Prospect Evaluation, Risk Analysis and Reserves Estimation: Matuku Prospect, New Zealand

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Prospect Evaluation, Risk and Reserves

Final Report

Matuku Prospect

(Basin Ranking, Lead Assessment, Prospect Assessment and Self Audit)

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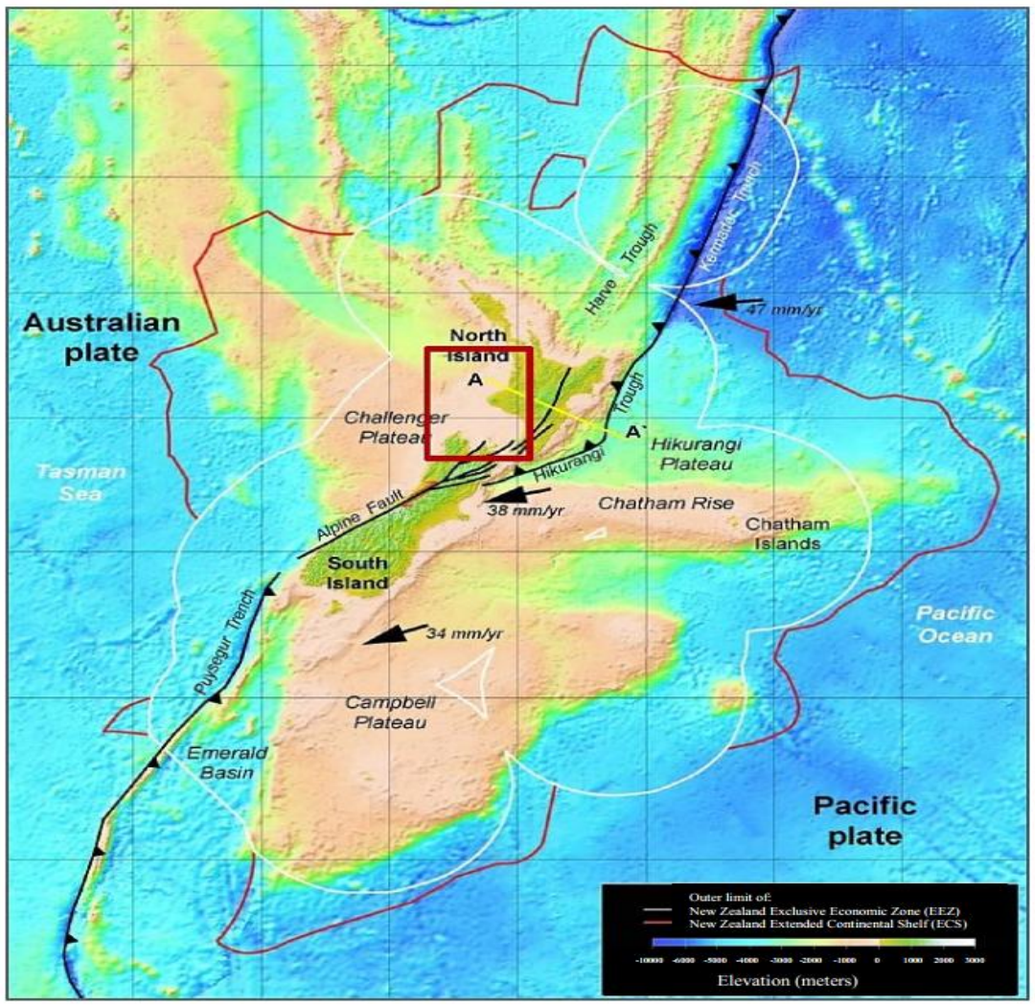
Taranaki Basin

- The Taranaki Basin is located on the west side of North Island, New Zealand
- Situated above the subduction zone where the Pacific Plate is subducting beneath the Australian Plate.
- It was formed in the Late Cretaceous by extensional tectonics associated with the continental separation.



Taranaki Sub-Basins / Terraces:

- Rakopi Terrace
- Maui - Moa High
- Kiwa Basin
- Maui - Pihama Basin

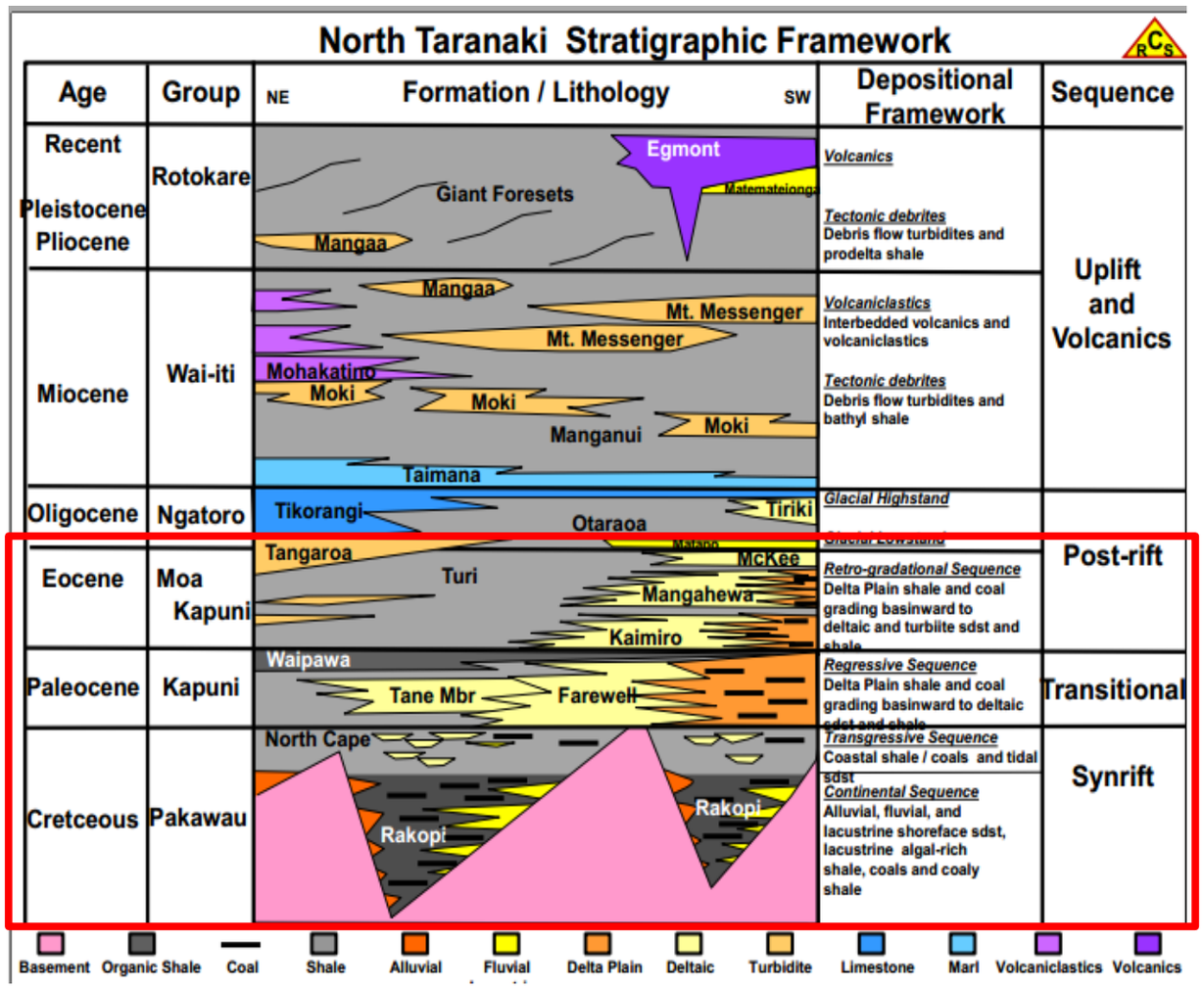
- Taranaki Basin location are marked by red square. This basin are divided into four sub-basin.

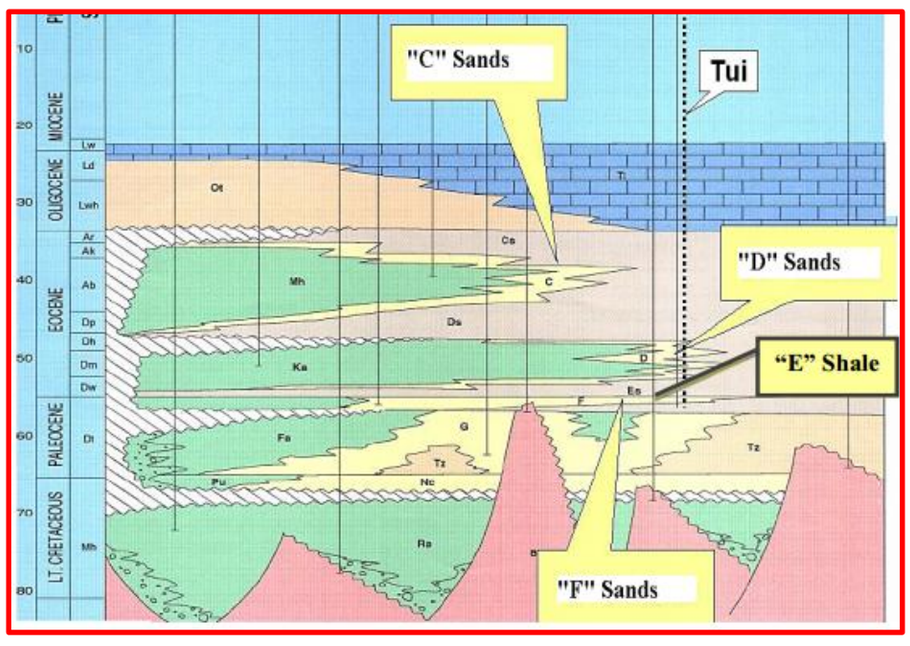
Taranaki Basin: Stratigraphy

- **Basin Play:**
  Paleocene - Eocene Turbidites (Kapuni Group)
  Cretaceous Synrift (Pakawau Grouop)

- Kapuni Group which consists of the Kaimiro Formation (Kapuni-D) and Farewell (Kapuni-E shale, Kapuni-F sand) Formation.

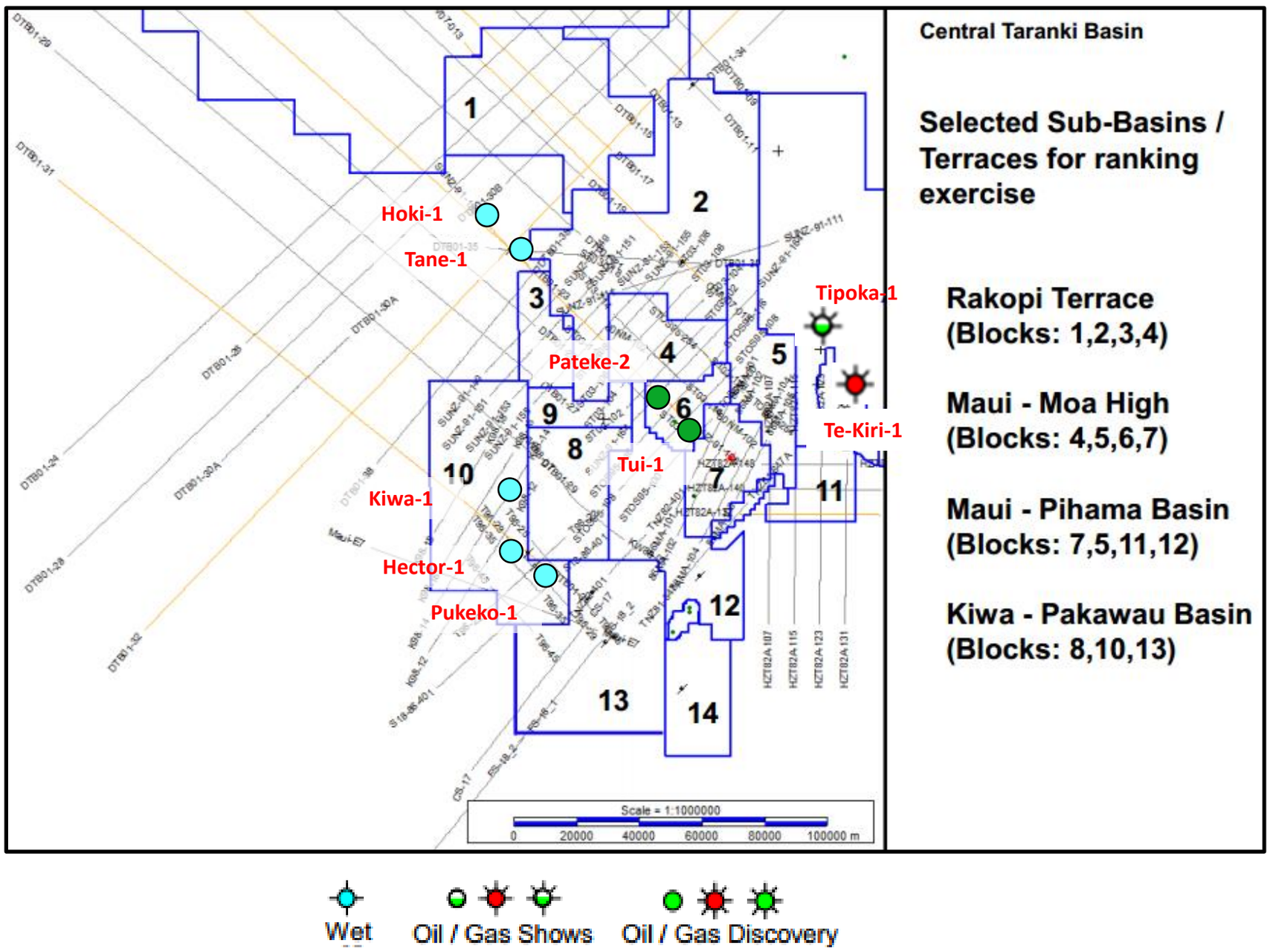
- Cretaceous Synrift Rakopi coals are the major source rock.





- Target section is mainly Eocene to Cretaceous. The main reservoir rocks are Kapuni-D and kapuni-F sandstone and seal is Kapuni-E shale.
- Potential source kitchen exist in the Cretaceous Synrift section.

Taranaki Sub-basin and Available Well



- This figure represent the available 2D seismic line and wells data to ranking the sub-basin. Legends represent the well status.

Portfolio Ranking System

Petroleum System (30 pts)

Mature Source rock and migration presence

10 pts:	Proven by test or production
7.5 pts:	Indicated by shows
5 pts:	Mapped source rocks and favorable migration pathway
2.5 pts:	No idea, but I need a source rock somewhere

Reservoir

10 pts:	Proven by good flow in tests or production
7.5 pts:	Good location on porosity depth curve
5 pts:	Not encountered, but favorable paleogeography
2.5 pts:	No idea, but I need a reservoir somewhere

Seal

10 pts:	More seal than reservoir
7.5 pts:	Section has several thick shale sequences
5 pts:	No idea, but I need a seal somewhere
2.5 pts:	More reservoir than seal

Data (30 pts)

Well Data

10 pts:	Objective section logged and cored
7.5 pts:	Objective section logged
5 pts:	Objective section encountered nearby
2.5 pts:	No well data

Seismic Data Coverage

10 pts:	Mixed 3D and 2D
7.5 pts:	Good 2D coverage
5 pts:	Wide-spaced 2D coverage
2.5 pts:	I saw a line

Amplitude Mitigation

10 pts:	Amplitude and attribute anomalies are proven to be DHIs
7.5 pts:	Numerous amplitude and attribute anomalies, not proven
5 pts:	Some amplitude and attribute anomalies,
2.5 pts:	No discernable amplitude and attribute anomalies

Exploration (40 pts)

Location

10 pts:	Onshore / shallow water (land rig – jack-up)
7.5 pts:	Mid-outer shelf (semi-submersible)
5 pts:	Deep water (drill ship)
2.5 pts:	Whale migration route or Maori Tribal Lands

Drilling to Date

10 pts:	1 or more Commercial Success
7.5 pts:	1 or more Technical Success
5 pts:	No wells or Non play condemning dry holes
2.5 pts:	Play condemning dry holes

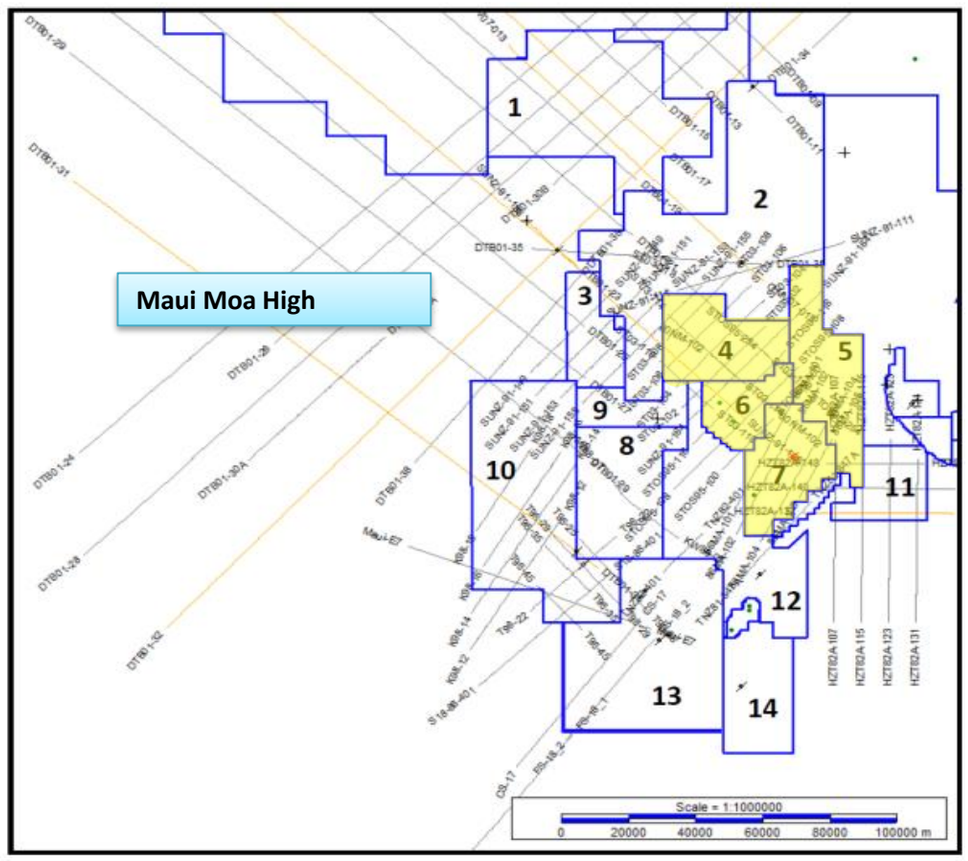
Scope

20 pts:	Drill ready prospects
15 pts:	Leads identified, stacked targets
10 pts:	Leads identified, single targets
5 pts:	Play concepts defined but leads not mapped
2.5 pts:	Play concepts not yet defined

Shortcoming:
Treats all prospects equally
8 TCF = 8 BCF

- These are the ranking parameters to evaluate the basin. Total score is 100; 30 for petroleum system, 30 for data and 40 for exploration.

