U.S. DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY

CRUISE REPORT

1990 OREGON PLACER MINERAL RESEARCH CRUISE (A1 90WO)

SEPTEMBER 21 - OCTOBER 3, 1990

by

H. Edward Clifton[1], Gerald G. Connard[2], Joe Fisher[3], David Fox[4], Cheryl Mardock[5], Gregory McMurray[6], Robert J. O'Brien[7], Curt Peterson[8], Rick Starr[4], Robert Woolsey[9]

Open-File Report 91-279

---

[1]U. S. Geological Survey, 345 Middlefield Road, Menlo Park, CA 94025
[2]Northwest Geophysical Associates, P.O.Box 1063, Corvallis OR 97339-1063
[3]Department of Oceanography, Oregon State University, Corvallis, OR 97331
[4]Oregon Department of Fish and Wildlife, Marine Science Drive, Newport, OR 97365
[5]U. S. Bureau of Mines, 1450 Queen Avenue, Albany, OR 97321
[6]State of Oregon Department of Geology and Mineral Industries, Portland, OR 97201-5528
[7]Department of Chemistry, Portland State University, Portland, OR 97201-0751
[8]Department of Geology, Portland State University, Portland, OR, 97201-0751
[9]Marine Minerals Technology Center, University of Mississippi, University, MS 38667

INTRODUCTION

PURPOSE OF CRUISE

The 1990 Placer Mineral Research Cruise resulted from recommendations by the Oregon Placer Minerals Technical Task Force to conduct a field program in 1990 that would provide needed information on the character of mineral resources on the southern Oregon continental shelf and the economic, strategic, and environmental aspects of any development of these resources. The objective of the cruise was to identify the concentration, quality, and distribution of placer minerals with depth in the sand section in at least two targets on the southern Oregon shelf and, concurrently with this examination, collect information on living resources and geology that would benefit further consideration if the potential for economic deposits appears favorable.

As a general strategy, the cruise focussed on two target areas, one off Cape Blanco and the other off Gold Beach (Fig. 1), that had been identified in previous studies as having potential for placer mineral concentrations. The goal was to collect a minimum of 4 to 6 cores or bulk samples through the upper 20 feet of shelf sediment in each target area. The location of these sample sites was to be established on the basis of magnetic and high-resolution acoustical profiling data collected in the initial phases of the cruise. The identification of specific mineralogic targets was also to provide locations for sampling of shelf biota in the vicinity of any placer deposits and comparing it with the biota in adjacent areas without mineral concentrations. Mineralogical samples collected from the target sites would receive preliminary examination on board the vessel to assist with the field interpretation of the nature of the deposit and the selection of additional sampling sites. The bulk of the sample would be taken to shore-based laboratories for detailed analysis following the cruise.

The purpose of this report is to indicate the nature and distribution of the data collected during the cruise. Analysis and interpretation of the data are continuing.

GENERAL ASPECTS OF THE CRUISE

TIMING AND LOCATION

The cruise (A1 90WO) was scheduled for a 15-day period in the latter part of September and early October 1990. This period was selected in part because it provided the most likely favorable weather for the cruise and also because it followed the closure of commercial fishing seasons. The general areas for sampling included two target areas in the vicinity of Cape Blanco and two target areas in the vicinity of the Rogue River mouth (Fig. 2). The primary target area ("Cape Blanco West"), about 15 km long and 5 km wide, lies west of Cape Blanco in water depths that range from 15 to 60 m. It included 5 specific target sites (Blanco 1 through 5, Table 1) that were identified on the basis of earlier studies. A smaller secondary target ("Cape Blanco South", containing target sites Blanco 6 and 8, Table 1) lay south of Cape Blanco in water depths of 20 to 40 m. Its position east of the Orford Reef provided some protection under the worst wind and wave conditions. The target areas in the vicinity of the Rogue River mouth included one ("Gold Beach South") about 12 km long and 3-5 km wide in water depths of 20 to 60 m between the mouth of the Rogue River and Cape Sebastian to the south. This area included target sites Rogue 1, 2, 4, 5, 8, and 9 (Table 1). A second target area ("Gold Beach West"), about 10 km long and 5 km wide, lay in deeper water (40 to 80 m) seaward of the Rogue Reef and included target site Rogue 3 (Table1).

Table 1. Proposed Target Sites for the Cape Blanco and Rogue River Areas

Prepared by LaVerne Kulm and Curt Peterson, Oregon State University and Portland State University

Date:11/30/1989

Target sites (Blanco 1, 2,3) listed in order of priority (highest number) for each target area (Blanco, Rogue)

Area	Latitude* (N)	Longitude* (W)	Water** depth (m)	Heavy*** mineral (%)	Gold# content (ppb)	Magnetic## anomaly (gamma)	Sediment+ thickness (m)	Topographic feature/ Mineral source	Target++ objective
Cape Blanco Area									
Blanco 1	42° 53.5'	124° 35.3'	50	>30	20	15	0-15	N. side paleoheadland, Sixes R.	HM, MG, Au
Blanco 2	42° 53.9'	124° 34.7'	<36	10-30	5-20	50	16	N. side paleoheadland, Sixes R.	HM, MG, Au
Blanco 3	42° 51.1'	124° 36.1'	33	10-20	>100	15	0-16	Bathymetric high headland	HM, MG, Au
Blanco 4	42° 49.4	124° 36.9	35	10-20	50	25-30	16-25	S. side paleoheadland	HM, Au, MG
Blanco 5	42° 50.0'	124° 36.0'	30	>30	50	NA	0-16	S. side paleoheadland, Elk R.	HM, Au
Blanco 6	42° 46.5'	124° 34.0'	33	10-20	NA	NA	0-16	S. side bathymetric high, Elk R.	HM
Blanco 7	42° 43.0'	124° 29.0'	24	<10	50	NA	0-16	Paleo-shoreline/headland	Au
Blanco 8	42° 46.5'	124° 32.2'	18	<10	0-10	NA	0-16	Offshore Mouth Elk River	Au
Rogue River Area									
Rogue 1	42° 23.5'	124° 26.5'	16	10-20	>100	125	16-20	Proximity to Rogue R. source	HM, MG, Au
Rogue 2	42° 23.7'	124° 27.8'	31	20-30	10	210-355	0-16	Proximity to Rogue R. source	HM, MG, Au
Rogue 3	42° 25.7'	124° 33.3'	67	20-30	5	200-255	20	Paleo-shoreline/river channel	HM, MG, Au
Rogue 4	42° 19.6'	124° 27.0'	25	20-30	NA	NA	16-25	Paleo-shoreline, south drift	HM
Rogue 5	42° 20.3	124° 26.8	22	10-20	NA	125-140	16-25	Paleo-shoreline, south drift	HM, MG
Rogue 6	42° 35.5'	124° 25.5'	36	<10	10-20	40	25	Paleo-shoreline, north drift	MG, Au
Rogue 7	42° 34.4'	124° 28.1'	51	10-20	NA	225	16	Paleo-shoreline, north drift	HM, MG
Rogue 8	42° 22.9'	124° 29.4'	45	10-20	NA	230	0-16	S. side rocky reef/paleoheadland	HM, MG
Rogue 9	42° 22.8'	124° 29.5'	48	10-20	NA	205	0-16	S. side rocky reef/paleoheadland	HM, MG

Explanation of Symbols

*Center of target area. Navigation was old Loran A with errors up to 1-2 km. Latitude (and water depth) most accurate position.

**Water depth in meters. Most reliable indicator of location in east west direction; target location best defined by water depth & latitude

***Heavy mineral concentrations in surface sediments at target site

#Gold content from Clifton, 1968 analysis of surface sediments

##Magnetic anomaly measured in gammas (regional magnetic field subtracted)

+Sediment thickness in meters from sediment overburden map

++Primary objective for target: HM=heavy mineral concentration; Au=gold content; MG=magnetic anomaly

VESSEL

Based on a combination of factors, including physical attributes, availability and cost, the Task Force chose the charter research vessel, M/V Aloha as a platform for the cruise. The vessel is operated by International Underwater Contractors and berthed in Ventura, California. The physical attributes of M/V Aloha are summarized in Table 2. The prime requisites were the 29-foot A-frame, which could deploy the vibracore/vibralift system; the amount of open deck space, which could be used to store and deploy the various sampling systems; the number of berths available to the scientific party, of which at least sixteen were required; and the presence of a bowthruster, which would simplify station-holding during vibracore/vibralift operations. Other physical factors affecting the choice of the vessel included winch and crane placement options and the presence of usable laboratory space.

Sampling systems and equipment were placed on the main (01) and boat (02) decks as shown in Figure 3. Geophysics controls, power sources, and data acquisition systems were mounted in the laboratory. The short baseline navigation system was mounted in the navigation room, beneath the bridge, and monitors were placed on the bridge and in the laboratory. The sampling systems were deployed using a system of winches and davits configured to avoid rerigging during operations. The sampling systems and their deployment modes are summarized in Table 3.

NAVIGATION

The navigational system used on the M/V Aloha cruise, A1 90WO, was an 80386 DOS-based system using inputs from a DECCA 540 Del Norte transponder ranging system and an Ashtech Model XII GPS receiver. Del Norte was used for the majority of the cruise because of its better positioning accuracy. GPS was used only when the ship was out of range of the land based transponder stations or in areas of poor station geometry, *e.g.* along baselines between stations. The positioning accuracy of the Del Norte system is about 5 meters when three or more of the stations were used for the ranging calculations. GPS accuracy for this cruise was calculated by comparing 40,696 pairs of good Del Norte fixes with GPS fixes. The mean difference was about 21 meters, with a standard deviation of 17 meters. Loran C was also used selectively.

Seven different Del Norte shore transponder locations were used during the cruise. Three of them were located directly on bench marks; two were within 33 meters of a benchmark and were located by tape measurement and theodolite and cross-checked by azimuth to a distant benchmark or feature; another was located by resection with 5 other features; and the last, a temporary station used only briefly, was measured from a topographic quadrangle map.

The DOS computer system gave a real-time numerical and graphical display that was used by the helmsman for line following and station re-occupation. Most station keeping was done by maneuvering the vessel about a temporary, bottom-anchored buoy. Del Norte positions were calculated by the computer program from the known locations of the shore transponders and the ranges. GPS positions were calculated by the Ashtech receiver and used by the computer program without modification.

CRUISE INDEX AND LIST OF PARTICIPANTS

A Cruise Data Index, indicating the time, location, and where appropriate, the water depth of sampling or other data acquisition, and a list of participants are appended to this report (Appendices A and B, respectively).

Table 2. Physical Attributes of M/V Aloha

Attribute	Quantifier
Length, overall	143 feet
Beam	32 feet
A-frame	29 feet
Crane	30-50 feet
Aft deck area	1700+ square feet
Berths	22, 25 as used
Bowthruster	250 horsepower
Generators	2 @ 75 kw each
Compressed air	250 CFM @ 150 PSI (added)
Laboratory	200 square feet
Navigation room	80 square feet
Rigid-hull inflatable	12 feet

Table 3 . Sampling Systems and Deployment Modes

System	Mode of Deployment
Seismic sound sources	Manual, off fantail
Hydrophones	Manual, off fantail
Magnetics fish	Magnetics winch (02 deck), A-frame
Side-scan sonar fish	Side-scan winch (02 deck), A-frame
Vibracore/Vibralift	Main winch, pneumatic winches (01) deck, A-frame
Grab sampler	Winch on port A-frame (01 deck)
Beam, otter trawls	Dual drum winch (02 deck), A-frame
Crab pots	Pneumatic winch (01 deck), off fantail

GEOPHYSICAL SURVEYS

MAGNETOMETER SURVEYS

Methods

Magnetic survey data were acquired at sea in eight separate surveys during the cruise. Six of the surveys were in the Cape Blanco area and two surveys were in the Rogue River area near the town of Gold Beach. An onshore magnetic base station at Sister's Rocks recorded time variations in the magnetic field during the entire cruise. Figure 4 summarizes the location of the magnetic survey tracks and the magnetic base station. The nominal trackline spacing is 300 meters in the Cape Blanco North area and 600 meters in the other survey areas. Figures 5 through 8 show the track locations in the four separate survey areas.

The magnetic data were acquired with a Geometrics G-811 magnetometer with a resolution of 0.01 nanotesla (nT) and recorded at approximately one-second intervals on the USGS data acquisition system. The navigation equipment and techniques are described above in the Navigation section of this report. The magnetic sensor was towed approximately 180 meters behind the ship (218 meters astern of the Del Norte Navigation antenna) to reduce interference from the ship's magnetic field.

Because of the relatively shallow water in the survey areas, a large float was attached to the sensor. This limited the sensor to a maximum depth of 15 meters. The Geometrics acquisition system indicated that the sensor depth varied from three to seven meters while underway on survey lines and dropped to nine to ten meters during turns. Sensor depth was not recorded digitally.

The magnetic base station, a Geometrics G-856 magnetometer with extended memory, was supplied and was operated by Oregon State University. Magnetic base station values were measured every two minutes and recorded in the G-856 internal memory during the entire cruise.

Magnetic Data Processing

Preliminary processing and analysis of the magnetic data were accomplished onboard. After the cruise, the diurnal magnetic variations recorded by the magnetic base station were removed and the data reprocessed.

The onboard processing consisted of 1) editing the navigation data to remove bad fixes, 2) merging the navigation and magnetic data including sensor tow-distance correction, 3) removing a regional field, and 4) plotting profiles and contour maps.

The navigation data were checked by screening for unlikely speed variations and plotting the ship tracks. Bad fixes were removed by hand editing the navigation data. Only Del Norte fixes were used for navigation. The latitude and longitude of the fixes were converted to UTM coordinates. The UTM coordinates of the location of magnetic measurements were calculated by linear interpolation between fixes based on time. The tow-distance correction was calculated by looking backwards along the ship's track for an amount of time equal to the ship's speed divided by the tow distance. (Note that this technique does not accurately recover the sensor position during turns.) The UTM coordinates of each magnetic measurement were converted to latitude-longitude. Magnetic anomaly values were calculated using a regional magnetic field correction from the IGRF-1985 (IAGA Division I, Working Group I, 1986) with the appropriate time terms. Profiles of magnetic anomalies projected along the ship tracks were plotted at a scale of 1:40,000. These profile plots provided both a check on data quality and a useful preliminary interpretation tool. The last step in the onboard processing was to grid the survey data using minimum curvature and plot contours at a scale of 1:40,000.

Five of the eight separate surveys cover the northern part of the Cape Blanco area. More than a week elapsed between the first and last surveys in this area. When the surveys were combined, mis-ties between the separate surveys were as large as 30 nT and caused spurious patterns in the contour map commonly referred to as "chevroning." Most of the mis-tie between surveys was caused by diurnal variations which were largely removed during the post-cruise processing using the magnetic base-station data.

A total of 384.3 km of magnetometer survey lines were run during the cruise. The distribution of these lines is shown in Figures 4 through 8. The data derived from these surveys indicate locations of magnetic anomalies. By evaluating the intensity, size, and shape of the anomalies, we can determine if they are produced by fossil beach or other concentrations of magnetite in the sediment or by magnetic minerals in the bedrock that underlies the sea floor.

HIGH-RESOLUTION SEISMIC PROFILING

A high-resolution seismic profiling system was employed during the cruise (Fig. 9) to establish and record: (1) sea-floor bathymetry (Fig. 10); (2) bottom conditions of sediment or exposed bedrock (Fig. 10); (3) thickness of unconsolidated sediment above bedrock (for isopachous mapping) (Fig. 10); (4) internal structures within unconsolidated sediment package; (5) warps, faults and/or channel cuts associated with the underlying bedrock wave-cut platform (Fig. 10); and (6) folds and/or faults associated with shallow basement rocks. As outlined above, all of the seismic track lines within the Cape Blanco and Rogue River target areas (a total of 198 km) were precisely navigated by the onshore transponder system. Two longer seismic track lines (Fig. 9) were run between Cape Sebastian and Humbug Mountain and between Cape Blanco and Cape Arago to constrain regional inner-shelf tectonic deformation adjacent to the target sites. These two lines, 13.8 and 69.9 km long, respectively, were navigated by Loran C.

The equipment used for the seismic profiling included (1) two Ferranti Ocean Research Equipment (ORE) Model 5210 A GeoPulse[R] power source and receiver units, each producing a broad sonic pulse of 175 J at a 0.25 second repetition rate, (2) one Datasonics Bubble Pulse System composed of a Model BPS-530 Bubble Pulser Power Supply and a model BPV-520 Sound Source producing a narrow sonic pulse of 30 J, centered at 400 Hz, at a 0.25-second repetition rate, and (3) a Model BPR-510 Bubble Pulser Receiver, .

The seismic power supply units were run on the ship's electrical supply (220 and 110 v). The sound source plates were deployed on a catamaran (ORE plates) and a modified surfboard (Bubble Pulse) separated by about 5 m, at a towed distance of 10 m behind the ship's stern. A Benthos hydrophone, with 30 elements over a 5-m active section, was towed at a distance of about 30 m astern the ship, between the sound sources. The incoming signal was filtered with high and low band pass filters to include only frequencies between 500 and 3,000 Hz. The incoming signal was recorded digitally and by analog EPC recorders at 0.25 second sweep rates. All records were annotated for time (generally at 5-minute intervals) and infrequently for the ship's position from the navigation system display terminal in the ship's lab.

The resulting seismic records are of exceptionally high quality, allowing for the completion of stated objectives above. Initial interpretations of seismic profiles in the Cape Blanco (Figs. 11 and 12) and Rogue River (Figs.13 and 14) target areas were performed during the cruise to select coring and biological trawl sites. Final interpretation and analysis of the records is presently underway.

SIDE-SCANNING SONAR

The side-scanning sonar provides an image of the sea floor that can delineate rock outcroppings or the texture of the bottom sediment. Waves and currents shape unconsolidated sand and gravel into ripples and dunes. The size and shape of these bedforms depends on both the nature and velocity of the current and the grain size of the sediment. Waves, in particular, generate relatively straight-crested ripples on the shelf that are oriented with crests more or less parallel to the shoreline. The size of these ripples depends strongly on the size of the material moved by the wave-generated currents. In fine sand, the ripples typically have a spacing of no more that a few decimeters and are no more than a centimeter or two high. Such ripples are too small to be resolved with the side-scanning sonar systems used in this cruise. In contrast, under the action of waves, gravel typically is shaped into much larger bedforms, spaced a meter or more apart and several decimeters high. Ripples of this size are readily resolved on a side-scanning sonar image (Fig. 15), and the profile can be used to delineate the distribution of the coarser sediment, which has relevance not only to the occurrence of placer minerals but also to the distribution of bottom fauna.

The side-scanning sonar systems deployed from the M/V Aloha included a Klein 531 system and an EE&G 272 system as backup. Each of these systems was used in different places to image the sea floor to a distance of 100 m on either side of the vessel.

Side-scanning sonar surveys were conducted in the Cape Blanco West (Fig. 16) and Cape Blanco South (Fig .17) areas to identify sea floor rock outcroppings and bottom sediment texture in advance of biological trawling in these areas. A total of 188 km of side-scanning sonar trackline was completed on the cruise.

SAMPLING

Sampling during the cruise collected material from the surface and from within the sediment column. Samples of surficial sediment were collected using a 0.1-m^2 Smith-McIntyre grab sampler, primarily for examination of benthic biology, but also to provide samples for mineralogic comparison with those taken previously in the same locations and for heavy metals analysis. Both vibracore and vibalift systems (described in detail below) were used in attempts to sample the sediment column. The location of all samples taken in the Cape Blanco West target area is shown in Figures 18 through 24, in the Cape Blanco South target area in Figures 25 through 27, and in the Gold Beach South target area in Figures 28 through 31.

DRILL SAMPLING PROGRAM

Technical support for the drill sampling program was provided by the Marine Minerals Technology Center, Continental Shelf Division (MMTC/CDS), University of Mississippi. The MMTC/CSD considered several factors in selecting the appropriate drill system for the sampling phase of this project. These factors included the severe sea conditions possible on the Oregon coast, the probable sediment characteristics based on knowledge of onshore deposits, and the attributes of the project vessel M/V Aloha.

The system chosen for the project was a pneumatically powered, convertible vibralift/vibracore drill, an MMTC/CSD design equipped with a unique drill feed drive. The vibralift/vibracore drill can be used in two different modes, as either a vibracore device where a continuous core of relatively undisturbed sediment can be recovered, or as a vibralift system where a slurry of sediment and water over discrete depth intervals is recovered. The drill feed is able to assist in penetration in either configuration with an available pulldown force of about 1,100 kg (2,500 lbs.), and, with the aid of vibration, it is also able to remotely extract the barrel from sediment. This semi-remote operation of the drill using the feed system permits use of the vibralift/vibracore drill in rougher sea conditions than is possible with most conventional sampling devices.

Vibralift/Vibracore System: The vibralift/vibracore drill, capable of sampling to 6 meters (20 feet), has a self-supporting frame and a NAVCO BH-8 pneumatic vibrator mounted to the barrel as the principal drive component for penetration of sediment. The drill frame is constructed with a center guide beam mounted to a heavy steel base (about 680 kg, 1,500 lbs.) and supported by four guy wires (Fig. 1a). Total weight of the system is approximately 1,600 kg (3,500 lbs.). The guide beam consists of a modified feed system of an Ingersoll-Rand Crawlair rock drill; this pneumatically powered, chain driven feed system allows the vibralift/vibracore barrel to be raised or lowered along the guide beam with a force of about 1,100 kg (2,500 lbs.).

In the pulldown mode, this force provides significant assistance in penetration during vibracoring or vibralifting. The feed system can also aid in the extraction of the barrel from the sediment, although vibration is additionally required since extraction loads may reach as much as 3,600 kg (4 tons). As vibration is detrimental to the recovery of unconsolidated samples, the full capability for remote extraction exists only when operating in a vibralift configuration.

A transducer from a Raytheon DE-719B recording fathometer is mounted near the top of the barrel to aid in determining the position of the barrel relative to the sea floor. As the system rests on the sea floor prior to the commencement of drilling, the fathometer registers a depth of approximately 6 meters (20 feet), the distance from the top of the barrel to the sea floor. As drilling proceeds, the depth indicated on the fathometer record decreases toward zero as full penetration is approached.

Vibralift Operation: When the system is configured to operate as a vibralift drill, the vibrator is equipped with a dual-walled barrel constructed of standard NW and HW drill casing, 7.6 cm (3 inches) and 10 cm (4 inches) I.D., respectively (Figures 32 and 33). Water is injected into the annular space of the barrel and enters the interior of the inner barrel through holes drilled in the wall of the inner casing near the cutting shoe. The water flows upward, helping to slurry the sediments and lift them toward the surface. Simultaneously, air is injected into the inner casing through a manifold near the top of the barrel (Figure 33). The air rises rapidly upward creating an airlift effect, which raises the slurry of sediment and water through an eductor hose to the surface.

Once the vibralift drill system is lowered from the vessel and reaches the sea floor, air and water pressure are activated, and the feed system is engaged to apply a downward force to the barrel. As the barrel penetrates the subbottom, the slurry is propelled upward and is subsampled at appropriate intervals. Once aboard the vessel, the slurry flows into a dewatering cone where a 70-80% solid sediment mixture can be sampled. The overflow from this cone is directed into a smaller dewatering cone where finer sediment can be sampled. Tests have shown that the dual-cone system is capable of reliably recovering heavy minerals to a size as fine as 200 mesh (0.074 mm). Following completion of the sampling, the feed system, with the aid of vibration, is engaged to extract the barrel from the sea floor.

Vibracore Operation: The vibralift drill can be converted for use as a vibracore device in approximately one to two hours (Figures 34 and 35). The conversion is accomplished by removing the inner length of NW casing from the dual-walled barrel. The outer length of HW drill casing is retained as the vibracore barrel. A 9.27 cm (3.65 inch) O.D. plastic tube is inserted into the barrel as a core liner, and a core retainer is inserted in its lower end. The liner and retainer are then secured in place by screwing a cutting shoe onto the end of the barrel. The final step is to replace the vibralift air manifold with a ball valve to assist in core retention (Figure 35). The vibrator and barrel assembly is attached to the guide beam by means of a hinged plate. The hinge allows the core barrel to be laid across the deck in order to facilitate insertion and removal of core liners.

The pneumatic vibrator provides impact, vibration and weight which combine to fluidize the sediment and assist in driving the barrel downward. The feed system also provides a significant downward drive component as noted earlier. Once penetration ceases, the core retainer and ball valve help to minimize sample loss during extraction and retrieval of the drill system. The vibracore drill is retrieved from the sea floor using shipboard winch power. After the drill is secured to the deck, the core barrel retainer ring is unlatched and the barrel is pivoted forward and lowered to a near horizontal position on the deck. In this position the cutting shoe can be unscrewed and the core retainer and liner can be withdrawn.

Problems Encountered: The principal problems encountered during the sampling were caused by the rough sea conditions prevalent in the area. Although the vibralift/vibracore drill system is capable of semi-remote operation, the drill ship must remain within a 10-m (30-foot) radius of the drill site. In calmer waters, the ship was able to maintain its position over the site using the bow thrusters and main engine. In harsher weather, it is generally necessary to anchor into the dominant vector of wind or current from the bow and use a stern anchor or thruster to maintain position on the arc of the bow anchor. Unfortunately, the M/V Aloha was not configured for this mode of operation.

During the initial tests of the vibracore drill offshore of the Rogue River, the vessel drifted off site and the lower 10-foot section of the vibracore barrel was broken off at the joint. As the ship's crew became more familiar with the drilling procedure, several sites in this area were sampled using the vibralift drill. Two attempts were made to drill in the rougher sea conditions and strong currents off Cape Blanco, but on both occasions the ship was unable to hold position. On the second attempt, the drill was able to penetrate two meters, but the ship shifted off position and the eductor hose parted.

A significant problem with the drill system design was the large number of air supply and exhaust hoses required to operate the various drill functions (six hoses are needed to control the vibralift and four are required for the vibracore). In water depths greater than 15 meters (45 feet), the hoses became very difficult to handle. A solution to this problem would be the use of a hose reel in shallow water or conversion of the system to a remotely operated electro-hydraulically powered system for deeper operations.

An added difficulty was the necessity to mobilize and demobilize the heavy drill to provide space for the other research activities during the cruise. This resulted in lost time and crew fatigue. Ideally, a drill of this size is secured to the stern using chain binders so that the forward edge of the base of the drill frame is wedged between two pipe studs welded to the stern. As the drill is retrieved, it is guided between the studs where it is wedged into place and prevented from swinging. In this position, the drill can be rapidly re-deployed by releasing the chain binders and letting out the winch cable.

SHIPBOARD MINERAL CHARACTERIZATION METHODS

Preliminary mineralogical evaluation of the sediments was performed aboard ship by binocular and petrographic optical microscopy. Representative two-liter splits were cored from buckets of one-meter-interval vibralift samples for analysis. Splits were panned to determine the presence of scant heavy constituents. Panned samples were recombined, split to a 100-milliliter fraction, then panned to obtain a prompt weight-percent estimate of "opaques." The opaque fraction contains constituents with a specific gravity greater than 4.0 and therefore may contain valuable minerals including chromite, ilmenite, magnetite, garnet, zircon, gold, and platinum-group metals. Wet-magnetic separation of magnetite, ilmenite, and chromite was performed on these fractions to determine relative weight percents of each. Panned fractions were remixed and split for on-board microscopic characterization of mineral forms and to determine the weight percents of the mid-weight fraction containing iron-magnesium silicate minerals and light minerals of less than specific gravity 3.0. Light constituents are predominantly rock fragments, shell fragments, quartz, feldspar, and mica.

Optical characterization indicates that sediments collected south of Cape Blanco offshore of the Rogue River and Cape Sebastian are predominantly composed of a few percent magnetite, about 25 percent mid-weight and the remainder light constituents. Preliminary analysis indicates there is no significant change in the concentration of heavy minerals with depth to seven meters. The sediment grains are sharply angular, and relatively unaltered indicating that the material is of primary and local origin. Grain size of the sand is fine (0.125-0.25 mm), with the bulk of the sediments apportioned into the minus-65- by plus-150-mesh range (0.212-0.105 mm).

Samples collected to one-meter depth, west and north of Cape Blanco, contain greater proportions (approximately 10 percent maximum) of opaque and (up to roughly 50 percent) mid-weight mineral fractions than samples from south of Cape Blanco. Incomplete sampling at these sites due to harsh sea conditions precluded determination of changes in concentration of heavy minerals with depth. Opaque portions have higher concentrations of chromite and ilmenite than those present in sediments collected south of Cape Blanco. Sand size, angularity, and alteration characteristics of these sediments are comparable to those of the sands collected south of Cape Blanco.

BIOLOGICAL STUDIES

OBJECTIVES

1) To obtain preliminary estimates of species diversity and relative abundance of demersal fish, epibenthic invertebrates, benthic infauna, birds, and mammals associated with shallow water areas containing deposits of heavy minerals.

2) To collect and analyze samples in a manner that will help determine an appropriate statistical sampling design to evaluate environmental impacts of mining, should further mineralogical studies be conducted in the target areas.

APPROACH

The cruise sampling plans were designed to provide multiple samples at mineralogical target locations and at locations known to contain no heavy minerals. The biological sampling plans were to provide enough replicate samples to estimate species composition, size composition, density, and relative abundance; and also estimate variability within and between stations, including day/night variability at one station. In a few areas, bottom types were reviewed using side-scan sonar.

Gear used on the cruise included:

- 9 m (headrope) otter trawl
- 3 m beam trawl
- 0.1 m^2 Smith-McIntyre grab
- side-scan sonar
- 7x40 binoculars
- 0.9 m diameter commercial crab pots with 10 cm wide escape ports
- 4 m long inflatable boat

RESULTS

Bird and Mammal Surveys: Birds and marine mammals were surveyed along transects using protocols recommended by the United States Fish and Wildlife Service (Gould and Forsell 1989). The M/V Aloha was used to conduct 150-m-wide belt transects at and between all stations. An inflatable boat was used to conduct 150-m-wide belt transects in the Rogue River-Cape Sebastian region as well. Birds and marine mammals were identified to species level, where possible, and counted; animal behavior was noted when possible.

Bird and mammal survey tracklines covered 351 km during the cruise. The two primary survey areas were located in the vicinity of Cape Blanco and near the Rogue River. Survey areas typically extended from shore to about 8 km offshore, and along shore for 15 km. In addition to the basic coastal transects, surveys were also conducted farther offshore when the M/V Aloha was transiting between the two study sites.

We observed 3,915 birds representing 48 species. None of the birds observed were associated with a rookery; all birds were observed over open water. Bird density averaged 11.2 birds/km of transect. Cassin's auklets (*Ptychoramphus aleutica*) were by far the most numerous bird species observed. Cassin's auklets represented 57% of the birds observed, and were 7.8 times more numerous than the next most abundant species. Table 4 lists bird species observed in the surveys.

We also observed 17 individuals representing 6 species of marine mammals. The harbor porpoise (*Phocoena phocoena*), gray whale (*Eschrichtius robustus*), and the northern sea lion (*Eumetopias jubatus*) were the most numerous. Rookeries and haul-out areas for the northern sea lion are located within 10 km of several of the stations. The number of northern sea lions

Table 4. List of bird species (common names) observed.

Arctic tern	Herring gull	Red-necked phalarope
Barn swallow	Heerman's gull	Red-throated loon
Black-footed albatross	Mallard	Sabine's gull
Black-legged albatross	Marbled murrelet	Sanderling
Black scoter	Mew gull	Sooty shearwater
Bonapart's gull	Northern fulmar	Song sparrow
Brandt's cormorant	Northern harrier	Surf scoter
Brown pelican	Parasitic jaeger	Thick-billed murre
Cassin's auklet	Pacific loon	Thayer's gull
California gull	Pelagic cormorant	Tufted puffin
Common loon	Pigeon guillemot	Unidentified gull
Common murre	Pink-footed shearwater	Unidentified tern
Double-crested cormorant	Pomarine jaeger	Western grebe
Elegant tern	Ring-billed gull	Western gull
Great blue heron	Red phalarope	White-throated sparrow
Glaucous-winged gull	Rhinoceros auklet	White-winged scoter

Table 5. List of marine mammal species (common names) observed.

California sea lion	Harbor porpoise	Steller's sea lion
Grey whale	Harbor seal	Unidentified porpoise

observed may not be representative of the number of animals in the study area because we attempted to stay more than 1.6 km away from all rookeries. Table 5 lists mammal species observed.

Fish Bottom Trawl Surveys: The bottom trawl sampling effort concentrated on fish not normally landed by commercial fisheries. Commercial fish catch data collected by the Oregon Department of Fish and Wildlife will provide enough information about adult fish distributions in the study areas to design further sampling projects. Trawl surveys were designed to learn more about juvenile forms of commercially caught species, and about species not retained by the commercial fishery. We were especially interested in catching forage species.

We used a small mesh net to examine the distribution and relative abundance of juvenile and undersized fish. The primary sampling device was a 3-m beam trawl with a 2.5-cm mesh bag and a 0.6 cm liner in the cod end. At one station a 9-m-wide otter trawl was also used. Trawl locations were centered over heavy mineral target locations. The trawls were towed parallel to isobaths to minimize variation caused by depth. Trawl lengths were determined first by time, then by distance. Initial tows were set and retrieved at 10-30 minute time intervals. Distances towed varied greatly due to wind and currents, so later trawls were set and retrieved at specified coordinates of latitude and longitude in an attempt to make consistent tow lengths of about 1.6 km. Actual distance trawled was obtained by recording the distance the beam trawl wheels moved over ground. We completed 16 trawls, covering a total distance of 23.98 km (Figures 36 through 40).

All fish were identified to the lowest taxonomic category possible, measured to the nearest millimeter (total length), and weighed to the nearest ounce (28.3 gm). Some voucher specimens were saved. Macroinvertebrate species were recorded and vouchered. Carapace lengths and weights for all Dungeness crab (*Cancer magister*) caught in the trawls were also recorded.

We counted 2,367 fish representing 30 species. Species encountered are listed in Table 6. The average catch for all species was 99 fish/km. Speckled sanddabs (*Citharichthys stigmaeus*) accounted for 50% of all fish caught. Other commercially important species caught in numbers included English sole (*Parophrys vetula*), butter sole (*Isopsetta isolepis*), Pacific sanddab (*Citharichthys sordidus*), and sand sole (*Psettichthys melanostictus*). An important prey species, the Pacific sand lance (*Ammodytes hexapterus*), was the second most numerous species caught, representing 26% of the total catch, by number. Dungeness crab were the fourth most abundant species caught in the trawls. Most crab caught in trawls were young of the year, and were in the 20-40 mm size class. Most juvenile crab were caught off Cape Blanco.

In the Cape Blanco South area, side-scanning sonar equipment was used to discern the boundaries of large gravel deposits (Figs. 15 and 17). With the precise capabilities of the Del Norte navigational equipment, we were able to tow the beam trawl over a gravel substrate. The trawl was also towed over a nearby sand substrate at the same depth. The data collected will allow comparisons between adjacent sand and gravel substrates. A much larger catch of fish was observed from the gravel substrate than from the adjacent sand substrate. Trawl catches averaged 409 fish/km over the gravel substrate and 53 fish/km over sand.

Seismic profiling devices showed rock outcrops near several of the geologic target sites. Kelp grew nearby as well. The seismic and side-scan equipment, with observations of kelp beds, indicated a diversity of soft and hard bottom habitats in the general vicinity of the geologic target sites.

Table 6. List of fish species (common names) observed.

Whitebait smelt	Staghorn sculpin	Curlfin turbot
Sandlance	Market squid	Sand sole
Pacific sanddab	Snailfish	English sole
Speckled sanddab	Pacific tomcod	Big skate
Cottid sp.	Northern spearnose poacher	Rock sole
Buffalo sculpin	Lingcod	Cabezon
Petrale sole	Warty poacher	Black rockfish
Butter sole	Osmerid sp.	Night smelt
Juvenile flatfish sp.	Tubenose poacher	Tube-snout
Juvenile *Sebastes* sp.		

Crab Pots: Five commercial crab pots were set out in three locations (Figs. 18 and 28). Each pot was baited with 2 lb. (907 gm) of squid. The first set soaked for about 12 hours just south of the mouth of the Rogue River (Figure 28). One pot contained 1 crab, all the others were empty. After rebaiting, the second set of pots was placed off Cape Sebastian in about 8 m of water (Figure 28). After about a 26-hour set, the pots were pulled and were full of crab. Each pot averaged 11.2 legal male crab. Crab carapace length averaged 17.15 cm, and crab weight averaged 816 gm. None of the pots in the third set, in 8 m of water off Cape Blanco (Figure 18), caught crab for a 24-hour set.

Benthic Infauna: The benthic infauna sampling was designed and executed to meet the biological study goals of generating baseline distributional information and gathering information needed to design detailed benthic environmental studies. In addition, cruise geologists collected subsamples from the benthic grabs for assessing mineralogy, bioturbation, and sediment grain size. Sediment subsamples were also collected for the Oregon Department of Environmental Quality for later analysis of heavy metals.

