

The background of the slide features a faded image of an industrial oil refinery with various towers and pipes. Overlaid on this is a semi-transparent map of the African continent. The title text is centered over the map.

# **FRONTIER OIL PLAYS IN SENEGAL**

November 2009

Jérôme Halbout, Vice-Chairman  
**Africa Fortesa Corporation**

# Africa Fortesa Corporation – Integrated Operations



## Ownership

- 1/3 Private Shareholders
- 2/3 Private Equity Funds (3)
- Houston Executive Office

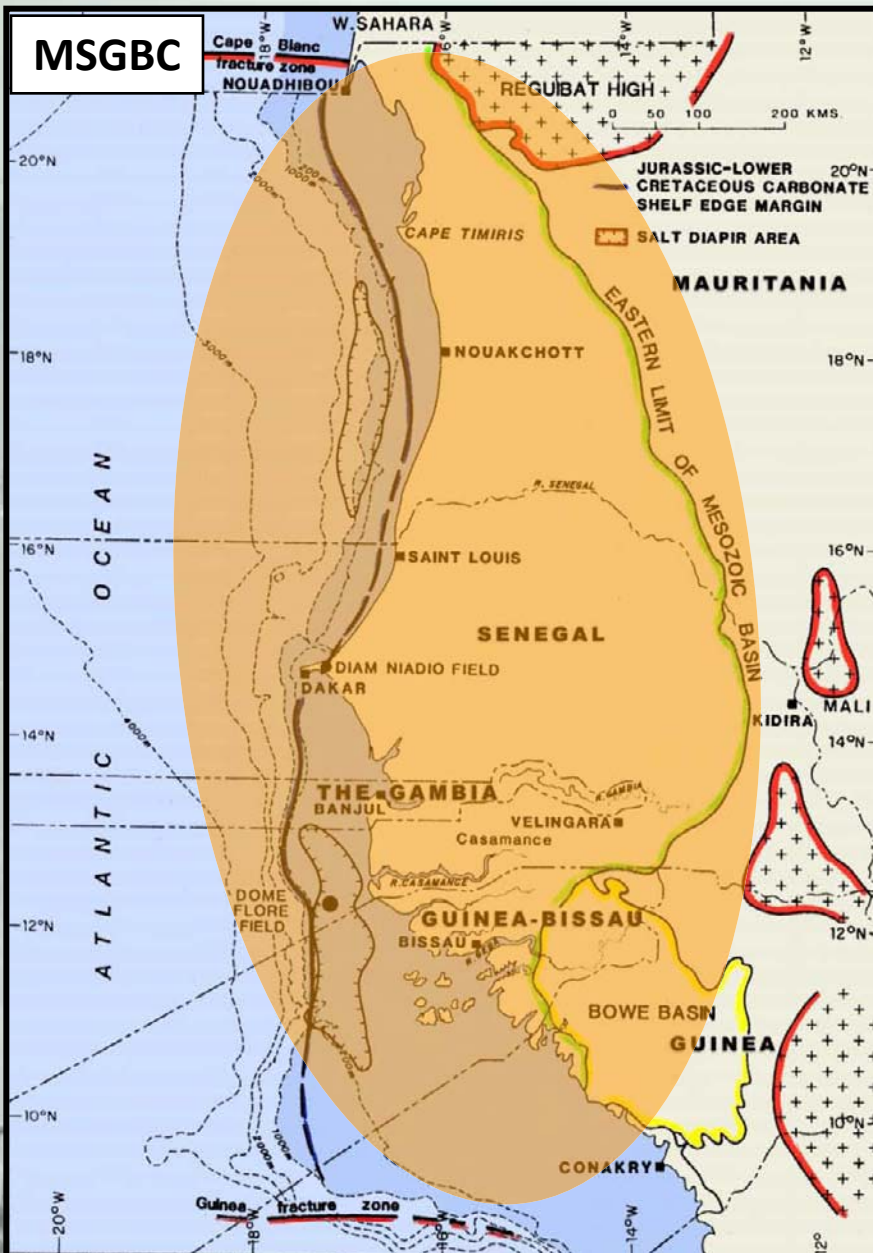


- HQ in Dakar Senegal
- E&P Company
- Tamna Permit PSA
- Gadiaga Concession Producing
- Pipeline to Dakar Power Market



- HQ in Dakar Senegal
- NW African Onshore Drilling Co.
- Drilling (for Fortesa & other operators)
  - 2 Land Drilling Rigs

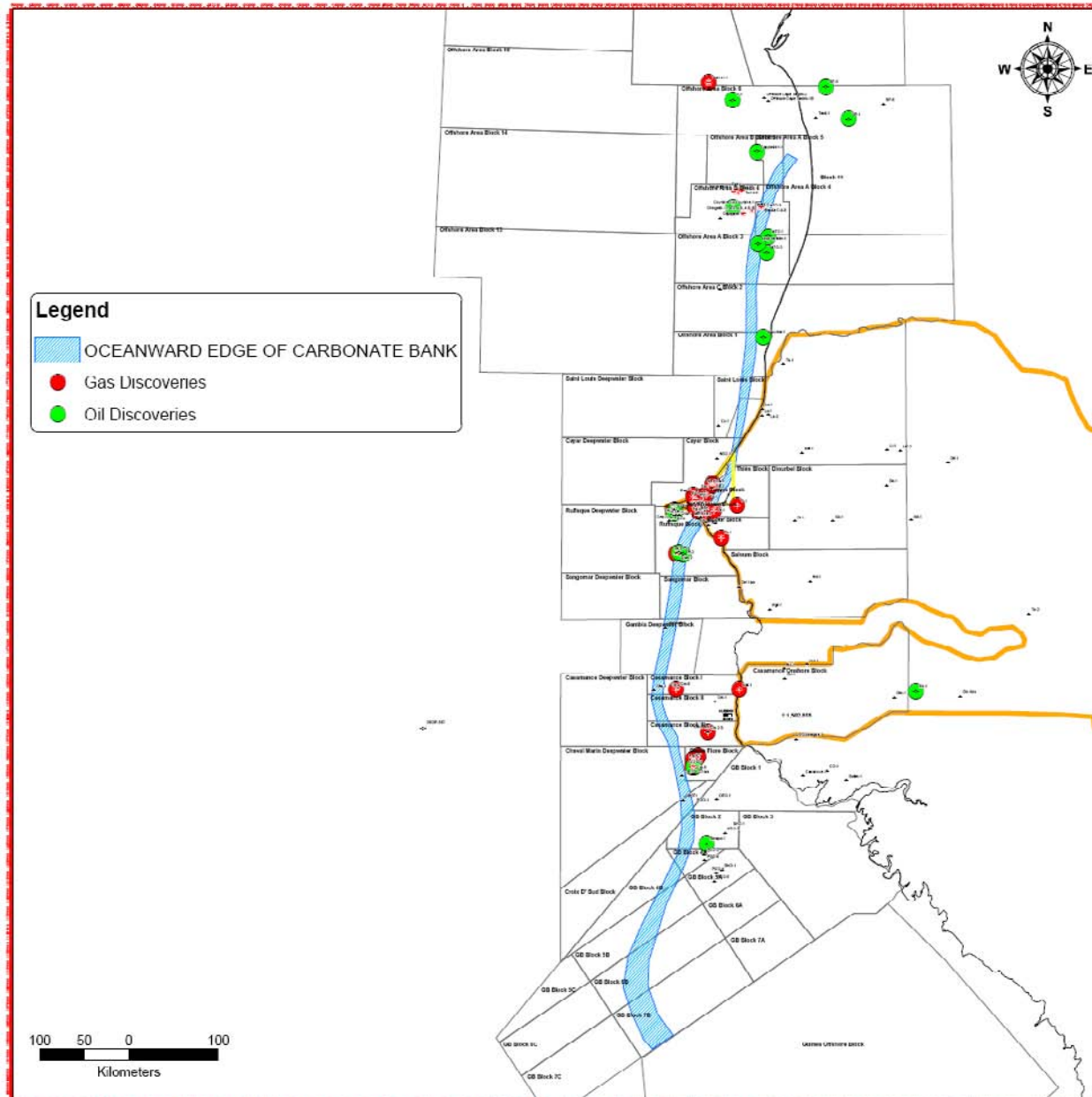
# Africa Fortesa Corporation – Operating Area



## AFRICA FORTESA CORP.

- 140 Employees 92% African
- Drilling in Senegal & Mauritania
- 8 Clastic Wells Producing in Gadiaga Field
- Natural Gas + Condensate
- Selling to *Commercial* plus *Government* for Power
- Intense Effort Geological, Geophysical + Engineering

# Regional Hydrocarbon Discoveries



# Recent MSGBC Hydrocarbon Results 2000 – 2009

Country	Offshore Wells	Onshore Wells	Fields
Mauritania	15	6	1
Senegal	0	8	1
Gambia	0	0	0
Guinea-Bissau	3	0	0
Guinea	0	0	0

**Senegal's Onshore contains many Deepwater Depositional Frontier Plays that do not require the Cost & Complexity of Offshore operations**

# Add Recent Sierra Leone's Discovery

The **45 ft of net hydrocarbon pay** cut by an Anadarko Petroleum Corp.-operated deepwater exploratory well off remote Sierra Leone was only part of a “tremendous amount” of reservoir-quality rock the well penetrated, company officials said.

In the **Venus** well Anadarko saw **good reservoir quality in numerous sands** and shows in numerous sands.

The well found a **combination stacked channel and fan complex**, and both facies can be productive, Anadarko said.

One source rock encountered in the Venus well is immediately adjacent to reservoirs, and the area could contain other source rocks not yet penetrated, the company said.

# MSGBC Discovered Geologic Reservoirs

Epoch	Stage	Field	Type
Miocene		<ul style="list-style-type: none"><li>• Chinguetti</li><li>• Banda</li></ul>	<ul style="list-style-type: none"><li>• Delta Front Sands</li><li>• Channel-Head Sands</li></ul>
Oligocene		<ul style="list-style-type: none"><li>• Dome Flore</li></ul>	<ul style="list-style-type: none"><li>• Carbonate</li></ul>
Senonian	<b>Maastrichtian</b>	<ul style="list-style-type: none"><li>• Diam Niadio</li></ul>	<ul style="list-style-type: none"><li>• Delta Front Sands</li></ul>
	<b>Lower Campanian</b>	<ul style="list-style-type: none"><li>• Gadiaga</li></ul>	<ul style="list-style-type: none"><li>• Channel Sands</li></ul>
	<b>Santonian</b>	<ul style="list-style-type: none"><li>• Gadiaga</li></ul>	<ul style="list-style-type: none"><li>• Beach / Delta Frontal</li></ul>
	<b>Lower Senonian</b>	<ul style="list-style-type: none"><li>• Gadiaga</li></ul>	<ul style="list-style-type: none"><li>• Beach Frontal Sands</li></ul>

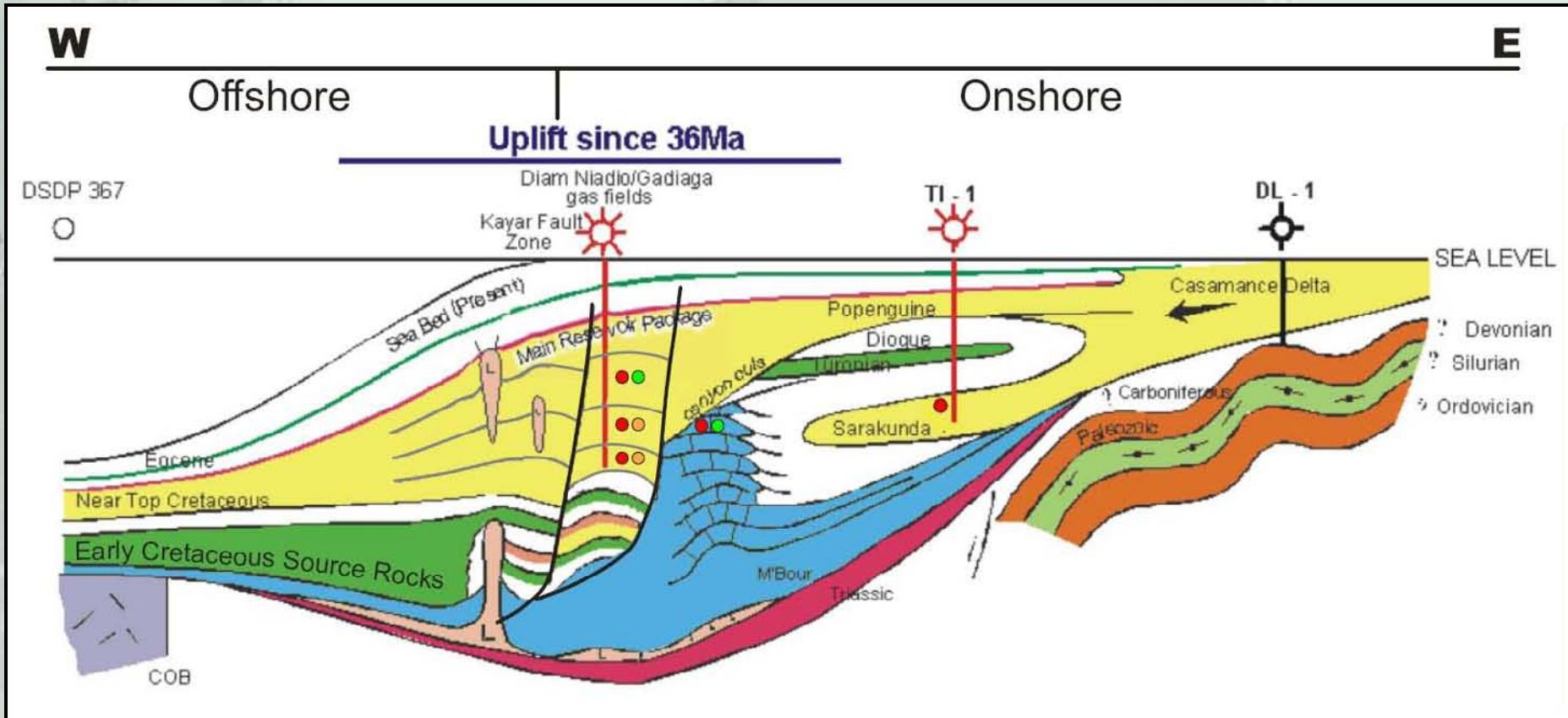
# Abundant Source Rocks Exist in the MSGBC