Basin Ranking: Maui-Moa High



80.5	**Maui-Moa High**
25.5	**Petroleum System (30 Points)**
10	Source rock and migration
8	Reservoir
7.5	Seal
24.5	**Data (30 Points)**
10	Well Data
7	Seismic Data Coverage
7.5	Amplitudes
30.5	**Exploration (40 pts)**
7.5	Location
10	Drilling to Date
13	Scope

Petroleum System:

a)Source: Rakopi coals in the Cretaceous rift sequences of the Kahurangi sub basin.

b) Reservoir: Kapuni-D, Kapuni-F and Moki-A

c) Seal: Uninterrupted thick Kapuni E shale

d) Trapping Configuration: Trap are formed by 4 way dip closure or by up thrown 3 way dip closer.

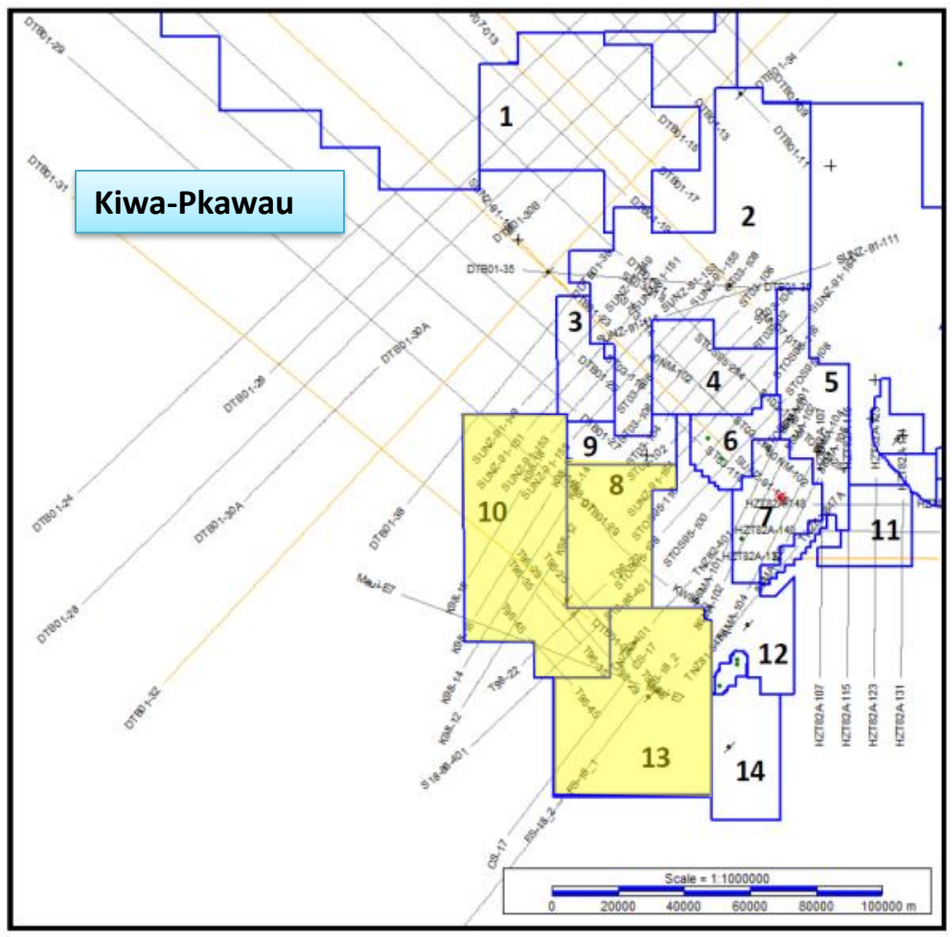
e) Potential Risk: Lack of closer in shallow reservoir and lack of charge.

Maui-Moa High was given a score of **80.5**; 25.5 for the petroleum system, 24.5 for data, and 30.5 for it’s exploration potential.

The petroleum system is good with excellent reservoir quality, thick uninterrupted seal and mature sources that are proved by Tui-1 and Puteke-2.

The potential risk is mainly associate with shallow prospect. Most likely explanation for failure Moki A inTui-1 section is lack of closer and/or lack of charge.

Basin Ranking: Kiwa–Pakawau



68	**Kiwa – Pakawau Basin**
21	**Petroleum System (30 Points)**
7.5	Source rock and migration
7.5	Reservoir
7	Seal
22.5	**Data (30 Points)**
8	Well Data
7	Seismic Data Coverage
7.5	Amplitudes
23.5	**Exploration (40 pts)**
7.5	Location
4	Drilling to Date
12	Scope

Petroleum System:

a)Source: Rakopi coal and organic mudstones in Cretaceous rift sequence of Kahurangi sub-basin.

b) Reservoir: Kapuni Sandstones (porosity: 12-24% in Kiwa-1 and 16% in Pukeko-1) and North Cape sandstones.

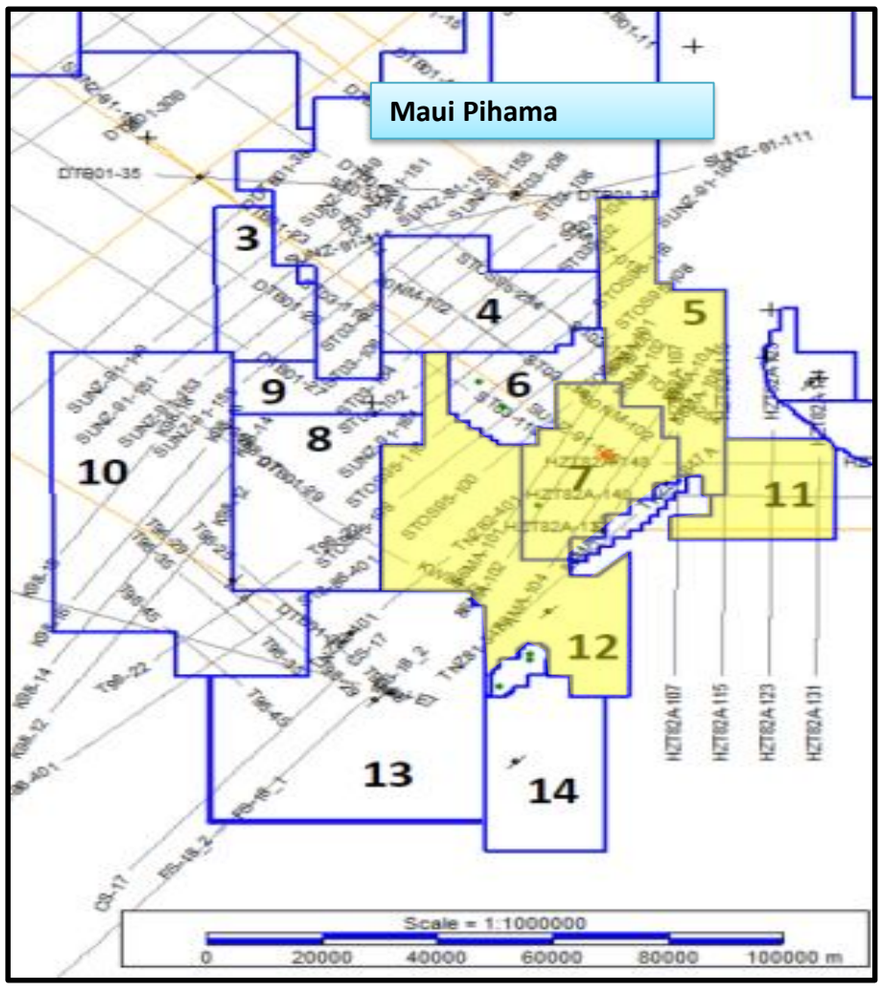
c) Seal: Turi shale and Kapuni E shale (103m thick in Pukeko-1).

d) Trapping Configuration: Structural 4-way dip closure

e) Potential Risk: The key risk is under charge

- Kiwa–Pakawau Basin was given a score of **68**; 21 for the petroleum system, 22.5 for data, and 23.5 for it’s exploration potential.
- **The key risk is under charge.** Hydrocarbon generation and expulsion is recent. Not commercial saturation is the result of insufficient geologic time to fill the large closer.

Maui- Pihama Basin



67.5	**Maui- Pihama Basin**
20.5	**Petroleum System (30 Points)**
8	Source rock and migration
5.5	Reservoir
7	Seal
23.5	**Data (30 Points)**
8.5	Well Data
7.5	Seismic Data Coverage
7.5	Amplitudes
23.5	**Exploration (40 pts)**
10	Location
2.5	Drilling to Date
11	Scope

Petroleum System:

a)Source: Coals and Carbonaceous Shale in the Kapuni Group and Pakawau Group.

b) Reservoir: Miocene Moki Formation sandstone and Late Cretaceous to Late Eocene kapuni Group.

c) Seal: The marine shale overlying the costal sands and the shale within the kapuni group are effective seals.

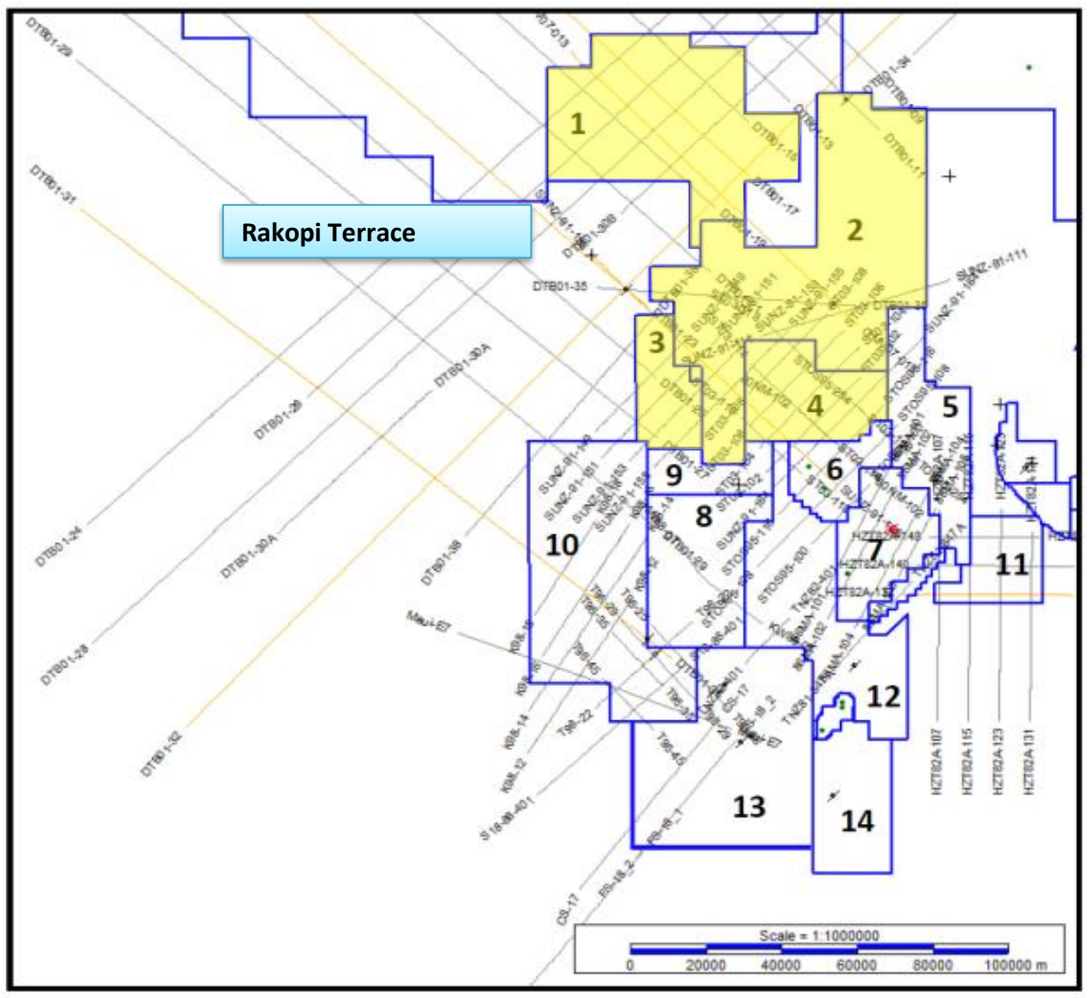
d) Trapping Configuration: 4 way Dip closure.

e) Potential Risk: Quality of reservoir.

- The Maui- Pihama was given a score of **67.5**; 20.5 for the petroleum system, 23.5 for data, and 23.5 for it's exploration potential.

- **The key risk is reservoir.** Petrophysical evaluation of Tipoka 1 and Te Kiri in the prospective Kupani sands and Moki Formation sandstones show very low porosity and high shale content.

