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OCEANOGRAPHY FOR LONG RANGE SONAR IN ATLANTIC AREA B FOR OCTOBE--ETC(U)
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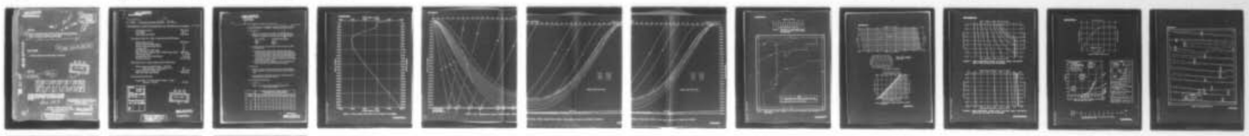

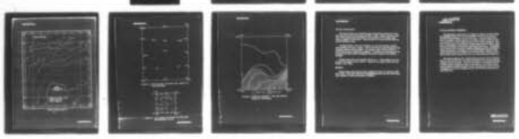

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INFORMAL MANUSCRIPT REPORT.

NO. O-103-63

LEVEL II

MOST Project - 2

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TITLE

OCEANOGRAPHY FOR LONG RANGE SONAR IN ATLANTIC AREA B FOR OCTOBER AND NOVEMBER.

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AUTHOR

OCEANOGRAPHIC DEVELOPMENT DIVISION

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APRIL 1963

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MARINE SCIENCES DEPARTMENT
U. S. NAVAL OCEANOGRAPHIC OFFICE
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ABSTRACT → CONTENTS:

1 - AREA: One-degree quadrangle 25°-26°N 72°-73°W;

2-PREDICTED VALUES FOR QUADRANGLE FOR OCTOBER AND NOVEMBER; and CONT

Sound Speed at Sonar	5047 ft/sec
Layer Depth	66 ft
Layer Depth Sound Speed	5048 ft/sec

Convergence Zone (For a depth of approximately 2900 fathoms)

Speed at Bottom (Fig 4)	5097 ft/sec
Minimum Refracted Angle (Fig 6)	1°
Maximum Refracted Angle (Fig 6)	7°
Average Angle	4°
Best Equipment Tilt (D/E) Angle	5°
Mean Horizontal Speed for Best Tilt (D/E) Angle (Fig 8)	4908 ft/sec
Initial Range (Fig 7)	71.7 kyds
Reswept Surface Zone Width (Fig 2)	0.6 kyds
Slant Path Velocity	4951.8 ft/sec

Bottom Bounce (For a depth of approximately 2900 fathoms)

Minimum useful Inclination Angle = Maximum Refracted Angle of Convergence + 3° =	10°
Predicted Detection Range (Fig 7)	52.3 kyds
Mean Horizontal Speed (Fig 8)	4850 ft/sec

Near Surface Path Detection

Range (Table I) (12-Knot Figure of Merit + Target Strength = 215 db)	23 kyds

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CONT' → 3- ~~III~~ USE OF GRAPHS FOR PARTICULAR CONDITIONS (U) ← ABSTRACT

1. From BT temperature trace, determine and tabulate sound speed at sonar depth (V_1) and at layer depth (V_2) from Figure 5. Tabulate bottom (V_3) from Figure 4.

2. Convergence zone

   a. Determine if convergence zone is possible. The difference between the bottom speed (V_3) and speed at sonar depth (V_1) will give a qualitative indication of convergence zone existence according to the table below.

$V_3 - V_1$ (ft/sec)	Convergence Zone Existence
Negative	None
0-30	Borderline
>30	Strong

   b. To determine angular width and midpoint of totally refracted rays usable in convergence zone:

   (1) Determine minimum angle for totally refracted ray from Figure 6 using sound speed at sonar depth (V_1) and sound speed at layer depth (V_2) (first vertexing speed). With no layer, the minimum angle is 0°.
   (2) Determine maximum angle for totally refracted ray from Figure 6 using sound speed at sonar depth and bottom sound speed (V_3) (second vertexing speed) from Figure 4. (Bottom sound speed may also be obtained from sound speed profile in Figure 1).
   (3) Best tilt (D/E) angle for convergence zone will be that equipment tilt nearest the average of the minimum and maximum angles.

3. Bottom Bounce

   a. Refracted ray angle (to the nearest degree) tangent to the bottom [item 2 b (2), above] plus 3° determines the minimum useful bottom bounce Ray angle.

   b. Use the equipment tilt (D/E) angle nearest to the minimum useful bottom bounce Ray angle as computed in item III 3 a.

4. Near surface path detection range

   a. Use Table 1.

TABLE 1 MEAN SURFACE PATH DETECTION RANGE (KYDS) OF A SHALLOW TARGET

LAYER DEPTH (FEET)	FIGURE OF MERIT PLUS TARGET STRENGTH (ALLOWABLE TWO-WAY LOSS IN DB)										
	170	175	180	185	190	195	200	205	210	215	220
0	3	3	4	4	5	5	6	7	8	8	9
50	7	8	10	11	12	14	15	17	19	20	22
100	10	11	13	16	17	19	22	24	26	29	31
400	13	17	19	23	27	30	34	38	41	45	49

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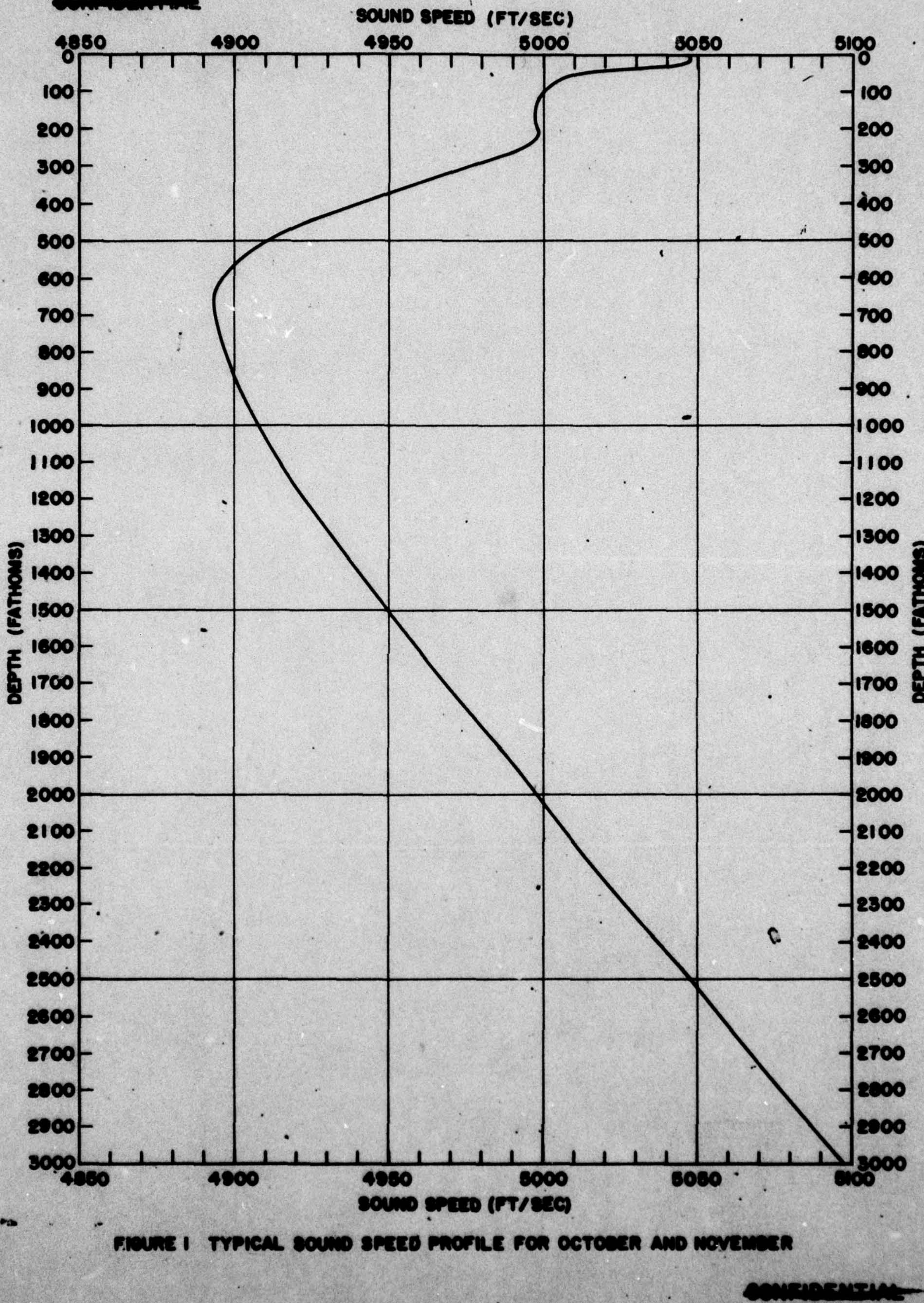