Benthic samples were collected with a 0.1-m^2 Smith-McIntyre grab sampler. The sampling procedure was to deploy the grab using a winch and A-frame on the port side of the vessel, retrieve the grab, measure sample thickness, and sieve the samples to collect benthic organisms. The majority of samples were sieved at 1.0 mm. Ten grabs from two stations were sieved with 1.0 mm and 0.5 mm nested sieves, yielding an additional 0.5 mm fraction. Meiofauna subsamples were also taken from five grabs at one station by extracting a core 2.88 cm wide by 5 cm deep from the undisturbed surface of each grab. The sieved organisms and meiofauna subsamples were preserved immediately after collection in a buffered 10% formalin solution stained with Rose Bengal, and then transferred to 70% alcohol about one week after the cruise.

Grabs were collected at 13 stations. Several stations in the Rogue (Figs. 28 through 31) and Blanco (Fig. 18) areas and a linear transect consisting of five stations off Cape Blanco (Figs. 18, 20, 21, 22, 23, and 24) were sampled to provide species composition, abundance, and distribution information. Additional information was gathered from grabs at a crab-pot station (Fig.18) and a gravel-bottom station, both near Cape Blanco (Fig. 25, 26, and 27). Sampling was designed to determine the optimum number of sample repetitions per station and to determine the optimum sieve size for processing the samples. Fifteen replicate grabs were collected at one station off the Rogue River. Successive comparison of species recovered and sample variances from these grabs can be used to estimate the optimum number of sample repetitions per station. At two of the stations, the samples were sieved in nested 1.0 mm and 0.5 mm sieves to allow us to determine the more efficient sieve size for sample processing. Table 7 summarizes sampling procedures at the benthic infauna stations.

We collected 68 successful grabs during the cruise. The mean sediment penetration depth of the grabs was 8.7 cm and the mean sediment volume recovered was 5.7 liters. When the samples are identified and enumerated, the data will provide an initial estimate of infauna species densities and assemblage composition for the time of year represented by the samples. Analysis of the information will also help determine the optimum number and distribution of sampling stations per sampling area, the optimum number of sample repetitions per station, and the most efficient sieve size for the study area.

ACKNOWLEDGEMENTS

The cruise was supported by cash and in-kind contributions from the Minerals Management Service, U.S. Geological Survey, U.S. Bureau of Mines, Oregon Department of Fish and Wildlife, Oregon Department of Geology and Mineral Industries, Oregon Division of State Lands, Oregon Department of Land Conservation and Development, and Marine Minerals Technology Center, University of Mississippi. Co-chief Scientists were Ed Clifton of the U.S. Geological Survey and Rick Starr of the Oregon Department of Fish and Wildlife. The capable assistance of the Master and crew of the M/V Aloha is acknowledged. The scientific crew is especially grateful to Oregon State Police and the men and women of the U.S. Coast Guard who assisted us during the cruise, including personnel from the cutters Orcas, Citrus and Acushnet, the Charleston and Rogue River Life Saving Stations, and the North Bend Air Station. The cruise was conducted under the auspices of the joint federal/state Oregon Placer Minerals Technical Task Force. Special thanks are due to Brad Lauback, of the Minerals Management Service, who assisted substantially with the logistics of the cruise.

Table 7. Summary of benthic infauna sampling stations.

Station	Area	# Grabs	Sampling Purposes	#Subsamples Meio.	Geol.	DEQ
1	Blanco	5	Geologic Target Station			4
2	Rogue	15	Geologic Target Station Sample Size Determination Meiofauna Sampling	5		5
3	Rogue	5	Geologic Target Station 0.5/1.0 mm Sieve			4
4	Rogue	5	Geologic Target Station		2	4
5	Rogue	5	Geologic Target Station			5
8	Blanco	1	Crab Pot Station		1	
10	Blanco	5	Transect Station		5	
11	Blanco	5	Transect Station		3	
12	Blanco	5	Transect Station		2	
13	Blanco	5	Transect Station		2	4
14	Blanco	5	Transect Station		2	5
17	Blanco	6	Geologic Target Station 0.5/1.0 mm Sieve		2	1
18	Blanco	1	Gravel Station		1	

Explanation of terms:

Grabs - Number of successful grabs per station
Meio. - Subsamples for meiofauna
Geol. - Subsamples for mineralogy, bioturbation, and/or grain size determination
DEQ - Subsamples for Department of Environmental Quality heavy metals analysis

LITERATURE CITED

Gould, P. F., and D. J. Forsell, 1989. Techniques for Shipboard Surveys of Marine Birds. U.S. Department of Interior, Fish and Wildlife Service Technical Report No. 25.

Kulm, L., 1988, Potential heavy mineral and metal placers on the southern Oregon continental shelf; Marine Mining, v. 7, p. 361-395.

IAGA Division I, Working Group I, 1986, International geomagnetic reference field revision 1985: EOS Transaction of the American Geophysical Union, v. 76, p. 523-524.

FIGURE CAPTIONS

1. General location of areas identified for offshore placer mineral and associated biological research on the southern Oregon shelf.

2. Location of placer mineral targets on the southern Oregon Shelf. Target attributes specified on Table 1.

3. Layout of data acquisition and sampling systems on the main and boat decks of the M/V Aloha.

4. Magnetometer survey lines,southern Oregon target areas.

5. Magnetometer survey lines, Cape Blanco West target area.

6. Magnetometer survey lines, Cape Blanco South target area.

7. Magnetometer survey lines, Gold Beach West target area.

8. Magnetometer survey lines, Gold Beach South target area.

9. High-resolution seismic profile tracklines, Cape Sebastian to Coos Bay

10. Part of a high-resolution seismic profile record from the Gold Beach West target area (between 42° 32.40', -124°26.35' and 42° 32.69' and -124° 26.35'), showing bathymetry, nature of sea floor, thickness of unconsolidated sediment above a fossil wave-cut platform, and a paleochannel cut into bedrock. Vertical scale indicated by horizontal reference lines approximately 15 m apart; horizontal scale as shown.

11. High-resolution seismic profile lines, Cape Blanco West target area.

12. High-resolution seismic profile lines, Cape Blanco South target area.

13. High-resolution seismic profile lines, Gold Beach West target area.

14. High-resolution seismic profile lines, Gold Beach South target area.

15. Part of a side-scanning sonar record from the Cape Blanco South target area (between 42° 46.17', 124° 33.13' and 42° 46.31', 124° 33.13') showing patch of gravel with large ripples surrounded by sea floor composed of fine sand. Upper part of record looks to left of ship (west); lower part looks to right (east). Broad irregularity of the sea floor reflector

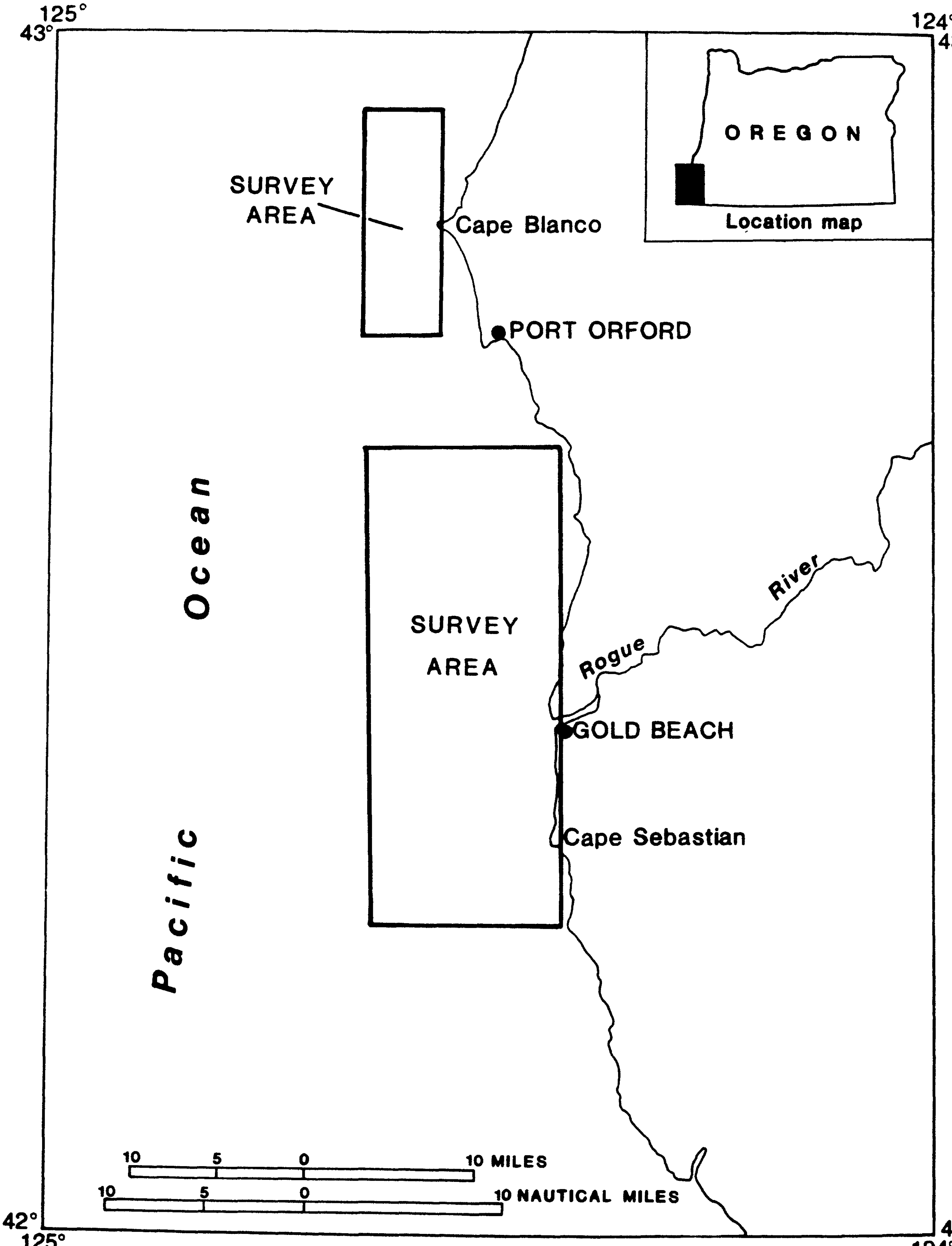

FIGURE 1. AREAS OF OFFSHORE RESEARCH ACTIVITY

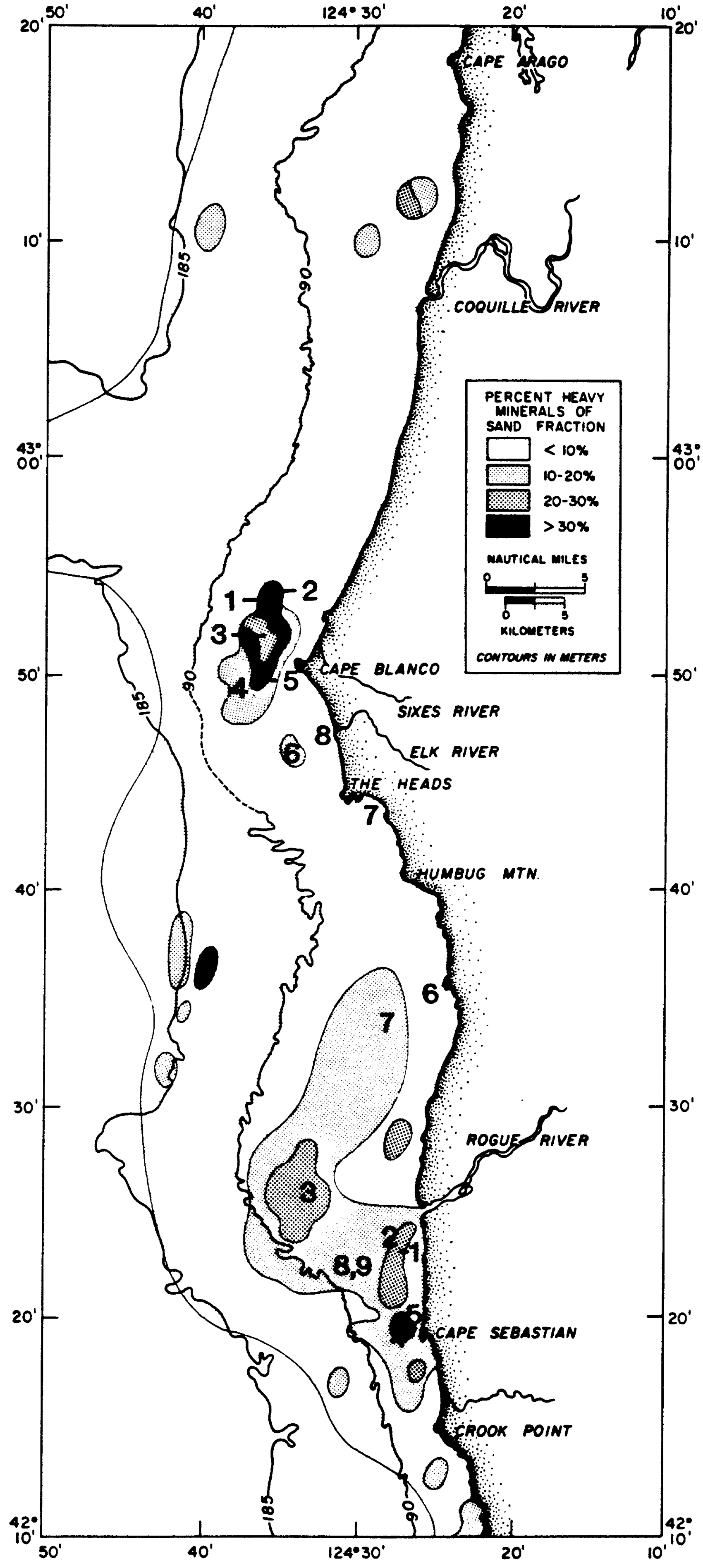

FIGURE 2. PLACER MINERAL TARGETS, SOUTHERN OREGON SHELF

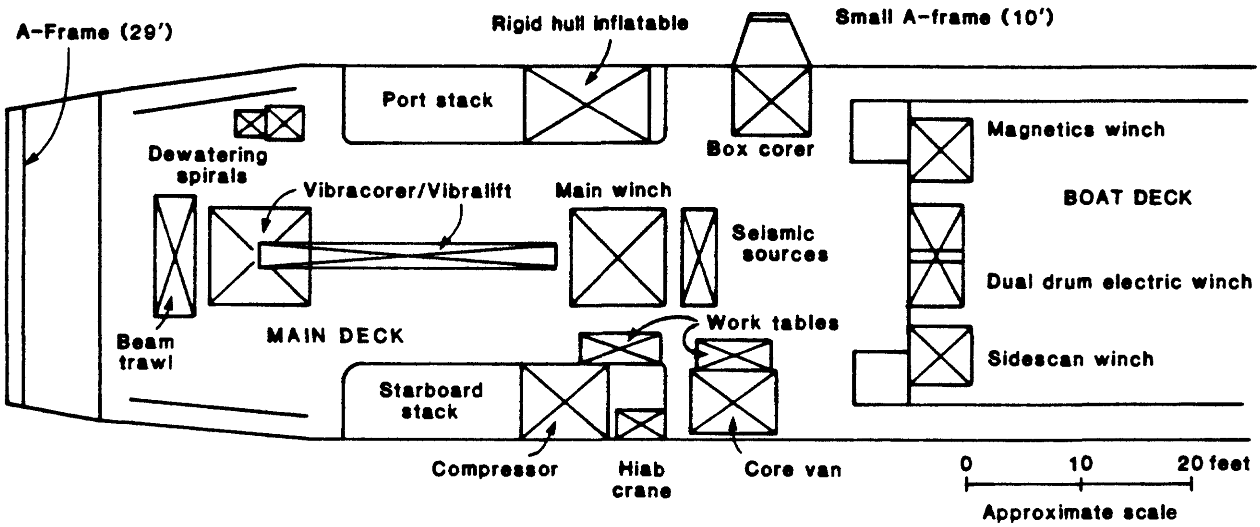

FIGURE 3. LAYOUT OF DATA ACQUISTION AND SAMPLING SYSTEMS, M/V ALOHA

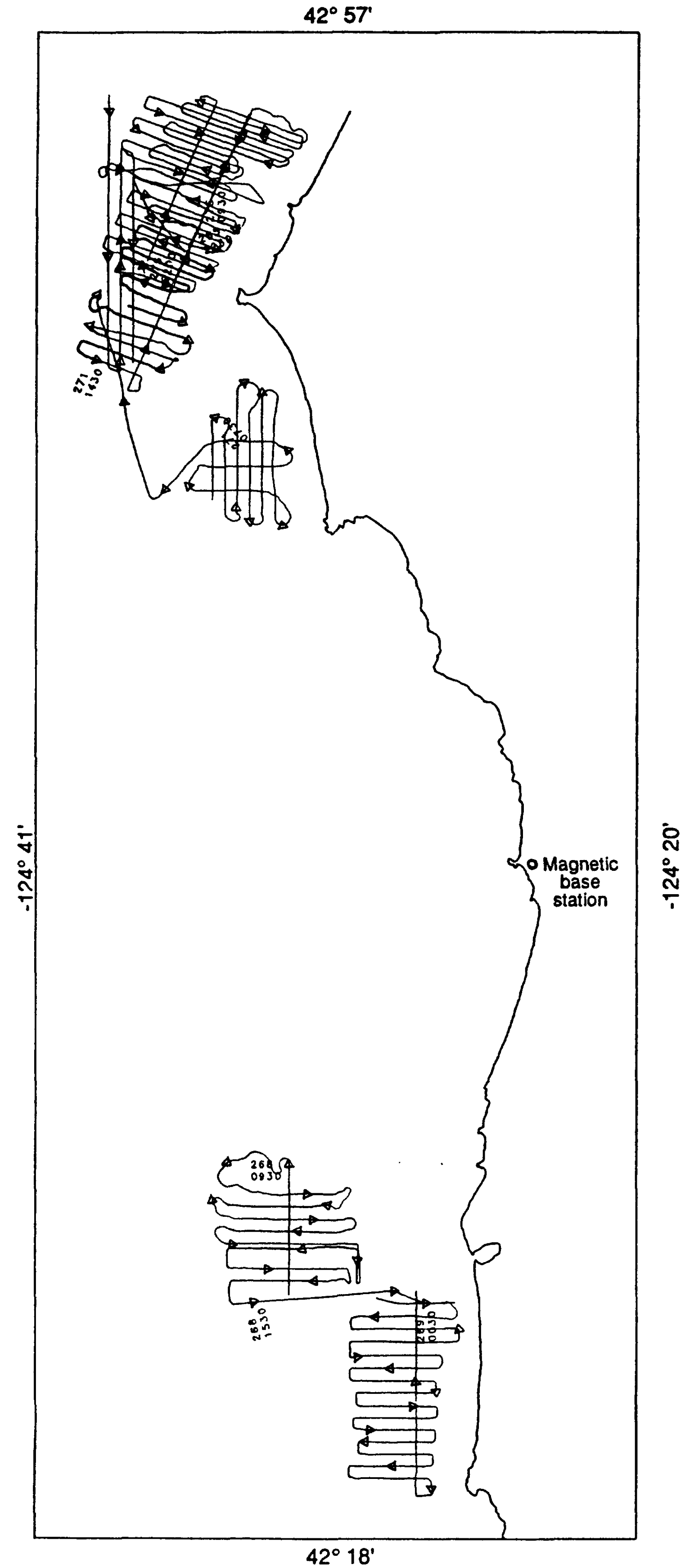

FIGURE 4. MAGNETOMETER LINES, SOUTHERN OREGON

MAP SCALE 1:250,000

0 ___ 20 km

0 ___ 10 nm

MERCATOR PROJECTION

STANDARD PARALLEL = 42.6167°

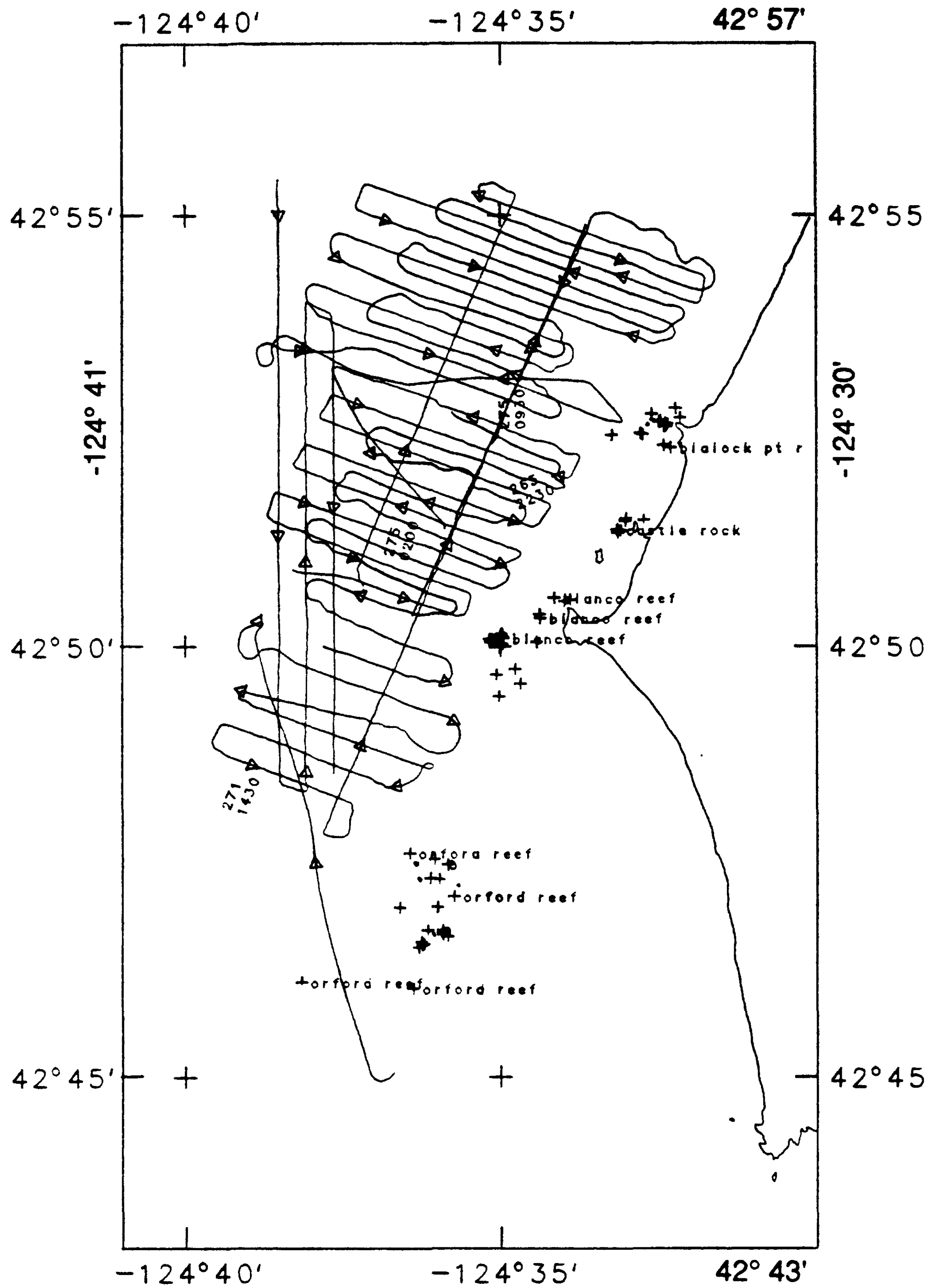

FIGURE 5. MAGNETOMETER LINES, CAPE BLANCO WEST

MAP SCALE 1:150,000

0 10 km

0 5 nm

MERCATOR PROJECTION STANDARD PARALLEL = 42.7833°

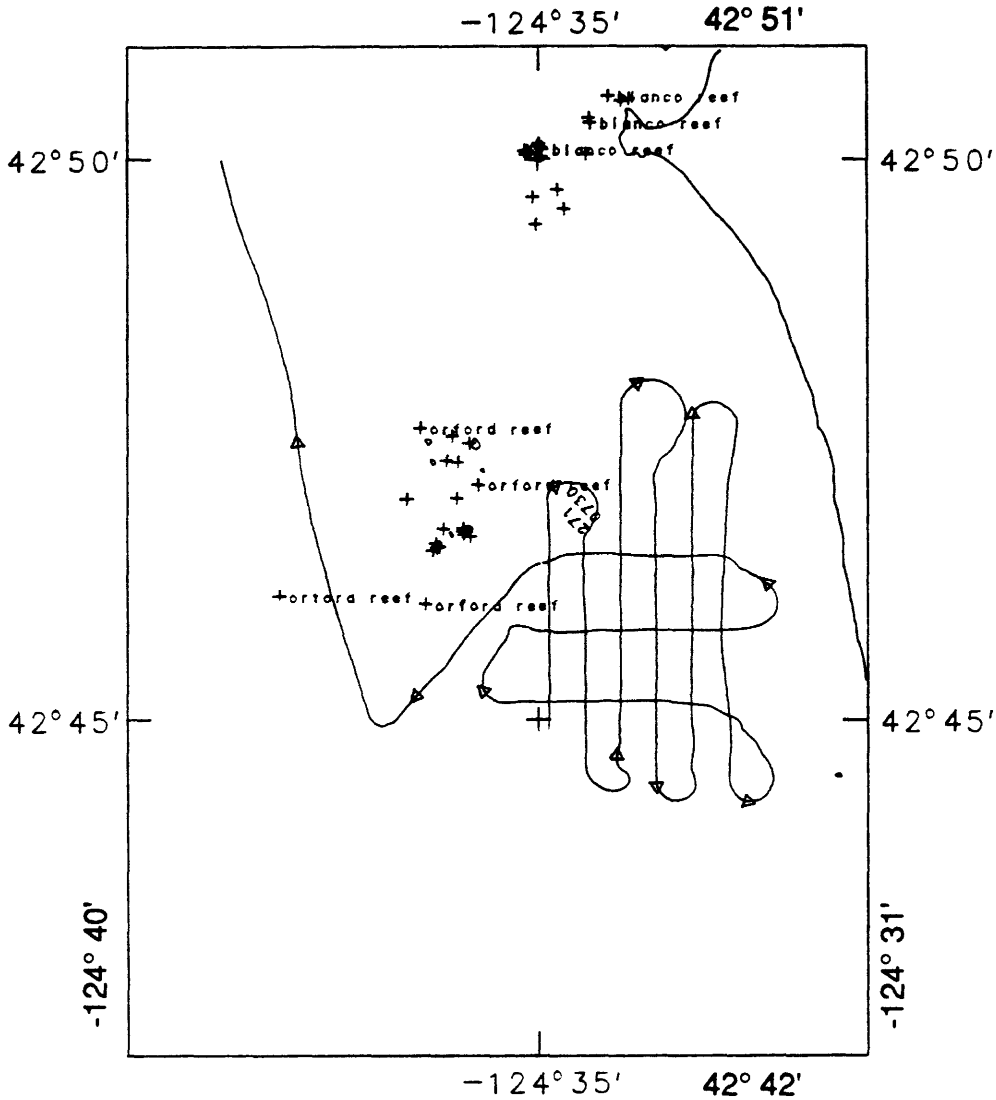

FIGURE 6. MAGNETOMETER LINES, CAPE BLANCO SOUTH

MAP SCALE 1:125,000

0 10 km

0 5 nm

MERCATOR PROJECTION STANDARD PARALLEL = 42.7833°

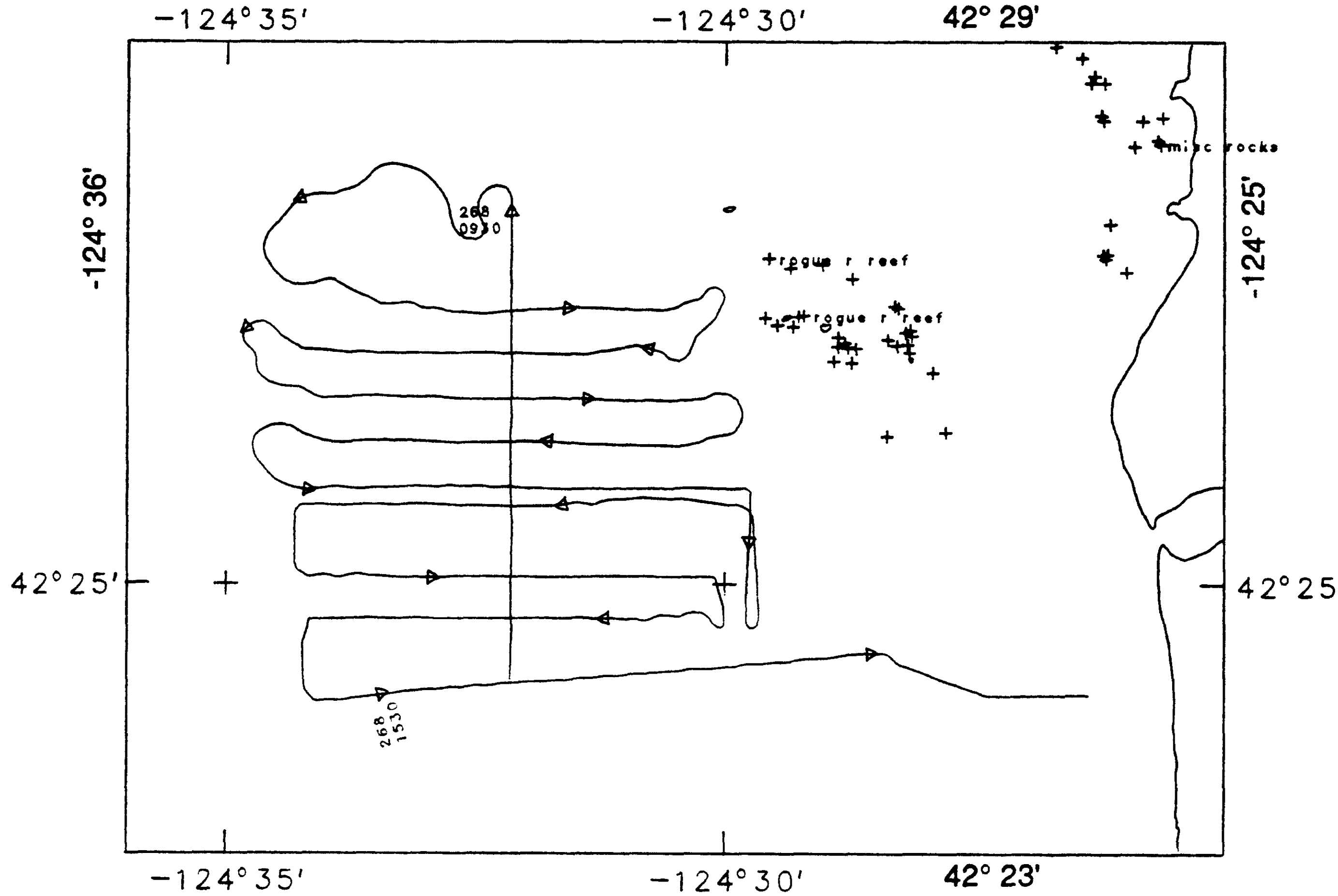

FIGURE 7. MAGNETOMETER LINES, GOLD BEACH WEST

MAP SCALE 1:100,000

0 10 km

0 5 nm

MERCATOR PROJECTION STANDARD PARALLEL = 42.5000°

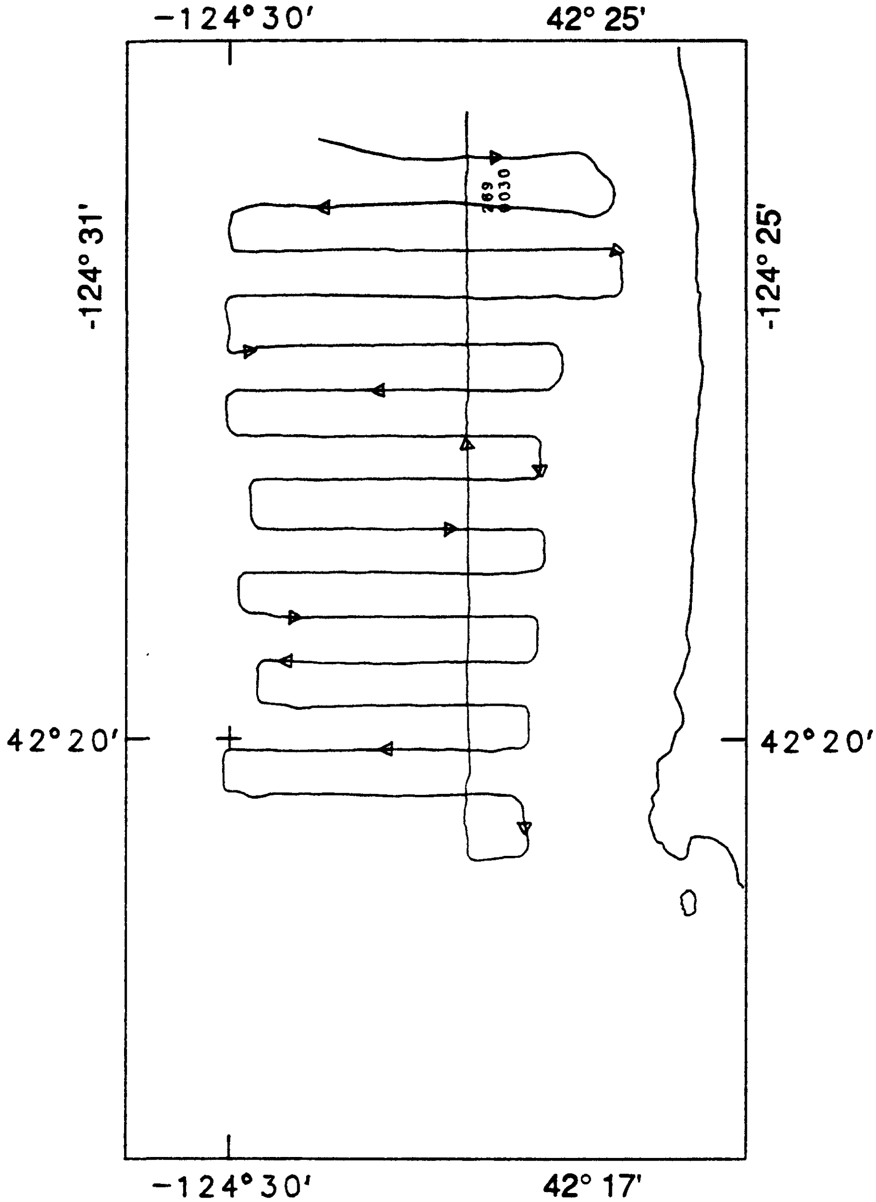

FIGURE 8. MAGNETOMETER LINES, GOLD BEACH SOUTH

MAP SCALE 1:100,000

0 10 km

0 5 nm

MERCATOR PROJECTION STANDARD PARALLEL = 42.5000°

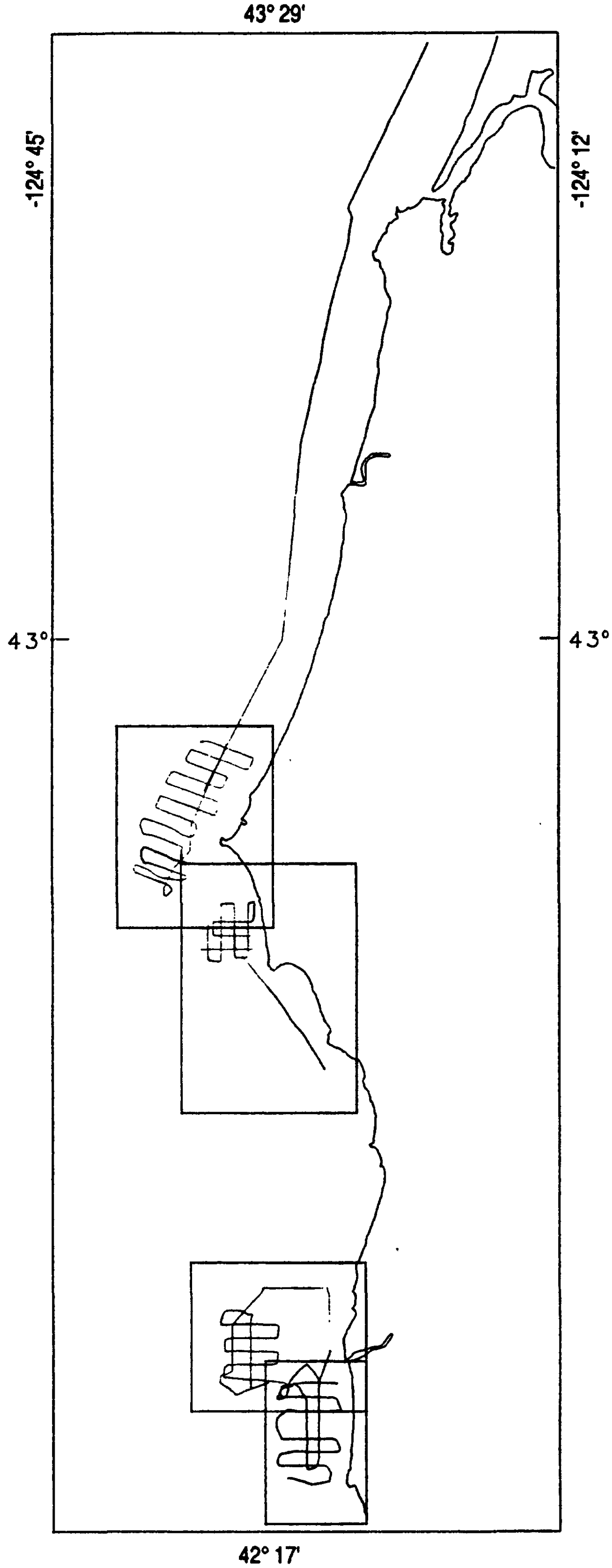

FIGURE 9. SEISMIC LINES, GOLD BEACH TO COOS BAY

MAP SCALE 1:500,000

0 25 km

0 15 nm

MERCATOR PROJECTION STANDARD PARALLEL = 42.1800°

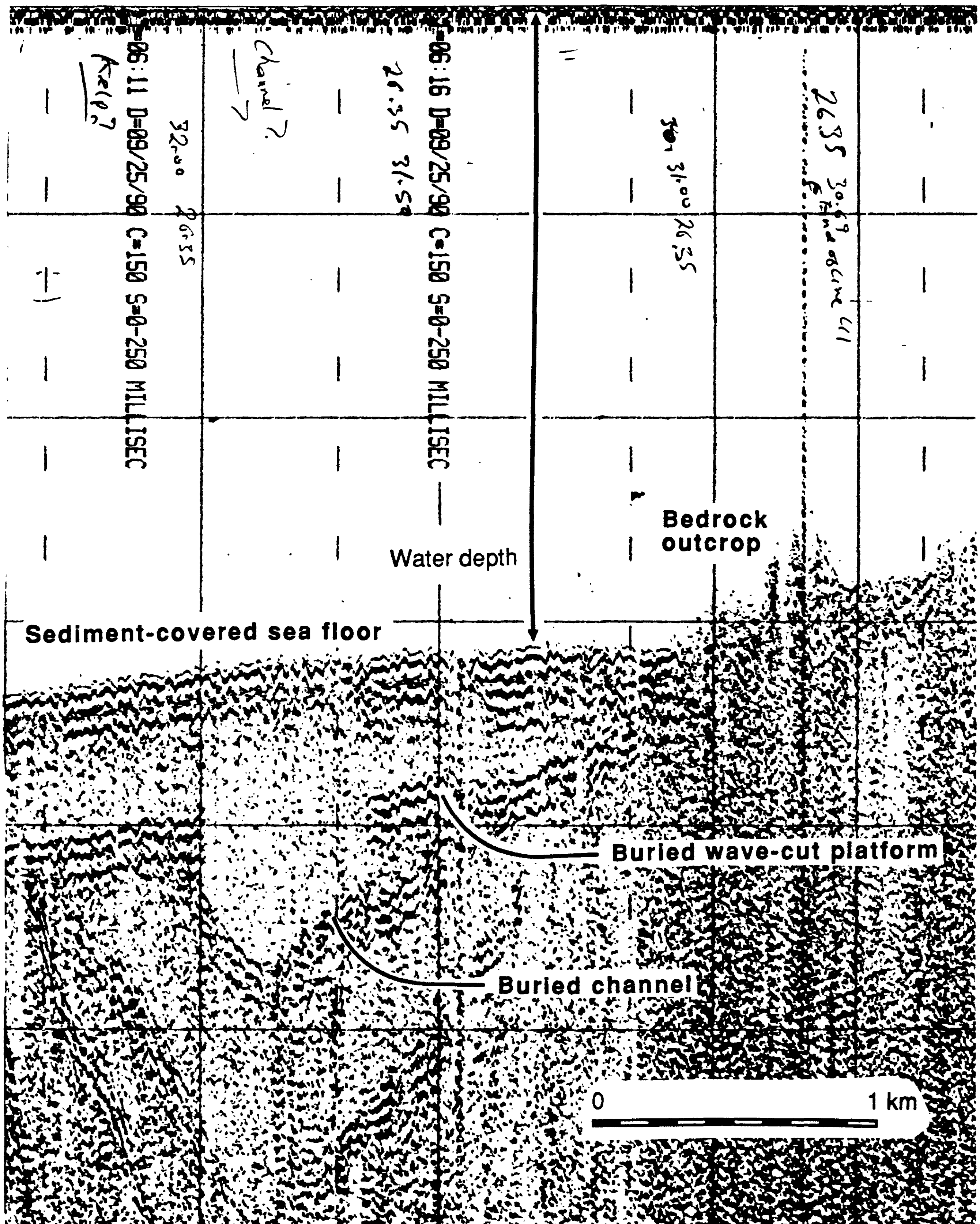

Figure 10. Portion of a high-resolution seismic profile, Gold Beach West.