Rakopi Terrace



61.5	**Rakopi Terrace**
21.5	**Petroleum System (30 Points)**
8	Source rock and migration
6	Reservoir
7.5	Seal
23	**Data (30 Points)**
10	Well Data
7	Seismic Data Coverage
6	Amplitudes
17	**Exploration (40 pts)**
7.5	Location
2.5	Drilling to Date
7	Scope

Petroleum System:

a)Source: Cretaceous Rakopi and Eocene Kapuni coal

b) Reservoir: North Cape sandstone, Pakawau Formation and Late Cretaceous Oaonui Formation

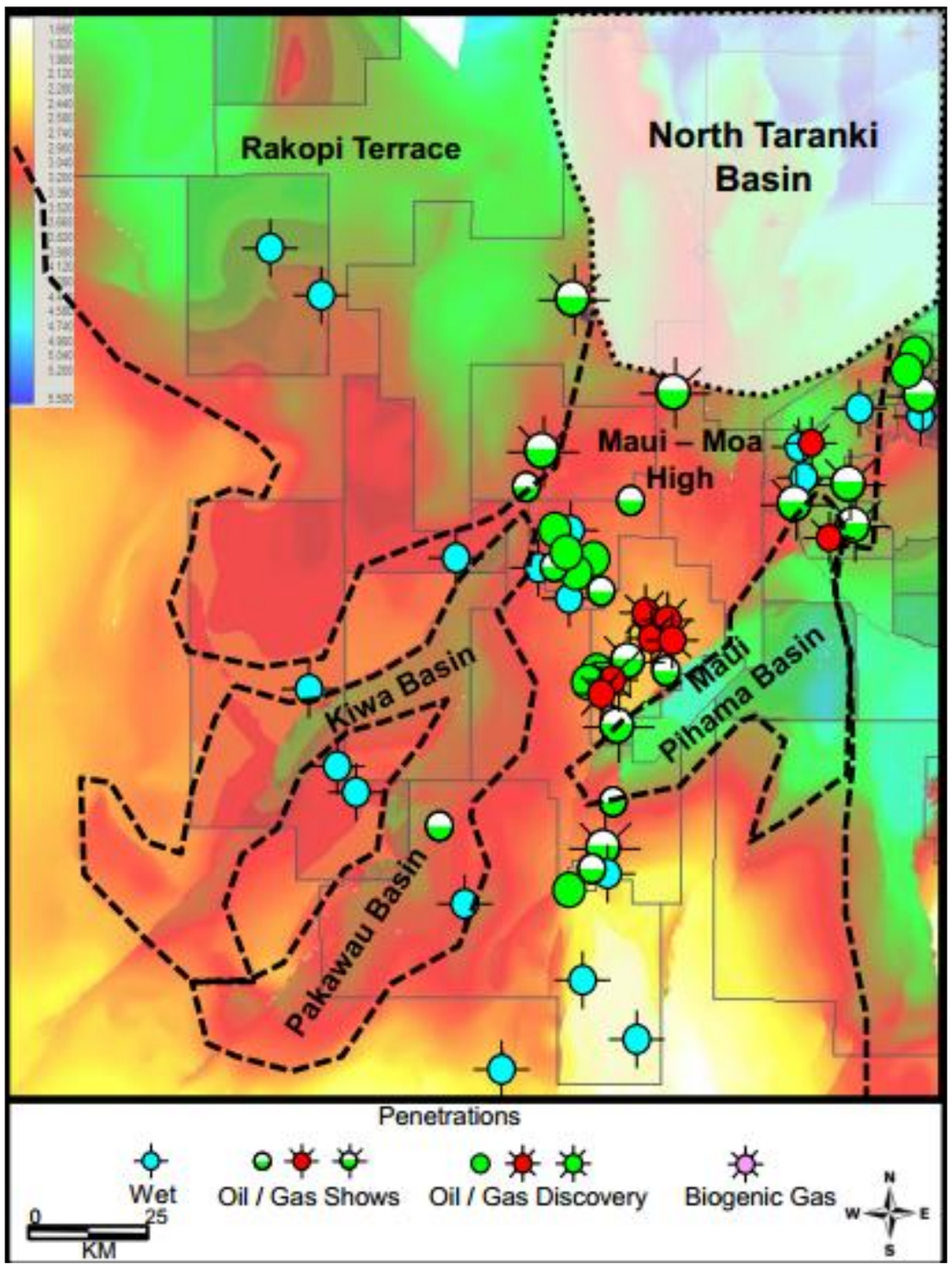
c) Seal: Turi formation and Kiata Formataion

d) Trapping Configuration: Structural trap, 4-way dip closure.

e) Potential Risk: The key risk is lack of charge

- Rakopi Terrace: Rakopi Terrace was given a score of 61.5; 21.5 for the petroleum system, 23 for data, and 17 for it’s exploration potential.
- **The key risk is lack of charge**; the Tarange-1 demonstrate the presence of mature Pakawau formation coaly source but failed to confirm migration.
- Secondary potential risk is reservoir quality. Low hydrocarbon saturation in Pakawau formation is the reason of low reservoir quality.

Taranaki Basin Ranking



Sub-Basins / Terraces

61.5 Rakopi Terrace

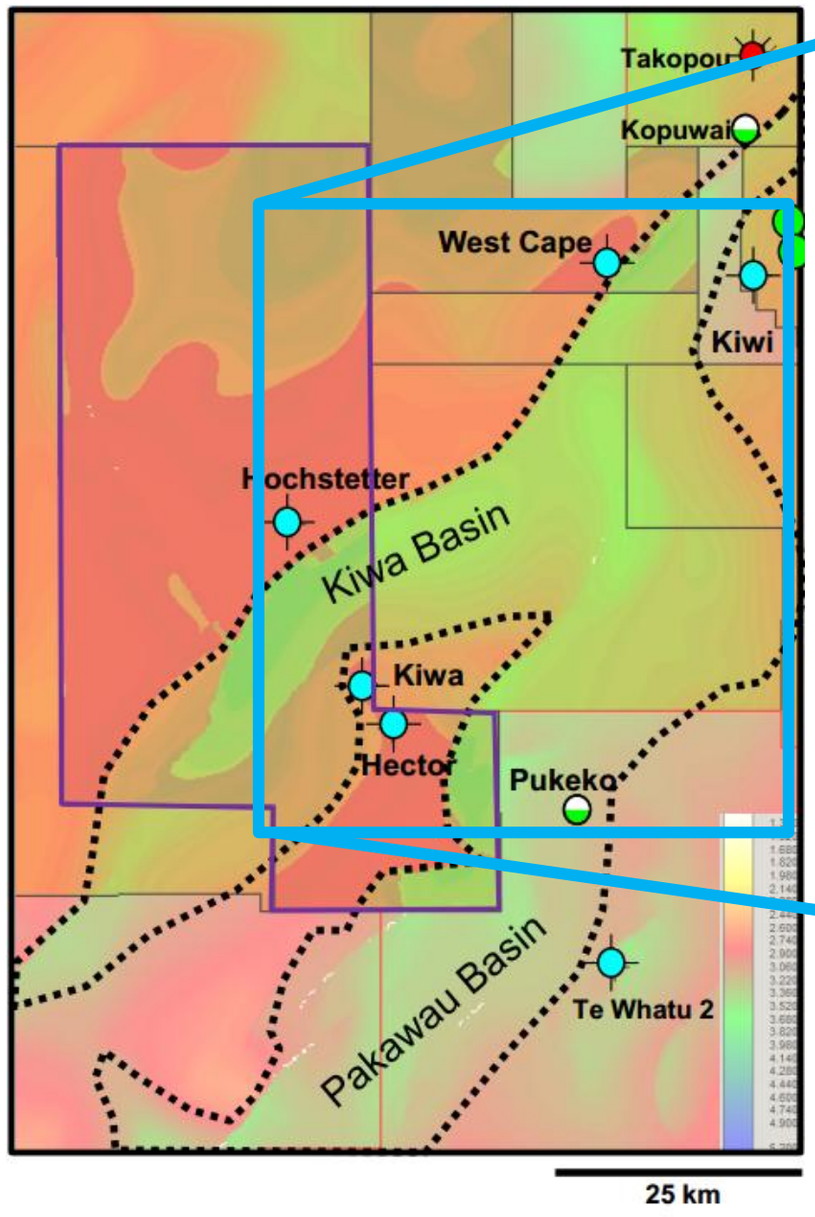
68 Kiwa – Pakawau Basin

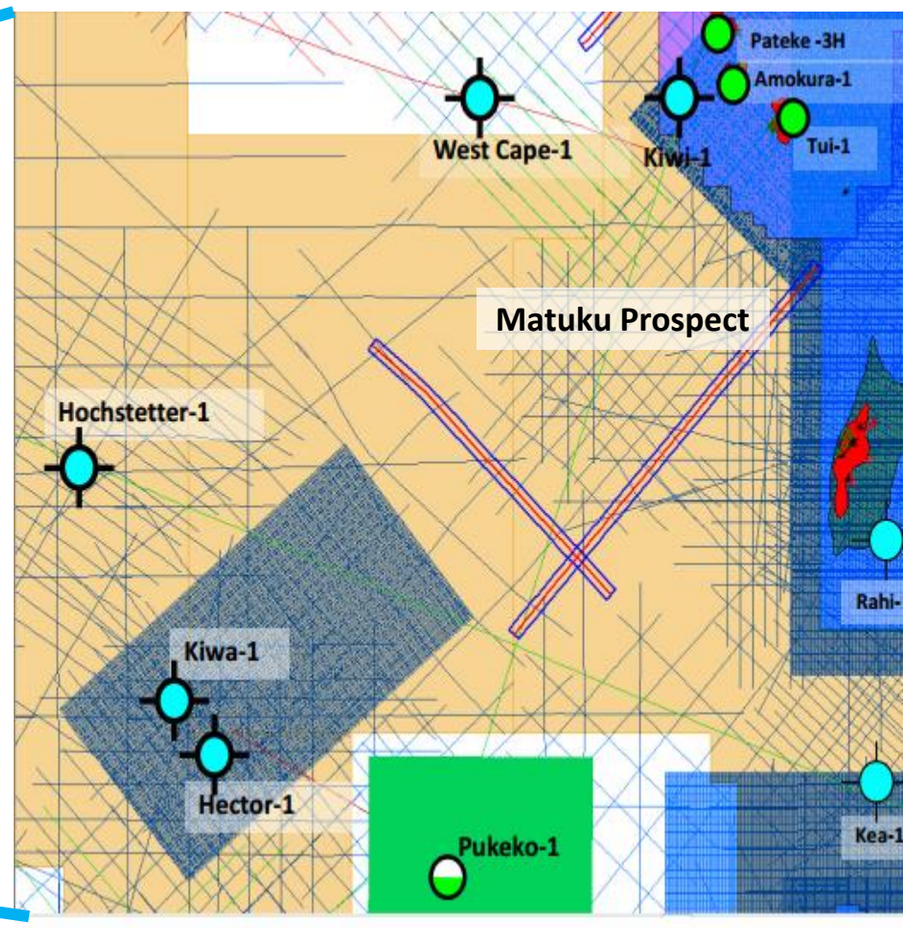
80.5 Maui-Moa High

67.5 Maui- Pihama Basin

- This is the summary of the sub-basin ranking of the North Taranaki Basin. The highest Ranked basin is Maui-Moa high and lowest ranked basin is Rakopi Terrace. Now we select one sub-basin for further evaluation.

Sub Basin for Additional evaluation





Sub-Basins / Terraces

61.5 Rakopi Terrace

68 Kiwa – Pakawau Basin

80.5 Maui-Moa High

67.5 Maui- Pihama Basin

- Northeast margin of Kiwa-Pakawau Basin (Matuku Prospect).
- The Matuku Prospect is located between the kitchen (Rakopi Coal in Kahurangi sub basin) and Tui-1 fields, Maui Moa High.

Management select Kiwa-Pakawau Basin for additional evaluation.

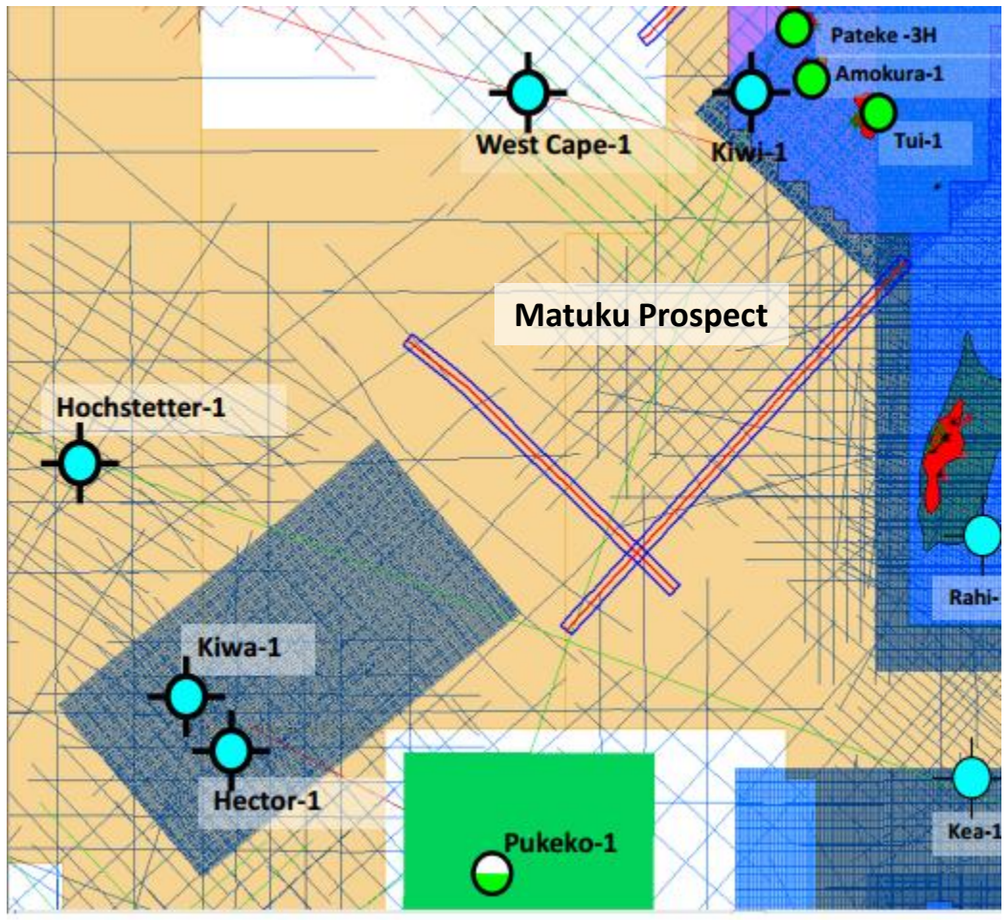
Why Kiwa-Pakawau Basin?

- High ranked Maui-Moa High is extensively leased.
- The low ranked Rakopi terrace is marginal to non prospective.
- Management want to avoid area with late stage structural deformation and volcanics
- Focus area are marked by blue rectangle which is located between Kitchen area and fields on Maui-Moa High.

Overview of the Matuku Prospect

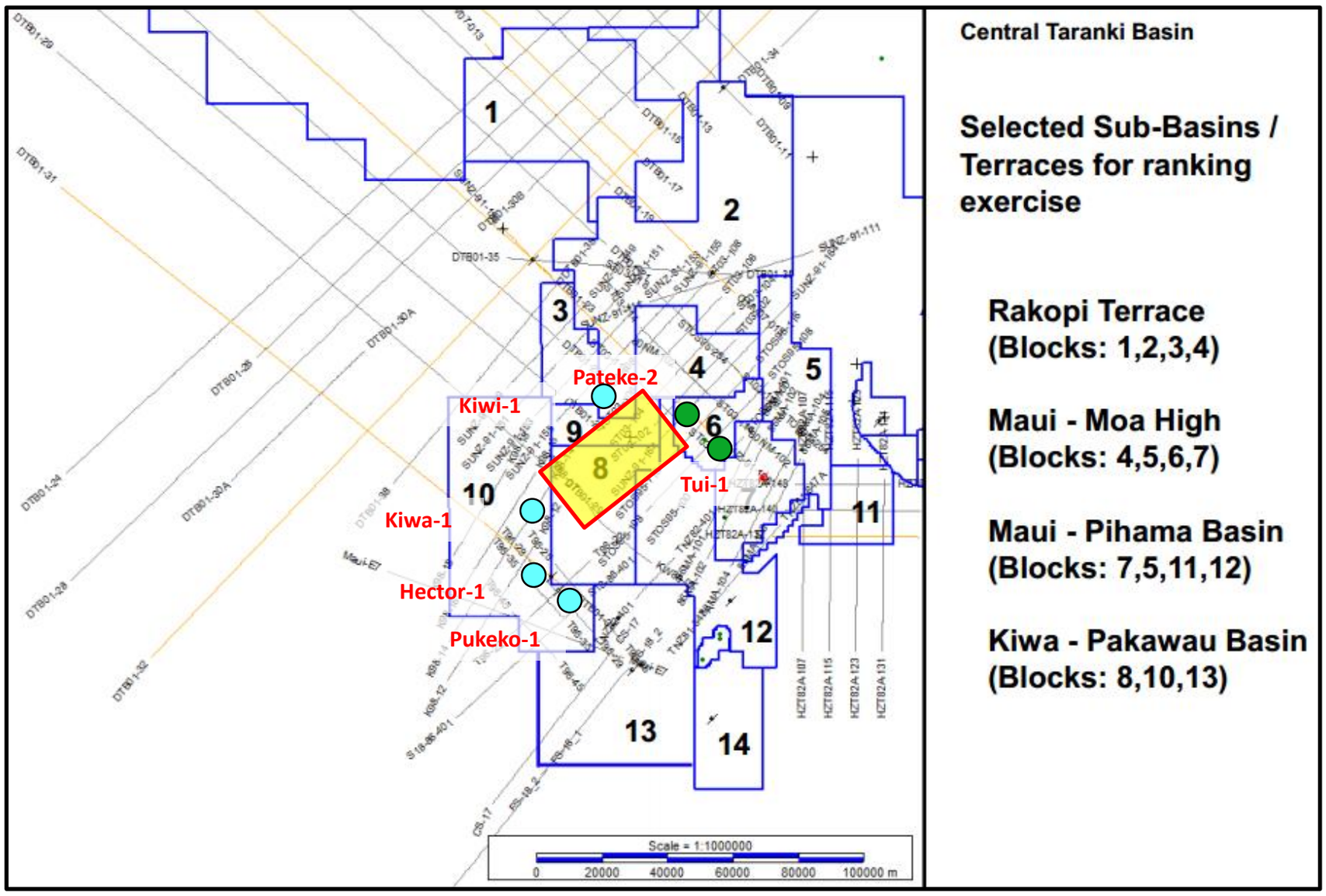
Matuku Prospect:

- Mataku prospect is located between Maui Moa High and Kiwa-Pakawau sub-basins.
- Both of the basin are treated by almost same petroleum system properties. They are excellent reservoir kapuni sands, dip closer trapping and effective top sealing
- So, Ideal trapping structure in Matuku prospect could be accumulate HC that generate and expulse from Cretaceous Rkopi coal.



