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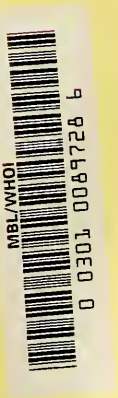
LITTORAL ENVIRONMENT OBSERVATION PROGRAM IN CALIFORNIA

Preliminary Report
February - December 1968

MISCELLANEOUS PAPER NO. 2 - 70

U. S. ARMY, CORPS OF ENGINEERS
COASTAL ENGINEERING
RESEARCH CENTER



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by

Andre Szuwalski

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ABSTRACT

This report describes the Littoral Environment Observation (LEO) Program and assembles in one paper the data collected under the program from February through December 1968. LEO is a cooperative effort of the State of California and the Corps of Engineers to collect information which will increase understanding of the littoral processes and physical characteristics of the California Shore.

The littoral variables collected under the LEO program include the following beach characteristics: foreshore slope, width and elevation of berm, presence of cusps and samples of the sediments. The beach material is analyzed for mean and median diameter, standard deviation, skewness, and kurtosis. State of the sea variables include tide level, wave height, wave period, wave direction, type of breaker, direction and velocity of littoral currents, presence of rip currents, and water temperature. Wind velocity and direction are recorded, and panoramic photographs are obtained.

The objective is to establish a bank of repetitive, systematic measurements of meteorological and oceanographic forces affecting the shoreline and the response of the shore to these forces. The data collected are being used as a base to analyze physical characteristics of the shoreline and the littoral processes affecting it.

FOREWORD

This report was prepared by Andre Szuwalski, Project Engineer, Evaluation Branch, under the general supervision of George M. Watts, Chief, Engineering Development Division, and Dennis W. Berg, Chief, Evaluation Branch.

At the time of publication, the Director of the Coastal Engineering Research Center was Lieutenant Colonel Edward M. Willis; the Technical Director was Joseph M. Caldwell.

NOTE: Comments on this publication are invited. Discussion will be published in the next issue of the CERC Bulletin.

This report is published under authority of Public Law 166, 79th Congress, approved July 31, 1945, as supplemented by Public Law 172, 88th Congress, approved November 7, 1963.

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Section I. INTRODUCTION

The demand for recreational and commercial facilities along the ocean shores of the United States has increased tremendously. This increase has intensified problems in the shore area.

Coastal engineers and scientists in their efforts to solve these problems have a great need for information about what is happening along a shore segment. Here the land is under constant attack by the forces of nature. Wind, waves, currents and tides are actively reshaping the coastlines, attempting to reach an equilibrium in a zone where change is generally the rule. Many buildings, beaches, roads, and shore-protection structures have failed because the designers of structures had insufficient data concerning the natural forces involved.

Even now when the need for such information is generally recognized, the coastal engineer is handicapped because such information is rarely available. The collection of the required littoral information at one site requires a long period of time.

What is required is a bank of data concerning the littoral environment. Such data would help engineers design and site shore facilities. The data would also be of use to scientists in their continuing study of the mechanics of littoral processes.

The Littoral Environment Observation Program described in this report makes possible the collection of many littoral variables that can be collected inexpensively and quickly with simple instruments.

Section II. PROGRAM

1. History

In late 1966 the State of California expressed to the U. S. Army Corps of Engineers an interest in initiating a cooperative program of data collection relating to littoral variables and the resulting changes in beach configuration. The Corps of Engineers was requested to cooperate in the program by accepting the responsibility of custody, cataloging, and eventual analysis of the data collected. The Coastal Engineering Research Center (CERC), the primary representative of the Corps in this field, accepted the proposal, provided that the data would be obtained and furnished on a regular and systematic basis by the State of California.

After a series of meetings between representatives of all interested parties, a pilot study at New Brighton State Beach, California, was undertaken in the fall of 1967. The purpose of this study was to evaluate

instrumentation, data recording forms, and procedures which would be used in the data collection program.

Based on the results of data collected at New Brighton State Beach, variables for observation were selected, recording forms were designed, instrumentation for measuring data was selected and a Memorandum of Understanding between the State of California and the Corps of Engineers was consummated (Appendix A). The memorandum defines the objectives and general guidelines for the data collection study and responsibilities of the various offices concerned in carrying out the assorted phases of the study.

2. Objective of the Program

The objective of the Littoral Environment Observation (LEO) program is to establish a reservoir of repetitive systematic observations of the meteorological and oceanographic forces which affect the shoreline and the response of the shoreline to these forces.

3. Responsibilities of the Participating Agencies

This project is a cooperative effort by the State of California and the U. S. Army Corps of Engineers. The State, acting through the Department of Water Resources, Division of Beaches and Parks, provides the necessary manpower for the collection of data.

CERC, the primary representative of the Corps in this program, is responsible for the custody of the data, translation of the data to a format usable in computer techniques, analysis and custody of the sand samples collected, and cataloging and custody of the photographs taken. CERC also is responsible for providing periodic output of the data recorded in a form convenient for examination and analysis. The South Pacific Division and the Los Angeles and San Francisco Engineer District offices act as technical liaison with CERC, the State of California and local park employees at each observation site.

4. Littoral Variables Observed and Recorded

Based on results of the test at New Brighton State Beach, the littoral variables selected for observation include:

a. Surf Observations

The surf observations include visual estimates of the wave height and period, the direction from which the waves are coming, and the type of breaking wave.

b. Wind Observations

The wind observations include the recording of the wind speed and the observed direction from which the wind is coming.

c. Littoral Current Observations

The littoral transport observations include measurement of littoral current speed, and determination of the direction the current is going.

d. Beach Observations

The beach observations include measurements of the berm-crest elevation above a reference datum, the berm-crest distance from the known reference point, and the slope of the foreshore.

e. Tide Level

If known, the relative state of the tide is recorded.

f. Water Temperature

Water temperatures are recorded at the discretion of the observer.

g. Rip Currents

The presence of rip currents and the spacing of these currents are recorded.

h. Beach Cusps

The presence and spacing of beach cusps are recorded.

i. Photographs, Sand Samples and Comments

In addition to the above, photographs are made of the shoreline at each particular site, and sand samples taken from the foreshore slope of the beach. Remarks or comments by the observer regarding unusual conditions of the beach are also recorded.

Surf and wind are observed twice a day; littoral currents, beach dimensions, rip currents, beach cusps and water temperature are observed once a day; photographs and sand samples are taken once a month.

5. Recording Form

At the initiation of planning and coordination of this program, it was evident that the volume of data would soon become unmanageable unless it could be recorded in a standard manner capable of speedy and convenient handling. This led to the design of a specialized form employing optical scanning techniques which facilitate automatic processing of data by a computer.

LITTORAL ENVIRONMENT OBSERVATIONS

COASTAL ENGINEERING RESEARCH CENTER
5201 Little Falls Road N.W., Washington, D.C. 20016

STATION IDENTIFICATION

State or Territory

Beach or Park

Name of beach or park

DATE — Year: 69 70 71 Month: Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Day: 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

TIME — Hour: 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23

Nearest quarter hour: 00 15 30 45

1. SURF OBSERVATIONS: These observations are to be made twice (2) daily, once in the morning and once in the afternoon.

a. Wave Period. Give the time in seconds for eleven breaker crests to pass a point. Eleven crests will include ten complete breakers (crests plus troughs). Crest 1 is zero time, crest 11 is cut time. 0 1 2 3 4 (100s) 5 6 7 8 9

0 1 2 3 4 (10s) 5 6 7 8 9

0 1 2 3 4 (1s) 5 6 7 8 9

b. Wave Height. Give the average wave height from crest to trough in feet for the highest third of the observed breakers. If less than one half (1/2) foot, record "0". 0 1 2 3 4 (10s) 5 6 7 8 9

0 1 2 3 4 (1s) 5 6 7 8 9

c. Wave Direction. Note the direction from which the waves are coming. See instructions for illustration. Calm N NE E SE S SW W NW

d. Type of Breaking Wave. See instructions for illustration of types. Spilling Plunging Surging

2. WIND OBSERVATIONS: These observations are to be made twice (2) daily; at the same time that the surf observations are made.

a. Wind Velocity. To be measured to the nearest mile per hour (mph). 0 1 2 3 4 (10s) 5 6 7 8 9

0 1 2 3 4 (1s) 5 6 7 8 9

b. Wind Direction. Note the direction from which the wind is coming. Onshore Offshore

Calm N NE E SE S SW W NW

3. BEACH OBSERVATIONS. The beach measurements are to be once (1) a day, preferably at the same time each day, between 1300 and 1900.

a. Measure the elevation of the most seaward Beach Berm crest, above or below a reference point to the nearest tenth of a foot. 0 1 2 3 4 (10s) 5 6 7 8 9

0 1 2 3 4 (1s) 5 6 7 8 9

Plus Minus 0 1 2 3 4 (0.1s) 5 6 7 8 9

b. Measure the distance of the most seaward Beach Berm crest from a reference point to the nearest foot. 0 1 2 3 4 (100s) 5 6 7 8 9

0 1 2 3 4 (10s) 5 6 7 8 9

Plus Minus 0 1 2 3 4 (1s) 5 6 7 8 9

c. Angle of the Foreshore Slope, measured in the area of the wave uprush, to the nearest degree. See instructions for illustration. 0 1 2 3 4 (10s) 5 6 7 8 9

0 1 2 3 4 (1s) 5 6 7 8 9

4. LITTORAL CURRENT OBSERVATIONS: To be made once (1) a day, preferably at the same time each day, between 0700 and 1200.

a. Current Velocity. Measure in feet the distance that the dye patch is observed to move during a one (1) minute period. 0 1 2 3 4 (100s) 5 6 7 8 9

0 1 2 3 4 (10s) 5 6 7 8 9

0 1 2 3 4 (1s) 5 6 7 8 9

b. Current Direction. Observe direction in which current is moving toward. Calm N NE E SE S SW W NW

5. TIDE LEVEL. If known, indicate the relative state of the tide

Rising Falling Low to 1/4 to 1/2 to 3/4 to High

6. ARE RIP CURRENTS PRESENT? (See inst. for illustration.)
Yes No If yes, indicate spacing in feet _____

7. ARE BEACH CUSPS PRESENT? (See inst. for illustration)
Yes No If yes, indicate spacing in feet _____

8. WERE PHOTOGRAPHS TAKEN? Yes No

9. WAS SAND SAMPLE OBTAINED? Yes No

10. WATER TEMPERATURE To the nearest degree, if available. 0 1 2 3 4 (10s) 5 6 7 8 9

0 1 2 3 4 (1s) 5 6 7 8 9

REMARKS. Yes No If "yes", use reverse side of form as necessary.

CERC Form No. 32 (16 Oct 67)

Observer's Signature

MAKE ALL MARKS WITH A NUMBER 2 BLACK LEAD PENCIL — ERASE COMPLETELY ALL MARKS YOU WISH TO CHANGE

Figure 1. Littoral Environment Observation Recording Form

The variables observed are recorded on CERC Form No. 32, Littoral Environment Observation (LEO) form (Figure 1). The data sheet is designed for use in the IBM 1231/1232 Optical Mark Page Reader. This equipment reads positional marks made by a No. 2 lead pencil on paper documents. The positional marks are converted into a machine-usable form and the information is then punched into cards. The present design of the LEO data collection form enables all the data recorded on that form to be transferred to one punch card.

Each LEO form contains, in addition to the variables mentioned, a locality code number for each site and the date and time that the LEO data were collected.

The LEO forms are forwarded to CERC on a regular basis. At CERC, each form is visually scanned for omission of the locality code number and date. The forms are then processed through the optical scanning machine which reads the relevant marks on the forms and transfers the information to punch cards. These cards, after a sorting operation to place them in chronological order, are ready for computer analysis.

6. Instrumentation

Each site is supplied with materials and instruments required to collect and record the data.

A Dwyer Wind Meter (Figure 2) is used to measure wind speed. The instrument's simplicity of construction and use ensures compatibility of data between observation sites.

An Abney Topographic Hand Level (Figure 2) is used to measure the beach berm-crest elevation. This is done by using the hand level as a surveying level, and sighting-in on a graduated reference pole which is installed on the backshore of the beach well back of the high water line.

The observer is provided with a 50-foot tape measure to obtain the distance of the most seaward berm from the reference pole.

To measure the slope of the foreshore, the Abney Hand Level is used as an inclinometer.

A supply of fluorescein or Rhodamine-B dye is provided for use in observing and measuring the littoral current.

To document changes in beach configurations, site observers take monthly photographs. Cameras are furnished by the State to most of the sites participating in the LEO program, and CERC supplies black-and-white film.

Plastic bags for collecting sand samples and envelopes for mailing the LEO forms and samples to CERC are also supplied.

Figure 2. Dwyer Wind Meter, Abney Topographic Hand Level, and Tape.

Each observation site is provided with a set of instructions to facilitate filling out the LEO data form. These instructions, illustrated in Figure 3, consist of short, concise statements relative to each variable to be recorded, and the manner in which each observation is to be made.

7. Site Selection

In October 1969 there were 36 sites in the State of California participating in the LEO data collection program. Table I lists the sites and their code numbers in a north to south direction. Thirty-two of these sites are part of the California State Park system. The remaining sites are publically owned property but are not State Parks. Maps of California with the locations of all sites are shown in Figures 4 and 5.

The selection of the sites depended on various factors, including whether the park is operated and staffed on a full-year basis, whether there is need for data on the area to assist in planning, design, construction or maintenance of coastal works, and whether the data would serve to document the effectiveness or ineffectiveness of an existing

LITTORAL ENVIRONMENT OBSERVATIONS

Instructions for filling out CERC form No. 32

CERC form No. 32 has been designed for processing by optical scanning equipment. This equipment automatically "reads" the observation forms and converts the recorded data to punched cards which will then allow analysis of the data by computer methods. It is therefore recommended that a number 2, black, lead pencil be used to mark the forms. When data positions are marked, the mark should be made the full length of the mark positions and should fill at least two-thirds of the space between the top and bottom of the guide lines. The marks should not extend more than 1/16" beyond the ends of the guide lines and in no case should they be extended beyond the margin on the right hand side of the form. Marks beyond the margin will result in erroneous reading of the data form. If an error is made in recording data, erasures should always be made carefully and completely. An incomplete erasure will be read as a mark.

STATION IDENTIFICATION:

Each site in the "Littoral Environment Observation" study has been assigned a numerical code consisting of 5 digits. The first two digits define the state or territory in which the site is located and the remaining 3 digits define the particular beach or park within the state or territory. A space has also been provided to write in the name of the particular beach or park at which the observation is taking place.

DATE:

Indicate in the spaces provided the year, month and day on which an observation is made.

TIME:

Indicate the time to the nearest quarter hour at which the observations are being made. The 24 hour system of recording time has been selected in order to eliminate any confusion between AM and PM. The hour "00" refers to midnight, "07" to 7:00 AM, "13" to 1:00 PM, etc.

SURF OBSERVATIONS:

a. Wave Period - Record the time in seconds for eleven (11) wave "crests" to pass some stationary point. Eleven "crests" will include ten complete waves (crests and troughs). The first (1) "crest" selected for observation is recorded as time zero and the eleventh (11) "crest" will be the stop or cut time. Record this time in seconds in the spaces provided.

b. Wave Height - This observation is based solely on the judgement of the observer. Natural or manmade features on the shoreline or in the surf zone whose dimensions are known may aid in judging the height of a wave. Otherwise the observer's best estimate will be sufficient. Record the wave height to the nearest foot.

c. Wave Direction - To indicate the direction of the approaching waves the observer must know the approximate orientation of the beach with respect to north. The observer can then determine the direction "from which" the waves are approaching the beach.

d. Type of Breaking Wave

Spilling - Spilling occurs when the wave crests becomes unstable at the top and the crest flows down the front face of the wave producing an irregular, foamy water surface. (see figure 1 on reverse side)

Plunging - Plunging occurs when the wave crest curls over the front face of the wave and falls into the base of the wave producing a high splash and much foam. (see figure 2 on reverse side)

Surging - Surging occurs when the wave crests remains unbroken while the base of the front face of the wave advances up the beach. (see figure 3 on reverse side)

WIND OBSERVATIONS:

a. Wind Velocity - A wind meter is provided to each observer and it is recommended that the instructions provided with the meter be followed to obtain wind velocity measurements.

b. Wind Direction - After the approximate orientation of the beach with respect to north has been defined the observer can determine the direction "from which" the wind is coming.

BEACH OBSERVATIONS:

a. Elevation of most seaward beach berm crest. To obtain this measurement a graduated reference pole has been installed on the beach and the observer has been provided with a hand level. The hand level will be used as a surveying level therefore it is suggested that the observer provide himself with a vertical support such as a 2 by 4 or a pipe to rest the instrument on. This support must be of a known length, say 4 or 5 feet. After locating the position of the most seaward beach berm crest the observer standing on the berm crest and using his level will take a reading of the graduated reference pole. This reading minus the known length of the level support shall be indicated on the form in the spaces provided. Space is also provided on the form to indicate whether the elevation is plus or minus.

b. Distance of most seaward beach berm crest from reference pole. The observer will measure the distance from the installed graduated reference pole to where he takes his level reading.

c. Angle of the foreshore slope. For this measurement it is suggested that the observer have with him a clip board. Lay the clip board on the foreshore slope and place the hand level on the board with the long axis perpendicular to the shoreline. Next, loosen the arc set screw, center the bubble on the crosshair in the bubble tube, tighten the arc set screw and note the reading on the DEGREE scale.

LITTORAL CURRENT OBSERVATIONS:

a. Current Velocity. For this measurement the observer has been provided with dye. The dye should be thrown into or just forward of the breaker zone. The observer will note the position of the dye at entry into the breaker zone and the position of the dye after an elapsed time of one (1) minute. Measure the distance between these two positions and enter the value in the spaces provided on the form.

b. Current direction. Having already established the approximate orientation of the beach the observer can readily determine the direction in which the dye or current is moving.

TIDE LEVEL:

The times of low and high tide for a particular area can be obtained from local newspapers or from tide tables published by various agencies. The relative state of the tide at the time of observation can readily be deducted from this information.

ARE RIP CURRENTS PRESENT?

Rip currents are defined as seaward moving channels of water which return the water that has been piled up along the shore by incoming waves. Rip currents are fed by feeder currents, water moving along the shore. (see figure at right). Two currents join and extend out in what is known as the "neck", where the water rushes through the breaker zone in a narrow lane. Beyond the breaker zone the current spreads out in what is called the "head" and dissipates. If such rip currents are present indicate so and if multiple currents exist record the distance between such rip currents.

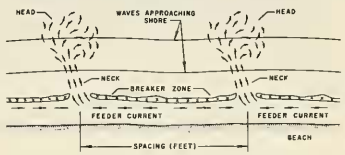


Figure 3a. Front of Instruction Sheet

ARE BEACH CUSPS PRESENT?

Cusps are semicircular or crescent shaped cutouts in the beach face (see figure 4 below). If such shapes are observed on the beach face, the distance between the "horns" of the cusps, as shown in figure 4 should be recorded in the space provided.

WERE PHOTOGRAPHS TAKEN?

Photographs are to be taken once a month, preferably early each month and at low tide. General panoramic views of the beach in the up and down coast direction are desired. Photographs each month should be taken from the same location and viewing the same area with a recognizable landmark in the background if possible. At least 3 photos should be taken each month, however the observer is not limited to this number and photos of unusual features on the beach are desirable. It is suggested that the 3 photos taken be as follows:

1. Overall view of the beach looking toward the ocean with the reference pole in the background.
2. View upcoast from the reference pole. (Reference pole may be in the scene).
3. View downcoast from the reference pole. (Reference pole may be in the scene).

It is requested that each observer note the following information on the back of the photos:

1. Name of park or beach.
2. Date and time when photograph was taken.
3. Direction of scene (general, up/down coast).
4. Remarks, if any.

WAS SAND SAMPLE OBTAINED?

Sand samples are to be taken once a month from the same general location on the beach. Special plastic bags are provided to collect the sand in. The bags should be filled full and the sample should be obtained from the foreshore slope of the beach, preferably in the zone wetted by the wave up-rush (see for example figure 3 below). All samples obtained should be identified with the following information: a) name of park or beach, b) date and time sample was taken.

WATER TEMPERATURE:

If water temperature is presently being obtained it is desired that this information be recorded.

REMARKS:

Give any information which you may think may be helpful in this study. Reasons as to why some observations could not be made would also be appreciated.

FIGURE 1 SPILLING WAVE

FIGURE 2. PLUNGING WAVE

FIGURE 3 SURGING WAVE

FIGURE 4 CUSPS

Figure 3b. Back of Instruction Sheet

project in the area. The sites selected were also chosen to document environmental conditions and changes on a variety of shore orientations and beach configurations. The shorelines at the observation sites vary from pocket beaches in the rugged, rocky headlands of Northern California to the long and uninterrupted beaches of Southern California.

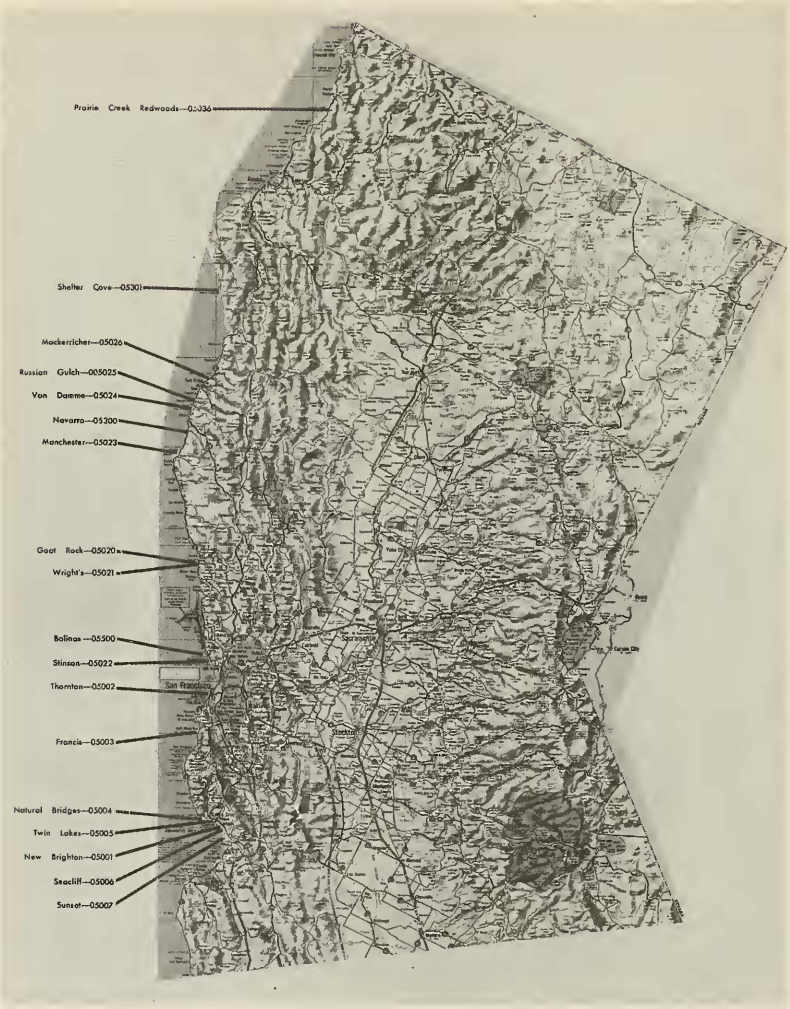
At the sites owned and operated by the State of California, Park Rangers, the professional personnel who staff these sites, make the daily observations in addition to their regular duties. At the other sites, private citizens donate a part of their time to make the observations.

TABLE I

Littoral Environment Observation Sites in California

Code No.	Name	Code No.	Name
05036	Prairie Creek Redwoods	05009	San Simeon
05301	Shelter Cove (1) (2)	05012	Pismo
05026	Mackerricher	05013	El Capitan
05025	Russian Gulch	05014	Carpinteria
05024	Van Damme	05015	San Buenaventura
05300	Navarro (1) (2)	05016	McGrath
05023	Manchester	05019	Point Mugu
05020	Goat Rock	05017	Leo Carrillo
05021	Wright's	05018	Bolsa Chica
05500	Bolinas	05027	Huntington
05022	Stinson	05700	Newport (1)
05002	Thornton	05028	Doheny
05003	Francis	05029	San Clemente
05004	Natural Bridges	05030	Carlsbad
05005	Twin Lakes	05031	South Carlsbad
05001	New Brighton	05033	San Elijo
05006	Seacliff	05034	Torrey Pines
05007	Sunset	05035	Silver Strand

(1) These sites are not part of the California State Park System.
(2) These sites began collecting data in early 1969.



LITTORAL ENVIRONMENT OBSERVATION SITES IN NORTHERN CALIFORNIA

Figure 4. Locations of Observation Sites in Northern California

LITTORAL ENVIRONMENT OBSERVATION SITES IN SOUTHERN CALIFORNIA

Figure 5. Locations of Observation Sites in Southern California

Section III. DATA PROCESSING

1. Meteorological and Oceanographic Variables

a. Tabular Output

As stated, the objective of this report is to make the data available for study in tabular and graphical form. Data printouts of this type are available for all sites participating in this program.

Because of the tremendous volume of data to be collected, forms applicable to optical scanning techniques are used to record the variables. An IBM 1232 Optical Mark Page Reader is used to convert the data on the scanning forms to punched cards. Each card contains, in addition to various meteorological and oceanographic variables, a code number identifying the site or location at which data was collected and the date the data was recorded.

Computers tabulate all the data and generate a monthly printout for each site. Appendix B is an example of the computer printout. This data was collected at Manchester State Beach (identification code No. 05023) for the period April through December 1968. The data is presented as it was recorded on CERC Form 32 without any corrections or editing. The computer printout page has been reduced to fit in this report.

Information concerning the spacing (in feet) of rip currents and beach cusps appears on CERC Form 32 but is not included in the example printout. The presence or absence of these phenomena is recorded by filling in the space provided on the recording form. However, the spacing is not suitable for machine scanning, and the LEO forms must be manually scanned to retrieve this information. CERC Form 32 has space for any remarks the observer thinks pertinent. These remarks must also be manually scanned for retrieval.

b. Graphical Output

A graphic portrayal of the littoral currents, beach characteristics, and wind and wave direction has been developed for each site. The graphical output was entirely drawn and written by computer apparatus on tracing paper. The graphs were reduced to page size for this report. These graphs, as described below, are presented in Appendix C.

The plot at the top of each graph shows the magnitude and direction of the littoral current on a daily basis. The littoral current is defined as "the inshore current moving essentially parallel to the shore, usually generated by waves breaking at an angle to the shoreline".*

* U. S. Army Coastal Engineering Research Center (1966), "Shore Protection Planning and Design", 3rd Edition, Coastal Engineering Research Center Technical Report No. 4, Washington, D. C.

The magnitude and direction of the littoral current is plotted as a vertical line; the length represents current speed in feet per second. The position of this line above or below the center line of the graph designates whether the current was upcoast or downcoast. The diamond symbol represents a calm condition or zero current recorded by the observer. Littoral currents in excess of 4 feet per second are considered erroneous and therefore this current speed has been chosen as a limit in plotting. It is assumed that currents of greater than 4 feet per second generally represent rip currents that may have developed at the time the observer was making measurements. A rip current is defined as a narrow current flowing seaward from the shore. It is the return movement of water piled up on the shore by incoming waves and wind. A rip current consists of three parts: (1) The "feeder currents" flowing parallel to the shore inside the breakers. (2) The "neck" - where the feeder currents converge and flow through the breakers in a narrow band or "rip". (3) The "head" - where the current widens and slackens outside the breaker line.

Below the Littoral Current Graph are plots showing the percent occurrence of wind and wave direction. These are computed and drawn on a monthly basis.

The plots at the bottom of the graphs show seasonal variations of the beach level. Plotted are the daily recorded observations of the elevation of the beach berm, the distance of this berm from the fixed reference pole, and the slope of the foreshore.

When the reference poles were installed on the beaches, the elevations of the poles were arbitrarily chosen and therefore the elevations of the berm as plotted and recorded are in no way related to any standard datum. The plots are presented simply to show the daily activity or inactivity of the beach berm. A monthly average of these beach characteristics was computed, and that average was plotted on the 15th of each month. The symbol $\bar{X}$ represents that monthly average. All variables are plotted as they were recorded on CERC Form 32 without any corrections or editing.

c. Surf Observations

Monthly averages of the wave height and wave period and the percent occurrence of the type of wave were computed for each station. A yearly average was also calculated. These computations are presented in tabular form in Appendix D.

In computing the average wave height and period, wave heights of 20 feet or greater and wave periods of 50 seconds or longer were considered as errors and were not included in the average computations. No other editing of data was done and the figures represent straight averages.

2. Sand Samples

At each site where LEO observations are made, the observer is asked to collect, once a month, a sand sample of about 100 to 150 grams from the wetted zone of the foreshore.

The samples are processed at CERC by a Rapid Sediment Analyzer as described by Duane and Meisburger.* Computer techniques are used in calculating size distributional characteristics of the samples. Characteristics calculated are the cumulative size-frequency curves, median and mean diameters, standard deviation, skewness, and kurtosis.

Cumulative size-frequency curves are presented in Appendix E. These curves were computed and drawn by computer techniques. Each figure contains curves for only those samples collected at the indicated site in 1968. The figures have been reduced to page size for this report. The remaining size characteristics (median and mean diameter, standard deviation, skewness and kurtosis) are summarized in tables in Appendix F.

Presently, this is the only analysis being made of the beach material samples; however, the samples are retained at CERC to permit other types of analyses if desired.

3. Photographs

As part of the LEO program each observer is asked to take three pictures of the beach in the immediate area of the reference pole. The three photos form a panoramic view - upcoast and downcoast, and toward the ocean. The observer is asked to take pictures monthly with supplied film. The photographs record general conditions at each site.

Appendix G contains the photographs taken at sites where a camera was available. Only photographs of the upcoast and downcoast views are included because these pictures show the seasonal variation of the beach more clearly than the overall view toward the ocean.

* Duane, D. B. and Meisburger, E. P. (1969), "Geomorphology and Sediments of the Nearshore Continental Shelf, Miami to Palm Beach, Florida, Coastal Engineering Research Center Technical Memorandum No. 29.

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APPENDIX A

MEMORANDUM OF UNDERSTANDING
BETWEEN THE U. S. ARMY CORPS OF ENGINEERS, SOUTH PACIFIC DIVISION
AND THE STATE OF CALIFORNIA, DEPARTMENT OF WATER RESOURCES
FOR COLLECTION OF DATA AT BEACHES ALONG THE CALIFORNIA COAST

I. General

Early in 1966, the Department of Water Resources suggested to the Department of Parks and Recreation that there was a need to document existing beach conditions, particularly in the northern and central coastal areas. A consideration was whether park rangers and attendants at manned state beaches would be available to make these observations.

In late 1966, representatives of the State of California Division of Beaches and Parks followed up this recommendation and expressed an interest to representatives of the San Francisco District Office of the Corps of Engineers, in initiating a cooperative program of observations along state operated or state affiliated beaches, where park personnel were available, in order to document certain littoral forces and the resulting changes which occur in beach configuration.

This program has definite merit and will provide much needed basic data on waves, currents, and erosion along the California coastline. It is envisioned that the program will be expanded to encompass other than state operated beaches and will utilize the services of cities, counties, and other public districts with a vested shoreline interest.

Therefore, the intention of the memorandum is to define the objective(s) and general guidelines for the proposed study and responsibilities of the various offices concerned in carrying out various phases of the proposed study.

II. Objective of the Study

The objective of this study is to establish a reservoir of repetitive, systematic measurements, by qualified observers, of some of the meteorological and oceanographic forces which affect the shoreline and the response of the shoreline to these forces. It is hoped that analysis of the data will result in meaningful correlations between the various recorded parameters and will lead to a better understanding of the physical characteristics of the California shoreline and the littoral processes occurring along that shoreline.

III. Duration of the Study

In order to provide a statistically significant volume of data, the study would be pursued for a minimum period of three years. At the end of this period, an evaluation of the study, as a whole, will be made by

the various offices concerned and a determination made whether or not continuation of the study is warranted.

IV. Coordination and Procedure

The local or state agency responsible for the beach to be studied shall be the appropriate agency to carry out the operational aspects of the study.

All matters pertaining to the study program which are broad in scope and intent, such as this Memorandum of Understanding, shall be coordinated between the California State Department of Water Resources and the U. S. Army Corps of Engineers, Engineer Division, South Pacific.

The Department will also complete a Memorandum of Understanding with each participating local or state agency.

A detailed procedure for execution of the program will be coordinated between the appropriate participating agency, the Department of Water Resources, the U.S. Army Corps of Engineers, San Francisco and Los Angeles District offices, and the Coastal Engineering Research Center.

Procedures for execution of the program may need periodic adjustment; and in this event, all parties involved will coordinate such changes and establish records thereof so there will be uniformity of understanding.

General procedures for carrying out the program shall be:

A. Sites for Observations/Measurements - Representative(s) from the appropriate U. S. Army Corps of Engineers District Office (and CERC, if deemed necessary) the Department of Water Resources and the appropriate participating agency will confer and select the sites where data will be collected. In selection of sites, consideration will be given to all known factors pertinent to the study. Examples of such factors are: (1) the need for the observational data to assist in the planning, design, construction, operation or maintenance of coastal works in the area in question; (2) correlation of the observational data with existing/planned basic data collection programs; (3) general shore conditions, i.e., a variety of shore exposures, orientation, beach configurations, and so forth, are desired; (4) spacing and number of sites in relation to the maximum number of sites that can be handled in the overall program.

B. Administrative Procedures - Coastal Engineering Research Center will forward to the appropriate participating agency detailed information and/or suggested procedures, forms, photographic film, and to the extent possible, instrumentation for making the field observations or measurements. The participating agency will disseminate the materials with appropriate directives to the field personnel. The procured field data will be transmitted to CERC or other designated office for processing. Approximately every six months CERC will provide the Department of Water Resources and the participating agency with tabulations of the collected data.

V. Observations/Measurements and Frequency

A. Basic Observations - As envisioned, the study will consist of the collection and recording of observations or measurements on various forces concerned with littoral processes and the response of the shoreline to these forces. The basic observations/measurements and frequency desired are:

1) Wave Observations: twice daily; height, period, direction and type of breaking wave.
2) Wind Observations/Measurements: twice daily; velocity and direction.
3) Littoral current observations/measurements: daily; velocity, and direction.
4) Beach measurements: daily; berm width and elevation, and slope of foreshore beach.
5) Photographs: Monthly; general panoramic photographs of the beach in up and downcoast direction.
6) Sand samples: monthly; small samples from the beach foreshore.

B. Optional Observations - In addition to the observations/measurements listed above, there are a number of additional items which may be taken at selected study sites to the extent of available personnel. These include but not limited to:

1) Water temperature: daily.
2) Tide level: twice daily; relative state.
3) Rip currents - as observed.
4) Beach cusps - as observed.

C. Extent of Participation - Participation by the appropriate local or state agency shall be subject to the extent of available personnel and shall not take precedence over other duties of higher priority.

By _____
JOHN A. B. DILLARD, Brigadier General 16 Feb 68
Division Engineer
South Pacific Division
U. S. Army Corps of Engineers

By _____
WILLIAM R. GIANELLI, Director 6 Feb 68
Department of Water Resources
State of California

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APPENDIX B

EXAMPLE PRINTOUT OF LITTORAL ENVIRONMENTAL OBSERVATION VARIABLES COLLECTED DURING 1968 AT MANCHESTER STATE BEACH, CALIFORNIA

LITTORAL ENVIRONMENT OBSERVATIONS (LEO)

MANCHESTER STATE BEACH(05023),CALIFORNIA
APRIL 1968

DAY	TIME	WAVE PERIOD SEC	WAVE HEIGHT FEET	WAVE DIR	WAVE TYPE	WIND SPEED MPH	WIND DIR	LITTORAL CURRENT FT/SEC	LITTORAL CURRENT DIR	BERM ELEV FEET	BERM REACH FEET	SHORE SLOPE DEG	TIDE LEVEL R=RISING F=FALLING		RIP FLOWS	BEACH CUSPS	WATER TEMP DEG F
26	1615	12.0	4	NW	PLUNG	10	NW	******	****	*****	****	**	F	1/4 TO LOW	YES	YES	**
26	1030	11.5	4	NW	PLUNG	15	NW	.45	S	14.9	153	35	R	3/4 TO HIGH	YES	YES	**
27	815	14.4	4	W	PLUNG	6	NW	1.73	S	14.9	153	35	R	1/4 TO 1/2	YES	YES	**
27	1630	11.8	3	NW	PLUNG	4	W	******	****	*****	****	**	F	1/4 TO LOW	YES	YES	**
28	900	13.2	55	W	PLUNG	10	SE	1.00	S	14.9	153	35	R	LOW TO 1/4	YES	YES	**
28	1615	13.2	3	W	PLUNG	12	SW	******	****	*****	****	**	F	1/2 TO 1/4	YES	YES	**
29	915	10.7	3	W	PLUNG	3	SE	.75	S	14.9	150	3	R	LOW TO 1/4	YES	***	**
29	1615	11.3	2	W	PLUNG	7	SW	******	****	*****	****	**	F	3/4 TO 1/2	YES	YES	**
30	815	11.1	3	W	SPILL	20	NW	1.10	S	14.9	153	35	R	LOW TO 1/4	YES	YES	**
30	1630	9.9	30	NW	SPILL	18	NW	******	****	*****	****	**	F	HIGH TO 3/4	YES	YES	**

** OR ?? ITEM WAS LEFT BLANK BY THE OBSERVER
**? THE OBSERVER HAS FILLED IN TWO SPACES FOR THE DATE,THEREFORE THE CORRECT DATE CANNOT BE DETERMINED

LITTORAL ENVIRONMENT OBSERVATIONS (LEO)

MANCHESTER STATE BEACH(05023),CALIFORNIA — MAY — 1968 — MANCHESTER(05023 MAY

DAY	TIME	WAVE PERIOD SEC	WAVE HEIGHT FEET	WAVE DIR	WAVE TYPE	WIND SPEED MPH	WIND DIR	LITTORAL CURRENT FT/SEC	LITTORAL CURRENT DIR	BERM ELEV FEET	BERM REACH FEET	SHORE SLOPE DEG	TIDE LEVEL R=RISING F=FALLING	RIP FLOWS	BEACH CUSPS	WATER TEMP DEG F
2	930	*****	**	****	*****	6	NW	1.52	N	15.0	152	19	F 1/4 TO LOW	YES	YES	**
3	1615	13.9	44	W	SPILL	6	SW	******	****	*****	****	**	R 3/4 TO HIGH	YES	NO	**
3	830	12.0	6	W	PLUNG	4	SE	.80	S	14.9	153	35	F 1/4 TO LOW	YES	YES	**
4	1600	16.8	3	W	SPILL	8	NW	******	****	*****	****	**	R 3/4 TO HIGH	YES	YES	**
6	930	10.5	4	NW	SPILL	20	NW	1.53	S	15.3	153	33	F 3/4 TO 1/2	YES	YES	**
6	1530	12.6	44	W	SPILL	15	NW	******	****	*****	****	**	R 1/4 TO 1/2	YES	YES	**
7	830	9.2	4	W	SPILL	3	SW	.90	S	14.9	152	20	F HIGH TO 3/4	YES	YES	**
7	1615	13.4	3	W	SPILL	9	NW	******	****	*****	****	**	R 1/4 TO 1/2	YES	YES	**
11	900	12.4	4	W	SPILL	20	NW	1.65	S	14.5	151	**	R 1/2 TO 3/4	YES	***	**
11	1630	13.3	5	W	SPILL	20	NW	******	****	*****	****	**	F 1/4 TO LOW	YES	***	**
12	900	13.3	4	W	SPILL	22	NW	1.10	S	14.6	152	18	R 1/4 TO 1/2	NO	YES	**
12	1615	9.8	2	NW	SPILL	15	NW	******	****	*****	****	**	F 1/2 TO 1/4	YES	YES	**
13	915	12.6	5	W	SPILL	2	NW	.50	S	14.6	152	**	R LOW TO 1/4	YES	YES	**
13	1600	10.5	4	W	SPILL	15	NW	******	****	*****	****	**	F 3/4 TO 1/2	YES	YES	**
14	830	8.8	3	W	PLUNG	5	SE	1.35	S	14.6	152	18	R LOW TO 1/4	YES	YES	**
14	1630	13.7	2	W	SPILL	6	W	******	****	*****	****	**	F HIGH TO 3/4	YES	YES	**
17	1630	9.0	1	W	SPILL	7	NW	******	****	*****	****	**	R 1/2 TO 3/4	YES	YES	**
17	830	13.2	1	W	SPILL	5	NW	.25	N	14.6	151	18	F 1/2 TO 1/4	YES	YES	**
18	****	15.2	1	W	SURGE	9	NW	******	****	*****	****	**	R 1/2 TO 3/4	YES	NO	**
18	930	11.4	4	W	SPILL	4	NW	1.40	N	14.6	153	18	F 1/4 TO LOW	YES	YES	**
19	915	9.8	2	W	SURGE	7	SE	.90	NW	14.6	152	18	F 1/2 TO 1/4	YES	YES	**
19	1615	15.5	3	W	*****	8	SE	******	****	*****	****	**	F 1/2 TO 1/4	YES	YES	**
20	1615	12.7	3	W	SPILL	8	W	******	****	*****	****	**	R 1/4 TO 1/2	YES	YES	**
20	830	18.4	2	W	SURGE	3	SE	1.80	N	14.6	152	18	F HIGH TO 3/4	YES	YES	**
21	630	13.3	3	W	SPILL	6	SE	2.30	N	15.3	146	18	R 3/4 TO HIGH	YES	YES	**
21	1615	12.4	4	SW	SPILL	8	SW	******	****	*****	****	**	R LOW TO 1/4	YES	NO	**
25	815	10.2	5	W	PLUNG	2	NW	2.02	N	14.6	152	18	R LOW TO 1/4	YES	NO	**
25	1615	10.3	5	NW	PLUNG	15	NW	******	****	*****	****	**	F 1/4 TO LOW	YES	YES	**
26	1615	11.3	4	W	SPILL	15	NW	******	****	*****	****	**	F 1/4 TO LOW	YES	YES	**
26	830	13.2	5	W	PLUNG	12	W	2.10	N	14.6	153	**	R 1/4 TO 1/2	YES	YES	**
27	1600	11.2	4	W	PLUNG	18	NW	******	****	*****	****	**	F 1/2 TO 1/4	YES	YES	**
27	915	12.8	3	W	SPILL	14	NW	1.80	SW	14.6	153	18	**********	YES	YES	**
28	1630	11.2	4	NW	PLUNG	12	NW	******	****	*****	****	**	F 3/4 TO 1/2	YES	YES	**
28	830	8.2	6	W	PLUNG	8	W	1.10	S	14.6	153	18	R LOW TO 1/4	YES	***	**
30	1700	13.4	4	W	SPILL	15	NW	******	****	*****	****	**	F HIGH TO 3/4	YES	YES	**
30	930	11.2	4	W	SPILL	25	NW	2.75	S	15.0	153	20	R LOW TO 1/4	YES	YES	**
31	945	11.8	2	W	SPILL	25	NW	2.20	S	15.2	152	20	R LOW TO 1/4	YES	YES	**
31	1630	11.2	1	NW	SPILL	25	NW	******	****	*****	****	**	R 3/4 TO HIGH	YES	YES	**

** OR ?? ITEM WAS LEFT BLANK BY THE OBSERVER
**? THE OBSERVER HAS FILLED IN TWO SPACES FOR THE DATE, THEREFORE THE CORRECT DATE CANNOT BE DETERMINED

LITTORAL ENVIRONMENT OBSERVATIONS (LEO)