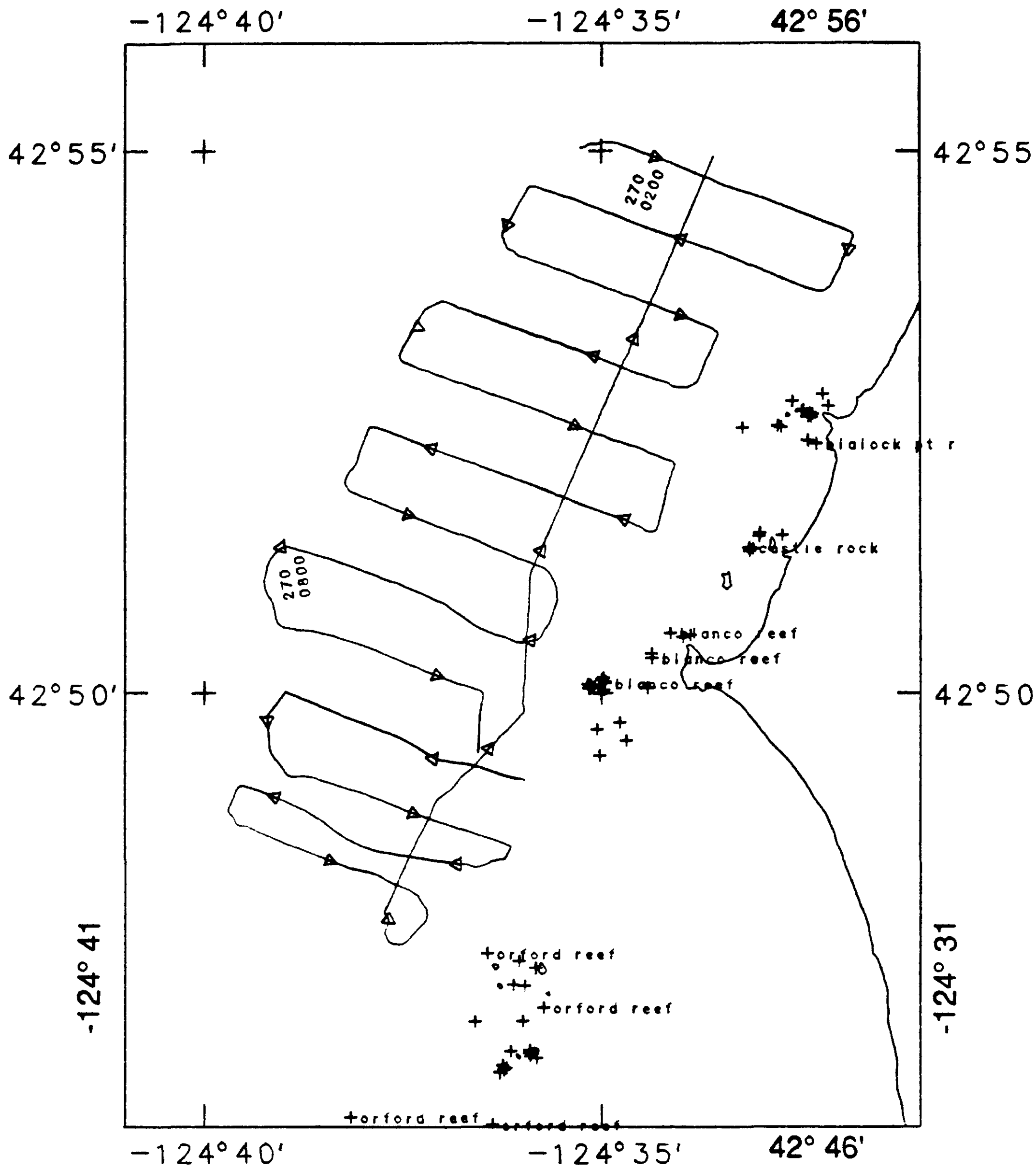

FIGURE 11. SEISMIC LINES, CAPE BLANCO WEST

MAP SCALE 1:125,000

0 10 km

0 5 nm

MERCATOR PROJECTION STANDARD PARALLEL = 42.7833°

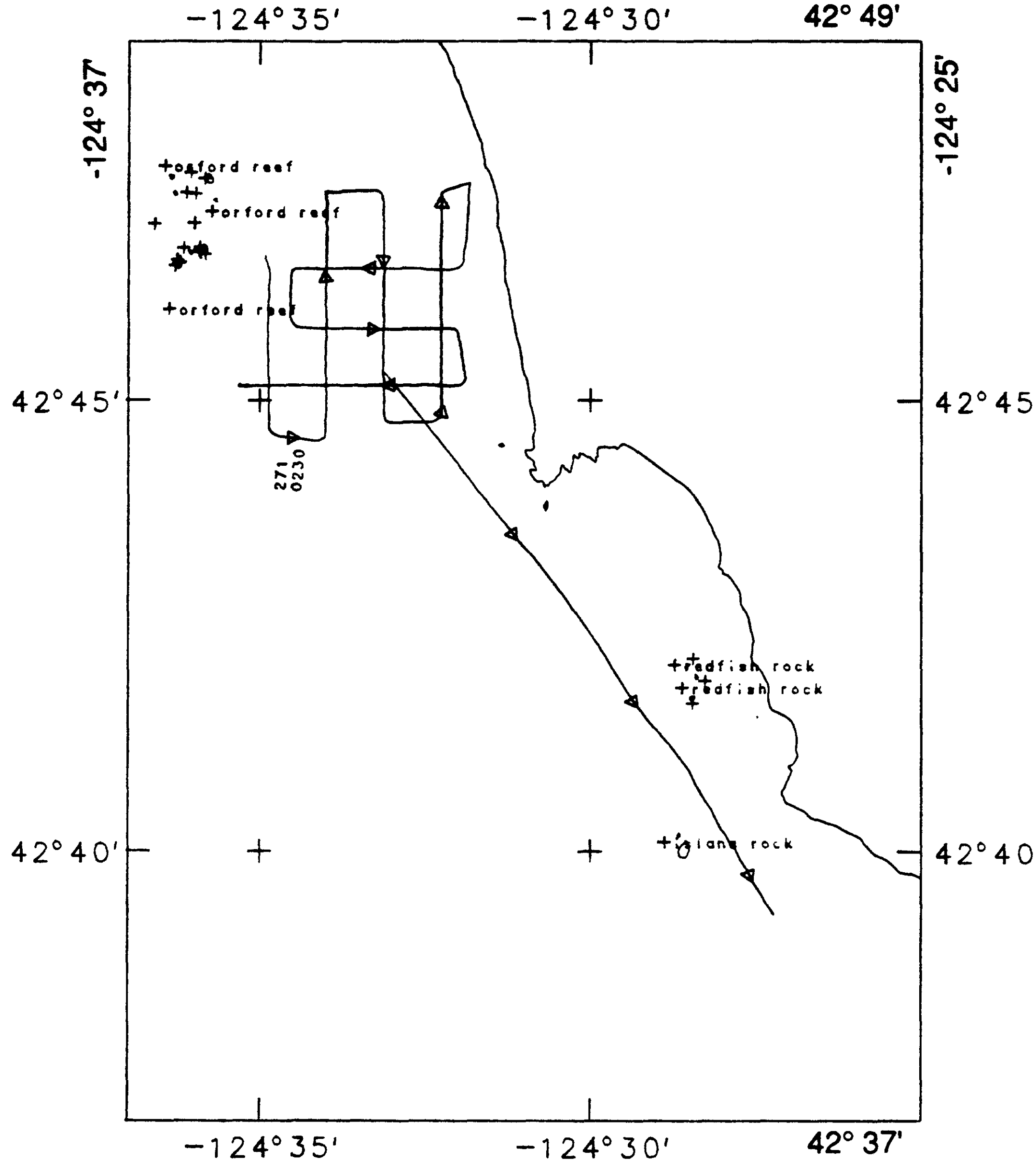

FIGURE 12. SEISMIC LINES, CAPE BLANCO SOUTH

MAP SCALE 1:150,000

0 10 km

0 5 nm

MERCATOR PROJECTION STANDARD PARALLEL = 42.7833°

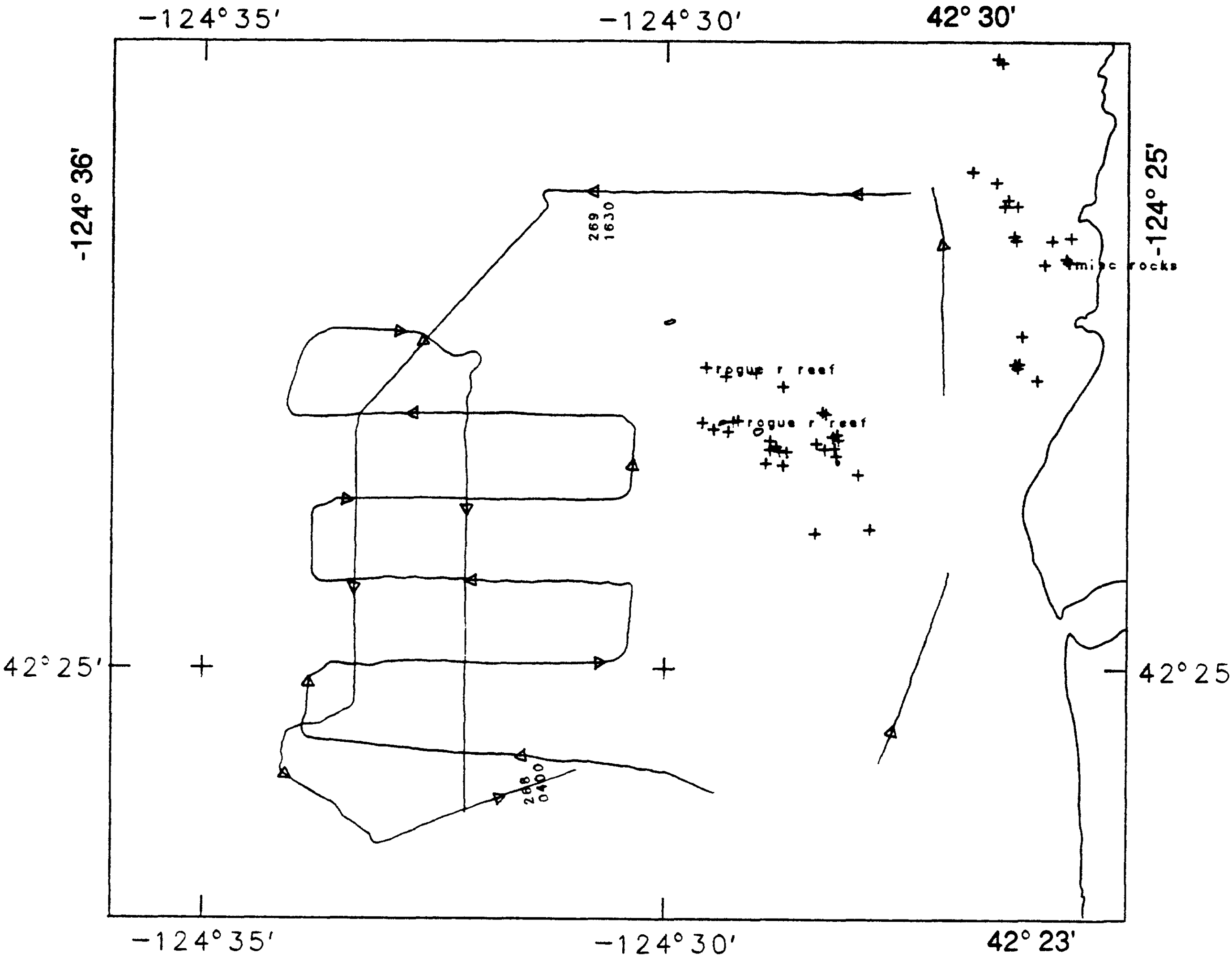

FIGURE 13. SEISMIC LINES, GOLD BEACH WEST

MAP SCALE 1:100,000

0 10 km

0 5 nm

MERCATOR PROJECTION STANDARD PARALLEL = 42.5000°

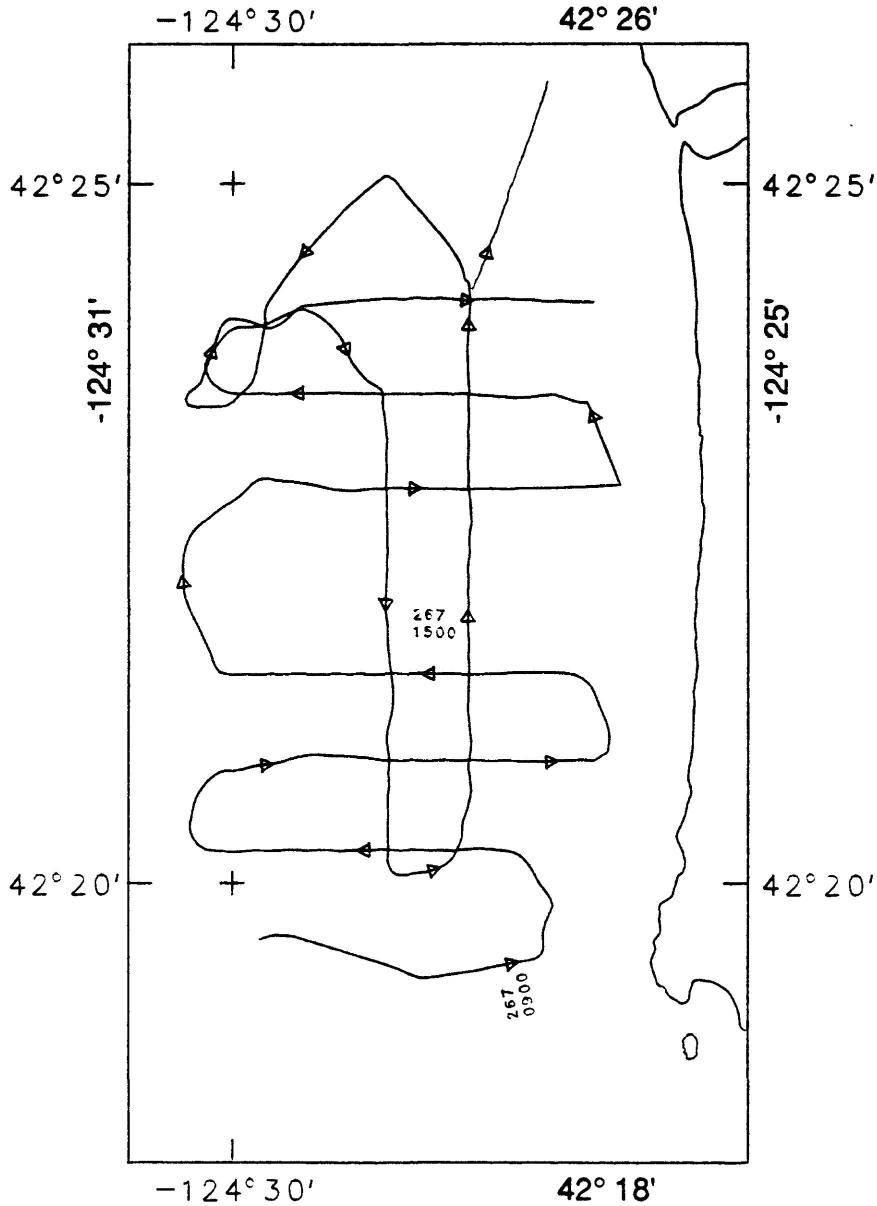

FIGURE 14. SEISMIC LINES, GOLD BEACH SOUTH

MAP SCALE 1:100,000

0 10 km

0 5 nm

MERCATOR PROJECTION STANDARD PARALLEL = 42.5000°

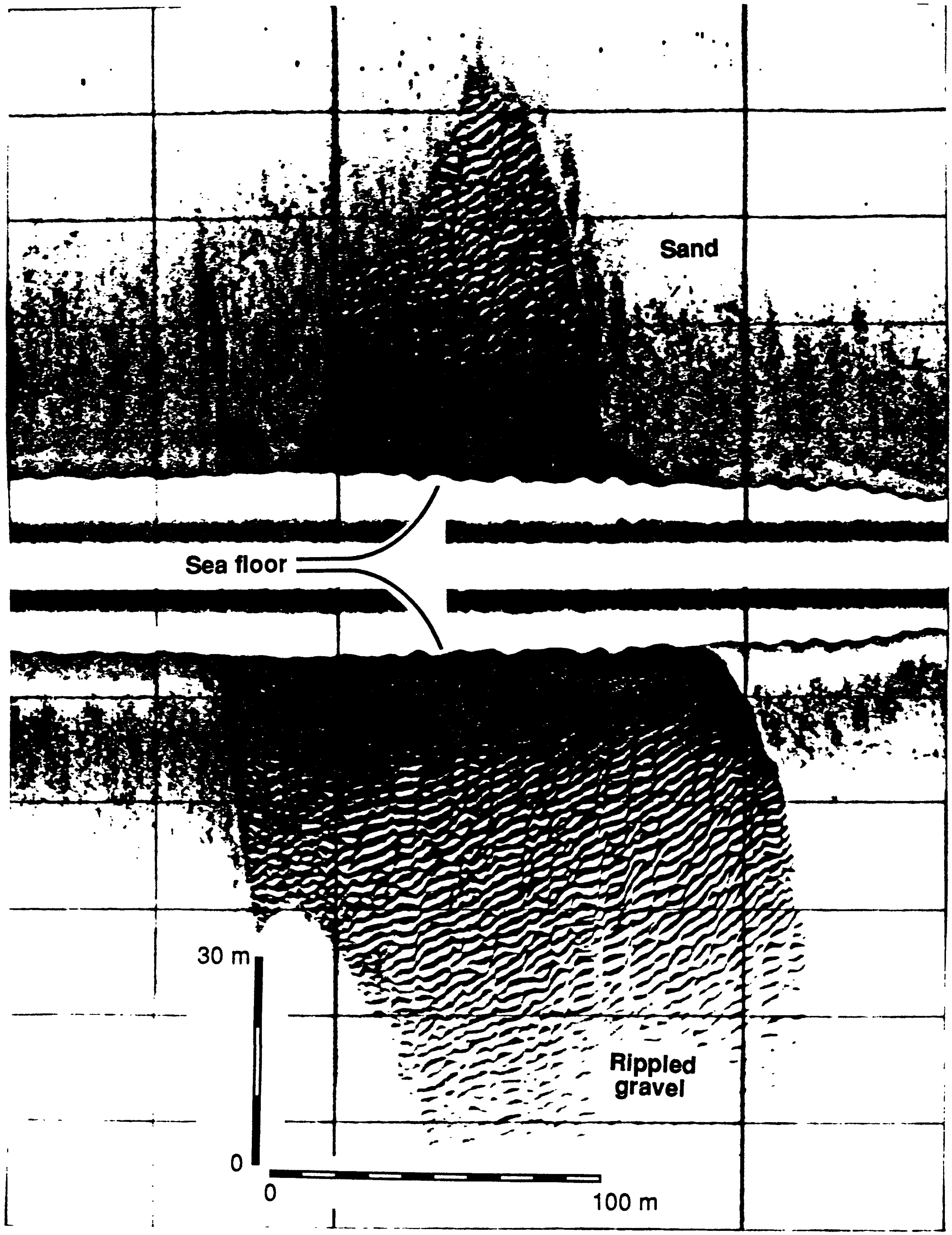

Figure 15. Portion of a side-scanning sonar record, Cape Blanco South.