- Cretaceous Source Rocks are in '*Oil-Window*'
  - Turonian
  - Cenomanian
  - Albian
  - Aptian

And are producing the most oil and gas in the region

- Also evident, though not needed, are Jurassic & Paleozoic Source Rocks
- Volcanism may have accelerated Oil in-place to become Gas in-place

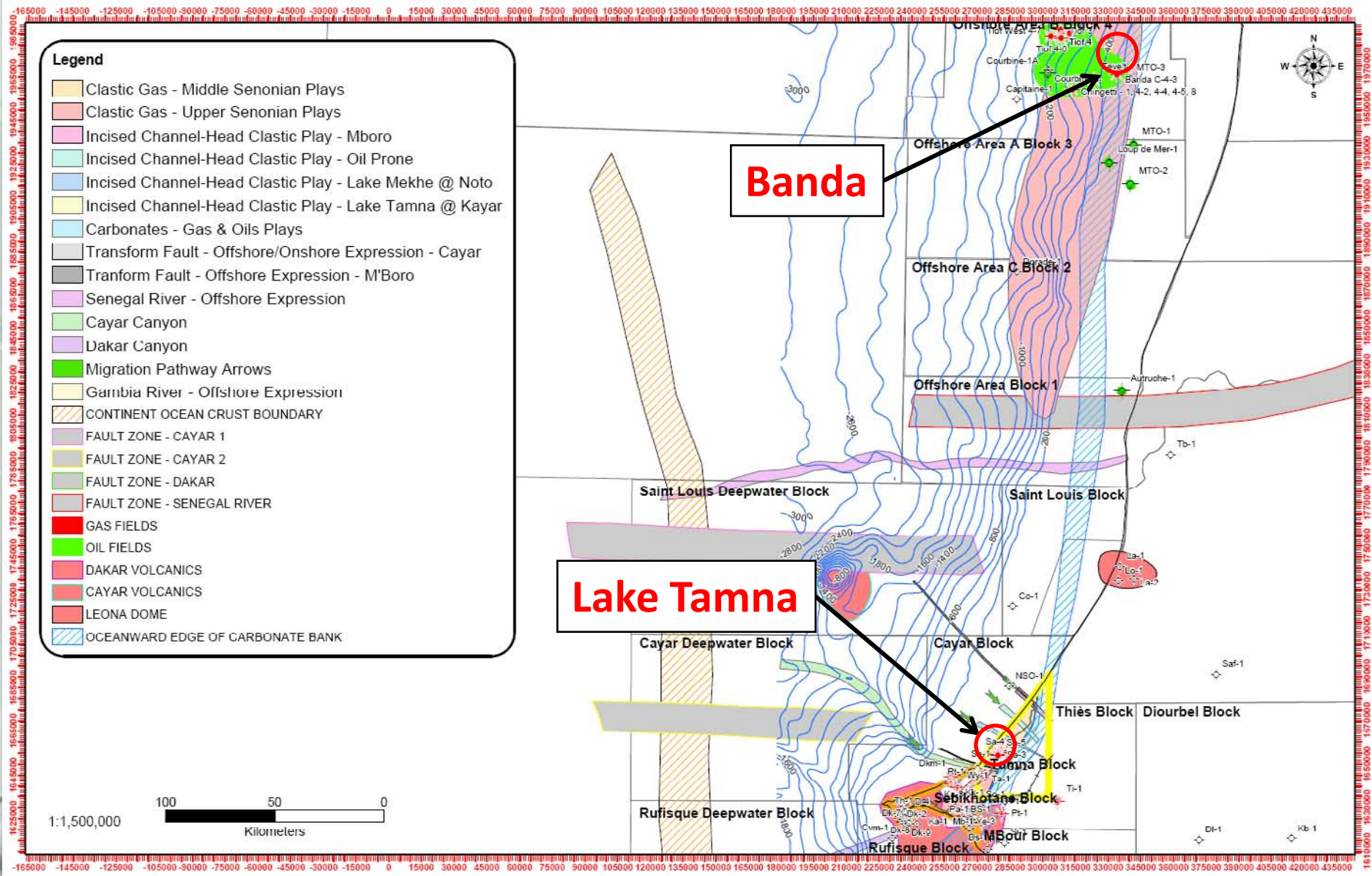
# SENEGAL Typical Geological Cross-Section



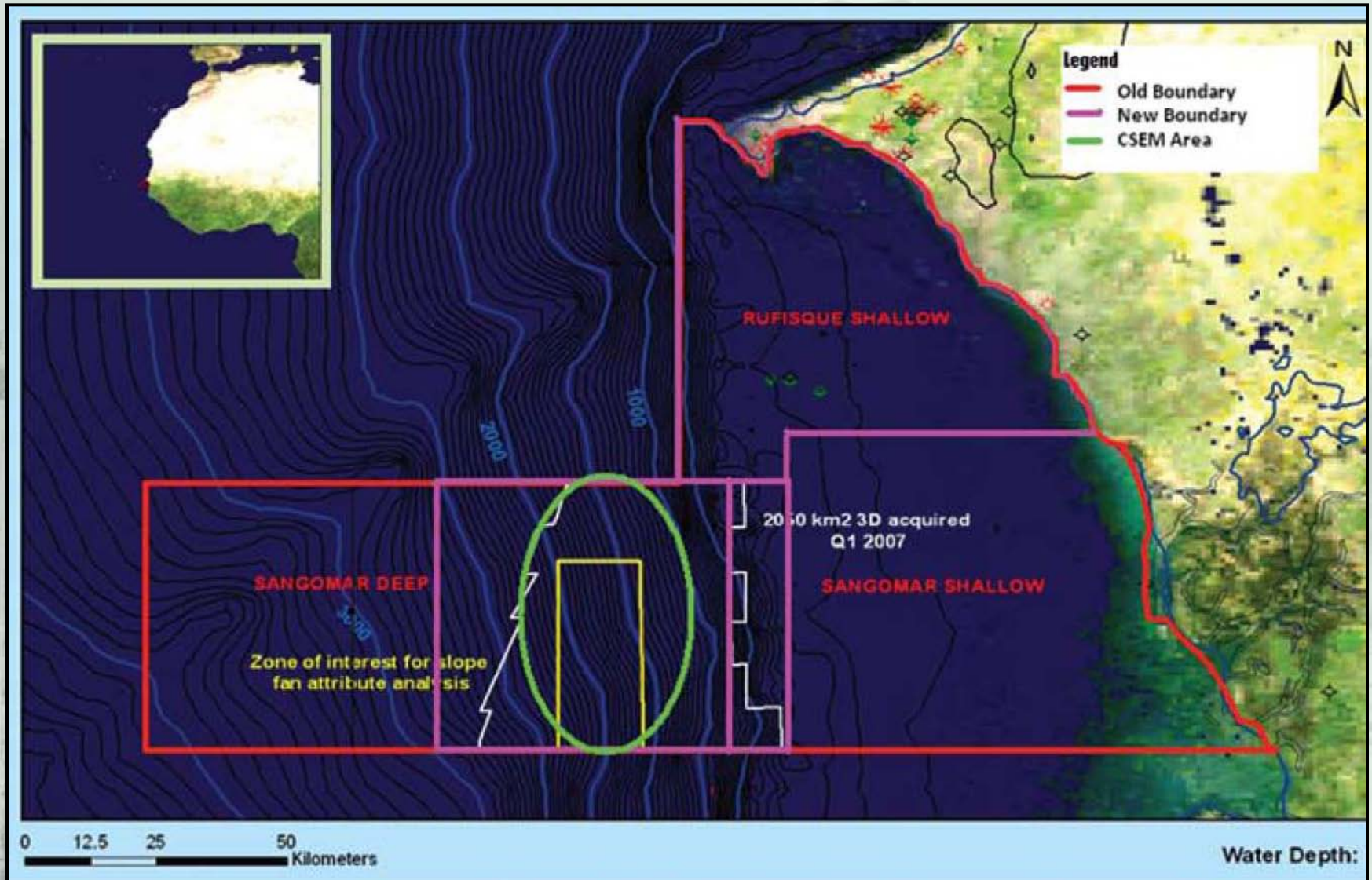
# Frontier Plays in Senegal

- Channel-Head Sand Traps
- Delta Frontal Sands
- Carbonate Shelf Related Plays
  - Tertiary (Oligocene)
  - Cretaceous (Neocomian)
  - Jurassic

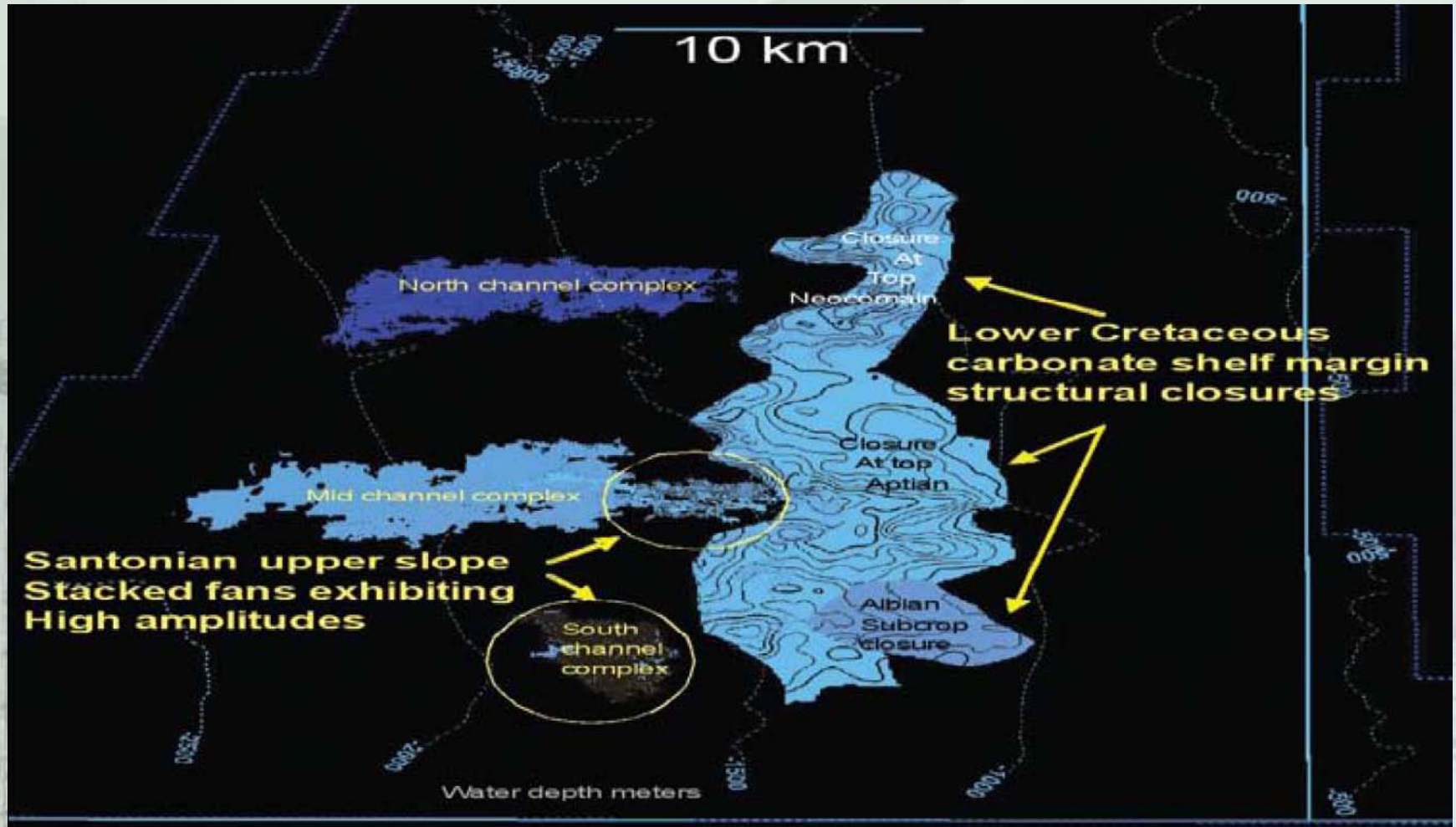
# Channel-Head Sand Traps, Offshore & Onshore