MANCHESTER STATE BEACH(05023),CALIFORNIA — JUNE 1968 — MANCHESTER(05023) JUNE

DAY	TIME	WAVE PERIOD SEC	WAVE HEIGHT FEET	WAVE DIR	WAVE TYPE	WIND SPEED MPH	WIND DIR	LITTORAL CURRENT FT/SEC	LITTORAL CURRENT DIR	BERM ELEV FEET	BERM REACH FEET	SHORE SLOPE DEG	TIDE LEVEL R=RISING F=FALLING		RIP FLOWS	BEACH CUSPS	WATER TEMP DEG F
1	1630	9.8	4	W	SPILL	7	NW	******	****	*****	****	**	R	3/4 TO HIGH	YES	YES	**
1	1015	12.2	**	W	SPILL	7	NW	.67	S	15.0	152	19	R	LOW TO 1/4	YES	YES	**
2	1615	11.5	4	W	SPILL	8	NW	******	****	*****	****	**	R	3/4 TO HIGH	YES	YES	**
2	230	16.0	3	W	PLUNG	8	NW	******	****	*****	****	**	R	1/2 TO 3/4	NO	YES	**
3	1615	12.8	3	W	SPILL	10	NW	******	****	*****	****	**	R	3/4 TO HIGH	YES	YES	**
4	900	11.2	3	W	SPILL	5	NW	.00	CALM	15.0	153	19	F	3/4 TO 1/2	YES	YES	**
9	1615	15.0	1	W	SPILL	12	NW	******	****	*****	****	**	F	1/4 TO LOW	YES	YES	**
9	1000	17.0	3	W	SPILL	9	NW	1.52	S	15.0	153	19	R	1/2 TO 3/4	YES	YES	**
10	1630	12.8	3	W	SPILL	9	NW	******	****	*****	****	**	F	3/4 TO 1/2	YES	YES	**
10	900	14.2	3	NW	SPILL	7	NW	1.70	S	15.0	153	19	R	1/4 TO 1/2	YES	YES	**
**?	****	12.7	5	W	SPILL	4	NW	1.05	N	15.0	152	19	F	1/4 TO LOW	YES	YES	**
13	1615	12.7	3	W	SPILL	12	NW	******	****	*****	****	**	F	HIGH TO 3/4	YES	YES	**
**?	1015	15.0	2	W	SPILL	10	NW	.35	S	14.5	164	16	R	1/4 TO 1/2	NO	YES	**
14	1615	13.6	3	W	SPILL	12	NW	******	****	*****	****	**	R	3/4 TO HIGH	YES	YES	**
14	900	11.8	2	W	SPILL	10	NW	.55	S	14.5	164	16	F	1/4 TO LOW	YES	YES	**
15	415	10.5	3	W	SPILL	7	NW	******	****	*****	****	**	R	1/2 TO 3/4	YES	YES	**
15	930	16.5	3	W	SPILL	15	NW	1.05	S	14.5	164	16	F	1/2 TO 1/4	YES	YES	**
16	1545	11.6	3	W	SPILL	9	NW	******	****	*****	****	**	R	1/2 TO 3/4	YES	YES	**
16	1000	11.2	3	W	SPILL	7	NW	1.68	****	14.6	164	15	F	1/4 TO LOW	YES	YES	**
17	1600	11.4	4	W	PLUNG	13	W	******	****	*****	****	**	R	1/4 TO 1/2	YES	YES	**
17	900	12.8	2	W	SPILL	8	NW	.60	N	14.6	154	16	F	1/2 TO 1/4	YES	YES	**
18	1600	13.4	3	W	SPILL	13	NW	******	****	*****	****	**	R	LOW TO 1/4	YES	YES	**
18	830	15.0	3	W	SPILL	2	W	1.60	S	14.5	154	16	F	HIGH TO 3/4	YES	YES	**
19	400	16.0	4	W	PLUNG	7	NW	******	****	*****	****	**	R	1/4 TO 1/2	NO	YES	**
19	915	12.8	3	W	SPILL	8	NW	.97	N	14.6	154	16	F	1/2 TO 1/4	YES	YES	**
20	400	17.5	4	W	PLUNG	15	NW	******	****	*****	****	**	R	1/4 TO 1/2	YES	YES	**
20	900	15.0	3	W	PLUNG	8	NW	2.15	S	14.6	154	16	R	3/4 TO HIGH	YES	YES	**
21	400	9.5	4	W	PLUNG	9	NW	******	****	*****	****	**	R	LOW TO 1/4	YES	YES	**
21	830	19.5	4	****	PLUNG	9	NW	2.15	S	14.6	154	16	R	1/2 TO 3/4	YES	YES	**
22	400	18.0	4	W	PLUNG	25	NW	******	****	*****	****	**	R	LOW TO 1/4	YES	YES	**
22	930	16.5	3	W	PLUNG	20	NW	1.65	S	14.6	154	16	R	1/4 TO 1/2	YES	YES	**
23	900	12.5	4	W	PLUNG	20	NW	1.85	S	12.8	154	16	R	1/4 TO 1/2	NO	YES	**
23	1615	10.2	2	NW	SPILL	25	NW	******	****	*****	****	**	R	LOW TO 1/4	NO	YES	**
24	1630	9.4	3	W	SPILL	24	W	******	****	*****	****	**	F	3/4 TO 1/2	YES	YES	**
24	945	11.0	2	W	SPILL	10	W	.55	S	14.6	154	16	R	LOW TO 1/4	YES	YES	**
25	915	9.8	2	W	SPILL	2	N	1.40	S	14.6	154	15	R	1/4 TO 1/2	YES	YES	**
26	400	13.0	3	W	PLUNG	7	NW	******	****	*****	****	**	F	HIGH TO 3/4	NO	YES	**
26	900	26.0	3	W	PLUNG	2	NW	.30	S	14.6	154	16	R	LOW TO 1/4	YES	YES	**
27	415	16.0	4	W	PLUNG	20	NW	.50	****	*****	****	**	F	3/4 TO 1/2	NO	YES	**
27	830	11.5	4	W	PLUNG	14	NW	.60	S	14.6	154	16	R	LOW TO 1/4	NO	YES	**

DATA FOR THE MONTH OF JUNE IS CONTINUED ON THE NEXT PAGE

LITTORAL ENVIRONMENT OBSERVATIONS (LEO)

MANCHESTER STATE BEACH(05023),CALIFORNIA — JUNE 1968 — MANCHESTER(05023) JUNE

DAY	TIME	WAVE PERIOD SEC	AVE HEIGHT FEET	WAVE DIR	WAVE TYPE	WIND SPEED MPH	WIND DIR	LITTORAL CURRENT FT/SEC	LITTORAL CURRENT DIR	BERM ELEV FEET	BERM REACH FEET	SHORE SLOPE DEG	TIDE LEVEL R=RISING F=FALLING		RIP FLOWS	BEACH CUSPS	WATER TEMP DEG F
28	400	10.0	4	W	PLUNG	20	NW	******	****	*****	****	**	F	1/4 TO LOW	NO	YES	**
28	830	12.3	4	W	PLUNG	20	NW	2.00	S	10.6	154	10	R	LOW TO 1/4	***	YES	**
29	1600	11.6	3	W	SPILL	12	NW	******	****	*****	****	**	R	1/2 TO 3/4	***	***	**
29	945	9.6	3	W	SPILL	20	NW	2.50	S	14.5	154	16	R	LOW TO 1/4	YES	***	**
30	800	10.5	5	W	PLUNG	8	NW	******	****	*****	****	**	R	3/4 TO HIGH	NO	YES	**
30	945	12.2	4	W	PLUNG	7	NW	2.80	S	14.6	154	16	R	LOW TO 1/4	NO	YES	**

** OR ?? ITEM WAS LEFT BLANK BY THE OBSERVER
**? THE OBSERVER HAS FILLED IN TWO SPACES FOR THE DATE, THEREFORE THE CORRECT DATE CANNOT BE DETERMINED

MANCHESTER STATE BEACH(05023),CALIFORNIA
JULY 1968

MANCHESTER(05023)
JULY

JULY 1968

DAY	TIME	WAVE PERIOD SEC	WAVE HEIGHT FEET	WAVE DIR	WAVE TYPE	WIND SPEED MPH	WIND DIR	LITTORAL CURRENT FT/SEC	LITTORAL CURRENT DIR	BERM ELEV FEET	BERM REACH FEET	SHORE SLOPE DEG	TIDE LEVEL RERISTNG FERALING	RIP FLOWS	BEACH CUSPS	WATER TEMP DEG F
1	1630	10.8	3	W	SPILL	18	NW	******	****	*****	****	**	R 3/4 TO HIGH	YES	YES	**
1	915	12.0	3	W	SPILL	9	SE	1.65	S	14.6	154	16	F 1/4 TO LOW	YES	YES	**
2	830	14.0	3	W	SPILL	4	****	1.95	S	14.6	154	16	F HIGH TO 3/4	YES	YES	**
3	400	10.0	3	W	PLUNG	10	NW	******	****	*****	****	**	R 1/2 TO 3/4	NO	YES	**
3	830	18.0	3	W	PLUNG	6	NW	1.13	S	14.6	154	16	F 1/2 TO 1/4	NO	YES	**
4	930	11.6	3	W	SPILL	12	NW	2.42	S	14.6	154	16	F 3/4 TO 1/2	YES	YES	**
4	1630	9.4	4	W	PLUNG	13	NW	******	****	*****	****	**	R 1/2 TO 3/4	YES	YES	**
5	1645	11.2	4	W	SPILL	16	NW	******	****	*****	****	**	R 1/4 TO 1/2	YES	YES	**
5	945	13.8	3	NW	SPILL	12	NW	2.22	S	14.6	154	16	F HIGH TO 3/4	YES	YES	**
6	400	13.5	4	W	PLUNG	5	NW	******	****	*****	****	**	R 1/4 TO 1/2	NO	YES	**
6	800	15.5	4	****	PLUNG	6	NW	2.20	S	14.0	154	16	R 1/2 TO 3/4	NO	YES	**
7	345	13.0	3	W	PLUNG	6	SW	******	****	*****	****	**	R LOW TO 1/4	YES	YES	**
7	930	22.0	3	W	*****	5	S	.40	S	14.0	154	10	R **********	YES	YES	**
8	415	18.4	3	W	PLUNG	9	NW	******	****	*****	****	**	R LOW TO 1/4	YES	YES	**
8	845	19.0	**	W	PLUNG	2	NW	.45	S	14.6	154	16	R 1/4 TO 1/2	YES	YES	**
9	330	9.0	3	W	PLUNG	10	NW	******	****	*****	****	**	F 3/4 TO 1/2	YES	YES	**
9	900	9.0	3	W	PLUNG	9	NW	.30	N	14.6	154	16	R 1/4 TO 1/2	NO	YES	**
10	415	14.0	4	W	PLUNG	7	NW	******	****	*****	****	**	F 3/4 TO 1/2	NO	YES	**
10	930	19.5	4	****	PLUNG	5	SW	.90	S	14.6	154	16	R 1/4 TO 1/2	YES	YES	**
11	1615	11.2	4	W	SPILL	18	W	******	****	*****	****	**	F 3/4 TO 1/2	YES	YES	**
11	915	13.2	4	W	SPILL	10	W	.73	S	14.6	154	16	R LOW TO 1/4	YES	YES	**
12	1600	18.0	3	W	PLUNG	7	NW	******	****	*****	****	**	F 1/4 TO LOW	YES	YES	**
12	845	19.0	3	W	PLUNG	3	NW	.95	S	14.6	154	16	R LOW TO 1/4	NO	YES	**
13	1630	8.8	3	W	SPILL	15	W	******	****	*****	****	**	**********	YES	YES	**
13	915	12.0	3	W	SPILL	9	NW	1.15	S	14.6	154	16	**********	YES	YES	**
14	1645	9.8	3	W	SPILL	18	W	******	****	*****	****	**	**********	YES	YES	**
14	930	9.5	3	W	SPILL	12	NW	.60	S	14.6	154	16	**********	YES	YES	**
15	830	14.5	5	****	*****	14	NW	1.60	S	14.6	154	16	F 3/4 TO 1/2	NO	YES	**
15	1600	8.8	3	NW	SPILL	7	NW	******	S	*****	****	**	R 1/2 TO 3/4	YES	YES	**
16	1600	14.5	4	W	PLUNG	16	NW	******	****	*****	****	**	R 1/2 TO 3/4	NO	YES	**
16	1030	11.5	4	W	PLUNG	10	NW	1.35	S	14.6	154	16	F 3/4 TO 1/2	NO	YES	**
17	400	19.5	4	W	PLUNG	12	NW	******	****	*****	****	**	R 1/2 TO 3/4	YES	YES	**
17	900	17.0	4	W	PLUNG	10	NW	2.25	S	14.6	154	16	F 3/4 TO 1/2	NO	YES	**
18	930	18.0	2	W	SPILL	6	SE	2.77	S	14.6	154	16	**********	YES	YES	**
18	1630	14.2	3	W	SPILL	18	NW	******	****	*****	****	**	**********	YES	YES	**
19	400	12.0	4	W	PLUNG	16	NW	******	****	*****	****	**	R 1/4 TO 1/2	NO	YES	**
19	830	6.0	3	W	PLUNG	16	NW	.70	S	14.6	154	**	R 3/4 TO HIGH	YES	YES	**
20	400	6.5	3	W	PLUNG	7	NW	******	****	*****	****	**	R LOW TO 1/4	NO	YES	**
20	400	8.3	4	W	PLUNG	8	NW	.50	****	*****	****	**	R 1/4 TO 1/2	NO	YES	**
20	930	11.0	3	W	PLUNG	8	NW	.52	S	14.6	154	16	R 3/4 TO HIGH	NO	YES	**

DATA FOR THE MONTH OF JULY IS CONTINUED O. THE NEXT PAGE

LITTORAL ENVIRONMENT OBSERVATIONS (LEO)

MANCHESTER STATE BEACH(05023),CALIFORNIA — JULY 1968

MANCHESTFR(05023) JULY

DAY	TIME	WAVE PERIOD SEC	WAVE HEIGHT FEET	WAVE DIR	WAVE TYPE	WIND SPEED MPH	WIND DIR	LITTORAL CURRENT FT/SEC	LITTORAL CURRENT DIR	BERM ELEV FEET	BERM REACH FEET	SHORE SLOPE DEG	TIDE LEVEL R=RISING F=FALLING		RIP FLOWS	BEACH CUSPS	WATER TEMP DEG F
21	1000	18.0	40	W	PLUNG	6	NW	1.55	S	14.6	154	16	R	1/2 TO 3/4	NO	YES	**
22	400	18.0	16	W	PLUNG	10	NW	******	****	*****	****	**	R	LOW TO 1/4	YES	YES	**
22	830	13.5	3	W	PLUNG	8	NW	1.10	S	14.6	154	16	R	1/2 TO 3/4	NO	YES	**
23	400	14.1	4	W	PLUNG	15	NW	******	****	*****	****	**	F	1/4 TO LOW	NO	YES	**
23	830	13.5	3	W	PLUNG	9	S	1.13	S	14.6	154	16	R	1/4 TO 1/2	NO	YES	**
24	400	12.0	4	W	PLUNG	8	NW	******	****	*****	****	**	R	3/4 TO HIGH	NO	YES	**
24	830	22.5	30	W	PLUNG	8	NW	1.15	S	14.6	154	16	R	LOW TO 1/4	NO	YES	**
25	400	16.0	4	W	PLUNG	8	NW	******	****	14.6	104	16	F	1/2 TO 1/4	NO	YES	**
25	830	8.0	4	NW	PLUNG	4	NW	2.25	S	14.6	154	16	F	1/2 TO 1/4	NO	YES	**
26	400	14.0	3	W	PLUNG	4	NW	.07	****	4.0	4	**	F	1/4 TO LOW	NO	YES	**
26	900	15.5	3	W	PLUNG	4	SW	.90	S	14.6	154	16	R	LOW TO 1/4	YES	YES	**
27	400	16.4	3	W	PLUNG	7	S	******	****	*****	****	**	F	1/4 TO LOW	NO	YES	**
27	415	15.0	4	W	PLUNG	5	NW	.67	****	*****	****	**	F	1/2 TO 1/4	NO	YES	**
**?	830	14.0	3	W	PLUNG	4	S	.77	S	14.6	154	16	R	LOW TO 1/4	NO	YES	**
28	830	17.0	3	W	PLUNG	4	S	1.17	S	14.6	154	16	R	LOW TO 1/4	NO	YES	**
29	400	18.0	**	W	PLUNG	7	NW	******	****	*****	****	**	F	1/4 TO LOW	NO	YES	**
29	830	18.0	3	W	PLUNG	2	S	.70	S	14.0	154	16	F	1/4 TO LOW	YES	YES	**
30	400	12.0	3	W	PLUNG	4	W	1.10	S	*****	****	**	R	3/4 TO HIGH	NO	YES	**
30	830	13.5	3	W	PLUNG	5	SW	1.10	S	14.6	154	16	F	3/4 TO 1/2	NO	YES	**
31	400	15.0	4	W	PLUNG	8	NW	******	S	*****	****	**	R	1/2 TO 3/4	YES	YES	**
31	830	14.5	0	W	PLUNG	5	NW	1.10	S	14.6	154	16	F	3/4 TO 1/2	YES	YES	**

** OR ?? ITEM WAS LEFT BLANK BY THE OBSERVER

**? THE OBSERVER HAS FILLED IN TWO SPACES FOR THE DATE, THEREFORE THE CORRECT DATE CANNOT BE DETERMINED

LITTORAL ENVIRONMENT OBSERVATIONS (LEO)

MANCHESTER STATE BEACH(05023),CALIFORNIA — AUGUST 1968

MANCHESTER(05023) AUGUST 1968

DAY	TIME	WAVE PERIOD SEC	WAVE HEIGHT FEET	WAVE DIR	WAVE TYPE	WIND SPEED MPH	WIND DIR	LITTORAL CURRENT FT/SEC	LITTORAL CURRENT DIR	BERM ELEV FEET	BERM REACH FEET	SHORE SLOPE DEG	TIDE LEVEL R=RISING F=FALLING	RIP FLOWS	BEACH CUSPS	WATER TEMP DEG F
1	400	18.6	3	W	PLUNG	8	NW	******	****	*****	****	**	R 3/4 TO HIGH	NO	YES	**
1	830	12.0	30	W	PLUNG	6	NW	1.45	S	14.6	154	16	F 1/4 TO LOW	NO	YES	**
2	400	15.0	3	W	PLUNG	10	NW	******	****	*****	****	**	R 3/4 TO HIGH	NO	YES	**
2	830	12.0	40	W	PLUNG	4	W	.85	S	14.6	154	16	R 1/4 TO 1/2	NO	YES	**
3	400	16.5	44	W	PLUNG	8	NW	******	****	*****	****	**	R 1/2 TO 3/4	NO	YES	**
3	830	13.0	4	W	PLUNG	2	NW	2.00	S	14.6	154	16	R 1/2 TO 3/4	NO	YES	**
4	900	9.0	30	W	PLUNG	6	NW	1.25	S	14.6	154	16	R 3/4 TO HIGH	NO	YES	**
5	415	14.8	3	W	PLUNG	9	NW	******	****	*****	****	**	R LOW TO 1/4	NO	YES	**
5	930	18.5	3	W	PLUNG	7	NW	1.35	S	14.6	154	16	R 1/2 TO 3/4	NO	YES	**
6	400	14.5	4	W	PLUNG	10	NW	******	****	*****	****	**	F 1/4 TO LOW	NO	YES	**
6	845	13.0	3	W	PLUNG	7	NW	1.20	S	14.6	154	16	R 1/4 TO 1/2	NO	YES	**
7	830	21.0	3	W	PLUNG	3	SW	.90	S	14.6	154	16	R LOW TO 1/4	NO	YES	**
7	415	18.0	3	W	PLUNG	8	SW	.07	****	4.0	****	**	F 1/4 TO LOW	NO	YES	**
8	1615	13.8	3	W	PLUNG	18	SE	******	****	*****	****	**	F 3/4 TO 1/2	YES	YES	**
8	845	18.8	3	W	PLUNG	12	SE	2.63	S	14.6	154	16	R LOW TO 1/4	YES	YES	**
9	400	15.0	2	W	SPILL	6	NW	******	****	*****	****	**	F 1/2 TO 1/4	NO	YES	**
9	830	13.0	2	W	PLUNG	4	NW	1.00	S	14.6	154	16	R LOW TO 1/4	NO	YES	**
10	430	15.0	2	W	SPILL	7	NW	1.00	****	*****	****	**	R 1/4 TO 1/2	NO	NO	**
10	830	16.5	2	W	PLUNG	7	NW	1.00	S	14.6	154	16	R LOW TO 1/4	NO	YES	**
11	400	15.0	2	W	SPILL	9	NW	******	****	*****	****	**	F 3/4 TO 1/2	NO	YES	**
11	900	14.8	2	W	PLUNG	12	NW	.35	S	14.6	154	16	R LOW TO 1/4	NO	YES	**
12	415	8.0	3	W	PLUNG	6	NW	******	S	*****	****	**	F 3/4 TO 1/2	NO	YES	**
12	830	15.0	3	W	PLUNG	5	NW	.92	S	14.6	154	16	F 1/4 TO LOW	NO	YES	**
13	400	7.5	3	W	PLUNG	6	NW	.50	****	4.0	4	**	R 3/4 TO HIGH	NO	YES	**
13	830	14.0	2	W	PLUNG	7	NW	.50	S	14.6	154	16	F 3/4 TO 1/2	NO	YES	**
14	****	13.5	3	W	PLUNG	2	NW	.40	S	14.6	154	16	F 1/4 TO LOW	NO	YES	**
**?	****	8.5	2	W	PLUNG	7	NW	******	****	*****	****	**	R 3/4 TO HIGH	NO	YES	**
15	415	16.5	4	W	PLUNG	9	NW	.67	****	*****	****	**	F 1/2 TO 1/4	NO	YES	**
15	930	8.5	3	W	PLUNG	14	NW	.75	****	14.6	154	16	F 1/4 TO LOW	NO	YES	**
16	400	6.0	4	W	PLUNG	10	NW	******	****	*****	****	**	R 1/2 TO 3/4	NO	YES	**
**?	****	10.5	4	W	PLUNG	12	NW	.75	S	14.6	154	16	F 3/4 TO 1/2	NO	YES	**
.17	400	7.5	5	W	PLUNG	8	NW	.07	****	*****	****	**	R 3/4 TO HIGH	NO	YES	**
17	830	12.0	4	W	PLUNG	14	NW	1.23	S	14.6	154	16	R 3/4 TO HIGH	NO	YES	**
18	1000	13.5	3	W	PLUNG	4	W	1.10	S	14.6	154	16	R 3/4 TO HIGH	YES	YES	**
18	1530	12.4	6	W	PLUNG	5	W	******	****	*****	****	**	R LOW TO 1/4	YES	YES	**
19	400	16.5	4	W	PLUNG	6	NW	******	****	*****	****	**	R 3/4 TO HIGH	NO	YES	**
19	900	11.8	6	W	PLUNG	9	S	.40	S	14.6	154	16	F 1/2 TO 1/4	NO	YES	**
20	1600	7.5	6	W	PLUNG	5	SW	******	****	*****	****	**	R LOW TO 1/4	NO	YES	**
20	830	13.0	5	W	PLUNG	7	S	.60	N	14.6	154	16	R 1/4 TO 1/2	NO	YES	**
21	830	13.0	4	W	PLUNG	4	SW	.40	N	14.6	154	16	R 1/4 TO 1/2	NO	YES	**

DATA FOR THE MONTH OF AUGUST IS CONTINUED ON THE NEXT PAGE

LITTORAL ENVIRONMENT OBSERVATIONS (LEO)

MANCHESTER STATE BEACH(05023),CALIFORNIA — AUGUST 1968 — MANCHESTER(05023) AUGUST

DAY	TIME	WAVE PERIOD SEC	WAVE HEIGHT FEET	WAVE DIR	WAVE TYPE	WIND SPEED MPH	WIND DIR	LITTORAL CURRENT FT/SEC	LITTORAL CURRENT DIR	BERM ELEV FEET	BERM REACH FEET	SHORE SLOPE DEG	TIDE LEVEL R=RISING F=FALLING		RIP FLOWS	BEACH CUSPS	WATER TEMP DEG F
21	1600	8.5	4	W	PLUNG	6	NW	******	****	*****	****	**	F	1/4 TO LOW	NO	YES	**
22	1600	9.5	3	W	PLUNG	11	NW	******	****	*****	****	**	F	1/4 TO LOW	NO	NO	**
22	900	14.6	3	W	PLUNG	9	NW	2.20	S	14.6	154	16	R	1/4 TO 1/2	NO	YES	**
23	400	16.5	3	W	PLUNG	8	NW	******	****	*****	****	**	F	1/4 TO LOW	NO	YES	**
23	830	16.5	2	W	PLUNG	7	NW	2.00	S	14.6	154	16	R	LOW TO 1/4	YES	YES	**
24	1630	16.5	4	W	PLUNG	6	NW	******	****	*****	****	**	F	1/4 TO LOW	NO	YES	**
24	830	9.5	3	W	PLUNG	10	NW	2.15	S	14.6	154	16	R	1/4 TO 1/2	NO	YES	**
25	400	9.5	4	W	PLUNG	8	SE	******	****	*****	****	**	F	1/2 TO 1/4	NO	YES	**
25	930	13.5	3	W	PLUNG	7	SE	.60	N	14.6	154	16	R	1/4 TO 1/2	NO	YES	**
26	400	15.0	3	W	PLUNG	13	S	******	****	*****	****	**	F	1/2 TO 1/4	YES	YES	**
26	830	14.0	3	W	PLUNG	5	S	1.40	S	14.6	154	16	R	LOW TO 1/4	YES	YES	**
27	1600	11.5	4	W	PLUNG	7	NW	******	****	*****	****	**	F	3/4 TO 1/2	NO	YES	**
27	845	10.5	3	W	PLUNG	2	NW	.80	S	14.6	154	16	F	3/4 TO 1/2	NO	YES	**
28	930	7.5	3	W	PLUNG	14	NW	1.90	S	14.6	154	16	R	LOW TO 1/4	NO	YES	**
28	1630	12.0	4	W	PLUNG	21	SW	******	****	*****	****	**	F	HIGH TO 3/4	YES	YES	**
29	400	8.5	4	W	PLUNG	4	NW	******	****	*****	****	**	R	3/4 TO HIGH	YES	YES	**
29	845	7.5	4	W	PLUNG	3	W	2.65	S	14.6	154	16	F	1/4 TO LOW	YES	YES	**
30	415	14.0	6	W	PLUNG	10	S	******	S	*****	****	**	R	3/4 TO HIGH	YES	YES	**
30	915	15.0	3	W	PLUNG	4	NW	1.45	S	14.6	154	16	F	3/4 TO 1/2	NO	YES	**
31	930	9.0	6	W	PLUNG	4	S	1.00	S	14.6	154	16	F	1/2 TO 1/4	YES	YES	**
31	1700	13.4	5	W	PLUNG	11	S	******	****	*****	****	**	R	3/4 TO HIGH	YES	YES	**

** OR ?? ITEM WAS LEFT BLANK BY THE OBSERVER
**? THE OBSERVER HAS FILLED IN TWO SPACES FOR THE DATE,THEREFORE THE CORRECT DATE CANNOT BE DETERMINED

MANCHESTER STATE BEACH(05023),CALIFORNIA
SEPTEMBER 1968

SEPTEMBER 1968

MANCHESTER(05023)
SEPTEMBER

DAY	TIME	WAVE PERIOD SEC	WAVE HEIGHT FEET	WAVE DIR	WAVE TYPE	WIND SPEED MPH	WIND DIR	LITTORAL CURRENT FT/SEC	LITTORAL CURRENT DIR	BERM ELEV FEET	BERM REACH FEET	SHORE SLOPE DEG	TIDE LEVEL R=RISING F=FALLING		RIP FLOWS	BEACH CUSPS	WATER TEMP DEG F
1	1030	16.0	3	W	PLUNG	10	NW	.85	N	14.6	154	16	F	1/2 TO 1/4	YES	YES	**
1	1530	9.8	2	W	SPILL	5	SW	******	****	*****	****	**	F	1/2 TO 1/4	YES	YES	**
2	415	11.5	4	W	PLUNG	10	NW	******	****	*****	****	**	R	1/4 TO 1/2	YES	YES	**
2	945	10.5	5	W	PLUNG	10	NW	******	****	14.6	154	16	R	3/4 TO HIGH	YES	YES	**
3	1630	12.0	3	W	PLUNG	8	NW	******	****	*****	****	**	R	LOW TO 1/4	YES	YES	**
3	830	14.5	5	W	PLUNG	6	SE	.55	S	14.6	154	16	R	1/4 TO 1/2	YES	YES	**
4	445	15.2	5	W	PLUNG	7	SE	******	****	*****	****	**	F	3/4 TO 1/2	YES	YES	**
4	830	22.0	4	W	PLUNG	0	CALM	1.50	S	14.6	154	**	R	1/4 TO 1/2	YES	YES	**
5	400	18.0	3	W	PLUNG	6	NW	******	****	*****	****	**	F	1/4 TO LOW	YES	YES	**
5	1000	12.8	2	W	SPILL	5	W	******	****	14.6	154	16	R	3/4 TO HIGH	YES	YES	**
6	1545	12.6	4	W	PLUNG	16	NW	******	****	*****	****	**	F	1/4 TO LOW	YES	YES	**
6	945	13.2	4	W	PLUNG	18	NW	1.05	S	14.6	154	15	R	1/4 TO 1/2	YES	YES	**
7	1600	19.8	2	W	PLUNG	7	NW	******	****	*****	****	**	F	1/4 TO LOW	NO	YES	**
8	1600	23.5	2	W	PLUNG	5	NW	******	****	*****	****	**	F	1/2 TO 1/4	NO	YES	**
8	930	22.8	2	W	PLUNG	2	NW	.35	S	14.6	154	16	R	1/4 TO 1/2	NO	YES	**
9	415	15.0	3	W	PLUNG	5	NW	******	****	*****	****	**	F	1/4 TO LOW	NO	YES	**
9	830	17.0	2	W	PLUNG	4	NW	1.45	S	14.6	154	16	R	LOW TO 1/4	NO	YES	**
10	1600	11.8	3	W	PLUNG	6	NW	******	****	*****	****	**	F	HIGH TO 3/4	YES	YES	**
10	1615	12.0	3	W	PLUNG	8	SE	******	****	*****	****	**	F	HIGH TO 3/4	YES	YES	**
10	1000	9.8	2	W	PLUNG	4	NW	1.10	S	14.6	154	16	R	1/4 TO 1/2	YES	YES	**
11	1530	12.4	3	W	PLUNG	7	NW	******	****	*****	****	**	F	3/4 TO 1/2	NO	YES	**
11	830	10.2	2	W	PLUNG	5	NW	1.20	S	14.6	154	16	F	1/4 TO LOW	NO	YES	**
12	830	15.3	3	W	PLUNG	4	NW	1.03	S	14.6	154	16	F	3/4 TO 1/2	YES	YES	**
12	1600	11.2	4	W	PLUNG	8	W	******	****	*****	****	**	F	HIGH TO 3/4	YES	YES	**
13	1545	11.2	4	W	PLUNG	12	NW	******	****	*****	****	**	R	3/4 TO HIGH	YES	YES	**
13	1000	12.8	3	NW	PLUNG	8	NW	.97	S	14.6	154	15	R	LOW TO 1/4	YES	YES	**
14	1600	11.8	4	W	PLUNG	16	NW	******	****	*****	****	**	F	3/4 TO 1/2	YES	YES	**
14	930	13.6	3	W	PLUNG	6	NW	.77	S	14.6	154	16	F	1/4 TO LOW	YES	YES	**
15	1630	12.0	6	W	PLUNG	19	NW	******	****	*****	****	**	R	1/2 TO 3/4	NO	YES	**
15	930	11.6	5	W	SPILL	18	NW	.87	N	14.6	154	16	F	HIGH TO 3/4	YES	YES	**
16	1630	14.2	6	****	PLUNG	8	NW	******	****	*****	****	**	R	1/2 TO 3/4	YES	YES	**
16	900	15.3	7	NW	PLUNG	7	NW	2.25	SE	14.6	154	16	?	HIGH TO 3/4	YES	YES	**
19	900	4.8	6	W	PLUNG	30	N	2.82	N	14.6	154	15	R	1/2 TO 3/4	YES	YES	**
19	1615	16.6	7	W	PLUNG	35	NW	******	****	*****	****	**	F	1/4 TO LOW	YES	YES	**
20	1545	13.8	5	W	PLUNG	18	NW	******	****	*****	****	**	F	1/4 TO LOW	YES	YES	**
20	900	11.8	4	W	PLUNG	9	W	2.35	S	14.6	154	16	R	1/2 TO 3/4	YES	YES	**
21	1600	12.8	**	****	*****	15	NW	******	****	*****	****	**	F	1/4 TO LOW	YES	YES	**
21	830	13.0	3	NW	PLUNG	9	NW	2.27	S	14.6	104	16	R	1/4 TO 1/2	YES	YES	**
22	900	9.6	3	W	PLUNG	2	W	1.65	S	14.6	154	16	R	1/4 TO 1/2	YES	YES	**
22	1600	9.6	3	W	PLUNG	8	W	******	****	*****	****	**	F	1/4 TO LOW	YES	YES	**

DATA FOR THE MONTH OF SEPTEMBER IS CONTINUED ON THE NEXT PAGE

LITTORAL ENVIRONMENT OBSERVATIONS (LEO)

MANCHESTER STATE BEACH(05023),CALIFORNIA
SEPTEMBER 1968

MANCHESTER(05023)
SEPTEMBER 1968

DAY	TIME	WAVE PERIOD SEC	WAVE HEIGHT FEET	WAVE DIR	WAVE TYPE	WIND SPEED MPH	WIND DIR	LITTORAL CURRENT FT/SEC	LITTORAL CURRENT DIR	BERM ELEV FEET	BERM REACH FEET	SHORE SLOPE DEG	TIDE LEVEL R=RISING F=FALLING		RIP FLOWS	BEACH CUSPS	WATER TEMP DEG F
23	1545	9.8	**	NW	SPILL	9	NW	******	****	*****	****	**	F	1/2 TO 1/4	YES	YES	**
23	945	8.3	1	NW	SPILL	2	NW	1.25	S	14.6	154	16	R	1/2 TO 3/4	YES	YES	**
26	1600	10.8	4	W	PLUNG	12	SW	******	****	*****	****	**	F	1/2 TO 1/4	YES	YES	**
26	900	10.2	3	****	*****	3	SW	1.40	S	14.6	54	15	R	LOW TO 1/4	YES	YES	**
27	845	9.6	2	****	*****	2	W	2.02	S	14.6	154	**	R	LOW TO 1/4	YES	YES	**
27	1530	12.4	4	W	PLUNG	8	NW	******	****	*****	****	**	R	3/4 TO HIGH	YES	YES	**
28	1600	12.4	4	W	PLUNG	9	SE	******	****	*****	****	**	R	3/4 TO HIGH	YES	YES	**
28	845	10.3	4	NW	PLUNG	5	SE	1.65	****	14.6	154	16	F	1/2 TO 1/4	YES	YES	**
29	1530	12.8	4	****	*****	28	SE	******	****	*****	****	**	R	1/2 TO 3/4	YES	***	**
29	900	14.3	4	W	*****	25	SE	2.05	N	14.6	154	16	F	1/2 TO 1/4	YES	YES	**
30	1545	12.6	4	W	PLUNG	8	NW	******	****	*****	****	**	F	3/4 TO 1/2	YES	YES	**
30	900	11.4	4	NW	PLUNG	2	SE	1.87	S	14.6	154	16	R	3/4 TO HIGH	YES	YES	**

** OR ?? ITEM WAS LEFT BLANK BY THE OBSERVER
**? THE OBSERVER HAS FILLED IN TWO SPACES FOR THE DATE,THEREFORE THE CORRECT DATE CANNOT BE DETERMINED

LITTORAL ENVIRONMENT OBSERVATIONS (LEO)

MANCHESTER STATE BEACH(05023),CALIFORNIA — OCTOBER 1968 — MANCHESTER(05023) OCTOBER

DAY	TIME	WAVE PERIOD SEC	WAVE HEIGHT FEET	WAVE DIR	WAVE TYPE	WIND SPEED MPH	WIND DIR	LITTORAL CURRENT FT/SEC	LITTORAL CURRENT DIR	BERM ELEV FEET	BERM REACH FEET	SHORE SLOPE DEG	TIDE LEVEL R=RISING F=FALLING		RIP FLOWS	BEACH CUSPS	WATER TEMP DEG F
3	1600	11.8	0	W	*****	8	S	******	****	*****	****	**	R	LOW TO 1/4	YES	YES	**
3	830	10.8	3	****	*****	3	SE	.30	N	.6	154	16	R	1/2 TO 3/4	YES	***	**
4	1600	11.6	2	W	PLUNG	5	W	******	****	*****	****	**	F	1/2 TO 1/4	YES	YES	**
4	830	12.0	1	W	SURGE	1	W	1.10	S	14.6	154	16	R	1/2 TO 3/4	YES	YES	**
6	1530	10.4	4	NW	PLUNG	28	NW	******	****	*****	****	**	F	1/2 TO 1/4	YES	YES	**
6	930	13.2	4	W	PLUNG	12	NW	1.60	S	14.6	154	16	R	1/2 TO 3/4	YES	YES	**
10	1030	.3	2	NW	PLUNG	2	W	.75	N	14.0	54	10	R	1/4 TO 1/2	YES	YES	**
12	845	10.0	4	W	PLUNG	6	SW	1.97	N	14.6	104	16	R	LOW TO 1/4	YES	YES	**
12	1545	11.2	5	****	PLUNG	14	S	******	****	*****	****	**	F	1/4 TO LOW	YES	YES	**
13	1615	12.4	5	W	PLUNG	15	NW	******	****	*****	****	**	F	HIGH TO 3/4	YES	YES	**
16	1530	12.4	4	W	*****	18	NW	******	****	*****	****	**	R	LOW TO 1/4	YES	YES	**
16	630	13.8	4	W	PLUNG	10	NW	1.15	N	14.6	154	16	R	3/4 TO HIGH	YES	YES	**
17	1630	13.2	5	W	SPILL	18	NW	******	****	*****	****	**	R	LOW TO 1/4	YES	YES	**
17	830	11.7	3	W	SPILL	0	NW	.90	N	14.6	154	16	R	3/4 TO HIGH	YES	YES	**
18	1545	13.0	4	W	SPILL	19	NW	******	****	*****	****	**	F	1/4 TO LOW	YES	YES	**
18	830	9.6	3	W	SPILL	12	NW	1.55	N	14.6	154	16	R	1/2 TO 3/4	YES	YES	**
19	1615	13.2	4	NW	SPILL	18	NW	******	****	*****	****	**	F	1/4 TO LOW	YES	YES	**
19	915	8.8	3	W	SPILL	10	NW	.32	N	14.6	154	16	R	1/2 TO 3/4	YES	YES	**
20	930	16.6	4	W	SPILL	20	NW	.05	****	*****	****	**	F	3/4 TO 1/2	YES	YES	**
20	930	16.8	3	W	SPILL	12	NW	.55	N	14.6	154	16	R	3/4 TO HIGH	YES	YES	**
21	945	18.2	5	W	SPILL	4	W	.75	N	14.6	154	16	F	3/4 TO 1/2	YES	YES	**
21	1600	17.6	5	W	SPILL	12	NW	******	****	*****	****	**	F	1/2 TO 1/4	YES	YES	**
24	1600	13.3	5	W	SPILL	15	NW	******	****	*****	****	**	F	3/4 TO 1/2	YES	YES	**
24	830	16.8	4	W	SPILL	4	NW	1.15	N	14.6	154	16	R	LOW TO 1/4	YES	YES	**
25	1545	16.4	5	W	SPILL	15	NW	******	****	14.6	154	16	F	HIGH TO 3/4	YES	YES	**
25	830	18.6	5	W	SPILL	8	NW	.42	N	14.6	154	16	R	LOW TO 1/4	YES	YES	**
26	1630	14.8	5	W	SPILL	12	NW	******	****	*****	****	**	F	HIGH TO 3/4	NO	YES	**
26	900	16.2	5	W	SPILL	0	CALM	.25	N	14.6	154	16	F	1/4 TO LOW	YES	YES	**
27	1630	13.6	4	W	SPILL	10	NW	******	****	10.0	****	**	F	HIGH TO 3/4	YES	YES	**
27	900	13.2	3	W	SPILL	2	W	.35	N	14.6	154	16	F	1/4 TO LOW	YES	YES	**
31	1615	3.8	5	W	SPILL	15	NW	******	****	*****	****	**	R	LOW TO 1/4	NO	YES	**
**?	****	11.0	4	W	SPILL	4	W	.33	S	14.6	154	16	F	HIGH TO 3/4	YES	YES	**

** OR ?? ITEM WAS LEFT BLANK BY THE OBSERVER
**? THE OBSERVER HAS FILLED IN TWO SPACES FOR THE DATE, THEREFORE THE CORRECT DATE CANNOT BE DETERMINED

LITTORAL ENVIRONMENT OBSERVATIONS (LEO)

MANCHESTER STATE BEACH(05023),CALIFORNIA — NOVEMBER 1968 — MANCHESTER(05023 NOVEMBER

DAY	TIME	WAVE PERIOD SEC	WAVE HEIGHT FEET	WAVE DIR	WAVE TYPE	WIND SPEED MPH	WIND DIR	LITTORAL CURRENT FT/SEC	LITTORAL CURRENT DIR	BERM ELEV FEET	BERM REACH FEET	SHORE SLOPE DEG	TIDE LEVEL R=RISING F=FALLING		RIP FLOWS	BEACH CUSPS	WATER TEMP DEG F
1	1600	11.0	4	W	SPILL	18	SE	******	****	*****	****	**	R	LOW TO 1/4	YES	YES	**
3	1545	12.8	5	W	PLUNG	18	NW	******	****	*****	****	**	F	1/4 TO LOW	YES	YES	**
3	915	14.6	4	W	PLUNG	10	NW	.77	N	14.6	154	16	R	3/4 TO HIGH	YES	YES	**
4	1530	16.8	6	W	PLUNG	18	SE	******	****	*****	****	**	F	1/4 TO LOW	YES	YES	**
4	930	15.6	6	W	PLUNG	18	E	1.10	S	14.6	154	16	R	3/4 TO HIGH	YES	YES	**
7	1530	13.6	5	NW	PLUNG	15	NW	******	****	*****	****	**	F	1/2 TO 1/4	YES	YES	**
7	830	16.9	5	W	*****	4	NW	1.15	N	14.6	154	16	R	1/4 TO 1/2	YES	YES	**
8	1500	14.5	5	W	SPILL	8	NW	******	****	*****	****	**	F	3/4 TO 1/2	YES	YES	**
8	845	13.2	4	W	SPILL	2	W	1.10	S	14.6	154	16	R	1/4 TO 1/2	YES	YES	**
9	****	14.4	4	W	PLUNG	0	CALM	.55	S	14.6	154	16	R	1/4 TO 1/2	YES	YES	**
9	1615	15.6	5	W	PLUNG	14	SE	******	****	*****	****	10	F	3/4 TO 1/2	YES	YES	**
10	1545	13.0	4	W	SPILL	12	NW	******	****	*****	****	**	F	1/2 TO 1/4	YES	YES	**
10	915	14.6	4	W	SPILL	8	NW	1.10	N	14.5	100	16	R	1/2 TO 3/4	YES	YES	**
11	1545	16.4	6	NW	PLUNG	25	NW	******	****	14.6	****	**	F	HIGH TO 3/4	YES	YES	**
11	900	15.8	5	NW	PLUNG	18	NW	1.15	S	14.6	154	16	R	LOW TO 1/4	YES	YES	**
14	1615	13.4	4	W	PLUNG	12	SE	******	****	*****	****	**	R	1/2 TO 3/4	YES	YES	**
14	930	13.6	4	W	PLUNG	15	SE	2.10	N	14.6	154	16	F	3/4 TO 1/2	YES	YES	**
15	815	13.2	4	W	PLUNG	18	SE	1.60	S	14.6	154	16	F	3/4 TO 1/2	YES	YES	**
16	930	14.8	5	W	PLUNG	15	SE	1.32	S	14.6	104	16	F	HIGH TO 3/4	YES	YES	**
16	1600	13.6	3	W	PLUNG	5	W	******	****	*****	****	**	R	LOW TO 1/4	YES	YES	**
17	1545	13.2	4	W	*****	9	W	******	****	*****	****	**	R	LOW TO 1/4	YES	YES	**
17	845	14.8	5	W	PLUNG	15	SE	.60	N	14.6	154	16	F	HIGH TO 3/4	YES	YES	**
18	900	11.0	3	W	SPILL	4	E	1.60	N	14.6	154	16	R	3/4 TO HIGH	YES	YES	**
18	1530	13.6	4	W	SPILL	10	SE	******	****	*****	****	**	F	1/4 TO LOW	YES	YES	**
19	1600	13.8	4	W	SPILL	15	NW	******	****	*****	****	**	F	1/4 TO LOW	YES	YES	**
19	830	12.6	3	W	SPILL	8	S	2.77	N	14.6	154	16	R	3/4 TO HIGH	YES	YES	**

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LITTORAL ENVIRONMENT OBSERVATIONS (LEO)

