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**THE NEOTECTONICS OF THE
WELLINGTON AND RUAHINE FAULTS
BETWEEN THE MANAWATU GORGE AND
PUKETITIRI, NORTH ISLAND,
NEW ZEALAND**

By

Judith Ann Hanson

A thesis presented as partial fulfilment of the requirements for the degree of
Doctor of Philosophy in Earth Science

Massey University
Palmerston North
New Zealand
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VOLUME II

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WELLINGTON FAULT TRENCHES

INGLIS 3 TRENCH, SCALE 1:20, *South wall*

INGLIS 4 TRENCH, SCALE 1:20, *North wall*

BEAGLEY ROAD TRENCH, SCALE 1:20, *West wall*

TROTTER 1 TRENCH, SCALE 1:20, *North, south and east walls plus correlated sequence of events for Trotter 1 and 2 trenches*

TROTTER 2 TRENCH, SCALE 1:20, *North, south, east and west walls*

MC COOL 1 TRENCH, SCALE 1:20, *North and south walls*

MC COOL 2 TRENCH, SCALE 1:40, *East Wall*

MC COOL 3 TRENCH, SCALE 1:20, *North, east and south walls*

SYME TRENCH, SCALE 1:20, *North wall*

TE WAKA SPLINTER FAULT TRENCH

WEDD TRENCH, SCALE 1:20, *South wall*

RUAHINE FAULT TRENCHES

DAVIS 1 TRENCH, SCALE 1:20, *North wall*

DAVIS 2 TRENCH, SCALE 1:20, *North and south walls*



Plate 1 View south from the Manawatu Gorge along the Eastern Taranua Range (T) showing the diverging Wellington (W) and Ruahine Faults (R) and the Kahuki Horst (K) which is part of a duplex structure on the Wellington Fault (Marden 1984) The Ballance Bridge and the Manawatu River can be seen in the foreground, the Ruahine Fault lies approximately 60m to the west of the duplex.

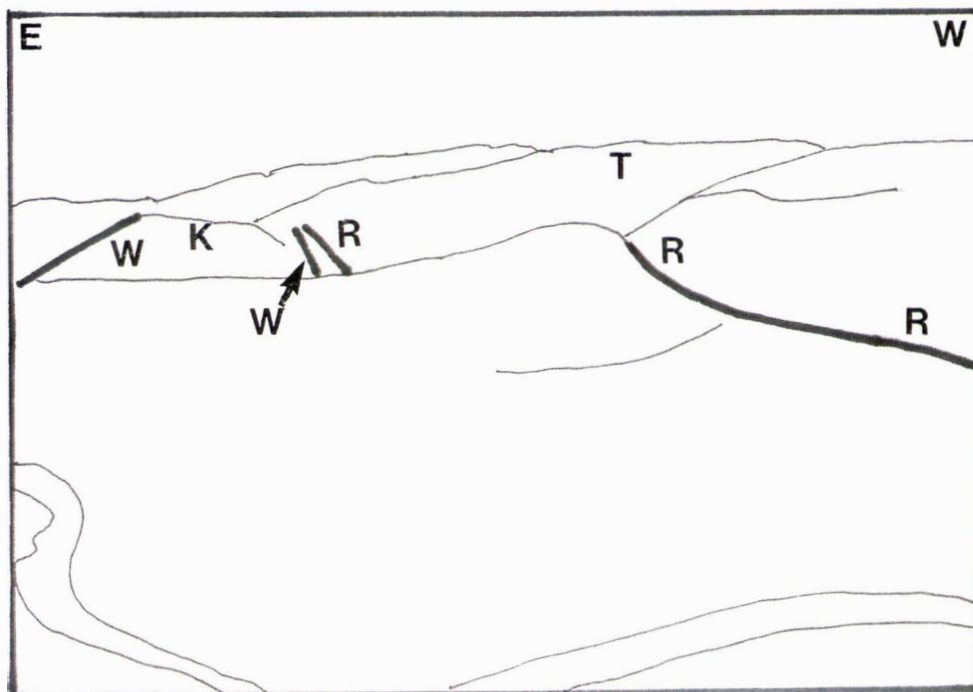
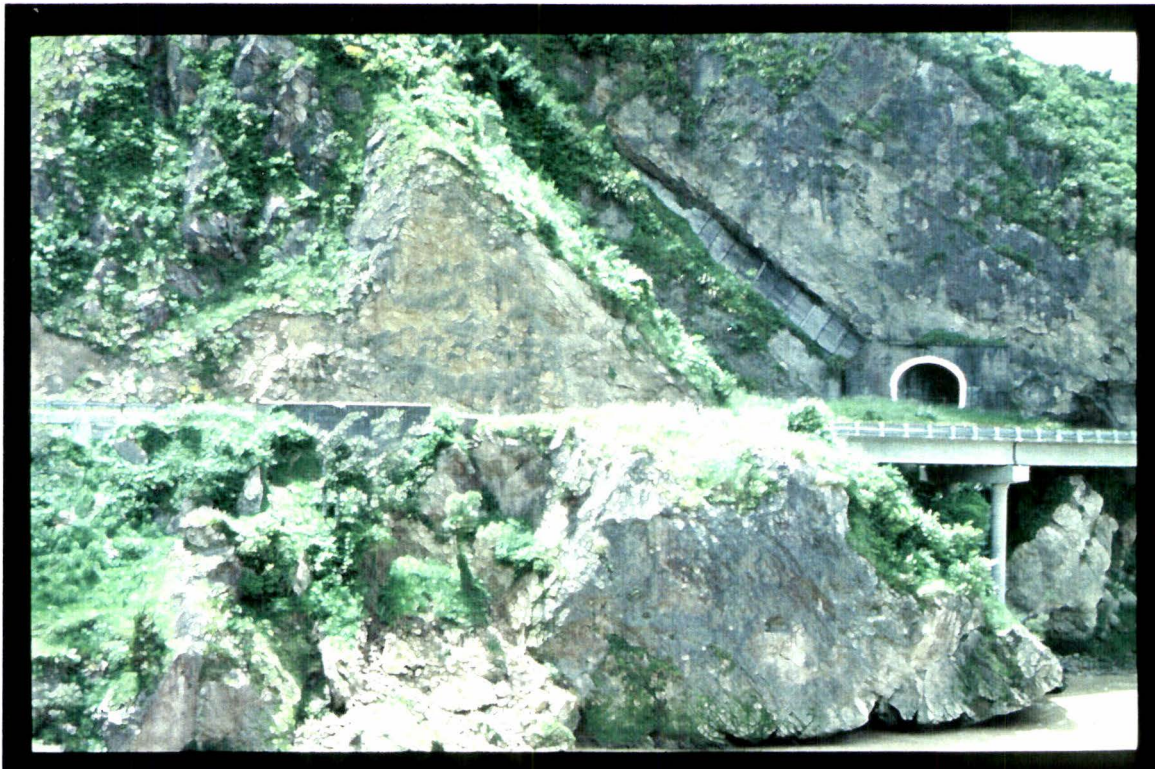




Plate 2, Engineering structures in the Manawatu Gorge showing the main trunk railway (Ra) line, State Highway bridge (B) and the Ruahine Fault trace (arrows)

Plate 3, Below, Steeply dipping Nukumaruan limestone which has slid eastward over the Wellington Fault trace probably during the last faulting event c.300 yrs B.P. The engineering structures are State Highway 3 and the railway tunnel.

W



E



Plate 4, Archival aerial photograph which was taken before extensive quarrying of the Nukumaruan limestone (N). The Wellington Fault scarp (W) can be seen south of the Manawatu Gorge. In the foreground are the frequently flooded flats of the eastern Manawatu Gorge entrance. The Ruahine Fault trace cannot be seen clearly but its approximate locality is marked with arrows.



Plate 5, The stereo pair to Plate 4, showing the Nukumaruan limestone block (N) and the Wellington Fault scarp (W) to the north of the limestone. This scarp has been uplifted to the west between 15m and 19m close to the Ballantrae Research Station and offsets Ohakean terrace surfaces. The head scarp of the Nukumaruan limestone slump, is marked with arrows.



Plate 6, A localised slump feature within the generally steeply eastward-dipping Nukumaruan limestone block situated at the eastern entrance of the Manawatu Gorge. The weakly aligned gravels in this lens have been buckled into a minor anticline during the block slide.

Plate 7, Unconsolidated silty unit with well rounded greywacke pebbles underlying the Nukumaruan limestone block at the eastern entrance to the Manawatu Gorge.





Plate 8, Contact between the Nukumaruan limestone block (L) and the underlying unconsolidated silty unit with pebbles (S) looking north across the Manawatu Gorge. This slope angle together with the underlying unconsolidated silty unit is enough to promote gravity sliding. But it is more likely that this block slide occurred during the last earthquake event on the Wellington Fault c. 300 yrs B.P. The Wellington Fault trace is hidden beneath this slide to the east of the photograph.

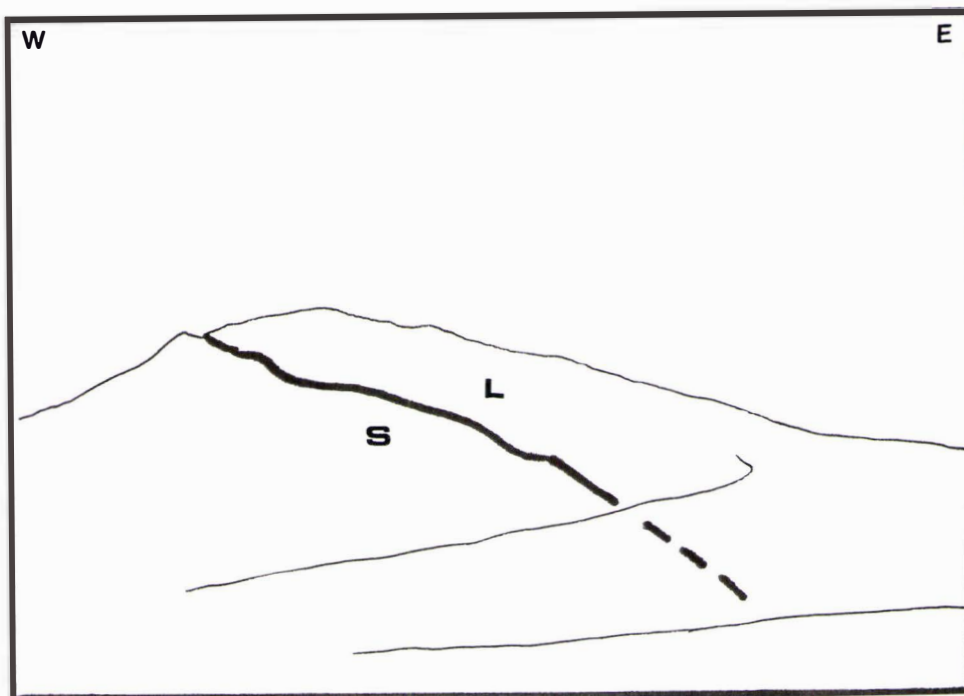




Plate 9, The Wellington Fault duplex at Inglis' farm. The Inglis 3 trench is being excavated. A farm track (f t) cuts the upthrown Ohakean gravels (Ohu) the two paleo-streams are behind the digger the oldest is marked (S1) and the younger (S2). Dr A S Palmer (Dept of Soil Science, Massey University) is seated on the downthrown Ohakean surface (Ohd).

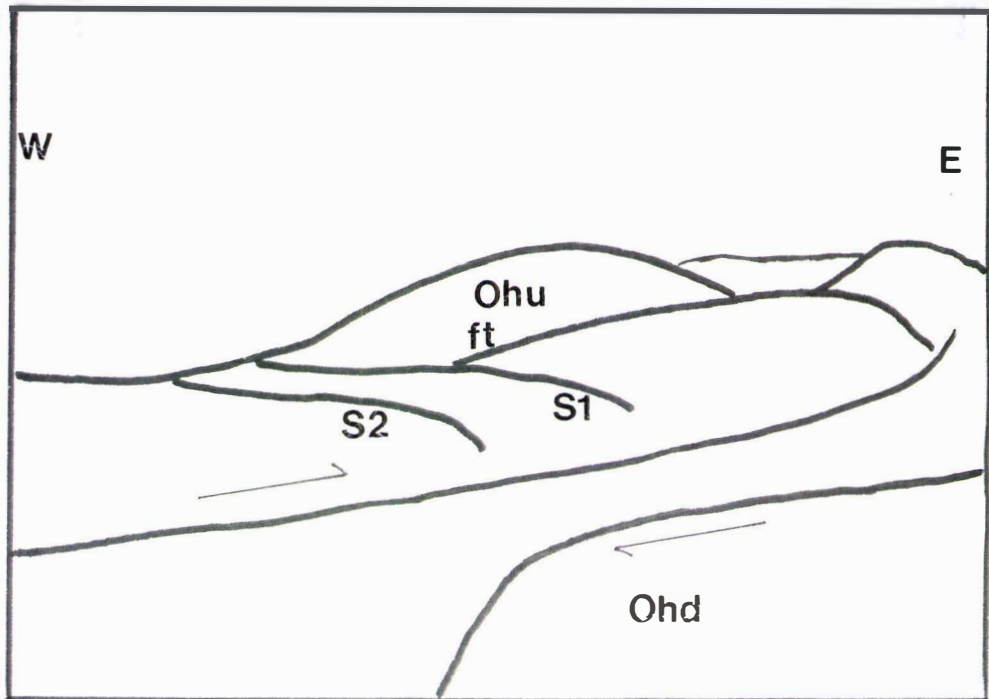




Plate 10, The main fault plane of the Wellington Fault as seen in the southwest wall of the Inglis 3 trench. The west wall of the fault is composed of Tertiary mudstone (Tm) which is overlain by Holocene gravels (H). Effects of subsequent deformation can be seen where finer (F) sediments have entered the gap between the bouldery gravels (bg) and the Tertiary mudstone in two consecutive episodes, labelled 1 and 2. Vertical displacement between 1 and 2 was measured at 0.9m

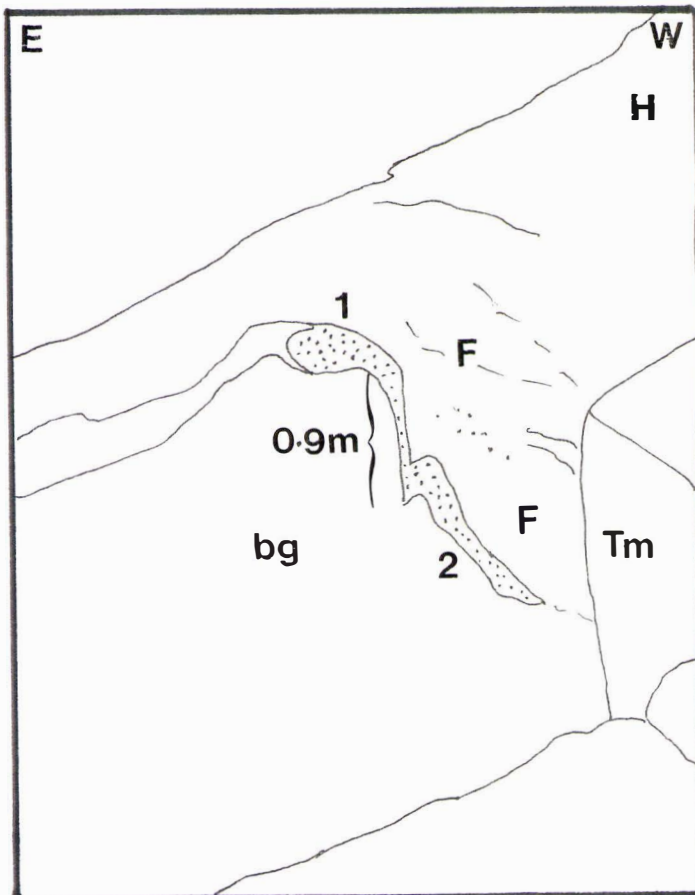




Plate 11, Wellington Fault Inglis 3 trench south wall mid-trench. The, strike-slip fault is seen as the latest faulting event within this trench. Finer sandy sediments are faulted against bouldery gravels. There was no vertical uplift associated with this faulting event, because the unctuous clay (Uc) surface is not offset. Bouldery gravels are labelled (Bg) and deformed finer sandy sediments are (Fs) The fault plane is marked with an arrow.

