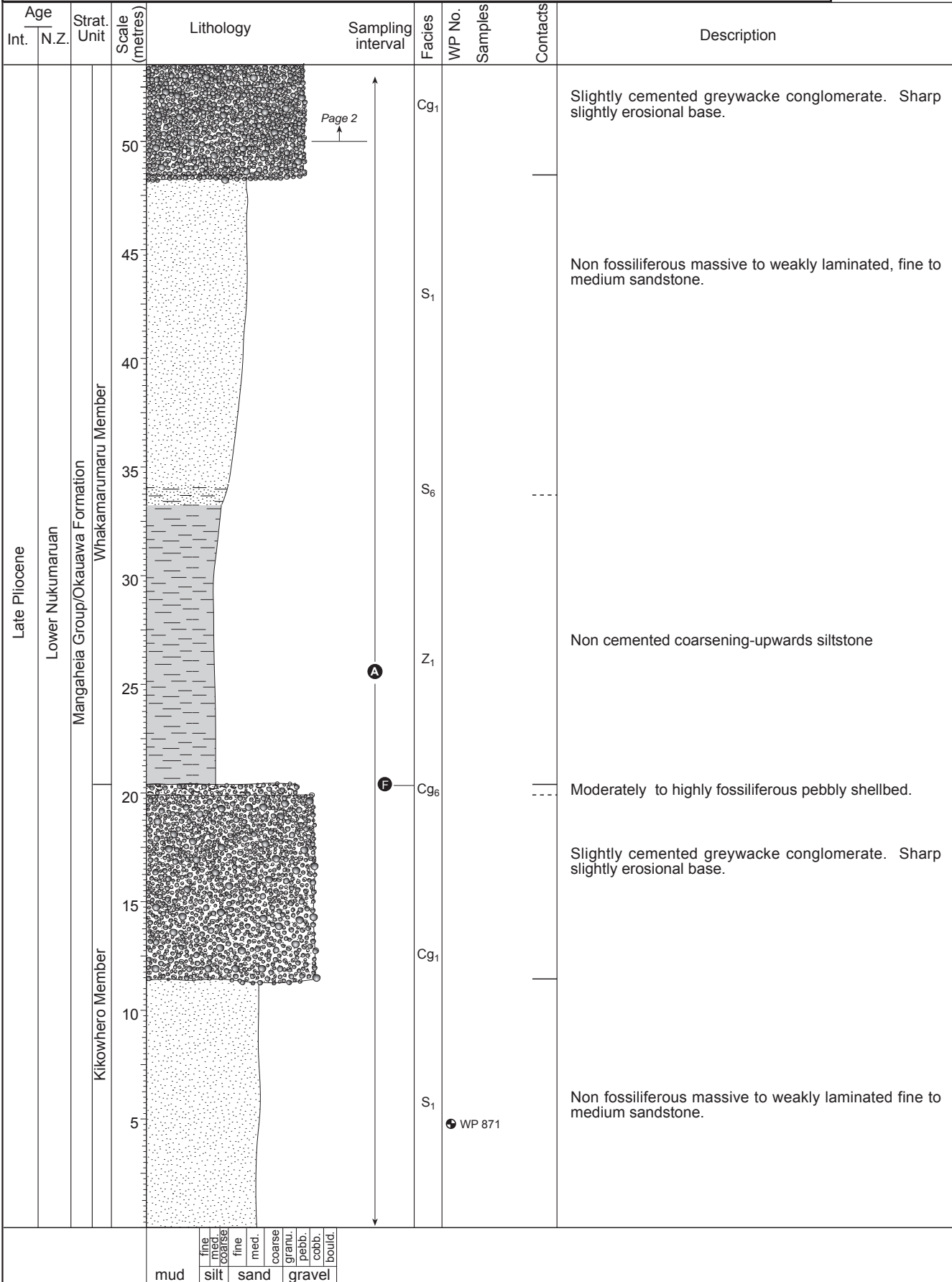


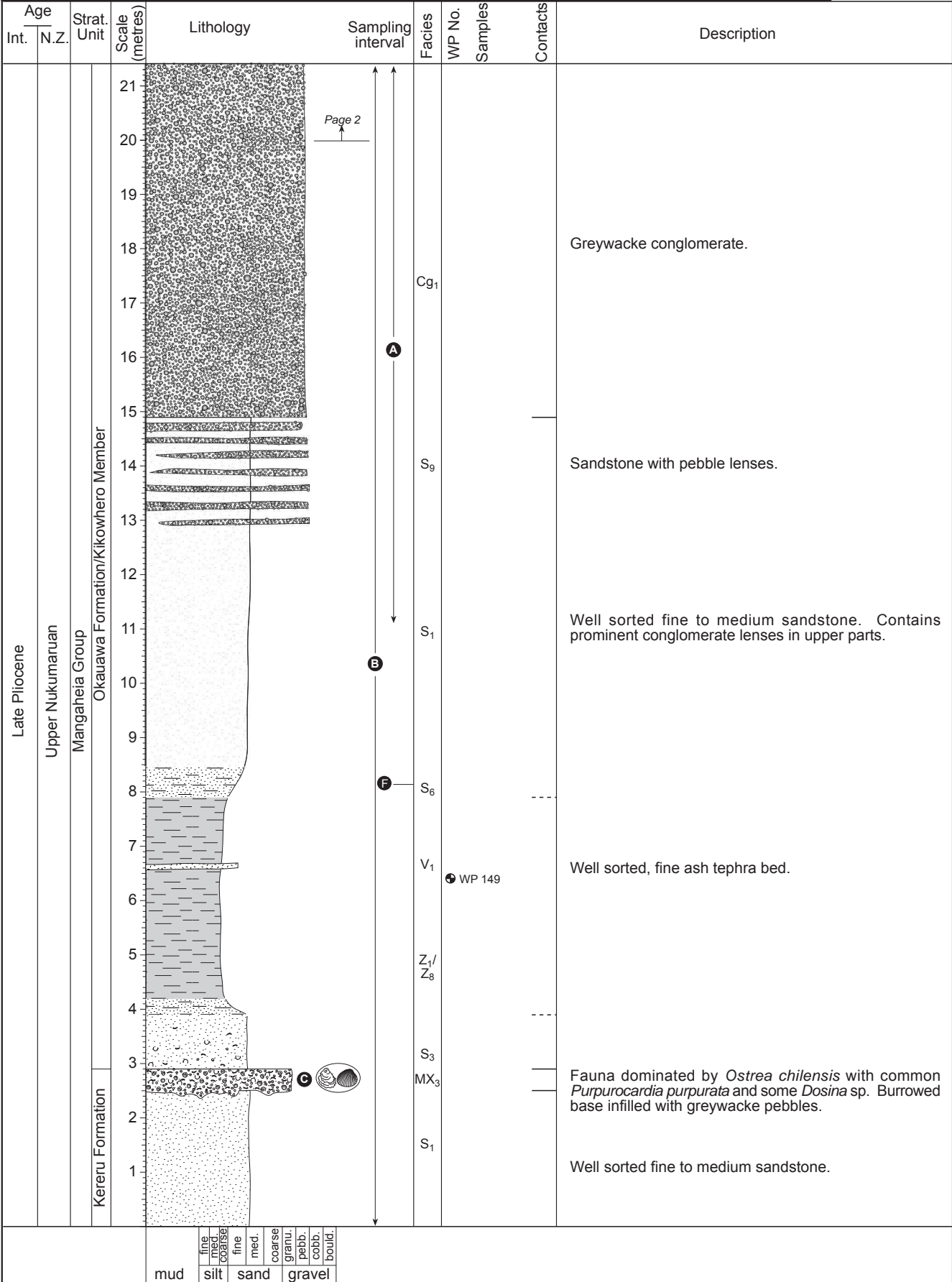
Fig. 9. Map showing location of stratigraphic columns within NZMS 260 Sheet U21.

