SIDE-SCAN SONAR EXAMINATION OF HELICOPTER SEARCH AREA, SCOTIAN SHELF

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ABSTRACT

An intensive search on the Scotian Shelf for a downed helicopter, provided uniquely dense coverage by side-scan sonar and bathymetry readings. A geological study of the side-scan sonar and bathymetric records, seafloor photographs and sediment sample analyses, was undertaken and an integrated interpretation completed. Maps of bathymetry and surficial geology resulted. Two major sediment units occur in the search area: an acoustically reflective glacial drift with a hummocky upper surface, and an acoustically transparent mud which is shown by sub-bottom reflections on echograms, to fill depressions in the upper surface of the glacial drift. The distribution of sediments is in general agreement with existing regional maps of surficial geology.

SECTION 1. INTRODUCTION

The side-scan sonar and echogram data, seafloor samples and photographs examined in this study are the product of an intensive search for a Canadian Armed Forces helicopter which crashed into the sea during a hovering maneuver in April, 1973. Fortunately, it can be added, the crew escaped the helicopter's sinking. The crash site was 15.5 km (25 nautical miles) due South of Chebucto Head, at the mouth of Halifax harbour, in Latitude 44°06.34'N and Longitude 63°32.32' W. (Plate 1). Water depth at the crash site is in the order of 175 m (80 fm). Because of a number of recent engine failures in these aircraft, it was deemed necessary to recover the downed helicopter for analysis of its power system. The search was carried out in May, 1973 from the CFAV SACKVILLE, with an EG&G side-scan sonar system, provided by the Metrology Section of the Bedford Institute of Oceanography. The system was operated under the direction of Dr. D. McKeown. Once found, the helicopter was eventually raised with the underwater assistance of the Armed Forces' SDL-1 submersible.

The helicopter search had two aspects: the first was a survey consisting of sub-parallel lines run sequentially with approximately a WNW-ESE orientation. The side-scan and precision depth recordings from this survey, constitute the basis of the present study. The second consisted of many

PLATE 1

HELICOPTER SEARCH LOCATION,

REGIONAL SURFICIAL GEOLOGY AND BATHYMETRY

(after King, 1970: Map 4040 G)

LEGEND

5a - Emerald Silt; poorly-sorted clayey and sandy silt

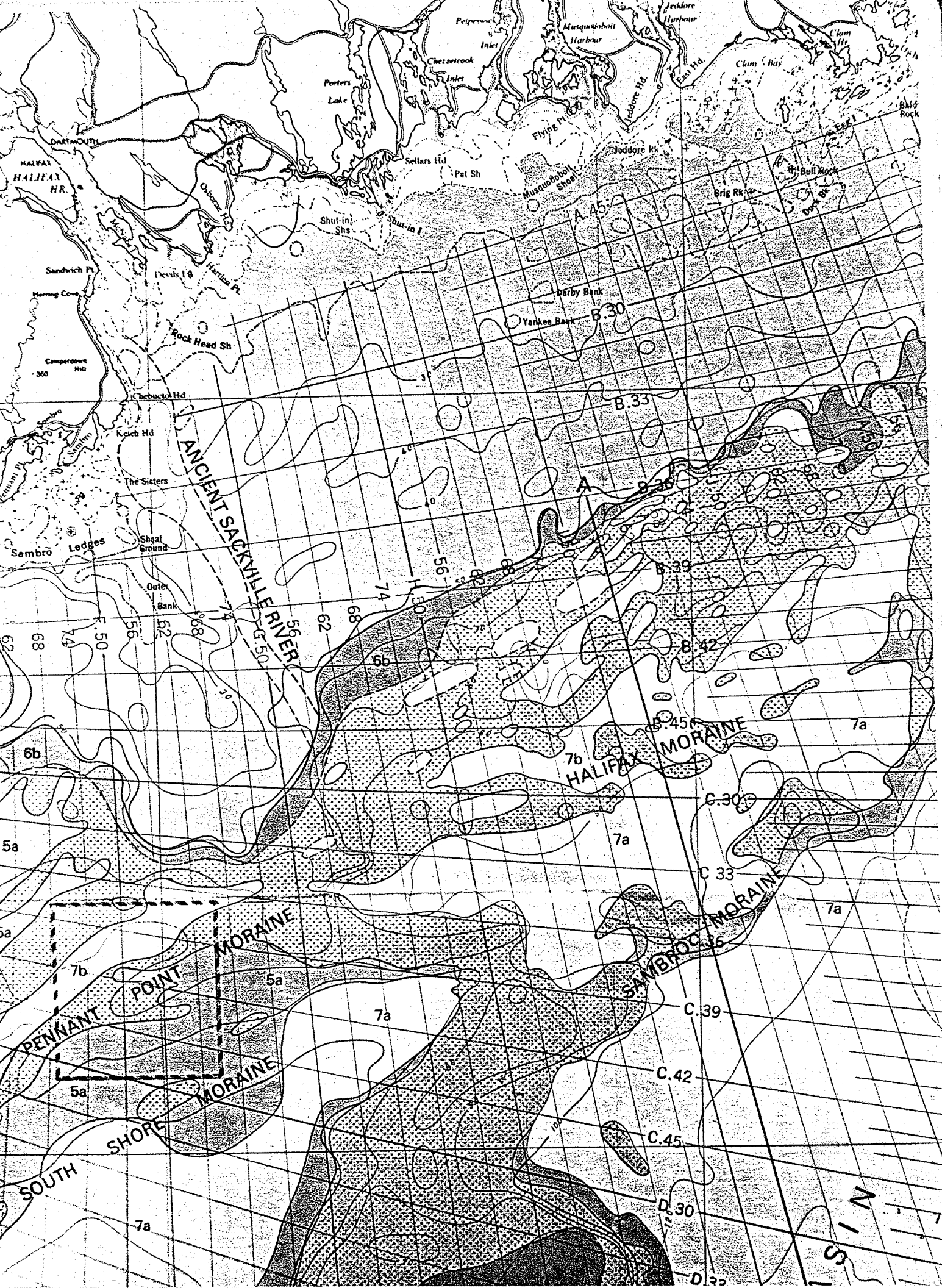
6b - Sambro Sand; mainly silty and clayey sand, some sandy gravel

7a - La Have Clay; silty clay

7b - La Have Clay; clayey silt

Pennant Point Moraine; glacial till

(Bathymetry Contours in Fathoms)


Peppervack Inlet
Musquodoboit Harbour
Jeddore Harbour
Clam Bay
Porters Lake
Chezzetcook Inlet
East Hd
Jeddore Hd
Flying Pt
Jeddore Rk
Bald Rock
Bull Rock
Brig Rk
Dark Rk
DARTMOUTH
HALIFAX
HALIFAX HR.
Sellars Hd
Pat Sh
Musquodoboit Shoal
Osborne Hd
Shut-in Shs
Shut-in I
Sandwich Pt
Devils I
Herring Cove
Harrius Pt
Darby Bank
Yankee Bank
Rock Head Sh
Camperdown Hill
360
Chebucto Hd
Sambro
Kcich Hd
The Sisters
Sambro Ledges
Shoal Ground
Outer Bank
ANCIENT SACKVILLE RIVER
A 45
B.30
B.33
B.36
B.39
B.42
B.45
C.30
C 33
C.36
C.39
C.42
C.45
D.30
D.33
A
6b
7b
7a
5a
HALIFAX MORAINE
SAMBRO MORAINE
PENNANT POINT MORAINE
SOUTH SHORE

maneuverings of the search vessel over various targets including that which ultimately proved to be the helicopter. Side-scan records of these maneuverings were generally excluded in the present study.

The object of this study was to exploit a uniquely dense side-scan survey on the Scotian Shelf in demonstrating the potential of such a survey to yield geological details of seafloor topography and composition. Such details relate to regional mapping of surficial geology and the rational design and routing of pipelines or cables. The study could further be considered as an example illustrating local variation of surficial geology for purposes of comparison with presently existing regional maps of the Scotian Shelf.

Regional maps of surficial geology on the Scotian Shelf, accompanying reports by King (1970), MacLean and King (1971) and Drapeau and King (1972) constitute the best published source of geological information for the area. Specifically, King's report and map of the Halifax to Sable Island area includes the helicopter search area of this study. These regional compilations of surficial geology are based upon the integrated interpretation of sediment grab samples and cores, echograms and intermediate-depth seismic reflection records. By correlating echogram characteristics with seafloor types and then classifying continuous echograms over the shelf as to the nature of the seafloor represented by varying morphology and acoustic reflectivity, these authors were able to greatly extend their geological mapping beyond the limited

influence of specific sediment grab samples. The seismic reflection records provide knowledge of the vertical dimension in the surficial geology of the area. To date, this vertical dimension is illustrated in publications by typical cross sections of the Scotian Shelf. Subsurface structure and isopach maps have yet to be generated. Several seismic profiles from the vicinity of the helicopter search area are illustrated in King's map 4040 G (King, 1970).

SECTION 2. REGIONAL AND TEMPORAL SETTING

King (1970) recognizes three distinct physiographic zones of the Scotian Shelf in the Halifax-Sable Island map area:

1. *The Inner Shelf*, bordering mainland Nova Scotia. It averages 25 km (15 n. miles) in width and is characterized by an irregular surface representing topography of the exposed or shallow-buried bedrock; Cambro-Ordovician metasediments and Devonian granites, continuous with similar rocks on the Nova Scotian mainland.
2. *The Central Shelf Trough*, a complex of depressions and isolated banks. The trough averages 40-50 km (20-25 n. miles) wide and is essentially continuous along the length of the Scotian Shelf. Its average depth is 145-180 m (80-100 fm).
3. *The Outer Shelf* consists of a series of shallow banks 50-65 km (25-35 n. miles) wide extending along the edge of the continental shelf, periodically interrupted by transverse troughs or saddles.

The helicopter search area has water depths of 175-208 m (80-95 fm). Physiography in the area is transitional between the Inner Shelf and Central Shelf Trough. Acoustic basement in this area is continuous with the Lower Paleozoic complex of Nova Scotia and consists of Cambro-Ordovician metasediments of the Meguma Group and intruded, Devonian granites. This basement complex was exposed and eroded periodically during deposition of Mesozoic and Tertiary strata seaward of the present Inner Shelf. Cretaceous clastics wedge out against the Devonian and Cambro-Ordovician basement. Reference to King's sections A-B and E-F (Map 4040 G) suggests that the erosional edge of these Cretaceous sediments probably passes through or near the survey area. The pre-Pleistocene extent of Tertiary sediments on the shelf is unknown due to subaerial erosion prior to, and glaciation during, the Pleistocene Epoch. Glaciation of the Scotian Shelf modified pre-existing fluvial patterns on the shelf. King (1970) suggests that the Inner Shelf, above a Pleistocene shoreline at approximately the present 120 m (65 fm) level, constituted part of mainland Nova Scotia, while the remainder of the shelf exhibited a complex topography of islands and submerged depressions.

During the Pleistocene Epoch, the Scotian Shelf was intermittently covered, in whole or in part, by the ice

sheets representing the major glacial advances. These ice sheets yielded a basal glacial till termed the *Scotian Shelf Drift* by King. This basal till probably represents the morainal deposits of the last ice sheet to cover a given area. The basal moraine crops out on the sides of banks but is covered in basins by fine sediments. The limit of the last glacial advance onto the shelf is marked by a semi-continuous series of end moraines. The Pennant Point Moraine in the survey area is one part of a linear morainal trend which includes, to the east, the Halifax, Eastern Shore and Country Harbour moraines of King's map. King characterizes the Scotian Shelf Drift, including the terminal moraines, as very dark greyish-brown, cohesive and poorly sorted sediment. While dominantly sandy, the drift contains considerable silt and clay, and in fact, despite an admixture of rock fragments of pebble, cobble and boulder size, King cites as the median diameter of surface samples a range of 0.05 to 1 mm.

Reworking of the basal Scotian Shelf Drift by transgressing shorelines resulted in the development of the *Sambro Sand* on the present banks (former islands) and along the seaward margin of the Inner Shelf. This Inner Shelf edge terminates just north of the study area. The inter-bank depressions of the Central Shelf Trough including the study area, were wholly or partly mantled by a succession of fine sediments derived by winnowing

from the adjacent shallows. In the area of present interest, these deposits are represented by the *Emerald Silt*. The Emerald Silt and Sambro Sand are thus contemporaneous deposits. King describes the Emerald Silt as very dark greyish-brown fine-grained muddy sediment, generally silty but angular gravel is normal where the unit is locally sandy. Median diameter generally lies between 0.01 and 0.05 mm. King cites palaeontological evidence which indicates that the silt is a pro-glacial deposit and suggests that "most of the Emerald Silt was deposited from floating ice carrying a wide range of particle sizes. Factors such as proximity to the ice front, the littoral and sub-littoral environments with respect to the Pleistocene shoreline, tidal currents, and the general configuration of bottom topography, have all contributed in varying degrees to the wide variations observed in the texture." The *La Have Clay* is described by King as overlying the Emerald Silt, in depressions on the shelf. It is characterized as being "very dark greyish-brown, loosly compacted silty clay which locally grades to clayey silt." It is acoustically, highly transparent and is further characterized by a high degree of lateral homogeneity. It is considered to be the product of winnowing from adjacent bank areas during the final transgression of the sea across the Scotian Shelf, following glacial retreat at the close of the Pleistocene Epoch. Its uppermost section is thought to represent a continuation of this process of winnowing during the Holocene

under the influence of bottom currents and storm waves. The La Have Clay time equivalent unit on the banks is the *Sable Island Sand*. The upper surfaces of the Emerald Silt and La Have Clay tend to be smooth and planar except where thinly draped over the upper surface of the Scotian Drift which tends to be hummocky.

SECTION 3. SURVEY AND ANALYTICAL PROCEDURES

INTRODUCTION

The initial survey aspect of the helicopter search was carried out from CFAV SACKVILLE in May of 1973, and consisted of approximately 37 sub-parallel lines with an approximate separation of 100-200 metres and an ESE-WSW orientation (Enclosure 1). Navigation for the survey was obtained by reference to Decca Chain 7 C/V (Nova Scotia) with the vessel operating 24 hours per day. Decca coordinates were recorded and sounding and side-scan records "event marked" simultaneously at approximately 6 minute intervals. The survey actually was completed over a period of days with interruptions for detailed examination of bottom targets suspected to be the downed helicopter.

TRACK CHART DERIVATION

An EG&G side-scan sonar system was employed. At an average ship speed over the bottom of between 4 and 5 knots, the side-scanning fish was approximately 50 metres deep. Assuming that the fish towed directly astern of the survey vessel, that is undeflected to port or starboard by cross-currents, the distance of the fish astern of the vessel was approximately 300 metres. This assumed distance for the fish behind the survey vessel was incorporated as a correction to the fish position in the final survey track plotting. An explanation of the necessity for this

correction follows.

Consider that a ship is towing a side-scan fish approximately 300 m astern and steaming from west to east along a straight line of a given length. When the ship is at the mid-point of this line, the towed fish is 300 metres to the west. At the end of the line, the ship turns to begin a parallel line, equal in length to the last, now the ship's heading is east to west. When the ship reaches the mid-point of the line, however, the towed fish is 300 metres to the east. Thus at the mid-point of each of the two parallel lines, the displacement of the towed fish position on the first line relative to its towing position on the second line is twice its distance behind the ship or 600 metres. By adjusting the navigation for the track plot so that the position of the fish is calculated and plotted rather than plotting the position of the ship, these effects of the lateral displacement of the fish are negated.

All tracks recorded in the helicopter search were derived by converting Decca fixes to latitudes and longitudes, adjusting for fish displacement relative to the ship and computer plotting with the aid of a Cal Comp drum plotter. Track plots for the survey aspect of the search were derived by eliminating tracks made during slow maneuvering in the vicinity of the helicopter's position. With the maneuvering tracks eliminated, the remaining data product constitutes the survey track plot

on which the present study is based. The working scale for the track plot was a natural scale of 1:10,000. (The track plot, side-scan sonar interpretation and contoured bathymetry maps, at the working scale of 1:10,000 were optically reduced to a scale of 1:20,000 for final presentation.

SEDIMENT SAMPLING AND PHOTOGRAPHY

Following completion of the main survey element of the helicopter search, and during recovery attempts, the R/V CSAV BLUETHROAT carried out a minimal grab sampling and bottom photography program to supplement the acoustic data and facilitate its geological interpretation. The sampling program consisted of Van Veen grab samples taken at six stations, few of which were ideally located to characterize the distinct bottom types as revealed by side-scan sonar and PDR records. Bottom photographs were obtained at Station 1 (one frame, Plate 4) and Station 2 (three frames, Plate 5). Sediment samples were size-analyzed by the Atlantic Geoscience Centre sediment laboratory. The sediments in sand and gravel classes were sieved at 1 Ø intervals while pipette analysis was performed on the fines (median grain size, less than 62 microns) to define gross silt and clay percentages.

PRECISION DEPTH RECORDINGS

Bathymetry was obtained by means of a hull-mounted, 12 kH_z transducer driven by a Gifft transceiver, with signals

recorded on a 50 cm (20 inch) wide EPC Labs dry-paper survey recorder. The depth recordings, made with a fathom scale on the recorder, were digitized at 2 minute intervals at 1 fathom increments of depth. These were keypunched and computer-plotted at a scale of 1:10,000. No correction for tide or water velocities was attempted. The bathymetric data was contoured using an interval of 5 fathoms.