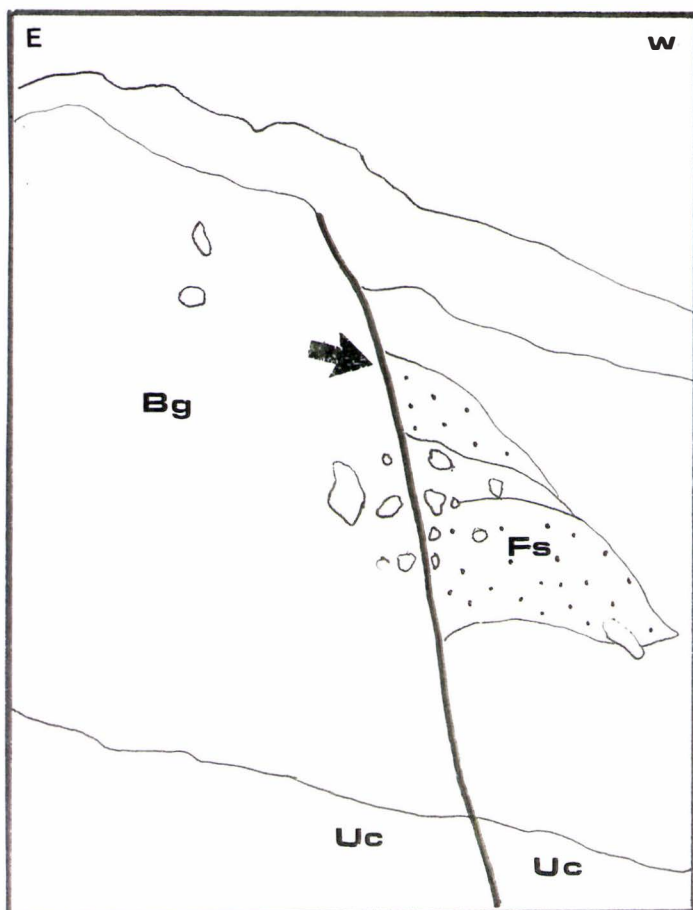




Plate 12, Wellington Fault, Inglis 3 trench northeast trench wall. This plate shows the east end of the mini-graben and the fault which created the graben (Figure 5). The unctuous clay (Uc) is vertically offset 0.9m. Some faint drag structures can be observed within the bouldery gravels (Bg). The second faulting episode in plate 10, has also been vertically offset 0.9m and is thought to have occurred at the same time as the above event.

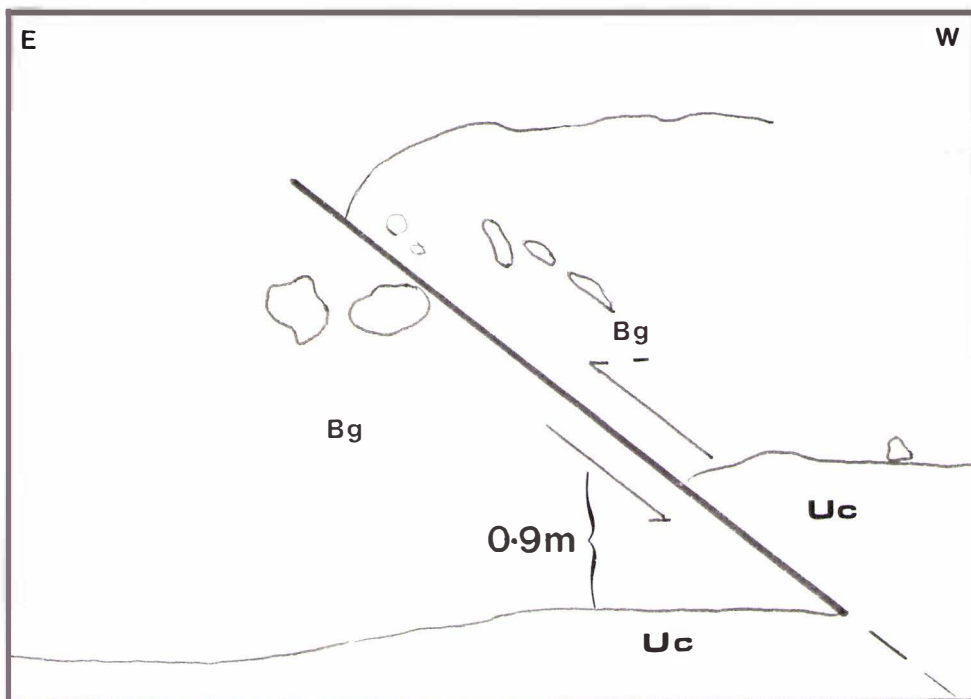
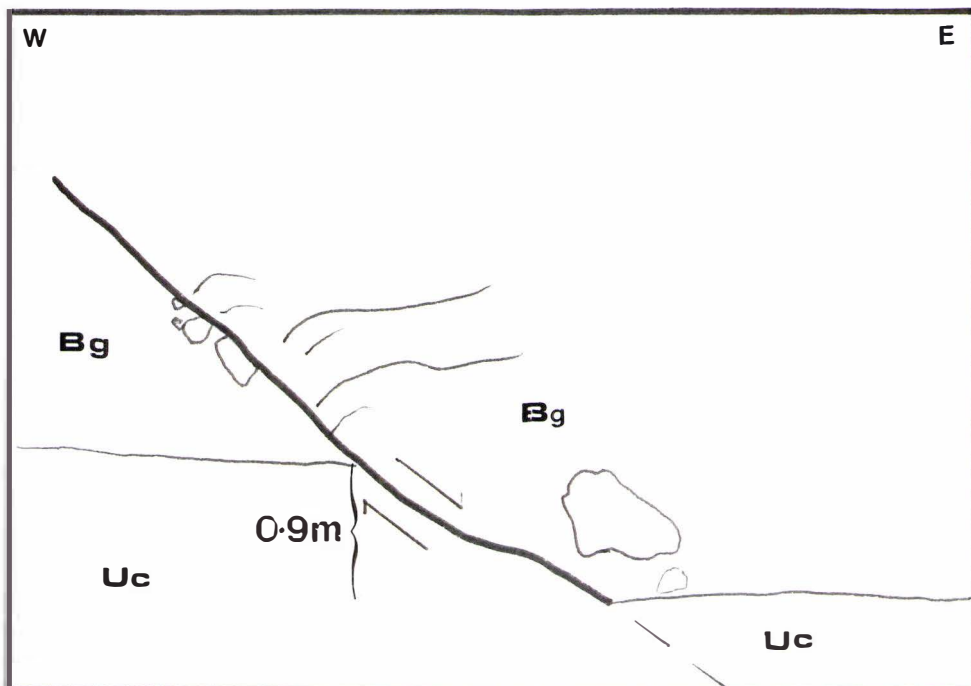




Plate 13, Inglis 3 trench excavated across the Wellington Fault, showing the south wall of the mini-graben and the fault which created this structure. The unctuous clay (Uc) is vertically offset 0.9m, some faint drag structures can be observed in the bouldery gravels (Bg). This deformation is thought to have occurred during faulting event 4 (Figure 8).



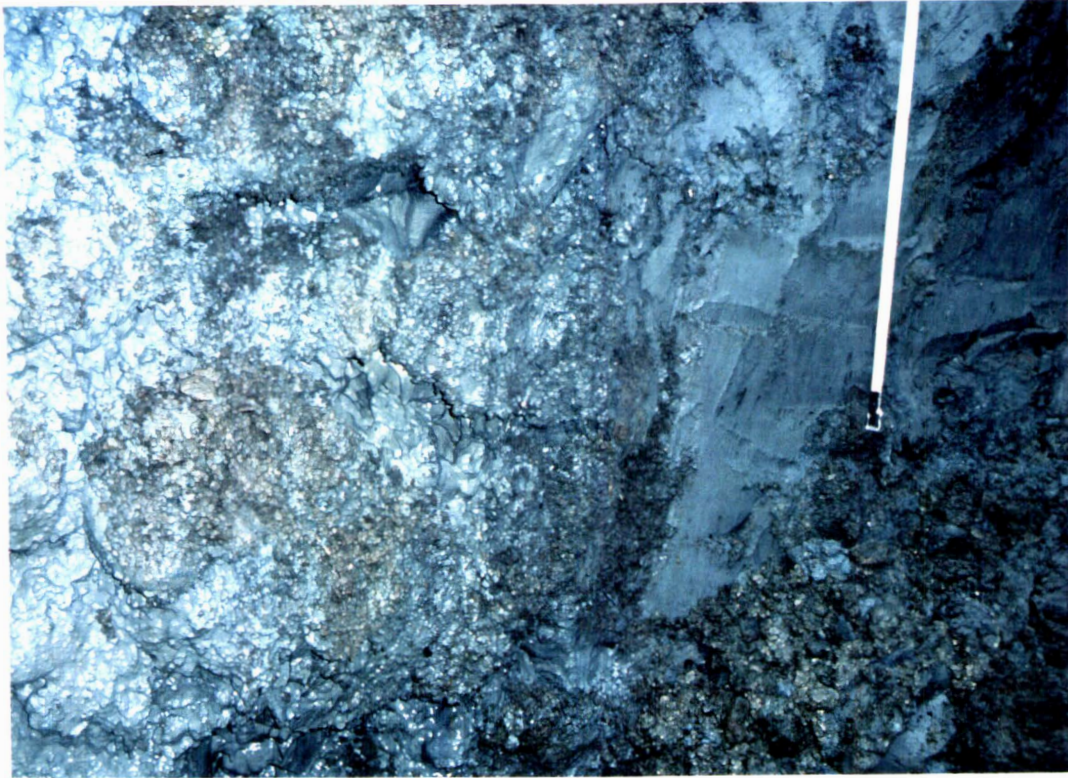


Plate 14, Inglis 3 trench, north wall. Drag and smear structures within the unctuous clay unit (Uc) and ripup clasts of unctuous clay within the fault breccia unit (b). The unctuous clay has been dragged down between the breccia unit and a pebbly gravel (Pg) unit. The deformation of the unctuous clay unit is thought to have occurred during earthquake events 3 and 4 (Chapter 3, Figures 5 and 8)

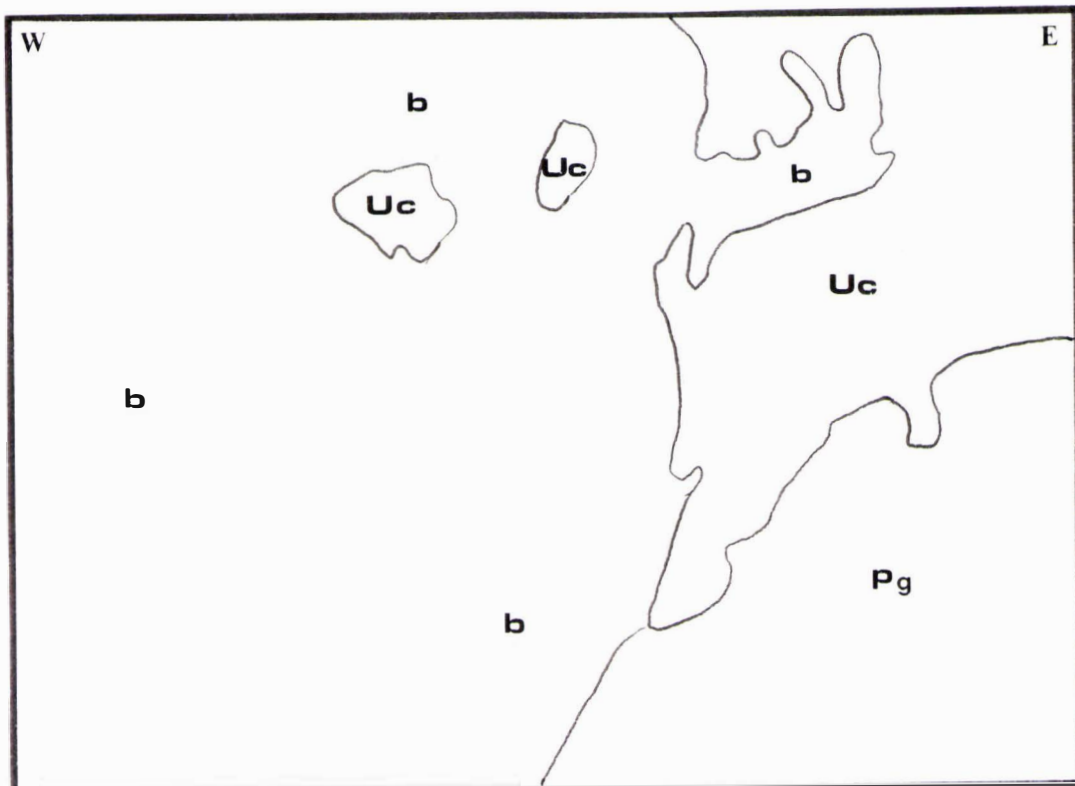
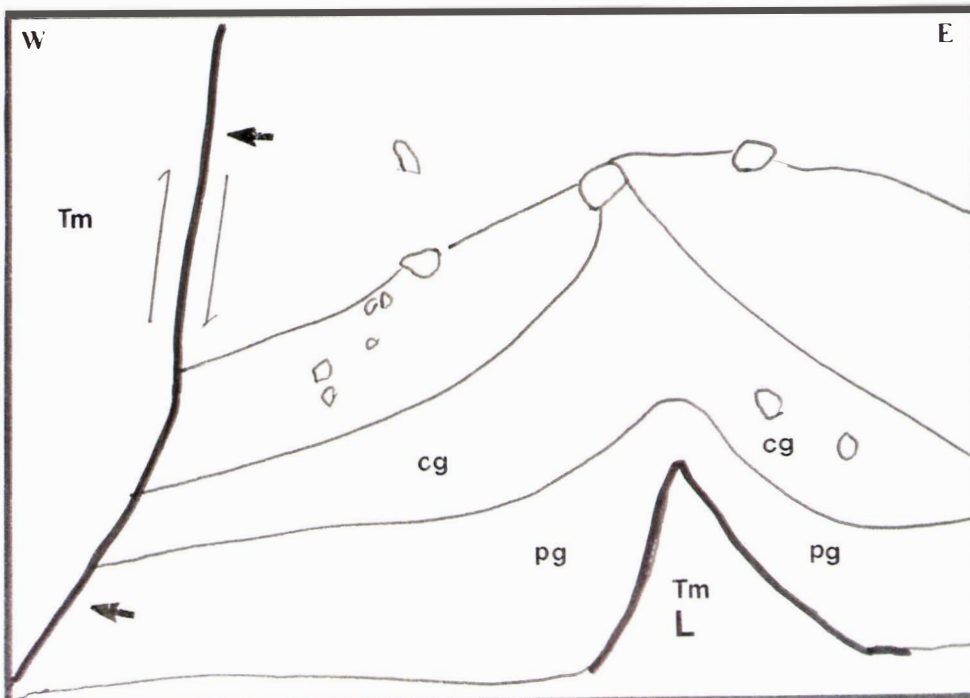




Plate 15, Inglis 4 trench north wall. The main fault plane (arrows) is visible where Tertiary mudstone (Tm) is upthrown 6m against younger Quaternary sediments to the east. This view also shows the listric fault (L) consisting of Tertiary mudstone with the overlying folded gravel units of pebbly (pg) and cobbly gravel (cg).



