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APPENDIX I

STATISTICAL DATA ON RIPPLE MARKS IN THE
NORTH-WESTERN PORTION OF THE BASIN

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	Symmetry of Crests	No. of Measurements	Mean Strike	Ripple Index
1	Fauresmith	Klein Platberg 756	On side of road	Lowermost Beaufort	Shale	Symmetrical	5	160°	5.39
6	Fauresmith	Goede Hoop 219	In stream	Lowermost Beaufort	Siltstone	Symmetrical	3	174°	15.00
7	Fauresmith	Ruigtepoort 61	In stream	Lowermost Beaufort	Siltstone	Symmetrical	6	43°	7.41
8	Fauresmith	Fauresmith Townlands 167	In stream	Lowermost Beaufort	Siltstone	Symmetrical	10	157°	6.65
9	Fauresmith	Fauresmith Townlands 167	In stream	Lowermost Beaufort	Siltstone	Symmetrical	6	136°	7.33
12	Fauresmith	Sandymount Park 1126	In stream	Lowermost Beaufort	Fine sandstone	Symmetrical	8	39°	5.36
14	Fauresmith	Riet Puts Dam 115	Above cliff	Lowermost Beaufort	Siltstone	Symmetrical	10	93°	10.20
17	Fauresmith	Jagersfontein 14	Side of hill	Lowermost Beaufort	Fine Sandstone	Symmetrical	7	108°	5.26
20	Trompsburg	Morgenzon 339	In stream	Lowermost Beaufort	Siltstone	Symmetrical	3	176°	10.33

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	Symmetry of Crests	No. of Measurements	Mean Strike	Ripple Index
25	Bloemfontein	Tafelkop 712	Cliffs	Lowermost Beaufort	Fine sandstone	Symmetrical	3	52°	7.85
34	Theuni sen	Heldersfontein 139	In stream	Lowermost Beaufort	Fine sandstone	Symmetrical	10	109°	9.85
39	Virginia	Wetvreden 443	In Dooring-spruit	Lowermost Beaufort	Fine	Symmetrical	20	113°	8.32
41	Virginia	Adamsonsvlei 655	Next to road	Lowermost Beaufort	Medium-fine sandstone	Symmetrical	7	52°	6.64
42	Virginia	Glen Harmony	Sandstone cliff	Lowermost Beaufort	Medium-fine sandstone	Symmetrical	5	95°	7.05
43	Kennenman	Rietgat 276	Below bridge in Riet-spruit	Lowermost Beaufort	Fine sandstone	Symmetrical	2	29°	7.69
45	Kroonstad	Highlands 2343	In quarry	Lowermost Beaufort	Medium sandstone	Asymmetrical (Linguoid)	5	4°	9.25
53	Hoopstad	Le Asar 459	South bank of Vaal	Middle Ecce	Medium sandstone	Symmetrical	9	156°	11.60
54	Hoopstad	Nieuwhoudts Rust	In donsa	Middle Ecce	Medium sandstone	Symmetrical	2	149°	17.25
57	Hoopstad	Elizabeth's Rust 47	Side of road	Middle Ecce	Medium sandstone	Symmetrical	4	107°	49.5
74	Viljoenskroon	Vierfontein	Vierfontein Colliery West Shaft	Middle Ecce	Medium to fine sandstone	Asymmetrical	10	163°	7.67

STATISTICAL DATA ON CROSS-BEDDING IN THE
NORTH-WESTERN PORTION OF THE BASIN

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of planar cross-bedded units
5	Fauresmith	Oorlogspoort 961	Small hill	Lowermost Beaufort	Fine-medium sandstone	5	34°	0.90	
12	Fauresmith	Sandymount Park 100	In stream	Lowermost Beaufort	Medium sandstone	3	301°	0.97	
19	Trompsburg	Bloemhof 186	Small hill	Lowermost Beaufort	Medium sandstone	3	348°	0.33	30.0"
21	Eienburg	Townlands 104	Small hill	Lowermost Beaufort	Coarse felspathic sandstone	11	298°	0.71	24.0"
22	Edenburg	Moederfontein 78	In Osipoort-spruit	Lowermost Beaufort	Fine-medium sandstone	7	145°	0.95	16.0"
23	Reddersburg	Reddersburg 291	In quarry	Lowermost Beaufort	Fine-medium sandstone	6	191°	0.92	20.0"
26	Bloemfontein	Tafelkop 712	Cliffs	Lowermost Beaufort	Fine-medium sandstone	10	308°	0.93	16.0"
26	Bloemfontein	Tafelkop 712	Road cutting	Lowermost Beaufort	Coarse-medium sandstone	8	226°	0.91	11.5"
31	Theunissen	Klein Begin 370	Below bridge across Vet River	Lowermost Beaufort	Fine sandstone	2	254°	0.99	

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of planar cross-bedded units
32	Brandfort	Portion 222	Small hill	Lowermost Beaufort	Fine-medium sandstone	10	318°	0.90	23.3"
33	Brandfort	Townlands 720	Road cutting	Lowermost Beaufort	Grit and conglomerate	5	271°	0.96	27.5"
34	Theunissen	Heldersfontein 139	In stream	Lowermost Beaufort	Fine sandstone	10	221°	0.82	9.0"
35	Theunissen	Abraham's Hof 323	Side of hill	Lowermost Beaufort	Coarse fels-pathic grit	10	231°	0.96	14.0"
35	Theunissen	Maree 211	Lowermost Cliff, Lion Hill	Lowermost Beaufort	Fine-medium sandstone	2	320°	0.93	
36	Theunissen	Maree 211	Upper cliff, Lion Hill	Lowermost Beaufort	Coarse fels-pathic sandstone	6	221°	0.78	48.0"
42	Virginia	Glen Harmony	Cliffs above Sand River	Lowermost Beaufort	Medium-coarse sandstone	10	202°	0.78	5.5"
44	Kroonstad	Elandsrand 2456	Side of hill	Lowermost Beaufort	Coarse fels-pathic sandstone	14	278°	0.82	
45	Kroonstad	Highlands 2343	In quarry	Lowermost Beaufort	Medium sandstone	6	130°	0.93	

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of planar cross-bedded units
46	Kroonstad	Townlands 460	Near road	Lowermost Beaufort	Coarse fels-pathic sandstone	8	140°	0.73	
47	Kroonstad	Cornerton 610	Cliffs	Lowermost Beaufort	Medium-coarse sandstone	4	270°	0.98	
48	Kroonstad	Mooivleij 1458	Side of Road	Lowermost Beaufort	Medium sandstone	5	312°	0.98	
49	Heilbron	Rietgat 1082	Road cutting	Lowermost Beaufort	Medium fels-pathic sandstone	5	282°	0.88	
50	Heilbron	Christiana 690	Cliffs north of River	Middle Ecca	Coarse fels-pathic sandstone	7	242°	0.97	32.0"
51	Heilbron	Mooifontein 590	Side of hi.	Middle Ecca	Coarse fels-pathic sandstone	5	245°	0.96	30.0"
52	Heilbron	Rietfontein 156	In stream	Middle Ecca	Coarse fels-pathic sandstone	5	246°	0.98	32.0"
53	Hoopstad	De Aar 459	South bank of Vaal	Middle Ecca	Medium sandstone	3	252°	0.98	

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of planar cross-bedded units
54	Hoopstad	Nieuwhoudts Rust 514	In donga	Middle Ecca	Medium-fine sandstone	3	206°	0.98	10.0"
55	Hoopstad	Smitsrust 415	Cliffs	Middle Ecca	Medium sandstone	4	169°	0.93	9.0"
56	Hoopstad	De Rots 9	Cliffs	Middle Ecca	Medium sandstone	2	152°	0.95	
58	Hoopstad	Elizabeth's Rust 47	In Vaal River	Middle Ecca	Fine sandstone	6	208°	0.87	
59	Wesselsbron	Clerkstroem 297	Cliff above Sandspuit	Middle Ecca	Medium sandstone	4	156°	0.95	
60	Wesselsbron	Clerkstroem 297	Side of road	Middle Ecca	Medium-coarse sandstone	3	141°	0.97	
61	Bothaville	Witkrans 267	Cliffs	Middle Ecca	Medium-coarse sandstone	6	159°	0.68	27.0"
62	Bothaville	Strydom 603	Cliffs	Middle Ecca	Medium sandstone	10	159°	0.46	41.5"
63	Bothaville	Mahomed 605	East bank of Vaal	Middle Ecca	Medium sandstone	8	167°	0.58	33.0"
64	Bothaville	Strydomfontein 256	In donga	Middle Ecca	Medium sandstone	5	131°	0.97	

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of planar cross-bedded units
65	Bothaville	Zandfontein	Side of road	Middle Eccla	Medium sandstone	3	149°	0.93	
66	Wolmarans-	Baviaans Krans H.P. 80	Cliff next to Vaal	Middle Eccla	Medium sandstone	10	174°	0.83	30.0"
67	Bothaville	Haasfontein	Cliffs	Middle Eccla	Medium sandstone	5	154°	0.88	15.0"
68	Bothaville	De Bank 407	Cliffs	Middle Eccla	Medium sandstone	6	138°	0.85	
69	Bothaville	Johannas Hoop 408	South bank of Vals river	Middle Eccla	Medium sandstone	10	241°	0.58	48.0"
70	Bothaville	Botharnia 9	Side of road	Middle Eccla	Medium sandstone	2	103°	0.95	
71	Bothaville	Klipfontein 459	In stream	Middle Eccla	Medium sandstone	10	236°	0.58	
75	Viljoens- kroon	Vierfontein 512	Near old adit	Middle Eccla	Medium-fine sandstone	10	121°	0.97	
76	Van der Bijl Park	Zandfontein 46	North bank of Vaal River	Middle Eccla	Coarse fels-pathic sandstone	8	214°	0.93	35.0"

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of planar cross-bedded units
77	Sasolburg	Verdun 1183	Cliffs above Taaibos Spruit	Middle Ecce	Medium sandstone	19	272°	0.77	38.5"
78	Sasolburg	Amelia 518	Cliffs above Taaibos Spruit	Middle Ecce	Medium sandstone	5	282	0.54	14.0"
79	Vereeniging	Kookfontein 57	Road cutting	Middle Ecce	Grit and Conglomerate	4	128°	0.93	

STATISTICAL DATA ON FUCOID STRUCTURES IN THE
NORTH-WESTERN PORTION OF THE BASIN

Out- crop No.	District	Farm	Outcrop Description	Strati- graphic posi- tion	Constit- uent Material	No. of Measure- ments	Length of Fucoids	Arith- metic Means	Vari- ance	Stan- dard devi- ation	Ratio of No. of measure- ments con- stituting each mean
2	Fauresmith	Wilgedraal 504	In donga	Ecca series	Shale	14	5.11"	208° 124°	-	-	1.33 1.00
3	Fauresmith	Rondefontein 99	In donga	Ecca series	Shale	5	3.10"	170° 266°	-	-	1.00 1.50
4	Jacobsdal	Du Toits dam 391	Side of road	Ecca series	Shale	9	3.56"	171° 250°	-	-	1.00 1.25
10	Fauresmith	Townlands 157	In stream	Ecca series	Shale	8	6.13"	269° 322°	-	-	1.66 1.00
11	Fauresmith	Kipersol 613	In stream	Ecca series	Shale	10	13.15"	182° 268°	-	-	1.00 1.50
13	Fauresmith	Brandewyns- kuil Coast 116	In stream	Ecca series	Shale	14	15.00"	214° 273°	-	-	3.70 1.00
15	Fauresmith	Kalkfontein 677	In donga	Ecca series	Shale	8	4.25"	251° 331°	-	-	3.00 1.00
16	Fauresmith	Schraal- fontein	In donga	Ecca series	Shale	15	6.30"	213° 316°	-	-	1.50 1.00
27	Bloemfontein	Uitvlugt West 2810	In Modder River	Ecca series	Shale	40	9.53"	253° 341°	211 653	15° 26°	1.00 1.50

Out- crop No.	District	Farm	Outcrop Description	Strati- graphic posi- tion	Constit- uent Material	No. of Measure- ments	Mean length of Fucoids	Arith- metic Means	Vari- ence	Stan- dard devi- ation	Ratio of No. of measure- ments con- stituting each mean
28	Brandfort	Lombards Drift 832	In Modder Riv	Ecca series	Shale	70	18.37"	242° 339°	1344 82	37° 9°	2.90 1.00
29	Brandfort	Dierhoek 410	In donga	Ecca series	Shale	7	4.43"	343° 270°	-	-	1.33 1.00
30	Brandfort	Wilhelmina 112	In stream	Ecca series	Shale	10	4.75"	311° 34°	-	-	1.50 1.00
37	Jacobsdal	Blaauwbanks Drift 195	In Riet River	Ecca series	Shale	14	5.64"	224° 143°	-	-	1.80 1.00
38	Boshof	Ryansdale 685	In Modder River	Ecca series	Shale	7	5.79"	336° 244°	-	-	1.00 1.33
40	Theunissen	Mond van Doorn Rivier 38	In Doring River	Ecca series	Shale	16	9.00"	288° 360°	-	-	1.00 1.30

STATISTICAL DATA ON PARTING LINEATIONS IN
THE NORTH-WESTERN PORTION OF THE BASIN

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent	No. Measurements	Mean Orientation	Remarks
18	Pauresmith	Lockshoek 192	In donga	Lowermost Beaufort	Medium sandstone	10	83°	
24	Bloefontein	Koppieskraal 407	Small hill	Lowermost Beaufort	Fine sandstone	10	8°	
72	Bothaville	Randfontein 154	Low ridge	Middle Ecca	Fine sandstone (beach deposit)	2	39°	Contains abundant heavy minerals
73	Bothaville	Broekmansfontein 535	Edge of pan	Middle Ecca	Fine sandstone (beach deposit)	5	39°	Contains abundant heavy minerals

STATISTICAL DATA ON RIPPLE MARKS IN THE
CAPE PROVINCE AND SOUTHERNMOST ORANGE FREE STATE

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	Symmetry of crests	No. Measurements	Mean Strike	Ripple Index
7	Peddie	Woodlands Fed.Q.23-5	Road cutting	Lower Ecca	Shale	Symmetrical	6	347°	9.77
9	Albany	Swampeters Aly.Q.15-30	Road cutting	Lower Ecca	Siltstone	Symmetrical	3	280°	5.19
10	Peddie	Tyefu's Location	Top of Committees Pass	Upper Ecca	Fine sand- stone	Symmetrical	5	293°	8.00
11	Albany	Lot PH Aly.Q.12-20	Cliff	Lower Ecca	Fine sand- stone	Symmetrical	5	349°	9.81
15	Albany	Lot A.G. Aly.Q.12-13	Sandstone ledge	Lower Ecca	Fine sand- stone	Symmetrical	3	80°	13.00
16	Albany	-	Side of road	Upper Ecca	Fine sand- stone	Symmetrical	4	292°	3.43
21	Albany	Wentzel Koeester	South bank of Fish River	Middle Ecca	Shale and sandstone	Asymmetrical	7	323°	-
23	Albany	Clifantskloof Aly.Q.15-10	In stream	Upper Ecca	Fine sand- stone	Symmetrical	6	348°	6.21
25	Albany	Uitkyk Aly.Q.3-41	In stream	Upper Ecca	Fine sand- stone	Symmetrical	3	48°	8.50

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	Symmetry of crests	No. Measurements	Mean Strike	Ripple Index
26	Bedford	Collisfontein Som.Q.5-45	In donga	Upper Ecc	Fine sandstone	Symmetrical	3	294°	4.80
27	Somerset East	Brakfontein Som.Q.18-2	In stream	Lower Ecc	Fine sandstone	Symmetrical	3	247°	16.67
28	Somerset East	Eriefontein Som.Q.6-53	Road cutting	Lower Ecc	Fine sandstone	Symmetrical	3	282°	9.70
33	Somerset East	Palmietfontein Som.Q.6-21	In donga	Upper Ecc	Fine sandstone	Symmetrical	3	111°	3.33
34	Somerset East	Rietfontein Som.Q.6-16	Road cutting	Upper Ecc (lowermost Beaufort)	Fine sandstone	Symmetrical	3	236°	2.67
35	Somerset East	Kruis Rivier Som.Q.6-13	In stream	Upper Ecc	Shales	Symmetrical	10	99°	4.22
36	Somerset East	Padderfontein Som.Q.6-14	In stream on side of road	Lower Ecc	Shales	Symmetrical	6	115°	5.05
37	Somerset East	Elipfontein	-	Lower Ecc	Fine sandstone	Symmetrical	3	33°	9.53
38	Somerset East	Volkers Rivier Som.Q.16-17	-	Upper Ecc	Fine sandstone	Symmetrical	3	124°	7.08
39	Somerset East	Volkers Rivier Som.Q.16-17	-	Middle Ecc	Shales	Symmetrical	6	107°	6.93

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	Symmetry of crests	No. Measurements	Mean Strike	Ripple Index
40	Somerset East	Bouwersfontein Som.Q.6-46	In donga	Upper Eccca	Fine sandstone	Symmetrical	5	102°	3.61
41	Somerset East	Welbedagt Som.Q.13-11	In Voels River	Upper Eccca	Shales	Symmetrical	2	99°	8.57
42	Somerset East	Vaal Krantz Som.Q.15-13	-	Upper Eccca	Fine sandstone	Symmetrical	5	105°	9.06
43	Jansenville	Welbevonden Uit.Q.4C.97	In donga	Upper Eccca	Fine sandstone	Symmetrical	5	110°	5.67
44	Jansenville	Draaihoek Jan.Q.7-10	-	Upper Eccca	Siltstone	Symmetrical	4	311°	9.43
45	Jansenville	Ganna Vlakte Uit.Q.4C.97	In stream	Upper Eccca	Fine sandstone	Symmetrical	10	251°	5.03
46	Jansenville	Kalkfontein Jan.Q.1-5	-	Upper Eccca	Shale	Symmetrical	5	90°	5.64
47	Jansenville	Verse Kraal	In Brak Rivier	Middle Eccca	Shale	Symmetrical	5	78°	19.53
49	Jansenville	Ganna Kraal	Palmiet Spruit	Middle Eccca	Shale	Symmetrical	6	325°	13.13
50	Jansenville	De Brokke Rivier Uit.Q.2-72	-	Upper Eccca	Shale	Symmetrical	3	104°	5.43

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	Symmetry of crests	No. Measurements	Mean Strike	Ripple Index
52	Jansen-ville	Klein Wolvenfontein Uit.Q.7-38	In Delports River	Upper Eccca	Siltstone	Symmetrical	4	82°	4.00
53	Jansen-ville	Klein Brak Rivier Uit.Q.2-28	In stream	Upper Eccca	Shale	Symmetrical	3	115°	4.00
54	Jansen-ville	Klein Brak Rivier Uit.Q.2-28	In Delports river	Upper Eccca	Shale and siltstone	Symmetrical	3	109°	4.12
55	Jansen-ville	Karoo Vlakke Uit.Q.10.56	Side of road	Upper Eccca	Shale	Symmetrical	3	308°	5.36
56	Jansen-ville	Zwart Rivier Jan.Q.4-18	In stream	Upper Eccca	Fine sandstone	Symmetrical	7	123°	5.47
57	Jansen-ville	Klipfontein Uit.Q.2-41	In stream	Lower Eccca	Fine sandstone	Asymmetrical	6	114°	6.03
58	Aberdeen	Hops Rivier GR.Q.13-1	In stream	Lower Eccca	Shale	Asymmetrical	8	88°	6.52
59	Aberdeen	Hops Rivier GR.Q.13-1	In stream	Lower Eccca	Shale and siltstone	Symmetrical	4	47°	9.29
60	Aberdeen	Hops Rivier Lot No. 17 GR.Q.13-41	In Hops River	Lowermost Beaufort	Fine sandstone	Symmetrical	2	127°	4.00
61	Willowmore	Hottentots River	Outcrop in river	Lowermost Beaufort	Fine sandstone	Symmetrical	4	74°	7.00

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	Symmetry of crests	No. Measurements	Mean Strike	Ripple Index
62	Willowmore	Grobbelaar Bf. Q. Q. 9-39	In Salt River	Upper Ecc	Shale and fine sandstone	Symmetrical	4	82°	5.95
65	Willowmore	Zoetendalsvlai F.A.Q. 1-36	In stream	Lower Ecc	Fine sandstone	Symmetrical	3	240°	7.47
67	Willowmore	Slabbertspoort W.E.Q. 2-9	In stream	Lower Ecc	Fine sandstone	Symmetrical	4	81°	4.76
70	Prince Albert	Modderdrift P.A.Q. 2-21	Road cutting	Lower Ecc	Shale and siltstone	Symmetrical	5	303°	7.91
72	Prince Albert	Jansens Kraal and Carolus Kraal Bf. W. Q. 6-33	In donga	Lower Ecc	Fine sandstone	Symmetrical	3	97°	3.64
74	Prince Albert	Rietfontein Bf. W. Q. 5-20	In stream	Lower Ecc	Fine sandstone	Symmetrical	10	338°	6.56
76	Prince Albert	Golwe Kraal Bf. W. Q. 5-23	Road cutting	Upper Ecc	Fine sandstone	Symmetrical	3	91°	5.88
78	Prince Albert	Swarte Bulletpiet Bf. W. Q. 5-24	Sandstone ledge	Upper Ecc	Fine sandstone	Symmetrical	4	342°	5.21
79	Prince Albert	Frans Kraal 1939-11-96	-	Upper Ecc	Fine sandstone	Symmetrical	3	270°	4.33
80	Prince Albert	Elandsberg and Jackalswater P.A.Q. 2-10	In donga	Upper Ecc	Siltstone	Symmetrical	6	83°	6.13

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	Symmetry of crests	No. Measurements	Mean Strike	Ripple Index
81	Prince Albert	Tuin Kraal and Riet Kraal Bf.W.Q.4-56	Road cutting	Lowermost Beaufort	Pine sandstone	Symmetrical	3	66°	12.71
82	Prince Albert	Plaaukrans Bf.W.Q.4-57	Road cutting	Upper Eccu	Shale	Symmetrical	3	82°	10.86
83	Laingsburg	Kettangs Hooft F.A.Q.4-6	Road cutting	Upper Eccu	Shale	Symmetrical	2	357°	11.15
84	Laingsburg	Leenders-Kraal Mor.Q.12-33	In donga	Upper Eccu	Shale	Symmetrical	3	96°	9.00
85	Laingsburg	Gemsbokfontein Gr.159/1928	Outcrop on hillside	Upper Eccu	Shale	Symmetrical	3	271°	10.00
86	Laingsburg	Brootfontein Mor.Q.12-46	In stream	Upper Eccu	Shale	Symmetrical	4	302°	5.52
87	Laingsburg	Grootfontein Mor.Q.12-46	In donga	Upper Eccu	Shale	Symmetrical	3	315°	8.17
88	Laingsburg	Faberskraal Mor.Q.18-45	In Geelbecks river	Upper Eccu	Pine sandstone	Symmetrical	5	147°	12.72
89	Laingsburg	Geelbecks-Kraal P.A.Q.2-1	Quarry	Middle Eccu	Shale	Symmetrical	4	107°	20.00

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	Symmetry of crests	No. Measurements	Mean Strike	Ripple Index
90	Laingsburg	Visch Kuil, etc. Mor. Q. 12-51	Road cutting	Lower Eccu	Shale	Asymmetrical	4	97°	23.23
91	Laingsburg	Visch Kuil, etc. Mor. Q. 12-51	Road cutting	Lower Eccu	Shale	Symmetrical	5	84°	10.09
92	Laingsburg	Doornkloof Mor. Q. 15-8	Road cutting	Lower Eccu	Fine sandstone	Symmetrical	7	282°	9.95
93	Laingsburg	Doornkloof Mor. Q. 15-8	Quarry	Lower Eccu	Shale	Symmetrical	3	184°	8.36
94	Laingsburg	Wilgenhoutfontein Mor. Q. 12-44	In stream	Middle Eccu	Shale and fine sandstone	Symmetrical	10	329°	8.29
95	Laingsburg	Wilgenhoutfontein Mor. Q. 12-44	Road cutting	Upper Eccu	Fine sandstone		3	343°	11.11
96	Laingsburg	Fortuin Mor. Q. 8-34	In donga	Lowermost Beaufort	Fine sandstone	Symmetrical	3	333°	16.00
99	Laingsburg	Hartjeskraal Mor. Q. 20-8	Cliff	Middle Eccu	Fine sandstone	Symmetrical	4	128°	12.75
100	Laingsburg	De Rante Mor. Q. 23-1	In stream	Lower Eccu	Shale and siltstone	Asymmetrical	7	160°	16.58
101	Laingsburg	Drie Koppen Mor. Q. 21-21	In stream	Lower Eccu	Shale and siltstone	Symmetrical	3	165°	16.88

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	Symmetry of crests	No. Measurements	Mean Strike	Ripple Index
102	Ceres	Bantamsfontein 1935.231	In donga	Middle Eccla	Siltstone	Symmetrical	3	105°	10.89
103	Ceres	Bantamsfontein 1935.231	Side of road	Middle Eccla	Fine sandstone	Symmetrical	4	127°	13.75
107	Sutherland	Bloemfontein Su.Q.3-15	In stream	Upper Eccla	Fine sandstone	Symmetrical	8	142°	13.81
108	Ceres	Thyskraal Cer.Q.2-4	In donga	Upper Eccla	Fine sandstone	Symmetrical	2	93°	11.80
109	Ceres	Thyskraal Cer.Q.2-4	Side of road	Upper Eccla	Fine sandstone	Symmetrical	5	161°	17.10
110	Ceres	Oude Muur Cer.Q.1-19	Road cutting	Upper Eccla	Fine sandstone	Symmetrical	3	171°	19.17
111	Ceres	Oude Muur Cer.Q.1-19	In donga	Upper Eccla	Fine sandstone	Symmetrical	3	176°	19.00
112	Ceres	Oude Muur Cer.Q.1-19	Side of road	Middle Eccla	Siltstone	Symmetrical	3	123°	14.00
113	Ceres	Pienaarsfontein Cer.Q.2-10	In stream	Middle Eccla	Shale and siltstone	Symmetrical	4	168°	13.09
114	Sutherland	De Hoop Su.Q.3-13	In Tanqua River	Upper Eccla	Fine sandstone	Symmetrical	2	178°	15.00
115	Sutherland	Waterval Su.Q.4-1	Road quarry	Middle Eccla	Shale and fine sandstone	Symmetrical	n	126°	14.38

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	Symmetry of crests	No. Measurements	Mean Strike	Ripple Index
116	Sutherland	Waterval Su. Q. 4-1	Gorge below waterfall	Middle Eccla	Shale	Symmetrical	8	141°	14.56
117	Sutherland	Tanqua Rivier Su. Q. 3-5	In stream	Middle Eccla	Shale	Symmetrical	4	150°	17.88
118	Sutherland	Klip Drift	In donga	Upper Eccla	Fine sandstone	Symmetrical	3	156°	7.75
119	Sutherland	Klipbanks Rivier Wor. Q. 20-1	Cliff	Upper Eccla	Fine sandstone	Symmetrical	3	253°	12.57
120	Sutherland	Blaauwewal Su. Q. 1-11	In Harthoek's River	Middle Eccla	Shale	Asymmetrical	3	112°	13.33
121	Sutherland	Bovenste wagen drift	West end of Koedoesberg	Middle Eccla	Fine sandstone	Symmetrical	4	136°	16.25
122	Sutherland	Leeu Kloof Su. Q. 2-1	In Kloof	Middle Eccla	Siltstone and fine sandstone	Symmetrical	10	146°	16.81
123	Sutherland	Langekloof Su. Q. 5-1	Cliffs	Middle Eccla	Fine sandstone	Symmetrical	10	175°	13.26
124	Calvinia	Kleinfontein	Top of Gannaga Pass	Upper Eccla	Fine sandstone	Symmetrical	10	159°	13.44
125	Calvinia	Gannaga Outspan 21-1950	Middle of Gannaga Pass	Middle Eccla	Fine sandstone	Symmetrical	3	15°	11.64

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	Symmetry of crests	No. Measurements	Mean Strike	Ripple Index
126	Calvinia	Kleinfontein Clv. Q. 9-2	Top of Gannaga Pass	Lowermost Beaufort	Siltstone	Symmetrical	8	79°	8.92
127	Calvinia	Blaauwkop Clv. Q. 16-5	Baviaanskop	Upper Ecc1	Fine sandstone	Symmetrical	4	159°	15.88
128	Calvinia	Klip Flaats Annexure Clv. Q. 29-11	Cliffs	Upper Ecc1	Shale and siltstone	Symmetrical	4	169°	20.86
129	Calvinia	Roodefontein Clv. Q. 2-31	Cliffs	Upper Ecc1	Shale and fine sandstone	Symmetrical	6	160°	17.09
130	Calvinia	Roodefontein Clv. Q. 2-31	Cliffs	Upper Ecc1	Fine sandstone	Symmetrical	10	158°	16.14
131	Calvinia	Aurets Kloof Clv. Q. 22-20	Cliffs	Upper Ecc1	Fine sandstone	Symmetrical	10	161°	16.40
132	Calvinia	Vitkomst Clv. Q. 2-35	Side of road	Upper Ecc1	Fine sandstone	Symmetrical	7	178°	18.33
133	Calvinia	Haugnes Clv. Q. 32-10	In stream	Upper Ecc1	Fine sandstone	Symmetrical	5	141°	12.79
134	Calvinia	Rietfontein Clv. Q. 2-26	Cliffs	Upper Ecc1	Fine sandstone	Symmetrical	8	155°	15.81
135	Calvinia	Albertfonteins Rugpens Clv. Q. 3-50	Cliffs	Upper Ecc1	Siltstone	Symmetrical	5	157°	18.80

