Exploring the Missing Blind Zone in the Gulf of Mexico Shelf*

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Abstract

While onshore unconventional resources capture the headlines of supporters and rejectionists, an underexplored zone of low risk potential resources, on the shelf of the Gulf of Mexico (GOM) should be considered as another optimum choice. The abundance of geological, geophysical, engineering and infrastructure data and facilities on the shelf can make this missing zone a high exploration potential target.

Historically, finding hydrocarbons started early by mapping structures via well correlations. In the last five decades, seismic mapping, including attributes such as bright spots, DHI, AVO, etc., became the tools for assessing potential prospects. However, seismic represents the response of acoustic waves to the subsurface litho-hydrogeology and occasionally to the hydrocarbon fluid contents. At the geopressure transition zone, shale and sand velocities cross over, and reflectivity becomes very weak and cannot be recognized on the seismic stacking velocity (PSTM) lines (i.e. blind spot). However, this zone represents more than 50% of the early offshore shelf discoveries since the 1950's.

Non-seismic methods of assessing, delineating and mapping this zone are introduced in this article. The concept of integrating the regional maximum flooding surfaces (MFS) and the top of geopressure (TOG) in a mappable fairways fashion is the foundation of this technique. The "Strat-Geopressure Fairway" represents the spatial belt surrounding the interception's contours where stratigraphic top (MFS) and TOG are met. Incorporating the established producing horizons (from the offset wells) to these fairways provides an essential fast-track tool for pre-drilling appraisal of a play concept, lead and prospect. Moreover, it identifies the underexplored leads and untapped exploration targets. It also delineates the drilled bypassed pay zones and potential reservoirs and sheds light on areas of potential deeper exploration and exploitation of secondary targets. Furthermore, it defines casing and mud-weight programs for further drilling on the offset structural segments on any potential prospect. This method can be applied worldwide in any mature clastic basin.

Selected References

Shaker, S., 2009, Velocities Crossover Due to Geopressure: Implication to AVO Assessment: 2009 SEG Annual Meeting, 25-30 October, Houston, Texas.

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27-28 January 2015

Exploring the Missing Blind Zone in the GOM Shelf

Selim Simon Shaker

Geopressure Analysis Services

G.A.S.

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- MICRO-STRAT INC
- Fairfield Industries
- MMS (now is BOEM. Gov)
- AAPG

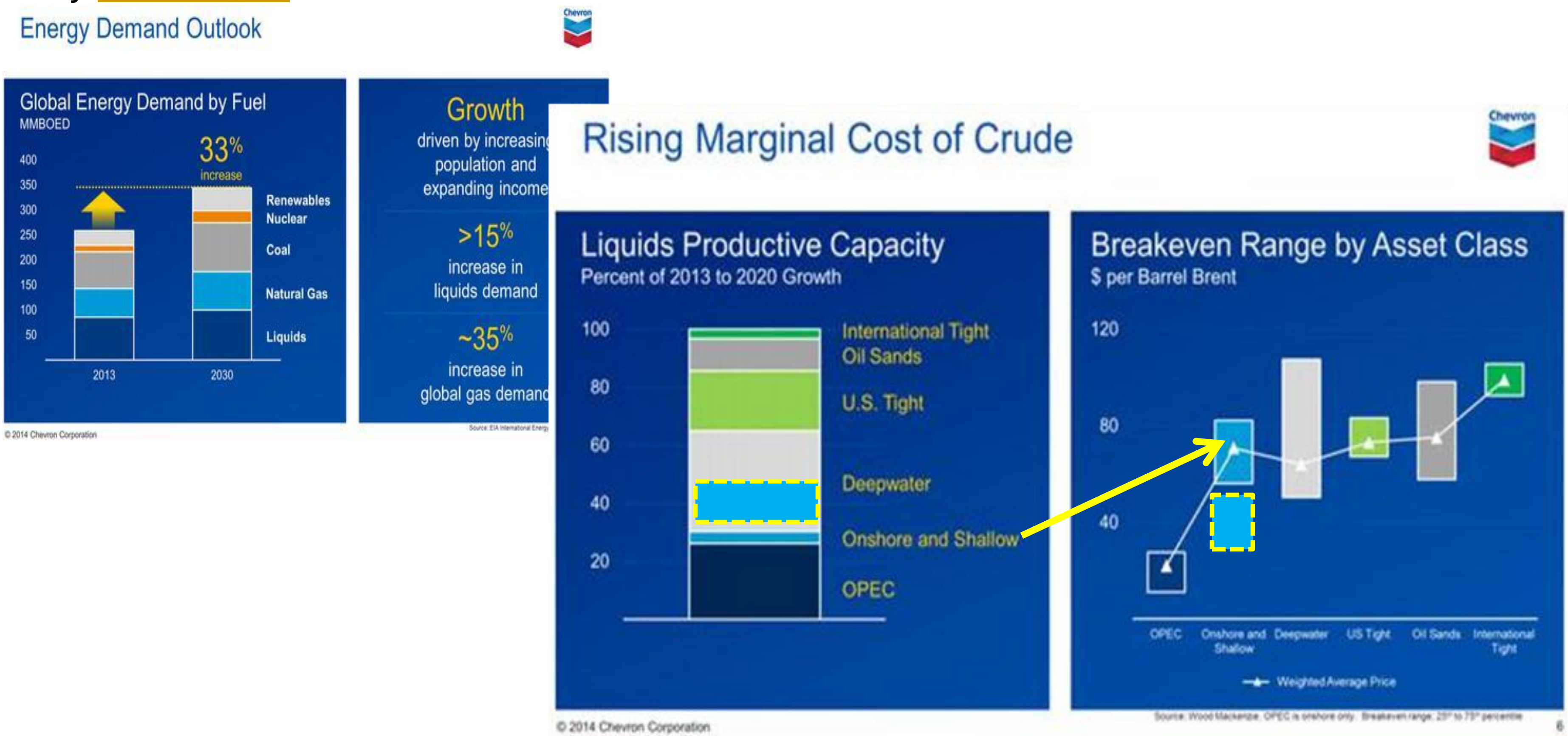
Objective is to explore the underexplored trends in semi-mature areas

Outlines:

1. Some of the hydrocarbon discoveries are unintentionally found
2. Seismic sometimes does not represent the true subsurface geology
3. Why there is a seismic blind zone
4. How can the integration of geology and geopressure mitigates for this blind zone
5. How pore pressure profile can assess for AVO
6. Delineating risk and reduce the marginal cost

Before Freaking Out Over Plunging Oil Prices Remember These Charts

By Matt DiLallo



Expansion due to exploring the blind zone

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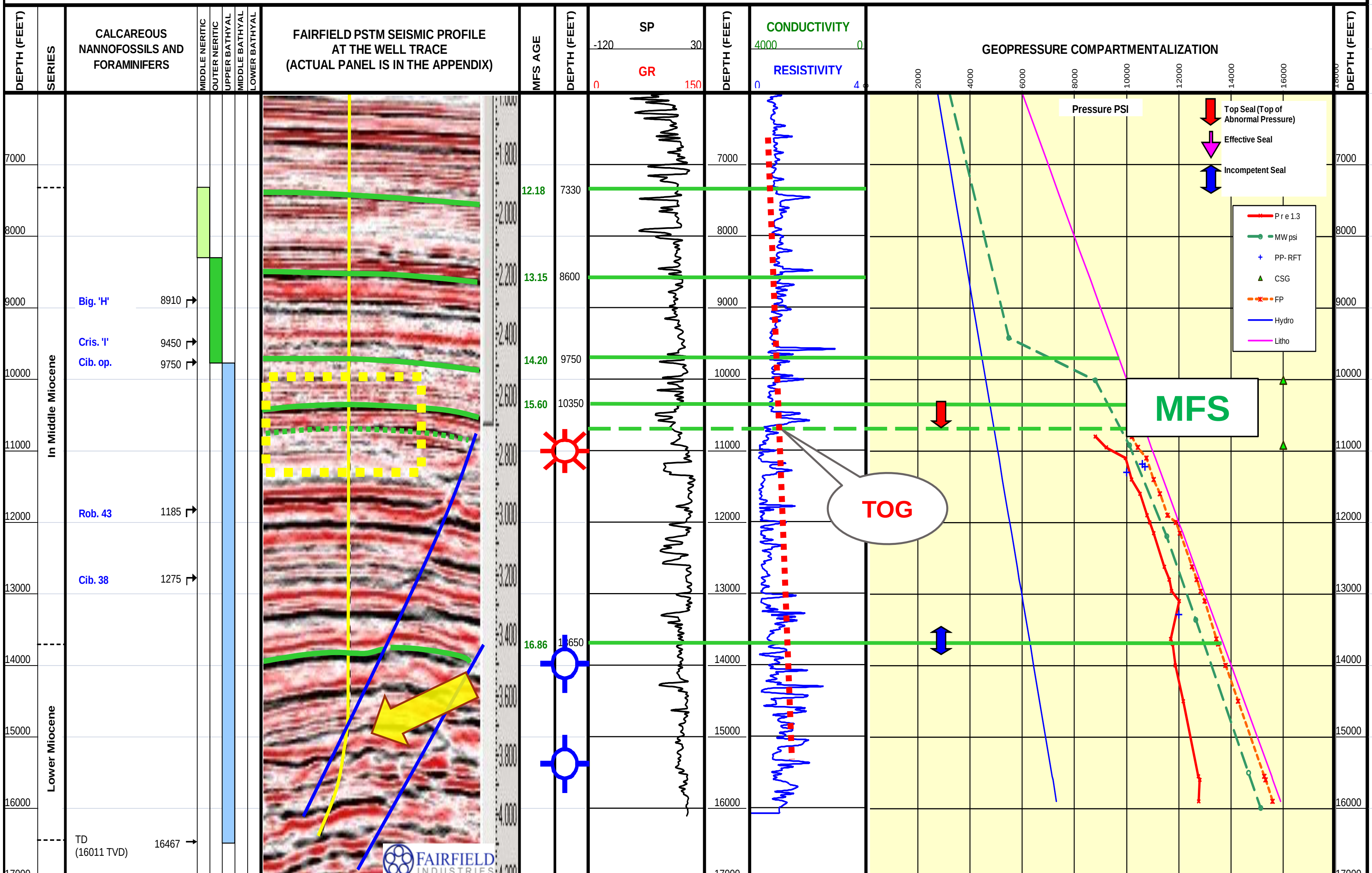
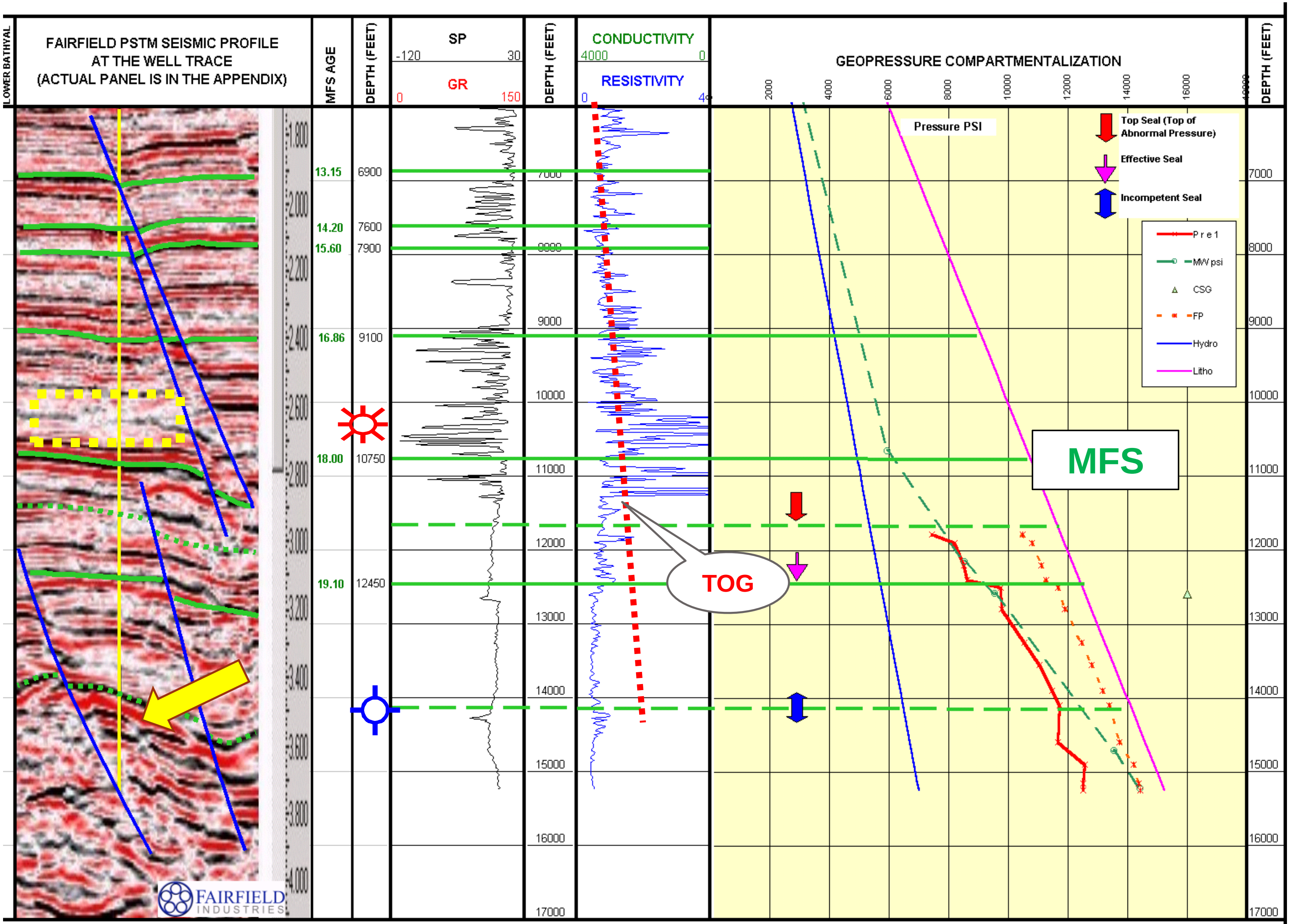
TENNECO OCS-G- #1 WELL, EAST CAMERON BLOCK , GULF OF MEXICO



