Beach Protection Authority Queensland

COASTAL OBSERVATION PROGRAMME – ENGINEERING (COPE)

# KINGS BEACH – CITY OF CALOUNDRA

HARBOURS MARINE

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ISSN 0158-7749

# COASTAL OBSERVATION PROGRAMME - ENGINEERING (COPE)

# KINGS BEACH - CITY OF CALOUNDRA

# FOR THE YEARS 1973 TO 1988

# REPORT NO. C24.1

Beach Protection Authority

December 1988

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## DOCUMENTATION PAGE

**REPORT NO.:-** C24.1

**TITLE:-** Report - Coastal Observation Programme - Engineering (COPE), Kings Beach - City of Caloundra

**DATE:-** December 1988

**TYPE OF REPORT:-** Technical Memorandum

**PREPARED BY:-** Beach Protection Branch of the Department of Harbours and Marine on behalf of the Beach Protection Authority.

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**DISTRIBUTION:-** Public Distribution

**ABSTRACT:-**

This report provides a summary of primary analyses of COPE data on wind, wave and beach processes observed at Kings Beach in the City of Caloundra, on the south east Queensland coast. The data was recorded by volunteer observers during the period September 1973 to May 1988. The Beach Protection Authority wishes to thank all observers in the recording of data at the COPE Station. The information published is considered representative of the long term conditions. At date of publication, recordings had recommenced with a new volunteer observer after a break in recordings from June 1988 to September 1988.

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Coastal Observation Programme - Engineering (COPE), Burleigh Heads - City of Gold Coast, (Report 22.1)

Coastal Observation Programme - Engineering (COPE), Bramston Beach and Bramston Beach North - Mulgrave Shire, (Report C23.1)

**REFERENCES:**


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.

## CONTENTS

## LIST OF TABLES

## LIST OF FIGURES

## 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, stop watch, 2.0 metre measuring sticks, recording forms and 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 and Local Authority 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 fifteen year period 1973 to 1988 in a useful statistical form. No attempt has been made to interpret the observed data.

If the fifteen 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

Kings Beach is located within the City of Caloundra and lies approximately 65 kilometres north of Brisbane on the south east Queensland coast. It is a 500 metre stretch of coastline, south of Caloundra Head. The location of the Kings Beach COPE station is shown in Figure 1.1 and 1.2.

### 2.2 Observers

This station has been operated by Caloundra City Council employees, Mr. C. Roughsedge (1973-1977), (1986-1988), Mr J. Irwin (1977-1983) and Mr S. Hadland (1983-1986).

### 2.3 Observed Parameters

The observers at this station recorded the majority of observations between 7.00 am and 10.00 am. Several afternoon observations were also recorded during the total period.

This station has recorded:

- Wave Period
- Wave Height
- Wave Direction
- Wave Type
- Surf Zone Width
- Presence of Offshore Bar
- Wind Speed
- Wind Direction
- State of Tide
- Distance to Berm
- Berm Elevation
- Distance to Vegetation Line
- Sand Level at C.O.P.E. Reference Pole
- Foreshore Slope
- Longshore Current Speed
- Longshore Current Direction
- Distance from Shoreline to Dye Patch (Recorded from February 1986)

In addition a sand sample was collected at the station each month, and since July 1975, a profile of the beach has usually been recorded monthly.

## 2.4 Tidal Information

Tidal information for Caloundra as presented below. Datum is Low Water Datum.

| | |
|---|---|
| M.H.W.S. | 1.60 metres |
| M.H.W.N. | 1.30 metres |
| M.S.L. | 0.90 metres |
| M.L.W.N. | 0.50 metres |
| M.L.W.S. | 0.20 metres |

A.H.D. is 0.97 metres above Low Water Datum.

Tidal information was obtained from the 1988, Queensland Tide Tables.

## 2.5 Description of the Beach

The beach at the Kings Beach 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: Varied from 50 to 80 metres measured from the seaward toe of the frontal dune to Low Water Mark over the fifteen year period (1973-1988).

- D50 sand size: 0.27 mm averaged over ten years (1975-1985).

- Adjoining Landform: Low and narrow frontal dune backed by a levelled area developed for parkland and car parking purposes.

- Vegetation: The frontal dune is well vegetated with elephant grass (Pennisetum purpureum). Other ground cover species include beach primrose (Oenothera drummondii) and dune couch (Zoysia macrantha). Scattered horsetail she-oak (Casuarina equisetifolia var. Incana) trees occur in a narrow belt along the landward slope of the frontal dune.

  A range of native and exotic grasses and shrubs have established a dense ground cover over the crest and seaward slope of the secondary dune.

## 2.6 Meteorological Events

The following cyclones were recorded by the Brisbane Bureau of Meteorology as having tracks within 500 kilometres of Kings Beach between September 1973 and May 1988. It is considered that the following meteorological events may have had some effect on the condition of Kings Beach.

| | |
|---|---|
| Cyclone Wanda | 24/01/74 - 25/01/74 |
| Cylcone Pam | 04/02/74 - 06/02/74 |
| Cyclone Zoe | 07/03/74 - 14/03/74 |
| Cyclone Alice | 21/03/74 - 23/03/74 |
| Cyclone David | 14/01/76 - 22/01/76 |
| Cyclone Beth | 14/02/76 - 22/02/76 |
| Cyclone Colin | 26/02/76 - 04/03/76 |
| Cyclone Dawn | 05/03/76 - 06/03/76 |
| Cyclone Watorea | 25/04/76 - 29/04/76 |
| Cyclone Paul | 03/01/80 - 08/01/80 |
| Cyclone Simon | 20/02/80 - 28/02/80 |
| Cyclone Cliff | 09/02/81 - 15/02/81 |
| Cyclone Abigail | 22/01/82 - 05/02/82 |
| Low Pressure System | 03/06/83 - 06/06/83 |
| Cyclone Ingrid | 20/02/84 - 25/02/84 |
| Cyclone Lance | 04/04/84 - 07/04/84 |
| Low Pressure System | 07/04/84 - 13/04/84 |
| Low Pressure System | 18/05/84 - 23/05/84 |
| Cyclone Pierre | 18/02/85 - 24/02/85 |
| Cyclone Vernon | 21/01/86 - 24/01/86 |

## 2.7 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 Caloundra City 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 fifteen year period September 1973 to May 1988 is presented on the attached figures. The data has 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 observer recorded the wind speed at the beach using a hand held wind meter at 1.5 metres above beach level. Prior to February 1986 wind direction was estimated to the nearest compass sector. After this time wind direction is recorded in degrees by compass.

A summary of annual wind speed and direction percentage occurrences are shown as a wind rose in Figure 3. Where applicable, morning and afternoon readings as well as the overall average are shown.

Wind speed was recorded in miles per hour (m.p.h.) rather than knots after February 1986. The recordings are converted from (m.p.h.) to knots for Figure 3.

### 3.3 Waves

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

Recordings of maximum wave height and method used to obtain wave height were introduced into the programme from February 1986. Wave type and state of tide were discontinued at this time.

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

Wave direction was recorded in degrees of a compass from March 1986. The direction recorded was then converted to a sector (see following paragraph regarding sector system).

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 $40^{o}$ east 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 4).

(b) the percentage occurrence of various combinations of wave heights and periods and directions (Figure 5 and Figure 6).

(c) surf zone width with an indication of the existence or otherwise of an offshore bar (Figure 7 to Figure 22).

(d) tabulation of the occurrence of various wave heights, periods, types and directions (Tables 1 to 16).

### 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 23 to Figure 38). Mean upcoast and downcoast components and the overall annual means are also presented.

### 3.5 Beach Profile Parameters

Beach profile parameters were measured until 1983 using an Abney level, tape measure and reference pole. These include:

- Distance from reference pole to the berm.
- Elevation of the berm.
- Distance from reference pole to the vegetation line.
- The foreshore slope.

Since 1983 profiles have been recorded using a measuring stick, the reference pole, and a line of sight to the horizon.

Sand level at the reference pole was formally recorded from June 1986 and the measurement of foreshore slope was discontinued at this time.

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 39 to Figure 54.

Pushing of sand from below the Low Water Mark was carried out at various intervals between 1973 to 1988 to repair erosion.

No significant changes in the recorded beach profiles occurred due to sand pushing.

## 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 55 to Figure 62.

TABLE 1

MONTHLY AND ANNUAL

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

Kings Beach | No. of Observations: 55 | Year 1973

| 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 | 9.0 | 1.03 | 50.0 | - | - | 50.0 | - | - | 50.0 | 50.0 | - | - | - |
| OCTOBER | 8.6 | 0.98 | 33.3 | - | - | 66.7 | - | - | 66.7 | 33.3 | - | - | - |
| NOVEMBER | 9.3 | 0.59 | 100.0 | - | - | - | - | - | 88.9 | 11.1 | - | - | - |
| DECEMBER | 9.0 | 0.78 | 83.3 | - | - | 16.7 | - | - | 100.0 | - | - | - | - |
| WHOLE YEAR | 9.0 | 0.84 | 62.3 | 0 | 0 | 37.7 | 0 | 0 | 74.5 | 25.5 | 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

Kings Beach | No. of Observations: 154 | Year 1974

| 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 | 9.3 | 1.32 | - | - | - | 100.0 | - | - | 44.4 | 55.6 | - | - | - |
| MARCH | 9.8 | 1.40 | - | - | - | 100.0 | - | - | 38.5 | 61.5 | - | - | - |
| APRIL | 8.2 | 1.08 | - | - | - | 100.0 | - | - | 22.2 | 77.8 | - | - | - |
| MAY | 9.7 | 1.10 | - | 11.1 | - | 88.9 | - | - | 12.5 | 87.5 | - | - | - |
| JUNE | - | 1.54 | - | 41.7 | - | 58.3 | - | - | 27.3 | 72.7 | - | - | - |
| JULY | 10.6 | 0.47 | - | 23.5 | - | 76.5 | - | - | - | 89.5 | 10.5 | - | - |
| AUGUST | 10.1 | 1.07 | - | 47.4 | - | 52.6 | - | - | 10.5 | 89.5 | - | - | - |
| SEPTEMBER | 9.2 | 0.79 | - | 6.3 | - | 87.4 | 6.3 | - | 6.3 | 87.4 | 0 | 0 | 6.3 |
| OCTOBER | 9.6 | 1.00 | 40.0 | 30.0 | - | 30.0 | - | - | - | 95.0 | 5.0 | - | - |
| NOVEMBER | 9.4 | 1.16 | 35.8 | - | 7.1 | 57.1 | - | - | - | 100.0 | - | - | - |
| DECEMBER | 8.6 | 0.82 | 16.7 | 8.3 | - | 75.0 | - | - | - | 91.7 | 8.3 | - | - |
| WHOLE YEAR | 9.5 | 1.07 | 9.9 | 17.9 | 0.7 | 70.8 | 0.7 | 0 | 12.0 | 84.6 | 2.7 | 0 | 0.7 |

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

Kings Beach | No. of Observations: 148 | Year 1975

| 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 | 8.9 | 1.07 | 6.7 | - | - | 93.3 | - | - | 13.3 | 86.7 | - | - | - |
| FEBRUARY | 9.5 | 1.10 | 7.1 | - | - | 92.9 | - | - | 25.0 | 75.0 | - | - | - |
| MARCH | 9.3 | 0.89 | 50.0 | - | - | 50.0 | - | - | - | 100.0 | - | - | - |
| APRIL | 9.4 | 1.16 | 14.3 | - | - | 85.7 | - | - | 7.1 | 92.9 | - | - | - |
| MAY | 10.0 | 1.01 | 45.0 | 5.0 | - | 50.0 | - | - | 20.0 | 80.0 | - | - | - |
| JUNE | 9.8 | 0.87 | 41.7 | 16.7 | - | 41.7 | - | - | - | 100.0 | - | - | - |
| JULY | 10.1 | 0.62 | 35.7 | 50.0 | - | 14.3 | - | - | - | 100.0 | - | - | - |
| AUGUST | 9.8 | 0.85 | 42.9 | 21.4 | - | 35.7 | - | - | 14.3 | 85.7 | - | - | - |
| SEPTEMBER | 8.7 | 1.02 | 29.4 | - | - | 70.6 | - | - | 47.1 | 52.9 | - | - | - |
| OCTOBER | 8.4 | 0.70 | 66.7 | - | - | 33.3 | - | - | - | 100.0 | - | - | - |
| NOVEMBER | 7.5 | 0.84 | 40.0 | - | - | 40.0 | 20.0 | - | 40.0 | 40.0 | - | - | 20.0 |
| DECEMBER | 8.5 | 1.12 | - | 25.0 | - | 75.0 | - | - | - | 100.0 | - | - | - |
| WHOLE YEAR | 9.4 | 0.95 | 31.5 | 9.6 | 0 | 58.2 | 0.7 | 0 | 15.5 | 83.8 | 0 | 0 | 0.7 |

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

Kings Beach | No. of Observations: 115 | 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 | 8.2 | 1.20 | 21.1 | - | - | 78.9 | - | - | - | 100.0 | - | - | - |
| MAY | 9.1 | 1.07 | 50.0 | - | - | 50.0 | - | - | - | 100.0 | - | - | - |
| JUNE | 8.7 | 1.10 | 28.6 | 14.3 | - | 57.1 | - | - | - | 100.0 | - | - | - |
| JULY | 9.4 | 0.99 | 31.3 | - | - | 68.8 | - | - | 11.8 | 88.2 | - | - | - |
| AUGUST | 11.1 | 0.86 | 40.0 | 26.7 | - | 33.3 | - | - | - | 100.0 | - | - | - |
| SEPTEMBER | 12.8 | 1.09 | 53.3 | 13.3 | - | 33.3 | - | - | - | 100.0 | - | - | - |
| OCTOBER | 8.5 | 0.45 | 57.1 | 28.6 | - | - | 14.3 | - | - | 85.7 | - | - | 14.3 |
| NOVEMBER | 10.1 | 0.64 | 25.0 | 50.0 | - | 8.3 | 16.7 | - | - | 91.7 | - | - | 8.3 |
| DECEMBER | 7.5 | 0.67 | 33.3 | 33.3 | - | 33.4 | - | - | 40.0 | 60.0 | - | - | - |
| WHOLE YEAR | 9.4 | 0.92 | 37.7 | 16.7 | 0 | 42.1 | 3.5 | 0 | 3.6 | 93.7 | 0 | 0 | 2.7 |

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 OCCURRENCES

Kings Beach | No. of Observations: 61 | 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 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| FEBRUARY | - | - | - | - | - | - | - | - | - | - | - | - | - |
| MARCH | 8.1 | 0.80 | 75.0 | 25.0 | - | - | - | - | - | 100.0 | - | - | - |
| APRIL | 10.0 | 1.00 | 100.0 | - | - | - | - | - | - | 100.0 | - | - | - |
| MAY | 11.0 | 0.93 | 66.7 | - | - | 33.3 | - | - | - | 100.0 | - | - | - |
| JUNE | 10.0 | 0.77 | 53.3 | - | - | 40.0 | 6.7 | - | - | 93.3 | - | - | 6.7 |
| JULY | 10.1 | 1.00 | 27.3 | 9.1 | - | 63.6 | - | - | 18.2 | 81.8 | - | - | - |
| AUGUST | 9.3 | 0.37 | 100.0 | - | - | - | - | - | - | 100.0 | - | - | - |
| SEPTEMBER | 10.0 | 0.75 | 50.0 | - | - | 50.0 | - | - | - | 100.0 | - | - | - |
| OCTOBER | - | - | - | - | - | - | - | - | - | - | - | - | - |
| NOVEMBER | 9.6 | 0.80 | - | - | - | 100.0 | - | - | 50.0 | 50.0 | - | - | - |
| DECEMBER | 8.9 | 0.68 | 75.0 | - | - | 25.0 | - | - | 60.0 | 35.0 | 5.0 | - | - |
| WHOLE YEAR | 9.5 | 0.78 | 59.0 | 3.3 | 0 | 36.1 | 1.6 | 0 | 24.6 | 72.2 | 1.6 | 0 | 1.6 |

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

TABLE 6

MONTHLY AND ANNUAL

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

Kings Beach | No. of Observations: 249 | 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 | 9.3 | 1.03 | 60.0 | 5.0 | - | 35.0 | - | - | 25.0 | 70.0 | 5.0 | - | - |
| FEBRUARY | 8.8 | 0.80 | 60.0 | - | 5.0 | 35.0 | - | - | 10.0 | 75.0 | 15.0 | - | - |
| MARCH | 9.9 | 0.93 | 47.6 | - | - | 52.4 | - | - | - | 71.4 | 28.6 | - | - |
| APRIL | 10.7 | 1.00 | 52.6 | - | - | 47.4 | - | - | - | 63.2 | 36.8 | - | - |
| MAY | 10.9 | 0.90 | 45.5 | - | - | 54.5 | - | - | - | 77.3 | 22.7 | - | - |
| JUNE | 10.6 | 0.69 | 70.0 | - | - | 30.0 | - | - | - | 70.0 | 30.0 | - | - |
| JULY | 10.4 | 0.74 | 76.2 | - | - | 23.8 | - | - | - | 61.9 | 28.6 | 9.5 | - |
| AUGUST | 10.2 | 1.04 | 22.7 | - | - | 77.3 | - | - | 9.1 | 50.0 | 40.9 | - | - |
| SEPTEMBER | 10.4 | 0.67 | 71.4 | - | - | 23.8 | 4.8 | - | - | 81.0 | 14.2 | - | 4.8 |
| OCTOBER | 10.1 | 0.75 | 31.8 | - | - | 68.2 | - | - | 4.5 | 77.3 | 18.2 | - | - |
| NOVEMBER | 9.6 | 0.80 | 77.3 | - | - | 22.7 | - | - | 9.1 | 72.7 | 18.2 | - | - |
| DECEMBER | 9.4 | 0.55 | 57.9 | - | 10.5 | 21.1 | 10.5 | - | 5.3 | 73.7 | 10.5 | - | 10.5 |
| WHOLE YEAR | 10.0 | 0.83 | 55.8 | 0.4 | 1.2 | 41.4 | 1.2 | 0 | 5.2 | 70.3 | 22.5 | 0.8 | 1.2 |

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

TABLE 7

MONTHLY AND ANNUAL

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

Kings Beach | No. of Observations: 250 | 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 | 8.7 | 0.91 | 42.9 | - | - | 57.1 | - | - | 14.3 | 33.3 | 52.5 | - | - |
| FEBRUARY | 9.0 | 1.05 | 45.0 | - | - | 55.0 | - | - | 15.0 | 60.0 | 25.0 | - | - |
| MARCH | 9.1 | 0.67 | 66.7 | - | - | 33.3 | - | - | 4.8 | 38.1 | 57.1 | - | - |
| APRIL | 10.4 | 0.77 | 66.7 | - | - | 33.3 | - | - | - | 83.3 | 16.7 | - | - |
| MAY | 9.6 | 0.59 | 63.6 | - | - | 36.4 | - | - | - | 54.5 | 45.5 | - | - |
| JUNE | 9.3 | 0.64 | 42.1 | - | - | 57.9 | - | - | 5.3 | 63.2 | 31.6 | - | - |
| JULY | 9.7 | 0.69 | 68.2 | - | - | 31.8 | - | - | - | 81.8 | 18.2 | - | - |
| AUGUST | 10.9 | 0.46 | 69.6 | - | - | 26.1 | 4.3 | - | - | 73.9 | 21.7 | - | 4.3 |
| SEPTEMBER | 10.4 | 0.48 | 70.0 | - | - | 25.0 | 5.0 | - | - | 55.0 | 40.0 | - | 5.0 |
| OCTOBER | 8.9 | 0.45 | 91.3 | - | - | 8.7 | - | - | 8.7 | 56.5 | 34.8 | - | - |
| NOVEMBER | 8.5 | 0.43 | 72.7 | - | - | 27.3 | - | - | 4.5 | 72.7 | 22.7 | - | - |
| DECEMBER | 8.8 | 0.59 | 36.8 | - | - | 63.2 | - | - | 5.3 | 57.9 | 36.8 | - | - |
| WHOLE YEAR | 9.4 | 0.64 | 62.0 | 0 | 0 | 37.2 | 0.8 | 0 | 4.8 | 60.8 | 33.6 | 0 | 0.8 |

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

TABLE 8

MONTHLY AND ANNUAL

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

Kings Beach | No. of Observations: 251 | 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 | 9.3 | 0.65 | 42.9 | - | - | 57.1 | - | - | 14.3 | 76.2 | 9.5 | - | - |
| FEBRUARY | 9.6 | 1.26 | 9.5 | - | - | 90.5 | - | - | 9.5 | 38.1 | 52.4 | - | - |
| MARCH | 10.3 | 0.69 | 65.0 | - | - | 35.0 | - | - | - | 60.0 | 40.0 | - | - |
| APRIL | 10.2 | 0.72 | 36.8 | - | - | 63.2 | - | - | 10.5 | 26.3 | 63.2 | - | - |
| MAY | 9.6 | 0.82 | 71.4 | - | - | 28.6 | - | - | 9.5 | 52.4 | 38.1 | - | - |
| JUNE | 11.5 | 0.60 | 57.9 | - | - | 36.8 | 5.3 | - | - | 68.4 | 26.3 | - | 5.3 |
| JULY | 10.5 | 0.43 | 60.9 | - | - | 34.8 | 4.3 | - | - | 73.9 | 21.8 | - | 4.3 |
| AUGUST | 10.1 | 0.52 | - | - | - | 100.0 | - | - | - | 95.2 | 4.8 | - | - |
| SEPTEMBER | 10.7 | 0.37 | 22.7 | - | - | 77.3 | - | - | - | 100.0 | - | - | - |
| OCTOBER | 9.6 | 0.83 | - | - | - | 100.0 | - | - | - | 95.7 | 4.3 | - | - |
| NOVEMBER | 10.2 | 0.62 | - | - | - | 100.0 | - | - | - | 95.0 | 5.0 | - | - |
| DECEMBER | 9.2 | 0.65 | 4.8 | - | - | 95.2 | - | - | 4.7 | 81.0 | 14.3 | - | - |
| WHOLE YEAR | 10.1 | 0.68 | 30.7 | 0 | 0 | 68.5 | 0.8 | 0 | 4.0 | 72.5 | 22.7 | 0 | 0.8 |

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

TABLE 9

MONTHLY AND ANNUAL

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

Kings Beach | No. of Observations: 160 | 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 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| FEBRUARY | - | - | - | - | - | - | - | - | - | - | - | - | - |
| MARCH | - | - | - | - | - | - | - | - | - | - | - | - | - |
| APRIL | - | - | - | - | - | - | - | - | - | - | - | - | - |
| MAY | 10.6 | 0.94 | - | - | - | 100.0 | - | - | 15.4 | - | 84.6 | - | - |
| JUNE | 11.1 | 0.76 | - | - | - | 100.0 | - | - | 33.3 | 66.7 | - | - | - |
| JULY | 11.0 | 0.52 | 14.3 | - | - | 81.0 | 4.8 | - | - | 71.4 | 23.8 | - | 4.8 |
| AUGUST | 10.5 | 0.56 | 9.5 | - | - | 81.0 | 9.5 | - | - | 71.4 | 19.1 | - | 9.5 |
| SEPTEMBER | 10.6 | 0.55 | 4.5 | - | - | 95.5 | - | - | - | 81.8 | 18.2 | - | - |
| OCTOBER | 9.6 | 0.61 | - | - | - | 100.0 | - | - | 4.5 | 68.2 | 27.3 | - | - |
| NOVEMBER | 9.7 | 0.73 | - | - | - | 100.0 | - | - | 5.3 | 89.4 | 5.3 | - | - |
| DECEMBER | 9.7 | 0.82 | 4.8 | - | - | 95.2 | - | - | - | 76.2 | 23.8 | - | - |
| WHOLE YEAR | 10.3 | 0.68 | 4.4 | 0 | 0 | 93.7 | 1.9 | 0 | 3.5 | 69.0 | 25.4 | 0 | 2.1 |

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

TABLE 10

MONTHLY AND ANNUAL

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

Kings Beach | No. of Observations: 246 | Year 1982

| 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 | 9.9 | 0.94 | - | - | - | 100.0 | - | - | - | 80.0 | 20.0 | - | - |
| FEBRUARY | 10.0 | 1.19 | - | - | - | 100.0 | - | - | - | 68.4 | 31.6 | - | - |
| MARCH | 10.4 | 1.24 | - | - | - | 100.0 | - | - | - | 91.3 | 8.7 | - | - |
| APRIL | 10.6 | 0.87 | - | - | - | 100.0 | - | - | - | 83.3 | 16.7 | - | - |
| MAY | 11.1 | 0.72 | 4.8 | - | - | 95.2 | - | - | - | 76.2 | 23.8 | - | - |
| JUNE | 12.0 | 0.92 | 6.3 | - | - | 93.8 | - | - | - | 93.8 | 6.2 | - | - |
| JULY | 11.5 | 0.63 | - | - | - | 100.0 | - | - | - | 77.3 | 22.7 | - | - |
| AUGUST | 10.2 | 0.91 | - | - | - | 100.0 | - | - | - | 95.2 | 4.8 | - | - |
| SEPTEMBER | 11.8 | 0.63 | 9.1 | - | - | 90.9 | - | - | - | 63.6 | 36.4 | - | - |
| OCTOBER | 11.1 | 0.71 | 9.5 | - | - | 90.5 | - | - | - | 71.4 | 28.6 | - | - |
| NOVEMBER | 9.6 | 0.76 | - | - | - | 100.0 | - | - | 9.1 | 68.2 | 22.7 | - | - |
| DECEMBER | 10.3 | 0.63 | - | - | 9.5 | 90.5 | - | - | - | 100.0 | - | - | - |
| WHOLE YEAR | 10.7 | 0.84 | 2.4 | 0 | 0.8 | 96.8 | 0 | 0 | 0.8 | 80.5 | 18.7 | 0 | 0 |

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

TABLE 11

MONTHLY AND ANNUAL

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

Kings Beach | No. of Observations: 189 | Year 1983

| 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 | 12.6 | 0.86 | - | - | - | 100.0 | - | - | - | 78.9 | 21.1 | - | - |
| FEBRUARY | 9.5 | 0.66 | - | - | - | 100.0 | - | - | - | 70.0 | 30.0 | - | - |
| MARCH | 9.8 | 0.80 | - | - | - | 100.0 | - | - | - | 90.9 | 9.1 | - | - |
| APRIL | 11.1 | 0.72 | 23.5 | - | - | 76.5 | - | - | - | 94.1 | 5.9 | - | - |
| MAY | 9.2 | 0.53 | 33.3 | - | - | 66.7 | - | - | - | 100.0 | - | - | - |
| JUNE | - | - | - | - | - | - | - | - | - | - | - | - | - |
| JULY | 7.6 | 1.04 | 65.0 | 30.0 | 5.0 | - | - | - | 25.0 | 15.0 | 60.0 | - | - |
| AUGUST | 9.8 | 0.61 | 71.4 | 14.3 | 4.8 | 4.8 | 4.8 | - | - | 61.9 | 38.1 | - | - |
| SEPTEMBER | 9.5 | 0.47 | 84.2 | 10.5 | - | - | 5.3 | - | 42.1 | 10.5 | 42.1 | - | 5.3 |
| OCTOBER | 11.7 | 0.31 | 94.4 | - | - | - | 5.6 | - | 5.6 | 33.3 | 55.6 | - | 5.6 |
| NOVEMBER | 8.1 | 0.71 | 43.8 | 25.0 | 25.0 | - | 6.3 | 6.3 | 43.8 | 43.8 | 6.3 | - | - |
| DECEMBER | 8.6 | 0.83 | 38.5 | - | 7.7 | 53.8 | - | - | 14.3 | 50.0 | 35.7 | - | - |
| WHOLE YEAR | 9.8 | 0.70 | 41.5 | 8.0 | 3.7 | 44.7 | 2.1 | 0.5 | 12.2 | 56.0 | 30.2 | 0 | 1.1 |

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

TABLE 12

MONTHLY AND ANNUAL

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

Kings Beach | No. of Observations: 74 | Year 1984

| 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 | 4.0 | 1.80 | - | 100.0 | - | - | - | - | - | - | 100.0 | - | - |
| FEBRUARY | 5.1 | 0.89 | 40.0 | 20.0 | - | 6.7 | 33.3 | - | - | 13.3 | 53.3 | - | 33.3 |
| MARCH | 8.8 | 0.55 | 55.0 | 20.0 | 5.0 | - | 20.0 | - | - | 25.0 | 55.0 | - | 20.0 |
| APRIL | 6.5 | 1.24 | 30.8 | 38.5 | 7.7 | 23.1 | - | - | - | 23.1 | 76.9 | - | - |
| MAY | 11.0 | 1.59 | 45.5 | 18.2 | - | 36.4 | - | - | 36.4 | 36.4 | 27.3 | - | - |
| JUNE | - | - | - | - | - | - | - | - | - | - | - | - | - |
| JULY | - | - | - | - | - | - | - | - | - | - | - | - | - |
| AUGUST | - | - | - | - | - | - | - | - | - | - | - | - | - |
| SEPTEMBER | - | - | - | - | - | - | - | - | - | - | - | - | - |
| OCTOBER | - | - | - | - | - | - | - | - | - | - | - | - | - |
| NOVEMBER | 7.4 | 0.38 | 42.9 | 7.1 | 7.1 | 7.1 | 35.7 | - | 14.3 | 28.6 | 21.4 | - | 35.7 |
| DECEMBER | - | - | - | - | - | - | - | - | - | - | - | - | - |
| WHOLE YEAR | 7.8 | 0.88 | 43.2 | 21.6 | 4.1 | 12.2 | 18.9 | 0 | 8.1 | 24.3 | 48.7 | 0 | 18.9 |

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

TABLE 13

MONTHLY AND ANNUAL

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

Kings Beach | No. of Observations: 11 | Year 1985

| 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 | 10.8 | 0.60 | 100.0 | - | - | - | - | - | - | 100.0 | - | - | - |
| MARCH | 9.6 | 1.02 | 50.0 | 20.0 | 30.0 | - | - | - | 20.0 | 10.0 | 70.0 | - | - |
| APRIL | - | - | - | - | - | - | - | - | - | - | - | - | - |
| MAY | - | - | - | - | - | - | - | - | - | - | - | - | - |
| JUNE | - | - | - | - | - | - | - | - | - | - | - | - | - |
| JULY | - | - | - | - | - | - | - | - | - | - | - | - | - |
| AUGUST | - | - | NO DATA RECORDED APRIL 1985 TO JUNE 1986 | | | | | | | | - | - | - |
| SEPTEMBER | - | - | - | - | - | - | - | - | - | - | - | - | - |
| OCTOBER | - | - | - | - | - | - | - | - | - | - | - | - | - |
| NOVEMBER | - | - | - | - | - | - | - | - | - | - | - | - | - |
| DECEMBER | - | - | - | - | - | - | - | - | - | - | - | - | - |
| WHOLE YEAR | 9.7 | 0.98 | 54.5 | 18.2 | 27.3 | 0 | 0 | 0 | 18.2 | 18.2 | 63.6 | 0 | 0 |

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

TABLE 14

MONTHLY AND ANNUAL

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

Kings Beach | No. of Observations: 94 | Year 1986

| 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 | 9.3 | 0.52 | CR | CR | CR | CR | CR | - | 13.6 | 40.9 | 40.9 | - | 4.6 |
| AUGUST | 9.8 | 0.45 | | | | | | - | - | 57.1 | 42.9 | - | - |
| SEPTEMBER | 8.7 | 0.48 | | | | | | - | 5.9 | 88.2 | 5.9 | - | - |
| OCTOBER | 9.1 | 0.21 | | | | | | - | 22.2 | 5.6 | 50.0 | - | 22.2 |
| NOVEMBER | 7.8 | 0.39 | | | | | | - | 14.3 | 7.1 | 78.6 | - | - |
| DECEMBER | - | - | | | | | | - | - | - | - | - | - |
| WHOLE YEAR | 9.0 | 0.41 | 0 | 0 | 0 | 0 | 0 | 0.0 | 10.9 | 41.3 | 42.4 | 0.0 | 5.4 |

SP - Spilling
PL - Plunging
SP/PL - Combined Spilling and Plunging
CR - Ceased Recording Wave Type

TABLE 15

MONTHLY AND ANNUAL

MEAN WAVE HEIGHT/MEAN WAVE PERIOD AND WAVE DIRECTION OCCURRENCES

Kings Beach | No. of Observations: 201 | Year 1987

| MONTH | MEAN WAVE PERIOD (secs) | MEAN WAVE HEIGHT (metres) | Percentage Occurrence - Wave Direction | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Wave Direction | | | | | |
| | | | 1 | 2 | 3 | 4 | 5 | Calm |
| JANUARY | 9.0 | 0.27 | - | - | 50.0 | 50.0 | - | - |
| FEBRUARY | 8.1 | 0.70 | - | 15.8 | 31.6 | 42.1 | 10.5 | - |
| MARCH | 8.2 | 0.53 | - | 5.0 | 20.0 | 75.0 | - | - |
| APRIL | 6.7 | 0.74 | - | 27.8 | 44.4 | 27.8 | - | - |
| MAY | 8.6 | 0.85 | - | - | 84.2 | 15.8 | - | - |
| JUNE | 9.4 | 0.67 | - | 52.6 | 36.8 | 10.6 | - | - |
| JULY | 10.9 | 0.73 | - | 25.9 | 74.1 | - | - | - |
| AUGUST | 9.1 | 0.62 | - | 47.4 | 52.6 | - | - | - |
| SEPTEMBER | 8.8 | 0.38 | - | 18.2 | 59.1 | 22.7 | - | - |
| OCTOBER | 8.2 | 0.63 | - | 7.1 | 57.1 | 35.8 | - | - |
| NOVEMBER | 7.8 | 0.35 | - | 9.1 | 54.5 | 36.4 | - | - |
| DECEMBER | 7.9 | 0.32 | - | - | 27.3 | 72.7 | - | - |
| WHOLE YEAR | 8.7 | 0.61 | 0.0 | 20.2 | 50.7 | 28.1 | 1.0 | 0.0 |

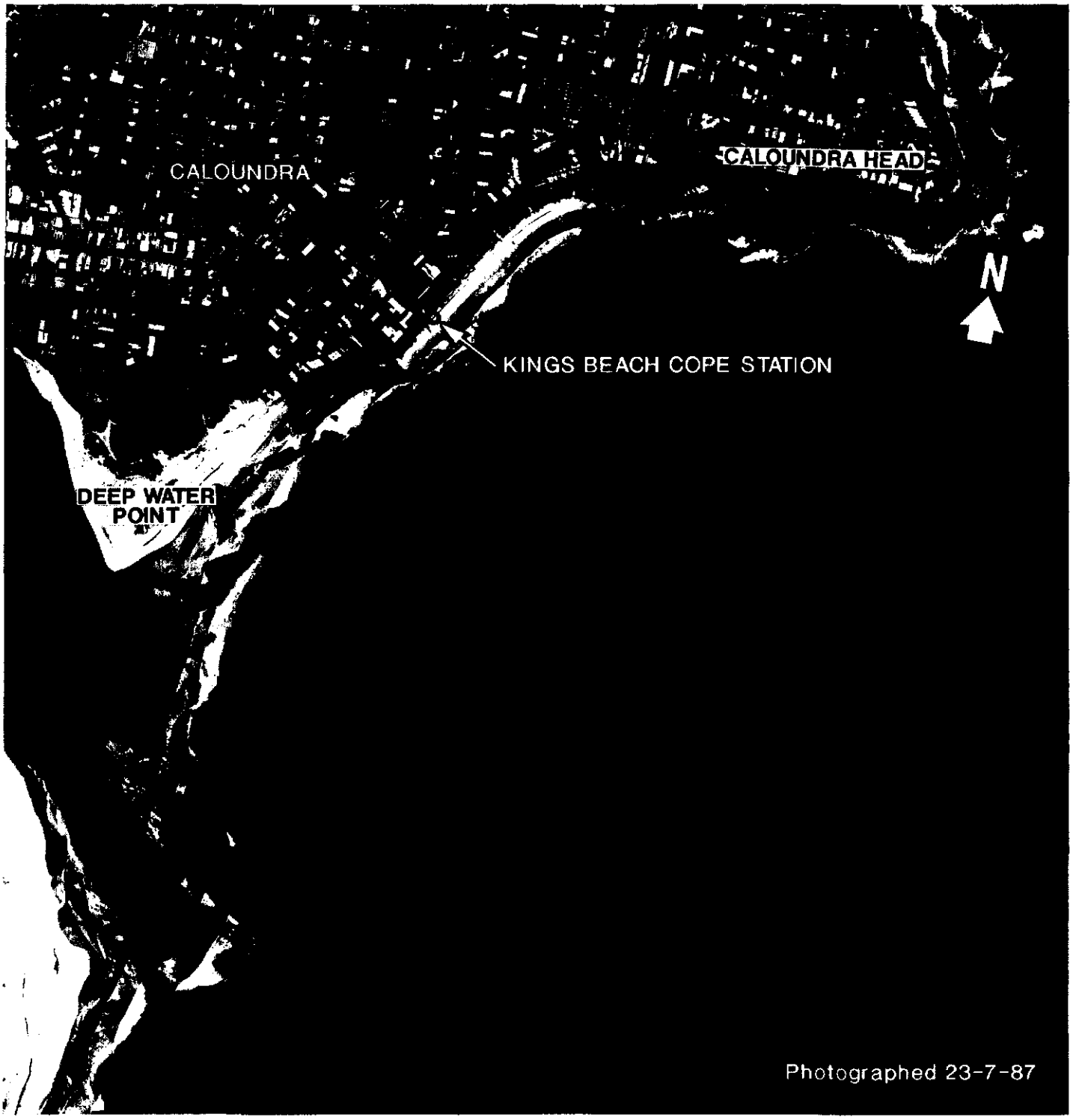
TABLE 16

MONTHLY AND ANNUAL

MEAN WAVE HEIGHT/MEAN WAVE PERIOD AND WAVE DIRECTION OCCURRENCES

Kings Beach | No. of Observations: 42 | Year 1988

| MONTH | MEAN WAVE PERIOD (secs) | MEAN WAVE HEIGHT (metres) | Percentage Occurrence - Wave Direction | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Wave Direction | | | | | |
| | | | 1 | 2 | 3 | 4 | 5 | Calm |
| JANUARY | 7.1 | 0.54 | - | 44.4 | 11.1 | 44.4 | - | - |
| FEBRUARY | 7.2 | 0.79 | - | 44.4 | - | 55.6 | - | - |
| MARCH | 7.5 | 0.79 | - | 72.7 | 18.2 | 9.1 | - | - |
| APRIL | 8.6 | 1.18 | - | 66.7 | 33.3 | - | - | - |
| MAY | 8.1 | 0.57 | - | | 71.4 | 28.6 | - | - |
| WHOLE YEAR | 7.6 | 0.76 | 0.0 | 47.6 | 23.8 | 28.6 | 0.0 | 0.0 |




100 0 100 200 300 400 500 metres

Scale 1:12 000 approx.

