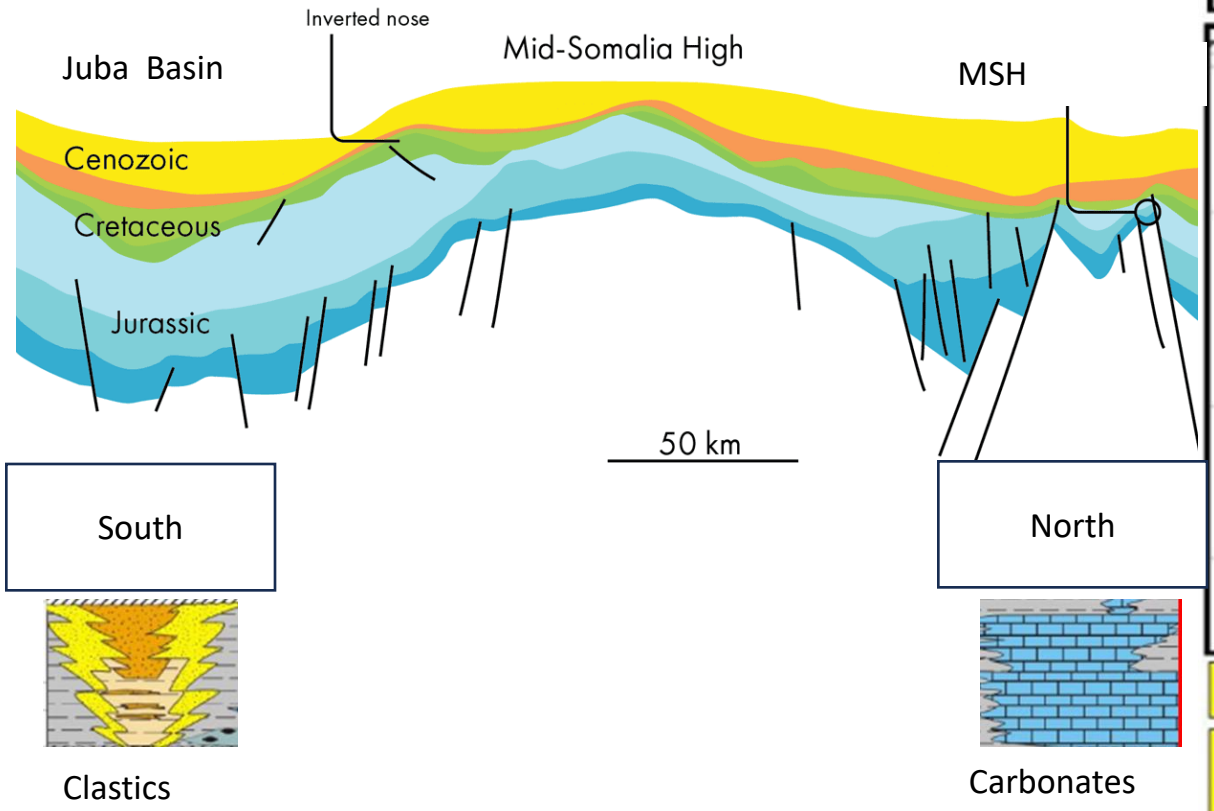


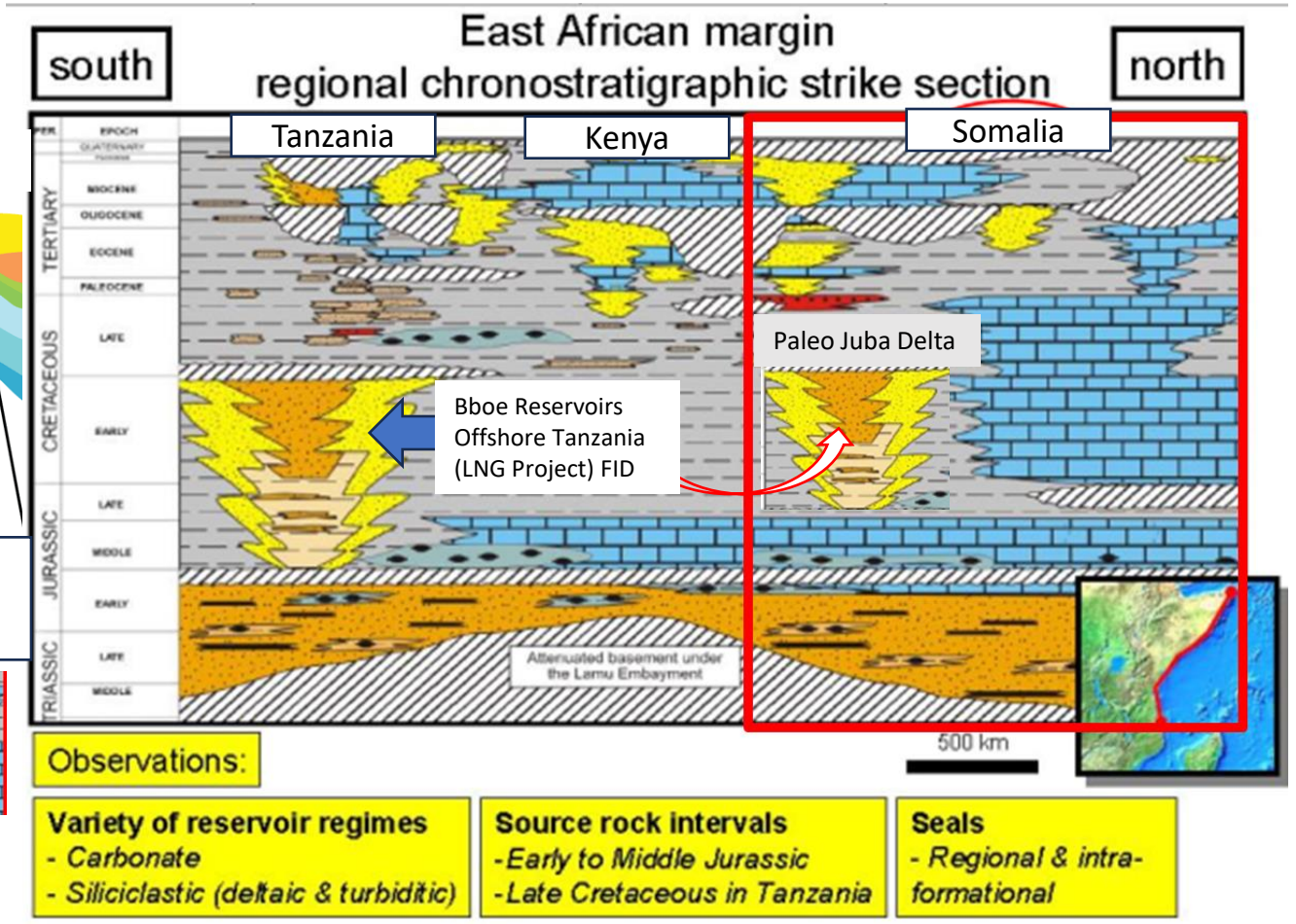
Structural Domain Schematic Offshore Somalia;
***Leopard* is on the northern flank of the Mid Somalia High (MSH)**
Carbonate Platform Deposition Dominates MSH Jurassic – Cretaceous)

Necking of Continental Crust towards Davie Fracture zone (DFZ)

Somali Petroleum Geology:East African & Persian Gulf Flavour!

PETROQUEST AFRICA-1&2

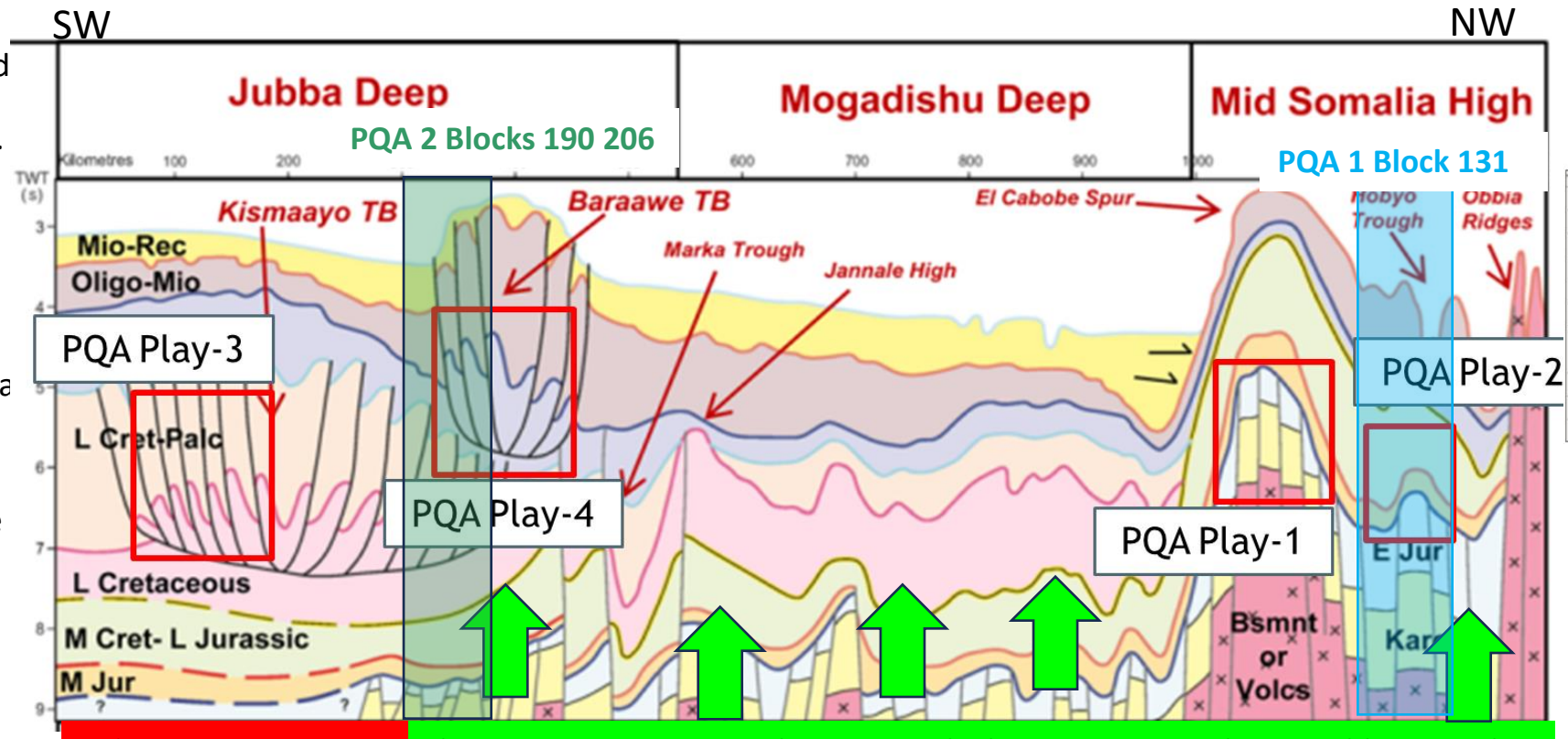


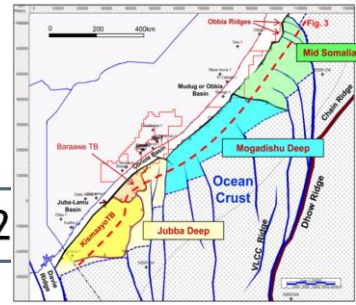


Stylized Cross Section Offshore Somalia PSA 131-190/206

Carbonate Platform Systems (North) & Cretaceous Deltaic Systems (South)

- PQA 1&2 Blocks 131,190 and 206 all have access to an extensive Jurassic oil charge.
- The Jurassic aged Petroleum (Carbonate) System dominates to the north, whilst to the south a clastic Cretaceous aged Petroleum System predominates (Jubba Deep).
- To the south of PQA blocks seismic interpretation of the deep crustal section becomes uncertain.
- Gravity data suggests that oceanic or hybrid crust underplates much of the southern Jubba Deep basin.





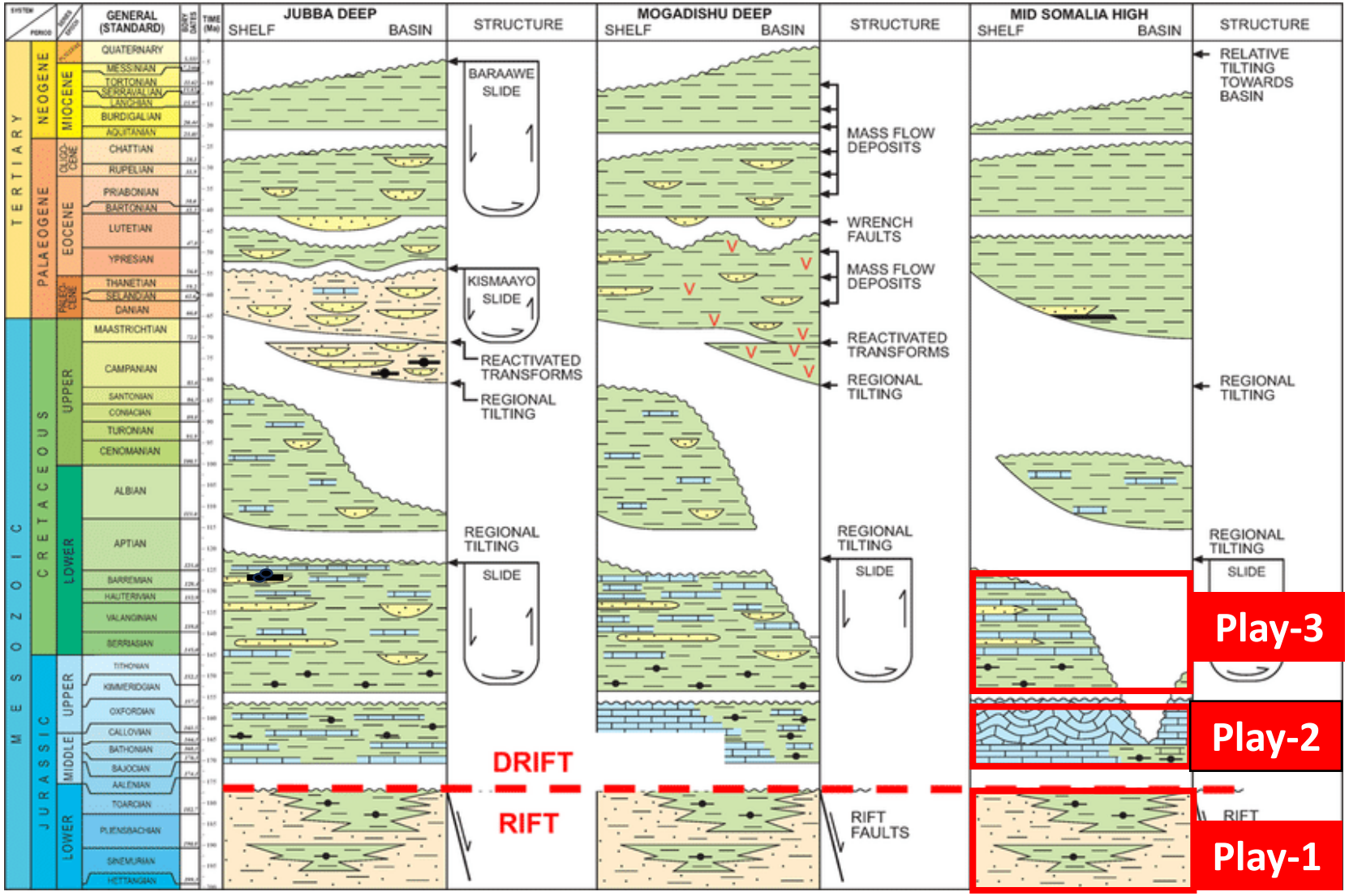
Underplated by Hybrid or Oceanic Crust
Jurassic Charge Risk High

Demonstrably underplated by Continental Crust with pre and syn-rift rotated fault blocks evident with a Liassic aged source system interpreted to be widely present. Jurassic Charge Risk Low

PSA 131 *Leopard Prospect* – Three Different Play Types

PETROQUEST AFRICA-1&2

Extensive Play Fairways & Lots of Running Room Present



Block (PSA) 131 Play Types (Leopard Prospect)

Play 3 : Early Drift Pulse 1, **Reservoir** Lower Cretaceous Limestones. **Source** (Upper Jurassic or Middle Jurassic) Organic Limestones/ Shales. Analogue ***Zakum*** (Abu Dhabi (Bbls)).

Play 2 : Post-Rift; Tethyan Realm **Source** Organic Limestones **Reservoirs**, Grainstones and Reefal Limestones (***Arab D)*** Saudi Arabian and Abu Dhabi Analogues).

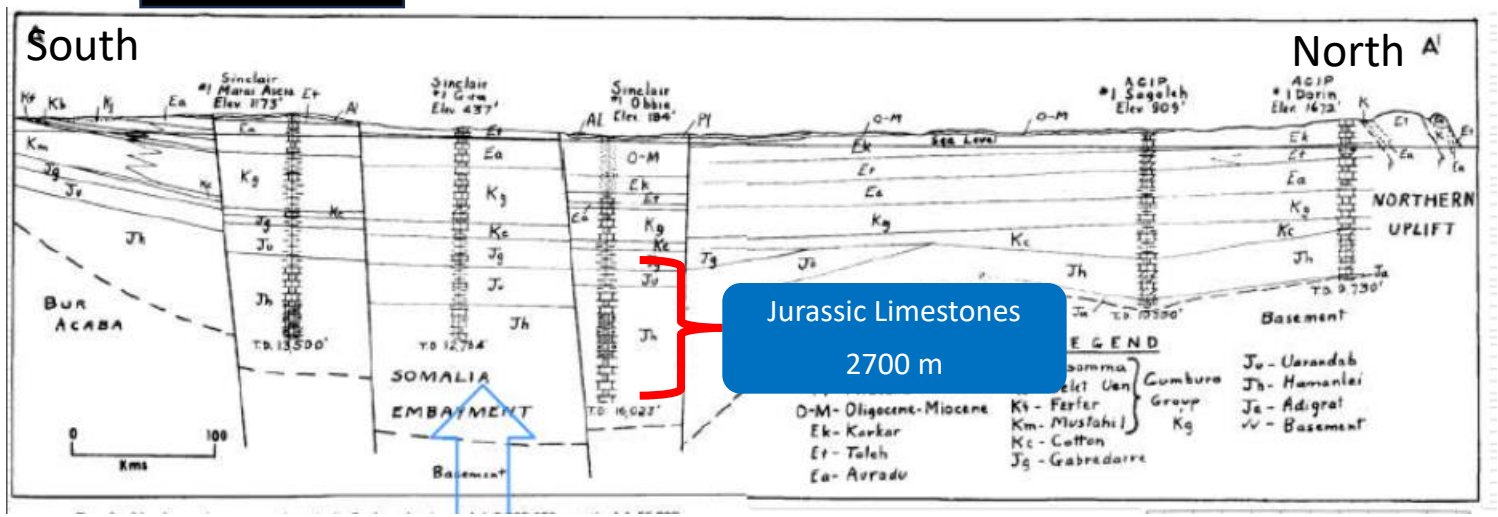
Play 1 : Early Syn-Rift Rotated Fault Blocks**. Source** Liassic organic shales; e.g. Madagascar (Bbls). **Reservoirs** Fluvial & Shallow Marine Sst

Somali (Obbia) Embayment (Thick Jurassic Carbonate Fill)

Leopard Prospect

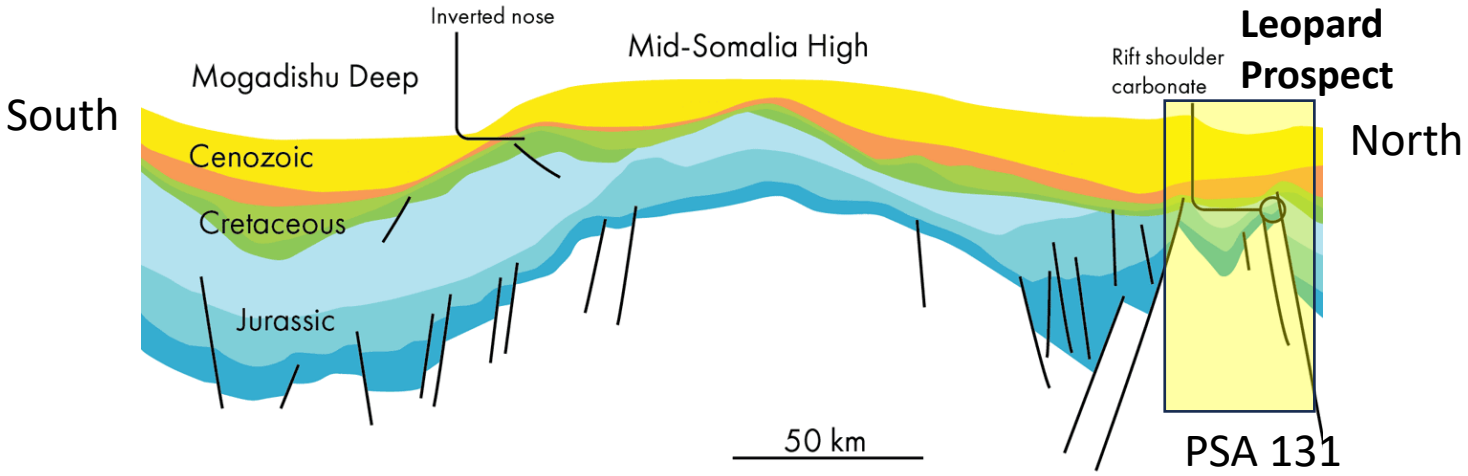
PETROQUEST AFRICA – 1&2

Onshore



Somali Embayment Very thick Jurassic Limestones

Offshore



- Whilst the Saudi Arabian Platform was open to Tethys marine circulation the limestones of Somalia were deposited in more restricted basins.

- The Obbia Embayment stretches offshore where it is caught up in the Somali Arch (Mid-Somalia High) a focus for hydrocarbon migration.

- Block131 is thought to have Neo-Tethyan realm Jurassic aged carbonates, including source rocks in both, the lower and upper Jurassic as per the lower Schematic.

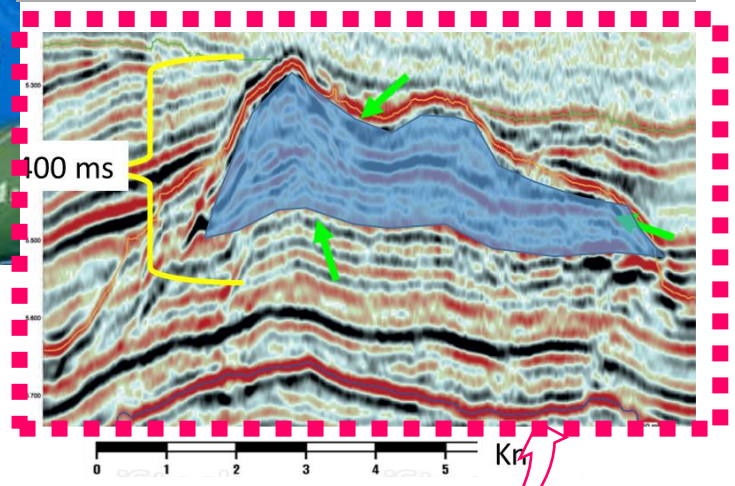
- ***Leopard Prospect*** is on the northern limb of the Mid Somalia High within the Obbia Basin and is a focus for hydrocarbon migration

Reefal Features (PSA 131): The Arabian 'Tethyan Realm'.

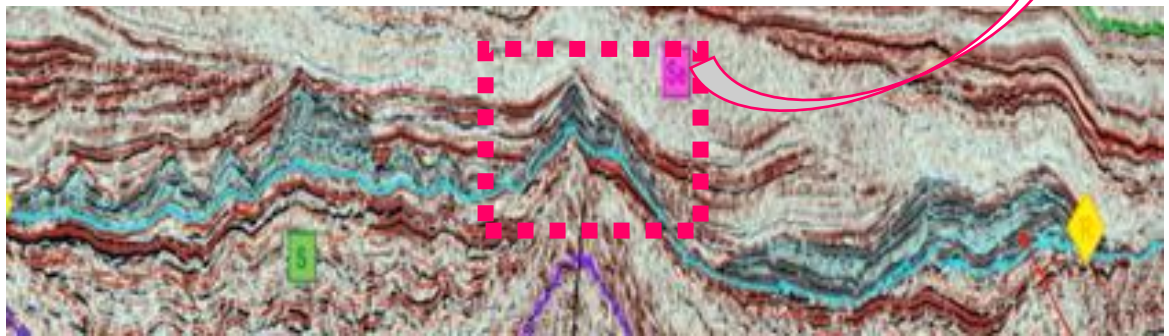
Jurassic Bajocian Barrier Reef System (Analogue Arab D & Zakum Abu Dhabi)

PETROQUEST AFRICA-1&2

- The reef system in the Obbia Basin is linear in nature and can be mapped laterally for 10's of kilometers as reef building has occurred along the strike of the apices of underlying rotated fault blocks pertaining to the syn-rift section.
- The Jurassic Petroleum System in the Obbia Basin is part of the Tethyan Realm that incudes the huge oil-fields of Abu Dhabi & Saudi Arabia!
- During both the Jurassic & early to Middle Cretaceous offshore Obbia (PSA 131) lay immediately next to present day Arabian Peninsula to which it was joined.
- Both areas experienced shared common depositional facies, basinal settings and Petroleum Systems.



