82022

CRUISE REPORT

LY-711-82

by Deborah R. Hutchinson

VESSEL: USNS LYNCH

CRUISE NUMBER: LY-711-82

PROJECT: MID-ATLANTIC (9840-01830)

LOCATION: LONG ISLAND PLATFORM

DATES: 8-19 July, 1982

PORTS: NEW LONDON

SCIENTIFIC CREW:

Deborah Hutchinson	USGS, Chief Scientist
Greg Miller	USGS, DFS V tech
Dave Nichols	USGS, DFS V tech
Dave Mason	USGS, Guns/Compressor
Ann Swift	USGS, Watch
Arnie Tanner	USGS, Watch
Robin Bell	USGS, Watch
Ralph Austin	NUSC, Liason (Naval Underwater Systems Center)

OBJECTIVES:

(I) To collect high-resolution seismic profiles at the Navy test site to map the shallow stratigraphy and velocity structure.

(II) To measure the signature of three seismic sources (40-in^3 airgun, 80-in^3 watergun, 15-in^3 watergun) frequently used with the multichannel seismic system.

(III) To expand the multichannel seismic grid of the Long Island Platform in order to map basement and subbasement structures.

(IV) To trace the northern and southern extents of the New York Bight fault and to determine the youngest reflector which is offset.

SCIENTIFIC EQUIPMENT

I. NAVIGATION

LORAN C Northstar 6000 with interface box to Silent 700
Silent 700 ASR with Cassette Deck
Magnavox MX-1107 Dual-Channel Satellite Navigator with paper hard copy.

II. MULTICHANNEL SEISMICS

a) Streamer
12-Channel USGS Fairfield Industries 120 m streamer

b) Sources
80-in^3 watergun borrowed fron URI, 15-in^3 watergun, 40-in^3 airgun

c) Acquisition (DFS V)
DFS V control module
DFS V analog module
2 Lambda regulated power supply boxes
2 DFS V Texas Instruments 9T tape drives
Mountain Systems extended header interface box
Fairfield Industries interface box
SIE, Inc. Oscillograph Model R-10A
Syntron, Inc. Command Console CC-801
True Time Model 468-DC Satellite Clock
BNC Model 7010 Digital Delay Cenator Box

d) Graphical Display
Krohn-nite Model 3550 filter
EPC 3200 graphic recorder

III. SIGNATURE TESTS
Aquatronics calibrated sonobuoy
Telseis STR 70-2F Aquatronics sonobuoy receiver
DFS V acquisiton (see above)

IV. MINISPARKER SYSTEM
Teledyne Model 253 Sparker
Teledyne 200-element streamer
Innerspace Technology Inc. Model 202 Premp/Filter
Krohn-hite Model 3550 filter
H/P Analog tapes recorder
ECP Model 4100 graphic recorder

V. ECHO SOUNDING
ORE Model 140 Transceiver (3.5 kHz)
Raytheon UGR graphic recorder
Ship's hull transducer

TOTAL KM OF DATA:	1509 km
12 Channel multichannel	1098
Minisparker	411
3.5 kHz	1509
Magnetometer	37

TOTAL DAYS AT SEA 11.1 days
8 July/1800z thru 19 July/2030z

ABBREVIATED CHRONOLOGICAL LOG

8 July 1982/1800z	Depart New London, NUSC dock

9 July 1982/0837z	Arrive Signature test area
0925z	Recover sonobuoy to redo connector and untangle hydrophone wire
1610z	Commence signature tests
2040z	End signature tests, head to NUSC survey area.
10 July 1982/0131z	Deploy minisparker
0421z	Begin minisparker survey
0635z	Break Line A to avoid traffic
0705z	Continue Line A
11 July 1982/0245z	End minisparker survey
0456z	Begin multichannel survey in NUSC area (Line 1)
1043z	End multichannel survey, NUSC area (Line 7)
1056z	Begin L.I. Platform multichannel lines (Line 8)
14 July 1982/1111z	Shut down multichannel lines due to compressor leak
1728z	Commence minisparker line during compressor repair (Line 10)
2003z	End minisparker line, steam to start of next multichannel line (Line 11)
15 July 1982/0121z	Resume multichannel lines, compressor repaired (Line 11)
16 July 1982/1719z	End multichannel lines (Line 16)
1828z	Commence minisparker survey in New York Bight area (Line 17)
17 July 1982/0200z	Minisparker recovered to repair connector
0244z	Connector repaired
1725z	End minisparker survey (Line 27)
1811z	Commence multichannel lines in

	New York Bight (Line 28)
2208z	Problems with 15 in^3 watergun
18 July 1982/0043z	Deploy 40 in^3 airgun
0758z	Begin 80 in^3 watergun line along Long Island (Line 31)
19 July 1982/1230z	End line 31, recover gear and steam to New London
2025z	Dock at New London

TABULATED DATA

FIGURES

COMMENTS

I. SCIENTIFIC OBJECTIVES

Cruise LY-711-82 was successful in completion the objectives initially laid out. Some of this success is due to the remarkably calm weather, but most of it can be attributed to both the scientific crew, particularly the technicians, for their efforts to keep the scientific equipment working and to the ship's crew for their cooperation and helpfulness. Tracklines for the cruise are shown in figures 1,2, and 3. A summary of the major scientific results follows.