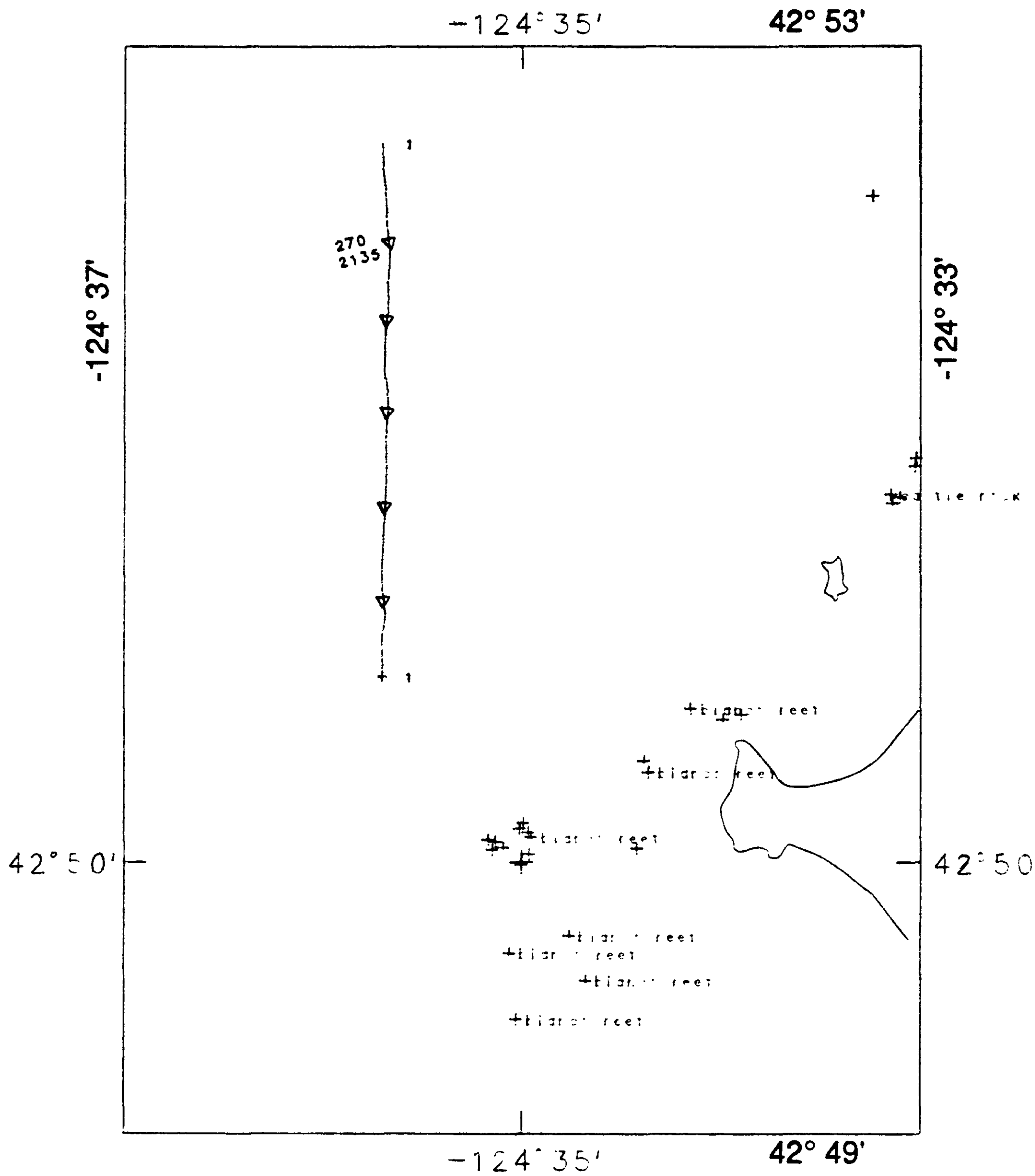

FIGURE 16. SIDESCANNING SONAR LINES, CAPE BLANCO WEST

MAP SCALE 1:50,000

0 5 km

0 3 nm

MERCATOR PROJECTION STANDARD PARALLEL = 42.7833°

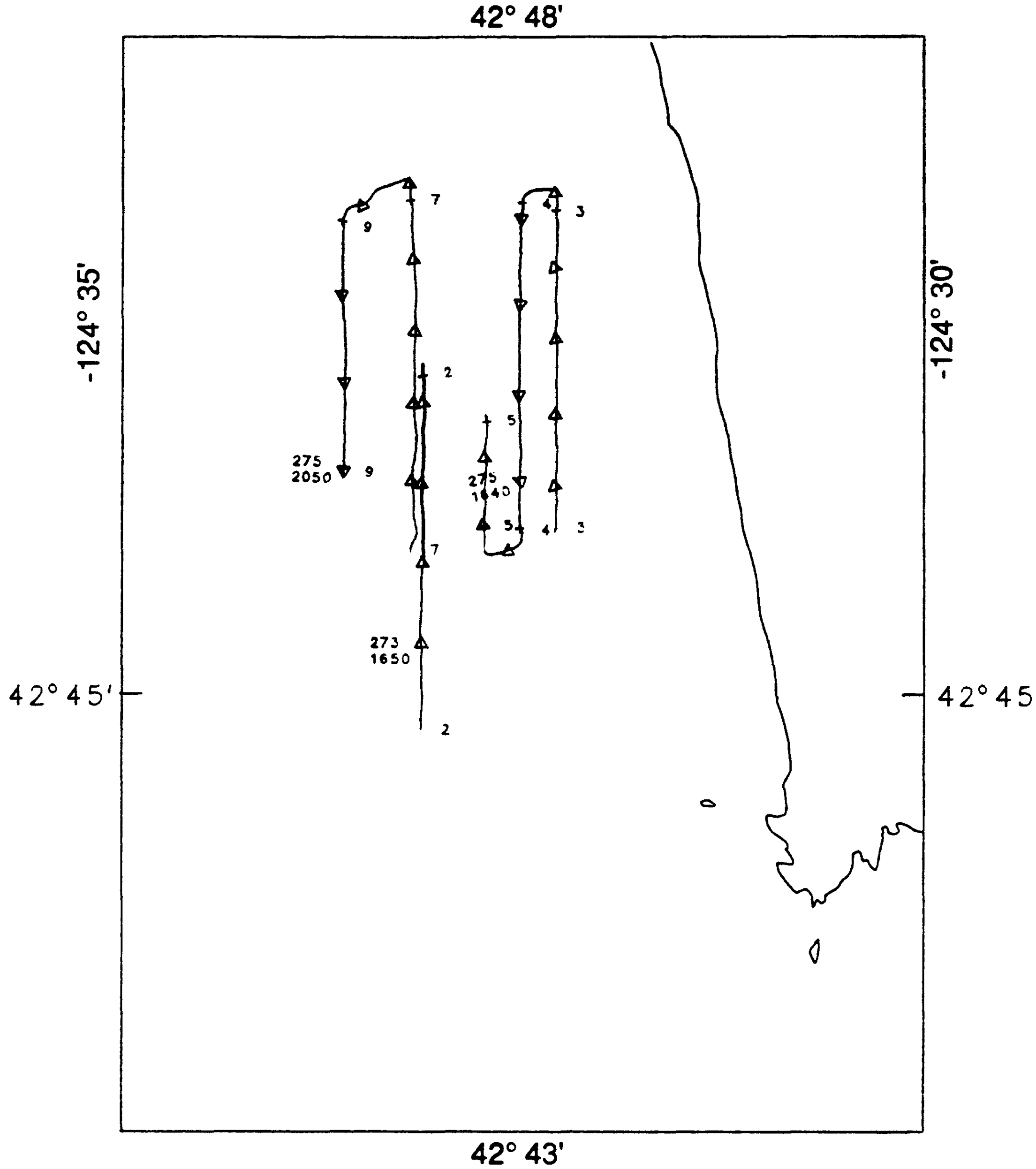

FIGURE 17. SIDESCANNING SONAR LINES, CAPE BLANCO SOUTH

MAP SCALE 1:60,000

0 5 km

0 3 nm

MERCATOR PROJECTION STANDARD PARALLEL = 42.7833°

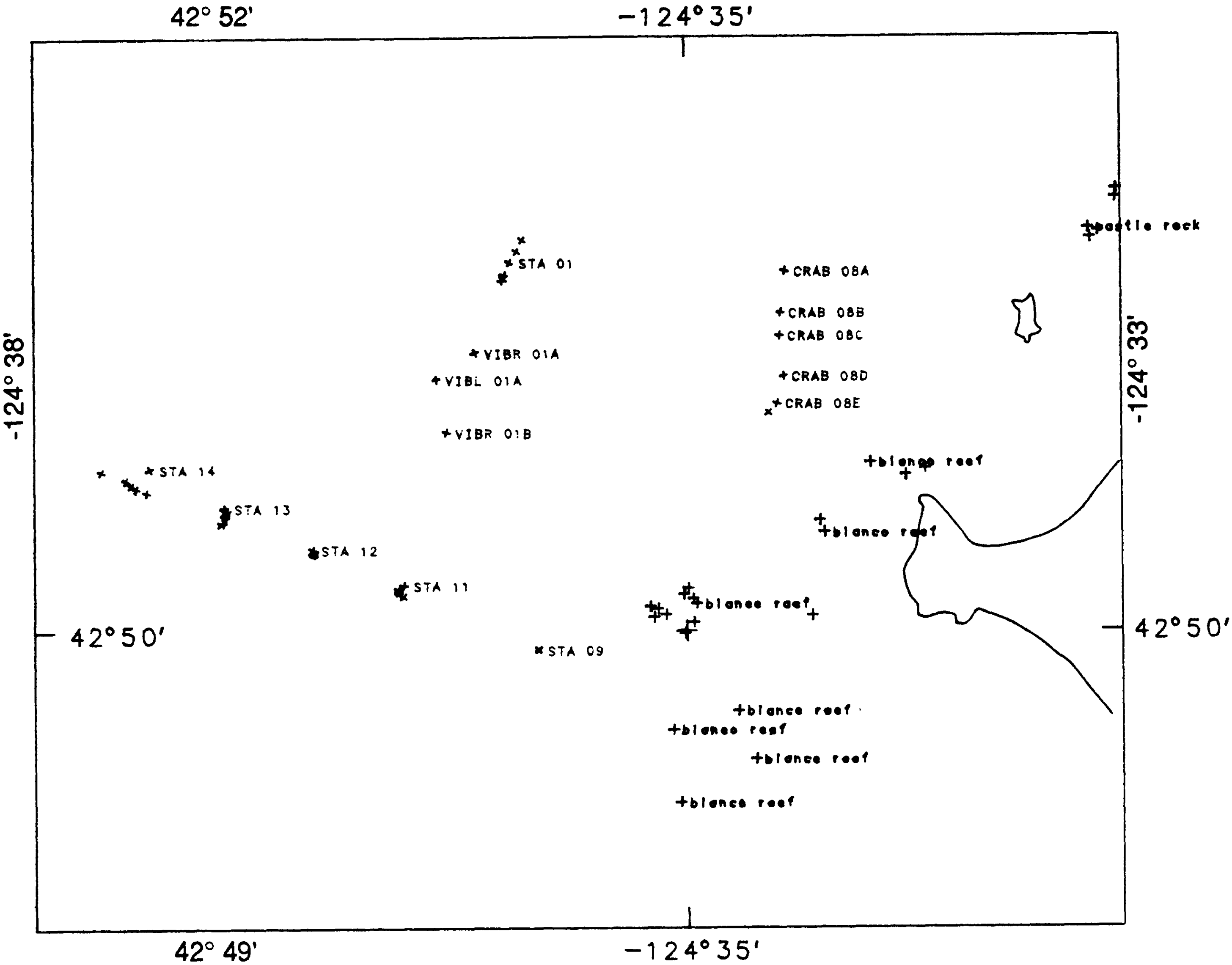

FIGURE 18. SAMPLE STATIONS, CAPE BLANCO WEST

MAP SCALE 1 : 40,000

1 0 3 km

1 0 2 nm

MERCATOR PROJECTION STANDARD PARALLEL = 42.7833°

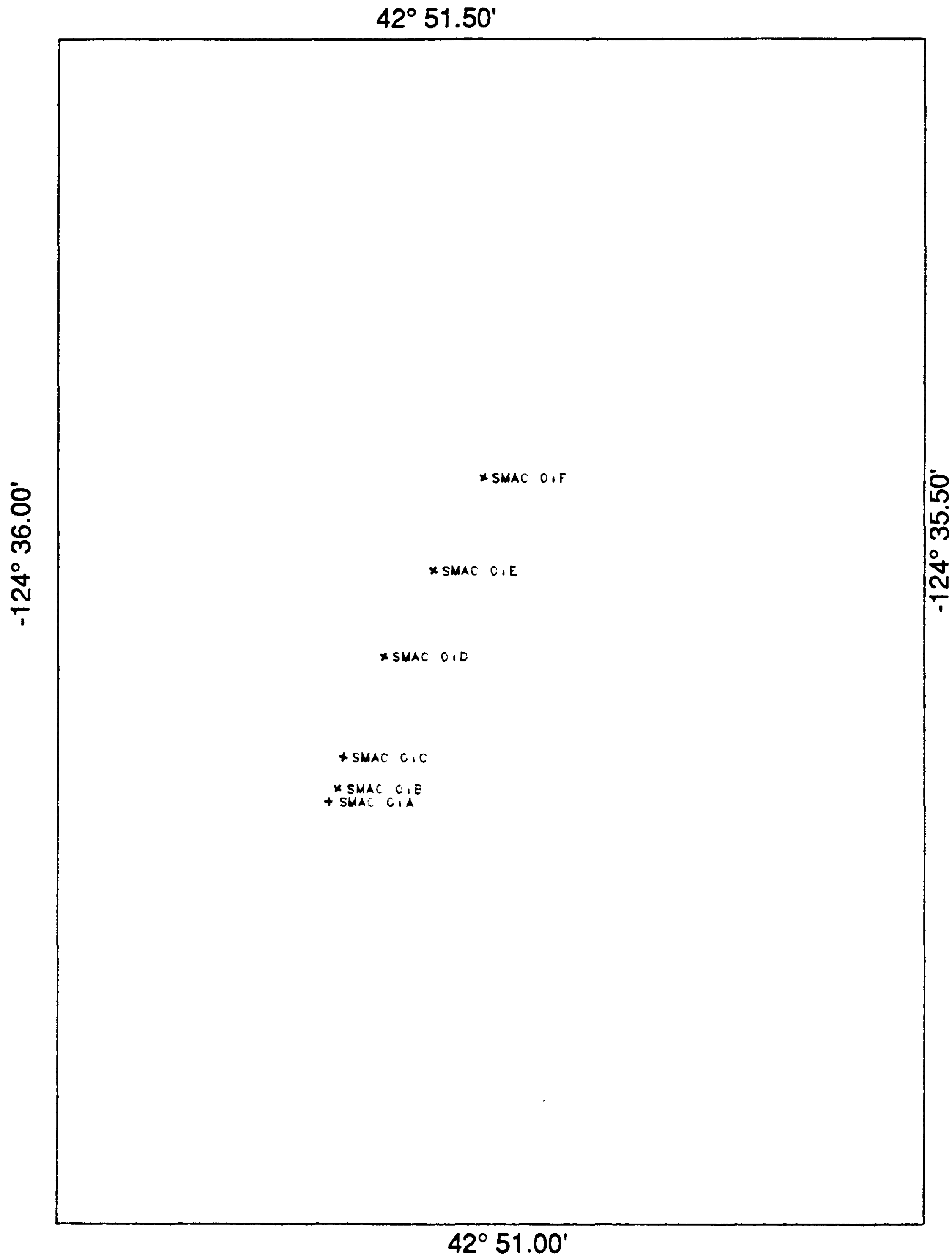

FIGURE 19. SAMPLE STATION 1, CAPE BLANCO WEST

MAP SCALE 1 : 5,000

100 0 300 m

MERCATOR PROJECTION STANDARD PARALLEL = 42.7833°

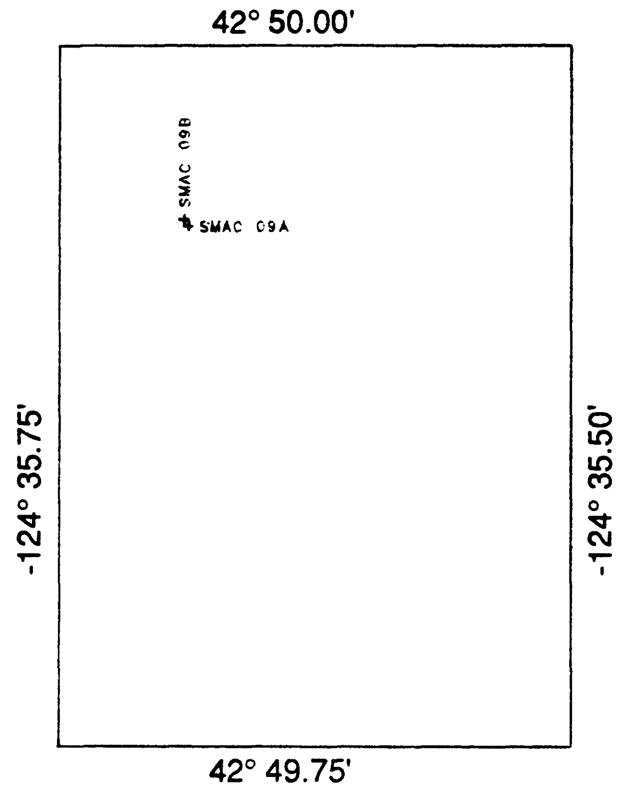

FIGURE 20. SAMPLE STATION 9, CAPE BLANCO WEST

MAP SCALE 1 : 5,000

100 0 300 m

MERCATOR PROJECTION

STANDARD PARALLEL = 42.7833°

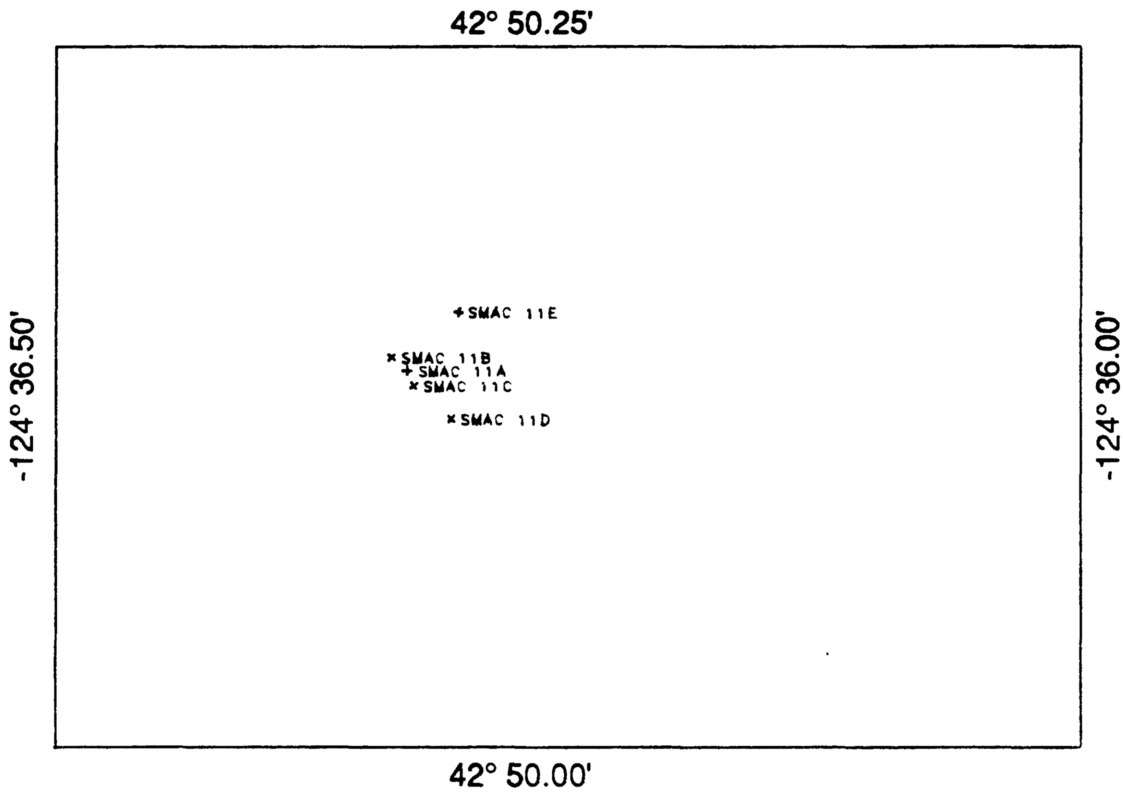

FIGURE 21. SAMPLE STATION 11, CAPE BLANCO WEST

MAP SCALE 1 : 5,000

100 0 300 m

MERCATOR PROJECTION

STANDARD PARALLEL = 42.7833°

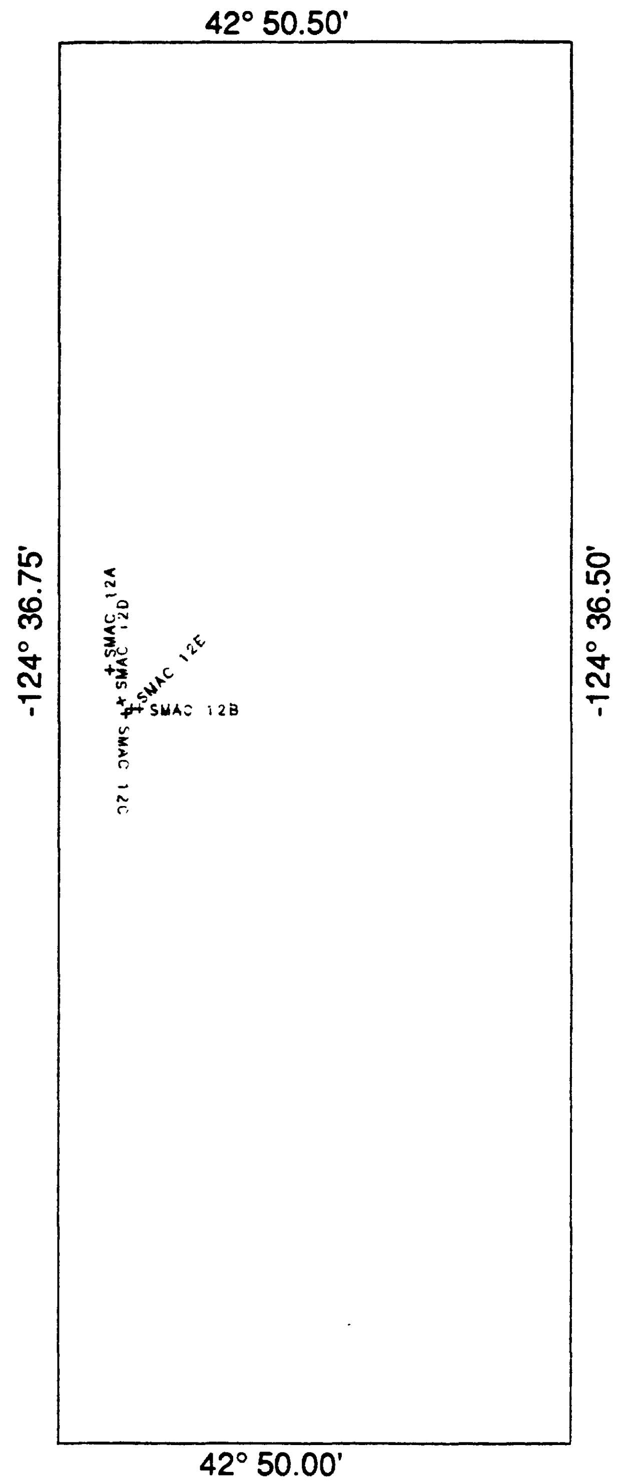

FIGURE 22. SAMPLE STATION 12, CAPE BLANCO WEST

MAP SCALE 1 : 5,000

100 0 300 m

MERCATOR PROJECTION STANDARD PARALLEL = 42.7833°

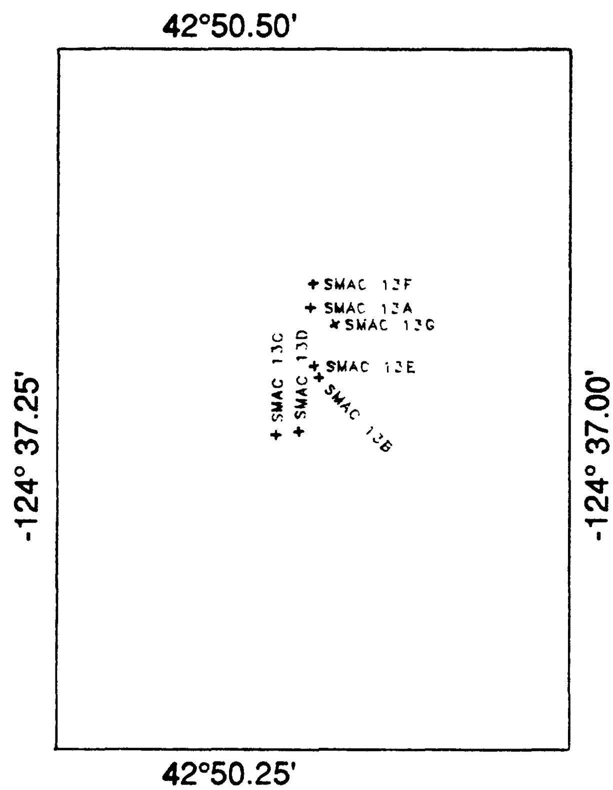

FIGURE 23. SAMPLE STATION 13, CAPE BLANCO WEST

MAP SCALE 1 : 5,000

100 0 300 m

MERCATOR PROJECTION

STANDARD PARALLEL = 42.7833°

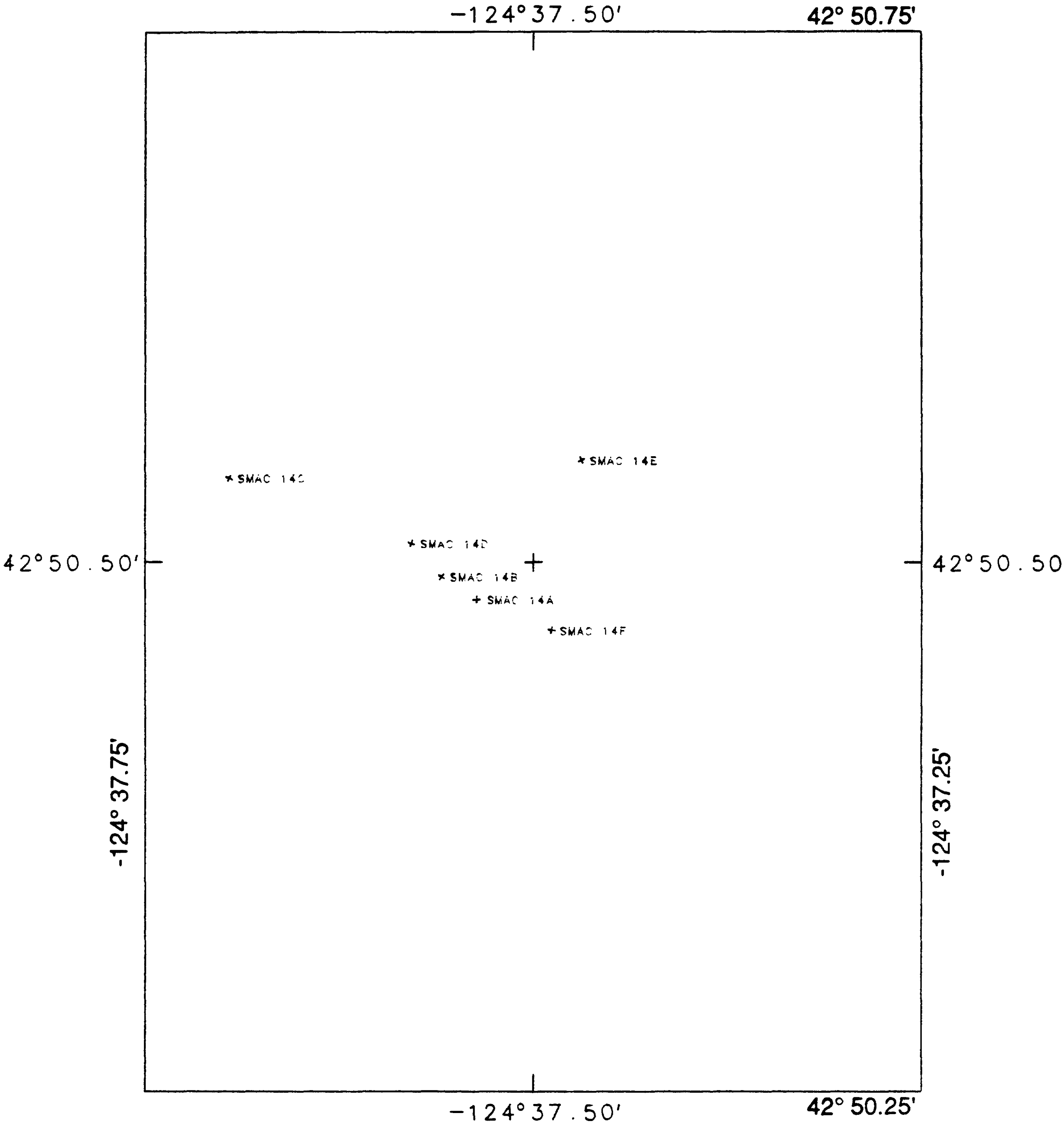

FIGURE 24. SAMPLE STATION 14, CAPE BLANCO WEST

MAP SCALE 1 : 5,000

100 0 300 m

MERCATOR PROJECTION STANDARD PARALLEL = 42.7833°

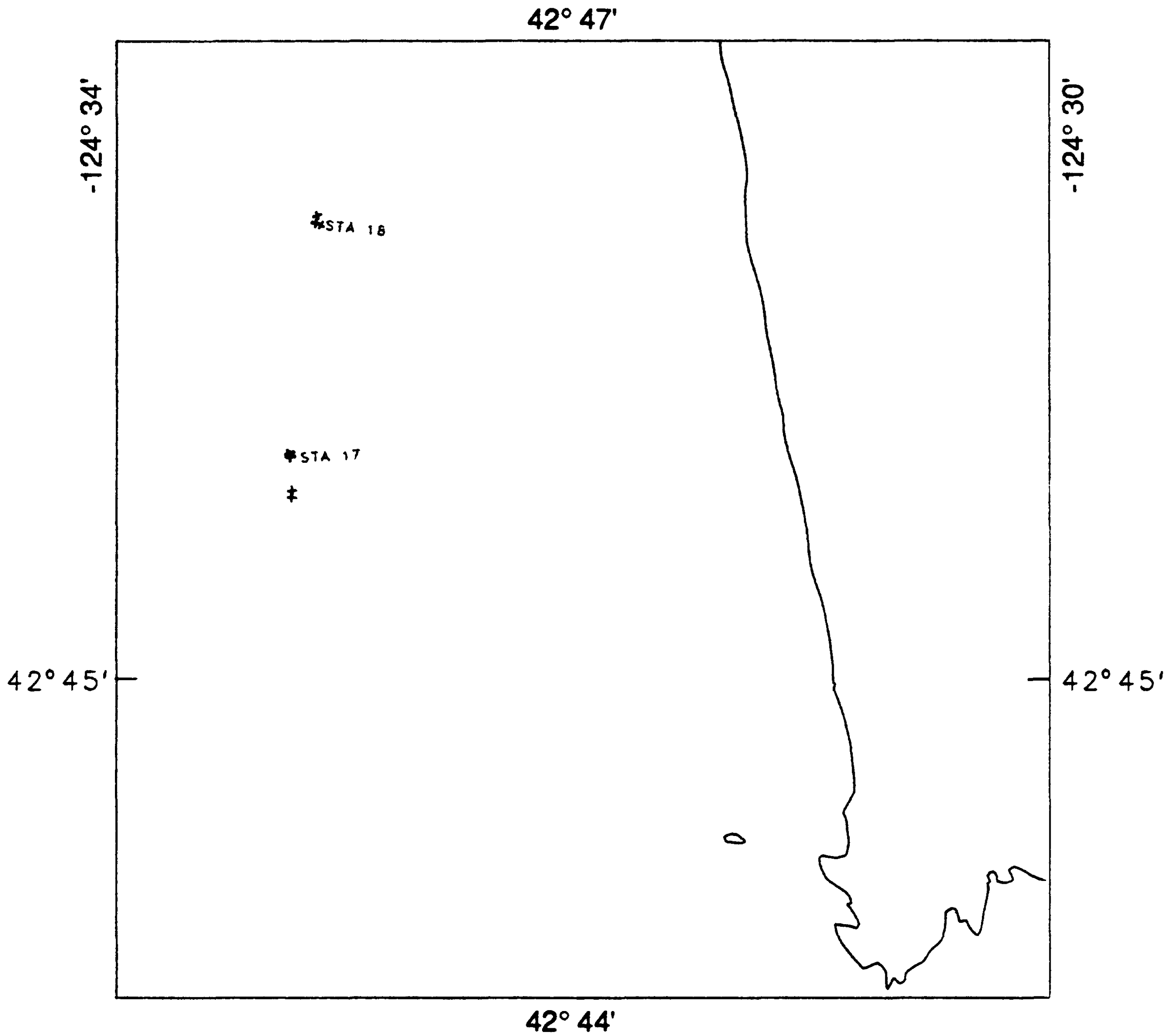

FIGURE 25. SAMPLE STATIONS, CAPE BLANCO SOUTH

MAP SCALE 1 : 40,000

1 0 3 km

1 0 2 nm

MERCATOR PROJECTION STANDARD PARALLEL = 42.7833°

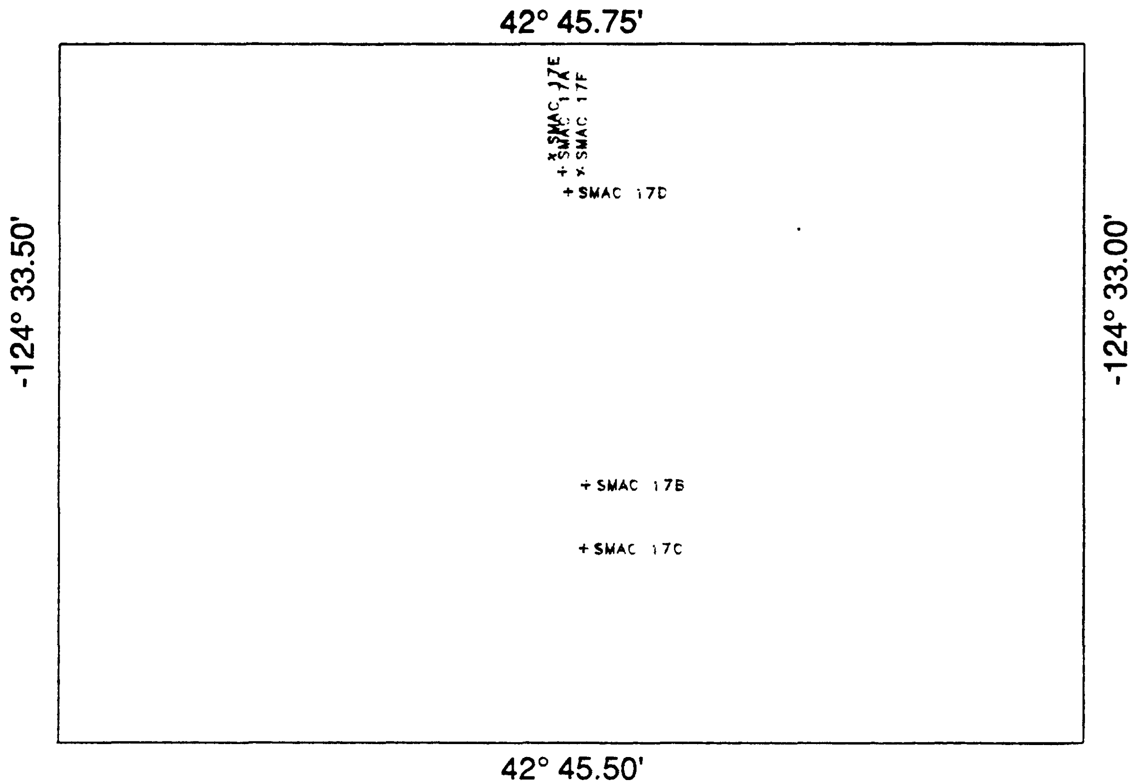

FIGURE 26. SAMPLE STATION 17, CAPE BLANCO SOUTH

MAP SCALE 1 : 5,000

100 0 300 m

MERCATOR PROJECTION

STANDARD PARALLEL = 42.7833°

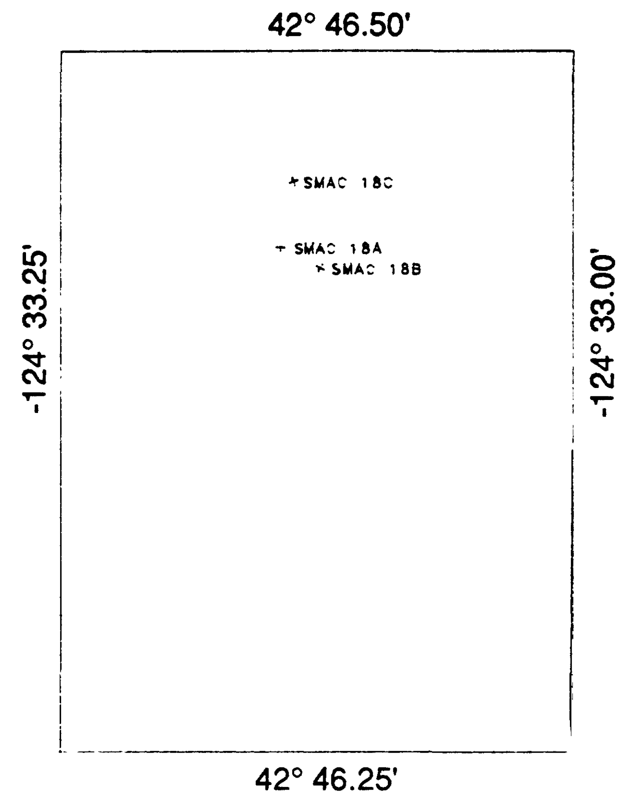

FIGURE 27. SAMPLE STATION 18, CAPE BLANCO SOUTH

MAP SCALE 1 : 5,000

100 0 300 m

MERCATOR PROJECTION

STANDARD PARALLEL = 42.7833°

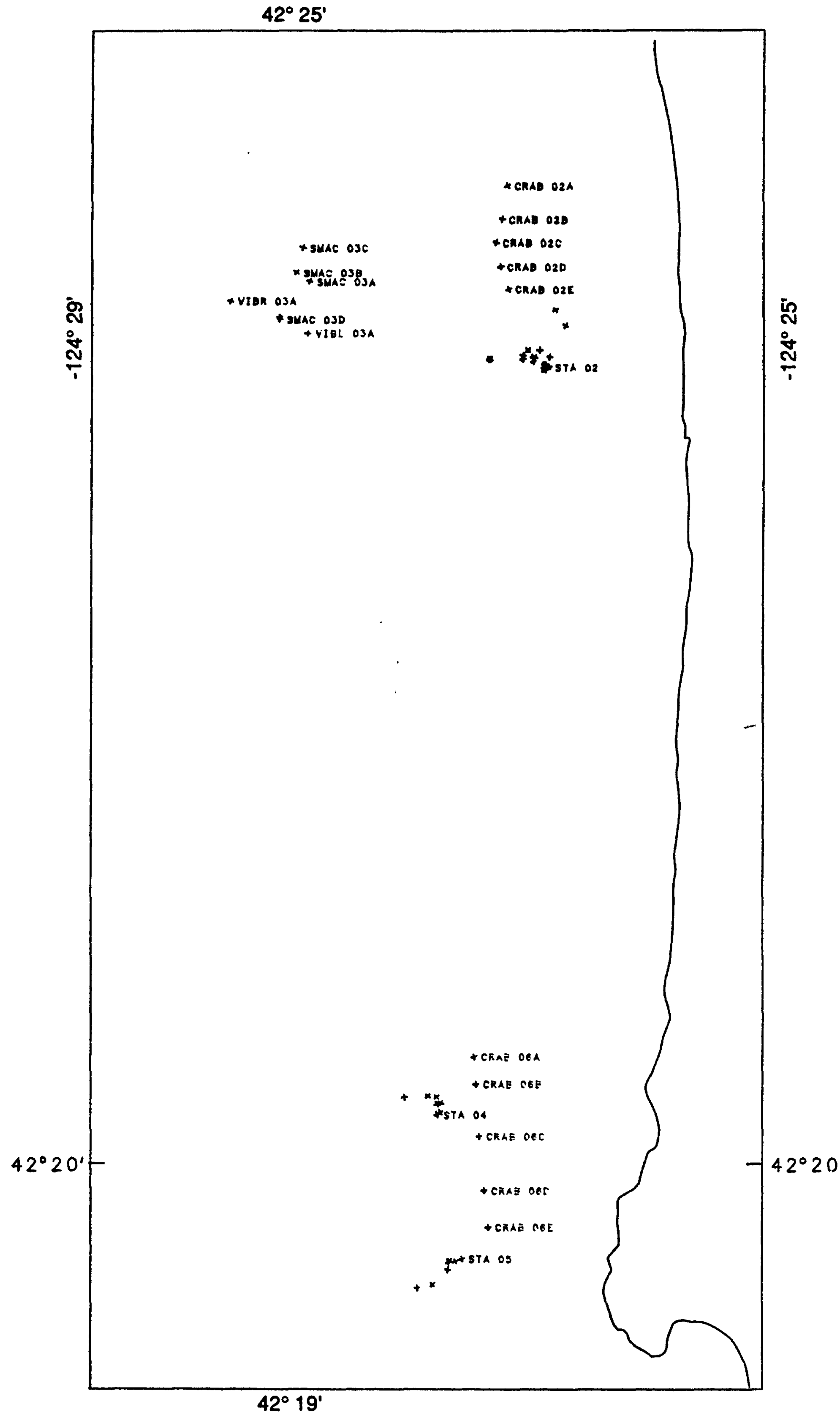

FIGURE 28. SAMPLE STATIONS, GOLD BEACH SOUTH.

