COASTAL OBSERVATION PROGRAMME - ENGINEERING (COPE)

THEODOLITE CREEK - ISIS SHIRE

FOR THE YEARS 1976 TO 1981

REPORT NO. C21.1

Beach Protection Authority

May 1986

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DOCUMENTATION PAGE

REPORT NO.:- C21.1

TITLE:- Report - Coastal Observation Programme - Engineering (COPE), Theodolite Creek - Isis Shire

DATE:- May 1986

TYPE OF REPORT:- Technical Memorandum

ISSUING ORGANISATION:- Beach Protection Authority
G.P.O. BOX 2195
BRISBANE QLD 4001
AUSTRALIA

DISTRIBUTION:- Public Distribution

ABSTRACT:-

This report provides a summary of primary analyses of COPE data on wind, wave and beach processes observed at Theodolite Creek, within Isis Shire on the Southern Queensland coast. The data were recorded by volunteer observers Mr and Mrs Peter Rudd and assistant volunteer observer Mr Tom Doss during the period September 1976 to September 1981. The recordings were made daily during the five year period except for a gap of seven months from June 1980 to January 1981, during which no recordings were taken. The information published is considered representative of the long term conditions.

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Coastal Observation Programme - Engineering (COPE), Maroochydore - Maroochy Shire, (Report C20.1)

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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

The COPE observers are supplied with a basic kit of recording instruments including:-

- 30 metre Tape
- Wind Meter
- Abney Level
- 1.5 metre Measuring stick
- 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 five year period 1979 to 1981 in a useful statistical form. No attempt has been made to interpret the observed data.

If the five 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 Theodolite Creek COPE Station is located in southern Queensland within Isis Shire. It lies adjacent to the mouth of Theodolite Creek and is situated approximately 33 kilometres south-east of the town of Bundaberg.

2.2 Observers

This station has been operated by Mr and Mrs Peter Rudd and Mr Tom Doss during the period September 1976 to September 1981.

2.3 Observed Parameters

The observers at this station iniatially recorded twice daily at approximately 7.30 a.m. and 5.00 p.m. But from December 1979 this was reduced to once daily at approximately 9.00 a.m.

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 October 1976, a profile of the beach has usually been recorded monthly.

2.4 Tidal Information

Tidal information as presented below. Datum is low Water Datum.

M.H.W.S.	2.60 metres
M.H.W.N.	2.00 metres
M.S.L.	1.40 metres
M.L.W.N.	0.80 metres
M.L.W.S.	0.20 metres

A.H.D. is 1.430 metres above Low Water Datum.

2.5 Description of the Beach

The beach at the Theodolite Creek COPE Station exhibits the following characteristics:-

- Typical beach slopes: Foreshore slope is in the range 1 in 8 to 1 in 29 (7^{o} - 2^{o}).

- Beach width: Typically 10 to 45 metres measured from the seaward toe of frontal dune to Low Water Mark.

- D50 sand size: 0.53 mm averaged over five years.

- Adjoining Landform: Low narrow frontal dune system backed by a levelled and cleared area used for residential purposes.

- Vegetation: The foredune and seaward slope of the secondary dune is well vegetated, with sand spinifex grass (Spinifex sericeus) and goats foot convolvulus (Ipomoea pes-caprae) being the dominant species. Beach vigna (Vigna marina) and pangola grass (Digitaria decumbens) are also found.

  Horsetail she-oak (Casuarina equisetifolia var. incana) occur in a narrow belt along the crest and landward slope of the secondary dune. Herbaceous vegetation in this area has been highly modified, with blue couch (Digitaria didactyla) having been extensively planted.

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 Isis 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 five year period September 1976 to September 1981 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^{o} to 60^{o}
Sector 2	-	61^{o} to 85^{o}
Sector 3	-	86^{o} to 95^{o}
Sector 4	-	96^{o} to 120^{o}
Sector 5	-	121^{o} to 180^{o}

Note: 0^{o} is the beach alignment to the left of the observer when facing seaward, and at the COPE station this direction is approximately 18^{o} west of 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 (Figure 6 to Figure 15.)

(d) tabulation of the occurrence of various wave heights, periods, types and directions (Tables 1 to 6).

3.4 *Longshore Currents*

The observers 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 16 to Figure 25). 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 reference pole to the 1.2 metre, relative to A.H.D. fixed contour level.
- 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 Figure 26 to Figure 31.

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 Figure 32 to Figure 34.

TABLE 1

MONTHLY AND ANNUAL

MEAN WAVE HEIGHT/MEAN WAVE PERIOD AND WAVE TYPE/WAVE DIRECTION OCCURRENCES

Theodolite Creek **Year 1976**

MONTH	MEAN WAVE PERIOD (secs)	MEAN WAVE HEIGHT (metres)	Percentage Occurrence - 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	5.9	0.23	33.3	66.7	-	-	-	-	-	-	100.0	-	-
OCTOBER	6.6	0.25	52.5	37.7	-	9.8	-	-	75.4	19.7	4.9	-	-
NOVEMBER	5.2	0.35	47.4	29.8	-	22.8	-	-	66.7	28.1	5.2	-	-
DECEMBER	4.7	0.30	51.6	16.1	-	32.3	-	-	54.8	32.3	12.9	-	-
WHOLE YEAR	5.7	0.30	50.0	30.9	0.0	19.1	0.0	0.0	66.4	25.0	8.6	0.0	0.0

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

Theodolite Creek **Year 1977**

MONTH	MEAN WAVE PERIOD (secs)	MEAN WAVE HEIGHT (metres)	Percentage Occurrence – Wave Type/Wave Direction										
			Wave Type					Wave Direction					
			SP	PL	Surge	SP/PL	Calm	1	2	3	4	5	Calm
JANUARY	5.1	0.41	34.9	16.3	-	48.8	-	-	25.6	27.9	46.5	-	-
FEBRUARY	5.4	0.51	28.0	20.0	-	52.0	-	-	32.0	24.0	44.0	-	-
MARCH	6.1	0.37	46.2	19.2	5.8	28.8	-	-	13.5	59.6	26.9	-	-
APRIL	5.3	0.40	36.2	10.6	-	53.2	-	-	26.1	39.1	34.8	-	-
MAY	6.2	0.28	18.6	46.5	-	34.9	-	-	23.3	60.4	16.3	-	-
JUNE	6.7	0.25	2.6	59.0	-	33.3	5.1	-	15.4	51.3	28.2	-	5.1
JULY	6.1	0.24	19.4	25.0	-	55.6	-	-	8.3	55.6	36.1	-	-
AUGUST	6.2	0.25	21.4	33.3	2.4	42.9	-	-	16.7	42.8	40.5	-	-
SEPTEMBER	4.6	0.31	5.6	36.1	-	58.3	-	-	58.4	22.2	19.4	-	-
OCTOBER	4.7	0.49	18.4	18.4	-	63.2	-	4.1	47.1	18.4	18.4	2.0	-
NOVEMBER	4.5	0.45	25.0	-	-	75.0	-	-	58.3	14.6	27.1	-	-
DECEMBER	4.3	0.52	16.7	5.6	-	77.7	-	-	50.0	16.7	33.3	-	-
WHOLE YEAR	5.5	0.37	24.1	24.1	0.8	50.6	0.4	0.4	31.5	36.6	30.9	0.2	0.4

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

Theodolite Creek **Year 1978**

MONTH	MEAN WAVE PERIOD (secs)	MEAN WAVE HEIGHT (metres)	Percentage Occurrence – Wave Type/Wave Direction										
			Wave Type					Wave Direction					
			SP	PL	Surge	SP/PL	Calm	1	2	3	4	5	Calm
JANUARY	4.2	0.48	17.6	8.8	–	73.6	–	–	29.4	47.1	23.5	–	–
FEBRUARY	4.2	0.44	25.0	14.3	–	60.7	–	–	35.7	35.7	28.6	–	–
MARCH	5.1	0.52	14.2	4.8	–	81.0	–	–	28.6	19.0	47.6	4.8	–
APRIL	4.7	0.37	10.5	–	5.3	84.2	–	–	10.5	47.4	42.1	–	–
MAY	3.7	0.60	–	–	–	100.0	–	–	–	100.0	–	–	–
JUNE	7.7	0.24	18.7	50.0	–	25.0	6.3	–	12.5	56.2	25.0	–	6.3
JULY	7.3	0.38	7.1	52.4	–	40.5	–	–	21.4	52.5	19.0	7.1	–
AUGUST	7.7	0.45	3.2	29.0	–	67.8	–	–	35.5	35.5	19.4	9.6	–
SEPTEMBER	5.4	0.39	28.6	19.0	–	52.4	–	–	45.2	31.0	19.0	4.8	–
OCTOBER	4.7	0.53	36.4	22.7	4.5	36.4	–	–	22.7	31.8	41.0	4.5	–
NOVEMBER	4.7	0.50	35.7	21.4	–	42.9	–	–	42.9	32.1	25.0	–	–
DECEMBER	4.8	0.43	15.0	15.0	–	70.0	–	–	55.0	40.0	5.0	–	–
WHOLE YEAR	5.5	0.44	20.2	22.7	0.9	55.9	0.3	0.0	31.3	38.6	26.4	3.4	0.3

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

Theodolite Creek **Year 1979**

MONTH	MEAN WAVE PERIOD (secs)	MEAN WAVE HEIGHT (metres)	Percentage Occurrence – Wave Type/Wave Direction										
			Wave Type					Wave Direction					
			SP	PL	Surge	SP/PL	Calm	1	2	3	4	5	Calm
JANUARY	3.8	0.55	16.7	–	–	83.3	–	–	16.7	–	83.3	–	–
FEBRUARY	4.9	0.61	32.0	4.0	–	64.0	–	–	12.0	16.0	72.0	–	–
MARCH	5.5	0.35	20.7	27.6	–	51.7	–	–	17.2	31.0	51.8	–	–
APRIL	6.2	0.33	11.1	11.1	–	77.8	–	–	44.4	38.9	16.7	–	–
MAY	5.7	0.34	5.0	50.0	–	45.0	–	–	10.0	60.0	30.0	–	–
JUNE	6.0	0.40	25.0	20.8	–	54.2	–	–	8.3	54.2	33.3	4.2	–
JULY	6.7	0.45	–	6.3	–	93.7	–	–	12.5	62.5	25.0	–	–
AUGUST	4.9	0.35	–	–	–	100.0	–	–	–	100.0	–	–	–
SEPTEMBER	5.2	0.28	53.8	30.8	–	15.4	–	–	53.8	23.1	23.1	–	–
OCTOBER	4.6	0.32	37.5	18.7	–	37.5	6.3	–	18.7	50.0	25.0	–	6.3
NOVEMBER	5.4	0.26	47.8	47.8	4.4	–	–	21.7	43.6	30.4	4.3	–	–
DECEMBER	4.7	0.35	55.6	11.0	5.6	27.8	–	11.1	38.9	16.7	33.3	–	–
WHOLE YEAR	5.4	0.38	27.6	22.4	1.0	48.5	0.5	3.3	23.8	37.1	34.8	0.5	0.5

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

TABLE 5

MONTHLY AND ANNUAL

MEAN WAVE HEIGHT/MEAN WAVE PERIOD AND WAVE TYPE/WAVE DIRECTION OCCURENCES

Theodolite Creek **Year 1980**

MONTH	MEAN WAVE PERIOD (secs)	MEAN WAVE HEIGHT (metres)	Percentage Occurrence - Wave Type/Wave Direction										
			Wave Type					Wave Direction					
			SP	PL	Surge	SP/PL	Calm	1	2	3	4	5	Calm
JANUARY	5.0	0.49	54.5	18.2	4.5	22.8	-	-	45.5	40.9	13.6	-	-
FEBRUARY	5.4	0.65	40.0	44.0	-	16.0	-	-	20.0	40.0	36.0	4.0	-
MARCH	5.5	0.44	65.0	10.0	-	25.0	-	-	30.0	60.0	10.0	-	-
APRIL	5.1	0.54	61.5	15.4	-	23.1	-	-	15.4	38.4	46.2	-	-
MAY	5.3	0.40	70.0	20.0	-	10.0	-	-	20.0	40.0	40.0	-	-
JUNE													
JULY													
AUGUST													
SEPTEMBER													
OCTOBER													
NOVEMBER													
DECEMBER													
WHOLE YEAR	5.2	0.52	55.6	23.3	1.1	20.0	0.0	0.0	27.8	44.4	26.7	1.1	0.0

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

TABLE 6

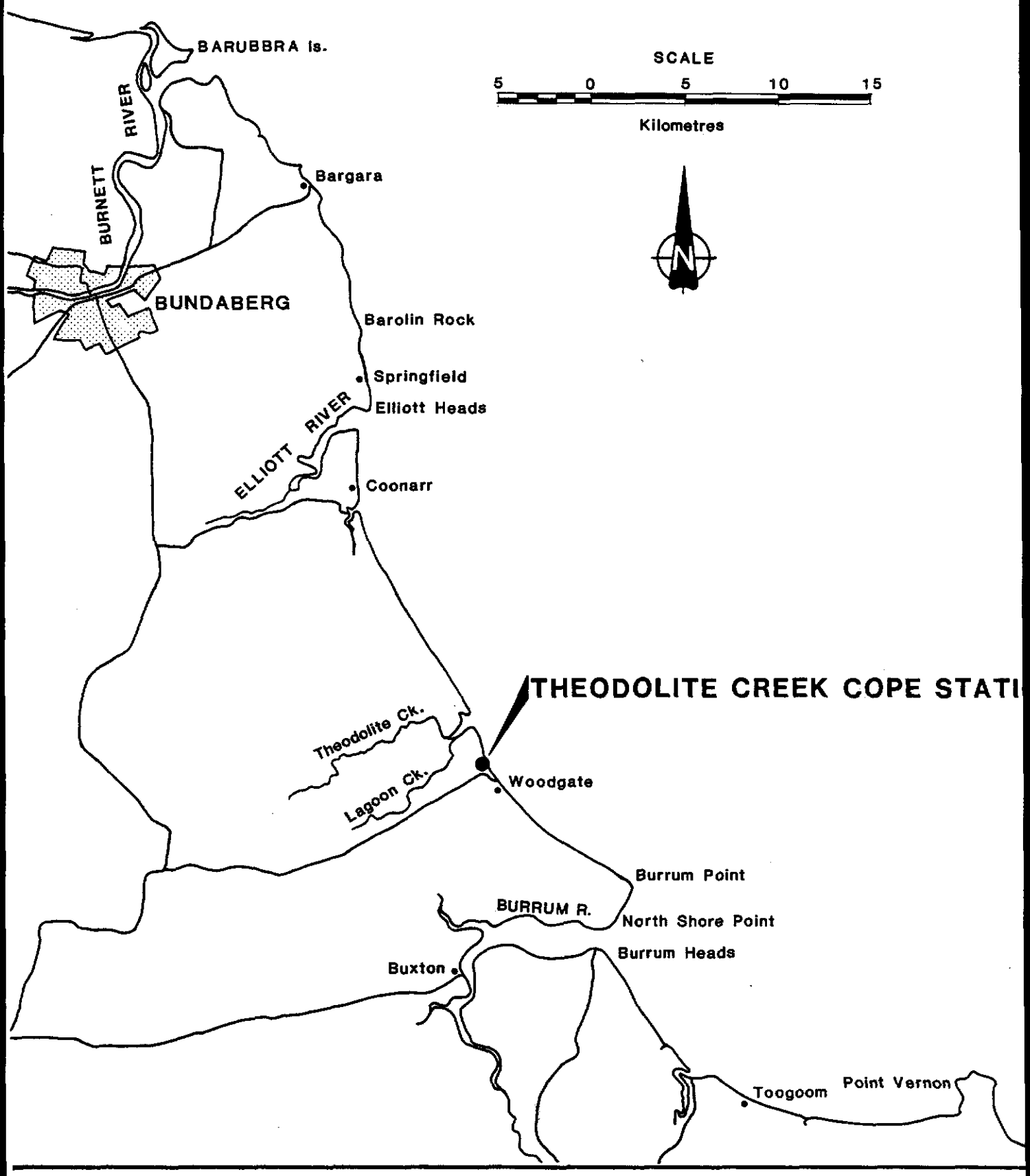
MONTHLY AND ANNUAL

MEAN WAVE HEIGHT/MEAN WAVE PERIOD AND TYPE/WAVE DIRECTION OCCURENCES

Theodolite Creek **Year 1981**

MONTH	MEAN WAVE PERIOD (secs)	MEAN WAVE HEIGHT (metres)	Percentage Occurrence – Wave Type/Wave Direction										
			Wave Type					Wave Direction					
			SP	PL	Surge	SP/PL	Calm	1	2	3	4	5	Calm
JANUARY	4.2	0.14	15.0	10.0	-	75.0	-	-	-	35.0	65.0	-	-
FEBRUARY	4.7	0.40	25.0	37.4	6.3	31.3	-	-	31.3	25.0	43.7	-	-
MARCH	5.5	0.27	10.0	10.0	-	80.0	-	-	5.0	55.0	35.0	5.0	-
APRIL	6.3	0.20	5.0	-	-	95.0	-	-	-	40.0	60.0	-	-
MAY	7.1	0.37	-	-	-	100.0	-	-	12.5	50.0	37.5	-	-
JUNE	6.2	0.15	-	-	-	75.0	25.0	-	-	50.0	-	25.0	25.0
JULY	5.5	0.32	-	11.1	-	88.9	-	-	33.3	22.2	44.5	-	-
AUGUST	6.5	0.26	65.0	5.0	-	20.0	10.0	5.0	35.0	30.0	20.0	-	10.0
SEPTEMBER	6.7	0.33	100.0	-	-	-	-	-	-	100.0	-	-	-
OCTOBER													
NOVEMBER													
DECEMBER													
WHOLE YEAR	5.6	0.26	21.7	10.0	0.8	65.0	2.5	0.8	14.2	39.2	41.6	1.7	2.5