<b>Stratigraphic Column No:</b> 114	<b>Grid Reference:</b> <b>Top</b>	<b>Bottom</b>	NZMS 260 U21  <span style="font-size: 2em; color: red;">114</span>  1 of 2
<b>GPS Waypoint No(s):</b> WP 871	<b>E:</b> 2805591	-	
<b>Region:</b> Kereru	<b>N:</b> 6173792	-	
<b>Location:</b> Poporangi Stream-Ohara Stream confluence	<b>Altitude:</b> 180 m	-	
<b>NZMS 260 Sheet:</b> U21 Kereru	<b>Page 1 of 2</b>	<b>Author:</b> K. Bland	



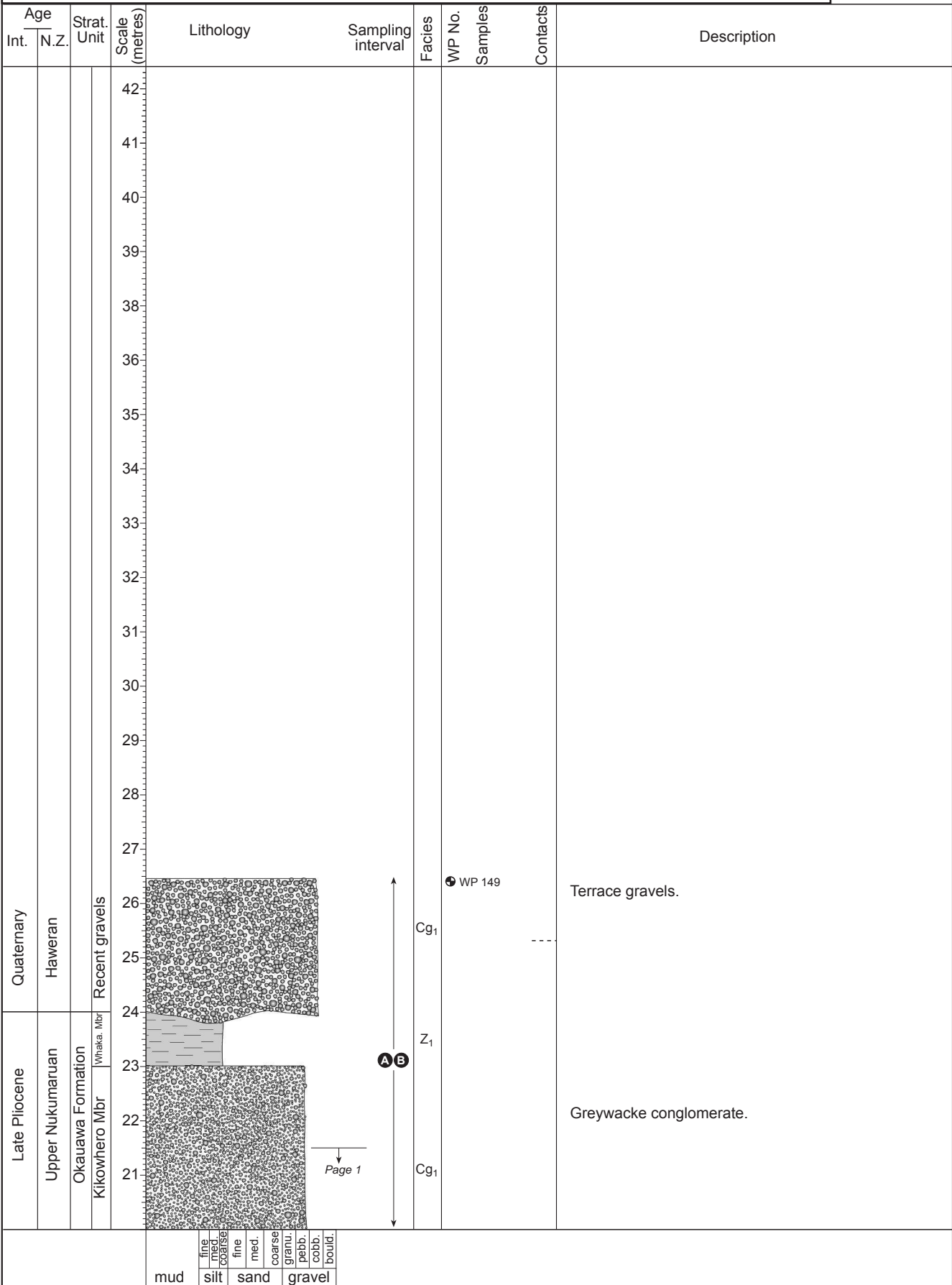


<b>Stratigraphic Column No:</b> 115	<b>Grid Reference:</b> <i>Top</i>	<i>Bottom</i>	NZMS 260 U21  <span style="font-size: 2em; font-weight: bold; color: red;">115</span>  1 of 3
<b>GPS Waypoint No(s):</b> Wp 868	<b>E:</b> 2804656	-	
<b>Region:</b> Kereru	<b>N:</b> 6172771	-	
<b>Location:</b> Ohara Stream several hundred metres below Big Hill Road bridge	<b>Altitude:</b> 184 m	-	
<b>NZMS 260 Sheet:</b> U21 Kereru	Page 1 of 2	<b>Author:</b> K. Bland	



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

**Stratigraphic Column No:** Ke-4      **Grid Reference:**    **Top**                      **Bottom**  
**GPS Waypoint No(s):** Wp 868                      **E:** 2804656                      -  
**Region:** Kereru                                      **N:** 6172771                      -  
**Location:** Ohara Stream several hundred metres below Big Hill Road bridge      **Altitude:** 184 m                      -  
**NZMS 260 Sheet:** U21 Kereru                      **Page 2 of 2**                      **Author:** K. Bland                      **NZMS 260 U21**  
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2 of 3

