



Buzzard – Seismic stratigraphic interpretation: a new approach to the giant Buzzard field

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1. Buzzard Field Overview
2. Buzzard Seismic Data
3. Buzzard Seismic Stratigraphy proxy for reservoir distribution?
4. Subsurface Integration & Conclusions

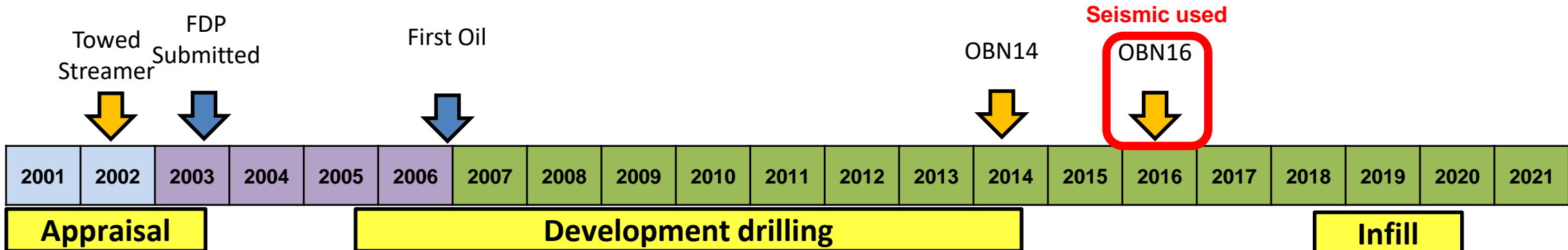
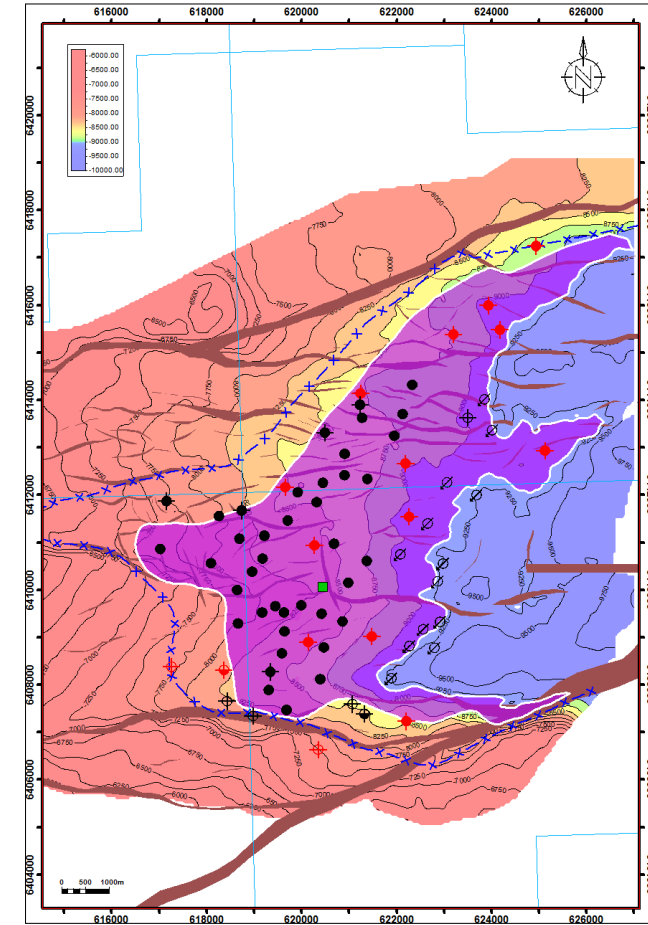
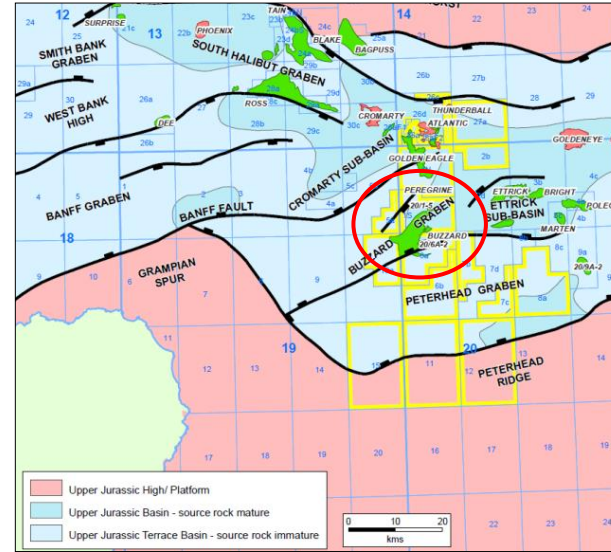


