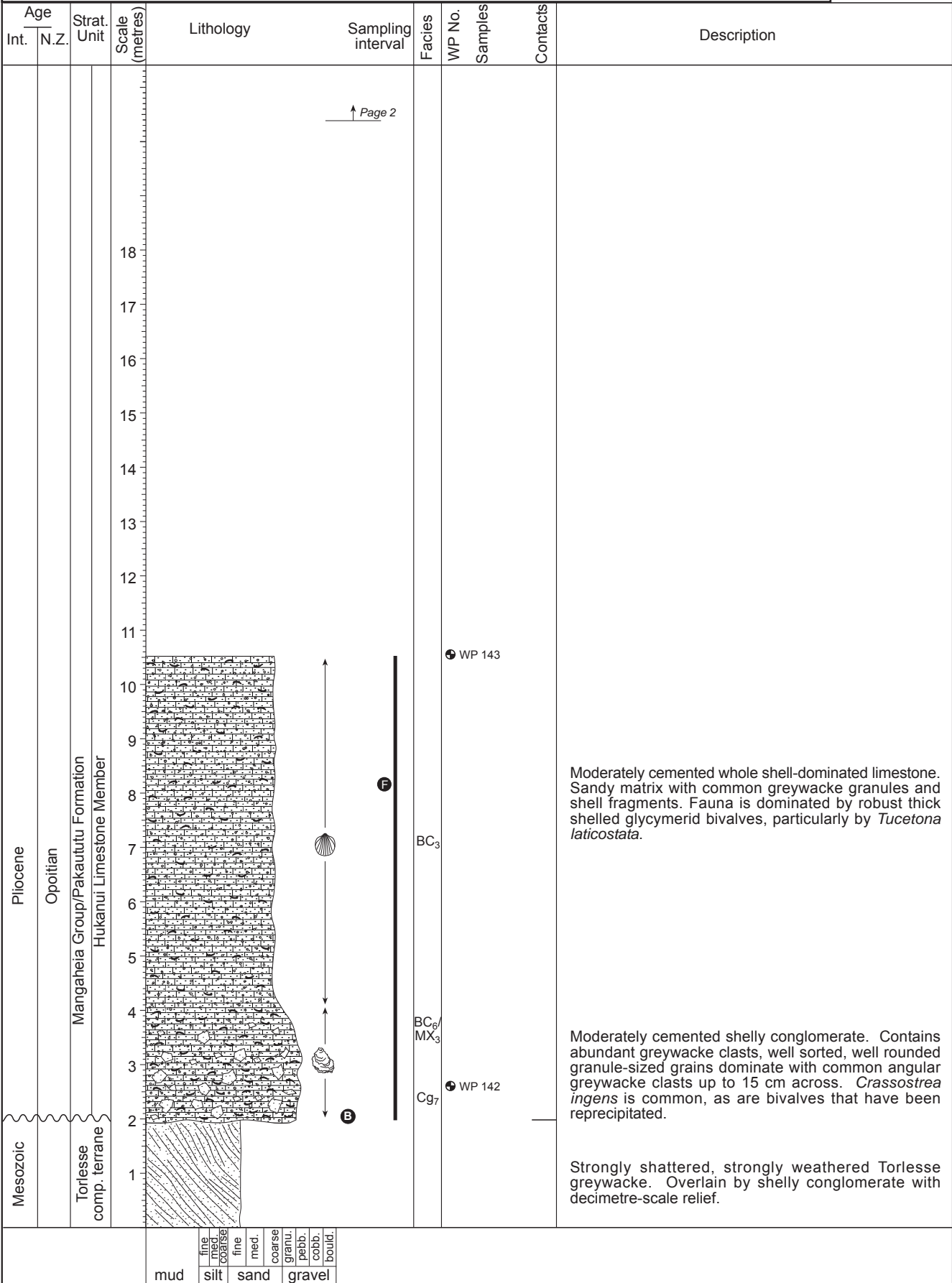


Fig. 7. Map showing location of stratigraphic columns within NZMS 260 Sheet V20.

Age	Strat. Unit	Lithology	Sampling interval	Facies	WP No.	Samples	Contacts	Description	
									Int.
Early Pliocene Upper Opoitian	Mangaheia Group/Pakaututu Formation Hukanui Limestone Member	10		F	BC ₃			Coarse-grained, moderately to well cemented shelly limestone with abundant intact bivalve shells. <i>Tucetona laticostata</i> -dominated	
		9			S ₉			Non to slightly cemented coarse-grained gritty sandstone composed of greywacke grains.	
		8		F	BC ₃			Moderately to well cemented shelly limestone. This unit is finer-grained than the lower limestone bed at this section, containing fewer large shells, and more siliclastic-dominated zones. The unit is dominated by shellhash.	
		7							
		6			S ₉			Non to slightly cemented, coarse-grained, gritty sandstone composed of greywacke clasts. The unit contains occasional shell fragments and greywacke pebbles. Upper contact with overlying unit is gradational.	
		5							
		4		F	BC ₃			Moderately to well cemented, coarse-grained shelly limestone with abundant greywacke pebbles up to 60 mm diameter set in a matrix of coarse-sand sized greywacke clasts. The greywacke pebbles are both well rounded and angular.	
		3					WP 113		
		2							
		1							Strongly deformed, moderately to strongly weathered basement flysch. Up to 1.8 m of relief is present on the upper surface of this unit at this locality. No encrusting faunas were visible on the upper contact.
Mesozoic ?Jurassic	Torlesse composite terrane								
		mud silt sand gravel							

Stratigraphic Column No: 36	Grid Reference: Top	Bottom	NZMS 260 V20 36 1 of 2
GPS Waypoint No(s): Wp 142	E: -	2812300	
Region: Pakaututu	N: -	6216500	
Location: Mohaka River below Makahu River confluence, near Kaweka Fault trace	Altitude: -	420 m	
NZMS 260 Sheet: V20 Esk	Page 1 of 1		Author: K. Bland





Stratigraphic Column No: 38	Grid Reference: Top	Bottom	NZMS 260 V20 38 1 of 3
GPS Waypoint No(s): Wp 29-35, 38, 779	E: 2828727	2826720	
Region: Titiokura	N: 6214418	6216336	
Location: Road cuttings on SH5 around Titiokura Saddle	Altitude: 681 m	535 m	
NZMS 260 Sheet: V20 Esk	Page 1 of 3	Author: K. Bland	

Age Int. N.Z.	Strat. Unit	Scale (metres)	Lithology	Sampling interval	Facies	WP No.	Samples	Contacts	Description									
	Late Miocene																	
	Lower Kapitean																	
	Tolaga Group/Waitere Formation																	
	Rakaitia Siltstone Member	1010 1000 950 900 850 800 750 700 650 600 550 500 450 400 350 300 250 200 150 100 50			Z ₁				<p>Blue-grey to white-grey, non cemented, massive to weakly laminated, non fossiliferous siltstone. Occasional spheroidal concretions are present up to 0.4 m across. The unit is bioturbated with occasional burrows visible.</p> <p>Unit continues to base of section where it is intersected by the Mohaka Fault at the Napier-Taupo Road bridge, although exposures are very patchy. Inferred to be gradationally underlain by non cemented, massive to laminated fine to medium concretionary sandstone of the Te Ipuohape Sandstone Member. This underlying unit is exposed in Mohaka River in the vicinity of the Napier-Taupo Road bridge.</p>									
			<table border="1"> <tr> <td></td> <td>fine</td> <td>med.</td> <td>coarse</td> <td></td> </tr> <tr> <td>mud</td> <td>silt</td> <td>sand</td> <td>gravel</td> <td></td> </tr> </table>		fine	med.	coarse		mud	silt	sand	gravel						
	fine	med.	coarse															
mud	silt	sand	gravel															

Stratigraphic Column No: 38	Grid Reference: Top	Bottom	NZMS 260 V20 38 3 of 3
GPS Waypoint No(s): Wp 29-35, 38, 779	E: 2828727	2826720	
Region: Titiokura	N: 6214418	6216336	
Location: Road cuttings on SH5 around Titiokura Saddle	Altitude: 681 m	535 m	
NZMS 260 Sheet: V20 Esk	Page 3 of 3		Author: K. Bland

Age	Strat. Unit	Scale (metres)	Lithology	Sampling interval	Facies	WP No.	Samples	Contacts	Description
Late Pliocene	Waipipian	Mangaheia Group Titiokura Formation			BC ₂	WP 779			<p>Dirty-cream, moderately cemented, medium to coarse sand shellhash limestone comprising stacked bioclastic bodies that become slightly coarser grained towards the base of the unit. Contains <i>Atrina pectinata zelandica</i>, <i>Talochlamys</i> (dominant), <i>Ostrea</i>, <i>Mesopeplum</i> sp., <i>Purpurocardia</i>, barnacles, brachiopods and bryozoans. Abundant well sorted, sub-angular to well rounded greywacke granule to fine pebble clasts are present. Intact shells more common in lower parts of the limestone. Sharply overlies fine sandstone.</p>
Late Miocene-Early Pliocene	Upper Kapitean-Lower Opoitian	Tolaga Group Mokonui Sandstone			S ₂				<p>Blue-grey weathering to yellow-brown, non cemented, massive to weakly laminated, fine sandstone. Slightly to moderately fossiliferous, contains <i>Tawera</i>, <i>Mactra</i> and <i>Talochlamys</i> with some shellhash and occasional burrows.</p>

↓ Page 2

mud	fine med coarse	fine med.	coarse granu. pebb. cobb. bould.
silt			gravel

Stratigraphic Column No: 39	Grid Reference: Top	Bottom	NZMS 260 V20 39 1 of 3
GPS Waypoint No(s): Wp 54	E: 2829193		
Region: Maungaharuru	N: 6219148		
Location: Bluffs at end of Maungaharuru Ridge Track, Waitara Station.	Altitude: 825m	-	
NZMS 260 Sheet: V20 Esk	Page 1 of 2		Author: K. Bland

