CHAPTER 5

QUALITATIVE INTERPRETATION

5. 1 Fault interpretation

Compared to the other regions in Taranaki basin, the Tui area is located in a tectonically calm region. Five sets of fault were interpreted in the study area. In addition, there are many more minor faults to be interpreted, but this study focuses more on geophysical viewpoints rather than geological ones. The faults interpreted were the faults which were assumed to play significant roles as migration pathways. The faults were picked along inlines because they are more obvious to see in this orientation. The faults interpreted were then validated by investigating them along crosslines. The dipping surfaces of the faults along with two horizons are shown in Figure 5.1. The horizons are top of basement and top of Kapuni D Sand.

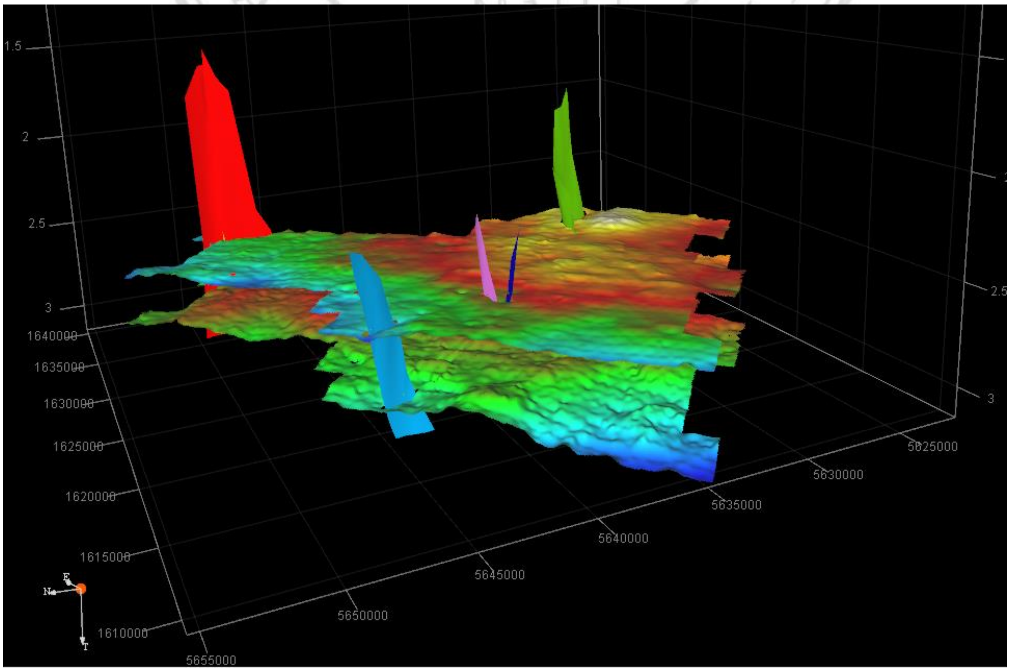

Figure 5.1. Dipping surfaces of five faults are shown in a VuPAK 3D perspective along with 2 horizons. The horizons are top of basement and top of Kapuni D Sand.

5. 2 Horizon Interpretation

Seven horizons were picked in the interval of interest, roughly from 2 s to 3 s. The horizons consist of Moki A Sandstone, Moki B Sandstone, Turi Ash Unit, Kapuni D Sandstone, Kapuni E Shale, Kapuni F Sandstone, and top of Basement. The horizons were picked using IHS Kingdom software. The tool used in this stage was Autopick 2D Hunt for some continuous reflections followed by manual pick in the area of discontinuity. The characteristics of the reflections are summarized in Table 5.2.

Table 5.1 Summary of interpreted horizons

Horizon Name	Color	Relative Acoustic Impedance	Picked seismic Reflector
Moki A Sandstone	Blue	Low	Trough
Moki B Sandstone	Cyan	Low	Trough
Turi Ash Unit	Yellow	Low	Trough
Kapuni D Sand	Red	High	Peak
Kapuni E Shale	Green	Low	Trough
Kapuni F Sand	Gold	High	Peak
Basement	Magenta	High	Peak

Noted: Picks of some events do not honor the polarity convention, for simplicity (more continuous, clearer to pick).