Now look for the leads in this area

Well Review



- Legends on the map represent the well status and location of the corresponded well.
- Information through wells review help us to know what works and what does not work. Besides, we can improve future prediction as well as provide insight in improving risk management.
- In the following slides I will review some wells in both Kiwa-Pakawau and Maui-Moa High. Those well are located nearby the Matuku Prospect.

Well Review: Kiwa–Pakawau Basin

Hector-1

Petroleum System	**Reservoir:** Kapuni ‘C’ Sands , Kapuni ‘D’ and ‘F’ intervals. **Traps:** Evaluate 4-way dip clouser
Results	No significant gas or fluorescent oil shows
Reason for Failure	Limit vertical migration through the Kapuni section

Kiwa-1

Petroleum System	**Reservoir**: Kapuni Sandstones **Trap**: Dop Closure **Source:** Coal in Rakupi Formation **Seal:** Kapuni E Shale
Results	No Hydrocarbon shows
Reason for Failure	The lack of hydrocarbon generation

Pukeko-1

Petroleum System	**Reservoir:** Kapuni ‘D’ sands and Kapuni ‘F’ sand. **Source**: Rakopi Coal and organic mudstone inkahurangi sub basin **Traps:** Anticlinal closer. **Seal:** Kapuni E Shale
Results	Weak oil shows
Reason for Failure	• Lack of effective regional top seal formation. • Lack of adequate charge

Kiwi-1

Petroleum System	**Traps:** Dip Closer **Source:** Rakopi Coal and Carboneous mudstone **Reservoir**: Kapuni ‘F’ sandstones and North Cape section. **Seal:** Kapuni E Shale
Results	Kapuni-F filled by brine.
Reason for Failure	Lack of access to the charge

- All of the wells have almost same petroleum system.
- Weak HC shows in Hector-1 and Pukeko-1.
- Lack of charge is the main reason for failure.

Well Review: Maui-Moa High

Pukeko-2

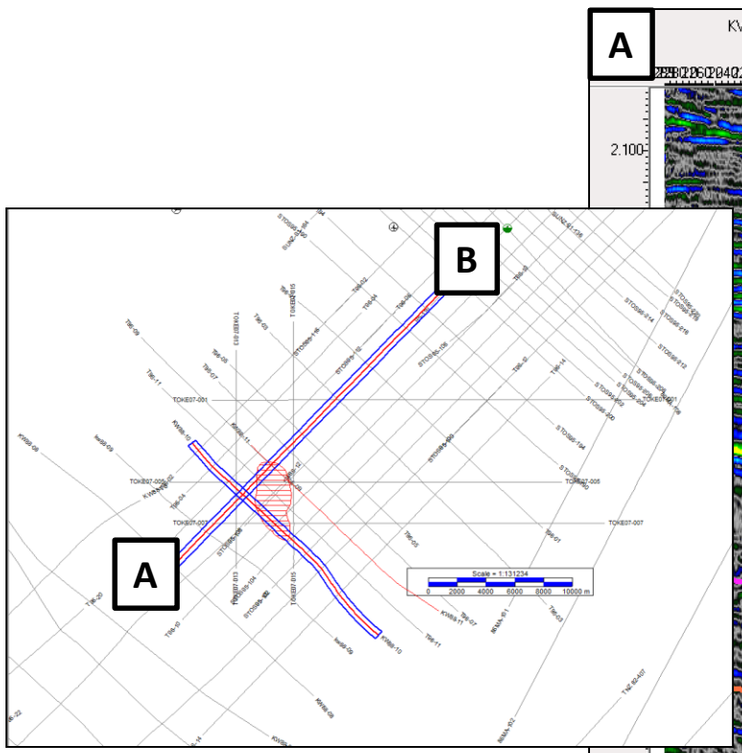
Petroleum System	**Source:** Rakopi coals in the Cretaceous rift sequences of the Kahurangi. **Reservoir:** The Kapuni "E" shale is about 180 meters thick. **Trap:** local 4-way dip closures **Seal:** Kapuni E shale
Results	No significant gas or fluorescent oil shows.
Reason for Failure	Limit vertical migration through the Kapuni section

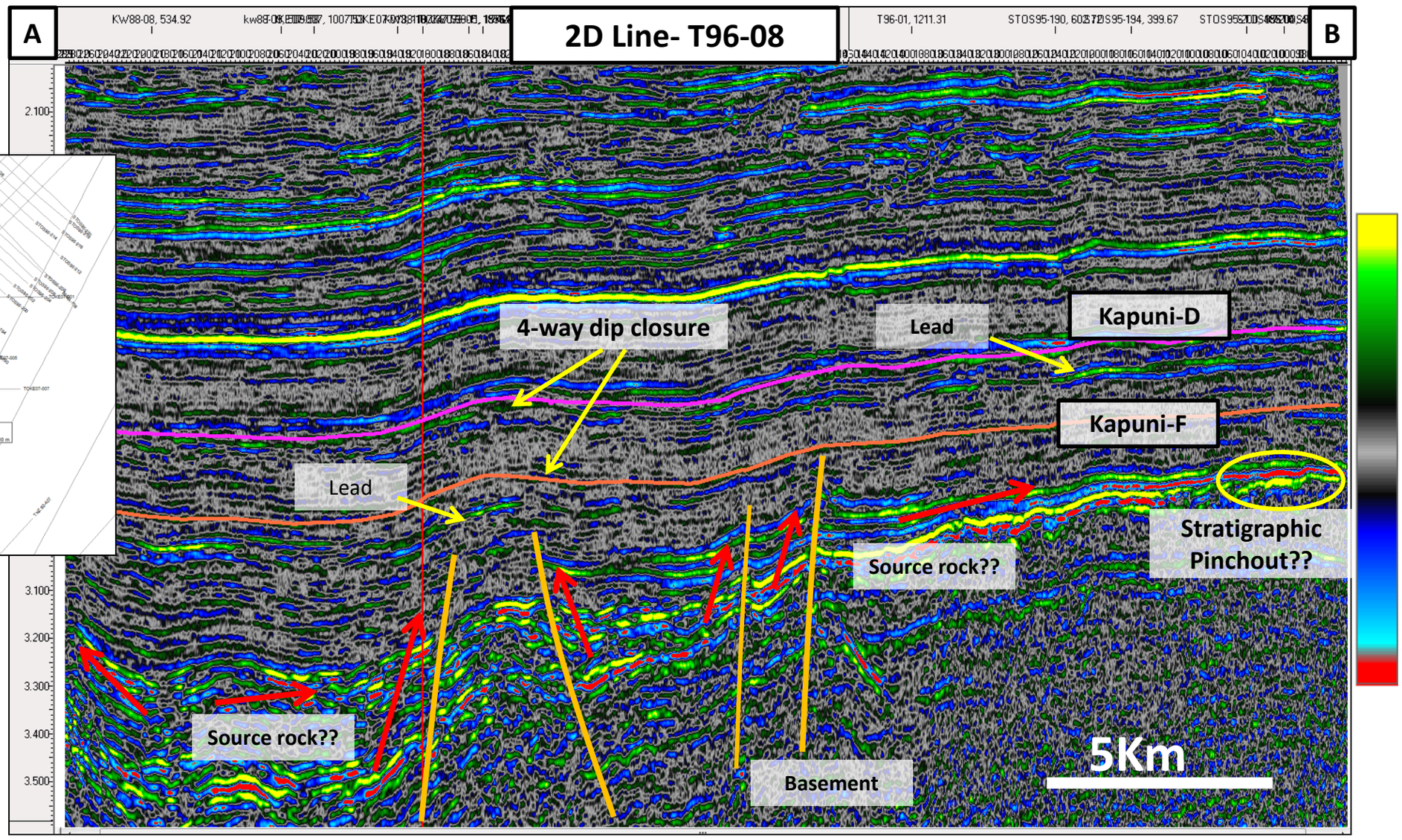
Tui -1

Petroleum System	**Reservoir:** Kapuni sandstones **Seal:** Kapuni E shale **Trap:** 4- way dip clousre s **Source:** Rakopi Coal
Results	Oil Discovery in Kapuni F
Reason for Failure	Lack of charge is the possible reason for Kapui-D and Moki formation

- Both wells has same petroleum system.
- Migration is the key problem

Lead Identification On 2D Seismic Line



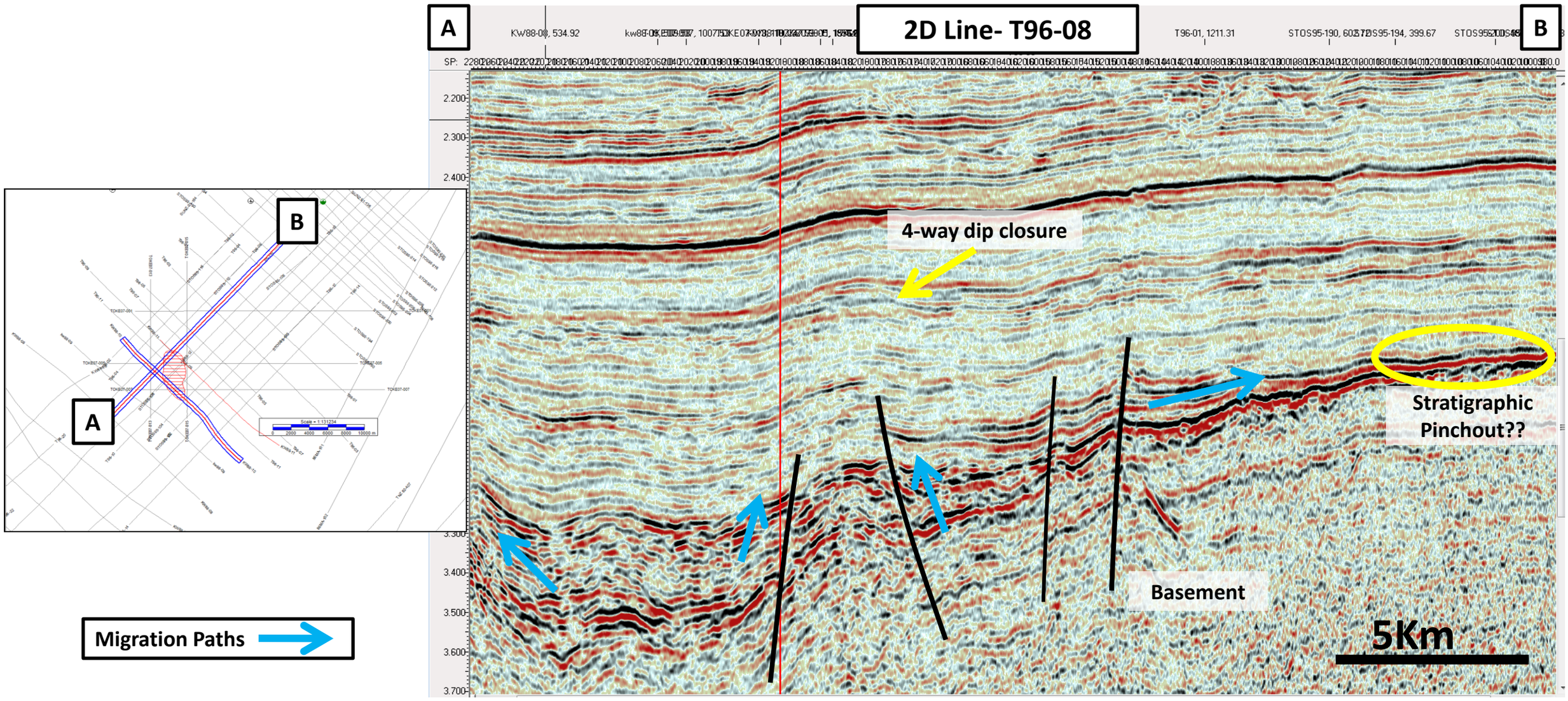


Migration Paths →

Vertical section using the RSA rai2 color bar; creastal amplitudes may be response to presence of source rock in synrift section.

- The RSA rai2 color bar, thresholded to enhance amplitude, combined with the geologic model can be helpful to identify the source-rich portion. High amplitudes are located mainly in the cretaceous synrift section are the potential source rock.
- Potential migration pathways are marked by red arrow and closers are fault controled basement high.

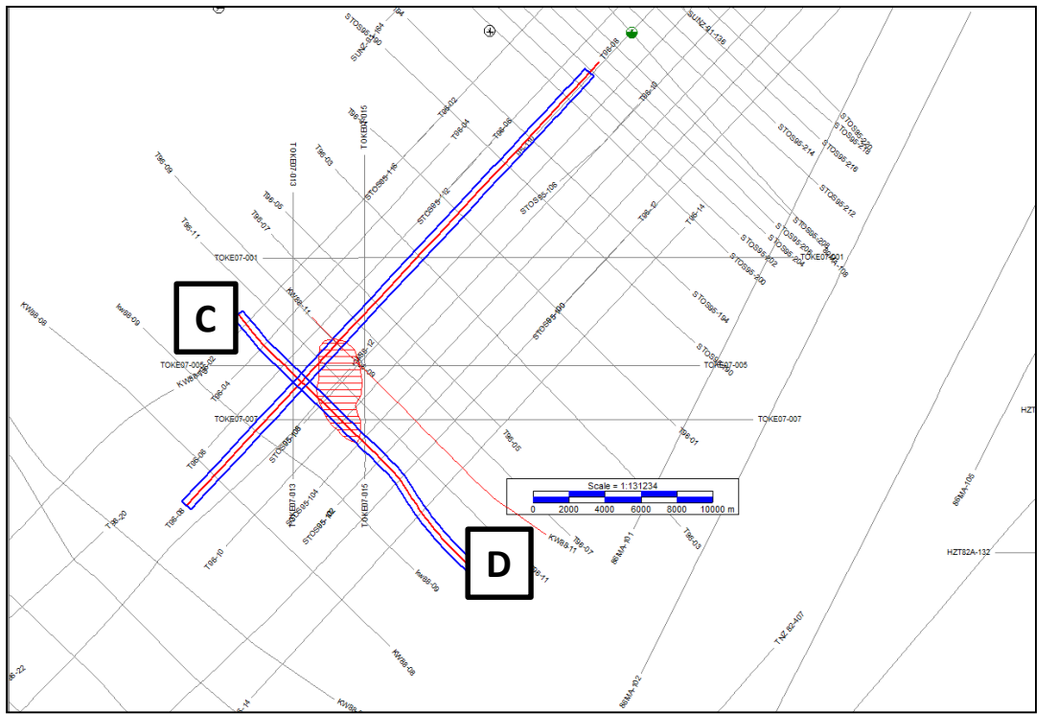
Lead Identification On 2D Seismic Line

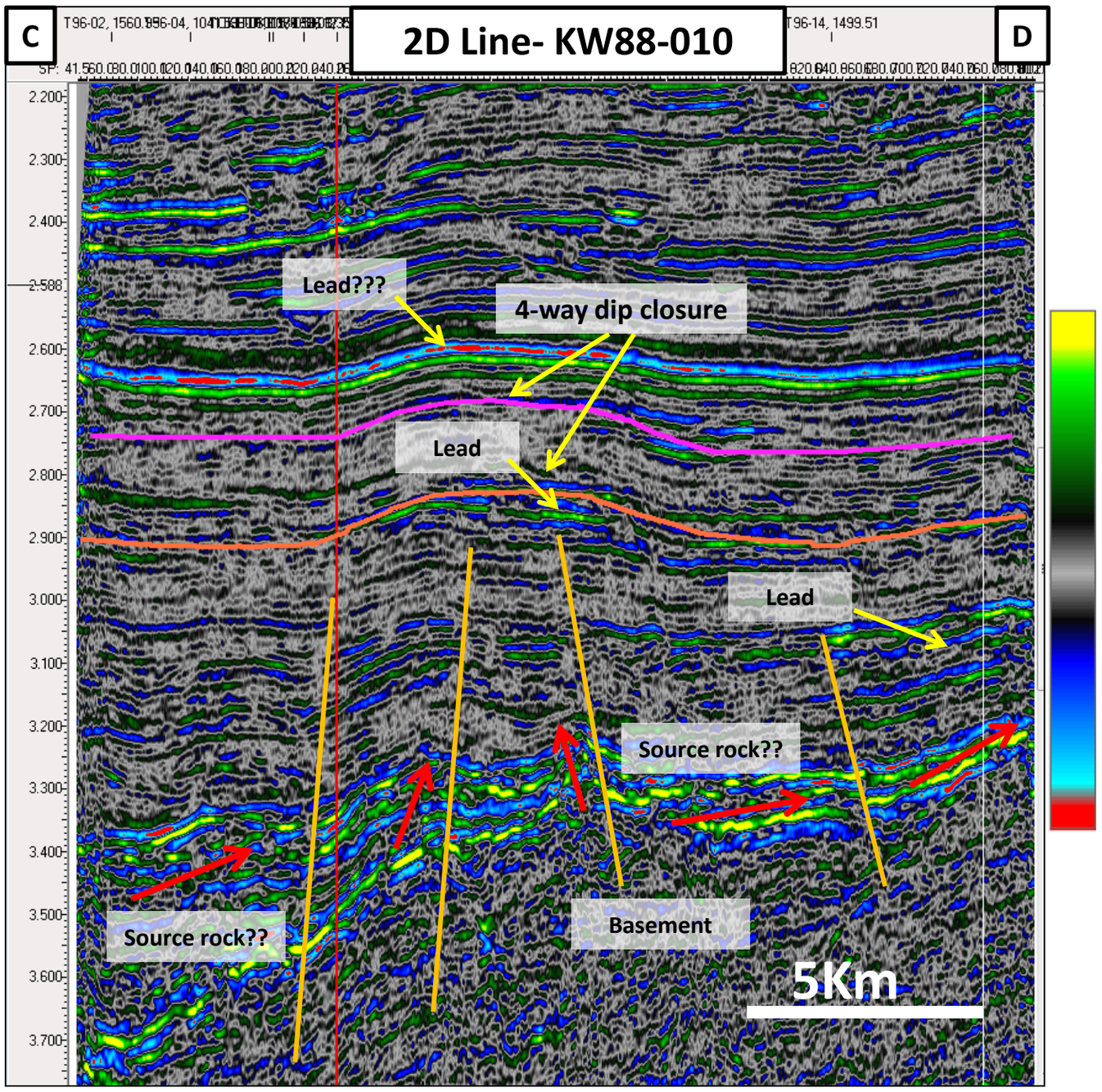


- Vertical section using Landmark colour bar to clearly identify the structural stratigraphic features.
- Some possible migration pathway are shown by blue arrow

- Same vertical line has been shown in previous slide using Landmark color bar. Using RSA rai2 color bar sometimes it is hard to understand structural and stratigraphic features.