Meso-Tethyan Realm
Obbia Basin/
Leopard Prospect



Leopard Structure: Deep Crustal Interpretation

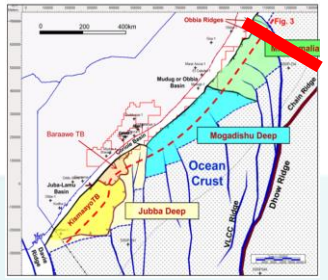
The Inboard Mid Somalia High is Largely Bald of Lower Jurassic Sediments

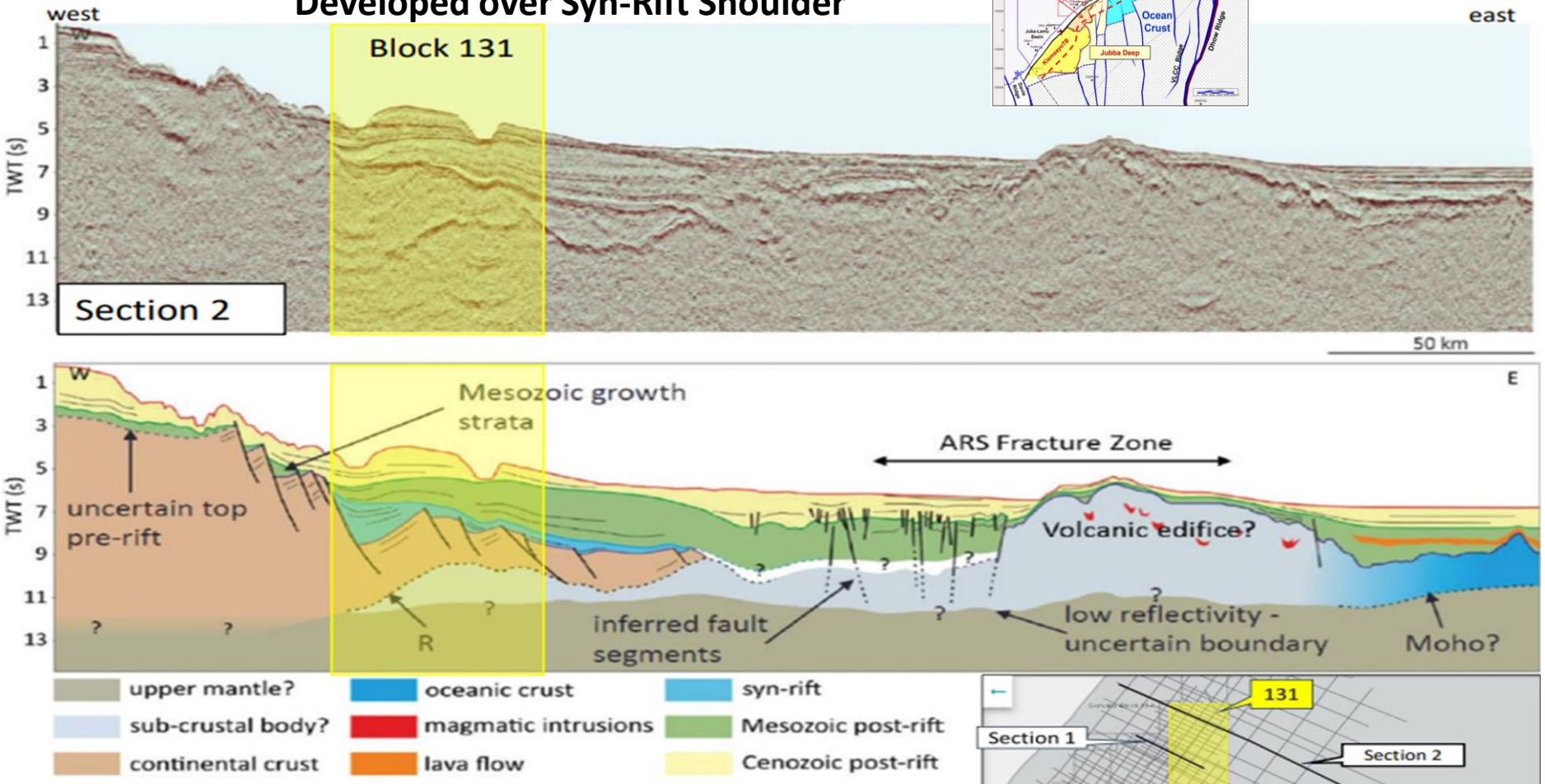
PETROQUEST AFRICA-1&2

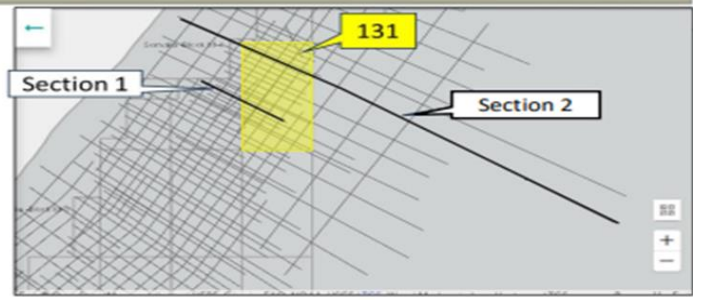
- Meregh-1 (drilled on the Somali High) tested a drift and latest post rift section with no source rocks identified.
- Whereas, in PQA 1 ***PSA 131*** there is a clear and unambiguous interpretation of 1) the syn and pre-rift early Jurassic section being present 2) continental crust evident in deepest section.
- The apex of Rotated Fault blocks within the syn-rift are a foci for later post rift-early drift reefal development comprising extensive barrier reef systems, built up and across the Middle Jurassic.
- Reactivation of these structures cause pronounced overlying drape in the Early – Mid Cretaceous

Somali High

Leopard Structure is Rollover Developed over Syn-Rift Shoulder

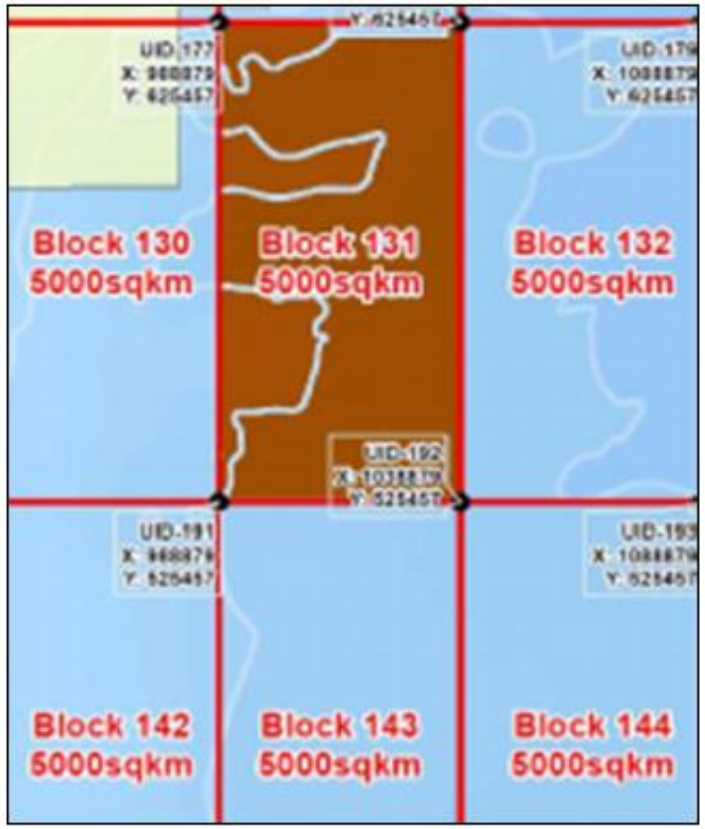






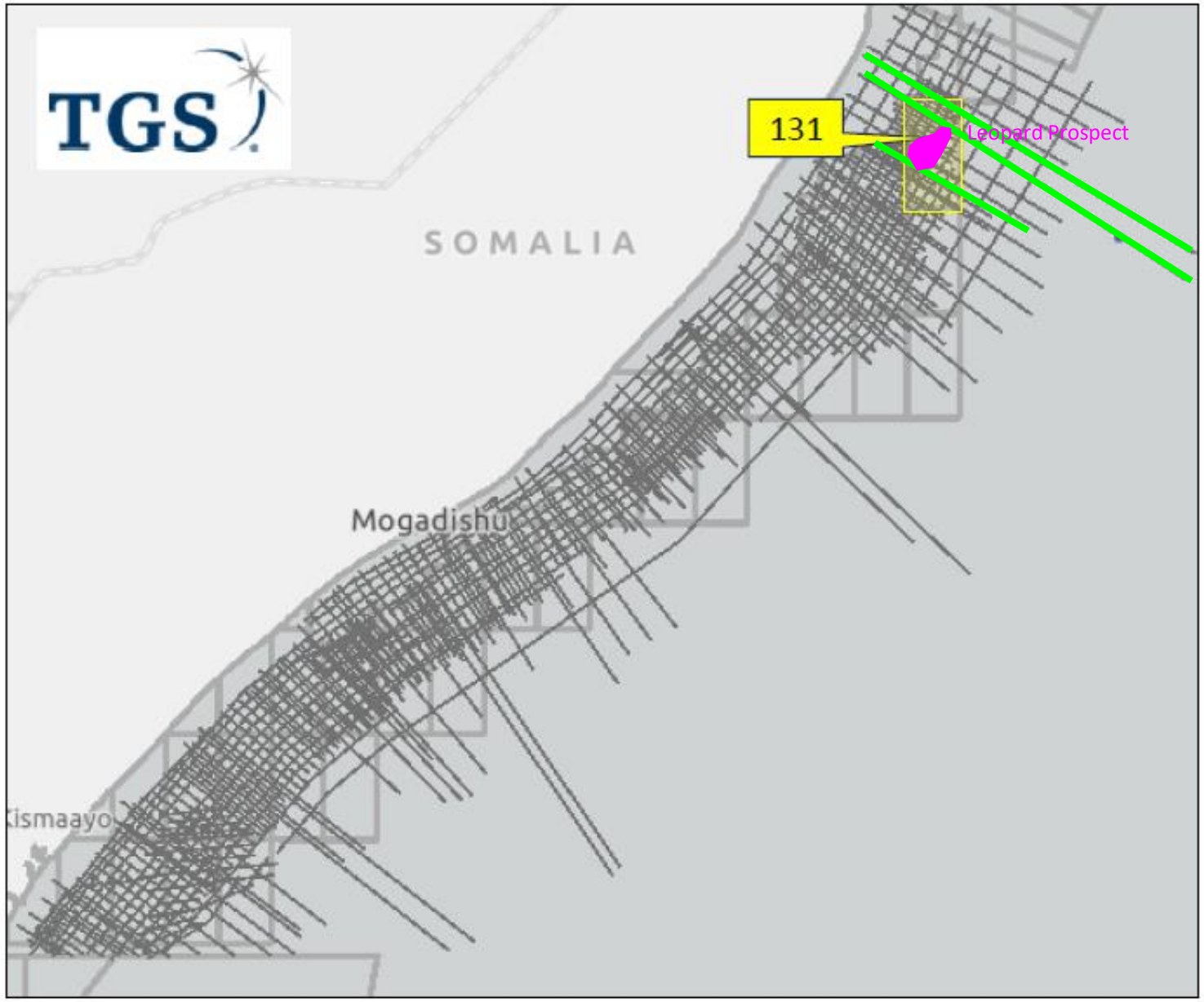
Section 3

PSA 131 (PQA 1): *Leopard Prospect* Northern Area



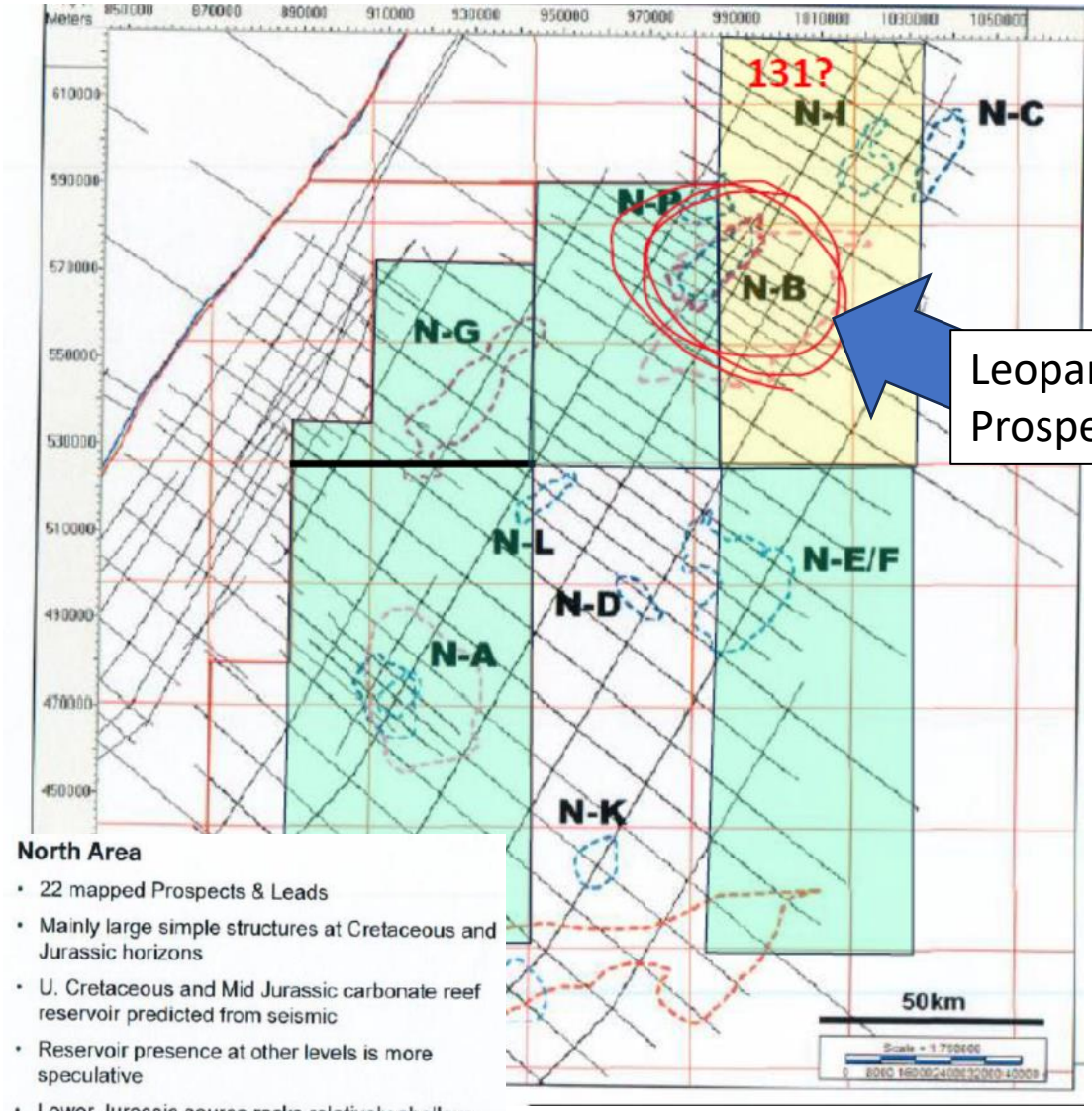
Block Name	Latitude (WGS84)	Longitude (WGS84)
131	5° 38' 30.339" N	49° 24' 37.336" E
131	5° 38' 17.406" N	49° 51' 37.411" E
131	4° 44' 23.268" N	49° 24' 14.751" E
131	4° 44' 12.413" N	49° 51' 12.542" E

Block 131



Leopard Prospect (PSA 131): Offshore Obbia (MSH)

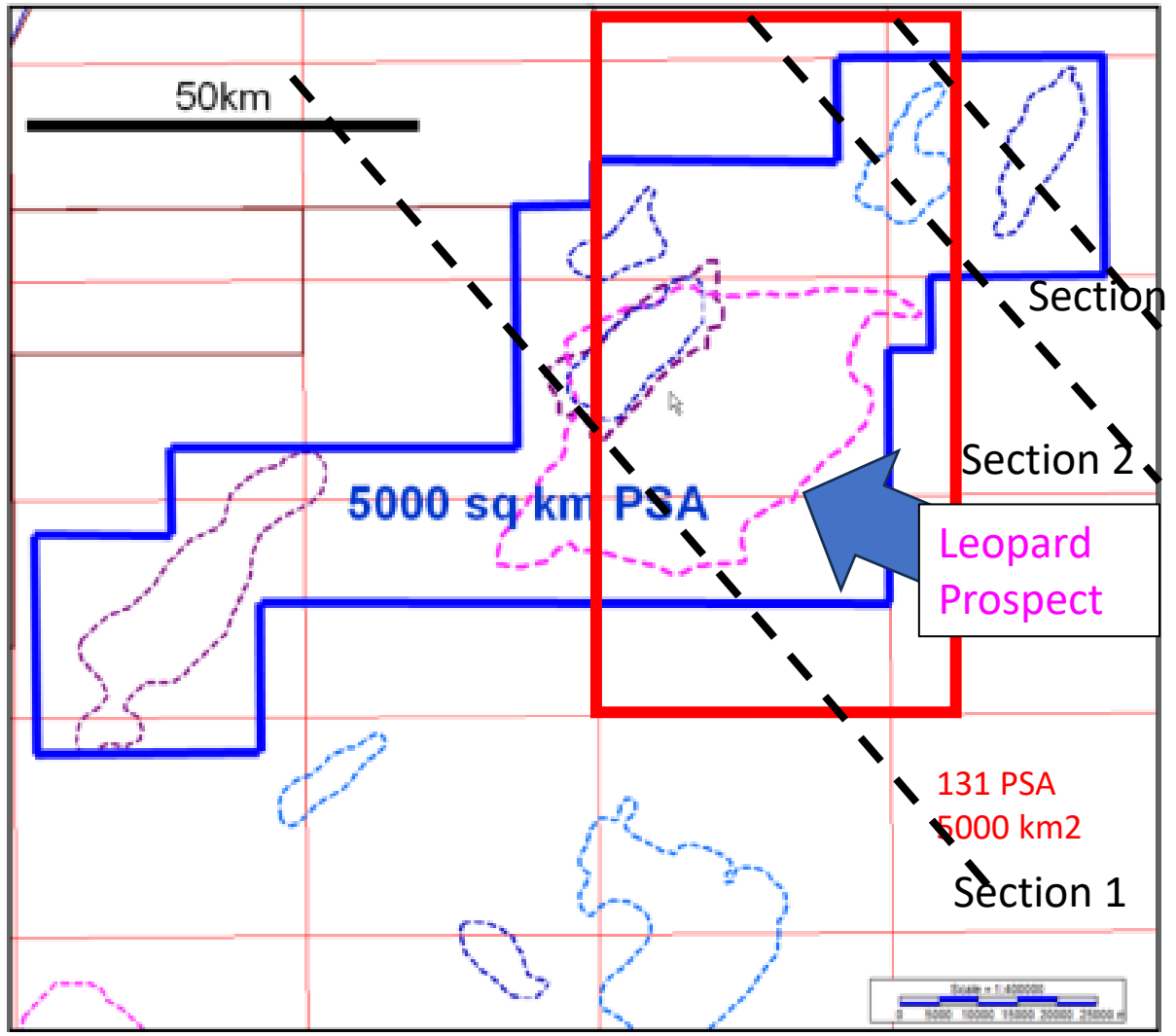
PETROQUEST AFRICA-1&2



North Area

- 22 mapped Prospects & Leads
- Mainly large simple structures at Cretaceous and Jurassic horizons
- U. Cretaceous and Mid Jurassic carbonate reef reservoir predicted from seismic
- Reservoir presence at other levels is more speculative
- Lower Jurassic source rocks relatively shallow – could be hydrocarbon mature at present day

Red	N6.5	Upper Cretaceous
Pink	N7	Mid Cretaceous Unc
Dk Blue	N7.5	Upper Jurassic Unc
Purple	N8.6	Mid Jurassic carbonate
Blue	N9	Base Mid Jurassic Unc



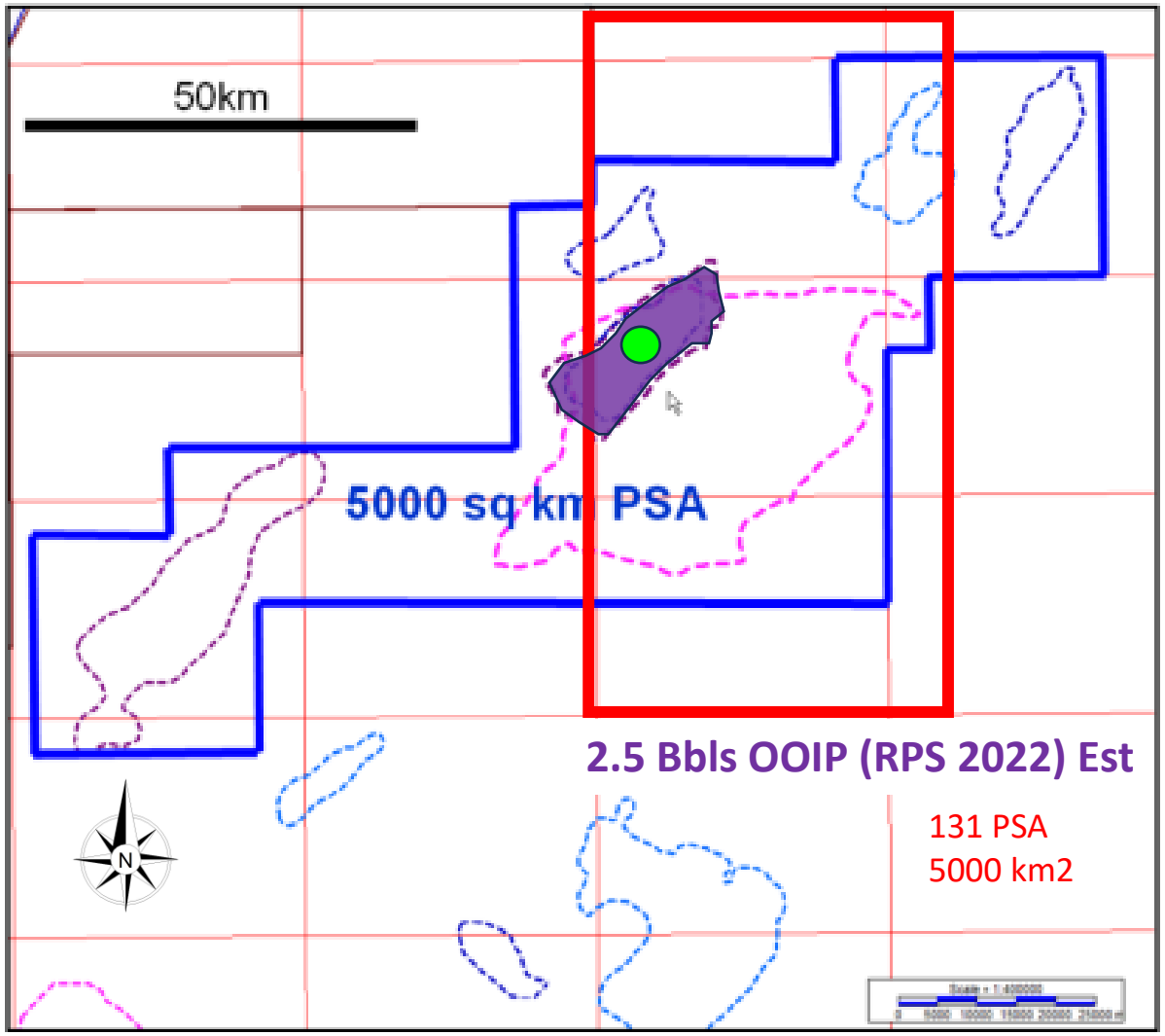
Approximate Area of Leopard Cretaceous closure
53 x 25 km = 1325 km2

Magenta Cretaceous (Leopard Shallow)
Dark Blue Upper Jurassic
Purple Middle Jurassic (Leopard Deep)
Light Blue Lower Jurassic Unconformity

Leopard Prospect ('Shallow & Deep') – Vital Statistics

PETROQUEST AFRICA – 1&2

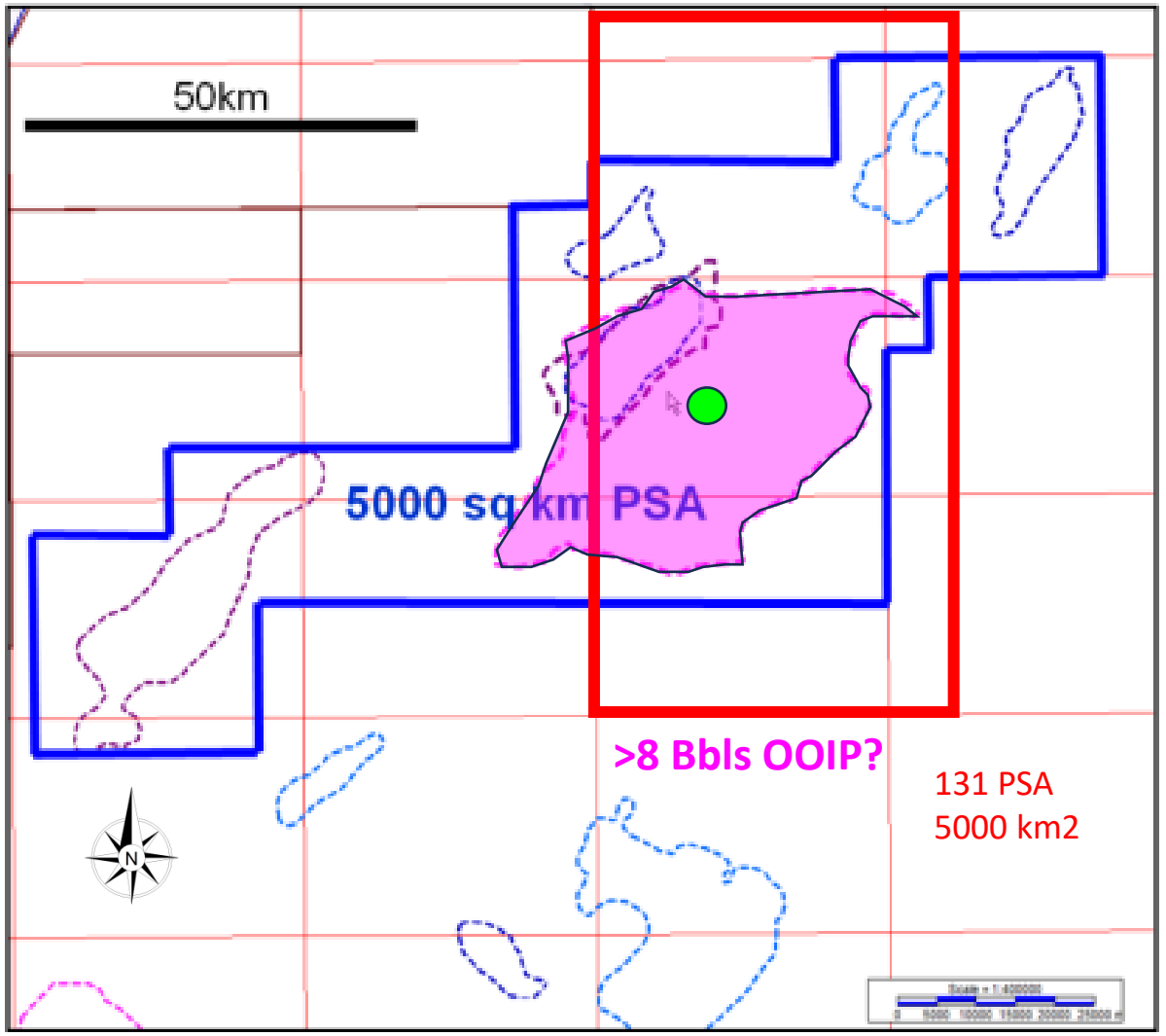
Leopard 'Deep' (Middle- Upper Jurassic (Arab D))



Closure Area approx 300 km2 90% in PSA 131

Drill location WD 2900 metres TD 5.5 kms

Leopard 'Shallow' (Lwr-Mid Cretaceous (Thamama Grp))



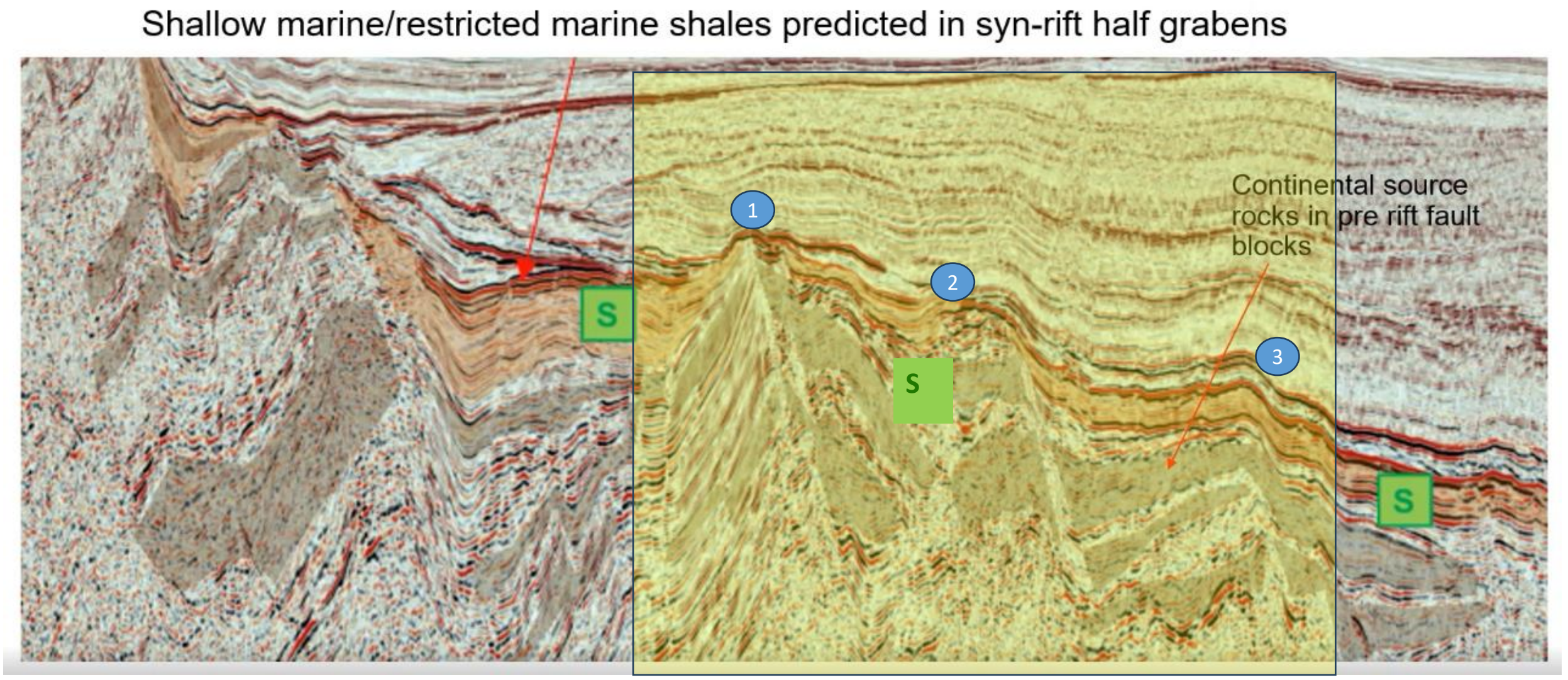
Closure Area 2000 km2 85% in PSA 131

Drill location WD 2750 metres TD 5.0 Kms

Local Seismic Data: 3 Syn-Rift Rotated Fault Blocks

Syn-rift to Earliest Post Rift & 3 Separate Source Kitchens

PETROQUEST AFRICA-1&2



Section 2

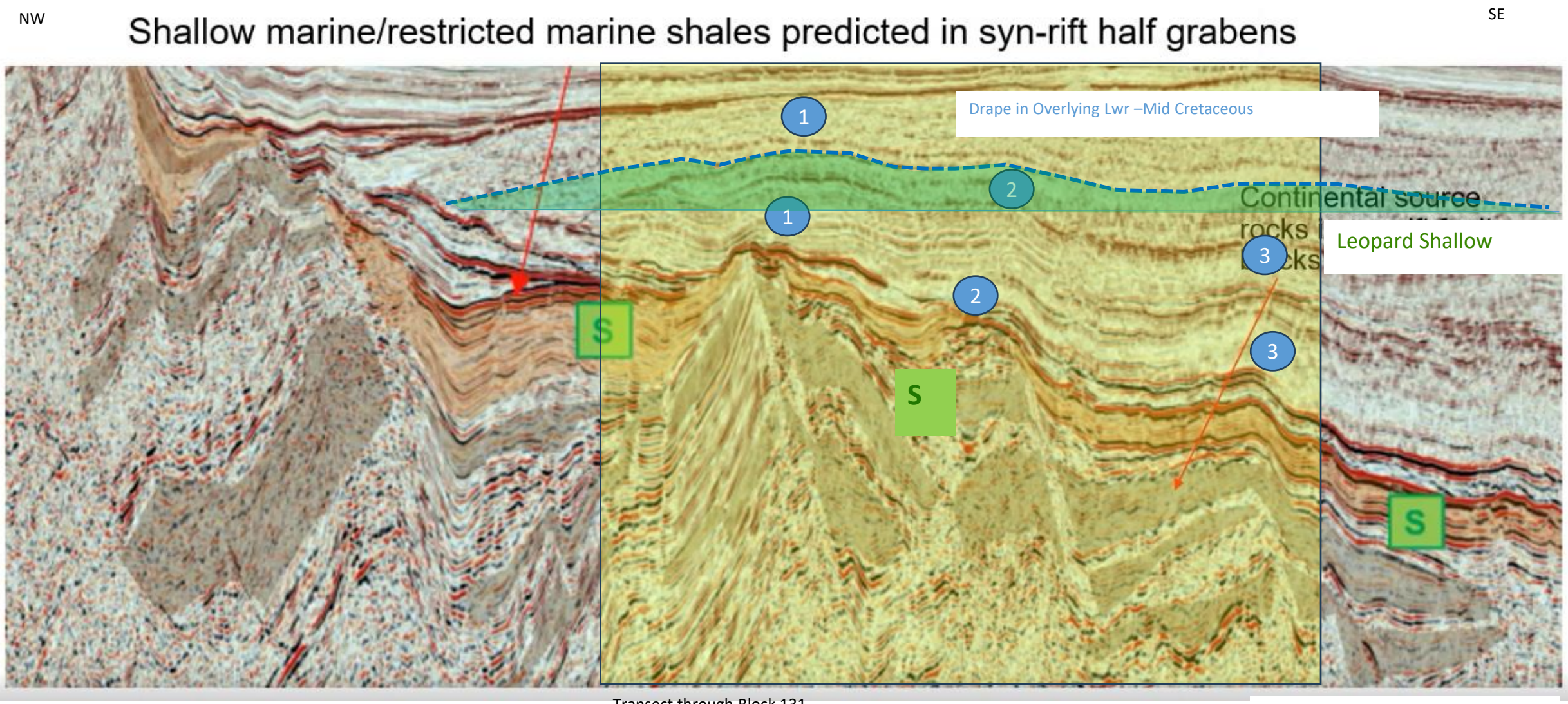
Transect through Block 131

0 1 2 4 km

Regional Seismic Data : Drape Structure (*Leopard 'Shallow'*)