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	Symmetry of crests	No. Measurements	Mean Strike	Ripple Index
136	Calvinia	Mierskloof Wor.Q.4-63	Cliffs	Upper Ecca	Fine sandstone	Symmetrical	8	139°	15.22
137	Calvinia	Driekuil 1947.70	Side of hill	Upper Ecca	Fine sandstone	Symmetrical	4	106°	12.58
138	Calvinia	Driekuil 1947.70	In stream	Middle Ecca	Shale	Symmetrical	2	94°	32.00
139	Calvinia	Groot Vloeren Clv.Q.13-37	Cliffs	Upper Ecca	Shale and fine sandstone	Symmetrical	8	164°	20.43
140	Calvinia	Leeuwenkuil Clv.Q.2-8	Sandstone ledge	Lowermost Beaufort	Fine sandstone	Symmetrical	8	169°	20.14
141	Calvinia	Hamburg 1929.140	Cliffs	Lowermost Beaufort	Fine sandstone	Symmetrical	4	166°	23.33
142	Williston	Rietfontein	Road cutting	Lowermost Beaufort	Fine sandstone	Symmetrical	4	171°	28.40
143	Williston	Lekker Leg Fr.Q.3-22	Road cutting	Lowermost Beaufort	Fine sandstone	Symmetrical	6	137°	15.46
144	Williston	Lunskloof Fr.Q.7-12	Road cutting	Lowermost Beaufort	Fine sandstone	Symmetrical	6	149°	15.09
145	Williston	Voorste var Zyls Plaats Fr.Q.8-7	In donga	Lowermost Beaufort	Fine sandstone	Symmetrical	6	145°	23.10

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	Symmetry of crests	No. Measurements	Mean Strike	Ripple Index
146	Williston	Springersburg Leege Fr. Q. 9-36	In donga	Upper Ecca	Shale	Symmetrical	4	183°	16.00
147	Williston	Elias Leege Fr. Q. 5-36	Side of hill	Upper Ecca	Fine sand- stone	Symmetrical	3	161°	16.50
148	Williston	Bakoven Fr. Q. 11-4	Cliffs	Upper Ecca	Fine sand- stone	Symmetrical	4	183°	15.88
149	Williston	Agterste van Zyls Plaats Fr. Q. 9-18	In stream	Upper Ecca	Shale	Symmetrical	2	190°	18.25
150	Williston	Ongetuiffontein Fr. Q. 9-13	Side of road	Lowermost Beaufort	Fine sand- stone	Symmetrical	3	122°	15.50
151	Williston	Vaalhoek Fr. Q. 1-24	Side of road	Lowermost Beaufort	Siltstone	Symmetrical	2	118°	20.00
152	Williston	Bloemfontein Fr. Q. 2-20	In donga	Lowermost Beaufort	Siltstone	Symmetrical	2	123°	28.00
155	Williston	Dassie Kloof Fr. Q. 3-15	In donga	Upper Ecca	Fine sand- stone	Symmetrical	3	180°	15.52
156	Williston	van Reenens Plaats Fr. Q. 1-11	In stream	Upper Ecca	Shale	Symmetrical	10	170°	18.17
157	Williston	Karreeboom Fr. Q. 3-1	In donga	Upper Ecca	Shale	Symmetrical	3	176°	21.80

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	Symmetry of crests	No. Measurements	Mean Strike	Ripple Index
158	Williston	Kareeboom Fr.Q.3-14	In donga	Upper Eccu	Fine sandstone	Symmetrical	4	154°	15.38
159	Williston	Klein Paarde Kloof Fr.Q.4-1	In donga	Upper Eccu	Fine sandstone	Symmetrical	5	127°	15.73
160	Williston	Ruitersfontein Fr.Q.2-16	In stream	Lowermost Beaufort	Fine sandstone	Symmetrical	3	95°	34.66
161	Williston	Drooge Puts	In donga	Lowermost Beaufort	Fine sandstone	Symmetrical	3	158°	18.50
162	Carnarvon	Klip Xalk Fr.Q.1-21	Side of road	Lowermost Beaufort	Fine sandstone	Symmetrical	2	165°	15.00
163	Carnarvon	Witfontein Car.Q.4-1	Side of road	Lowermost Beaufort	Shale and siltstone	Symmetrical	4	175°	16.89
164	Carnarvon	Witfontein Car.Q.4-1	Side of road	Lowermost Beaufort	Shale and siltstone	Symmetrical	4	160°	14.30
165	Carnarvon	Konka A 1936-157	Side of hill	Upper Eccu	Fine sandstone	Symmetrical	6	173°	18.27
166	Carnarvon	Klederenfontein Bf.W.Q.3-47	In donga	Lowermost Beaufort	Shale	Symmetrical	5	161°	16.40
167	Carnarvon	Carnarvon Commonage	Road cutting	Lowermost Beaufort	Fine sandstone	Symmetrical	6	164°	11.59
168	Carnarvon	Carnarvon Commonage	Sandstone ledge	Upper Eccu	Fine sandstone	Symmetrical	8	153°	20.53

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	Symmetry of crests	No. Measurements	Mean Strike	Ripple Index
169	Carnarvon	Rem Blaauw Krantz Bf.W.Q.3-63	Side of Hill	Lowermost Beaufort	Shale and fine sandstone	Symmetrical	6	162°	17.17
170	Carnarvon	Kareebosch Fontein Bf.W.Q.3-63	In stream	Upper Ecca	Fine sandstone	Symmetrical	6	144°	16.33
171	Carnarvon	Remainder of Lower Zwart-rand V.W.Q.1-24	Side of hill	Upper Ecca	Siltstone	Symmetrical	3	171°	18.40
172	Carnarvon	Upper Zwart-rand V.W.Q.1-24	In stream	Upper Ecca	Shale	Symmetrical	2	171°	-
173	Victoria West	Biesjes Dam	Aasvoelkop	Upper Ecca	Shale and siltstone	Symmetrical	4	132°	16.63
174	Victoria West	Pamponpoort V.W.Q.3-2	Side of road	Lowermost Beaufort	Fine sandstone	Symmetrical	8	113°	13.74
175	Victoria West	Pamponpoort V.W.Q.3-2	Side of road	Lowermost Beaufort	Fine sandstone	Symmetrical	6	164°	14.29
176	Victoria West	Biesjeskuil 888/1944	In stream	Lowermost	Fine sandstone	Symmetrical	5	141°	9.47
177	Victoria West	Riet Poort Bf.W.Q.2-56	In stream	Lowermost Beaufort	Fine sandstone	Symmetrical	2	60°	11.50

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	Symmetry of crests	No. Measurements	Mean Strike	Ripple Index
178	Victoria West	Vaark Fonteijn Bf.W.Q.2-38	In stream	Lowermost Beaufort	Fine sandstone	Symmetrical	8	136°	17.20
180	Victoria West	Volwekop V.W.Q.3-21	Near dam	Upper Ecca	Fine sandstone	Symmetrical	2	113°	29.50
181	Britstown	Daggafonteijn Bf.W.Q.23.45	Leebskop	Upper Ecca	Shale and fine sandstone	Symmetrical	10	162°	15.18
182	Victoria West	Lot 453 of Biesjes Dam Ric.Q.1-15	Cliff	Lowermost Beaufort	Fine sandstone	Symmetrical	8	165°	16.75
183	Richmond	Biesjes Dam Ric.Q.1-14	In donga	Lowermost Beaufort	Fine sandstone	Symmetrical	5	117°	11.89
184	Richmond	Schramfontein Ric.Q.5-6	Side of hill	Lowermost Beaufort	Fine sandstone	Symmetrical	3	115°	13.86
185	Richmond	Alleemans Combeis Ric.Q.1-20	-	Lowermost Beaufort	Fine sandstone	Symmetrical	4	166°	14.11
186	Britstown	Combeisfontein Co.Q.2-55	Quarry	Lowermost Beaufort	Shale	Symmetrical	10	145°	18.00
187	Britstown	Jackals Kuylen Co.Q.2-52	In gulch	Lowermost Beaufort	Shale	Symmetrical	4	161°	24.67
188	Britstown	Jackals Kuylen Co.Q.2-52	Cutting	Lowermost Beaufort	Fine sandstone	Symmetrical	2	1°	19.00

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	Symmetry of crests	No. Measurements	Mean Strike	Ripple Index
189	De Aar	Bosjesmans Fountain Co.Q.4-28	Side of road	Upper Ecca	Pine sandstone	Symmetrical	2	144°	17.50
190	Britstown	Twyfelhoek Co.Q.3-63	Quarry	Upper Ecca	Shale	Symmetrical	3	117°	20.40
191	De Aar	De Aar Ric.Q.3-11	Quarry	Upper Ecca	Shale	Symmetrical	8	133°	11.88
192	De Aar	Faarde Vley No. 1.Br.F. 1-1	Road Quarry	Upper Ecca	Shale	Symmetrical	8	155°	25.91
193	De Aar	Jackhals Fontein Co.Q.8-5	Cutting	Upper Ecca	Shale	Symmetrical	4	138°	17.25
194	De Aar	Weigegund Co.Q.5-97	Cutting	Upper Ecca	Shale	Symmetrical	4	136°	19.25
195	De Aar	Pienaars Kloof Ph.Q.1-10	-	Upper Ecca	Shale	Symmetrical	2	143°	32.00
196	Philipstown	Modderfontein Ph.Q.2-3	Side of road	Upper Ecca	Pine sand-	Symmetrical	3	147°	19.17
198	Phillips-town	Slingersfontein Ph.Q.1-16	In stream	Lowermost Beaufort	Shale	Symmetrical	6	64°	28.00
199	Phillips-town	Winkel Haak Ph.Q.1-9	Side of road	Lowermost Beaufort	Pine sandstone	Symmetrical	3	94°	7.00

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	Symmetry of crests	No. Measurements	Mean Strike	Ripple Index
200	Colesberg	Biscuitfontein Co.Q.3-19	In donga	Lowermost Beaufort	Shale	Symmetrical	7	125°	12.95
202	Colesberg	Schaapekraal Gr.Q.7-19	In donga	Ecca Series	Shale	Asymmetrical	16	135°	12.64
210	Philips-town	Rietvalley Co.Q.3-32	In stream	Lowermost Beaufort	Pine sandstone	Symmetrical	11	148°	8.75
211	Philippolis	Somersfontein 69	In donga	Lowermost Beaufort	Shale	Symmetrical	3	89°	9.67
213	Philippolis	Witzicht 185	In Knopsak river	Lowermost Beaufort	Pine sandstone	Asymmetrical	5	84°	7.14
214	Philippolis	Witfontein 39	Side of road	Lowermost Beaufort	Shale	Symmetrical	4	153°	5.00
215	Philippolis	Vrede 491	Road quarry	Lowermost Beaufort	Pine sandstone	Symmetrical	5	58°	6.40
216	Philippolis	Boezmansfontein 6	In donga	Lowermost Beaufort	Siltstone	Symmetrical	8	86°	4.24
217	Philippolis	Philippolis 143	Side of road	Lowermost Beaufort	Shale	Symmetrical	3	160°	3.33
219	Philippolis	Ctterpoort 243	In donga	Lowermost Beaufort	Siltstone	Symmetrical	8	99°	7.81

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	Symmetry of crests	No. Measurements	Mean Strike	Ripple Index
220	Philippolis	Groot Waaihoek 284	In donga	Lowermost Beaufort	Siltstone	Symmetrical	12	163°	5.27
222	Colesberg	Blaauw Krans Co. Q. 9-15	In van der Walts river	Lowermost Beaufort	Siltstone	Symmetrical	8	13°	3.56
224	Colesberg	Twyffels Poort Gr. Q. 7-26	In stream	Lowermost Beaufort	Shale	Symmetrical	20	159°	5.94
225	Colesberg	GannaLoek Gr. Q. 7-27	In donga	Lowermost Beaufort	Shale	Symmetrical	2	52°	7.69
226	Colesberg	Twyffels Poort Gr. Q. 7-26	In donga	Lowermost Beaufort	Shale	Symmetrical	5	15°	7.20
229	Trompsburg	Koortshoek 302	In donga	Lowermost Beaufort	Fine sandstone	Symmetrical	10	91°	6.70
230	Trompsburg	Koortshoek 302	In donga	Lowermost Beaufort	Fine sandstone	Symmetrical	5	56°	7.24

STATISTICAL DATA ON CROSS-BEDDING IN THE
CAPE PROVINCE AND SOUTHERNMOST ORANGE FREE STATE

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
1	East London	-	South bank of Buffalo river	Lowermost Beaufort	Fine sandstone	4	38°	0.99	21"
2	East London	-	Chalumna Pass	Middle Beaufort	Coarse sandstone and conglomerate	3	327°	0.63	
3	East London	Kidds Beach	Rocks along shore line	Middle Beaufort	Coarse sandstone and conglomerate	10	14°	0.38	21"
4	East London	Part No. 7 E.L.Q.5-7	Above Keiskamma river	Lowermost Beaufort	Fine sandstone	2	352°	0.75	
5	Peddle	Hazburg Commorage	South bank of Keiskamma river	Lowermost Beaufort	Fine sandstone	2	347°	0.80	
14	Albany	Lot A.1 Aly.Q.12-15	Road cutting	Lower Ecca	Fine sandstone	2	46°	0.98	
16	Albany	-	Road cutting	Upper Ecca	Fine sandstone	2	358°	0.99	
17	Albany	Thrive Farm Aly.Q.19-7	Road cutting	Upper Ecca	Fine sandstone	8	346°	0.49	18"

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
18	Albany	Lifford Aly.Q.20-7	Road cutting	Upper Eccca	Fine sandstone	3	338°	0.98	22"
19	Albany	Fontein Floot Aly.Q.10-5	Road cutting	Upper Eccca	Fine sandstone	4	32°	0.88	14"
22	Albany	Schele Drift Aly.Q.20-6	In donga	Upper Eccca	Fine sandstone	2	341°	0.98	27"
23	Albany	Olifants Kloof Aly.Q.16-10	In stream	Upper Eccca	Fine sandstone	3	2°	0.97	13"
24	Albany	Mountain top Aly.Q.10-58	Sandstone ledge	Upper Eccca	Fine sandstone	3	19°	0.97	24"
26	Bedford	Collisfontein Som.Q.5-45	In stream	Upper Eccca	Fine sandstone	3	9°	0.97	17"
29	Bedford	Caffirs Kloof Som.Q.3-24	In donga	Upper Eccca	Fine sandstone	5	347°	0.68	15"
30	Somerset East	Middleton Som.Q.16-12	Road cutting	Upper Eccca	Fine sandstone	8	349°	0.84	22"
32	Somerset East	Palmietfontein Som.Q.6-21	In donga	Upper Eccca	Fine sandstone	2	355°	0.65	19"

Out- crop No.	District	Farm	Outcrop Description	Strati- graphic position	Constituent Material	No. Measure- ments	Vectoral Mean	Consis- tency Ratio	Mean thickness of Planar Cross-bedded units
48	Jansenville	Driekops Vley East Jan.Q.2-17	In Driekops River	Lowermost Beaufort	Fine sand- stone	3	344°	0.95	
71	Prince Albert	Modderdrift P.A.Q.2-21	In stream	Lower Ecca	Fine sand- stone	2	35°	0.98	
75	Prince Albert	Prince Albert Commonage Bf.W.Q.5-5	Prince Albert hill	Upper Ecca	Fine sand- stone	3	316°	0.97	16"
97	Laingsburg	Barendskraal Wor.Q.8-57	Cliff	Upper Ecca	Fine sand- stone	4	86°	0.65	20"
98	Laingsburg	Barendskraal Wor.Q.8-57	Cliff	Upper Ecca	Fine sand- stone	4	89°	0.98	72"
104	Ceres	Gats Rivier	Cliff	Upper Ecca	Fine sand- stone	3	89°	0.97	20"
106	Sutherland	Wind Heuvel Su.Q.4-10	Cliff	Upper Ecca	Fine sand- stone	4	333°	0.93	20"
153	Williston	Boega Fr.Q.11-23	In stream	Lowermost Beaufort	Fine sand- stone	8	54°	0.98	
154	Williston	Oest	In stream	Lowermost	Fine sand- stone	5	32°	0.94	
179	Victoria	Graanvoegel Vley V.Q.11-33	In Brok River	Upper Ecca	Fine sand- stone	6	54°	0.98	

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
201	Colesberg	Kuipersfontein G.R.Q.7-15	In Seekoel river	Lowermost Beaufort	Fine sandstone	8	338°	0.86	8"
218	Philippolis	Philippolis 143	Cliff	Lowermost Beaufort	Medium sandstone	4	308°	0.99	18"
221	Colesberg	Kietbult G.R.Q.7-29	Sandstone ledge	Lowermost Beaufort	Fine sandstone	6	74°	0.87	16"
223	Colesberg	Blaauwkrans Co.Q.9-15	Cliff	Lowermost Beaufort	Medium sandstone	4	78°	0.99	
227	Colesberg	Schaape kraal G.R.Q.7-19	Sandstone ledge	Lowermost Beaufort	Medium sandstone	3	34°	0.93	
228	Colesberg	Schaape kraal G.R.Q.7-19	Cliff above Seekoel river	Upper Ecca	Fine sandstone	3	65°	0.87	7"

STATISTICAL DATA ON GROOVE CASTS IN THE
CAPE PROVINCE AND SOUTHERNMOST ORANGE FREE STATE

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Mean Orientation	Remarks
6	Peddie	Gnusha Poort Ped.Q.22-25	Road cutting	Lower Ecca	Siltstone	6	74°	
8	Peddie	Hoggsback Ped.Q.1-3	Along shore-line	Lower Ecca	Siltstone	3	72°	
12	Albany	Lot A.H. Aly.Q.12-14	Road cutting	Lower Ecca	Siltstone	10	40°	
13	Albany	Lot A.L. Aly.Q.12-15	Road cutting	Lower Ecca	Siltstone	3	72°	
20	Albany	Jordaans Kraal Aly.Q.3-36	Cliff	Lower Ecca	Siltstone	7	354°	
59	Aberdeen	Hops Rivier Gr.Q.131	In stream	Lower Ecca	Fine sandstone	12	331°	
63	Willowmore	Slabberts Poort Estate 1931-53	Small hill	Lower Ecca	Siltstone	12	5°	
64	Willowmore	Zoetendals Vlei P.A.Q.1-36	In stream	Lower Ecca	Siltstone	5	271°	
66	Willowmore	Schilpads Vlaakte Lot 2 Wm.Q.2-1	In stream	Lower	Siltstone	4	84°	

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Mean Orientation	Remarks
68	Prince Albert	Riet Kuil P.A.Q.3-4	Side of road	Lower Ecca	Siltstone	3	107°	
69	Prince Albert	Klipgat P.A.Q.67	In stream	Lower Ecca	Siltstone	10	82°	
73	Prince Albert	Groot Tygerberg	Road cutting	Lower Ecca	Fine sand- stone	3	353°	
77	Prince Albert	Swart Bullette Bf.W.Q.5-24	Road cutting	Lower Ecca	Siltstone	4	336°	

STATISTICAL DATA ON PARTING LINEATIONS IN
THE CAPE PROVINCE AND SOUTHERNMOST ORANGE FREE STATE

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Mean Orientation	Remarks
31	Somerset East	Botha's Baaken Som.Q.17-28	In quarry	Upper Eccra	Fine sand-stone	6	336°	
33	Somerset East	Palmietfontein	In donga	Upper Eccra	Fine sand-stone	5	38°	
51	Jansenville	Jansenville Commonage	Below Sundays river bridge	Lowermost Beaufort	Fine sand-stone	3	360°	
105	Sutherland	Wind Heuvel Su.Q.4-10	In stream	Upper Eccra	Fine sand-stone	3	53°	

STATISTICAL DATA ON FUCOID STRUCTURES IN THE
CAPE PROVINCE AND SOUTHERNMOST ORANGE FREE STATE

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Mean length of Fucoids	Arithmetic mean	Standard Deviation	Ratio of No. of measurements constituting each mean
197	Philipstown	Slagtkraal Ph.Q.2-10	In stream	Ecca Series	Shale	11	16.32"	194° 119°	-	1.80 1.00
203	Colesberg	Bultfontein Gr.Q.7-18	In Seekoei river	Ecca Series	Shale	20	6.15"	285° 24°	-	2.33 1.00
204	Colesberg	Deerde Poort Gr.Q.7-20	In stream	Ecca Series	Shale	10	6.38"	272° 335°	-	1.00 2.33
205	Colesberg	Deerde Poort Gr.Q.7-20	In donga	Ecca Series	Shale	6	10.25"	274° 356°	-	2.00 1.00
206	Colesberg	Doorn Kloof Gr.Q.7-22	In donga	Ecca Series	Shale	5	6.20"	273° 346°	-	1.00 1.50
207	Colesberg	Broederstroom Co.Q.3-30	In donga	Ecca Series	Shale	7	5.36"	200° 207°	-	2.10 1.00
208	Colesberg	Kattegat Co.Q.3-29	In donga	Ecca Series	Shale	6	5.00"	259° 351°	-	1.00 1.00
209	Colesberg	Kattegat Co.Q.3-29	In stream	Ecca Series	Shale	6	5.93"	220° 325°	-	1.00 1.00

Out- crop No.	District	W. T.	Outcrop Description	Strati- graphic position	Constit- uent Material	No. of Measure- ments	Mean length of Fucoids	Arith- metic Means	Vari- ence	Stan- dard Devia- tion	Ratio of No. of measure- ments con- stituting each mean
212	Philippolis	Bloedfontein 120	In stream	Ecca Series	Shale	5	8.20"	253° 167°	-	-	1.00 1.50

STATISTICAL DATA ON CROSS-BEDDING IN THE
EASTERN PORTION OF THE KAHROO BASIN

Out- crop No.	District	Farm	Outcrop Description	Strati- graphic position	Constituent Material	No. of Measure- ments	Vectoral Mean	Consis- tency Ratio	Mean thickness of Planar Cross-bedded units
1	Umvoti	Mount Ernestene 1802	Cutting	Middle Ecca	Medium sandstone	4	163°	0.96	
2	Umvoti	Rust 1112	Cutting	Middle Ecca	Coarse- medium sandstone	4	217°	0.99	
3	Umvoti	Bankfontein	Side of hill	Middle Ecca	Coarse sandstone	5	164°	0.62	
4	Umvoti	Rustenburg 1116	Above Umvoti river	Middle Ecca	Coarse fels- pathic sand- stone	7	205°	0.96	15"
5	Estcourt	-	Side of road	Lowermost Beaufort	Medium sandstone	3	295°	0.97	
6	Lions River	Wellington 2212	Road cutt- ing	Lowermost Beaufort	Medium sandstone	3	2°	0.97	
7	Estcourt	Estcourt Townlands	In Bushmans river	Lowermost Beaufort	Medium sandstone	5	240°	0.92	
8	Pietermar- itzburg	Otto's Bluff 15013	Cliffs	Middle Ecca	Coarse sandstone	6	144°	0.98	66"

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
9	Pietermaritzburg	Pietermaritzburg Townlands	Cliffs on Town hill	Middle Ecga	Coarse sandstone	7	246°	0.98	22"
10	Pietermaritzburg	Pietermaritzburg Townlands	Sweet waters quarry	Middle Ecga	Coarse sandstone	6	264°	0.57	25"
11	Mpendle	Elandschoek 1024	Side of road	Lowermost Beaufort	Medium sandstone	5	282°	0.78	
12	Pietermaritzburg	Zwart Kop Native Location	Road cutting	Middle Ecga	Coarse sandstone	4	179°	0.90	
13	Pietermaritzburg	Zwart Kop Native Location	Road cutting	Middle Ecga	Coarse sandstone	10	278°	0.97	4"
14	Richmond	Drie Fontein 854	Road cutting	Middle Ecga	Medium sandstone	4	206°	0.98	15"
15	Richmond	Dunbar Estate 1478	Road cutting	Middle Ecga	Medium sandstone	5	223°	0.94	
16	Richmond	Weltevreden 1298	In stream	Middle Ecga	Medium sandstone	6	222°	0.67	26"
17	Richmond	Roselands 13833	Above waterfall	Middle Ecga	Medium sandstone	3	240°	0.98	"

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
18	Ixopo	-	Hele-Hele pass	Middle Ecca	Coarse sandstone	4	210°	0.80	
19	Ixopo	-	Hele-Hele pass	Middle Ecca	Coarse sandstone	10	247°	0.72	20"
20	Underberg	-	Side of road	Lowermost Beaufort	Medium sandstone	3	245°	0.97	
21	Underberg	-	Road cutting	Middle Beaufort	Medium sandstone	3	337°	0.97	
22	Polela	Location No. 2	Sandstone ledge	Lowermost Beaufort	Coarse sandstone	3	246°	0.83	
23	Inanda	Tongaat Beach	Along shore-line	Middle Ecca	Fine-medium sandstone	8	326°	0.84	6.5"
24	Inanda	Cenozana Beach	Along shore-line	Middle Ecca	Fine-medium sandstone	5	322°	0.82	15.0"
25	Inanda	-	South bank of Umhloti river	Middle Ecca	Coarse grit and sandstone	3	230°	0.97	21.0"
26	Inanda	Umkhanga Rocks	Rocks along beach	Middle Ecca	Coarse grit and sandstone	14	252°	0.91	26.4"

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded Units
27	Inanda	Duffs Road	Railway cutting	Middle Eccca	Coarse sandstone	6	223°	0.50	15.0"
28	Inanda	Zeekoe Valley 787	Quarry	Middle Eccca	Coarse sandstone	7	123°	0.83	21.0"
29	Umlazi	Umnini Location 1788	Rocks along shoreline	Middle Eccca	Coarse grained sandstone	14	283°	0.94	16.0"
30	Ixopo	-	Above Qunu Falls	Middle Eccca	Medium sandstone	5	137°	0.54	10.0"
31	Ixopo	Cassington 4287	Road cutting	Middle Eccca	Medium sandstone	2	229°	0.85	11.0"
32	Ixopo	-	Road cutting	Middle Eccca	Coarse felspathic sandstone	5	196°	0.98	10.0"
33	Umzimkulu	-	Road cutting	Middle Eccca	Coarse sandstone	2	207°	0.80	13.5"
34	Umzimkulu	-	Road cutting	Middle Eccca	Coarse sandstone	5	151°	0.86	9.0"
35	Umzimkulu	Location No. 23	Road cutting	Middle Eccca	Coarse sandstone	4	220°	0.95	12.0"

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
36	Alfred	The Uplands 7885	Road cutting	Middle Ecca	Medium sandstone	3	230°	0.93	7.0"
37	Kokstad	Zuurfontein G.E.Q.1-13	In stream	Lowermost Beaufort	Fine sandstone	3	277°	0.97	
38	Port Shepstone	Sea Park	Side of hill	Middle Ecca	Fine-medium sandstone	2	248°	0.85	
39	Mount Frere	Rode Location No. 28	Road cutting	Lowermost Beaufort	Medium sandstone	3	305°	0.98	
40	Mount Frere	Mount Frere Commorage	Road cutting	Middle Beaufort	Medium-coarse sandstone	5	36°	0.98	
41	Qumbu	Lwandlana Location No. 32	Road cutting	Middle Beaufort	Medium sandstone	3	330°	0.97	
42	Qumbu	Qumbu Commorage 102	Road cutting	Middle Beaufort	Medium sandstone	4	27°	0.90	
43	Tsoilo	Mbokotwana Location No. 3	South bank of Tsitsa river	Middle Beaufort	Medium sandstone	4	322°	0.95	
44	Libode	Sibangweni Location No. 9	Road cutting	Lowermost Beaufort	Fine sandstone	3	353°	0.98	