1. Buzzard Field Overview: Introduction

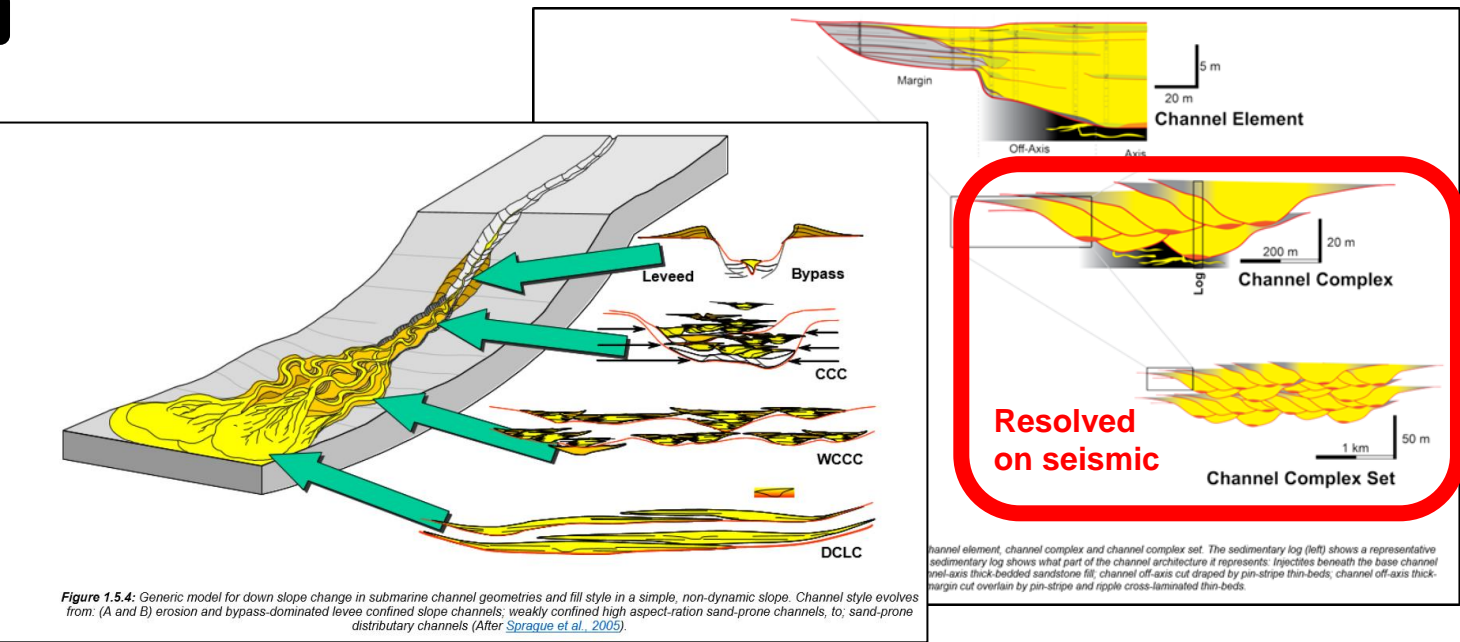
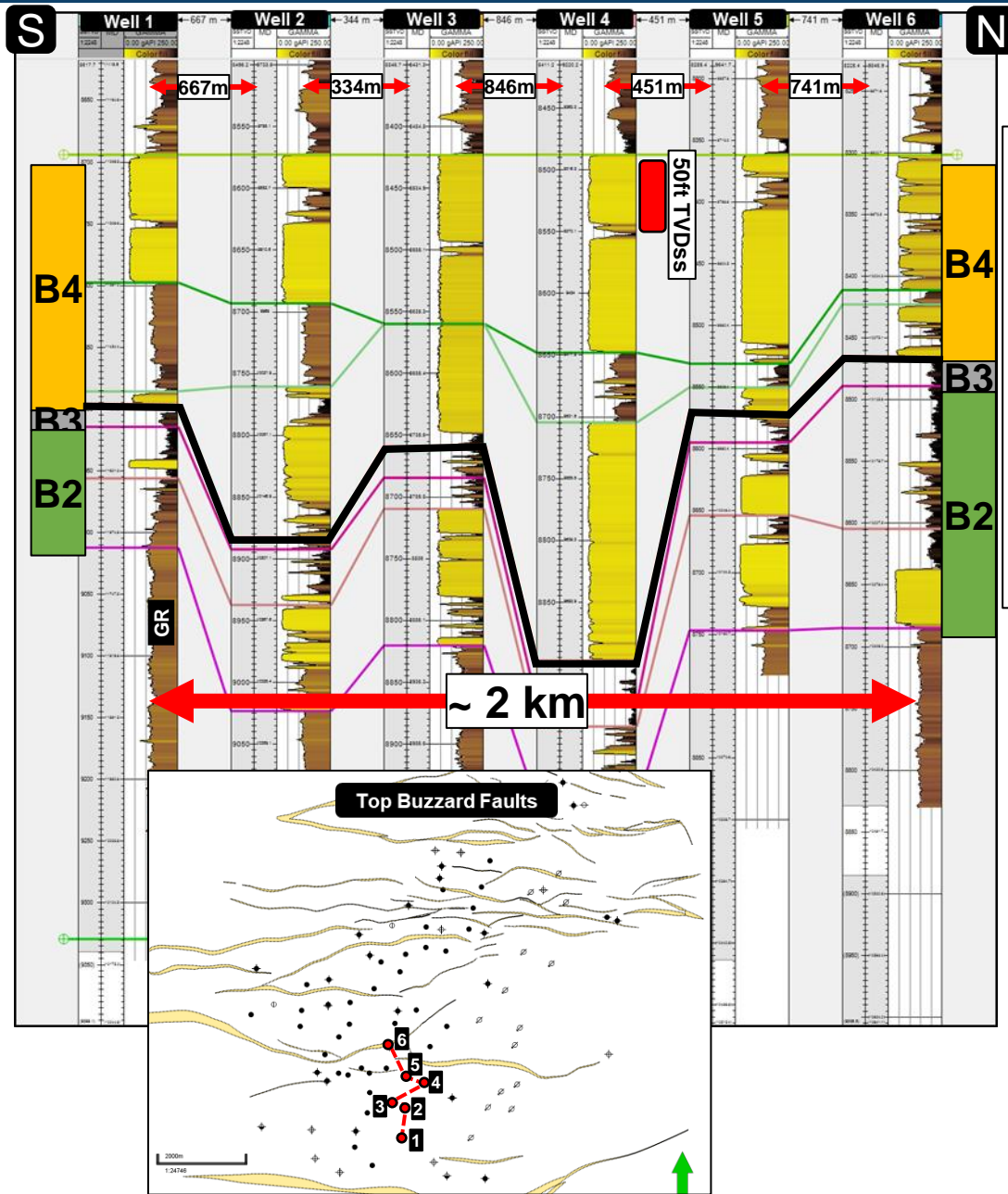
- 100km NE of Aberdeen
- **Discovered in 2001, first oil in 2007**
- Last infill campaign 2018- 2020
- +40 producers & 15 injectors

Geological Settings:

- Buzzard is part of the late Jurassic NW-SE Outer Moray Firth basin
- **Buzzard graben is bounded by faults to the North & South**
- **Reservoir:** Jurassic turbidites – several sands
- **Trap:** stratigraphic pinch-out to the West
- **Source:** Grampian Spur to the West
- **Resources:** ~1.7MMSTB in place

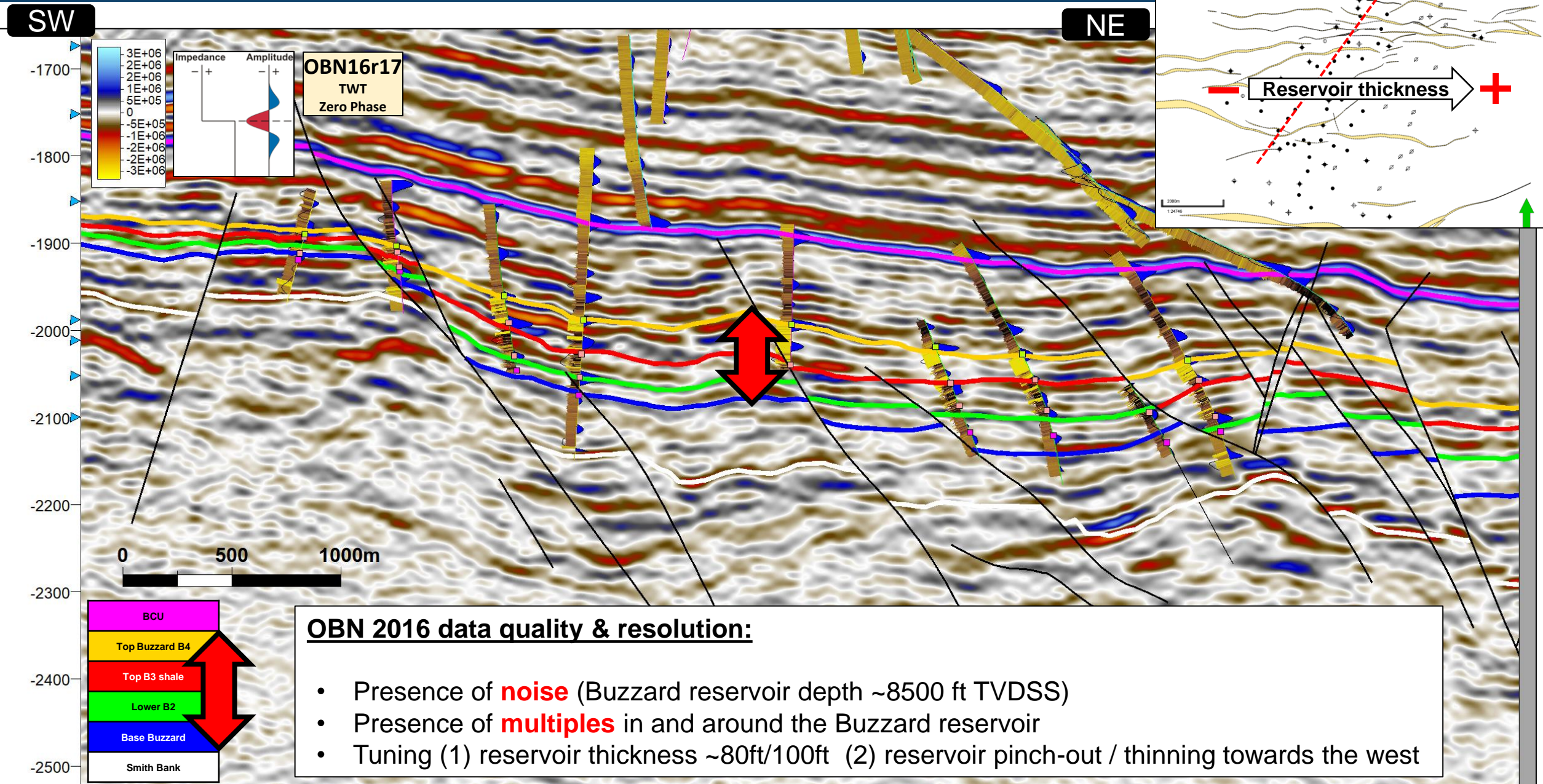


1. Buzzard Field Overview: Stratigraphy



- Buzzard Reservoir is Upper Jurassic turbidites
- Accommodation space created by faults and underlying topography (Mass transport Deposit)
- B4 reservoirs are sand rich with some channel lags but no sign of levee facies
- **Even though this correlation suggest a “layer cake” stratigraphy, seismic interpretation highlight more complexity in reservoir distribution**

2. Buzzard Seismic Data: OBN16r17



3. Buzzard Seismic Stratigraphy: Introduction

What is Seismic Stratigraphy?

