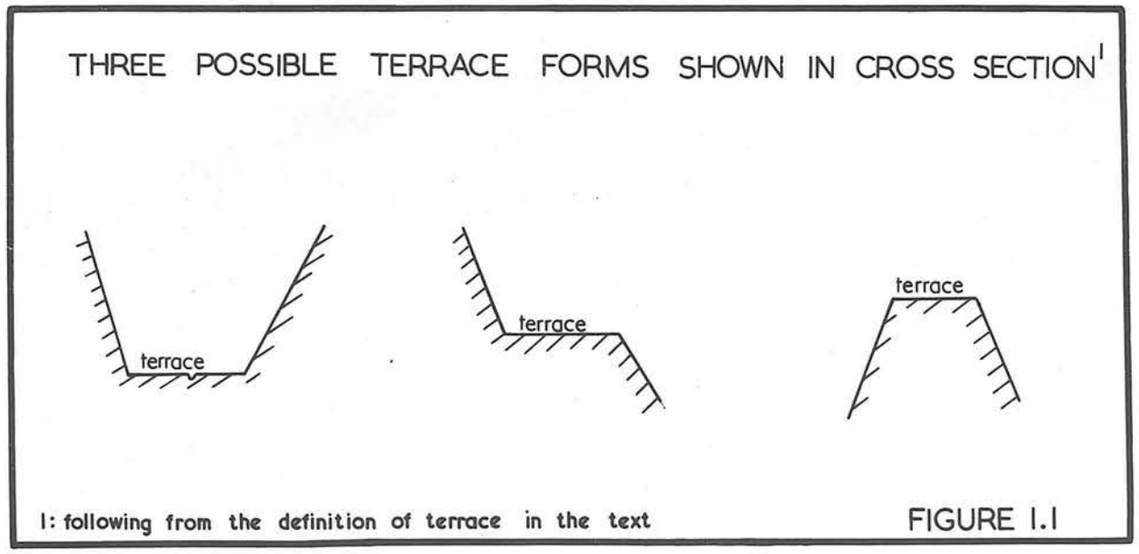
DIAGRAMS & PLATES



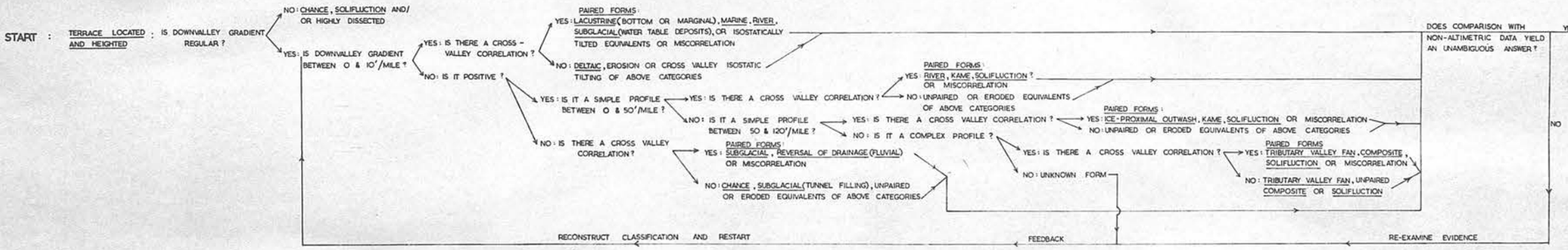
1: following from the definition of terrace in the text

FIGURE 1.1

Erratum: The bottom line on figure 1.2 should read:

NOTE:UNDERLINED TERMS ARE DESCRIPTIVE OR GENETIC
PREFIXES. E.G. <u>CHANCE</u> TERRACES

TERRACE AND TERRACE FRAGMENT ORIGIN BY ALTIMETRIC ANALYSIS



NOTE : UNDERLINED TERMS ARE DESCRIPTIVE OR DESCRIPTIVE PREFIXES E.G. CHANCE TERRACES

FIGURE 1.2

POSSIBLE VARIATIONS IN TERRASIFORM STRATIGRAPHY WITHIN A BEDROCK VALLEY

A. ONE PAIRED TERRACE

B. TWO PAIRED TERRACES

C. THREE PAIRED TERRACES

1. ONE ALLUVIAL FILL

2. TWO ALLUVIAL FILLS

3. THREE ALLUVIAL FILLS

FIGURE 2.1

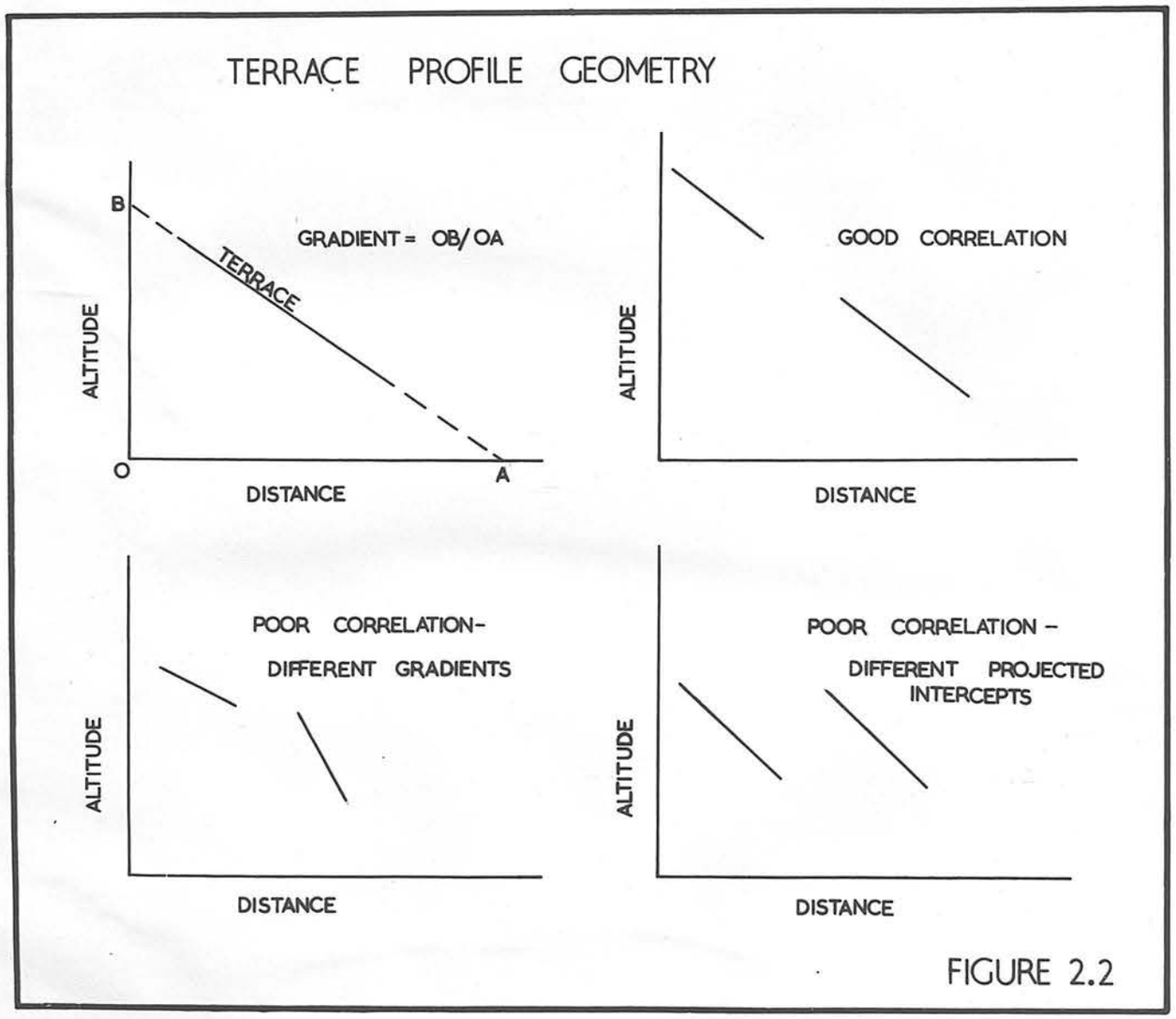


FIGURE 2.2

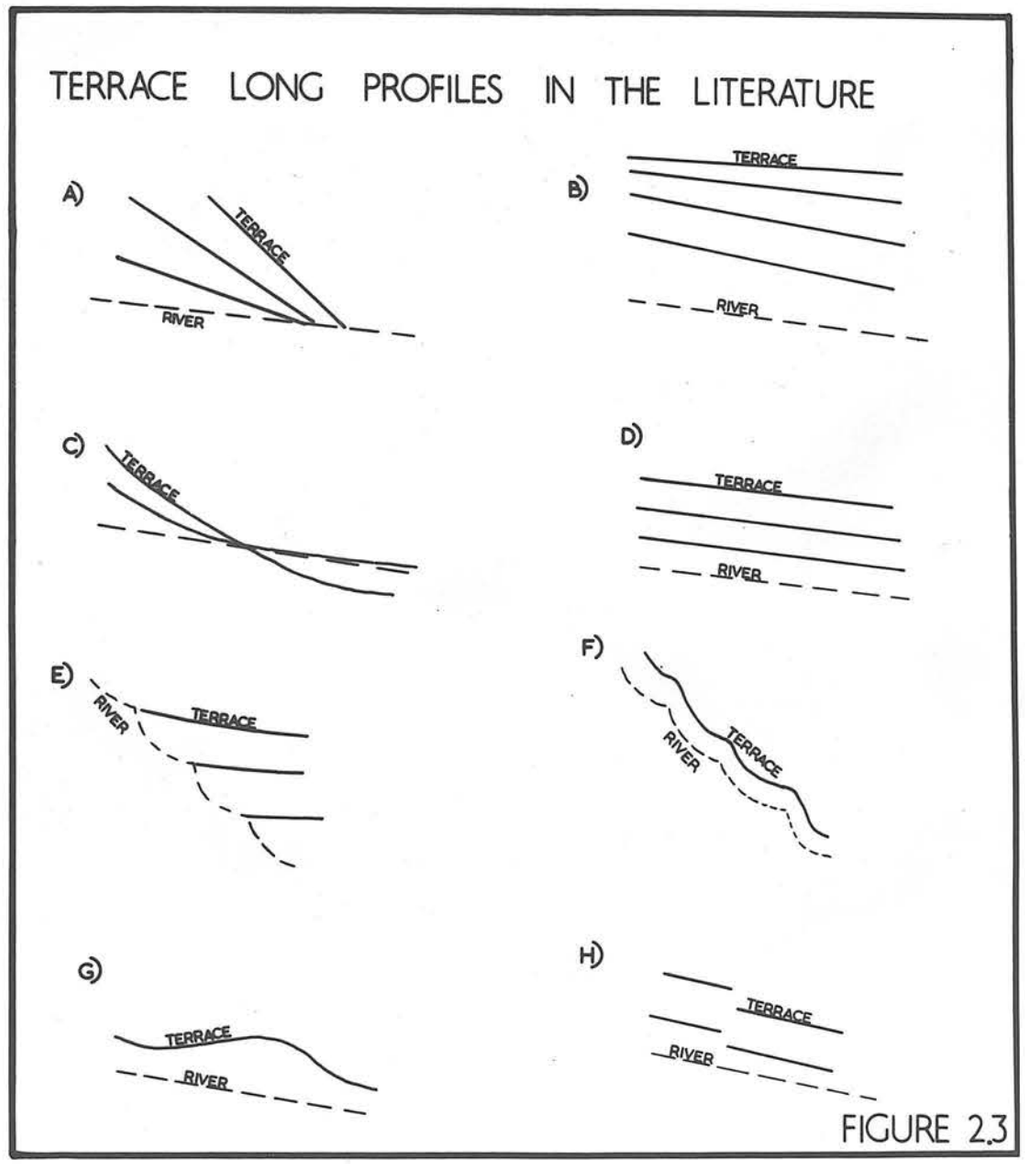


FIGURE 2.3

SOME TYPICAL TERRACE CROSS PROFILES

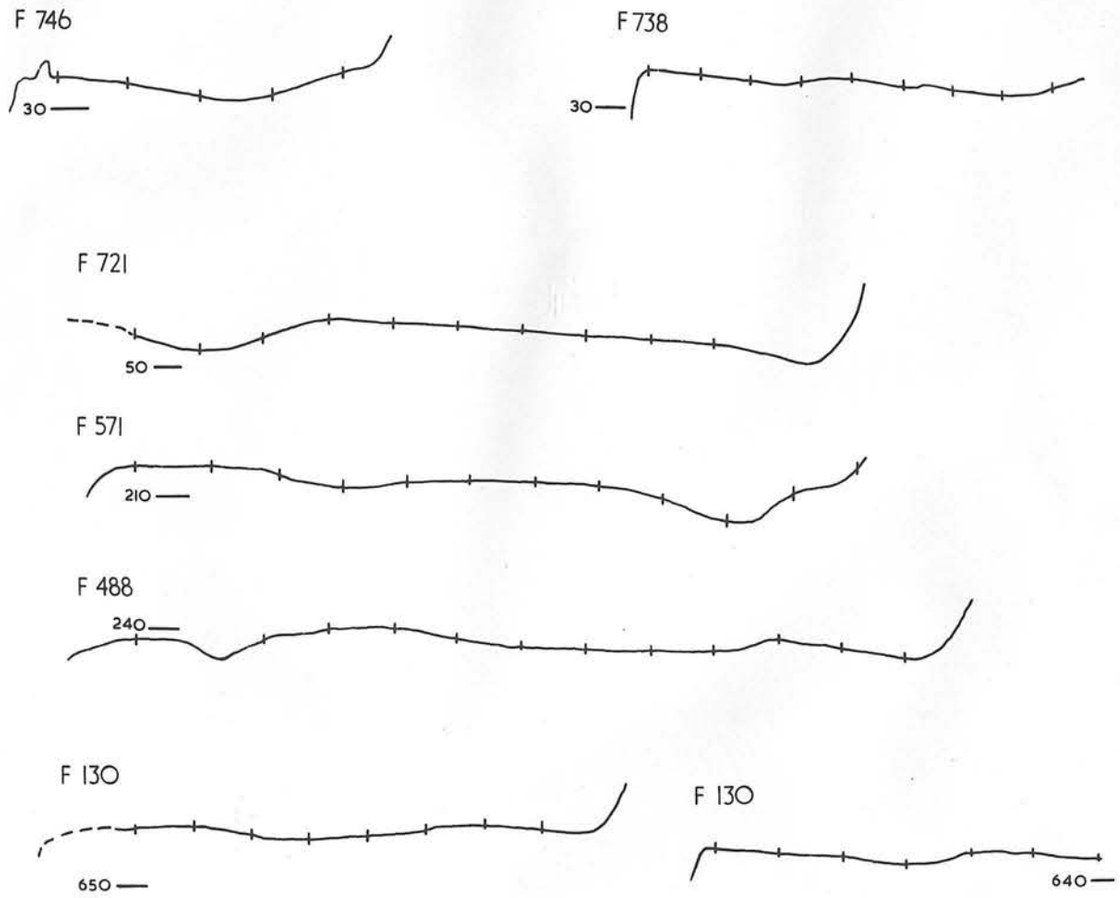
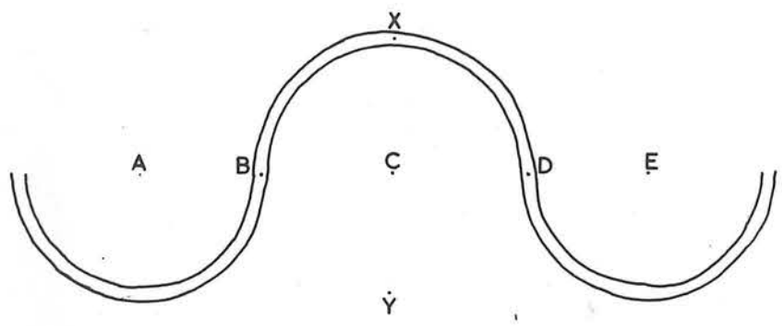


FIGURE 3.1

STREAM GEOMETRY TERMINOLOGY[1]

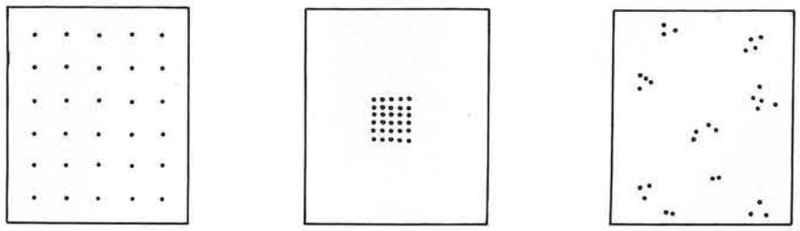


Wavelengh of meanders = AE = BDx 2
Amplitude of meanders = XY
Frequency of meanders = 1/AE = 1/BDx 2
Width of meander belt = XY
Sinuosity index = length of channel mid point/length of meander belt axis

1 : after Brice (1964) and others

FIGURE 3.2

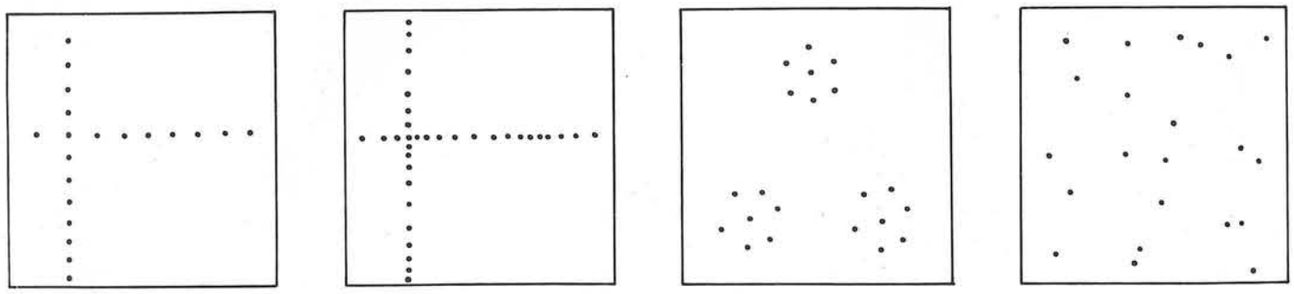
EQUAL DENSITY, DIFFERENT FREQUENCY SPOT HEIGHT LAY--OUTS (after Greig-Smith 1964)



Each square represents a terrace fragment

FIGURE 3.3

SOME POSSIBLE HEIGHT LAYOUTS ON A TERRACE FRAGMENT

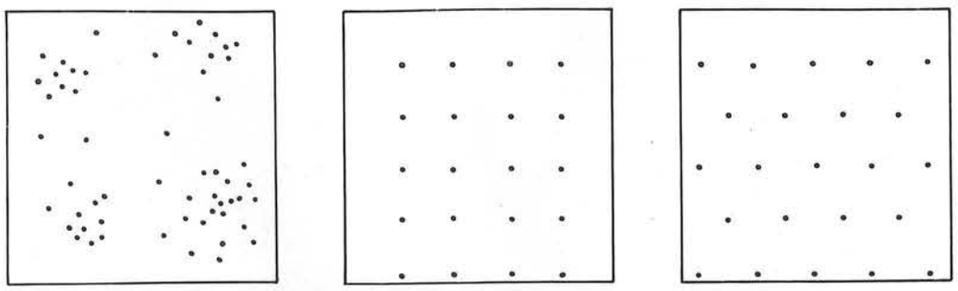


1) FIXED INTERVAL LINEAR

2) VARYING INTERVAL LINEAR

3) GROUPED

4) RANDOM



5) CLUSTERED

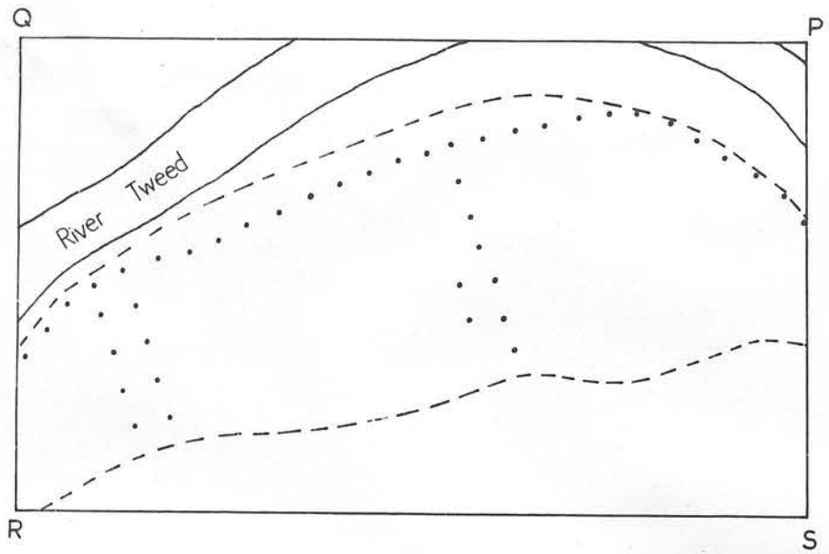
6) RECTANGULAR GRID

7) TRIANGULAR GRID

EACH SQUARE REPRESENTS ONE TERRACE FRAGMENT

EACH DOT REPRESENTS ONE SPOT HEIGHT

FIGURE 3.4



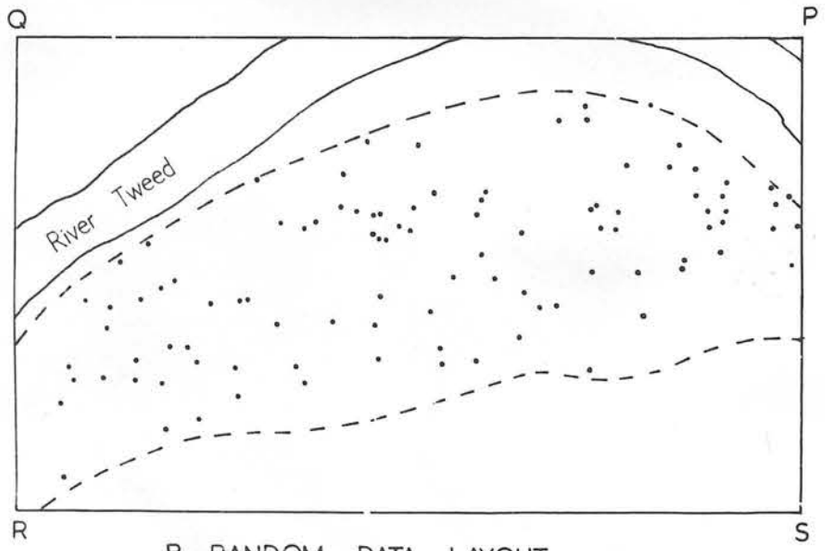
A. CLUSTERED DATA LAYOUT

VARIATIONS IN THE LAYOUT OF SPOT HEIGHTS ON A PART OF F 585

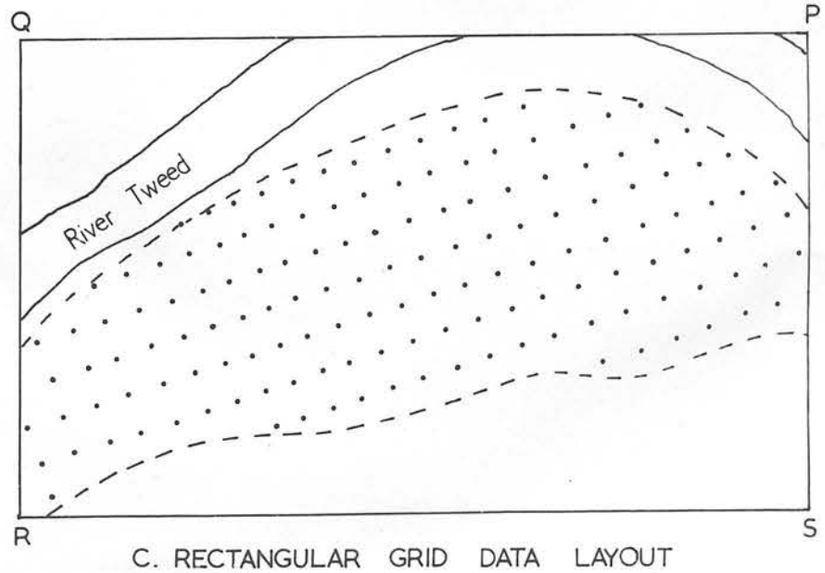
· SPOT HEIGHT

--- APPROXIMATE BOUNDARY OF TERRACE FRAGMENT

P	NT 7000	3360
Q	NT 6900	3360
R	NT 6900	3300
S	NT 7000	3300



B. RANDOM DATA LAYOUT



C. RECTANGULAR GRID DATA LAYOUT

FIGURE 3.5

A COMPARISON OF TWEED SURFACE PROFILES DERIVED FROM LEVELLING AND ANEROID BAROMETER TRAVERSES

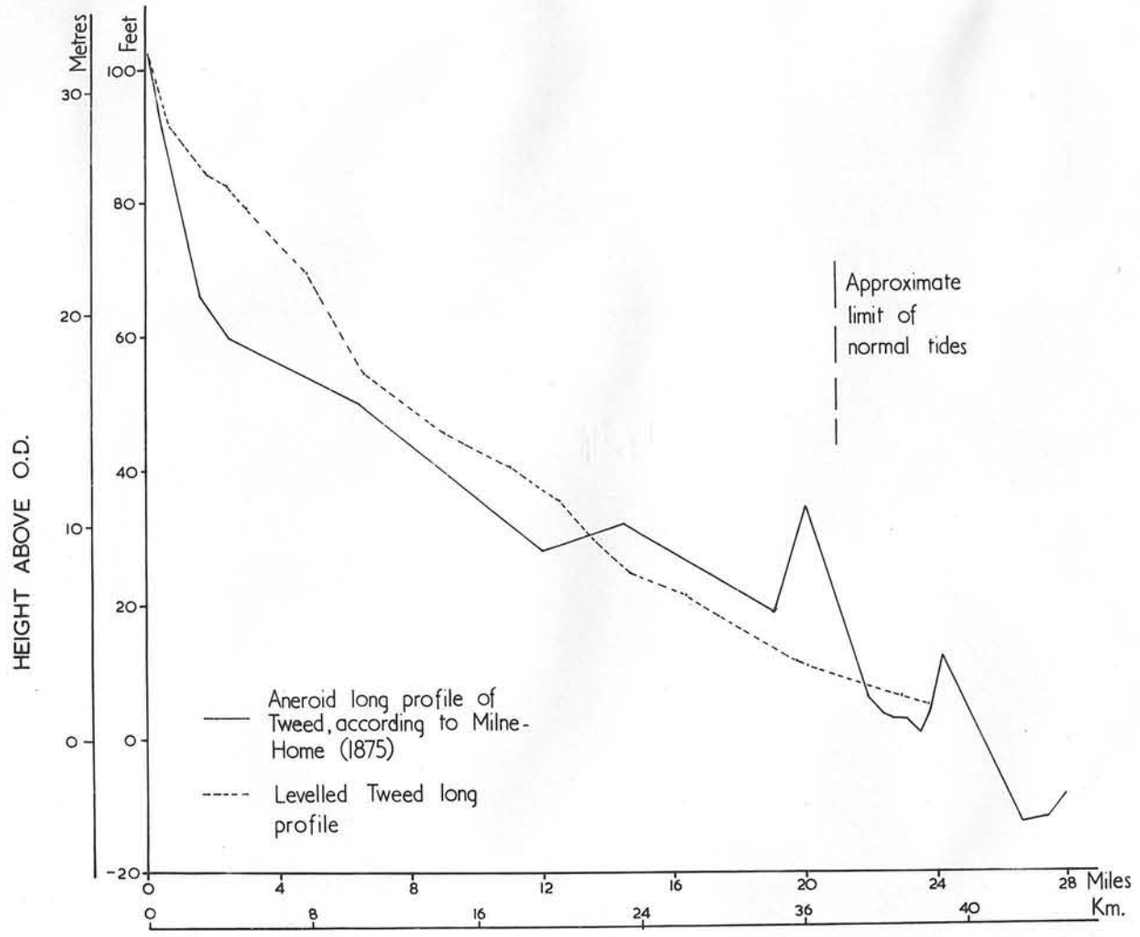


FIGURE 3.6

A COMPARISON OF TERRACE HEIGHTS OBTAINED WITH A LEVEL AND WITH AN ANEROID BAROMETER

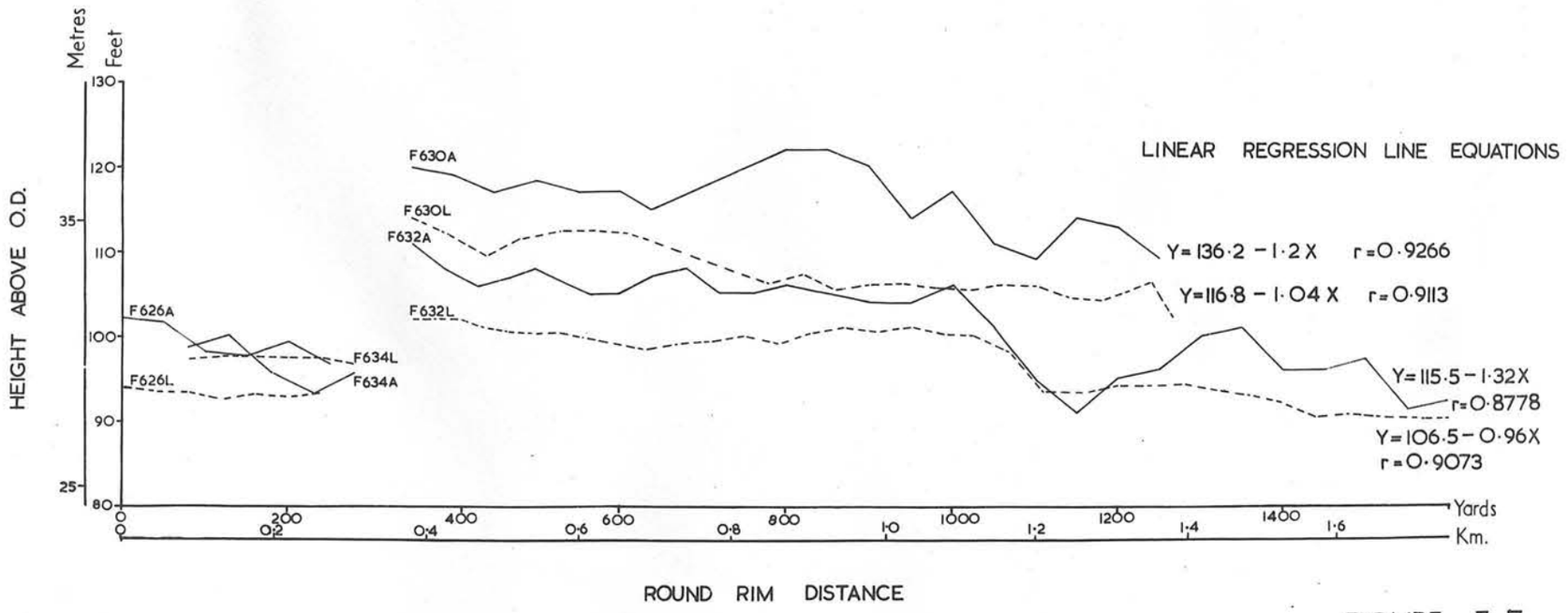


FIGURE 3.7

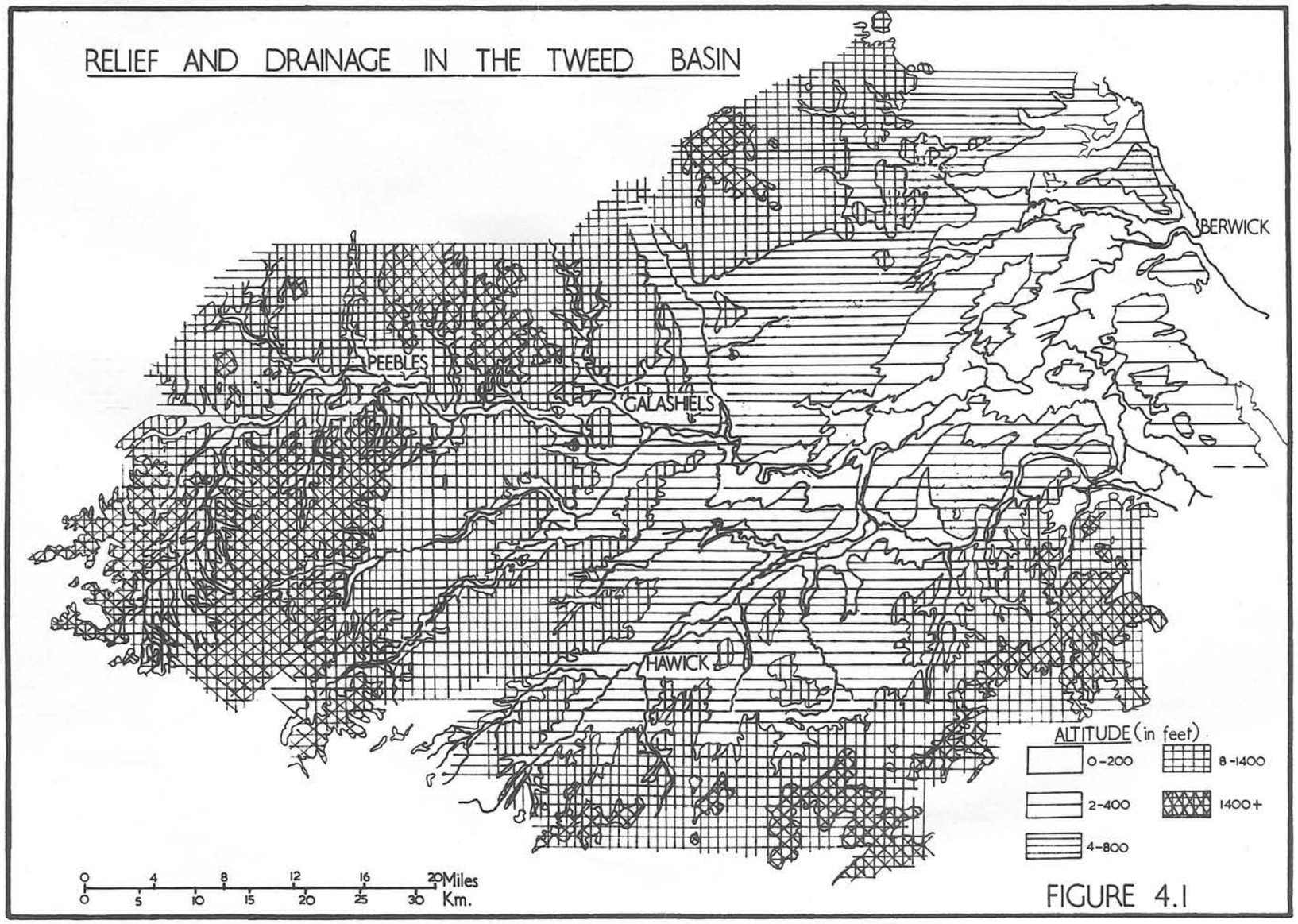
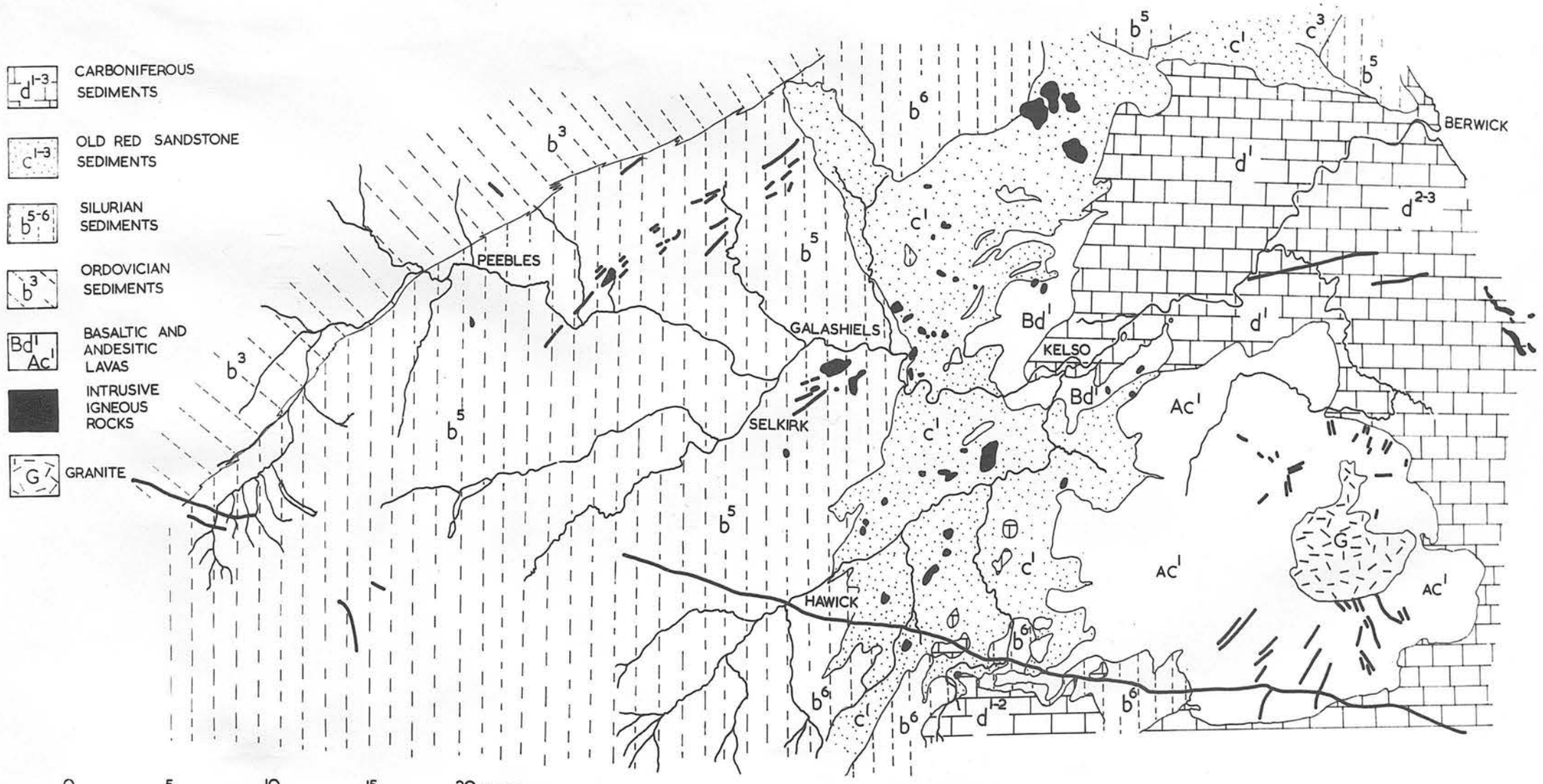

RELIEF AND DRAINAGE IN THE TWEED BASIN
BERWICK
PEEBLES
GALASHIELS
HAWICK
ALTITUDE (in feet)
0-200
2-400
4-800
8-1400
1400+
0 4 8 12 16 20 Miles
0 5 10 15 20 25 30 Km.