(i) Shallow stratigraphy in NUSC area

Minisparker records show that the NUSC survey area (figs 1, 2) can be divided into 3 areas of differing shallow structure. The northern third is dominated by a wedge of S-SW dipping reflectors that shallows toward the N-NE from ~100 milliseconds (ms) to ~35 ms beneath the water bottom (figure 4). The central third is dominated by a subhorizontal reflector ~40-50 ms beneath the water bottom. The southern third is characterized by many unconformities and pinchouts near the water bottom. A strong and undulating reflector at 300 ms subbottom in the southern third may continue northeastward to join the unconformity at the top of the wedge of prograding reflectors. The minisparker record is clearest to ~100 ms subbottom, at which depth the first multiple occurs. Unfortunately, the length of the outgoing signal (~25 ms) reduces the resolution on the shallowmost reflectors.

(ii) Shallow velocity structure and deeper stratigraphy in the NUSC area

The 15-in^3 and 80-in^3 watergun profiles recorded on the multichannel system require processing to determine the shallow velocity structure. The analog records show some of the shallower features seen on the minisparker profiles, but the deeper stratigraphy is obscured by multiple interference. The processed data should reduce this multiple interference.

(iii) Signature Tests

We sucessfully recorded far-field signatures for the 15-in^3 and 80-in^3 waterguns and the 40-in^3 airgun with waveshaper chamber. These were recorded at .5 ms sampling interval and a 1s record length. Each source was recorded 18-512 Hz and out-512 Hz. Sample records from the oscillograph monitor show the differences in source length and ringiness (fig. 5). The sonobuoy configuration and towing geometry are shown in fig. 6.

(iv) L.I. Platform Stratigraphy and structure

The unprocessed 80-in^3 watergun records show detail in the sedimentary and basement surfaces that should improve with processing. The basement surface has considerable small scale relief (10-20 m). Subbasement reflectors can be identified in the New York Bight and near the intersection of USGS lines 9 and 36. Both locations of subbottom reflectors have been identified in other data sets and are probably related to rift-graben formation. The Lynch lines should provide enough profiles to map these horizons.

(v) Well Ties

The seismic profiles from this cruise come within about 1 km of the Island Beach (N.J.) and Fire Island (N.Y.) wells which penetrate the Coastal Plain section and basement. The profiles also cross AMCOR site 6011 and the Ambrose Light well in the New York Bight (fig. 1). These four well ties should improve our understanding of the ages of mapped reflectors.

(vi) New York Bight Fault

One of the significant discoveries about the New York Bight Fault is that it extends north towards Long Island and may extend beneath the Island. Our results show the fault is dextrally offset at its northern end, which explains why our data were inconclusive about the northern extent of the trace based on last years Long Island Platform cruise (GY-81-14A). It appears that the fault extends southward from our estimate last year, although offset also decreases southward, making the fault more difficult to identify.

Offset does not appear to affect the glacial section. The minisparker record indicates shallow subbottom reflectors which are offset are probably part of the Coastal Plain section. Unfortunately, the minisparker resolution of the glacial section is not good enough to make this conclusion final.

II. EQUIPMENT PERFORMANCE

The equipment performed well on LY-711-82 with minor exception. The DFS V acquisition system and the 80-in^3 watergun perfomed flawlessly. The most critical problem arose from a hairline crack in a high pressure hose fitting on the compressor. Fortunately, the ship's engineers willingly offered their machine shop and expertise to help Dave Mason complete the repair. Total down time was about 14 hours. Some of the other problems were:

(i) Loran C cassette tape:

The Silent 700 system failed on the second day of the cruise. This was a major problem for navigation along the minisparker lines, since it meant no tape or hardcopy of the fixes. Navigation along the minisparker profiles was by manually recorded TD's. It was less of a problem on the multichannel lines, since the DFS V system records navigation in the extended header.

(ii) Minisparker:

We suffered a continuous problem of random misfiring of the minisparker. This was somewhat improved by keeping the lab air conditioning set high. Whether the system is old and tired, or does not like summer humidity, or both, was never fully resolved. One of the two connectors on the junction of the deck cable with the sleeve cracked and severed the lead in wire, causing a 45 min down period. The NAVOCEANO science technician aboard the ship had a replacement connector which we used.

(iii) 15 in^3 watergun:

This was rebuilt once during line 3 and again during line 29. Its second failure appeared to be a solenoid problem, which, since we did not have a spare solenoid, rendered the gun useless for the rest of the cruise.

(iv) Towing Harness for 80 in^3 watergun.

Our original towing configuration of a large Norweigian float attached to the shackle above the exit ports failed twice; the second time the polypropylene line frayed in about 20 minutes. A more satisfactory towing configuration utilized a fiberglass flotation sled with a welded metal frame, from which the gun hung by two specified lengths of chain. A large Norweigian float attached to the front of the sled assured flotation (fig. 7).