The Relationship between Sequence Stratigraphy, Seals and Geopressure Compartmentalization as an Essential Exploration, Exploitation and Drilling Tool



Sequence Stratigraphy, Seals and Geopressure Compartmentalization as an Essential Exploration, Exploitation and Drilling Tool

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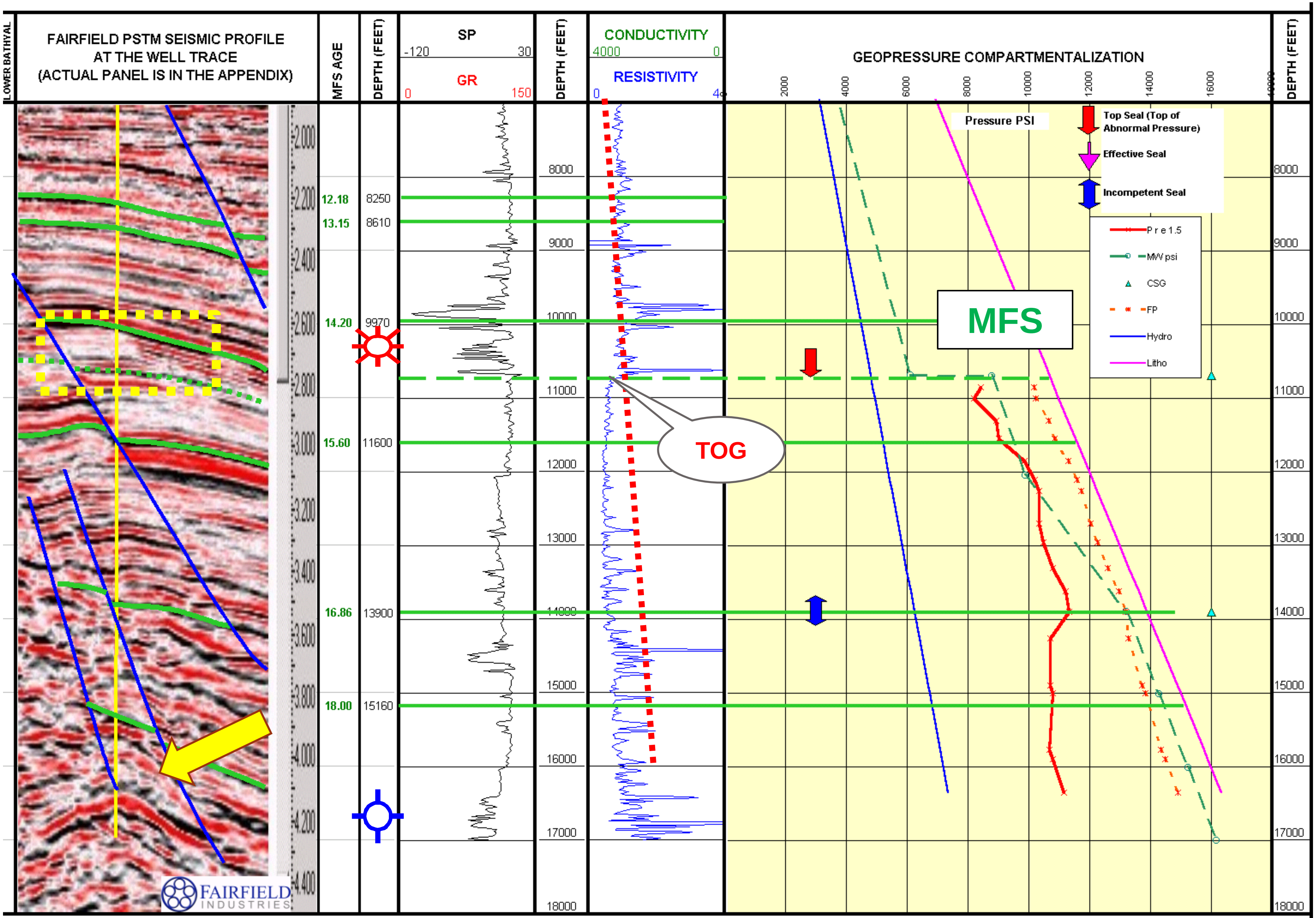
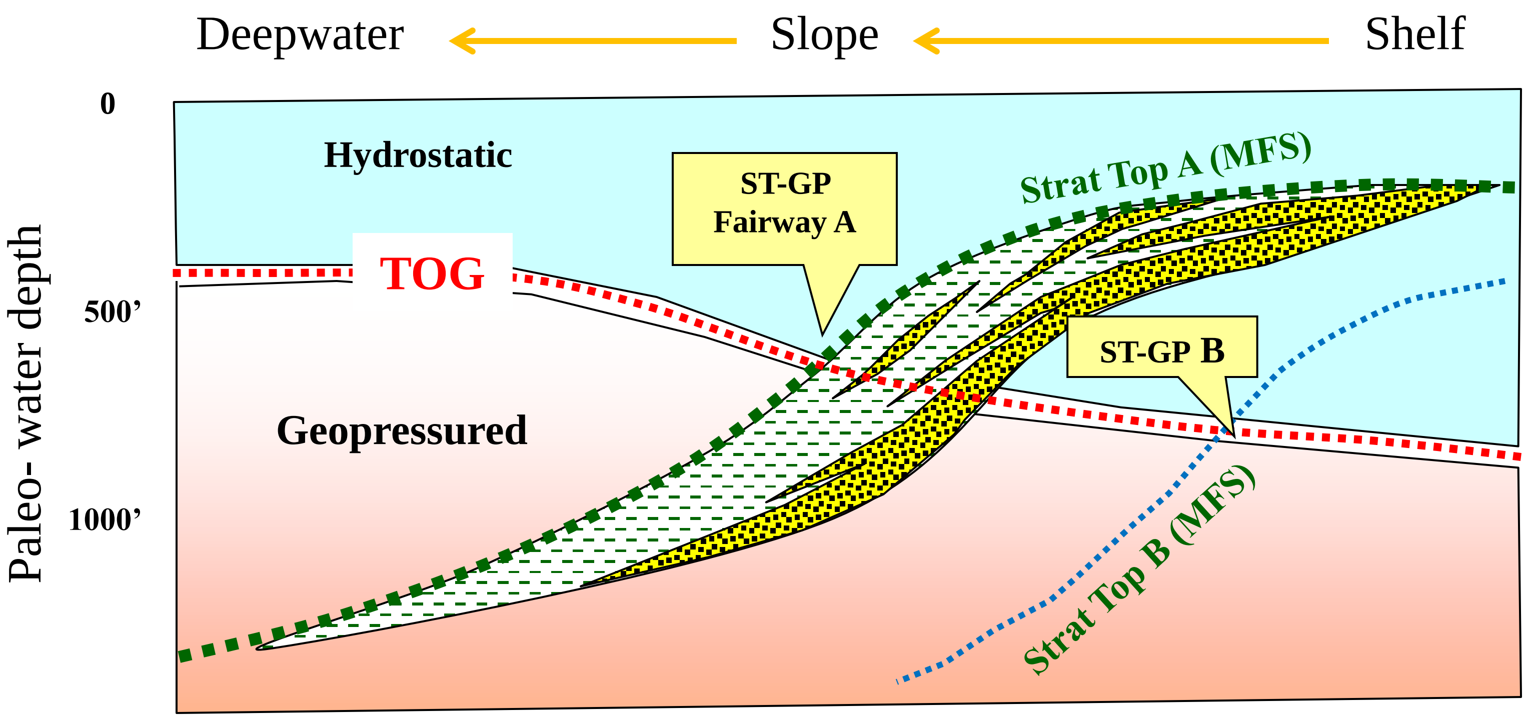


Sequence Stratigraphy, Seals and Geopressure Compartmentalization as an Essential Exploration, Exploitation and Drilling Tool