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
45	Umtata	Umtata Common-are 912 Umt. F.2-5	Cliff	Lowermost Beaufort	Fine sandstone	4	325	0.85	
47	Ngqeleni	Mpoza Location No. 43	Road cutting	Ecca Series	Siltstone	2	55°	0.98	10.5"
50	Ngqeleni	Lucingweni Location No.	Road cutting	Lowermost Beaufort	Medium sandstone	10	83°	0.93	16.0"
54	Lusikisiki	Lower Ntafufu Location No. 35	Rocks along shoreline	Lowermost Beaufort	Fine sandstone	4	32°	0.93	
55	Port St. John's	Port St. John's Commonage	1st Beach	Lowermost Beaufort	Medium sandstone	3	60°	0.93	24.0"
58	Elliotdale	Hobeni Location No. 27	Rocks along shoreline	Ecca Series	Fine sandstone	5	344°	0.62	18.5"
59	Kentani	Geina Location No. 12	Rocks along shoreline	Lowermost Beaufort	Fine sandstone	7	11°	0.77	17.5"
60	Willowvale	Ntlabane Location No. 10	Sandstone ledge	Lowermost Beaufort	Fine sandstone	3	6°	0.77	

Outcrop No.	District	Part	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-Bedded units
61	Willowvale	Nqadu Location No. 9	Sandstone ledge	Lowermost Beaufort	Fine sandstone	3	339°	0.77	
63	Elliotdale	Shelora Location No. 36	Left bank of Pesho river	Ecca Series	Fine sandstone	2	324°	0.99	14.0"
64	Elliotdale	Xora Location No. 20	In Xora river	Lowermost Beaufort	Fine sandstone	7	351°	0.86	
65	Kentani	Shelora Location No. 47	Rocks along shoreline	Middle Beaufort	Medium-coarse sandstone	12	299°	0.92	20.0"
66	East London	Glen Garrif Beach	Rocks along shoreline	Middle Beaufort	Medium-coarse sandstone	5	331°	0.86	
67	East London	-	Road cutting	Middle Beaufort	Medium-coarse sandstone	3	6°	0.90	
68	Zongga	-	South bank of the Kei river	Lowermost Beaufort	Fine sandstone	5	286°	0.80	

STATISTICAL DATA ON PARTING LINEATIONS IN THE
EASTERN PORTION OF THE KARROO BASIN

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Mean Orientation.	Remarks
46	Port St. Johns	Ntsimbini Location No. 3	Road quarry	Ecca Series	Shale	2	211°	
49	Ngqeleni	Lower Ndu- ganyeni Loca- tion No. 47	Side of road	Lowermost Beaufort	Medium sandstone	4	176°	
53	Lusikisiki	Lower Ntatafu Location No. 35	Quarry	Ecca Series	Shale	8	212°	
56	Nganduli	Ntonjane loca- tion No. 18	Rocks along shoreline	Ecca Series	Shale and siltstone	3	319°	

STATISTICAL DATA ON GROOVE CASTS IN THE
EASTERN PORTION OF THE KARROO BASIN

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Mean Orientation	Remarks
51	Mquanduli	Lower Nenga Location No. 19	Cliffs along shoreline	Ecca Series	Siltstone and shale	12	312°	Prod casts also present.
52	Mquanduli	Lower Nenga Location No. 19	Cliffs along shoreline	Ecca Series	Siltstone	10	18°	Prod casts also present.
57	Elliotdale	Mncwasa Location No. 1	Mboiomo Point	Ecca Series	Siltstone	3	350°	
62	Willowvale	Gakazana Location No. 23	Road cutting	Ecca Series	Siltstone	3	291°	

STATISTICAL DATA ON RIPPLE MARKS IN THE
EASTERN PORTION OF THE KARROO BASIN

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	Symmetry of crests	No. of Measurements	Mean Strike	Ripple Index
48	Mogeloni	Intsimbini Location No. 48	In donga	Lowermost Beaufort	Fine sandstone	Symmetrical	4	237°	4.20
54	Lusikisiki	Lower Ntsufu Location	Rocks along shoreline	Lowermost Beaufort	Siltstone	Symmetrical	2	190°	6.00

STATISTICAL DATA ON CROSS-BEDDING IN THE
NORTH-EASTERN PORTION OF THE BASIN

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
1	Dundee	-	Cutting	Below coal zone	Coarse sandstone and grit	10	178°	0.59	92"
2	Musaga	Kliprivier Location 1072	In stream	Below coal zone	Coarse-medium sandstone	26	160°	0.78	20"
3	Dundee	Uithoek 1078	In stream	Below coal zone	Coarse grit and sandstone	15	229°	0.91	27"
4	Dundee	Uithoek 1078	In stream	Below coal zone	Coarse sandstone	1	248°	-	-
5	Dundee	Vermaakskraal 1124	In stream	Below coal zone	Coarse grit and sandstone	6	202°	0.93	-
6	Dundee	Vermaakskraal 1124	In stream	Below coal zone	Coarse grit and sandstone	15	207°	0.60	-
7	Dundee	Verseleger 1157	In stream	Below coal zone	Coarse sandstone	5	196°	0.96	34"

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
8	Dundee	Uitval 1244	quarry	Below coal zone	Coarse sandstone	7	194°	0.89	-
9	Dundee	Goede Keuse 1066	in stream	Below coal zone	Medium sandstone	3	161°	0.90	8"
10	Dundee	Goede Keuse 1066	in spruif	Below coal zone	Medium sandstone	5	158°	0.98	-
11	Dundee	Goede Keuse 1066	stream	Below coal zone	Coarse-Medium sandstone	5	204°	0.98	-
12	Dundee	Uitval 1244	side of road	Below coal zone	Medium sandstone	5	181°	0.58	11"
13	Dundee	Vaal Kop 1164	side of road	Below coal zone	Medium sandstone	6	150°	0.63	-
14	Dundee	Vaal Kop 1164	in Waschbark river	Below coal zone	Coarse sandstone	14	229°	0.88	14"
15	Dundee	Uitvlucht 1155	side of road	Below coal zone	Coarse sandstone and grit	11	106°	0.98	42"
16	Dundee	Uitvlucht 1156	stream	Below coal zone	Coarse sandstone	5	195°	0.92	-

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
17	Dundee	Uitvlucht 1156	Small hill	Below coal zone	Coarse sandstone	13	295°	0.92	32"
18	Dundee	Uitvlucht 1156	In stream	Below coal zone	Coarse sandstone	7	166°	0.81	-
19	Dundee	Uitvlucht 1156	In stream	Below coal zone	Coarse sandstone	7	221°	0.89	-
20	Kliprivier	Opmerksaamheid 1394	Side of road	Below coal zone	Coarse sandstone	8	190°	0.98	-
21	Kliprivier	Olifants Kop 1259	In donga	Below coal zone	Medium sandstone	5	208°	0.44	-
22	Kliprivier	Opmerksaamheid 1394	In stream	Below coal zone	Coarse sandstone and grit	15	260°	0.78	-
23	Kliprivier	Olifants Kop 1259	In donga	Below coal zone	Fine sandstone	9	299°	0.64	-
24	Dundee	Petronella	In donga	Below coal zone	Coarse sandstone and grit	15	253°	0.95	-
25	Dundee	Kiekerks Kraal 1167	Cutting	Above coal zone	Coarse sandstone and grit	10	178°	0.33	73"

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
26	Dundee	Niekerks Kraal 1167	In stream	Above coal zone	Coarse sandstone	11	176°	0.76	18"
27	Dundee	Kleine Water-val 1125	In stream	Below coal zone	Coarse sandstone	15	219°	0.93	120"
28	Dundee	Klipfontein	In stream	Below coal zone	Coarse sandstone	10	147°	0.91	-
29	Dundee	Kuick Vlei Settlement 12751	In stream	Below coal zone	Fine sandstone	6	202°	0.78	-
30	Dundee	Zuick Vlei Settlement	Small hill	Below coal zone	Coarse sandstone	5	210°	0.98	120"
31	Dundee	Verdruk 2080	In stream	Below coal zone	Coarse sandstone	8	154°	0.84	32"
32	Dundee	Krants-Kop 1065	In stream	Below coal zone	Coarse sandstone	10	172°	0.95	120"
33	Dundee	Goedekeuse 1066	In spruit	Below coal zone	Coarse sandstone	7	188°	0.83	18"
34	Dundee	Paarde Berg 1068	Cliffs	Coal zone	Fine-medium sandstone	3	236°	0.97	7"

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
35	Dundee	Paarde Berg 1068	In donga	Coal zone	Coarse-medium sandstone	10	185°	0.91	
36	Dundee	Paarde Berg 1069	In donga	Above coal zone	Fine-medium sandstone	13	191°	0.81	8"
37	Dundee	Paddafontein 3214	Road cutting	Above coal zone	Coarse sandstone	8	218°	0.94	72"
38	Dundee	Kuick Vlei 1396	In Waschbank River	Below coal zone	Medium sandstone	3	85°	0.60	
39	Dundee	Kuick Vlei 1396	In stream	Below coal zone	Fine-medium sandstone	3	216°	0.97	
40	Dundee	Kleine Water-val 1125	Cliffs	Below coal zone	Fine-medium sandstone	10	234°	0.83	
41	Kliprivier	Kleinfontein 1262	Quarry	Above coal zone	Medium sandstone	5	255°	0.78	
42	Kliprivier	Plat Berg 1241	In stream	Above coal zone	Fine-medium sandstone	5	237°	0.82	
43	Kliprivier	Plat Berg 1241	In stream	Above coal zone	Coarse sandstone and grit	5	238°	0.96	14"
44	Kliprivier	Elandslaagte 1239	In stream	Above coal zone	Coarse sandstone and grit	8	277°	0.79	

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
45	Kliprivier	Roo de Poort 1045	Road cutting	Above coal zone	Coarse sandstone	5	220°	0.96	40"
46	Kliprivier	Plat Berg 1241	In stream	Above coal zone	Coarse sandstone and grit	5	281°	0.48	9"
47	Kliprivier	Stein Coal Spruit 1171	In stream	Above coal zone	Coarse sandstone	9	283°	0.52	33"
48	Kliprivier	Stein Coal Spruit 1171	In stream	Above coal zone	Coarse sandstone and grit	6	298°	0.88	33"
49	Kliprivier	Stein Coal Spruit 1171	In stream	Above coal zone	Coarse sandstone and grit	10	331°	0.94	21"
50	Kliprivier	Stein Coal Spruit 1171	In stream	Above coal zone	Coarse sandstone	11	259°	0.92	18"
51	Dundee	Mooispruit 2398	Sandstone ledge	Above coal zone	Coarse sandstone	6	283°	0.28	
52	Dundee	Lyell 2398	In stream	Above coal zone	Coarse sandstone and grit	10	153°	0.92	13"

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
53	Dundee	Mooispruit 2398	Side of road	Above coal zone	Coarse sandstone and grit	8	283°	0.97	12"
54	Kliprivier	Stein Coal Spruit 1171	In donga	Above coal zone	Medium sandstone	3	153°	0.93	
55	Dundee	Bosch Kloof 1073	Sandstone ledge	Above coal zone	Fine sandstone	4	174°	0.95	
56	Kliprivier	Waterkloof 4244	In stream	Above coal zone	Coarse sandstone	9	218°	0.92	
57	Newcastle	Quaggas Kirk	In stream	Above coal zone	Coarse sandstone	5	174°	0.96	
58	Newcastle	One Tree Hill 3301	Cliffs	Lowermost Beaufort	Medium sandstone	12	210°	0.84	36"
59	Newcastle	Waaq Alles 8899	In stream	Above coal zone	Medium sandstone	3	228°	0.90	28"
60	Dundee	Burnside 8287	Cliffs	Lowermost Beaufort	Medium sandstone	10	209°	0.80	44"
61	Dundee	Burnside 8287	In stream	Above coal zone	Coarse sandstone	5	261°	0.90	

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
62	Dundee	Burnside 8287	Busi river	Below coal zone	Coarse sandstone and grit	11	217°	0.71	18"
63	Dundee	Uithoek 1335	In donga	Above coal zone	Fine sandstone	5	253°	0.94	12"
64	Dundee	Uithoek 1335	In donga	Coal zone	Coarse sandstone and grit	8	214°	0.71	
65	Dundee	Uithoek 1335	In stream	Below coal zone	Medium sandstone	6	202°	0.90	19"
66	Dundee	Uithoek 1335	In Busi river	Below coal zone	Coarse sandstone and grit	6	157°	0.53	12"
67	Dundee	Biggarsgat 12753	In stream	Below coal zone	Coarse sandstone and grit	11	314°	0.88	23"
68	Dundee	Biggarsgat 12753	Cutting	Coal zone	Coarse sandstone	12	209°	0.80	28"
69	Dundee	Uithoek 1335	In donga	Above coal zone	Coarse sandstone	3	222°	0.80	18"
70	Dundee	Boschfontein 3307	Cliffs	Lowermost Beaufort	Medium sandstone	32	134°	0.83	25"

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
71	Dundee	Fair Play 4261	Sandstone ledges	Below coal zone	Coarse sandstone and grit	18	218°	0.83	31"
72	Dundee	Fair Play 2465	In stream	Below coal zone	Coarse sandstone and grit	30	210°	0.96	13"
73	Dundee	Fair Play 4261	Cutting	Below coal zone	Coarse sandstone	5	200°	0.98	28"
74	Dundee	Fair Play 4261	Cutting	Below coal zone	Coarse sandstone	16	170°	0.92	
75	Dundee	Dundee 4339	In Steenkool Spruit	Below coal zone	Coarse sandstone	12	186°	0.92	31"
76	Dundee	Craigside 2272	Side of hill	Below coal zone	Coarse sandstone	12	207°	0.88	
77	Dundee	Craigside 2272	In stream	Below coal zone	Coarse sandstone	5	224°	0.96	
78	Newcastle	Driehoek 9171	In donga	Below coal zone	Coarse sandstone	6	281°	0.87	13"
79	Newcastle	Cardwell 4340	Cliffs on Krantz Kop	Lowermost Beaufort	Fine-medium sandstone	9	140°	0.86	19"

Out-crop No.	District	Part	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
80	Newcastle	Drie-hoek 9171	In stream	Above coal zone	Medium sandstone	6	225°	0.87	
81	Dundee	Davelsfontein 4348	In river	Below coal zone	Coarse sandstone	3	239°	0.93	
82	Dundee	Alleta 4350	In stream	Below coal zone	Fine sandstone	6	193°	0.52	
83	Dundee	Morgenstond 3347	In stream	Below coal zone	Medium sandstone	4	170°	0.92	10"
84	Dundee	Davelsfontein 4348	In donga	Below coal zone	Coarse sandstone and grit	12	177°	0.95	
85	Dundee	Porfar 4473	In stream	Below coal zone	Coarse sandstone	2	135°	0.95	12"
86	Dundee	Cotswold 4332	Road cutting	Below coal zone	Coarse sandstone	7	183°	0.76	120"
87	Dundee	Van Rooyan 4252	In Sandspuit	Below coal zone	Coarse sandstone	5	226°	0.98	
88	Dundee	Van Hooyan 4252	In spruit	Below coal zone	Coarse sandstone	2	139°	0.95	
89	Dundee	Dalry 2413	In donga	Coal zone	Coarse sandstone	10	224°	0.79	29"

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectorial Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
90	Dundee	Dalry 2413	In stream	Below coal zone	Coarse sandstone	9	209°	0.89	7"
91	Dundee	Hazeldene 12649	In donga	Coal zone	Coarse sandstone and grit	17	209°	0.79	24"
92	Dundee	Sunshine Farm 4450	In donga	Below coal zone	Coarse sandstone	14	114°	0.96	
93	Dundee	Sunshine Farm 4450	In donga	Below coal zone	Coarse sandstone	3	347°	0.97	70"
94	Dundee	Winkle 5054	In stream	Below coal zone	Coarse sandstone	5	211°	0.94	6"
95	Dundee	Mursling 4495	Mlungwane Hill	Below coal zone	Coarse sandstone	9	163°	0.87	6"
96	Dundee	Langfontein 2397	Top of Hill	Above coal zone	Coarse sandstone	31	163°	0.84	
97	Dundee	Matatana 13024	Cliffs	Below coal zone	Coarse sandstone	10	180°	0.71	28"
98	Dundee	Matatana 13024	In stream	Below coal zone	Coarse sandstone and grit	13	173°	0.98	

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
99	Dundee	Overton 3315	In stream	Below coal zone	Coarse sandstone and grit	11	136°	0.95	
100	Dundee	Menteith 3328	In stream	Below coal zone	Coarse sandstone	13	159°	0.93	80"
101	Dundee	Menteith 3328	Bank of Buffalo river	Below coal zone	Coarse sandstone	5	202°	0.96	240"
102	Utrecht	Krisfontein 112	In stream	Below coal zone	Medium sandstone	9	223°	0.87	
103	Dundee	Prestwick 2415	Cutting	Below coal zone	Medium sandstone	2	83°	0.90	60"
104	Utrecht	De Jagers-drift North 12852	In river	Below coal zone	Coarse sandstone	9	218°	0.91	120"
105	Utrecht	Rietvlei 101	Side of road	Below coal zone	Coarse sandstone	7	213°	0.96	24"
106	Utrecht	Rietvlei 101	Bank of Buffalo river	Below coal zone	Medium sandstone	11	195°	0.92	53"
107	Utrecht	De Jagersdrift North 12852	In stream	Below coal zone	Coarse grit and sandstone	5	139°	0.98	55"

Out- crop No.	District	Farm	Outcrop Description	Strati- graphic position	Constituent Material	No. of Measure- ments	Vectoral Mean	Consis- tency Ratio	Mean thickness of Planar Cross-bedded units
108	Utrecht	De Jagersdrift North 12852	In stream	Below coal zone	Medium sand- stone	9	155°	0.76	7"
109	Utrecht	Nooitgedacht 60	In stream	Below coal zone	Coarse sand- stone	5	210°	0.92	
110	Utrecht	Nooitgedacht 60	In stream	Below coal zone	Coarse sand- stone	6	217°	0.88	
111	Utrecht	Klipspruit 64	Side of hill	Below coal zone	Coarse sand- stone	8	48°	0.74	10"
112	Utrecht	Klipspruit 106	Cutting	Below coal zone	Coarse sand- stone	5	182°	0.76	
113	Dundee	Bulwer 4250	Side of hill	Above coal zone	Coarse sand- stone and grit	10	278°	0.66	
114	Newcastle	Perth 7540	In donga	Below coal zone	Fine sand- stone	4	79°	0.85	
115	Dundee	Plint 9350	In Poona spruit	Below coal zone	Medium sand- stone	10	189°	0.96	130"
116	Utrecht	Eersteling 174	Below dam	Below coal zone	Coarse sand- stone	11	259°	0.87	
117	Utrecht	Puigtefontein 54	In donga	Below coal zone	Coarse sand- stone	3	208°	0.93	

Out- crop No.	District	Farm	Outcrop Description	Strati- graphic position	Constituent Material	No. of Measure- ments	Vectoral Mean	Consis- tency Ratio	Mean thickness of Planar Cross-bedded units
118	Newcastle	Peach Hill 13672	In stream	Below coal zone	Medium sand- stone	8	103°	0.84	
119	Utrecht	Ruigtesfontein 54	Side of road	Below coal zone	Coarse sand- stone	9	259°	0.79	
120	Utrecht	Geluk 158	Side of road	Below coal zone	Coarse sand- stone and grit	10	264°	0.83	13"
121	Newcastle	Springbok- laagte 9666	In donga	Below coal zone	Medium sand- stone	8	105°	0.76	
122	Newcastle	Farm No. 3733	Tendeka river	Below coal zone	Coarse sand- stone and grit	10	113°	0.94	8"
123	Newcastle	Vlaklaagte 9482	In stream	Below coal zone	Coarse sand- stone	3	121°	0.93	6"
124	Newcastle	Drycut 8198	Cutting	Below coal zone	Coarse sand- stone	5	142°	0.72	
125	Utrecht	Groothoek 152	Side of hill	Coal zone	Coarse sand- stone	10	185°	0.81	16"
126	Utrecht	Klipspruit	Side of road	Below coal zone	Coarse sand- stone	3	201°	0.93	
127	Utrecht	Prischgewaagd	In stream	Below coal zone	Coarse sand- stone	4	213°	0.88	

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Veotoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
128	Utrecht	Waaiohoek 173	Side of hill	Below coal zone	Coarse sandstone and grit	10	195°	0.73	21"
129	Utrecht	Gum Tree Grove 126	In stream	Below coal zone	Coarse sandstone and grit	5	106°	0.98	120"
130	Utrecht	Gum Tree Grove 126	In donga	Below coal zone	Coarse sandstone	6	152°	0.90	
131	Utrecht	Weltevreden 53	Cutting	Coal zone	Coarse sandstone and grit	12	161°	0.81	27"
132	Utrecht	Utrecht Townlands	In stream	Below coal zone	Medium sandstone	6	168°	0.68	9"
133	Utrecht	Vergenoegd 107	Cliffs on Uys Kop	Lowermost Beaufort	Medium sandstone	10	191°	0.77	
134	Utrecht	Frischgewaagt 105	Ledges	Above coal zone	Coarse sandstone	8	218°	0.94	
135	Utrecht	Waaiohoek 171	In stream	Above coal zone	Coarse sandstone	11	264°	0.74	17"
136	Utrecht	Vaalbank 103	Side of hill	Above coal zone	Medium sandstone	10	202°	0.89	35"
137	Utrecht	Rustverwacht 151	In stream	Below coal zone	Medium sandstone	14	101°	0.81	
138	Utrecht	Doornkop 172	In donga	Coal zone	Medium sandstone	9	170°	0.81	14"

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vecto. Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
139	Utrecht	Doornkop 172	In stream	Coal zone	Medium sandstone	6	241°	0.93	
140	Utrecht	Vaalspruit 115	In stream	Below coal zone	Medium sandstone	8	22°	0.81	
141	Utrecht	Krommellenboog 170	In stream	Below coal seam	Medium sandstone	6	158°	0.92	
142	Utrecht	Novemblersdrift 87	In Ewek spruit	Below coal zone	Coarse sandstone	9	158°	0.71	
143	Utrecht	Dageraad 49	Side of mountain	Lowermost Beaufort	Medium sandstone	10	219°	0.34	13"
144	Utrecht	Wasbank 149	In donga	Below coal zone	Medium sandstone	3	174°	0.93	
145	Utrecht	Hartebeest-spruit 111	In stream	Below coal zone	Coarse sandstone	15	153°	0.91	126"
146	Utrecht	Utrecht Townlands	In stream	Below coal zone	Coarse sandstone	6	215°	0.87	9"
147	Newcastle	Brakfontein 4278	Side of road	Coal zone	Coarse sandstone	6	253°	0.95	
148	Newcastle	Alcockspruit 7329	Side of hill	Below coal zone	Medium sandstone	2	246°	0.85	

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
149	Newcastle	Kopij Aleen 8816	Road quarry	Above coal zone	Coarse sandstone	6	234°	0.97	
150	Amersfoort	Washbank 62	Side of hill	Lowermost Beaufort	Medium sandstone	5	175°	0.76	8"
151	Amersfoort	Drie-fontein 70	Side of hill	Lowermost Beaufort	Medium sandstone	6	181°	0.65	11"
152	Amersfoort	Grootfontein 64	In little Vaal	Above coal zone	Coarse sandstone	10	203°	0.77	
153	Wakkerstroom	Twyfelhoek 358	Cutting	Coal zone	Coarse sandstone and grit	6	204°	0.82	22"
154	Wakkerstroom	Makwassa 344	Small hill	Below coal zone	Coarse sandstone	12	297°	0.71	9"
155	Wakkerstroom	Langverwacht 281	Side of mountain	Coal zone	Coarse sandstone	8	264°	0.94	20"
156	Wakkerstroom	Elandsfontein 141	Cliffs	Above coal zone	Coarse sandstone and grit	11	260°	0.20	30"
157	Wakkerstroom	Pampoenkraal 144	Side of road	Below coal zone	Coarse sandstone	8	276°	0.83	32"

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
158	Wakkerstroem	Amsterdam 3	In stream	Below coal zone	Coarse sandstone	10	311°	0.55	19"
159	Wakkerstroem	Grootrietvlei 228	In Assegaai river	Below coal zone	Coarse sandstone	8	230°	0.96	
160	Wakkerstroem	Rivierveld 87	In Assegaai river	Below coal zone	Medium sandstone	2	164°	0.95	
161	Wakkerstroem	Vergelegen 68	In stream	Below coal zone	Medium sandstone	4	179°	0.95	
162	Wakkerstroem	Vryheid 27	Cliff	Coal zone	Coarse sandstone	3	148°	0.93	
163	Wakkerstroem	In Malkaar 312	In donga	Coal zone	Coarse sandstone	15	33°	0.65	
164	Wakkerstroem	Loskop 219	In donga	Coal zone	Coarse sandstone and grit	6	181°	0.45	11"
165	Wakkerstroem	Maauwgevonden 369	Cliff	Below coal zone	Coarse sandstone and grit	6	201°	0.90	24"
166	Wakkerstroem	Maauwgevonden 369	Side of hill	Coal zone	Coarse sandstone	10	258°	0.41	11"
167	Utrecht	Springfontein 238	In stream	Above coal zone	Coarse sandstone	10	231°	0.94	11"

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
168	Wakkerstroem	Juurbron 30	In stream	Above coal zone	Coarse sandstone	3	157°	0.97	
169	Wakkerstroem	Johannesloop 376	Cutting	Above coal zone	Coarse sandstone and grit	5	238°	0.84	18"
170	Wakkerstroem	Suikerhoek 28	In donga	Coal zone	Coarse sandstone	10	205°	0.66	
171	Wakkerstroem	Vaalbank 200	Small hill	Coal zone	Coarse sandstone	10	238°	0.90	16"
172	Wakkerstroem	Plaatjesfontein 178	Side of road	Below coal zone	Coarse sandstone	5	280°	0.80	
173	Wakkerstroem	Plaatjesfontein 178	Side of hill	Coal zone	Coarse sandstone	10	256°	0.76	7"
174	Wakkerstroem	Doornloek 370	Side of road	Below coal zone	Coarse sandstone	10	166°	0.53	
175	Wakkerstroem	Van Der Walts Poort 56	Cliffs	Coal zone	Coarse sandstone	8	189°	0.83	40"
176	Wakkerstroem	Van Der Walts Poort 56	Cliffs	Coal zone	Coarse sandstone and grit	10	244°	0.93	11"

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
177	Wakkerstroom	Kromhoek 76	Side of mountain	Coal zone	Coarse sandstone and grit	10	225°	0.94	
178	Utrecht	Mooifontein 366	Side of hill	Lowermost Beaufort	Medium sandstone	7	293°	0.93	
179	Utrecht	Vredehof 17	Side of road	Above coal zone	Coarse sandstone	5	148°	0.84	10"
180	Utrecht	Vredehof 17	Side of road	Below coal zone	Coarse sandstone and grit	10	205°	0.79	21"
181	Utrecht	Rooipoort 97	Cliffs	Coal zone	Coarse sandstone	10	233°	0.79	35"
182	Utrecht	Kaffirsdrift 116	Cliffs	Below coal zone	Coarse sandstone	7	254°	0.94	26"
183	Utrecht	Kaffirsdrift 116	Side of road	Below coal zone	Coarse sandstone	10	215°	0.69	
184	Utrecht	Kemps Lust	In stream	Below coal zone	Coarse sandstone	10	238°	0.37	13"
185	Wakkerstroom	Marthinus Wesselstroom 276	Cutting	Lowermost Beaufort	Medium sandstone	3	236°	0.97	19"

Out- crop No.	District	Farm	Outcrop Description	Strati- graphic position	Constituent Material	No. of Measure- ments	Vectoral Mean	Consis- tency Ratio	Mean thickness of Planar Cross-bedded units
186	Utrecht	Purtje 330	Cliffs	Lowermost Beaufort	Medium sandstone	6	218°	0.52	14"
187	Utrecht	Engelbrechts Drift 258	Side of mountain	Lowermost Beaufort	Medium sandstone	10	220°	0.79	
188	Utrecht	Spitzkop	Cliffs	Coal zone	Coarse sandstone	12	182°	0.83	
189	Utrecht	Gejaagd 99	Cliffs	Lowermost Beaufort	Coarse sandstone and grit	6	181°	0.85	12"
190	Volkstrust	Drie Foort 71	Ledges	Coal zone	Medium sandstone	11	186°	0.80	14"
191	Volkstrust	Dasvicklip 26	In sand spruit	Above coal zone	Medium sandstone	6	233°	0.95	
192	Volkstrust	Paardekop 48	Quarry	Lowermost Beaufort	Medium sandstone	10	201°	0.92	13"
193	Amersfoort	Schulpapruit 57	In Schulp- spruit	Above coal zone	Medium sandstone	5	184°	0.40	
194	Amersfoort	Schulpapruit 57	In Schulp- spruit	Above coal zone	Medium sandstone	6	138°	0.55	
195	Amersfoort	Enon 58	Side of hill	Above coal zone	Medium sandstone	4	127°	0.85	

