H10618

NOAA FORM 76-35A

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SERVICE

DESCRIPTIVE REPORT

Type of Survey ... Multibeam/Side Scan

Field No. ... B

Registry No. ... H-10618

LOCALITY

State ... New York

General Locality ... Western Long Island Sound

Sublocality ... 2 Miles NW of Matinecock Point to Hart Island

19 95

CHIEF OF PARTY
Walter Simmons (SAIC)

LIBRARY & ARCHIVES

DATE ... October 20, 1997

NOAA FORM 77-28 (11-72)	U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NO. H-10618
	HYDROGRAPHIC TITLE SHEET	
INSTRUCTIONS - The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.		FIELD NO. B

State NEW YORK

General locality WESTERN LONG ISLAND SOUND

Locality 2 MILES NW OF MATINECOCK POINT TO HART ISLAND

JUNE 14 - JUNE 29, 1995
Nov. 4 - Nov 12, 1995
~~JUNE - JULY 1995~~

Scale 1:10,000 Date of survey ~~NOVEMBER 1995~~

Instructions dated September 30, 1994 as amended Project No. OPR-B389-CN

Vessel M/V ATLANTIC SURVEYOR

Chief of party WALTER SIMMONS

Surveyed by J. Miller; S. Ferguson; A. Gagnon; D. Allen; J. Kiernan; P. Selvetti; R. Watson; L. Gates; E. DeAngelo; J. Case; A. Maddock; S. Cook; R. Franchuck; T. Hamel; D. Reifsteck

Soundings taken by (echo sounder) hand lead, pole MULTIBEAM RESON SEABAT 9002

Graphic record scaled by SURVEY PERSONNEL

Graphic record checked by SURVEY PERSONNEL

~~Protracted~~ Evaluation by GARY C. NELSON Automated plot by HP650 ~~J. Kiernan; J. Case~~

Verification by D. Reifsteck

Soundings in fathoms (meters) feet at MLW (MLLW) and decimeters

REMARKS:* Contract # 50-DGNC-4-00035
Contractor Name: Science Applications International Corp.;
221 Third Street; Newport, R. I. 02840;
Subcontractor Name: Ocean Surveys Inc.;
91 Shefield Street; Old Saybrook; CT 06475
SUPPLEMENTAL REPORTS ARE FILED WITH THE HYDROGRAPHIC DATA
Smooth Sheet Production Date/Time 05/14/96 14:55
TIME REFERENCE: UTC

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* Marginal notes and revisions to the Descriptive Report were generated at the Pacific Hydrographic Branch during review of the survey work.

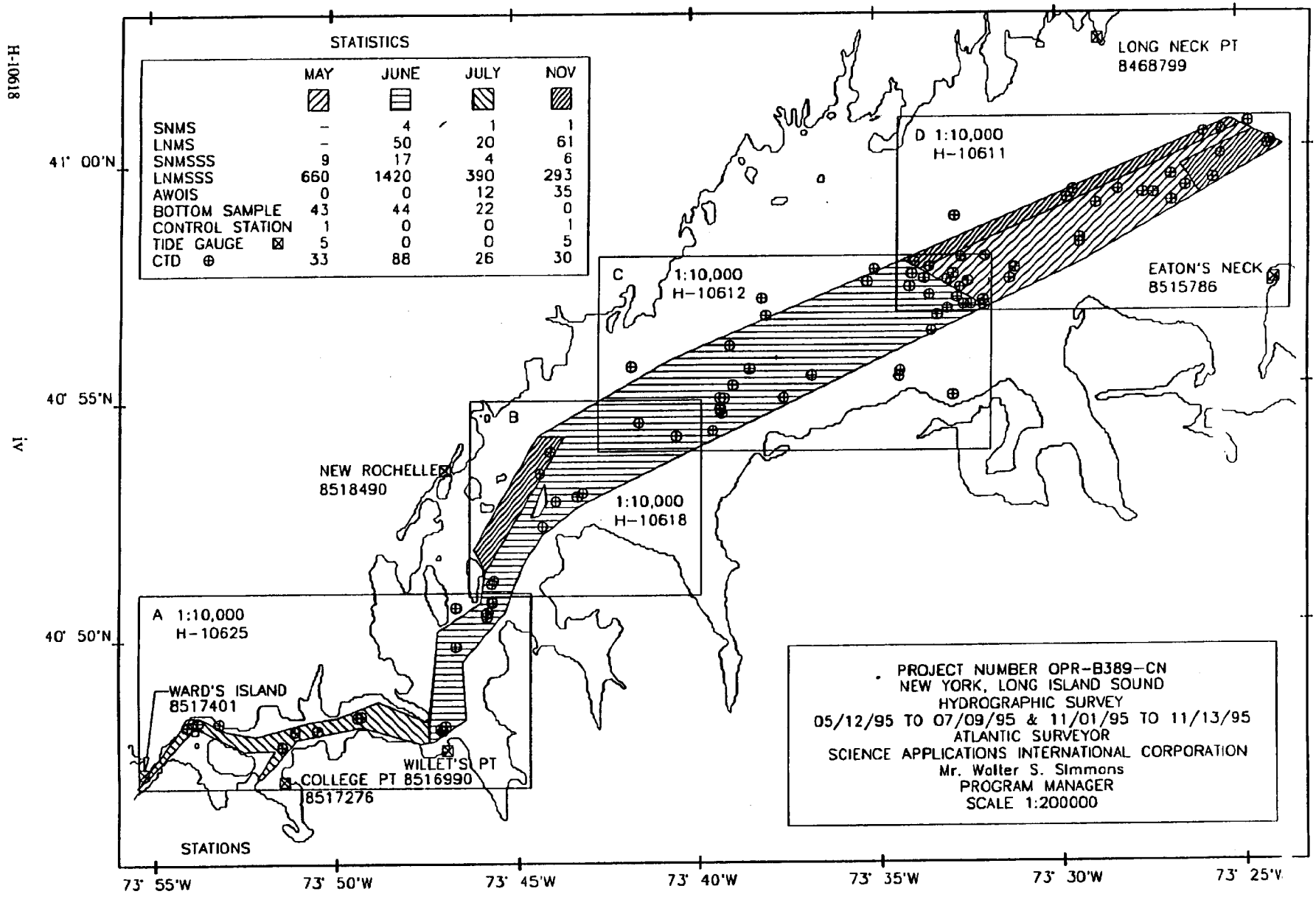
4/2/97 SJV

INDEX OF SHEETS

The Progress Sketch on the following page indicates:

