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A speculative ridge within the Kidson Sub-basin – integrated interpretation from geophysical data

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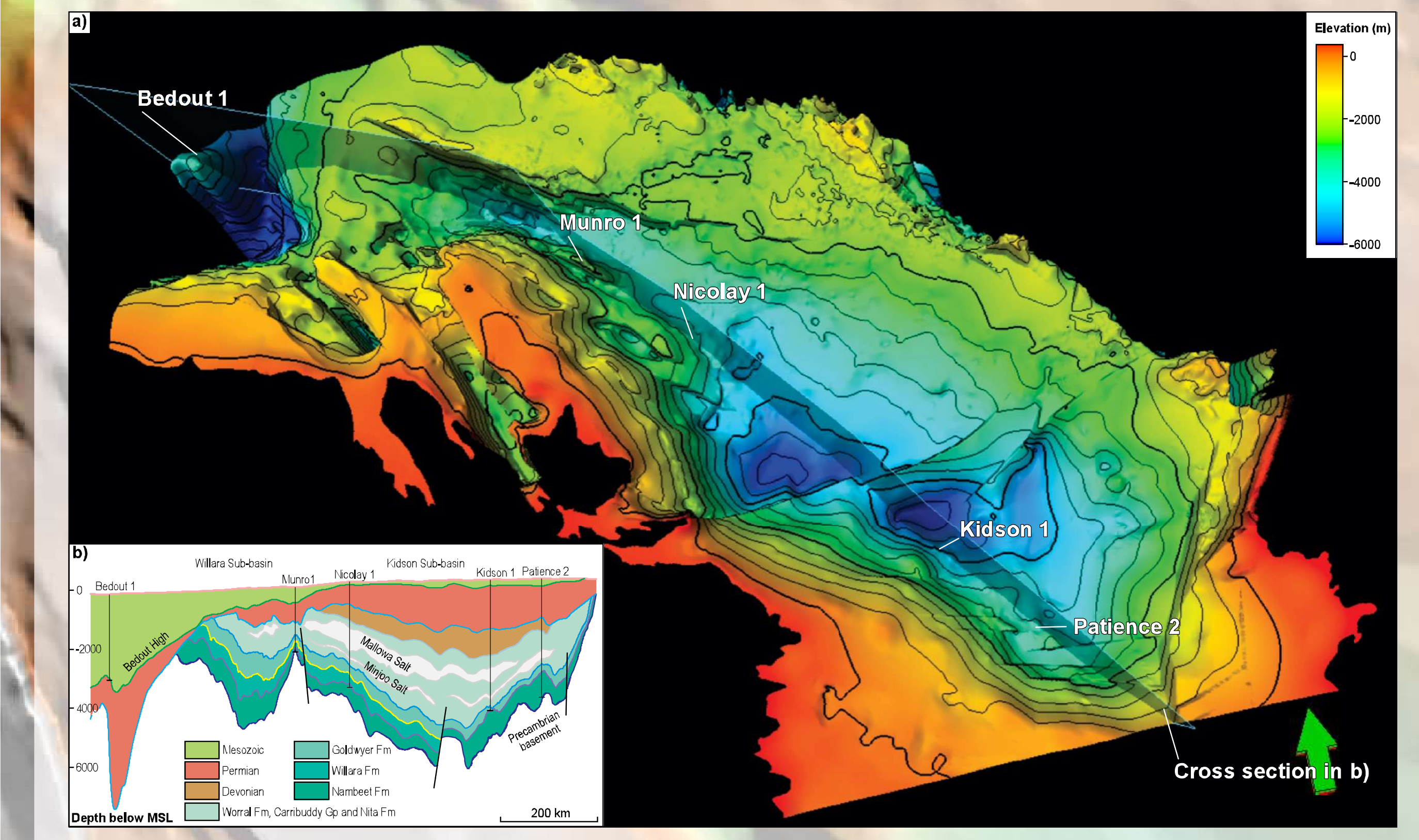


Introduction

The Kidson Sub-basin of the Canning Basin has long been considered as a relatively simple sag, based on mathematical extrapolation of basement depth interpretation from the sub-basin periphery to central area. However, the correctness of this concept remains uncertain due to a significant data gap, approximately 100 km wide and 300 km long in the central area of the sub-basin.

This multi-disciplinary reassessment involves an integration of seismic, AEM, gravity and aeromagnetic data. By leveraging these diverse datasets, this paper presents an alternative model for the sub-basin's geometry (**Fig. 1**), with implications for resource prospectivity within the Paleozoic succession.