FIGURE I TYPICAL SOUND SPEED PROFILE FOR OCTOBER AND NOVEMBER

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AREA B - OCT & NOV

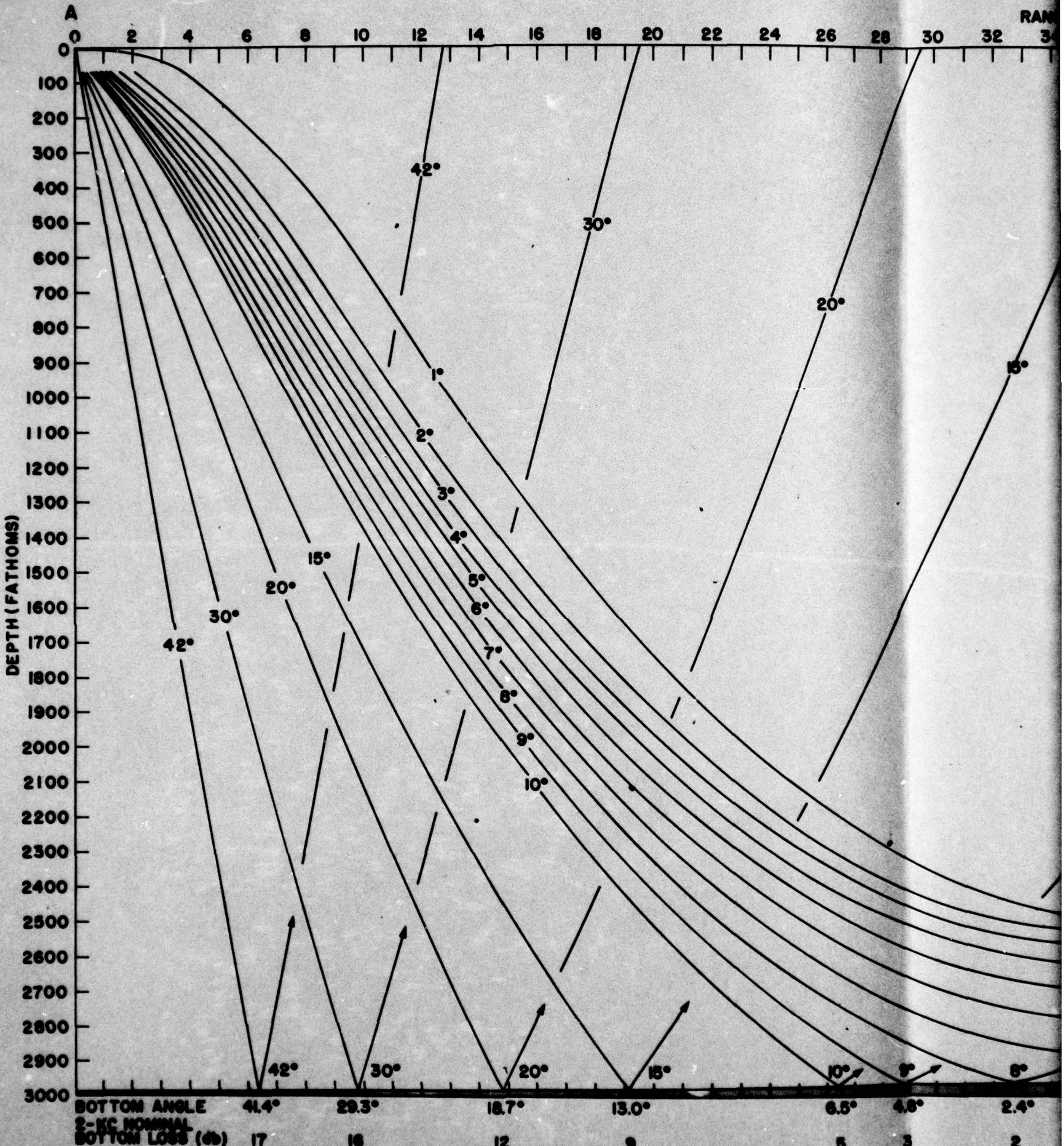
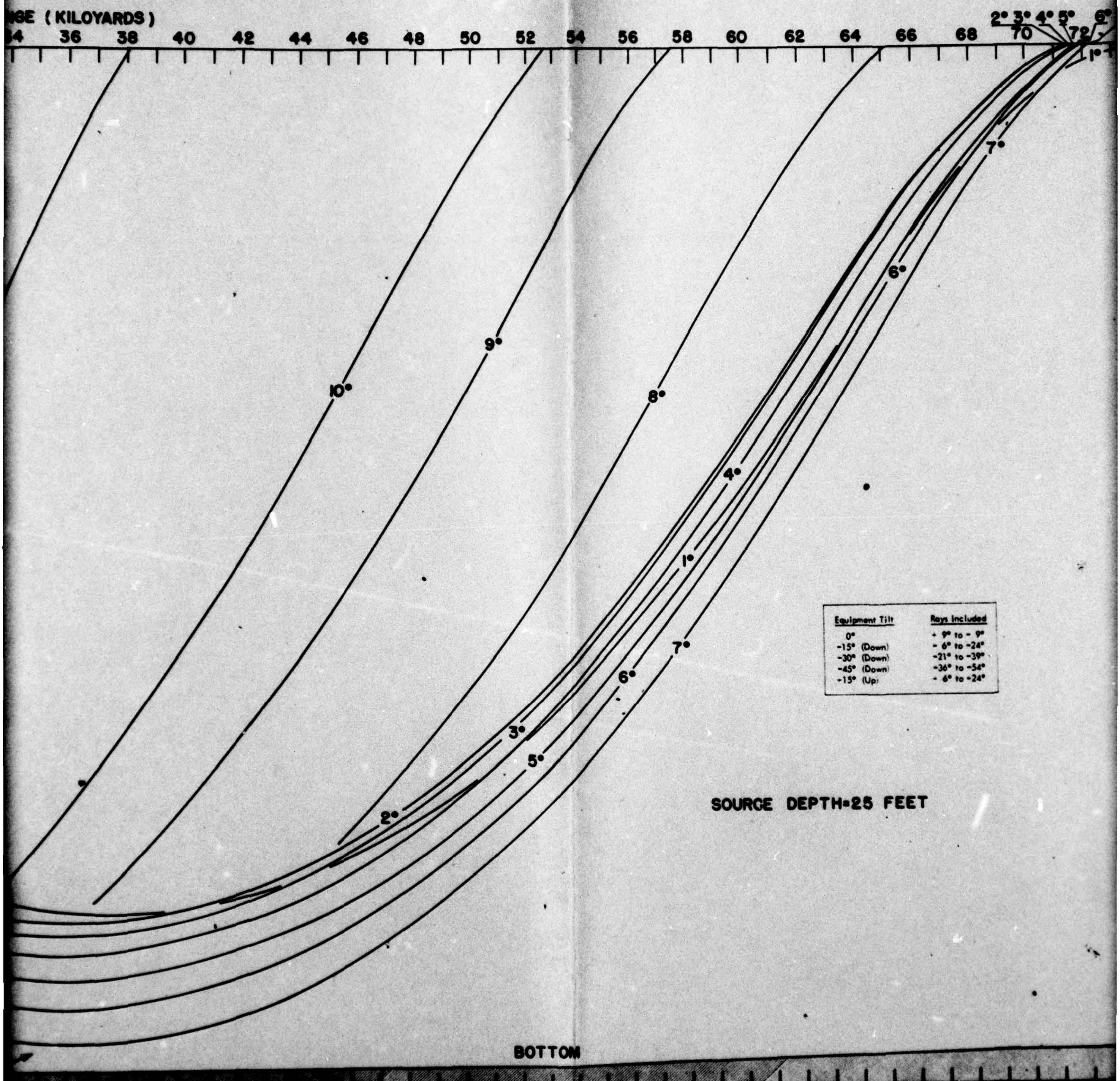
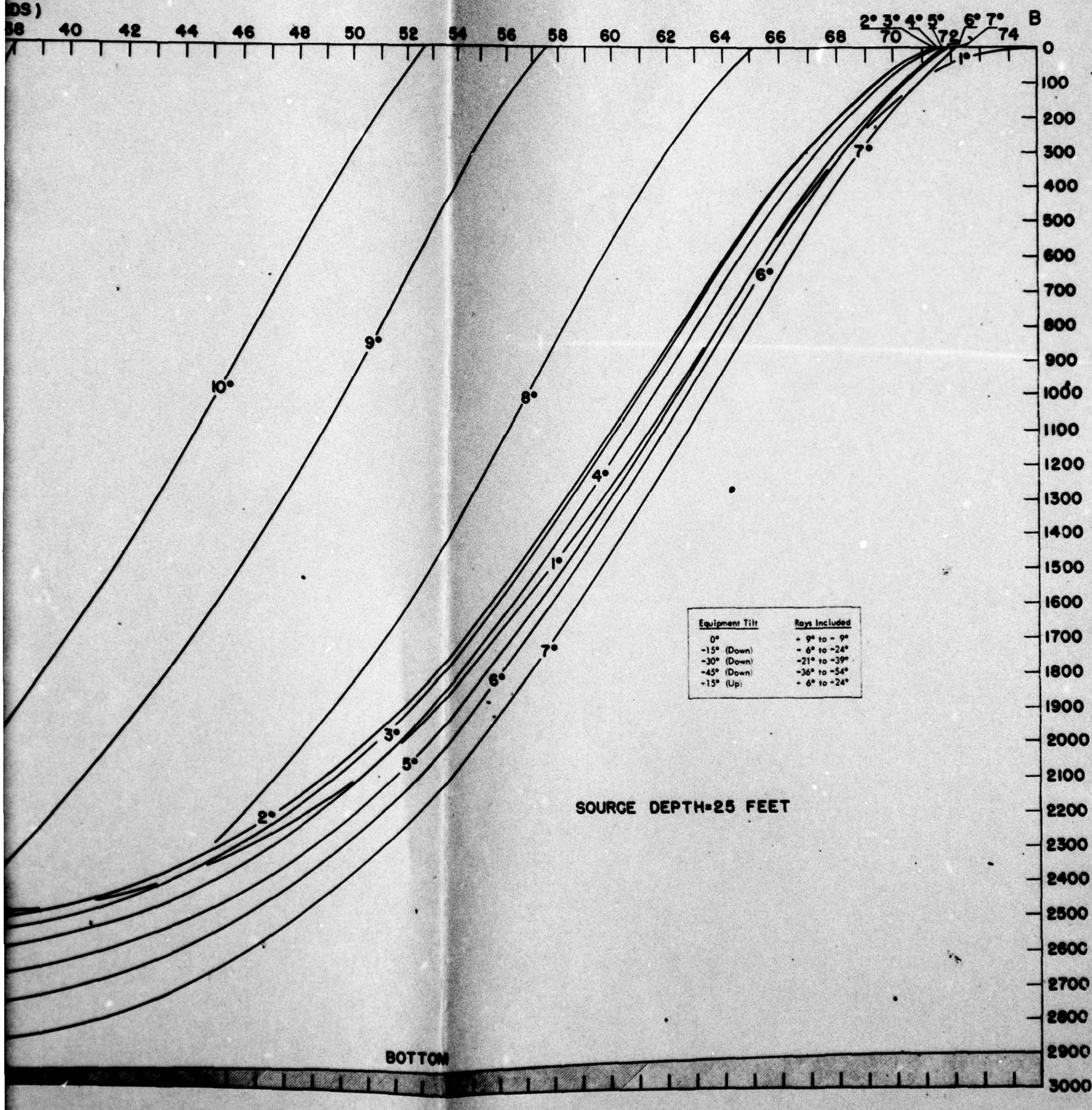


FIGURE 2 RAY DIAGRAM FOR OCTOBER AND NOVEMBER COMPU



TED FROM TYPICAL SOUND SPEED PROFILE FOR CROSS SECTION A-B SHOWN ON FIGURE 4



YPICAL SOUND SPEED PROFILE FOR CROSS SECTION A-B SHOWN ON FIGURE 4

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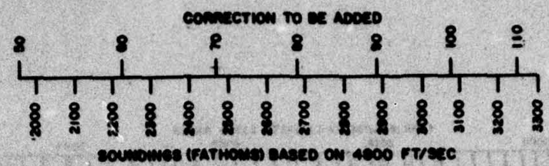