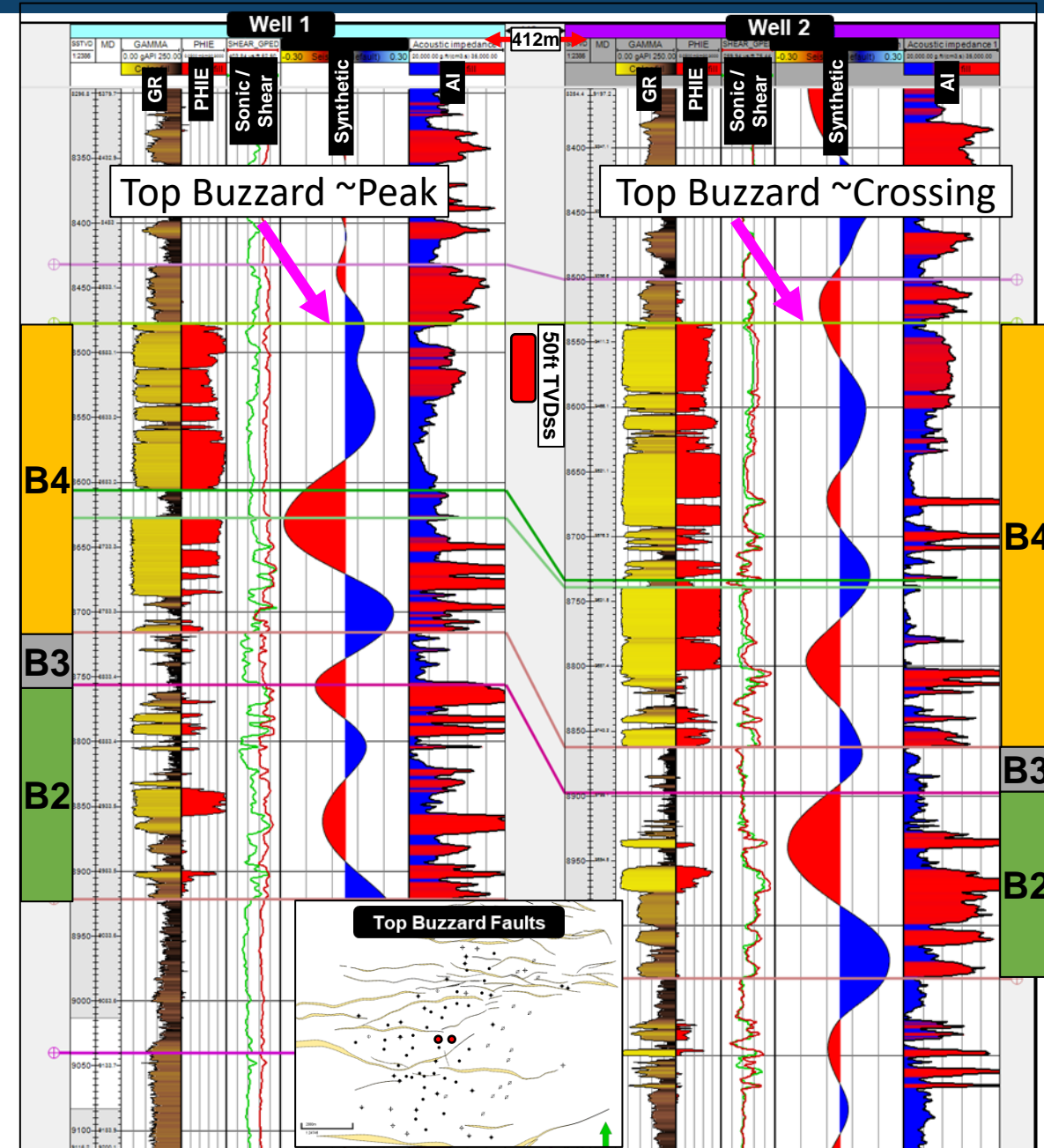
- Seismic stratigraphy (Vail et al., 1977) is an interpretation technique developed to **help predicting facies and reservoir distribution beyond well control**
- The main tool is **seismic facies analysis** which consists of **defining reflection amplitude/continuity & reflection geometry**

Why are we using the Seismic Stratigraphy in Buzzard?

- **Not able to do reliable geophysical quantitative interpretation**
 - Little difference between the water and oil filled sands (impacts AVO & DHI)
 - Variation in rock properties in very short distances (impact on inversion products)
- Sand / Shale proportion is making it **difficult to easily identify the “channel axis”**
- Recent **OBN16 dataset** reveals more seismic geometries than the previous data

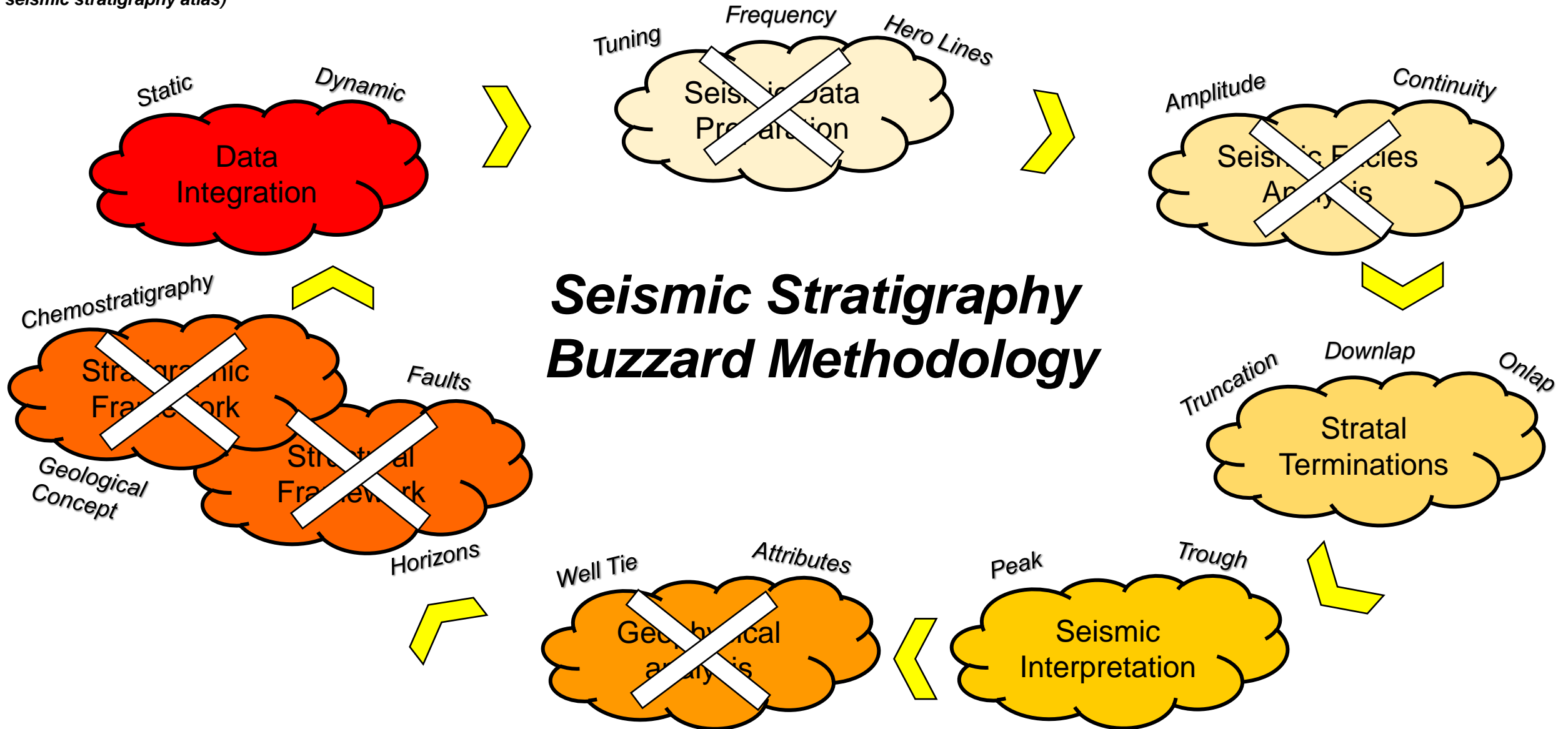
Ultimate Goals of Buzzard Seismic Stratigraphy?