The Strat-Geopressure (ST-GP) Model

for a *specific* Stratigraphic Sequence



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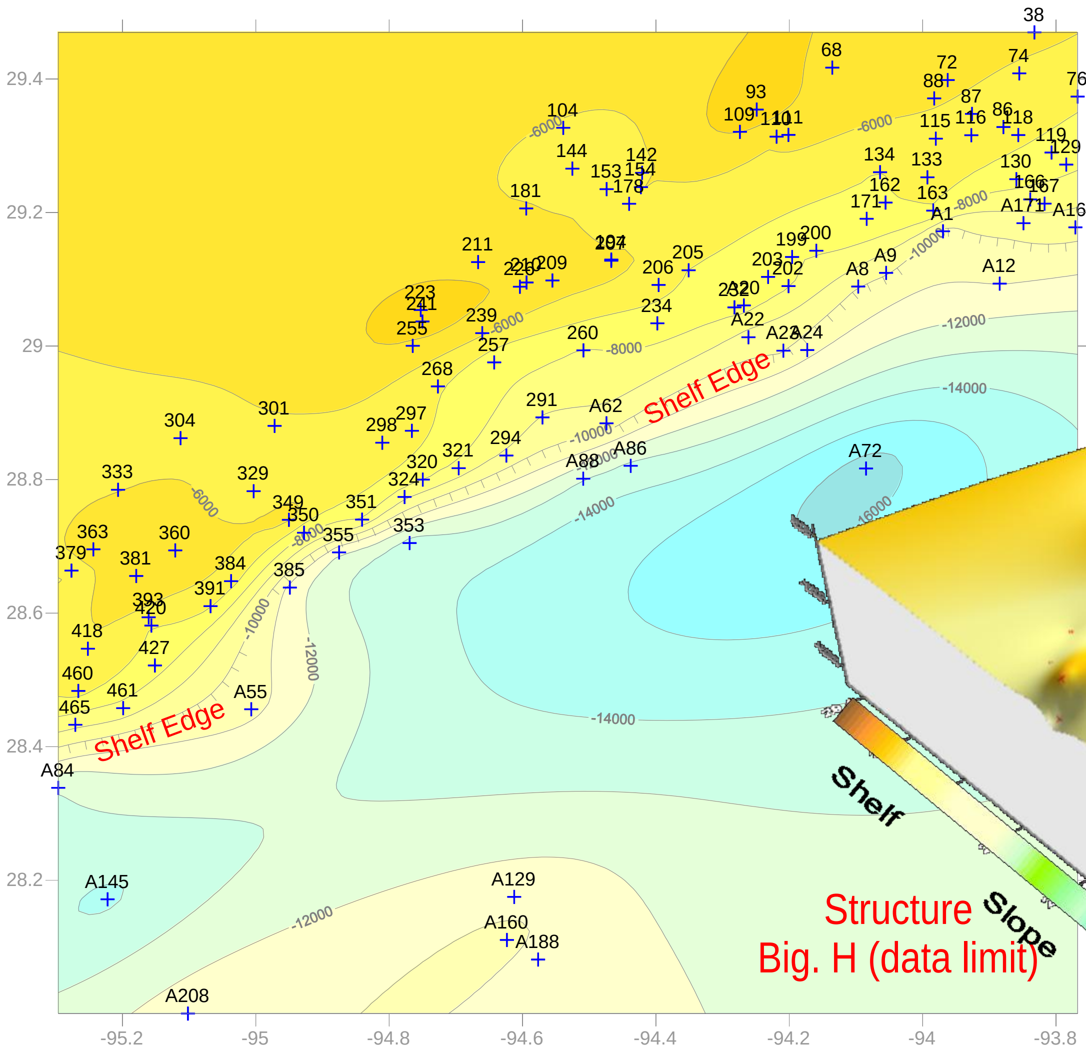
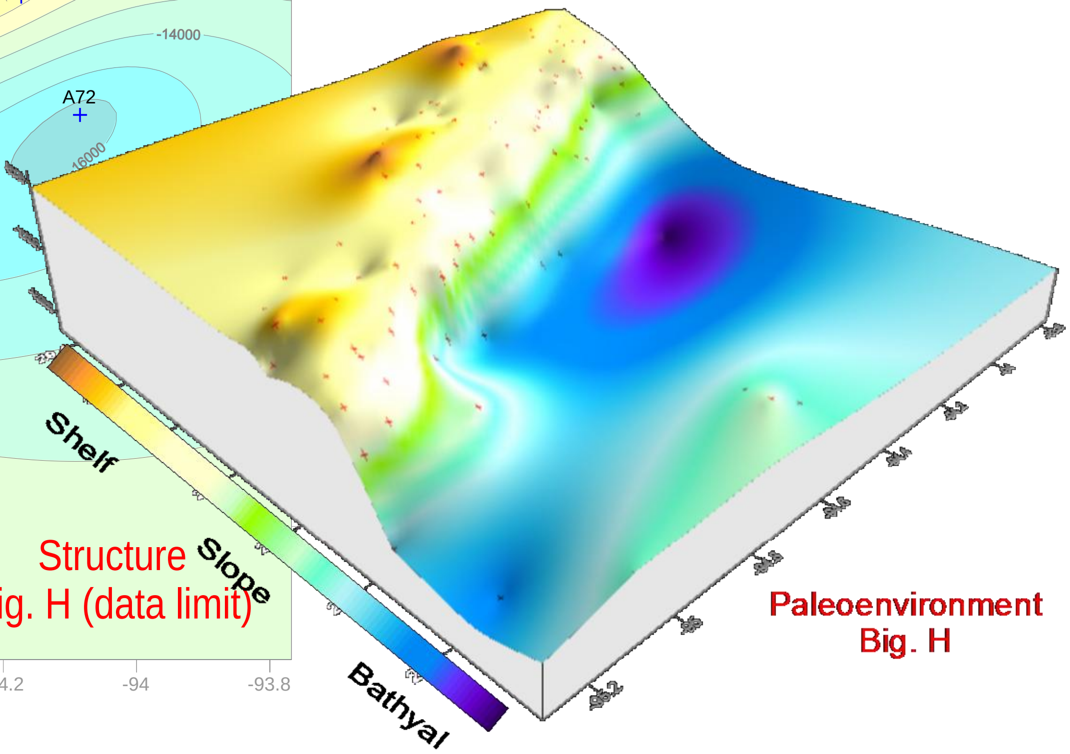
Map of MFS (maximum flooding surface) of a stratigraphic sequence





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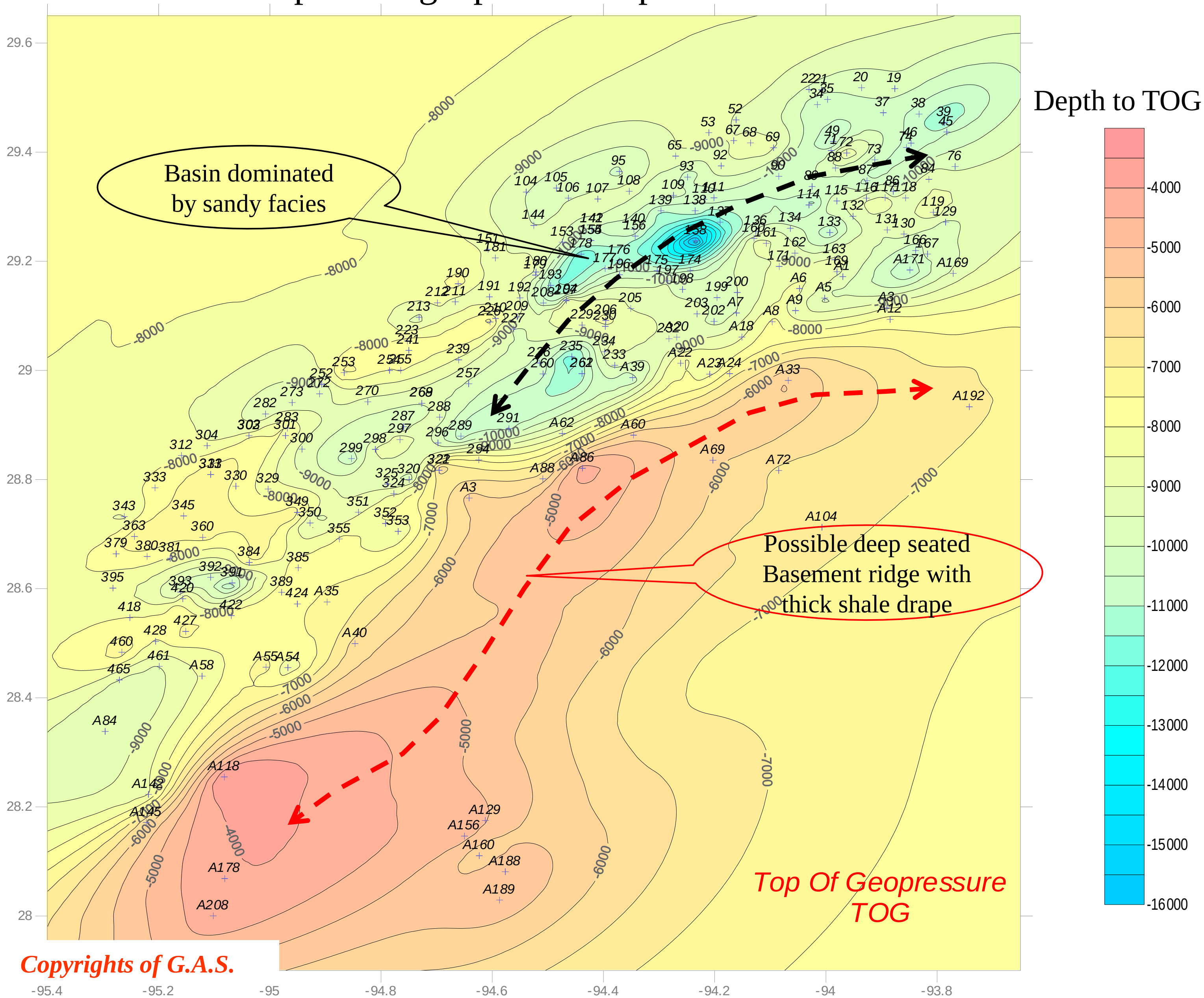
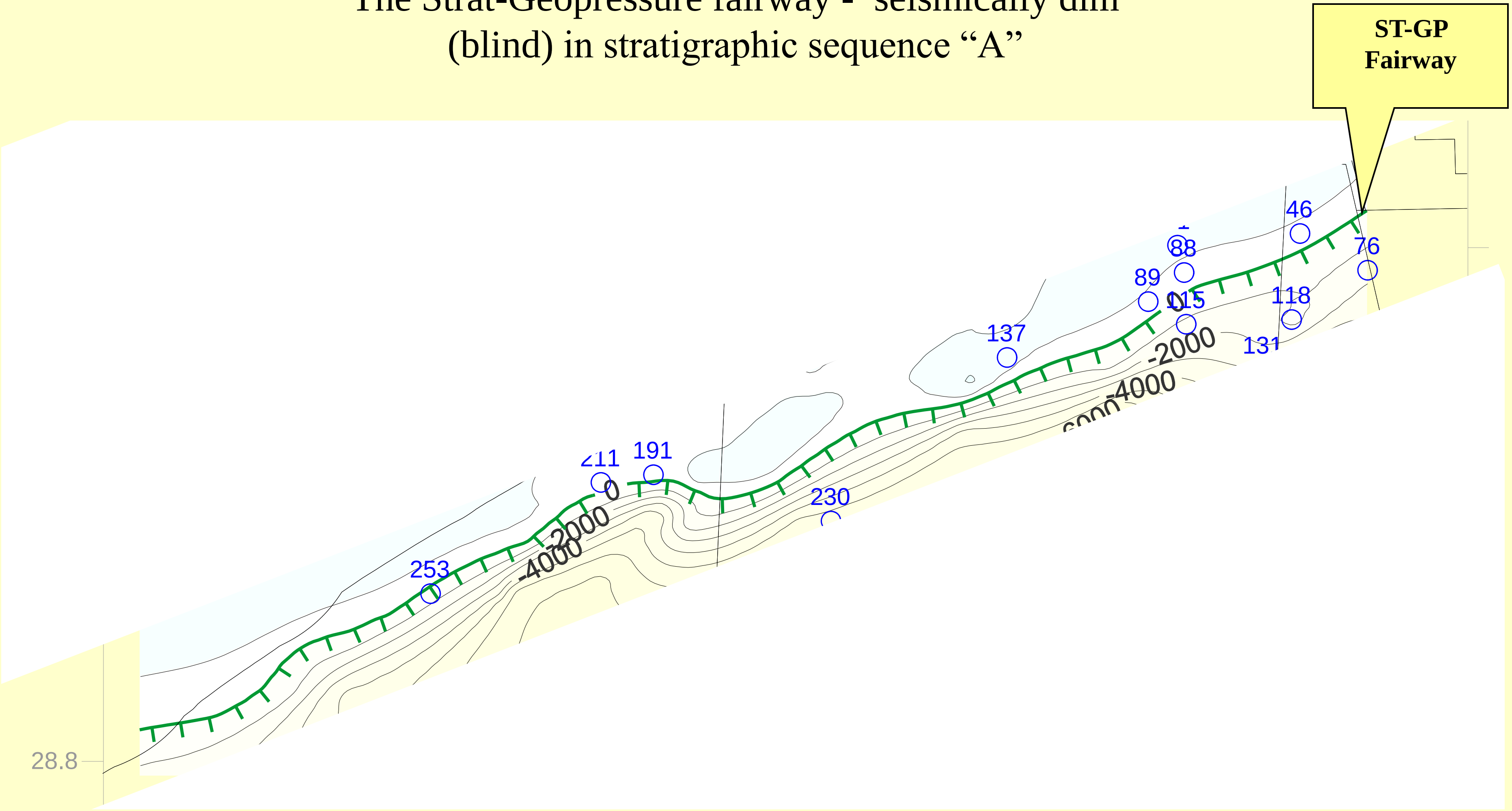
Map of the geopressure top in the area



The Strat-Geopressure fairway - seismically dim (blind) in stratigraphic sequence "A"