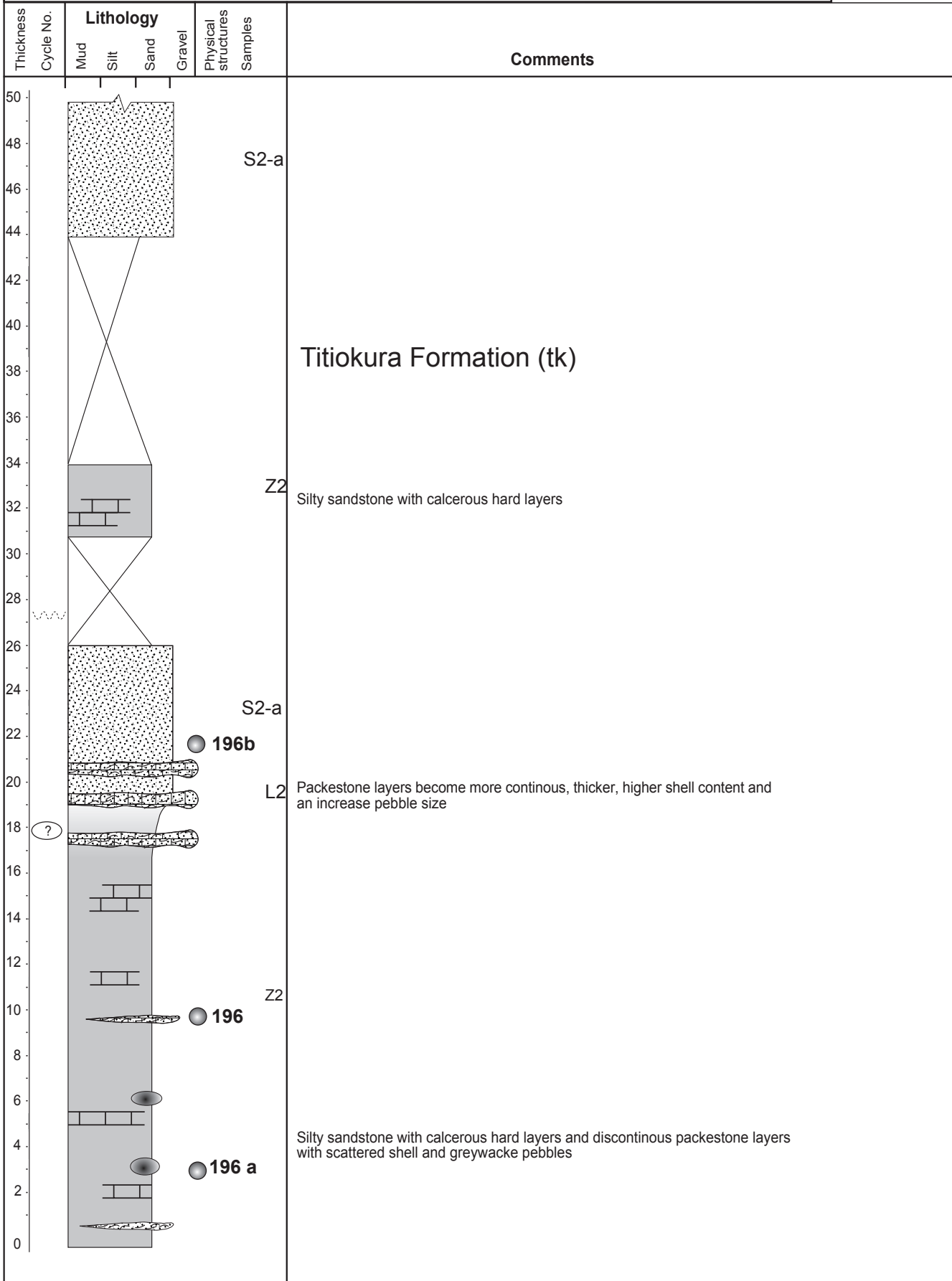
Age Int.	N.Z.	Strat. Unit	Lithology	Sampling interval	Facies	WP No.	Samples	Contacts	Description								
		Late Pliocene															
		Waipipian															
		Mangaheia Group															
		Titiokura Formation															
						BC ₁				Massive to blocky limestone with a coarse sand-sized matrix and common shells and greywacke pebbles.							
						S ₅				Moderately cemented slightly flaggy calcareous sandstone, grading up into sandy limestone.							
						S ₁₀				Light-brown, moderately cemented, slightly cross-bedded medium sandstone with rare water escape structures. More strongly cemented layers are present up to 1.5 m thick, that are often continuous over many metres. Concretions are common and are up to 0.1 m thick and non fossiliferous.							
						S ₅	WP 54			Moderately cemented, medium-grained calcareous sandstone. Units such as this one are quite discontinuous through the section. The entire section is underlain by a very poorly sorted and coarse-grained conglomerate with very round sandstone and mudstone clasts up to 2 m in diameter, with abundant shell hash, <i>Talochlamys gemmulata</i> , oyster, barnacles and greywacke clasts up to 0.05 m in diameter.							
				<table border="1"> <tr> <td>mud</td> <td>fine med coarse</td> <td>fine med.</td> <td>coarse granu. pebb. cobb. bould.</td> </tr> <tr> <td>silt</td> <td>sand</td> <td>gravel</td> <td></td> </tr> </table>	mud	fine med coarse	fine med.	coarse granu. pebb. cobb. bould.	silt	sand	gravel						
mud	fine med coarse	fine med.	coarse granu. pebb. cobb. bould.														
silt	sand	gravel															

Stratigraphic Column No: 39	Grid Reference: Top	Bottom	NZMS 260 V20 39 2 of 3
GPS Waypoint No(s): Wp 54	E: 2829193		
Region: Maungaharuru	N: 6219148		
Location: Bluffs at end of Maungaharuru Ridge Track, Waitara Station.	Altitude: 825m	-	
NZMS 260 Sheet: V20 Esk	Page 2 of 2		Author: K. Bland

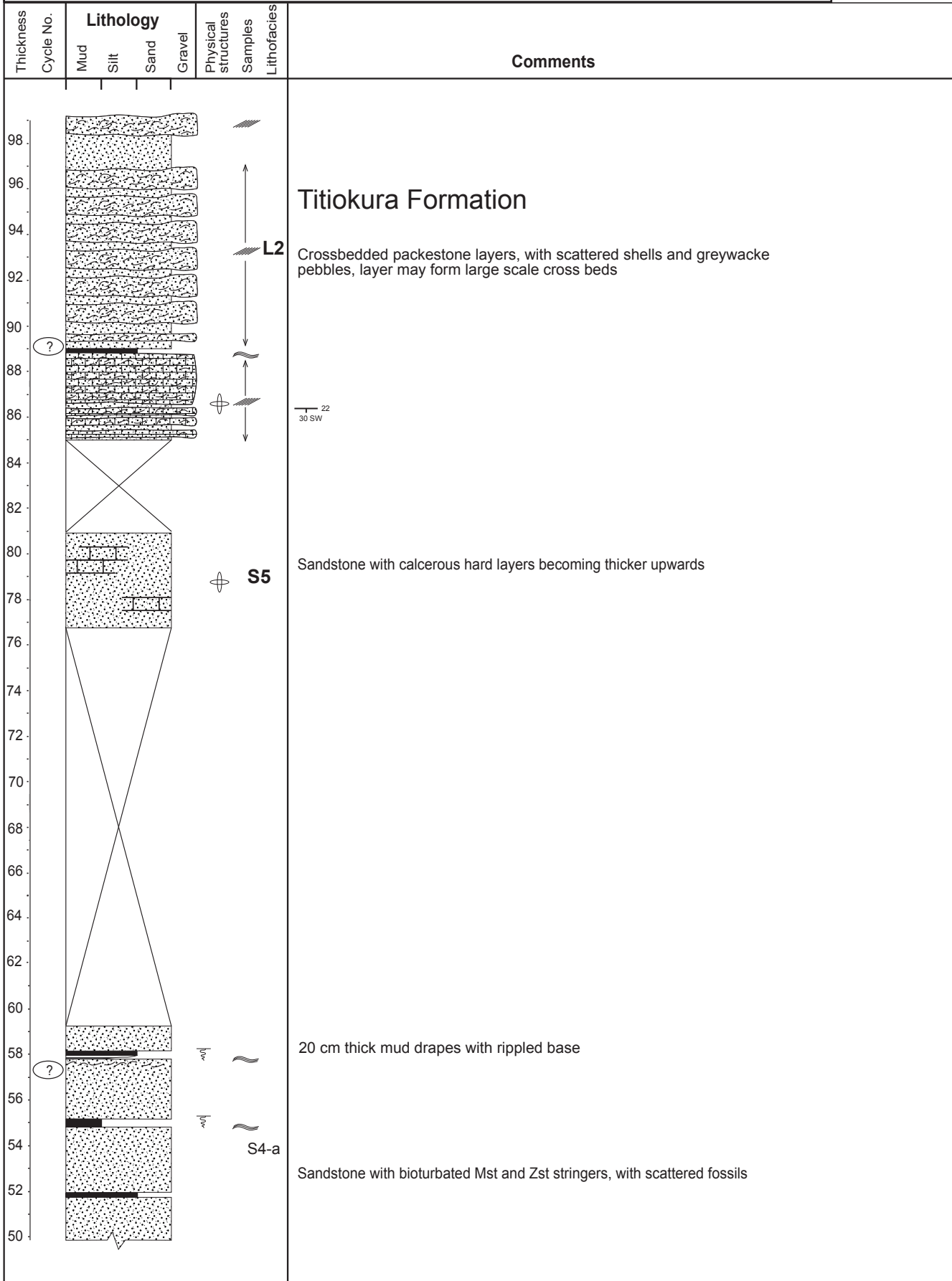
Age Int.	N.Z.	Strat. Unit	Lithology	Sampling interval	Facies	WP No.	Samples	Contacts	Description												
		Late Pliocene																			
		Waipipian																			
		Mangaheia Group																			
		Titikura Formation																			
66																					
64																					
62																					
60																					
58																					
56																					
54																					
52																					
50																					
48																					
46					BC ₁ / BC ₂				Light-grey flaggy to massive, moderately to well cemented sandy limestone with common small well rounded greywacke pebbles. Shellhash comprises a large portion of the matrix, with barnacle plates, <i>Talochlamys gemmulata</i> and various oysters also common.												
44																					
42																					
40																					
38																					
36																					
34																					
32																					
30																					
28					S ₅				Moderately cemented slightly flaggy calcareous sandstone, grading up into sandy limestone.												
			<table border="1" style="font-size: 0.8em;"> <tr> <td>mud</td> <td>fine med coarse</td> <td>fine med.</td> <td>coarse</td> <td>granu.</td> <td>pebb.</td> <td>cobb.</td> <td>bould.</td> </tr> <tr> <td></td> <td>silt</td> <td>sand</td> <td>gravel</td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	mud	fine med coarse	fine med.	coarse	granu.	pebb.	cobb.	bould.		silt	sand	gravel						
mud	fine med coarse	fine med.	coarse	granu.	pebb.	cobb.	bould.														
	silt	sand	gravel																		