FIGURE 4.1

THE SOLID GEOLOGY OF THE TWEED BASIN



REDUCED FROM THE I.G.S. ONE-INCH MAPS

FIGURE 4.2

STRIAE AND ORIENTATED RELIEF IN
THE TWEED BASIN

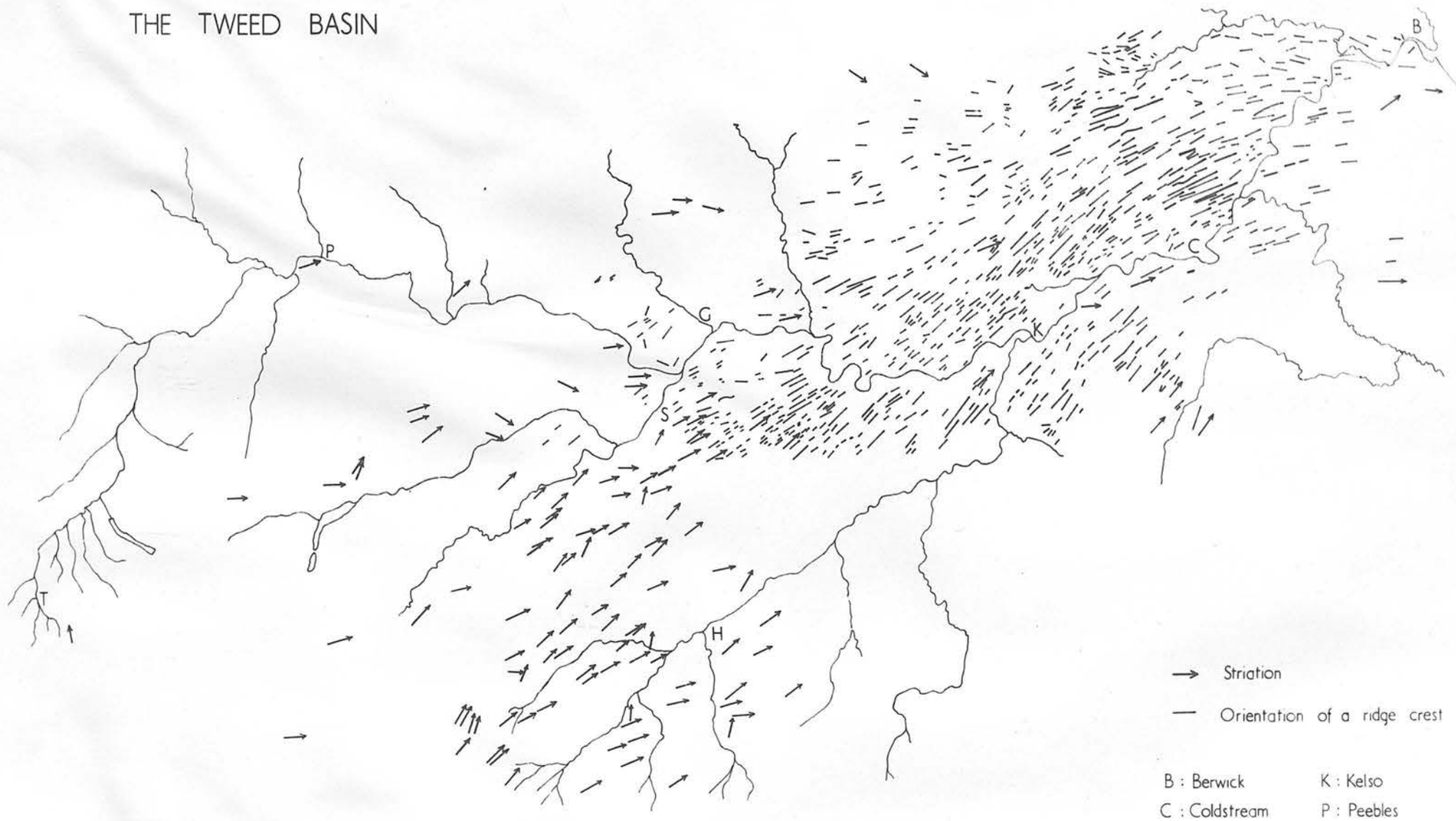


FIGURE 4.3

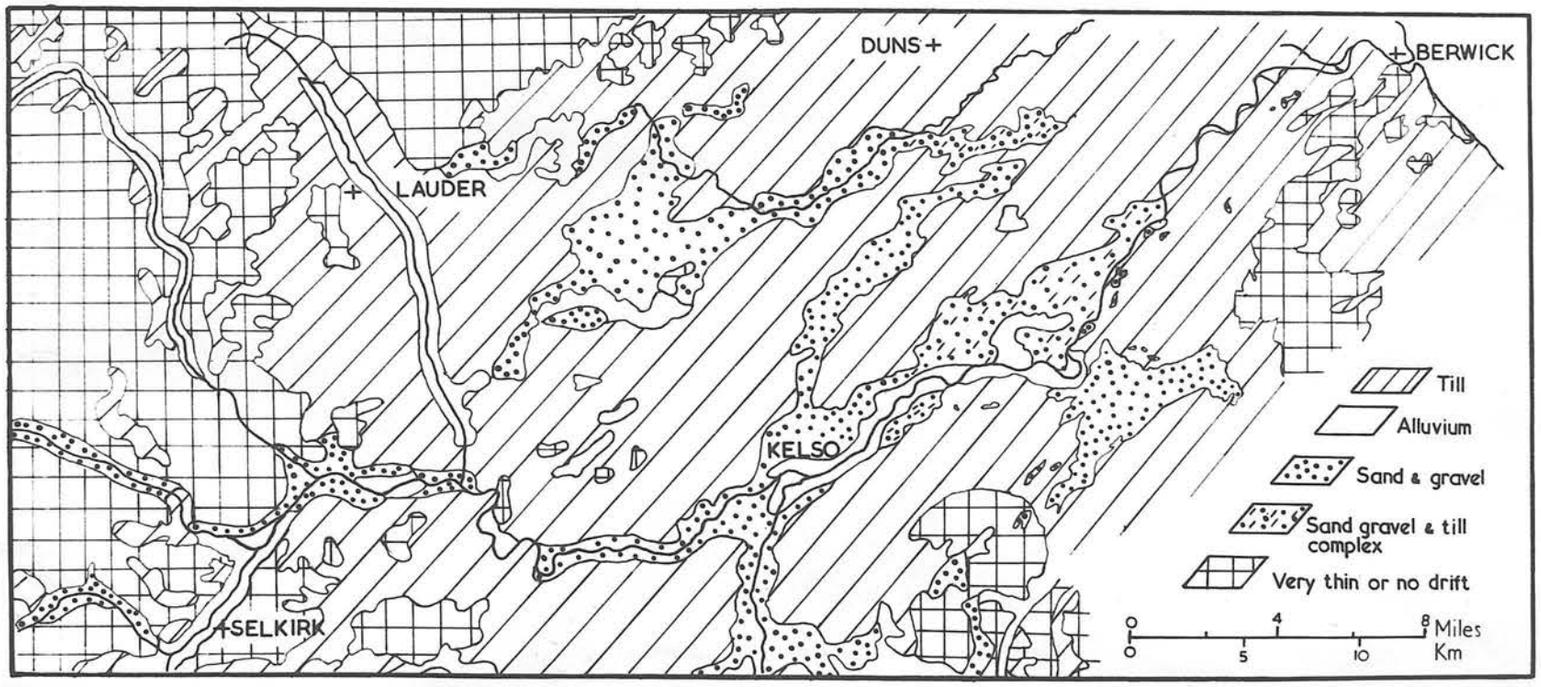


FIGURE 4.4 GENERALISED DRIFT DISTRIBUTION (after Ragg 1960 and others)

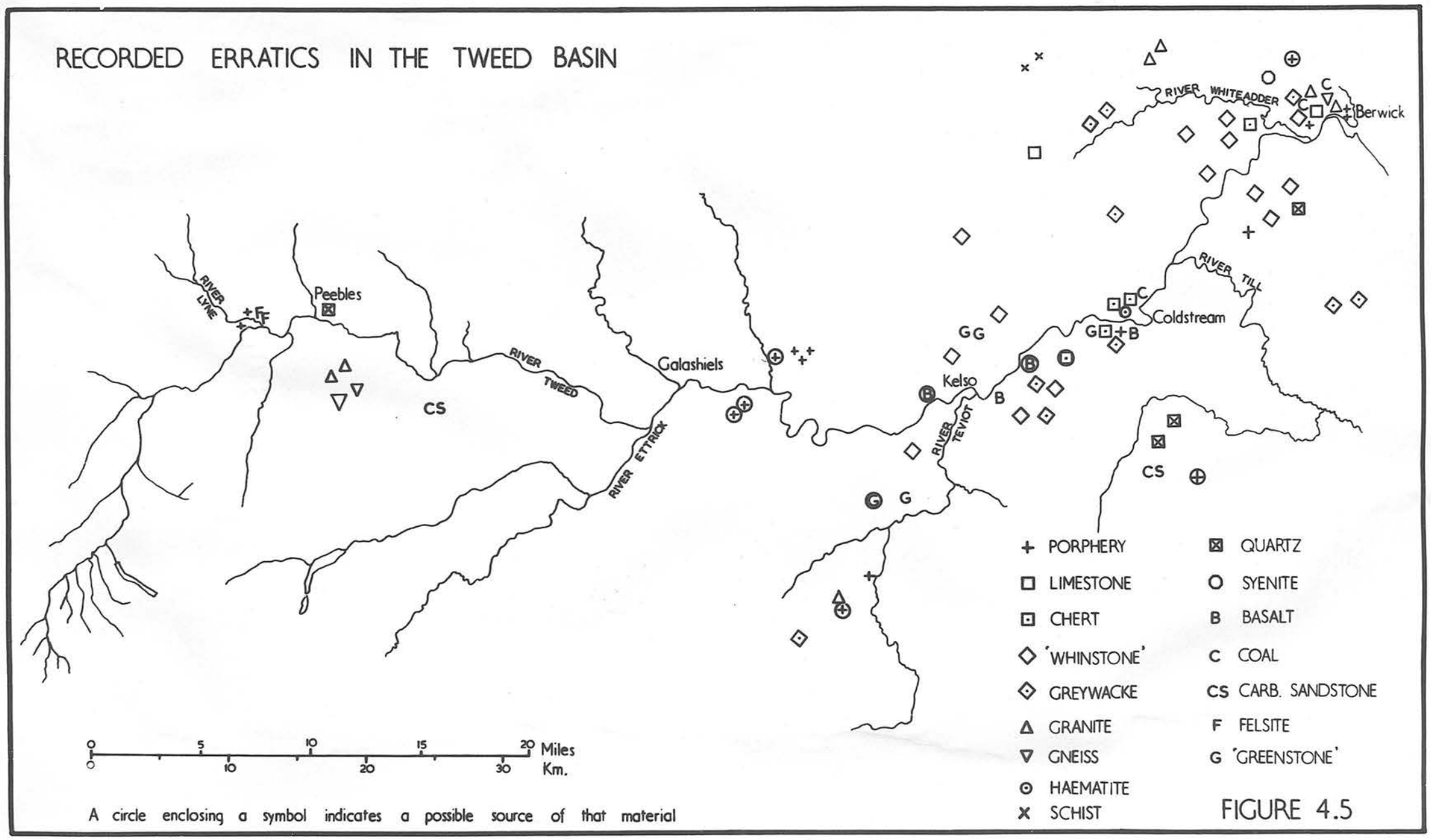
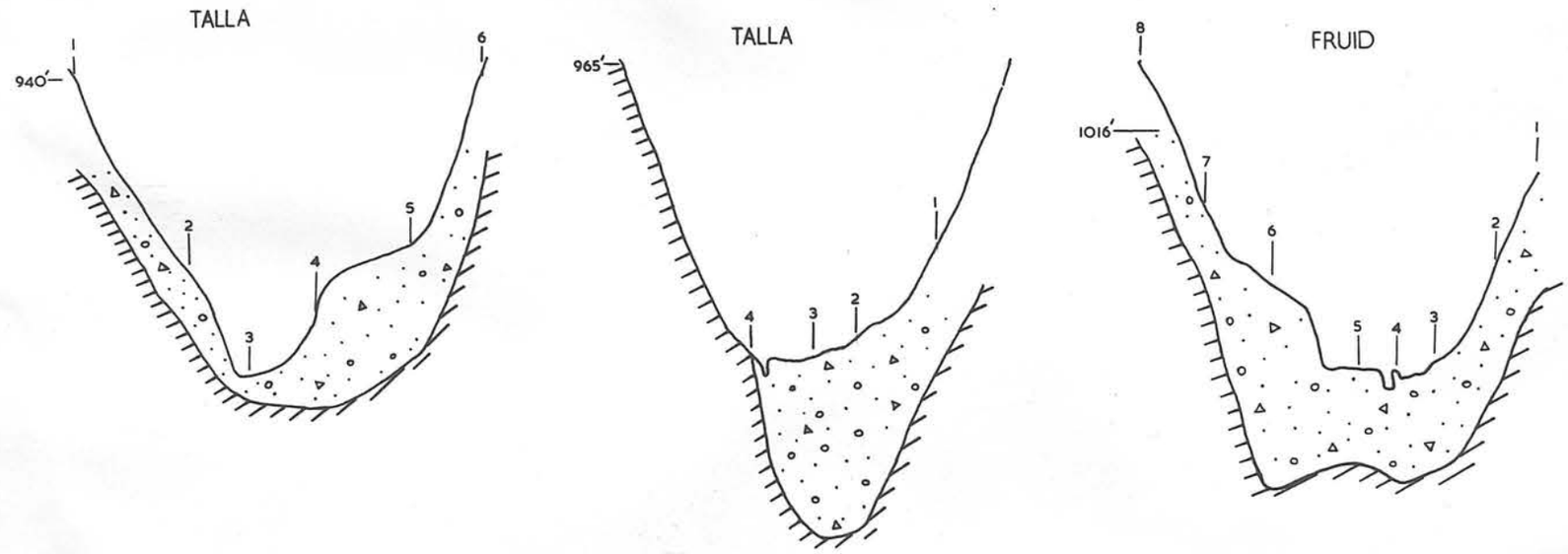

RECORDED ERRATICS IN THE TWEED BASIN
RIVER LYNE
Peebles
RIVER TWEED
Galashiels
RIVER ETTRICK
CS
RIVER WHITEADDER
Berwick
RIVER TILL
Coldstream
Kelso
RIVER TEVIOT
GG
G
B
C
CS
0 5 10 15 20 Miles
0 10 20 30 Km.
A circle enclosing a symbol indicates a possible source of that material
+ PORPHERY
⊠ QUARTZ
□ LIMESTONE
O SYENITE
⊡ CHERT
B BASALT
◇ 'WHINSTONE'
C COAL
◈ GREYWACKE
CS CARB. SANDSTONE
△ GRANITE
F FELSITE
▽ GNEISS
G 'GREENSTONE'
⊙ HAEMATITE
× SCHIST

FIGURE 4.5

DRIFT AND ROCKHEAD IN THE TALLA AND FRUID VALLEYS



SCALE :

Horizontal: 0, 400, 800 Feet; 0, 100, 200 Metres

Vertical: 0, 40, 80 Feet; 0, 10, 20 Metres

Drift, comprising clay, sand, gravel and boulders.

Rockhead

Borehole location

Exact locations of the sections are unknown.

FIGURE 4.6

MIRROR IMAGE ROSE DIAGRAMS OF TILL FABRICS FROM A SITE AT BERWICK-ON-TWEED

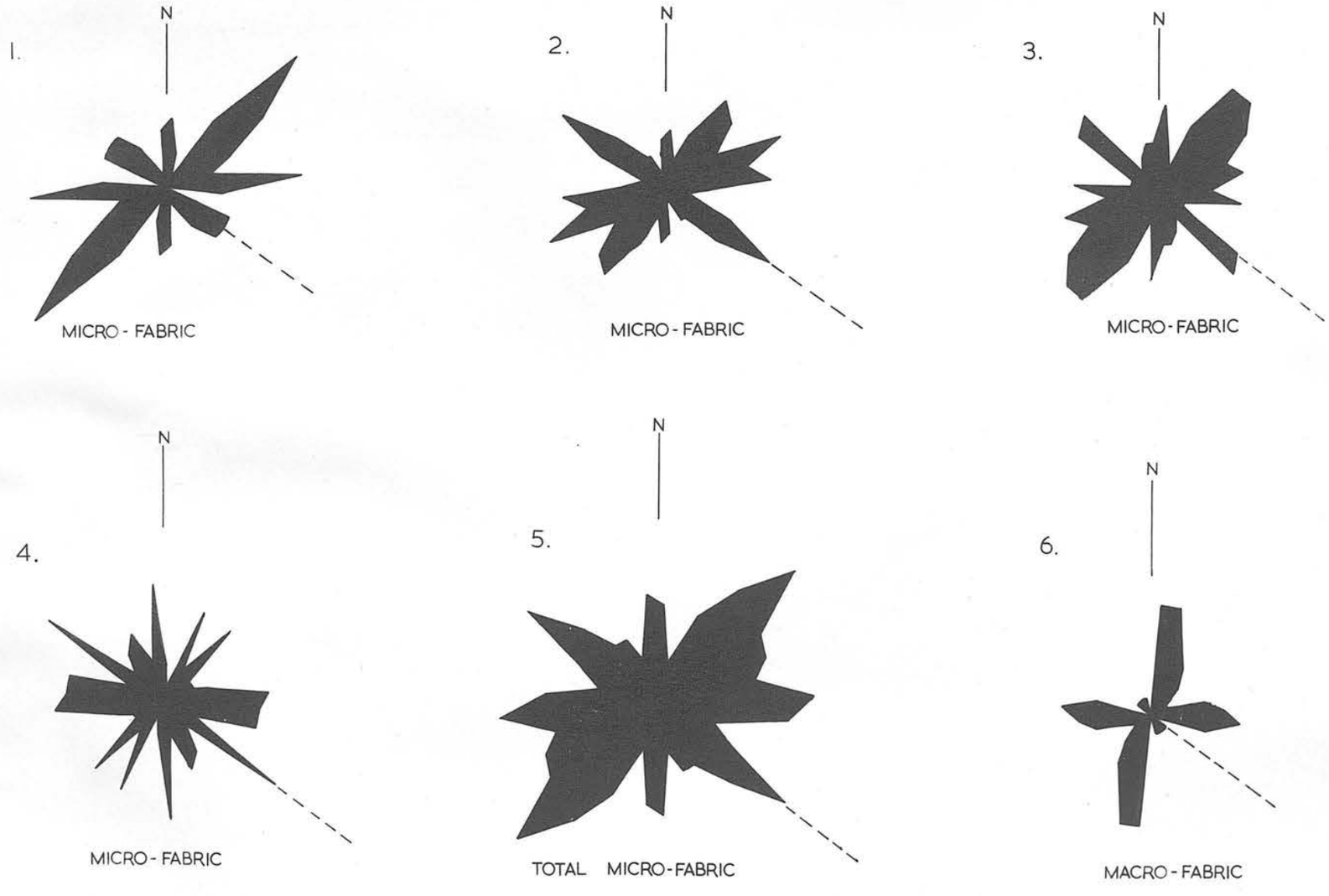


FIGURE 4.7

ICE FLOW ORIENTATION IN THE TWEED BASIN AS RECORDED BY STRIAE, ORIENTATED RELIEF AND ERRATIC TRANSPORT

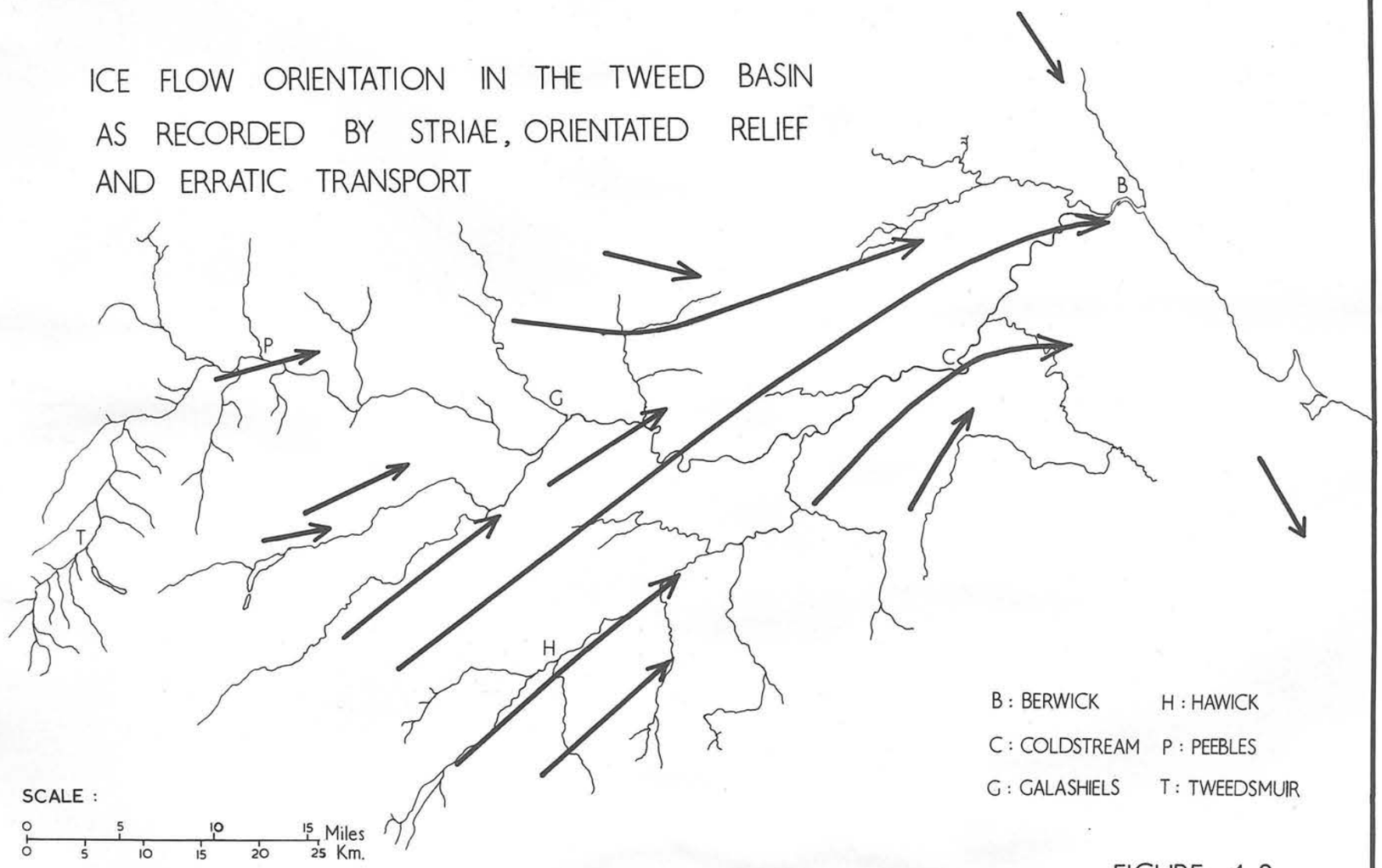


FIGURE 4.8

EXAMPLES OF SEISMIC WAVE VELOCITY/DISTANCE GRAPHS

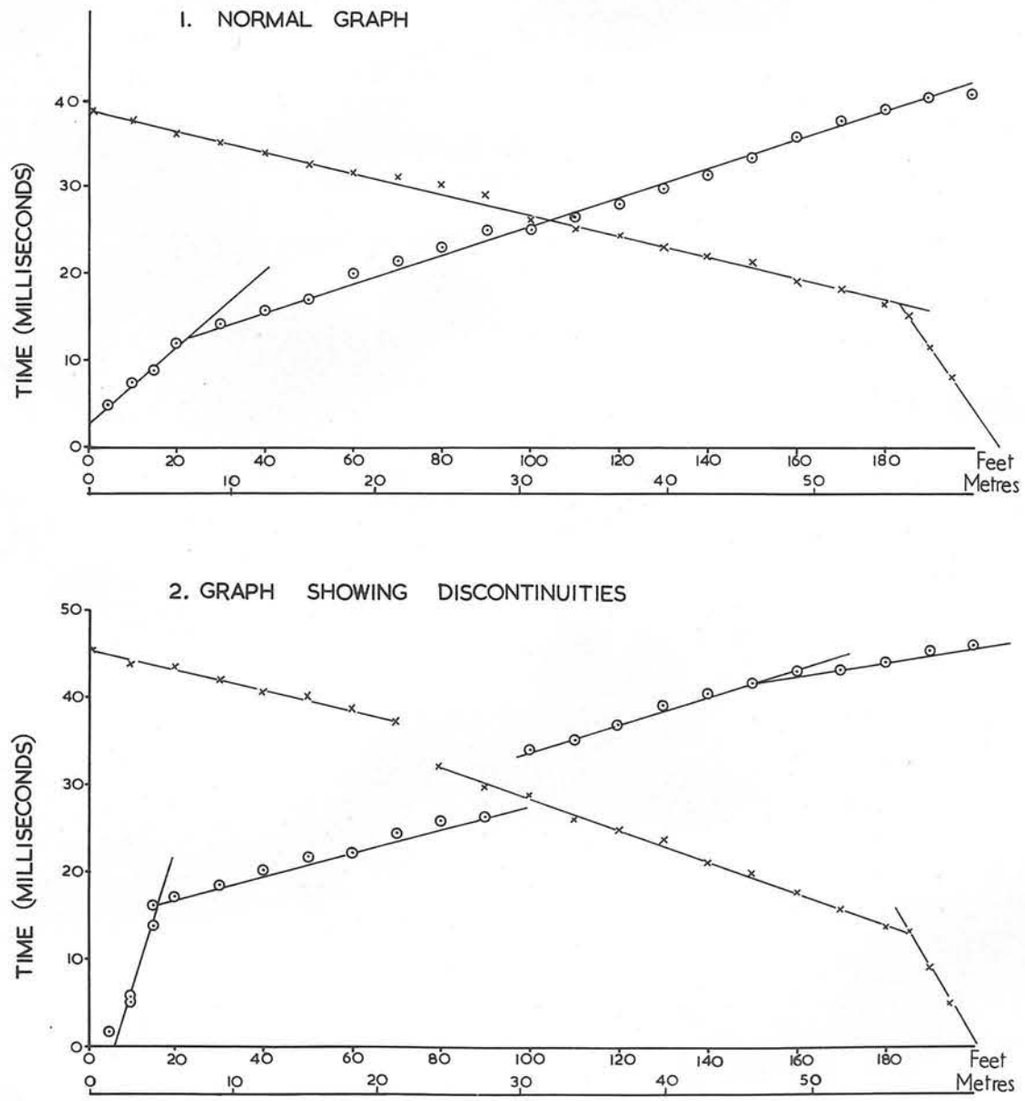


FIGURE 4.9

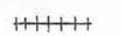
MAP SYMBOLS.

The symbols used in figures 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 7.1 and 7.2 are defined as follows:

Terrace or terrace fragment.

Doubtful terrace fragment.

F 345 — Terrace fragment number (F is occasionally omitted where space is at a premium)



Esker

Kame

Meltwater channel (bar at heighest point of the channel base).

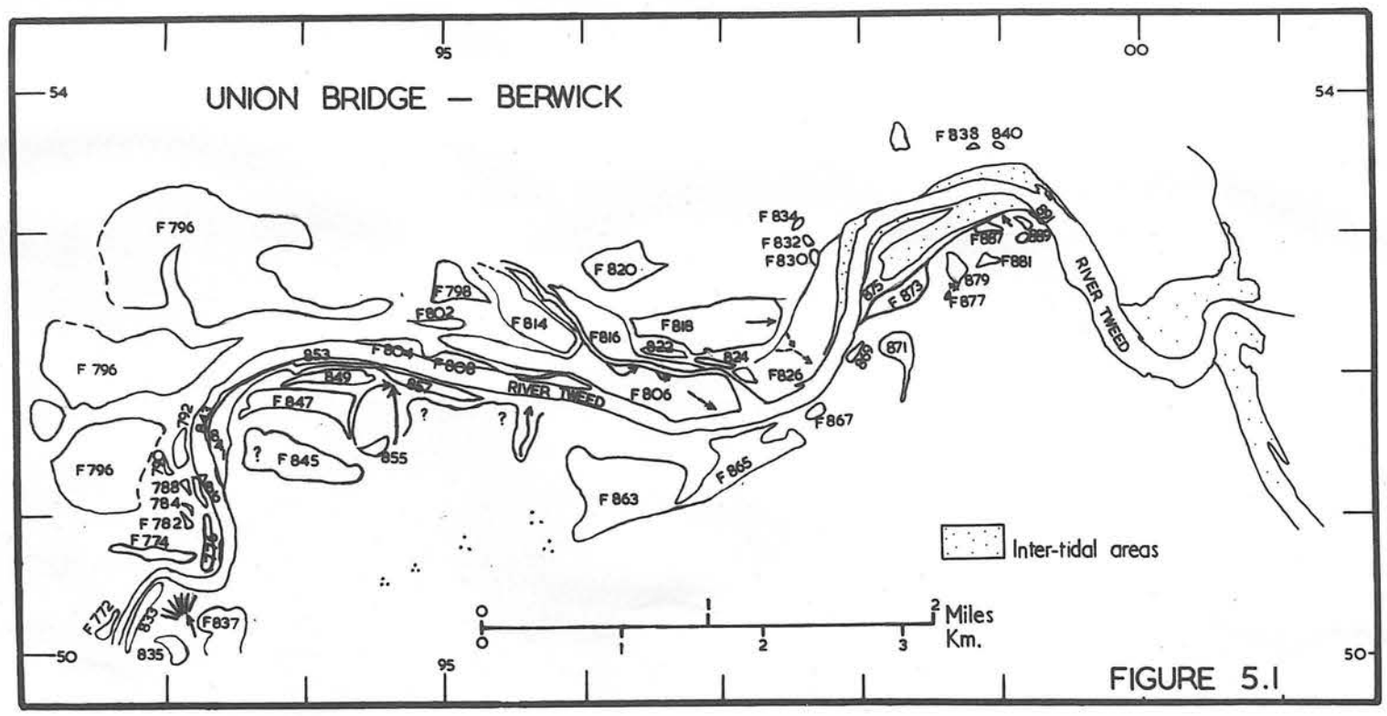
Channel in the lowest terrace.

Other relevant channels.

Kettle holes

Fan

85 — National Grid Line.