III. OTHER

(i) USGS - NUSC Cooperative programs:

This cruise was a "cruise of opportunity" in that NUSC provided the ship time. We profiled in the NUSC test site (fig. 1) in order to supply NUSC information on the stratigraphy and velocity structure in the uppermost 100-200 m of sediment. I heartly recommend future joint efforts based on the success of this effort. Jim Gallagher was our NUSC contact.

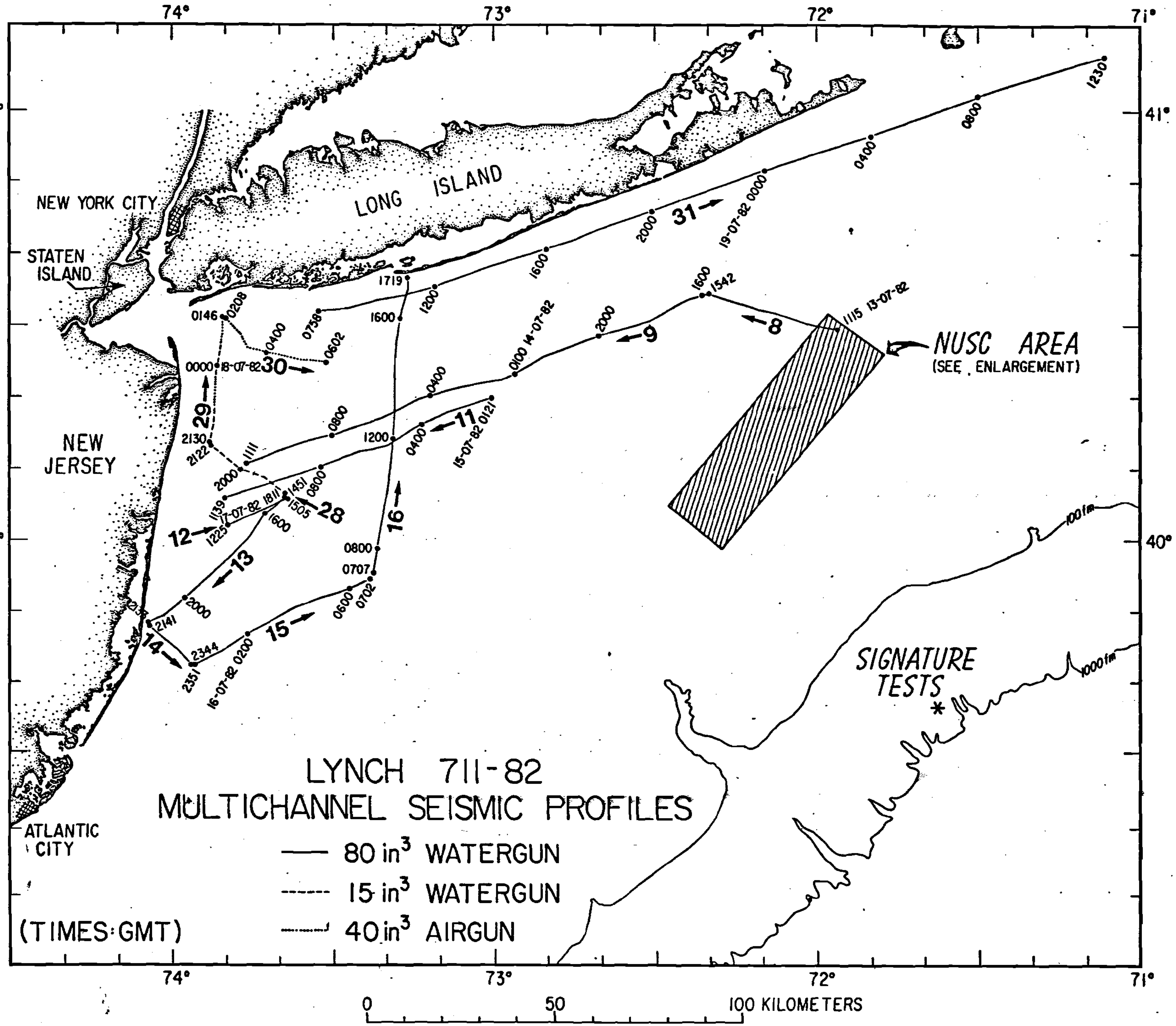

LYNCH 711-82
MULTICHANNEL SEISMIC PROFILES
80 in³ WATERGUN
15 in³ WATERGUN
40 in³ AIRGUN
(TIMES: GMT)
NEW YORK CITY
STATEN ISLAND
LONG ISLAND
NEW JERSEY
ATLANTIC CITY
NUSC AREA
(SEE ENLARGEMENT)
SIGNATURE TESTS
100 fm
1000 fm
74°
73°
72°
71°
41°
40°
0
50
100 KILOMETERS