Stratigraphic Column No: 40 (1/3)	Grid Reference: Top	Bottom	NZMS 260 V20 40 1 of 3
Section:	E: 2834600	2834500	
GPS Waypoint No(s):	N: 6219700	6218300	
Region: Central Hawkes Bay	Altitude:	-	
Location: Toronui Station (1/5)	Author: R. Graafhuis		
NZMS 260 Sheet: V20			



Stratigraphic Column No: 40 (2/3)	Grid Reference: Top	Bottom	NZMS 260 V20 40 2 of 3
Section:	E: 2834600	2834500	
GPS Waypoint No(s):	N: 6219700	6218300	
Region: Central Hawkes Bay	Altitude:	-	
Location: Toronui Station (2/5)	Author: R. Graafhuis		
NZMS 260 Sheet: V20			



Stratigraphic Column No: 40 (3/3)	Grid Reference: Top	Bottom	NZMS 260 V20 40 3 of 3
Section:	E: 2834600	2834500	
GPS Waypoint No(s):	N: 6219700	6218300	
Region: Central Hawkes Bay	Altitude:	-	
Location: Toronui Station (3/5)	Author: R. Graafhuis		
NZMS 260 Sheet: V20			

Thickness Cycle No.	Lithology				Physical structures	Samples	Lithofacies	Comments		
	Mud	Silt	Sand	Gravel						
120										
118										
116										
114										
112										
110										
108									S2	
106										
104										
102									L2	
100										
98										
							<p>Titiokura Formation</p> <p>Packestone layers becoming thinner and further apart, sand content increasing</p>			

Stratigraphic Column No: 41
 Section:
 GPS Waypoint No(s):
 Region: Central Hawkes Bay
 Location: Makomako Road
 NZMS 260 Sheet: V20

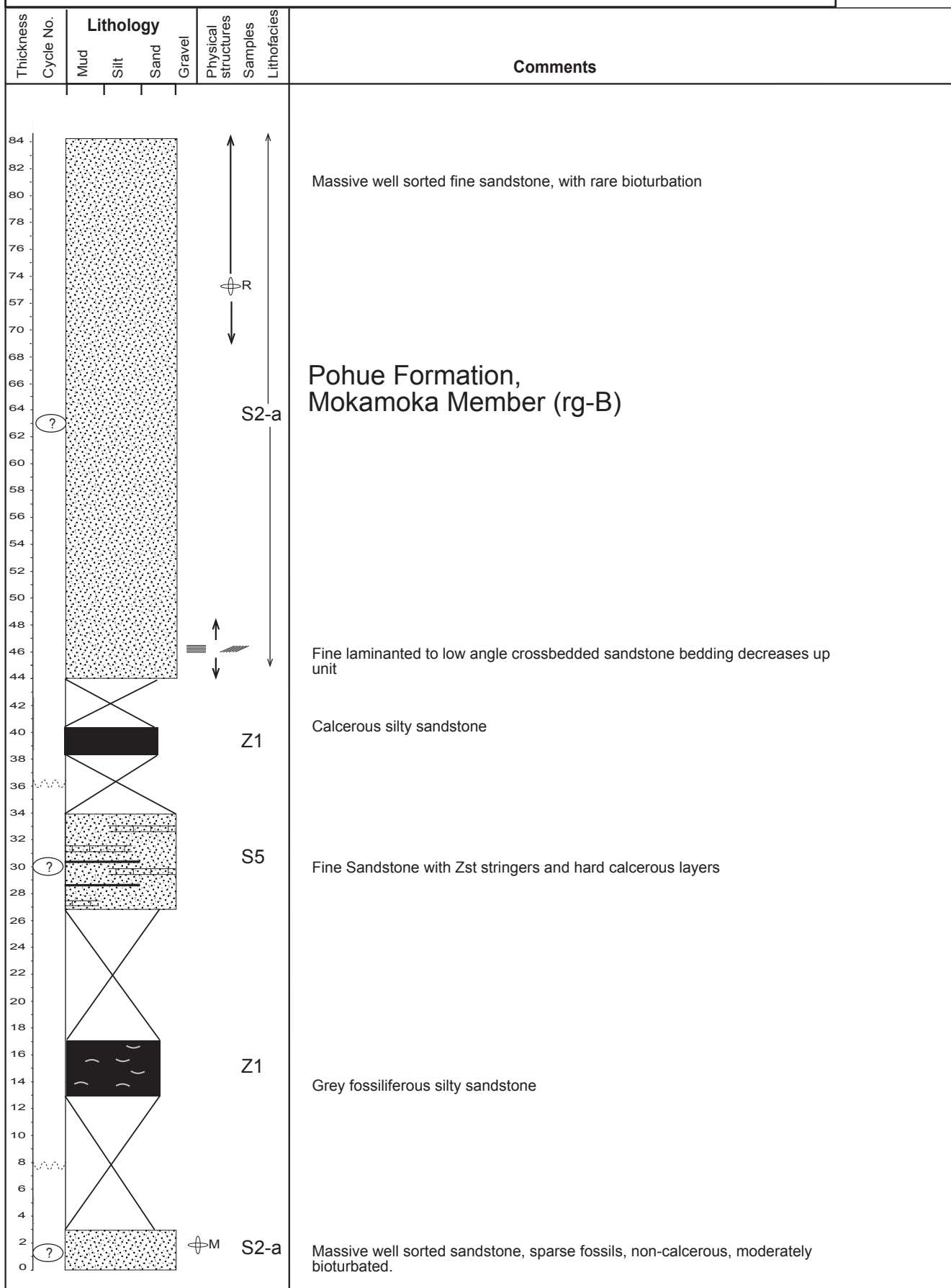
Grid Reference: Top Bottom
 E: 2838300 2837900
 N: 6219100 6218100
 Altitude: -

NZMS 260 V20

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1 of 1

Author: R. Graafhuis



Stratigraphic Column No: 42 (1/2)

Grid Reference: Top

Bottom

NZMS 260 V20

Section:

E: 2840500

2840800

GPS Waypoint No(s):

N: -

6214800

Region: Central Hawkes Bay

Altitude:

-

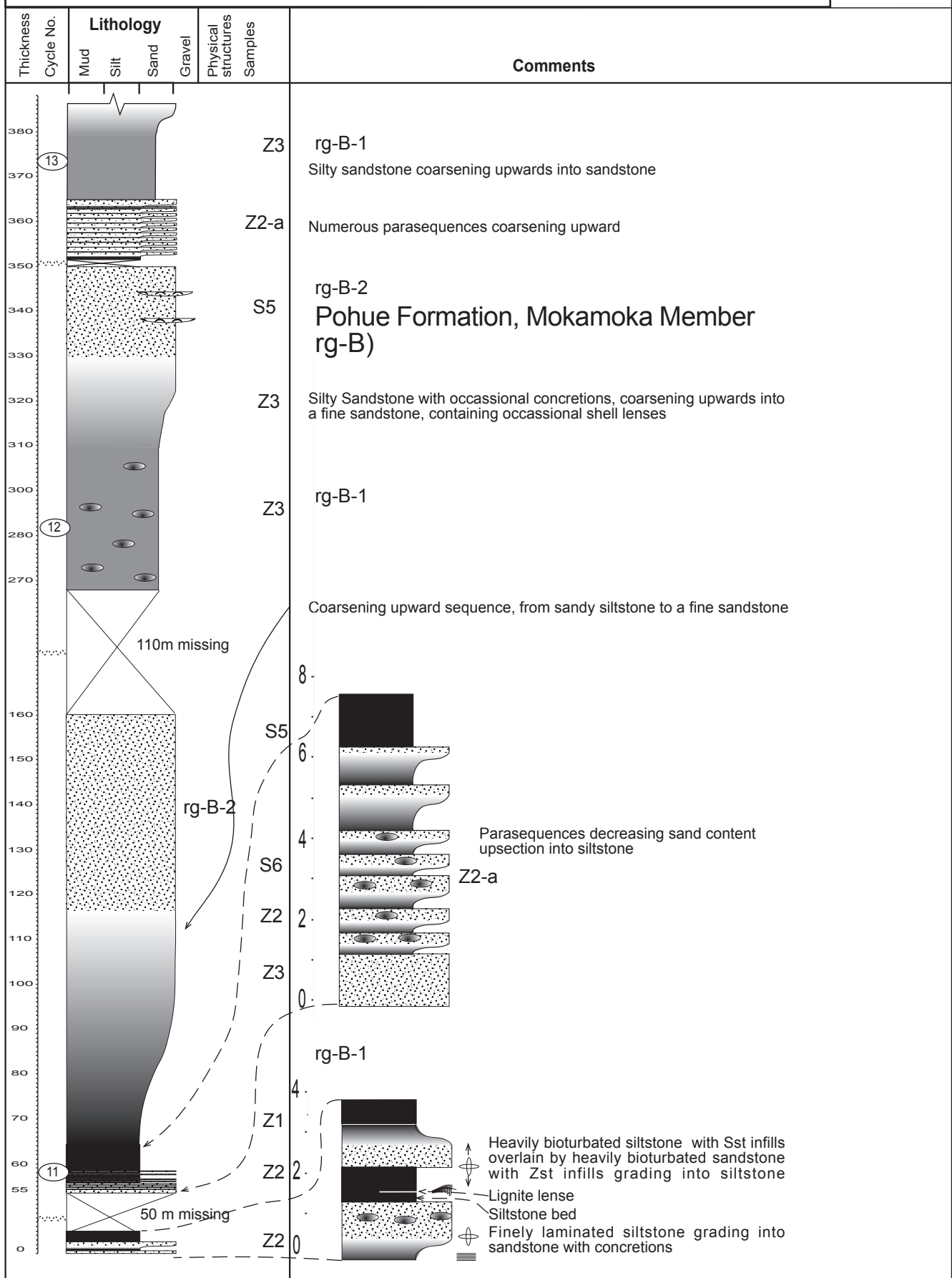
Location: Waikoau River Section (8/10) : please note inaccessibility and poor exposure throughout section