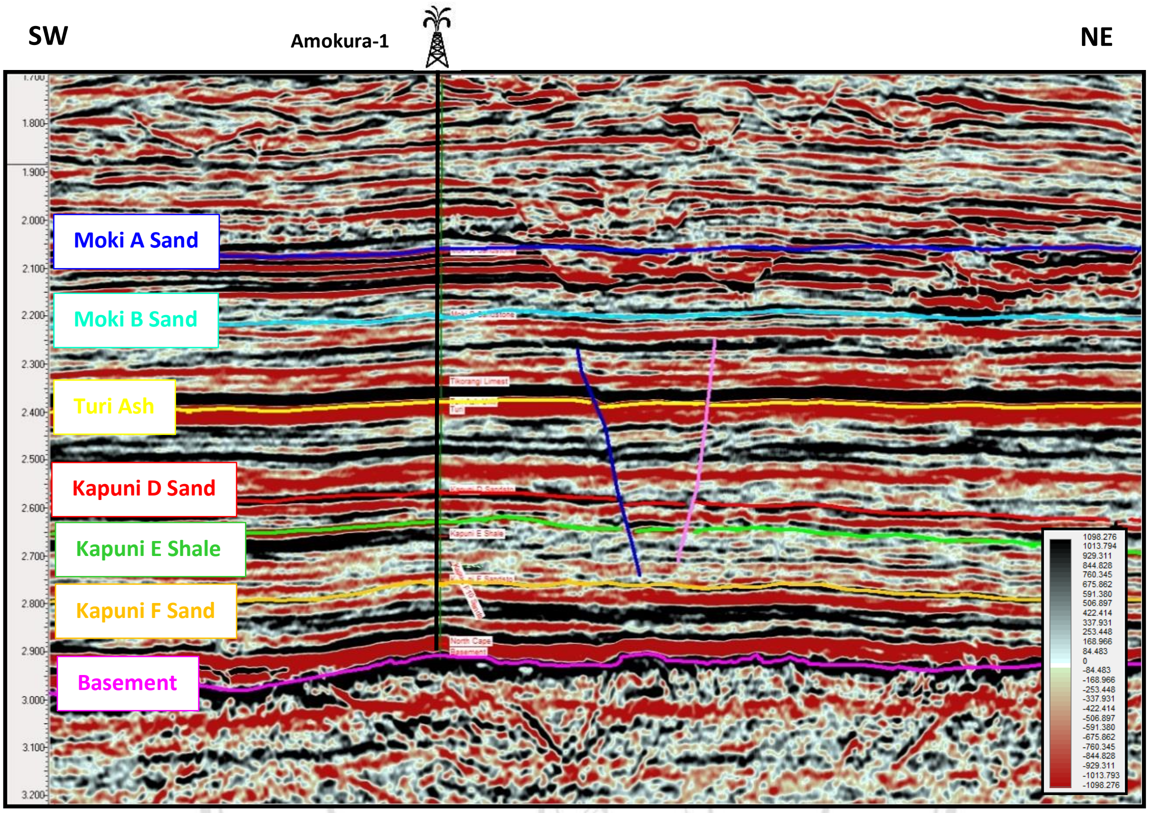

Figure 5.2. Inline 4109 showing seismic data quality in the interval of interest, including interpreted faults and horizons. The seismic line crosses the Amokura-1 well.

The following are descriptions of the horizons picked.

1. Basement

   This horizon was picked at a prominent peak between 2.6 and 3s. The reflection shows quite a contrast compared to surrounding events. Some sub-parallel events can still be seen while the events below it are more chaotic. The horizon is generally dipping toward the northwest. Three faults were identified cutting this horizon.

2. Kapuni F Sand

   This horizon was picked at a peak event between 2.6 and 2.8 s. It is characterized by low reflection continuity. The event generally dips toward the northwest. The faults cutting the basement are visible cutting this horizon as well.

3. Kapuni E Shale

This horizon was picked on a trough around 2.6 to 2.7 s. This event has medium continuity (high continuity in some areas but discontinuous in others). It generally dips toward the north. Five faults cut this horizon.

4. Kapuni D Sand

This horizon was picked on a seismic peak around 2.5 to 2.7 s. It has medium-high continuity. It generally dips toward the north and northwest. Five faults cut this horizon.

5. Turi Ash Unit

The Turi Ash Unit was picked on a seismic trough between 2.3 and 2.5 s. The event has high continuity and high contrast due to continous reflection event above and below it. The event generally dips toward the west. Four faults cut this particular event.

6. Moki B Sand

This horizon was picked on a seismic trough between 2.0 and 2.3 s. It has medium continuity. The event generally dips toward the west. Some channels are observed in this horizon.

7. Moki A Sand

This horizon was picked on a seismic trough around 1.8 to 2.2 s. This event has high continuity. The event generally dips toward the west. Some more channels are identified in this horizon.

Considering the importance of the structural maps, each horizon was converted to a grid and displayed as a time structural map. Each map is very useful in understanding the dip of the bedding and any structural features.

Figure 5.3 displays the time structural map of the Top of Basement. Generally, the bedding dips toward the northwest. A relatively large anticline is observed in the south, where the Tieke-1 well is located. A smaller anticline is identified in the northeast part, around Taranui-1, while another one is approximately 6.5 km southwest of the Taranui-1 anticline.