Figure 1. Possibly compartmentalised Kidson Sub-basin in the southern Canning Basin

Interpretation

Depths to the top and base of the Noonkanbah Formation were interpreted and gridded from AEM sections, revealing a near west-east trending structural high that divides the sub-basin into north and south structural components (**Fig. 2**).

As interpreted from seismic data elsewhere, there is structural similarity throughout the Paleozoic strata, indicating that the entire sedimentary fill inherited the fundamental geometry of the basement despite several episodes of uplifting and erosion in the Kidson Sub-basin. It is possible, therefore, to infer a basement ridge beneath the sub-basin on the basis of the structural high seen in the Permian Noonkanbah Formation.

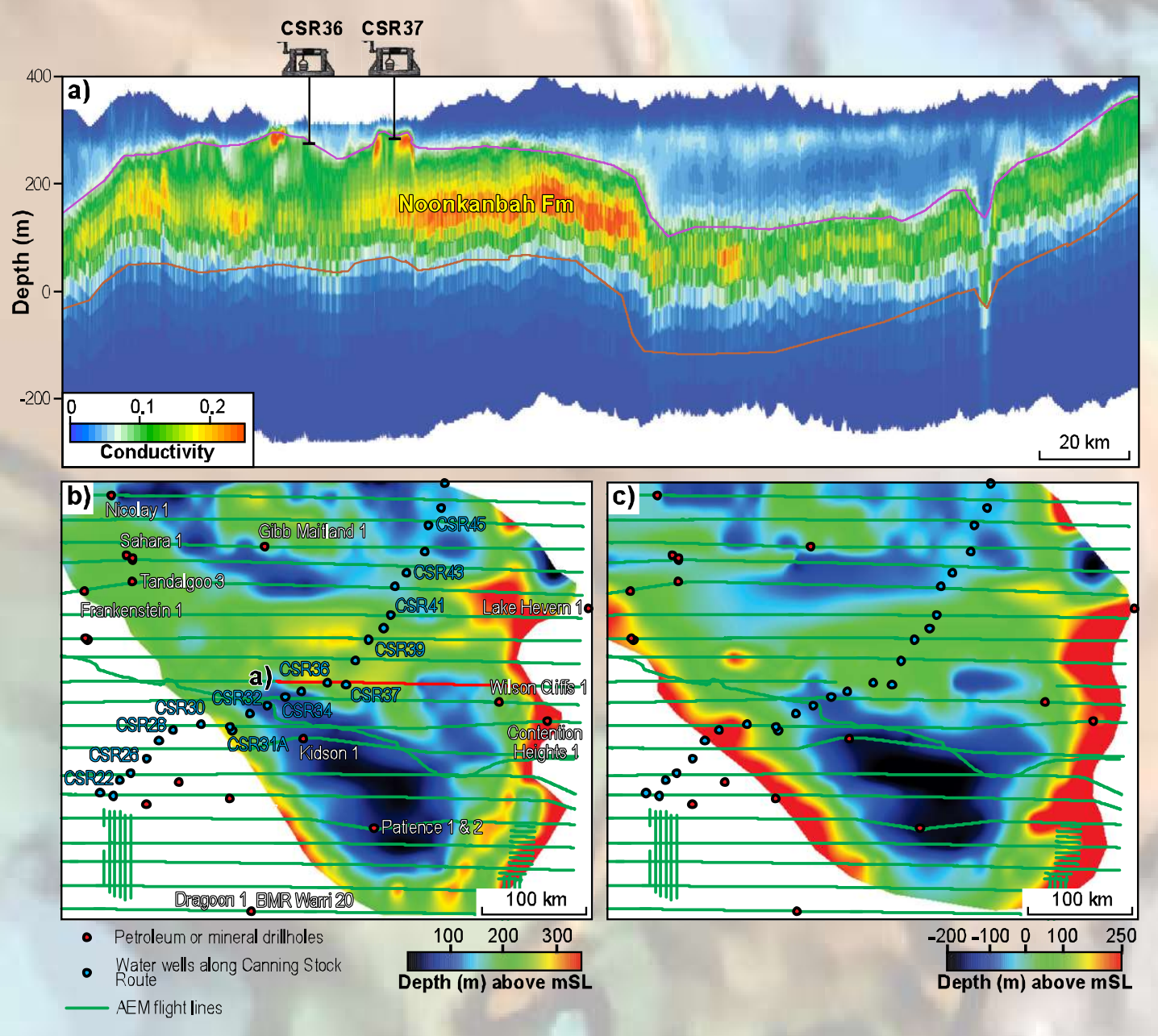


Figure 2. AEM interpretation and mapping

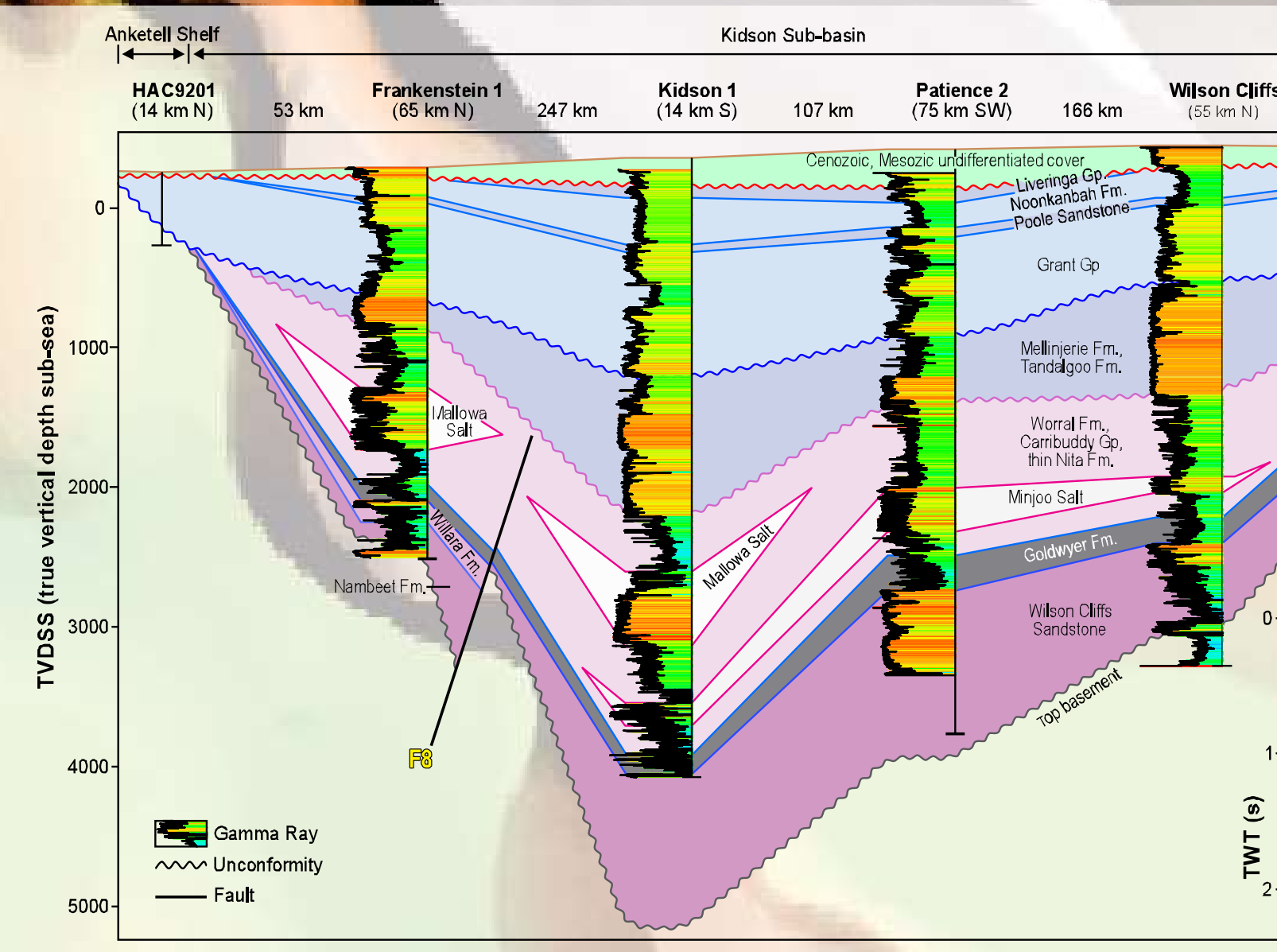
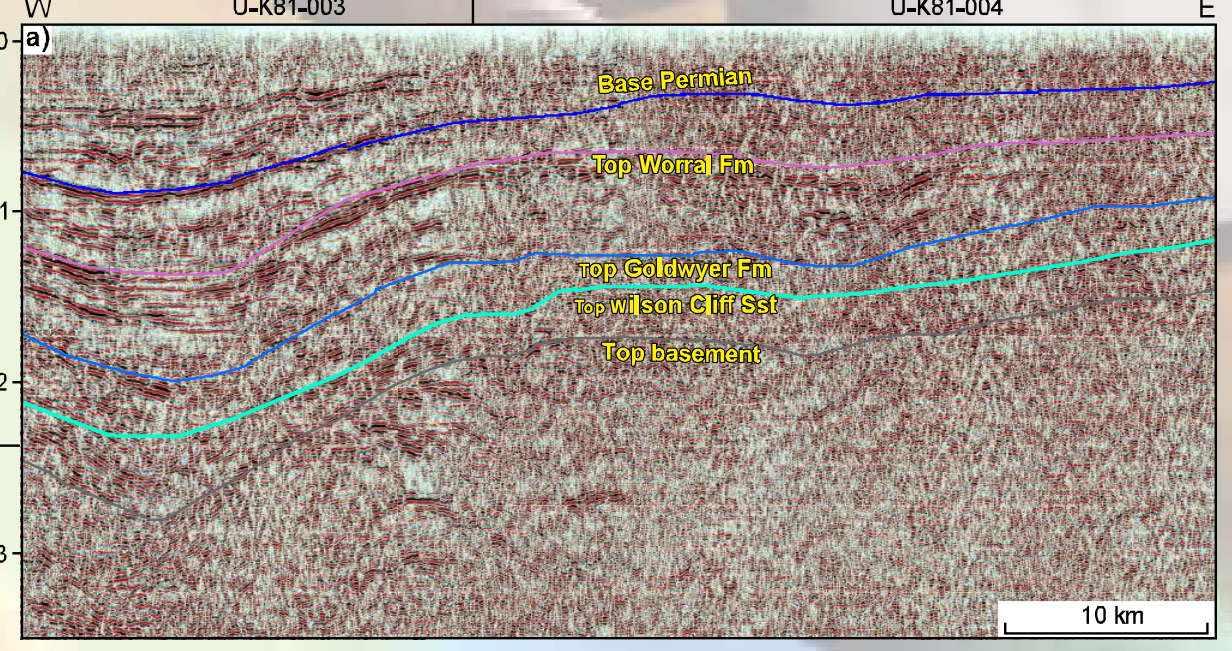
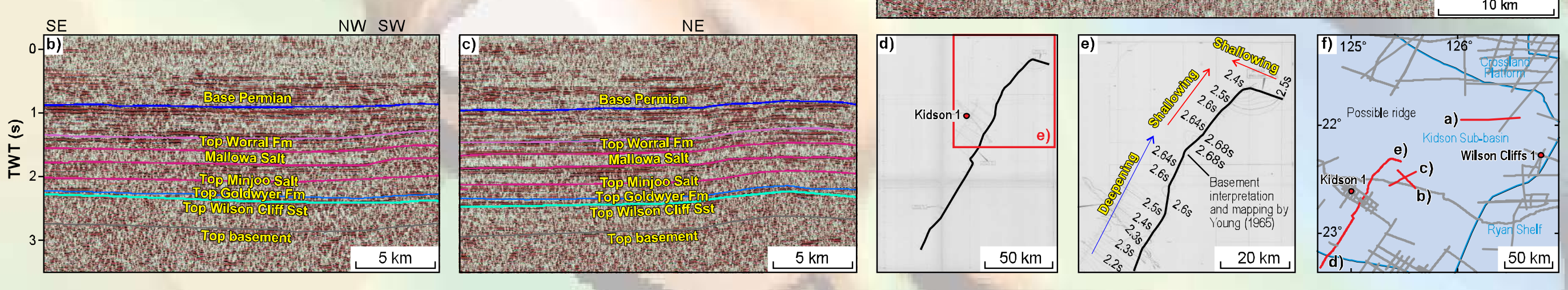