Play Type 3: Post Rift Lwr – Mid Cretaceous Carbonates in Drape Rollover (Leopard)

PETROQUEST AFRICA-1&2



Transect through Block 131

Section 2

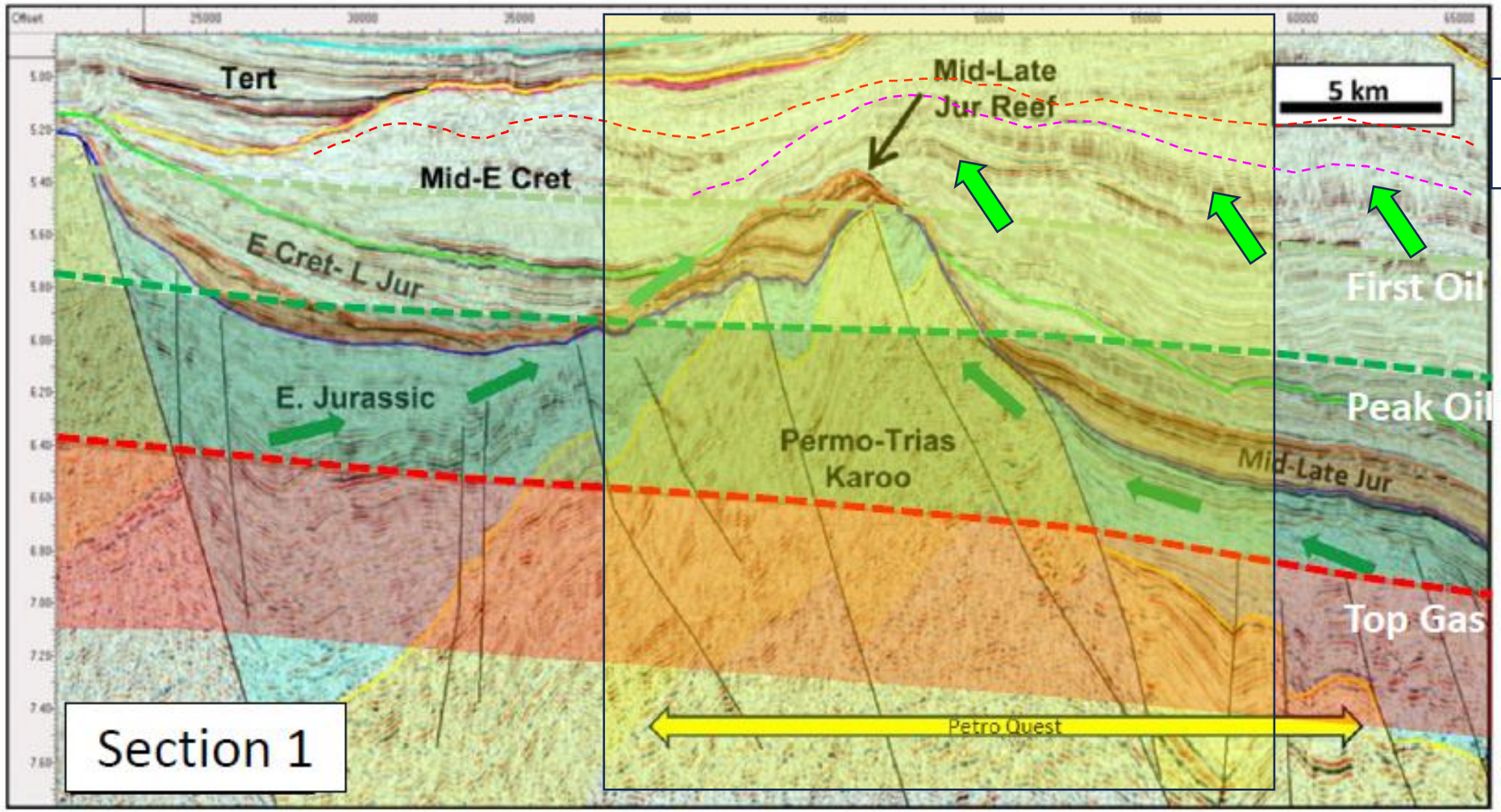
TGS Published Seismic Line

Hydrocarbon Maturity: *Leopard Structure* (PSA 131)

Plays 1 & 2 within the Oil Window (Present Day)

PETROQUEST AFRICA – 1&2

Note: *Leopard Prospect* is present at Play Levels 1, 2 and 3



Middle & Lwr K Seismic Markers

Migrating Hydrocarbons

Transect through Block 131

Section 1

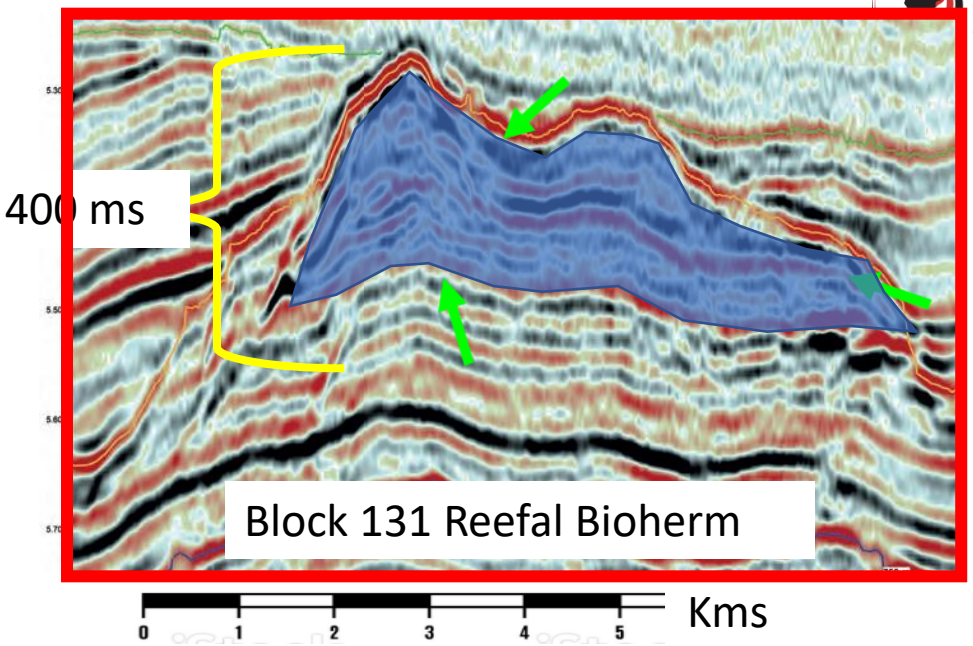
Reefs: Jurassic Targets (PSA 131) *Leopard 'Deep' Prospect*

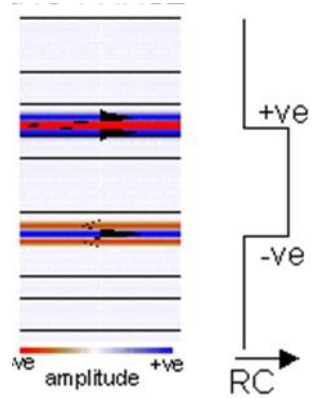
Middle Jurassic Reefs (Barrier System) Play 2

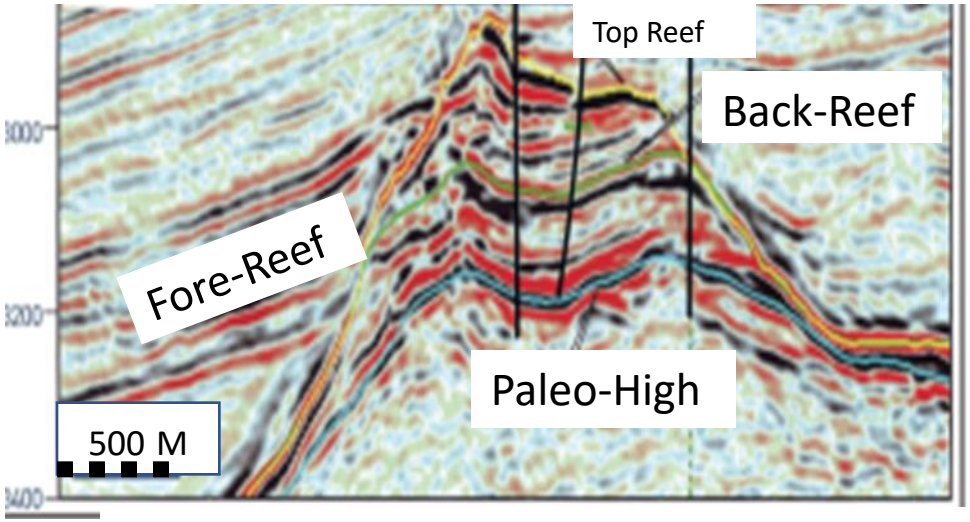
PETROQUEST AFRICA – 1&2

Play Type 2 PSA 131: Undrilled Jurassic Reefs: Analogues Saudi & Abu Dhabi Reservoirs (Arab D).

- Middle to Late Jurassic Reefs of the Tethyan Realm are key targets in Block 131. This reef (Bioherm) system extends into Block 131 and is undrilled/untested.
- The Reef framework has potential source rocks, below to the top and side and is not unlike the Malampaya hydrocarbon field offshore Philippines, however, offshore Somalia is an order of magnitude larger!
- A better productive analogue are the Arab D reservoirs of both Saudi Arabia and Abu Dhabi.







Malampaya Hydrocarbon Field Philippines

Leopard Prospect: Analogues, Central Ridge & Zakum Oil-field

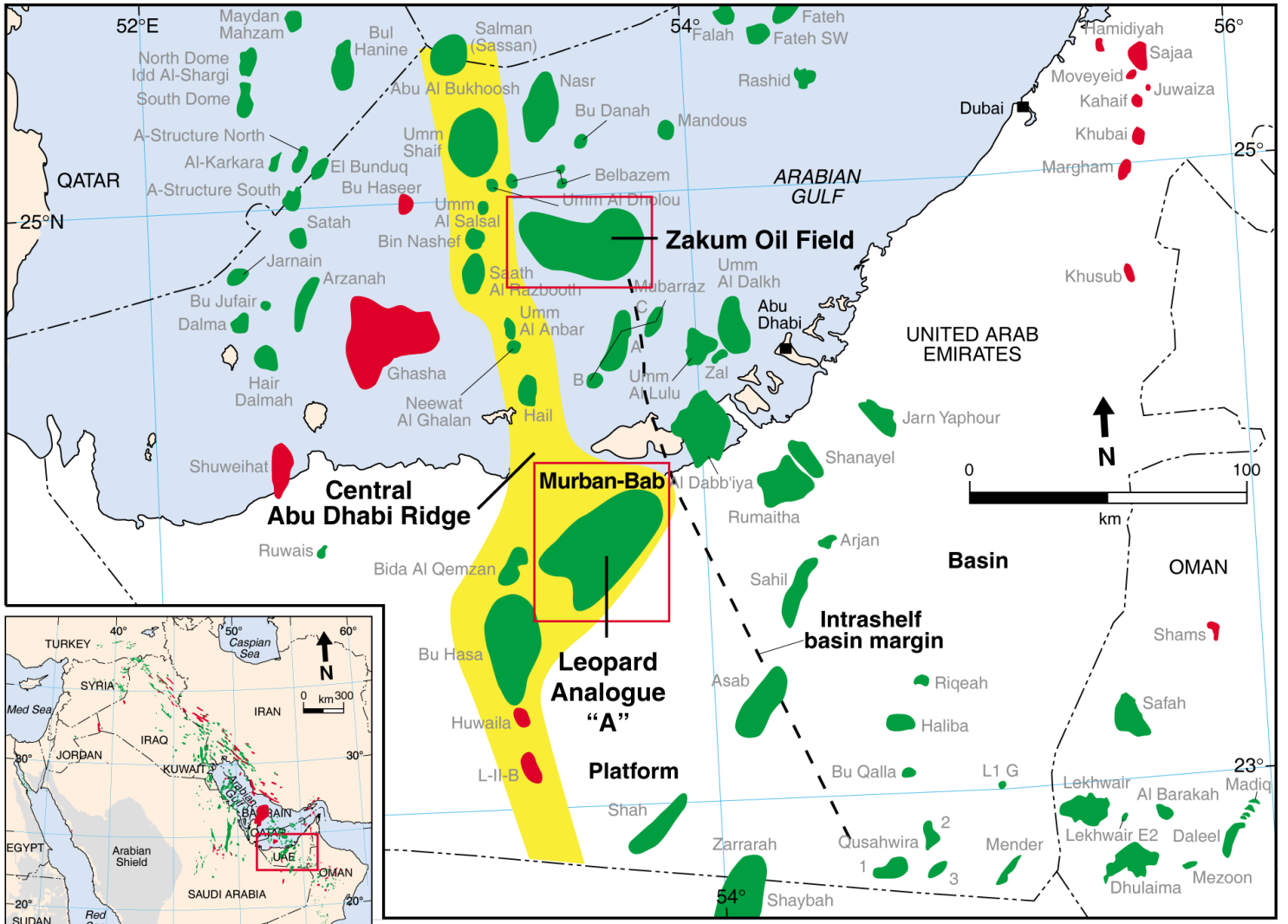
Tethyan Realm - Abu Dhabi (UAE)

PETROQUEST AFRICA-1&2

Two ***Leopard*** Analogues

1) **Analogue A** (Murban-Bab)
   Arab D & Thamama Grp
   Leopard 'Deep'

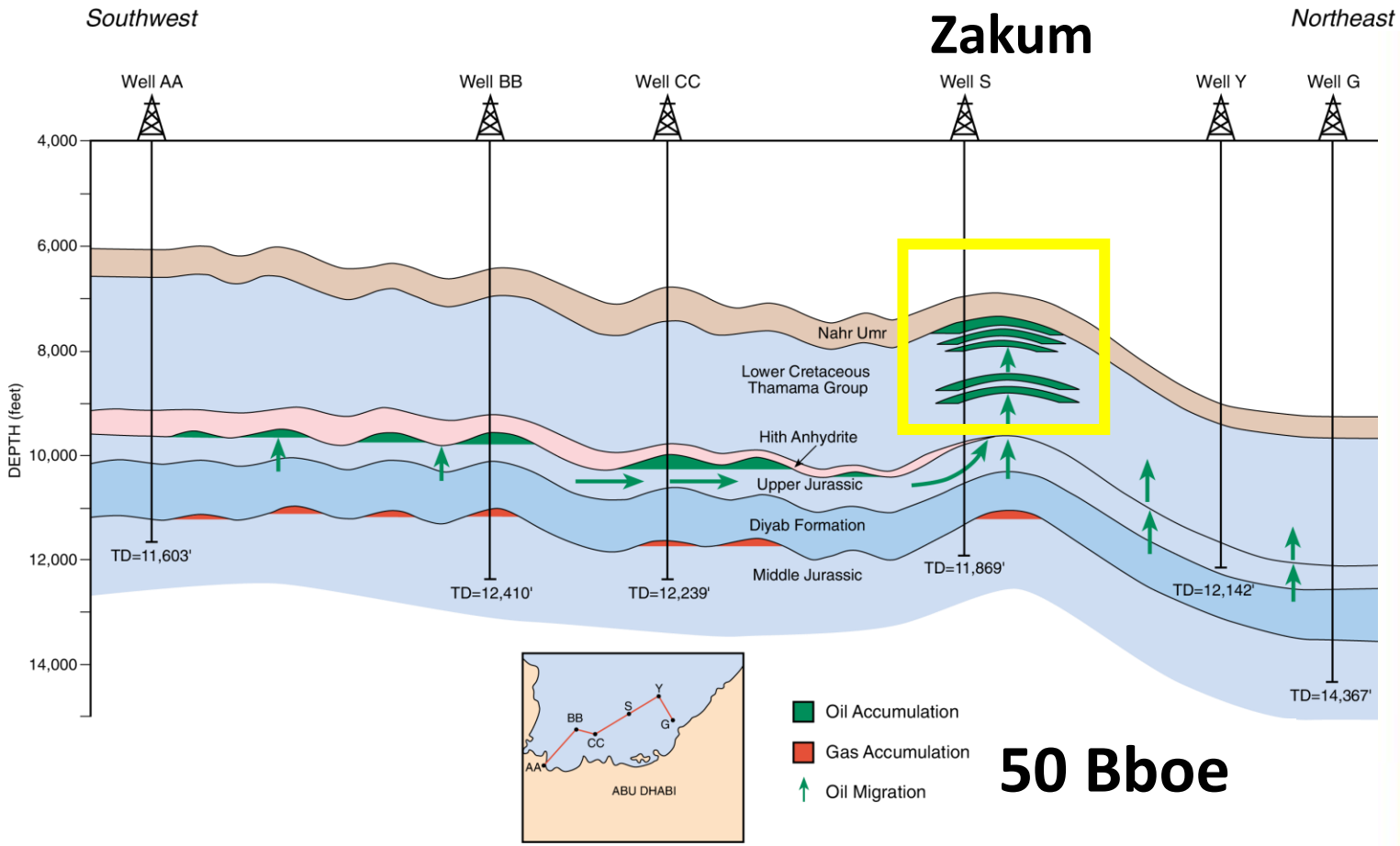
2) **Zakum Oil-Field**
   Upr/Lwr Zakum
   Leopard 'Shallow'



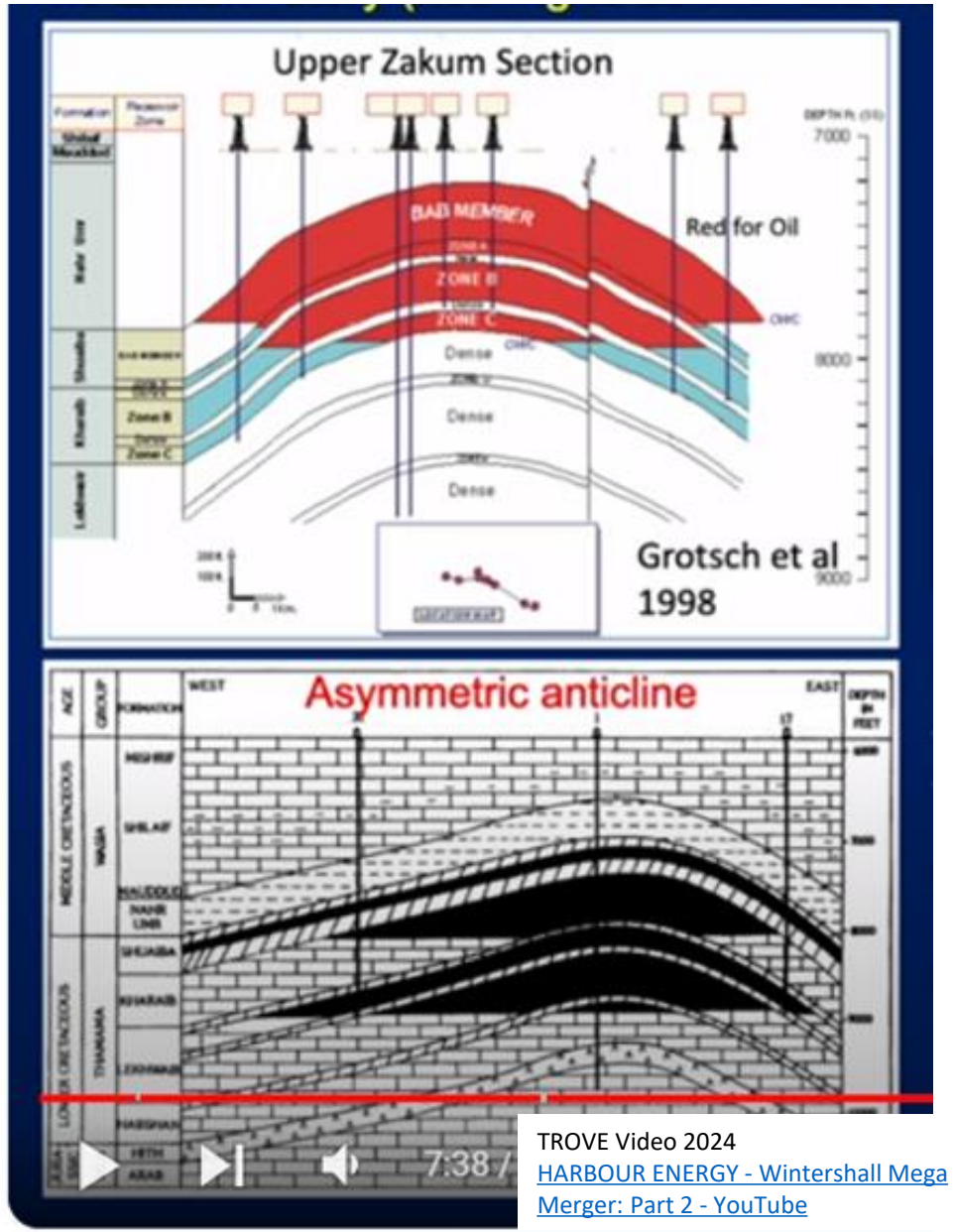
Map of Potential Abu Dhabi Analogues (UAE)

'*Leopard Shallow*': Analogue, Zakum Oil-field Abu Dhabi.

PETROQUEST AFRICA – 1&2



50 Bboe



TROVE Video 2024
[HARBOUR ENERGY - Wintershall Mega Merger: Part 2 - YouTube]

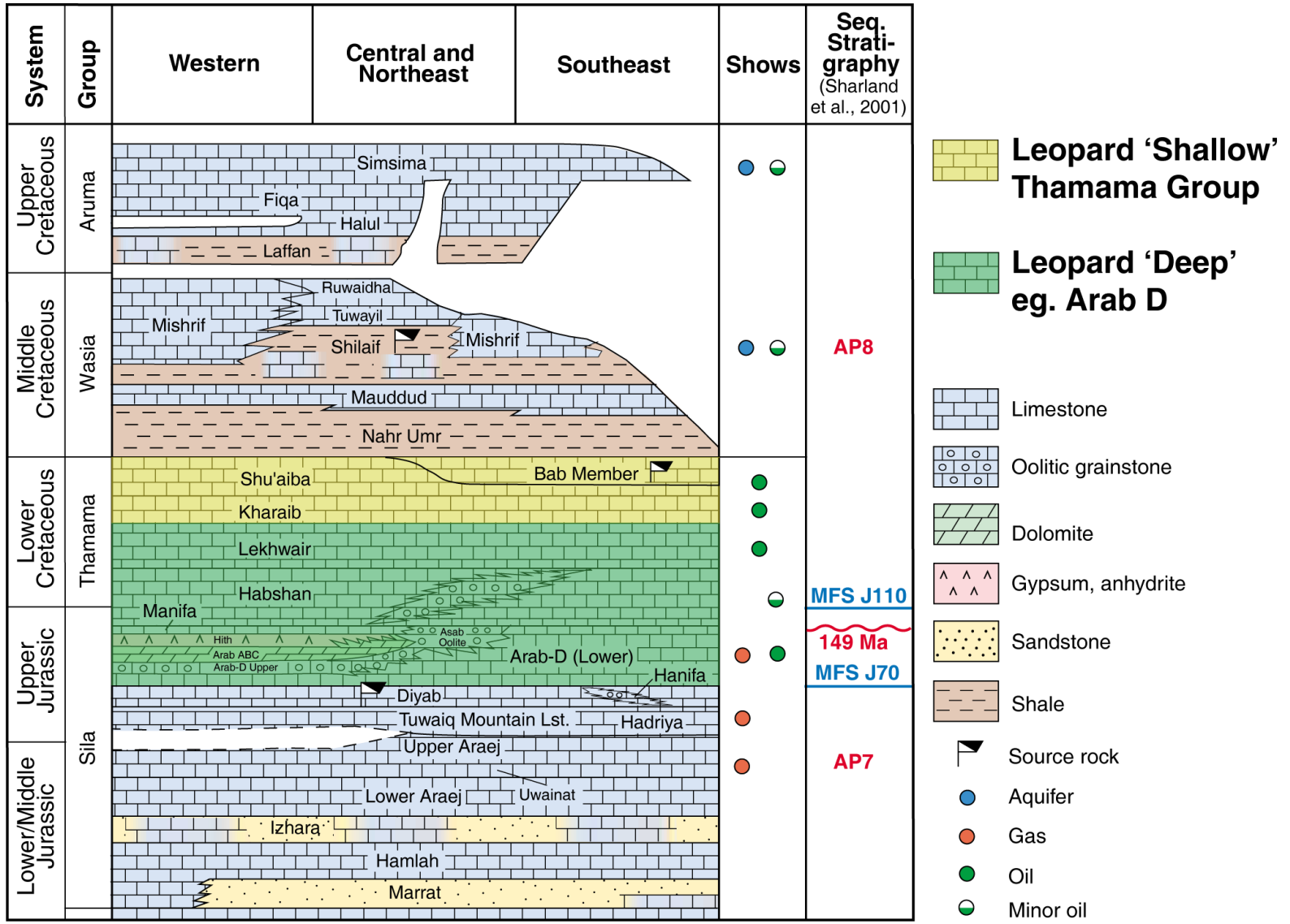
Asset (Year)	1997	2014	2019	2024
Zakum Oil Reserves	17 Bbls	17.5 Bbls	21.6 Bbls	18.4 Bls

Asset (Year)		2014	2019	2024
Zakum Gas Reserves		13 Tcf	12 Tcf	12.4 Tcf

Leopard Prospect: Analogues, Abu Dhabi

Central Ridge & Zakum Oil-field

The Arab Formation in the context of the hydrocarbon habitat of the Central Abu Dhabi Ridge, showing stacked Jurassic and Cretaceous intrashelf basins.