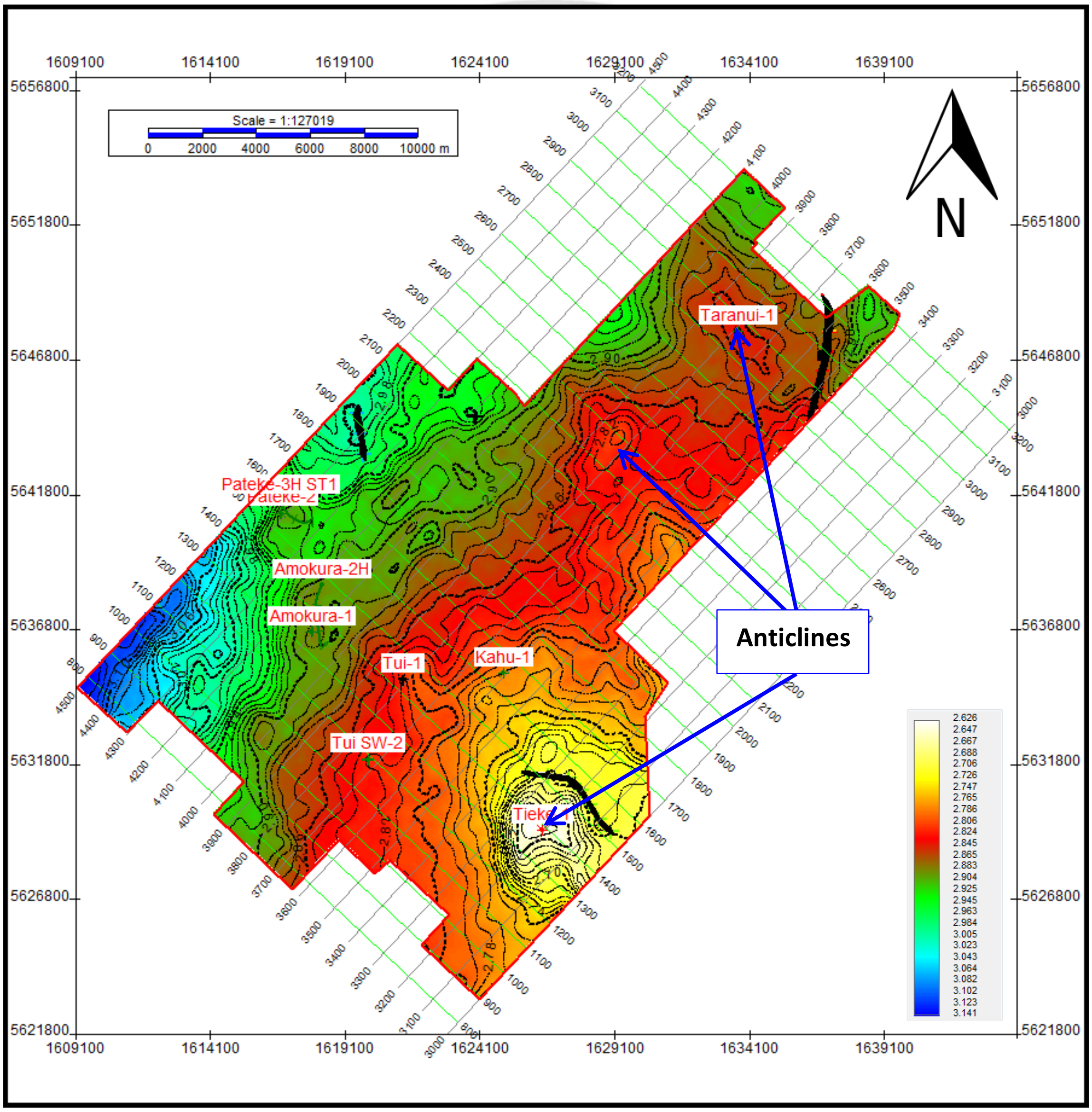

Figure 5.3. Time structure map of Basement. Contour interval = 10 ms.

Figure 5.4 shows the time structural map of the Kapuni F Sandstone. In general the bedding dips toward the north and northwest. Those anticlines observed previously were still observed in this formation. The Kapuni F Sandstone is a proven reservoir. In term of trapping system viewpoint, the anticline annotated by red start will be very promising for the next drilling point.