SIDE-SCAN SONOGRAM ANALYSIS

The side-scan sonar detected little seafloor micro-relief. Instead, distinctive variations on the sonograms are indicative of varying seafloor reflectivity. This, in turn, arises as a result of sediment grain-size distribution patterns. Two major sediment grain-size types appear to be present: a sand or gravelly sand, and a mud. The differing acoustic reflectivity of each is largely responsible for the sonogram patterns. Plate 2 shows a typical sonogram from the search area (Line 17) and illustrates the elements of each record. Note that out-going port and starboard side-scan signals radiate in a lobate pattern rather than in a perfect spherical pattern. This results in a recording discontinuity between vertically-directed lobes which record water depth below the fish, and the main side-looking lobe. The main lobe intersects the seafloor at some distance from the point of intersection of a vertical line drawn between the side-scan fish and the seafloor. This distance is dependent on the main beam's angle of inclination, on the distance of the fish from the seafloor and on the actual

shapes of the signal lobes.

The side-scan sonograms made during the regional survey were given line numbers in sequence from North to South. Paper reproductions of each side-scan line were made as work copies. The limits of distinctive sediment units were marked for both port and starboard recordings. These boundaries were next correlated from port to starboard. The point of intersection of these boundary correlation lines with the mid-line of the recording was taken as the boundary position directly beneath the fish. The position of this point relative to adjacent fixes was determined and translated into sedimentary unit limits, plotted on the track chart at scale 1:10,000. Where correlation of units from port to starboard was not possible, the boundaries of these units were located with respect to adjacent fixes by drawing perpendiculars from unit boundaries to the mid-line of the sonogram. The intersection of these two lines was plotted on the track chart and the port or starboard location indicated. With all side-scan sonar data transferred to this base map, correlations were made from the data of each line to adjacent lines. Thus a map of acoustically distinct seafloor types evolved from our examination of side-scan sonar records. Simultaneously recorded precision depth recordings were examined for indications of varying acoustic reflectivity of the seafloor and for bottom and sub-bottom topography relating to observed side-scan sonogram features.

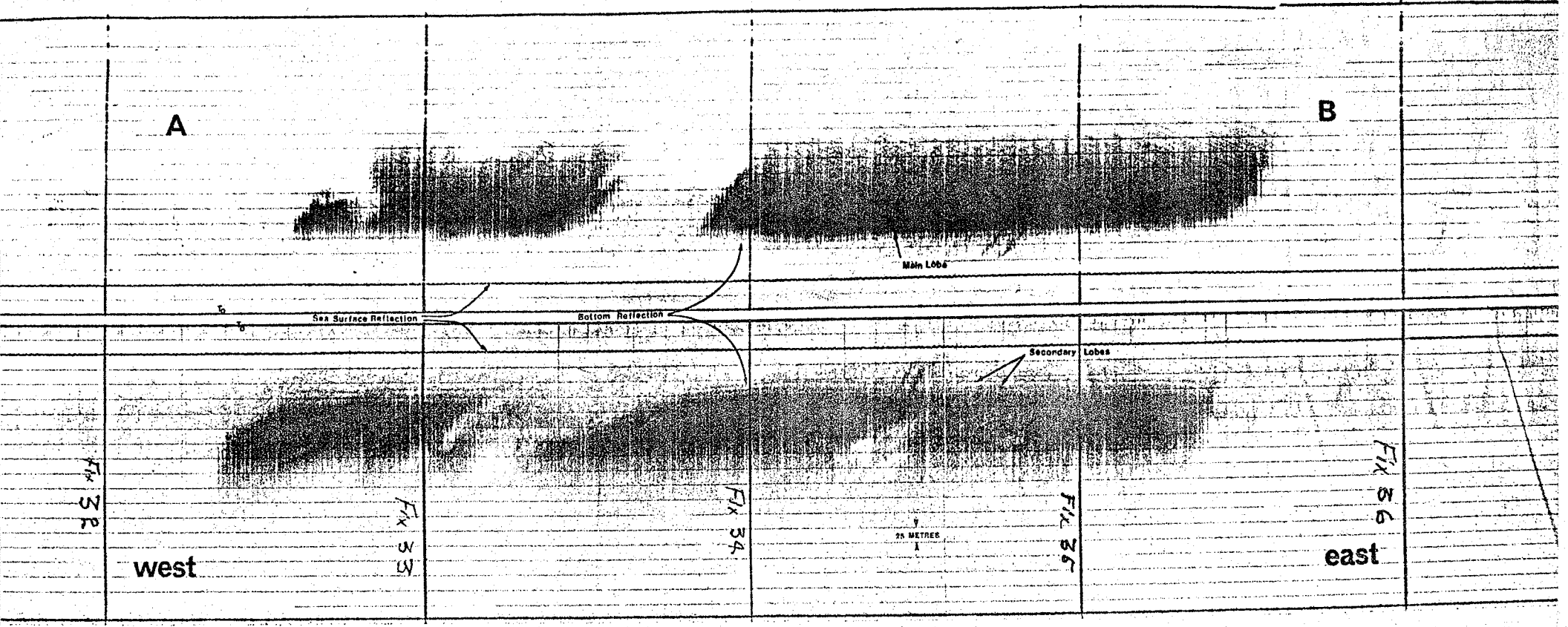
PLATE-2

TYPICAL SIDE-SCAN SONOGRAM

Dark areas represent intense acoustic reflectivity by the seafloor and are correlated with sand and gravel of the Pennant Point Moraine.

Light areas represent acoustic absorption by the seafloor and are correlated with muds of the Emerald Silt and/or La Have Clay.

Record displayed is from Line 17 between fixes 32 and 36. Starboard side is displayed at the bottom of the sonogram and port side, at the top.


A
B
Main Lobe
Sea Surface Reflection
Bottom Reflection
Secondary Lobes
Fix 32
Fix 33
Fix 34
Fix 35
Fix 36
25 METRES
west
east

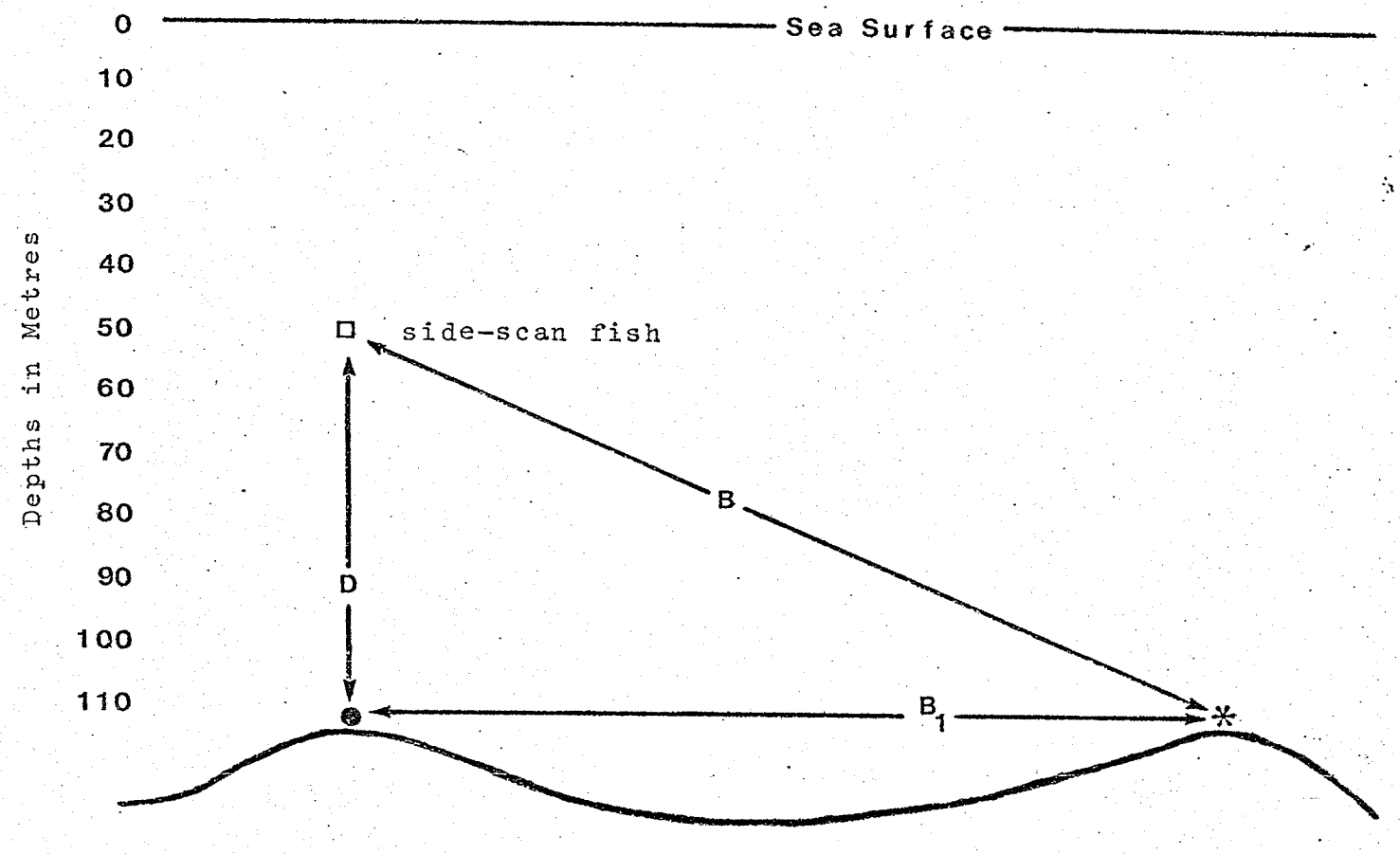
The lateral or slant range scale of the sonograms is 0-500 metres for port and starboard with the total possible sweep width represented by the records being 1000 metres. In practice, little more than 200 metres horizontal distance, port and starboard was actually examined by the system. Even with the sweep distance potential unrealized, 100 percent overlapping coverage from adjacent lines was attained because of the close spacing of the survey lines. With such closely spaced lines, it was unnecessary for purposes of the present study, to determine distances to reflecting units which lay either to port or to starboard of the fish's track over the seafloor.

For reference purposes, note that the recorded horizontal distances (slant range from the side-scan fish to objects on the seafloor are apparent distances. The true horizontal distance must be derived. The geometric relationships of these measurements are illustrated in Figure 1.

For a given area, a nomogram illustrating the relationship between slant range and true horizontal range can be derived using Pythagoras' Theorem and inserting an appropriate range of water depths and corresponding fish distances from the seafloor (assuming constant fish depth below the sea surface). Such a nomogram, constructed for the helicopter search area, is included as Figure 2. The derivation of the slant range correction is described below. Refer to Figure 1 for definitions.

FIGURE 1

SIDE-SCAN SONAR DISTANCE MEASUREMENT GEOMETRY



D = water depth below side-scan fish

B = slant range to an object on the seafloor (as recorded on side-scan sonogram)

B_1 = Actual horizontal range to an object on the seafloor (calculated from slant range)

From Pythagoras' Theorem:

$$\text{True range} = \sqrt{(\text{slant range})^2 - (\text{Depth below fish})^2}$$

Example:

Water depth: 146 metres (80 fathoms)
Fish depth: 50 metres
Depth below fish (D): 96 metres

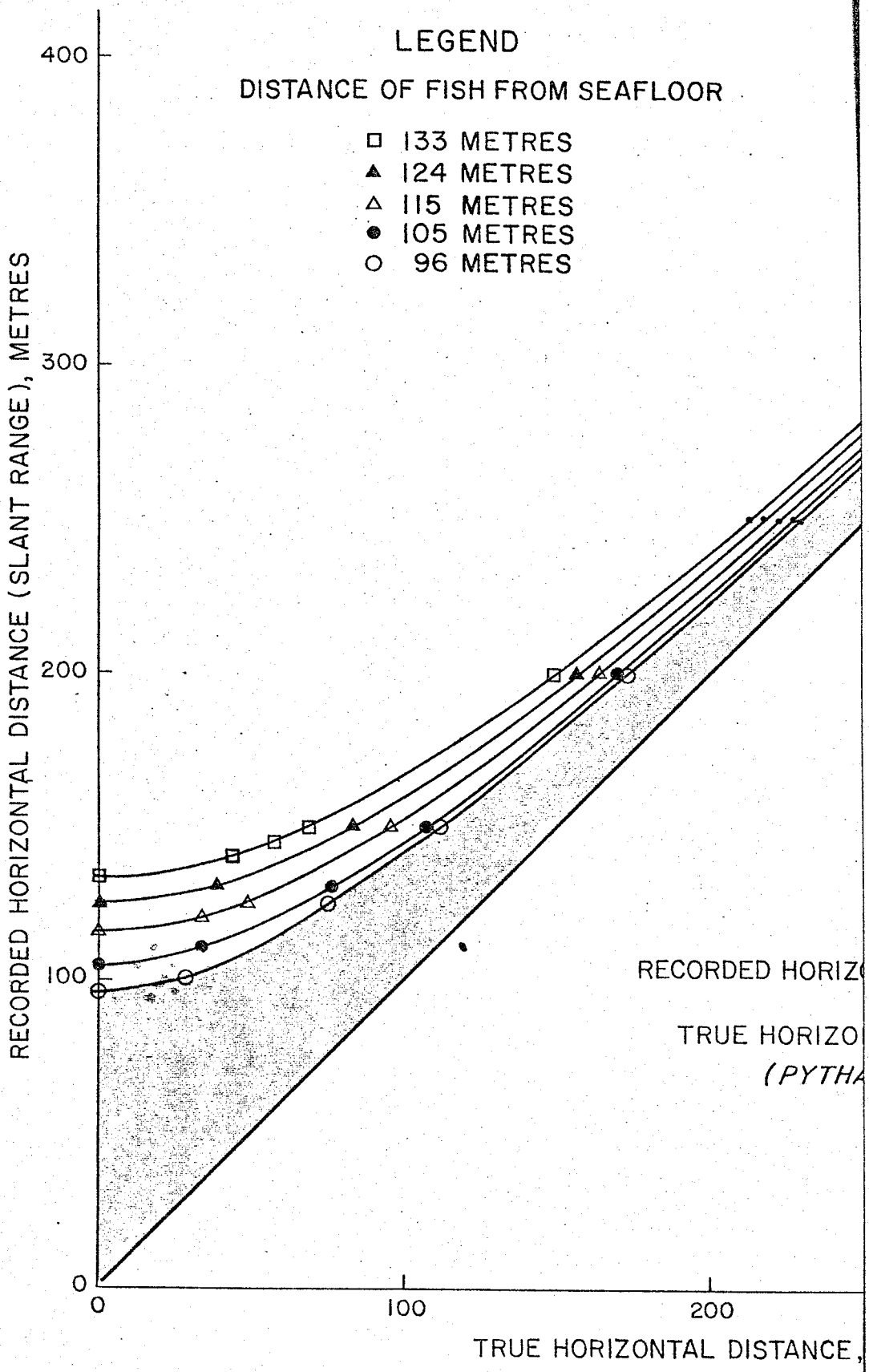
For an object on the seafloor with a recorded horizontal distance or slant range (B) of 125 metres, the calculated actual horizontal distance from the fish (B_1) is:

$$B_1 = \sqrt{B^2 - D^2}$$

$$B_1 = \sqrt{(125)^2 - (96)^2}$$

$$B_1 = 75 \text{ metres}$$

For a slant range (B) of 400 metres, the actual horizontal distance (B_1) is 387 metres. Clearly, slant range errors are greatest where the object on the seafloor to which slant range is measured, has a small horizontal displacement from the fish.