NZMS 260 Sheet: V20

Author: R. Graafhuis

42

1 of 2

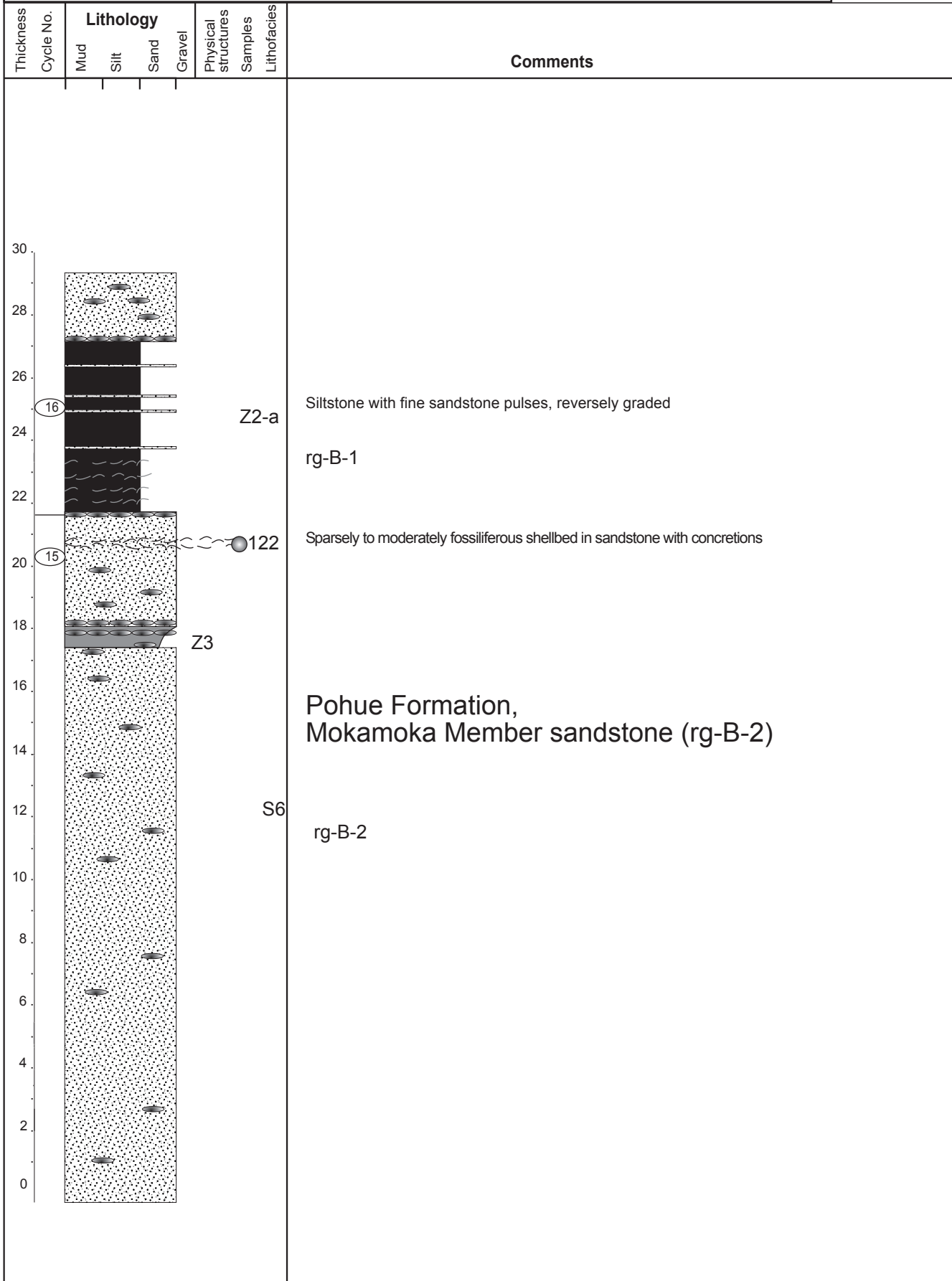


Stratigraphic Column No: 42 (2/2)	Grid Reference: Top	Bottom	NZMS 260 V20 42 2 of 2
Section:	E: 2840500	2840800	
GPS Waypoint No(s):	N: -	6214800	
Region: Central Hawkes Bay	Altitude:	-	
Location: Waikoau River Section (9/10) : please note inaccessibility and poor exposure throughout section	Author: R. Graafhuis		
NZMS 260 Sheet: V20			

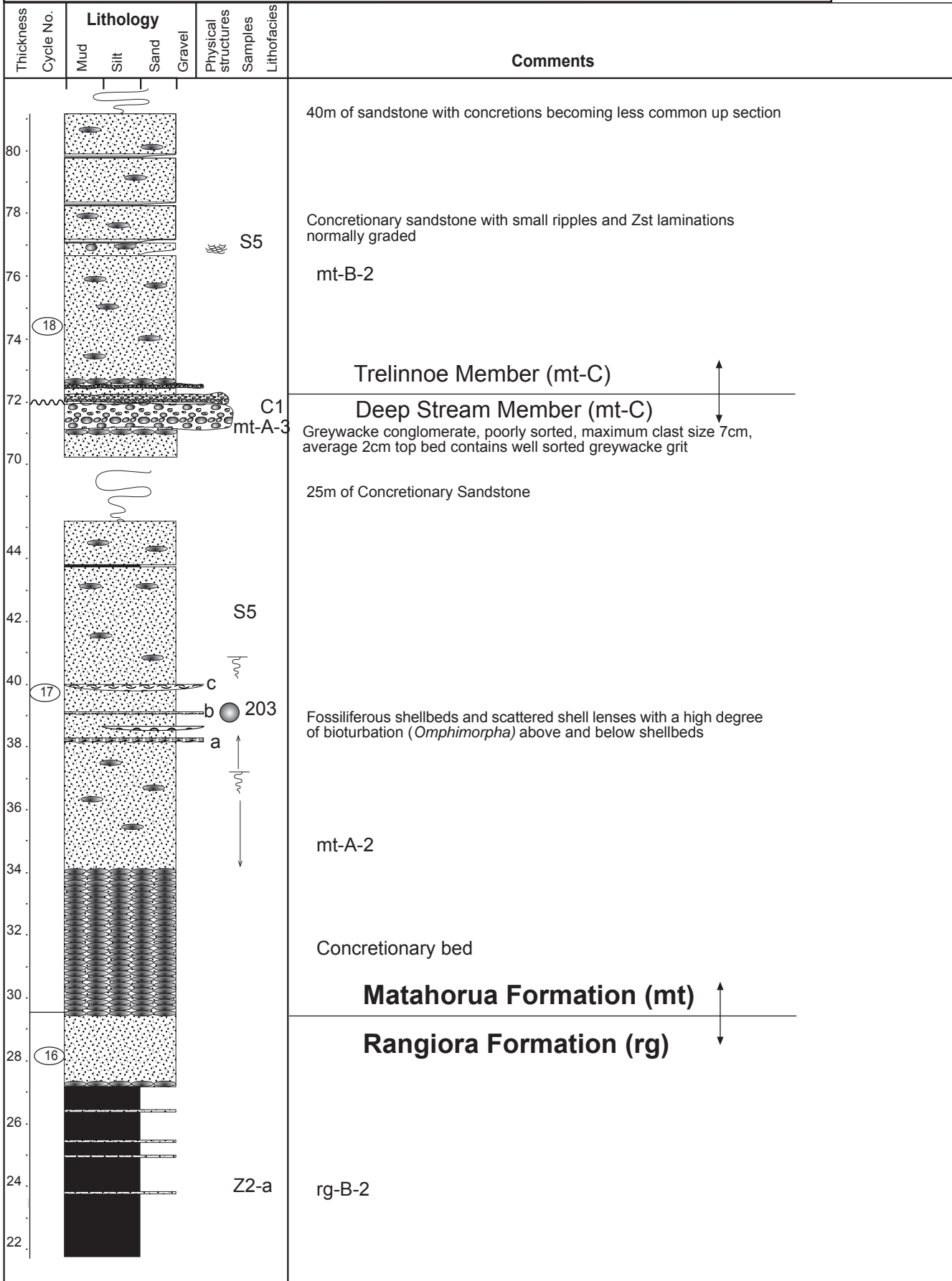
Thickness	Cycle No.	Lithology				Physical structures	Samples	Lithofacies	Comments
		Mud	Silt	Sand	Gravel				
730	16						Z1	100m missing to base of concretionary unit, most likely is sandstone with concretions	
720							S1	rg-B-1	
600							Z1	Sandstone with concretions continued for 100m +	
590							S2	rg-B-2	
580							Z2		
570								rg-B-1	
560	15						Z1	Blue grey frittered calcareous siltstone, with scattered fossils, and Sandstone intra-beds becoming more dominant up section eventually grading into massive sandstone with concretions	
550								<i>Bulmina</i> sp., <i>Elpehidium</i> sp., <i>Astronomium</i> sp., <i>Notortalia</i> sp., <i>Asidualia</i> sp., <i>Hayniesina depressula</i> sp., <i>Nonionella flemingi</i> sp. (dominate), <i>Glob. Woodi</i> sp., and macro-fossil <i>Patro undatus</i>	
540						125			
530									
520									
510									
500								Pohue Formation, Mokamoka Member (rg-B)	
490									
480									
470	14							rg-B-2	
460							S6		
450									
440									
430									
420									
410							Z1	Sandy siltstone grading rapidly into massive sandstone with concretions	
400								rg-B-1	
390	13						S6	rg-B-2	
380									
370							Z3	Silty sandstone coarsening upwards into sandstone with concretions	