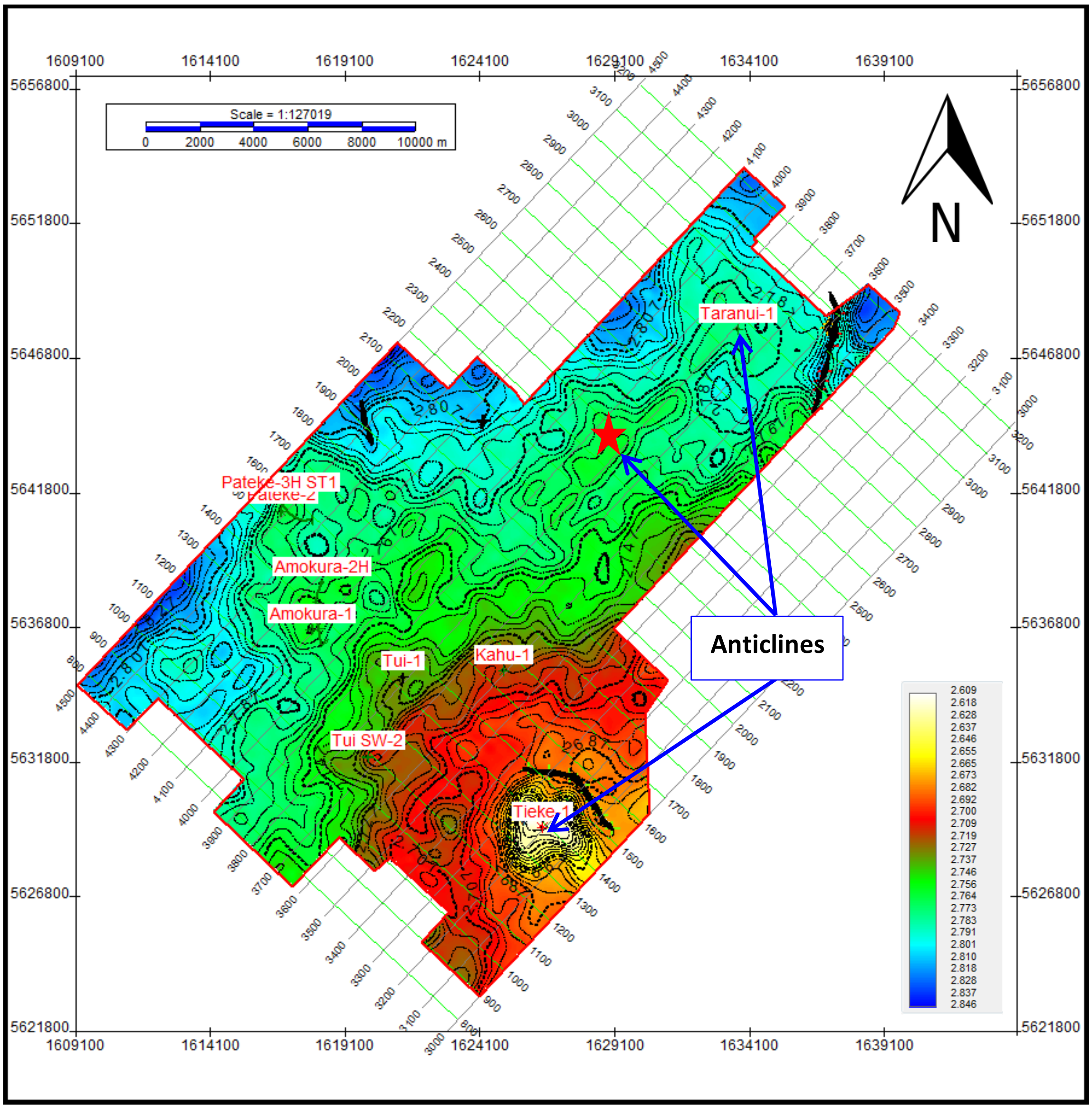

Figure 5.4. Time structure map of the Kapuni F Sandstone. Contour interval = 5 ms.

Figure 5.5 shows a time structural map of the Kapuni E Shale. Instead of dipping toward the northwest as previous formations, this formation generally dips toward the north. The big anticline in Tieke-1 is still observed. Other anticlines are identified in Taranui-1, Kiwi-1, Tui-SW2, Pateke, and Tui-1. This formation is relatively thick shale which is considered to be a seal for the petroleum play below this formation.