UNION BRIDGE — BERWICK
95
00
54
50
F 796
F 798
F802
F 820
F 814
F816
F818
F 834
F 8320
F830
F838 840
F887
F881
F879
F877
F 573
RIVER TWEED
F804
F808
F 847
F 845
F806
F826
F867
F 865
F 863
871
855
Inter-tidal areas
Miles
Km.
FIGURE 5.1

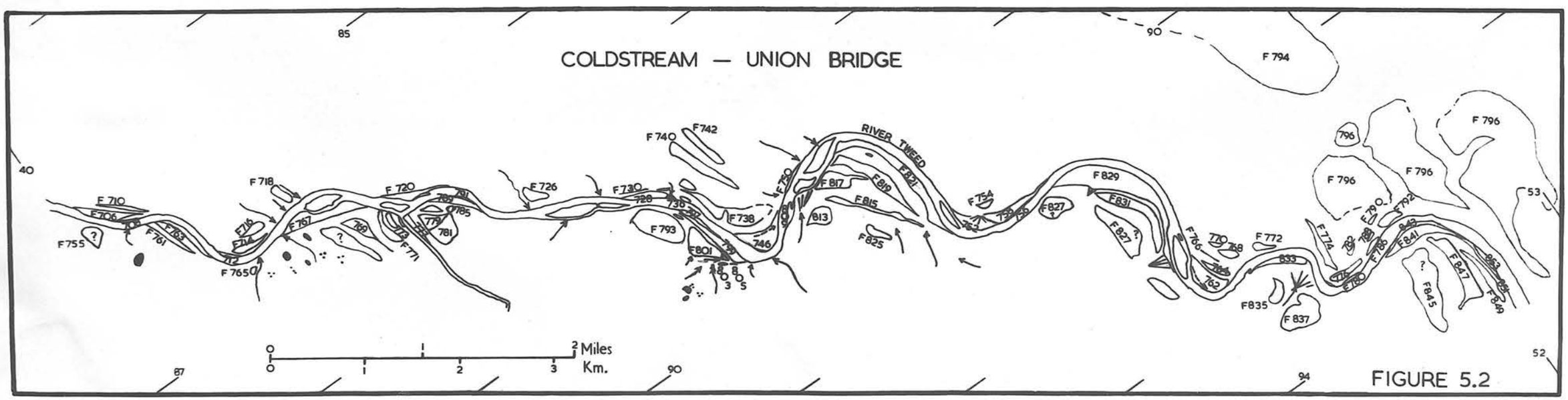
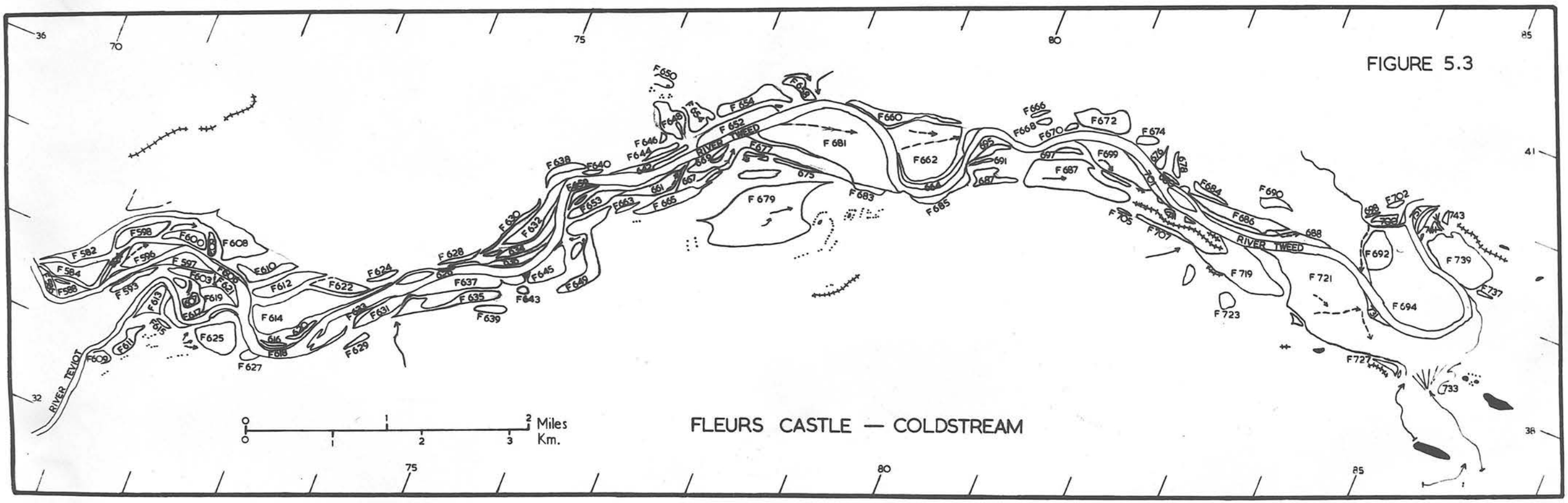

COLDSTREAM — UNION BRIDGE
85
90
40
87
90
94
52
F 794
F 796
F 740
F742
F 730
F 726
F 718
F 720
F 710
F 755
F 765
F 771
F 793
F801
F 738
F 817
F819
F821
F815
F825
F 829
F831
F827
F 766
F 772
F774
F 792
F 841
F 845
F 847
F835
F 837
RIVER TWEED
Miles
Km.
FIGURE 5.2

FIGURE 5.3


36
70
75
80
85
41
38
32
RIVER TEVIOT
RIVER TWEED
F582
F584
F588
F593
F596
F597
F598
F600
F603
F608
F609
F610
F611
F612
F613
F614
F616
F617
F618
F619
F621
F622
F624
F625
F627
F628
F629
F630
F631
F632
F635
F637
F639
F643
F645
F649
F650
F652
F654
F660
F662
F663
F665
F666
F668
F670
F672
F674
F677
F679
F681
F683
F684
F685
F686
F687
F690
F692
F694
F699
F702
F705
F707
F719
F721
F723
F727
F733
F737
F739
Miles
Km.
FLEURS CASTLE — COLDSTREAM

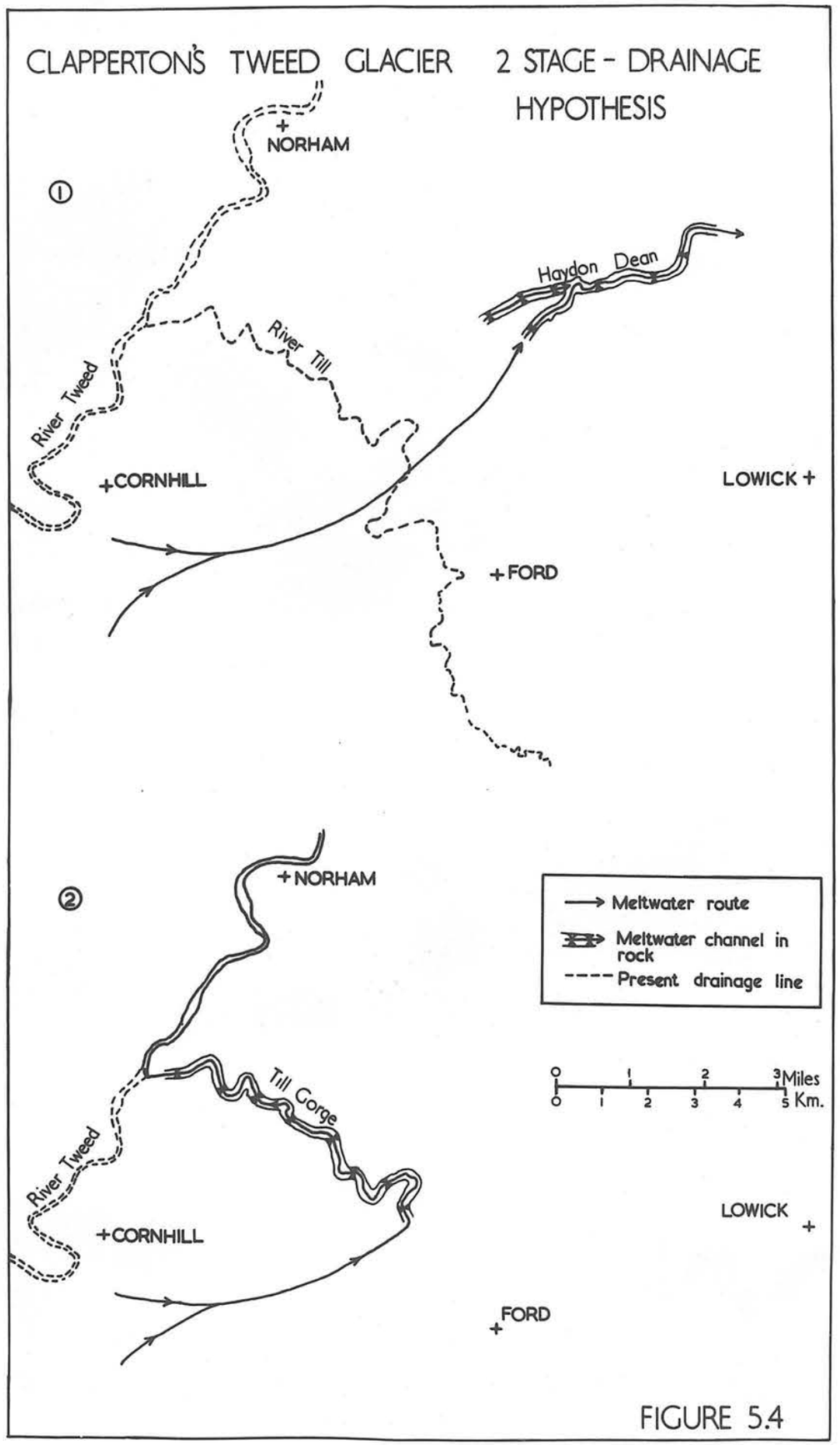

CLAPPERTON'S TWEED GLACIER 2 STAGE - DRAINAGE HYPOTHESIS
NORHAM
①
Haydon Dean
River Till
River Tweed
CORNHILL
LOWICK
FORD
NORHAM
②
Meltwater route
Meltwater channel in rock
Present drainage line
Till Gorge
River Tweed
CORNHILL
LOWICK
FORD
0 1 2 3 Miles
0 1 2 3 4 5 Km.

FIGURE 5.4

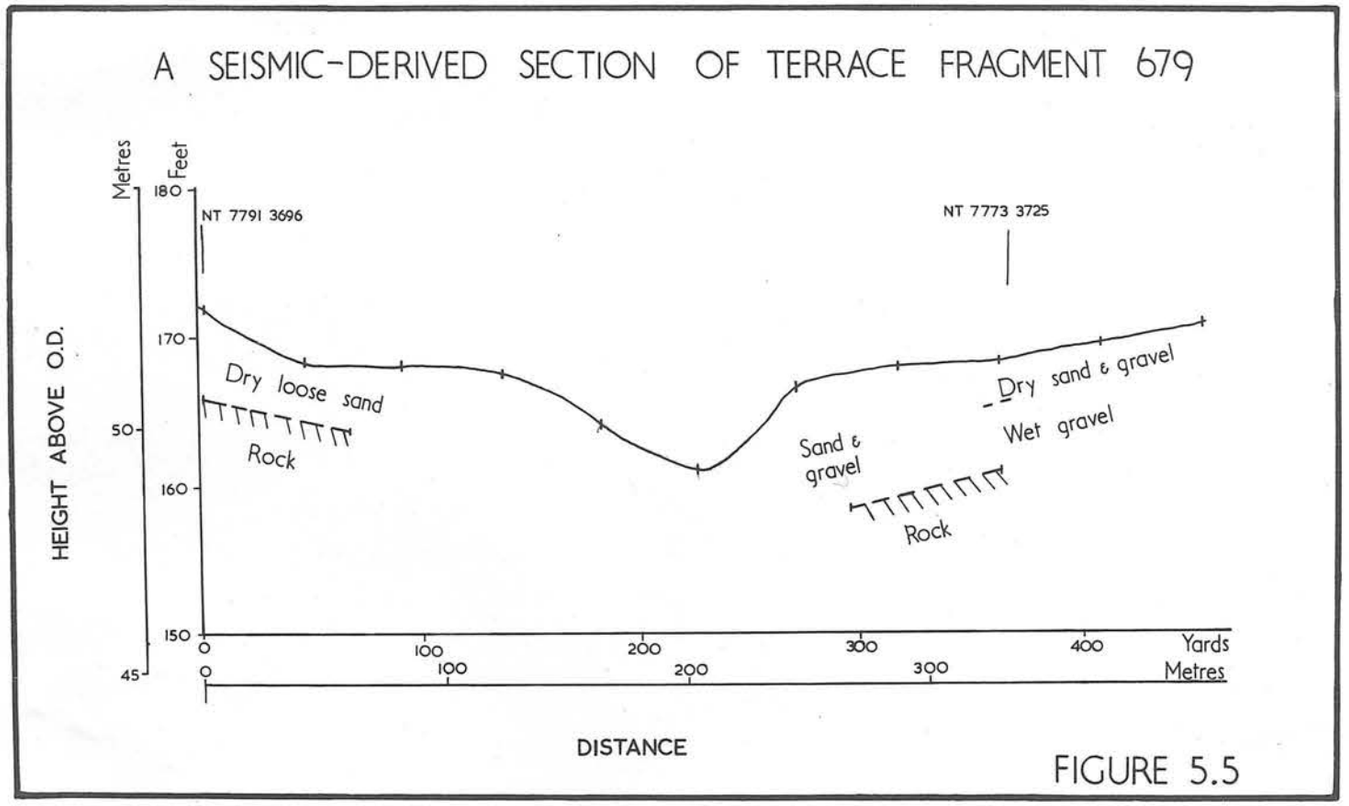


FIGURE 5.5

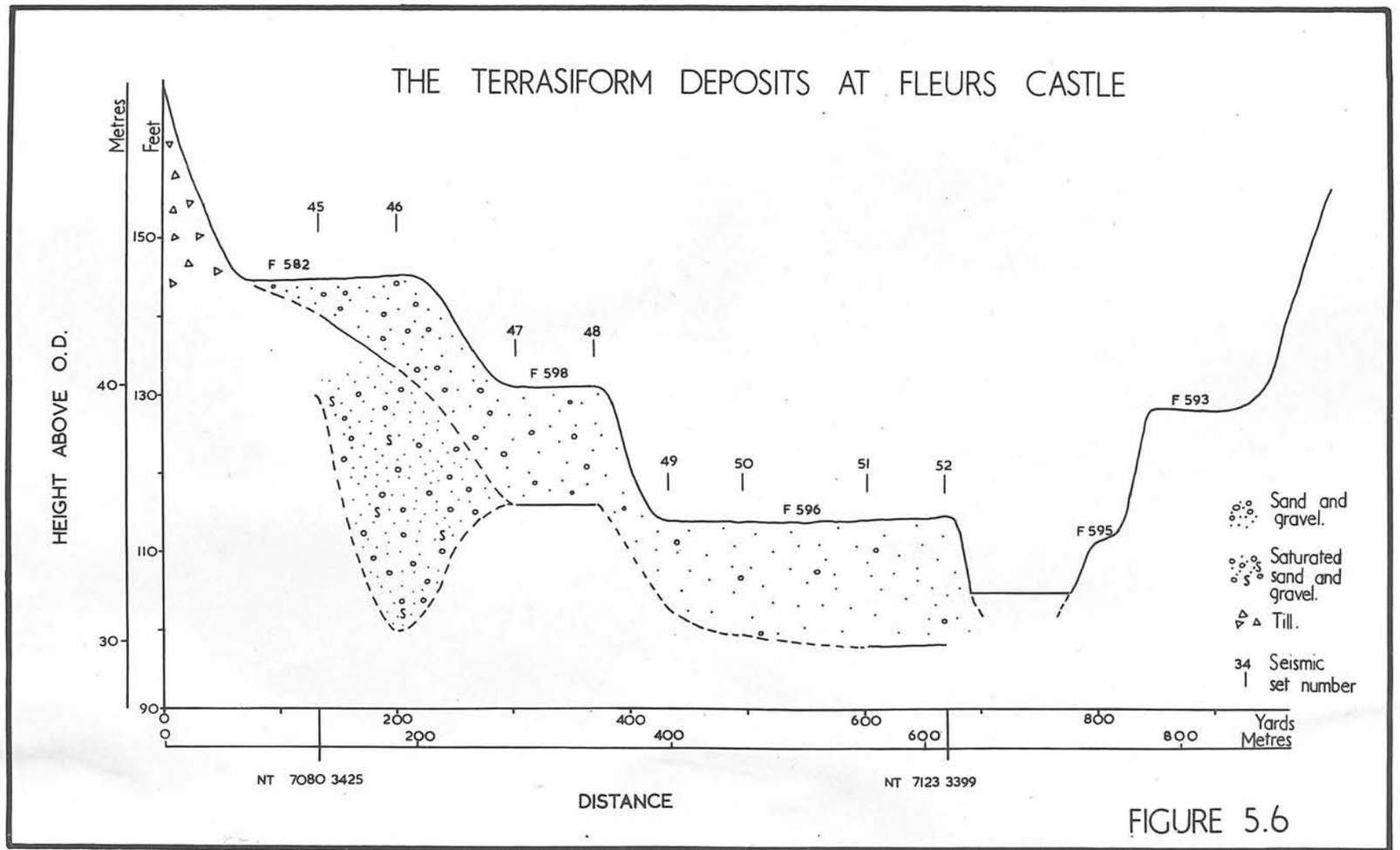
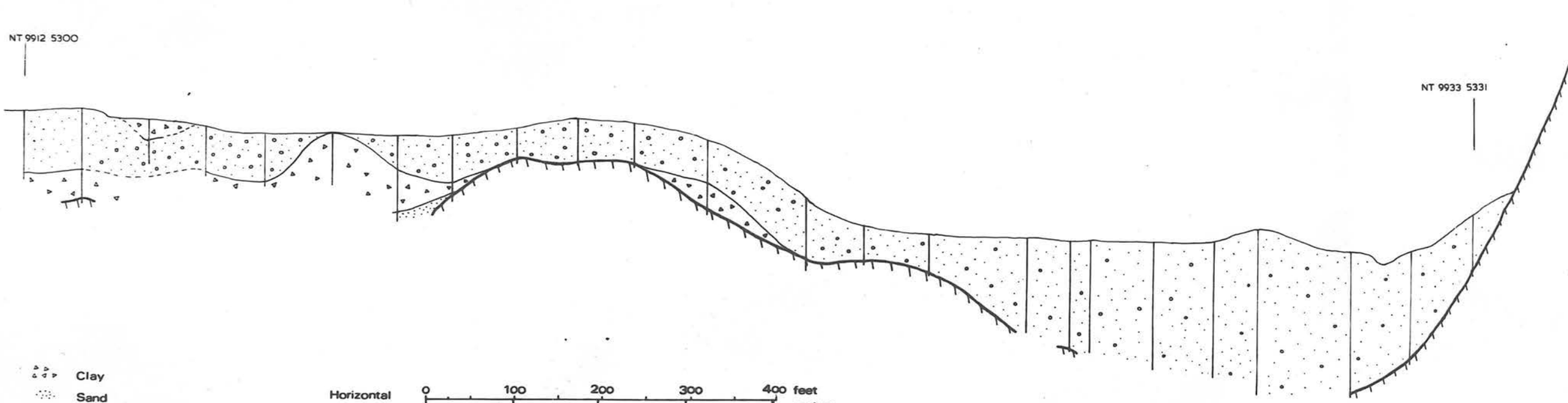


FIGURE 5.6

DRIFT DEPOSITS UNDER THE RAIL BRIDGE, BERWICK



Each vertical line represents the position of a borehole

FIGURE 5.7

THE MINIMUM POSSIBLE DEPTH OF DRIFT UNDER THE ROYAL TWEED BRIDGE, BERWICK

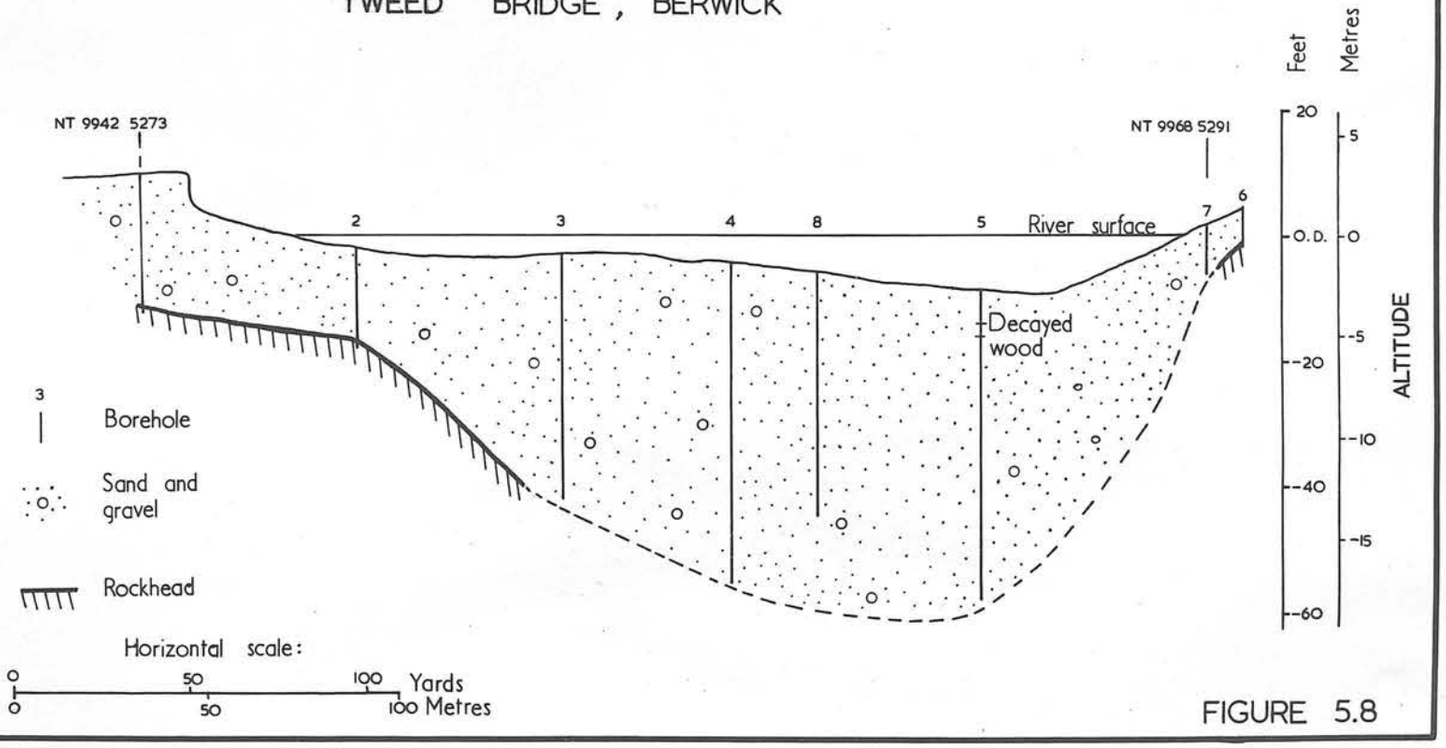


FIGURE 5.8

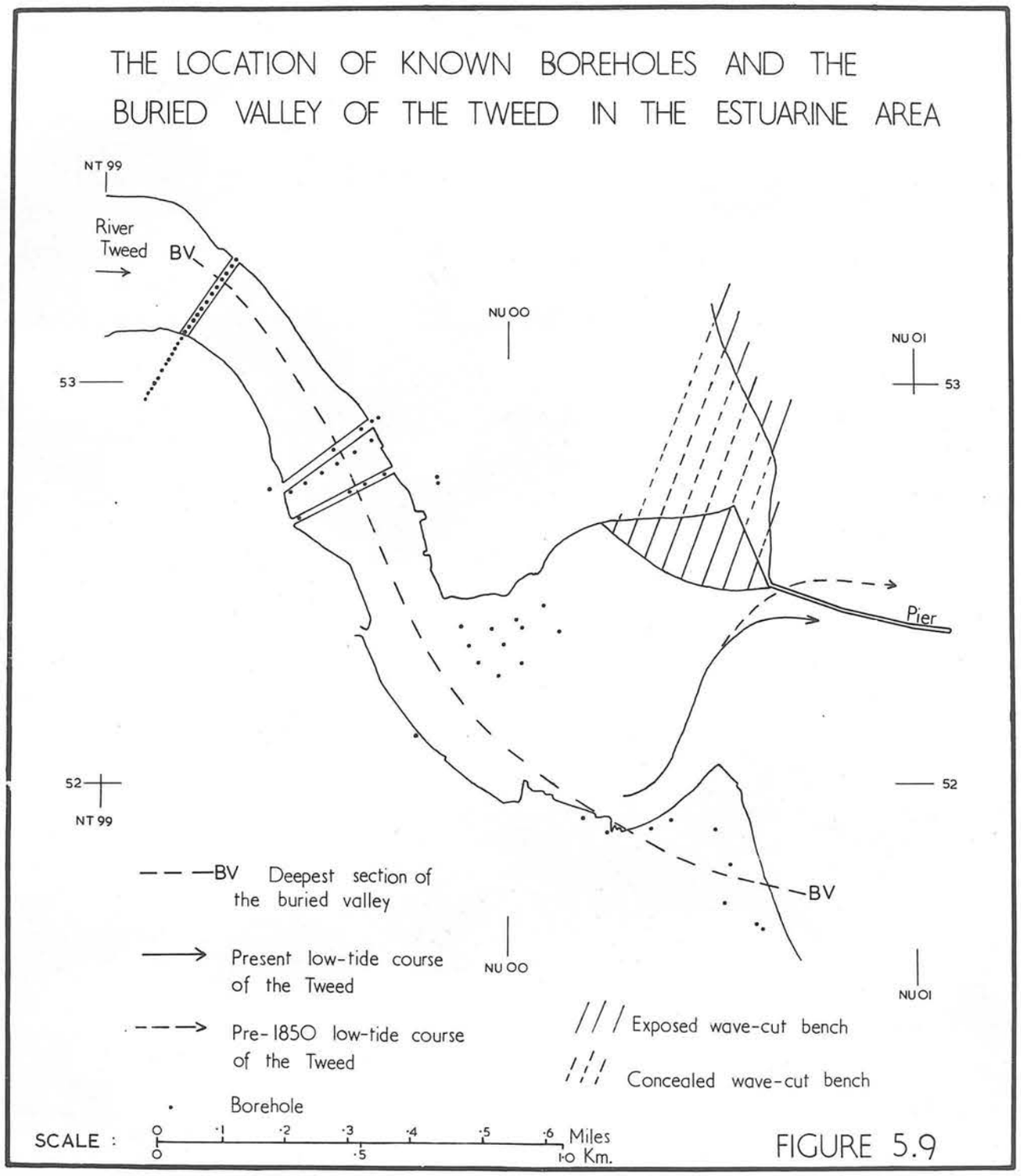
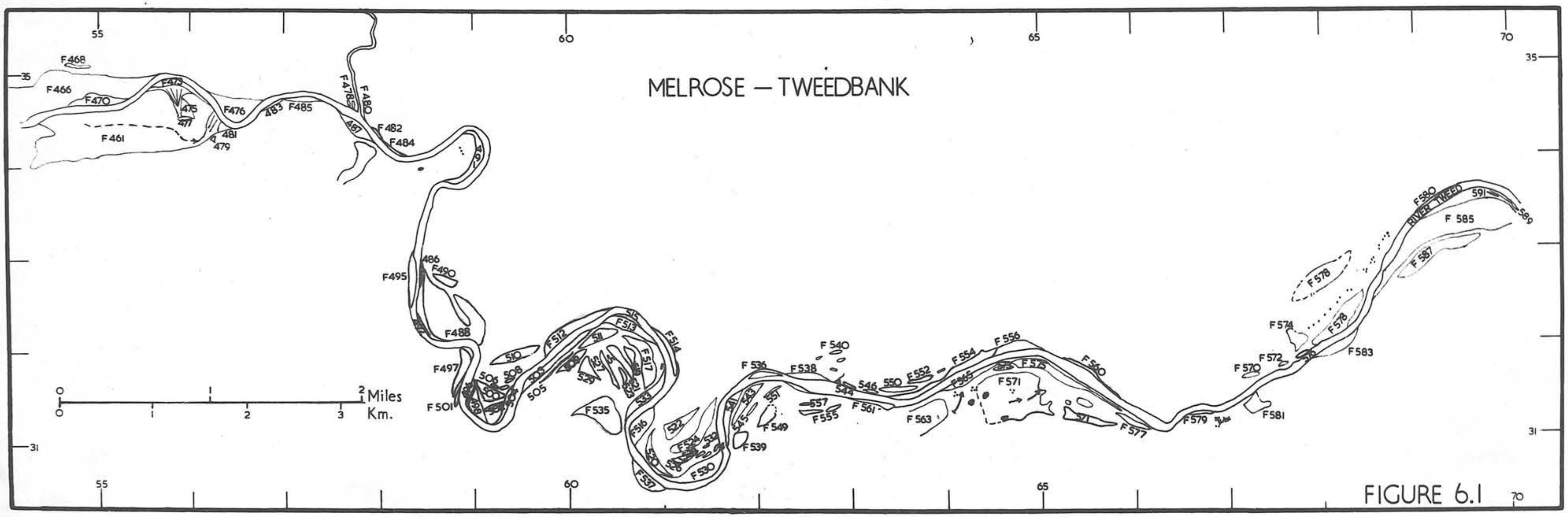

THE LOCATION OF KNOWN BOREHOLES AND THE
BURIED VALLEY OF THE TWEED IN THE ESTUARINE AREA
NT 99
River Tweed
BV
53
NU 00
NU 01
53
Pier
52
NT 99
52
BV
NU 00
NU 01
BV Deepest section of the buried valley
Present low-tide course of the Tweed
Pre-1850 low-tide course of the Tweed
Exposed wave-cut bench
Concealed wave-cut bench
Borehole
SCALE :
0 ·1 ·2 ·3 ·4 ·5 ·6 Miles
0 ·5 1·0 Km.

FIGURE 5.9



MELROSE – TWEEDBANK
RIVER TWEED
Miles
Km.
FIGURE 6.1

THORNIELEE – MELROSE

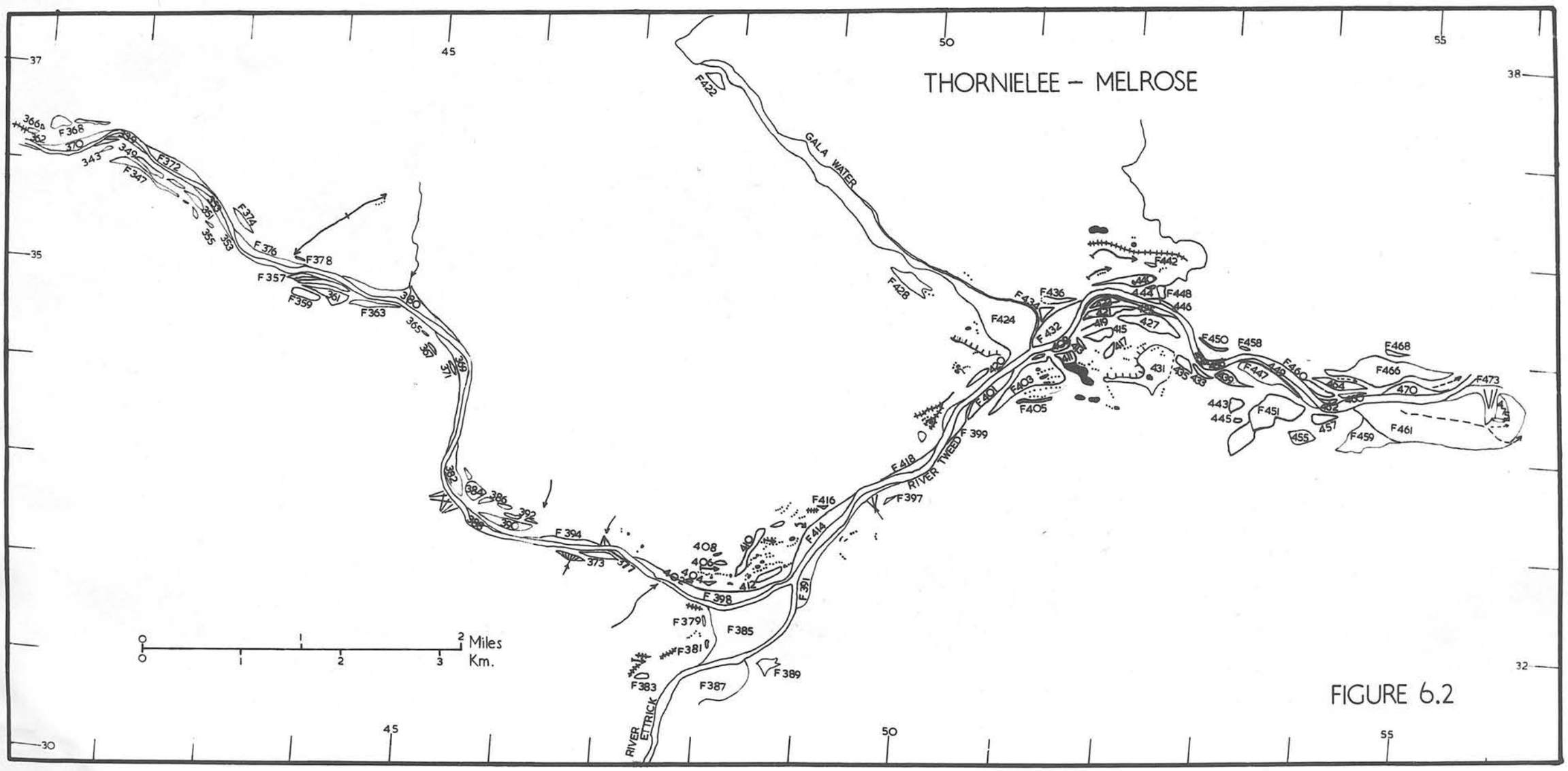


FIGURE 6.2

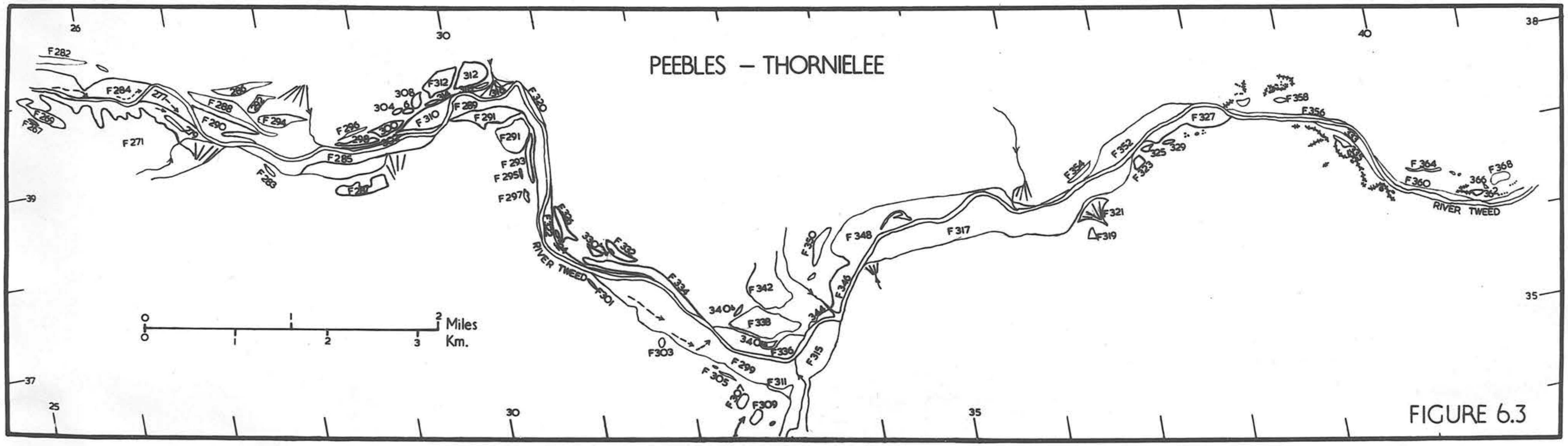

PEEBLES – THORNIELEE
RIVER TWEED
Miles
Km.
F 282
F 284
F 288
F 290
F 294
F 271
F 285
F 283
F 296
F 310
F 312
F 289
F 291
F 293
F 295
F 297
F 320
F 301
F 334
F 342
F 338
F 336
F 315
F 303
F 299
F 305
F 311
F 309
F 348
F 317
F 321
F 319
F 327
F 358
F 356
F 352
F 364
F 360
F 368
304
308
312
298
300
325
329
340
366
362
25
26
30
35
37
38
39
40