Beach Protection Authority

SITE PLAN

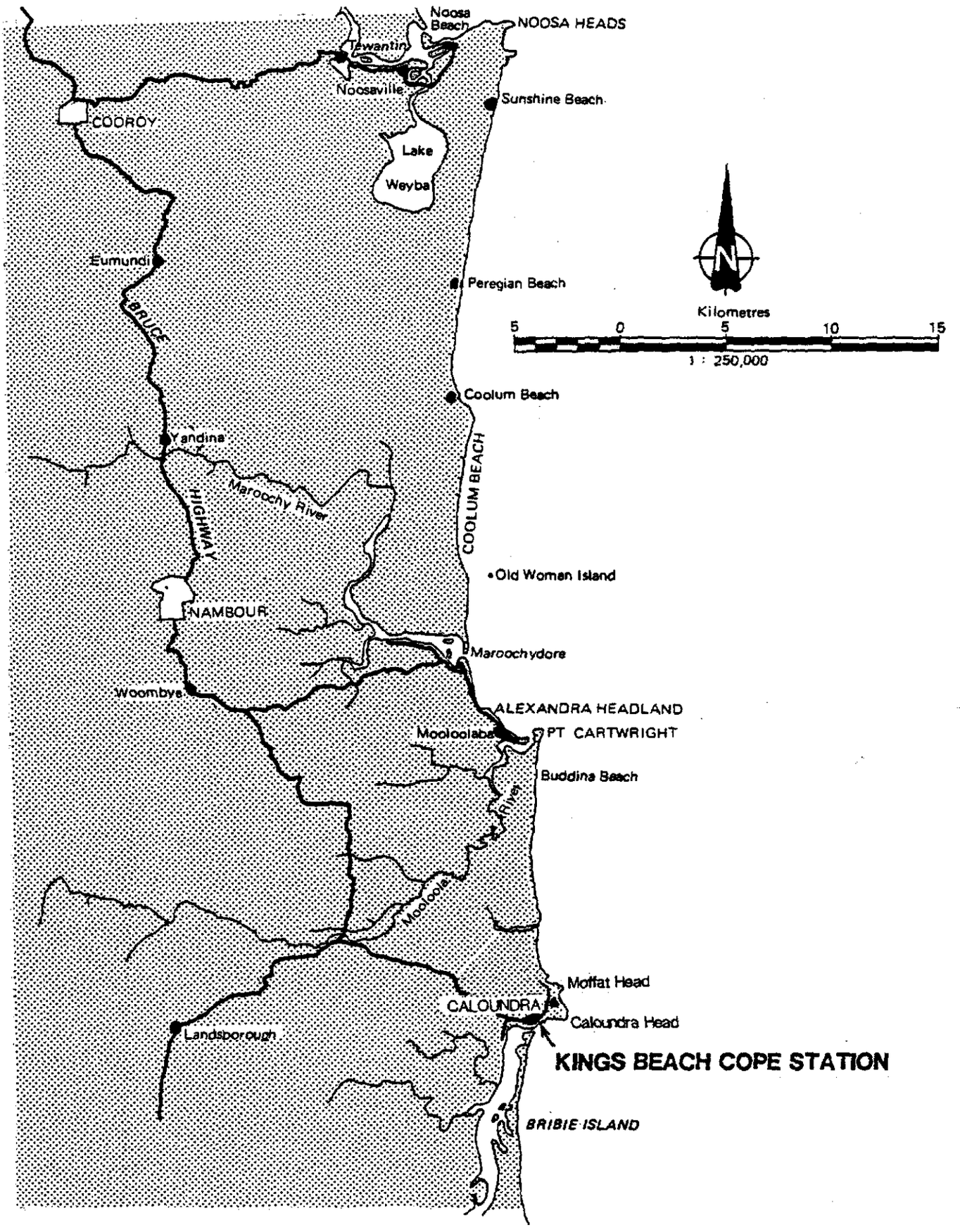
# KINGS BEACH COPE STATION

COPE

Kings Beach

**Figure 1.1**

C 24.1




Beach Protection Authority

# LOCALITY PLAN

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Kings Beach

**Figure 1.2**

C24.1

Form No. BE 48

# BEACH PROTECTION AUTHORITY OF QUEENSLAND

## COASTAL OBSERVATION PROGRAMME – ENGINEERING

# COPE

**RECORD ALL DATA CAREFULLY AND LEGIBLY**

| SITE NUMBER | DAY | MONTH | YEAR | TIME |
|---|---|---|---|---|
| 1 2 3 4 5 | 6 7 | 8 9 | 10 11 | Record time using 24 hour system 12 13 14 15 |

**(i) WAVE HEIGHT (AVERAGE)**

Record the best estimate of the average breaking wave height to the nearest tenth of a metre. **If less than 0.1 record as 0.0 and go directly to Section (ii).** 16 . 17

**WAVE HEIGHT (MAXIMUM)**

Record the best estimate of the maximum breaking wave height during the entire observation period to the nearest tenth of a metre. 18 . 19

**WAVE HEIGHT METHOD**

Record the method that you used to obtain wave height. 20
Record 1 if visual estimate
Record 2 if measured with COPE sticks
Record 3 if measured by COPE pole

**WAVE PERIOD**

Record the time in seconds for eleven (11) wave crests to pass a stationary point just seaward of the surf zone. 21 22 23

**WAVE DIRECTION**

Determine the direction that the waves are entering the surf zone using the compass provided and record the direction in degrees. 24 25 26

**SURF ZONE WIDTH**

Record the time in seconds for a wave of average height to traverse the surf zone from break point to final run-up on the beach. 27 28 29

**(ii) CURRENT SPEED**

Measure in metres the distance that the centre of the dye patch is observed to move during a one (1) minute period; if no long shore movement record 000. 30 31 32

**CURRENT DIRECTION**

When the observer faces the sea 33
0 — no long shore movement
L — dye moves to the left
R — dye moves to the right

**DISTANCE FROM SHORE**

Record the distance in metres from the shore to where the current measurements were commenced. 34 35

**OFFSHORE BAR**

Is an off-shore bar causing the waves to break? 36
1—yes 0—no

**(iii) WIND SPEED**

Record wind speed to the nearest m.p.h. If **calm record 00 and go directly to Section (iv).** 37 38

**WIND DIRECTION**

Determine the direction that the wind is coming from using the compass provided and record the direction in degrees. 39 40 41

**(iv) BERM ELEVATION**

Record the elevation of berm to the nearest tenth of a metre. Measurements should be taken of the most seaward berm if more than one exists. 42 . 43

**DISTANCE TO THE BERM**

Record the distance, to the nearest metre, from the reference post to the berm. Distances landward of the reference post are negative. 44 45 46
e.g. 009 measures 9 metres seaward (No sign);
—07 measures 7 metres landward. (Minus sign).

**(v) DISTANCE TO THE VEGETATION**

Record the distance from the reference post to the average vegetation line. Distances landward of the reference post are negative. 47 48 49

**SAND LEVEL AT POLE**

Record to nearest tenth of a metre. 50 . 51

**(vi) SAND SAMPLE**

If sample taken then record 1. Otherwise leave blank. 52

PLEASE PRINT

Please check the form for completeness

SITE NAME _____ OBSERVER _____

REMARKS: _____

Make any additional remarks, computations or sketches on the reverse side of this form.

(for office use only)
53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

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# OBSERVATION FORM

COPE
Kings Beach

**Figure 2.1**
C24.1

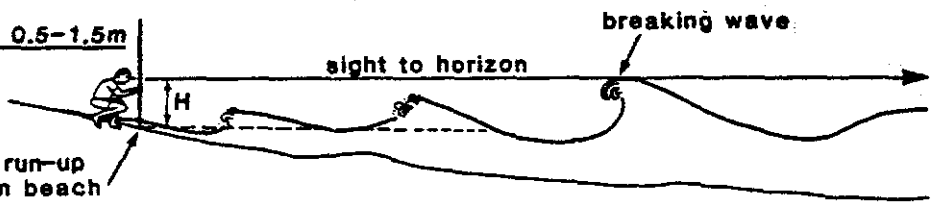
## WAVE HEIGHT AND DIRECTION INSTRUCTIONS

### METHOD 1 VISUAL ESTIMATION

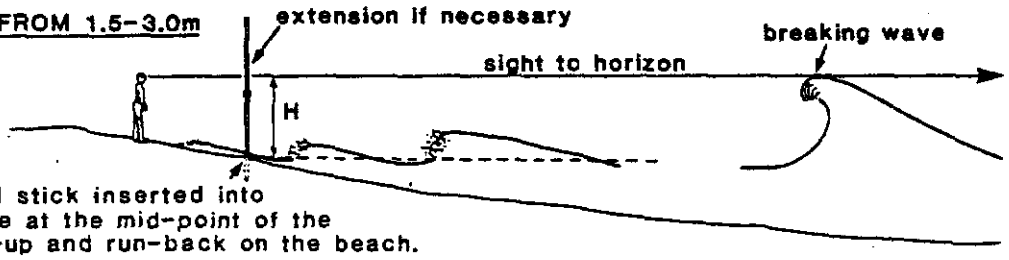
This method should only be used where the waveheights are below 0.5 and it is not practicable to use the preferred Method 2.

### METHOD 2

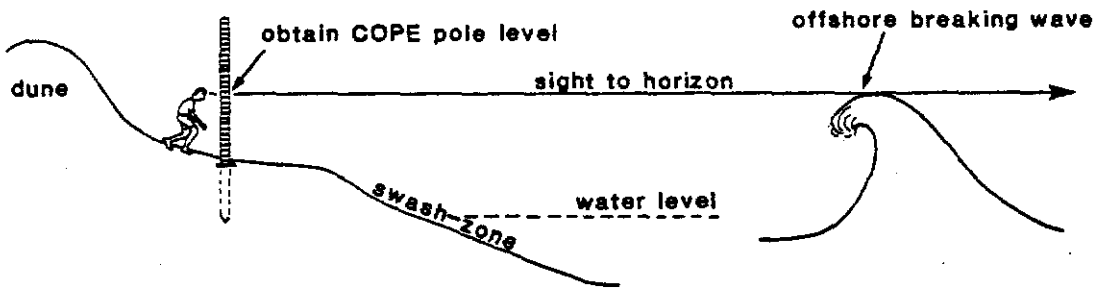
HEIGHTS FROM 0.5–1.5m



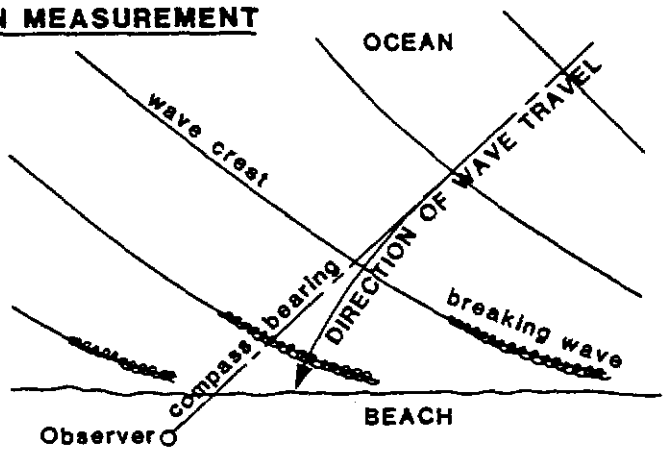

HEIGHTS FROM 1.5–3.0m




### METHOD 3 FOR WAVES OVER 3m




### WAVE DIRECTION MEASUREMENT

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# (METHODS FOR RECORDING WAVE PARAMETERS)

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Kings Beach

**Figure 2.2**

C24.1

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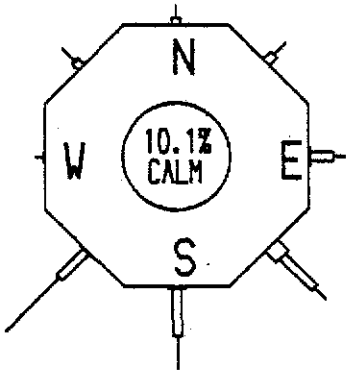
CALOUNDRA CITY KINGS BEACH 0601

ALL OBSERVATIONS

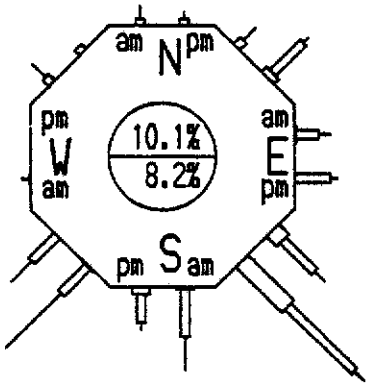



Total No. of Observations : 2282

---

MORNING - AFTERNOON OBSERVATIONS

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




LEGEND

>30 kts
16-30 kts
6-15 kts
1-5 kts

No. of Morning Observations : 2221
No. of Afternoon Observations : 61

Mean Time :- Morning Obs : 0825 hrs
Mean Time :- Afternoon Obs : 1423 hrs

SCALE
0 10 20 30 40 50
Percentage

# WIND DATA - SEPT 1973 to MAY 1988

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Kings Beach

**WIND DATA**

**Figure 3**

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# WAVE HEIGHT % EXCEEDANCE

## ALL DATA

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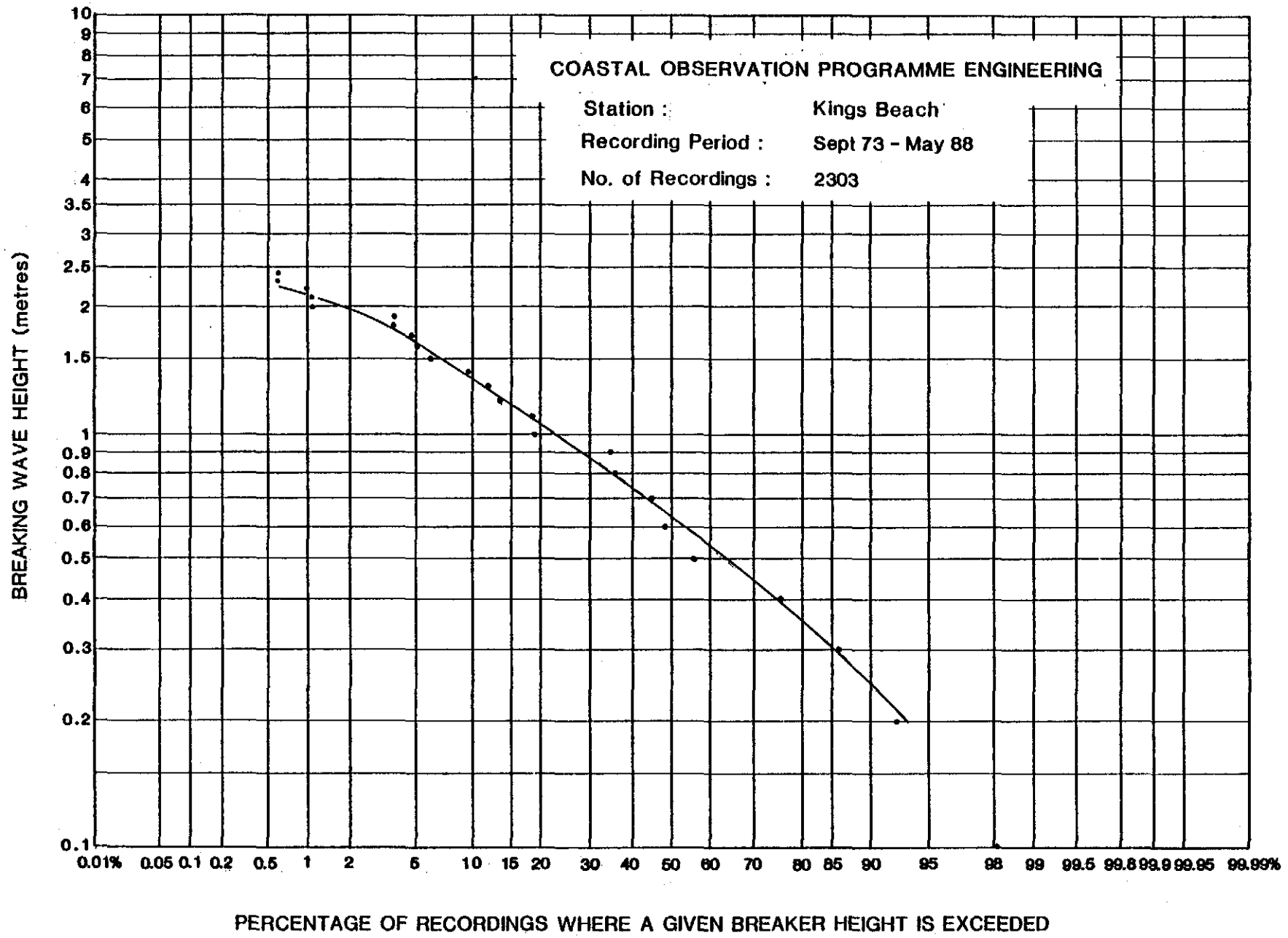
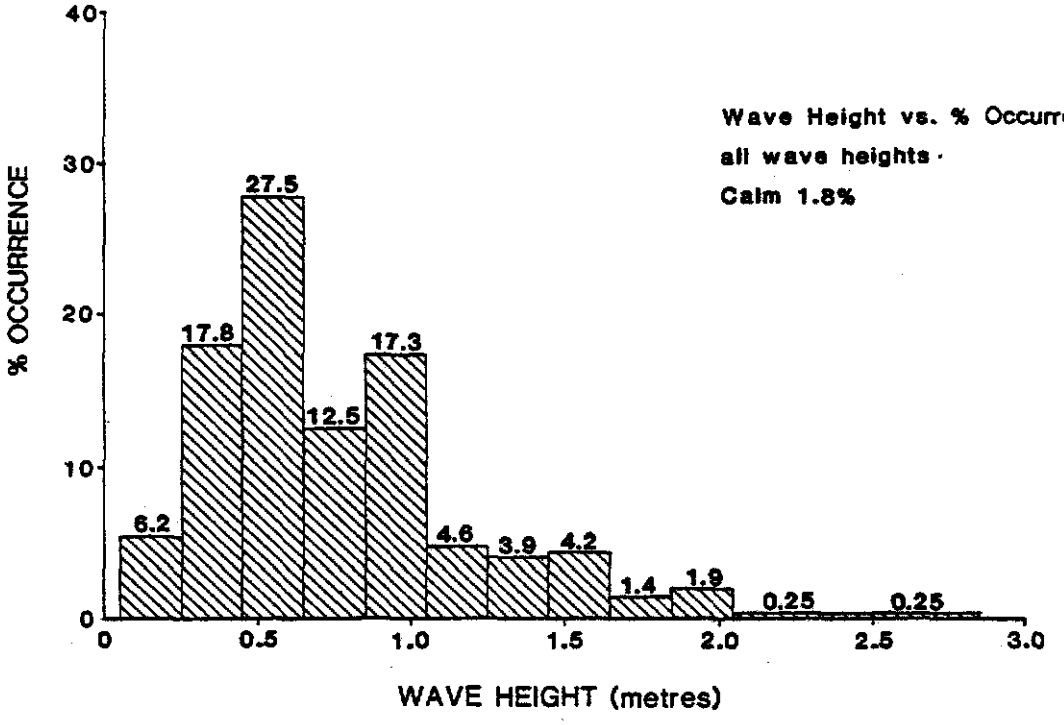
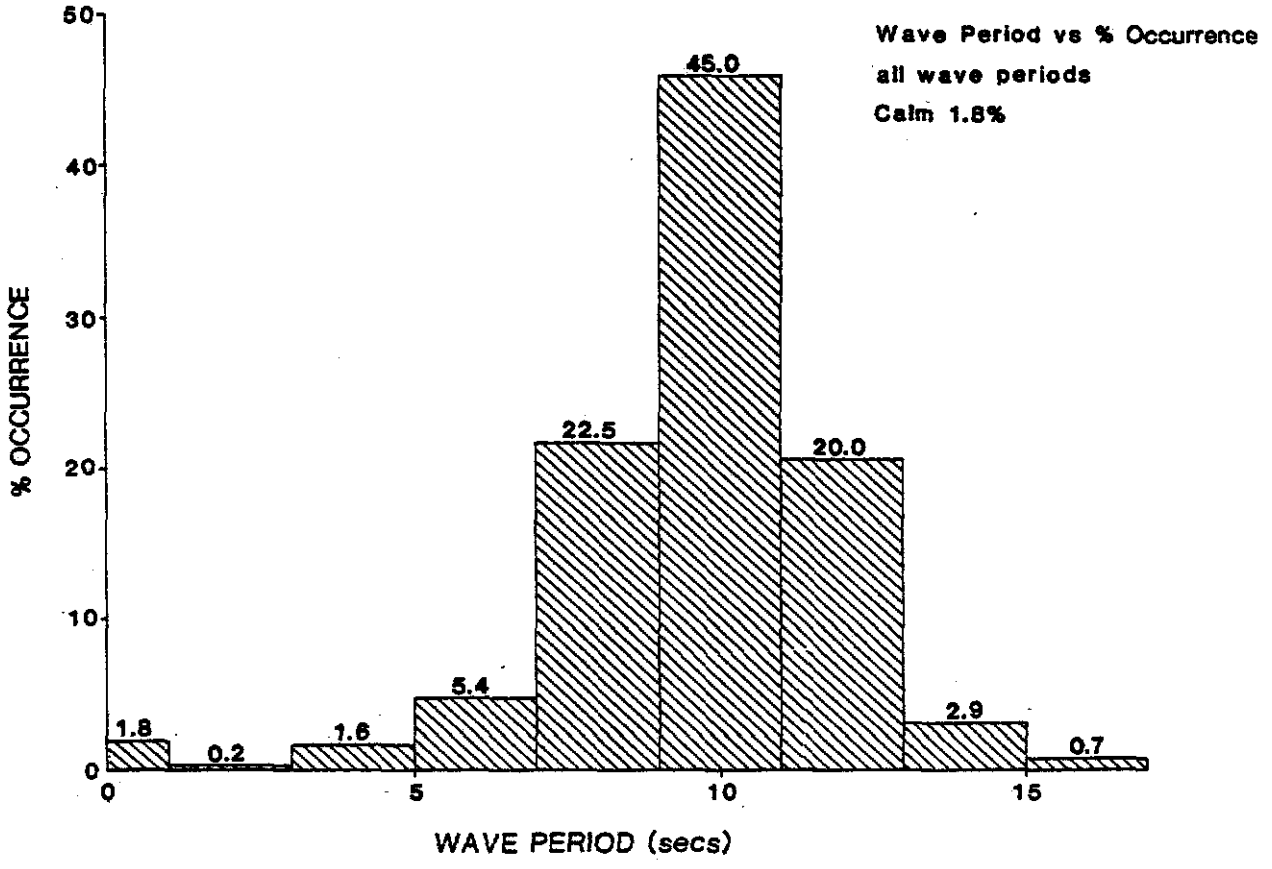
Kings Beach

**Figure 4**
C 24.1



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# WAVE HEIGHT AND PERIOD % OCCURRENCE

## ALL DATA

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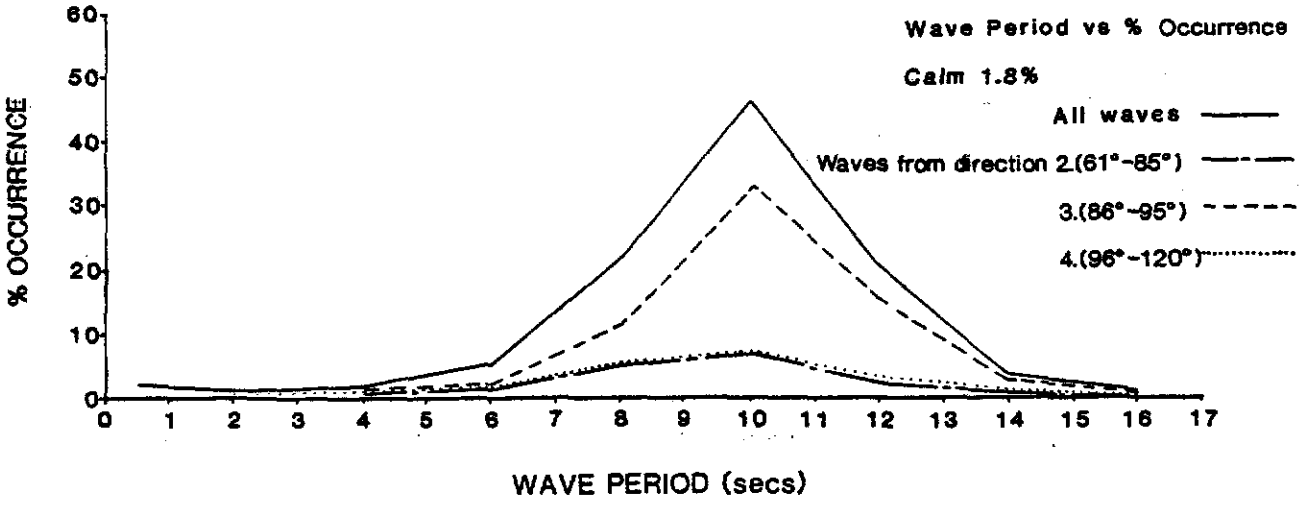
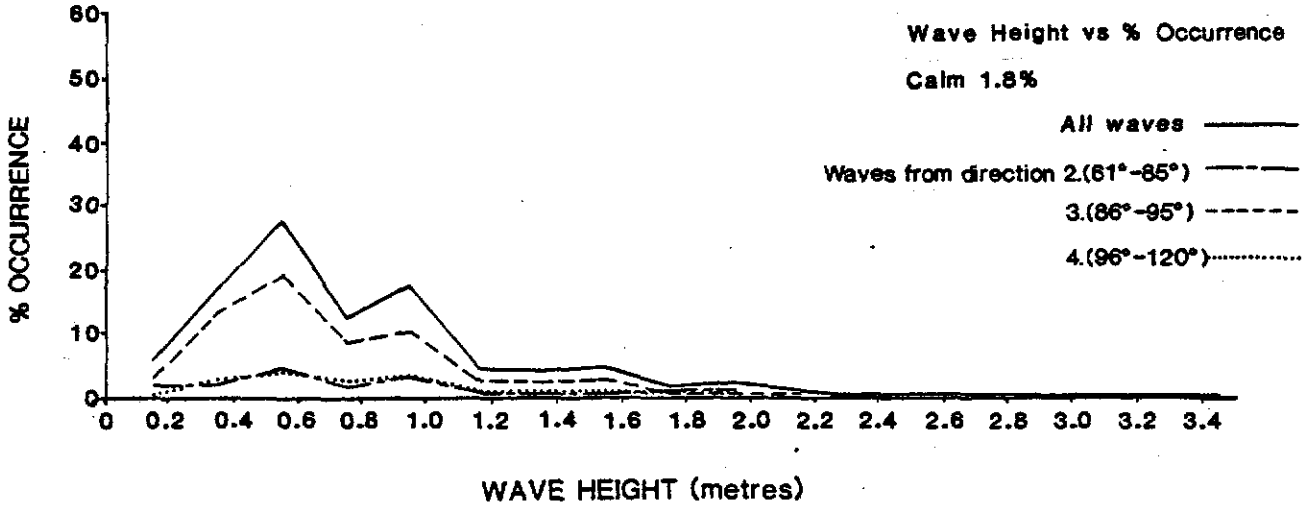
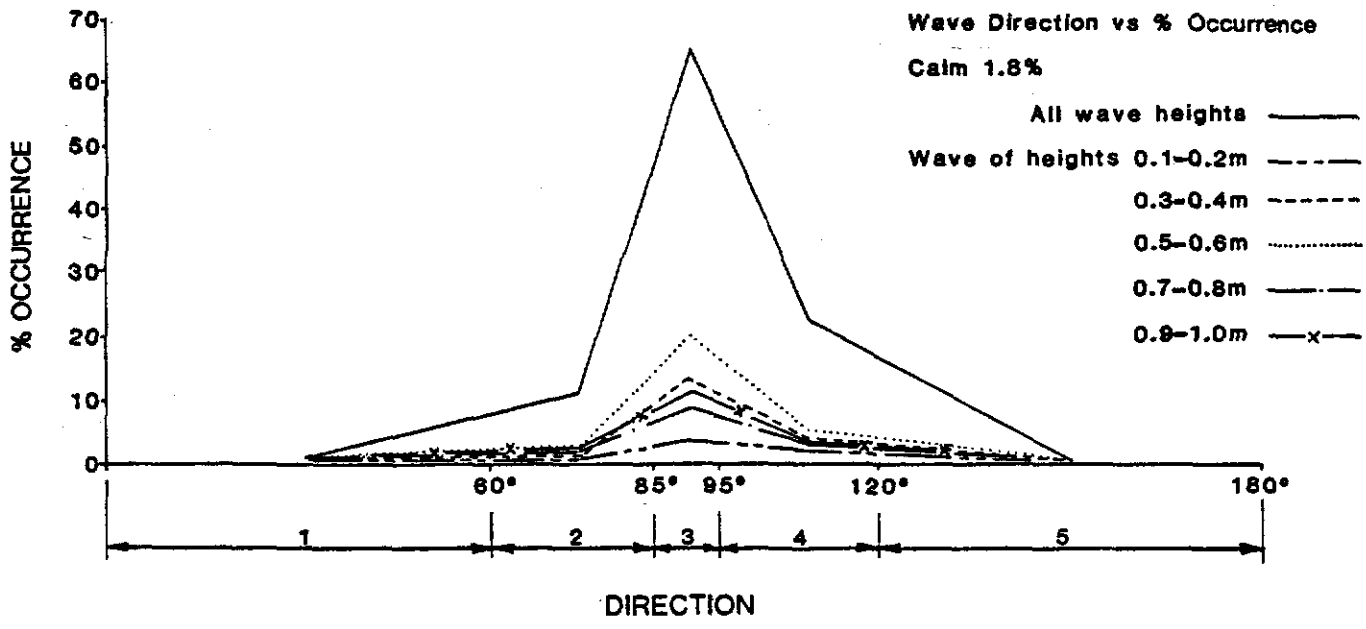
Kings Beach

**Figure 5**

C 24.1

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# WAVE DIRECTION ANALYSIS
# ALL DATA

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**Figure 6**
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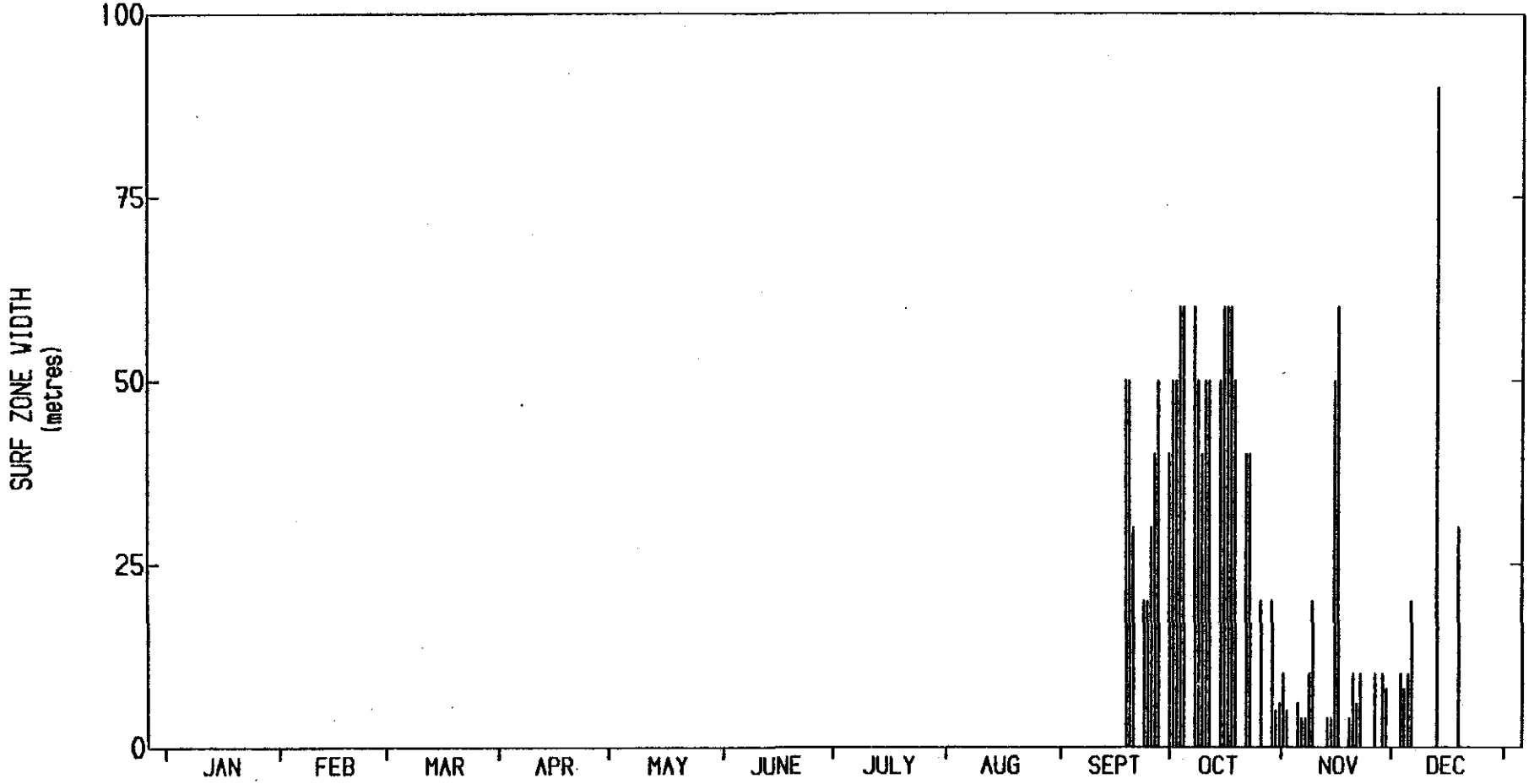
KINGS BEACH

0601




## SURF ZONE WIDTH SUMMARY - 1973

No. of Observations : 53

MORNING OBSERVATIONS

Mean Surf Zone Width = 30.5 m

SURF ZONE WIDTH - MORNING 1973

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Figure 7
C24.1

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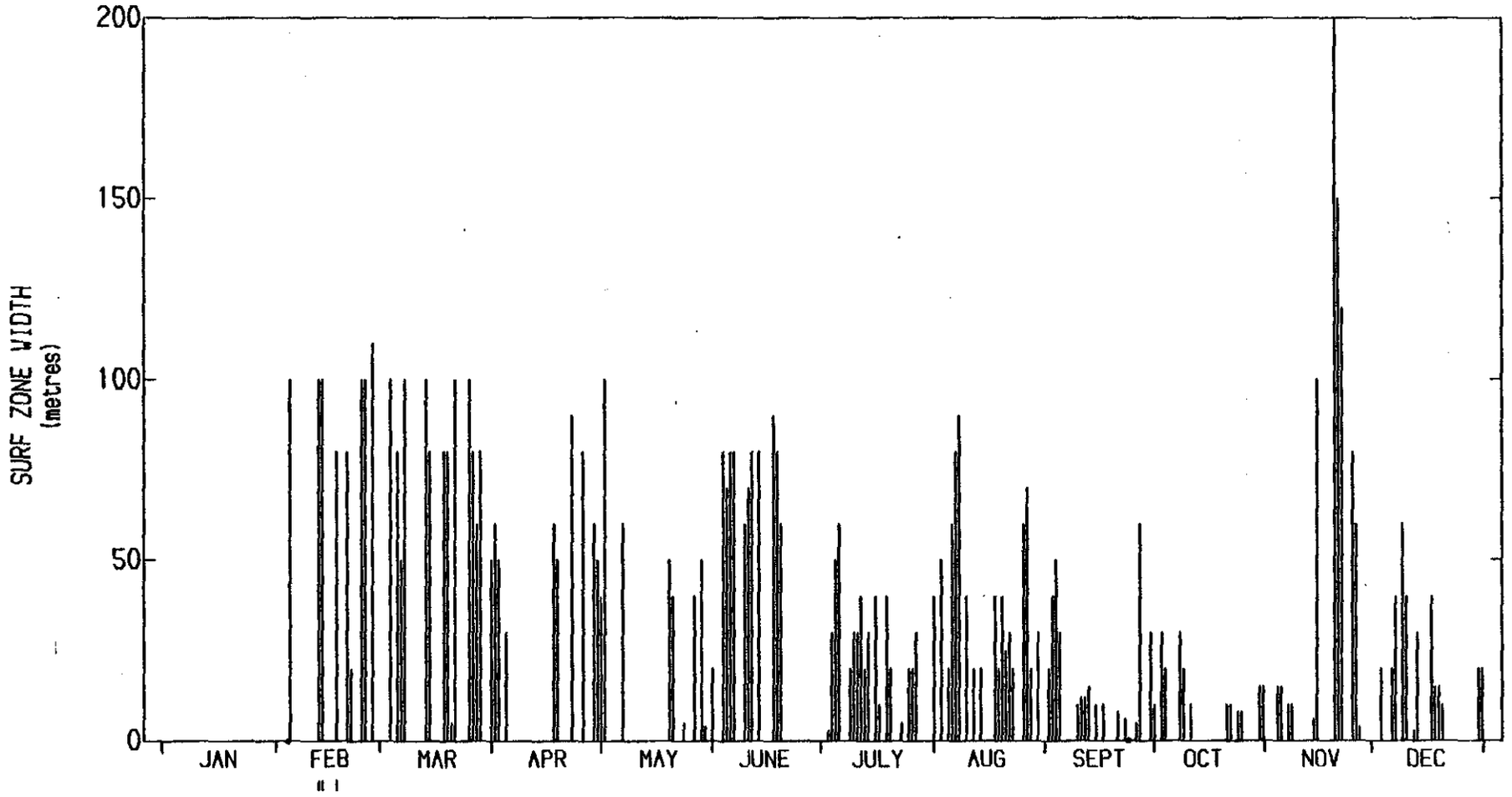
0601




## SURF ZONE WIDTH SUMMARY - 1974

No. of Observations : 145

MORNING OBSERVATIONS

Mean Surf Zone Width = 45.7 m

m Indicates Offshore Bar Present

SURF ZONE WIDTH - MORNING 1974

Figure 8
C 24.1

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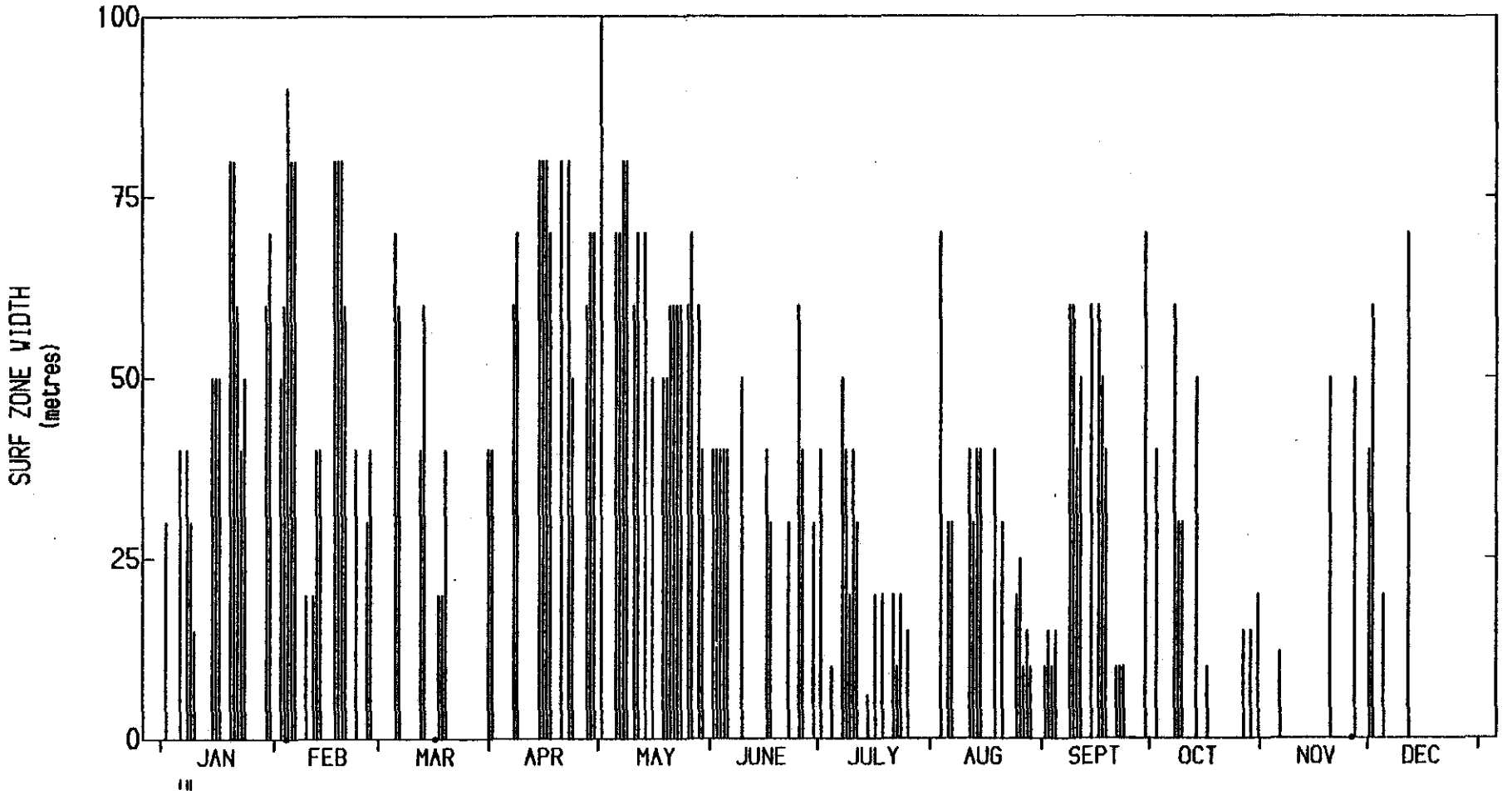
0601