- Field Depositional Concepts (sand fairways) for each units
- Identify geo-baffles and structural lineament controlling sand distribution
- Better understanding of field production & Identify drilling opportunity

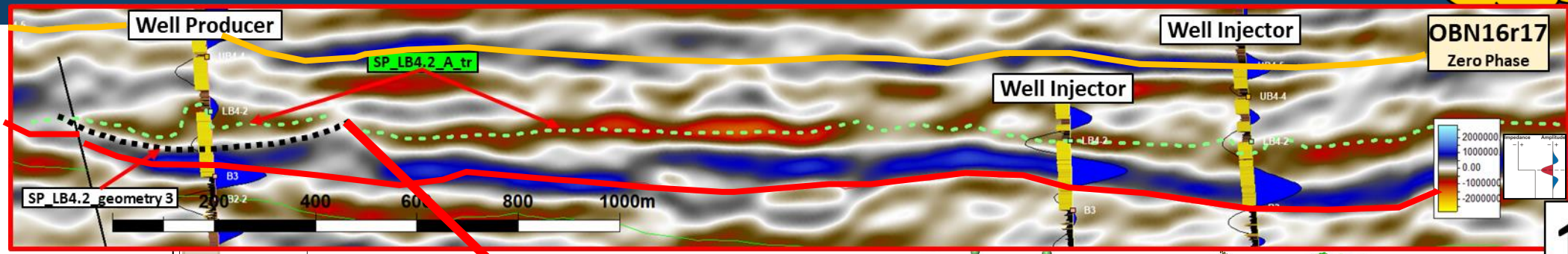


3. Buzzard Seismic Stratigraphy: Methodology

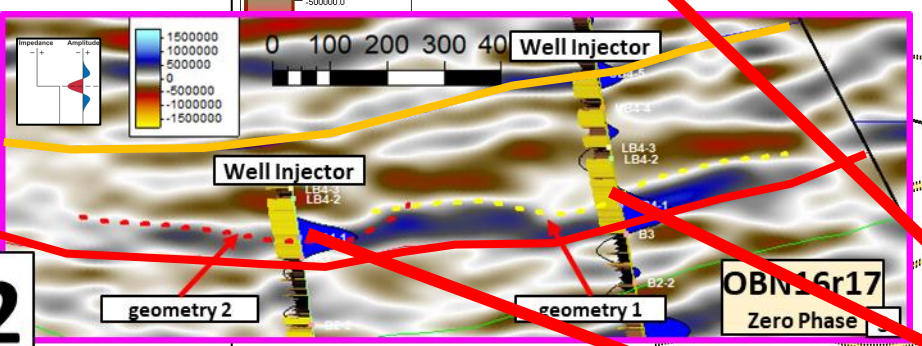
Project timeline : ~ 1year (from project framing to putting together seismic stratigraphy atlas)



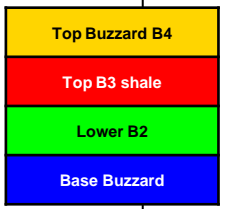
3. Buzzard Seismic Stratigraphy: Interpretation



1



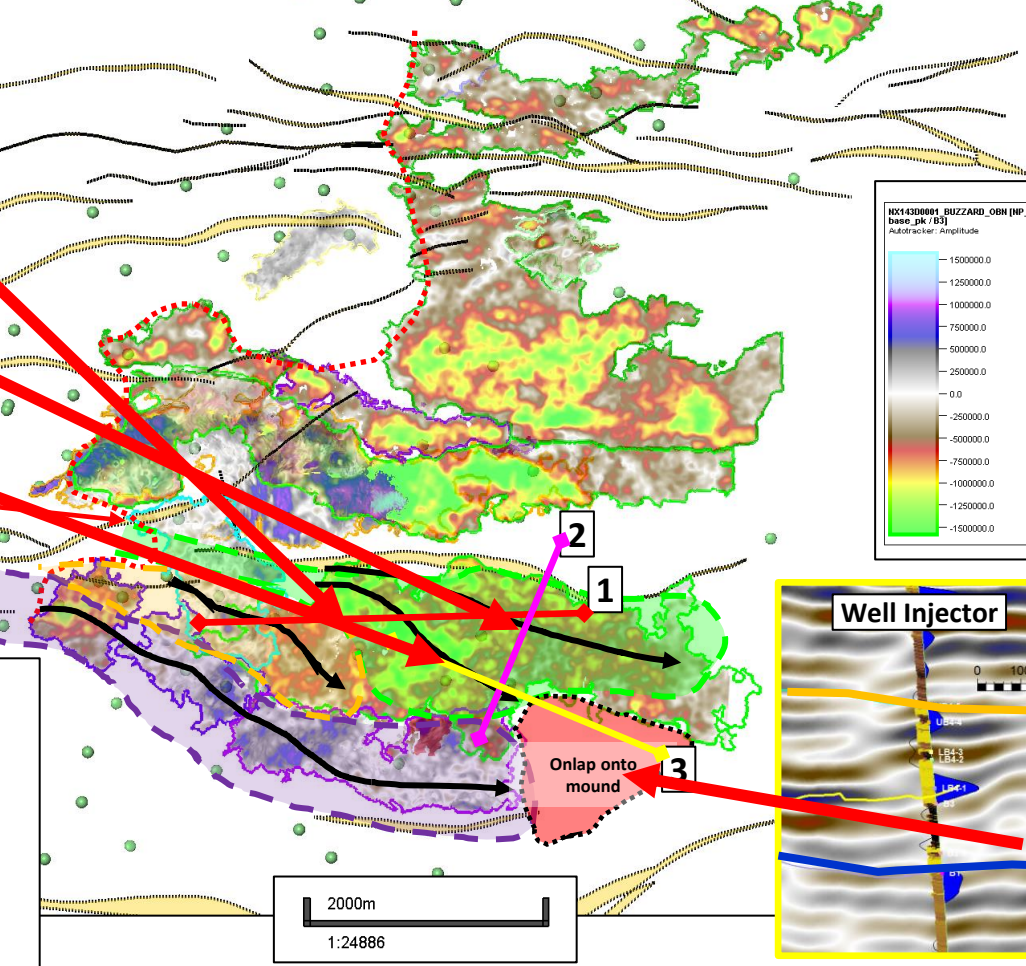
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Note:

Fairways are interpreted based on **seismic geometries** interpretation when possible and if absent relying on **well penetrations & correlations**.