FIGURE 6.3

SUPPOSED TERRASIFORM DEPOSITS UPSTREAM FROM ST. BOSWELLS BRIDGE

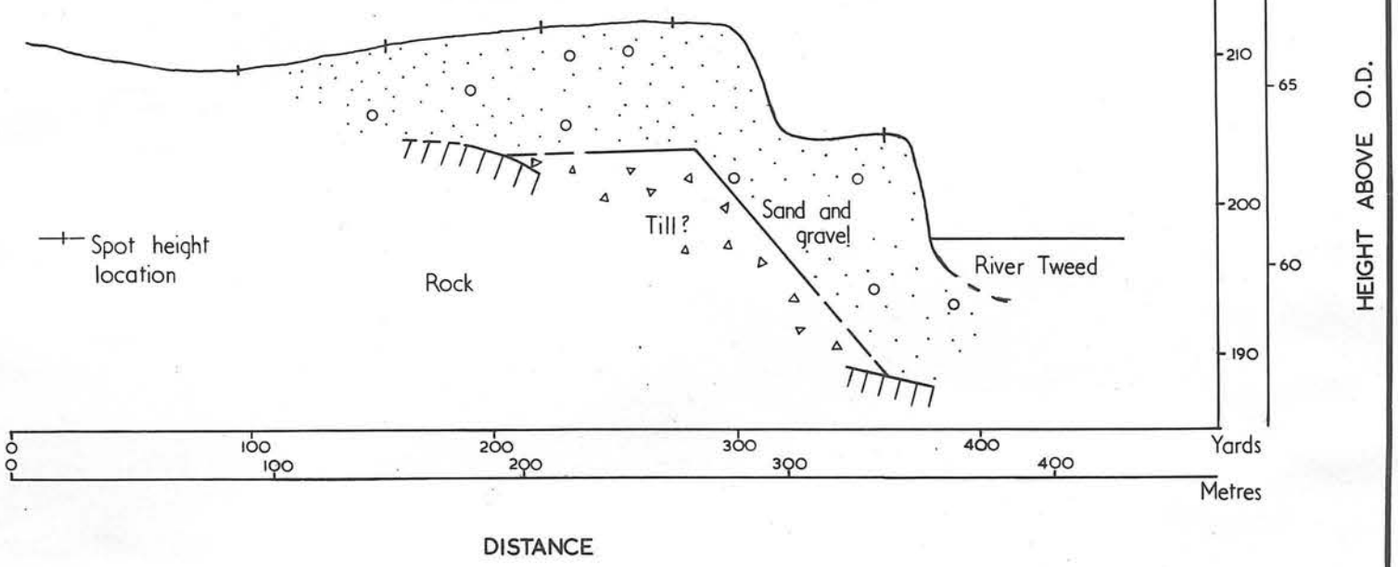


FIGURE 6.4

SUPERFICIAL DEPOSITS UNDER THE PROPOSED LOWOOD BRIDGE, GALASHIELS

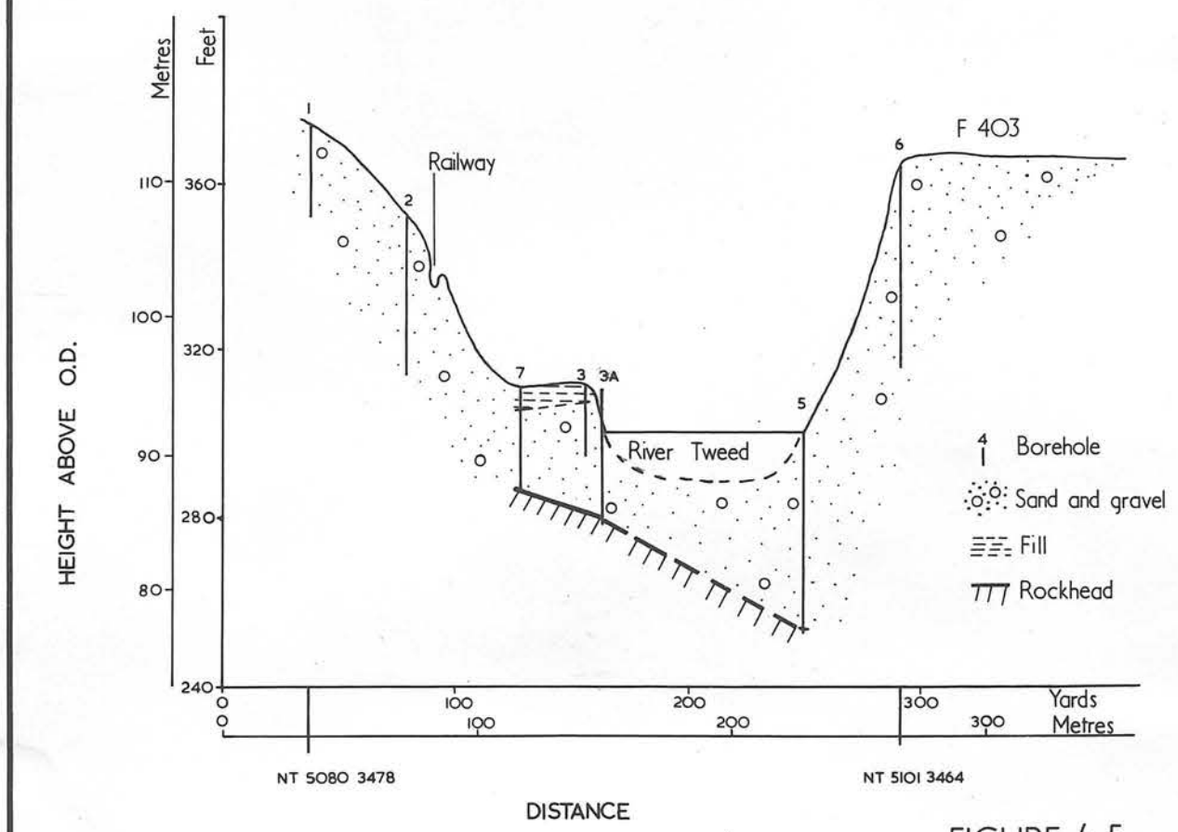


FIGURE 6.5

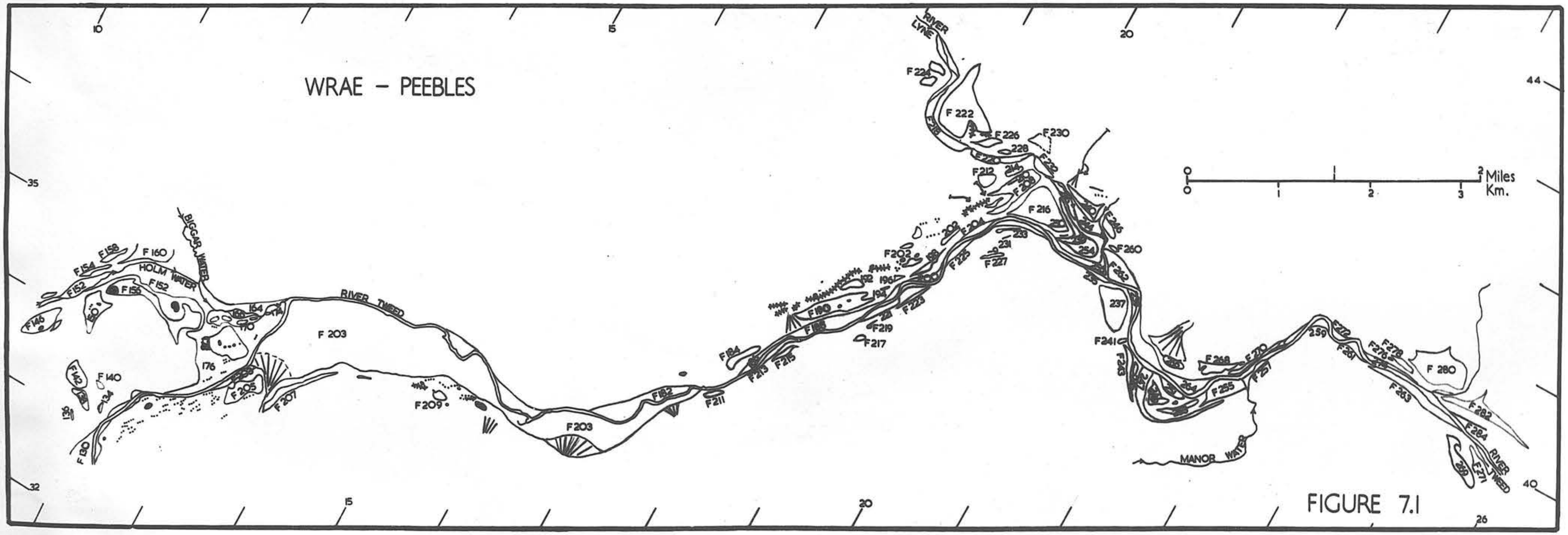

WRAE - PEEBLES
RIVER TWEED
RIVER LYNE
HOLM WATER
BIGGAR WATER
MANOR WATER
Miles
Km.
F 203
F 222
F 280
F 216
F 230
F 140
F 209

FIGURE 7.1

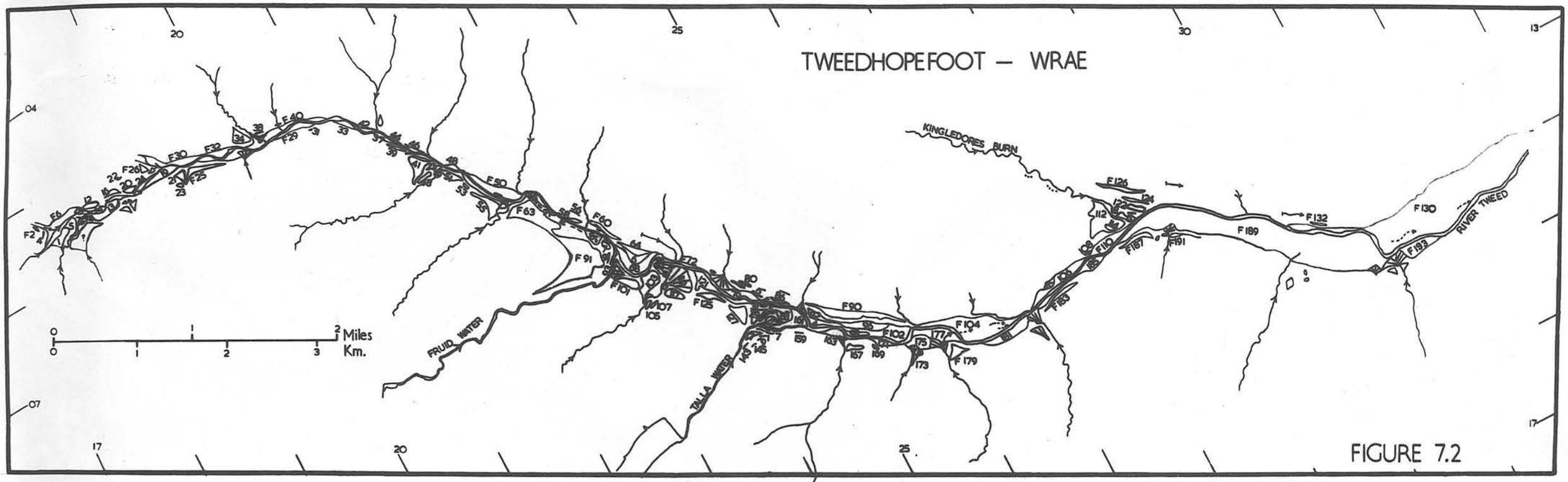


FIGURE 7.2

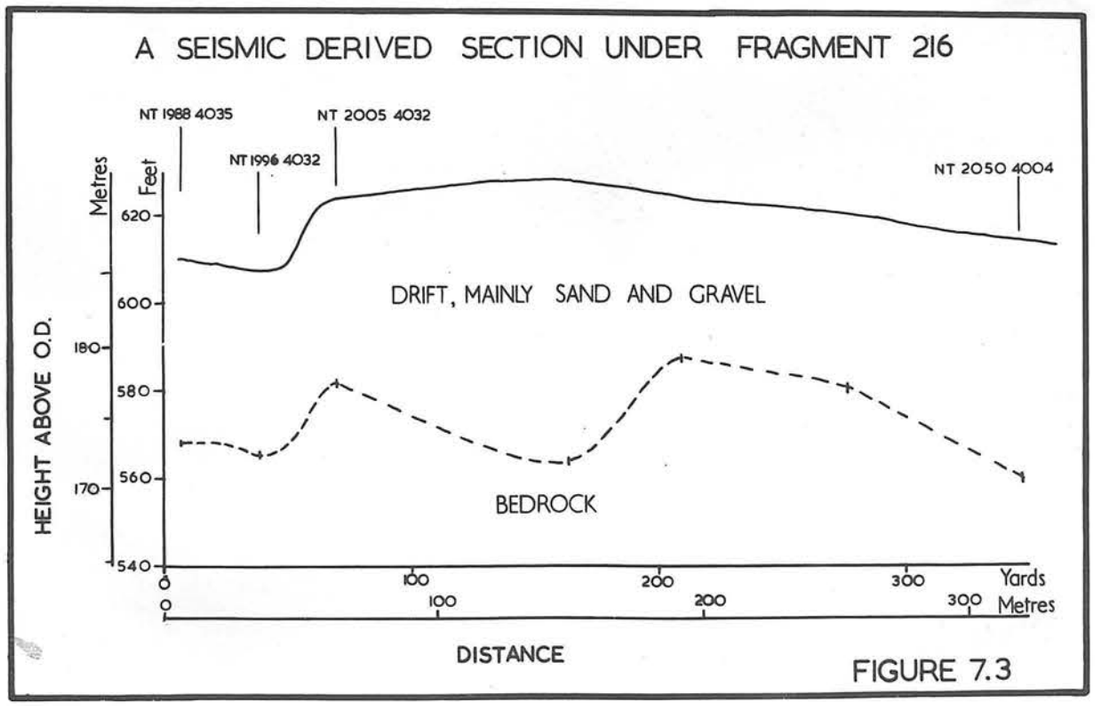
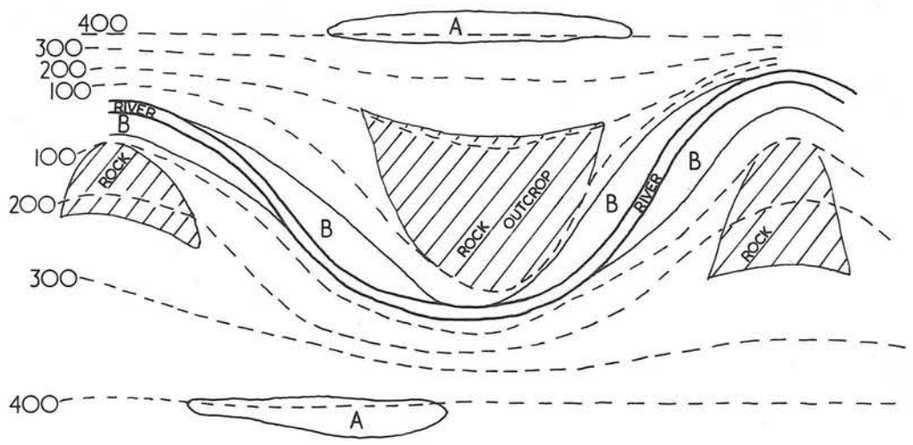


FIGURE 7.3

HYPOTHETICAL DIAGRAM ILLUSTRATING THE DESIRABILITY OF USING DIFFERENT PROJECTION PLANES FOR DIFFERENT TERRACES

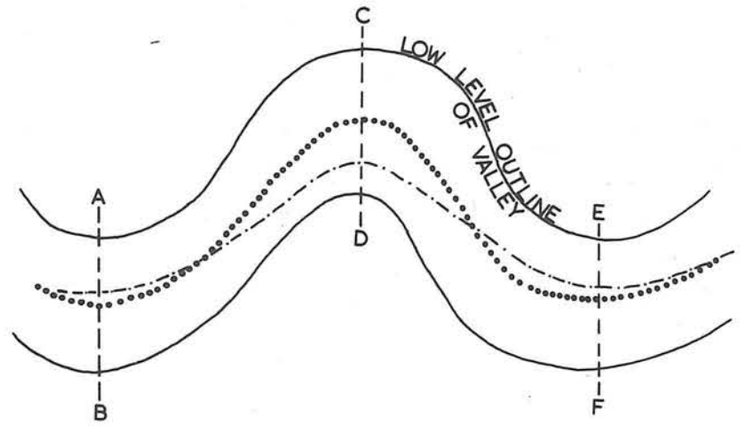


THE MOST SUITABLE PROJECTION PLANE FOR THE TERRACES MARKED 'A' IS PARALLEL TO THE 400(ARBITRARY) UNITS CONTOUR WHILE THAT FOR THOSE TERRACES MARKED 'B' IS COINCIDENT WITH THE RIVER COURSE.

SCALE : ARBITRARY

FIGURE 8.1

VALLEY ASYMETRY AND THE SINUOSITY OF PROJECTION PLANES



VALLEY CROSS SECTIONS

••••••• PROJECTION PLANE COURSE DOWN THE CENTRE OF THE LOWER VALLEY

·—·—·— PROJECTION PLANE COURSE DOWN THE CENTRE OF THE UPPER VALLEY

FIGURE 8.2

HEIGHT PROJECTION INTO A SEMI-CIRCULAR PLANE

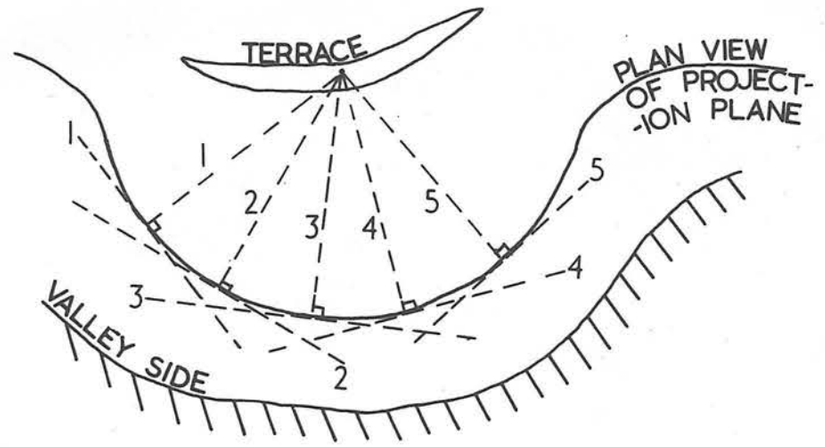


FIGURE 8.3

TERRACE GRADIENT VARIATION DUE TO PROJECTION INTO A CURVILINEAR PLANE

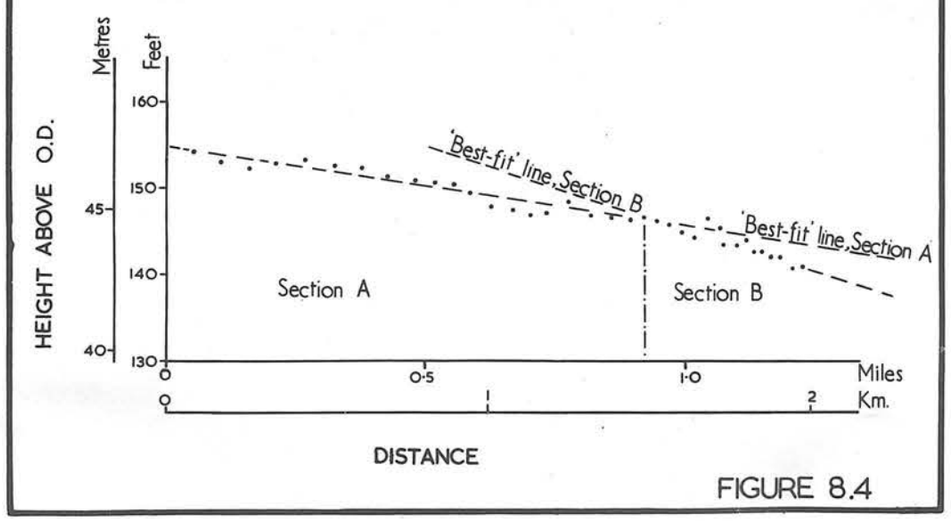


FIGURE 8.4

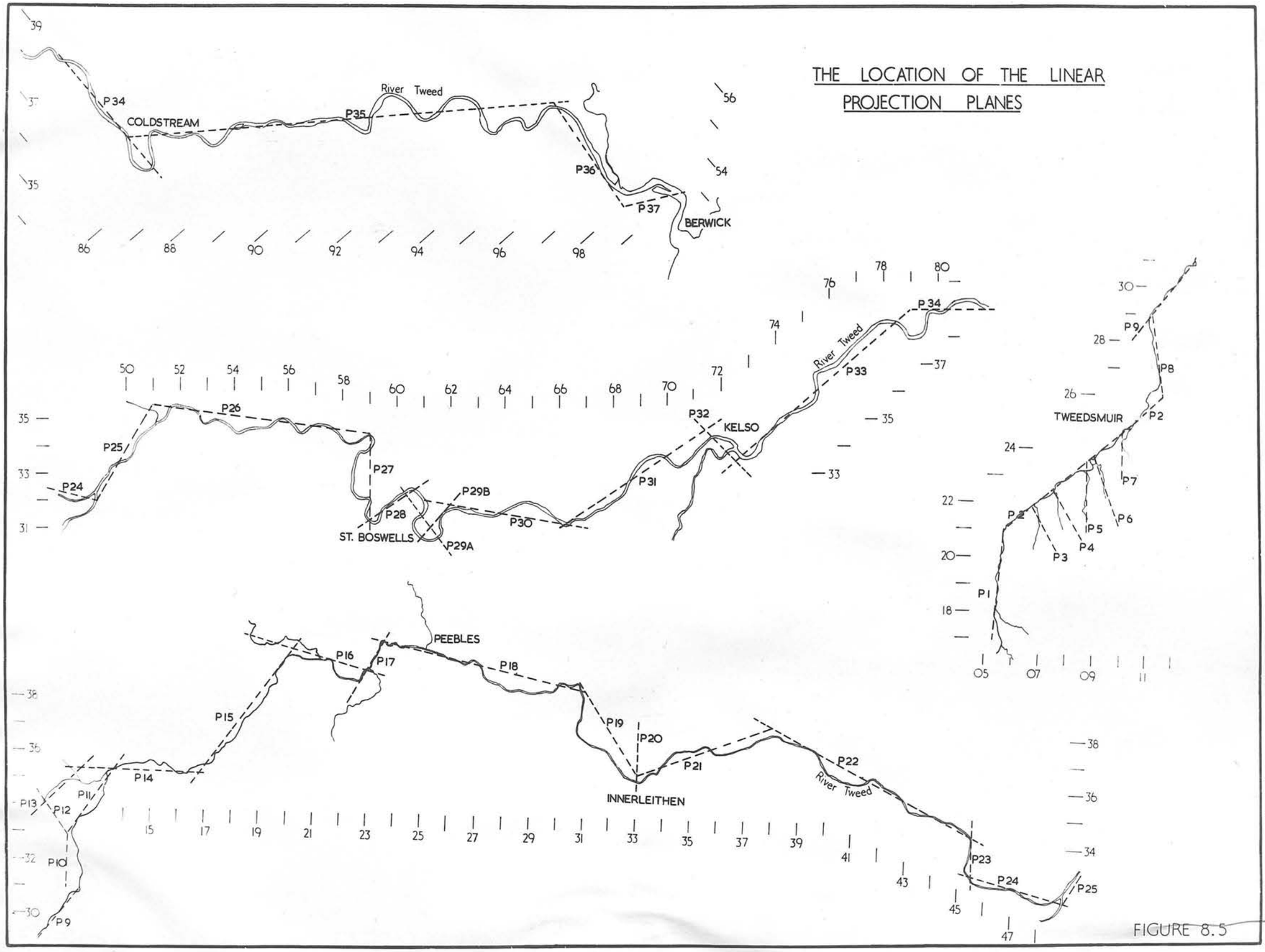

THE LOCATION OF THE LINEAR PROJECTION PLANES
River Tweed
COLDSTREAM
BERWICK
KELSO
TWEEDSMUIR
ST. BOSWELLS
PEEBLES
INNERLEITHEN
P1
P2
P3
P4
P5
P6
P7
P8
P9
P10
P11
P12
P13
P14
P15
P16
P17
P18
P19
P20
P21
P22
P23
P24
P25
P26
P27
P28
P29A
P29B
P30
P31
P32
P33
P34
P35
P36
P37

FIGURE 8.5

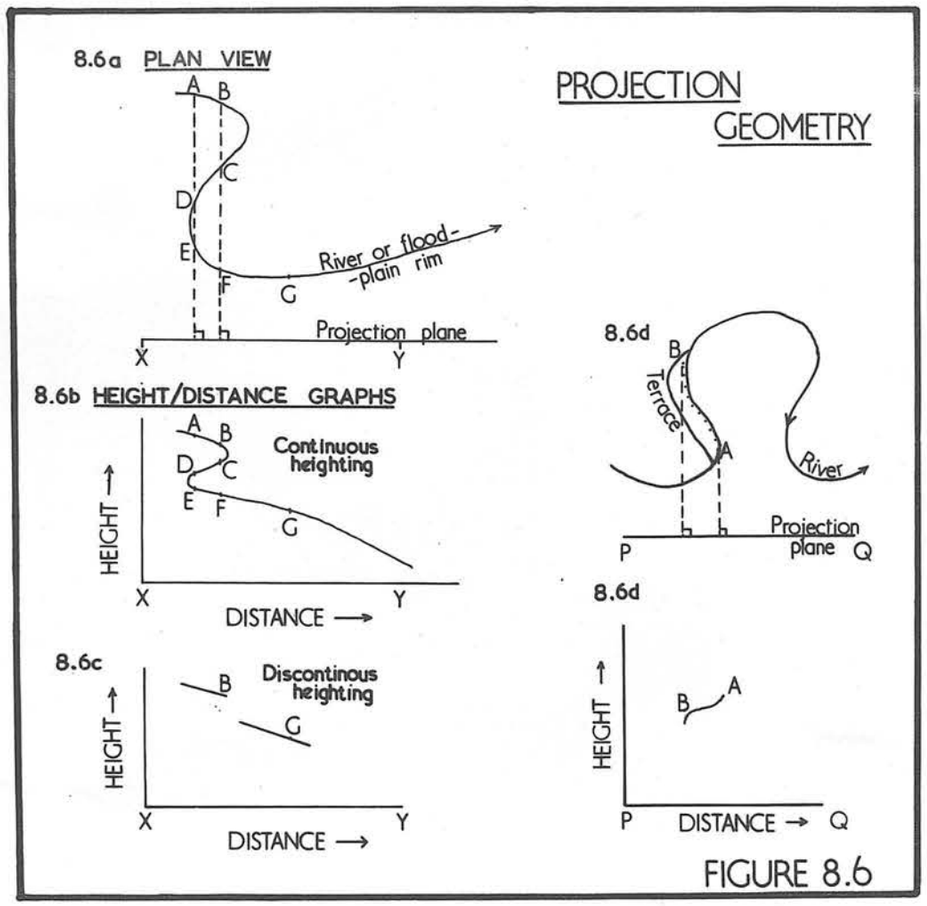


FIGURE 8.6

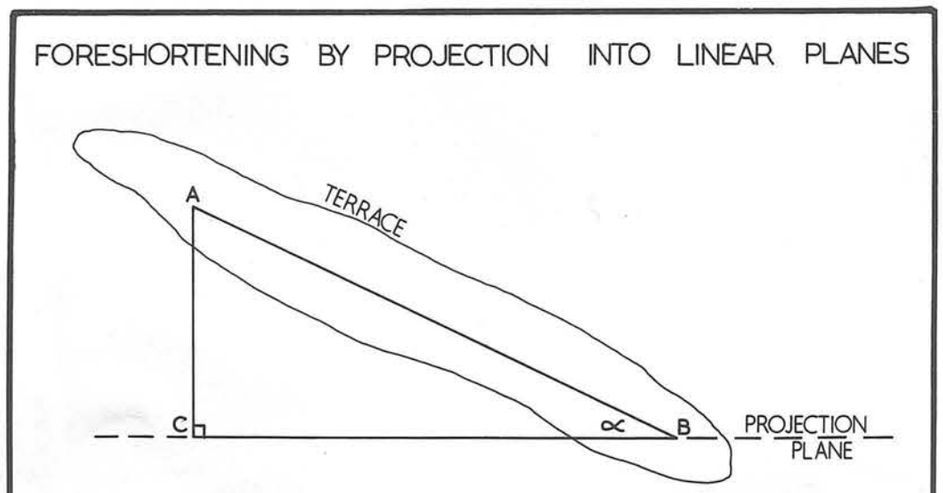


FIGURE 8.7

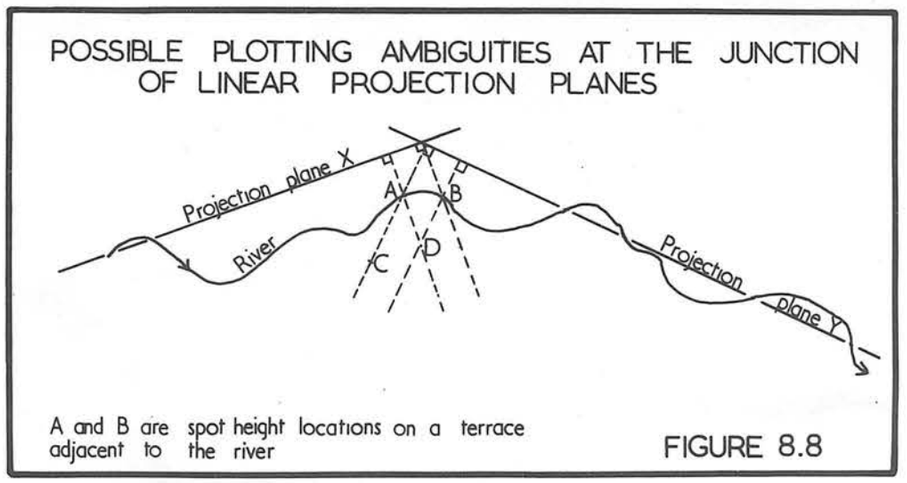


FIGURE 8.8

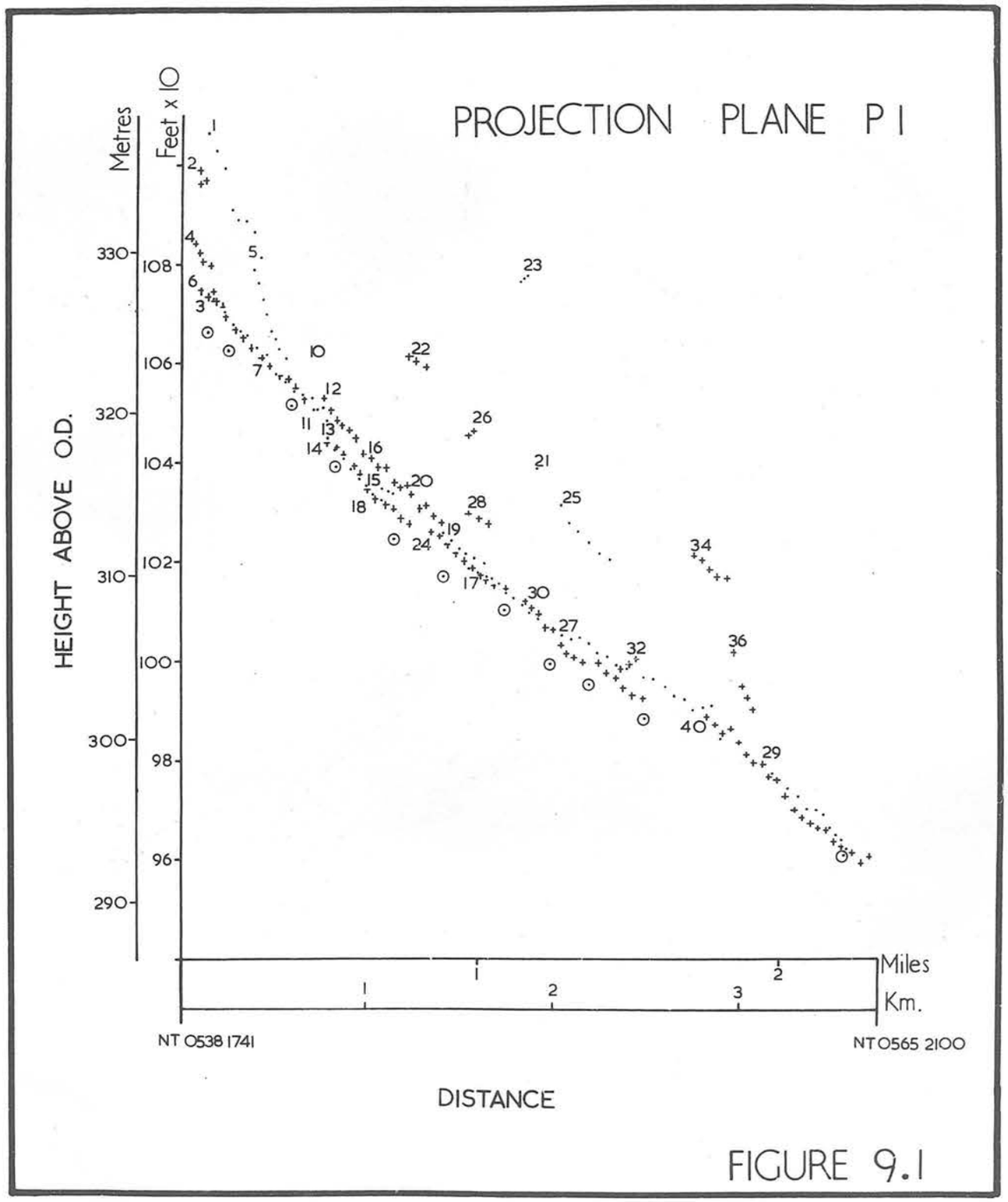

PROJECTION PLANE P I
HEIGHT ABOVE O.D.
Metres
Feet x 10
330
108
320
106
310
104
300
102
290
100
98
96
Miles
Km.
NT 0538 1741
NT 0565 2100
DISTANCE