FIGURE 1

NUSC TEST SITE PROFILES

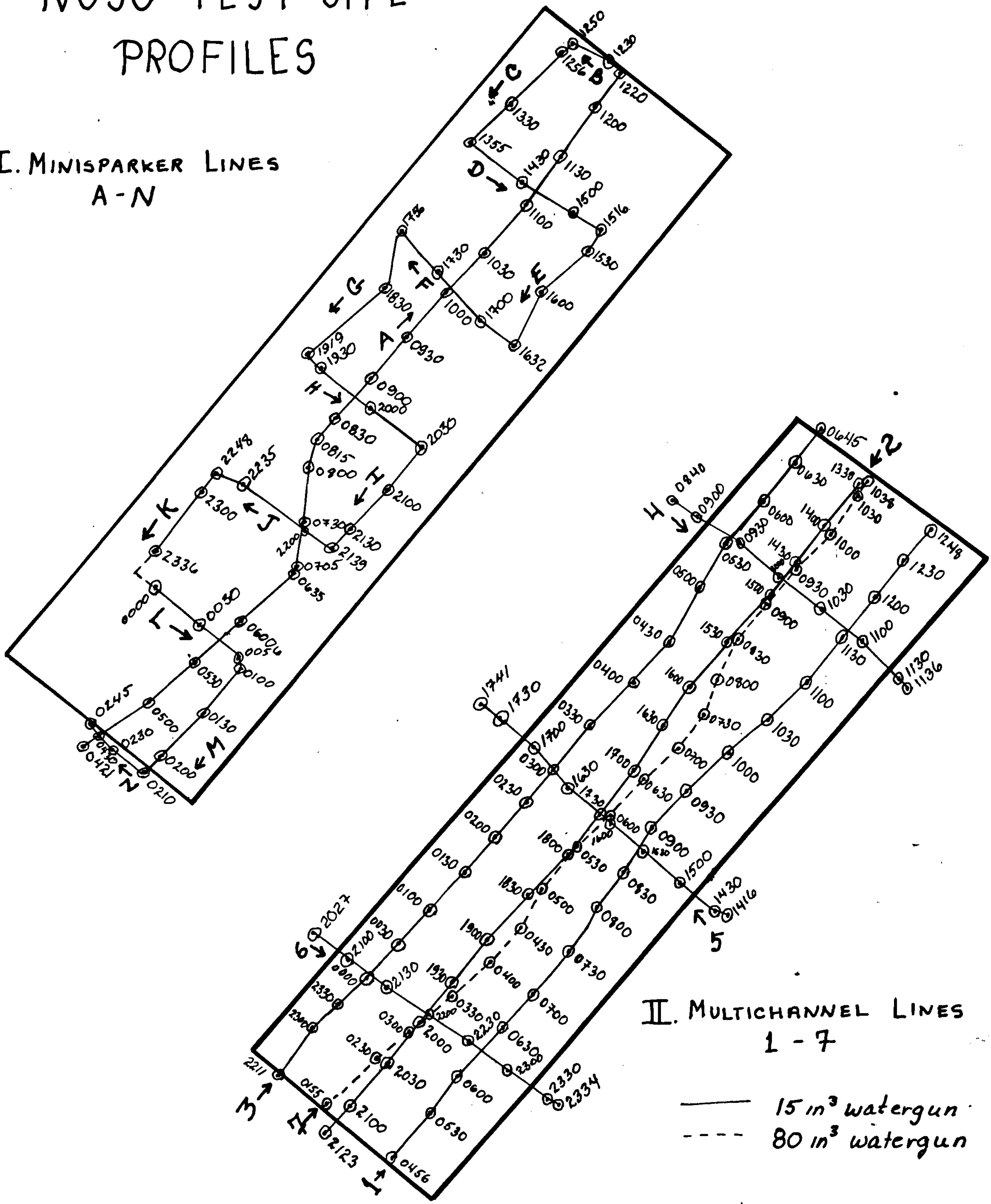


FIGURE 2

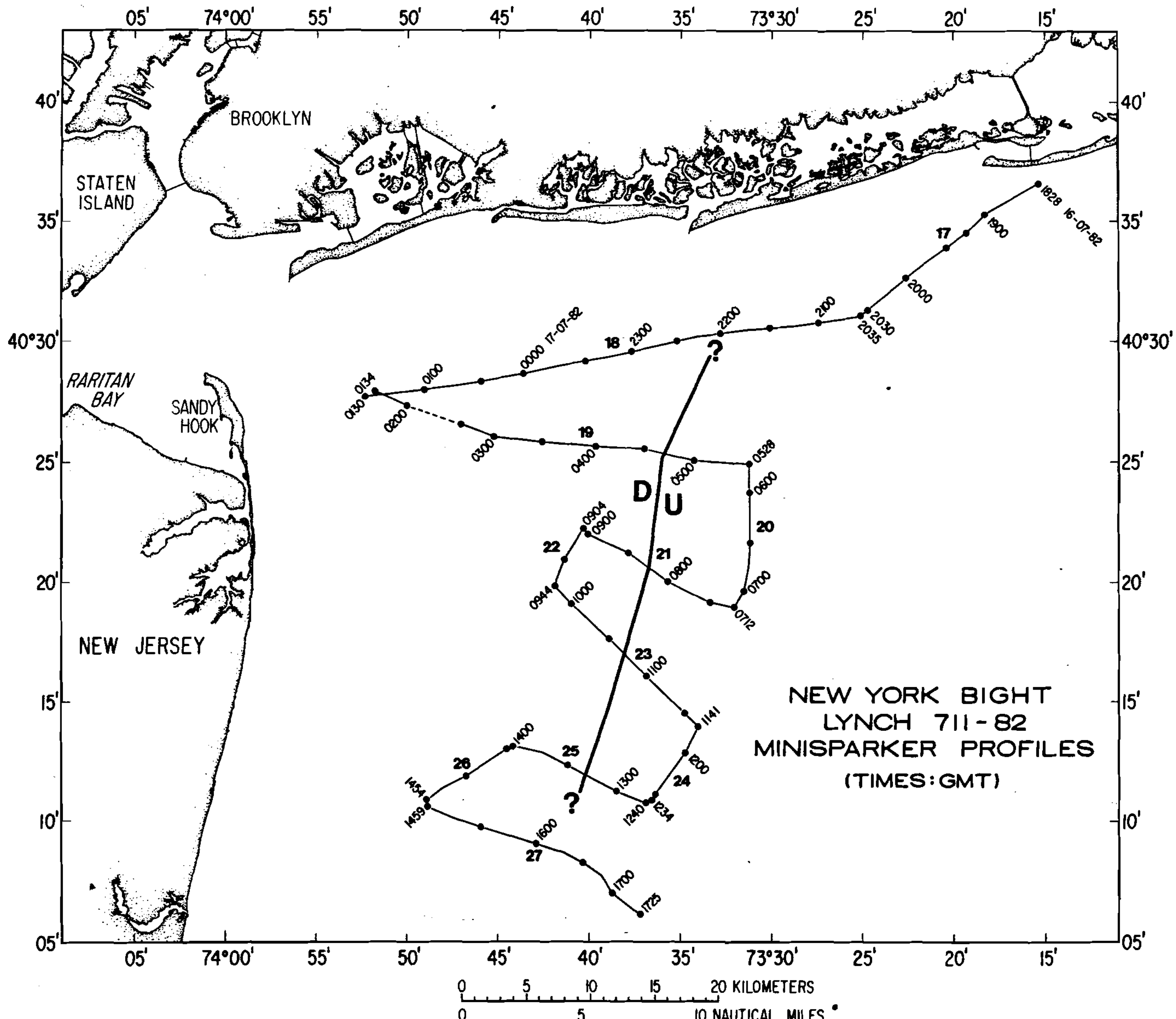

NEW YORK BIGHT
LYNCH 711-82
MINISPARKER PROFILES
(TIMES: GMT)
BROOKLYN
STATEN ISLAND
RARITAN BAY
SANDY HOOK
NEW JERSEY
05'
74°00'
55'
50'
45'
40'
35'
73°30'
25'
20'
15'
40°30'
10'
D
U
?
17
18
19
20
21
22
23
24
25
26
27
0 5 10 15 20 KILOMETERS
0 5 10 NAUTICAL MILES