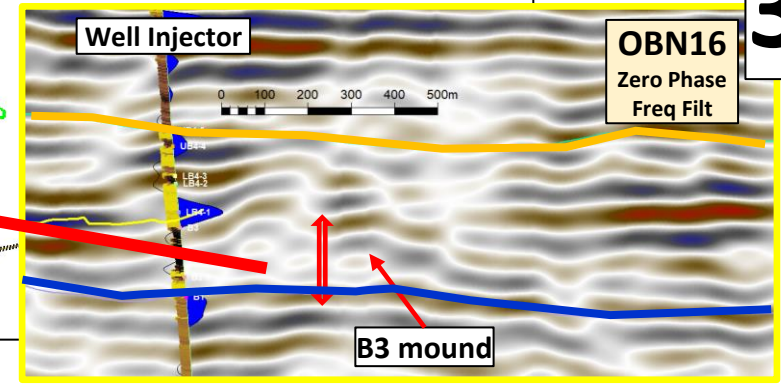
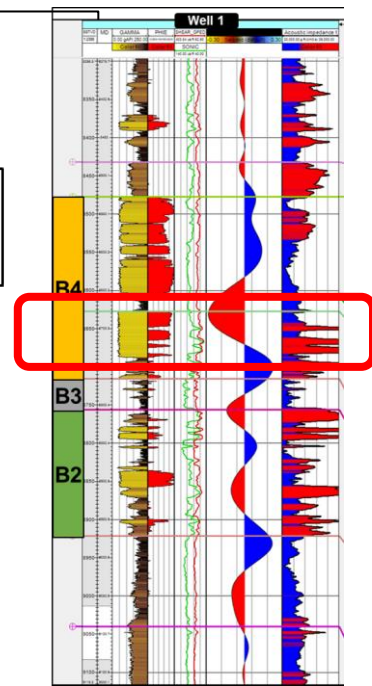
Entry point interpreted to be coming from the West



2

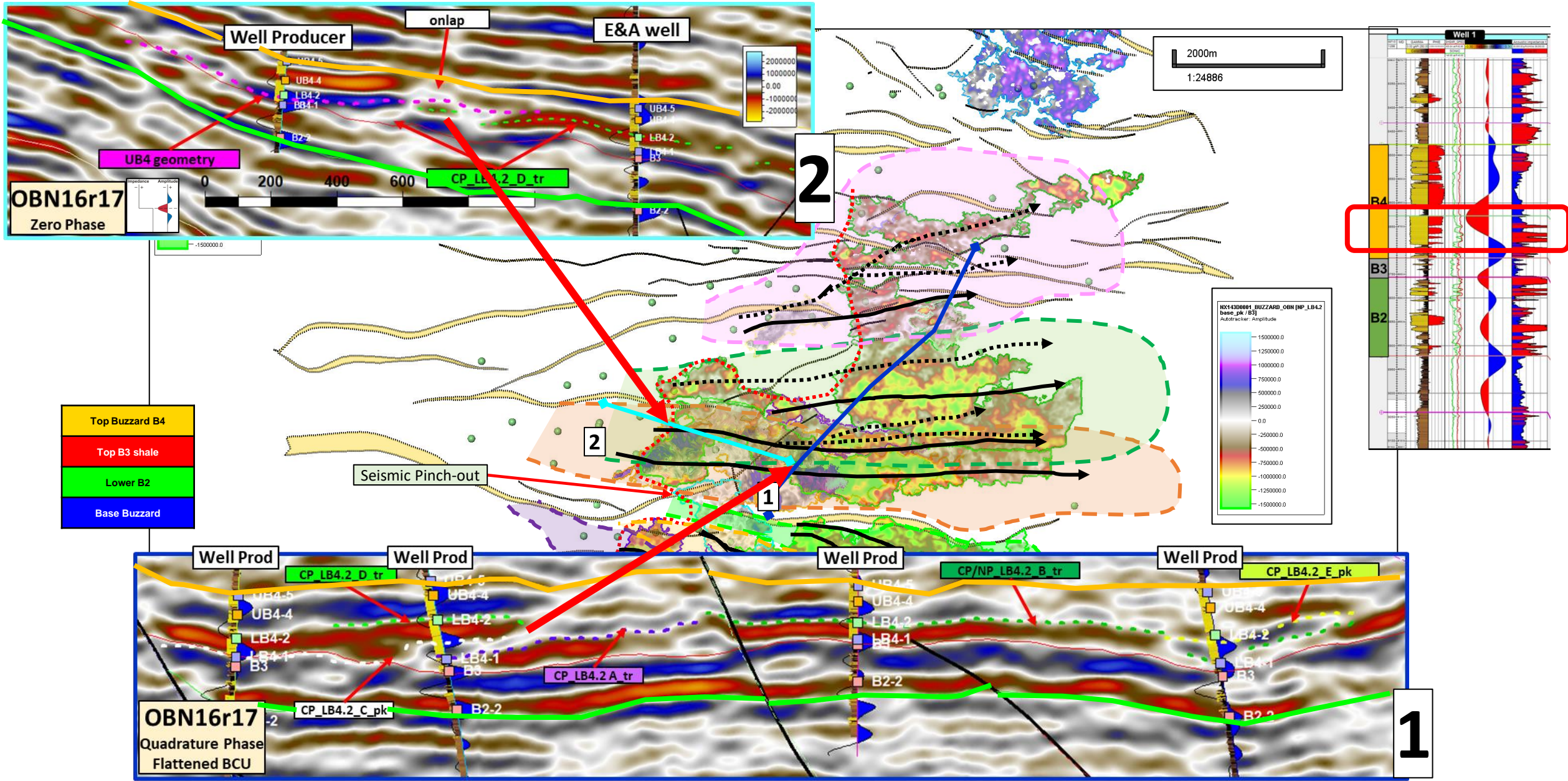
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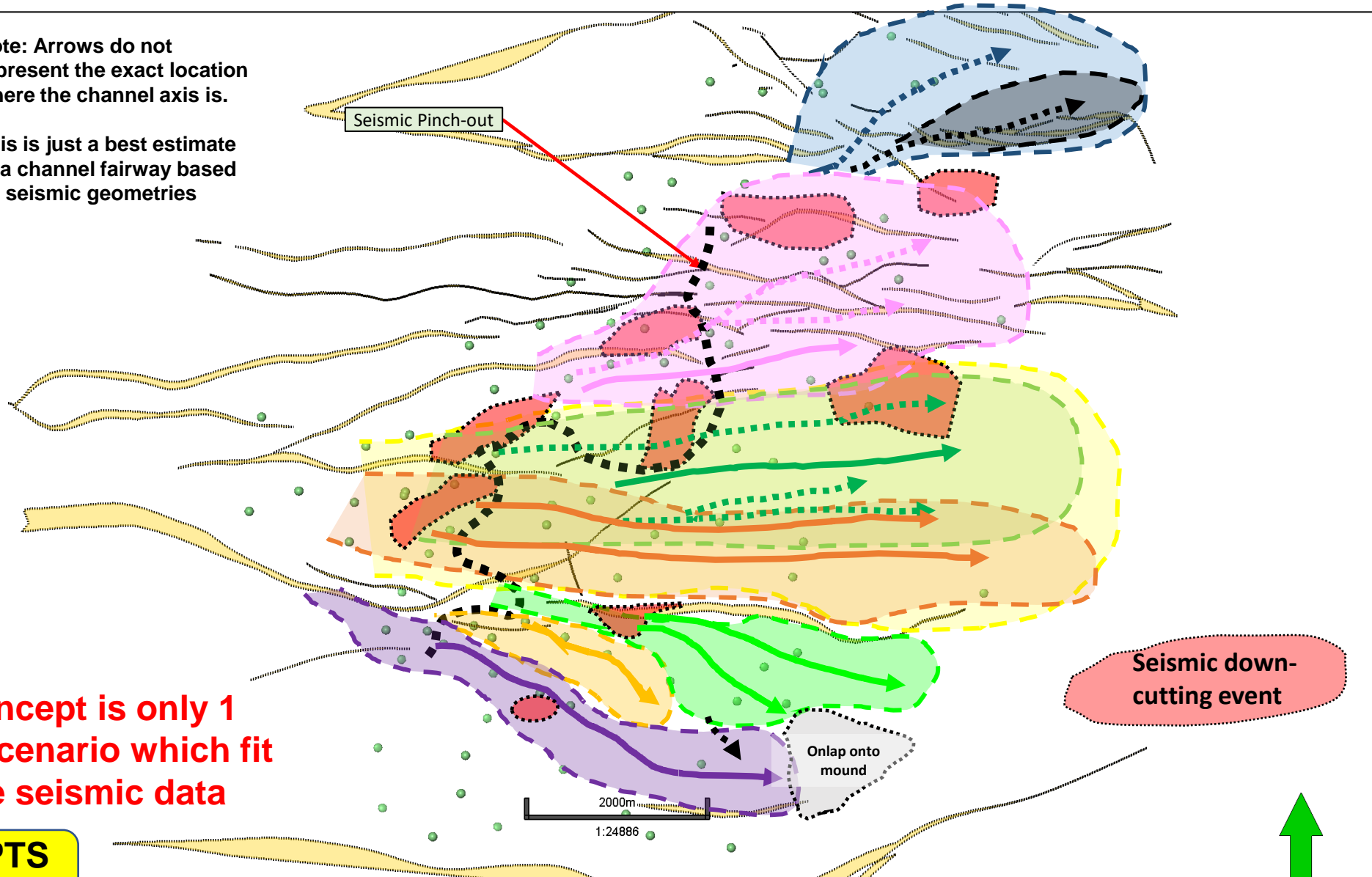
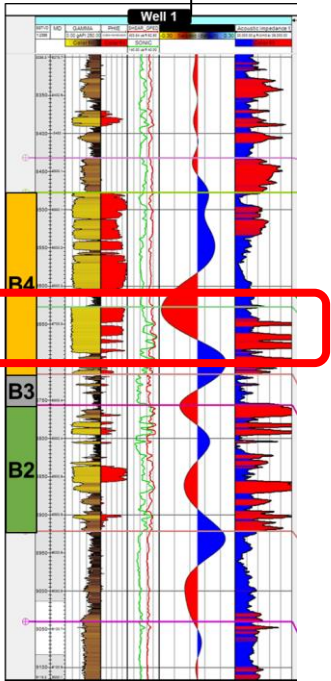
3. Buzzard Seismic Stratigraphy: Interpretation