FIGURE 9.1

PROJECTION PLANE P 2

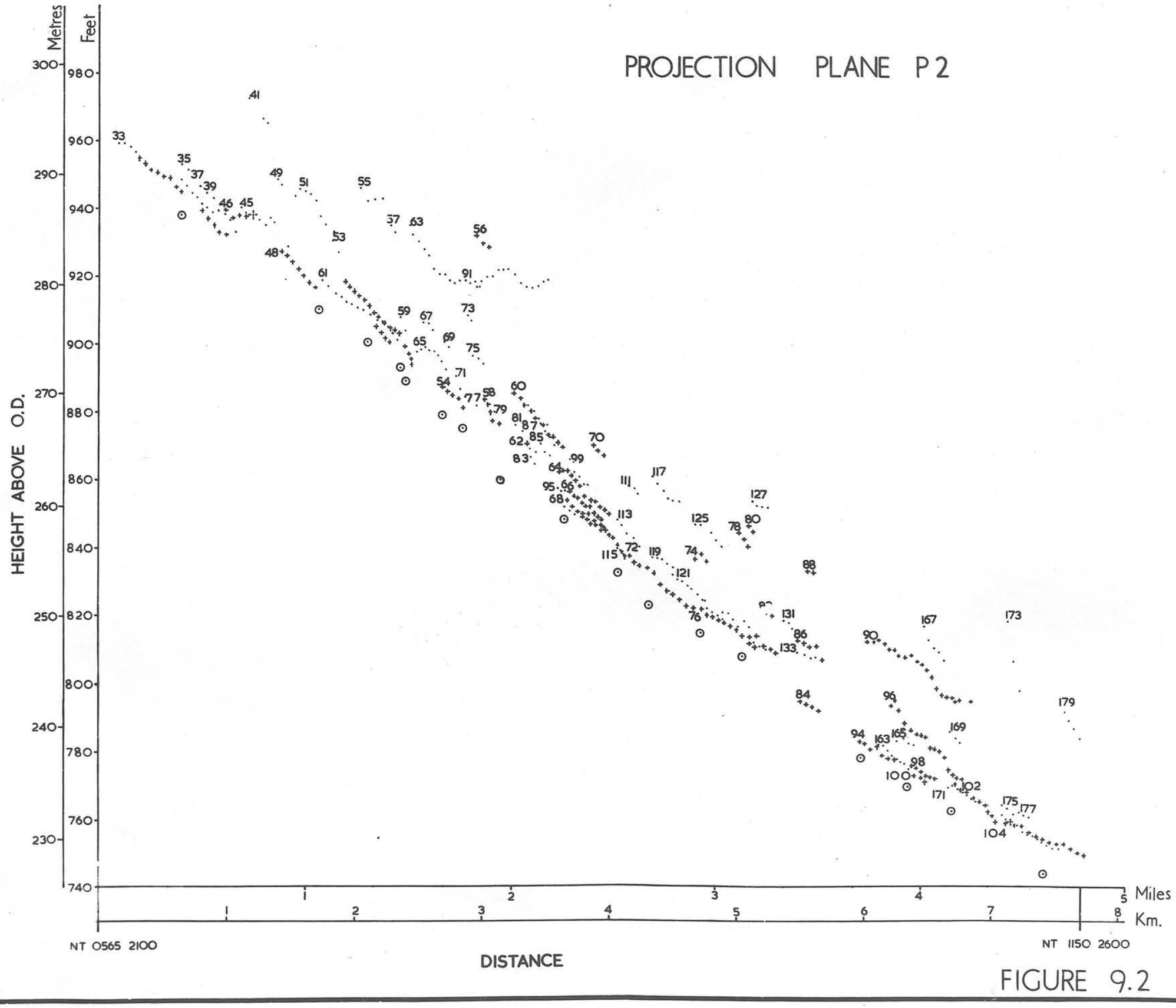


FIGURE 9.2

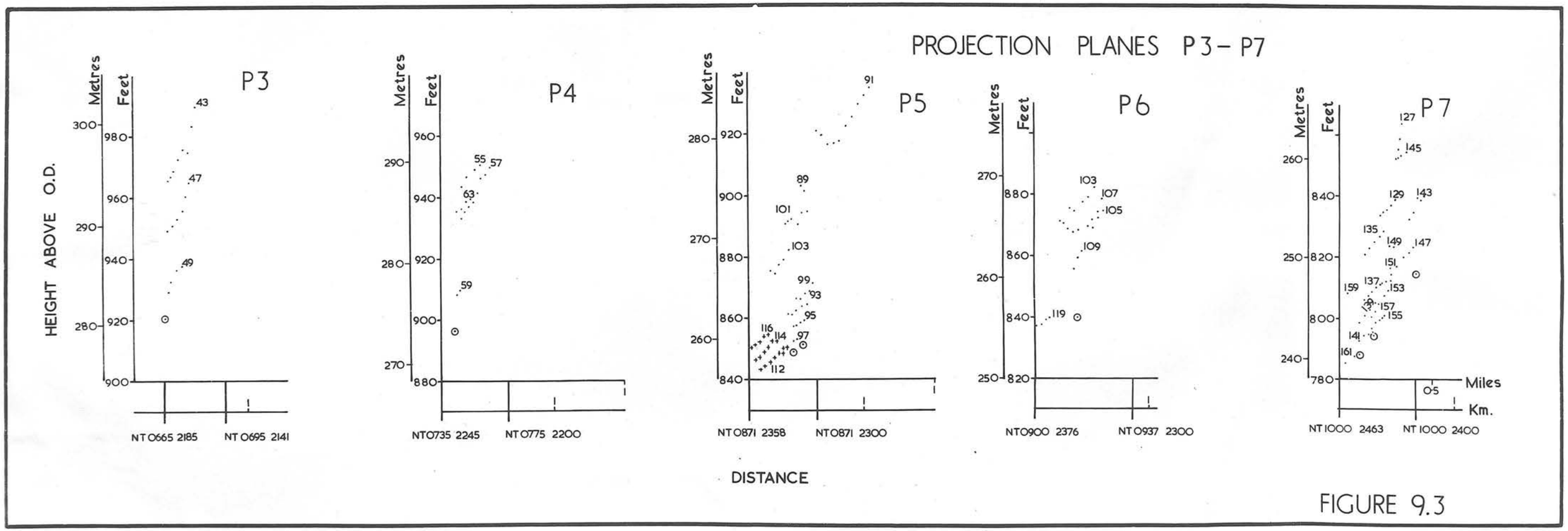

PROJECTION PLANES P3 – P7
HEIGHT ABOVE O.D.
P3
Metres
Feet
300
980
960
290
940
280
920
900
43
47
49
NT 0665 2185
NT 0695 2141
P4
Metres
Feet
290
960
940
280
920
900
270
880
55
57
63
59
NT0735 2245
NT0775 2200
P5
Metres
Feet
280
920
900
270
880
860
260
840
91
89
101
103
99
93
95
116
114
97
112
NT0871 2358
NT0871 2300
P6
Metres
Feet
270
880
860
260
840
250
820
103
107
105
109
119
NT0900 2376
NT0937 2300
P7
Metres
Feet
260
840
250
820
800
240
780
127
145
129
143
135
149
147
151
137
153
159
157
155
141
161
0 5
Miles
Km.
NT1000 2463
NT1000 2400
DISTANCE

FIGURE 9.3

PROJECTION PLANE P 8

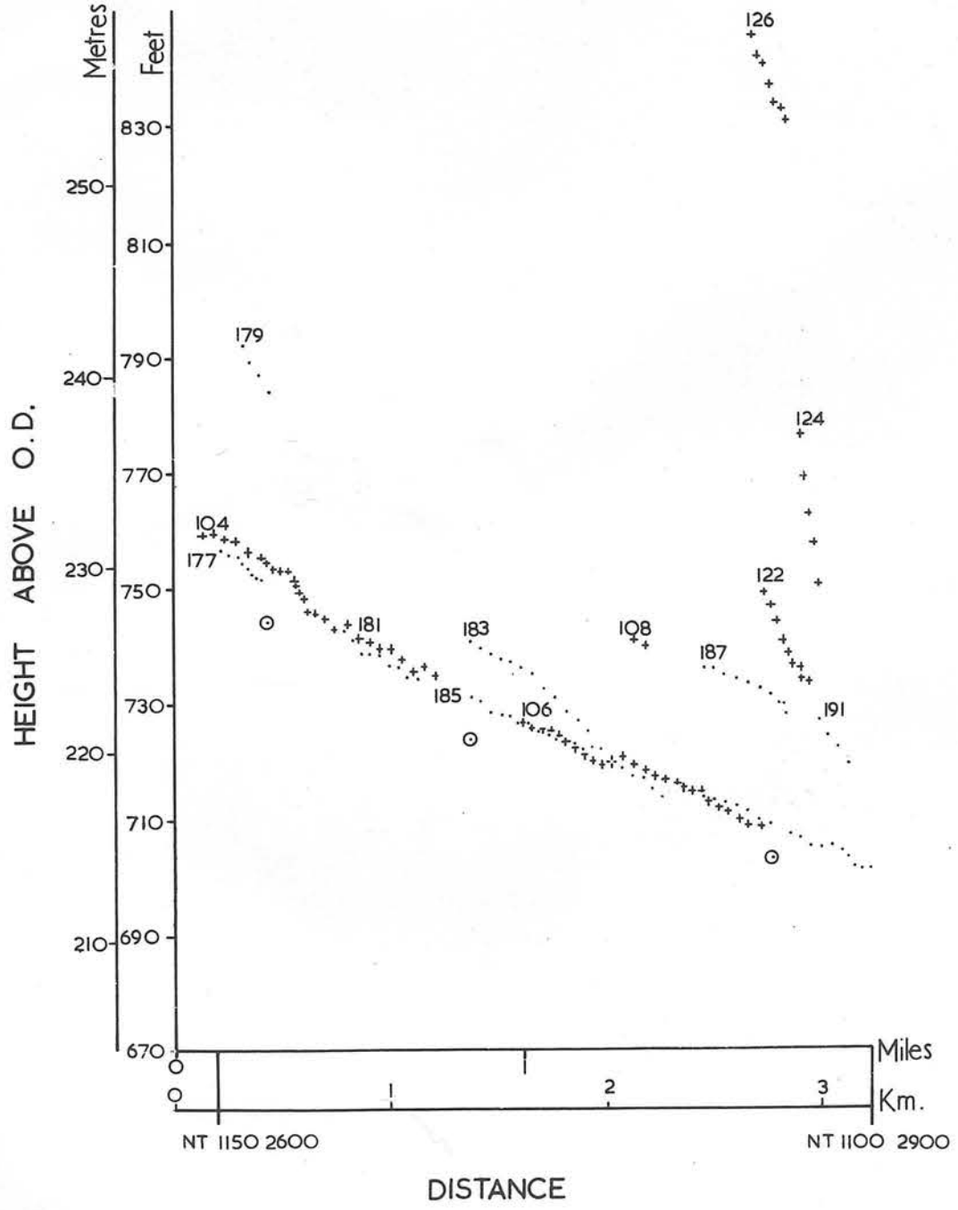


FIGURE 9.4

PROJECTION PLANE P 9

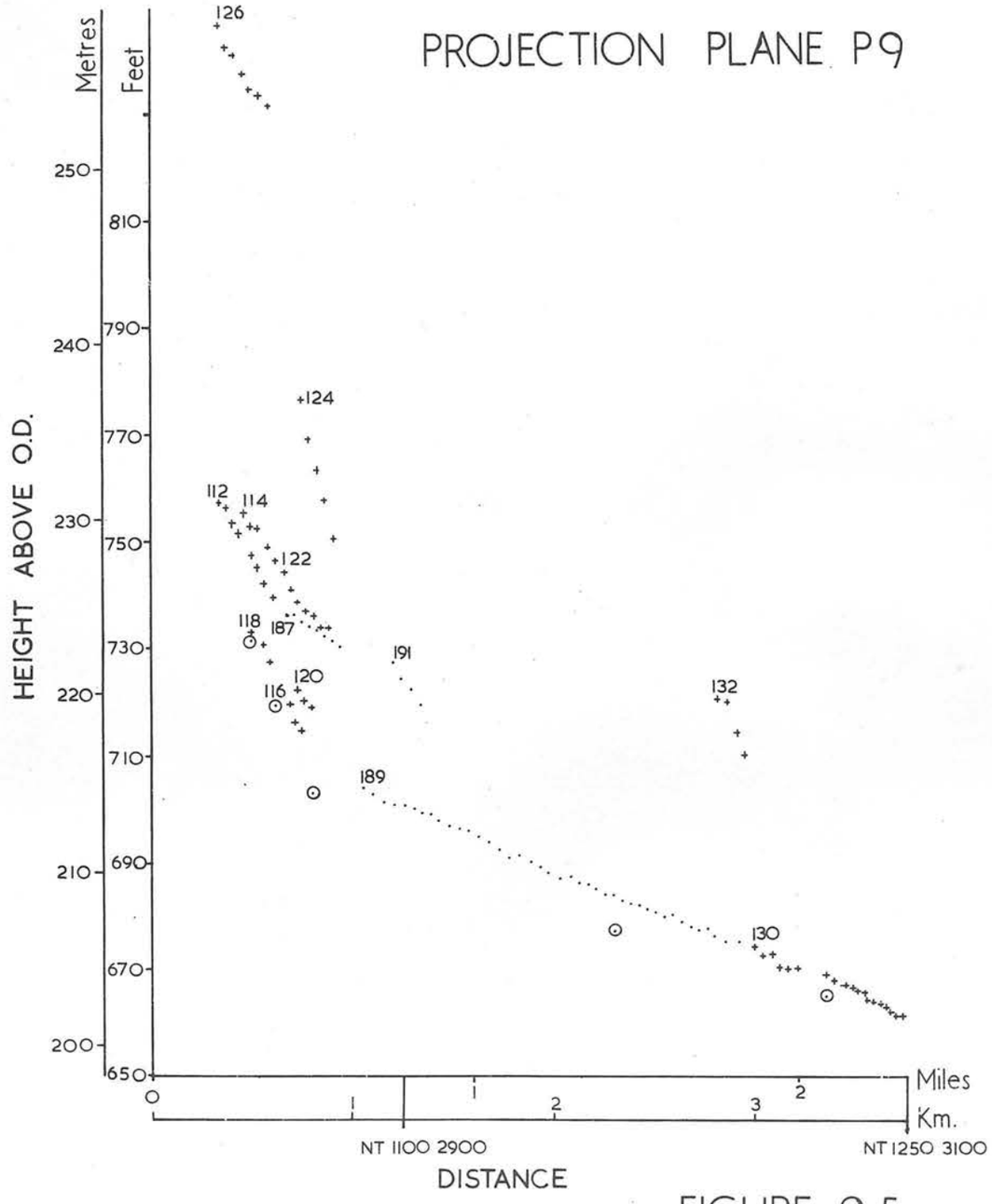


FIGURE 9.5

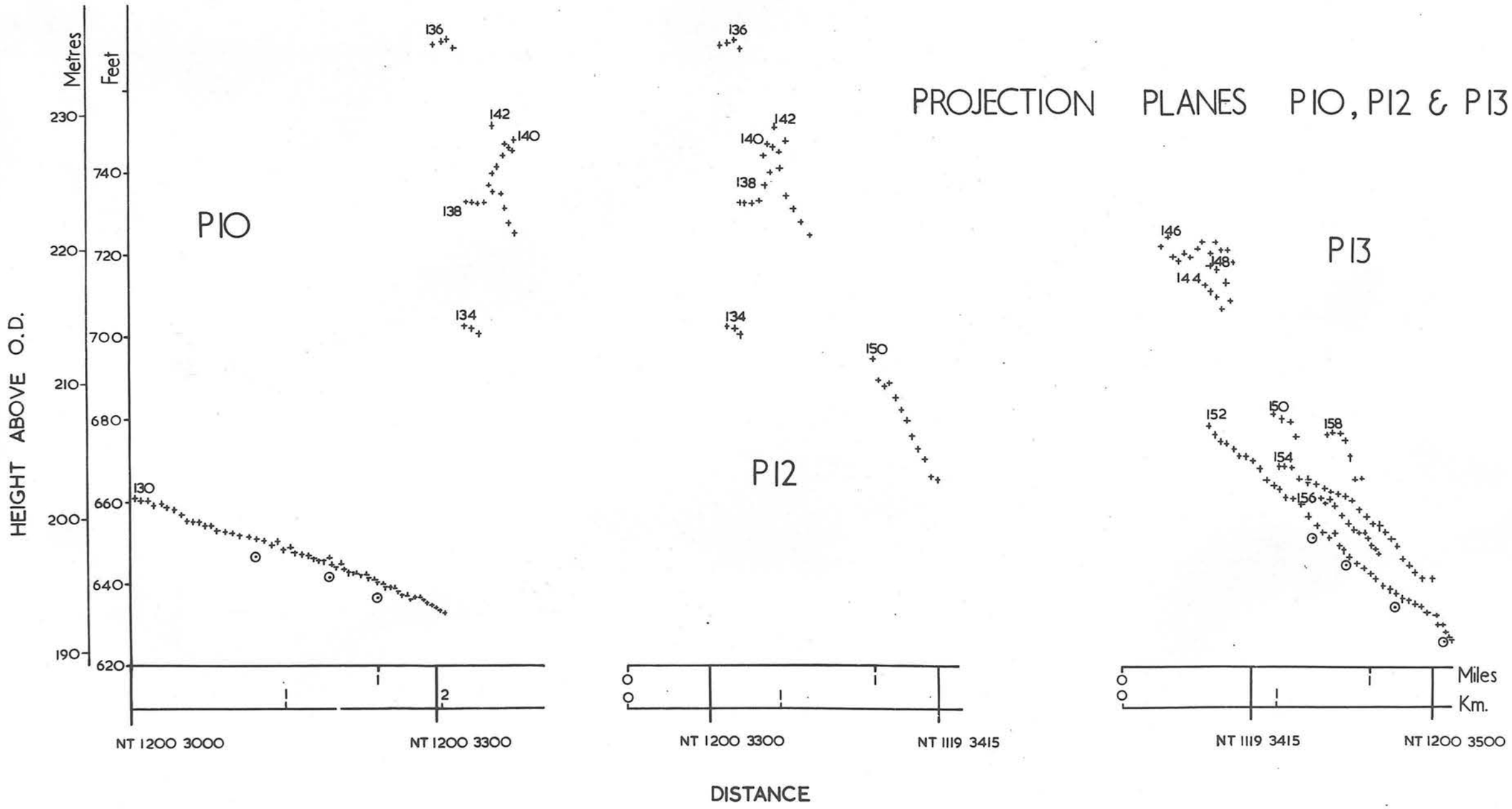

PROJECTION PLANES P10, P12 & P13
HEIGHT ABOVE O.D.
Metres
Feet
230
740
220
720
700
210
680
660
200
640
190
620
P10
P12
P13
130
134
136
138
140
142
144
146
148
150
152
154
156
158
1
2
NT 1200 3000
NT 1200 3300
NT 1119 3415
NT 1200 3500
Miles
Km.
DISTANCE

FIGURE 9.6

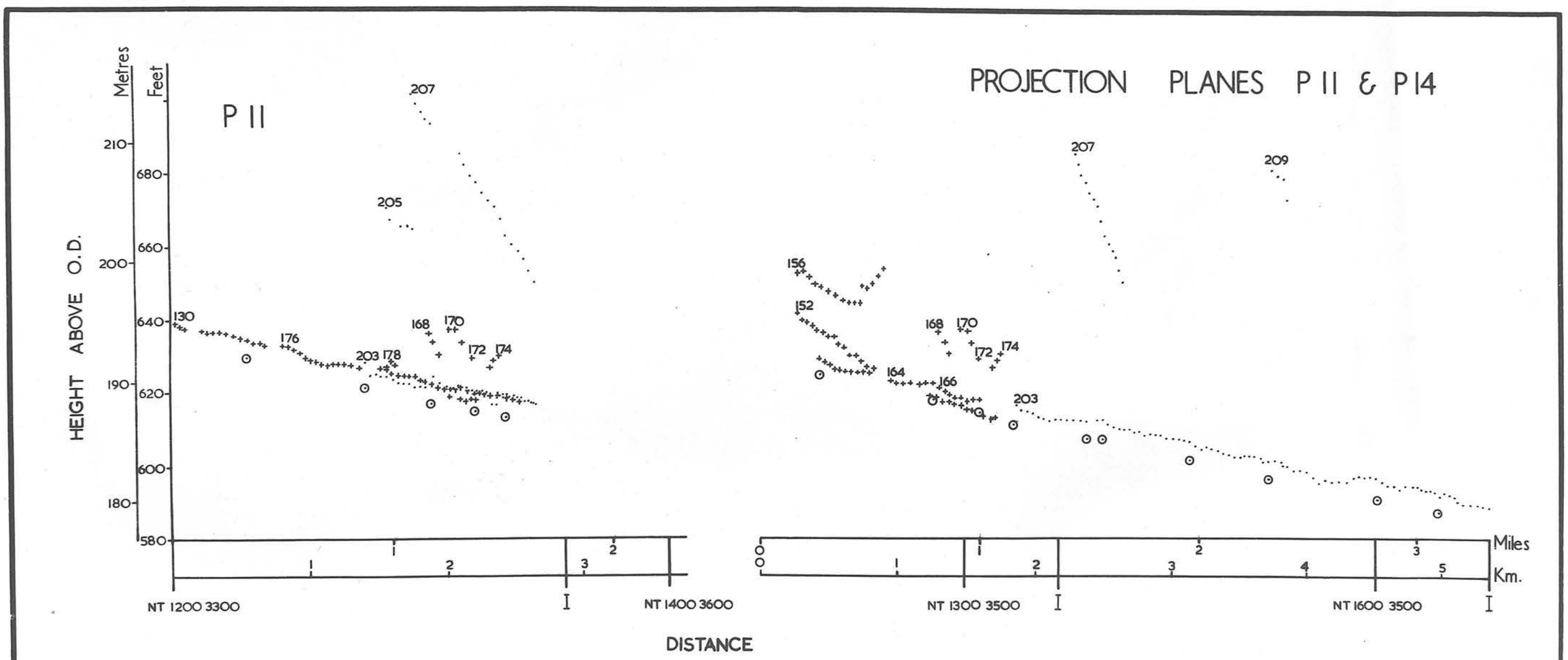

PROJECTION PLANES P 11 & P 14
P 11
HEIGHT ABOVE O.D.
Metres
Feet
210
680
200
660
640
190
620
600
180
580
207
205
130
176
203 178
168 170
172 174
156
152
164
166
207
209
NT 1200 3300
NT 1400 3600
NT 1300 3500
NT 1600 3500
Miles
Km.
DISTANCE

FIGURE 9.7

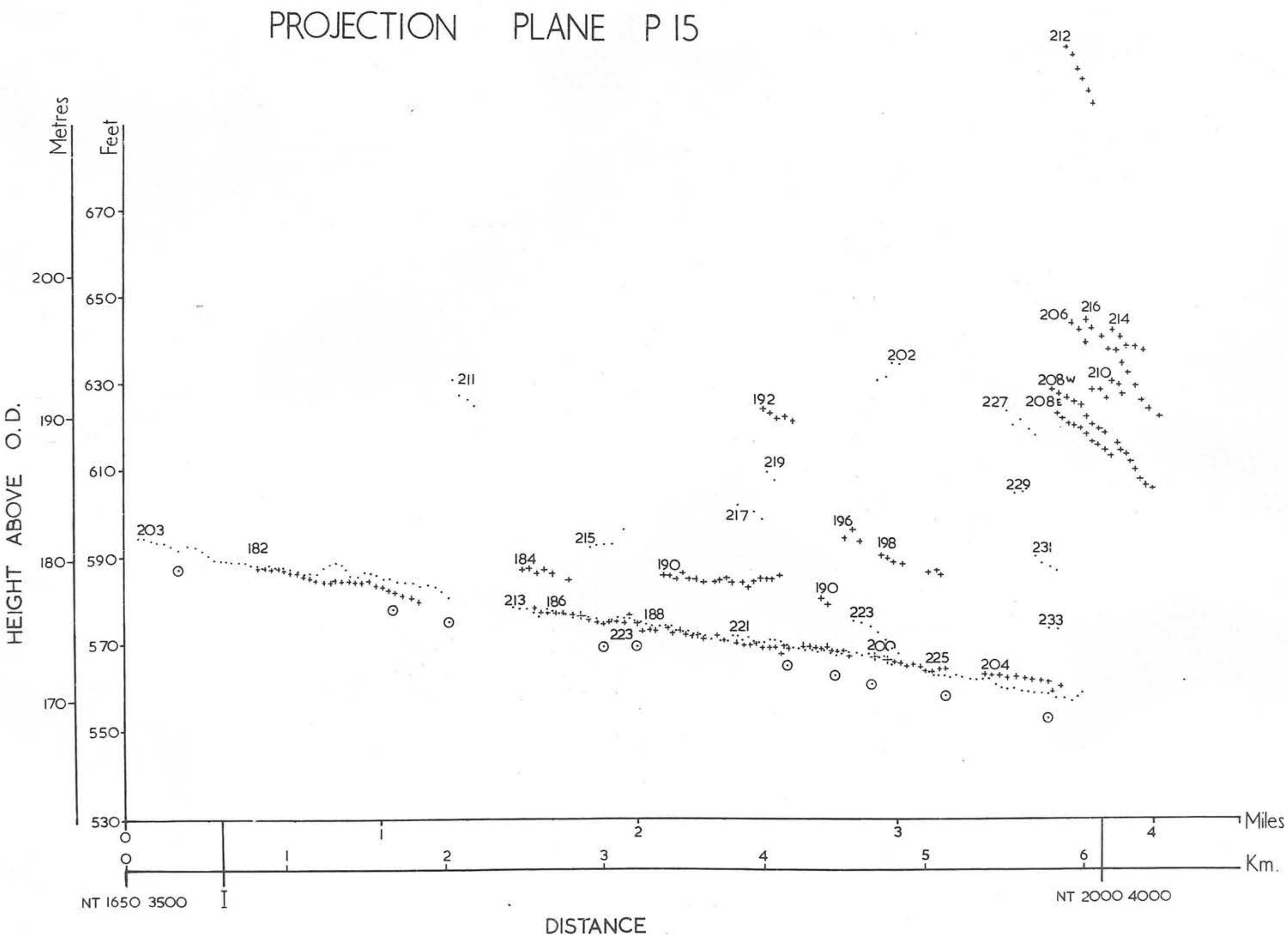

PROJECTION PLANE P 15
HEIGHT ABOVE O. D.
Metres
Feet
200
190
180
170
670
650
630
610
590
570
550
530
203
182
211
184
215
213
186
223
188
190
192
219
217
221
196
198
190
223
200
202
225
204
227
229
231
233
212
206
216
214
210
208W
208E
Miles
Km.
NT 1650 3500
NT 2000 4000
DISTANCE

FIGURE 9.8

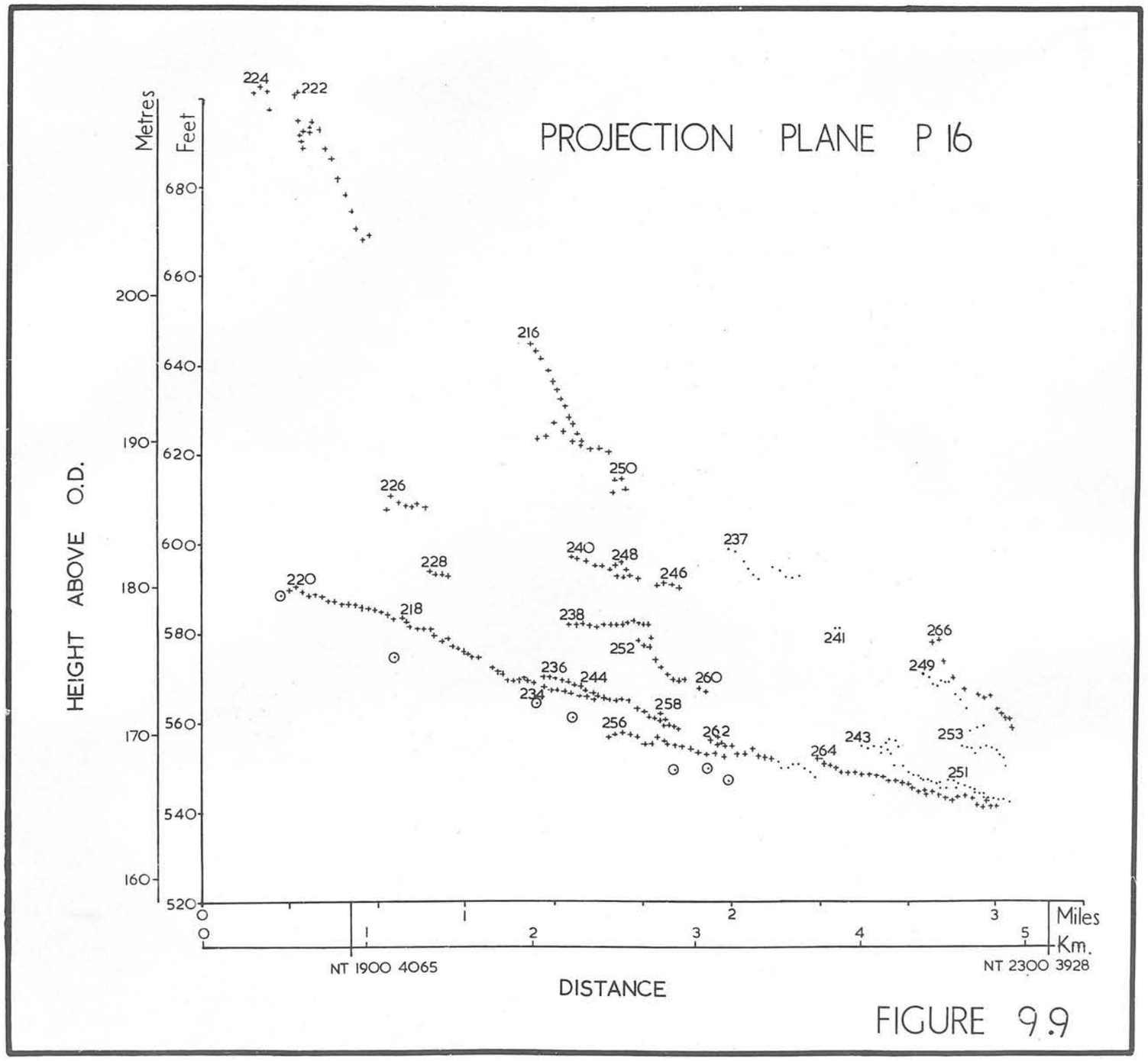

PROJECTION PLANE P 16
HEIGHT ABOVE O.D.
Metres
Feet
200
190
180
170
680
660
640
620
600
580
560
540
520
160
224
222
216
250
226
237
240
248
246
228
220
218
238
241
266
252
249
236
244
260
234
258
256
262
243
253
264
251
0
1
2
3
Miles
0
1
2
3
4
5
Km.
NT 1900 4065
NT 2300 3928
DISTANCE

FIGURE 9.9

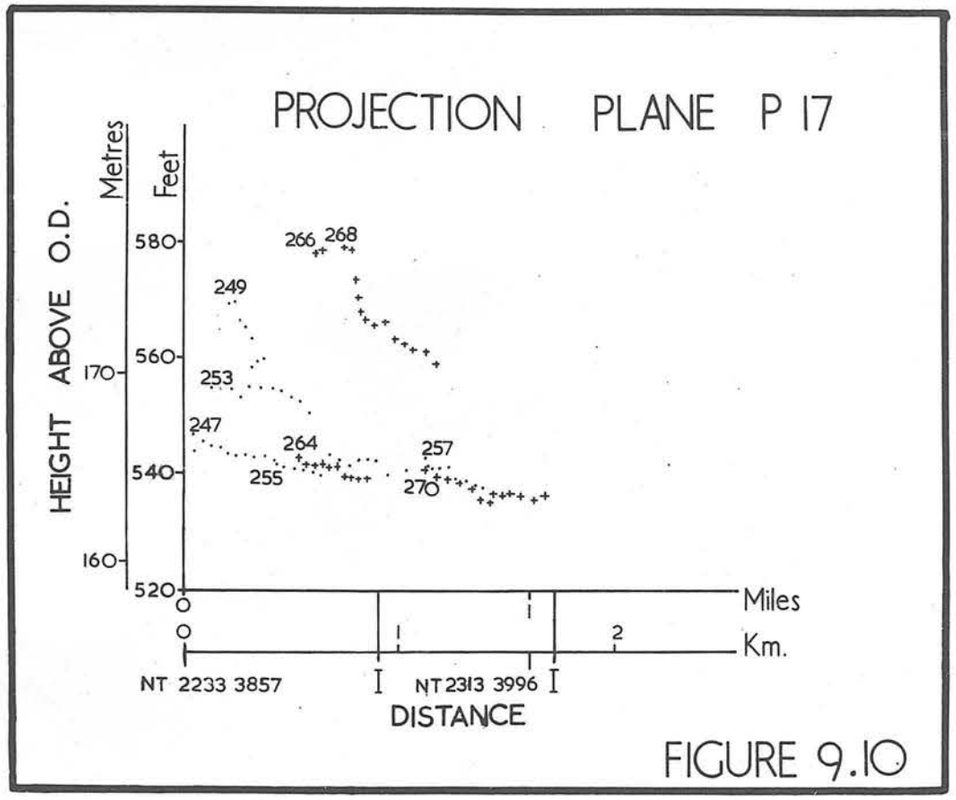


FIGURE 9.10

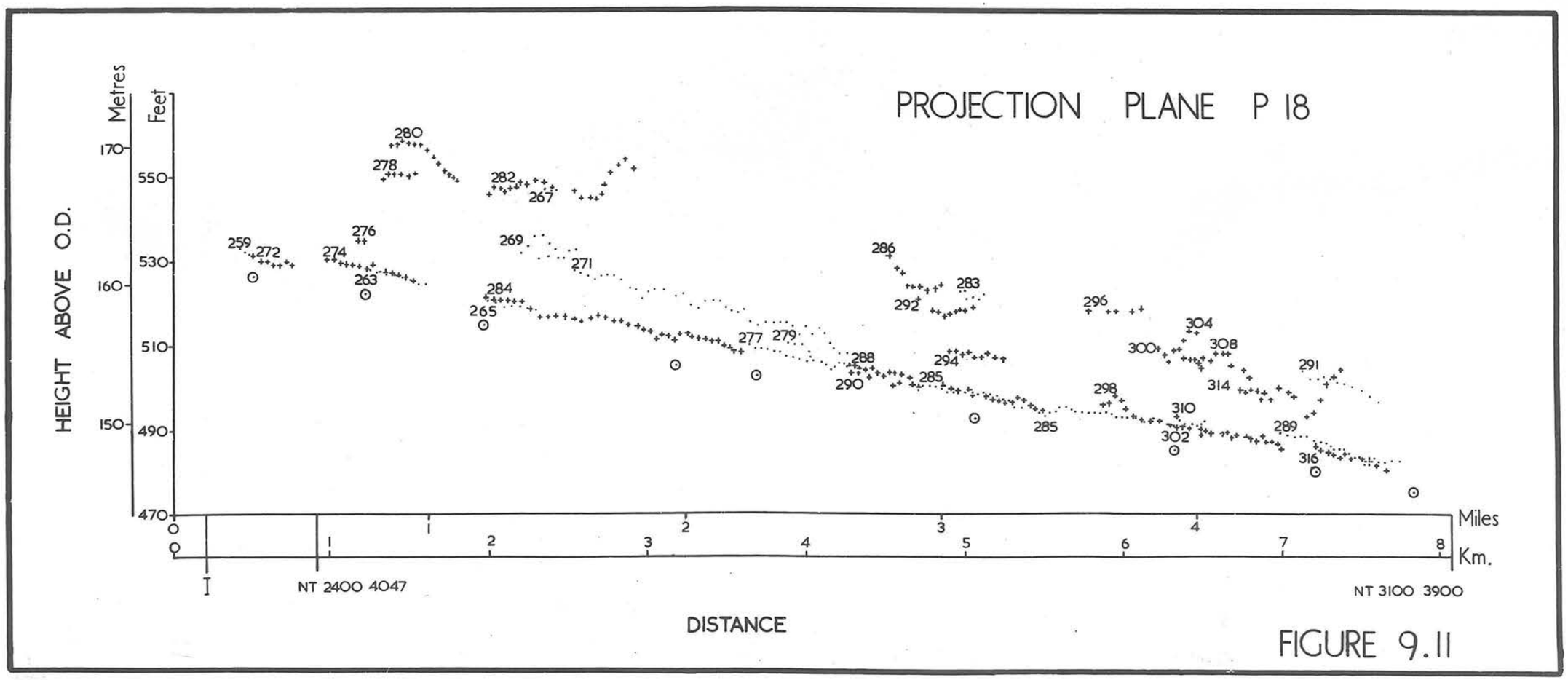


FIGURE 9.11

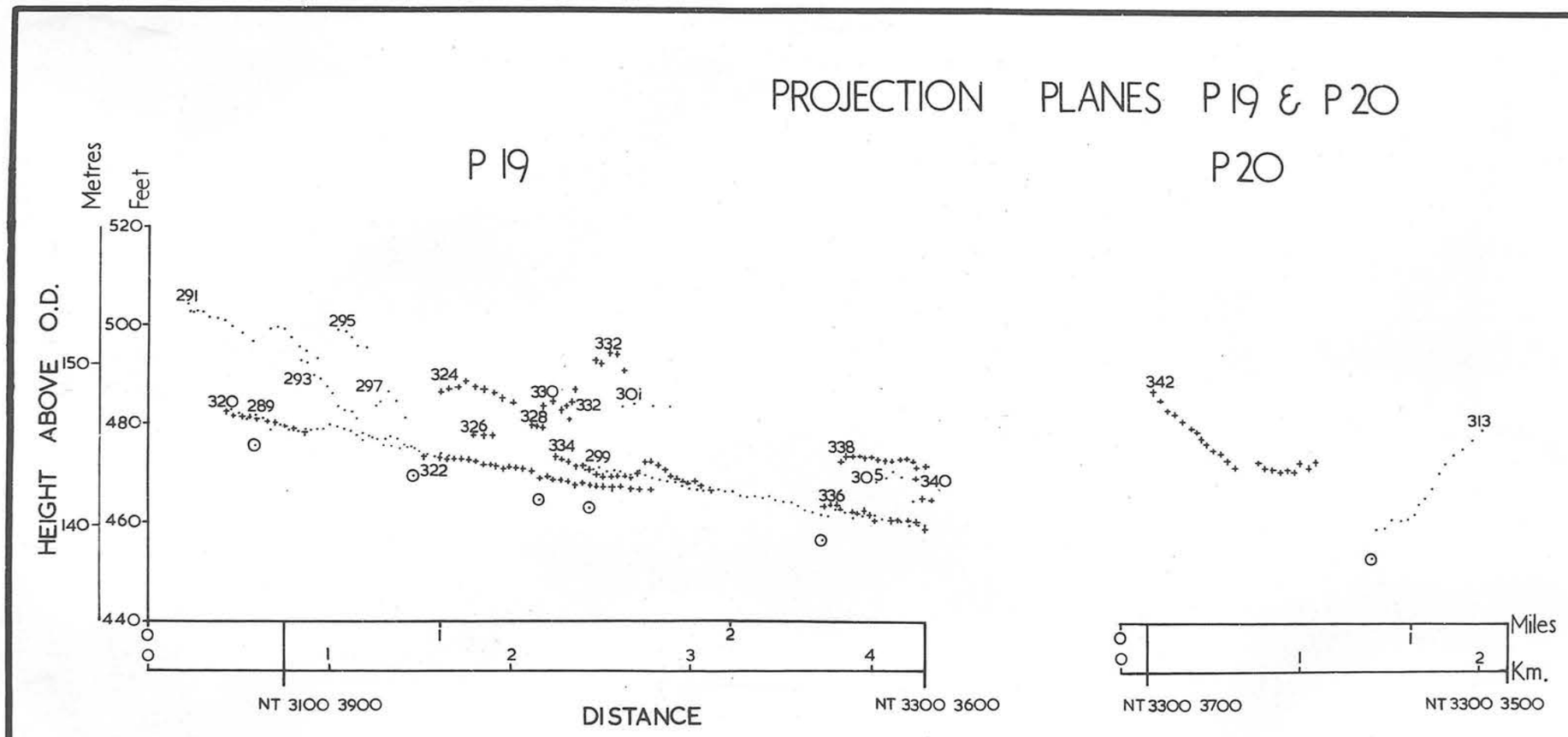

PROJECTION PLANES P 19 & P 20
P 19
P 20
HEIGHT ABOVE O.D.
Metres
Feet
520
500
150
480
140
460
440
291
295
293
297
320
289
322
324
326
330
328
332
301
334
299
338
305
340
336
342
313
0
1
2
3
4
Miles
Km.
NT 3100 3900
NT 3300 3600
NT 3300 3700
NT 3300 3500
DISTANCE