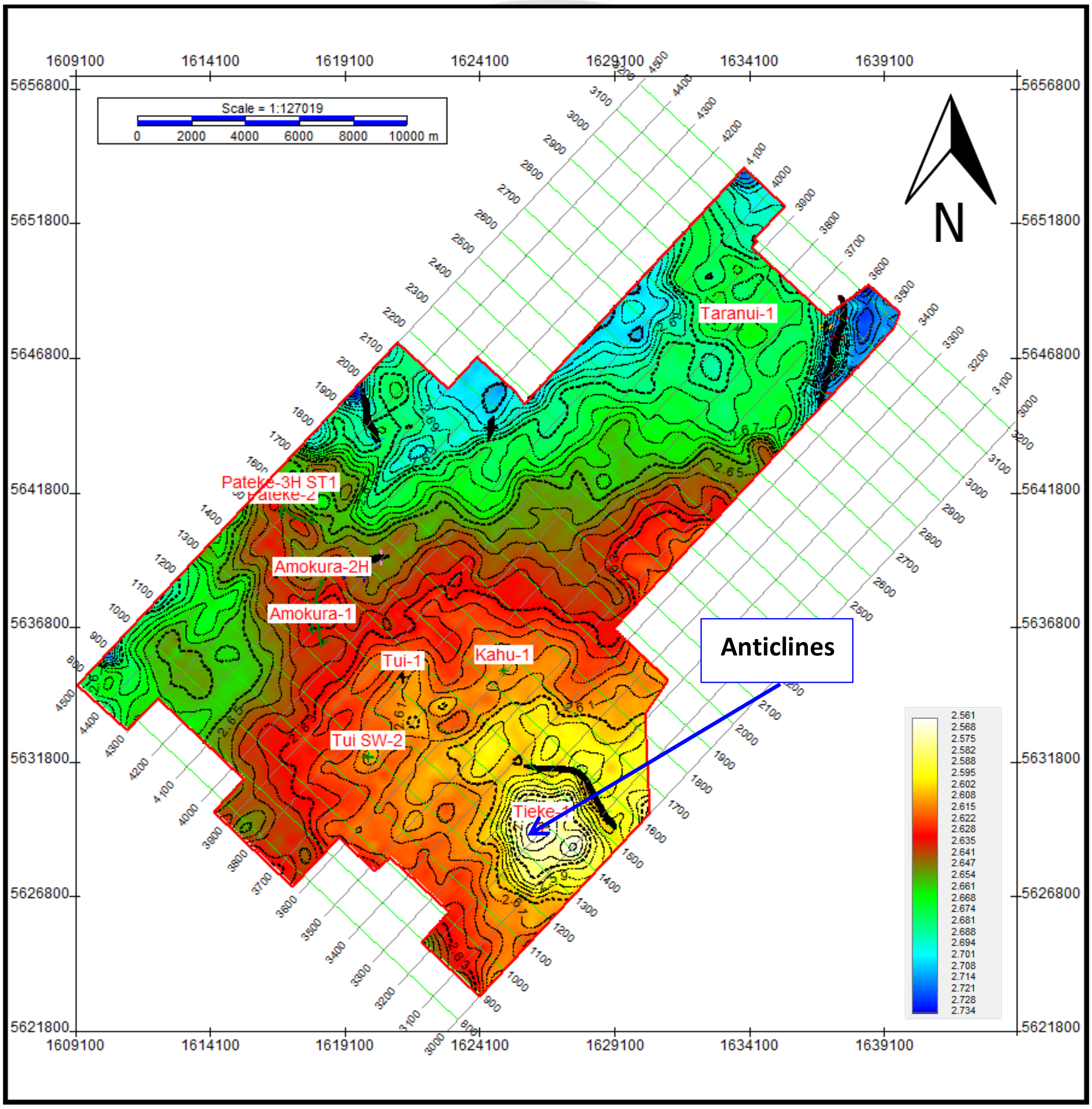

Figure 5.5. Time structure map of the Kapuni E Shale. Contour interval = 5 ms.

Figure 5.6 shows a time structural map of the Kapuni D Sandstone. In general, the bedding dips toward the north and northwest. Unlike the previous formation, all anticlines here are more separated resulting in relatively higher-relief structure. Four anticlines are obvious, involving Tieke-1, Kahu-1, Tui-1, and Tui-SW2. This formation is the second best potential reservoir in the area.

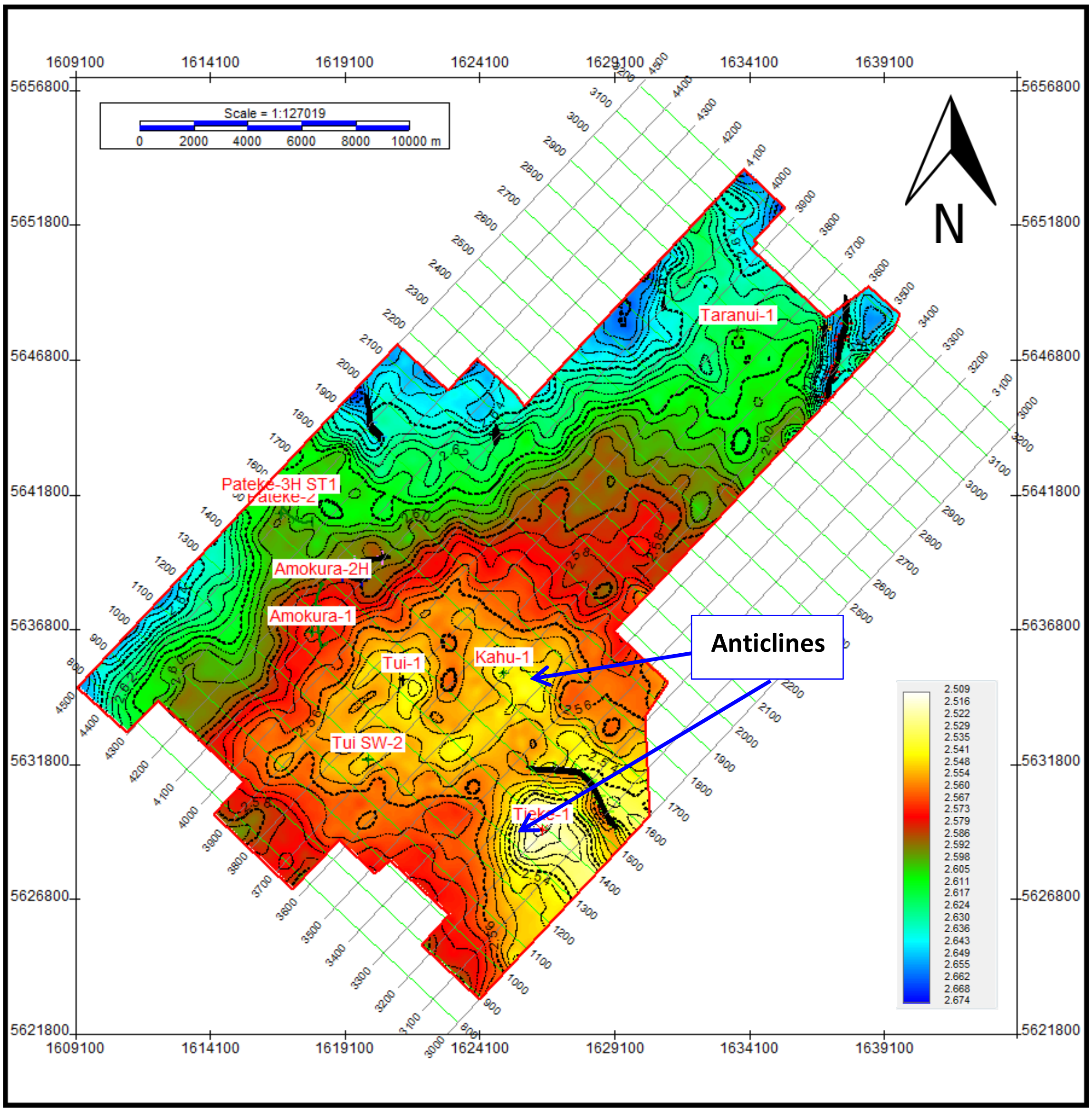

Figure 5.6. Time structure map of the Kapuni D Sandstone. Contour interval = 5 ms.