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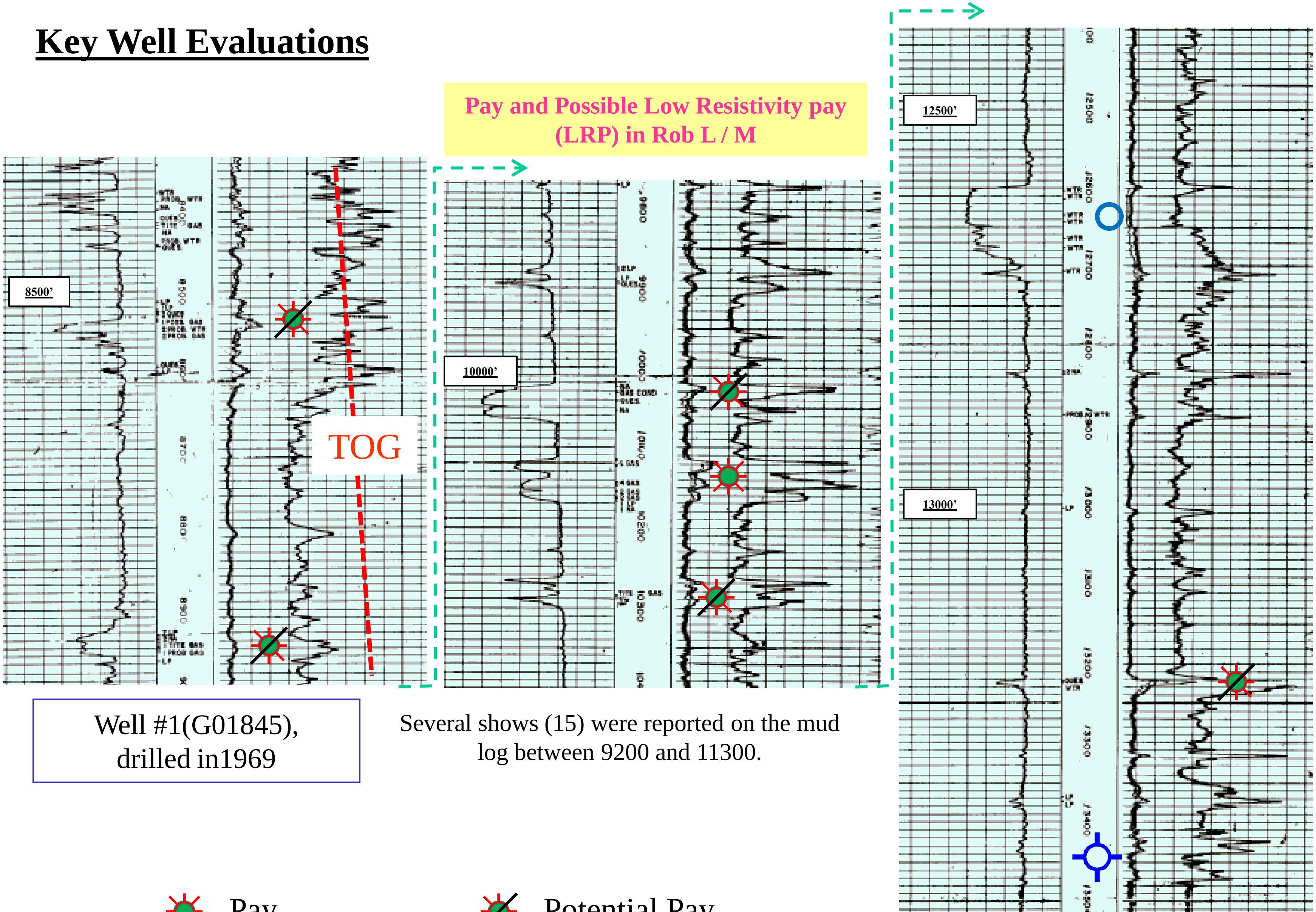
Key Well Evaluations



Well #1(G01845), drilled in1969

Several shows (15) were reported on the mud log between 9200 and 11300.

Potential Disc B reservoir and LRP

Pay

Potential Pay

Wet Reservoir

Tight

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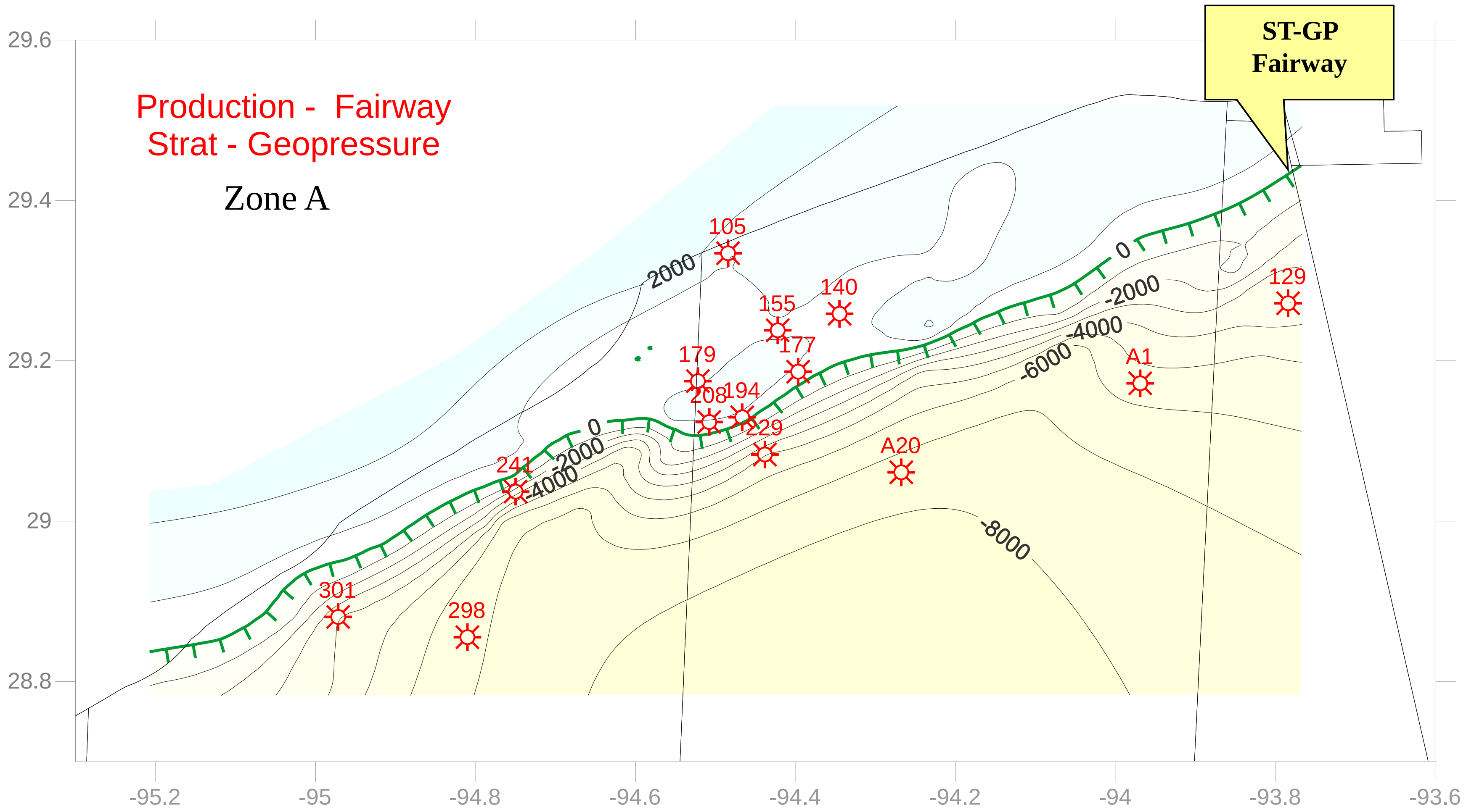

Production - Fairway
Strat - Geopressure
Zone A
ST-GP
Fairway
105
140
155
177
179
208
194
229
241
301
298
A20
A1
129
2000
0
-2000
-4000
-6000
-8000
29.6
29.4
29.2
29
28.8
-95.2
-95
-94.8
-94.6
-94.4
-94.2
-94
-93.8
-93.6

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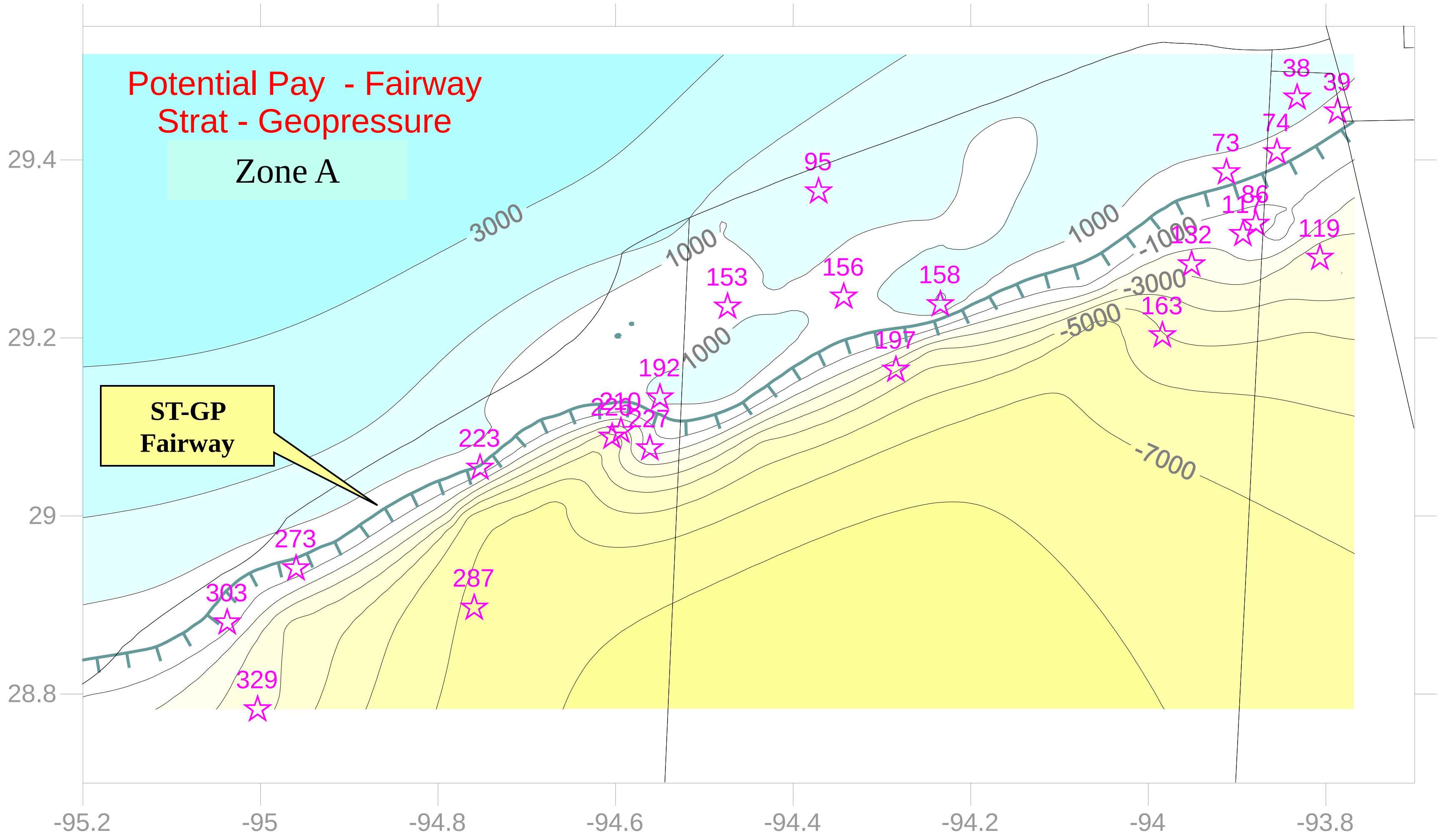