Figure 3. Well correlation in the Kidson Sub-basin

Supporting evidence

Based on well intersections, a depositional compartmentalisation can be inferred between the southeast and the northwest of the Kidson Sub-basin, expressed as differences in lithofacies and thickness of the Ordovician Nambeet, Willara, and Goldwyer Formations (**Fig. 3**).





In addition, a few seismic lines near the southern flank of the ridge exhibit shallowing of reflectors towards the central part of the sub-basin, instead of following the broad deepening trend (**Fig. 4**).

The proposed ridge provides an explanation for the depositional variations and the structural reversal along the southern flank of the ridge suggests the proximity of the basement high.

Figure 4. Seismic profiles and maps near the possible ridge

Prospectivity & uncertainty

If the ridge exists, it could enhance the prospectivity of the area for petroleum, natural hydrogen and helium, as well as mineral resources, compared to the simple structural interpretation currently perceived for the Kidson Sub-basin. However, the existence of this basement ridge remains highly uncertain, given the lack of a seismic profile across its axis or drilling to confirm basement at shallower depths than expected from previous basin models. Further workis required to verify the presence of the inferred ridge (**Fig. 5**).

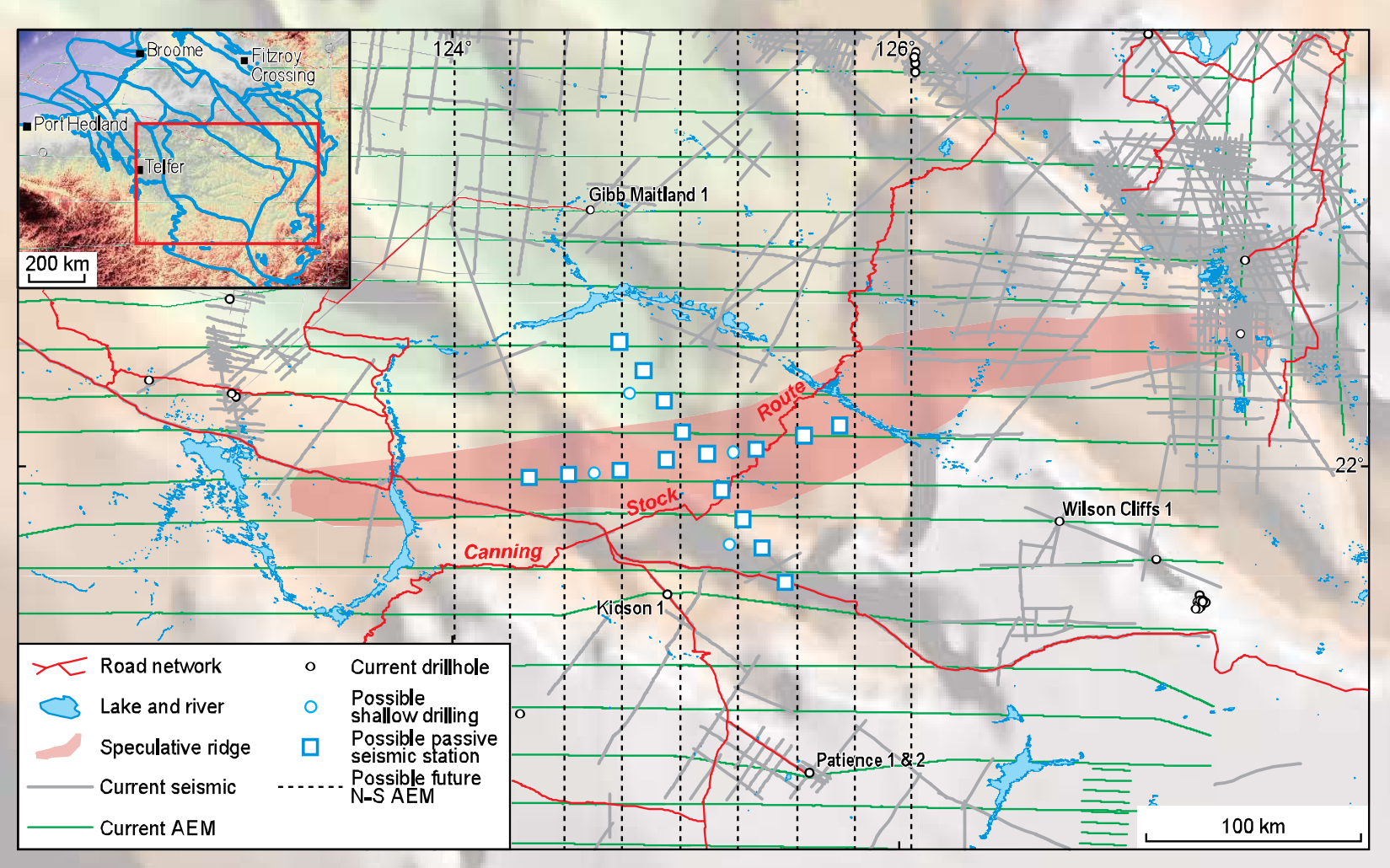


Figure 5. Current dataset and suggested future data acquisition to de-risk exploration