MANCHESTER STATE BEACH(05023),CALIFORNIA — DECEMBER 1968

MANCHESTER(05023 DECEMBER

DAY	TIME	WAVE PERIOD SEC	WAVE HEIGHT FEET	WAVE DIR	WAVE TYPE	WIND SPEED MPH	WIND DIR	LITTORAL CURRENT FT/SEC	LITTORAL CURRENT DIR	BERM ELEV FEET	BERM REACH FEET	SHORE SLOPE DEG	TIDE LEVEL R=RISING F=FALLING	RIP FLOWS	BEACH CUSPS	WATER TEMP DEG F
9	1530	15.8	5	W	PLUNG	26	SE	******	****	*****	****	**	F HIGH TO 3/4	YES	YES	**
9	900	14.6	4	W	PLUNG	21	SE	1.92	S	14.6	154	16	R 1/2 TO 3/4	YES	YES	**
10	830	11.6	7	W	PLUNG	25	SE	2.60	N	14.6	154	16	? 1/4 TO LOW	YES	YES	**
10	1600	13.4	5	W	PLUNG	18	SE	******	****	*****	****	**	F 3/4 TO 1/2	YES	YES	**
12	1545	12.9	5	W	PLUNG	15	SE	******	****	*****	****	**	R 3/4 TO HIGH	YES	YES	**
12	830	14.3	6	W	PLUNG	9	SE	2.25	S	14.6	154	16	F 3/4 TO 1/2	YES	YES	**
16	1500	13.6	6	W	SPILL	10	W	******	****	14.6	****	**	F 1/4 TO LOW	YES	YES	**
16	900	14.7	8	W	SPILL	0	CALM	1.15	N	14.6	154	16	F HIGH TO 3/4	YES	YES	**
17	1600	12.0	4	W	SPILL	9	NW	******	****	*****	****	**	**********	YES	YES	**
17	815	15.3	5	W	SPILL	5	NW	2.02	S	14.6	154	16	R 3/4 TO HIGH	YES	YES	**
18	1630	13.4	3	W	SPILL	7	NW	******	****	*****	****	**	F 1/4 TO LOW	YES	YES	**
18	815	12.0	3	W	SPILL	4	NW	1.10	S	14.6	154	16	R 3/4 TO HIGH	YES	YES	**
19	1545	16.0	3	W	PLUNG	10	S	******	****	*****	****	**	F 1/4 TO LOW	YES	YES	**
19	815	18.6	3	W	PLUNG	2	E	2.77	S	14.6	156	12	R 3/4 TO HIGH	YES	YES	**
20	1600	13.0	3	W	SPILL	15	SE	******	****	*****	****	**	F 1/2 TO 1/4	YES	YES	**
20	800	13.8	3	W	PLUNG	8	E	1.60	S	14.6	156	12	R 1/2 TO 3/4	YES	YES	**
23	1530	10.0	6	W	SPILL	28	SE	******	****	*****	****	**	F 3/4 TO 1/2	YES	YES	**
23	815	14.7	5	****	SPILL	28	SE	2.05	N	4.6	156	12	R LOW TO 1/4	YES	YES	**
24	830	15.4	5	W	SPILL	15	SE	1.60	S	14.6	156	12	F 1/4 TO LOW	YES	YES	**
26	845	13.2	3	W	SPILL	3	NW	1.15	N	14.6	156	12	F 1/2 TO 1/4	YES	YES	**
27	1545	13.0	3	W	SPILL	8	NW	******	****	*****	****	**	R 1/4 TO 1/2	YES	YES	**
28	1515	10.6	5	W	SPILL	25	SE	******	****	*****	****	**	F 3/4 TO 1/2	YES	YES	**
28	815	14.2	4	W	SPILL	12	SE	1.05	S	14.6	156	12	F HIGH TO 3/4	YES	YES	**
30	1600	11.0	2	W	SPILL	5	SW	******	****	*****	****	**	R LOW TO 1/4	YES	YES	**
30	900	11.2	2	W	SPILL	3	E	1.15	N	14.6	156	12	F HIGH TO 3/4	YES	YES	**
31	900	12.0	1	W	SPILL	2	E	1.65	N	14.6	156	12	F HIGH TO 3/4	NO	YES	**
31	1530	13.2	1	W	SPILL	5	SE	******	****	*****	****	**	R LOW TO 1/4	YES	YES	**

** OR ?? ITEM WAS LEFT BLANK BY THE OBSERVER
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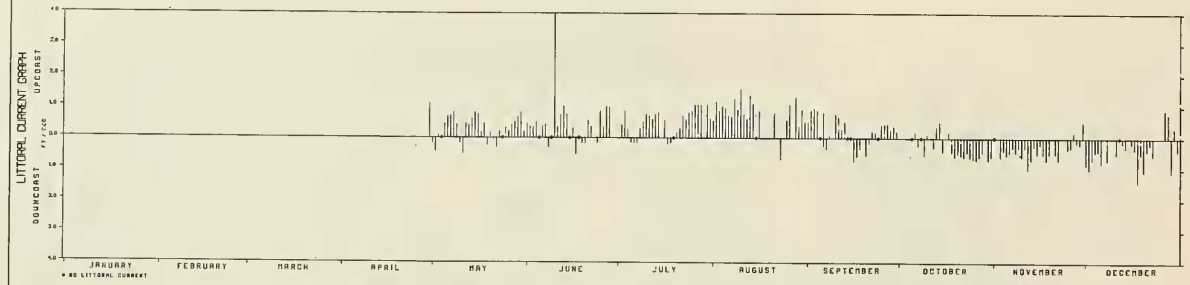
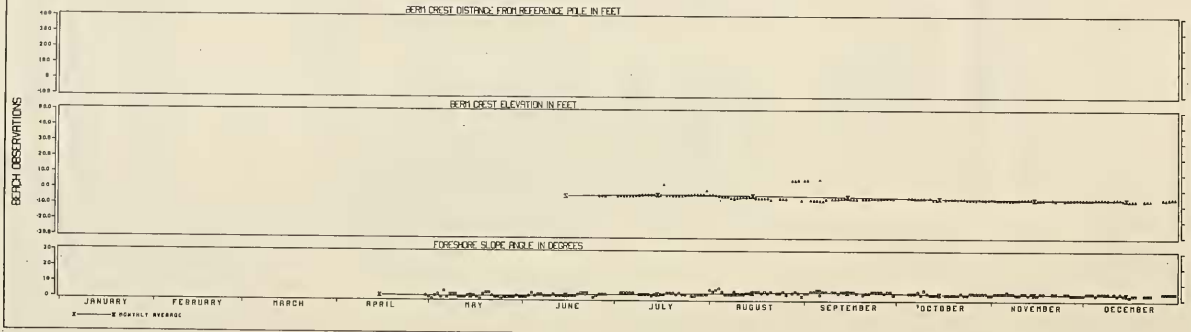
APPENDIX C

GRAPHS OF LITTORAL CURRENT, BEACH OBSERVATIONS AND OCCURRENCE OF WIND AND WAVE DIRECTION FOR EACH SITE

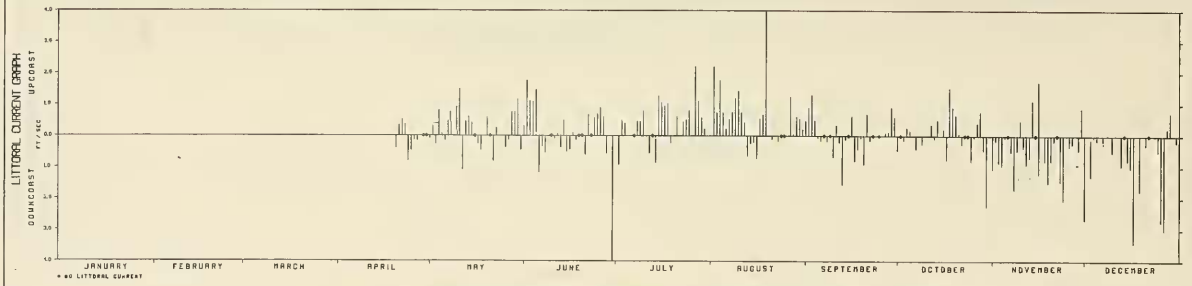
INDEX

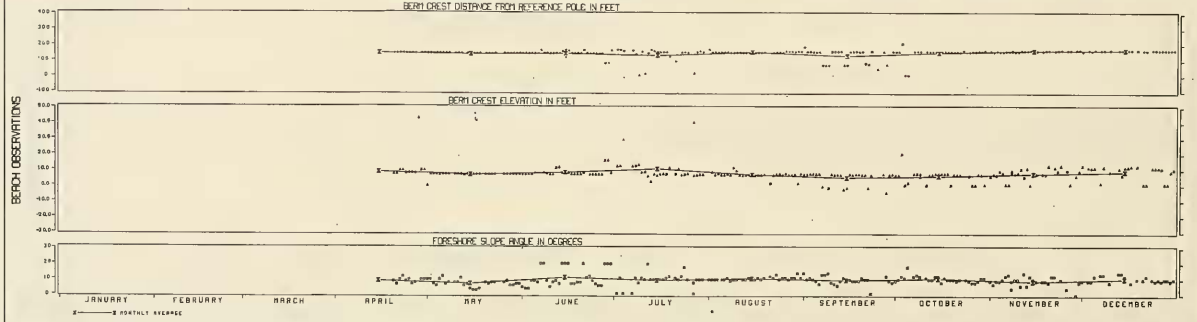
BOLINAS BRIGHTON AVE (05500) CALIFORNIA LEO DATA 1968



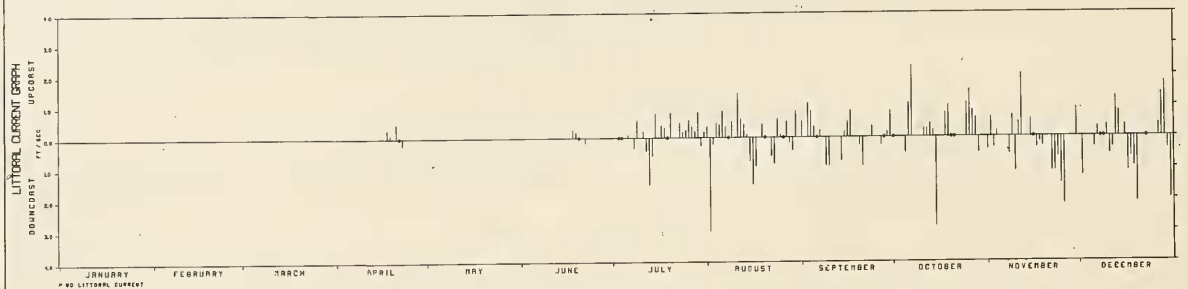


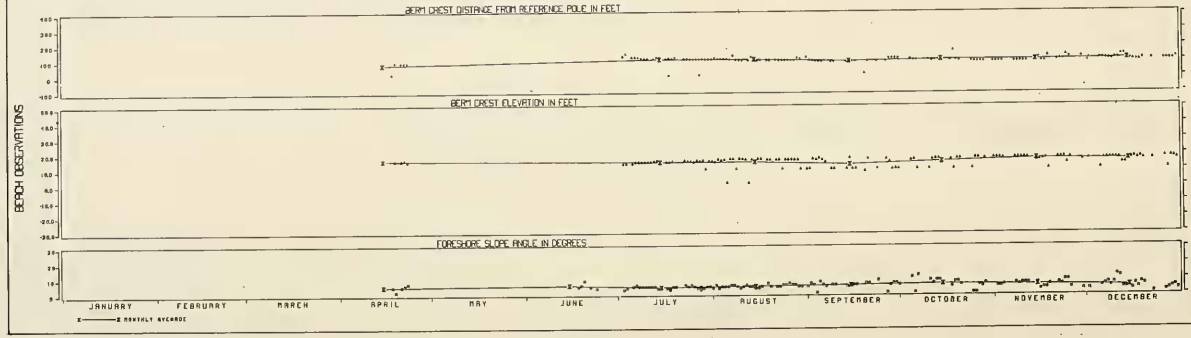
BOLSA CHICA (05018) CALIFORNIA LEO DATA 1968



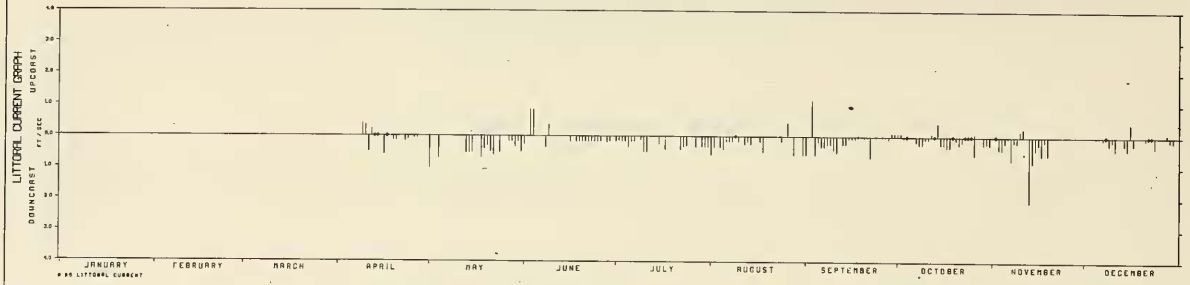


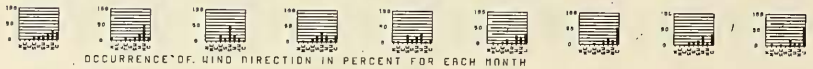
CARLSBAD (05030) CALIFORNIA LEO DATA 1968

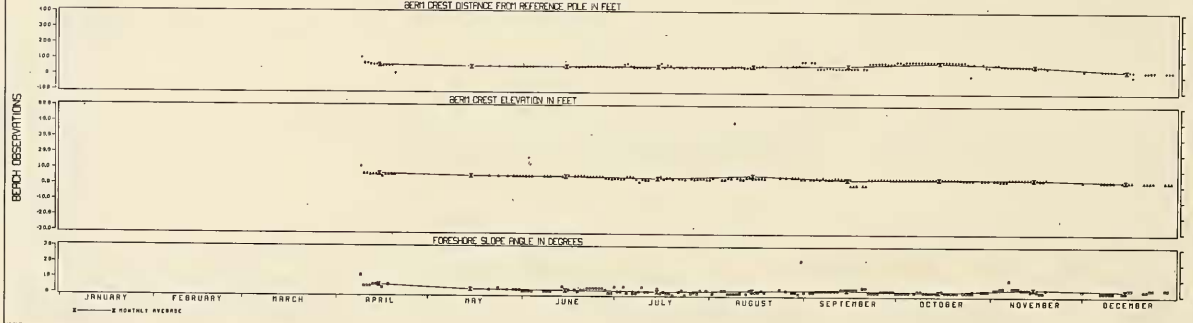




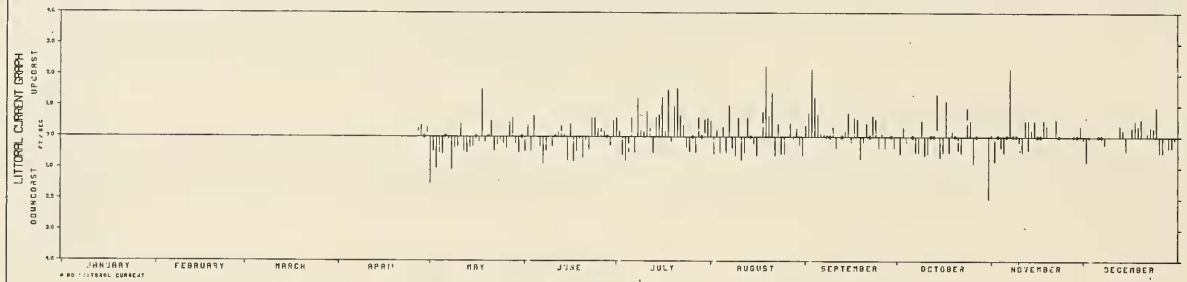
CARPINTERIA (05014) CALIFORNIA LEO DATA 1968

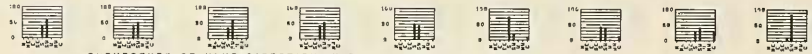


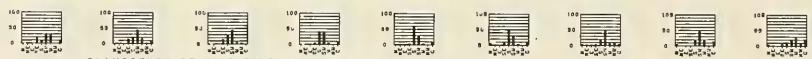


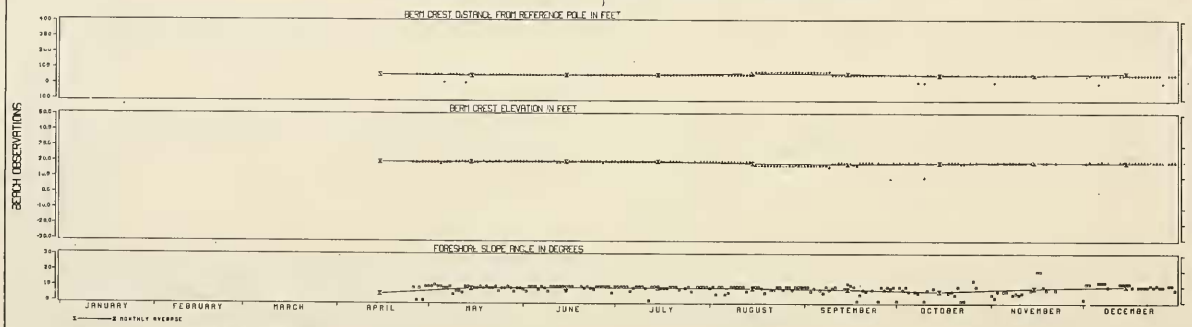


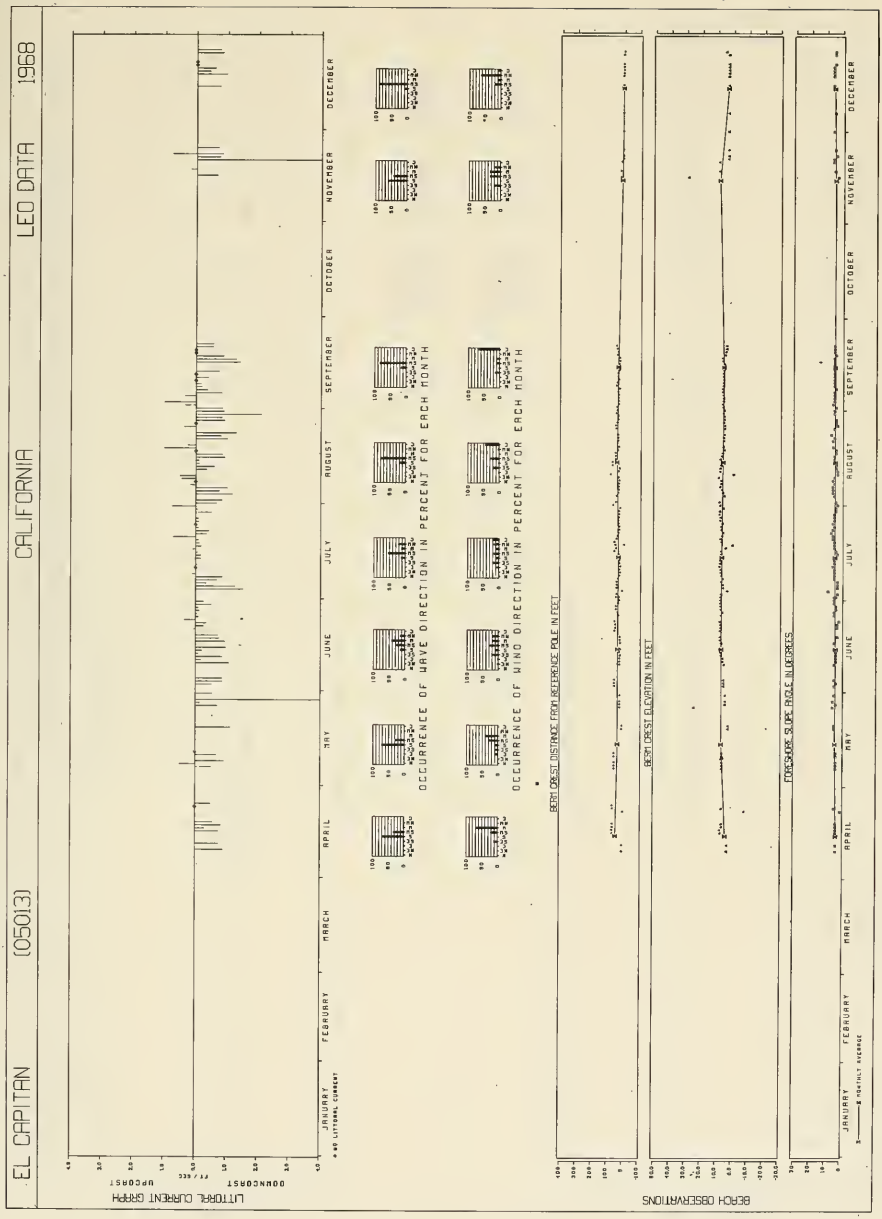
DOHENY (05028) CALIFORNIA LEO DATA 1968

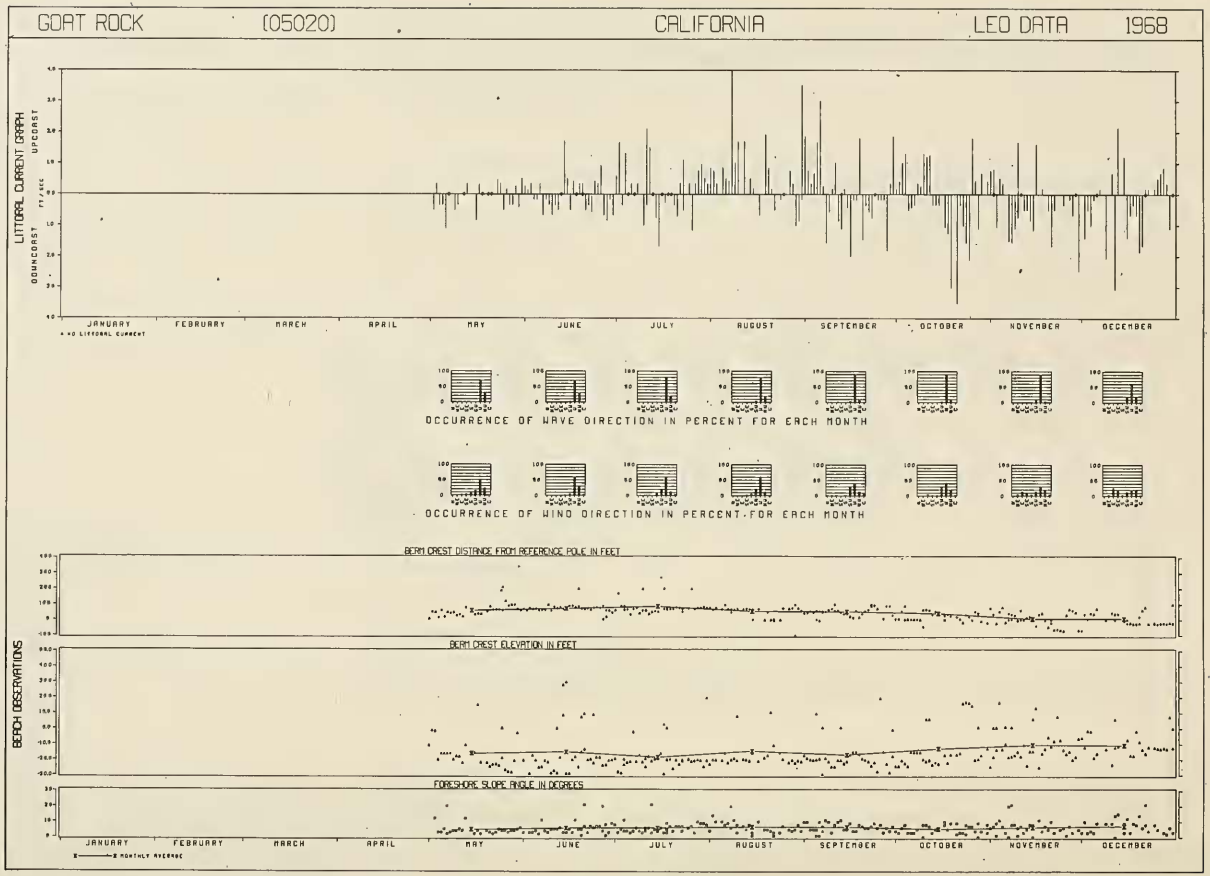




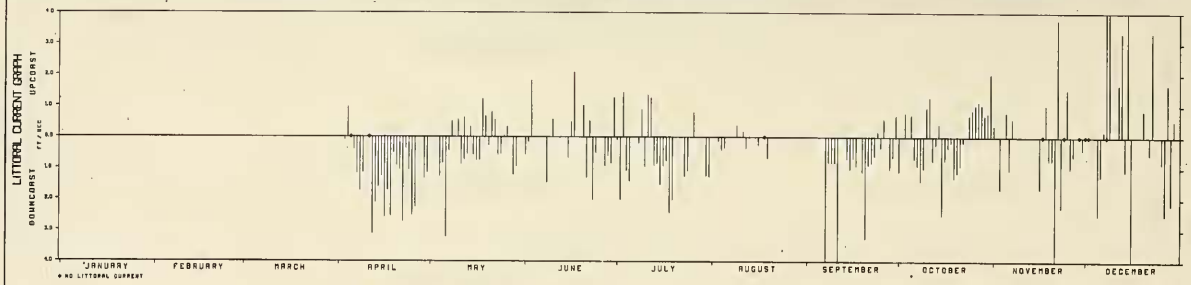


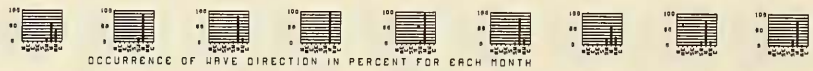


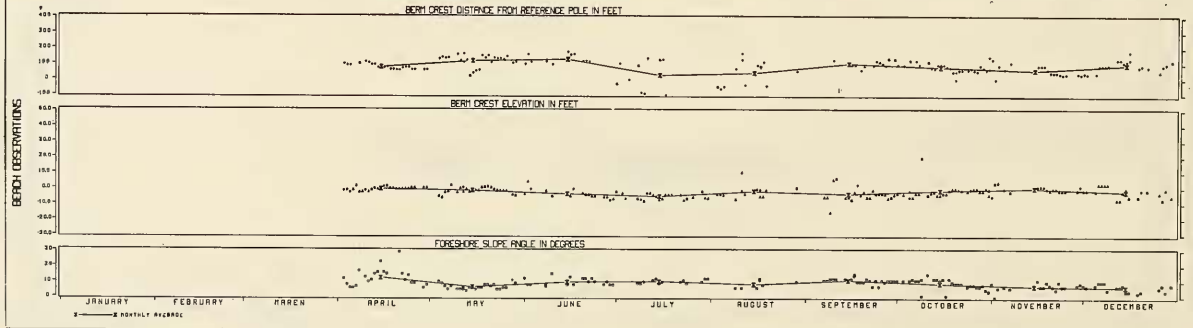

EL CAPITAN (05013) CALIFORNIA LEO DATA 1968
LITTORAL CURRENT GRAPH
DOWNCOAST
UPCOAST
FT./SEC
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER
OCCURRENCE OF WAVE DIRECTION IN PERCENT FOR EACH MONTH
OCCURRENCE OF WIND DIRECTION IN PERCENT FOR EACH MONTH
BERM CREST DISTANCE FROM REFERENCE POLE IN FEET
BERM CREST ELEVATION IN FEET
FORESHORE SLOPE ANGLE IN DEGREES
BEACH OBSERVATIONS


GOAT ROCK (05020) CALIFORNIA LEO DATA 1968
LITTORAL CURRENT GRAPH
DOWNCOAST FT/SEC UPCOAST
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER
OCCURRENCE OF WAVE DIRECTION IN PERCENT FOR EACH MONTH
OCCURRENCE OF WIND DIRECTION IN PERCENT FOR EACH MONTH
BEACH OBSERVATIONS
BERM CREST DISTANCE FROM REFERENCE POLE IN FEET
BERM CREST ELEVATION IN FEET
FORESHORE SLOPE ANGLE IN DEGREES
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER

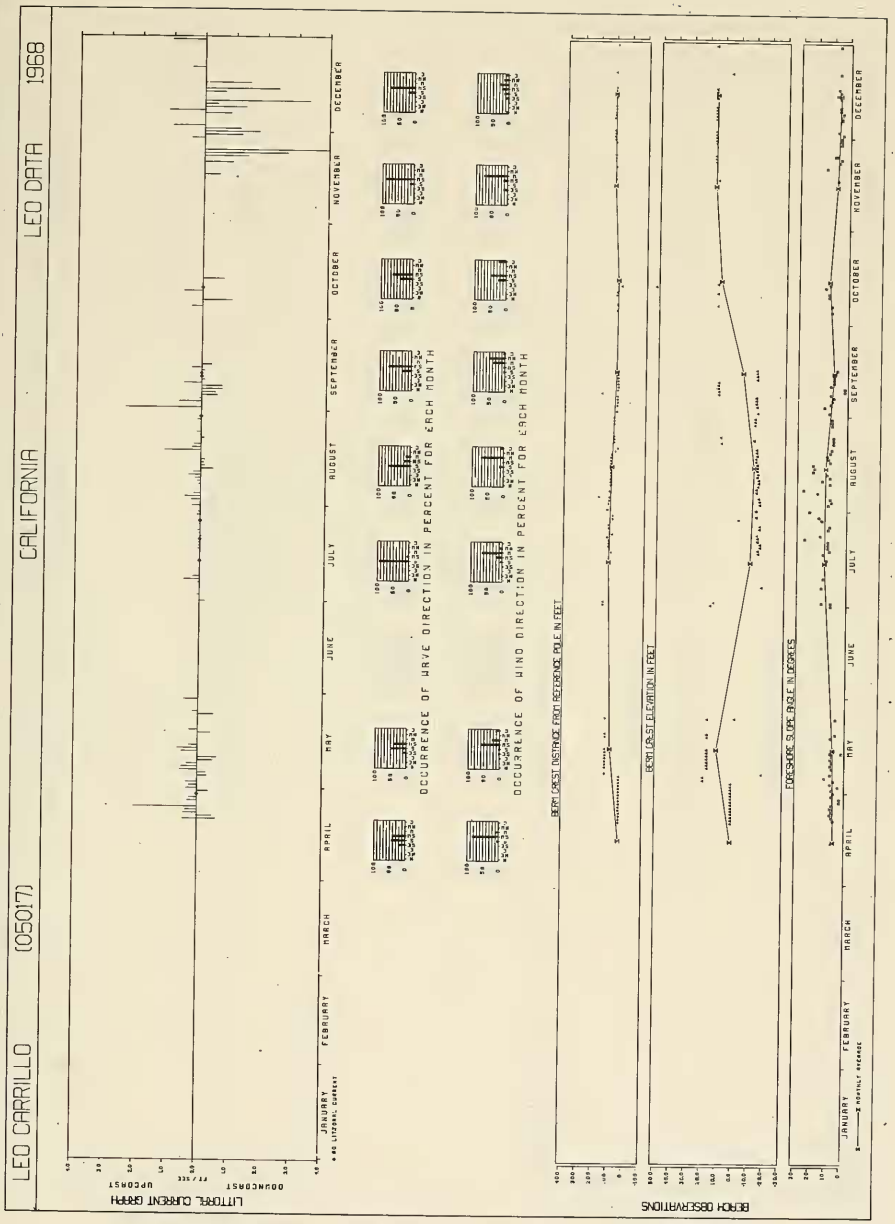
FRANCIS (05003) CALIFORNIA LEO DATA 1968



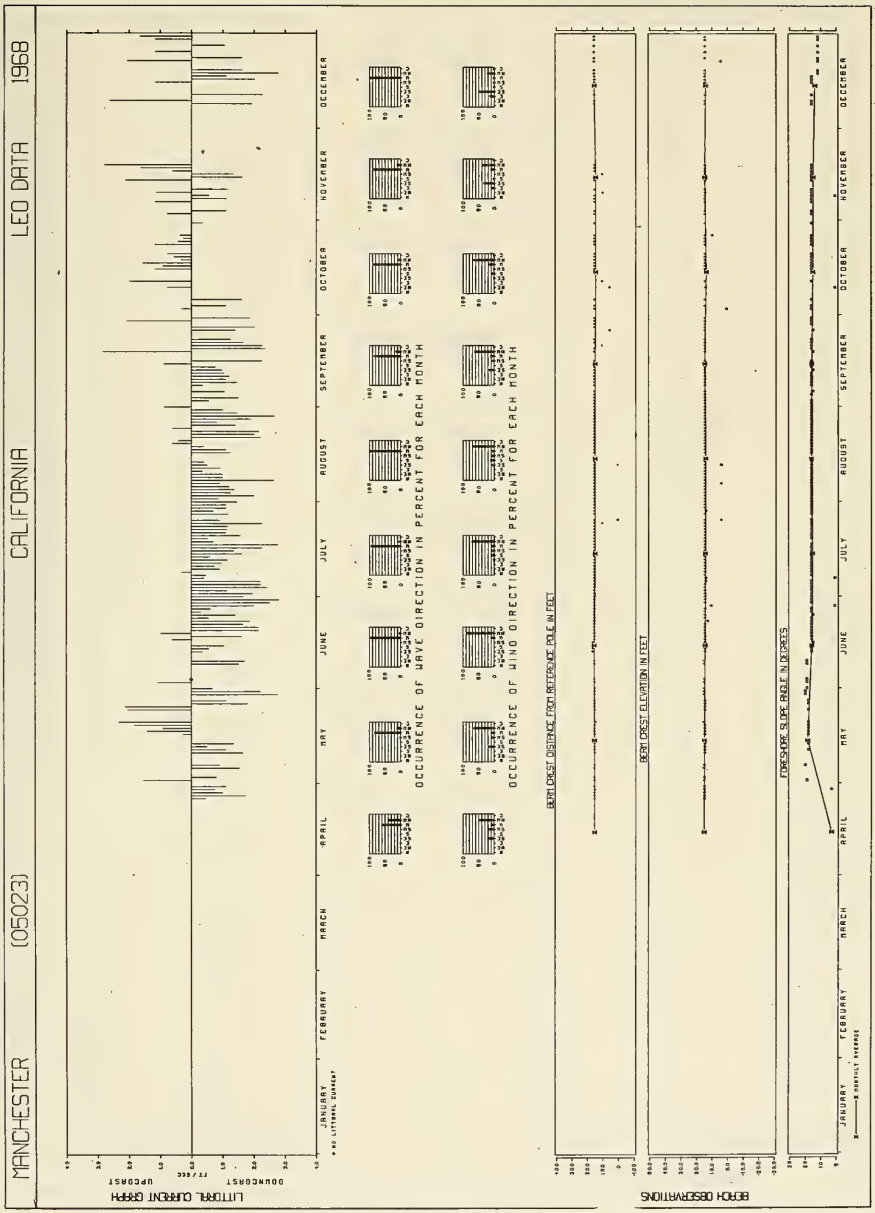


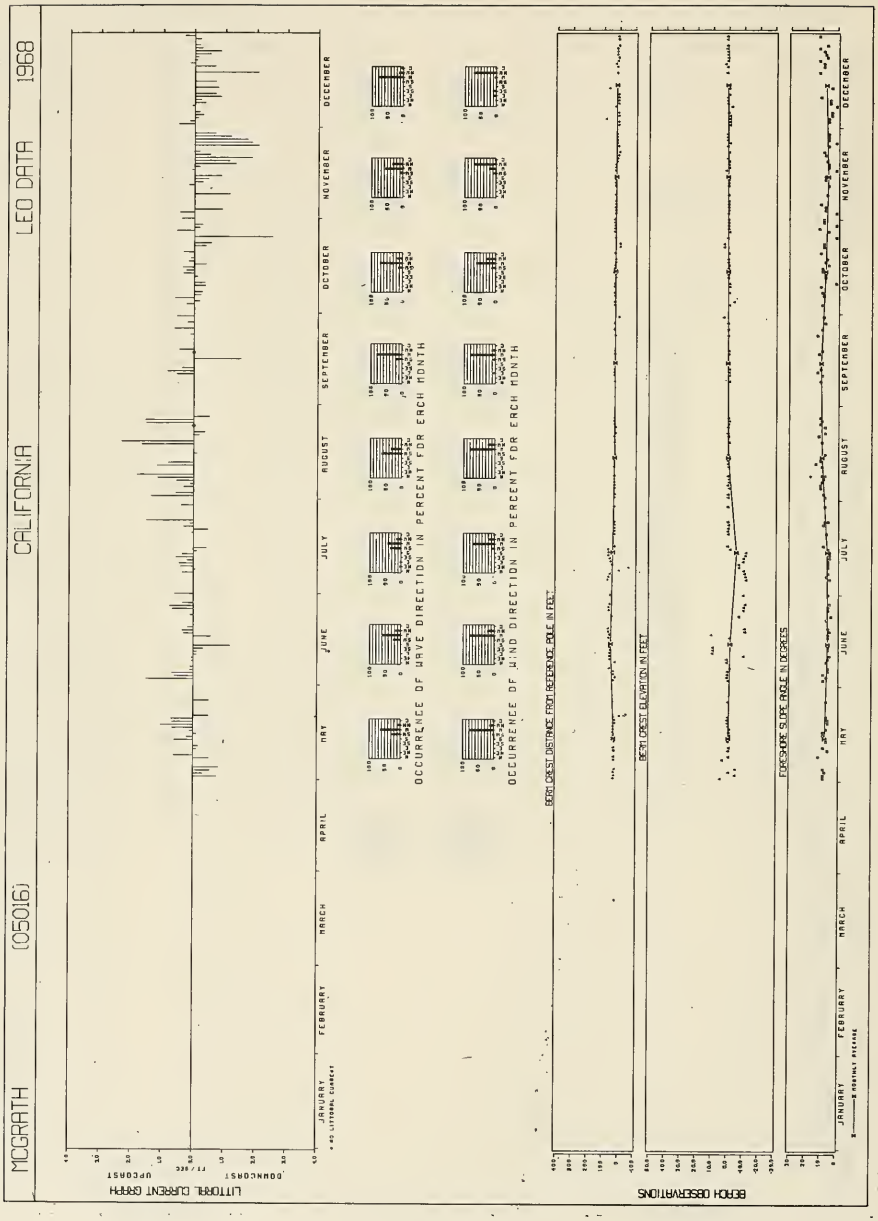


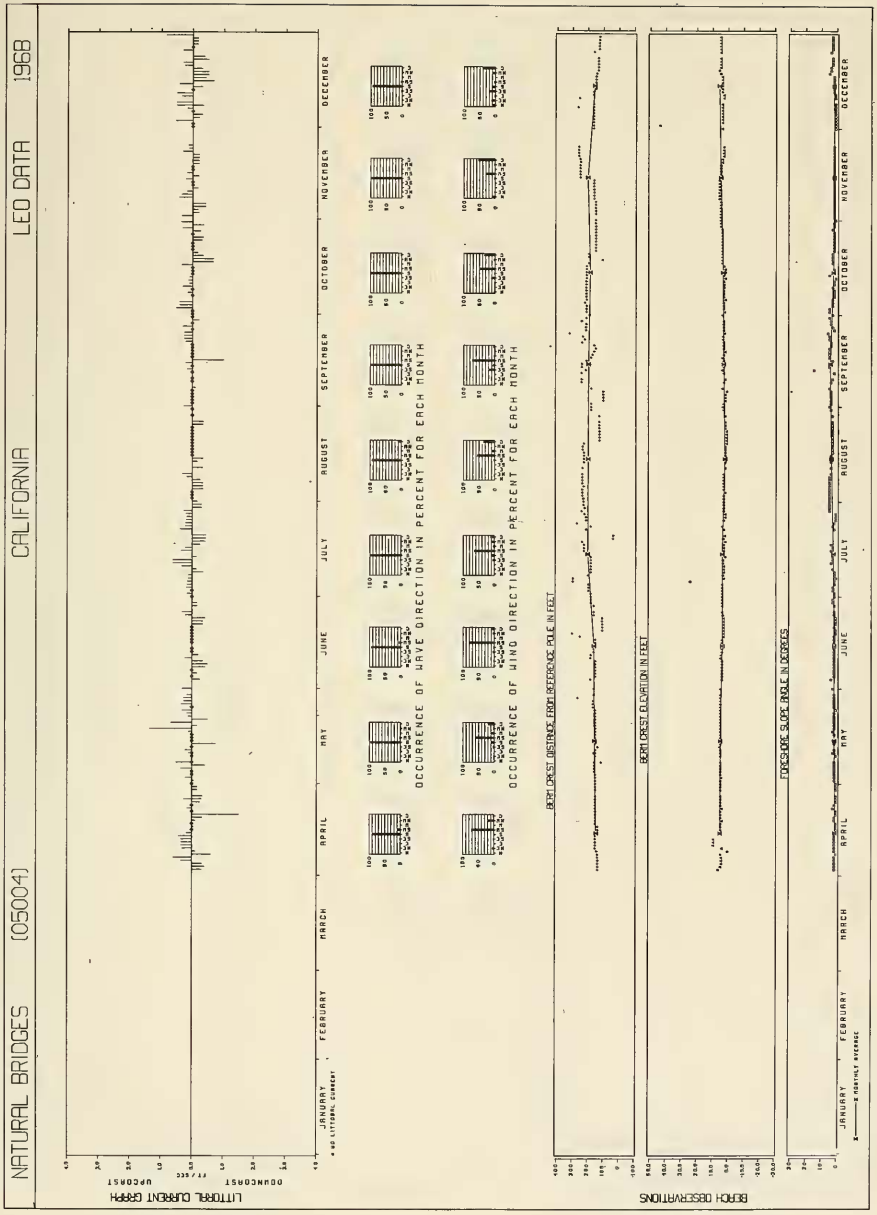
HUNTINGTON (050271) CALIFORNIA LEO DATA 1968
LITTORAL CURRENT GRAPH
DOWNCOAST
UPCOAST
FT / SEC
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER
OCCURRENCE OF WAVE DIRECTION IN PERCENT FOR EACH MONTH
OCCURRENCE OF WIND DIRECTION IN PERCENT FOR EACH MONTH
BEACH OBSERVATIONS
BEACH PROFILE DISTANCE FROM REFERENCE POLE IN FEET
BEACH PROFILE ELEVATION IN FEET
FORESHORE SLOPE ANGLE IN DEGREES


LEO CARRILLO (05017) CALIFORNIA LEO DATA 1968
LITTORAL CURRENT GRAPH
DOWNCOAST
UPCOAST
FT/SEC
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
OCCURRENCE OF WAVE DIRECTION IN PERCENT FOR EACH MONTH
OCCURRENCE OF WIND DIRECTION IN PERCENT FOR EACH MONTH
BERM CREST DISTANCE FROM REFERENCE POLE IN FEET
BERM ELEVATION IN FEET
FORESHORE SLOPE ANGLE IN DEGREES
BEACH OBSERVATIONS

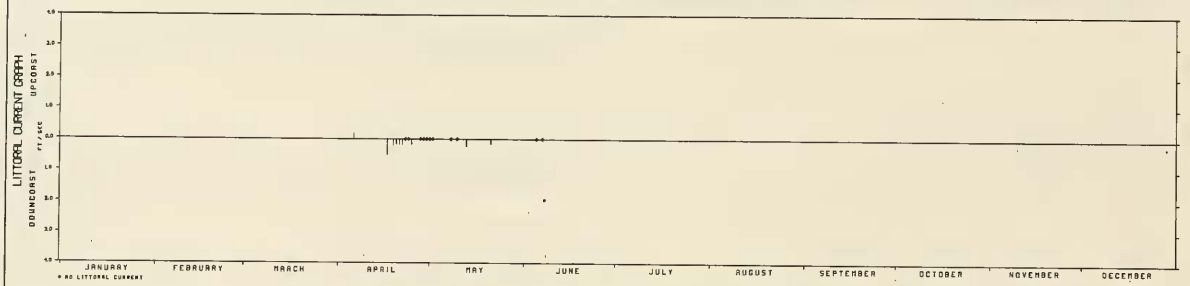
MACKERRICHER (05026) CALIFORNIA LEO DATA 1968
LITTORAL CURRENT GRAPH
DOWNCOAST
UPCOAST
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
OCCURRENCE OF WAVE DIRECTION IN PERCENT FOR EACH MONTH
OCCURRENCE OF WIND DIRECTION IN PERCENT FOR EACH MONTH
BEACH OBSERVATIONS
BERM CREST DISTANCE FROM REFERENCE POLE IN FEET
BERM CREST ELEVATION IN FEET
FORESHORE SLOPE ANGLE IN DEGREES


MANCHESTER (05023) CALIFORNIA LEO DATA 1968
LITTORAL CURRENT GRAPH
DOWNCOAST UPCOAST
FT/SEC
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER
* NO LITTORAL CURRENT
OCCURRENCE OF WAVE DIRECTION IN PERCENT FOR EACH MONTH
OCCURRENCE OF WIND DIRECTION IN PERCENT FOR EACH MONTH
BEACH CREST DISTANCE FROM REFERENCE POLE IN FEET
BEACH CREST ELEVATION IN FEET
FORESHORE SLOPE ANGLE IN DEGREES
BEACH OBSERVATIONS
* MONTHLY AVERAGE


MCGRATH (05016) CALIFORNIA LEO DATA 1968
LITTORAL CURRENT GRAPH
OFFSHORE
UPCOAST
FT/SEC
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
OCCURRENCE OF WAVE DIRECTION IN PERCENT FOR EACH MONTH
OCCURRENCE OF WIND DIRECTION IN PERCENT FOR EACH MONTH
BERM OBSERVATIONS
BERM CREST DISTANCE FROM REFERENCE POLE IN FEET
BERM CREST ELEVATION IN FEET
FORESHORE SLOPE ANGLE IN DEGREES