Figure 5.7 shows the time structure map of the Turi Ash Unit. This bed dips toward the west. The structural high around Tieke-1 looks broader in this formation. A couple anticlinal features identified in the previous formation cannot be seen in this top formation.

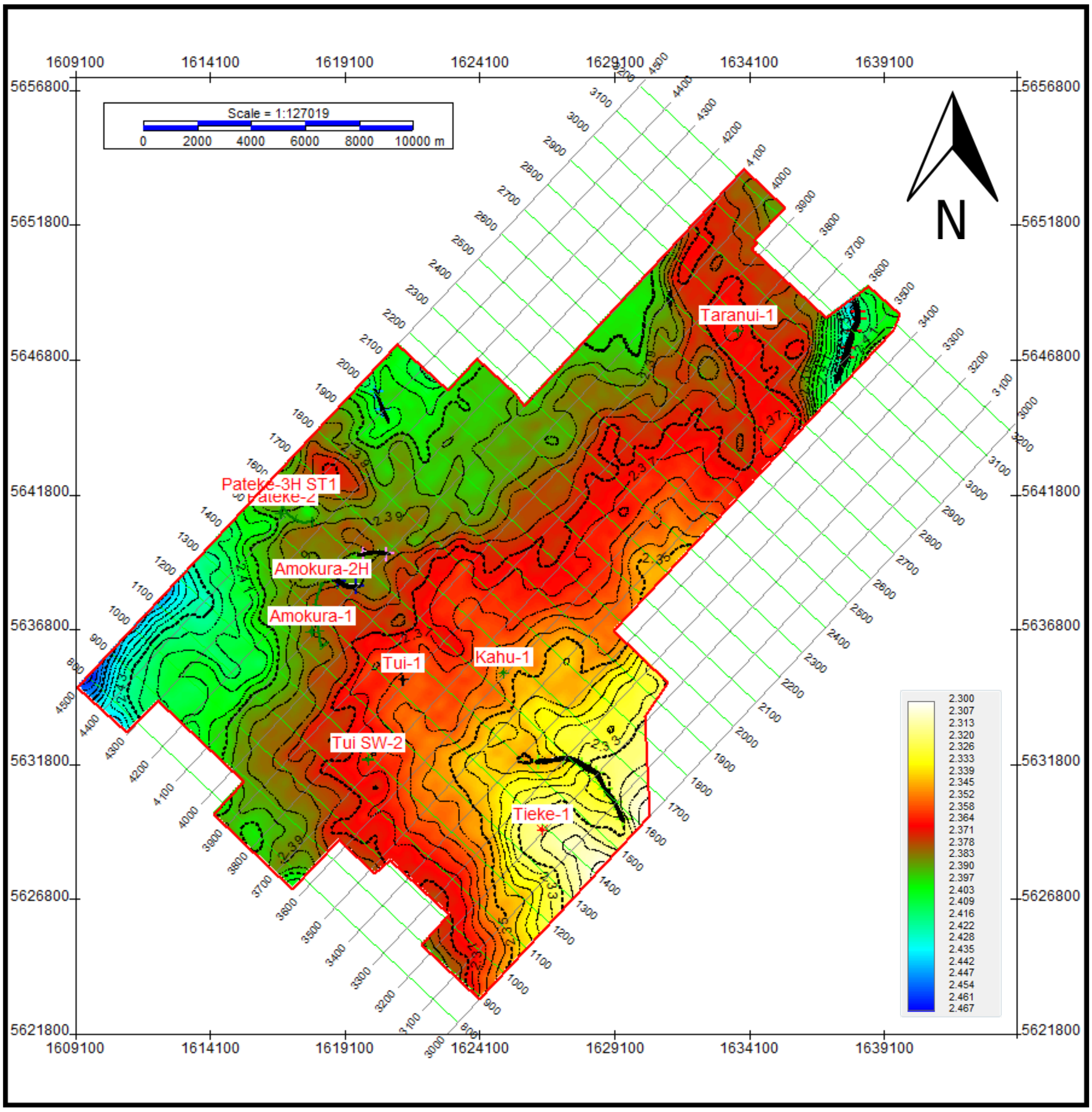

Figure 5.7. Time structure map of the Turi Ash Unit. Contour interval = 5 ms.

Figure 5.8 shows the time structure map of the Moki B Sandstone. The bedding generally dips toward the northwest. The previous anticlines are not observable except for a plunging broad anticline near Tieke-1. This formation is also one of the potential reservoirs in the area. However, as far the well data are concerned, This particular formation is water-bearing in this area but hydrocarbon-bearing in another area. One of possible reason not having hydrocarbon is the absence of trap.