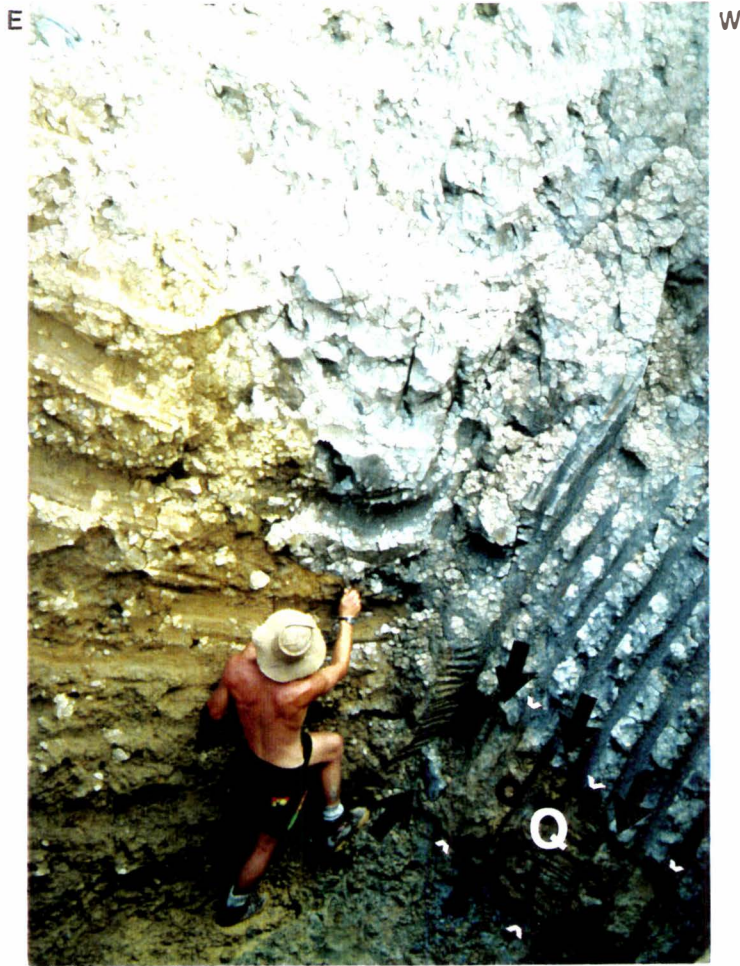


Plate 16. Inglis 4 southwest trench wall. The main fault plane lies between Quaternary sediments coloured yellow/brown to the east and Tertiary mudstone to the west (grey sediment). Within the Tertiary mudstone is a horse or slice (inside arrows) of Quaternary (Q) sediments which has been thrust by faulting activity into the hanging wall of the fault (see Chapter 3)

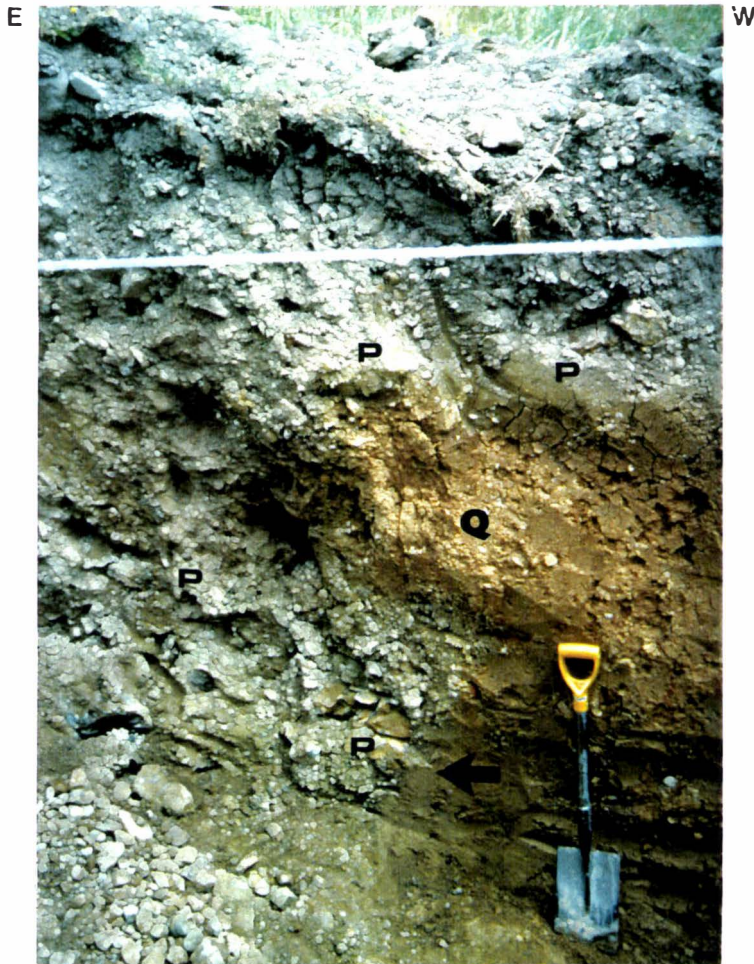


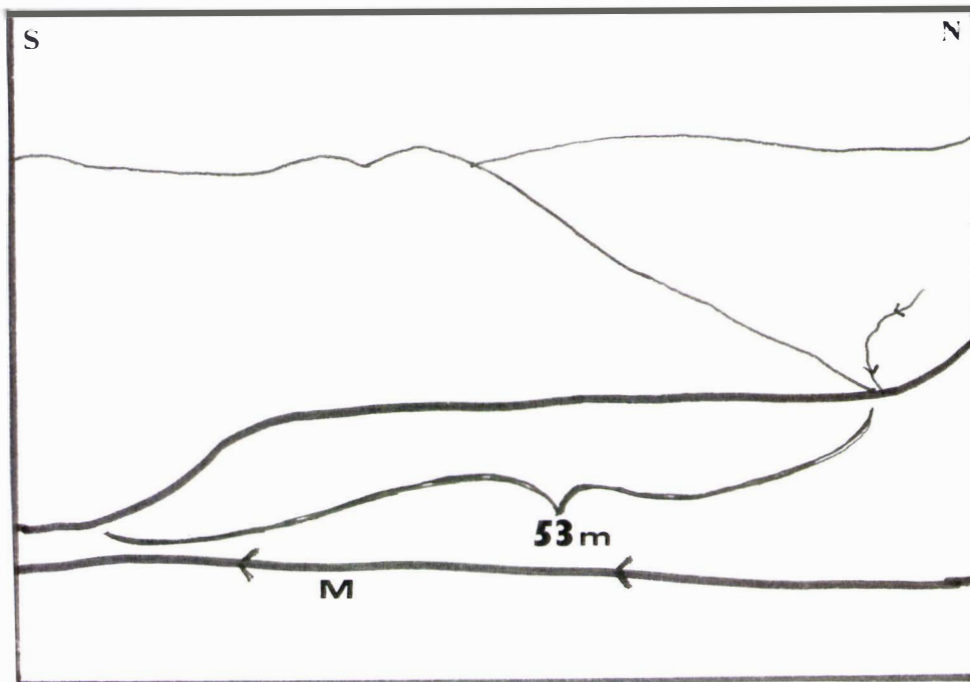
Plate 17, Inglis 4 trench south wall. A horse or slice of Quaternary (Q) sediments has been thrust into what are thought to be Porewan (P) gravels (Appendix 3). Although it is possible that the overlying Porewan gravels may have fallen on top of the Quaternary sediments, the 50° eastward dip (arrow) between the two units makes it more likely that they were faulted against each other.



Plate 18, Inglis 4 trench, south wall showing a horse or slice of Tertiary mudstone (Tm) that has been thrust into Quaternary sediments (Q). The V section (arrow) was dug out with a pocket knife and has a bearing and plunge of $235/40^{\circ}$ which is 15° oblique to the strike of main fault plane at this locality.



Plate 19, The Wellington Fault at Beagley Road. The fault has dextrally offset a small stream by 53m. The stream is located in the north (right) of the photograph and flows eastward behind the faulted ridge (R) where it intersects the fault and flows along the fault plane for 53m before turning eastward again to join the Mangapapa Stream (M).



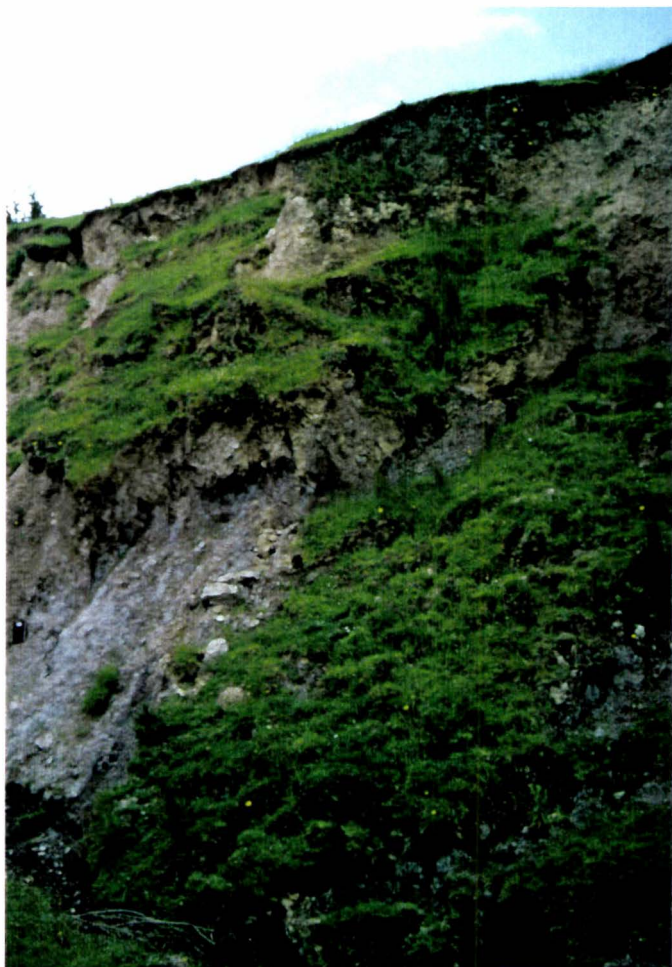


Plate 20, Left Detailed photograph of the Wellington Fault scarp at Beagley Road. The scarp is steep ($>40^{\circ}$) and composed of Tertiary mudstone with some breccia and well rounded to angular greywacke cobbles, boulders and pebbles. At the bottom left of the photograph is the small offset stream.

Plate 21, Below. The Beagley Trench with the tree (T) in growth position before it was overwhelmed by the newly formed stream which cut a new channel due to faulting activity post- 5324 ± 61 yrs B.P (Figures 12 and 13).





Plate 22, Detailed aerial view of the offset paleo-stream pair at Beagley Road (Figure 12) and the Wellington Fault (arrows). The original stream is marked (1) the paleo-stream that was trenched (2) and today's stream (3).



Plate 23, View northwards along the Wellington Fault at the Paper Road site showing offset ridge scarps, stream and ponded drainage (to left). Dotted lines represent the shape of the original scarp showing collapse of the hanging wall and demonstrating the amount of scarp erosion since the latest faulting event (see chapter 8). The scarps are composed of sandy silty Quaternary marine sediments (Marden 1984).

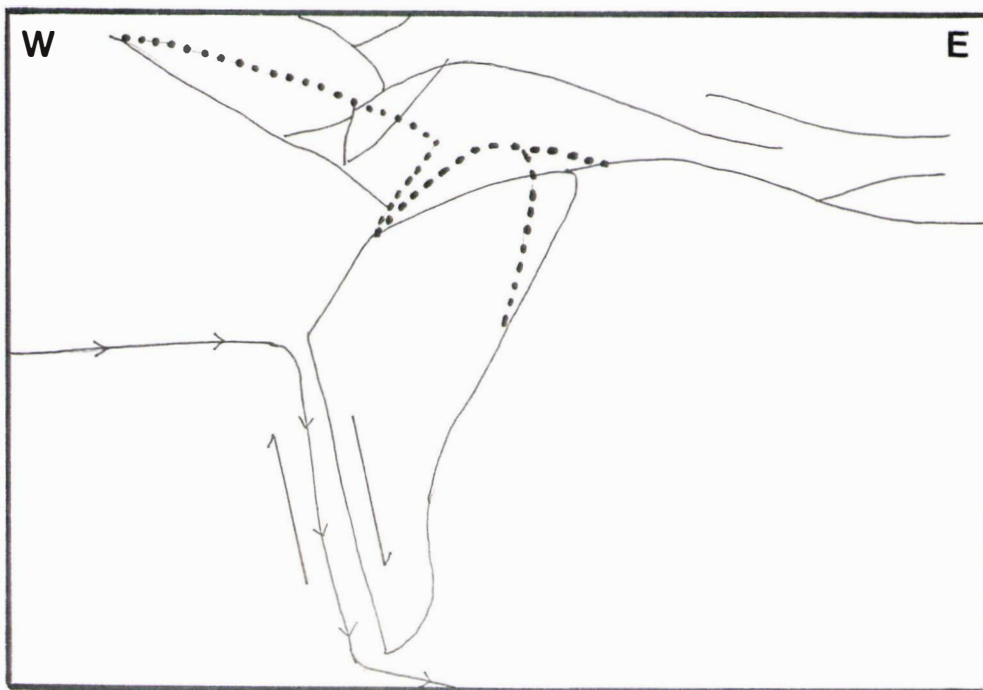




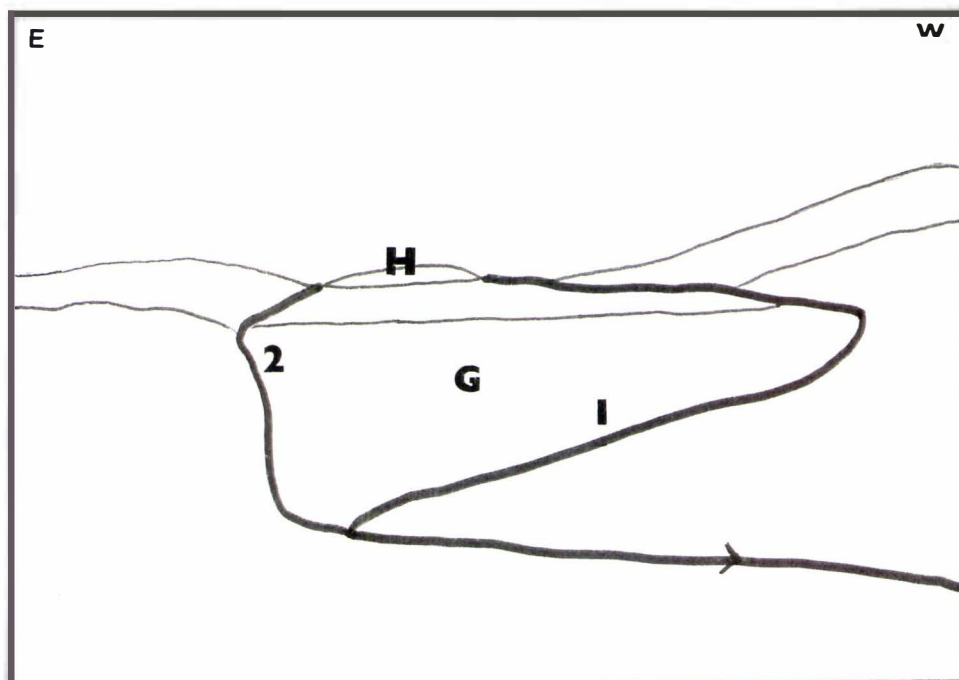
Plate 24, A 93m offset stream on the Wellington Fault 1km south of Coppermine Road. The fault scarps (arrows) are low (<6m) and steep, with uplift to the southeast in this area.