NATURAL BRIDGES (05004) CALIFORNIA LEO DATA 1968
LITTORAL CURRENT GRAPH
DOWNCOAST
UPCOAST
FT/SEC
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
OCCURRENCE OF WAVE DIRECTION IN PERCENT FOR EACH MONTH
OCCURRENCE OF WIND DIRECTION IN PERCENT FOR EACH MONTH
BEACH CREST DISTANCE FROM REFERENCE POLE IN FEET
BEACH CREST ELEVATION IN FEET
BEACH OBSERVATIONS
FORESHORE SLOPE ANGLE IN DEGREES

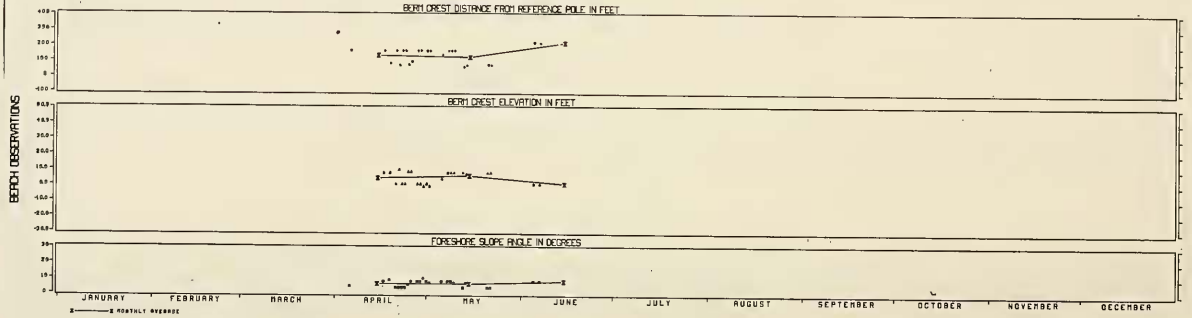
NEW BRIGHTON (05001) CALIFORNIA LEO DATA 1968

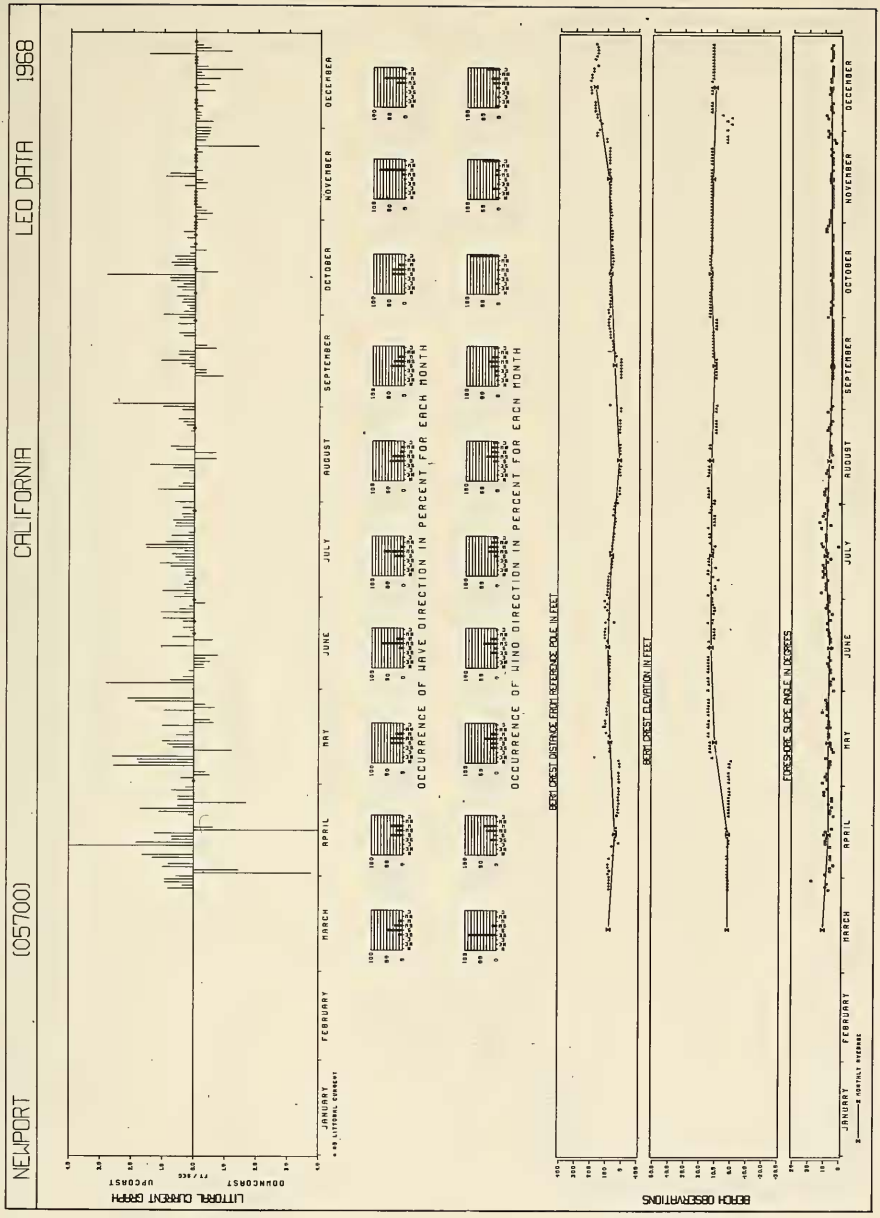


OCCURRENCE OF WAVE DIRECTION IN PERCENT FOR EACH MONTH

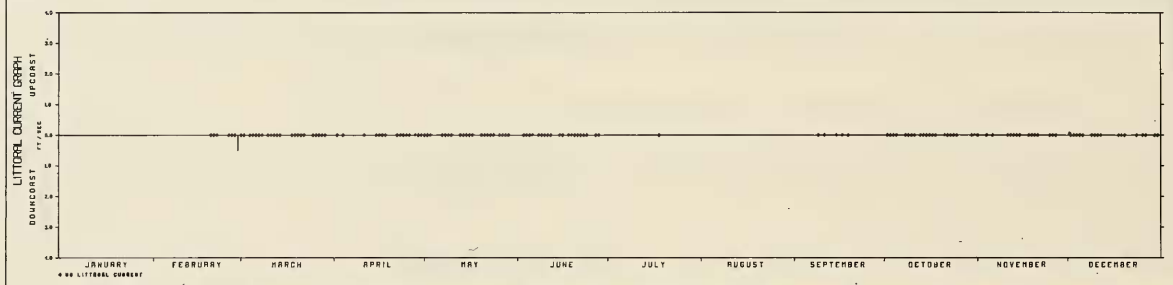
OCCURRENCE OF WIND DIRECTION IN PERCENT FOR EACH MONTH

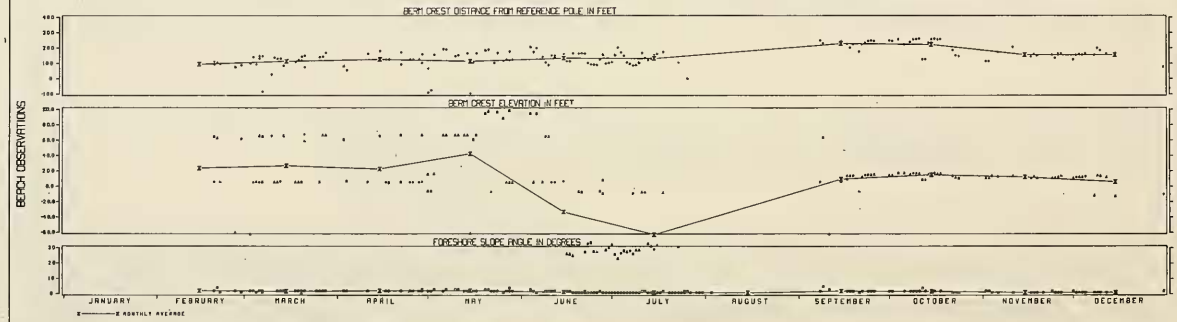
BEACH OBSERVATIONS




NEWPORT (05700) CALIFORNIA LEO DATA 1968
LITTORAL CURRENT GRAPH
DOWNCOAST
UPCOAST
FT/SEC
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
OCCURRENCE OF WAVE DIRECTION IN PERCENT FOR EACH MONTH
OCCURRENCE OF WIND DIRECTION IN PERCENT FOR EACH MONTH
BEACH OBSERVATIONS
BEACH CREST DISTANCE FROM REFERENCE POLE IN FEET
BEACH CREST ELEVATION IN FEET
FORESHORE SLOPE ANGLE IN DEGREES

PISMO (05012) CALIFORNIA LEO DATA 1968





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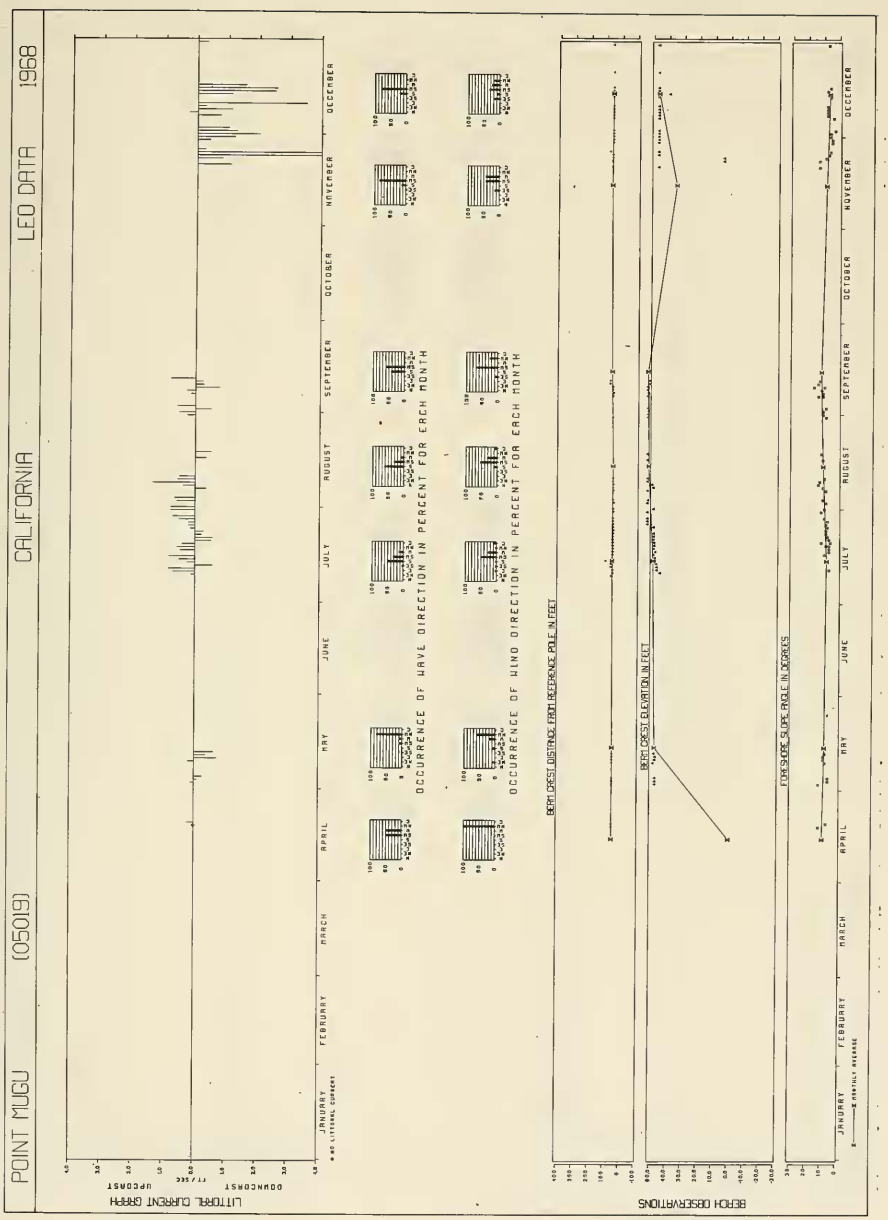
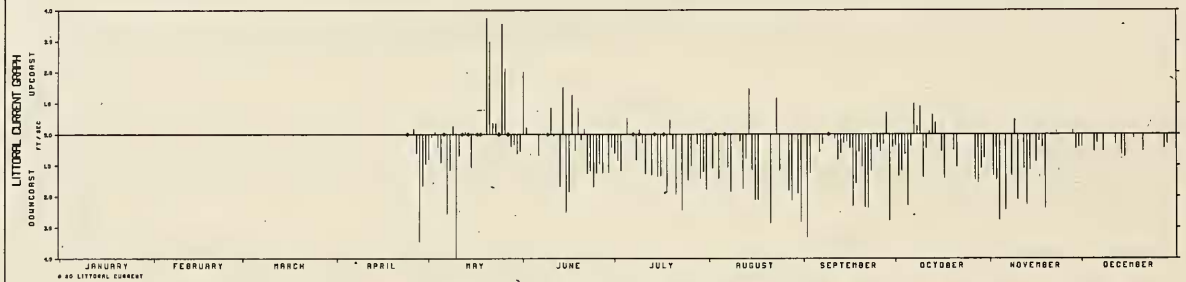
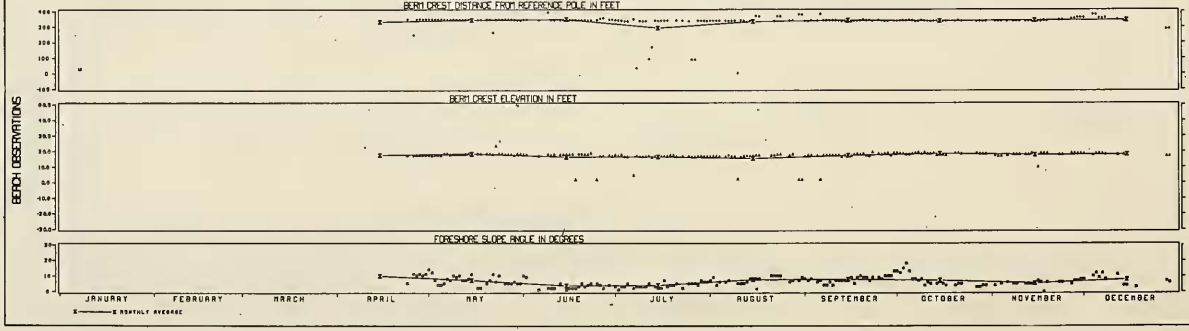
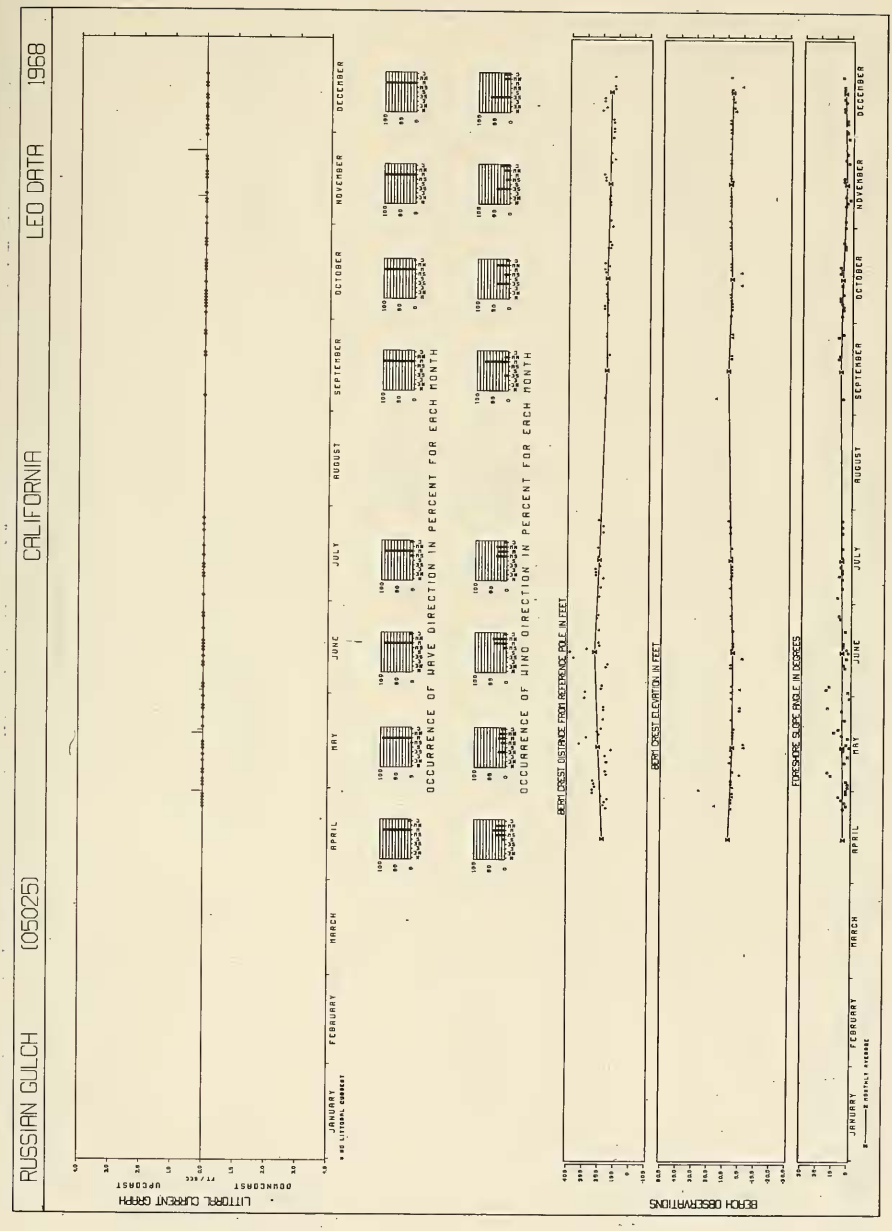

POINT MUGU (05019) CALIFORNIA LEO DATA 1968
LITTORAL CURRENT GREEN
DOWNCOAST FT/SEC UPCOAST
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER
OCCURRENCE OF WAVE DIRECTION IN PERCENT FOR EACH MONTH
OCCURRENCE OF WIND DIRECTION IN PERCENT FOR EACH MONTH
BEACH OBSERVATIONS
BERM CREST DISTANCE FROM REFERENCE PILE IN FEET
BERM CREST ELEVATION IN FEET
FORESHORE SLOPE ANGLE IN DEGREES

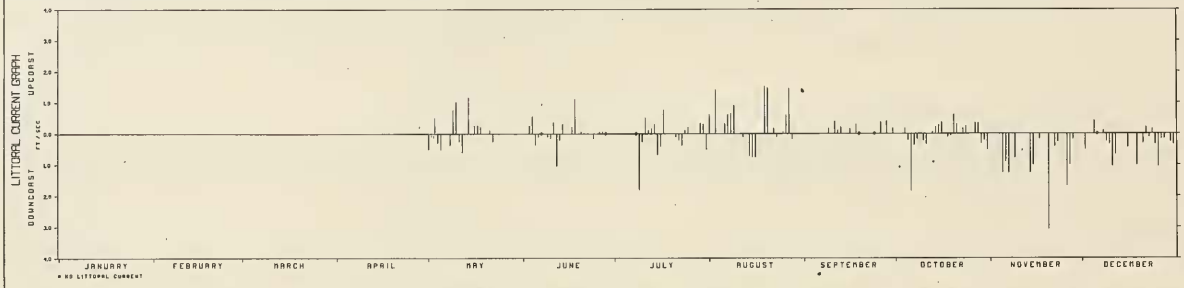
PRAIRIE CREEK REDWOODS(05036) CALIFORNIA LEO DATA 1968

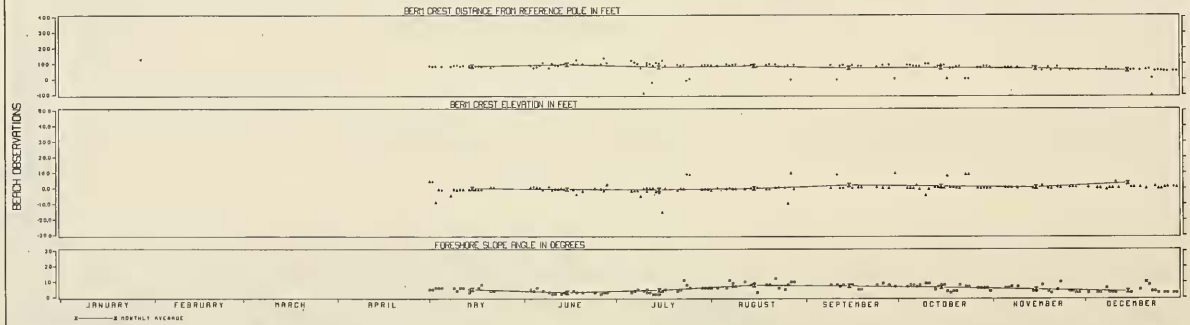





RUSSIAN GULCH (05025) CALIFORNIA LEO DATA 1968
LITTORAL CURRENT GRAPH
DOWNCOAST
UPCOAST
FT/SEC
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
OCCURRENCE OF WAVE DIRECTION IN PERCENT FOR EACH MONTH
OCCURRENCE OF WIND DIRECTION IN PERCENT FOR EACH MONTH
BEACH CREST DISTANCE FROM REFERENCE POLE IN FEET
BEACH CREST ELEVATION IN FEET
FORESHORE SLOPE FROM POLE IN DEGREES
BEACH OBSERVATIONS

SAN BUENAVENTURA (05015) CALIFORNIA LEO DATA 1968





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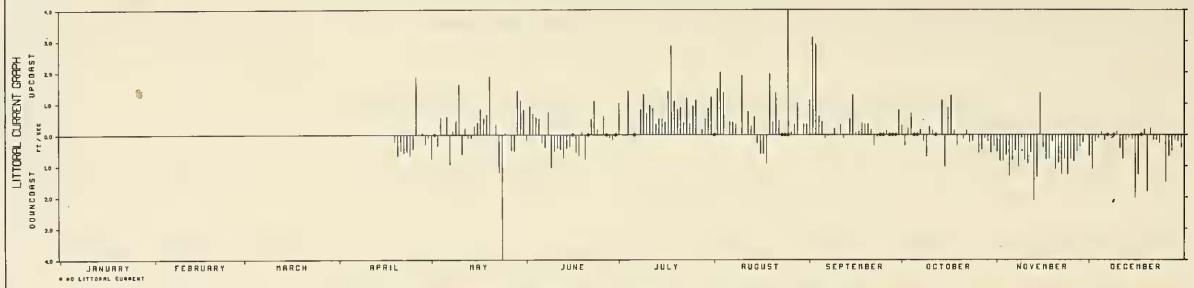
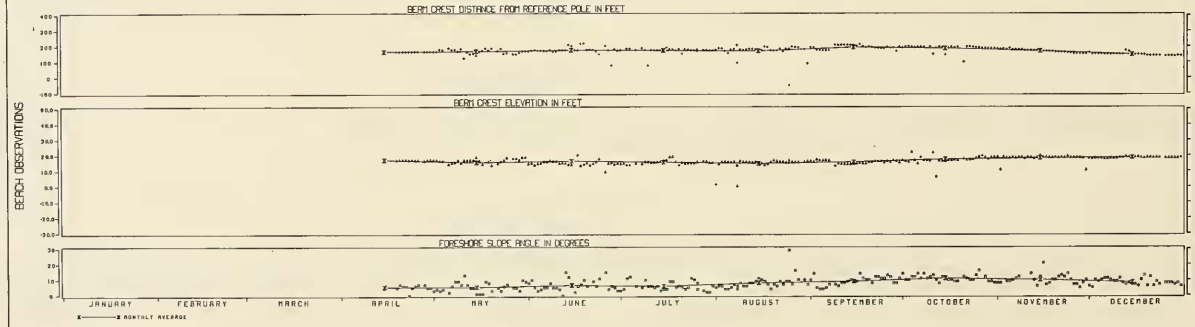
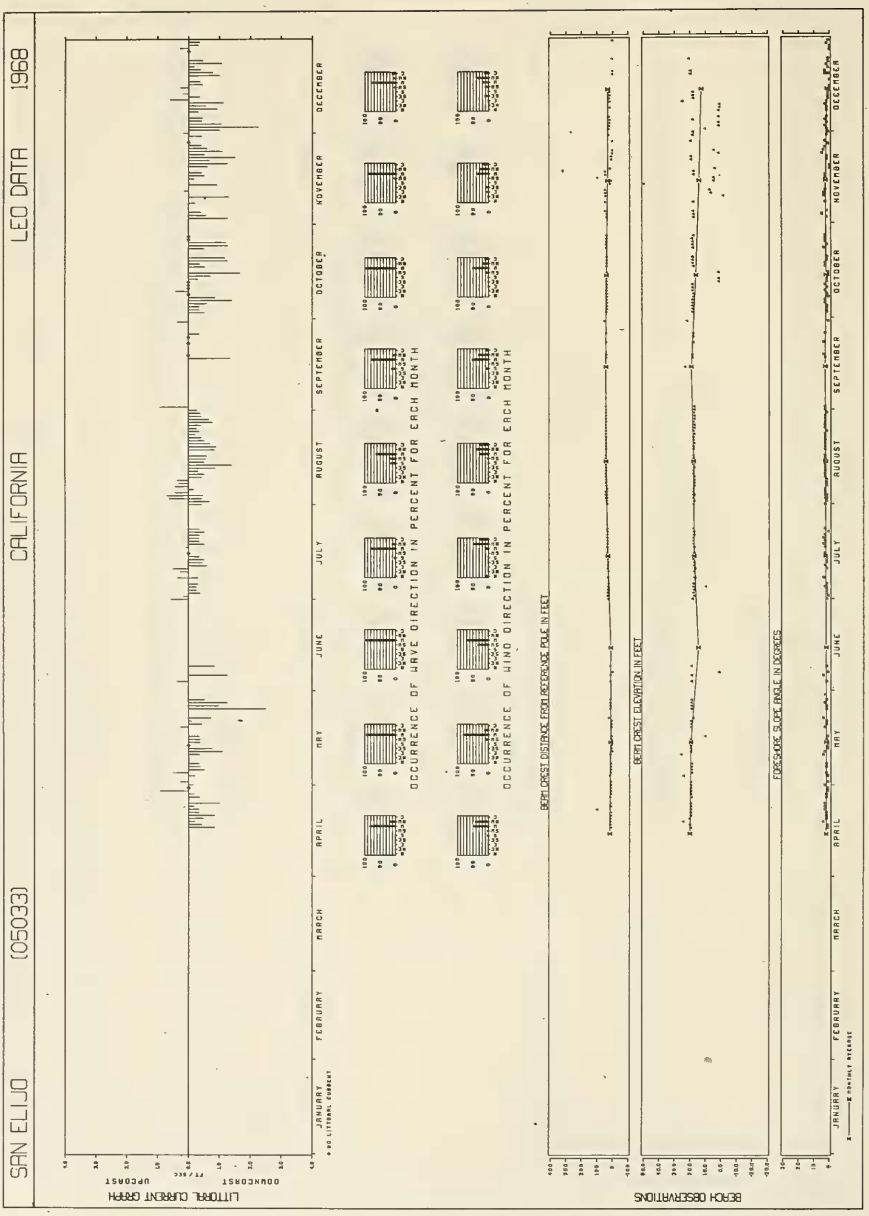
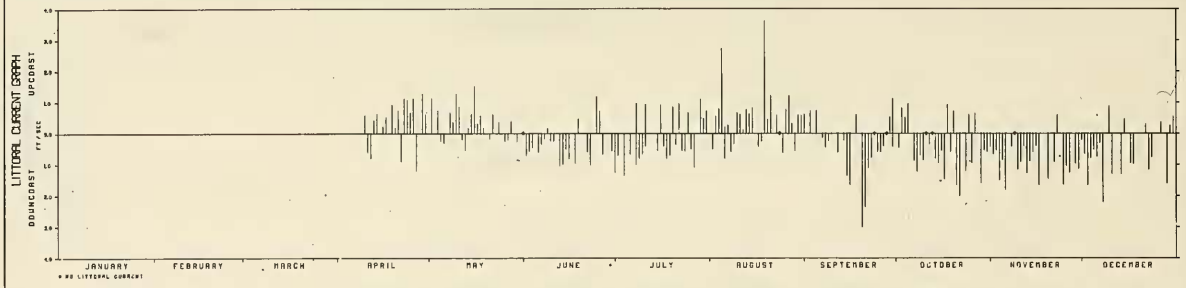
SAN CLEMENTE (05029) CALIFORNIA LEO DATA 1968



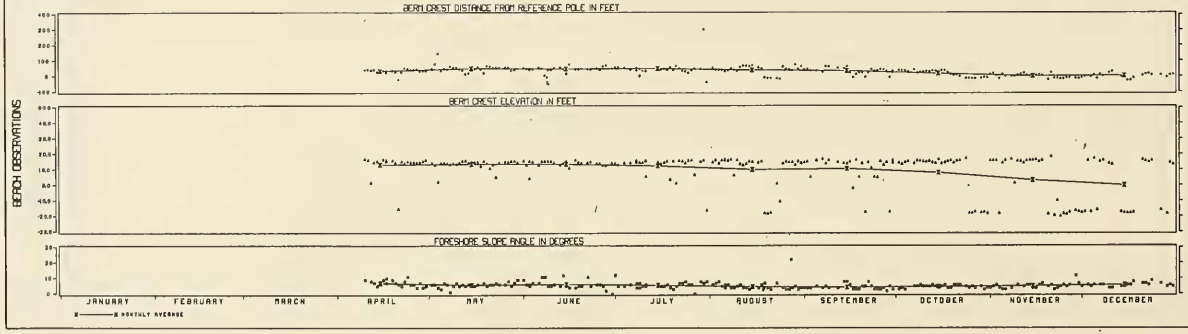


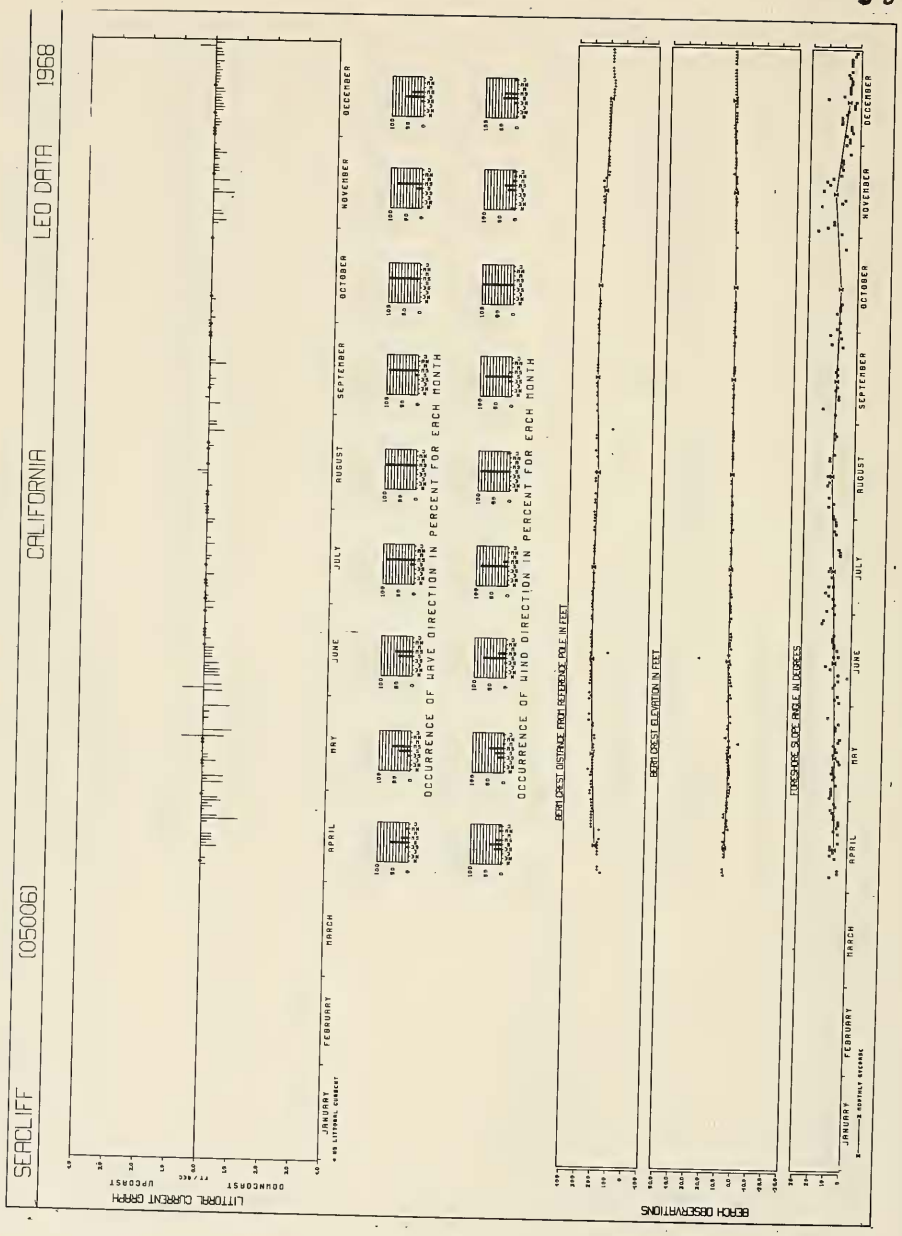

SAN ELIJO (05033) CALIFORNIA LEO DATA 1968
LITTORAL CURRENT GRAPH
DOWNCOAST
UPCOAST
FT/SEC
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER
OCCURRENCE OF WAVE DIRECTION IN PERCENT FOR EACH MONTH
OCCURRENCE OF WIND DIRECTION IN PERCENT FOR EACH MONTH
BERM CREST DISTANCE FROM REFERENCE POLE IN FEET
BERM CREST ELEVATION IN FEET
FORESHORE SLOPE ANGLE IN DEGREES
BEACH OBSERVATIONS

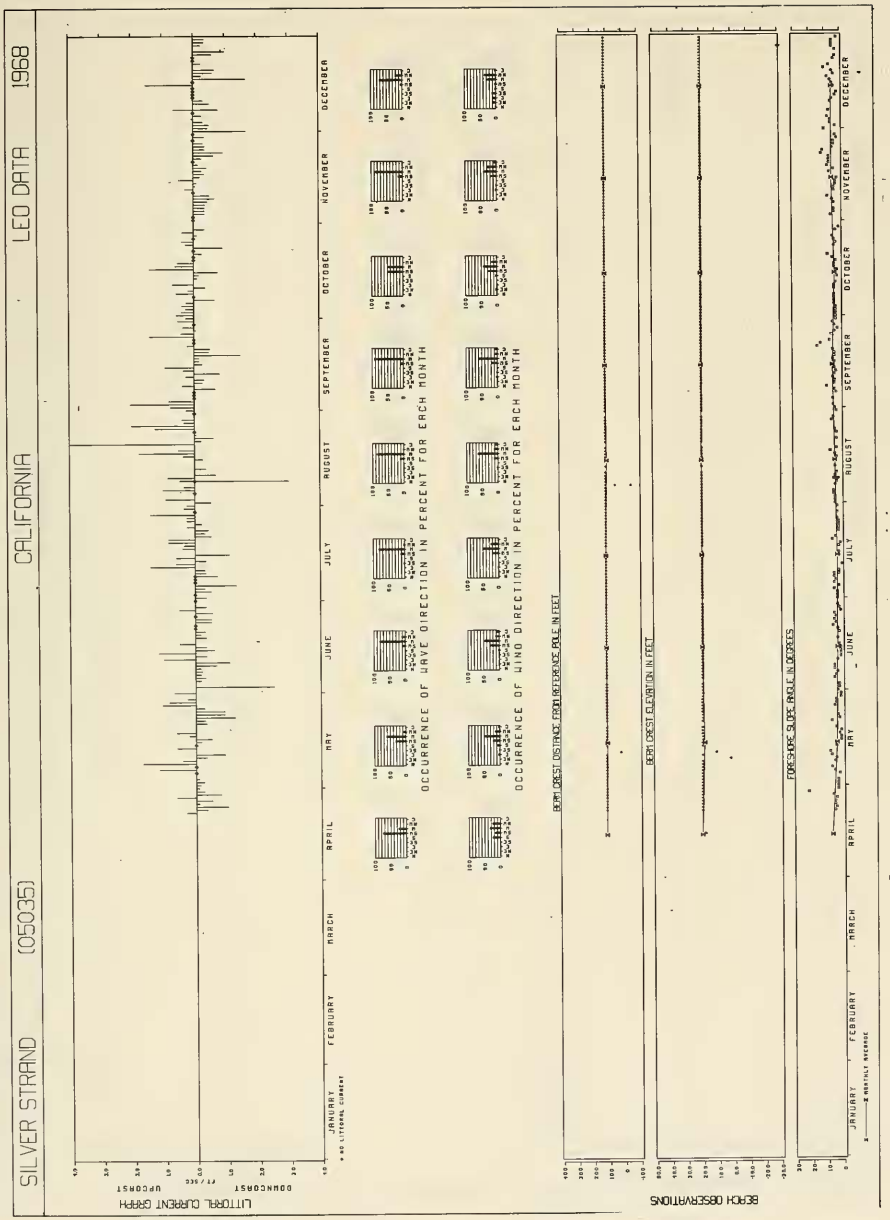

LITTORAL CURRENT GRAPH
DOWNCOAST FT/SEC UPCOAST
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
= NO LITTORAL CURRENT


OCCURRENCE OF WAVE DIRECTION IN PERCENT FOR EACH MONTH

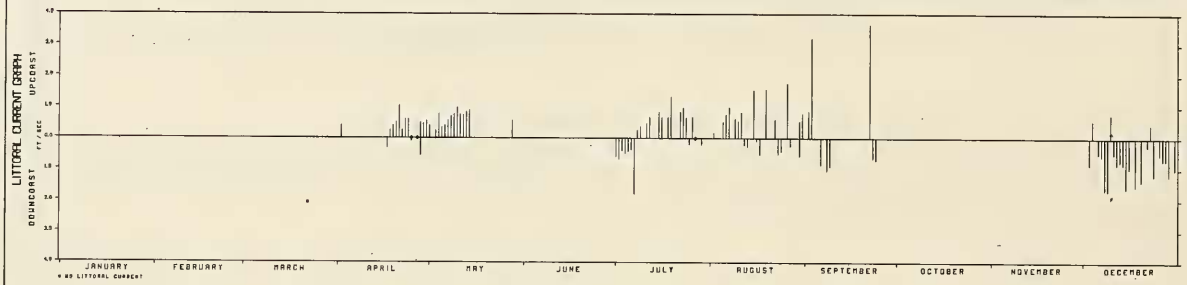

OCCURRENCE OF WIND DIRECTION IN PERCENT, FOR EACH MONTH

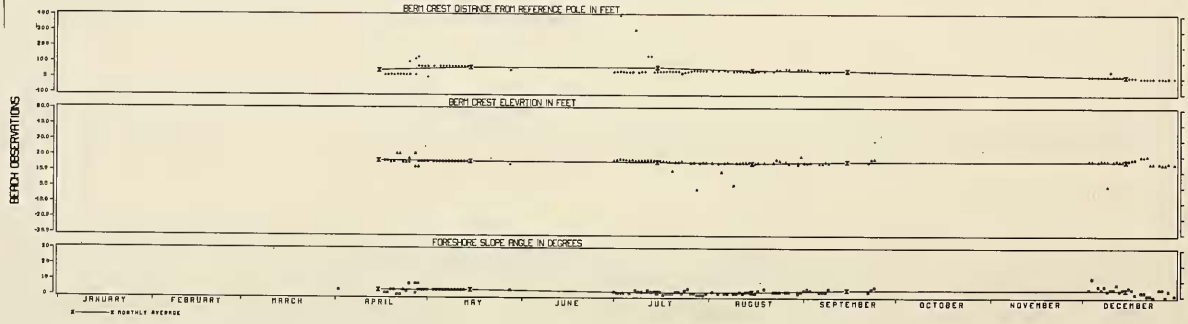

BEACH OBSERVATIONS
BERM CREST DISTANCE FROM REFERENCE POLE IN FEET
BERM CREST ELEVATION IN FEET
FORESHORE SLOPE ANGLE IN DEGREES
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
= MONTHLY AVERAGE

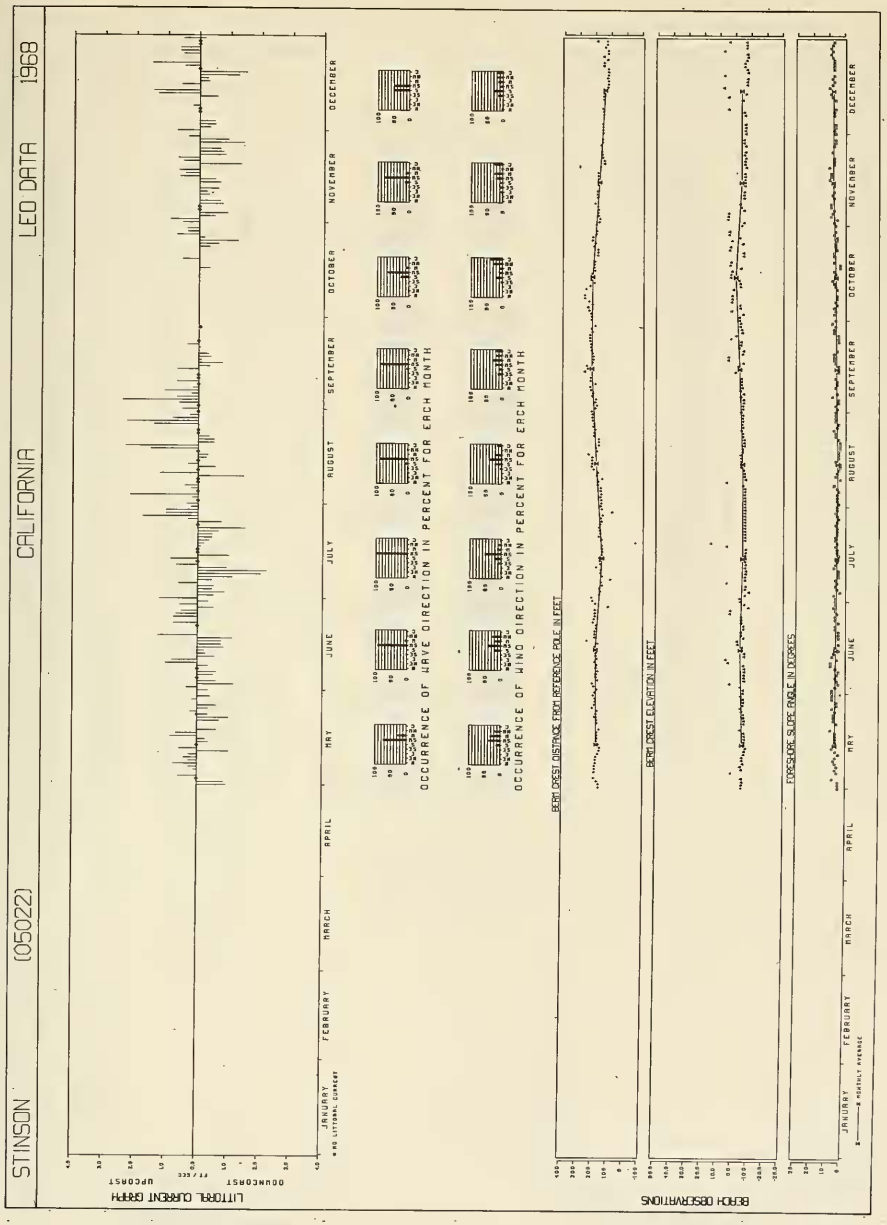

SEACLIFF (05006) CALIFORNIA LEO DATA 1968
LITTORAL CURRENT GRAPH
DOWNCOAST
UPCOAST
FT/SEC
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
OCCURRENCE OF WAVE DIRECTION IN PERCENT FOR EACH MONTH
OCCURRENCE OF WIND DIRECTION IN PERCENT FOR EACH MONTH
BERM CREST DISTANCE FROM REFERENCE POLE IN FEET
BERM CREST ELEVATION IN FEET
FORESHORE SLOPE FROM 0 TO 3 FEET IN DEGREES
BEACH OBSERVATIONS


SILVER STRAND (05035) CALIFORNIA LEO DATA 1968
LITTORAL CURRENT GRAPH
DOWNCOAST
UPCOAST
FT/SEC
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
OCCURRENCE OF WAVE DIRECTION IN PERCENT FOR EACH MONTH
OCCURRENCE OF WIND DIRECTION IN PERCENT FOR EACH MONTH
BERM CREST DISTANCE FROM REFERENCE POLE IN FEET
BERM CREST ELEVATION IN FEET
FORESHORE SLOPE FROM IN DEGREES
BEACH OBSERVATIONS