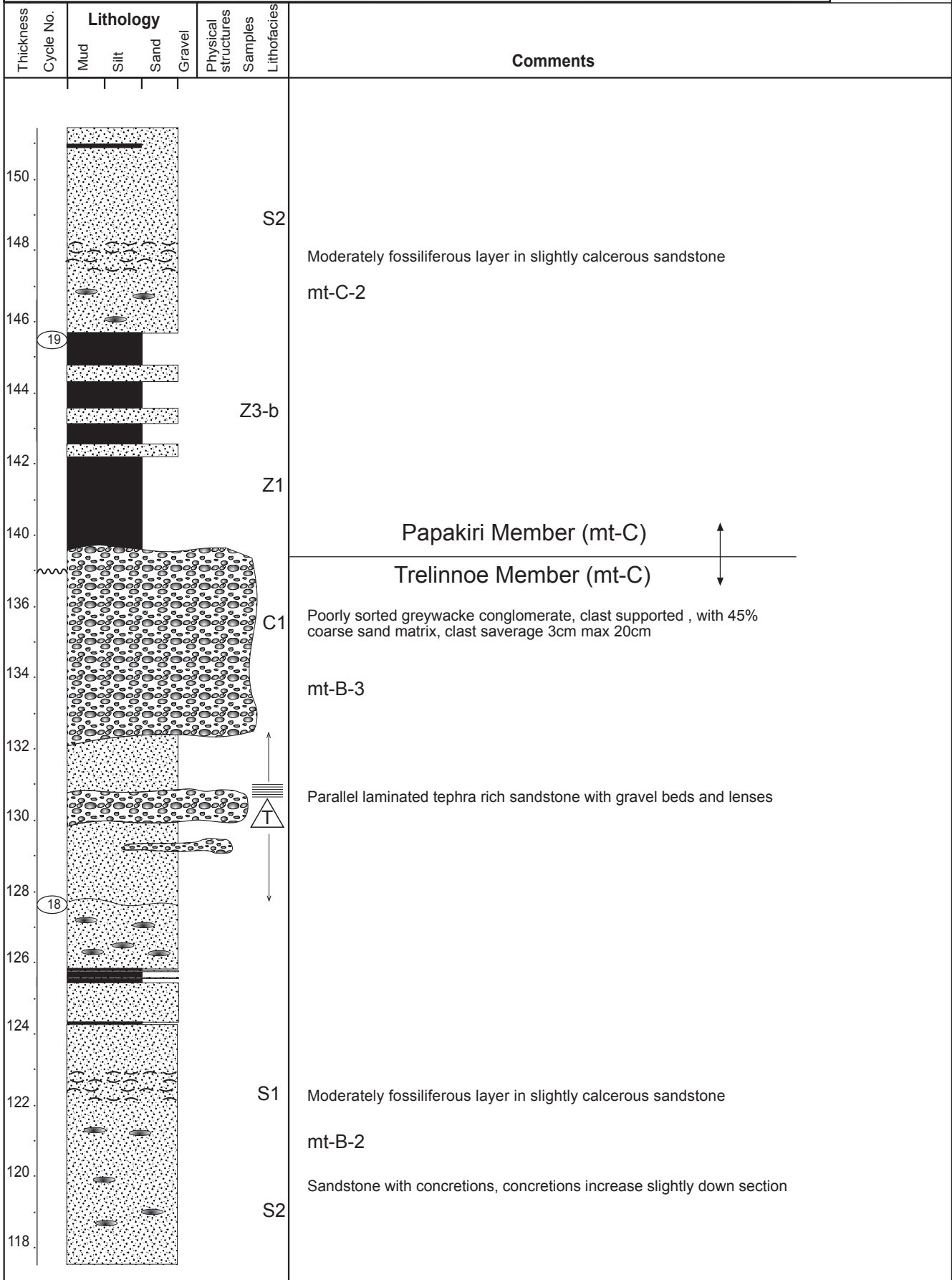
Stratigraphic Column No: 44 (1/7)	Grid Reference: Top	Bottom	NZMS 260 V20 44 1 of 7
Section:	E: 2840800	2843000	
GPS Waypoint No(s):	N: 6214800	6212200	
Region: Central Hawkes Bay	Altitude:	-	
Location: Waikoau River Section (1/10)	Author: R. Graafhuis		
NZMS 260 Sheet: V20			



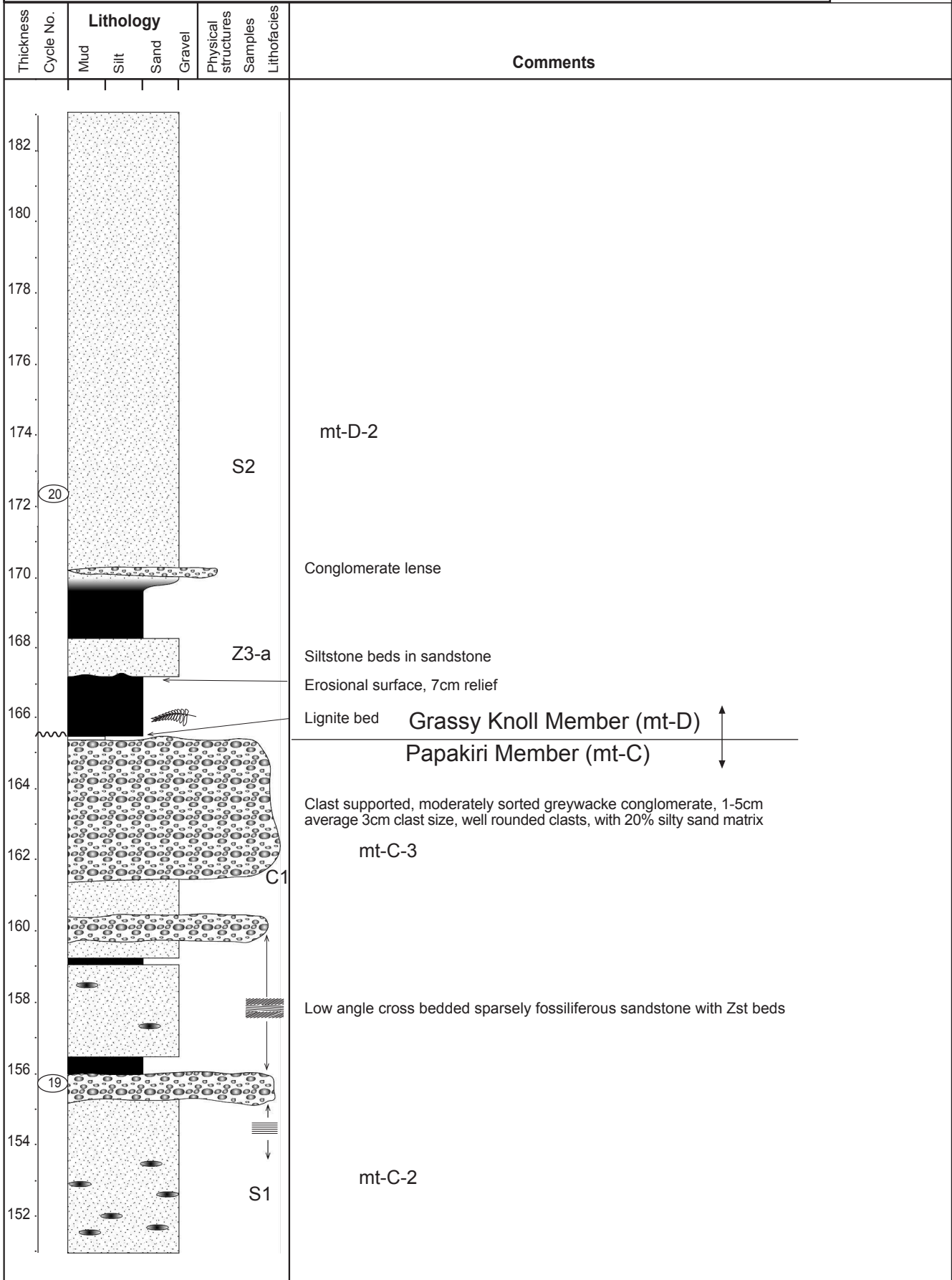
Stratigraphic Column No: 44 (2/7)	Grid Reference: Top	Bottom	NZMS 260 V20 44 2 of 7
Section:	E: 2840800	2843000	
GPS Waypoint No(s):	N: 6214800	6212200	
Region: Central Hawkes Bay	Altitude:	-	
Location: Waikoau River Section (2/10)	Author: R. Graafhuis		
NZMS 260 Sheet: V20			



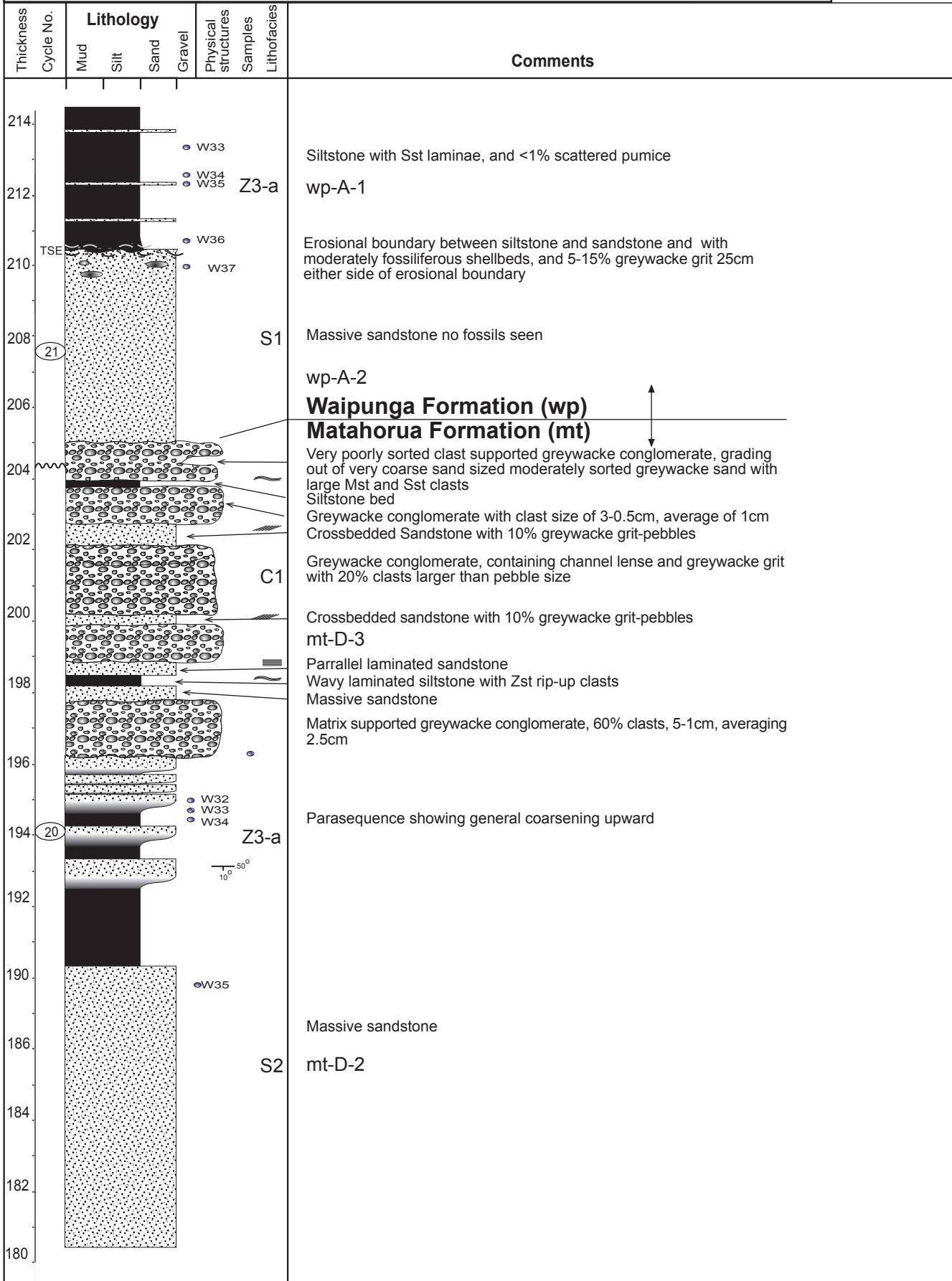
Stratigraphic Column No: 44 (3/7)	Grid Reference: Top	Bottom	NZMS 260 V20 44 3 of 7
Section:	E: 2840800	2843000	
GPS Waypoint No(s):	N: 6214800	6212200	
Region: Central Hawkes Bay	Altitude:	-	
Location: Waikoau River Section (3/10)	Author: R. Graafhuis		
NZMS 260 Sheet: V20			