Plate 25, Steep (30° to 40°) Wellington Fault scarp composed of Ohakean gravels above the Trotter 2 trench site which is situated at the north end of the Fairbrother Road duplex.

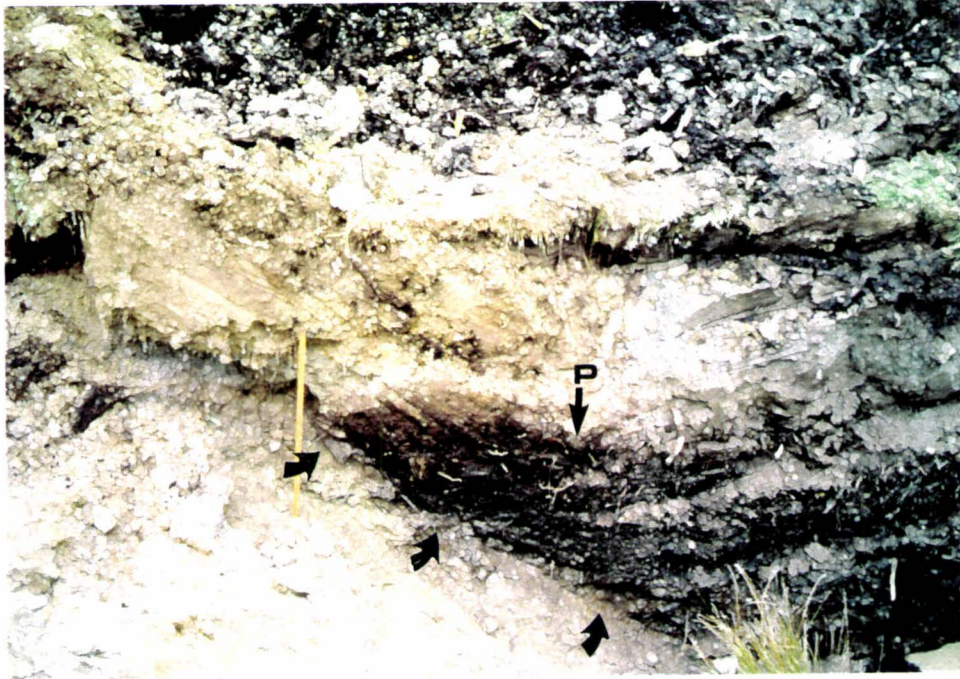




Plate 26, Duplex at Fairbrother Road, looking south along the Wellington Fault. In the foreground is the downthrown graben (G) and middle background the upthrown horst (H) end of the duplex. The stream and swamp in the foreground is fed by a spring located on the fault. Trotter 1 and 2 trench localities are marked 1 and 2.



W



E

Plate 27, The Wellington Fault plane in the Trotter 1 trench. View of the north wall showing the peat (P) unit which has been dragged upward along the shallow dipping (26°) fault plane (arrows) a 1m ruler rests against the trench wall for scale.

Plate 28, Below is a stream (arrows) which has been offset 100m (Figure 19a and 19b) by movement on the Wellington Fault. In the background is a Ratan Gravel Hill (Marden 1984).





Plate 29, Trotter 2 trench, south trench wall showing the Wellington Fault plane (arrows) which is the contact between Ohakean (Oh) gravels (to the east) and Holocene sediments. There are some angular boulders and cobbles with their long axes aligned to the fault plane and a peat (P) unit which has been dragged upward due to faulting activity (Figure 17).

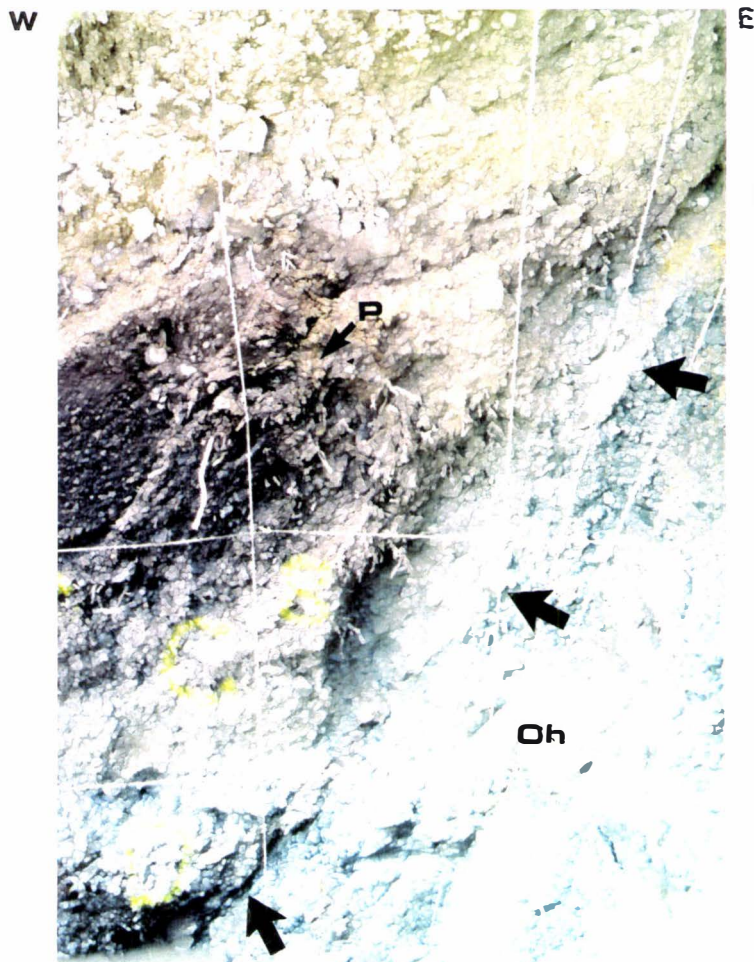


Plate 30, Trotter 2 trench, north trench wall showing the Wellington Fault plane (arrows) which has a change in dip. The fault plane lies between Ohakean gravels (to the east) and Holocene sediments (to the west) which includes the peat (P) unit which has been dragged upward by faulting events (Figure 16)



Plate 30a, The Wellington Fault traversing the southern Ruahine Range between the Apiti and Moorcock Saddles. Looking south toward the Apiti Saddle where there are well defined offset ridges (arrow) upthrown toward the northwest. In contrast this photograph was taken from the Moorcock Saddle, where there is no appreciable uplift only a number of springs to mark the fault trace.

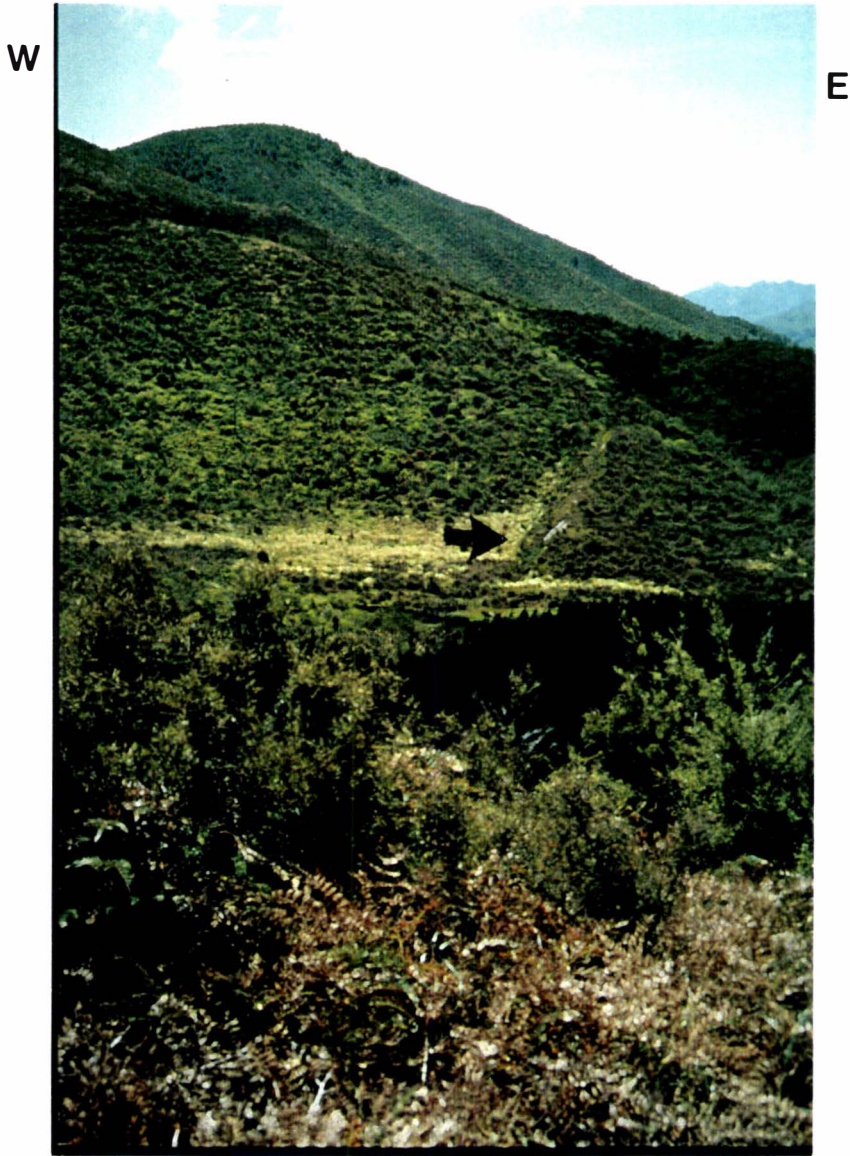


Plate 31, The Wellington Fault west of Moorcock Stream showing offset spurs in Torlesse basement greywacke (Figure 20). The offset on the dextrally displaced spur in the foreground (arrow) was measured at 100m. Reverse movement of the fault and the sharp recent nature of the steep (60° dipping) scarp is clearly visible. This is the only area along the Wellington Fault trace where the free face of the hanging wall was (sometimes) preserved.



Plate 32, Above, Wellington Fault scarp at Gull Road, where a small amount of creep may be occurring along the fault trace. A galvanised pipe running at right angles across the fault scarp has been pulled apart twice since 1960. The pipe is (arrow) in the background.

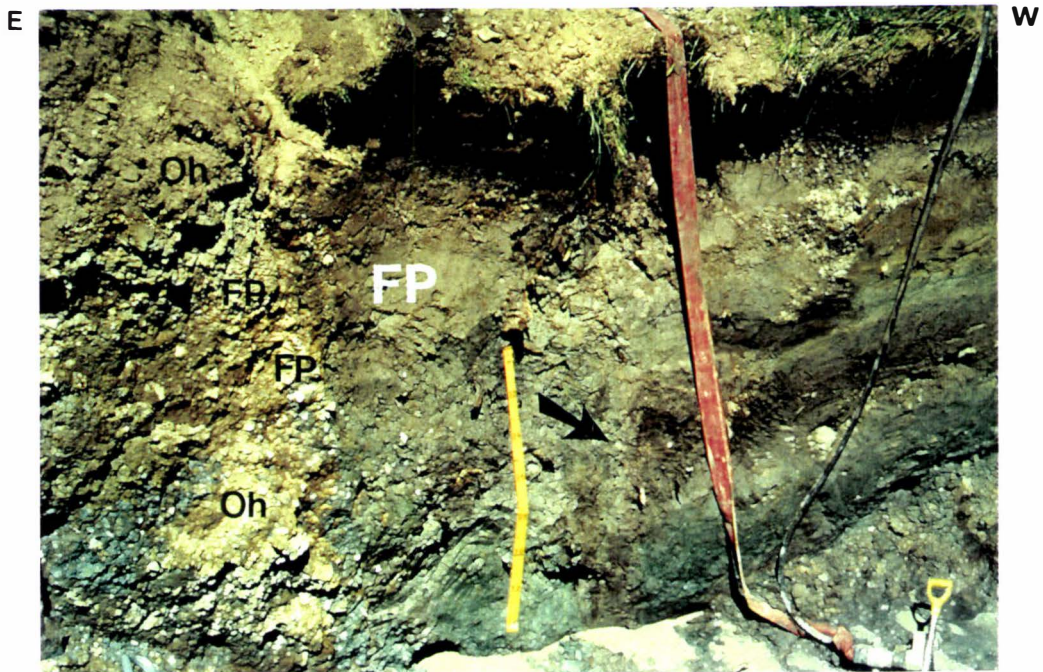


Plate 33, Left, The repaired pipe (arrow) at Gull road, in the background (in the shadow)is the fault scarp.



Plate 34, The Wellington Fault plane in the McCool 1 trench, north wall. Tephra (arrow, aged between 5206 ± 81 yrs and 805 ± 58 yrs B.P.) terminate abruptly against the fault plane (FP) which lies to the west of the tephra (Figure 23). The fault plane is composed of silty clay with pebbles (fault gauge).

Plate 35, The Wellington Fault plane at McCool 1 trench, south wall. The same tephra (arrows) are dragged down by faulting action. The fault plane (FP) is composed of gravel and carbonaceous silt which lies between uplifted Ohakean gravels (Oh) to the east and Holocene silts and tephra to the west (Figure 24).





W

E

Plate 36, The Wellington Fault scarp at Big Hill (arrow) looking north. Torlesse greywacke is west of the fault and Tertiary sediments to the east.



Plate 37, The Wellington Fault scarp and the McCool 3 trench site (arrow) looking north. This trench was excavated up to the tree line (to the right of the arrow) but may have missed the main fault plane.



Plate 38, View of the lake on Big Hill Station which has been formed through faulting activity and the 3 offset lake overflow channels. The present overflow channel is (arrow) the northern most outlet. The oldest channel is marked 3 (nearest camera) 2 is the next oldest channel and 1 is the channel which was trenched. Unfortunately no dateable material was retrieved from this trench. The fresh looking fault scarp surface dips at 45° to the west. The total horizontal offset at this locality was 66m.