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



Beach Protection Authority

LOCALITY PLAN

COPE
Theodolite Cre

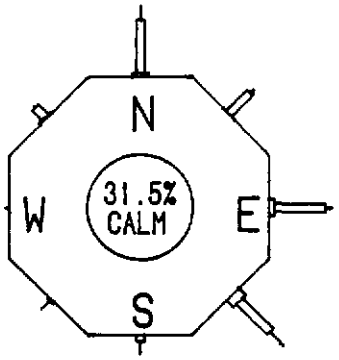
Figure 1

C 21.1

COPE - Coastal Observation Programme Engineering

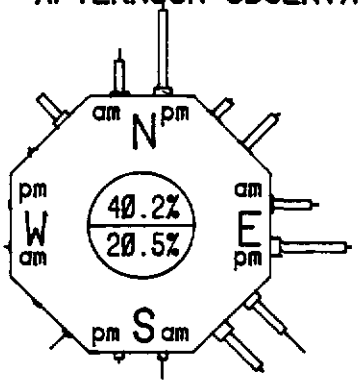
ISIS SHIRE THEODOLITE CREEK 1102

ALL OBSERVATIONS



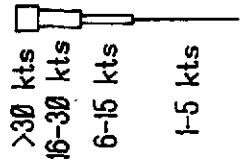
Total No. of Observations : 1395

MORNING - AFTERNOON OBSERVATIONS



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

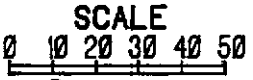
LEGEND



No. of Morning Observations : 776
No. of Afternoon Observations : 619

Mean Time :- Morning Obs : 0750 hrs
Mean Time :- Afternoon Obs : 1647 hrs

SCALE



WIND DATA - SEPT 1976 to SEPT 1981

Beach Protection Authority

WAVE HEIGHT PERCENTAGE EXCEEDANCE

ALL DATA

COPE

Theodolite Cree

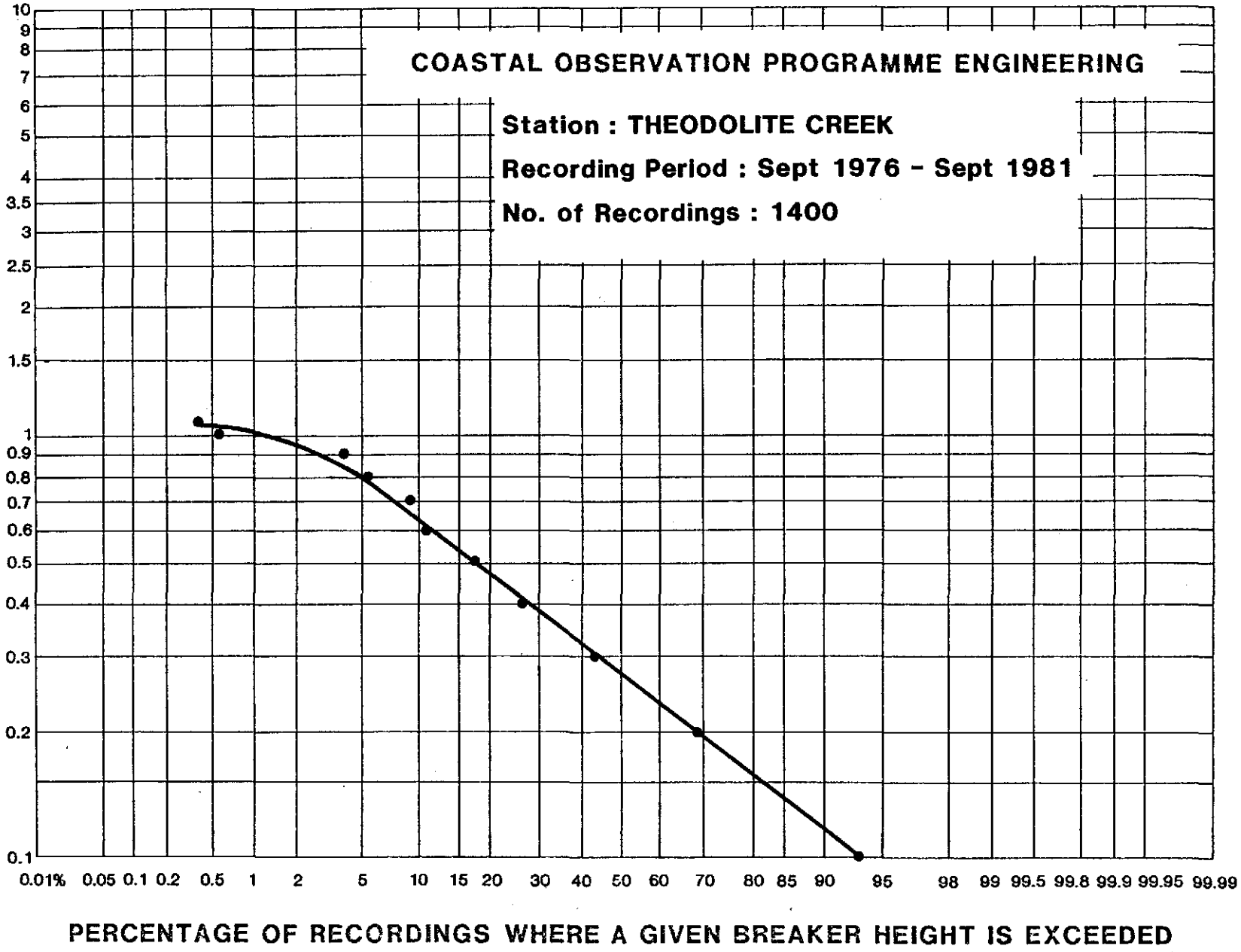
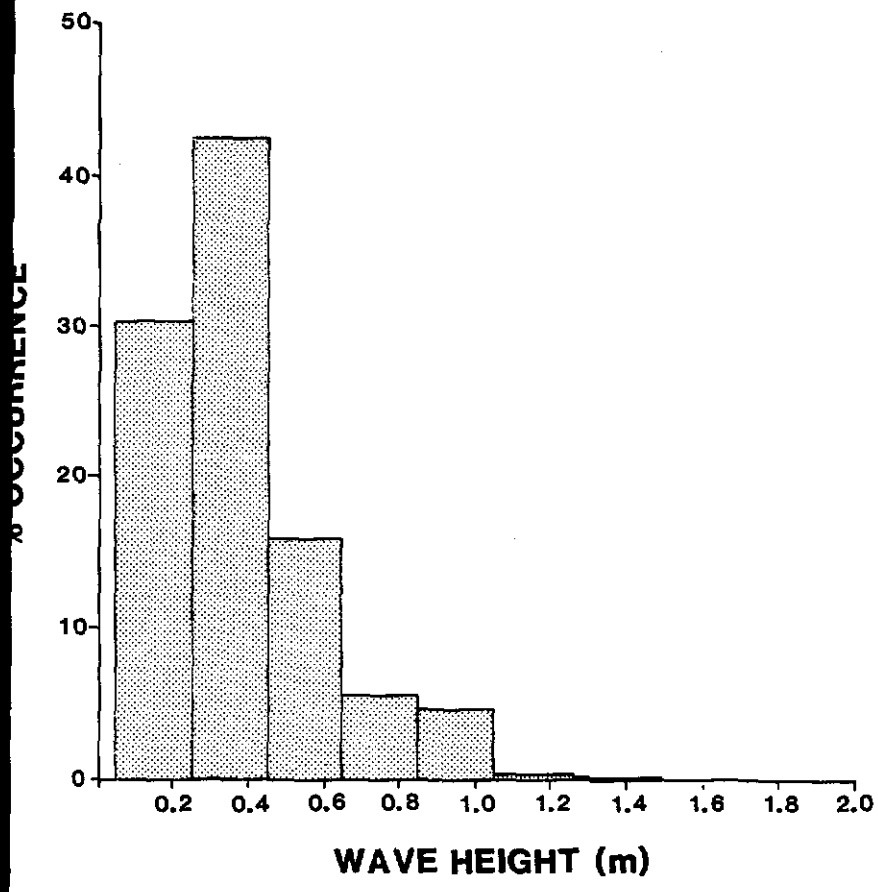


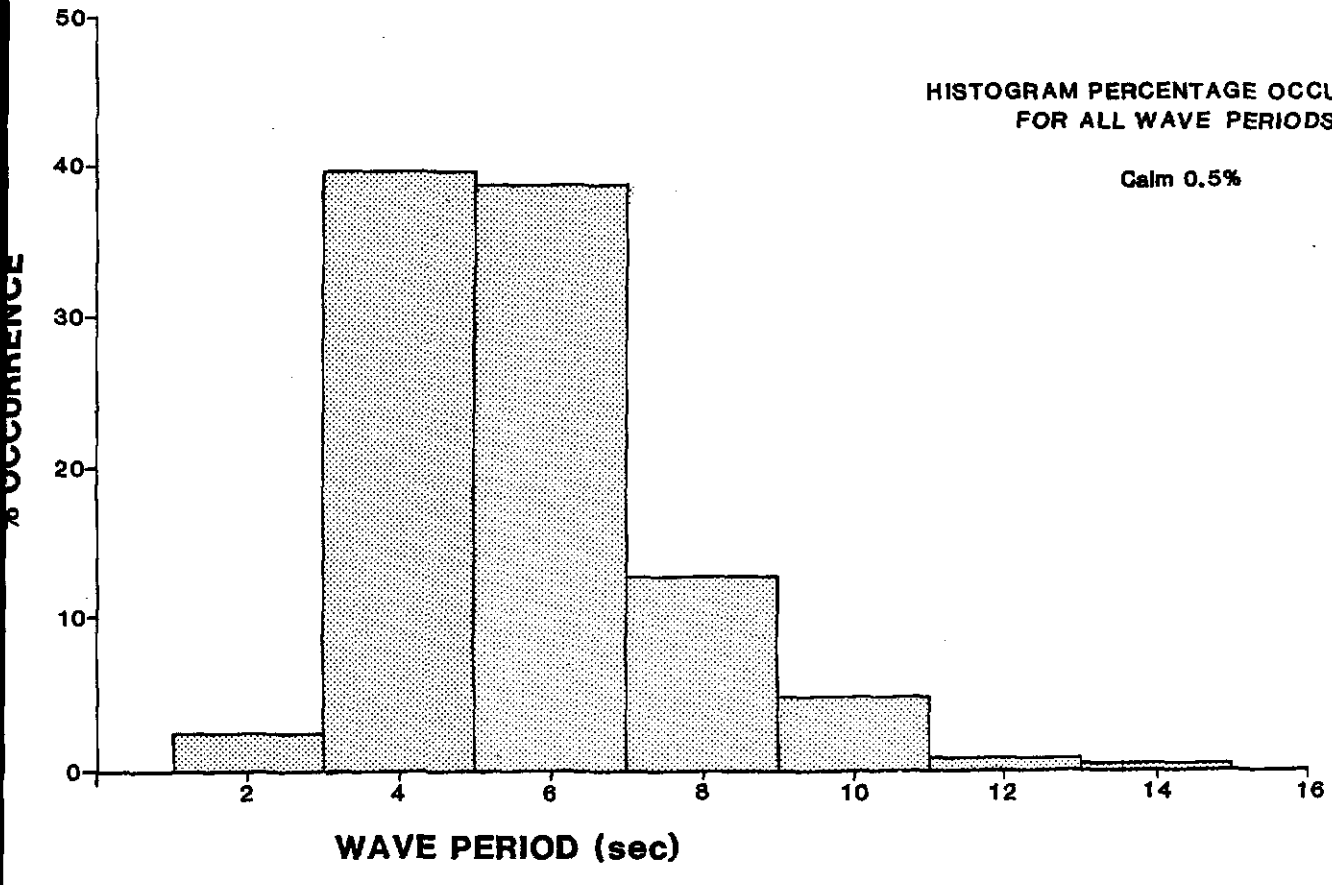
Figure 3

C 21.1



HISTOGRAM PERCENTAGE OCCURRENCE
FOR ALL WAVE HEIGHTS

Calm 0.5%



HISTOGRAM PERCENTAGE OCCURRENCE
FOR ALL WAVE PERIODS

Calm 0.5%

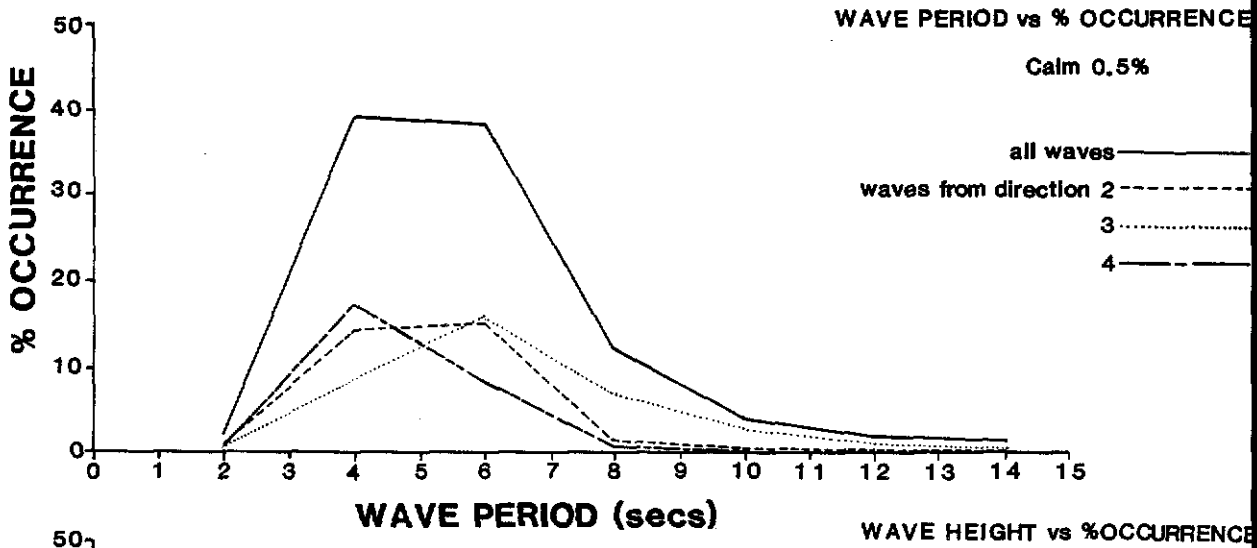
Beach Protection Authority

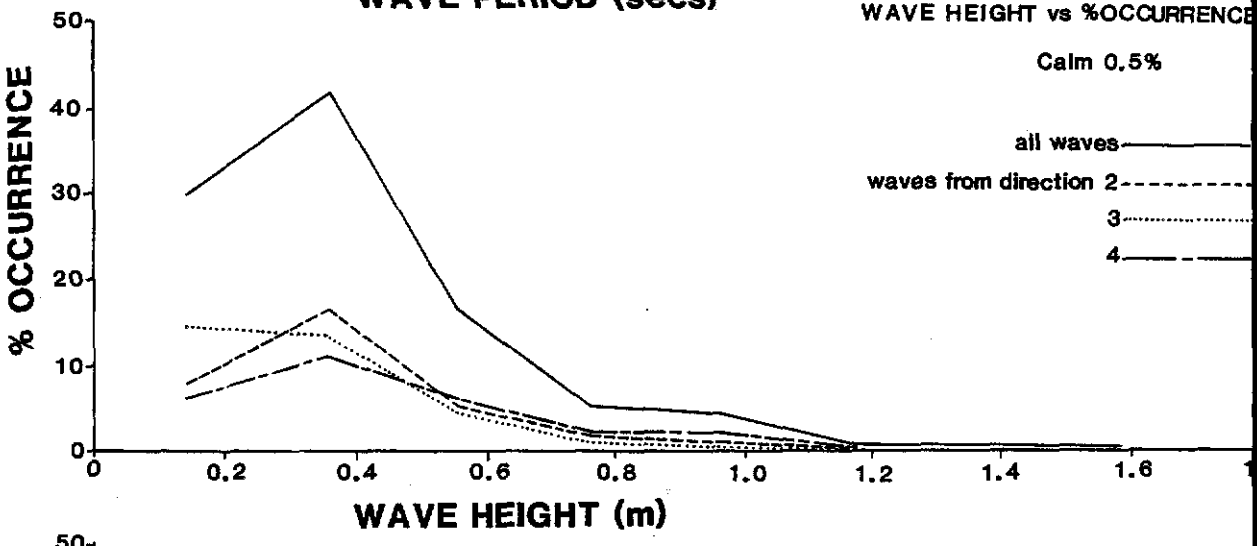
PERCENTAGE OCCURRENCE OF WAVE HEIGHT AND WAVE PERIOD ALL DATA

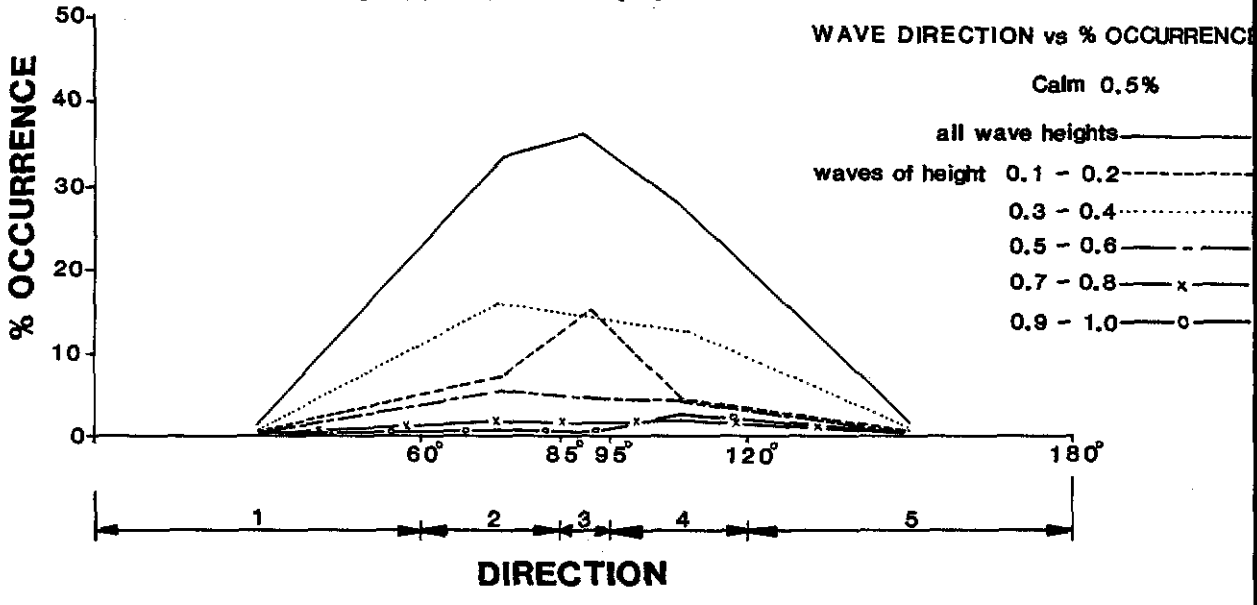
COPE
Theodolite Creek

Figure 4

C 21.1







Beach Protection Authority

WAVE DIRECTION ANALYSIS
ALL DATA

COPE
Theodolite Cre

Figure 5

C 21.1

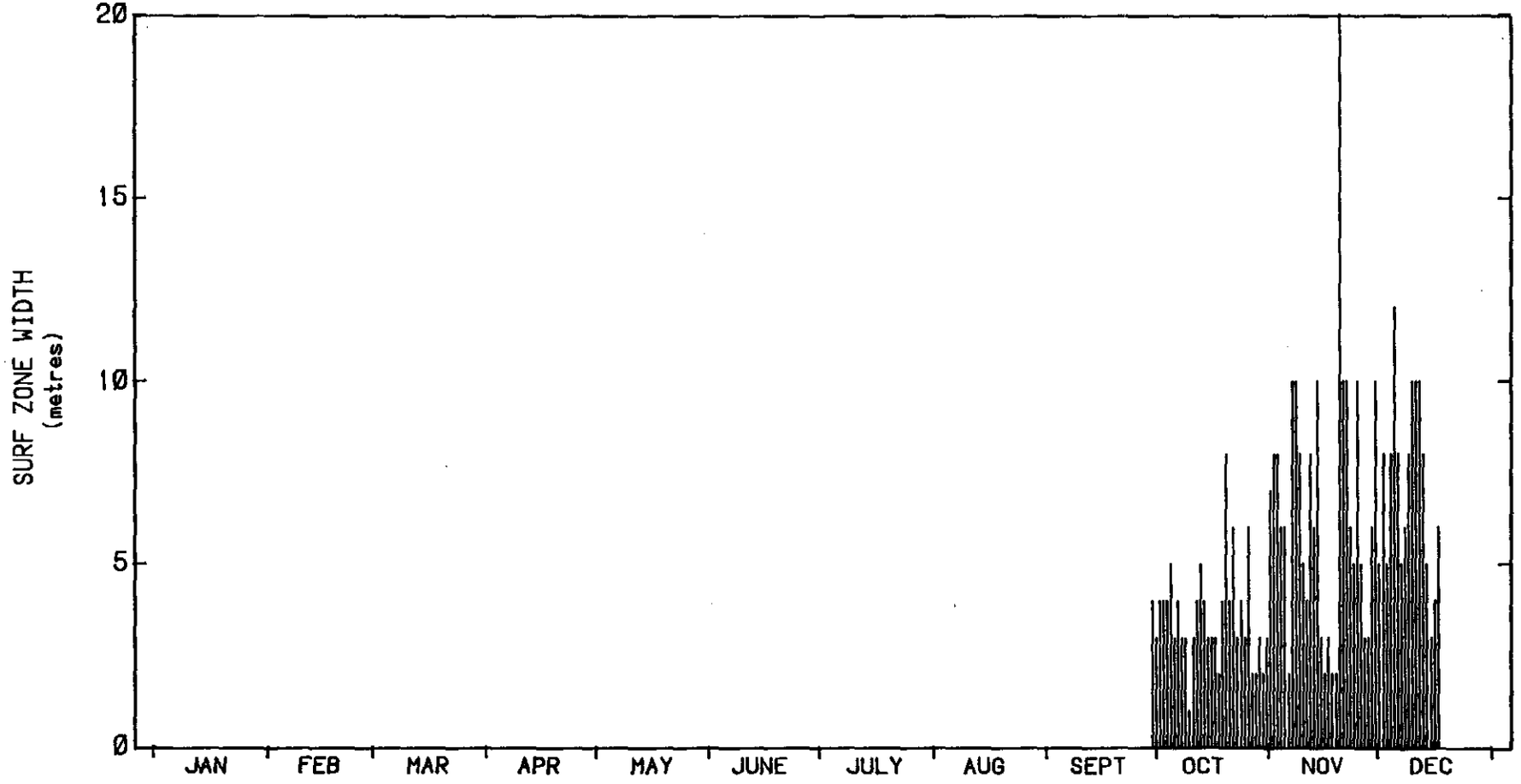
Beach Protection Authority

COPE - Coastal Observation Programme Engineering

THEODOLITE CREEK

ISIS SHIRE

1102



SURF ZONE WIDTH - MORNING 1976

COPE
Theodolite Creek

Figure 6
C 21.1

SURF ZONE WIDTH SUMMARY - 1976

No. of Observations : 79

MORNING OBSERVATIONS

Mean Surf Zone Width = 5.5 m

Beach Protection Authority

COPE - Coastal Observation Programme Engineering

THEODOLITE CREEK

ISIS SHIRE

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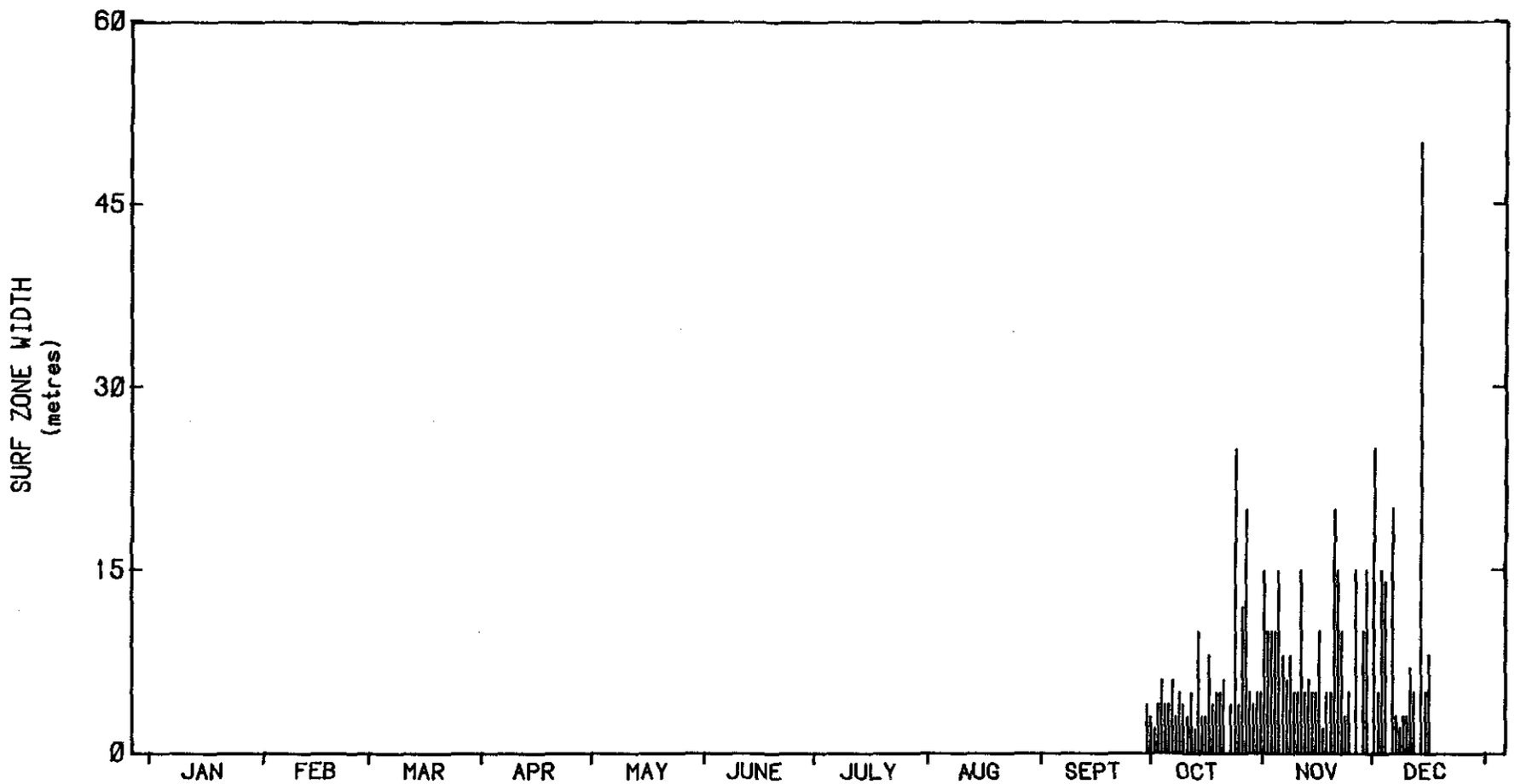