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
196	Utrecht	Witklip	In stream	Coal zone	Coarse sandstone and grit	11	202°	0.91	15"
197	Utrecht	Witklip	Sandstone ledges	Below coal zone	Medium grained	10	266°	0.94	120"
198	Utrecht	Schuilklip 109	Sandstone ledges	Below coal zone	Medium sandstone	11	195°	0.74	
199	Utrecht	Schuijvepoort 102	Cliffs	Above coal zone	Medium sandstone	12	232°	0.32	19"
200	Newcastle	Dunfirmline 3321	In Ingogo river	Above coal zone	Coarse sandstone and grit	12	352°	0.77	
201	Newcastle	Wykom 2368	In stream	Coal zone	Medium sandstone	10	282°	0.89	
202	Newcastle	Buffalo river 4308	In stream	Coal zone	Coarse sandstone	22	34°	0.15	6"
203	Newcastle	Tweefontein 3344	Cutting	Coal zone	Coarse sandstone	11	248°	0.65	27"
204	Newcastle	Tweefontein 3344	Cutting	Coal zone	Coarse sandstone and grit	11	209°	0.86	18"

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
205	Newcastle	Newcastle Townlands 4702	Quarry	Above coal zone	Coarse sandstone	4	266°	0.98	24"
206	Newcastle	Tiger Kloof 3383	Cliffs	Above coal zone	Coarse sandstone	17	205°	0.79	
207	Newcastle	Kilbarchen 2969	In donga	Above coal zone	Medium sandstone	9	267°	0.88	7"
208	Newcastle	Ballengeich 3299	Bank of Horn river	Above coal zone	Medium sandstone	16	257°	0.79	
209	Newcastle	Ballengeich 3299	In stream	Above coal zone	Coarse sandstone	29	138°	0.79	22"
210	Newcastle	Farm No. 11634	Top of mountain	Lowermost Beaufort	Medium sandstone	13	278°	0.72	13"
211	Newcastle	Farm No. 10877	Road cutting	Lowermost Beaufort	Medium sandstone	6	207°	0.22	
212	Wakkerstroom	Klipspuit 461	Cutting	Coal zone	Coarse sandstone and grit	6	176°	0.90	
213	Piet Retief	Annyspruit 143	Old mine	Coal zone	Coarse sandstone	6	251°	0.97	20"

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
214	Piet Retief	Goddehoop 122	Side of hill	Below coal zone	Coarse sandstone	10	169°	0.70	
215	Piet Retief	Tafelberg 123	Cliffs	Below coal zone	Coarse sandstone	5	249°	0.62	
216	Piet Retief	Ouderfont 12	Cliffs	Below coal zone	Coarse sandstone	10	220°	0.76	
217	Utrecht	Kampanus 51	Side of mountain	Coal zone	Coarse sandstone	10	189°	0.72	16"
218	Paulpietersburg	Witkoot 34	In donga	Below coal zone	Coarse sandstone	7	182°	0.56	15"
219	Paulpietersburg	Moolhoek 34	Side of hill	Coal zone	Coarse sandstone	7	190°	0.94	
220	Paulpietersburg	Boschkraas 69	Small hill	Coal zone	Coarse sandstone and grit	11	284°	0.65	22"
221	Paulpietersburg	Akateeskop 59	Cliffs	Below coal zone	Medium sandstone	20	140°	0.71	
222	Paulpietersburg	Paulpietersburg Townlands	Side of mountain	Coal zone	Coarse sandstone	15	258°	0.93	19"
223	Paulpietersburg	Paulpietersburg Townlands	Side of mountain	Below coal zone	Medium sandstone	14	190°	0.87	

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
224	Wakkerstroom	Langewacht 247	Side of mountain	Coal zone	Coarse sandstone and grit	10	235°	0.72	11"
225	Faulpietersburg	Geluk 58	Side of hill	Coal zone	Coarse sandstone	8	185°	0.52	15"
226	Paulpietersburg	Geluk 58	Side of hill	Below coal zone	Coarse sandstone	12	179°	0.90	61"
227	Paulpietersburg	Trekdrift 39	Side of hill	Below coal zone	Coarse sandstone and grit	7	174°	0.91	
228	Vryheid	Woltersteden 300	Cliff	Below coal zone	Medium sandstone	22	235°	0.42	53"
229	Vryheid	Erfstuk 4	Side of hill	Below coal zone	Medium sandstone	11	249°	0.82	
230	Vryheid	Erfstuk 4	In stream	Coal zone	Coarse sandstone and grit	15	250°	0.84	13"
231	Vryheid	Kambula	Top of cliff	Below coal zone	Medium sandstone	6	147°	0.97	
232	Vryheid	Mooitgedacht 388	Side of mountain	Coal zone	Medium sandstone	16	255°	0.69	53"

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
233	Vryheid	Nocitgedacht 388	In stream	Below coal zone	Coarse sandstone	7	166°	0.99	48"
234	Vryheid	Schaapkopje 194	Ledges	Below coal zone	Medium sandstone	21	153°	0.86	
235	Vryheid	Schaapkopje 194	Ledges	Coal zone	Coarse sandstone	18	266°	0.96	17"
236	Vryheid	Vryheid Townlands	In donga	Below coal zone	Coarse sandstone	4	175°	0.95	
237	Vryheid	Aanstoot 231	Side of hill	Below coal zone	Medium sandstone	10	173°	0.97	
238	Utrecht	Goede Hoop 177	Side of hill	Coal zone	Coarse sandstone	10	223°	0.61	29"
239	Utrecht	Goede Hoop 177	Side of hill	Coal zone	Coarse sandstone	10	204°	0.83	14"
240	Utrecht	Zoetmelks Rivier 86	In stream	Coal zone	Coarse sandstone and grit	10	215°	0.76	25"
241	Utrecht	Klipspruit 106	Side of hill	Below coal zone	Medium sandstone	4	192°	0.91	
242	Vryheid	Bembaskop 7086	Ledges	Below coal zone	Coarse sandstone	8	152°	0.36	

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
243	Vryheid	Aardappel Kraai 282	Side of hill	Below coal zone	Medium sandstone	3	194°	0.78	18"
244	Vryheid	Aardappel Kraai 282	Cliffs	Coal zone	Coarse sandstone and grit	10	202°	0.71	17"
245	Vryheid	Welgevonden 287	Cliffs	Coal zone	Coarse sandstone and grit	20	201°	0.90	35"
246	Vryheid	Hlobane 506	In stream	Coal zone	Medium sandstone	4	226°	0.98	
247	Vryheid	Hlobane 506	Side of hill	Coal zone	Coarse sandstone	15	191°	0.77	
248	Vryheid	Welgevonden 287	In donga	Below coal zone	Coarse sandstone	6	177°	0.98	
249	Vryheid	Leeuwnnek 51	Side of mountain	Coal zone	Coarse sandstone	20	188°	0.50	17"
250	Vryheid	Leeuwnnek 51	Side of road	Below coal zone	Medium sandstone	18	242°	0.79	
251	Nqutu	Native Reserve No. 18	Side of hill	Below coal zone	Medium sandstone	10	188°	0.75	

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
252	Dundee	Mchjeane 2254	Hill	Below coal zone	Coarse sandstone	3	160°	0.93	9"
253	Nqutu	Native Reserve No. 18	Bank of Buffalo river	Below coal zone	Medium sandstone	11	199°	0.74	8"
254	Ngotshe	Broedersrust 144	Side of road	Below coal zone	Medium sandstone	2	237°	0.95	
255	Ngotshe	Smaldeel 575	Quarry	Coal zone	Coarse	16	283°	0.73	27"
256	Ngotshe	Mooiklip	Side of mountain	Coal zone	Coarse sandstone	30	212°	0.24	20"
257	Vryheid	Waterval 310	Quarry	Below coal zone	Coarse sandstone	9	211°	0.67	23"
258	Vryheid	Veelsgeluk 171	In stream	Coal zone	Coarse sandstone and grit	12	206°	0.91	12"
259	Vryheid	Veelsgeluk 171	Side of hill	Coal zone	Coarse sandstone	16	211°	0.67	20"
260	Vryheid	Veelsgeluk 171	Small hill	Coal zone	Coarse sandstone	20	185°	0.86	53"

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
261	Vryheid	Vaalbank 450	Adit	Coal zone	Coarse sandstone	2	228°	0.95	30"
262	Vryheid	Vaalkrans 306	Cutting	Coal zone	Coarse sandstone and grit	17	198°	0.94	33"
263	Vryheid	Riversdale 372	In donga	Coal zone	Coarse sandstone	9	194°	0.87	
264	Vryheid	Bloerendal 18	Side of mountain	Coal zone	Coarse sandstone	11	187°	0.92	14"
265	Vryheid	Langkrans 367	Side of mountain	Below coal zone	Medium sandstone	11	191°	0.58	119"
266	Vryheid	Bloerendal 18	Cutting	Coal zone	Coarse sandstone	16	148°	0.90	22"
267	Vryheid	Riversdale 75	Side of mountain	Below coal zone	Medium sandstone	10	192°	0.75	28"
268	Vryheid	Riversdale 75	Side of mountain	Coal zone	Coarse sandstone and grit	25	218°	0.60	31"
269	Ngotshe	Frischgewaagte 401	Side of hill	Below coal zone	Coarse sandstone and grit	9	210°	0.75	25"

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
270	Ngotshe	Isikhlangeni 689	Side of road	Below coal zone	Coarse sandstone and grit	3	123°	0.93	9"
271	Ngotshe	Waterfall 553	Cutting	Below coal zone	Coarse sandstone	3	183°	0.77	10"
272	Hlatikulu		In stream	Coal zone	Coarse sandstone and grit	20	224°	0.87	17"
273	Hlatikulu		In Ngwavuma River	Coal zone	Coarse sandstone and grit	10	293°	0.94	
274	Hlatikulu		Side of hill	Coal zone	Coarse sandstone	3	222°	0.47	
275	Hlatikulu		In stream	Coal zone	Coarse sandstone	5	236°	0.98	
276	Piet Retief	Langola 160	Side of road	Below coal zone	Coarse sandstone	5	270°	0.26	
277	Piet Retief	Pongola 160	Small hill	Below coal zone	Coarse sandstone	19	151°	0.78	25"
278	Ngotshe	Mogut 12436	Cutting	Coal zone	Coarse sandstone	20	178°	0.85	16"

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
279	Nongoma	Native Reserve No. 12	Cliffs	Below coal zone	Coarse sandstone and grit	15	223°	0.93	19"
280	Nongoma	Nongoma Townlands	Cutting	Above coal zone	Medium sandstone	5	172°	0.72	
281	Nongoma	Native Reserve No. 12	In donga	Coal zone	Coarse sandstone	20	207°	0.66	13"
282	Nongoma	Native Reserve No. 12	In stream	Below coal zone	Coarse sandstone	5	193°	0.96	22"
283	Nongoma	Native Reserve No. 12	Side of hill	Above coal zone	Coarse sandstone	4	212°	0.58	11"
284	Hlabisa		Side of hill	Below coal zone	Coarse sandstone	2	290°	0.90	18"
285	Lower Umfolozi	Umfolozi Game Reserve	In stream	Below coal zone	Coarse sandstone and grit	23	203°	0.80	22"
286	Lower Umfolozi	Umfolozi Game Reserve	In stream	Below coal zone	Coarse sandstone and grit	10	196°	0.84	65"
287	Umvoti	Olivefontein 4427	Side of mountain	Below coal zone	Medium sandstone	5	123°	0.96	

Out- crop No.	District	Farm	Outcrop Description	Strati- graphic position	Constituent Material	No. of Measure- ments	Vectoral Mean	Consis- tency Ratio	Mean thickness of Planar Cross-bedded units
288	Umvoti	Olivefontein 4427	Cutting	Coal zone	Medium sandstone	4	201°	0.85	18"
289	Msinga	Impofana Location No. 4677	Side of mountain	Below coal zone	Medium sandstone	20	173°	0.79	29"
290	Msinga	Impofana Location No. 4577	Side of mountain	Below coal zone	Coarse sandstone	6	219°	0.83	30"
291	Umvoti	Rooie Bok Vlakte 1858	In donga	Below coal zone	Coarse sandstone	10	125°	0.85	
292	Umvoti	Mount St. Bernard 2121	In stream	Below coal zone	Medium sandstone	6	132°	0.98	
293	Umvoti	Geluk Stadt 1847	Cliff	Below coal zone	Medium sandstone	7	251°	0.83	
294	Weenen	Erskine 2200	Cliffs	Coal zone	Coarse sandstone	8	179°	0.79	
295	Umvoti	Nietgedacht 1192	Cliff	Below coal zone	Coarse sandstone	3	163°	0.99	
296	Umvoti	Nietgedacht 1192	Small hill	Below coal zone	Medium sandstone	7	130°	0.91	

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic Position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
297	Umvoti	Geluk Stadt 1847	Cliffs	Below coal zone	Coarse sandstone	6	162°	0.99	
298	Umvoti	Geluk Stadt 1847	Cliff	Coal zone	Coarse sandstone	10	231°	0.95	26"
299	Umvoti	Nietgedacht 1152	Cliff	Below coal zone	Coarse sandstone	2	138°	0.99	130"
300	Estcourt	Estcourt Townlands	Cliffs	Lowermost Beaufort	Medium sandstone	5	282°	0.80	19"
302	Elliprivier	Vertrek 1091	Cuttings	Lowermost Beaufort	Medium sandstone	2	88°	0.96	
303	Estcourt	-	Side of hill	Lowermost Beaufort	Medium sandstone	4	160°	0.93	

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	Symmetry of Crests	No. of Measurements	Mean Strike	Ripple Index
171	Wakkerstroom	Vaalbank 200	Side of hill	Coal zone	Fine sandstone	Asymmetrical	3	195°	12.02
202	Newcastle	Wykom 2368	In stream	Coal zone	Fine sandstone	Symmetrical	12	154°	8.4

Out- crop No.	District	Farm	Outcrop Description	Strati- graphic position	Constituent Material	No. of Measure- ments	Vectoral Mean	Consis- tency Ratio	Mean thickness of Planar Cross-bedded units
1	Wakkerstroom	Twyfelhoek 338	In stream	Below coal zone	Coarse sandstone	12	239°	0.74	37"
2	Wakkerstroom	Driefontein 351	Side of hill	Below coal zone	Coarse sandstone	10	277°	0.81	11"
3	Wakkerstroom	Driefontein 351	Cliffs	Below coal zone	Coarse sandstone and grit	8	220°	0.53	23"
4	Wakkerstroom	Sobbeken 385	Cliffs	Below coal zone	Coarse sandstone and grit	6	44°	0.17	16"
5	Wakkerstroom	Buhrmanns Bosch 303	In stream	Below coal zone	Coarse sandstone	4	254°	0.60	11"
6	Wakkerstroom	Buhrmanns Bosch 303	In stream	Coal zone	Coarse sandstone	5	170°	0.86	27"
7	Wakkerstroom	Lyden 278	Side of mountain	Above coal zone	Medium sandstone	5	301°	0.98	
8	Amersfoort	Uitgezocht	Cutting	Above coal zone	Coarse sandstone	2	156°	0.99	
9	Amersfoort	Uitgezocht 32	Above Little Vaal river	Above coal zone	Coarse sandstone	6	194°	0.43	17"

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
10	Amersfoort	Willem Hendriks Vallei 26	Side of hill	Above coal zone	Medium sandstone	8	280°	0.93	17"
11	Amersfoort	Willem Hendriks Vallei 26	In stream	Above coal zone	Coarse sandstone	4	274°	0.99	
12	Amersfoort	Goedehoop 25	Cliffs	Above coal zone	Medium sandstone	8	222°	0.93	
13	Ermelo	Goedenoop 24	Cliffs	Above coal zone	Medium sandstone	17	239°	0.55	
14	Ermelo	De Emigratie 271	Ledge	Above coal zone	Coarse sandstone and grit	10	214°	0.93	
15	Ermelo	Rotterdam 117	Cliffs	Above coal zone	Medium sandstone	10	265°	0.78	
16	Ermelo	Mavrieriestad 116	at mine	Coal zone	Coarse sandstone	10	275°	0.90	
17	Ermelo	Mavrieriestad 116	Cliffs	Below coal zone	Coarse sandstone and grit	10	158°	0.83	
18	Ermelo	Mavrieriestad 116	In donga	Below coal zone	Coarse sandstone	3	287°	0.93	
19	Ermelo	Rietvallei 102	Side of road	Below coal zone	Coarse sandstone	6	162°	0.98	

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
20	Ermelo	Klipfontein 284	Above water-fall	Coal zone	Coarse sandstone	5	140°	0.74	
21	Ermelo	Witbank 272	Small hill	Coal zone	Coarse sandstone	2	195°	0.95	
22	Ermelo	Zandspruit 103	Near beacon	Coal zone	Coarse sandstone	2	288°	0.93	
23	Ermelo	Waaikoek 170	Above water-fall	Coal zone	Coarse sandstone	3	129°	0.93	
24	Ermelo	Waaikoek 170	Cliff	Coal zone	Coarse sandstone	5	253°	0.96	
25	Ermelo	Klipbank 104	Cliffs	Above coal zone	Medium sandstone	5	282°	0.80	9"
26	Ermelo	Welterreden 5	Cutting	Above coal zone	Medium sandstone	4	311°	0.85	9"
27	Ermelo	Witpunt 16	Cliffs	Above coal zone	Coarse sandstone	12	251°	0.94	
28	Ermelo	Witpunt 16	Top of hill	Above coal zone	Coarse sandstone	10	267°	0.83	
29	Ermelo	Uitkomst 273	Quarry	Above coal	Coarse	8	172°	0.93	

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
30	Ermelo	Janhondriksfontein 13	Ledges above pan	Above coal zone	Coarse sandstone	6	254°	0.98	12"
31	Ermelo	Witbank	Ledge	Coal zone	Coarse sandstone	5	242°	0.30	
32	Ermelo	Onverwacht 90	Side of road	Above coal zone	Medium sandstone	5	115°	0.97	
33	Ermelo	Bankplaats	Side of road	Coal zone	Coarse sandstone	4	236°	0.98	
34	Ermelo	Bankplaats 87	Cliffs	Coal zone	Coarse sandstone	3	268°	0.43	
35	Amersfoort	Vermaakskraal 532	In stream	Above coal zone	Coarse sandstone	3	253°	0.97	
37	Amersfoort	Kaffirskraal 513	In donga	Above coal zone	Medium sandstone	7	270°	0.90	
38	Amersfoort	Kaffirskraal 513	Side of hill	Above coal zone	Medium sandstone	5	275°	0.93	
39	Standerton	Katspruit 519	In stream	Above coal zone	Fine sandstone	10	225°	0.35	
40	Standerton	Katspruit 516	In stream	Above coal zone	Medium sandstone	3	215°	0.90	

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
41	Ermelo	Uitspanning 491	Side of hill	Coal zone	Coarse sandstone and grit	8	274°	0.81	
42	Ermelo	Vaalkop 490	In stream	Above coal zone	Coarse sandstone	10	215°	0.87	
43	Standerton	Protest 456	Above Pan	Above coal zone	Coarse sandstone	5	171°	0.94	
44	Ermelo	Morgenzon 466	Cutting	Above coal zone	Coarse sandstone	10	170°	0.83	11"
45	Ermelo	Tweefontein 479	Side of road	Above coal zone	Coarse sandstone	2	169°	0.98	
46	Ermelo	Tweefontein 479	Side of road	Above coal zone	Coarse sandstone	4	261°	0.98	
47	Amersfoort	Mcoifontein 497	Cutting	Above coal zone	Coarse sandstone	4	256°	0.88	
48	Amersfoort	Begin van Lyn 474	Cutting	Above coal zone	Coarse sandstone	6	194°	0.93	
49	Ermelo	Holland 471	Side of road	Above coal zone	Coarse sandstone	3	284°	0.80	
50	Ermelo	Dorpsplaats 470	In stream	Above coal zone	Coarse sandstone	7	252°	0.83	

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectorial Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
51	Ermelo	Drinkwater 443	Side of road	Above coal zone	Coarse sandstone	4	263°	0.93	
52	Ermelo	Drinkwater 451	In stream	Above coal zone	Medium sandstone	11	287°	0.85	
53	Ermelo	Uitzicht	In stream	Above coal zone	Coarse sandstone	6	248°	0.92	
54	Ermelo	Drinkwater 451	Cutting	Above coal zone	Medium sandstone	10	298°	0.90	
55	Ermelo	Brakfontein 452	Side of road	Above coal zone	Coarse sandstone	2	282°	0.95	
56	Bethal	Roodekrans 457	In stream	Above coal zone	Coarse sandstone	10	253°	0.70	25"
57	Ermelo	Nelspan 449	Side of road	Above coal zone	Medium sandstone	3	241°	0.97	
58	Ermelo	Cshoek	In stream	Above coal zone	Coarse sandstone	2	245°	0.95	
59	Bethal	Klipfontein 422	Side of road	Above coal zone	Coarse sandstone	4	281°	0.95	
60	Bethal	Sukkelgar 421	Cliff	Above coal	Coarse	5	259°	0.92	

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
61	Bethal	Sukkelaar 421	Quarry	Above coal zone	Coarse sandstone and grit	6	240°	0.90	12"
62	Ermeo	De Vereeniging 448	Side of hill	Above coal zone	Fine sandstone	14	300°	0.92	
63	Ermeo	Rietveld 437	Cliffs above par	Above coal zone	Medium sandstone	7	252°	0.86	22"
64	Ermeo	Nooitgedacht 268	Quarry	Coal zone	Coarse sandstone and grit	6	247°	0.82	10"
65	Ermeo	Vitgezoicht 430	Quarry	Coal zone	Medium sandstone	6	283°	0.83	
66	Ermeo	Winkelhaal	In stream	Above coal zone	Coarse sandstone	11	261°	0.59	14"
67	Ermeo	Rehooft 428	Side of road	Above coal zone	Coarse sandstone and grit	8	238°	0.95	
68	Ermeo	Rietveld 433	Side of hill	Above coal zone	Medium sandstone	10	202°	0.81	11"
69	Ermeo	De Roo epoort	Side of road	Above coal zone	Medium sandstone	5	25°	0.96	

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
70	Ermelo	De Roodepoort 435	In stream	Above coal zone	Medium sandstone	10	271°	0.36	13"
71	Ermelo	Mooitgedacht 268	Old mine	Coal zone	Coarse sandstone and grit	10	152°	0.79	27"
72	Ermelo	Mooifontein 287	Cutting	Coal zone	Medium sandstone	2	197°	0.95	8"
73	Ermelo	Spitskop 276	Side of hill	Coal zone	Coarse sandstone	5	211°	0.92	8"
74	Ermelo	Zaffirspruit 274	Cutting	Coal zone	Coarse sandstone and grit	2	176°	0.95	28"
75	Ermelo	Voegelfontein 245	Cutting	Coal zone	Coarse sandstone and grit	4	182°	0.88	
76	Ermelo	Bosmanskranz 217	Side of road	Coal zone	Coarse sandstone and grit	5	255°	0.96	
77	Middelburg	Draaifontein 203	Side of hill	Coal zone	Coarse sandstone	5	234°	0.92	
78	Ermelo	Goddehoop 205	Cliffs	Coal zone	Coarse sandstone and grit	6	230°	0.90	

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
79	Middelburg	Kaffirstad 195	In river	Coal zone	Coarse sandstone	6	218°	0.93	
80	Bethal	Brakpan 225	Above pan	Coal zone	Coarse sandstone	3	228°	0.93	
81	Bethal	Halfgewonnen 140	In stream	Coal zone	Coarse sandstone	2	214°	0.98	
82	Middelburg	Roodepoort 151	Ledges	Coal zone	Coarse sandstone	3	187°	0.97	
83	Middelburg	Boschmanskop 154	Cliffs	Coal zone	Coarse sandstone and grit	6	197°	0.95	
84	Middelburg	Groot Drakenstein 157	Cutting	Coal zone	Coarse sandstone	6	358°	0.93	18"
85	Erzelo	Kranspan 95	Quarry	Coal zone	Coarse sandstone and grit	3	227°	0.93	11"
86	Erzelo	Smitsfield 157	Cutting	Coal zone	Coarse sandstone and grit	6	169°	0.88	
87	Erzelo	Lietgekozen 183	Cliff	Coal zone	Medium sandstone	7	188°	0.61	

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
88	Ermelo	Lothair 195	Cliffs	Coal zone	Coarse sandstone	2	239°	0.90	
89	Ermelo	Bloemfontein 288	Cutting	Coal zone	Coarse grits and sandstone	4	200°	0.93	
90	Ermelo	Welgelegen 132	Side of hill	Coal zone	Coarse grits and sandstone	9	153°	0.84	25"
91	Ermelo	Zlipstapel 145	Next to stream	Coal zone	Coarse sandstone	4	180°	0.95	
92	Ermelo	Lilliput 142	Side of road	Coal zone	Medium sandstone	3	259°	0.98	
93	Carolina	Goedewerachtig 221	Old mine	Coal zone	Coarse sandstone	5	231°	0.66	20"
94	Ermelo	Botwell 140	Side of lake	Coal zone	Medium sandstone	12	261°	0.98	
95	Ermelo	Terence 174	Side of pan	Coal zone	Medium sandstone	4	189°	0.55	380"
96	Ermelo	Kloekdun 178	Side of road	Coal zone	Coarse sandstone	5	192°	0.78	19"

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
97	Ermelo	Hamilton 118	Above pan	Coal zone	Medium sandstone	4	249°	0.98	
98	Ermelo	Kelvin'side 163	Cliffs	Coal zone	Coarse sandstone	5	1°	0.92	
99	Carolina	Kleinbuffels-spruit 111	Small hill	Below coal zone	Coarse sandstone and grit	10	226°	0.89	
100	Carolina	Onbekend 172	Side of hill	Below coal zone	Coarse sandstone and grit	2	145°	0.98	
101	Carolina	Onbekend 172	Side of hill	Coal zone	Coarse sandstone	2	234°	0.98	
102	Carolina	Moortredacht 51	In stream	Coal zone	Coarse sandstone	10	248°	0.87	
103	Carolina	Paardeplaats 187	Side of road	Coal zone	Coarse sandstone	3	233°	0.98	
104	Carolina	Kwaagfontein 55	Coal mine	Coal zone	Coarse sandstone	4	231°	0.98	
105	Carolina	Jagtlust 245	Side of hill	Below coal zone	Coarse sandstone	10	235°	0.97	

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of planar cross-bedded units
106	Belfast	Zoekop 426	Small hill	Coal zone	Coarse sandstone and grit	4	228°	0.99	
107	Belfast	Leeuwbank 427	Cliffs	Coal zone	Coarse sandstone and grit	7	195°	0.80	30"
108	Belfast	Wonderfontein 428	Side of pan	Coal zone	Coarse sandstone	3	228°	0.77	8"
109	Carolina	Klippan 452	Side of pan	Coal zone	Coarse sandstone	7	149°	0.66	
110	Middelburg	Elesbokfontein 485	Side of hill	Coal zone	Coarse sandstone	4	238°	0.95	
111	Middelburg	Rietvlei 397	Side of road	Coal zone	Coarse sandstone	3	174°	0.83	
112	Witbank	Erasmial 279		Coal zone	Coarse sandstone and grit	-	213°	0.91	
113	Witbank	Mooringelicht	Near colliery	Coal zone	Coarse sandstone and grit	6	223°	0.73	
114	Witbank	Elandsfontein 309	Side of hill	Coal zone	Coarse sandstone and grit	5	264°	0.98	9"

Out- crop No.	District	Farm	Outcrop Description	Strati- graphic position	Constituent Material	No. of Measure- ments	Vectoral Mean	Consis- tency Ratio	Mean thickness of Planar Cross-bedded units
115	Witbank	Blesboklaagte 296	Near location	Coal zone	Coarse sandstone and grit	3	209°	0.93	
116	Witbank	Blauwkrans 323	Above pan	Above coal zone	Medium sandstone	8	240°	0.78	
117	Middelburg	Driefontein 338	Below kraal	Coal zone	Coarse sandstone and grit	10	152°	0.86	
118	Middelburg	Driefontein 338	Cliffs	Coal zone	Coarse sandstone and grit	3	172°	0.98	
119	Middelburg	Bankfontein 340	Above stream	Coal zone	Coarse sandstone	11	199°	0.85	31"
120	Middelburg	Sterkwater	Side of pan	Coal zone	Coarse sandstone	2	175°	0.98	
121	Middelburg	Elandspruit 291	Cliffs	Coal zone	Coarse sandstone and grit	2	169°	0.98	
122	Witbank	Klipplaat 14	Side of hill	Coal zone	Coarse sandstone and grit	10	238°	0.75	24"

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
123	Witbank	Zaaiwater 11	In stream	Coal zone	Coarse sandstone and grit	6	180°	0.97	
124	Bethel	Middelbult 42	Steenkool spruit	Coal zone	Coarse sandstone and grit	4	169°	0.68	
125	Witbank	Van Dyksdrift 19	Cliffs	Coal zone	Coarse sandstone and grit	3	182°	0.98	
126	Middelburg	Haasfontein 28	Cliffs	Coal zone	Coarse sandstone and grit	9	161°	0.88	14"
127	Middelburg	Leeuwfontein 48	Side of hill	Coal zone	Fine sandstone	3	220°	0.87	6"
128	Bethal	Onverwacht 70	In stream	Coal zone	Coarse sandstone and grit	10	252°	0.99	
129	Bethal	Kaffirstad 79	Near old mine	Coal zone	Coarse sandstone	6	163°	0.82	
130	Bethal	Ystervarkfontein 106	Cutting	Coal zone	Coarse sandstone and grit	8	145°	0.91	