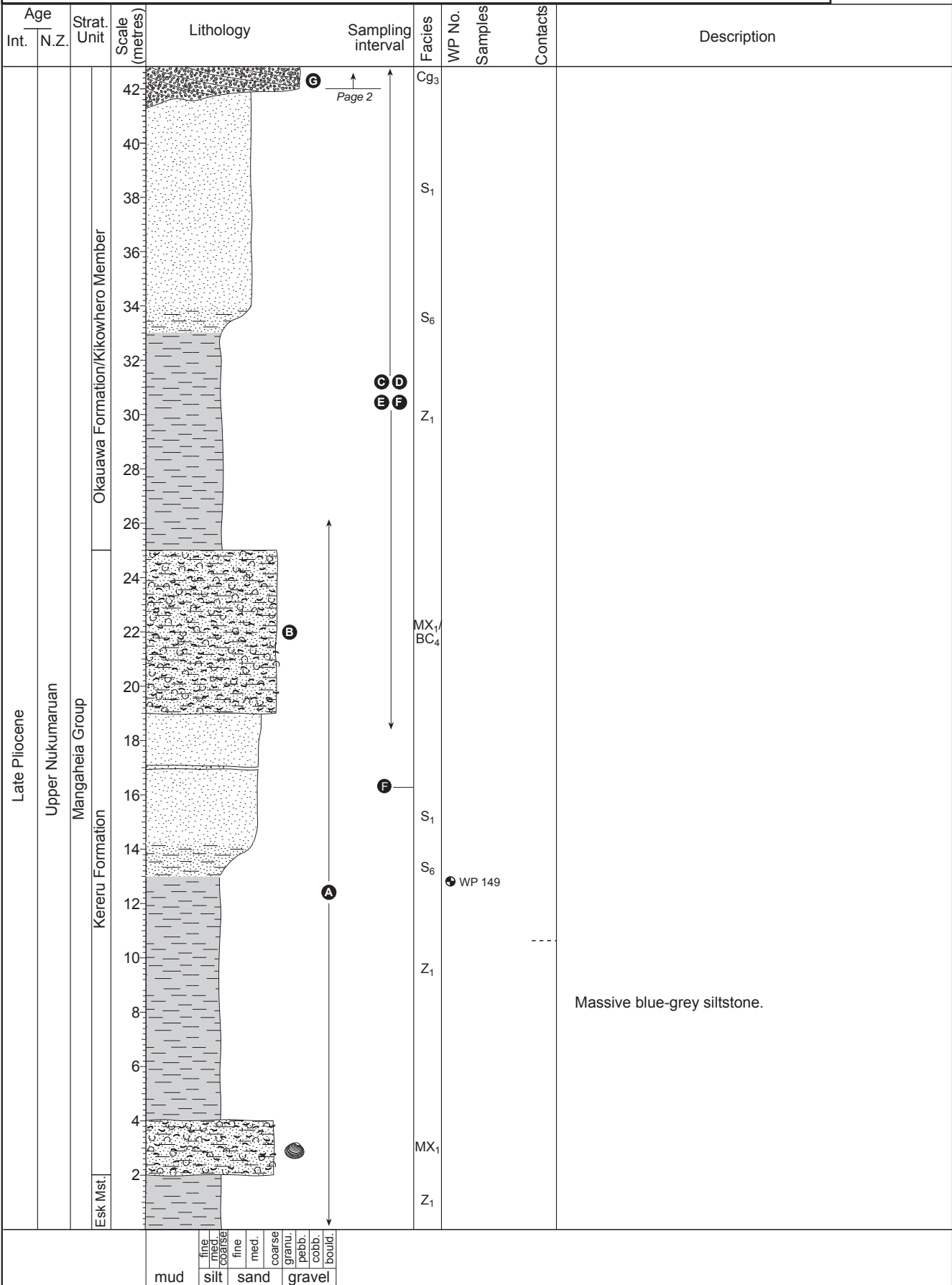


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3 of 3



<b>Stratigraphic Column No:</b> 116	<b>Grid Reference:</b> <b>Top</b>	<b>Bottom</b>	<b>NZMS 260 U21</b>  <b>116</b>  1 of 3
<b>GPS Waypoint No(s):</b> Wp 877	<b>E:</b> 2802643	-	
<b>Region:</b> Kereru	<b>N:</b> 6172062	-	
<b>Location:</b> Ohara Stream at Big Hill Stream confluence	<b>Altitude:</b> 205 m	-	
<b>NZMS 260 Sheet:</b> U21 Kereru	<b>Page 1 of 2</b>	<b>Author:</b> K. Bland	

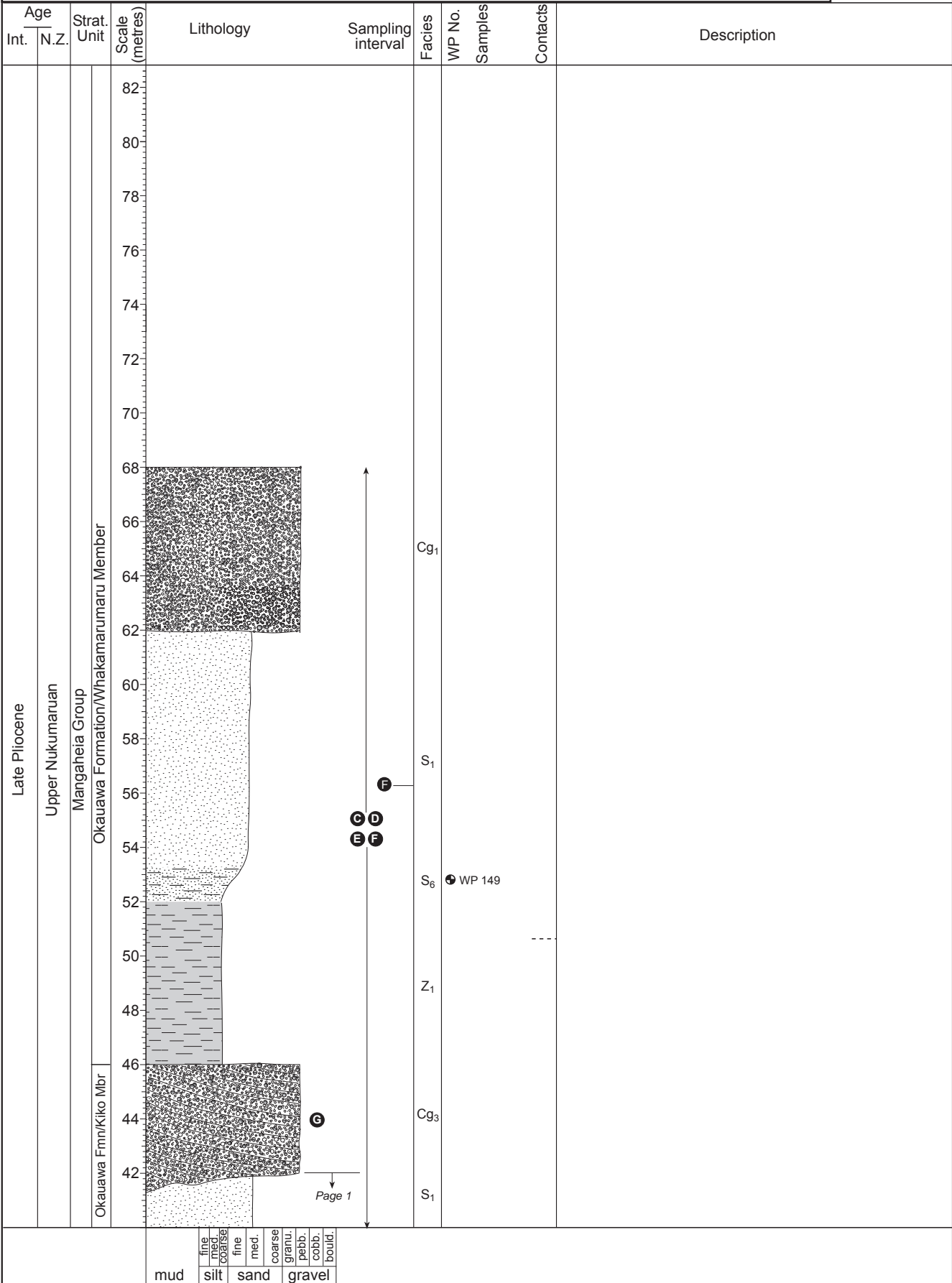


**Stratigraphic Column No:** 116      **Grid Reference:**    **Top**                      **Bottom**  
**GPS Waypoint No(s):** Wp 877                      **E:** 2802643                      -  
**Region:** Kereru                                      **N:** 6172062                      -  
**Location:** Ohara Stream at Big Hill Stream confluence      **Altitude:** 205 m                      -  
**NZMS 260 Sheet:** U21 Kereru                      **Page 2 of 2**                      **Author:** K. Bland