Potential Pay - Fairway
Strat - Geopressure
Zone A
ST-GP
Fairway
3000
1000
1000
1000
-1000
-3000
-5000
-7000
95
153
156
158
197
192
210
220
227
223
273
303
329
287
38
39
74
73
86
117
132
119
163
29.4
29.2
29
28.8
-95.2
-95
-94.8
-94.6
-94.4
-94.2
-94
-93.8

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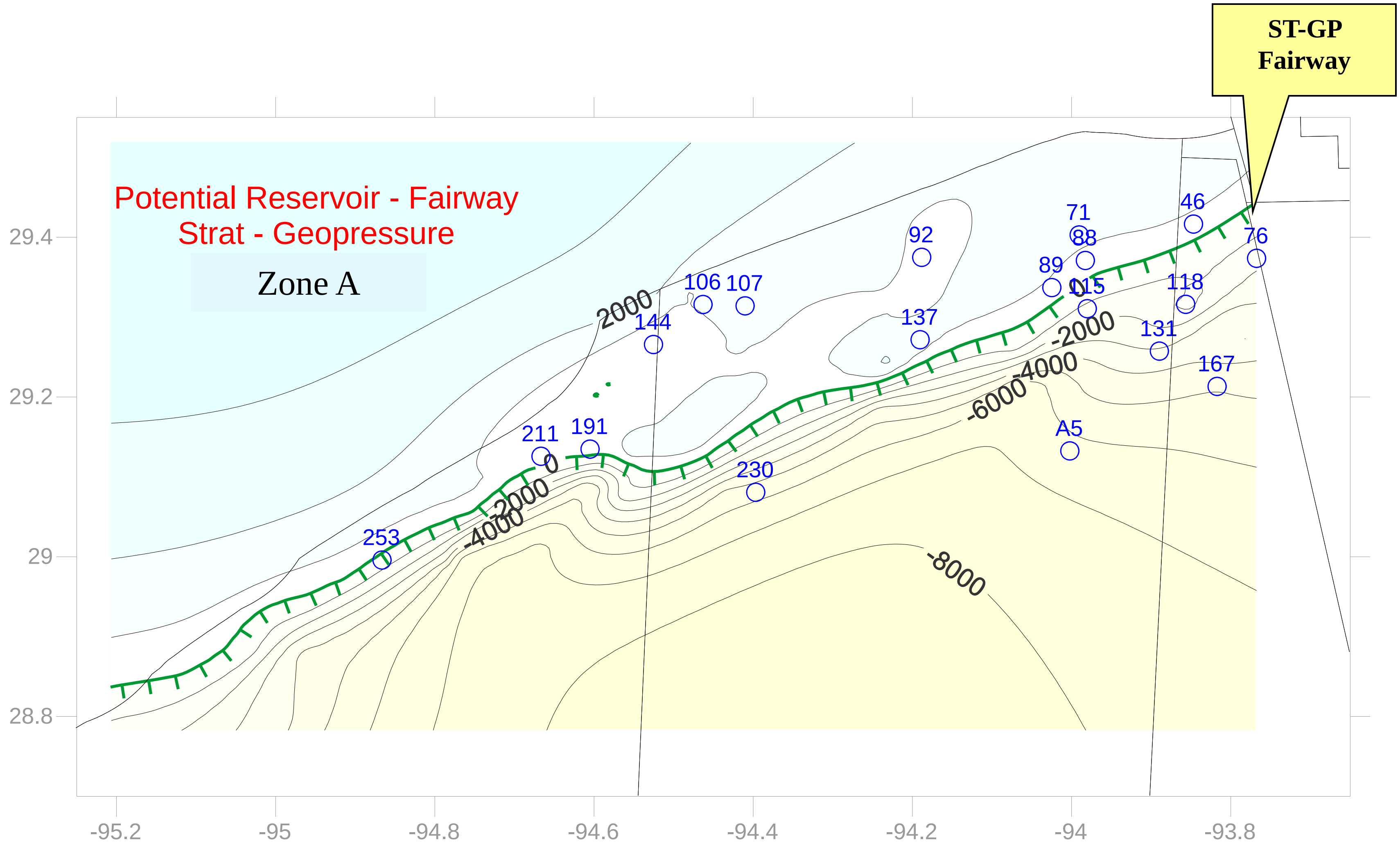

Wet sand that can be potential reservoirs in up dip structural segments.

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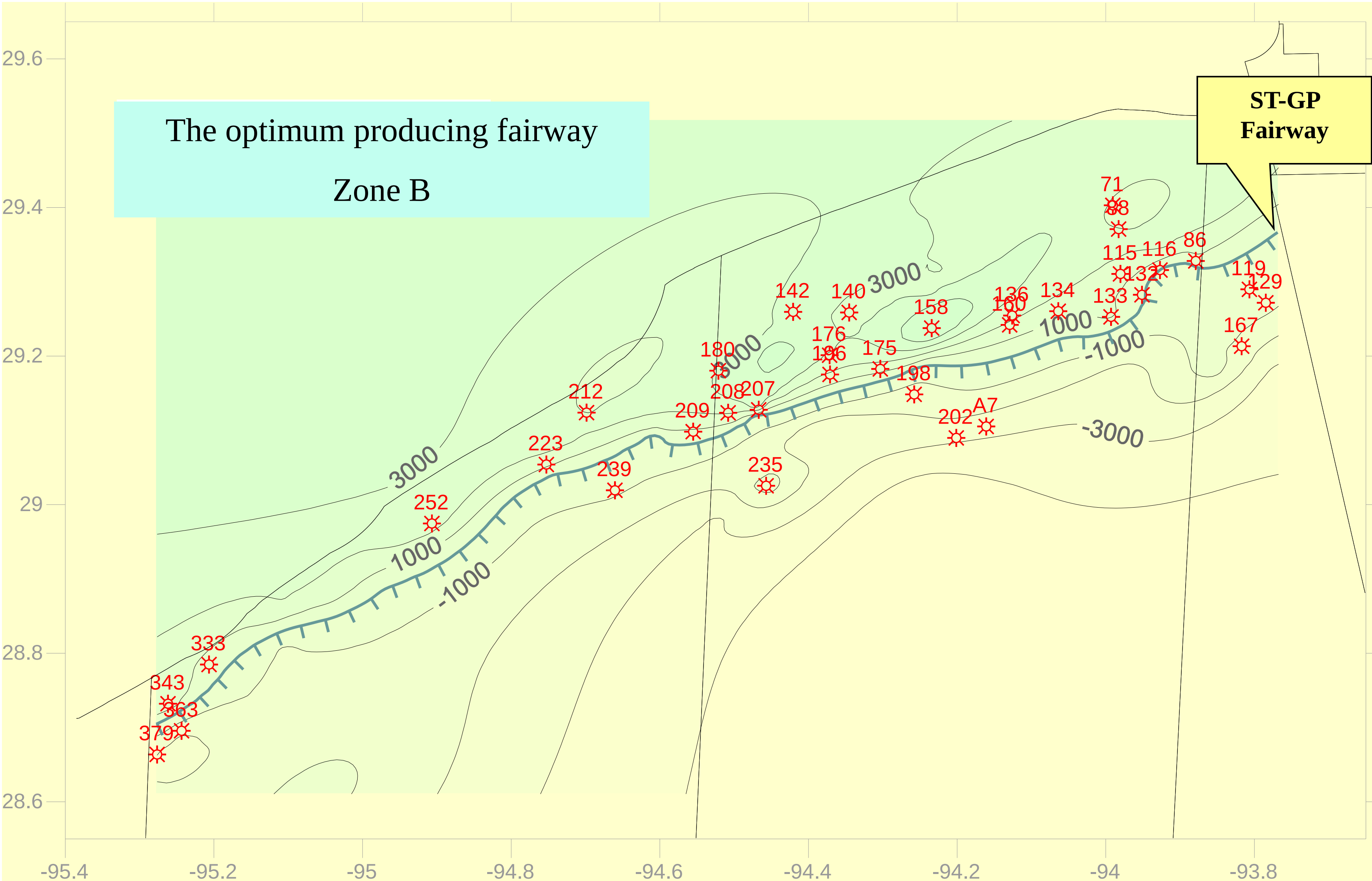
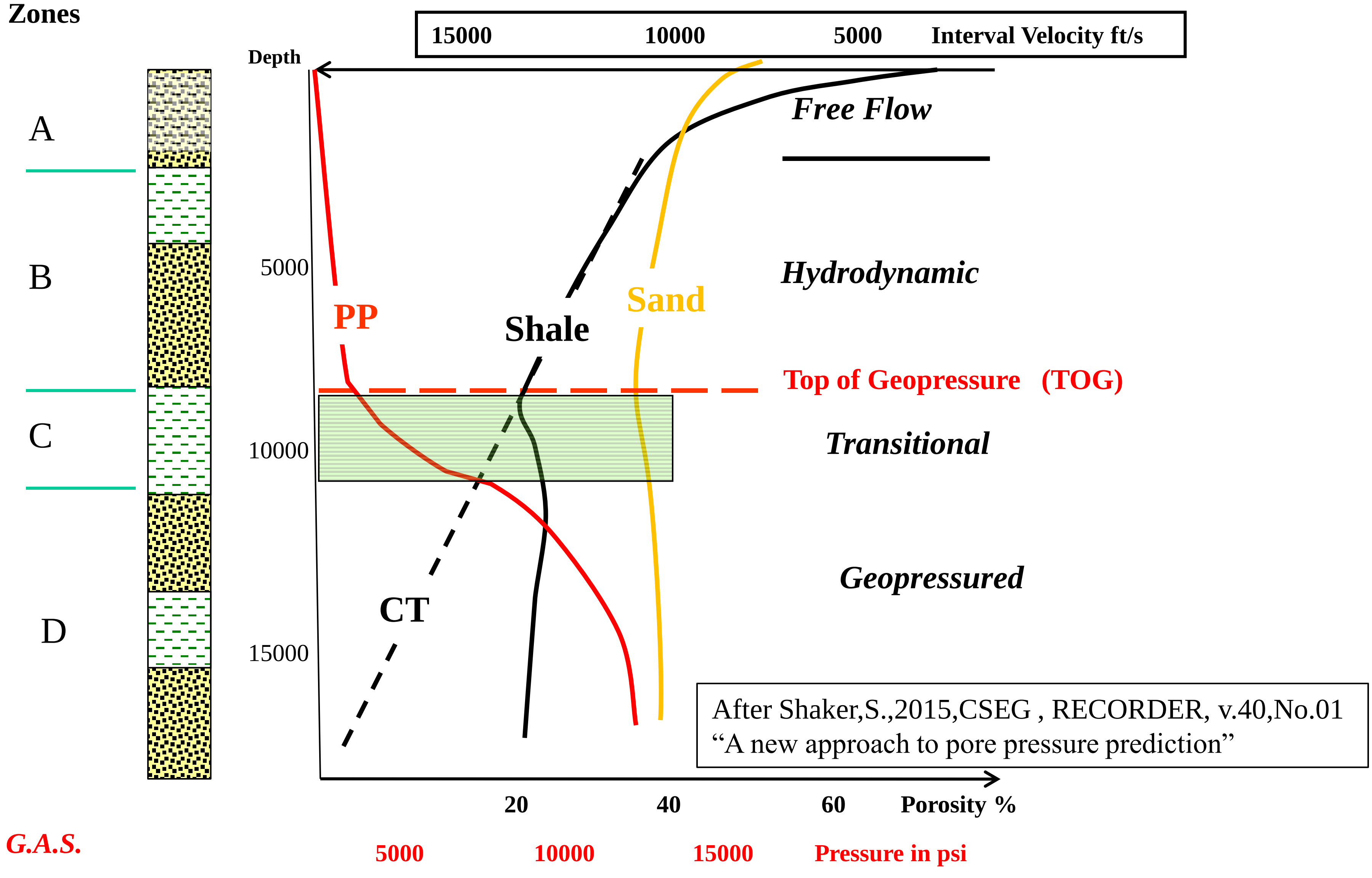


The optimum producing fairway
Zone B
ST-GP Fairway
29.6
29.4
29.2
29
28.8
28.6
-95.4
-95.2
-95
-94.8
-94.6
-94.4
-94.2
-94
-93.8
3000
1000
-1000
-3000
71
115
116
86
119
129
132
133
134
167
142
140
158
175
198
202
A7
180
207
208
209
212
223
235
239
252
333
343
379

So, Why this zone is Blind (Dim) especially if it is charged with hydrocarbon ?

