NOS Oceanographic Circulatory
Survey Report No. 3

Puget Sound Approaches Circulatory Survey

Rockville, Md.
August 1980

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Ocean Survey

NOS Oceanographic Survey Reports

This series of reports presents information on circulatory surveys by the National Ocean Survey. Normal activity includes the measurements of water flow (currents), tides, temperature, salinity, and occasionally other parameters needed for understanding the physical processes. These surveys are made primarily for the Nation's navigational waterways; however, data are also obtained to describe the circulatory patterns of estuaries and harbors.

These reports offer information on sampling locations, measurement techniques, processing and analysis routines, data formats, and general information on the survey area. They do not present technical interpretations of hydrodynamics of the areas.

No. 1 Tide and Tidal Current Observations From 1965 Through 1967 in Long Island Sound, Block Island Sound, and Tributaries. Elmo E. Long, January 1978.

No. 2 Tampa Bay Circulatory Survey 1963. Demetrio A. Dinardi, August 1978.

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Bruce B. Parker and James T. Bruce

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U.S. DEPARTMENT OF COMMERCE
Philip M. Klutznick, Secretary

National Oceanic and Atmospheric Administration
Richard A. Frank, Administrator

National Ocean Survey
Herbert R. Lippold, Jr., Director

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PUGET SOUND APPROACHES CIRCULATORY SURVEY

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Rockville, Maryland

ABSTRACT

During the period from the fall of 1973 through the fall of 1976, a seven-phase circulatory survey was carried out by the National Ocean Survey (NOS) in the waters of the Strait of Juan de Fuca, Haro and Rosario Straits, and the Strait of Georgia, referred to collectively as Puget Sound Approaches. Extensive and detailed measurements were made of currents, tides, and the temperature and salinity of the water, along with additional measurements of various atmospheric parameters, such as wind speed and direction, sea-level pressure, and air temperature. This report provides details about this survey including locations of stations, time periods of occupation, instrumentation, sampling rates, and data processing techniques; numerous charts and tables are provided. Also included is a chapter summarizing all current and tide data taken by NOS in this area prior to the present survey.

1.0 INTRODUCTION AND GENERAL INFORMATION

1.1 Survey Area and Its Importance

The area covered by this circulatory survey report includes the southeastern end of the Strait of Georgia, the waterways among and around the San Juan Islands, including Haro and Rosario Straits, and the eastern half of the Strait of Juan de Fuca (fig. 1). This entire area will be referred to as Puget Sound Approaches, and designated as OPR-509.

This area, along with Puget Sound, is a commercial and recreational center of major importance. Directly or indirectly, this waterway system is the basis for much of the economy of the region. The several deepwater ports make shipping an important industry; the Puget Sound ports are established terminals for shipping with the Far East and U.S.S.R. Fish and shellfish are plentiful and are the basis for a multimillion dollar commercial fishing industry and an even larger industry revolving around sport fishing. Other recreational activities abound (skindiving, boating, sightseeing, etc.) as a result of the miles of beautiful coastline and beaches; in Puget Sound alone there are over 67,000 registered pleasure boats. Other industries such as forestry, farming, and heavy industry make some use of the various waterways, even if it's only as the final depository of their wastes and sewage.

Because its protected deep water can handle large oil tankers, this area also has several large oil refineries (i.e., at Cherry Point, Ferndale, Anacortes, Edmonds, and Tacoma; see figure 1). Oil spills from tankers heading for these refineries, or even chronic low-level leakage, could obviously have serious detrimental effects on the enviroment and thus on many of the industries previously mentioned. Since the completion of the Trans-Alaska pipeline, oil tanker traffic to these refineries has been greatly increasing, making hazardous oil spills and leakage much more likely. It was the concern over this inevitable increase in oil tanker traffic that led to the Puget Sound Approaches circulatory survey.

1.2 A Circulatory Survey and Its Benefits

A circulatory survey consists of the acquisition of various physical data from which an accurate description of water movement can be deduced, along with a theoretical appreciation of its causes. More specifically, it includes the measurement of currents, tides, the temperature and salinity of the water, and various atmospheric parameters, such as wind speed and direction, sea-level pressure, and air temperature. These measurements are made at selected locations and depths in order to obtain a reasonably complete three-dimensional description of these dynamic properties.

Currents are the horizontal water movement resulting from the periodic astronomic tide-producing forces, as well as from winds, density differences between water masses, and river runoff. The measured tides are simply the periodic vertical water movement resulting from the same astronomic forces, with some movement also caused by atmospheric pressure and winds. The salinity and temperature measurements are used to determine the density

structure of the water masses, which can have significant effects on the currents as well as on mixing and dispersion processes. The atmospheric measurements are necessary to correlate the nontidal (nonperiodic) water movements with their causes (e.g., water levels raised by strong onshore winds and/or low atmospheric pressure).

The benefits derived from a knowledge of the water movement in this area are numerous. In the event of an oil spill, for example, the movement of the slick could be predicted, as well as the expected amount of time it would take to break up. This information would be necessary in selecting the best techniques of containment and removal for a particular situation. With an accurate knowledge of water movement, oil tanker routes could perhaps even be selected for optimum natural dispersion and flushing of a possible oil spill. Preferred times of tanker travel in an area, using this same criterion, could also be predicted. At the very least, the accurate current data gained from this survey will make navigation safer and will perhaps reduce the number of accidents. These data will aid the rest of the shipping industry and pleasure boating as well.

From the tide data, tidal datums can be calculated which are useful in settling seaward boundary disputes, determining land subsidence or emergence, and aiding in shoreline control for ecological purposes. All phases of coastal zone management and coastal engineering make use of both tide and current data. The data from this survey will also be used in basic oceanographic research and as input into various numerical hydrodynamic models.

1.3 Details of the Puget Sound Approaches Circulatory Survey

The entire area specified in Section 1.1 has been investigated in seven phases. These include a preliminary survey carried out in the fall of 1973, and six full-scale surveys, of about 2 to 3 months duration each, during the spring and fall seasons of 1974 through 1976. Table 1 summarizes these seven completed phases. The project designated as OPR-509 was extended to include the waters of Puget Sound proper (Phases 7 through 9) and the western half of the Strait of Juan de Fuca (Phase 10), the entire project being completed in the fall of 1978. Phases 7 through 10 will be described in a later report.

The data resulting from this survey were taken by the NOAA Ship McARTHUR, under the commands of Comdr. George Poor (1973), Comdr. Austin Yeager (1974-75), and Comdr. Darrell Crawford (1976). This 175-foot Class III ship, whose home port is the Pacific Marine Center (PMC) in Seattle, Wash., carries a complement of 6 officers and 30 crew and has been specifically equipped for circulatory survey operations. (It has also completed, during the summers, similar circulatory surveys in Cook Inlet, Alaska, and Prince William Sound, Alaska, the southern end of the Trans-Alaska pipeline.) The ship is capable of deploying and retrieving current meter mooring systems, taking salinity and temperature measurements, making in situ data quality checks, and carrying out onboard electronic maintenance. Ship's personnel also install tide gages assisted by the National Ocean Survey's (NOS) Pacific Tide Party, which is based at PMC. Instrumentation used in the actual data collection will be described in succeeding chapters.

The interests of the MESA* Puget Sound Project Office have been considered during the planning of this survey; the resulting data will provide important baseline information for future MESA studies. Some cooperative work has also been done with the Pacific Marine Environmental Laboratory (PMEL) in Seattle, Wash., and with Environment Canada in Victoria, B.C.; details appear in later chapters. Most of the weather data for this survey were acquired from local representatives of the National Weather Service. This was supplemented by weather information from the ship's smooth log and data from installed NOS wind towers. Some weather information was also obtained from the Canadian Weather Service.

1.4 Purpose of This Report

The purpose of this survey report is not to provide the reader with actual data or any analytical results based on these data. Rather, the main purpose is to make the public and other scientific institutions and government agencies (Federal, State, and local) aware of the existence of these valuable data. This report will supply the details that a potential user would be most interested in, such as instrumentation used, location of stations, time periods of occupation, quality of the data, sampling rate, and standard processing done on the data. These data can be obtained from the National Oceanographic Data Center (Washington, D.C.) or from NOS. This report also includes a chapter summarizing the current and tide data taken by NOS in this area prior to this survey.

The data summarized in this report have been analyzed and the results can be found in Parker (1977). That report presents the results of the harmonic analysis of these tide and current data in the form of tables, cotidal and corange charts, and charts illustrating the relationships between various tidal constituents. The implications of these results relative to the tidal hydrodynamics of the area are discussed generally.

*MESA = Marine Ecosystems Analysis

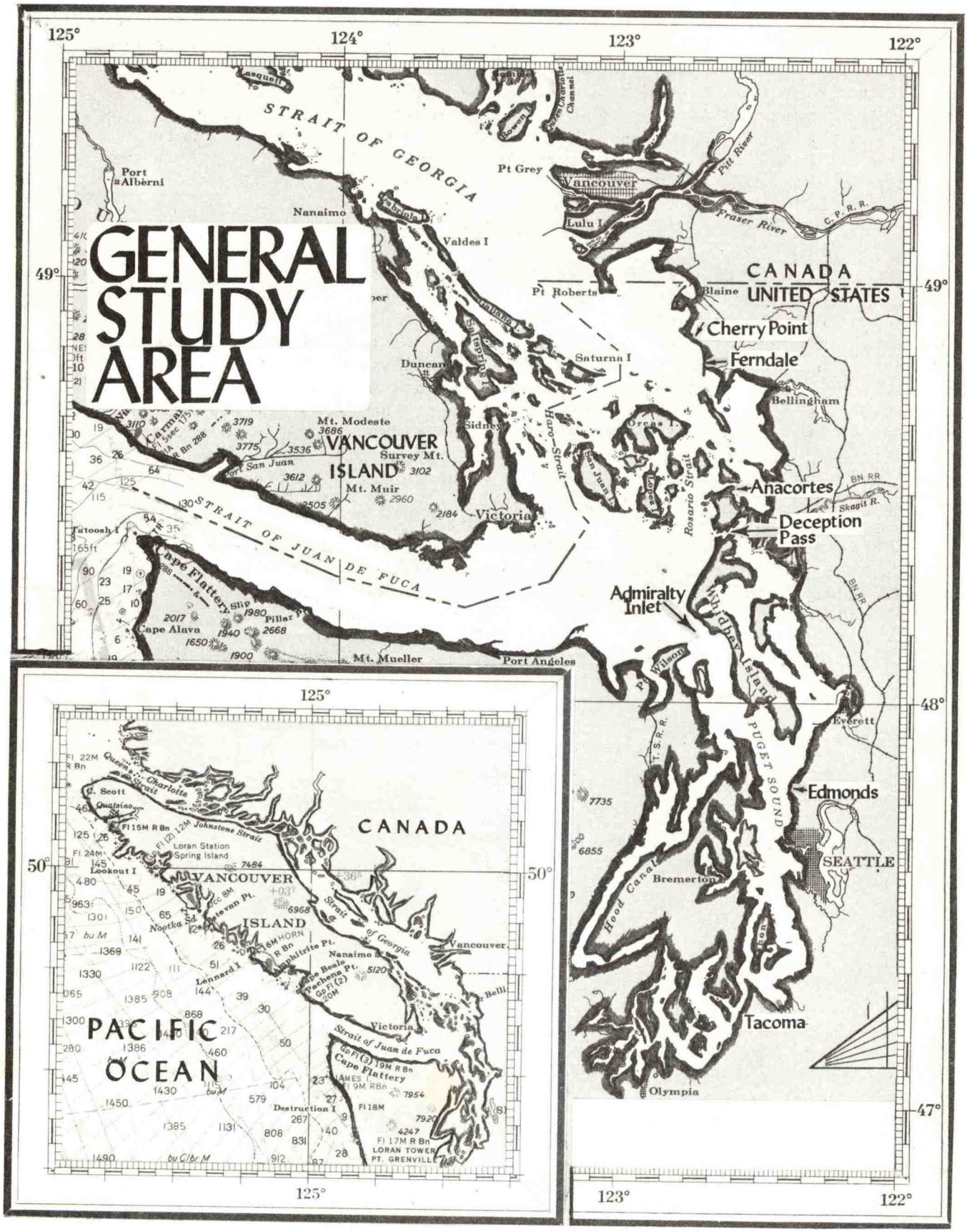

Figure 1.--*General area of circulatory survey.*

Table 1.--*Phases of Puget Sound Approaches Circulatory Survey.*

PHASE	STATUS	DATES	GENERAL AREA	CURRENT STATIONS	TIDE STATIONS	STD* STATIONS
Preliminary	completed	Oct. 1-Nov. 1, 1973	Entire area	6	12	23
I	completed	Jan. 29-Apr. 10, 1974	Rosario Strait	23	29	28
II	completed	Sept. 10-Nov. 8, 1974	Inner San Juan Islands	24	34	56
III	completed	Feb. 4-Apr. 14, 1975	Strait of Georgia	20	18	28
IV	completed	Sept. 3-Nov. 11, 1975	Strait of Juan de Fuca (eastern half)	22	22	30
V	completed	Feb. 17-Apr. 23, 1976	Juan de Fuca and Admiralty Inlet	29	23	36
VI	completed	Sept. 2-Nov. 10, 1976	Haro Strait	28	23	46

* Salinity and Temperature at Depth.

2.0 CURRENT DATA

2.1 Locations of Current Stations and Relevant Information

The locations of the current stations occupied during the Preliminary Phase and Phases I through VI of the Puget Sound Approaches survey are shown in figures 2 through 6. The necessary information about the stations, such as latitude, longitude, depth of current meters, and dates of observation are given in tables 2 and 3. All current stations were deployed for a minimum of 15 days and often for 30 days or longer. Several stations were reoccupied in more than one field season. Scheduling was based on the desire for simultaneous observations at certain locations. The time periods for current station occupancy during each phase are shown in figures 7 through 13. The currents were measured with the Aanderaa recording current meter Model 4 on taut wire moorings. The instrumentation, data processing, and forms of data available will be explained in succeeding sections.

2.2 Instrumentation

The Aanderaa current meter converts a 1-minute Savonious-type rotor count into current speed, and takes one instantaneous direction reading at the end of the rotor count, using a compass and large vane. All meters also measure temperature, and many have conductivity and pressure sensors. (See figure 14 and table 4 for current meter specifications.) The sampling rate commonly used is 6 samples/hour, but may be set at values from 1/hour to 120/hour. The data are recorded in binary form within the meter on quarter-inch wide magnetic tape. The recorder has the capabity to store 60 days of data at a sampling rate of 6/hour. The meter has an acoustic telemetry output which allows remote monitoring of performance.

The meters were originally calibrated by their inventor, Ivar Aanderaa of Norway. Before the field operations they are calibrated and checked by the Northwest Regional Calibration Center (in Bellevue, Wash.). Routine meter maintenance is performed aboard the McARTHUR.

The mooring platform is a taut wire moor with an anchor and acoustic release at the bottom, a subsurface float above the top meter, and a surface buoy. (See figure 15.) As many as 5 meters have been suspended on the same cable using this system.

The taut wire mooring system was chosen to reduce the effect of the surface noise on the Savonious rotor. The currents were usually measured at standard depths of 15 feet below the surface at mean lower low water (MLLW), 70 feet below the surface (at MLLW), and 50 feet above the bottom. The meters are mounted with gimbals that allow a swivel of about 23 degrees. If the wire angle exceeds this value, the meter tilts with respect to the current flow and the Savonious rotor gives erroneous values. Excessive drag due to high current speeds can cause large wire angles and increase the depth of the current meter. Prior to a field survey a computer model developed by the Engineering Development Laboratory of NOS is used to predict wire angle and meter excursion based on water depth, mooring configuration, and probable current speeds expected at a location. Appropriate adjustments are then made if required, including the use of "haired" Kevlar fairing, which reduces mooring line drag by reducing vortex shedding.

The only disadvantage of the taut wire moor is the changing effect of the wind field on the current measurements due to the changing depth of the sensors relative to the surface. However, since the currents are predominantly tidal, and the top meter is 15 feet below the surface (at MLLW), the sensors are deep enough so that the change in wind effects is small.

A discussion of problems involved in current measurement, including those problems with the system used in this survey, can be found in Parker and Walker (1978).

2.3 Data Processing and Analysis

"Processing," as it is used in this report, means "putting the data that were recorded on magnetic tape inside the Aanderaa current meter into a computer compatible, easily accessible, efficiently stored form, in engineering units, with all errors due to obvious mechanical or electronic failures corrected and timing checked for accuracy."

Each 3-inch reel of quarter-inch wide, half-mil magnetic tape, from the Aanderaa current meter, was copied onto a 5-inch reel of quarter-inch wide, 1.5 mil tape, which was shipped to the Oceanographic Division of NOS in Rockville, Md. The data on the 5-inch reel were transcribed onto a 7-track computer-compatible tape, and then a 3-phase data processing scheme was carried out, using software written on a CDC 6600 computer. This processing scheme accomplished the following: (1) it took care of extra or missing Aanderaa words (there should be six words per data point); (2) it converted Aanderaa units into engineering units, using calibration results obtained annually from the Northwest Regional Calibration Center; (3) it assigned correct times to the data points of the time series, after a careful time-checking procedure was carried out; and (4) it carried out a computerized statistical editing (using a Wiener-type predictor) to eliminate erroneous data values due to obvious mechanical or electronic malfunctions. The final data were stored in a compact form for later use, and were also sent to the National Oceanographic Data Center and PMEL. The data were also plotted on 35mm microfilm.

The data from this survey have been harmonically analyzed; details about analysis methods and results can be found in Parker (1977). Analysis results will also appear in future editions of the Tidal Current Tables, Pacific Coast of North America and Asia, from which current predictions will be obtainable for these current station locations. A proposed series of Tidal Current Charts will also graphically display current flow in the survey area for each hour of a mean tidal current cycle. Other analyses of these data are and will be carried out, such as spectral analyses, nonharmonic comparison analyses, and the correlation of the lower frequency currents with wind and other nontidal factors.

3.0 SALINITY AND TEMPERATURE DATA

3.1 Instrumentation

Salinity and temperature data acquired during this survey were from three sources.

First, the Aanderaa current meters themselves had temperature sensors, and some had conductivity sensors from which salinity can be calculated. The data from these sensors, therefore, are long-period time series (six data points per hour for at least 15 days) at from one to three points along the vertical water column, depending on the station. Table 4 shows ranges and accuracies of measurements.

Second, salinity and temperature data were obtained from casts using a Plessey Model 9006 STD system. The STD sensors were lowered at about 30 meters per minute to within a few meters of the bottom, as determined by a pinger attached to the STD cage. Salinity and temperature data were recorded in analog plot form on an Esterline Angus x_1-x_2-y recorder and in digital form (at a rate of 0.5 second per scan) on a Plessey Model 8400 Digital Data Logger. Data were recorded only during descent, except for calibration purposes. These data were sent by the McARTHUR to PMEL in Seattle where they were processed and then sent to NOS on magnetic tape. The processing involved translating, editing, and correcting the data to provide values of salinity and temperature at 1-meter intervals. Density in the form of sigma-t was also supplied, being computed from the averaged salinity and temperature values.

Third, casts were taken using a Plessey Model 9060 STD system. The same procedures were used as in (2) above, except that the data were digitized by hand, from the analog plots, at 5-meter intervals (by NOS in Rockville).

STD calibrations for (2) and (3) above, were obtained by placing a Nansen bottle above the STD sensor and tripping it at a depth where the analog trace indicated approximately constant values of salinity and temperature. Each bottle was allowed 5 minutes to reach equilibrium. Nansen samples were measured using reversing thermometers calibrated by the National Oceanographic Instrumentation Center (now the Test and Evaluation Laboratory) in Washington, D.C. and a laboratory inductive salinometer (Hytech Model 6220).

While each STD cast only represents data taken at an approximate instant in time, it gives values for the entire vertical water column. The Aanderaa data and the STD data complement each other as far as time resolution and spatial resolution are concerned. In addition, several time series STD stations were carried out which allowed vertical resolution over a period of one or two tidal cycles, thus giving some idea of how the density structure changed over this time period.

3.2 Salinity and Temperature Station Locations

Refer to figures 2 through 6 for the locations of Aanderaa stations. Tables 2 and 3 give the depths occupied at each station and also indicate which meters had conductivity sensors (all had temperature sensors).

STD stations were of three types.

Many stations were part of a transect (or line), i.e., one of a series of stations done in succession as quickly as possible in order to give a cross-sectional or longitudinal picture of the density structure. Some longitudinal lines were of such length as to take up a good portion of the tidal cycle in carrying them out, and this should be kept in mind whenever using these data. These transect stations are labeled ST in figures 16 through 24 and tables 5 through 11.

A few stations were long period stations, i.e., those locations where STD casts were made at approximately half-hour intervals over a 13- or 25-hour period, in order to see the change in the density structure over one or two tidal cycles. During the spring 1974 phase (Phase I), two entire cross-sectional transects were repeated as often as possible over approximately a 24-hour period (the interval between successive casts at a particular station was therefore greater than a half-hour in these cases). These long period STD stations are labeled TS in the previously mentioned figures and tables.

There were also single station casts, i.e., stations done once or twice during a field season, usually at slack before flood and slack before ebb. There stations are labeled S in the previously mentioned figures and tables. During some of the field seasons, one such station was repeated many times throughout the entire field season.

Microfilm plots of cross-sections and time series sections are routinely made using the data from the first two types described above.

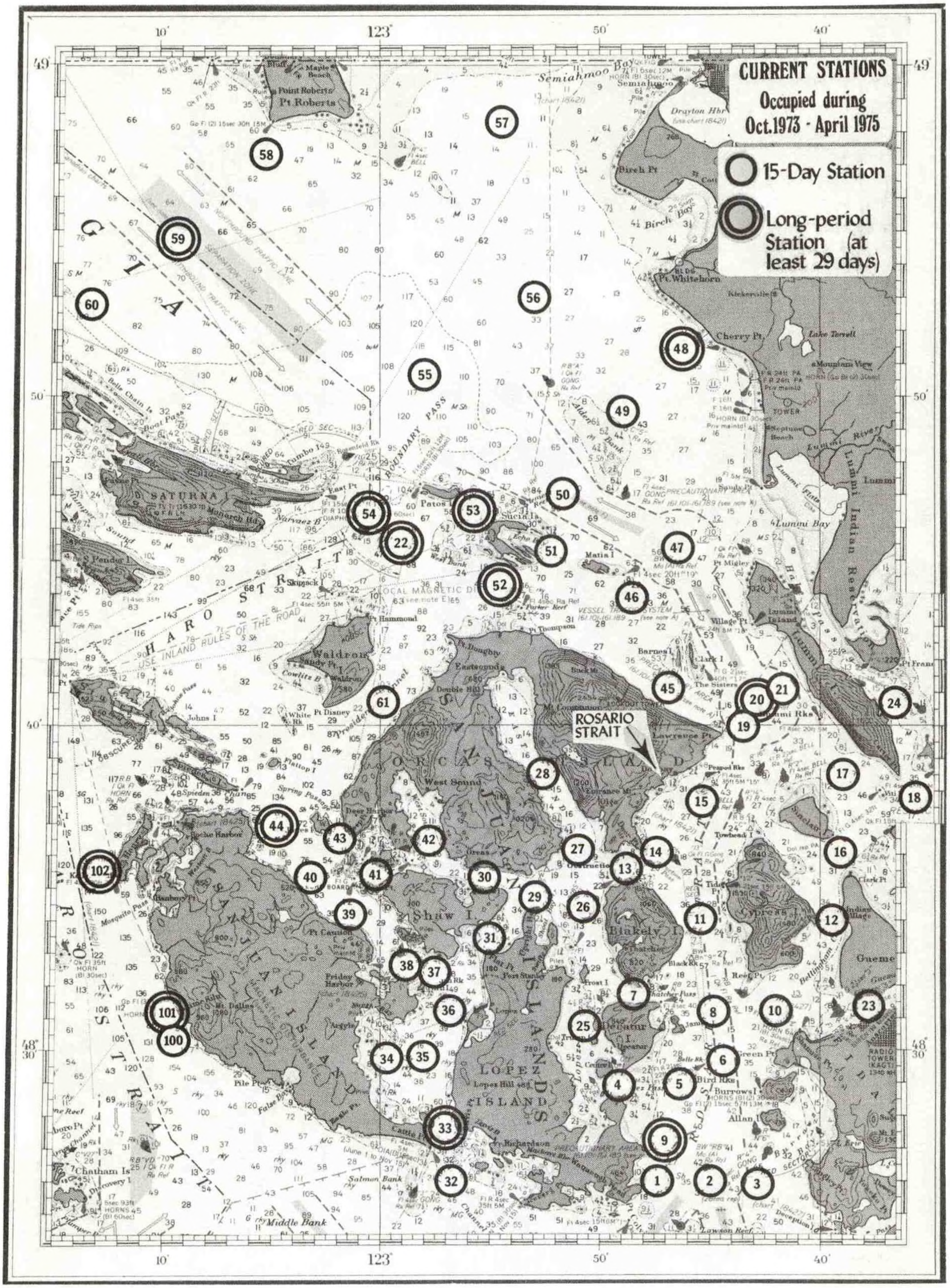

Figure 2.--*Current stations occupied during the Preliminary Phase and Phases I through III of the Puget Sound Approaches Circulatory Survey.*

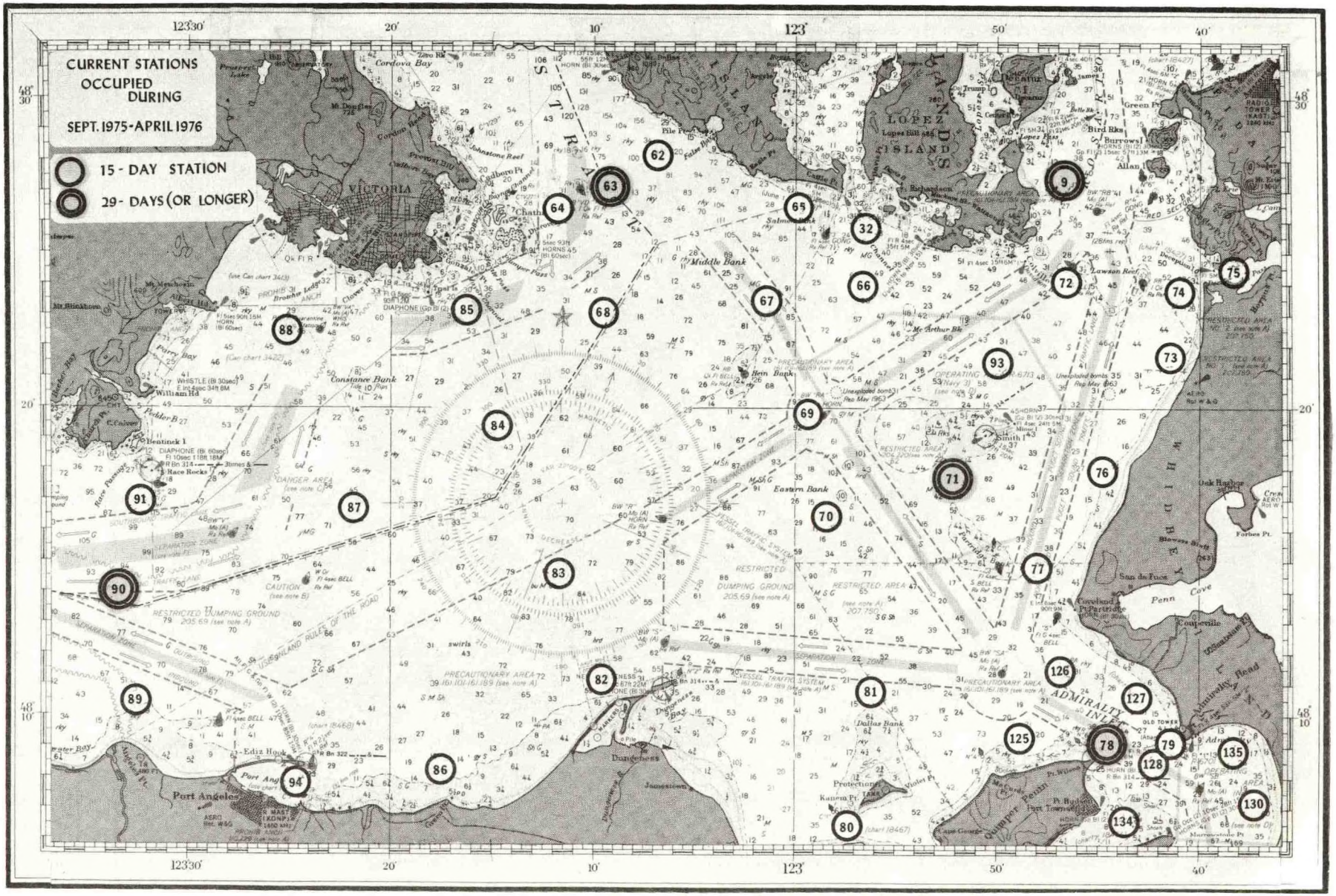

Figure 3.--*Current stations occupied during Phases IV through VI of the Puget Sound Approaches Circulatory Survey.*

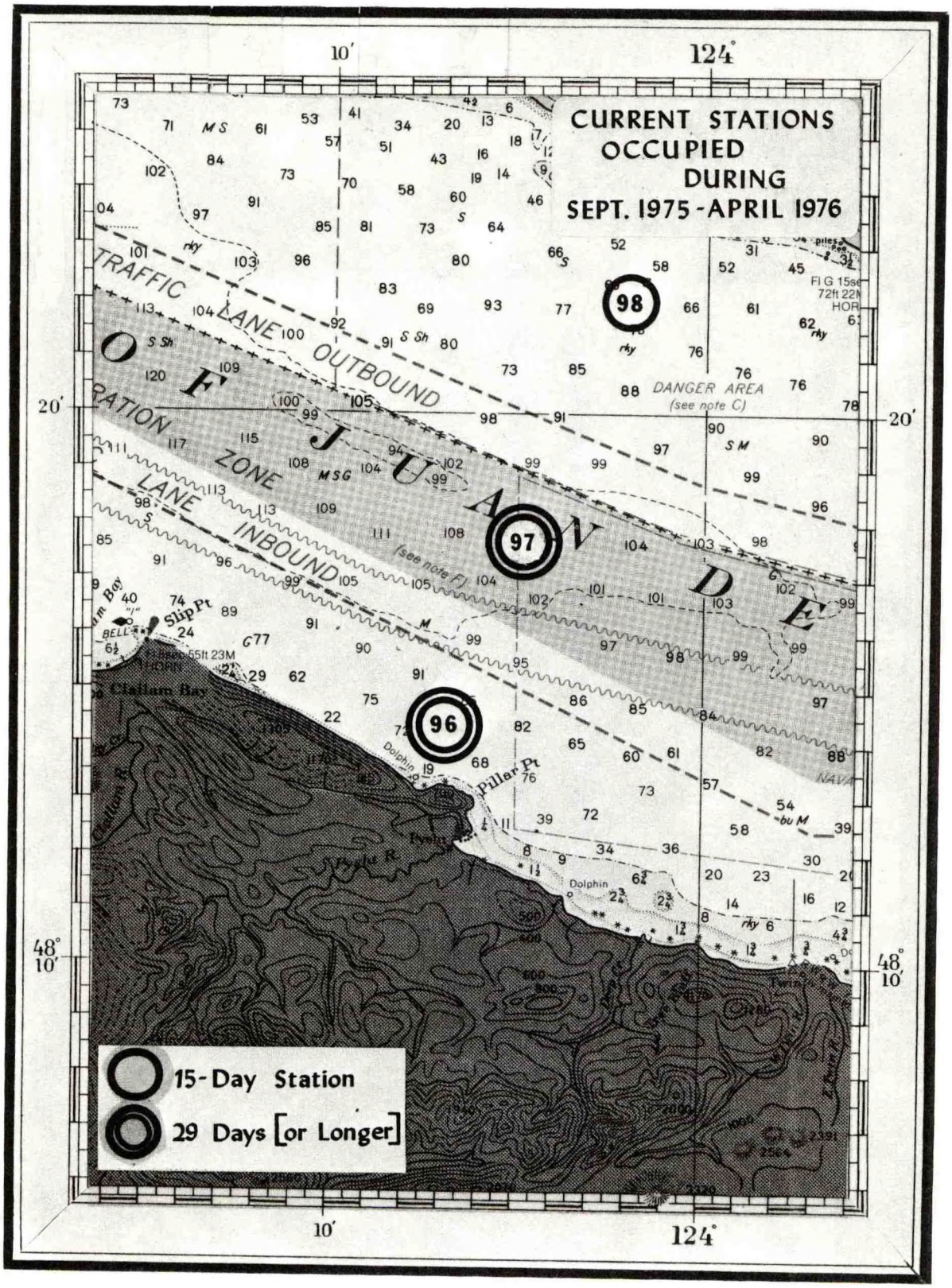

Figure 4.--*Current stations occupied during Phases IV through VI of the Puget Sound Approaches Circulatory Survey.*