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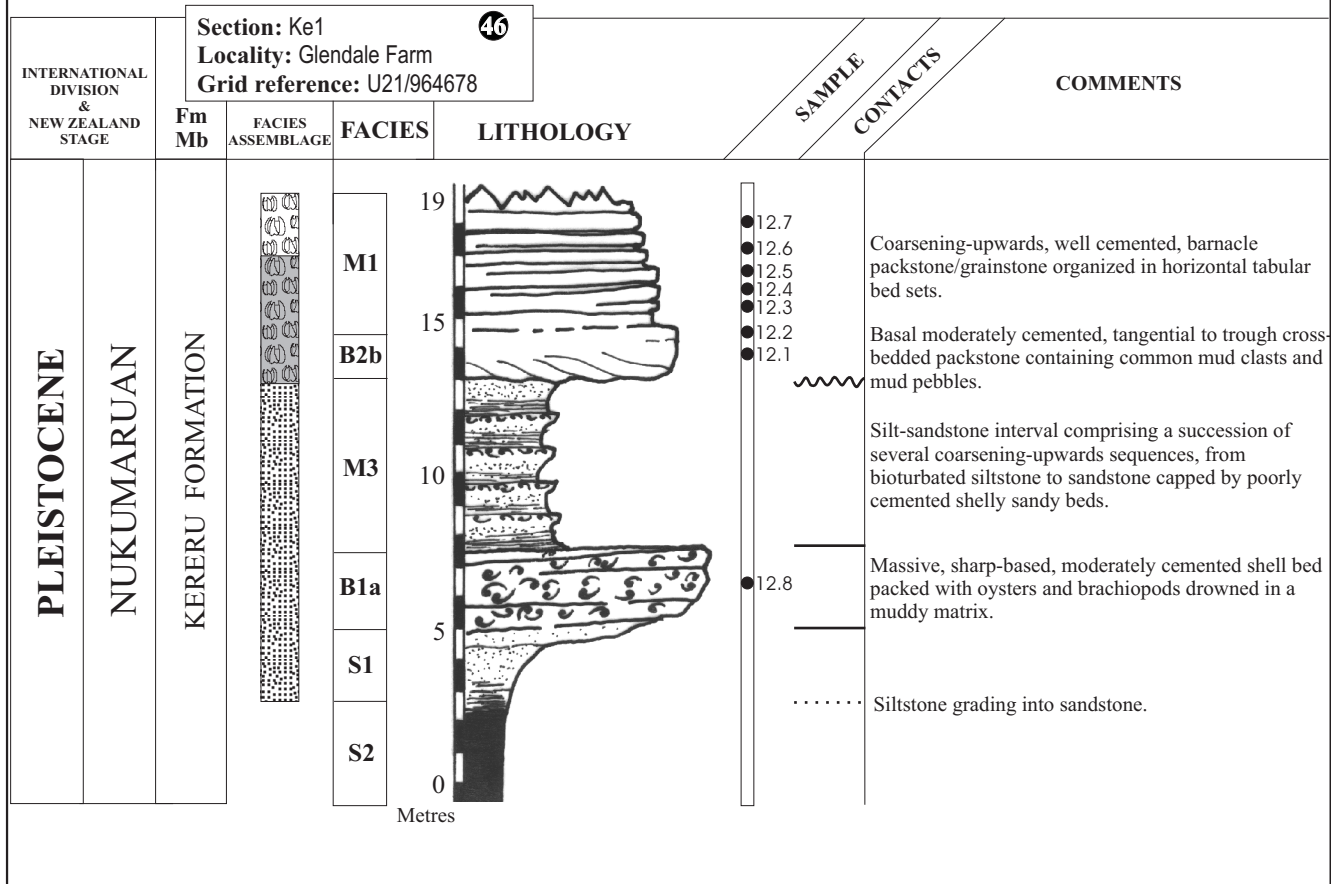
3 of 3



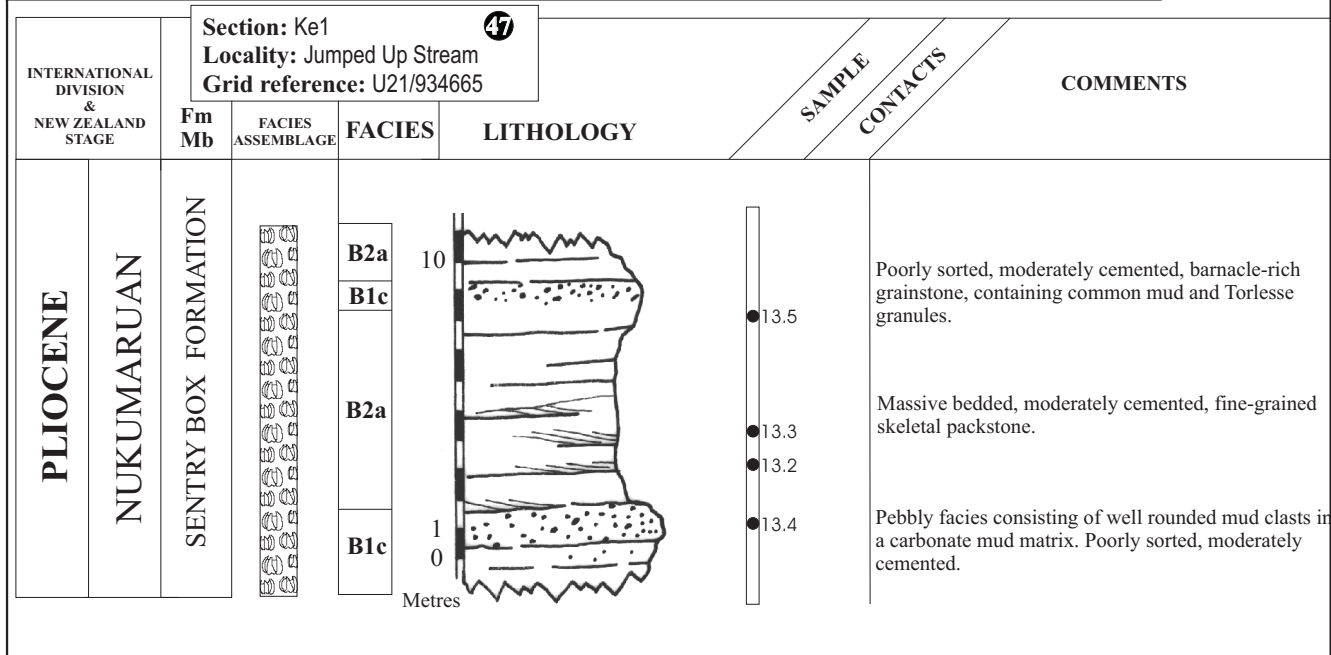
<b>Stratigraphic Column No:</b> 117	<b>Grid Reference:</b> <b>Top</b>	<b>Bottom</b>	NZMS 260 U21  <span style="font-size: 2em; color: red;">117</span>  1 of 1
<b>GPS Waypoint No(s):</b> Wp 873	<b>E:</b> 2797172	-	
<b>Region:</b> Kereru	<b>N:</b> 6171783	-	
<b>Location:</b> Gull Flat Road immediately below Rocky Outcrop	<b>Altitude:</b> 401 m	-	
<b>NZMS 260 Sheet:</b> U21 Kereru	<b>Page 1 of 1</b>	<b>Author:</b> K. Bland	