1. Smooth Sheet Layout
2. Surveys and Registry Numbers
3. Tide Gauge Locations
4. CTD (Sound Velocity) Stations
5. Work Accomplished by Month

PROGRESS SKETCH



H-10618

IV

Science Applications International Corporation (SAIC) warrants only that the survey data acquired by SAIC and delivered to NOAA under Contract 50-DGNC-4-00035 reflect the state of the sea floor in existence on the day and at the time the survey was conducted.

Page

Descriptive Report to Accompany
Hydrographic Survey H-10618

A. PROJECT ✓

Project number: OPR-B389-CN

Dates of instructions:	
30 September 1994	Original 50-DGNC-4-00035
21 March 1995	Modification #1
03 April 1995	Modification #2
06 June 1995	Modification #3
23 June 1995	Project limit definition, Execution Rocks
10 July 1995	Modification #4
07 September 1995	Modification #5
07 November 1995	56-DGNC-6-13003

Sheet letter: B
Registry number: H-10618
Purpose: Obtain 100% multibeam sonar coverage and 200% side scan sonar coverage within the survey area limits

B. AREA SURVEYED ✓

General locality: New York, Western Long Island Sound, 2 miles NW of Matinecock Point to Hart Island, bounded approximately by the following positions:

Lat.	Long.
40° 50.85' N	073° 45.16' W
40° 50.88' N	073° 45.90' W
40° 51.37' N	073° 45.78' W
40° 51.83' N	073° 46.12' W
40° 54.17' N	073° 44.43' W
40° 54.90' N	073° 42.56' W
40° 53.85' N	073° 40.09' W
40° 52.72' N	073° 43.23' W
40° 52.12' N	073° 44.28' W
40° 51.47' N	073° 44.83' W

with exclusion zones around Execution Rocks and the rocks near Pea Island.

Dates of data acquisition:
14 June (day 165) through 21 June 1995 (day 172)
23 June (day 174) through 26 June 1995 (day 177)
29 June 1995 (day 180)
04 November (day 308) through 05 November 1995 (day 309)
09 November 1995 (day 313)
11 November (day 315) through 12 November 1995 (day 316)

C. SURVEY VESSELS ✓

The M/V ATLANTIC SURVEYOR (ID# D582365) was the platform for all multibeam sonar, side scan sonar, sound velocity and bottom sampling operations. Data acquisition and post processing systems were mounted in CONEX containers which were welded in place on the aft deck. The gyro compass was mounted in the pilot house, and the TSS335B motion sensor was mounted on the aft end of the deck house just above the main deck.

Multibeam sounder transducers were mounted back to back on a plate at the bottom of a stainless steel pipe at the starboard waist. Bearing plates were welded to the main deck, and a stabilizing alignment bracket was welded to the side of the boat. The primary GPS navigation antenna was mounted directly above the transducer pole and the reference GPS antenna was mounted just inboard on the same mount.

The vessel layout is depicted in Figures C-1, C-2, C-3, and C-4, the coordinate systems in use are shown in Figure C-5, and the vessel offsets are shown in Table C-1 and C-2. The Reference Point for the entire system is located on the transducer pole at the water line. For surveys conducted from May through July 1995, the transducer depth was recorded as 2.20 meters, therefore the pole was marked with the Reference Point at 2.20 meters. During survey operations conducted from September through November, 1995, the transducer depth was recorded as 2.30 meters and the pole was marked accordingly. In all cases Lead Line comparisons confirmed the recorded transducer depth.

As discussed in the Phase IIA Summary Report, the IHSS, the RESON, and the TSS-335B all have different coordinate systems, and therefore care must be taken when inputting correctors to the system. The IHSS considers "z" to be positive down, while both the RESON and TSS consider "z" positive up. Both the IHSS and TSS consider "x" positive forward, the RESON considers "x" as positive athwartships to starboard. IHSS considers "y" positive athwartships to starboard, the TSS considers "y" positive athwartships to port and the RESON considers "y" as positive forward.