# SURF ZONE WIDTH SUMMARY - 1975

No. of Observations : 146

MORNING OBSERVATIONS

Mean Surf Zone Width = 44.4 m

## SURF ZONE WIDTH - MORNING 1975

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Figure 9

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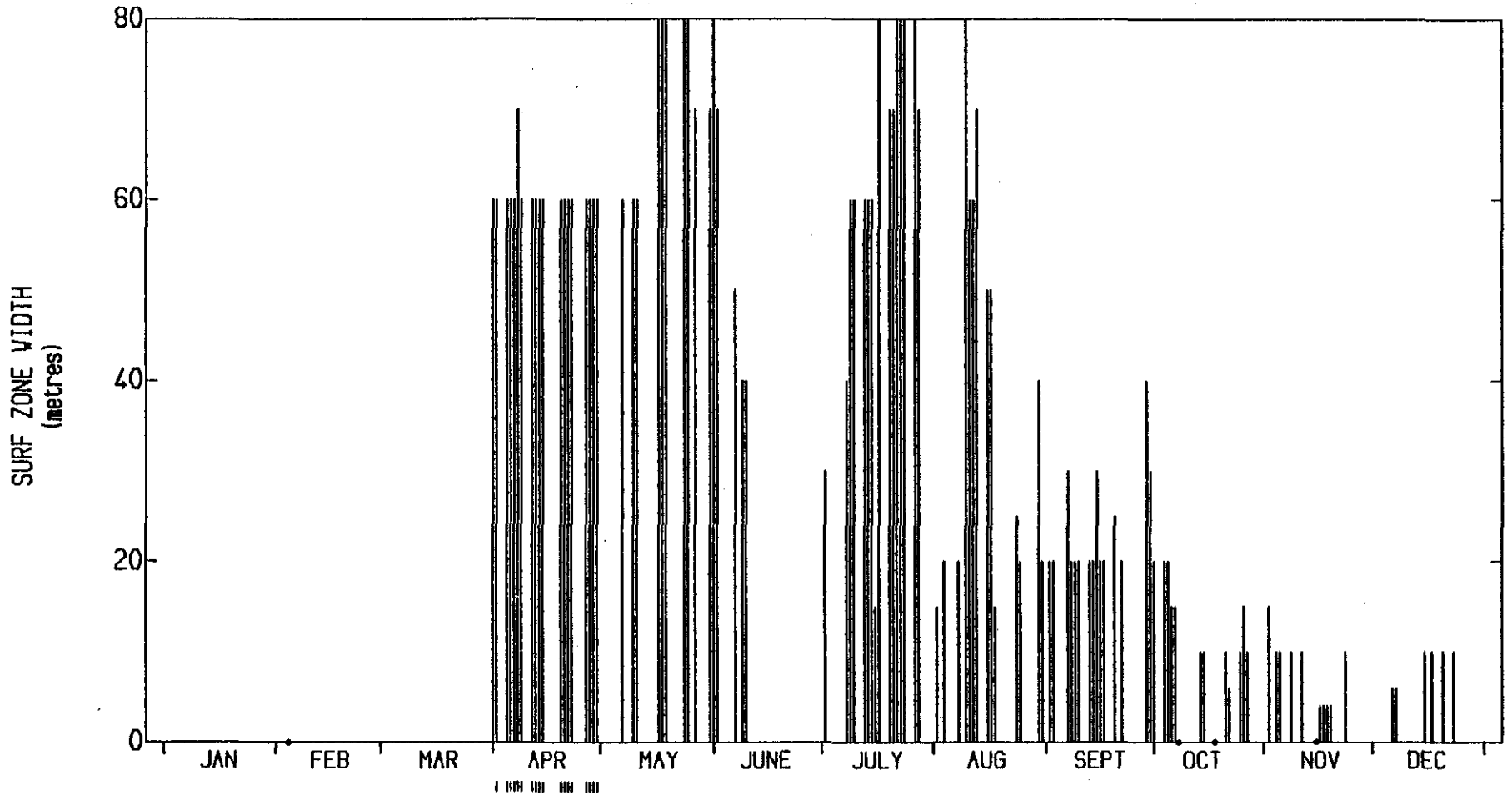


## SURF ZONE WIDTH SUMMARY - 1976

No. of Observations : 110

MORNING OBSERVATIONS

Mean Surf Zone Width = 39.4 m

m Indicates Offshore Bar Present

**SURF ZONE WIDTH - MORNING 1976**

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**Figure 10**

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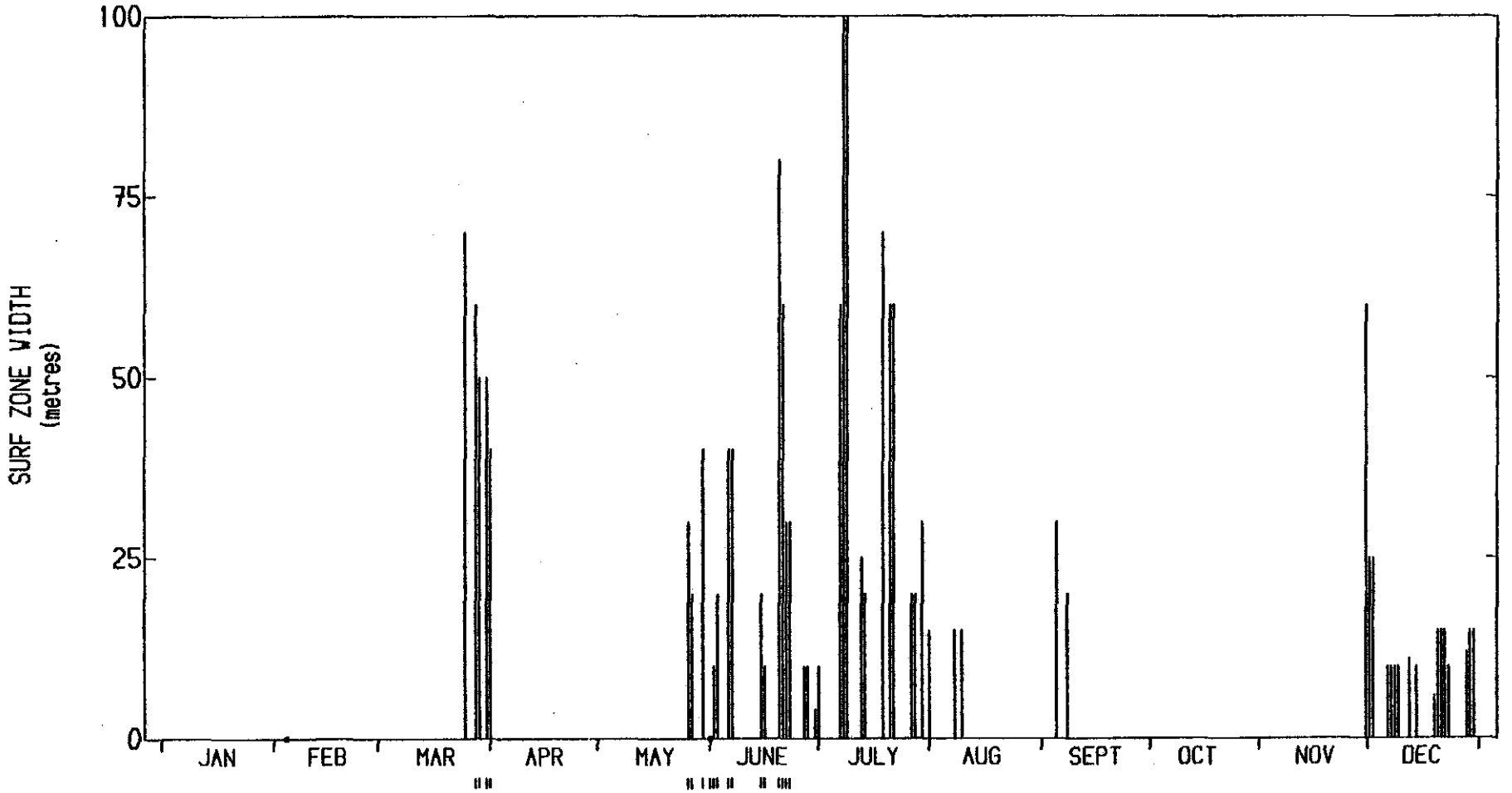


## SURF ZONE WIDTH SUMMARY - 1977

No. of Observations : 56

MORNING OBSERVATIONS

Mean Surf Zone Width = 29.8 m

# SURF ZONE WIDTH - MORNING 1977

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Figure 11

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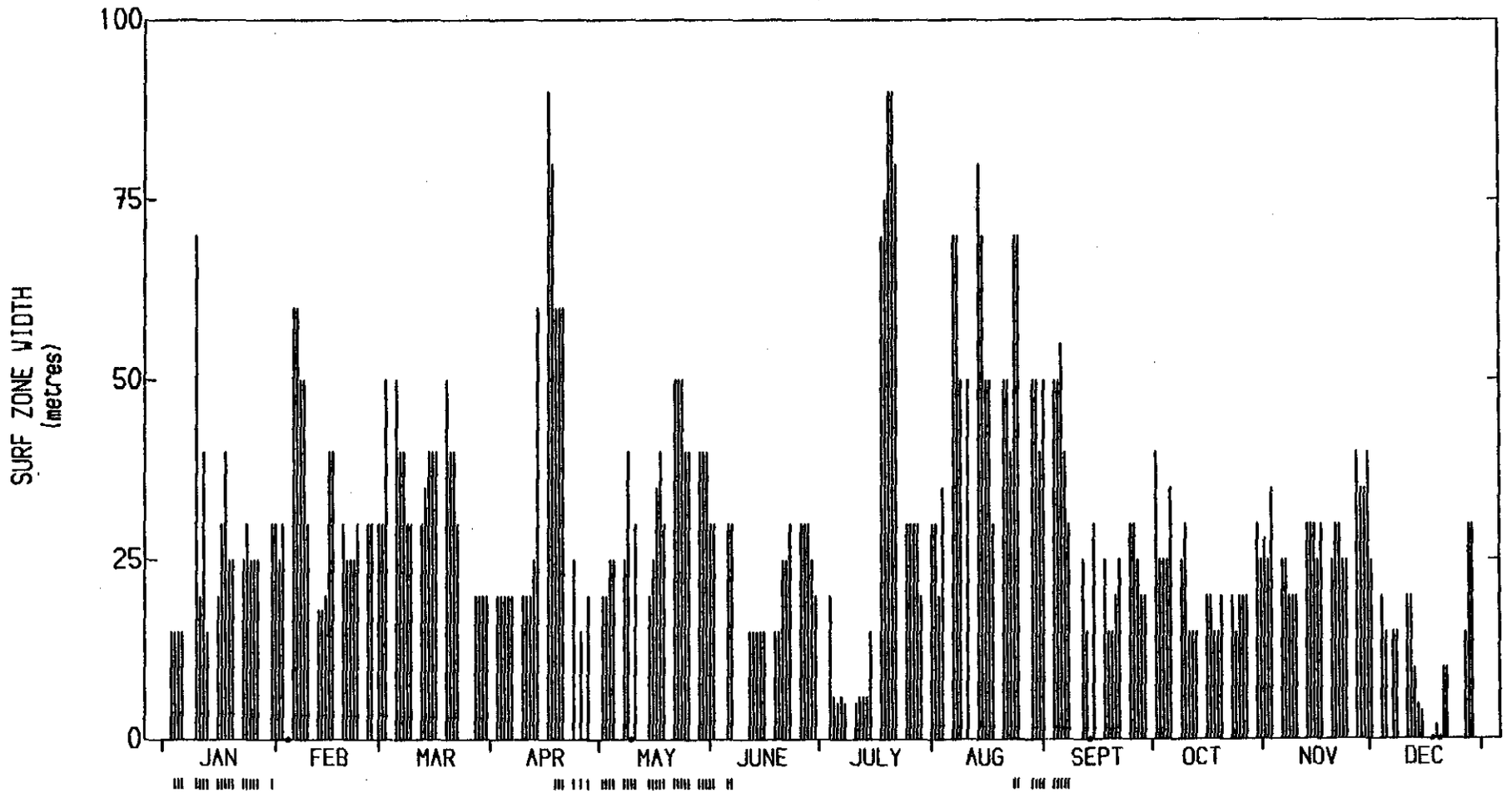
0601




# SURF ZONE WIDTH - MORNING 1978

## SURF ZONE WIDTH SUMMARY - 1978

No. of Observations : 242

MORNING OBSERVATIONS

Mean Surf Zone Width = 30.2 m

m Indicates Offshore Bar Present

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**Figure 12**

C24.1

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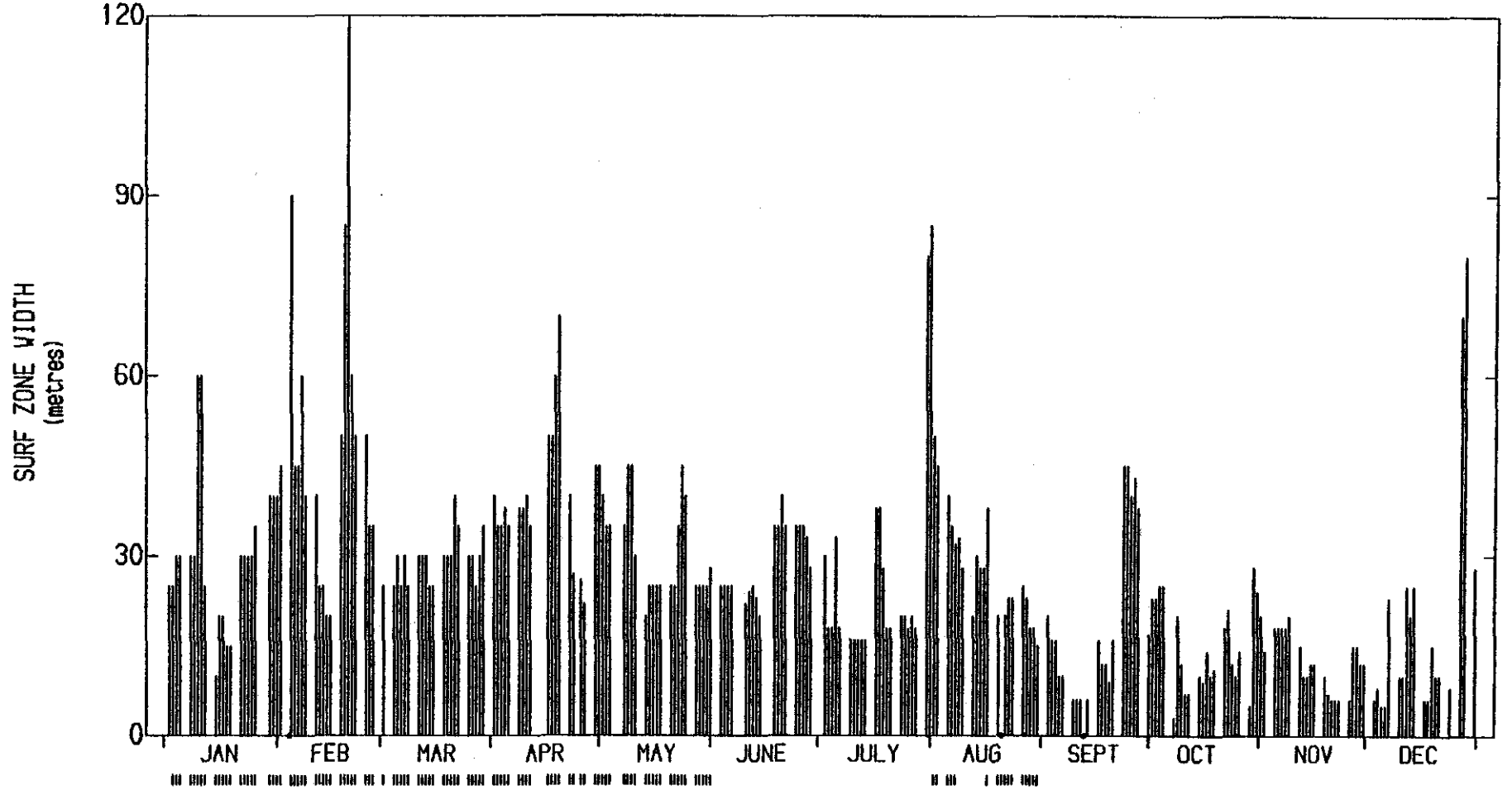


## SURF ZONE WIDTH SUMMARY - 1979

No. of Observations : 250

MORNING OBSERVATIONS

Mean Surf Zone Width = 27.3 m

m Indicates Offshore Bar Present

SURF ZONE WIDTH - MORNING 1979

Figure 13
C24.1

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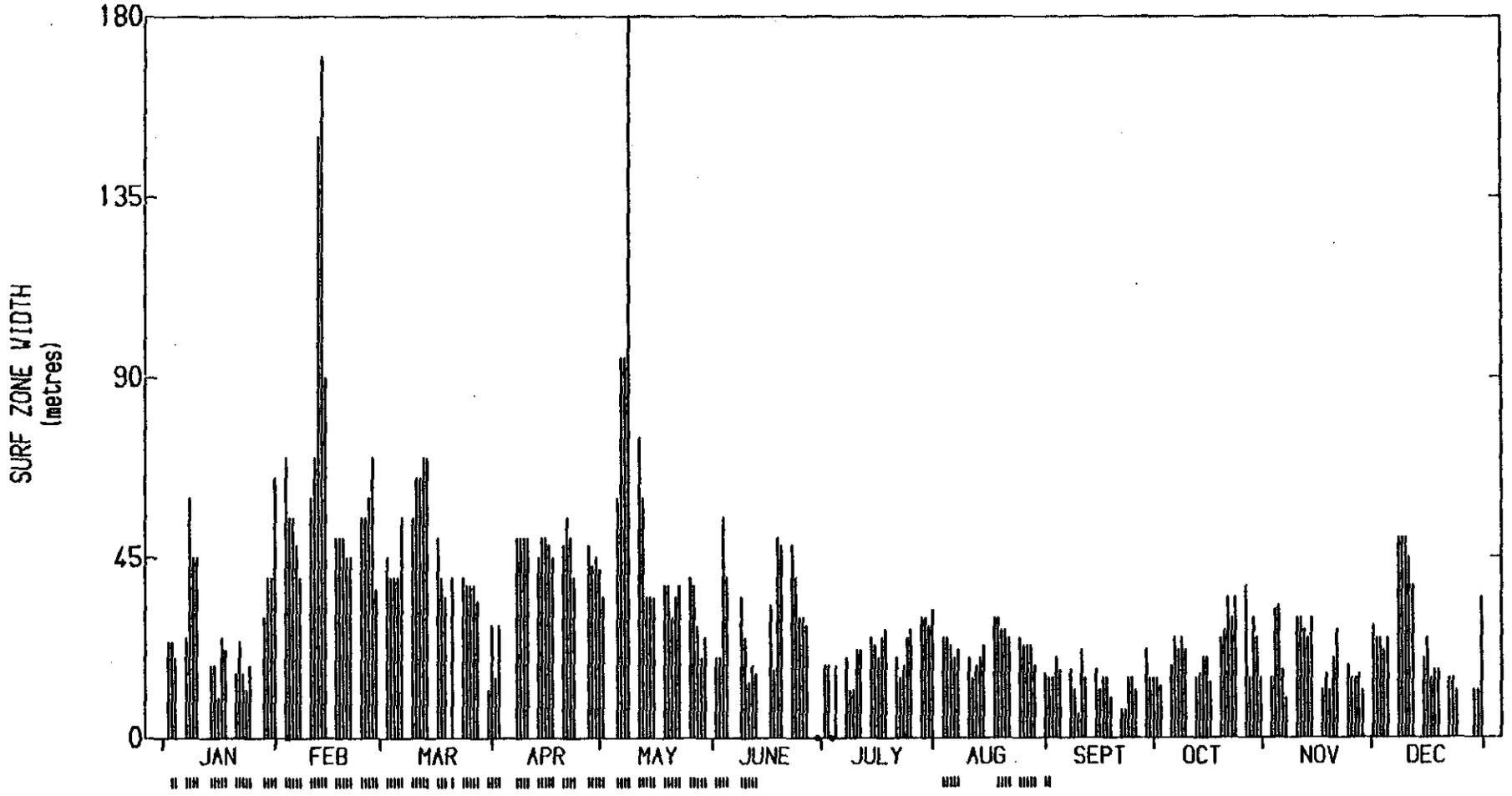
0601




## SURF ZONE WIDTH SUMMARY - 1980

No. of Observations : 250

MORNING OBSERVATIONS

Mean Surf Zone Width = 32.3 m

m Indicates Offshore Bar Present

**SURF ZONE WIDTH - MORNING 1980**

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**Figure 14**

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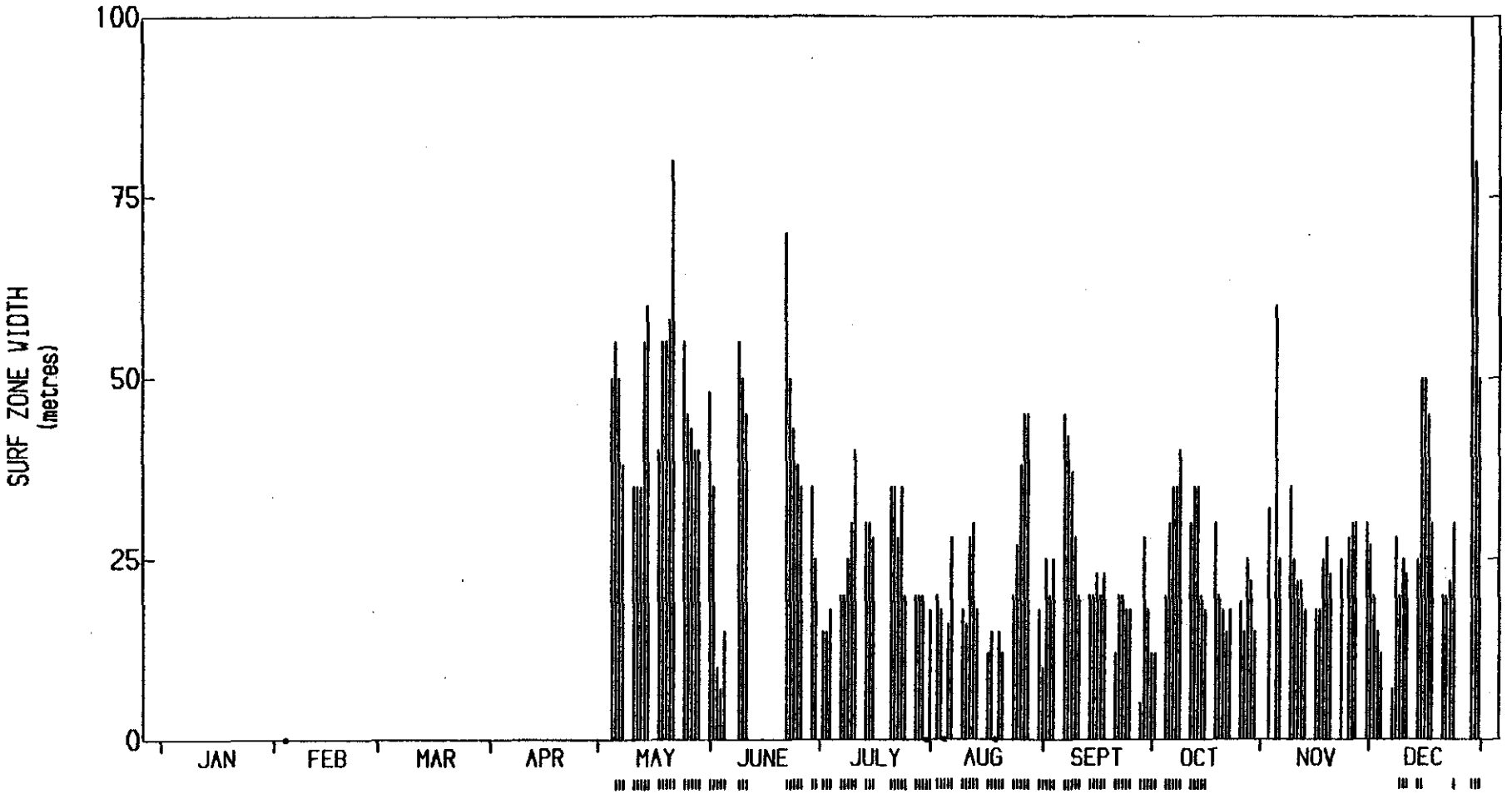
KINGS BEACH

0601




## SURF ZONE WIDTH SUMMARY - 1981

No. of Observations : 159

MORNING OBSERVATIONS

Mean Surf Zone Width = 29.2 m

■ Indicates Offshore Bar Present

**SURF ZONE WIDTH - MORNING 1981**

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**Figure 15**

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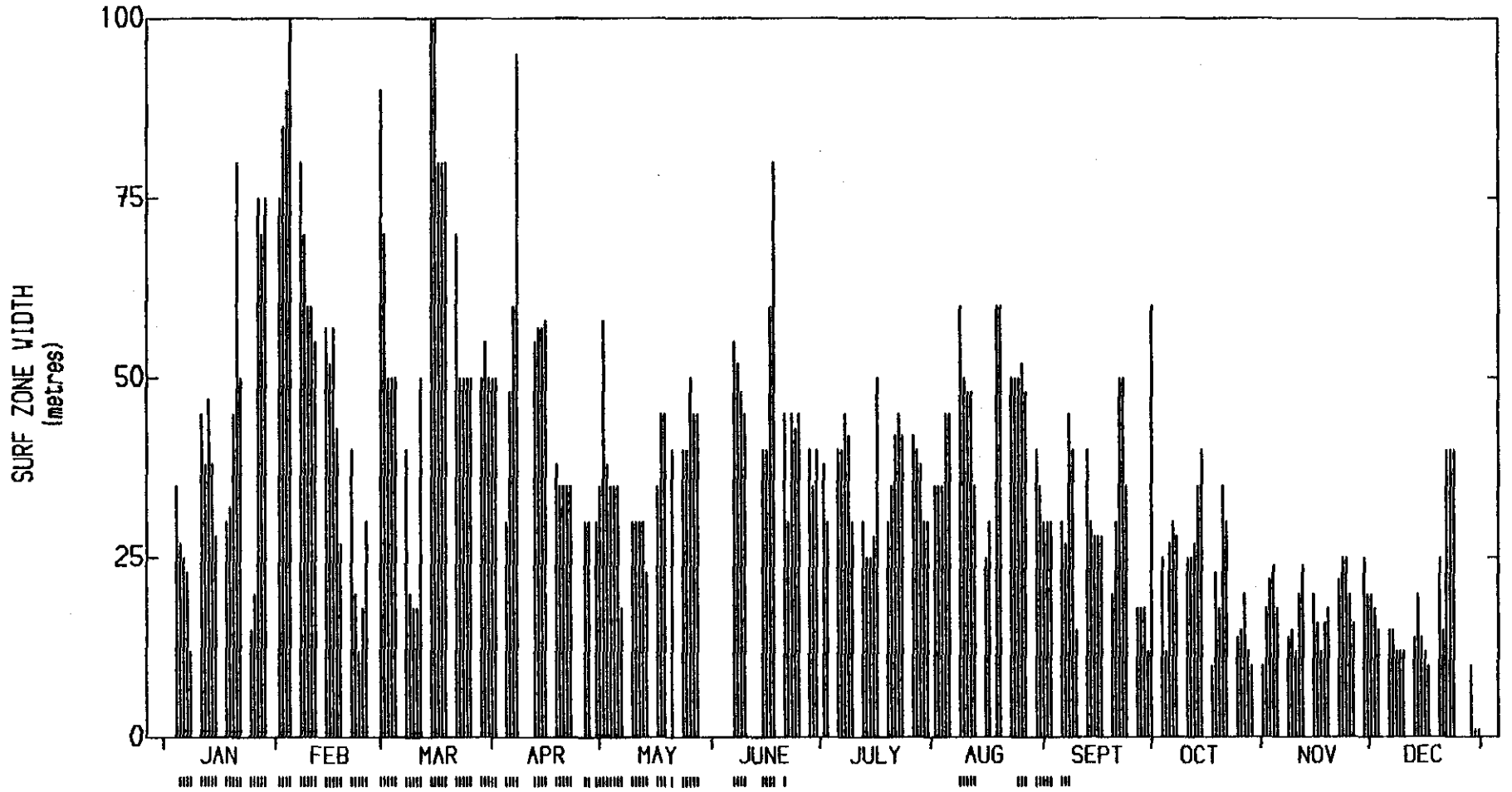
0601




# SURF ZONE WIDTH SUMMARY - 1982

No. of Observations : 246

MORNING OBSERVATIONS

Mean Surf Zone Width = 37.4 m

m Indicates Offshore Bar Present

## SURF ZONE WIDTH - MORNING 1982

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Kings Beach

**Figure 16**

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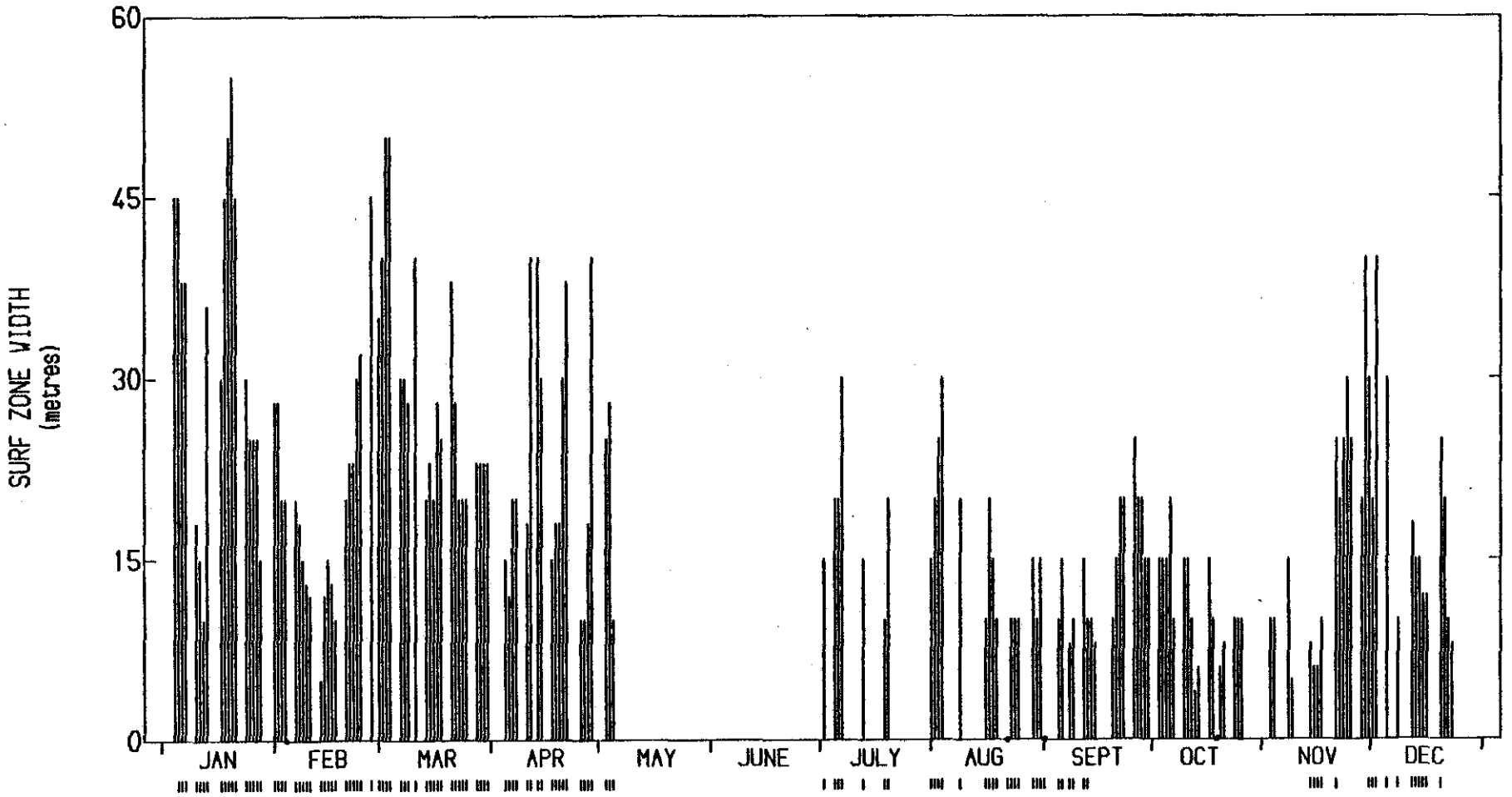
0601




# SURF ZONE WIDTH SUMMARY - 1983

No. of Observations : 169

MORNING OBSERVATIONS

Mean Surf Zone Width = 20.2 m

**SURF ZONE WIDTH - MORNING 1983**

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**Figure 17**

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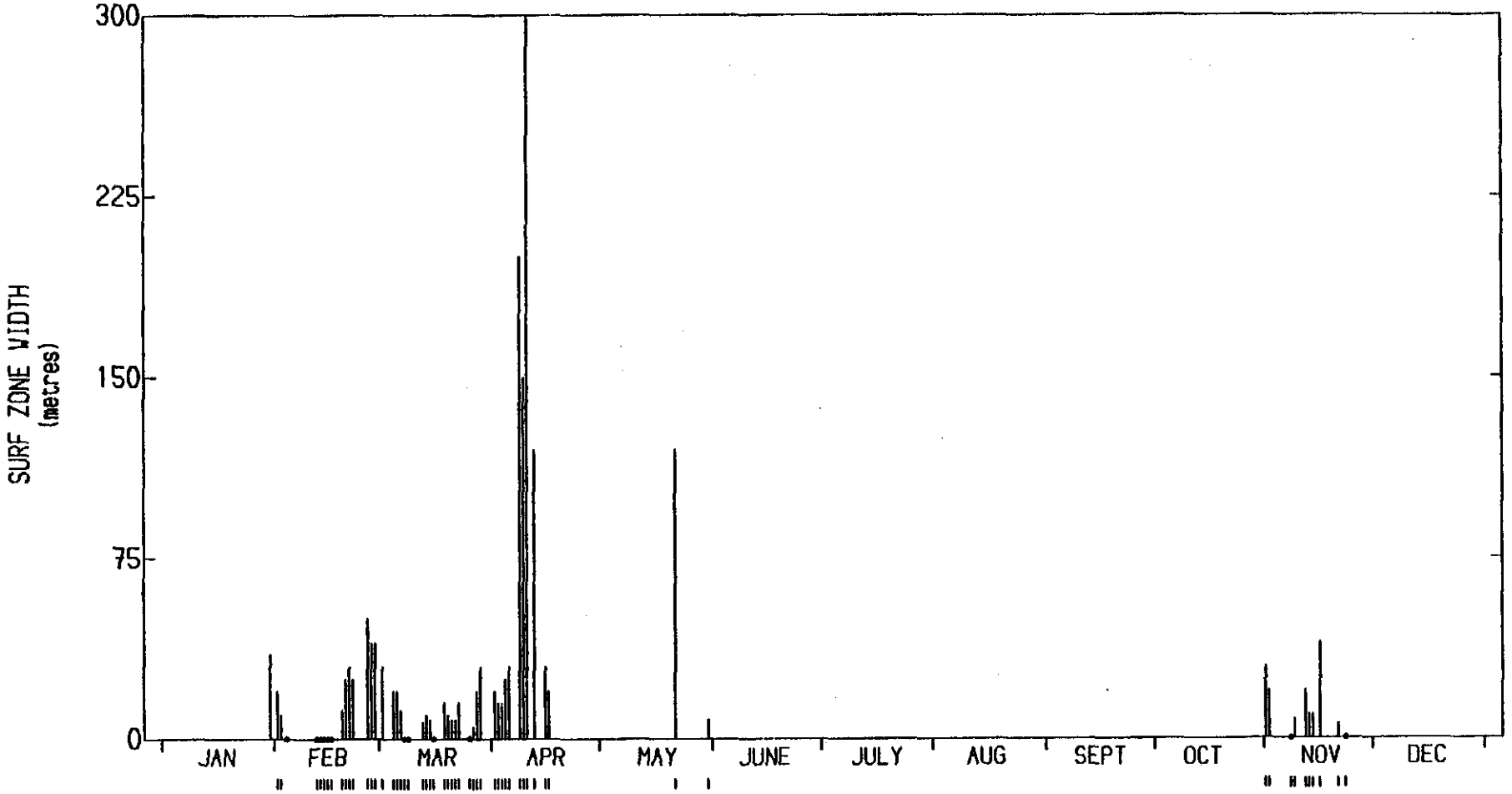
0601