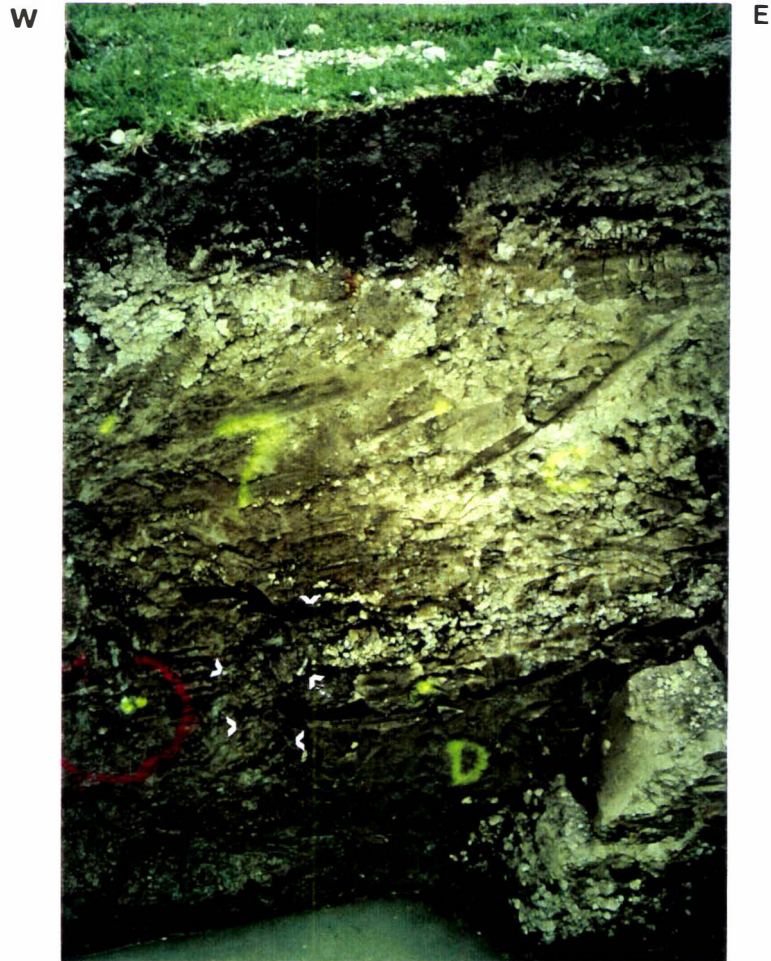


Plate 39, McCool 3 trench north wall, showing the gravel unit (arrows) which has been curved downward due to faulting activity (Figure 25). This trench may not have been excavated across the main Wellington Fault plane, it is possible that mostly strike-slip action is seen here.

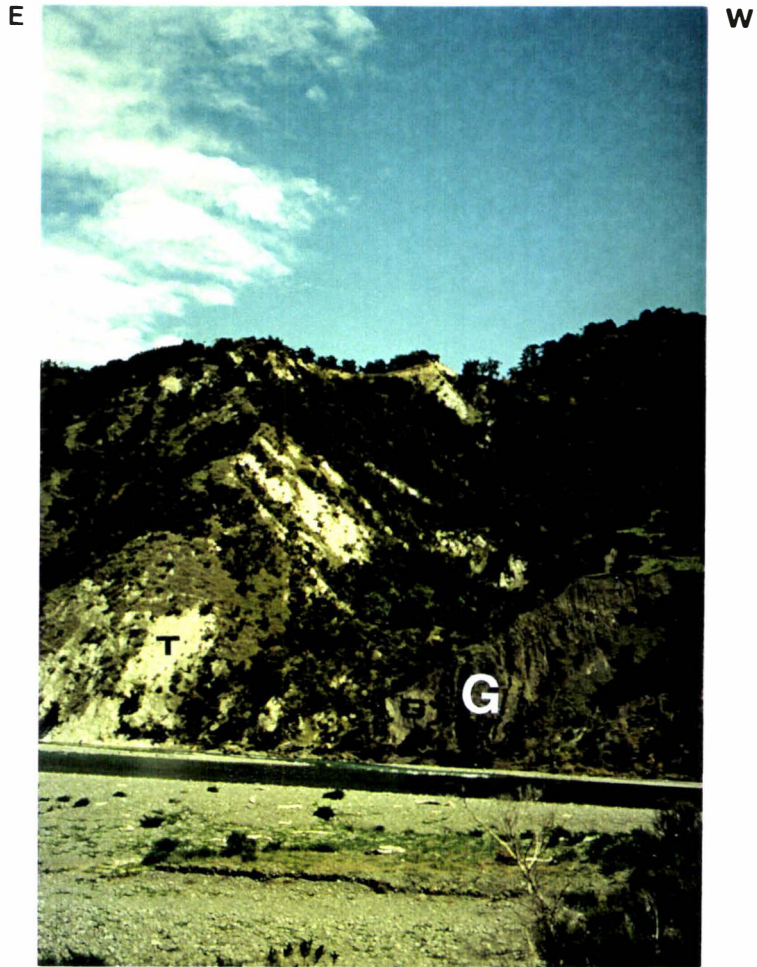


Plate 40, The Wellington Fault scarp, south bank of the Ngaruroro River with Tertiary (T) sediments to the east and Torlesse greywacke (G) to the west. The scarp is overly steep and has been heavily eroded. The more resistant greywacke has created small rapids in the river at this point.



Plate 41, Offset Ohakean and Ratan (R) terraces on the north bank of the Ngaruroro River. T marks the fault trace across the Ohakean terrace surface. In the background is the Fort composed of Whanawhana limestone (arrow). The Wellington Fault trace traverses the east flank of this hill (Figure 27)

Plate 42, Below, the Wellington Fault with rent and bridge structures where it crosses the above Ohakean terraces. In the centre of the photograph are Dr A Palmer and Ms C Hannan (Dept of Soil Science, Massey University) digging through the fault trace surface (arrow)





Plate 43, Above The Wellington Fault crossing Hawkstone Station. The Syme trench site is marked T and offset ridges with arrows. This plate shows little vertical offset but the ridges and streams are horizontally offset (approximately 60m close to the trench site) showing that strike-slip action is the prevalent motion at this locality.

Plate 44, Below, the Wellington Fault Scarp (looking north) forming the western face of the Maniaroa Range (Te Waka limestone). There are several small landslides covering the steep uplifted fault scarp surface (up to the east). The downthrown dipslopes of Te Waka limestone (arrow) can be seen to the west of the Fault. The maximum vertical offset at this locality from the base of the dipslope to the top of the uplifted scarp is 140m.



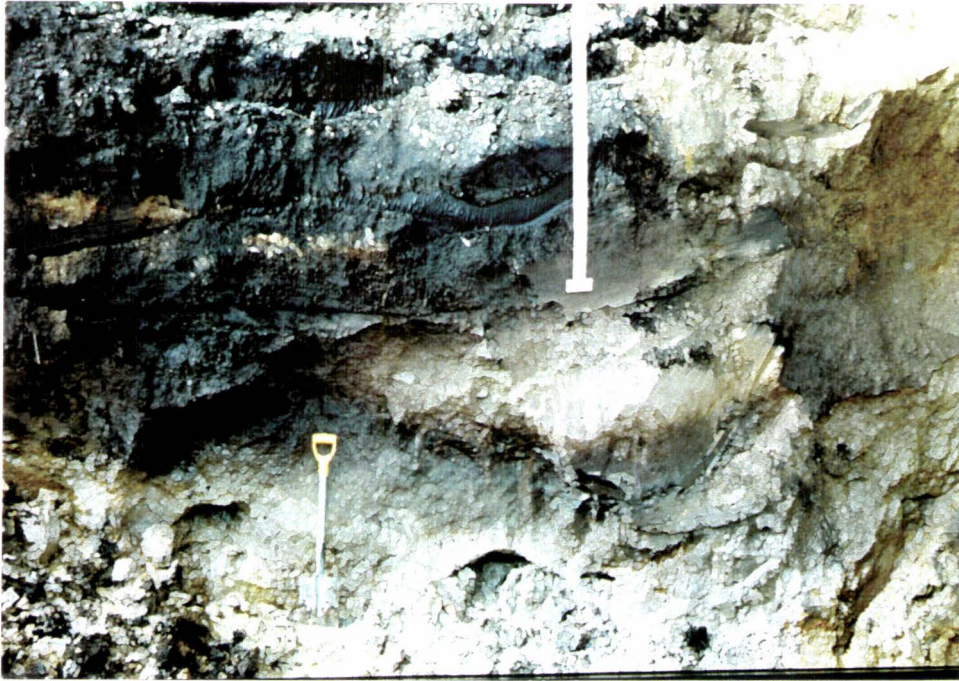
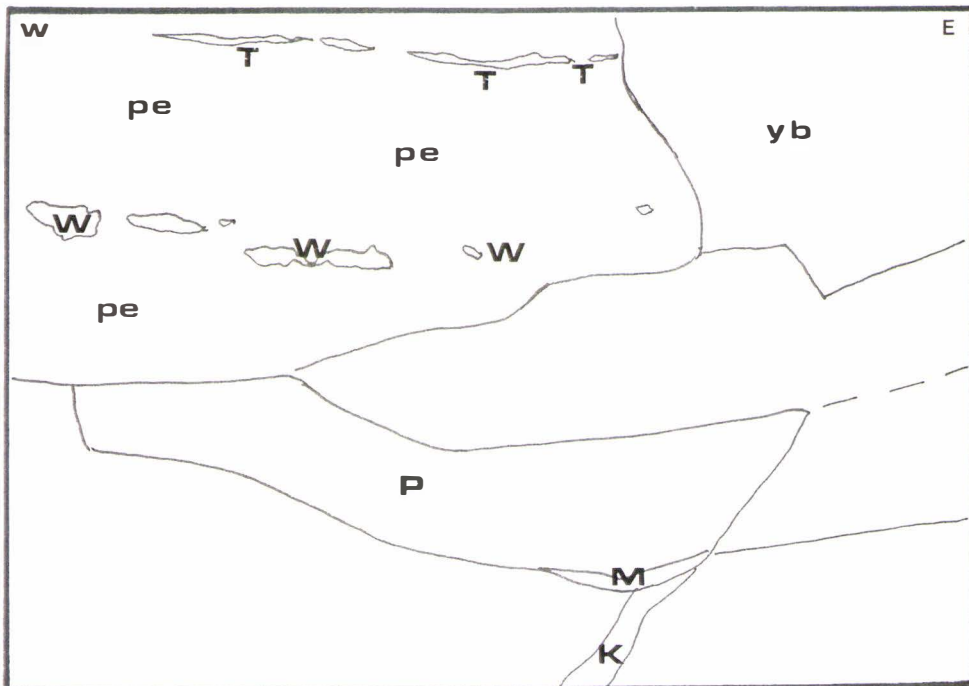


Plate 45, The Syme trench excavated across the Wellington Fault on Hawkstone Station (north wall) where Waimihia (W) and Taupo (T) Tephras are truncated by a yellow-brown allophanic loamy unit (yb). These tephras are located within a peat unit (pe). Mangamate Tephra (M) is located in the base of a paleosol (P) and Karapiti (K) Tephra is located at the base of the trench (Figure 29)



W

E



Plate 46. The Wellington Fault at Potter Road looking north. Here a landslide (L) blocked a stream (S) to create shallow lake. The fault trace is marked with arrows

Plate 47. Below the Wellington Fault (W) north of the Napier-Taupo Highway. This view of the scarp will soon be lost as the area has been planted in pines

W

E



W**E**

Plate 48, The Wellington Fault (W) 300m south of Puketitiri Road, on the western slopes of the Maniaroa Range. A landslide (L) covers most of the fault trace. The eastward (extensional) diverging Te Waka Splinter Fault scarp can be seen on the skyline (arrow).



Plate 49. Above the Te Waka Splinter Fault (valley centre) 500m north of the Wedd Trench site looking north. Small scarps seen in the background (arrows) can be found usually no more than 700m from the southern end of the fault trace and always expose Taupo and Waimihia Tephras. The scarps are thought to originate from a faulting event because they are found nowhere else in this vicinity.

Plate 50. Below small scarps foreground and background close to the Wedd trench site (arrows). The Taupo (T) Tephra can be seen in the top of the scarp in the foreground and the Waimihia (W) Tephra in the base.

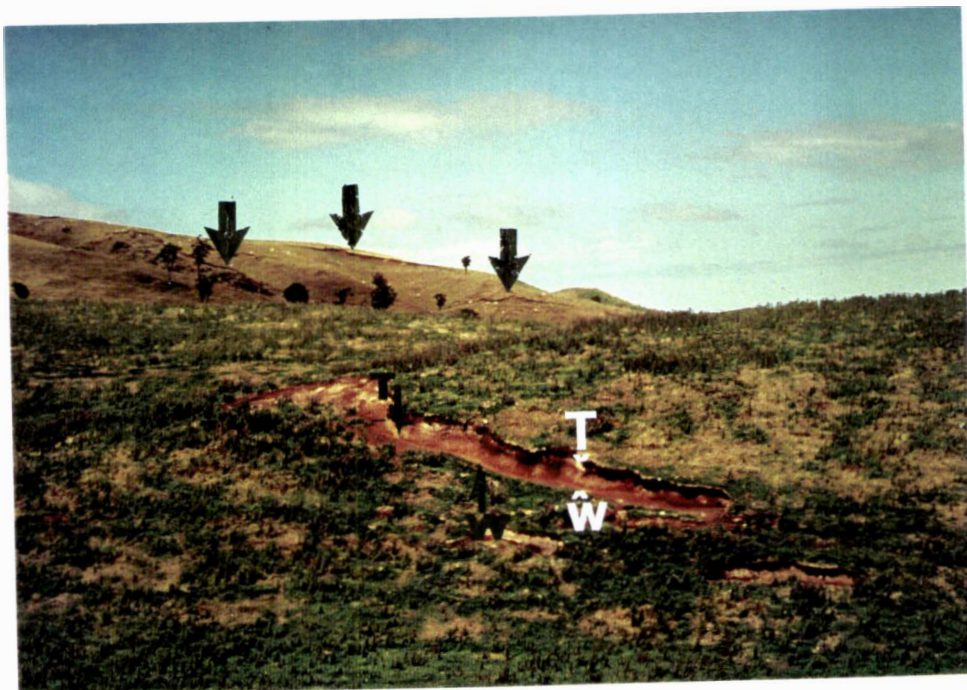




Plate 51, The Wedd trench, on the Te Waka Fault, south wall. This shows the buckled sandy (S) unit, limestone rubble (LR), the uplifted limestone (UL) and a buried carbonaceous unit (C). There is downthrown limestone under the spade along the base of the trench (Figure 30).



Plate 52, Above. broad u-shaped valley on the Te Waka Splinter Fault. Small scarps (arrow) exposing Taupo and Waimihia Tephra can be seen on the eastern (upthrown) valley wall

Plate 53, Below. The termination of the Te Waka Splinter Fault (photo taken from the Te Waka Trig looking north) Massive Te Waka limestone and alternating silty sand and limestone beds can be found in exposures to the west of the fault (arrows) but not to the east. The underlying Titiokura (T) limestone (Beu 1995) is exposed along the ridge spine



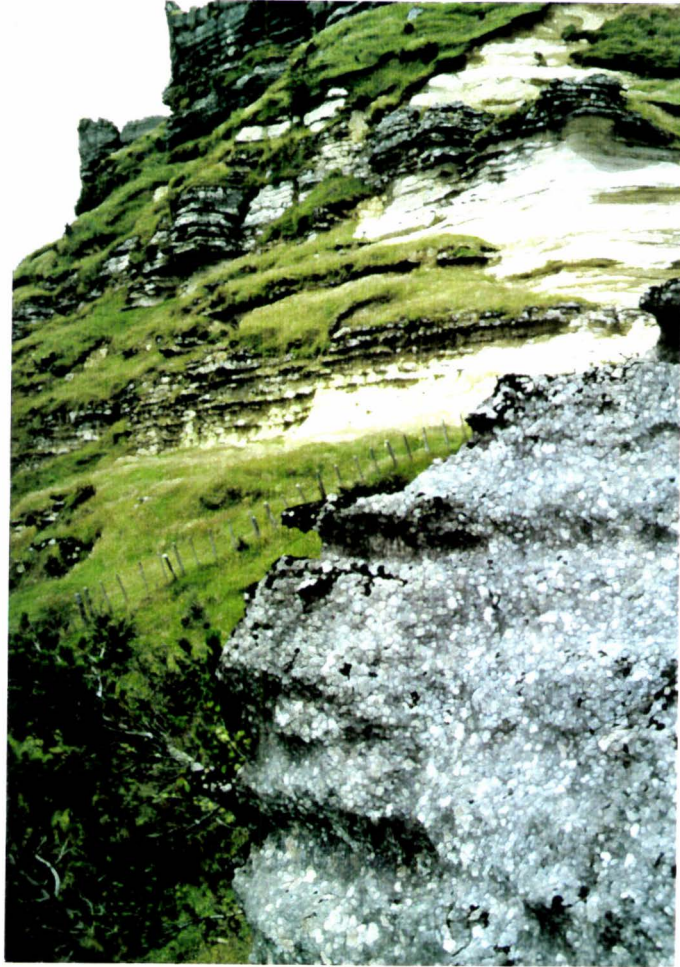


Plate 54, Exposure of Te Waka limestone (background) is uplifted on the east side of Te Waka Fault. The exposure in the foreground is thought to be the same unit but downthrown 30m on the west side of Te Waka Fault. The Te Waka Trig is located on top of the unit in the background.