SURF ZONE WIDTH - AFTERNOON 1976

SURF ZONE WIDTH SUMMARY - 1976

No. of Observations : 72

AFTERNOON OBSERVATIONS

Mean Surf Zone Width = 8.2 m

COPE Theodolite Cr

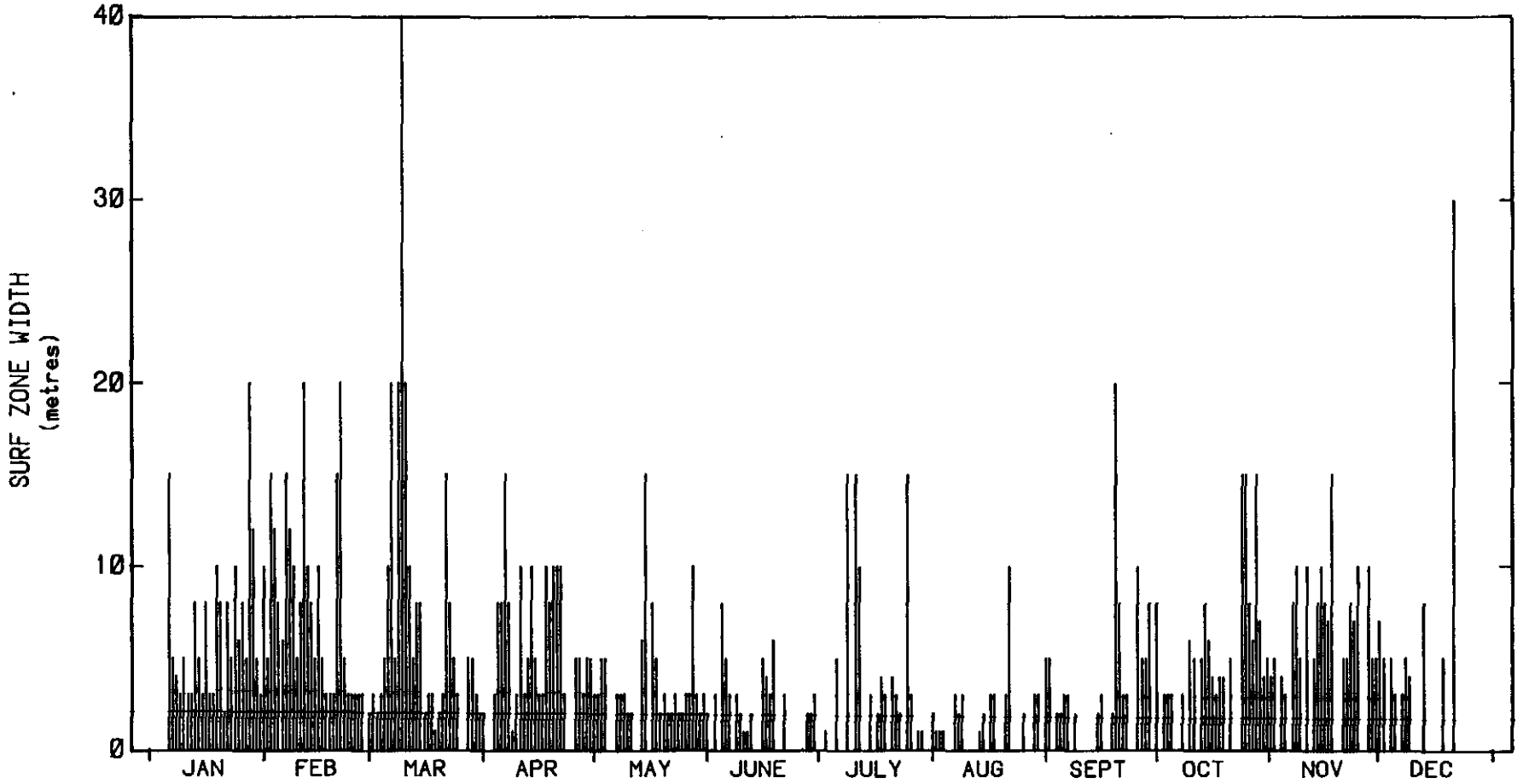
Figure 7

C 21.1

Beach Protection Authority

COPE - Coastal Observation Programme Engineering

THEODOLITE CREEK ISIS SHIRE 1102



SURF ZONE WIDTH - MORNING 1977

SURF ZONE WIDTH SUMMARY - 1977

No. of Observations : 260 MORNING OBSERVATIONS Mean Surf Zone Width = 5.9 m

COPE Theodolite Cre

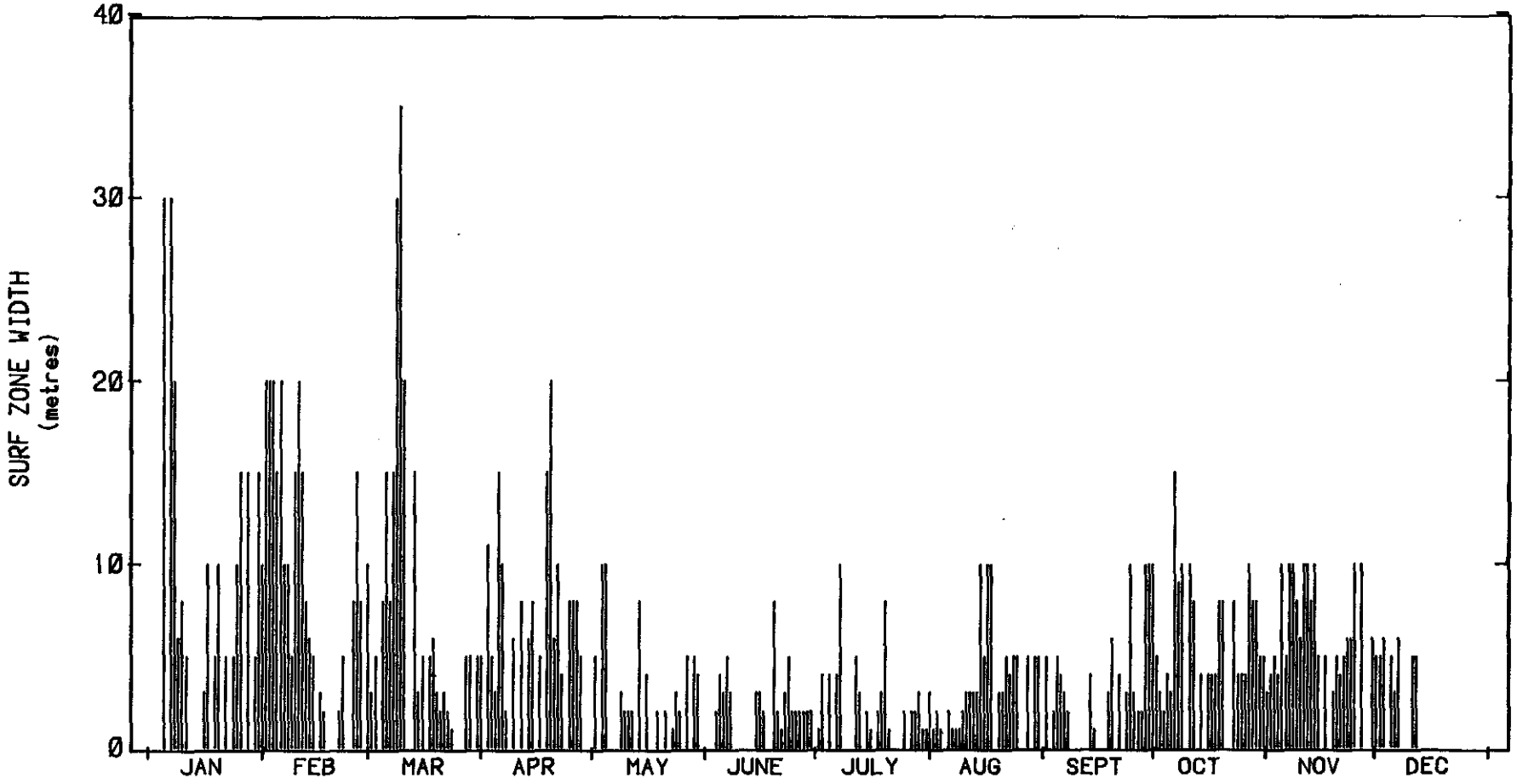
Figure 8

C 21.1

Beach Protection Authority

COPE - Coastal Observation Programme Engineering

THEODOLITE CREEK ISIS SHIRE 1102



SURF ZONE WIDTH - AFTERNOON 1977

SURF ZONE WIDTH SUMMARY - 1977

No. of Observations : 242 AFTERNOON OBSERVATIONS Mean Surf Zone Width = 6.4 m

COPE
Theodolite Creek

Figure 9
C 21.1

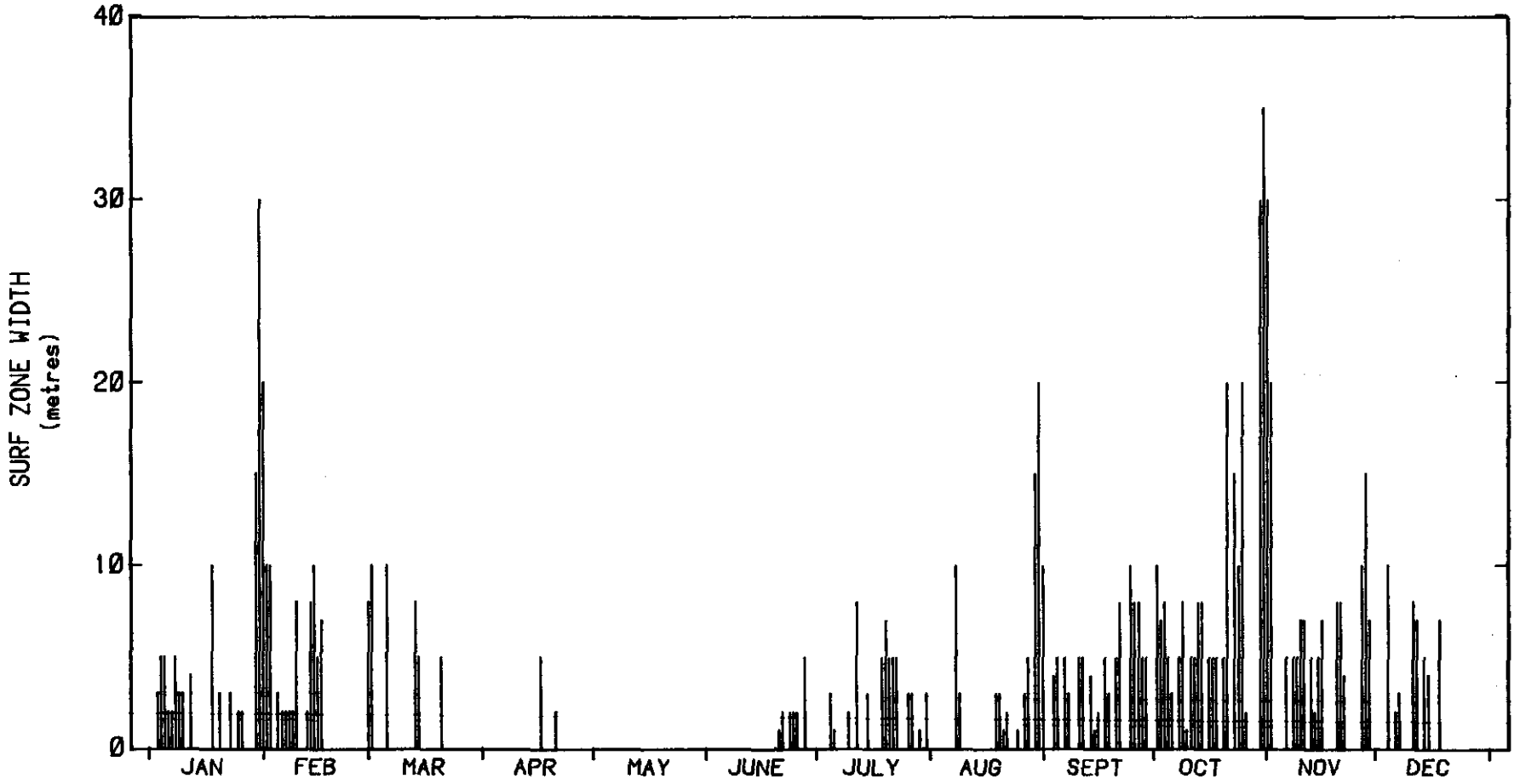
Beach Protection Authority

COPE - Coastal Observation Programme Engineering

THEODOLITE CREEK

ISIS SHIRE

1102



SURF ZONE WIDTH SUMMARY - 1978

No. of Observations : 138

MORNING OBSERVATIONS

Mean Surf Zone Width = 6.5 m

SURF ZONE WIDTH - MORNING 1978

COPE
Theodolite Cre

Figure 10
C 21.1

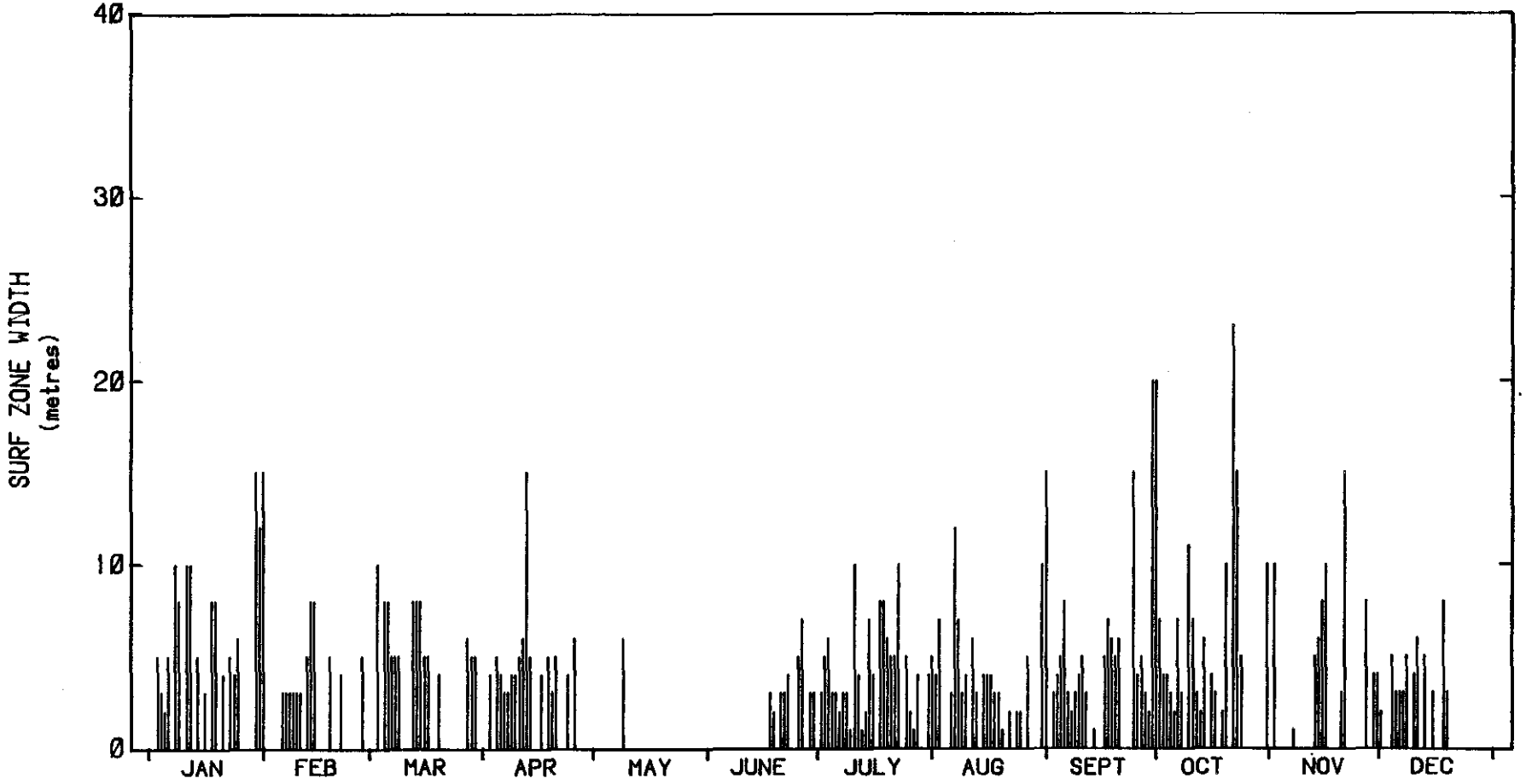
Beach Protection Authority

COPE - Coastal Observation Programme Engineering

THEODOLITE CREEK

ISIS SHIRE

1102



SURF ZONE WIDTH SUMMARY - 1978

No. of Observations : 188

AFTERNOON OBSERVATIONS

Mean Surf Zone Width = 5.5 m

SURF ZONE WIDTH - AFTERNOON 1978

COPE
Theodolite Creek

Figure 11
C 21.1

COPE - Coastal Observation Programme Engineering

THEODOLITE CREEK

ISIS SHIRE

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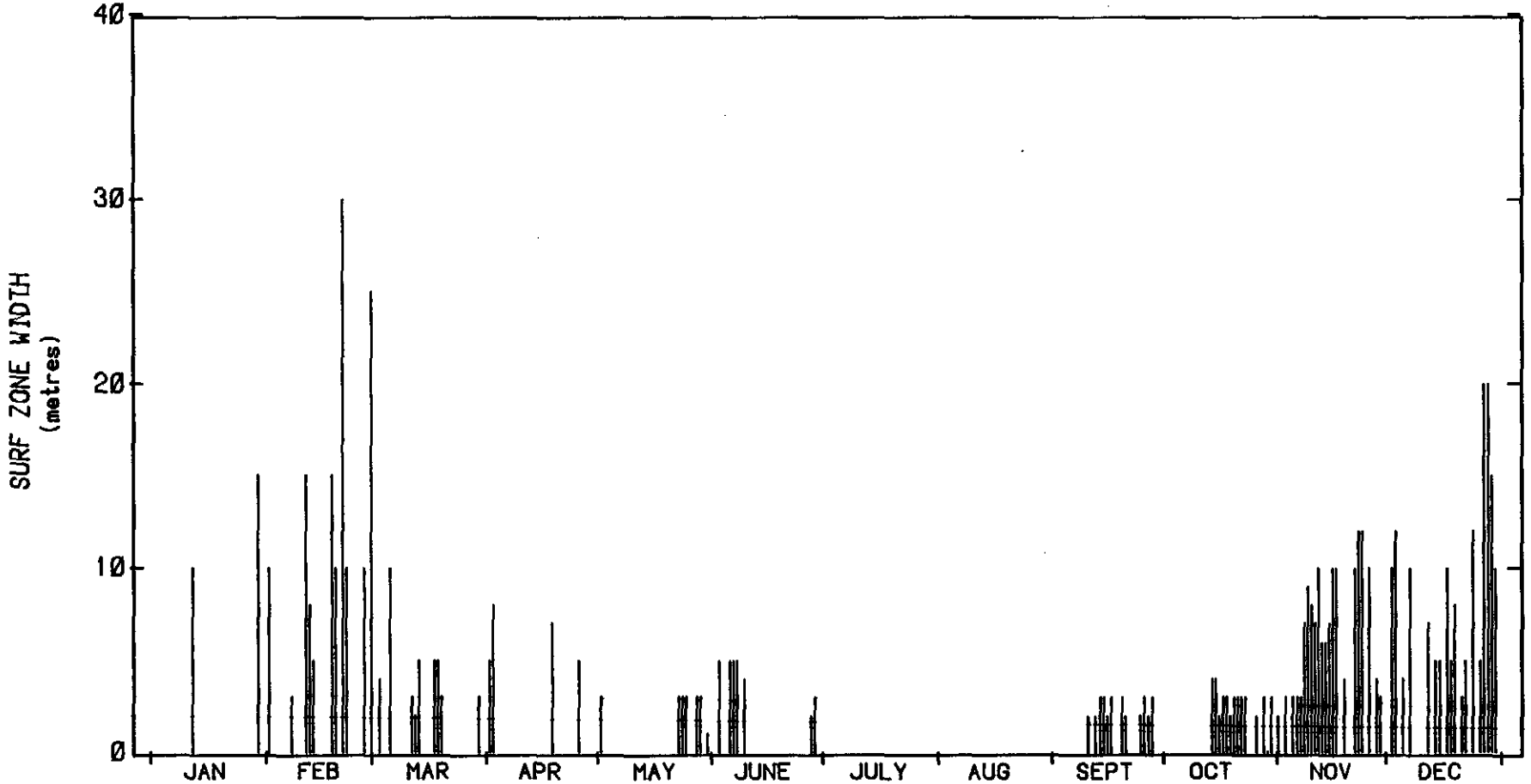