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar cross-bedded units
131	Bethal	Vaalkop 104	In stream	Above coal zone	Medium sandstone	10	191°	0.95	22"
132	Bethal	Trichardtsfontein 140	Ledges	Above coal zone	Coarse sandstone and grit	10	210	0.91	
133	Bethal	Uitzalkaar 126	Cutting	Above coal zone	Medium sandstone	6	180°	0.98	48"
134	Standerton	Springbokdraai 277	Side of road	Above coal zone	Coarse sandstone	5	159°	0.96	
135	Standerton	De Bank 280	Quarry	Above coal zone	Fine sandstone	3	259°	0.80	
136	Standerton	Rodebank 323	Waterval river	Above coal zone	Coarse sandstone	10	263°	0.98	
137	Bethal	Goedekoop 301	Cutting	Above coal zone	Coarse sandstone	4	167°	0.98	
138	Bethal	Witbank 303	In stream	Above coal zone	Medium sandstone	4	230°	0.95	
139	Bethal	Sterkfontein 299	Side of road	Above coal zone	Coarse sandstone	8	211°	0.84	24"
140	Bethal	Vlaakspruit 308	In stream	Above coal zone	Coarse sandstone	6	235°	0.93	

Out-crop No.	District	Field No.	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
141	Standerton	Liebenberg 345	In stream	Above coal zone	Medium sandstone	4	237°	0.93	
142	Standerton	Twee drank 378	West bank of Vaal river	Above coal zone	Coarse sandstone and grit	10	189°	0.94	26"
143	Standerton	Diepspruit	In stream	Above coal zone	Coarse sandstone and grit	5	208°	0.98	21"
144	Standerton	Langevlei 410	In stream	Above coal zone	Medium sandstone	5	232°	0.90	
145	Standerton	Eriskak 51	In stream	Above coal zone	Fine sandstone	2	259°	0.95	7"
146	Vrede	Kleinfontein 431	In stream	Above coal zone?	Fine sandstone	4	238°	0.83	
147	Vrede	Farm 481	Cliffs	Above coal zone?	Fine sandstone	3	247°	0.97	
148	Vrede	Tweefontein 335	In stream	Above coal zone?	Coarse sandstone	10	272°	0.79	18"
149	Vrede	Farm 1125	South bank of river	Above coal zone?	Medium sandstone	10	260°	0.96	12"

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
150	Vrede	Krynnauws Lust 275	Ledges	Above coal zone	Coarse sandstone and grit	8	103°	0.65	29"
151	Vrede	Farm 833	Small hill	Lowermost Beaufort	Coarse sandstone	10	225°	0.94	18"
152	Vrede	Middelkop 453	Side of hill	Above coal zone?	Coarse sandstone	7	230°	0.94	
153	Frankfort	Annie 106	In stream	Lowermost Beaufort	Coarse sandstone	3	205°	0.97	
154	Frankfort	Farm 1032	In stream	Lowermost Beaufort	Medium sandstone	5	195°	0.78	
155	Frankfort	Farm 324	Verkyke" kop	Lowermost Beaufort	Fine sandstone	10	8°	0.90	30"
156	Frankfort	Frankfort	South bank of Wilge river	Above coal zone	Coarse sandstone	5	274°	0.82	
157	Frankfort	Frankfort Townlands	Side of hill	Above coal zone	Medium sandstone	10	250°	0.90	
158	Frankfort	Farm 243	Cutting	Above coal zone	Coarse sandstone and grit	5	267°	0.85	

No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
59	Frankfort	Grootvley 136	Cutting	Above coal zone	Medium sandstone	3	249°	0.97	
50	Heidelberg	Dwaalhoek 246	Small hill	Above coal zone	Medium sandstone	3	117°	0.80	
52	Balfour	Draaifontein 278	Small hill	Above coal zone	Medium sandstone	6	247°	0.42	
64	Sasolburg	Anniestrust 763	Side of pan	Coal zone	Medium sandstone	2	194°	0.98	
65	Heidelberg	Rietersruit 223	South bank of river	Below coal zone	Fine sandstone	4	171°	0.98	
66	Heidelberg	Modderfontein 55	In stream	Below coal zone	Coarse sandstone	7	288°	0.63	19"
67	Balfour	Malanskraal 73	Cliff	Below coal zone	Coarse sandstone and grit	3	197°	0.90	
68	Witbank	Klipfontein 566	Quarry	Coal zone	Coarse sandstone and grit	4	193°	0.90	
169	Balfour	Modderfontein 562	Side of pan	Below coal zone	Medium sandstone	8	246°	0.81	14"
170	Balfour	Witbank 340	In stream	Coal zone	Medium sandstone	7	190°	0.69	

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
171	Standerton	Rietkuil	Side of road	Above coal zone	Coarse sandstone	5	193°	0.98	
172	Balfour	Saltpeterkranz 351	Cliffs	Above coal zone	Coarse sandstone	10	240°	0.76	19"
173	Nigel	Honingfontein 339	In stream	Above coal zone	Medium sandstone	3	305°	0.97	
174	Nigel	Varkensfontein 153	Quarry	Coal zone	Coarse sandstone and grit	6	126°	0.90	
175	Nigel	Nooitgedacht	Quarry	Coal zone	Medium sandstone	5	215°	0.96	
176	Witbank	Kromdraai 263	In stream	Coal zone	Coarse sandstone and grit	4	165°	0.90	
177	Witbank	Kromdraai 263	Small hill	Coal zone	Coarse sandstone and grit	3	229°	0.90	14"
178	Delmas	Brakfontein 264	Small hill	Coal zone	Coarse sandstone and grit	4	282°	0.95	12"
179	Witbank	Honingkranz 536	Cliffs	Coal zone	Coarse sandstone and grit	12	126°	0.51	

Out- crop No.	District	Farm	Outcrop Description	Strati- graphic position	Constituent Material	No. of Measure- ments	Vectoral Mean	Consis- tency Ratio	Mean thickness of Planar Cross-bedded units
180	Stegi		Lutala river	Coal zone	Coarse sandstone and grit	3	219°	0.90	
181	Jtegi		In stream	Coal zone	Coarse sandstone and grit	4	231°	0.98	
182	Stegi		Praser Shaft	Coal zone	Coarse sandstone and grit	5	244°	0.94	41"
183	Stegi		Side of road	Coal zone	Coarse sandstone and grit	6	154°	0.92	
184	Manzini		Rail cutting	Coal zone	Coarse sandstone and grit	20	220°	0.91	33"
185	Manziri		Uzizipofu river	Coal zone	Coarse sandstone	4	241°	0.98	
186	Stegi		Mtendekwa river	Above coal zone	Medium sandstone	8	187°	0.96	
187	Hl-tikulu		Nhaloyo river	Coal zone	Coarse sandstone and grit	5	190°	0.92	

Out-crop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	No. of Measurements	Vectoral Mean	Consistency Ratio	Mean thickness of Planar Cross-bedded units
188	Hlatikulu		In stream	Coal zone	Coarse sandstone and grit	20	209°	0.86	

STATISTICAL DATA ON RIPPLE MARKS IN THE
NORTHERN PORTION OF THE BASIN

Outcrop No.	District	Farm	Outcrop Description	Stratigraphic position	Constituent Material	Symmetry of crests	No. of Measurements	Mean Strike	Ripple Index
13	Ermelo	Goedehoop 24	Cliffs	Above coal zone	Medium sandstone	Symmetrical	2	269°	6.00
36	Ermelo	Mooifontein 497	In stream	Above coal zone	Fine sandstone	Symmetrical	3	280°	5.40
56	Bethal	Roodekrans 457	In stream	Above coal zone	Coarse sandstone	Symmetrical	3	88°	3.47
89	Ermelo	Bloemfontein 288	Cutting	Coal zone	Fine sandstone	Symmetrical	3	111°	1.88
125	Witbank	Van Dyks Drift 19	Cliffs	Coal zone	Fine sandstone	Symmetrical	6	133°	11.00
135	Standerton	De Bank 280	Above stream	Above coal zone	Medium sandstone	Symmetrical	5	68°	5.15
161	Balfour	Keefontein 159	Ledges	Above coal zone	Medium sandstone	Symmetrical	7	19°	11.37
163	Balfour	Britzville 10	Side of hill	Above coal zone	Medium sandstone	Symmetrical	2	65°	10.56
169	Balfour	Modderfontein 562	In per	Below coal zone	Medium sandstone	Symmetrical	3	121°	35.00
178	Delmas	Brakfontein 264	In Wilge river	Coal zone	Fine sandstone	Symmetrical	3	151°	15.00

A P P E N D I X 18PEBBLE SIZES

Outcrop No.	District	Farm	Outcrop Description	Mean length of long axis of 10 largest pebbles
98	Dundee	Matatana 13024	In stream	3.4"
99	Dundee	Overton 3315	In stream	3.1"
27	Dundee	Van Rensselaer 4252	In Sandspruit	5.8"
52	Dundee	Lyell 2398	In stream	1.8"
198	Utrecht	Schuilklip 109	Side of hill	1.1"
196	Utrecht	Witklip 98	In stream	1.3"
110	Utrecht	Nooitgedacht 60	In stream	5.7"
142	Utrecht	Novembersdrift 87	In donga	4.3"
227	Paulpietersburg	Trekdrift 39	Near bridge	3.8"
221	Paulpietersburg	Makateuskop 59	Side of hill	5.6"
262	Vryheid	Vaalkrans 306	Cutting	2.6"
265	Vryheid	Langkrans 367	Side of mountain	6.0"
230	Vryheid	Erfstuk 4	In stream	4.9"
268	Vryheid	Riversdale 75	Side of mountain	5.0"
277	Piet Retief	Pongola 160	Tititulu hill	6.8"
281	Nongoma	Native Reserve No. 12	In donga	5.6"
165	Wakkerstroom	Nauwgevonden 369	Cliff	2.6"
212	Wakkerstroom	Klipspruit 461	In donga	4.2"

Outcrop No.	District	Farm	Outcrop Description	Mean length of long axis of 10 largest pebbles
133	Bethal	Uitmolkaar 126	Cutting	4.8"
64	Ermelo	Nooitgedacht	Quarry	2.3"
-	Middleburg	Uitkyk 290	Quarry	5.9"
179	Witbank	Honingkranz	Old mine	6.1"
184	Manzini	-	Rail cutting	5.5"
188	Hlatikulu	-	In stream	3.2"
-	Ermelo	Bellevue 176	Cutting	9.0"
100	Carolina	Onbekend 172	Side of hill	10.1"
99	Carolina	Kleinbuffel-spruit 111	Side of hill	9.4"
167	Balfour	Malanskraal 562	Ledges	20.1"
169	Balfour	Modderfontein 562	Side of pan	5.3"
-	Vereeniging	Klipplaatdrift 83	North bank of river	5.6"

BOREHOLE CONTROL POINTS USED IN THE CONSTRUCTION
OF ISOPACH MAP OF THE TOTAL ECRA PLUS UPPER DWIKA SHALE

Reference No.	Locality	Thickness	Source of Information	Remarks
1	Brakfontein 953	1,425'	Kingston Report (1961)	Incomplete section
2	Dannhauser G.S.D.1	1,670'	Kingston Report (1961)	Incomplete section
3	Amersfoort S.12	1,472'	Kingston Report (1961)	Incomplete section
4	Langbank 1165	973'	Kingston Report (1961)	
5	Mara 1	977'	Kingston Report (1961)	
6	Nooitgedacht 1	1,165'	Kingston Report (1961)	
7	Novo 1	1,201'	Kingston Report (1961)	
8	Rietpan 1	965'	Kingston Report (1961)	
9	Tierbank Noord 257	1,013'	Kingston Report (1961)	
10	Paardefontein	973'	Kingston Report (1961)	
11	Oliefontein 856	881'	Kingston Report (1961)	
12	Roodewal 779	1,088'	Kingston Report (1961)	Incomplete section
13	Fairview 2009	775'	Kingston Report (1961)	
14	Friskweld 647	866'	Kingston Report (1961)	
15	Windsor 528	894'	Kingston Report (1961)	
16	Nooitgedacht 298	956'	Kingston Report (1961)	
17	Zuurfontein 301	871'	Kingston Report (1961)	
18	Steynsrust Townlands	904'	Kingston Report (1961)	
19	Laverstock 272	994'	Kingston Report (1961)	
20	Blaauwboschbank 643	854'	Kingston Report (1961)	

Reference No.	Locality	Thickness	Source of Information	Remarks
21	Geneva 895	648'	Kingston Report (1961)	Incomplete section
22	Olie 50	797'	Kingston Report (1961)	
23	Mocipan 721	914'	Kingston Report (1961)	
24	Wonderheuvel 250	950'	Kingston Report (1961)	
25	Vaalbank 206	943'	Kingston Report (1961)	
26	Kafferspruit 265	891'	Kingston Report (1961)	
27	Welgelegen 382	1,041'	Kingston Report (1961)	
28	Bosrand 2289	1,090'	Kingston Report (1961)	
29	Wynandsfontein 653	1,150'	Kingston Report (1961)	
30	Madeleine 380	1,203'	Kingston Report (1961)	
31	Kranakraal 87	1,065'	Kingston Report (1961)	
32	Waterpan 376	1,486'	Kingston Report (1961)	
33	Middelkop 622	1,158'	Kingston Report (1961)	
34	Williesdam 334	1,252'	Kingston Report (1961)	
35	Leeuwkuil 698	1,219'	Kingston Report (1961)	
36	Brandfort Townlands	1,101'	Kingston Report (1961)	
37	Koolklip 318	932'	Kingston Report (1961)	
38	Sunny Vale 784	892'	Kingston Report (1961)	
39	Middelspruit 2029	729'	Kingston Report (1961)	
40	Jagersfontein Mine	1,620'	Kingston Report (1961)	
41	Plaatjesfontein 143	1,630'	Kingston Report (1961)	
42	Plaatjesfontein 143	1,334'	Kingston Report (1961)	

Reference No.	Locality	Thickness	Source of Information	Remarks
43	Lucerne 264	1,695'	Kingston Report (1961)	Incomplete section Incomplete section Incomplete section
44	Lucerne 264	1,711'	Kingston Report (1961)	
45	Vlakfontein 165	1,694'	Kingston Report (1961)	
46	Vlakfontein 165	1,639'	Kingston Report (1961)	
47	Mynhoop 62	1,926'	Kingston Report (1961)	
48	Dubbeldde Vlei	3,060'	Kingston Report (1961)	
49	Sambokkraal	8,025'	Haughton et al 1953	
50	De Aar Townlands	1,300'	Rogers (1907)	
51	Paardekraal	1,503'	Anglo American Corporation	
57	Sternderton Townlands	710'	Cehlke and van der Merwe (1959)	
58	Somkele	2,960'	Southern Oil Exploration Corp.	
59	Tuinplaats 307	2,000'	Union Corporation	
60	Klip Drift Wer. Q. 16-2	5,456'	Southern Oil Exploration Corp.	Incomplete section Incomplete section Incomplete section
61	Quaggas Fontein Fr. Q. 9-12	4,051'	Southern Oil Exploration Corp.	
62	Abrahams Kraal B.F.W.Q. 1-25	4,664'	Southern Oil Exploration Corp.	
63	Karsse Bosch Mu.Q. 1-30	5,985'	Southern Oil Exploration Corp.	

MEASURED SECTION CONTROL POINTS USED IN THE
CONSTRUCTION OF ISOPACH MAP OF THE TOTAL ECCA PLUS UPPER DWYKA SHALE

Reference No.	Locality	Thickness	Source of Information	Remarks
1	Southern Swaziland	2,475'	Scoggings and Lenz (1961)	Incomplete section, Upper Eccca estimated to be 500'
2	Natal-Transvaal border	1,750'	Visser et al (1958)	
3	Vryheid	1,850'	Blignaut & Furter (1940)	
4	Dundee	2,350'	Du Toit (1918)	3,075' measured by geologist of the Standard Vac. Co.
5	Tugela Valley	3,200'	Du Toit (1931)	
6	Greytown	2,600'	Du Toit (1918)	
7	Pietermaritzburg	2,700'	King (1948)	Only lower and middle Eccca re-presented
8	Umsinkulu Valley	2,600'	Du Toit (1918)	
9	Durban	±2,500'	King (1964)	
10	North of Durban	±3,000'	Kent (1938)	Only lower and middle Eccca re-presented
11	Port St. Johns	2,500'	Du Toit (1918)	
12	Roggeveld Escarpment	2,610'	Kingston Report (1961)	1705' measured by geologists of the Standard Vac. Co.
13	Koedoesberg	4,085'	Kingston Report (1961)	

Reference No.	Locality	Thickness	Source of Information	Remarks
14	Beukesfontein	4,085'	Kingston Report (1961)	Incomplete section; estimated thickness of Upper Dwyka Stage = 600'
15	Hantamsberg	+1,800'	Du Toit (1904)	
16	Willemskraal west of Dwyka River	6,938'	Haughton et al (1953)	
17	Along Dwyka River	6,643'	Haughton et al (1953)	
18	Along Gamka River	7,213'	Haughton et al (1953)	
19	Prince Albert	6,713'	Haughton et al (1953)	
20	Haagklip-Groot Waterval	7,436'	Haughton et al (1953)	
21	Zwartkraal	7,164'	Haughton et al (1953)	
22	Kommande Kraal-Waalkraal	7,854'	Haughton et al (1953)	
23	North of Miller Station	10,894'	Haughton et al (1953)	
24	N. of Volwefontein Station	9,450' +	Haughton et al (1953)	
25	North of Grahamstown	10,900'	Geol. Surv. S.A. (Johnstone)	

STATISTICAL DATA ON DIRECTIONAL SEDIMENTARY STRUCTURES

Portion of Basin	Cross-bedding		Ripple Marks		Gracve Casts		Parting Lineations		Fucoid Structures		Sub Total	
	No. of Measurements	No. of Outcrops	No. of Measurements	No. of Outcrops	No. of Measurements	No. of Outcrops	No. of Measurements	No. of Outcrops	No. of Measurements	No. of Outcrops	No. of Measurements	No. of Outcrops
North-Western	311	49	135	20	-	-	27	4	247	15	720	88
Cape Province and southernmost Orange Free State	136	33	884	176	82	13	17	4	93	13	1,212	239
Eastern	295	59	6	2	28	4	17	4	-	-	346	69
North-Eastern	2,736	300	15	2	-	-	-	-	-	-	2,801	302
Northern	1,070	175	37	10	-	-	-	-	-	-	1,107	185
Sub Total	4,595	616	1,077	210	110	17	61	12	340	28	6,186	883

Grand Total

AVERAGE NUMBER OF DIRECTIONAL SEDIMENTARY
STRUCTURAL MEASUREMENTS PER OUTCROP

Portion of Basin	Cross-Bedding	Ripple Marks	Groove Casts	Parting Lineations	Fucoid Structures	Population Average
North-Western	6.3	6.8	-	6.8	16.5	8.2
Cape Province and southernmost Orange Free State	4.1	5.0	6.3	4.3	7.2	5.1
Eastern	5.0	3.0	7.0	4.3	-	5.0
North-Eastern	9.3	7.5	-	-	-	9.3
Northern	6.1	3.7	-	-	-	5.0
Population Average	7.5	5.1	6.5	5.1	12.1	7.0

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- FIG. 2 The White Band north of Matjiesfontein
- FIG. 3 Rectangular jointing in massive bedded sandstone
- FIG. 4 The Western Flank of the Koedoesberg
- FIG. 5 Typical lower Ecca Shale, Northern Facies
- FIG. 6 The Eastern Escarpment near Greytown
- FIG. 7 Sandstone formations in the Middle Ecca Group, Northern Facies
- FIG. 8 The second and third sandstone formations
- FIG. 9 Triangular diagram illustrating percentage mineral compositions
- FIG. 10 Coarse-grained Middle Ecca sandstone, Northern Facies
- FIG. 11 Graywacke sandstone of the Southern Ecca Facies
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- FIG. 13 Visual Wentworth size chart
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- FIG. 17 Beta-cross-bedding
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- FIG. 20 Zeta-cross-bedding
- FIG. 21 Theta-cross-bedding
- FIG. 22 Iota-cross-bedding
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- FIG. 25 Omikron-cross-bedding
- FIG. 26 Symmetrical ripple marks
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- FIG. 28 Polish section of asymmetrical ripple mark
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- FIG. 30 Sand waves
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- FIG. 32 Large groove cast
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- FIG. 40 Shale pebble conglomerate
- FIG. 41 Spherical gas pits
- FIG. 42 Load structures
- FIG. 43 Ball-and-pillow structures
- FIG. 44 Penecontemporaneous recumbent fold
- FIG. 45 Incoherent slump structures
- FIG. 46 Sandstone sills and dykes
- FIG. 47 Compaction wrinkles in sandstone dyke
- FIG. 48 Probable crustacean tracks
- FIG. 49 Possible tracks in shale of Central Ecce Facies
- FIG. 50 Fish trails
- FIG. 51 Worm trails
- FIG. 52 Plan view of vertical worm burrows
- FIG. 53 Vertical worm burrows in carbonaceous sandstone

- FIG. 54 Bifurcating worm burrows
- FIG. 55 Graph showing bimodal orientation of fucoid structures
- FIG. 56 Graph showing bimodal orientation of fucoid structures
- FIG. 57 Graph showing bimodal orientation of fucoid structures
- FIG. 58 Graph showing bimodal orientation of fucoid structures

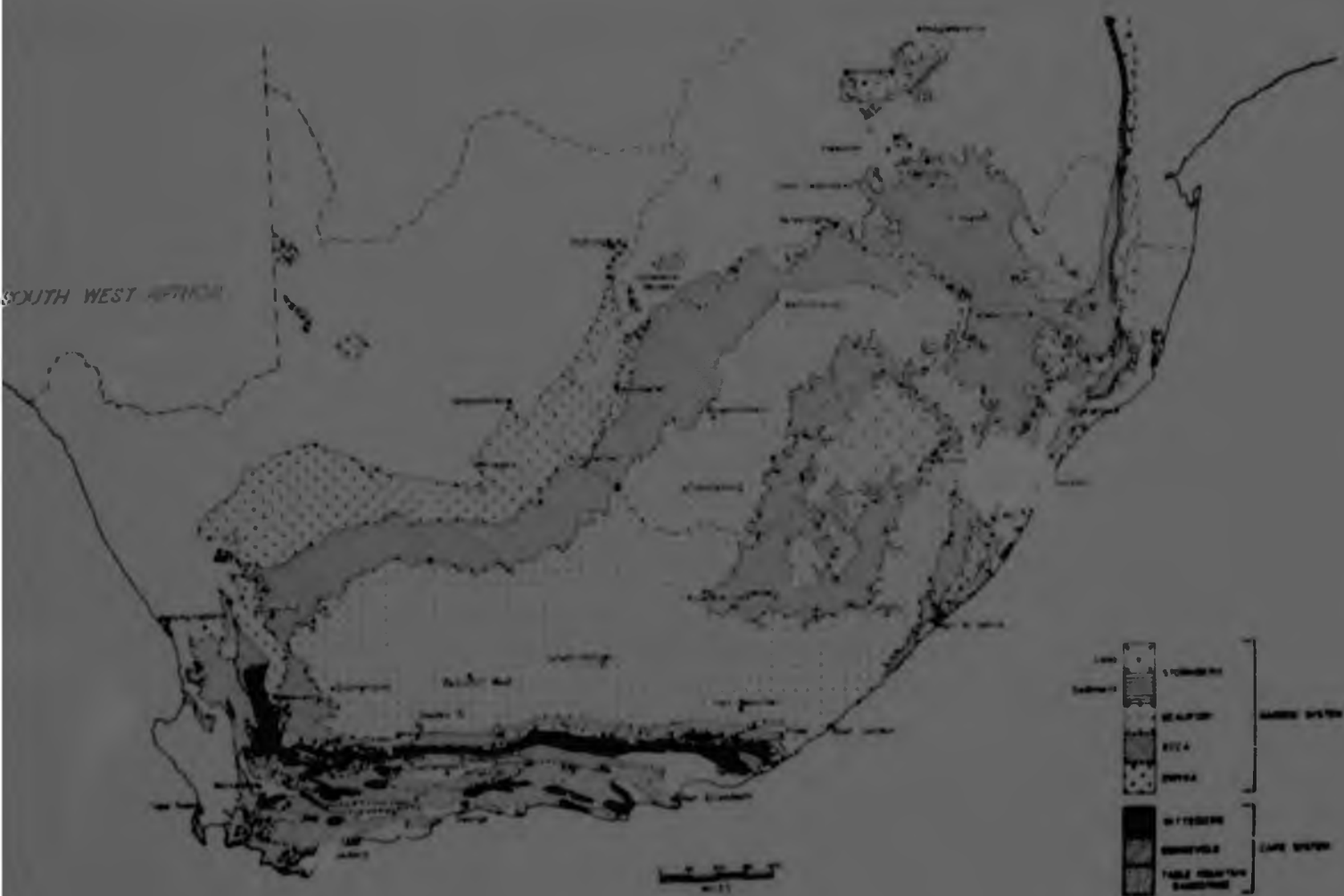


FIG. 1 GENERALIZED GEOLOGICAL MAP OF THE
CAPE AND KARROO SYSTEMS IN THE REPUBLIC OF SOUTH AFRICA



FIG. 2 THE WHITE BAND NORTH OF
MATJIESFONTEIN, LANSBURGH DISTRICT, CAPE



FIG. 3 RECTANGULAR JOINTING IN MASSIVE BEDDED
SANDSTONE, MIDDLE ECCA GROUP WESTERN FACIES,
BUTHERLAND DISTRICT



FIG. 4 THE WESTERN FLANK OF THE KOEDOESBERG, SUTHERLAND
DISTRICT. CLIFFS AND FLANKS COMPOSED OF ECCA STRATA
(WESTERN FACIES). MOUNTAIN CAPPED BY THIN SUCCESSION
OF LOWERMOST BEAUFORT BEDS



FIG. 5 TYPICAL LOWER ECCA SHALE, NORTHERN FACIES,
UMTINGA DISTRICT, NATAL



FIG. 6 THE EASTERN ESCARPMENT NEAR GREYTOWN, NATAL.
BUILT UP OF MIDDLE ECCA SEDIMENTS AND THICK DOLOERITE SILLS



FIG. 7 SANDSTONE FORMATIONS IN THE MIDDLE ECCA
GROUP, NORTHERN FACIES. MOOI RIVER VALLEY, NATAL



FIG. 8 THE SECOND AND THIRD SANDSTONE FORMATIONS,
MIDDLE ECCA GROUP, NEAR TREDEN, NATAL

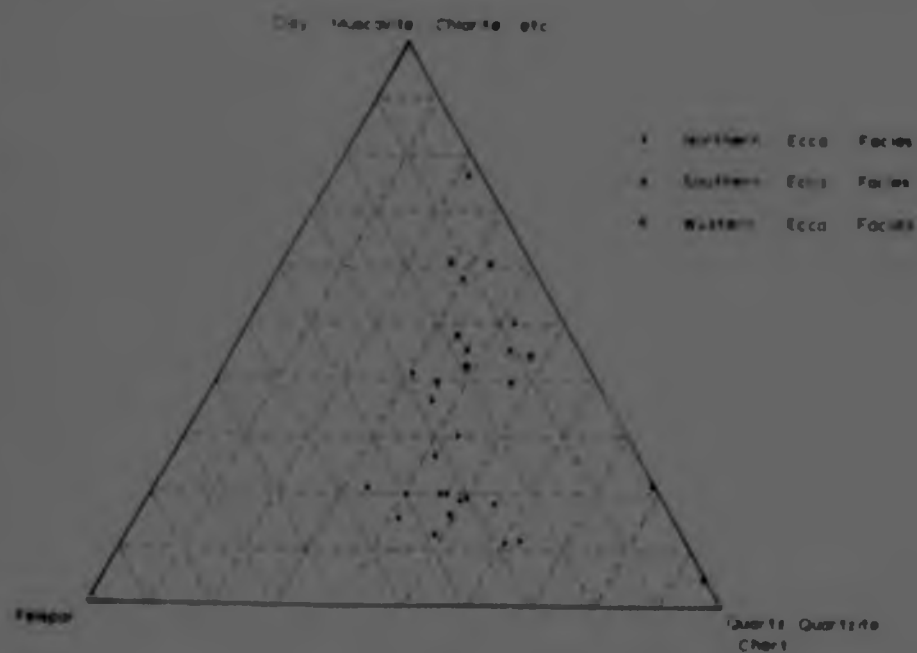


FIG. 9 TRIANGULAR DIAGRAM ILLUSTRATING PERCENTAGE
MINERAL COMPOSITIONS OF ECCA / FOSSELS

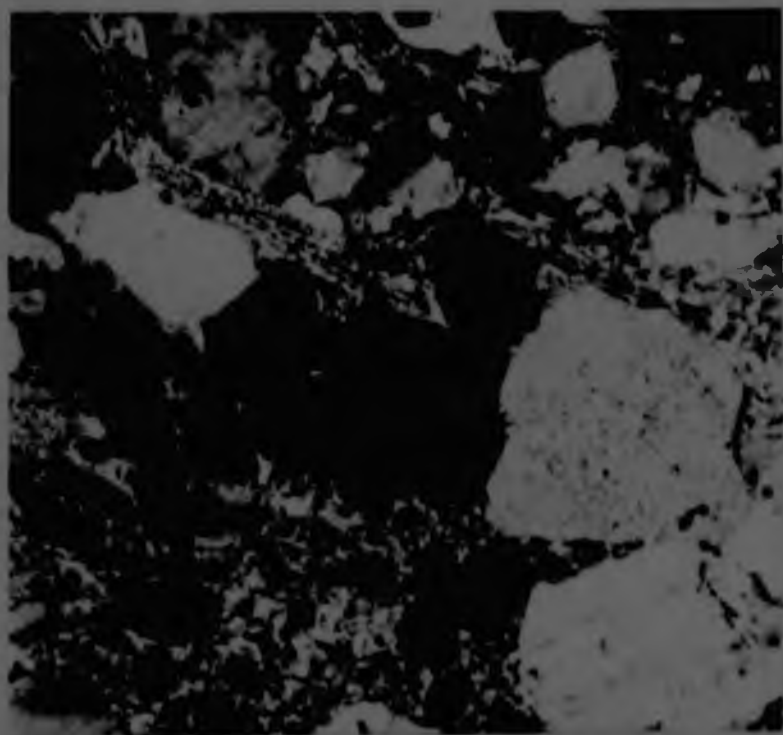


FIG. 10 TYPICAL COARSE-GRAINED MIDDLE ECCA SANDSTONE OF
THE NORTHERN ECCA FACIES: SHOWING DETRITAL MUSCOVITE BENT
ROUND QUARTZ GRAINS. LARGE GRAINS OF MICROCLINE ARE ABUNDANT
X 62.5