FIGURE 3 CORRECTION TO ECHO-SOUNDER DEPTH TO OBTAIN TRUE DEPTH FOR OCTOBER AND NOVEMBER

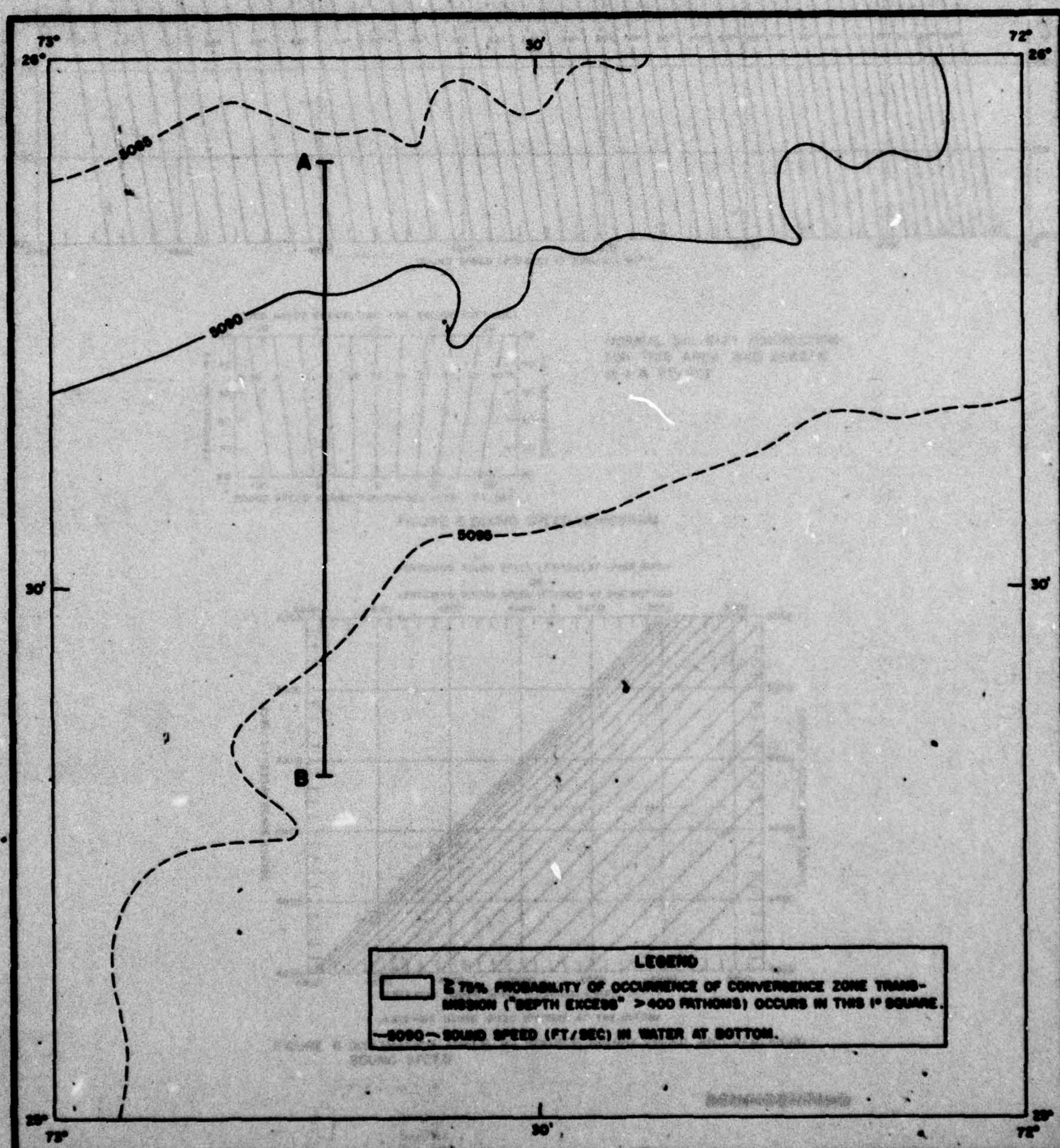

FIGURE 4 SOUND SPEED (FT/SEC) IN WATER AT BOTTOM AND CONVERGENCE ZONE PROBABILITY OF OCCURRENCE

AREA B - OCT & NOV

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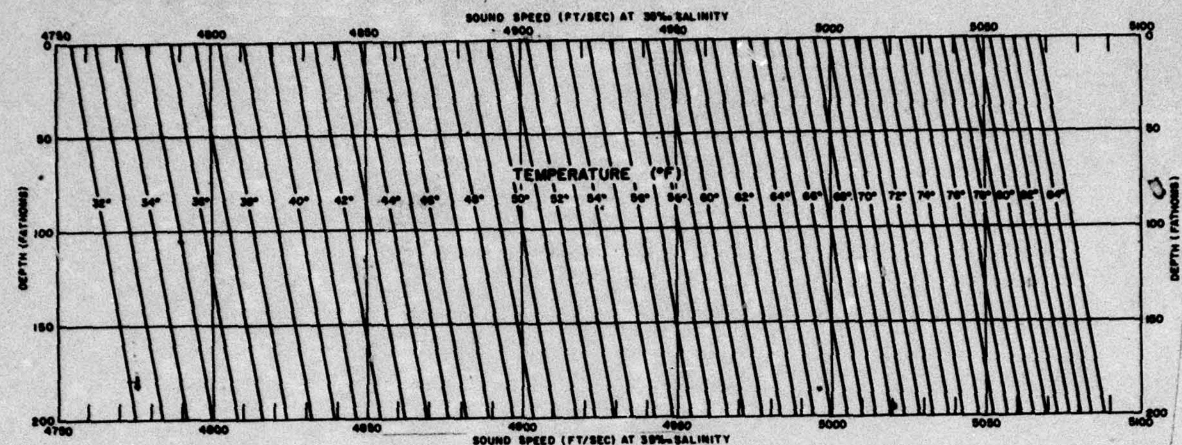