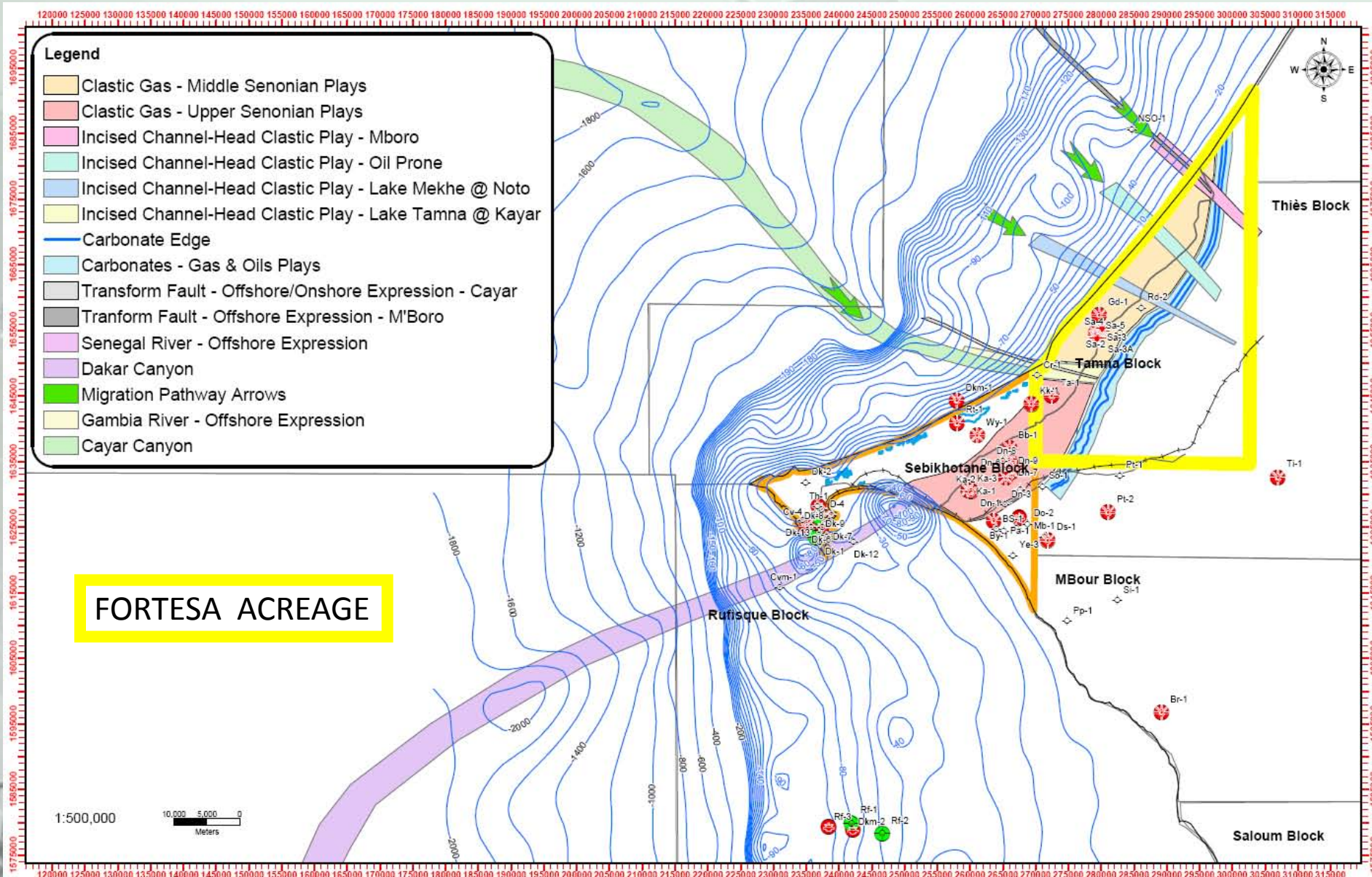
# Offshore Senegal – Sangomar Deepwater Block



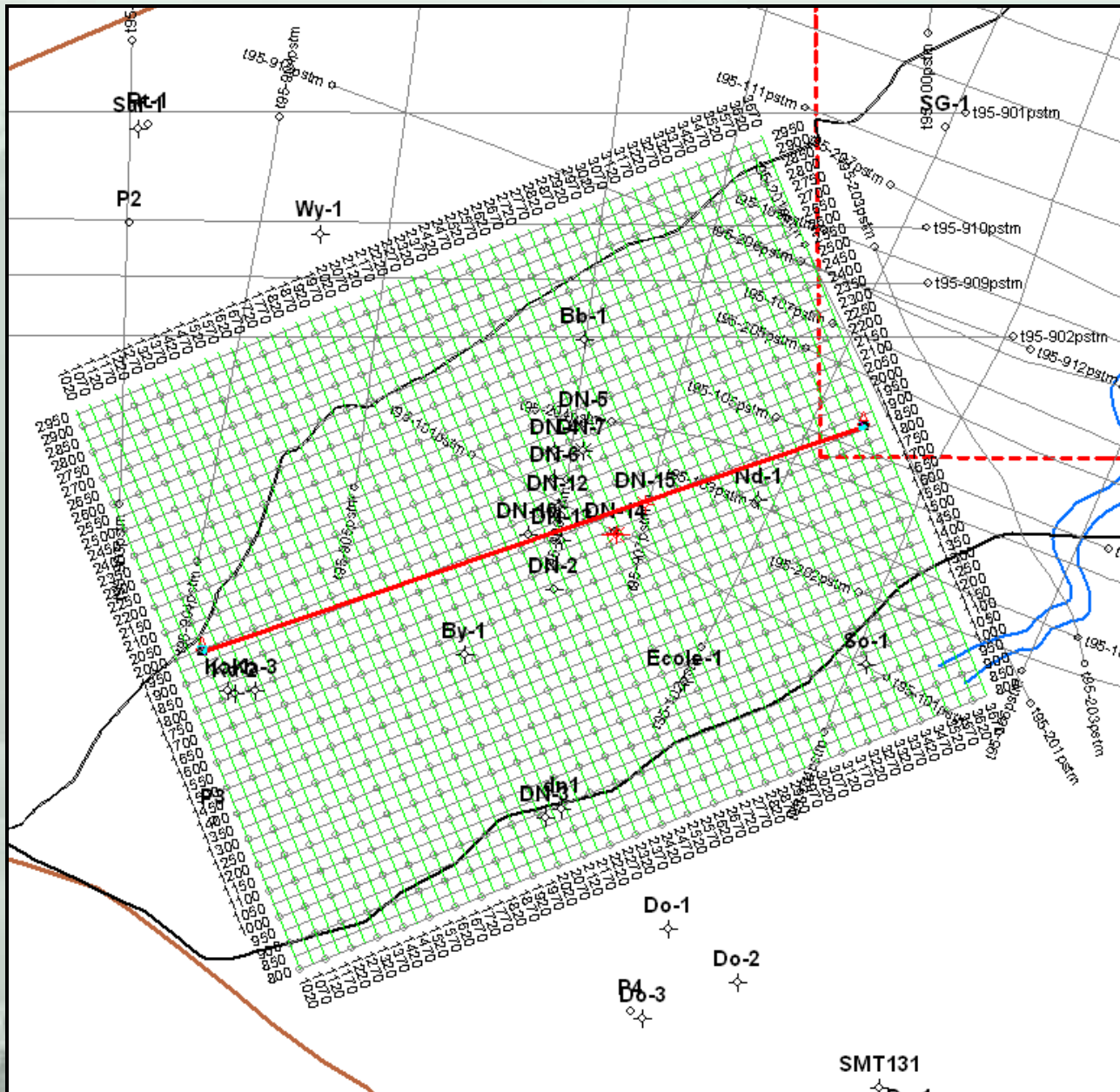
# Offshore Senegal – Sangomar Deepwater Block