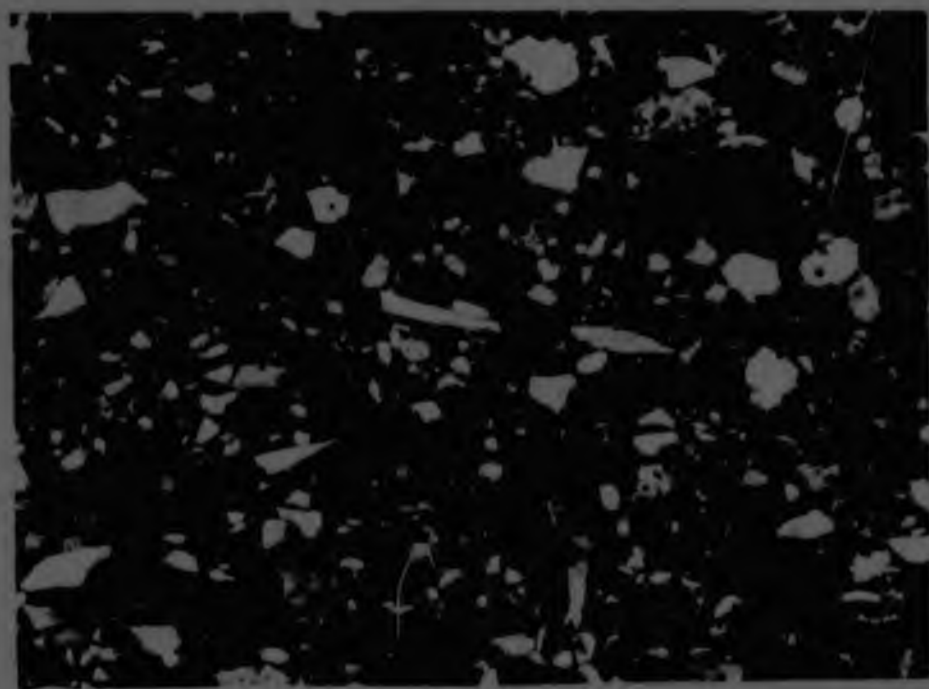


FIG. 11 TYPICAL GRAYWACKE SANDSTONE OF THE
SOUTHERN ECCA FACIES, SHOWING POINTED SHIVERS OF QUARTZ

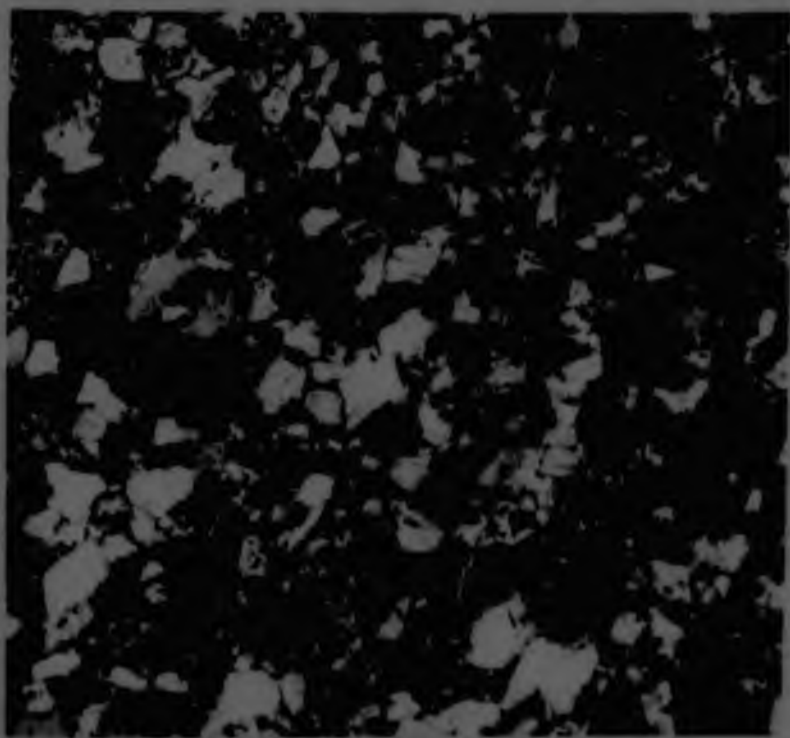


FIG. 12 TYPICAL SUB-GRAYWACKE SANDSTONE FROM THE
UPPER ECCA GROUP OF THE WESTERN ECCA FAULTS. NOTE
THE ANGULAR POORLY SORTED NATURE OF THE GRAINS AND
THE PRESENCE OF ARBORESCENCE. X 62.5

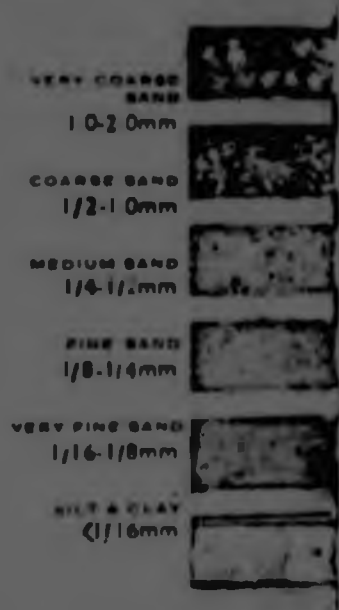


FIG. 13 VISUAL WENTWORTH SIZE CHART USED FOR
DETERMINING AVERAGE GRAIN SIZE OF ECCA SANDSTONES

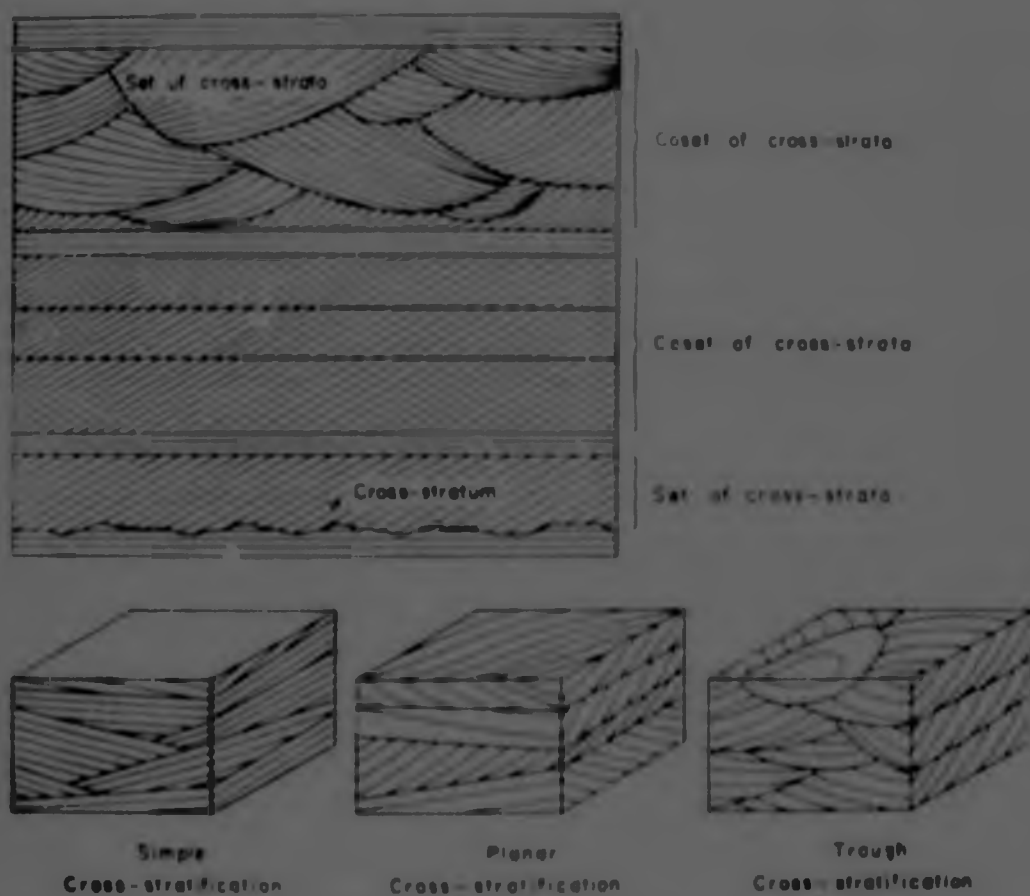


FIG. 14 CLASSIFICATION OF CROSS-BEDDING
(MCKEE AND WEIR, 1955)

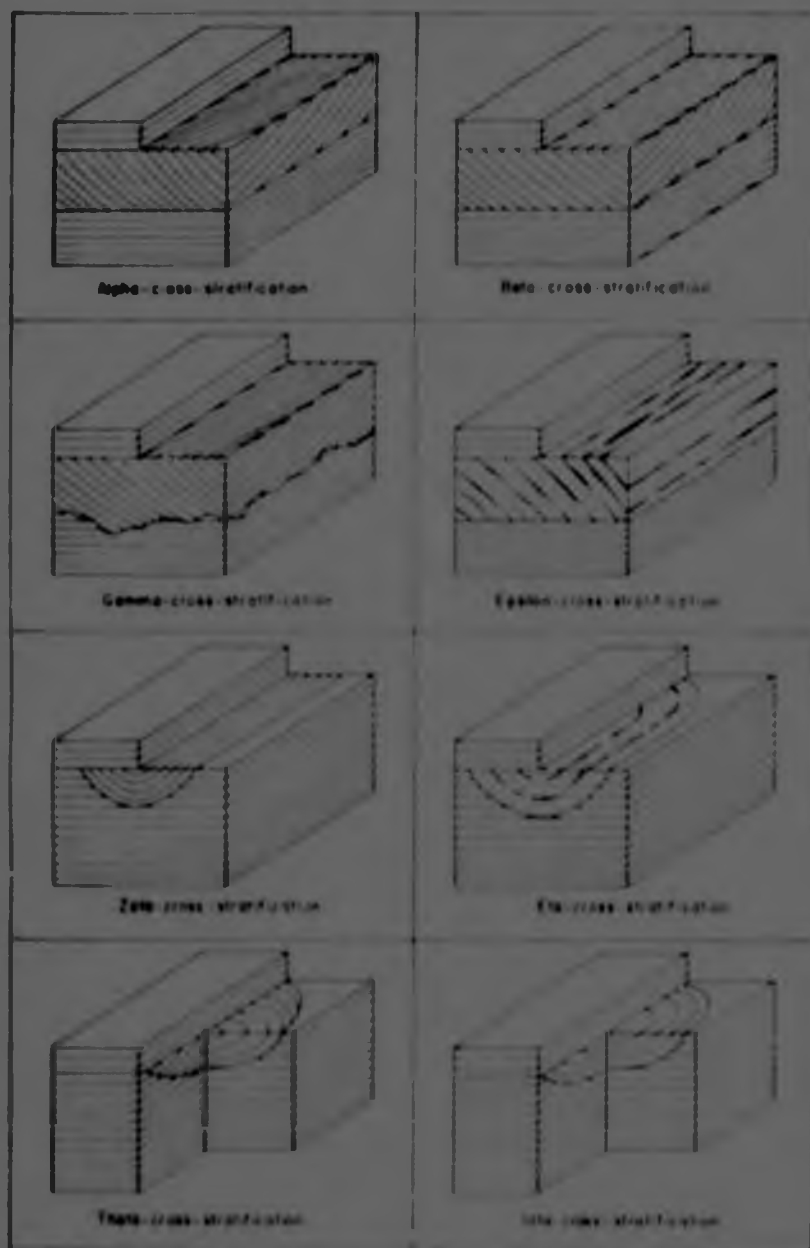


FIG. 15 GENERALIZED BLOCK DIAGRAMS ILLUSTRATING
TYPES OF CROSS-BEDDING (ALLEN, 1963)



FIG. 16 ALPHA - CROSS-BEDDING OVERLYING A COAL SEAM
IN THE MIDDLE ECCA GROUP, NORTHERN FACIES, DUNDEE
DISTRICT, NATAL



FIG. 17 BETA - CROSS-BEDDING IN THE MIDDLE ECCA
GROUP, NORTHERN FACIES, LEROUX DISTRICT, TRANSVAAL



FIG. 18 VERY LARGE SCALE BETA - CROSS-BEDDING, MIDDLE
ECCA GROUP, NORTHERN FACIES, LORRETT DISTRICT, NATAL



FIG. 1 GAMMA - CROSS-BEDDING, MIDDLE ECCA GROUP,
NORTHERN FACIES, NEWCASTLE DISTRICT, NATAL



FIG. 20 CONTEMPORANEOUS EROSION CHANNEL OR ZETA-
CROSS-BEDDING IN THE UPPER ECCA GROUP, JENTERS FACIES
SUTHERLAND DISTRICT, CAPE

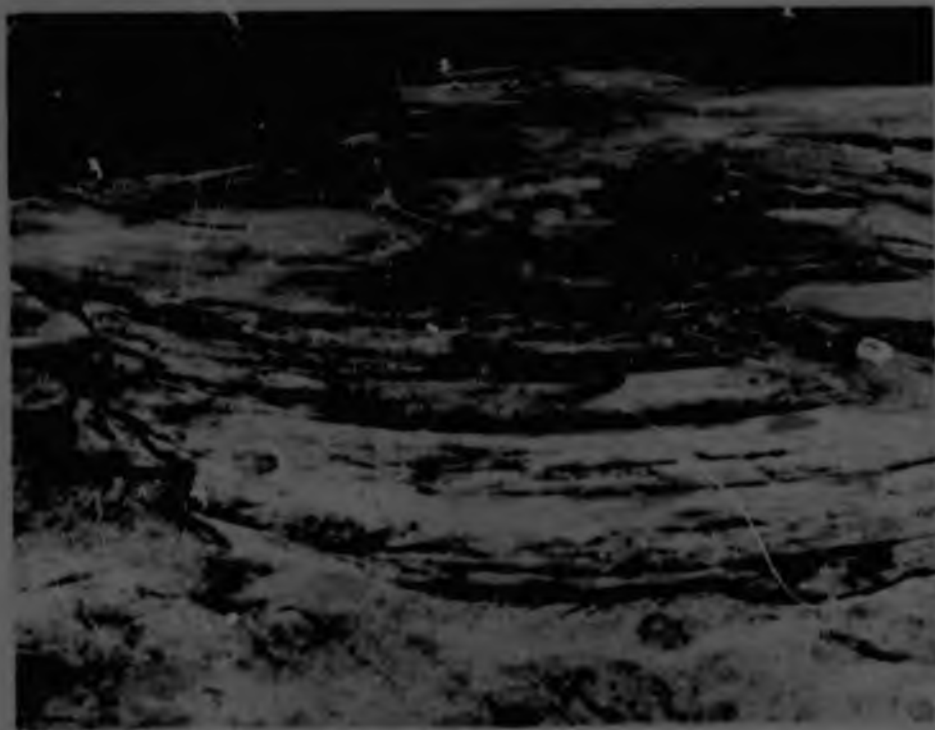


FIG. 21 THETA - CROSS-BEDDING IN MIDDLE ECCA
GROUP, NORTHERN FACIES, ERNELO DISTRICT, TRANSVAAL

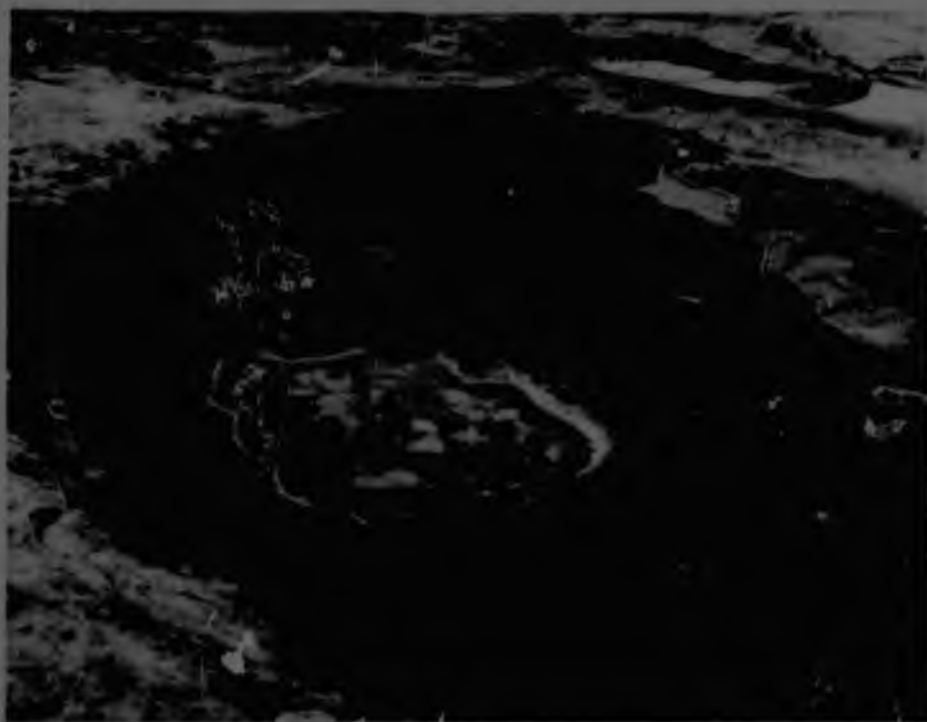


FIG. 22 IOTA - CONGLOMERATE BEDDING IN THE UPPER SANDSTONE
FORMATION, CARLEO DISTRICT, TRANSVAAL

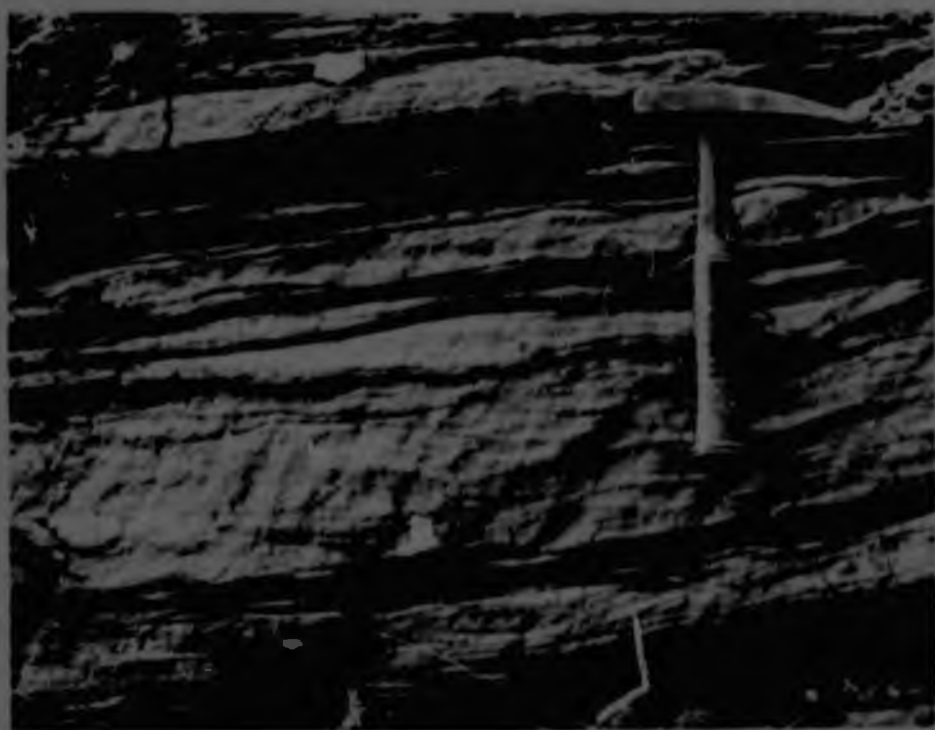


FIG. 23 FLAZER BEDDING IN THE MIDDLE ECCA GROUP,
NORTHERN FACIES, UTRECHT DISTRICT, NATAL

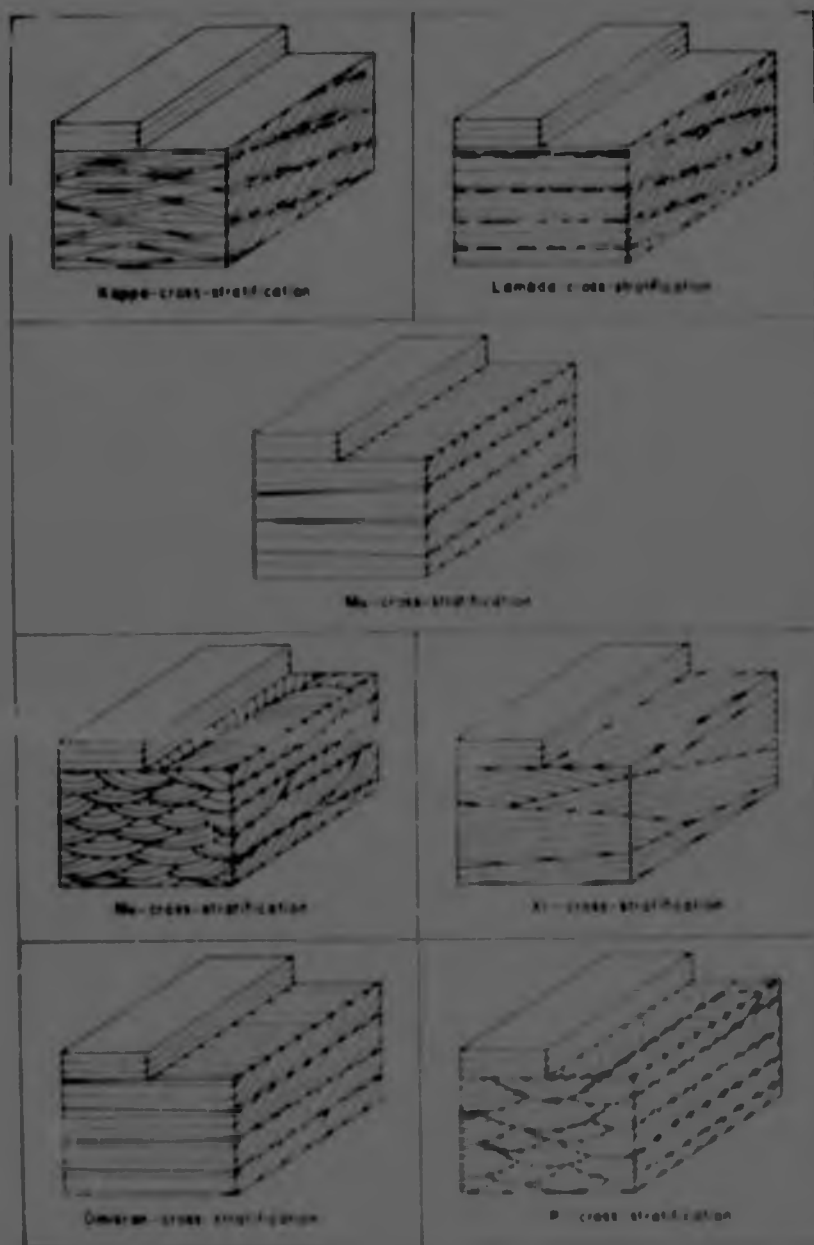


FIG. 24 GENERALIZED BLOCK DIAGRAMS ILLUSTRATING
TYPES OF CROSS-BEDDING (ALLEN, 1963)

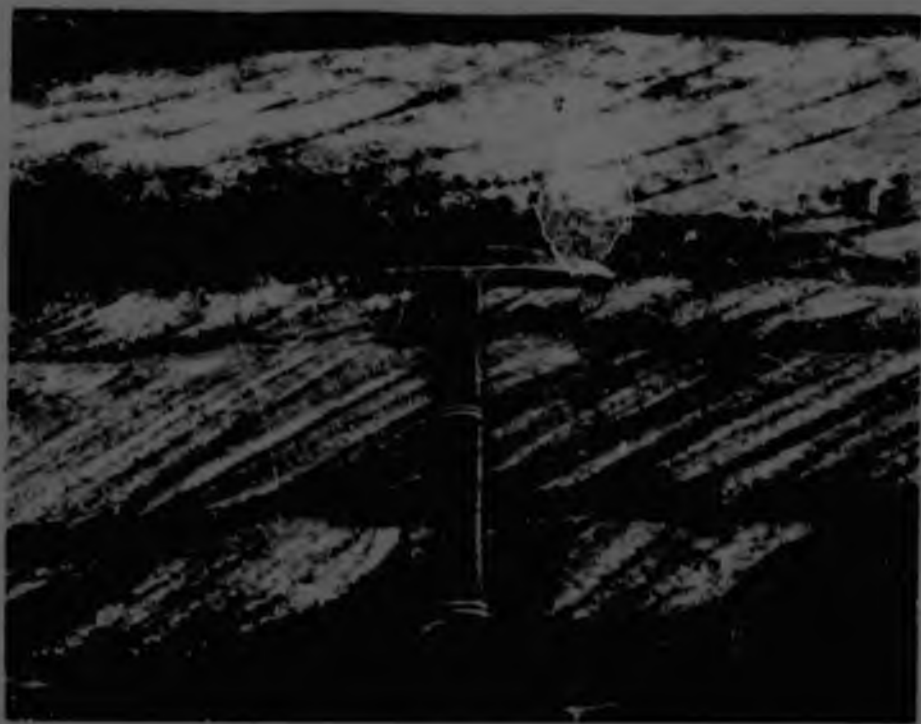


FIG. 25 CMIKRON - CROSS-BEDDING IN MIDDLE EGGA GROUP,
NORTHERN FACIES, NEWCASTLE DISTRICT, LARAL. NOTE
THICKNESS VARIATIONS BETWEEN BEDS