LEGEND
DISTANCE OF FISH FROM SEAFLOOR
133 METRES
124 METRES
115 METRES
105 METRES
96 METRES
RECORDED HORIZONTAL DISTANCE (SLANT RANGE), METRES
400
300
200
100
0
0
100
200
TRUE HORIZONTAL DISTANCE,
RECORDED HORIZ
TRUE HORIZO
(PYTHA

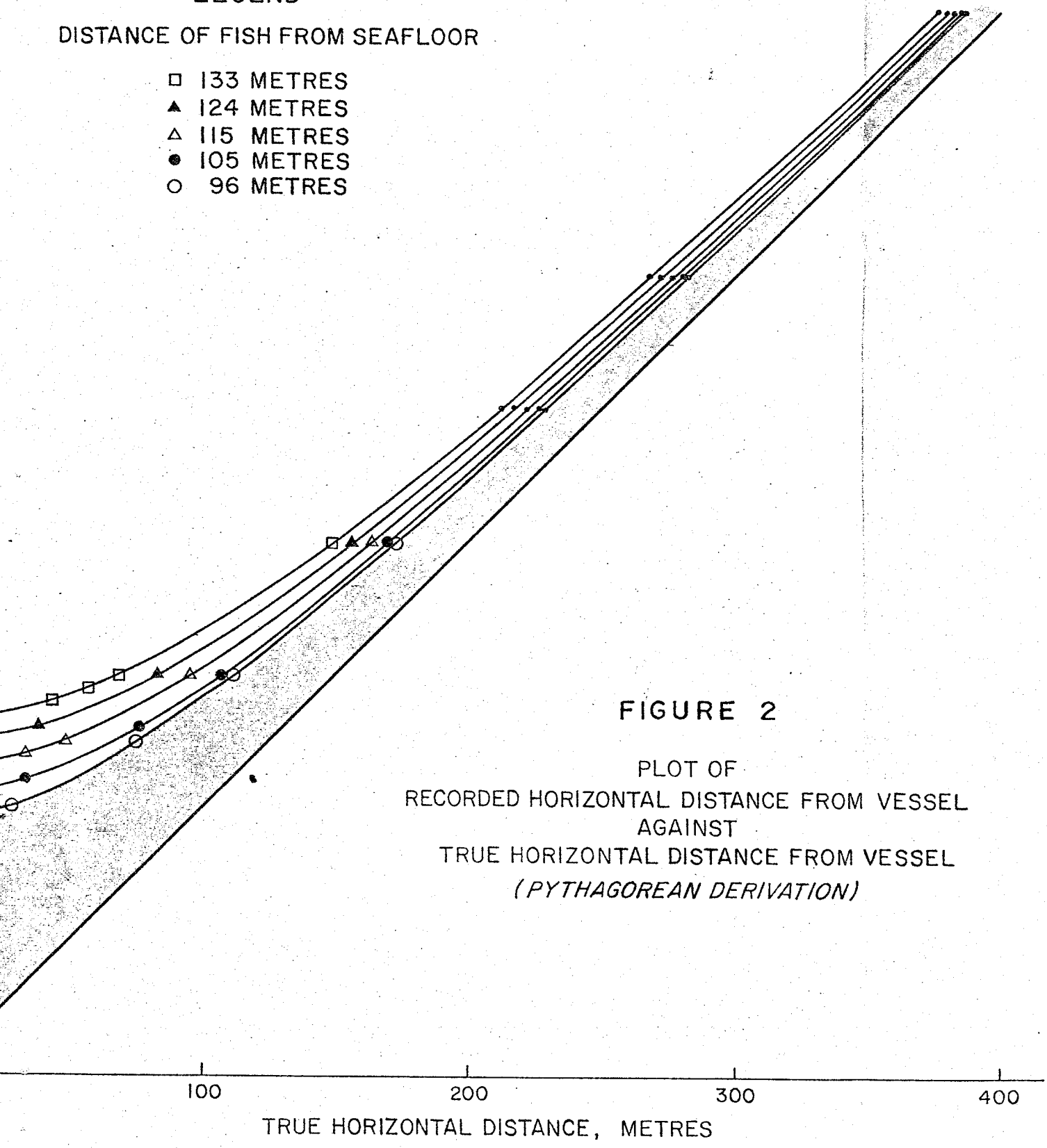


FIGURE 2

PLOT OF
RECORDED HORIZONTAL DISTANCE FROM VESSEL
AGAINST
TRUE HORIZONTAL DISTANCE FROM VESSEL
(PYTHAGOREAN DERIVATION)

SECTION 4. SURVEY INTERPRETATION

Bathymetric records, side-scan sonograms, sediment sample analysis and bottom photographs were examined and the interpretations integrated to produce maps of bathymetry and surficial geology in the search area. Plate 3 illustrates the complementary aspects of side-scan sonograms and depth recordings in the search area.

Two sedimentary/bathymetry regimes are indicated by the present data, within the search area. These we correlate with the Pennant Point Moraine (Scotian Drift) and the Emerald Silt and La Have Clay of King's Chart 4040 G. On the basis of the existing data, we have been unable to positively distinguish the La Have Clay from the Emerald Silt although the inference may be made through reference to King's chart, that the basinal sediments southeast of the Pennant Point Moraine belong to the Emerald Silt while those northwest of the moraine belong to the La Have Clay. For purposes of discussion here, the two are considered together.

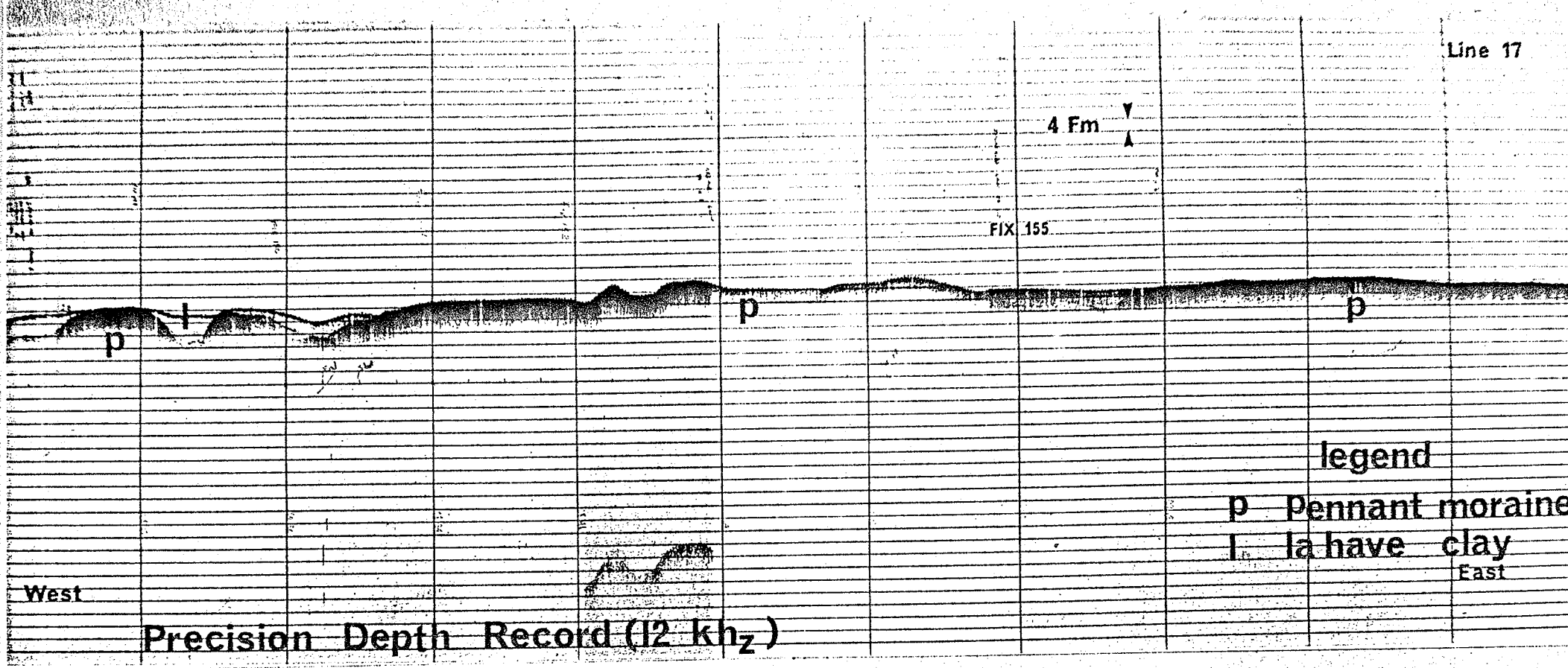
1. *Pennant Point Moraine (Scotian Shelf Drift)*

This unit is characterized by a strong reflection from seafloor and no acoustic penetration on depth recordings. Side-scan sonograms display a smooth, unmottled and intense acoustic reflection. This reflective unit occurs mainly on an elongate though intermittent ridge trending NE-SW. Sub-

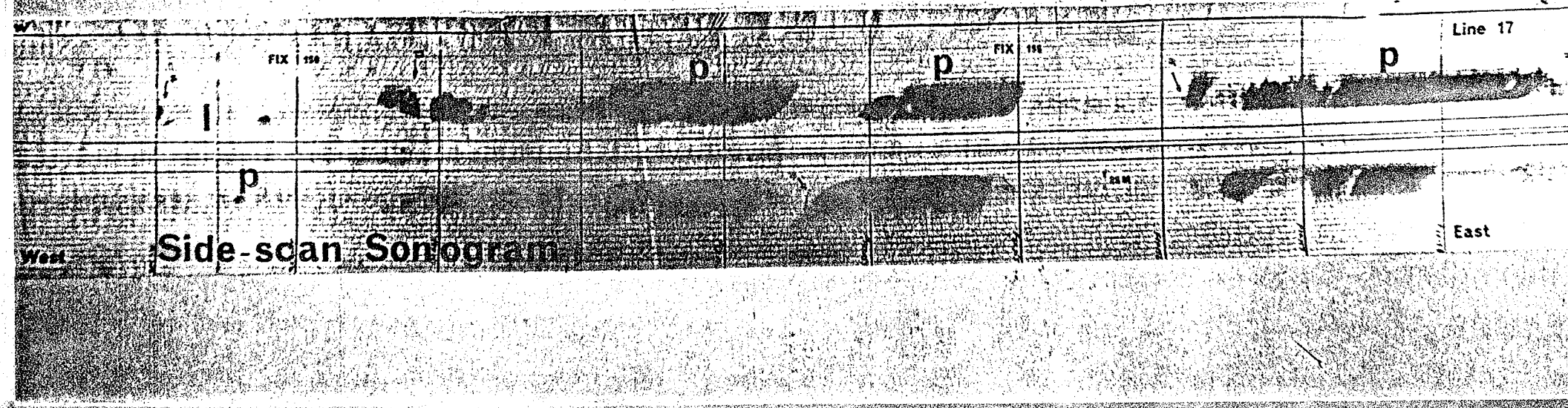
PLATE 3

COMPOSITE SIDE-SCAN SONOGRAM

AND PRECISION DEPTH RECORDING



Precision Depth Record (12 khz)



Side-scan Sonogram

bottom reflections observed on sounding records from the flanking basins of soft sediment indicate that the drift is continuous throughout the search area but its highly irregular upper surface is completely or partially covered by fine sediments (Plate 3). The drift protrudes through this partial sediment cover giving rise to the numerous occurrences of drift which in"plan view" are seemingly isolated on the seafloor. Sediment grab samples and seafloor photographs were not positioned so as to conclusively characterize the bottom sediments of this acoustic unit. The grab samples of Station 2 and Station 5 are both located near the edge of the drift unit and contain 47% gravel, 30% sand, 23% mud and 0% gravel, 46% sand and 54% mud respectively. Such grain-size distributions, considering their position relative to the main body of drift, are consistent with the observed side-scan and PDR indications of strong seafloor reflectivity.

Seafloor photographs are equally inconclusive in characterizing the nature of the reflective drift unit. The single photograph from Station 1 was taken with the camera a considerable distance off the seafloor and bottom features are difficult to distinguish. It is estimated that the sediment of the photograph is sand. While there is no acoustic data at the photo location, the presence of the drift unit immediately west suggests that this photograph may be representative of the drift surface (Plate 4).

PLATE 4

SEAFLOOR PHOTOGRAPH

Photograph was taken at Station #1 (Enclosure 1) at the northeast edge of the survey area. It is estimated that the sediment is sand.

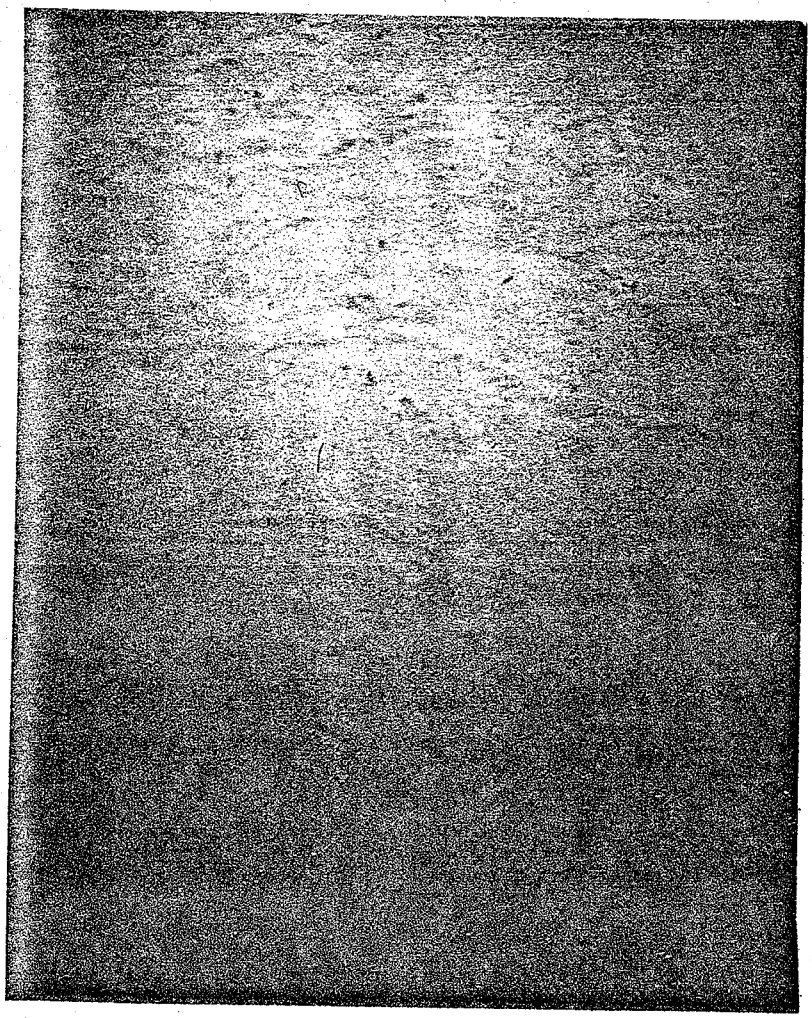
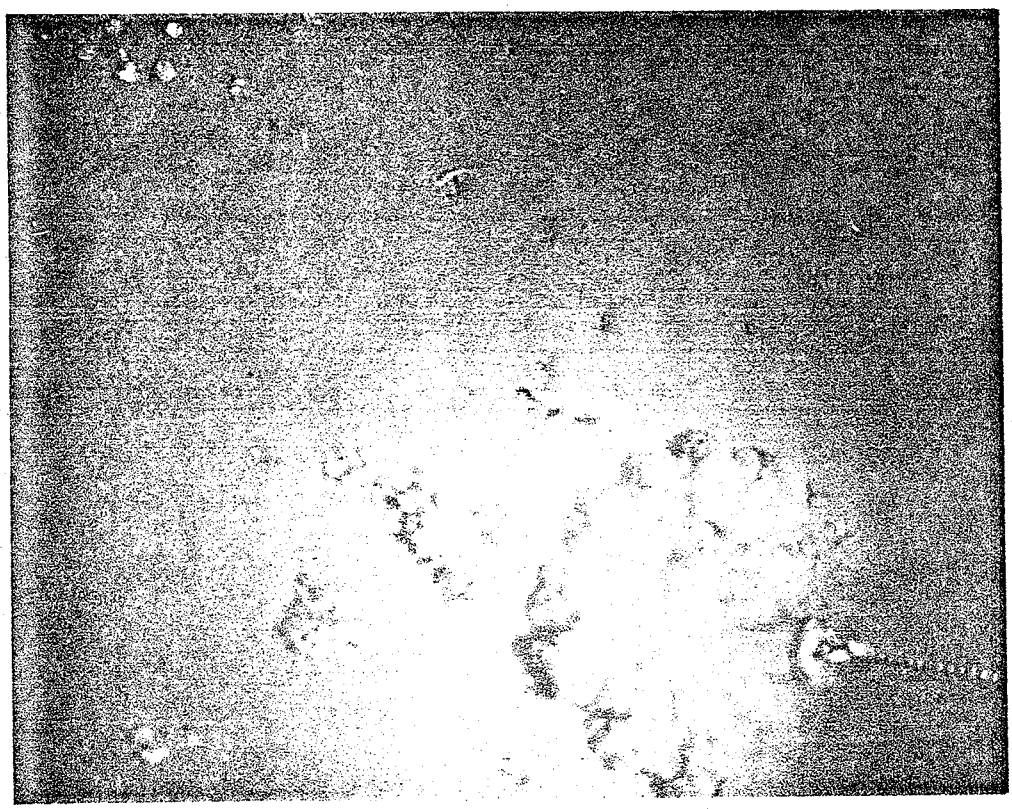
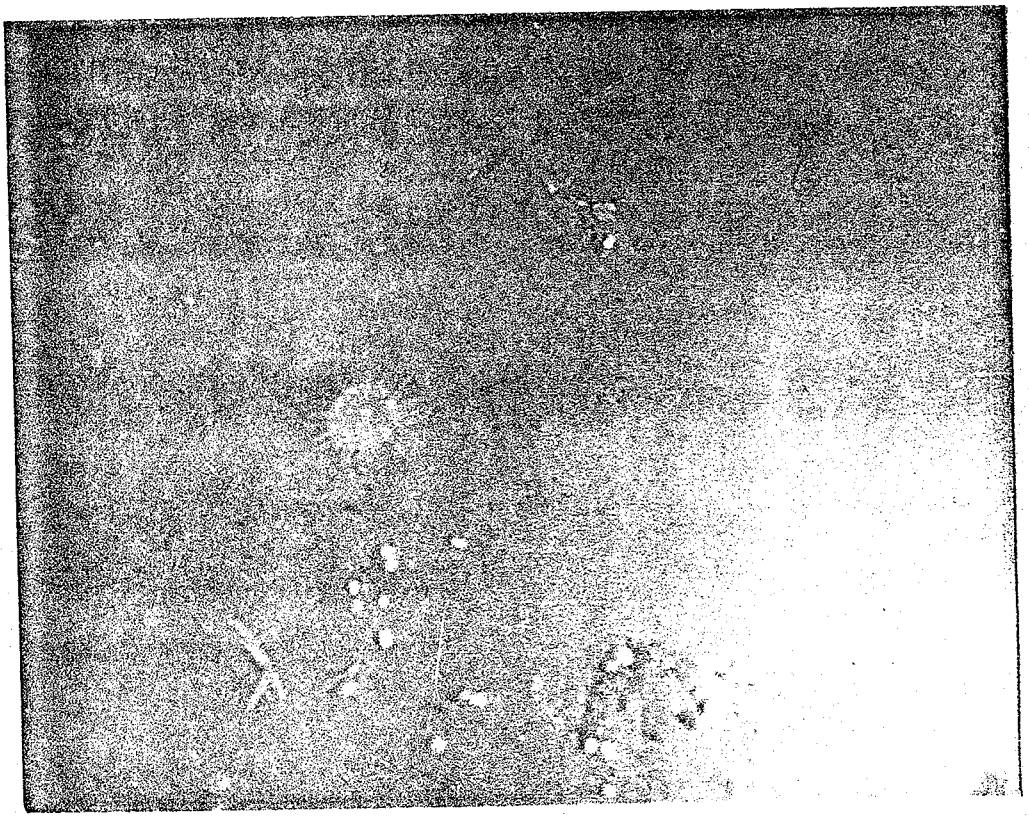


PLATE 5

SEAFLOOR PHOTOGRAPHS

Photographs were taken at Station #2 (Enclosure 1) in the east central portion of the survey area over what is probably Emerald Silt. The camera station is located close to the margin of the Emerald Silt and Point Pennant Moraine.