Stratigraphic Column No: 44 (4/7)	Grid Reference: Top	Bottom	NZMS 260 V20 44 4 of 7
Section:	E: 2840800	2843000	
GPS Waypoint No(s):	N: 6214800	6212200	
Region: Central Hawkes Bay	Altitude:	-	
Location: Waikoau River Section (4/10)	Author: R. Graafhuis		
NZMS 260 Sheet: V20			



Stratigraphic Column No: 44 (5/7)	Grid Reference: Top	Bottom	NZMS 260 V20 44 5 of 7
Section:	E: 2840800	2843000	
GPS Waypoint No(s):	N: 6214800	6212200	
Region: Central Hawkes Bay	Altitude:	-	
Location: Waikoau River Section (5/10)	Author: R. Graafhuis		
NZMS 260 Sheet: V20			



Stratigraphic Column No: 44 (6/7)
 Section:
 GPS Waypoint No(s):
 Region: Central Hawkes Bay
 Location: Waikoau River Section (6/10)
 NZMS 260 Sheet: V20

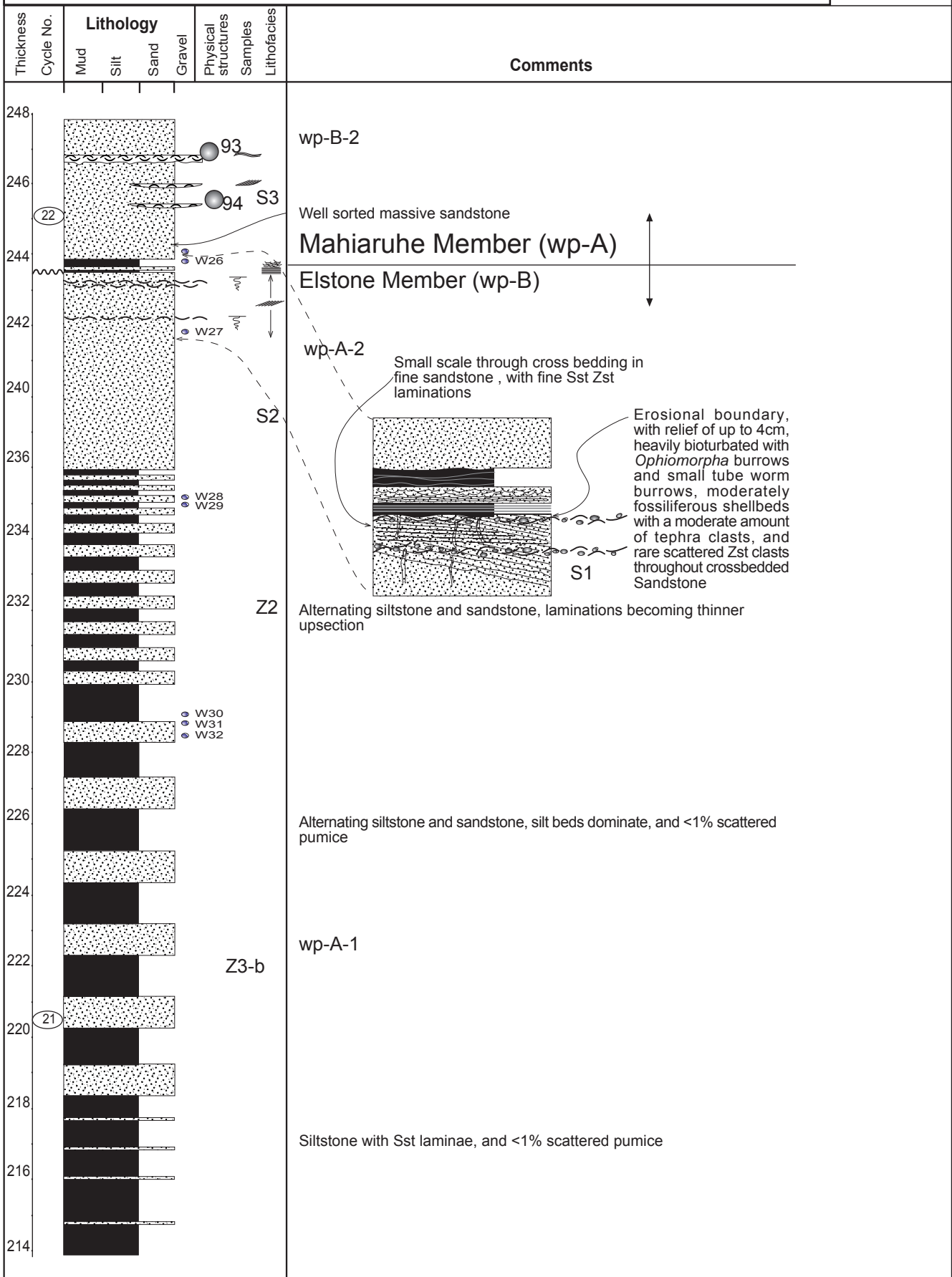
Grid Reference: Top Bottom
 E: 2840800 2843000
 N: 6214800 6212200
 Altitude: -

NZMS 260 V20

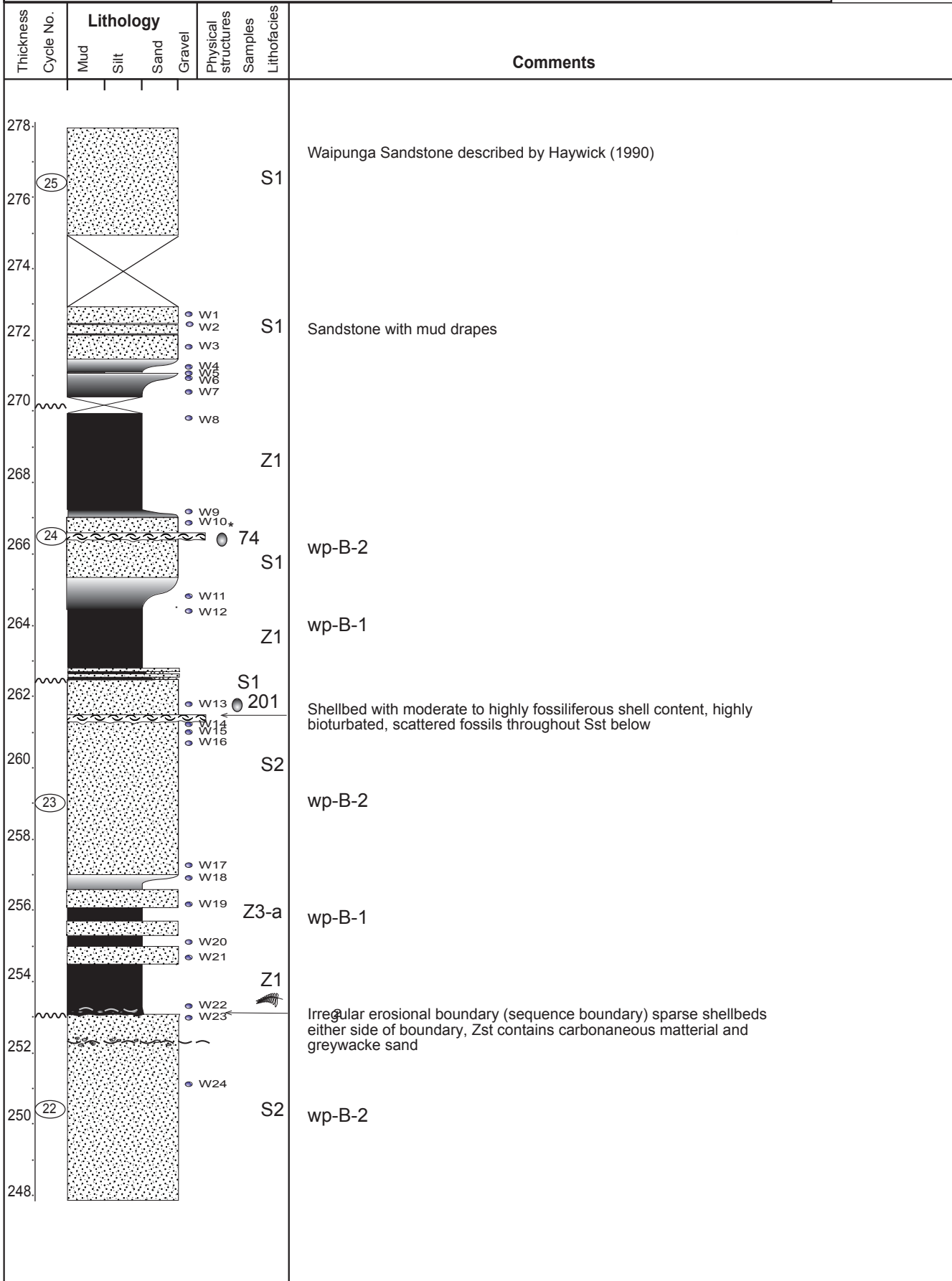
44

Author: R. Graafhuis

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Stratigraphic Column No: 44 (7/7)	Grid Reference: Top	Bottom	NZMS 260 V20 44 7 of 7
Section:	E: 2840800	2843000	
GPS Waypoint No(s):	N: 6214800	6212200	
Region: Central Hawkes Bay	Altitude:	-	
Location: Waikoau River Section (7/10)	Author: R. Graafhuis		
NZMS 260 Sheet: V20			



Stratigraphic Column No: 45	Grid Reference: Top	Bottom	NZMS 260 V20 45 2 of 8
GPS Waypoint No(s): Wp 750-759	E: 2846139	2844776	
Region: Tangoio	N: 6207878	6208068	
Location: Road cuttings along Devils Elbow, Napier-Wairoa highway (SH2).	Altitude: 259 m	150 m	
NZMS 260 Sheet: V20 Esk	Page 2 of 6		Author: K. Bland

Age	Strat. Unit	Scale (metres)	Lithology	Sampling interval	Facies	WP No.	Samples	Contacts	Description					
										Int.	N.Z.			
Late Pliocene	Upper Nukumaruan	41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21			Z ₂		<ul style="list-style-type: none"> ● WP 753 ● Wn-H-25c ● Wn-H-24c ● WP 752 ● Wn-H-13c 		<p>Blue-grey to dirty-cream, non cemented slightly fossiliferous, massive siltstone. Contains <i>Ostrea chilensis</i>, <i>Talochlamys gemmulata</i> and <i>Amalda novaezelandiae</i> among many other molluscs. <i>Pellicaria convexa</i> present with sutures characteristic of <i>P. convexa</i> form "fossa".</p> <p>Blue-grey, non cemented, slightly fossiliferous massive siltstone. Fauna dominated by <i>Stiracolpus</i> spp., with <i>Ostrea chilensis</i>, <i>Neilo</i> sp., <i>Amalda novaezelandiae</i>, <i>Taniella</i>, <i>Maoricolpus roseus</i> and <i>Dosinia greyi</i>.</p> <p>Blue-grey, non cemented, slightly fossiliferous, massive siltstone.</p>					
			<table border="1"> <tr> <td>mud</td> <td>fine med. coarse</td> <td>silt</td> <td>fine med. coarse</td> <td>sand</td> <td>granu. pebb. cobb.</td> <td>gravel</td> <td>bould.</td> </tr> </table>	mud	fine med. coarse	silt	fine med. coarse	sand	granu. pebb. cobb.	gravel	bould.			
mud	fine med. coarse	silt	fine med. coarse	sand	granu. pebb. cobb.	gravel	bould.							