Relation of *sand vs. shale velocities* (porosity index) / burial depth and pore pressure



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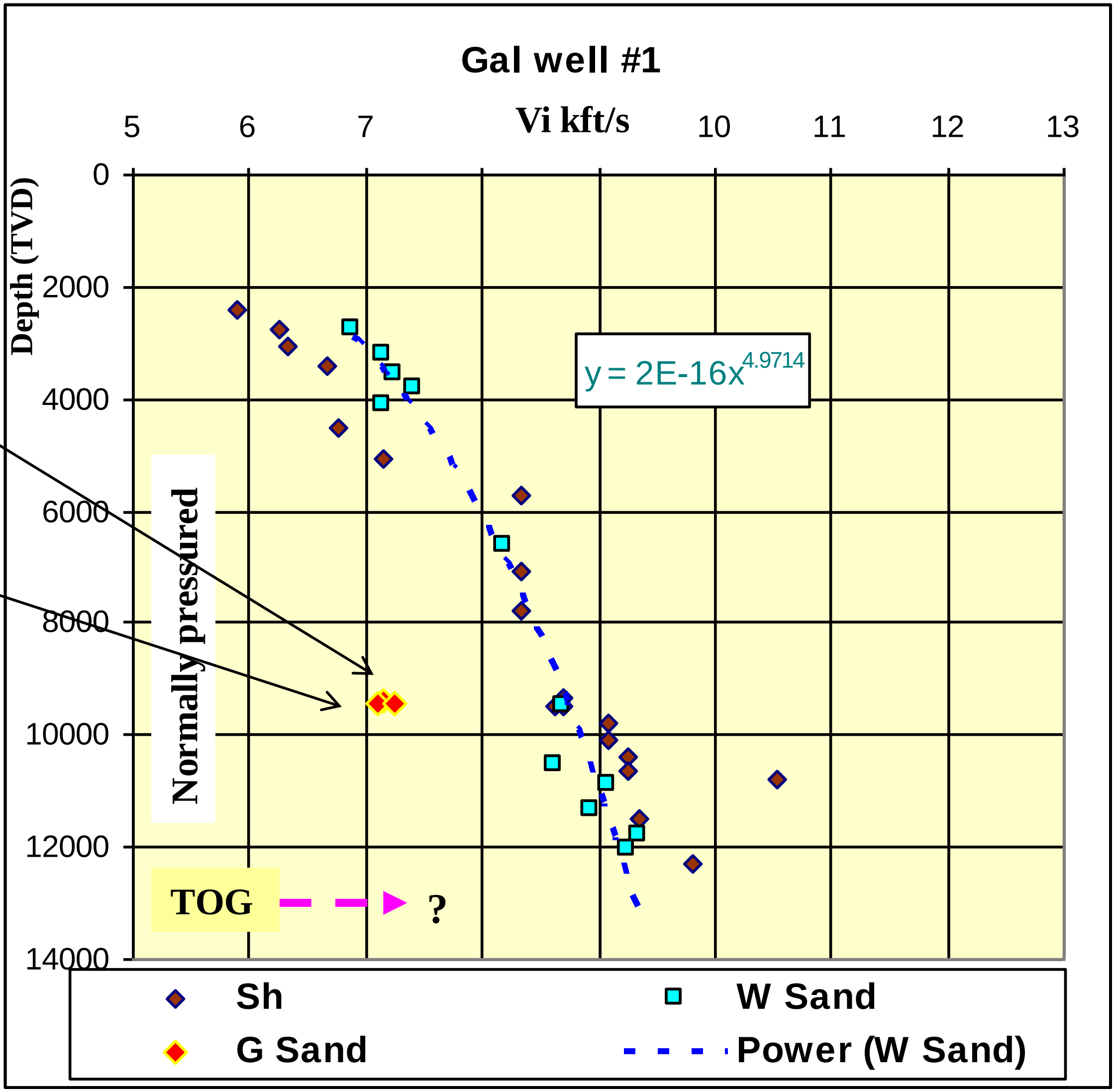
Velocity relationship between wet sand – gas sand and shale
ABOVE TOG



Velocity slower in Gas sand relative to shale (above TOG)

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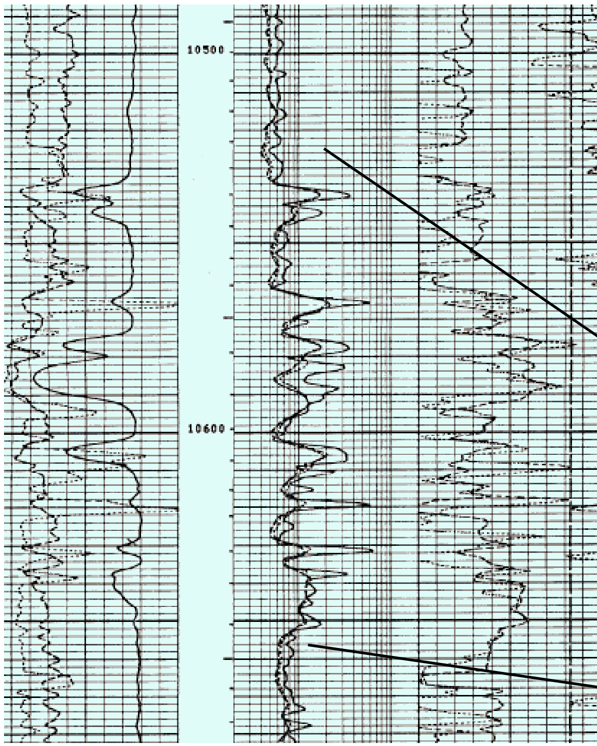
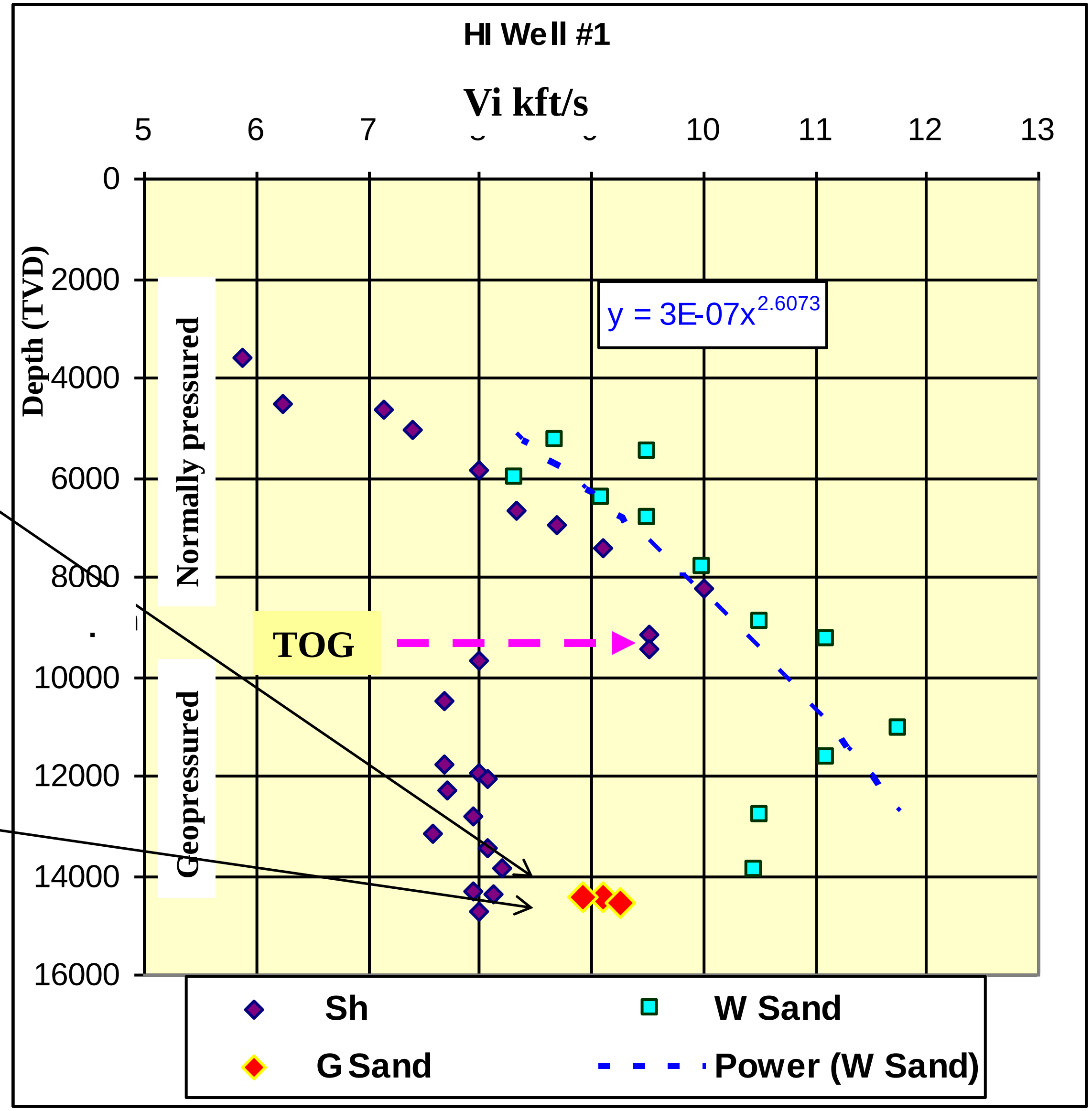
After Shaker, S. 2009. SEG annual meeting

Velocity relationship between wet sand – gas sand and shale
BELOW TOG





Velocity faster in Gas sand relative to shale (**below** TOG)