Age	Strat. Unit		Scale (metres)	Lithology	Sampling interval	Facies	WP No.	Samples	Contacts	Description
	Int.	N.Z.								
Late Pliocene		Lower Nukumaru								<p>Slightly to moderately cemented massive to laminated sandy limestone with occasional areas of trough cross-bedding. Slightly pebbly, clasts are of granule to fine pebble size and are well rounded and well sorted. Bryozoan fragments are common through the bed with some barnacles.</p>
		Mangaheia Group								
		Sentry Box Formation								
Upper Mangapianian		Puketitiri Formation								<p>Greywacke conglomerate/breccia comprising angular to subrounded clasts 0.4-0.5 m across.</p>
										<p>Non cemented massive fine to medium sandstone with scattered shellhash throughout the bed.</p>
				<div style="display: flex; justify-content: space-between; font-size: 0.8em;"> <span>mud</span> <span>fine med coarse</span> <span>fine med.</span> <span>coarse granu. pebb. cobb. bould.</span> </div>						

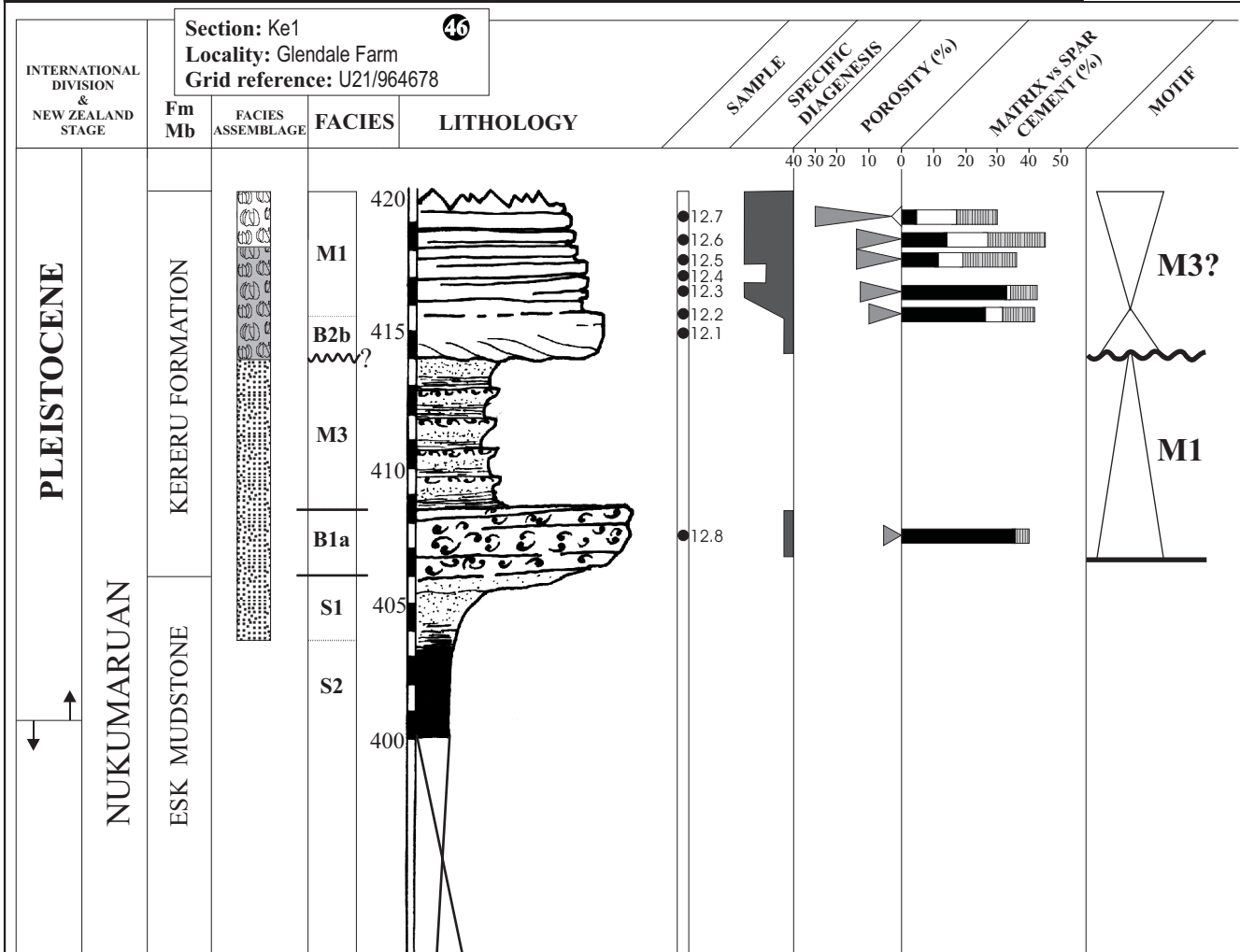
Stratigraphic Column No: 118	Grid Reference: Top	Bottom	NZMS 260 U21  <span style="font-size: 2em; color: red;">118</span>  1 of 2
Section: Ke1	E: 2796400-2796600	-	
GPS Waypoint No(s):	N: 6167800-6168500	-	
Region: Central Hawkes Bay	Altitude:	-	
Location: Glendale Farm	Author: V.Caron		
NZMS 260 Sheet: U21			



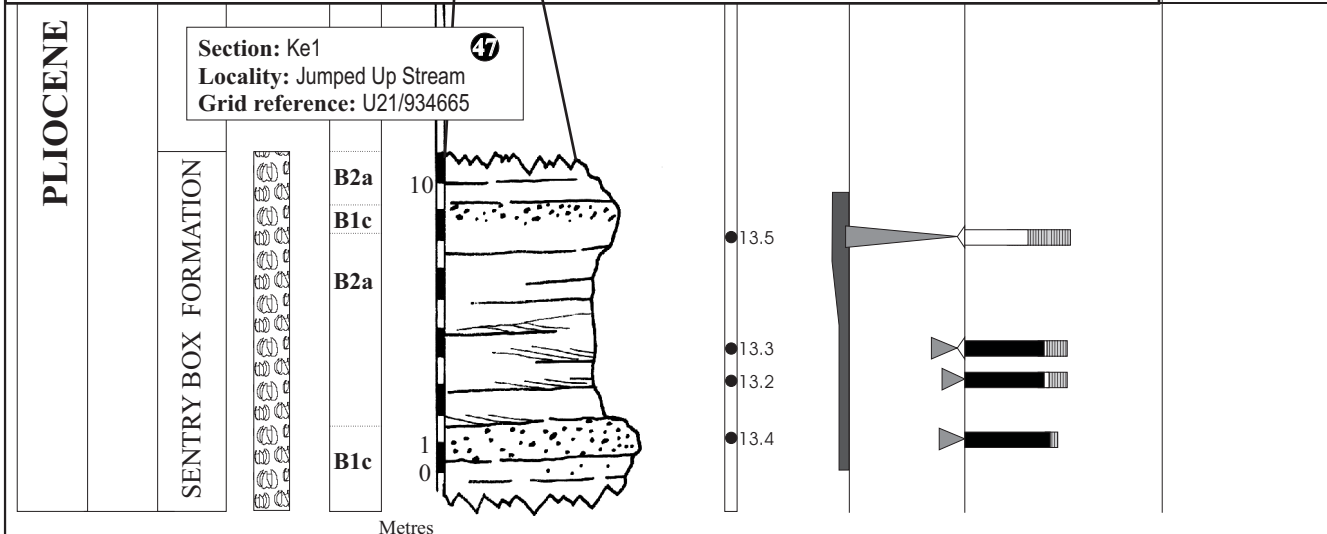
Stratigraphic Column No: 47	Grid Reference: Top	Bottom	NZMS 260 U21  <span style="font-size: 2em; color: red;">118</span>  1 of 2
Section: Ke1	E: 2793400	-	
GPS Waypoint No(s):	N: 6166500	-	
Region: Central Hawkes Bay	Altitude:	-	
Location: Jumped Up Stream	Author: V.Caron		
NZMS 260 Sheet: U21			