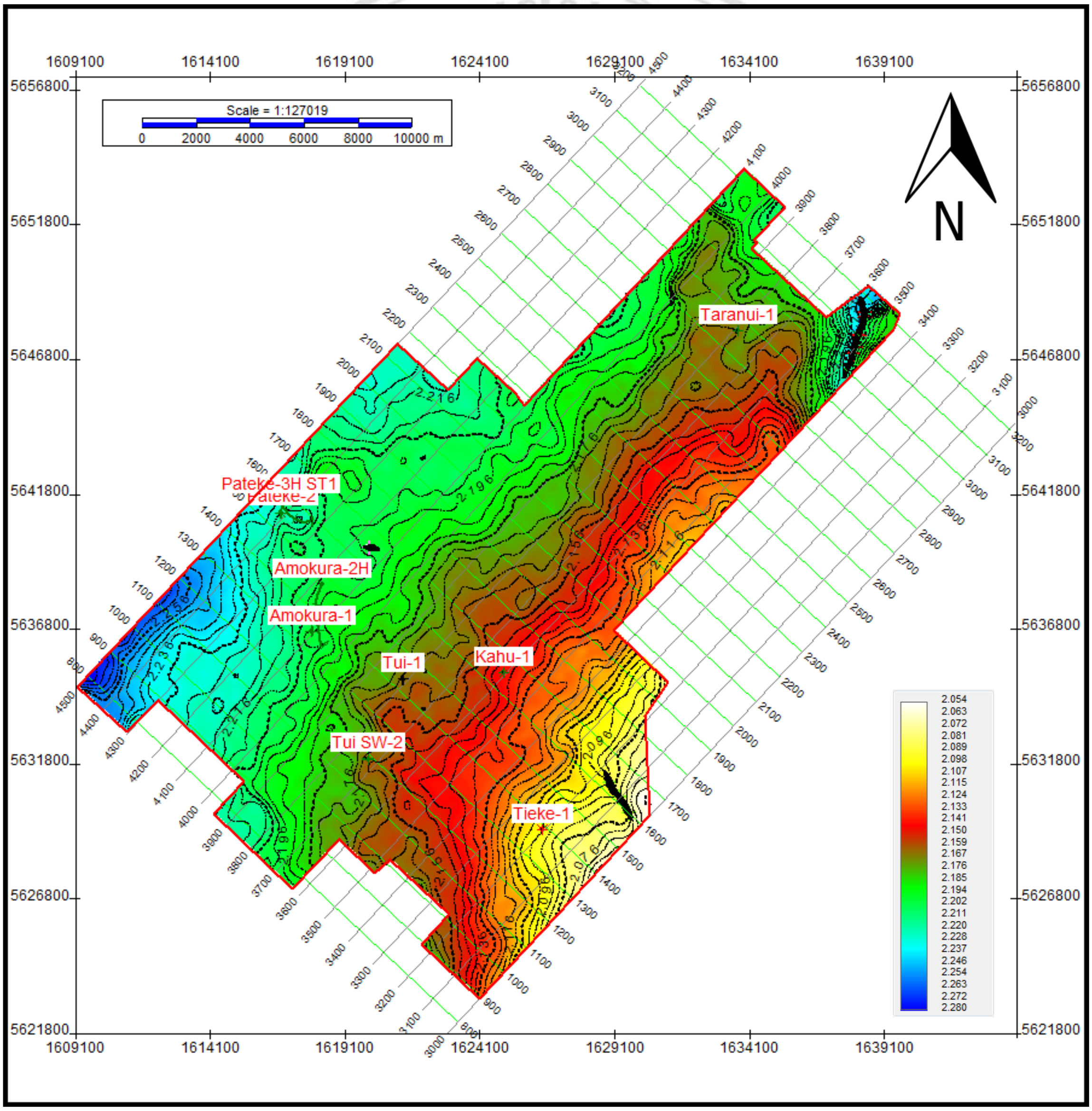

Figure 5.8. Time structure map of the Moki B Sandstone. Contour interval = 5 ms.

Figure 5.9 shows a time structure map of the Moki A Sandstone. In general, the bedding dips to the northwest. There are no obvious anticlines in this formation. However, some NW-SE channel-like features are identified (Figure 5.10). This formation is the shallowest potential reservoir in the area under review. No hydrocarbon was found in this formation. The absence of trap is probably one of the issue in this formation.