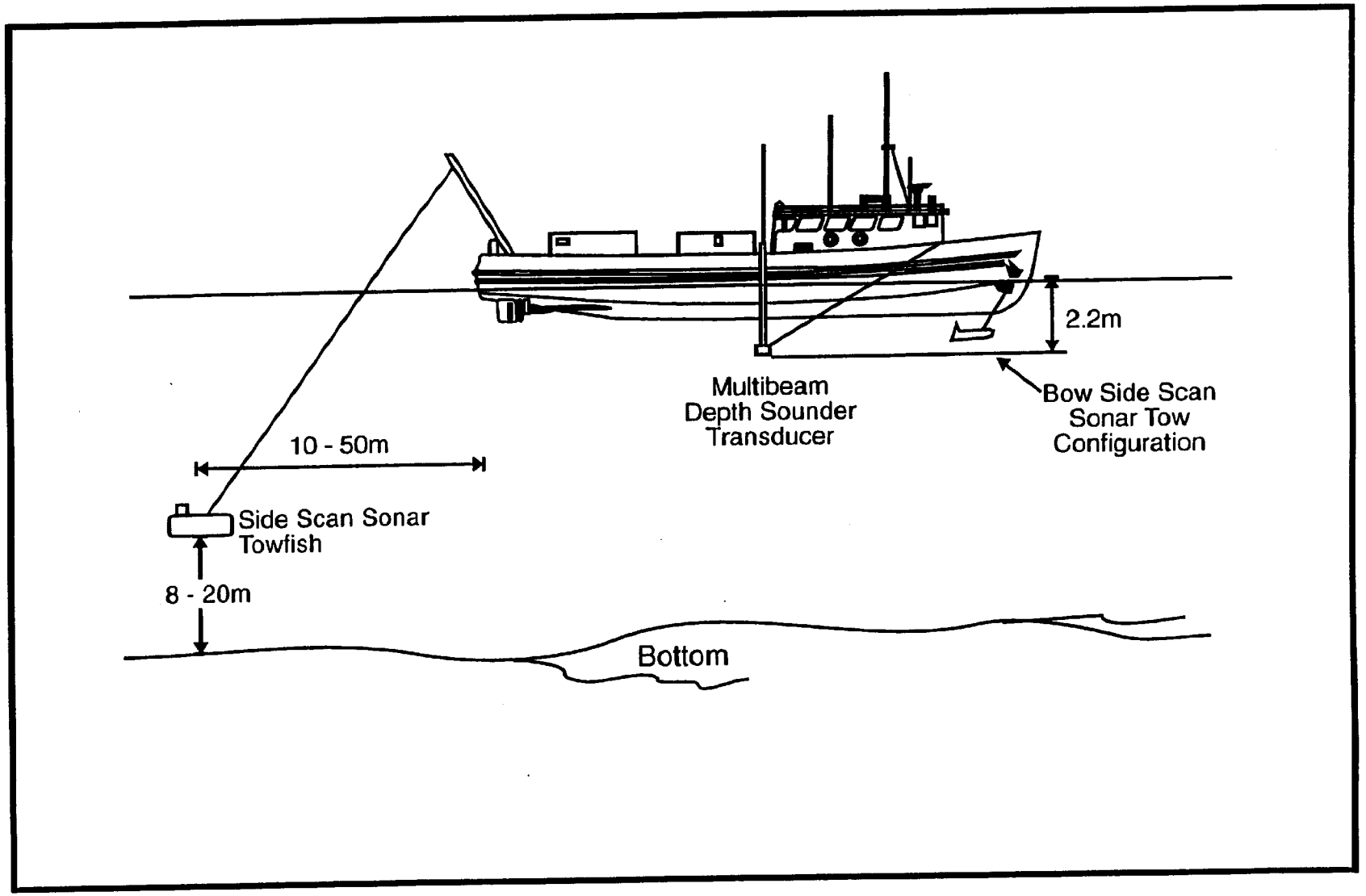


Figure C-1. Configuration of M/V Atlantic Surveyor During Survey Operations (May 14 - July 9, 1995)

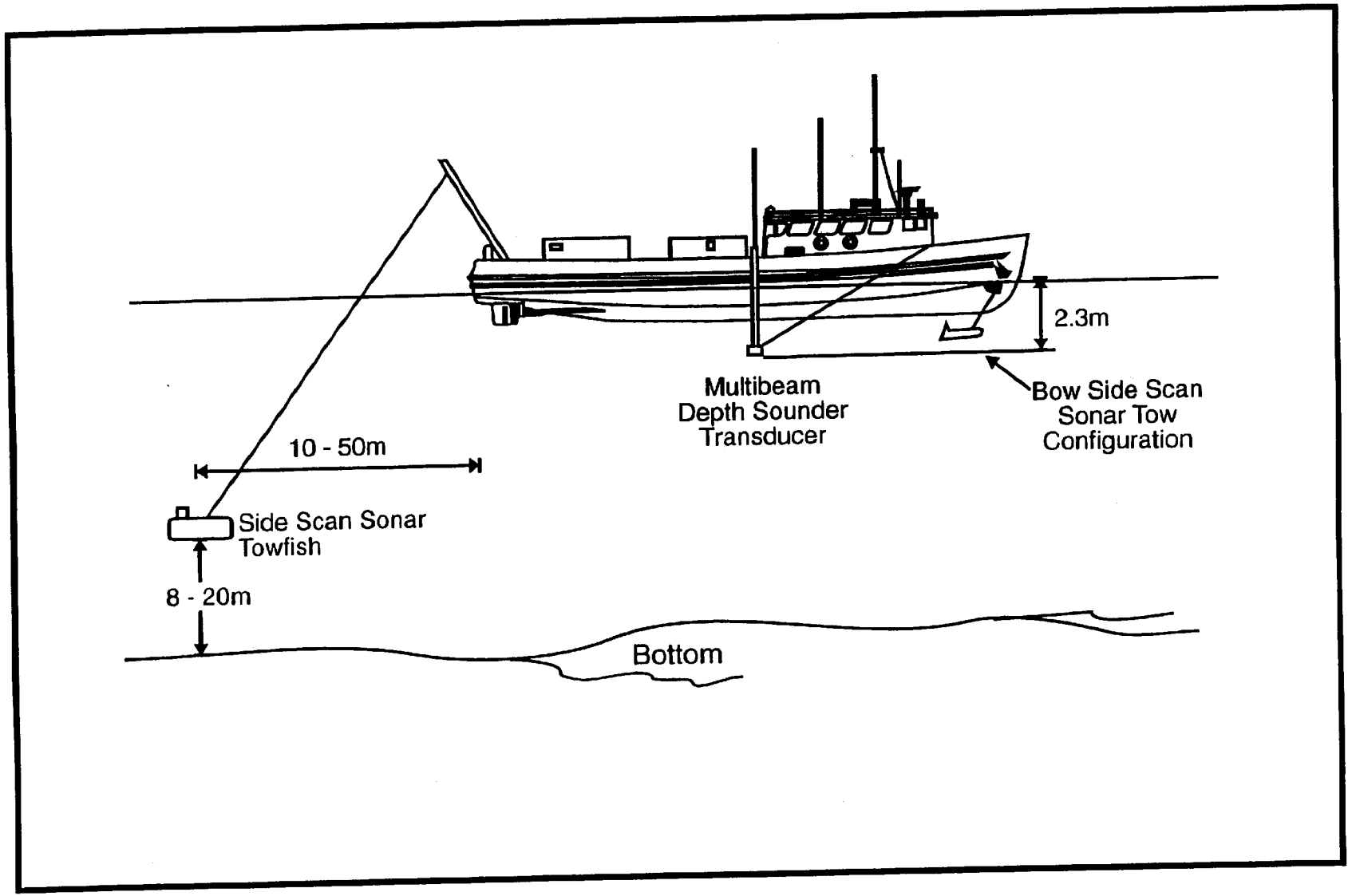


Figure C-2. Configuration of M/V Atlantic Surveyor During Survey Operations (Sept. 19 - Nov. 13, 1995)

