

COASTAL OBSERVATION PROGRAMME - ENGINEERING (COPE)

BARWELL CREEK - LIVINGSTONE SHIRE

FOR THE YEARS 1975 TO 1978

REPORT NO. C17.1

Beach Protection Authority

October 1985

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ABSTRACT:-

This report provides a summary of primary analyses of COPE data on wind, wave and beach processes observed at Barwell Creek which is in Livingstone Shire on the central Queensland coast. The data were recorded by volunteer observers Mr. & Mrs. E. Dunstone during the period November 1975 to November 1978. The recordings were made daily during the three year period and the information published is considered representative of the long term conditions.

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Coastal Observation Programme - Engineering (COPE), Shingly Beach - Proserpine Shire, (Report C14.1).

Coastal Observation Programme - Engineering (COPE), Yeppoon - Livingstone Shire, (Report C15.1).

Coastal Observation Programme - Engineering (COPE), Bargara - Woongarra Shire, (Report C16.1).

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1. ROBINSON, D.A. AND JONES, C.M.

Queensland Volunteer Coastal Observation Programme - Engineering (COPE). 3rd Australian Conference on Coastal and Ocean Engineering, Melbourne, April 1977.

2. PATTERSON, D.C. AND BLAIR, R.J.

Visually Determined Wave Parameters. 6th Australian Conference on Coastal and Ocean Engineering, Gold Coast, July 1983.

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1.0 INTRODUCTION

1.1 The Programme

The Beach Protection Authority requires basic data on the behaviour of Queensland's beaches in order to provide well founded advice on coastal management to local authorities. The COPE project aims to collect information on wind, waves and beach behaviour in areas where extensive investigations are not practical and where otherwise little or no data exist.

The project is based on the recruitment of volunteer observers who are prepared to record a series of basic parameters once or twice daily for at least a three year period.

1.2 Site Selection

In selecting a site for a COPE station, consideration is given to:-

- (a) the general shoreline configuration and the possibility of extrapolation of data to other adjacent beaches;
- (b) the distribution of stations along Queensland's coastline;
- (c) the need to correlate the COPE data with planned or existing data collection programmes.

1.3 Instrumentation

Each COPE observer is supplied with a basic kit of recording instruments including:-

- 30 metre Tape
- Wind Meter
- Abney Level
- 1.5 metre Sighting Support
- Recording Forms
- Fluorescent Dye.

A graduated reference pole is installed on the beach to serve as the base point for all plan measurements and the control for vertical levelling.

1.4 Observers

The majority of COPE observers are volunteers, who may be local business people, local residents or school children. Some stations are operated by Government employees who carry out the observations as part of their official duties.

1.5 Accuracy

Individual observers differ in their subjective assessment of the various parameters recorded as part of the COPE programme. Wave parameters such as type, height, and angle of approach together with surf zone width and the location of the vegetation line all require visual assessment, the accuracy of which will vary from observer to observer and from recording to recording.

Although the Authority is confident that all observers make their observations to the best of their ability and accepts these observations without adjustment, the existence of random and non-random errors in the recorded data is to be expected.

Problems associated with the use of data containing these errors are minimised in two ways. Firstly, regular visits are made to the COPE stations by the Authority's COPE Field Officer to provide a check on any bias introduced into the recordings by incorrect observation procedures. Secondly, it has been found that, with a large number of observations taken on a regular basis, a reasonable assessment can be made of the average climatologies of the observed parameters provided the observation errors are random. A minimum recording period of three years has been adopted for the analysis and publication of the data. Five day moving averages are applied to observations of the various beach width and foreshore slope parameters to smooth out random errors.

For these reasons, the Authority is of the opinion that published COPE data can be used with confidence provided the above inherent limitations are recognised.

1.6 Presentation of Data

The purpose of this report is to present COPE data for the three year period 1975 to 1978 in a useful statistical form. No attempt has been made to interpret the observed data.

If the three year period is representative of the long term average meteorological conditions, the statistics presented on wind, wave and beach movements can be regarded as typical. However, this recording period may be considered too short to be representative in terms of the average occurrence of extreme events such as cyclones and floods, and this should be taken into account when consideration is being given to the influence of such events on trends of long term beach behaviour.

2.0 STATION PARTICULARS

2.1 Location

The Barwell Creek COPE station is located on the central Queensland coast within the Livingstone Shire. It forms part of an 18 kilometre stretch of coastline between Spring Head to the south and Sandy Point to the north. The town of Yeppoon is situated immediately south of the COPE station. The location of the Barwell Creek COPE station is shown in Figure 1.

2.2 Observers

This station has been operated by Mr. & Mrs. Eric Dunstone during the period November 1975 to November 1978. Mr. & Mrs. Dunstone were residents of Yeppoon.

2.3 Observed Parameters

The observers at this station usually recorded once daily at approximately 9.15 a.m. or 4.00 p.m. during the three year period 1975 to 1978.

This station has recorded:

- Wave Period
- Wave Height
- Wave Angle
- Wave Type
- Surf Zone Width
- Presence of Offshore Bar
- Wind Speed
- Wind Direction
- State of Tide
- Distance to Fixed Contour
- Distance to Vegetation Line
- Foreshore Slope
- Longshore Current Speed
- Longshore Current Direction.

In addition a sand sample was collected at the station each month and since May 1976 a profile of the beach has usually been recorded monthly.

2.4 Tidal Information

Tidal information for this station as presented below is essentially the same as that for Rosslyn Bay. Datum is Low Water Datum.

M.H.W.S. 4.10 metres
 M.H.W.N. 3.20 metres
 M.S.L. 2.38 metres
 M.L.W.N. 1.60 metres
 M.L.W.S. 0.70 metres.

A.H.D. is 2.300 metres above Low Water Datum.

2.5 Description of the Beach

The beach at Barwell Creek is essentially in its natural state and has a well formed dunal system which supports an abundance of vegetation. It exhibits the following characteristics:

- Typical beach slopes: foreshore slope is in the range 1 in 57 to 1 in 19 (1° to 3°).
- Beach width: typically 30 to 100 metres from the seaward edge of the frontal dune to low water mark.
- D50 sand size: 0.22 mm averaged over three years.
- Adjoining Landform: Low frontal dune backed by a well developed hind dune system.
- Vegetation: The frontal dune supports sand spinifex grass (Spinifex sericeus) and goats foot convolvulus (Ipomoea pes-caprae) herbland. Vegetation on the foredune system consists of mixed grassland dominated by blady grass (Imperata cylindrica var. major) with scattered horsetail she-oak (Casuarina equisetifolia var. incana) and screw pine (Pandanus pedunculatus).

2.6 Supervision of Station

The observers were instructed in the recording programme by the COPE Field Officer and the initial instruction period was followed up with visits to the station during the period of recordings presented in this report.

Installation and maintenance of the reference pole for this station has been carried out by the Livingstone Shire Council, and the Authority wishes to thank the Council for its assistance in all matters associated with the COPE project.

3.0 DATA

3.1 General

COPE data for this station for the three year period November 1975 to November 1978 are presented on the attached figures. The data have been analysed statistically and/or smoothed to reveal long term averages or trends. A brief description of each of the observed parameters is given below with the relevant figure references.

3.2 Wind

The observers recorded the wind speed at the beach using a hand held wind meter at 1.5 metres above beach level. Wind direction is estimated to the nearest compass sector.

A summary of annual wind speed and direction percentage occurrences are shown as a wind rose in Figure 2. Where applicable, morning and afternoon readings as well as the overall average are shown.

3.3 Waves

The average breaker height (trough to crest) is usually estimated to the nearest 0.1 metre. From experience this estimate has been found to be comparable with the equivalent deep water significant wave height.

The observers estimate the wave period by recording the time taken for eleven wave crests (the duration of 10 waves) to pass a point.

The wave direction is estimated as one of five direction sectors indicating the angle to the shoreline alignment from which the waves are approaching the beach. These sectors have been selected as:-

- Sector 1 - 0° to 60°
- Sector 2 - 61° to 85°
- Sector 3 - 86° to 95°
- Sector 4 - 96° to 120°
- Sector 5 - 121° to 180°

Note: 0° is the beach alignment to the left of the observer when facing seaward, and at the COPE station this direction is approximately true north.

Statistical representations of the observed wave data include:-

- (a) the percentage of wave height recordings which exceed any given wave height for all directions combined (Figure 3).
- (b) the percentage occurrence of various combinations of wave heights and periods and directions (Figure 4 and Figure 5).
- (c) surf zone width with an indication of the existence or otherwise of an offshore bar in Figures 6 to 13.
- (d) tabulation of the occurrence of various wave heights, periods, types and directions (Tables 1 to 4).

3.4 Longshore Currents

The observer measured the distance parallel to the shoreline that a dye patch in the surf zone moved in one minute. Current direction is either upcoast or downcoast, upcoast being to the left when facing the sea from the beach.

The readings are converted to a velocity which is plotted on a daily basis (Figure 14 to Figure 21). Mean upcoast and downcoast components and the overall annual means are also presented.

3.5 Beach Profile Parameters

Beach profile parameters were measured using an Abney level, tape measure and reference pole. These include:

- Distance from the reference pole to the 2.5 metre, relative to A.H.D., fixed contour level from November 1975 to the end of December 1977 and distance from the reference pole to the 1.8 metre, relative to A.H.D., fixed contour level from January 1978 to November 1978.
- Distance from reference pole to the vegetation line.
- The foreshore slope.

Changes in these parameters with time indicate how the beach moves in response to varying wave attack. Plots of these parameters are shown in Figures 22 to 25.

3.6 Monthly Beach Profiles

Beach profiles are normally taken at the beginning of each month. However, should the beach undergo appreciable erosion or accretion during the month, then the observer is requested to take another beach profile. Monthly beach profiles are shown in Figures 26 and 27.

TABLE 1
MONTHLY AND ANNUAL
MEAN WAVE HEIGHT/MEAN WAVE PERIOD AND WAVE TYPE/WAVE DIRECTION
OCCURRENCES

Barwell Creek

YEAR 1975

MONTH	MEAN WAVE PERIOD (Secs)	MEAN WAVE HEIGHT (Metres)	Percentage Occurrences - Wave Type/Wave Direction											
			Wave Type					Wave Direction						
			SP	PL	Surge	SP/PL	Calm	1	2	3	4	5	Calm	
JANUARY														
FEBRUARY														
MARCH														
APRIL														
MAY														
JUNE														
JULY														
AUGUST														
SEPTEMBER														
OCTOBER														
NOVEMBER	5.2	0.36	54.5	9.1	0	27.3	9.1	0	9.3	81.6	0	0	9.1	
DECEMBER	5.1	0.41	74.5	2.1	0	21.3	2.1	0	12.5	85.4	0	0	2.1	
WHOLE YEAR	5.2	0.38	66.3	5.0	0.0	23.7	5.0	0.0	11.0	84.0	0.0	0.0	5.0	

SP - Spilling
 PL - Plunging
 SP/PL - Combined Spilling and Plunging

TABLE 2
MONTHLY AND ANNUAL
MEAN WAVE HEIGHT/MEAN WAVE PERIOD AND WAVE TYPE/WAVE DIRECTION
OCCURRENCES

Barwell Creek

YEAR 1976

MONTH	MEAN WAVE PERIOD (Secs)	MEAN WAVE HEIGHT (Metres)	Percentage Occurrences - Wave Type/Wave Direction										
			Wave Type					Wave Direction					
			SP	PL	Surge	SP/PL	Calm	1	2	3	4	5	Calm
JANUARY	6.1	0.50	80.8	-	-	15.4	3.8	-	3.8	84.7	7.7	-	3.8
FEBRUARY	6.5	0.45	81.5	-	-	14.8	3.7	-	3.7	92.6	-	-	3.7
MARCH	7.3	0.37	62.5	12.5	-	12.5	12.5	-	-	81.2	6.3	-	12.5
APRIL	5.7	0.34	63.6	-	-	27.3	9.1	-	-	86.4	4.5	-	9.1
MAY	6.4	0.38	76.2	-	-	14.3	9.5	-	4.8	76.2	9.5	-	9.5
JUNE	6.5	0.22	40.0	-	-	6.7	53.3	-	-	40.0	6.7	-	53.3
JULY	6.2	0.33	50.0	-	-	30.0	20.0	-	12.5	55.0	12.5	-	20.0
AUGUST	7.2	0.24	61.9	-	-	-	38.1	-	-	61.9	-	-	38.1
SEPTEMBER	7.2	0.26	59.1	-	-	13.6	27.3	-	13.6	50.0	9.1	-	27.3
OCTOBER	9.0	0.25	75.0	-	-	-	25.0	12.5	25.0	31.2	6.3	-	25.0
NOVEMBER	7.4	0.33	100.0	-	-	-	-	-	33.3	66.7	-	-	-
DECEMBER	5.6	0.52	52.7	-	-	36.8	10.5	-	52.6	31.6	5.3	-	10.5
WHOLE YEAR	6.6	0.36	66.5	0.9	0.0	15.1	17.5	0.9	10.2	65.9	5.5	0.0	17.5

SP - Spilling

PL - Plunging

SP/PL - Combined Spilling and Plunging

TABLE 3
MONTHLY AND ANNUAL
MEAN WAVE HEIGHT/MEAN WAVE PERIOD AND WAVE TYPE/WAVE DIRECTION
OCCURRENCES

Barwell Creek

YEAR 1977

MONTH	MEAN WAVE PERIOD (Secs)	MEAN WAVE HEIGHT (Metres)	Percentage Occurrences - Wave Type/Wave Direction										
			Wave Type					Wave Direction					
			SP	PL	Surge	SP/PL	Calm	1	2	3	4	5	Calm
JANUARY	7.2	0.45	77.3	-	-	13.6	9.1	-	13.6	68.2	9.1	-	9.1
FEBRUARY	5.8	0.40	100.0	-	-	-	-	-	-	100.0	-	-	-
MARCH	7.3	0.32	82.4	-	-	5.8	11.8	-	5.9	58.8	17.6	5.9	11.8
APRIL	6.3	0.34	85.7	-	-	14.3	-	-	-	85.7	14.3	-	-
MAY	7.6	0.20	46.2	-	-	11.5	42.3	3.8	-	50.1	3.8	-	42.3
JUNE	7.6	0.25	41.6	-	-	29.2	29.2	-	-	37.5	33.3	-	29.2
JULY	7.1	0.39	51.8	-	-	31.0	17.2	-	-	62.1	20.7	-	17.2
AUGUST	7.2	0.32	77.8	-	-	11.1	11.1	-	-	77.8	11.1	-	11.1
SEPTEMBER	9.1	0.33	80.0	-	-	12.0	8.0	-	8.0	84.0	-	-	8.0
OCTOBER	7.6	0.35	61.9	-	-	28.6	9.5	-	14.4	71.3	4.8	-	9.5
NOVEMBER	7.7	0.37	78.6	-	-	10.7	10.7	-	14.3	75.0	-	-	10.7
DECEMBER	7.4	0.30	63.0	-	-	7.4	29.6	-	7.4	63.0	-	-	29.6
WHOLE YEAR	7.5	0.33	66.2	0.0	0.0	16.1	17.7	0.4	5.9	65.7	9.9	0.4	17.7

SP - Spilling

PL - Plunging

SP/PL - Combined Spilling and Plunging

TABLE 4
MONTHLY AND ANNUAL
MEAN WAVE HEIGHT/MEAN WAVE PERIOD AND WAVE TYPE/WAVE DIRECTION
OCCURRENCES

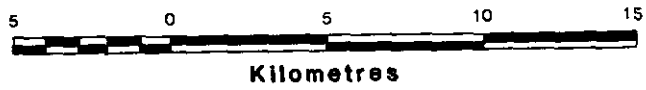
Barwell Creek

YEAR 1978

MONTH	MEAN WAVE PERIOD (Secs)	MEAN WAVE HEIGHT (Metres)	Percentage Occurrences - Wave Type/Wave Direction										
			Wave Type					Wave Direction					
			SP	PL	Surge	SP/PL	Calm	1	2	3	4	5	Calm
JANUARY	7.3	0.34	85.0	-	-	-	15.0	-	5.0	75.0	5.0	-	15.0
FEBRUARY	8.2	0.40	50.0	-	-	29.2	20.8	-	-	70.8	8.4	-	20.8
MARCH	8.4	0.32	71.4	-	-	9.6	19.0	4.8	4.8	71.4	-	-	19.0
APRIL	12.4	0.30	80.0	-	-	-	20.0	-	20.0	60.0	-	-	20.0
MAY	7.8	0.34	66.7	-	-	8.3	25.0	-	4.2	58.3	12.5	-	25.0
JUNE	9.7	0.13	43.7	-	-	6.3	50.0	-	-	37.5	12.5	-	50.0
JULY	9.7	0.27	68.4	-	-	15.8	15.8	-	5.2	63.2	15.8	-	15.8
AUGUST	9.1	0.29	78.6	-	-	14.3	7.1	-	7.1	78.7	7.1	-	7.1
SEPTEMBER	6.5	0.28	100.0	-	-	-	-	9.1	36.4	54.5	-	-	-
OCTOBER	7.3	0.67	83.3	-	-	16.7	-	-	22.2	61.1	16.7	-	-
NOVEMBER	7.5	0.42	95.0	-	-	5.0	-	5.0	25.0	45.0	25.0	-	-
DECEMBER	-	-	-	-	-	-	-	-	-	-	-	-	-
WHOLE YEAR	8.2	0.35	72.9	0.0	0.0	11.0	16.1	1.6	9.9	62.0	10.4	0.0	16.1