SURF ZONE WIDTH SUMMARY - 1979

No. of Observations : 106

MORNING OBSERVATIONS

Mean Surf Zone Width = 6.2 m

SURF ZONE WIDTH - MORNING 1979

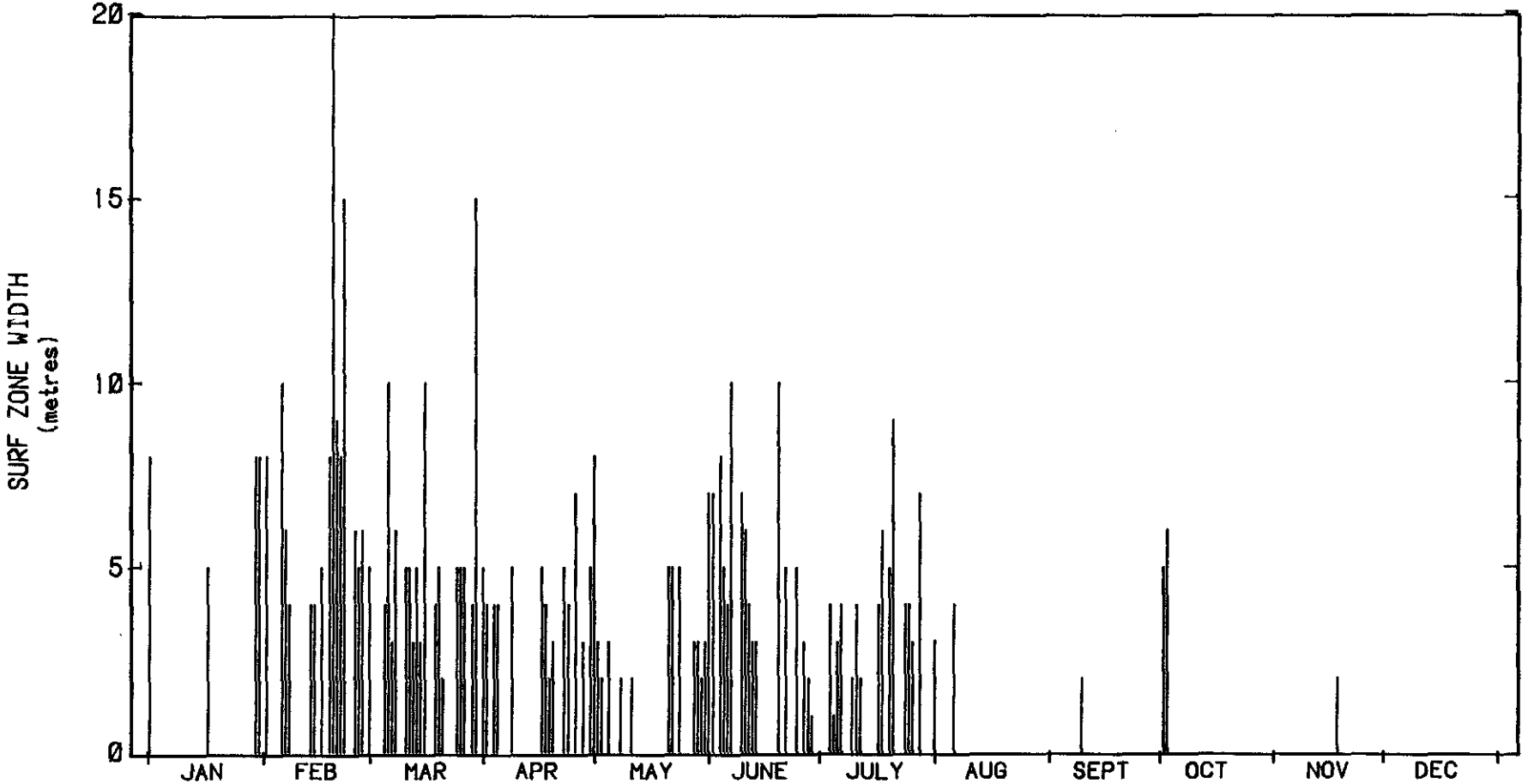
COPE
Theodolite Cre

Figure 12
C 21.1

Beach Protection Authority

COPE - Coastal Observation Programme Engineering

THEODOLITE CREEK ISIS SHIRE 1102



SURF ZONE WIDTH SUMMARY - 1979

No. of Observations : 104 AFTERNOON OBSERVATIONS Mean Surf Zone Width = 5.1 m

SURF ZONE WIDTH - AFTERNOON 1979

COPE
Theodolite Creek

Figure 13
C 21.1

Beach Protection Authority

COPE - Coastal Observation Programme Engineering

THEODOLITE CREEK

ISIS SHIRE

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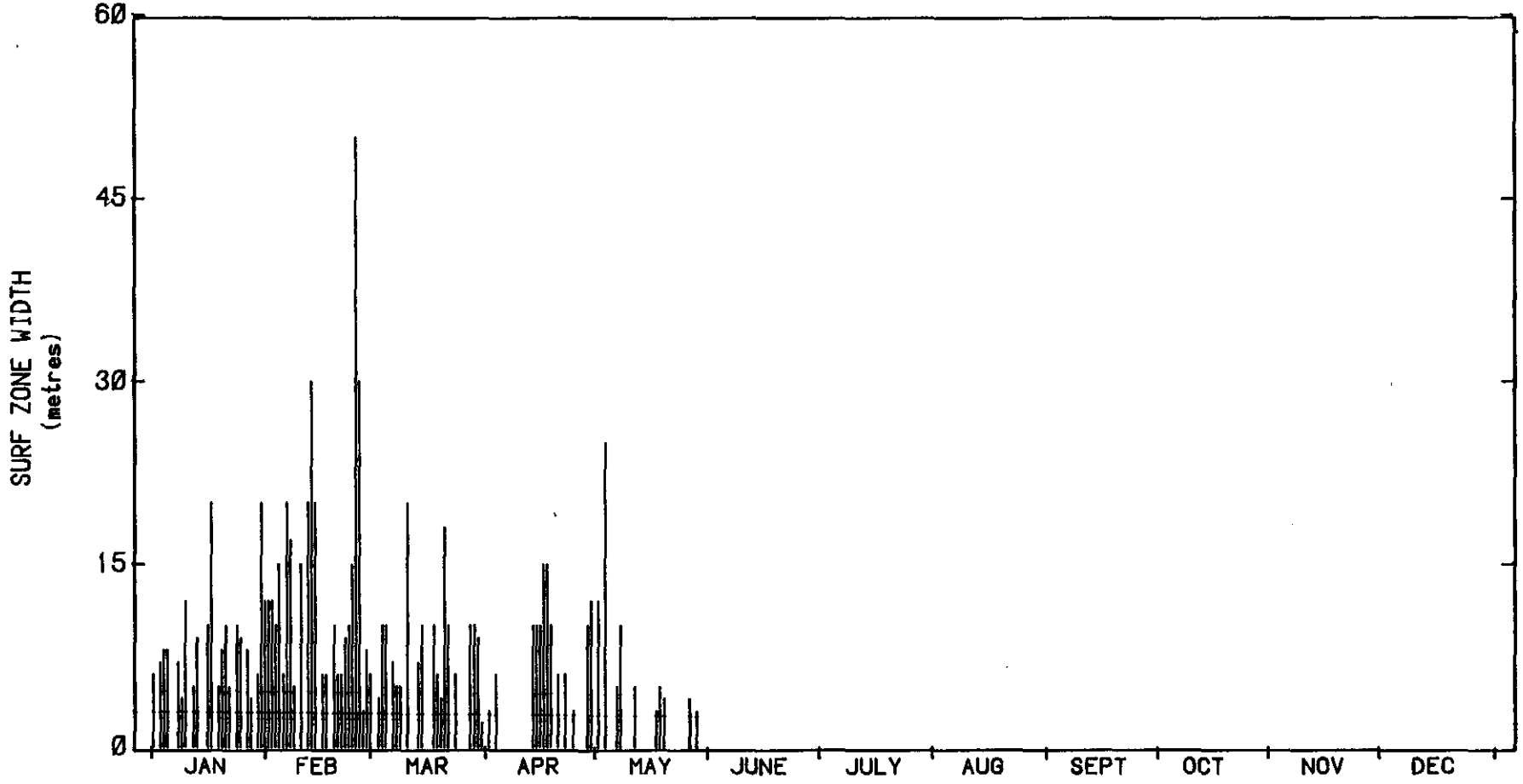


SURF ZONE WIDTH SUMMARY - 1980

No. of Observations : 89

MORNING OBSERVATIONS

Mean Surf Zone Width = 10.1 m

SURF ZONE WIDTH - MORNING 1980

COPE Theodolite Cre

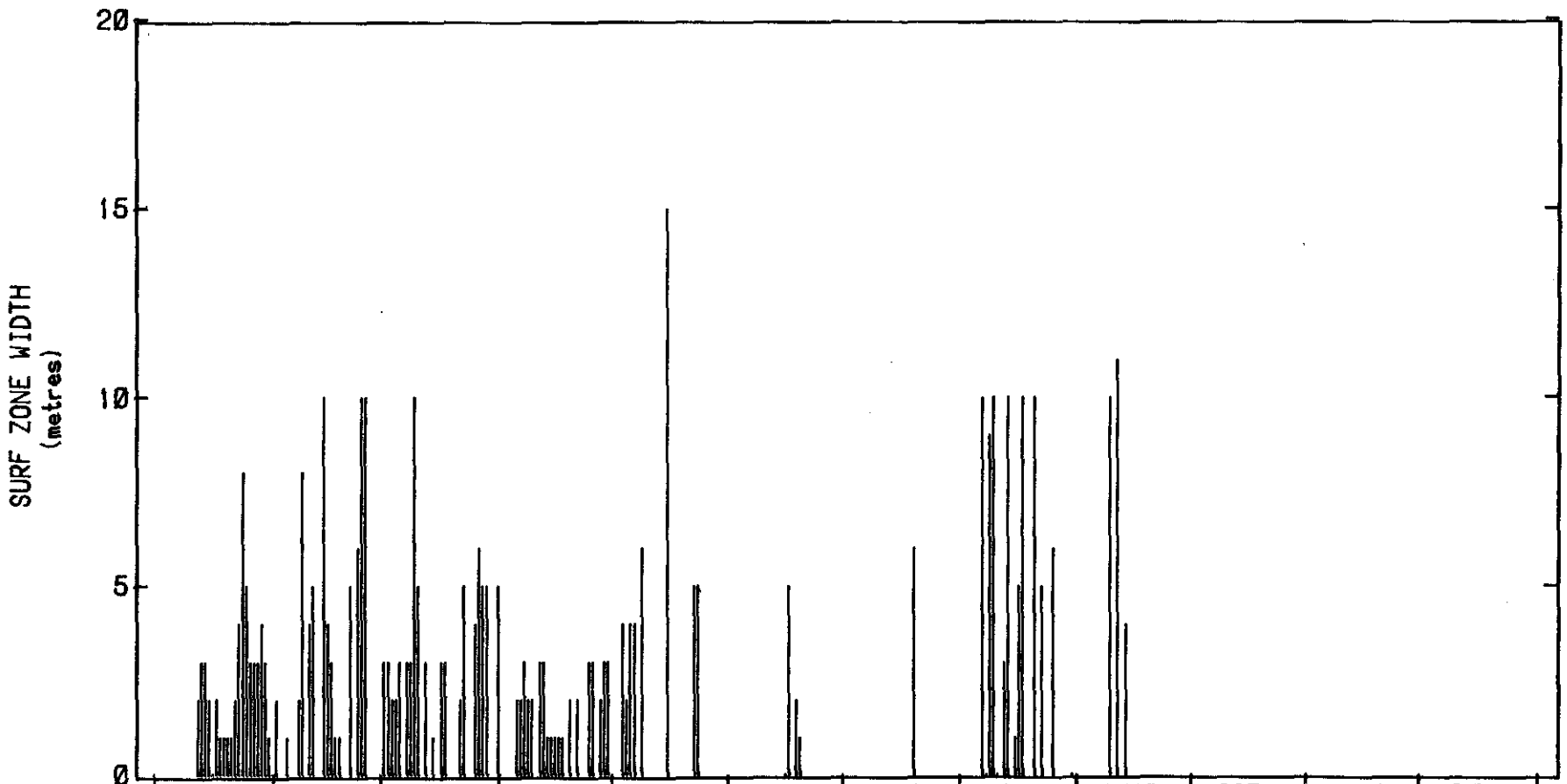
Figure 14

C 21.1

Beach Protection Authority

COPE - Coastal Observation Programme Engineering

THEODOLITE CREEK ISIS SHIRE 1102



SURF ZONE WIDTH - MORNING 1981

SURF ZONE WIDTH SUMMARY - 1981

No. of Observations : 105 MORNING OBSERVATIONS Mean Surf Zone Width = 3.8 m

■ Indicates Offshore Bar Present

COPE
Theodolite Creek

Figure 15
C 21.1

Beach Protection Authority

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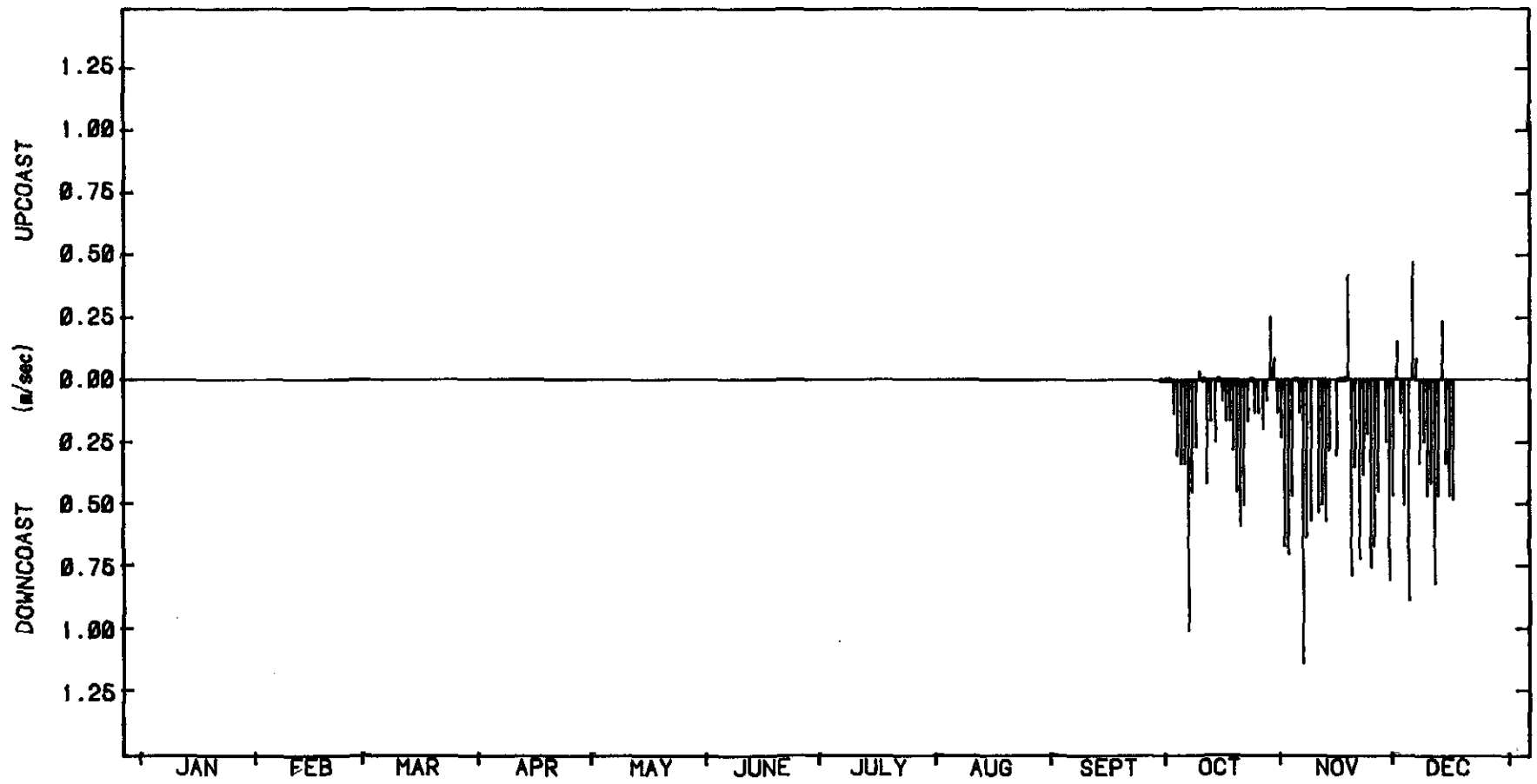
ISIS SHIRE

THEODOLITE CREEK 1102



LITTORAL CURRENT SUMMARY - 1976

Mean Vel = -.304 m/sec (down) Mean Upcoast Vel = 0.215 m/sec Mean Downcoast Vel = 0.421 m/sec

MORNING OBSERVATIONS - (76 recordings)