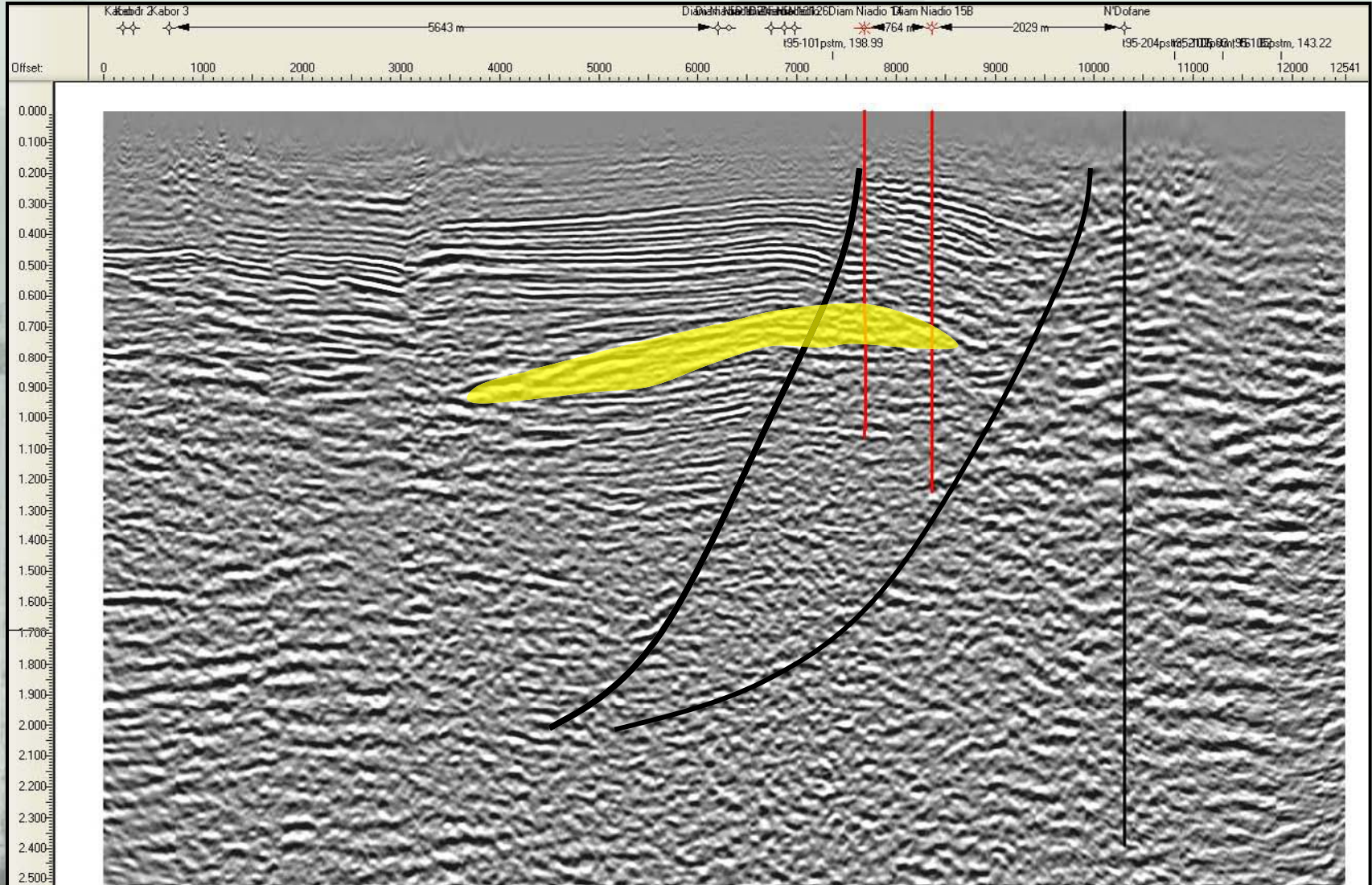
# Wells with Oil & Gas Indicated



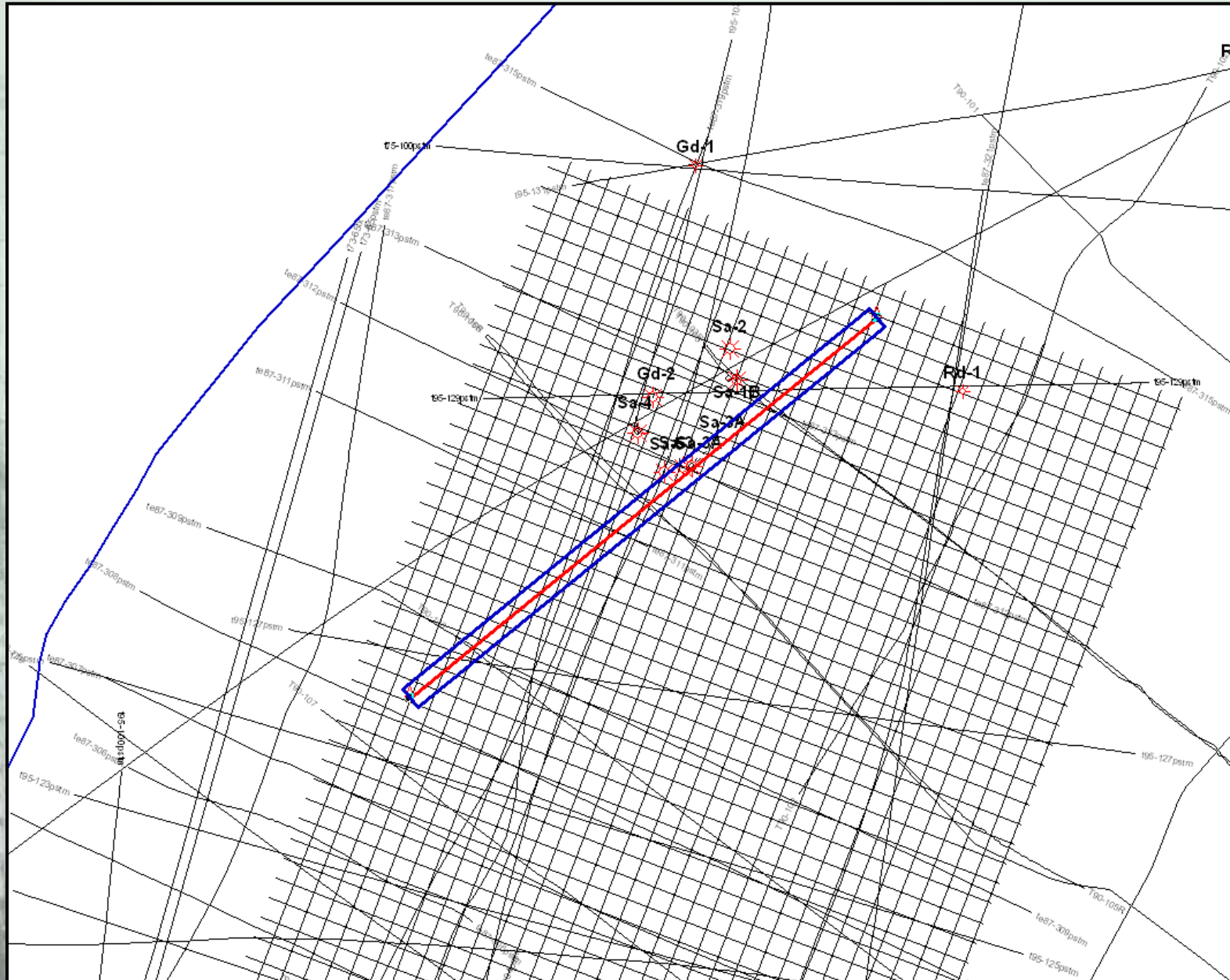
# Delta Front Play @ Diam Niadio



# Delta Front Play @ Diam Niadio

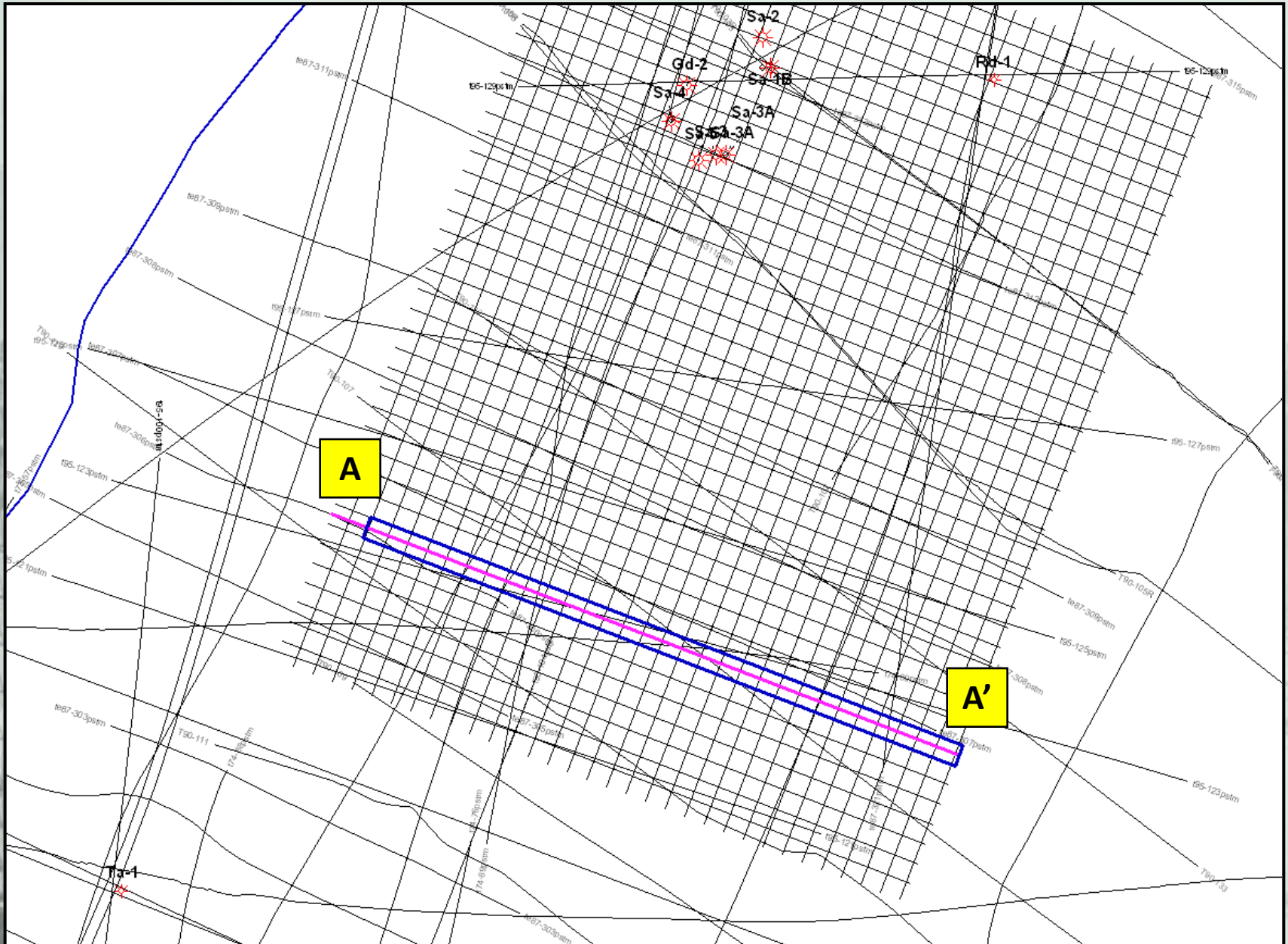


# Delta Front Potential @ Gadiaga Field

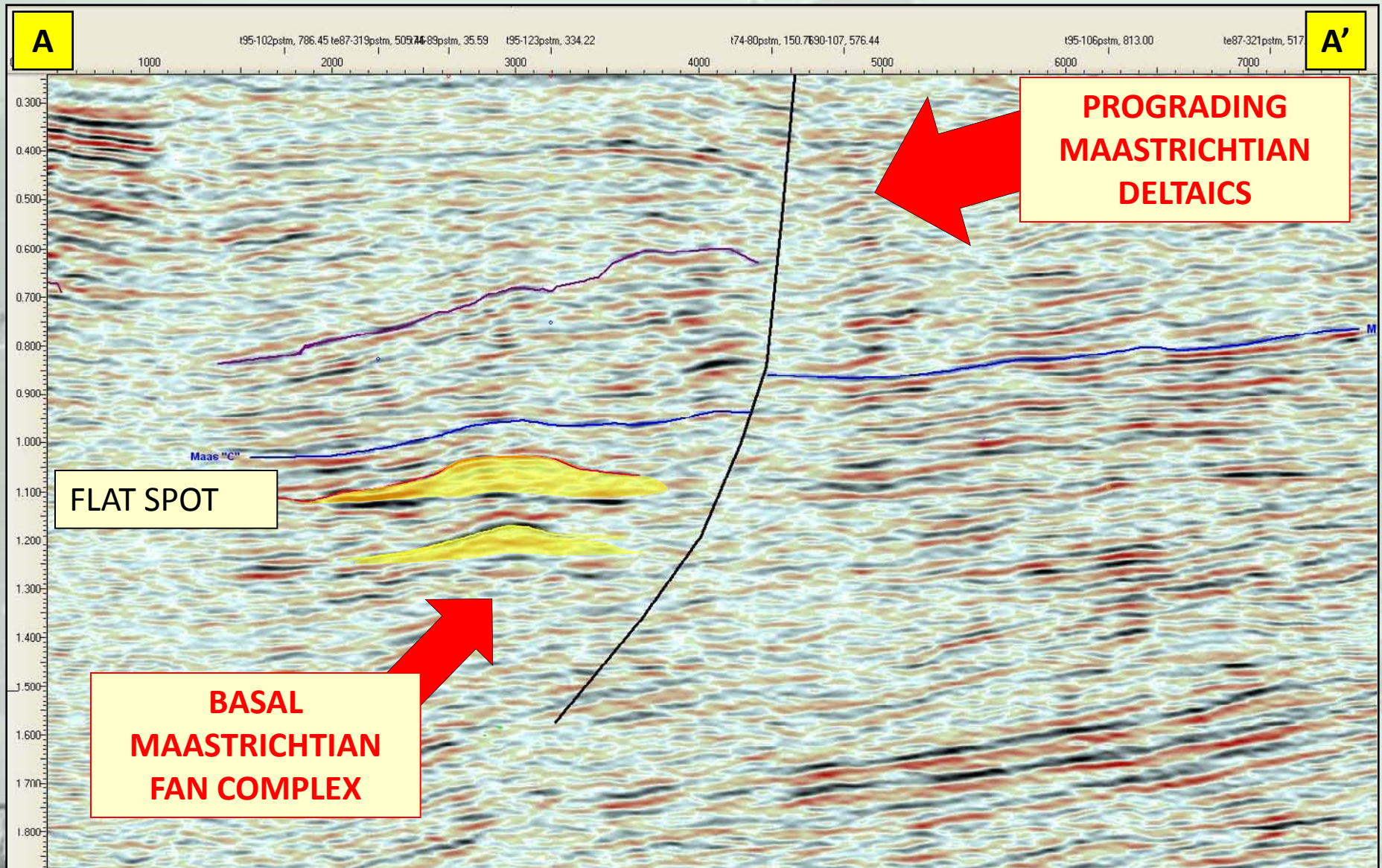