Analogues, Abu Dhabi Central Ridge & Zakum Oil-field

Hydrocarbon Habitat Arab D and Upper & Lower Zakum (Murban-Bab)

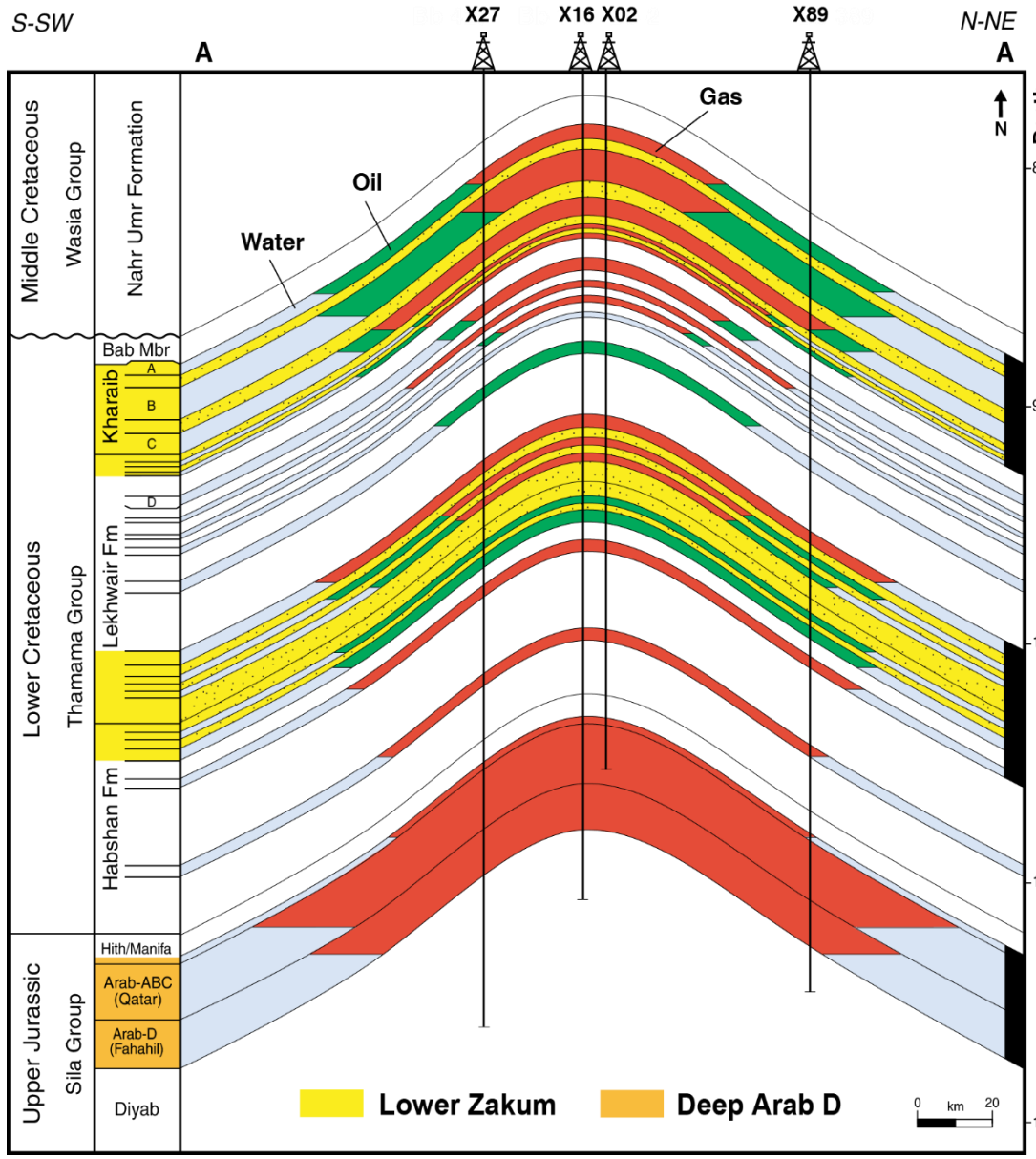
PETROQUEST AFRICA-1&2

Leopard Prospect:

Leopard 'Shallow' Upper Zakum

Leopard 'Shallow' Lower Zakum

Leopard 'Deep' Arab D



Leopard Analogue A
Central Ridge Abu Dhabi

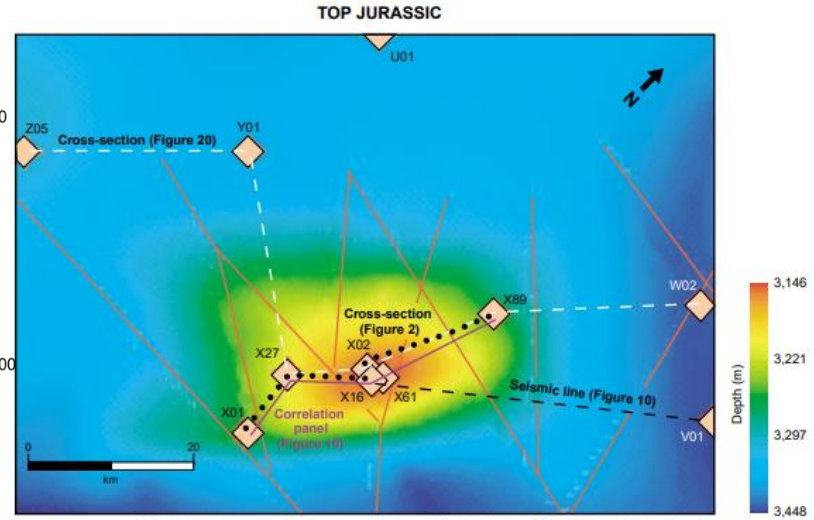


Figure 5: Tentative Top Jurassic structure map of the studied field with faults shown as red lines. Dip angles in the flanks of the field are less than 5°. Well locations are shown as X01.

'Leopard Shallow': Analogue the Zakum Oil-field Abu Dhabi

PETROQUEST AFRICA – 1&2

- The Zakum oil field is an east-west plunging anticline, located in offshore Abu Dhabi, UAE. The field was discovered in 1963 by seismic survey, and came on production in 1967 at an initial rate of 50 000 bopd from the Lower Cretaceous carbonate sediments. The Zakum structure is a broad asymmetric anticlinal feature characterized by gentle dips throughout

- At Zakum field the Lower Cretaceous Thamama Group is a thick shallow-marine carbonate sequence with an average thickness of about 2300 ft, and is divided into four formations: Shuaiba, Kharaib, Lekhwair and Habshan (in descending order). An informal reservoir-oriented classification was set up for this group. It was subdivided into six zones given a numerical notation from top to bottom (Zones I to VI).

- The Kharaib Formation represent shallowing upward cycles formed in very shallow epicontinental seas. The energy level grades from low-energy subtidal to high-energy setting at or above wave base. It is characterized by dense-argillaceous pyritic bioclastic lime mudstones/wackestones, peloidal-ooidal packstones/grainstones, dolomitic limestones and thin black shale laminae.

- The reservoir quality of the formation is controlled by vertical and lateral distribution of porosity, permeability and stylolites. The porosities ranges from 5 to 28%, and permeabilities from less than 1 to 100 Md. The influence of initial environment of deposition, diagenesis and petrophysical properties on the reservoir characteristics is evaluated.

Geology and reservoir characteristics of Lower Cretaceous Kharaib Formation in Zakum Field, Abu Dhabi, United Arab Emirates

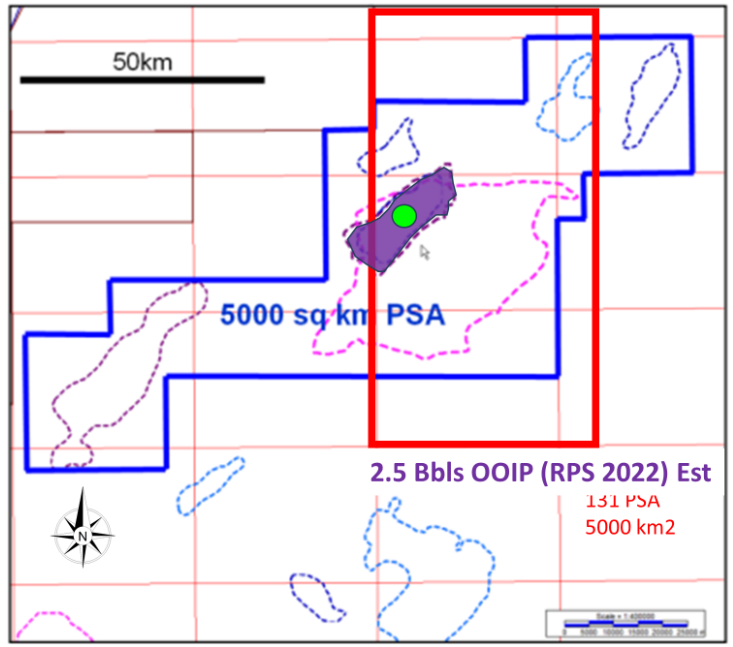
Author: A. S. Alsharhan AUTHORS INFO & AFFILIATIONS

Publication: Geological Society, London, Special Publications
Volume 50
Pages 299 - 316
https://doi.org/10.1144/GSL.SP.1990.050.01.16

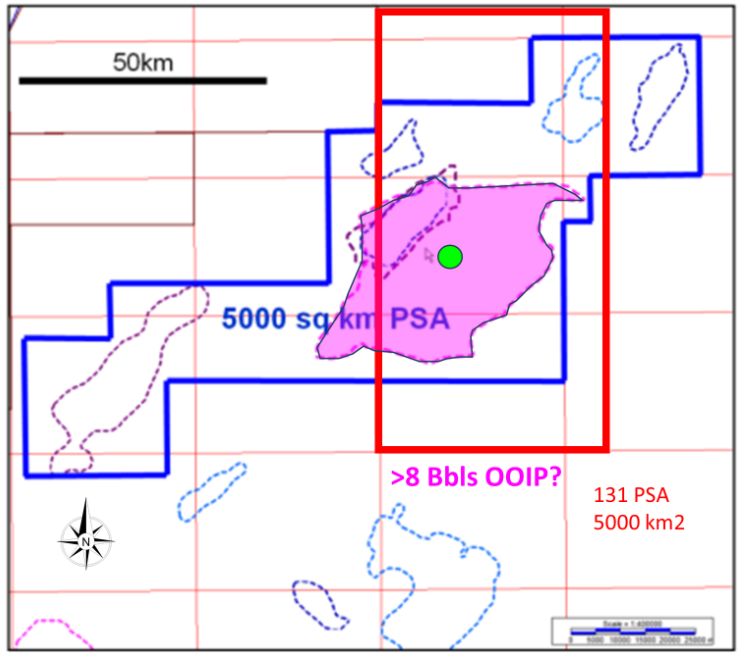
Leopard Prospect: Summary

- The Leopard structure is one of 21 Prospects and Leads mapped on the Flanks of the Mid-Somalia High.
- Relatively un-faulted four-way dip closure is mapped at the level of the top syn-rift, early post-rift 1 (Jurassic) and post rift 2 (Lower-Middle Cretaceous).
- Oil Mature Sources rocks are evoked within the late syn-rift sag phase (Early Jurassic), early post rift (Middle-Upper Jurassic).
- Potential Reservoirs lie within mapped Middle Jurassic barrier reef systems, and Lower Cretaceous Carbonate Reefs and Shoals.
- Thick effective seal units have been penetrated onshore Obbia-1 (Sinclair) across both the Jurassic and Lower Cretaceous sections in the form of both Mudstones and Marls.
- Area of closure for Leopard 'deep' is 250 km2 at Middle Jurassic level and over 1325 km2 at Leopard 'Shallow'.
- RPS suggest **2.5 billion barrels** of in place at Leopard 'Deep' alone.
- An excellent producing analogue exists for Leopard in the Zakum field Abu Dhabi (UAE) with **oil reserves** in excess of **18 Bbls**

Leopard Deep Middle- Upper Jurassic (Arab D)



Leopard Shallow Lwr-Mid Cretaceous (Thamama Grp)



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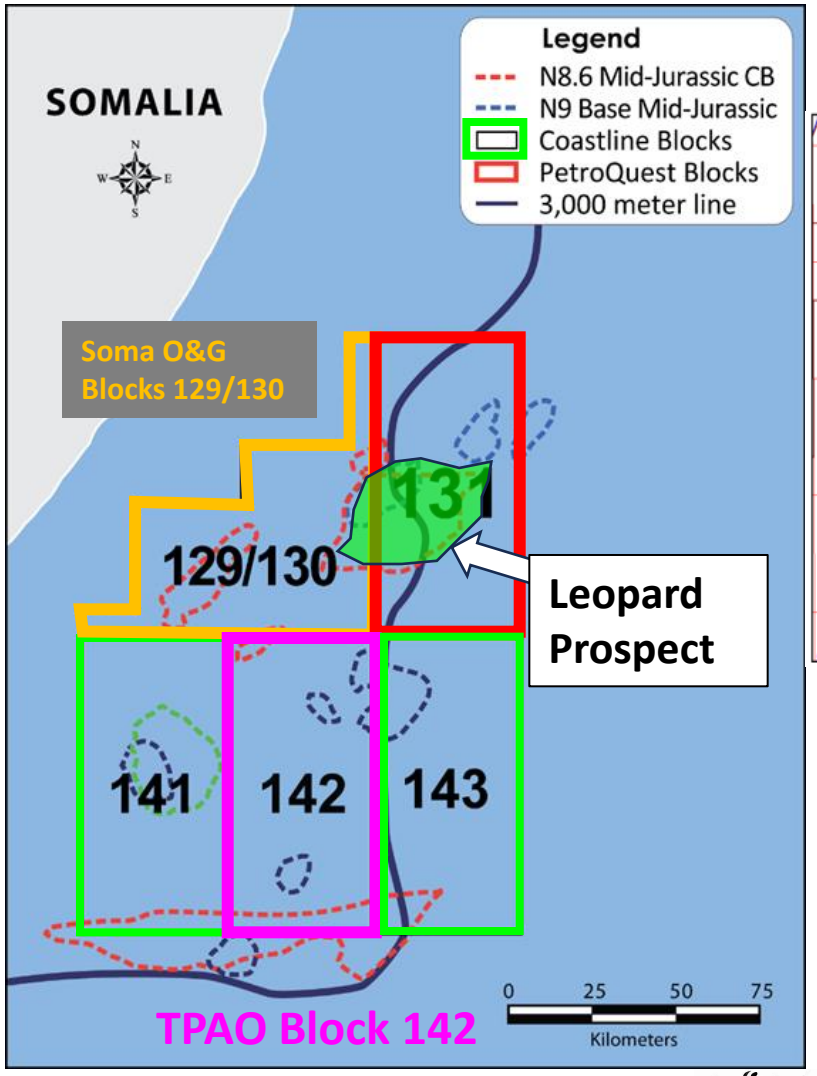
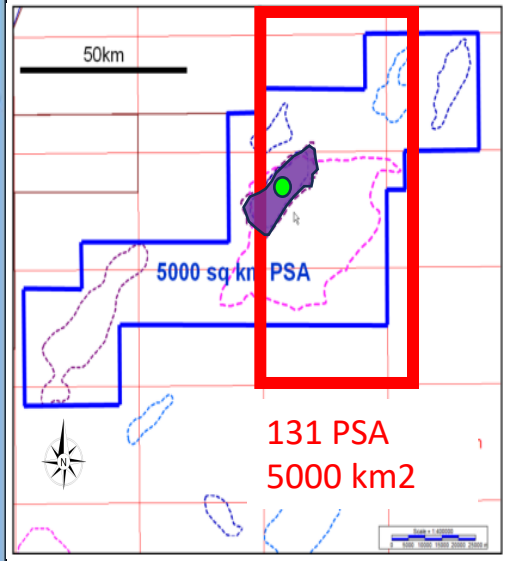
New Oil Prone Opportunities Offshore Somalia!

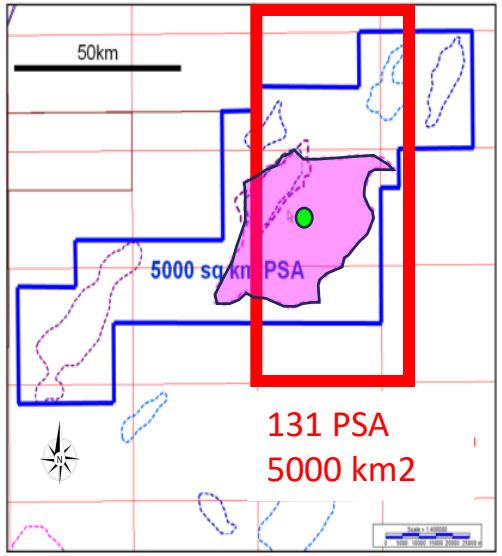
Leopard Prospect



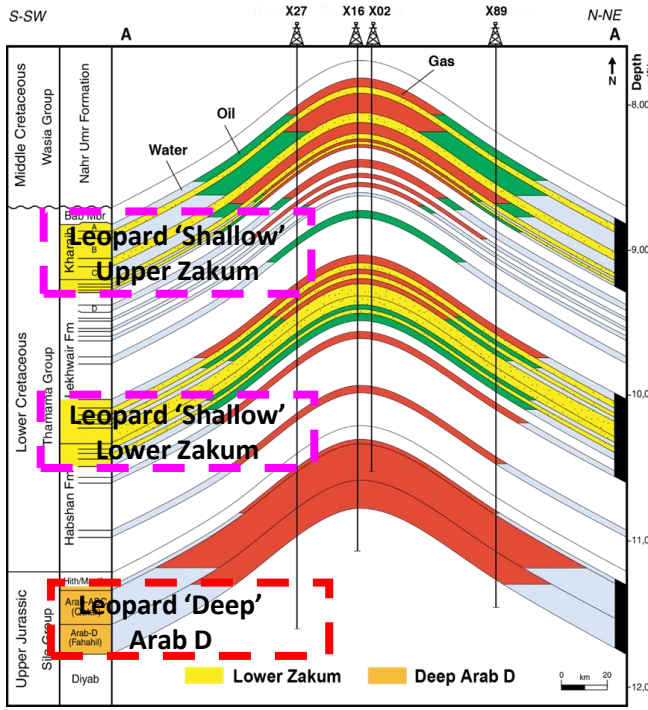
Published Soma Maps 2015



Closure Area approx 250 km2
90% in PSA 131
Drill location WD 2900 metres
TD 5.5 kms



Closure Area 1325 km2 85%
in PSA 131
Drill location WD 2750
metres TD 5.0 Kms



- ***Leopard*** comprises three levels, with closure mapped at Lower Jurassic, Middle Jurassic and Lower-Mid Cretaceous.

The Leopard Prospect

Multi-Billion Barrel 'Zakum' Analogue

Somalia Affiliate

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Northern Area Prospects & Volumes

RPS Report 2016

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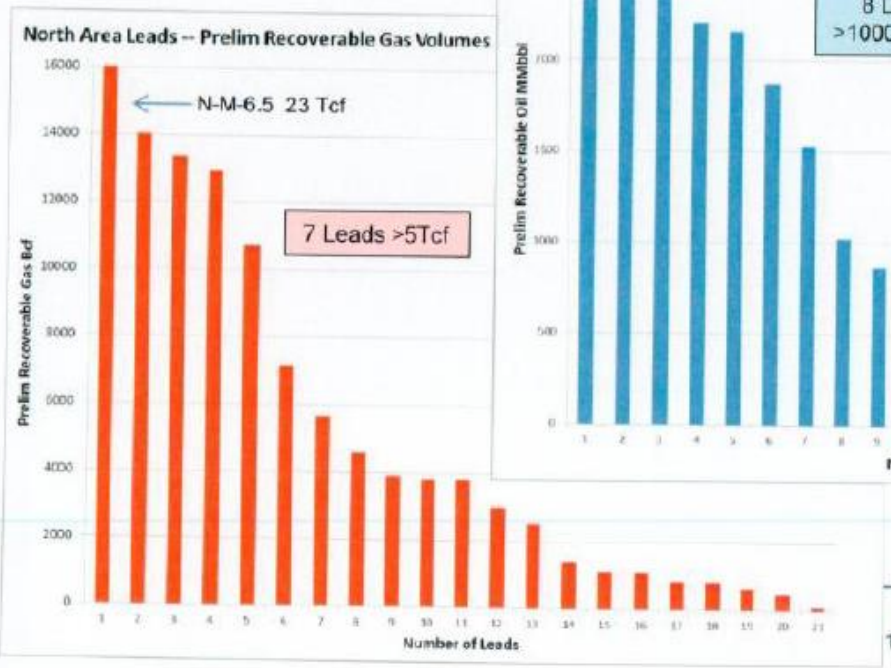
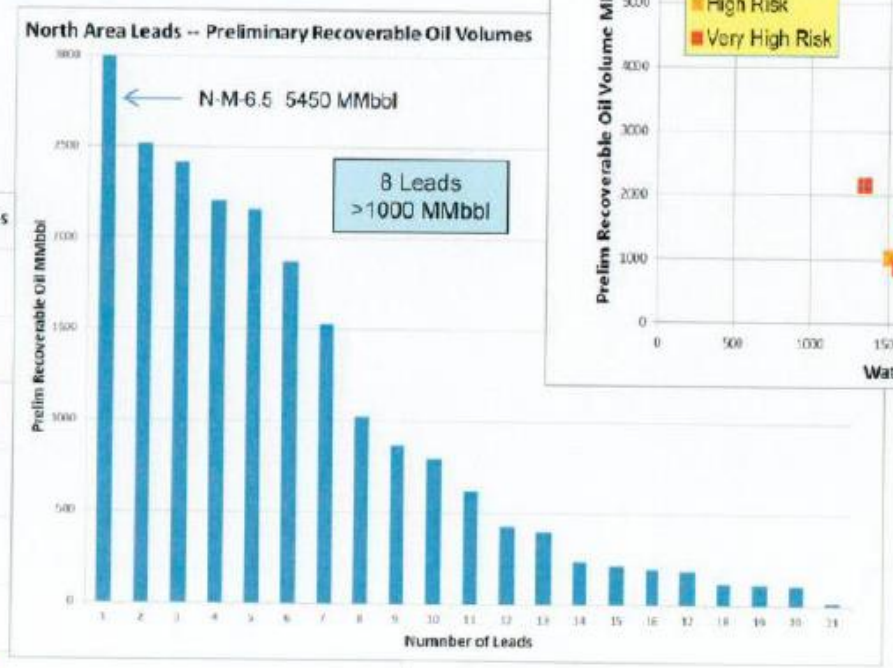
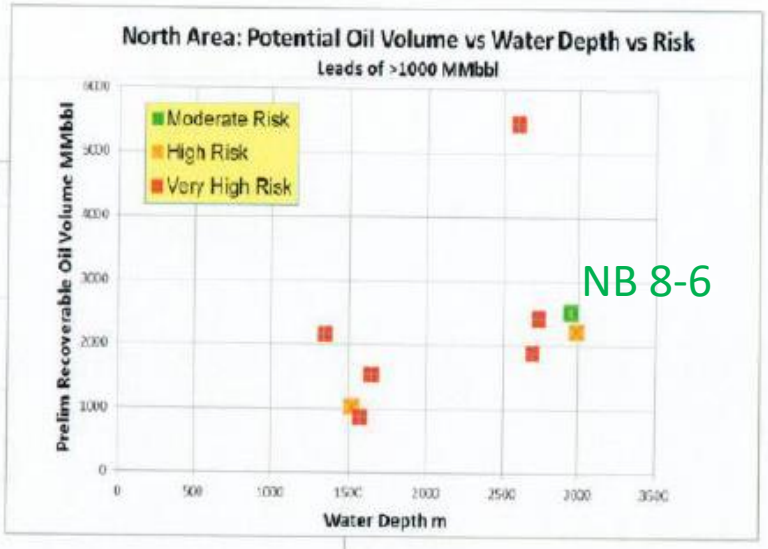
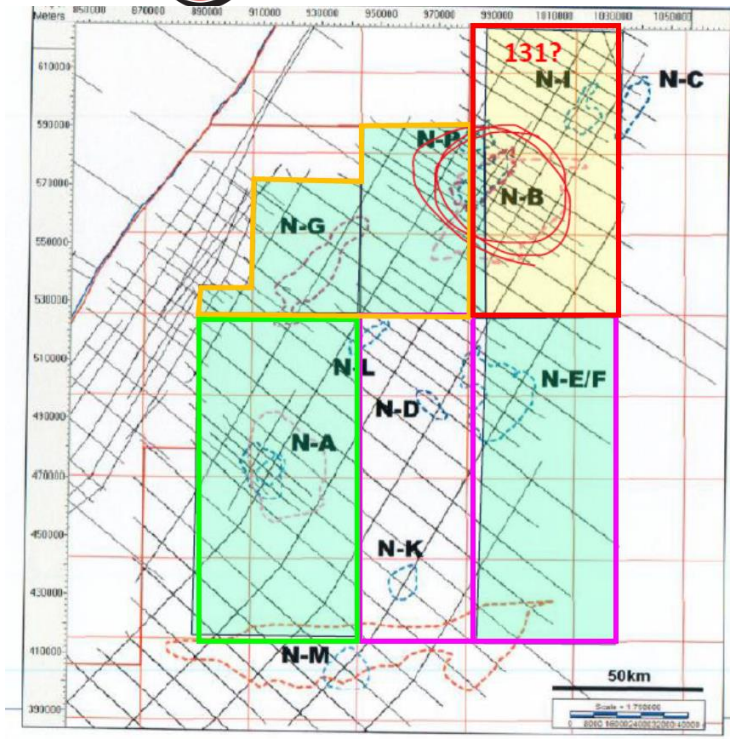
- One outstanding prospect N-B-8.6; moderate risk and 2.5 Bbbl potential
- Other leads are High or Very High Risk – for reservoir & source
- 8 leads >1000 MMbbl, all in water depths 1500-3000m
- 21 prospects & leads









North Area

- 22 mapped Prospects & Leads
- Mainly large simple structures at Cretaceous and Jurassic horizons
- U. Cretaceous and Mid Jurassic carbonate reef reservoir predicted from seismic
- Reservoir presence at other levels is more speculative
- Lower Jurassic source rocks relatively shallow – could be hydrocarbon mature at present day

Red	N6.5	Upper Cretaceous
Pink	N7	Mid Cretaceous Unc
Dk Blue	N7.5	Upper Jurassic Unc
Purple	N8.6	Mid Jurassic carbonate
Blue	N9	Base Mid Jurassic Unc

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AFRICA – 1&2

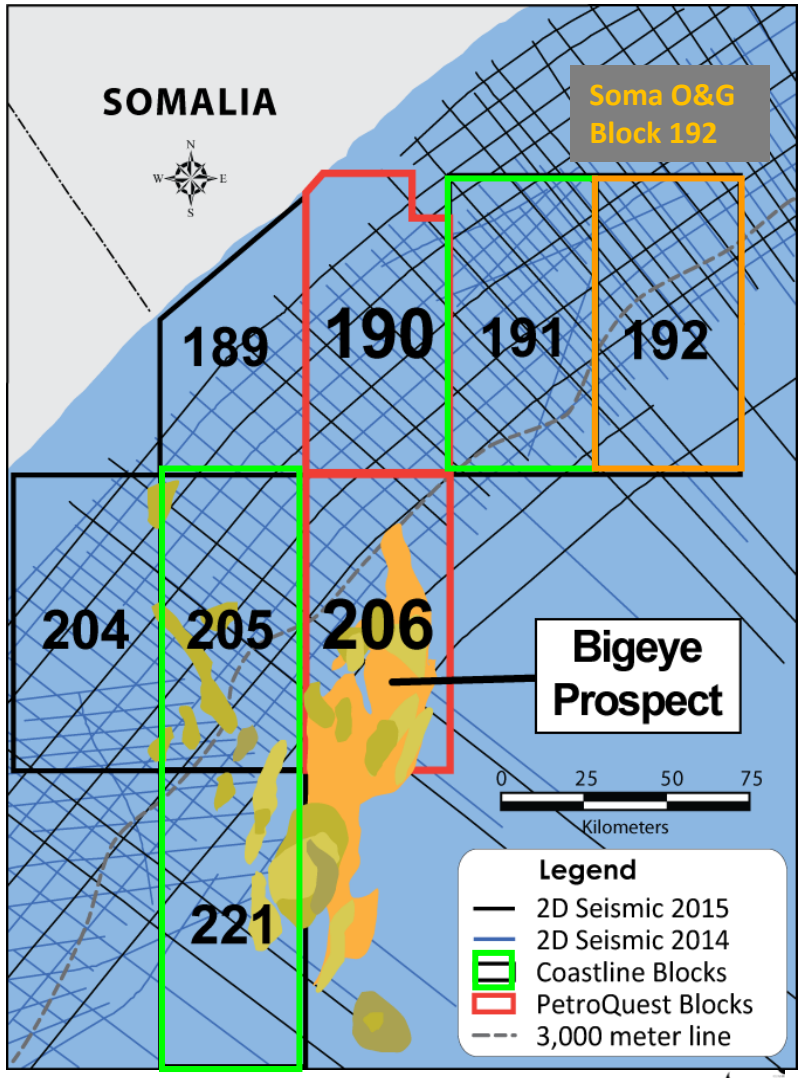
Havoc Partners: Endorses Block 131 and Leopard Shallow!