FIGURE 9.12

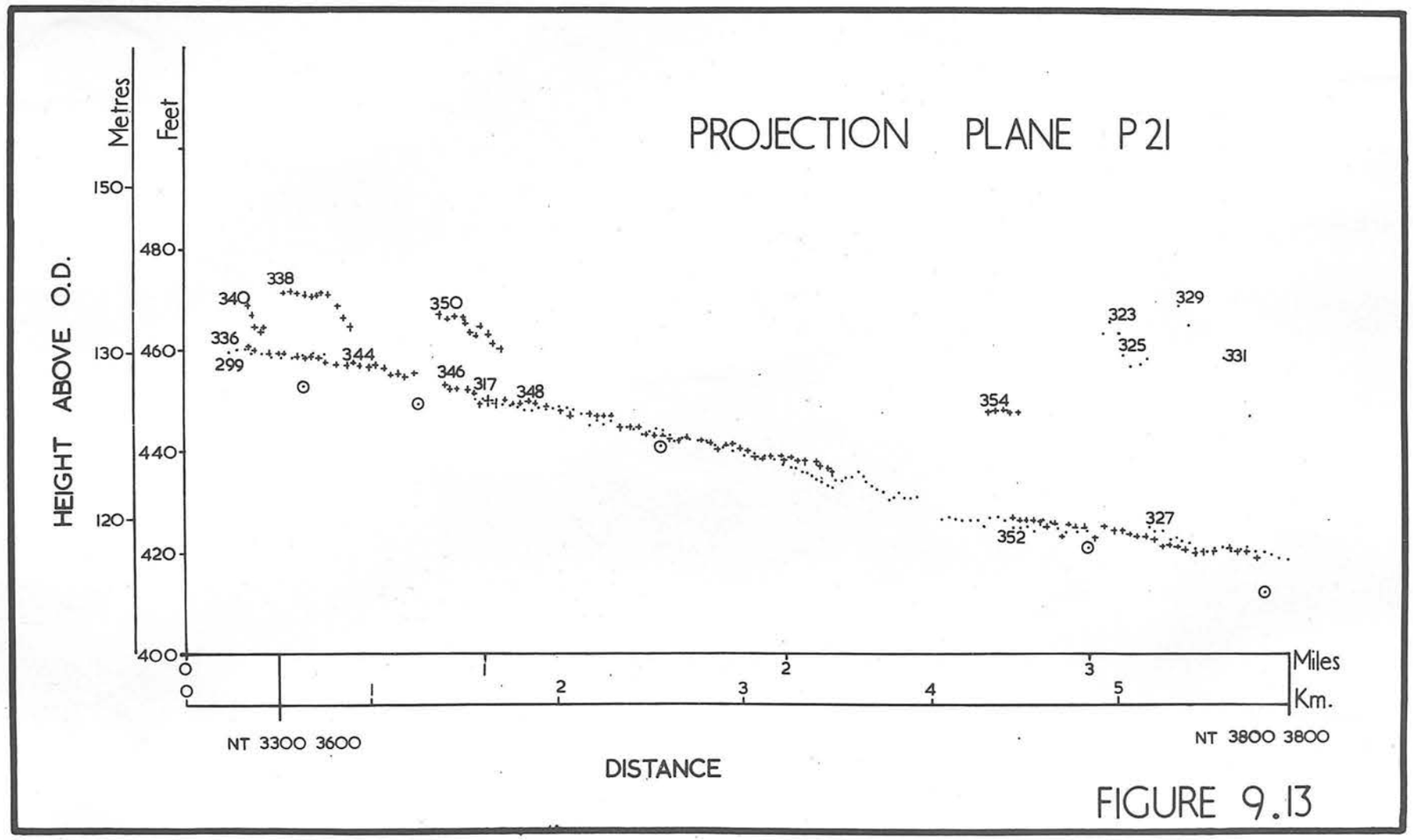

PROJECTION PLANE P 21
HEIGHT ABOVE O.D.
Metres
Feet
150
480
130
460
440
120
420
400
338
340
336
299
344
350
346
317
348
354
323
329
325
331
327
352
0
1
2
3
4
5
Miles
Km.
NT 3300 3600
NT 3800 3800
DISTANCE

FIGURE 9.13

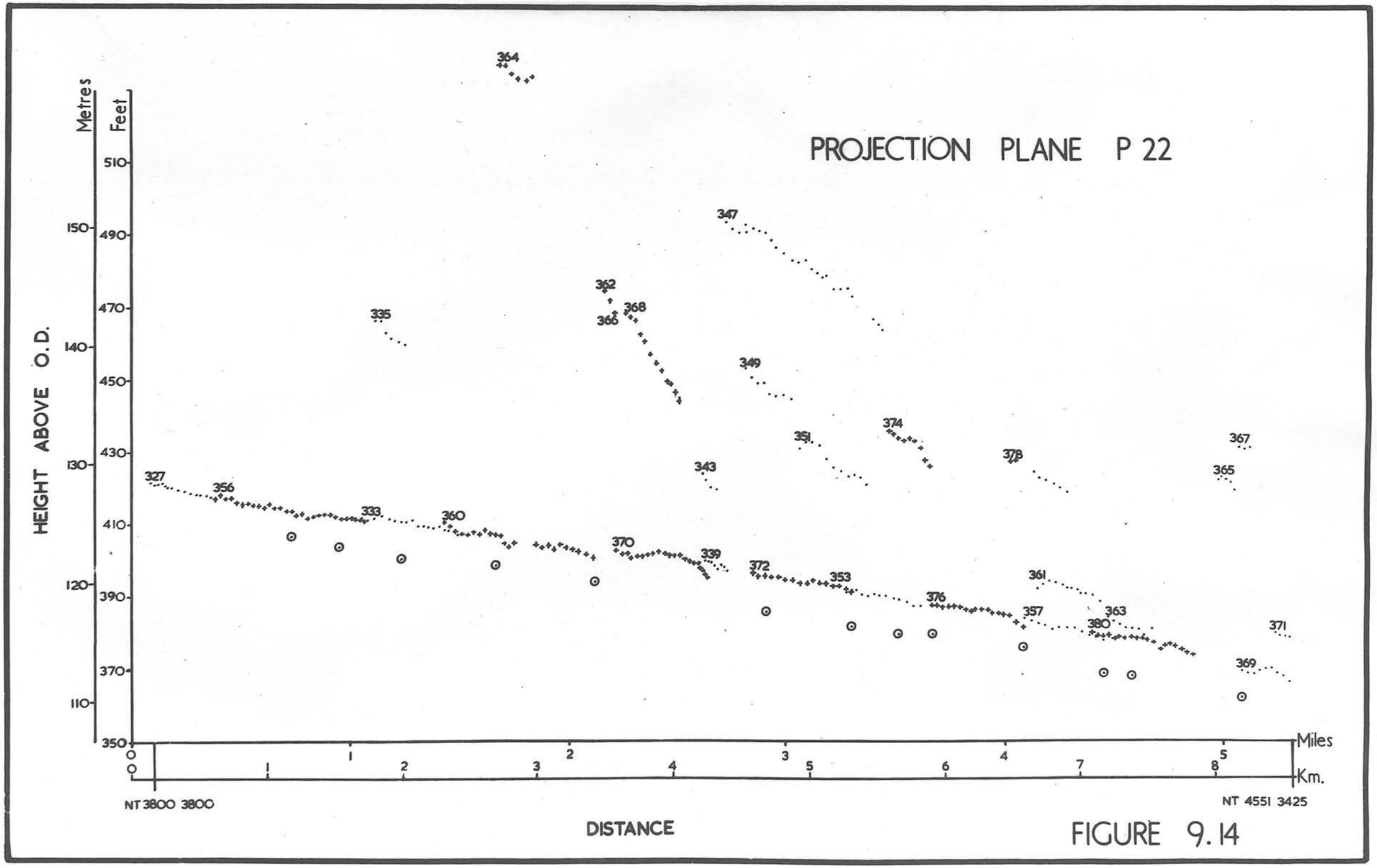

PROJECTION PLANE P 22
HEIGHT ABOVE O.D.
Metres
Feet
150
490
140
450
130
430
120
390
110
370
350
364
347
362
368
366
335
349
374
351
343
378
367
365
327
356
333
360
370
339
372
353
361
376
357
363
380
371
369
0
1
2
3
4
5
6
7
8
Miles
Km.
NT 3800 3800
NT 4551 3425
DISTANCE

FIGURE 9.14

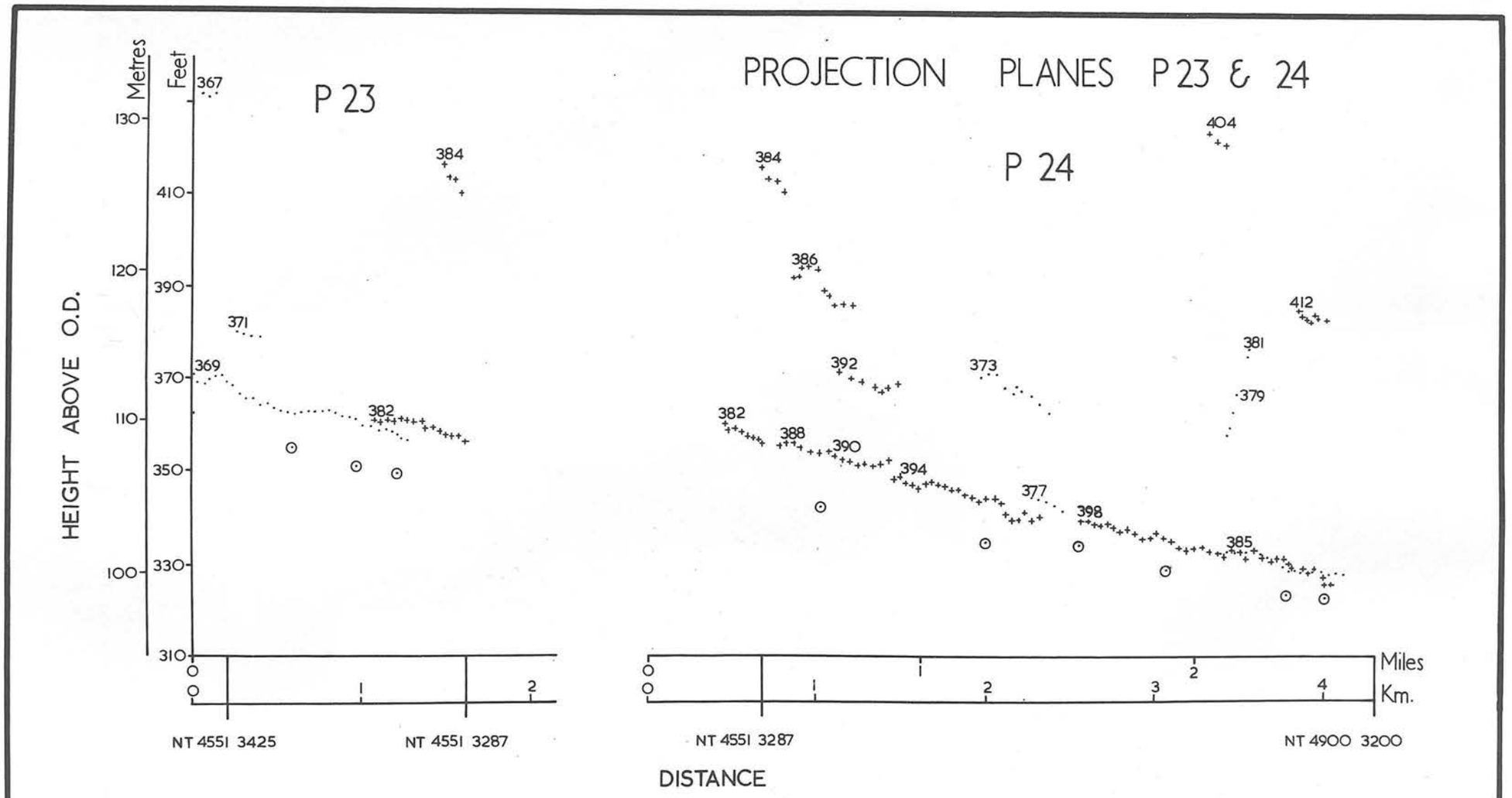

PROJECTION PLANES P 23 & 24
P 23
P 24
HEIGHT ABOVE O.D.
Metres
Feet
130
410
120
390
370
110
350
100
330
310
367
384
371
369
382
404
384
386
412
381
392
373
379
382
388
390
394
377
398
385
0
1
2
3
4
Miles
Km.
NT 4551 3425
NT 4551 3287
NT 4551 3287
NT 4900 3200
DISTANCE

FIGURE 9.15

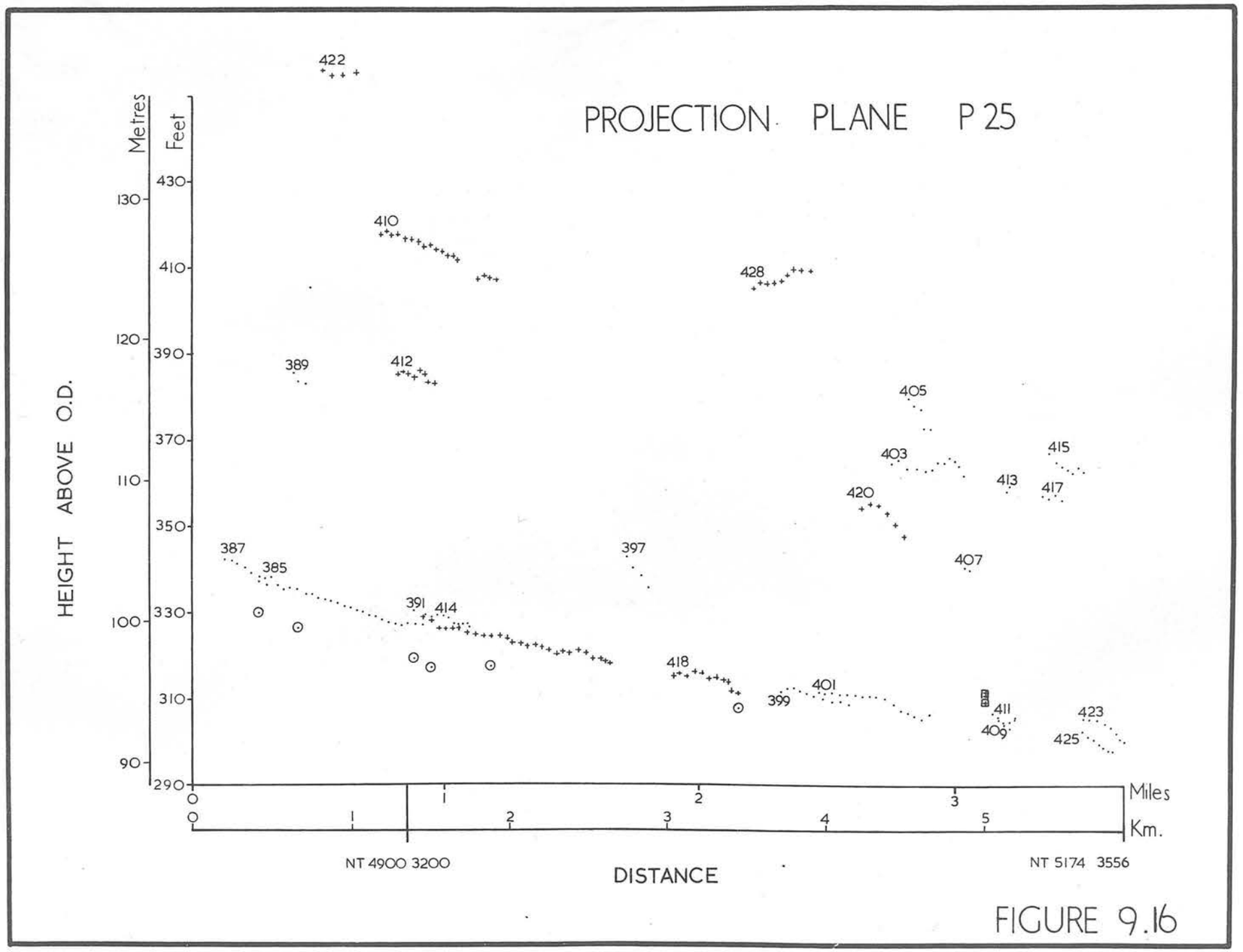

PROJECTION PLANE P 25
HEIGHT ABOVE O.D.
Metres
Feet
130
120
110
100
90
430
410
390
370
350
330
310
290
422
410
389
412
428
405
403
415
413
417
420
407
387
385
391
414
397
418
401
399
411
409
423
425
0
1
2
3
4
5
Miles
Km.
NT 4900 3200
NT 5174 3556
DISTANCE

FIGURE 9.16

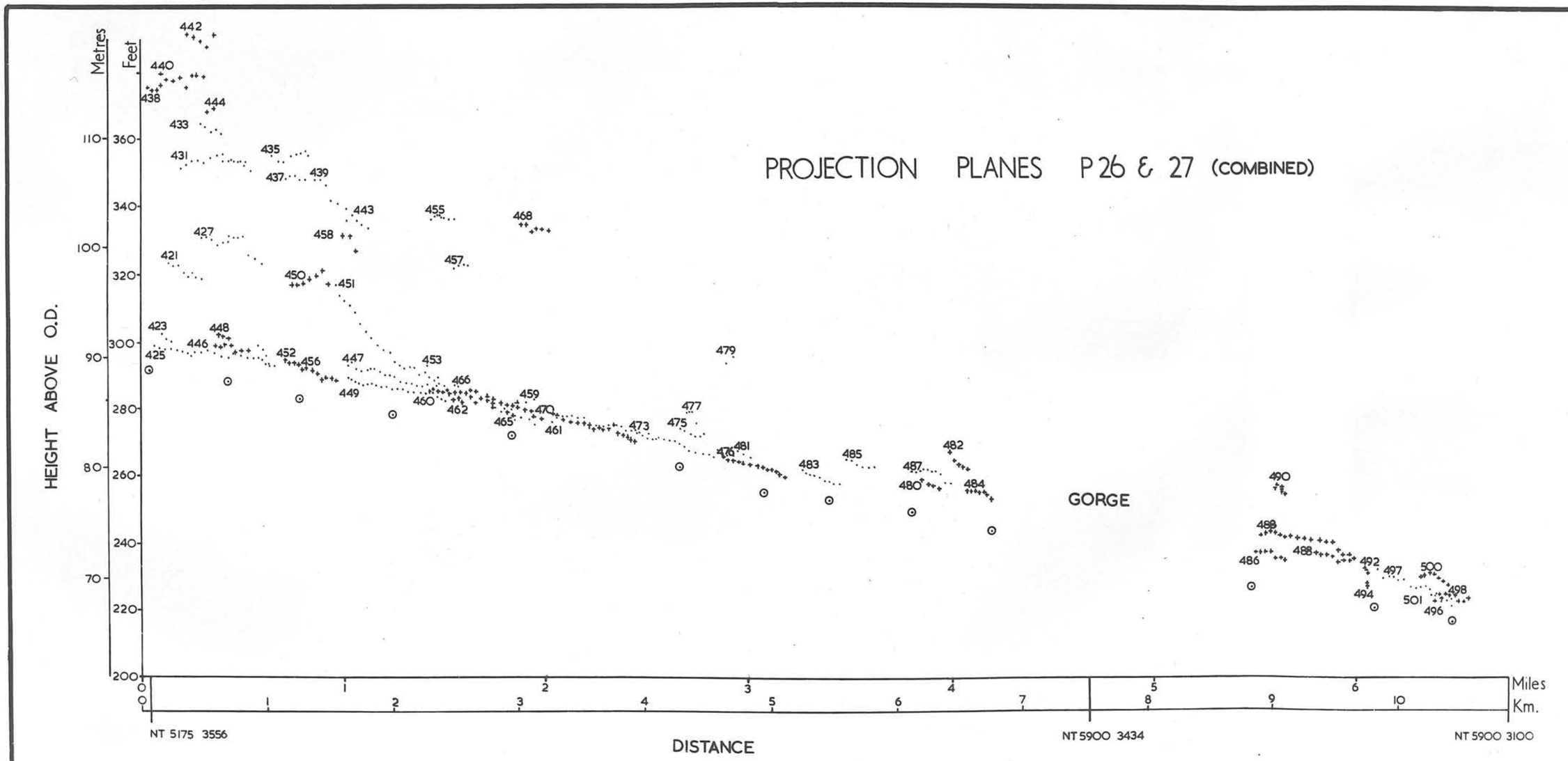

PROJECTION PLANES P 26 & 27 (COMBINED)
HEIGHT ABOVE O.D.
Metres
Feet
110
100
90
80
70
360
340
320
300
280
260
240
220
200
GORGE
Miles
Km.
NT 5175 3556
NT 5900 3434
NT 5900 3100
DISTANCE

FIGURE 9.17

PROJECTION PLANES P28, P29A & P29B

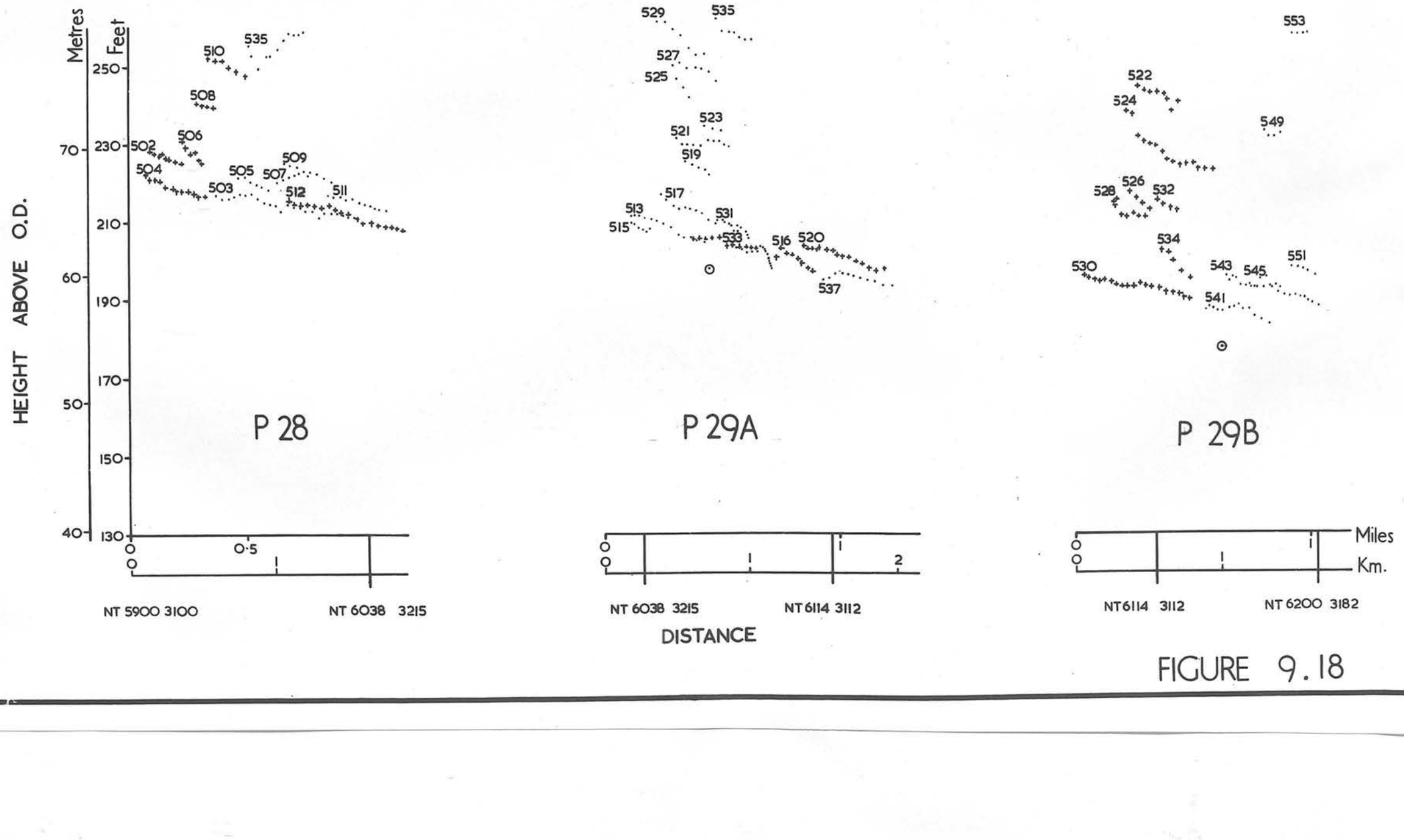


FIGURE 9.18

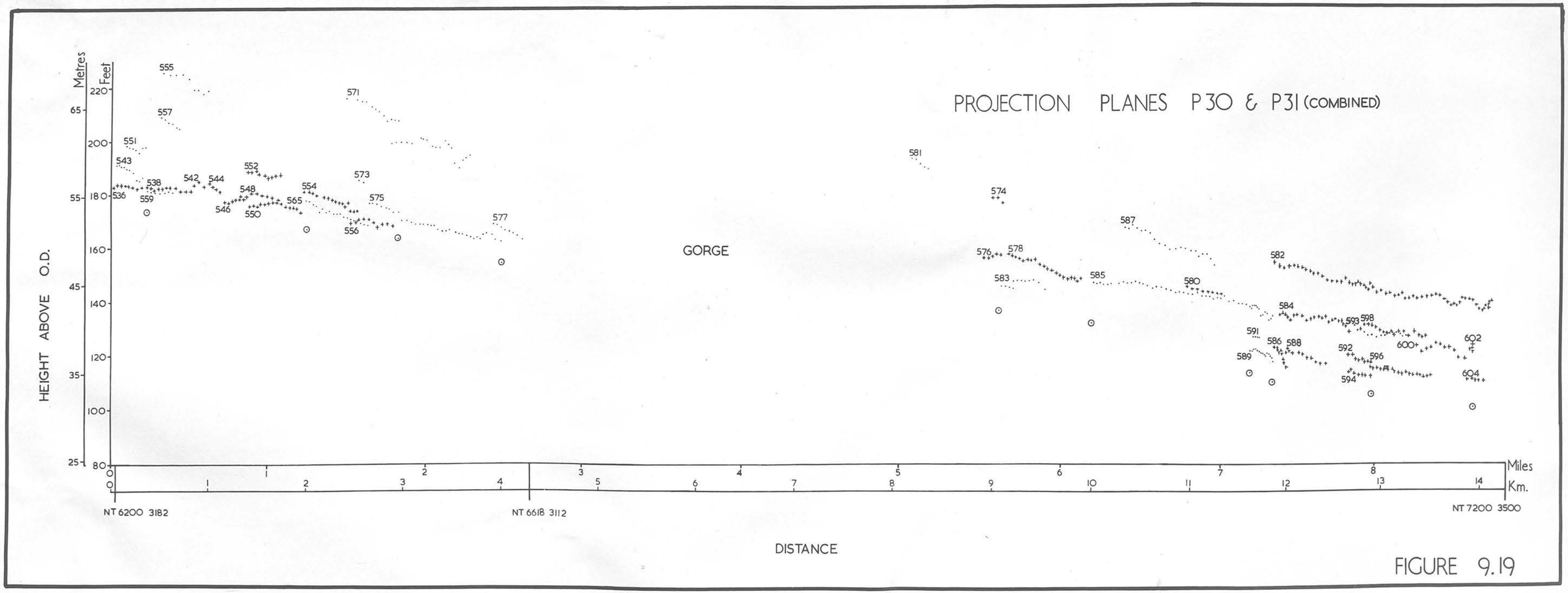

PROJECTION PLANES P30 & P31 (COMBINED)
HEIGHT ABOVE O.D.
Metres
Feet
65
200
55
180
45
140
35
120
25
100
80
220
160
555
557
571
551
543
538
536
559
542
544
552
548
546
550
554
565
573
575
556
577
581
574
587
576
578
583
585
580
582
584
593
598
591
586
588
592
596
589
600
602
594
604
GORGE
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
Miles
Km.
NT 6200 3182
NT 6618 3112
NT 7200 3500
DISTANCE

FIGURE 9.19

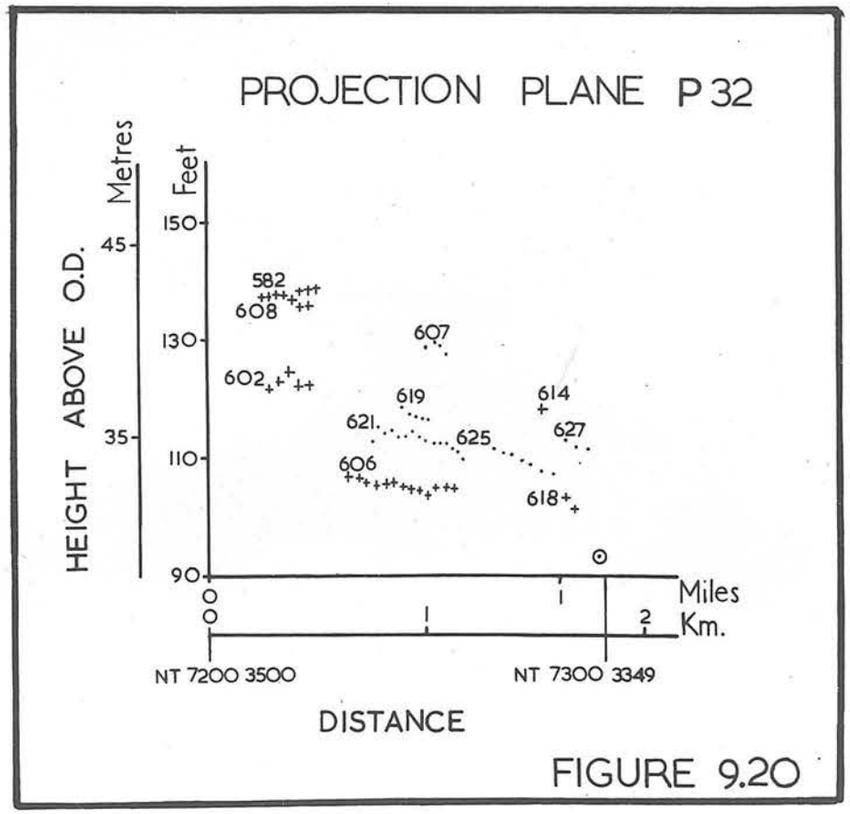

PROJECTION PLANE P 32
HEIGHT ABOVE O.D.
Metres
45
35
Feet
150
130
110
90
582
608
607
602
619
614
621
625
627
606
618
0
0
1
1
2
Miles
Km.
NT 7200 3500
NT 7300 3349
DISTANCE