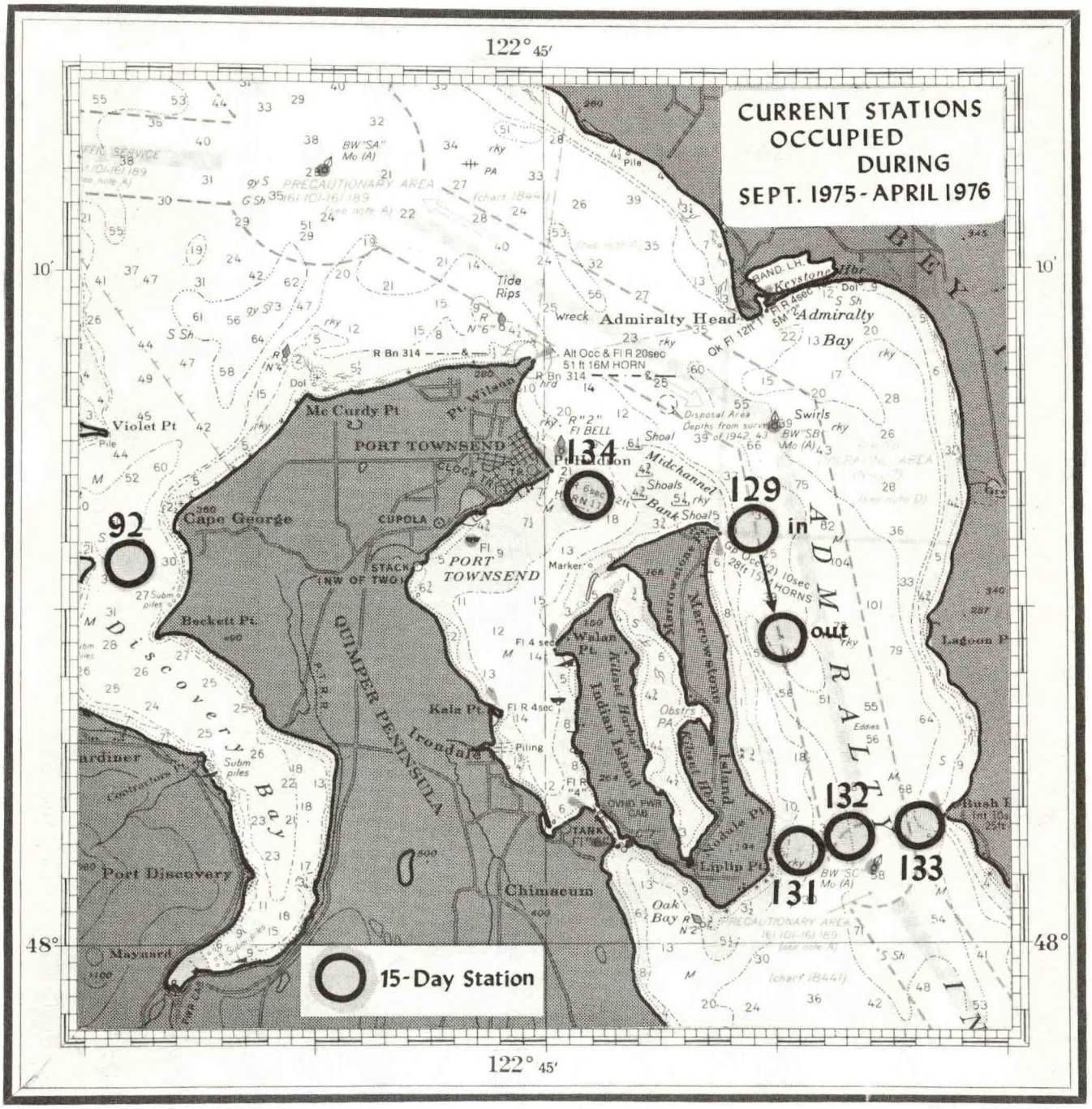

Figure 5.--*Current stations occupied during Phases IV through VI of the Puget Sound Approaches Circulatory Survey.*

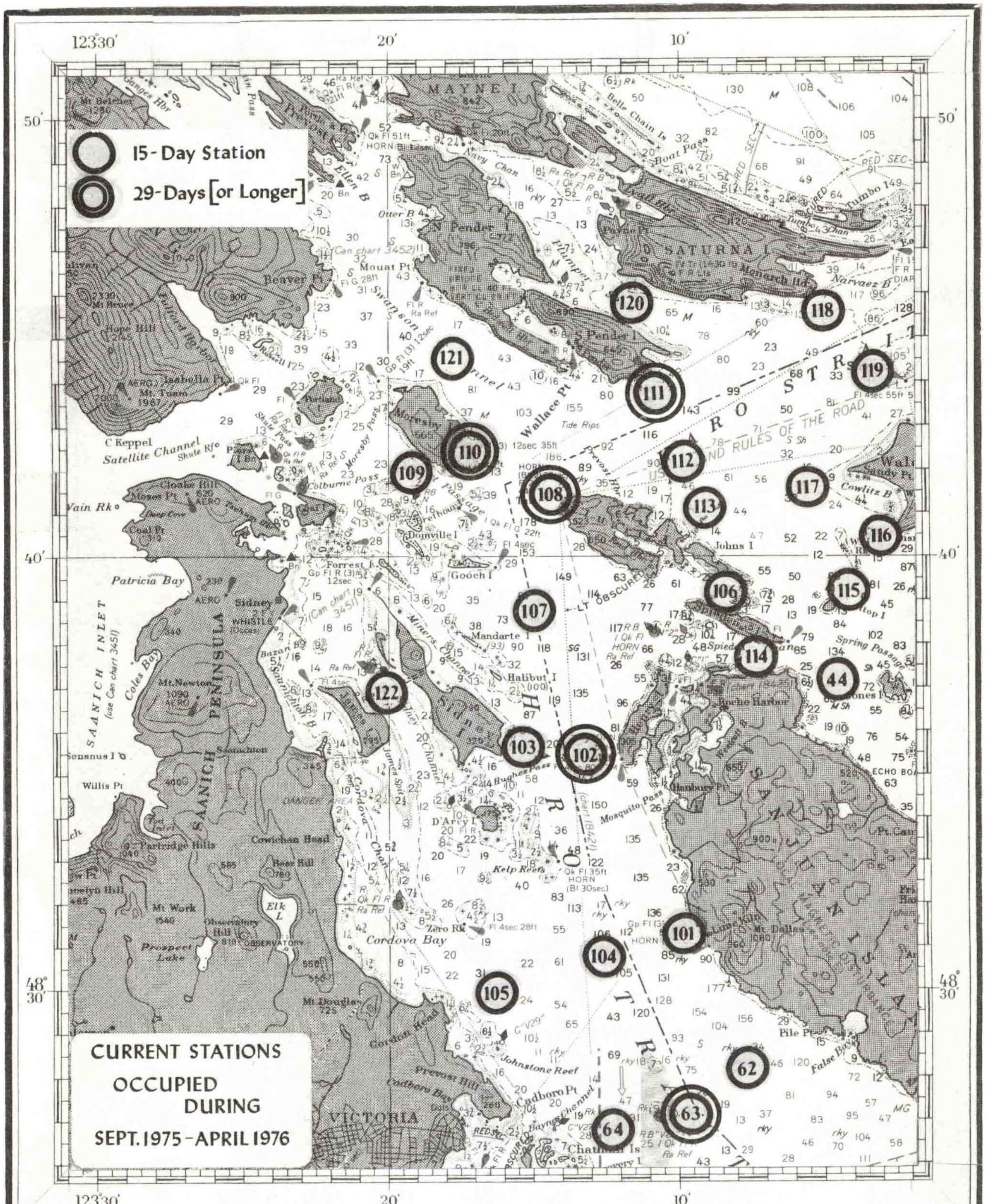

Figure 6.--*Current stations occupied during Phases IV through VI of the Puget Sound Approaches Circulatory Survey.*

KEY TO TABLES 2 & 3

(*1) 1 FOOT = 0.305 METER

(*2) - NUMBER INDICATES DEPTH BELOW SURFACE (AT MEAN LOWER LOW WATER)

+ NUMBER INDICATES HEIGHT ABOVE BOTTOM

-15 FEET = -4.58 METERS

-70 FEET = -21.35 METERS

+50 FEET = +15.25 METERS

(*3) S = SPEED SENSOR (ROTOR)

D = DIRECTION SENSOR (VANE)

T = TEMPERATURE SENSOR

C = CONDUCTIVITY SENSOR

P = PRESSURE SENSOR

(*4) TR = TRANSCRIBED

PH1 = PHASE 1

PH2 = PHASE 2

PH3 = PHASE 3

T.CH. = TIME CHECK (✓ INDICATES GOOD TIME CHECK;

- NUMBER INDICATES NUMBER OF DATA POINTS SHORT;

+ NUMBER INDICATES NUMBER OF DATA POINTS LONG.)

(*5) BAD DATA - MECHANICAL MALFUNCTIONS PREVENTED DATA RECOVERY

(*6) PLOT = TIME SERIES PLOT MADE

(*7) H.A. = HARMONIC ANALYSIS RUN

Table 2.--*Current stations occupied during the Preliminary Phase and Phases I through III of the Puget Sound Approaches Circulatory Survey.*

STA.	LATITUDE (N)	LONGITUDE (W)	(#1) DEPTH OF WATER (FT)	(#2) DEPTH OF METER (FT)	DATES OF OBSERVATION	DAYS OF DATA	(#3) SENSORS IN OPERATION S	D	T	C	P	(#4) PROCESSING COMPLETED TR	PH1	PH2	PH3	T.CH	(#5) DATA BAD	(#6) PLOT	(#7) H.A.
1	48°26.12'	122°47.00'	174	-15	1/29-2/13,74	15.2	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70	1/29-2/13,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	1/29-2/13,74		✓	✓	✓			✓	✓	✓	✓	✓		✓	✓
2	48°25.90'	122°44.70'	271	-15	1/29-2/14,74	15.1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	
				-70	1/29-2/14,74		✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓
				+50	1/29-2/14,74		✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓
3	48°26.05'	122°43.00'	240	-15	1/30-2/14,74	15.1	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70	1/30-2/14,74		✓	✓	✓		✓	✓	✓	✓	-325			✓	
				+50	1/30-2/14,74		✓	✓	✓			✓	✓	✓	✓	✓		✓	✓
4	48°28.80'	122°49.15'	83	-15	9/10-9/26,74	15.8	✓	✓	✓		✓	✓	✓	✓	✓	+1169	✓	✓	
				-50	9/10-9/26,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
5	48°28.90'	122°46.50'	131	-15	1/30-2/14,74	15.1	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	1/30-2/14,74		✓	✓	✓			✓	✓	✓	✓	✓		✓	✓
6	48°29.20'	122°44.50'	397	-15	1/29-2/14,74	15.2	✓	✓	✓		✓	✓	✓	✓		-32		✓	
				-70	1/29-2/14,74		✓	✓	✓		✓	✓	✓	✓		-10		✓	
				+50	1/29-2/14,74		✓	✓	✓			✓	✓	✓		-271		✓	
7	48°31.65'	122°48.37'	180	-15	9/10-9/25,74	15.0	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-66	9/10-9/25,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	9/10-9/25,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
8	48°31.35'	122°44.90'	214	-15	2/15-3/4,74	17.0	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70	2/15,3/4,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	Meter Lost	---													
9	48°27.53'	122°46.77'	132	-15	10/1-10/31,73	30.1	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	10/1-10/31,73		✓	✓	✓			✓	✓	✓		-17		✓	
	48°27.35'	122°46.92'	138	-15	1/29-2/26,74	28.0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
				-70	1/29-2/26,74		✓	✓	✓	✓		✓	✓	✓	✓	-3		✓	✓
				+32	1/29-2/26,74		✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓

Table 2.--*Continued*

STA.	LATITUDE (N)	LONGITUDE (W)	*1 DEPTH OF WATER (FT)	*2 DEPTH OF METER (FT)	DATES OF OBSERVATION	DAYS OF DATA	*3 SENSORS IN OPERATION S	D	T	C	P	*4 PROCESSING COMPLETED Tr	PH1	PH2	PH3	T.CH	*5 DATA BAD	*6 PLOT	*7 H.A.
9	48°26.87'	122°46.88'	143	-15	2/28-3/11,74	12.0	✓	✓	✓	✓	✓	✓	✓	✓		No	✓		
				-70	2/28-3/11,74		✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	
				-32	2/28-3/11,74		✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	
	48°27.07'	122°46.95'	120	-15	3/12-4/5,74	23.2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
				-70	3/12-4/5,74		✓	✓	✓	✓		✓	✓	✓		-692		✓	
				+32	3/12-4/5,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
10	48°31.32'	122°42.13'	127	-15	2/14-3/1,74	15.0	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	2/14-3/1,74		✓	✓	✓			✓	✓	✓	✓	✓		✓	✓
11	48°33.65'	122°44.85'	191	-15	2/15-3/4,74	17.0	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70	2/15-3/4,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	Meter Lost	---													
12	48°33.90'	122°39.60'	389	-15	2/15-3/6,74	18.8	✓	✓	✓		✓	✓	✓	✓		-21		✓	
				-70	2/15-3/6,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	Meter Lost	---													
13	48°35.45'	122°48.55'	69	-15	9/11-9/27,74	15.9	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-45	9/11-9/27,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
14	48°36.00'	122°48.20'	85	-15	9/11-9/27,74	15.8	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-45	9/11-9/27,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70	9/11-9/27,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
15	48°38.78'	122°43.45'	275	-15	3/6-3/23,74	14.2	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70	3/6-3/23,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	3/6-3/23,74		✓	✓	✓			✓	✓	✓	✓	✓		✓	✓
16	48°36.02'	122°38.98'	203	-15	3/20-4/5,74	15.8	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70	3/20-4/5,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	3/20-4/5,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
17	48°38.58'	122°38.75'	180	-15	3/21-4/5,74	15.0	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70	3/21-4/5,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	3/21-4/5,74		✓	✓	✓			✓	✓	✓	✓	✓		✓	✓

Table 2.--*Continued*

STA.	LATITUDE (N)	LONGITUDE (W)	①DEPTH OF WATER (FT)	②DEPTH OF METER (FT)	DATES OF OBSERVATION	DAYS OF DATA	③SENSORS IN OPERATION S	D	T	C	P	④PROCESSING COMPLETED Tr	Ph1	Ph2	Ph3	T.Ch	⑤DATA BAD	⑥PLOT	⑦H.A.
18	48°37.65'	122°36.00'	385	-15	3/6-3/24,75	18.1	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70	3/6-3/24,75		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	3/6-3/24,75		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
19	48°39.85'	122°42.93'	304	-15	3/4-3/19,75	15.0	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-75	3/4-3/19,75		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	3/4-3/19,75		✓	✓	✓		✓	✓	✓		-14			✓	
20	48°40.85'	122°42.87'	282	-15	10/2-11/1,73	30.7	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-67	10/2-11/1,73		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	10/2-11/1,73		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
	48°40.40'	122°42.30'	282	-15	2/14-4/10,74	54.1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
				-70	2/14-4/10,74		✓	✓	✓	✓		✓	✓	✓		✓		✓	
				+50	2/14-4/10,74		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
	48°40.62'	122°42.43'	280	-15	2/20-3/11,75	18.0	✓	✓	✓		✓	✓	✓	✓		-250		✓	
				-70	2/20-3/11,75		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	2/20-3/11,75		✓	✓	✓		✓	✓	✓		No		✓	✓	
	48°40.65'	122°42.42'	281	-15	3/12-4/11,75	30.0	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70	3/12-4/11,75		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	3/12-4/11,75		✓	✓	✓		✓	✓	✓		+9			✓	
21	48°40.87'	122°41.30'	219	-15	3/5-3/21,74	15.2	✓	✓	✓		✓	✓	✓	✓	✓			✓	✓
				-70	3/5-3/21,74		✓	✓	✓		✓	✓	✓	✓	✓			✓	✓
				+50	3/5-3/21,74		✓	✓	✓		✓	✓	✓	✓	✓			✓	✓
22	48°45.23'	122°58.57'	408	-15	10/2-11/1,73	30.0	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	
				-67	10/2-11/1,73		✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓
				+50	10/2-11/1,73		✓	✓	✓	✓		✓	✓	✓	✓			✓	✓
23	48°31.43'	122°37.88'	74	-15	3/4-3/20,74	15.0	✓	✓	✓		✓	✓	✓	✓	✓			✓	✓
				+50	3/4-3/20,74		✓	✓	✓			✓	✓	✓	✓			✓	✓
24	48°40.50'	122°36.05'	53	-15	3/5-3/20,75	15.2	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓

Table 2.--*Continued*

STA.	LATITUDE (N)	LONGITUDE (W)	#1 DEPTH OF WATER (FT)	#2 DEPTH OF METER (FT)	DATES OF OBSERVATION	DAYS OF DATA	#3 SENSORS IN OPERATION S	D	T	C	P	#4 PROCESSING COMPLETED Tr	Ph1	Ph2	Ph3	T.Ch	#5 DATA BAD	#6 PLOT	#7 H.A.
25	48°30.85'	122°30.50'	72	-15	9/10-9/25,74	14.9	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	9/10-9/25,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
26	48°33.90'	122°50.50'	173	-15	9/11-9/26,74	14.9	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70	9/11-9/26,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	9/11-9/26,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
27	48°35.75'	122°50.92'	98	-15	9/25-10/10,74	14.8	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-50	9/25-10/10/74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
28	48°38.58'	122°52.95'	101	-15	9/25-10/10,74	14.8	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70	9/25-10/10,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
29	48°34.77'	122°53.20'	238	-15	9/26-10/11,74	14.9	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70	9/26-10/11,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	9/26-10/11,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
30	48°35.32'	122°54.75'	106	-15	10/22-11/6,74	15.0	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-50	10/22-11/6,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
31	48°33.27'	122°55.20'	165	-15	9/26-10/9,74	5.5	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
	48°33.22'	122°55.20'	165	-15	10/8-10/11,74	2.9	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-70	9/26-10/11,74	14.9	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	9/26-10/11,74	12.0	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
32	48°25.93'	122°56.45'	326	-15	10/8-10/23,74	15.0	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70	10/8-10/23,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	10/8-10/23,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
33	48°27.43'	122°56.90'	370	-15	9/12-10/8,74	25.6	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
				-70	9/12-10/8,74		✓	✓	✓		✓	✓	✓	✓		✓	✓	✓	
				+50	9/12-10/8,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
	48°27.38'	122°56.90'	373	-15	10/11-11/6,74	25.8	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70	10/11-11/6,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	10/11-11/6,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓

Table 2.--*Continued*

STA.	LATITUDE (N)	LONGITUDE (W)	*1 DEPTH OF WATER (FT)	*2 DEPTH OF METER (FT)	DATES OF OBSERVATION	DAYS OF DATA	*3 SENSORS IN OPERATION S	D	T	C	P	*4 PROCESSING COMPLETED Tr	PH1	PH2	PH3	T.CH	*5 DATA BAD	*6 PLOT	*7 H.A.
34	48°29.90'	122°58.95'	239	-15	10/8-10/23,74	15.0	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70	10/8-10/23,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	10/8-10/23,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
35	48°30.00'	122°57.43'	300	-15	10/10-10/25,74	15.0	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70	10/10-10/25,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	10/10-10/25,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
36	48°31.25'	122°56.47'	294	-15	10/10-10/25,74	14.9	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70	10/10-10/25,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	10/10-10/25,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
37	48°32.40'	122°57.18'	281	-15	9/24-10/9,74	15.0	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70	9/24-10/9,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	9/24-10/9,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
38	48°32.50'	122°58.83'	210	-15	10/9-10/24,74	15.0	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70	10/9-10/15,74	5.9	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-70	10/15-10/24,74	8.9	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				+50	10/9-10/24,74	15.0	✓	✓	✓	✓	✓	✓	✓	✓		-28		✓	
39	48°33.98'	123°00.57'	457	-15	10/24-11/8,74	14.9	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
				-70	10/24-11/8,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	10/24-11/8,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
40	48°35.37'	123°02.63'	450	-15	10/23-11/7,74	15.0	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70	10/23-11/7,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	10/23-11/7,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
41	48°35.43'	122°59.80'	80	-15	9/24-10/9,74	14.9	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-45	9/24-10/9,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
42	48°36.92'	122°58.00'	74	-15	10/24-10/25,74	1.3	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-15	10/25-11/8,74	13.8	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-45	10/24-11/8,74	15.0	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓

Table 2.--*Continued*

STA.	LATITUDE (N)	LONGITUDE (W)	*1 DEPTH OF WATER (FT)	*2 DEPTH OF METER (FT)	DATES OF OBSERVATION	DAYS OF DATA	*3 SENSORS IN OPERATION S	D	T	C	P	*4 PROCESSING COMPLETED Tr	Ph1	Ph2	Ph3	T.Ch	*5 DATA BAD	*6 PLOT	*7 H.A.
43	48°36.73'	123°01.88'	120	-15	10/23-11/7,74	15.0	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-45	10/23-11/7,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
44	48°37.38'	123°04.17'	608	-15	10/9-11/8,74	30.0	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70	10/9-11/8,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	10/9-11/8,74		✓	✓	✓		✓	✓	✓		-89			✓	
45	48°40.98'	122°46.50'	352	-15	3/6-3/21,75	15.0	✓	✓	✓		✓	✓	✓	✓	✓			✓	✓
				-70	3/6-3/21,75		✓	✓	✓		✓	✓	✓	✓	✓			✓	✓
				+50	3/6-3/21,75		✓	✓	✓		✓	✓	✓	✓	✓			✓	✓
46	48°44.02'	122°48.12'	368	-15	3/4-3/20,74	16.0	✓	✓	✓		✓	✓	✓	✓	-65			✓	
				-70	3/4-3/20,74		✓	✓	✓		✓	✓	✓	✓	-32			✓	
				+50	3/4-3/20,74		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
47	48°45.73'	122°46.85'	300	-15	10/9-11/1,73	23.0	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-67	10/9-11/1,73		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	10/9-11/1,73		✓		✓			✓	✓	✓	✓	✓		✓	
	48°44.90'	122°45.77'	305	-15	2/20-3/10,75	17.1	✓	✓	✓		✓	✓	✓	✓	✓	-258	✓	✓	
				-70	2/20-3/10,75		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	2/20-3/10,75		✓	✓	✓		✓	✓	✓		-86			✓	
48	48°51.10'	122°46.47'	114	-22	10/2-10/6,73	3.3	✓	✓	✓		✓	✓	✓	✓	✓			✓	
				+50	10/2-10/6,73		✓	✓	✓			✓	✓	✓	✓			✓	
	48°51.47'	123°45.95'	132	-15	2/5-3/4,75	26.7	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	2/5-3/4,75		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
	48°51.47'	122°46.10'	131	-15	3/4-4/1,75	27.7	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	3/4-4/1,75		✓	✓	✓		✓	✓	✓		-3			✓	
	48°51.47'	122°46.10'	131	-15	4/1-4/11,75	9.9	✓	✓	✓		✓	✓	✓	✓	✓			✓	
				+50	4/1-4/11,75		✓	✓	✓		✓	✓	✓	✓	✓			✓	
49	48°49.40'	122°49.10'	183	-15	2/5-2/21,75	16.1	✓	✓	✓		✓	✓	✓	✓	No	✓		✓	
				-70	2/5-2/21,75		✓	✓	✓		✓	✓	✓	✓	-6			✓	
				+50	2/5-2/21,75		✓	✓	✓		✓	✓	✓	✓	✓			✓	✓
	48°49.42'	122°49.08'	183	-15	2/25-3/14,75	16.3	✓	✓	✓		✓	✓	✓	✓	✓			✓	✓

Table 2.--*Continued*

STA.	LATITUDE (N)	LONGITUDE (W)	*1 DEPTH OF WATER (FT)	*2 DEPTH OF METER (FT)	DATES OF OBSERVATION	DAYS OF DATA	*3 SENSORS IN OPERATION S	D	T	C	P	*4 PROCESSING COMPLETED Tr	Ph1	Ph2	Ph3	T.Ch	*5 DATA BAD	*6 PLOT	*7 H.A.
50	48°47.10'	122°51.60'	542	-15	2/19-3/6,75	15.1	✓	✓	✓			✓	✓	✓	✓	✓		✓	✓
				-70	2/19-3/6,75		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	2/19-3/6,75		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
51	48°45.30'	122°51.80'	421	-15	3/7-3/26,75	19.1	✓	✓	✓			✓	✓	✓	✓	✓		✓	✓
				-70	3/7-3/26,75		✓	✓	✓		✓	✓	✓	✓		-6		✓	
				+50	3/7-3/26,75		✓	✓	✓		✓	✓	✓			-11		✓	
52	48°44.25'	122°53.80'	314	-15	3/7-4/10,75	33.9	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70	3/7-4/10,75		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	3/7-4/10,75		✓	✓	✓		✓	✓	✓			-1600	✓	✓	
53	48°46.65'	122°55.30'	163	-15	3/11-3/14,75	3.3		✓	✓	✓	✓	✓	✓			✓			
				-15	3/14-4/14,75	30.7	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	3/11-4/14,75	34.3	✓	✓	✓	✓	✓	✓	✓			✓			
54	48°46.48'	123°00.13'	479	-15	3/11-4/10,75	30.0	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70	3/11-4/10,75		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	3/11-4/10,75		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
55	48°50.47'	122°58.05'	709	-15	2/18-3/6,75	14.9	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70	2/18-3/6,75		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	2/18-3/6,75		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
56	48°53.30'	122°53.50'	189	-15	2/18-3/5,75	15.0	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70	2/18-3/5,75		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	2/18-3/5,75		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
57	48°58.37'	122°54.42'	91	-15	2/5-2/25,75	20.4	✓	✓	✓		✓	✓	✓	✓	✓	-6		✓	
				+50	2/5-2/25,75	12.3	✓	✓	✓		✓	✓	✓	✓	✓	-1161	✓	✓	
58	48°56.85'	123°05.62'	383	-15	2/4-2/25,75	14.9	✓	✓	✓		✓	✓	✓	✓	✓	-65		✓	
				-70	2/4-2/25,75		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	2/4-2/25,75		✓	✓	✓		✓	✓	✓	✓	✓	-171		✓	

Table 2.--*Concluded*

STA.	LATITUDE (N)	LONGITUDE (W)	(#1) DEPTH OF WATER (FT)	(#2) DEPTH OF METER (FT)	DATES OF OBSERVATION	DAYS OF DATA	(#3) SENSORS IN OPERATION S	D	T	C	P	(#4) PROCESSING COMPLETED TR	PH1	PH2	PH3	T.CH	(#5) DATA BAD	(#6) PLOT	(#7) H.A.
59	48°54.60'	123°09.47'	407	-15	2/4-3/7,75	30.1	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70	2/4-3/7,75		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	2/4-3/7,75		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
60	48°52.85'	123°12.75'	516	-15	2/4-2/19,75	15.0	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70	2/4-2/19,75		✓	✓	✓		✓	✓	✓	✓	✓	-6		✓	
				+50	2/4-2/19,75		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
61	48°40.67'	122°59.95'	621	-15	3/25-4/14,75	11.0	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-70	3/25-4/14,75	6.9	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				+50	3/25-4/7,75	11.0	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				+50	4/7-4/14,75	7.2	✓	✓	✓		✓	✓	✓	✓		-5		✓	
100	48°30.23'	123°09.18'	984	-980	2/14-3/11,74	24.8	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓
101	48°30.97'	123°09.57'	888	-55	2/22-4/4,74	42.0	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-115	2/22-4/4,74		✓	✓	✓	✓		✓	✓	✓		-86		✓	
102	48°35.35'	123°13.47'	864	-15	10/2-11/2,73	30.7	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-67	10/2-11/2,73		✓	✓	✓		✓	✓	✓	✓		✓		✓	
				+50	10/2-11/2,73		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓

Table 3.--*Current stations occupied during Phases IV through VI of the Puget Sound Approaches Circulatory Survey.*

STA.	LATITUDE (N)	LONGITUDE (W)	*1 DEPTH OF WATER (FT)	*2 DEPTH OF METER (FT)	DATES OF OBSERVATION	DAYS OF DATA	*3 SENSORS IN OPERATION S	D	T	C	P	*4 PROCESSING COMPLETED TR	PH1	PH2	PH3	T, CH	*5 DATA BAD	*6 PLOT	*7 H.A.
9	48°27.13'	122°46.93'	153	-15	9/4-9/24, 75	0	✓	✓	✓		✓	✓	✓	✓		-205	✓	✓	
				-70		20	✓	✓	✓		✓	✓	✓	✓	✓	-1		✓	
				+32		20	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-15	9/24-10/1, 75	7	✓	✓	✓		✓	✓	✓	✓	✓	+1		✓	
				-70		7	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				+32		7	✓	✓	✓		✓	✓	✓	✓	✓	+1		✓	
				-15	10/6-10/19, 75	13	✓	✓	✓		✓	✓	✓	✓	✓			✓	
				-70		13	✓	✓	✓		✓	✓	✓	✓	✓			✓	
				+32		13	✓	✓	✓		✓	✓	✓	✓	✓			✓	
32	48°25.73'	122°56.47'	306	-15	2/19-3/8, 76	18	✓	✓	✓		✓	✓	✓	✓	✓			✓	✓
				-70		0	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	
				+50		18	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
61	48°40.63'	123°00.20'	621	-15	10/20-11/4, 76	15	✓	✓	✓			✓	✓	✓	✓	✓		✓	
				-70		15	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	
				+50		15	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	
62	48°27.85'	123°07.13'	654	-15	9/22-10/7, 75	15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-70		14	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				+50		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
	48°27.83'	123°07.03'	654	-15	9/2-9/17, 76	15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50		12	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
63	48°27.00'	123°09.60'	654	-15	9/19-10/6, 75	17	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-70		17	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-200		17	✓	✓	✓		✓	✓	✓	✓	✓	+1		✓	✓
				+50		17	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	

Table 3.--*Continued*

STA.	LATITUDE (N)	LONGITUDE (W)	*1 DEPTH OF WATER (FT)	*2 DEPTH OF METER (FT)	DATES OF OBSERVATION	DAYS OF DATA	*3 SENSORS IN OPERATION S	D	T	C	P	*4 PROCESSING COMPLETED Tr	Ph1	Ph2	Ph3	T.Ch	*5 DATA BAD	*6 PLOT	*7 H.A.
63	48°27.10'	123°09.40'	654	-15	10/6-10/19, 75	12	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-70		12	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-200		12	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				+50		12	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
	48°27.20'	123°09.22'	464	-15	9/2-9/16, 76	14	✓	✓	✓	✓	✓	✓	✓	✓	✓	-2		✓	
				-70		14	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	
				+50		4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	
	48°27.05'	123°09.67'	654	-13	9/16-10/6, 76	14	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	
				-68		14	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	
				+50		4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	
64	48°26.35'	123°12.30'	286	-15	10/6-10/21,75	14	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-70		14	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				+50		14	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
	48°26.33'	123°12.35'	286	-13	9/2-9/18, 76	15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-68		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
65	48°26.60'	123°00.03'	265	-15	2/19-3/8, 76	0	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-70		17	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50			Meter Malfunction										✓		
66	48°23.90'	122°56.50'	329	-15	2/18-3/8, 76	18	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70		18	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50		18	✓	✓	✓	✓	✓	✓	✓	✓	✓	-12		✓	
67	48°22.25'	123°01.20'	464	-16	2/17-3/4, 76		Meter Malfunction										✓		
				-71		14	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50		14	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
68	48°23.13'	123°09.67'	178	-15	10/21-11/9, 76	19	✓	✓	✓	✓	✓	✓	✓	✓	✓	-2		✓	
				-70		19	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
				+50		0	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	

Table 3.--*Continued*

STA.	LATITUDE (N)	LONGITUDE (W)	*1 DEPTH OF WATER (FT)	*2 DEPTH OF METER (FT)	DATES OF OBSERVATION	DAYS OF DATA	*3 SENSORS IN OPERATION S	D	T	C	P	*4 PROCESSING COMPLETED Tr	PH1	PH2	PH3	T.CH	*5 DATA BAD	*6 PLOT	*7 H.A.
69	48°19.75'	122°58.85'	517	-15	9/8-9/18, 75	5	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-70		14	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-200		14	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				+50		14	✓	✓	✓		✓	Meter Malfunction					✓		
			517	-15	11/3-11/8, 75	4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	
				-70		4	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-200		4	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				+50		4	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
70	48°16.62'	122°58.40'	86	-15	10/21-11/10,76	19	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				+27		19	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
71	48°17.70'	122°52.17'	221	-18	2/17-3/3, 76	0	✓	✓	✓		✓	✓	✓	✓					
				-73								Meter Malfunction					✓	✓	✓
				+50		14	✓	✓	✓		✓	✓	✓	✓	✓	-20		✓	
	48°17.90'	122°52.03'	221	-15	3/3-3/28, 76	26	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
				-70		26	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
				+50		17	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
	48°17.67'	122°52.10'	221	-20	4/5-4/19, 76	14	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-75		0	✓	✓	✓		✓	✓	✓	✓	✓	-14		✓	
				+50		14	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
72	48°24.30'	122°46.50'	158	-15	9/19-10/6, 75	17	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-70		17	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50		17	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
73	48°21.63'	122°41.70'	177	-15	3/5-3/22, 76	0	✓	✓	✓	✓	✓	✓	✓	✓		-1000		✓	
				-70		17	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+30		17	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
74	48°24.07'	122°41.03'	355	-15	3/2-3/18, 76	16	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
				-70		16	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50		16	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓

Table 3.--*Continued*

STA.	LATITUDE (N)	LONGITUDE (W)	DEPTH OF WATER (FT) *1	DEPTH OF METER (FT) *2	DATES OF OBSERVATION	DAYS OF DATA	SENSORS IN OPERATION *3					PROCESSING COMPLETED *4					DATA BAD *5	PLOT *6	H.A. *7
							S	D	T	C	P	TR	PH1	PH2	PH3	T.CH			
75	48°24.30'	122°38.60'	100	-63	3/9-3/29, 76	7	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
76	48°18.45'	122°45.47'	176	-15	3/5-3/16, 76	0	Meter Malfunction										✓		
				-70		17	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50		17	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
77	48°14.30'	122°48.60'	176	-15	3/4-3/22, 76	18	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
				-70		0	✓	✓	✓		✓	✓	✓	✓		-52			
				+50		0	✓	✓	✓		✓	✓	✓	✓		-224			
	48°14.25'	122°48.30'	176	-15	3/26-4/12, 76	17	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70		17	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50		8	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
78	48°08.90'	122°44.25'	178	-15	9/3-9/23, 75	19	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	
				-70		19	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	
				+50		19	✓	✓	✓			✓	✓	✓	✓	✓		✓	
	48°09.00'	122°44.65'	178	-50	9/23-10/3, 75	0	✓	✓	✓	✓		✓	✓	✓		-375			
				-70		0	✓	✓	✓	✓	✓	✓	✓	✓		+93			
				+50		0	Meter Malfunction										✓	✓	
	48°08.90'	122°44.60'	178	-13	3/19-3/25, 76	16	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	
				-68		16	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
				+50		16	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	
	48°08.95'	122°44.70'	178	-15	3/25-4/13, 76	18	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
				-70		18	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50		18	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
	48°08.90'	122°44.67'	178	-15	4/13-4/21, 76	8	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70		8	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				+50		8	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
79	48°09.28'	122°41.42'	214	-15	9/22-10/10, 75	15	✓	✓	✓		✓	✓	✓	✓	✓	-10		✓	
				-70	9/22-10/11, 75	17	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50	9/22-10/11, 75	17	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	