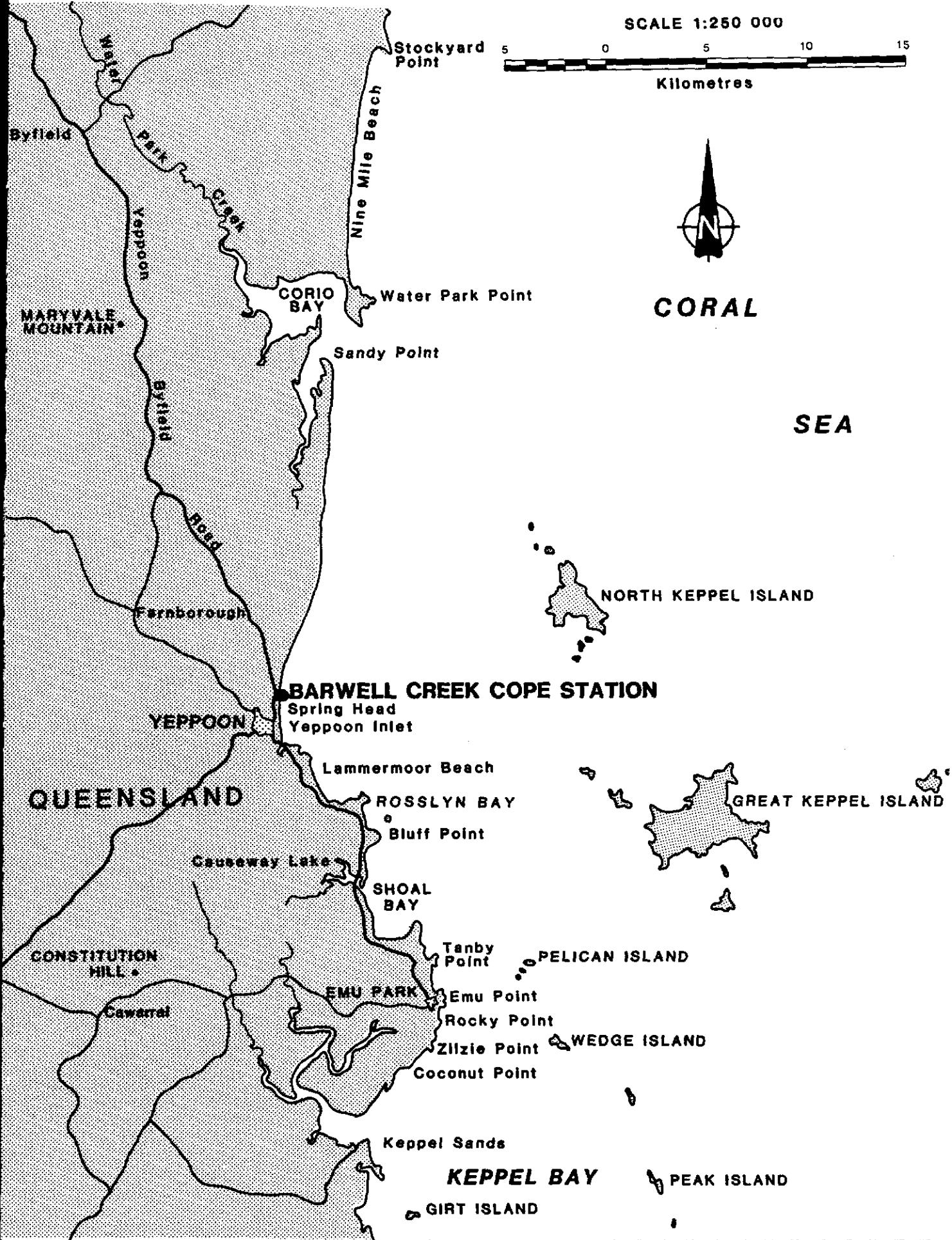
SP - Spilling
 PL - Plunging
 SP/PL - Combined Spilling and Plunging

SCALE 1:250 000



CORAL

SEA

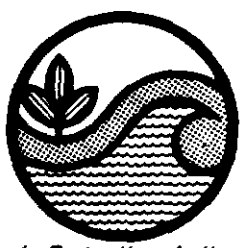


QUEENSLAND

CONSTITUTION HILL

BARWELL CREEK COPE STATION

KEPPEL BAY



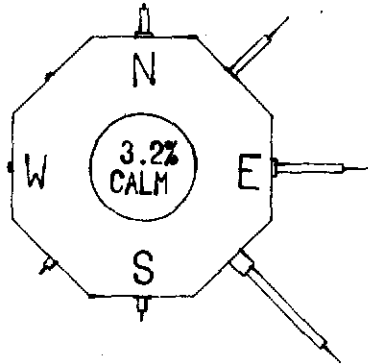
Beach Protection Authority

LOCALITY PLAN

COPE
Barwell Creek

FIGURE 1
C 17. 1

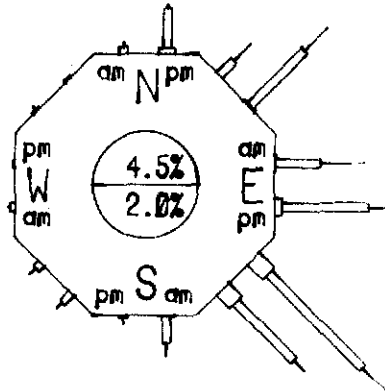
ALL OBSERVATIONS



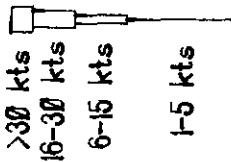
Total No. of Observations : 754

MORNING - AFTERNOON OBSERVATIONS

NOTES :
 Figures in Central Circle
 Represent Percentage
 of CALM Observations.
 Upper Figure for AM
 Lower Figure for PM

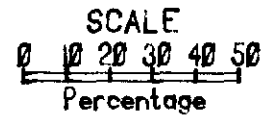


LEGEND

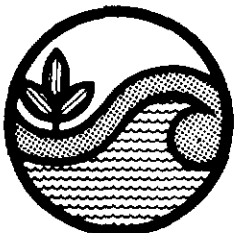


No. of Morning Observations : 352
 No. of Afternoon Observations : 402

Mean Time :- Morning Obs : 0914 hrs
 Mean Time :- Afternoon Obs : 1553 hrs



WIND DATA - NOV 1975 to DEC 1978

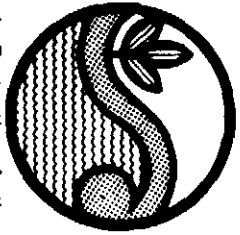


Beach Protection Authority

WIND DATA

COPE
 Barwell Creek

Figure 2
 C 17.1



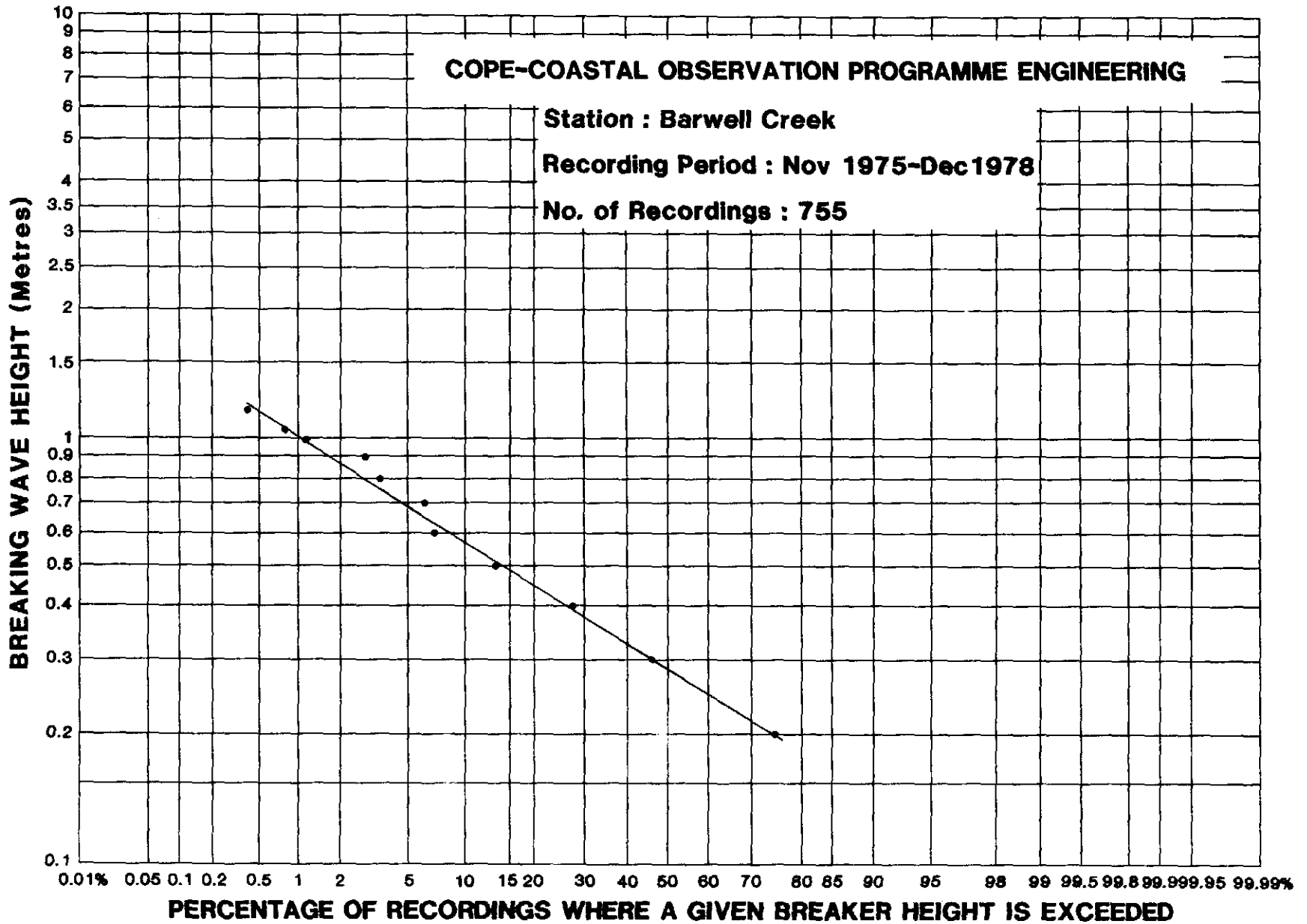
**WAVE HEIGHT % EXCEEDANCE
ALL DATA**

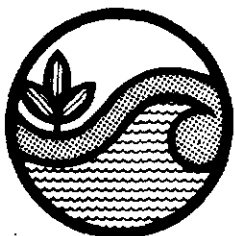
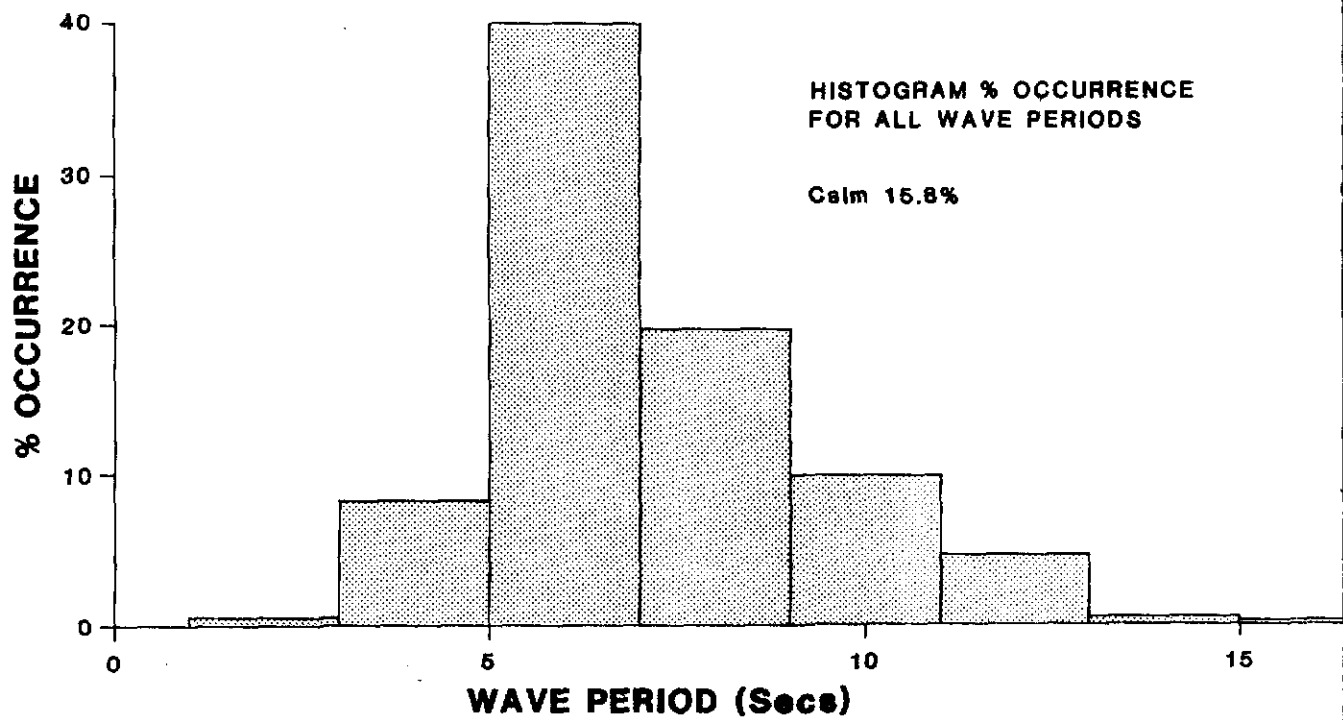
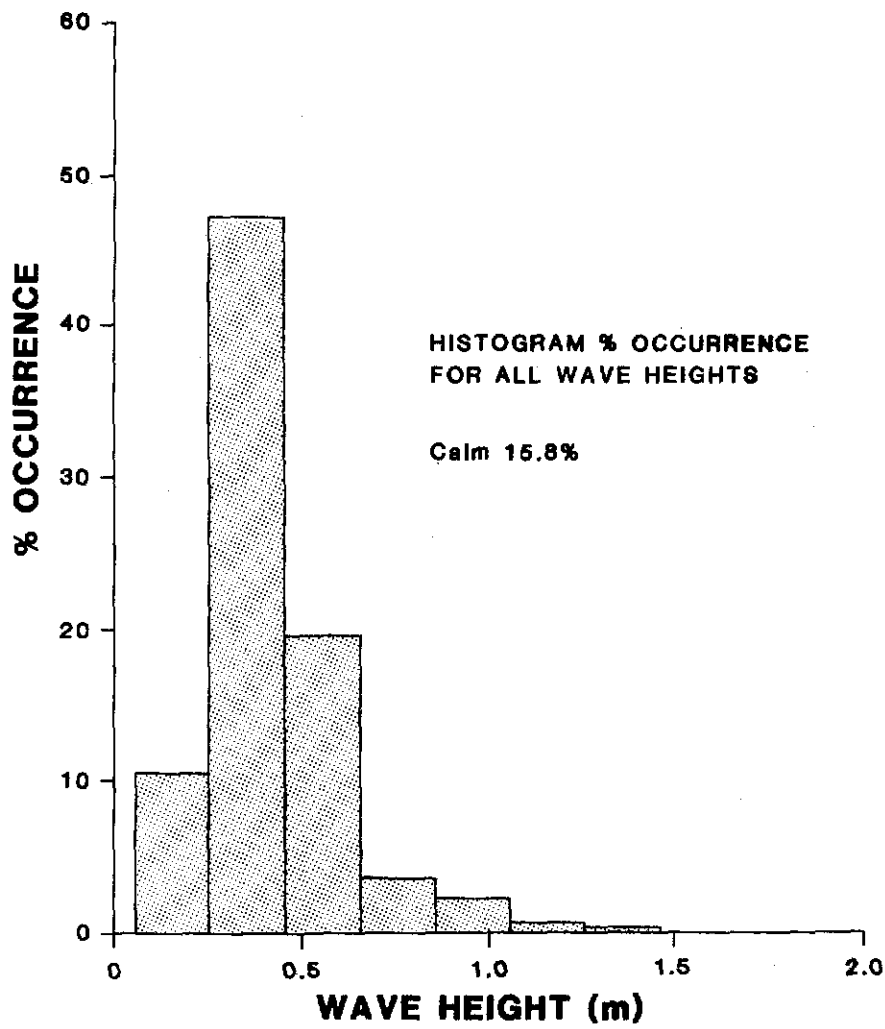
COPE