The unmottled and monotonal sonographs are strongly suggestive of a sand or fine gravel bottom. Strong, point source reflections and record mottling common to boulder fields are absent. This indirect evidence and the inconclusive direct evidence from grab samples and bottom photographs suggests that the uppermost section of the Pennant Point Moraine has been reworked to the extent that cobbles and boulders if present in the moraine, are at this point covered by a veneer of sand or fine gravel.

2. *Emerald Silt and La Have Clay*

The Emerald Silt and La Have Clay sedimentary units, here considered as one unit acoustically, are characterized by a comparitively weak seafloor reflection on bathymetric records (Plate 3), and a weak, to non-existent reflection on side-scan sonar records (at the gain settings used in the recording). They are further characterized by sub-bottom penetration of 12 kH_z signals. Sub-bottom reflections from as deep as 20 m (65 ft.) beneath the seafloor are common (the depth calculation assumes the surficial sediments to have the same velocity as sea water). Internal reflectors may be seen in places. The Emerald Silt and La Have Clay unit is thus observed to fill elongate basins in the Pennant Point Moraine surface, flanking the NE-SW trending protrusions of the morainal ridge.

Seafloor grab samples were not ideally located to definitively ground truth the side-scan sonar indications of sediment types. Several sample locations fortuitously fell in transition zones between areas exhibiting distinct topographic and sedimentary characteristics. From Appendix B, one can see that stations 1, 3, 4 and 6 have low sand and high silt percentages. Stations 3, 4 and 6 lie in areas interpreted to be silt from side-scan records. There is no side-scan coverage of the Station 1 sample which has the highest percentage of sand (18.7%) of the four samples. However, from the map of surficial geology (Enclosure 3) one may predict that the sample would exhibit the influence of Pennant Point Moraine sediments.

Seafloor photographs at Station 2 (Plate 5) were taken near the contact of the basinal silts and morainal sands, but from an area designated as silt. The photographs suggest that a fine sand or silty sand bottom is present whereas the grab sample is much coarser (47% gravel). This correlates well with the slightly different locations of the Station 2 grab sample and bottom photograph; the former on the moraine and the latter just off the moraine.

In summary, the basinal sediments are typified by a relatively high mud content. Consequently, they exhibit relatively low acoustic reflectivity from the surface. They are further characterized by an acoustically transparent internal constitution.

SECTION 5. DISCUSSION

The purpose of the survey was to locate the downed helicopter as quickly as possible. The realization that the gathered data had geological significance occurred as an afterthought.

Our interpretation of the survey data confirms the generalized patterns of King's surficial geology map (op. cit.) while providing a more detailed description of an area encompassed by King's map. As such, our map illustrates the degree of variation to be encountered in this sedimentary environment when detailed knowledge of the seafloor is required as for the establishment of offshore petroleum production facilities. It is immediately apparent that side-scan sonar recordings constitute the most efficient means of obtaining such information. The detailed nature of many side-scan sonograms, however, invites the invention of a technique for conveyance of their detail to a map by some method which is more convenient and less expensive than continuous photographic reduction and reproduction.

Shallow seismic profiling is an important form of data in such studies of continental shelves. The 12 kH_z hull-mounted transducer, which was used in this survey, provided much needed information. We would suggest however that an array of 3.5 kH_z transducers in a towed body, which regularly produce 60 metres or more sub-bottom penetration in the highly stratified silts of the nearby Emerald Basin, would have been the ideal shallow

profiling instrument.

Finally, intermediate-depth seismic profiles (recorded with sparker boomer or air-gun sources) would be informative of such factors as depth to bedrock and the thickness of surficial gravel and sand deposits.

It would be most desirable to design a program of sediment sampling and photography following preliminary interpretation of acoustic data as opposed to sampling on a preset grid.

This is an example of the type of survey which will eventually be required for the design of offshore petroleum production facilities. This design will include the choice between floating, bottom pile-sitting or jack-up platforms and the selection of routes for pipelines and gathering systems. The detailed mapping of surficial and sub-surface sediments with differing physical properties and the evaluation of their strength or "engineering"characteristics, will be an integral part of the design process. Referring to the present study as the basis for pipeline route selection, it is apparent that a pipeline traversing the area from northeast to southwest would probably be laid in the silt-filled valleys paralleling the Pennant Point Moraine, where trenching would be easiest. A pipeline traversing from northwest to southeast might be routed to cross the Pennant Point Moraine at the point of minimum surface exposure.

Similarly, an evaluation of the environmental impact of marine construction will, to some extent, depend on the security afforded structures by surficial sediments, and the quality of ground-fishing conditions as revealed by geological mapping of the seabed.

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APPENDIX A

STATION POSITIONS

STATION POSITIONS REFERENCED TO DECCA CHAIN 7 C/V N.S.

Station #	Decca Green	Decca Purple	Latitude/ Longitude	Latitude/ Longitude
#1				
Grab	C40.71	F60.88	44.12069 N 63.47480 W	44°7.2414' N 63°28.488' W
Camera Down	C40.92	F62.75	44.11684 N 63.46387 W	44°7.0104' N 63°27.8322'W
Camera Up	C41.11	F64.01	44.11366 N 63.45644 W	44°6.8196' N 63°27.3864'W
#2				
Grab	C42.80	F57.56	44.09961 N 63.49323 W	44°5.9766' N 63°29.5938'W
Camera Down	C42.97	F57.04	44.09815 N 63.49624 W	44°5.889' N 63°29.7744'W
Camera Up	C43.06	F56.58	44.09754 N 63.49891 W	44°5.8524' N 63°29.9346'W
#3				
Grab	C45.14	F58.09	44.07272 N 63.48949 W	44°4.3632' N 63°29.3694'W
#4				
Grab	C46.26	E77.14	44.07169 N 63.55484 W	44°4.3014' N 63°33.2904'W
Camera Down	C46.28	E77.20	44.07141 N 63.55450 W	44°4.2846' N 63°33.27' W
Camera Up	C46.42	E77.38	44.06972 N 63.55345 W	44°4.1832' N 63°33.207' W
#5				
Grab	C43.00	E78.02	44.10587 N 63.54900 W	44°6.3522' N 63°32.94' W
#6				
Grab	C40.05	E78.15	44.13773 N 63.54810 W	44°8.2638' N 63°32.886' W

APPENDIX B

SEDIMENT GRAIN-SIZE ANALYSES

Station Number	Percentage Gravel	Percentage Sand	Percentage Silt	Percentage Clay	Percentage Mud
1	1.4	18.7	57.6	22.3	79.9
2	47.3	29.5	14.4	8.8	23.2
3	8.4	14.8	50.8	26.0	76.8
4	0.1	9.3	57.8	32.8	90.6
5	0.1	45.5	36.2	18.2	54.4
6	0.0	3.1	61.9	35.0	96.9

APPENDIX C

SURVEY COURSE, SPEED AND POSITION DATA

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
120	1504	4	440663	-633392	C4290	E7500					
120	1507	5	440664	-633426	C4298	E7400	272.3	4.9	.5	.2	.05
120	1507	5	440664	-633426	C4298	E7400					
120	1512	6	440669	-633497	C4308	E7200	275.6	6.2	1.0	.5	.08
120	1525	7	440640	-633584	C4375	E7000					
120	1532	8	440640	-633514	C4356	E7200	90.0	4.3	.9	.5	.12
120	1532	8	440640	-633514	C4356	E7200					
120	1539	9	440641	-633442	C4337	E7400	88.9	4.4	1.0	.5	.12
120	1539	9	440641	-633442	C4337	E7400					
120	1546	10	440640	-633373	C4322	E7600	91.1	4.3	.9	.5	.12
120	1546	10	440640	-633373	C4322	E7600					
120	1553	11	440638	-633302	C4307	E7800	92.2	4.4	.9	.5	.12
120	1553	11	440638	-633302	C4307	E7800					
120	1601	12	440634	-633232	C4295	F5000	94.5	3.8	.9	.5	.13
120	1601	12	440634	-633232	C4295	F5000					
120	1607	13	440640	-633162	C4272	F5200	83.2	5.1	.9	.5	.10
120	1607	13	440640	-633162	C4272	F5200					
120	1615	14	440617	-633092	C4294	F5400	114.5	4.2	1.0	.6	.13
120	1615	14	440617	-633092	C4294	F5400					
120	1624	15	440605	-633021	C4295	F5600	103.2	3.5	1.0	.5	.15
120	1624	15	440605	-633021	C4295	F5600					
120	1631	16	440590	-632951	C4300	F5800	106.6	4.5	1.0	.5	.12
120	1631	16	440590	-632951	C4300	F5800					
120	1638	17	440580	-632881	C4300	F6000	101.2	4.4	1.0	.5	.12

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
120	1644	18	440551	-632865	C4334	F6000					
120	1651	19	440564	-632935	C4332	F5800	284.5	4.5	1.0	.5	.12
120	1651	19	440564	-632935	C4332	F5800					
120	1656	20	440575	-633006	C4332	F5600	282.1	6.3	1.0	.5	.08
120	1656	20	440575	-633006	C4332	F5600					
120	1702	21	440586	-633076	C4332	F5400	282.3	5.2	1.0	.5	.10
120	1702	21	440586	-633076	C4332	F5400					
120	1708	22	440598	-633146	C4331	F5200	283.4	5.2	1.0	.5	.10
120	1708	22	440598	-633146	C4331	F5200					
120	1715	23	440609	-633217	C4330	F5000	282.1	4.5	1.0	.5	.12
120	1715	23	440609	-633217	C4330	F5000					
120	1723	24	440623	-633305	C4330	E7750	282.5	4.9	1.2	.6	.13
120	1723	24	440623	-633305	C4330	E7750					
120	1728	25	440631	-633357	C4330	E7600	282.1	4.6	.7	.4	.08
120	1728	25	440631	-633357	C4330	E7600					
120	1733	26	440642	-633427	C4330	E7400	282.3	6.2	1.0	.5	.08
120	1733	26	440642	-633427	C4330	E7400					
120	1742	27	440661	-633532	C4328	E7100	284.1	5.2	1.4	.8	.15
120	1742	27	440661	-633532	C4328	E7100					
120	1747	28	440674	-633602	C4327	E6900	284.5	6.2	1.0	.5	.08
120	1759	29	440658	-633583	C4350	E7000					
120	1807	30	440646	-633513	C4351	E7200	103.4	3.9	1.0	.5	.13
120	1807	30	440646	-633513	C4351	E7200					
120	1813	31	440634	-633443	C4352	E7400	103.4	5.2	1.0	.5	.10

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
120	1813	31	440634	-633443	C4352	E7400					
120	1821	32	440622	-633373	C4351	E7600	103.4	3.9	1.0	.5	.13
120	1821	32	440622	-633373	C4351	E7600					
120	1829	33	440610	-633303	C4352	E7800	103.4	3.9	1.0	.5	.13
120	1829	33	440610	-633303	C4352	E7800					
120	1836	34	440601	-633232	C4350	F5000	100.0	4.5	1.0	.5	.12
120	1836	34	440601	-633232	C4350	F5000					
120	1844	35	440588	-633162	C4352	F5200	104.4	3.9	1.0	.5	.13
120	1844	35	440588	-633162	C4352	F5200					
120	1850	36	440578	-633091	C4350	F5400	101.1	5.2	1.0	.5	.10
120	1850	36	440578	-633091	C4350	F5400					
120	1857	37	440566	-633021	C4352	F5600	103.4	4.4	1.0	.5	.12
120	1857	37	440566	-633021	C4352	F5600					
120	1906	38	440555	-632950	C4352	F5800	102.1	3.5	1.0	.5	.15
120	1906	38	440555	-632950	C4352	F5800					
120	1912	39	440547	-632880	C4348	F6000	99.0	5.1	.9	.5	.10
120	1918	40	440529	-632863	C4371	F6000					
120	1926	41	440528	-632935	C4384	F5800	268.9	3.9	1.0	.5	.13
120	1926	41	440528	-632935	C4384	F5800					
120	1933	42	440543	-633006	C4377	F5600	286.3	4.6	1.0	.5	.12
120	1933	42	440543	-633006	C4377	F5600					
120	1941	43	440562	-633094	C4372	F5350	286.7	5.0	1.2	.7	.13
120	1941	43	440562	-633094	C4372	F5350					
120	1946	44	440571	-633147	C4370	F5200	283.3	4.7	.7	.4	.08

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
120	1946	44	440571	-633147	C4370	F5200					
120	1952	45	440587	-633217	C4365	F5000	287.6	5.3	1.0	.5	.10
120	1952	45	440587	-633217	C4365	F5000					
120	2000	46	440600	-633322	C4370	E7700	279.8	5.8	1.4	.8	.13
120	2000	46	440600	-633322	C4370	E7700					
120	2012	47	440621	-633463	C4373	E7300	281.7	5.2	1.9	1.0	.20
120	2012	47	440621	-633463	C4373	E7300					
120	2022	48	440640	-633568	C4370	E7000	284.1	4.7	1.4	.8	.17
120	2028	49	440631	-633585	C4392	E7000					
120	2038	50	440616	-633497	C4392	E7250	103.3	3.9	1.2	.7	.17
120	2038	50	440616	-633497	C4392	E7250					
120	2044	51	440611	-633444	C4388	E7400	97.5	3.9	.7	.4	.10
120	2044	51	440611	-633444	C4388	E7400					
120	2051	52	440593	-633374	C4397	E7600	109.6	4.6	1.0	.5	.12
120	2051	52	440593	-633374	C4397	E7600					
120	2058	53	440582	-633303	C4393	E7800	102.1	4.5	1.0	.5	.12
120	2058	53	440582	-633303	C4393	E7800					
120	2105	54	440575	-633232	C4390	F5000	97.8	4.4	1.0	.5	.12
120	2105	54	440575	-633232	C4390	F5000					
120	2114	55	440561	-633162	C4393	F5200	105.5	3.5	1.0	.5	.15
120	2114	55	440561	-633162	C4393	F5200					
120	2122	56	440549	-633091	C4394	F5400	103.2	3.9	1.0	.5	.13
120	2122	56	440549	-633091	C4394	F5400					
120	2129	57	440541	-633020	C4390	F5600	98.9	4.4	1.0	.5	.12

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
120	2129	57	440541	-633020	C4390	F5600					
120	2136	58	440530	-632949	C4390	F5800	102.1	4.5	1.0	.5	.12
120	2136	58	440530	-632949	C4390	F5800					
120	2144	59	440516	-632879	C4392	F6000	105.5	3.9	1.0	.5	.13
120	2150	60	440496	-632863	C4414	F6000					
120	2157	61	440512	-632934	C4410	F5800	287.4	4.6	1.0	.5	.12
120	2157	61	440512	-632934	C4410	F5800					
120	2204	62	440514	-633006	C4420	F5600	272.2	4.5	1.0	.5	.12
120	2204	62	440514	-633006	C4420	F5600					
120	2211	63	440532	-633076	C4412	F5400	289.6	4.6	1.0	.5	.12
120	2211	63	440532	-633076	C4412	F5400					
120	2219	64	440545	-633146	C4411	F5200	284.5	3.9	1.0	.5	.13
120	2219	64	440545	-633146	C4411	F5200					
120	2226	65	440558	-633217	C4409	F5000	284.3	4.5	1.0	.5	.12
120	2226	65	440558	-633217	C4409	F5000					
120	2233	66	440569	-633288	C4410	E7800	282.1	4.5	1.0	.5	.12
120	2233	66	440569	-633288	C4410	E7800					
120	2239	67	440580	-633358	C4410	E7600	282.3	5.2	1.0	.5	.10
120	2239	67	440580	-633358	C4410	E7600					
120	2246	68	440590	-633430	C4409	E7400	280.9	4.5	1.0	.5	.12
120	2246	68	440590	-633430	C4409	E7400					
120	2252	69	440601	-633501	C4410	E7200	282.1	5.2	1.0	.5	.10
120	2252	69	440601	-633501	C4410	E7200					
120	2259	70	440613	-633571	C4409	E7000	283.4	4.4	1.0	.5	.12