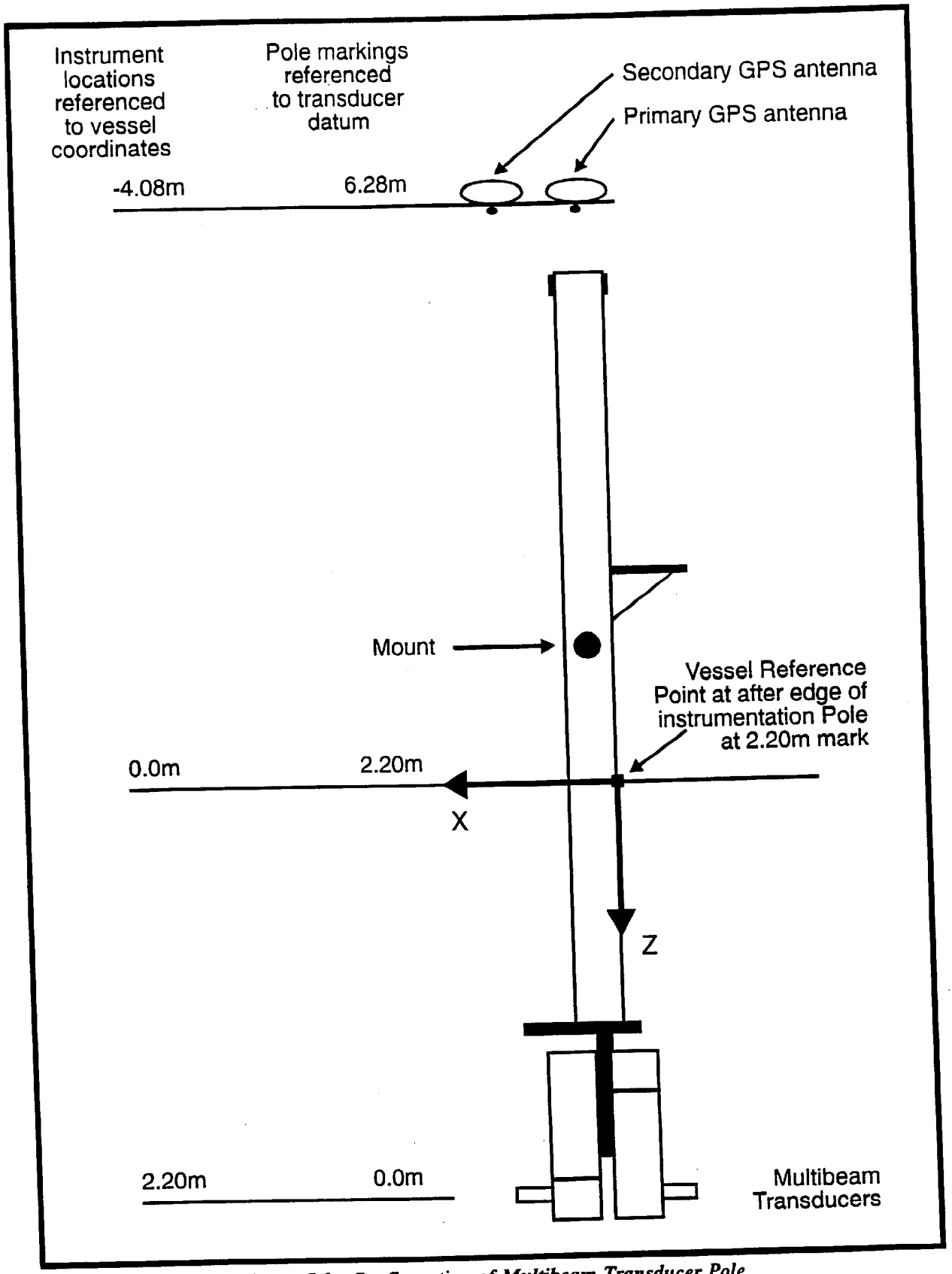


Figure C-3. Configuration of Multibeam Transducer Pole (May 14 - July 9, 1995)