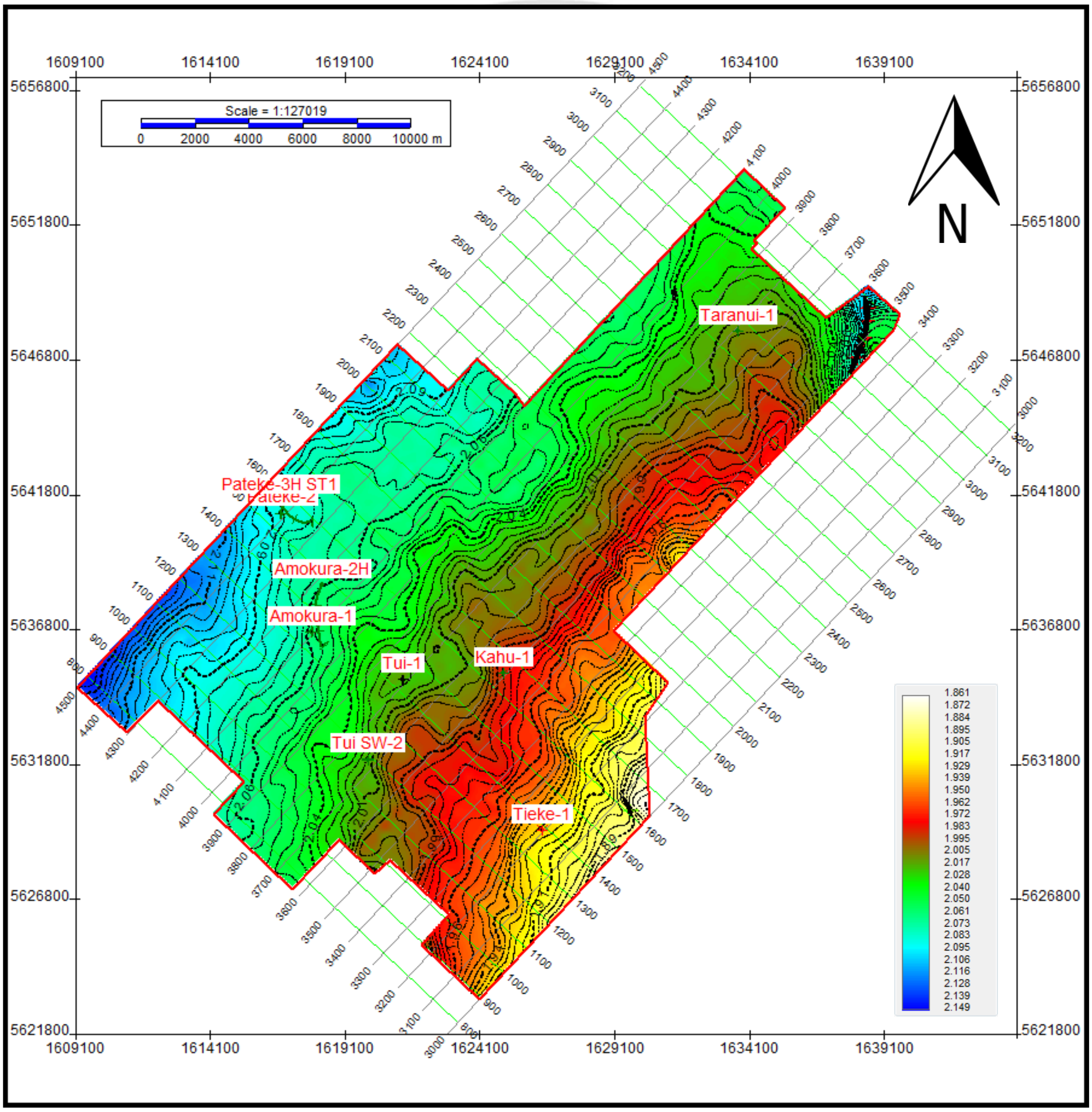

Figure 5.9. Time structure map of the Moki A Sandstone. Contour interval = 5 ms.

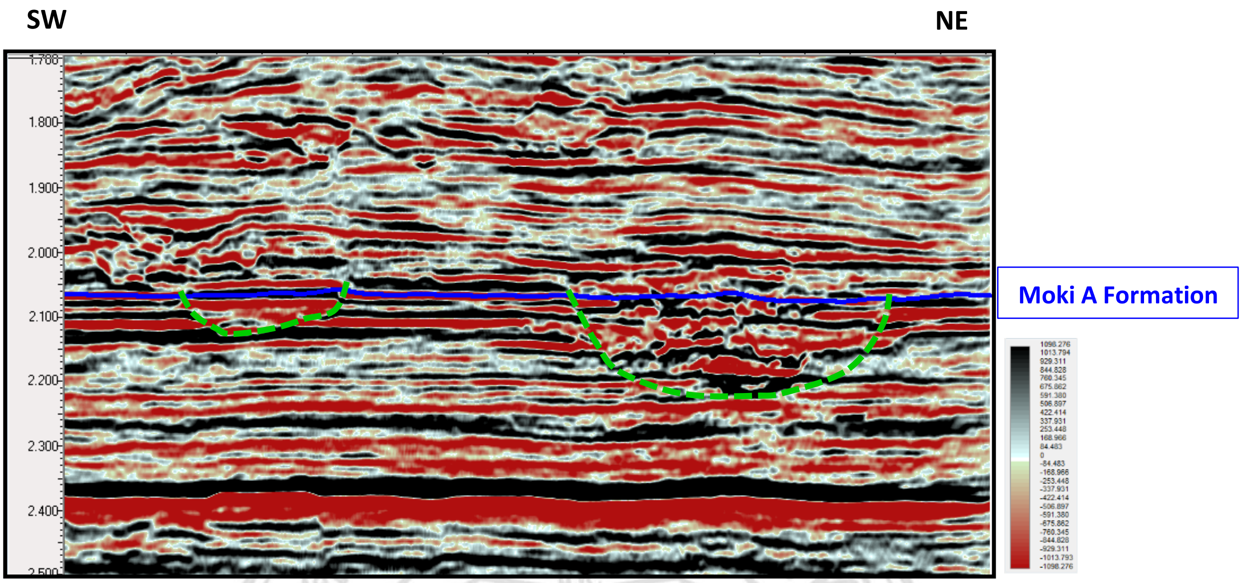

Figure 5.10. Cross-section (inline 4186) showing the horizon Moki A Sand crossing two channel-like features.