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
120	2307	71	440610	-633585	C4428	E7000					
120	2315	72	440594	-633515	C4432	E7200	107.6	4.0	1.0	.5	.13
120	2315	72	440594	-633515	C4432	E7200					
120	2322	73	440583	-633445	C4430	E7400	102.3	4.4	1.0	.5	.12
120	2322	73	440583	-633445	C4430	E7400					
120	2330	74	440576	-633374	C4425	E7600	97.8	3.9	1.0	.5	.13
120	2330	74	440576	-633374	C4425	E7600					
120	2337	75	440558	-633303	C4433	E7800	109.4	4.6	1.0	.5	.12
120	2337	75	440558	-633303	C4433	E7800					
120	2344	76	440548	-633233	C4430	F5000	101.2	4.4	1.0	.5	.12
120	2344	76	440548	-633233	C4430	F5000					
120	2351	77	440537	-633162	C4430	F5200	102.1	4.5	1.0	.5	.12
120	2351	77	440537	-633162	C4430	F5200					
120	2358	78	440527	-633091	C4428	F5400	101.1	4.5	1.0	.5	.12
120	2358	78	440527	-633091	C4428	F5400					
121	5	79	440511	-633020	C4433	F5600	107.4	4.6	1.0	.5	.12
121	5	79	440511	-633020	C4433	F5600					
121	13	80	440506	-632949	C4424	F5800	95.6	3.9	1.0	.5	.13
121	13	80	440506	-632949	C4424	F5800					
121	20	81	440497	-632878	C4423	F6000	100.0	4.5	1.0	.5	.12
121	20	81	440497	-632878	C4423	F6000					
121	27	82	440474	-632806	C4439	F6200	113.9	4.9	1.1	.6	.12
121	35	83	440491	-632799	C4400	F6202					
121	40	84	440526	-632804	C4350	F6192	354.1	4.2	.7	.4	.08

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
121	40	84	440526	-632804	C4350	F6192					
121	45	85	440560	-632800	C4300	F6209	4.8	4.1	.6	.3	.08
121	45	85	440560	-632800	C4300	F6209					
121	50	86	440594	-632796	C4250	F6221	4.8	4.1	.6	.3	.08
121	50	86	440594	-632796	C4250	F6221					
121	56	87	440630	-632811	C4200	F6185	343.3	3.8	.7	.4	.10
121	59	88	440649	-632815	C4185	F6150					
121	104	89	440641	-632867	C4207	F6000	258.0	4.6	.7	.4	.08
121	104	89	440641	-632867	C4207	F6000					
121	110	90	440654	-632937	C4202	F5800	284.5	5.2	1.0	.5	.10
121	110	90	440654	-632937	C4202	F5800					
121	116	91	440655	-633007	C4217	F5600	271.1	5.0	.9	.5	.10
121	116	91	440655	-633007	C4217	F5600					
121	124	92	440669	-633079	C4203	F5400	285.1	4.0	1.0	.5	.13
121	124	92	440669	-633079	C4203	F5400					
121	131	93	440693	-633148	C4184	F5200	295.8	4.7	1.0	.6	.12
121	131	93	440693	-633148	C4184	F5200					
121	139	94	440706	-633216	C4184	F5000	284.9	3.8	.9	.5	.13
121	139	94	440706	-633216	C4184	F5000					
121	146	95	440712	-633286	C4191	E7800	276.8	4.4	.9	.5	.12
121	146	95	440712	-633286	C4191	E7800					
121	152	96	440721	-633355	C4192	E7600	280.3	5.1	.9	.5	.10
121	152	96	440721	-633355	C4192	E7600					
121	159	97	440730	-633425	C4193	E7400	280.1	4.4	.9	.5	.12

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
121	159	97	440730	-633425	C4193	E7400					
121	206	98	440740	-633495	C4192	E7200	281.2	4.4	1.0	.5	.12
121	206	98	440740	-633495	C4192	E7200					
121	212	99	440766	-633563	C4175	E7000	298.0	5.5	1.0	.6	.10
121	218	100	440740	-633580	C4215	E7000					
121	225	101	440731	-633510	C4211	E7200	100.1	4.4	.9	.5	.12
121	225	101	440731	-633510	C4211	E7200					
121	233	102	440723	-633441	C4212	E7400	99.1	3.8	.9	.5	.13
121	233	102	440723	-633441	C4212	E7400					
121	241	103	440710	-633371	C4214	E7600	104.5	3.9	1.0	.5	.13
121	241	103	440710	-633371	C4214	E7600					
121	248	104	440703	-633302	C4207	E7800	98.0	4.3	.9	.5	.12
121	248	104	440703	-633302	C4207	E7800					
121	255	105	440698	-633232	C4200	F5000	95.7	4.3	.9	.5	.12
121	255	105	440698	-633232	C4200	F5000					
121	302	106	440680	-633162	C4213	F5200	109.6	4.6	1.0	.5	.12
121	302	106	440680	-633162	C4213	F5200					
121	309	107	440673	-633093	C4207	F5400	98.0	4.3	.9	.5	.12
121	309	107	440673	-633093	C4207	F5400					
121	316	108	440664	-633023	C4205	F5600	100.1	4.4	.9	.5	.12
121	316	108	440664	-633023	C4205	F5600					
121	323	109	440646	-632953	C4216	F5800	109.6	4.6	1.0	.5	.12
121	323	109	440646	-632953	C4216	F5800					
121	333	110	440635	-632883	C4215	F6000	102.3	3.1	1.0	.5	.17

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
121	333	110	440635	-632883	C4215	F6000					
121	341	111	440633	-632813	C4207	F6200	92.3	3.8	.9	.5	.13
121	347	112	440606	-632814	C4245	F6150					
121	354	113	440624	-632868	C4228	F6000	294.8	3.7	.8	.4	.12
121	354	113	440624	-632868	C4228	F6000					
121	404	114	440628	-632956	C4238	F5750	273.6	3.8	1.2	.6	.17
121	404	114	440628	-632956	C4238	F5750					
121	410	115	440649	-633007	C4225	F5600	299.7	4.2	.8	.4	.10
121	410	115	440649	-633007	C4225	F5600					
121	420	116	440653	-633112	C4238	F5300	273.0	4.5	1.4	.8	.17
121	420	116	440653	-633112	C4238	F5300					
121	423	117	440654	-633147	C4245	F5200	272.3	5.0	.5	.3	.05
121	423	117	440654	-633147	C4245	F5200					
121	431	118	440658	-633217	C4254	F5000	274.5	3.8	.9	.5	.13
121	431	118	440658	-633217	C4254	F5000					
121	438	119	440678	-633286	C4243	E7800	291.9	4.6	1.0	.5	.12
121	438	119	440678	-633286	C4243	E7800					
121	447	120	440686	-633373	C4250	E7550	277.3	4.2	1.2	.6	.15
121	447	120	440686	-633373	C4250	E7550					
121	452	121	440694	-633426	C4250	E7400	281.8	4.7	.7	.4	.08
121	452	121	440694	-633426	C4250	E7400					
121	458	122	440702	-633496	C4252	E7200	279.0	5.1	.9	.5	.10
121	458	122	440702	-633496	C4252	E7200					
121	504	123	440712	-633566	C4253	E7000	281.2	5.1	1.0	.5	.10

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
121	512	124	440735	-633580	C4224	E7000					
121	520	125	440725	-633510	C4227	E7200	101.2	3.9	1.0	.5	.13
121	520	125	440725	-633510	C4227	E7200					
121	529	126	440711	-633441	C4230	E7400	105.7	3.4	1.0	.5	.15
121	529	126	440711	-633441	C4230	E7400					
121	538	127	440696	-633372	C4232	E7600	106.8	3.5	1.0	.5	.15
121	538	127	440696	-633372	C4232	E7600					
121	546	128	440692	-633302	C4226	E7800	94.5	3.8	.9	.5	.13
121	546	128	440692	-633302	C4226	E7800					
121	555	129	440678	-633232	C4230	F5000	105.5	3.5	1.0	.5	.15
121	555	129	440678	-633232	C4230	F5000					
121	604	130	440655	-633162	C4250	F5200	114.5	3.7	1.0	.6	.15
121	604	130	440655	-633162	C4250	F5200					
121	613	131	440644	-633092	C4250	F5400	102.3	3.4	1.0	.5	.15
121	613	131	440644	-633092	C4250	F5400					
121	624	132	440633	-633022	C4253	F5600	102.3	2.8	1.0	.5	.18
121	624	132	440633	-633022	C4253	F5600					
121	635	133	440622	-632952	C4252	F5800	102.3	2.8	1.0	.5	.18
121	635	133	440622	-632952	C4252	F5800					
121	642	134	440606	-632882	C4257	F6000	107.6	4.5	1.0	.5	.12
121	642	134	440606	-632882	C4257	F6000					
121	653	135	440604	-632812	C4250	F6200	92.3	2.8	.9	.5	.18
121	657	136	440590	-632796	C4265	F6200					
121	704	137	440592	-632865	C4277	F6000	272.3	4.3	.9	.5	.12

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
121	704	137	440592	-632865	C4277	F6000					
121	710	138	440603	-632937	C4273	F5800	282.0	5.3	1.0	.5	.10
121	710	138	440603	-632937	C4273	F5800					
121	717	139	440616	-633007	C4270	F5600	284.5	4.5	1.0	.5	.12
121	717	139	440616	-633007	C4270	F5600					
121	724	140	440626	-633077	C4272	F5400	281.2	4.4	1.0	.5	.12
121	724	140	440626	-633077	C4272	F5400					
121	730	141	440638	-633146	C4270	F5200	283.6	5.1	.9	.5	.10
121	730	141	440638	-633146	C4270	F5200					
121	736	142	440647	-633217	C4272	F5000	280.0	5.2	1.0	.5	.10
121	736	142	440647	-633217	C4272	F5000					
121	743	143	440659	-633293	C4272	F7780	282.4	4.8	1.0	.6	.12
121	743	143	440659	-633293	C4272	F7780					
121	748	144	440669	-633357	C4272	F7600	282.2	5.7	.9	.5	.08
121	748	144	440669	-633357	C4272	F7600					
121	754	145	440679	-633427	C4272	F7400	281.2	5.1	1.0	.5	.10
121	754	145	440679	-633427	C4272	F7400					
121	800	146	440691	-633496	C4270	F7200	283.6	5.1	.9	.5	.10
121	800	146	440691	-633496	C4270	F7200					
121	806	147	440702	-633566	C4270	E7000	282.3	5.2	1.0	.5	.10
121	814	148	440694	-633582	C4291	E7000					
121	822	149	440682	-633512	C4292	E7200	103.4	3.9	1.0	.5	.13
121	822	149	440682	-633512	C4292	E7200					
121	830	150	440671	-633442	C4291	E7400	102.3	3.9	1.0	.5	.13

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
121	830	150	440671	-633442	C4291	E7400					
121	838	151	440661	-633372	C4291	E7600	101.2	3.9	1.0	.5	.13
121	838	151	440661	-633372	C4291	E7600					
121	846	152	440650	-633302	C4291	E7800	102.3	3.9	1.0	.5	.13
121	846	152	440650	-633302	C4291	E7800					
121	854	153	440639	-633232	C4290	F5000	102.3	3.9	1.0	.5	.13
121	854	153	440639	-633232	C4290	F5000					
121	901	154	440629	-633162	C4290	F5200	101.2	4.4	1.0	.5	.12
121	901	154	440629	-633162	C4290	F5200					
121	909	155	440617	-633092	C4291	F5400	103.4	3.9	1.0	.5	.13
121	909	155	440617	-633092	C4291	F5400					
121	918	156	440609	-633022	C4289	F5600	99.0	3.4	.9	.5	.15
121	918	156	440609	-633022	C4289	F5600					
121	925	157	440599	-632951	C4289	F5800	101.1	4.5	1.0	.5	.12
121	925	157	440599	-632951	C4289	F5800					
121	934	158	440587	-632881	C4290	F6000	103.4	3.5	1.0	.5	.15
121	934	158	440587	-632881	C4290	F6000					
121	941	159	440576	-632811	C4290	F6200	102.3	4.4	1.0	.5	.12
121	947	160	440558	-632794	C4310	F6200					
121	954	161	440569	-632865	C4309	F6000	282.1	4.5	1.0	.5	.12
121	954	161	440569	-632865	C4309	F6000					
121	1000	162	440580	-632935	C4310	F5800	282.3	5.2	1.0	.5	.10
121	1000	162	440580	-632935	C4310	F5800					
121	1006	163	440589	-633006	C4311	F5600	280.0	5.2	1.0	.5	.10

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
121	1006	163	440589	-633006	C4311	F5600					
121	1012	164	440600	-633076	C4312	F5400	282.3	5.2	1.0	.5	.10
121	1037	165	440518	-633136	C4440	F5250					
121	1041	166	440545	-633139	C4400	F5246	355.4	4.1	.5	.3	.07
121	1041	166	440545	-633139	C4400	F5246					
121	1047	167	440578	-633138	C4350	F5248	1.3	3.3	.6	.3	.10
121	1047	167	440578	-633138	C4350	F5248					
121	1052	168	440611	-633139	C4300	F5248	358.7	4.0	.6	.3	.08
121	1052	168	440611	-633139	C4300	F5248					
121	1058	169	440644	-633137	C4250	F5252	2.5	3.3	.6	.3	.10
121	1058	169	440644	-633137	C4250	F5252					
121	1103	170	440677	-633138	C4200	F5250	358.7	4.0	.6	.3	.08
121	1111	171	440664	-633162	C4250	F5178					
121	1115	172	440630	-633161	C4300	F5180	178.8	5.1	.6	.3	.07
121	1115	172	440630	-633161	C4300	F5180					
121	1118	173	440598	-633160	C4350	F5180	178.7	6.4	.6	.3	.05
121	1130	174	440559	-633227	C4400	F4998					
121	1136	175	440592	-633226	C4350	F5000	1.3	3.3	.6	.3	.10
121	1136	175	440592	-633226	C4350	F5000					
121	1141	176	440624	-633226	C4300	F5000	0	3.8	.6	.3	.08
121	1141	176	440624	-633226	C4300	F5000					
121	1146	177	440657	-633225	C4250	F5000	1.3	4.0	.6	.3	.08
121	1153	178	440672	-633216	C4250	F5025					
121	1157	179	440638	-633213	C4300	F5032	176.4	5.1	.6	.3	.07

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
121	1157	179	440638	-633213	C4300	F5032					
121	1200	180	440606	-633214	C4350	F5030	181.3	6.4	.6	.3	.05
121	1200	180	440606	-633214	C4350	F5030					
121	1204	181	440573	-633215	C4400	F5028	181.3	5.0	.6	.3	.07
121	1219	182	440514	-633139	C4450	F5230					
121	1225	183	440546	-633147	C4400	F5225	349.8	3.3	.6	.3	.10
121	1225	183	440546	-633147	C4400	F5225					
121	1231	184	440579	-633145	C4350	F5228	2.5	3.3	.6	.3	.10
121	1235	185	440608	-633146	C4318	F5200					
121	1242	186	440611	-633217	C4325	F5000	273.4	4.4	.9	.5	.12
121	1315	188	440659	-633216	C4270	F5018					
121	1317	189	440640	-633224	C4300	E7997	196.9	6.0	.4	.2	.03
121	1317	189	440640	-633224	C4300	E7997					
121	1321	190	440621	-633230	C4330	E7985	192.8	2.9	.4	.2	.07
121	1639	191	440679	-633565	C4310	E7050					
121	1645	192	440671	-633512	C4310	E7200	101.8	3.9	.7	.4	.10
121	1645	192	440671	-633512	C4310	E7200					
121	1653	193	440660	-633442	C4310	E7400	102.3	3.9	1.0	.5	.13
121	1653	193	440660	-633442	C4310	E7400					
121	1701	194	440648	-633372	C4312	E7600	103.4	3.9	1.0	.5	.13
121	1701	194	440648	-633372	C4312	E7600					
121	1708	195	440636	-633302	C4310	E7800	103.4	4.4	1.0	.5	.12
121	1708	195	440636	-633302	C4310	E7800					
121	1716	196	440637	-633232	C4292	F5000	88.9	3.8	.9	.5	.13

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
121	1716	196	440637	-633232	C4292	F5000					
121	1719	197	440639	-633208	C4283	F5070	83.4	3.5	.3	.2	.05
121	1724	198	440652	-633196	C4250	F5088					
121	1728	199	440684	-633190	C4200	F5100	7.7	4.8	.6	.3	.07
121	1732	200	440703	-633206	C4200	F5055					
121	1737	201	440670	-633203	C4250	F5060	176.3	4.0	.6	.3	.08
121	1737	201	440670	-633203	C4250	F5060					
121	1742	202	440638	-633210	C4300	F5038	189.0	3.9	.6	.3	.08
121	1742	202	440638	-633210	C4300	F5038					
121	1745	203	440612	-633218	C4340	F5025	192.5	5.3	.5	.3	.05
121	1813	204	440582	-633369	C4400	E7596					
121	1818	205	440614	-633367	C4350	E7600	2.6	3.8	.6	.3	.08
121	1818	205	440614	-633367	C4350	E7600					
121	1823	206	440646	-633366	C4300	E7600	1.3	3.8	.6	.3	.08
121	1823	206	440646	-633366	C4300	E7600					
121	1827	207	440678	-633365	C4250	E7600	1.3	4.8	.6	.3	.07
121	1827	207	440678	-633365	C4250	E7600					
121	1831	208	440710	-633364	C4200	E7600	1.3	4.8	.6	.3	.07
121	1836	209	440728	-633381	C4200	E7557					
121	1850	211	440665	-633383	C4300	E7548	181.3	2.7	1.2	.6	.23
121	1850	211	440665	-633383	C4300	E7548					
121	1855	212	440626	-633384	C4360	E7548	181.1	4.7	.7	.4	.08
121	1855	212	440626	-633384	C4360	E7548					
121	1900	213	440594	-633384	C4410	E7549	180.0	3.8	.6	.3	.08