Age	Strat. Unit		Lithology	Sampling interval	Facies	WP No.	Samples	Contacts	Description	
	Int.	N.Z.								
Early Pleistocene		Waipatiki Limestone Member	94						<p>Tightly-packed, clast-supported <i>Tawera subsulcata</i> and <i>Ostrea chilensis</i> dominated coarse-grained shelly coquina with abundant biomoulds of aragonitic bivalves. Matrix comprises shellhash and bioclastic sand. The bed is commonly case-hardened, although laminations and cross-bedding are visible in exposed areas. Rare scattered fine greywacke clasts of granule to fine pebble size are present through the bed. The underlying bioclastic sandstone is greywacke-clast free, and is separated from this bed by a sharp planar contact.</p> <p>Bioclastic-dominated strongly cross-bedded sandstone. Occasional lenses of macrofossils occur through the bed.</p> <p>Slightly fossiliferous fine to medium sandstone with lenses and interbeds of tephra.</p> <p>Slightly cemented <i>Tawera subsulcata</i>-dominated shellbed. Matrix of fine to medium bioclastic sandstone.</p> <p>Alternating beds 0.15-0.3 m thick of siliciclastic-rich and <i>Tawera subsulcata</i>-rich sediments.</p> <p>Blue-grey massive to laminated silty sandstone with scattered <i>Tawera subsulcata</i>.</p> <p>Massive to laminated silty sandstone.</p> <p>Moderately fossiliferous sandstone.</p> <p>Non cemented, massive to slightly laminated fine to medium sandstone.</p> <p>Rapidly coarsens up-section into fine to medium sandstone. Scattered shells.</p> <p><i>Talochlamys gemmulata</i>, <i>Ostrea chilensis</i>-rich siltstone.</p> <p><i>Pellicaria convexa</i> form <i>fossa</i>-dominated siltstone.</p> <p><i>Pellicaria convexa</i> form <i>fossa</i>, <i>Austrofusus taitae</i>, <i>Talochlamys gemmulata</i>.</p>	
			93		BC ₃					
			92							
			91							
			90				BC ₇			
			89					Wn-H-31a,b,c		
			88							
			87				MX ₁	Wn-H-30a,b,c		
			86							
			85							
Late Pliocene		Mangaheia Group/Petane Formation	84							
			83		S ₃					
			82							
			81				S ₁			
			80					WP 756		
			79							
			78							
			77				Z ₂			
			76							
			75							

mud	fine med coarse silt	fine med. sand	coarse granu. pebb. cobb. bould. gravel
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Stratigraphic Column No: 45	Grid Reference: Top	Bottom	NZMS 260 V20 45 5 of 8
GPS Waypoint No(s): Wp 750-759	E: 2846139	2844776	
Region: Tangoio	N: 6207878	6208068	
Location: Road cuttings along Devils Elbow, Napier-Wairoa highway (SH2).	Altitude: 259 m	150 m	
NZMS 260 Sheet: V20 Esk	Page 5 of 6		

Age		Strat. Unit	Scale (metres)	Lithology	Sampling interval	Facies	WP No.	Samples	Contacts	Description									
Int.	N.Z.																		
Early Pleistocene Upper Nukumaruan		Mangaheia Group/Petane Formation Devils Elbow Mudstone Member	114		↑ Page 3	Z ₂				<p>Blue-grey to creamy-grey, non cemented, moderately fossiliferous siltstone. Contains <i>Pleuomeris</i> sp. (articulated and disarticulated), <i>Dosinia greyi</i>, <i>Zeacolpus</i> sp., <i>Maoricolpus ordinaria</i>, <i>Eumarcia ?plana</i>, <i>Tanea</i> sp., <i>Struthiolaria</i> sp., <i>Amalda novaezelandiae</i>, <i>Austrofuscus taitae</i> and Turrids spp.</p> <p><i>Talochlamys gemmulata</i>-dominated shellbed with <i>Tegulorhynchia nigricans</i>, <i>Eumarginela</i> and shellhash.</p> <p>Scattered macrofossils throughout this zone. <i>Talochlamys gemmulata</i>-dominated, common <i>Ostrea chilensis</i>. <i>Atrina pectinata zelandica</i>, <i>Alcithoe brevis</i>, <i>Pratulium pulchellum</i>, <i>Antalis nana</i>, <i>Stiracolpus</i> sp., <i>Cominella</i> sp., <i>Pellicaria convexa</i> form <i>fossa</i> and <i>Poieria</i> sp. are also present.</p>									
			113								112	111	110	109	108	107	106	105	104
Early Pleistocene Upper Nukumaruan Waipatiki Lst. Mbr		Waipatiki Lst. Mbr	95		BC ₃					<p>Blue-grey to creamy-grey, non cemented, moderately fossiliferous siltstone that sharply overlies coarse-grained limestone. This unit contains a diverse molluscan fauna including <i>Austrofuscus taitae</i>, <i>Pellicaria convexa</i> form <i>fossa</i>, <i>Amalda depressa</i>, <i>Amalda mucronata</i>, <i>Amalda novaezelandiae</i>, <i>Talochlamys gemmulata</i>, <i>Pratulium pulchellum</i>, <i>Maoricolpus roseus</i>, <i>Ostrea chilensis</i>, <i>Neilo</i>, <i>?Amygdalum</i> sp. and <i>Waltonia inconspicua</i>. Fossil content decreases up-section.</p> <p>Case-hardened limestone.</p>									
			94								93	92	91	90	89	88	87	86	85

mud	fine med coarse	fine med.	coarse	granu. pebb. cobb. bould.
silt	sand	gravel		

Stratigraphic Column No: 45	Grid Reference: Top	Bottom	NZMS 260 V20 45 6 of 8
GPS Waypoint No(s): Wp 750-759	E: 2846139	2844776	
Region: Tangoio	N: 6207878	6208068	
Location: Road cuttings along Devils Elbow, Napier-Wairoa highway (SH2).	Altitude: 259 m	150 m	
NZMS 260 Sheet: V20 Esk	Page 6 of 6		Author: K. Bland

Age	Strat. Unit		Lithology	Sampling interval	Facies	WP No.	Samples	Contacts	Description						
	Int.	N.Z.													
Early Pleistocene	Upper Nukumaruian	Mangaheia Group	Petane Formation/Devils Elbow Mudstone Member Kaiwaka Formation	134											
				133											
				132											
				131											
				130											
				129											
				128											
				127											
				126											
				125											
124															
123					S ₇			Slightly cemented, internally laminated alternating siltstone-sandstone beds 0.1-0.2 m thick. Siltstone beds also display ripple lamination, flaser bedding and detached lenses.							
122					BC ₄	Wn-T-03		Coarse grained shellhash limestone. Sharply overlies sandy siltstone across a broad, erosional contact. Slightly to moderately cemented. The top of the limestone is marked by a concentration of <i>Tawera subculcata</i> valves and fragments in a shellhash matrix.							
121					S ₄			Moderately to tightly packed, slightly cemented shellbed dominated by articulated <i>Tawera subculcata</i> . <i>Talochlamys gemmulata</i> , intact barnacles, and barnacle plates also occur.							
120					MX ₁			Fauna is sparse through this section, although articulated <i>Tawera subculcata</i> , <i>Dosinia greyi</i> , <i>Fellaster zelandiae</i> (relatively intact), <i>Bassina yatei</i> , <i>Ostrea chilensis</i> and barnacle plates are present.							
119															
118					S ₄										
117															
116															
115						WP 759		Silty sandstone with bioturbated sandy siltstone interbeds. Faunal content decreases up section as the sediment in the unit coarsens. Fauna contains <i>Bassina yatei</i> , <i>Maorimactra ordinaria</i> , <i>Dosinia lambata</i> , <i>Serratina</i> sp., <i>Dosinia greyi</i> (<i>in situ</i>) and <i>Myadora stephaniae</i> .							
114					Z ₂										
			<table border="1" style="font-size: 0.8em;"> <tr> <td>mud</td> <td>fine silt</td> <td>med. coarse silt</td> <td>fine sand</td> <td>med. coarse sand</td> <td>coarse granu. pebb.</td> <td>cobb.</td> <td>bould.</td> </tr> </table>	mud	fine silt	med. coarse silt	fine sand	med. coarse sand	coarse granu. pebb.	cobb.	bould.				
mud	fine silt	med. coarse silt	fine sand	med. coarse sand	coarse granu. pebb.	cobb.	bould.								