# SURF ZONE WIDTH SUMMARY - 1984

No. of Observations : 57

MORNING OBSERVATIONS

Mean Surf Zone Width = 29.9 m

**SURF ZONE WIDTH - MORNING 1984**

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**Figure 18**

C24.1

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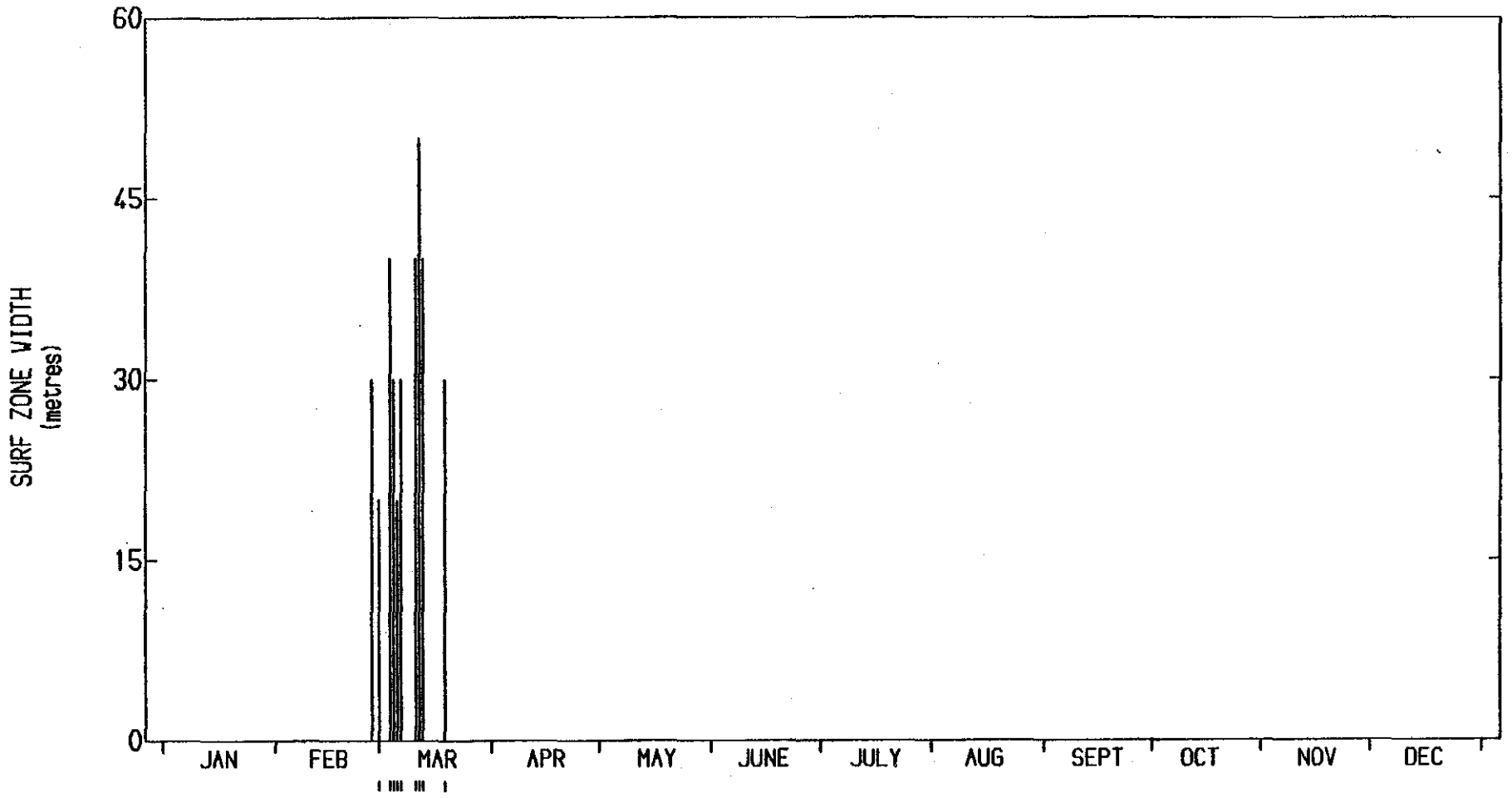
0601




## SURF ZONE WIDTH SUMMARY - 1985

No. of Observations : 10

MORNING OBSERVATIONS

Mean Surf Zone Width = 33.0 m

**SURF ZONE WIDTH - MORNING 1985**

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Kings Beach

**Figure 19**
C24.1

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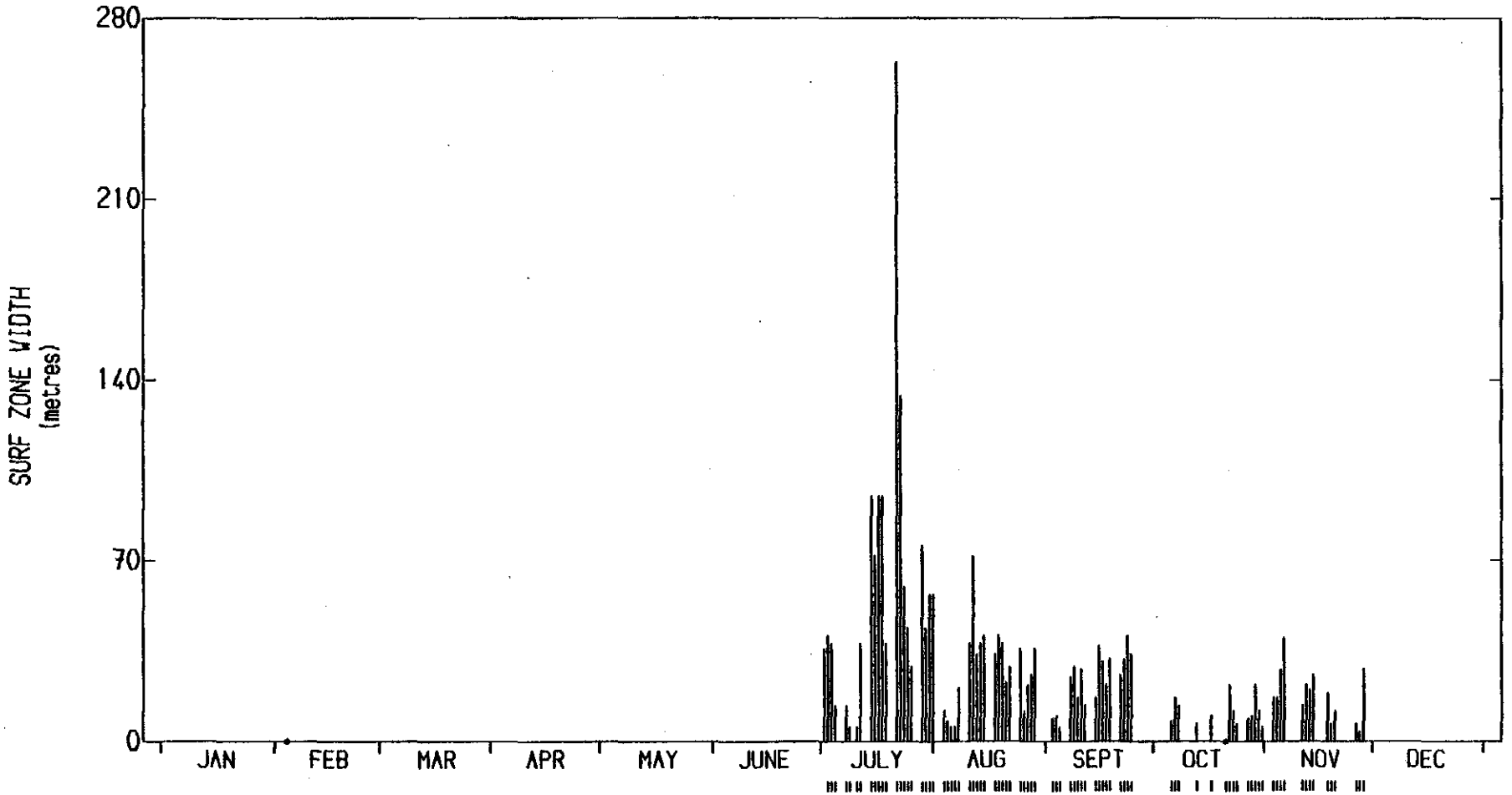
0601




# SURF ZONE WIDTH SUMMARY - 1986

No. of Observations : 94

MORNING OBSERVATIONS

Mean Surf Zone Width = 29.6 m

SURF ZONE WIDTH - MORNING 1986

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Figure 20

C24.1

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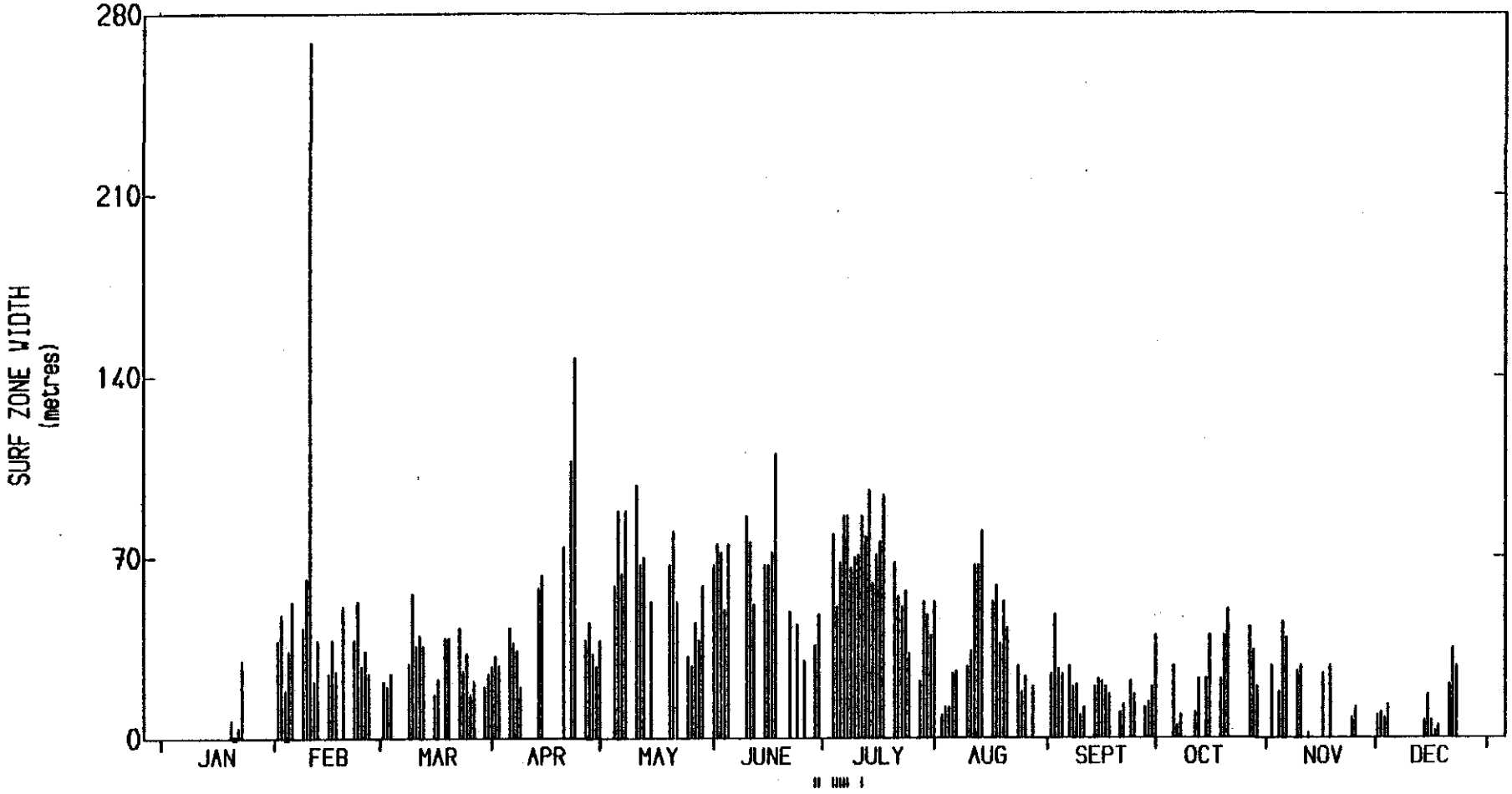
KINGS BEACH

0601




## SURF ZONE WIDTH SUMMARY - 1987

No. of Observations : 194

MORNING OBSERVATIONS

Mean Surf Zone Width = 41.3 m

m Indicates Offshore Bar Present

SURF ZONE WIDTH - MORNING 1987

Figure 21
C24.1

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Kings Beach

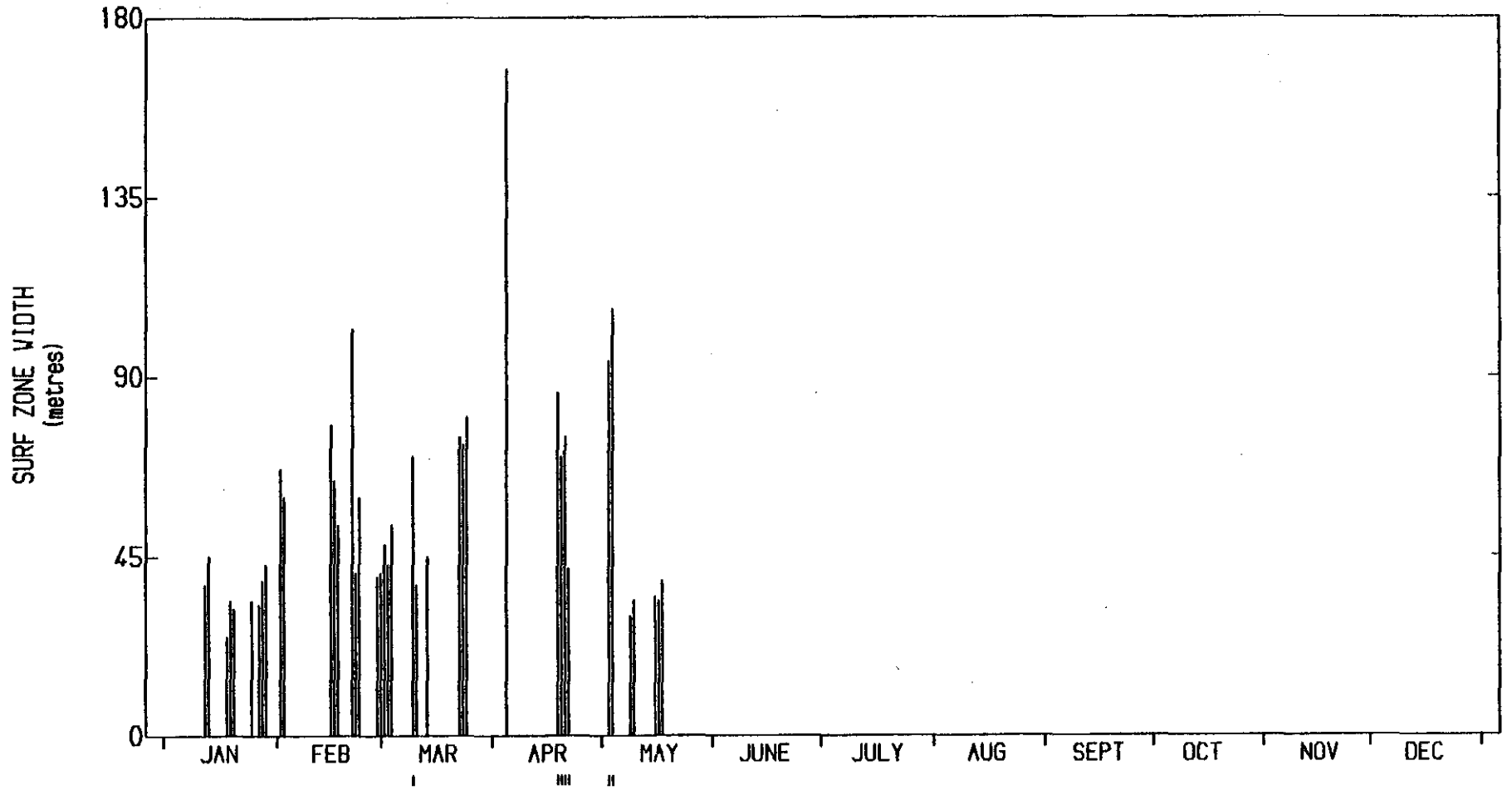
Beach Protection Authority

COPE - Coastal Observation Programme Engineering

CALOUNDRA CITY

KINGS BEACH

0601




## SURF ZONE WIDTH SUMMARY - 1988

No. of Observations : 40

MORNING OBSERVATIONS

Mean Surf Zone Width = 56.7 m

Indicates Offshore Bar Present

# SURF ZONE WIDTH - MORNING 1988

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Kings Beach

**Figure 22**

C24.1

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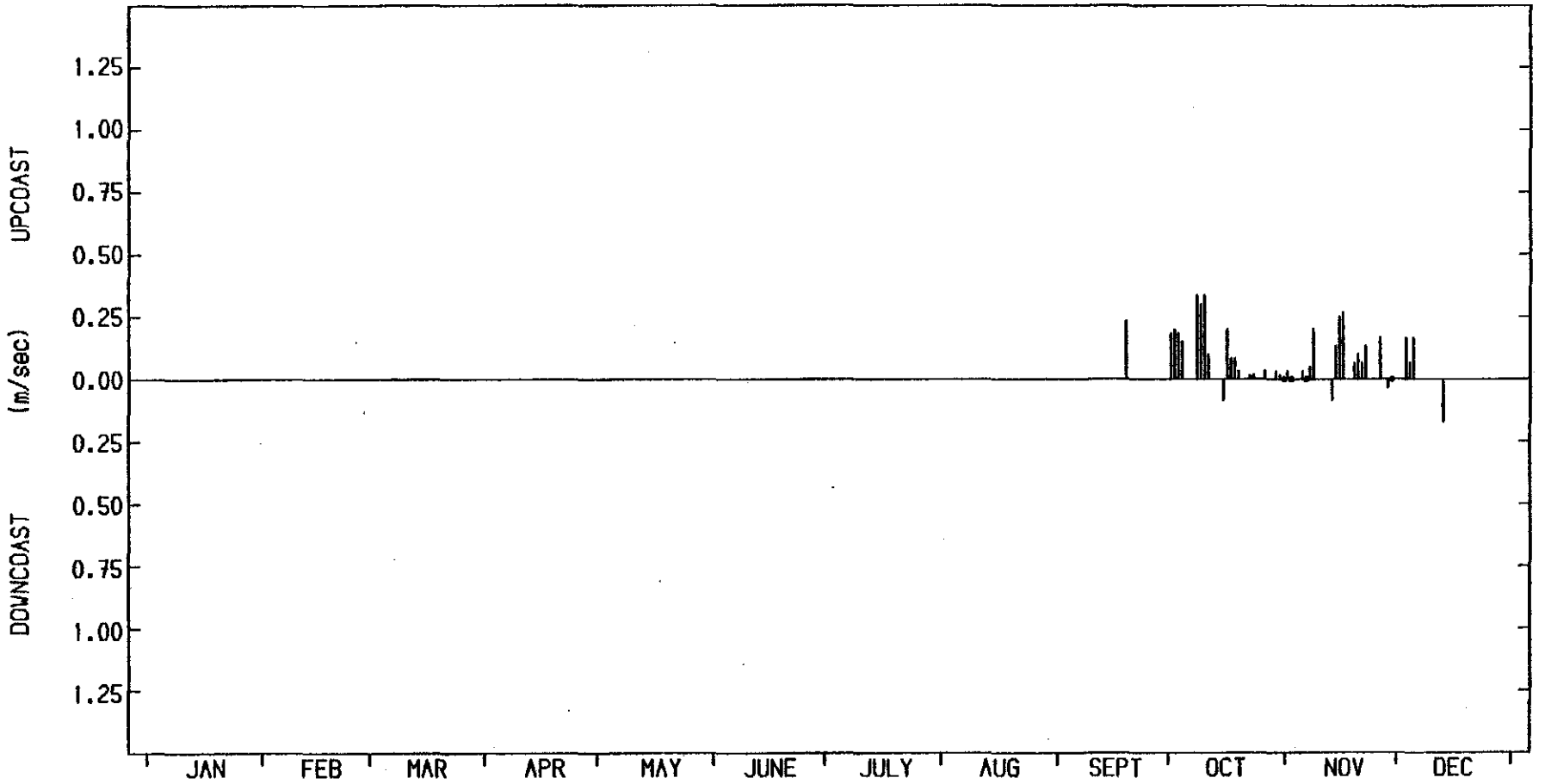
COPE - Coastal Observation Programme Engineering

CALOUNDRA CITY

KINGS BEACH

0601




# LITTORAL CURRENTS - MORNING 1973

## LITTORAL CURRENT SUMMARY - 1973

Mean Vel = .099 m/sec (up)

Mean Upcoast Vel = .134 m/sec

Mean Downcoast Vel = .092 m/sec

MORNING OBSERVATIONS - ( 41 recordings)

COPE

Kings Beach

**Figure 23**

C24.1

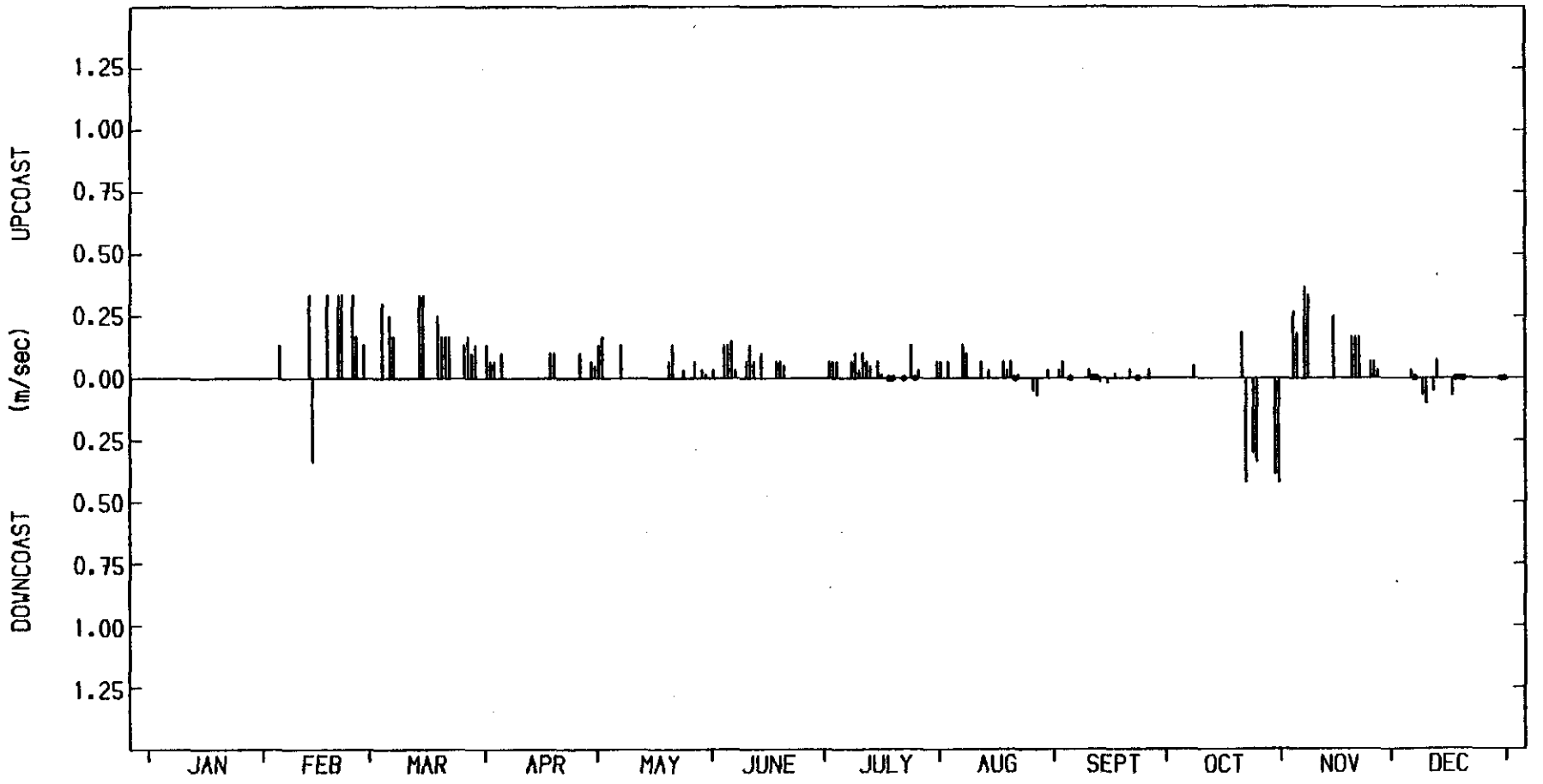
Beach Protection Authority

COPE - Coastal Observation Programme Engineering

CALOUNDRA CITY

KINGS BEACH

0601




# LITTORAL CURRENT SUMMARY - 1974

Mean Vel = .077 m/sec (up)

Mean Upcoast Vel = .127 m/sec

Mean Downcoast Vel = .187 m/sec

MORNING OBSERVATIONS - (126 recordings)

LITTORAL CURRENTS - MORNING 1974

Figure 24
C24.1

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Kings Beach

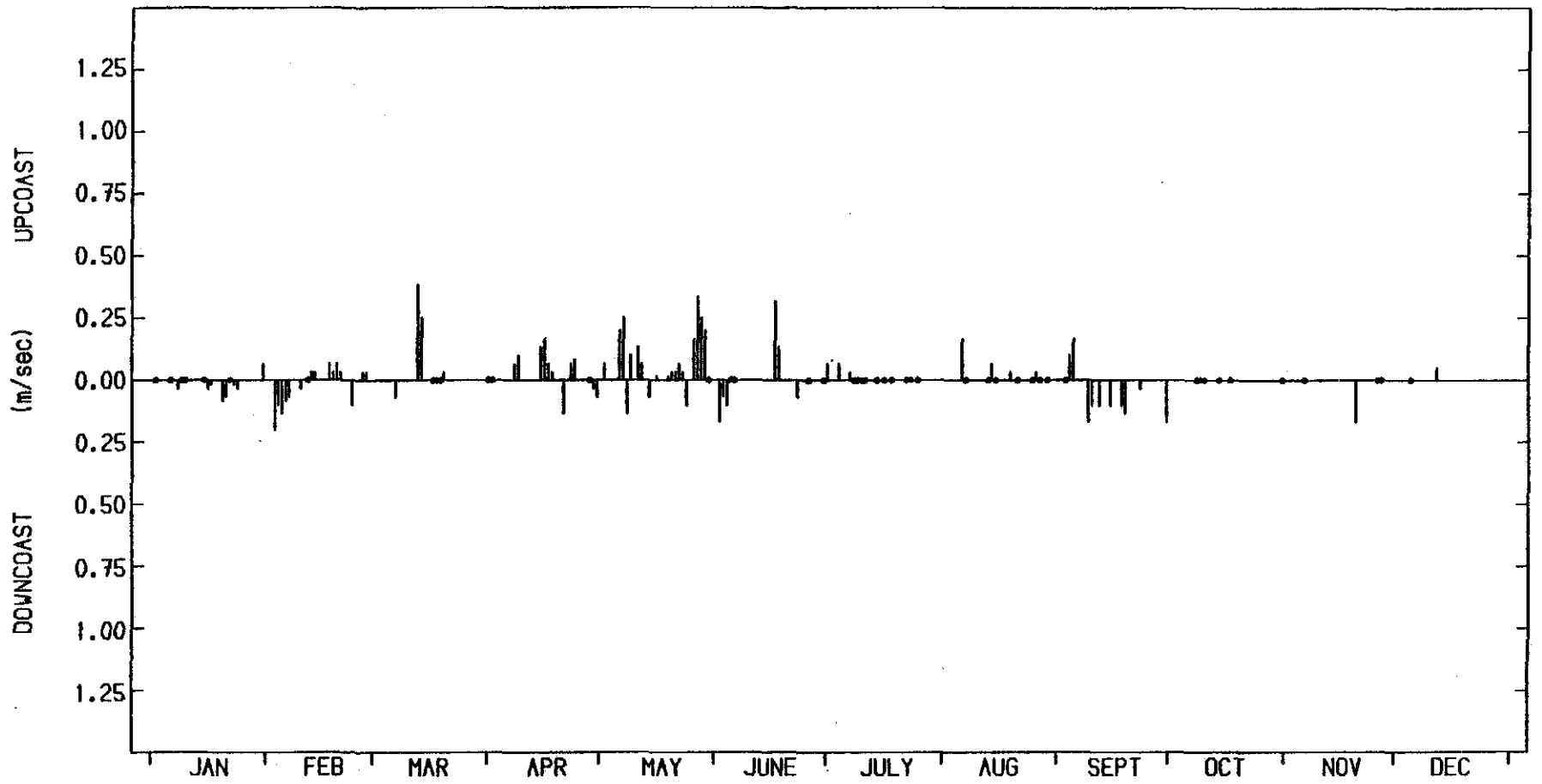
Beach Protection Authority

COPE - Coastal Observation Programme Engineering

CALOUNDRA CITY

KINGS BEACH

0601




## LITTORAL CURRENT SUMMARY - 1975

Mean Vel = .015 m/sec (up)

Mean Upcoast Vel = .104 m/sec

Mean Downcoast Vel = .090 m/sec

MORNING OBSERVATIONS - (128 recordings)

LITTORAL CURRENTS - MORNING 1975

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Kings Beach

Figure 25

C24.1

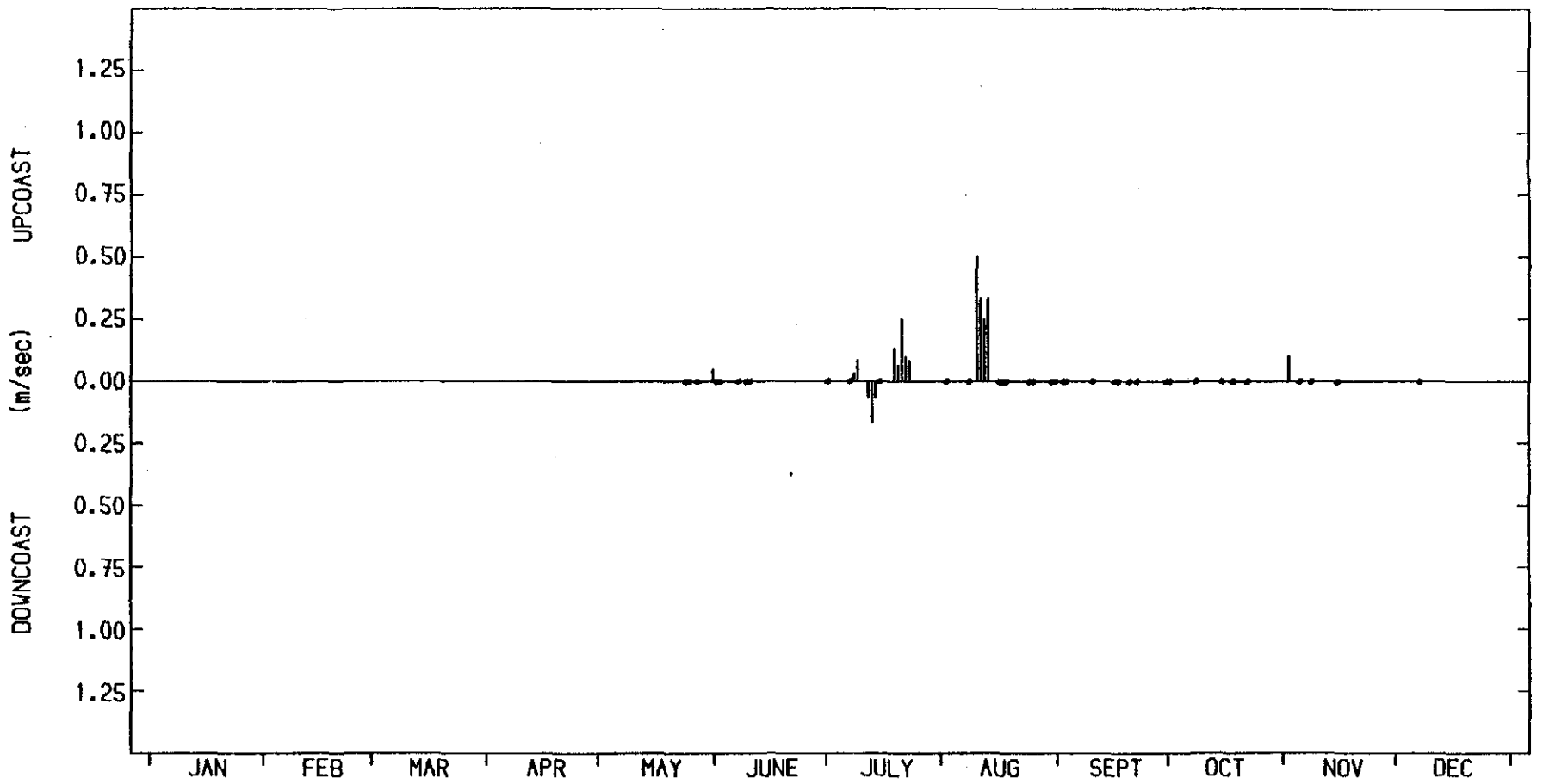
Beach Protection Authority

COPE - Coastal Observation Programme Engineering

CALOUNDRA CITY

KINGS BEACH

0601




## LITTORAL CURRENT SUMMARY - 1976

Mean Vel = .038 m/sec (up)

Mean Upcoast Vel = .178 m/sec

Mean Downcoast Vel = .100 m/sec

MORNING OBSERVATIONS - ( 53 recordings)

LITTORAL CURRENTS - MORNING 1976

COPE

Kings Beach

Figure 26

C24.1

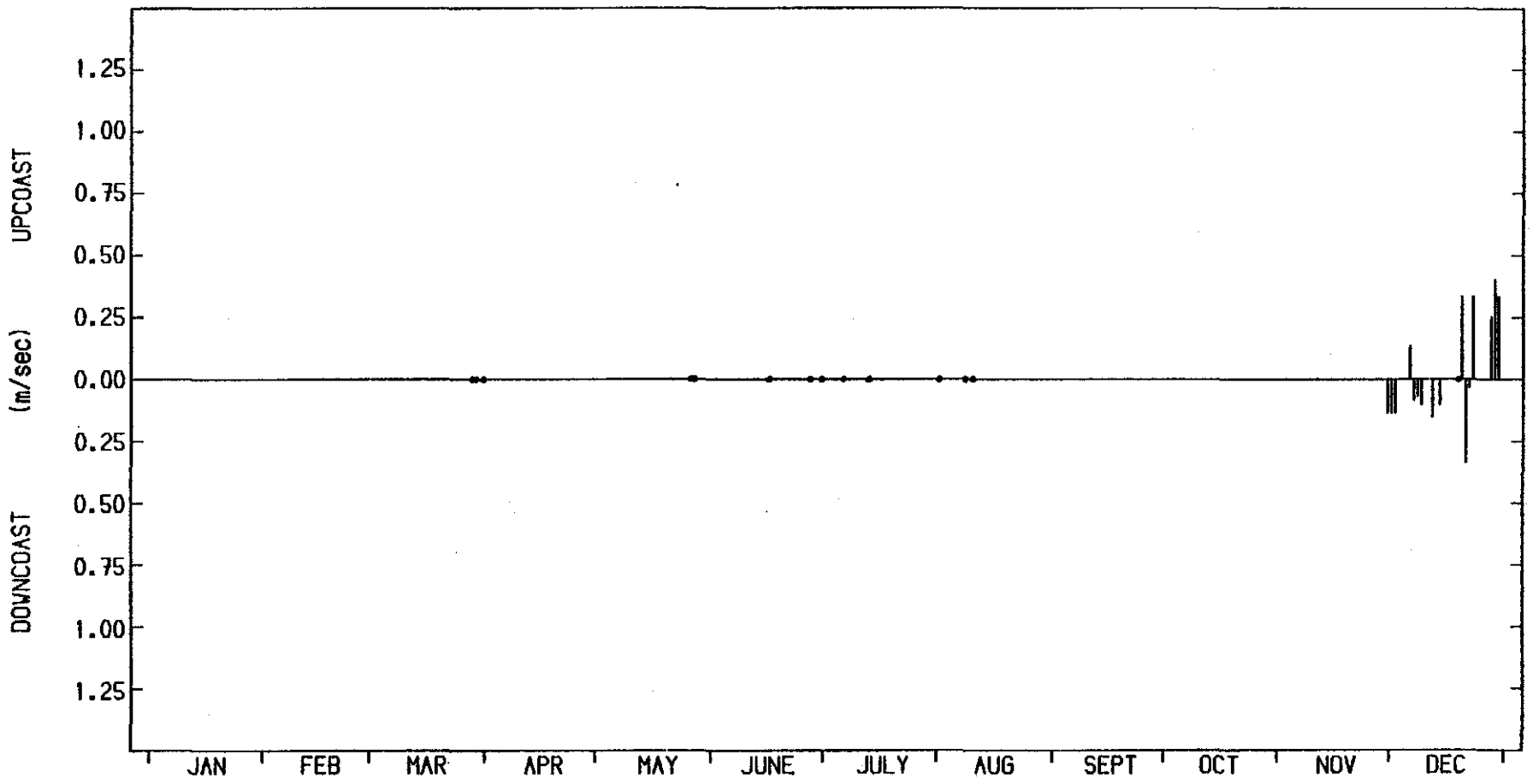
Beach Protection Authority

COPE - Coastal Observation
Programme Engineering

CALOUNDRA CITY

KINGS BEACH

0601




# LITTORAL CURRENTS - MORNING 1977

## LITTORAL CURRENT SUMMARY - 1977

Mean Vel = .017 m/sec (up)

Mean Upcoast Vel = .297 m/sec

Mean Downcoast Vel = .127 m/sec

MORNING OBSERVATIONS - ( 30 recordings)

**Figure 27**
C24.1

COPE
Kings Beach

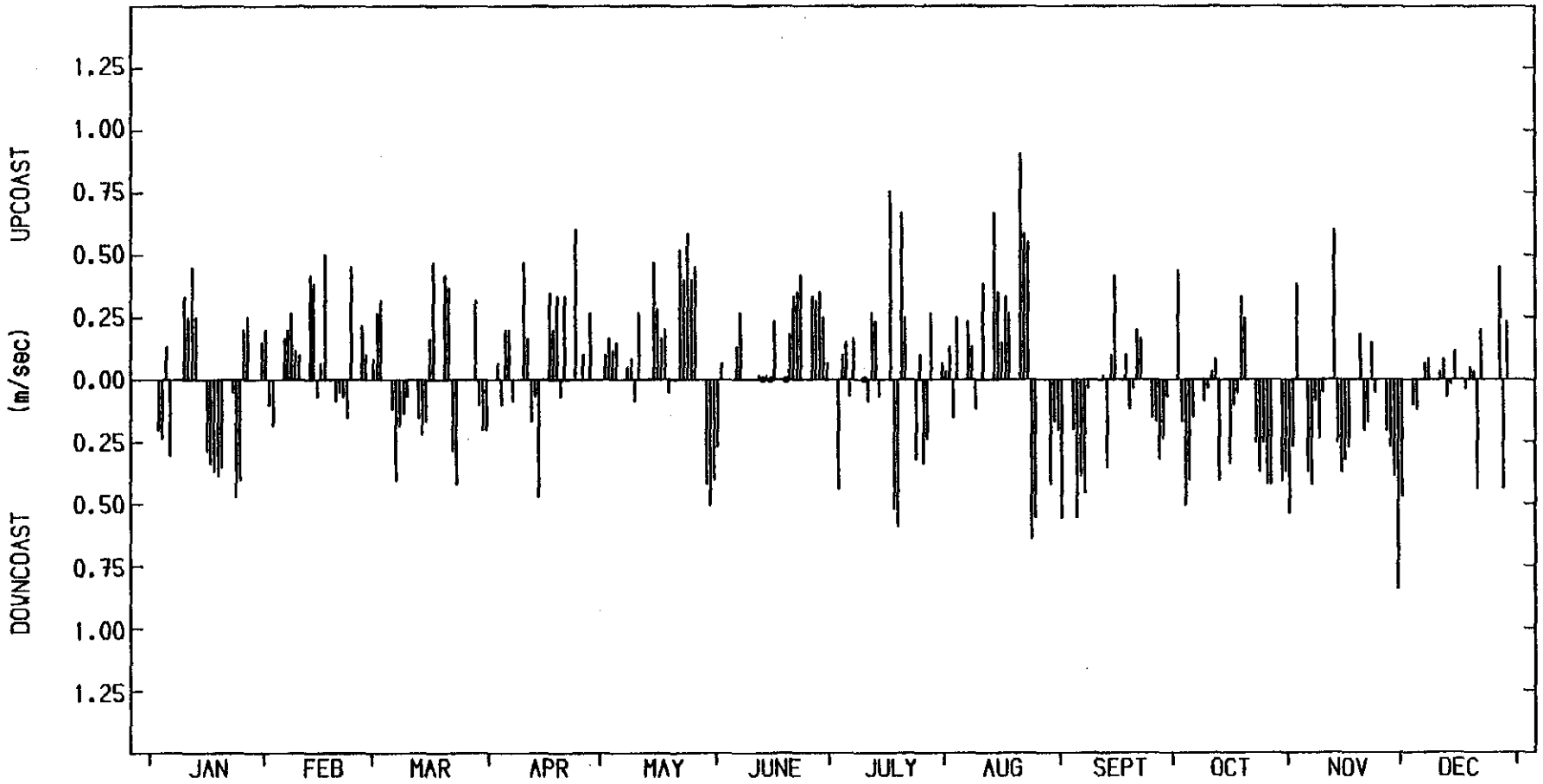
Beach Protection Authority

COPE - Coastal Observation Programme Engineering

CALOUNDRA CITY

KINGS BEACH

0601




# LITTORAL CURRENT SUMMARY - 1978

Mean Vel = .008 m/sec (up)