Lead Identification On 2D Seismic Line





Migration Pathway →

- Distribution of source rich rock Synrift section.
- Prospective trapping may be four way dip closer/ fault controlled closer.

Petroleum System of Matuku Prospect

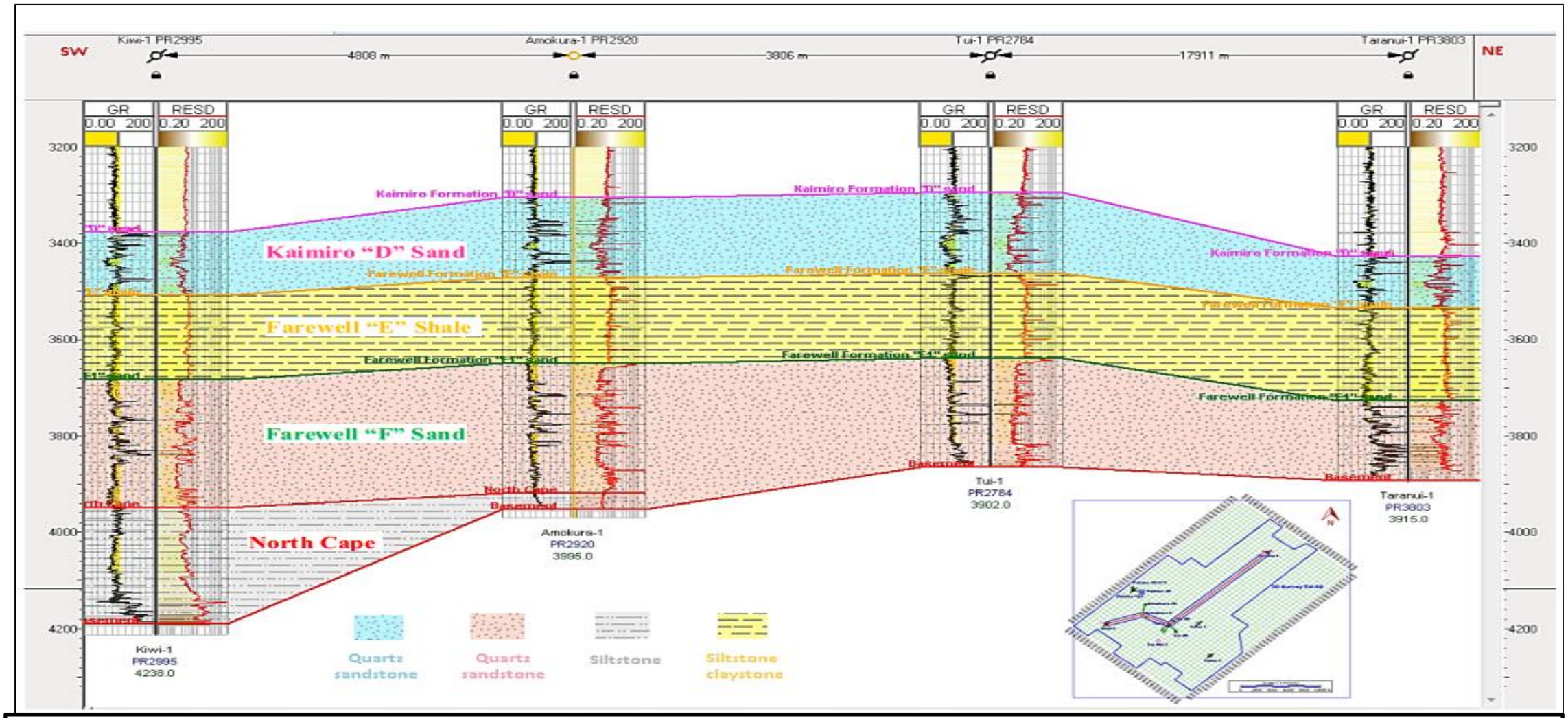


Figure-1: Well to well correlation showing the lithology and distribution (Yagci 2016)

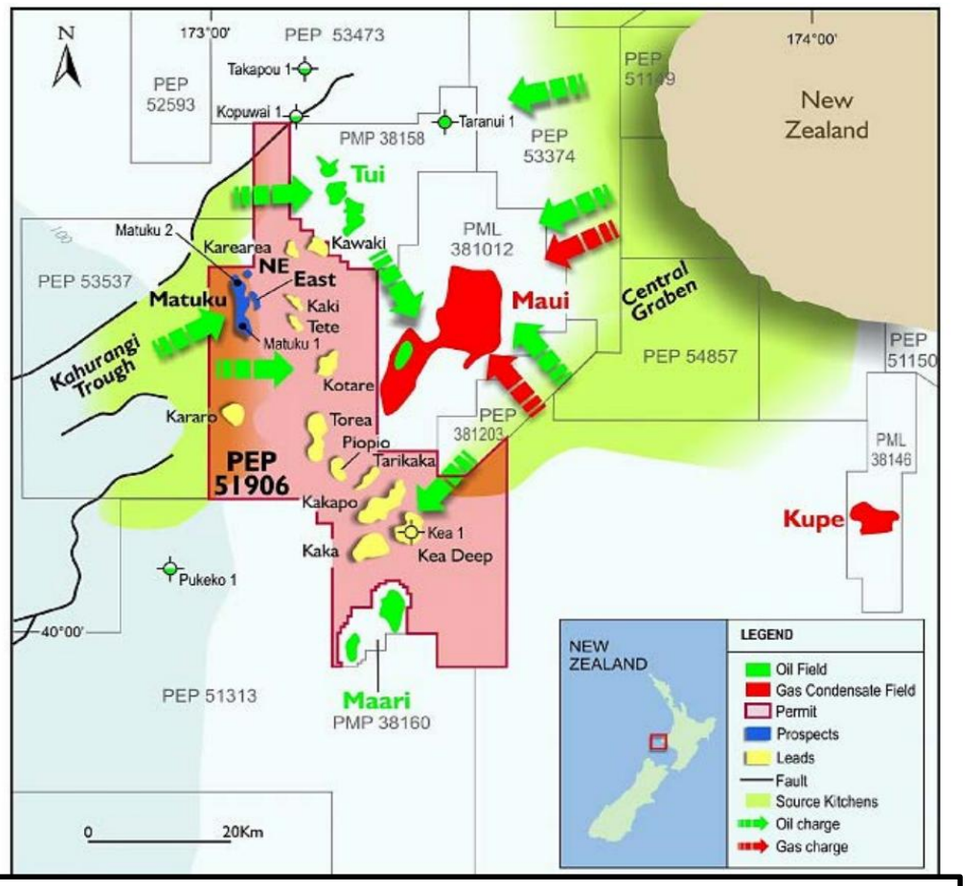


Figure-2: Possible Migration Pathway (Yagci 2016)

Potential Petroleum System:

Source: Rakopi coal in the Cretaceous rift sequences of the Kahurangi sub basin. That is mature for oil generation and may charge to Matuku prospect like Maui-Moa High (Tui-1).

Migration: Oil generated in Kahurangi sub basin from Rakopi coal might be charge the Matuku prospect.

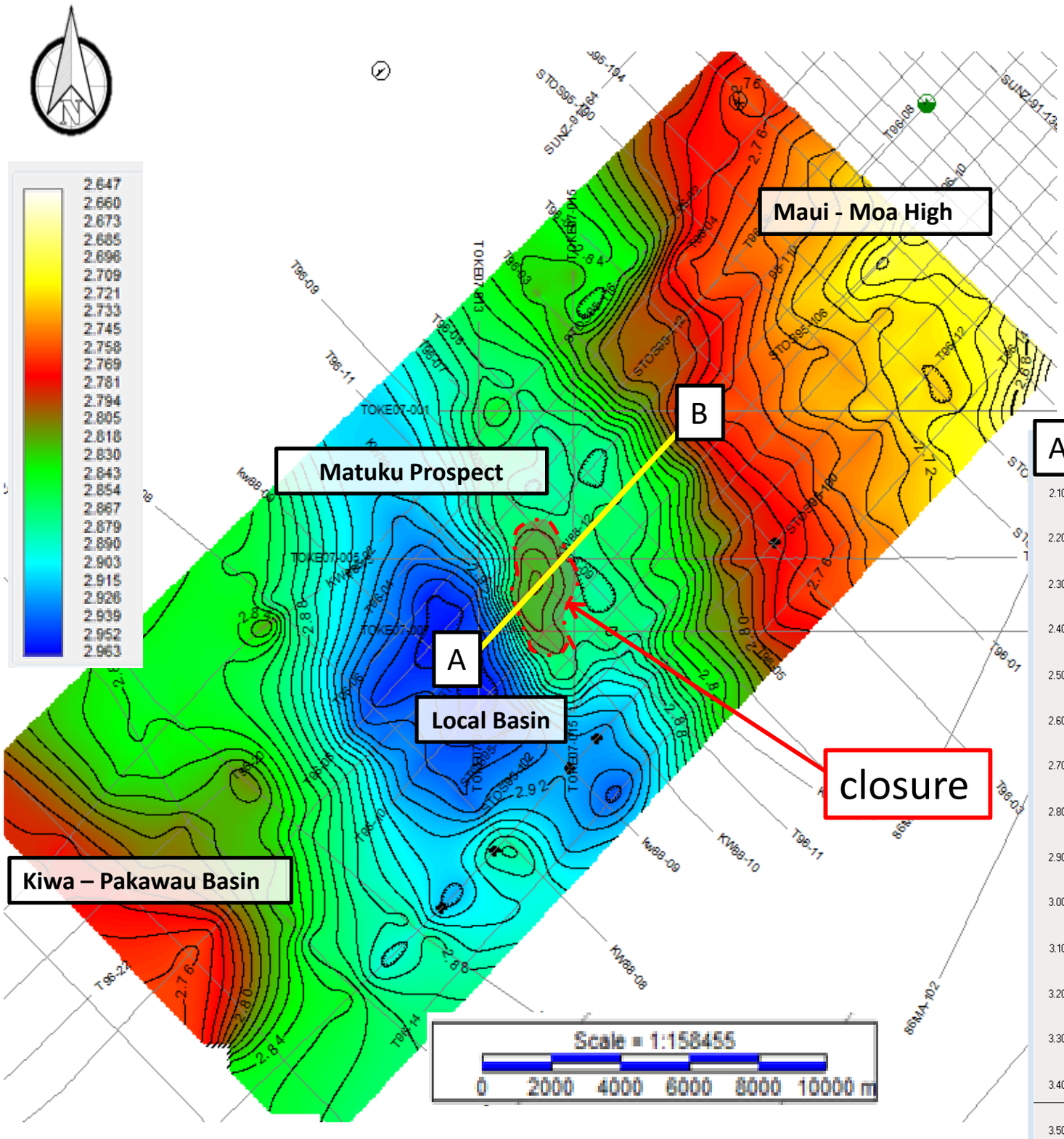
Reservoir: Good reservoir quality Kapuni-F sandstones.

Seal: Thick Kapuni-E shale can be effective seal for Kapuni-F

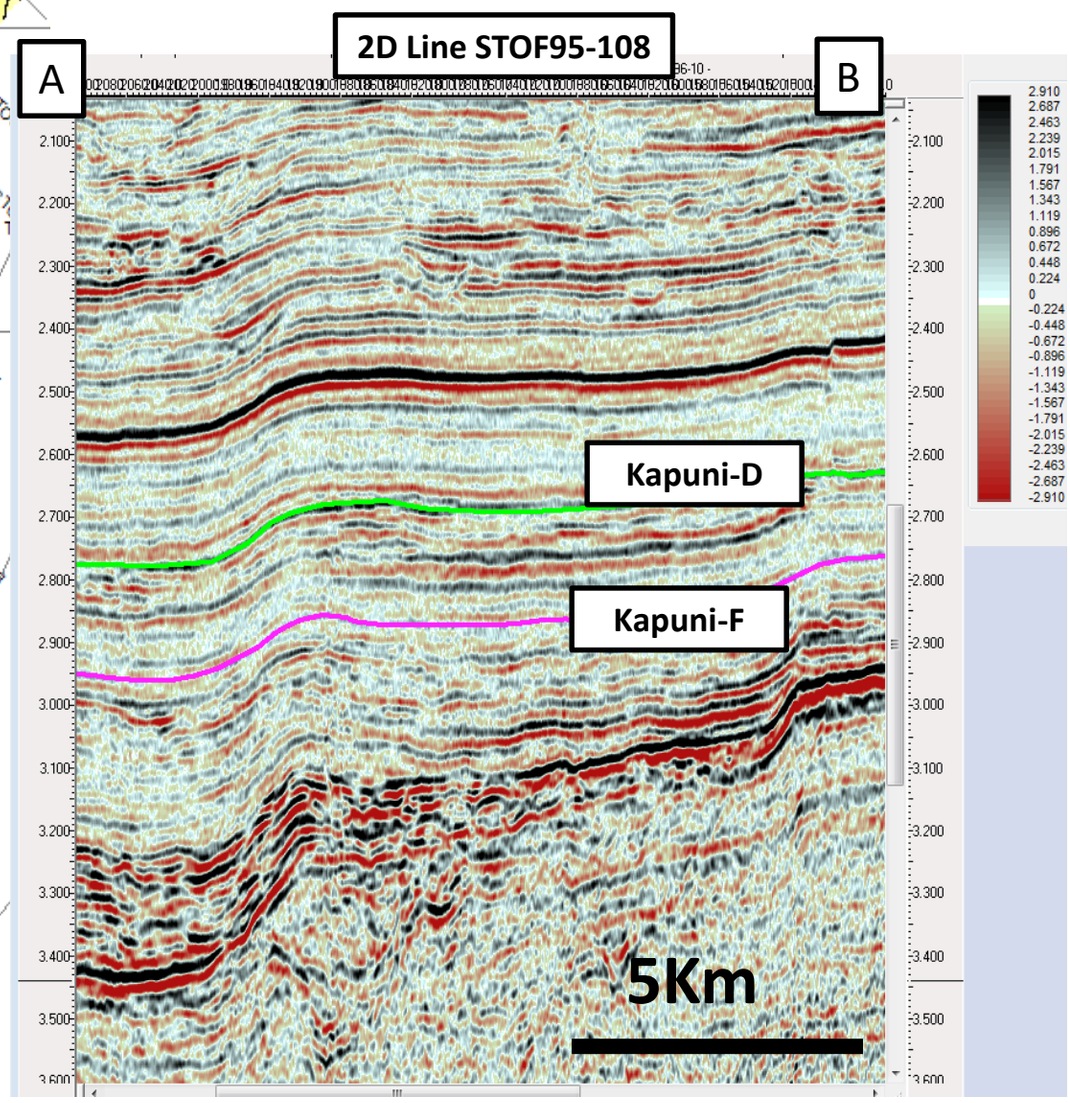
Trap: 4-way dip clousre.

- The producing reservoir in Maui-Moa high is the Paleocene kapuni F sand. Shallower and deeper sand are countered but are not pay bearing. So we consider Kapuni-F sand as potential reservoir.
- The cross section from Yagci's 2016 Dissertation, we can see thick Kapuni-F sand overlaid by thick Kapuni-E shale which is the potential seal.
- Potential migration pathways are shown in figure 2.