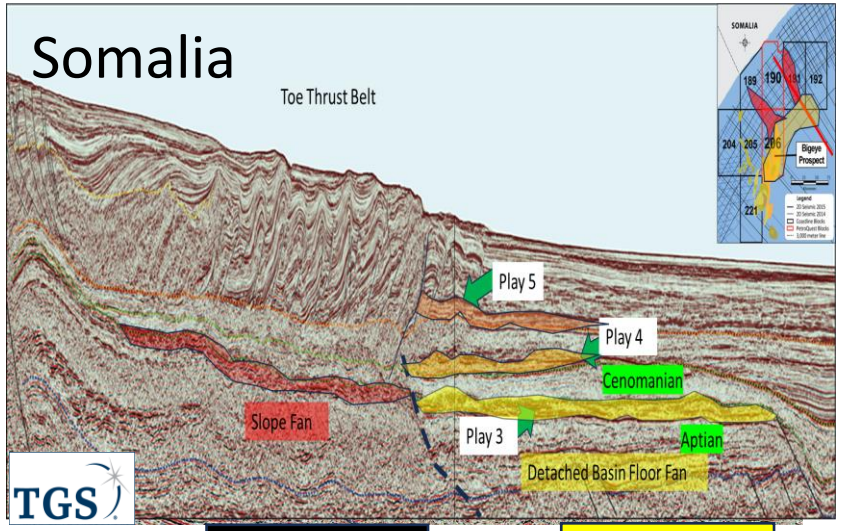
Comments by Dr Alan Stein - ex Ophir CEO (Offshore Tanzania Fame)

Focused on International Offshore and Onshore Projects

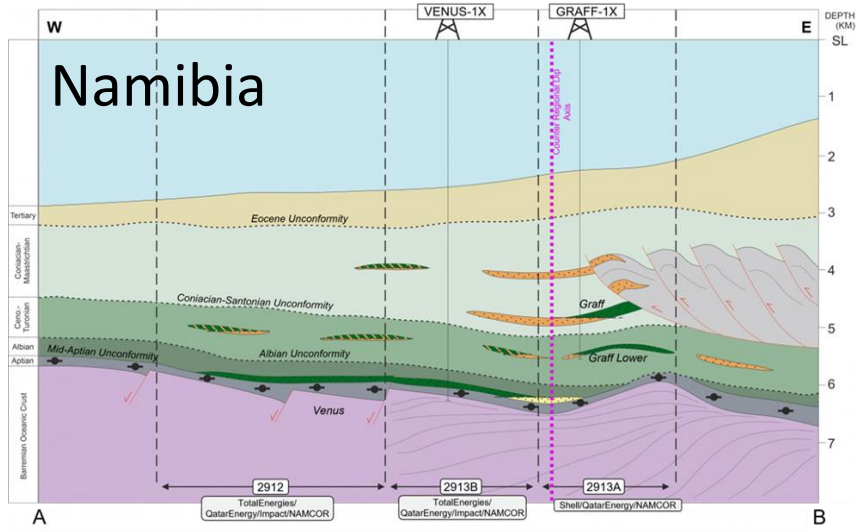
New Oil Prone Opportunities Offshore Somalia!

Big Eye Lead – Stacked Basin Floor Fan





Somalia | Aptian Source



Orange Basin

- Bigeye mega-closure is a series of laterally stacked fan lobes (Albian Age) that comprise a large detached Basin Floor Fan (BFF) deposited directly on Aptian (OAE1) source rocks with stacked potential!

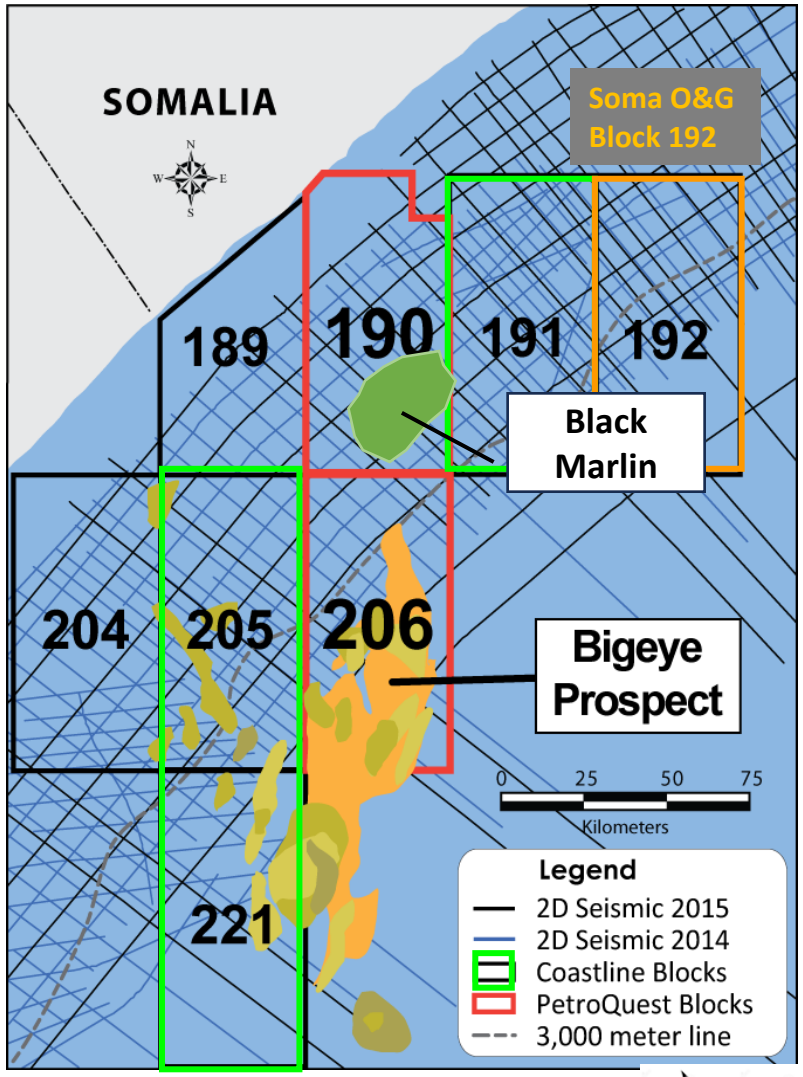
Petroleum Elements	Somalia (Juba Basin)	Namibia (Orange Basin)
OAE 1 & OAE 2 Source	Yes	Yes
Detachment Shales	Yes	Yes
Toe Thrusts Domains	Yes	Yes
Slope & Basin Floor Fans	Yes (Paleo Juba River)	Yes (Paleo Orange River)
Charge & Maturity	Yes (proven onshore wells)	Yes (Tested Wells)

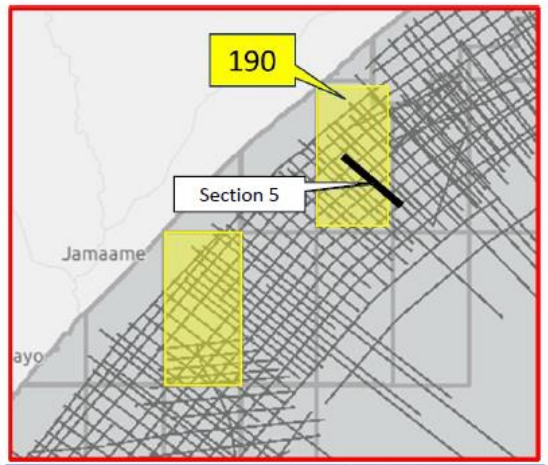
The Bigeye Lead

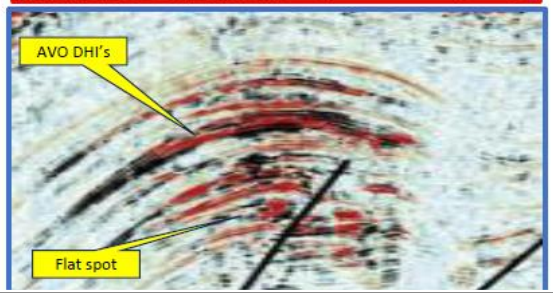
Multi-Billion Barrel 'Venus' Oil

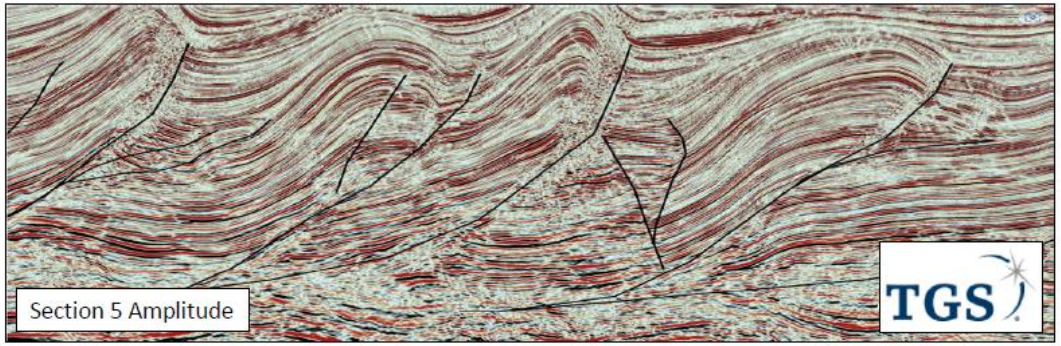
New Oil Prone Opportunities Offshore Somalia!

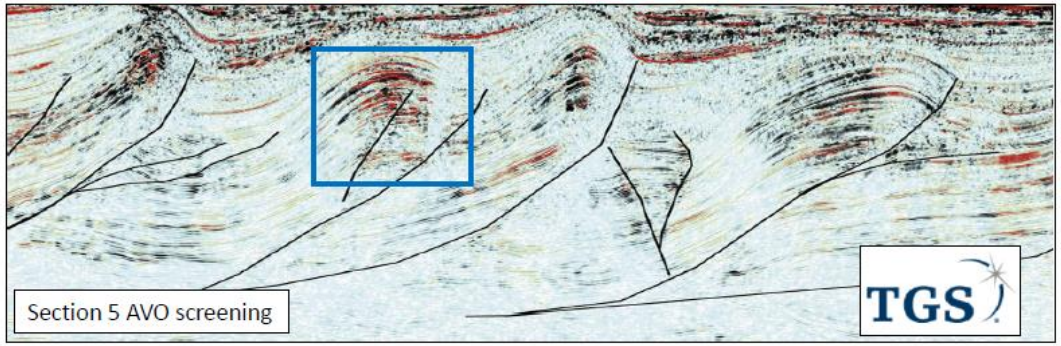
Black Marlin Leads – Recon AVO Supported











This line has been located within Petro Quest Block 190 based on notes and

The Black Malin Leads

Rovuma 'Windjammer' Analogue

Petroleum Elements	Somalia (Juba Basin)	Mozambique Rovuma
OAE 1 & OAE 2 Source	Yes	Yes
Detachment Shales	Yes	Yes
Toe Thrusts Domains	Yes	Yes
AVO Anomalies in Thrusts	Yes	Yes
Charge, Maturity, Migration	Yes (onshore wells)	Yes (Tested in Wells)

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AFRICA-1&2

Work Program (Seismic)

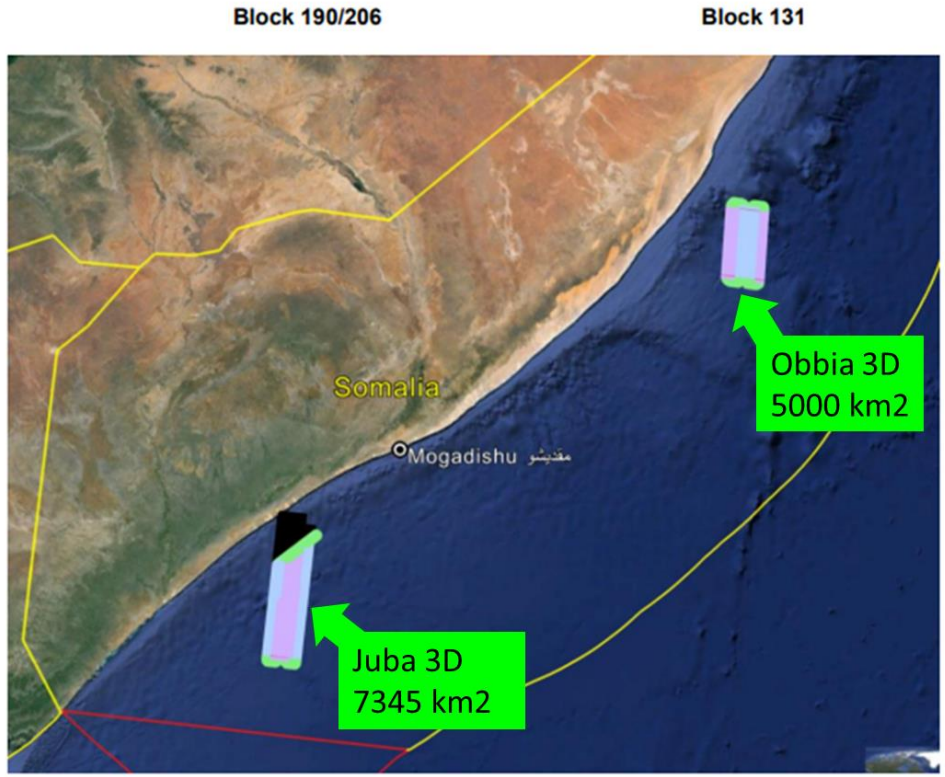
Best Technical Case TGS/PGS

Focused on International Offshore and Onshore Projects

Work Program 2025: 2D Data Purchase vs Acquire New 3D

Variation by Means of Substitution

- In 2024 OPCOM SPA (Regulator) agreed to substitute our commitment to purchase the MC2D in our blocks (2770 CDP line kilometres) for new 3D in each of our PSA areas.
- It's a given, with the appropriate vessel we can acquire 'state of the art' high quality 3D seismic data over the entire area of the PSA blocks, 131 and 206 and over most of block 190.
- The 3D data will be acquired with the latest 3D streamer technology using a purpose-built 3D seismic vessel with an exemplary HSE record.
- The 3D will be processed with the latest technology to incorporate detailed velocity building and Advanced Pre-stack Depth Imaging and specialist AVO and DHI mapping.
- It will be interpreted using Paradigm 3D Canvas and Geoteric Software and will include advanced QI processing for Recon AVO processing and Spectral Analyses via Sharp Reflections and Apex Spectral Technology respectively.

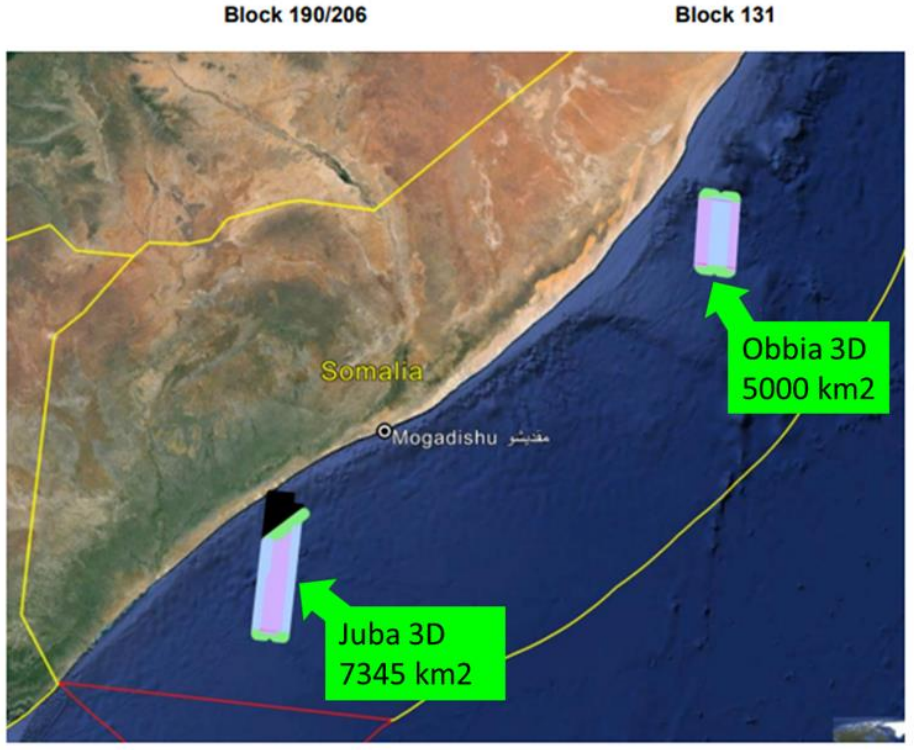


Suggested Year 1 Exploration Program (Completed)

Work Focuses on Preparation for 3D Seismic Data Acquisition

- ***By end of Year 1 G&G (March 7th 2025) Completed***

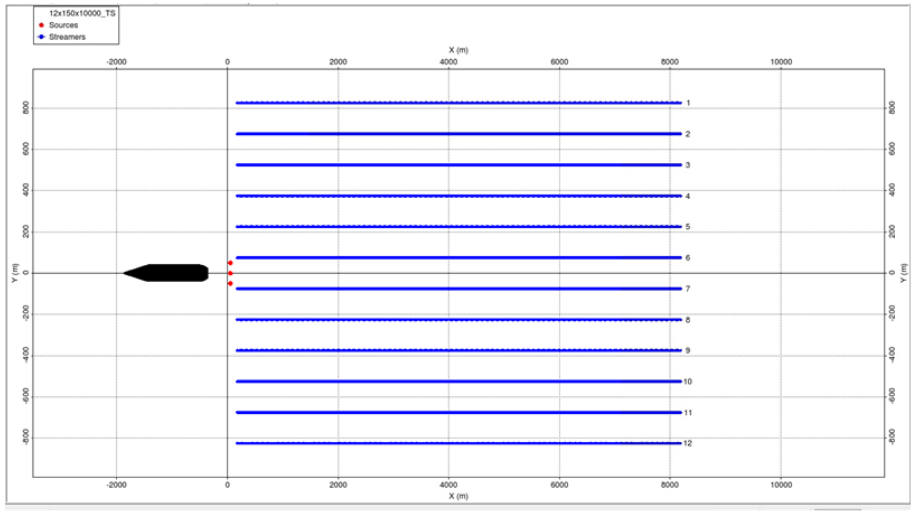
- Deliver a robust and cost-effective Exploration style 3D Seismic Survey design for three PSA areas to include detailed survey pre-planning **(Best Technical Case).**
- Deliver an industry standard yet robust Site-Specific Environment Report For the Purpose of Regulatory Approval For 3D Seismic Surveys in each of PQA I and II bocks.
- Conduct a regional over-view of East African & Potential Somali Source Rocks (Completed and presented at ***Image 2024 in Houston***

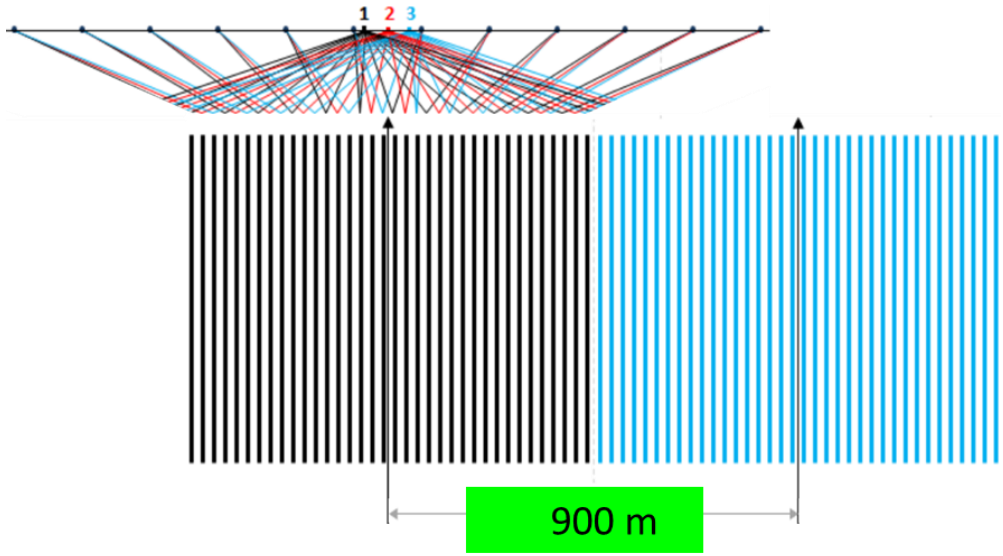


Suggested Year 2 Exploration Program

Work Focuses on Safe Delivery of 3D Seismic Acquisition Operations

- ***By end of Year 2 G&G (March 7th 2026)***
- By end of Year 2 we've acquired an agreed amount of Exploration style 3D seismic in each of the three PSAs in the preferred weather window of Q1 January 2025–March 2026.
- A copy of the Field and Navigation Data will be delivered to the SPA.
- A final acquisition, navigation and QC overseers report for both acquisition and navigation will be delivered to the SPA no later than 6 months after de-mobilization date



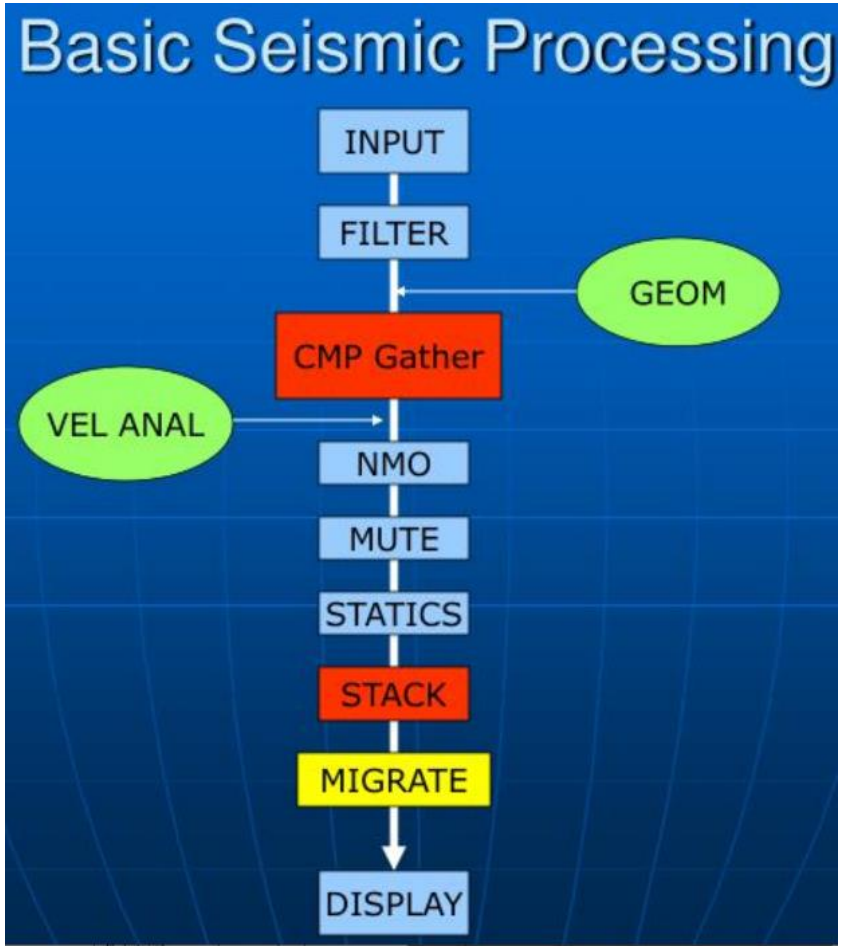


Suggested Year 3 Exploration Program

Work Focuses on Delivery of 3D Seismic Data Processing & Interpretation

By end of Year 3 G&G (March 7th 2027)

- Complete the 3D Processing of 3D surveys in each of the PSA Areas, 131, 190 and 206.
- Complete a comprehensive AVO and or EEI screening analyses of all the 3D data in each PSA area, with a view to produce a catalogue of amplitude and AVO supported opportunities.
- Generate a play based seismic interpretation of all the seismic data acquired across all three PSA areas and produce a catalogue of risked and ranked prospects and leads for the 4 key Petroleum Systems a) Pre-rift, b) Syn-rift c) Post Rift d) Drift.
- Integrate the screening semi-quantitative AVO and Dispersion Work with the prospect and lead catalogue to reduce a risked and ranked catalogue of mature drill opportunities.
- Provide Final Processing Products in Seg-Y format to SPA
- Provide Final Processing Report and Processing QC report no later than six months after receipt of processed 3D data at the Operator's registered office
- Provide a Final Interpretation Report and interpretation products no later than 6 months after interpretation has been completed.



Year 3 Costs 2.38mm USD

Notional OBBIA & JUBA 3D Processing Flow:

Kirchhoff LSM (Depth)

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GeoStreamer P-UP

1. Reformat navigation-seismic merged H-RAW and G-RAW
2. Omit bad shots, zero and interpolate bad channels
3. Zero phase Butterworth low cut filter applied to H-RAW
    - 2 Hz (@ -3 dB) 18 dB/octave
4. Zero phase Butterworth low cut filter applied to G-RAW
    - Suppression of strong low frequency vibration noise recorded by the geosensor, compensated for in Step 7
5. Swell and impulsive noise attenuation
6. Linear noise attenuation
    - Tail buoy tug and front end strum noise
7. PGS multisensor (2C) 3D wavefield separation-based receiver-side de-ghosting
    - Response normalisation & spatial array matching of geosensor to hydrophone data
    - Low frequency compensation of the geosensor data
    - Including obliquity scaling of the vertical velocity sensor (geosensor) data according to the 3D emergence angles
    - Receiver-side re-datuming to mean sea level
8. P-UP shot gathers SEGY output

Pre-processing

9. Overlapping shot deblending
    - Limit trace length to 10,000 ms
10. 3D **S**ource-Based **B**andwidth **O**ptimization (**SBO**)
    - PGS processing-based source-side phase and amplitude deg
    - Source-side redatuming to mean sea level
11. **B**andwidth **O**ptimized **S**ignature **S**olution (**BOSS+**) designature to zer
    - Shot by shot and/or directional
12. Temporal anti-alias filter and resample to 4 ms
13. Direct arrival attenuation
14. Seismic interference noise attenuation
15. Shot & channel consistent amplitude compensation
16. Receiver motion correction
17. Tidal and water column statics correction
18. 3D demultiple
    - Wavefield extrapolation SRME
        - Up to 51 km² propagation box size
    - 3D convolutional SRME
        - Up to 13 km² aperture
    - 2 x pass curvlet domain adaptive model subtraction
19. Phase only inverse Q compensation
20. NMO velocity analysis (1,000 m x 1,000 m grid)
21. High-resolution parabolic Radon demultiple
22. Demultiple shot gathers SEGY output
23. 3D binning
    - Redundant offset rejection (to remove over-fold)
24. 4D anti-alias anti-leakage Fourier transform regularization & interpolation
    - 4D = CMP X & Y coordinates, offset, time dimensions
    - Output 12.5 m (xl) x 12.5 m (il) grid
25. 3D multiple diffraction removal
26. Denoise
27. Pre-migration 3D CDP gathers SEGY output

PSDM VMB

Please note that the sequencing of VMB steps will be derived from testing and will include interleaving and iterating if that is what is required to produce the optimum model.