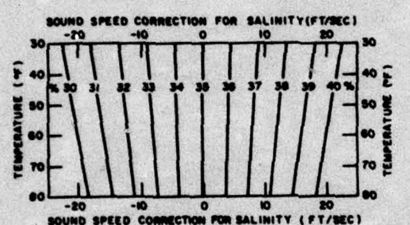

NORMAL SALINITY CORRECTION FOR THIS AREA AND SEASON IS + 4 FT/SEC

FIGURE 5 SOUND SPEED NOMOGRAM

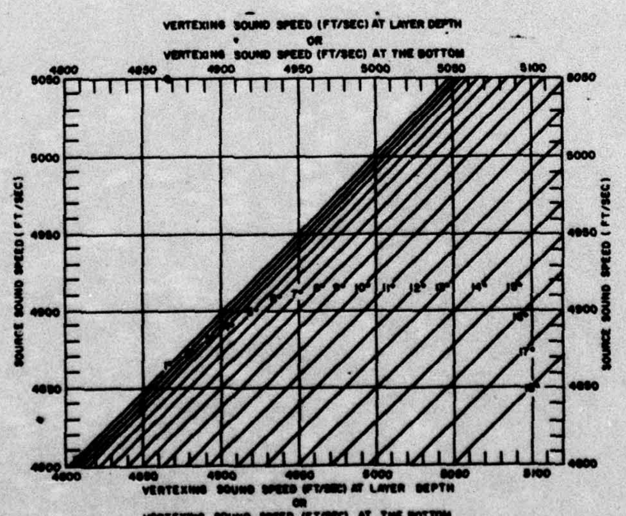

FIGURE 6 INCLINATION ANGLE VS SOURCE SOUND SPEED AND VERTEXING SOUND SPEED

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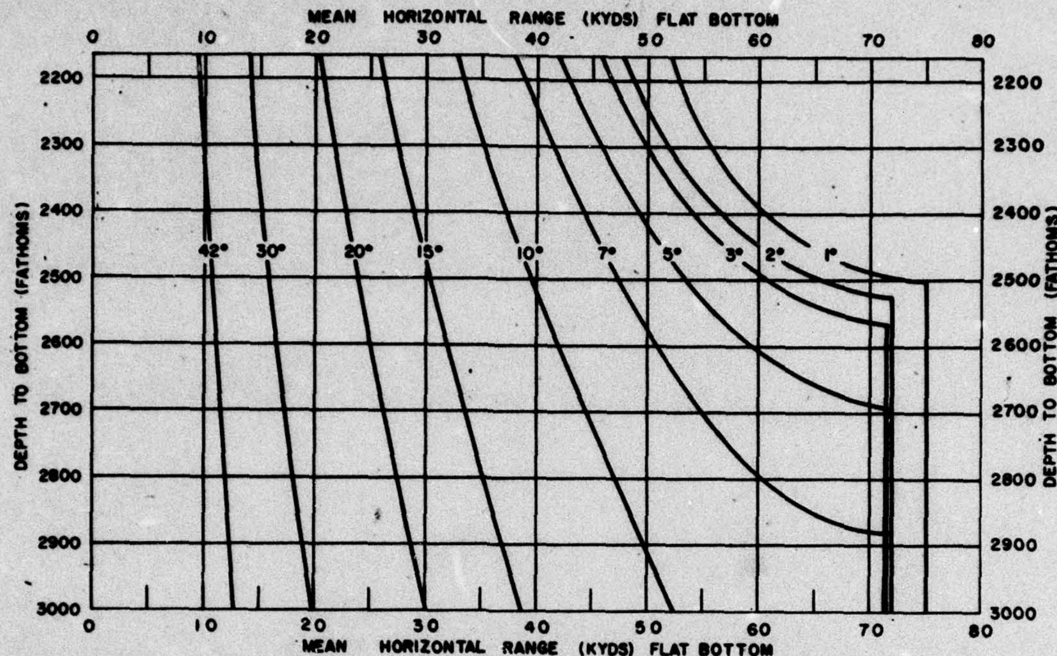

FIGURE 7 MEAN HORIZONTAL RANGE VS INITIAL ANGLE AND WATER DEPTH FOR OCTOBER AND NOVEMBER

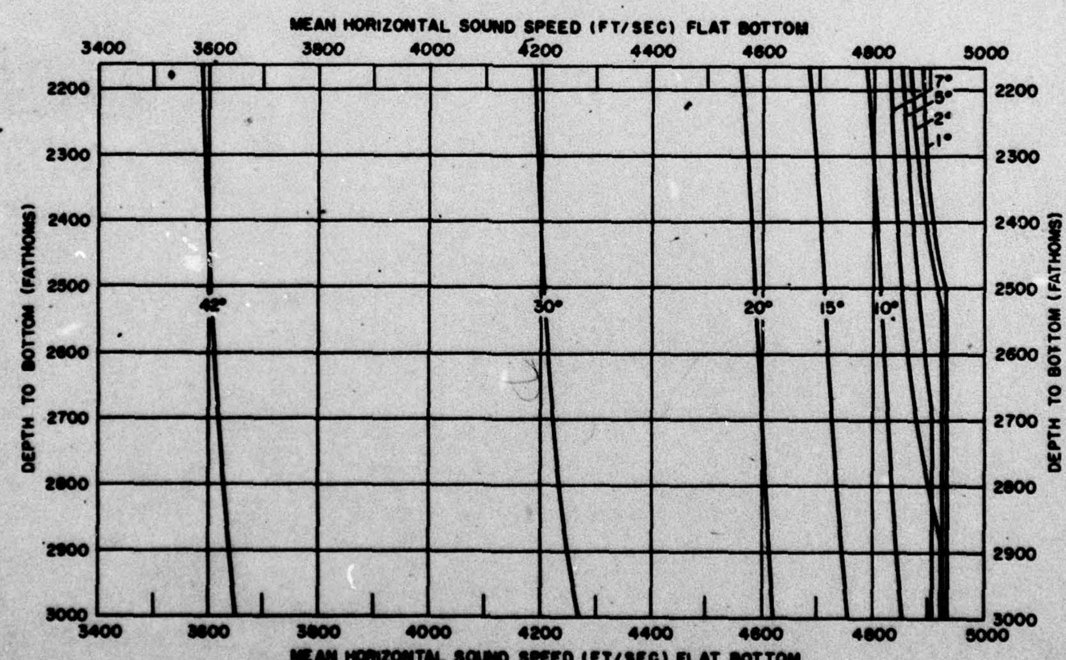

FIGURE 8 MEAN HORIZONTAL SOUND SPEED VS INITIAL ANGLE AND WATER DEPTH FOR OCTOBER AND NOVEMBER

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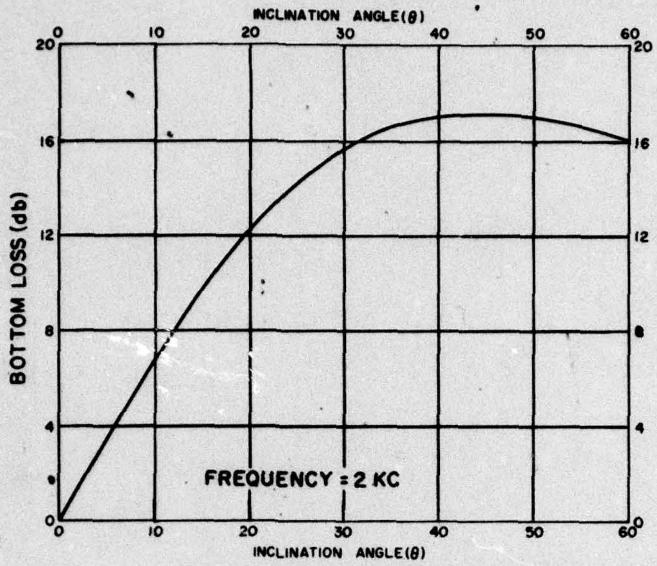