Table 3.--*Continued*

STA.	LATITUDE (N)	LONGITUDE (W)	*1 DEPTH OF WATER (FT)	*2 DEPTH OF METER (FT)	DATES OF OBSERVATION	DAYS OF DATA	*3 SENSORS IN OPERATION S	D	T	C	P	*4 PROCESSING COMPLETED Tr	Ph1	Ph2	Ph3	T.Ch	*5 DATA BAD	*6 PLOT	*7 H.A.
79	48°09.28'	122°41.42'	214	-15	3/16-3/26, 76	8	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-70		9	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				+50		4	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
80	48°06.45'	122°57.45'	242	-15	3/30-4/14, 76	15	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	
				-70		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50		15	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
81	48°10.95'	122°55.60'	116	-15	10/31-11/9, 75	10	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				+27		9	✓	✓	✓		✓	✓	✓	✓		+30			
				-15	3/4-3/26/76	0	Meter Malfunction										✓	✓	
				+30	3/4-3/26, 76	22	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
82	48°11.23'	123°09.50'	362	-15	10/20-11/4, 75	15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-70		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50		15	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	
83	48°14.90'	123°12.10'	445	-15	10/20-11/4, 75	15	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	
				-70		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50		15	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
84	48°19.40'	123°15.03	321	-15	10/20-11/4, 75	15	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
				-70		3	✓	✓	✓		✓	✓	✓	✓	✓	✓			✓
				+50		3	✓	✓	✓	✓	✓	✓	✓	✓	✓	-1			
	48°19.43'	123°15.03'	321	-70	10/23-11/4, 75	12	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				+50		3	✓	✓	✓	✓	✓	✓	✓	✓		-955			
85	48°23.45'	123°16.97'	165	-15	10/20-11/4, 75	15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-70		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50		15	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			

Table 3.--*Continued*

STA.	LATITUDE (N)	LONGITUDE (W)	(#1) DEPTH OF WATER (FT)	(#2) DEPTH OF METER (FT)	DATES OF OBSERVATION	DAYS OF DATA	(#3) SENSORS IN OPERATION S	D	T	C	P	(#4) PROCESSING COMPLETED Tr	Ph1	Ph2	Ph3	T.Ch	(#5) DATA BAD	(#6) PLOT	(#7) H.A.
86	48°08.15'	123°17.45'	82	-15	10/16-10/31,75	15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+27		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
87	48°16.70'	123°22.00'	363	-15	9/3-9/18, 75	15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70	9/4-9/18, 75	14	✓	✓	✓		✓	✓	✓	✓	✓	✓			
				-200	9/3-9/18, 75	15	✓	✓	✓		✓	✓	✓	✓	✓	✓			
				+50	9/3-9/19, 75	15	✓	✓	✓		✓	✓	✓	✓	✓	✓			
88	48°22.42'	123°26.13'	251	-15	10/8-11/7, 75	16	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70		16	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50		16	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
89	48°10.62'	123°32.07'	95	-15	9/3-9/19, 75	15	✓	✓	✓		✓	✓	✓	✓	✓	✓			
				+27		15	✓	✓	✓		✓	✓	✓	✓	✓	✓			✓
90	48°13.85'	123°33.43'	521	-15	9/4-9/23, 75	19	✓	✓	✓	✓	✓	✓	✓	✓		+7			
				-70		19	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-200		19	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	
				-350		19	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				+50		19	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
	48°14.03'	123°33.55'	521	-15	9/24-10/8, 75	11	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-70		14	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-200		14	✓	✓	✓	✓	✓	✓	✓	✓	✓	-1			
				-350		14	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				+50		14	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
	48°13.73'	123°34.03'	521	-15	10/9-10/19, 75	10	✓	✓	✓		✓	✓	✓	✓		-2			
				-70		10	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-200		10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	
				-350		10	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				+50		10	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
91	48°16.85'	123°32.60'	454	-15	9/3-9/19, 75	14	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70		14	✓	✓	✓		✓	✓	✓	✓		-7			✓
				+50		14	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓

Table 3.--*Continued*

STA.	LATITUDE (N)	LONGITUDE (W)	(#1) DEPTH OF WATER (FT)	(#2) DEPTH OF METER (FT)	DATES OF OBSERVATION	DAYS OF DATA	(#3) SENSORS IN OPERATION S	D	T	C	P	(#4) PROCESSING COMPLETED Tr	Ph1	Ph2	Ph3	T.Ch	(#5) DATA BAD	(#6) PLOT	(#7) H.A.
92	48°05.62'	122°53.93'	190	-13	3/30-4/14, 76	15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-68		15	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
				+50		0	✓	✓	✓		✓	✓	✓	✓		✓	✓		
93	48°21.45'	122°50.10'	284	-15	2/18-3/5, 76	15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
94	48°08.13'	123°25.00'	151	-15	2/19-3/9, 76	19	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	
				+50		19	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
96	48°15.10'	124°06.30'	526	-15	10/8-11/7, 75	30	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70		30	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50		30	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
97	48°17.95'	124°04.90'	623	-15	10/2-11/4, 75	32	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70		32	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50		6	✓	✓	✓		✓	✓	✓	✓	✓	✓			
98	48°21.90'	124°02.25'	418	-15	10/2-10/16, 75	5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
				-70		0	✓	✓	✓		✓	✓	✓	✓		-144			
				+50		25	✓	✓	✓		✓	✓	✓	✓	✓	✓			
	48°21.90'	124°02.00'	418	-15	10/16-11/11, 75	25	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	
				-70		25	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				+50		25	✓	✓	✓			✓	✓	✓	✓	✓		✓	
101	48°30.67'	123°10.87'	825	-40	9/3-9/20, 76	17	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70		0	✓	✓	✓		✓	✓	✓	✓		✓	✓	✓	
102	48°35.15'	123°13.28'	869	-42	9/21-10/7, 76	16	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-72		16	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	
				-42	10/7-10/21, 76	14	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	
				-72		14	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	

Table 3.--*Continued*

STA.	LATITUDE (N)	LONGITUDE (W)	①DEPTH OF WATER (FT)	②DEPTH OF METER (FT)	DATES OF OBSERVATION	DAYS OF DATA	③SENSORS IN OPERATION S	D	T	C	P	④PROCESSING COMPLETED TR	PH1	PH2	PH3	T.CH	⑤DATA BAD	⑥PLOT	⑦H.A.
103	48°35.53'	123°15.13'	187	-20	9/21-10/6, 76	15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-75		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				+50		0	✓	✓	✓		✓	✓	✓			+32			
104	48°30.50'	123°12.43'	633	-40	9/2-9/20, 76	18	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70		18	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50		0	✓	✓	✓		✓	✓	✓			+1270			
105	48°29.85'	123°16.47'	214	-15	9/3-9/20, 76	17	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70		17	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50		17	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
106	48°38.95'	123°08.60'	325	-15	9/22-10/7, 76	15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-70		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				+50		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
107	48°38.88'	123°15.05'	525	-15	9/21-10/6, 76	15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-70		15	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	
	48°38.93'	123°15.30'	525	-15	10/22-11/8, 76	17	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓		✓
				+50		17	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
108	48°41.82'	123°13.88'	614	-40	10/7-10/22, 76	14	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70		14	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	
				-40	10/22-11/2, 76	11	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	
				-70		11	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	
	48°41.77'	123°14.00'	614	-40	11/2-11/8, 76	6	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-70			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	
109	48°42.03'	123°19.03'	193	-16	9/21-10/6, 76	5	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-71		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				+50		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	

Table 3.--*Continued*

STA.	LATITUDE (N)	LONGITUDE (W)	#1 DEPTH OF WATER (FT)	#2 DEPTH OF METER (FT)	DATES OF OBSERVATION	DAYS OF DATA	#3 SENSORS IN OPERATION S	D	T	C	P	#4 PROCESSING COMPLETED Tr	Ph1	Ph2	Ph3	T.Ch	#5 DATA BAD	#6 PLOT	#7 H.A.
110	48°42.60'	123°17.10'	242	-13	9/22-10/7, 76	15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-68		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
	48°42.57'	123°16.97'		-17	10/7-10/22, 76	0	✓	✓	✓		✓	✓	✓			✓	✓		
				-72		0	✓	✓	✓		✓	✓	✓			-31			
				+50		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
111	48°43.62'	123°11.48'	589	-15	10/5-10/20, 76	14	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-70		14	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	
	48°43.62'	123°11.48'	499	+50	10/19-11/4, 76	0	✓	✓	✓		✓	✓	✓	✓		-10			
				-15		16	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-70		0	✓	✓	✓	✓	✓	✓	✓	✓	✓	**			
112	48°42.35'	123°09.72'	502	-15	10/5-10/20, 76	15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-70		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				+50		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
113	48°40.95'	123°08.55'	277	-15	10/5-10/20, 76	15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-70		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				+50		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
114	48°37.62'	123°07.40'	314	-15	10/21-11/5, 76	15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-72		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
115	48°39.28'	123°04.25'	566	-15	10/21-11/5, 76	15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓

** off 16 days

Table 3.--*Continued*

STA.	LATITUDE (N)	LONGITUDE (W)	*1 DEPTH OF WATER (FT)	*2 DEPTH OF METER (FT)	DATES OF OBSERVATION	DAYS OF DATA	*3 SENSORS IN OPERATION S	D	T	C	P	*4 PROCESSING COMPLETED Tr	Ph1	Ph2	Ph3	T.Ch	*5 DATA BAD	*6 PLOT	*7 H.A.
116	48°40.17'	123°02.97'	321	-15	10/19-11/3, 76	15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-70		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				+50		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
117	48°41.50'	123°05.57'	139	-15	10/7-10/22, 76	15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-70		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				+30		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
118	48°45.62'	123°05.28'	709	-39	10/21-11/5, 76	15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-69		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
119	48°43.90'	123°03.52'	150	+30	10/19-11/3, 76	15	✓	✓	✓		✓	✓	✓	✓		-252			
				-70		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-15		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
120	48°45.65'	123°11.92'	85	-15	10/19-11/3, 76	15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+30		15	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
121	48°44.21'	123°17.67'	461	-17	10/5-10/20, 76	15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-72		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				+50		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
122	48°36.77'	123°19.92'	122	-15	9/3-9/20, 76	19	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
				+50		19	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
125	48°09.33'	122°49.30'	89	-15	3/16-4/1, 76	0	✓	✓	✓		✓	✓	✓				✓		
				+17		15	✓	✓	✓		✓	✓	✓	✓	✓	+3			✓
126	48°11.40'	122°47.13'	196	-15	3/16-3/31, 76	15	✓	✓	✓		✓	✓	✓	✓	✓	-3			✓
				-70		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50		15	✓	✓	✓		✓	✓	✓	✓	✓	+2			✓

Table 3.--*Concluded*

STA.	LATITUDE (N)	LONGITUDE (W)	(#1) DEPTH OF WATER (FT)	(#2) DEPTH OF METER (FT)	DATES OF OBSERVATION	DAYS OF DATA	(#3) SENSORS IN OPERATION S	D	T	C	P	(#4) PROCESSING COMPLETED Tr	Ph1	Ph2	Ph3	T.Ch	(#5) DATA BAD	(#6) PLOT	(#7) H.A.
127	48°11.03'	122°43.30'	242	-70	3/17-4/9, 76	22	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				+30		22	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
128	48°08.73'	122°42.40'	226	-15	3/16-3/31, 76	0	✓	✓	✓	✓	✓	✓	✓				✓		
				-70		15	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
				-110		15	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
				+30		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
129	48°06.25'	122°40.40'	210	-18	4/1-4/12, 76	11	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				-73		11	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
				+50		11	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
	48°06.20'	122°40.30'	210	+50	4/12-4/23, 76	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	
130	48°06.33'	122°36.92'	233	-16	4/1-4/21, 76	20	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				-71		20	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50		20	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
131	48°01.35'	122°39.50'	86	-15	3/30-4/16, 76	17	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+15		17	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
132	48°01.63'	122°38.20'	351	-13	3/23-4/22, 76	30	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
				-178		30	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
133	48°01.85'	122°36.70'	328	-15	3/17-4/2, 76	0	✓	✓	✓		✓	✓	✓	✓		✓	✓		
				-70		16	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50		16	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
134	48°06.60'	122°44.05'	98	-15	4/1-4/16, 76	15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
				+50		15	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	
135	48°09.20'	122°37.97'	106	-18	4/1-4/21, 76	20	✓	✓	✓	✓	✓	✓	✓	✓	✓	+1		✓	✓
				+50		19	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓

Table 4.--*Table of specifications for Aanderaa RCM4 current meter.*

Weight in Air

Recording unit: 12.5 kg
Vane assembly: 12.0 kg

Dimensions

Overall length: 136 cm
Recording unit diameter: 12.8 cm
Vane size: 36 x 100 cm

Depth Capability

Standard version: 2000 m
High pressure version: 6000 m

Materials Exposed to Sea Water

Pressure case 90/10 CuNi alloy, nickel plated. Other parts acid resistant steel or nickel plated bronze. Vane 8 mm red PVC.

Mooring

Spindle end pieces designed for 14 mm max. diameter wire or rope and force of 2000 kg. A gimbal mounting permits ± 30° deviation between instrument and mooring line.

Measuring Ranges and Accuracies

Current speed: 1.5 to 250 cm/sec
Direction: 0-360° ± 5° magnetic
Temperature: choice between 3 ranges:
  Low range: -2.46°C to 21.40°C
  High range: 10.08°C to 36.00°C
  Wide range: -0.34°C to 32.17°C
  Standard calibration curves are accurate to +0.1°C. Calibration to ± 0.0125°C is possible.
Conductivity: 0-60 mmho
Pressure: choice between 5 ranges: 0-200 PSI, 0-500 PSI, 0-1000 PSI, 0-5000 PSI, 0-8000 PSI
Accuracy: better than ±1% of range.

Measuring System

Rotary encoder system with sequential measuring of 6 channels by self-balancing bridge. Bridge is balanced in 10 binary steps and gives a 10-bit binary word for each channel. Measuring speed: 4.5 sec/channel. The channels are: Reference (a control measurement), Temperature, Conductivity (optional), Depth (optional), Current Direction, Current Speed.

Recording System

Serial recording of 10-bit binary words on 1/4-inch magnetic tape by use of short and long pulses. Total storage capacity: 60,000 words. Tape: 600 feet on 3 or 3-1/4-inch spools. End of record pulse (sync pulse) after each completed cycle.

Telemetry

By crystal controlled pulse coded acoustic carrier 16.385 kHz, 6 words sent in the course of 30 sec. Detecting range with tuned hydrophone receiver is typically 800 m.

Rotor Speed Reduction Gear

6000:1 is standard. 40,000:1 and 1200:1 available on request... These rates are recommended for sampling intervals of 5 to 20 min., 30 to 60 min., and 0.5 to 2.5 min., respectively.

Clock

Accuracy: ± 2 sec/day over temperature range 0-20°C. Operating time on new battery: 3 years.

Sampling Intervals

60, 30, 20, 15, 10, 5, 2.5, 2, 1, and 0.5 min. according to interval selecting plug. The 10 min. plug is standard.

External Triggering

Is possible by applying a 6 volt positive pulse to electric terminal on top end plate. Same terminal also gives output signals (5 volt pulses of negative polarity).

Batteries

Main battery: Tudor 9T1 or similar battery (9 volt battery, 63 x 50 x 80 mm, nonmagnetic)
Clock battery: Mallory type TR-113 (16.6 mm diameter, 21.1 mm long)

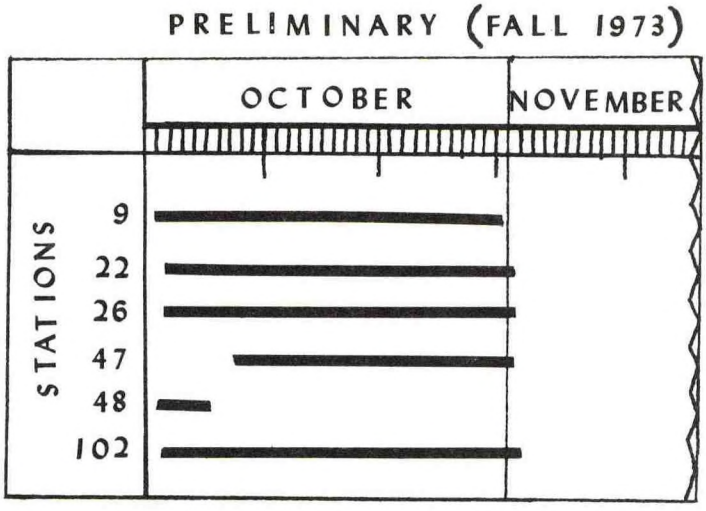

Figure 7.--*Periods of occupation for current stations during the Preliminary Phase.*