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
121	2118	231	440719	-633232	C4170	F5000					
121	2125	232	440702	-633163	C4178	F5200	108.9	4.5	1.0	.5	.12
121	2125	232	440702	-633163	C4178	F5200					
121	2133	233	440699	-633093	C4170	F5400	93.4	3.8	.9	.5	.13
121	2133	233	440699	-633093	C4170	F5400					
121	2141	234	440687	-633023	C4172	F5600	103.4	3.9	1.0	.5	.13
121	2141	234	440687	-633023	C4172	F5600					
121	2148	235	440678	-632954	C4170	F5800	100.3	4.3	.9	.5	.12
121	2148	235	440678	-632954	C4170	F5800					
121	2154	236	440669	-632884	C4170	F6000	100.1	5.1	.9	.5	.10
121	2154	236	440669	-632884	C4170	F6000					
121	2200	237	440666	-632831	C4166	F6150	94.5	3.8	.7	.4	.10
121	2205	238	440671	-632799	C4150	F6200					
121	2212	239	440678	-632869	C4152	F6000	277.9	4.4	.9	.5	.12
121	2212	239	440678	-632869	C4152	F6000					
121	2218	240	440685	-632939	C4154	F5800	277.9	5.1	.9	.5	.10
121	2218	240	440685	-632939	C4154	F5800					
121	2225	241	440698	-633008	C4150	F5600	284.7	4.4	1.0	.5	.12
121	2225	241	440698	-633008	C4150	F5600					
121	2231	242	440707	-633078	C4151	F5400	280.1	5.1	.9	.5	.10
121	2231	242	440707	-633078	C4151	F5400					
121	2237	243	440714	-633147	C4155	F5200	278.0	5.0	.9	.5	.10
121	2237	243	440714	-633147	C4155	F5200					
121	2244	244	440729	-633216	C4148	F5000	286.8	4.5	1.0	.5	.12

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
121	2244	244	440729	-633216	C4148	F5000					
121	2250	245	440741	-633286	C4146	E7800	283.4	5.2	1.0	.5	.10
121	2250	245	440741	-633286	C4146	E7800					
121	2256	246	440749	-633355	C4148	E7600	279.1	5.0	.9	.5	.10
121	2256	246	440749	-633355	C4148	E7600					
121	2302	247	440752	-633426	C4155	E7400	273.4	5.1	.9	.5	.10
121	2302	247	440752	-633426	C4155	E7400					
121	2308	248	440767	-633494	C4150	E7200	287.0	5.1	.9	.5	.10
121	2315	249	440781	-633509	C4133	E7200					
121	2322	250	440779	-633439	C4126	E7400	92.3	4.3	.9	.5	.12
121	2322	250	440779	-633439	C4126	E7400					
121	2329	251	440765	-633371	C4129	E7600	105.9	4.4	.9	.5	.12
121	2329	251	440765	-633371	C4129	E7600					
121	2335	252	440752	-633301	C4133	E7800	104.5	5.2	1.0	.5	.10
121	2335	252	440752	-633301	C4133	E7800					
121	2342	253	440745	-633232	C4130	F5000	98.0	4.3	.9	.5	.12
121	2342	253	440745	-633232	C4130	F5000					
121	2350	254	440734	-633163	C4132	F5200	102.5	3.8	.9	.5	.13
121	2350	254	440734	-633163	C4132	F5200					
121	2355	255	440722	-633094	C4133	F5400	103.6	6.1	.9	.5	.08
121	2355	255	440722	-633094	C4133	F5400					
122	2	256	440717	-633024	C4128	F5600	95.7	4.3	.9	.5	.12
122	2	256	440717	-633024	C4128	F5600					
122	9	257	440708	-632955	C4128	F5800	100.3	4.3	.9	.5	.12

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
122	9	257	440708	-632955	C4128	F5800					
122	19	258	440694	-632885	C4132	F6000	105.5	3.1	1.0	.5	.17
122	19	258	440694	-632885	C4132	F6000					
122	24	259	440694	-632833	C4123	F6150	90.0	4.5	.7	.4	.08
122	30	260	440705	-632800	C4104	F6200					
122	37	261	440698	-632870	C4120	F6000	262.1	4.4	.9	.5	.12
122	37	261	440698	-632870	C4120	F6000					
122	45	262	440714	-632940	C4112	F5800	287.6	4.0	1.0	.5	.13
122	45	262	440714	-632940	C4112	F5800					
122	50	263	440726	-633009	C4109	F5600	283.6	6.1	.9	.5	.08
122	50	263	440726	-633009	C4109	F5600					
122	56	264	440733	-633078	C4112	F5400	278.0	5.0	.9	.5	.10
122	56	264	440733	-633078	C4112	F5400					
122	102	265	440746	-633147	C4107	F5200	284.7	5.1	1.0	.5	.10
122	102	265	440746	-633147	C4107	F5200					
122	108	266	440751	-633217	C4115	F5000	275.7	5.1	.9	.5	.10
122	108	266	440751	-633217	C4115	F5000					
122	115	267	440768	-633285	C4106	E7800	289.1	4.4	1.0	.5	.12
122	115	267	440768	-633285	C4106	E7800					
122	121	268	440768	-633355	C4119	E7600	270.0	5.0	.9	.5	.10
122	121	268	440768	-633355	C4119	E7600					
122	127	269	440778	-633424	C4117	E7400	281.4	5.1	.9	.5	.10
122	127	269	440778	-633424	C4117	E7400					
122	133	270	440794	-633493	C4107	E7200	287.8	5.2	1.0	.5	.10

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
122	139	271	440814	-633508	C4084	E7200					
122	145	272	440798	-633439	C4092	E7400	107.8	5.2	1.0	.5	.10
122	145	272	440798	-633439	C4092	E7400					
122	152	273	440791	-633370	C4087	E7600	98.0	4.3	.9	.5	.12
122	152	273	440791	-633370	C4087	E7600					
122	158	274	440781	-633301	C4090	E7800	101.4	5.1	.9	.5	.10
122	158	274	440781	-633301	C4090	E7800					
122	205	275	440775	-633232	C4086	F5000	96.9	4.3	.9	.5	.12
122	205	275	440775	-633232	C4086	F5000					
122	212	276	440755	-633163	C4095	F5200	111.9	4.6	1.0	.5	.12
122	212	276	440755	-633163	C4095	F5200					
122	218	277	440751	-633094	C4091	F5400	94.6	5.0	.9	.5	.10
122	218	277	440751	-633094	C4091	F5400					
122	226	278	440749	-633025	C4082	F5600	92.3	3.7	.9	.5	.13
122	226	278	440749	-633025	C4082	F5600					
122	233	279	440730	-632956	C4094	F5800	110.9	4.6	1.0	.5	.12
122	233	279	440730	-632956	C4094	F5800					
122	240	280	440726	-632886	C4085	F6000	94.5	4.3	.9	.5	.12
122	240	280	440726	-632886	C4085	F6000					
122	246	281	440717	-632817	C4087	F6200	100.3	5.1	.9	.5	.10
122	251	282	440727	-632801	C4070	F6200					
122	258	283	440730	-632871	C4075	F6000	273.4	4.3	.9	.5	.12
122	258	283	440730	-632871	C4075	F6000					
122	304	284	440742	-632940	C4072	F5800	283.6	5.1	.9	.5	.10

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
122	304	284	440742	-632940	C4072	F5800					
122	310	285	440751	-633009	C4073	F5600	280.3	5.1	.9	.5	.10
122	310	285	440751	-633009	C4073	F5600					
122	315	286	440760	-633079	C4071	F5400	280.1	6.1	.9	.5	.08
122	315	286	440760	-633079	C4071	F5400					
122	322	287	440770	-633147	C4073	F5200	281.5	4.3	.9	.5	.12
122	322	287	440770	-633147	C4073	F5200					
122	327	288	440780	-633216	C4072	F5000	281.4	6.1	.9	.5	.08
122	327	288	440780	-633216	C4072	F5000					
122	334	289	440785	-633286	C4076	E7800	275.7	4.3	.9	.5	.12
122	334	289	440785	-633286	C4076	E7800					
122	341	290	440800	-633355	C4066	E7600	286.8	4.4	1.0	.5	.12
122	341	290	440800	-633355	C4066	E7600					
122	347	291	440818	-633423	C4062	E7400	290.2	5.2	1.0	.5	.10
122	347	291	440818	-633423	C4062	E7400					
122	353	292	440822	-633492	C4067	E7200	274.6	5.0	.9	.5	.10
122	400	293	440840	-633507	C4044	E7200					
122	406	294	440822	-633439	C4053	E7400	110.2	5.2	1.0	.5	.10
122	406	294	440822	-633439	C4053	E7400					
122	412	295	440816	-633370	C4050	E7600	96.9	5.0	.9	.5	.10
122	412	295	440816	-633370	C4050	E7600					
122	424	296	440802	-633267	C4050	E7900	100.7	3.8	1.4	.8	.20
122	424	296	440802	-633267	C4050	E7900					
122	431	297	440783	-633192	C4050	F5100	109.4	4.9	1.1	.6	.12

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
122	431	297	440783	-633192	C4050	F5100					
122	434	298	440785	-633164	C4053	F5200	84.3	4.1	.4	.2	.05
122	434	298	440785	-633164	C4053	F5200					
122	441	299	440779	-633094	C4050	F5400	96.8	4.4	.9	.5	.12
122	441	299	440779	-633094	C4050	F5400					
122	450	300	440763	-633025	0	0	107.8	3.5	1.0	.5	.15
122	450	300	440763	-633025	0	0					
122	454	301	440761	-632956	C4050	F5800	92.3	7.5	.9	.5	.07
122	454	301	440761	-632956	C4050	F5800					
122	501	302	440748	-632887	C4052	F6000	104.7	4.4	1.0	.5	.12
122	501	302	440748	-632887	C4052	F6000					
122	505	303	440748	-632853	C4048	F6100	90.0	3.7	.5	.2	.07
122	505	303	440748	-632853	C4048	F6100					
122	512	304	440748	-632783	C4040	F6300	90.0	4.3	.9	.5	.12
122	528	305	440751	-632770	C4024	F6300					
122	532	306	440756	-632803	C4026	F6200	281.9	3.6	.4	.2	.07
122	532	306	440756	-632803	C4026	F6200					
122	543	307	440762	-632872	C4031	F6000	276.9	2.7	.9	.5	.18
122	543	307	440762	-632872	C4031	F6000					
122	548	308	440774	-632975	C4033	F5700	279.2	9.0	1.4	.8	.08
122	548	308	440774	-632975	C4033	F5700					
122	556	309	440788	-633079	C4031	F5400	280.6	5.7	1.4	.8	.13
122	556	309	440788	-633079	C4031	F5400					
122	602	310	440798	-633148	C4030	F5200	281.4	5.1	.9	.5	.10

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
122	602	310	440798	-633148	C4030	F5200					
122	608	311	440805	-633217	C4033	F5000	278.0	5.0	.9	.5	.10
122	608	311	440805	-633217	C4033	F5000					
122	613	312	440817	-633286	C4029	E7800	283.6	6.1	.9	.5	.08
122	613	312	440817	-633286	C4029	E7800					
122	619	313	440826	-633354	C4029	E7600	280.4	5.0	.9	.5	.10
122	619	313	440826	-633354	C4029	E7600					
122	625	314	440835	-633423	C4029	E7400	280.3	5.0	.9	.5	.10
122	625	314	440835	-633423	C4029	E7400					
122	631	315	440846	-633492	C4027	E7200	282.5	5.1	.9	.5	.10
122	637	316	440875	-633505	C3992	E7200					
122	646	317	440851	-633439	C4010	E7400	116.8	3.5	1.0	.5	.15
122	646	317	440851	-633439	C4010	E7400					
122	652	318	440845	-633370	C4007	E7600	96.9	5.0	.9	.5	.10
122	652	318	440845	-633370	C4007	E7600					
122	658	319	440835	-633301	C4008	E7800	101.4	5.1	.9	.5	.10
122	658	319	440835	-633301	C4008	E7800					
122	706	320	440822	-633226	C4010	F5020	103.5	4.2	1.0	.6	.13
122	706	320	440822	-633226	C4010	F5020					
122	712	321	440812	-633164	C4013	F5200	102.6	4.6	.8	.5	.10
122	712	321	440812	-633164	C4013	F5200					
122	718	322	440807	-633095	C4009	F5400	95.7	5.0	.9	.5	.10
122	718	322	440807	-633095	C4009	F5400					
122	726	323	440796	-633026	C4010	F5600	102.5	3.8	.9	.5	.13

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
122	726	323	440796	-633026	C4010	F5600					
122	733	324	440787	-632958	C4010	F5800	100.4	4.3	.9	.5	.12
122	733	324	440787	-632958	C4010	F5800					
122	741	325	440777	-632880	C4010	F6025	100.1	4.3	1.1	.6	.13
122	741	325	440777	-632880	C4010	F6025					
122	746	326	440774	-632820	C4006	F6200	94.0	5.2	.8	.4	.08
122	746	326	440774	-632820	C4006	F6200					
122	749	327	440769	-632794	C4008	F6275	104.9	3.9	.4	.2	.05
122	753	328	440774	-632770	C3993	F6300					
122	756	329	440788	-632805	C3980	F6200	299.0	5.8	.5	.3	.05
122	756	329	440788	-632805	C3980	F6200					
122	801	330	440789	-632873	C3991	F6000	271.2	5.9	.9	.5	.08
122	801	330	440789	-632873	C3991	F6000					
122	808	331	440796	-632943	C3992	F5800	277.9	4.4	.9	.5	.12
122	808	331	440796	-632943	C3992	F5800					
122	814	332	440804	-633011	C3992	F5600	279.3	5.0	.9	.5	.10
122	814	332	440804	-633011	C3992	F5600					
122	820	333	440815	-633080	C3990	F5400	282.5	5.1	.9	.5	.10
122	820	333	440815	-633080	C3990	F5400					
122	826	334	440823	-633149	C3990	F5200	279.1	5.0	.9	.5	.10
122	836	335	440804	-633224	C4050	F5000					
122	840	336	440771	-633224	C4100	F5000	180.0	4.9	.6	.3	.07
122	840	336	440771	-633224	C4100	F5000					
122	844	337	440738	-633223	C4150	F5002	178.7	5.0	.6	.3	.07

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
122	844	337	440738	-633223	C4150	F5002					
122	848	338	440706	-633224	C4200	F5000	181.3	4.8	.6	.3	.07
122	848	338	440706	-633224	C4200	F5000					
122	852	339	440673	-633225	C4250	E7998	181.3	5.0	.6	.3	.07
122	852	339	440673	-633225	C4250	E7998					
122	858	340	440640	-633225	C4300	E7997	180.0	3.3	.6	.3	.10
122	858	340	440640	-633225	C4300	E7997					
122	903	341	440624	-633228	C4325	E7990	187.7	1.9	.3	.2	.08
122	939	342	440619	-633129	C4295	F5250					
122	946	343	440629	-633189	C4293	F5080	283.0	3.8	.8	.4	.12
122	946	343	440629	-633189	C4293	F5080					
122	949	344	440632	-633217	C4294	F5000	278.5	4.1	.4	.2	.05
122	949	344	440632	-633217	C4294	F5000					
122	954	345	440639	-633252	C4293	E7900	285.5	3.1	.5	.3	.08
122	1000	346	440630	-633295	C4320	E7820					
122	1007	347	440623	-633239	C4320	E7980	99.8	3.5	.8	.4	.12
122	1007	347	440623	-633239	C4320	E7980					
122	1011	348	440615	-633216	C4326	F5045	115.8	2.8	.3	.2	.07
122	1029	349	440617	-633154	C4303	F5180					
122	1033	350	440624	-633189	C4300	F5080	285.5	3.9	.5	.3	.07
122	1033	350	440624	-633189	C4300	F5080					
122	1038	351	440630	-633223	C4303	F7980	283.8	3.0	.5	.3	.08
122	1038	351	440630	-633223	C4303	F7980					
122	1042	352	440631	-633252	C4305	F7900	272.7	3.1	.4	.2	.07

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
122	1050	353	440627	-633267	C4317	E7900					
122	1054	354	440624	-633239	C4317	E7980	98.5	3.1	.4	.2	.07
122	1054	354	440624	-633239	C4317	E7980					
122	1059	355	440617	-633216	C4320	F5045	112.9	2.2	.3	.2	.08
122	1059	355	440617	-633216	C4320	F5045					
122	1107	356	440611	-633162	C4317	F5200	98.8	3.0	.7	.4	.13
122	1130	357	440598	-633223	C4340	F5005					
122	1132	358	440611	-633225	C4320	F5003	353.7	3.9	.2	.1	.03
122	1132	358	440611	-633225	C4320	F5003					
122	1136	359	440624	-633223	C4300	F5005	6.3	2.0	.2	.1	.07
122	1136	359	440624	-633223	C4300	F5005					
122	1139	360	440637	-633225	C4280	F5003	353.7	2.6	.2	.1	.05
122	1139	360	440637	-633225	C4280	F5003					
122	1147	361	440689	-633224	C4200	F5004	.8	3.9	1.0	.5	.13
122	1156	362	440699	-633221	C4210	F5007					
122	1200	363	440672	-633222	C4250	F5008	181.5	4.1	.5	.3	.07
122	1200	363	440672	-633222	C4250	F5008					
122	1204	364	440644	-633222	C4293	F5006	180.0	4.2	.5	.3	.07
122	1204	364	440644	-633222	C4293	F5006					
122	1208	365	440624	-633225	C4325	E7998	186.2	3.0	.4	.2	.07
122	1208	365	440624	-633225	C4325	E7998					
122	1212	366	440607	-633225	C4350	F5007	180.0	2.5	.3	.2	.07
122	1212	366	440607	-633225	C4350	F5007					
122	1215	367	440574	-633223	C4400	F5006	177.5	6.6	.6	.3	.05