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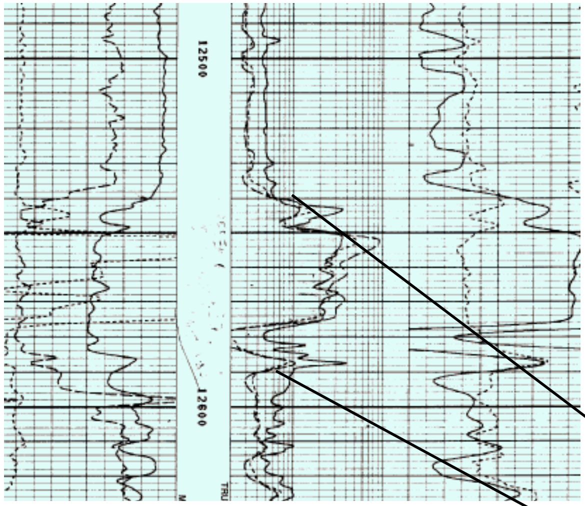
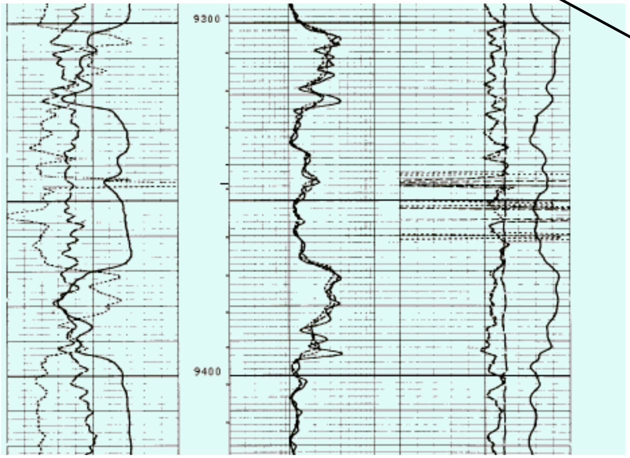
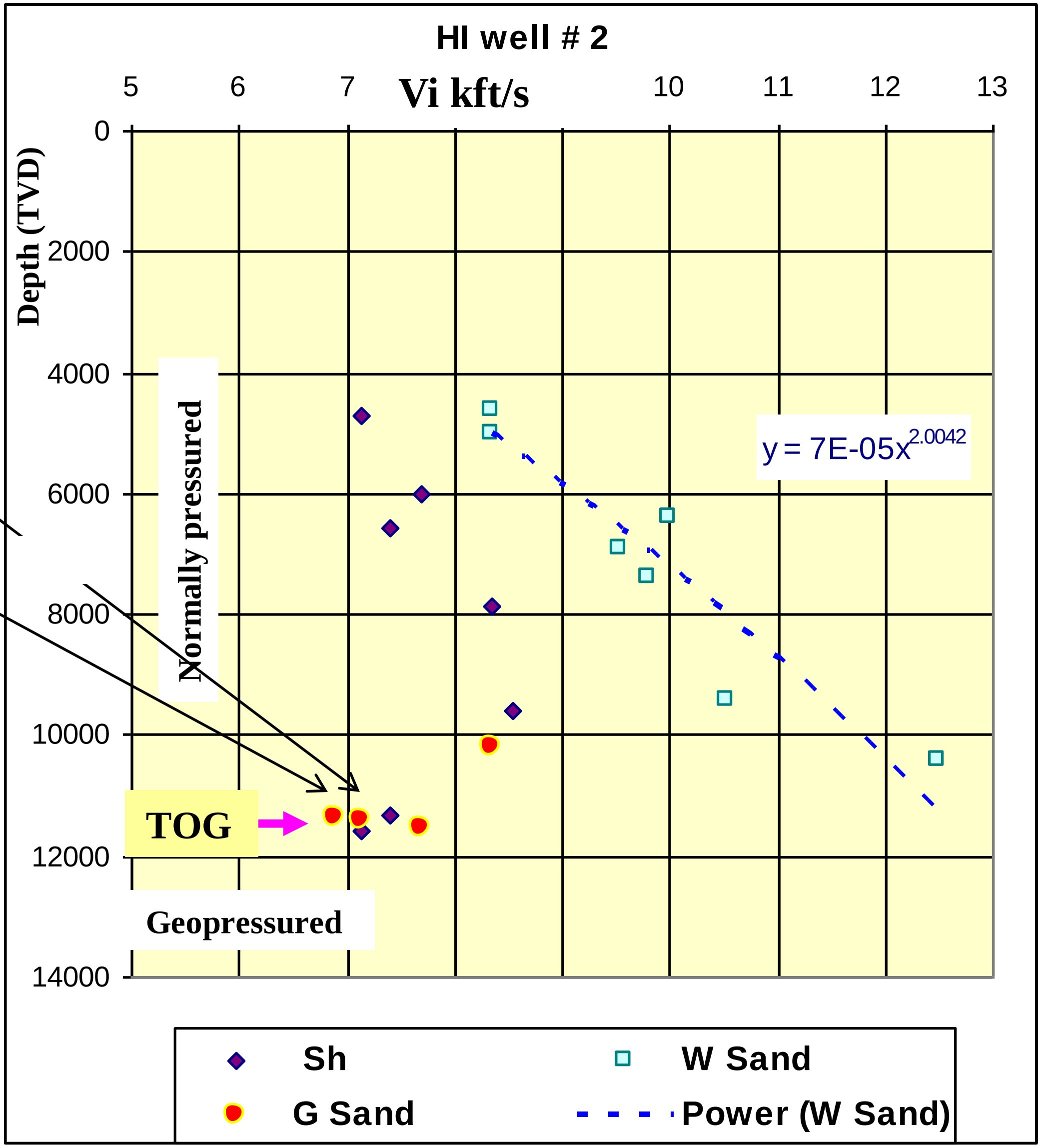
Velocity relationship between wet sand – gas sand and shale WITHIN TOG zone





Velocities in the gas sand and shale are in proximity at the TOG zone



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The seismically blind (dim) zone

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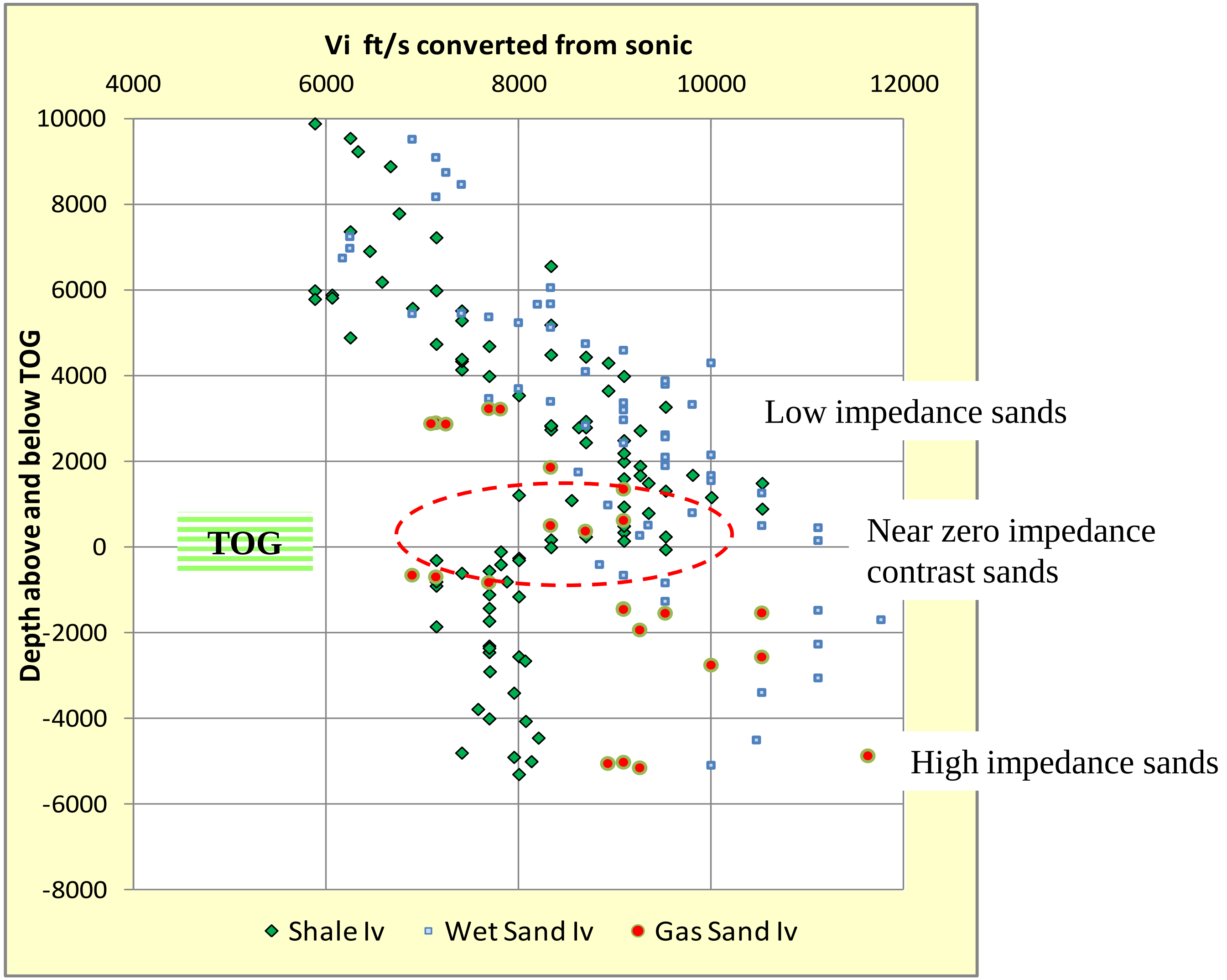
Possible correlation between AVO classes and velocities crossover at zero offset (well location)



Data from several wells in offshore Galveston, High Island and West Cameron areas.
Notice the shale and the gas sand velocities crossover at the Top of Geopressure zone.

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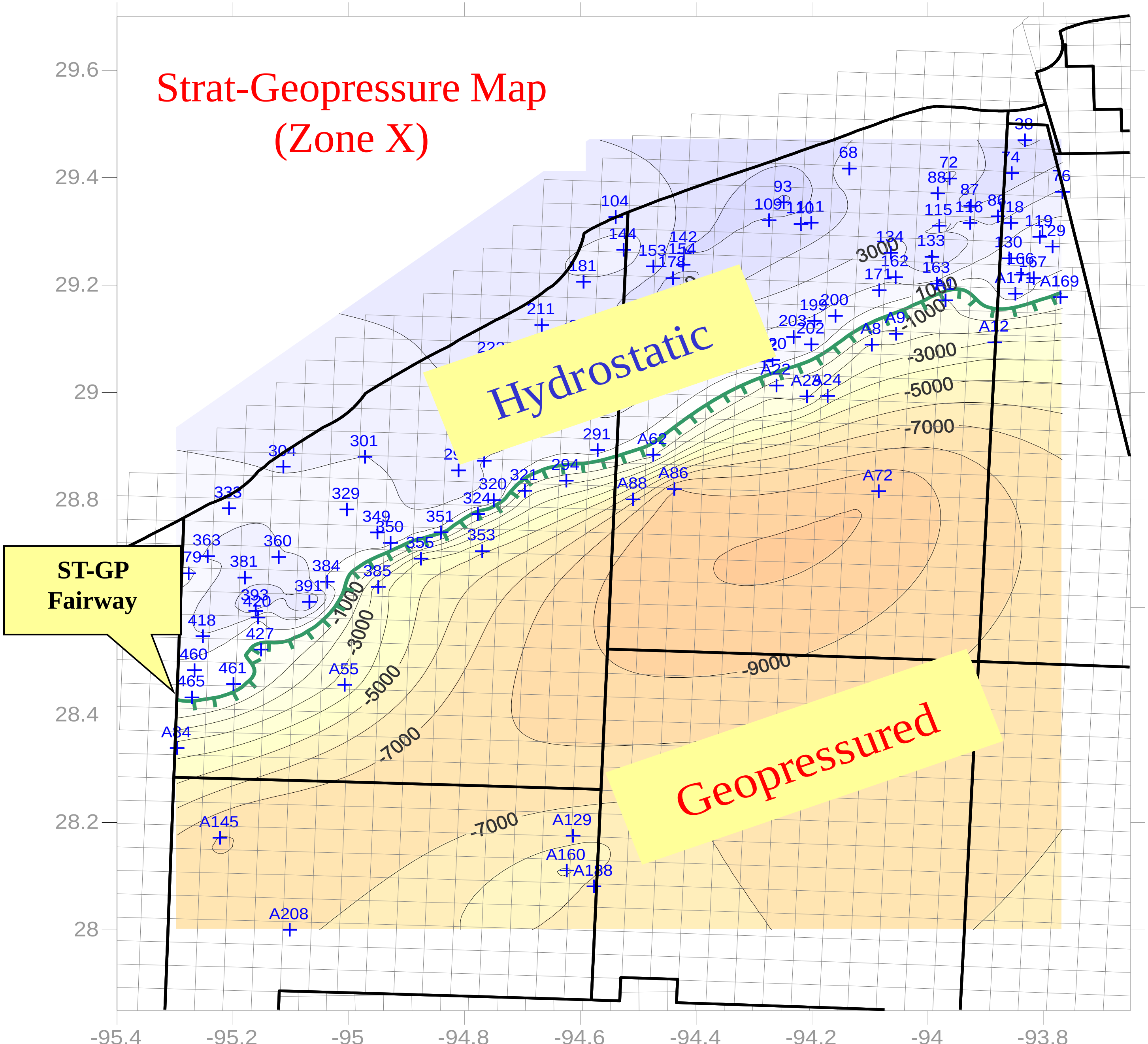
Establish the Casing and Mud program in an area