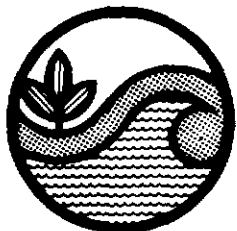
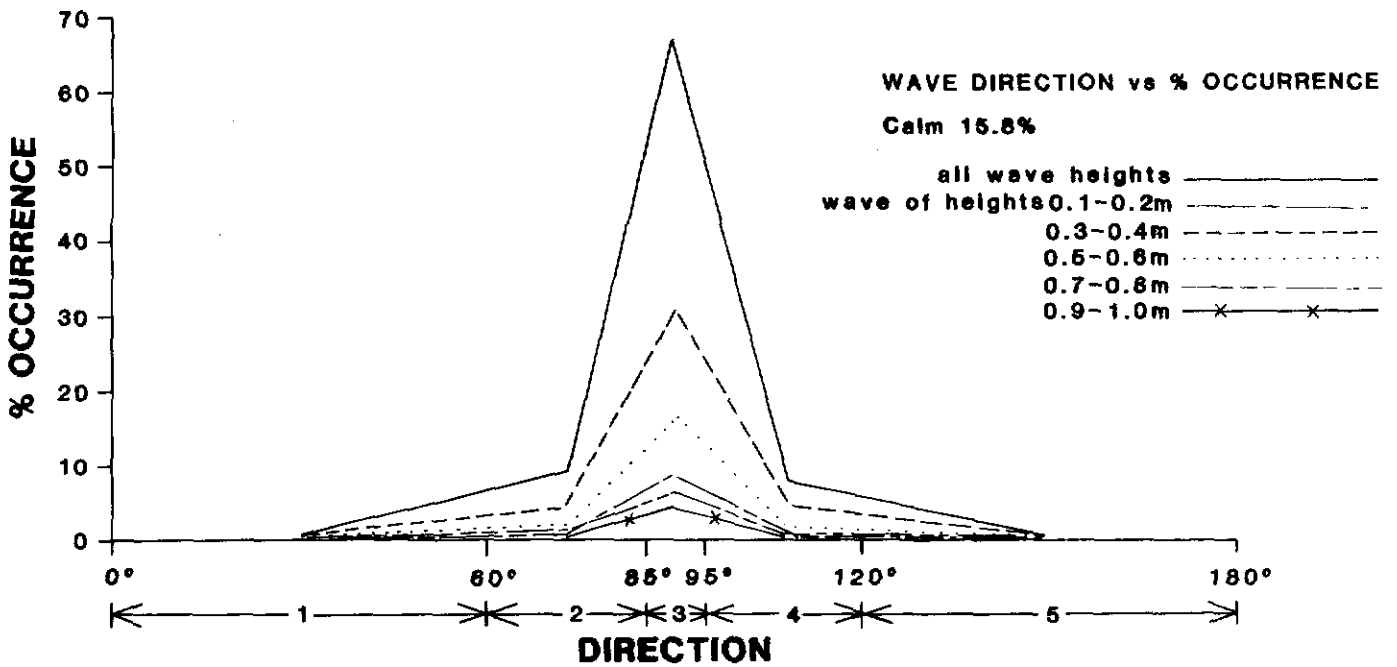
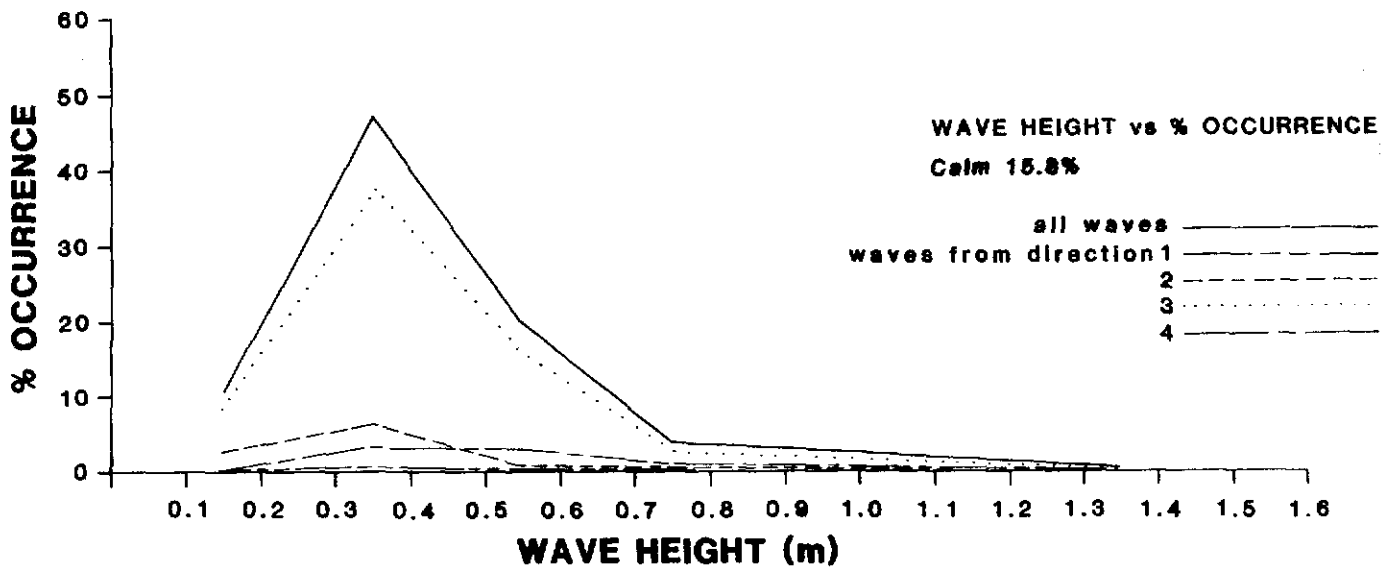
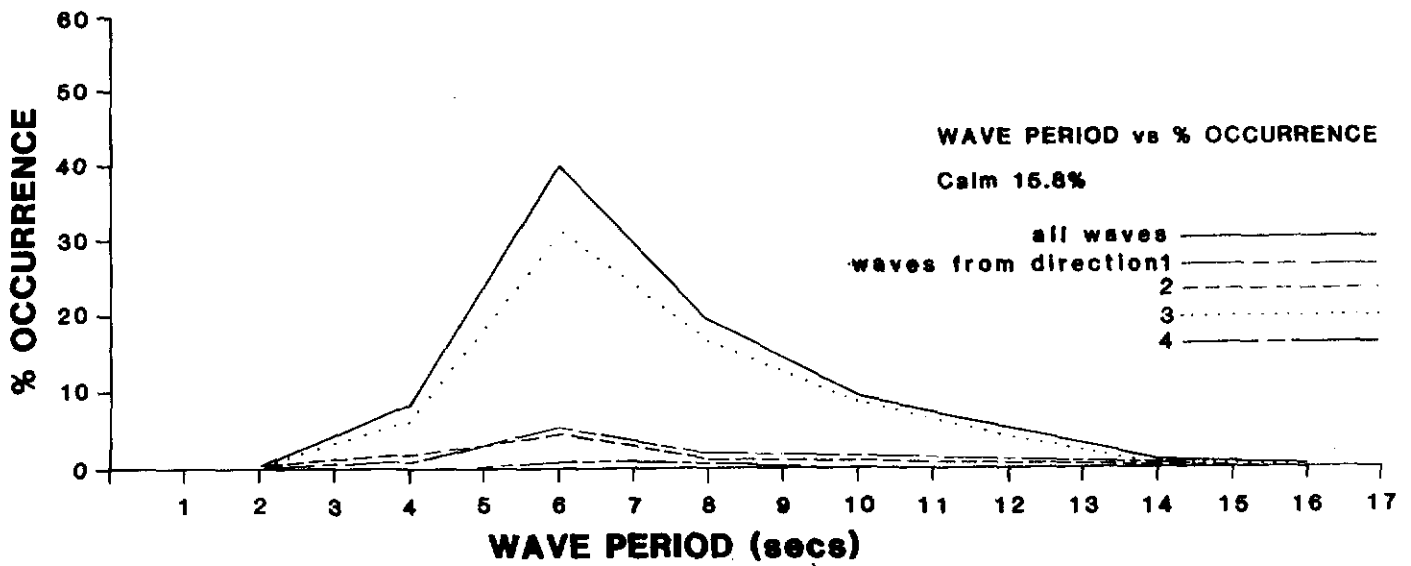
Barwell Creek