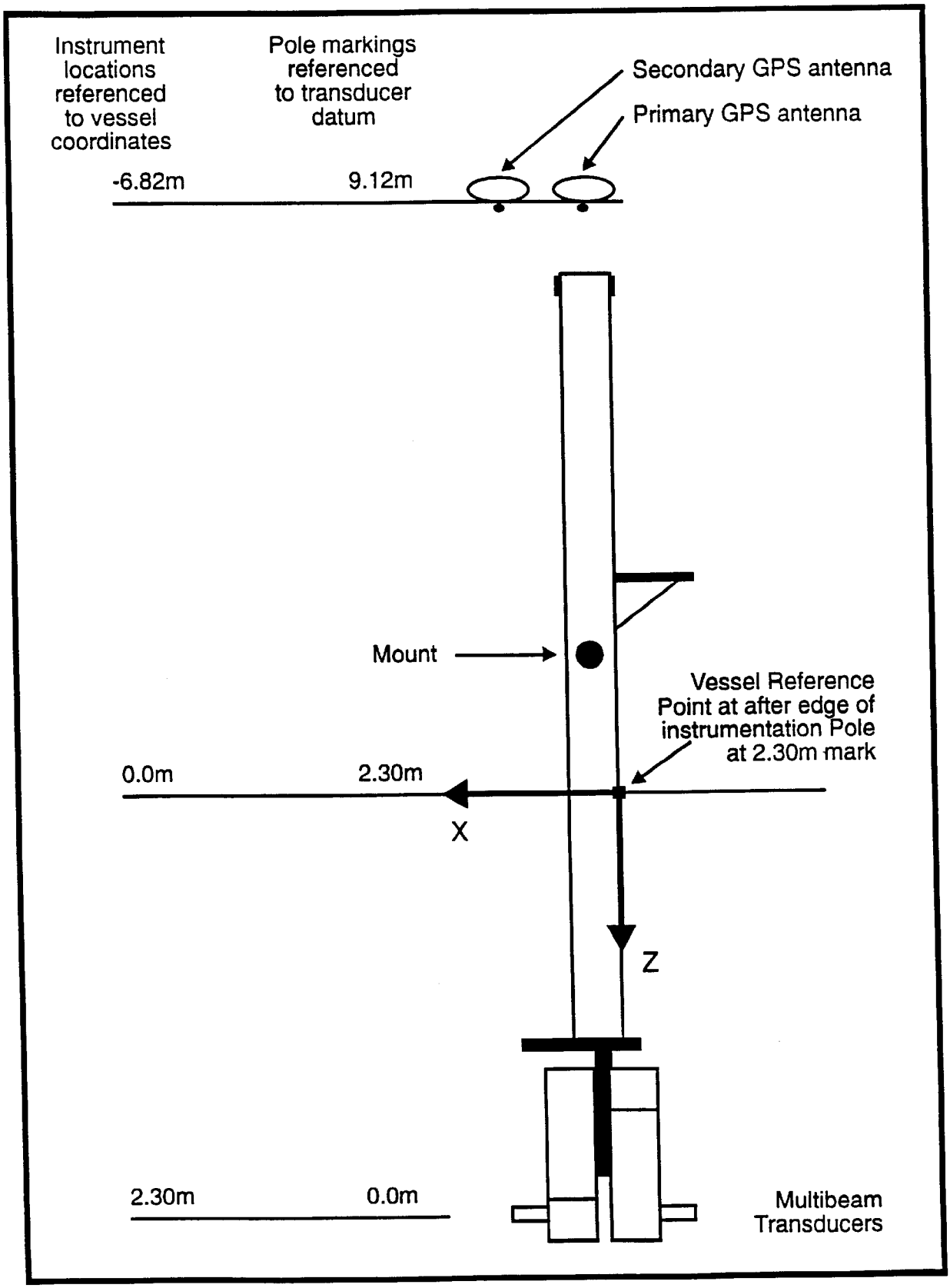


Figure C-4. Configuration of Multibeam Transducer Pole (Oct. 3 - Nov. 13, 1995)

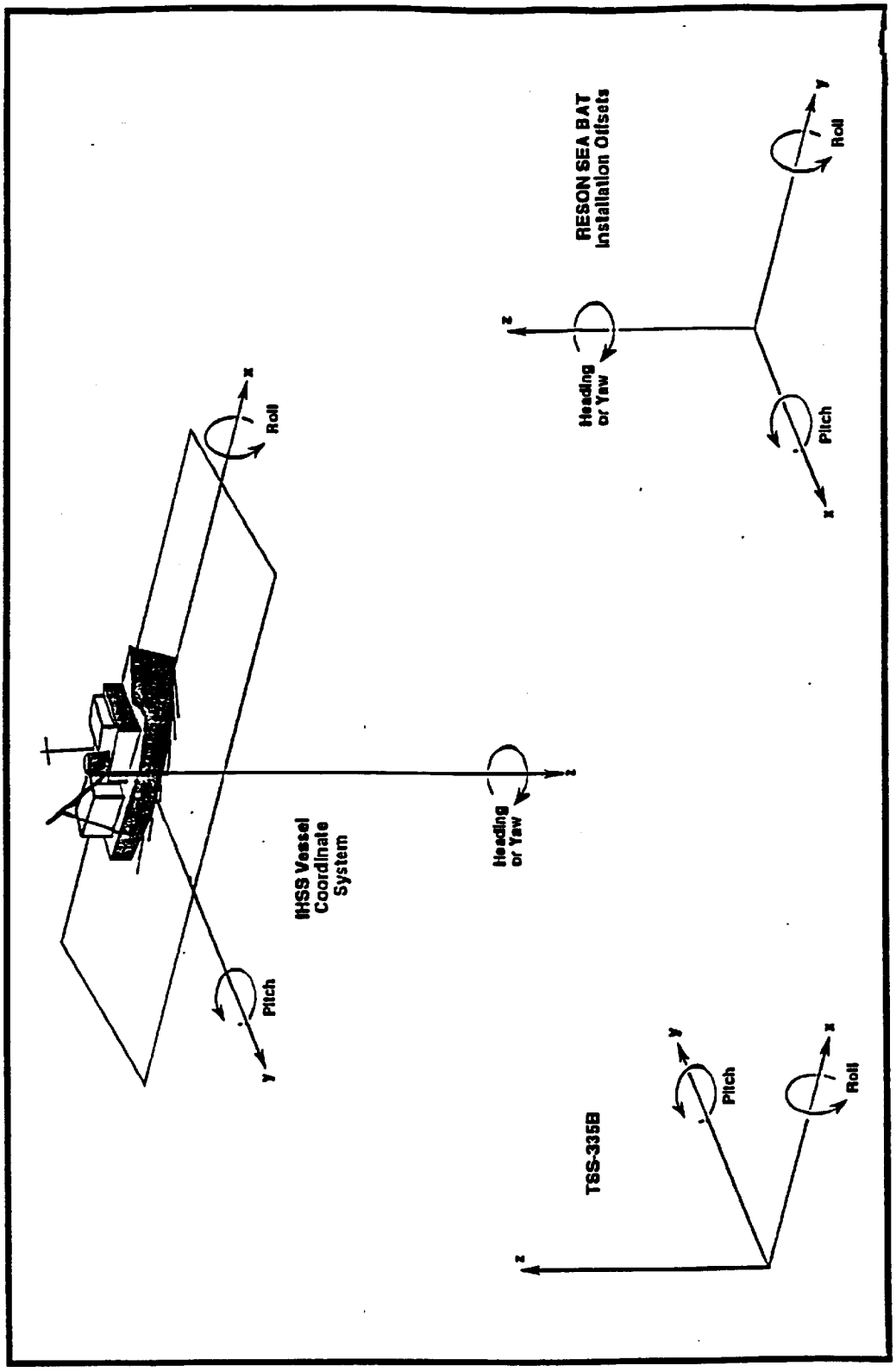


Figure C-5. Relevant IHSS Instrument Coordinate Systems

Table C-1. Antenna and Transducer Locations Relative to Vessel Reference Point (May 14 - July 9, 1995)