Stratigraphic Column No: 118	Grid Reference: Top	Bottom	NZMS 260 U21  <span style="font-size: 2em; color: red;">118</span>  2 of 2
Section: Ke1	E: 2796400-2796600	-	
GPS Waypoint No(s):	N: 6167800-6168500	-	
Region: Central Hawkes Bay	Altitude:	-	
Location: Glendale Farm	Author: V.Caron		
NZMS 260 Sheet: U21			



Stratigraphic Column No: 47	Grid Reference: Top	Bottom
Section: Ke1	E: 2793400	-
GPS Waypoint No(s):	N: 6166500	-
Region: Central Hawkes Bay	Altitude:	-
Location: Jumped Up Stream	Author: V.Caron	
NZMS 260 Sheet: U21		





<b>Stratigraphic Column No:</b> 119	<b>Grid Reference:</b> <b>Top</b>	<b>Bottom</b>	<b>NZMS 260 U21</b>  <b>119</b>  2 of 3
<b>GPS Waypoint No(s):</b> 1004	<b>E:</b> 2796869	-	
<b>Region:</b> Kereru	<b>N:</b> 6168447	-	
<b>Location:</b> Glendale Farm below Mount Mary on farm track beside Mohaka Fault	<b>Altitude:</b> 484 m	-	
<b>NZMS 260 Sheet:</b> U21 Kereru	<b>Page 2 of 2</b>		<b>Author:</b> K. Bland

Age	Strat. Unit	Scale (metres)	Lithology	Sampling interval	Facies	WP No.	Samples	Contacts	Description					
										Int.	N.Z.			
Late Pliocene	Upper Nukumaruan Mangaheia Group Kereru Formation	11 to 20							<p>BC<sub>3</sub>: Slightly to moderately cemented, white-coloured, barnacle-dominated massive to weakly laminated coarse-grained limestone. Contains scattered <i>Ostrea</i> valves in the upper 0.3 m. There is no <i>Ostrea</i> shellbed capping the bed at this locality.</p> <p>MX<sub>1</sub>: Poorly cemented, massive, bioclastic medium sandstone. Dominated by shellhash. Contains <i>Ostrea</i> valves and rare mudstone clasts up to 0.15 m across. Sharply overlies sandy siltstone.</p> <p>S<sub>4</sub>: Fossiliferous sandy siltstone to fine sandstone. Dominated by shellhash with <i>Neothyris</i>, <i>Ostrea</i>, <i>Patro</i>, barnacle plates and <i>Talochalmys</i>. Sharply overlain by coarse-grained limestone.</p>					
			<table border="1"> <tr> <td>mud</td> <td>fine silt</td> <td>med. sand</td> <td>coarse sand</td> <td>granu. pebb.</td> <td>cobb.</td> <td>bould.</td> </tr> </table>	mud	fine silt	med. sand	coarse sand	granu. pebb.	cobb.	bould.				
mud	fine silt	med. sand	coarse sand	granu. pebb.	cobb.	bould.								