MAP SCALE 1 : 40,000

1 0 3 km

1 0 2 nm

MERCATOR PROJECTION STANDARD PARALLEL = 42.5000°

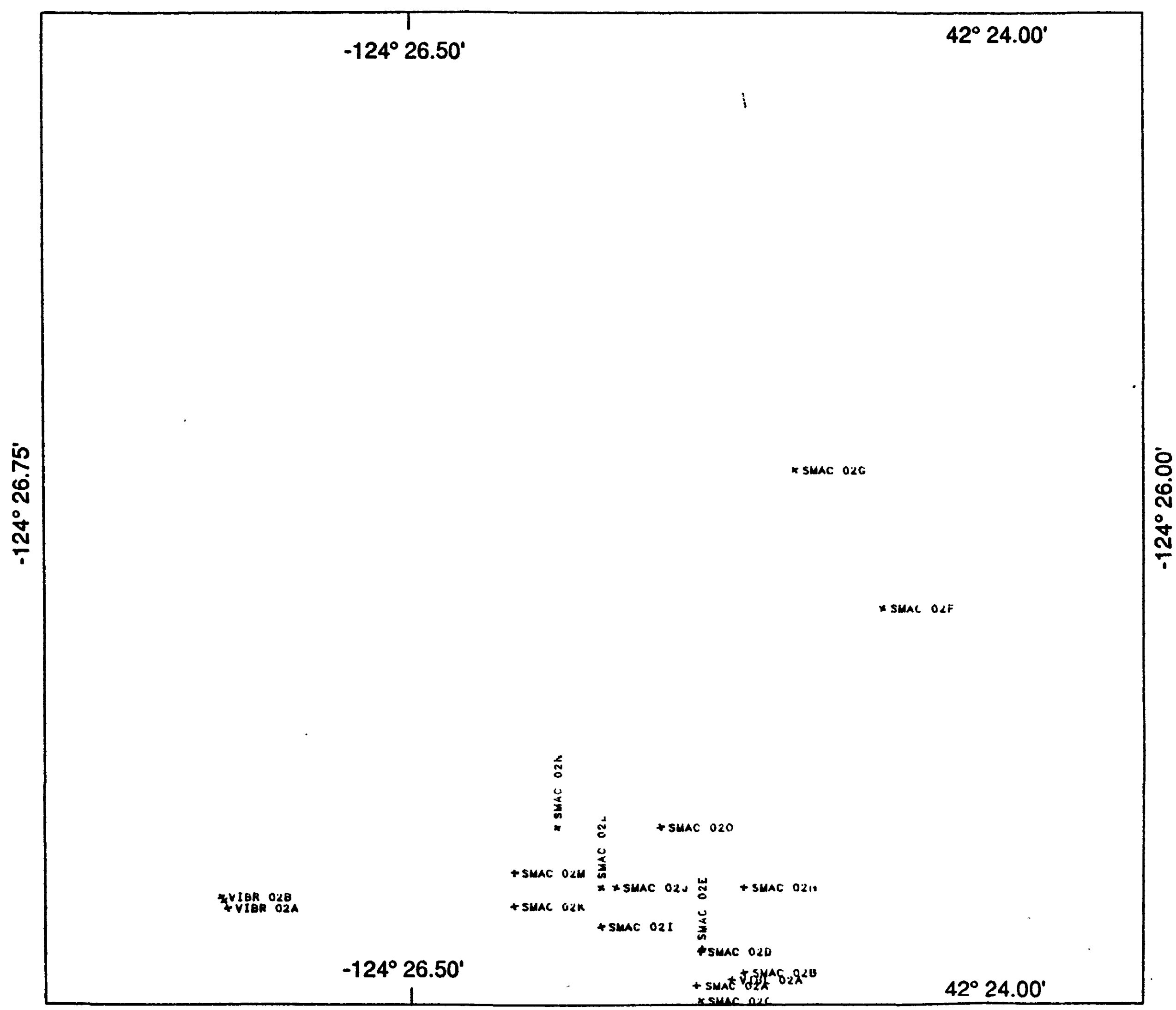

FIGURE 29. SAMPLE STATION 2.
GOLD BEACH SOUTH

MAP SCALE 1 : 5,000

100 0 300 m

MERCATOR PROJECTION

STANDARD PARALLEL = 42.5000°

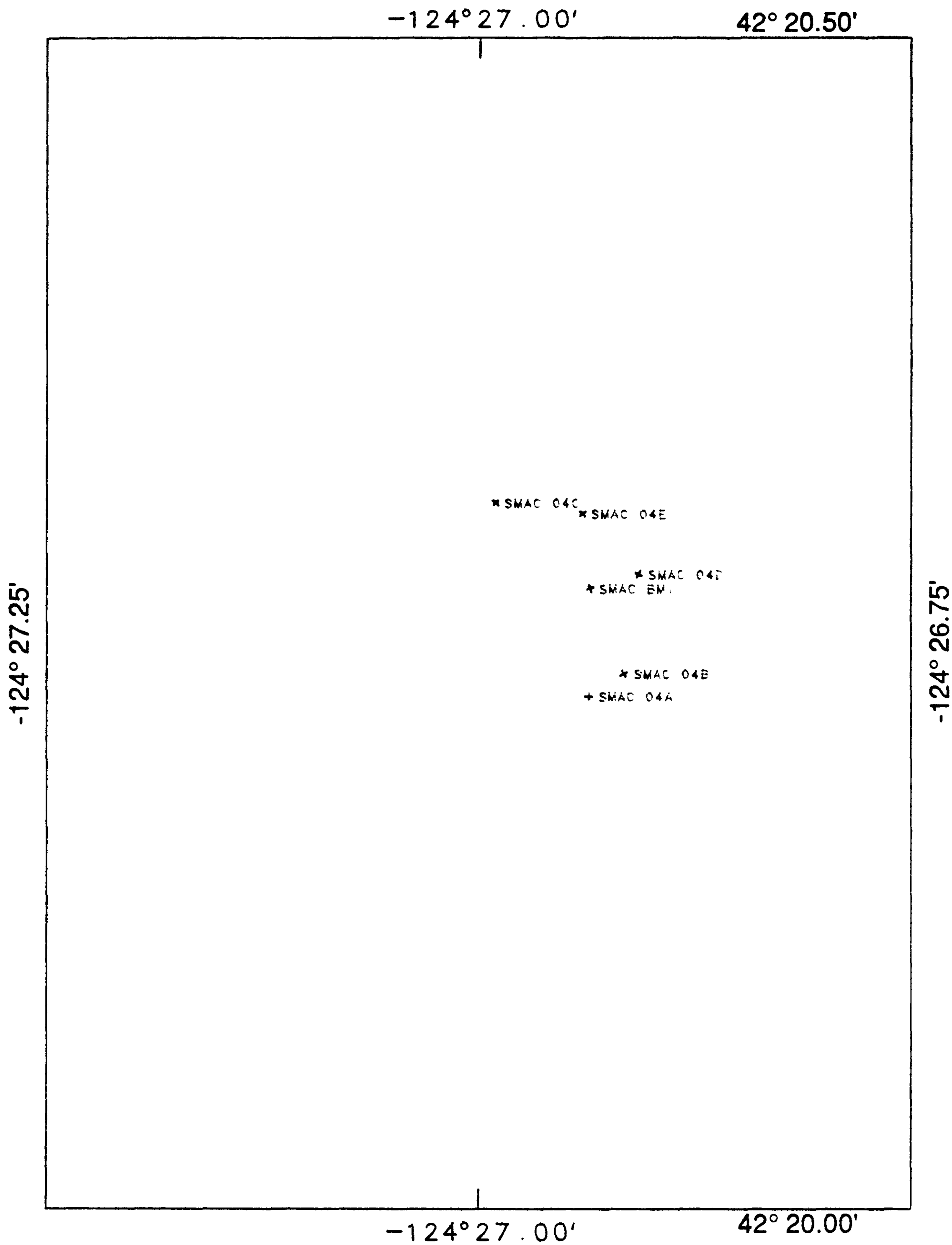

FIGURE 30. SAMPLE STATION 4, GOLD BEACH SOUTH

MAP SCALE 1 : 5,000

100 0 300 m

MERCATOR PROJECTION STANDARD PARALLEL = 42.5000°

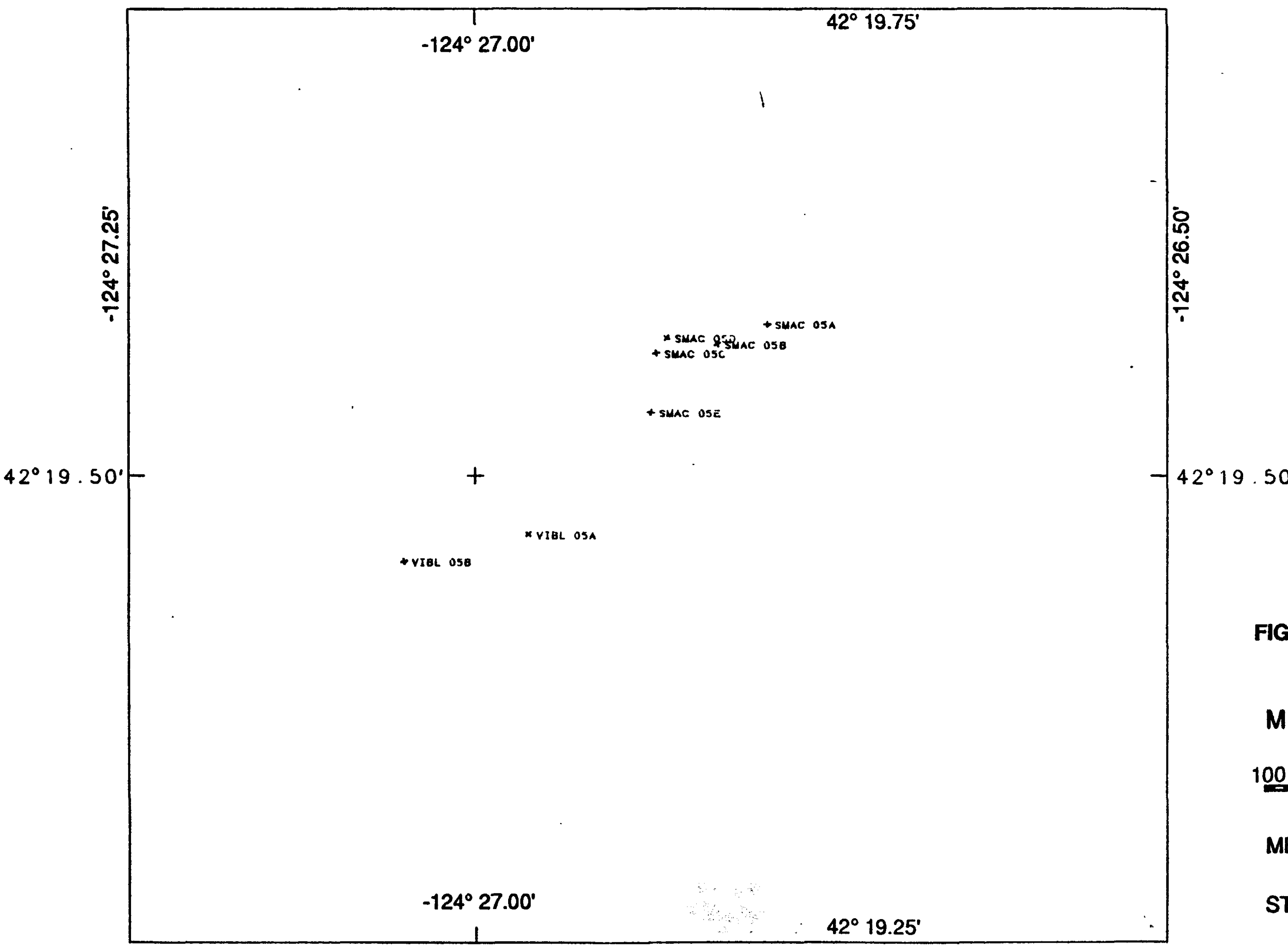

FIGURE 31. SAMPLE STATION 5, GOLD BEACH SOUTH

MAP SCALE 1 : 5,000

100 0 300 m

MERCATOR PROJECTION

STANDARD PARALLEL = 42.5000°

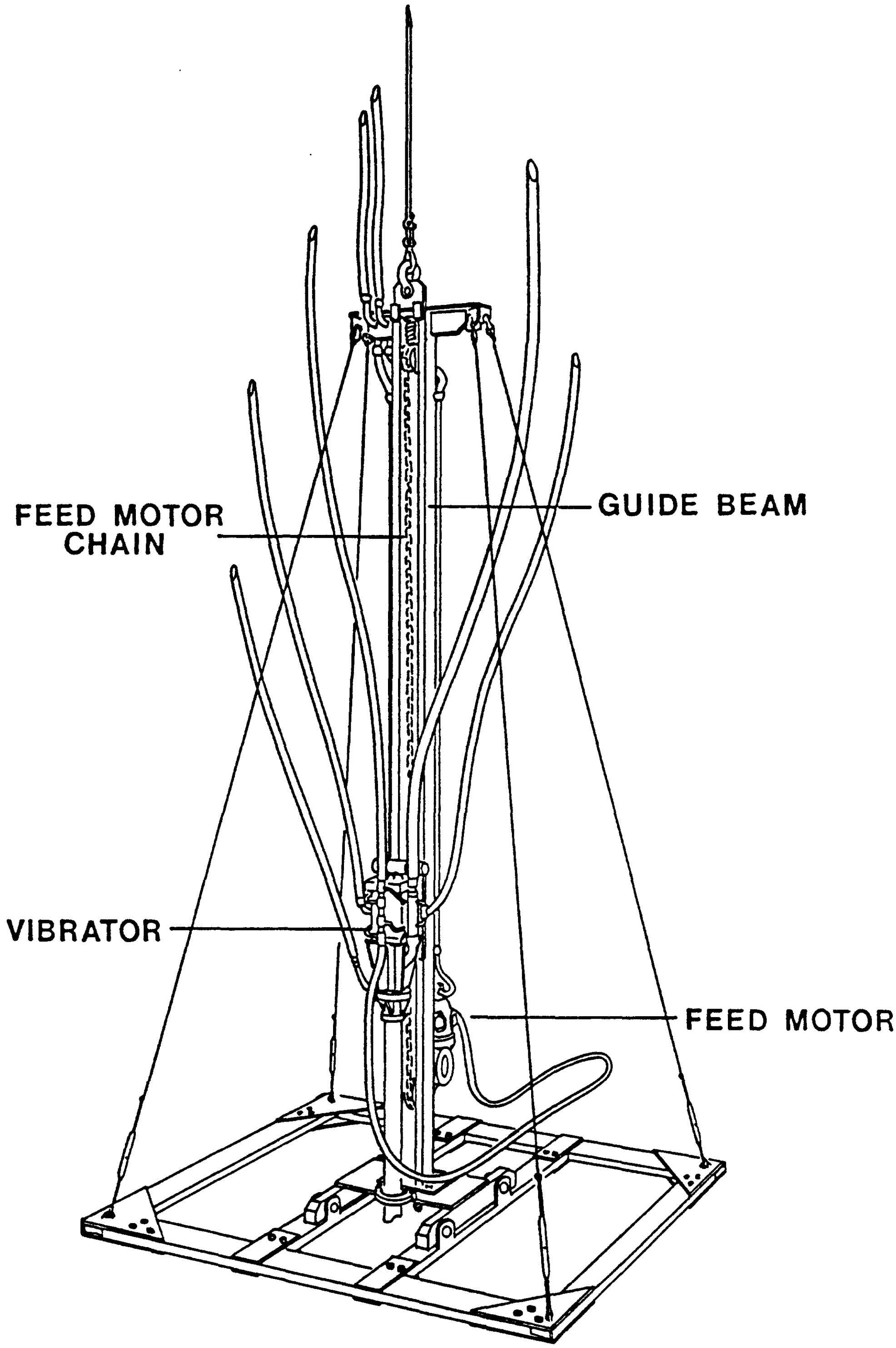

FIGURE 32. VIBRALIFT CONFIGURATION

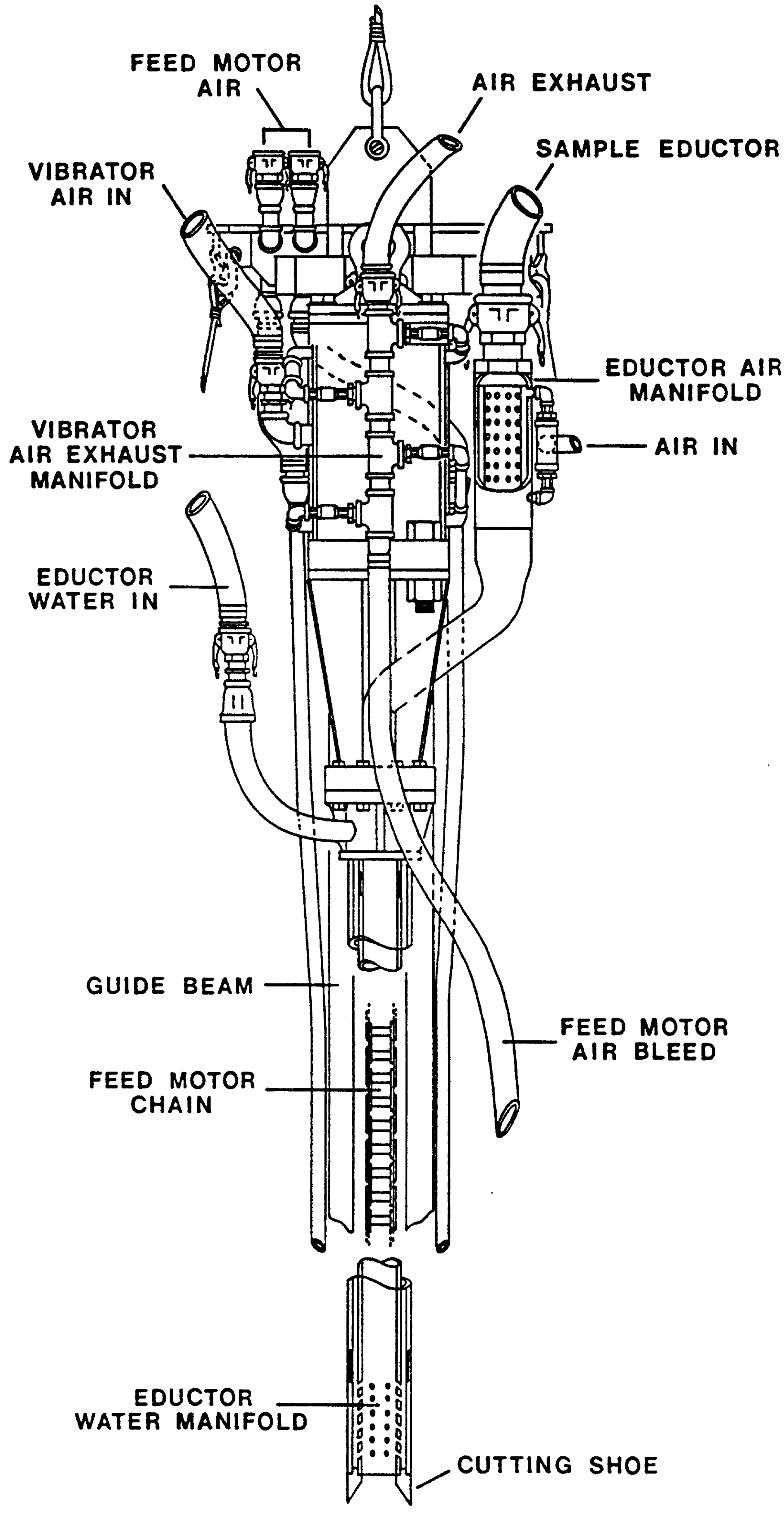

FIGURE 33. VIBRALIFT

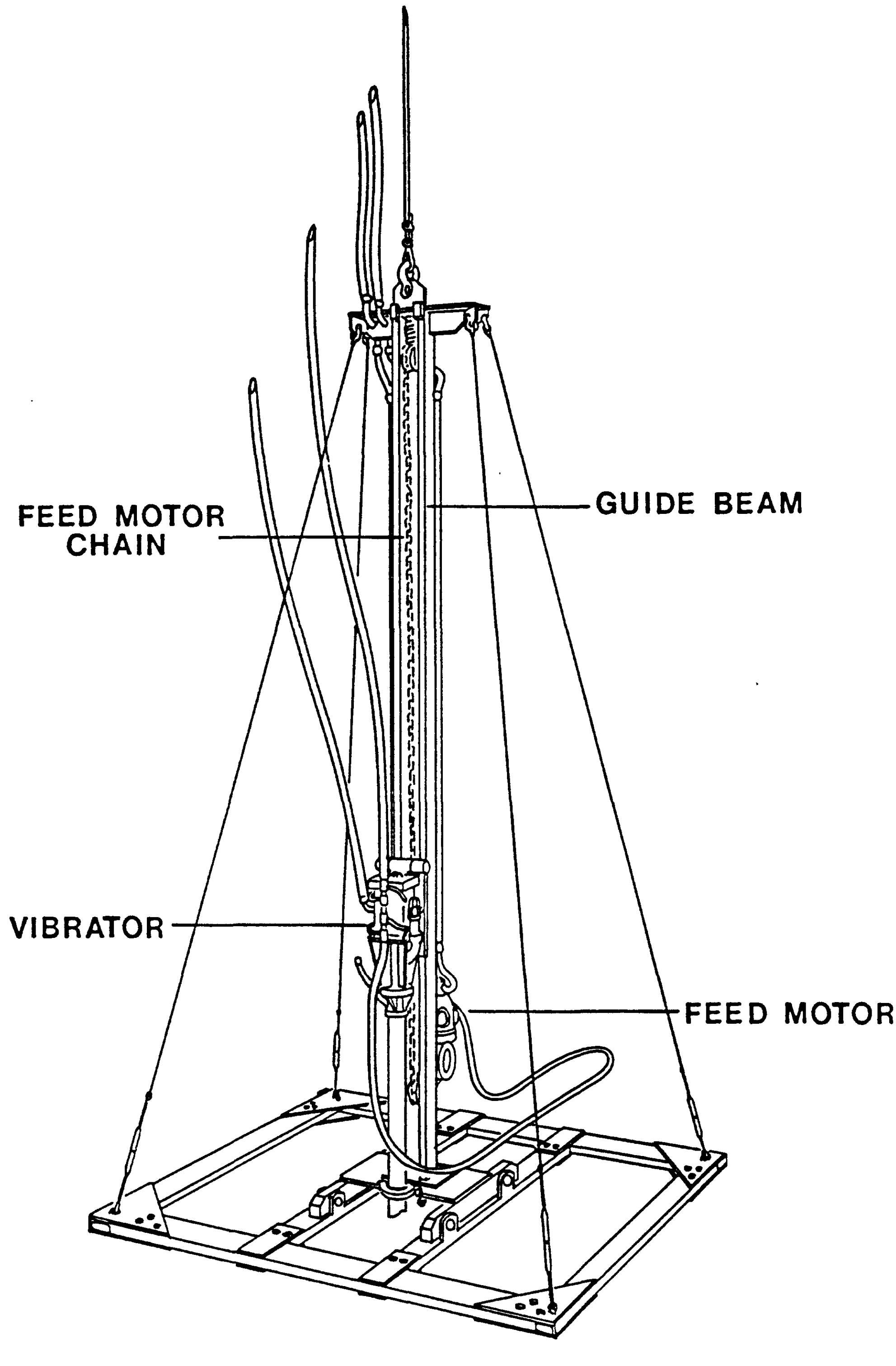

FIGURE 34. VIBRACORE CONFIGURATION

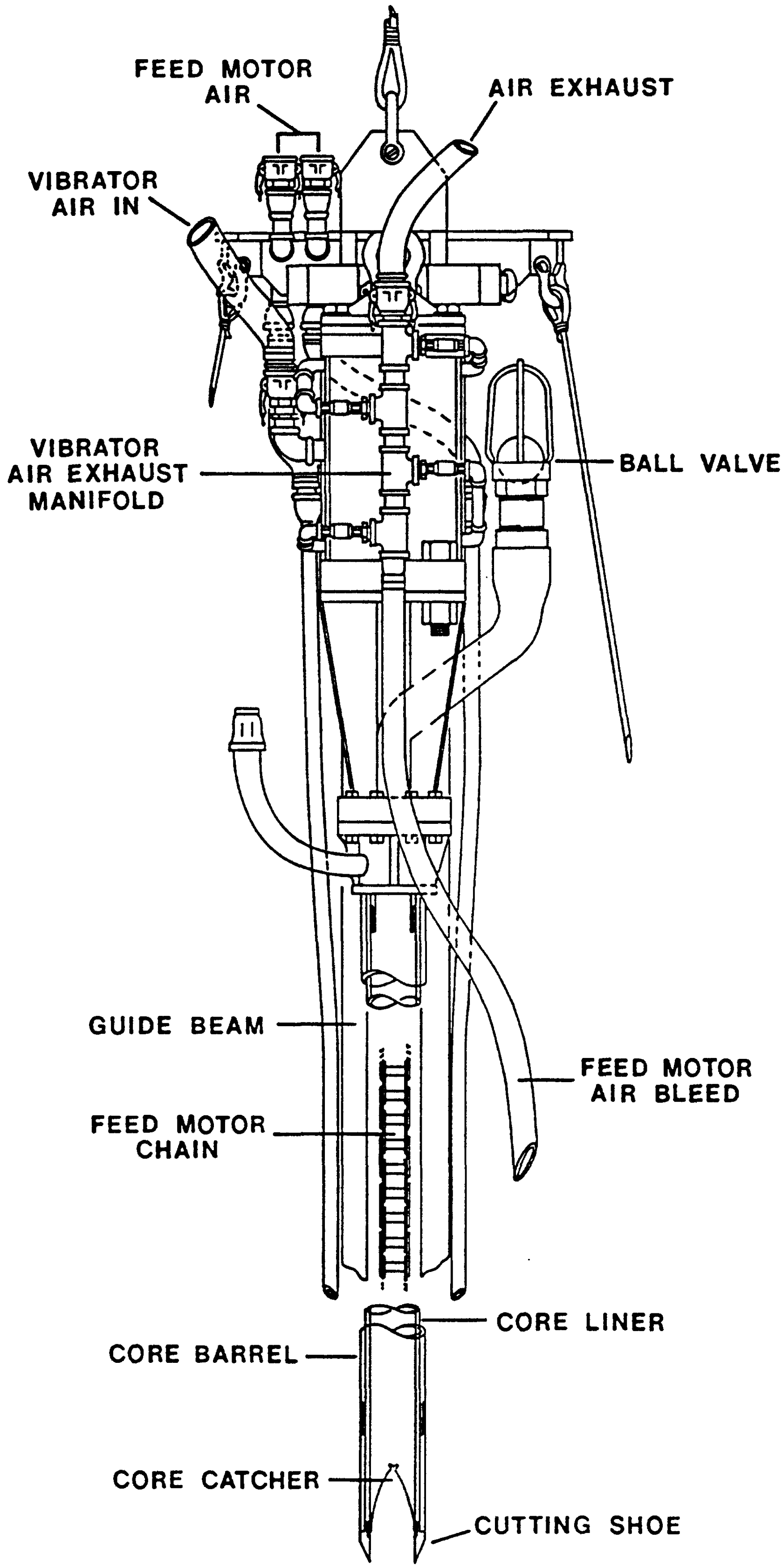

FIGURE 35. VIBRACORE

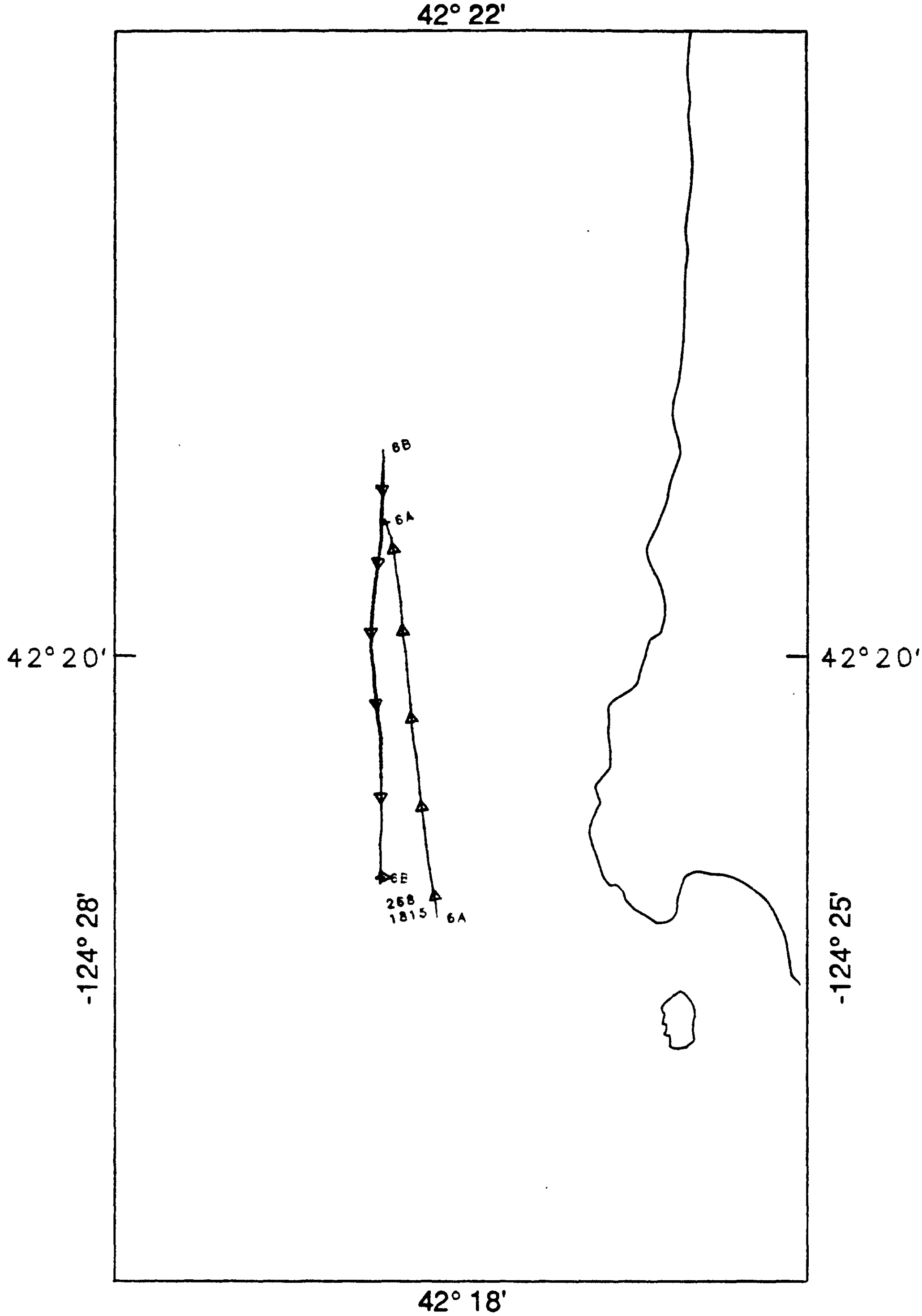

FIGURE 36. BEAM TRAWL LINES, GOLD BEACH SOUTH

MAP SCALE 1 : 40,000

1 0 3 km

1 0 2 nm

MERCATOR PROJECTION STANDARD PARALLEL = 42.5000°

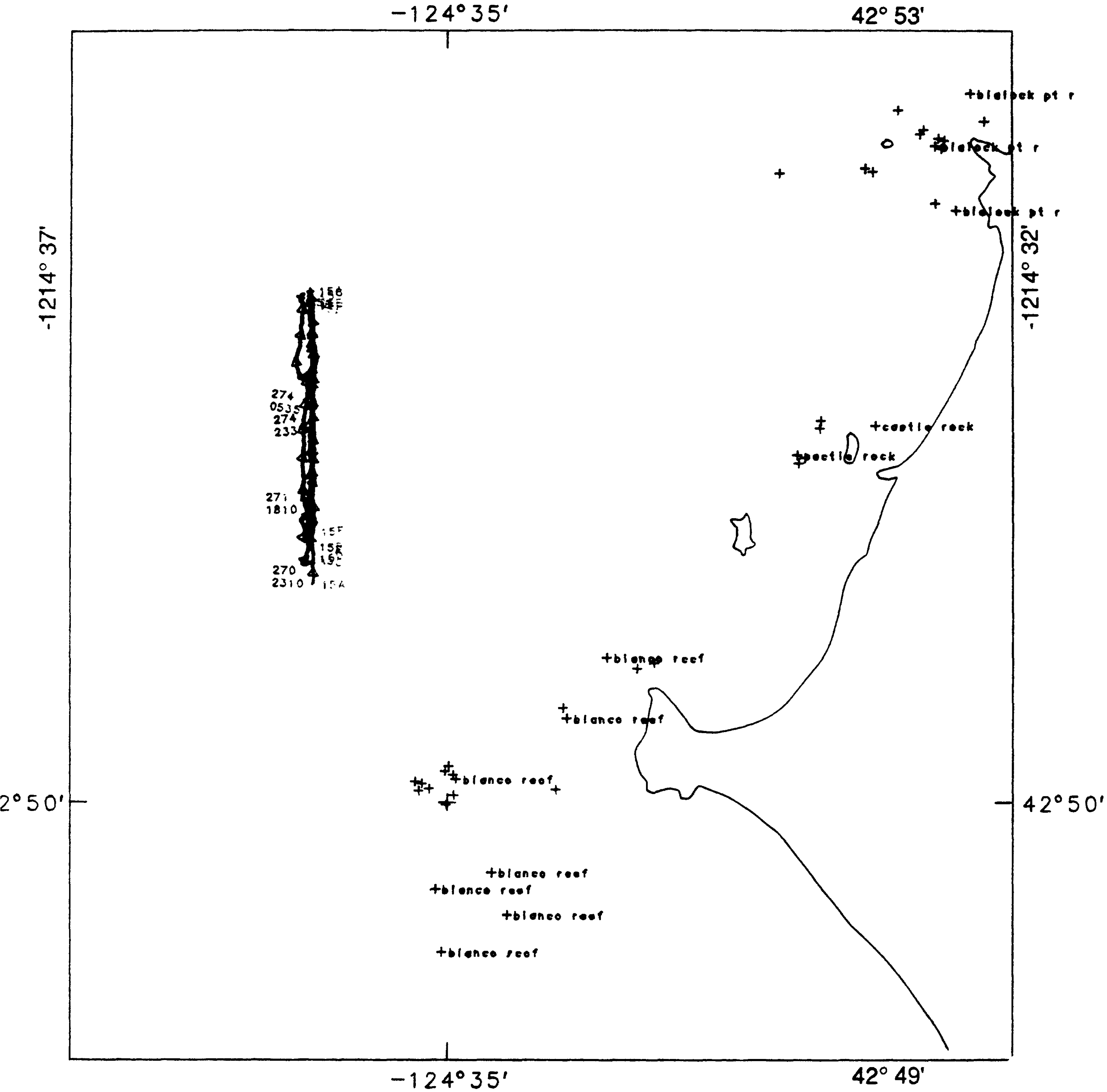

FIGURE 37. TRAWL LINES, CAPE BLANCO WEST

MAP SCALE 1 : 40,000

1 0 3 km

1 0 2 nm

MERCATOR PROJECTION STANDARD PARALLEL = 42.7833°

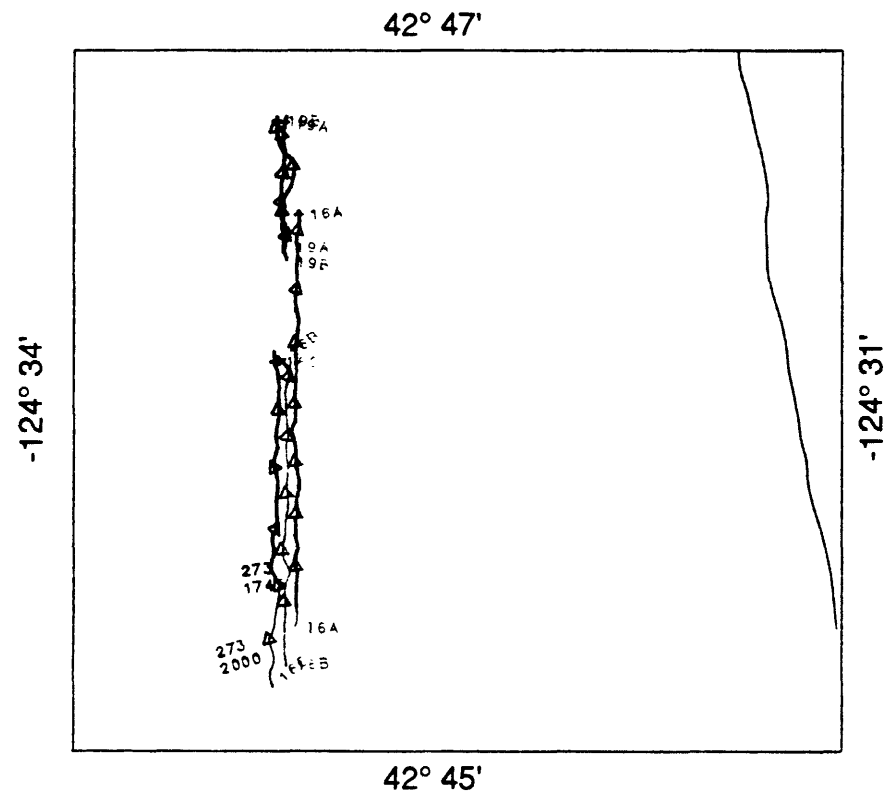

FIGURE 38. TRAWL LINES, CAPE BLANCO SOUTH

MAP SCALE 1 : 40,000

1 0 3 km

1 0 2 nm

MERCATOR PROJECTION STANDARD PARALLEL = 42.7833°

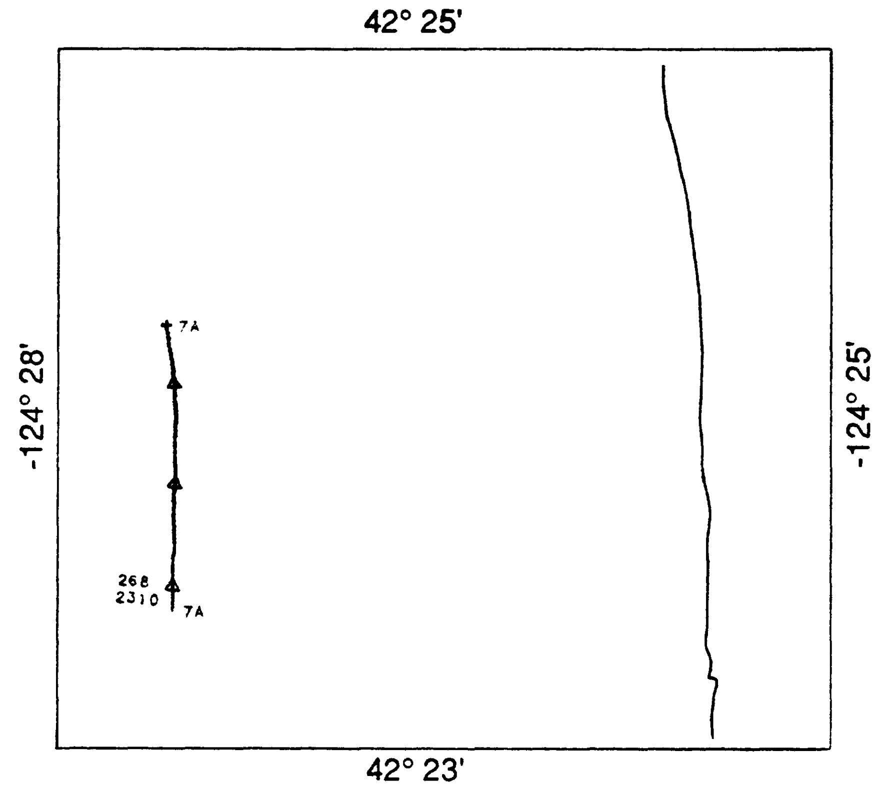

FIGURE 39. OTTER TRAWL LINES, GOLD BEACH WEST

MAP SCALE 1 : 40,000

1 0 3 km

1 0 2 nm

MERCATOR PROJECTION STANDARD PARALLEL = 42.5000°

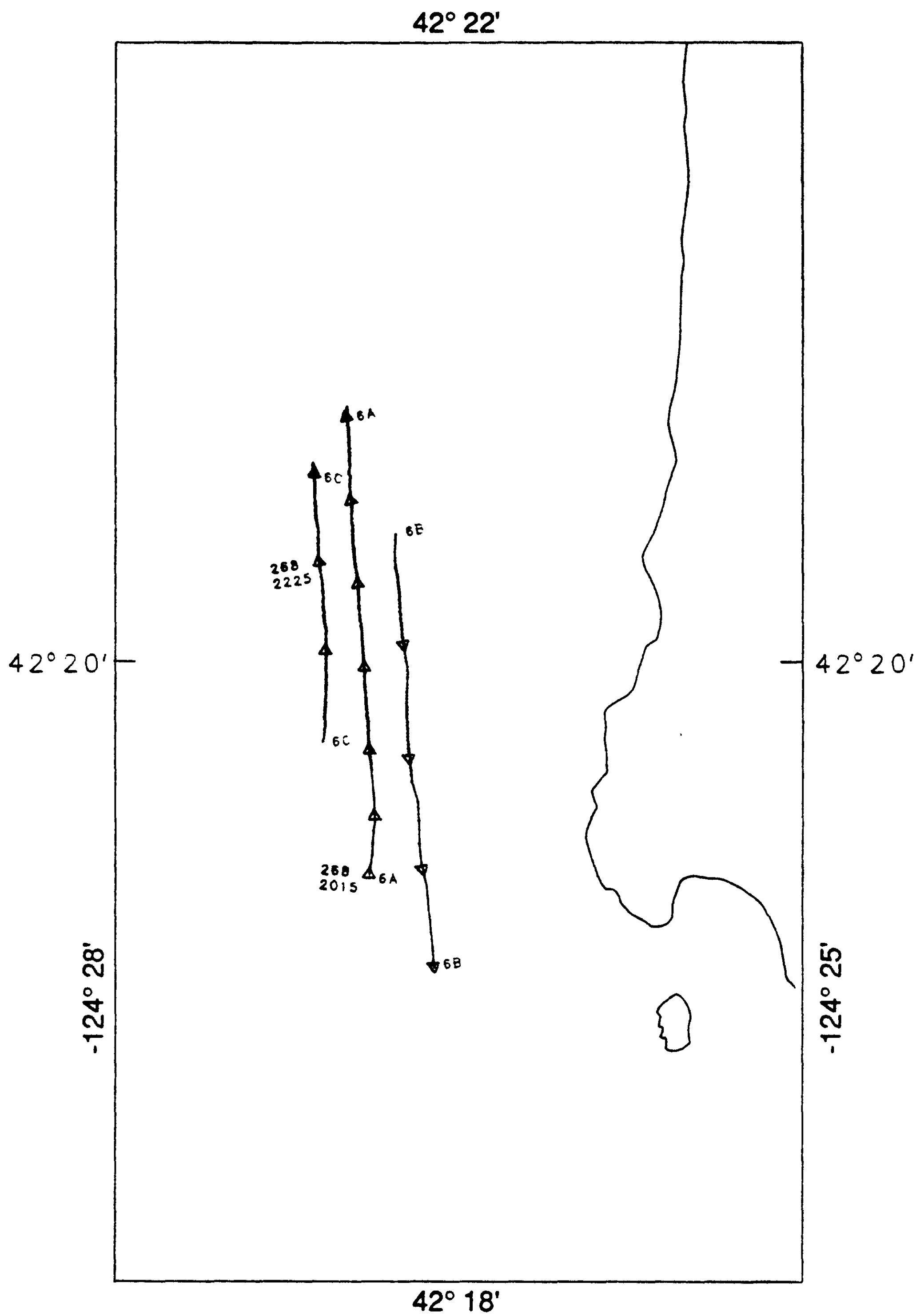

FIGURE 40. OTTER TRAWL LINES, GOLD BEACH SOUTH

MAP SCALE 1 : 40,000

1 0 3 km

1 0 2 nm

MERCATOR PROJECTION STANDARD PARALLEL = 42.5000°

APPENDIX A. CRUISE DATA INDEX

1990 OREGON PLACER MINERAL RESEARCH CRUISE

SEPTEMBER 21 - OCTOBER 3, 1990

A1 90WO

M/V ALOHA

TIME DATUM: GREENWICH MEAN TIME

RECORDING MEDIA	DATE AND TIME	STATUS	ACTIVITY	LINE	STA-TION	POLL REEL SAMPLE	LATITUDE DEC DEG	LONGITUDE DEC DEG	RC	SAMP DPTH	UN