LITTORAL CURRENTS - MORNING 1976

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Theodolite Cre

Figure 16
C 21.1

Beach Protection Authority

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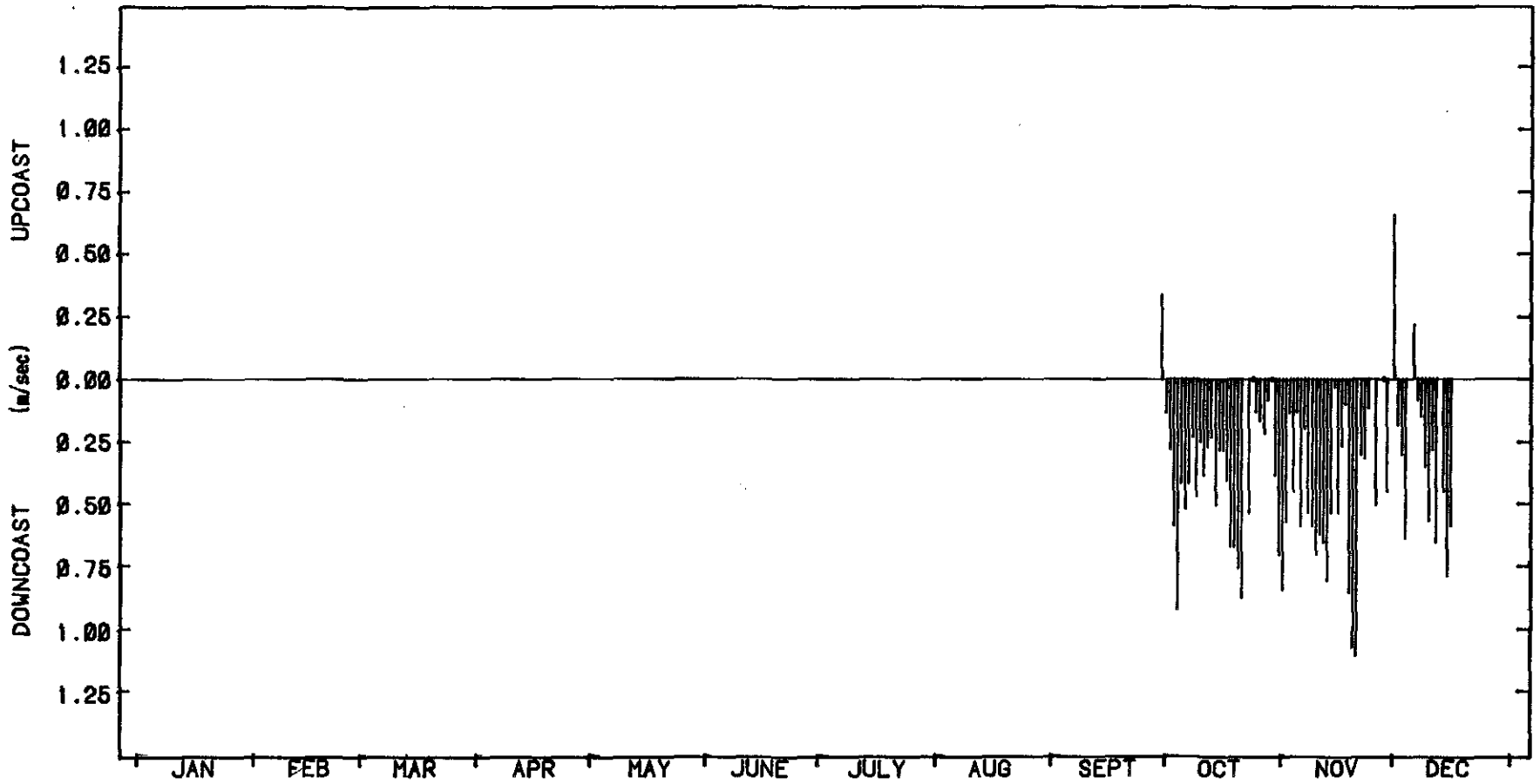
THEODOLITE CREEK 1102



LITTORAL CURRENTS - AFTERNOON 1976

LITTORAL CURRENT SUMMARY - 1976

Mean Vel = -.396 m/sec (down) Mean Upcoast Vel = 0.400 m/sec Mean Downcoast Vel = 0.450 m/sec

AFTERNOON OBSERVATIONS - (72 recordings)

COPE
Theodolite Creek

Figure 17
C 21.1

Beach Protection Authority

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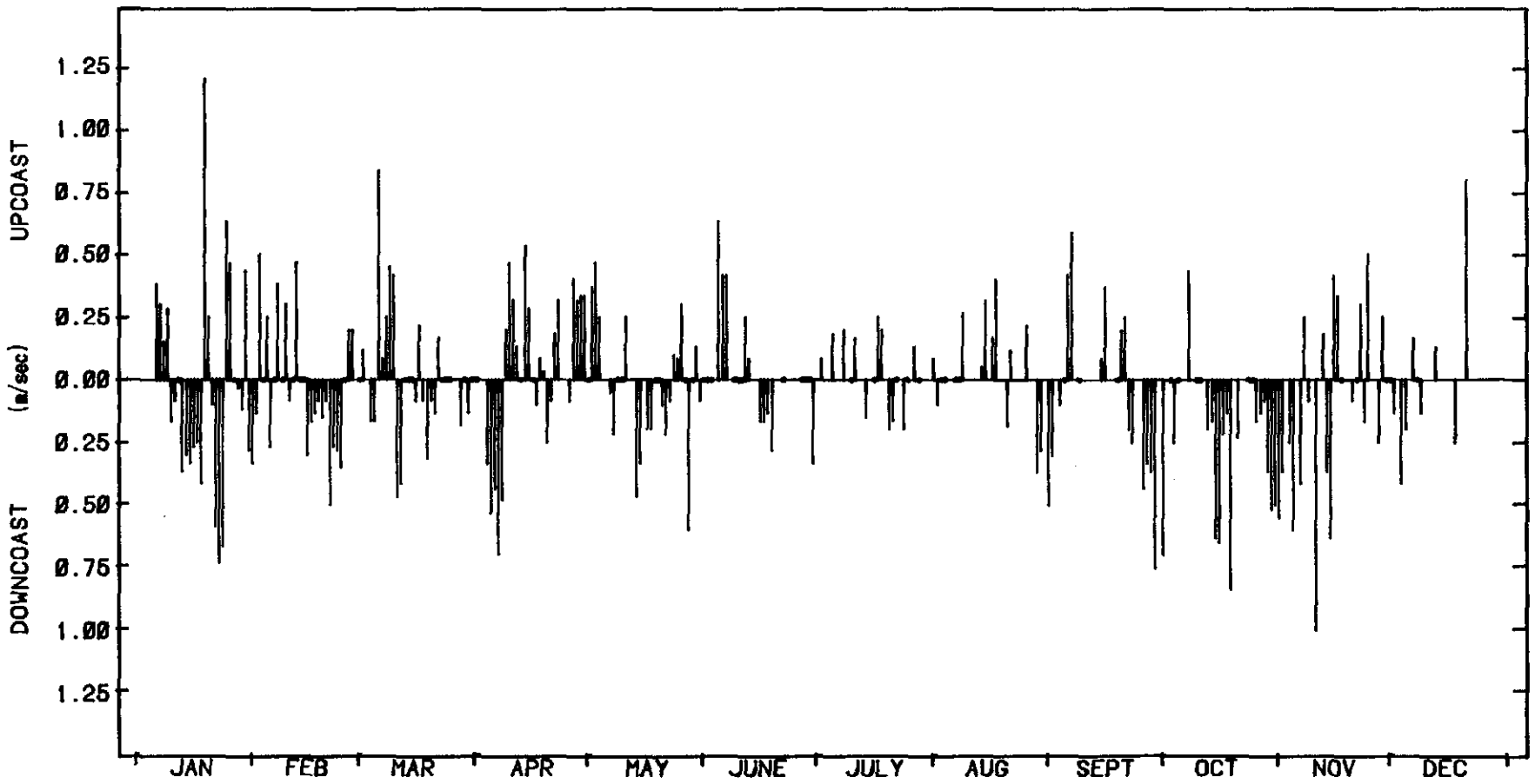
Programme Engineering

ISIS SHIRE

THEODOLITE CREEK 1102



LITTORAL CURRENT SUMMARY - 1977

Mean Vel = -.031 m/sec (down) Mean Upcoast Vel = 0.303 m/sec Mean Downcoast Vel = 0.289 m/sec

MORNING OBSERVATIONS - (259 recordings)

LITTORAL CURRENTS - MORNING 1977

COPE
Theodolite Cre

Figure 18

C 21.1

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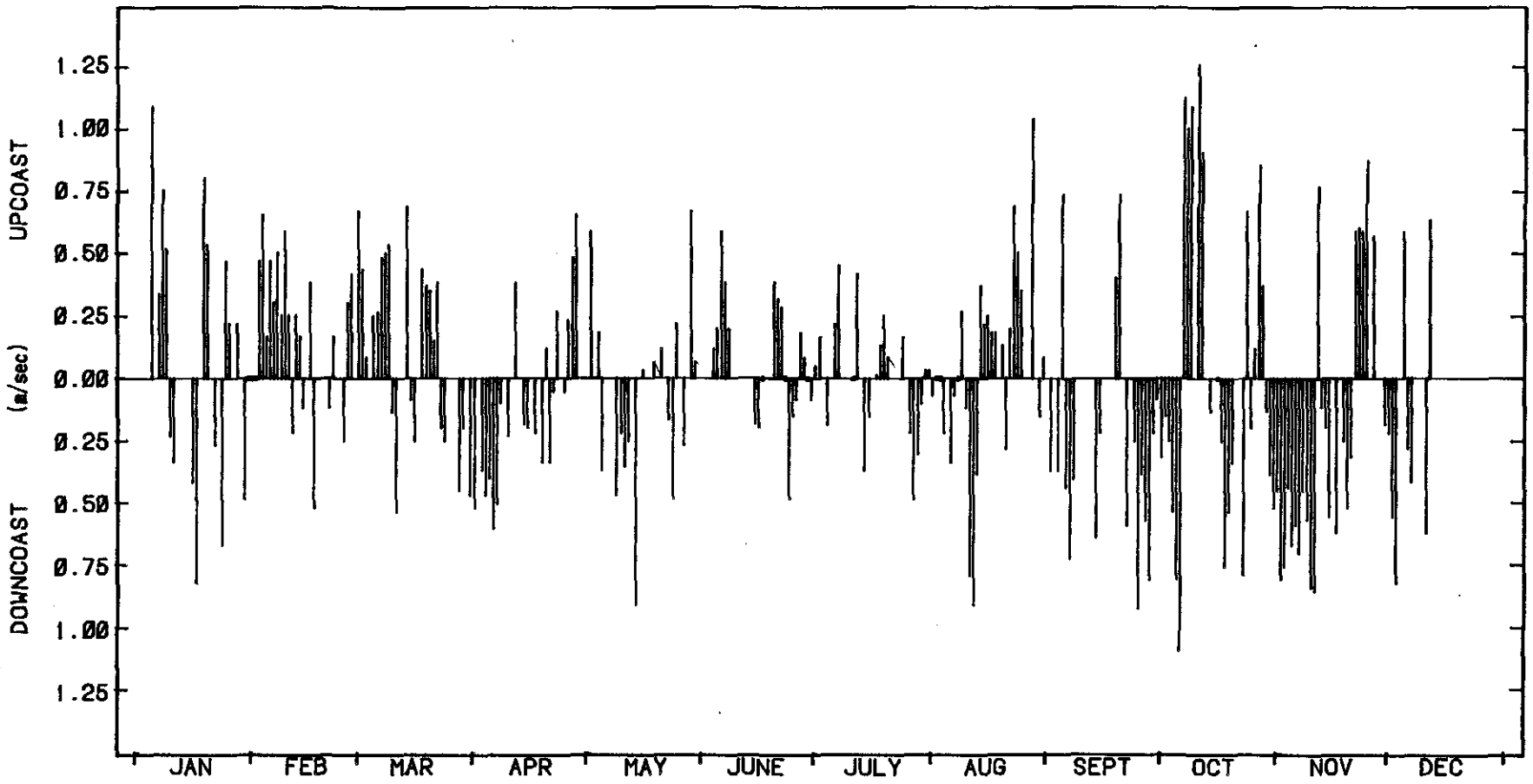
THEODOLITE CREEK 1102



LITTORAL CURRENT SUMMARY - 1977

Mean Vel = -.019 m/sec (down) Mean Upcoast Vel = 0.406 m/sec Mean Downcoast Vel = 0.388 m/sec

AFTERNOON OBSERVATIONS - (242 recordings)

LITTORAL CURRENTS - AFTERNOON 1977

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Figure 19
C 21.1

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Programme Engineering

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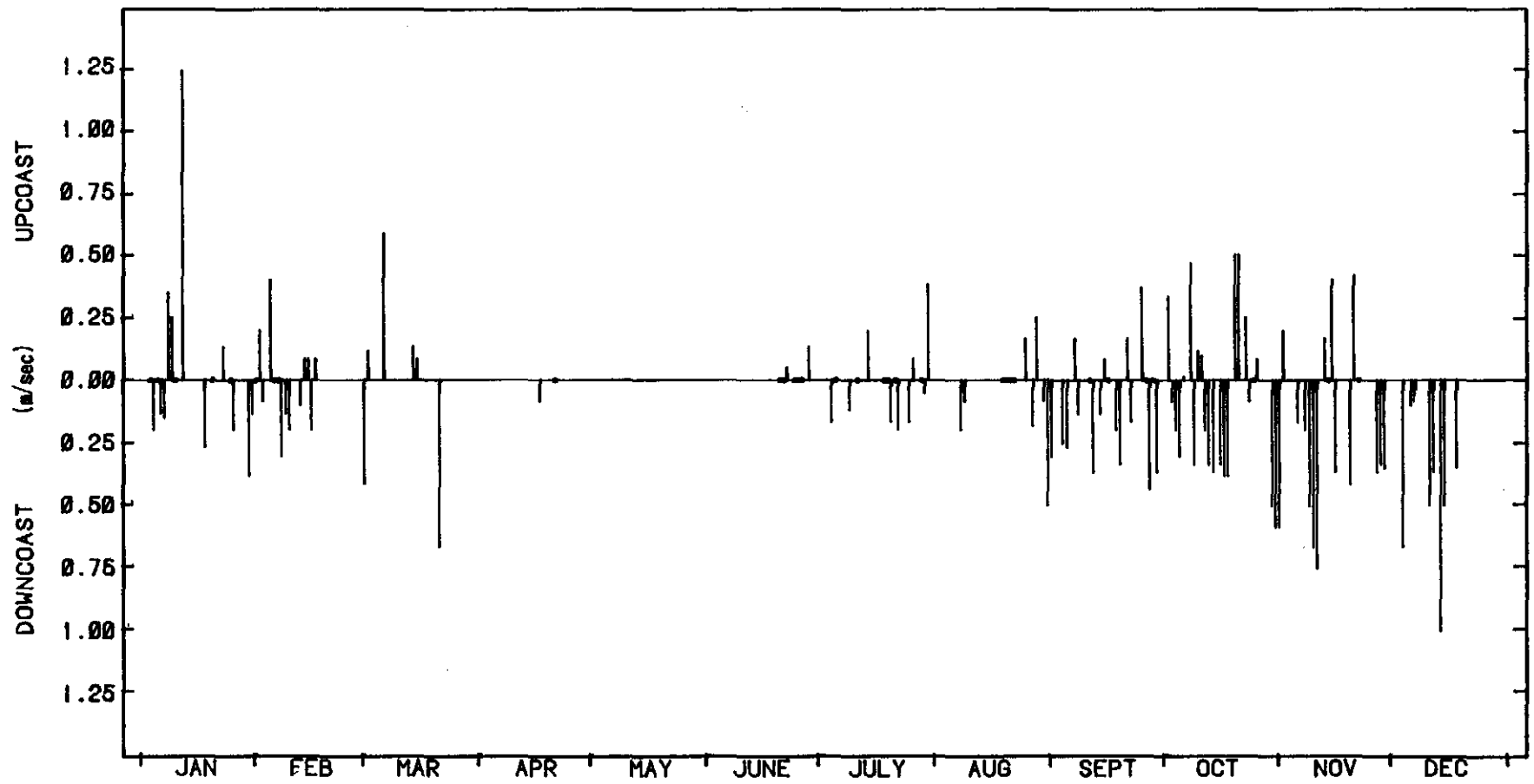
THEODOLITE CREEK 1102



LITTORAL CURRENT SUMMARY - 1978

Mean Vel = -.084 m/sec (down) Mean Upcoast Vel = 0.252 m/sec Mean Downcoast Vel = 0.298 m/sec

MORNING OBSERVATIONS - (138 recordings)

LITTORAL CURRENTS - MORNING 1978

COPE
Theodolite Cree

Figure 20
C 21.1

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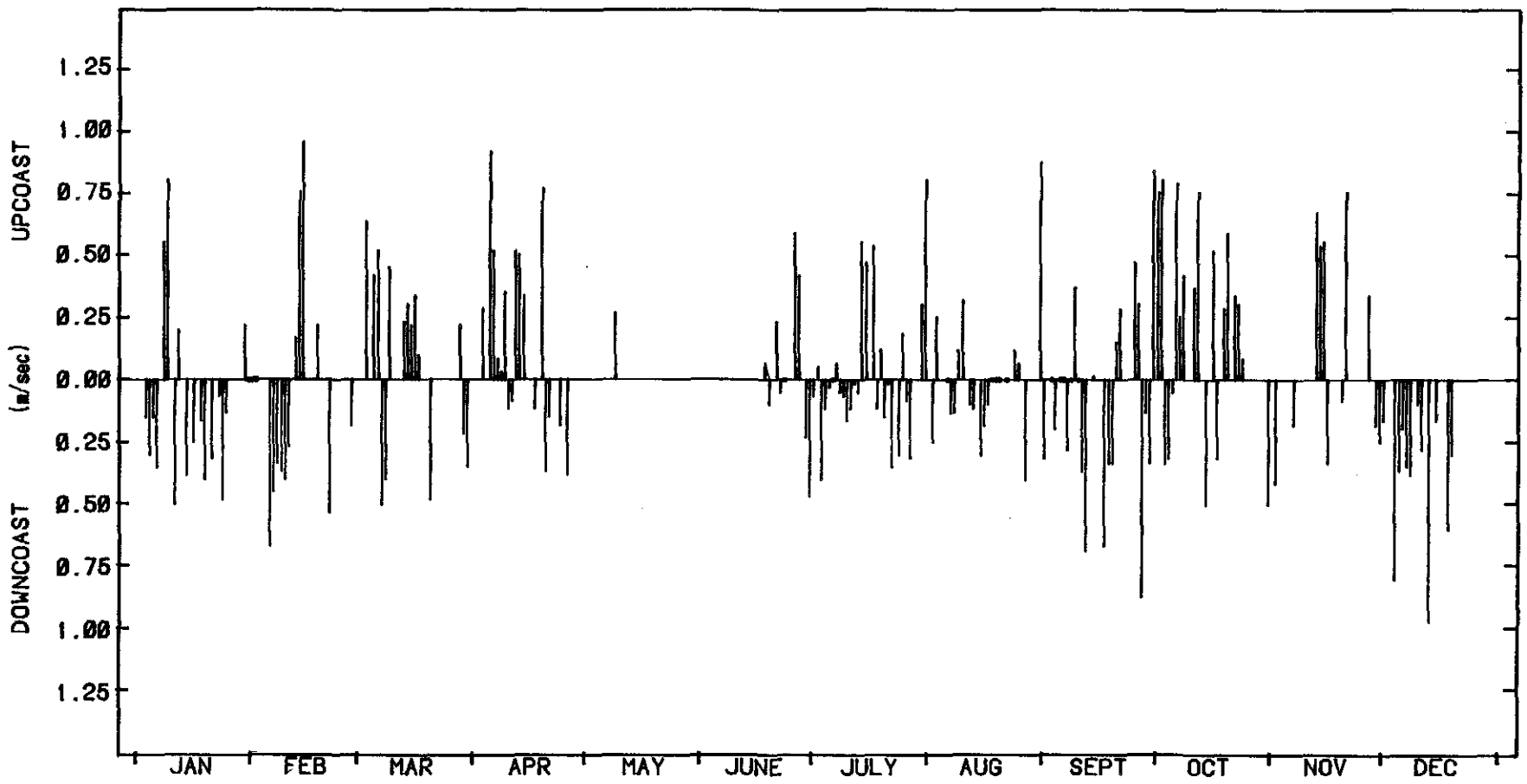
Programme Engineering

ISIS SHIRE

THEODOLITE CREEK 1102



LITTORAL CURRENTS - AFTERNOON 1978

LITTORAL CURRENT SUMMARY - 1978

Mean Vel = 0.008 m/sec (up) Mean Upcoast Vel = 0.403 m/sec Mean Downcoast Vel = 0.284 m/sec

AFTERNOON OBSERVATIONS - (186 recordings)

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Figure 21
C 21.1

Beach Protection Authority

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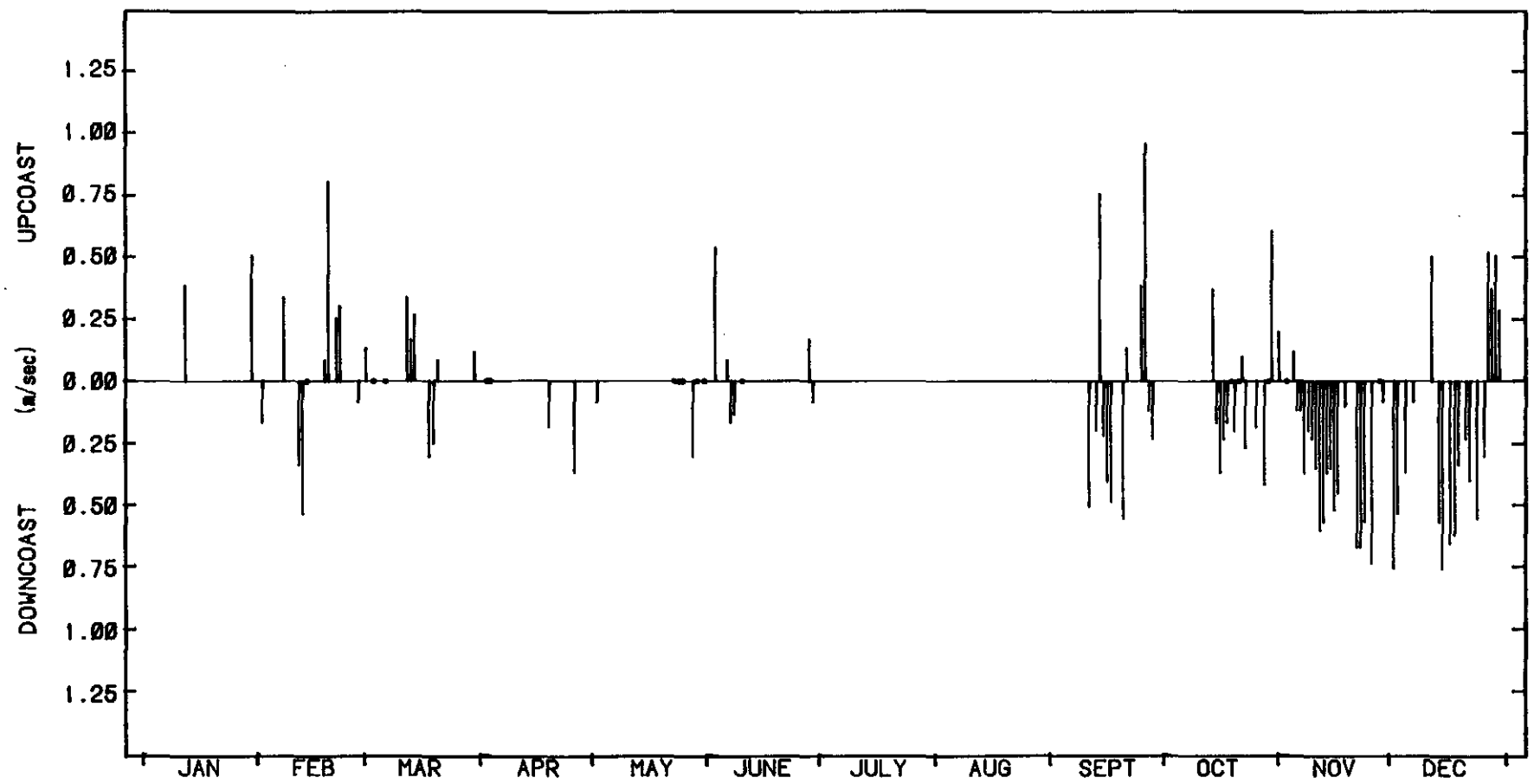
Programme Engineering