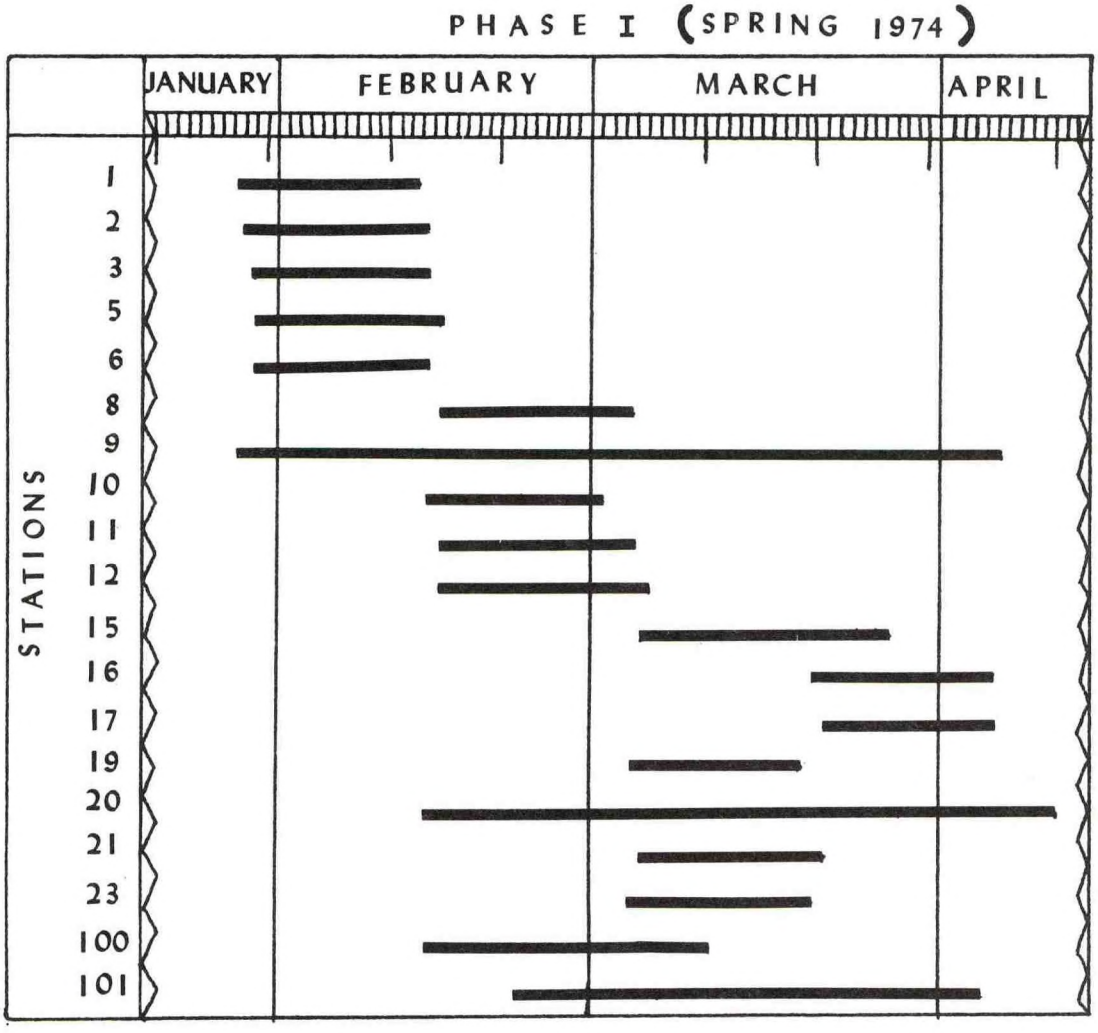

Figure 8.--*Periods of occupation for current stations during Phase I.*

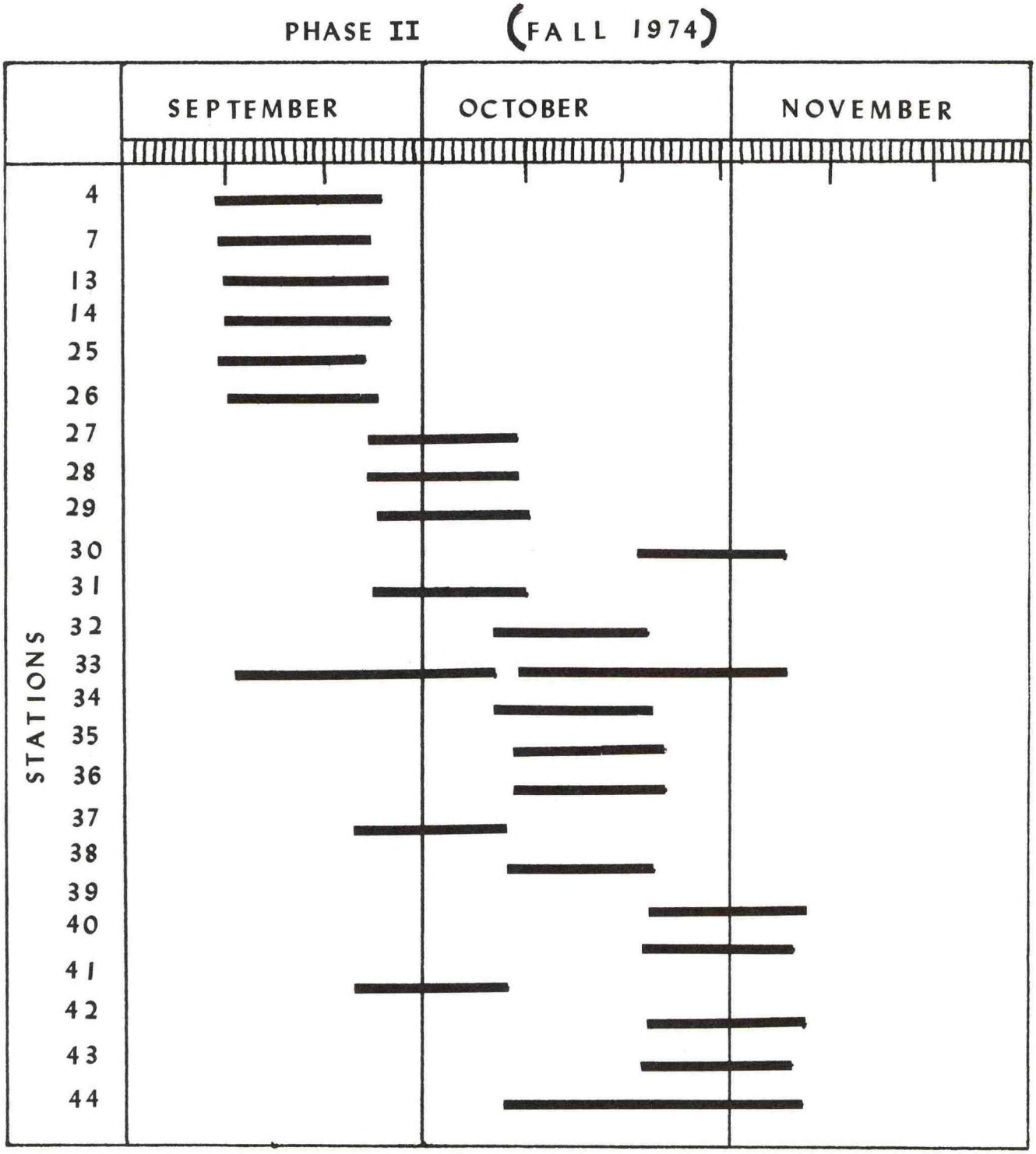

Figure 9.--*Periods of occupation for current stations during Phase II.*

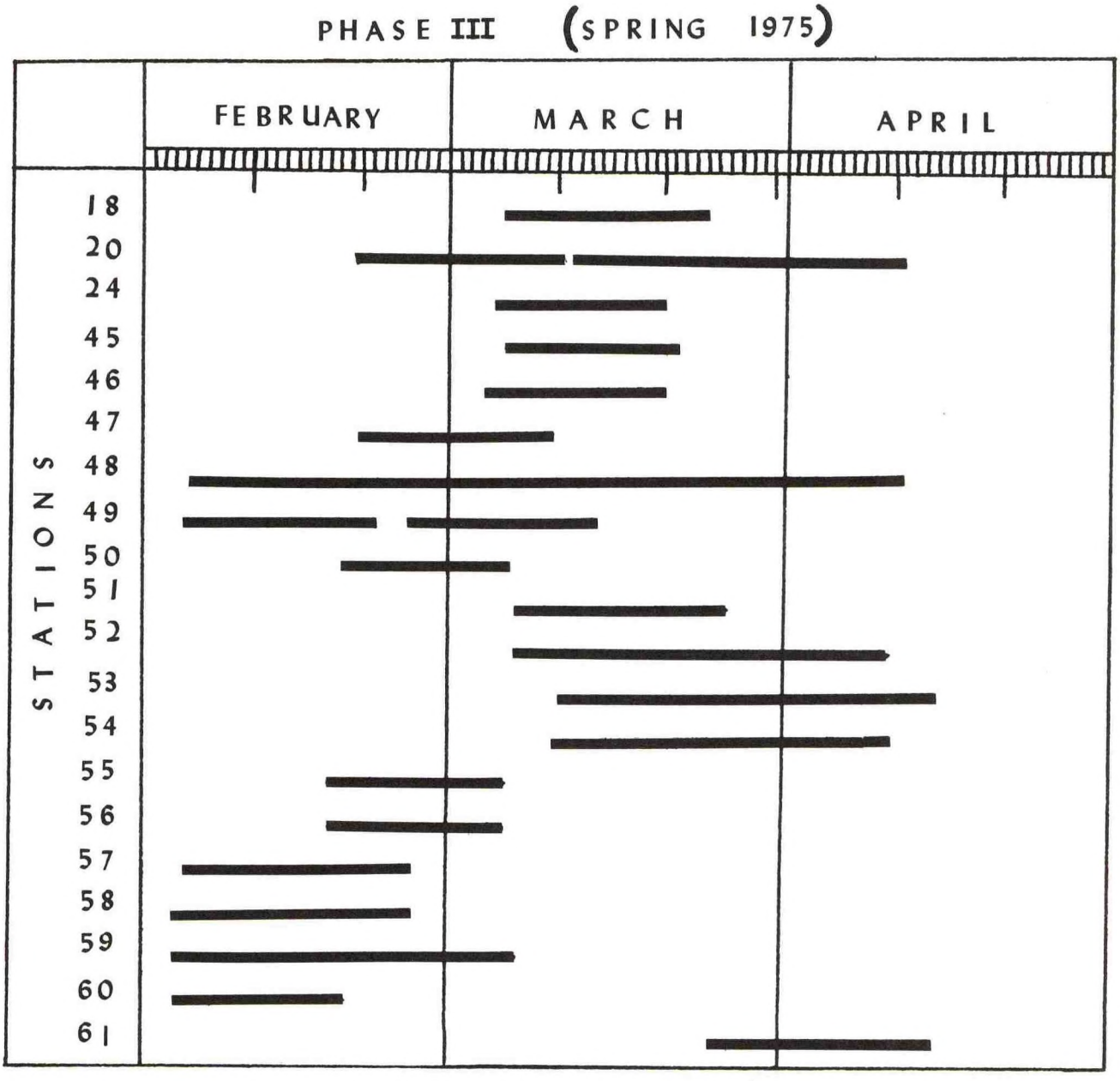

Figure 10.--*Periods of occupation for current stations during Phase III.*

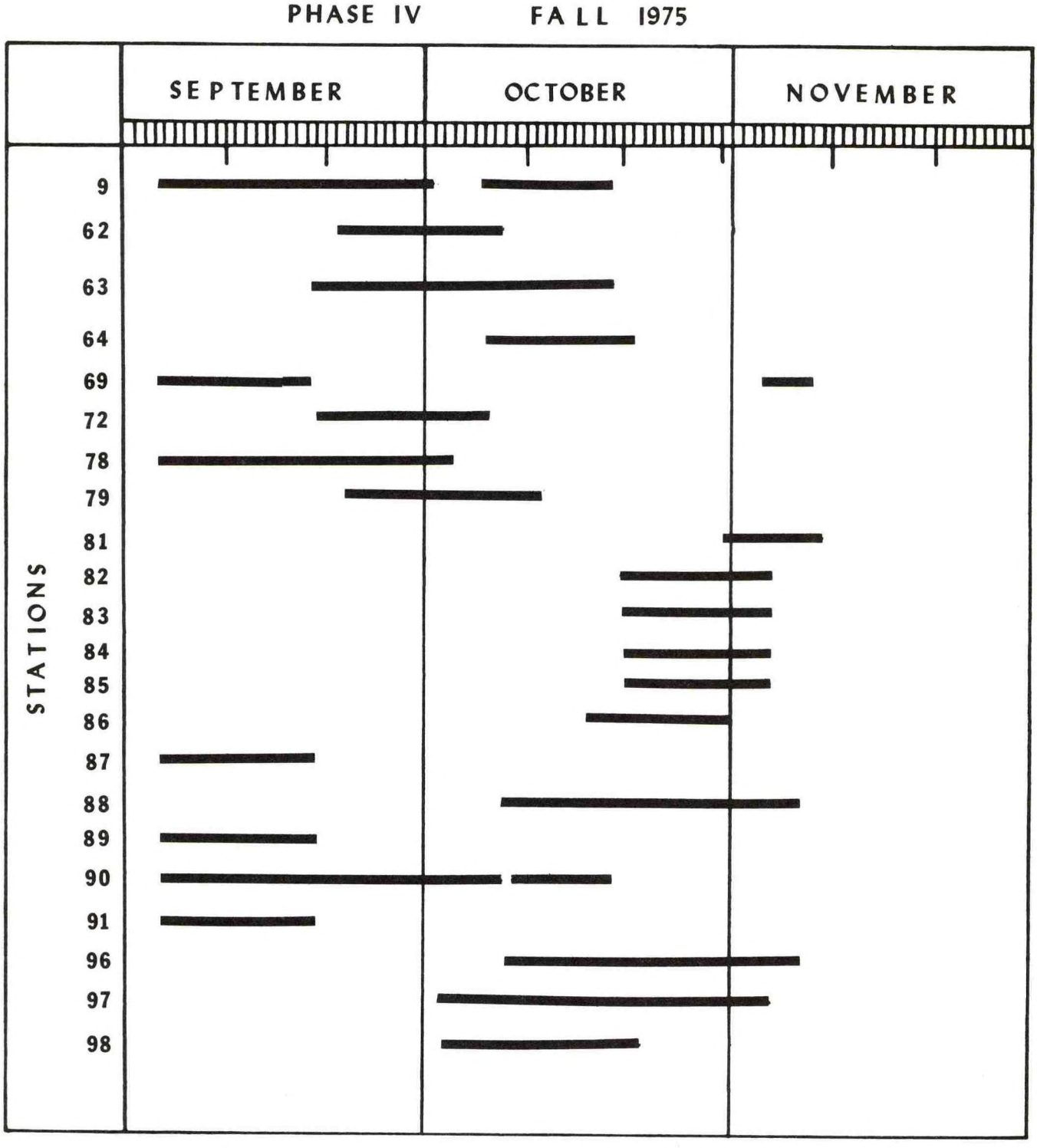

Figure 11.--*Periods of occupation for current stations during Phase IV.*

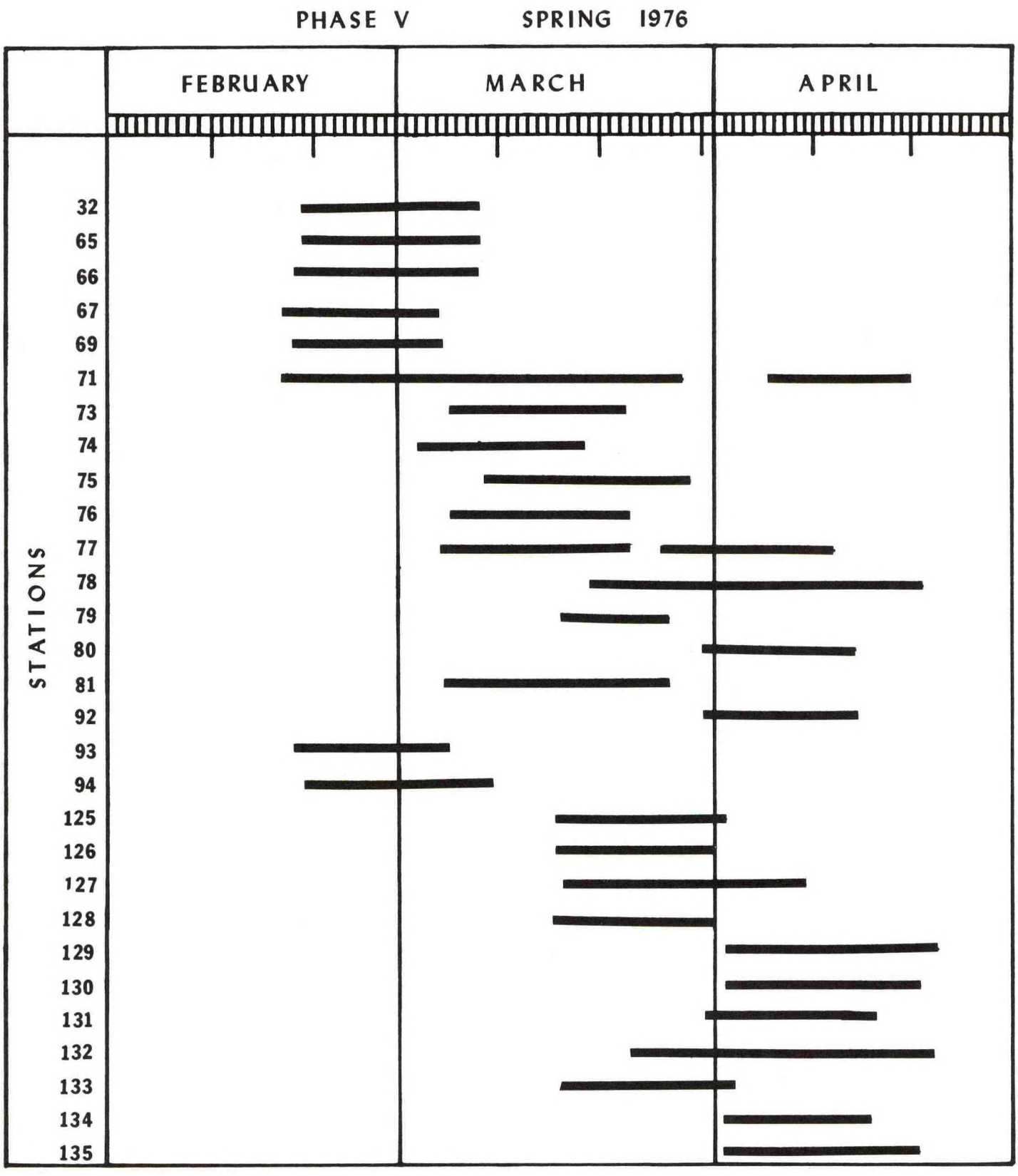

Figure 12.--*Periods of occupation for current stations during Phase V.*

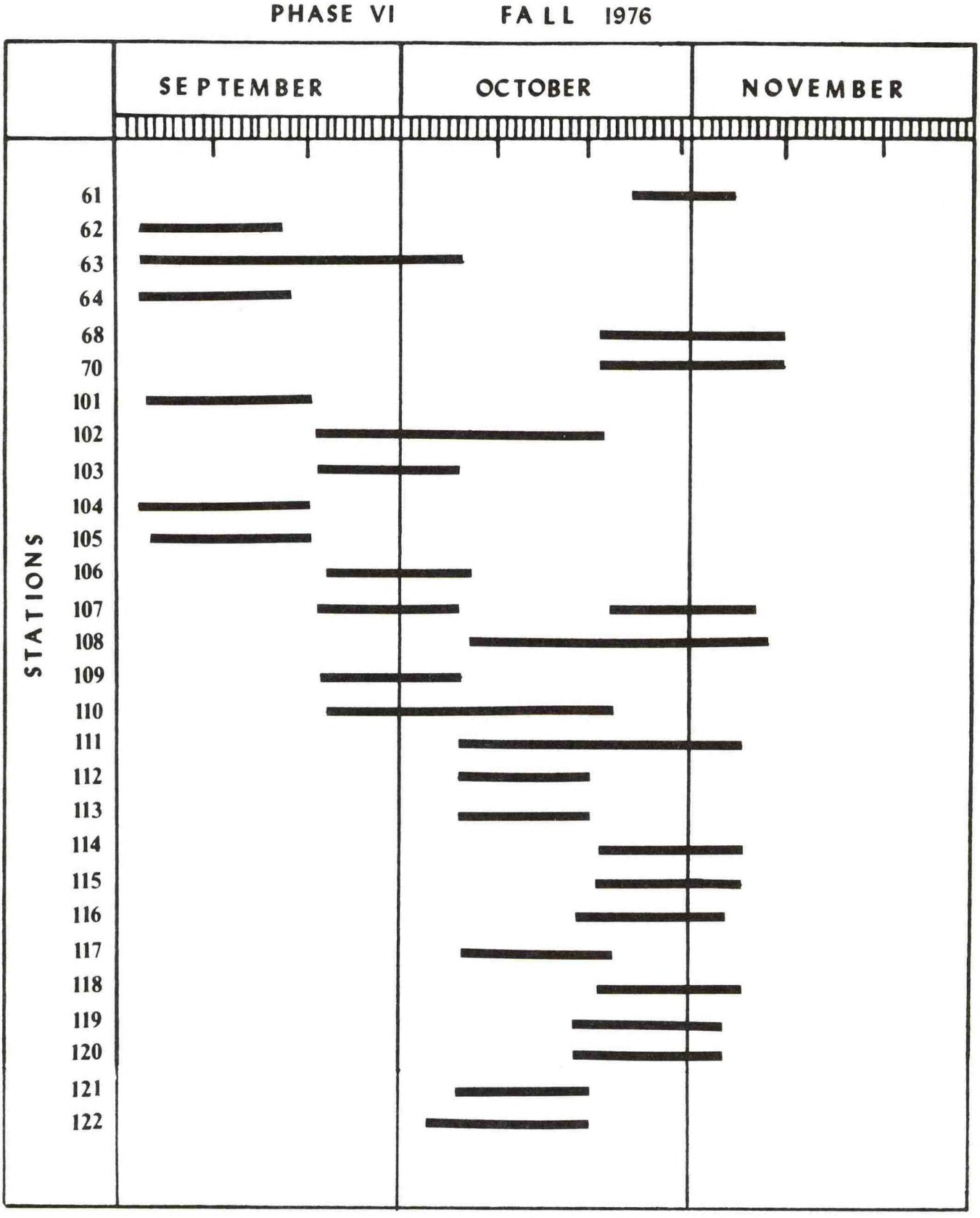

Figure 13.--*Periods of occupation for current stations during Phase VI.*

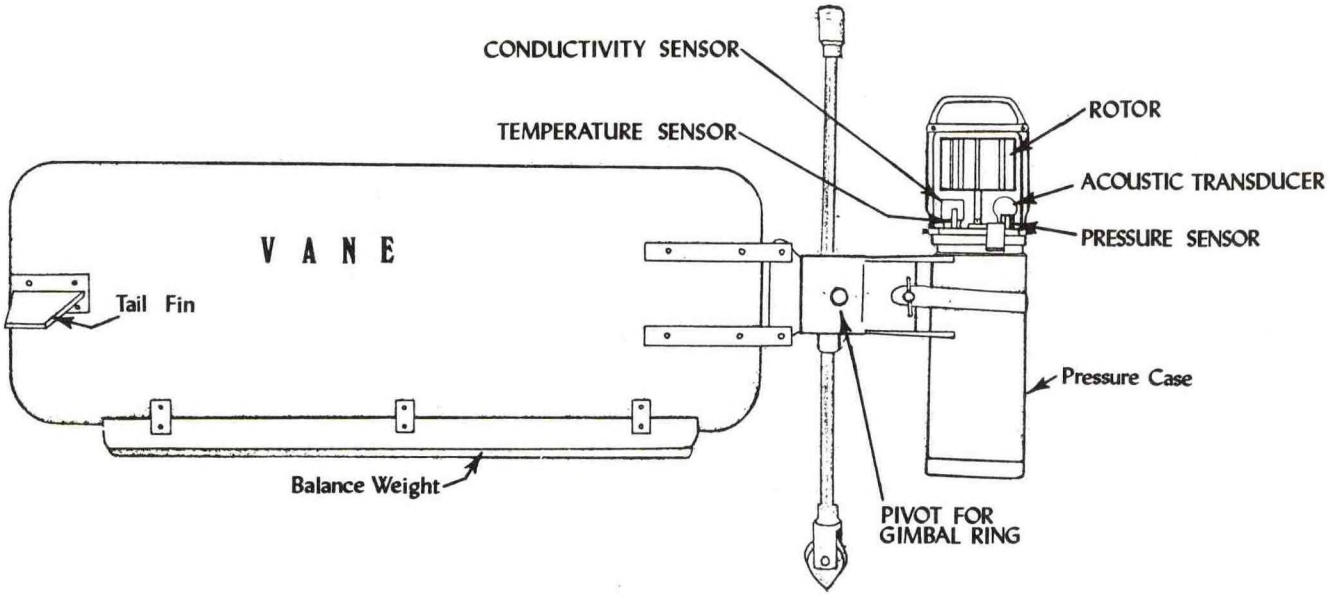

Figure 14.--*Aanderaa current meter (Model RCM4) used during Puget Sound Approaches Circulatory Survey.*

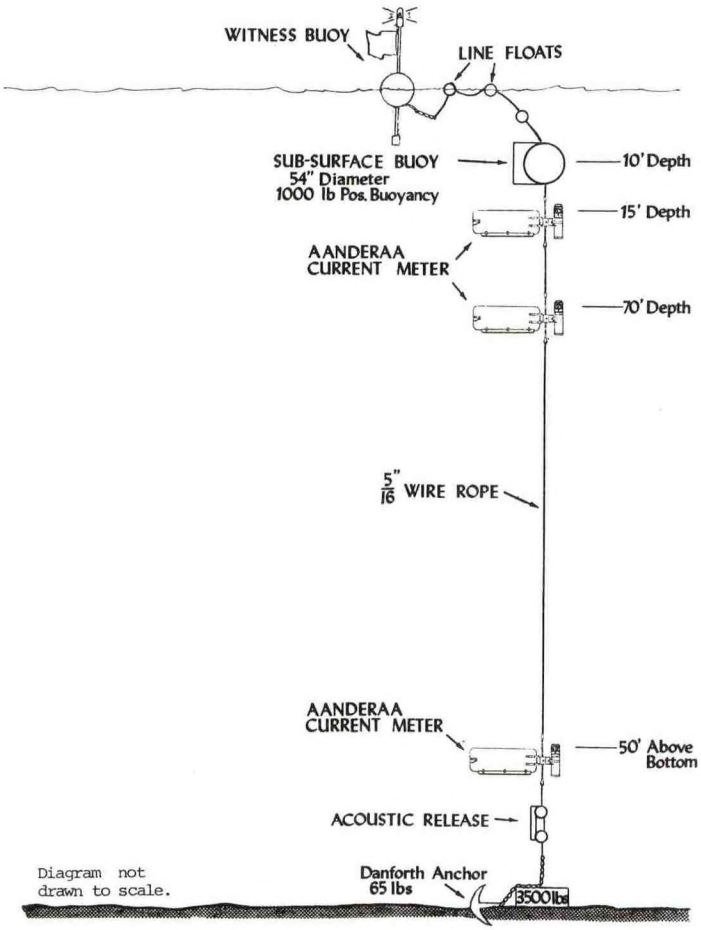

Figure 15.--*Taut wire mooring system used during Puget Sound Approaches Circulatory Survey.*