FIGURE 3

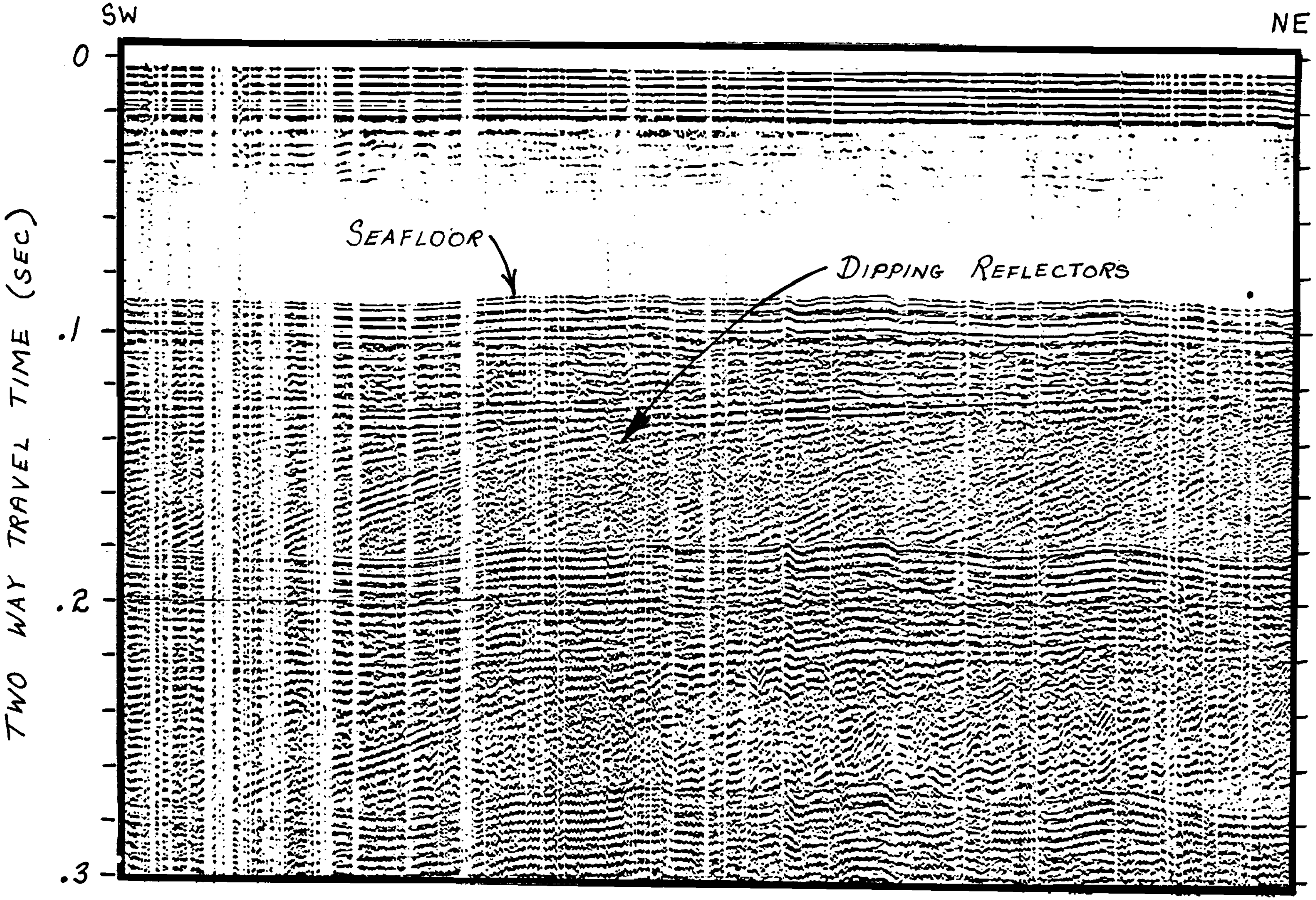

SW
NE
0
.1
.2
.3
TWO WAY TRAVEL TIME (SEC)