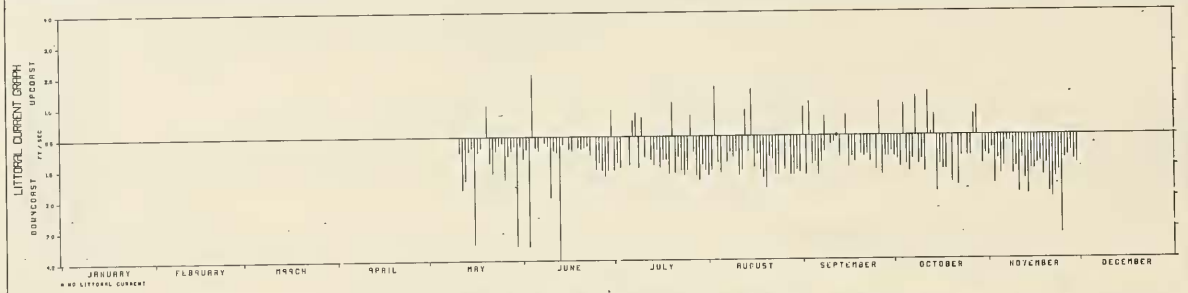
SOUTH CARLSBAD (05031) CALIFORNIA LEO DATA 1968

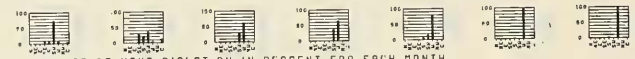


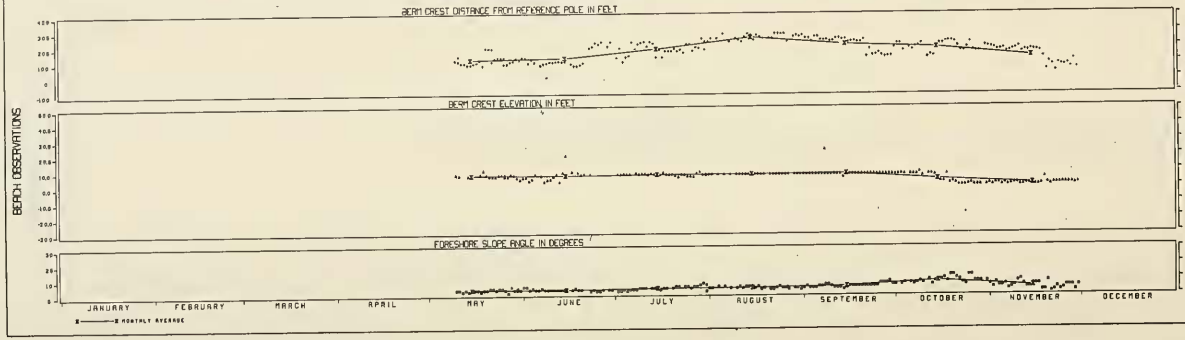



STINSON (05022) CALIFORNIA LEO DATA 1968
LITTORAL CURRENT GRAPH
DOWNCOAST
UPCOAST
FT/SEC
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
OCCURRENCE OF WAVE DIRECTION IN PERCENT FOR EACH MONTH
OCCURRENCE OF WIND DIRECTION IN PERCENT FOR EACH MONTH
BERM CREST OFFTRACK FROM REFERENCE POLE IN FEET
BERM CREST ELEVATION IN FEET
FORESLOPE SLOPE ANGLE IN DEGREES
BEACH OBSERVATIONS

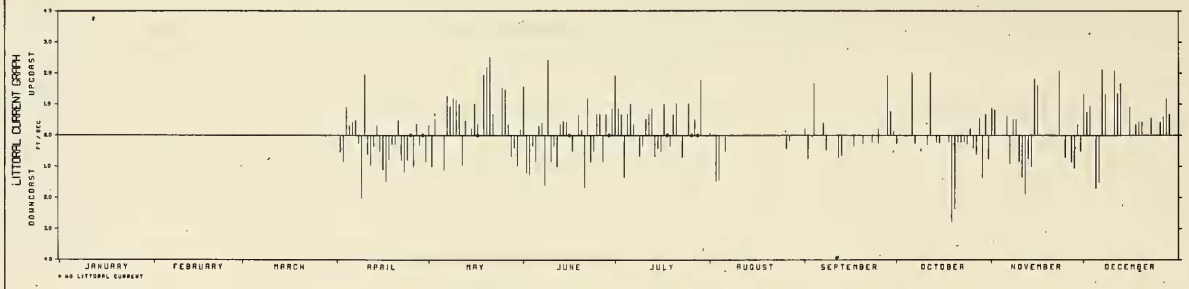
SUNSET (05007) CALIFORNIA LEO DATA 1968

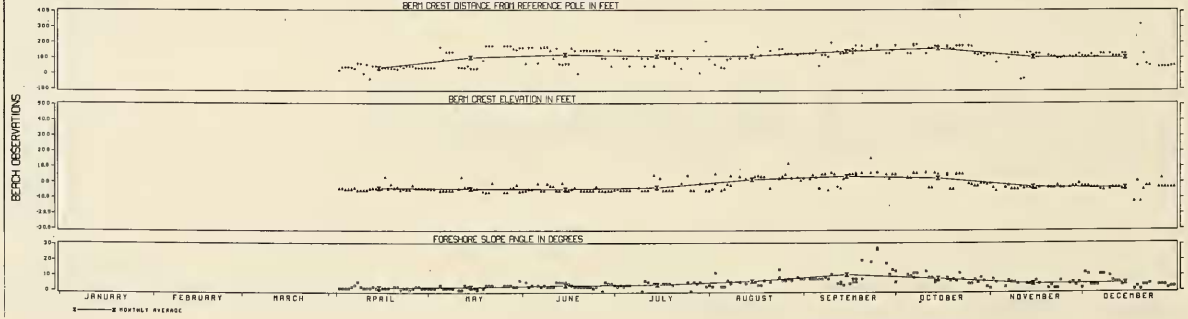


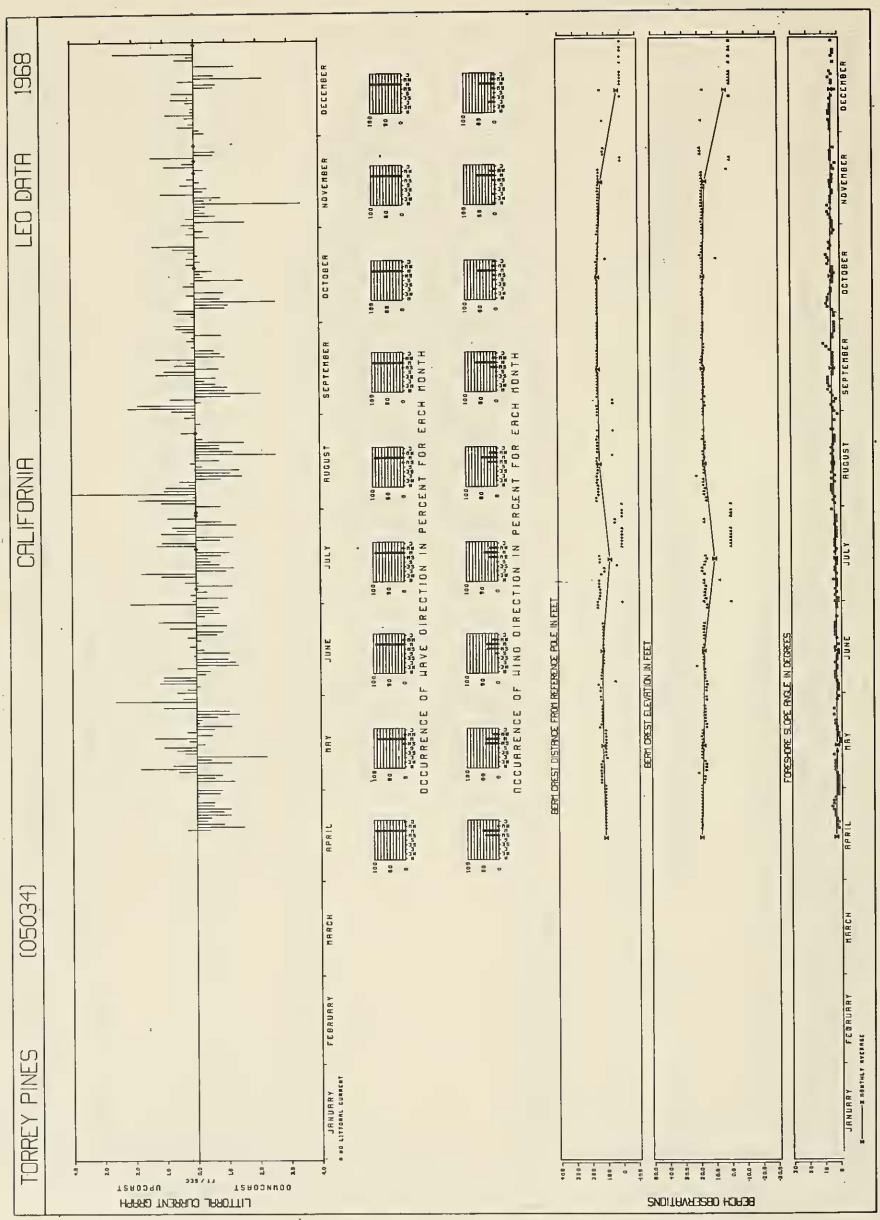




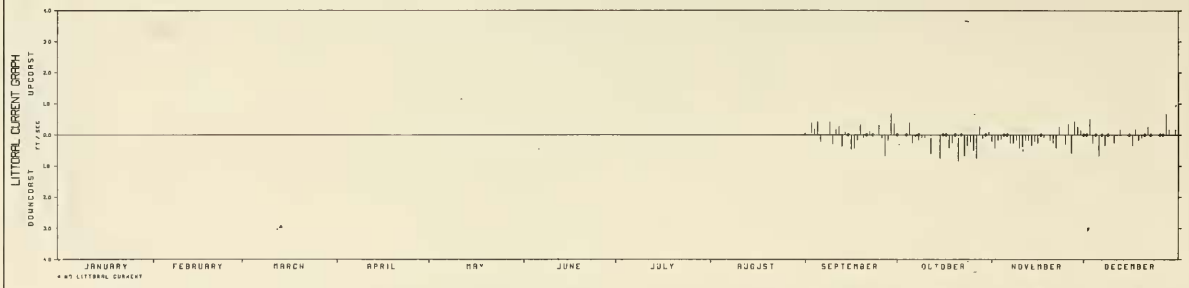
THORNTON (05002) CALIFORNIA LEO DATA 1968

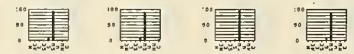




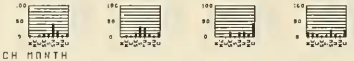

TORREY PINES (05034) CALIFORNIA LEO DATA 1968
LITTORAL CURRENT GRAPH
DOWNCOAST
UPCOAST
FT/SEC
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
OCCURRENCE OF WAVE DIRECTION IN PERCENT FOR EACH MONTH
OCCURRENCE OF WIND DIRECTION IN PERCENT FOR EACH MONTH
BERM CREST DISTANCE FROM REFERENCE POLE IN FEET
BERM CREST ELEVATION IN FEET
FORESHORE SLOPE ANGLE IN DEGREES
BEACH OBSERVATIONS

TWIN LAKES (05005) CALIFORNIA LEO DATA 1968

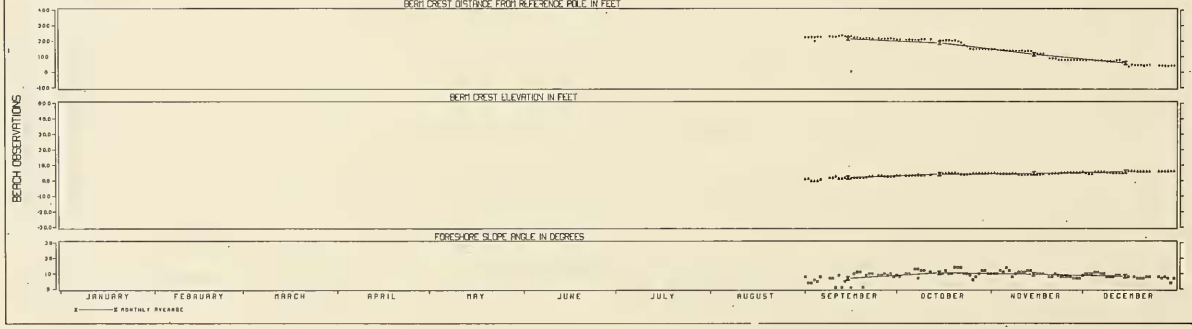




OCCURRENCE OF WAVE DIRECTION IN PERCENT FOR EACH MONTH

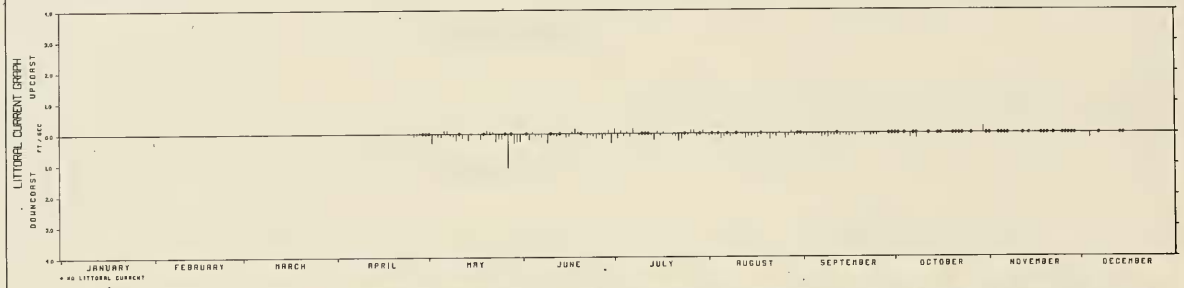


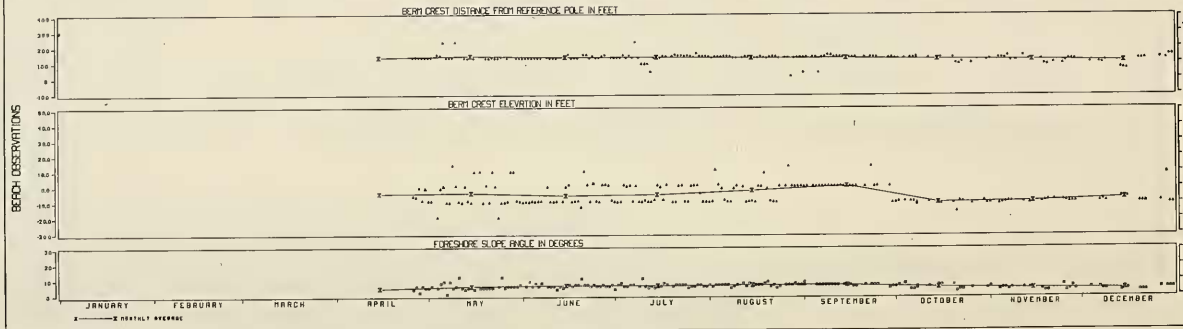
OCCURRENCE OF WIND DIRECTION IN PERCENT FOR EACH MONTH



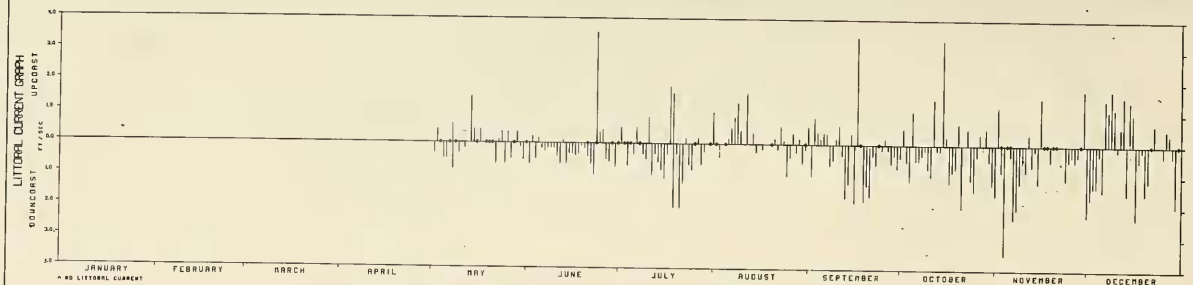
C-33

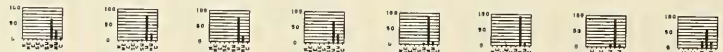
VAN DAMME (05024) CALIFORNIA LEO DATA 1968

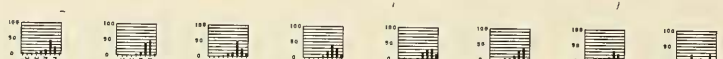


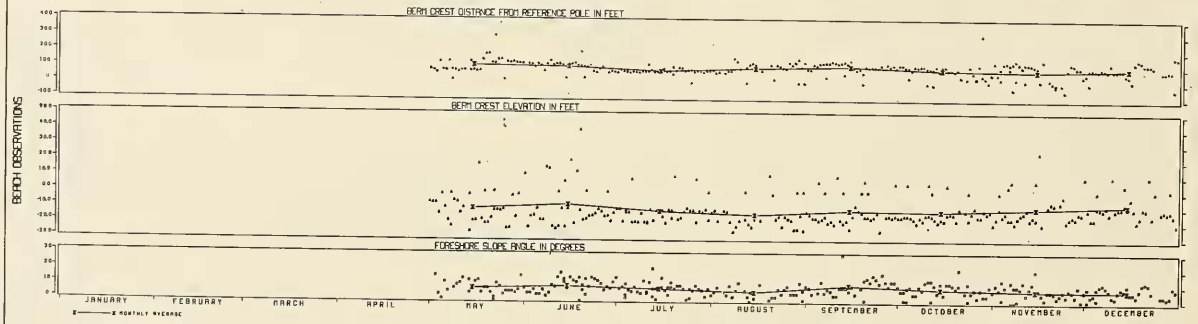


WRIGHT'S (05021) CALIFORNIA LEO DATA 1968









APPENDIX D

TABLES OF THE MONTHLY AVERAGES OF WAVE PERIOD AND HEIGHT AND PERCENT OCCURRENCE OF THE TYPE OF WAVE FOR EACH STATION

INDEX

NEW BRIGHTON (05001)

MONTH	NUMBER OF OBS	WAVE HEIGHT (FT)	WAVE PERIOD (SEC)	TYPE OF BREAKING WAVE SPILLING (%)	PLUNGING (%)	SURGING (%)
JAN	NO RECORD					
FEB	NO RECORD					
MAR	NO RECORD					
APR	13	2.7	10.74	100.0	.0	.0
MAY	7	2.0	7.76	86.7	13.3	.0
JUN	3	2.0	10.83	100.0	.0	.0
JUL	NO RECORD					
AUG	NO RECORD					
SEP	NO RECORD					
OCT	NO RECORD					
NOV	NO RECORD					
DEC	NO RECORD					
YEAR	23	2.4	9.84	94.6	5.4	.0

THORNTON (05002)

MONTH	NUMBER OF OBS	WAVE HEIGHT (FT)	WAVE PERIOD (SEC)	TYPE OF BREAKING WAVE SPILLING (%)	PLUNGING (%)	SURGING (%)
JAN	NO RECORD					
FEB	NO RECORD					
MAR	NO RECORD					
APR	56	4.0	12.75	14.0	82.5	3.5
MAY	53	3.6	10.93	.0	75.0	25.0
JUN	58	3.8	9.73	.0	72.4	27.6
JUL	44	4.0	9.15	6.5	84.8	8.7
AUG	17	3.8	14.79	3.7	92.6	3.7
SEP	31	3.1	10.94	54.3	45.7	.0
OCT	40	4.9	10.90	65.9	34.1	.0
NOV	45	4.8	11.13	30.4	69.6	.0
DEC	43	4.0	10.82	.0	100.0	.0
YEAR	387	4.0	10.99	17.9	73.2	8.9

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FRANCIS (05003)

MONTH	NUMBER OF OBS	WAVE HEIGHT (FT)	WAVE PERIOD (SEC)	TYPE OF BREAKING WAVE SPILLING (%)	PLUNGING (%)	SURGING (%)
JAN	NO RECORD					
FEB	NO RECORD					
MAR	NO RECORD					
APR	47	4.0	11.06	62.5	25.0	12.5
MAY	46	3.2	13.18	45.7	41.3	13.0
JUN	31	4.2	13.61	34.4	53.1	12.5
JUL	28	3.8	14.36	78.1	15.6	6.3
AUG	15	3.5	17.93	31.6	52.6	15.8
SEP	26	4.6	15.03	53.6	32.1	14.3
OCT	50	5.2	10.42	43.1	56.9	.0
NOV	34	5.1	10.13	48.6	51.4	.0
DEC	38	4.4	9.26	66.7	33.3	.0
YEAR	315	4.3	12.15	52.6	39.9	7.5

NATURAL BRIDGES (05004)

MONTH	NUMBER OF OBS	WAVE HEIGHT (FT)	WAVE PERIOD (SEC)	TYPE OF BREAKING WAVE SPILLING (%)	PLUNGING (%)	SURGING (%)
JAN	NO RECORD					
FEB	NO RECORD					
MAR	NO RECORD					
APR	37	3.6	12.55	35.7	32.1	32.1
MAY	46	3.1	13.36	35.5	38.7	25.8
JUN	47	2.7	14.02	46.0	34.0	20.0
JUL	60	2.3	14.56	66.7	28.1	5.3
AUG	55	3.1	14.07	59.3	38.9	1.9
SEP	55	2.0	13.17	80.7	17.5	1.8
OCT	61	2.9	13.56	58.1	41.9	.0
NOV	47	3.3	13.15	41.2	58.8	.0
DEC	52	3.1	9.80	61.4	31.6	7.0
YEAR	460	2.9	13.18	54.0	35.6	10.5

TWIN LAKES (05005)

MONTH	NUMBER OF OBS	WAVE HEIGHT (FT)	WAVE PERIOD (SEC)	TYPE OF BREAKING WAVE SPILLING (%)	PLUNGING (%)	SURGING (%)
JAN	NO RECORD					
FEB	NO RECORD					
MAR	NO RECORD					
APR	NO RECORD					
MAY	NO RECORD					
JUN	NO RECORD.					
JUL	NO RECORD					
AUG	NO RECORD					
SEP	51	2.0	13.58	8.9	91.1	.0
OCT	52	3.0	12.80	1.9	98.1	.0
NOV	57	2.8	12.33	5.2	93.1	1.7
DEC	41	2.8	12.31	32.7	65.4	1.9
YEAR	201	2.6	12.77	11.9	87.2	.9

SEACLIFF (05006)

MONTH	NUMBER OF OBS	WAVE HEIGHT (FT)	WAVE PERIOD (SEC)	TYPE OF BREAKING WAVE SPILLING (%)	PLUNGING (%)	SURGING (%)
JAN	NO RECORD					
FEB	NO RECORD					
MAR	NO RECORD					
APR	22	2.0	10.02	70.0	10.0	20.0
MAY	33	2.5	11.25	23.5	41.2	35.3
JUN	21	2.8	11.08	18.5	59.3	22.2
JUL	22	2.4	12.00	13.6	50.0	36.4
AUG	15	2.6	11.85	6.7	60.0	33.3
SEP	15	2.3	11.81	26.7	20.0	53.3
OCT	7	2.7	12.44	.0	75.0	25.0
NOV	21	3.5	11.40	9.5	81.0	9.5
DEC	34	3.8	11.64	29.4	67.6	2.9
YEAR	190	2.8	11.40	26.2	49.5	24.3

SUNSET (05007)

MONTH	NUMBER OF OBS	WAVE HEIGHT (FT)	WAVE PERIOD (SEC)	TYPE OF BREAKING WAVE SPILLING (%)	PLUNGING (%)	SURGING (%)
JAN	NO RECORD					
FEB	NO RECORD					
MAR	NO RECORD					
APR	NO RECORD					
MAY	25	3.2	10.48	92.7	.0	7.3
JUN	52	2.9	9.91	100.0	.0	.0
JUL	62	3.6	12.29	98.3	1.7	.0
AUG	53	3.4	13.61	100.0	.0	.0
SEP	56	3.5	13.34	100.0	.0	.0
OCT	56	4.9	13.50	72.2	27.8	.0
NOV	40	5.0	12.71	73.3	26.7	.0
DEC	NO RECORD					
YEAR	344	3.8	12.42	90.7	8.5	.8

SAN SIMEON (05009)

MONTH	NUMBER OF OBS	WAVE HEIGHT (FT)	WAVE PERIOD (SEC)	TYPE OF BREAKING WAVE SPILLING (%)	PLUNGING (%)	SURGING (%)
JAN	NO RECORD					
FEB	NO RECORD					
MAR	NO RECORD					
APR	39	2.2	10.61	26.8	43.9	29.3
MAY	57	3.2	10.05	44.4	53.7	1.9
JUN	50	2.8	8.88	46.2	48.1	5.8
JUL	53	2.6	9.25	11.5	86.5	1.9
AUG	43	2.5	11.15	18.8	81.3	.0
SEP	47	3.2	9.79	6.3	91.7	2.1
OCT	49	3.8	9.40	.0	95.7	4.3
NOV	49	3.1	10.06	2.1	56.3	41.7
DEC	40	3.2	9.79	.0	72.5	27.5
YEAR	427	3.0	9.85	18.1	70.0	11.9

PISMO (05012)

MONTH	NUMBER OF OBS	WAVE HEIGHT (FT)	WAVE PERIOD (SEC)	TYPE OF BREAKING WAVE SPILLING (%)	PLUNGING (%)	SURGING (%)
JAN	NO RECORD					
FEB	7	4.7	15.26	90.9	9.1	.0
MAR	40	2.8	12.52	95.6	2.2	2.2
APR	27	2.5	11.36	93.1	.0	6.9
MAY	36	2.1	11.04	100.0	.0	.0
JUN	41	2.0	12.44	92.7	7.3	.0
JUL	61	1.8	10.05	60.7	34.4	4.9
AUG	31	1.6	10.83	74.2	25.8	.0
SEP	29	2.2	11.83	100.0	.0	.0
OCT	39	2.4	12.58	100.0	.0	.0
NOV	36	2.5	13.35	97.3	2.7	.0
DEC	47	2.2	11.70	89.4	10.6	.0
YEAR	394	2.2	11.76	88.6	9.9	1.5

EL CAPITAN (05013)

MONTH	NUMBER OF OBS	WAVE HEIGHT (FT)	WAVE PERIOD (SEC)	TYPE OF BREAKING WAVE SPILLING (%)	PLUNGING (%)	SURGING (%)
JAN	NO RECORD					
FEB	NO RECORD					
MAR	NO RECORD					
APR	7	1.7	11.41	77.8	22.2	.0
MAY	11	1.7	11.57	81.8	18.2	.0
JUN	36	2.1	10.62	40.0	60.0	.0
JUL	58	2.4	10.41	56.5	43.5	.0
AUG	47	2.3	9.10	36.8	63.2	.0
SEP	41	2.2	8.96	54.5	45.5	.0
OCT	NO RECORD					
NOV	5	5.2	12.10	42.9	42.9	14.3
DEC	11	3.3	13.09	66.7	33.3	.0
YEAR	216	2.3	10.15	50.8	48.8	.4

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CARPINTERIA (05014)

MONTH	NUMBER OF OBS	WAVE HEIGHT (FT)	WAVE PERIOD (SEC)	TYPE OF BREAKING WAVE SPILLING (%)	PLUNGING (%)	SURGING (%)
JAN	NO RECORD					
FEB	NO RECORD					
MAR	NO RECORD					
APR	32	3.4	12.28	91.2	2.9	5.9
MAY	29	1.7	10.67	90.3	9.7	.0
JUN	39	1.8	9.87	97.6	2.4	.0
JUL	42	2.0	11.09	97.7	2.3	.0
AUG	30	2.3	10.65	90.0	10.0	.0
SEP	37	2.0	10.83	80.5	14.6	4.9
OCT	60	2.1	13.78	44.1	55.9	.0
NOV	50	2.9	12.78	32.0	66.0	2.0
DEC	29	2.0	13.72	62.5	37.5	.0
YEAR	348	2.2	11.89	72.9	25.8	1.4

SAN BUENAVENTURA (05015)

MONTH	NUMBER OF OBS	WAVE HEIGHT (FT)	WAVE PERIOD (SEC)	TYPE OF BREAKING WAVE SPILLING (%)	PLUNGING (%)	SURGING (%)
JAN	NO RECORD					
FEB	NO RECORD					
MAR	NO RECORD					
APR	NO RECORD					
MAY	34	2.5	11.24	94.3	5.7	.0
JUN	35	2.6	9.50	97.2	2.8	.0
JUL	40	2.5	10.03	61.5	38.5	.0
AUG	37	3.2	10.72	18.9	81.1	.0
SEP	21	2.9	11.34	14.3	85.7	.0
OCT	40	2.8	11.04	26.2	73.8	.0
NOV	28	2.1	9.87	60.0	33.3	6.7
DEC	36	1.9	8.94	64.9	27.0	8.1
YEAR	271	2.6	10.30	56.0	42.2	1.8

MCGRATH (05016)

MONTH	NUMBER OF OBS	WAVE HEIGHT (FT)	WAVE PERIOD (SEC)	TYPE OF BREAKING WAVE SPILLING (%)	PLUNGING (%)	SURGING (%)
JAN	NO RECORD					
FEB	NO RECORD					
MAR	NO RECORD					
APR	NO RECORD					
MAY	33	2.8	11.37	21.2	12.1	66.7
JUN	35	3.5	9.95	10.8	56.8	32.4
JUL	38	3.2	10.66	17.5	57.5	25.0
AUG	39	4.0	11.48	12.8	87.2	.0
SEP	21	3.8	11.67	25.0	75.0	.0
OCT	40	3.6	11.76	17.9	82.1	.0
NOV	36	3.6	10.02	37.8	54.1	8.1
DEC	39	2.5	10.37	41.0	43.6	15.4
YEAR	281	3.4	10.88	22.9	58.5	18.7

LEO CARRILLO (05017)

MONTH	NUMBER OF OBS	WAVE HEIGHT (FT)	WAVE PERIOD (SEC)	TYPE OF BREAKING WAVE SPILLING (%)	PLUNGING (%)	SURGING (%)
JAN	NO RECORD					
FEB	NO RECORD					
MAR	NO RECORD					
APR	17	3.5	10.78	.0	100.0	.0
MAY	31	3.9	11.33	.0	100.0	.0
JUN	NO RECORD					
JUL	32	2.1	11.18	.0	100.0	.0
AUG	45	1.8	11.94	.0	100.0	.0
SEP	22	1.8	9.95	.0	100.0	.0
OCT	7	2.1	14.91	.0	100.0	.0
NOV	8	3.2	11.92	.0	87.5	12.5
DEC	12	1.7	10.31	.0	76.9	23.1
YEAR	174	2.5	11.33	.0	97.9	2.1

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BOLSA CHICA (05018)

MONTH	NUMBER OF OBS	WAVE HEIGHT (FT)	WAVE PERIOD (SEC)	TYPE OF BREAKING WAVE SPILLING (%)	PLUNGING (%)	SURGING (%)
JAN	NO RECORD					
FEB	NO RECORD					
MAR	NO RECORD					
APR	17	2.5	11.10	80.0	10.0	10.0
MAY	56	2.5	16.75	83.9	14.3	1.8
JUN	55	2.3	14.38	84.7	10.2	5.1
JUL	37	3.5	18.51	82.0	18.0	.0
AUG	59	1.9	17.09	84.7	15.3	.0
SEP	52	1.8	12.54	63.3	26.5	10.2
OCT	40	3.7	14.06	56.9	21.6	21.6
NOV	44	2.8	9.69	65.5	20.0	14.5
DEC	42	2.1	9.92	54.5	31.8	13.6
YEAR	402	2.5	14.10	73.1	18.7	8.1

POINT MUGU (05019)

MONTH	NUMBER OF OBS	WAVE HEIGHT (FT)	WAVE PERIOD (SEC)	TYPE OF BREAKING WAVE SPILLING (%)	PLUNGING (%)	SURGING (%)
JAN	NO RECORD					
FEB	NO RECORD					
MAR	NO RECORD					
APR	2	1.5	10.25	.0	100.0	.0
MAY	9	1.6	14.31	.0	100.0	.0
JUN	NO RECORD					
JUL	25	2.3	13.87	3.6	96.4	.0
AUG	11	2.7	15.80	.0	92.3	7.7
SEP	10	1.4	13.05	.0	75.0	25.0
OCT	NO RECORD					
NOV	6	2.8	12.17	.0	100.0	.0
DEC	13	1.9	10.05	.0	71.4	28.6
YEAR	76	2.1	13.21	1.1	89.7	9.2

GOAT ROCK (05020)

MONTH	NUMBER OF OBS	WAVE HEIGHT (FT)	WAVE PERIOD (SEC)	TYPE OF BREAKING WAVE SPILLING (%)	PLUNGING (%)	SURGING (%)
JAN	NO RECORD					
FEB	NO RECORD					
MAR	NO RECORD					
APR	NO RECORD					
MAY	52	3.8	9.94	72.2	27.8	.0
JUN	60	3.7	8.82	88.5	11.5	.0
JUL	65	3.5	9.24	82.8	17.2	.0
AUG	49	4.1	10.14	70.4	29.6	.0
SEP	57	4.4	9.78	72.9	27.1	.0
OCT	57	5.7	11.42	43.1	56.9	.0
NOV	58	5.9	12.12	58.6	39.7	1.7
DEC	53	5.3	11.52	56.6	32.1	11.3
YEAR	451	4.5	10.35	68.5	29.9	1.5

WRIGHT'S (05021)

MONTH	NUMBER OF OBS	WAVE HEIGHT (FT)	WAVE PERIOD (SEC)	TYPE OF BREAKING WAVE SPILLING (%)	PLUNGING (%)	SURGING (%)
JAN	NO RECORD					
FEB	NO RECORD					
MAR	NO RECORD					
APR	NO RECORD					
MAY	58	3.7	10.18	82.0	18.0	.0
JUN	55	3.7	9.15	86.0	14.0	.0
JUL	65	3.5	9.15	92.6	7.4	.0
AUG	54	3.9	10.46	72.2	27.8	.0
SEP	59	4.2	9.82	67.2	32.8	.0
OCT	61	5.7	11.84	37.9	60.3	1.7
NOV	57	5.9	11.84	53.4	44.8	1.7
DEC	59	5.1	11.29	44.6	46.4	8.9
YEAR	468	4.5	10.46	67.7	30.9	1.5

STINSON (05022)

MONTH	NUMBER OF OBS	WAVE HEIGHT (FT)	WAVE PERIOD (SEC)	TYPE OF BREAKING WAVE SPILLING (%)	PLUNGING (%)	SURGING (%)
JAN	NO RECORD					
FEB	NO RECORD					
MAR	NO RECORD					
APR	NO RECORD					
MAY	60	3.6	12.34	93.3	3.3	3.3
JUN	60	3.8	11.44	98.3	.0	1.7
JUL	61	3.2	12.74	91.9	.0	8.1
AUG	61	3.4	13.27	82.0	.0	18.0
SEP	59	3.5	12.43	89.7	.0	10.3
OCT	61	3.5	11.98	96.6	.0	3.4
NOV	52	3.9	12.82	98.1	.0	1.9
DEC	55	3.8	11.69	87.0	13.0	.0
YEAR	469	3.6	12.34	92.0	1.9	6.0

MANCHESTER (05023)

MONTH	NUMBER OF OBS	WAVE HEIGHT (FT)	WAVE PERIOD (SEC)	TYPE OF BREAKING WAVE SPILLING (%)	PLUNGING (%)	SURGING (%)
JAN	NO RECORD					
FEB	NO RECORD					
MAR	NO RECORD					
APR	8	3.2	12.00	20.0	80.0	.0
MAY	35	3.4	12.09	69.4	22.2	8.3
JUN	45	3.2	13.35	60.9	39.1	.0
JUL	57	3.5	13.54	25.4	74.6	.0
AUG	57	3.5	12.92	4.9	95.1	.0
SEP	50	3.6	13.11	10.6	89.4	.0
OCT	32	3.3	12.70	69.0	27.6	3.4
NOV	26	4.4	14.09	37.5	62.5	.0
DEC	27	4.1	13.46	66.7	33.3	.0
YEAR	337	3.6	13.12	36.9	61.9	1.2

VAN DAMME (05024)

MONTH	NUMBER OF OBS	WAVE HEIGHT (FT)	WAVE PERIOD (SEC)	TYPE OF BREAKING WAVE SPILLING (%)	PLUNGING (%)	SURGING (%)
JAN	NO RECORD					
FEB	NO RECORD					
MAR	NO RECORD					
APR	9	1.4	9.44	22.2	66.7	.0
MAY	52	1.1	6.41	52.9	47.1	.0
JUN	56	.5	6.75	69.2	30.8	.0
JUL	50	.6	6.71	78.8	21.2	.0
AUG	51	1.4	7.37	56.9	37.3	5.9
SEP	29	1.0	9.67	96.6	3.4	.0
OCT	24	2.3	10.69	57.1	42.9	.0
NOV	15	2.1	10.94	37.5	62.5	.0
DEC	13	1.6	6.32	30.0	60.0	10.0
YEAR	299	1.1	7.66	63.2	35.1	1.4

RUSSIAN GULCH (05025)

MONTH	NUMBER OF OBS	WAVE HEIGHT (FT)	WAVE PERIOD (SEC)	TYPE OF BREAKING WAVE SPILLING (%)	PLUNGING (%)	SURGING (%)
JAN	NO RECORD					
FEB	NO RECORD					
MAR	NO RECORD					
APR	11	2.8	9.95	100.0	.0	.0
MAY	32	2.3	9.92	100.0	.0	.0
JUN	23	.9	10.15	100.0	.0	.0
JUL	16	1.1	10.27	100.0	.0	.0
AUG	NO RECORD					
SEP	8	.4	10.47	100.0	.0	.0
OCT	26	1.0	9.46	100.0	.0	.0
NOV	24	1.7	10.50	87.5	12.5	.0
DEC	17	1.5	9.69	88.2	11.8	.0
YEAR	157	1.5	10.01	96.9	3.1	.0

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MACKERRICHER (05026)

MONTH	NUMBER OF OBS	WAVE HEIGHT (FT)	WAVE PERIOD (SEC)	TYPE OF BREAKING WAVE SPILLING (%)	PLUNGING (%)	SURGING (%)
JAN	NO RECORD					
FEB	NO RECORD					
MAR	NO RECORD					
APR	7	2.6	8.33	87.5	12.5	.0
MAY	44	2.1	8.64	80.9	14.9	4.3
JUN	21	3.0	8.40	61.9	38.1	.0
JUL	29	2.4	9.12	82.8	13.8	3.4
AUG	28	2.2	7.98	82.6	17.4	.0
SEP	24	3.0	9.33	87.5	12.5	.0
OCT	40	3.4	9.19	82.5	15.0	2.5
NOV	32	3.3	11.03	54.3	45.7	.0
DEC	30	3.5	11.81	71.0	19.4	9.7
YEAR	255	2.8	9.42	76.0	21.3	2.7

HUNTINGTON (05027)

MONTH	NUMBER OF OBS	WAVE HEIGHT (FT)	WAVE PERIOD (SEC)	TYPE OF BREAKING WAVE SPILLING (%)	PLUNGING (%)	SURGING (%)
JAN	NO RECORD					
FEB	NO RECORD					
MAR	NO RECORD					
APR	18	2.7	15.72	50.0	50.0	.0
MAY	58	3.4	15.29	69.5	30.5	.0
JUN	42	2.4	15.51	64.7	29.4	5.9
JUL	58	2.3	16.55	81.7	18.3	.0
AUG	62	2.1	18.04	68.3	28.3	3.3
SEP	51	2.5	17.63	56.6	35.8	7.5
OCT	46	3.1	11.68	70.8	18.8	10.4
NOV	24	2.9	12.43	70.4	22.2	7.4
DEC	47	2.5	12.63	52.1	47.9	.0
YEAR	406	2.6	15.34	66.3	30.0	3.8

DOHENY (05028)

MONTH	NUMBER OF OBS	WAVE HEIGHT (FT)	WAVE PERIOD (SEC)	TYPE OF BREAKING WAVE SPILLING (%)	PLUNGING (%)	SURGING (%)
JAN	NO RECORD					
FEB	NO RECORD					
MAR	NO RECORD					
APR	10	2.5	10.75	10.0	60.0	30.0
MAY	58	2.2	13.10	15.3	83.1	1.7
JUN	59	1.6	13.43	56.7	36.7	6.7
JUL	58	2.0	14.19	30.6	64.5	3.2
AUG	59	2.8	15.14	35.1	57.9	7.0
SEP	55	2.1	14.74	68.5	24.1	7.4
OCT	50	2.7	14.58	36.5	55.8	7.7
NOV	42	1.5	13.52	70.5	29.5	.0
DEC	43	3.0	13.76	18.8	72.9	8.3
YEAR	434	2.2	14.00	40.1	53.8	5.8

SAN CLEMENTE (05029)

MONTH	NUMBER OF OBS	WAVE HEIGHT (FT)	WAVE PERIOD (SEC)	TYPE OF BREAKING WAVE SPILLING (%)	PLUNGING (%)	SURGING (%)
JAN	NO RECORD					
FEB	NO RECORD					
MAR	NO RECORD					
APR	21	2.3	16.04	86.4	13.6	.0
MAY	54	2.2	15.00	55.9	44.1	.0
JUN	50	1.7	14.42	78.8	21.2	.0
JUL	58	2.2	15.06	69.5	30.5	.0
AUG	57	2.3	14.91	25.0	67.9	7.1
SEP	58	1.6	13.85	46.6	25.9	27.6
OCT	60	2.1	14.65	38.3	33.3	28.3
NOV	60	1.7	11.80	56.7	28.3	15.0
DEC	59	1.7	11.17	61.4	28.1	10.5
YEAR	477	2.0	13.92	55.3	34.0	10.8

CARLSBAD (05030)

MONTH	NUMBER OF OBS	WAVE HEIGHT (FT)	WAVE PERIOD (SEC)	TYPE OF BREAKING WAVE SPILLING (%)	PLUNGING (%)	SURGING (%)
JAN	NO RECORD					
FEB	NO RECORD					
MAR	NO RECORD					
APR	5	2.8	14.78	87.5	.0	12.5
MAY	NO RECORD					
JUN	5	3.4	14.76	60.0	.0	40.0
JUL	44	2.9	13.60	84.0	14.0	2.0
AUG	50	2.4	12.68	70.6	5.9	23.5
SEP	30	2.2	13.62	34.2	5.3	60.5
OCT	33	3.1	14.22	33.3	16.7	50.0
NOV	31	2.7	13.10	2.7	83.8	13.5
DEC	33	2.5	11.15	5.0	47.5	47.5
YEAR	231	2.6	13.13	44.0	25.9	30.1

SOUTH CARLSBAD (05031)

MONTH	NUMBER OF OBS	WAVE HEIGHT (FT)	WAVE PERIOD (SEC)	TYPE OF BREAKING WAVE SPILLING (%)	PLUNGING (%)	SURGING (%)
JAN	NO RECORD					
FEB	NO RECORD					
MAR	NO RECORD					
APR	21	4.2	13.94	100.0	.0	.0
MAY	28	3.4	18.41	96.4	3.6	.0
JUN	NO RECORD					
JUL	57	2.6	15.90	96.6	3.4	.0
AUG	37	2.4	13.56	81.1	18.9	.0
SEP	15	2.7	12.59	75.0	25.0	.0
OCT	NO RECORD					
NOV	NO RECORD					
DEC	50	2.6	12.35	64.7	35.3	.0
YEAR	208	2.8	14.53	85.3	14.7	.0

SAN ELIJO (05033)

MONTH	NUMBER OF OBS	WAVE HEIGHT (FT)	WAVE PERIOD (SEC)	TYPE OF BREAKING WAVE SPILLING (%)	PLUNGING (%)	SURGING (%)
JAN	NO RECORD					
FEB	NO RECORD					
MAR	NO RECORD					
APR	22	2.8	11.30	87.5	4.2	8.3
MAY	41	2.6	11.11	95.0	5.0	.0
JUN	6	3.3	7.97	100.0	.0	.0
JUL	44	2.4	13.48	100.0	.0	.0
AUG	67	2.8	11.62	100.0	.0	.0
SEP	16	2.3	11.62	100.0	.0	.0
OCT	39	1.9	11.49	97.5	.0	2.5
NOV	42	2.2	10.60	81.0	19.0	.0
DEC	39	1.8	11.07	57.1	35.7	7.1
YEAR	316	2.4	11.50	90.0	8.1	1.9

TORREY PINES (05034)

MONTH	NUMBER OF OBS	WAVE HEIGHT (FT)	WAVE PERIOD (SEC)	TYPE OF BREAKING WAVE SPILLING (%)	PLUNGING (%)	SURGING (%)
JAN	NO RECORD					
FEB	NO RECORD					
MAR	NO RECORD					
APR	22	2.6	10.19	96.0	4.0	.0
MAY	57	2.6	9.04	91.5	8.5	.0
JUN	60	2.2	10.09	58.3	41.7	.0
JUL	57	2.2	14.32	57.9	40.4	1.8
AUG	52	2.4	13.92	77.4	22.6	.0
SEP	52	2.3	13.15	94.4	5.6	.0
OCT	47	3.6	14.88	79.6	20.4	.0
NOV	51	3.7	14.06	82.4	17.6	.0
DEC	43	3.0	14.47	88.6	9.1	2.3
YEAR	441	2.7	12.72	79.2	20.4	.4