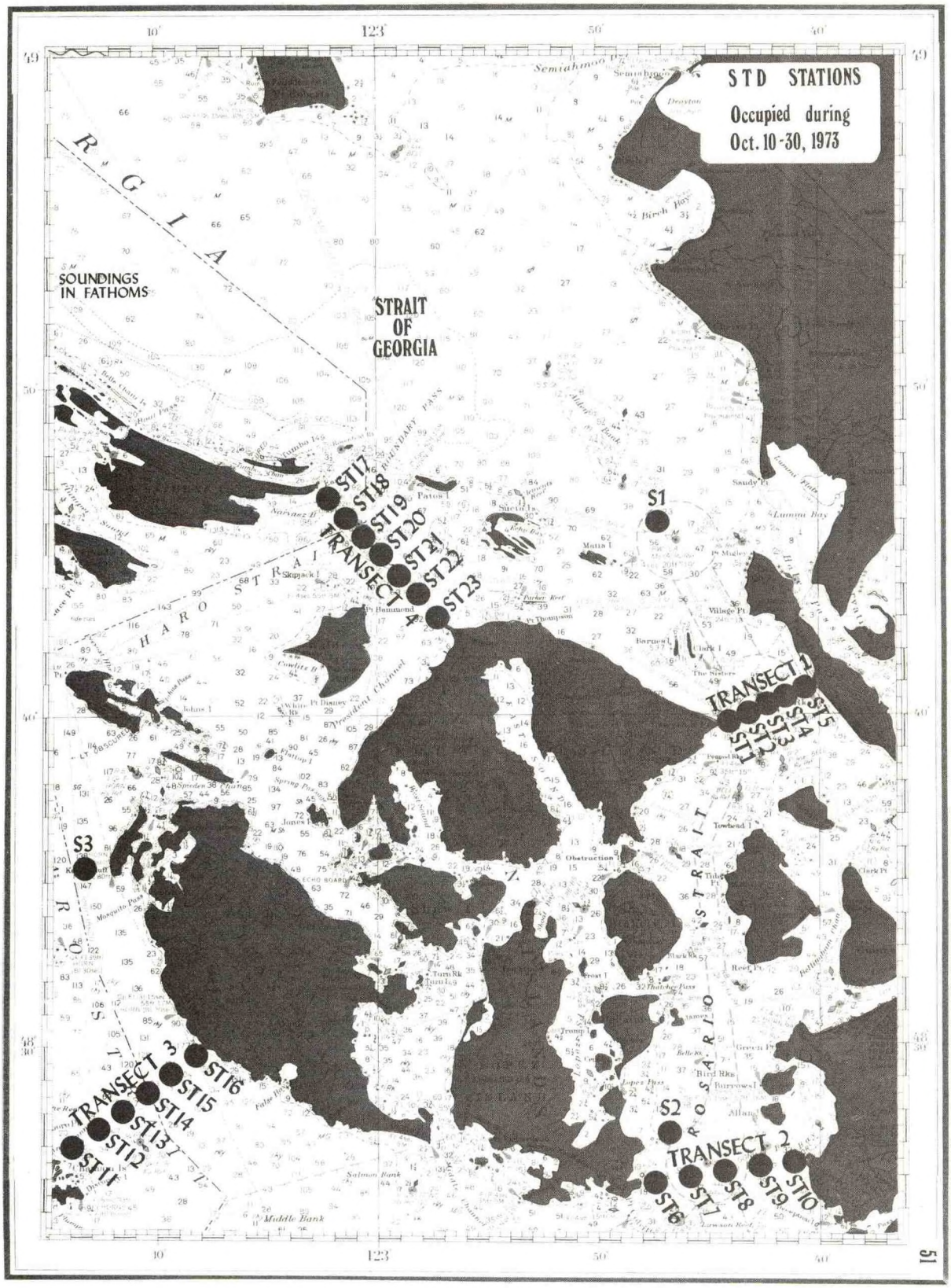

Figure 16.--*STD stations occupied during the Preliminary Phase.*

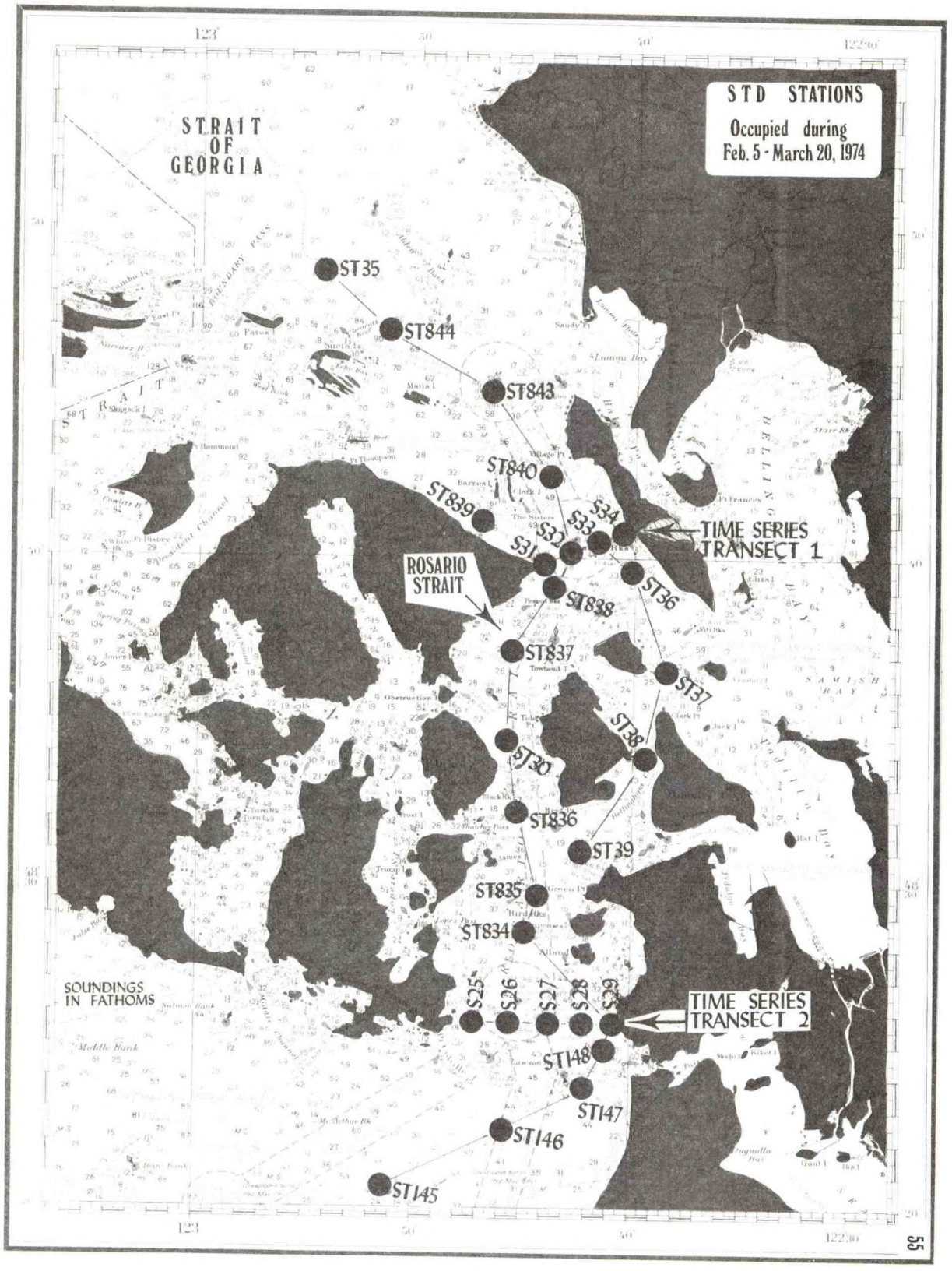

Figure 17.--*STD stations occupied during Phase I.*

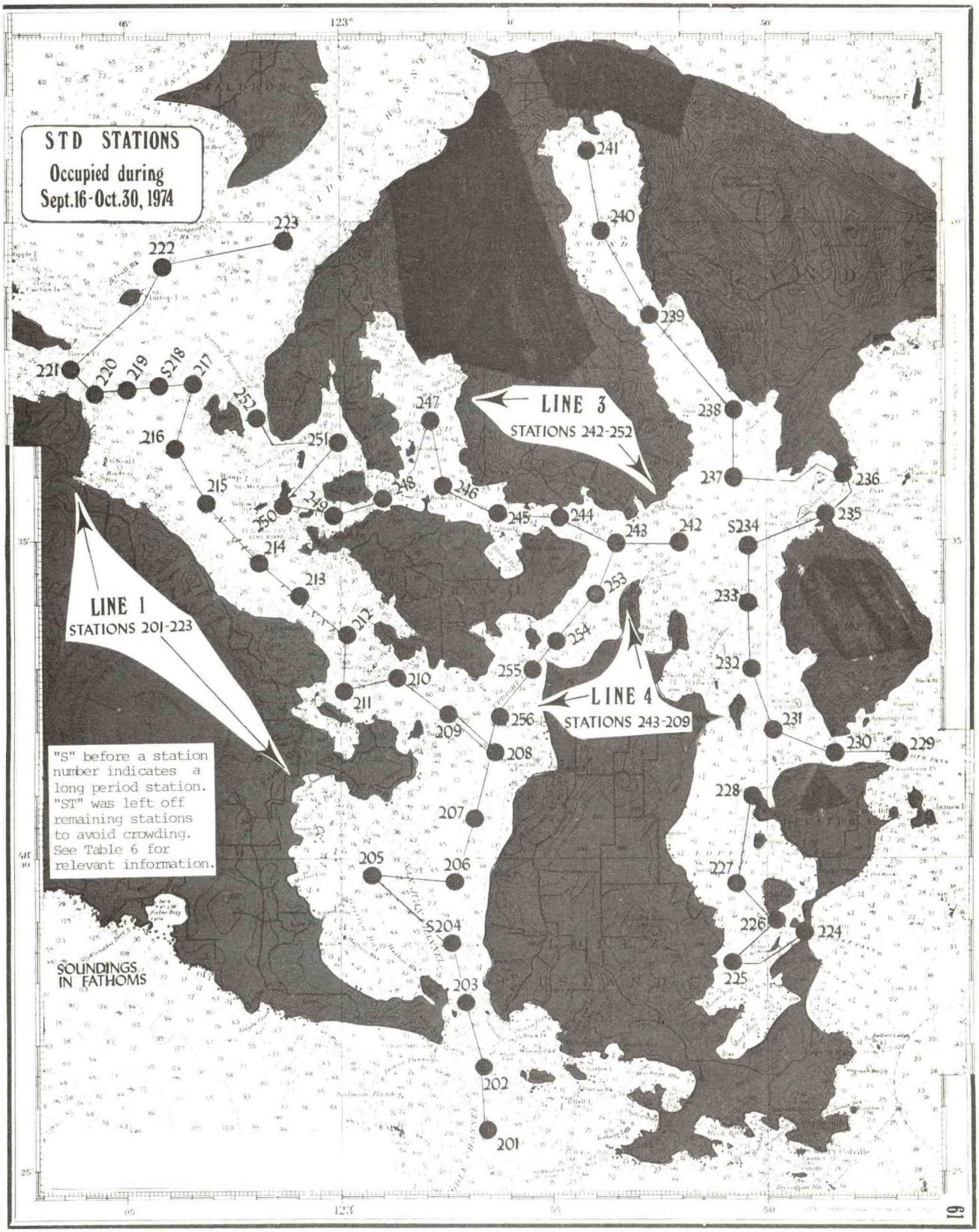

Figure 18.--*STD stations occupied during Phase II.*

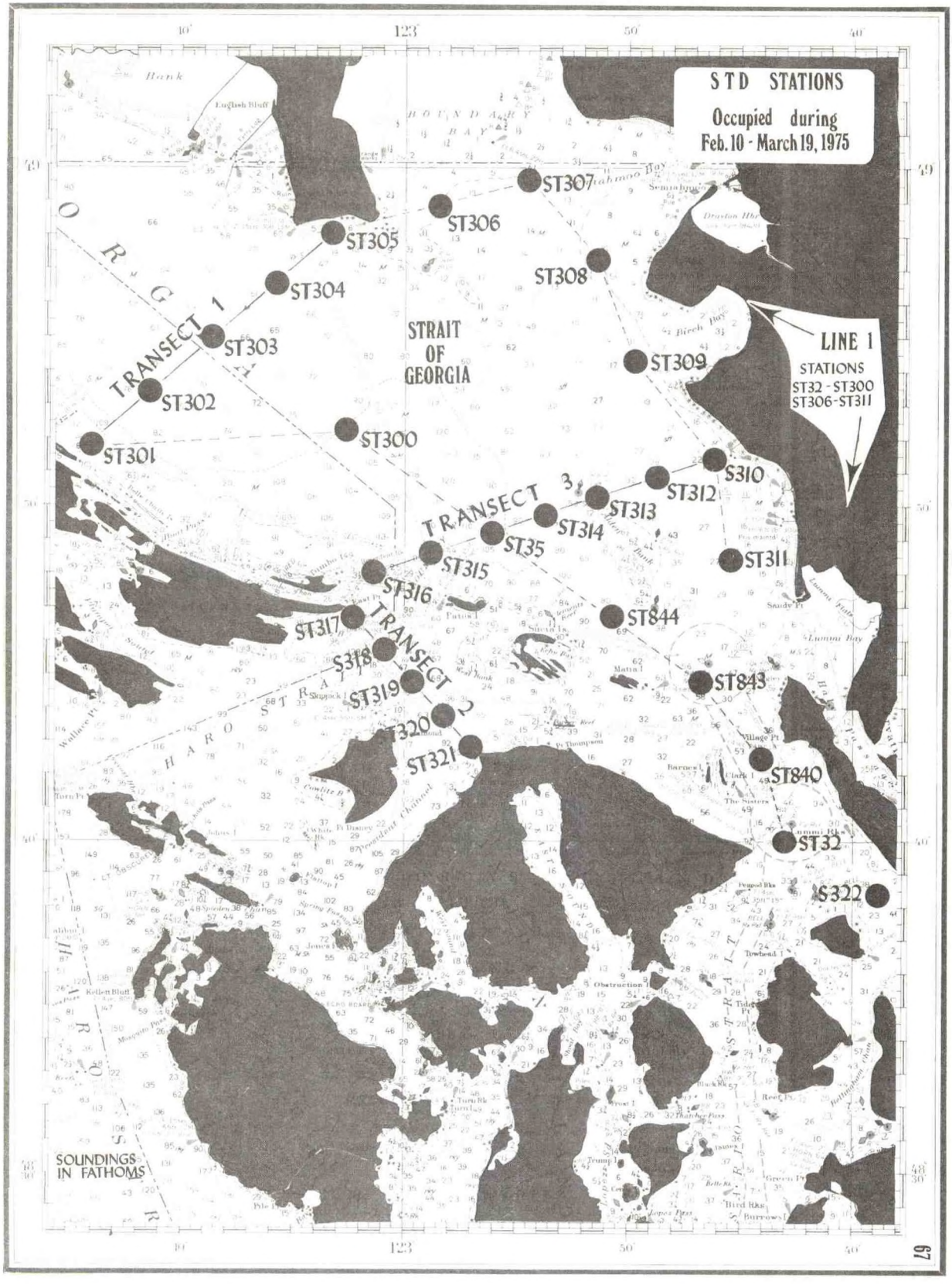

Figure 19.--*STD stations occupied during Phase III.*

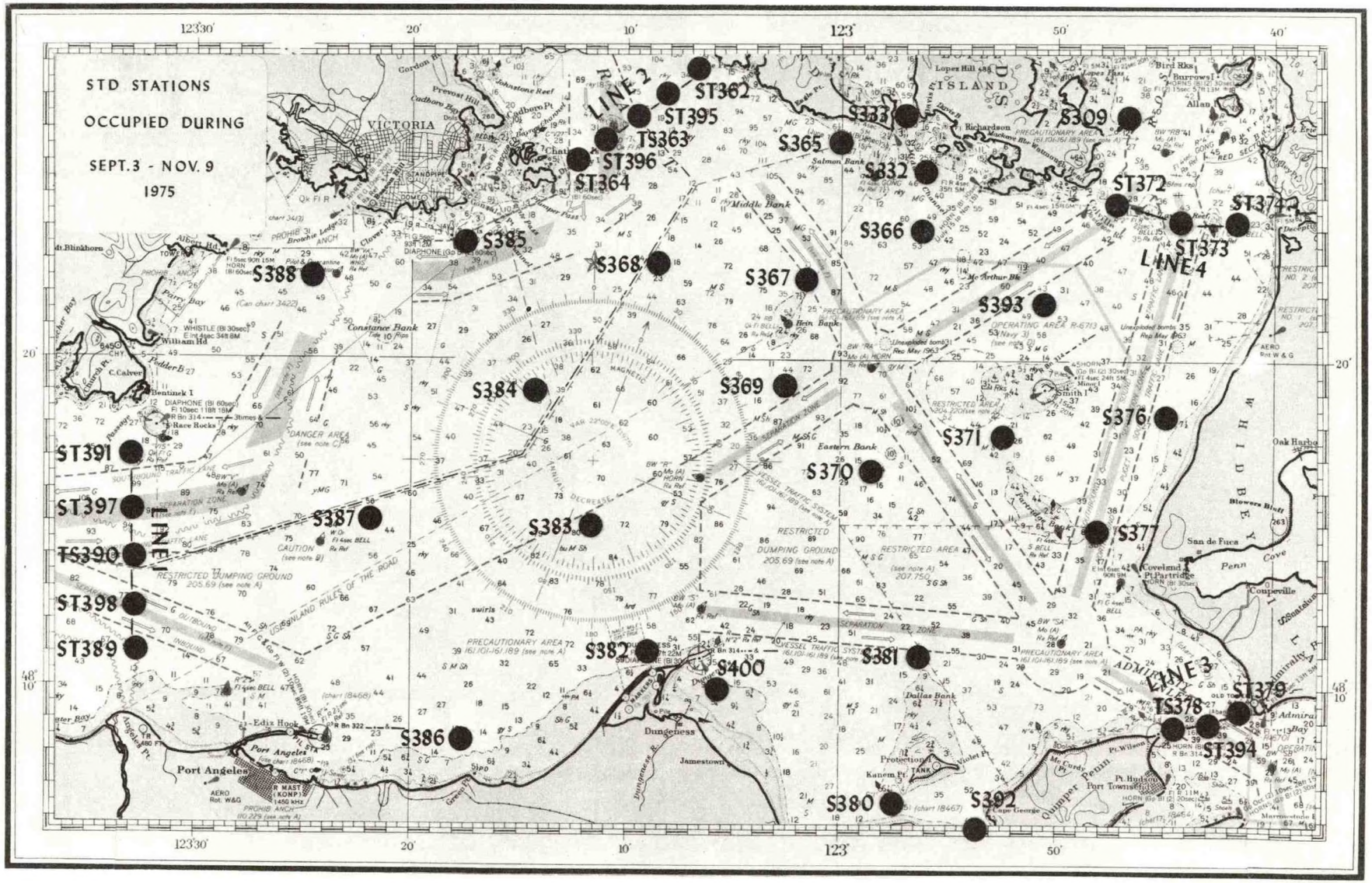

Figure 20.--*STD stations occupied during Phase IV.*

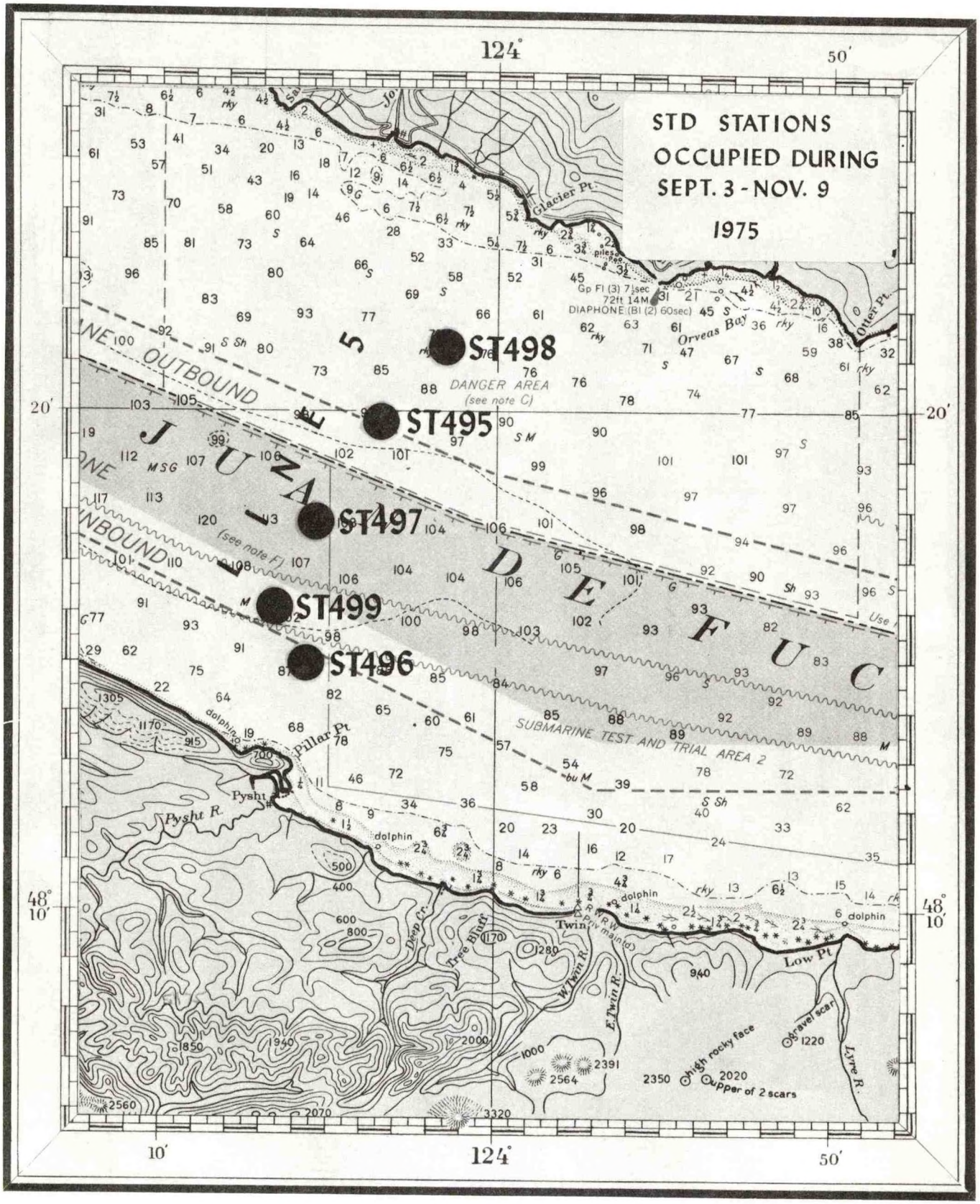

Figure 21.--*STD stations occupied during Phase IV.*

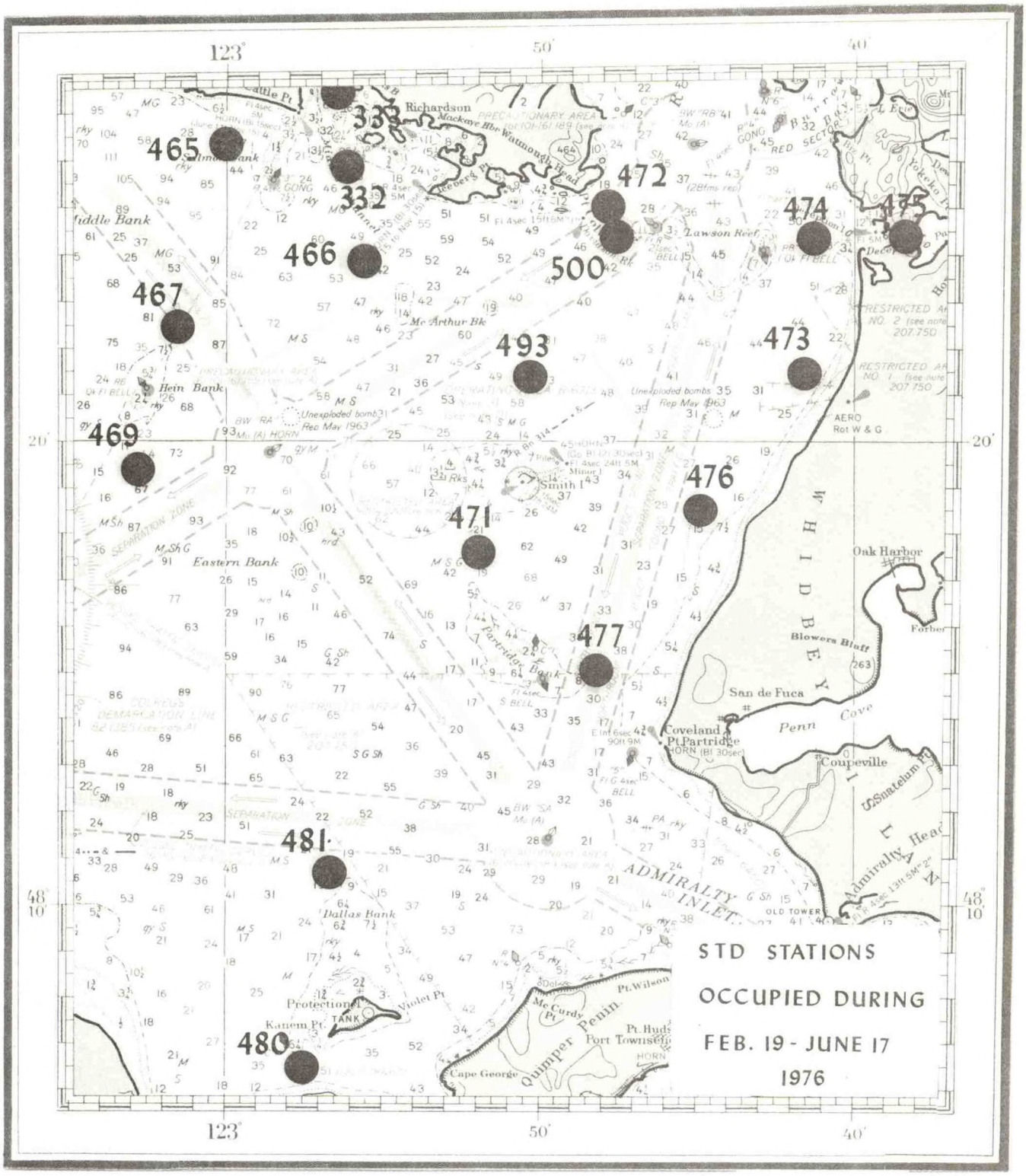

Figure 22.--*STD stations occupied during Phase V.*

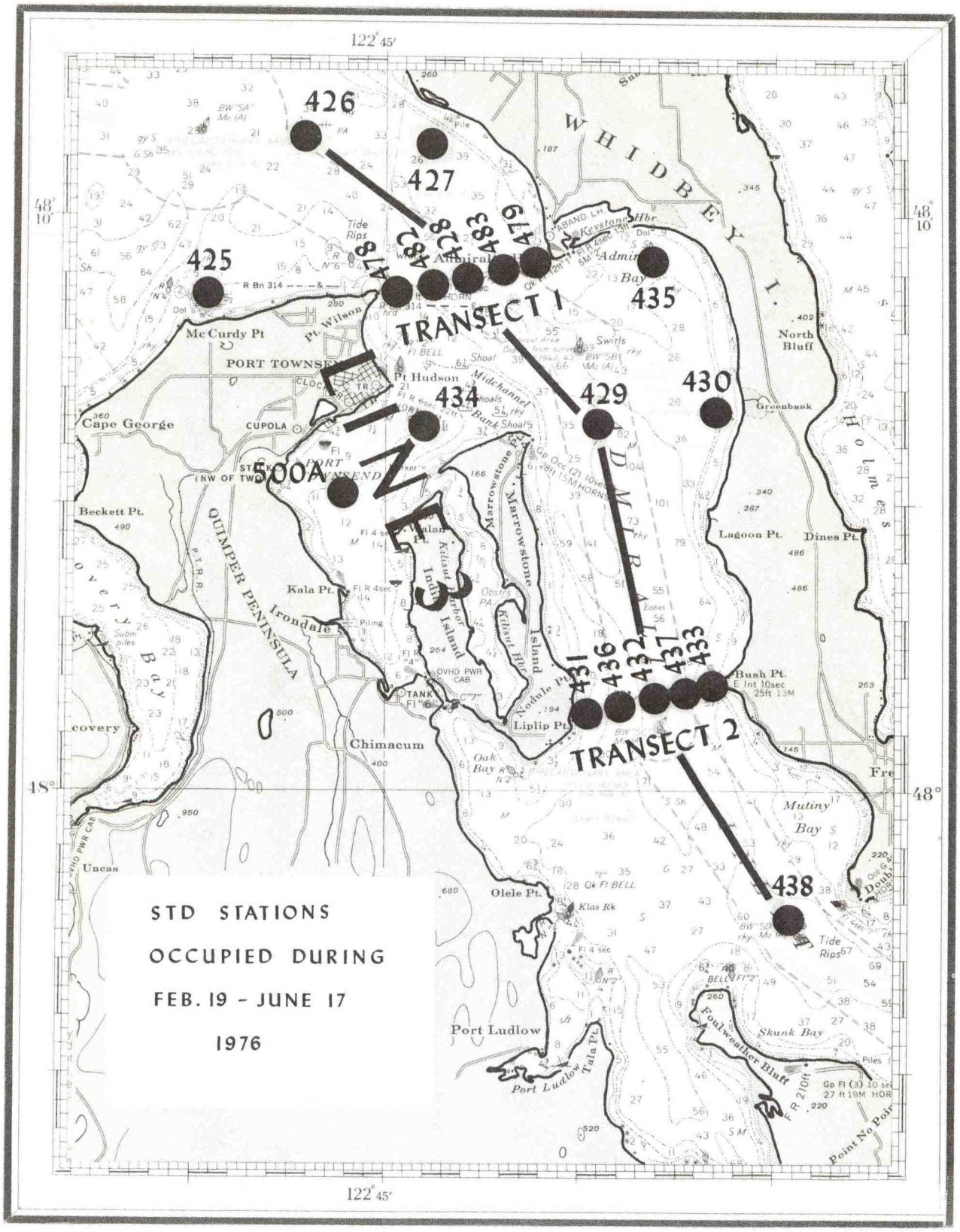

Figure 23.--*STD stations occupied during Phase V.*

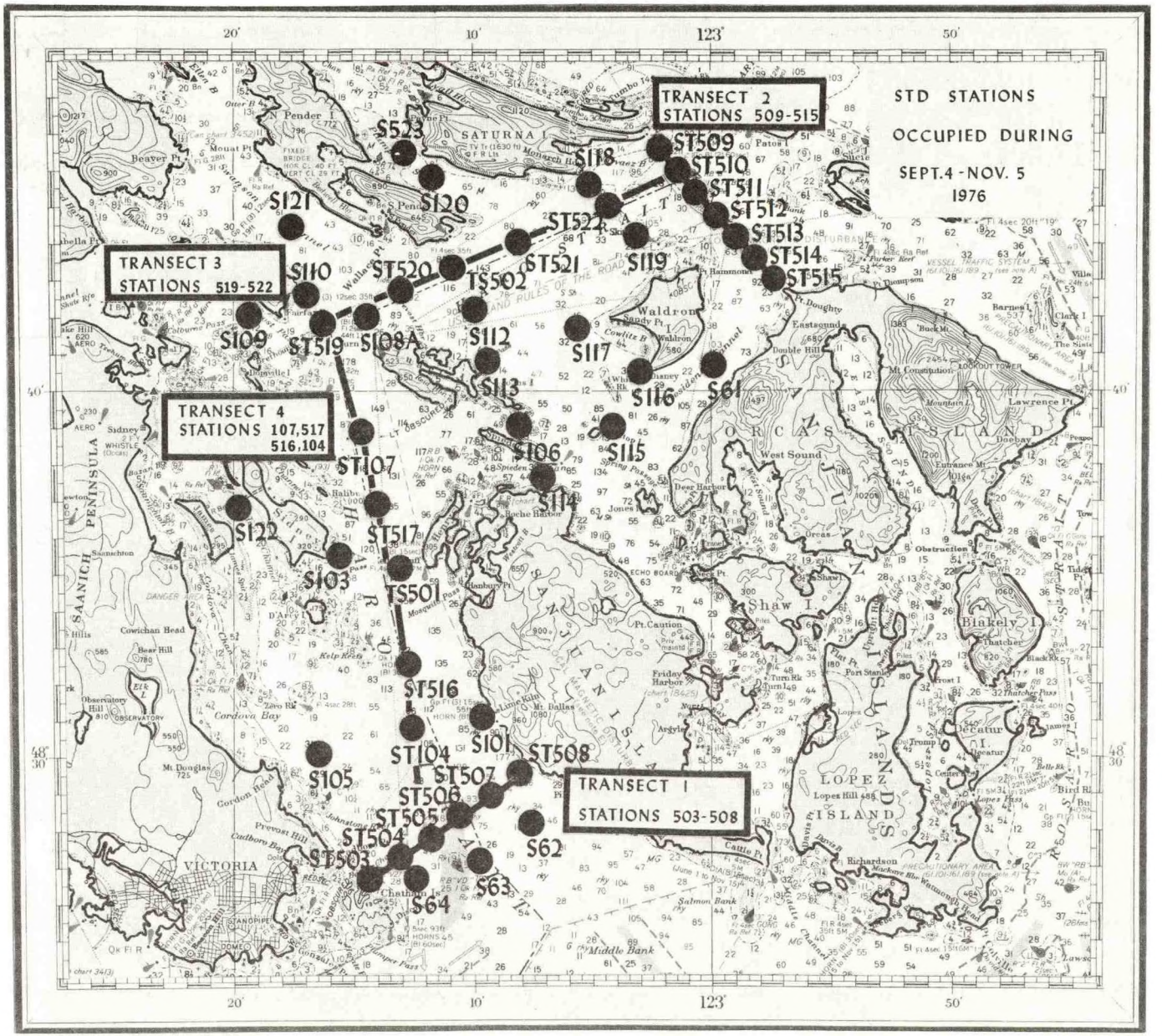

Figure 24.--*STD stations occupied during Phase VI.*

Table 5.--*STD stations occupied during the Preliminary Phase of the Puget Sound Approaches Circulatory Survey.*

STATION	LAT.(N)	LONG.(W)	DATE	TIME (GMT)	APPROX. WATER DEPTH(M)	TRANSECT OR LONG-PERIOD	CAST #	BOTTOM DATA DEPTH (M)*
ST1	48°39.8'	122°44.1'	10/18/73	1410	84	Trans. 1, 1st	32	73
	48°39.8'	122°44.1'	10/18/73	2051		Trans. 1, 2nd	37	81
ST2	48°40.0'	122°43.3'	10/18/73	1335	100	Trans. 1, 1st	31	99
	48°40.0'	122°43.3'	10/18/73	2034		Trans. 1, 2nd	36	91
ST3	48°40.3'	122°42.5'	10/18/73	1320	87	Trans. 1, 1st	30	84
	48°40.3'	122°42.5'	10/18/73	2017		Trans. 1, 2nd	35	87
ST4	48°40.6'	122°41.6'	10/18/73	1252	74	Trans. 1, 1st	29	63
	48°40.6'	122°41.6'	10/18/73	2001		Trans. 1, 2nd	34	74
ST5	48°40.9'	122°40.7'	10/18/73	1238	47	Trans. 1, 1st	28	42
	48°40.9'	122°40.7'	10/18/73	1938		Trans. 1, 2nd	33	47
ST6	48°25.8'	122°47.8'	10/29/73	1742	49	Trans. 2, 1st	70	49
	48°25.8'	122°47.8'	10/29/73	2322		Trans. 2, 2nd	75	Plot Only
ST7	48°26.0'	122°46.0'	10/29/73	1720	64	Trans. 2, 1st	69	63
	48°26.0'	122°46.0'	10/29/73	2306		Trans. 2, 2nd	74	63
ST8	48°26.2'	122°44.2'	10/29/73	1658	79	Trans. 2, 1st	68	79
	48°26.2'	122°44.2'	10/29/73	2244		Trans. 2, 2nd	73	77
ST9	48°26.4'	122°42.6'	10/29/73	1641	83	Trans. 2, 1st	67	76
	48°26.4'	122°42.6'	10/29/73	2225		Trans. 2, 2nd	72	83
ST10	48°26.5'	122°40.9'	10/29/73	1625	70	Trans. 2, 1st	66	Plot Only
	48°26.5'	122°40.9'	10/29/73	2204		Trans. 2, 2nd	71	66
ST11	48°26.8'	123°13.9'	10/11/73	0033	47	Trans. 3, 1st	1	47
	48°26.8'	123°13.9'	10/11/73	0930		Trans. 3, 2nd	12	43
ST12	48°27.3'	123°12.8'	10/11/73	0100	88	Trans. 3, 1st	2	82
	48°27.3'	123°12.8'	10/11/73	0915		Trans. 3, 2nd	11	84
ST13	48°29.9'	123°11.6'	10/11/73	0121	115	Trans. 3, 1st	3	111
	48°29.9'	123°11.6'	10/11/73	0851		Trans. 3, 2nd	10	110
ST14	48°28.6'	123°10.3'	10/11/73	0147	200	Trans. 3, 1st	4	171
	48°28.6'	123°10.3'	10/11/73	0820		Trans. 3, 2nd	9	200

* Data were digitized at one meter intervals.

Table 5.--*Concluded*

STATION	LAT.(N)	LONG.(W)	DATE	TIME (GMT)	APPROX. WATER DEPTH(M)	TRANSECT OR LONG-PERIOD	CAST #	BOTTOM DATA DEPTH (M)*
ST15	48°29.2'	123°09.2'	10/11/73	0207	273	Trans. 3, 1st	5	273
	48°29.2'	123°09.2'	10/11/73	0752		Trans. 3, 2nd	8	259
ST16	48°29.7'	123°13.9'	10/11/73	0242	275	Trans. 3, 1st	6	242
	48°29.7'	123°13.9'	10/11/73	0712		Trans. 3, 2nd	7	202
ST17	48°46.7'	123°02.3'	10/17/73	1528	190	Trans. 4, 1st	20	187
	48°46.7'	123°02.3'	10/17/73	1932		Trans. 4, 2nd	27	190
ST18	48°46.1'	123°01.5'	10/17/73	1448	216	Trans. 4, 1st	19	216
	48°46.1'	123°01.5'	10/17/73	1904		Trans. 4, 2nd	26	196
ST19	48°45.4'	123°00.6'	10/17/73	1359	114	Trans. 4, 1st	18	114
	48°45.4'	123°00.6'	10/17/73	1843		Trans. 4, 2nd	25	109
ST20	48°44.8'	122°59.7'	10/17/73	1332	72	Trans. 4, 1st	17	57
	48°44.8'	122°59.7'	10/17/73	1825		Trans. 4, 2nd	24	72
ST21	48°44.2'	122°58.9'	10/17/73	1247	135	Trans. 4, 1st	16	132
	48°44.2'	122°58.9'	10/17/73	1804		Trans. 4, 2nd	23	128
ST22	48°43.6'	122°58.0'	10/17/73	1222	161	Trans. 4, 1st	15	148
	48°43.6'	122°58.0'	10/17/73	1745		Trans. 4, 2nd	22	151
ST23	48°43.0'	122°57.2'	10/17/73	1720	158	Trans. 4, 2nd	21	158
	48°43.0'	122°57.2'	10/17/73	1159		Trans. 4, 1st	14	143
S-1 (27 digitized casts)	48°45.8'	122°47.2'	F 10/30/73	0728	100	13-Hour	F 109	100 (max.)
			L 10/31/73	2028			L 135	66 (min.)
S-2 (16 digitized casts)	48°27.3'	122°46.9'	F 10/30/73	0003	46	15-Hour	F 76	46 (max.)
			L 10/30/73	1528			L 107	27 (min.)
S-3 (28 digitized casts)	48°35.4'	122°13.4'	F 10/23/73	2246	282	15-Hour	F 38	282 (max.)
			L 10/24/73	1326			L 65	218 (min.)
Calibration	48°26.6'	122°40.8'	10/12/73	2031		Calibration	13	43

F refers to first cast of a time series.
L refers to last cast of a time series.

* Data were digitized at One Meter intervals.

Table 6.--*STD stations occupied during Phase I of the Puget Sound Approaches Circulatory Survey.*

STATION	LAT.(N)	LONG.(W)		DATE	TIME (GMT)	APPROX. WATER DEPTH(M)	TRANSECT OR LONG-PERIOD	CAST #	BOTTOM DATA DEPTH (M)*
S 25	48°25.5'	122°47.1'		2/5/74	1230	70		9	64
	48°25.5'	122°47.1'	F	2/6/74	0535	70	Time Series	31,36,41,46,	37 (min.)
			L	2/7/74	0402		Transect 1	51,56,61,66,	67 (max.)
								71,76,81,86	
	48°25.9'	122°47.1'		2/26/74	0752	58		111	49
	48°25.5'	122°47.2'		3/19/74	0257	58		140	53
S 26	48°25.4'	122°45.2'		2/5/74	1209	74		8	68
	48°25.4'	122°45.2'	F	2/6/74	0549	74	Time Series	32,37,42,47,	47 (min.)
			L	2/7/74	0425		Transect 1	52,57,62,67,	74 (max.)
								72,77,82,87	
	48°26.0'	122°45.3'		2/26/74	1030	75		112	73
	48°25.6'	122°45.2'		3/19/74	0314	73		141	68
S 27	48°25.8'	122°43.2'		2/5/74	1137	77		7	72
	48°25.8'	122°43.2'	F	2/6/74	0606	77	Time Series	33,38,43,48,	65 (min.)
			L	2/7/74	0443		Transect 1	53,58,63,68,	74 (max.)
								73,78,83,88	
	48°25.7'	122°43.2'		2/26/74	1110	75		113	71
	48°25.6'	122°43.4'		3/19/74	0337	75		142	70
S 28	48°25.7'	122°42.0'		2/5/74	1106	78		6	73
	48°25.7'	122°42.0'	F	2/6/74	0624	78	Time Series	34,39,44,49,	66 (min.)
			L	2/7/74	0459		Transect 1	54,59,64,69,	76 (max.)
								74,79,84,89	
	48°25.6'	122°42.1'		2/26/74	1125	77		114	71
	48°25.7'	122°41.9'		3/19/74	0347	77		143	74
S 29	48°25.9'	122°40.9'		2/5/74	1047	82		5	74
	48°25.9'	122°40.9'	F	2/6/74	0644	82	Time Series	35,40,45,50,	70 (min.
			L	2/7/74	0514		Transect 1	55,60,65,70,	83 (max.)
								75,80,85,90	
	48°25.7'	122°40.8'		2/26/74	1145	86		115	80
	48°25.7'	122°40.8		3/19/74	0359	82		144	83

* Data were digitized at one meter intervals.

F refers to first cast of a time series.
L refers to last cast of a time series.

Table 6.--*Continued*

STATION	LAT.(N)	LONG.(W)	DATE	TIME (GMT)	APPROX. WATER DEPTH(M)	TRANSECT OR LONG-PERIOD	CAST #	BOTTOM DATA DEPTH (M)*
ST30	48°34.4'	122°45.8'	2/5/74	1427	73		13	59
	48°34.2'	122°45.9'	3/19/74	0145	76		136	75
S 31	48°39.5'	122°43.7'	2/5/74	1603	91		16	96
	48°39.7'	122°44.1'	2/26/74	0453	89		104	78
	48°39.7'	122°44.2'	3/18/74	2330	90		130	81
	48°39.7'	122°44.2'	F 3/19/74	0718	90	Time Series	149,153,157,	56 (min.)
			L 3/20/74	0451		Transect 2	161,165,169,	108 (max.)
							173,177,181,	
							185,189,193,	
							194,198,202,	
							206,210	
S 32	48°40.0'	122°42.7'	2/5/74	1624	91		17	83
	48°40.0'	122°42.9'	2/26/74	0435	91		103	88
	48°40.1'	122°42.9'	3/19/74	0004	91		131	84
	48°40.1'	122°42.9'	F 3/19/74	0714	91	Time Series	150,159,158,	86 (min.)
			L 3/20/74	0512		Transect 2	162,166,170,	92 (max.)
							174,178,182,	
							186,190,195,	
							199,203,207,	
							211	
S 33	48°40.4'	122°41.8'	2/5/74	1643	79		18	71
	48°40.5'	122°41.8'	2/5/74	2106	76		26	73
	48°40.4'	122°41.6'	2/25/74	2140	70		95	68
	48°40.4'	122°41.0'	2/26/74	0420	80		102	75
	48°40.4'	122°41.7'	3/18/74	1808	77		124	71
	48°40.4'	122°41.7'	3/19/74	0020	76		132	71
	48°40.4'	122°41.7'	F 3/19/74	0800	76	Time Series	151,155,159,	66 (min.)
			L 3/20/74	0527		Transect 2	163,167,171	77 (max.)
							175,179,183,	
							187,191,196,	
							200,204,208,	
							212	

* Data were digitized at one meter intervals.

F refers to first cast of a time series.
L refers to last cast of a time series.

Table 6.--*Continued*

STATION	LAT.(N)	LONG.(W)		DATE	TIME (GMT)	APPROX. WATER DEPTH(M)	TRANSECT OR LONG-PERIOD	CAST #	BOTTOM DATA DEPTH (M)*
S 34	48°40.7'	122°40.8'		2/5/74	1706	61		19	66
	48°40.7'	122°40.6'		2/26/74	0400	49		101	44
	48°40.6'	122°40.6'		3/19/74	0041	45		133	43
	48°40.6'	122°40.6'	F	3/19/74	0814	60	Time Series	152,156,160,	36 (min.)
			L	3/20/74	0540		Tramsect 2	164,168,172, 176,180,184, 188,192,197, 201,205,209, 213	58 (max.)
ST35	48°48.7'	122°54.4'		2/5/74	1950	191		25	185
	48°48.7'	122°54.5'		2/25/74	2247	190		96	187
	48°48.9'	122°54.7'		3/18/74	2005	184		125	188
ST36	48°39.6'	122°40.2'		2/5/74	2124	82		27	80
	48°39.5'	122°40.0'		2/25/74	2123	82		94	72
	48°39.5'	122°40.1'		3/18/74	1743	81		123	78
ST37	48°36.7'	122°38.6'		2/5/74	2155	47		28	52
	48°36.7'	122°38.5'		2/25/74	2057	46		93	36
	48°36.5'	122°38.5'		3/18/74	1719	47		122	43
ST38	48°34.0'	122°39.8'		2/5/74	2219	122		29	114
	48°33.8'	122°39.7'		2/25/74	2025	114		92	92
	48°33.8'	122°39.7'		3/18/74	1648	112		121	106
ST39	48°31.1'	122°42.5'		2/5/74	2248	45		30	43
	48°31.0'	122°42.5'		2/25/74	1932	45		91	38
	48°31.8'	122°42.4'		3/18/74	1612	46		120	41
ST145	48°20.6'	122°51.3'		2/5/74	0840	106		1	99
	48°20.9'	122°51.5'		2/26/74	1348	90		119	95
	48°20.9'	122°51.5'		3/19/74	0526	102		148	99
ST146	48°22.3'	122°45.7'		2/5/74	0930	88		2	86
	48°21.2'	122°45.7'		2/26/74	1313	88		118	83
	48°21.7'	122°45.7'		3/19/74	0457	86		147	83

* Data were digitized at one meter intervals.

F refers to first cast of a time series.
L refers to last cast of a time series.

Table 6.--*Concluded*

STATION	LAT.(N)	LONG.(W)	DATE	TIME (GMT)	APPROX. WATER DEPTH(M)	TRANSECT OR LONG-PERIOD	CAST #	BOTTOM DATA DEPTH (M)*
ST147	48°23.7'	122°42.1'	2/5/74	1000	87		3	80
	48°23.6'	122°42.0'	2/26/74	1235	90		117	85
	48°23.6'	122°42.1'	3/19/74	0436	89		146	86
ST148	48°25.0'	122°41.1'	2/5/74	1020	90		4	85
	48°24.9'	122°41.1'	2/26/74	1205	95		116	88
	48°24.9'	122°41.1'	3/19/74	0416	91		145	90
ST834	48°28.4'	122°45.0'	2/5/74	1257	71		10	64
	48°28.4'	122°45.0'	2/26/74	0730	70		110	63
	48°28.4'	122°44.8'	3/19/74	0236	70		139	63
ST835	48°29.5'	122°44.0'	2/5/74	1312	151		11	131
	48°29.5'	122°44.5'	2/26/74	0707	155		109	144
	48°29.4'	122°44.3'	3/19/74	0221	135		138	132
ST836	48°32.1'	122°45.3'	2/5/74	1340	81		12	75
	48°32.0'	122°45.2'	3/19/74	0201	77		137	67
ST837	48°37.1'	122°45.8'	2/5/74	1505	53		14	40
	48°37.1'	122°45.9'	2/26/74	0540	45		106	48
	48°37.1'	122°45.7'	3/19/74	0125	52		135	46
ST838	48°38.9'	122°43.6'	2/5/74	1539	105		15	98
	48°39.1'	122°43.7'	2/26/74	0513	113		105	112
	48°39.0'	122°43.7'	3/19/74	0102	109		134	109
ST839	48°40.9'	122°46.7'	2/5/74	1738	113		20	110
	48°41.0'	122°47.0'	2/26/74	0325	113		100	108
	48°41.0'	122°47.2'	3/18/74	2257	113		129	110
ST840	48°42.4'	122°44.5'	2/5/74	1807	97		21	67
	48°42.4'	122°44.5'	2/5/74	1815	97		22	94
	48°42.4'	122°44.1'	2/26/74	0236	90		99	90
	48°42.3'	122°43.9'	3/18/74	2228	90		128	86
ST843	48°45.1'	122°46.7'	2/5/74	1848	101		23	98
	48°45.0'	122°46.5'	2/26/74	0000	102		98	97
	48°44.9'	122°44.9'	3/18/74	2155	102		127	99
ST844	48°46.8'	122°51.0'	2/5/74	1920	147		24	144
	48°46.8'	122°51.7'	2/25/74	2331	146		97	143
	48°46.8'	122°51.6'	3/18/74	2055	148		126	143

* Data were digitized at one meter intervals.

Table 7.--*STD stations occupied during Phase II of the Puget Sound Approaches Circulatory Survey.*

STATION	LAT.(N)	LONG.(W)	DATE	TIME (GMT)	APPROX. WATER DEPTH(M)	TRANSECT OR LONG-PERIOD	CAST #	BOTTOM DATA DEPTH (M)*
ST201	48°25.8'	122°56.6'	10/18/74	2145	95	Line 1	99	90
ST202	48°26.9'	122°56.8'	10/18/74	2127	55	Line 1	98	51
ST203	48°27.7'	122°57.1'	10/18/74	2055	130	Line 1	97	132
S 204	48°28.7'	122°57.2'	10/18/74	2032	117	Line 1	96	112
	48°28.7'	122°57.3'	F 10/21/74	1835	113	25-Hour	F 100	86 (min.)
			L 10/22/74	1929			L 150	117 (max.)
ST205	48°29.6'	122°59.1'	10/18/74	2004	86	Line 1	95	83
ST206	48°29.6'	122°57.4'	10/18/74	1934	119	Line 1	94	116
ST207	48°30.6'	122°56.8'	10/18/74	1912	79	Line 1	93	74
ST208	48°31.5'	122°56.2'	9/30/74	1814	89	Line 1	75	86
	48°31.6'	122°56.3'	10/18/74	1851	89	Line 1	92	86
ST209	48°32.3'	122°57.5'	9/30/74	1840	110	Line 4	76	104
	48°32.2'	122°57.5'	10/18/74	1830	117	Line 1	91	88
ST210	48°32.8'	122°58.7'	10/18/74	1811	114	Line 1	90	109
ST211	48°32.6'	123°00.0'	10/18/74	1753	106	Line 1	89	99
ST212	48°33.5'	122°59.5'	10/18/74	1730	132	Line 1	88	142
ST213	48°34.1'	123°00.9'	10/18/74	1715	139	Line 1	87	138
ST214	48°34.8'	123°02.1'	10/18/74	1656	123	Line 1	86	119
ST215	48°35.4'	123°02.8'	10/18/74	1636	136	Line 1	85	130
ST216	48°36.4'	123°03.8'	10/18/74	1619	149	Line 1	84	152
ST217	48°37.4'	123°03.4'	10/18/74	1600	162	Line 1	83	167
S 218	48°37.4'	123°04.0'	10/18/74	1540	187	Line 1	82	185
	48°37.3'	123°04.2'	F 10/29/74	2202	188	25-Hour	F 162	165 (min.)
			L 10/30/74	2259			L 212	187 (max.)
ST219	48°37.3'	123°05.0'	10/18/74	1522	177	Line 1	81	171
ST220	48°37.2'	123°05.6'	10/18/74	1512	51	Line 1	80	50
ST221	48°37.8'	123°06.7'	10/18/74	1432	160	Line 1	79	159
ST222	48°39.3'	123°04.3'	10/18/74	1404	176	Line 1	78	154
ST223	48°39.5'	123°01.5	10/18/74	1339	192	Line 1	77	176
ST224	48°28.8'	122°49.3'	9/16/74	1637	31	Line 2	1	19

* Data were digitized at one meter intervals.

F refers to first cast of a time series.
L refers to last cast of a time series.

Table 7.--*Continued*

STATION	LAT.(N)	LONG.(W)	DATE	TIME (GMT)	APPROX. WATER DEPTH(M)	TRANSECT OR LONG-PERIOD	CAST #	BOTTOM DATA DEPTH (M)*
ST225	48°28.4'	122°50.8'	9/16/74	1656	37	Line 2	2	31
ST226	48°29.0'	122°49.7'	9/16/74	1718	38	Line 2	3	32
ST227	48°29.6'	122°50.8'	9/16/74	1735	22	Line 2	4	12
ST228	48°31.1'	122°50.3'	9/16/74	1755	21	Line 2	5	18
ST229	48°31.6'	122°46.9'	9/16/74	1830	59	Line 2	6	47
ST230	48°31.6'	122°48.3'	9/16/74	1850	55	Line 2	7	49
ST231	48°32.0'	122°49.9'	9/16/74	1906	63	Line 2	8	62
ST232	48°33.1'	122°50.5'	9/16/74	1929	44	Line 2	9	42
ST233	48°34.0'	122°50.5'	9/16/74	1940	52	Line 2	10	49
S 234	48°35.0'	122°50.3'	9/16/74	1953	55	Line 2	11	52
	48°35.1'	122°50.5	F 9/17/74	0106	57	25-Hour	F 19	24 (min.)
			L 9/18/74	0200			L 69	53 (max.)
ST235	48°35.5'	122°48.4'	9/16/74	2017	28	Line 2	12	26
ST236	48°36.0'	122°48.1'	9/16/74	2030	29	Line 2	13	22
ST237	48°36.0'	122°50.8'	9/16/74	2052	28	Line 2	14	26
ST238	48°37.1'	122°51.0'	9/16/74	2120	44	Line 2	15	40
ST239	48°38.4'	122°52.6'	9/16/74	2134	33	Line 2	16	31
ST240	48°39.9'	122°53.7'	9/16/74	2148	29	Line 2	17	26
ST241	48°41.1'	122°54.2'	9/16/74	2207	25	Line 2	18	24
ST242	48°35.0'	122°52.1'	10/29/74	1725	31	Line 3	151	25
ST243	48°34.9'	122°53.5'	9/30/74	1650	57	Line 4	70	53
	48°34.8'	122°53.9'	10/29/74	1745	63	Line 3	152	59
ST244	48°35.3'	122°55.2'	10/29/74	1801	34	Line 3	153	29
ST245	48°35.5'	122°56.6'	10/29/74	1815	43	Line 3	154	38
ST246	48°35.9'	122°57.7'	10/29/74	1832	53	Line 3	155	50
ST247	48°36.9'	122°57.8'	10/29/74	1844	23	Line 3	156	22
ST248	48°35.6'	122°59.0'	10/29/74	1906	29	Line 3	157	24
ST249	48°35.4'	122°00.2'	10/29/74	1918	32	Line 3	158	28

F refers to first cast of a time series.
L refers to last cast of a time series.

* Data were digitized at one meter intervals.

Table 7.--*Concluded*

STATION	LAT.(N)	LONG.(W)	DATE	TIME (GMT)	APPROX. WATER DEPTH(M)	TRANSECT OR LONG-PERIOD	CAST #	BOTTOM DATA DEPTH (M)*
ST250	48°35.7'	123°00.8'	10/29/74	1928	36	Line 3	159	31
ST251	48°36.5'	123°00.1'	10/29/74	1944	29	Line 3	160	26
ST252	48°36.8'	123°02.0'	10/29/74	2012	36	Line 3	161	30
ST253	48°34.1'	122°54.0'	9/30/74	1708	55	Line 4	71	52
ST254	48°33.5'	122°54.8'	9/30/74	1727	50	Line 4	72	46
ST255	48°33.0'	122°55.7'	9/30/74	1749	54	Line 4	73	46
ST256	48°32.1'	122°56.2'	9/30/74	1801	81	Line 4	74	80

* Data were digitized at one meter intervals.