ISIS SHIRE

THEODOLITE CREEK 1102



LITTORAL CURRENT SUMMARY - 1979

Mean Vel = -.100 m/sec (down) Mean Upcoast Vel = 0.343 m/sec Mean Downcoast Vel = 0.348 m/sec

MORNING OBSERVATIONS - (106 recordings)

LITTORAL CURRENTS - MORNING 1979

COPE
Theodolite Cree

Figure 22
C 21.1

Beach Protection Authority

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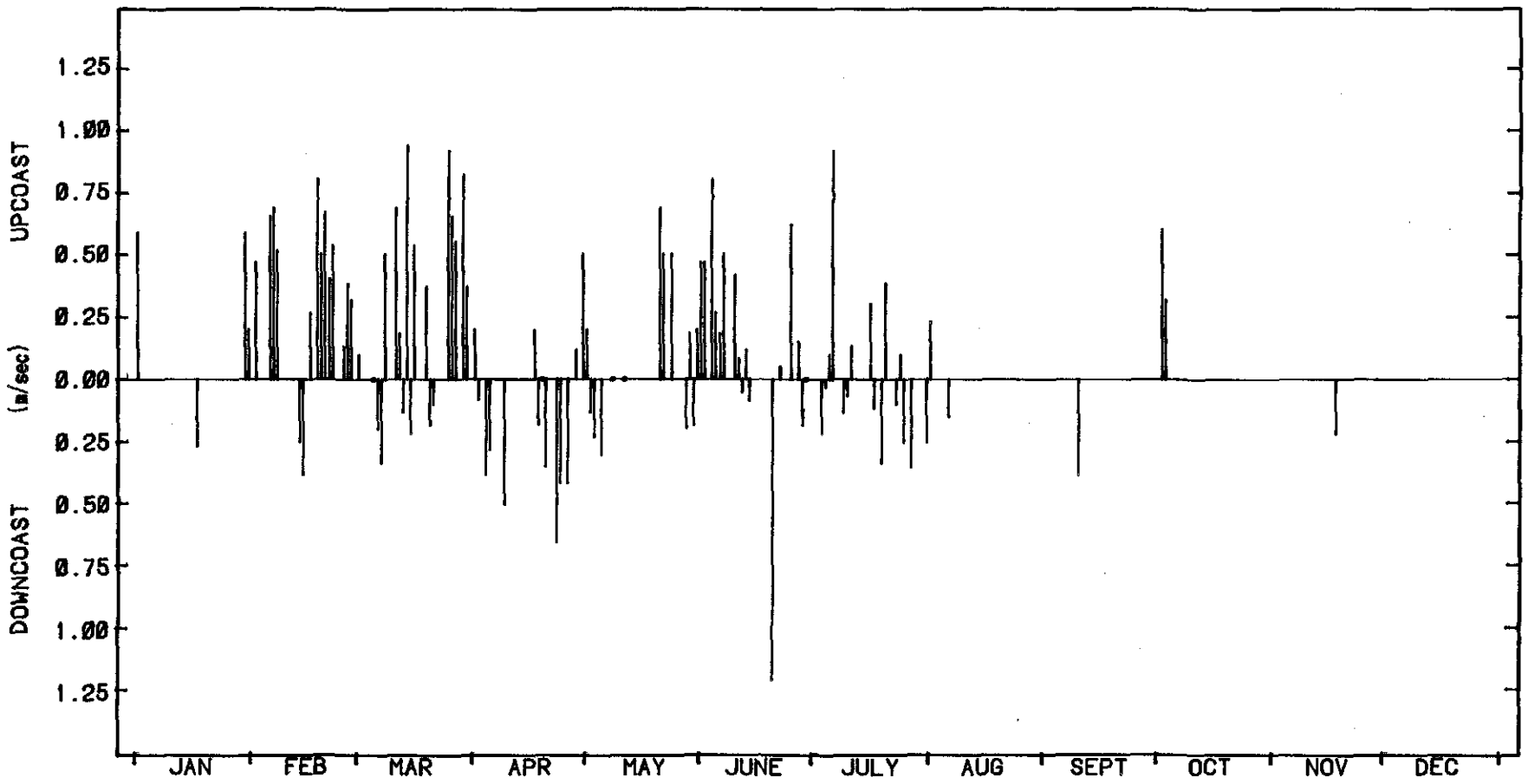
ISIS SHIRE

THEODOLITE CREEK 1102



LITTORAL CURRENT SUMMARY - 1979

Mean Vel = 0.137 m/sec (up) Mean Upcoast Vel = 0.420 m/sec Mean Downcoast Vel = 0.262 m/sec

AFTERNOON OBSERVATIONS - (104 recordings)

LITTORAL CURRENTS - AFTERNOON 1979

COPE
Theodolite Creek

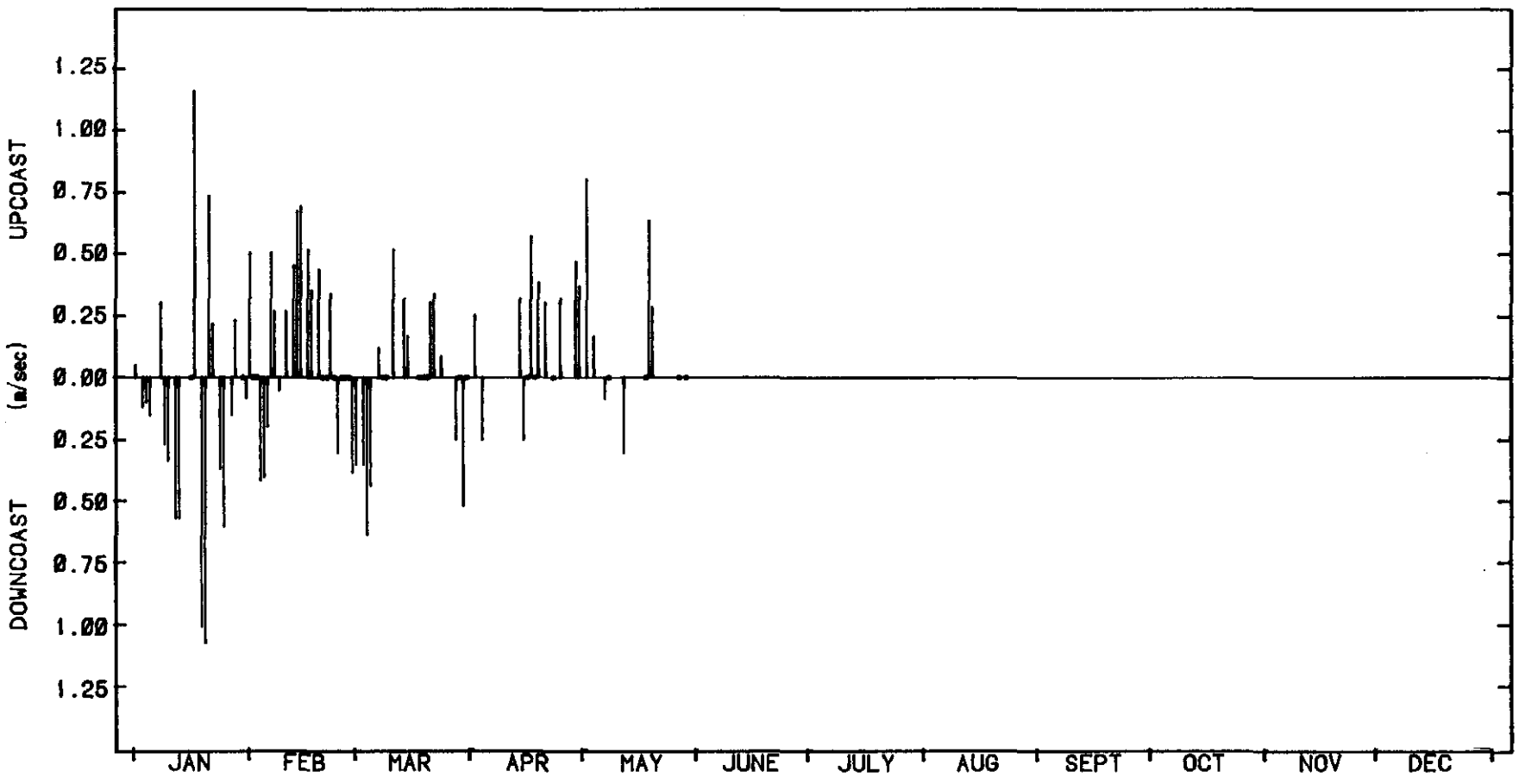
Figure 23
C 21.1

Beach Protection Authority

COPE - Coastal Observation Programme Engineering

ISIS SHIRE

THEODOLITE CREEK 1102



LITTORAL CURRENT SUMMARY - 1980

Mean Vel = 0.043 m/sec (up) Mean Upcoast Vel = 0.398 m/sec Mean Downcoast Vel = 0.363 m/sec

MORNING OBSERVATIONS - (89 recordings)

LITTORAL CURRENTS - MORNING 1980

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Theodolite Cre

Figure 24

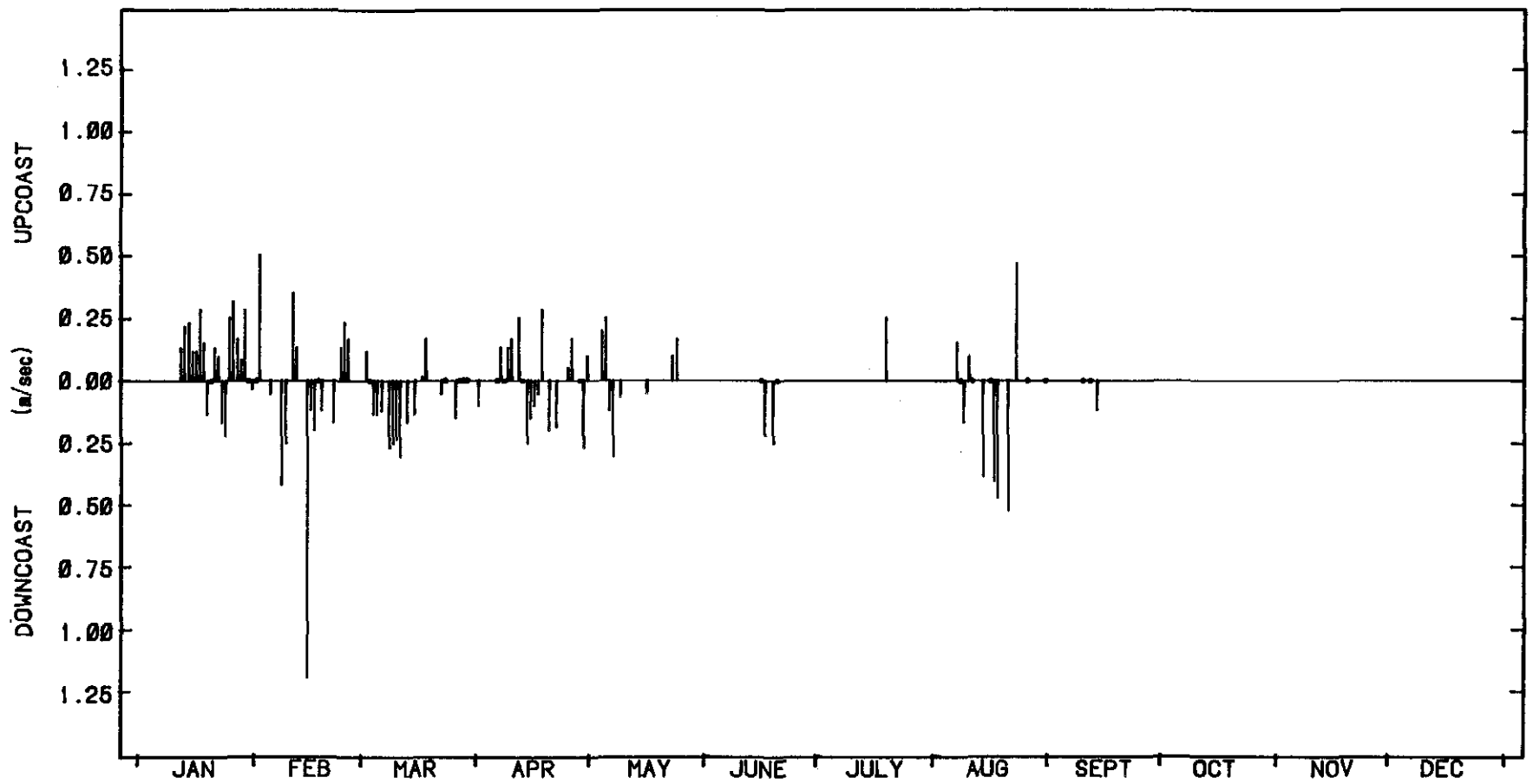
C 21.1

Beach Protection Authority

COPE - Coastal Observation Programme Engineering

ISIS SHIRE

THEODOLITE CREEK 1102



LITTORAL CURRENT SUMMARY - 1981

Mean Vel = -.019 m/sec (down) Mean Upcoast Vel = 0.189 m/sec Mean Downcoast Vel = 0.217 m/sec

MORNING OBSERVATIONS - (104 recordings)

LITTORAL CURRENTS - MORNING 1981

COPE
Theodolite Creek

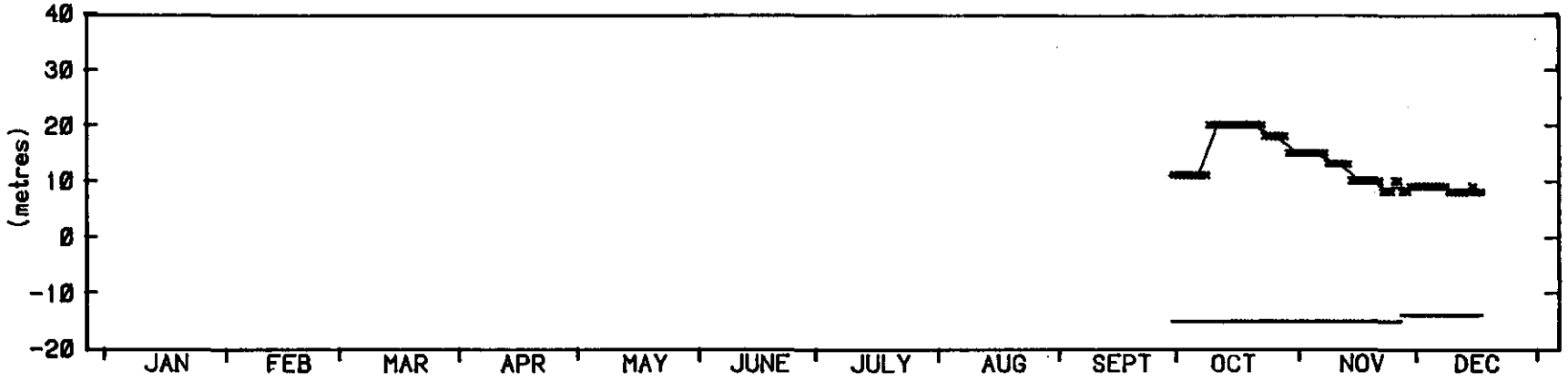
Figure 25
C 21.1

Beach Protection Authority

COPE - Coastal Observation Programme Engineering

ISIS SHIRE

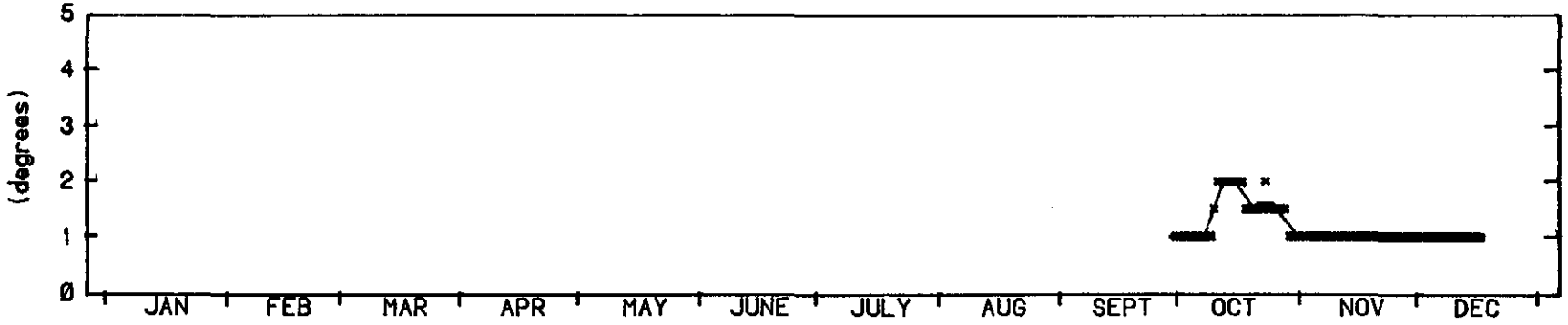
THEODOLITE CREEK 1102



DISTANCE TO FIXED CONTOUR AND VEGETATION LINE - 1976

Indicates Distance to Fixed Contour : 79 Observations Fixed Contour Level is approx 1.2 m above AHD

Indicates Distance to Vegetation Line : 79 Observations



FORESHORE SLOPE - 1976

Five Day Moving Average

No. of Observations : 79

BEACH PROFILE PARAMETERS - 1976

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Theodolite Creek

Figure 26
C 21.1

Beach Protection Authority

BEACH PROFILE PARAMETERS - 1977

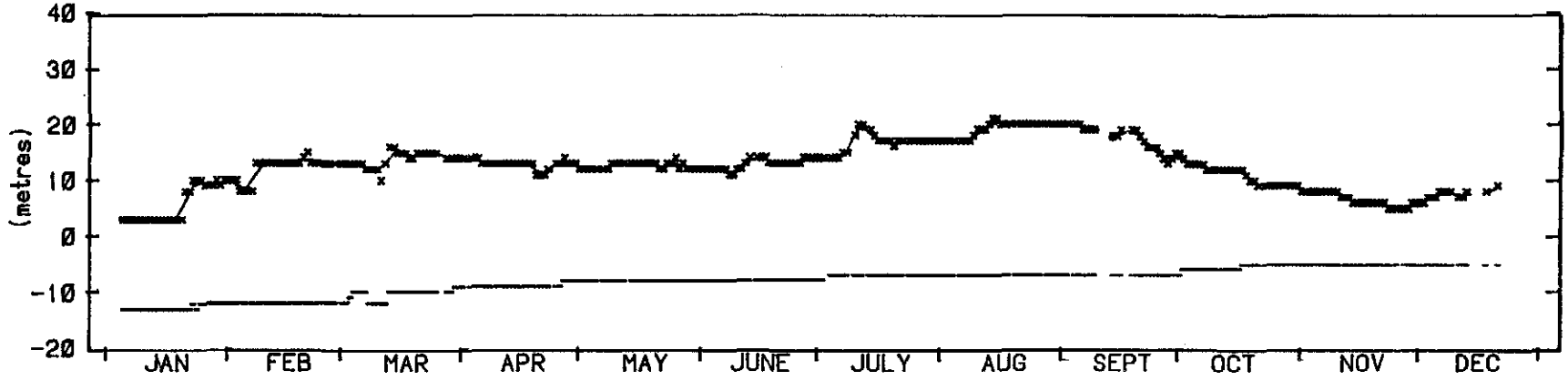
COPE
Theodolite Creek

Figure 27
C 21.1

COPE - Coastal Observation Programme Engineering

ISIS SHIRE

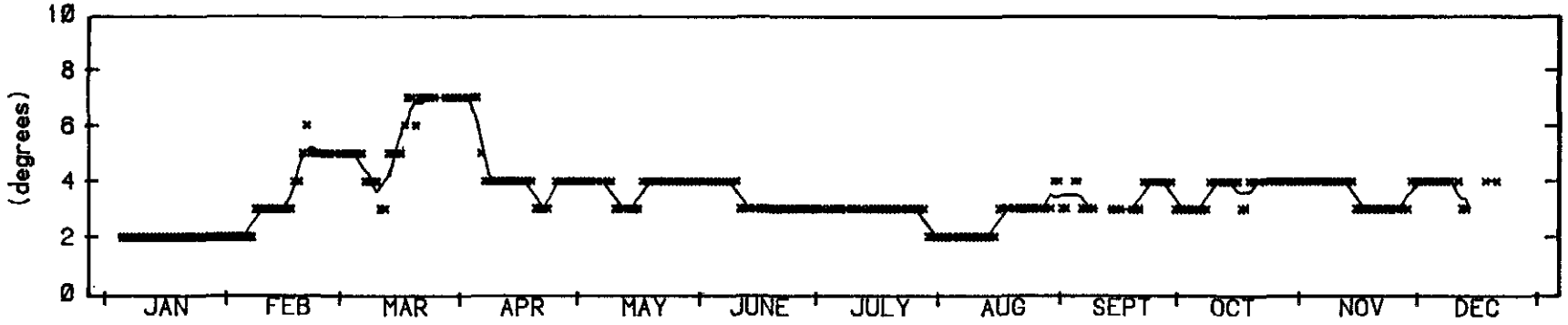
THEODOLITE CREEK 1102



DISTANCE TO FIXED CONTOUR AND VEGETATION LINE - 1977

Indicates Distance to Fixed Contour : 321 Observations Fixed Contour Level is approx 1.2 m above AHD