36. Velocity model building
    - Generation of initial velocity model
    - Utilizing best set of available velocities
    - Water velocity derivation using scans and TSDIP data, if available
    - Water bottom interpretation
    - Velocity model smoothing as required
37. Velocity model updating (TTI)
    - 6 x reflection tomography updates
    - Kirchhoff migration with full volume PSDM stacks and common image gathers on a 50 m x 50 m grid
    - Residual move-out picking incorporating non-hyperbolic event picking
    - For anisotropic updates, joint inversion tomography may be used
38. Full Waveform Inversion
    - Simultaneous update of refractions and reflections
    - Interleaved with tomography as best suits the data
    - Multiple passes to 20 Hz maximum frequency
    - 50 m x 50 m x 20 m velocity model output grid

Kirchhoff PSDM

39. Anisotropic TTI Kirchhoff PSDM
    - 3 m with variable depth sampling in the migration
    - 10,000 m maximum depth
    - 6,000 m half aperture
    - Input / output on a 12.5 m x 12.5 m grid
    - Output to full fold polygon
40. Raw Kirchhoff PSDM 3D CDP gathers SEGY output
41. Raw Kirchhoff PSDM full fold and 4 x angle stacks SEGY outpu
42. Stretch from depth to time
43. Residual anisotropic automatic velocity picking (100 m x 100 m
44. High resolution parabolic Radon demultiple
45. Time variant trim statics
46. Amplitude only inverse Q compensation
47. Denoise
48. Final Kirchhoff PSDM 3D CDP gathers SEGY output
49. Full fold and 4 x angle stacks
50. Acquisition footprint attenuation
51. Denoise
52. Time variant filter
53. Display gain
54. Final Kirchhoff PSDM full fold and 4 x angle stacks SEGY outp

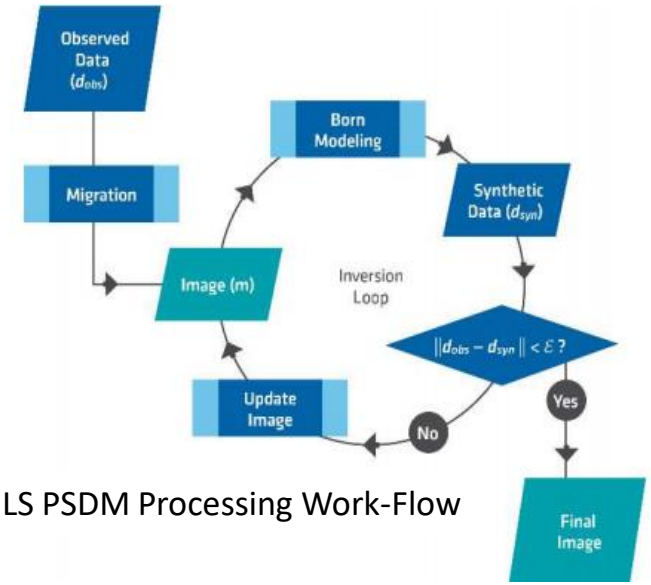
LS-KPSDM

55. Reformat the following data from above sequence
    - Final KPSDM 3D CDP gathers
    - Final KPSDM velocity model data
    - Final fully pre-processed 3DCDP gathers used as input to the migration
56. Data conditioning and denoise as required for LS KPSDM
57. Least squares inversion to define operator from Point Spread Function (PSF) analysis
58. PGS LS KPSDM
    - Data domain implementation
    - 3 m with variable depth sampling in the migration
    - 10,000 m maximum depth
    - 6,000 m half aperture
    - Input / output on a 12.5 m x 12.5 m grid
    - Output to full fold polygon
59. CDP domain denoise

60. Final LS KPSDM 3D CDP gathers SEGY output
61. Full fold and 4 x angle stacks
62. Stack domain denoise
63. Final LS KPSDM full fold and 4 x angle stacks SEGY output

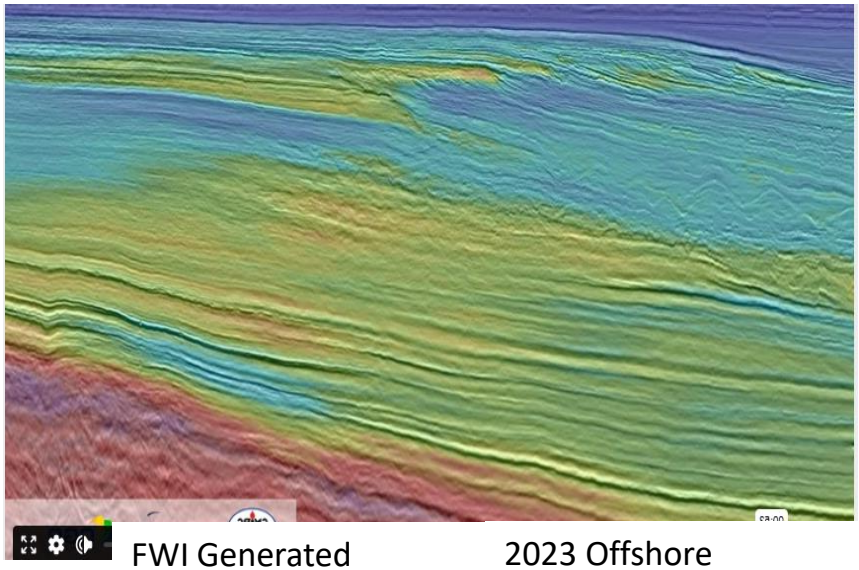
FWI & LS PSDM Delivering Superior Depth Imaging

Full Waveform Inversion (FWI) Providing Hi-Fi Velocity Models

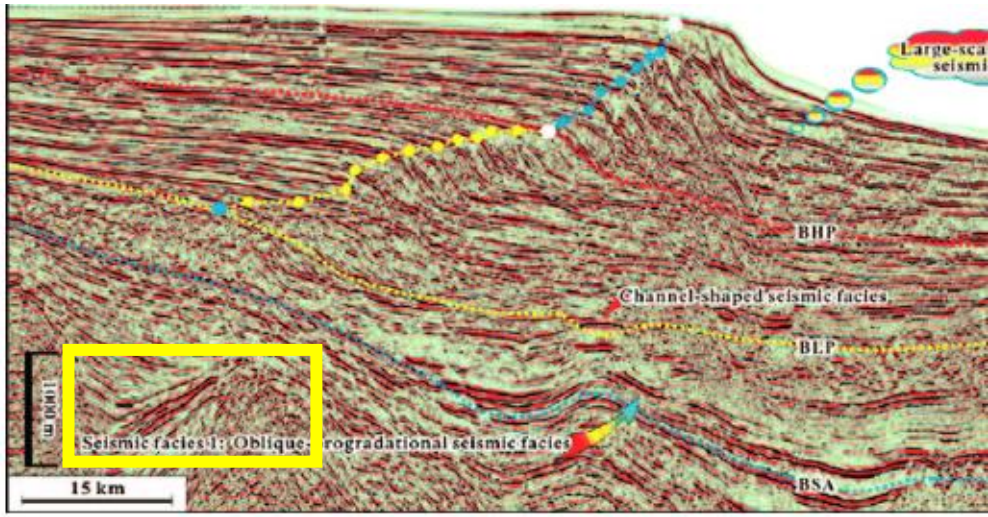


LS PSDM Processing Work-Flow

Image courtesy of CGG Website



FWI Generated Velocity Model



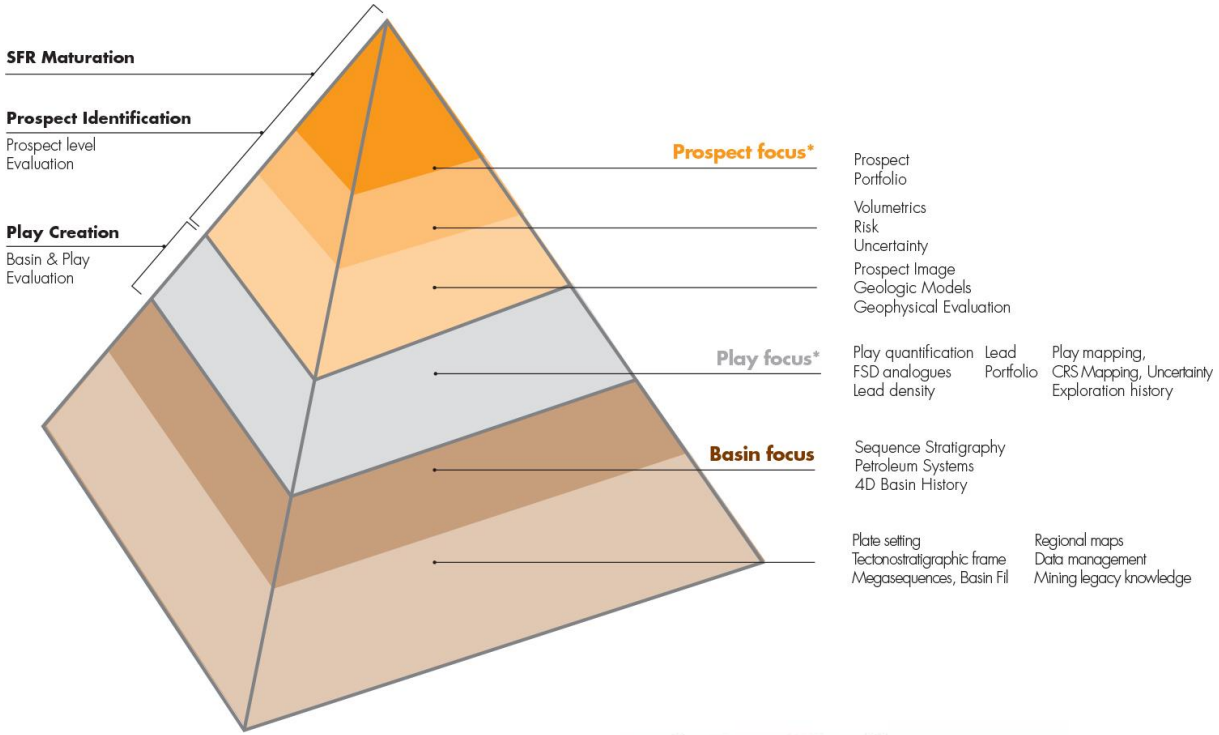
2023 Offshore Suriname Shelf

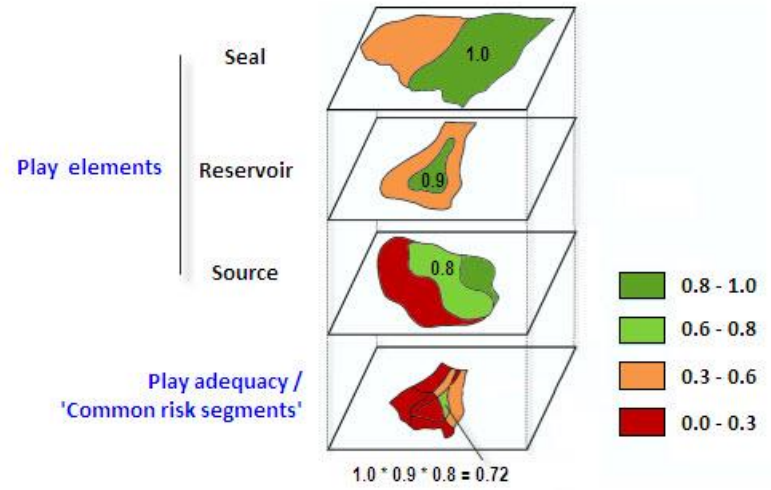
Delivering low frequency 'deep imaging' and detailed shelf edge trajectory mapping

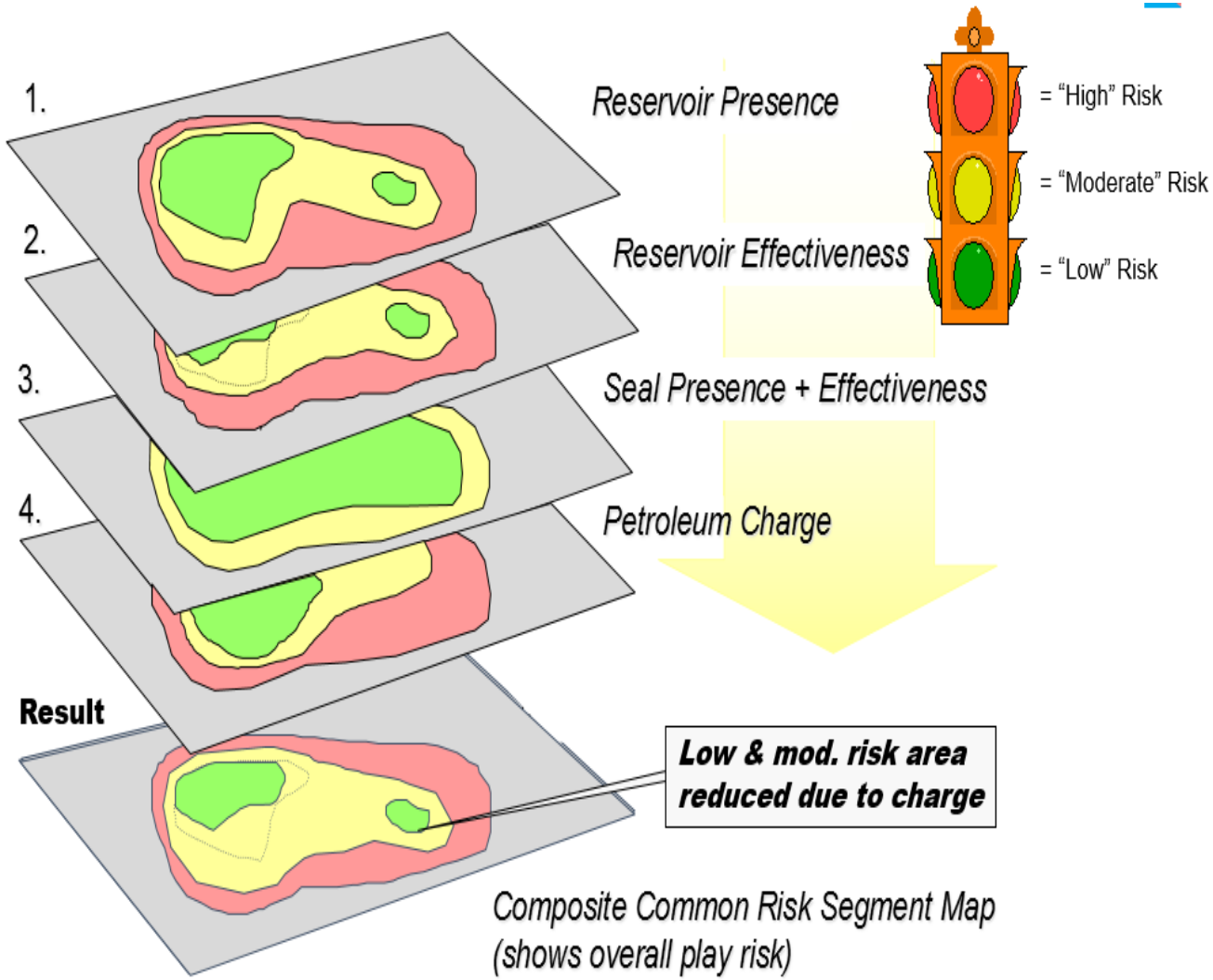
- Strong lateral velocity variation in the this example sets-up imaging complexities due to non hyperbolic moveout
- The requirement for precise velocity modelling via FWI is a pre-determinant for successful drilling and new field discovery
- Velocity model building and uncertainty management are the key building blocks for any advanced imaging across the shelf.
- Multi-azimuthal 3D seismic may be required to accurately solve for TTI, VTI and HTI for development.
- LS PSDM (Least Squares PSDM) introduces a broad-band imaging solution that addresses illumination difficulties
- These requirements make 3D seismic expensive to both acquire and process but fit for purpose!

Mapping Work-Flows: Seismic Interpretation

Advanced Play Based Mapping – Common Risk Elements







after Fraser 2012

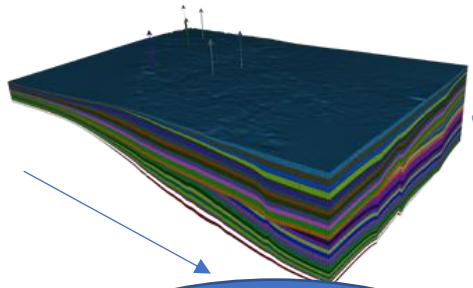
Advanced Mapping: AI Based Seismic Interpretation

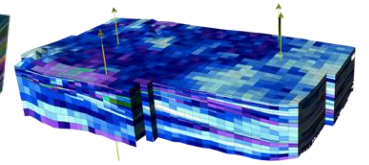
Advanced Voxel Based AI Interpretation:

Probability based
Fault Networks

Probability based
horizon interpretation

ML Wheeler Volumes





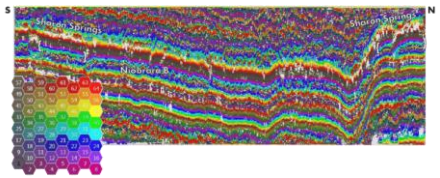
ML Fault Picking

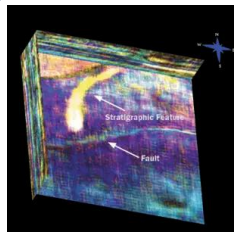
ML Horizon picking

ML Elastic Volumes

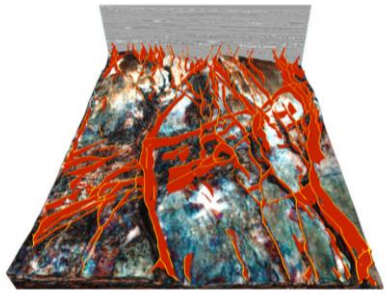
ML Rock Physics & Petrophysics

ML Spectral Volumes

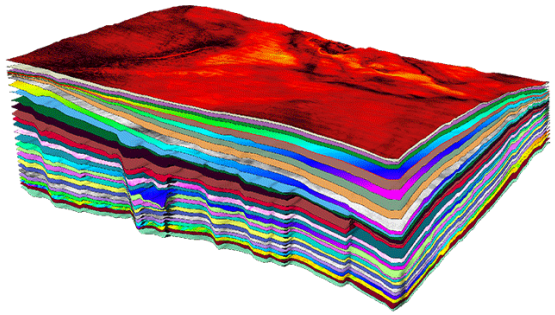




Global Fault Derived
Fault & Fracture Models



Machine Learning Based
Auto-pickers

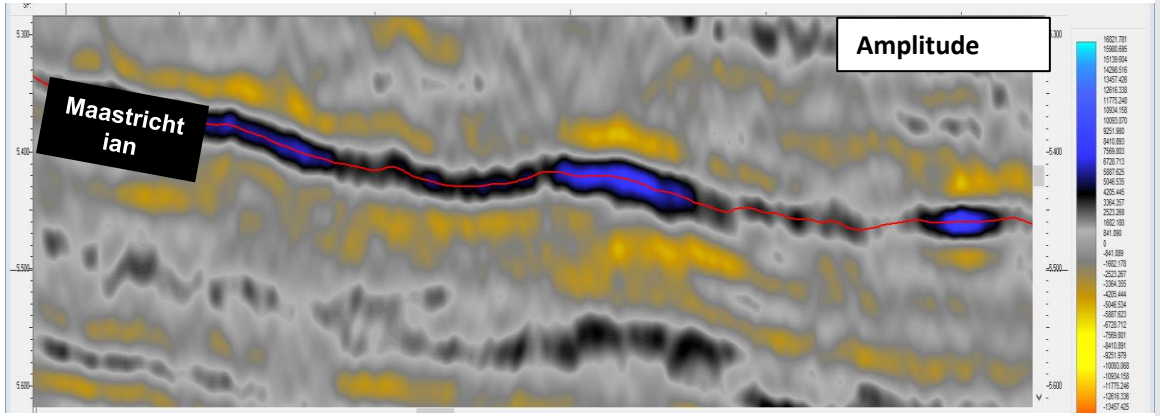


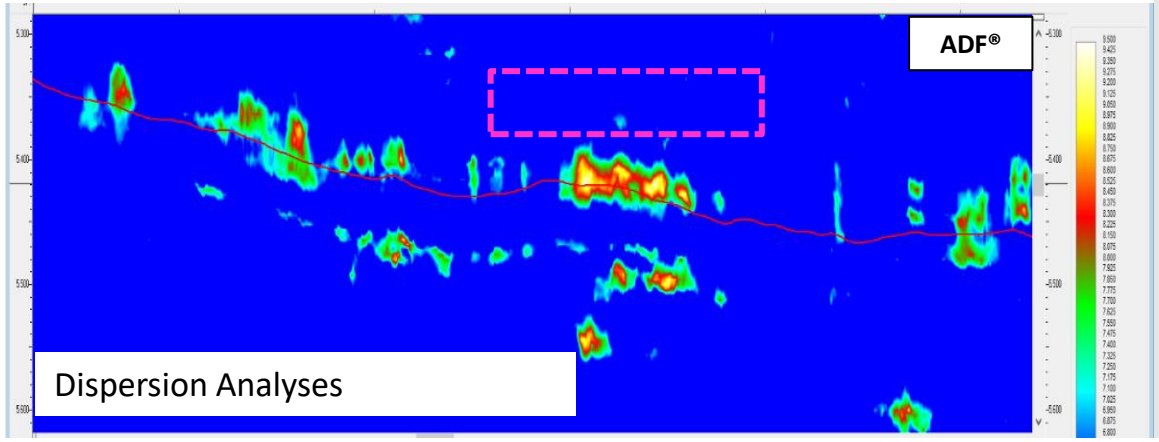
Machine Learning Based
Wheeler transforms, PCA Attribute analyses leading to a depth referenced reservoir/prospect model

Dispersion Work-Flows: Seismic Interpretation

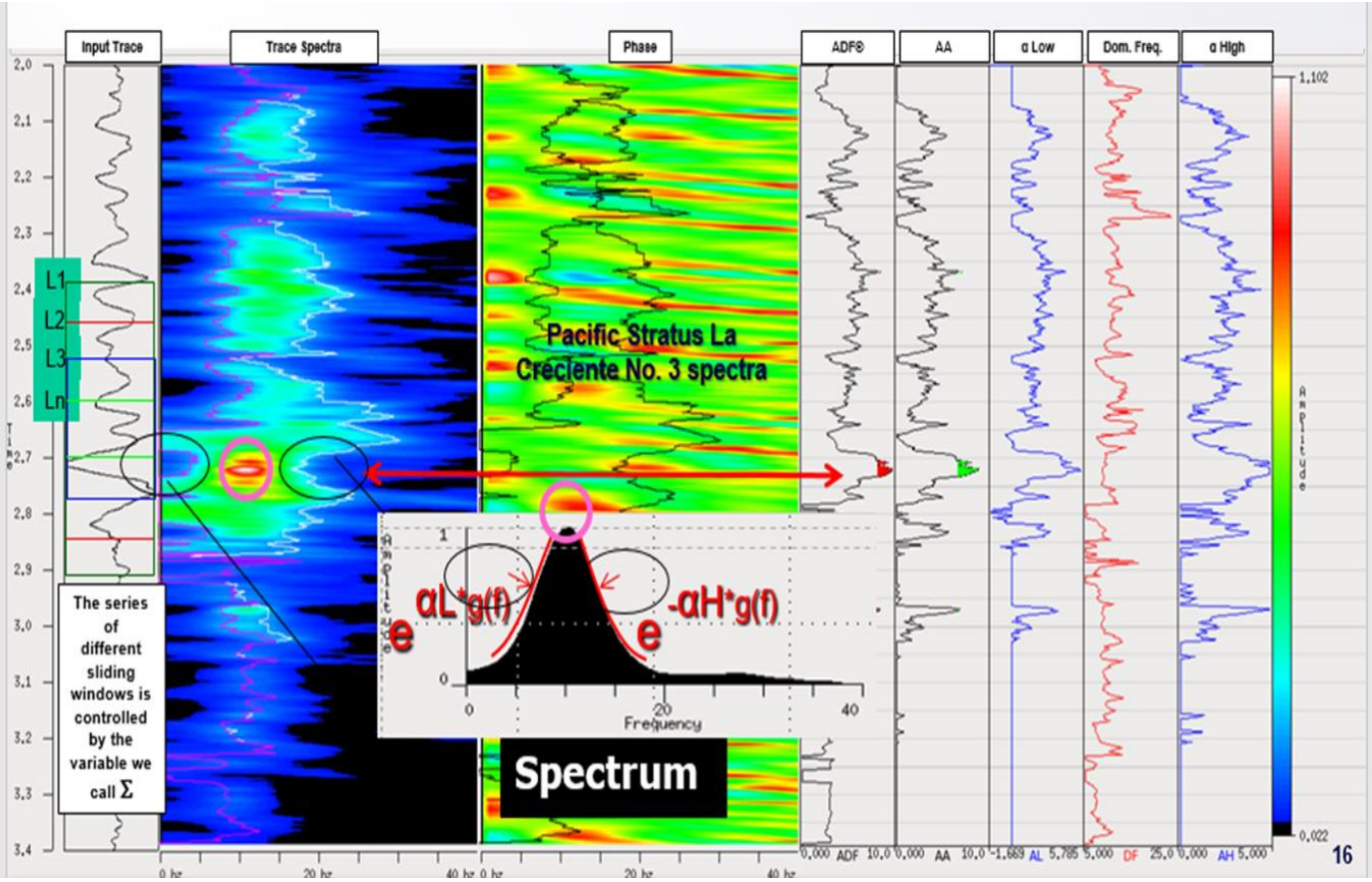
Advanced Spectral Analyses Finds Hydrocarbon filled Reservoirs Guyana

Images Courtesy of Apex Spectral Technology





Predrill Prediction: Offshore Guyana (Discovery)



Detects hydrocarbon presence & fluid mobility due to drop in dominant frequency and steepening of spectral slope

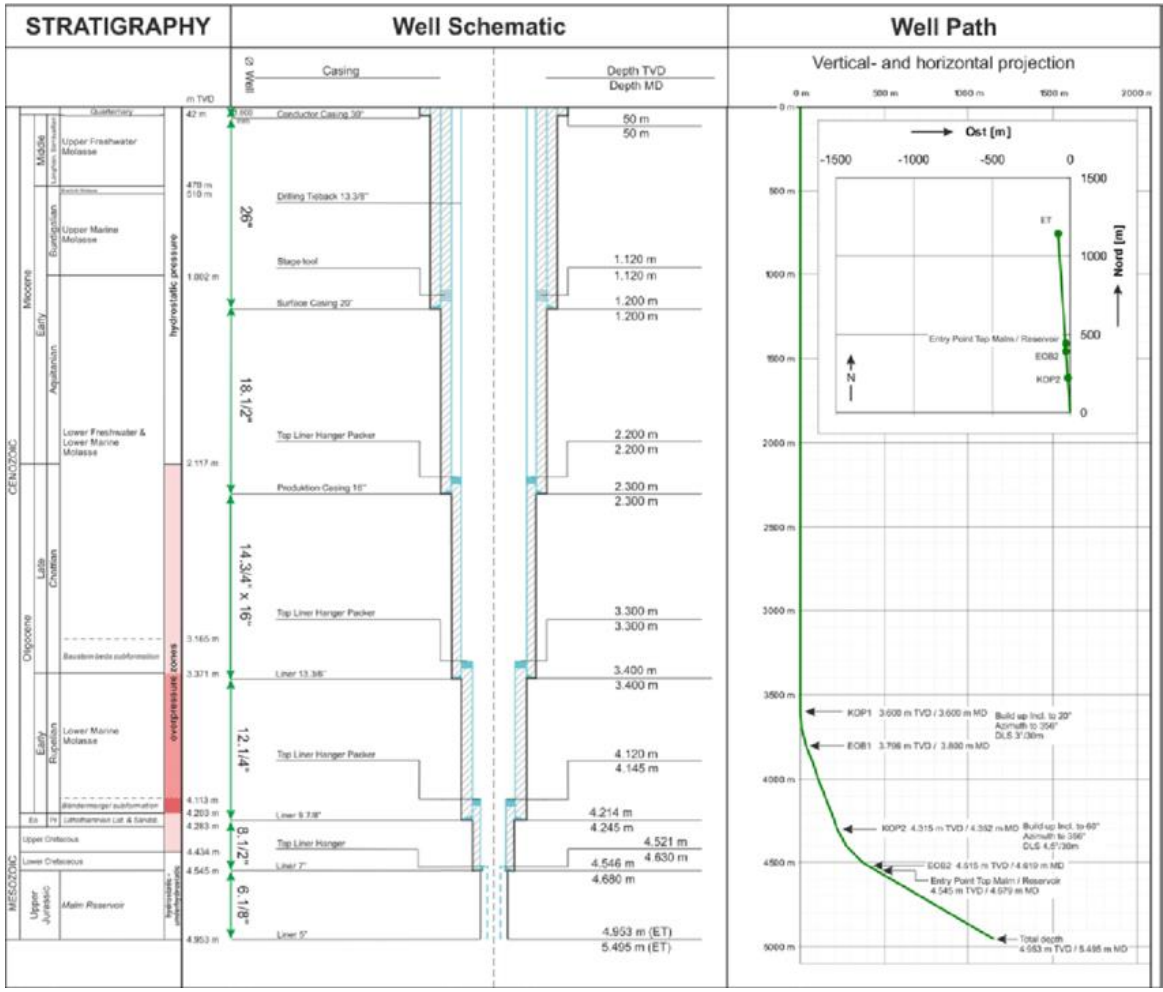
APEX

Suggested Year 4 Exploration Program

Work Focuses on Delivery of Year 5 Well Design & Planning

By end of Year 4 G&G (March 7th 2028)

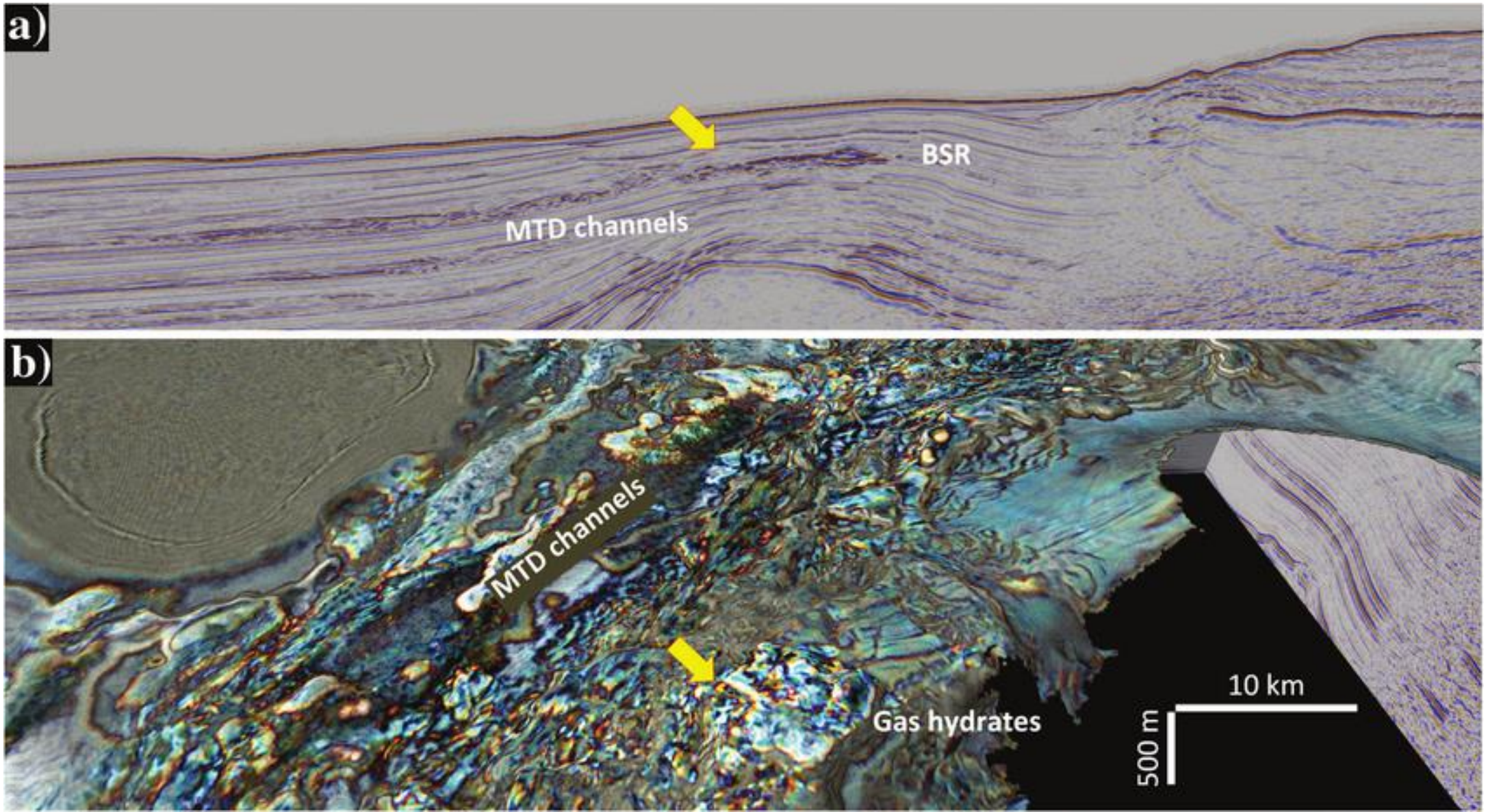
- Complete the delivery of Well Evaluation Program for each of the three wells (**Cost 25,000 USD**)
- Complete Drill Planning Preparation for a HSE focused well design for one well in each of the three PSA (**Cost 300,000 USD**).
- Complete a Shallow and Drill Hazards Study to support the safe drilling of each of the planned wells (**Cost 60,000 USD**).
- Complete the Drill-Ship Tendering Process for a drilling campaign that completes in Year 5 (**Cost 100,000 USD**).
- Select the preferred drilling Contractor for Year 5 drilling campaign (**Cost 15,000 USD**).
- Delivery of Site specific safety plan for Year 5 drilling Program (**Cost 50,000 USD**)
- Delivery of Site specific environmental plan for Year 5 drilling program (**Cost 50,000 USD**).
- Delivery of Well Evaluation Program Report for each of the 3 wells (**Cost 5,000 USD**)