3. Buzzard Seismic Stratigraphy: Depositional Map

Note: Arrows do not represent the exact location where the channel axis is.

This is just a best estimate of a channel fairway based on seismic geometries



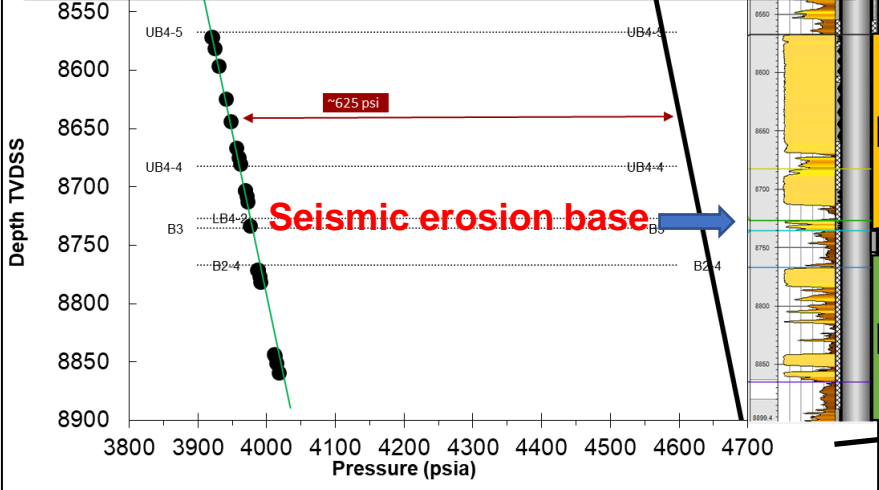
This concept is only 1 of the scenario which fit best the seismic data

CONCEPTS Lower B4

- Channel Complex Interpreted Fairway when dashed = conceptual > no to very little seismic evidence)
- Channel Complex Fairway (allowing lateral communication between complexes)

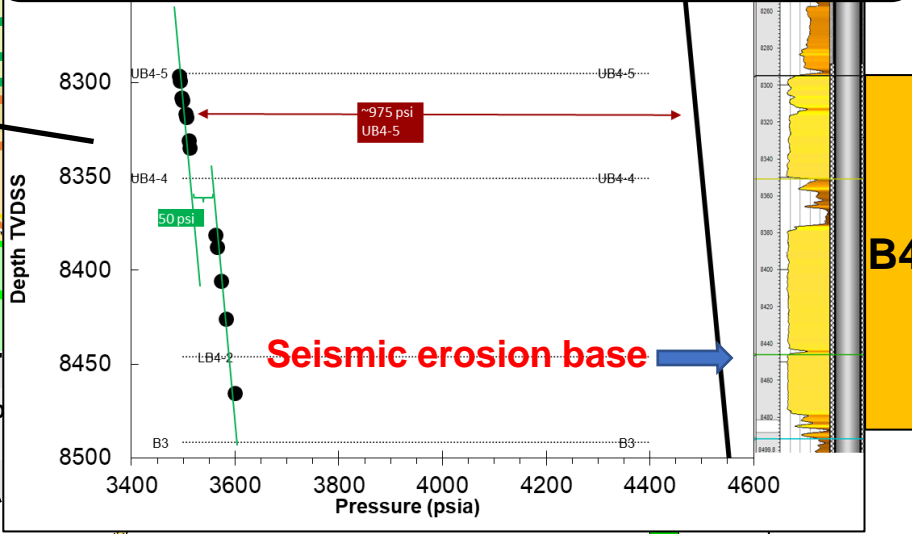
4. Integration: What about the dynamic data? RFT

• Well 1: B4 & B2 sands sits on 1 gradient (above and below the seismic erosion surface)

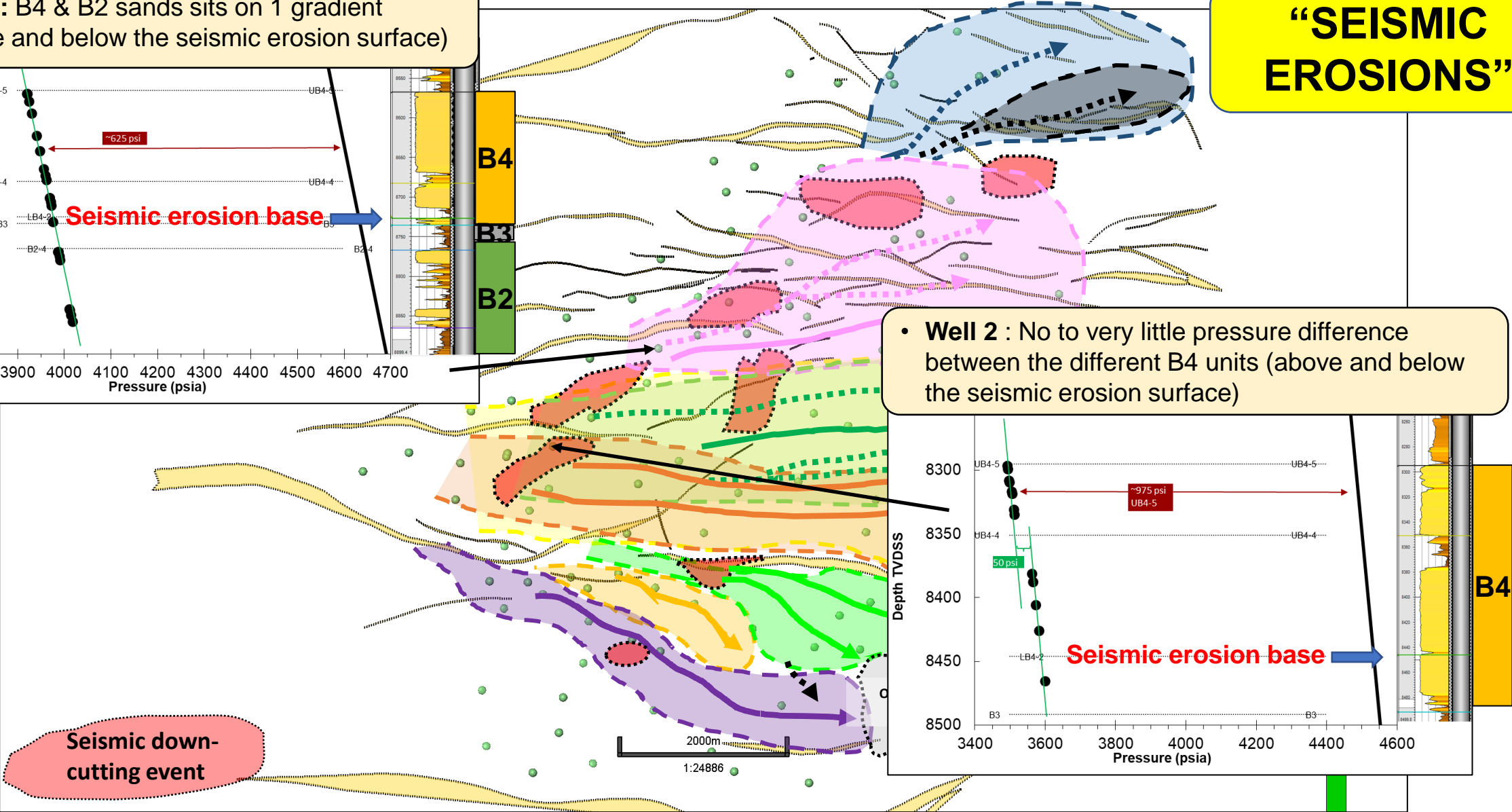
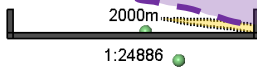