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SILVER STRAND (05035)

MONTH	NUMBER OF OBS	WAVE HEIGHT (FT)	WAVE PERIOD (SEC)	TYPE OF BREAKING WAVE SPILLING (%)	PLUNGING (%)	SURGING (%)
JAN	NO RECORD					
FEB	NO RECORD					
MAR	NO RECORD					
APR	13	2.4	10.12	100.0	.0	.0
MAY	48	2.7	11.71	98.0	.0	2.0
JUN	50	2.5	12.25	95.9	.0	4.1
JUL	53	2.8	13.04	96.4	.0	3.6
AUG	56	3.0	13.71	93.3	6.7	.0
SEP	56	2.9	14.06	94.7	5.3	.0
OCT	60	3.2	12.95	100.0	.0	.0
NOV	59	3.2	13.66	89.8	10.2	.0
DEC	61	2.9	12.61	86.4	13.6	.0
YEAR	456	2.9	12.95	94.4	4.6	1.1

PRAIRIE CREEK REDWOODS (05036)

MONTH	NUMBER OF OBS	WAVE HEIGHT (FT)	WAVE PERIOD (SEC)	TYPE OF BREAKING WAVE SPILLING (%)	PLUNGING (%)	SURGING (%)
JAN	NO RECORD					
FEB	NO RECORD					
MAR	NO RECORD					
APR	5	4.0	11.10	83.3	16.7	.0
MAY	27	3.3	9.82	93.1	6.9	.0
JUN	29	2.7	9.70	100.0	.0	.0
JUL	50	2.6	9.90	98.0	2.0	.0
AUG	46	2.8	10.37	89.1	10.9	.0
SEP	33	3.8	9.24	87.5	12.5	.0
OCT	24	3.8	10.59	83.3	16.7	.0
NOV	20	5.1	10.62	57.9	42.1	.0
DEC	12	4.7	10.86	92.3	7.7	.0
YEAR	246	3.3	10.06	89.6	10.4	.0

BOLINAS BRIGHTON AVE (05500)

MONTH	NUMBER OF OBS	WAVE HEIGHT (FT)	WAVE PERIOD (SEC)	TYPE OF BREAKING WAVE SPILLING (%)	PLUNGING (%)	SURGING (%)
JAN	NO RECORD					
FEB	NO RECORD					
MAR	NO RECORD					
APR	1	2.0	14.10	.0	100.0	.0
MAY	16	7.0	14.83	.0	100.0	.0
JUN	42	1.8	13.42	.0	100.0	.0
JUL	57	2.4	15.12	.0	100.0	.0
AUG	39	2.5	14.72	2.3	97.7	.0
SEP	56	2.7	14.67	3.6	96.4	.0
OCT	53	2.8	14.32	.0	100.0	.0
NOV	54	3.0	13.04	.0	100.0	.0
DEC	53	3.6	11.51	.0	100.0	.0
YEAR	371	2.9	13.87	.7	99.3	.0

NEWPORT (05700)

MONTH	NUMBER OF OBS	WAVE HEIGHT (FT)	WAVE PERIOD (SEC)	TYPE OF BREAKING WAVE SPILLING (%)	PLUNGING (%)	SURGING (%)
JAN	NO RECORD					
FEB	NO RECORD					
MAR	8	1.9	11.67	.0	100.0	.0
APR	42	3.1	13.24	23.3	74.4	2.3
MAY	28	3.6	14.35	6.7	93.3	.0
JUN	38	2.7	13.23	5.3	92.1	2.6
JUL	57	2.7	14.57	8.6	84.5	6.9
AUG	40	2.8	13.97	2.4	90.5	7.1
SEP	30	3.1	10.72	3.3	90.0	6.7
OCT	29	3.2	11.57	.0	100.0	.0
NOV	27	2.4	11.13	7.4	85.2	7.4
DEC	23	2.1	10.38	13.0	56.5	30.4
YEAR	322	2.8	12.86	7.9	86.0	6.1

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APPENDIX E

CUMULATIVE SIZE-FREQUENCY CURVES FOR SAND SAMPLES

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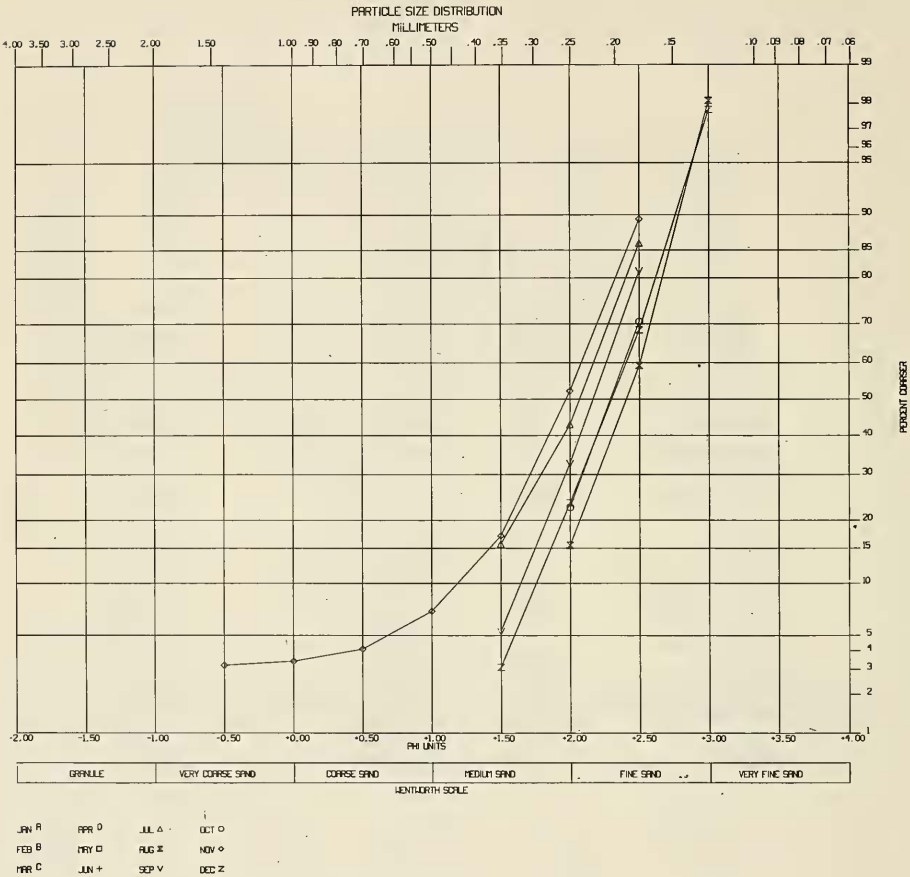
BOLINAS (BRIGHTON AVE)



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BOLSA CHICA

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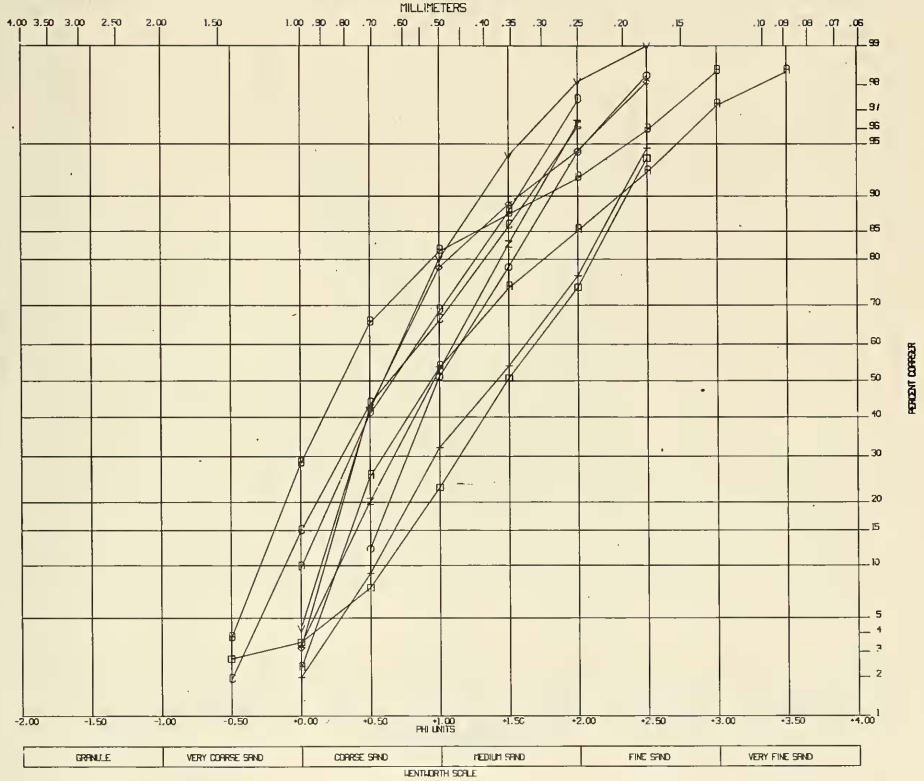

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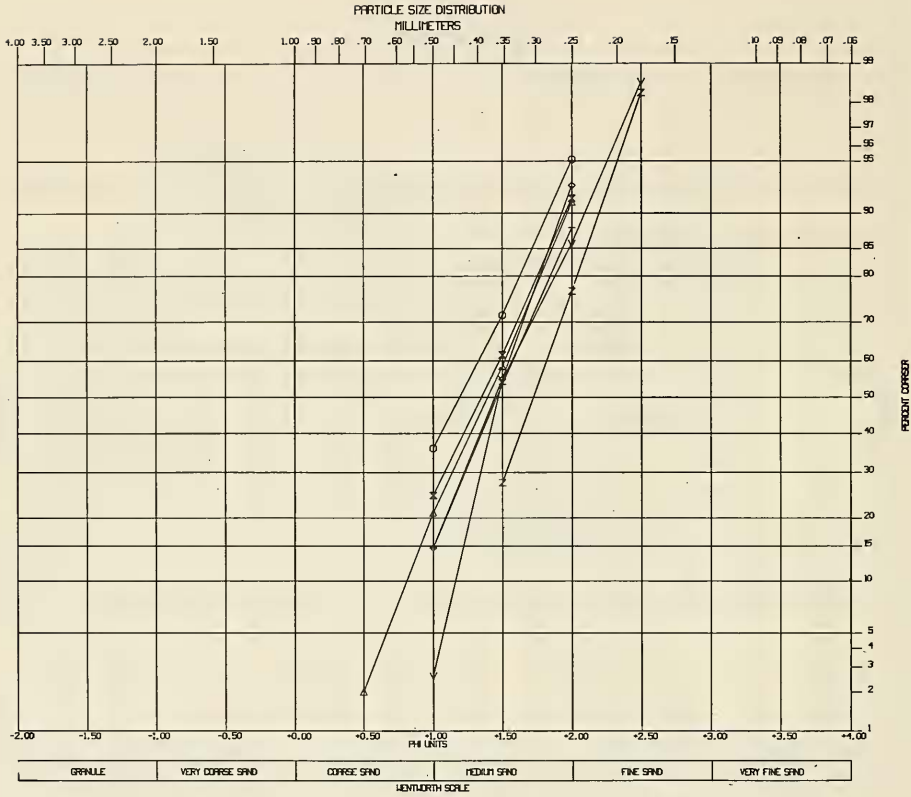
FEB B MAY □ AUG ⧖ NOV ◇
MAR C JUN + SEP ▽ DEC Z

CARLSBAD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PERCENT COARSER
-2.00 -1.50 -1.00 -0.50 +0.00 +0.50 +1.00 +1.50 +2.00 +2.50 +3.00 +3.50 +4.00
PHI UNITS
GRANULE
VERY COARSE SAND
COARSE SAND
MEDIUM SAND
FINE SAND
VERY FINE SAND
WENTWORTH SCALE
JAN A
FEB B
MAR C
APR D
MAY □
JUN +
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AUG ⧖
SEP V
OCT ○
NOV ◇
DEC Z

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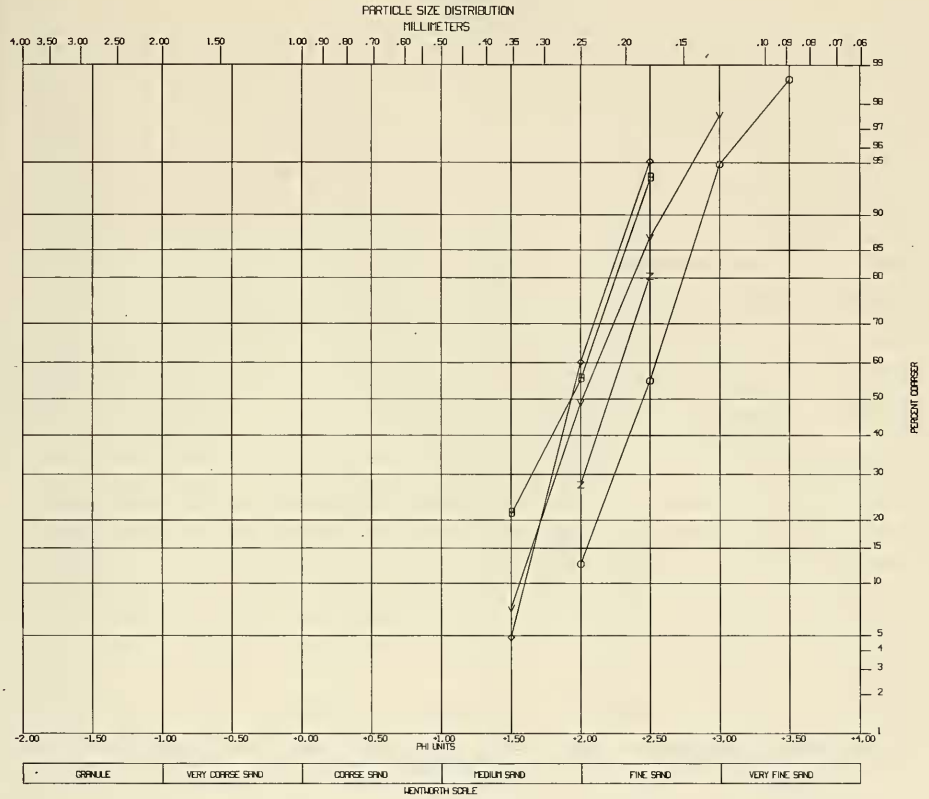

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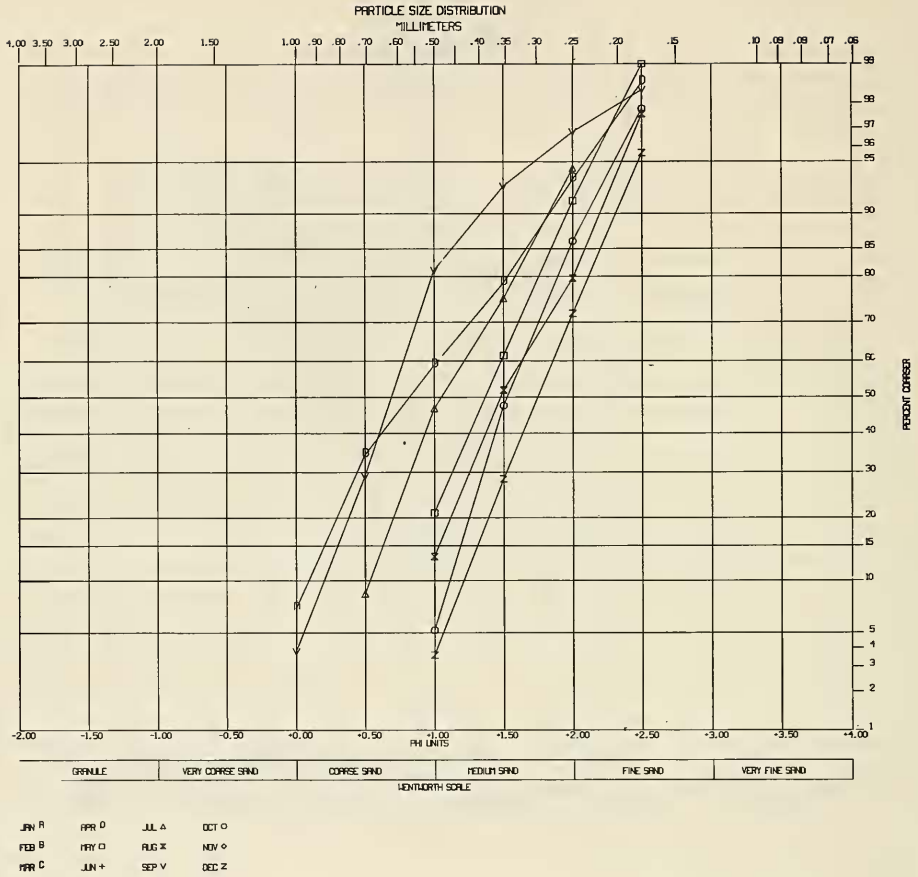
FEB B MAY □ AUG ⧓ NOV ◇
MAR C JUN + SEP V DEC Z

DOHENY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99 98 97 96 95 90 85 80 70 60 50 40 30 20 15 10 5 1 3 2 1
PERCENT COARSER
-2.00 -1.50 -1.00 -0.50 +0.00 +0.50 +1.00 +1.50 +2.00 +2.50 +3.00 +3.50 +4.00
PHI UNITS
GRANULE
VERY COARSE SAND
COARSE SAND
MEDIUM SAND
FINE SAND
VERY FINE SAND
WENTWORTH SCALE
JAN A
FEB B
MAR C
APR D
MAY □
JUN +
JUL △
AUG ✕
SEP ▽
OCT ○
NOV ◇
DEC Z

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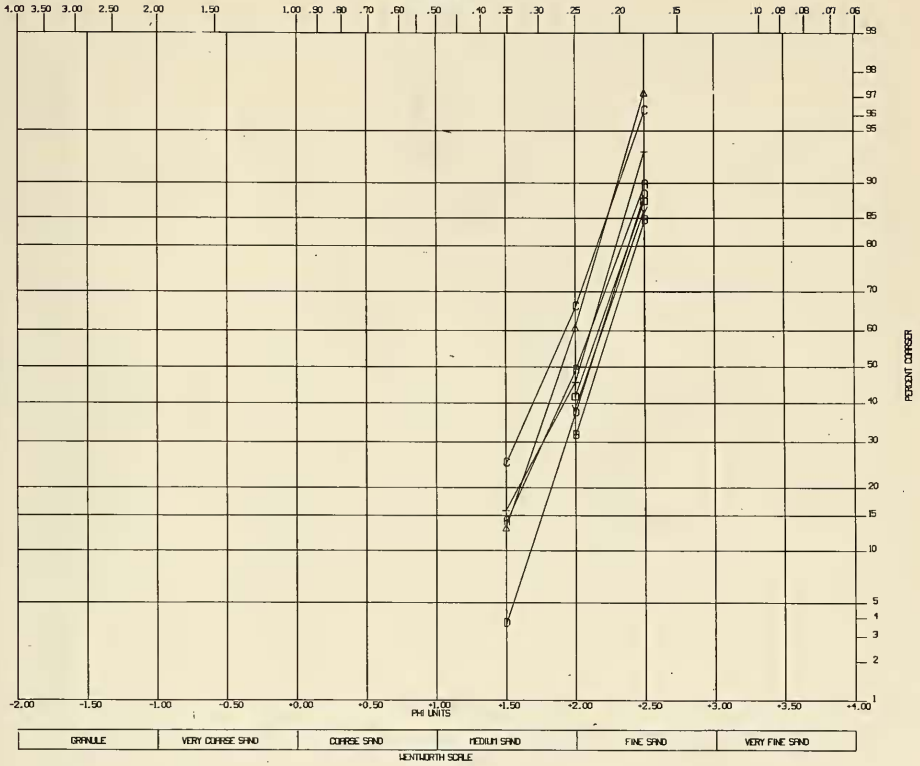
EL CAPITAN

PARTICLE SIZE DISTRIBUTION



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MAR C JUN + SEP ▽ DEC Z

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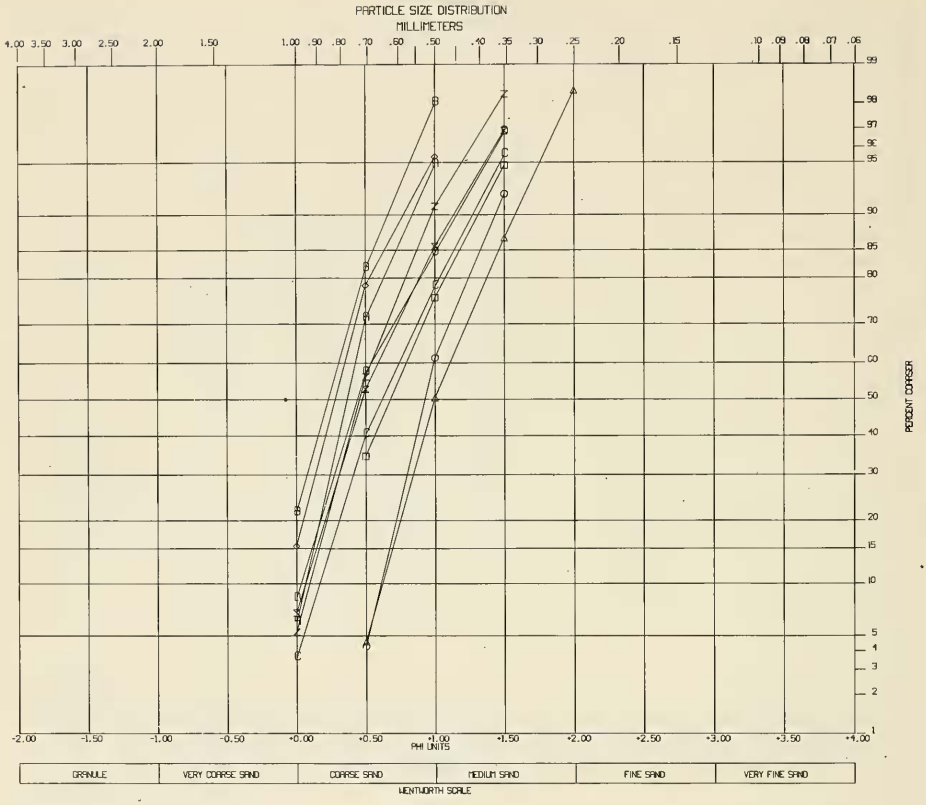
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99 98 97 96 95 90 85 80 70 60 50 40 30 20 15 10 5 4 3 2 1
PERCENT COARSER
-2.00 -1.50 -1.00 -0.50 +0.00 +0.50 +1.00 +1.50 +2.00 +2.50 +3.00 +3.50 +4.00
PHI UNITS
GRANULE
VERY COARSE SAND
COARSE SAND
MEDIUM SAND
FINE SAND
VERY FINE SAND
WENTWORTH SCALE
JAN A
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JUN +
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AUG X
SEP V
OCT O
NOV ◇
DEC Z

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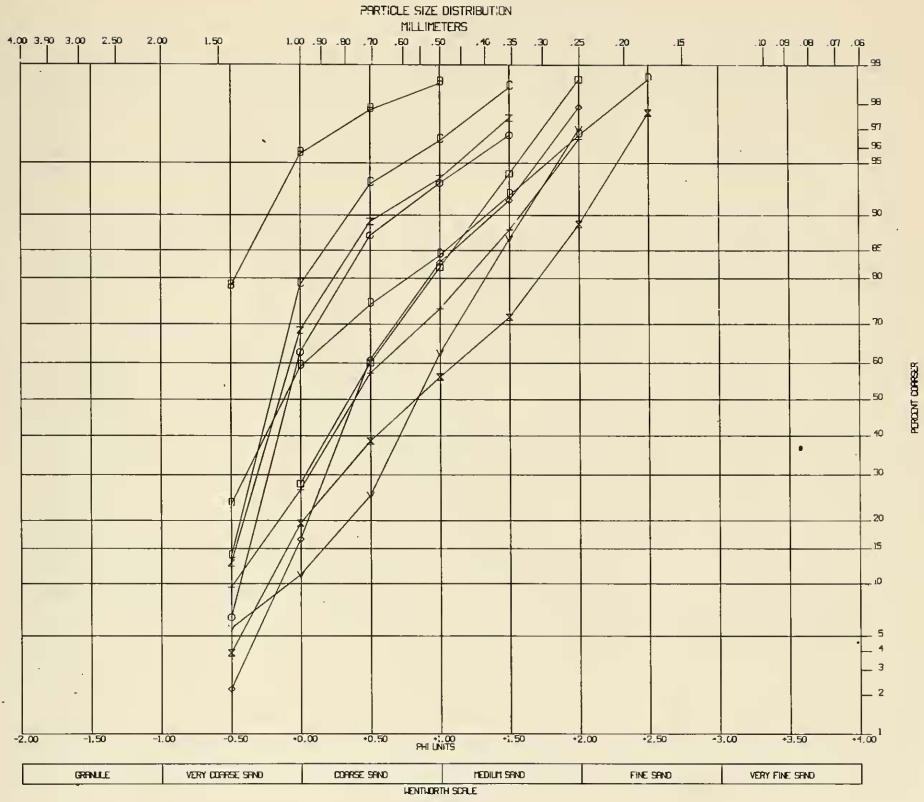

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MAR C JUN + SEP V DEC Z

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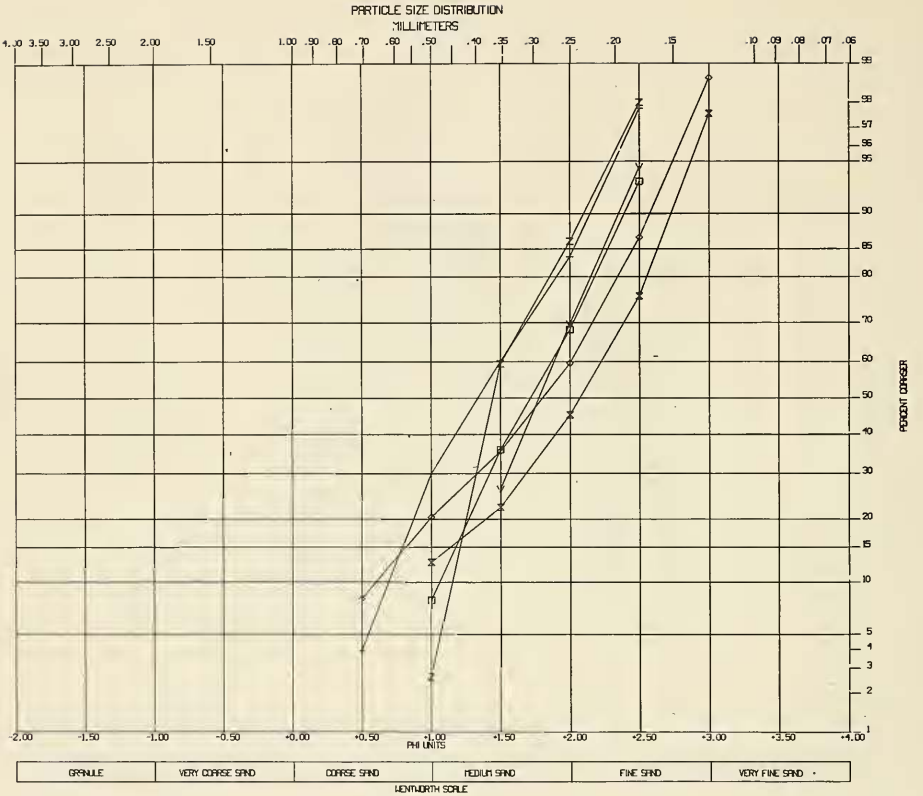

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MAR C JUN + SEP V DEC Z

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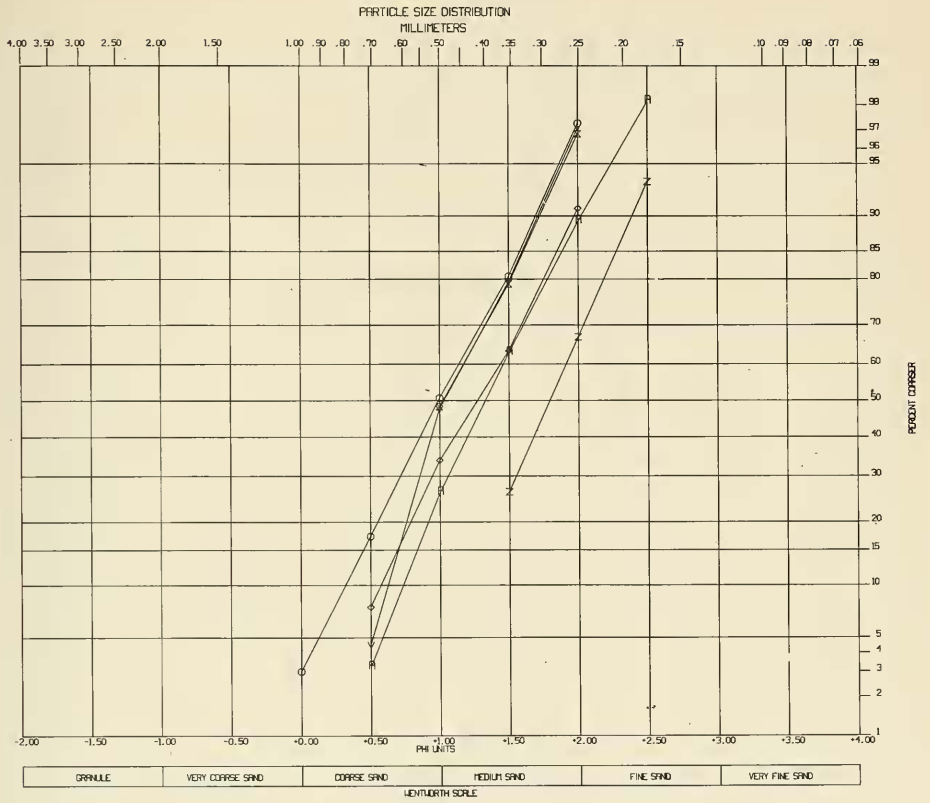

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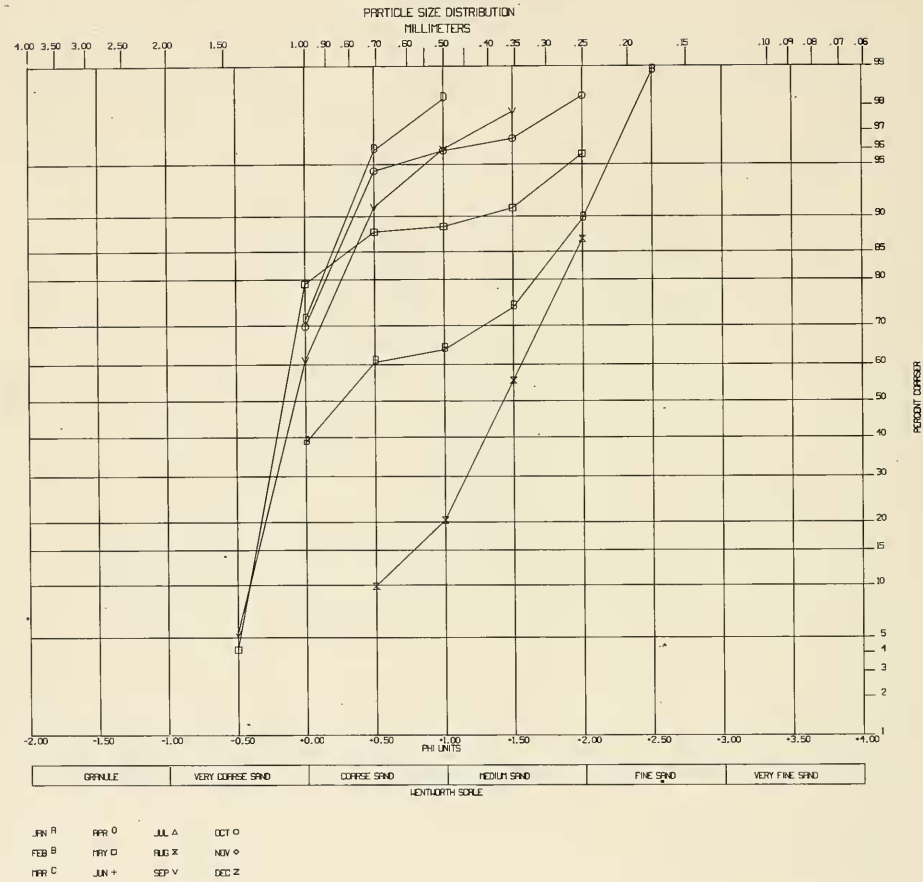

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MAR C JUN + SEP ▽ DEC ⧗

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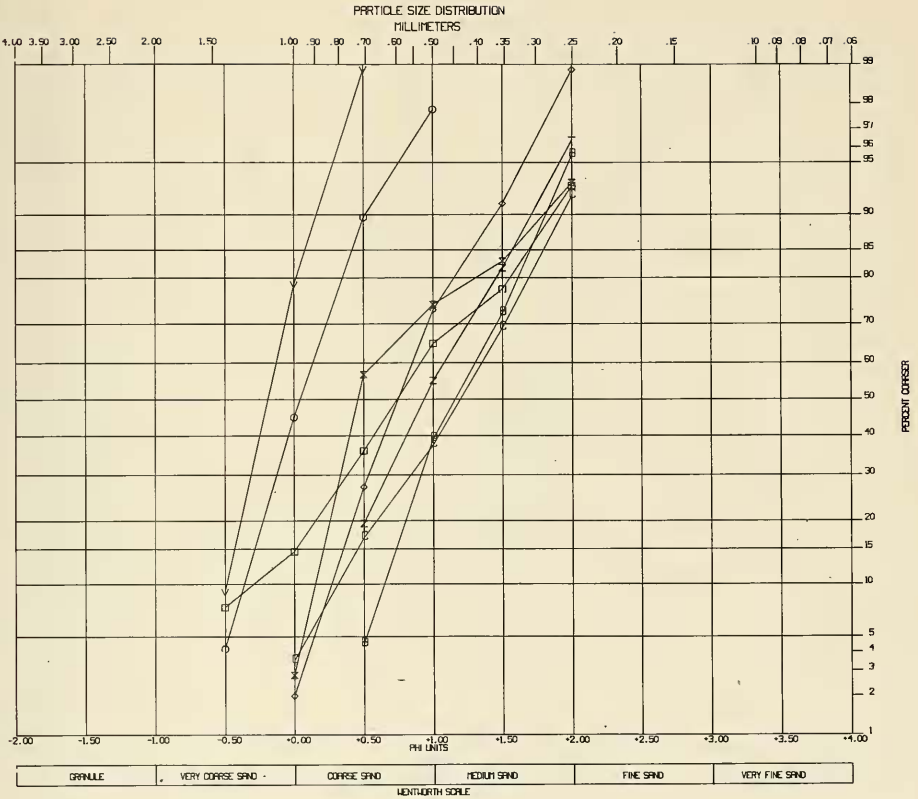

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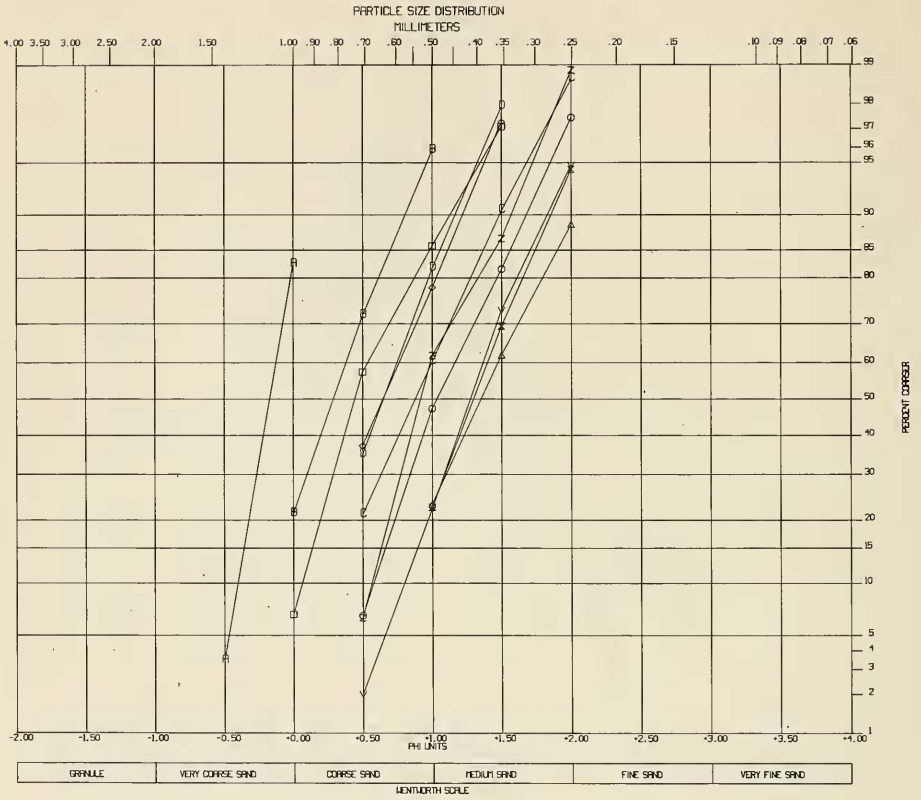

JAN B APR D JUL Δ OCT ○
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MAR C JUN + SEP ▽ DEC Z

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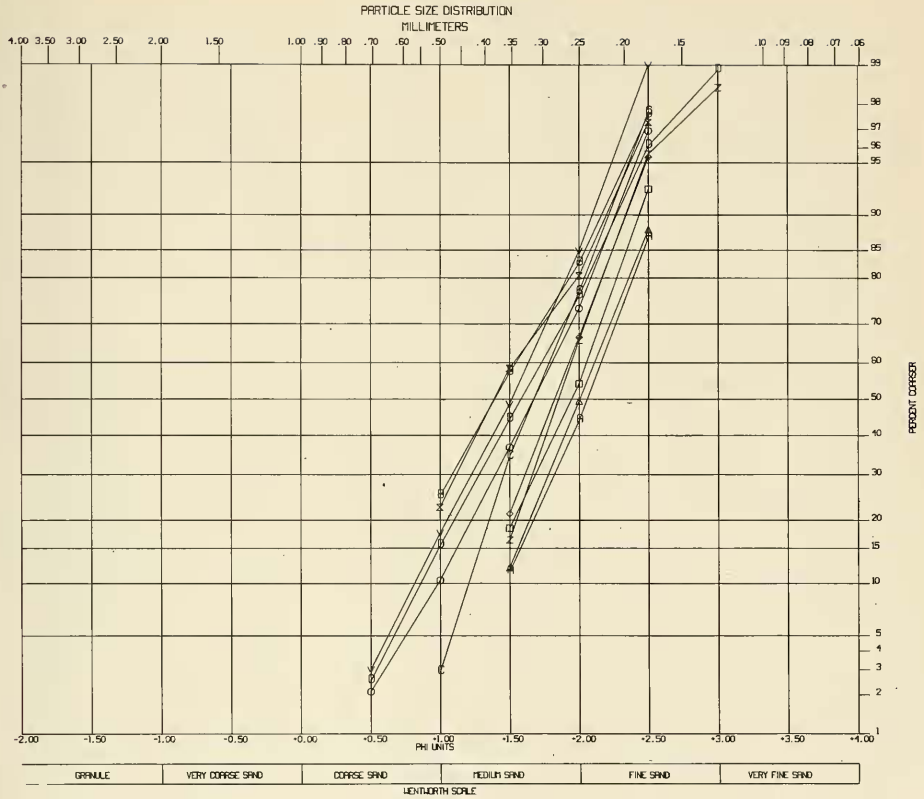
NATURAL BRIDGES



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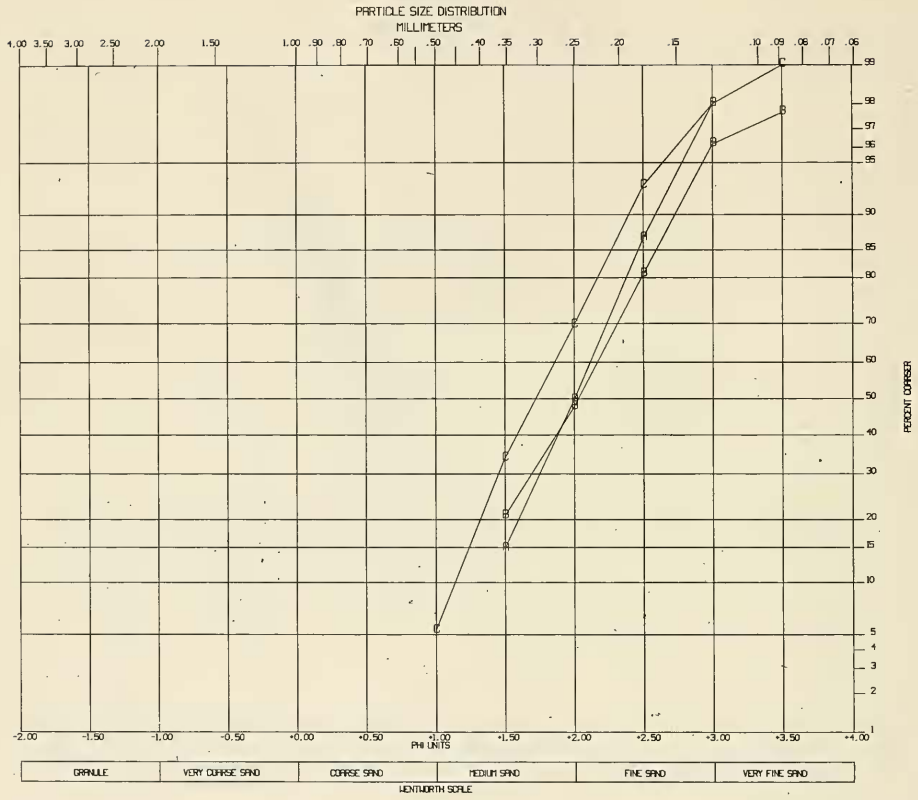
MAR C JUN + SEP ▽ DEC Z

NEW BRIGHTON



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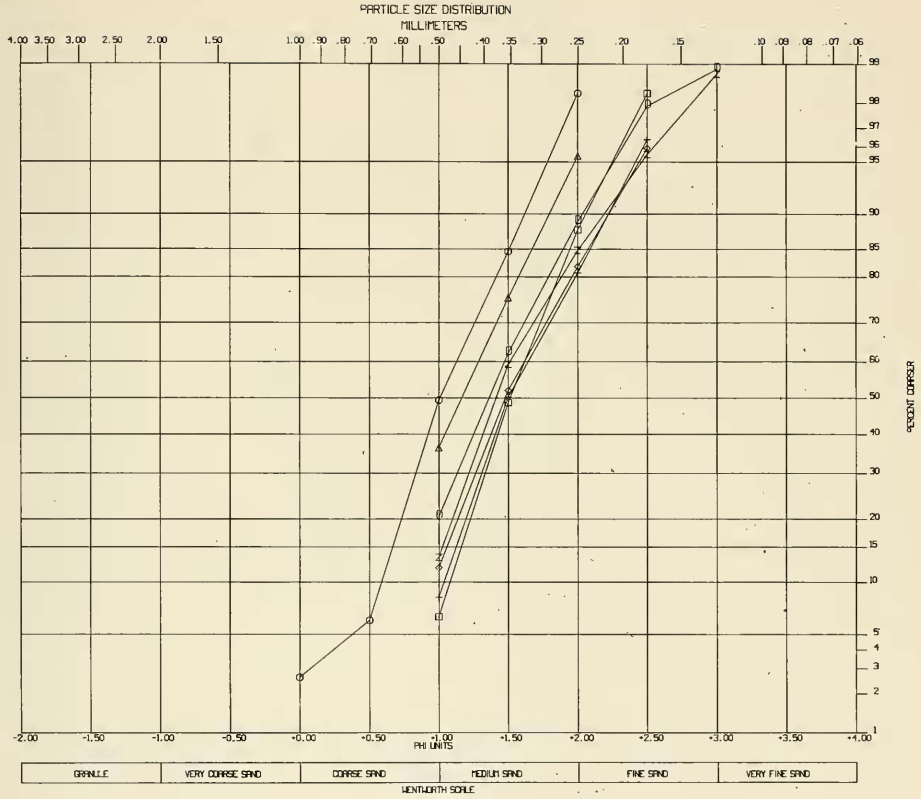
MAR C JUN + SEP V DEC Z