Table 8.--*STD stations occupied during Phase III of the Puget Sound Approaches Circulatory Survey.*

STATION	LAT.(N)	LONG.(W)	DATE	TIME (GMT)	APPROX. WATER DEPTH(M)	TRANSECT OR LONG-PERIOD		CAST #	BOTTOM DATA DEPTH (M)*
ST32	48°40.0'	122°43.0'	2/10/75	1909	94	Line 1		1	90
ST35	48°49.1'	122°56.2'	2/10/75	2143	207	Line 1		5	202
	48°49.2'	122°56.2'	2/24/75	2145	208	Trans. 3, 1st		74	205
	48°49.0'	122°56.3'	2/28/75	1812	205	Trans. 3, 2nd		81	203
ST300	48°52.2'	123°02.6'	2/10/75	2232	202	Line 1		6	207
ST301	48°51.8'	123°14.2'	2/11/75	0048	79	Trans. 1		7	85
ST302	48°53.5'	123°11.5'	2/11/75	0019	138	Trans. 1		8	134
ST303	48°55.2'	123°11.5'	2/11/75	0139	124	Trans. 1		9	121
ST304	48°56.5'	123°05.8'	2/11/75	0200	118	Trans. 1		10	117
ST305	48°57.9'	123°03.3'	2/11/75	0230	35	Trans. 1		11	32
ST306	48°59.0'	122°58.1'	2/11/75	0307	28	Line 1		12	25
ST307	48°59.7'	122°54.3'	2/11/75	0326	31	Line 1		13	28
ST308	48°57.2'	122°51.4'	2/11/75	0348	21	Line 1		14	13
ST309	48°54.3'	122°49.8'	2/11/75	0413	31	Line 1		15	26
S 310	48°51.4'	122°46.6'	2/11/75	0438	38	Line 1		16	31
	48°51.8'	122°46.8'	F 2/11/75	0630	45	25-Hour	F	19	44 (max)
	48°51.8'	122°46.8'	L 2/12/75	0730			L	69	35 (min)
	48°51.5'	122°46.4'	2/24/75	2015	41	Trans. 3, 1st		70	40
	48°51.5'	122°46.2'	2/28/75	1642	41	Trans. 3, 2nd		77	39
ST311	48°48.3'	122°45.5'	2/11/75	0507	47	Line 1		17	39
ST312	48°50.7'	122°48.4'	2/24/75	2040	62	Trans. 3, 1st		71	58
	48°50.9'	122°47.9'	2/28/75	1710	56	Trans. 3, 2nd		78	54
ST313	48°50.4'	122°51.5'	2/24/75	2107	34	Trans. 3, 1st		72	32
	48°50.2'	122°51.3'	2/28/75	1735	20	Trans. 3, 2nd		79	15
ST314	48°49.7'	122°53.7'	2/24/75	2125	142	Trans. 3, 1st		73	140
	48°49.7'	122°53.8'	2/28/75	1755	144	Trans. 3, 2nd		80	98
ST315	48°48.7'	122°58.9'	2/28/75	1847	192	Trans. 3, 2nd		82	204
	48°48.5'	122°58.9	2/24/75	2214	195	Trans. 3, 1st		75	196

*Data were digitized at one meter intervals.

F refers to first cast of a time series.
L refers to last cast of a time series.

Table 8.--*Concluded*

STATION	LAT.(N)	LONG.(W)		DATE	TIME (GMT)	APPROX. WATER DEPTH(M)	TRANSECT OR LONG-PERIOD		CAST #	BOTTOM DATA DEPTH (M)*
ST316	48°48.2'	123°01.0'		2/24/75	2235	44	Trans. 3, 1st		76	44
	48°48.0'	123°00.9'		2/28/75	1915	181	Trans. 3, 2nd		83	204
ST317	48°46.8'	123°01.8'		3/12/75	1913	189	Trans. 2, 1st		84	187
	48°46.8'	123°02.1'		3/19/75	1726	193	Trans. 2, 2nd		176	192
S 318	48°45.9'	123°01.2'		2/13/75	1946	169	Trans. 2, 1st		85	169
	48°45.8'	123°01.2'	F	3/14/75	0300	225	18-Hour	F	139	227 (max)
	48°46.0'	123°01.4'	L	3/14/75	2100			L	175	120 (min)
	48°46.2'	123°01.5'		3/19/75	1747	200	Trans. 2, 2nd		177	205
ST319	48°44.9'	122°59.6'		3/12/75	2013	58	Trans. 2, 1st		86	55
	48°45.1'	122°59.6'		3/19/75	1811	91	Trans. 2, 2nd		178	82
ST320	48°43.8'	122°58.2'		3/12/75	2042	149	Trans. 2, 1st		87	140
	48°43.9'	122°58.2'		3/19/75	1833	150	Trans. 2, 2nd		179	150
ST321	48°43.0'	122°57.5'		3/12/75	2104	150	Trans. 2, 1st		88	150
	48°43.0'	122°57.3'		3/19/75	1852	150	Trans. 2, 2nd		180	152
S322	48°38.4'	122°38.8'	F	3/12/75	2250	67	25-Hour	F	89	63 (max)
	48°38.4'	122°38.8'	L	3/13/75	2330			L	138	54 (min)
ST840	48°42.5'	122°44.0'		2/10/75	1951	80	Line 1		2	71
ST843	48°44.7'	122°46.8'		2/10/75	2024	109	Line 1		3	107
	48°44.8'	122°47.0'		2/11/75	0531	121	Line 1		18	95
ST844	48°46.7'	122°50.8'		2/10/75	2054	133	Line 1		4	127

F refers to first cast of a time series.
L refers to last cast of a time series.

* Data were digitized at one meter intervals.

Table 9.--*STD stations occupied during Phase IV of the Puget Sound Approaches Circulatory Survey.*

STATION	LAT.(N)	LONG.(W)	DATE	TIME (GMT)	APPROX. WATER DEPTH(M)	TRANSECT OR LONG-PERIOD	CAST #	BOTTOM DATA DEPTH (M)*
S 309	48°27.4'	122°46.6'	258	1630	45		70	
	48°28.1'	122°47.5'	267	0127	18		85	9
ST 362	48°28.8'	123°06.6'	287	2240	230	Trans. 2, 1st	156	185
	48°07.6'	123°29.9'	289	0805	229	Trans. 2, 2nd		
TS 363	48°25.2'	123°09.8'	F273	0703	41	25-Hour	F 90	45 (min)
			L274	1800			L 141	90 (max)
ST 363	48°27.1'	123°09.8'	287	2302	133	Trans. 2, 1st	158	95
	48°09.1'	123°27.5'	289	0730	139	Trans. 2, 2nd	213	105
ST 364	48°25.7'	123°12.1'	287	2333	100	Trans. 2, 1st	160	40
	48°25.8'	123°12.0'	289	0646	86	Trans. 2, 2nd	211	55
S 368	48°23.1'	123°09.6'	294	2024	55		221	55
	48°23.2'	123°09.9'	297	1716	55		229	45
S 369	48°19.7'	122°58.9'	246	1855	154		1	4
	48°19.7'	122°58.9'	255	1915	165		69	93
S 370	48°16.9'	122°58.3'	294	1504	26		220	20
	48°16.6'	122°57.7'	313	2345	26		233	
TS 378	48°08.2'	122°44.0'	F253	0700	29	25-Hour	F 12	18 (min)
			L254	0800			L 62	28 (max)
ST 378	48°08.2'	122°44.0'	269	1515	27	Trans. 3, 1st	87	25
	48°08.3'	122°43.8'	274	1610	62	Trans. 3, 2nd	144	45
ST 379	48°09.2'	122°41.3'	269	1630	55	Trans. 3, 1st	89	65
	48°09.4'	122°41.1'	274	1500	78	Trans. 3, 2nd	142	65
S 382	48°11.5'	123°09.6'	295	2142	142		222	110
	48°11.3'	123°09.3'	295	2104	142		225	105
S 383	48°14.9'	123°12.3'	295	2104	142		224	140
	48°13.9'	123°08.8'	296	1523	137		226	120
S 384	48°19.5'	123°15.1'	293	1929	100		218	80
	48°19.4'	123°14.7'	296	1629	93		227	80
S 385	48°23.8'	123°16.7'	293	2009	48		219	30
	48°73.8'	123°17.2'	297	1642	64		228	55
S 386	48°08.3'	123°17.3'	295	1552	25		223	15

* Data were digitized at five meter intervals.

F refers to first cast of a time series.
L refers to last cast of a time series.

Table 9.--*Continued*

STATION	LAT.(N)	LONG.(W)	DATE	TIME (GMT)	APPROX. WATER DEPTH(M)	TRANSECT OR LONG-PERIOD	CAST #	BOTTOM DATA DEPTH (M)*
S 387	48°16.4'	123°22.3'	246	2038	104		2	74
	48°16.8'	122°22.0'	261	0125	115		77	88
S 388	48°22.2'	123°26.3'	301	2019	82		230	65
ST 389	48°10.9'	123°32.0'	248	1912	42	Trans. 1, 1st	10	31
	48°11.0'	123°32.5'	254	2040	47	Trans. 1, 2nd	67	35
	48°10.5'	123°32.5'	258	2250	30	Trans. 1, 3rd	75	
	48°10.7'	123°32.6'	261	1932	37	Trans. 1, 4th	82	24
S 390	48°13.9'	123°33.4'	247	1900	161		4	98
ST 390	48°13.8'	123°32.6'	248	1835	155	Trans. 1, 1st	8	94
	48°14.0'	123°32.4'	254	2000	155	Trans. 1, 2nd	65	92
	48°13.0'	123°32.3'	258	2201	159	Trans. 1, 3rd	73	
	48°13.8'	123°33.5'	261	1852	155	Trans. 1, 4th	80	94
TS 390	48°13.9'	123°32.3'	F 288	F 0332	160	25-Hour	F 161	120 (min)
	48°13.9'	123°32.6'	L 289	L 0431			L 210	160 (max)
ST 391	48°16.8'	123°32.4'	246	2312	159	Trans. 1, 1st	6	93
	48°16.5'	123°32.7'	254	1902	146	Trans. 1, 2nd	63	94
	48°16.7'	123°31.9'	258	2102	183	Trans. 1, 3rd	71	
	48°15.4'	123°33.5'	261	1800	137	Trans. 1, 4th	78	91
ST 394	48°08.9'	122°43.0'	269	1550	45	Trans. 3, 1st	88	
	48°09.0'	122°43.2'	274	1530	54	Trans. 3, 2nd	143	35
ST 395	48°27.7'	123°07.6'	287	2240	201	Trans. 2, 1st	157	170
	48°28.2'	123°08.2'	289	0748	228	Trans. 2, 2nd	214	65
ST 396	48°26.3'	123°11.1	287	2319	91	Trans. 2, 1st	159	70
	48°10.4'	123°26.5'	289	0714	139	Trans. 2, 2nd	212	90
ST 397	48°15.4'	123°32.5'	248	1810	174	Trans. 2, 1st	07	95
	48°15.3'	123°32.7'	254	1944	174	Trans. 2, 2nd	64	94
	48°15.5'	123°32.5'	258	2132	185	Trans. 2, 3rd	72	
	48°15.4'	123°32.4'	261	1832	164	Trans. 2, 4th	79	92

*Data were digitized at five meter intervals.

F refers to first cast of a time series.
L refers to last cast of a time series.

Table 9.--*Concluded*

STATION	LAT.(N)	LONG.(W)	DATE	TIME (GMT)	APPROX. WATER DEPTH(M)	TRANSECT OR LONG-PERIOD	CAST #	BOTTOM DATA DEPTH (M)*
ST 398	48°12.3'	123°32.4'	248	1844	141	Trans. 1, 1st	09	94
	48°12.3'	123°32.4'	254	2021	139	Trans. 1, 2nd	66	95
	48°12.4'	123°33.0'	258	2225	137	Trans. 1, 3rd	74	
	48°12.4'	123°32.6'	261	1912	137	Trans. 1, 4th	81	81
S 400	48°10.0'	123°05.5'	248	0120	22		05	14
	48°09.9'	123°05.0'	252	0418	12		11	11
	48°09.9'	123°05.0'	255	0600	16		70	
	48°10.1'	123°04.8'	259	0057	32		76	
	48°10.0'	123°05.1'	262	1325	51		83	5
	48°09.9'	123°05.3'	266	0300	51		84	8
	48°09.9'	123°05.0'	269	0415	50		86	15
	48°09.9'	123°04.9'	293	0240	20		216	15
	48°10.8'	123°05.1'	301	2223	73		231	70
ST 495	48°19.8'	124°03.5'	275	2315	177	Trans. 5, 1st	149	160
	48°18.8'	124°04.3'	282	0014	183	Trans. 5, 2nd	154	165
ST 496	48°15.0'	124°07.2'	272	2130	161	Trans. 5, 1st	146	150
	48°15.1'	124°05.8'	281	2255	163	Trans. 5, 2nd	151	150
ST 497	48°17.8'	124°05.4'	275	2245	172	Trans. 5, 1st	148	170
	48°17.8'	124°05.5'	281	2355	192	Trans. 5, 2nd	153	175
ST 498	48°21.6'	124°02.5'	275	2347	137	Trans. 5, 1st	150	125
	48°21.5'	124°01.7'	281	0050	181	Trans. 5, 2nd	155	135
ST 499	48°16.0'	124°08.0'	275	2207	182	Trans. 5, 1st	147	150
	48°16.4'	124°06.7	281	2334	187	Trans. 5, 2nd	152	165

* Data digitized at five meter intervals.

Table 10.--*STD stations occupied during Phase V of the Puget Sound Approaches Circulatory Survey.*

STATION	LAT.(N)	LONG.(W)	DATE	TIME (GMT)	APPROX. WATER DEPTH(M)	TRANSECT OR LONG-PERIOD	CAST #	BOTTOM DATA DEPTH (M)*
S 332	48°26.1'	122°56.5'	050	2306	119		2	100
	48°25.9'	122°56.7'	51	1630	91		5	75
S 333	48°27.5'	122°57.0'	50	1608	119		4	90
	48°27.5'	122°56.1'	075	1850	119		39	105
S 425	48°09.3'	122°49.5'	076	1945	55		41	
	48°09.4'	122°48.3'	090	2055	36		138	20
ST 426	48°11.5'	122°47.3'	99	2100	63	Line 3, 1	151	60
	48°11.6'	122°47.2'	100	1940	64	Line 3, 2	161	60
S 427	48°11.3'	122°43.4'	77	1951	25		42	20
ST 428	48°09.1'	122°42.9'	71	1725	58	Trans. 1, 1st	27	40
	48°09.1'	122°42.9'	71	2041	57	Trans. 1, 2nd	33	50
TS 428	48°08.9'	122°43.2'	F84	2027	59	25-Hour	F90	20 (min)
			L85	2129	59		L136	65 (max)
ST 428	48°09.1'	122°43.0'	99	2033	64	Line 3, 1	150	55
	48°09.0'	122°42.7'	100	1914	62	Line 3, 2	160	45
	48°09.1'	122°42.7'	104	1850	63	Trans. 1, 3rd	167	45
	48°08.8'	122°42.2'	104	2348	64	Trans. 1, 4th	172	60
ST 429	48°06.6'	122°39.8'	99	2010		Line 3, 1	149	20
	48°06.6'	122°39.6'	100	1844	67	Line 3, 2	159	40
S 430	48°06.3'	122°37.0'	92	2108	68		141	65
	48°06.8'	122°37.2'	103	2325	53		162	50
ST 431	48°01.6'	122°39.4'	99	1648	27	Trans. 2 1	142	20
	48°01.7'	122°39.3'	100	1555	36	Trans. 2 2	152	35
TS 432	48°02.1'	122°37.7'	F83	1830	106	25-Hour	F45	40 (min)
			L84	1930			L89	120 (max)
ST 432	48°02.0'	122°38.1'	99	1715	106	Trans. 2, 1	144	75
	48°01.5'	122°36.6'	99	1913	115	Line 3, 1	148	85
	48°02.1'	122°38.25'	100	1637	108	Trans. 2, 2	154	110
	48°01.6'	122°37.6'	100	1810	117	Line 3, 2	158	75
ST 433	48°01.7'	122°36.5'	99	1805	82	Trans. 2, 1	146	85
	48°01.75'	122°36.7'	100	1713	106	Trans. 2, 2	156	105

*Data were digitized at five meter intervals.

F refers to first cast of a time series.
L refers to last cast of a time series.

Table 10.--*Continued*

STATION	LAT.(N)	LONG.(W)	DATE	TIME (GMT)	APPROX. WATER DEPTH(M)	TRANSECT OR LONG-PERIOD	CAST #	BOTTOM DATA DEPTH (M)*
S 434	48°06.48'	122°43.55'	92	2002	30		139	25
	48°06.9'	122°44.1'	104	0012	35		164	30
S 435	48°09.2'	122°37.9'	92	2045	31		140	25
	48°08.9'	122°38.2'	103	2344	36		163	35
ST 436	48°01.7'	122°38.6'	99	1702	102	Trans. 2, 1	143	100
	48°02.2'	122°39.1'	100	1625	34	Trans. 2, 2	153	30
ST 437	48°01.8'	122°37.3'	99	1750	128	Trans. 2, 1	145	125
	48°01.9'	122°37.2'	100	1713	126	Trans. 2, 2	155	125
ST 438	47°57.3'	122°34.8'	99	1836	106	Line 3, 1	147	110
	47°57.4'	122°34.8'	100	1745	113	Line 3, 2	157	75
S 465	48°26.7'	123°00.25'	051	0004	84		3	60
	48°26.5'	123°03.3'	051	1732	91		7	80
S 466	48°21.2'	122°56.3'	058	1820	93		12	80
S 467	48°23.1'	123°02.3'	49	2139	146		1	110
	48°23.5'	123°02.3'	58	1318	142		8	
S 469	48°19.4'	123°01.9'	58	1415	142		9	
	48°20.5'	122°57.0'	58	1904	131		13	95
S 471	48°17.9'	122°52.1'	69	2043	67		24	50
	48°18.0'	122°51.9'	75	2005	46		40	30
S 472	48°25.2'	122°47.7'	62	2203	40		16	25
	48°25.0'	122°47.9'	72	2013	36		36	30
S 473	48°21.6'	122°42.6'	65	1806	58		19	45
	48°21.7'	122°42.7'	72	2117	55		38	45
S 474	48°24.3'	122°41.4'	62	1847	111		15	85
	48°24.0'	122°41.1'	68	1756	108		21	85
S 475	48°24.4'	122°37.6'	63	1915	33		17	
S 476	48°18.5'	122°45.3'	65	1837	55		20	40
	48°18.5'	122°45.5'	72	2051	55		37	45

* Data were digitized at five meter intervals.

Table 10.--*Concluded*

STATION	LAT.(N)	LONG.(W)	DATE	TIME (GMT)	APPROX. WATER DEPTH(M)	TRANSECT OR LONG-PERIOD	CAST #	BOTTOM DATA DEPTH (M)*
S 477	48°14.2'	122°48.9'	64	1907	56		18	45
	48°14.4'	122°48.9'	69	2005	46		23	35
ST 478	48°08.8'	122°44.3'	71	1700	55	Trans. 1, 1	25	30
	48°08.8'	122°44.3'	71	2013	53	Trans. 1, 2	31	45
	48°08.9'	122°44.8'	104	1827	42	Trans. 1, 3	165	30
	48°08.9'	122°44.1'	104	2322	72	Trans. 1, 4	170	70
ST 479	48°09.0'	122°41.2'	71	1810	66	Trans. 1, 1	29	50
	48°09.25'	122°41.3'	71	2124	57	Trans. 1, 2	35	45
	48°09.1'	122°41.1'	104	1927	57	Trans. 1, 3	169	30
	48°09.2'	122°41.3'	105	0024	58	Trans. 1, 4	174	40
S 480	48°06.5'	122°57.4'	90	1835-40	64		137	20
	48°06.5'	122°57.4'	105	1800	73		175	75
S 481	48°11.1'	122°56.5'	69	1908	35		22	25
	48°10.7'	122°56.0'	71	1918	26		30	20
ST 482	48°09.0'	122°43.5'	71	1710	56	Trans. 1, 1	26	35
	48°08.9'	122°43.6'	71	2026	64	Trans. 1, 2	32	50
	48°09.0'	122°43.7'	104	1838	56	Trans. 1, 3	166	46
	48°09.0'	122°43.4'	104	2334	49	Trans. 1, 4	171	45
ST 483	48°09.1'	122°42.0'	71	1754	77	Trans. 1, 1	28	60
	48°09.2'	122°42.9'	71	2109	77	Trans. 1, 2	34	65
	48°09.0'	122°42.0'	167	1916	76	Trans. 1, 3	168	60
	48°09.1'	122°41.3'	105	0012	73	Trans. 1, 4	173	55
S 493	48°21.5'	122°50.4'	58	1530	81		10	
	48°21.5'	122°50.4'	58	1734	73		11	55
S 500	48°27.8'	122°47.7'	67	0145	18		14	15
	48°27.9'	122°47.5'	78	0350	15		43	20
S 500A	48°05.3'	122°46.0'	79	0321	26		44	15

*Data were digitized at five meter intervals.

Table 11.--*STD stations occupied during Phase V of the Puget Sound Approaches Circulatory Survey.*

STATION	LAT.(N)	LONG.(W)	DATE	TIME (GMT)	APPROX. WATER DEPTH(M)	TRANSECT OR LONG-PERIOD	CAST #	BOTTOM DATA DEPTH (M)*
S 61	48°40.48'	123°00.0'	296	0059	188		208	175
	48°40.6'	123°00.5'	307	1705	179		226	175
S 62	48°27.8'	123°07.2'	252	2025	164		009	135
	48°27.9'	123°06.8'	259	2057	195		075	175
S 63	48°27.4'	123°09.8'	246	2137	146		001	115
	48°27.1'	123°09.5'	252	2050	137		010	115
	48°27.2'	123°09.4'	259	2038	146		024	125
S 64	48°26.2'	123°12.5'	252	2113	71		011	45
	48°26.1'	123°12.1'	259	2019	73		023	65
S 101	48°30.7'	123°10.7'	253	2010	238		013	225
	48°30.7'	123°10.6'	260	2114	265		026	260
S 103	48°35.7'	123°15.8'	265	1808	183		029	175
	48°25.5'	123°14.9'	279	0040	188		052	180
ST 104	48°30.4'	123°12.7'	260	2134	146		027	135
	48°30.8'	123°12.0'	268	2206	130	Trans. 4, 1	037	180
	48°30.5'	123°12.1'	274	2248	201	Trans. 4, 2	045	185
S 105	48°29.6'	123°16.5'	253	1930	60		012	65
	48°29.7'	123°16.3'	260	2159	62		028	50
S 106	48°39.2'	123°08.7'	275	0216	64		048	60
	48°39.1'	123°08.9'	279	0002	82		051	75
ST 107	48°38.8'	123°14.4'	268	1936	183	Trans. 4, 1	033	175
	48°38.8'	123°14.0'	274	2116	155	Trans. 4, 2	041	140
S 108A	48°42.0'	123°14.45'	289	0204	316		161	290
	48°42.0'	123°13.8'	289	1205	188		178	175
S 109	48°41.9'	123°18.8'	275	0111	64		047	60
	48°42.0'	123°19.2'	279	2315	47		050	40
S 110	48°42.2'	123°17.2'	278	1812	82		049	65
	48°42.27'	123°16.7'	289	0225	148		162	135
S 112	48°42.2'	123°09.8'	279	1824	146		053	130
	48°42.2'	123°09.9'	286	1935	138		060	95

*Data were digitized at five meter intervals.

Table 11.--*Continued*

STATION	LAT.(N)	LONG.(W)	DATE	TIME (GMT)	APPROX. WATER DEPTH(M)	TRANSECT OR LONG-PERIOD	CAST #	BOTTOM DATA DEPTH (M)*
S 113	48°41.1'	123°08.8'	279	1905	87		054	100
	48°41.1'	123°08.9'	286	1920	82		059	55
S 114	48°37.6'	123°07.5'	295	1721	88		202	75
	48°37.6'	123°07.6'	307	2236	46		228	25
S 115	48°39.22'	123°04.3'	296	0017	155		206	147
	48°39.4'	123°04.7'	307	1733	157		227	142
S 116	48°40.38'	123°03.5'	293	2159	95		200	75
	48°40.38'	123°03.5'	296	0038	91		207	85
	48°40.4'	123°03.5'	307	1644	71		225	60
S 117	48°41.6'	123°05.4'	281	2005	55		056	45
	48°41.5'	123°05.9'	286	1852	55		058	25
	48°41.58'	123°05.7'	295	2357	46		205	35
S 118	48°45.45'	123°05.0'	295	2305	119		203	115
	48°45.5'	123°05.4'	307	1608	175		224	160
S 119	48°44.0'	123°03.6'	293	1641	73		199	65
	48°44.1'	123°02.6'	295	2324	128		204	120
S 120	48°45.7'	123°12.1'	293	1602	25		198	15
	48°45.6'	123°11.9'	307	2332	29		229	20
S 121	48°44.3'	123°18.1'	289	0313	110		163	105
	48°44.3'	123°17.9'	289	1121	93		177	80
S 122	48°36.8'	123°20.0'	257	2352	42		015	25
	48°36.5'	123°19.8'	265	2310	42		030	30
ST 501	48°35.2'	123°13.1'	268	2045	263	Trans. 4, 1	035	245
	48°35.0'	123°13.1'	274	2203	256	Trans. 4, 2	043	205
TS 501	F48°35.03'	123°12.85'	F288	0015	280	25-Hour	F112	195 (min)
	L48°35.18'	123°12.8'	L289	0100			160	330 (max)
TS 502	F48°43.6'	123°10.6'	F286	2022	280	25-Hour	F061	170 (min)
	L48°43.35'	123°10.9'	L287	2132			L111	275 (max)
ST 502	48°43.5'	123°10.5'	289	0450	316	Trans. 3, 1	166	300
	48°43.33'	123°10.78'	289	1334	274	Trans. 3, 2	181	265

*Data were digitized at five meter intervals.

F refers to first cast of a time series.
L refers to last cast of a time series.

Table 11.--*Continued*

STATION	LAT.(N)	LONG.(W)	DATE	TIME (GMT)	APPROX. WATER DEPTH(M)	TRANSECT OR LONG-PERIOD	CAST #	BOTTOM DATA DEPTH (M)*
ST 503	48°26.8'	123°13.7'	251	2005	46	Trans. 1, 1	007	20
	48°26.8'	123°13.6'	258	2103	49	Trans. 1, 2	021	45
ST 504	48°28.4'	123°12.6'	251	1946	100	Trans. 1, 1	006	85
	48°27.5'	123°12.3'	258	2047	104	Trans. 1, 2	020	105
ST 505	48°27.0'	123°11.5'	251	1923	111	Trans. 1, 1	005	90
	48°27.9'	123°11.6'	258	2034	104	Trans. 1, 2	019	95
	48°28.0'	123°11.8'	268	2234	100	Trans. 4, 1	038	95
	48°27.9'	123°11.9'	274	2323	111	Trans. 4, 1	046	90
ST 506	48°28.5'	123°10.2'	251	1900	190	Trans. 1, 1	004	165
	48°28.6'	123°10.4'	258	2020	192	Trans. 1, 2	018	185
ST 507	48°29.2'	123°09.2'	251	1840	256	Trans. 1, 1	003	225
	48°29.1'	123°09.1'	258	1945	265	Trans. 1, 2	017	260
ST 508	48°29.7'	123°08.1'	251	1755	285	Trans. 1, 1	002	250
	48°29.6'	123°08.0'	258	1910	298	Trans. 1, 2	016	285
ST 509	48°46.7'	123°02.2'	300	2107	183	Trans. 2, 1	209	180
	48°46.5'	123°02.5'	306	2222	185	Trans. 2, 2	216	130
ST 510	48°45.8'	123°01.5'	289	0604	155	Trans. 3, 1	169	145
	48°46.3'	123°01.3'	289	1438	164	Trans. 3, 2	184	155
	48°46.1'	123°02.0'	300	2136	218	Trans. 2, 1	210	160
	48°46.0'	123°01.6'	306	2257	205	Trans. 2, 2	217	194
ST 511	48°45.3'	123°00.6'	300	2204	106	Trans. 2, 1	211	95
	48°45.3'	123°00.5'	306	2317	120	Trans. 2, 2	218	117
ST 512	48°44.7'	123°00.0'	300	2217	60	Trans. 2, 1	212	52
	48°44.7'	122°59.7'	306	2335	40	Trans. 2, 2	219	36
ST 513	48°44.0'	122°58.9'	300	2234	126	Trans. 2, 1	213	60
	48°44.1'	122°58.8'	306	2346	128	Trans. 2, 2	220	117
ST 514	48°43.5'	122°58.0'	300	2247	150	Trans. 2, 1	214	142
	48°43.6'	122°58.0'	307	0000	146	Trans. 2, 2	221	139
ST 515	48°42.9'	122°57.5'	300	2307	146	Trans. 2, 1	215	122
	48°42.9'	122°57.5'	307	0017	137	Trans. 2, 2	222	117

*Data were digitized at five meter intervals.

Table 11.--*Concluded*

STATION	LAT.(N)	LONG.(W)	DATE	TIME (GMT)	APPROX. WATER DEPTH(M)	TRANSECT OR LONG-PERIOD	CAST #	BOTTOM DATA DEPTH (M)*
ST 516	48°32.9'	123°12.5'	268	2137	256	Trans. 4, 1	036	230
	48°32.8'	123°12.5'	274	2225	229	Trans. 4, 2	044	215
ST 517	48°37.3'	123°14.2'	268	2017	225	Trans. 4, 1	034	215
	48°37.2'	123°14.1'	274	2138	228	Trans. 4, 2	042	130
ST 519	48°41.3'	123°15.5'	268	1837	311	Trans. 4, 1	032	285
	48°41.3'	123°15.4'	274	2032	329	Trans. 4, 2	040	220
	48°41.6'	123°16.0'	289	0345	274	Trans. 3, 1	164	195
	48°41.8'	123°16.0'	289	1235	247	Trans. 3, 2	179	235
ST 520	48°42.7'	123°13.3'	289	0427	214	Trans. 3, 1	165	205
	48°42.75'	123°13.4'	289	1310	247	Trans. 3, 2	180	235
ST 521	48°44.1'	123°07.9'	289	0515	141	Trans. 3, 1	167	130
	48°44.38'	123°07.9'	289	1357	141	Trans. 3, 2	182	135
ST 522	48°45.0'	122°04.4'	289	0537	155	Trans. 3, 1	168	145
	48°45.1'	123°04.4'	289	1420	157	Trans. 3, 2	183	140
S 523	48°45.9'	123°13.2'	252	0120	22		008	20
	48°45.9'	123°12.9'	254	0110	22		014	20
	48°45.9'	123°13.0'	259	0348	24		022	20
	48°46.0'	123°12.2'	267	0048	79		031	70
	48°45.8'	123°13.1'	274	1400	20		039	15
	48°45.8'	123°13.0'	281	0032.	20		055	2
	48°45.7'	123°12.8'	282	0100	22		057	15
	48°46.0'	123°12.6'	289	0723	24		170	15
	48°45.9'	123°11.45'	289	0754	24		171	20
	48°45.9'	123°11.45'	289	0824	24		172	20
	48°45.9'	123°11.45'	289	0853	24		173	15
	48°45.85'	123°11.1'	289	0923	24		174	25
	48°45.9'	123°11.7'	289	0952	24		175	25
	48°45.9'	123°12.5'	289	1020	24		176	25
	48°45.9'	123°13.0'	293	0015	20		197	10
	48°45.9'	123°12.9'	293	2310	26		201	20
	48°45.9'	123°12.5'	307	0600	26		223	17
	48°45.8'	123°13.0'	308	2300	27		230	20

*Data were digitized at five meter intervals.

4.0 TIDE DATA

4.1 Locations of Tide Gages and Installation Information

The locations of tide gages during the seven phases of this project are shown in the charts in figures 25 through 27. Tables 12 and 13 give relevant information about each tide station including: latitude and longitude, dates of occupation, type of gage, stage of processing accomplished, and comments on data quality. All stations were occupied for at least 29 days, and many (control stations, indicated by single letter labels) were in for 1 or more years. The shorter period tide stations were usually installed simultaneously with nearby current stations.

All but two tide gages were installed by the NOAA Ship McARTHUR assisted by NOS's Pacific Tide Party (at PMC). The remaining gages were run by Environment Canada, who have graciously supplied the data to NOS. Before a tide gage is installed, a reconnaissance of the proposed site is carried out to determine the availability of structures for the gage, water depths, the recovery of old bench marks, and possible sites for new bench marks. During installation differential levels are run from the tide staff to established bench marks and whenever possible to the National Geodetic Vertical Control Network.

4.2 Instrumentation, Processing, and Analysis

The National Ocean Survey used two types of tide gages during this part of the project: an ADR (Analog-Digital-Recorder) and a Bubbler (gas purged). Table 14 gives specifications for these gages.

The ADR gage outputs samples every 6 minutes onto foil-backed paper tape, which is processed using a mechanical translator and computers. The steps in processing are generally: (1) putting the 6-minute samples onto computer-compatible magnetic tape; (2) deriving hourly values from these (by picking the nearest 6-minute value to the hour) and storing them on cards and tape and in tabulated form; and (3) tabulating high and low waters, various tidal datums (e.g., mean high water, mean low water, and mean sea level), and other relevant parameters.

The Bubbler gage produces a continuous analog plot on a 6-inch strip chart. Resolution is not as good as with the ADR and generally only high and low waters and various tidal datums are tabulated. Hourly values are sometimes determined for special needs using a Bubbler marigram scanner, which digitizes the data at visually selected points.

Many tide stations are analyzed using: (1) 29-day Fourier harmonic analyses; (2) least-squares harmonic analyses (for 1-year series); (3) non-harmonic comparison analyses relating a short period station to a longer period control station; (4) various filtering and spectral techniques; and (5) FR80 microfilm plotting. The harmonic constants obtained from item (2) can be used to make predictions for table 1 of the Tide Tables, West Coast of North and South America. Results from items (1), (2), and (3) can be used in table 2 of this same publication. Harmonic analysis results for tide data from this area have been presented in Parker (1977).