“SEISMIC EROSIONS”

• Well 2 : No to very little pressure difference between the different B4 units (above and below the seismic erosion surface)



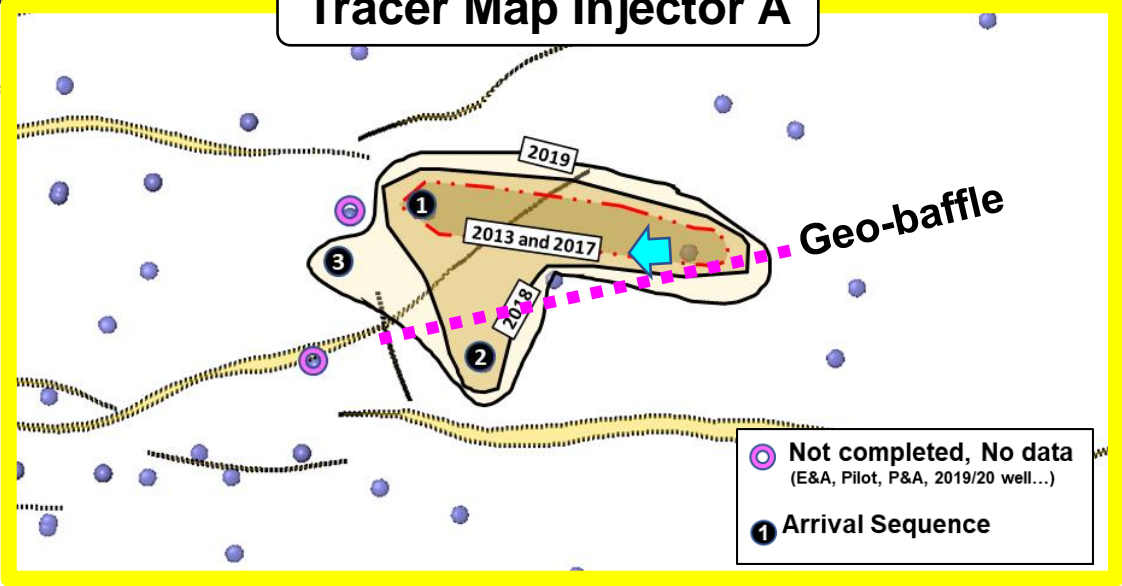
Seismic down-cutting event



4. Integration: What about the dynamic data? Tracer

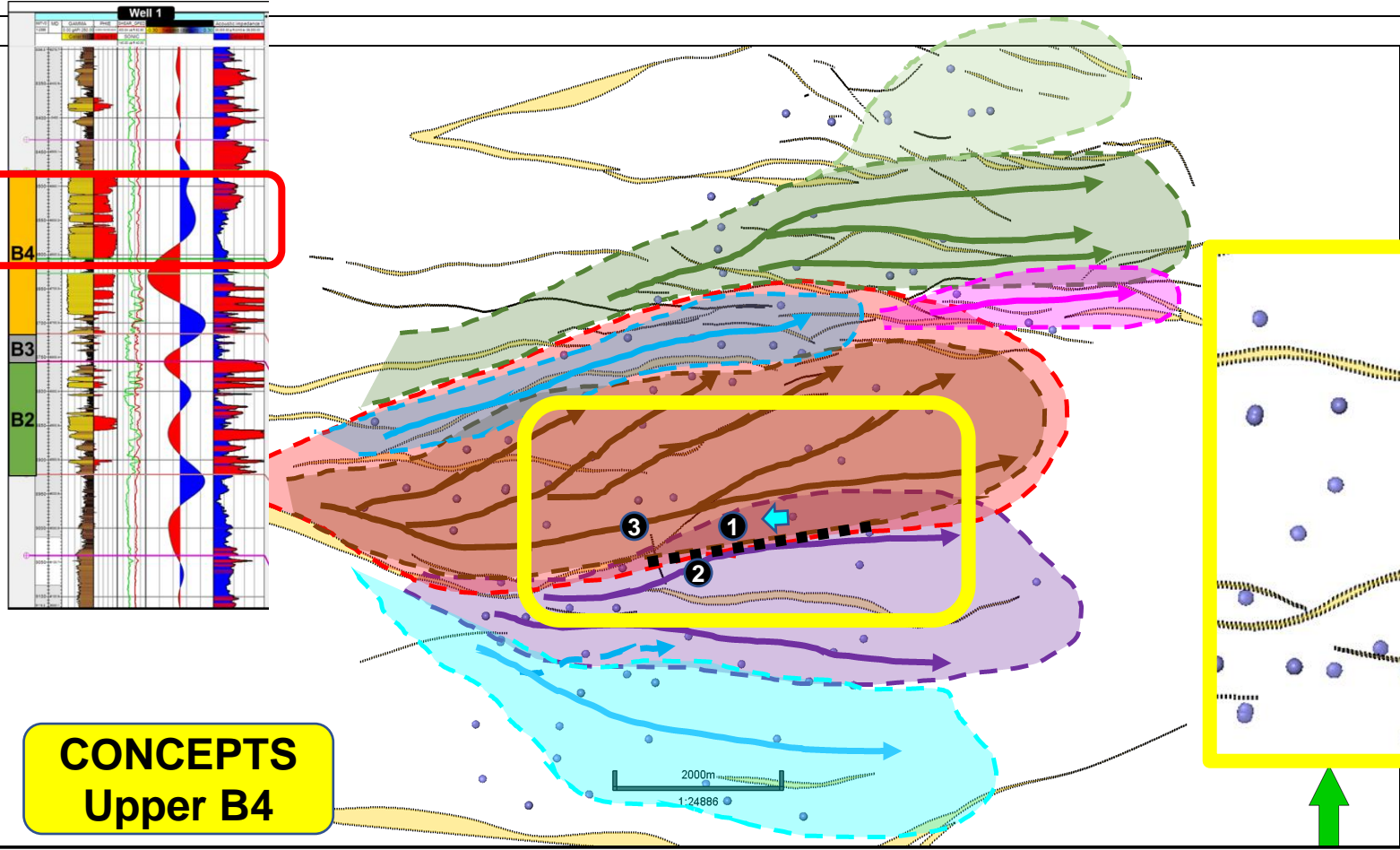
Geo-Baffles

Tracer Map Injector A



Injector A

- Injecting in Upper B4 sands
- Tracer arrives in well 1 in 2013
- Tracer arrives later in well 2 in 2017
- Tracer arrives in well 3 in 2019 (drilled in 2019)
- Possible stratigraphic geo-baffle observed on seismic at the same level – Boundary between Red & Purple fairways