Sensor	Offset in IHSS	IHSS Coordinate Value, m	Offset in RESON 6042	RESON Coordinate Value, m
Multibeam	x	0	x(port)	-0.07
	y	0	y(port)	+0.11
	z	0	z(port)	-2.20
			x(stbd)	+0.07
			y(stbd)	-0.02
			z(stbd)	-2.20
Trimble 4000DS	x	0		
	y	0		
	z	-4.08		
TSS335B	x			-3.204
	y			+3.169
	z			+1.200
Sidescan Tow PT	x	-15.90		
"A" frame aft	y	-2.46		
	z	-5.18		

Table C-2. Antenna and Transducer Locations Relative to Vessel Reference Point (Oct. 3 - Nov. 13, 1995)

Sensor	Offset in IHSS	IHSS Coordinate Value, m	Offset in RESON 6042	Reson Coordinate Value, m
Multibeam	x	0	x(port)	-0.07
	y	0	y(port)	+0.11
	z	0	z(port)	-2.30
			x(stbd)	+0.07
			y(stbd)	-0.02
			z(stbd)	-2.30
Trimble 4000DS	x	0		
	y	0		
	z	-6.82		
TSS-335B	x			-3.020
	y			+3.320
	z			+1.300
Side scan Tow PT	x	-15.90		
"A" frame aft	y	-2.46		
	z	-5.18		

Note that offsets relative to depth measurement are input to the RESON, while those for navigation are input to the IHSS.

D. AUTOMATED DATA ACQUISITION AND PROCESSING

SEE EVAL. RPT, SECT. D

The following SAIC IHSS software modules were used in the real time acquisition of MULTIBEAM data during the spring survey operation(May 14 - July 9, 1995):

Program	Modification Date
ap9	May 20, 1995
auto_archive	May 4, 1995
cbatdtc	May 11, 1995
	May 13, 1995
	May 15, 1995
cbatout	May 11, 1995
	May 13, 1995
	May 15, 1995
chutil	May 9, 1995
datamgr	May 4, 1995
dtc_data_display	May 4, 1995
eoscandtc	May 10, 1995
	May 18, 1995
	May 30, 1995
filemgr	May 4, 1995
irig-b pdd	May 8, 1995
kfstub	May 5, 1995
klein595	May 8, 1995
	May 23, 1995
mbmgr	May 4, 1995
	May 18, 1995
mergeserve	May 4, 1995
	May 27, 1995
messagemgr	May 4, 1995
mk32	Apr 26, 1995
navmgr	May 5, 1995
	May 17, 1995
	May 28, 1995
nms	May 9, 1995
ntimesrv	Apr 06, 1995
kflog	Apr 10, 1995
	May 18, 1995
	May 30, 1995
helm_display	May 05, 1995
	May 17, 1995
	May 28, 1995
rtkfst	Apr 29, 1995
setclock	Apr 22, 1995
sb_sssv	Apr 26, 1995
	May 22, 1995
spmgr	May 05, 1995
stateb	May 04, 1995
stateb	May 04, 1995
strip	May 09, 1995
svpmon	May 04, 1995
swathplot	May 04, 1995
sync_os2	Apr 23, 1995
sync_ux	May 04, 1995
syscon	May 04, 1995
teltx	May 04, 1995
telrx	May 04, 1995
timechk telrx	May 04, 1995
tr4000	May 08, 1995
	May 16, 1995

Program	Modification Date
tr4ref	May 08, 1995
	May 16, 1995
tss335b	May 08, 1995
utilitymgr	May 04, 1995

The following Polaris Imaging and SAIC IHSS software modules were used in real time acquisition of SIDE SCAN Data during the spring survey operation (May 14 - July 9, 1995):

Program	Modification Date
eoscan.exe	May 15, 1995
sonar.bin	May 15, 1995
eoscan.cfg	May 15, 1995
sonar.bin/eoscan.exe	May 16, 1995
sonar.bin/eoscan.exe	May 17, 1995
eoscan.cfg	May 18,1995
sonar.bin/eoscan.cfg	May 19, 1995
DSP Card (Hardware), eoscan.exe	May 21, 1995
eoscan.exe, eoscan.cfg	June 13 ,1995

The following SAIC IHSS software modules were used in the real-time acquisition of MULTIBEAM data during the fall survey operation (September 19 - November 13, 1995):

Program	Modification Date
ap9	May 20, 1995
auto_archive	May 4, 1995
cbatdtc	May 15, 1995
cbatout	May 15, 1995
chutil	May 9, 1995
datamgr	May 4, 1995
dtc_data_display	May 4, 1995
eoscandtc	Sept. 19, 1995
eoscandtc	Sept. 23, 1995
filemgr	May 4, 1995
irig-b pdd	May 8, 1995
kfstub	May 5, 1995
klein595	May 23, 1995
mbmgr	May 18, 1995
mergeserve	May 27, 1995
messagemgr	May 4, 1995
mk32	Apr 26, 1995
navmgr	May 28, 1995
nms	May 9, 1995
ntimesrv	Apr 06, 1995
kflog	May 30, 1995
helm_display	May 28, 1995
rtkfst	Apr 29, 1995
seabird seasoft (4.210)	Feb. 23, 1995
setclock	Apr 22, 1995
sb_sssv	May 22, 1995
spmgr	May 05, 1995
stateb	May 04, 1995
strip	May 09, 1995
svpmon	May 04, 1995
swathplot	May 04, 1995
sync_os2	Apr 23, 1995
sync_ux	May 04, 1995
syscon	May 04, 1995
Teltx	May 04, 1995
telrx	May 04, 1995
timechk telrx	May 04, 1995