FIGURE 9 NOMINAL BOTTOM LOSS

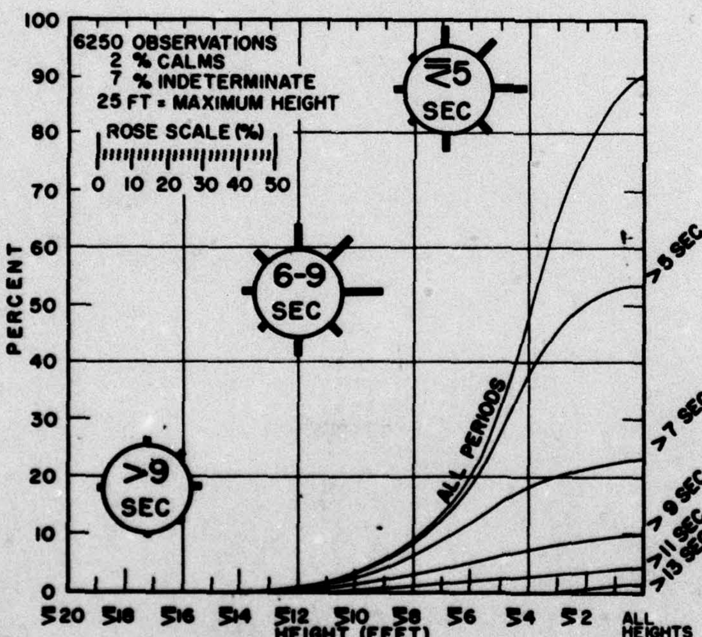
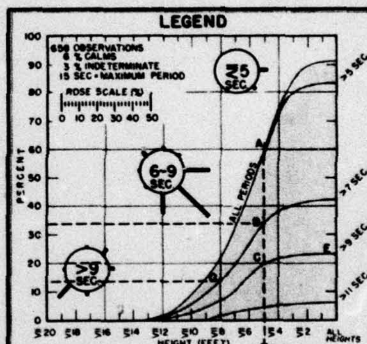


FIGURE 10 WAVES FOR OCTOBER, NOVEMBER, AND DECEMBER
AREA (24°-26°N, 72°-74°W)

LEGEND



A POINT ON THE GRAPH SHOWS THE PERCENTAGE OF ALL WAVES OBSERVED WITH PERIODS EXCEEDING, AND HEIGHTS EQUAL TO OR EXCEEDING, CERTAIN VALUES

POINT A 60 % OF ALL WAVES WERE ≥5 FEET
" B 34 % OF ALL WAVES WERE >7 SECONDS, ≥5 FEET
" E 23 % OF ALL WAVES WERE >9 SECONDS

AN INTERVAL BETWEEN TWO POINTS OF THE SAME HEIGHT CATEGORY SHOWS THE PERCENTAGE OF ALL WAVES OF THAT HEIGHT CATEGORY WITHIN A CERTAIN RANGE OF PERIODS

B >7 SECONDS; C >9 SECONDS; ≥5 — 14 % OF ALL WAVES WERE 7-9 SECONDS, ≥5 FEET

AN INTERVAL BETWEEN TWO POINTS ON THE SAME PERIOD CURVE SHOWS THE PERCENTAGE OF ALL WAVES REPRESENTED BY THE CURVE WITHIN A CERTAIN RANGE OF HEIGHTS

B >7 SECONDS; D; ≥8 ≥5 — 20% OF ALL WAVES WERE 5-8 FEET, >7 SECONDS

AN ARM OF A ROSE INDICATES THE PERCENTAGE OF ALL OBSERVATIONS WHICH ARE IN THE GIVEN PERIOD-DIRECTION CATEGORY

25% OF ALL WAVES OBSERVED HAD PERIODS OF 6-9 SECONDS AND CAME FROM THE SOUTHEAST

15% OF ALL WAVES OBSERVED CAME FROM THE SOUTH. 12% OF THESE WAVES HAD PERIODS OF 6-9 SECONDS AND 3% HAD PERIODS >9 SECONDS.

SEA CODE	0	1	2	3	4	5	6	7	8	9	TOTAL OBS
SEA HEIGHT (FT)	CALM	<1	1-3	3-5	5-8	8-12	12-20	20-40	≥40	CONFUSED	
PERCENT	2.9	13.0	22.5	29.0	20.3	9.4	1.4	1.4	-	-	138

SEA TABULATIONS IN PERCENT OF OBSERVATIONS FOR NOVEMBER
AREA (24°-26°N, 72°-74°W)

3 - Oct. & Nov.

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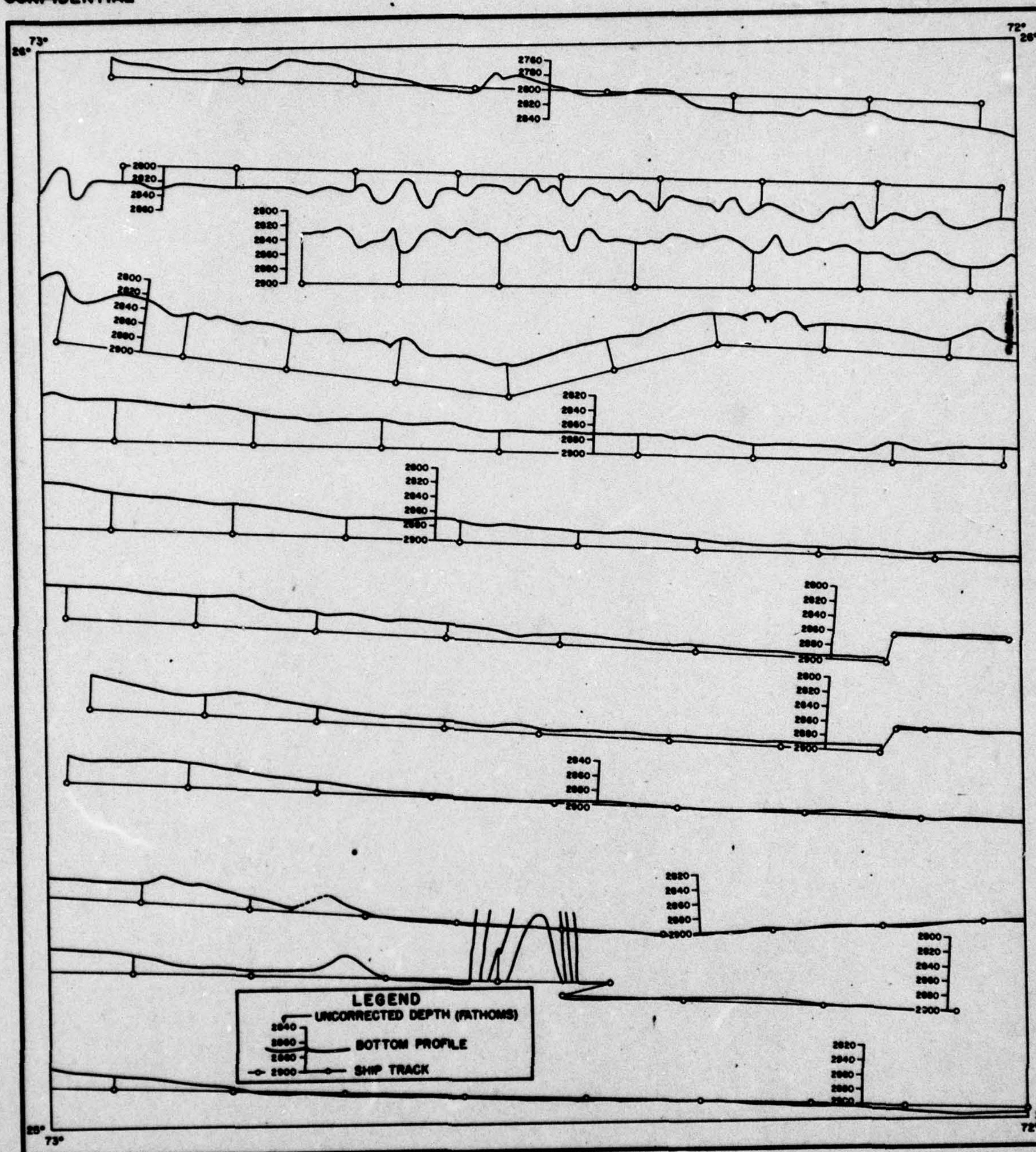