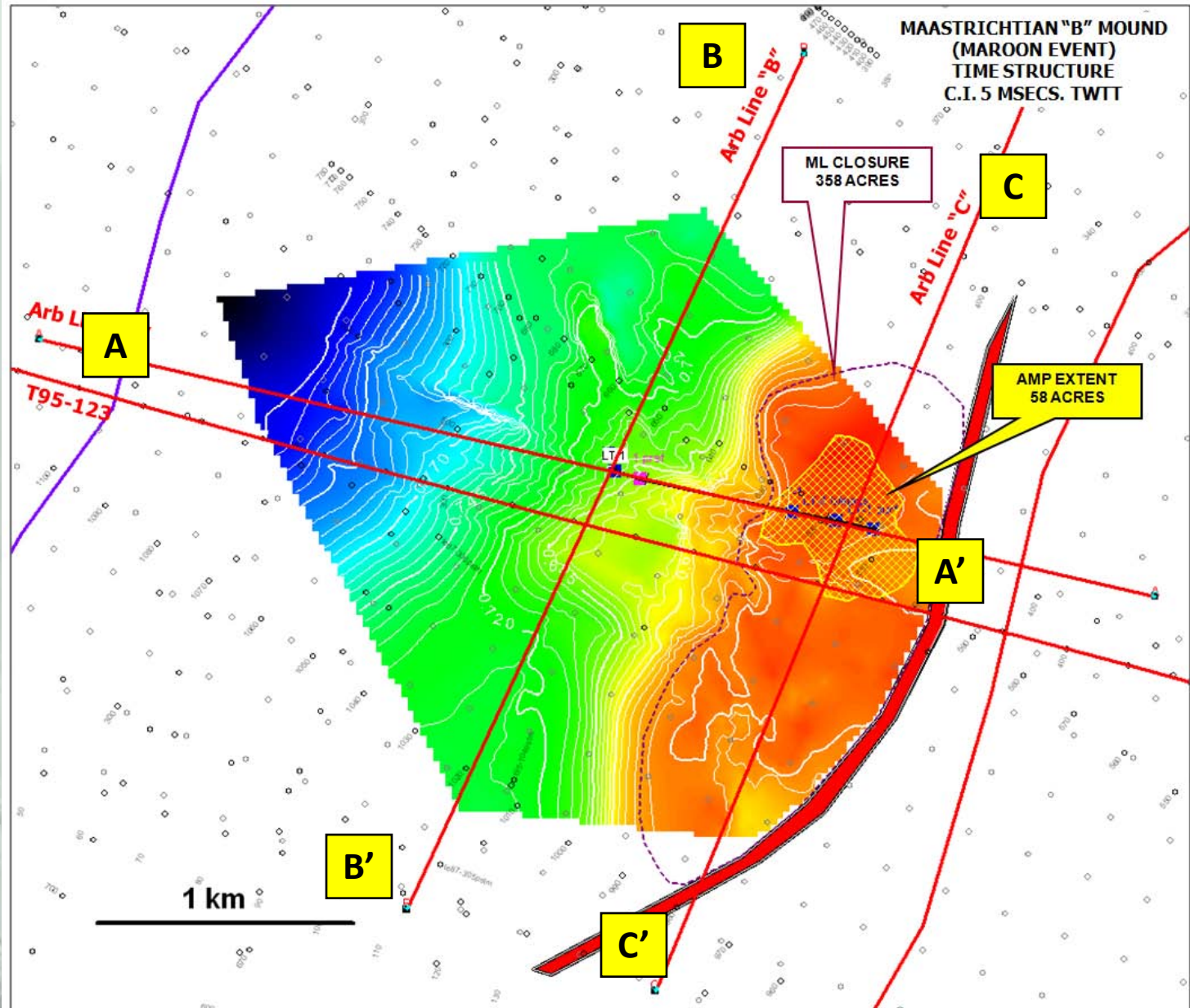
# Delta Front Fan Complex Prospect @ Lake Tamna



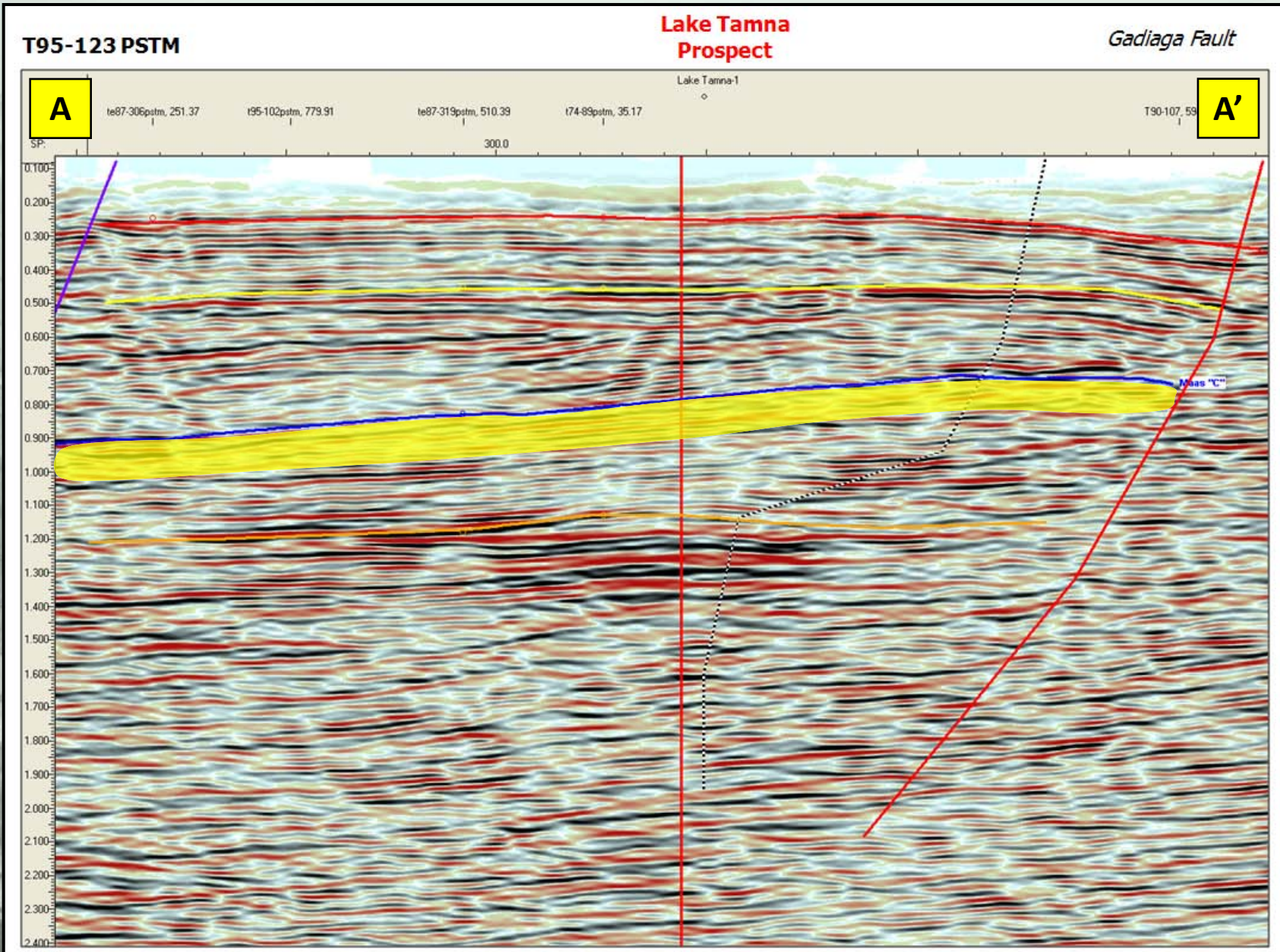
# Channel-Head Sand Prospect @ Lake Tamna



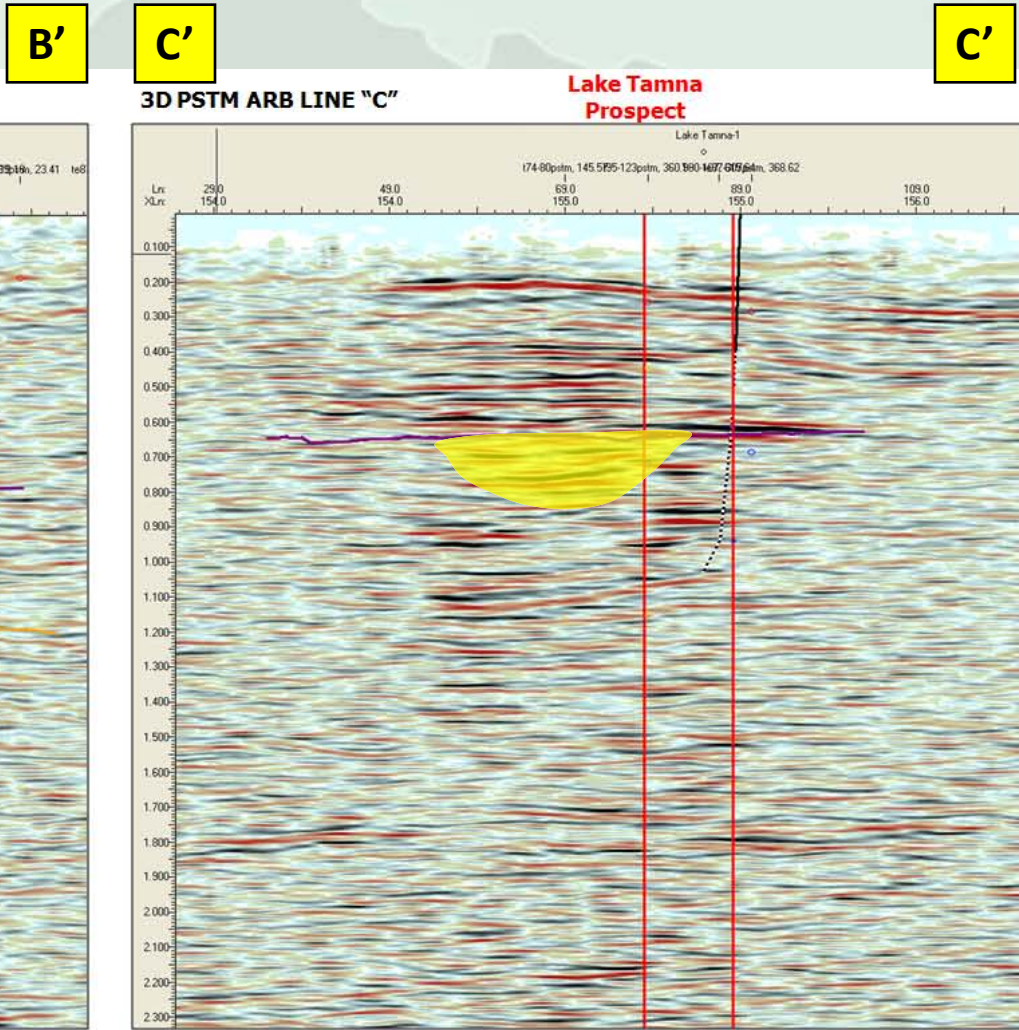
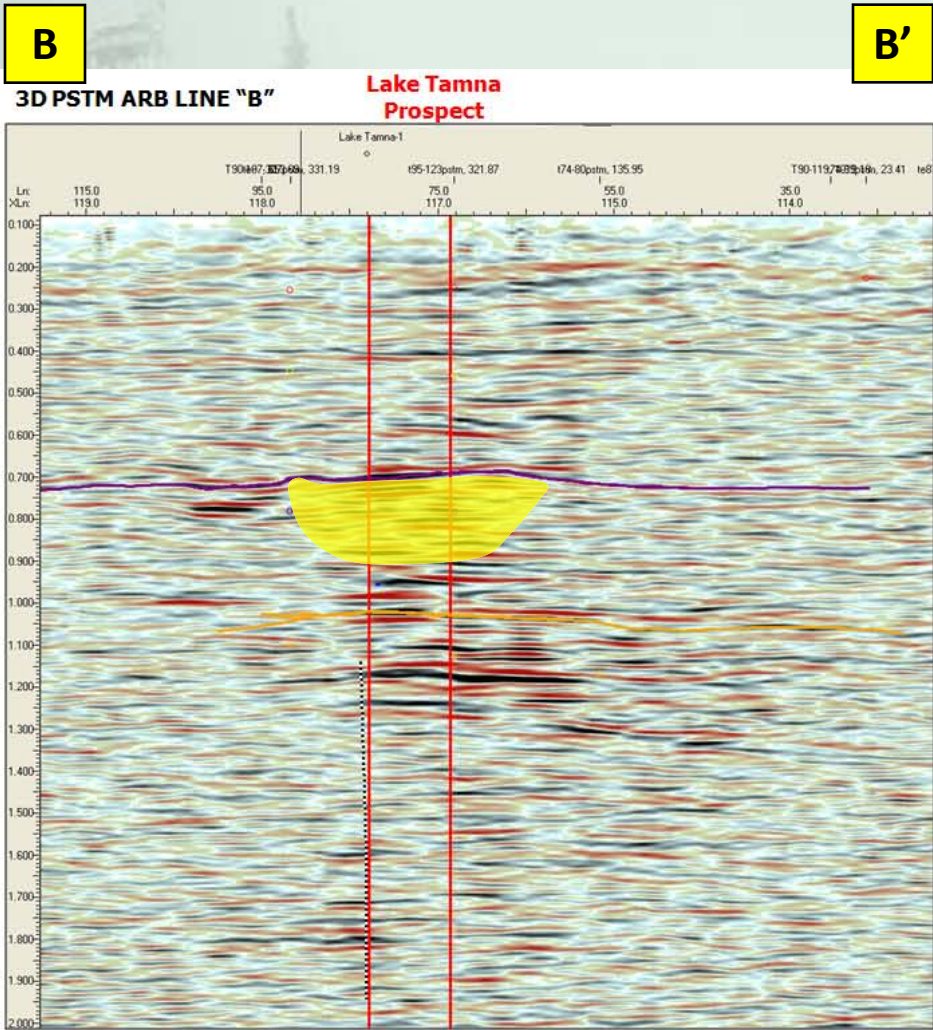
# Channel-Head Sand Trap, Lake Tamna – Onshore Senegal