SEAFLOOR
DIPPING REFLECTORS

FIGURE 4

SOURCE SIGNATURES

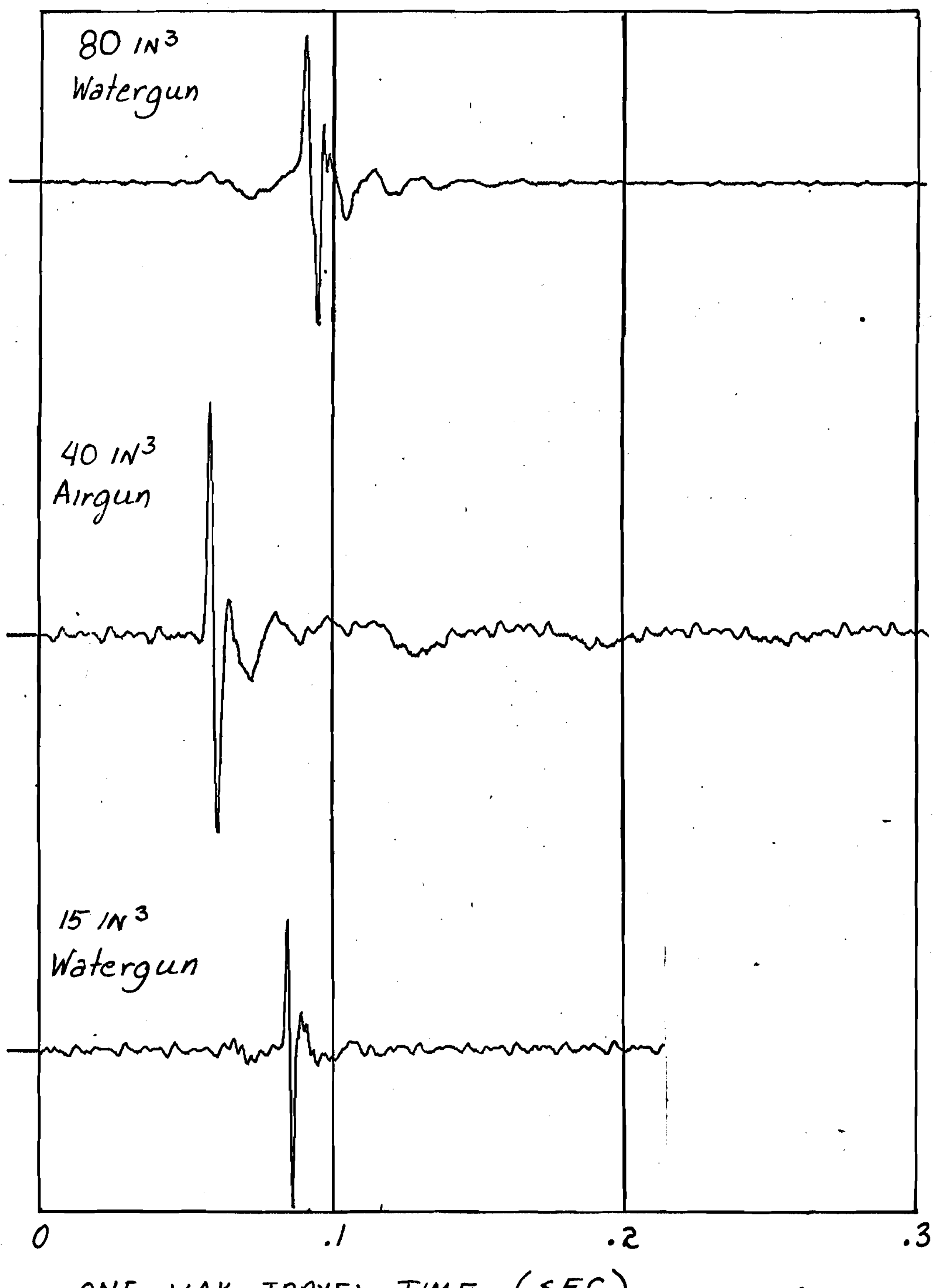