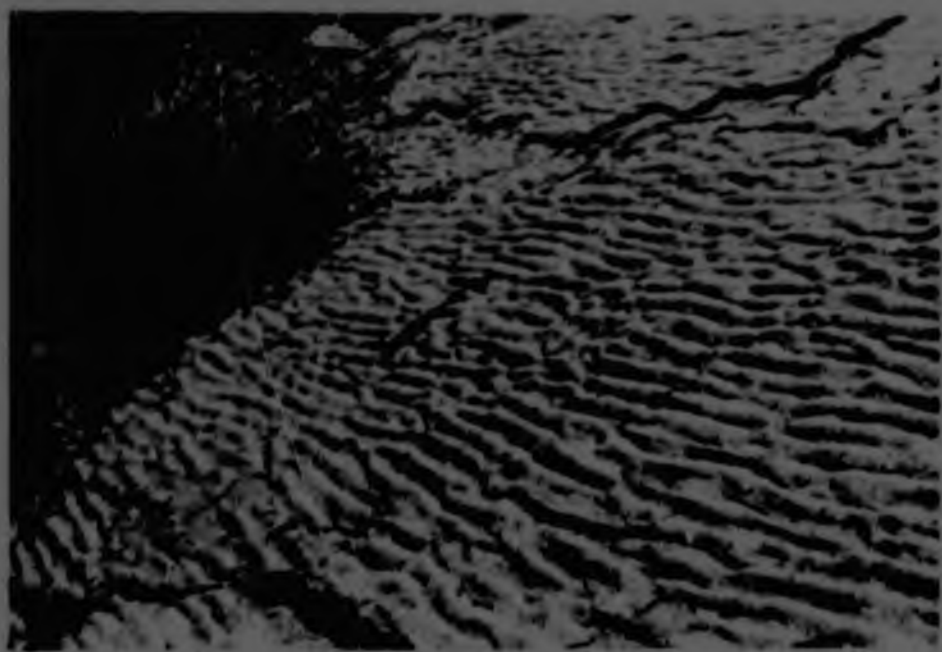


FIG. 26 SYMMETRICAL RIPPLE MARKS IN THE
LOWER EGGA GROUP OF THE SOUTHERN FACIES

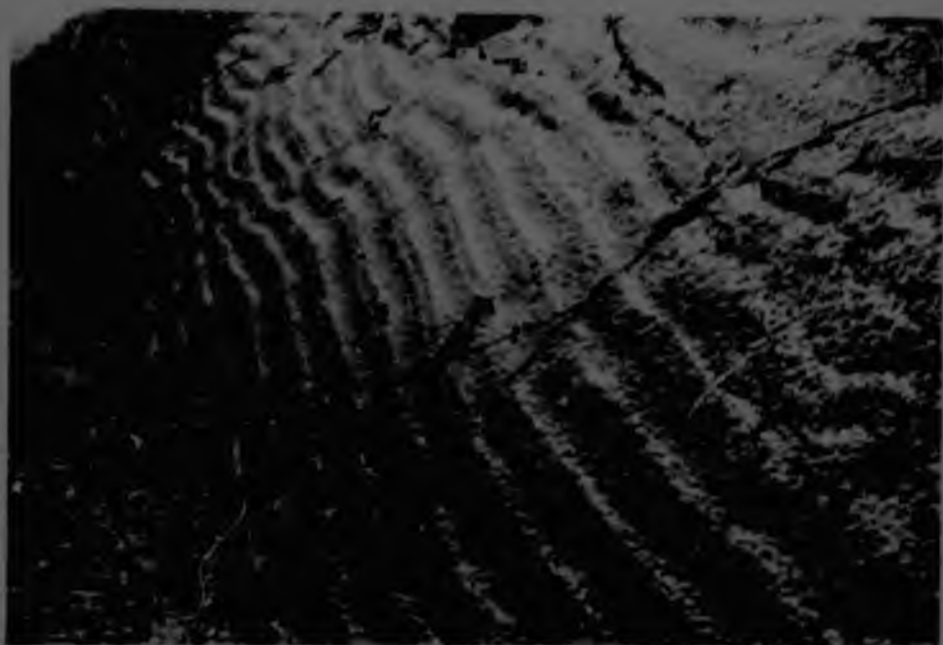


FIG. 27 SLIGHTLY ASYMMETRICAL RIPPLE MARKS IN THE
LOWER ECCA GROUP OF THE SOUTHERN FACIES,
LEWISBURG DISTRICT, CAPT



FIG. 28 POLISH SECTION OF ASYMMETRICAL RIPPLE
MARK IN THE LOWER ECCA GROUP OF THE WESTERN FACIES



FIG. 27 SLIGHTLY ASYMMETRICAL RIPPLE MARKS IN THE
LOWER ECCA GROUP OF THE SOUTHERN PACIFIC,
LAINGSBURG DISTRICT, CAPE



FIG. 28 POLISH SECTION OF ASYMMETRICAL RIPPLE
MARK IN THE LOWER ECCA GROUP OF THE WESTERN PACIFIC



FIG. 29 INTERFERENCE RIPPLE MARKS IN THE MIDDLE
ECCA GROUP OF THE WESTERN FACIES, CERES DISTRICT, CAPE



FIG. 30 SAND WAVES IN THE ALBERTA IN FRONT OF
THE NORTHERN FACIES, BETHAM DISTRICT, TELLERVAAL

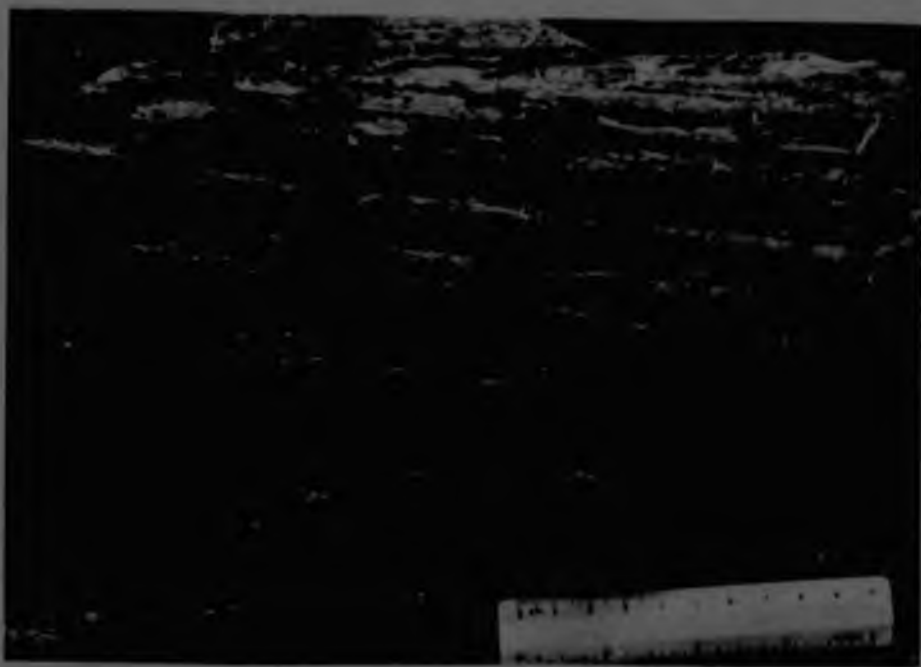


FIG. 31 TWO SETS OF GROOVE CASTS ON UNDERSIDE OF
GRAYWACKE SANDSTONE, LOWER ECCA GROUP, SOUTHERN FACIES

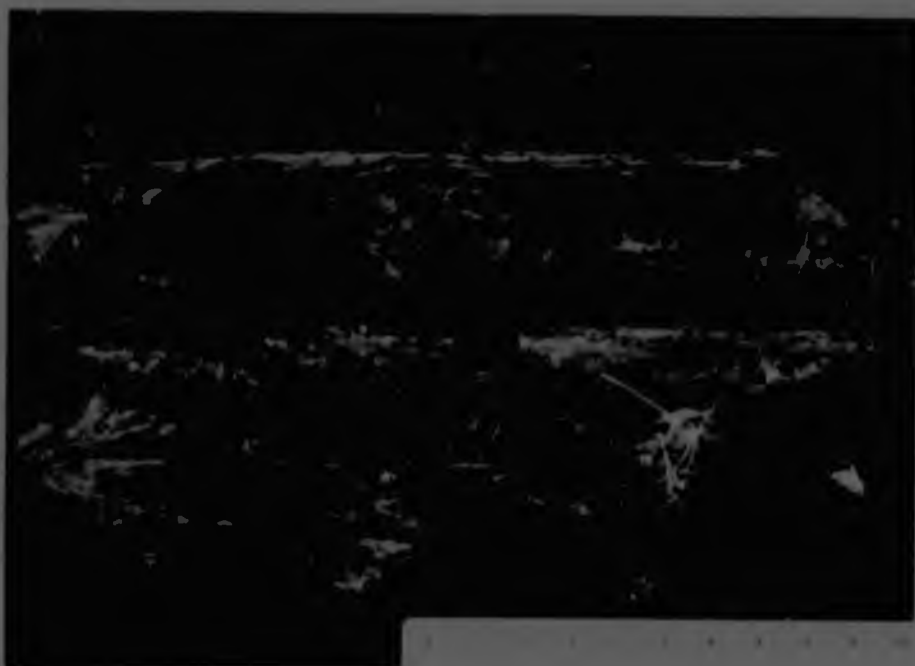


FIG. 32 LARGE GROOVE CAST CONTAINING SMALLER
SUPERIMPOSED GROOVES ON THE UNDERSIDE OF GRAYWACKE
SANDSTONE, LOWER ECCA GROUP, SOUTHERN FACIES

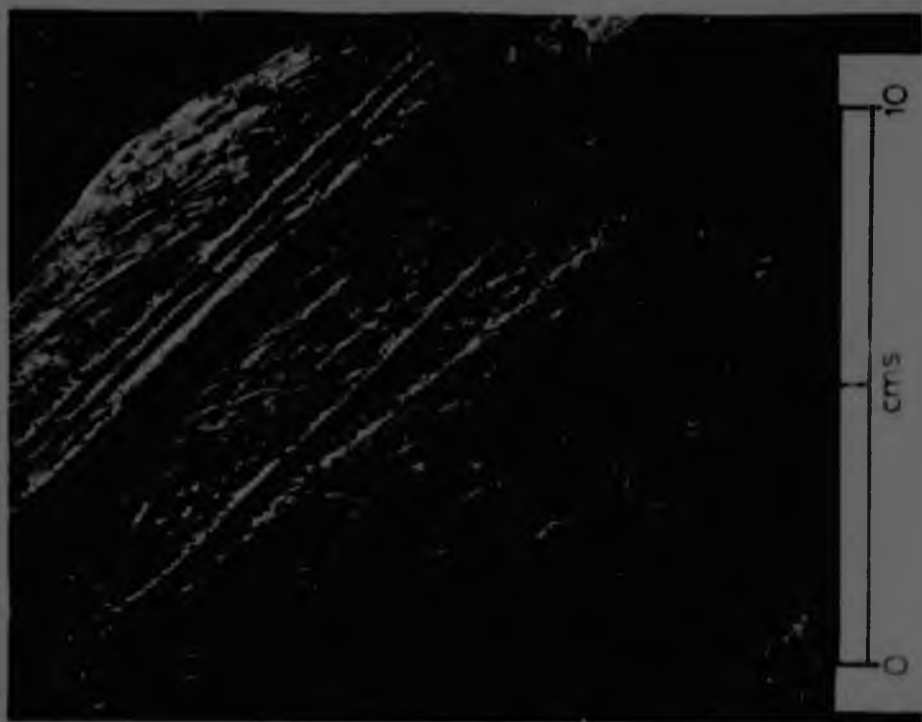


FIG. 33 GROOVE, BOUNCE AND PROD CASTS ON THE
UNDERSIDE OF A GRAYWACKE SANDSTONE, LOWER ECCA
GROUP, SOUTHERN FACIES

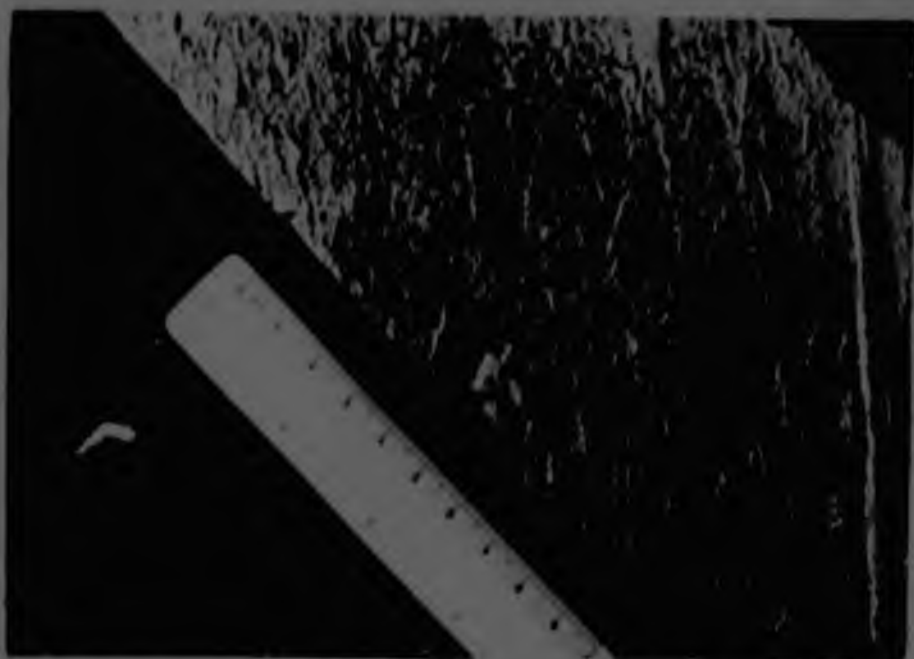


FIG. 34 GROOVE, BOUNCE AND PROD CASTS ON THE
UNDERSIDE OF A GRAYWACKE SANDSTONE, LOWER ECCA
GROUP, SOUTHERN FACIES

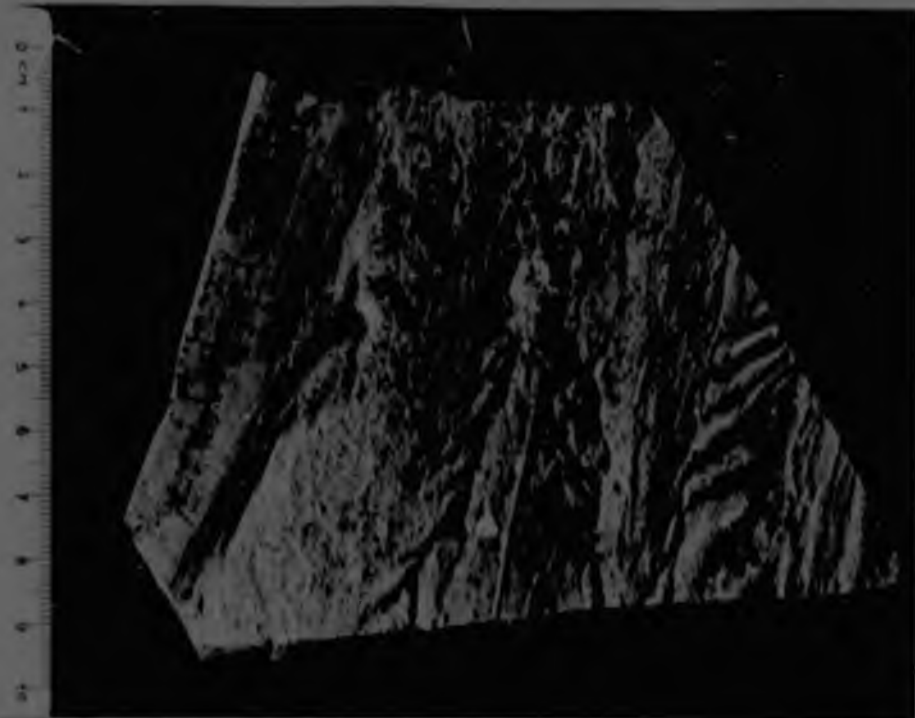


FIG. 35 CHEVRON AND HALF-CHEVRON CASTS ON THE
UNDERSURFACE OF A GRAY-WACKE SANDSTONE, LOWER EGUA
GROUP, SOUTHERN FACIES

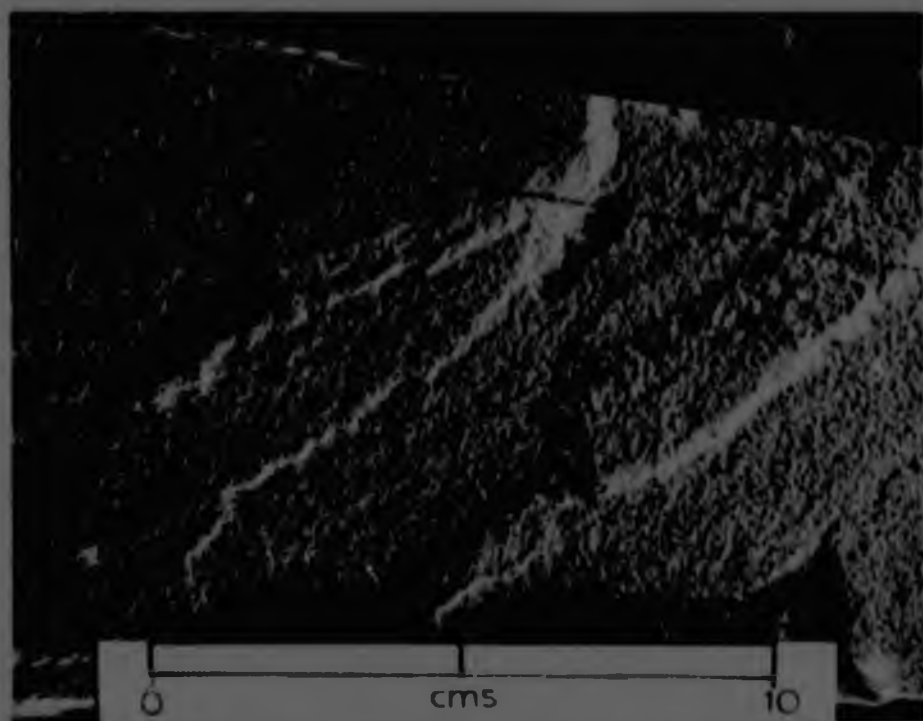


FIG. 36 PARTING LAMINATION IN SANDSTONE OF THE
UPPER EGUA GROUP, SOUTHERN FACIES



FIG. 37 FUCOID STRUCTURES IN BLUISH-BLACK SHALE OF
THE CENTRAL ECCA FACIES, LOMBARDS DRIFT 832,
BRANDFORD DISTRICT, ORANGE FREE STATE



FIG. 38 FUCOID STRUCTURE DISPLAYING A SEMI-CIRCULAR
TERMINATION, LOMBARDS DRIFT 832, BRANDFORD DISTRICT,
ORANGE FREE STATE

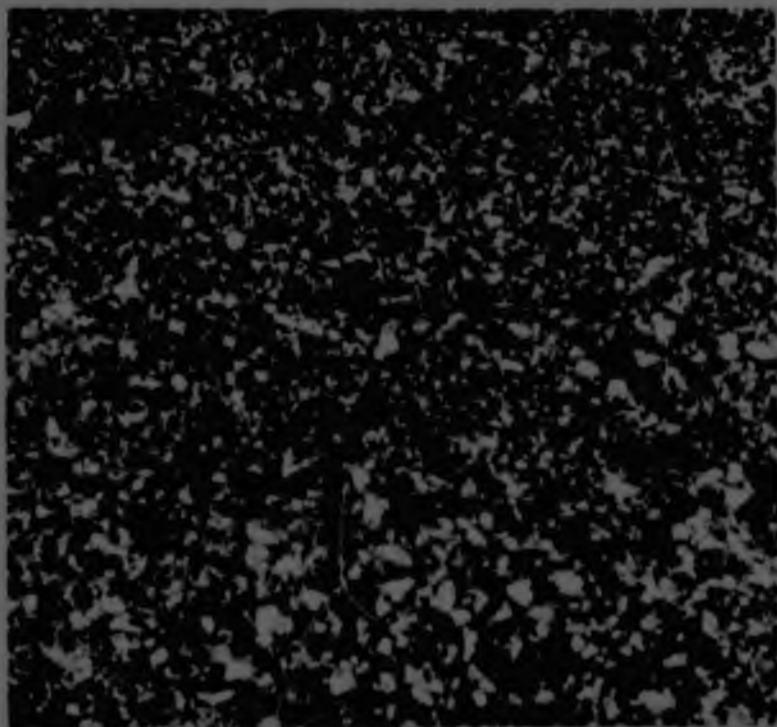


FIG. 39 GRADED BEDDING ON A MICROSCOPIC SCALE
IN SANDSTONE OF THE LOWER ECCA GROUP, SOUTHERN FACIES
x 62.5



FIG. 40 SHALE PEBBLE CONGLOMERATE IN THE LOWER
ECCA GROUP, SOUTHERN FACIES, PRINCE ALBERT DISTRICT, CAPE



FIG. 41 SPHERICAL GAS PITS IN THE LOWERMOST BEUFORT
BEDS, WESTERN FACIES, WILLISTON DISTRICT, S.D.



FIG. 42 LOAD STRUCTURES IN THE MIDDLE ECCA GROUP,
NORTHERN FACIES. NOTE THE DEFORMED NATURE OF
THE UNDERLYING SHALES



FIG. 43 BALL-AND-PILLOW STRUCTURES ISOLATED IN
SHALE, MIDDLE ECCA GROUP, WESTERN TAFELBERG,
ORANGE FRIEDLAND, CAPE



FIG. 44 PENECONTEMPORANEOUS RECUMBENT FOLD IN
MIDDLE ECCA SANDSTONE, NORTHERN FACIES, INANDA
DISTRICT, NATAL



FIG. 45 INCOHERENT BLUNT STRUCTURES, LOWER ECCA GROUP, SOUTHERN FACIES, NORTH OF COFFEE BAY, TRANSKEI



FIG. 46 SANDSTONE SILLS AND DYKES INTRUSIVE INTO SHALE OF THE SOUTHERN ECCA FACIES, COFFEE BAY, TRANSKEI



FIG. 47 COMPACTION WRINKLES IN SANDSTONE DYKE,
COFFEE BAY, TRANSKEI. NOTE ALSO THE TRANSGRESSING SILL



FIG. 48 PROBABLE CRUSTACEAN TRACKS IN CHERTY
SHALE NEAR BASE OF CENTRAL ECCA FACIES, KOFFIEFONTEIN
DISTRICT, ORANGE FREE STATE

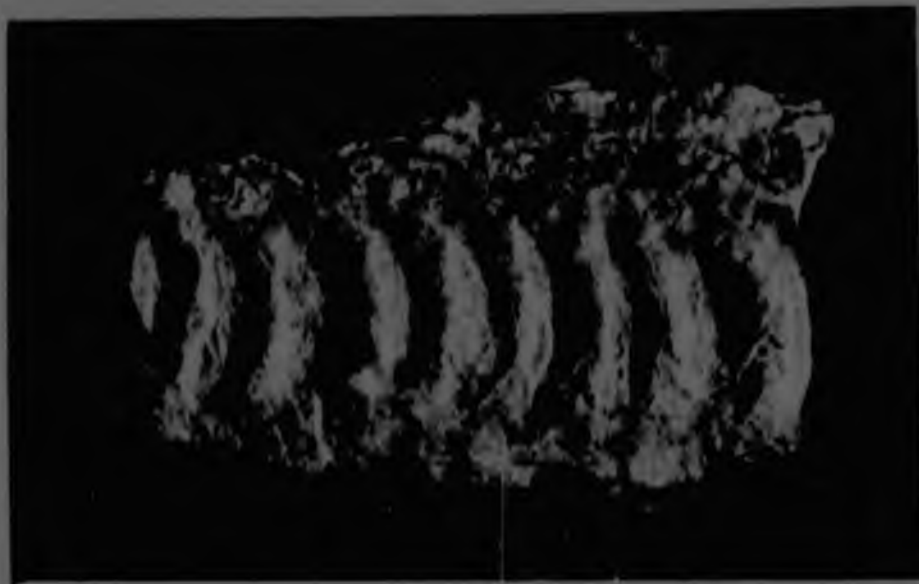


FIG. 49 POSSIBLE TRACKS FOUND IN SHALE OF THE
CENTRAL ECCA FACIES AND THE UPPER ECCA GROUP
OF THE NORTHERN FACIES

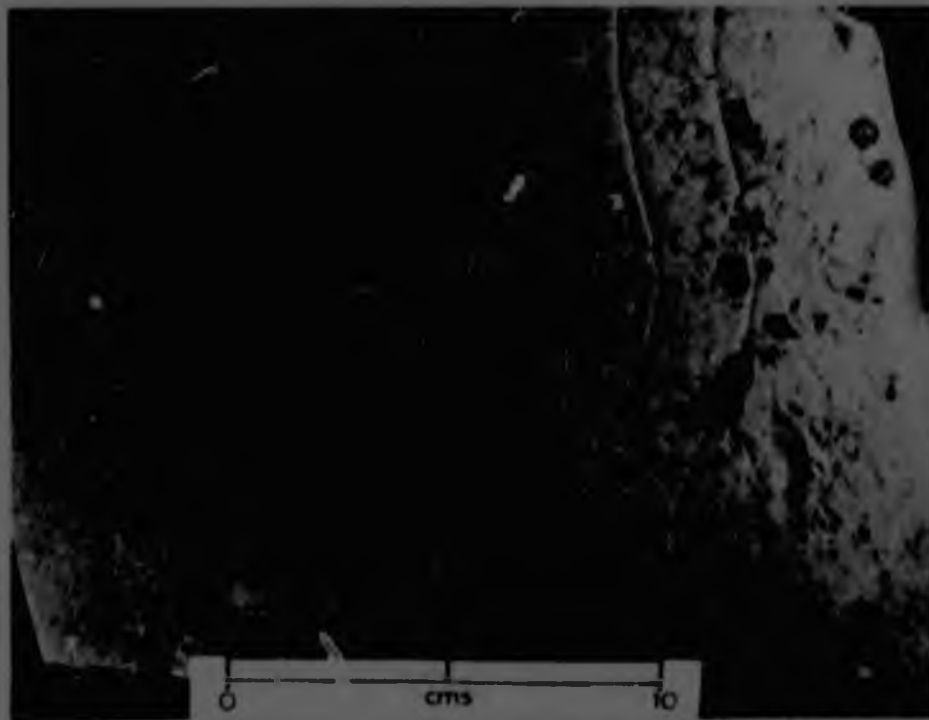


FIG. 50 FISH TRAILS IN SHALE OF THE MIDDLE
ECCA GROUP, SOUTHERN ECCA FACIES, ALBANY DISTRICT, CAPE



FIG. 51
WORM TRAILS, UPPER ECCA GROUP, WESTERN FACIES,
CALVINIA DISTRICT, CAPE

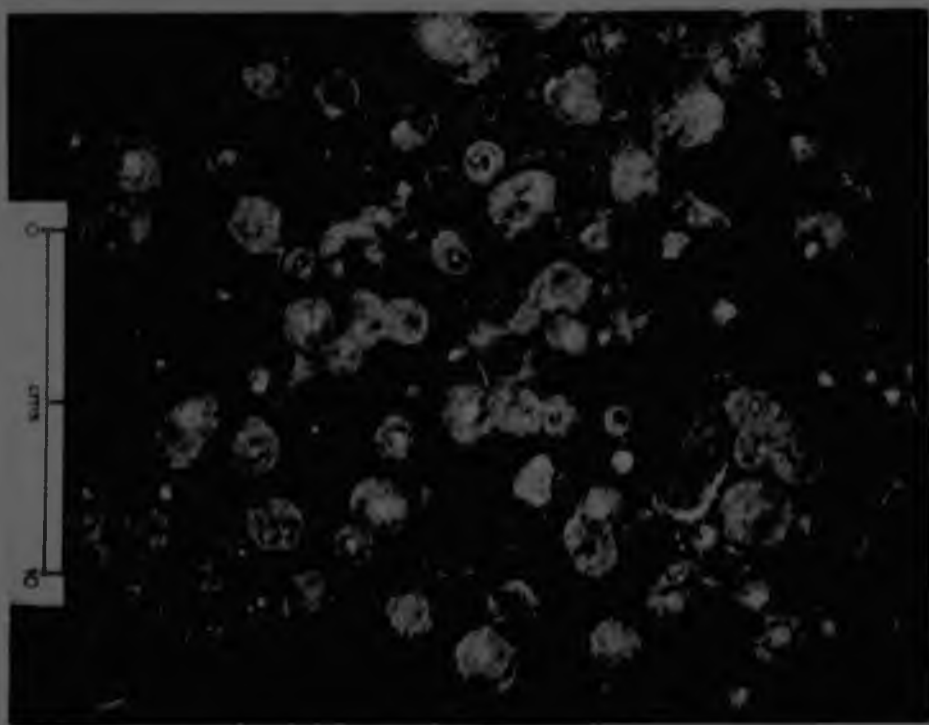


FIG. 52 PLAN VIEW OF VERTICAL WORM BURROWS IN
MICACEOUS SANDSTONE OF THE MIDDLE ECCA GROUP,
NORTHERN FACIES, HOOTHEAD DISTRICT, ORANGE FREE STATE



FIG. 53 VERTICAL WORM BURROWS IN CARBONACEOUS
SANDSTONE OF THE MIDDLE ECCA GROUP, NORTHERN FACIES,
UTRECHT DISTRICT, NATAL



FIG. 54 BIFURCATING WORM BURROWS LYING APPROXIMATELY
PARALLEL TO THE BEDDING IN SHALE OF THE LOWER ECCA
GROUP ABOUT $\frac{1}{2}$ MILE SOUTH OF UMTATA MOUTH, TRANSKEI