**A**

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**B**



**C**



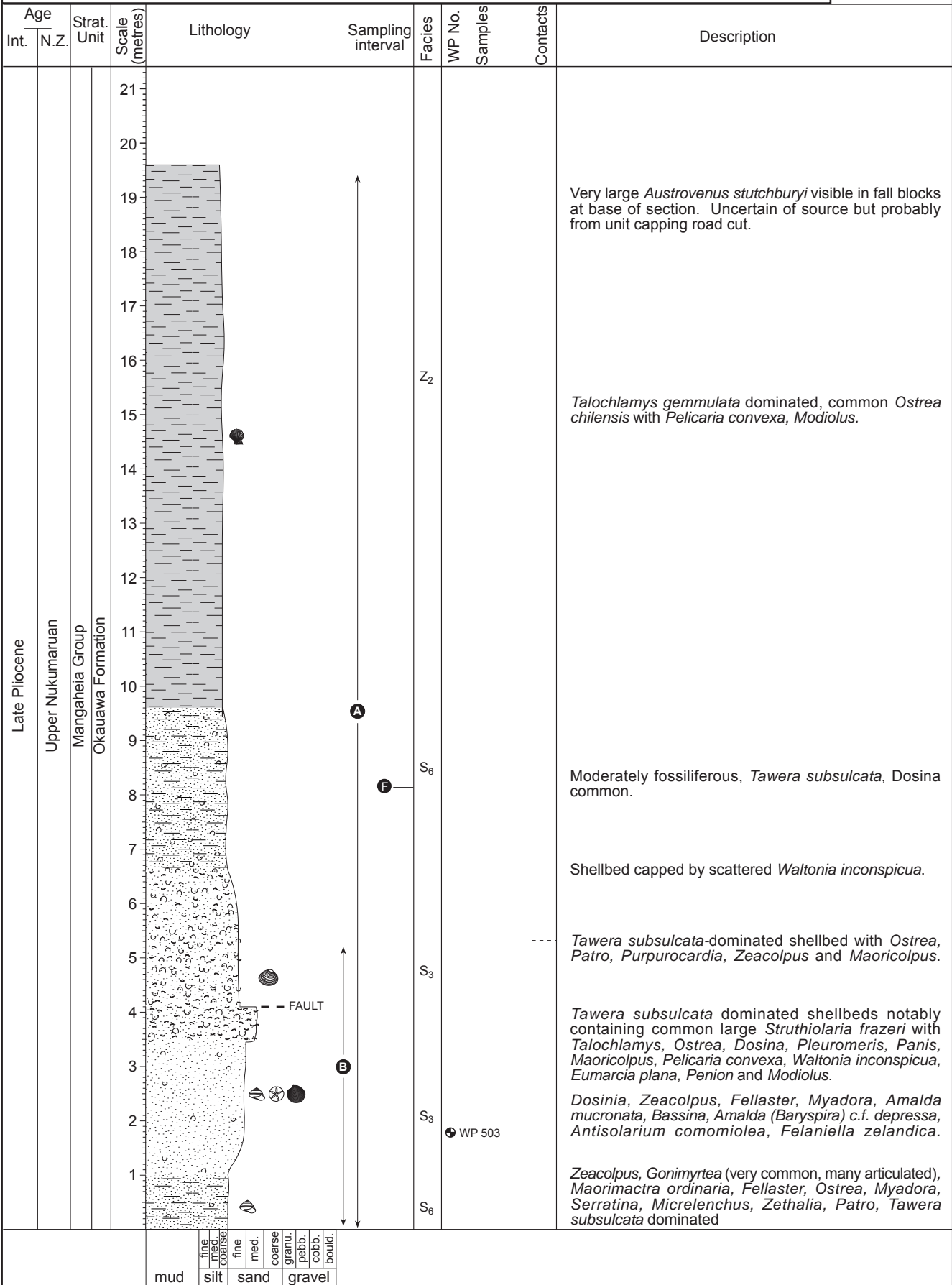
**D**



**E**



<b>Stratigraphic Column No:</b> 120	<b>Grid Reference:</b> <b>Top</b>	<b>Bottom</b>	NZMS 260 U21  <span style="font-size: 2em; color: red;">120</span>  1 of 2
<b>GPS Waypoint No(s):</b> Wp 503	<b>E:</b> 2809423	-	
<b>Region:</b> Kereru	<b>N:</b> 6168965	-	
<b>Location:</b> Kereru Road at bridge over Whanakino Stream	<b>Altitude:</b> 174 m	-	
<b>NZMS 260 Sheet:</b> U21 Kereru	<b>Page 1 of 1</b>	<b>Author:</b> K. Bland	



A



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B

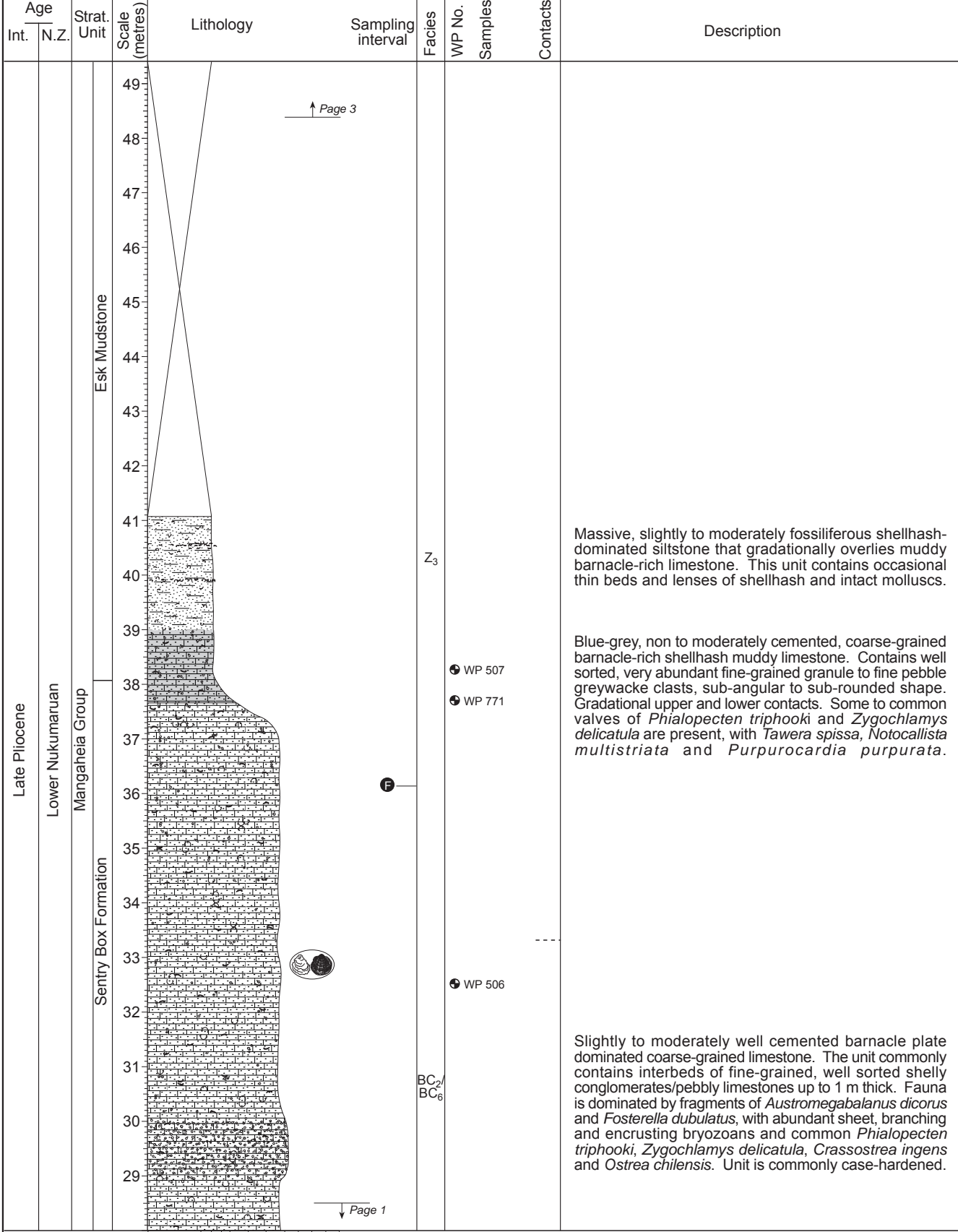


<b>Stratigraphic Column No:</b> 121	<b>Grid Reference:</b> <b>Top</b>	<b>Bottom</b>	<b>NZMS 260 U21</b>  <b>121</b>  1 of 3
<b>GPS Waypoint No(s):</b> Wp 506-507, 769-771	<b>E:</b> 2792572	2793509	
<b>Region:</b> Kereru	<b>N:</b> 6166364	6166513	
<b>Location:</b> Jumped Up Stream/Sentry Box Hill Composite	<b>Altitude:</b> 585 m	454 m	
<b>NZMS 260 Sheet:</b> U21 Kereru	<b>Page 1 of 3</b>	<b>Author:</b> K. Bland	

Age	Strat. Unit	Scale (metres)	Lithology	Sampling interval	Facies	WP No.	Samples	Contacts	Description
Late Pliocene	Lower Nukumatuan	Sentry Box Formation	29			BC <sub>2</sub> / BC <sub>6</sub>			Slightly to moderately well cemented barnacle plate dominated coarse-grained limestone. The unit commonly contains interbeds of fine-grained, well sorted shelly conglomerates/pebbly limestones up to 1 m thick. Fauna is dominated by fragments of <i>Austromegabalanus dicorus</i> and <i>Fosterella dubulatus</i> , with abundant sheet, branching and encrusting bryozoans and common <i>Phialopecten triphooki</i> , <i>Zygochlamys delicatula</i> , <i>Crassostrea ingens</i> and <i>Ostrea chilensis</i> . Unit is commonly case-hardened.
			28						
			27						
			26						
			25						
			24						
			23						
			22						
			21						
			20						
			19						
			18						
Upper Mangapanian	Mangaheia Group	Puketitiri Formation	17			Z <sub>1</sub>	● WP 770		Highly fossiliferous pebbly shellbeds with a muddy matrix containing a very diverse molluscan fauna dominated by fragments and intact specimens of barnacles <i>Austromegabalanus dicorus</i> and <i>Fosterella dubulatus</i> . Contains <i>Zygochlamys delicatula</i> and <i>Phialopecten triphooki</i> .
			16						
			15						
			14						
			13						
			12						
			11						
			10						
			9						
			8						
			7						
			6						
5									
4									
3									
2									
1									
					Z <sub>2</sub>	● WP 769 ● MICROPAL		Non cemented massive to weakly laminated slightly fossiliferous siltstone. Valves are dissolved. Fauna are dominated by <i>Neilo</i> , with <i>Notocallista</i> , <i>Calliostoma</i> , <i>Talochlamys</i> , <i>Pleuromeris</i> and a nuculanid.	