45

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Stratigraphic Column No: 46 **Grid Reference:** **Top** **Bottom**
GPS Waypoint No(s): Wp 586-589, 775-776 **E:** 2840702 2839726
Region: Tangoio **N:** 6210500 6210752
Location: Road section up Darkys Spur Road on northwest side of Tangoio Block **Altitude:** 444 m 356 m
NZMS 260 Sheet: V20 Esk **Page 1 of 4** **Author:** K. Bland **1 of 5**

Age	Strat. Unit	Scale (metres)	Lithology	Sampling interval	Facies	WP No.	Samples	Contacts	Description	
										Int.
Late Pliocene	Upper Nukumaruan Mangaheia Group/Petane Formation	10			S ₇				Non cemented, very well sorted, slightly micaceous fine to medium sandstone with abundant siltstone stringers up to 0.1 m thick.	
		9			S ₁				Non cemented, slightly micaceous fine to medium sandstone.	
		8			S ₄				Non cemented, laminated sandy siltstone.	
		7			S ₇				Non cemented, slightly micaceous fine to medium sandstone with siltstone stringers and lenses.	
		6			S ₆				Alternating beds of non cemented, slightly micaceous fine to medium sandstone and non cemented, laminated sandy siltstone. Lower sandy siltstone beds in this zone contain prominent trace fossils.	
		5			S ₆					
		4			S ₆					
		3			S ₆					
		2			S ₄					Massive, non cemented bioturbated, slightly fossiliferous sandy siltstone. Fauna contains <i>Talochlamys gemmulata</i> , <i>Pellicaria convexa</i> , <i>in situ Panopea zelandica</i> , <i>Austrofusus</i> , <i>Dosinia lambata</i> , <i>Atrina pectinata zelandica</i> , <i>Modiolaca</i> , <i>Zenatia acinaces</i> , <i>Bassina yatei</i> , and <i>Penion sulcatus</i> .
		1			S ₄					

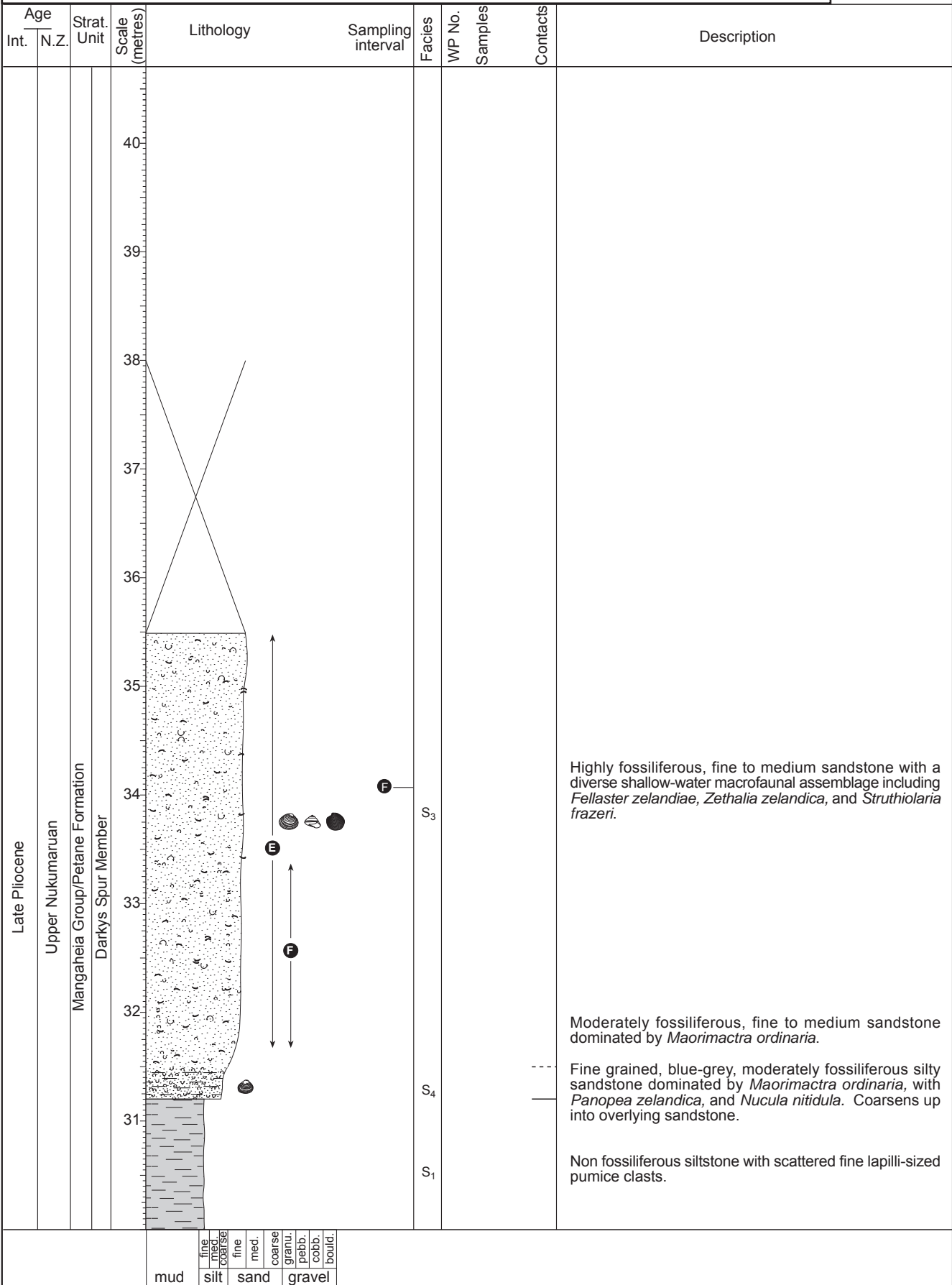
mud	fine med coarse	fine med.	coarse granu. pebb. cobb. bould.
silt	sand	gravel	

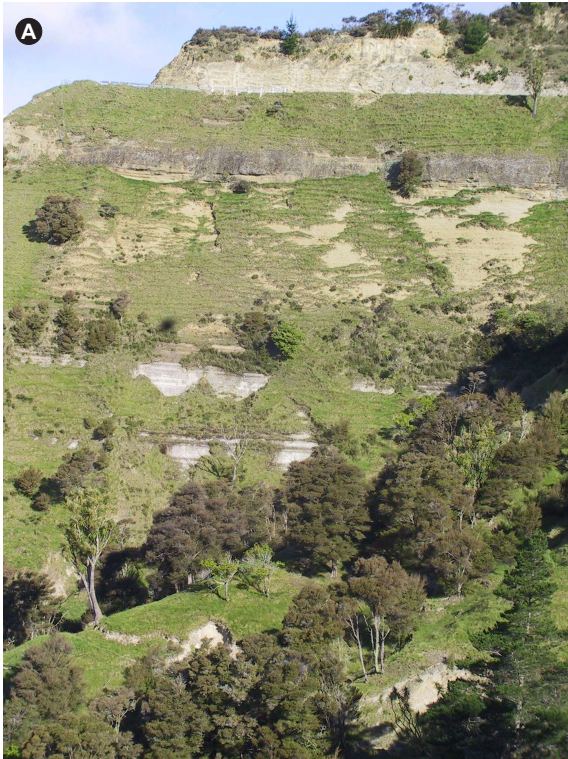
Stratigraphic Column No: 46	Grid Reference: Top	Bottom	NZMS 260 V20 46 2 of 5
GPS Waypoint No(s): Wp 586-589, 775-776	E: 2840702	2839726	
Region: Tangoio	N: 6210500	6210752	
Location: Cliff section up Darkys Spur Road on northwest face of Tangoio Block	Altitude: 444 m	356 m	
NZMS 260 Sheet: V20 Esk	Page 2 of 4		

Age	Strat. Unit	Scale (metres)	Lithology	Sampling interval	Facies	WP No.	Samples	Contacts	Description
Late Pliocene	Upper Nukumaruan Mangaheia Group/Petane Formation Darkys Spur Member	20			Cg ₄				
		19			Cg ₂				Non cemented, ripple and flaser bedded siltstone.
		18			S ₉				Non cemented, broadly trough cross-bedded to swaley-bedded, fine to medium sandstone.
		17			S ₃				
		16			S ₃				Non cemented broadly trough cross-bedded, very well sorted slightly micaceous fine to medium sandstone with abundant moderately to highly fossiliferous shelly lenses. Lenses are dominated by disarticulated, concave-down shallow-water bivalves. Contains <i>Dosinia anus</i> , <i>Rexithaerus spenceris</i> , <i>Tellinota edgari</i> , <i>Perinidea gaimardi</i> and <i>Austromegabalanus dacorus</i> . Shell lenses become less prominent up-section.
		15			S ₃				
		14			S ₃				
		13			S ₃				
		12			S ₃				Non cemented, very well sorted, slightly micaceous fine to medium sandstone with common slightly to well cemented concretionary bodies and lenses. The unit is weakly laminated throughout, though more prominently at base. The upper half is broadly trough cross-bedded with prominent moderately to tightly-packed shell lenses dominated by disarticulated concave-down shallow-water bivalves.
		11			S ₃				
							S ₇		

mud
 fine silt
 med. coarse sand
 granu. pebb. cobb. bould. gravel

Stratigraphic Column No: 46 **Grid Reference:** **Top** **Bottom**
GPS Waypoint No(s): Wp 586-589, 775-776 **E:** 2840702 2839726
Region: Tangoio **N:** 6210500 6210752
Location: Road section up Darkys Spur Road on northwest side of Tangoio Block **Altitude:** 444 m 356 m
NZMS 260 Sheet: V20 Esk **Page 4 of 4** **Author:** K. Bland **46**
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Stratigraphic Column No: 47	Grid Reference: Top	Bottom	NZMS 260 V20 47 1 of 1
GPS Waypoint No(s): Site 89	E: 2837100	-	
Region: Te Pohue	N: 6208400	-	
Location: Esk River above Deep Stream confluence	Altitude: -	-	
NZMS 260 Sheet: V20 Esk	Page 1 of 1	Author: K. Bland	

Age	Strat. Unit		Scale (metres)	Lithology	Sampling interval	Facies	WP No.	Samples	Contacts	Description											
	Int.	N.Z.																			
Late Pliocene	Lower Nukumaru	Mangaheia Group Matahouna Formation/Papakiri Member	50 45 40 35 30 25 20 15 10 5			Z ₈				<p>Blue-grey to white, non cemented, slightly fossiliferous siltstone with prominent tephra layers. Tephra beds are pumiceous and contain ash to lapilli-sized clasts up to 3 mm across.</p> <p>Interbedded laminated siltstone, greywacke conglomerate with sandstone lenses. All layers are moderately to highly fossiliferous. Contains L.O. <i>Phialopecten triphooki</i>.</p> <p>Fine pebble-sized, moderately well cemented, non to slightly fossiliferous greywacke conglomerate. Clasts are well rounded and spheroidal in shape.</p>											
				<table border="1"> <tr> <td>mud</td> <td>fine med. coarse</td> <td>fine med.</td> <td>coarse granu. pebb.</td> <td>cobb.</td> <td>bould.</td> </tr> <tr> <td></td> <td>silt</td> <td>sand</td> <td>gravel</td> <td></td> <td></td> </tr> </table>	mud	fine med. coarse	fine med.	coarse granu. pebb.	cobb.	bould.		silt	sand	gravel							
mud	fine med. coarse	fine med.	coarse granu. pebb.	cobb.	bould.																
	silt	sand	gravel																		