Time Structure Map of Kapuni-F sand

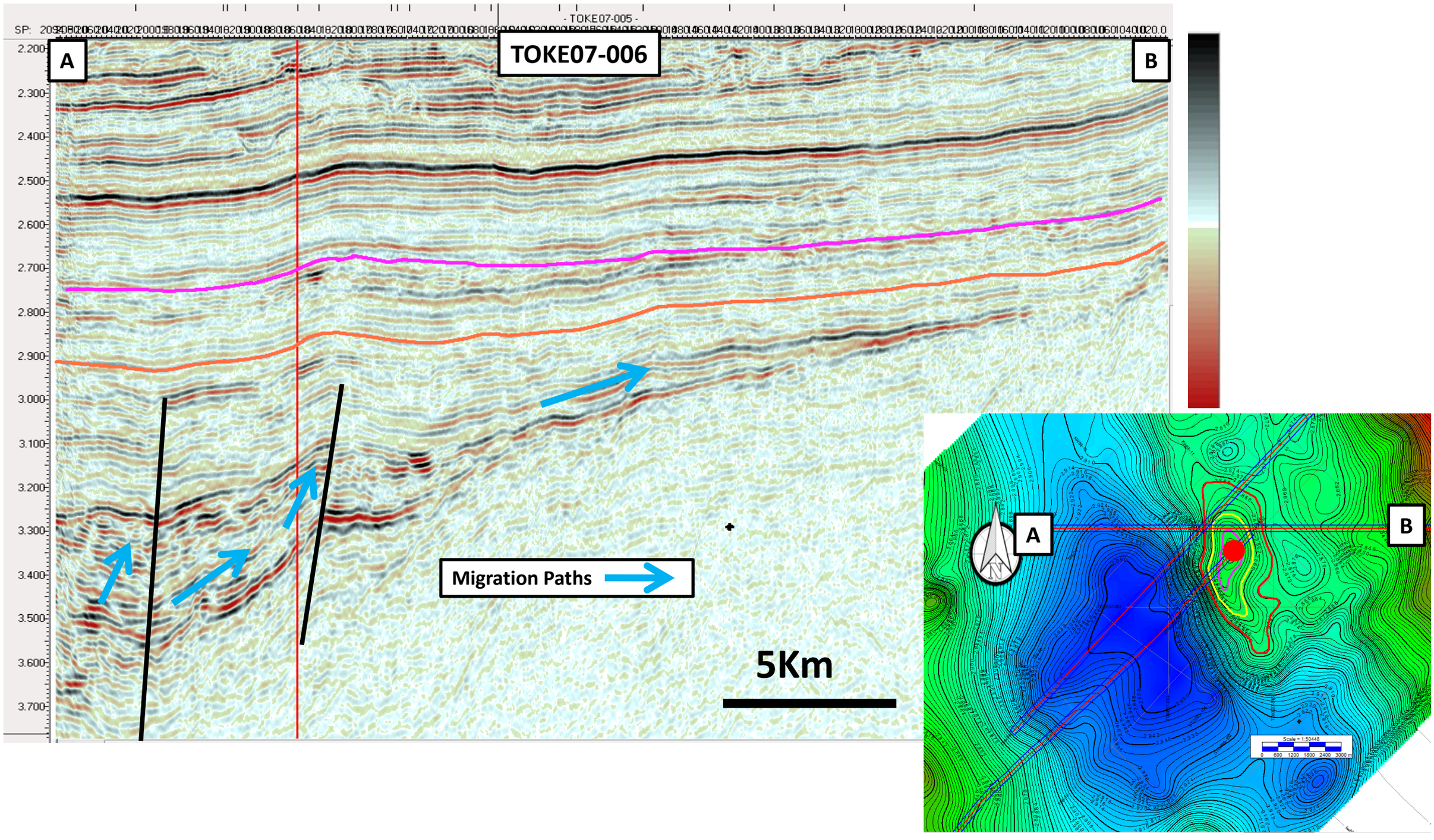


- Four way dip closure and local basin are observed in the center of the map.
- Contour interval 8ms.



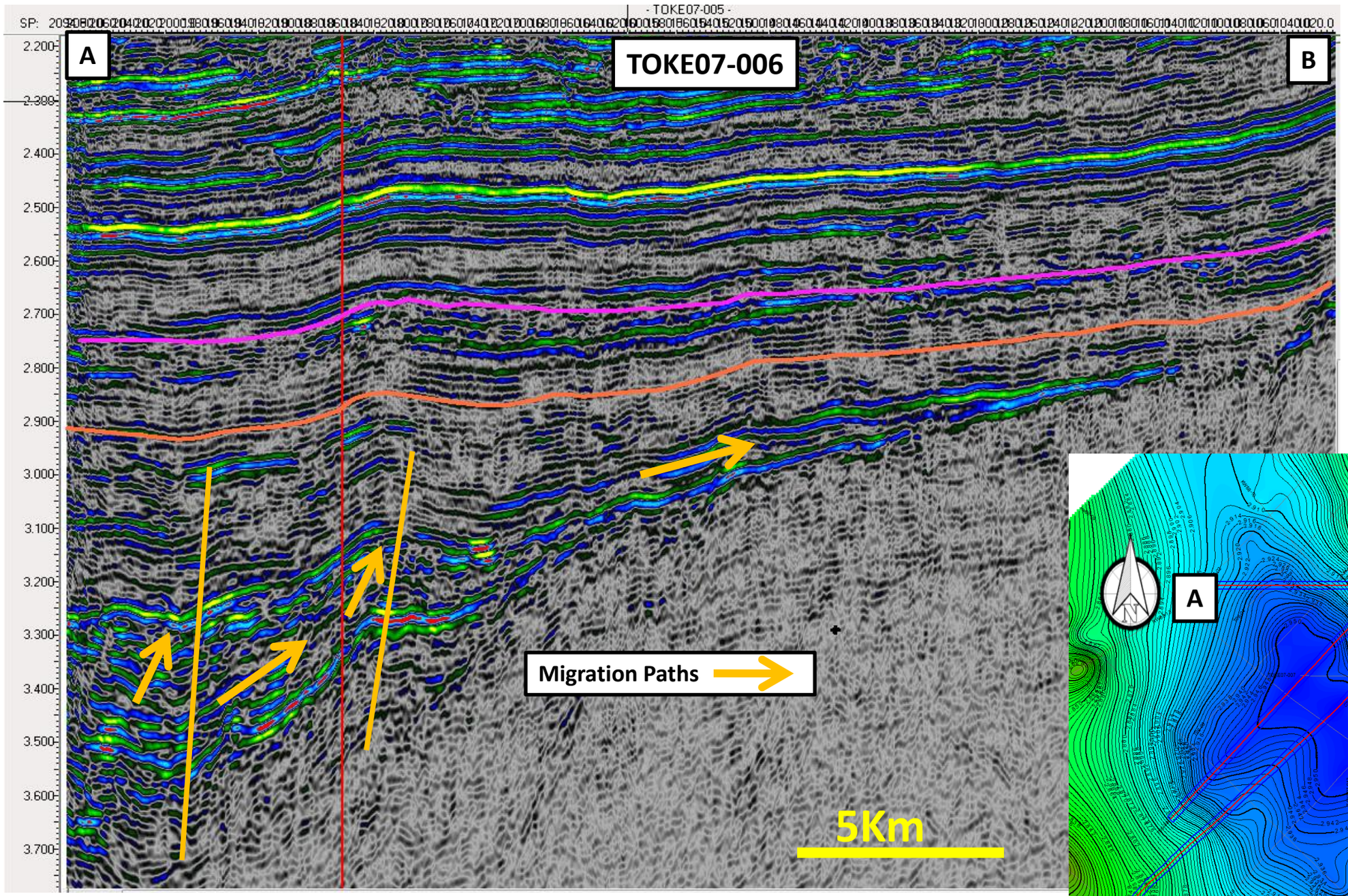
- Time structure map of Kapuni-F sand. Potential closure area are enclosed by the red boundary in the center of the map.
- 4 way dip closure in the map is response to the basement high in the vertical section.

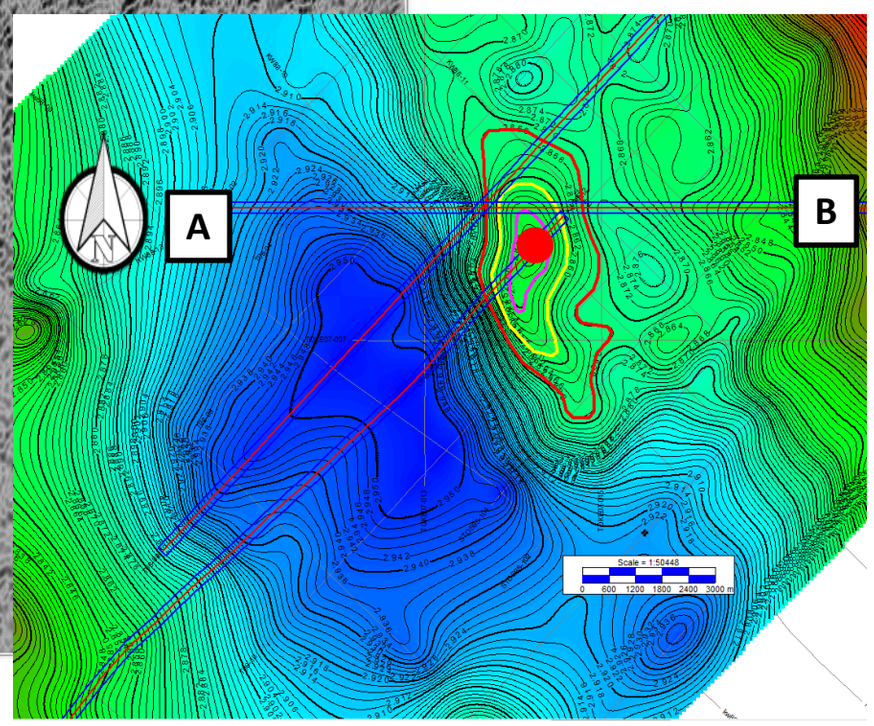
Key Line Over Prospect



- Vertical section over the identified lead using Landmark color bar. Migration through northwestern side to closure may be controlled by fault.

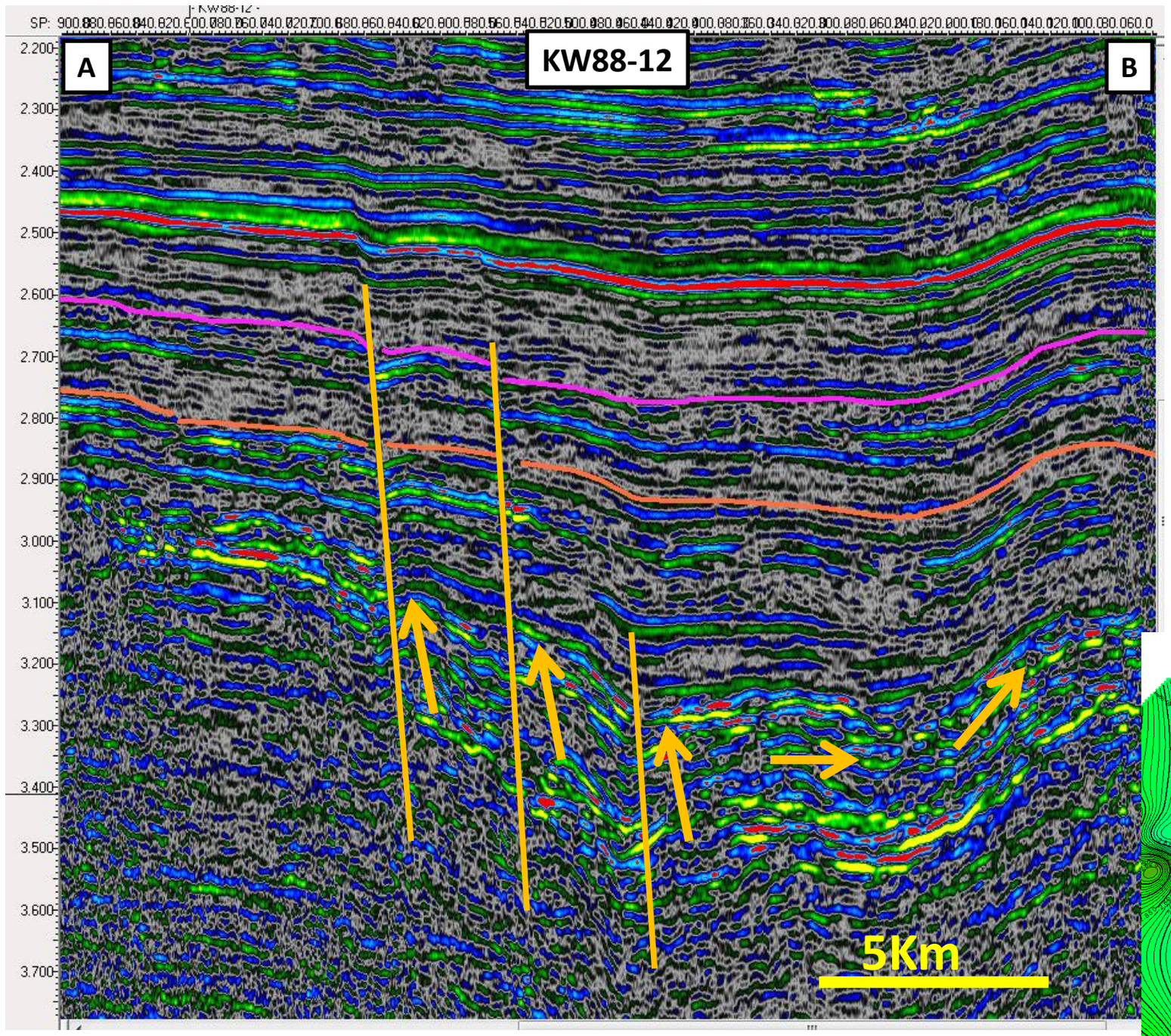
Key Line Over Prospect



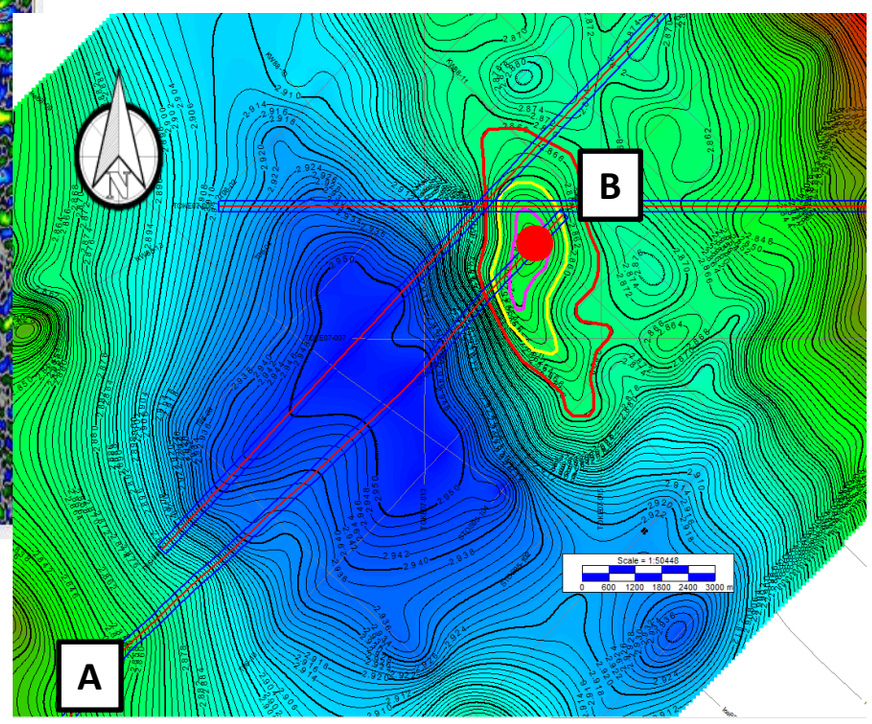


- Migration through northwestern side to closer may controlled by fault.
- RSA rai2 color bar are more clearly defined the cretaceous source rock.