FIGURE II BATHYMETRIC PROFILES

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AREA B – ALL MONTHS

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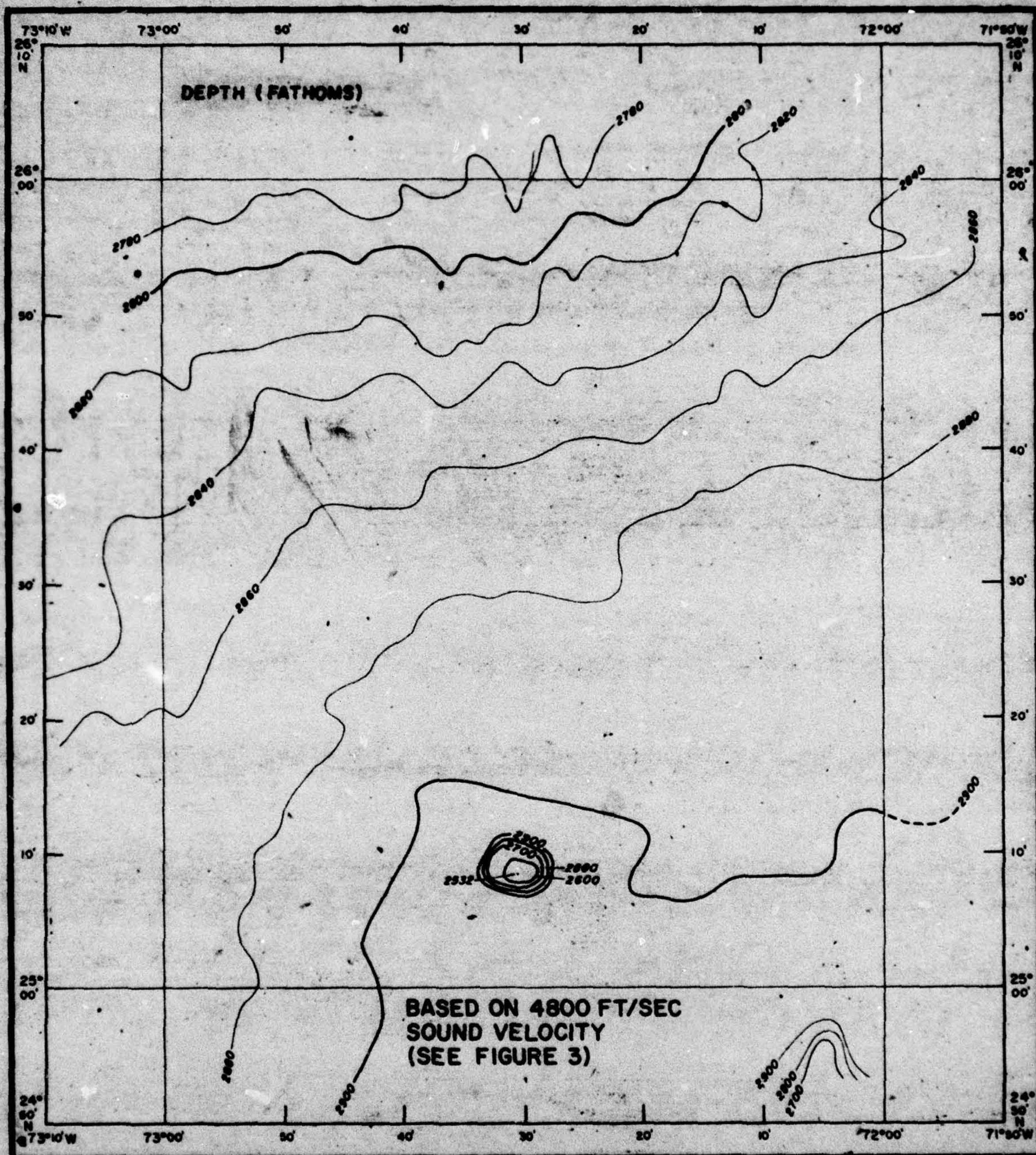

FIGURE 12 BATHYMETRY

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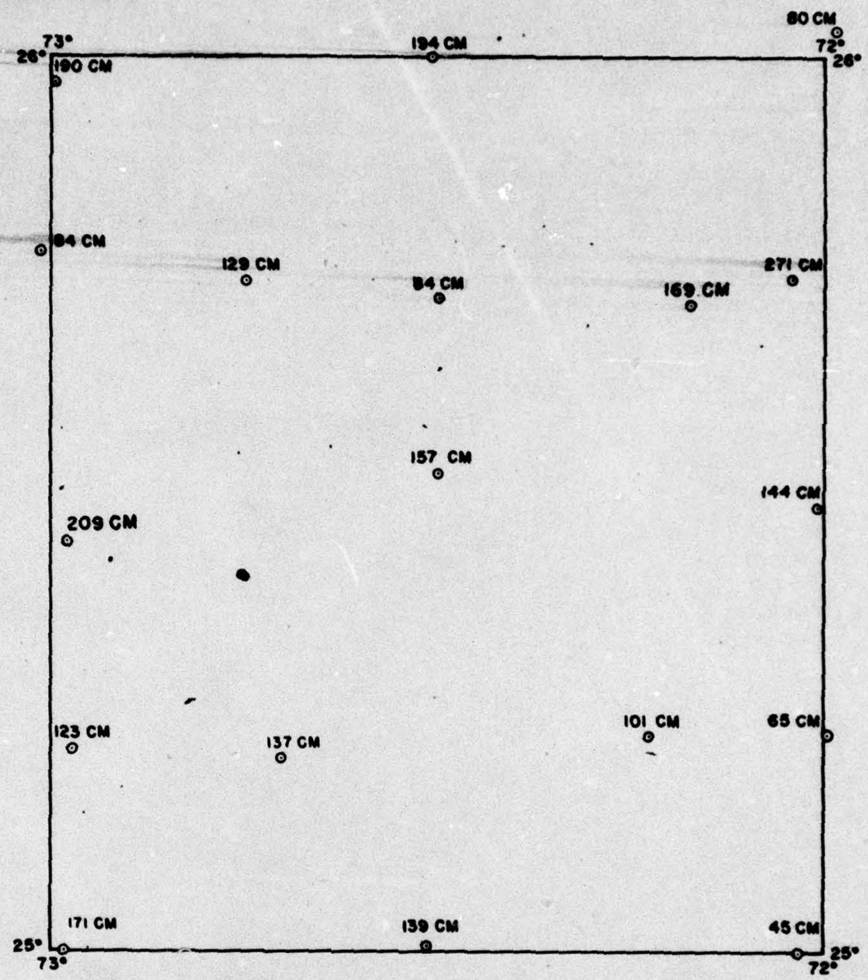