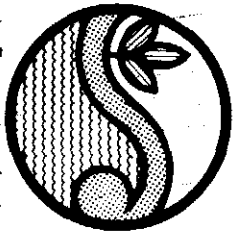
FIGURE 3

C 17.1









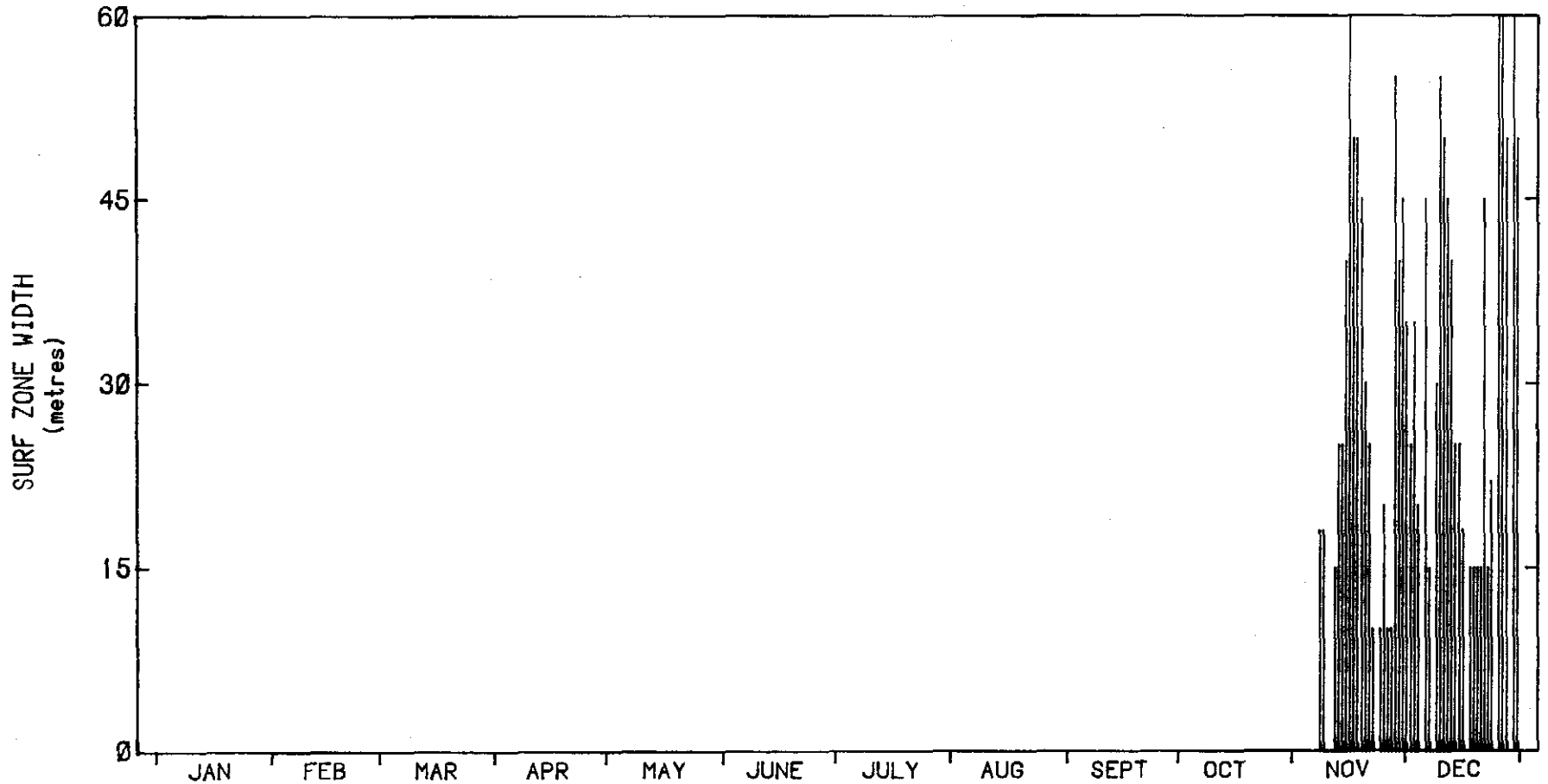
SURF ZONE WIDTH - MORNING 1975

COPE - Coastal Observation Programme Engineering

BARWELL CREEK

LIVINGSTONE SHIRE

1603



SURF ZONE WIDTH SUMMARY - 1975

No. of Observations : 49

MORNING OBSERVATIONS

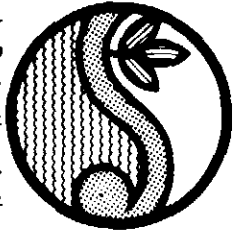
Mean Surf Zone Width = 30.3 m

COPE

Barwell Creek

Figure 6

C 17.1



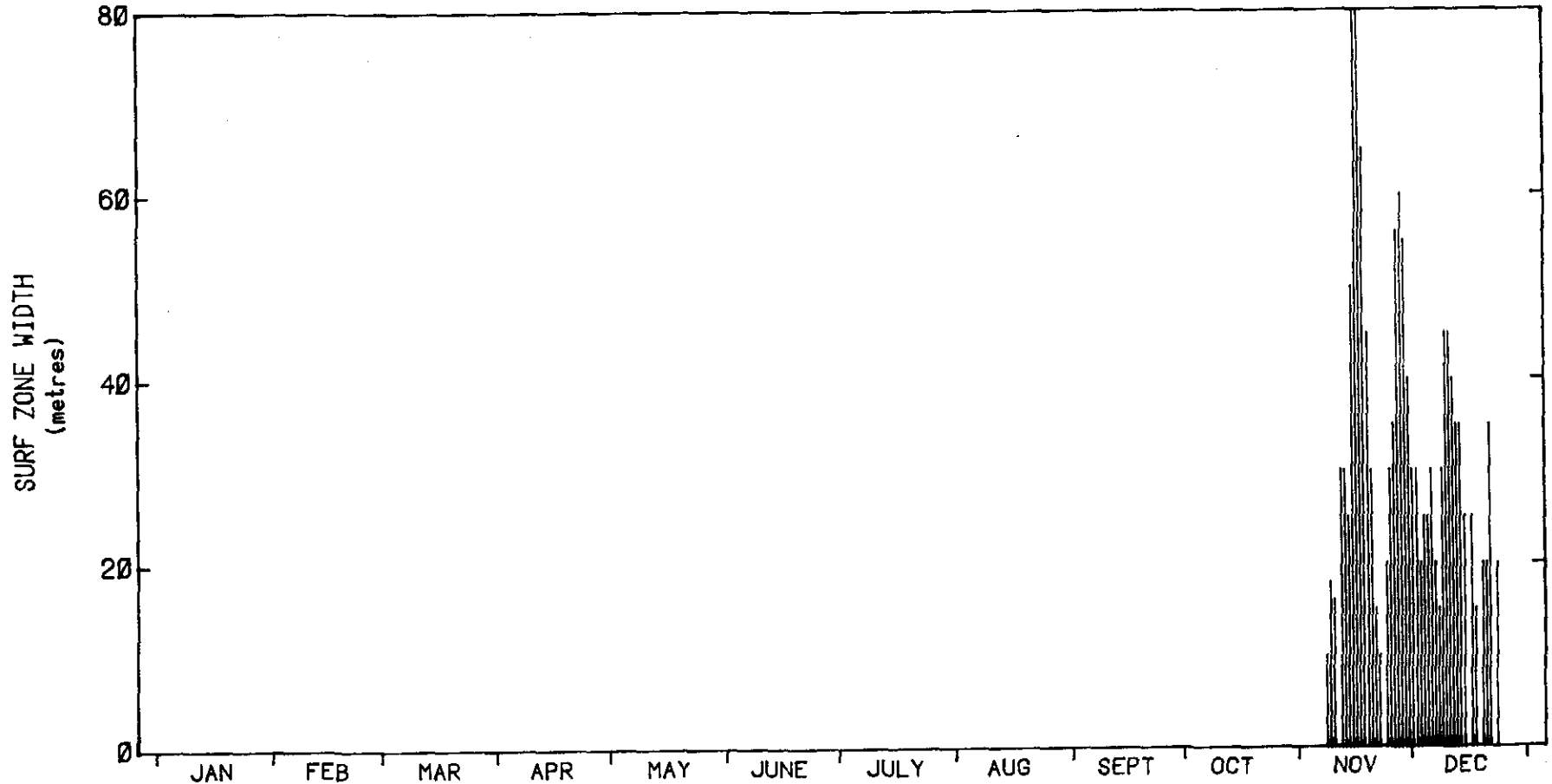
SURF ZONE WIDTH - AFTERNOON 1975

COPE - Coastal Observation Programme Engineering

BARWELL CREEK

LIVINGSTONE SHIRE

1983



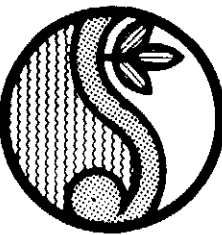
SURF ZONE WIDTH SUMMARY - 1975

No. of Observations : 43

AFTERNOON OBSERVATIONS

Mean Surf Zone Width = 32.2 m

COPE
Barwell Creek
Figure 7
C 17.1



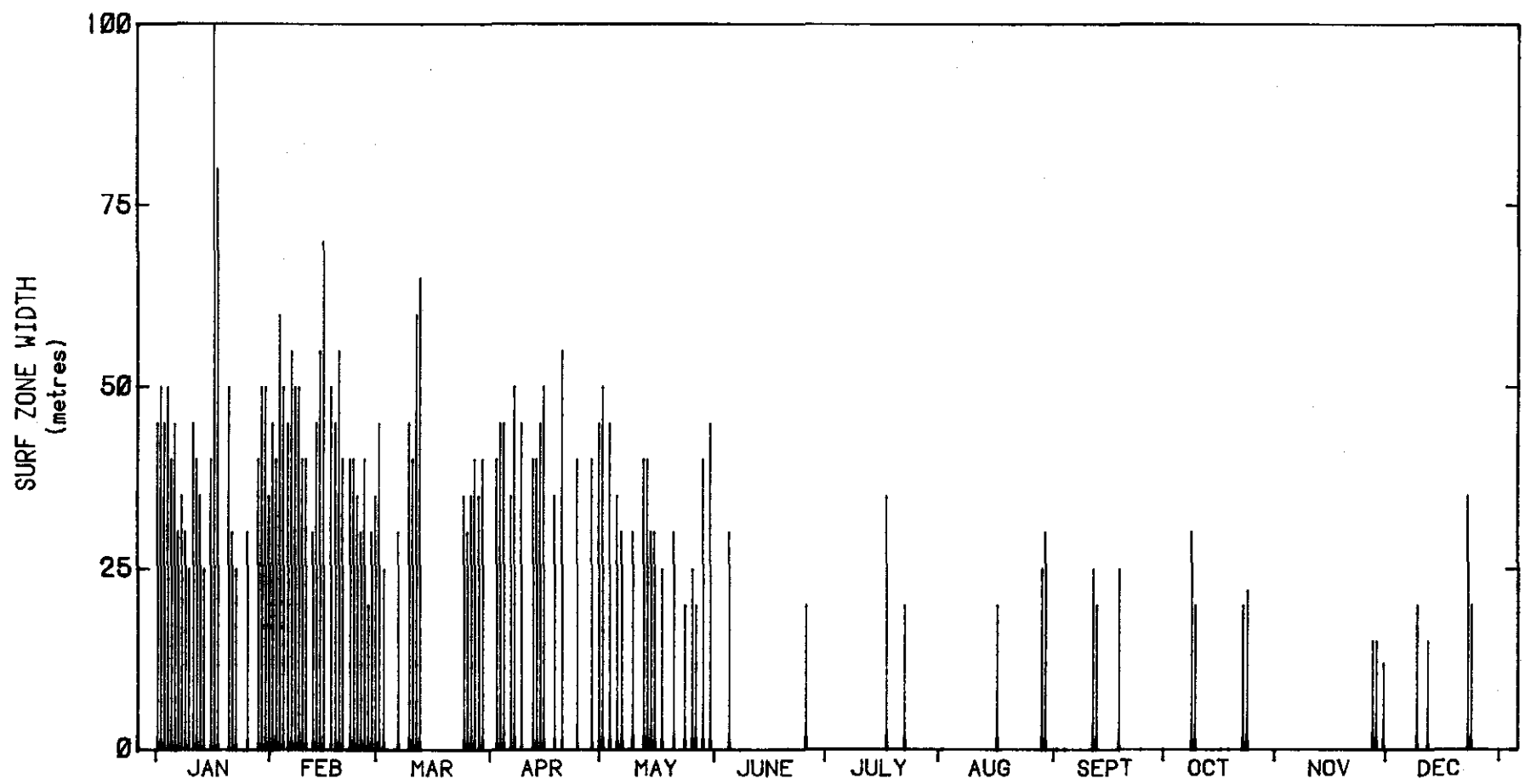
SURF ZONE WIDTH - MORNING 1976

COPE - Coastal Observation Programme Engineering

BARWELL CREEK

LIVINGSTONE SHIRE

1603



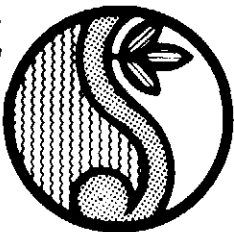
SURF ZONE WIDTH SUMMARY - 1976

No. of Observations : 137

MORNING OBSERVATIONS

Mean Surf Zone Width = 32.0 m

COPE
Barwell Creek
Figure 8
C 17.1



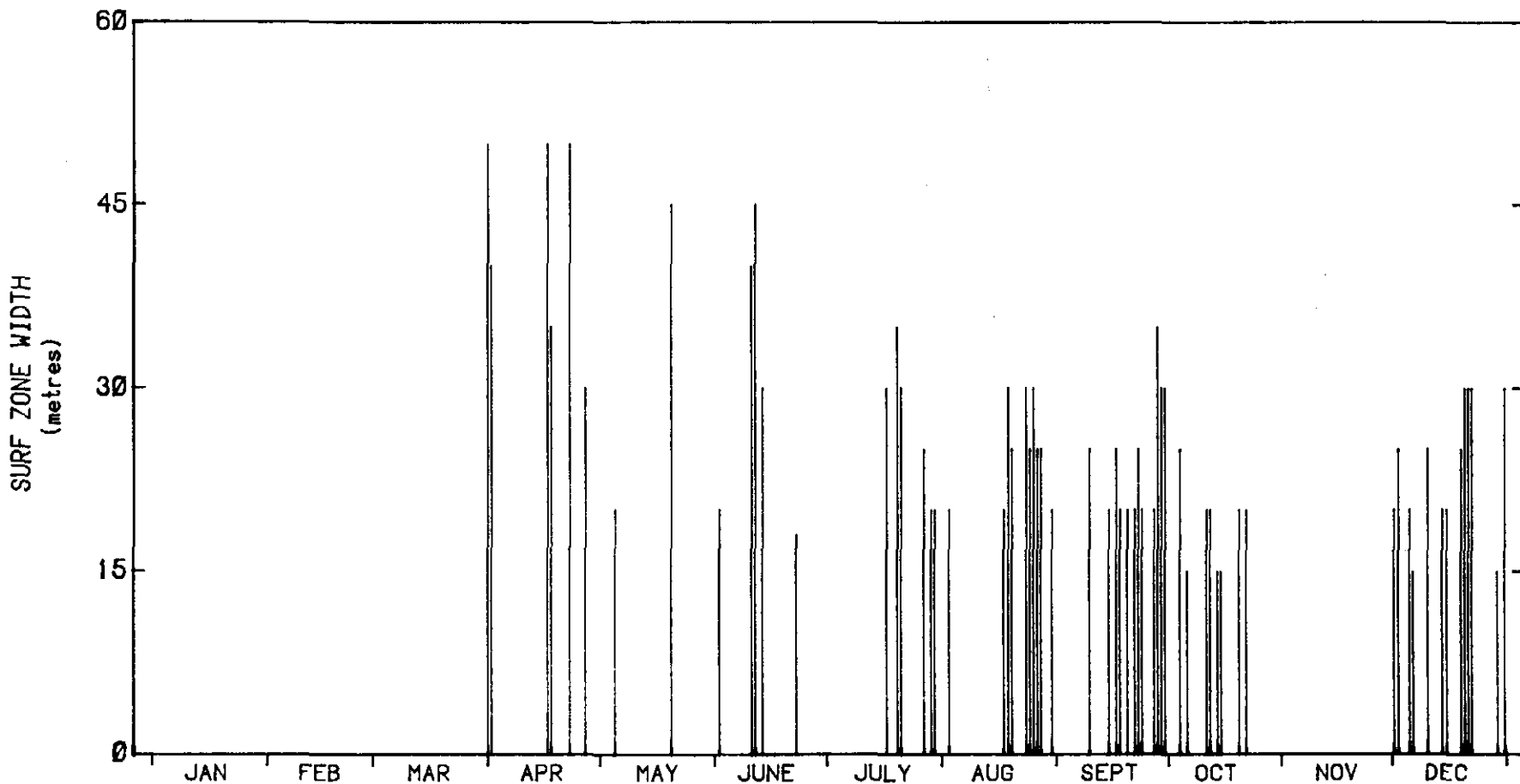
SURF ZONE WIDTH - AFTERNOON 1976

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Programme Engineering

BARWELL CREEK

LIVINGSTONE SHIRE

1983



SURF ZONE WIDTH SUMMARY - 1976

No. of Observations : 80

AFTERNOON OBSERVATIONS

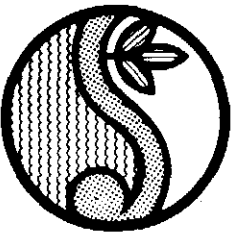
Mean Surf Zone Width = 20.3 m

COPE

Barwell Creek

Figure 9

C 17.1



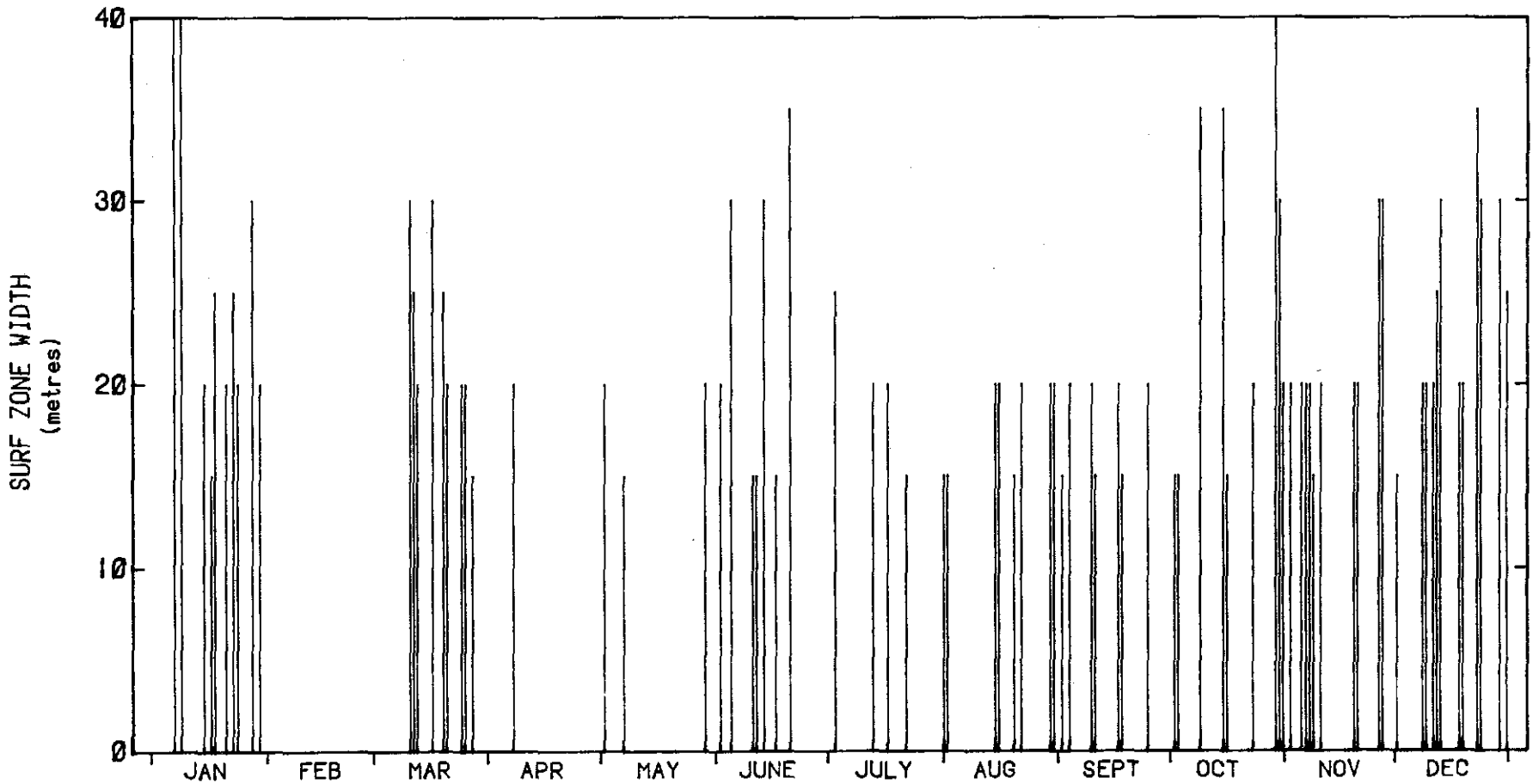
SURF ZONE WIDTH - MORNING 1977

COPE - Coastal Observation Programme Engineering

BARWELL CREEK

LIVINGSTONE SHIRE

1983



SURF ZONE WIDTH SUMMARY - 1977

No. of Observations : 101

MORNING OBSERVATIONS

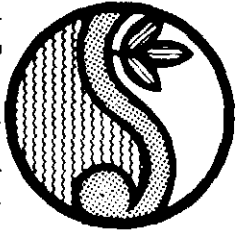
Mean Surf Zone Width = 17.6 m

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Barwell Creek

Figure 10

C 17.1



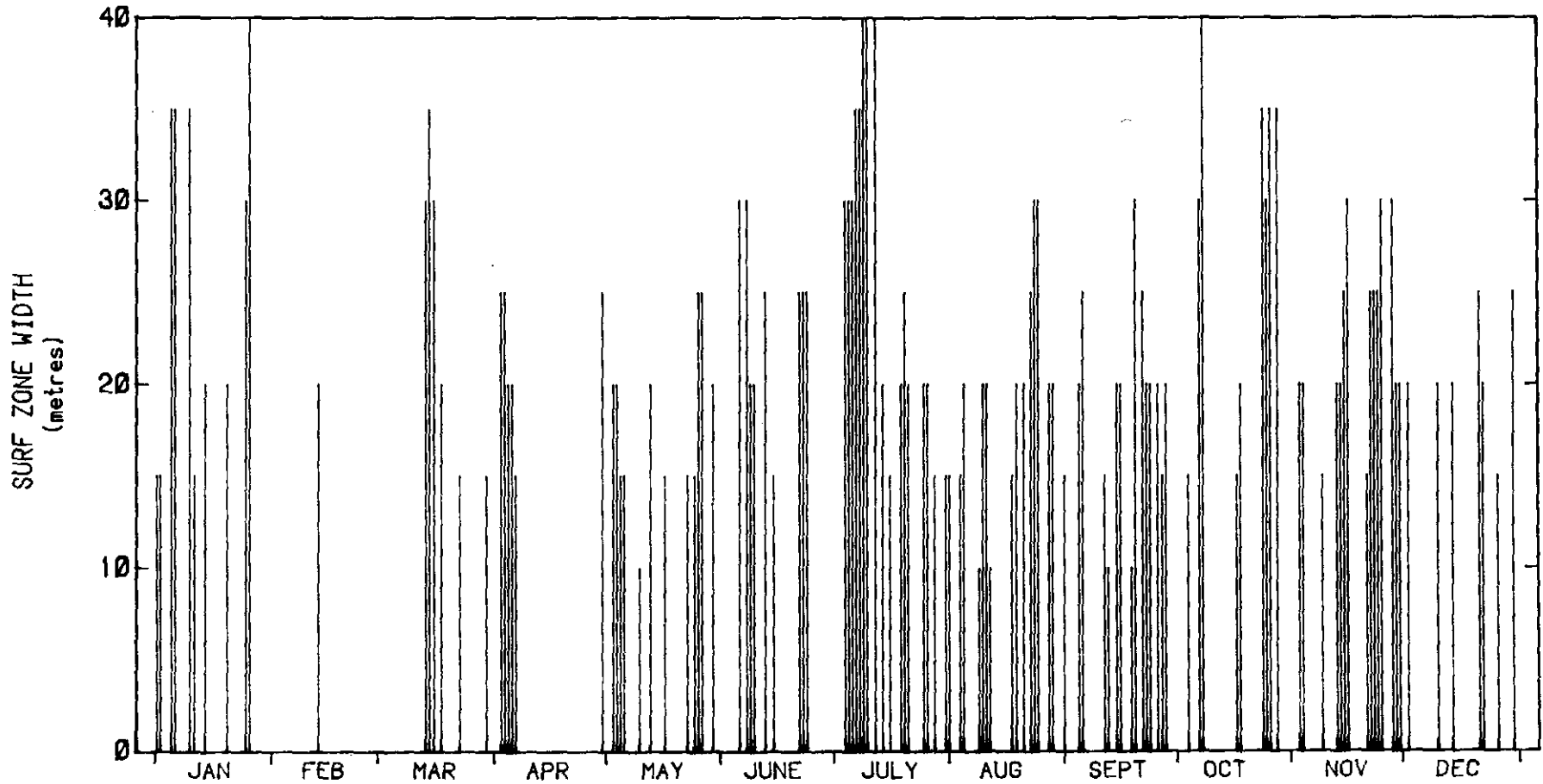
SURF ZONE WIDTH - AFTERNOON 1977

COPE - Coastal Observation Programme Engineering

BARWELL CREEK