Mean Upcoast Vel = .257 m/sec

Mean Downcoast Vel = .254 m/sec

MORNING OBSERVATIONS - (242 recordings)

**LITTORAL CURRENTS - MORNING 1978**

COPE

Kings Beach

**Figure 28**

C24.1

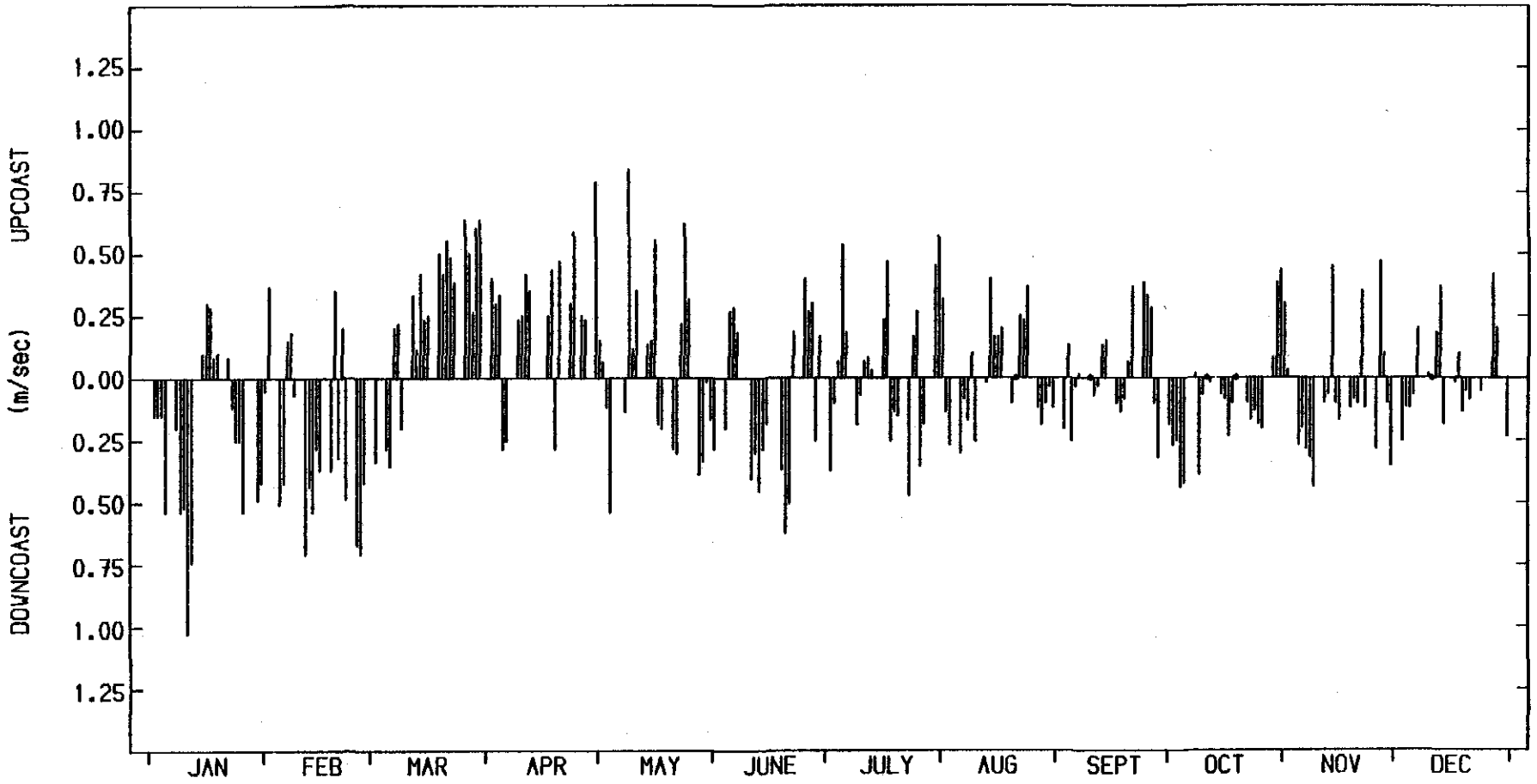
Beach Protection Authority

COPE - Coastal Observation Programme Engineering

CALOUNDRA CITY

KINGS BEACH

0601




## LITTORAL CURRENT SUMMARY - 1979

Mean Vel = -.010 m/sec (down)

Mean Upcoast Vel = .288 m/sec

Mean Downcoast Vel = .249 m/sec

MORNING OBSERVATIONS - (250 recordings)

LITTORAL CURRENTS - MORNING 1979

Figure 29
C24.1

COPE
Kings Beach

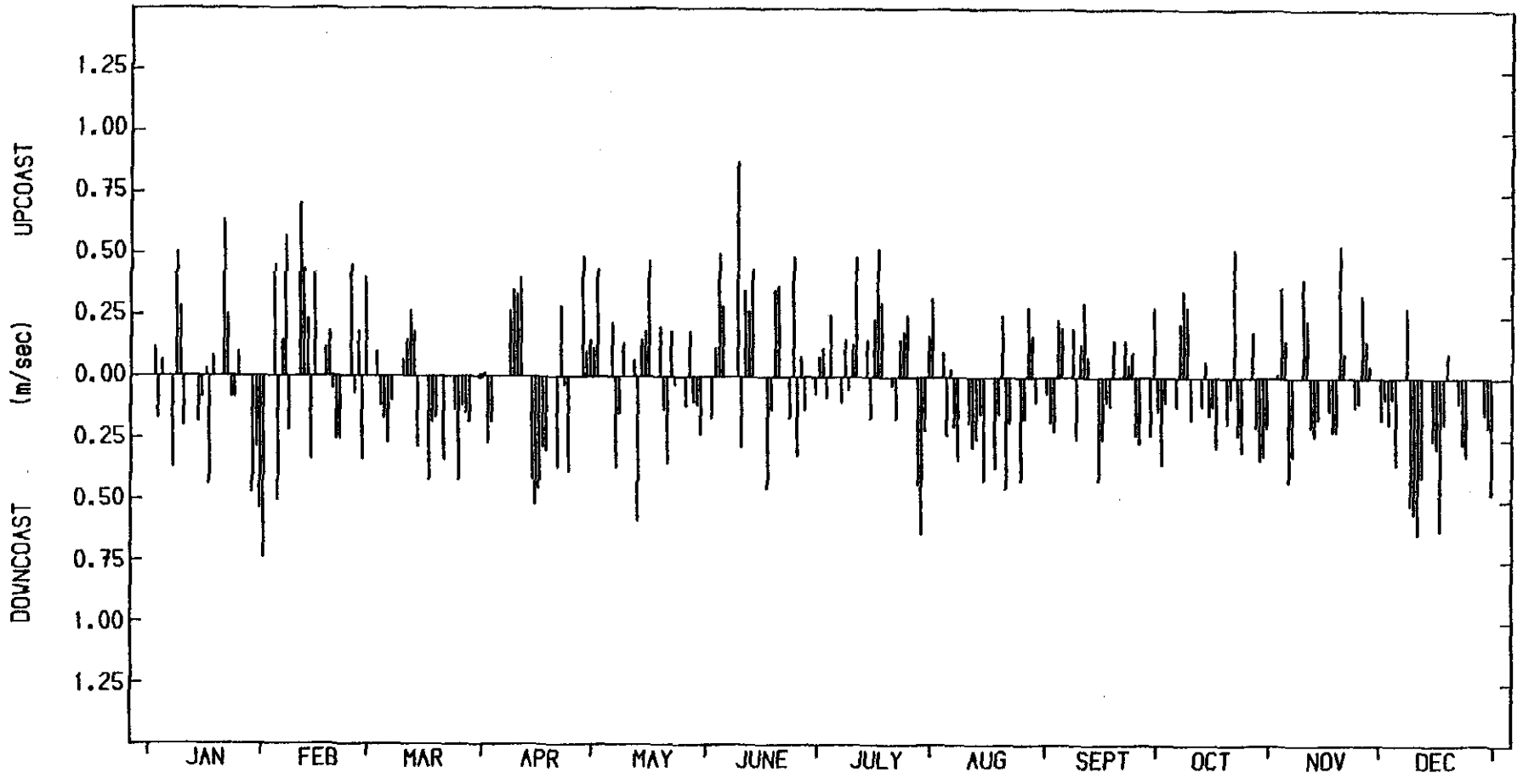
Beach Protection Authority

COPE - Coastal Observation
Programme Engineering

CALOUNDRA CITY

KINGS BEACH

0601




# LITTORAL CURRENTS - MORNING 1980

## LITTORAL CURRENT SUMMARY - 1980

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

Mean Upcoast Vel = .250 m/sec

Mean Downcoast Vel = .246 m/sec

MORNING OBSERVATIONS - (250 recordings)

COPE

Kings Beach

Figure 30
C24.1

Beach Protection Authority

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CALOUNDRA CITY

KINGS BEACH

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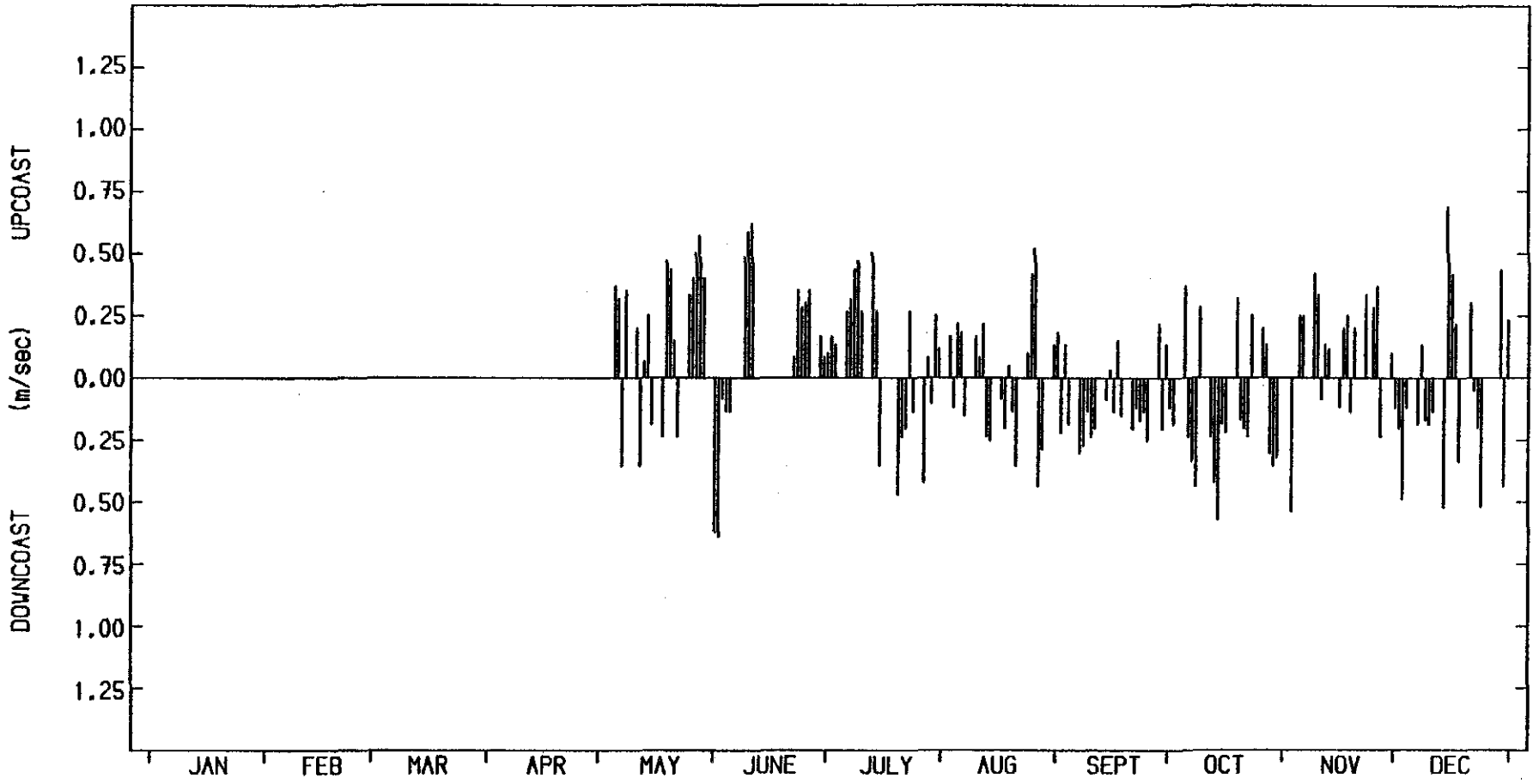


# LITTORAL CURRENT SUMMARY - 1981

Mean Vel = .017 m/sec (up)

Mean Upcoast Vel = .272 m/sec

Mean Downcoast Vel = .247 m/sec

MORNING OBSERVATIONS - (159 recordings)

LITTORAL CURRENTS - MORNING 1981

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Figure 31

C24.1

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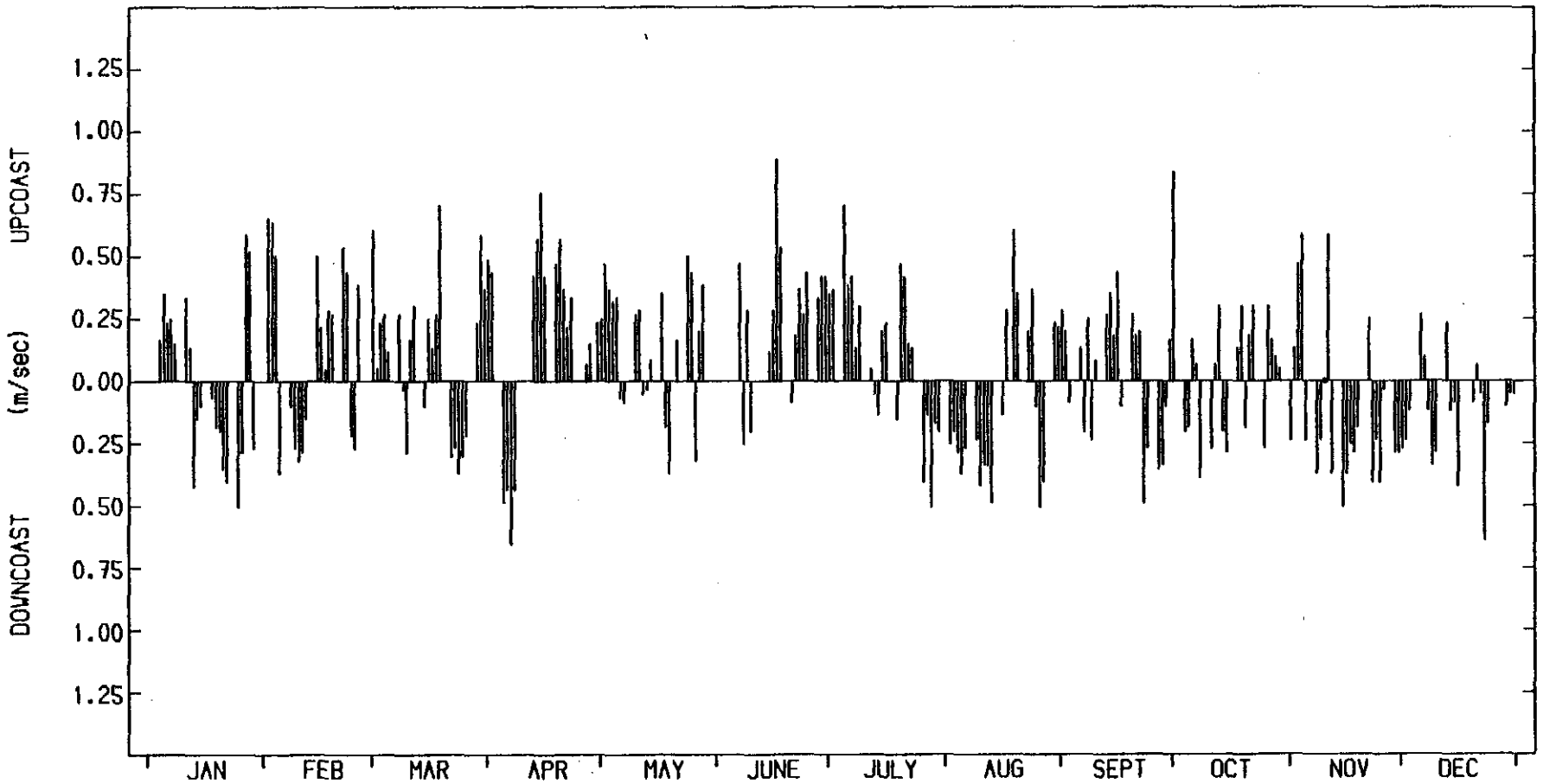
CALOUNDRA CITY

KINGS BEACH

0601




# LITTORAL CURRENTS - MORNING 1982

## LITTORAL CURRENT SUMMARY - 1982

Mean Vel = .055 m/sec (up)

Mean Upcoast Vel = .316 m/sec

Mean Downcoast Vel = .253 m/sec

MORNING OBSERVATIONS - (245 recordings)

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Kings Beach

**Figure 32**

C24.1

Beach Protection Authority

COPE - Coastal Observation Programme Engineering

CALOUNDRA CITY

KINGS BEACH

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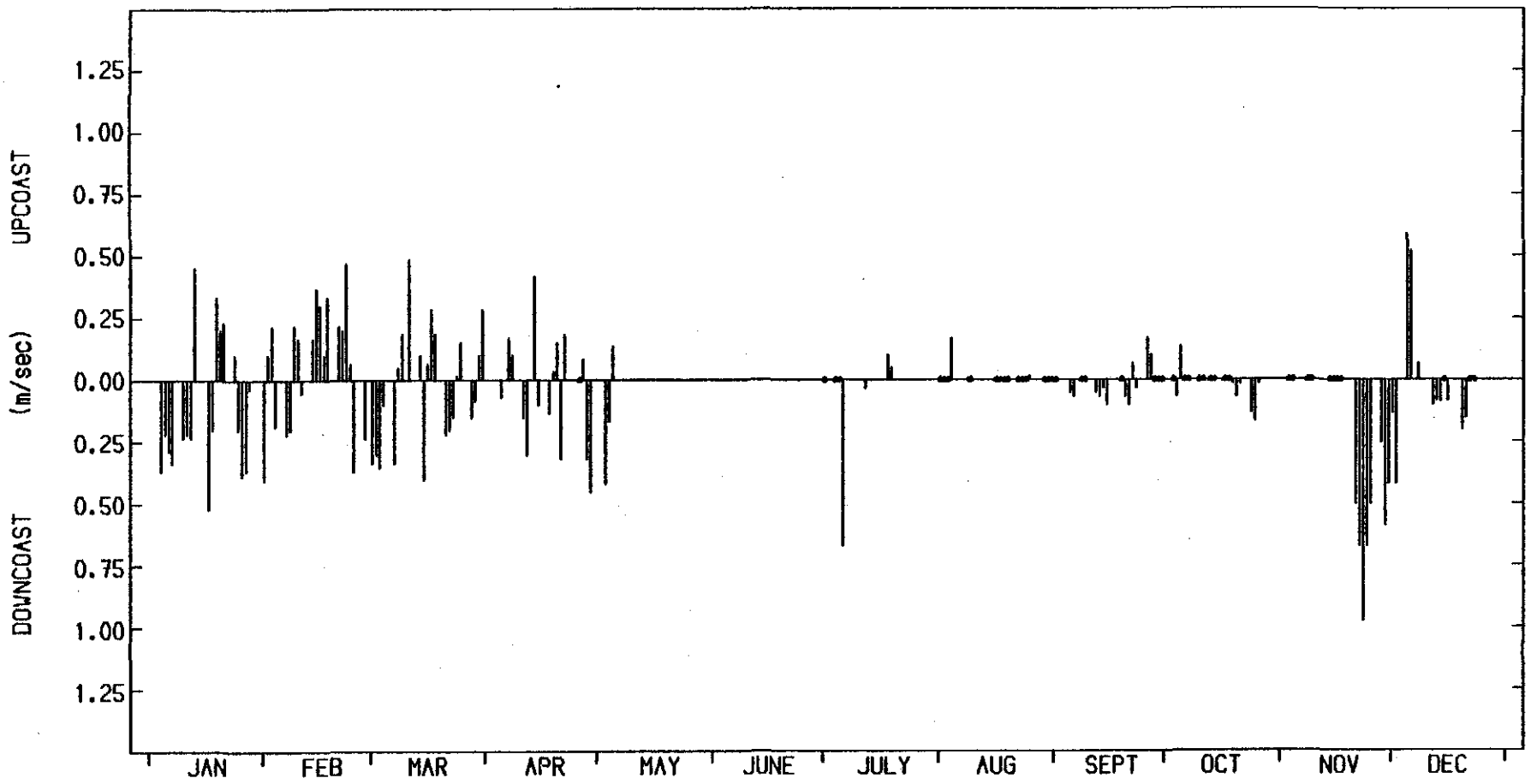


## LITTORAL CURRENT SUMMARY - 1983

Mean Vel = -.050 m/sec (down)

Mean Upcoast Vel = .195 m/sec

Mean Downcoast Vel = .238 m/sec

MORNING OBSERVATIONS - (168 recordings)

LITTORAL CURRENTS - MORNING 1983

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Figure 33
C24.1

Beach Protection Authority

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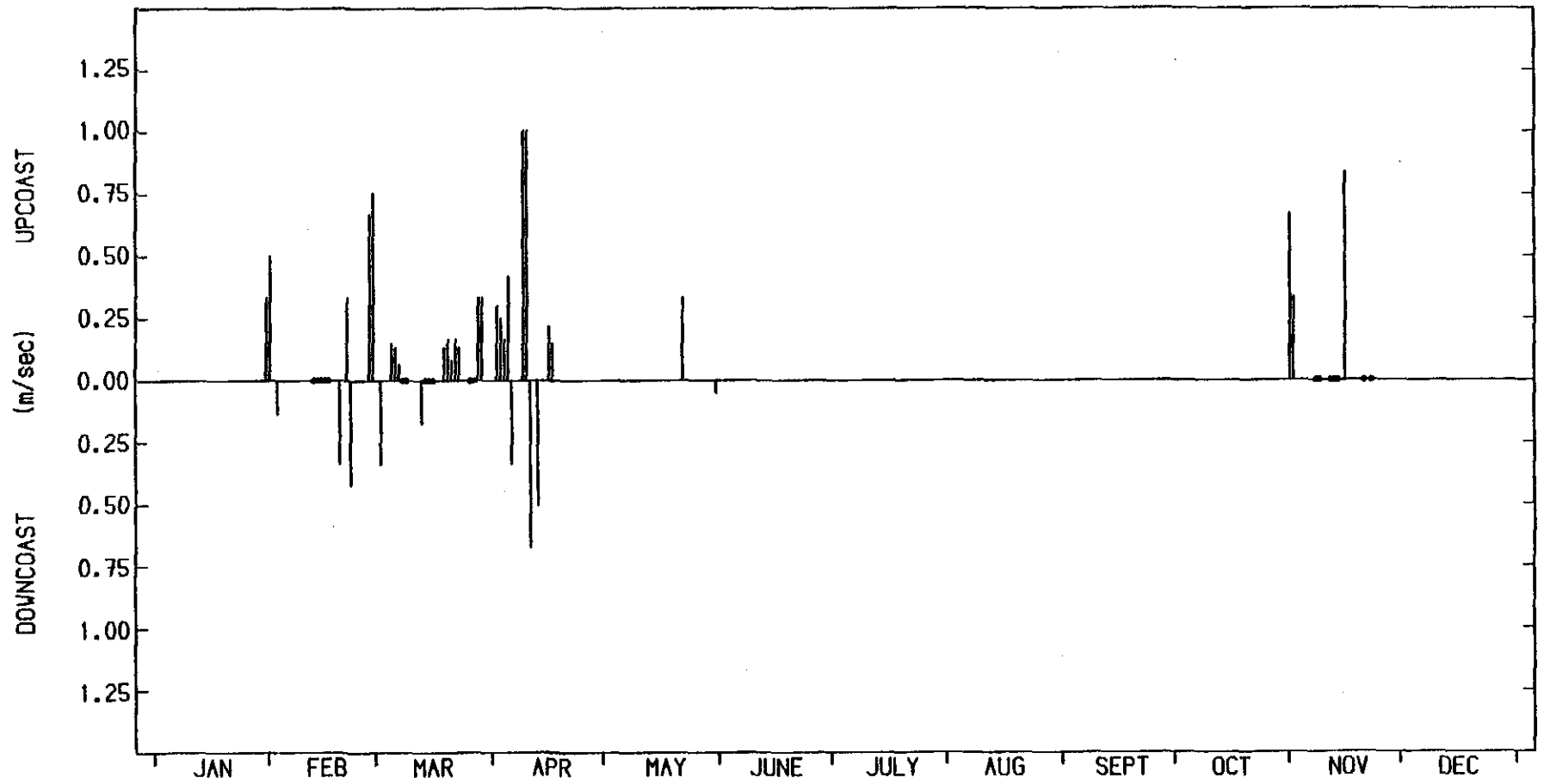
KINGS BEACH

0601




# LITTORAL CURRENT SUMMARY - 1984

Mean Vel = .128 m/sec (up)

Mean Upcoast Vel = .369 m/sec

Mean Downcoast Vel = .326 m/sec

MORNING OBSERVATIONS - ( 55 recordings)

LITTORAL CURRENTS - MORNING 1984

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Kings Beach

Figure 34

C24.1

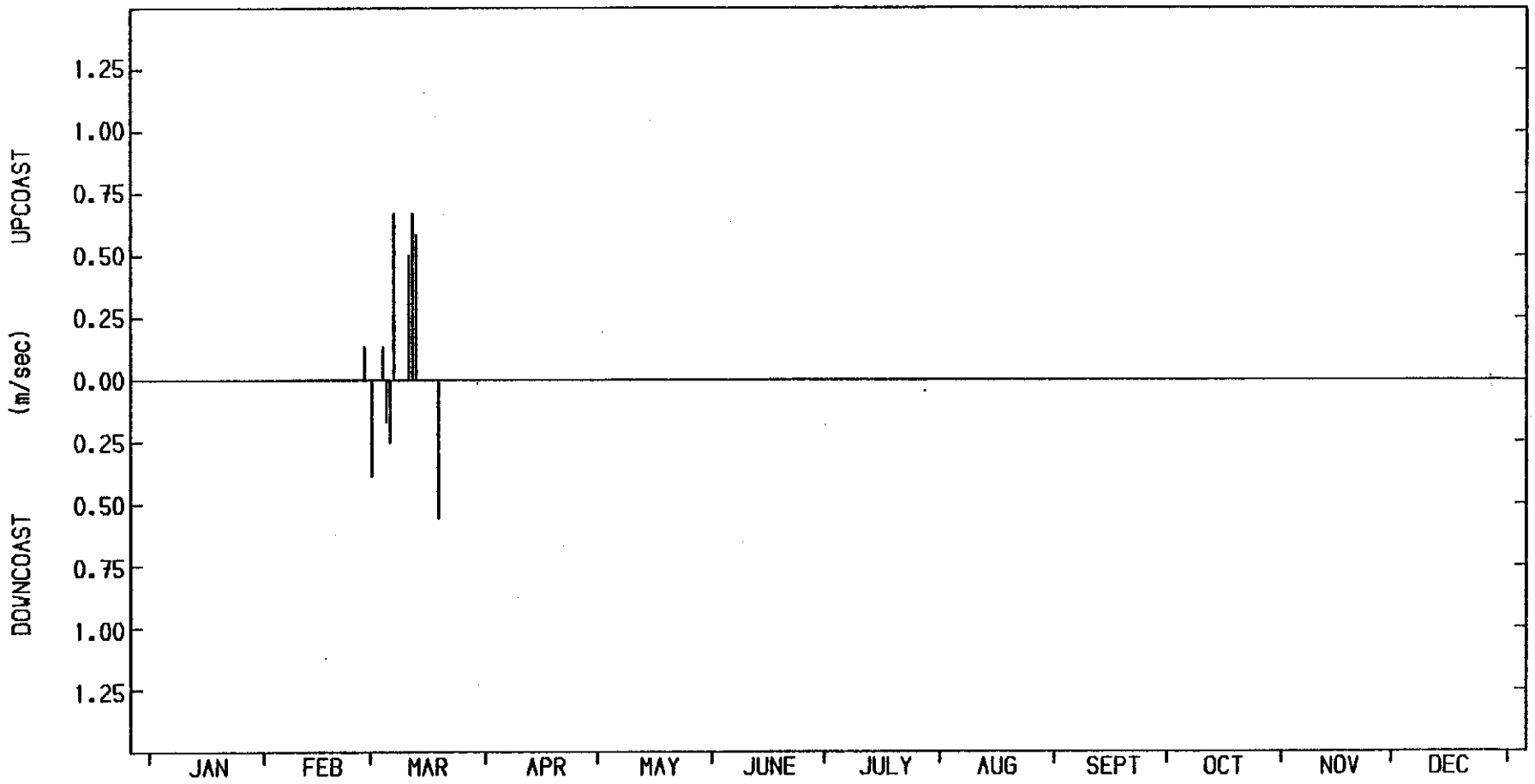
Beach Protection Authority

COPE - Coastal Observation Programme Engineering

CALOUNDRA CITY

KINGS BEACH

0601




# LITTORAL CURRENTS - MORNING 1985

## LITTORAL CURRENT SUMMARY - 1985

Mean Vel = .133 m/sec (up)

Mean Upcoast Vel = .447 m/sec

Mean Downcoast Vel = .337 m/sec

MORNING OBSERVATIONS - ( 10 recordings)

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Kings Beach

Figure 35

C24.1

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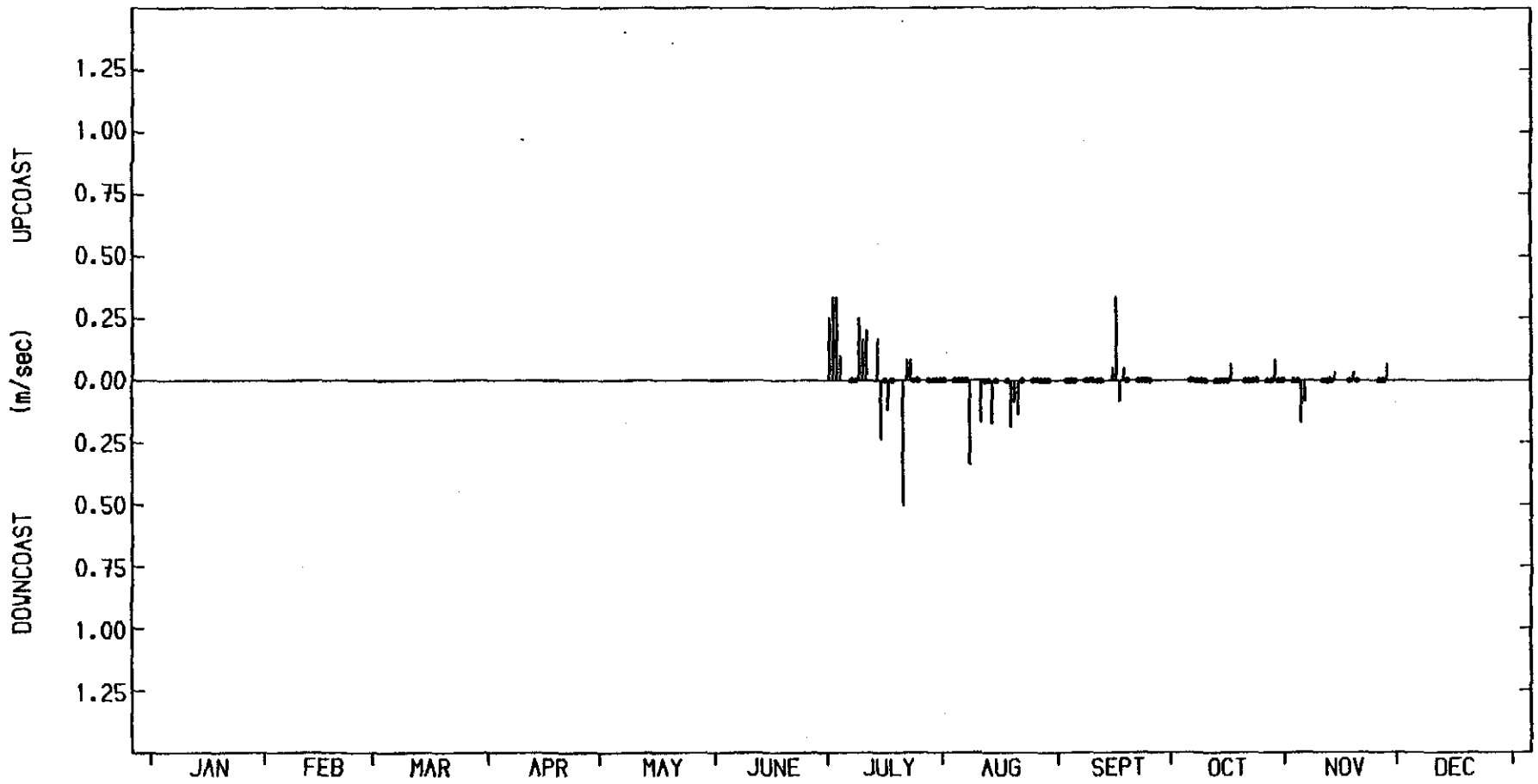
KINGS BEACH

0601




# LITTORAL CURRENTS - MORNING 1986

## LITTORAL CURRENT SUMMARY - 1986

Mean Vel = .005 m/sec (up)

Mean Upcoast Vel = .149 m/sec

Mean Downcoast Vel = .187 m/sec

MORNING OBSERVATIONS - ( 94 recordings)

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Figure 36
C24.1

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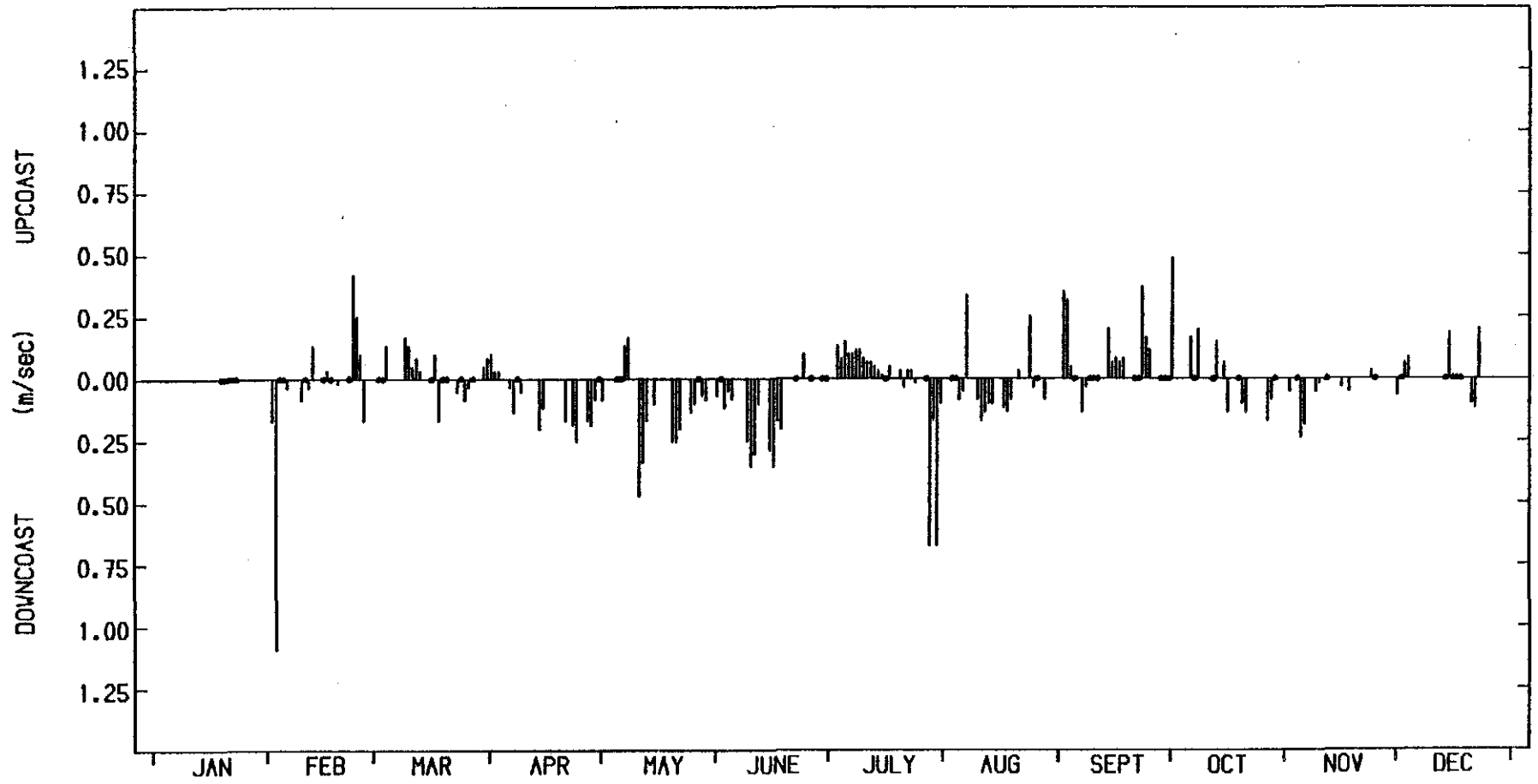


## LITTORAL CURRENT SUMMARY - 1987

Mean Vel = -.024 m/sec (down)

Mean Upcoast Vel = .127 m/sec

Mean Downcoast Vel = .153 m/sec

MORNING OBSERVATIONS - (197 recordings)