****
*DATA CATEGORY = GEOLOGIC *
****

*******SYSTEM = SEAFLOOR CORE

*******DATA OR EQUIPMENT CODE = VIBRALIFT (BULK SAMPLE VIBRACORE)

RECORDING MEDIA	DATE AND TIME	STATUS	ACTIVITY	LINE	STATION	POLL REEL SAMPLE	LATITUDE DEC DEG	LONGITUDE DEC DEG	RC	SAMP DPTH	UN
S-PHYSICAL SAMPLE ATTEMPT	90 267 0136	START	START VIBRALIFT 5A		0005	005A	42.32447	-124.44936			
S-PHYSICAL SAMPLE ATTEMPT	90 267 0203	END	END VIBRALIFT 5A		0005	005A	42.32494	-124.44954	Y		
S-PHYSICAL SAMPLE ATTEMPT	90 267 0232	START	START VIBRALIFT 5B		0005	005B	42.32423	-124.45088		30m	
S-PHYSICAL SAMPLE ATTEMPT	90 267 0239	END	END VIBRALIFT 5B		0005	005B	42.32460	-124.45109	Y	30m	
S-PHYSICAL SAMPLE ATTEMPT	90 267 0405	START	START VIBRALIFT 4A		0004	004A	42.33824	-124.45219		26m	
S-PHYSICAL SAMPLE ATTEMPT	90 267 0423	END	END VIBRALIFT 4A		0004	004A	42.33834	-124.45256	Y	26m	
S-PHYSICAL SAMPLE ATTEMPT	90 267 2120	START	START VIBRALIFT 2A		0002	002A	42.39188	-124.43805		13m	
S-PHYSICAL SAMPLE ATTEMPT	90 267 2143	END	END VIBRALIFT 2A		0002	002A	42.39157	-124.43781	Y	13m	
S-PHYSICAL SAMPLE ATTEMPT	90 268 0115	START	START VIBRALIFT 3A		0003	003A	42.39444	-124.46187		28m	
S-PHYSICAL SAMPLE ATTEMPT	90 268 0127	END	END VIBRALIFT 3A		0003	003A	42.39379	-124.46185	Y	28m	
S-PHYSICAL SAMPLE ATTEMPT	90 274 1930	START	START VIBRALIFT 1A		0001	001A	42.84745	-124.60253		28m	
S-PHYSICAL SAMPLE ATTEMPT	90 274 1943	END	END VIBRALIFT 1A		0001	001A	42.84692	-124.60300	Y	28m	
W-INVENTORY OF SCIENTIFIC GEAR	90 266 2240		VIBRATING LIFT								

*******DATA OR EQUIPMENT CODE = VIBRATING CORE

RECORDING MEDIA	DATE AND TIME	STATUS	ACTIVITY	LINE	STATION	POLL REEL SAMPLE	LATITUDE DEC DEG	LONGITUDE DEC DEG	RC	SAMP DPTH	UN
S-PHYSICAL SAMPLE ATTEMPT	90 266 1450	START	START VIBRACORE 2A		0002	002A	42.39248	-124.44377		16m	
S-PHYSICAL SAMPLE ATTEMPT	90 266 1503	END	END VIBRACORE 2A		0002	002A	42.39242	-124.44372	N	16m	
S-PHYSICAL SAMPLE ATTEMPT	90 266 1536	START	START VIBRACORE 2B		0002	002B	42.39257	-124.44385		16m	
S-PHYSICAL SAMPLE ATTEMPT	90 266 1545	END	END VIBRACORE 2B		0002	002B	42.39239	-124.44409	N	16m	
S-PHYSICAL SAMPLE ATTEMPT	90 266 1556	START	START VIBRACORE 2C		0002	002C	42.39254	-124.44382		16m	
S-PHYSICAL SAMPLE ATTEMPT	90 266 1610	END	END VIBRACORE 2C		0002	002C	42.39273	-124.44385	N	16m	
S-PHYSICAL SAMPLE ATTEMPT	90 266 1655	START	START VIBRACORE 3A		0003	003A	42.39688	-124.46948		31m	
S-PHYSICAL SAMPLE ATTEMPT	90 266 1700	END	END VIBRACORE 3A		0003	003A	42.39687	-124.46958	N	32m	
S-PHYSICAL SAMPLE ATTEMPT	90 274 0715	START	START VIBRACORE 1A		0001	001A	42.84894	-124.59956		32m	
S-PHYSICAL SAMPLE ATTEMPT	90 274 0718	END	END VIBRACORE 1A		0001	001A	42.84884	-124.59974	N	32m	
S-PHYSICAL SAMPLE ATTEMPT	90 274 0839	START	START VIBRACORE 1B		0001	001B	42.84445	-124.60180		27m	
S-PHYSICAL SAMPLE ATTEMPT	90 274 0844	END	END VIBRACORE 1B		0001	001B	42.84444	-124.60188	N	27m	
W-INVENTORY OF SCIENTIFIC GEAR	90 266 2240		VIBRATING CORE								

*******SYSTEM = SEAFLOOR GRAB

*******DATA OR EQUIPMENT CODE = SMITH/MACINTRYE GRAB

RECORDING MEDIA	DATE AND TIME	STATUS	ACTIVITY	LINE	STATION	POLL REEL SAMPLE	LATITUDE DEC DEG	LONGITUDE DEC DEG	RC	SAMP DPTH	UN
S-PHYSICAL SAMPLE ATTEMPT	90 265 1701	SAMPLE	SMITH/MACINTYRE GRAB		0001	001A	42.85297	-124.59738	Y	34m	
S-PHYSICAL SAMPLE ATTEMPT	90 265 1712	SAMPLE	SMITH/MACINTYRE GRAB		0001	001B	42.85306	-124.59730	Y	34m	
S-PHYSICAL SAMPLE ATTEMPT	90 265 1723	SAMPLE	SMITH/MACINTYRE GRAB		0001	001C	42.85328	-124.59725	Y	32m	
S-PHYSICAL SAMPLE ATTEMPT	90 265 1733	SAMPLE	SMITH/MACINTYRE GRAB		0001	001D	42.85393	-124.59686	Y	34m	
S-PHYSICAL SAMPLE ATTEMPT	90 265 1742	SAMPLE	SMITH/MACINTYRE GRAB		0001	001E	42.85459	-124.59639	Y	34m	
S-PHYSICAL SAMPLE ATTEMPT	90 265 1751	SAMPLE	SMITH/MACINTYRE GRAB		0001	001F	42.85524	-124.59591	Y	34m	
S-PHYSICAL SAMPLE ATTEMPT	90 266 0542	SAMPLE	SMITH/MACINTYRE GRAB		0002	002A	42.39183	-124.43844	Y	12m	
S-PHYSICAL SAMPLE ATTEMPT	90 266 0549	SAMPLE	SMITH/MACINTYRE GRAB		0002	002B	42.39194	-124.43739	Y	12m	

RECORDING MEDIA	DATE AND TIME	STATUS	ACTIVITY	LINE	STA-TION	ROLL REEL SAMPLE	LATITUDE DEC DEG	LONGITUDE DEC DEG	RC	SAMP DPTH	UN
S-PHYSICAL SAMPLE ATTEMPT	90 266 0553	SAMPLE	SMITH/MACINTYRE GRAB		0002	002C	42.39170	-124.43839	Y	12m	
S-PHYSICAL SAMPLE ATTEMPT	90 266 0557	SAMPLE	SMITH/MACINTYRE GRAB		0002	002D	42.39212	-124.43839	Y	12m	
S-PHYSICAL SAMPLE ATTEMPT	90 266 0602	SAMPLE	SMITH/MACINTYRE GRAB		0002	002E	42.39214	-124.43838	Y	12m	
S-PHYSICAL SAMPLE ATTEMPT	90 266 0623	SAMPLE	SMITH/MACINTYRE GRAB		0002	002F	42.39500	-124.43630	Y	9m	
S-PHYSICAL SAMPLE ATTEMPT	90 266 0629	SAMPLE	SMITH/MACINTYRE GRAB		0002	002G	42.39616	-124.43730	Y	10m	
S-PHYSICAL SAMPLE ATTEMPT	90 266 0643	SAMPLE	SMITH/MACINTYRE GRAB		0002	002H	42.39266	-124.43799	Y	12m	
S-PHYSICAL SAMPLE ATTEMPT	90 266 0649	SAMPLE	SMITH/MACINTYRE GRAB		0002	002I	42.39233	-124.43950	Y	12m	
S-PHYSICAL SAMPLE ATTEMPT	90 266 0653	SAMPLE	SMITH/MACINTYRE GRAB		0002	002J	42.39266	-124.43933	Y	13m	
S-PHYSICAL SAMPLE ATTEMPT	90 266 0658	SAMPLE	SMITH/MACINTYRE GRAB		0002	002K	42.39250	-124.44050	Y	13m	
S-PHYSICAL SAMPLE ATTEMPT	90 266 0703	SAMPLE	SMITH/MACINTYRE GRAB		0002	002L	42.39266	-124.43950	Y	13m	
S-PHYSICAL SAMPLE ATTEMPT	90 266 0707	SAMPLE	SMITH/MACINTYRE GRAB		0002	002M	42.39278	-124.44050	Y	13m	
S-PHYSICAL SAMPLE ATTEMPT	90 266 0711	SAMPLE	SMITH/MACINTYRE GRAB		0002	002N	42.39316	-124.44000	Y	12m	
S-PHYSICAL SAMPLE ATTEMPT	90 266 0715	SAMPLE	SMITH/MACINTYRE GRAB		0002	002O	42.39316	-124.43883	Y	13m	
S-PHYSICAL SAMPLE ATTEMPT	90 266 0832	SAMPLE	SMITH/MACINTYRE GRAB		0003	003A	42.39833	-124.46156	Y	27m	
S-PHYSICAL SAMPLE ATTEMPT	90 266 0833	SAMPLE	SMITH/MACINTYRE GRAB		0003	003B	42.39900	-124.46300	Y	27m	
S-PHYSICAL SAMPLE ATTEMPT	90 266 0843	SAMPLE	SMITH/MACINTYRE GRAB		0003	003C	42.40083	-124.46233	Y	27m	
S-PHYSICAL SAMPLE ATTEMPT	90 266 0859	SAMPLE	SMITH/MACINTYRE GRAB		0003	003D	42.39550	-124.46466	Y	28m	
S-PHYSICAL SAMPLE ATTEMPT	90 266 0905	SAMPLE	SMITH/MACINTYRE GRAB		0003	003E	42.39566	-124.46466	Y	30m	
S-PHYSICAL SAMPLE ATTEMPT	90 266 2229	SAMPLE	SMITH/MACINTYRE GRAB		0004	004A	42.33698	-124.44895	Y	25m	
S-PHYSICAL SAMPLE ATTEMPT	90 266 2234	SAMPLE	SMITH/MACINTYRE GRAB		0004	004B	42.33714	-124.44860	Y	24m	
S-PHYSICAL SAMPLE ATTEMPT	90 266 2240	SAMPLE	SMITH/MACINTYRE GRAB		0004	SBM1	42.33775	-124.44894	Y	24m	
S-PHYSICAL SAMPLE ATTEMPT	90 266 2246	SAMPLE	SMITH/MACINTYRE GRAB		0004	004C	42.33836	-124.44985	Y	25m	
S-PHYSICAL SAMPLE ATTEMPT	90 266 2251	SAMPLE	SMITH/MACINTYRE GRAB		0004	004D	42.33785	-124.44846	Y	24m	
S-PHYSICAL SAMPLE ATTEMPT	90 266 2255	SAMPLE	SMITH/MACINTYRE GRAB		0004	004E	42.33828	-124.44901	Y	24m	
S-PHYSICAL SAMPLE ATTEMPT	90 267 0018	SAMPLE	SMITH/MACINTYRE GRAB		0005	005A	42.32635	-124.44649	Y	25m	
S-PHYSICAL SAMPLE ATTEMPT	90 267 0024	SAMPLE	SMITH/MACINTYRE GRAB		0005	005B	42.32617	-124.44708	Y	24m	
S-PHYSICAL SAMPLE ATTEMPT	90 267 0029	SAMPLE	SMITH/MACINTYRE GRAB		0005	005C	42.32609	-124.44780	Y	25m	
S-PHYSICAL SAMPLE ATTEMPT	90 267 0035	SAMPLE	SMITH/MACINTYRE GRAB		0005	005D	42.32623	-124.44768	Y	24m	
S-PHYSICAL SAMPLE ATTEMPT	90 267 0043	SAMPLE	SMITH/MACINTYRE GRAB		0005	005E	42.32556	-124.44786	Y	24m	
S-PHYSICAL SAMPLE ATTEMPT	90 270 1539	SAMPLE	SMITH/MACINTYRE GRAB		0008	008A	42.84553	-124.57709	Y	17m	
S-PHYSICAL SAMPLE ATTEMPT	90 270 1614	SAMPLE	SMITH/MACINTYRE GRAB		0009	009A	42.83226	-124.59477	N	19m	
S-PHYSICAL SAMPLE ATTEMPT	90 270 1618	SAMPLE	SMITH/MACINTYRE GRAB		0009	009B	42.83230	-124.59482	N	20m	
S-PHYSICAL SAMPLE ATTEMPT	90 270 1634	SAMPLE	SMITH/MACINTYRE GRAB		0010	010A	42.83349	-124.59820	Y	26m	
S-PHYSICAL SAMPLE ATTEMPT	90 270 1640	SAMPLE	SMITH/MACINTYRE GRAB		0010	010B	42.83390	-124.59961	Y	26m	
S-PHYSICAL SAMPLE ATTEMPT	90 270 1644	SAMPLE	SMITH/MACINTYRE GRAB		0010	010C	42.83417	-124.60055	Y	27m	
S-PHYSICAL SAMPLE ATTEMPT	90 270 1649	SAMPLE	SMITH/MACINTYRE GRAB		0010	010D	42.83451	-124.60172	Y	27m	
S-PHYSICAL SAMPLE ATTEMPT	90 270 1652	SAMPLE	SMITH/MACINTYRE GRAB		0010	010E	42.83471	-124.60243	Y	27m	
S-PHYSICAL SAMPLE ATTEMPT	90 270 1709	SAMPLE	SMITH/MACINTYRE GRAB		0011	011A	42.83557	-124.60548	Y	32m	
S-PHYSICAL SAMPLE ATTEMPT	90 270 1714	SAMPLE	SMITH/MACINTYRE GRAB		0011	011B	42.83565	-124.60560	Y	32m	
S-PHYSICAL SAMPLE ATTEMPT	90 270 1719	SAMPLE	SMITH/MACINTYRE GRAB		0011	011C	42.83548	-124.60542	Y	32m	
S-PHYSICAL SAMPLE ATTEMPT	90 270 1724	SAMPLE	SMITH/MACINTYRE GRAB		0011	011D	42.83528	-124.60512	Y	32m	
S-PHYSICAL SAMPLE ATTEMPT	90 270 1729	SAMPLE	SMITH/MACINTYRE GRAB		0011	011E	42.83592	-124.60506	Y	32m	
S-PHYSICAL SAMPLE ATTEMPT	90 270 1758	SAMPLE	SMITH/MACINTYRE GRAB		0012	012A	42.83793	-124.61209	Y	37m	
S-PHYSICAL SAMPLE ATTEMPT	90 270 1803	SAMPLE	SMITH/MACINTYRE GRAB		0012	012B	42.83770	-124.61185	Y	36m	
S-PHYSICAL SAMPLE ATTEMPT	90 270 1807	SAMPLE	SMITH/MACINTYRE GRAB		0012	012C	42.83767	-124.61196	Y	36m	
S-PHYSICAL SAMPLE ATTEMPT	90 270 1810	SAMPLE	SMITH/MACINTYRE GRAB		0012	012D	42.83774	-124.61199	Y	36m	
S-PHYSICAL SAMPLE ATTEMPT	90 270 1814	SAMPLE	SMITH/MACINTYRE GRAB		0012	012E	42.83770	-124.61191	Y	36m	
S-PHYSICAL SAMPLE ATTEMPT	90 270 1828	SAMPLE	SMITH/MACINTYRE GRAB		0013	013A	42.84013	-124.61877	Y	42m	
S-PHYSICAL SAMPLE ATTEMPT	90 270 1832	SAMPLE	SMITH/MACINTYRE GRAB		0013	013B	42.83971	-124.61870	Y	43m	
S-PHYSICAL SAMPLE ATTEMPT	90 270 1836	SAMPLE	SMITH/MACINTYRE GRAB		0013	013C	42.83937	-124.61906	Y	42m	
S-PHYSICAL SAMPLE ATTEMPT	90 270 1841	SAMPLE	SMITH/MACINTYRE GRAB		0013	013D	42.83939	-124.61886	N	42m	
S-PHYSICAL SAMPLE ATTEMPT	90 270 1844	SAMPLE	SMITH/MACINTYRE GRAB		0013	013E	42.83978	-124.61874	Y	42m	
S-PHYSICAL SAMPLE ATTEMPT	90 270 1848	SAMPLE	SMITH/MACINTYRE GRAB		0013	013F	42.84027	-124.61876	N	42m	
S-PHYSICAL SAMPLE ATTEMPT	90 270 1851	SAMPLE	SMITH/MACINTYRE GRAB		0013	013G	42.84003	-124.61858	Y	42m	
S-PHYSICAL SAMPLE ATTEMPT	90 270 1938	SAMPLE	SMITH/MACINTYRE GRAB		0014	014A	42.84137	-124.62561	Y	47m	
S-PHYSICAL SAMPLE ATTEMPT	90 270 1944	SAMPLE	SMITH/MACINTYRE GRAB		0014	014B	42.84155	-124.62599	Y	47m	

RECORDING MEDIA	DATE AND TIME	STATUS	ACTIVITY	LINE	STA- TION	ROLL REEL SAMPLE	LATITUDE DEC DEG	LONGITUDE DEC DEG	R C	SAMP DPTH	U N
S-PHYSICAL SAMPLE ATTEMPT	90 270 1949	SAMPLE	SMITH/MACINTYRE GRAB	:	:0014	:014C	42.84232	-124.62827	Y:	51m	:
S-PHYSICAL SAMPLE ATTEMPT	90 270 1955	SAMPLE	SMITH/MACINTYRE GRAB	:	:0014	:014D	42.84181	-124.62631	N:	49m	:
S-PHYSICAL SAMPLE ATTEMPT	90 270 2001	SAMPLE	SMITH/MACINTYRE GRAB	:	:0014	:014E	42.84246	-124.62449	Y:	47m	:
S-PHYSICAL SAMPLE ATTEMPT	90 270 2006	SAMPLE	SMITH/MACINTYRE GRAB	:	:0014	:014F	42.84113	-124.62482	Y:	47m	:
S-PHYSICAL SAMPLE ATTEMPT	90 273 2104	SAMPLE	SMITH/MACINTYRE GRAB	:	:0017	:017A	42.76173	-124.55425	Y:	31m	:
S-PHYSICAL SAMPLE ATTEMPT	90 273 2109	SAMPLE	SMITH/MACINTYRE GRAB	:	:0017	:017B	42.75987	-124.55406	Y:	32m	:
S-PHYSICAL SAMPLE ATTEMPT	90 273 2116	SAMPLE	SMITH/MACINTYRE GRAB	:	:0017	:017C	42.75949	-124.55408	Y:	32m	:
S-PHYSICAL SAMPLE ATTEMPT	90 273 2121	SAMPLE	SMITH/MACINTYRE GRAB	:	:0017	:017D	42.76161	-124.55421	Y:	30m	:
S-PHYSICAL SAMPLE ATTEMPT	90 273 2125	SAMPLE	SMITH/MACINTYRE GRAB	:	:0017	:017E	42.76182	-124.55434	Y:	31m	:
S-PHYSICAL SAMPLE ATTEMPT	90 273 2129	SAMPLE	SMITH/MACINTYRE GRAB	:	:0017	:017F	42.76173	-124.55411	Y:	31m	:
S-PHYSICAL SAMPLE ATTEMPT	90 273 2208	SAMPLE	SMITH/MACINTYRE GRAB	:	:0018	:018A	42.77383	-124.55237	N:	26m	:
S-PHYSICAL SAMPLE ATTEMPT	90 273 2212	SAMPLE	SMITH/MACINTYRE GRAB	:	:0018	:018B	42.77371	-124.55205	Y:	26m	:
S-PHYSICAL SAMPLE ATTEMPT	90 273 2221	SAMPLE	SMITH/MACINTYRE GRAB	:	:0018	:018C	42.77422	-124.55228	Y:	27m	:
W-INVENTORY OF SCIENTIFIC GEAR	90 266 2240		SMITH/MACINTYRE GRAB	:	:	:			:		:

****
*DATA CATEGORY = HYDROLOGIC   *
****

*******SYSTEM = NET

*******DATA OR EQUIPMENT CODE = CRAB TRAP (POT)

RECORDING MEDIA	DATE AND TIME	STATUS	ACTIVITY	LINE	STA- TION	ROLL REEL SAMPLE	LATITUDE DEC DEG	LONGITUDE DEC DEG	R C	SAMP DPTH	U N
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 266 0935	START	CRAB POT 2A	:	:0002	:002A	42.40528	-124.44207	:	12m	:
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 266 0938	START	CRAB POT 2B	:	:0002	:002B	42.40287	-124.44259	:	12m	:
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 266 0940	START	CRAB POT 2C	:	:0002	:002C	42.40120	-124.44317	:	14m	:
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 266 0942	START	CRAB POT 2D	:	:0002	:002D	42.39942	-124.44275	:	14m	:
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 266 0944	START	CRAB POT 2E	:	:0002	:002E	42.39772	-124.44193	:	14m	:
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 268 1731	START	CRAB POT 6A	:	:0006	:006A	42.34123	-124.44526	:	19m	:
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 268 1733	START	CRAB POT 6B	:	:0006	:006B	42.33922	-124.44509	:	20m	:
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 268 1736	START	CRAB POT 6C	:	:0006	:006C	42.33537	-124.44478	:	19m	:
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 268 1739	START	CRAB POT 6D	:	:0006	:006D	42.33137	-124.44430	:	19m	:
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 268 1741	START	CRAB POT 6E	:	:0006	:006E	42.32870	-124.44387	:	19m	:
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 270 1514	START	CRAB POT 8A	:	:0008	:008A	42.85343	-124.57574	:	19m	:
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 270 1516	START	CRAB POT 8B	:	:0008	:008B	42.85112	-124.57612	:	17m	:
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 270 1517	START	CRAB POT 8C	:	:0008	:008C	42.84984	-124.57622	:	17m	:
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 270 1519	START	CRAB POT 8D	:	:0008	:008D	42.84757	-124.57590	:	17m	:
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 270 1520	START	CRAB POT 8E	:	:0008	:008E	42.84603	-124.57643	:	16m	:
E-RECOVERY OF SCIENTIFIC GEAR	90 266 2054	END	CRAB POT 2A	:	:0002	:002A	42.40465	-124.44168	Y:	12m	:
E-RECOVERY OF SCIENTIFIC GEAR	90 266 2102	END	CRAB POT 2B	:	:0002	:002B	42.40331	-124.44242	N:	13m	:
E-RECOVERY OF SCIENTIFIC GEAR	90 266 2109	END	CRAB POT 2C	:	:0002	:002C	42.40079	-124.44321	N:	14m	:
E-RECOVERY OF SCIENTIFIC GEAR	90 266 2116	END	CRAB POT 2D	:	:0002	:002D	42.39962	-124.44234	N:	14m	:
E-RECOVERY OF SCIENTIFIC GEAR	90 266 2124	END	CRAB POT 2E	:	:0002	:002E	42.39823	-124.44214	N:	14m	:
E-RECOVERY OF SCIENTIFIC GEAR	90 269 1957	END	CRAB POT 6A	:	:0006	:006A	42.34041	-124.44645	Y:	19m	:
E-RECOVERY OF SCIENTIFIC GEAR	90 269 2008	END	CRAB POT 6B	:	:0006	:006B	42.33852	-124.44545	Y:	20m	:
E-RECOVERY OF SCIENTIFIC GEAR	90 269 2016	END	CRAB POT 6C	:	:0006	:006C	42.33495	-124.44470	Y:	19m	:
E-RECOVERY OF SCIENTIFIC GEAR	90 269 2027	END	CRAB POT 6D	:	:0006	:006D	42.33158	-124.44462	Y:	19m	:
E-RECOVERY OF SCIENTIFIC GEAR	90 269 2037	END	CRAB POT 6E	:	:0006	:006E	42.32849	-124.44421	Y:	19m	:
E-RECOVERY OF SCIENTIFIC GEAR	90 271 1943	END	CRAB POT 8A	:	:0008	:008A	42.85305	-124.57610	N:	19m	:
E-RECOVERY OF SCIENTIFIC GEAR	90 271 1952	END	CRAB POT 8B	:	:0008	:008B	42.85084	-124.57622	Y:	19m	:
E-RECOVERY OF SCIENTIFIC GEAR	90 271 1958	END	CRAB POT 8C	:	:0008	:008C	42.84889	-124.57688	Y:	17m	:

RECORDING MEDIA	DATE AND TIME	STATUS	ACTIVITY	LINE	STA-TION	ROLL REEL SAMPLE	LATITUDE DEC DEG	LONGITUDE DEC DEG	R C	SAMP DPTH	U N
E-RECOVERY OF SCIENTIFIC GEAR	90 271 2004	END	CRAB POT 8D		0008	008D	42.84690	-124.57653	N	16m	
E-RECOVERY OF SCIENTIFIC GEAR	90 271 2010	END	CRAB POT 8E		0008	008E	42.84544	-124.57659	N	17m	
W-INVENTORY OF SCIENTIFIC GEAR	90 266 2240		CRAB POTS								
*******DATA OR EQUIPMENT CODE = BEAM TRAWL											
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 268 1814	START	START BEAM TRAWL		0006	006A	42.31939	-124.44333		24m	
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 268 1903	START	START BEAM TRAWL		0006	006B	42.34426	-124.44728		20m	
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 270 2309	START	START BEAM TRAWL		0015	015A	42.84741	-124.59524			
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 271 1751	START	START BEAM TRAWL		0015	015B	42.84939	-124.59535			
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 273 1741	START	START BEAM TRAWL		0016	016A	42.75594	-124.55217			
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 273 1950	START	START BEAM TRAWL		0016	016B	42.75397	-124.55279			
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 273 1956	START	START BEAM TRAWL		0016	016C	42.75299	-124.55366			
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 274 0521	START	START BEAM TRAWL		0015	015C	42.84919	-124.59532			
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 274 2202	START	START BEAM TRAWL		0015	015D	42.84875	-124.59525		27m	
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 274 2317	START	START BEAM TRAWL		0015	015E	42.84993	-124.59541		27m	
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 275 0429	START	START BEAM TRAWL		0015	015F	42.85069	-124.59527		29m	
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 275 2131	START	START BEAM TRAWL		0019	019A	42.77398	-124.55289		27m	
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 275 2217	START	START BEAM TRAWL		0019	019B	42.77341	-124.55282		27m	
E-RECOVERY OF SCIENTIFIC GEAR	90 268 1837	END	END BEAM TRAWL		0006	006A	42.34040	-124.44707	Y	24m	
E-RECOVERY OF SCIENTIFIC GEAR	90 268 1933	END	END BEAM TRAWL		0006	006B	42.32150	-124.44749	Y	29m	
E-RECOVERY OF SCIENTIFIC GEAR	90 270 2351	END	END BEAM TRAWL		0015	015A	42.86626	-124.59544	Y		
E-RECOVERY OF SCIENTIFIC GEAR	90 271 1858	END	END BEAM TRAWL		0015	015B	42.86598	-124.59632	Y		
E-RECOVERY OF SCIENTIFIC GEAR	90 273 1817	END	END BEAM TRAWL		0016	016A	42.77553	-124.55197	Y		
E-RECOVERY OF SCIENTIFIC GEAR	90 273 1917	END	END BEAM TRAWL		0016	016B	42.76849	-124.55300	Y		
E-RECOVERY OF SCIENTIFIC GEAR	90 273 2024	END	END BEAM TRAWL		0016	016C	42.76845	-124.55353	Y		
E-RECOVERY OF SCIENTIFIC GEAR	90 274 0545	END	END BEAM TRAWL		0015	015C	42.86574	-124.59532	Y		
E-RECOVERY OF SCIENTIFIC GEAR	90 274 2233	END	END BEAM TRAWL		0015	015D	42.86544	-124.59549	Y	36m	
E-RECOVERY OF SCIENTIFIC GEAR	90 274 2353	END	END BEAM TRAWL		0015	015E	42.86549	-124.59545	Y	36m	
E-RECOVERY OF SCIENTIFIC GEAR	90 275 0449	END	END BEAM TRAWL		0015	015F	42.86550	-124.59538	Y	36m	
E-RECOVERY OF SCIENTIFIC GEAR	90 275 2147	END	END BEAM TRAWL		0019	019A	42.77994	-124.55291	Y	24m	
E-RECOVERY OF SCIENTIFIC GEAR	90 275 2236	END	END BEAM TRAWL		0019	019B	42.77997	-124.55342	Y	23m	
W-INVENTORY OF SCIENTIFIC GEAR	90 266 2240		BEAM TRAWL								
*******DATA OR EQUIPMENT CODE = OTTER TRAWL											
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 268 2015	START	START OTTER TRAWL		0006	006A	42.32172	-124.44812		28m	
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 268 2120	START	START OTTER TRAWL		0006	006B	42.34033	-124.44625		22m	
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 268 2215	START	START OTTER TRAWL		0006	006C	42.32893	-124.45157		32m	
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 268 2309	START	START OTTER TRAWL		0007	007A	42.38385	-124.45923			
E-RECOVERY OF SCIENTIFIC GEAR	90 268 2045	END	END OTTER TRAWL		0006	006A	42.34629	-124.44977	Y	23m	
E-RECOVERY OF SCIENTIFIC GEAR	90 268 2140	END	END OTTER TRAWL		0006	006B	42.31712	-124.44348	Y		
E-RECOVERY OF SCIENTIFIC GEAR	90 268 2230	END	END OTTER TRAWL		0006	006C	42.34326	-124.45219	Y		
E-RECOVERY OF SCIENTIFIC GEAR	90 268 2323	END	END OTTER TRAWL		0007	007A	42.40341	-124.45960	N		

```
                                                                                                ROLL
   RECORDING MEDIA              DATE AND TIME      STATUS        ACTIVITY           LINE STA-  REEL   LATITUDE  LONGITUDE R SAMP U
                                                                                         TION SAMPLE DEC DEG    DEC DEG  C DPTH N

W-INVENTORY OF SCIENTIFIC GEAR  90 266 2240               BEAM TRAWL               :    :    :                            :    :
W-INVENTORY OF SCIENTIFIC GEAR  90 266 2240               OTTER TRAWL              :    :    :                            :    :

                                                   ****************************************
                                                   *DATA CATEGORY = VESSEL DATA           *
                                                   ****************************************

*******SYSTEM = NAVIGATION

*******DATA OR EQUIPMENT CODE = INTEGRATED NAV

A-ANALOG PAPER ROLLS            90 264 1500        START  START PC PAPER #1        :    :    :0001  43.37604 -124.21177  :    :
A-ANALOG PAPER ROLLS            90 276 1340        END    END PC PAPER #1          :    :    :0001  43.47097 -124.34870  :    :

C-FLOPPY DISK OR PUNCH CARDS    90 264 1500        START  START NAV FLOPPY #1      :    :    :0001  43.37604 -124.21177  :    :
C-FLOPPY DISK OR PUNCH CARDS    90 265 2252        END    END NAV FLOPPY #1        :    :    :0001  42.87294 -124.60497  :    :
C-FLOPPY DISK OR PUNCH CARDS    90 265 2254        START  START NAV FLOPPY #2      :    :    :0002  42.87444 -124.61031  :    :
C-FLOPPY DISK OR PUNCH CARDS    90 266 0153        END    END NAV FLOPPY #2        :    :    :0002  42.82508 -124.63422  :    :
C-FLOPPY DISK OR PUNCH CARDS    90 266 0410        START  START NAV FLOPPY #3      :    :    :0003  42.68721 -124.63971  :    :
C-FLOPPY DISK OR PUNCH CARDS    90 266 0451        END    END NAV FLOPPY #3        :    :    :0003  42.41273 -124.49026  :    :
C-FLOPPY DISK OR PUNCH CARDS    90 267 0452        START  START NAV FLOPPY #4      :    :    :0004  42.33792 -124.45231  :    :
C-FLOPPY DISK OR PUNCH CARDS    90 267 1231        END    END NAV FLOPPY # 4       :    :    :0004  42.38944 -124.44185  :    :
C-FLOPPY DISK OR PUNCH CARDS    90 267 1231        START  START NAV FLOPPY #5      :    :    :0005  42.38944 -124.44185  :    :
C-FLOPPY DISK OR PUNCH CARDS    90 268 2356        END    END NAV FLOPPY #5        :    :    :0005  42.41014 -124.47658  :    :
C-FLOPPY DISK OR PUNCH CARDS    90 268 2356        START  START NAV FLOPPY #6      :    :    :0006  42.41014 -124.47658  :    :
C-FLOPPY DISK OR PUNCH CARDS    90 270 1004        END    END NAV FLOPPY #6        :    :    :0006  42.82580 -124.65313  :    :
C-FLOPPY DISK OR PUNCH CARDS    90 270 1004        START  START NAV FLOPPY #7      :    :    :0007  42.82580 -124.65313  :    :
C-FLOPPY DISK OR PUNCH CARDS    90 271 0624        START  START NAV FLOPPY #8      :    :    :0008  42.75169 -124.58934  :    :
C-FLOPPY DISK OR PUNCH CARDS    90 271 0624        END    END NAV FLOPPY #7        :    :    :0007  42.75169 -124.58934  :    :
C-FLOPPY DISK OR PUNCH CARDS    90 273 2139        END    END NAV FLOPPY #3        :    :    :0008  42.76122 -124.55437  :    :
C-FLOPPY DISK OR PUNCH CARDS    90 273 2140        START  START NAV FLOPPY #9      :    :    :0009  42.76125 -124.55414  :    :
C-FLOPPY DISK OR PUNCH CARDS    90 275 0425        START  START NAV FLOPPY #10     :    :    :0010  42.84716 -124.59530  :    :
C-FLOPPY DISK OR PUNCH CARDS    90 275 0425        END    END NAV FLOPPY #9        :    :    :0009  42.84716 -124.59530  :    :
C-FLOPPY DISK OR PUNCH CARDS    90 276 1340        END    END NAV FLOPPY #10       :    :    :0010  43.47097 -124.34870  :    :

W-INVENTORY OF SCIENTIFIC GEAR  90 266 2240               PC NAVIGATION            :    :    :                            :    :
*******DATA OR EQUIPMENT CODE = LORAN C

W-INVENTORY OF SCIENTIFIC GEAR  90 266 2240               HYPERBOLIC LORAN         :    :    :                            :    :
*******DATA OR EQUIPMENT CODE = GPS SATELLITE

W-INVENTORY OF SCIENTIFIC GEAR  90 266 2240               ASHTECH GPS RECEIVER     :    :    :                            :    :

*******DATA OR EQUIPMENT CODE = CRUISE

K-SHIP MOVEMENTS                90 264 1700        START  LV COOS BAY, START       :PORT:    :          43.37603 -124.21179  :    :
K-SHIP MOVEMENTS                90 276 1900        END    ARR COOS BAY, END        :PORT:    :                               :    :
*******DATA OR EQUIPMENT CODE = STATION

K-SHIP MOVEMENTS                90 265 1604        START  START OF STATION #1      :    :0001:          42.85245 -124.59738  :    :
K-SHIP MOVEMENTS                90 265 2227        END    END OF STATION #1        :    :0001:          42.86931 -124.57013  :    :
K-SHIP MOVEMENTS                90 266 0541        START  START OF STATION #2      :    :0002:          42.89163 -124.43821  :    :
```