Plate 55, Te Waka Splinter Fault and proposed termination splay looking southeast. Te Waka limestone (TW) outcrops on the far ridge in the distance, this is the main fault. The east side of splay 1 (middle distance a) is capped with sandy siltstone (S) with underlying limestone (L). The west side of splay 1 (foreground) is capped with Te Waka limestone (L) with a sandy silty (S) layer below. There is a second deeply cut Valley (splay 2) to the west of the photograph (Figure 28)

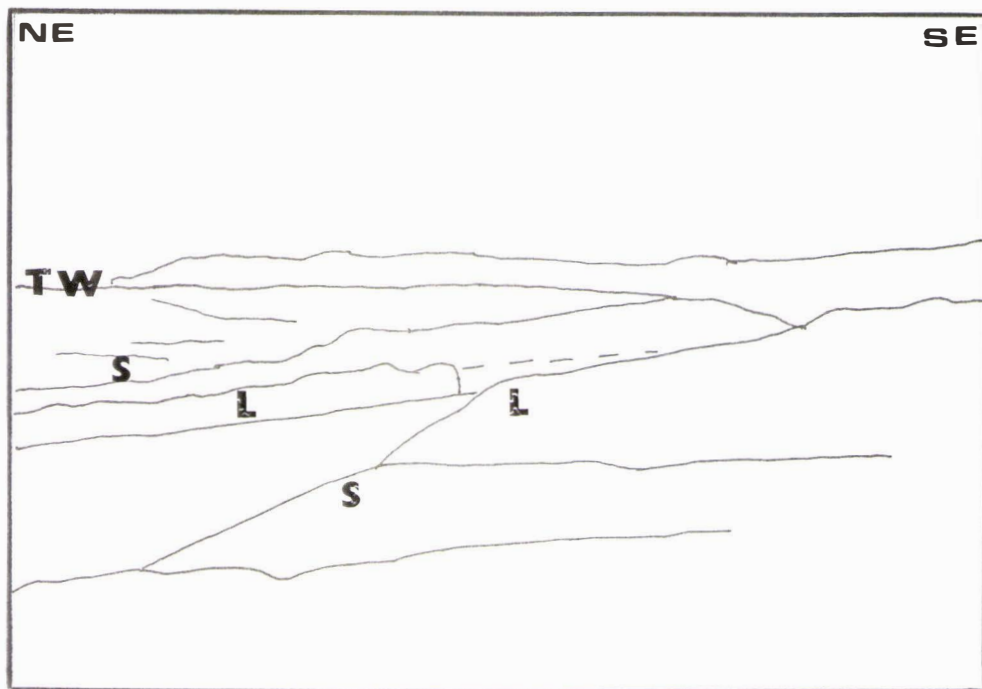
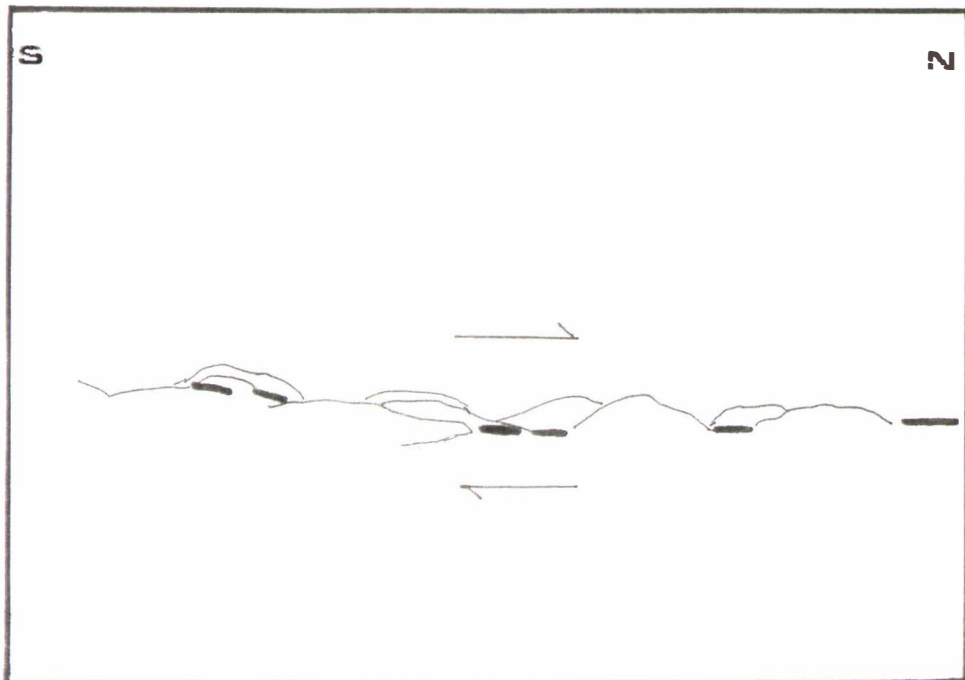




Plate 56, The Ruahine Fault between North Block Road and Glenny Road looking west toward the uplifted Ruahine Range in the southern part of the Ohara Depression (Figure 21). Showing well rounded offset ridges of 60m to 100m, considerable erosion has taken place in this vicinity since the last movement on the fault. Offset scarps show mainly strike-slip action with some minor uplift to the east.



W

E



Plate 57, The Ruahine Fault north of Whittle Road (Figure 32) and 100m north of the Davis 2 trench site showing dextrally displaced spurs and steep fault scarps with slopes of $>30^{\circ}$ where the latest vertical faulting is up to the east. Here, the fault is the contact between Torlesse greywacke to the west and Tertiary siltstone to the east.



Plate 58, Davis 1 trench north wall (Figure 34). The Ruahine Fault showing the main fault plane and a displaced block of Tertiary siltstone (B) which lies on top of a pebbly peat unit. The uplifted Tertiary siltstone lies immediately east of the displaced block. The orange-brown unit is Waimihia (W) Tephra, the cream coloured unit is Taupo Tephra (T) the black units are peat, overlying these units is a blue-grey rubble and sand unit.

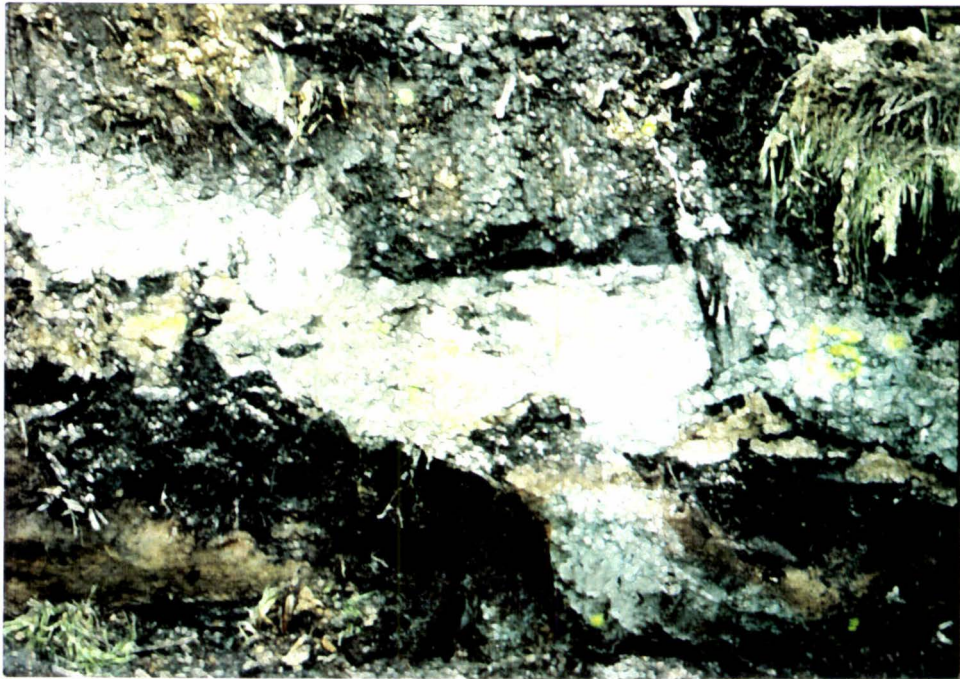
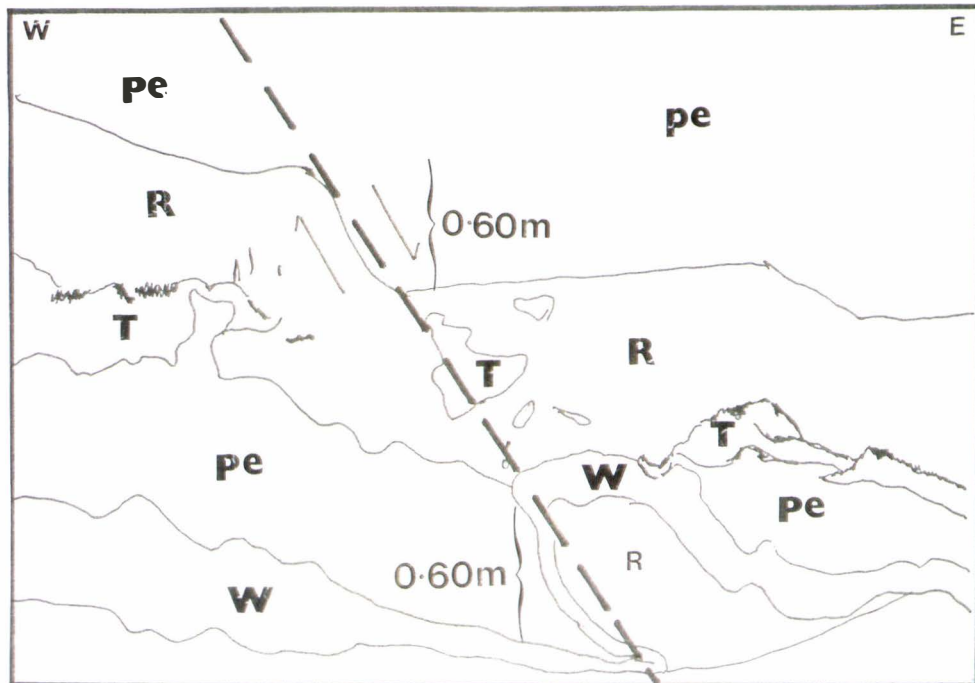


Plate 59, Ruahine Fault. Davis 1 trench north wall, mid-trench. 12 to 13m vertical marks (Figure 34). This photograph shows the folded Waimihia Tephra and disrupted Taupo (T) Tephra caused by faulting activity post-1850 years B P. The peat (pe) and underlying blue-grey rubble (R) units have dropped down 0.60m and the underlying Waimihia (W) Tephra has a 0.60m fold on the same axis as the downthrown peat and rubble.



W

E

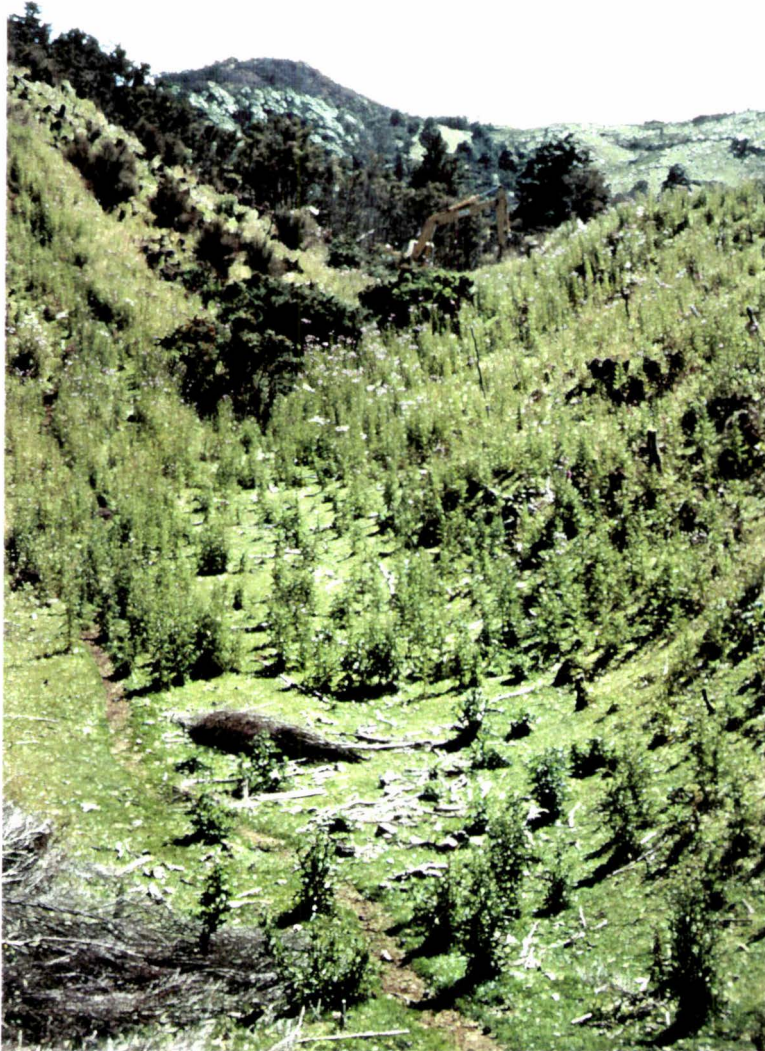


Plate 60, Ruahine Fault scarp south of Whittle Road, viewed to the north. The latest vertical uplift is toward the east (right) with steep ($>30^{\circ}$) scarps. An excavator can be seen in the background at the Davis 2 trench site. At this site, both sides of the fault are composed of Torlesse greywacke.