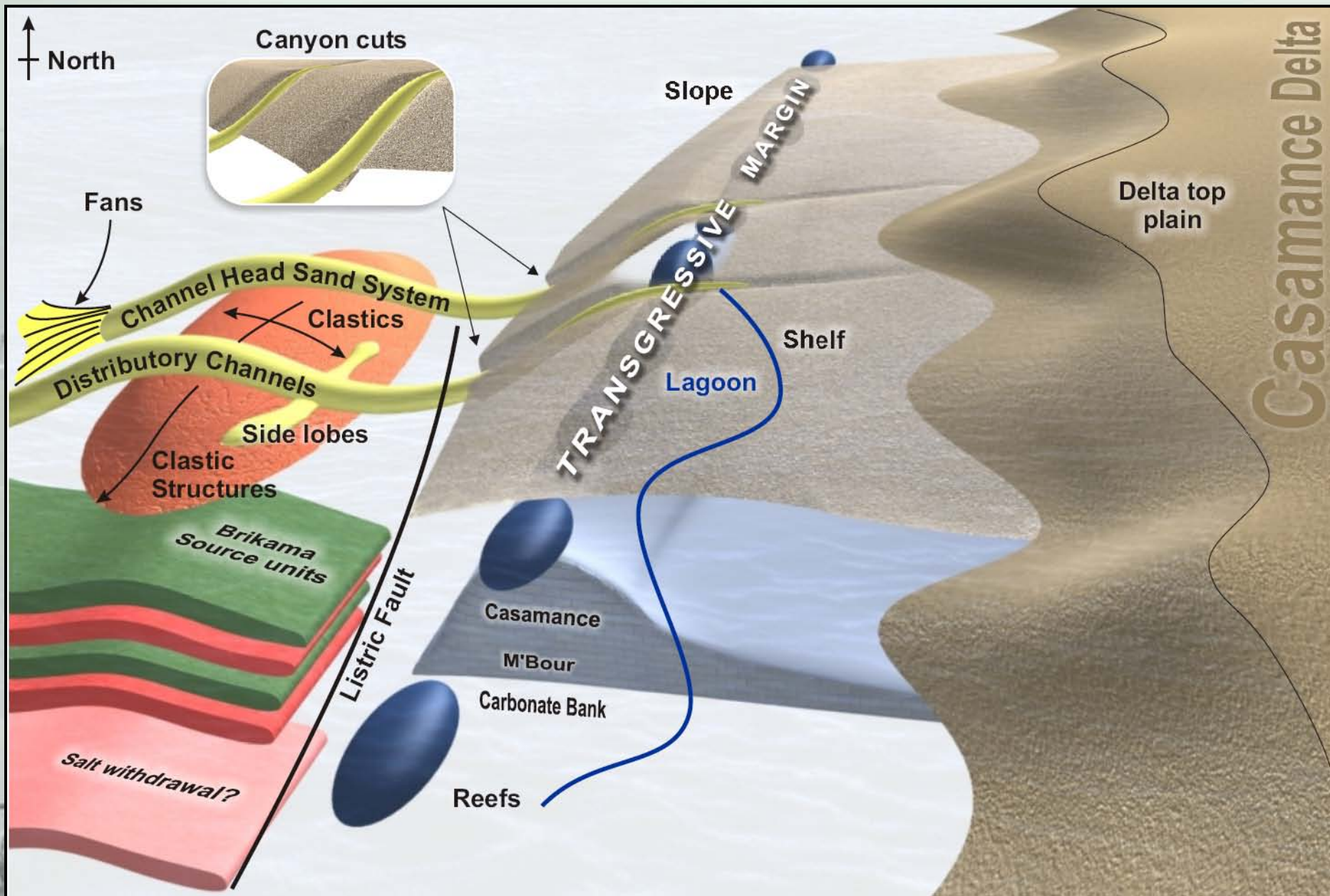
# Channel-Head Sand Trap, Dip Line T95-123



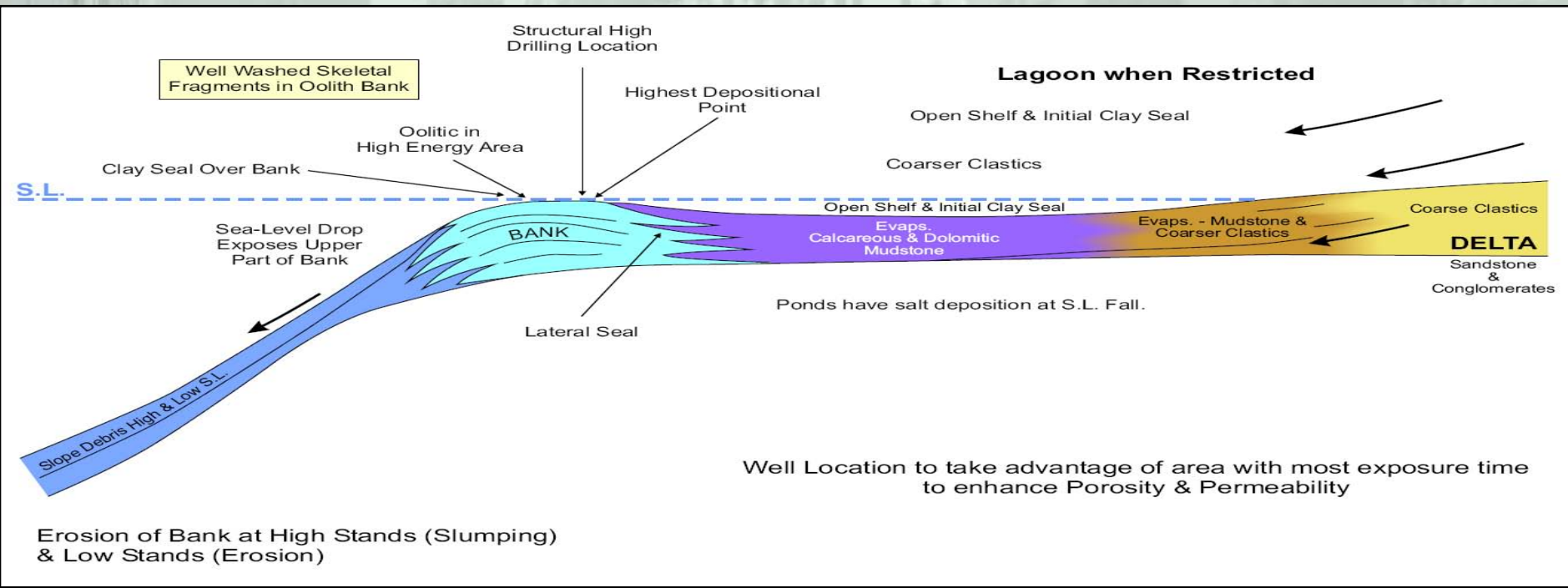
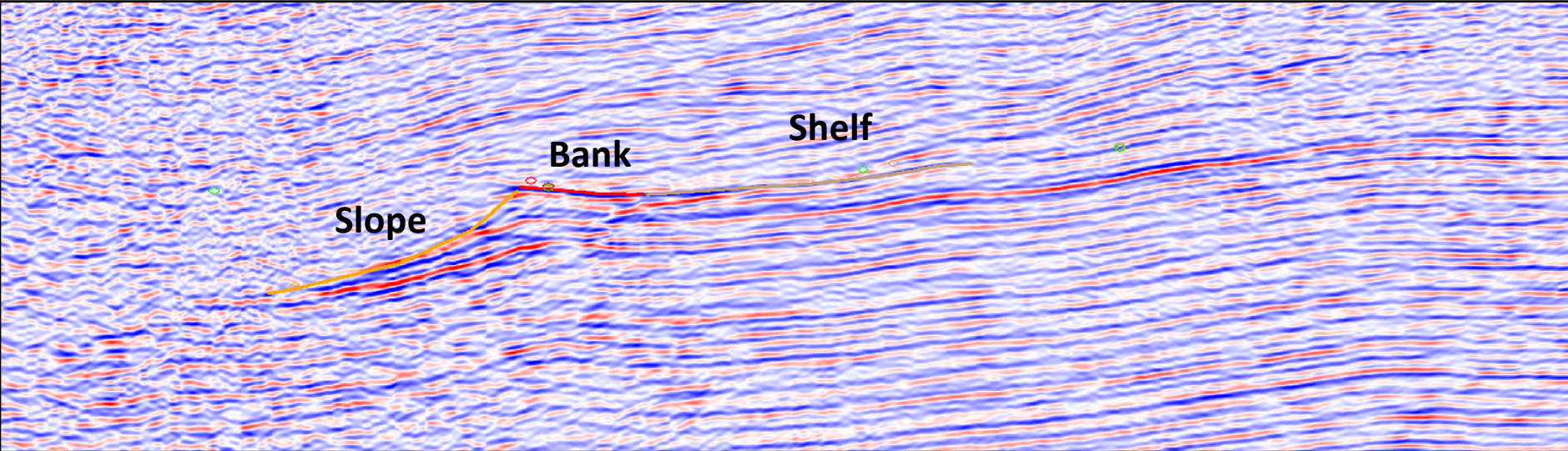
# Channel-Head Sand Trap, Arbitrary Strike Lines