RECORDING MEDIA	DATE AND TIME	STATUS	ACTIVITY	LINE	STA-TION	ROLL REEL SAMPLE	LATITUDE DEC DEG	LONGITUDE DEC DEG	RC	SAMP DPTH	UN
K-SHIP MOVEMENTS	90 266 0800	END	END OF STATION #2		0002		42.39273	-124.43789			
K-SHIP MOVEMENTS	90 266 0827	START	START OF STATION #3		0003		42.39278	-124.43799			
K-SHIP MOVEMENTS	90 266 0911	END	END OF STATION #3		0003		42.39810	-124.46393			
K-SHIP MOVEMENTS	90 266 0935	START	START OF STATION #2		0002		42.40528	-124.44207			
K-SHIP MOVEMENTS	90 266 1610	END	END OF STATION #2		0002		42.39273	-124.44385			
K-SHIP MOVEMENTS	90 266 1628	START	START OF STATION #3		0003		42.39569	-124.46844			
K-SHIP MOVEMENTS	90 266 2030	END	END OF STATION #3		0003		42.40587	-124.46149			
K-SHIP MOVEMENTS	90 266 2054	START	START OF STATION #2		0002		42.40466	-124.44168			
K-SHIP MOVEMENTS	90 266 2124	END	END OF STATION #2		0002		42.39823	-124.44214			
K-SHIP MOVEMENTS	90 266 2227	START	START OF STATION #4		0004		42.33745	-124.44930			
K-SHIP MOVEMENTS	90 266 2305	END	END OF STATION #4		0004		42.33357	-124.44750			
K-SHIP MOVEMENTS	90 266 2323	START	START OF STATION #5		0005		42.32662	-124.44532			
K-SHIP MOVEMENTS	90 267 0303	END	END OF STATION #5		0005		42.32436	-124.45059			
K-SHIP MOVEMENTS	90 267 0320	START	START OF STATION #4		0004		42.33672	-124.45164			
K-SHIP MOVEMENTS	90 267 0611	END	END OF STATION #4		0004		42.33887	-124.45153			
K-SHIP MOVEMENTS	90 267 1730	START	START OF STATION #2		0002		42.39429	-124.44190			
K-SHIP MOVEMENTS	90 267 2210	END	END OF STATION #2		0002		42.39362	-124.43969			
K-SHIP MOVEMENTS	90 268 0043	START	START OF STATION #3		0003		42.39493	-124.46186			
K-SHIP MOVEMENTS	90 268 0258	END	END OF STATION #3		0003		42.38470	-124.46596			
K-SHIP MOVEMENTS	90 268 1730	START	START OF STATION #6		0006		42.34174	-124.44536			
K-SHIP MOVEMENTS	90 268 2238	END	END OF STATION #6		0006		42.35071	-124.45280			
K-SHIP MOVEMENTS	90 268 2300	START	START OF STATION #7		0007		42.38050	-124.46049			
K-SHIP MOVEMENTS	90 268 2350	END	END OF STATION #7		0007		42.41223	-124.46732			
K-SHIP MOVEMENTS	90 269 1957	START	START OF STATION #6		0006		42.34041	-124.44645			
K-SHIP MOVEMENTS	90 269 2037	END	END OF STATION #6		0006		42.32849	-124.44421			
K-SHIP MOVEMENTS	90 270 1509	START	START OF STATION #8		0008		42.85398	-124.57427			
K-SHIP MOVEMENTS	90 270 1545	END	END OF STATION #8		0008		42.84576	-124.57719			
K-SHIP MOVEMENTS	90 270 1610	START	START OF STATION #9		0009		42.83245	-124.59488			
K-SHIP MOVEMENTS	90 270 1621	END	END OF STATION #9		0009		42.83261	-124.59514			
K-SHIP MOVEMENTS	90 270 1633	START	START OF STATION #10		0010		42.83342	-124.59796		27m	
K-SHIP MOVEMENTS	90 270 1654	END	END OF STATION #10		0010		42.83485	-124.60290			
K-SHIP MOVEMENTS	90 270 1705	START	START OF STATION #11		0011		42.83559	-124.60548		32m	
K-SHIP MOVEMENTS	90 270 1730	END	END OF STATION #11		0011		42.83590	-124.60501			
K-SHIP MOVEMENTS	90 270 1744	START	START OF STATION #12		0012		42.83783	-124.61199		37m	
K-SHIP MOVEMENTS	90 270 1817	END	END OF STATION #12		0012		42.83841	-124.61133			
K-SHIP MOVEMENTS	90 270 1826	START	START OF STATION #13		0013		42.84030	-124.61866		42m	
K-SHIP MOVEMENTS	90 270 1852	END	END OF STATION #13		0013		42.84005	-124.61863			
K-SHIP MOVEMENTS	90 270 1930	START	START OF STATION #14		0014		42.84213	-124.62555			
K-SHIP MOVEMENTS	90 270 2010	END	END OF STATION #14		0014		42.84149	-124.62499			
K-SHIP MOVEMENTS	90 270 2300	START	START OF STATION #15		0015		42.84342	-124.59576			
K-SHIP MOVEMENTS	90 270 2356	END	END OF STATION #15		0015		42.86762	-124.59509			
K-SHIP MOVEMENTS	90 271 1738	START	START OF STATION #15		0015		42.84085	-124.59487			
K-SHIP MOVEMENTS	90 271 1906	END	END OF STATION #15		0015		42.86847	-124.59560			
K-SHIP MOVEMENTS	90 271 1930	START	START OF STATION #8		0008		42.85217	-124.57623			
K-SHIP MOVEMENTS	90 271 2020	END	END OF STATION #8		0008		42.84373	-124.58669			
K-SHIP MOVEMENTS	90 273 1737	START	START OF STATION #16		0016		42.75329	-124.55242			
K-SHIP MOVEMENTS	90 273 2025	END	END OF STATION #16		0016		42.76906	-124.55363			
K-SHIP MOVEMENTS	90 273 2100	START	START OF STATION #17		0017		42.75909	-124.55405			
K-SHIP MOVEMENTS	90 273 2140	END	END OF STATION #17		0017		42.76125	-124.55414			
K-SHIP MOVEMENTS	90 273 2206	START	START OF STATION #18		0018		42.77415	-124.55222			
K-SHIP MOVEMENTS	90 273 2225	END	END OF STATION #18		0018		42.77347	-124.55267			
K-SHIP MOVEMENTS	90 274 0500	START	START OF STATION #15		0015		42.84260	-124.59779			
K-SHIP MOVEMENTS	90 274 0552	END	END OF STATION #15		0015		42.86852	-124.59560			
K-SHIP MOVEMENTS	90 274 0633	START	START OF STATION #1		0001		42.85062	-124.59893			
K-SHIP MOVEMENTS	90 274 0945	END	END OF STATION #1		0001		42.84446	-124.60196			
K-SHIP MOVEMENTS	90 274 1718	START	START OF STATION #1		0001		42.85179	-124.59833			

RECORDING MEDIA	DATE AND TIME	STATUS	ACTIVITY	LINE	STATION	ROLL REEL SAMPLE	LATITUDE DEC DEG	LONGITUDE DEC DEG	RC	SAMP DPTH	UN
K-SHIP MOVEMENTS	90 274 1943	END	END OF STATION #1		0001		42.84692	-124.60300			
K-SHIP MOVEMENTS	90 274 2147	START	START OF STATION #15		0015		42.83932	-124.59570			
K-SHIP MOVEMENTS	90 275 0000	END	END OF STATION #15		0015		42.86863	-124.59547			
K-SHIP MOVEMENTS	90 275 0420	START	START OF STATION #15		0015		42.84460	-124.59631			
K-SHIP MOVEMENTS	90 275 0454	END	END OF STATION #15		0015		42.86780	-124.59660			
K-SHIP MOVEMENTS	90 275 2125	START	START OF STATION #19		0019		42.77084	-124.55326			
K-SHIP MOVEMENTS	90 275 2240	END	END OF STATION #19		0019		42.78184	-124.55356			

*******DATA OR EQUIPMENT CODE = LORAN C RHO-RHO

RECORDING MEDIA	DATE AND TIME	STATUS	ACTIVITY	LINE	STATION	ROLL REEL SAMPLE	LATITUDE DEC DEG	LONGITUDE DEC DEG	RC	SAMP DPTH	UN
W-INVENTORY OF SCIENTIFIC GEAR	90 266 2240		MEGAPULSE LORAN								

*******DATA OR EQUIPMENT CODE = TRACKLINE

RECORDING MEDIA	DATE AND TIME	STATUS	ACTIVITY	LINE	STATION	ROLL REEL SAMPLE	LATITUDE DEC DEG	LONGITUDE DEC DEG	RC	SAMP DPTH	UN
K-SHIP MOVEMENTS	90 265 2212	START	SOL 9 MAGNETICS	0009			42.87844	-124.59626			
K-SHIP MOVEMENTS	90 265 2227	END	EOL 9 MAGNETICS	0009			42.86931	-124.57013			
K-SHIP MOVEMENTS	90 265 2236	START	SOL 10 MAGNETICS	0010			42.86377	-124.56793			
K-SHIP MOVEMENTS	90 265 2255	END	EOL 10 MAGNETICS	0010			42.87523	-124.61295			
K-SHIP MOVEMENTS	90 265 2304	START	SOL 11 MAGNETICS	0011			42.86898	-124.61031			
K-SHIP MOVEMENTS	90 265 2318	END	EOL 11 MAGNETICS	0011			42.86129	-124.57941			
K-SHIP MOVEMENTS	90 265 2325	START	SOL 12 MAGNETICS	0012			42.85776	-124.58740			
K-SHIP MOVEMENTS	90 265 2336	END	EOL 12 MAGNETICS	0012			42.86538	-124.61669			
K-SHIP MOVEMENTS	90 265 2345	START	SOL 13 MAGNETICS	0013			42.86149	-124.61987			
K-SHIP MOVEMENTS	90 266 0000	END	EOL 13 MAGNETICS	0013			42.84953	-124.58404			
K-SHIP MOVEMENTS	90 266 0009	START	SOL 14 MAGNETICS	0014			42.84766	-124.59733			
K-SHIP MOVEMENTS	90 266 0019	END	EOL 14 MAGNETICS	0014			42.85589	-124.62479			
K-SHIP MOVEMENTS	90 266 0032	START	SOL 15 MAGNETICS	0015			42.84939	-124.61904			
K-SHIP MOVEMENTS	90 266 0045	END	EOL 15 MAGNETICS	0015			42.84225	-124.59646			
K-SHIP MOVEMENTS	90 266 0055	START	SOL 16 MAGNETICS	0016			42.84069	-124.61077			
K-SHIP MOVEMENTS	90 266 0104	END	EOL 16 MAGNETICS	0016			42.84537	-124.62722			
K-SHIP MOVEMENTS	90 266 0115	START	SOL 17 MAGNETICS	0017			42.83973	-124.62716			
K-SHIP MOVEMENTS	90 266 0127	END	EOL 17 MAGNETICS	0017			42.83122	-124.59898			
K-SHIP MOVEMENTS	90 266 0133	START	SOL 18 MAGNETICS	0018			42.82722	-124.60504			
K-SHIP MOVEMENTS	90 266 0141	END	EOL 18 MAGNETICS	0018			42.83269	-124.62762			
K-SHIP MOVEMENTS	90 267 0653	START	SOL 37 SEISMIC TEST	0037			42.33119	-124.49881			
K-SHIP MOVEMENTS	90 267 0735	END	EOL 37 SEISMIC	0037			42.32671	-124.44940			
K-SHIP MOVEMENTS	90 267 0747	START	SOL 35 SEISMIC TEST	0035			42.33407	-124.45757			
K-SHIP MOVEMENTS	90 267 0816	END	EOL 35 SEISMIC	0035			42.33871	-124.49710			
K-SHIP MOVEMENTS	90 267 0832	START	SOL 37 SEISMIC REAL	0037			42.32666	-124.49563			
K-SHIP MOVEMENTS	90 267 0902	END	EOL 37 SEISMIC	0037			42.32409	-124.45251			
K-SHIP MOVEMENTS	90 267 0916	START	SOL 35 SEISMIC	0035			42.33710	-124.45498			
K-SHIP MOVEMENTS	90 267 0941	END	EOL 35 SEISMIC	0035			42.33717	-124.49629			
K-SHIP MOVEMENTS	90 267 1001	START	SOL 33 SEISMIC	0033			42.34753	-124.49356			
K-SHIP MOVEMENTS	90 267 1035	END	EOL 33 SEISMIC	0033			42.34796	-124.44147			
K-SHIP MOVEMENTS	90 267 1045	START	SOL 31 SEISMIC	0031			42.35771	-124.44317			
K-SHIP MOVEMENTS	90 267 1119	END	EOL 31 SEISMIC	0031			42.35825	-124.49890			
K-SHIP MOVEMENTS	90 267 1143	START	SOL 27 SEISMIC	0027			42.38092	-124.49669			
K-SHIP MOVEMENTS	90 267 1220	END	EOL 27 SEISMIC	0027			42.38063	-124.43975			
K-SHIP MOVEMENTS	90 267 1233	START	SOL 25 SEISMIC	0025			42.39067	-124.44350			
K-SHIP MOVEMENTS	90 267 1306	END	EOL 25 SEISMIC	0025			42.39166	-124.49851			
K-SHIP MOVEMENTS	90 267 1339	START	SOL 21 SEISMIC	0021			42.39041	-124.47569			
K-SHIP MOVEMENTS	90 267 1424	END	EOL 21 SEISMIC	0021			42.33713	-124.47480			
K-SHIP MOVEMENTS	90 267 1443	START	SOL 19 SEISMIC	0019			42.34455	-124.45145			
K-SHIP MOVEMENTS	90 267 1534	END	EOL 19 SEISMIC	0019			42.40411	-124.46157			

RECORDING MEDIA	DATE AND TIME	STATUS	ACTIVITY	LINE STA-TION	ROLL REEL SAMPLE	LATITUDE DEC DEG	LONGITUDE DEC DEG	R C	SAMP DPTH	U N
K-SHIP MOVEMENTS	90 267 1536	START	SOL 18 SEISMIC	:0019:	:	42.40627	-124.46268	:		:
K-SHIP MOVEMENTS	90 267 1545	END	EOL 18 SEISMIC	:0018:	:	42.41533	-124.47181	:		:
K-SHIP MOVEMENTS	90 267 1549	START	SOL 17 SEISMIC	:0017:	:	42.41736	-124.47583	:		:
K-SHIP MOVEMENTS	90 267 1606	END	EOL 17 SEISMIC	:0017:	:	42.40338	-124.49345	:		:
K-SHIP MOVEMENTS	90 267 1639	START	SOL 23 SEISMIC	:0023:	:	42.39949	-124.49379	:		:
K-SHIP MOVEMENTS	90 267 1714	END	EOL 23 SEISMIC	:0023:	:	42.40262	-124.44167	:		:
K-SHIP MOVEMENTS	90 268 0336	START	SOL 38 SEISMIC	:0038:	:	42.39998	-124.49029	:		:
K-SHIP MOVEMENTS	90 268 0421	END	EOL 38 SEISMIC	:0038:	:	42.40699	-124.55979	:		:
K-SHIP MOVEMENTS	90 268 0435	START	SOL 39 SEISMIC	:0039:	:	42.41736	-124.55890	:		:
K-SHIP MOVEMENTS	90 268 0500	END	EOL 39 SEISMIC	:0039:	:	42.41743	-124.51242	:		:
K-SHIP MOVEMENTS	90 268 0516	START	SOL 40 SEISMIC	:0040:	:	42.42793	-124.51167	:		:
K-SHIP MOVEMENTS	90 268 0546	END	EOL 40 SEISMIC	:0040:	:	42.42814	-124.55950	:		:
K-SHIP MOVEMENTS	90 268 0558	START	SOL 41 SEISMIC	:0041:	:	42.43854	-124.56051	:		:
K-SHIP MOVEMENTS	90 268 0624	END	EOL 41 SEISMIC	:0041:	:	42.43907	-124.51193	:		:
K-SHIP MOVEMENTS	90 268 0639	START	SOL 42 SEISMIC	:0042:	:	42.45024	-124.51030	:		:
K-SHIP MOVEMENTS	90 268 0710	END	EOL 42 SEISMIC	:0042:	:	42.45001	-124.56129	:		:
K-SHIP MOVEMENTS	90 268 0740	START	SOL 43 SEISMIC	:0043:	:	42.45805	-124.53346	:		:
K-SHIP MOVEMENTS	90 268 0828	END	EOL 43 SEISMIC	:0043:	:	42.39973	-124.53587	:		:
K-SHIP MOVEMENTS	90 268 0902	START	SOL 43 MAGNETICS	:0043:	:	42.40459	-124.53587	:		:
K-SHIP MOVEMENTS	90 268 0929	END	EOL 43 MAGNETICS	:0043:	:	42.46022	-124.53580	:		:
K-SHIP MOVEMENTS	90 268 1013	START	SOL 42 MAGNETICS	:0042:	:	42.45185	-124.55949	:		:
K-SHIP MOVEMENTS	90 268 1038	END	EOL 42 MAGNETICS	:0042:	:	42.45052	-124.50856	:		:
K-SHIP MOVEMENTS	90 268 1059	START	SOL 44 MAGNETICS	:0044:	:	42.44525	-124.51162	:		:
K-SHIP MOVEMENTS	90 268 1122	END	EOL 44 MAGNETICS	:0044:	:	42.44537	-124.56849	:		:
K-SHIP MOVEMENTS	90 268 1147	START	SOL 41 MAGNETICS	:0041:	:	42.43968	-124.55929	:		:
K-SHIP MOVEMENTS	90 268 1206	END	EOL 41 MAGNETICS	:0041:	:	42.43907	-124.50784	:		:
K-SHIP MOVEMENTS	90 268 1223	START	SOL 45 MAGNETICS	:0045:	:	42.43354	-124.51130	:		:
K-SHIP MOVEMENTS	90 268 1246	END	EOL 45 MAGNETICS	:0045:	:	42.43450	-124.56870	:		:
K-SHIP MOVEMENTS	90 268 1303	START	SOL 40 MAGNETICS	:0040:	:	42.42833	-124.56209	:		:
K-SHIP MOVEMENTS	90 268 1323	END	EOL 40 MAGNETICS	:0040:	:	42.42841	-124.50279	:		:
K-SHIP MOVEMENTS	90 268 1354	START	SOL 46 MAGNETICS	:0046:	:	42.42708	-124.51105	:		:
K-SHIP MOVEMENTS	90 268 1415	END	EOL 46 MAGNETICS	:0046:	:	42.42632	-124.56640	:		:
K-SHIP MOVEMENTS	90 268 1426	START	SOL 39 MAGNETICS	:0039:	:	42.41781	-124.56065	:		:
K-SHIP MOVEMENTS	90 268 1446	END	EOL 39 MAGNETICS	:0039:	:	42.41749	-124.50229	:		:
K-SHIP MOVEMENTS	90 268 1456	START	SOL 47 MAGNETICS	:0047:	:	42.41270	-124.51096	:		:
K-SHIP MOVEMENTS	90 268 1519	END	EOL 47 MAGNETICS	:0047:	:	42.41224	-124.56826	:		:
K-SHIP MOVEMENTS	90 268 1529	START	SOL 38 MAGNETICS	:0038:	:	42.40245	-124.56077	:		:
K-SHIP MOVEMENTS	90 268 1559	END	EOL 38 MAGNETICS	:0038:	:	42.40778	-124.47863	:		:
K-SHIP MOVEMENTS	90 268 1600	START	SOL 23 MAGNETICS	:0023:	:	42.40794	-124.47628	:		:
K-SHIP MOVEMENTS	90 268 1614	END	EOL 23 MAGNETICS	:0023:	:	42.40277	-124.43968	:		:
K-SHIP MOVEMENTS	90 269 0020	START	SOL 23 MAGNETICS REDO	:0023:	:	42.40494	-124.48593	:		:
K-SHIP MOVEMENTS	90 269 0037	END	EOL 23 MAGNETICS REDO	:0023:	:	42.40312	-124.44649	:		:
K-SHIP MOVEMENTS	90 269 0047	START	SOL 24 MAGNETICS	:0024:	:	42.39631	-124.44597	:		:
K-SHIP MOVEMENTS	90 269 0104	END	EOL 24 MAGNETICS	:0024:	:	42.39722	-124.49460	:		:
K-SHIP MOVEMENTS	90 269 0109	START	SOL 25 MAGNETICS	:0025:	:	42.39153	-124.49805	:		:
K-SHIP MOVEMENTS	90 269 0129	END	EOL 25 MAGNETICS	:0025:	:	42.39182	-124.44099	:		:
K-SHIP MOVEMENTS	90 269 0135	START	SOL 26 MAGNETICS	:0026:	:	42.38593	-124.44212	:		:
K-SHIP MOVEMENTS	90 269 0154	END	EOL 26 MAGNETICS	:0026:	:	42.38527	-124.49659	:		:
K-SHIP MOVEMENTS	90 269 0200	START	SOL 27 MAGNETICS	:0027:	:	42.37955	-124.49771	:		:
K-SHIP MOVEMENTS	90 269 0217	END	EOL 27 MAGNETICS	:0027:	:	42.38055	-124.44970	:		:
K-SHIP MOVEMENTS	90 269 0222	START	SOL 28 MAGNETICS	:0028:	:	42.37484	-124.45099	:		:
K-SHIP MOVEMENTS	90 269 0237	END	EOL 28 MAGNETICS	:0028:	:	42.37477	-124.49563	:		:
K-SHIP MOVEMENTS	90 269 0243	START	SOL 29 MAGNETICS	:0029:	:	42.36936	-124.49489	:		:
K-SHIP MOVEMENTS	90 269 0257	END	EOL 29 MAGNETICS	:0029:	:	42.36934	-124.45400	:		:
K-SHIP MOVEMENTS	90 269 0302	START	SOL 30 MAGNETICS	:0030:	:	42.36436	-124.45314	:		:
K-SHIP MOVEMENTS	90 269 0316	END	EOL 30 MAGNETICS	:0030:	:	42.36427	-124.49456	:		:

RECORDING MEDIA	DATE AND TIME	STATUS	ACTIVITY	LINE	STA-TION	ROLL REEL SAMPLE	LATITUDE DEC DEG	LONGITUDE DEC DEG	R C	SAMP DPTH	U N
K-SHIP MOVEMENTS	90 269 0321	START	SOL 31 MAGNETICS	0031			42.35833	-124.49202			
K-SHIP MOVEMENTS	90 269 0335	END	EOL 31 MAGNETICS	0031			42.35836	-124.45113			
K-SHIP MOVEMENTS	90 269 0339	START	SOL 32 MAGNETICS	0032			42.35324	-124.45273			
K-SHIP MOVEMENTS	90 269 0354	END	EOL 32 MAGNETICS	0032			42.35317	-124.49628			
K-SHIP MOVEMENTS	90 269 0400	START	SOL 33 MAGNETICS	0033			42.34789	-124.49031			
K-SHIP MOVEMENTS	90 269 0412	END	EOL 33 MAGNETICS	0033			42.34802	-124.45481			
K-SHIP MOVEMENTS	90 269 0417	START	SOL 34 MAGNETICS	0034			42.34247	-124.45306			
K-SHIP MOVEMENTS	90 269 0431	END	EOL 34 MAGNETICS	0034			42.34269	-124.49297			
K-SHIP MOVEMENTS	90 269 0435	START	SOL 35 MAGNETICS	0035			42.33751	-124.49370			
K-SHIP MOVEMENTS	90 269 0448	END	EOL 35 MAGNETICS	0035			42.33737	-124.45594			
K-SHIP MOVEMENTS	90 269 0453	START	SOL 36 MAGNETICS	0036			42.33223	-124.45447			
K-SHIP MOVEMENTS	90 269 0508	END	EOL 36 MAGNETICS	0036			42.33196	-124.49718			
K-SHIP MOVEMENTS	90 269 0512	START	SOL 37 MAGNETICS	0037			42.32710	-124.50007			
K-SHIP MOVEMENTS	90 269 0527	END	EOL 37 MAGNETICS	0037			42.32681	-124.45771			
K-SHIP MOVEMENTS	90 269 0536	START	SOL 19 MAGNETICS	0019			42.32020	-124.46165			
K-SHIP MOVEMENTS	90 269 0619	END	EOL 19 MAGNETICS	0019			42.40725	-124.46186			
K-SHIP MOVEMENTS	90 269 1426	START	SOL 48 SEISMIC	0048			42.40422	-124.46136			
K-SHIP MOVEMENTS	90 269 1451	START	SOL 49 (ROOKERY)	0049			42.42890	-124.44913			
K-SHIP MOVEMENTS	90 269 1451	END	EOL 48 SEISMIC	0048			42.42890	-124.44913			
K-SHIP MOVEMENTS	90 269 1501	END	EOL 49 (ROOKERY)	0049			42.44235	-124.44987			
K-SHIP MOVEMENTS	90 269 1501	START	SOL 50 SEISMIC	0050			42.44235	-124.44987			
K-SHIP MOVEMENTS	90 269 1537	END	EOL 50 SEISMIC	0050			42.47988	-124.45185			
K-SHIP MOVEMENTS	90 269 1554	START	SOL 51 SEISMIC	0051			42.48003	-124.45608			
K-SHIP MOVEMENTS	90 269 1634	END	EOL 51 SEISMIC	0051			42.48009	-124.51878			
K-SHIP MOVEMENTS	90 269 1639	START	SOL 52 SEISMIC	0052			42.47813	-124.52159			
K-SHIP MOVEMENTS	90 269 1711	END	EOL 52 SEISMIC	0052			42.45036	-124.55501			
K-SHIP MOVEMENTS	90 269 1712	START	SOL 53 SEISMIC	0053			42.44937	-124.55543			
K-SHIP MOVEMENTS	90 269 1743	END	EOL 53 SEISMIC	0053			42.41191	-124.55603			
K-SHIP MOVEMENTS	90 269 1744	START	SOL 54 SEISMIC	0054			42.41129	-124.55673			
K-SHIP MOVEMENTS	90 269 1753	END	EOL 54 SEISMIC	0054			42.40839	-124.56755			
K-SHIP MOVEMENTS	90 269 1754	START	SOL 55 SEISMIC	0055			42.40780	-124.56829			
K-SHIP MOVEMENTS	90 269 1758	END	EOL 55 SEISMIC	0055			42.40416	-124.56888			
K-SHIP MOVEMENTS	90 269 1800	START	SOL 56 SEISMIC	0056			42.40277	-124.56884			
K-SHIP MOVEMENTS	90 269 1811	END	EOL 56 SEISMIC	0056			42.39567	-124.55515			
K-SHIP MOVEMENTS	90 269 1816	START	SOL 57 SEISMIC	0057			42.39349	-124.55073			
K-SHIP MOVEMENTS	90 269 1840	END	EOL 57 SEISMIC	0057			42.40317	-124.51598			
K-SHIP MOVEMENTS	90 270 0149	START	SOL 1 SEISMIC	0001			42.91716	-124.58789			
K-SHIP MOVEMENTS	90 270 0226	END	EOL 1 SEISMIC	0001			42.90484	-124.53293			
K-SHIP MOVEMENTS	90 270 0240	START	SOL 3 SEISMIC	0003			42.89573	-124.54024			
K-SHIP MOVEMENTS	90 270 0323	END	EOL 3 SEISMIC	0003			42.91130	-124.59727			
K-SHIP MOVEMENTS	90 270 0336	START	SOL 5 SEISMIC	0005			42.90122	-124.60164			
K-SHIP MOVEMENTS	90 270 0405	END	EOL 5 SEISMIC	0005			42.88947	-124.56008			
K-SHIP MOVEMENTS	90 270 0416	START	SOL 7 SEISMIC	0007			42.88032	-124.56683			
K-SHIP MOVEMENTS	90 270 0453	END	EOL 7 SEISMIC	0007			42.89345	-124.61549			
K-SHIP MOVEMENTS	90 270 0507	START	SOL 9 SEISMIC	0009			42.88395	-124.62381			
K-SHIP MOVEMENTS	90 270 0544	END	EOL 9 SEISMIC	0009			42.86918	-124.56962			
K-SHIP MOVEMENTS	90 270 0557	START	SOL 11 SEISMIC	0011			42.85868	-124.57457			
K-SHIP MOVEMENTS	90 270 0639	END	EOL 11 SEISMIC	0011			42.87409	-124.63048			
K-SHIP MOVEMENTS	90 270 0652	START	SOL 13 SEISMIC	0013			42.86424	-124.63552			
K-SHIP MOVEMENTS	90 270 0722	END	EOL 13 SEISMIC	0013			42.85024	-124.59320			
K-SHIP MOVEMENTS	90 270 0734	START	SOL 15 SEISMIC	0015			42.84184	-124.60299			
K-SHIP MOVEMENTS	90 270 0756	END	EOL 15 SEISMIC	0015			42.85436	-124.64175			
K-SHIP MOVEMENTS	90 270 0810	START	SOL 17 SEISMIC	0017			42.84358	-124.65013			
K-SHIP MOVEMENTS	90 270 0836	END	EOL 17 SEISMIC	0017			42.83395	-124.61001			
K-SHIP MOVEMENTS	90 270 0912	START	SOL 19 SEISMIC	0019			42.81995	-124.59960			
K-SHIP MOVEMENTS	90 270 0953	END	EOL 19 SEISMIC	0019			42.83274	-124.64710			

RECORDING MEDIA	DATE AND TIME	STATUS	ACTIVITY	LINE	STA-TION	ROLL REEL SAMPLE	LATITUDE DEC DEG	LONGITUDE DEC DEG	R C	SAMP DPTH	U N
K-SHIP MOVEMENTS	90 270 1012	START	SOL 21 SEISMIC	0021			42.82054	-124.64698			
K-SHIP MOVEMENTS	90 270 1044	END	EOL 21 SEISMIC	0021			42.81003	-124.60305			
K-SHIP MOVEMENTS	90 270 1102	START	SOL 22 SEISMIC	0022			42.80743	-124.61565			
K-SHIP MOVEMENTS	90 270 1133	END	EOL 22 SEISMIC	0022			42.81945	-124.65543			
K-SHIP MOVEMENTS	90 270 1145	START	SOL 23 SEISMIC	0023			42.81297	-124.65907			
K-SHIP MOVEMENTS	90 270 1213	END	EOL 23 SEISMIC	0023			42.80322	-124.62398			
K-SHIP MOVEMENTS	90 270 1234	START	SOL 24 SEISMIC	0024			42.80111	-124.62814			
K-SHIP MOVEMENTS	90 270 1249	END	EOL 24 SEISMIC	0024			42.81586	-124.61869			
K-SHIP MOVEMENTS	90 270 1250	START	SOL 25 SEISMIC	0025			42.81681	-124.61807			
K-SHIP MOVEMENTS	90 270 1307	END	EOL 25 SEISMIC	0025			42.82378	-124.60055			
K-SHIP MOVEMENTS	90 270 1308	START	SOL 26 SEISMIC	0026			42.83074	-124.53967			
K-SHIP MOVEMENTS	90 270 1326	END	EOL 26 SEISMIC	0026			42.85067	-124.59849			
K-SHIP MOVEMENTS	90 270 1327	START	SOL 27 SEISMIC	0027			42.85179	-124.53831			
K-SHIP MOVEMENTS	90 270 1426	END	EOL 27 SEISMIC	0027			42.91525	-124.56019			
K-SHIP MOVEMENTS	90 270 2130	START	SOL 1 SIDESCAN	0001			42.87741	-124.59504			
K-SHIP MOVEMENTS	90 270 2200	END	EOL 1 SIDESCAN	0001			42.84406	-124.59505			
K-SHIP MOVEMENTS	90 271 0200	START	SOL 28 SEISMIC	0028			42.77680	-124.59165			
K-SHIP MOVEMENTS	90 271 0224	END	EOL 28 SEISMIC	0029			42.74692	-124.58100			
K-SHIP MOVEMENTS	90 271 0236	START	SOL 29 SEISMIC	0023			42.74427	-124.56682			
K-SHIP MOVEMENTS	90 271 0314	END	EOL 29 SEISMIC	0029			42.78596	-124.56648			
K-SHIP MOVEMENTS	90 271 0323	START	SOL 30 SEISMIC	0030			42.78653	-124.55230			
K-SHIP MOVEMENTS	90 271 0351	END	EOL 30 SEISMIC	0030			42.74721	-124.55204			
K-SHIP MOVEMENTS	90 271 0401	START	SOL 31 SEISMIC	0031			42.74807	-124.53762			
K-SHIP MOVEMENTS	90 271 0431	END	EOL 31 SEISMIC	0031			42.78722	-124.53746			
K-SHIP MOVEMENTS	90 271 0443	START	SOL 32 SEISMIC	0032			42.77643	-124.53200			
K-SHIP MOVEMENTS	90 271 0510	END	EOL 32 SEISMIC	0032			42.77445	-124.57291			
K-SHIP MOVEMENTS	90 271 0520	START	SOL 33 SEISMIC	0033			42.76353	-124.57285			
K-SHIP MOVEMENTS	90 271 0542	END	EOL 33 SEISMIC	0033			42.76327	-124.53453			
K-SHIP MOVEMENTS	90 271 0551	START	SOL 34 SEISMIC	0034			42.75256	-124.53408			
K-SHIP MOVEMENTS	90 271 0622	END	EOL 34 SEISMIC	0034			42.75256	-124.58740			
K-SHIP MOVEMENTS	90 271 0712	START	SOL 28 MAGNETICS	0029			42.74836	-124.58122			
K-SHIP MOVEMENTS	90 271 0725	END	EOL 28 MAGNETICS	0029			42.77462	-124.58112			
K-SHIP MOVEMENTS	90 271 0735	START	SOL 35 MAGNETICS	0035			42.78036	-124.57174			
K-SHIP MOVEMENTS	90 271 0750	END	EOL 35 MAGNETICS	0035			42.74847	-124.57395			
K-SHIP MOVEMENTS	90 271 0802	START	SOL 29 MAGNETICS	0029			42.74739	-124.56689			
K-SHIP MOVEMENTS	90 271 0826	END	EOL 29 MAGNETICS	0029			42.79309	-124.56660			
K-SHIP MOVEMENTS	90 271 0839	START	SOL 36 MAGNETICS	0036			42.78866	-124.55852			
K-SHIP MOVEMENTS	90 271 0857	END	EOL 36 MAGNETICS	0036			42.74773	-124.55958			
K-SHIP MOVEMENTS	90 271 0908	START	SOL 30 MAGNETICS	0030			42.74825	-124.55203			
K-SHIP MOVEMENTS	90 271 0927	END	EOL 30 MAGNETICS	0030			42.78855	-124.55206			
K-SHIP MOVEMENTS	90 271 0939	START	SOL 37 MAGNETICS	0037			42.78297	-124.54504			
K-SHIP MOVEMENTS	90 271 0955	END	EOL 37 MAGNETICS	0037			42.74762	-124.54437			
K-SHIP MOVEMENTS	30 271 1010	START	SOL 34 MAGNETICS	0034			42.75026	-124.54344			
K-SHIP MOVEMENTS	90 271 1025	END	EOL 34 MAGNETICS	0034			42.75265	-124.58194			
K-SHIP MOVEMENTS	90 271 1039	START	SOL 33 MAGNETICS	0033			42.76319	-124.58361			
K-SHIP MOVEMENTS	90 271 1054	END	EOL 33 MAGNETICS	0033			42.76332	-124.54350			
K-SHIP MOVEMENTS	90 271 1104	START	SOL 32 MAGNETICS	0032			42.77360	-124.54406			
K-SHIP MOVEMENTS	90 271 1116	END	EOL 32 MAGNETICS	0032			42.77447	-124.57782			
K-SHIP MOVEMENTS	90 271 1118	START	SOL 38 MAGNETICS	0038			42.77315	-124.58317			
K-SHIP MOVEMENTS	90 271 1131	END	EOL 38 MAGNETICS	0038			42.75234	-124.60965			
K-SHIP MOVEMENTS	90 271 1136	START	SOL 39 MAGNETICS	0039			42.75128	-124.61808			
K-SHIP MOVEMENTS	90 271 1225	END	EOL 39 MAGNETICS	0039			42.83291	-124.64753			
K-SHIP MOVEMENTS	90 271 1238	START	SOL 19 MAGNETICS	0019			42.83183	-124.64733			
K-SHIP MOVEMENTS	90 271 1256	END	EOL 19 MAGNETICS	0019			42.82156	-124.60645			
K-SHIP MOVEMENTS	90 271 1308	START	SOL 20 MAGNETICS	0020			42.81416	-124.60591			
K-SHIP MOVEMENTS	90 271 1330	END	EOL 20 MAGNETICS	0020			42.82449	-124.65095			