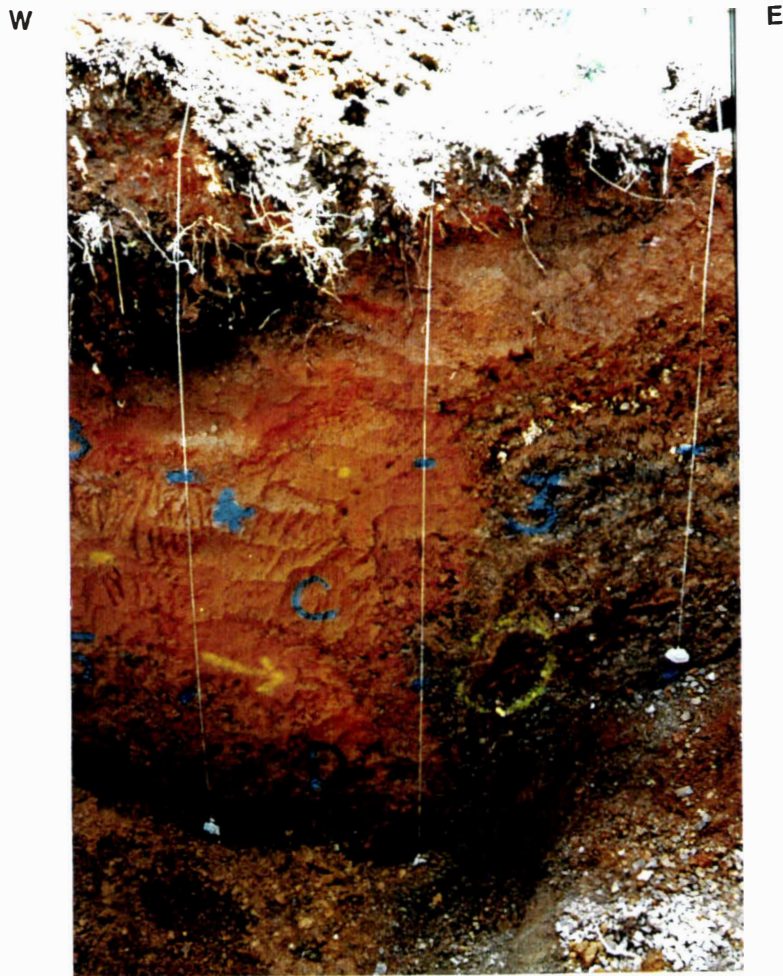


Plate 61, Davis 2 trench north wall (Figure 36) Ruahine Fault, showing shattered greywacke (3) with remnant bedding which has been uplifted (approximately 2m) to the east. The yellow arrow points to a small lens of Waiohau Tephra dated at 11,850 yrs B.P. Above (4) are Waimihia Tephra and Taupo Tephra.

S



N

Plate 62, View of the Ruahine Fault showing the fault trace as a break in slope (arrows) on the eastern slopes of the Kaweka Range with the latest uplift being to the west. In contrast, only 4km south at the Davis trench sites the latest faulting events show uplift to the east.

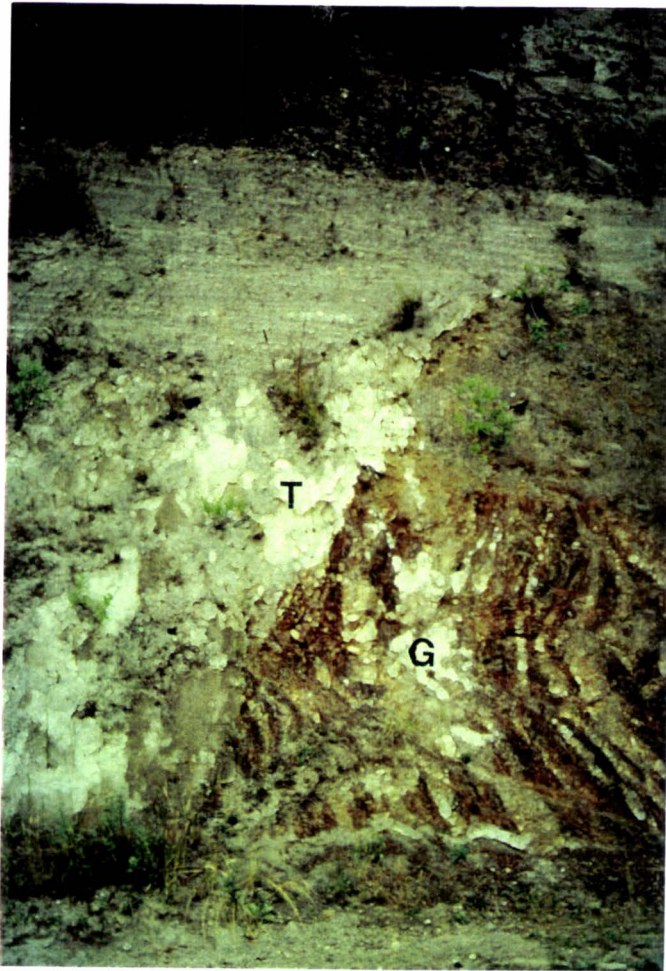


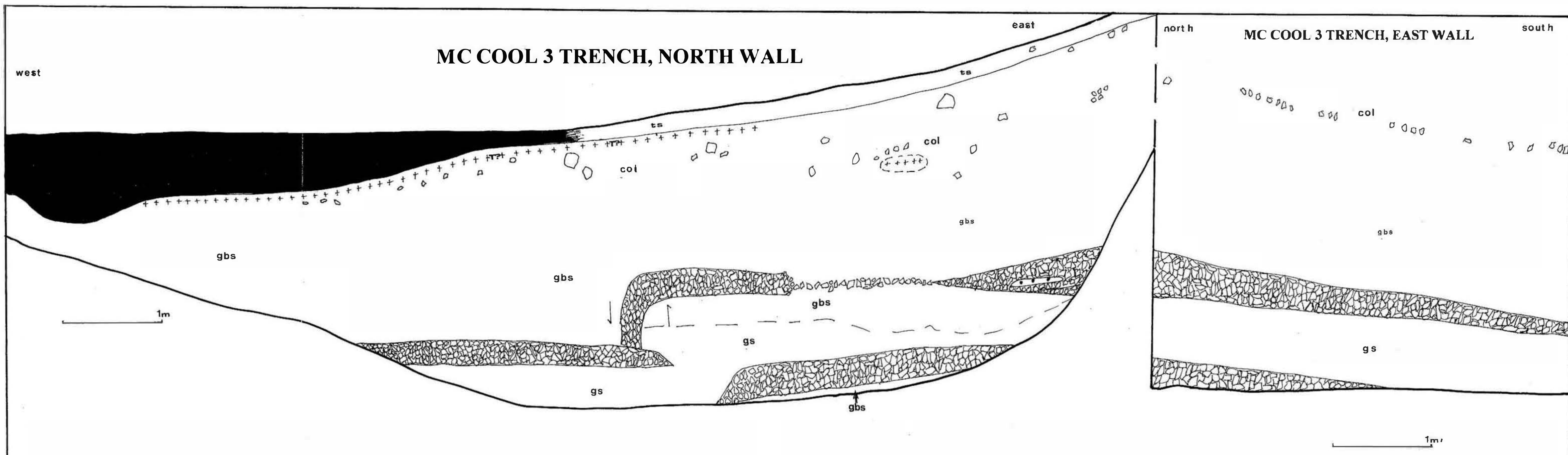
Plate 63, Weathered Torlesse greywacke with sub-vertical bedding seen in a road cutting on Hot Springs Road (Figure 33). To the left of the greywacke (G) is a deposit of Taupo Ignimbrite (T) aged 1850 years B.P which has either been deposited against the greywacke unit or faulted against it. There is an extensional sidestep (200m) in the Ruahine Fault at this locality (see Chapter 7). There are no faulted surfaces evident, but most excavated trenches also showed juxtaposed sediments with a lack of faulted surfaces (see Chapter 8).



Plate 64, The Ruahine Fault traversing river terraces south of the Mohaka-Ripia River junction. The fault trace in the foreground has been upthrown 0.90m to the west (arrow) while the trace in the background (either side of the road) has been uplifted 2m. It is presumed that the section of the trace in the background is an exhumed surface (due to erosion from the Mohaka River) showing multiple events, while that in the foreground represents a single faulting event (see Chapter 7)



Plate 65, Nukumaruan limestone (containing *Pellicaria* fossils) on the Napier-Taupo Highway. Where this moderately undeformed unit has been isolated by activity on the Ruahine Fault. The limestone appears to be an outlier surrounded by greywacke. The nearest other known deposit of Nukumaruan limestone is found approximately 25km to the south. If a paleogeographic reconstruction (Beu 1995) is used, this would give a total horizontal offset of 25km.



KEY

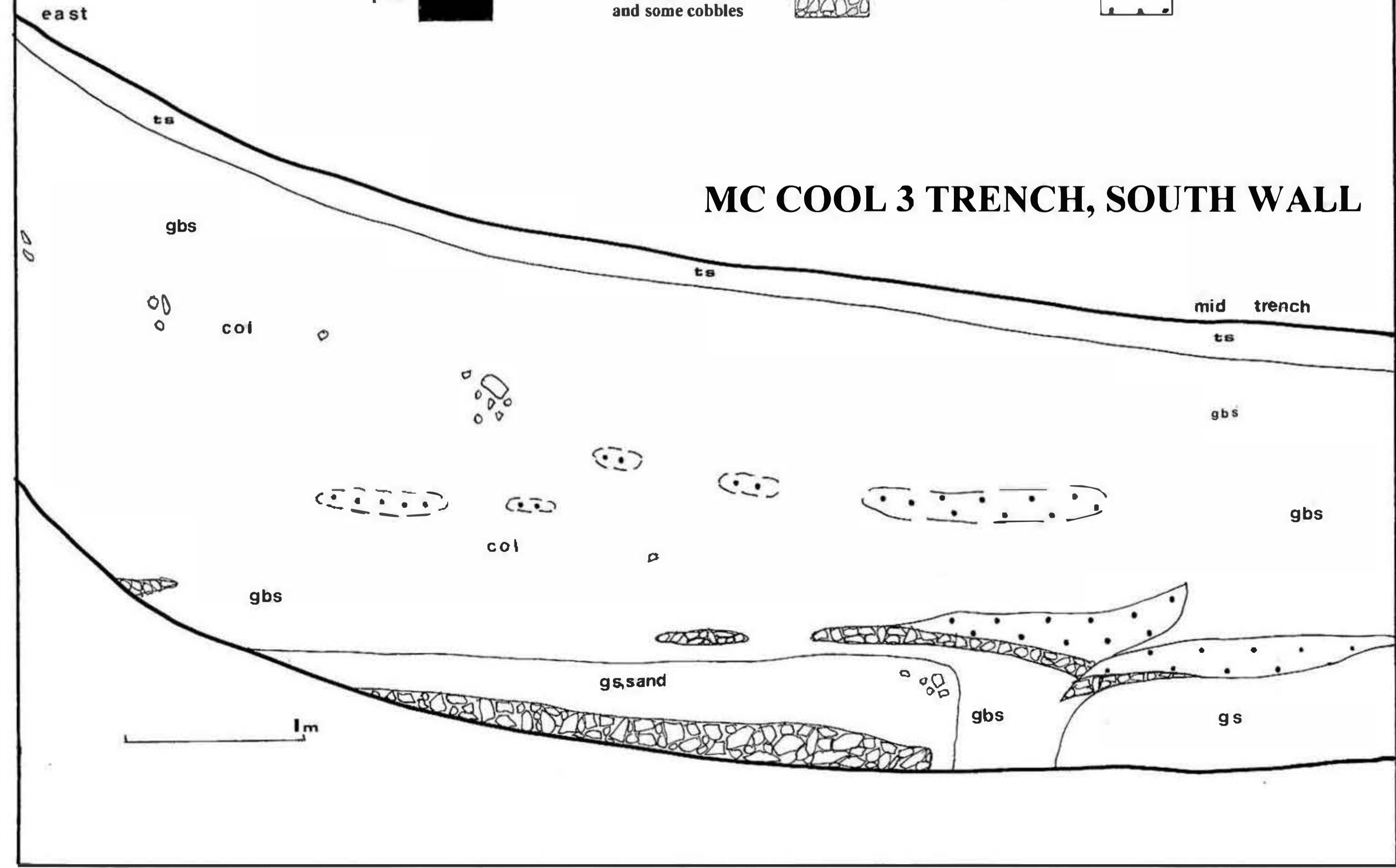
MC COOL 3 TRENCH, WELLINGTON FAULT

LOGGED ON A SCALE OF 1:20

Although this trench was excavated across the fault trace it does not appear to be located across the main fault plane and is quite different in structure to Mc Cool 1 trench excavated approximately 500m to the south. The topsoil is marked ts, +++T+++ is dispersed Tephra Taupo? and ++++ is a dispersed andesitic tephra, gbs is a grey-brown silt, gs is grey silt and col represents layers of colluvium.

- peat
- closely packed pebbles and some cobbles
- pea gravel

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Palmarston North
Turlita
b 1061313040



MC COOL 2 TRENCH, EAST WALL

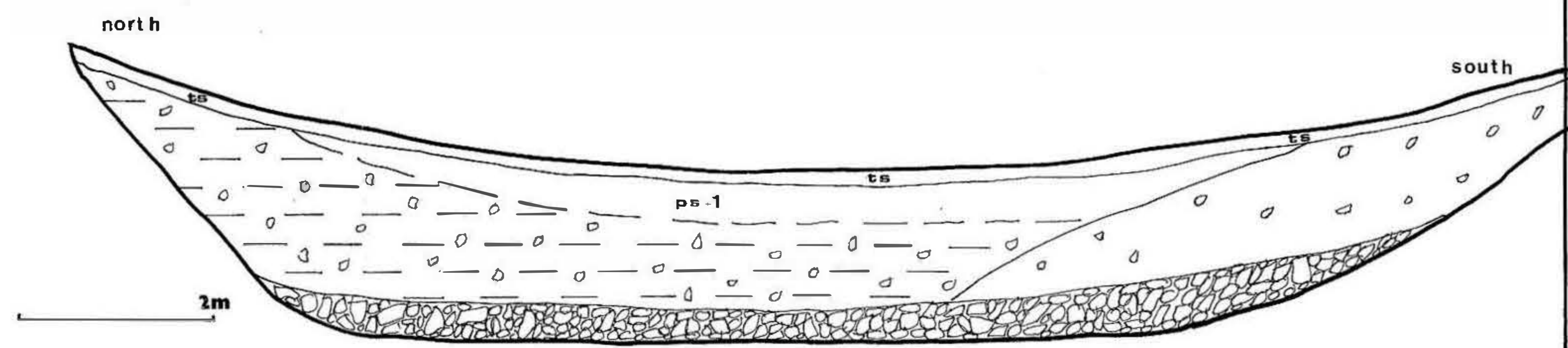
KEY

MC COOL 2 TRENCH (OFFSET STREAM)

LOGGED ON A SCALE OF 1:40

Ps-1 is a paleosol containing carbonaceous material but this may have formed post European settlement as there are orange burn marks in the soil, ts is the topsoil.