Key Line Over Prospect

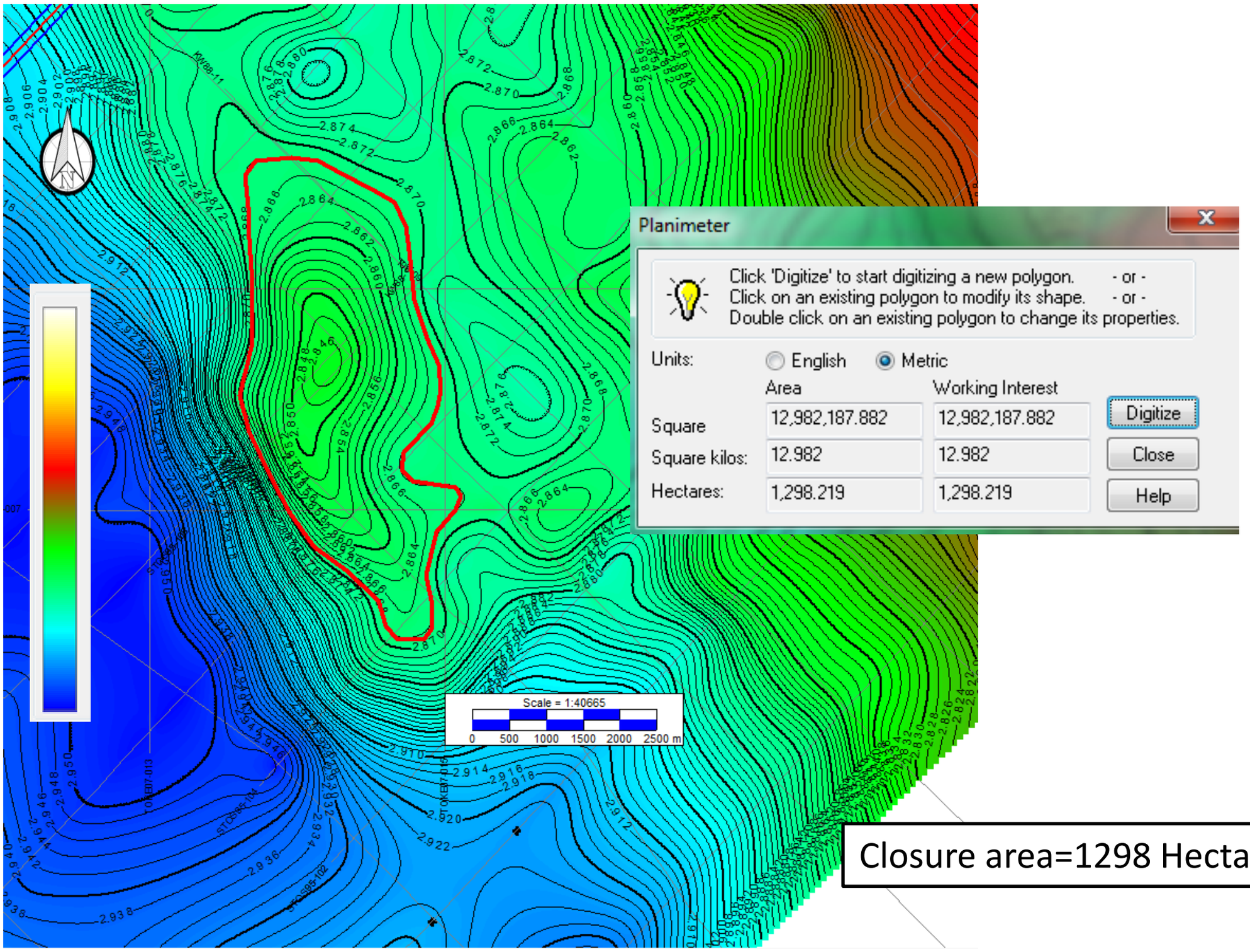


Migration Paths



- Migration through Southwestern side to closer may controlled by basement high. Oil might be charged by up dip movement.
- RSA rai2 color bar are more clearly defined the cretaceous source rock.

Lead Assessment: Area Measurement



- We have identified the lead. Now we need to assessing the lead.
- At lead assessment, we only look for how big it can be at it's biggest. Because we have to know if the lead can have enough volume to meet economic criteria.
- To determine largest potential volume we have to input the maximum of the variables.
- Now we measure the maximum closure area for Matuku. Find the halfway of between the last closing contour and the next contour and plainmeter the area. The closure area is 13 Km2.

Lead Assessment: Volumetric Calculation

Original oil in Place (OOIP)=$\frac{10^4 * A * h * \Phi * (1 - S_w)}{B_{oi}}$

Where,
10^4= Hectare conversion; 1 ha= 10^4 m^3
A=Drainage area in hectares
h=Net height of reservoir rock in meters
Φ=Porosity
S_w=Water saturation
B_{oi}=Oil formation volume factor

Now,

OOIP= $\frac{10^4 * 1300 * 67 * 0.21 * (1 - 0.07)}{1.5}$

=113,404,200 m^3

=713,312,418 bbls (1 m^3 =6.29 bbls)

Table 1: Calculated petrophysical properties for the Farewell "F" Sand in the study area.

Well name	Gross (m)	Hpv (m)	Kh	Km (md)	Net (m)	Ngr	Pha	Phih	Swa
Amokura-1	319	48.93	47143	54.47	284.00	0.89	0.21	58.61	0.16
Kahu-1	167	8.79	130.22	0.09	95.80	0.57	0.10	9.51	0.07
Kiwi-1	521	67.19	606704	10.50	459.20	0.88	0.17	78.33	0.13
Taranui-1	181.5	16.90	1788	2.06	129.60	0.71	0.15	19.03	0.10
Tui-1	240.25	33.08	12157	20.55	210.20	0.87	0.19	39.32	0.15

- As I mentioned previous slide primary target is determine the largest volume. Therefore, we took the largest value for each of the variables from the data compiled for the sand by Yagci, 2016.
- The largest possible OOIP for Matuku is 113 million cubic metres. To converting that to barrels, multiply by 6.29.
- Volumetric calculation by deterministic method gives us a maximum volume of 713 million barrels.
- This is an unrisked volume. Now we need do risk analysis to define the Chance of Success to determine a risked volume.

Lead Assessment: Risk Analysis

Petroleum System:

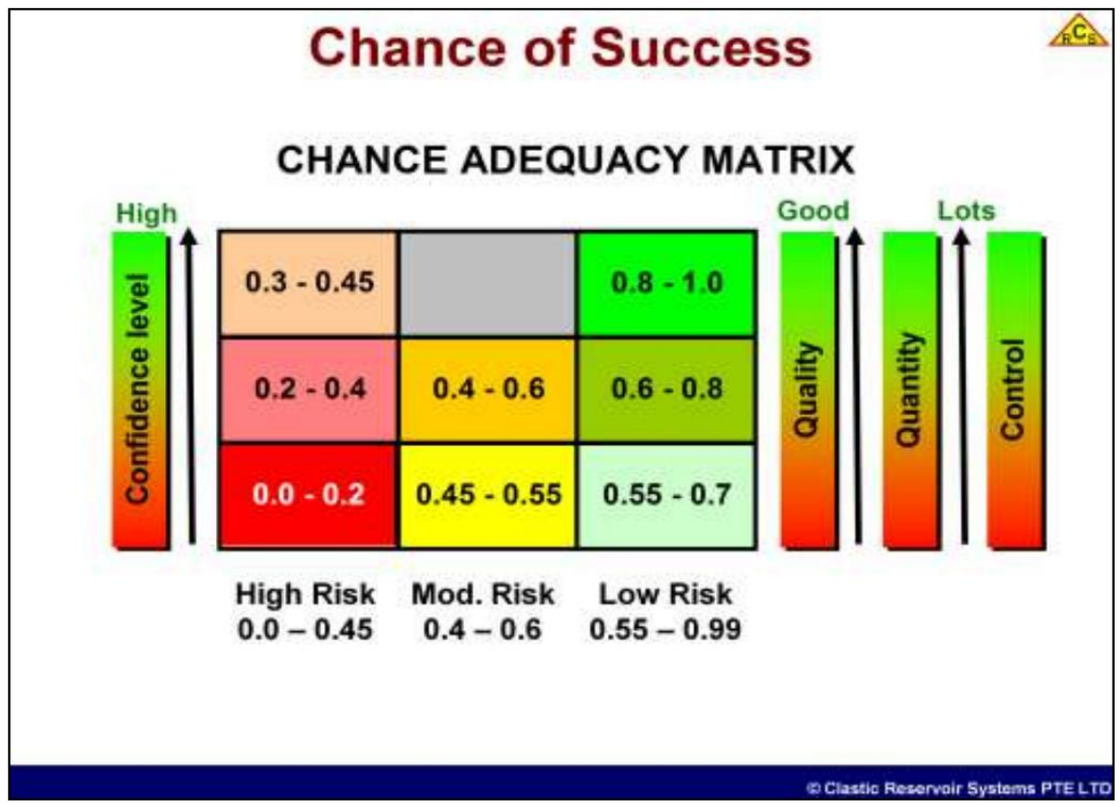
Source: Rakopi coal in the Cretaceous rift sequences of the Kahurangi sub basin. That is mature for oil generation and may charge to Matuku prospect like Maui-Moa High (Tui-1).

Migration: There has **high risk in migration**. **Lack of charge** is the main reason for failure in Hector-1, Kiwi-1 and Pukeko-1.

Reservoir: Good reservoir quality Kapuni-F sandstones (like as Maui Moa High and Pakawau sub-basins).

Seal: Thick Kapuni-E shale can be effective seal for Kapuni-F

Trap: Closer is estimated by time structure map using 2D line. The trap would be effected the time depth conversion. So **trap risk is moderate.**



Risk Assessment:

- Source: 80%
- Migration: 40%
- Reservoir: 90%
- Trap: 50%
- Seal: 85%
- Chance of Success (COS): 13%

- We have been used the Chance Adequacy Matrix to define the confidence level of the petroleum system components.
- It has a perceived low risk associated with existence of mature source rock, presence of suitable reservoir rock and adequacy of seal. So we put high confidence value for those component.
- After well reviews we found that the lack of charge is the key reason for most of the fields nearby Matuku prospect . Therefore we considered migration is the key risk.
- In addition, time structure map is constructed using 2D and a slight velocity gradient could open the structure. that is why we considered trap is moderate risk.
- The Cos is 13%

Lead Assessment: Risked Volume

Risk Assessment:

- Source: 80%
- Migration: 40%
- Reservoir: 90%
- Trap: 50%
- Seal: 85%
- Chance of Success (COS): 13%

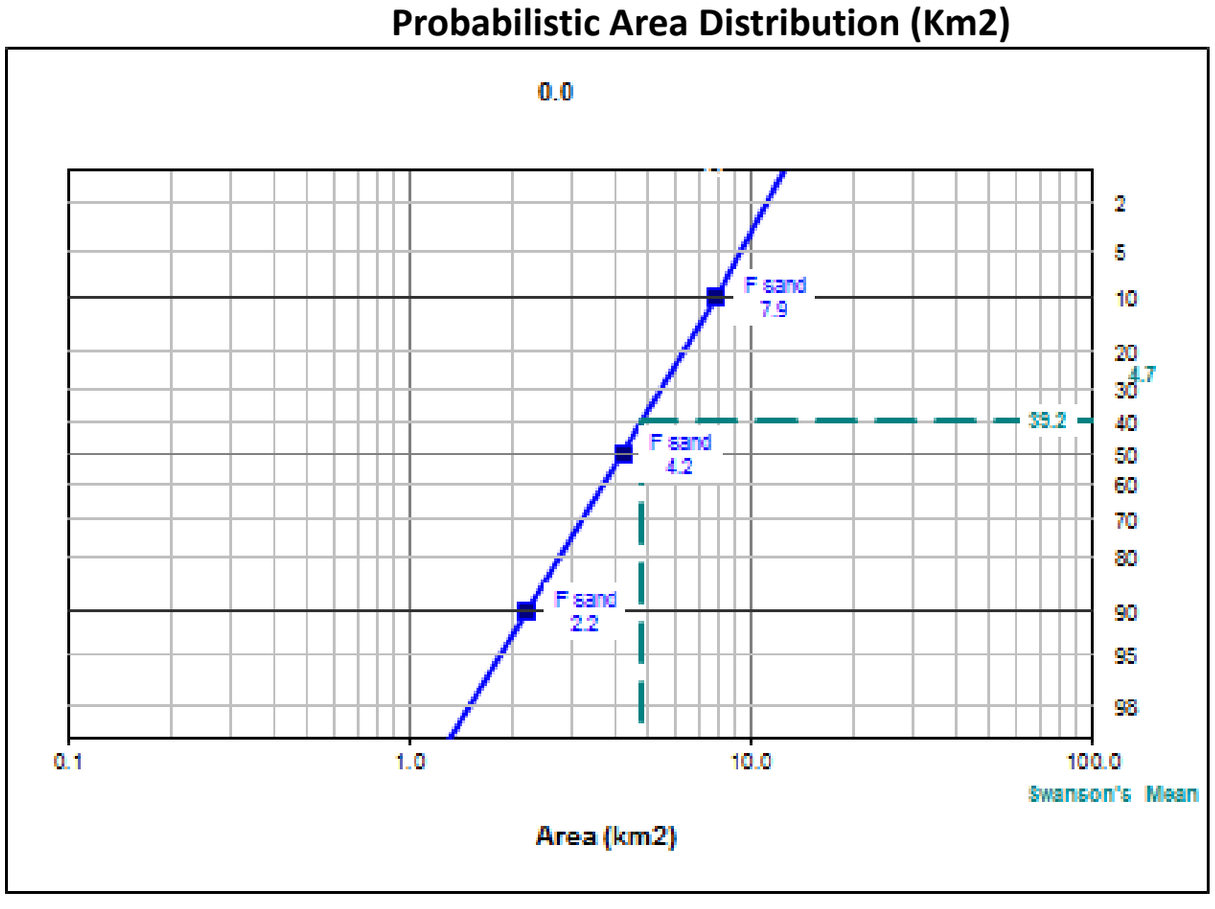
- **Unrisked Volume**: 713,312,418 bbls
- **Risked Volume**: (713,312,418*0.13)=92.7 million barrels

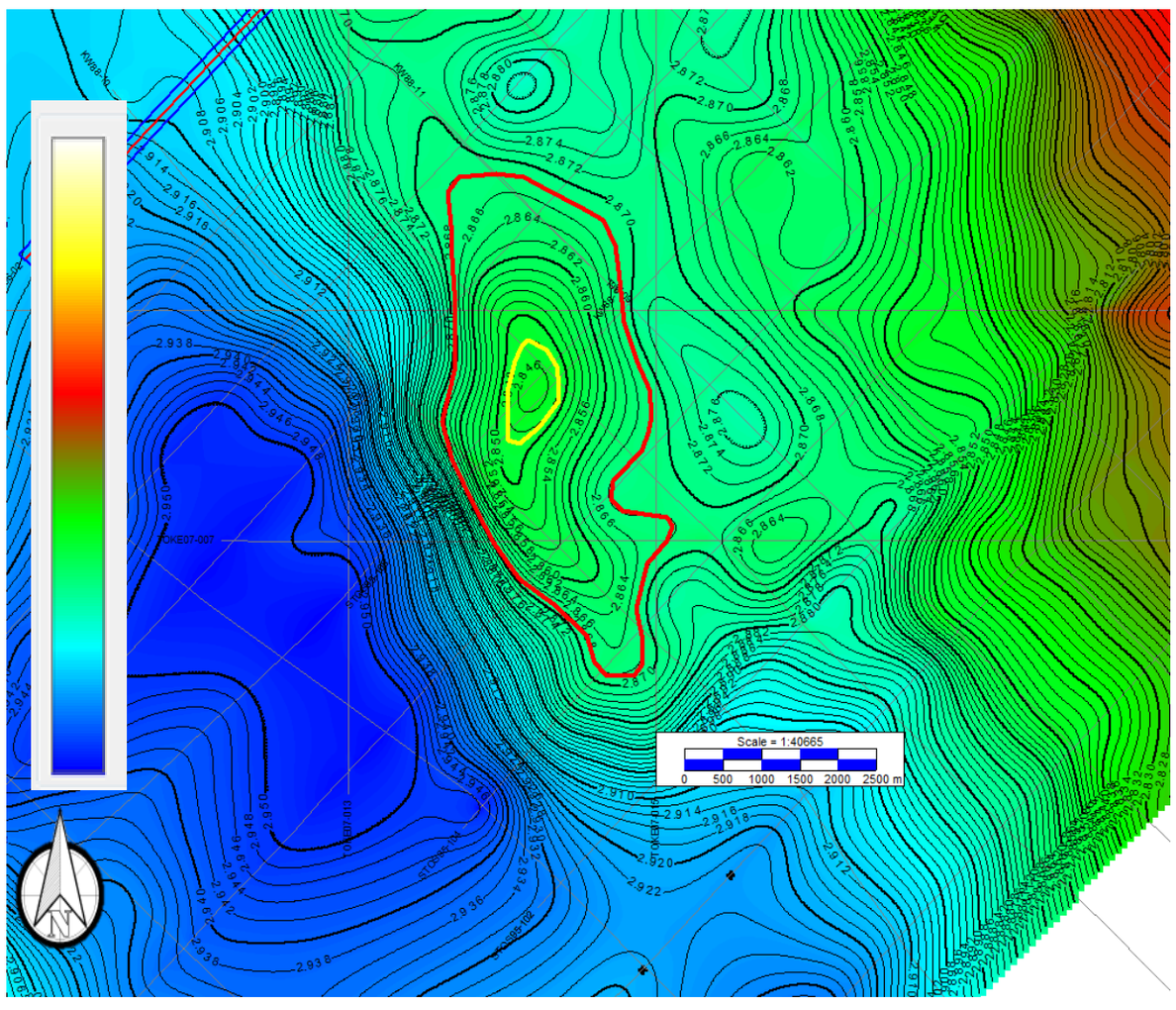
- To determine the risked volume, we multiply the unrisked volume by the COS and risk discounted volume is 92 million barrels.
- After lead assessment, Management consider that Matuku is a prospect. Now we move to prospect assessment.