RECORDING MEDIA	DATE AND TIME	STATUS	ACTIVITY	LINE	STA-TION	ROLL REEL SAMPLE	LATITUDE DEC DEG	LONGITUDE DEC DEG	R C	SAMP DPTH	U N
K-SHIP MOVEMENTS	90 271 1334	START	SOL 21 MAGNETICS	0021			42.82167	-124.64870			
K-SHIP MOVEMENTS	90 271 1353	END	EOL 21 MAGNETICS	0021			42.80970	-124.60266			
K-SHIP MOVEMENTS	90 271 1404	START	SOL 22 MAGNETICS	0022			42.80749	-124.61695			
K-SHIP MOVEMENTS	90 271 1422	END	EOL 22 MAGNETICS	0022			42.81807	-124.65524			
K-SHIP MOVEMENTS	90 271 1426	START	SOL 23 MAGNETICS	0023			42.81346	-124.65840			
K-SHIP MOVEMENTS	90 271 1440	END	EOL 23 MAGNETICS	0023			42.80351	-124.62456			
K-SHIP MOVEMENTS	90 271 1448	START	SOL 24 MAGNETICS	0024			42.79757	-124.63028			
K-SHIP MOVEMENTS	90 271 1616	END	EOL 24 MAGNETICS	0024			42.91475	-124.56075			
K-SHIP MOVEMENTS	90 273 0157	START	SOL 40 MAGNETICS	0040			42.92336	-124.64213			
K-SHIP MOVEMENTS	90 273 0253	END	EOL 40 MAGNETICS	0040			42.80824	-124.64170			
K-SHIP MOVEMENTS	90 273 0301	START	SOL 41 MAGNETICS	0041			42.80957	-124.63504			
K-SHIP MOVEMENTS	90 273 0407	END	EOL 41 MAGNETICS	0041			42.89871	-124.63472			
K-SHIP MOVEMENTS	90 273 0414	START	SOL 42 MAGNETICS	0042			42.89357	-124.62728			
K-SHIP MOVEMENTS	90 273 0456	END	EOL 42 MAGNETICS	0042			42.80987	-124.62738			
K-SHIP MOVEMENTS	90 273 1645	START	SOL 2 SIDESCAN	0002			42.74726	-124.55224			
K-SHIP MOVEMENTS	90 273 1707	END	EOL 2 SIDESCAN	0002			42.77413	-124.55212			
K-SHIP MOVEMENTS	90 275 0050	START	SOL 15A MAGNETICS	015A			42.84824	-124.63842			
K-SHIP MOVEMENTS	90 275 0104	END	EOL 15A MAGNETICS	015A			42.83970	-124.59705			
K-SHIP MOVEMENTS	90 275 0108	START	SOL 14A MAGNETICS	014A			42.84387	-124.59229			
K-SHIP MOVEMENTS	90 275 0124	END	EOL 14A MAGNETICS	014A			42.85706	-124.64162			
K-SHIP MOVEMENTS	90 275 0128	START	SOL 13A MAGNETICS	013A			42.86299	-124.64182			
K-SHIP MOVEMENTS	90 275 0146	END	EOL 13A MAGNETICS	013A			42.84839	-124.58784			
K-SHIP MOVEMENTS	90 275 0151	START	SOL 12A MAGNETICS	012A			42.85235	-124.58055			
K-SHIP MOVEMENTS	90 275 0209	END	EOL 12A MAGNETICS	012A			42.86731	-124.63533			
K-SHIP MOVEMENTS	90 275 0213	START	SOL 11A MAGNETICS	011A			42.87201	-124.63348			
K-SHIP MOVEMENTS	90 275 0231	END	EOL 11A MAGNETICS	011A			42.85693	-124.57725			
K-SHIP MOVEMENTS	90 275 0235	START	SOL 10A MAGNETICS	010A			42.86101	-124.57089			
K-SHIP MOVEMENTS	90 275 0254	END	EOL 10A MAGNETICS	010A			42.87632	-124.62744			
K-SHIP MOVEMENTS	90 275 0259	START	SOL 9A MAGNETICS	009A			42.88117	-124.62480			
K-SHIP MOVEMENTS	90 275 0317	END	EOL 9A MAGNETICS	009A			42.86625	-124.56835			
K-SHIP MOVEMENTS	90 275 0322	START	SOL 8A MAGNETICS	008A			42.87049	-124.56596			
K-SHIP MOVEMENTS	90 275 0342	END	EOL 8A MAGNETICS	008A			42.88646	-124.62296			
K-SHIP MOVEMENTS	90 275 0345	START	SOL 51 MAGNETICS	0051			42.88426	-124.62615			
K-SHIP MOVEMENTS	90 275 0358	END	EOL 51 MAGNETICS	0051			42.85767	-124.59898			
K-SHIP MOVEMENTS	90 275 0517	START	SOL 52 MAGNETICS	0052			42.84600	-124.62053			
K-SHIP MOVEMENTS	90 275 0555	END	EOL 52 MAGNETICS	0052			42.91957	-124.57964			
K-SHIP MOVEMENTS	90 275 0601	START	SOL 01 MAGNETICS	0001			42.91990	-124.58746			
K-SHIP MOVEMENTS	90 275 0619	END	EOL 01 MAGNETICS	0001			42.90569	-124.53265			
K-SHIP MOVEMENTS	90 275 0624	START	SOL 02 MAGNETICS	0002			42.89991	-124.53344			
K-SHIP MOVEMENTS	90 275 0654	END	EOL 02 MAGNETICS	0002			42.92224	-124.61667			
K-SHIP MOVEMENTS	90 275 0658	START	SOL 03 MAGNETICS	0003			42.91738	-124.61995			
K-SHIP MOVEMENTS	90 275 0724	END	EOL 03 MAGNETICS	0003			42.89645	-124.54110			
K-SHIP MOVEMENTS	90 275 0732	START	SOL 04 MAGNETICS	0004			42.89417	-124.55282			
K-SHIP MOVEMENTS	90 275 0756	END	EOL 04 MAGNETICS	0004			42.91205	-124.62112			
K-SHIP MOVEMENTS	90 275 0801	START	SOL 05 MAGNETICS	0005			42.90787	-124.62480			
K-SHIP MOVEMENTS	90 275 0820	END	EOL 05 MAGNETICS	0005			42.89221	-124.56830			
K-SHIP MOVEMENTS	90 275 0825	START	SOL 06 MAGNETICS	0006			42.88623	-124.57015			
K-SHIP MOVEMENTS	90 275 0845	END	EOL 06 MAGNETICS	0006			42.90183	-124.62622			
K-SHIP MOVEMENTS	90 275 0851	START	SOL 07 MAGNETICS	0007			42.89694	-124.62990			
K-SHIP MOVEMENTS	90 275 0916	END	EOL 07 MAGNETICS	0007			42.87680	-124.55505			
K-SHIP MOVEMENTS	90 275 0932	START	SOL 08 MAGNETICS	0008			42.88506	-124.58753			
K-SHIP MOVEMENTS	90 275 0947	END	EOL 08 MAGNETICS	0008			42.89047	-124.63213			
K-SHIP MOVEMENTS	90 275 1006	START	SOL 7A MAGNETICS	007A			42.39083	-124.61310			
K-SHIP MOVEMENTS	90 275 1021	END	EOL 7A MAGNETICS	007A			42.87853	-124.57438			
K-SHIP MOVEMENTS	90 275 1029	START	SOL 6A MAGNETICS	006A			42.88497	-124.57548			
K-SHIP MOVEMENTS	90 275 1042	END	EOL 6A MAGNETICS	006A			42.89500	-124.61170			

RECORDING MEDIA	DATE AND TIME	STATUS	ACTIVITY	LINE	STA-TION	ROLL REEL SAMPLE	LATITUDE DEC DEG	LONGITUDE DEC DEG	RC	SAMP DPTH	UN
K-SHIP MOVEMENTS	90 275 1049	START	SOL 5A MAGNETICS	005A			42.90121	-124.60831			
K-SHIP MOVEMENTS	90 275 1101	END	EOL 5A MAGNETICS	005A			42.99034	-124.57302			
K-SHIP MOVEMENTS	90 275 1106	START	SOL 4A MAGNETICS	004A			42.89439	-124.56736			
K-SHIP MOVEMENTS	90 275 1118	END	EOL 4A MAGNETICS	004A			42.90355	-124.59976			
K-SHIP MOVEMENTS	90 275 1127	START	SOL 3A MAGNETICS	003A			42.90931	-124.60019			
K-SHIP MOVEMENTS	90 275 1145	END	EOL 3A MAGNETICS	003A			42.89473	-124.54516			
K-SHIP MOVEMENTS	90 275 1150	START	SOL 2A MAGNETICS	002A			42.89936	-124.53508			
K-SHIP MOVEMENTS	90 275 1211	END	EOL 2A MAGNETICS	002A			42.91383	-124.59380			
K-SHIP MOVEMENTS	90 275 1216	START	SOL 1A MAGNETICS	001A			42.91959	-124.59608			
K-SHIP MOVEMENTS	90 275 1236	END	EOL 1A MAGNETICS	001A			42.90275	-124.53411			
K-SHIP MOVEMENTS	90 275 1254	START	SOL 53 MAGNETICS	0053			42.91685	-124.55774			
K-SHIP MOVEMENTS	90 275 1328	END	EOL 53 MAGNETICS	0053			42.83949	-124.60643			
K-SHIP MOVEMENTS	90 275 1557	START	SOL 3 SIDESCAN	0003			42.76214	-124.53830			
K-SHIP MOVEMENTS	90 275 1619	END	EOL 3 SIDESCAN	0003			42.78670	-124.53834			
K-SHIP MOVEMENTS	90 275 1624	START	SOL 4 SIDESCAN	0004			42.78739	-124.54178			
K-SHIP MOVEMENTS	90 275 1643	END	EOL 4 SIDESCAN	0004			42.76251	-124.54190			
K-SHIP MOVEMENTS	90 275 1650	START	SOL 5 SIDESCAN	0005			42.76251	-124.54569			
K-SHIP MOVEMENTS	90 275 1658	END	EOL 5 SIDESCAN	0005			42.77064	-124.54546			
K-SHIP MOVEMENTS	90 275 2005	START	SOL 7 SIDESCAN	0007			42.76067	-124.55336			
K-SHIP MOVEMENTS	90 275 2029	END	EOL 7 SIDESCAN	0007			42.78741	-124.55342			
K-SHIP MOVEMENTS	90 275 2037	START	SOL 9 SIDESCAN	0009			42.78598	-124.56043			
K-SHIP MOVEMENTS	90 275 2050	END	EOL 9 SIDESCAN	0009			42.76719	-124.56026			
K-SHIP MOVEMENTS	90 275 2330	START	SOL 54 SEISMIC	0054			42.75493	-124.55196			
K-SHIP MOVEMENTS	90 276 0106	END	EOL 54 SEISMIC	0054			42.65589	-124.45465			
K-SHIP MOVEMENTS	90 276 0340	START	SOL 55 SEISMIC	0055			42.87939	-124.59304			
K-SHIP MOVEMENTS	90 276 0550	END	EOL 55 SEISMIC	0055			42.99899	-124.50069			
K-SHIP MOVEMENTS	90 276 0552	START	SOL 56 SEISMIC	0056			43.00081	-124.49982			
K-SHIP MOVEMENTS	90 276 0823	END	EOL 56 SEISMIC	0056			43.15927	-124.47911			
K-SHIP MOVEMENTS	90 276 0824	START	SOL 57 SEISMIC	0057			43.15943	-124.47898			
K-SHIP MOVEMENTS	90 276 1122	END	EOL 57 SEISMIC	0057			43.33399	-124.42404			
K-SHIP MOVEMENTS	90 276 1124	START	SOL 58 SEISMIC	0058			43.33566	-124.42370			
K-SHIP MOVEMENTS	90 276 1330	END	EOL 58 SEISMIC	0058			43.47536	-124.34134			

*******DATA OR EQUIPMENT CODE = DEL NORT RNG/RNG

W-INVENTORY OF SCIENTIFIC GEAR	90 266 2240		DEL NORTE RANGE/RANGE								

*******SYSTEM = SCIENTIFIC STAFF

*******DATA OR EQUIPMENT CODE = BIOLOGIST

R-PERSONNEL LIST	90 264 1700	ON	DAVE FOX, ODFW								
R-PERSONNEL LIST	90 264 1700	ON	GREG MCMURRAY, DOGAMI								
R-PERSONNEL LIST	90 264 1700	ON	JOE FISHER, OSU								
R-PERSONNEL LIST	90 264 1700	ON	BOB O'BRIEN, PSU								
R-PERSONNEL LIST	90 276 1900	OFF	JOE FISHER, OSU								
R-PERSONNEL LIST	90 276 1900	OFF	GREG MCMURRAY, DOGAMI								
R-PERSONNEL LIST	90 276 1900	OFF	DAVE FOX, ODFW								
R-PERSONNEL LIST	90 276 1900	OFF	BOB O'BRIEN, PSU								

*******DATA OR EQUIPMENT CODE = GEOLOGIST

R-PERSONNEL LIST	90 264 1700	ON	GERRY CONNARD, NW GEO.								
R-PERSONNEL LIST	90 264 1700	ON	MONTY SIMMONS, U. MISS								
R-PERSONNEL LIST	90 264 1700	ON	WALTER O'NIELL, U. MISS								

```
                                                                                           ROLL
     RECORDING MEDIA            DATE AND TIME      STATUS        ACTIVITY          LINE STA- REEL  LATITUDE  LONGITUDE R SAMP U
                                                                                        TION SAMPLE DEC DEG   DEC DEG  C DPTH N

R-PERSONNEL LIST                90 264 1700        ON     RUSTY TARVER, U. MISS    :    :    :                          :    :
R-PERSONNEL LIST                90 264 1700        ON     BOB WOOLSEY, U. MISS     :    :    :                          :    :
R-PERSONNEL LIST                90 264 1700        ON     CHERYL MARDOCK, USBM     :    :    :                          :    :
R-PERSONNEL LIST                90 276 1900        OFF    CHERYL MARDOCK, USBM     :    :    :                          :    :
R-PERSONNEL LIST                90 276 1900        OFF    BOB WOOLSEY, UNV. OF MIS:    :    :                         .:    :
R-PERSONNEL LIST                90 276 1900        OFF    WALTER O'NIELL, UNV. OF :    :    :                          I:SS. :
R-PERSONNEL LIST                90 276 1900        OFF    RUSTY TARVER, UNV. OF MI:    :    :                          S:.   :
R-PERSONNEL LIST                90 276 1900        OFF    MONTY SIMMONS, UNV. OF M:    :    :                          S:S.  :
R-PERSONNEL LIST                90 276 1900        OFF    GERRY CONNARD, NW GEO.   :    :    :                          :    :
*******DATA OR EQUIPMENT CODE = NAVIGATOR

R-PERSONNEL LIST                90 264 1700        ON     MICHAEL HAMER, USGS      :    :    :                          :    :
R-PERSONNEL LIST                90 264 1700        ON     GRAIG MCHENDRIE, USGS    :    :    :                          :    :
R-PERSONNEL LIST                90 276 1900        OFF    GRAIG MCHENDRIE, USGS    :    :    :                          :    :
R-PERSONNEL LIST                90 276 1900        OFF    MICHAEL HAMER, USGS      :    :    :                          :    :
*******DATA OR EQUIPMENT CODE = ELECTRONICS T

R-PERSONNEL LIST                90 264 1700        ON     DAVE HOGG, USGS          :    :    :                          :    :
R-PERSONNEL LIST                90 276 1900        OFF    DAVE HOGG, USGS          :    :    :                          :    :
*******DATA OR EQUIPMENT CODE = CHIEF SCIENTIST

R-PERSONNEL LIST                90 264 1700        ON     ED CLIFTON, USGS         :    :    :                          :    :
R-PERSONNEL LIST                90 264 1700        ON     RICK STARR, ODFW         :    :    :                          :    :
R-PERSONNEL LIST                90 276 1900        OFF    ED CLIFTON, USGS         :    :    :                          :    :
R-PERSONNEL LIST                90 276 1900        OFF    RICK STARR, ODFW         :    :    :                          :    :
*******DATA OR EQUIPMENT CODE = GEOPHYSICIST

R-PERSONNEL LIST                90 264 1700        ON     CURT PETERSON, PSU       :    :    :                          :    :
R-PERSONNEL LIST                90 276 1900        OFF    CURT PETERSON, PSU       :    :    :                          :    :
*******SYSTEM = SHIP'S CREW

*******DATA OR EQUIPMENT CODE = SHIP CAPTAIN

R-PERSONNEL LIST                90 264 1700        ON     BOB SHERMER              :    :    :                          :    :
R-PERSONNEL LIST                90 276 1900        OFF    BOB SHERMER              :    :    :                          :    :
*******DATA OR EQUIPMENT CODE = CHIEF ENGINEER

R-PERSONNEL LIST                90 264 1700        ON     NESTOR VERDUGO           :    :    :                          :    :
R-PERSONNEL LIST                90 276 1900        OFF    NESTOR VERDUGO           :    :    :                          :    :
*******DATA OR EQUIPMENT CODE = CHIEF MATE

R-PERSONNEL LIST                90 264 1700        ON     JOSE MANUEL GARCESTO     :    :    :                          :    :
R-PERSONNEL LIST                90 276 1900        OFF    JOSE MANUEL GARCESTO     :    :    :                          :    :


                                             **************************************
                                             *DATA CATEGORY = GEOPHYSICAL         *
                                             **************************************

*******SYSTEM = HIGH RESOLUTION ACOUSTICS

*******DATA OR EQUIPMENT CODE = DATASONICS BUBBLE PULSER SEISMIC SYSTEM

A-ANALOG PAPER ROLLS            90 267 0553        START  SOR 1               :0037:     :0001  42.33119 -124.49831 :    :
A-ANALOG PAPER ROLLS            90 267 1305        END    EOR 1               :TURN:     :0001  42.39165 -124.49851 :    :
A-ANALOG PAPER ROLLS            90 267 1310        START  SOR 2               :TURN:     :0002  42.39392 -124.50399 :    :
```

RECORDING MEDIA	DATE AND TIME	STATUS	ACTIVITY	LINE	STA-TION	ROLL REEL SAMPLE	LATITUDE DEC DEG	LONGITUDE DEC DEG	R C	SAMP DPTH	U N
A-ANALOG PAPER ROLLS	90 257 1714	END	EOR 2	0023		0002	42.40262	-124.44167			
A-ANALOG PAPER ROLLS	90 268 0325	START	SOR 3A (REPLAY)			003A	42.39159	-124.48575			
A-ANALOG PAPER ROLLS	90 268 0330	START	SOR 3	0038		0003	42.39691	-124.49596			
A-ANALOG PAPER ROLLS	90 268 0335	END	EOR 3A (REPLAY)			003A	42.39961	-124.48908			
A-ANALOG PAPER ROLLS	90 268 0828	END	EOR 3	0043		0003	42.39873	-124.53587			
A-ANALOG PAPER ROLLS	90 269 1345	START	SOR 4	0049		0004	42.40192	-124.46170			
A-ANALOG PAPER ROLLS	90 269 1420	START	SOR 4A (REPLAY)	0048		004A	42.39950	-124.46429			
A-ANALOG PAPER ROLLS	90 269 1645	END	EOR 4A (REPLAY)	0051		004A	42.47363	-124.52686			
A-ANALOG PAPER ROLLS	90 269 1842	END	EOR 4	0057		0004	42.40311	-124.51329			
A-ANALOG PAPER ROLLS	90 270 0145	START	SOR 5	0001		0005	42.91556	-124.59167			
A-ANALOG PAPER ROLLS	90 270 0507	START	SOR 5A (REPLAY)	0009		005A	42.88395	-124.62381			
A-ANALOG PAPER ROLLS	90 270 0940	END	EOR 5A (REPLAY)	0019		005A	42.82772	-124.63014			
A-ANALOG PAPER ROLLS	90 270 1044	END	EOR 5	TURN		0005	42.81003	-124.60305			
A-ANALOG PAPER ROLLS	90 270 1050	START	SOR 6	TURN		0006	42.80800	-124.60353			
A-ANALOG PAPER ROLLS	90 270 1426	END	EOR 6	0027		0006	42.91525	-124.56019			
A-ANALOG PAPER ROLLS	90 271 0200	START	SOR 7	0028		0007	42.77680	-124.53165			
A-ANALOG PAPER ROLLS	90 271 0623	END	EOR 7	0034		0007	42.75250	-124.58878			
A-ANALOG PAPER ROLLS	90 275 2320	START	SOR 8			0008	42.75220	-124.55830			
A-ANALOG PAPER ROLLS	90 276 0837	END	EOR 8	0057		0008	43.17402	-124.47405			
A-ANALOG PAPER ROLLS	90 276 0840	START	SOR 9	0057		0009	43.17737	-124.47293			
A-ANALOG PAPER ROLLS	90 276 1330	END	EOR 9	0058		0009	43.47536	-124.34134			
W-INVENTORY OF SCIENTIFIC GEAR	90 266 2240		DATASONICS GEOPULSE								
X-OPERATION OF SCIENTIFIC GEAR	90 267 0645	ON	GEOPULSE SYSTEM ON				42.33272	-124.48994			
X-OPERATION OF SCIENTIFIC GEAR	90 267 1715	OFF	GEOPULSE SYSTEM OFF				42.40243	-124.44033			
X-OPERATION OF SCIENTIFIC GEAR	90 268 0300	ON	GEOPULSE SYSTEM ON				42.38451	-124.46699			
X-OPERATION OF SCIENTIFIC GEAR	90 268 0828	OFF	GEOPULSE SYSTEM OFF				42.39879	-124.53587			
X-OPERATION OF SCIENTIFIC GEAR	90 269 1345	ON	GEOPULSE SYSTEM ON				42.40192	-124.46170			
X-OPERATION OF SCIENTIFIC GEAR	90 269 1452	OFF	GEOPULSE SYSTEM OFF				42.42976	-124.44897			
X-OPERATION OF SCIENTIFIC GEAR	90 269 1511	ON	GEOPULSE SYSTEM ON				42.45300	-124.44997			
X-OPERATION OF SCIENTIFIC GEAR	90 269 1537	OFF	GEOPULSE SYSTEM OFF				42.47988	-124.45185			
X-OPERATION OF SCIENTIFIC GEAR	90 269 1544	ON	GEOPULSE SYSTEM ON				42.48474	-124.45507			
X-OPERATION OF SCIENTIFIC GEAR	90 269 1842	OFF	GEOPULSE SYSTEM OFF				42.40311	-124.51329			
X-OPERATION OF SCIENTIFIC GEAR	90 270 0145	ON	GEOPULSE SYSTEM ON				42.91556	-124.59167			
X-OPERATION OF SCIENTIFIC GEAR	90 270 1044	OFF	GEOPULSE SYSTEM OFF				42.81003	-124.60305			
X-OPERATION OF SCIENTIFIC GEAR	90 270 1050	ON	GEOPULSE SYSTEM ON				42.80800	-124.60353			
X-OPERATION OF SCIENTIFIC GEAR	90 270 1426	OFF	GEOPULSE SYSTEM OFF				42.91525	-124.56019			
X-OPERATION OF SCIENTIFIC GEAR	90 271 0200	ON	GEOPULSE SYSTEM ON				42.77680	-124.58165			
X-OPERATION OF SCIENTIFIC GEAR	90 271 0623	OFF	GEOPULSE SYSTEM OFF				42.75250	-124.58878			
X-OPERATION OF SCIENTIFIC GEAR	90 275 2320	ON	GEOPULSE SYSTEM ON	0054			42.75220	-124.55830			
X-OPERATION OF SCIENTIFIC GEAR	90 276 0110	OFF	GEOPULSE SYSTEM OFF	0054			42.65902	-124.46147			
X-OPERATION OF SCIENTIFIC GEAR	90 276 0320	ON	GEOPULSE SYSTEM ON	0055			42.85817	-124.58279			
X-OPERATION OF SCIENTIFIC GEAR	90 276 1330	OFF	GEOPULSE SYSTEM OFF	0058			43.47536	-124.34134			

*******DATA OR EQUIPMENT CODE = SIDE SCAN SONAR

RECORDING MEDIA	DATE AND TIME	STATUS	ACTIVITY	LINE	STA-TION	ROLL REEL SAMPLE	LATITUDE DEC DEG	LONGITUDE DEC DEG	R C	SAMP DPTH	U N
A-ANALOG PAPER ROLLS	90 270 2130	START	SOR 1	0001		0001	42.87741	-124.59504			
A-ANALOG PAPER ROLLS	90 275 2050	END	EOR 1	0009		0001	42.76719	-124.56026			
W-INVENTORY OF SCIENTIFIC GEAR	90 266 2240		KLEIN SIDESCAN								

RECORDING MEDIA	DATE AND TIME	STATUS	ACTIVITY	LINE	STA-TION	ROLL REEL SAMPLE	LATITUDE DEC DEG	LONGITUDE DEC DEG	R C	SAMP DPTH	U N
X-OPERATION OF SCIENTIFIC GEAR	90 270 2130	ON	SIDESCAN SYSTEM ON	0001			42.87741	-124.59504			
X-OPERATION OF SCIENTIFIC GEAR	90 270 2200	OFF	SIDESCAN SYSTEM OFF	0001			42.84405	-124.59505			
X-OPERATION OF SCIENTIFIC GEAR	90 273 1623	ON	SIDESCAN SYSTEM ON	0002			42.72715	-124.53810			
X-OPERATION OF SCIENTIFIC GEAR	90 273 1707	OFF	SIDESCAN SYSTEM OFF	0002			42.77413	-124.55212			
X-OPERATION OF SCIENTIFIC GEAR	90 275 1535	ON	SIDESCAN SYSTEM ON	0003			42.74104	-124.53911			
X-OPERATION OF SCIENTIFIC GEAR	90 275 1658	OFF	SIDESCAN SYSTEM OFF	0005			42.77064	-124.54546			
X-OPERATION OF SCIENTIFIC GEAR	90 275 2005	ON	SIDESCAN SYSTEM ON	0007			42.76067	-124.55336			
X-OPERATION OF SCIENTIFIC GEAR	90 275 2050	OFF	SIDESCAN SYSTEM OFF	0009			42.76719	-124.56026			

*******SYSTEM = SHIPBOARD MAGNETICS

*******DATA OR EQUIPMENT CODE = SHIPBOARD MAGGY

RECORDING MEDIA	DATE AND TIME	STATUS	ACTIVITY	LINE	STA-TION	ROLL REEL SAMPLE	LATITUDE DEC DEG	LONGITUDE DEC DEG	R C	SAMP DPTH	U N
A-ANALOG PAPER ROLLS	90 265 2202	START	START MAG PAPER #1			0001	42.88303	-124.61271			
A-ANALOG PAPER ROLLS	90 269 0621	END	END MAG PAPER #1			0001	42.41047	-124.46235			
A-ANALOG PAPER ROLLS	90 271 0702	SAMPLE	START MAG PAPER #2			0002	42.72877	-124.58129			
A-ANALOG PAPER ROLLS	90 275 1330	END	END MAG PAPER #2			0002	42.83588	-124.60865			
C-FLOPPY DISK OR PUNCH CARDS	90 265 2202	START	START FLOPPY #1			0001	42.88303	-124.61271			
C-FLOPPY DISK OR PUNCH CARDS	90 266 0143	END	END FLOPPY #1			0001	42.83330	-124.63225			
C-FLOPPY DISK OR PUNCH CARDS	90 268 0900	START	START FLOPPY #2			0002	42.40232	-124.53600			
C-FLOPPY DISK OR PUNCH CARDS	90 268 1616	END	END FLOPPY #2			0002	42.40151	-124.43983			
C-FLOPPY DISK OR PUNCH CARDS	90 269 0020	START	START FLOPPY #3			0003	42.40494	-124.48593			
C-FLOPPY DISK OR PUNCH CARDS	90 269 0621	END	END FLOPPY #3			0003	42.41047	-124.46235			
C-FLOPPY DISK OR PUNCH CARDS	90 271 0655	START	START FLOPPY #4			0004	42.72424	-124.58319			
C-FLOPPY DISK OR PUNCH CARDS	90 271 1616	END	END FLOPPY #4			0004	42.91475	-124.56075			
C-FLOPPY DISK OR PUNCH CARDS	90 273 0154	START	START FLOPPY #5			0005	42.92635	-124.64400			
C-FLOPPY DISK OR PUNCH CARDS	90 275 1021	END	END FLOPPY #5			0005	42.87858	-124.57488			
C-FLOPPY DISK OR PUNCH CARDS	90 275 1029	START	START FLOPPY #6			0006	42.88497	-124.57548			
C-FLOPPY DISK OR PUNCH CARDS	90 275 1330	END	END FLOPPY #6			0006	42.83588	-124.60865			
W-INVENTORY OF SCIENTIFIC GEAR	90 266 2240		MAGNETOMETER								
X-OPERATION OF SCIENTIFIC GEAR	90 265 2202	ON	MAGNETICS SYSTEM ON				42.88303	-124.61271			
X-OPERATION OF SCIENTIFIC GEAR	90 266 0143	OFF	MAGNETICS SYSTEM OFF				42.83330	-124.63225			
X-OPERATION OF SCIENTIFIC GEAR	90 268 0900	ON	MAGNETICS SYSTEM ON				42.40232	-124.53600			
X-OPERATION OF SCIENTIFIC GEAR	90 268 1616	OFF	MAGNETICS SYSTEM OFF				42.40151	-124.43983			
X-OPERATION OF SCIENTIFIC GEAR	90 269 0020	ON	MAGNETICS SYSTEM ON				42.40494	-124.48593			
X-OPERATION OF SCIENTIFIC GEAR	90 269 0621	OFF	MAGNETICS SYSTEM OFF				42.41047	-124.46235			
X-OPERATION OF SCIENTIFIC GEAR	90 271 0702	ON	MAGNETICS SYSTEM ON				42.72877	-124.58129			
X-OPERATION OF SCIENTIFIC GEAR	90 271 1616	OFF	MAGNETICS SYSTEM OFF				42.91475	-124.56075			
X-OPERATION OF SCIENTIFIC GEAR	90 273 0154	ON	MAGNETICS SYSTEM ON				42.92635	-124.64400			
X-OPERATION OF SCIENTIFIC GEAR	90 273 0457	OFF	MAGNETICS SYSTEM OFF				42.80824	-124.62742			
X-OPERATION OF SCIENTIFIC GEAR	90 275 0038	ON	MAGNETICS SYSTEM ON				42.86456	-124.63194			
X-OPERATION OF SCIENTIFIC GEAR	90 275 0359	OFF	MAGNETICS SYSTEM OFF				42.85593	-124.59788			
X-OPERATION OF SCIENTIFIC GEAR	90 275 0515	ON	MAGNETICS SYSTEM ON				42.84409	-124.61908			
X-OPERATION OF SCIENTIFIC GEAR	90 275 1330	OFF	MAGNETICS SYSTEM OFF				42.83588	-124.60865			

TRACKLINE SUMMARY:

	KILOMETERS	NAUTICAL MILES	HOURS
LINE 0009	2.4	1.3	<1
LINE 0010	3.9	2.1	<1
LINE 0011	2.9	1.6	<1
LINE 0012	2.5	1.4	<1
LINE 0013	3.2	1.8	1
LINE 0014	2.4	1.3	<1
LINE 0015	2.0	1.1	<1
LINE 0016	1.5	.8	1
LINE 0017	2.5	1.4	<1
LINE 0018	2.0	1.1	<1
LINE 0037	4.7	2.5	1
LINE 0035	3.3	1.8	1
LINE 0037	3.7	2.0	1
LINE 0035	3.4	1.8	<1
LINE 0033	4.3	2.3	<1
LINE 0031	4.6	2.5	1
LINE 0027	4.9	2.7	1
LINE 0025	4.6	2.5	1
LINE 0021	5.9	3.2	1
LINE 0019	6.7	3.7	1
LINE 0018	1.3	.7	<1
LINE 0017	2.1	1.2	1
LINE 0023	4.4	2.4	1
LINE 0038	5.8	3.2	1
LINE 0039	3.8	2.1	1
LINE 0040	3.9	2.1	<1
LINE 0041	4.0	2.2	1
LINE 0042	4.2	2.3	1
LINE 0043	16.6	9.0	2
LINE 0042	4.3	2.3	<1
LINE 0044	4.5	2.5	1
LINE 0041	4.2	2.3	1
LINE 0045	4.6	2.5	<1
LINE 0040	4.9	2.7	<1
LINE 0046	4.6	2.5	1
LINE 0039	4.8	2.6	<1
LINE 0047	4.7	2.6	1
LINE 0038	6.8	3.7	<1
LINE 0023	61.9	33.7	8
LINE 0024	4.0	2.2	1
LINE 0025	4.7	2.6	<1
LINE 0026	4.5	2.4	<1
LINE 0027	4.0	2.2	<1
LINE 0028	3.7	2.0	<1
LINE 0029	3.4	1.9	<1
LINE 0030	3.4	1.8	<1
LINE 0031	3.4	1.8	<1
LINE 0032	3.6	1.9	<1
LINE 0033	2.9	1.6	<1
LINE 0034	3.3	1.8	<1
LINE 0035	3.1	1.7	<1
LINE 0036	3.5	1.9	1
LINE 0037	3.5	1.9	<1

	KILOMETERS	NAUTICAL MILES	HOURS
LINE 0019	9.9	5.4	1
LINE 0048	3.0	1.6	<1
LINE 0049	1.5	.8	1
LINE 0050	4.3	2.3	<1
LINE 0051	5.2	2.8	1
LINE 0052	4.4	2.4	1
LINE 0053	4.2	2.3	<1
LINE 0054	1.0	.5	<1
LINE 0055	.4	.2	<1
LINE 0056	1.4	.8	<1
LINE 0057	3.1	1.7	<1
LINE 0001	4.8	2.6	1
LINE 0003	5.0	2.7	1
LINE 0005	3.6	2.0	1
LINE 0007	4.3	2.3	<1
LINE 0009	4.7	2.6	<1
LINE 0011	4.9	2.7	1
LINE 0013	3.9	2.1	1
LINE 0015	3.5	1.9	<1
LINE 0017	3.5	1.9	<1
LINE 0019	4.2	2.3	<1
LINE 0021	3.8	2.1	<1
LINE 0022	3.5	1.9	<1
LINE 0023	3.1	1.7	1
LINE 0024	1.8	1.0	<1
LINE 0025	2.1	1.1	1
LINE 0026	2.2	1.2	<1
LINE 0027	7.7	4.2	1
LINE 0001	4.3	2.4	1
LINE 0028	3.5	1.9	<1
LINE 0029	4.8	2.6	1
LINE 0030	4.4	2.4	<1
LINE 0031	4.4	2.4	<1
LINE 0032	3.5	1.9	1
LINE 0033	3.2	1.7	<1
LINE 0034	4.4	2.4	1
LINE 0028	2.9	1.6	<1
LINE 0035	3.6	2.0	<1
LINE 0029	5.1	2.8	<1
LINE 0036	4.6	2.5	<1
LINE 0030	4.5	2.5	<1
LINE 0037	3.9	2.1	<1
LINE 0034	3.2	1.7	<1
LINE 0033	3.3	1.8	<1
LINE 0032	2.8	1.5	<1
LINE 0038	3.2	1.7	<1
LINE 0039	9.5	5.1	1
LINE 0019	3.8	2.0	<1
LINE 0020	4.0	2.2	<1
LINE 0021	4.0	2.2	<1
LINE 0022	3.4	1.8	<1
LINE 0023	3.0	1.6	<1
LINE 0024	14.3	7.8	2
LINE 0040	12.9	7.0	1
LINE 0041	10.0	5.4	1
LINE 0042	9.3	5.1	<1

	KILOMETERS	NAUTICAL MILES	HOURS
LINE 0002	3.0	1.6	1
LINE 015A	3.5	1.9	1
LINE 014A	4.3	2.3	<1
LINE 013A	4.7	2.6	<1
LINE 012A	4.8	2.6	1
LINE 011A	4.9	2.7	<1
LINE 010A	4.9	2.7	<1
LINE 009A	4.9	2.6	1
LINE 008A	5.0	2.7	<1
LINE 0051	3.5	1.9	<1
LINE 0052	3.9	4.8	<1
LINE 0001	4.8	2.6	<1
LINE 0002	7.2	3.9	<1
LINE 0003	6.8	3.7	1
LINE 0004	5.9	3.2	<1
LINE 0005	4.9	2.7	<1
LINE 0006	4.9	2.7	<1
LINE 0007	6.5	3.5	1
LINE 0008	3.8	2.0	<1
LINE 007A	3.9	2.1	<1
LINE 006A	3.2	1.7	<1
LINE 005A	3.1	1.7	1
LINE 004A	2.9	1.6	<1
LINE 003A	4.8	2.6	<1
LINE 002A	5.1	2.8	1
LINE 001A	5.4	2.9	<1
LINE 0053	9.5	5.2	1
LINE 0003	2.7	1.5	1
LINE 0004	2.8	1.5	<1
LINE 0005	.9	.5	<1
LINE 0007	3.0	1.6	<1
LINE 0009	2.1	1.1	<1
LINE 0054	13.8	7.5	2
LINE 0055	15.0	8.2	2
LINE 0056	17.7	9.6	3
LINE 0057	20.0	10.8	3
LINE 0058	17.2	9.3	2

TOTAL NUMBER OF TRACKLINES RUN = 148

TOTAL NUMBER OF HOURS RUNNING TRACKLINES = 66

STATION SUMMARY:

	LONG	LAT	HOURS ON STATION
STATION 0001	-124.57013	42.86931	6
STATION 0002	-124.43789	42.39278	3
STATION 0003	-124.46393	42.39810	1
STATION 0002	-124.44385	42.39273	7
STATION 0003	-124.46149	42.40587	4
STATION 0002	-124.44214	42.39823	1
STATION 0004	-124.44750	42.33957	1
STATION 0005	-124.45059	42.32436	4
STATION 0004	-124.45153	42.33887	3
STATION 0002	-124.43969	42.39362	5
STATION 0003	-124.46596	42.38470	2
STATION 0006	-124.45280	42.35071	5
STATION 0007	-124.46732	42.41223	<1
STATION 0006	-124.44421	42.32849	1
STATION 0008	-124.57719	42.84576	<1
STATION 0009	-124.59514	42.93261	<1
STATION 0010	-124.60290	42.83485	<1
STATION 0011	-124.60501	42.83590	<1
STATION 0012	-124.61133	42.83841	1
STATION 0013	-124.61863	42.84005	<1
STATION 0014	-124.62499	42.84149	1
STATION 0015	-124.59560	42.86847	20
STATION 0008	-124.58669	42.84373	1
STATION 0016	-124.55363	42.76906	3
STATION 0017	-124.55416	42.76125	<1
STATION 0018	-124.55267	42.77347	<1
STATION 0015	-124.59560	42.86852	<1
STATION 0001	-124.60300	42.84692	13
STATION 0015	-124.59660	42.86780	7
STATION 0019	-124.55356	42.78184	1

TOTAL NUMBER OF STATIONS OCCUPIED = 33

TOTAL NUMBER OF HOURS ON STATION = 59

UNDERWAY AND GEOPHYSICAL DATA COLLECTION:

DATA OR CATEGORY	KILOMETERS	NAUTICAL MILES	TIME IN HOURS	NUMBER OF ROLLS/REELS
STATION			59	
TRACKLINE	2139.0	1162.5	65	
DATASONICS BUBBLE PULSER	2139.0	1162.5	39	9
SIDE SCAN SONAR	2005.0	1099.7	119	1
SHIPBOARD MAGGY	1945.0	1057.1	394	5

APPENDIX B. SCIENTIFIC STAFF

1990 OREGON PLACER MINERAL RESEARCH CRUISE

SEPTEMBER 21 - OCTOBER 3, 1990

Edward Clifton	U.S. Geological Survey	Chief Scientist, geologist
Richard Starr	Oregon Department of Fish and Wildlife	Co-chief scientist, biologist
Curt Peterson	Portland State University	Geologist
Robert Woolsey	University of Mississippi	Mineralogist
Cheryl Mardock	U.S. Bureau of Mines	Mineralolgist
Gerry Connard	Northwest Geophysical Associates	Magnetics
Joe Fisher	Oregon State University	Biologist
Dave Fox	Oregon Department of Fish and Wildlife	Biologist
Robert O'Brien	Portland State University	Sea birds and mammals
Greg McMurray	Oregon Department. of Geology and Mineral Industries	Biologist
Walter O'Niell	University of Mississippi	Coring Specialist
Rusty Tarver	University of Mississippi	Coring Specialist
Monty Simmons	University of Mississippi	Coring Specialist
Graig McHendrie	U.S. Geological Survey	Navigation specialist
Mike Hamer	U.S. Geological Survey	Navigation specialist
Dave Hogg	U.S. Geological Survey	Electronic technician