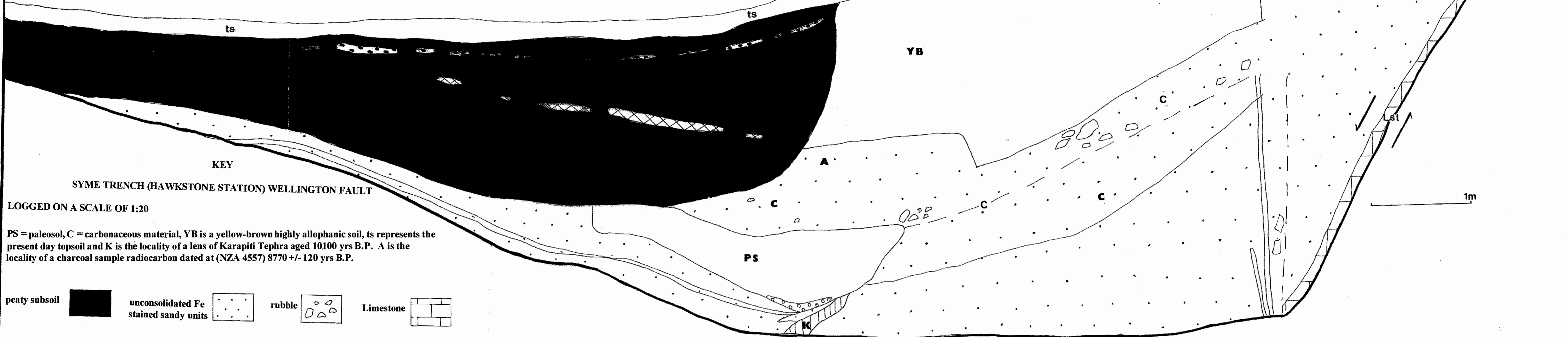
- colluvium
- brown silty gravels mostly pebbles + some cobbles
- closely packed pebbles and cobbles



SYME TRENCH, NORTH WALL

WEST

EAST



KEY
SYME TRENCH (HAWKSTONE STATION) WELLINGTON FAULT

LOGGED ON A SCALE OF 1:20

PS = paleosol, C = carbonaceous material, YB is a yellow-brown highly allophanic soil, ts represents the present day topsoil and K is the locality of a lens of Karapiti Tephra aged 10100 yrs B.P. A is the locality of a charcoal sample radiocarbon dated at (NZA 4557) 8770 +/- 120 yrs B.P.

peaty subsoil [black] unconsolidated Fe stained sandy units [dotted] rubble [triangles] Limestone [bricks]

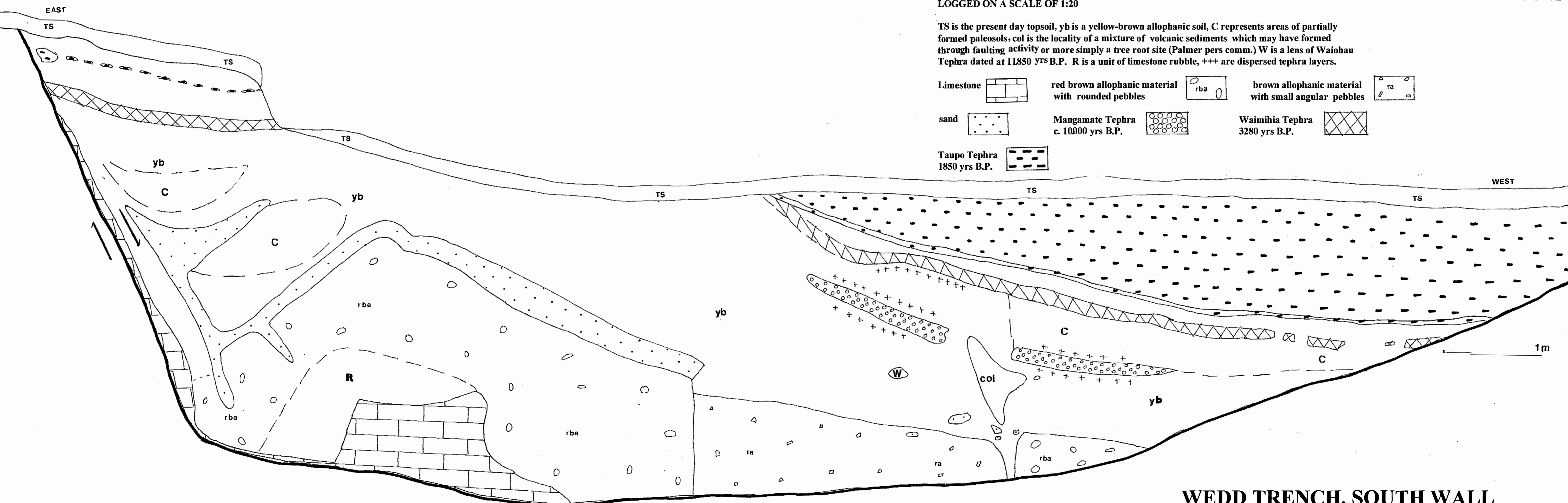
Mangamate Tephra c. 10000 yrs B.P. [circles] Waimihia Tephra 3280 yrs B.P. [crosses] Taupo Tephra 1850 yrs B.P. [dashed lines]

WEDD TRENCH, TE WAKA SPLINTER FAULT

LOGGED ON A SCALE OF 1:20

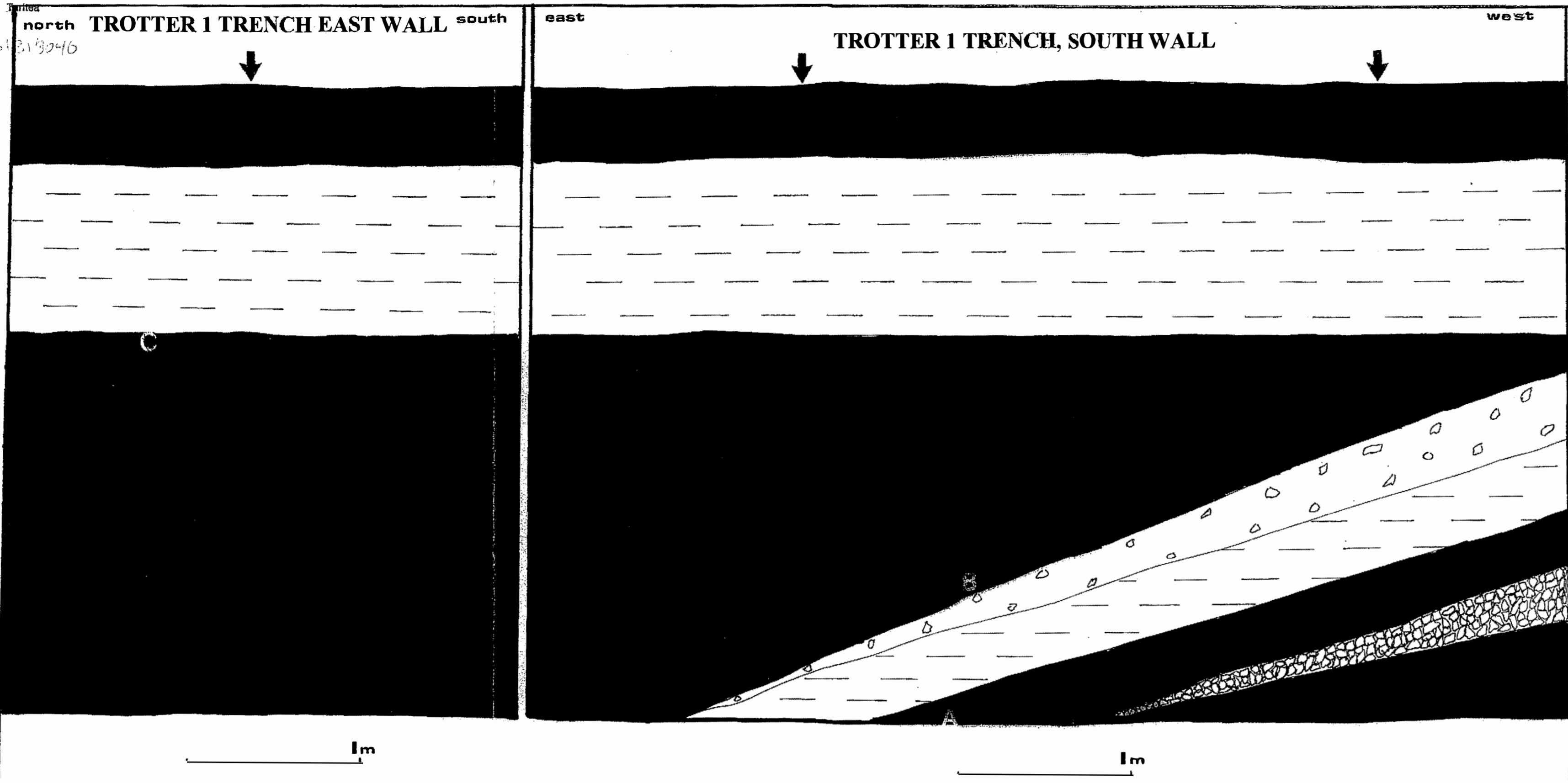
TS is the present day topsoil, yb is a yellow-brown allophanic soil, C represents areas of partially formed paleosols, col is the locality of a mixture of volcanic sediments which may have formed through faulting activity or more simply a tree root site (Palmer pers comm.) W is a lens of Waiohau Tephra dated at 11850 yrs B.P. R is a unit of limestone rubble, +++ are dispersed tephra layers.

Limestone [bricks] red brown allophanic material with rounded pebbles [rba] brown allophanic material with small angular pebbles [ra]
 sand [dotted] Mangamate Tephra c. 10000 yrs B.P. [circles] Waimihia Tephra 3280 yrs B.P. [crosses]
 Taupo Tephra 1850 yrs B.P. [dashed lines]

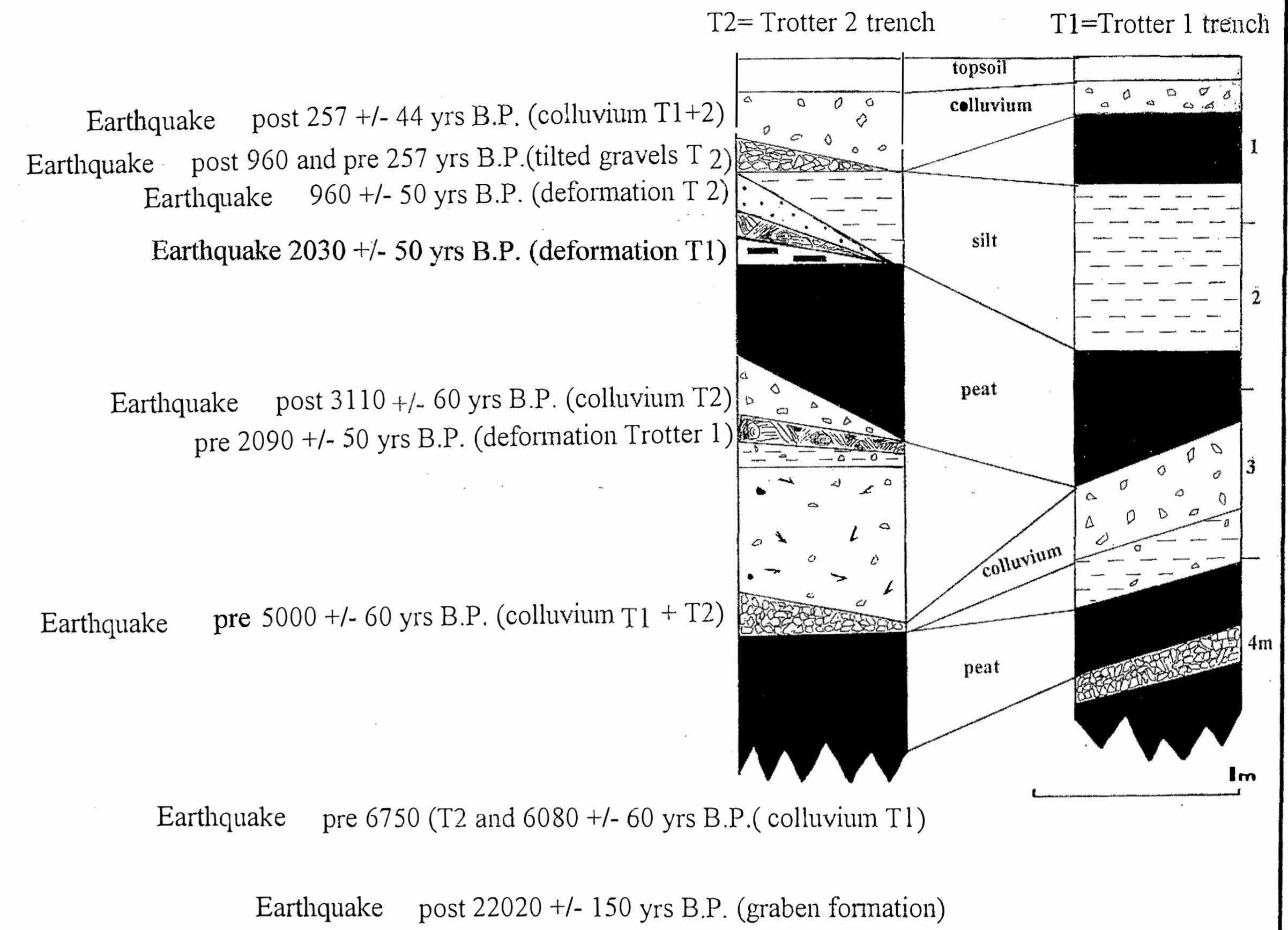


WEDD TRENCH, SOUTH WALL

6106 319046



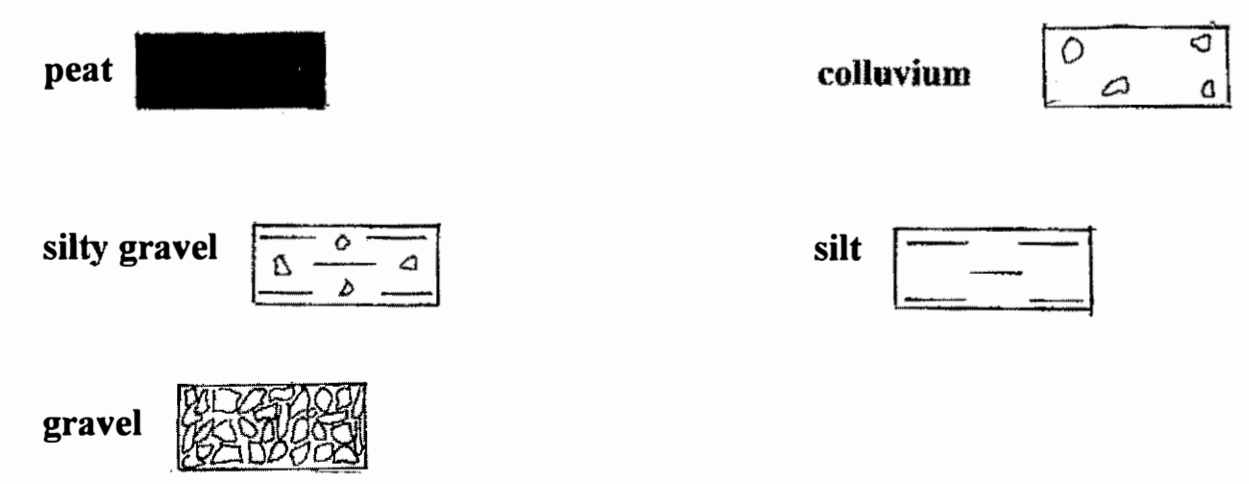
Integrated Stratigraphic Column For The Trotter 1 and 2 Trenches



KEY TROTTER 1 TRENCH, WELLINGTON FAULT

LOGGED ON A SCALE OF 1:20

The fault plane is marked with direction indicators, OH are Ohakean gravels located below the fault plane. Arrows indicate the present day swamp surface and ts is today's top soil. A is the locality of a wood sample (Wk 3145) radiocarbon dated at 6080 +/- 60 yrs B.P. B is the locality of wood sample (Wk 3114) radiocarbon dated at 5000 +/- 60 yrs B.P. and C is the locality of wood sample (Wk 3141) radiocarbon dated at 2090 +/- 50 yrs B.P.



TROTTER 1 TRENCH, NORTH WALL