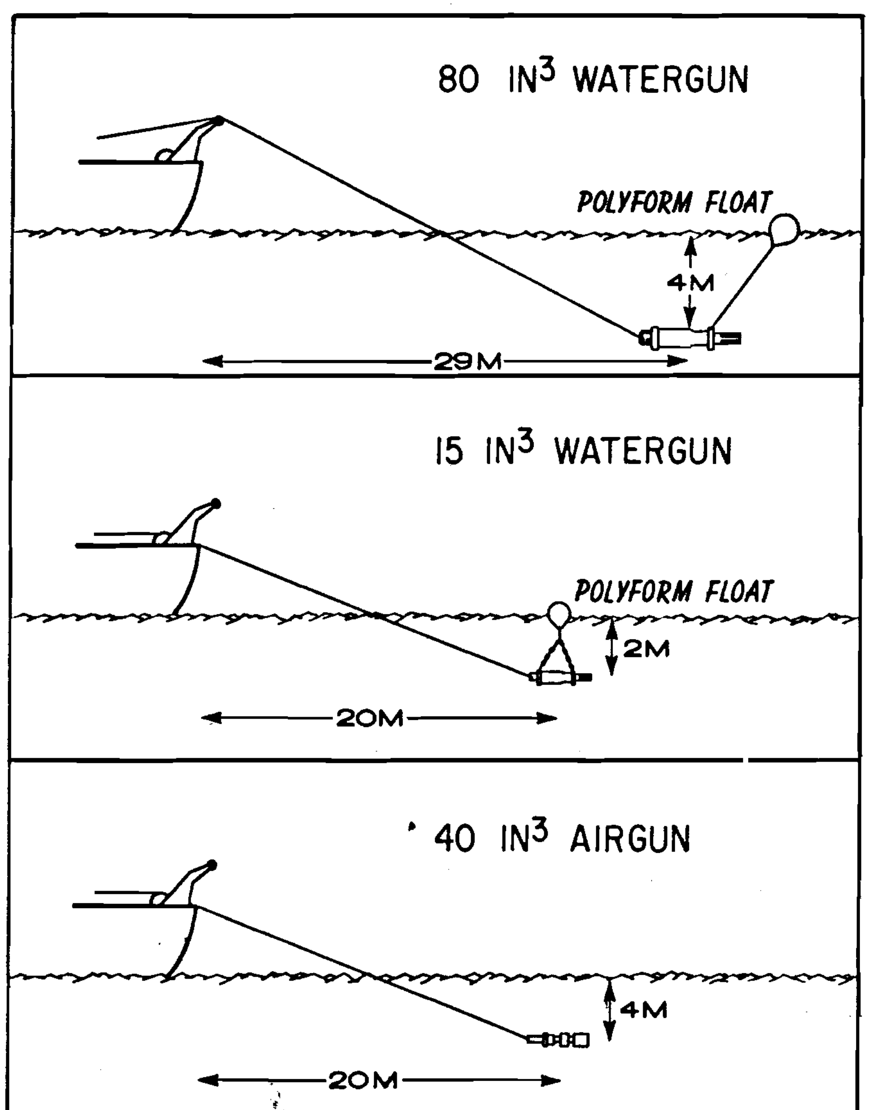
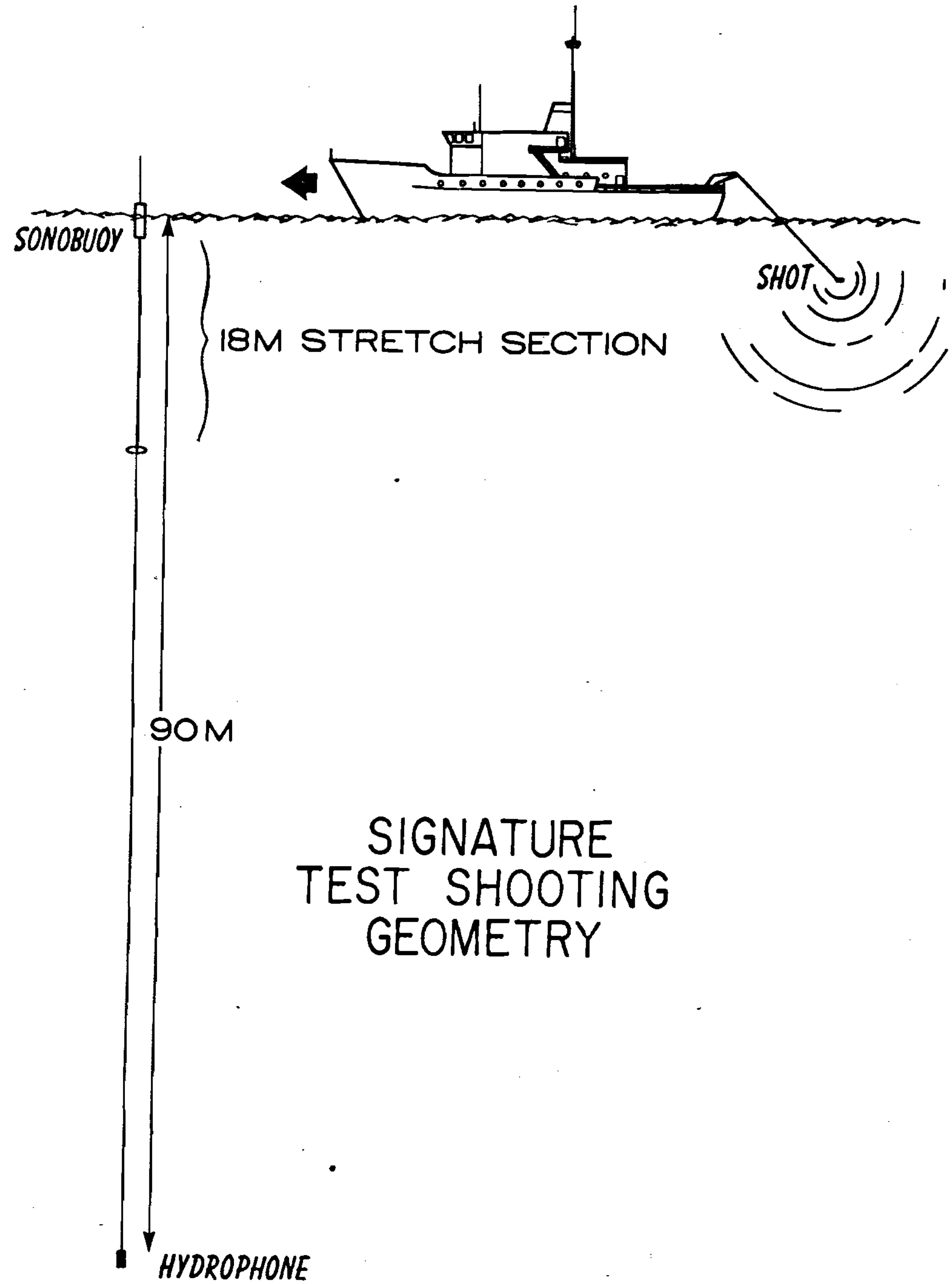