FIGURE 9.20

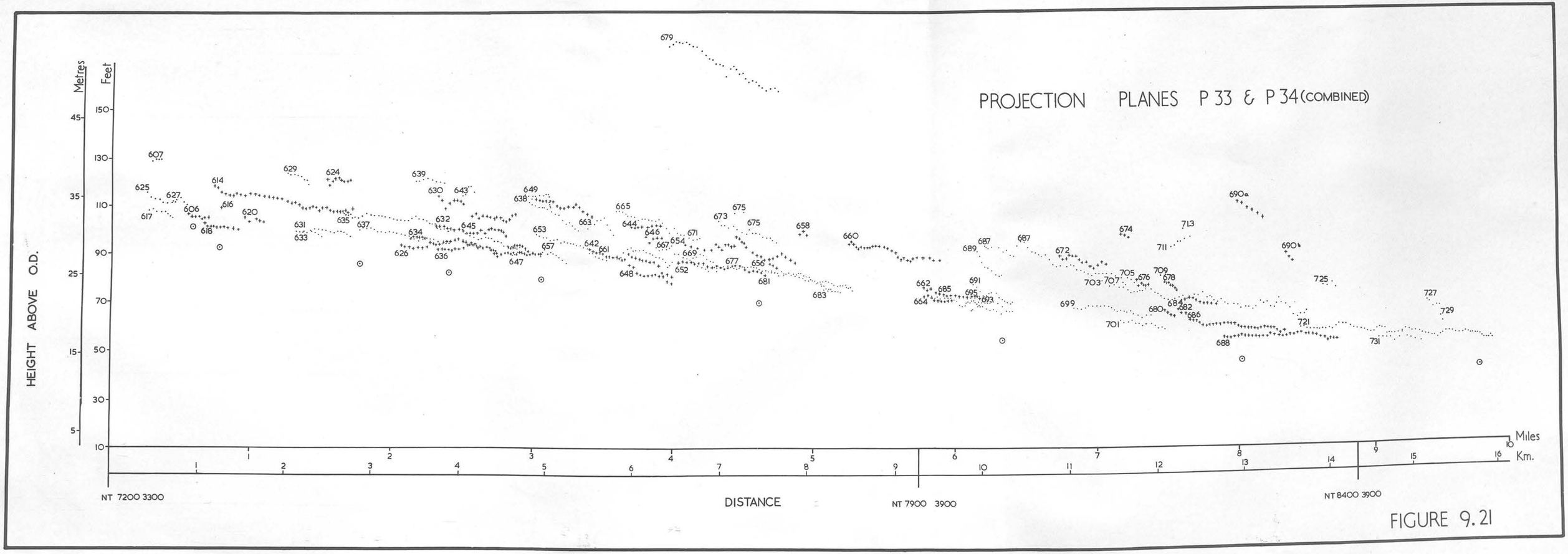

PROJECTION PLANES P 33 & P 34 (COMBINED)
HEIGHT ABOVE O.D.
Metres
Feet
45
150
130
35
110
90
25
70
15
50
30
5
10
607
625
627
617
606
618
614
616
620
629
624
631
633
635
637
639
630
643
632
634
645
626
636
647
649
638
653
657
642
661
665
663
644
646
667
654
671
669
652
648
675
673
677
656
681
658
683
660
679
662
664
685
691
695
693
687
689
687
672
703
707
705
676
709
678
674
711
713
690a
690b
725
699
680
684
682
686
701
721
688
727
729
731
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Miles
Km.
NT 7200 3300
DISTANCE
NT 7900 3900
NT 8400 3900

FIGURE 9.21

PROJECTION PLANE P 35

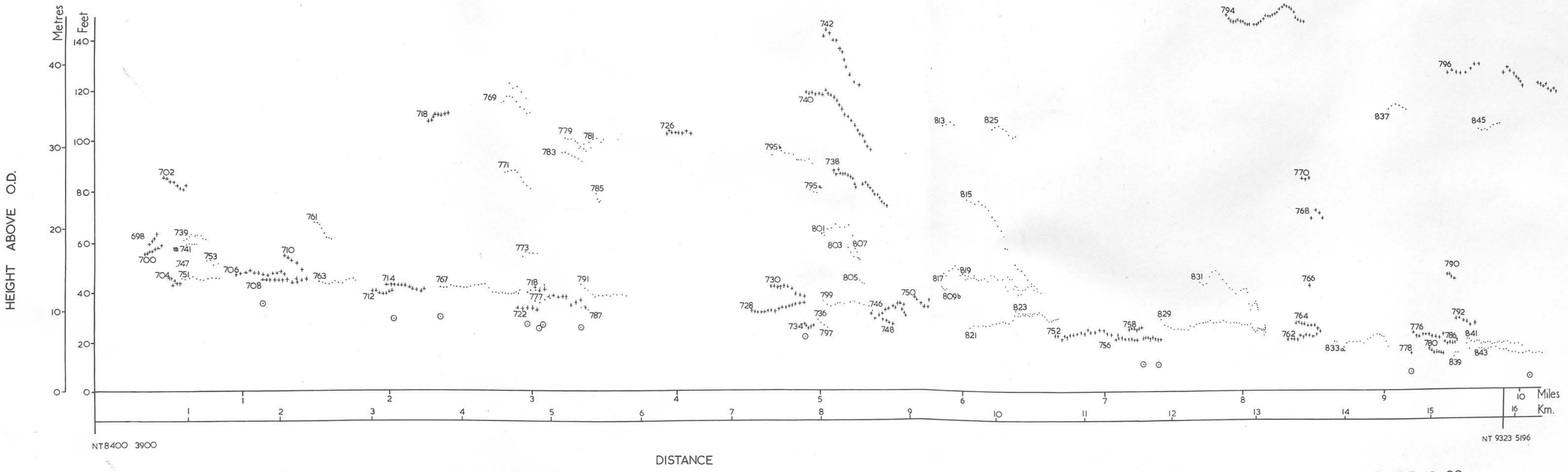


FIGURE 9.22

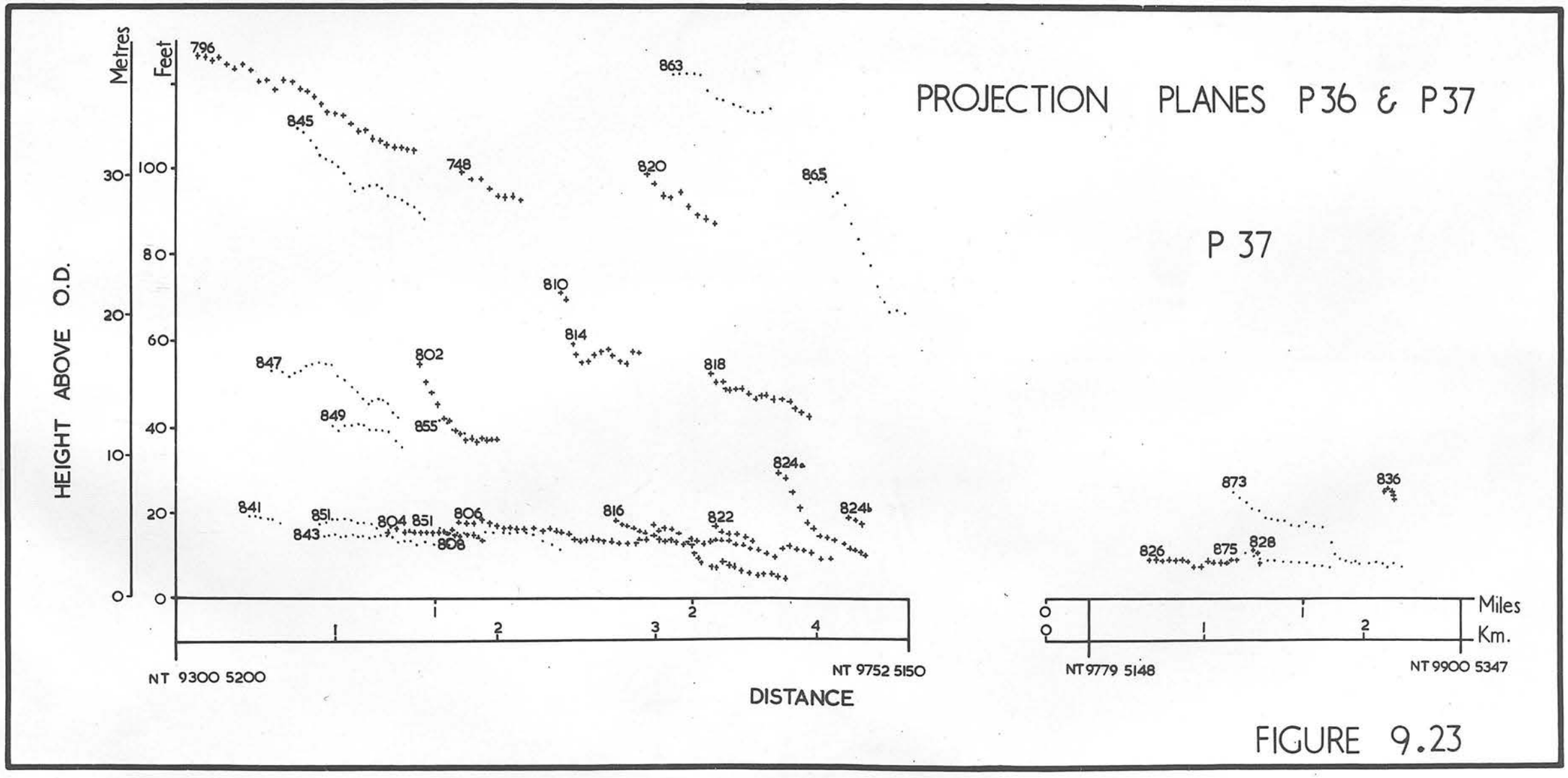

PROJECTION PLANES P36 & P37
P 37
HEIGHT ABOVE O.D.
Metres
Feet
30
100
80
20
60
40
10
20
0
0
796
845
748
863
820
865
810
814
847
802
818
849
855
824
841
851
804 851
806
816
822
824
843
808
873
836
826
875
828
1
2
3
4
1
2
0
0
1
2
Miles
Km.
NT 9300 5200
NT 9752 5150
NT 9779 5148
NT 9900 5347
DISTANCE