LIVINGSTONE SHIRE

1983



SURF ZONE WIDTH SUMMARY - 1977

No. of Observations : 146

AFTERNOON OBSERVATIONS

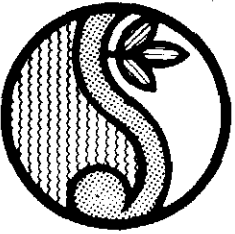
Mean Surf Zone Width = 18.8 m

COPE

Barwell Creek

Figure 11

C 17.1



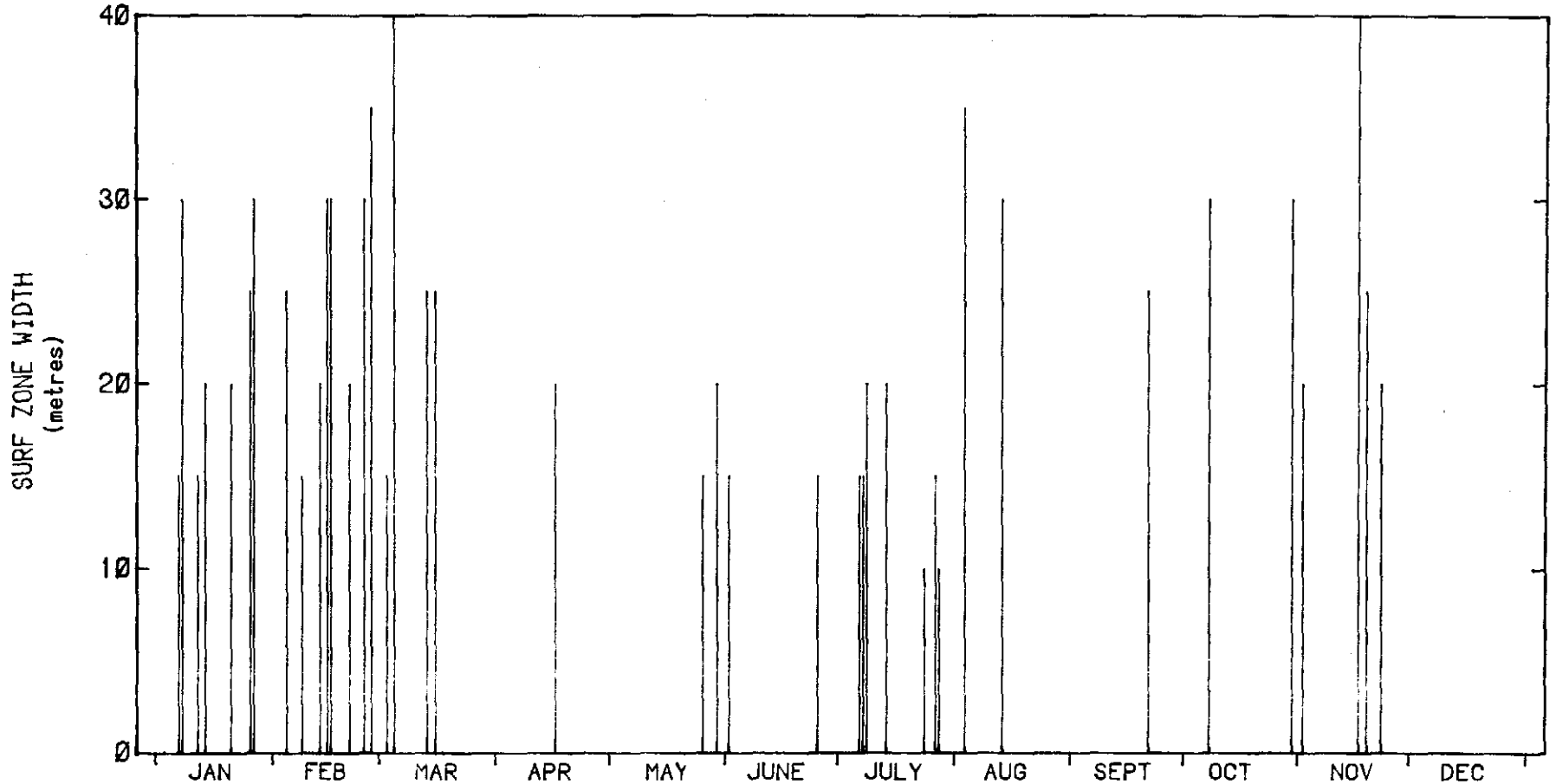
SURF ZONE WIDTH - MORNING 1978

COPE - Coastal Observation Programme Engineering

BARWELL CREEK

LIVINGSTONE SHIRE

1983



SURF ZONE WIDTH SUMMARY - 1978

No. of Observations : 51

MORNING OBSERVATIONS

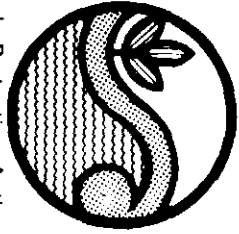
Mean Surf Zone Width = 17.8 m

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Barwell Creek

Figure 12

C 17.1



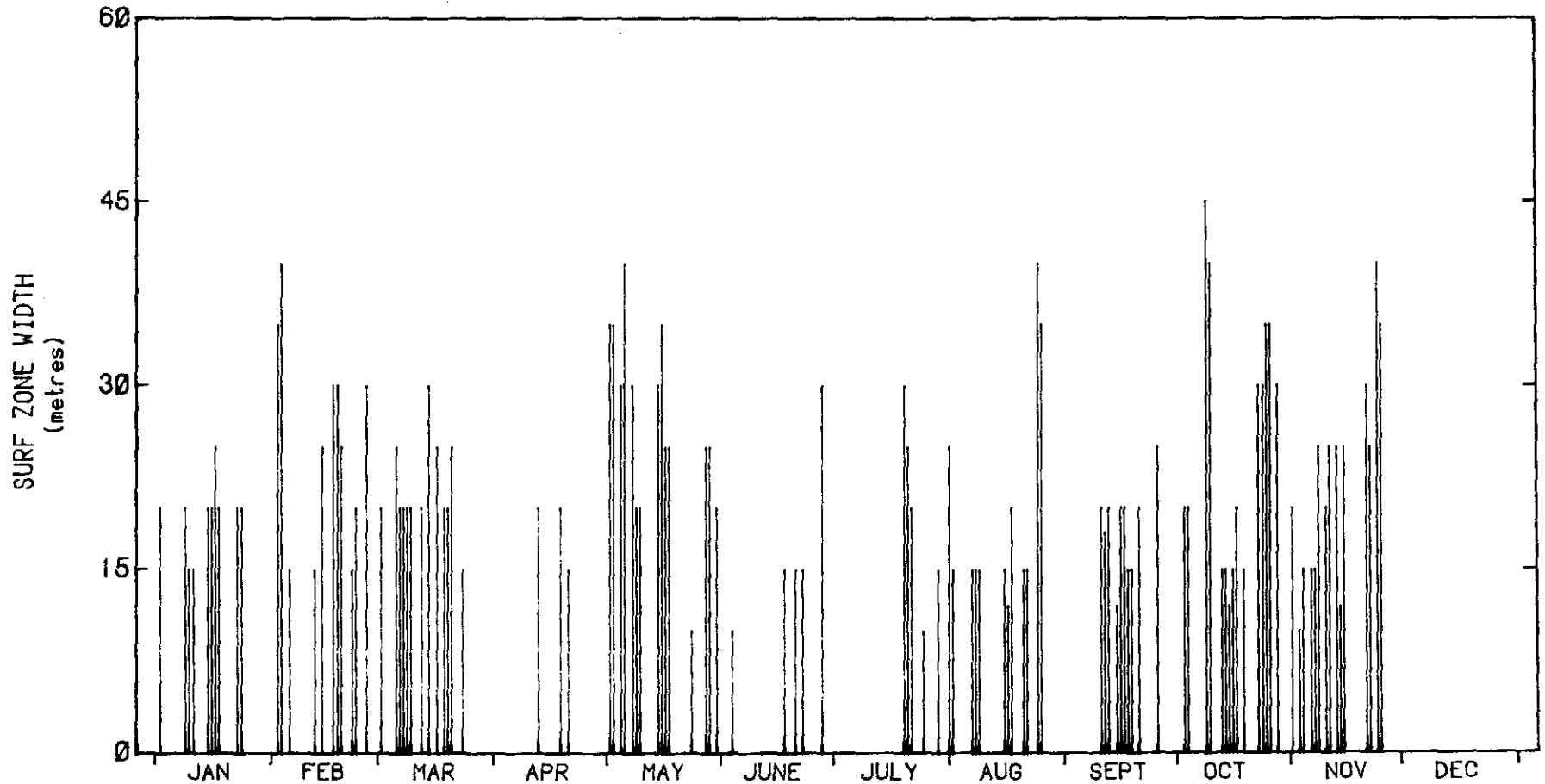
SURF ZONE WIDTH - AFTERNOON 1978

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BARWELL CREEK

LIVINGSTONE SHIRE

1983



SURF ZONE WIDTH SUMMARY - 1978

No. of Observations : 133

AFTERNOON OBSERVATIONS

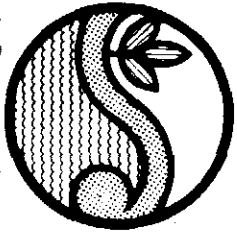
Mean Surf Zone Width = 19.1 m

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Barwell Creek

Figure 13

C 17.1



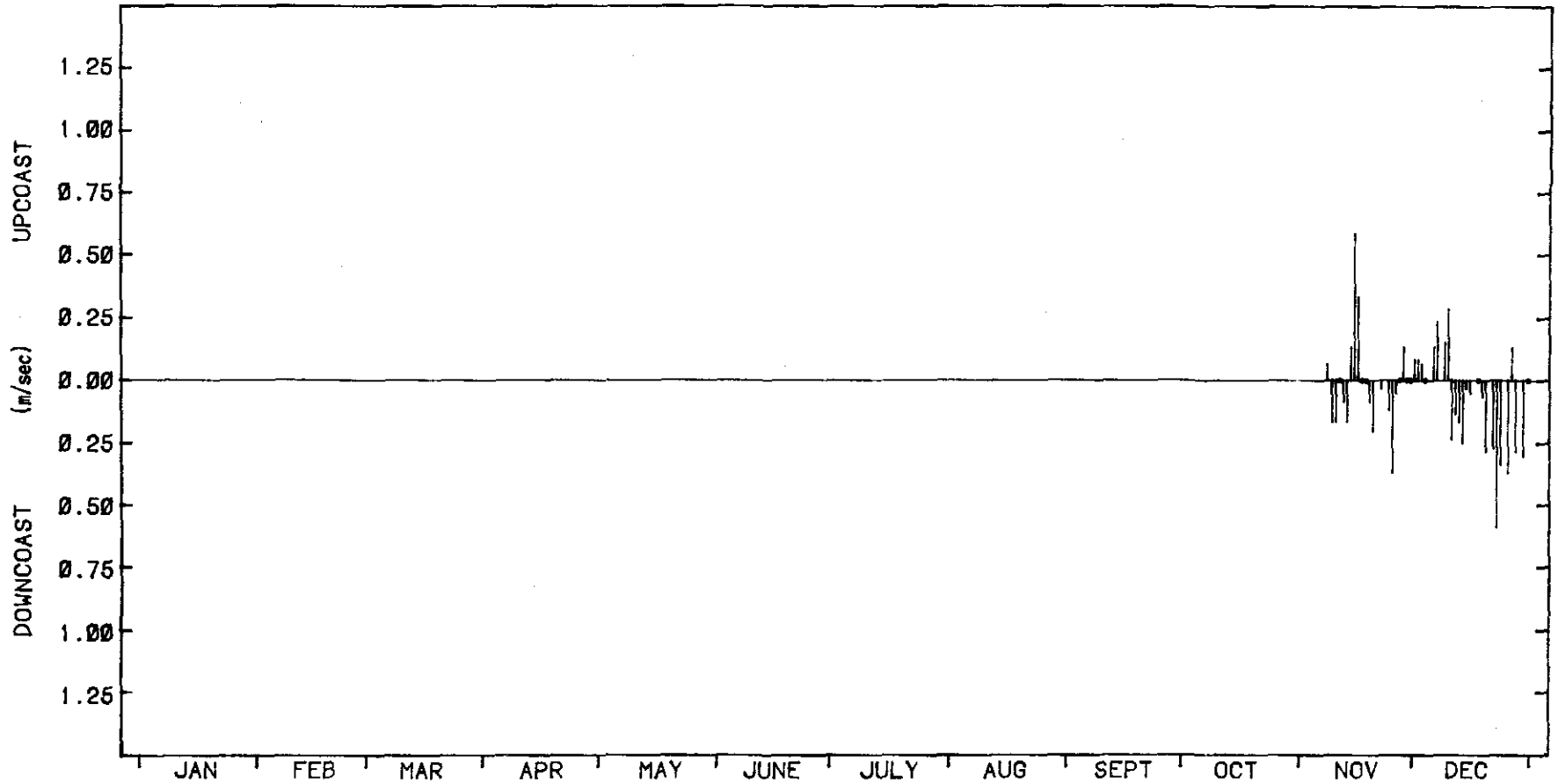
LITTORAL CURRENTS - MORNING 1975

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LIVINGSTONE SHIRE

BARWELL CREEK

1603



LITTORAL CURRENT SUMMARY - 1975

Mean Vel = -.051 m/sec (down)

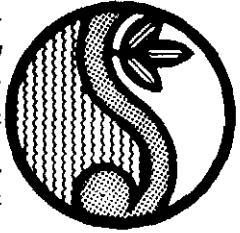
Mean Upcoast Vel = 0.186 m/sec

Mean Downcoast Vel = 0.199 m/sec

MORNING OBSERVATIONS - (46 recordings)

Figure 14
C 17.1

COPE
Barwell Creek



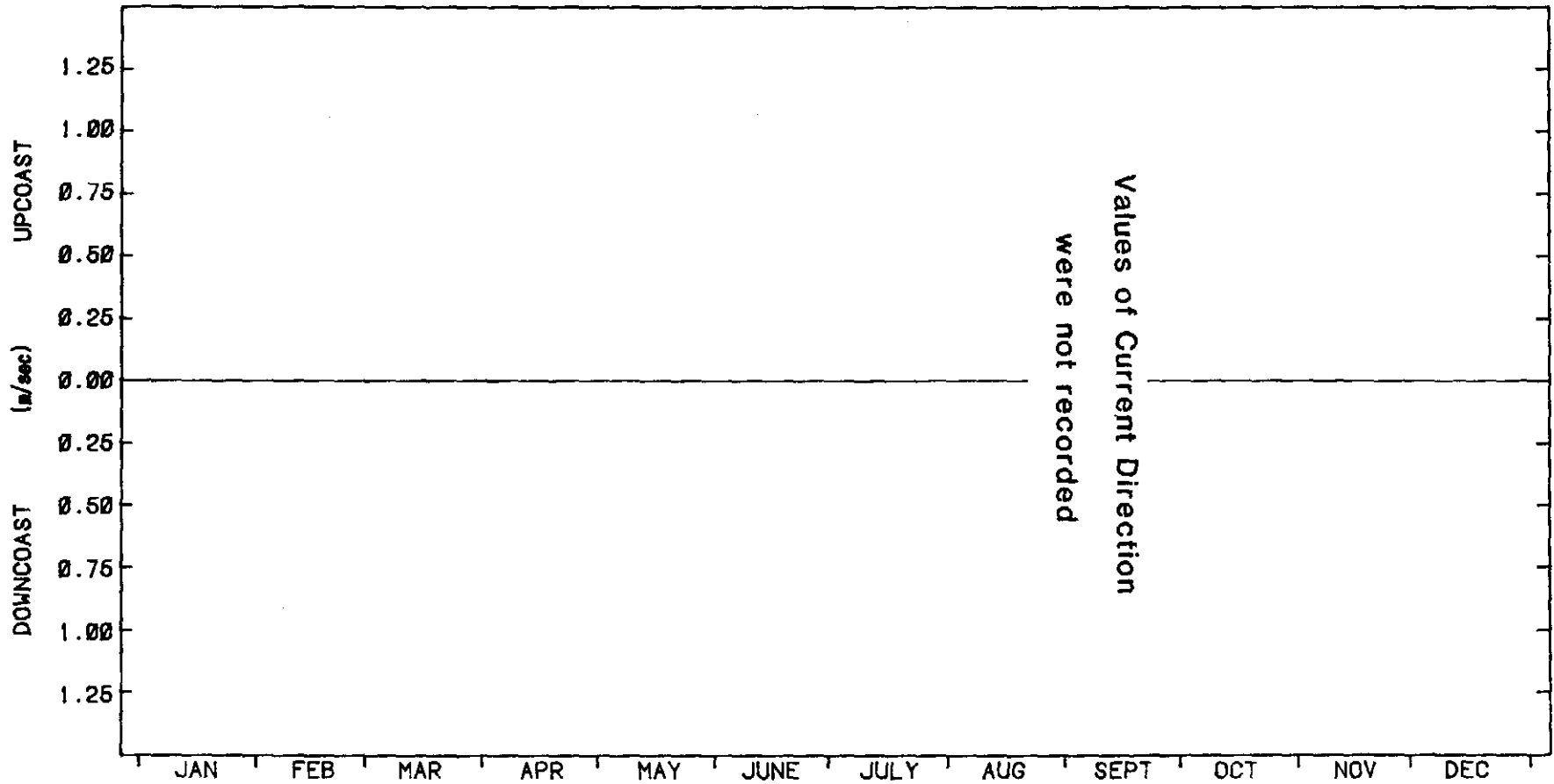
LITTORAL CURRENTS - AFTERNOON 1975

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BARWELL CREEK

1603



LITTORAL CURRENT SUMMARY - 1975

Mean Vel = 0.0 m/sec

Mean Upcoast Vel = 0.0 m/sec

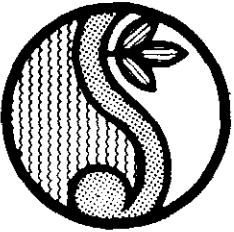
Mean Downcoast Vel = 0.0 m/sec

AFTERNOON OBSERVATIONS - (00 recordings)

COPE
Barwell Creek

Figure 15

C 17.1



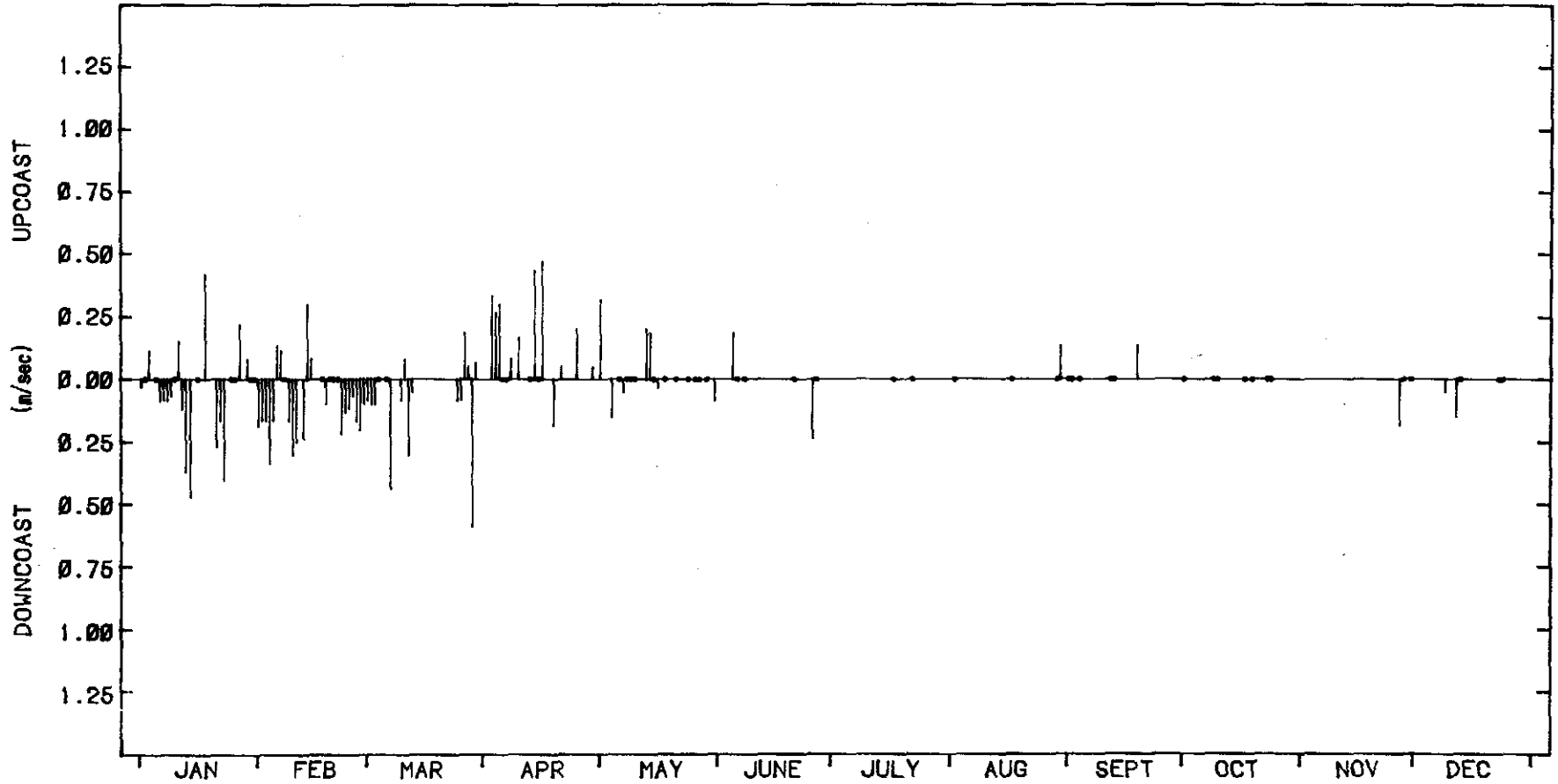
LITTORAL CURRENTS - MORNING 1976

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LIVINGSTONE SHIRE

BARWELL CREEK

1603



LITTORAL CURRENT SUMMARY - 1976

Mean Vel = -.021 m/sec (down)