Prospect Assessment

Probabilistic Area Estimation

- P1 = reasonable maximum
- P99 = realistic and measurable
- The P1 and P99 provide reality checks to the uncertainty distribution.





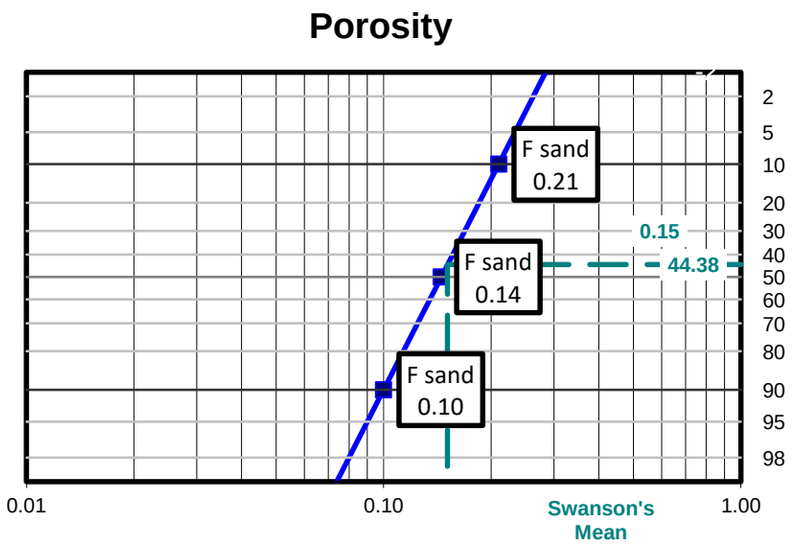
P1= 13 km2

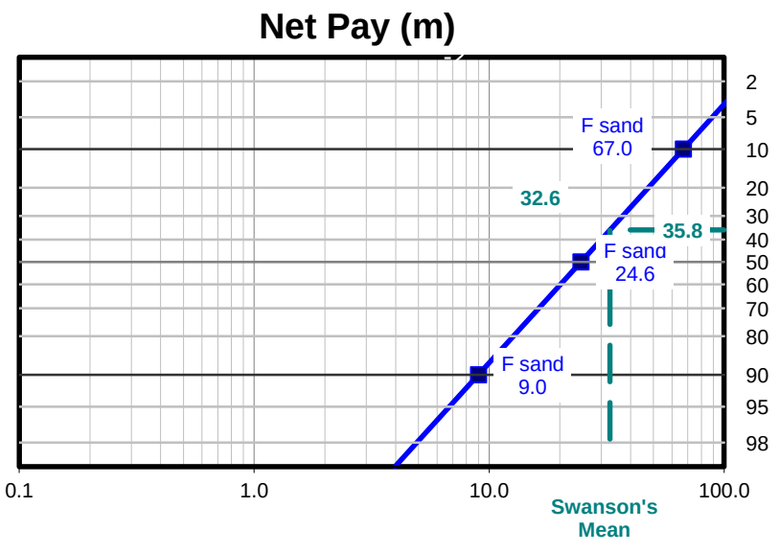
P99= 1.4 km2

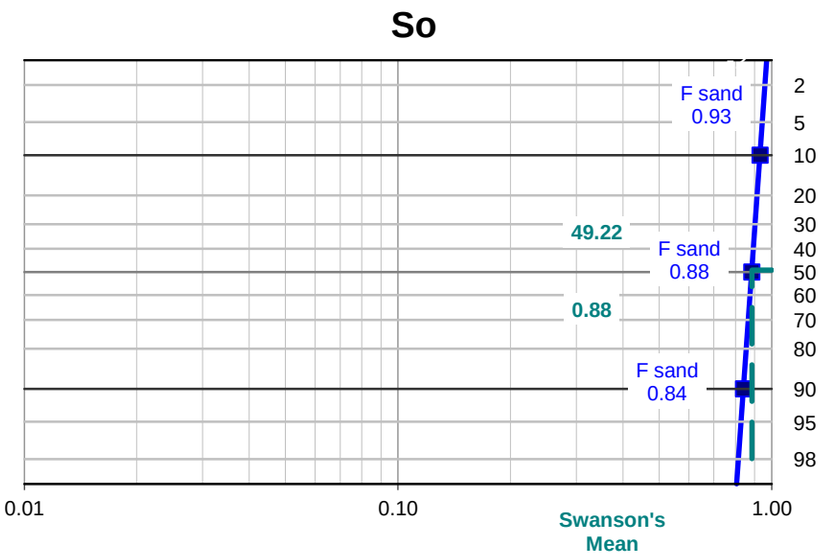
- Most of the geophysicists are poor guesser. Volumes determined by deterministic method are almost wrong. To prospect assessment, we need to introduce the range of uncertainty. To cover the whole range of uncertainty and evaluate the prospect we applied the Rose Philosophy. Rose methodology use lognormality to deal the whole range of variable uncertainty mathematically.
- At first we need to define uncertainty range and have to check the reality using the tails P1 and P99. P1 is 13 Km2 considering the half way between the last observed closing contour and the next contour.
- P99 is 1.4 Km2 ?? though I have no real basis.
- From lognormal distribution P50 is 4.2 Km2

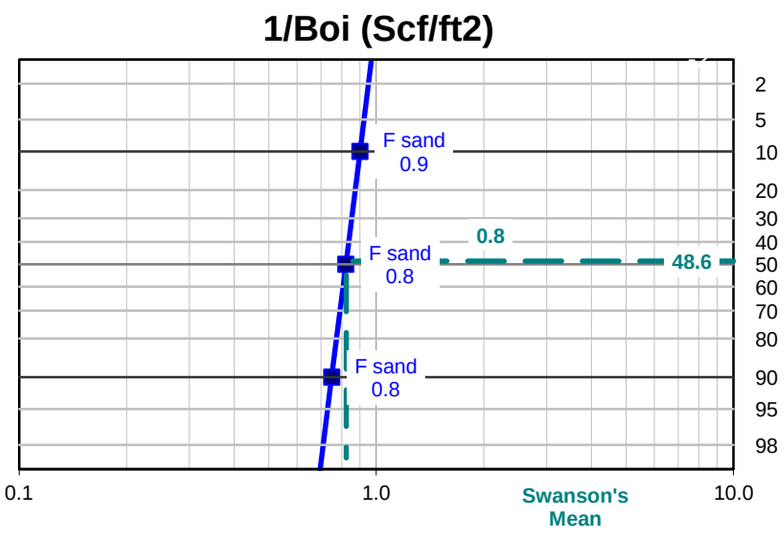
Prospect Assessment

Probabilistic Distribution of Porosity, Net pay and Saturation









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- These graph are represent the uncertainty distribution of the others variable (Porosity, Net pay, Oil formation volume factor and Oil saturation).
- To make this distribution we used the data compiled by Yagci (Yagci, 2016). From data table we choose maximum and minimum values as input of P10 and P90 respectively.
- For saturation, the uncertainty distribution shows very narrow and P99 (84%) and P1 (97%) are too high because data is compiled from produced well.

Prospect Assessment

Table 1: Variables for Determine the STOOIP

Probability	P99	P90	P50	P10	P01	Mean	Var of ln
Area (km2)	1.5	2.3	4.3	7.9	13.0	4.8	0.23
Net Pay (m)	4.0	9.0	24.6	67.0	151.9	33.4	0.61
Porosity	0.07	0.10	0.14	0.21	0.28	0.15	0.08
So	0.81	0.84	0.88	0.93	0.97	0.88	0.00
1/Boi (Stb/bbl)	0.70	0.75	0.82	0.90	0.97	0.82	0.005

POS Estimation					
Source	Migration	Reservoir	Seal	Trap	COS
0.80	0.40	0.90	0.50	0.85	0.13

Table 2: Unrisked Prospect STOOIP (MMStb)

P99	P90	P50	P10	P01	Mean	Var of ln	Var
7.3	20.1	69.3	239.3	657.4	110.6	0.94	18946.4

Table 3: Risked Prospect STOOIP

P99	P90	P50	P10	P01	Mean	Var of ln	Var
1.0	2.7	9	32	85.5	15.2	0.94	359.2

Table-1 shows the value of input parameters for different uncertainty. Table-2 and Table-3 represent the unrisked and risked prospect STOOIP respectively.

Probabilistic Expected Monetary Value (EMV) Calculation

Table-1: Estimated Ultimate Recoverable (EUR) Volume

Probability	STOOIP	RF	EUR
P90	20.1	25%	5 mmbo
P50	69.3	40%	28 mmbo
P10	239.3	60%	144 mmbo

Swanson's Mean

Smean=(0.3*P90)+(0.4*P50)+(0.3*P10)

P90 Resources *0.3	1.5 mmbo
P50 Resources *0.4	11.2 mmbo
P10 Resources *0.3	43.2 mmbo
Swanson's Mean resources	**55.9 mmbo**

Risk Discounted Volume= 55.9*0.13=7.27 mmbo

- It is not possible produce 100% volume of IOIP. Recoverable oil is determined by multiplying the in-place resource or reserve by a Recovery Factor (R.F.).
- We used a range of recovery factors to convert the in-place volumes to Ultimate Recoverable Volumes (Table-1).
- We used Swanson's mean to determine the estimated recoverable volume. Risk discounted estimated recoverable volume is 7 mmbo.

Return on Investment

Table-2: Estimated Ultimate Recovery (EUR) to Dollar:

Probability	EUR (mmbo)	2020 ($/bo)	DV $
P90	5	52	$260
P50	28	52	$1,456
P10	144	52	$7,488

Risk discounted EMV

Category	Value (DV)	Probability Calc	Probability (Decimal)	Adjusted Value
Dry hole Cost	**30,000,000**	**(1-COS)**	**0.87**	**26,000,000**
DV P90 EUR	260,000,000	(COS*0.3)	0.039	10,140,000
DV P50 EUR	1,456,000,000	(COS*0.4)	0.052	75,712,000
DV P10 EUR	7,488,000,000	(COS*0.3)	0.039	292,032,000
			EMV	**351,884,000**

Discounted Return on investment (ROI):

(351,884,000/30,000,000)=12:1

Money return:

(30,000,000/351,884,000)*10 = 8.3%

- The ultimate target is making money. Now we need to convert volume calculation to dollars. To convert EUR to dollar, corporate decide oil price in 2020 $52/bbl. Risk discounted Expected Monetary Value (EMV) is = (10.14+75.7+292.03)-26 = $351.88 MM

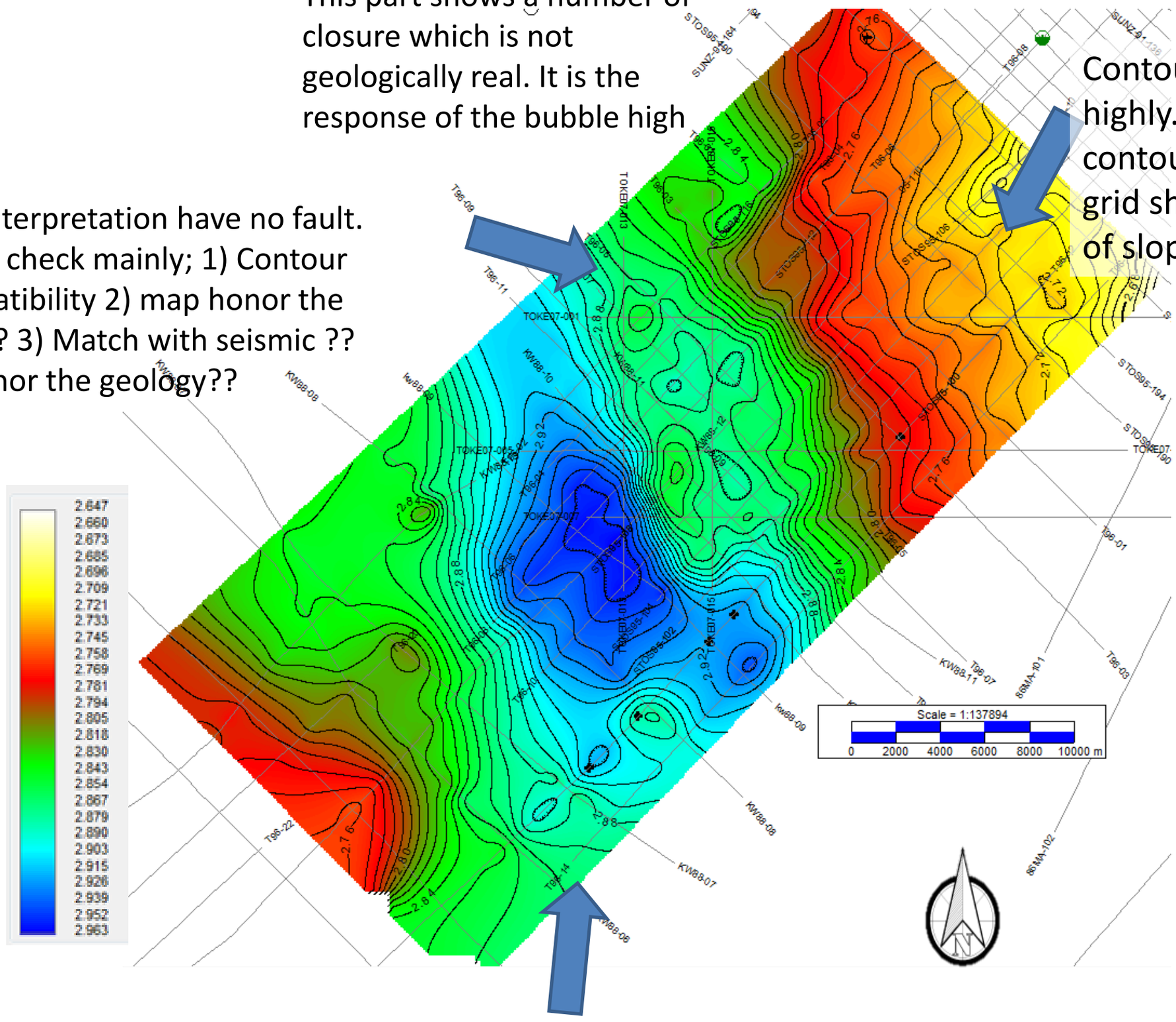
- Return on Investment:
  companies look for make a sufficient return on their investment to justify the investment. In Matuku prospect, the ratio of ROI is 12/1 and money return rate is 8.3%.

Self Audit

This part shows a number of closure which is not geologically real. It is the response of the bubble high

Contour compatibility impact highly. Highly spiking of the contour may be response to grid shifting or dramatic change of slope during picking.

Our interpretation have no fault. So we check mainly; 1) Contour compatibility 2) map honor the data?? 3) Match with seismic ?? 4) Honor the geology??



In this part contour doesn't match the data. Gridding process shift the picking.

- Our real objective is to make money for your company. To make money, it is crucial to know Resource and Reserve amount as accurate as possible. Accurate resource and reserve estimates require accurate interpretations and maps.

- If we underestimate reserves, then we can cause our company to not drill potentially economic wells. If we overestimate reserves, we can cause our company to drill non-economic wells. So, it will significantly hamper the company economy and reputation of the interpreters.

- Maps generated in the workstation are almost always wrong. So we need to conduct self audit. It's a simple process to fix the mistakes through checking couple of instructions. These are; map honor the data, contour compatibility, honor the geology, match the seismic etc.

Summary and Recommendation

Summary:

- Basin ranking analysis provide high rank for Maui-Moa high.
- Management decided to apply additional analysis on the northeast margin of Kiwa-Pakawau basin (Matuku prospect).
- Matuku prospect has low risk regarding reservoir, source rock and seal but migration and trap is under high to moderate risk
- Closure area for prospective Kapuni-F sand is P1 13km2 and P99 1.3 Km2
- Chance of success is 14%.
- Unrisked prospect Volume is 20-200 mmbo (P10 & P90).
- Risk discounted recoverable volume 7 mmbo
- Risk discounted EMV is $350mm
- Return on investment is 12:1

Recommendation:

- Shot 3D to reduce the structure uncertainty.
- Run of the seismic attributes could be use to see the migration to or through the prospect.
- Run velocity gradient analysis. If there have any velocity gradient that would impact the depth conversion and help to review COS.
- ROI is reasonable, drilling a well would be good decision to find out new opportunity.

- Pre-mortem are always cheaper and safer than take quick decision. It helps us always to improve the COS and avoid the dry hole.
- We should run self audit of the map and review all of the available data as well as accomplish recommended actions.
- Once those studies will be completed, we should review COS again.

Thank You