FIGURE 5

SIGNATURE TESTS

GUN TOWING GEOMETRY





SIGNATURE TEST SHOOTING GEOMETRY

FIGURE 6

80 IN^3 WATERGUN TOWING HARNESS

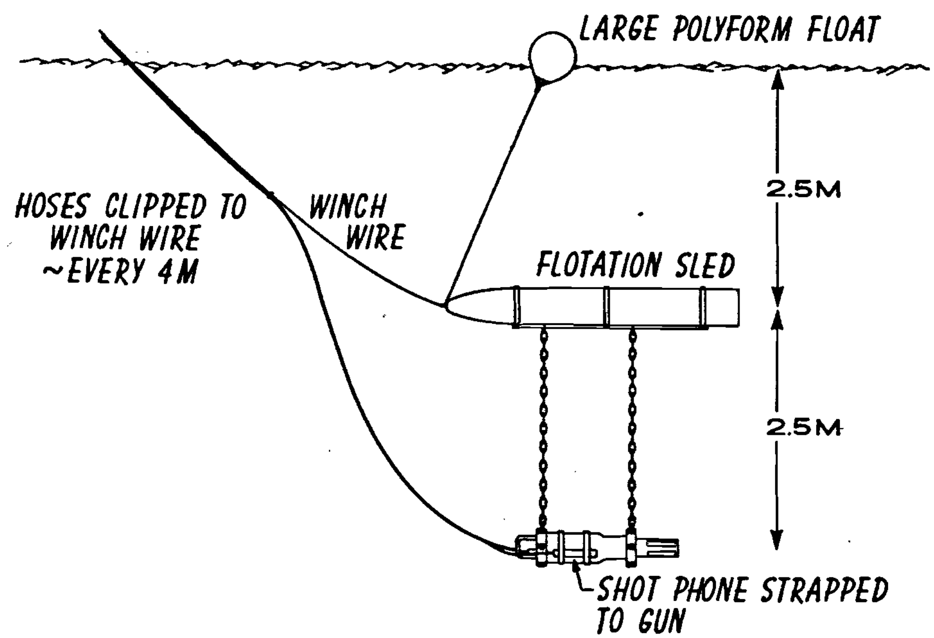


FIGURE 7