Mean Upcoast Vel = 0.190 m/sec

Mean Downcoast Vel = 0.175 m/sec

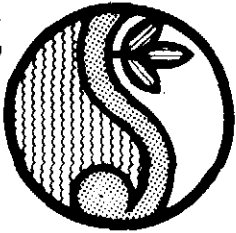
MORNING OBSERVATIONS - (132 recordings)

COPE

Barwell Creek

Figure 16

C 17.1



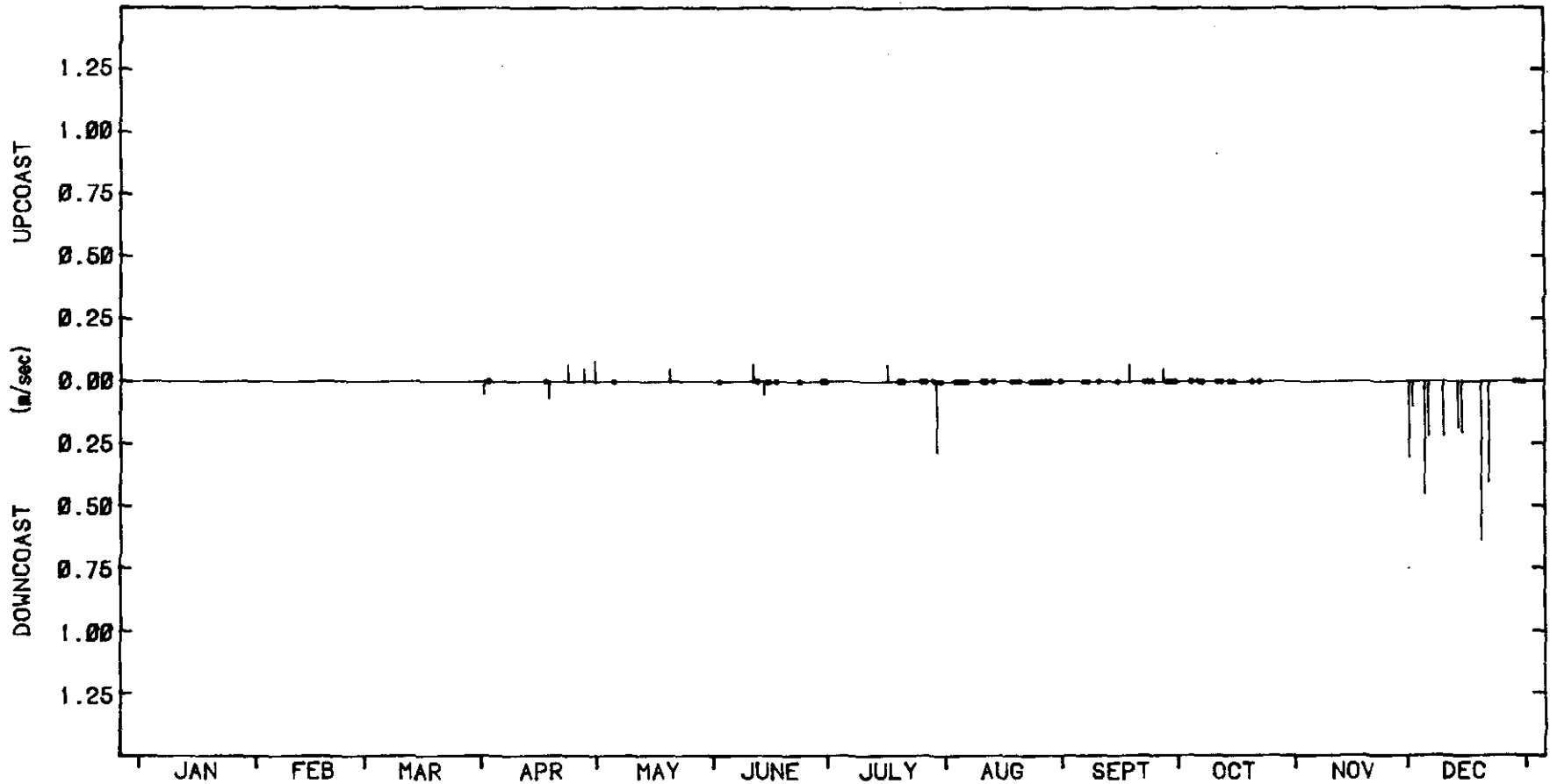
LITTORAL CURRENTS - AFTERNOON 1976

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BARWELL CREEK

1603



LITTORAL CURRENT SUMMARY - 1976

Mean Vel = -.035 m/sec (down)

Mean Upcoast Vel = 0.062 m/sec

Mean Downcoast Vel = 0.242 m/sec

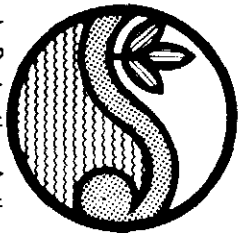
AFTERNOON OBSERVATIONS - (76 recordings)

COPE

Barwell Creek

Figure 17

C 17.1



LITTORAL CURRENTS - MORNING 1977

COPE
Barwell Creek

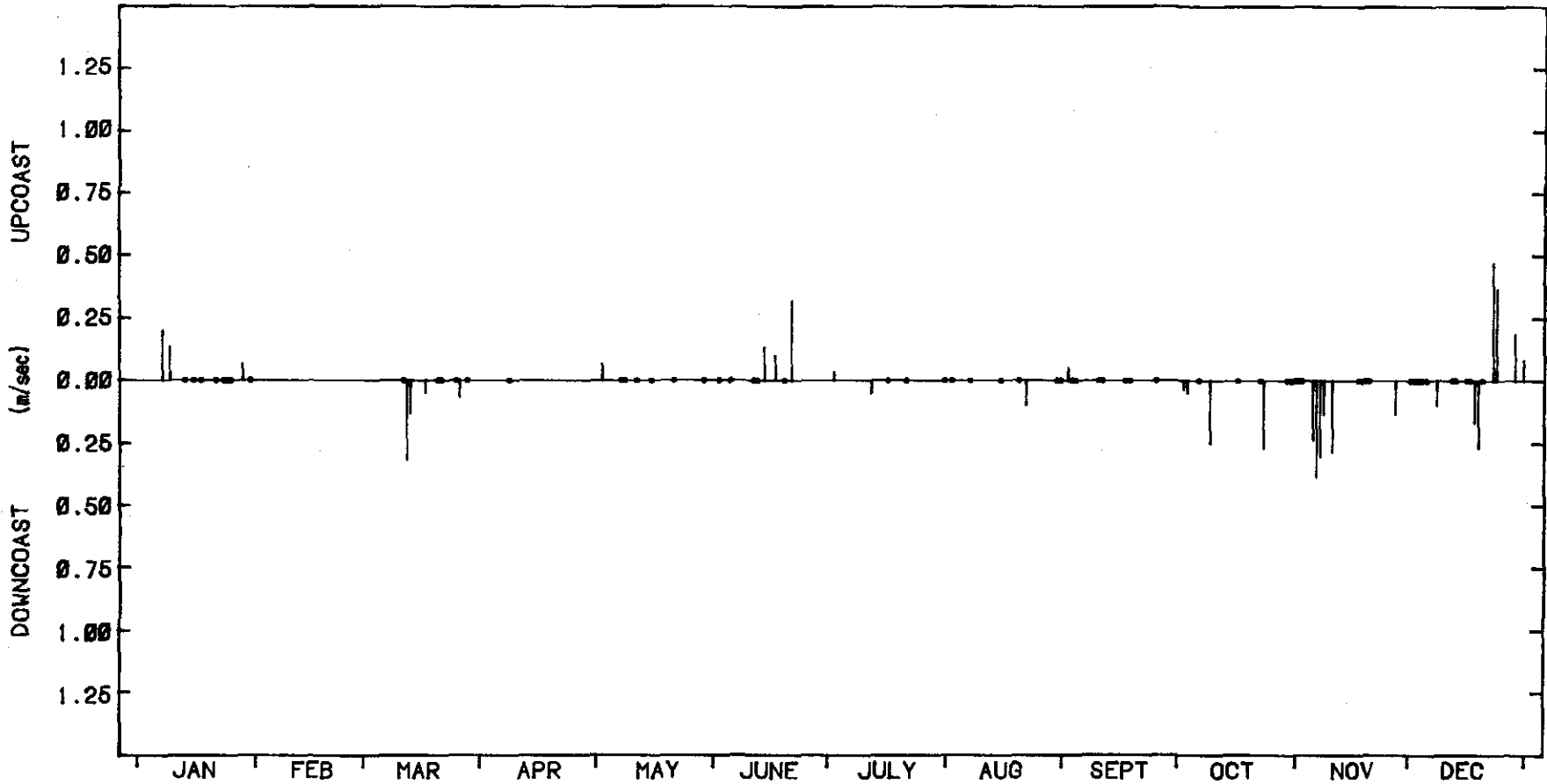
Figure 18
C 17.1

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BARWELL CREEK

1983



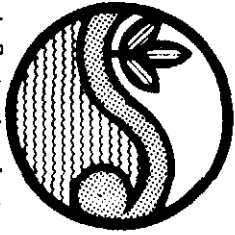
LITTORAL CURRENT SUMMARY - 1977

Mean Vel = -.012 m/sec (down)

Mean Upcoast Vel = 0.168 m/sec

Mean Downcoast Vel = 0.175 m/sec

MORNING OBSERVATIONS - (95 recordings)



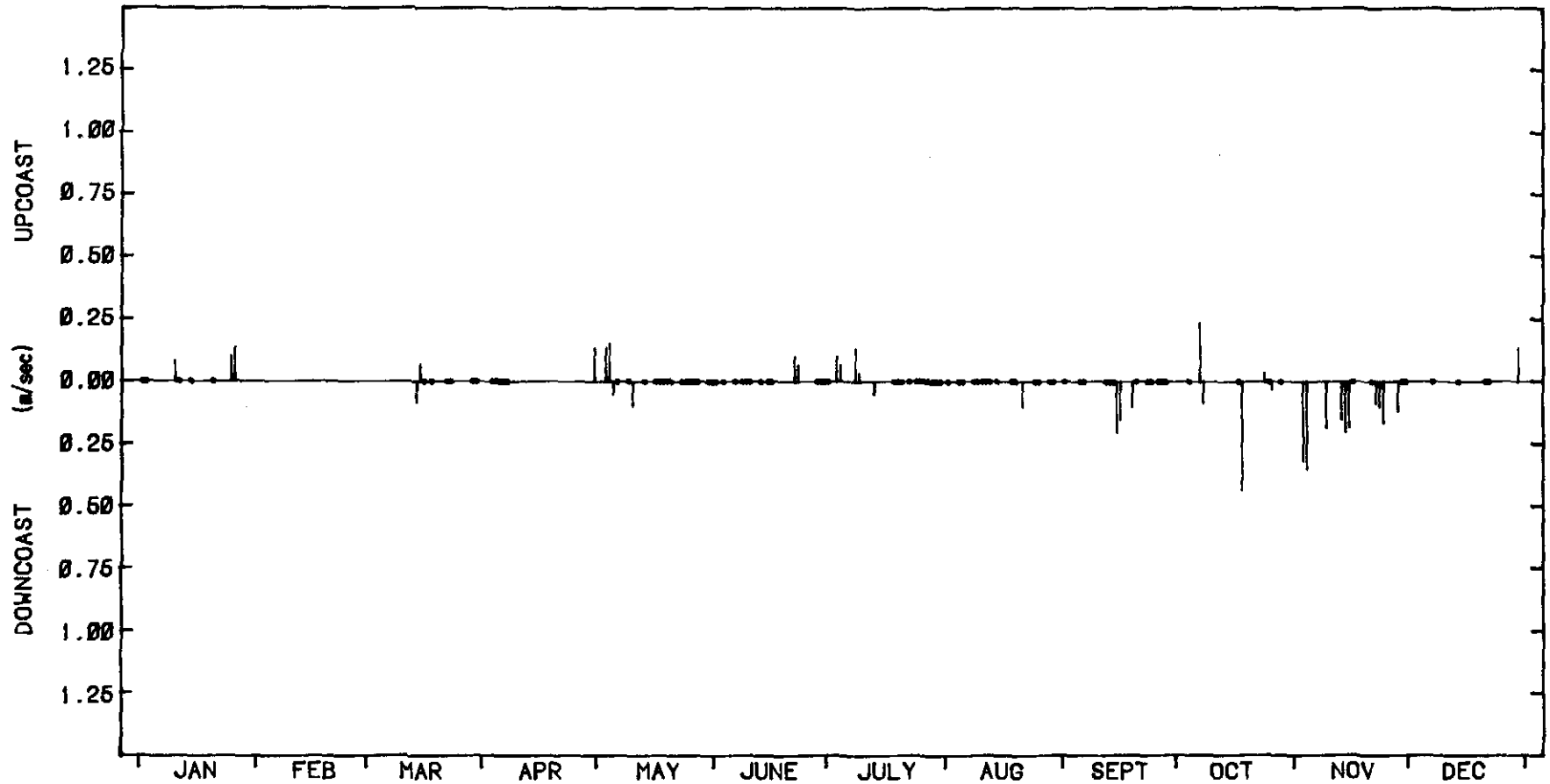
LITTORAL CURRENTS - AFTERNOON 1977

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LIVINGSTONE SHIRE

BARWELL CREEK

1983



LITTORAL CURRENT SUMMARY - 1977

Mean Vel = $-.012$ m/sec (down)

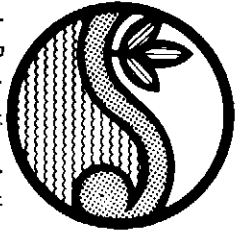
Mean Upcoast Vel = 0.106 m/sec

Mean Downcoast Vel = 0.154 m/sec

AFTERNOON OBSERVATIONS - (131 recordings)

Figure 19
C 17.1

COPE
Barwell Creek



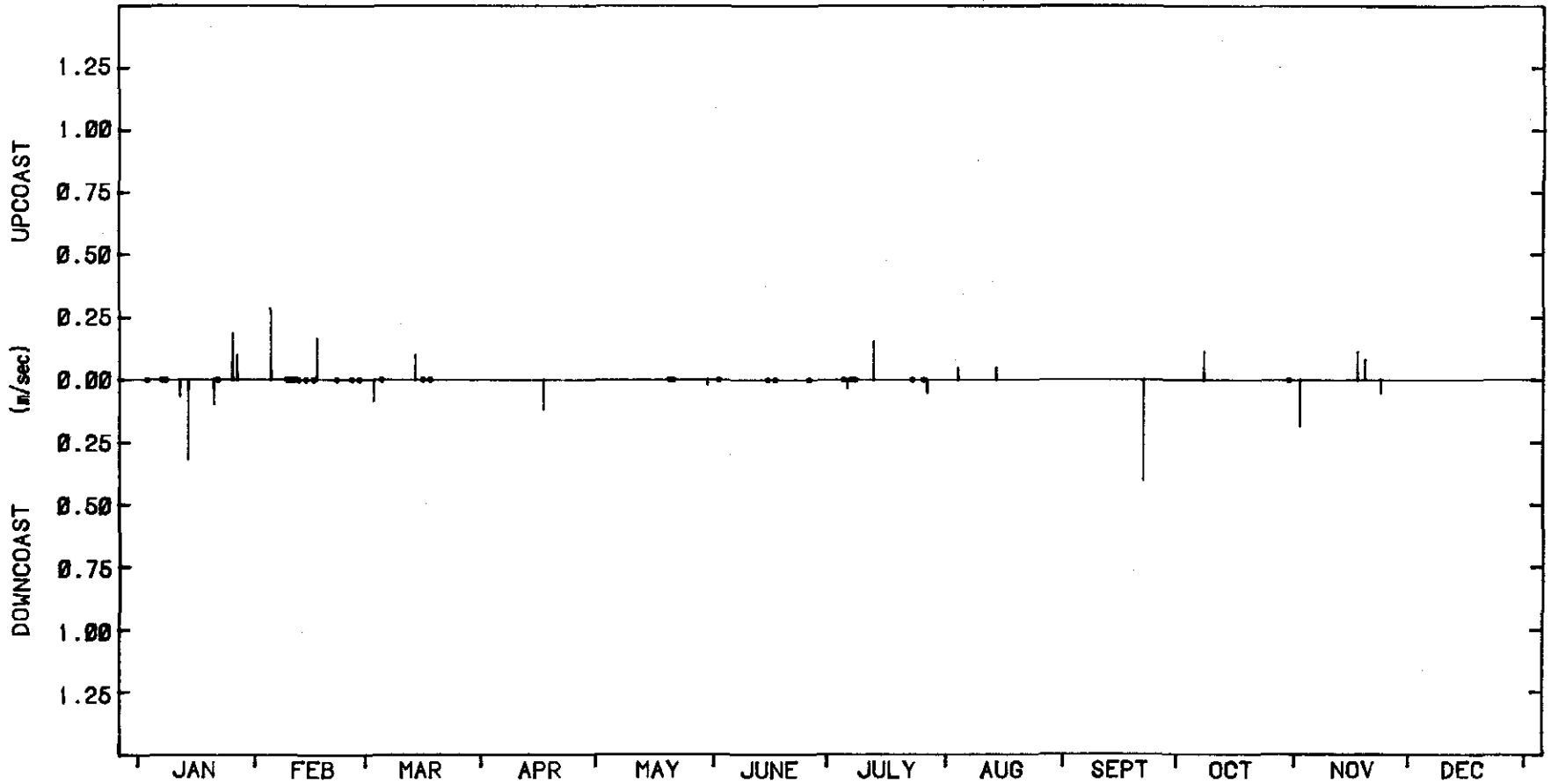
LITTORAL CURRENTS - MORNING 1978

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BARWELL CREEK

1603



LITTORAL CURRENT SUMMARY - 1978

Mean Vel = -.001 m/sec (down)

Mean Upcoast Vel = 0.127 m/sec

Mean Downcoast Vel = 0.129 m/sec

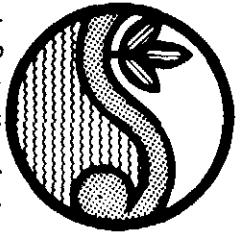
MORNING OBSERVATIONS - (50 recordings)