FIGURE 13 BOTTOM CORE LOCATIONS AND LENGTH OF CORE OBTAINED

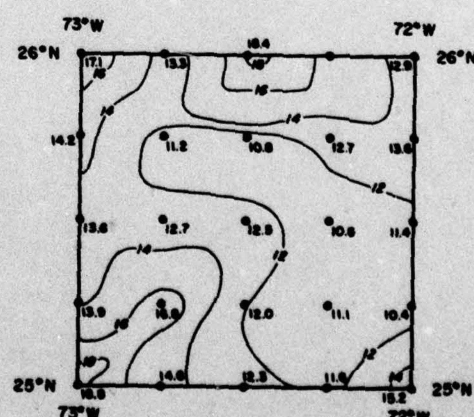

FIGURE 14 12-KC NORMAL INCIDENCE BOTTOM LOSS MEASUREMENTS IN db

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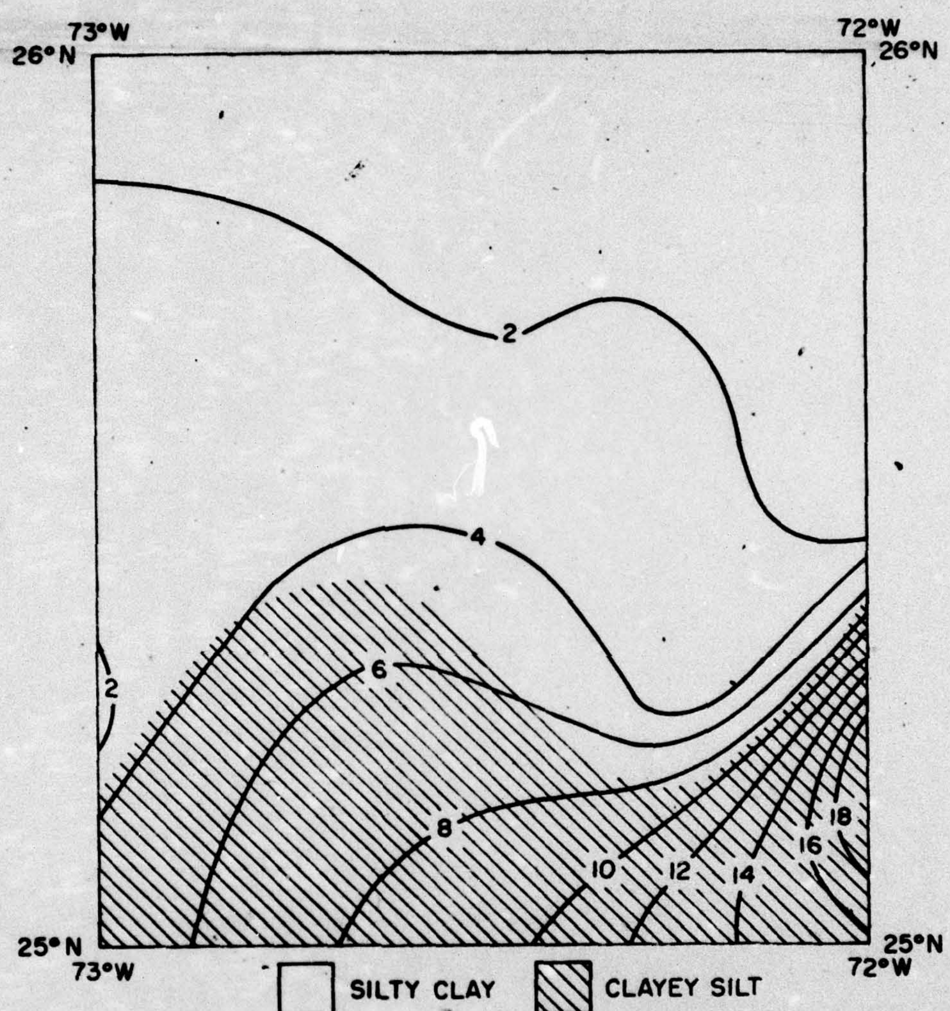

FIGURE 15 SURFACE SEDIMENT TYPE AND MEDIAN DIAMETER (MICRONS)

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"B" MAY ALL MONTHS EXCEPT FEB

BOTTOM TOPOGRAPHY

The area is situated on the southwest edge of the Hatteras Abyssal Plain where the ocean bottom is flat with a slope of less than 1:1000. Depths in this area range from 2,780 to greater than 2,900 fathoms with a seamount on the southern edge rising to a depth of 2,532 fathoms. Bottom profiles were constructed from data from the USS RHODES in 1961.

The depth profiles, which were recorded in an east-west direction, indicate slope gradients of less than 1 degree. This was determined by generalizing the slopes of several randomly selected profiles. The seamount in the vicinity of 25°07'N, 73°30'W has a slope of greater than 2 degrees. No gradients were determined in the north-south direction because the positions could not be repeated with sufficient precision.

Positions of this survey were obtained with Loran A. These positions have been corrected and adjusted to give a best fit. Position errors average 3 miles, and vary between 1 and 7 miles.

BIOLOGY

During October and November there is probably less than one whale per 1,000 square miles. Some whale sharks (to 45 feet long) and bluefin tunas (to 10 feet long) may be present, but their concentration is unknown.

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BOTTOM ACOUSTIC PROPERTIES

The cores taken in this area vary in length to a maximum of almost 9 feet and consisted of yellow brown clay interbedded with distinct thin layers of silt and, in some instances, very thin sand layers. The high porosity (70 to 80 %), low density, and fine-grained clay sediment present in this area indicates possible low velocity sediments having a low acoustic impedance. However, increased grain size and density and decreased porosity in the silt layers indicates an increase in the acoustic impedance of these layers. The presence of low velocity and low acoustic impedance sediments generally provides poor reflectivity; however, the presence of silt and sand layers in the short cores and the possible presence of additional silt and sand layers, known to occur in abyssal plain regions, indicates that this area could provide good reflectivity.

The normal incidence 12-kc reflection loss ranges from a low of 10 db to a high of 18 db and shows that anomalously high losses are not found at this high frequency and grazing angle. Assuming that reflection loss decreases with decreasing frequency and grazing angle it would appear, on the basis of 12-kc normal incidence reflection loss and from the core analysis as well as from the accessibility of the area to turbidity currents, that this area would be one of good reflectivity.

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B ALL MONTHS