LITTORAL CURRENTS - MORNING 1987

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Figure 37

C24.1

Beach Protection Authority

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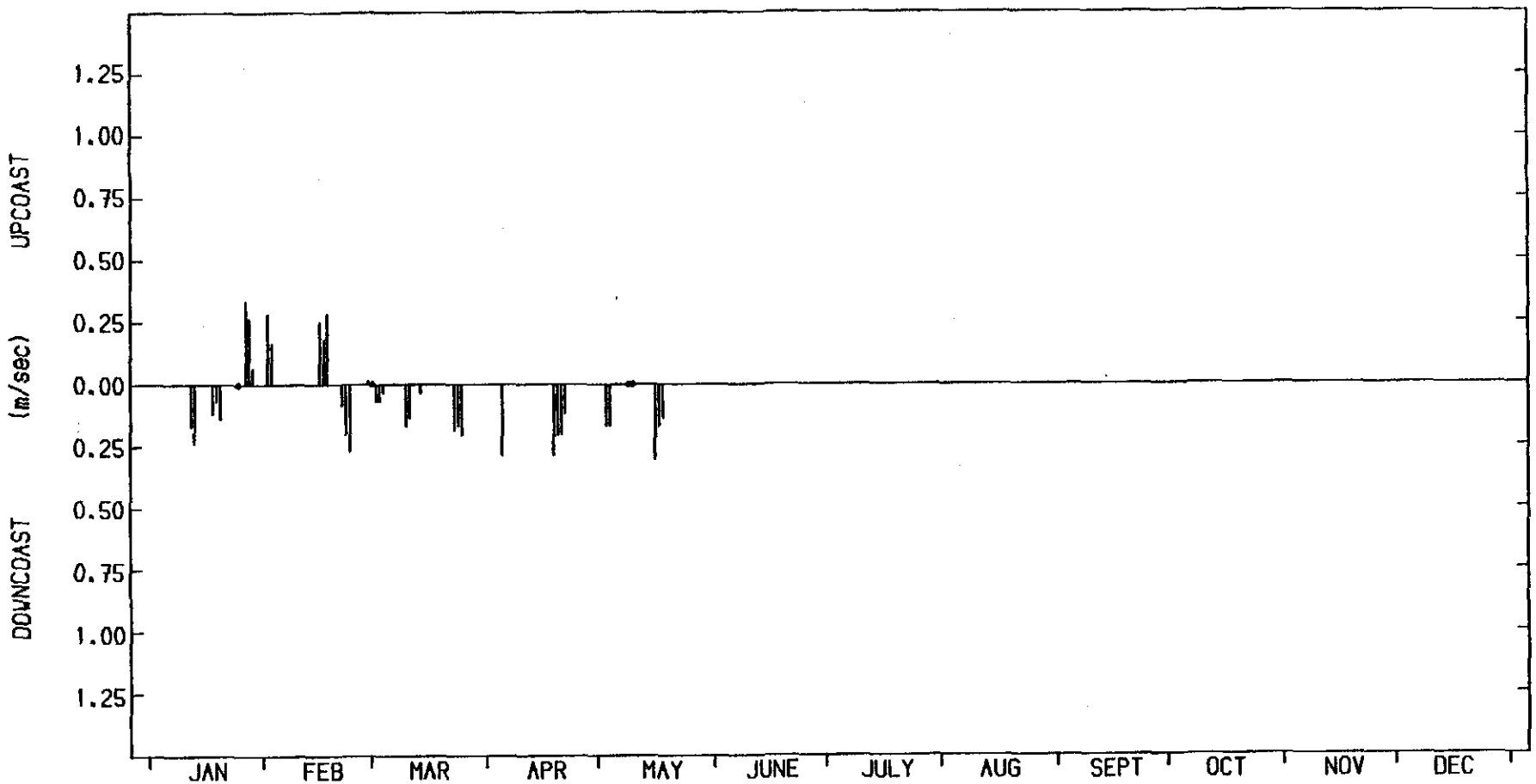
KINGS BEACH

0601




# LITTORAL CURRENTS - MORNING 1988

## LITTORAL CURRENT SUMMARY - 1988

Mean Vel = -.062 m/sec (down)

Mean Upcoast Vel = .206 m/sec

Mean Downcoast Vel = .160 m/sec

MORNING OBSERVATIONS - ( 40 recordings)

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Kings Beach

**Figure 38**

C24.1

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CALOUNDRA CITY

KINGS BEACH

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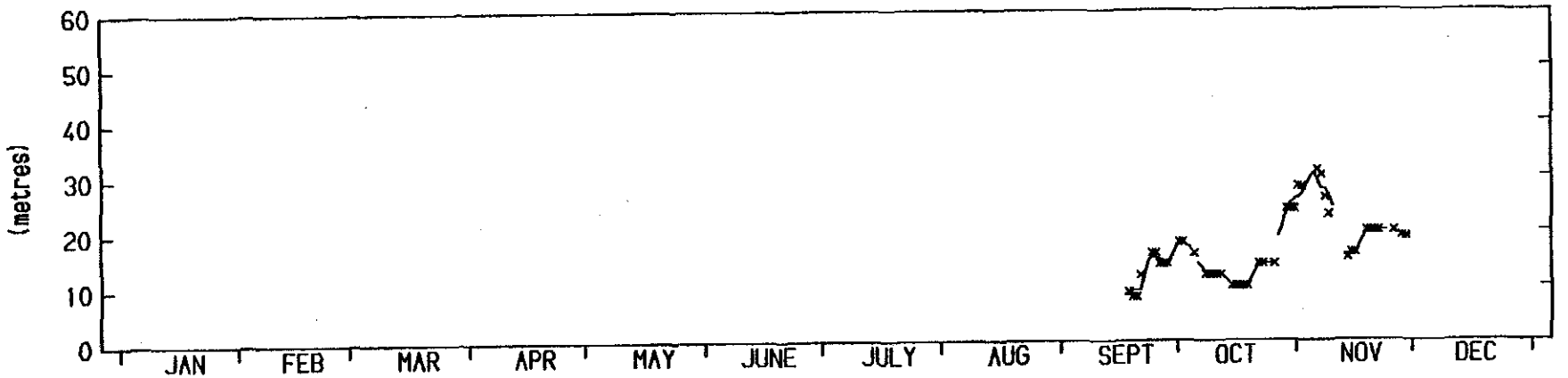
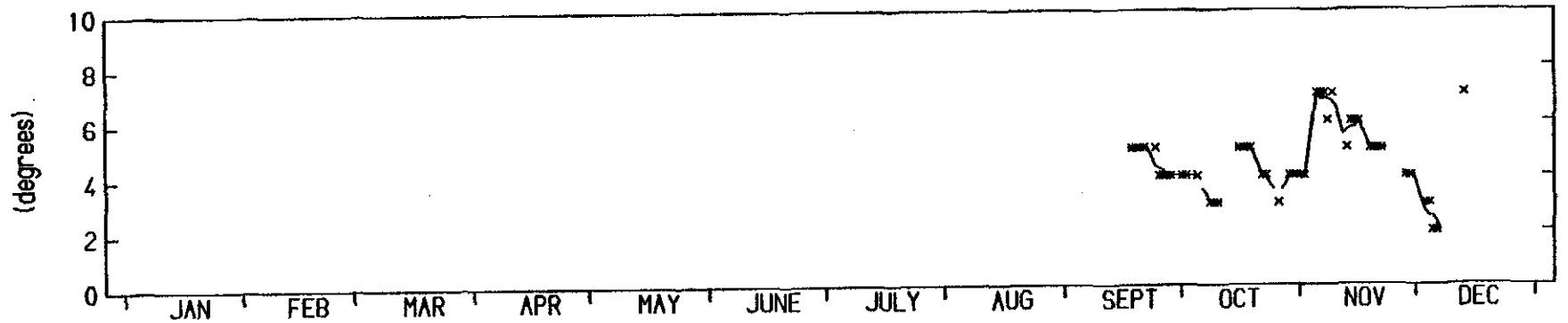



DISTANCE TO BERM AND VEGETATION LINE - 1973

×××× Indicates Distance to Berm : 44 Observations




FORESHORE SLOPE - 1973

Five Day Moving Average

No. of Observations : 47

BEACH PROFILE PARAMETERS - 1973

Kings Beach

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Figure 39
C24.1

Beach Protection Authority

COPE - Coastal Observation Programme Engineering

CALOUNDRA CITY

KINGS BEACH

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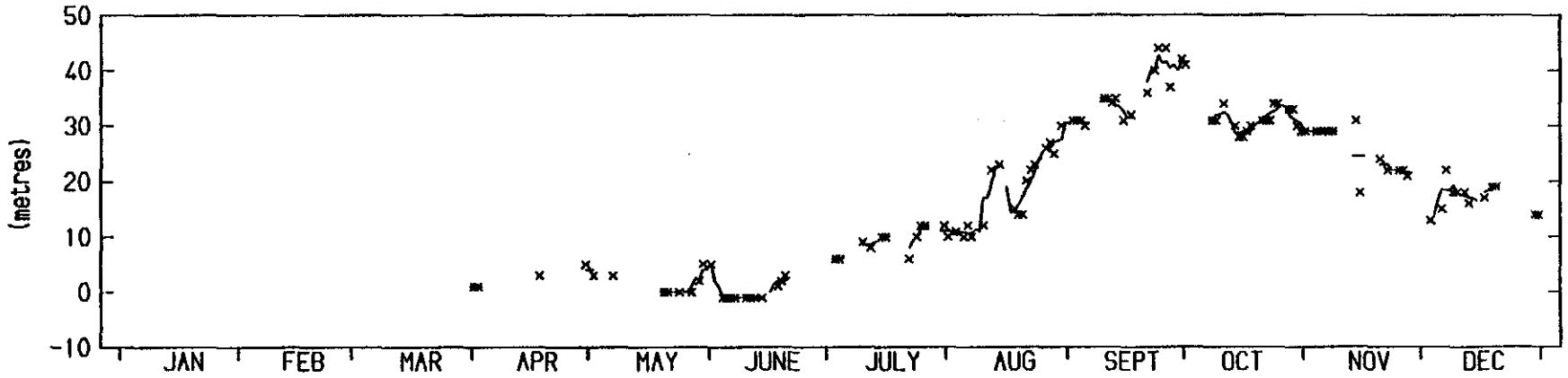
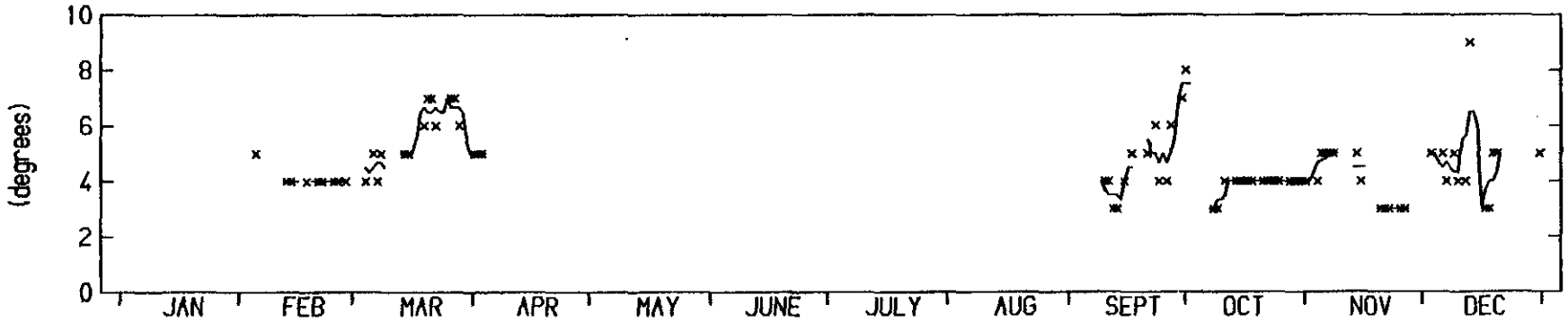



DISTANCE TO BERM AND VEGETATION LINE - 1974

xxxxx Indicates Distance to Berm : 112 Observations




FORESHORE SLOPE - 1974

Five Day Moving Average

No. of Observations : 80

**BEACH PROFILE PARAMETERS - 1974**

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Kings Beach

**Figure 40**

C24.1

Beach Protection Authority

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CALOUNDRA CITY

KINGS BEACH

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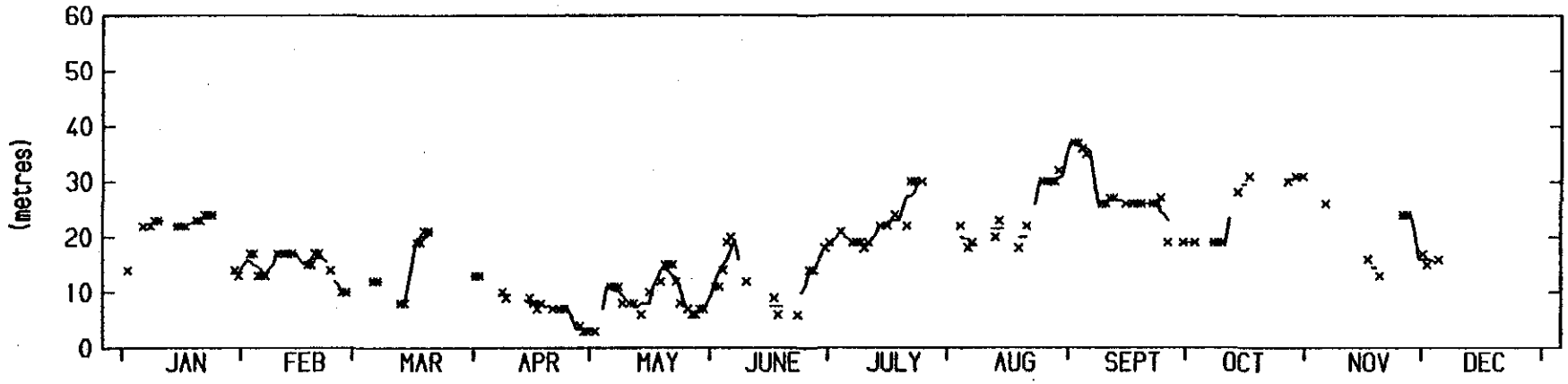
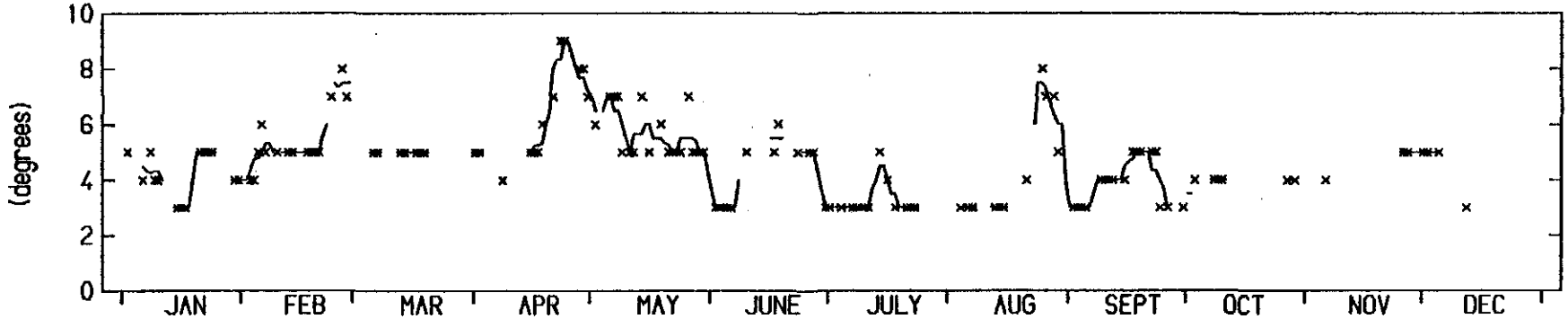



DISTANCE TO BERM AND VEGETATION LINE - 1975

×××× Indicates Distance to Berm : 145 Observations




FORESHORE SLOPE - 1975

Five Day Moving Average

No. of Observations : 133

BEACH PROFILE PARAMETERS - 1975

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Figure 41

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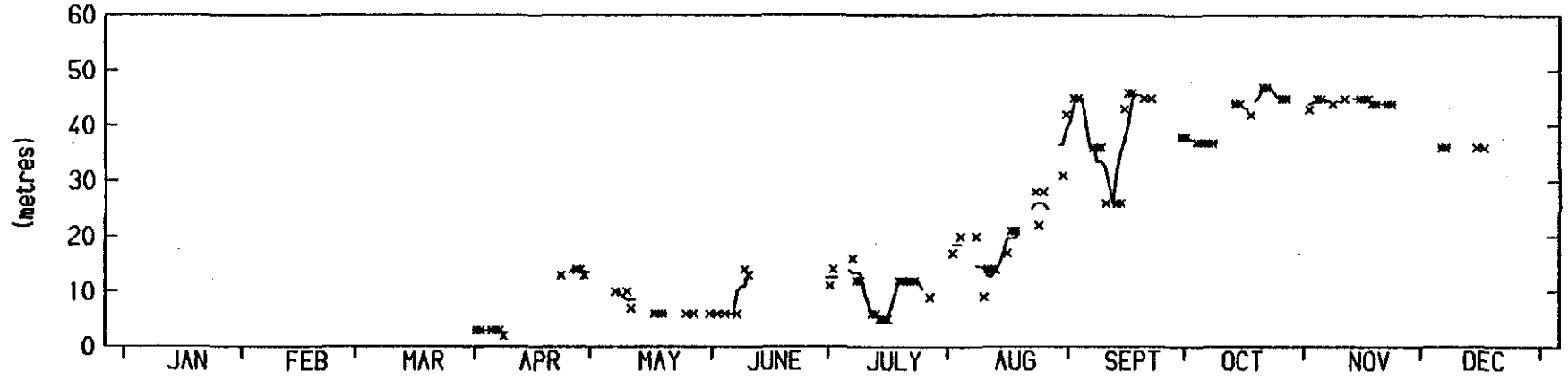
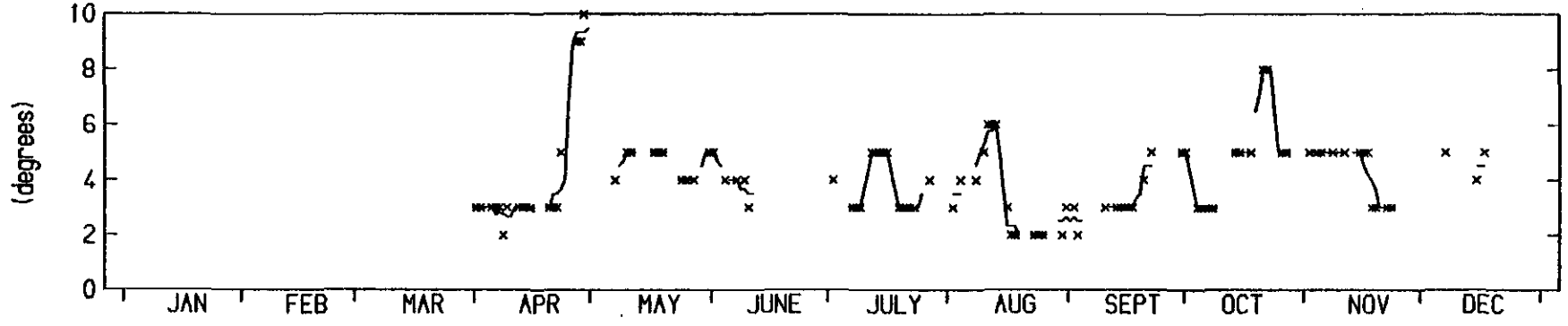



DISTANCE TO BERM AND VEGETATION LINE - 1976

×××× Indicates Distance to Berm : 98 Observations




FORESHORE SLOPE - 1976

Five Day Moving Average

No. of Observations : 102

BEACH PROFILE PARAMETERS - 1976

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Figure 42

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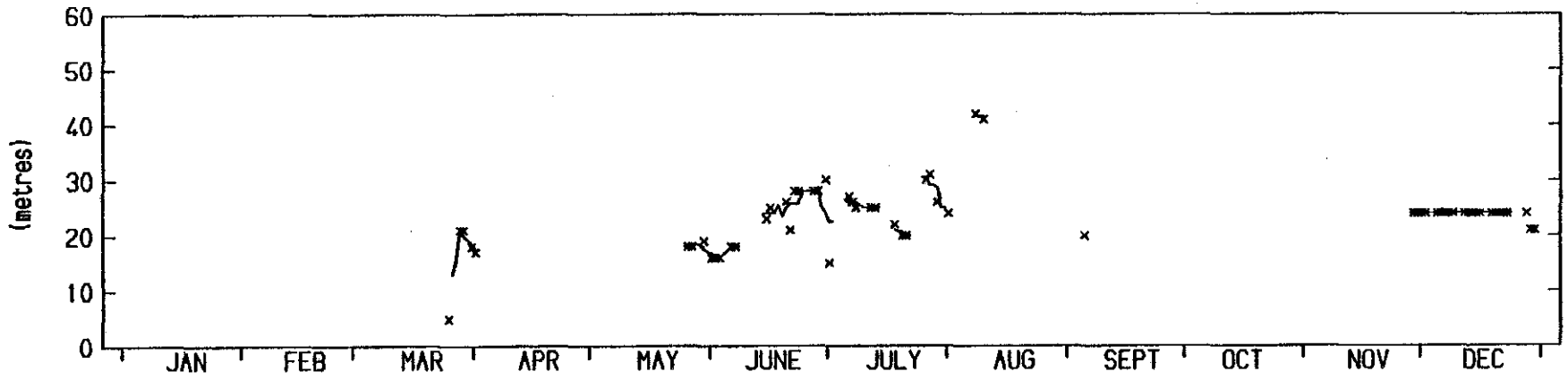
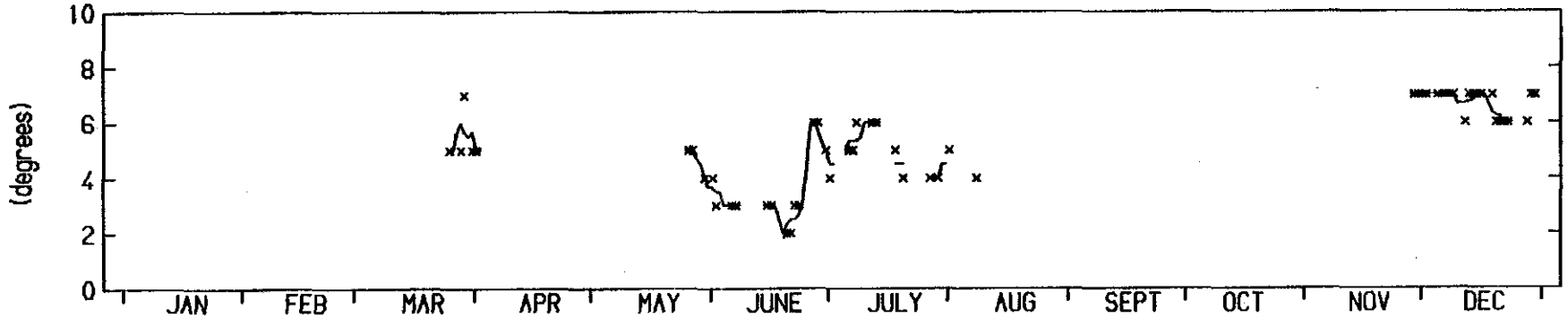



DISTANCE TO BERM AND VEGETATION LINE - 1977

×××× Indicates Distance to Berm : 60 Observations




FORESHORE SLOPE - 1977

Five Day Moving Average

No. of Observations : 55

BEACH PROFILE PARAMETERS - 1977

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Figure 43

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KINGS BEACH

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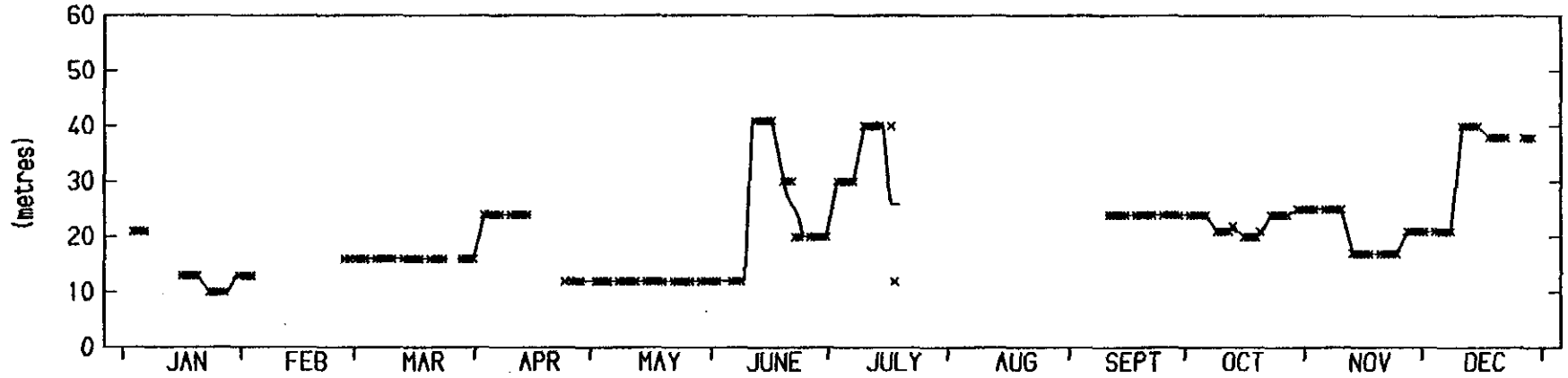
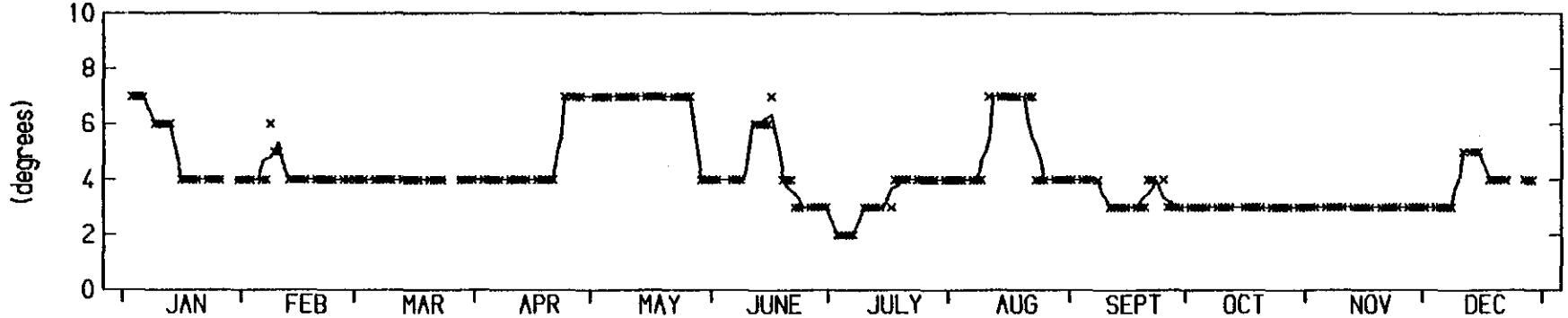



DISTANCE TO BERM AND VEGETATION LINE - 1978

xxxxx Indicates Distance to Berm : 187 Observations




FORESHORE SLOPE - 1978

Five Day Moving Average

No. of Observations : 245

BEACH PROFILE PARAMETERS - 1978

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Figure 44
C24.1

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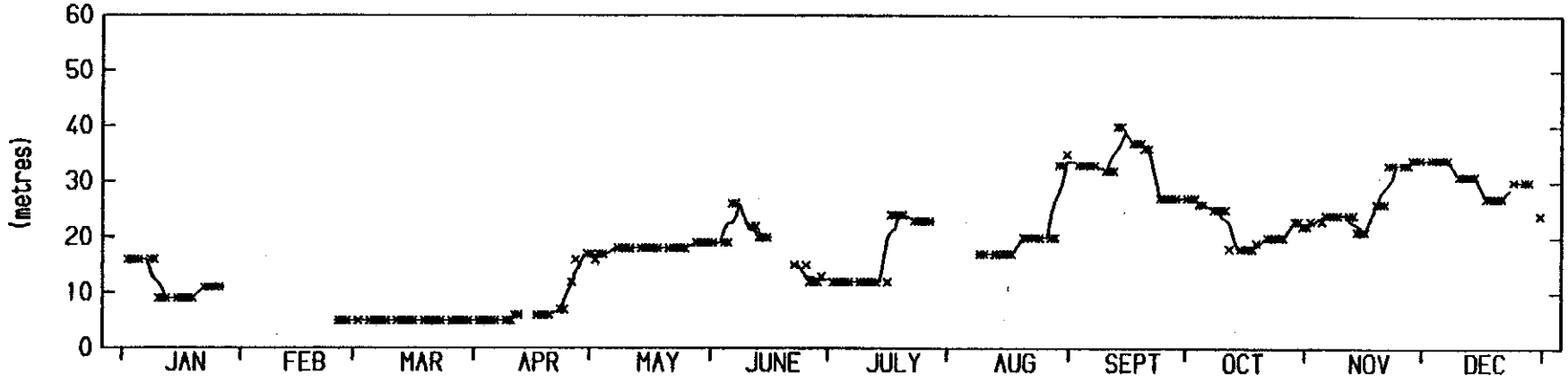
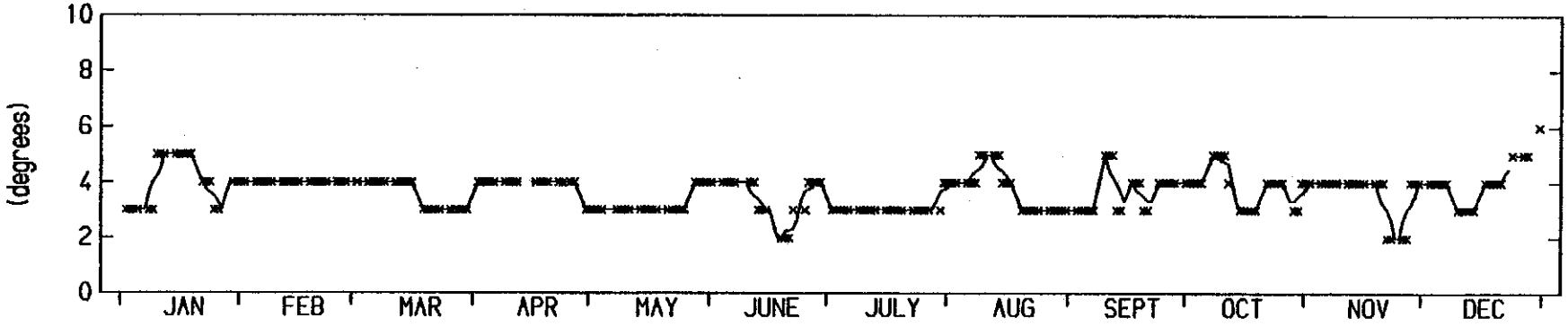



DISTANCE TO BERM AND VEGETATION LINE - 1979

×××× Indicates Distance to Berm : 220 Observations




FORESHORE SLOPE - 1979

Five Day Moving Average

No. of Observations : 250

BEACH PROFILE PARAMETERS - 1979

COPE

Kings Beach

Figure 45
C 24.1

Beach Protection Authority

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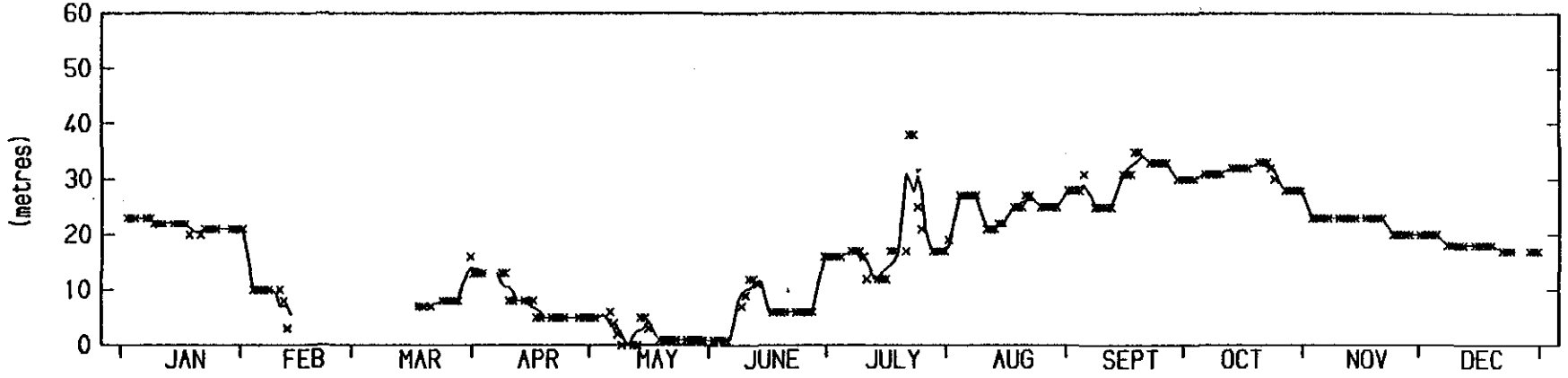
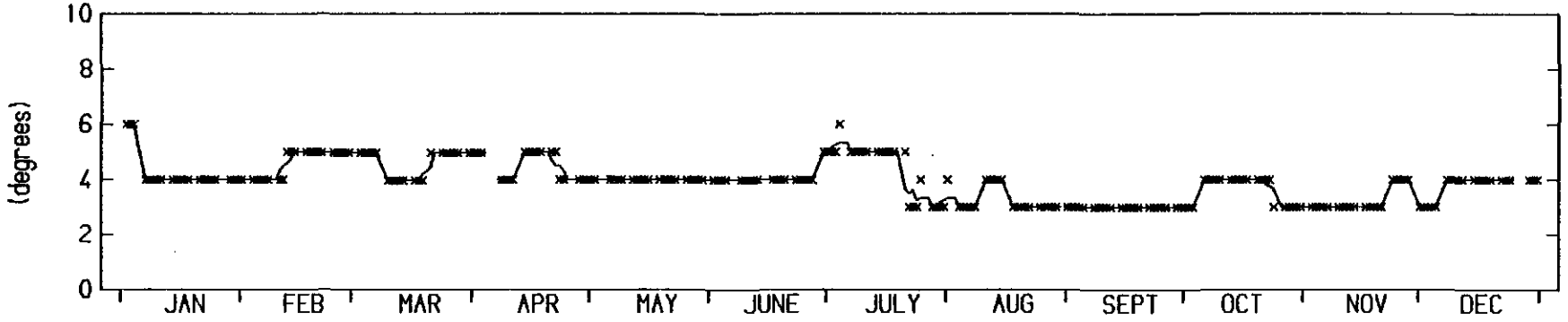



DISTANCE TO BERM AND VEGETATION LINE - 1980

×××× Indicates Distance to Berm : 228 Observations




FORESHORE SLOPE - 1980

Five Day Moving Average

No. of Observations : 251

BEACH PROFILE PARAMETERS - 1980

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Figure 46

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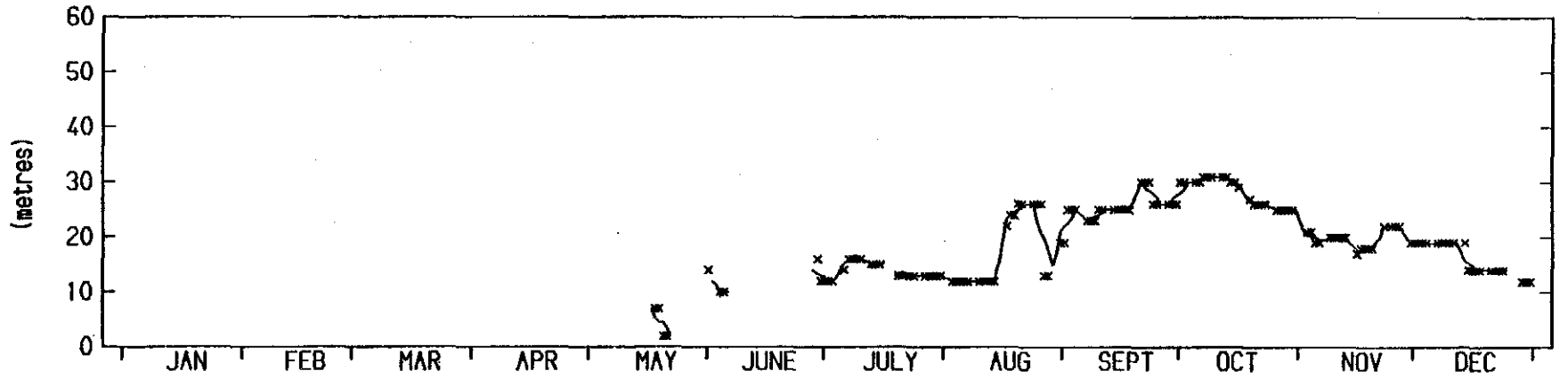
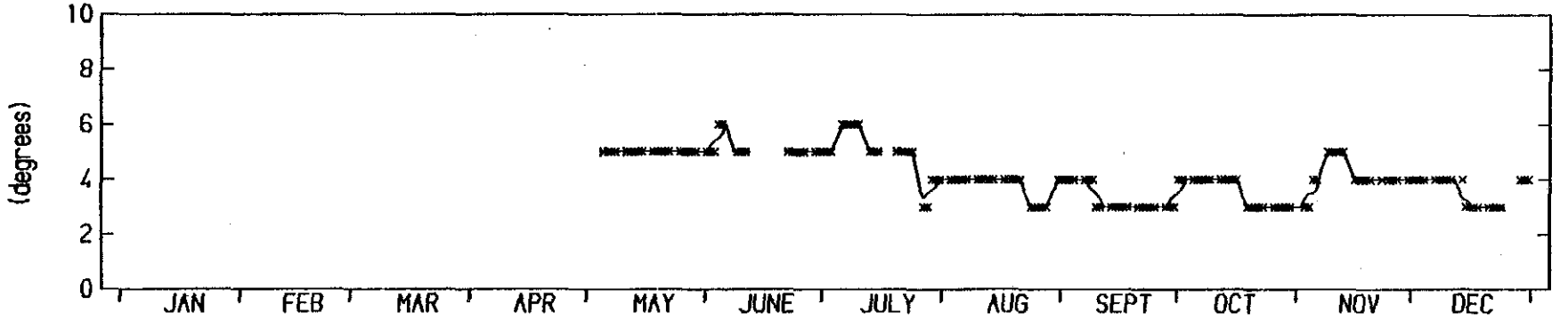



DISTANCE TO BERM AND VEGETATION LINE - 1981

xxxxx Indicates Distance to Berm : 135 Observations




FORESHORE SLOPE - 1981

Five Day Moving Average

No. of Observations : 160

BEACH PROFILE PARAMETERS - 1981

Figure 47
C 24.1

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KINGS BEACH

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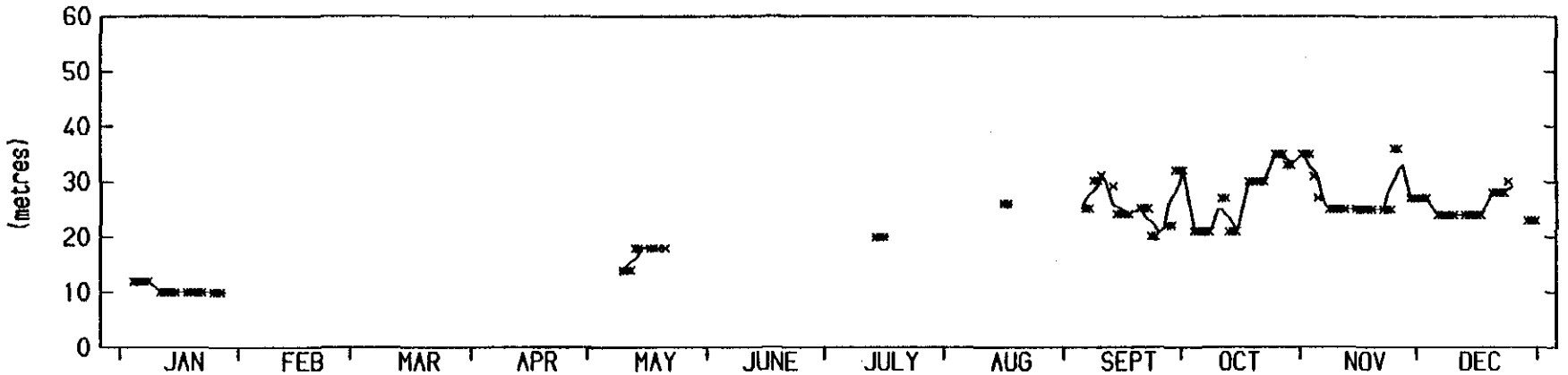
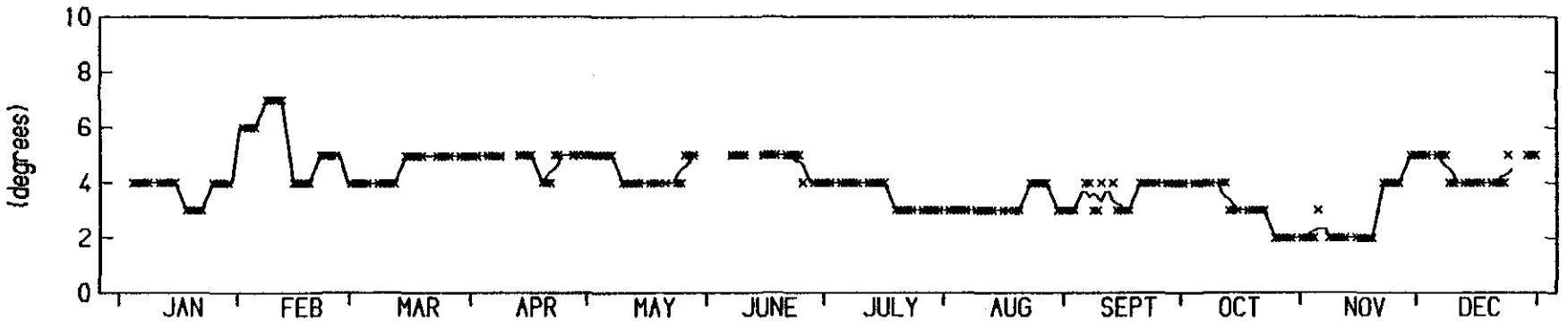