Program	Modification Date
tr4000	May 16, 1995
tr4ref	May 16, 1995
tss335b	May 08, 1995
utilitymgr	May 04, 1995

The following Polaris Imaging and SAIC IHSS software modules were used in real-time acquisition of SIDE SCAN Data during the fall survey operation (September 19 - November 13, 1995):

Program	Modification Date
eoscan.exe	May 15, 1995
sonar.bin	May 15, 1995
eoscan.cfg	May 15, 1995
sonar.bin/eoscan.exe	May 17, 1995
eoscan.cfg	May 18,1995
sonar.bin/eoscan.cfg	May 19, 1995
DSP Card (Hardware), eoscan.exe	May 21, 1995
eoscan.exe, eoscan.cfg	June 13 ,1995

The following SAIC software modules were used in the processing of all data.

Program	Modification Date
appcors	May 17, 1995
applydft	July 26, 1995
applysqt	July 26, 1995
chutil	May 05, 1995
corrtarg	Aug. 1995
corrtarg	Sept. 18, 1995
corrtarg	Oct. 17, 1995
datamgr	May 4, 1995
datasumm	Aug. 15, 1995
examgyro	Jun 22, 1995
exammb	May 19, 1995
gsf2hdcs	May 22, 1995
gsfedit	Sept. 4, 1995
gsfupdat	June 30, 1995
MBHAT>check_cover	Sept. 19, 1995
MBHAT>check_z	Nov. 21, 1995
MBHAT> contact_dxf	Jan 5, 1996
MBHAT>cover_dxf	Nov. 16, 1995
MBHAT>feature_gsf	Nov. 16, 1995
MBHAT> get_contact	Nov. 8, 1995
MBHAT>init_sheet	July 19, 1995
MBHAT>junction	Oct. 23, 1995
MBHAT>main_x_diff	June 29, 1995
MBHAT>make_contours	Dec 22, 1995
MBHAT>make_final_contours	Nov. 3, 1995
MBHAT>makeacadpcx	July 20, 1995
MBHAT>new_select	Jan 5, 1996
MBHAT>new_ss_cover	Nov. 28, 1995
MBHAT>noaagsf	Nov. 8. 1995
MBHAT>set_eoflag	Oct. 2, 1995
MBHAT>target_dxf	Jan. 5, 1996
MBHAT>track_dxf	July 20, 1995
MBHAT>update_contact	Nov. 6, 1995
MBHAT>view3d	July 21, 1995
MBHAT>ztogsf	Oct. 5, 1995
navup	Sept. 19, 1995
rangeflt	Sept. 4, 1995
rangeflt	Oct. 5, 1995
refdraft	Sept. 20, 1995
resetflg	Sept. 18, 1995

Program	Modification Date
resonflt	May 05, 1995
setsound	July 25, 1995
swathmap	May 05, 1995
tid2hmps	May 17, 1995

Throughout this descriptive report wherever software is mentioned (in bold print) the most current version of the software available was used.

E. SONAR EQUIPMENT (Side scan sonar operations) ✓

The following side scan sonar equipment was used for the entire Sheet B survey:

- Klein 595 Side Scan Sonar Recorder, Klein Associates, Serial Number 658.
- Klein 595 Dual Frequency Towfish, Klein Associates, Serial Number 700.
- Klein 595 Dual Frequency Towfish, Klein Associates, Serial Number 894.
- Eoscan Digital Side Scan Recording and Target Analysis, Polaris Imaging, Serial Number 10270A.

The vertical beam width of the Klein 595 side scan was 40° at 3dB. A depression angle of 20° was used on the tow fish. The dual frequency fish had the 500 kHz frequency disabled, and the 100 kHz frequency was used at all times.

Side scan operations were conducted in water depths ranging from 3 meters to 37 meters. The point of deployment of the tow fish was the center A-frame at the stern of the vessel.

The 75 meter range scale was used throughout the survey. Since the range scale was chosen to be 75 m, the survey vessels speed was maintained at six knots or less. A line spacing of 50 m was standard throughout Sheet B.

The side scan altitude off the bottom was maintained between 6 and 15 m for the 75 m range scale setting, except as noted in restricted time periods indicated in the Sheet B Processing and Multibeam Summary Report and the *bssl.p00* file. The amount of cable deployed was determined by using the 1 meter markings on the cable. As the cable length was adjusted to maintain the proper fish altitude, the operator would note the markings on the cable and enter the amount of cable deployed for layback calculations.

To verify that the side scan signal reached the full extent of the slant range setting, records were checked for location of known objects at the far edge of the slant range. Lobster pots were also useful as confidence checks because they were good sonar targets which extended across the area of coverage.

Side-Scan Target and Feature Processing ✓

For a full discussion of side scan processing, refer to the Phase IIA Summary Report: for complete Sheet B processing lists to the Sheet B Processing and Multibeam Summary Report.

Sheet B side scan targets were collected with the **Eoscan_DTC**, versions are as noted in Section D of this report. Layback is not independently recorded in the records collected during the spring deployment, while layback is included in the records from the November deployment. Target and fish positions prior to Sept. 23 are calculated with a different layback equation than those collected after this date, as described in the Phase IIA Summary Report.

For the targets collected during the spring deployment, all targets were read into an Excel spreadsheet, which calculated slant range and target height. Using the output listing from the spreadsheet, two side-scan processors reviewed each graphic record and the associated target file. The hydrographer selected some targets for recalculation of the positions, corrected ranges, and target heights using the (August 1995) **corr_targ** program. The target heights for these recalculated targets were overestimated due to an error in this version of the **corr_targ** program. These heights were not recalculated because the information was sufficient for and had been used to establish target-to-feature correlations.