COPE

Barwell Creek

Figure 20

C 17.1



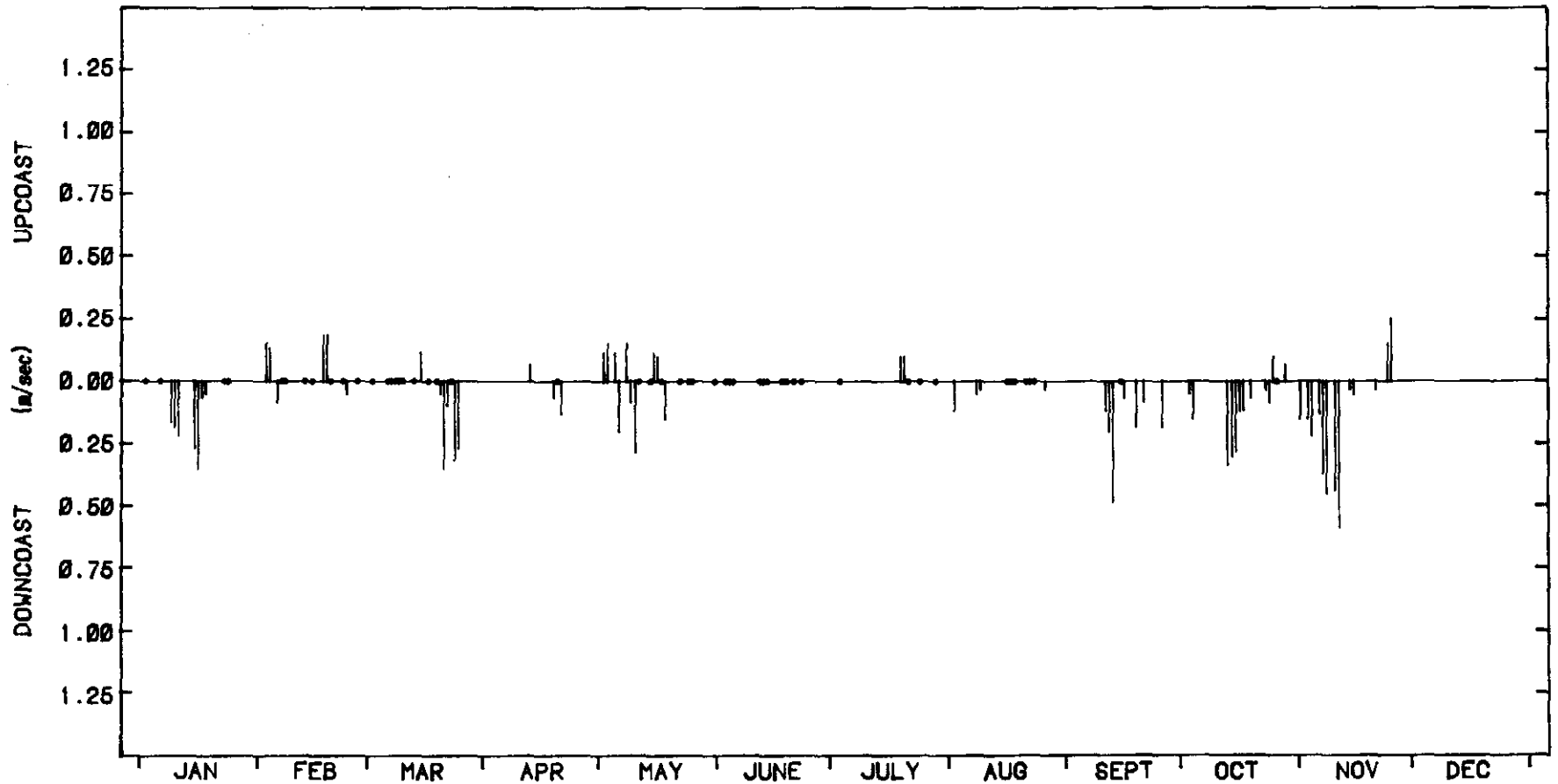
LITTORAL CURRENTS - AFTERNOON 1978

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BARWELL CREEK

1983



LITTORAL CURRENT SUMMARY - 1978

Mean Vel = -0.056 m/sec (down)

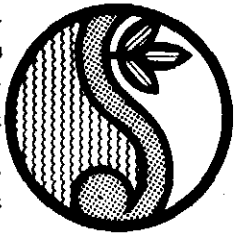
Mean Upcoast Vel = 0.131 m/sec

Mean Downcoast Vel = 0.175 m/sec

AFTERNOON OBSERVATIONS - (121 recordings)

Figure 21
C 17.1

COPE
Barwell Creek



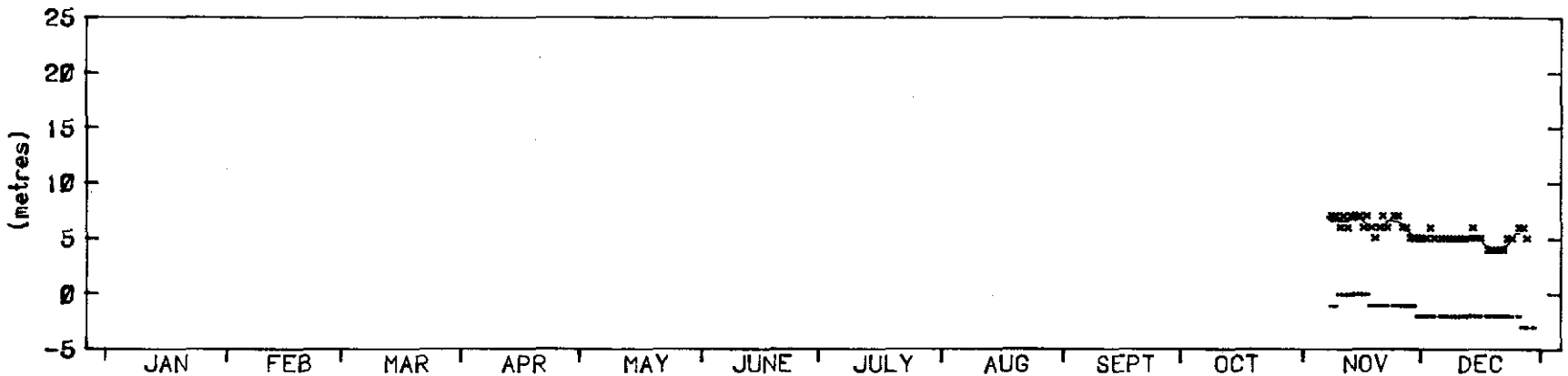
BEACH PROFILE PARAMETERS - 1975

COPE - Coastal Observation Programme Engineering

LIVINGSTONE SHIRE

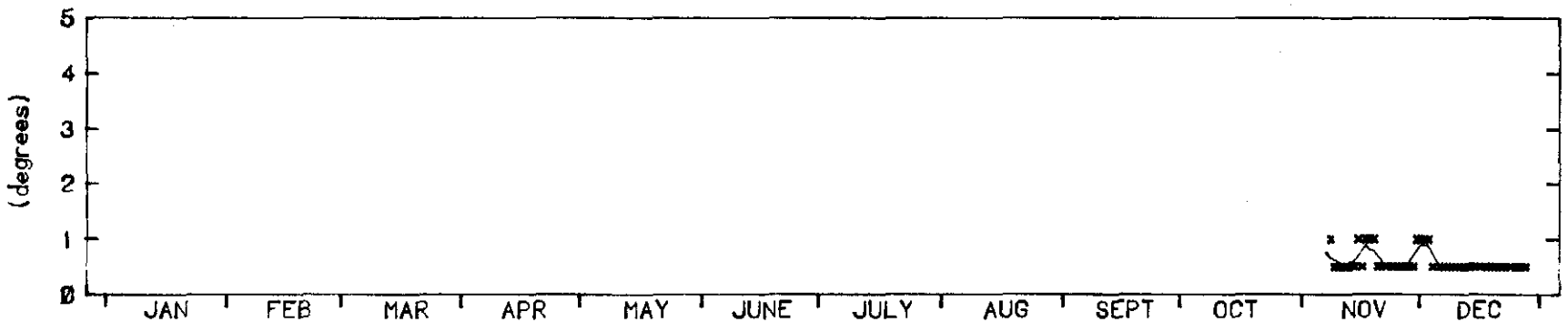
BARWELL CREEK

1603



DISTANCE TO FIXED CONTOUR AND VEGETATION LINE - 1975

Indicates Distance to Fixed Contour : 47 Observations Fixed Contour Level is approx 2.5 m above AHD
 Indicates Distance to Vegetation Line : 48 Observations



FORESHORE SLOPE - 1975

Five Day Moving Average

No. of Observations : 47

Figure 22
C 17.1

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Barwell Creek



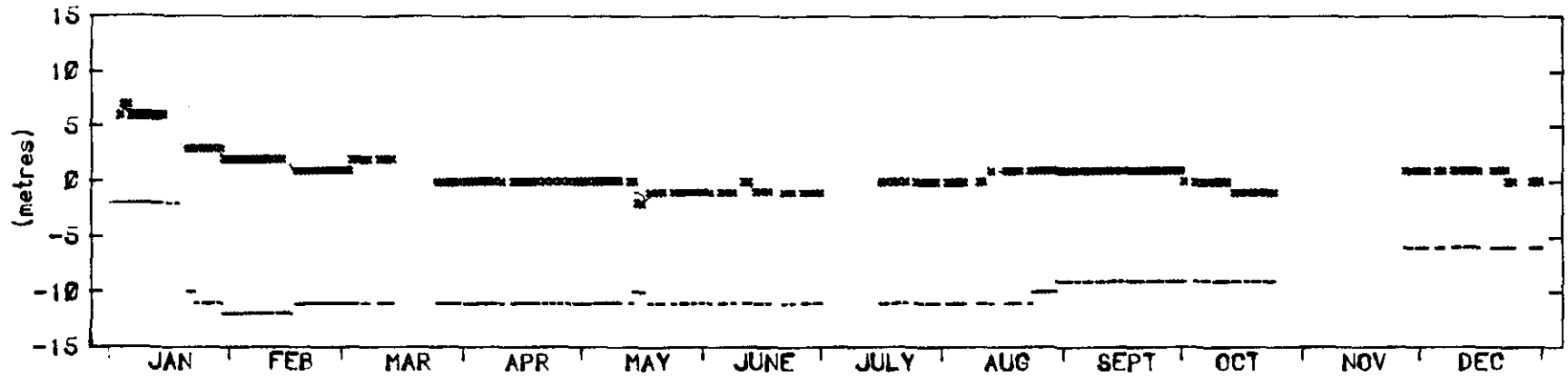
BEACH PROFILE PARAMETERS - 1976

COPE - Coastal Observation
Programme Engineering

LIVINGSTONE SHIRE

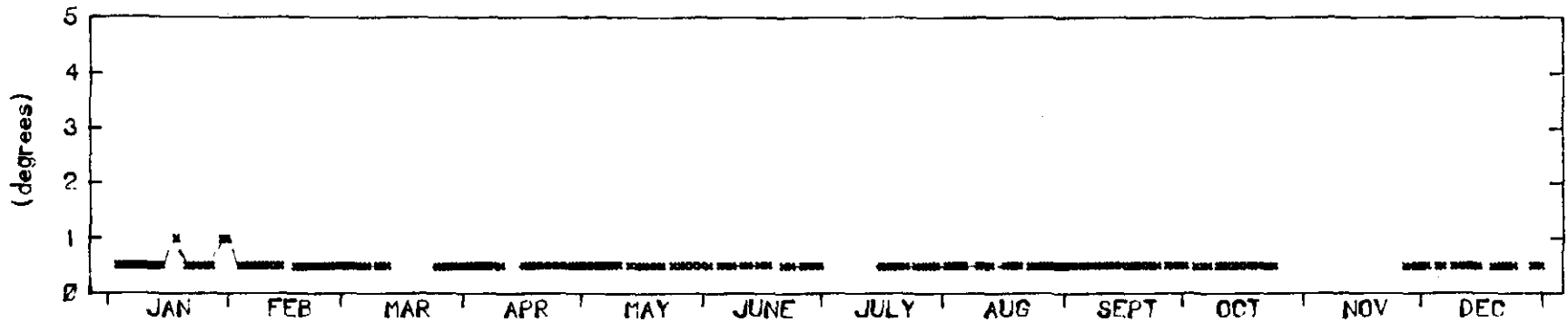
BARWELL CREEK

1983



DISTANCE TO FIXED CONTOUR AND VEGETATION LINE - 1976

— Indicates Distance to Fixed Contour : 211 Observations Fixed Contour Level is approx 2.5 m above AHD
 - - - Indicates Distance to Vegetation Line : 217 Observations



FORESHORE SLOPE - 1976

∩ Five Day Moving Average

No. of Observations : 199

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Barwell Creek

Figure 23

C 17.1



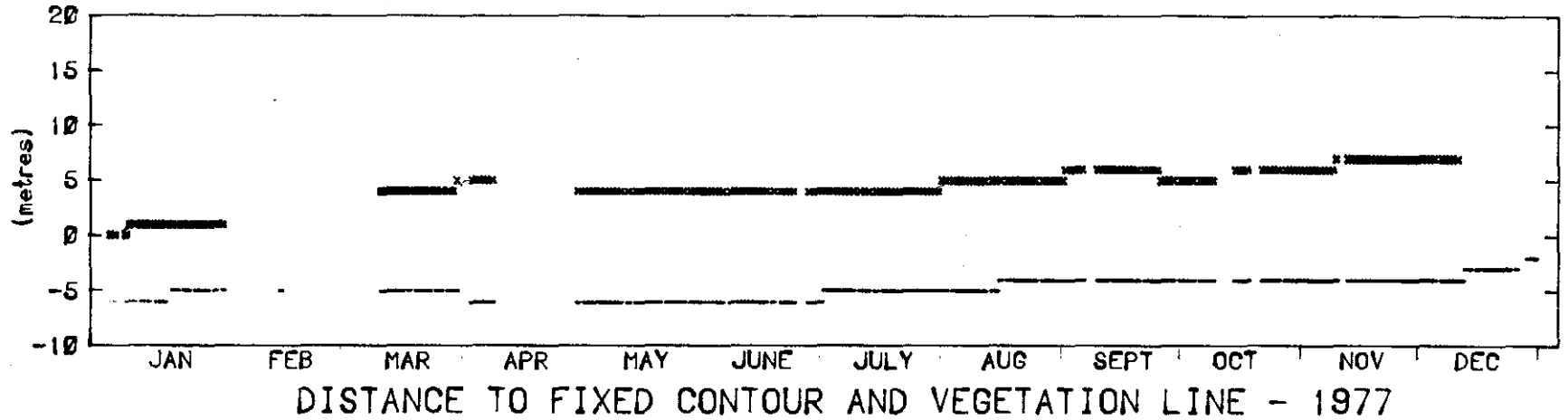
BEACH PROFILE PARAMETERS - 1977

COPE - Coastal Observation Programme Engineering

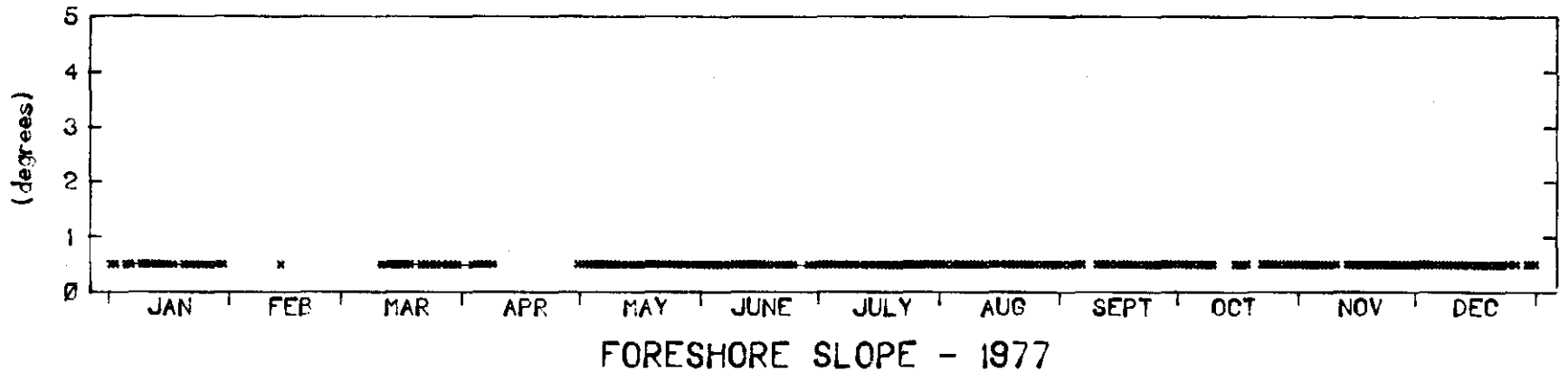
LIVINGSTONE SHIRE

BARWELL CREEK

1603



— Indicates Distance to Fixed Contour : 235 Observations Fixed Contour Level is approx 2.5 m above AHD
 - - - Indicates Distance to Vegetation Line : 252 Observations