Year 4 Costs 605,000 USD

Shallow – Drilling Hazards Survey

Work Focuses on Delivery of Year 5 Well Design & Planning



Suggested Year 5 Exploration Program

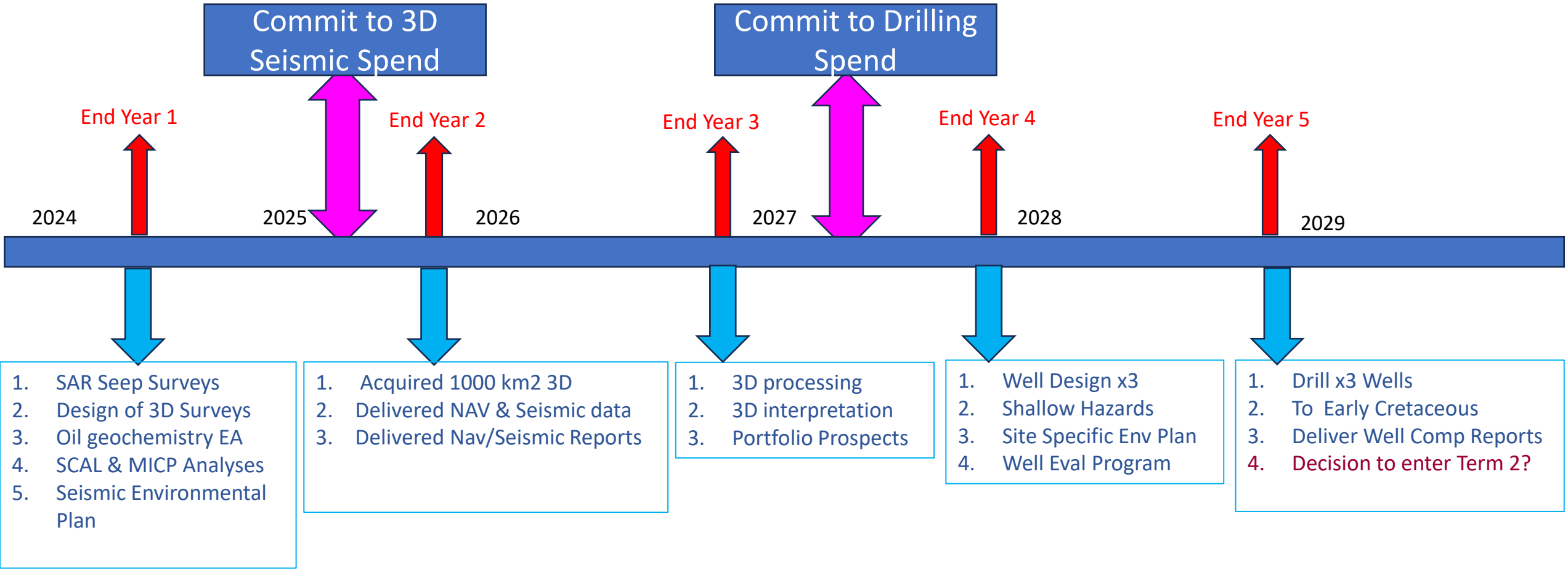
Work Focuses on Delivery of 3D Seismic Data Acquisition

By end of Year 5 G&G (March 7th 2028)

- By end of **Year 5** Complete the exploration drilling of one well in each PSA area to a maximum depth of the Jurassic
- Provide Well Completion Reports for each of the three drilled wells no later than six months after well drilling
- Evaluation of Decision Whether To Enter the 2nd Term.

Exploration Work Program Time Line – 'Idealised'

Work Program Summary Years 1-5 – Total Work Program Costs



a) 3D seismic decision points by September 2025 commit to 3D seismic spend

b) Drilling decision point August 2027

PetroQuest Africa 1 & 2:(PSA's 131,190 & 206)

Summary: 5 Year Exploration Work Program

- On March 7th 2024, PSA's 131, 190 and 206 were ratified by the Oil Minister
  - Year 1 compiled fixed costs required to prepare for the 3D Seismic Acquisition and gain necessary approvals.
  - Year 2 looks at deploying a vessel to the AOI and acquiring an agreed amount of modern broad band streamer-based 3D.
  - Year 3 looks at processing and interpreting this 3D data for optimum well location selection.
  - Year 4 looks at all the well design, well evaluation program and approvals required to drill 3 exploration wells.
  - Year 5 looks at drilling operations with end of Year 5 leading to a decision to proceed into the following term.

Notional Exploration Strategy – Forward Planning PSA 131

- Plan For 3D Seismic Q4 2025 – Q2 2026 & Execute 3D Seismic Acquisition Contract (Survey Start-Up Q4 2025)
- Confirm Vital Statistics of Leopard Prospect on 2D Data (Mapping+ Volumetrics) June 2025 – November 2025.
- Complete Notional Drill Design for Ultra–Deep Water Well Leopard-1 Q4 2025 (Design & Budget Cost Only).
- Complete 3D Acquisition by Q1 2026
- Complete 3D Processing by Q4 2026
- Complete 3D Recon QI by Q4 2026
- Complete 3D Seismic Interpretation, Mapping & Volumetrics Q1 2027
- Complete Leopard-1 Drill Design Q2 2027 & Prepare AFE Cost
- Sign Rig Contract Q3 2027.
- Complete Exploration Well Leopard-1 Q1 2028

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PETROQUEST
AFRICA-1&2

3D Seismic Survey Design, Planning & Budget

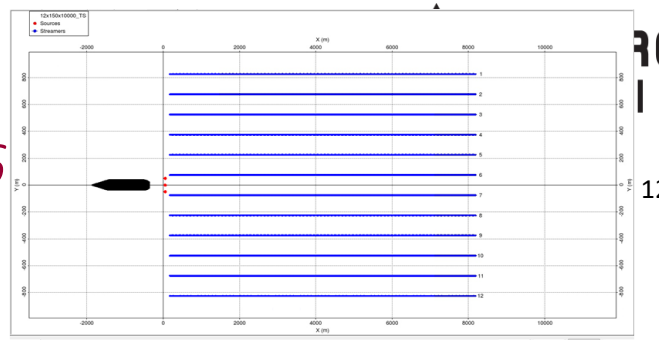
Seismic Acquisition Rates & Costings

Focused on International Offshore and Onshore Projects

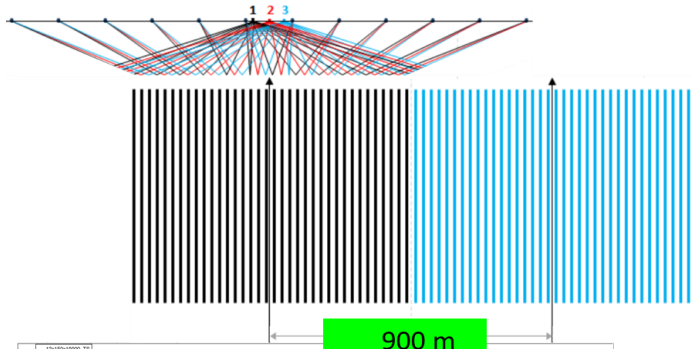
‘Obbia 3D’ 2025-2026 Costings (Two Quotes)

Two Companies have vessel availability for Q4 2025 – Q1 2026

1. TGS/PGS Offered M/V Titan
   12 x 10 km streamers

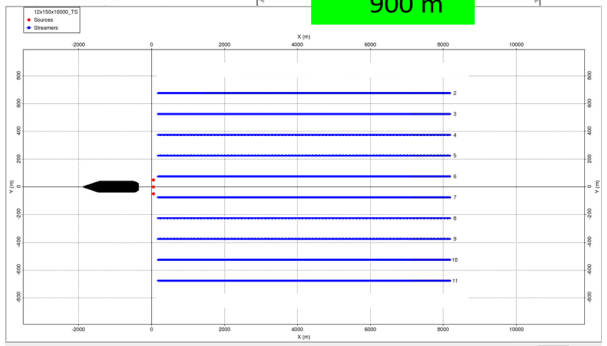


12 x 10 km streamers

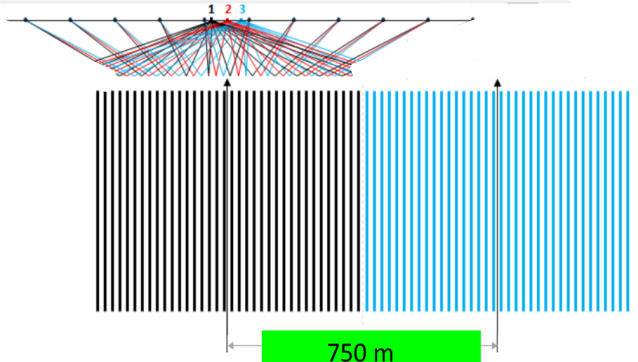


2. PXGEO Offered M/V PXGEO

   10 x 8.1 km streamers



10 x 8.1 km Streamers

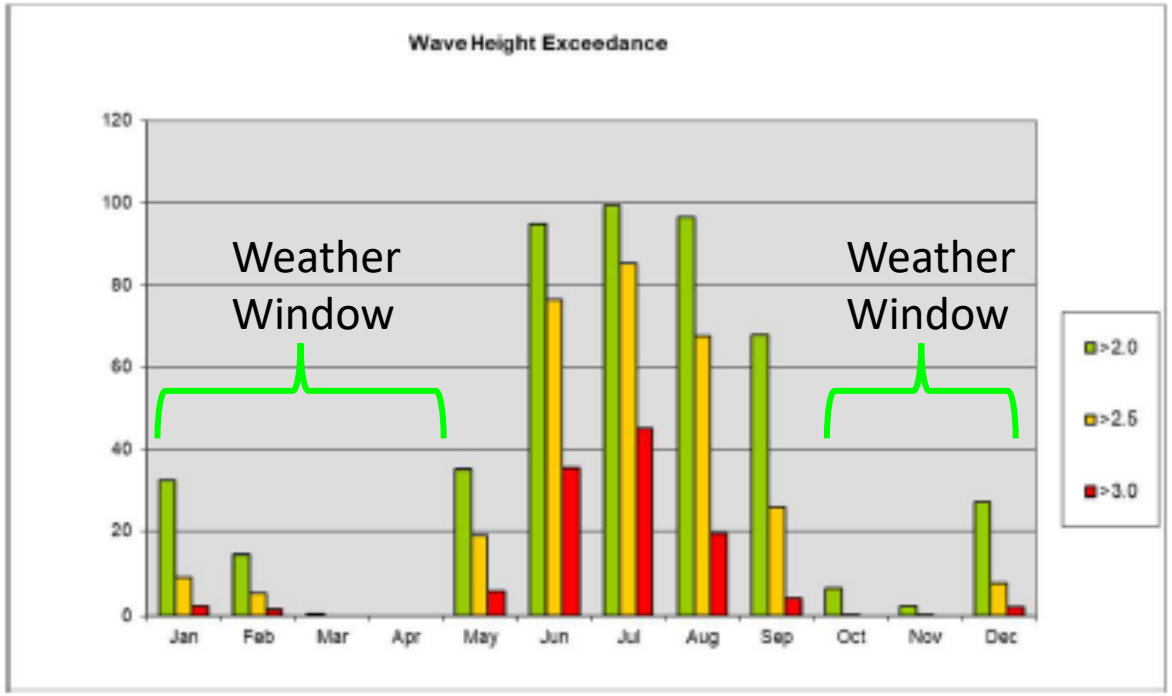


Met Ocean Conditions Offshore Somalia

Optimum Weather Window October - May

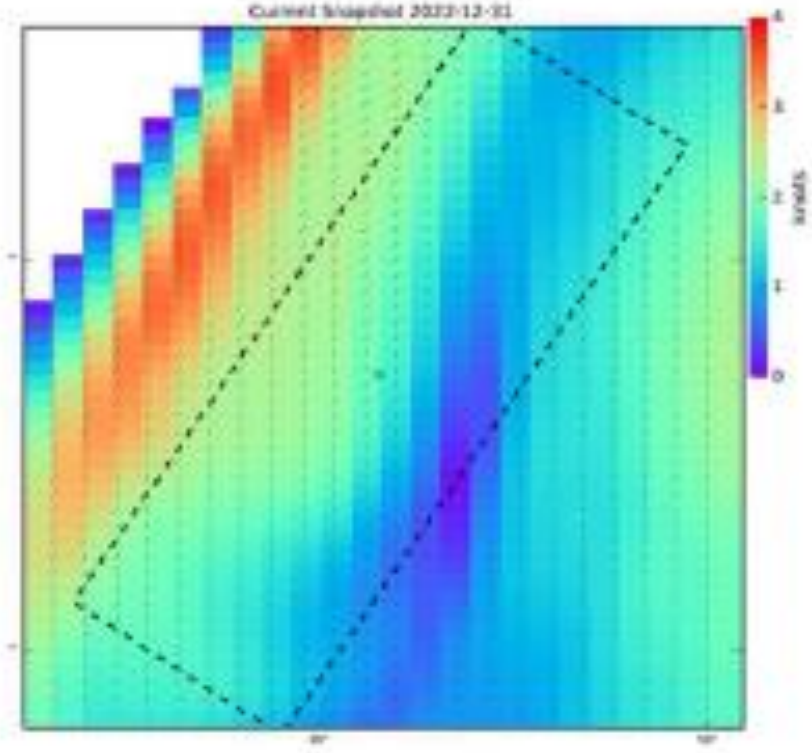
PETROQUEST AFRICA – 1&2

Weather



As can be seen the good weather period runs from October through May.

Currents

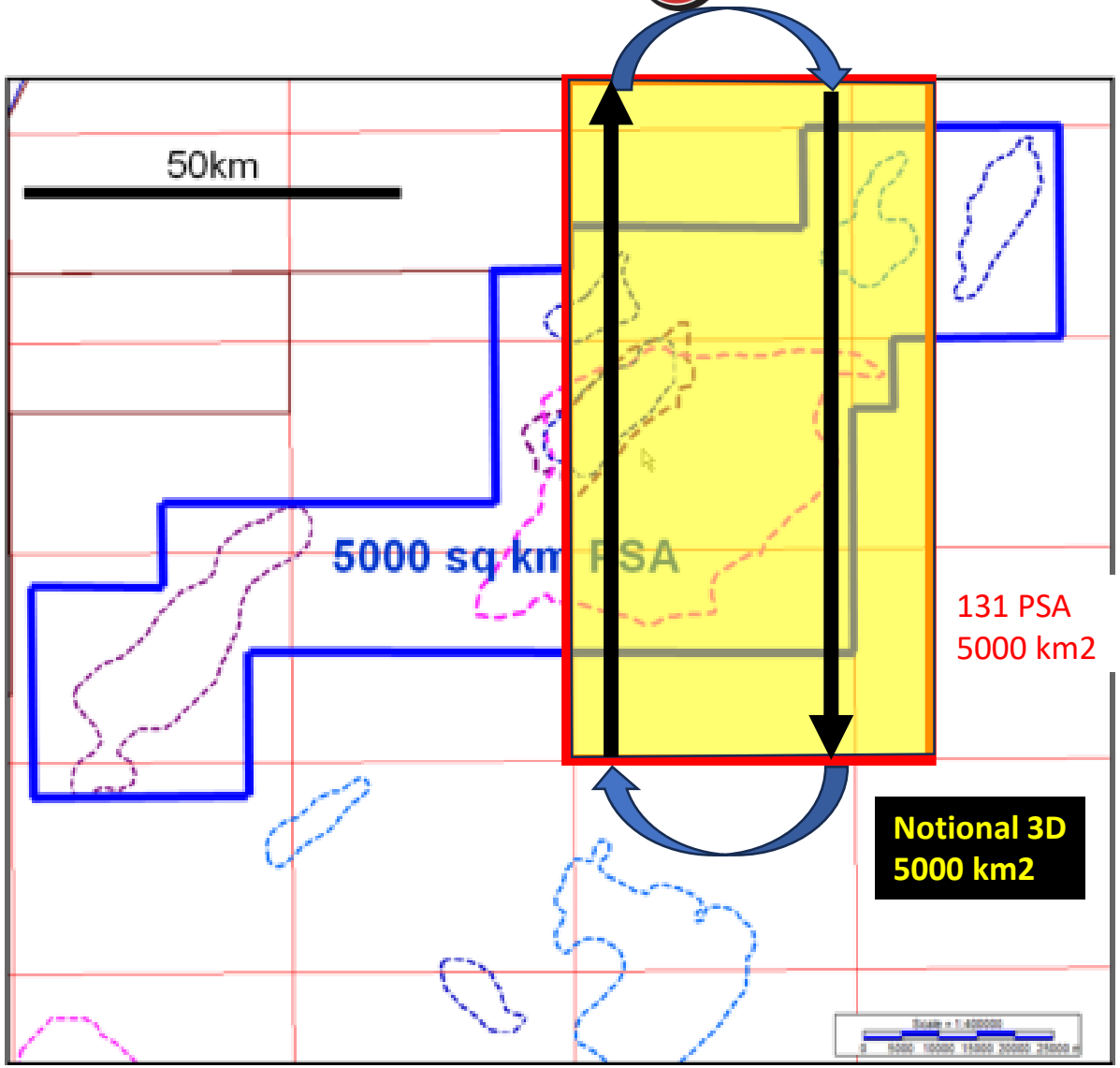


Currents – general

The Somali current is a cold ocean boundary current that runs along the coast of Somalia and Oman in the Western Indian Ocean. This current is heavily influenced by the monsoons. The northeast monsoon from December to February movies the coastal waters southwest and from, June to September the Southwest monsoon moves the coastal waters northeast. A complicating and unpredictable variable is the impact of the Great Whirl. As can be seen in the image below the current is strongest inboard of the survey area however currents in-excess of 2 knots, and likely over 3 knots can be expected which could have a significant impact on acquisition speed and streamer depth control.

Option 1: Exploration 'PQA 1 Sole Shoot' PSA 131 (5000 km2)

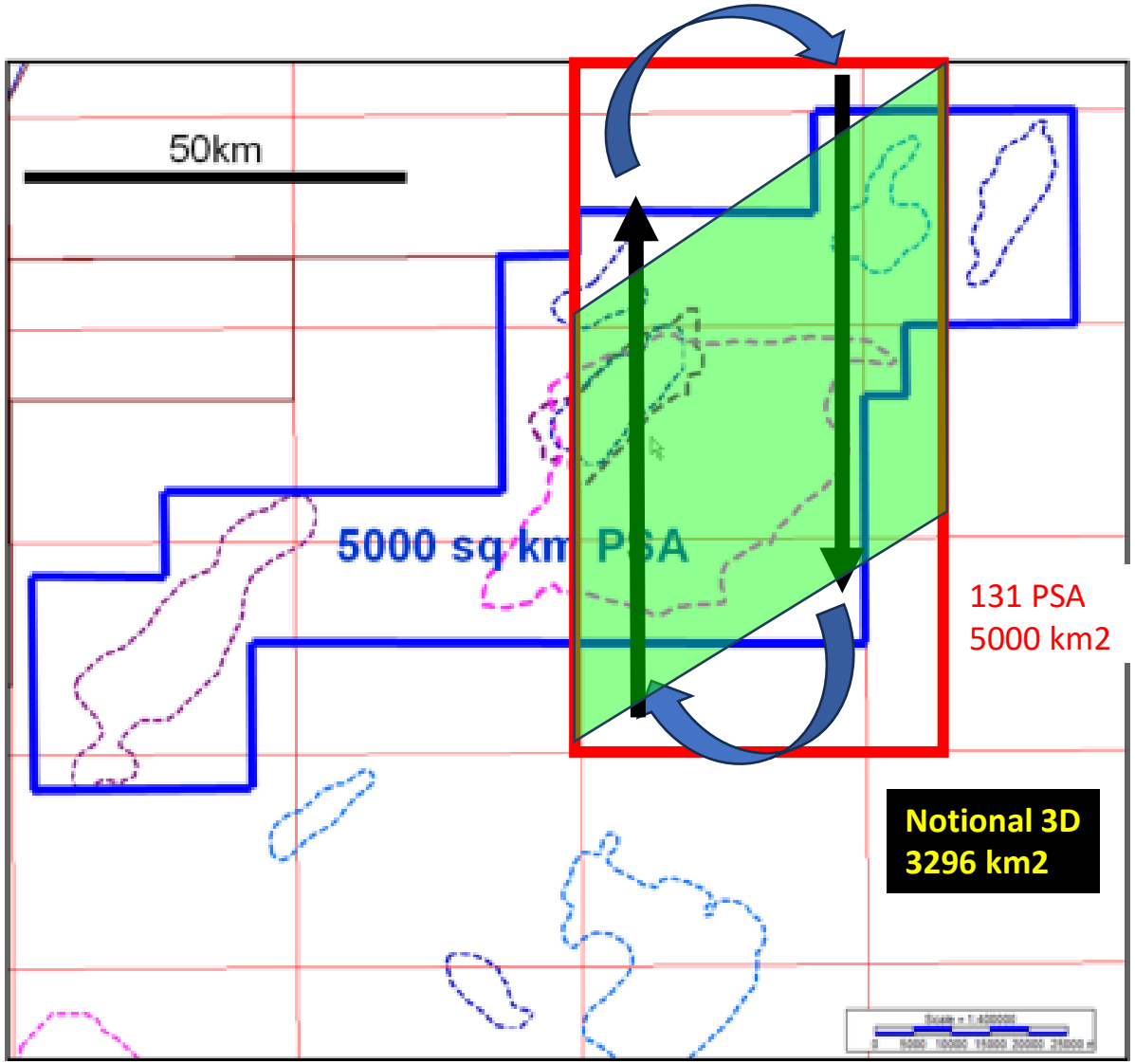
- 5000 km2 Exploration Shoot Covers Leopard Shallow and Deep
- Shooting Direction is NE–SW Race-track Pattern. WD >2500 m
- Average line length is 100 km & Sail-line Separation is 900 m.
- Acquisition Spread is 12 x 10 km and Streamer Separation is 150 m
- Triple Source (50 m Source Separation).
- Acquisition native bin size is 12.5 (Inline) x 25 m (Crossline)
- Estimated Seismic ***Cost 8,200 USD per km2 (40.2 MM USD)*** includes Mob/Demob. Survey Duration **83 km2/day** = 60 days (includes gear lay-out (7 days) and pick-up (7 days)).



Option 2: Targeted 'PQA 1 'Obbia 3D' PSA 131 (3296 km2)

PETROQUEST AFRICA-1&2

- 3296 km2 Targeted Shoot Covers Leopard Shallow and Deep
- Shooting Direction is N–S Race-track Pattern.
- Water Depth Greater 3000 m (WD>3000m)
- Average line length is 60 km & Sail-line Separation is 900 m.
- Acquisition Spread is 12 x 8 km and Streamer Separation is 150 m
- Triple Source (50 m Source Separation).
- Acquisition native bin size is 12.5 (Inline) x 25 m (Crossline)
- Estimated Seismic ***Cost 10,600 USD per km2 (35.1MM USD)*** includes Mob/Demob. Survey Duration **66 km2/day** = 50 days

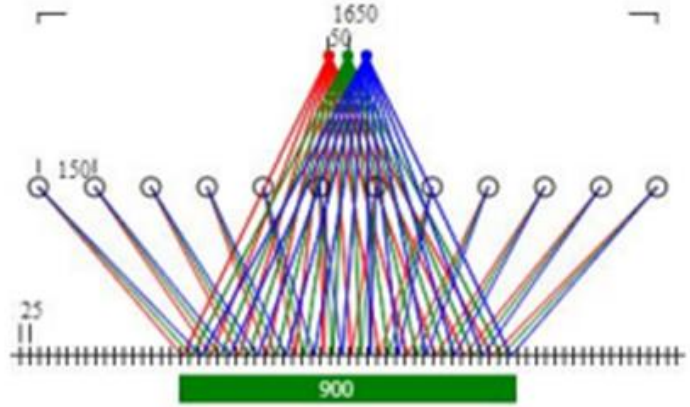


Obbia 3D

Option 1 TGS *Obbia* : 3D Seismic Acquisition Parameters

PETROQUEST AFRICA-1&2

Streamer type	GeoStreamer – Dual sensor
Number of streamers	12
Length of streamers [m]	10,050
Separation of streamers [m]	150
Depth of streamers [m]	20
Nominal Fold	100
Acquisition bin size [m]	in-line 6.25 x-line 25



Source	
Source type	Bolt 1900 LLXT
Number of sources	3
Air pressure [psi]	2,000
Volume [cu in]	3,280
Source separation [m]	50
Number of sub-arrays (per source)	2
Sub array separation [m]	10
Source depth [m]	8 - to be confirmed
Shot point interval [m]	16.667

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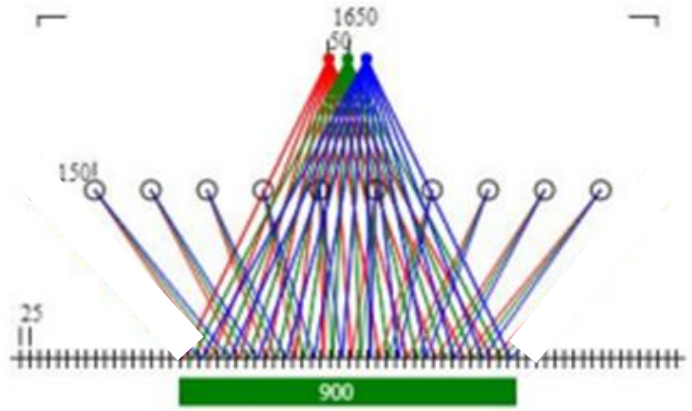
Option 2 PXGEO *Obbia* : 3D Seismic Acquisition Parameters

PETROQUEST AFRICA-1&2

Streamer type	**Sercel Sentinel Solid Streamer**
Number of streamers	10
Length of streamers [m]	**8100 m**
Separation of streamers [m]	150
Depth of streamers [m]	20
Nominal Fold	100
Acquisition bin size [m]	in-line 6.25 x-line 25



Source	
Source type	**Sercel G Source III**
Number of sources	3
Air pressure [psi]	2.000 **Or 3000 psi**
Volume [cu in]	**2340 cu in**
Source separation [m]	50
Number of sub-arrays (per source)	2
Sub array separation [m]	10
Source depth [m]	8 - to be confirmed
Shot point interval [m]	16.667

3D Seismic Acquisition Cost Analyses:

Survey Selection versus km2 rate vs Total Cost

PETROQUEST AFRICA – 1&2

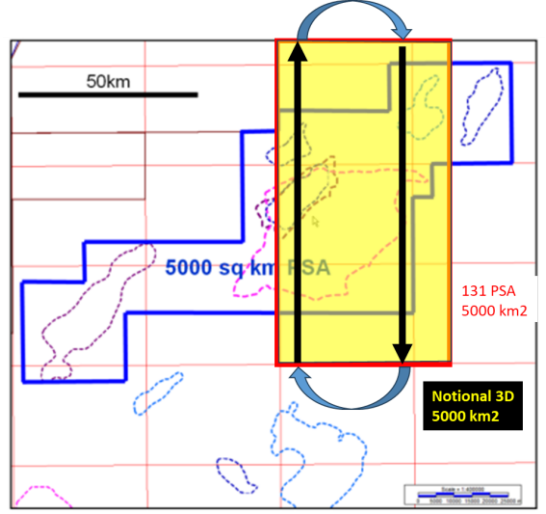
Survey Selection No WHT	Km2 Rate	Total Acquisition Cost	Survey Size km2
PXGEO Obbia Only Turnkey	10,676 USD/km2	35.186720 mm USD	3296 km2
PXGEO Obbia Only Day Rate	8,956 USD/km2	29.521000 mm USD	3296 km2
PXGEO O+J+M Turnkey	8,872 USD/km2	69.025733 mm USD	8228 km2
TGS Obbia Only Turnkey	8,200 USD/Km2	40.200000 mm USD	5000 km2
TGS O+J+M Turnkey	6,794 USD/Km2	83.880000 mm USD	12345km2 4117 km2 6,803
PXGEO O+J+M Day Rate	6,790 USD/km2	55.870000 mm USD	8228 km2