DISTANCE TO BERM AND VEGETATION LINE - 1982

xxxxx Indicates Distance to Berm : 115 Observations




FORESHORE SLOPE - 1982

Five Day Moving Average

No. of Observations : 245

BEACH PROFILE PARAMETERS - 1982

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Kings Beach

Figure 48

C 24.1

Beach Protection Authority

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KINGS BEACH

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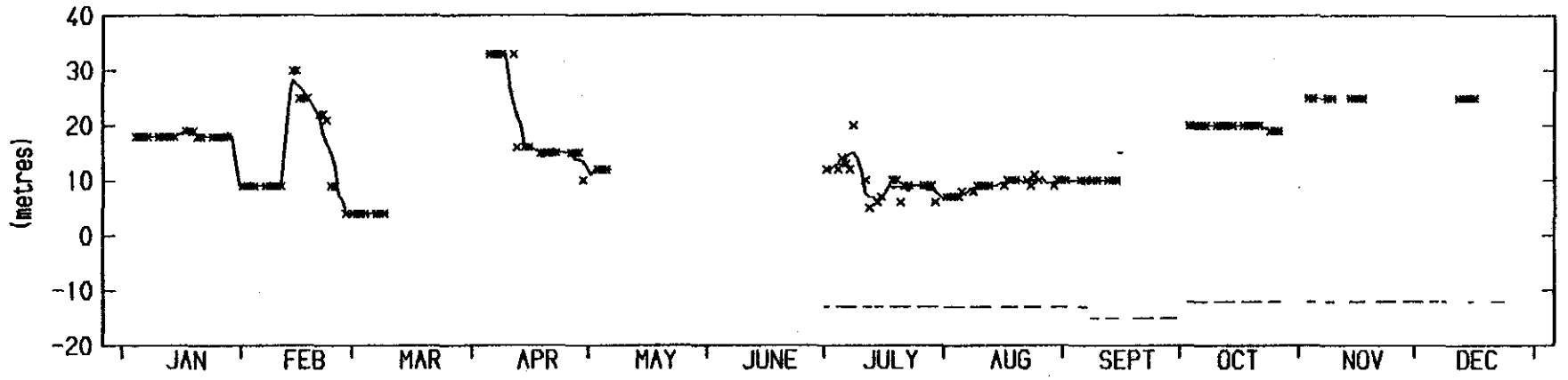
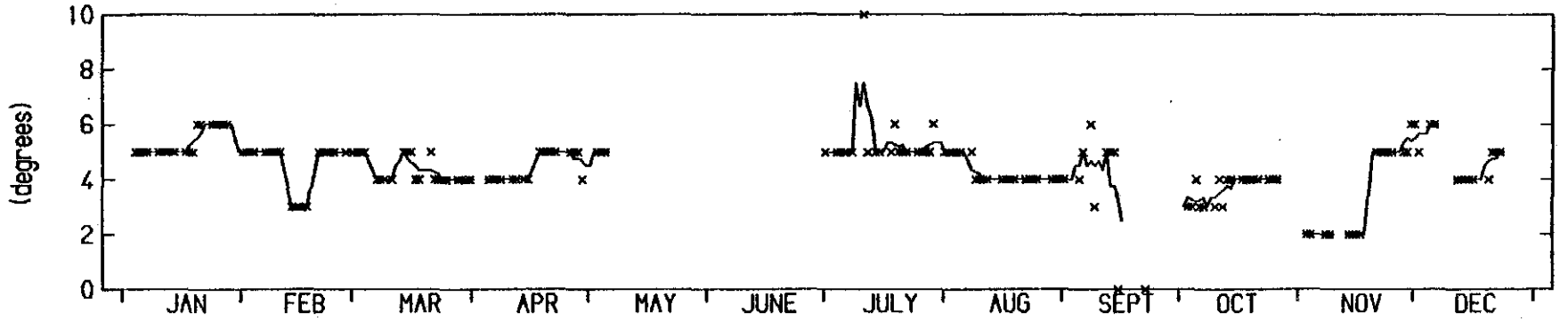



DISTANCE TO BERM AND VEGETATION LINE - 1983

×××× Indicates Distance to Berm : 147 Observations

— Indicates Distance to Vegetation Line : 102 Observations




FORESHORE SLOPE - 1983

Five Day Moving Average

No. of Observations : 178

BEACH PROFILE PARAMETERS - 1983

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Kings Beach

Figure 49

C 24.1

Beach Protection Authority

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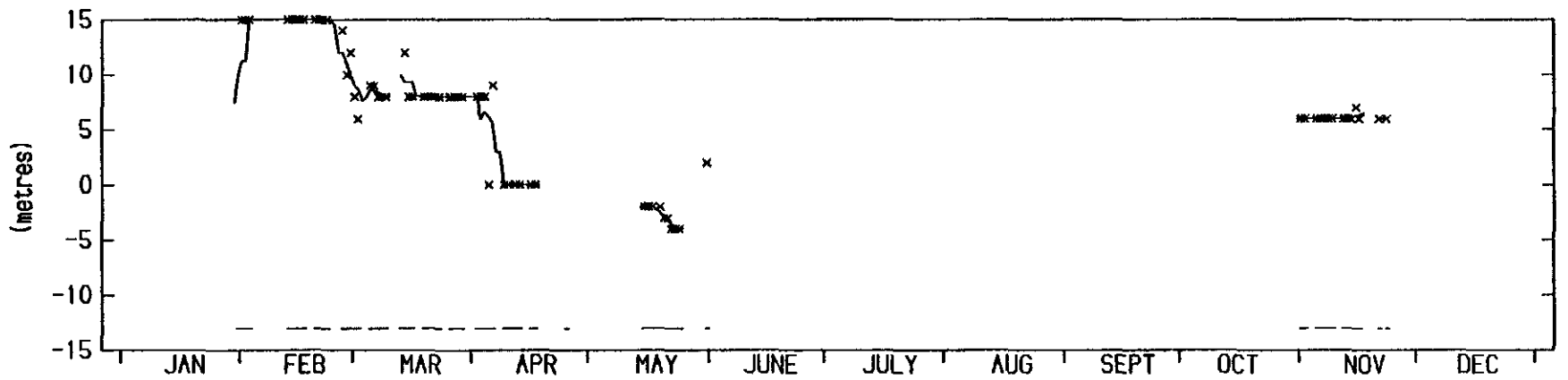
CALOUNDRA CITY

KINGS BEACH

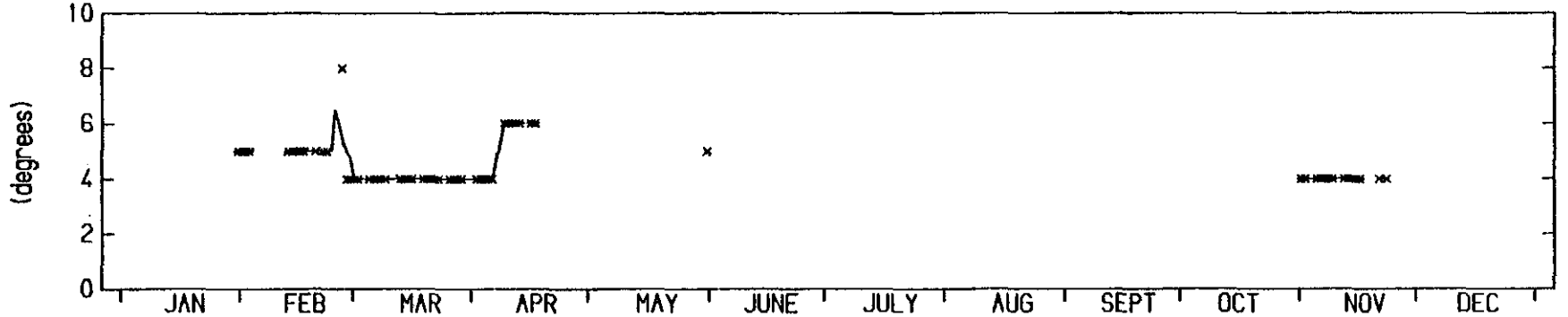
0601




DISTANCE TO BERM AND VEGETATION LINE - 1984

xxxxx Indicates Distance to Berm : 70 Observations

— Indicates Distance to Vegetation Line : 74 Observations




FORESHORE SLOPE - 1984

Five Day Moving Average

No. of Observations : 62

# BEACH PROFILE PARAMETERS - 1984

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Figure 50

C 24.1

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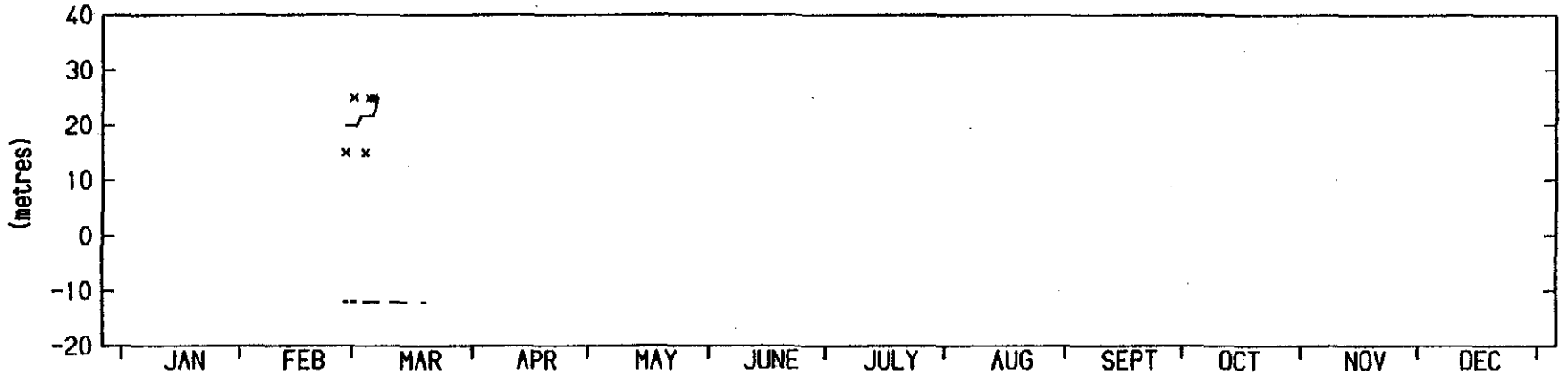
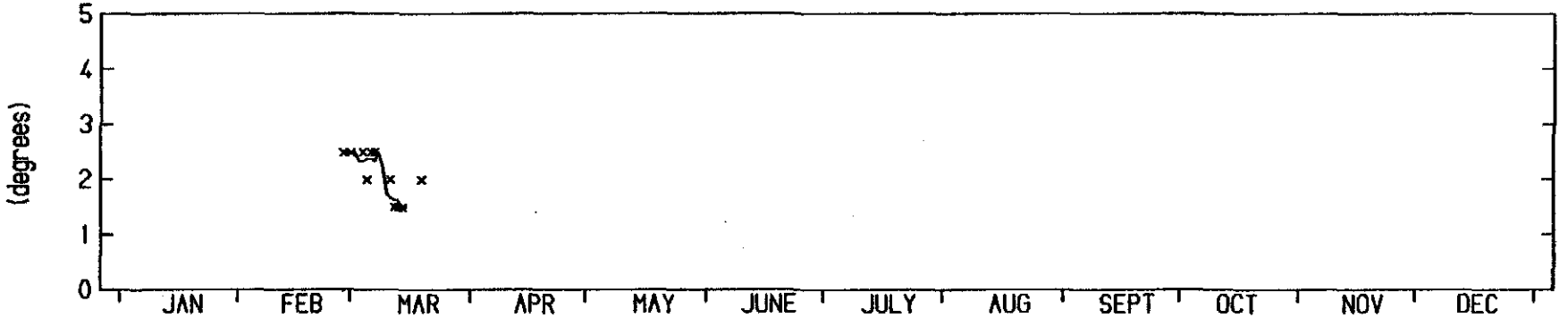



DISTANCE TO BERM AND VEGETATION LINE - 1985

×××××  Indicates Distance to Berm : 5 Observations

—  Indicates Distance to Vegetation Line : 11 Observations




FORESHORE SLOPE - 1985

Five Day Moving Average

No. of Observations : 11

**BEACH PROFILE PARAMETERS - 1985**

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**Figure 51**

C 24.1

Beach Protection Authority

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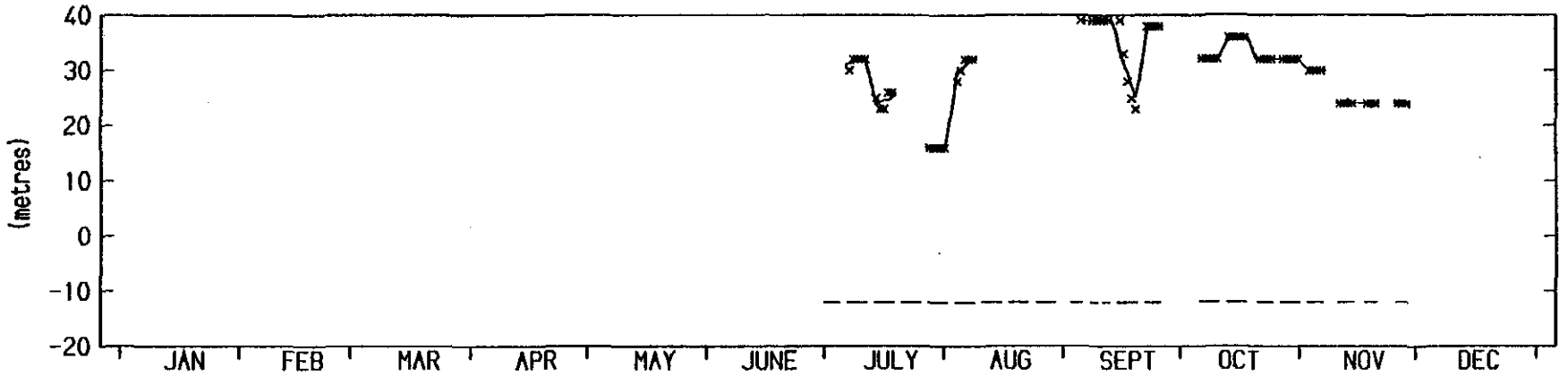
KINGS BEACH

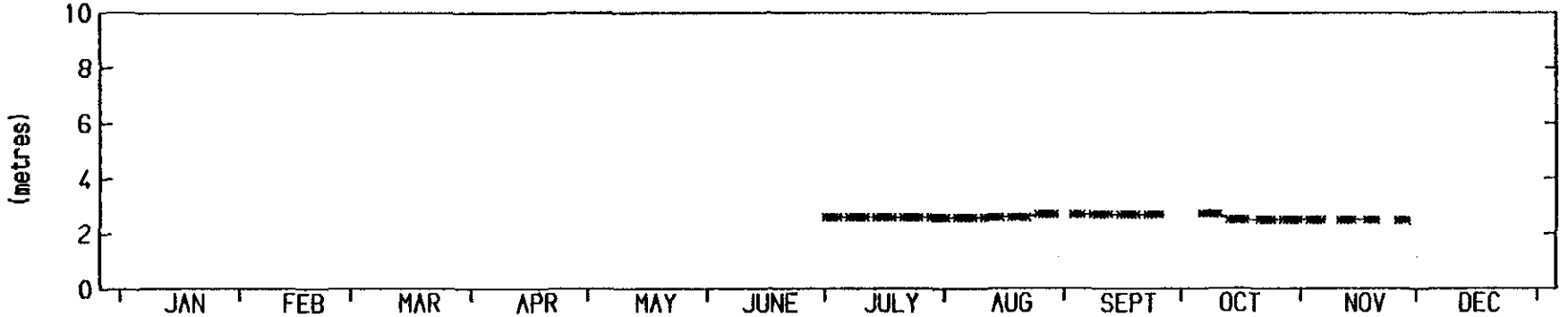
0601




DISTANCE TO BERM AND VEGETATION LINE - 1986

xxxxx Indicates Distance to Berm : 68 Observations

— Indicates Distance to Vegetation Line : 93 Observations




SAND LEVEL AT POLE - 1986

Five Day Moving Average

No. of Observations : 94

BEACH PROFILE PARAMETERS - 1986

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Kings Beach

Figure 52

C 24.1

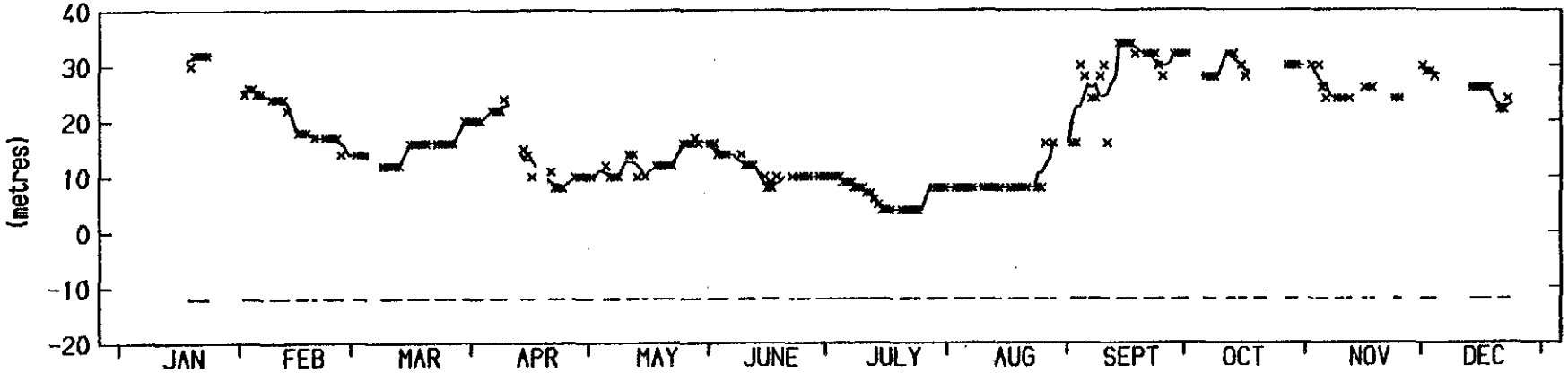
Beach Protection Authority

COPE - Coastal Observation Programme Engineering

CALOUNDRA CITY

KINGS BEACH

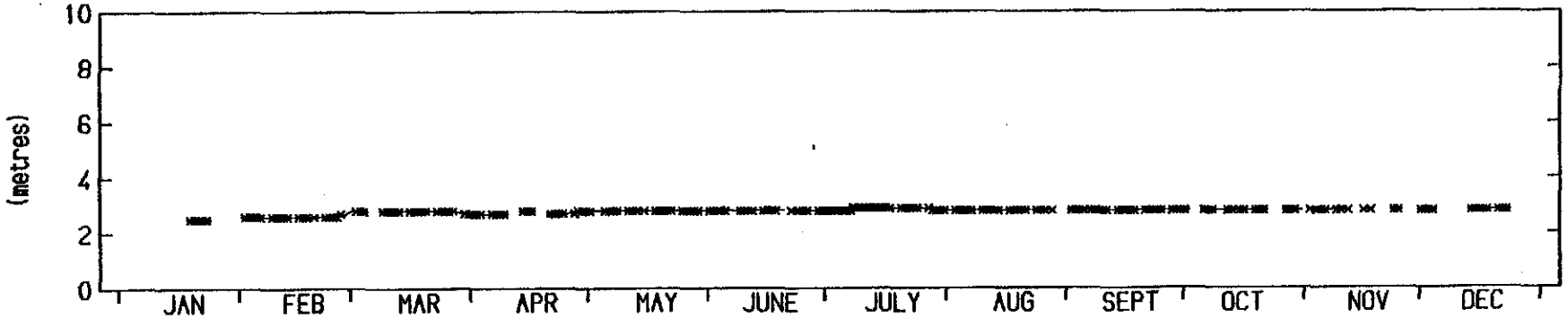
0601




DISTANCE TO BERM AND VEGETATION LINE - 1987

xxxxx Indicates Distance to Berm : 201 Observations

— Indicates Distance to Vegetation Line : 205 Observations




SAND LEVEL AT POLE - 1987

Five Day Moving Average

No. of Observations : 205

BEACH PROFILE PARAMETERS - 1987

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Figure 53

C 24.1

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# BEACH PROFILE PARAMETERS - 1988

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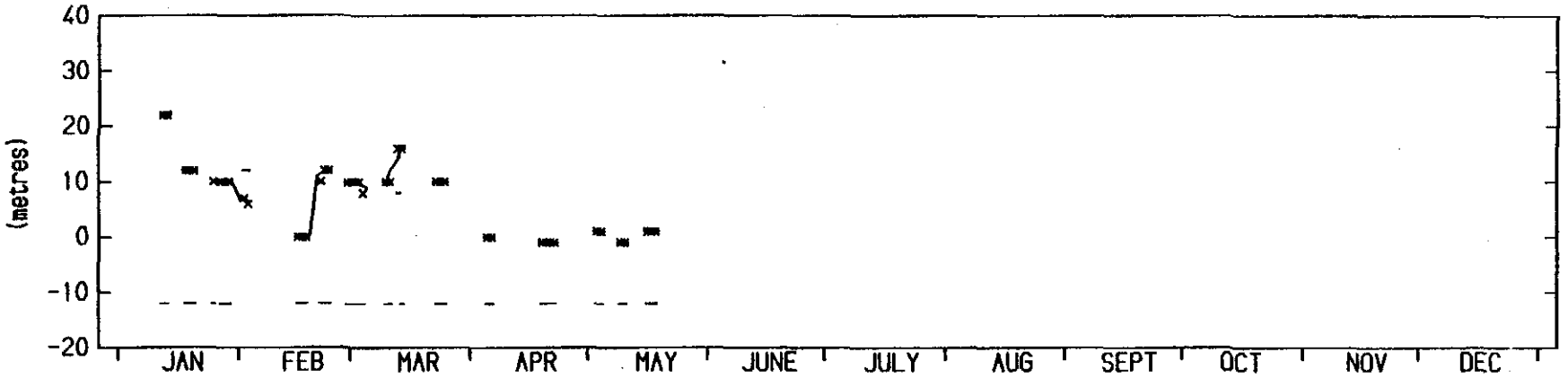
CALOUNDRA CITY

KINGS BEACH

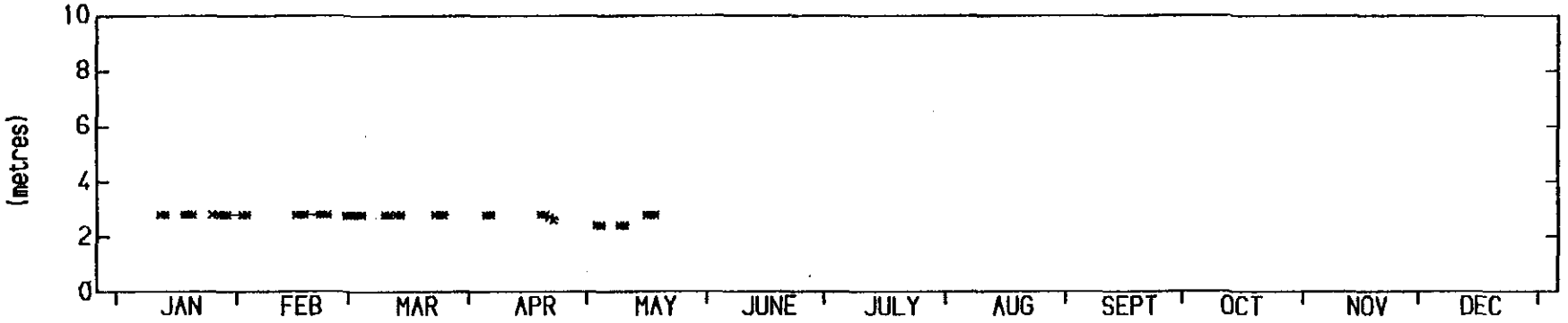
0601




DISTANCE TO BERM AND VEGETATION LINE - 1988

xxxxx Indicates Distance to Berm : 42 Observations

— Indicates Distance to Vegetation Line : 42 Observations




SAND LEVEL AT POLE - 1988

Five Day Moving Average

No. of Observations : 42

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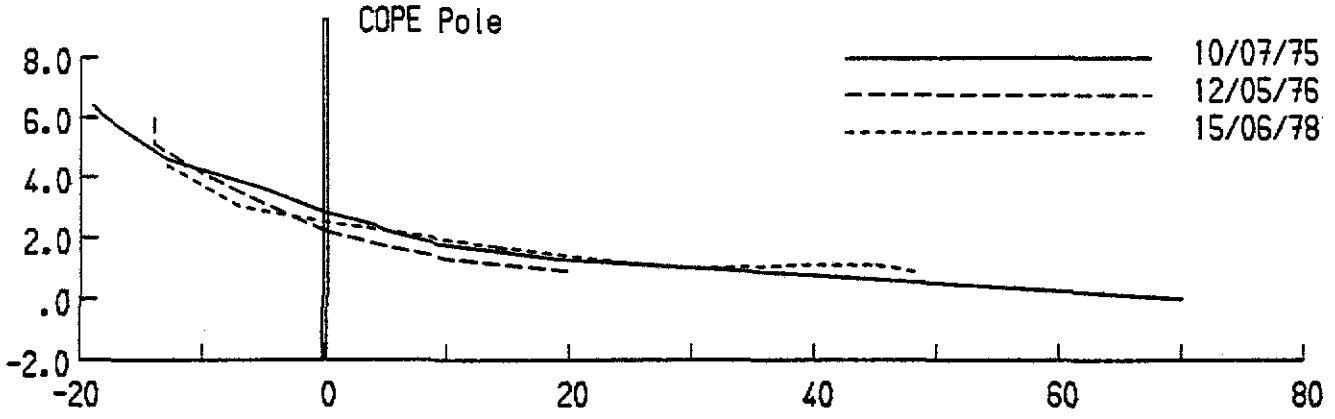
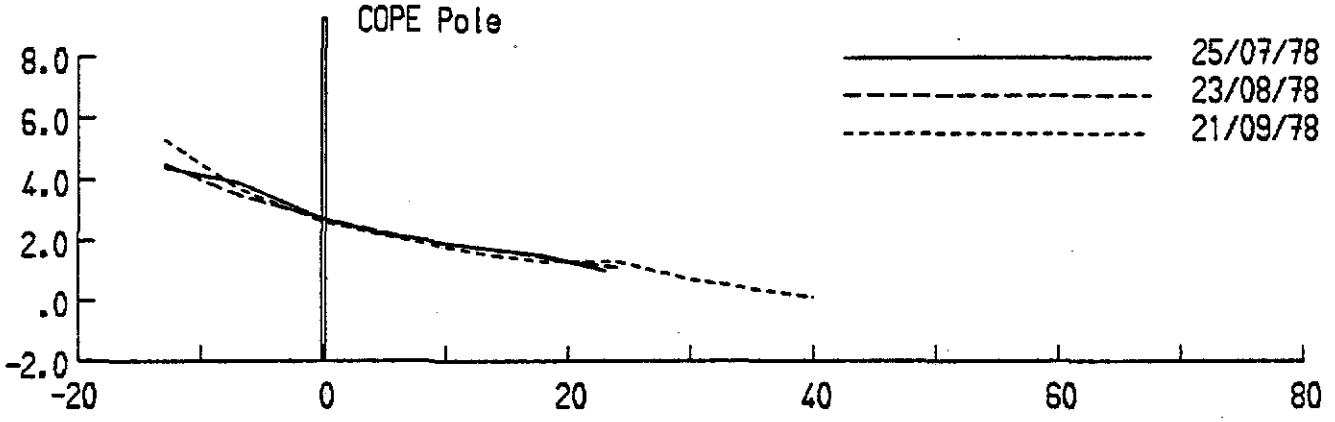
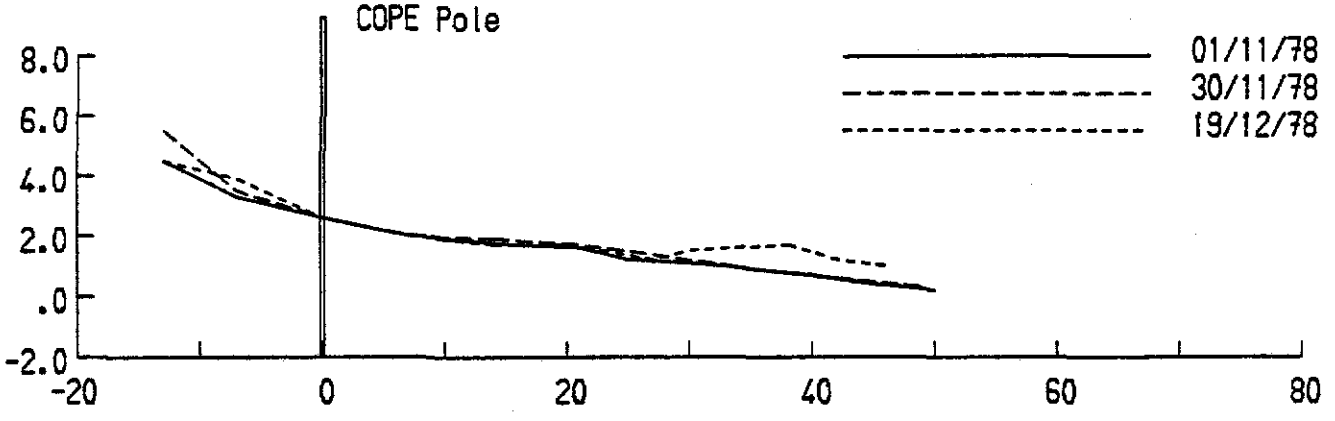
Kings Beach

**Figure 54**

C 24.1




Level Datum is -0.2 m A.H.D. Distances and Levels are measured in Metres

Beach Protection Authority

# MONTHLY BEACH PROFILES

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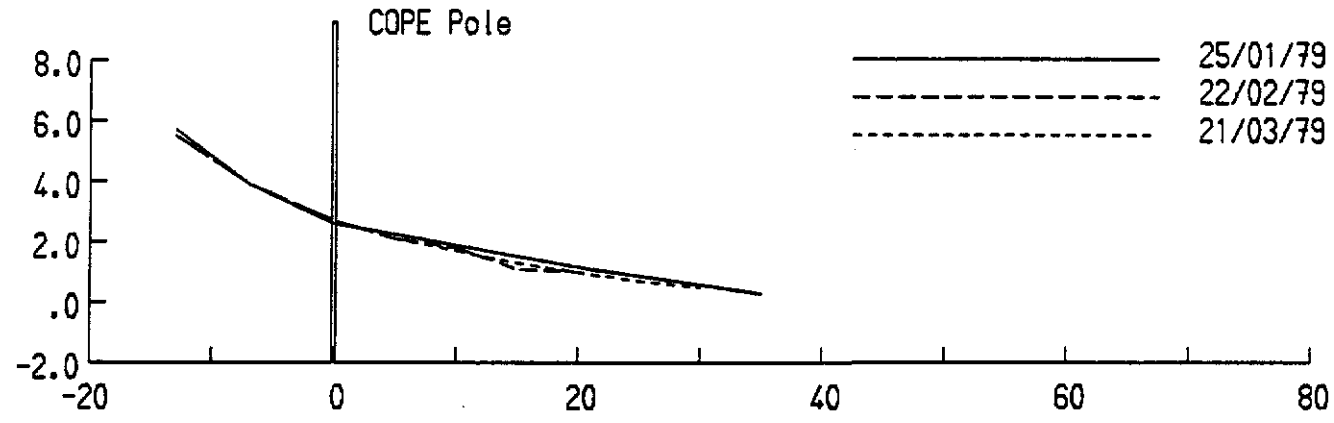
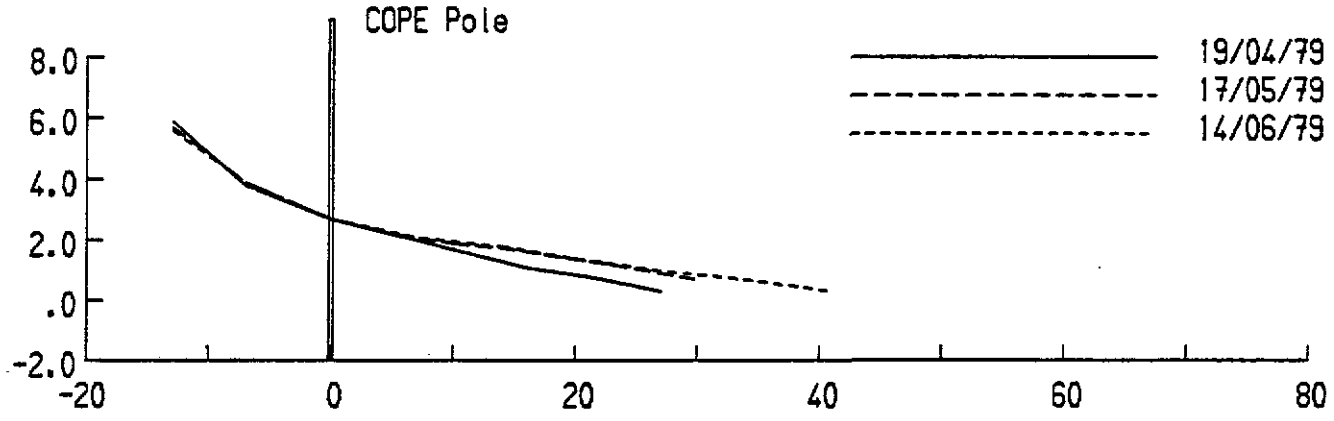
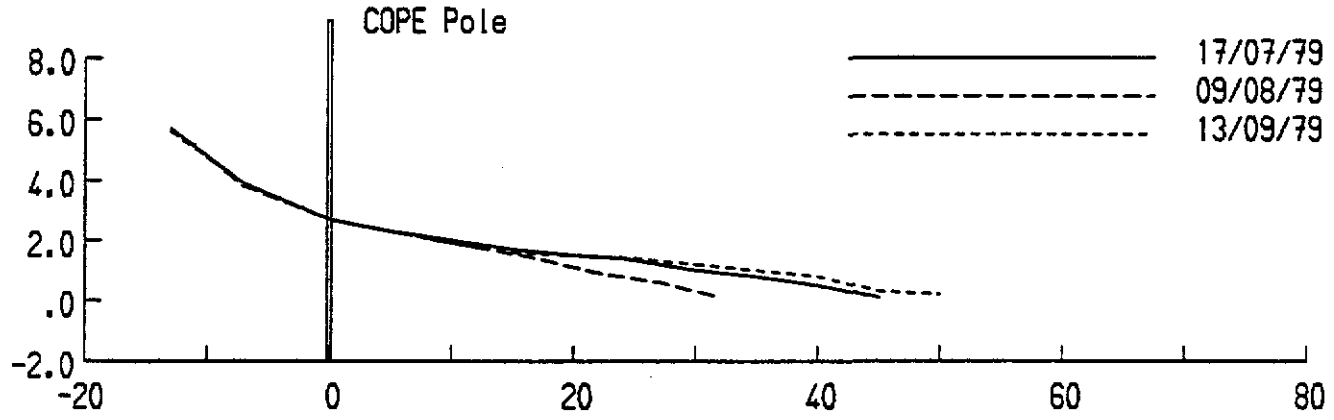
Kings Beach