∩ Five Day Moving Average

No. of Observations : 245

COPE
Barwell Creek

Figure 24

C 17.1



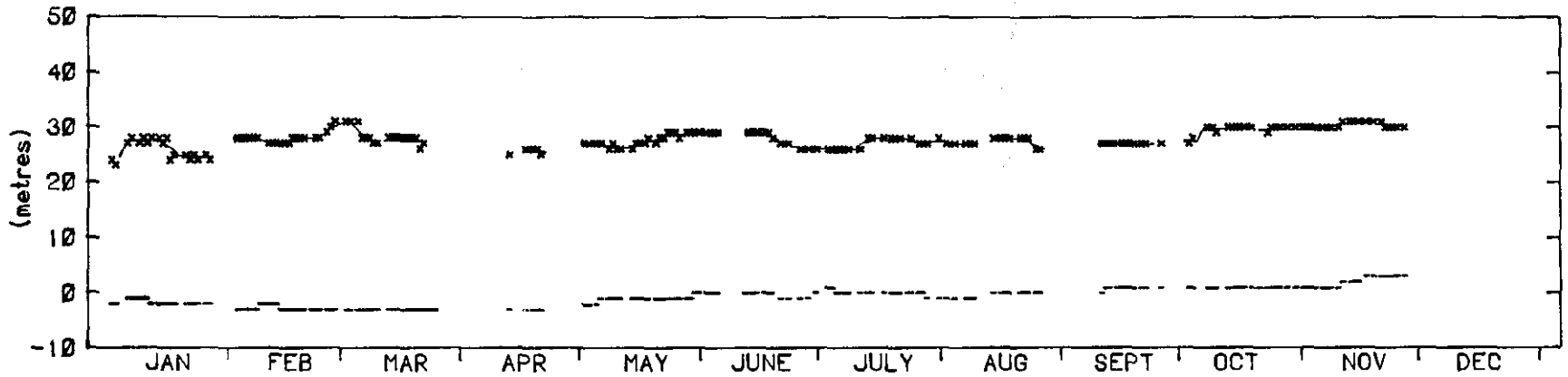
BEACH PROFILE PARAMETERS - 1978

COPE - Coastal Observation Programme Engineering

LIVINGSTONE SHIRE

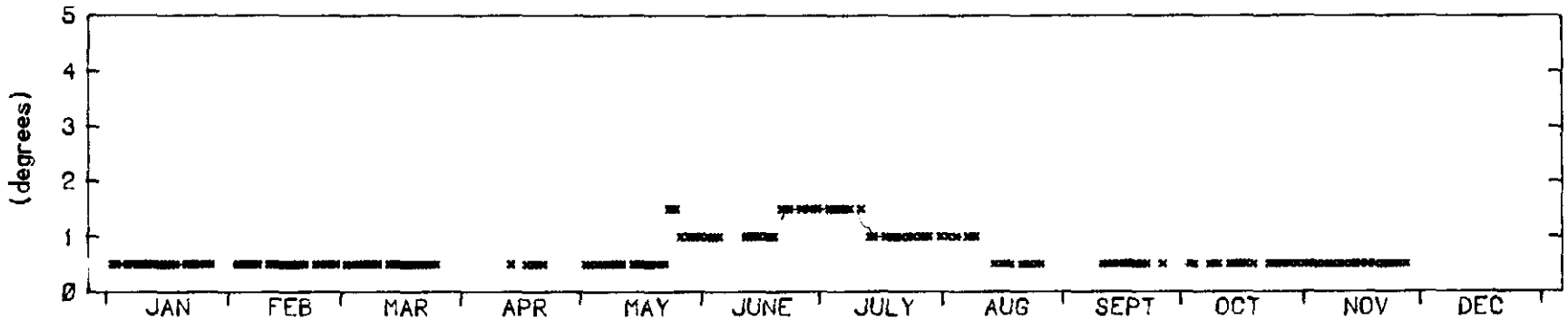
BARWELL CREEK

1603



DISTANCE TO FIXED CONTOUR AND VEGETATION LINE - 1978

xxxxx Indicates Distance to Fixed Contour : 182 Observations Fixed Contour Level is approx 1.8 m above AHD
 - - - Indicates Distance to Vegetation Line : 192 Observations



FORESHORE SLOPE - 1978

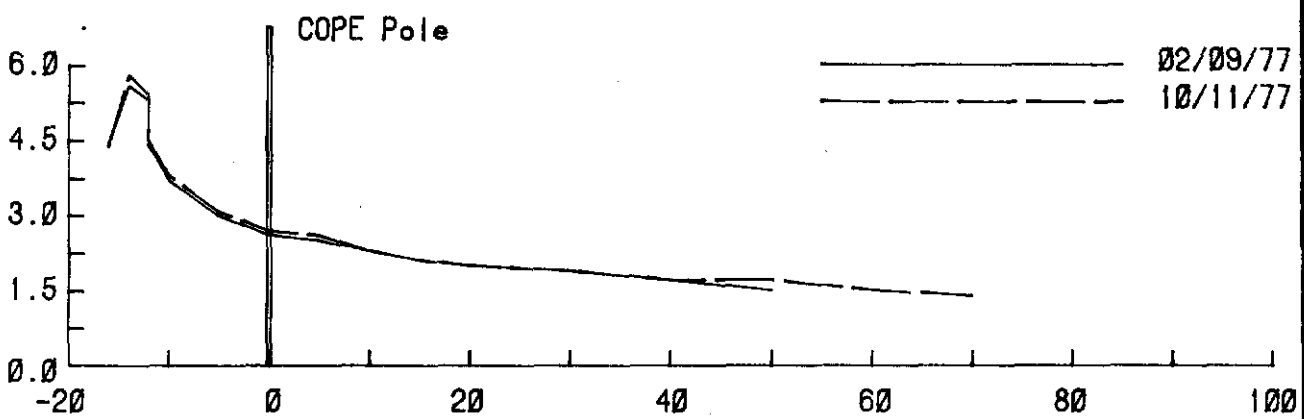
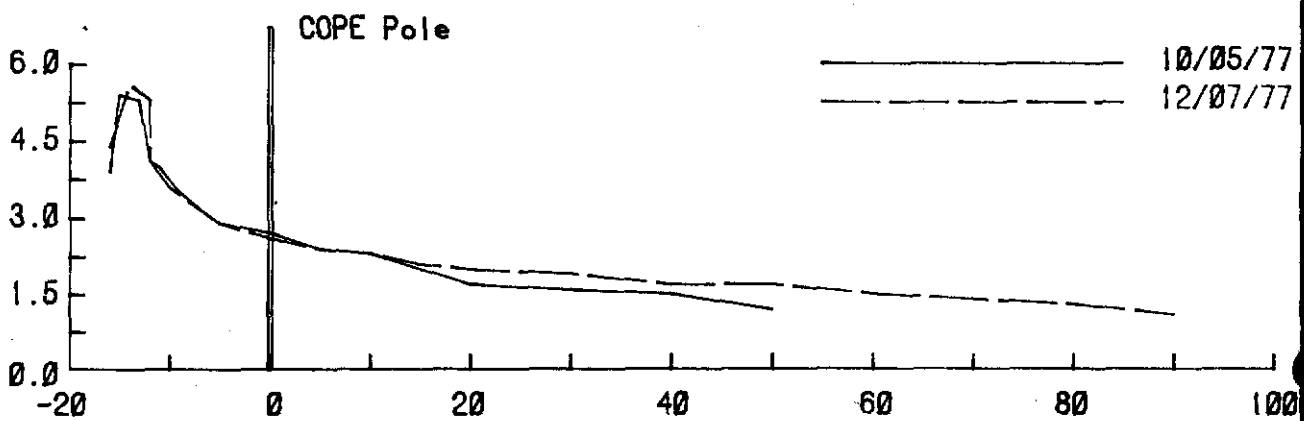
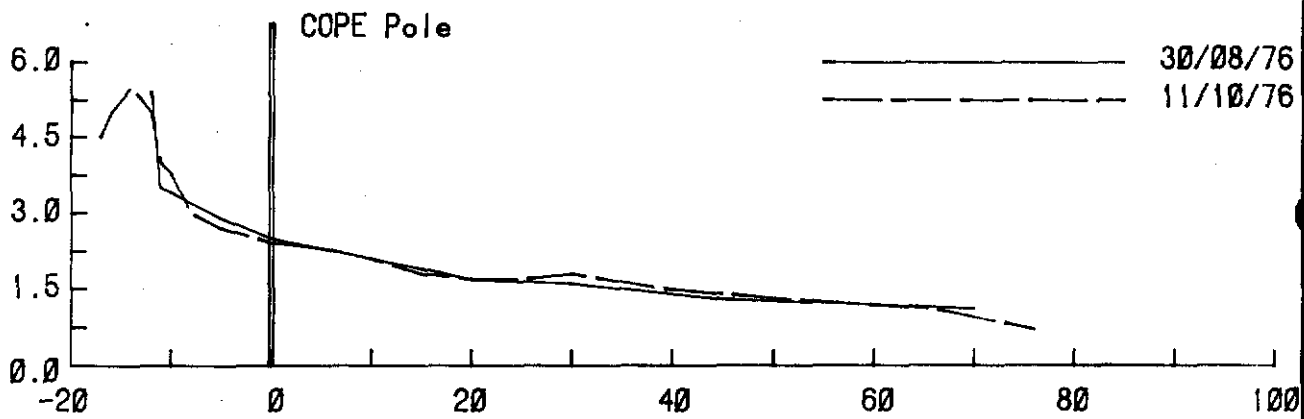
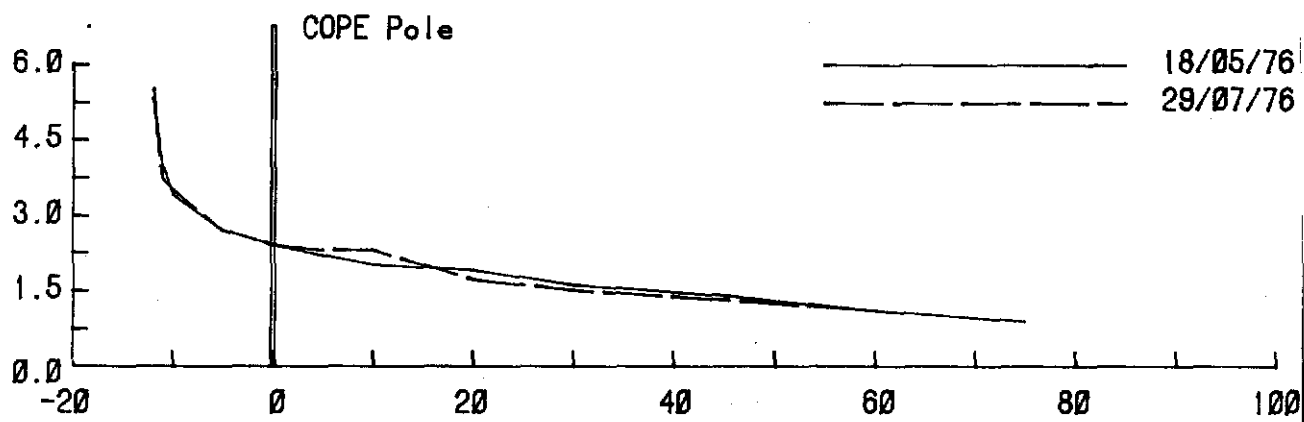
Five Day Moving Average

No. of Observations : 187

COPE

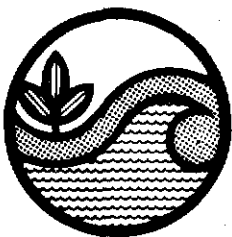
Barwell Creek

Figure 25
 C 17.1



Level Datum is A.H.D.

Distances and Levels are measured in Metres

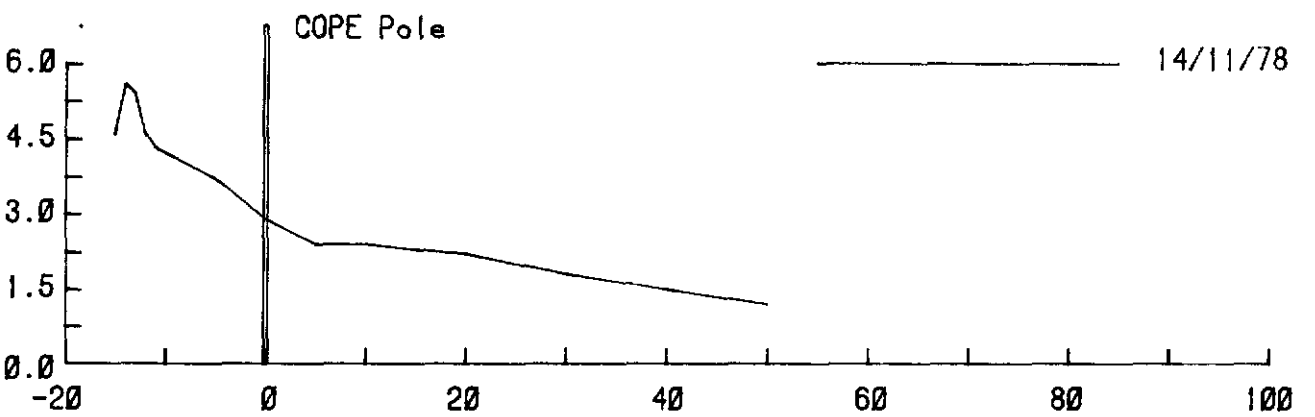
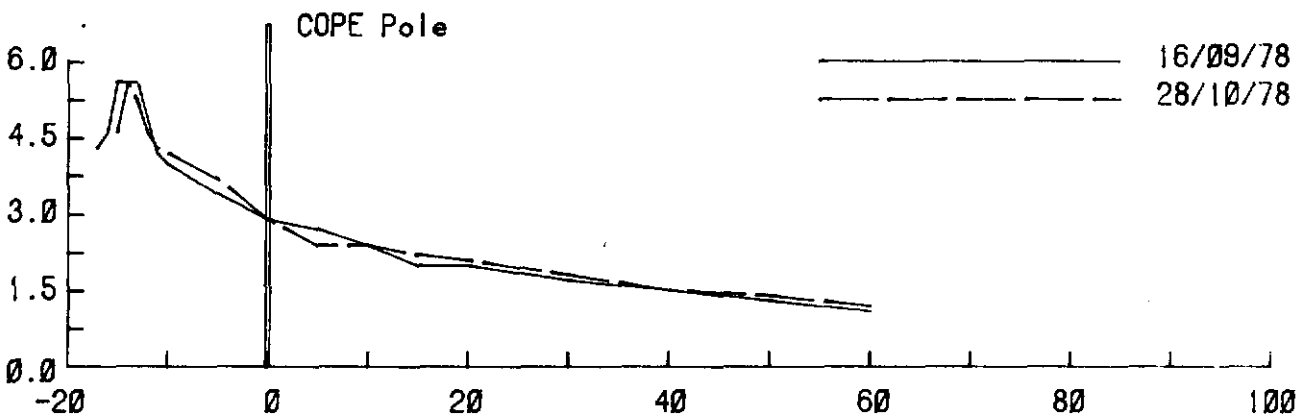
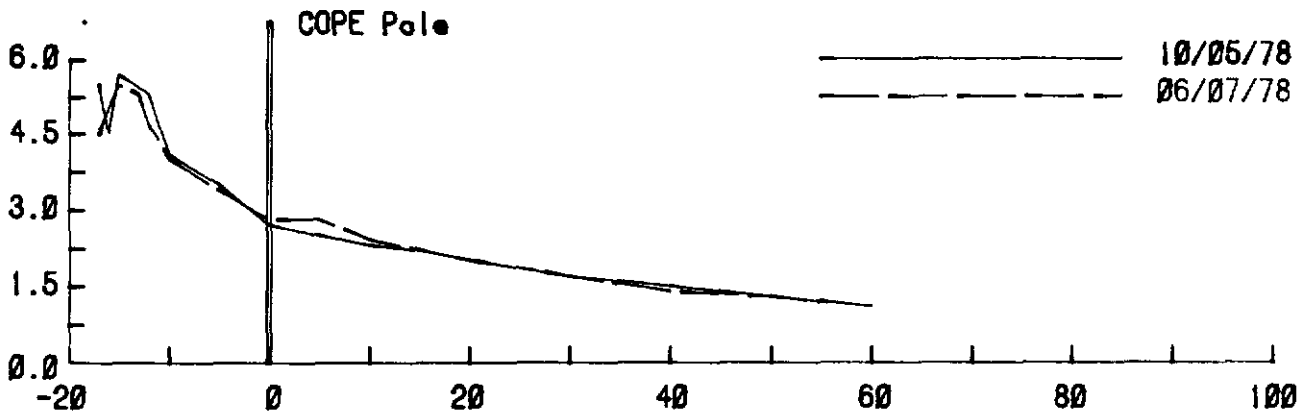
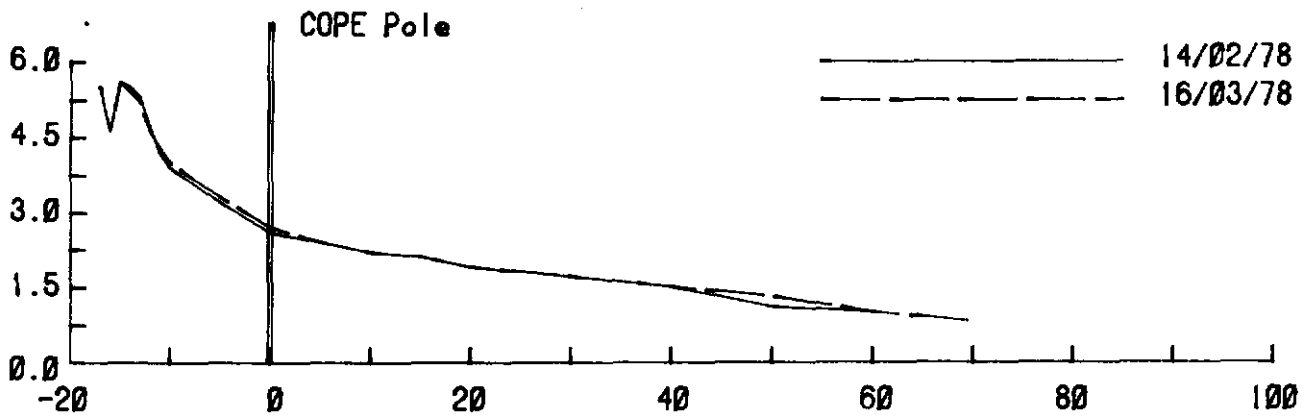


Beach Protection Authority

COPE
Barwell Creek

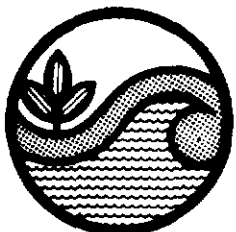
MONTHLY BEACH PROFILES
1976-1977

Figure 26
C 17.1



Level Datum is A.H.D.

Distances and Levels are measured in Metres



Beach Protection Authority

MONTHLY BEACH PROFILES
1978

COPE
Barwell Creek

Figure 27
C 17.1