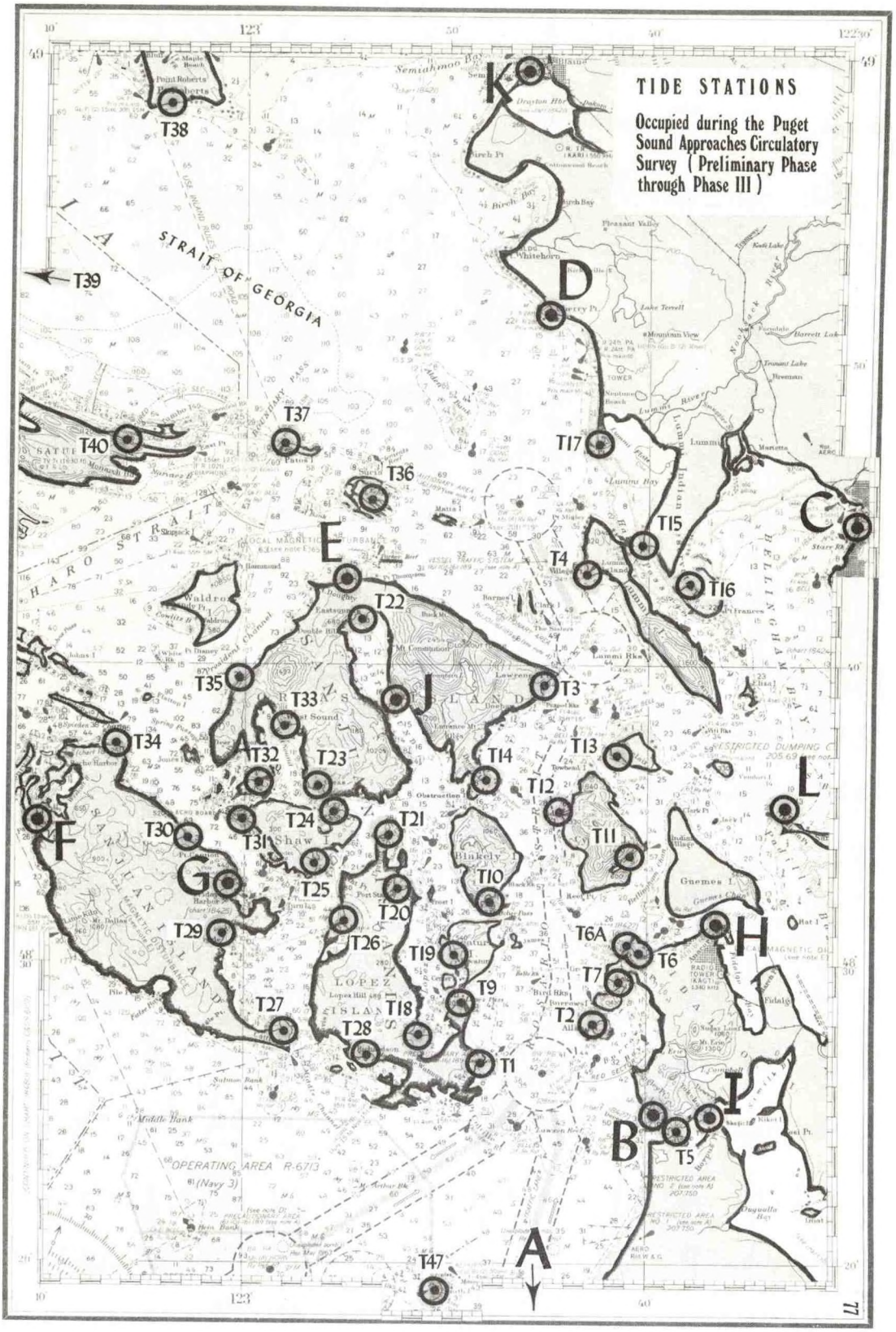

Figure 25.--*Tide stations occupied during the Puget Sound Approaches Circulatory Survey (Preliminary Phase through Phase III).*

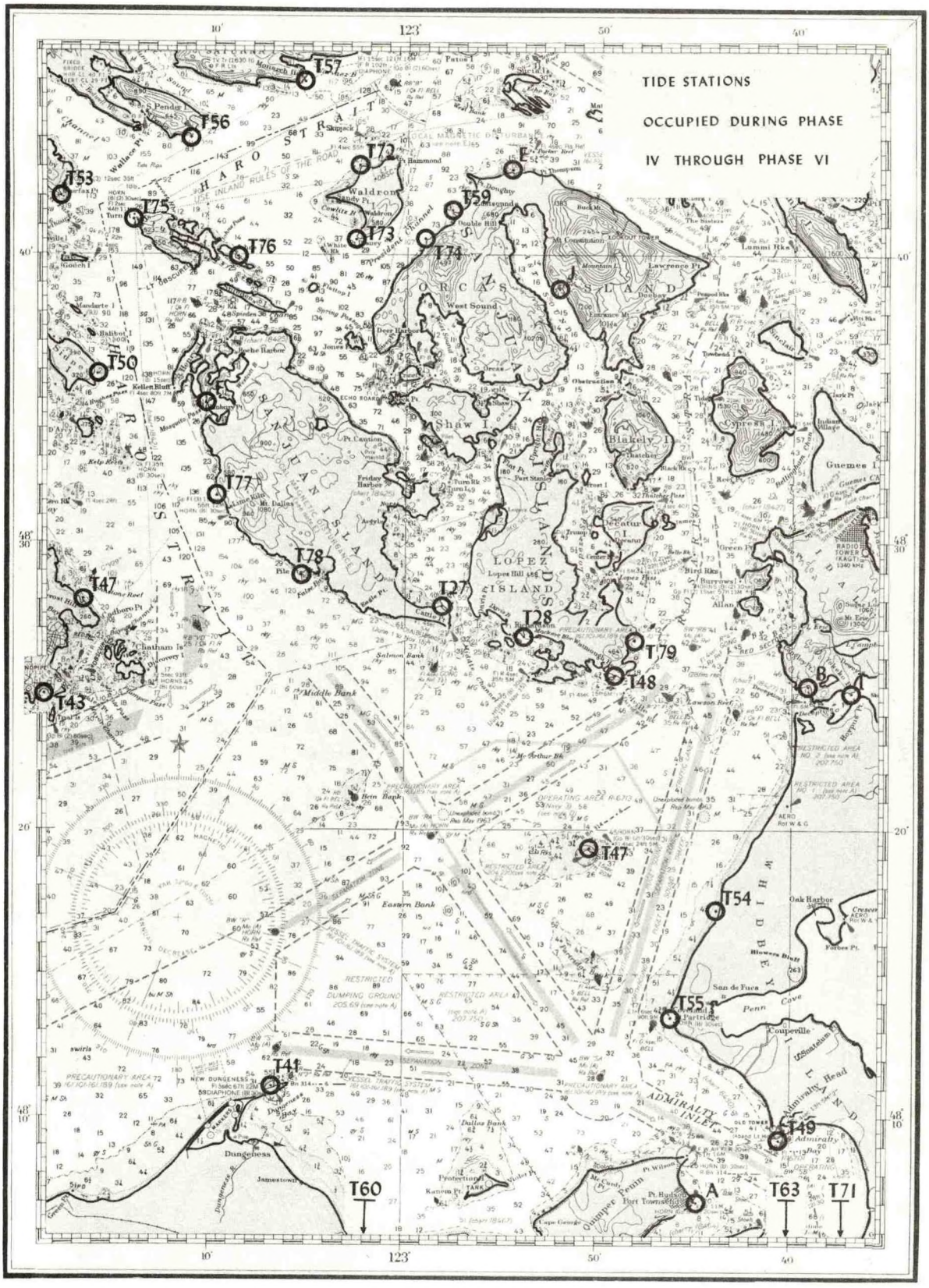

Figure 26.--*Tide stations occupied during the Puget Sound Approaches Circulatory Survey (Phases IV through VI).*

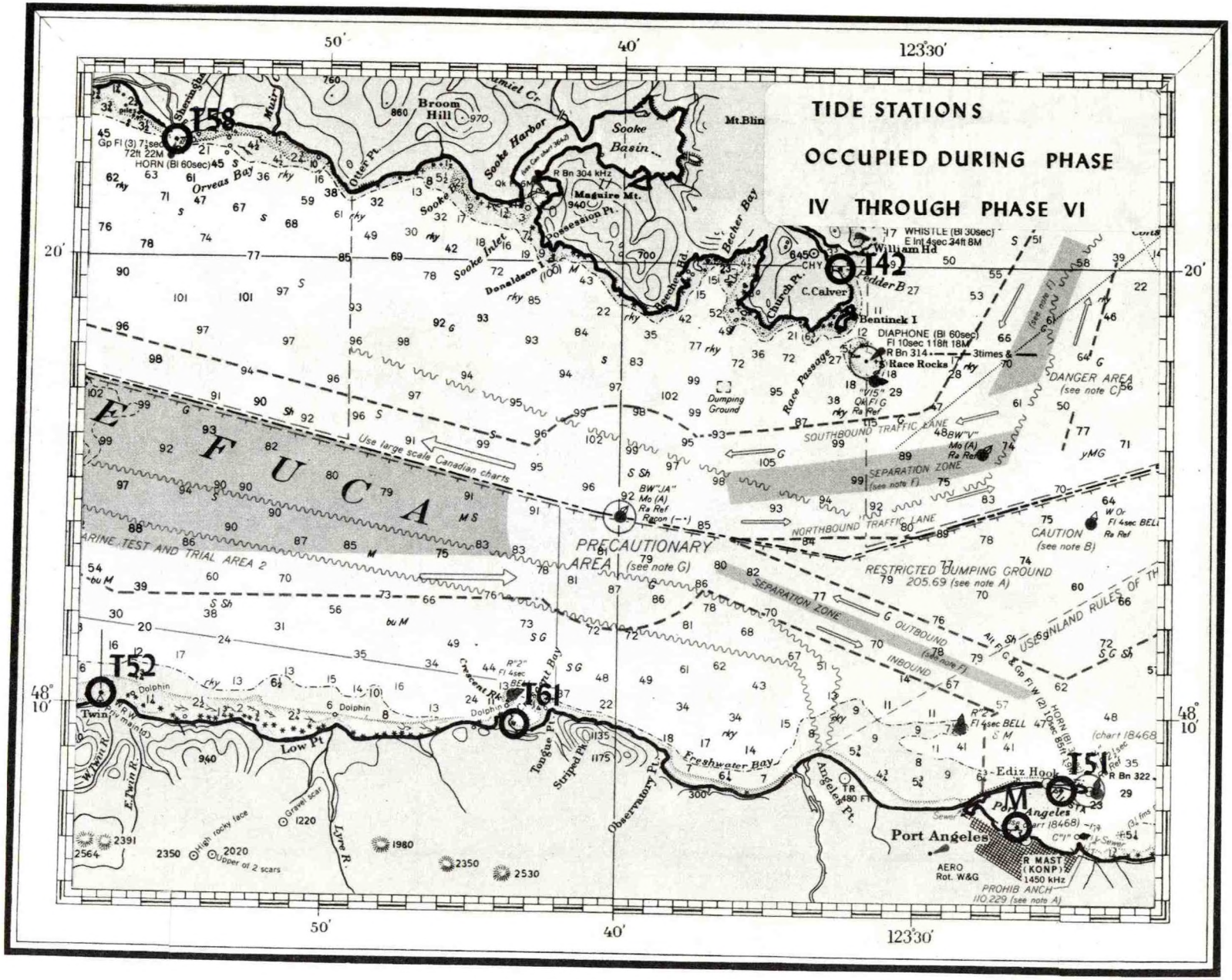

Figure 27.--*Tide stations occupied during the Puget Sound Approaches Circulatory Survey (Phases IV through VI).*

Table 12.--*Tide stations occupied during the Preliminary Phase and Phases I through III of the Puget Sound Approaches Circulatory Survey.*

STA. NO.	STATION	LATITUDE (N)	LONGITUDE (W)	⊗ DATES OF OBSERVATION	⊛ TYPE OF GAGE	# PROCESSING 1	2	3	⊗ MISSING DATA
A.	Port Townsend * 944-4900	48°06.9'	122°45.0'	2/72-Present**	ADR	✓	✓	✓	June-Aug. 73; Sept. 74
B.	Reservation Bay, Fidalgo Is.* 944-8614	48°24.9'	122°39.1'	10/26/73-Present	ADR	✓	✓	✓	
C.	Bellingham* 944-9211	48°44.7'	122°29.2'	3/30/73-7/22/75	ADR	✓	✓	✓	May 73
D.	Cherry Point 944-9424	48°51.8'	122°44.9'	11/20/71-Present	ADR	✓	✓	✓	
E.	North Beach, Orcas Is. 944-9737	48°42.7'	122°54.5'	10/18/73-Present	ADR	✓	✓	✓	
F.	Hanbury Point, San Juan Is. 944-9828	48°34.8'	123°10.3'	10/10/73-Present	ADR	✓	✓	✓	Feb. 75
G.	Friday Harbor* 944-9880	48°32.8'	123°00.4'	1934-Present	ADR	✓	✓	✓	
H.	Anacortes, Fidalgo Is.* 944-8794	48°31.34'	122°36.75'	10/21/73-2/14/75	ADR	✓	✓	✓	
I.	Yokeko Pt., Fidalgo Is.* 944-8601	48°25.0'	122°36.8'	11/10/73-1/24/75	ADR	✓	✓	✓	Feb. 74
J.	Rosario, Orcas Is.* 944-9771	48°38.8'	122°52.2'	10/19/73-Present	ADR	✓	✓	✓	
K.	Blaine* 944-9679	48°59.5'	122°45.9'	10/26/73-Present	ADR	✓	✓	✓	
L.	Williams Pt., Samish Is. 944-8919	48°35.0'	122°33.0'	1/28/74-Present	Bubbler		✓	✓	
T1.	Telegraph Bay, Lopez Is. 944-9988	48°26.6'	122°48.3'	1/30/74-4/ 8/74	Bubbler			✓	
T2.	Allan Island* 944-8683	48°27.6'	122°41.7'	1/31/74-4/10/74	Bubbler			✓	
T3.	Lawrence Pt., Orcas Is. 944-9765	48°39.2'	122°45.1'	2/7/74-4/9/74	Bubbler			✓	
T4.	Village Pt., Lummi Is.* 944-9161	48°43.0'	122°42.5'	2/9/74-4/10/74	ADR	✓	✓	✓	
				1/28/75-4/1/75	ADR	✓	✓	✓	
T5.	Pass Island, Deception Pass 944-7999	48°24.4'	122°38.5'	2/19/74-4/8/74	Bubbler			✓	
T6.	Ship Harbor, Fidalgo Is. 944-8722	48°30.4'	122°40.6'	2/3/74-3/25/74	ADR	✓	✓	✓	
T6A.	Shannen Pt., Fidalgo Is. 944-8773	48°30.6'	122°40.9'	4/12/74-1/24/75	Bubbler			✓	

* Station has been occupied prior to this survey; see Section 5.2.

⊕ 1, 2, and 3 refer to processing steps described in Section 4.2; ✓ indicates completion of step; ✓́ indicates partial completion.

⊗ If station was already installed when survey began, original installation date is used; in such cases only the most recent gage type is indicated.

⊗⊗ Small breaks in data are not indicated here.

⊛ Types of gages are described in Section 4.2 and in Table 14.

** If stations are dated Present they were in at the time the report was submitted for publication.

Table 12.--*Continued*

STA. NO.	STATION	LATITUDE (N)	LONGITUDE (W)	ⓧ DATES OF OBSERVATION	⊛ TYPE OF GAGE	# PROCESSING 1	2	3	ⓧ MISSING DATA
T7.	Burrows Bay, Fidalgo Is.* 944-8739	48°29.4'	122°40.6'	2/22/74-4/11/74	Bubbler			✓	
T9.	Lopez Pass, Lopez Is. 944-9965	48°28.65'	122°49.25'	2/7/74-3/21/74	Bubbler			✓	
				8/25/74-9/2/74	Bubbler			✓	
				9/12/74-10/9/74	Bubbler			✓	
T10.	Armitage Is., Thatcher Pass* 944-9932	48°32.1'	122°47.8'	2/8/74-3/21/74	ADR	✓	✓	✓	
				9/10/74-10/10/74	ADR	✓	✓	✓	
T11.	Deepwater Harbor, Cypress Is. 944-8871	48°33.3'	122°41.25'	2/20/74-3/29/74	Bubbler			✓	
T12.	Tide Point, Cypress Is. 944-8919	48°35.2'	122°44.2'	3/1/74-4/3/74	Bubbler				
T13.	Sinclair Island 944-8967	48°37.0'	122°41.6'	3/5/74-4/5/74	ADR			✓	
T14.	Deer Point, Orcas Is. 944-9794	48°36.2'	122°48.2'	2/11/74-3/26/74	Bubbler			✓	
				9/11/74-10/17/74	Bubbler			✓	
T15.	Gooseberry Pt., Hale Passage* 944-9184	48°43.9'	122°40.2'	3/7/74-4/12/74	ADR	✓	✓	✓	
T16.	Portage Bay 944-9150	48°42.9'	122°37.0'	3/14/74-5/17/74	Bubbler				
T17.	Sandy Point, Lumni Bay 944-9292	48°47.4'	122°42.45'	2/10/74-4/9/74	ADR	✓	✓	✓	
				1/27/75-4/11/75	ADR			✓	2/13-3/4 bad
T18.	Mud Bay, Lopez Is. 944-9980	48°27.0'	122°51.0'	8/28/74-10/10/74	Bubbler			✓	
T19.	Decatur Island (SW side)* 944-9951	48°30.1'	122°49.3'	9/13/74-10/18/74	ADR	✓	✓	✓	
T20.	Port Stanely, Lopez Is. 944-9922	48°32.5'	122°52.4'	8/29/74-10/16/74	Bubbler			✓	
T21.	Upright Head, Lopez Is.* 944-9911	48°34.3'	122°53.0'	9/11/74-10/15/74	ADR	✓	✓	✓	
T22.	East Sound, Orcas Is. 944-9752	48°41.5'	122°54.2'	9/18/74-10/20/74	ADR	✓	✓	✓	June 74
T23.	Orcas, Orcas Is.* 944-9798	48°36.0'	122°57.0'	9/16/74-10/21/74	ADR	✓	✓	✓	
T24.	Shaw Is. Ferry, Harney Channel 944-9904	48°35.1'	122°55.7'	9/23/74-10/28/74	ADR	✓	✓	✓	
T25.	Squaw Bay, Shaw Is. 944-9920	48°33.75'	122°56.5'	9/24/74-10/23/74	ADR	✓	✓	✓	
T26.	Lopez, Lopez Is. 944-9939	48°31.3'	122°55.0'	9/27/74-10/29/74	ADR	✓	✓	✓	
T27.	Fish Creek, San Juan Is. 944-9896	48°27.75'	122°58.0'	8/17/74-11/6/74	ADR				
T28.	Richardson, Lopez Is.* 944-9982	48°26.8'	122°53.8'	8/25/74-10/15/74	ADR	✓	✓	✓	
T29.	Argyle, San Juan Is.* 944-9882	48°31.1'	123°00.8'	10/2/74-11/5/74	ADR	✓	✓	✓	
T30.	San Juan Channel, San Juan Is. 944-9870	48°34.2'	123°02.8'	10/2/74-11/5/74	ADR	✓	✓	✓	
T31.	Neck Point, Shaw Is. 944-9906	48°34.7'	123°00.7'	10/8/74-11/8/74	Bubbler			✓	
T32.	Pole Pass, Crane Is. 944-9795	48°36'	122°59'	10/3/74-11/4/74	ADR	✓	✓	✓	

Table 12.--*Concluded*

STA. NO.	STATION	LATITUDE (N)	LONGITUDE (W)	⊗ DATES OF OBSERVATION	⊛ TYPE OF GAGE	# PROCESSING 1	2	3	⊗ MISSING DATA
T33.	Haida Point, West Sound 944-9781	48°37.8'	122°57.3'	9/18/74-10/21/74	ADR	✓	✓	✓	
T34.	Limestone Pt., San Juan Is. 944-9829	48°37.3'	123°06.4'	10/3/74-11/6/74	ADR	✓	✓	✓	
T35.	President Channel, Orcas Is. 944-9751	48°38.2'	123°01.1'	9/19/74-10/21/74	ADR	✓	✓	✓	
T36.	Echo Bay, Sucia Is.* 944-9712	48°45.6'	122°53.8'	2/6/75-4/10/75	Bubbler			✓	
T37.	Alden Point, Patos Is 944-9704	48°47.2'	122°57.0'	2/6/75-4/3/75	Bubbler			✓	
T38.	Point Roberts, South Beach 944-9639	48°58.3'	122°05.0'	1/29/74-4/3/75	Bubbler			✓	
T39.	Whaler Bay 821-0911	48°53'	123°19'	1964 - present	Canadian		✓	✓	
T40.	Tumbo Channel 821-0765	48°47'	123°06'	1967 - present	Canadian		✓	✓	
T47.	Smith Island* 944-7985	48°19.3'	122°50.1'	4/19-25/74	Bubbler		✓	✓	
	Twin Rivers o * 944-3642	48°10.0'	123°57.4'	3/20/74-4/10/74	Bubbler		✓	✓	
	Sekiu Pt., Clallam Bay o * 944-3361	48°16'	124°18'	5/11/73-1/31/74	ADR	✓	✓	✓	
	Neah Bay o * 944-3090	48°22.1'	124°37.0'	1934-Present	ADR	✓	✓	✓	

o Station was not part of survey plans but was occupied in a neighboring area during the period of the survey.

Table 13.--*Tide stations occupied during Phases IV through VI of the Puget Sound Approaches Circulatory Survey.*

STA. NO.	STATION	LATITUDE (N)	LONGITUDE (W)	⊗ DATES OF OBSERVATION	TYPE OF GAGE	# PROCESSING 1	2	3	⊗ MISSING DATA
A	Port Townsend, WA, 944-4900	48°07'	122°45'	1/75-11/76	ADR	✓	✓	✓	
B	Reservation Bay, WA, 944-8614	48°25'	122°39'	All 1975; 1/76-7/20/76	ADR	✓	✓	✓	
D	Cherry Point, WA, 944-9424	48°41'	122°45'	All 1975; 1/76-8/76	ADR	✓	✓	✓	
E	North Beach, WA, 9-4-9737	48°43'	123°54'	All 1975	ADR	✓	✓	✓	
				1/76-8/76	ADR		✓	✓	7/76
F	Hanbury Point, WA, 944-9828	48°37.5'	123°10.3'	All 1975	ADR	✓	✓	✓	
				1/76-3/76	ADR	✓	✓	✓	
I	Yokeko Point, WA, 944-8601	48°24.9'	122°36.8'	8/25-11/9/75	ADR	✓	✓	✓	
				2/3-4/13/76	ADR			✓	
J	Rosario Orcas Island, WA, 944-9771	48°38.8'	122°52.3'	1/75-9/75	ADR	✓	✓	✓	
M	Port Angeles, WA, 944-4090	48°07.5'	124°26.4'	8/75-11/76	ADR	✓	✓	✓	
T-27	Fish Creek, WA, 944-9896	48°27.8'	122°56.0'	9/19-10/28/75	ADR	✓	✓	✓	
T-28	Richardson, WA, 944-9482	48°26.5'	122°54.0'	2/4-4/12/76	ADR	✓	✓	✓	
T-41	New Dungeness, WA, 944-4472	48°11.0'	123°06.5'	3/11-4/14/76	Bubbler			✓	
T-42	Pedder Bay, B.C, 821-0611	48°19.9'	123°32.1'	1/76-10/76	ADR	✓	✓	✓	
T-43	McNeil Bay, B.C., 821-0294	48°24.7'	123°19.0'	8/7-11/14/75	Bubbler			✓	
T-46	Provost Hill, B.C., 821-0332	48°29.8'	123°18.3'	9/1-10/24/76	Bubbler			✓	
T-47	Smith Island, WA, 944-7985	48°19.0'	122°50.2'	2/18-4/18/76	Bubbler			✓	
				9/5-10/4/75	Bubbler		✓	✓	
T-48	Point Colville, WA, 944-9995	48°25.3'	122°48.7'	9/16-11/12/75	Bubbler		✓	✓	
				2/3-4/12/76	Bubbler			✓	
T-49	Admiralty Head, WA, 944-7905	48°09.4'	122°40.2'	2/19-4/13/76	Bubbler				
				9/10-10/31/75	Bubbler		✓	✓	
T-50	Sidney Island, B.C., 821-0519	48°35.4'	123°16.1'	9/13-11/3/76	Bubbler				
T-51	Ediz Hook, WA, 944-4122	48°08.4'	123°24.8'	1/9-6/30/76	ADR	✓	✓	✓	
T-52	Twin Rivers, WA, 944-3642	48°10.0'	123°57.4'	10/2-11/4/76	Bubbler			✓	
T-53	Fairfax Point, B.C., 821-0655	48°42.6'	123°17.6'	9/19-11/5/76	Bubbler				
T-54	Sunset Beach, WA, 944-7951	48°17.0'	122°43.7'	2/26-4/28/76	Bubbler			✓	
T-55	Point Patridge, WA, 944-7934	48°13.9'	122°45.9'	2/76-4/76	Bubbler			✓	
T-56	Gowlland Point, B.C., 821-0704	48°44.6'	123°10.2'	9/14-11/3/76	Bubbler			✓	

Table 13.--*Concluded*

STA. NO.	STATION	LATITUDE (N)	LONGITUDE (W)	⊗ DATES OF OBSERVATION	TYPE OF GAGE	# PROCESSING 1	2	3	⊗ MISSING DATA
T-57	Monarch Head, B.C., 821-0747	48°45.9'	123°05.5'	9/15-11/3/76	Bubbler				
T-58	Sheringham Point, B.C., 821-0210	48°22.6'	123°55.2'	10/2-11/6/76	Bubbler			✓	
T-59	Toke Point, WA, 944-0910	46°42'	123°58'	10/76-11/76	ADR				
T-60	Sequim Bay, WA, 944-4555	48°04.9'	123°02.6'	7/31/75-12/75	Bubbler	✓		✓	
					Bubbler			✓	
T-61	Crescent Bay, WA, 944-3826	48°09.7'	123°43.7'	8/30/76-10/15/76	Bubbler			✓	
T-62	Neah Bay, WA, 944-3090	48°22.1'	124°37.0'	All 1975; 1/76-10/76	ADR				
T-63	Lip Lip Point, WA, 944-4994	48°00.8'	122°40.5'	3/16/76-4/20/76	Bubbler	✓		✓	
T-71	Bush Point, WA, 944-7854	48°01.9'	122°36.4'	3/3/76-4/19/76	ADR				
T-72	Fishery Point, WA, 944-9739	48°43.0'	123°02.4'	9/15/76-11/3/76	Bubbler				
T-73	Point Disney, WA, 944-9747	47°40.6'	123°02.6'	9/21/76-11/3/76	Bubbler				
T-74	President Channel, WA, 944-9751	48°40.5'	122°59.0'	9/23/76-11/4/76	Bubbler				
T-75	Turn Point, WA, 944-9802	48°41.3'	123°14.2'	9/19/76-11/18/76	Bubbler				
T-76	Johns Island, WA, 944-9808	48°39.9'	123°14.2'	9/11/76-11/3/76	Bubbler				
T-77	Bellvue, WA, 944-9845	48°32.4'	123°09.6'	9/1/76-10/9/76	Bubbler				
T-78	Kanaka Bay, WA, 944-9856	48°29.0'	123°04.9'	9/2/76-10/18/76	Bubbler				
T-79	Telegraph Bay, WA, 944-9988	48°26.6'	122°48.3'	9/15/75-11/12/75	Bubbler	✓		✓	
				2/3/76-4/12/76				✓	

Table 14.--Tide gage specifications

Bubbler (Gas Purged)

Manufacturer: Bristol
Range: 0-10 feet to 0-50 feet
Precision: 1 percent of full scale
Recorder: 6-inch strip chart
Record Format: Analog, curvilinear
Sampling Rate: Continuous
Duration: Chart - 1 month
Chart drive, spring wound - 8 days
Processing: Visual
Mode of Operation: Compressed nitrogen is purged through the system, actuating a pressure-sensitive element, which measures water level fluctuations.

ADR (Analog - Digital Recorder)

Manufacturer: Fischer - Porter
Range: 0-99.99 feet
Precision: $\pm$ 1/2 binary count
Recorder: Foil-backed paper tape (punch)
Record Format: Binary - decimal code
Sampling Rate: 6-minute intervals
Duration: Chart - 3 months
Chart drive, battery - 3 months
Processing: Mechanical translator
Mode of operation: Float movement is translated into binary code and recorded on paper tape.

Processed monthly tabulations (high and low waters and tidal datums) from each station are verified as to staff-marigram relationship, and equivalent 19-year mean values are computed through simultaneous comparison with the appropriate tide control station. Tidal bench mark elevations are established by referencing these bench marks to the computed tidal datums. New elevations for historical bench marks are used to check any vertical land movement that may have occurred. The relationships between tidal datums and the National Geodetic Vertical Network are also computed when level connections can be made to geodetic bench marks.

5.0 HISTORICAL DATA

5.1 Introduction

The National Ocean Survey (formerly the U.S. Coast and Geodetic Survey) was created in 1807. Over the past 170 years it has acquired a huge quantity of current, temperature, and especially tide data, some of which came from the area of the present survey. This is a deepwater area where coastlines and bottom topography do not change rapidly. The hydrodynamic conditions have therefore probably remained about the same for many years. Thus historical tide and current data from this area are as valuable today as they were when they were collected. (Any changes in coastline or bottom contours that may have come about will have had more of an effect on the currents near the change than on the tide. Most of NOS's historical current data are, however, relatively recent compared with the tide data, and any differences between old and new current data would more likely be due to the different methods of measurement.) Details concerning these historical data will be presented in the following sections.

5.2 Current Data

Most of the historical current data in this area came from several small surveys in the 1950's and a larger survey covering various periods of 1964 through 1966. (Some data exist from as far back as 1887, but they are not included here because of questionable quality and applicability.) Figure 28 shows locations of these historical current stations. Table 15 gives relevant information concerning these data, such as dates of observations, depths, and method of measurement. Most of the current data were obtained using Roberts Radio Current meters; some of the 1966 data came from Photographic (Geodyne A100) meters, and some of the older data came from float or pole measurements or from Price current meters. Information concerning these methods of current measurement can be found in Manual of Current Observations, U.S. Coast and Geodetic Survey, S.P. 215, 1950. Predictions and mean values for some of these historical current stations can be found in Tidal Current Tables, Pacific Coast of North America and Asia, published by NOS.

Although the 109 current stations listed in table 15 and shown in figure 28 seem like a large quantity of current data, it should be noticed that all but a dozen of these have less than 5 days of data and only five stations have 29 days of data, the amount needed to obtain fairly accurate values for the five main harmonic constituents (M_1, S_2, N_2, O_1, and K_1). In the past current predictions in this area were usually based on approximate relationships to nearby tide stations. The present survey described in Chapter 2 had no stations occupied for less than 15 days, a dozen occupied for at least a month, and several for many months.