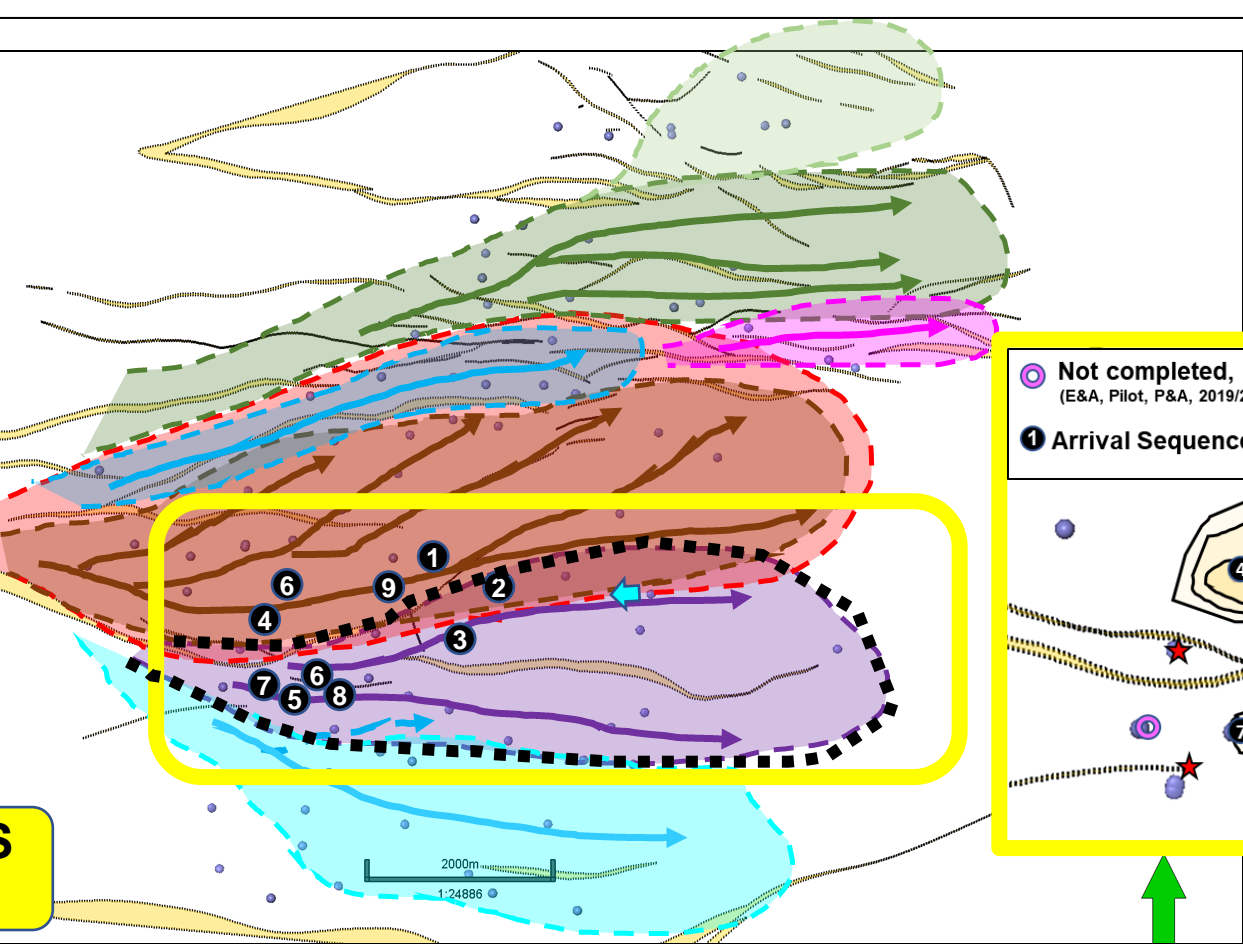
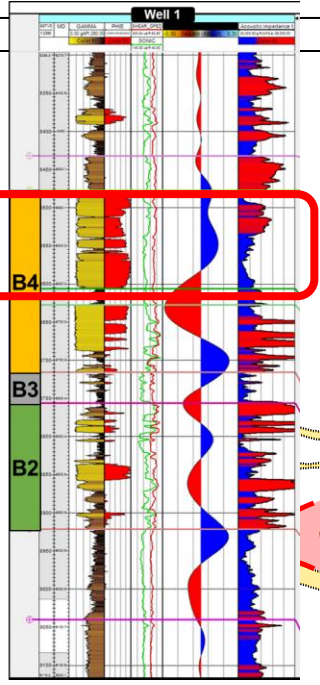
**CONCEPTS
Upper B4**

- Channel Complex Interpreted Fairway when **dashed = conceptual** > no to very little seismic evidence)
- - - Channel Complex Fairway (allowing lateral communication between complexes)

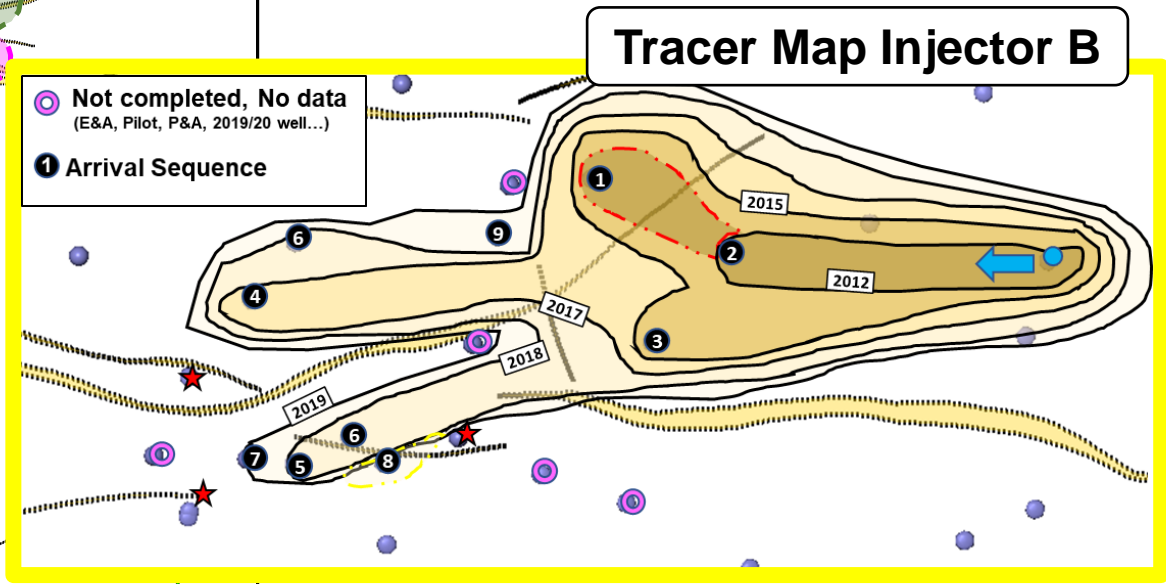
4. Integration: What about the dynamic data? Tracer



Connectivity



**CONCEPTS
Upper B4**



- Injector B**
- Injecting in Upper B4 sands
 - Tracer arrives in Southern Panel wells in 2018 – connectivity through the relay ramp
 - Note: well 9 drilled in Q4 2019
 - **Seismic stratigraphy confirms main fairway (purple) running through the relay ramp and connecting the injectors to the southern panel producers**

- Seismic Stratigraphy is a common practice in the **Exploration / Appraisal phase**
- In the absence of reliable quantitative geophysical interpretation (AVO, DHI, Inversions...) **a new approach** of seismic interpretation has been tested in Buzzard
- The primary objective of this seismic stratigraphic work was to “dissect” the OBN16r17 and tease out **the sediment fairway and possible reservoir distribution**
- **Detail interpretation of the shape and continuity** of the reflectors allowed us to capture depositional trends
- **Stratigraphic edges** (geo-baffles) and **reservoir connections** (“erosions”) have been identified in a number of zones
- This work will feed into our next phase geo-model & future infill drilling
- Note: all the seismic stratigraphic concepts in this pack is **1 scenario** which tries to best fit the seismic reflection & geological understanding. **Other interpreters might interpret different depositional concepts**, but (hopefully) the actual horizon interpretation (reflectors) should be the same Until a new seismic data arrives 😊

Thanks to the Buzzard Subsurface Team, CNOOC International

Thanks to the Buzzard Co-Venturers: Suncor, Harbour Energy & ONE-Dyas