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

<b>Stratigraphic Column No:</b> 121	<b>Grid Reference:</b> <b>Top</b>	<b>Bottom</b>	NZMS 260 U21  <span style="font-size: 2em; color: red;">121</span>  2 of 3
<b>GPS Waypoint No(s):</b> Wp 506-507, 769-771	<b>E:</b> 2793370	2793509	
<b>Region:</b> Kereru	<b>N:</b> 6166364	6166513	
<b>Location:</b> Jumped Up Stream/Sentry Box Hill Composite	<b>Altitude:</b> 585 m	454 m	
<b>NZMS 260 Sheet:</b> U21 Kereru	<b>Page 2 of 3</b>	<b>Author:</b> K. Bland	



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

<b>Stratigraphic Column No:</b> 121	<b>Grid Reference:</b> <b>Top</b>	<b>Bottom</b>	NZMS 260 U21  <span style="font-size: 2em; color: red;">121</span>  3 of 3
<b>GPS Waypoint No(s):</b> Wp 506-507, 769-771	<b>E:</b> 2793370	2793509	
<b>Region:</b> Kereru	<b>N:</b> 6166364	6166513	
<b>Location:</b> Jumped Up Stream/Sentry Box Hill Composite	<b>Altitude:</b> 585 m	454 m	
<b>NZMS 260 Sheet:</b> U21 Kereru	<b>Page 3 of 3</b>	<b>Author:</b> K. Bland	

Age	Strat. Unit	Scale (metres)	Lithology	Sampling interval	Facies	WP No.	Samples	Contacts	Description
	Late Pliocene	69 68 67 66 65 64 63 62 61 60 59 58 57 56 55 54 53 52 51 50 49							<p>Massive, non cemented sparsely to moderately fossiliferous sandy siltstone. Fauna dominated by <i>Tawera subsulcata</i> with <i>Pratulium pulchellum</i>, <i>Zenatia acinaces</i>, <i>Atrina pectinata zelandica</i> and <i>Austrofusus</i> sp.</p>
	Lower Nukumaruian								
	Mangaheia Group								
	Esk Mudstone								

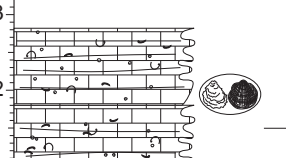
↓ Page 2

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

**Stratigraphic Column No:** 122      **Grid Reference:**    **Top**                      **Bottom**  
**GPS Waypoint No(s):** Wp 506                      **E:** -                      2792572  
**Region:** Kereru                      **N:** -                      6166364  
**Location:** Sentry Box Scenic Reserve off Mangleton Road, Ohara Depression      **Altitude:** -                      585 m  
**NZMS 260 Sheet:** U21 Kereru                      **Page 1 of 2**                      **Author:** K. Bland                      **NZMS 260 U21**  
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1 of 3

Age	Strat. Unit	Scale (metres)	Lithology	Sampling interval	Facies	WP No.	Samples	Contacts	Description																
										Int.	N.Z.														
Late Pliocene	Lower Nukumaruan																								
	Mangaehia Group																								
	Sentry Box Formation																								
		21		↑ Page 2																					
		20																							
		19																							
		18																							
		17							Unit is arranged into four broad-packages, each separated by master weathering surfaces. The composition of the limestone is similar in each package. Case hardening is common across section.																
		16																							
		15																							
		14																							
		13			BC <sub>2</sub> / BC <sub>6</sub>																				
		12																							
		11							--- Cream-coloured slightly to moderately cemented coarse-grained pebbly limestone with abundant intact macrofossils. Unit comprises of stacked bioclastic-dominated sheets 0.15-0.3 m thick. Greywacke pebbles are common and typically 20-30 mm across, with rare clasts to 100 mm across. Pebbles are sub to well rounded in shape; rare jasper pebbles present. Some zones around 1 m thick are present throughout the exposure containing abundant fine greywacke pebbles.																
		10																							
		9																							
		8							Barnacle-dominated unit with intact barnacles commonly attached to bivalves and each other. Abundant bryozoans are present, typically in sheet and branching forms with occasional encrusting types. Some echinoid spines and brachiopods also occur. Contains <i>Zygochlamys patagonica delicatula</i> , <i>Phialopecten triphooki</i> , <i>Mesopeplum convexum</i> , <i>Crassostrea ingens</i> and <i>Ostrea chilensis</i> .																
		7																							
		6				● WP 506																			
		5																							
		4																							
		3																							
		2							---																
		1																							
			<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></td> <td></td> <td></td> </tr> <tr> <td>sand</td> <td></td> <td></td> <td></td> </tr> <tr> <td>gravel</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																									

<b>Stratigraphic Column No:</b> 122	<b>Grid Reference:</b> <b>Top</b>	<b>Bottom</b>	NZMS 260 U21  <span style="font-size: 2em; color: red;"><b>122</b></span>  2 of 3
<b>GPS Waypoint No(s):</b> Wp 506	<b>E:</b> -	2792572	
<b>Region:</b> Kereru	<b>N:</b> -	6166364	
<b>Location:</b> Sentry Box Scenic Reserve off Mangleton Road, Ohara Depression	<b>Altitude:</b> -	585 m	
<b>NZMS 260 Sheet:</b> U21 Kereru	<b>Page 2 of 2</b>	<b>Author:</b> K. Bland	

Age	Strat. Unit	Scale (metres)	Lithology	Sampling interval	Facies	WP No.	Samples	Contacts	Description															
										Int.	N.Z.													
Late Pliocene	Lower Nukumaru Group Mangaehia Group Sentry Box Formation	35 34 33 32 31 30 29 28 27 26 25 24 23 22							<p>-----</p> <p>Barnacle-dominated unit with intact barnacles commonly attached to bivalves and each other. Abundant bryozoans are present, typically in sheet and branching forms with occasional encrusting types. Some echinoid spines and brachiopods also occur. Contains <i>Phialopecten triphooki</i>, <i>Mesopeplum convexum</i>, <i>Crassostrea ingens</i> and <i>Ostrea chilensis</i>.</p>															
			<table border="1"> <tr> <td>fine</td><td>med.</td><td>coarse</td><td>coarse</td><td>granu.</td><td>pebb.</td><td>cobb.</td><td>bould.</td> </tr> <tr> <td>mud</td><td>silt</td><td>sand</td><td>gravel</td><td></td><td></td><td></td><td></td> </tr> </table>	fine	med.	coarse	coarse	granu.	pebb.	cobb.	bould.	mud	silt	sand	gravel									
fine	med.	coarse	coarse	granu.	pebb.	cobb.	bould.																	
mud	silt	sand	gravel																					