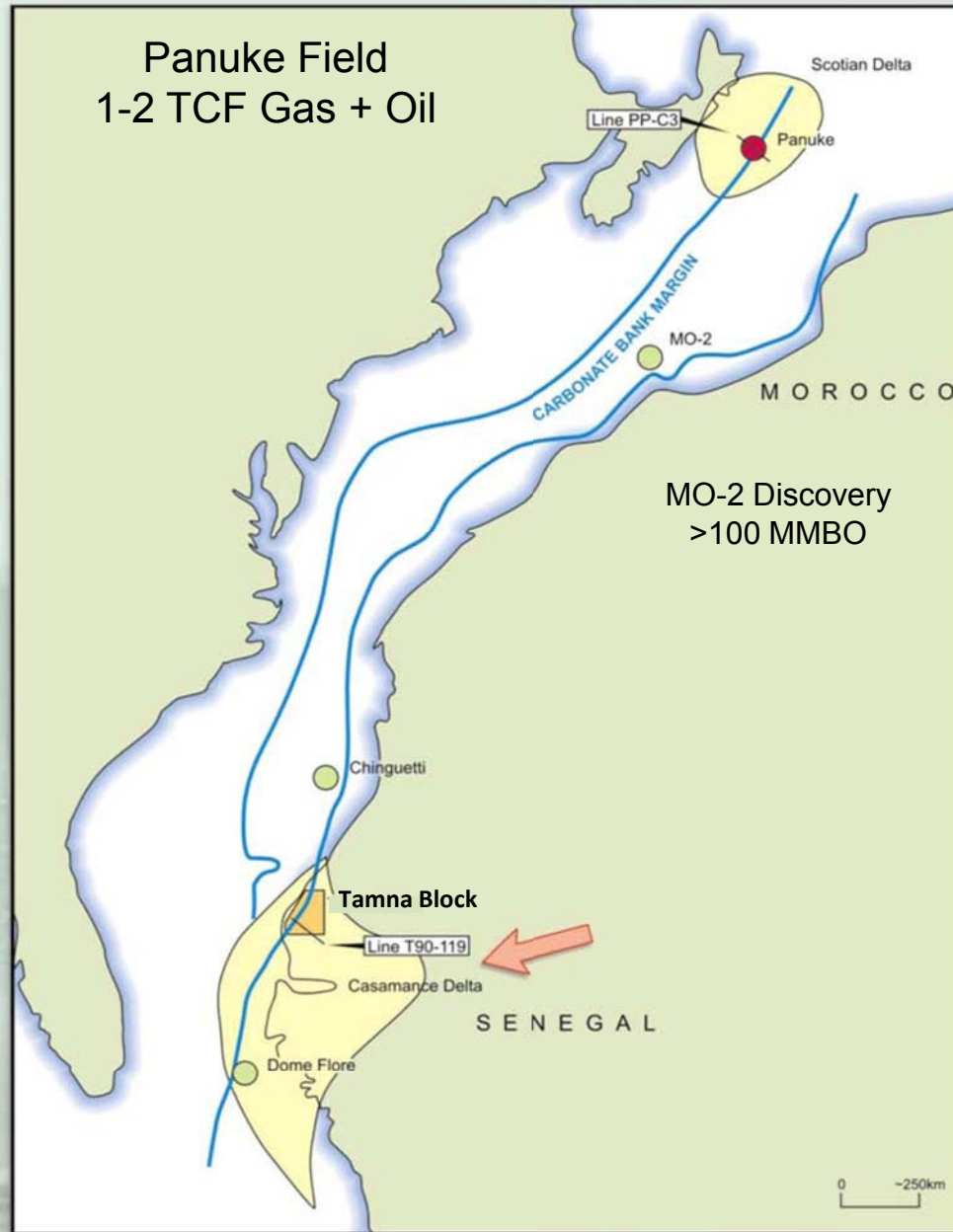
# Frontier Play: Carbonate Shelf



# Carbonate System Diagram

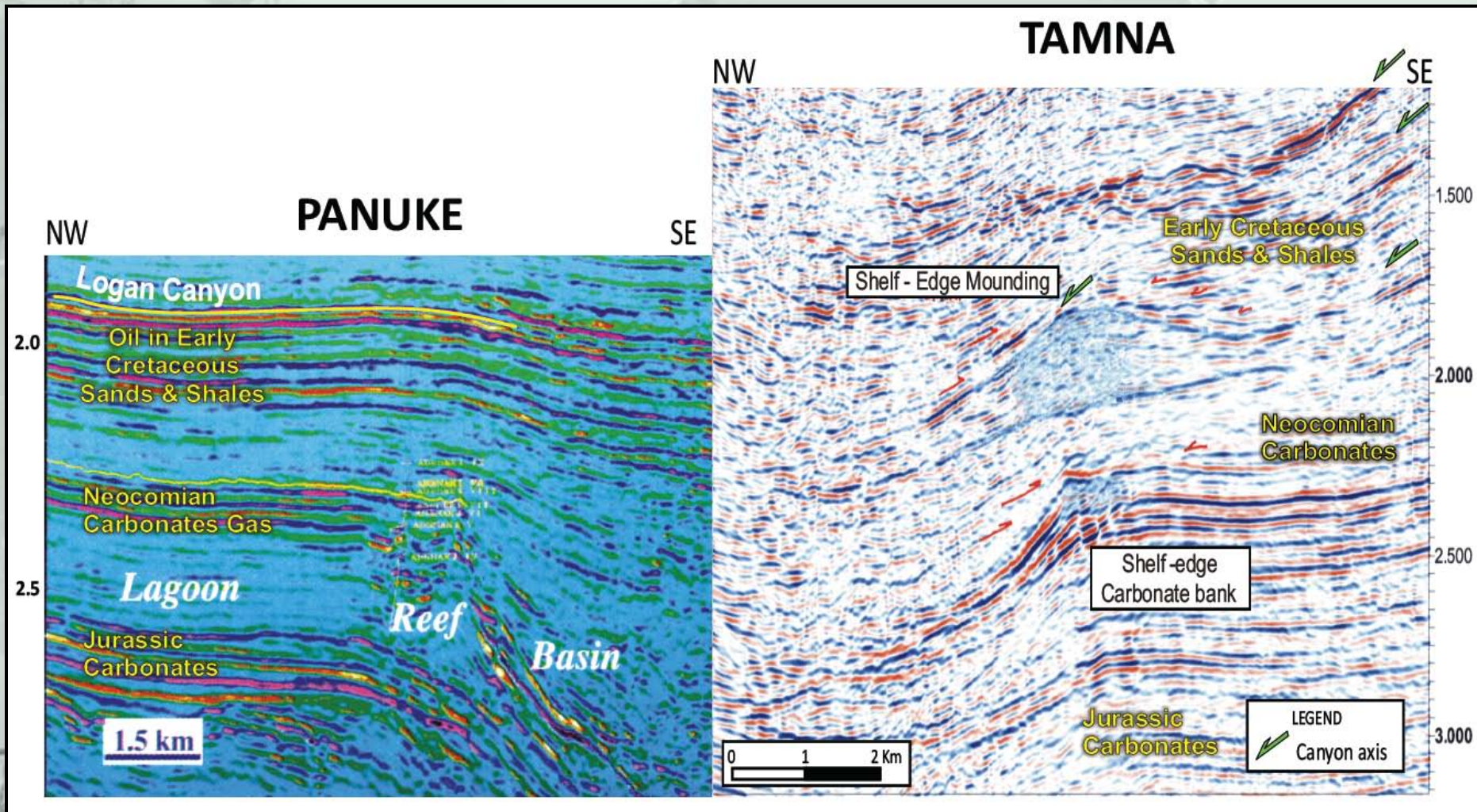


# Frontier Play: Carbonate Shelves in USA & SENEGAL

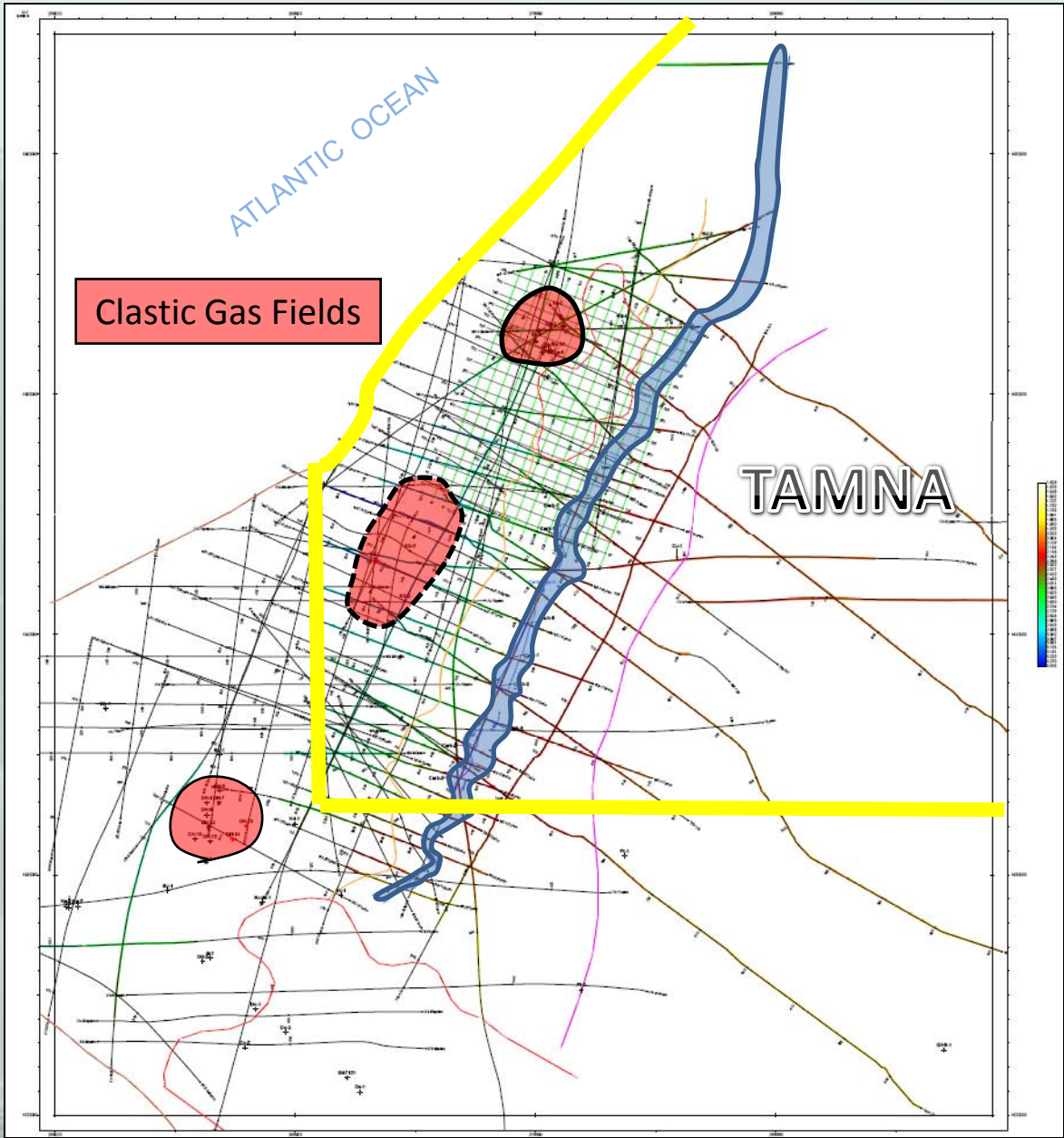


# Frontier Play: Carbonate Shelf – Panuke to Senegal

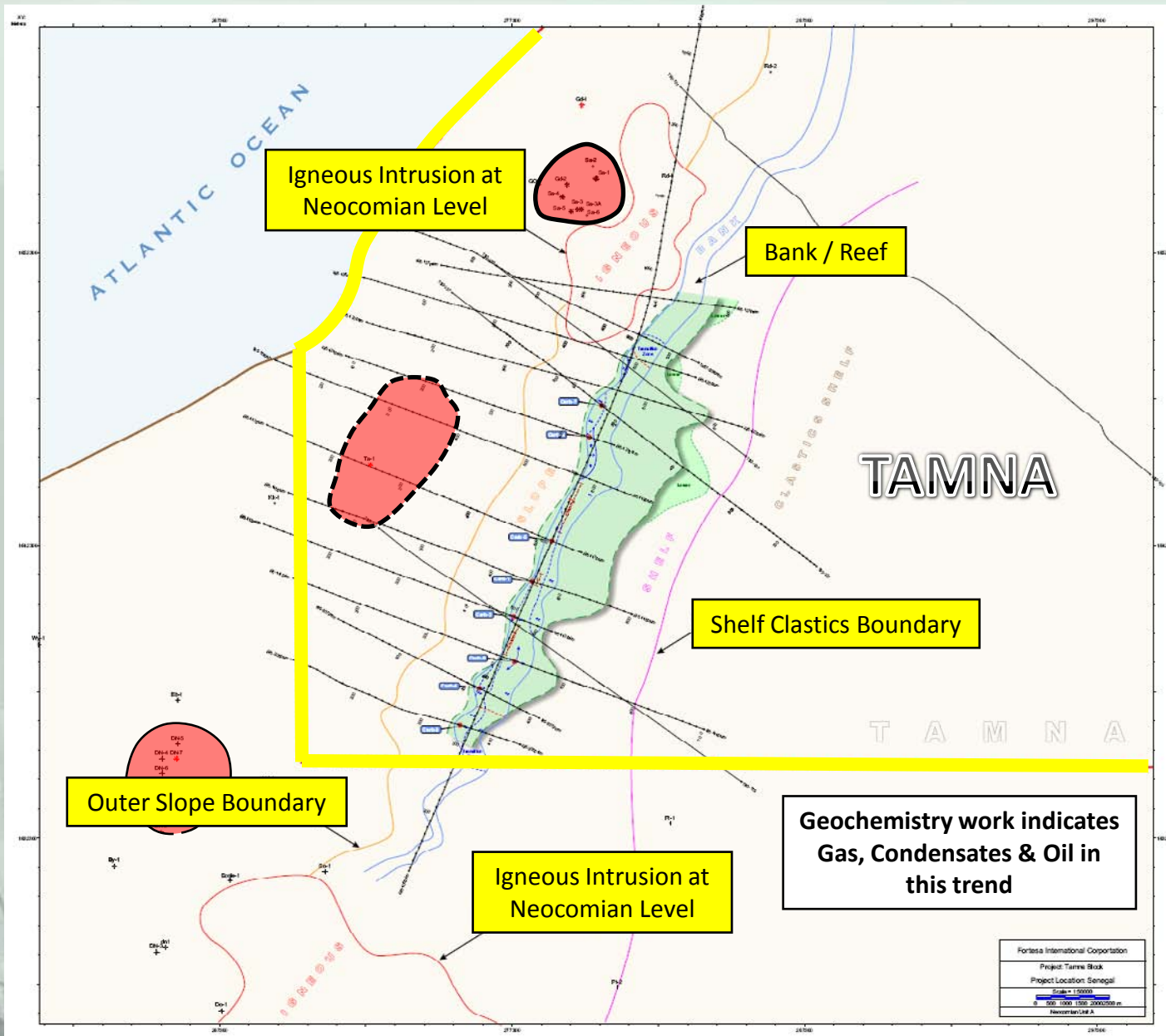
- Seismic Section Depicting Panuke Analog to Tamna