FIGURE 55
IN MEASUREMENTS

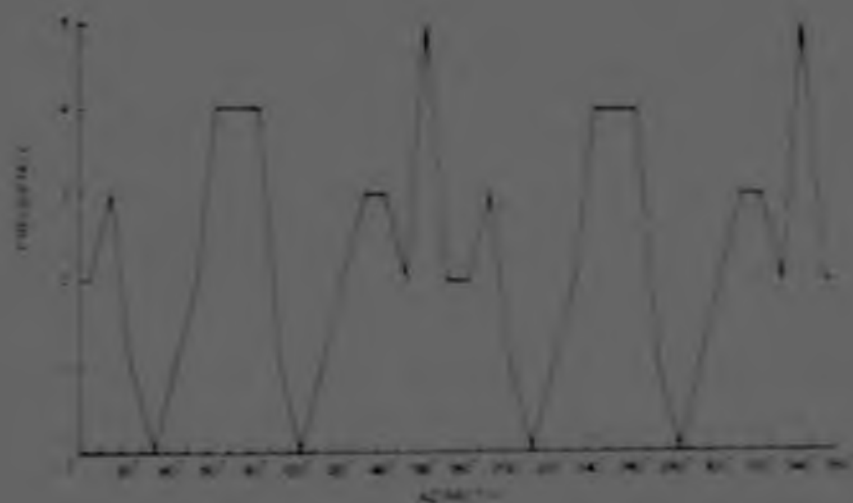


FIG. 55 GRAPH SHOWING THE BIMODAL ORIENTATION
OF FUCOID STRUCTURES AT OCTOBER 27

FIGURE 56 IN MEASUREMENTS

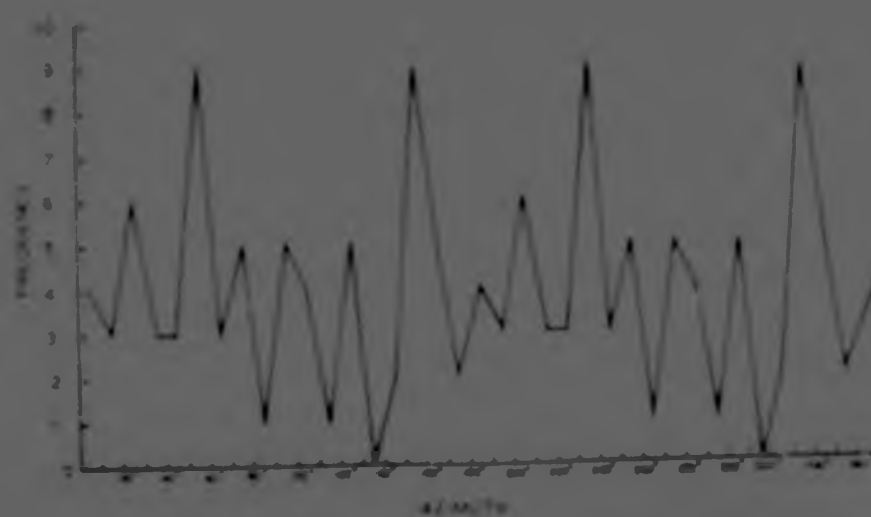


FIG. 56 GRAPH SHOWING THE BIMODAL ORIENTATION OF
FUCOID STRUCTURES AT OCTOBER 28

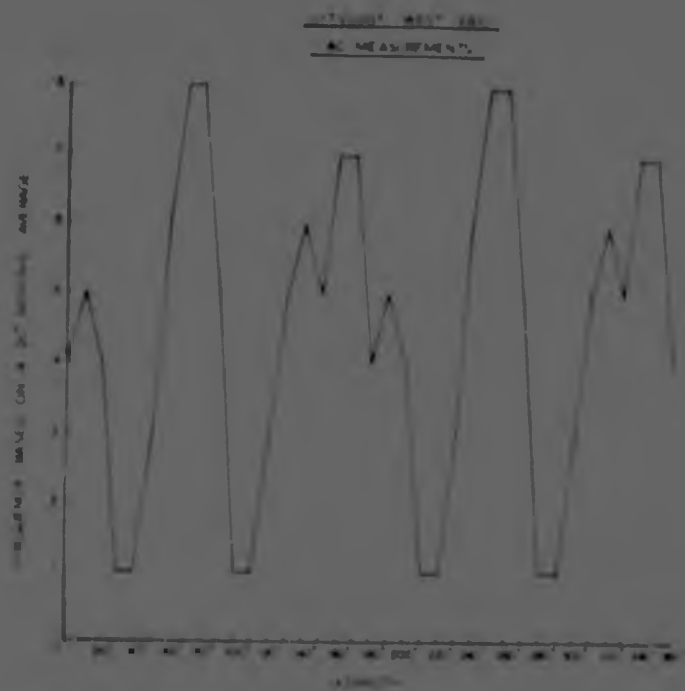


FIG. 57 GRAPH SHOWING THE BIMODAL ORIENTATION
OF FUCOID STRUCTURES AT OUTCROP 27. NOTE
FREQUENCY BASED ON A 20° MOVING AVERAGE

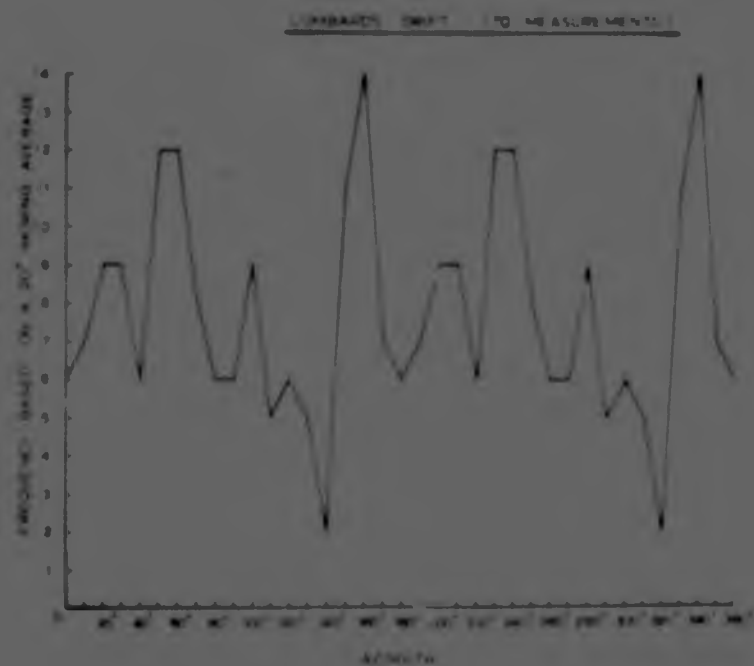


FIG. 58 GRAPH SHOWING THE BIMODAL ORIENTATION
OF FUCOID STRUCTURES AT OUTCROP 28. NOTE
FREQUENCY BASED ON A 20° MOVING AVERAGE

LIST OF FOLDERS

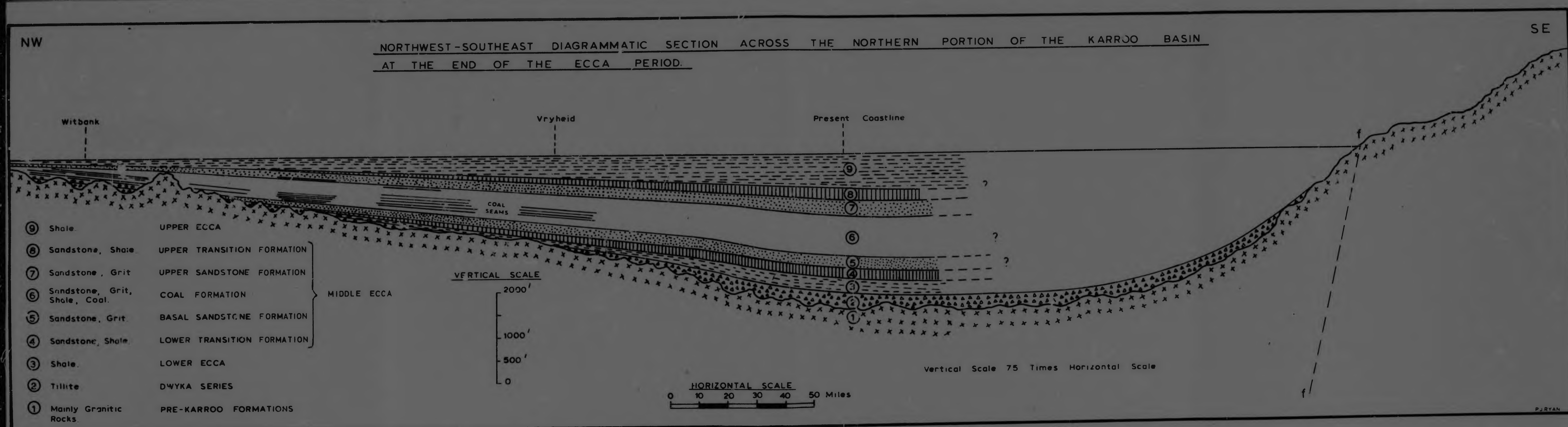
- FOLDER 1 Isobach Map of Total Ecca plus Upper Dwyka Shale in the Karroo Basin.
- FOLDER 2 Facies distribution map of the Ecca Series in the Karroo Basin.
- FOLDER 3 Paleocurrent map of the Ecca Series and Lowermost Beaufort Beds in the Cape Province and Southernmost Orange Free State.
- FOLDER 4 E - SW diagrammatic section across the Karroo Basin at the end of the Ecca Period.
- FOLDER 5 Paleocurrent map of the Ecca Series and Lowermost Beaufort Beds in the north-western portion of the Karroo Basin.
- FOLDER 6 Paleocurrent map of the Ecca Series and Lowermost Beaufort Beds in the northern portion of the Karroo Basin.
- FOLDER 7 Paleocurrent map of the Ecca Series and Lowermost Beaufort Beds in the north-eastern portion of the Karroo Basin.
- FOLDER 8 Paleocurrent map of the Ecca Series and certain Beaufort Beds in the eastern part of the Karroo Basin.
- FOLDER 9 NW - SE diagrammatic section across the northern portion of the Karroo Basin at the end of the Ecca Period.
- FOLDER 10 Average grain size of Ecca Sandstones in the Karroo Basin.
- FOLDER 11 Average length of long axis of 10 largest pebbles in conglomerates of the Middle Ecca in the northern portion of the Karroo Basin.
- FOLDER 12 Rose diagrams of Fucoid Structures in the Ecca Series.
- FOLDER 13 Interpretive paleocurrent map of the Ecca Series in the Karroo Basin.
- FOLDER 14 Mean thickness of planar cross-bedded units in the Ecca Series of the Karroo Basin.
- FOLDER 15 Ripple-index in the Ecca Series and Lowermost Beaufort Beds of the Karroo Basin.
- FOLDER 16 Tectonic framework during the Ecca Period.
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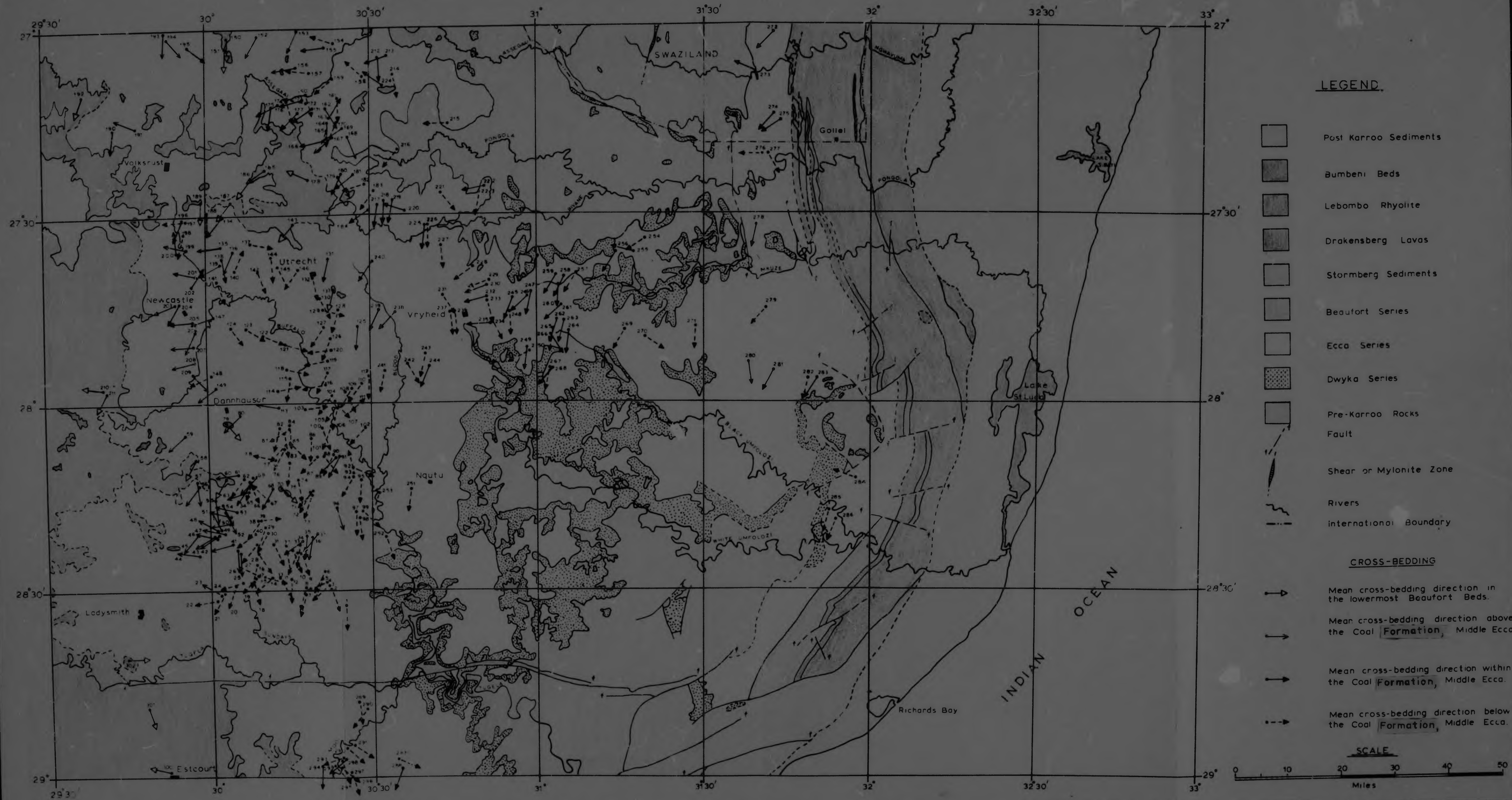
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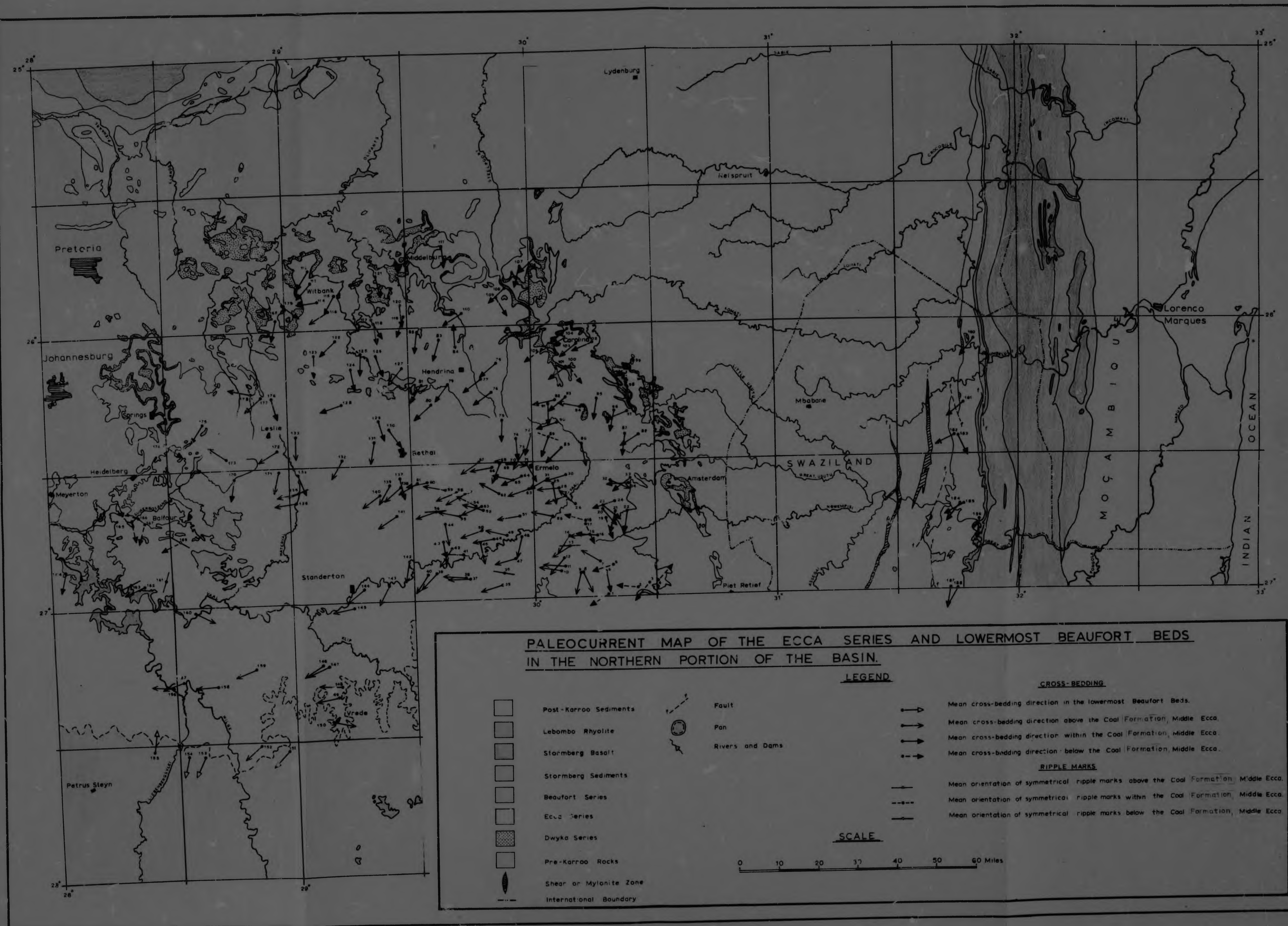






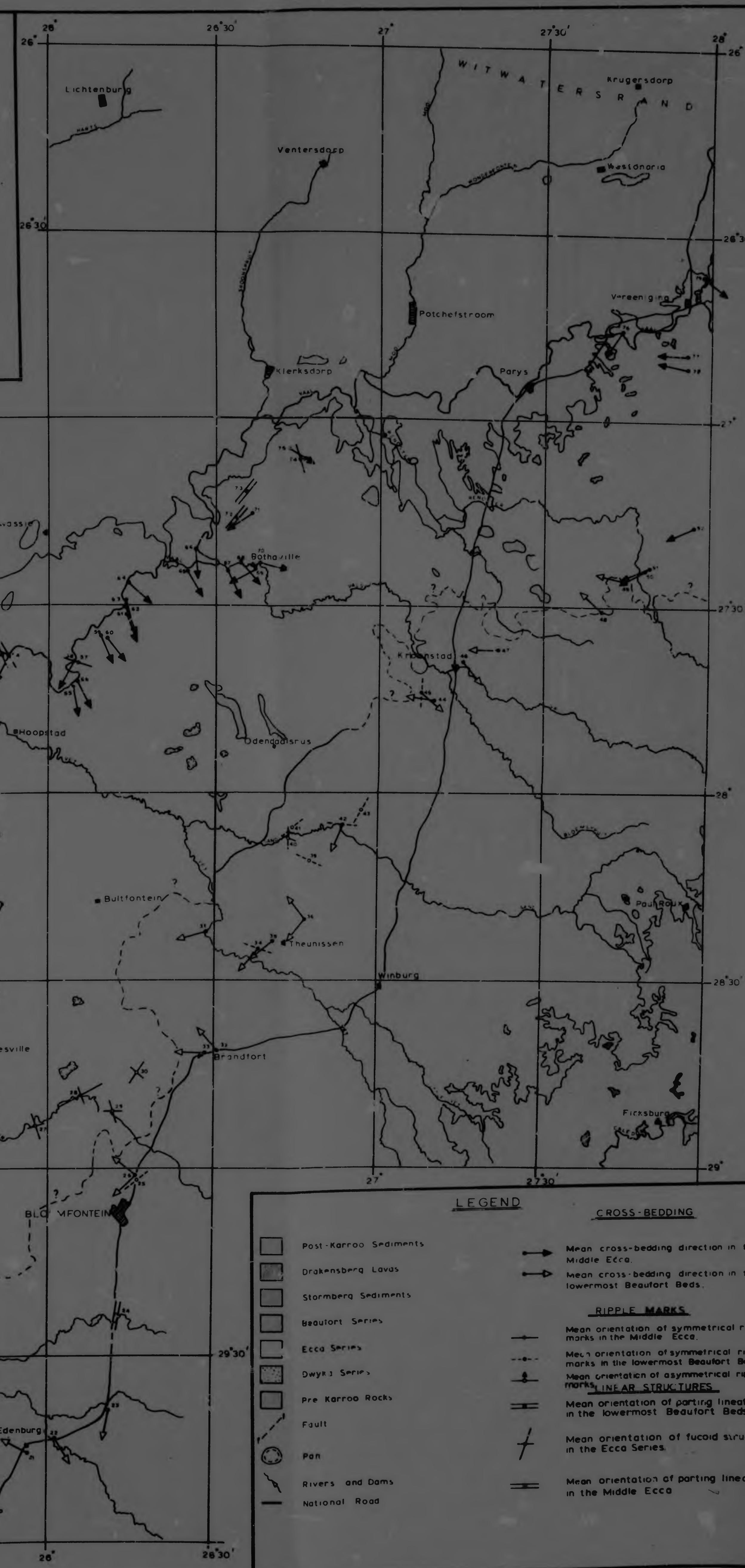
PALEOCURRENT MAP OF THE ECCA SERIES AND LOWERMOST BEAUFORT BEDS IN
THE NORTH-EASTERN PORTION OF THE BASIN





PALEOCURRENT MAP OF THE ECCA SERIES AND LOWERMOST BEAUFORT BEDS IN THE NORTH-WESTERN PORTION OF THE BASIN

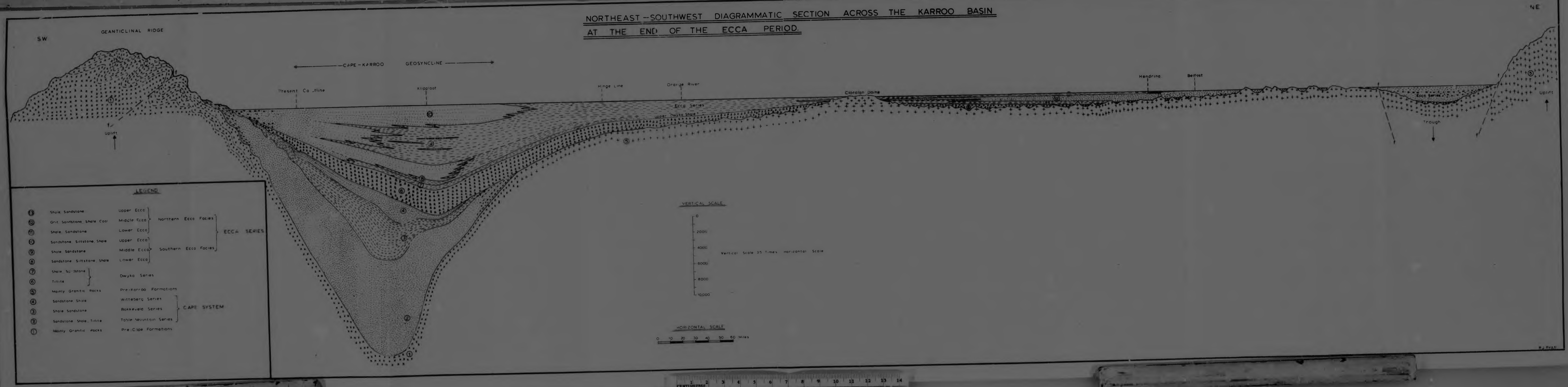
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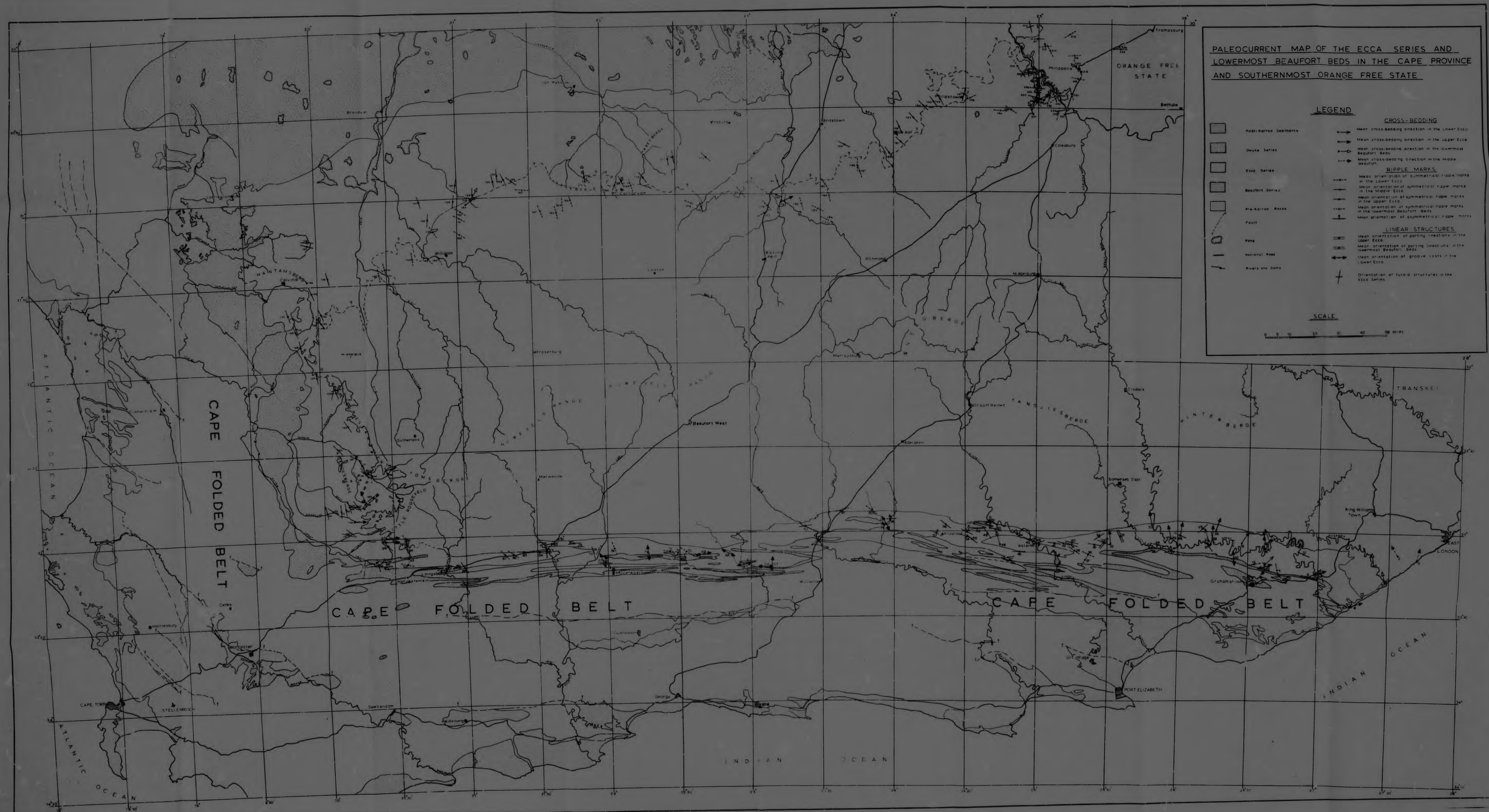


LEGEND

- | | | | |
|--|----------------------|--|--|
| | Post-Karoo Sediments | | Mean cross-bedding direction in the Middle Eccca |
| | Drakensberg Lavas | | Mean cross-bedding direction in the lowermost Beaufort Beds |
| | Stormberg Sediments | | Mean orientation of symmetrical ripple marks in the Middle Eccca |
| | Beaufort Series | | Mean orientation of asymmetrical ripple marks in the lowermost Beaufort Beds |
| | Eccca Series | | Mean orientation of asymmetrical ripple marks in the lowermost Beaufort Beds |
| | Dwyka Series | | Mean orientation of parting lineations in the lowermost Beaufort Beds |
| | Pre-Karoo Rocks | | Mean orientation of fucoid structures in the Eccca Series |
| | Fault | | Mean orientation of parting lineations in the Middle Eccca |
| | Pan | | |
| | Rivers and Dams | | |
| | National Road | | |







Author Ryan P J

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