Indicates Distance to Vegetation Line : 321 Observations



FORESHORE SLOPE - 1977

Five Day Moving Average

No. of Observations : 321

Beach Protection Authority

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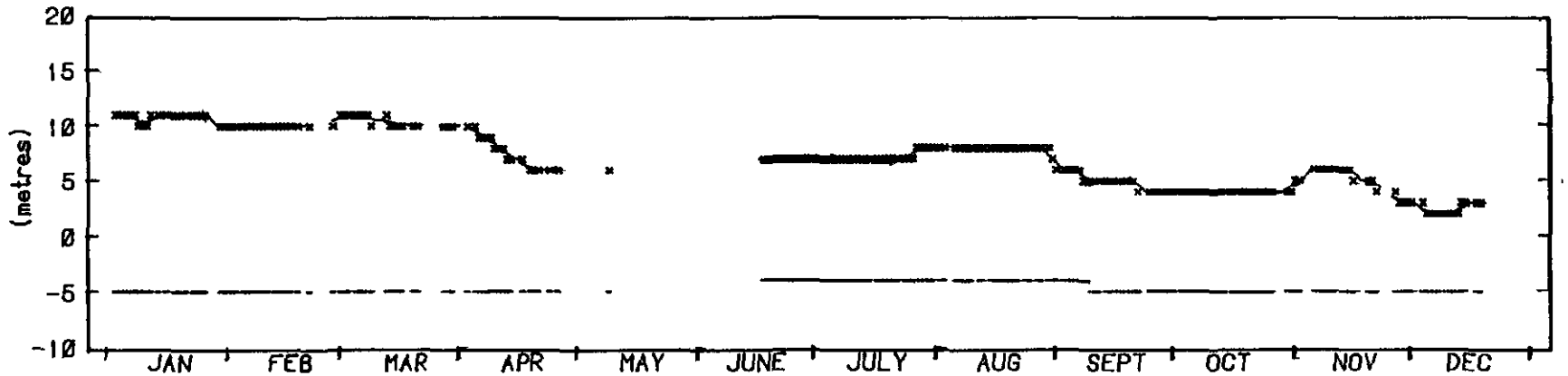
Programme Engineering

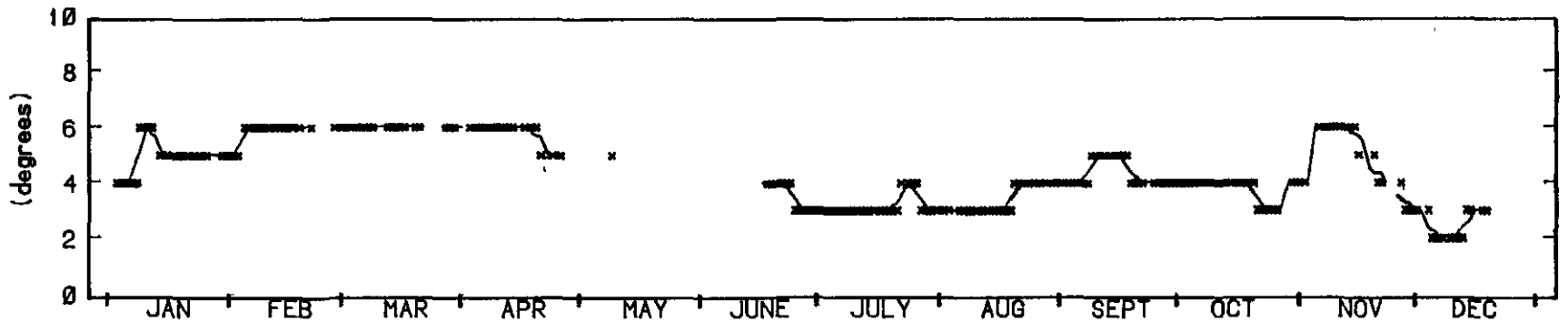
ISIS SHIRE **THEODOLITE CREEK** **1102**



DISTANCE TO FIXED CONTOUR AND VEGETATION LINE - 1978

xxxxx Indicates Distance to Fixed Contour : 227 Observations Fixed Contour Level is approx 1.2 m above AHD

— Indicates Distance to Vegetation Line : 227 Observations



FORESHORE SLOPE - 1978

Five Day Moving Average

No. of Observations : 227

BEACH PROFILE PARAMETERS - 1978

COPE
Theodolite Cree

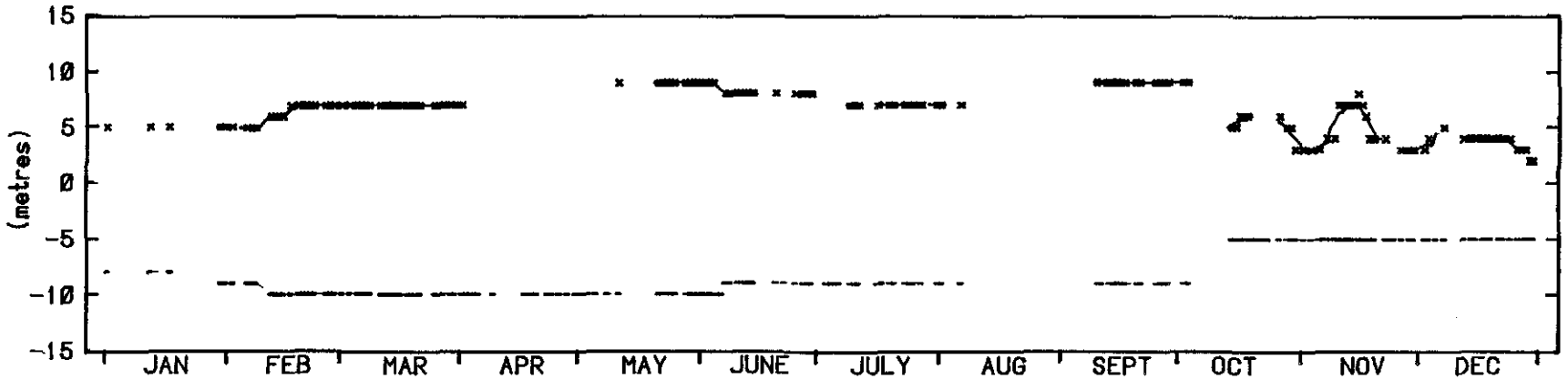
Figure 28
C 21.1

Beach Protection Authority

COPE - Coastal Observation Programme Engineering

ISIS SHIRE

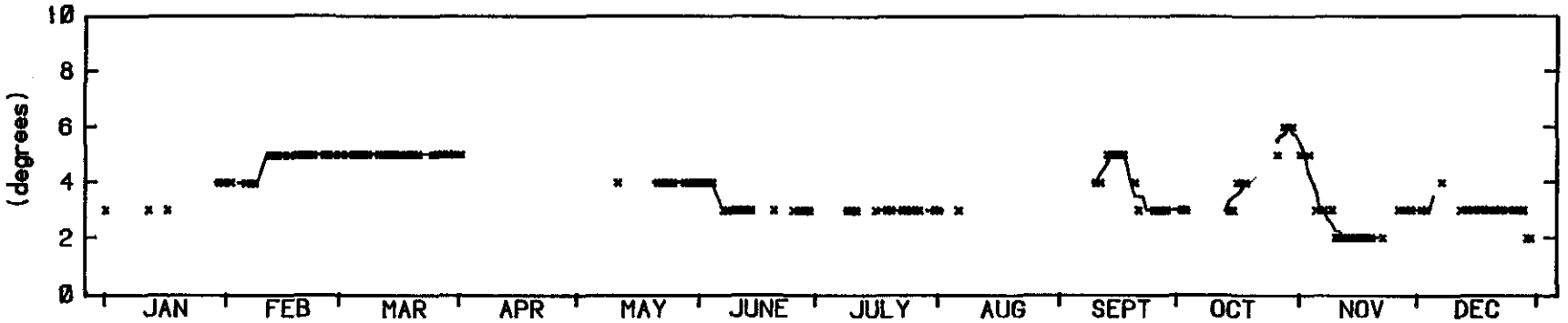
THEODOLITE CREEK 1102



DISTANCE TO FIXED CONTOUR AND VEGETATION LINE - 1979

xxxxx Indicates Distance to Fixed Contour : 143 Observations Fixed Contour Level is approx 1.2 m above AHD

— Indicates Distance to Vegetation Line : 180 Observations



FORESHORE SLOPE - 1979

Five Day Moving Average

No. of Observations : 143

BEACH PROFILE PARAMETERS - 1979

COPE
Theodolite Creek

Figure 29
C 21.1

Beach Protection Authority

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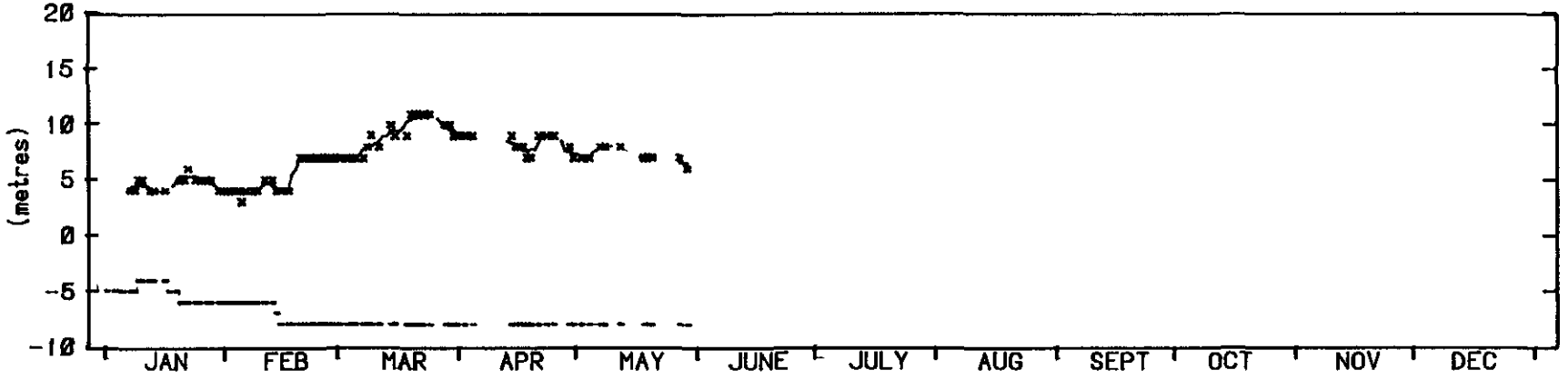
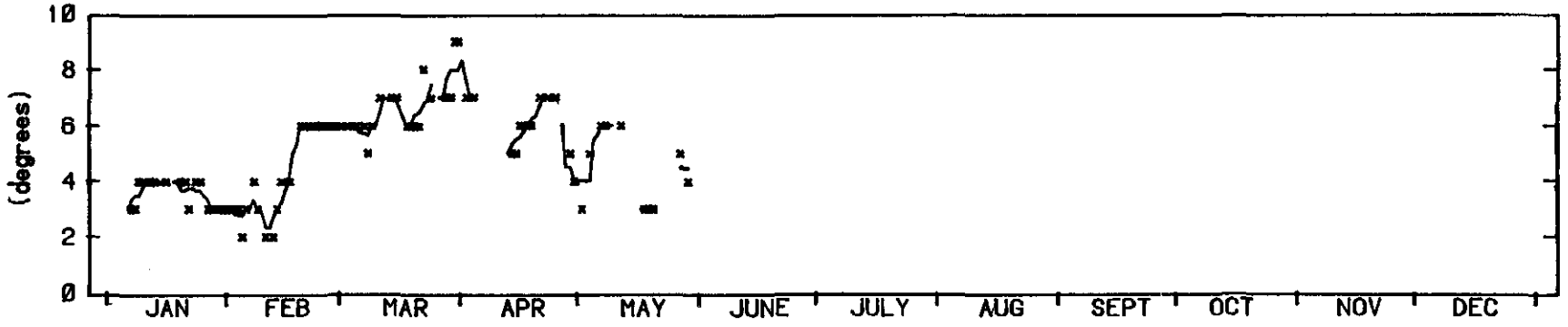
THEODOLITE CREEK 1102



DISTANCE TO FIXED CONTOUR AND VEGETATION LINE - 1980

xxxxx Indicates Distance to Fixed Contour : 82 Observations Fixed Contour Level is approx 1.2 m above AHD

— Indicates Distance to Vegetation Line : 90 Observations



FORESHORE SLOPE - 1980

Five Day Moving Average

No. of Observations : 82

BEACH PROFILE PARAMETERS - 1980

COPE Theodolite Cre

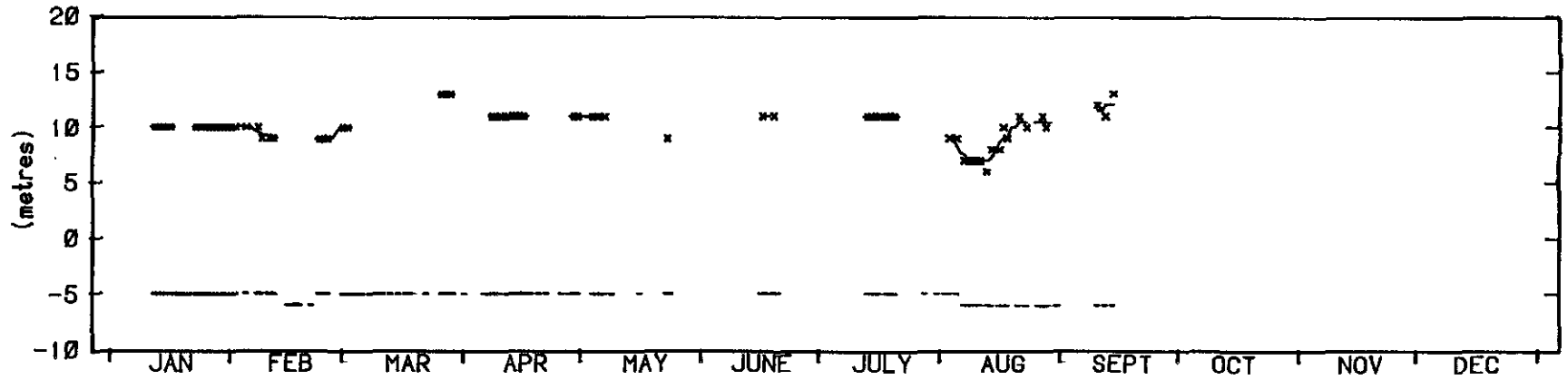
Figure 30

C 21.1

Beach Protection Authority

COPE - Coastal Observation
Programme Engineering

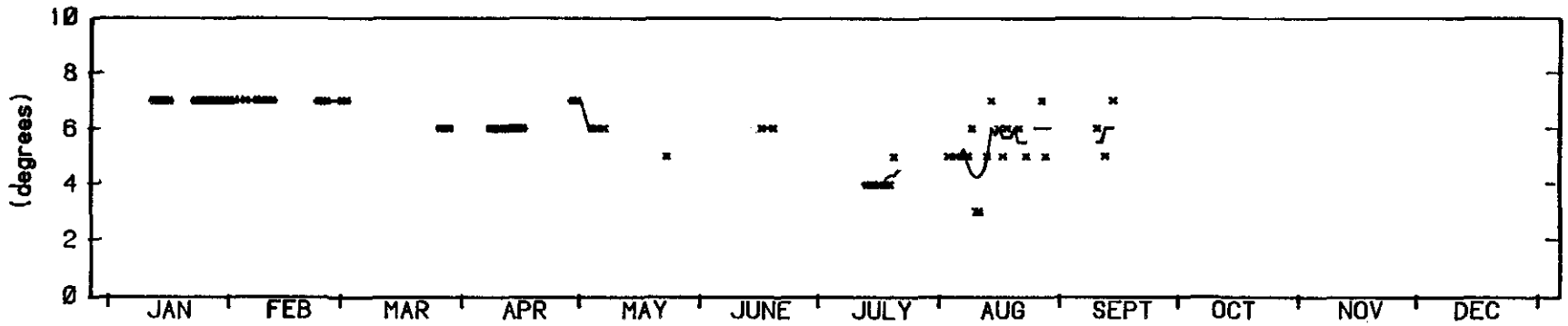
ISIS SHIRE **THEODOLITE CREEK** **1102**



DISTANCE TO FIXED CONTOUR AND VEGETATION LINE - 1981

xxxxx Indicates Distance to Fixed Contour : 71 Observations Fixed Contour Level is approx 1.2 m above AHD

— Indicates Distance to Vegetation Line : 116 Observations



FORESHORE SLOPE - 1981

Five Day Moving Average

No. of Observations : 71

BEACH PROFILE PARAMETERS - 1981

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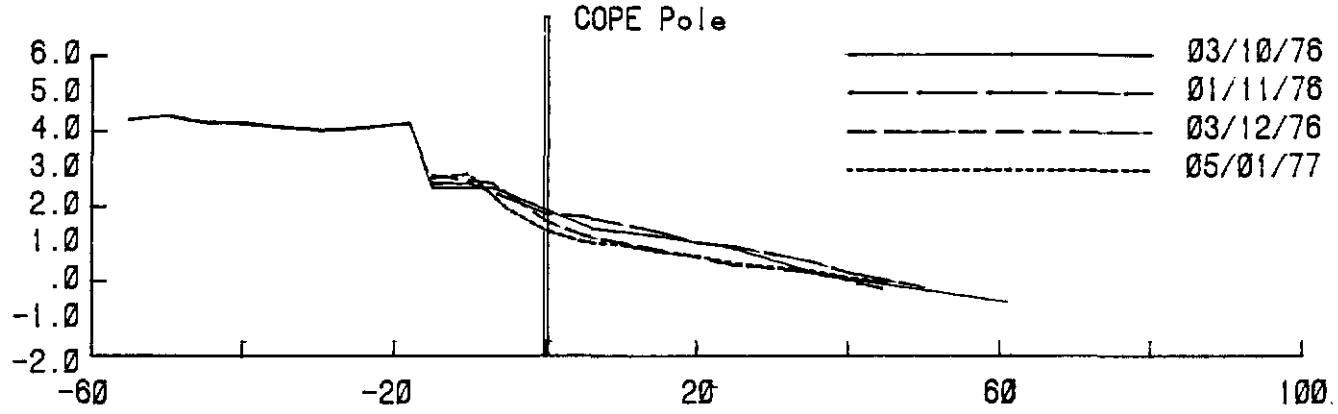
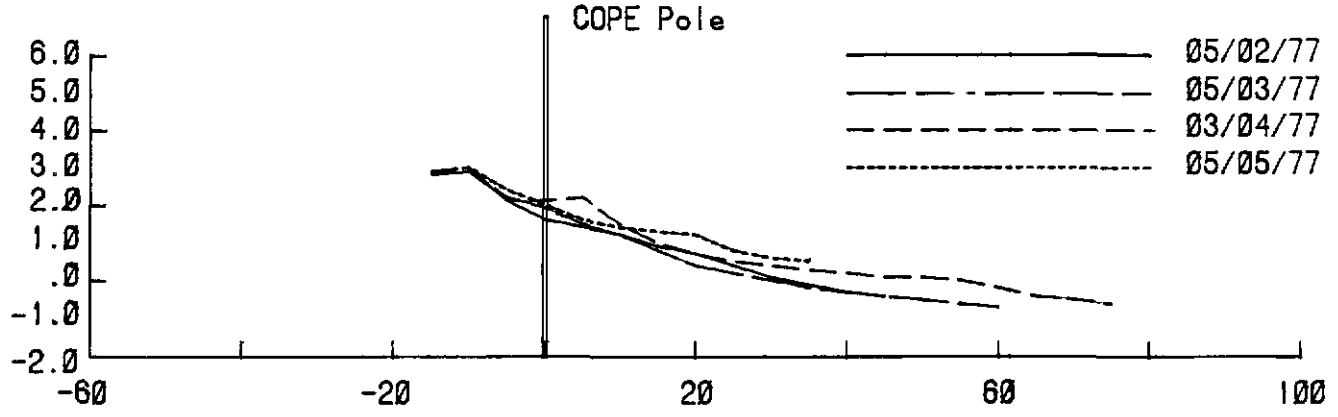
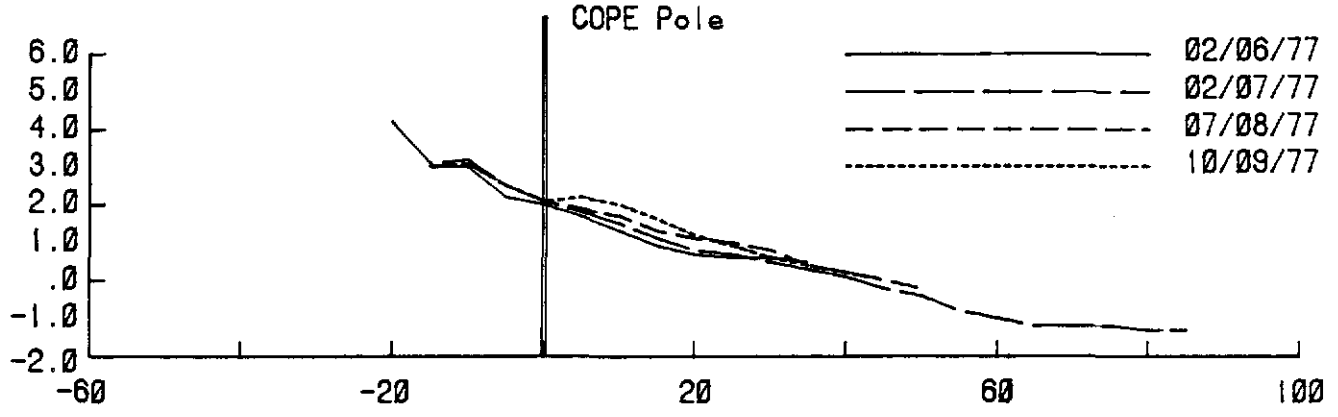
Theodolite Creek