NEWPORT



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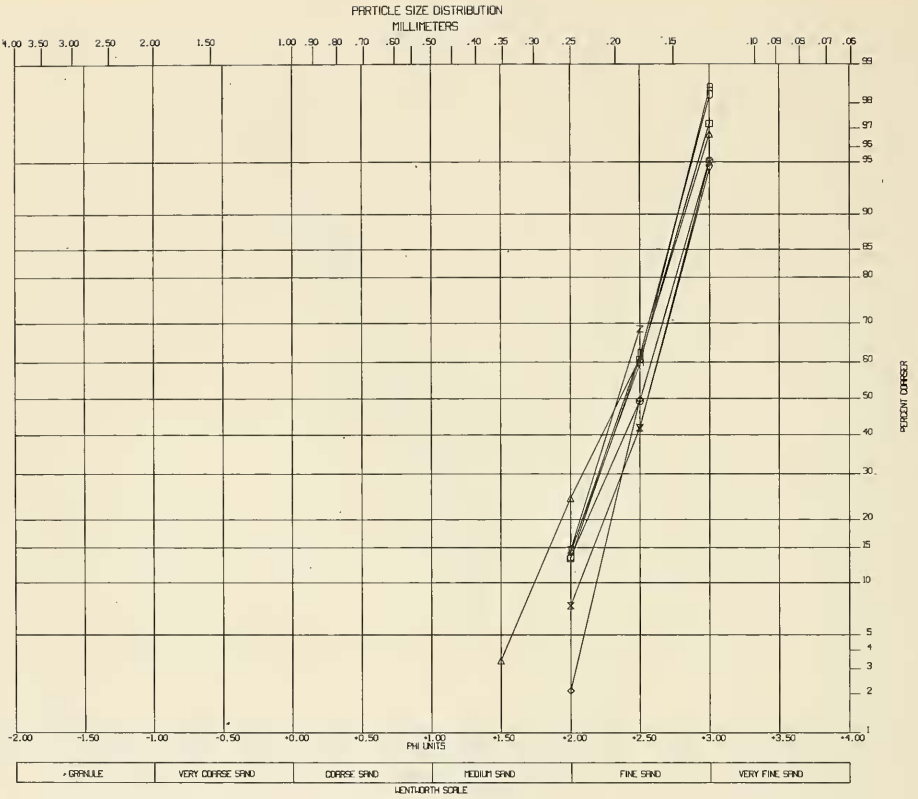

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MAR C JUN + SEP ▽ DEC Z

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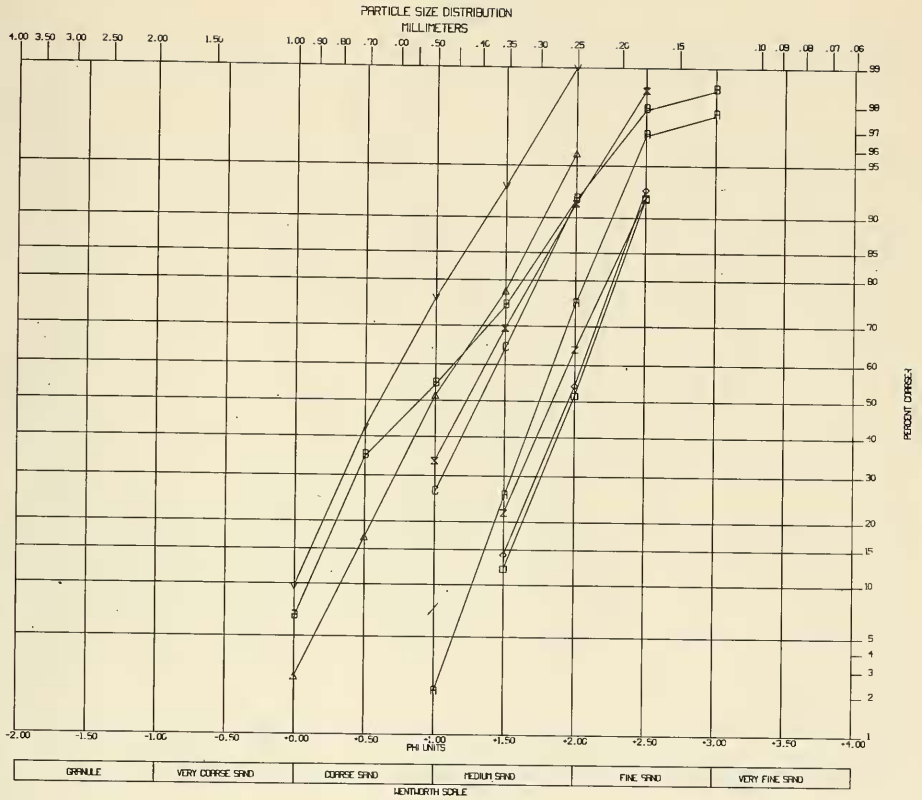

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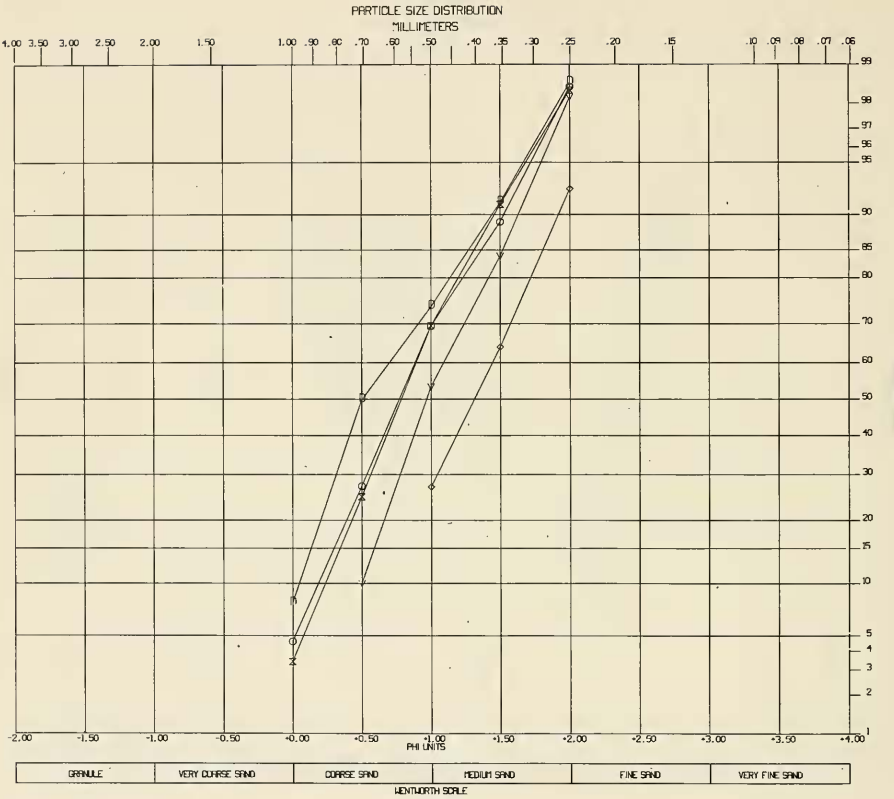

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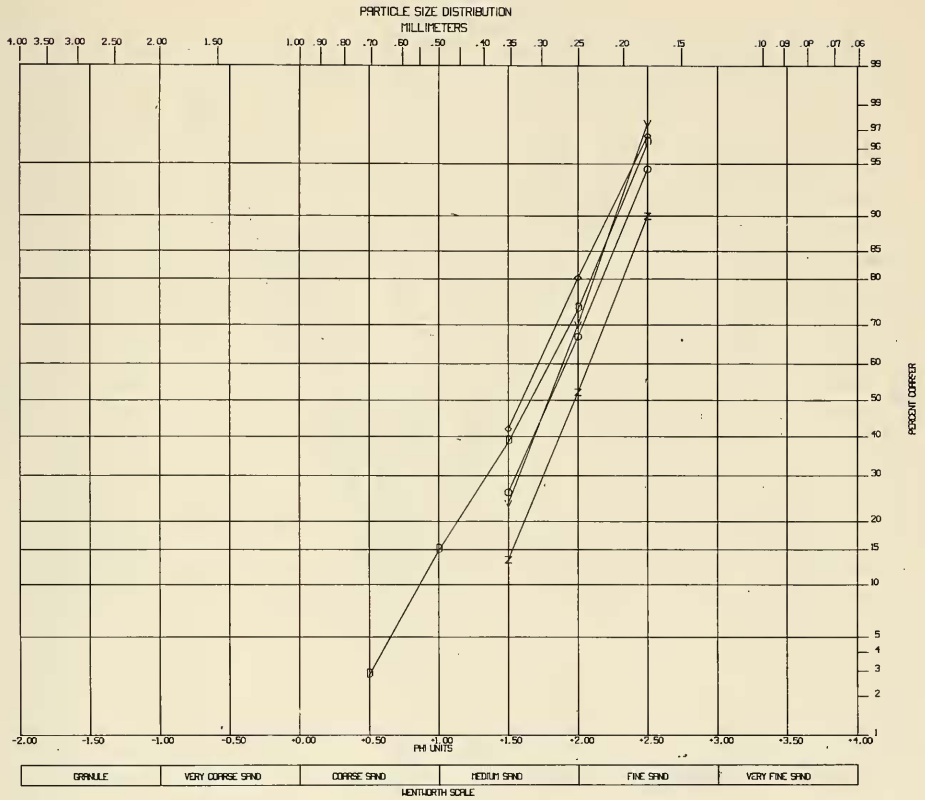

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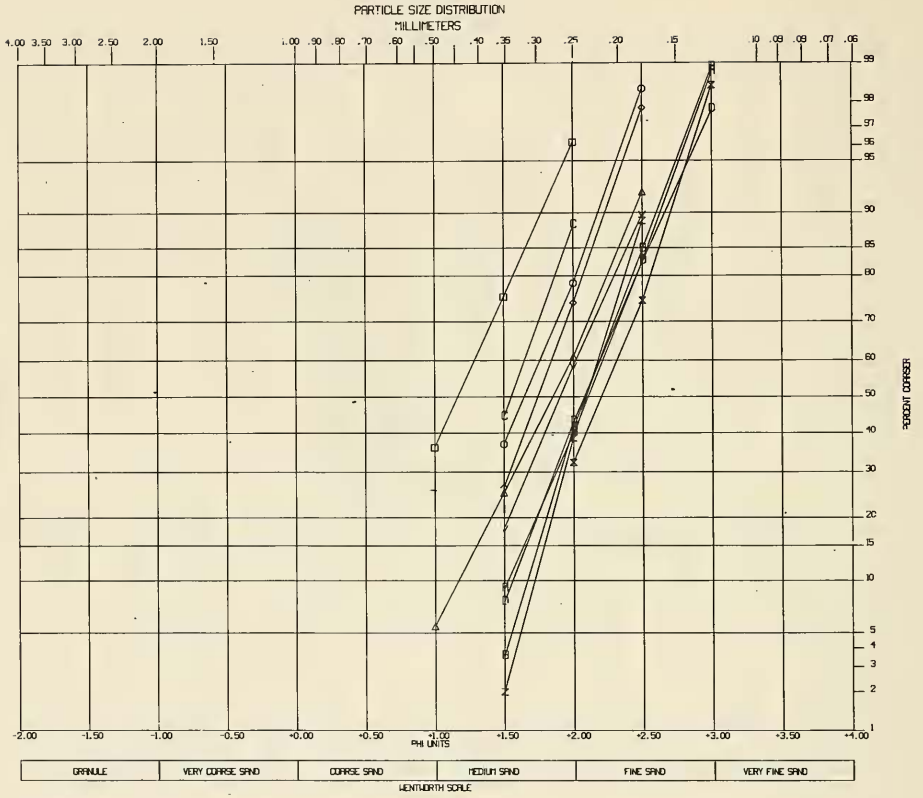
MAR C JUN + SEP ▽ DEC Z

SAN BUENAVENTURA



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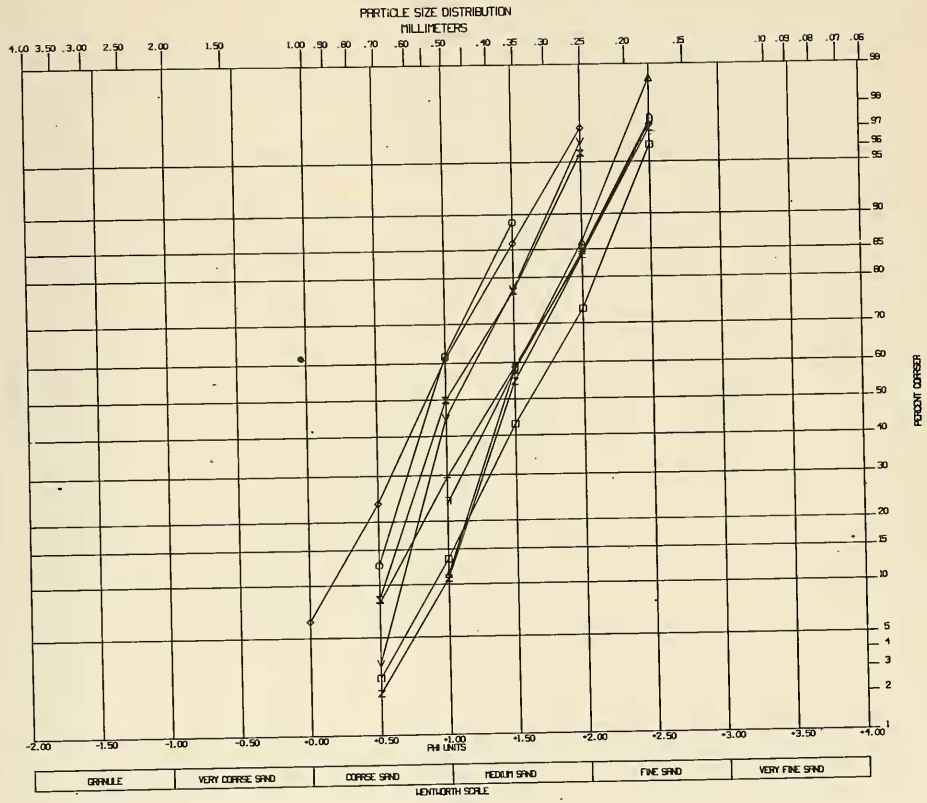

JAN A APR D JUL Δ OCT O
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MAR C JUN + SEP V DEC Z

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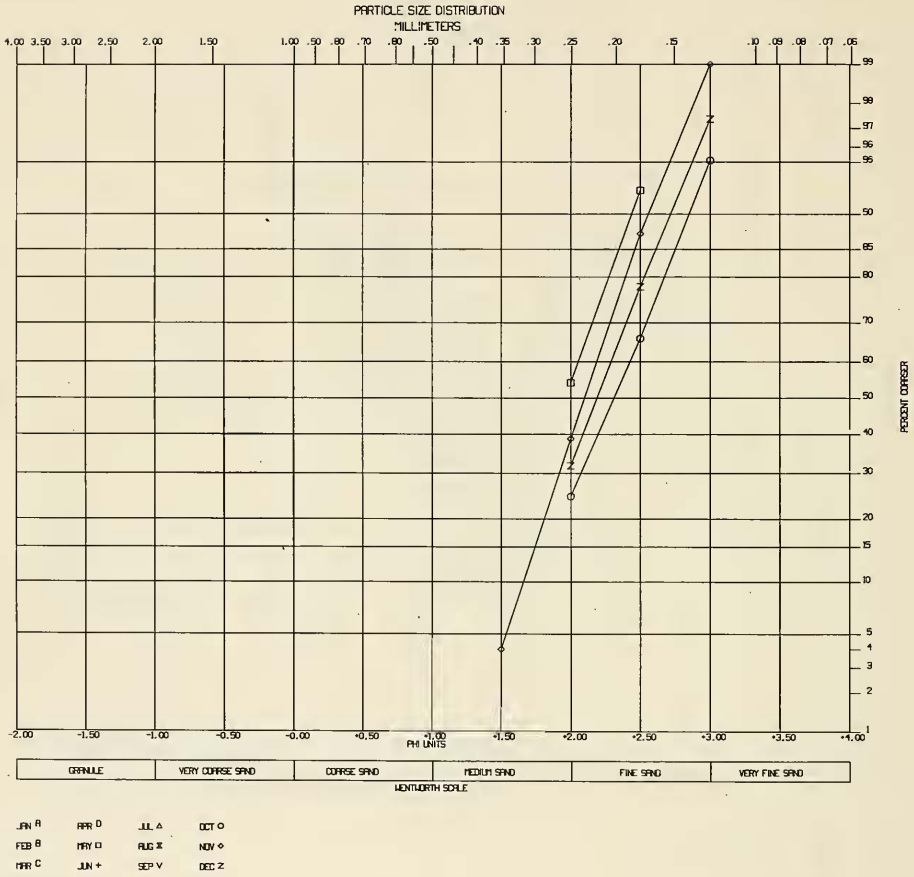
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PHI UNITS
GRANULE
VERY COARSE SAND
COARSE SAND
MEDIUM SAND
FINE SAND
VERY FINE SAND
WENTWORTH SCALE
JAN A
FEB B
MAR C
APR D
MAY □
JUN +
JUL △
AUG ⧖
SEP V
OCT ○
NOV ◇
DEC Z

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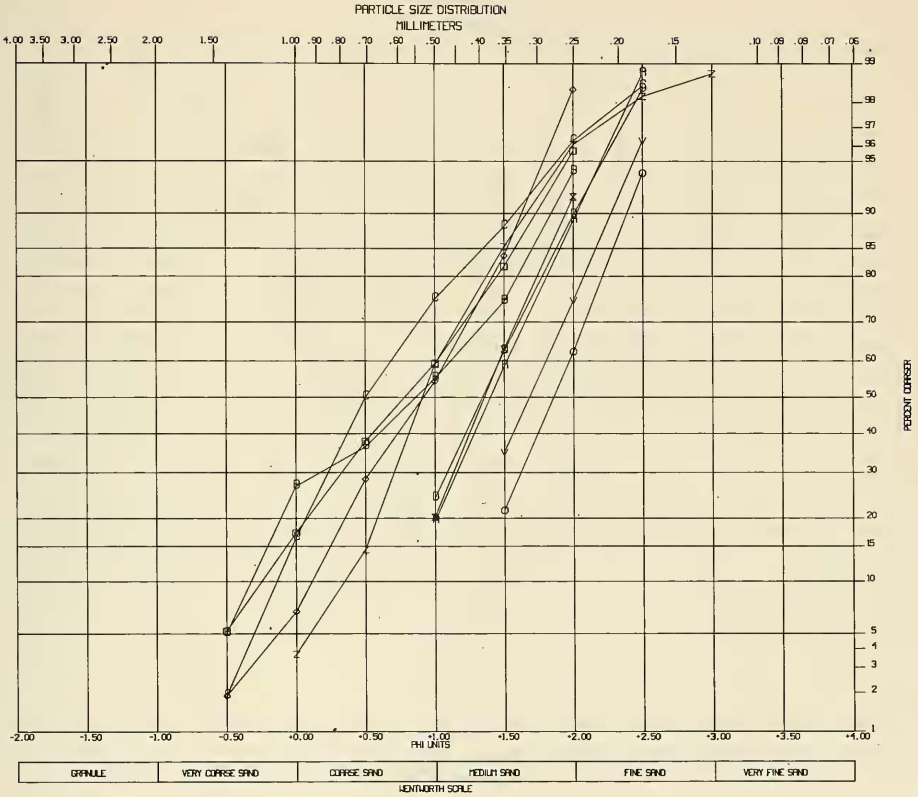
SAN SIMEON



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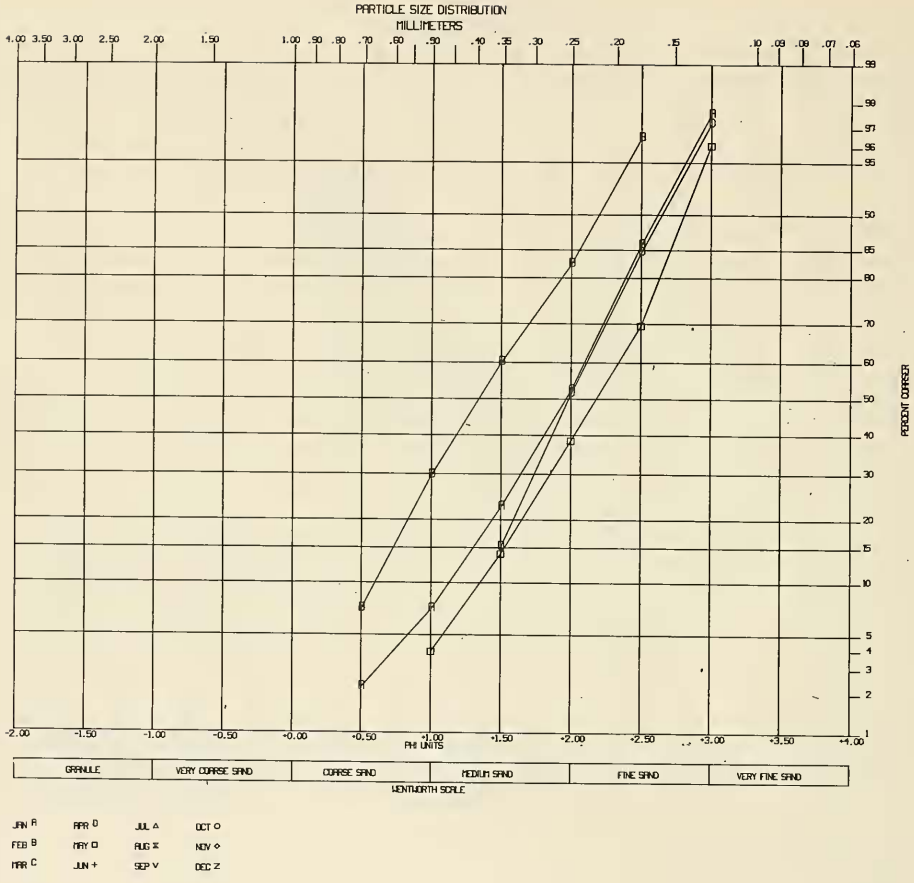
FEB B MAY □ AUG ⧖ NOV ◇
MAR C JUN + SEP ▽ DEC Z

SEACLIFF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99 98 97 96 95 90 85 80 70 60 50 40 30 20 15 10 5 4 3 2 1
PERCENT COARSER
-2.00 -1.50 -1.00 -0.50 +0.00 +0.50 +1.00 +1.50 +2.00 +2.50 +3.00 +3.50 +4.00
PHI UNITS
GRANULE
VERY COARSE SAND
COARSE SAND
MEDIUM SAND
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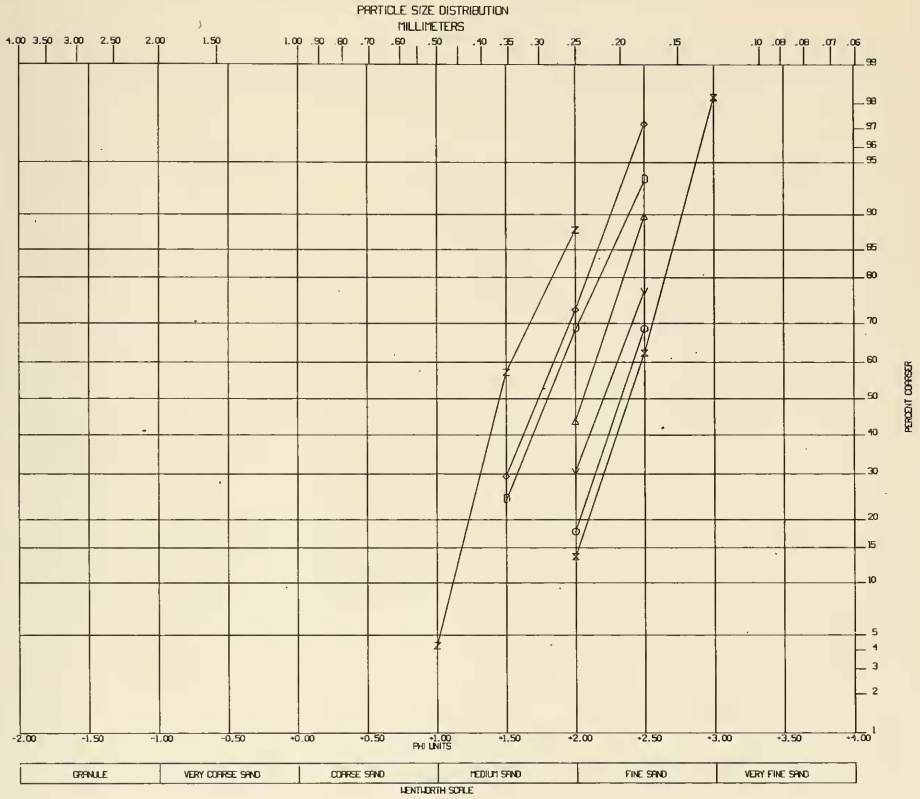
VERY FINE SAND
WENTWORTH SCALE
JAN A
FEB B
MAR C
APR D
MAY □
JUN +
JUL △
AUG ⋇
SEP ▽
OCT ○
NOV ◇
DEC ▷

SILVER STRAND



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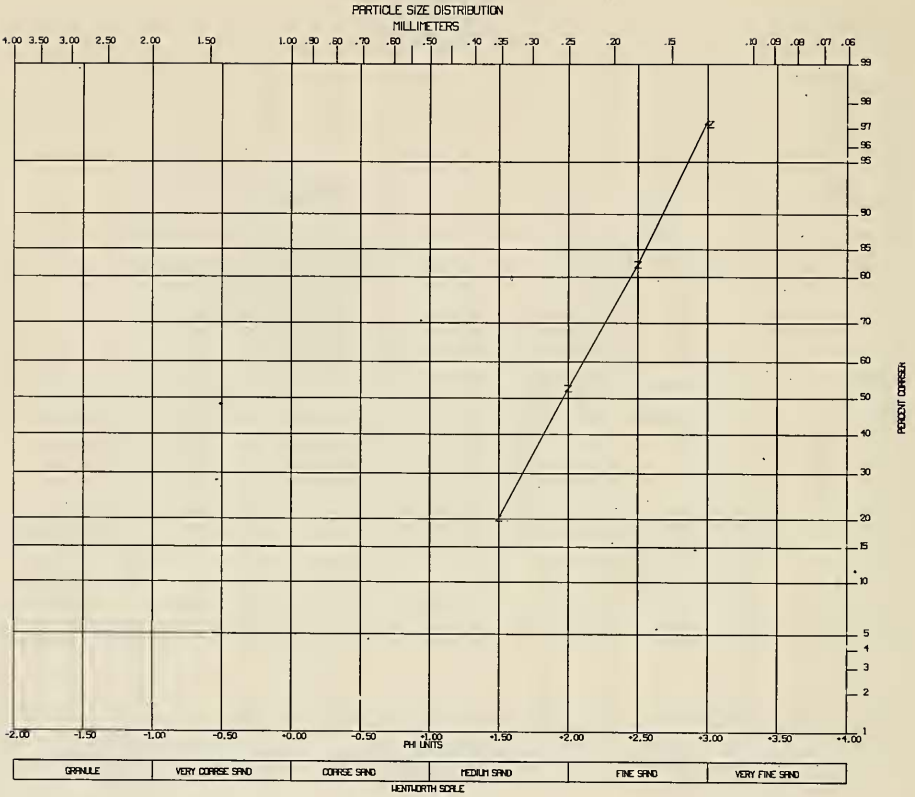
FEB B MAY □ AUG ⊠ NOV ◇
MAR C JUN + SEP ▽ DEC ⊠

SOUTH CARLSBAD



JAN A APR D JUL Δ OCT ○
FEB B MAY □ AUG ⧖ NOV ◇
MAR C JUN + SEP ▽ DEC Z

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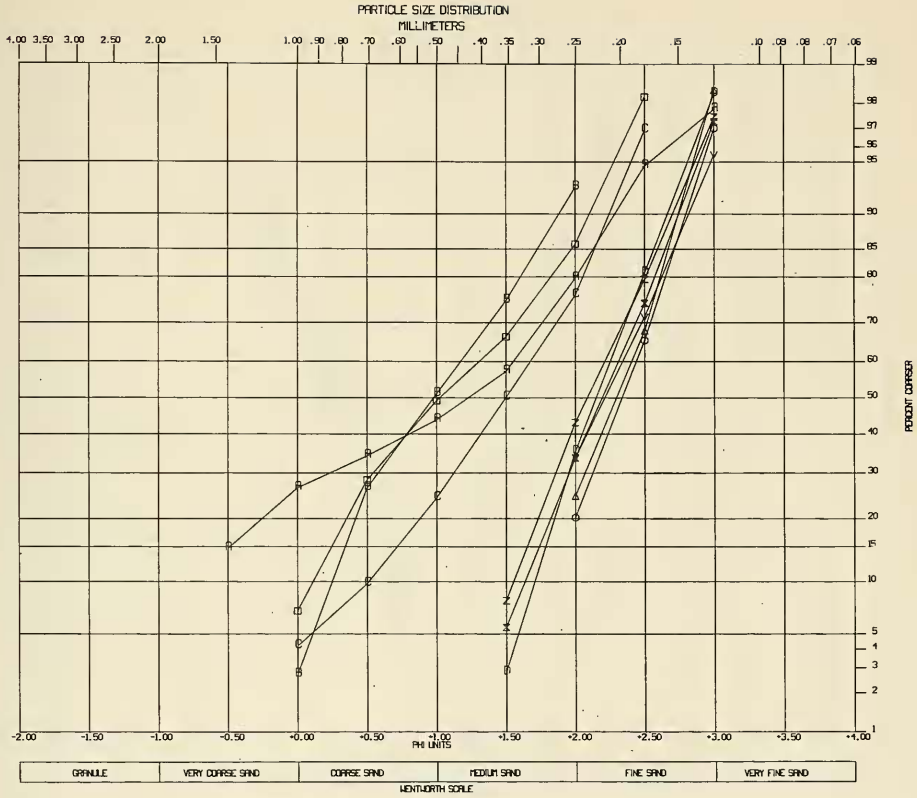
STINSON



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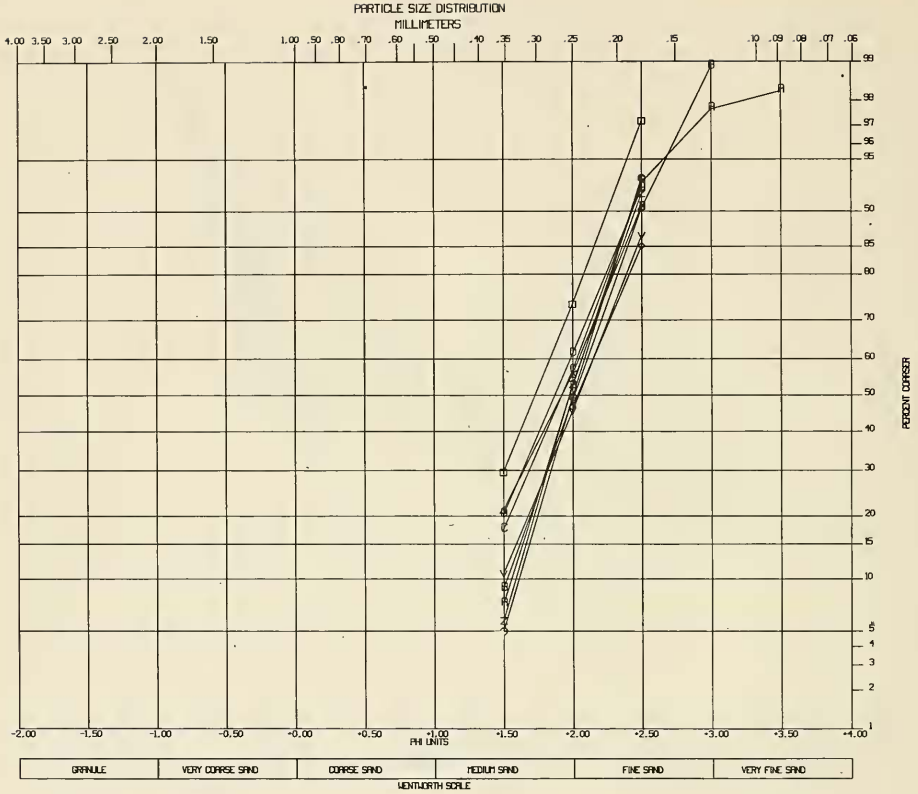
FEB B	MAY □	AUG ✕	NOV ◇
MAR C	JUN +	SEP ▽	DEC ☒

SUNSET



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FEB B MAY □ AUG ✕ NOV ◇
MAR C JUN + SEP ▽ DEC ☆

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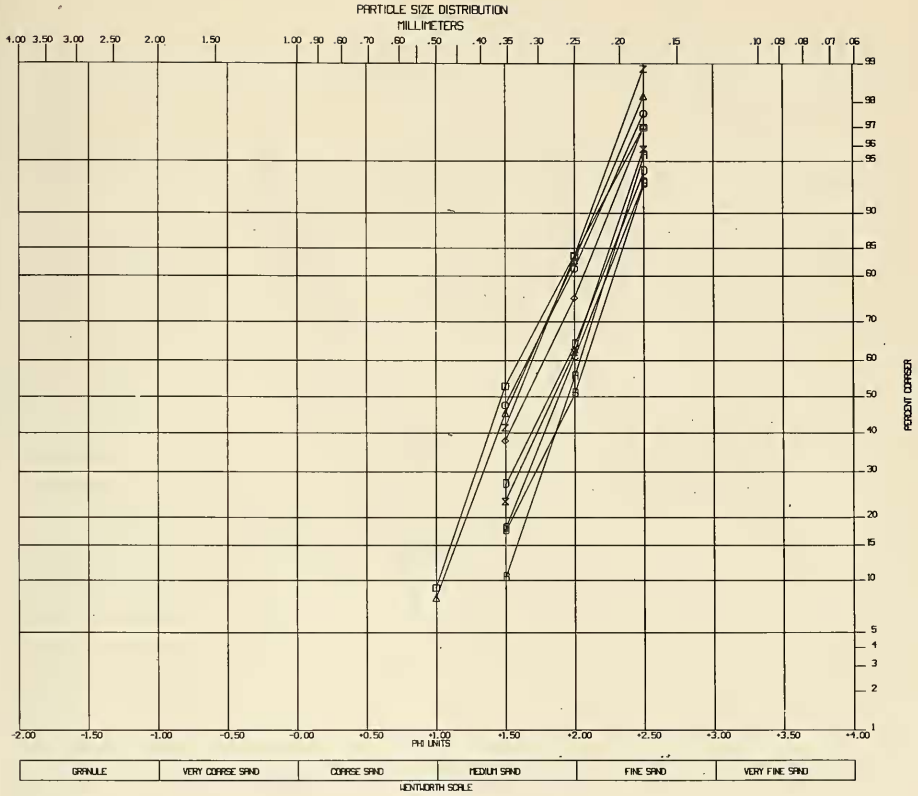
THORNTON



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FEB B MAY □ AUG ✕ NOV ◇
MAR C JUN + SEP ▽ DEC ▷

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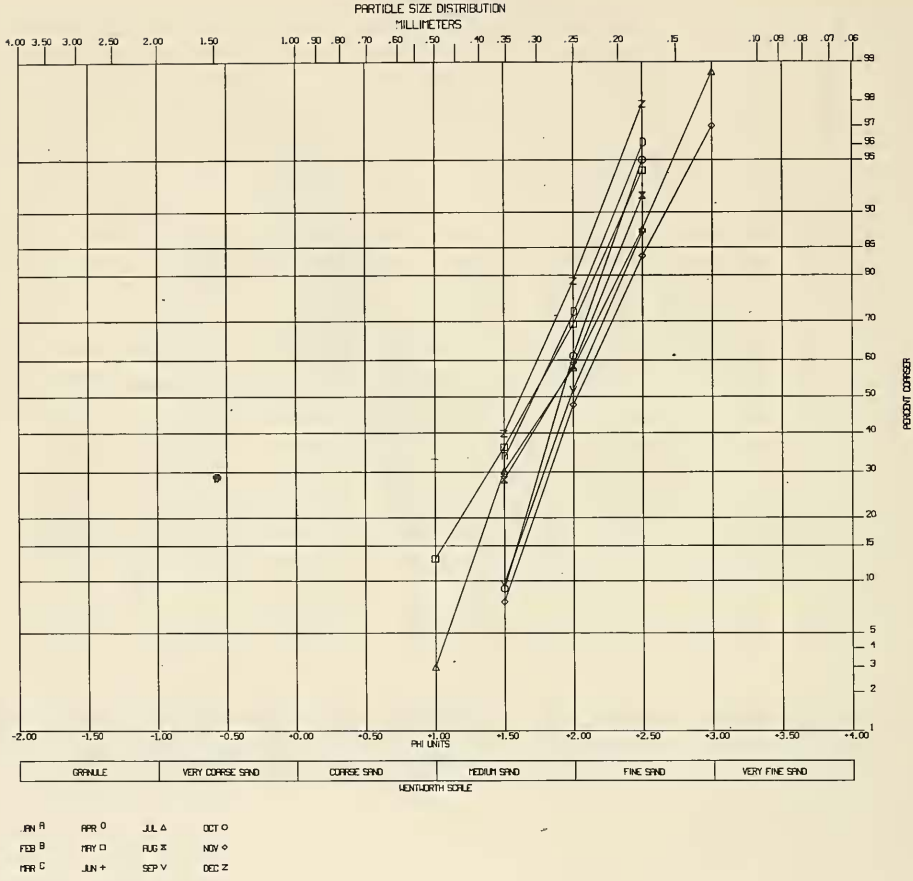

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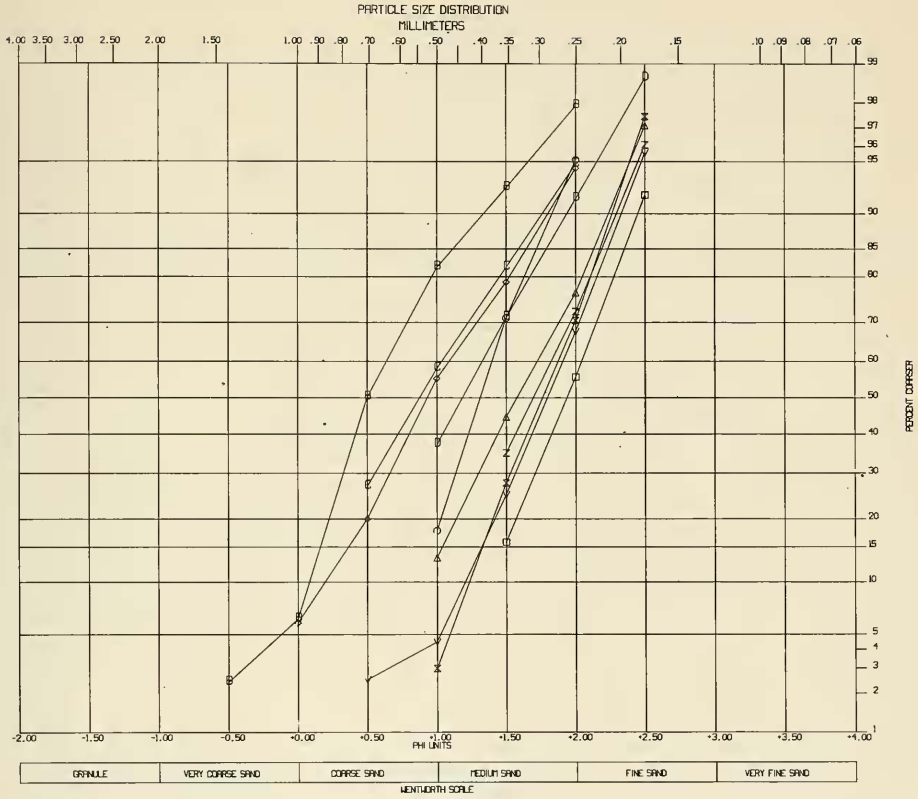
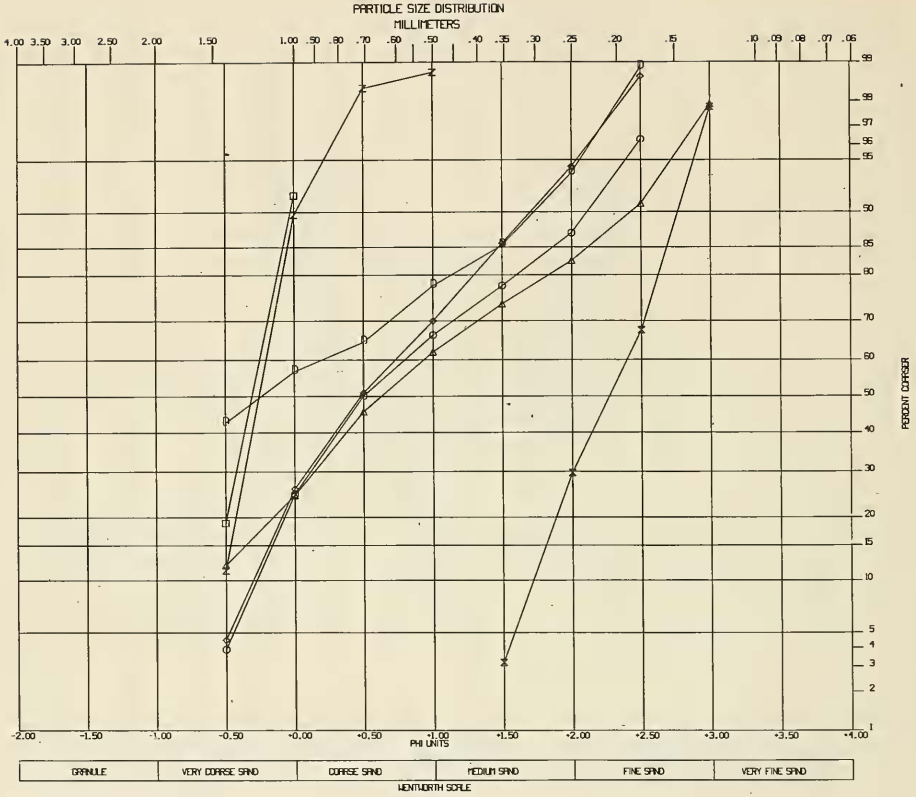
TWIN LAKES



JAN A	APR D	JUL Δ	OCT O
FEB B	MAY □	AUG ⧖	NOV ◇
MAR C	JUN +	SEP V	DEC Z

VAN DAMME


PARTICLE SIZE DISTRIBUTION
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99 98 97 96 95 90 85 80 70 60 50 40 30 20 15 10 5 4 3 2 1
PERCENT COARSER
-2.00 -1.50 -1.00 -0.50 +0.00 +0.50 +1.00 +1.50 +2.00 +2.50 +3.00 +3.50 +4.00
PHI UNITS
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COARSE SAND
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VERY FINE SAND
WENTWORTH SCALE
JAN A
FEB B
MAR C
APR D
MAY □
JUN +
JUL △
AUG ⧖
SEP ▽
OCT ○
NOV ◇
DEC ⧗

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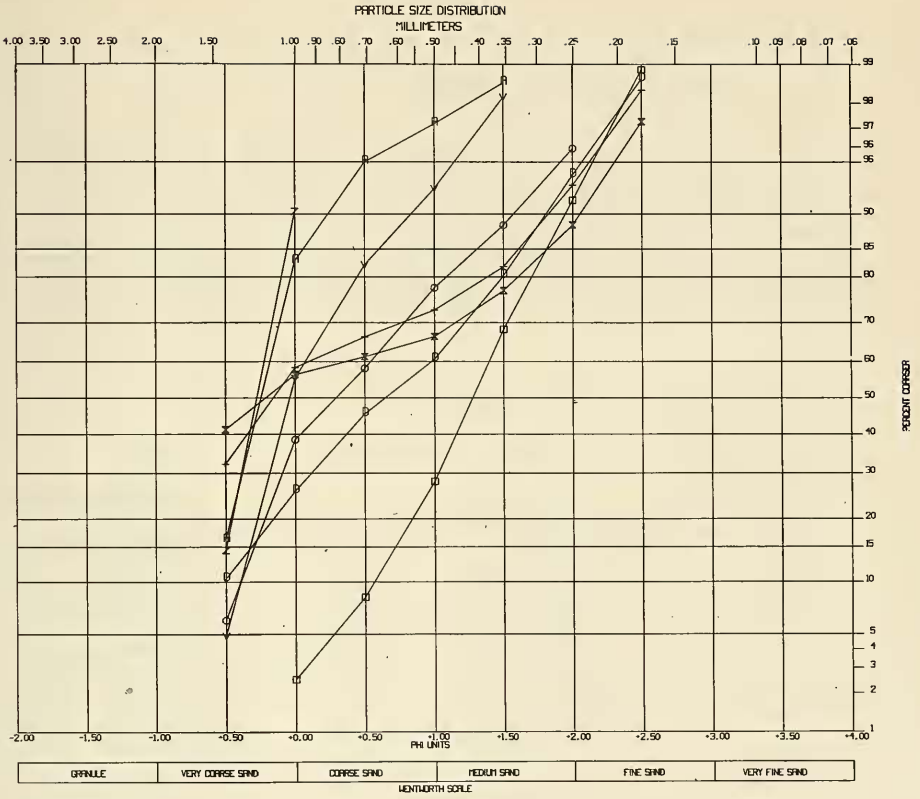
WRIGHTS



JAN A APR D JUL Δ OCT ○
FEB B MAY □ AUG ⧗ NOV ◇
MAR C JUN + SEP V DEC Z

APPENDIX F

TABLES SUMMARIZING THE MEDIAN AND MEAN DIAMETER, STANDARD DEVIATION, SKEWNESS AND KURTOSIS OF SAND SAMPLES

These characteristics were obtained by "computing various moments of the sample distribution about some central measure of sediment diameter" (Inman, 1952). This is a common statistical method for describing a frequency distribution. A detailed discussion of moment measures and related sediment characteristics is given by Douglas L. Inman in "Measures for Describing the Size Distribution of Sediments", *Journal of Sedimentary Petrology*, Vol. 22, No. 3, pp. 125-245, 1952.