1) Cheapest outlay Survey is Obbia only acquired by PXGEO using day rate option 29.5 mm USD) 3296 km2
2) Best value for money survey and best technical case is TGS Turnkey Obbia only 40.2 mm USD 5000 km2 (-5% WHT)
3) Survey with the best km2 rate is TGS Turnkey O+J+M Buys you full coverage 6,794 USD/km2 but at highest cost
4) Work commitment is most cheaply met with PXGEO Day rate for O+J+M 55.87 mm USD
5) Work commitment is met with least risk PXGEO Turnkey rate O+J+M 69.02 mm USD

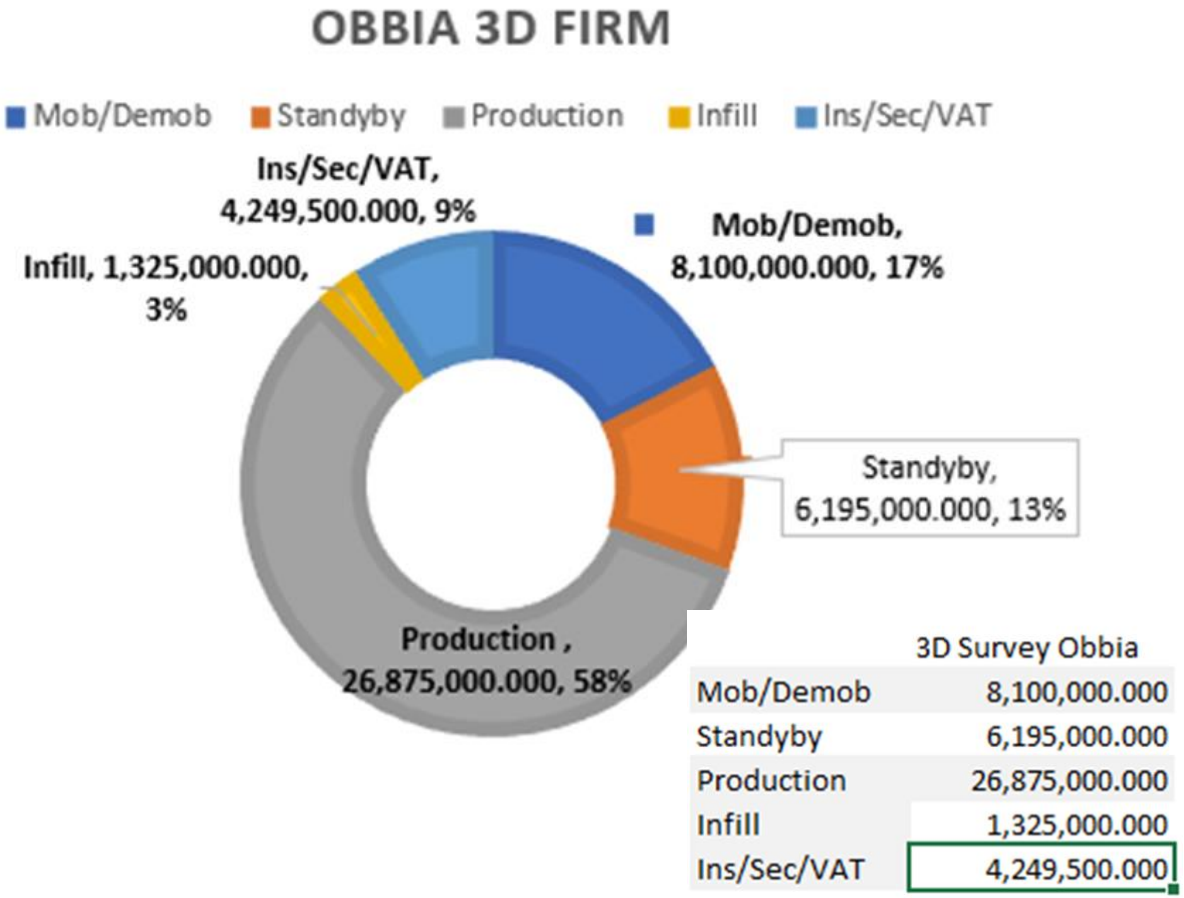
Obbia 3D *5000 Km2 (Proprietary) Best Technical Case*

160 km 2 Acquisition rate
5.90 mm USD mob
5,375 USD /km2 Prime
4500 USD /km2 Infill
21,000 /hr standby charge
2.20 mm USD Demob
Mob/Demob = 8.1 mm USD

5000 x 5375 = 26.875 mm USD 5000 km2 Production Shooting
5% infill = 5% of 5000 km2 1250 km2 x 5300 6.625 mm USD
Lay-out 7 days
Pick-up 7 days
Weather Downtime – Waves/Swell/Storms/Currents/Fishing Gear 15% of 75 days = 11.25 days
x24 = 270 hrs of downtime = 5.67 mm USD
# line changes = 56
3.42 hours in line change time 15 % of line changes have extended line change of 3 hours so that is 8.42 turns have 3 hour extended line change = 25 hours x standby rate.



Cost Element	Obbia
Mobilisation (Fixed) (30-day steam)	05.900 mm USD
Deployment 7 days (12x 10,000m)	Included in Mob
Production Shooting includes 5% infill	26.875mm USD
Infill Plus = 5% of 5000 =250 km2 x 5300	1.3250mm USD
Client Standby W/C/F (15% of total time)	05.670 mm USD
Extended Line Change Standby 20% of LC	00.525 mm USD
Gear Pick-up 7 days	Included in demob
Demob	02.200 mm USD
Total (Includes 5% WHT)	42.495 mm USD



Sense Check 5000 km2 = 42.495 million USD = 8499 USD/km2)

3D Seismic Data Processing Obbia 3D Only

(TGS Proposal 19th of July 2024)

PETROQUEST AFRICA-1&2

131 (4999 km2)	Cost (MM USD)
3D Processing VBM & PSDM	2.125740
Advanced Depth Imaging (LSM)	0.508980
QI & Analyses	0.134730
Totals	2.769450

5. Pricing

The following rates are valid for the quoted areas +/-10%, are in US$, and are inclusive of 5% withholding tax.

Block 131 – 4,990 km²	km² unit rate	Value
P-UP, pre-processing, VMB and PSDM	$426	$2,125,740
Early out PSTM	$25	$124,750
LS PSDM (data domain)	$102	$508,980
Block 131, 190 & 206 – 12,335 km²	**km² unit rate**	**Value**
P-UP, pre-processing, VMB and PSDM	$392	$4,835,320
Early out PSTM	$22	$271,370
LS PSDM (data domain)	$101	$1,245,835
Quantitative Interpretation Block 131 – 4,990 km²	**km² unit rate**	**Value**
Data loading, QC and review Reservoir Oriented Processing (ResOP) AVA Attributes Estimation Relative Pre-Stack Inversion Attribute analysis and report	$27	$134,730
Quantitative Interpretation Block 131, 190 & 206 – 12,335 km²	**km² unit rate**	**Value**
Data loading, QC and review Reservoir Oriented Processing (ResOP) AVA Attributes Estimation Relative Pre-Stack Inversion Attribute analysis and report	$20	$246,700

Obbia 3D Time Line

Acquisition & Processing

PETROQUEST AFRICA-1&2

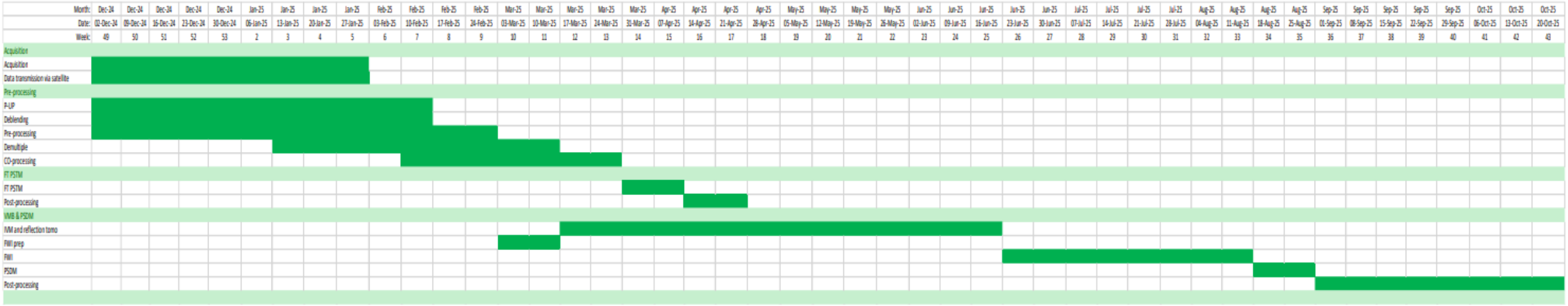
See **zoomable** schematic Gantt below.

Turnarounds are:

FT PSTM = three months from last shot point

FI PSTM = nine months from last shot point

Optional LS PSDM = ten months from last shot point



Obbia 3D (5000 Km2) Estimated cost 600 USD/Km2 3.0 mm USD + G&G QC Costs

Obbia 3D (3500 Km2) Estimated cost 600 USD/Km2 2.1 mm USD + G&G QC Costs

Obbia 3D: Best Technical Case: *AFE Costs*

5000 km2 (131)Includes + 5 % Withholding Tax

PETROQUEST AFRICA – 1&2

Cost Element (# of days)	Cost (USD) + AFE 10%	Company G&G Costs USD
Acquisition 60 days	42.495 mm + 4.2495 mm	0.220 Company Men + Nav QC
Insurance	00.600 mm/month x 2.5 (1.50mm)	-
Security & Vessel Hardening	01.150 mm/month x 2.5 (2.875mm)	-
Processing 300 days	2.769450 mm + 0.276945 mm	0.300 Processing QC (10 months)
Interpretation 180 days	0.10 mm (Petrosys + 3D Canvas)	0.180 Interpreter (6 months)
Medivac	00.080 mm	-
Total AFE Cost	54.345895 mm USD	0.7 mm USD

Obbia 3D Cheapest Option: AFE Costs : *3960 km2 (131)*

Cheapest Option (Day Rate) No WHT

Cost Element (# of days)	Cost (USD) + AFE 10%	Company G&G Costs USD
Acquisition 55 days	30.00 mm + 3.0 mm	0.220 Company Men + Nav QC
Insurance	00.600 mm/month x 2.5 (1.50mm)	-
Security & Vessel Hardening	01.150 mm/month x 2.5 (2.875mm)	-
Processing 300 days	2.0 mm + 0.20 mm	0.300 Processing QC (10 months)
Interpretation 180 days	0.10 mm (Petrosys + 3D Canvas)	0.180 Interpreter (6 months)
Medivac	00.080 mm	-
Total AFE Cost	39.380 mm USD	0.7 mm USD

Summary

1. We have 25 years experience working East Africa and 12 years working the Somali Basin (***1st Mover in 2012***)
2. We've secured 3 Offshore Somali Basin Blocks, via ***PSAs; 131, 190, & 206***.
3. We've developed a new oil prone source model for the Somali Basin and presented this to the industry at ***IMAGE 2024***.
4. We've developed a prospect in Block 131 (***Leopard***) that has stacked multi-billion-barrel potential (***8 -10 bbls RPS 2016)***.
5. We've identified a nearby oil 'super-giant' direct analogue, the ***Zakum Oil-field*** offshore Abu Dhabi (***20 bbls Reserves***).
6. Our PSAs are in good standing with a 2024 work program variation approved by ***SPA,*** which swapped out 2D for new 3D.
7. We've designed, planned and costed out new 3D seismic data with input and support from PGS/TGS and PXGEO.
8. We have binding costs estimates for our ***Obbia 2025-2026 Best Technical Case 3D at 40 mm USD for 5000 km2***
9. ***We have environmental and regulator approvals largely in place to acquire the data in the period Q4 2025-Q1 2026.***

Mark Sloan Project Geoscientist Liberty Petroleum Corporation

Mini-Bio

Mark L. Sloan (FGS)
Project Geoscientist

- 1980-1985 BSc. Geology: Trinity College Dublin, & MSc. Applied Geophysics (UCG)
- 2000-2008: ConocoPhillips Australia (Chief Geophysicist).
- 2008-2020: INPEX Australia (Principal Geophysicist)
- 2003-Now: Petro-Quest Africa (PQA) & Liberty Petroleum Corporation (Project Geoscientist)

Acknowledgements

- Big shout out to Simon O'Toole LPC/PQA's Geophysical and Somalia Security Consultant.
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- Andy Lambert PXGeo Sales Manager
- Martin Widmaier PGS/TGS Global Chief Geophysicist (Sales & Services).
- Alan Ryder Global Sales Manger PGS/TGS
- Dr Andrew Long PGS/TGS Chief Scientist PGS.

Thank You For Your Attention

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LibertyPetroleumCorp.com

Back up

Mark Sloan 3D Seismic Project Management 1990-2024

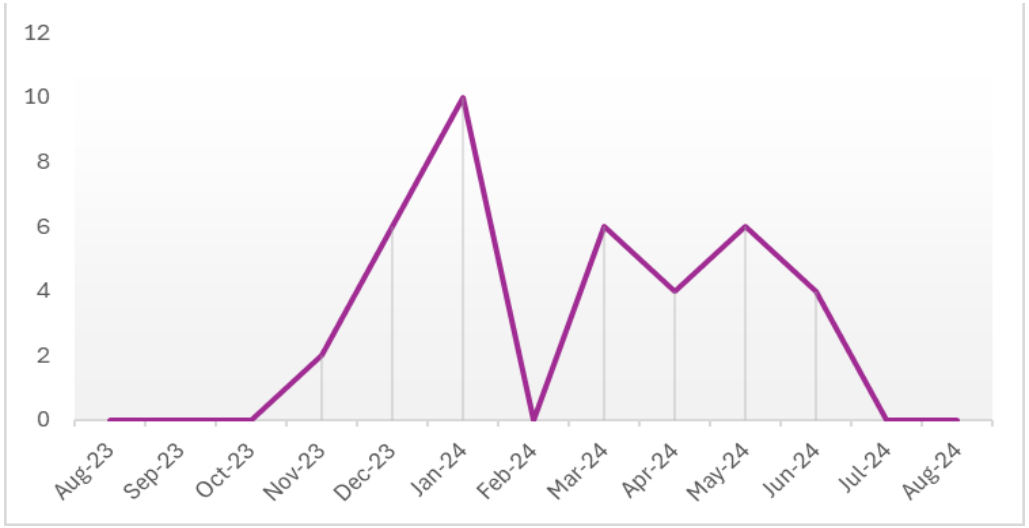
(Note MC3D costs are for only licensed acreage from the total shot).

Well Name	Date	Survey Type	Survey Area	Approx Cost USDMM
Iona 3D	1990	Vibroseis	100 km2	5.2 MM USD
Barrow Island 3D	1994	Vibroseis	250 km2	20.0 MM USD
Kerry 3D	1996	Dual Source Marine	900 km2	9.0 MM USD
Perseus 3D	1998	Single Source Marine	1100 km2	11.5 MM USD
Caldita 3D	2005	Dual Source Marine	1040 km2	13.2 MM USD
ATTQ MC3D	2008	MC 3D Marine 3D	2580 km2	1.8 MM USD
ATQ MC 3D	2009	MC 3D Marine 3D	800 km2	1.2 MM USD
Bassett 3D	2011	Dual sensor Broad Band	800 km2	8.5 MM USD
Caswell MC3D	2013	MC3D Phase I (Air-gun)	1400 km2	2.2 MM USD
Caswell MC3D	2016	Advanced Imaging & QI	1400 km2	1.5 MM USD
Exmouth MC3D	2017	Dual Sensor Broad Band	90 km2	0.9 mm USD
Total 11 Surveys		**2x Land/9x Marine**	**10460 km2**	**75 mm USD**

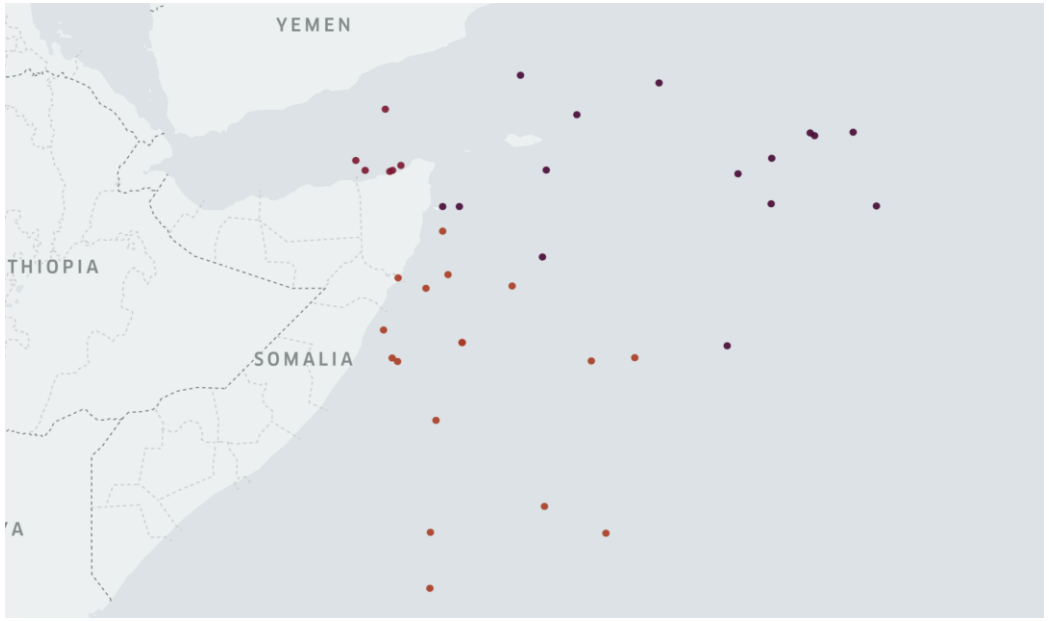
Somalia – Ever Reducing Above Ground Risks – *Castor Vali*

Piracy Threat

- Two piracy action groups (PAGs) are likely operating in the Indian Ocean: one 600nm ESE of Socotra and another 970nm east of Mogadishu, possibly with a mothership and small craft.
- Most incidents occur off Somalia's Bari and Mudug Regions and 600nm east of Socotra.
- Pirates are highly likely to be armed with machine guns, assault rifles, and RPGs.
- Attack patterns in March, May, and June suggest the threat may be spreading south.
- Pirates are targeting not just regional vessels but also global maritime traffic.
- Small vessels are most affected due to lacking countermeasures.
- The terrorism-piracy nexus complicates counter-piracy efforts and means pirates are well-armed.



Piracy Incidents between August 2023 and 22 August 2024. Data: Maritrace



Piracy Incidents between August 2023 and August 2024. Data: Maritrace

Factors Reducing Threat

- Piracy incidents have decreased since June 2024.
- Puntland Marine Police, with international support, has boosted coastal surveillance.
- In July 2024, the Turkish Navy took command of CTF 151, a task force against piracy off Somalia. Other operations include EUNAVFOR ATALANTA, and the Indian Navy and Chinese also conduct patrols.
- A large surge in piracy is unlikely due to naval operations, anti-piracy laws, and capacity-building efforts like EUCAP Somalia.
- The risk would rise if the international community withdrew, though this is unlikely.
- Self-protection measures, such as armed security, can further reduce the threat.

Obbia and Juba 3Ds : Survey Design - Towed Streamer Surveys

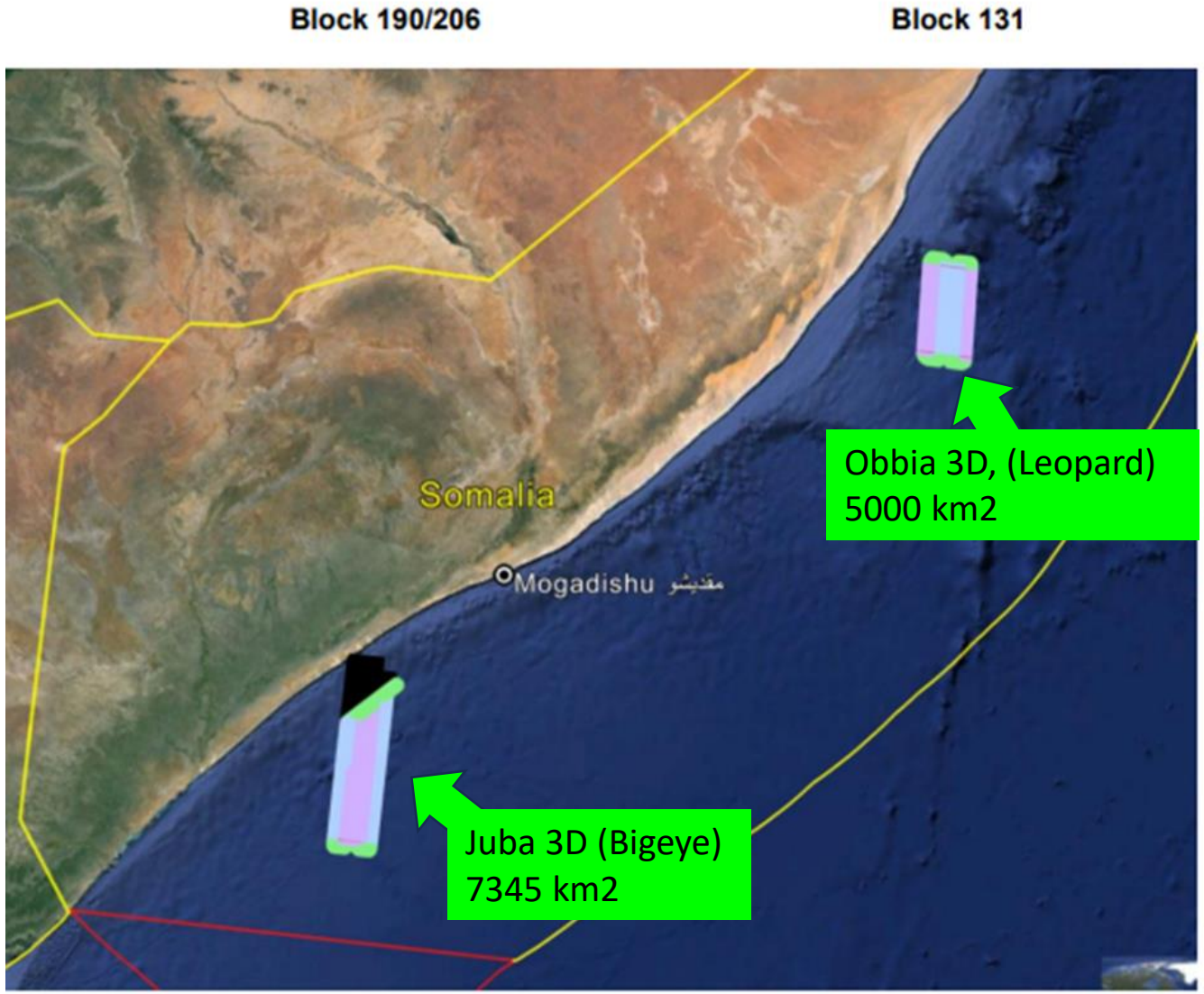
Obbia 3D 5000 km2 & Juba 3D 7345 km2 (Total 12,345 km2)

- The significant oil potential of both the ***Leopard*** and ***Big Eye*** Prospects invites and justifies the acquisition of two separate 3D seismic surveys, Obbia (131) and Juba 190/206 3D's respectively.

- PQA has worked with PGS, now merged with TGS (to form TGS), to help provide the best technical case for the Obbia and Juba 3D's to optimally explore the known play fairways across PSA's; 131,190,206, to include ***Leopard*** and ***Bigeye*** (206).

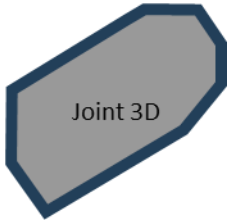
- The collaboration included two meetings with PGS in Oslo Norway and one meeting with PGS in the UK office, over the period, early May 2024 – late June 2024. People across the PGS/TGS organisation and its functions were included.

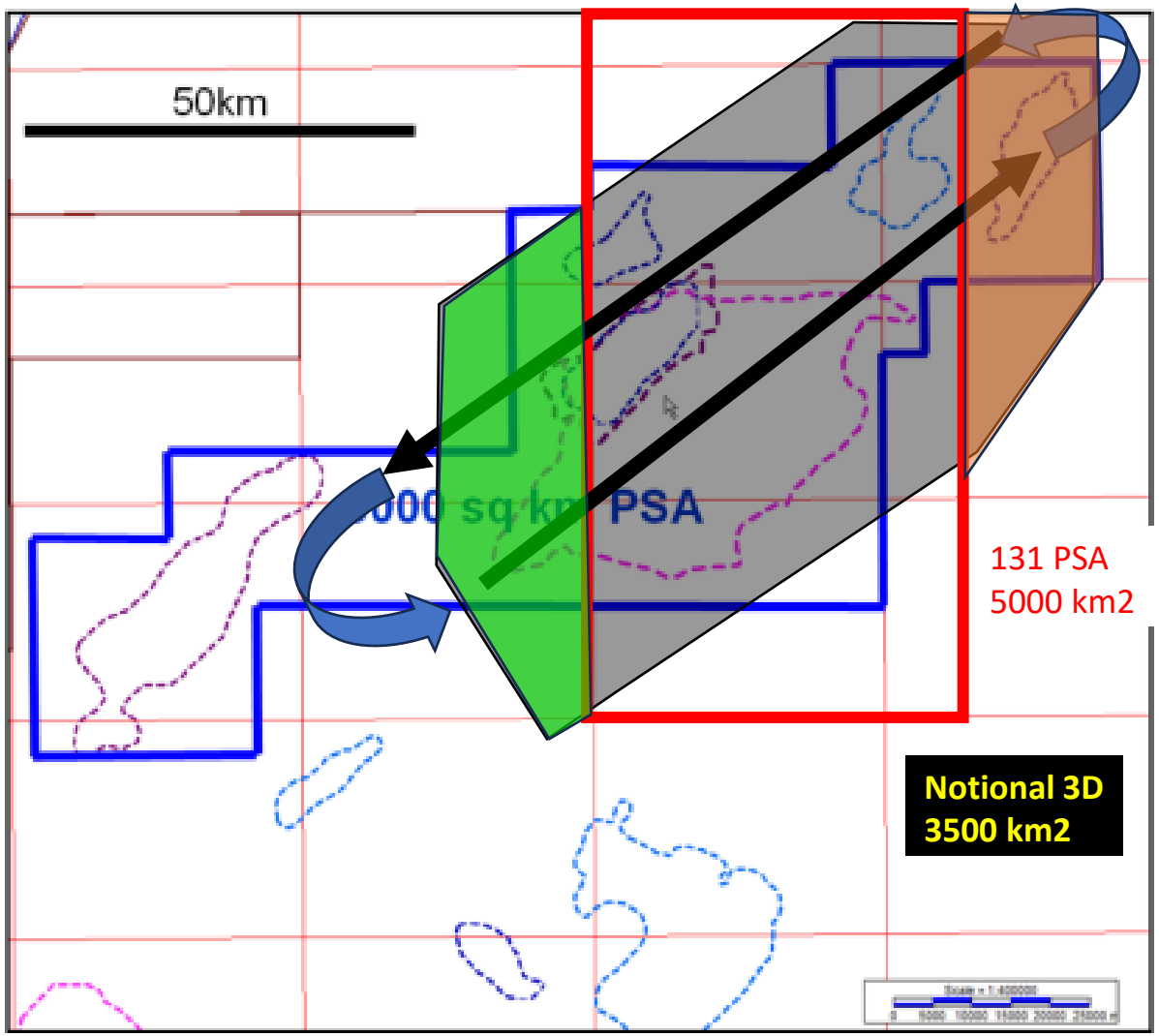
- The collaboration with PGS has resulted in an agreed survey design, but as yet only 'draft' acquisition polygons, that cover all of PSA 131 (5000 km2), about 50% of block 190 (2500 km2) and 100 % of block 206 (5000 km2). Because of these large areas, TGS is offering a Titan Class vessel.



Map Outlines of Draft 3D Survey Polygons

Option 3: Targeted 'Joint Shoot' PSA 131 (3500 km2 - 50 Days)





- 3500 km2 Joint Shoot Covers Leopard Shallow and Deep WD>2500 m
  15% PSA 130 and 13% Open Acreage
- Shooting Direction is NE–SW Race-track Pattern.
- Average line length is 75 km & Sail-line Separation is 900 m.
- Acquisition Spread is 12 x 10 km and Streamer Separation is 150 m
- Triple Source (50 m Source Separation).
- Acquisition native bin size is 12.5 (Inline) x 25 m (Crossline)
- Estimated ***Cost 10,000 USD per km2 (35 MM USD)*** includes Mob/Demob
  Survey Duration **70 km2/day** 50 days ***(Net Cost Liberty 35 MM USD).***