FIGURE 9.23

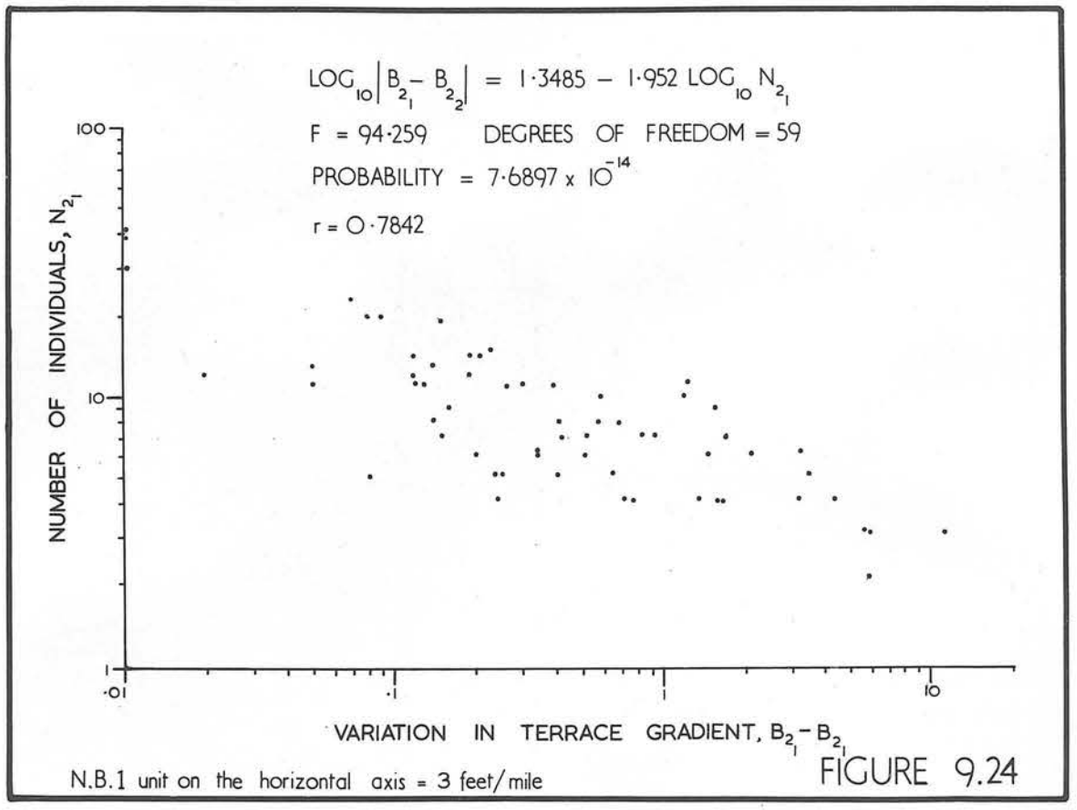


FIGURE 9.24

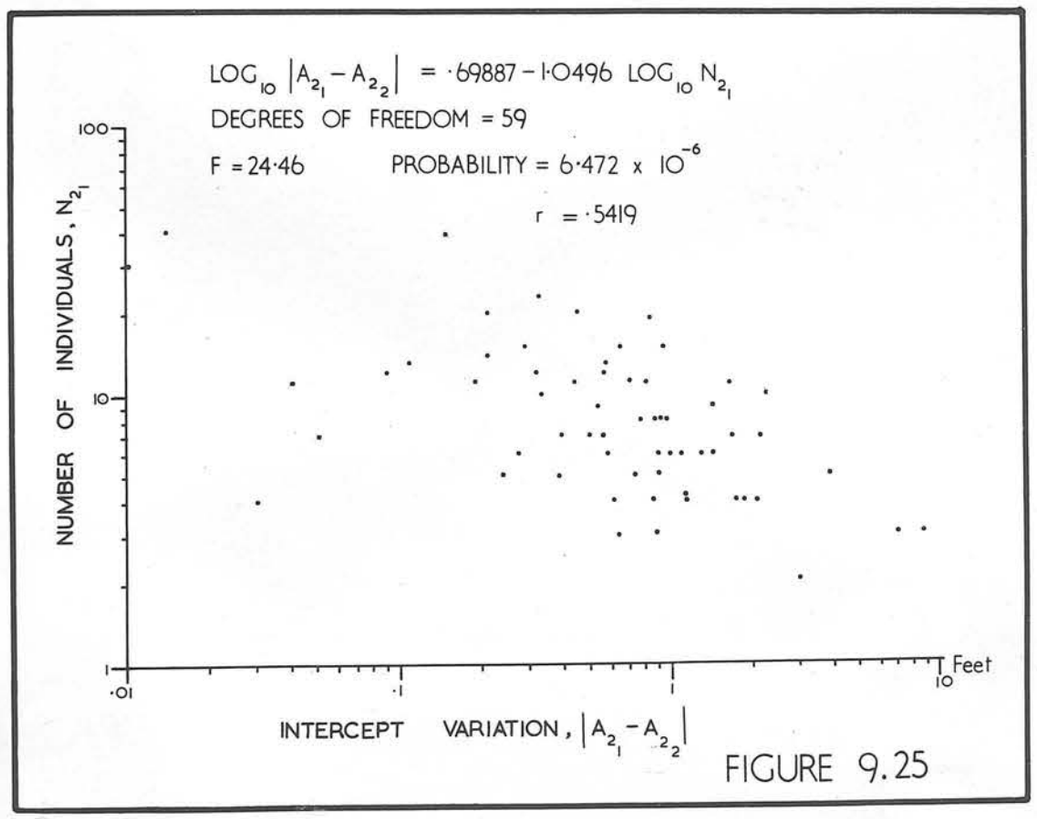


FIGURE 9.25

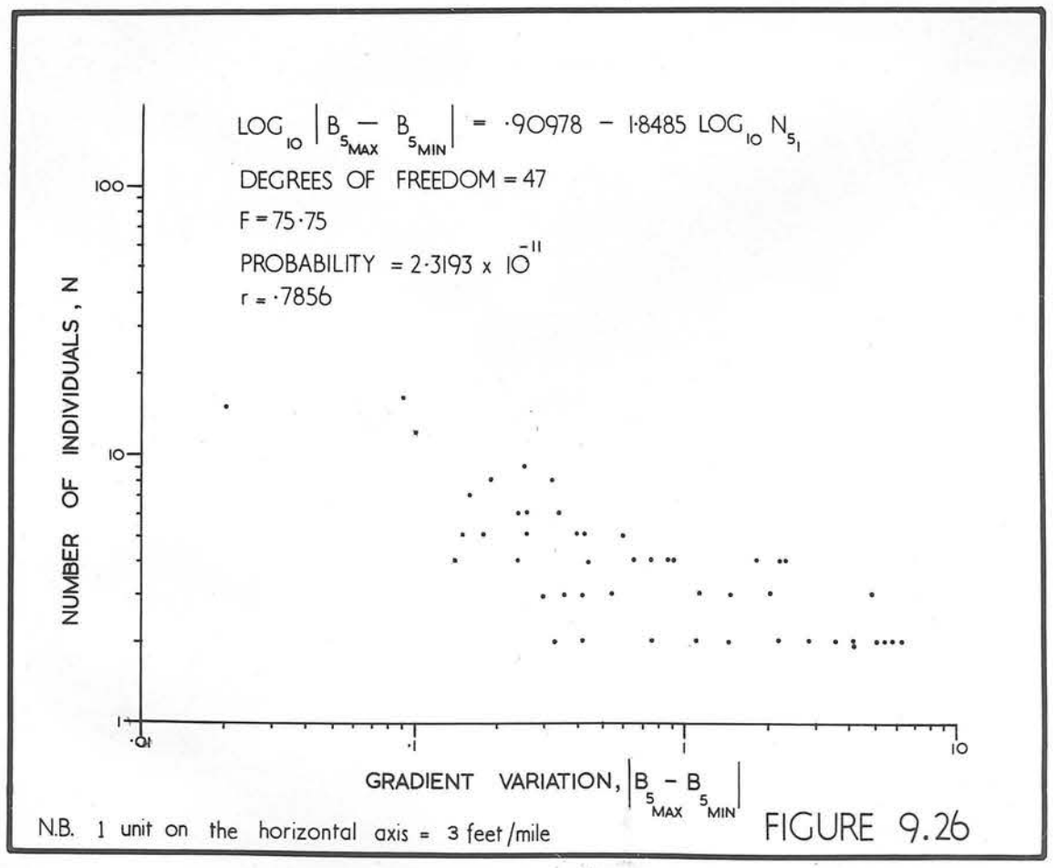


FIGURE 9.26

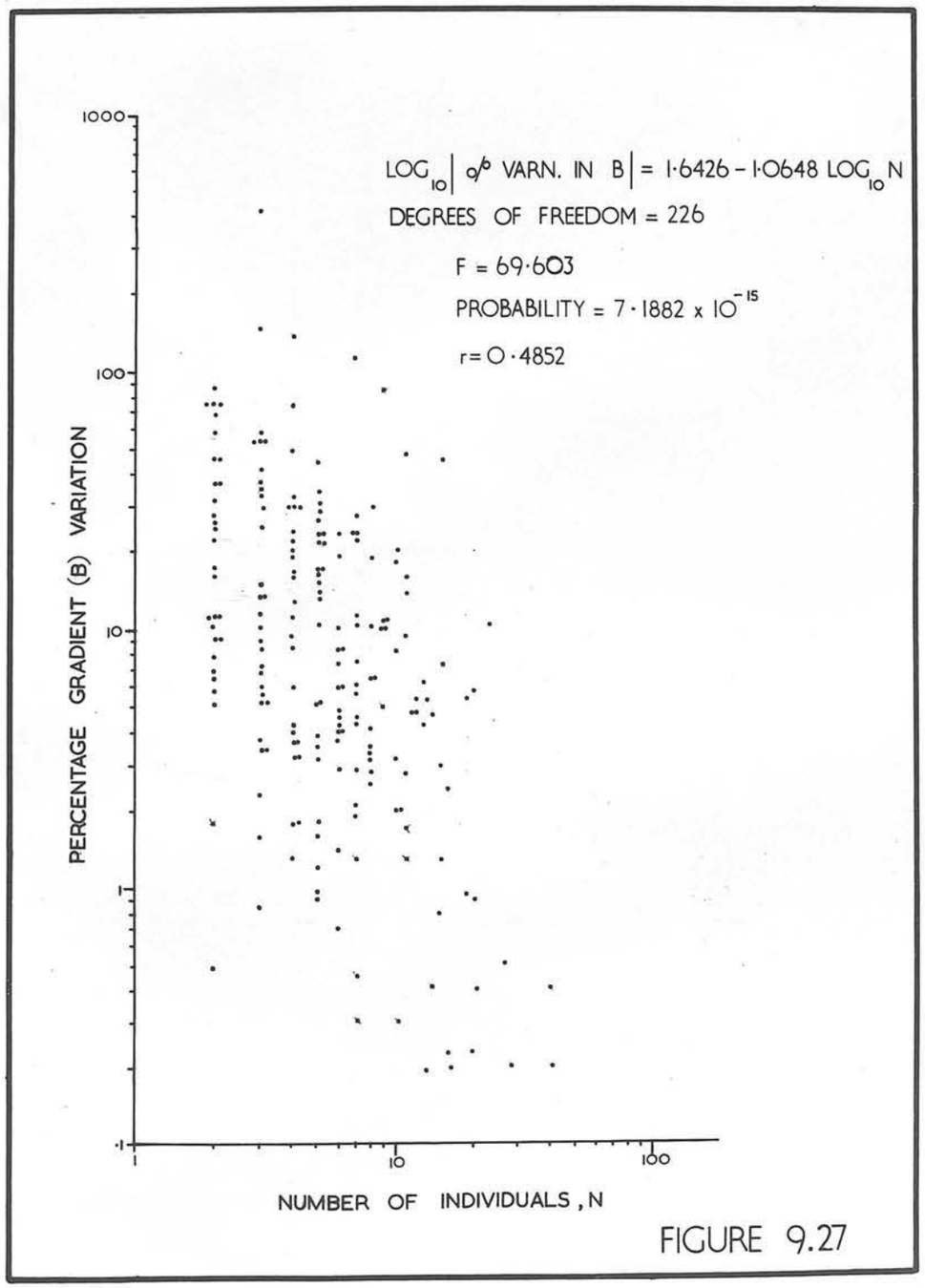


FIGURE 9.27

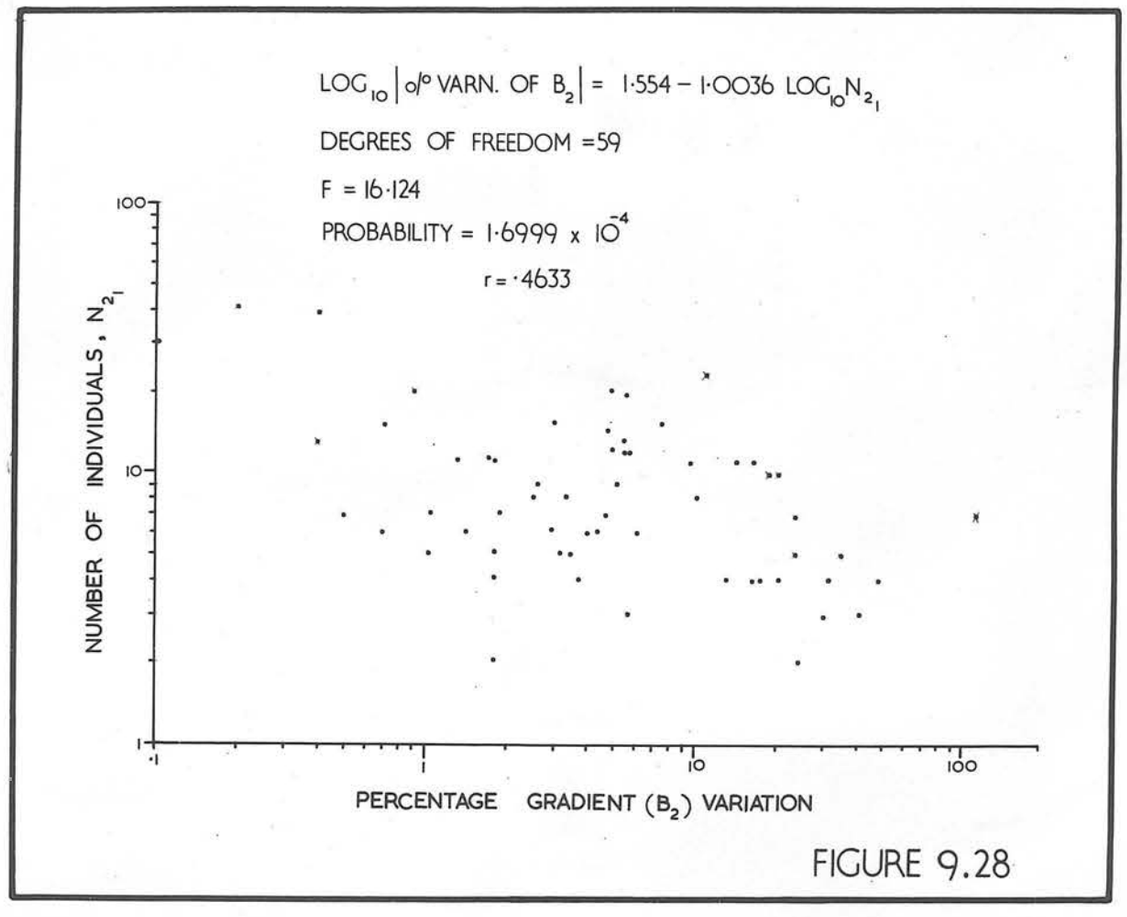


FIGURE 9.28

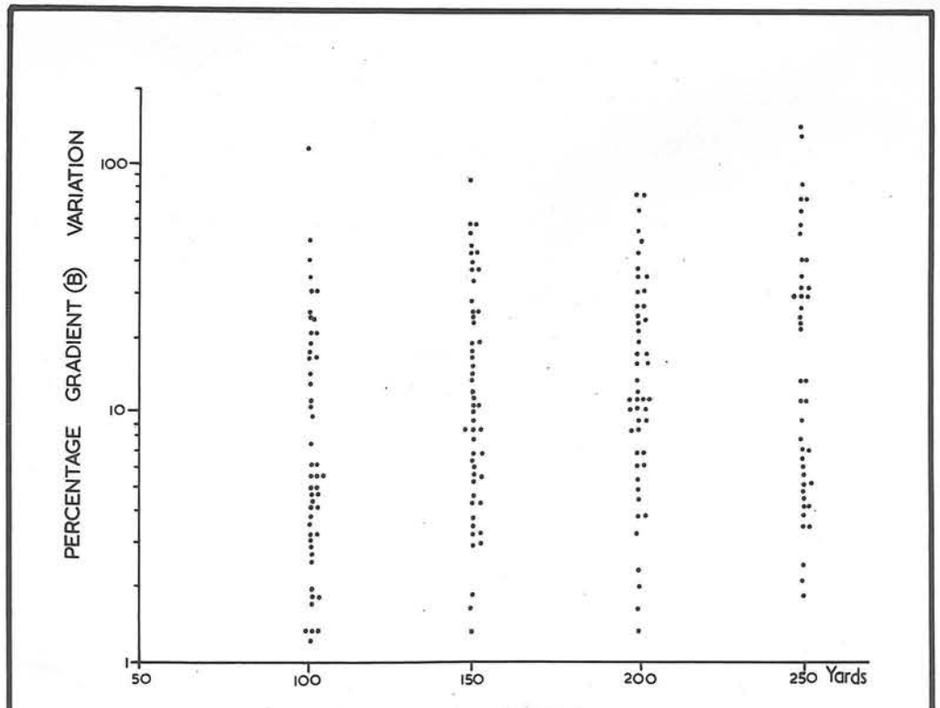


FIGURE 9.29

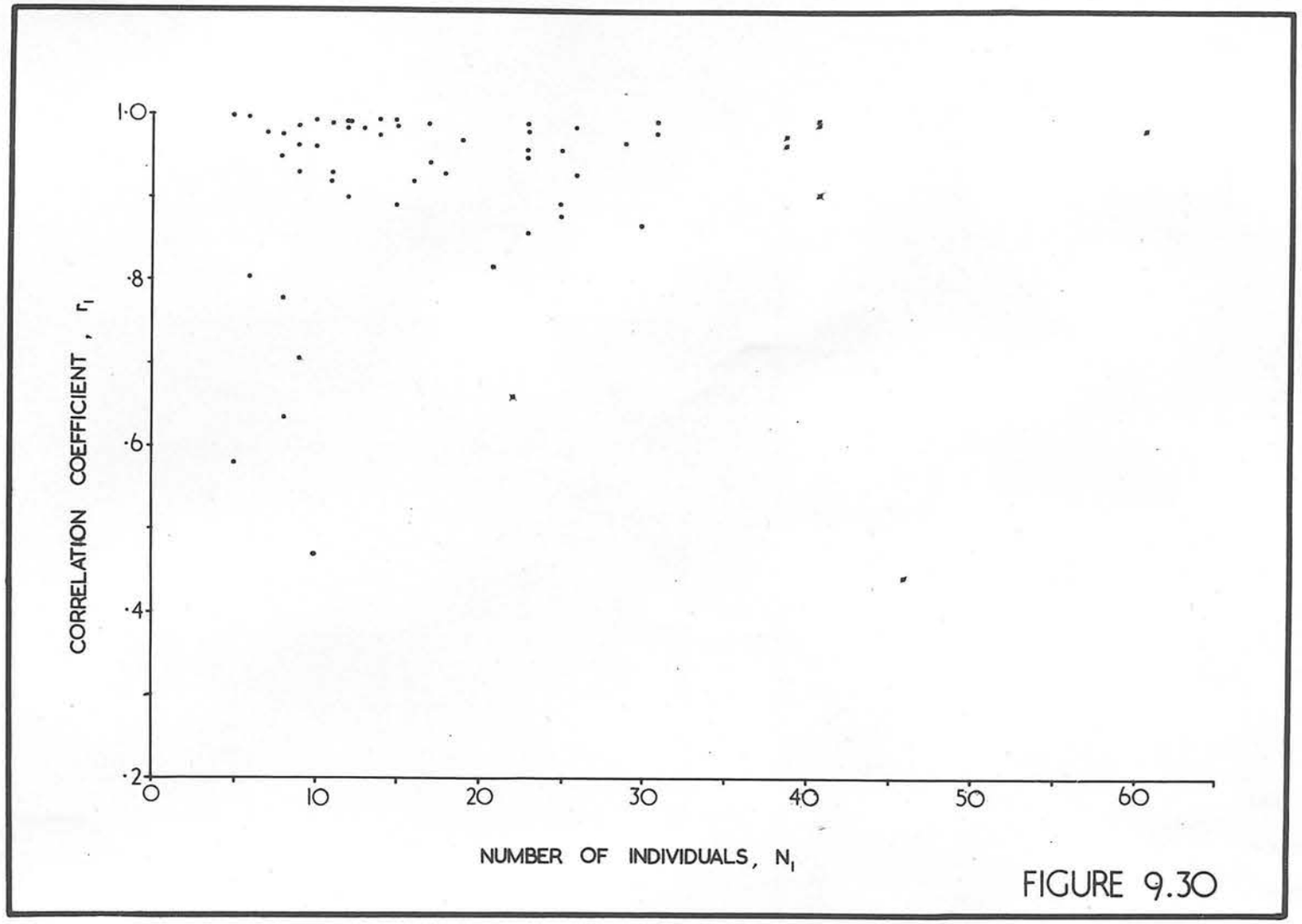


FIGURE 9.30

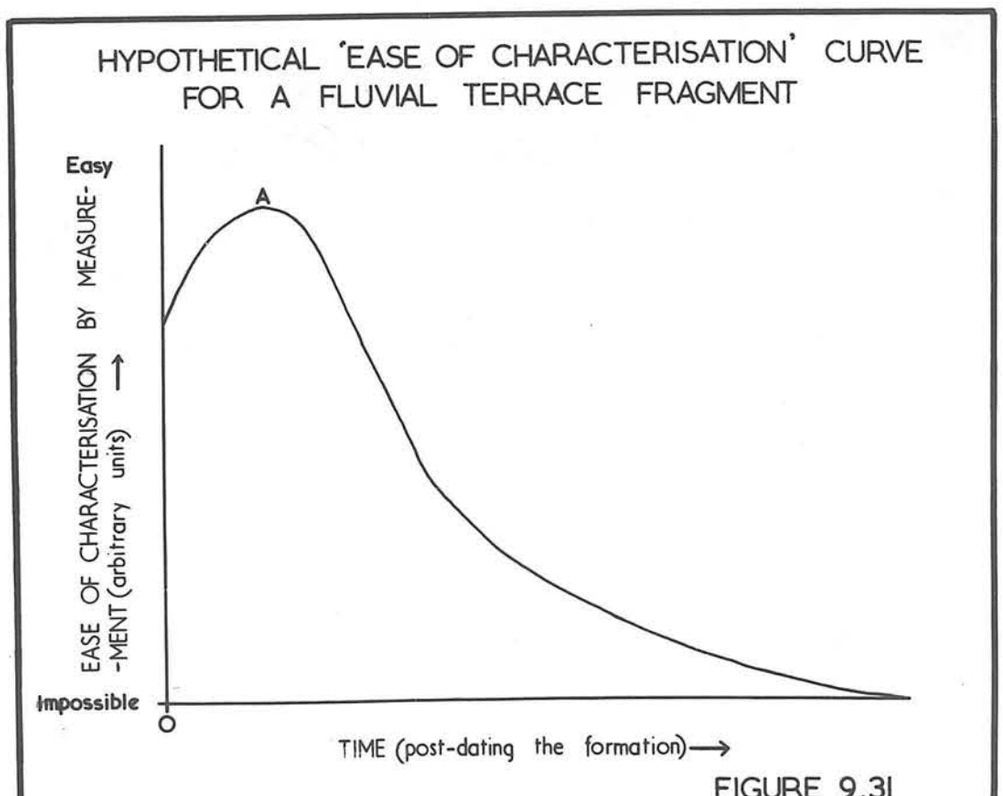


FIGURE 9.31

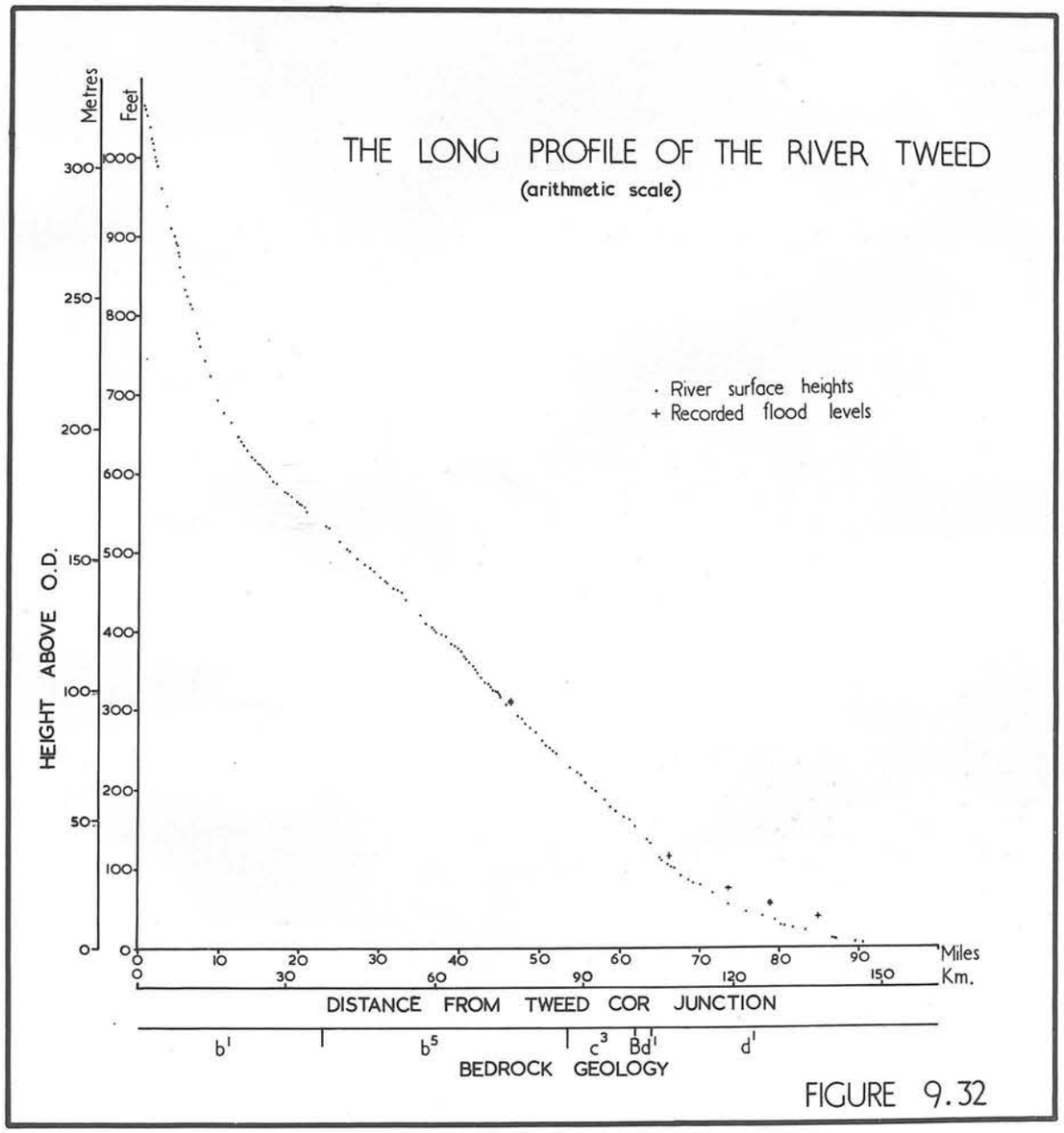


FIGURE 9.32

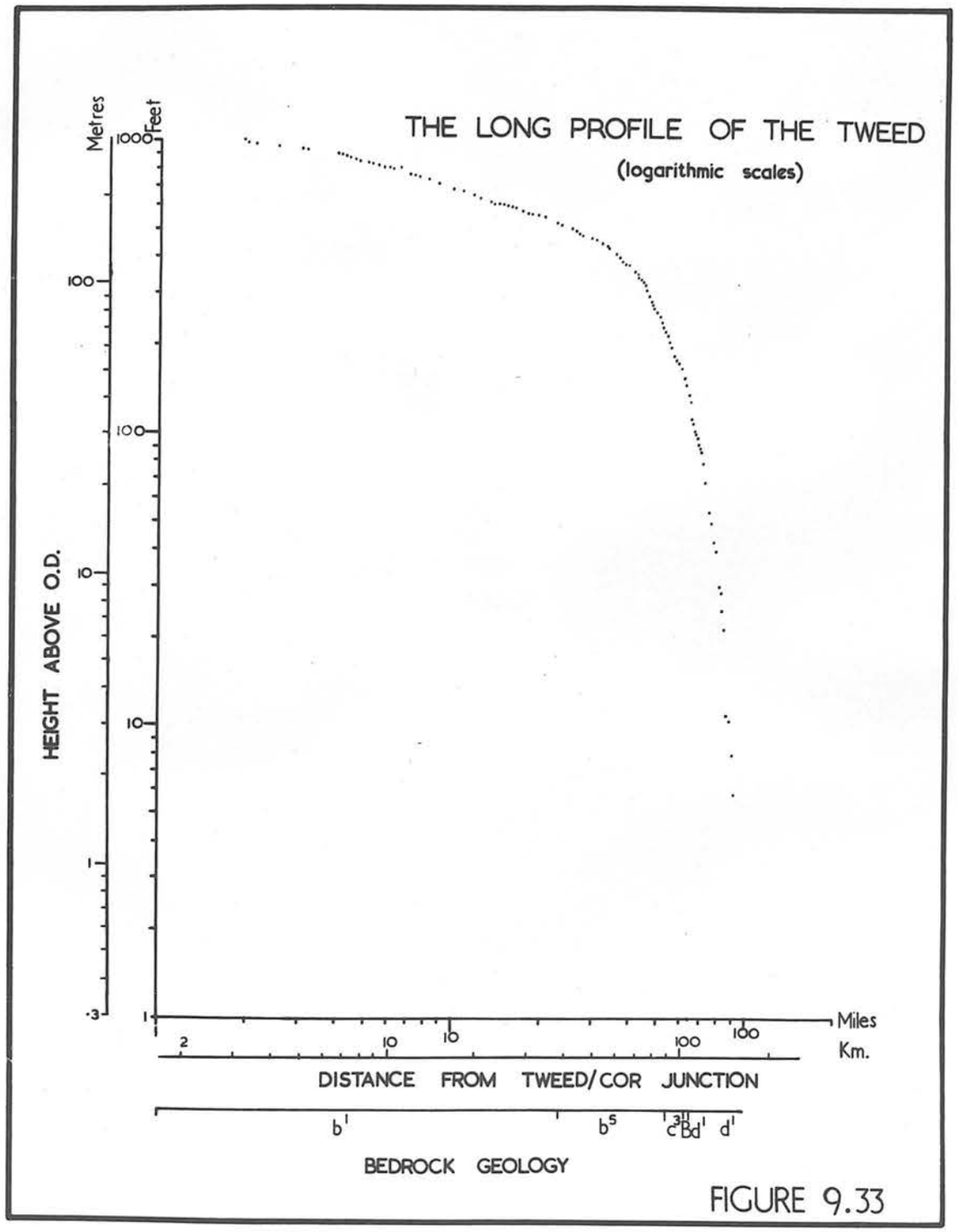


FIGURE 9.33

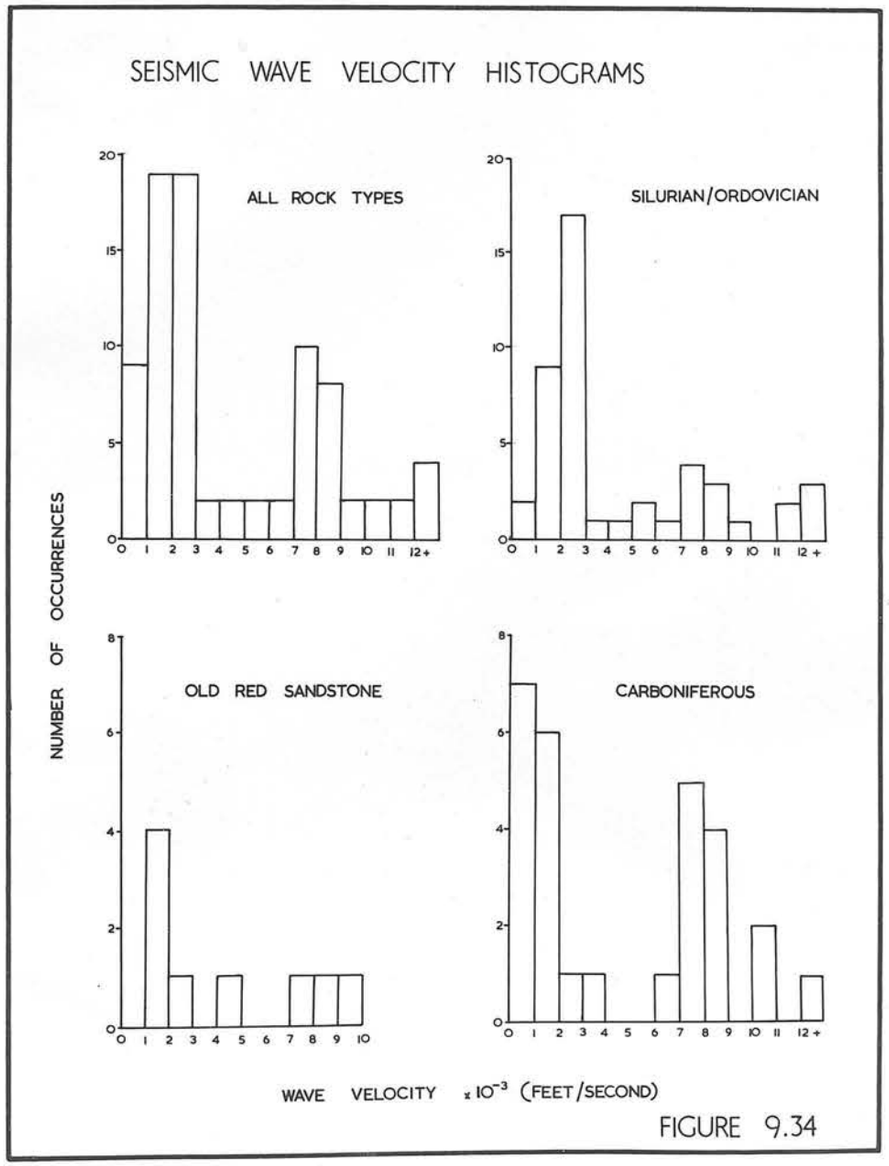

SEISMIC WAVE VELOCITY HISTOGRAMS
ALL ROCK TYPES
SILURIAN/ORDOVICIAN
OLD RED SANDSTONE
CARBONIFEROUS
NUMBER OF OCCURRENCES
WAVE VELOCITY x 10⁻³ (FEET/SECOND)

FIGURE 9.34

TERRACES AND TERRACE FRAGMENTS OF THE TWEED VALLEY

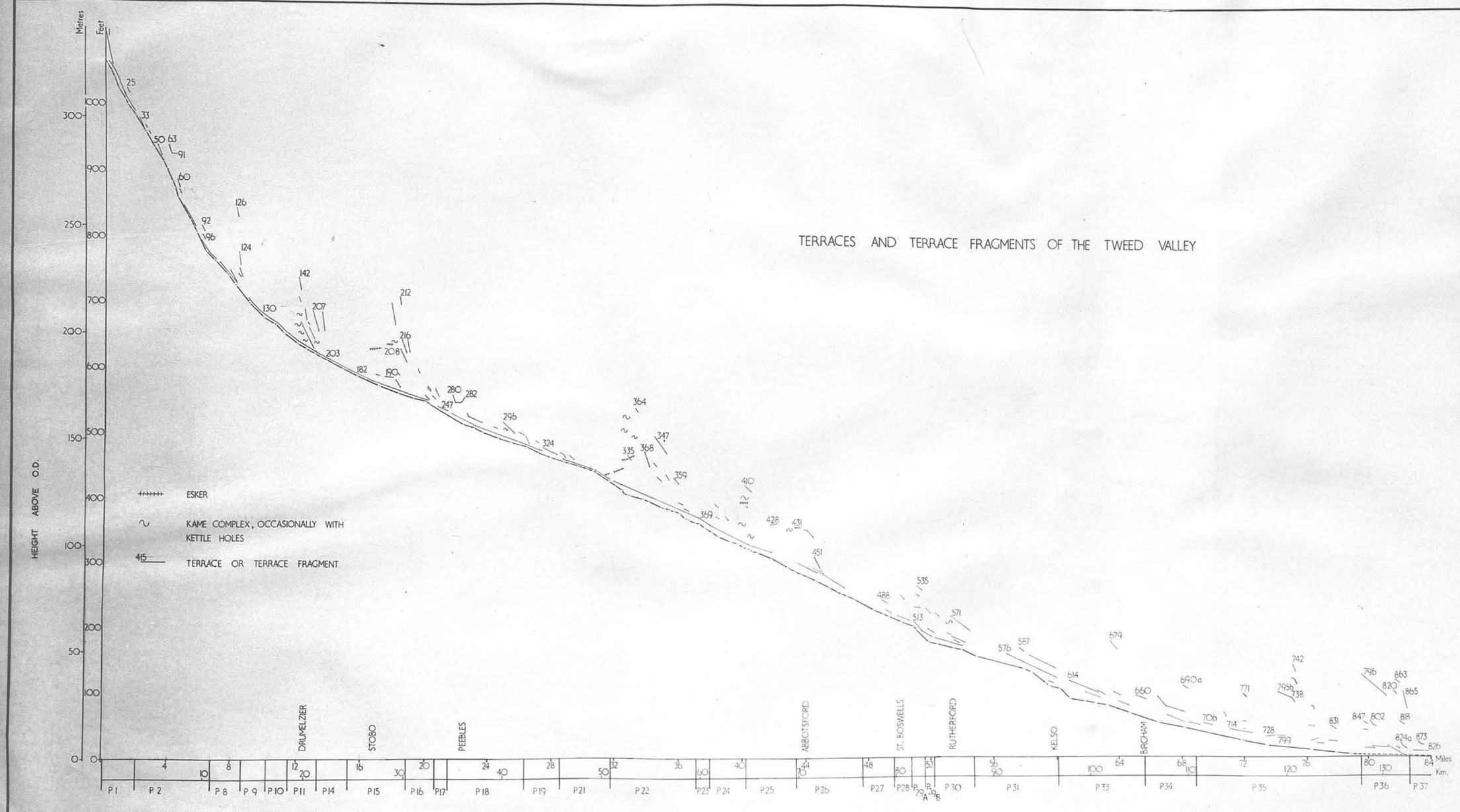


FIGURE 9.35

MELTWATER PHENOMENA IN A PART OF THE LAMMERMUIR HILLS

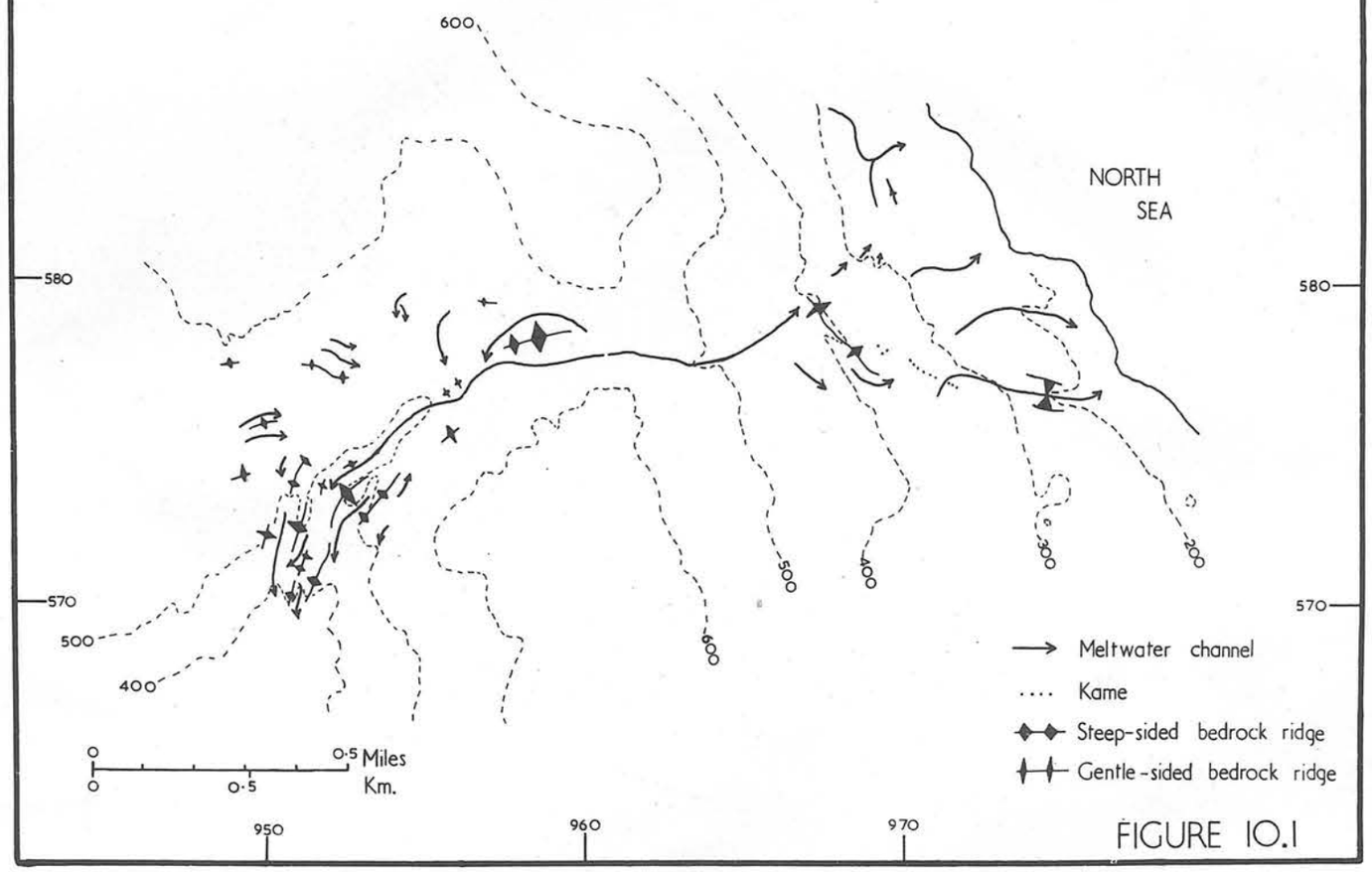


FIGURE 10.1

THE CUTTING OF THE TWEED GORGES

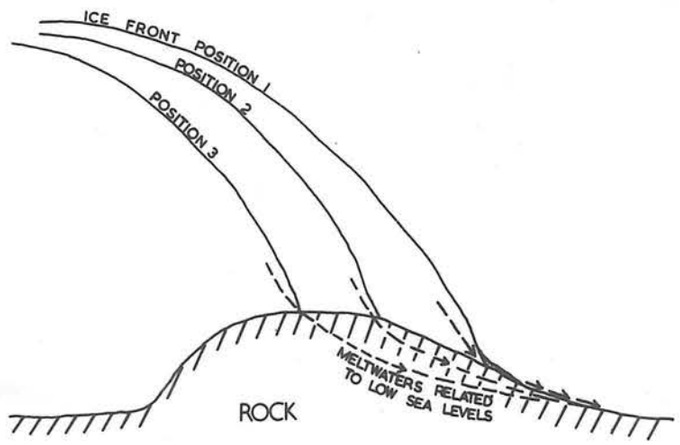


FIGURE 10.2

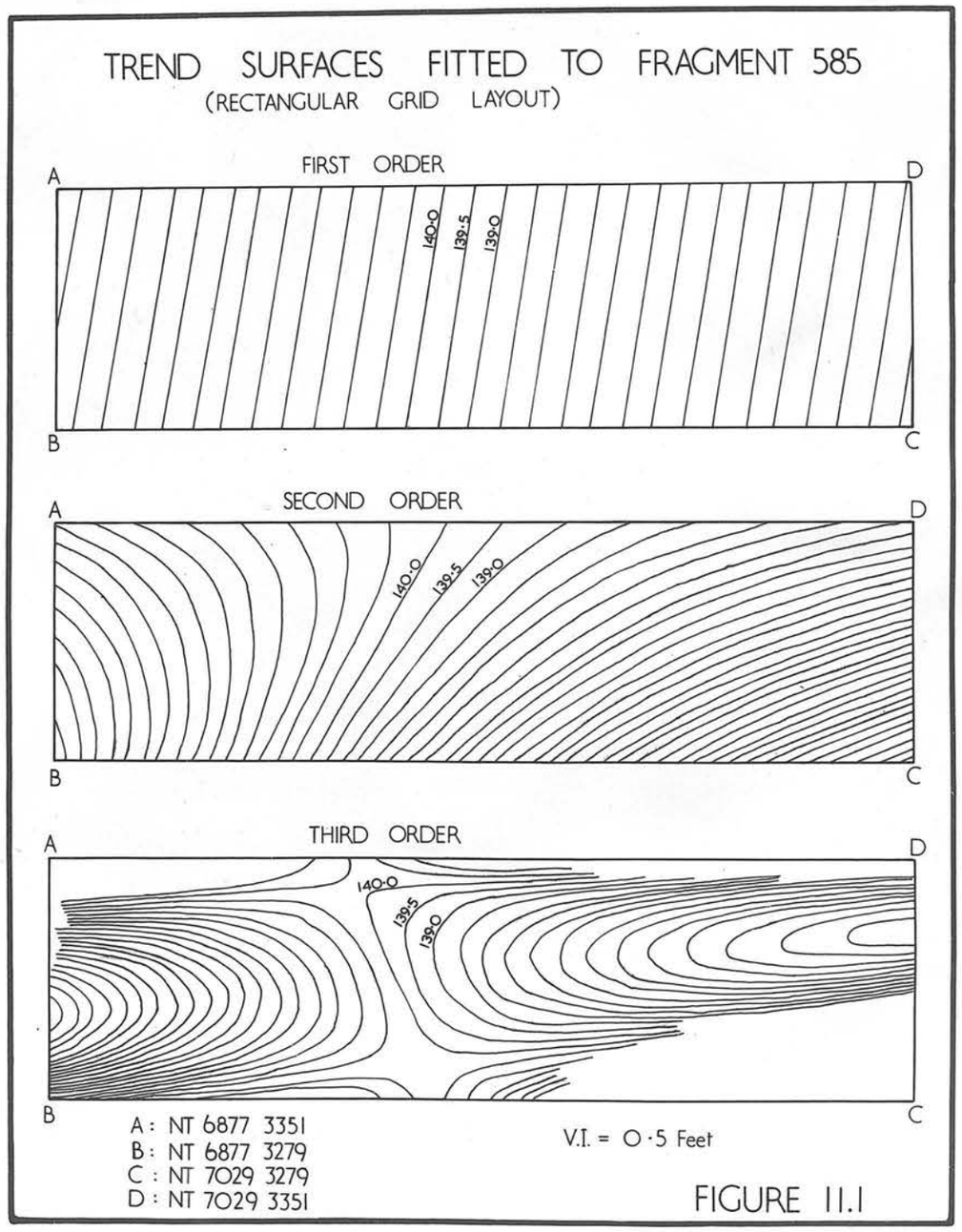

TREND SURFACES FITTED TO FRAGMENT 585
(RECTANGULAR GRID LAYOUT)
FIRST ORDER
A
D
140·0
139·5
139·0
B
C
SECOND ORDER
A
D
140·0
139·5
139·0
B
C
THIRD ORDER
A
D
140·0
139·5
139·0
B
C
A : NT 6877 3351
B : NT 6877 3279
C : NT 7029 3279
D : NT 7029 3351
V.I. = 0·5 Feet

FIGURE 11.1

FIRST ORDER PROJECTED TREND SURFACES WITHIN A MEANDERING VALLEY

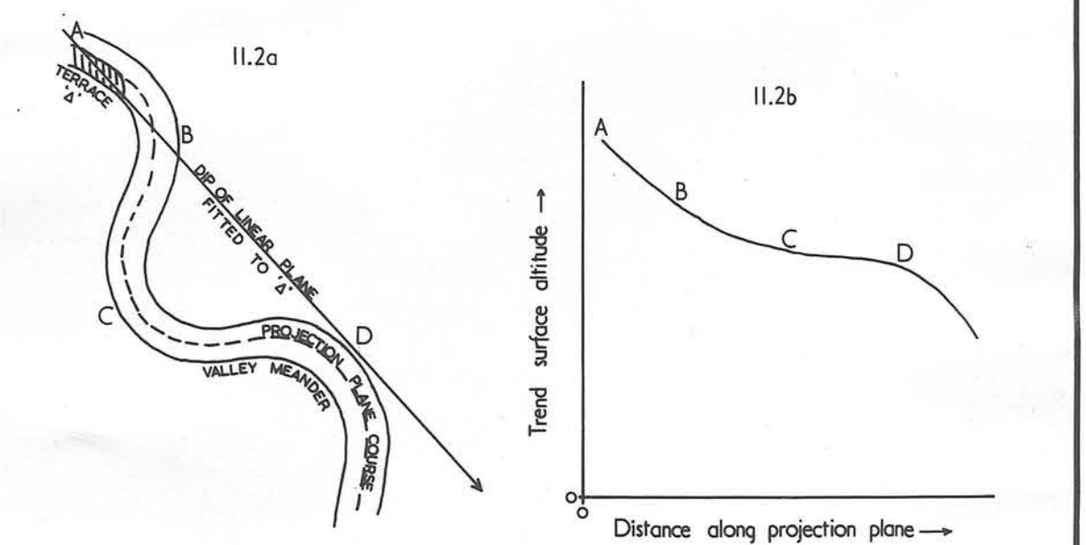


FIGURE 11.2

PROJECTION OF SECOND OR HIGHER ORDER TREND SURFACES WITHIN AN ASYMMETRICAL MEANDERING VALLEY

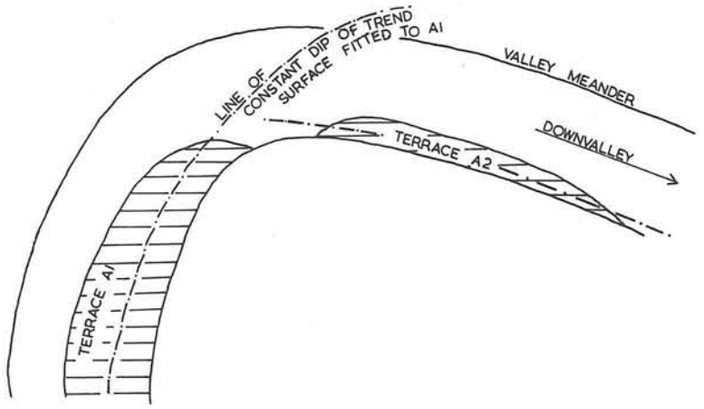


FIGURE 11.3

Plate 1: The 'Terra-Scout' portable refraction seismograph set up ready for use.

Plate 2: Sand and gravel containing shells, enclosed in till, Berwick Plantation.

Plate 3: Kames at Mount Pleasant, near Berwick.

Plate 4: Fragment 814 and backing slope.

Plate 5: Fragment 802, Gainslawhill, near Berwick.

Plate 6: Fragment 794 with drumlinised relief in the background. Winfield aerodrome, near Berwick.

Plate 7: Meltwater channel at 907 462, running towards the Tweed.

Plate 8: Section under F 783, Twizel Station.

Plate 9: Terrace fragments around the Till/Tweed junction.

Plate 10: Contorted and faulted sands at 8467 4007, Coldstream.

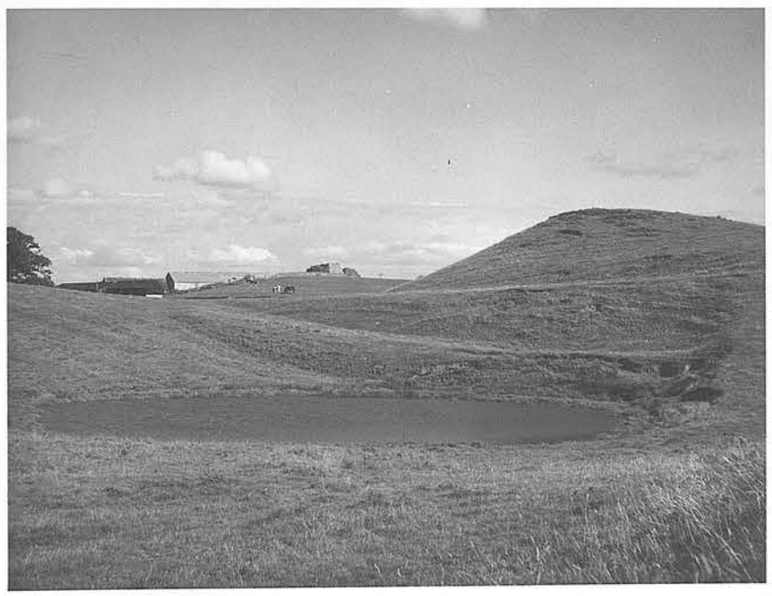


Plate 11: Kame and Kettle hole at 858 384, Campfield.

Plate 12: View westwards from the Cornhill-Crookham sands over F 721 to Wark.

Plate 17: Till section, containing gravel lens, overlying rock at Mertoun Mill.

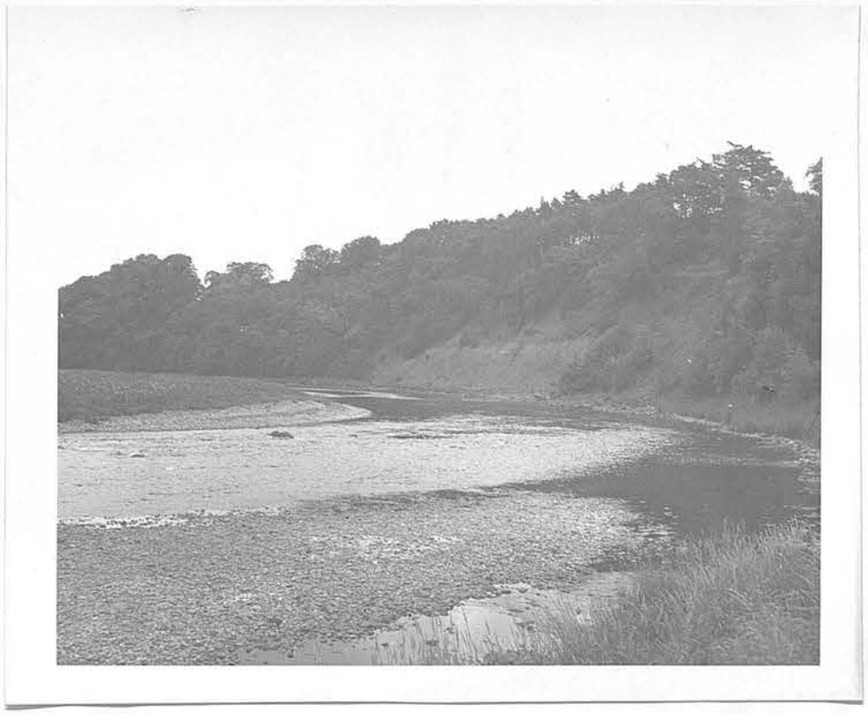


Plate 18: Till (dark) overlying gravel (lighter) in section at Newstead.

Plate 19: Ice-contact slope at 5227 3464, near Darnick.

Plate 20: Dead ice hollow at 517 344, near Abbotsford.

Plate 13: View eastwards along the crest of the Wark Kaim.

Plate 14: F 679, looking northeastwards towards Reddon.

Plate 15: Banded silts and sands under F 607 at 7185 3370, Kelsohaugh.

Plate 16: The Fleurs terraces and Fleurs Castle from the south.

Plate 21: Low level kettle hole and floodplain underneath Rink Farm (4891 3268).

Plate 22: V shaped cross section of the Tweed Valley and low terraces looking westwards towards Fernielee.

Plate 23: F 347, the highest of the Ashiesteel terraces.

Plate 24: Kaim Knowe, near Walkerburn, cut by the Peebles - Galashiels road.

Plate 25: Cademuir dry channel, looking westwards.

Plate 26: Terraces in the vicinity of the Tweed/Lyne junction.

Plate 27: F 216, looking up the Tweed valley.

Plate 28: The Sheriffmuir Esker.

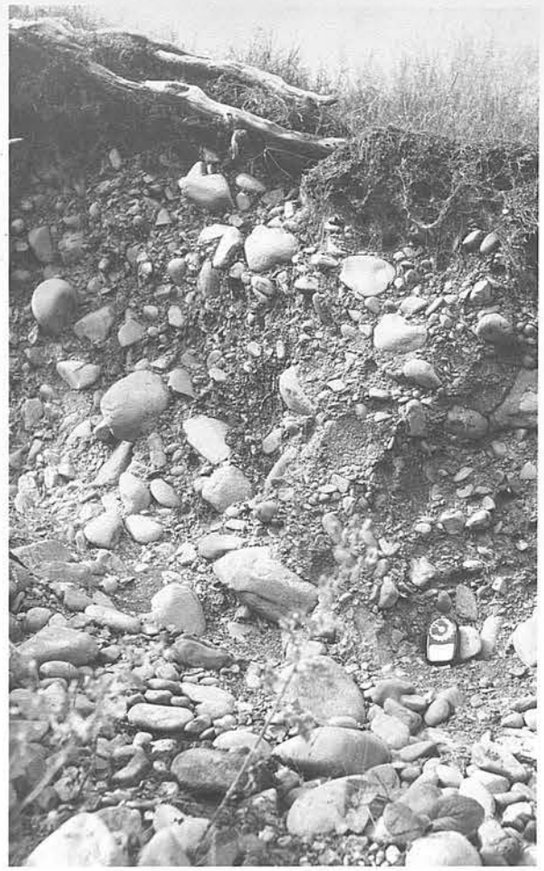


Plate 29: Section at 1870 3848 in the Sheriffmuir Esker.

Plate 30: Kames upvalley from Drumelzier Bridge.

Plate 31: A 'barren area' - the floodplains of the Tweed west of Wrae Farm.

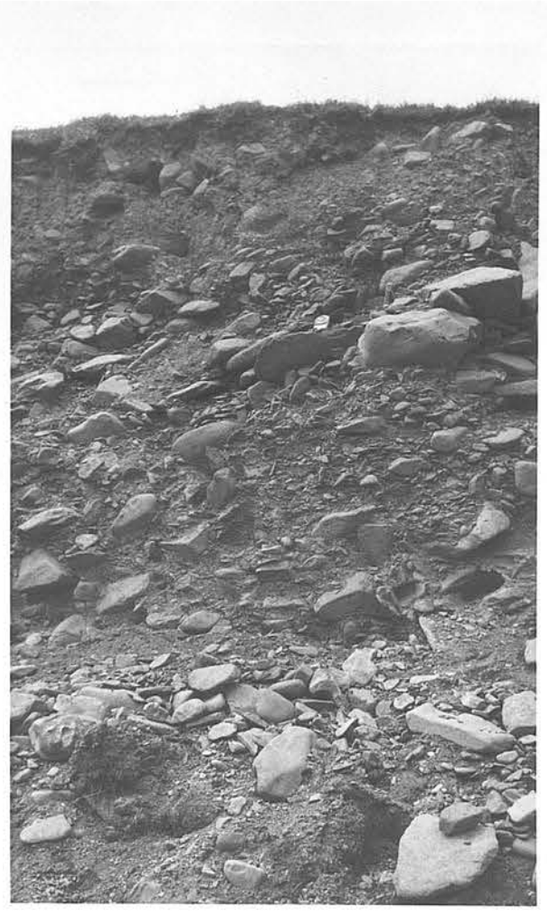


Plate 32: Section under F 120, near the Kingledores Burn/ Tweed junction.

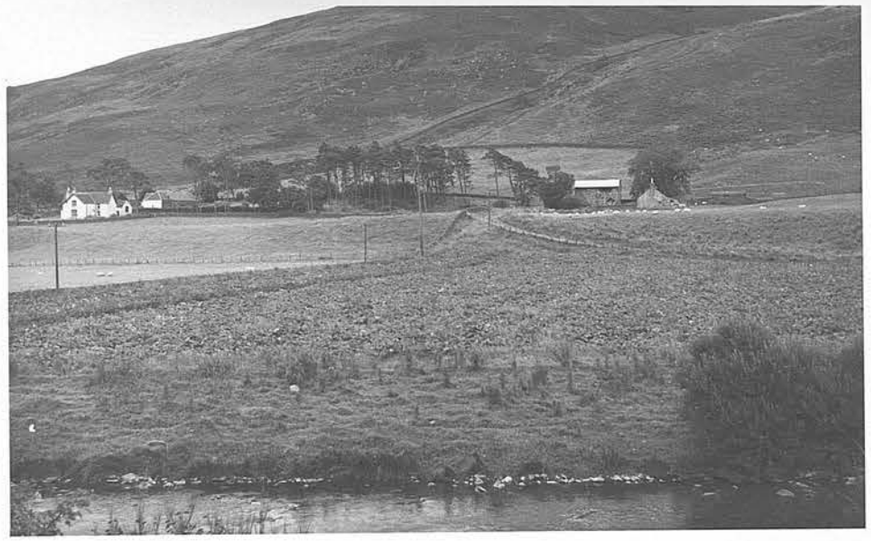


Plate 33: F 189 and 191 at Patervan.

Plate 34: Terrace fragments downvalley from Tweedsmuir Bridge.

Plate 35: Part of section 26 at 1012 2477.

Plate 36: Outwash at the mouth of the Fruid Water valley.

Plate 37: Section 27 under the Badentree 'fan'.