INDEX

SIZE CHARACTERISTICS OF SAND SAMPLES

1968 DATA

NEW BRIGHTON (05001)

	MEDIAN		MEAN		STND. DEV.		SKEWNESS	KURTOSIS
	PHI	MM.	PHI	MM.	PHI	MM.		
JAN 12	2.00	.250	2.01	.248	.43	1.347	.35	2.59
FEB 23	2.03	.245	2.03	.245	.56	1.474	.41	2.99
MAR 8	1.70	.308	1.75	.297	.52	1.434	.69	3.85
APR	NO SAMPLE WAS COLLECTED							
MAY	NO SAMPLE WAS COLLECTED							
JUN	NO SAMPLE WAS COLLECTED							
JUL	NO SAMPLE WAS COLLECTED							
AUG	NO SAMPLE WAS COLLECTED							
SEP	NO SAMPLE WAS COLLECTED							
OCT	NO SAMPLE WAS COLLECTED							
NOV	NO SAMPLE WAS COLLECTED							
DEC	NO SAMPLE WAS COLLECTED							

SIZE CHARACTERISTICS OF SAND SAMPLES

1968 DATA

THORNTON (05002)

	MEDIAN		MEAN		STND. DEV.		SKEWNESS	KURTOSIS
	PHI	MM.	PHI	MM.	PHI	MM.		
JAN 2	1.95	.259	1.94	.261	.34	1.266	.07	2.18
FEB 7	1.99	.252	1.95	.259	.39	1.310	-.19	2.12
MAR 4	1.87	.274	1.90	.268	.39	1.310	.32	2.17
APR 15	1.81	.285	1.83	.281	.40	1.320	.22	2.04
MAY 6	1.47	.361	1.54	.344	.44	1.357	.57	2.69
JUN	NO SAMPLE WAS COLLECTED							
JUL 15	1.56	.339	1.56	.339	.44	1.357	.32	2.29
AUG 13	1.85	.277	1.85	.277	.38	1.301	.14	2.07
SEP	NO SAMPLE WAS COLLECTED							
OCT 11	1.53	.346	1.62	.325	.40	1.320	.68	2.61
NOV 8	1.61	.328	1.72	.304	.38	1.301	.65	2.43
DEC 8	1.59	.332	1.62	.325	.37	1.292	.43	2.48

SIZE CHARACTERISTICS OF SAND SAMPLES

1968 DATA

FRANCIS (05003)

	MEDIAN		MEAN		STND. DEV.		SKEWNESS	KURTOSIS
	PHI	MM.	PHI	MM.	PHI	MM.		
JAN 8	.31	.807	.37	.774	.33	1.257	.60	3.78
FEB 7	.17	.889	.23	.853	.31	1.240	.71	3.38
MAR 7	.01	.655	.68	.624	.43	1.347	.56	3.03
APR 15	.42	.747	.50	.707	.46	1.376	.58	3.19
MAY 7	.67	.629	.74	.599	.40	1.320	.76	2.97
JUN	NO SAMPLE WAS COLLECTED							
JUL 15	1.00	.500	1.05	.483	.39	1.310	.56	2.95
AUG 15	.47	.722	.53	.693	.44	1.357	.65	3.55
SEP	NO SAMPLE WAS COLLECTED							
OCT 11	.90	.536	.96	.514	.34	1.266	.62	2.91
NOV 9	.25	.841	.29	.818	.36	1.283	.67	3.83
DEC 8	.45	.732	.49	.712	.37	1.292	.57	3.85

SIZE CHARACTERISTICS OF SAND SAMPLES

1968 DATA

NATURAL BRIDGES (05004)

	MEDIAN		MEAN		STND. DEV.		SKEWNESS	KURTOSIS
	PHI	MM.	PHI	MM.	PHI	MM.		
JAN 11	2.08	.237	2.04	.243	.41	1.329	-.01	2.06
FEB 11	1.37	.387	1.43	.371	.53	1.444	.38	2.36
MAR 11	1.69	.310	1.69	.310	.41	1.329	.12	2.39
APR 1	1.59	.332	1.58	.334	.56	1.474	.08	2.69
MAY 10	1.94	.261	1.93	.262	.39	1.310	.15	2.04
JUN	NO SAMPLE WAS COLLECTED							
JUL 10	2.01	.248	2.01	.248	.40	1.320	.06	1.96
AUG 12	1.35	.392	1.46	.363	.54	1.454	.43	2.31
SEP 12	1.52	.349	1.49	.356	.50	1.414	-.24	2.47
OCT 10	1.65	.319	1.65	.319	.50	1.414	-.30	2.78
NOV 11	1.84	.279	1.85	.277	.37	1.292	.15	2.32
DEC 9	1.84	.279	1.87	.274	.36	1.283	.69	3.61

SIZE CHARACTERISTICS OF SAND SAMPLES

1968 DATA

TWIN LAKES (05005)

		MEDIAN		MEAN		STND. DEV.		SKEWNESS	KURTOSIS
		PHI	MM.	PHI	MM.	PHI	MM.		
JAN		NO SAMPLE WAS COLLECTED							
FEB	7	.50	.707	.60	.660	.54	1.454	.49	4.30
MAR	6	.87	.547	.96	.514	.56	1.474	.59	2.56
APR	8	1.16	.448	1.25	.420	.48	1.395	.66	2.77
MAY	15	1.92	.264	1.93	.262	.39	1.310	.28	2.28
JUN		NO SAMPLE WAS COLLECTED							
JUL	17	1.58	.334	1.59	.332	.50	1.414	.05	2.22
AUG	10	1.77	.293	1.75	.297	.41	1.329	-.09	2.38
SEP	3	1.81	.285	1.77	.293	.49	1.404	-.78	4.72
OCT	5	1.29	.409	1.33	.398	.37	1.292	.48	2.97
NOV	8	.91	.532	.97	.511	.61	1.526	.12	2.66
DEC	6	1.70	.308	1.73	.301	.41	1.329	.34	2.23

SIZE CHARACTERISTICS OF SAND SAMPLES

1968 DATA

SEACLIFF (05006)

		MEDIAN		MEAN		STND. DEV.		SKEWNESS	KURTOSIS
		PHI	MM.	PHI	MM.	PHI	MM.		
JAN	1	1.96	.257	1.91	.266	.60	1.516	-.31	3.01
FEB	1	1.33	.398	1.37	.387	.62	1.537	.15	2.44
MAR		NO SAMPLE WAS COLLECTED							
APR	6	1.98	.253	2.01	.248	.47	1.385	.30	2.56
MAY	8	2.22	.215	2.14	.227	.58	1.495	-.56	2.84
JUN		NO SAMPLE WAS COLLECTED							
JUL		NO SAMPLE WAS COLLECTED							
AUG		NO SAMPLE WAS COLLECTED							
SEP		NO SAMPLE WAS COLLECTED							
OCT		NO SAMPLE WAS COLLECTED							
NOV		NO SAMPLE WAS COLLECTED							
DEC		NO SAMPLE WAS COLLECTED							

SIZE CHARACTERISTICS OF SAND SAMPLES

1968 DATA

SUNSET (05007)

	MEDIAN		MEAN		STND. DEV.		SKEWNESS	KURTOSIS
	PHI	MM.	PHI	MM.	PHI	MM.		
JAN 1	1.98	.253	2.00	.250	.40	1.320	1.21	6.26
FEB 4	2.01	.248	2.02	.247	.39	1.310	.43	3.36
MAR 1	1.92	.264	1.92	.264	.40	1.320	.12	2.31
APR 5	1.86	.275	1.88	.272	.41	1.329	.27	2.44
MAY 10	1.72	.304	1.74	.299	.38	1.301	.24	2.35
JUN	NO SAMPLE WAS COLLECTED							
JUL 20	1.94	.261	1.93	.262	.43	1.347	.02	2.20
AUG	NO SAMPLE WAS COLLECTED							
SEP 8	2.05	.241	2.04	.243	.41	1.329	-.11	2.42
OCT 12	2.00	.250	2.00	.250	.33	1.257	.18	2.46
NOV 2	2.03	.245	2.08	.237	.37	1.292	.46	2.26
DEC 17	1.96	.257	1.98	.253	.35	1.275	.33	2.41

SIZE CHARACTERISTICS OF SAND SAMPLES

1968 DATA

SAN SIMEON (05009)

		MEDIAN		MEAN		STND. DEV.		SKEWNESS	KURTOSIS
		PHI	MM.	PHI	MM.	PHI	MM.		
JAN	3	1.40	.379	1.43	.371	.44	1.357	.40	2.61
FEB	2	.90	.536	.79	.578	.84	1.790	-.09	1.81
MAR	9	.50	.707	.60	.660	.67	1.591	.79	3.28
APR	9	1.31	.403	1.38	.384	.46	1.376	.54	2.66
MAY	1	.84	.559	.77	.586	.75	1.682	-.05	2.21
JUN		NO SAMPLE WAS COLLECTED							
JUL		NO SAMPLE WAS COLLECTED							
AUG	4	1.34	.395	1.38	.384	.42	1.338	.39	2.55
SEP	5	1.67	.314	1.72	.304	.41	1.329	.39	2.32
OCT	2	1.87	.274	1.88	.272	.38	1.301	.32	2.31
NOV	1	.95	.518	.90	.536	.59	1.505	-.28	2.70
DEC	1	.90	.536	.97	.511	.55	1.464	.87	5.06

SIZE CHARACTERISTICS OF SAND SAMPLES

1968 DATA

PISMO (05012)

		MEDIAN		MEAN		STND. DEV.		SKEWNESS	KURTOSIS
		PHI	MM.	PHI	MM.	PHI	MM.		
JAN	3	2.41	.188	2.38	.192	.33	1.257	-.18	2.43
FEB		NO SAMPLE WAS COLLECTED							
MAR		NO SAMPLE WAS COLLECTED							
APR	1	2.39	.191	2.37	.193	.34	1.266	-.19	2.55
MAY	1	2.40	.189	2.40	.189	.32	1.248	.08	2.29
JUN		NO SAMPLE WAS COLLECTED							
JUL	1	2.38	.192	2.33	.199	.43	1.347	-.31	2.35
AUG	2	2.57	.168	2.53	.173	.32	1.248	-.31	2.42
SEP	3	2.57	.168	2.56	.170	.29	1.223	.05	2.10
OCT	1	2.51	.176	2.46	.182	.36	1.283	-.11	2.05
NOV	1	2.50	.177	2.48	.179	.26	1.197	-.19	2.25
DEC	2	2.34	.198	2.33	.199	.30	1.231	-.15	2.40

SIZE CHARACTERISTICS OF SAND SAMPLES

1968 DATA

EL CAPITAN (05013)

		MEDIAN		MEAN		STND. DEV.		SKEWNESS	KURTOSIS
		PHI	MM.	PHI	MM.	PHI	MM.		
JAN	6	2.01	.248	1.99	.252	.42	1.338	-.13	2.40
FEB	2	2.18	.221	2.16	.224	.33	1.257	.05	2.31
MAR	5	1.75	.297	1.81	.285	.39	1.310	.34	2.41
APR	1	2.12	.230	2.09	.235	.35	1.275	-.04	2.43
MAY	8	2.09	.235	2.11	.232	.33	1.257	.21	2.17
JUN	3	2.04	.243	1.98	.253	.40	1.320	-.51	2.47
JUL	4	1.89	.270	1.89	.270	.33	1.257	.12	2.24
AUG		NO SAMPLE WAS COLLECTED							
SEP	1	2.11	.232	2.11	.232	.34	1.266	.19	2.19
OCT		NO SAMPLE WAS COLLECTED							
NOV		NO SAMPLE WAS COLLECTED							
DEC		NO SAMPLE WAS COLLECTED							

SIZE CHARACTERISTICS OF SAND SAMPLES

1968 DATA

CARPINTERIA (05014)

		MEDIAN		MEAN		STND. DEV.		SKEWNESS	KURTOSIS
		PHI	MM.	PHI	MM.	PHI	MM.		
JAN		NO SAMPLE WAS COLLECTED							
FEB	1	1.94	.261	1.91	.266	.41	1.329	-.04	2.23
MAR		NO SAMPLE WAS COLLECTED							
APR		NO SAMPLE WAS COLLECTED							
MAY		NO SAMPLE WAS COLLECTED							
JUN		NO SAMPLE WAS COLLECTED							
JUL		NO SAMPLE WAS COLLECTED							
AUG		NO SAMPLE WAS COLLECTED							
SEP	16	2.01	.248	2.05	.241	.43	1.347	.70	3.68
OCT	1	2.44	.184	2.44	.184	.38	1.301	.29	3.13
NOV	4	1.90	.268	1.94	.261	.32	1.248	.49	2.81
DEC	9	2.24	.212	2.23	.213	.31	1.240	.08	2.25

SIZE CHARACTERISTICS OF SAND SAMPLES

1968 DATA

SAN BUENAVENTURA (05015)

135

	MEDIAN		MEAN		STND. DEV.		SKEWNESS	KURTOSIS
	PHI	MM.	PHI	MM.	PHI	MM.		
JAN 5	2.11	.232	2.10	.233	.41	1.329	.15	2.84
FEB 2	2.10	.233	2.10	.233	.38	1.301	.15	2.40
MAR 15	1.56	.339	1.58	.334	.34	1.266	.32	2.24
APR 1	2.08	.237	2.09	.235	.43	1.347	.25	2.47
MAY 2	1.14	.454	1.20	.435	.42	1.338	.50	2.58
JUN	NO SAMPLE WAS COLLECTED							
JUL 9	1.86	.275	1.83	.281	.49	1.404	-.16	2.27
AUG 1	2.22	.215	2.21	.216	.39	1.310	.10	2.14
SEP 12	1.89	.270	1.93	.262	.41	1.329	.32	2.15
OCT 6	1.64	.321	1.69	.310	.36	1.283	.41	2.42
NOV 5	1.69	.310	1.76	.295	.34	1.266	.52	2.48
DEC 4	2.10	.233	2.09	.235	.33	1.257	.06	2.42

SIZE CHARACTERISTICS OF SAND SAMPLES

1968 DATA

MCGRATH (05016)

	MEDIAN		MEAN		STND. DEV.		SKEWNESS	KURTOSIS
	PHI	MM.	PHI	MM.	PHI	MM.		
JAN 5	-.20	1.149	-.16	1.117	.20	1.149	.24	3.26
FEB 2	.21	.865	.30	.812	.37	1.292	.69	3.06
MAR 15	.85	.555	.89	.540	.44	1.357	.45	2.66
APR 1	.61	.655	.69	.620	.33	1.257	.82	3.07
MAY 2	.42	.747	.51	.702	.43	1.347	.87	3.41
JUN	NO SAMPLE WAS COLLECTED							
JUL 10	1.35	.392	1.39	.382	.45	1.366	.33	2.31
AUG 1	1.26	.418	1.32	.401	.39	1.310	.49	2.68
SEP 12	1.24	.423	1.29	.409	.39	1.310	.43	3.19
OCT 6	1.03	.490	1.10	.467	.43	1.347	.39	2.54
NOV 5	.61	.655	.69	.620	.37	1.292	.64	2.67
DEC 4	.86	.551	.98	.507	.41	1.329	.52	2.91

SIZE CHARACTERISTICS OF SAND SAMPLES

1968 DATA

LEO CARRILLO (05017)

	MEDIAN		MEAN		STND. DEV.		SKEWNESS	KURTOSIS
	PHI	MM.	PHI	MM.	PHI	MM.		
JAN 3	1.32	.401	1.36	.390	.50	1.414	.38	2.93
FEB	NO SAMPLE WAS COLLECTED							
MAR	NO SAMPLE WAS COLLECTED							
APR	NO SAMPLE WAS COLLECTED							
MAY	NO SAMPLE WAS COLLECTED							
JUN	NO SAMPLE WAS COLLECTED							
JUL	NO SAMPLE WAS COLLECTED							
AUG 9	1.02	.493	1.12	.460	.42	1.338	.63	2.44
SEP 15	1.03	.490	1.12	.460	.41	1.329	.46	2.61
OCT 6	.99	.503	1.00	.500	.54	1.454	.05	2.33
NOV 21	1.32	.401	1.27	.415	.54	1.454	-.07	2.30
DEC 3	1.75	.297	1.81	.285	.43	1.347	.39	2.44

SIZE CHARACTERISTICS OF SAND SAMPLES

1968 DATA

BOLSA CHICA (05018)

		MEDIAN		MEAN		STND. DEV.		SKEWNESS	KURTOSIS
		PHI	MM.	PHI	MM.	PHI	MM.		
JAN	6	.91	.532	1.11	.463	.82	1.765	1.04	3.82
FEB	7	.24	.847	.50	.707	.82	1.765	1.50	4.98
MAR	7	.66	.633	.70	.616	.69	1.613	.36	2.39
APR	6	.63	.646	.73	.603	.61	1.526	.42	2.69
MAY	2	1.49	.356	1.49	.356	.72	1.647	-.57	3.55
JUN	21	1.38	.384	1.40	.379	.71	1.636	.01	2.20
JUL		NO SAMPLE WAS COLLECTED							
AUG		NO SAMPLE WAS COLLECTED							
SEP	2	.59	.664	.68	.624	.50	1.414	1.32	6.07
OCT	2	.98	.507	1.07	.476	.53	1.444	.73	3.00
NOV	2	.56	.678	.74	.599	.58	1.495	1.51	5.32
DEC	4	.95	.518	.97	.511	.54	1.454	.25	2.71

SIZE CHARACTERISTICS OF SAND SAMPLES

1968 DATA

POINT MUGU (05019)

	MEDIAN		MEAN		STND. DEV.		SKEWNESS	KURTOSIS
	PHI	MM.	PHI	MM.	PHI	MM.		
JAN 11	1.74	.299	1.76	.295	.43	1.347	.97	5.70
FEB 4	.90	.536	.95	.518	.75	1.682	.56	2.94
MAR 3	1.29	.409	1.35	.392	.43	1.347	.40	2.35
APR	NO SAMPLE WAS COLLECTED							
MAY 1	1.98	.253	1.98	.253	.37	1.292	.14	2.39
JUN	NO SAMPLE WAS COLLECTED							
JUL 10	.98	.507	1.03	.490	.56	1.474	.13	2.50
AUG 1	1.20	.435	1.29	.409	.47	1.385	.68	2.87
SEP 1	.59	.664	.65	.637	.52	1.434	.43	2.86
OCT	NO SAMPLE WAS COLLECTED							
NOV 21	1.94	.261	1.94	.261	.38	1.301	.24	2.25
DEC 3	1.82	.283	1.86	.275	.41	1.329	.38	2.44

SIZE CHARACTERISTICS OF SAND SAMPLES

1968 DATA

GOAT ROCK (05020)

	MEDIAN		MEAN		STND. DEV.		SKEWNESS	KURTOSIS
	PHI	MM.	PHI	MM.	PHI	MM.		
JAN	NO SAMPLE WAS COLLECTED							
FEB 15	-.73	1.659	-.63	1.548	.34	1.266	2.75	13.01
MAR 15	-.34	1.266	-.20	1.149	.44	1.357	2.10	8.35
APR 15	-.15	1.110	.09	.940	.82	1.765	1.08	3.61
MAY 1	.27	.829	.43	.742	.58	1.495	.81	2.95
JUN 1	.34	.790	.49	.712	.76	1.693	.42	2.50
JUL	NO SAMPLE WAS COLLECTED							
AUG 1	.78	.582	.86	.551	.88	1.840	.07	2.06
SEP 3	.83	.563	.81	.570	.65	1.569	-.26	3.05
OCT 1	-.12	1.087	.02	.986	.51	1.424	1.68	6.01
NOV 3	.36	.779	.49	.712	.59	1.505	.78	3.44
DEC 2	-.16	1.117	-.04	1.028	.50	1.414	1.69	6.38

SIZE CHARACTERISTICS OF SAND SAMPLES

1968 DATA

WRIGHT'S (05021)

	MEDIAN		MEAN		STND. DEV.		SKEWNESS	KURTOSIS
	PHI	MM.	PHI	MM.	PHI	MM.		
JAN 15	-.30	1.231	-.23	1.173	.42	1.338	2.41	11.45
FEB 15	-.84	1.790	-.75	1.682	.18	1.133	1.09	2.69
MAR 15	-.65	1.569	-.65	1.569	.14	1.102	-.07	3.17
APR 15	.64	.642	.67	.629	.88	1.840	.07	2.11
MAY 1	1.29	.409	1.26	.418	.55	1.464	-.20	3.10
JUN 1	-.25	1.189	.22	.859	1.02	2.028	.78	2.23
JUL	NO SAMPLE WAS COLLECTED							
AUG 1	-.39	1.310	.31	.807	1.15	2.219	.61	1.80
SEP 3	-.05	1.035	.08	.946	.50	1.414	1.15	3.92
OCT 1	.20	.871	.41	.753	.77	1.705	.68	2.56
NOV	NO SAMPLE WAS COLLECTED							
DEC 2	-.26	1.197	-.27	1.206	.23	1.173	.37	3.11

SIZE CHARACTERISTICS OF SAND SAMPLES

1968 DATA

STINSON (05022)

	MEDIAN		MEAN		STND. DEV.		SKEWNESS	KURTOSIS
	PHI	MM.	PHI	MM.	PHI	MM.		
JAN 23	1.25	.420	1.00	.500	1.11	2.158	-.22	1.85
FEB 24	.98	.507	1.01	.497	.63	1.548	.19	2.13
MAR 14	1.50	.354	1.44	.369	.69	1.613	-.55	2.90
APR 17	2.15	.225	2.16	.224	.39	1.310	.17	2.55
MAY 18	1.03	.490	1.08	.473	.77	1.705	.10	1.98
JUN	NO SAMPLE WAS COLLECTED							
JUL 20	2.33	.199	2.30	.203	.37	1.292	-.10	2.25
AUG 10	2.21	.216	2.20	.218	.43	1.347	.01	2.37
SEP 10	2.22	.215	2.24	.212	.43	1.347	.32	2.30
OCT 7	2.31	.202	2.34	.198	.35	1.275	.32	2.14
NOV 7	2.18	.221	2.16	.224	.35	1.275	-3.37	42.11
DEC 3	2.09	.235	2.11	.232	.45	1.366	.32	2.53

SIZE CHARACTERISTICS OF SAND SAMPLES

1968 DATA

MANCHESTER (05023)

	MEDIAN		MEAN		STND. DEV.		SKEWNESS	KURTOSIS
	PHI	MM.	PHI	MM.	PHI	MM.		
JAN	NO SAMPLE WAS COLLECTED							
FEB 1	1.14	.454	1.19	.438	.46	1.376	.30	2.37
MAR 5	1.21	.432	1.16	.448	.62	1.537	-.32	2.57
APR	NO SAMPLE WAS COLLECTED							
MAY 6	.71	.611	.78	.582	.80	1.741	-.09	2.59
JUN	NO SAMPLE WAS COLLECTED							
JUL	NO SAMPLE WAS COLLECTED							
AUG 19	.43	.742	.70	.616	.64	1.558	1.14	3.15
SEP 1	-.20	1.149	-.17	1.125	.26	1.197	.42	3.22
OCT 10	.03	.979	.07	.953	.37	1.292	.80	4.45
NOV 18	.67	.629	.79	.578	.45	1.366	.75	3.25
DEC 9	.92	.529	.98	.507	.52	1.434	.32	2.33

SIZE CHARACTERISTICS OF SAND SAMPLES

1968 DATA

VAN DAMME (05024)

		MEDIAN		MEAN		STND. DEV.		SKEWNESS	KURTOSIS
		PHI	MM.	PHI	MM.	PHI	MM.		
JAN		NO SAMPLE WAS COLLECTED							
FEB		NO SAMPLE WAS COLLECTED							
MAR	7	-.57	1.485	-.46	1.376	.58	1.495	3.28	16.13
APR	8	-.32	1.248	.12	.920	1.01	2.014	.76	2.31
MAY	6	-.29	1.223	-.33	1.257	.25	1.189	-.05	3.31
JUN		NO SAMPLE WAS COLLECTED							
JUL	10	.62	.651	.80	.574	1.07	2.099	.37	2.28
AUG	3	2.29	.204	2.25	.210	.43	1.347	-.16	2.14
SEP		NO SAMPLE WAS COLLECTED							
OCT	1	.50	.707	.71	.611	.90	1.866	.55	2.23
NOV	1	.47	.722	.59	.664	.78	1.717	.54	2.52
DEC	4	-.25	1.189	-.24	1.181	.28	1.214	2.25	13.97

SIZE CHARACTERISTICS OF SAND SAMPLES

1968 DATA

RUSSIAN GULCH (05025)

	MEDIAN		MEAN		STND. DEV.		SKEWNESS	KURTOSIS
	PHI	MM.	PHI	MM.	PHI	MM.		
JAN	NO SAMPLE WAS COLLECTED							
FEB	NO SAMPLE WAS COLLECTED							
MAR	NO SAMPLE WAS COLLECTED							
APR 25	1.65	.319	1.63	.323	.54	1.454	-.17	2.59
MAY	NO SAMPLE WAS COLLECTED							
JUN	NO SAMPLE WAS COLLECTED							
JUL	NO SAMPLE WAS COLLECTED							
AUG	NO SAMPLE WAS COLLECTED							
SEP 16	1.81	.285	1.80	.287	.37	1.292	.05	2.37
OCT 3	1.81	.285	1.82	.283	.40	1.320	.22	2.19
NOV 8	1.58	.334	1.66	.316	.39	1.310	.63	2.66
DEC 5	1.97	.255	1.97	.255	.40	1.320	.17	2.13

SIZE CHARACTERISTICS OF SAND SAMPLES

1968 DATA

MACKERRICHER (05026)

		MEDIAN		MEAN		STND. DEV.		SKEWNESS	KURTOSIS
		PHI	MM.	PHI	MM.	PHI	MM.		
JAN		NO SAMPLE WAS COLLECTED							
FEB	3	.11	.927	.63	.646	.91	1.879	.62	1.82
MAR		NO SAMPLE WAS COLLECTED							
APR	1	-.11	1.079	-.04	1.028	.29	1.223	2.13	9.84
MAY	1	-.20	1.149	.02	.986	.70	1.625	2.21	6.76
JUN		NO SAMPLE WAS COLLECTED							
JUL		NO SAMPLE WAS COLLECTED							
AUG	2	1.41	.376	1.39	.382	.57	1.485	-.50	2.67
SEP	4	-.07	1.050	-.01	1.007	.43	1.347	1.92	8.35
OCT	6	-.06	1.042	.00	1.000	.43	1.347	3.42	15.98
NOV		NO SAMPLE WAS COLLECTED							
DEC		NO SAMPLE WAS COLLECTED							

SIZE CHARACTERISTICS OF SAND SAMPLES

1968 DATA

HUNTINGTON (05027)

		MEDIAN		MEAN		STND. DEV.		SKEWNESS	KURTOSIS
		PHI	MM.	PHI	MM.	PHI	MM.		
JAN		NO SAMPLE WAS COLLECTED							
FEB		NO SAMPLE WAS COLLECTED							
MAR		NO SAMPLE WAS COLLECTED							
APR		NO SAMPLE WAS COLLECTED							
MAY	1	1.71	.306	1.73	.301	.51	1.424	.15	2.23
JUN	2	1.35	.392	1.38	.384	.56	1.474	.22	2.23
JUL		NO SAMPLE WAS COLLECTED							
AUG	1	2.08	.237	1.98	.253	.64	1.558	-.44	2.27
SEP	1	1.77	.293	1.81	.285	.40	1.320	.45	2.61
OCT		NO SAMPLE WAS COLLECTED							
NOV	1	1.81	.285	1.70	.308	.74	1.670	-.41	2.34
DEC	3	1.38	.384	1.52	.349	.40	1.320	.78	2.86

SIZE CHARACTERISTICS OF SAND SAMPLES

1968 DATA

DOHENY (05028)

	MEDIAN		MEAN		STND. DEV.		SKEWNESS	KURTOSIS
	PHI	MM.	PHI	MM.	PHI	MM.		
JAN	NO SAMPLE WAS COLLECTED							
FEB	NO SAMPLE WAS COLLECTED							
MAR	NO SAMPLE WAS COLLECTED							
APR 26	.78	.582	.90	.536	.68	1.602	.38	2.46
MAY 15	1.32	.401	1.38	.384	.44	1.357	.43	2.61
JUN	NO SAMPLE WAS COLLECTED							
JUL 15	1.05	.483	1.13	.457	.50	1.414	.45	2.36
AUG 15	1.47	.361	1.54	.344	.48	1.395	.25	2.16
SEP 18	.66	.633	.73	.603	.50	1.414	1.26	6.19
OCT 15	1.52	.349	1.56	.339	.40	1.320	.64	3.44
NOV	NO SAMPLE WAS COLLECTED							
DEC 15	1.77	.293	1.76	.295	.43	1.347	.11	2.72

SIZE CHARACTERISTICS OF SAND SAMPLES

1968 DATA

SAN CLEMENTE (05029)

	MEDIAN		MEAN		STND. DEV.		SKEWNESS	KURTOSIS
	PHI	MM.	PHI	MM.	PHI	MM.		
JAN	NO SAMPLE WAS COLLECTED							
FEB	NO SAMPLE WAS COLLECTED							
MAR	NO SAMPLE WAS COLLECTED							
APR 19	1.38	.384	1.43	.371	.52	1.434	.33	2.34
MAY 2	1.61	.328	1.60	.330	.55	1.464	-.10	2.49
JUN 5	1.33	.398	1.36	.390	.60	1.516	.19	2.29
JUL 8	1.40	.379	1.48	.358	.43	1.347	.53	2.49
AUG 21	1.00	.500	1.09	.470	.49	1.404	.54	2.48
SEP 1	1.08	.473	1.14	.454	.44	1.357	.50	2.68
OCT 1	.87	.547	.93	.525	.42	1.338	.35	2.61
NOV 3	.83	.563	.88	.543	.56	1.474	.19	2.88
DEC 1	1.43	.371	1.49	.356	.48	1.395	.32	2.82

SIZE CHARACTERISTICS OF SAND SAMPLES

1968 DATA

CARLSBAD (05030)

	MEDIAN		MEAN		STND. DEV.		SKEWNESS	KURTOSIS
	PHI	MM.	PHI	MM.	PHI	MM.		
JAN	NO SAMPLE WAS COLLECTED							
FEB	NO SAMPLE WAS COLLECTED							
MAR	NO SAMPLE WAS COLLECTED							
APR	NO SAMPLE WAS COLLECTED							
MAY	NO SAMPLE WAS COLLECTED							
JUN 4	1.45	.366	1.47	.361	.42	1.338	.29	2.14
JUL 15	1.39	.382	1.40	.379	.44	1.357	.02	2.43
AUG 18	1.34	.395	1.36	.390	.44	1.357	.20	2.21
SEP 15	1.44	.369	1.52	.349	.40	1.320	.65	2.63
OCT 15	1.19	.438	1.24	.423	.41	1.329	.40	2.21
NOV 16	1.44	.369	1.44	.369	.37	1.292	.20	2.34
DEC 15	1.71	.306	1.75	.297	.32	1.248	.55	2.53

SIZE CHARACTERISTICS OF SAND SAMPLES

1968 DATA

SOUTH CARLSBAD (05031)

	MEDIAN		MEAN		STND. DEV.		SKEWNESS	KURTOSIS
	PHI	MM.	PHI	MM.	PHI	MM.		
JAN	NO SAMPLE WAS COLLECTED							
FEB	NO SAMPLE WAS COLLECTED							
MAR	NO SAMPLE WAS COLLECTED							
APR	NO SAMPLE WAS COLLECTED							
MAY	NO SAMPLE WAS COLLECTED							
JUN	NO SAMPLE WAS COLLECTED							
JUL	NO SAMPLE WAS COLLECTED							
AUG	NO SAMPLE WAS COLLECTED							
SEP	NO SAMPLE WAS COLLECTED							
OCT	NO SAMPLE WAS COLLECTED							
NOV	NO SAMPLE WAS COLLECTED							
DEC 15	1.95	.259	1.99	.252	.51	1.424	.37	2.42

SIZE CHARACTERISTICS OF SAND SAMPLES

1968 DATA

SAN ELIJO (05033)

	MEDIAN		MEAN		STND. DEV.		SKEWNESS	KURTOSIS
	PHI	MM.	PHI	MM.	PHI	MM.		
JAN	NO SAMPLE WAS COLLECTED							
FEB	NO SAMPLE WAS COLLECTED							
MAR	NO SAMPLE WAS COLLECTED							
APR	NO SAMPLE WAS COLLECTED							
MAY 15	1.96	.257	2.01	.248	.31	1.240	.53	2.50
JUN	NO SAMPLE WAS COLLECTED							
JUL	NO SAMPLE WAS COLLECTED							
AUG	NO SAMPLE WAS COLLECTED							
SEP	NO SAMPLE WAS COLLECTED							
OCT 8	2.30	.203	2.31	.202	.41	1.329	.09	2.20
NOV 16	2.10	.233	2.10	.233	.36	1.283	.17	2.77
DEC 13	2.19	.219	2.21	.216	.38	1.301	.29	2.47

SIZE CHARACTERISTICS OF SAND SAMPLES

1968 DATA

TORREY PINES (05034)

	MEDIAN		MEAN		STND. DEV.		SKEWNESS	KURTOSIS
	PHI	MM.	PHI	MM.	PHI	MM.		
JAN	NO SAMPLE WAS COLLECTED							
FEB	NO SAMPLE WAS COLLECTED							
MAR	NO SAMPLE WAS COLLECTED							
APR 18	1.71	.306	1.74	.299	.41	1.329	.30	2.21
MAY 10	1.73	.301	1.70	.308	.53	1.444	.04	2.08
JUN	NO SAMPLE WAS COLLECTED							
JUL 10	1.88	.272	1.86	.275	.53	1.444	.11	2.18
AUG 3	1.86	.275	1.85	.277	.46	1.376	.11	2.08
SEP 5	1.97	.255	1.99	.252	.41	1.329	.28	2.08
OCT 5	1.90	.268	1.92	.264	.33	1.257	.26	2.35
NOV 5	2.02	.247	2.06	.240	.43	1.347	.46	2.62
DEC 5	1.62	.325	1.66	.316	.39	1.310	.43	2.40

SIZE CHARACTERISTICS OF SAND SAMPLES

1968 DATA

SILVER STRAND (05035)

		MEDIAN		MEAN		STND. DEV.		SKEWNESS	KURTOSIS
		PHI	MM.	PHI	MM.	PHI	MM.		
JAN		NO SAMPLE WAS COLLECTED							
FEB		NO SAMPLE WAS COLLECTED							
MAR		NO SAMPLE WAS COLLECTED							
APR	18	1.76	.295	1.82	.283	.40	1.320	.51	2.58
MAY		NO SAMPLE WAS COLLECTED							
JUN		NO SAMPLE WAS COLLECTED							
JUL	1	2.06	.240	2.07	.238	.34	1.266	.33	2.32
AUG	3	2.41	.188	2.39	.191	.31	1.240	.02	2.32
SEP	3	2.22	.215	2.23	.213	.34	1.266	.18	2.16
OCT	2	2.33	.199	2.33	.199	.30	1.231	.07	2.02
NOV	12	1.74	.299	1.77	.293	.35	1.275	.51	2.32
DEC	1	1.42	.374	1.50	.354	.38	1.301	.53	2.42

SIZE CHARACTERISTICS OF SAND SAMPLES

1968 DATA

PRAIRIE CREEK REDWOODS(05036)

	MEDIAN		MEAN		STND. DEV.		SKEWNESS	KURTOSIS
	PHI	MM.	PHI	MM.	PHI	MM.		
JAN	NO SAMPLE WAS COLLECTED							
FEB	NO SAMPLE WAS COLLECTED							
MAR	NO SAMPLE WAS COLLECTED							
APR 24	.50	.707	.64	.642	.56	1.474	.57	2.66
MAY	NO SAMPLE WAS COLLECTED							
JUN	NO SAMPLE WAS COLLECTED							
JUL	NO SAMPLE WAS COLLECTED							
AUG 12	.74	.599	.81	.570	.47	1.385	.52	3.16
SEP	NO SAMPLE WAS COLLECTED							
OCT 1	.77	.586	.82	.566	.50	1.414	.41	2.87
NOV 4	1.33	.398	1.35	.392	.41	1.329	.36	2.32
DEC	NO SAMPLE WAS COLLECTED							

SIZE CHARACTERISTICS OF SAND SAMPLES

1968 DATA

BOLINAS BRIGHTON AVE (05500)

	MEDIAN		MEAN		STND. DEV.		SKEWNESS	KURTOSIS
	PHI	MM.	PHI	MM.	PHI	MM.		
JAN	NO SAMPLE WAS COLLECTED							
FEB	NO SAMPLE WAS COLLECTED							
MAR	NO SAMPLE WAS COLLECTED							
APR	NO SAMPLE WAS COLLECTED							
MAY	NO SAMPLE WAS COLLECTED							
JUN	NO SAMPLE WAS COLLECTED							
JUL 12	2.07	.238	2.03	.245	.43	1.347	-.29	2.40
AUG 10	2.42	.187	2.39	.191	.34	1.266	-.15	2.35
SEP 12	2.19	.219	2.15	.225	.38	1.301	-.46	2.89
OCT 8	2.29	.204	2.30	.203	.31	1.240	.13	1.82
NOV 18	1.97	.255	1.87	.274	.67	1.591	-2.03	8.69
DEC 21	2.30	.203	2.29	.204	.40	1.320	-.19	2.65

SIZE CHARACTERISTICS OF SAND SAMPLES

1968 DATA

NEWPORT (05700)

		MEDIAN		MEAN		STND. DEV.		SKEWNESS	KURTOSIS
		PHI	MM.	PHI	MM.	PHI	MM.		
JAN		NO SAMPLE WAS COLLECTED							
FEB		NO SAMPLE WAS COLLECTED							
MAR		NO SAMPLE WAS COLLECTED							
APR	1	1.34	.395	1.42	.374	.46	1.376	.94	3.95
MAY	3	1.51	.351	1.53	.346	.39	1.310	.46	2.83
JUN	3	1.50	.354	1.58	.334	.47	1.385	.56	2.76
JUL	9	1.20	.435	1.22	.429	.42	1.338	.47	2.63
AUG		NO SAMPLE WAS COLLECTED							
SEP		NO SAMPLE WAS COLLECTED							
OCT	1	1.01	.497	1.05	.483	.45	1.366	-.44	4.50
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DEC	3	1.38	.384	1.49	.356	.50	1.414	1.02	3.75

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APPENDIX G

PHOTOGRAPHS TAKEN UNDER THE LEO PROGRAM

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7 MAR (1968)

BOLSA CHICA STATE BEACH

VIEW UPCOAST

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2 JUN (0900)

1 OCT

1 NOV

BOLSA CHICA STATE BEACH

VIEW UPCOAST

1968

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6 NOV (1967)

6 DEC (1967)

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BOLSA CHICA STATE BEACH

VIEW DOWNCOAST

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15 DEC

CARLSBAD STATE BEACH

VIEW UPCOAST

1968

15 AUG

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CARLSBAD STATE BEACH

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24 APR (0930)

15 MAY(1030)

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15 OCT (1400)

DOHENY STATE BEACH

VIEW UPCOAST

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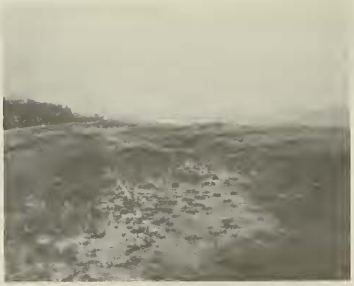

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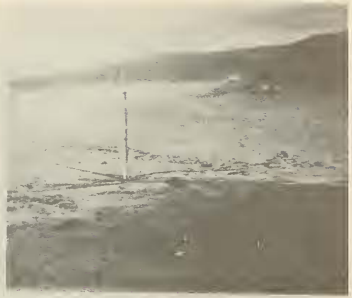

MAR

8 APR

MAY

FRANCIS BEACH

VIEW UPCOAST

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JUL

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VIEW UPCOAST

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GOAT ROCK BEACH

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SEP

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7 DEC (0900)

MAC KERRICHER STATE PARK

VIEW UPCOAST

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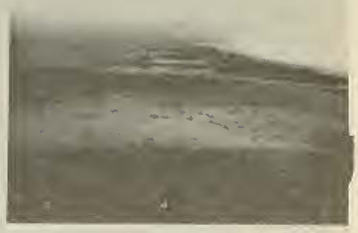

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MAC KERRICHER STATE PARK

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OVERALL VIEW DOWNCOAST

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NEW BRIGHTON STATE BEACH

OVERALL VIEW DOWNCOAST

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1 JUL

1 AUG

3 SEP

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PISMO STATE BEACH

VIEW UPCOAST

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1 AUG

3 SEP

NOV

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PISMO STATE BEACH

VIEW DOWNCOAST

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POINT MUGU STATE RECREATION AREA

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1968

7 OCT

1 DEC

VIEW UPCOAST

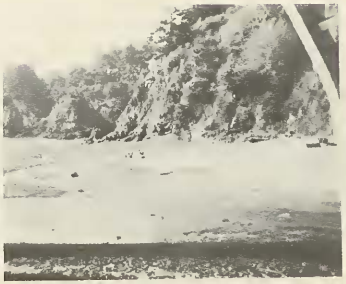
7 OCT

1 DEC

VIEW DOWNCOAST

PRAIRIE CREEK REDWOODS STATE PARK

1968



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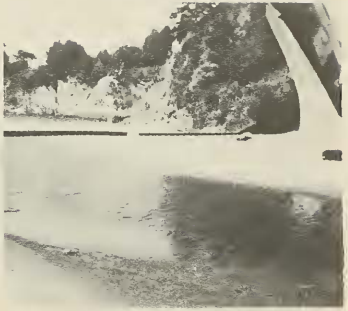

15 OCT

RUSSIAN GULCH STATE PARK

VIEW UPCOAST

1968

7 FEB

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1 MAY

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1 JUL

15 OCT

RUSSIAN GULCH STATE PARK

VIEW DOWNCOAST

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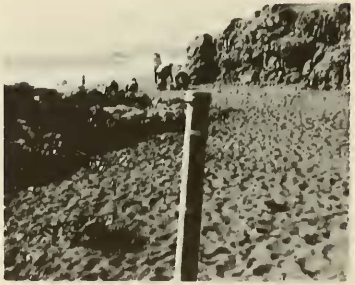

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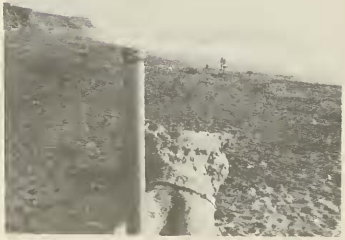

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TORREY PINES STATE RESERVE

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TWIN LAKES STATE BEACH

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VAN DAMME STATE PARK

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WRIGHT'S BEACH

VIEW DOWNCOAST

1968

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4. DESCRIPTIVE NOTES (Type of report and inclusive dates)

5. AUTHOR(S) (First name, middle initial, last name)

Andre Szuwalski

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13. ABSTRACT

This report describes the Littoral Environment Observation (LEO) Program, and assembles in one paper the data collected under the program from February through December 1968. LEO is a cooperative effort of the State of California and the Corps of Engineers to collect information which will increase understanding of the littoral processes and physical characteristics of the California shore.

The littoral variables collected under the LEO program include the following beach characteristics: foreshore slope, width and elevation of berm, presence of cusps, and samples of the sediments. The beach samples are analyzed for mean and median diameter, standard deviation, skewness, and kurtosis. Sea variables include tide level, wave height, wave period, wave direction, type of breaker, direction and velocity of littoral currents, presence of rip currents, and water temperature. Wind velocity and direction are recorded, and panoramic photographs are obtained.

The objective is to establish a bank of repetitive, systematic measurements of meteorological and oceanographic forces affecting the shoreline and the response of the shore to these forces. The data collected are being used as a base to analyze physical characteristics of the shoreline and the littoral processes affecting it.

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	ROLE	WT	ROLE	WT	ROLE	WT
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Wave statistics						
Beach sediments						
Littoral currents						
California						

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February 1970

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2. Wave Statistics
3. Beach Sediments
4. Littoral Currents
5. California

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