# Carbonate Trend with Seismic Lines

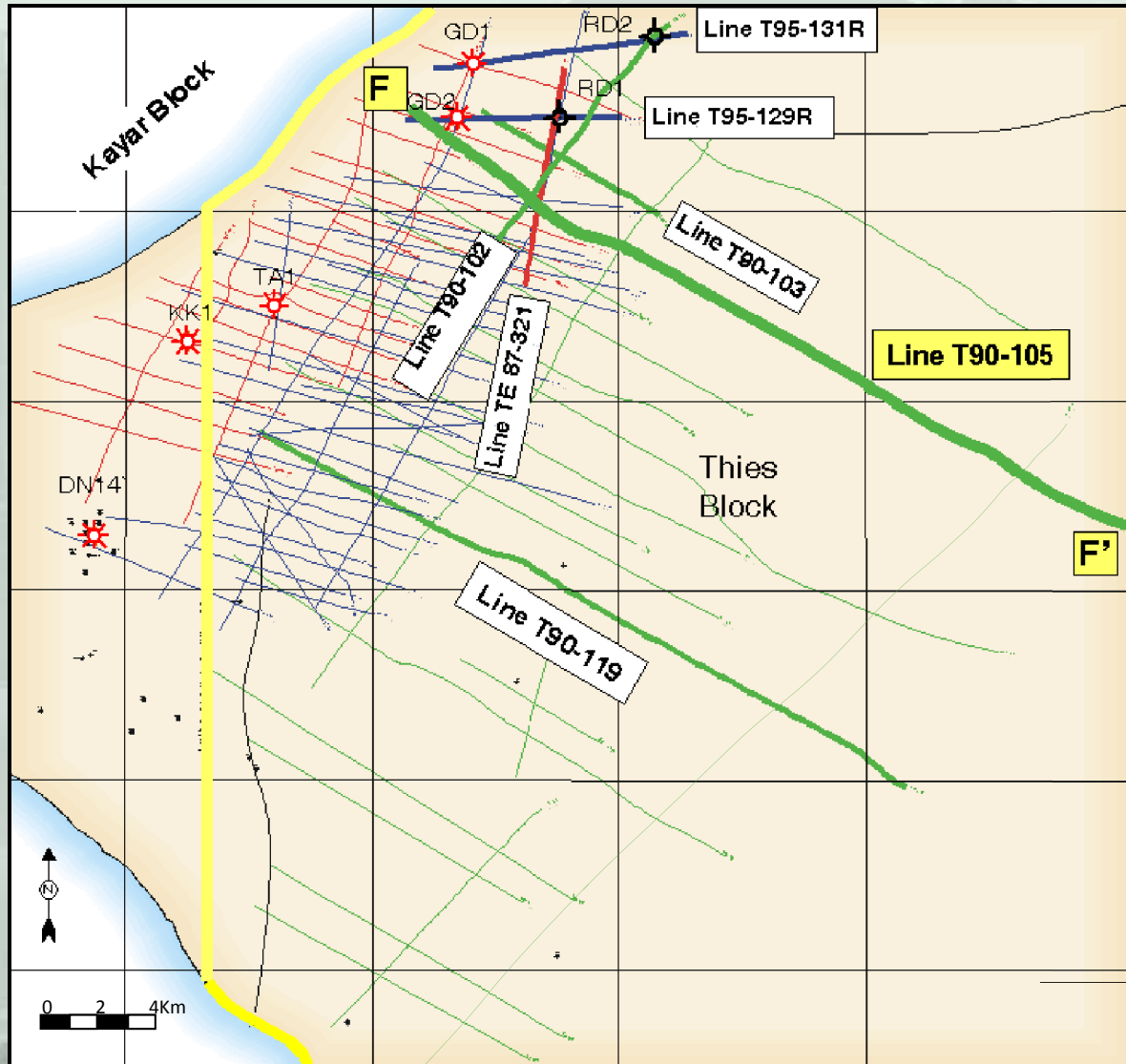


# Map of Upper Neocomian- Carbonate Formation Top



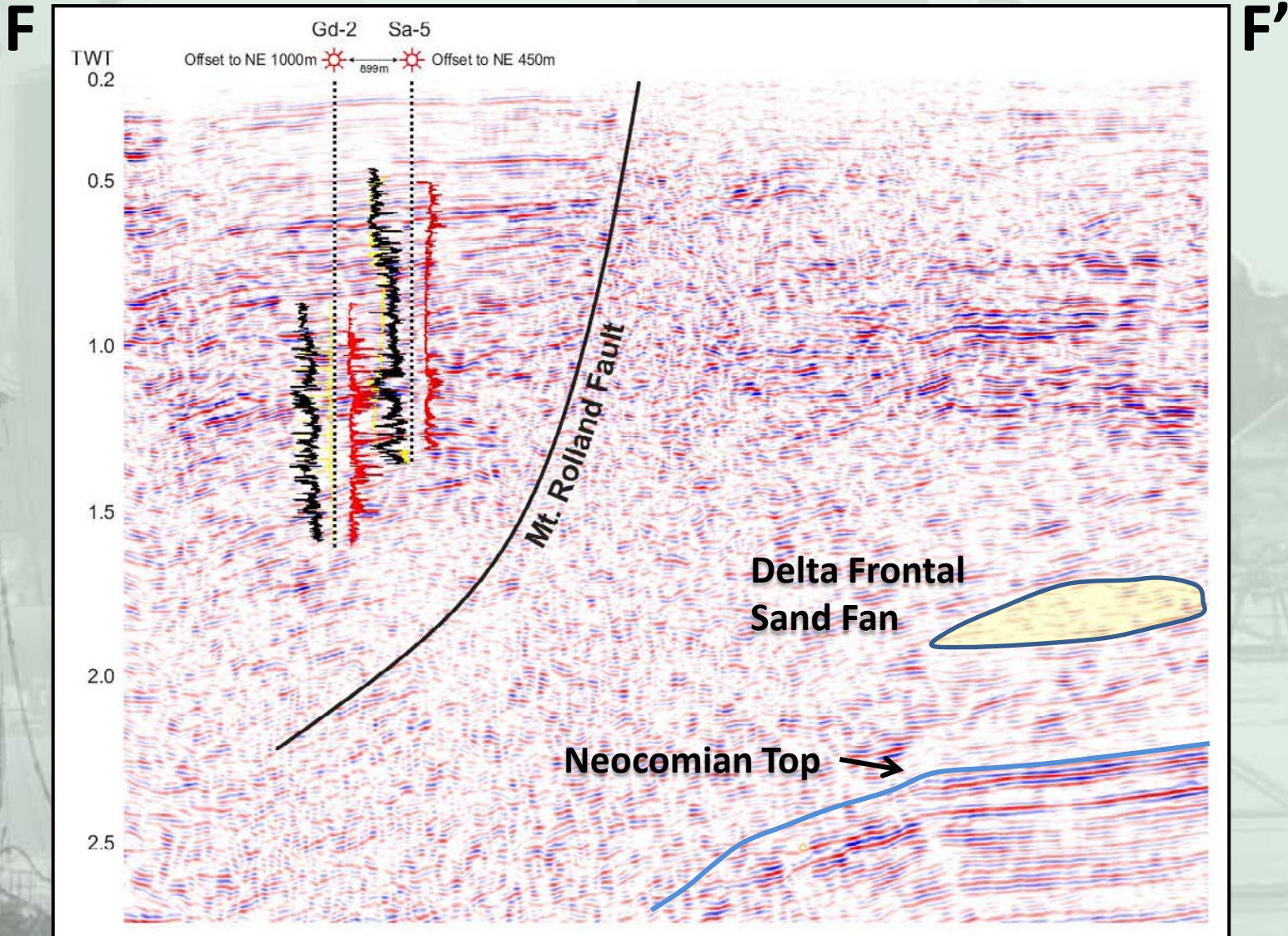
# Frontier Play: Carbonate Shelf – Seismic Evidence

- Gadiaga to Shelf Edge
  - Seismic Line Location Map indicating Profile F – F' (Line T95-105)

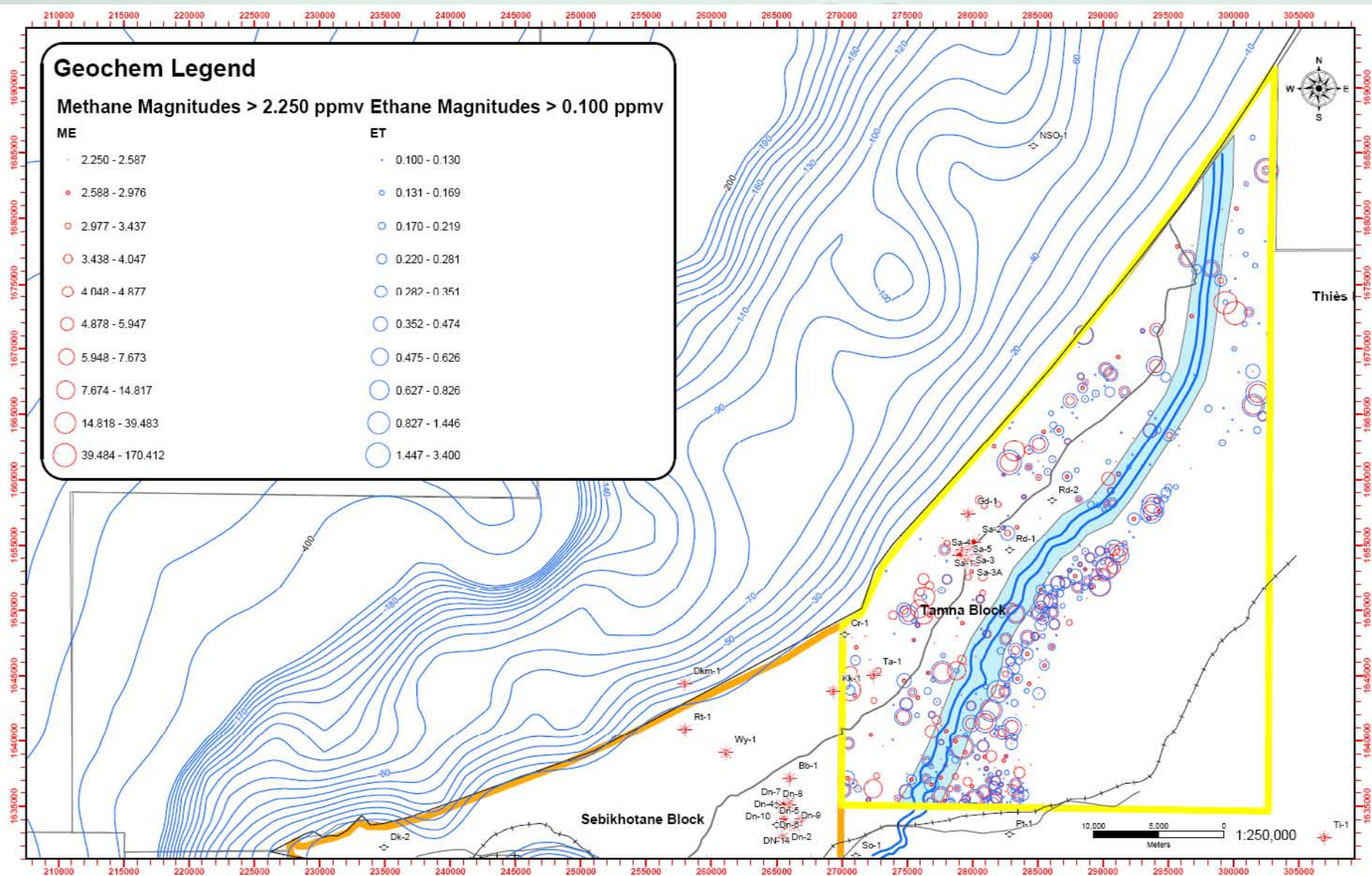


# Frontier Play: Carbonate Shelf – Seismic Evidence

- Gadiaga to Shelf Edge
  - Onshore Seismic Line T90-105 Through Proposed Gadiaga-3 Location



# Frontier Play: Carbonate Shelf – Surface Geochemical



# Conclusions

- Super-Giant Oil System Proven
  - Dome Flore > 1 BBO
- High TOC in Early Cretaceous Source Rocks
  - DSDP-367 (28%, 9%) Throughout DW Offshore
- Good Seals in the Senonian Sand Sequences
- Not Seen are Typical Large Structural Closures
- Structures Originate from Listric Faulting
- Many Stratigraphic Traps from Channel-Head Sands and Delta-Front Sands Possible
- GAS is OK with Local Market Appreciation
- Carbonate Shelf-Related Plays have high potential for Oil and Condensates as well