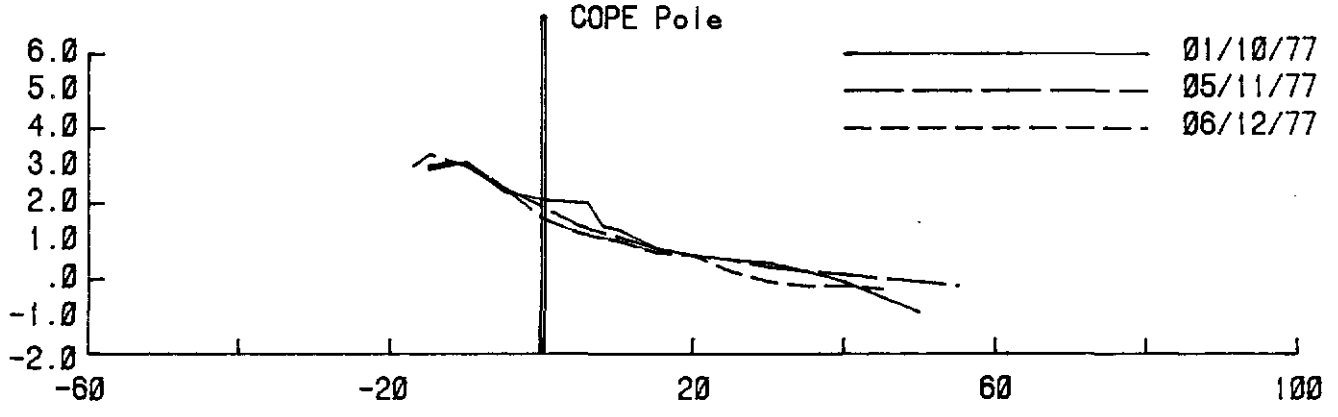
Figure 31

C 21.1









Level Datum is A.H.D.

Distances and Levels are measured in Metres

Beach Protection Authority

MONTHLY BEACH PROFILES

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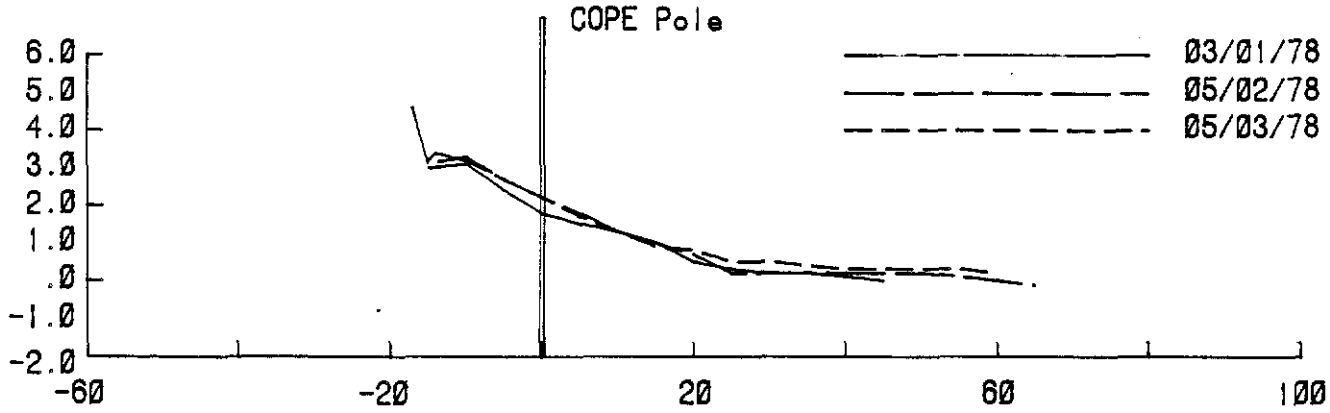
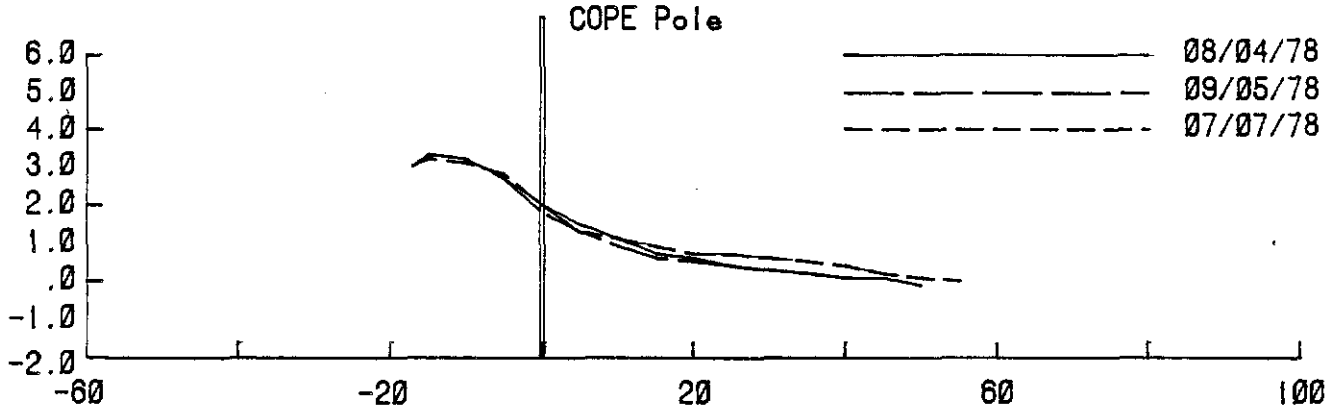
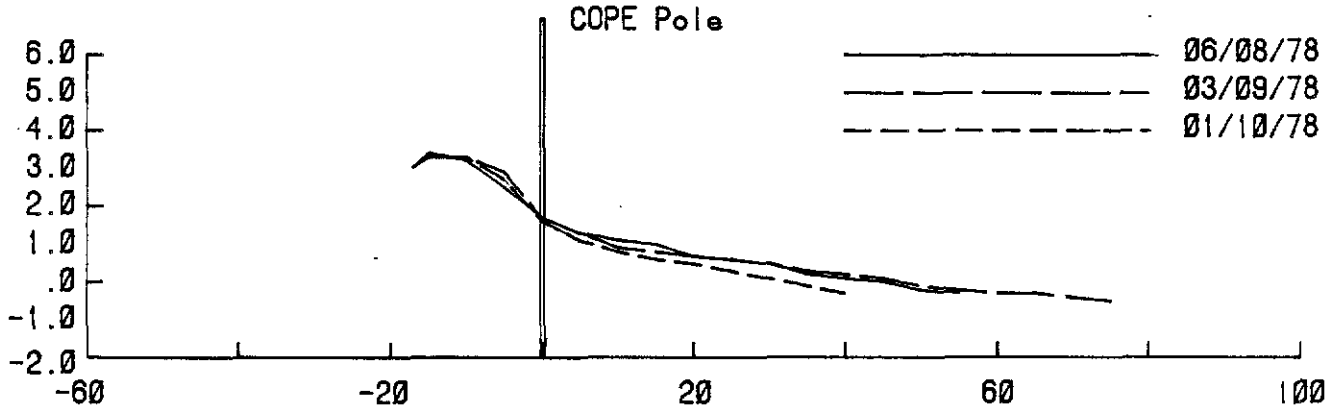
Theodolite Creek

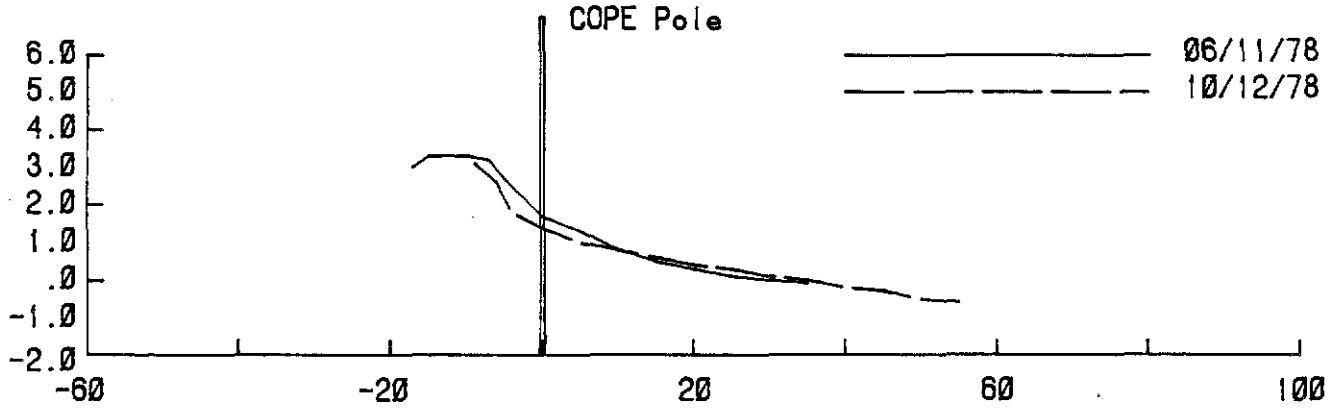
Figure 32

C 21.1









Level Datum is A.H.D.

Distances and Levels are measured in Metres

Beach Protection Authority

MONTHLY BEACH PROFILES

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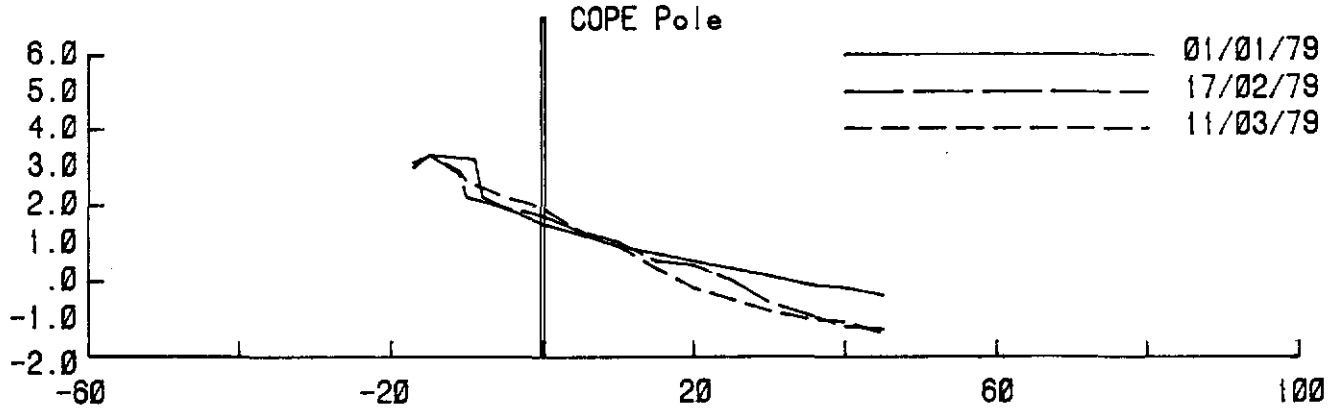
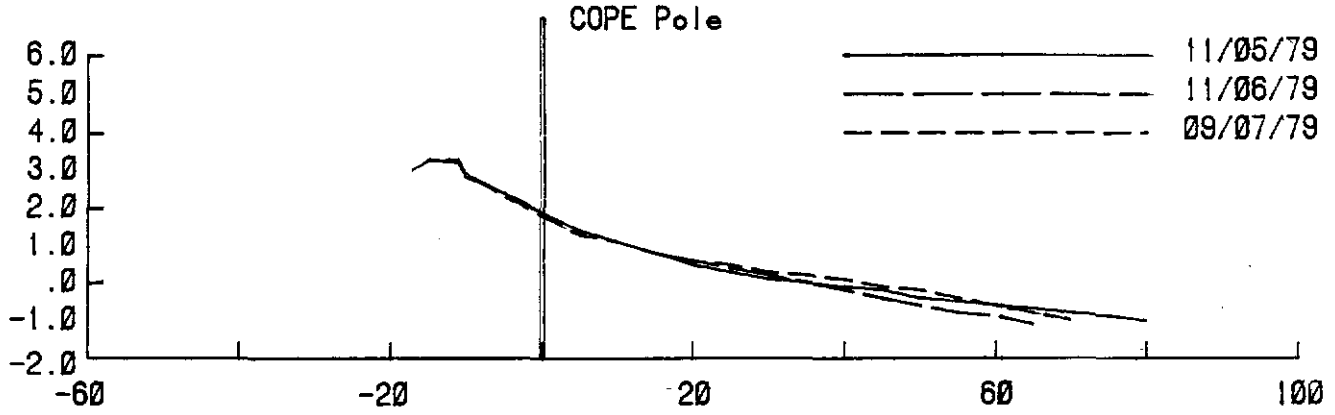
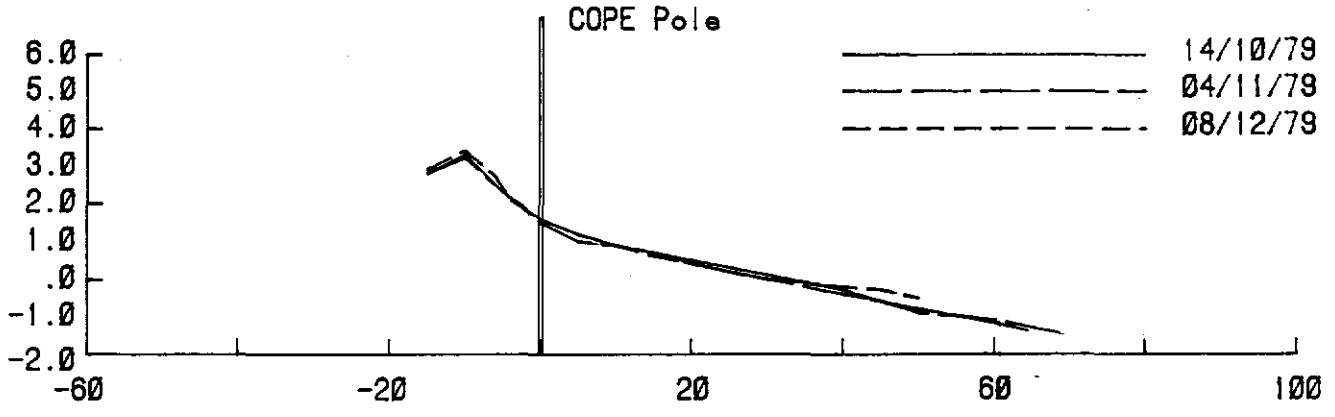
Theodolite Creek

Figure 33

C 21.1







Level Datum is A.H.D.

Distances and Levels are measured in Metres

Beach Protection Authority

MONTHLY BEACH PROFILES

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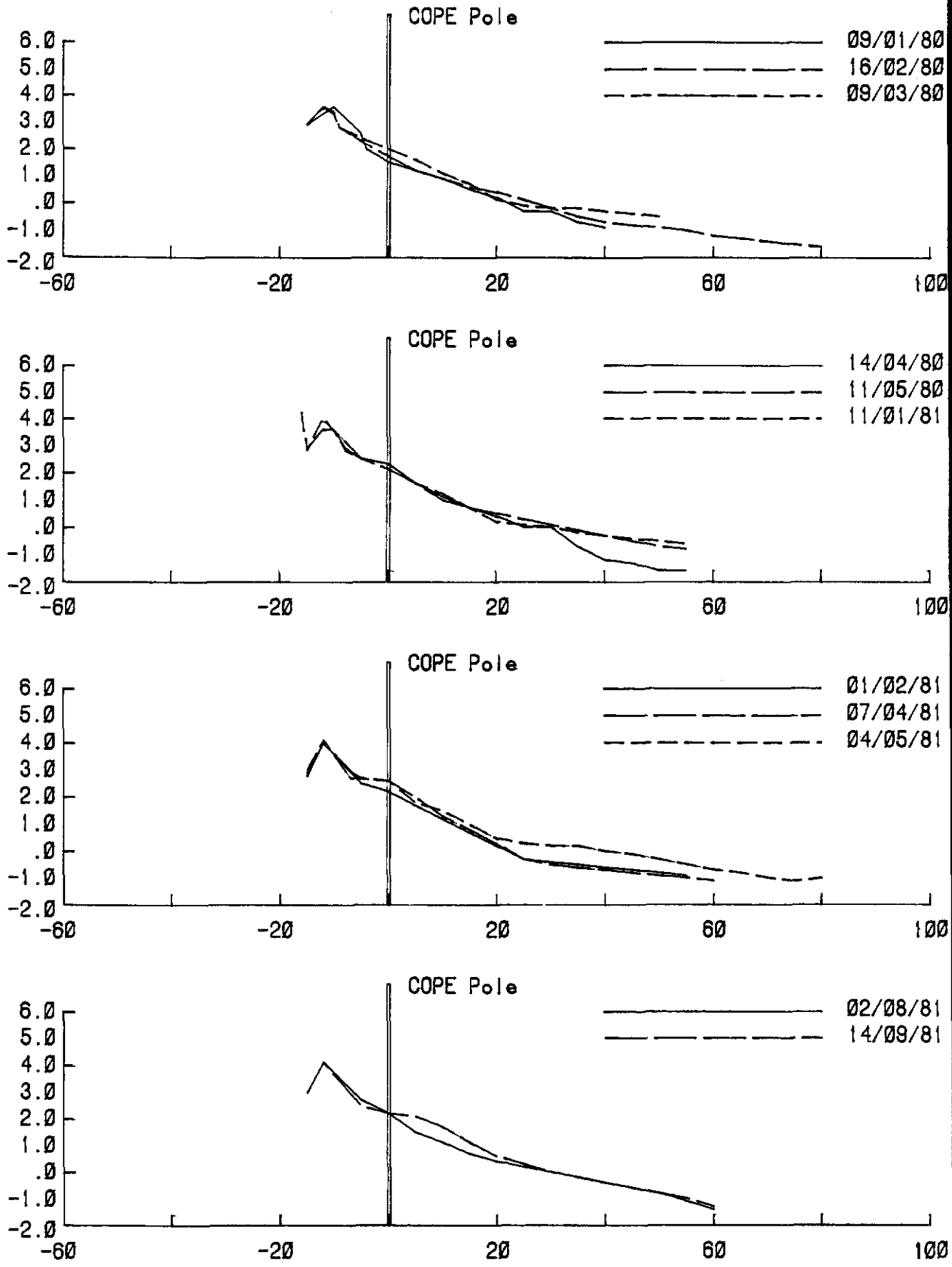
Theodolite Creek

Figure 34

C 21.1



Level Datum is A.H.D.

Distances and Levels are measured in Metres

Beach Protection Authority

MONTHLY BEACH PROFILES

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Theodolite Creek

Figure 35

C 21.1