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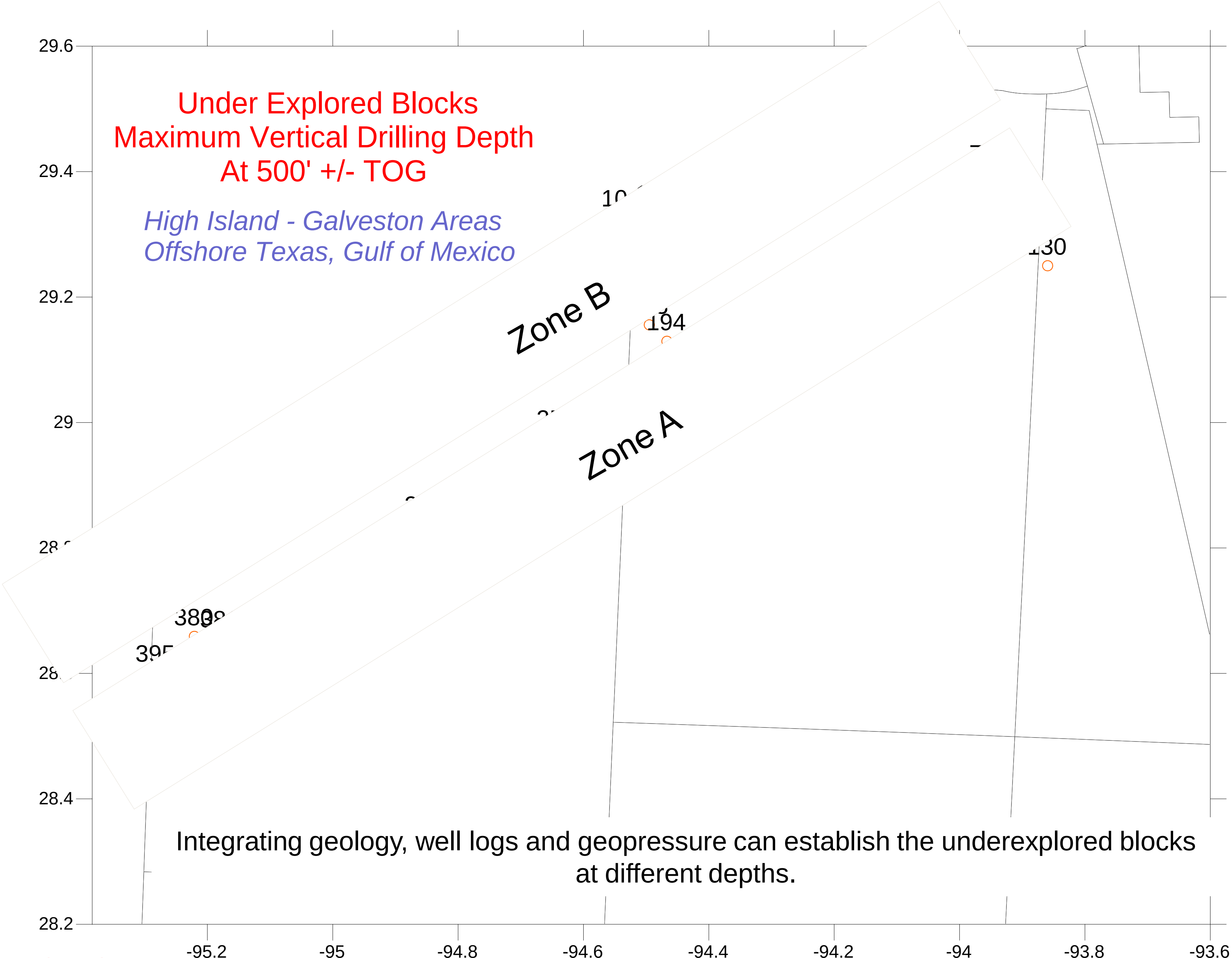
Under Explored Blocks
Maximum Vertical Drilling Depth
At 500' +/- TOG

High Island - Galveston Areas
Offshore Texas, Gulf of Mexico



Integrating geology, well logs and geopressure can establish the underexplored blocks at different depths.

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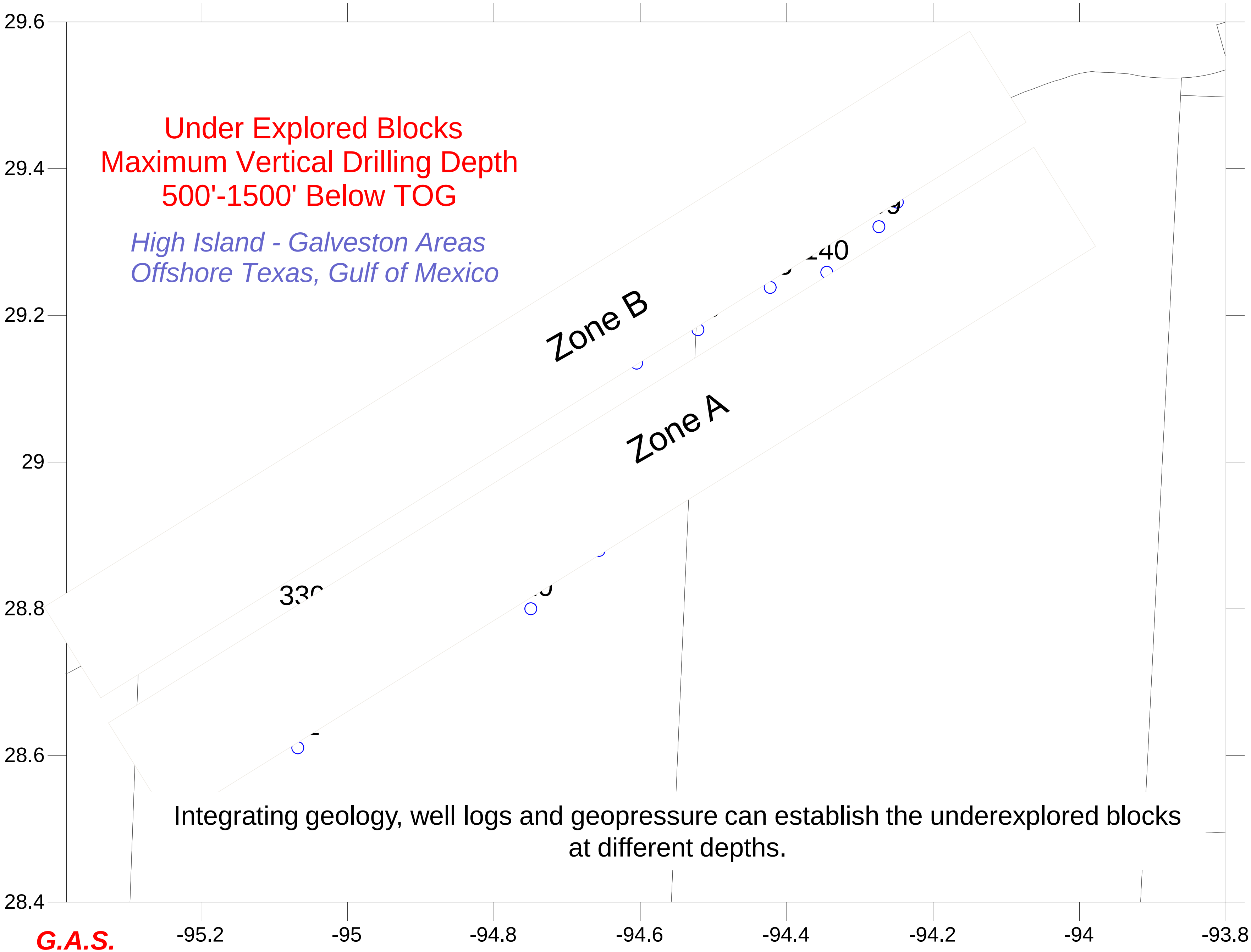
Under Explored Blocks
Maximum Vertical Drilling Depth
500'-1500' Below TOG

High Island - Galveston Areas
Offshore Texas, Gulf of Mexico



Integrating geology, well logs and geopressure can establish the underexplored blocks at different depths.

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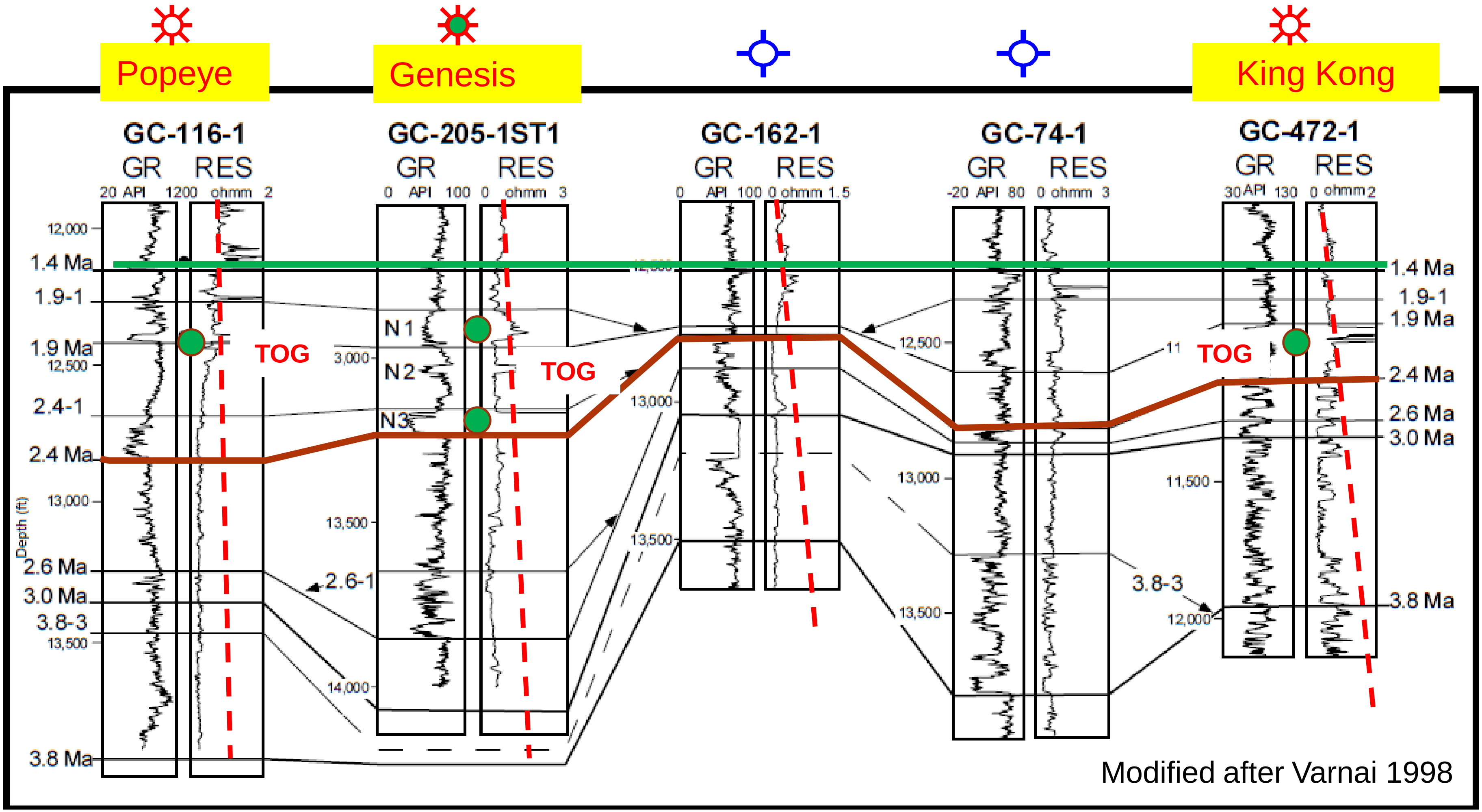
Economic Feasibility Advantage

1. Shallow water
2. Abundance of infrastructure
3. Wealth of technical data including existing seismic
4. Drill only to the predicted TOG (area up dip of the ST-GP fairway) and set 9 5/8 " casing only down dip.
5. Shallow hazards are scarce
6. Long term production (some of the shelf wells are producing for 40 years and beyond)

Can this method work in the Deepwater ?   YES



A well correlation cross section exhibits the pay zones (green circles) that are usually hovering around the Top of Geopressure (TOG). The dashed red lines represent the compaction trend (CT)

After Shaker, S. 2015. AAPG, Deep and Shelf Water, GTW
“Predicting the Seal failure in Deepwater

Thank you