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
122	1226	368	440559	-633230	C4400	E7992					
122	1231	369	440591	-633224	C4350	F5004	7.7	3.9	.6	.3	.08
122	1231	369	440591	-633224	C4350	F5004					
122	1233	370	440607	-633222	C4325	F5008	5.1	4.8	.3	.2	.03
122	1233	370	440607	-633222	C4325	F5008					
122	1238	731	440627	-633222	C4295	F5006	0	2.4	.4	.2	.08
122	1238	731	440627	-633222	C4295	F5006					
122	1243	372	440656	-633221	C4250	F5010	1.4	3.5	.5	.3	.08
122	1257	373	440704	-633212	C4200	F5026					
122	1300	374	440671	-633216	C4250	F5026	185.0	6.6	.6	.3	.05
122	1300	374	440671	-633216	C4250	F5026					
122	1306	375	440621	-633206	C4320	F5066	171.8	5.1	.9	.5	.10
122	1345	376	440671	-633209	C4250	F5035					
122	1348	377	440639	-633214	C4300	F5029	186.4	6.4	.6	.3	.05
122	1348	377	440639	-633214	C4300	F5029					
122	1351	378	440606	-633215	C4350	F5027	181.3	6.6	.6	.3	.05
122	1403	379	440590	-633215	C4350	F5026					
122	1408	380	440622	-633214	C4300	F5028	1.3	3.8	.6	.3	.08
122	1408	380	440622	-633214	C4300	F5028					
122	1412	381	440655	-633215	C4250	F5027	358.7	5.0	.6	.3	.07
122	1419	382	440672	-633222	C4250	F5010					
122	1422	383	440639	-633217	C4300	F5021	173.8	6.6	.6	.3	.05
122	1422	383	440639	-633217	C4300	F5021					
122	1426	384	440606	-633218	C4350	F5019	181.3	5.0	.6	.3	.07

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
122	1436	385	440590	-633216	C4350	F5026					
122	1441	386	440623	-633216	C4300	F5025	0	4.0	.6	.3	.08
122	1453	387	440638	-633212	C4300	F5034					
122	1456	388	440606	-633213	C4350	F5031	181.3	6.4	.6	.3	.05
122	1510	389	440590	-633216	C4350	F5024					
122	1514	390	440623	-633215	C4300	F5026	1.3	5.0	.6	.3	.07
122	1557	391	440643	-633336	C4308	E7704					
122	1601	392	440640	-633302	C4307	E7800	97.0	3.7	.5	.2	.07
122	1601	392	440640	-633302	C4307	E7800					
122	1614	394	440625	-633197	C4305	F5100	101.2	3.6	1.4	.8	.22
122	1614	394	440625	-633197	C4305	F5100					
122	1625	396	440618	-633192	C4312	F5115	152.8	.4	.1	.1	.18
122	1813	397	440582	-633501	C4448	E7240					
122	1821	398	440573	-633445	C4448	E7400	102.6	3.1	.8	.4	.13
122	1821	398	440573	-633445	C4448	E7400					
122	1830	399	440558	-633367	C4450	E7620	104.9	3.9	1.1	.6	.15
122	1830	399	440558	-633367	C4450	E7620					
122	1840	400	440547	-633298	C4450	E7815	102.5	3.1	.9	.5	.17
122	1840	400	440547	-633298	C4450	E7815					
122	1848	401	440537	-633232	C4449	F5000	101.9	3.6	.9	.5	.13
122	1848	401	440537	-633232	C4449	F5000					
122	1855	402	440526	-633161	C4448	F5200	102.1	4.5	1.0	.5	.12
122	1855	402	440526	-633161	C4448	F5200					
122	1903	403	440515	-633090	C4448	F5400	102.1	3.9	1.0	.5	.13

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
122	1903	403	440515	-633090	C4448	F5400					
122	1910	404	440504	-633019	C4448	F5600	102.1	4.5	1.0	.5	.12
122	1910	404	440504	-633019	C4448	F5600					
122	1918	405	440491	-632948	C4450	F5800	104.2	4.0	1.0	.5	.13
122	1918	405	440491	-632948	C4450	F5800					
122	1926	406	440481	-632877	C4449	F6000	101.1	3.9	1.0	.5	.13
122	1926	406	440481	-632877	C4449	F6000					
122	1934	407	440468	-632806	C4450	F6200	104.2	4.0	1.0	.5	.13
122	1943	408	440465	-632808	C4456	F6150					
122	1947	409	440461	-632861	C4470	F6000	264.0	5.8	.7	.4	.07
122	1947	409	440461	-632861	C4470	F6000					
122	1953	410	440471	-632932	C4471	F5800	281.1	5.2	1.0	.5	.10
122	1953	410	440471	-632932	C4471	F5800					
122	1957	411	440490	-633004	C4464	F5600	290.1	8.3	1.0	.6	.07
122	1957	411	440490	-633004	C4464	F5600					
122	2003	412	440497	-633075	C4470	F5400	277.8	5.2	1.0	.5	.10
122	2003	412	440497	-633075	C4470	F5400					
122	2009	413	440505	-633146	C4473	F5200	278.9	5.2	1.0	.5	.10
122	2009	413	440505	-633146	C4473	F5200					
122	2015	414	440518	-633217	C4472	F5000	284.3	5.3	1.0	.5	.10
122	2015	414	440518	-633217	C4472	F5000					
122	2022	415	440528	-633288	C4473	E7800	281.1	4.5	1.0	.5	.12
122	2022	415	440528	-633288	C4473	E7800					
122	2028	416	440539	-633359	C4475	E7600	282.1	5.2	1.0	.5	.10

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
122	2028	416	440539	-633359	C4475	E7600					
122	2034	417	440551	-633430	C4475	E7400	283.2	5.3	1.0	.5	.10
122	2034	417	440551	-633430	C4475	E7400					
122	2039	418	440561	-633487	C4472	E7240	283.7	5.1	.8	.4	.08
122	2044	419	440557	-633517	C4491	E7200					
122	2052	420	440548	-633446	C4488	E7400	100.0	3.9	1.0	.5	.13
122	2052	420	440548	-633446	C4488	E7400					
122	2100	421	440535	-633375	C4490	E7600	104.2	4.0	1.0	.5	.13
122	2100	421	440535	-633375	C4490	E7600					
122	2107	422	440525	-633304	C4487	E7800	101.1	4.5	1.0	.5	.12
122	2107	422	440525	-633304	C4487	E7800					
122	2115	423	440510	-633233	C4491	F5000	106.3	4.0	1.0	.5	.13
122	2115	423	440510	-633233	C4491	F5000					
122	2122	424	440501	-633161	C4487	F5200	99.8	4.5	1.0	.5	.12
122	2122	424	440501	-633161	C4487	F5200					
122	2130	425	440484	-633091	C4494	F5400	108.6	4.0	1.0	.5	.13
122	2130	425	440484	-633091	C4494	F5400					
122	2138	426	440482	-633018	C4482	F5600	92.2	3.9	1.0	.5	.13
122	2138	426	440482	-633018	C4482	F5600					
122	2146	427	440465	-632947	C4488	F5800	108.4	4.0	1.0	.5	.13
122	2146	427	440465	-632947	C4488	F5800					
122	2154	428	440451	-632876	C4491	F6000	105.3	4.0	1.0	.5	.13
122	2154	428	440451	-632876	C4491	F6000					
122	2201	429	440443	-632804	C4487	F6200	98.8	4.5	1.0	.5	.12

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
122	2209	430	440425	-632806	C4511	F6150					
122	2215	431	440432	-632861	C4511	F6000	280.0	4.0	.7	.4	.10
122	2215	431	440432	-632861	C4511	F6000					
122	2221	432	440450	-632932	C4505	F5800	289.4	5.4	1.0	.5	.10
122	2221	432	440450	-632932	C4505	F5800					
122	2227	433	440458	-633003	C4509	F5600	278.9	5.2	1.0	.5	.10
122	2227	433	440458	-633003	C4509	F5600					
122	2233	434	440471	-633075	C4508	F5400	284.1	5.4	1.0	.5	.10
122	2233	434	440471	-633075	C4508	F5400					
122	2239	435	440482	-633146	C4509	F5200	282.1	5.2	1.0	.5	.10
122	2239	435	440482	-633146	C4509	F5200					
122	2246	436	440492	-633217	C4512	F5000	281.1	4.5	1.0	.5	.12
122	2246	436	440492	-633217	C4512	F5000					
122	2252	437	440505	-633289	C4510	E7800	284.1	5.4	1.0	.5	.10
122	2252	437	440505	-633289	C4510	E7800					
122	2258	438	440515	-633360	C4512	E7600	281.1	5.2	1.0	.5	.10
122	2258	438	440515	-633360	C4512	E7600					
122	2305	439	440525	-633431	C4514	E7400	281.1	4.5	1.0	.5	.12
122	2305	439	440525	-633431	C4514	E7400					
122	2310	440	440541	-633487	C4508	E7240	291.6	5.2	.8	.4	.08
122	2315	441	440537	-633517	C4527	E7200					
122	2323	442	440522	-633447	C4528	E7400	106.6	3.9	1.0	.5	.13
122	2323	442	440522	-633447	C4528	E7400					
122	2332	443	440509	-633375	C4530	E7600	104.1	3.6	1.0	.5	.15

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
122	2332	443	440509	-633375	C4530	E7600					
122	2339	444	440504	-633304	C4520	E7800	95.6	4.4	1.0	.5	.12
122	2339	444	440504	-633304	C4520	E7800					
122	2347	445	440487	-633233	C4527	F5000	108.4	4.0	1.0	.5	.13
122	2347	445	440487	-633233	C4527	F5000					
122	2354	446	440476	-633161	C4525	F5200	102.0	4.5	1.0	.5	.12
122	2354	446	440476	-633161	C4525	F5200					
123	1	447	440466	-633090	C4523	F5400	101.1	4.5	1.0	.5	.12
123	1	447	440466	-633090	C4523	F5400					
123	9	448	440451	-633018	C4527	F5600	106.1	4.1	1.0	.5	.13
123	9	448	440451	-633018	C4527	F5600					
123	18	449	440437	-632947	C4530	F5800	105.3	3.5	1.0	.5	.15
123	18	449	440437	-632947	C4530	F5800					
123	25	450	440425	-632875	C4530	F6000	103.0	4.6	1.0	.5	.12
123	25	450	440425	-632875	C4530	F6000					
123	35	451	440415	-632804	C4527	F6200	101.0	3.1	1.0	.5	.17
123	42	452	440397	-632788	C4552	F6200					
123	50	453	440406	-632860	C4550	F6000	279.8	4.0	1.0	.5	.13
123	50	453	440406	-632860	C4550	F6000					
123	56	454	440419	-632931	C4550	F5800	284.3	5.3	1.0	.5	.10
123	56	454	440419	-632931	C4550	F5800					
123	103	455	440436	-633003	C4545	F5600	288.1	4.7	1.0	.5	.12
123	103	455	440436	-633003	C4545	F5600					
123	110	456	440445	-633074	C4550	F5400	280.0	4.5	1.0	.5	.12

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
123	110	456	440445	-633074	C4550	F5400					
123	117	457	440450	-633150	C4557	F5190	275.2	4.7	1.0	.6	.12
123	117	457	440450	-633150	C4557	F5190					
123	124	458	440471	-633217	C4545	F5000	293.5	4.5	1.0	.5	.12
123	124	458	440471	-633217	C4545	F5000					
123	131	459	440477	-633289	C4554	E7800	276.6	4.5	1.0	.5	.12
123	131	459	440477	-633289	C4554	E7800					
123	138	460	440489	-633360	C4553	E7600	283.2	4.5	1.0	.5	.12
123	138	460	440489	-633360	C4553	E7600					
123	145	461	440504	-633431	C4550	E7400	286.3	4.6	1.0	.5	.12
123	145	461	440504	-633431	C4550	E7400					
123	152	462	440518	-633502	C4550	E7200	285.3	4.5	1.0	.5	.12
123	159	463	440507	-633519	C4574	E7200					
123	206	464	440496	-633448	C4568	E7400	102.1	4.5	1.0	.5	.12
123	206	464	440496	-633448	C4568	E7400					
123	214	465	440485	-633376	C4567	E7600	102.0	4.0	1.0	.5	.13
123	214	465	440485	-633376	C4567	E7600					
123	222	466	440475	-633304	C4565	E7800	100.9	4.0	1.0	.5	.13
123	222	466	440475	-633304	C4565	E7800					
123	229	467	440455	-633233	C4575	F5000	111.3	4.7	1.0	.5	.12
123	229	467	440455	-633233	C4575	F5000					
123	236	468	440445	-633162	C4570	F5200	101.0	4.5	1.0	.5	.12
123	236	468	440445	-633162	C4570	F5200					
123	243	469	440435	-633090	C4568	F5400	100.9	4.5	1.0	.5	.12

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
123	243	469	440435	-633090	C4568	F5400					
123	250	470	440433	-633017	C4556	F5600	92.2	4.5	1.0	.5	.12
123	250	470	440433	-633017	C4556	F5600					
123	257	471	440407	-632947	C4572	F5800	117.3	4.9	1.1	.6	.12
123	257	471	440407	-632947	C4572	F5800					
123	305	472	440396	-632875	C4572	F6000	102.0	4.0	1.0	.5	.13
123	320	473	440387	-632931	C4595	F5800					
123	325	474	440413	-633003	C4580	F5600	296.6	7.0	1.1	.6	.08
123	325	474	440413	-633003	C4580	F5600					
123	334	475	440412	-633075	C4595	F5400	268.9	3.5	1.0	.5	.15
123	334	475	440412	-633075	C4595	F5400					
123	341	476	440432	-633146	C4585	F5200	291.3	4.7	1.0	.5	.12
123	341	476	440432	-633146	C4585	F5200					
123	348	477	440444	-633218	C4584	F5000	283.0	4.6	1.0	.5	.12
123	348	477	440444	-633218	C4584	F5000					
123	355	478	440454	-633289	C4592	E7800	281.1	4.5	1.0	.5	.12
123	355	478	440454	-633289	C4592	E7800					
123	405	479	440465	-633361	C4590	E7600	282.0	3.2	1.0	.5	.17
123	405	479	440465	-633361	C4590	E7600					
123	411	480	440478	-633443	C4593	E7370	282.4	6.1	1.1	.6	.10
123	411	480	440478	-633443	C4593	E7370					
123	418	481	440496	-633503	C4585	E7200	292.6	4.0	.9	.5	.12
123	425	482	440486	-633520	C4606	E7200					
123	433	483	440468	-633449	C4613	E7400	109.4	4.1	1.0	.5	.13

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
123	433	483	440468	-633449	C4613	E7400					
123	440	484	440458	-633377	C4610	E7600	100.9	4.5	1.0	.5	.12
123	440	484	440458	-633377	C4610	E7600					
123	448	485	440445	-633302	C4609	E7810	103.5	4.2	1.0	.6	.13
123	448	485	440445	-633302	C4609	E7810					
123	454	486	440431	-633234	C4612	F5000	105.9	5.1	.9	.5	.10
123	454	486	440431	-633234	C4612	F5000					
123	502	487	440419	-633162	C4610	F5200	103.0	4.0	1.0	.5	.13
123	502	487	440419	-633162	C4610	F5200					
123	508	488	440410	-633090	C4606	F5400	99.8	5.3	1.0	.5	.10
123	514	489	440393	-633075	C4623	F5400					
123	522	490	440404	-633146	C4628	F5200	282.1	3.9	1.0	.5	.13
123	522	490	440404	-633146	C4628	F5200					
123	530	491	440415	-633218	C4633	F5000	282.0	4.0	1.0	.5	.13
123	530	491	440415	-633218	C4633	F5000					
123	538	492	440426	-633290	C4631	E7800	282.0	4.0	1.0	.5	.13
123	538	492	440426	-633290	C4631	E7800					
123	545	493	440441	-633362	C4628	E7600	286.1	4.6	1.0	.5	.12
123	545	493	440441	-633362	C4628	E7600					
123	552	494	440455	-633433	C4628	E7400	285.3	4.5	1.0	.5	.12
123	552	494	440455	-633433	C4628	E7400					
123	559	495	440466	-633505	C4630	E7200	282.0	4.5	1.0	.5	.12
123	606	496	440459	-633521	C4650	E7200					
123	613	497	440443	-633450	C4652	E7400	107.4	4.6	1.0	.5	.12