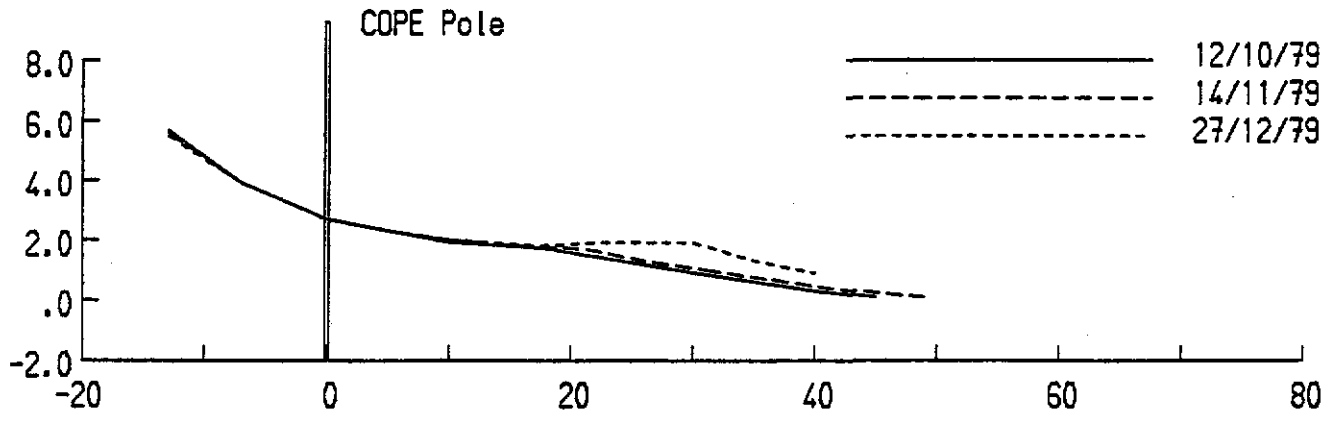
**Figure 55**

C 24.1




Level Datum is -0.2 m A.H.D. Distances and Levels are measured in Metres

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# MONTHLY BEACH PROFILES

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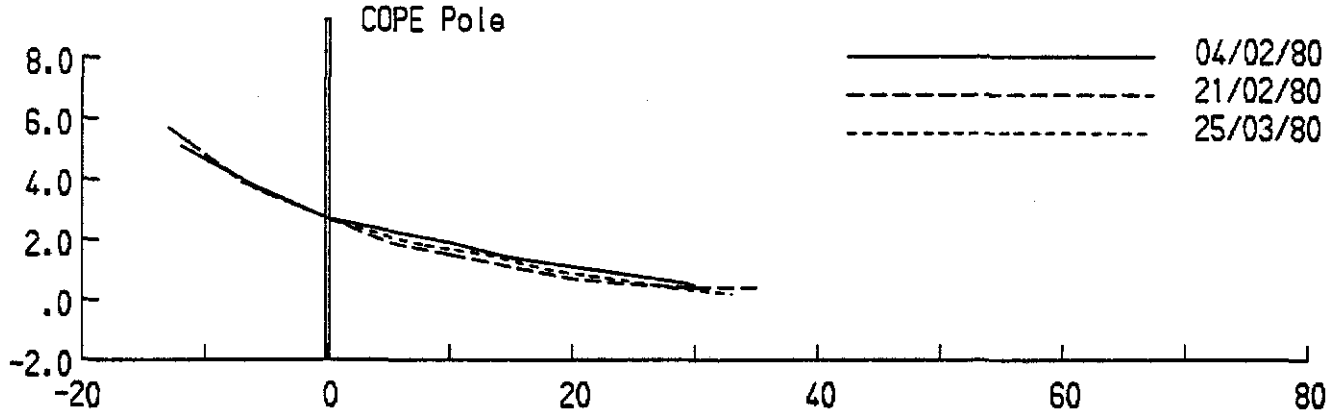
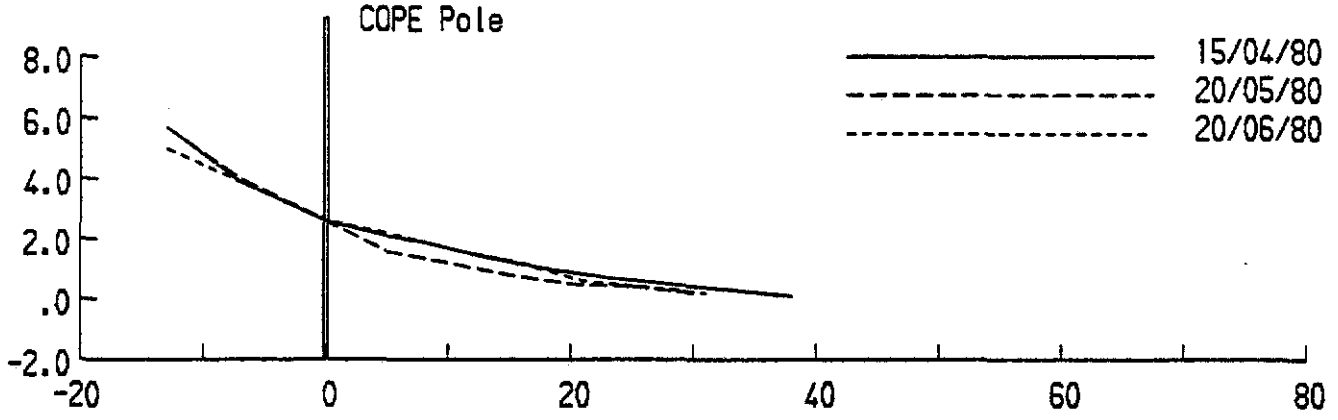
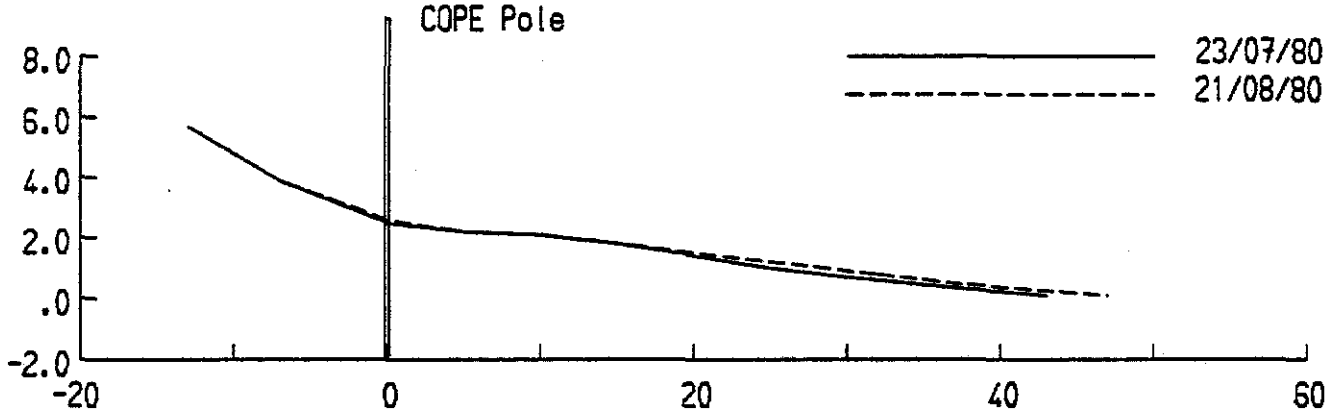
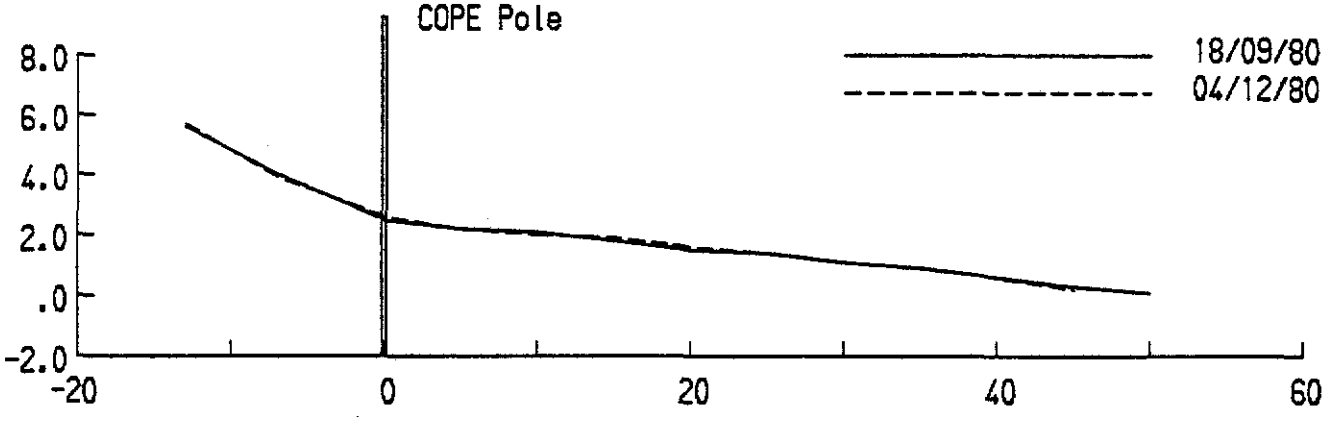
**Figure 56**

C 24.1




Level Datum is -0.2 m A.H.D. Distances and Levels are measured in Metres

Beach Protection Authority

# MONTHLY BEACH PROFILES

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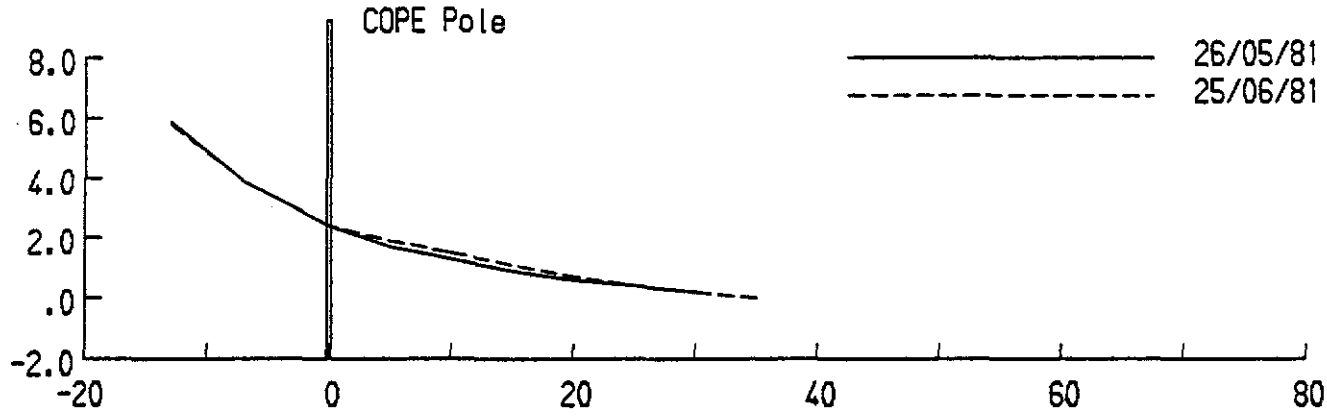
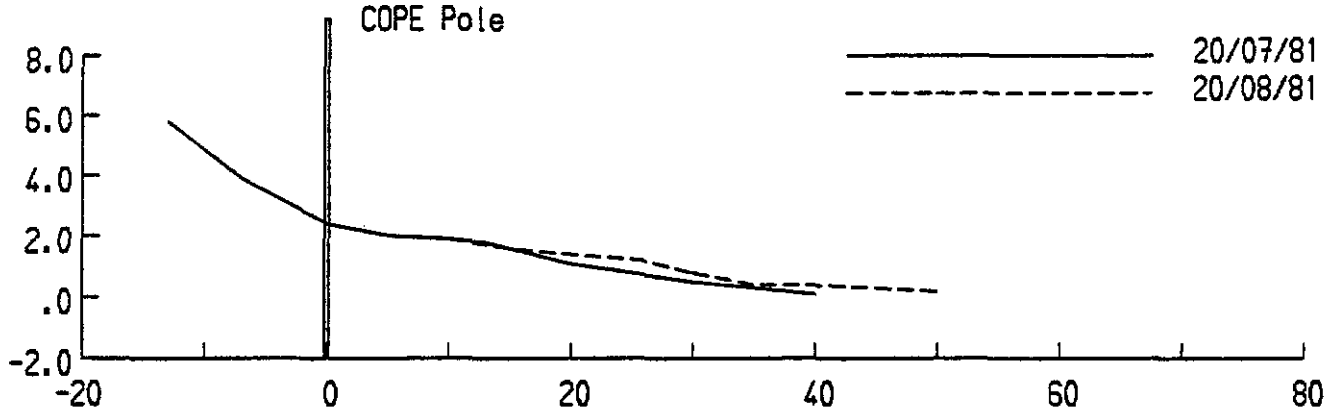
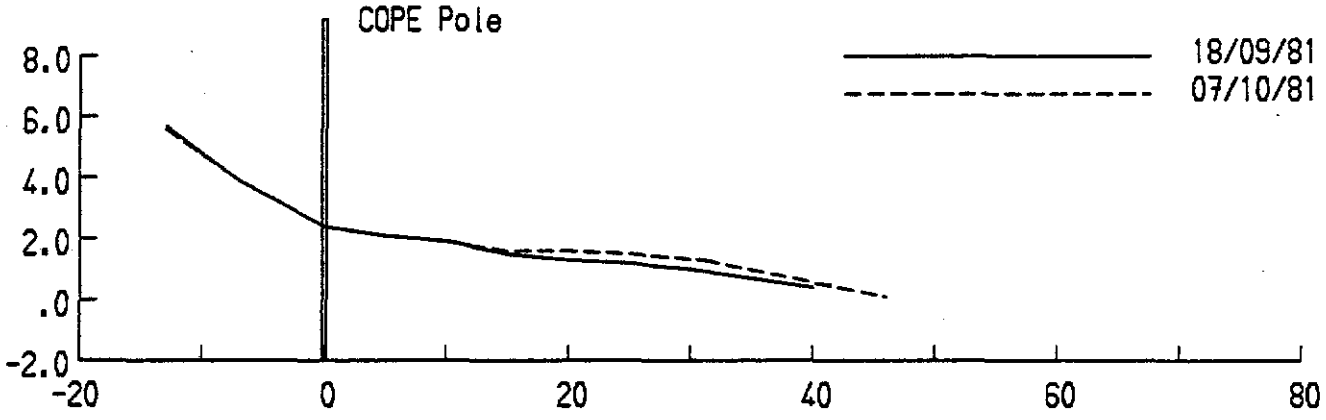
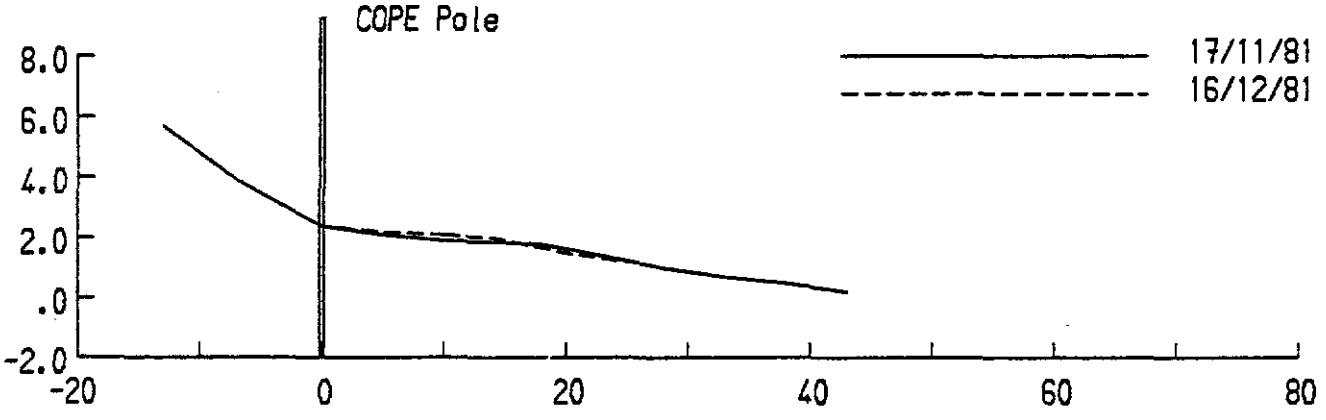
**Figure 57**

C 24.1




Level Datum is -0.2 m A.H.D. Distances and Levels are measured in Metres

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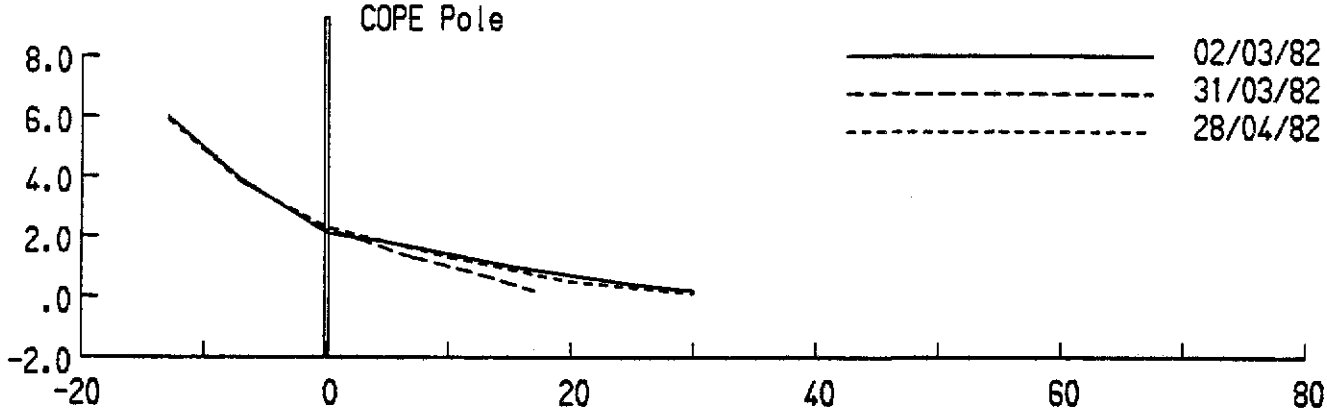
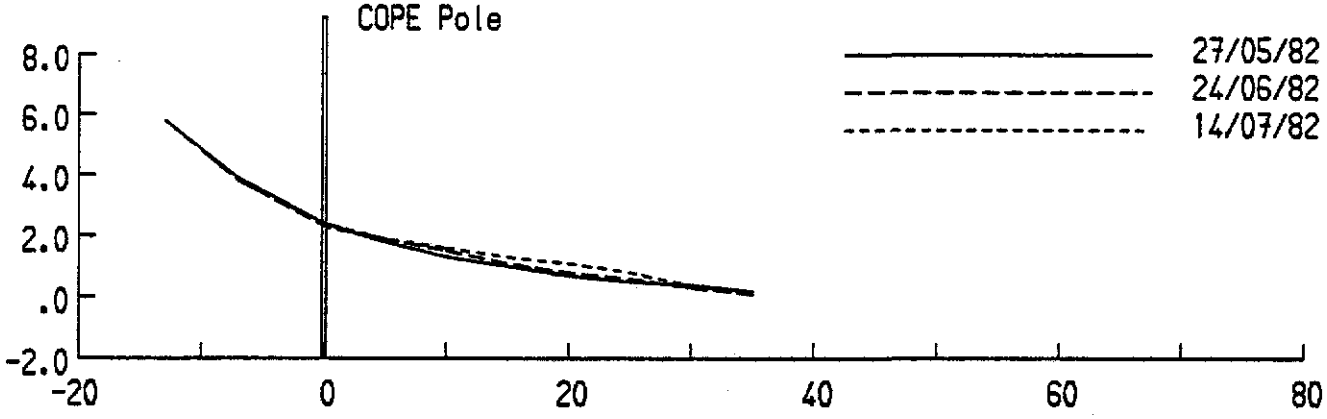
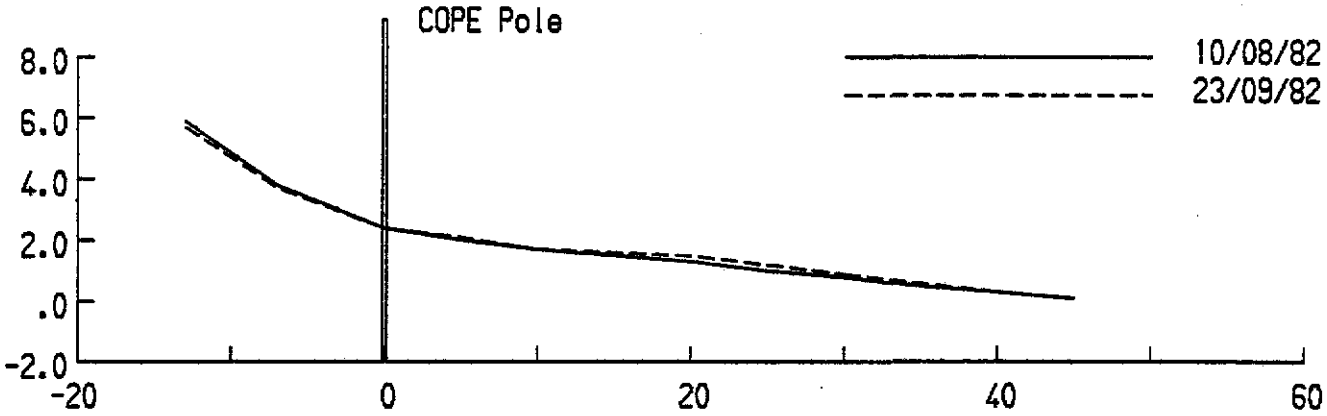
# MONTHLY BEACH PROFILES

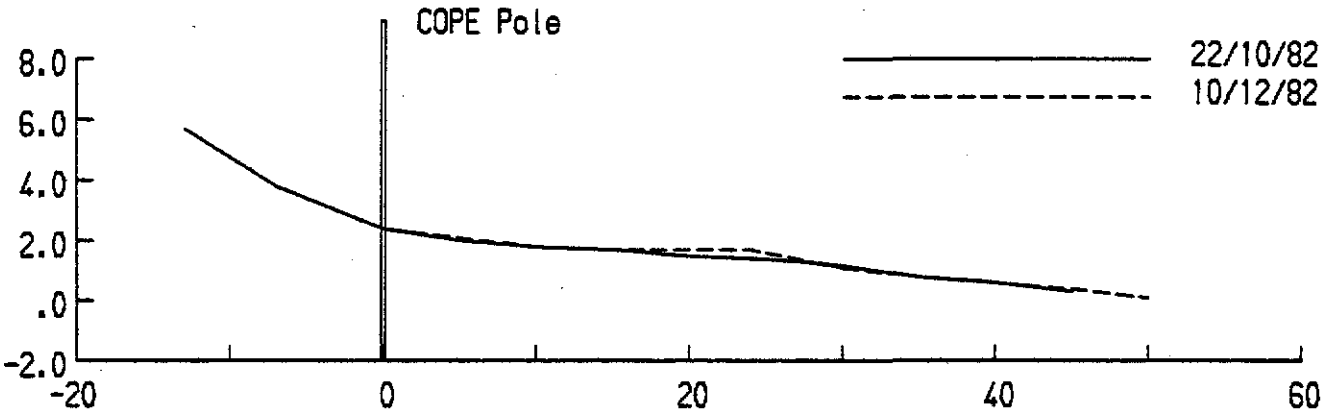
**Figure 58**

C 24.1




Level Datum is -0.2 m A.H.D. Distances and Levels are measured in Metres

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# MONTHLY BEACH PROFILES

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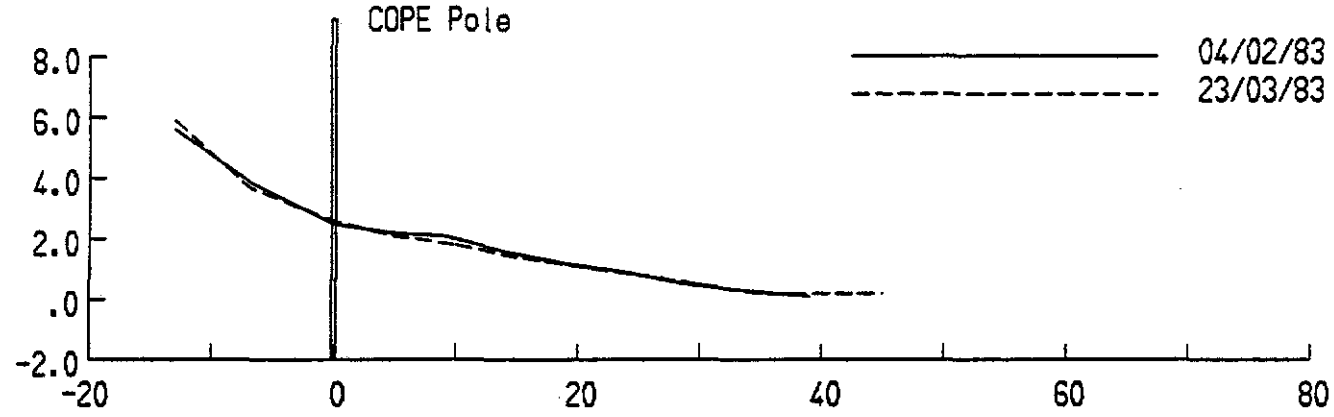
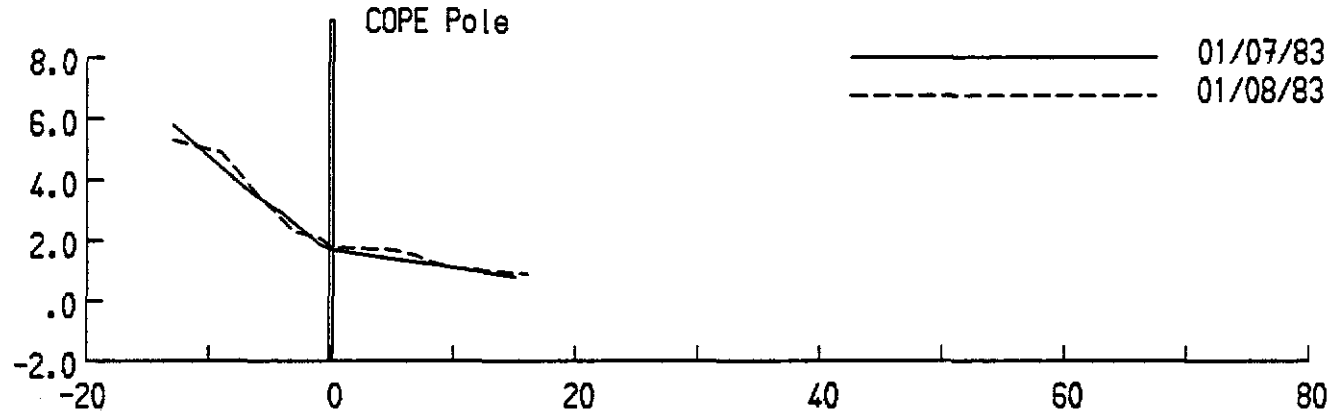
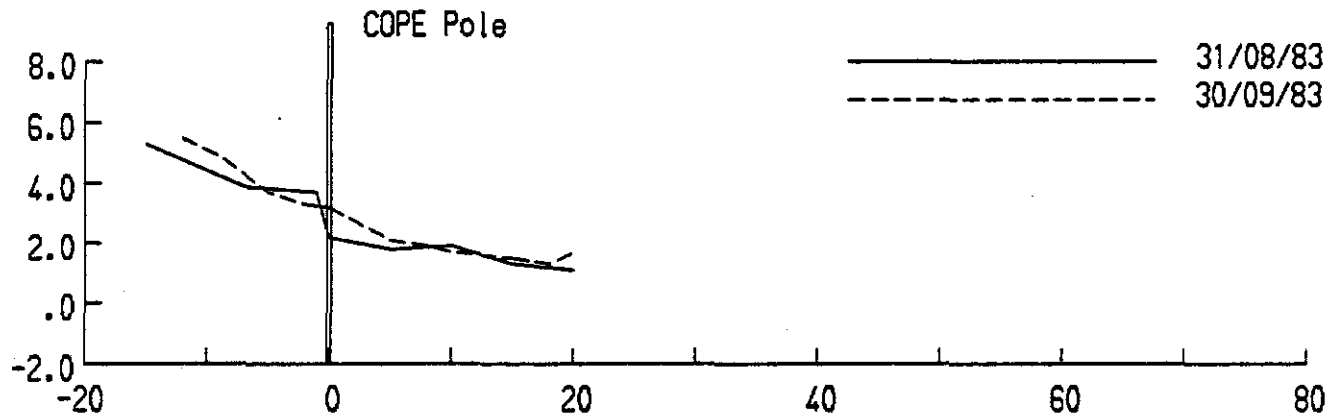
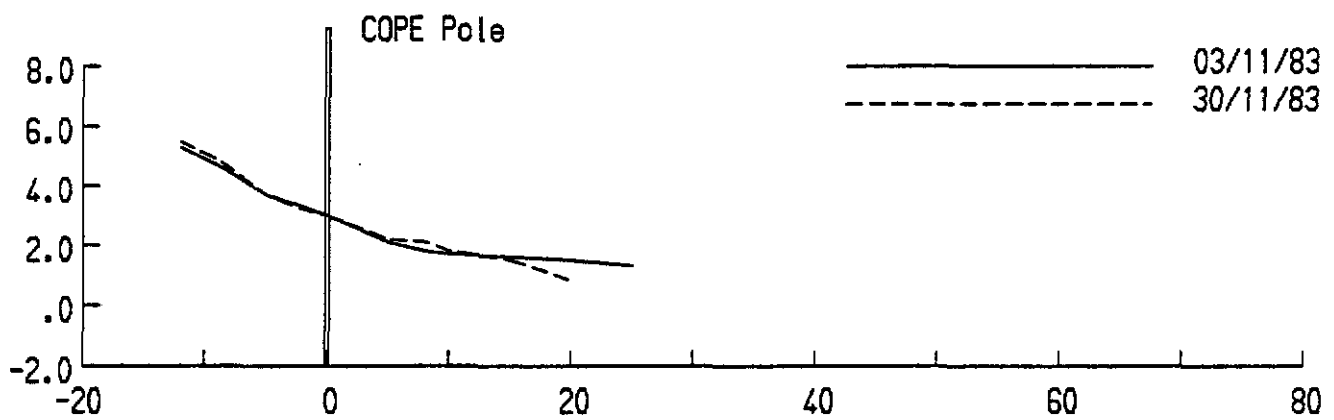
**Figure 59**

C 24.1




Level Datum is -0.2 m A.H.D. Distances and Levels are measured in Metres

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# MONTHLY BEACH PROFILES

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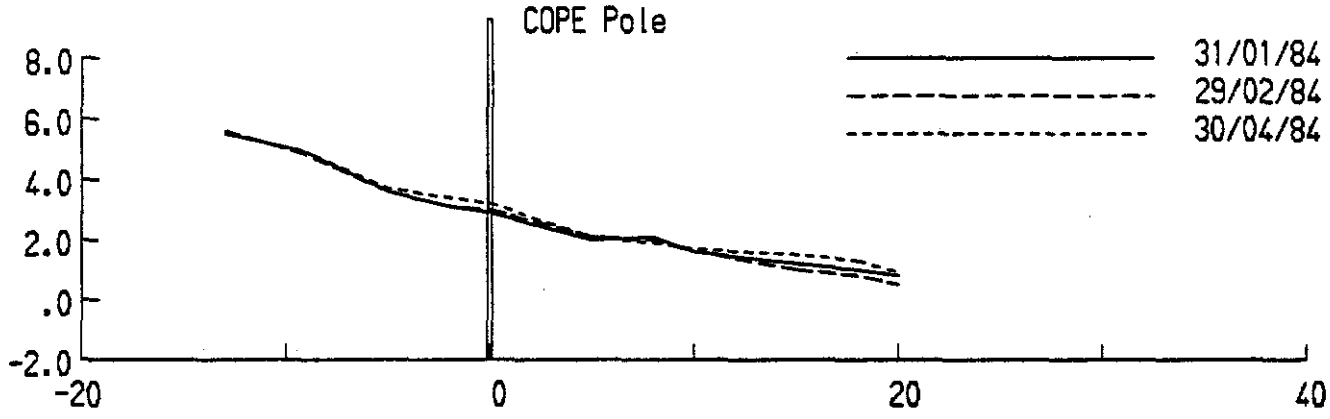
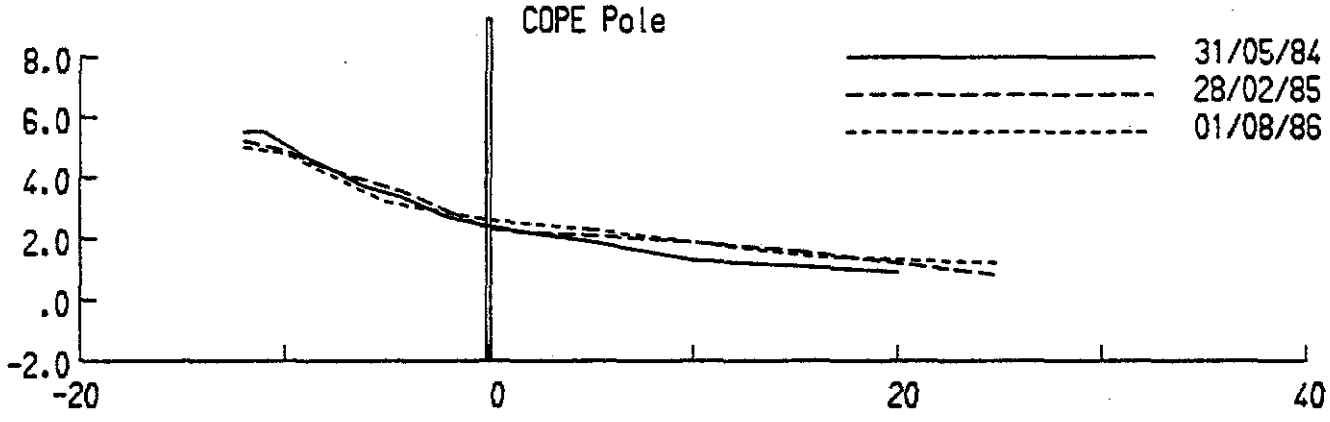
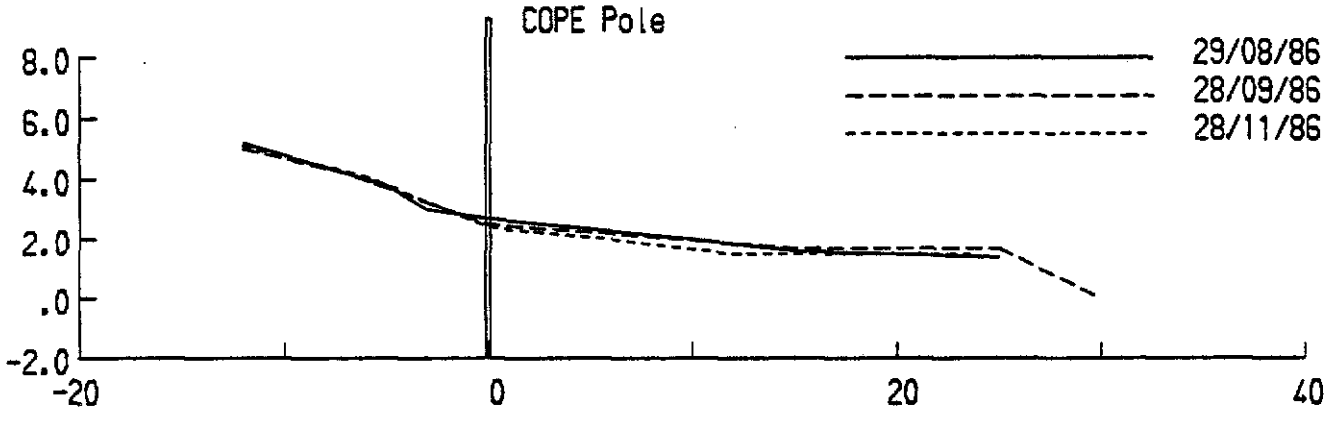
**Figure 60**

C 24.1




Level Datum is -0.2 m A.H.D  Distances and Levels are measured in Metres

Beach Protection Authority

# MONTHLY BEACH PROFILES

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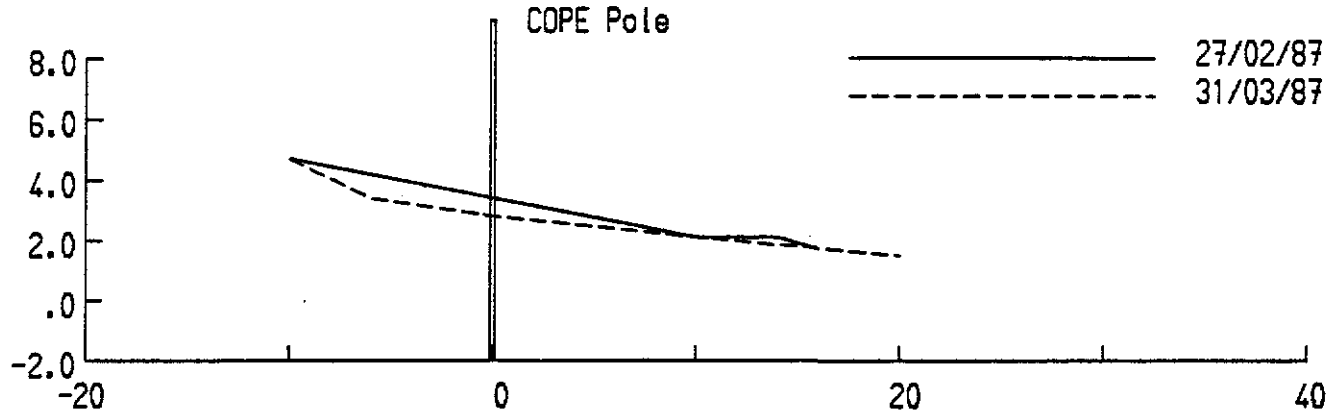
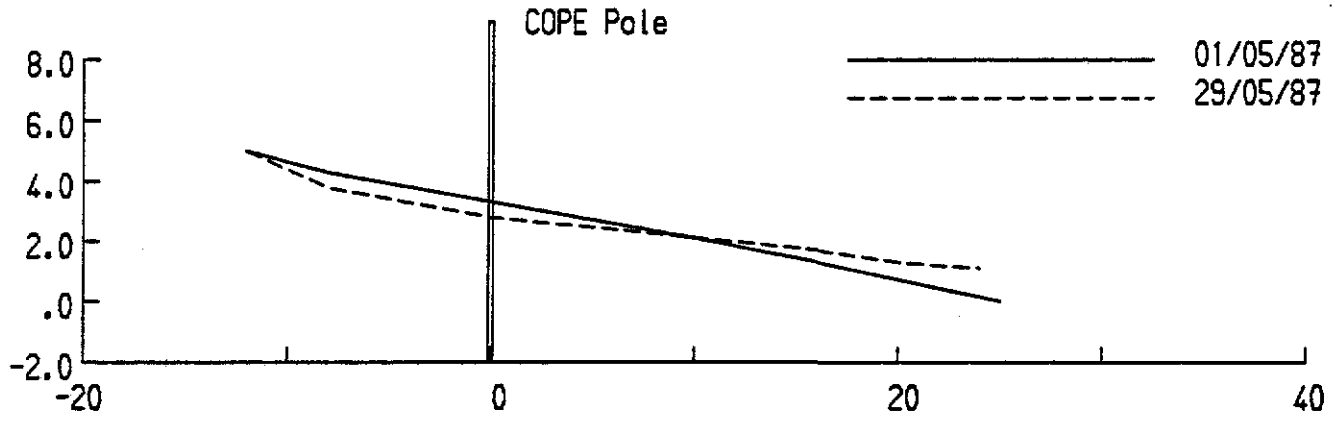
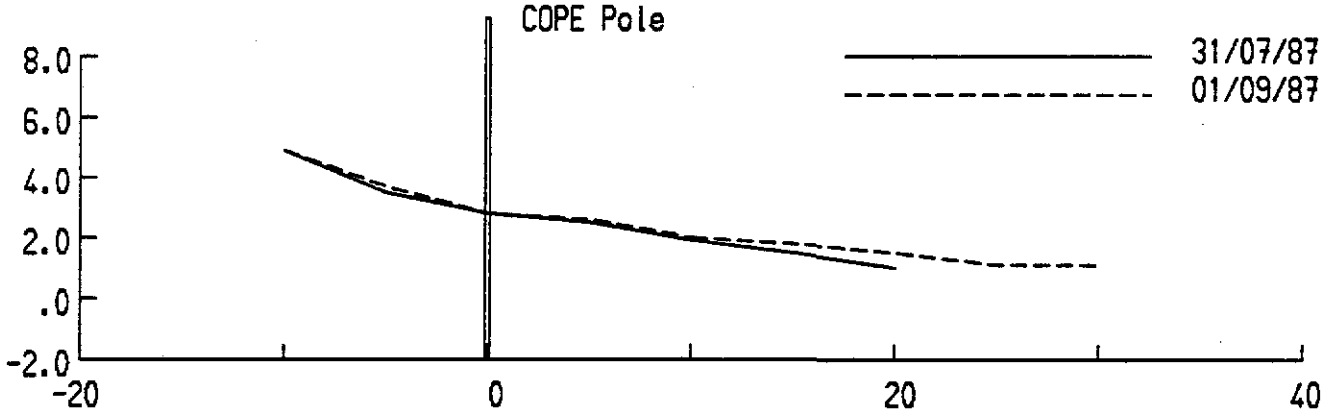
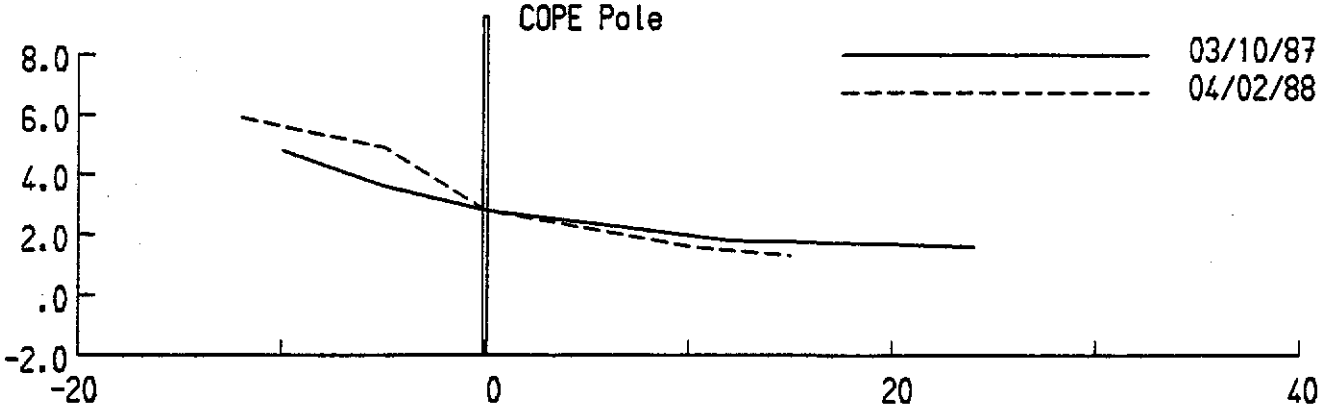
**Figure 61**

C 24.1




Level Datum is -0.2 m A.H.D  Distances and Levels are measured in Metres

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**Figure 62**

C 24.1