5.3 Tide Data

The historical tide data in this area ar quite extensive. Many stations have at least a year's worth of data. Two stations, Neah Bay and Friday Harbor, have been running continuously since 1934. Figure 29 shows locations of these stations, and table 16 gives relevant information. Although some stations have data from as early as the 1800's in most cases only more recent data series

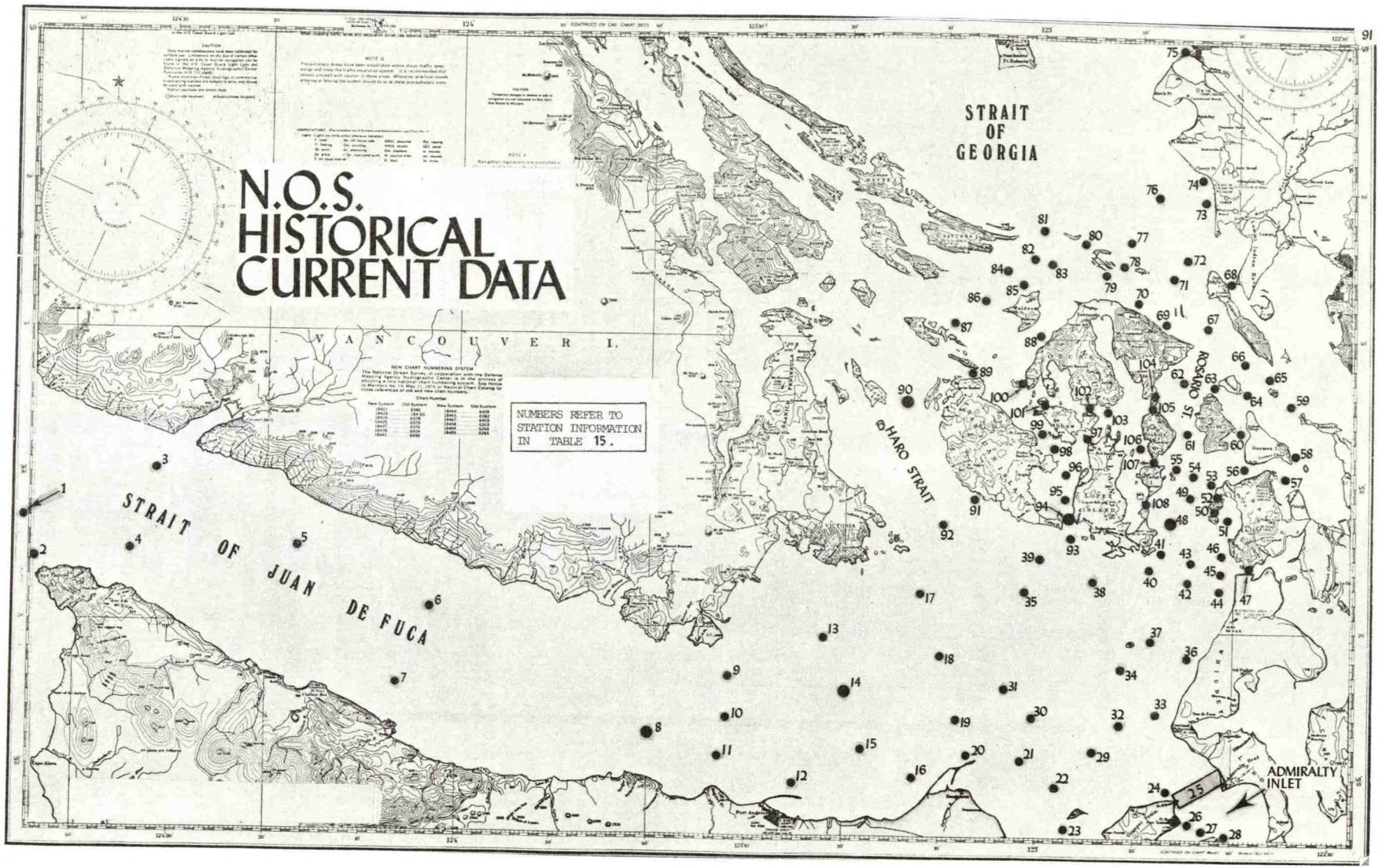

Figure 28.--*NOS historical current data for Puget Sound Approaches.*

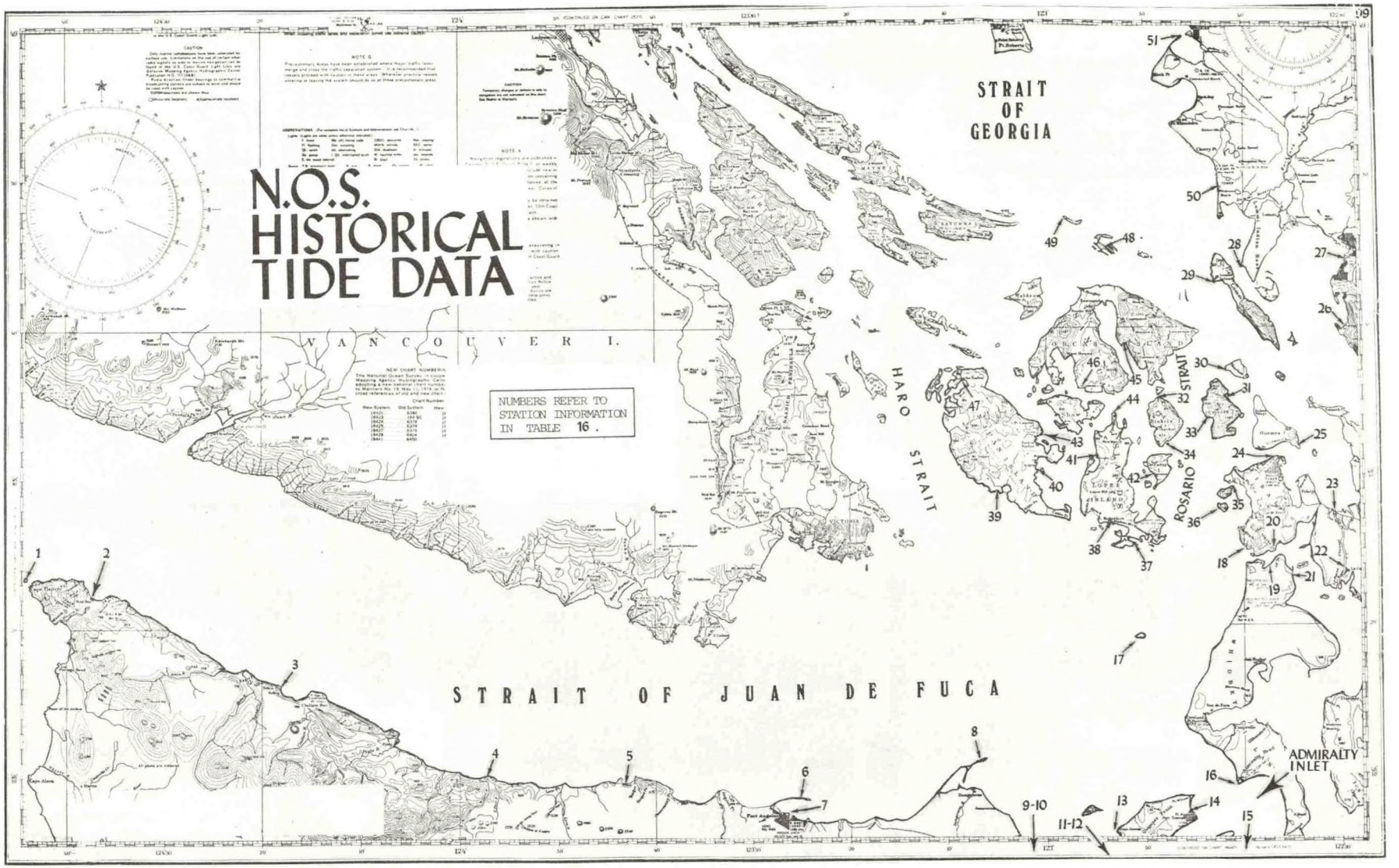

Figure 29.--*NOS historical current data for Puget Sound Approaches.*

Table 15.--*NOS historical current data.*

REF. NO.	DATES	C.O. OF SHIP	STA. NO.	LATITUDE(N)	LONGITUDE(W)	DEPTHS (FEET)	METHOD OF MEASUREMENT		DAYS DATA
1	June 13-27, 1966	Grunwell	95	48°26.7'	124°46.5'	15	Photo A100	6/Hr	15
2	May 12-16, 1966	Grunwell	96	48°24.0'	124°44.2'	15	RRCM	2/Hr	4 1/2
3	May 21-June 4, 1966	Grunwell	97	48°30.3'	124°32.2'	15	Photo A100	6/Hr	15
4	June 10-27, 1966	Grunwell	98	48°24.9'	124°34.2'	15	Photo A100	6/Hr	17
5	June 6-20, 1966	Grunwell	100	48°24.9'	124°16.3'	15	Photo A100	6/Hr	15
6	July 8-23, 1966	Grunwell	102	48°21.4'	124°03.2'	15	Photo A100	6/Hr	15
7	Apr. 17-May 2, 1966	Grunwell	103	48°16.1'	124°06.6'	15	Photo A100	6/Hr	15
8	June 22-July 24, 1966	Grunwell	104	48°13.2'	123°40.0'	15	Photo A100	6/Hr	32
9	July 15-19, 1964	Hull	63	48°16.4'	123°31.9'	15,303,505	RRCM	2/Hr	4 1/2
10	July 15-19, 1964	Hull	64	48°13.9'	123°32.6'	15,267,445	RRCM	2/Hr	4 1/2
11	July 15-19, 1964	Hull	65A	48°11.5'	123°33.2'	15,197,324	RRCM	2/Hr	4
12	Apr. 20-25, 1963	Keith	1	48°09.6'	123°24.6'	15,138,230	RRCM	2/Hr	4 1/2
13	July 19-24, 1964	Hull	66	48°19.2'	123°22.1'	15,152,249	RRCM	2/Hr	4 1/2
14	July 20-24, 1964	Hull	67	48°15.6'	123°19.9'	15,182,299	RRCM	2/Hr	4
	Aug. 6-Sept. 5, 1966	Grunwell	67	48°15.7'	123°20.0'	15	Photo A100	6/Hr	30
15	July 20-24, 1964	Hull	68	48°11.2'	123°17.3'	15,127,209	RRCM	2/Hr	4
16	Apr. 20-25, 1963	Keith	3	48°09.9'	123°12.7'	15,90,150	RRCM	2/Hr	4
17	Aug. 5-9, 1964	Keith	69	48°22.6'	123°12.2'	15,107,174	RRCM	2/Hr	4 1/2
18	Aug. 10-14, 1964	Keith	70	48°18.2'	123°09.9'	15,187,309	RRCM	2/Hr	4
19	Aug. 10-14, 1964	Keith	71	48°13.6'	123°08.0'	15,227,374	RRCM	2/Hr	4
20	Apr. 20-25, 1963	Keith	2	48°11.6'	123°05.8'	15,142,235	RRCM	2/Hr	4 1/2
21	Sept. 14-18, 1964	Keith	80	48°10.9'	123°02.25'	15,147,244	RRCM	2/Hr	4
22	March 19-23, 1965	Munson	83	48°09.9'	122°57.8'	15,77,124	RRCM	2/Hr	4 1/2
23	March 19-23, 1965	Munson	81	48°06.3'	122°58.1'	15,87,149	RRCM	2/Hr	4
24	March 10-14, 1965	Munson	87	48°09.5'	122°46.1'	12,34,61	RRCM	2/Hr	4
25	July 7-19, 1952	Conerly	31	48°08.8'	122°44.8'	8,62.5,120	RRCM	2/Hr	13 1/2
	Feb. 11-15, 1946	Finnegan	3	48°09.0'	122°44.6'	15	RRCM	2/Hr	4 1/2
	March 10-15, 1965	Munson	88	48°08.8'	122°43.9'	15,97,159	RRCM	2/Hr	5
	July 7-11, 1952	Conerly	32	48°09.1'	122°43.8'	8,64,120	RRCM	2/Hr	4
	Feb. 11-15, 1946	Finnegan	2	48°09.5'	122°43.6'	15	RRCM	2/Hr	5
	July 21-23, Aug. 9-13, 1952	Conerly	33	48°09.2'	122°43.0'	8,60,122	RRCM	2/Hr	6

Table 15.--*Continued*

REF. NO.	DATES	C.O. OF SHIP	STA. NO.	LATITUDE(N)	LONGITUDE(W)	DEPTHS (FEET)	METHOD OF MEASUREMENT		DAYS DATA
25	Aug. 15-16, 1952	Conerly	49	48°09.5'	122°42.8'	-9,+206,* +186,+166, +146,+126, +106,+84, +66,+46, +26,+6, +3.8,+2	RRCM	2/Hr	1 1/2
	Feb. 11-16, 1946	Finnegan	1	48°10.0'	122°42.5'	15	RRCM	2/Hr	5
	July 21-23, Aug. 9-13, 1952	Conerly	34	48°09.5'	122°42.3'	8,76,137	RRCM	2/Hr	6
	March 10-14, 1965	Munson	89	48°09.4'	122°41.9'	15,87,139	RRCM	2/Hr	4 1/2
	July 9-18, 1952	Conerly	35	48°09.8'	122°41.6'	8,30,60	RRCM	2/Hr	9
26	May 29-June 3, 1963	Keith	10	48°07.0'	122°44.1'	15,60,100	RRCM	2/Hr	4 1/2
27	May 30-June 3, 1963	Keith	11	48°06.8'	122°42.4'	6,18,30	RRCM	2/Hr	4
28	May 30-June 4, 1963	Keith	12	48°06.3'	122°40.8'	15,60,100	RRCM	2/Hr	4 1/2
29	March 20-24, 1965	Munson	84	48°11.4'	122°54.8'	15,157,219	RRCM	2/Hr	4
30	June 10-14, 1964	Hull	79	48°13.9'	123°00.1'	15,202,334	RRCM	2/Hr	4
31	June 3-7, 1964	Hull	78	48°16.4'	123°03.2'	15,272,449	RRCM	2/Hr	4
32	June 9-13, 1964	Hull	85	48°13.5'	122°51.6'	15,150,250	RRCM	2/Hr	4
33	June 8-12, 1964	Hull	86	48°14.6'	122°47.9'	15,90,150	RRCM	2/Hr	4
34	June 1-6, 1964	Hull	76	48°17.7'	122°51.0'	15,150	RRCM	2/Hr	4 1/2
	Apr. 16-May 1, 1966	Grunwell	76	48°17.7'	122°51.3'	15	Photo A100	6/Hr	15
35	May 28-June 1, 1964	Hull	72	48°22.7'	123°01.5'	15,237,394	RRCM	2/Hr	4
	May 26-31, 1965	Munson	72A	48°22.7'	123°01.3'	15	RRCM	2/Hr	4 1/2
36	Apr. 19-23, 1964	Hull	1	48°18.1'	122°45.2'	15,72,114	RRCM	2/Hr	4
37	Apr. 19-23, 1964	Hull	2	48°19.3'	122°47.55'	15,102,169	RRCM	2/Hr	4
38	May 27-31, 1964	Hull	74	48°23.2'	122°54.7'	15,117,194	RRCM	2/Hr	4

* + indicates height above bottom

Table 15.--*Continued*

REF. NO.	DATES	C.O. OF SHIP	STA. NO.	LATITUDE(N)	LONGITUDE(W)	DEPTHS (FEET)	METHOD OF MEASUREMENT		DAYS DATA
39	May 28-June 1, 1964	Hull	73	48°24.5'	122°59.9'	15,207,344	RRCM	2/Hr	4 1/2
	May 26-31, 1965	Munson	73A	48°24.5'	122°59.7'	15	RRCM	2/Hr	4 1/2
40	Apr. 16-20, 1964	Hull	4	48°24.0'	122°48.8'	15,142,234	RRCM	2/Hr	4 1/2
41	May 7-12, 1950	Boothe	2	48°24.7'	122°47.3'	15	RRCM	2/Hr	5
	Apr. 5-11, 1964	Richards	5	48°25.0'	122°47.0'	15,92,149	RRCM	2/Hr	5 1/2
42	May 7-12, 1950	Boothe	3	48°23.1'	122°44.7'	15	RRCM	2/Hr	5
43	Apr. 6-10, 1964	Richards	6	48°24.6'	122°44.3'	15,132,219	RRCM	2/Hr	4
	May 4-7, 1950	Boothe	12A	48°24.8'	122°44.2'	15	RRCM	2/Hr	3 1/2
44	May 2-7, 1950	Boothe	4	48°22.8'	122°41.6'	15	RRCM	2/Hr	5
45	Apr. 5-9, 1964	Richards	7	48°24.25'	122°41.7'	15,152	RRCM	2/Hr	4
46	May 2-7, 1950	Boothe	6	48°25.2'	122°41.7'	15	RRCM	2/Hr	5
47	July 28-Aug. 1, 1960	Taylor	2	48°24.4'	122°38.4'	Surface	Floats	2/Hr	4
48	May 7-12, 1950	Boothe	5	48°27.1'	122°46.1'	15	RRCM	2/Hr	5
	March 27-Apr. 29, 1964	Richards	9	48°27.8'	122.46.7'	8,20,124	RRCM	2/Hr	33
	March 9-Apr. 8, 1965	Munson	9C	48°27.5'	122.46.75'	20	Photo A100	6/Hr	30
49	Apr. 6-10, 1964	Richards	10A	48°28.65'	122°44.2'	15,147,249	RRCM	2/Hr	4 1/2
	May 2-12, 1950	Boothe	12	48°28.7'	122°43.7'	15	RRCM	2/Hr	10
	March 24-28, 1964	Richards	10	48°29.0'	122°43.95'	8,20,252	RRCM	2/Hr	4
50	May 3-12, 1950	Boothe	11	48°28.3'	122°41.9'	15	RRCM	2/Hr	9
51	May 2-7, 1950	Boothe	10	48°27.7'	122°40.9'	15	RRCM	2/Hr	5
52	May 2-11, 1950	Boothe	13	48°29.4'	122°41.1'	15	RRCM	2/Hr	9
	May 3-8, 1950	Boothe	13A	48°29.4'	122°42.0'	15	RRCM	2/Hr	5
53	Apr. 27-30, 1965	Munson	106	48°30.3'	122°42.3'	15,45,75	RRCM	2/Hr	3
54	Apr. 27-30, 1965	Munson	105	48°30.7'	122°43.8'	15,45,75	RRCM	2/Hr	3
55	Apr. 27-30, 1965	Munson	104	48°31.2'	122°46.0'	15,84,140	RRCM	2/Hr	3
56	March 22-26, 1964	Richards	16	48°31.5'	122°34.1'	8,24,41	RRCM	2/Hr	4 1/2
57	May 21-25, 1963	Keith	19	48°30.7'	122°35.1'	8,34,40	RRCM	2/Hr	4 1/2
	May 21-25, 1963	Keith	20	48°30.6'	122°35.6'	7,20,34	RRCM	2/Hr	4 1/2
	May 21-25, 1963	Keith	21	48°30.7'	122°35.9'	11,34,58	RRCM	2/Hr	4 1/2

Table 15.--*Continued*

REF. NO.	DATES	C.O. OF SHIP	STA. NO.	LATITUDE(N)	LONGITUDE(W)	DEPTHS (FEET)	METHOD OF MEASUREMENT		DAYS DATA
58	Sept. 28-Oct. 2, 1964	Keith	18A	48°31.9'	122°33.7'	122,204	RRCM	2/Hr	4
	June 5-7, 1939	Knox	4	48°32.7'	122°34.0'	7,42,105, 168	Pole, Price	2/Hr	2
59	Apr. 24-28, 1964	Hull	19	48°35.0'	122°34.7'	15,47,74	RRCM	2/Hr	4
60	March 22-26, 1964	Richards	17	48°33.7'	122°39.65'	15,187	RRCM	2/Hr	4
61	March 25-31, 1964	Richards	13	48°33.6'	122°45.2'	15,122,199	RRCM	2/Hr	6
	July 12-15, 1955	Stewart	1A	48°33.6'	122°43.3'	7,47,117, 187	Pole, Price	2/Hr	3
62	March 22-26, 1964	Richards	20	48°37.5'	122°44.8'	15,122	RRCM	2/Hr	5
	Sept. 21-25, 1955	Taylor	7	48°37.5'	122°44.1'	15	RRCM	2/Hr	5 1/2
63	March 22-26, 1964	Richards	21	48°36.8'	122°42.2'	15,62,99	RRCM	2/Hr	4 1/2
	Oct. 13-15, 1955	Taylor	8	48°36.8'	122°42.2'	15	RRCM	2/Hr	2
64	Apr. 24-29, 1964	Hull	22	48°36.1'	122°38.9'	15,97,164	RRCM	2/Hr	4 1/2
	Oct. 18-22, 1955	Taylor	9	48°36.3'	122°39.4'	15	RRCM	2/Hr	2
65	Sept. 28-Oct. 2, 1964	Keith	23	48°37.3'	122°36.7'	15,162,274	RRCM	2/Hr	4 1/2
66	Sept. 28-Oct. 2, 1964	Keith	25	48°38.6'	122°39.5'	15,122	RRCM	2/Hr	4 1/2
	June 21-25, 1956	Jeffers	10	48°38.5'	122°39.2'	15	RRCM	2/Hr	4
67	Oct. 3-7, 1964	Jeffers	26	48°40.6'	122°42.9'	150,142,239	RRCM	2/Hr	4 1/2
68	Oct. 3-7, 1964	Jeffers	30	48°43.9'	122°40.6'	8,20,32	RRCM	2/Hr	4 1/2
69	Oct. 3-7, 1964	Jeffers	27	48°41.1'	122°47.2'	15,162,269	RRCM	2/Hr	4
70	March 31-Apr. 4, 1966	Grunwell	28A	48°42.6'	122°50.0'	15	RRCM	2/Hr	4 1/2
	Sept. 21-26, 1956	Mast	12	48°42.5'	122°49.5'	15	RRCM	2/Hr	5
71	Oct. 3-7, 1964	Keith	29	48°44.05'	122°46.4'	15,167,274	RRCM	2/Hr	4
72	Sept. 6-11, 1956	Jeffers	13	48°45.4'	122°45.9'	15	RRCM	2/Hr	5
73	Aug. 25-29, 1964	Keith	34	48°49.4'	122°43.7'	13,40,62	RRCM	2/Hr	4
74	Aug. 25-29, 1964	Keith	34A	48°50.7'	122°43.4'	8,37	RRCM	2/Hr	4
75	July 28-30, 1959	Tonkel	1	48°59.5'	122°46.6'	6,12,27,42	Pole, Price	2/Hr	2
76	March 27-31, 1965	Munson	35	48°46.7'	122°56.4'	15,162,269	RRCM	2/Hr	4 1/2
77-	Apr. 3-4, 1965	Munson	36	48°47.2'	123°00.2'	15,317	RRCM	2/Hr	

Table 15.--*Continued*

REF. NO.	DATES	C.O. OF SHIP	STA. NO.	LATITUDE(N)	LONGITUDE(W)	DEPTHS (FEET)	METHOD OF MEASUREMENT	DAYS DATA
78	Sept. 11-16, 1959	Tonkel	2	48°45.05'	122°51.8'	15	RRCM 2/Hr	5
79	March 27-31, 1965	Munson	31	48°44.6'	122°53.5'	15,152,249	RRCM 2/Hr	4
	Oct. 11-15, 1959	Tonkel	4	48°44.1'	122°53.6'	15	RRCM 2/Hr	4 1/2
80	March 27-31, 1965	Munson	35	48°46.7'	122°56.4'	15,162,269	RRCM 2/Hr	4 1/2
	June 5-10, 1960	Taylor	1	48°46.2'	122°55.8'	15	RRCM 2/Hr	5
81	Apr. 3-4, 1965	Munson	36	48°47.2'	123°00.2'	15,317	RRCM 2/Hr	2
	May 17-21, 1965	Munson	36A	48°47.3'	123°00.3'	15,317,524	RRCM 2/Hr	4
82	Sept. 25-29, 1959	Tonkel	3	48°45.7'	123°00.6'	15	RRCM 2/Hr	4
83	March 27-31, 1965	Munson	37	48°45.3'	122°58.6'	15,197,324	RRCM 2/Hr	4 1/2
84	May 10-14, 1965	Munson	40	48°45.0'	123°03.8'	15,267,444	RRCM 2/Hr	4 1/2
85	Apr. 3-7, 1965	Munson	39	48°43.6'	123°02.3'	15,52,84	RRCM 2/Hr	4 1/2
86	May 10-14, 1965	Munson	41	48°42.6'	123°06.7'	15,152,249	RRCM 2/Hr	4 1/2
87	May 10-14, 1965	Munson	42	48°41.1'	123°08.8'	15,137	RRCM 2/Hr	4 1/2
88	Apr. 3-7, 1965	Munson	38	48°40.5'	123°00.1'	15,317,524	RRCM 2/Hr	4 1/2
89	July 21-25, 1954	Partington	5	48°37.5'	123°07.3'	7,12,30,48	Pole, Price 2/Hr	4 1/2
90	May 5-June 2, 1965	Munson	48B	48°35.3'	123°13.3'	8	RRCM 2/Hr	28
	May 11-June 9, 1966	Grunwell	48C	48°35.5'	123°13.2'	15,200	Photo Al02 6/Hr	29
91	Sept. 9-13, 1964	Keith	51	48°28.9'	123°06.5'	15,37.7, 62.4	RRCM 2/Hr	4 1/2
92	Sept. 9-13, 1964	Keith	50	48°27.2'	123°09.5'	15,242,400	RRCM 2/Hr	4 1/2
93	May 20-25, 1964	Hull	62A	48°26.0'	122°56.7'	8,20	RRCM 2/Hr	5
94	May 20-June 18, 1964	Hull	62B	48°27.7'	122°57.0'	15,200	RRCM 2/Hr	30
95	May 13-17, 1964	Hull	62	48°28.8'	122°57.4'	15,200	RRCM 2/Hr	4
96	May 13-25, 1964	Hull	61	48°30.6'	122°56.8'	8,20,199	RRCM 2/Hr	12
	Apr. 14-18, 1953	ULM	1	48°30.7'	122°57.1'	7,48,120, 192	Pole, Price 2/Hr	4
97	March 31-Apr. 4, 1966	Grunwell	60A	48°33.1'	122°55.3'	15	RRCM 2/Hr	4 1/2
	Apr. 2-6, 1954	Partington	1	48°33.1'	122°55.6'	7,17,42,67	Pole, Price 2/Hr	4
	Oct. 4-8, 1957	Russel	3	48°33.05'	122°55.5'	15	RRCM 2/Hr	4

Table 15.--*Concluded*

REF. NO.	DATES	C.O. OF SHIP	STA. NO.	LATITUDE(N)	LONGITUDE(W)	DEPTHS (FEET)	METHOD OF MEASUREMENT	DAYS DATA
98	May 4-8, 1954	Partington	3	48°32.6'	122°59.3'	7,24,60,96	Pole, Price 2/Hr	4
99	May 23-27, 1964	Hull	56	48°33.4'	122°59.8'	15,245,420	RRCM 2/Hr	4
100	May 22-26, 1964	Hull	54	48°36.8'	123°01.9'	15,48,80	RRCM 2/Hr	4
101	May 18-23, 1964	Hull	55	48°35.5'	122°59.4'	15,47,74	RRCM 2/Hr	5
	May 19-23, 1954	Partington	4	48°35.3'	123°00.1'	7,18,45,72	Pole, Price 2/Hr	4
102	May 18-22, 1964	Hull	57	48°35.4'	122°55.1'	15,48,80	RRCM 2/Hr	4
	Apr. 7-11, 1954	Partington	2	48°35.2'	122°54.9'	7,12,30,48	Pole, Price 2/Hr	4
103	Oct. 4-8, 1957	Russel	2	48°34.9'	122°53.2'	15	RRCM 2/Hr	4
104	March 30-Apr. 5, 1964	Richards	15	48°36.2'	122°48.6'	10,32,49	RRCM 2/Hr	6
105	March 31-Apr. 4, 1964	Richards	14	48°35.2'	122°49.0'	7,19,31	RRCM 2/Hr	4
	Aug. 24-28, 1955	Taylor	6	48°35.3'	122°48.7'	15	RRCM 2/Hr	4 1/2
106	Oct. 20-25, 1956	Mast	4	48°32.3'	122°49.8'	15	RRCM 2/Hr	5
107	March 30-Apr. 3, 1964	Richards	12	48°31.7'	122°47.9'	15,82,139	RRCM 2/Hr	4
	July 15-20, 1955	Stewart	3	48°31.7'	122°48.4'	7,15	RRCM 2/Hr	4
109	Apr. 23-27, 1964	Hull	8	48°28.8'	122°49.1'	14,41,68	RRCM 2/Hr	4

Table 16.--*NOS historical tide data.*

REF. NO.	STATION	LATITUDE(N)	LONGITUDE(W)	DATES OF OBSERVATION
1	Tatoosh Island, Cape Flattery	48°23.5'	124°44.2'	June 1 - July 12, 1931
2	Neah Bay	48°22.1'	124°37.0'	1934 - present
3	Sekiu Point, Clallam Bay	48°16'	124°18'	July 17 - September 17, 1931
4	Twin Rivers	48°10.5'	123°57.0'	March 14 - April 30, 1967
5	Crescent Bay	48°10'	123°43'	September 18 - October 15, 1931
		48°09.7'	123°43.7'	April 1967
6	Ediz Hook	48°08.4'	123°24.8'	February 10 - March 5, 1954
				September 1-17, 1970
7	Port Angeles	48°07'	123°26'	July - October 1931
				August 1934 - July 1935
				November 1 - December 17, 1940
8	New Dungeness	48°11'	123°07'	December 10, 1940 - January 11, 1941
				April 7 - May 10, 1967
9	Washington Harbor (Entrance)	48°04.8'	123°02.7'	August 8 - September 26, 1935
10	Sequim Bay	48°02.4'	123°01.4'	March 22 - June 28, 1967
11	Gardiner	48°04'	122°55'	August 29 - September 26, 1935
12	Port Discovery	48°02'	122°52'	May 12 - October 11, 1881
13	Cape George Colony	48°06.1'	122°53.1'	April 15 - June 26, 1967
14	Port Townsend	48°08.3'	122°45.6'	March 1934 - February 1936
		48°06.8'	122°45.0'	August 1952 - August 1953
				February 1972 - present
15	Fort Flagler (Marrowstone Island)	48°05.5'	122°41.4'	December 14, 1944 - January 11, 1945
				July - September 1966
16	Admiralty Head	48°09.5'	122°40.1'	January - February 1953
17	Smith Island	48°19.1'	122°50.3'	June 11-18, 1942, May 23 - June 20, 1972
18	Reservation Bay, Fidalgo Island	48°25'	122°40'	September 1925, September 1934
				August 17 - September 6, 1939
				December 19-31, 1940, June 6-20, 1972
19	Cornet Bay	48°24.1'	122°37.4'	July 1952 - August 1953

Table 16.--*Continued*

REF. NO.	STATION	LATITUDE(N)	LONGITUDE(W)	DATES OF OBSERVATION
20	Yokeko Point,. E. end Deception Pass	48°24.8'	122°36.9'	September 1925 August 18 - September 1, 1939
21	Ala Spit, Skagit Bay	48°23.8'	122°35.2'	June 8 - August 28, 1939
22	La Conner, Swinomish Slough	48°23.3'	122°29.9'	July 1935 April 1964 April 1965, Nov. 29, 1972 - Jan. 31, 1973
23	Swinomish Slough (N. end), Padilla Bay	48°27.5'	122°30.8'	October 24 - November 26, 1940 April 11 - August 31, 1955 August 16 - September 30, 1965
24	Anacortés	48°31.2'	122°37.3'	June 1921 - May 1924 November 1934 - September 1935 June 1939 - March 1940 November - December 1940 October 18, 1941 - March 11, 1942 January - April 1947 April 8 - November 18, 1955
25	Guemes Island, Padilla Bay	48°32'	122°34.5'	August 1-29, 1887
26	Chuckanut Bay, Bellingham Bay	48°40'	122°30'	July 23 - September 18, 1888
27	Bellingham, Bellingham Bay	48°44.7'	122°29.6'	September 1934 - August 1935 May 3 - July 30, 1956
28	Gooseberry Point,. Hale Passage	48°43.9'	122°40.2'	December 29, 1952 - February 2, 1953 July 19 - August 24, 1956
29	Village Point, Lumni Island	48°43.0'	122°42.5'	May 1972
30	Sinclair Island	48°37.0'	122°41.5'	September 27 - October 26, 1955 November 9-15, 1955 April 6-12, 19 - May 26, 1956
31	Eagle Harbor, Cypress Island	48°35.2'	122°41.6'	May 12 - June 20, 1972
32	Pearine Pass	48°35.1'	122°48.9'	May 17 - June 14, 1972

Table 16.--*Concluded*

REF. NO.	STATION	LATITUDE(N)	LONGITUDE(W)	DATES OF OBSERVATION
33	Strawberry Bay, Cypress Island	48°33.9'	122°43.3'	July - September 1955
34	Armitage Island, Thatcher Pass	48°32.2'	122°48.0'	May 18 - June 19, 1972
35	Burrows Bay, Fidalgo Head	48°29.4'	122°40.9'	December 12, 1939 - March 18, 1940
36	Allan Island	48°27.7'	122°42.5'	May 19 - June 20, 1972
37	Aleck Bay, Lopez Island	48°25.5'	122°51.2'	October 14 - December 28, 1941
				May 17 - June 14, 1972
38	Richardson, Lopez Island	48°26.8'	122°53.9'	December 1942 - February 3, 1943
39	Kanaka Bay, San Juan Island	48°29.1'	123°05.0'	October 1926, August 26 - Sept. 30, 1953
40	Argyle, North Bay	48°31.1	123°00.8'	March 28 - May 9, 1903
				April 12-30, 1953
41	Lopez, Lopez Island	48°31.3'	122°54.9'	May 6 - June 25, 1953
42	Decatur Island (SW side)	48°30.2'	122°49.3'	March 16 - April 5, 1940
43	Friday Harbor, San Juan Island	48°32.8'	123°00.4'	1934 - present
44	Upright Head, Lopez Island	48°34.3'	122°53.1'	January 9 - April 24, 1947
45	Rosario, East Sound (Orcas Island)	48°39'	122°52'	August - September 1935
				October 21-31, November 8-14, 1956
46	Orcas, Orcas Island	48°35.8'	122°56.7'	September 18 - October 20, 1958
47	Roche Harbor, San Juan Island	48°36.6'	123°09.1'	June 28 - September 15, 1954
48	Echo Bay, Sucia Island	48°45.6'	122°53.8'	August 10 - September 27, 1956
				May 1 - August 31, 1957
				June - September 1959
				April 12 - June 1960
				April 21 - May 19, 1972
49	Patos Island Wharf	48°47.4'	122°58.2'	January - August 1968
50	Ferndale	48°49.6'	122°43.2'	January - October 1968
51	Blaine, Semiahmoo Bay	48°59'	122°46'	August 1934 - July 1935
				December 13, 1939 - January 21, 1940
				May 6 - Oct. 14, 1959

are included. Various types of water-level measuring devices were used to obtain these data. Descriptions of these devices can be found in Manual of Tide Observations, U.S. Coast and Geodetic Survey, Pub. 30-1, 1965, or in Tidal Datum Planes, U.S. Coast and Geodetic Survey, S.P. 135, 1951. Predictions and mean ranges for some of these historical tide stations can be found in Tide Tables, West Coast of North and South America, published by NOS.

5.4 Temperature and Density Data

Although no STD observations or observations from current meters with temperature sensors have been made in this area prior to this survey, temperature and density measurements have been made for many years at some of the tide stations. These were strictly surface measurements usually made once each weekday (at varying times). Measurements were made using a thermometer and several hydrometers. Table 17 presents station locations and the periods for which observations were taken.

Although these daily surface observations give no information about the entire vertical water column or about the changes over a tidal cycle, they do supply valuable seasonal information. Monthly means for much of these data can be found in Surface Water Temperature and Density, Pacific Coast, NOS Pub. 31-1, 1970.

Table 17.--*NOS historical temperature and density data.*

STATION*	LATITUDE (N)	LONGITUDE (W)	FROM	TO
Neah Bay	48°23.1'	124°37.0'	March 1935	Present
Port Angeles	48°07'	123°26'	July 1934	Sept. 1935
Port Townsend (Fort Worden)	48°08.3'	122°45.6'	Apr. 1935	Feb. 1936
Port Townsend (town)	48°06.8'	122°45.0'	Nov. 1873	Dec. 1876
			May 1973	Present
Ancortes	48°31.2'	122°37.3'	Dec. 1921	May 1924
			Nov. 1934	Sept. 1935
Friday Harbor	48°33'	123°00'	Apr. 1934	Aug. 1952
Cherry Point	48°51.8'	122°44.9'	Dec. 1971	Sept. 1973
Blaine	48°59'	122°46'	Aug. 1934	Aug. 1935

(*See Table 16 and Figure 15 for locations of stations.)

ACKNOWLEDGMENTS

Members of the Oceanographic Division who contributed information to this report include: Thomas Sheehan, Thomas Baumgardner, James Johnson, and Gary Dingle. Numerous members of the Tides and Water Levels Branch and the Oceanographic Surveys Branch were involved in the processing of the data described here. Pat Laird, of the Pacific Marine Environmental Laboratory, processed the Plessey 9006 STD data for Phases I through III of this project. Gina Stoney typed the tables and the final draft of the text.

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