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
123	613	497	440443	-633450	C4652	E7400					
123	621	498	440431	-633378	C4650	E7600	103.0	4.0	1.0	.5	.13
123	621	498	440431	-633378	C4650	E7600					
123	628	499	440414	-633306	C4656	E7800	108.1	4.7	1.0	.5	.12
123	628	499	440414	-633306	C4656	E7800					
123	635	500	440403	-633231	C4652	F5010	101.5	4.7	1.0	.6	.12
123	644	501	440390	-633226	C4670	E7980					
123	651	502	440405	-633301	C4668	E7770	285.5	4.8	1.0	.6	.12
123	651	502	440405	-633301	C4668	E7770					
123	658	503	440415	-633373	C4672	E7570	280.9	4.5	1.0	.5	.12
123	658	503	440415	-633373	C4672	E7570					
123	704	504	440426	-633435	C4672	E7400	283.8	4.6	.9	.5	.10
123	704	504	440426	-633435	C4672	E7400					
123	710	505	440439	-633506	C4672	E7200	284.3	5.3	1.0	.5	.10
123	719	506	440425	-633519	C4696	E7210					
123	727	507	440420	-633443	C4688	E7420	95.2	4.1	1.0	.6	.13
123	727	507	440420	-633443	C4688	E7420					
123	734	508	440406	-633379	C4690	E7600	106.9	4.1	.9	.5	.12
123	734	508	440406	-633379	C4690	E7600					
123	741	509	440391	-633307	C4692	E7800	106.1	4.6	1.0	.5	.12
123	803	510	440402	-633075	C4600	F5420					
123	808	511	440449	-633077	C4530	F5415	358.2	5.6	.9	.5	.08
123	812	512	440477	-633067	C4485	F5445					
123	815	513	440500	-633066	C4450	F5450	1.8	4.6	.4	.2	.05

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
123	825	514	440502	-632998	C4430	F5640					
123	830	515	440539	-632999	C4375	F5640	358.9	4.4	.7	.4	.08
123	832	516	440555	-632994	C4350	F5655					
123	839	517	440629	-632995	C4240	F5655	359.4	6.3	1.4	.7	.12
123	839	517	440629	-632995	C4240	F5655					
123	845	518	440677	-632997	C4170	F5655	358.3	4.8	.9	.5	.10
123	845	518	440677	-632997	C4170	F5655					
123	847	519	440696	-632988	C4140	F5680	18.8	6.0	.4	.2	.03
123	847	519	440696	-632988	C4140	F5680					
123	851	520	440736	-632989	C4080	F5680	359.0	6.0	.7	.4	.07
123	913	521	440825	-633148	C3990	F5200					
123	920	522	440833	-633217	C3990	F5000	279.1	4.3	.9	.5	.12
123	920	522	440833	-633217	C3990	F5000					
123	927	523	440841	-633286	C3991	E7800	279.1	4.3	.9	.5	.12
123	927	523	440841	-633286	C3991	E7800					
123	933	524	440850	-633354	C3991	E7600	280.4	5.0	.9	.5	.10
123	933	524	440850	-633354	C3991	E7600					
123	940	525	440860	-633423	C3991	E7400	281.4	4.3	.9	.5	.12
123	940	525	440860	-633423	C3991	E7400					
123	947	526	440869	-633491	C3991	E7200	280.4	4.3	.9	.5	.12
123	951	527	440883	-633507	C3973	E7200					
123	958	528	440878	-633438	C3970	E7400	95.7	4.3	.9	.5	.12
123	958	528	440878	-633438	C3970	E7400					
123	1004	529	440867	-633370	C3972	E7600	102.7	5.0	.9	.5	.10

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
123	1004	529	440867	-633370	C3972	E7600					
123	1010	530	440858	-633301	C3972	E7800	100.3	5.0	.9	.5	.10
123	1010	530	440858	-633301	C3972	E7800					
123	1017	531	440849	-633233	C3972	F5000	100.4	4.3	.9	.5	.12
123	1017	531	440849	-633233	C3972	F5000					
123	1023	532	440840	-633164	C3971	F5200	100.3	5.0	.9	.5	.10
123	1023	532	440840	-633164	C3971	F5200					
123	1030	533	440831	-633096	C3971	F5400	100.4	4.3	.9	.5	.12
128	1200	534	440676	-633224	C4245	F5000					
128	1204	535	440637	-633223	C4304	F5002	178.9	5.9	.7	.4	.07
128	1204	535	440637	-633223	C4304	F5002					
128	1210	536	440574	-633222	C4400	F5008	179.3	6.3	1.2	.6	.10
128	1222	537	440557	-633214	C4400	F5030					
128	1227	538	440609	-633214	C4320	F5030	0	6.2	1.0	.5	.08
128	1227	538	440609	-633214	C4320	F5030					
128	1232	539	440649	-633214	C4260	F5030	0	4.8	.7	.4	.08
128	1304	541	440609	-633111	C4308	F5300					
128	1307	542	440619	-633188	C4315	F5080	280.2	11.3	1.0	.6	.05
128	1307	542	440619	-633188	C4315	F5080					
128	1314	543	440604	-633276	C4360	E7830	256.7	5.6	1.2	.7	.12
128	1319	544	440646	-633330	C4300	E7720					
128	1334	545	440628	-633197	C4300	F5100	100.6	3.9	1.8	1.0	.25
128	1334	545	440628	-633197	C4300	F5100					
128	1335	546	440625	-633179	C4300	F5150	103.0	8.0	.2	.1	.02

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
128	1340	547	440586	-633132	C4360	F5250					
128	1354	548	440614	-633185	C4330	F5100	306.2	2.0	.9	.5	.23
128	1354	548	440614	-633185	C4330	F5100					
128	1358	549	440623	-633220	C4325	F5000	289.6	4.0	.5	.3	.07
128	1358	549	440623	-633220	C4325	F5000					
128	1359	550	440628	-633252	C4325	E7910	282.2	14.2	.4	.2	.02
128	1419	551	440642	-633267	C4295	E7900					
128	1424	552	440627	-633186	C4300	F5130	104.4	7.2	1.1	.6	.08
128	2115	563	440611	-633083	C4300	F5380					
128	2121	564	440621	-633146	C4300	F5200	282.4	4.6	.9	.5	.10
128	2121	564	440621	-633146	C4300	F5200					
128	2125	565	440625	-633181	C4300	F5100	279.0	3.8	.5	.3	.07
128	2125	565	440625	-633181	C4300	F5100					
128	2137	566	440646	-633321	C4300	E7700	281.8	5.2	1.9	1.0	.20
128	2137	566	440646	-633321	C4300	E7700					
128	2150	567	440632	-633232	C4305	F5000	102.3	3.0	1.2	.7	.22
128	2150	567	440632	-633232	C4305	F5000					
128	2153	568	440626	-633193	C4305	F5110	102.0	5.7	.5	.3	.05
128	2153	568	440626	-633193	C4305	F5110					
128	2205	569	440606	-633181	C4330	F5100	156.6	1.1	.4	.2	.20
128	2205	569	440606	-633181	C4330	F5100					
128	2208	570	440611	-633216	C4330	F5000	281.2	5.1	.5	.3	.05
128	2208	570	440611	-633216	C4330	F5000					
128	2212	571	440617	-633251	C4330	E7900	283.4	3.9	.5	.3	.07

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
128	2212	571	440617	-633251	C4330	E7900					
128	2226	572	440637	-633267	C4305	E7900	330.0	1.0	.4	.2	.23
128	2226	572	440637	-633267	C4305	E7900					
128	2228	573	440632	-633232	C4305	F5000	101.2	7.7	.5	.3	.03
128	2228	573	440632	-633232	C4305	F5000					
128	2249	574	440589	-632951	C4305	F5800	102.0	5.9	3.8	2.1	.35
128	2311	575	440596	-632900	C4280	F5900					
128	2321	576	440599	-633006	C4300	F5600	272.3	4.6	1.4	.8	.17
128	2321	576	440599	-633006	C4300	F5600					
128	2327	577	440609	-633076	C4300	F5400	281.2	5.1	1.0	.5	.10
128	2327	577	440609	-633076	C4300	F5400					
128	2345	578	440635	-633192	C4287	F5070	287.3	2.9	1.6	.9	.30
128	2345	578	440635	-633192	C4287	F5070					
128	2349	579	440658	-633227	C4260	E7970	312.4	5.1	.6	.3	.07
128	2356	580	440640	-633179	C4280	F5150					
129	2	581	440629	-633109	C4280	F5350	102.3	5.2	1.0	.5	.10
129	12	582	440603	-633098	C4310	F5340					
129	19	583	440623	-633164	C4300	F5150	292.8	4.4	1.0	.5	.12
129	33	584	440648	-633232	C4280	F5000					
129	100	585	440569	-633144	C4365	F5228	141.2	2.3	1.9	1.0	.45
129	100	585	440569	-633144	C4365	F5228					
129	120	586	440686	-633142	C4212	F5235	.7	3.5	2.2	1.2	.33
129	120	586	440686	-633142	C4212	F5235					
129	150	587	440640	-633229	C4285	F5008	233.7	1.6	1.4	.8	.50

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
129	150	587	440640	-633229	C4285	F5008					
129	215	588	440608	-633114	C4310	F5290	111.1	2.1	1.6	.9	.42
129	259	589	440660	-633215	C4255	F5048					
129	315	590	440616	-633056	C4285	F5458	111.0	4.6	2.3	1.2	.27
129	315	590	440616	-633056	C4285	F5458					
129	337	591	440672	-633311	C4255	E7775	287.0	5.2	3.6	1.9	.37
129	337	591	440672	-633311	C4255	E7775					
129	410	592	440688	-633085	C4186	F5375	84.4	3.0	3.0	1.6	.55
129	410	592	440688	-633085	C4186	F5375					
129	422	593	440631	-633163	C4300	F5175	224.6	4.0	1.5	.8	.20
129	422	593	440631	-633163	C4300	F5175					
129	434	594	440561	-633252	C4418	E7900	222.5	4.7	1.8	.9	.20
129	434	594	440561	-633252	C4418	E7900					
129	439	595	440555	-633323	C4445	E7700	263.3	6.2	1.0	.5	.08
129	455	596	440579	-633342	C4400	E7655					
129	502	597	440651	-633396	C4300	E7505	331.6	7.0	1.5	.8	.12
129	502	597	440651	-633396	C4300	E7505					
129	506	598	440683	-633399	C4250	E7500	356.1	4.8	.6	.3	.07
129	506	598	440683	-633399	C4250	E7500					
129	510	599	440716	-633401	C4200	E7492	357.5	5.0	.6	.3	.07
129	530	602	440689	-633356	C4250	E7600					
129	532	603	440677	-633391	C4272	E7500	244.6	8.4	.5	.3	.03
129	532	603	440677	-633391	C4272	E7500					
129	535	604	440676	-633417	C4280	E7425	266.9	3.8	.3	.2	.05

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
129	542	605	440696	-633477	C4260	E7300					
129	545	606	440693	-633442	C4255	E7400	96.8	5.1	.5	.3	.05
129	545	606	440693	-633442	C4255	E7400					
129	548	607	440689	-633407	C4253	E7500	99.0	5.1	.5	.3	.05
129	548	607	440689	-633407	C4253	E7500					
129	550	608	440687	-633380	C4250	E7575	95.9	5.9	.4	.2	.03
129	550	608	440687	-633380	C4250	E7575					
129	551	609	440687	-633372	C4248	E7600	90.0	3.5	.1	.1	.02
129	606	610	440698	-633286	C4215	E7800					
129	612	611	440699	-633356	C4226	E7600	271.1	5.0	.9	.5	.10
129	612	611	440699	-633356	C4226	E7600					
129	616	612	440709	-633390	C4220	E7500	292.2	4.0	.5	.3	.07
129	616	612	440709	-633390	C4220	E7500					
129	618	613	440714	-633425	C4220	E7400	281.2	7.7	.5	.3	.03
129	637	615	440727	-633381	C4200	E7560					
129	644	616	440663	-633373	C4300	E7570	174.9	5.5	1.2	.6	.12
129	644	616	440663	-633373	C4300	E7570					
129	647	617	440632	-633376	C4350	E7568	184.0	6.2	.6	.3	.05
129	648	618	440651	-633399	C4300	E7500					
129	703	619	440683	-633395	C4250	E7510	5.1	1.3	.6	.3	.25
129	703	619	440683	-633395	C4250	E7510					
129	706	620	440715	-633394	C4200	E7512	1.3	6.4	.6	.3	.05
129	751	621	440794	-633044	C4015	F5550					
129	805	622	440739	-632988	C4100	F5680	143.7	2.9	1.3	.7	.23

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
129	805	622	440739	-632988	C4100	F5680					
129	814	623	440671	-632986	C4200	F5680	178.8	4.5	1.3	.7	.15
129	814	623	440671	-632986	C4200	F5680					
129	822	624	440604	-632985	C4300	F5680	179.4	5.0	1.2	.7	.13
129	906	627	440635	-633162	C4280	F5200					
129	909	628	440632	-633127	C4280	F5300	96.8	5.1	.5	.3	.05
129	909	628	440632	-633127	C4280	F5300					
129	915	629	440621	-633056	C4280	F5500	102.1	5.2	1.0	.5	.10
129	915	629	440621	-633056	C4280	F5500					
129	919	630	440616	-633021	C4280	F5600	101.2	3.9	.5	.3	.07
129	919	630	440616	-633021	C4280	F5600					
129	923	631	440611	-632986	C4280	F5700	101.2	3.9	.5	.3	.07
129	930	632	440584	-633005	C4320	F5600					
129	945	633	440611	-633181	C4320	F5100	282.0	5.2	2.4	1.3	.25
129	945	633	440611	-633181	C4320	F5100					
129	948	634	440617	-633216	C4320	F5000	283.4	5.2	.5	.3	.05
129	1002	635	440623	-633267	C4325	E7900					
129	1005	636	440619	-633232	C4325	F5000	99.0	5.1	.5	.3	.05
129	1005	636	440619	-633232	C4325	F5000					
129	1007	637	440615	-633207	C4325	F5070	102.5	5.5	.3	.2	.03
129	1020	638	440607	-633146	C4320	F5200					
129	1023	639	440612	-633181	C4320	F5100	281.2	5.1	.5	.3	.05
129	1023	639	440612	-633181	C4320	F5100					
129	1028	640	440620	-633234	C4320	E7950	281.8	4.7	.7	.4	.08

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
129	1042	641	440641	-633337	C4315	E7700					
129	1051	642	440625	-633232	C4315	F5000	101.9	5.2	1.4	.8	.15
129	1051	642	440625	-633232	C4315	F5000					
129	1125	643	440703	-633016	C4150	F5620	63.4	3.1	3.2	1.7	.57
129	1150	645	440724	-632878	C4100	F6000					
129	1158	646	440659	-632874	C4194	F6004	177.5	4.9	1.2	.7	.13
129	1158	646	440659	-632874	C4194	F6004					
129	1206	647	440602	-632873	C4278	F6001	179.3	4.3	1.1	.6	.13
129	1233	648	440599	-633076	C4315	F5400					
129	1235	649	440605	-633111	C4315	F5300	283.4	7.8	.5	.3	.03
129	1235	649	440605	-633111	C4315	F5300					
129	1238	650	440610	-633146	C4315	F5200	281.2	5.1	.5	.3	.05
129	1238	650	440610	-633146	C4315	F5200					
129	1244	650	440621	-633216	C4315	F5000	282.3	5.2	1.0	.5	.10
129	1244	650	440621	-633216	C4315	F5000					
129	1247	652	440626	-633251	C4315	E7900	281.2	5.1	.5	.3	.05
129	1930	656	440631	-633092	C4274	F5400					
129	1934	657	440623	-633057	C4275	F5500	107.6	4.0	.5	.3	.07
129	1934	657	440623	-633057	C4275	F5500					
129	1940	658	440618	-633022	C4276	F5600	101.2	2.6	.5	.3	.10
129	1940	658	440618	-633022	C4276	F5600					
129	1952	659	440612	-632987	C4275	F5700	103.4	1.3	.5	.3	.20
129	1959	660	440608	-632952	C4275	F5800					
129	2005	661	440602	-632916	C4276	F5900	103.0	2.7	.5	.3	.10

DAY	HOUR	FIX	LATITUDE	LONGITUDE	DECCA	DECCA	COURSE	SPEED	D(KM)	D(NM)	TIME
129	2011	662	440605	-632877	C4250	F5990					
129	2022	663	440627	-632878	C4218	F5990	358.1	1.2	.4	.2	.18
129	2106	665	440625	-633041	C4270	F5500					
129	2116	666	440641	-633146	C4270	F5200	281.9	4.6	1.4	.8	.17
129	2116	666	440641	-633146	C4270	F5200					
129	2117	667	440644	-633163	C4270	F5150	283.8	7.6	.2	.1	.02
129	2117	667	440644	-633163	C4270	F5150					
129	2135	668	440679	-633356	C4260	E7600	284.1	4.8	2.7	1.4	.30
129	2135	668	440679	-633356	C4260	E7600					
129	2137	669	440683	-633377	C4260	E7540	284.8	4.7	.3	.2	.03
129	2137	669	440683	-633377	C4260	E7540					
129	2225	670	440619	-633216	C4320	F5000	118.9	1.7	2.5	1.3	.80
129	2225	670	440619	-633216	C4320	F5000					
129	2245	671	440620	-633198	C4315	F5050	85.6	.4	.2	.1	.33
130	54	672	440633	-633299	C4316	E7810					
130	108	673	440628	-633216	C4305	F5045	94.8	2.6	1.1	.6	.23
130	138	674	440630	-633166	C4289	F5142					
130	147	675	440641	-633242	C4278	E7948	281.4	3.7	1.0	.6	.15
130	203	676	440722	-633220	C4174	F5012					
130	223	677	440624	-633212	C4322	F5035	176.6	2.9	1.8	1.0	.33
130	342	678	440657	-633224	C4275	F5000					
130	430	679	440705	-633220	C4200	F5011	3.4	.6	.9	.5	.80
130	430	679	440705	-633220	C4200	F5011					
130	536	680	440608	-633183	C4320	F5100	164.6	.9	1.9	1.0	1.10