All Sheet B targets collected during the November deployment were read into a revised Excel spreadsheet, which calculated only slant range. Using the output listing from the spreadsheet, two side-scan processors reviewed each graphic record and the associated target file. Additions, corrections and deletions of target ranges, shadows, and times were agreed upon and entered into the spreadsheet. The **corr_targ** program (Oct. 17, 1995) was then run to update target positions, ranges, and heights for these targets.

Targets were correlated with multibeam features using the **get_contact** program, which produces the *bfeature* file and modifies the *btargets.ctv* file. Correlations were made in two phases. First, targets collected during the spring deployment were processed as described above and correlated with features during July and August 1995 in order to provide recommendations for item investigation. Because feature-to-target correlations were made and features selected at this time, targets collected during the spring were not reprocessed with a revised layback estimate nor using the updated **corr_targ** program. The second processing phase was during November when 208 additional targets were identified; they were processed as described above and added to the *btargets.ctv* file.

There are 293 features and 1493 targets for Sheet B. Each feature was reevaluated with reference to its position and relation to soundings on the smooth sheet. *Bfeature* and *btargets.ctv* files were combined into the *bupdate.out* file using **update_contact** to provide a correlated features-to-targets listing. The *bfeatgsf.out* file was created using the **feature_gsf** program, which traces a feature to a multibeam file, ping and beam number. 284 features were correlated directly to corresponding multibeam 1xIHO least depths using the **feature_gsf** program; 6 features were correlated with 1xIHO multibeam least depths using the **gsfedit** program; 3 features were correlated to 2xIHO least depths using the **feature_gsf** program.

After completion of item investigations, the target/feature correlations were redone using all multibeam data with all correctors applied. As a result, some features were judged non-significant and removed from the features list. In some cases, non-significant features had been placed on the list and were therefore removed. In other cases item investigation resulted in

1xIHO depths which showed features to be non-significant. The following features were removed from the features list as non-significant after analysis of final data:

Feat. #	Latitude North	Longitude West	Feature Depth	Feature Type	1 or 2 x IHO	Description
5	40 54.05769	073 44.25972	9.58	ROCK	1	in 10.1m
18	40 54.15725	073 44.13290	9.5	ROCK	1	in 10.4m on slope
19	40 54.15958	073 44.06350	10.36	ROCK	1	in 11.0m
20	40 54.18215	073 44.05635	9.16	ROCK	1	in 9.4m on slope, 15m horiz. dist. from 8.9 depth
21	40 54.17899	073 44.00429	6.88	ROCK	1	in 7.6m on slope, 10m horiz. dist. from 6.8m depth
48	40 53.93884	073 44.04947	17.57	ROCK	1	in17.7m on slope
52	40 53.88695	073 44.33832	13.69	ROCK	1	in 14.9m on slope
55	40 53.90824	073 44.35078	13.17	ROCK	2	2 14.3m on slope, 10m horiz. dist. from 13.2m depth
56	40 54.18971	073 44.19665	7.49	ROCK	1	in 7.8m
62	Outside the survey, no soundings					
63	Outside the survey, no soundings					
64	Outside the survey, no soundings					
72	40 53.53707	073 44.07652	11.01	ROCK	1	in 12.4m, less than 50m horiz. dist. from #70, 9.4m Rk
76	40 53.68202	073 44.42429	23.94	ROCK	1	in 24.3m
85	40 52.93434	073 43.18928	19.72	ROCK	1	in 20.0m
87	40 52.85656	073 42.99855	14.13	ROCK	1	in 15.1m, 20m horiz. dist. from #86, 13.4m Rk
88	40 52.92859	073 42.96155	15.2	ROCK	1	in 16.0m
97	40 52.71689	073 43.21772	19.98	ROCK	1	in 20.7m
102	40 52.77169	073 42.94242	14.87	ROCK	1	in 15.4m on slope, 10m horiz. dist. from 14.8m depth
103	40 52.77999	073 42.95912	14.94	ROCK	1	in 15.3m on slope, 25m horiz. dist. from #101, 13.7 Rk
106	40 52.85058	073 42.89182	18.44	ROCK	1	in 19.2m on slope, 10m horiz. dist from 18.4 depth
109	40 52.76594	073 42.89394	14.81	ROCK	1	in 15.5m on slope
111	40 52.06201	073 44.51407	22.4	ROCK	2	in 23.4m
113	40 52.61553	073 43.97373	13.94	ROCK	1	in 14.5m on slope, 10m horiz. dist. from 14.0m depth
114	40 52.57565	073 43.99016	13.89	ROCK	1	in 14.2m on slope
117	40 51.56372	073 44.86018	13.22	ROCK	1	in 14.5m on slope, 20m horiz. dist. from #118, 12.0m Rk
133	40 52.18929	073 44.29378	25.58	ROCK	1	no identifiable object
137	40 51.23431	073 45.18142	16.79	ROCK	1	in 17.0m on slope
138	40 51.10468	073 45.35807	18.92	ROCK	1	no elevated object
143	40 51.64027	073 44.84371	15.27	ROCK	1	in 15.8m on slope
154	40 52.83527	073 44.10488	6.46	ROCK	1	in 7.2m on slope, 30m horiz. dist. from 6.5m depth
170	40 53.00223	073 44.05900	8.52	ROCK	1	in 9.9m on slope, 35m horiz. dist. from #169, 7.1m Rk
180	40 53.10622	073 44.16089	4.61	ROCK	1	in 5.1m, 35m horiz. dist. from #181, 3.4m Rk
195	40 53.18196	073 44.07262	8.94	ROCK	1	in 10.0m on slope, 15m horiz. dist.

* See subsequent page for additional features.

						from 8.6m depth
202	40 53.28895	073 43.97371	12.3	ROCK	1	in 13.0m, 10m horiz. dist. from 12.1m depth
205	40 53.35171	073 43.97822	10.06	ROCK	1	in 10.8m
209	40 53.39236	073 44.03727	7.76	ROCK	1	in 9.0m, 25m horiz. dist. from #210, 7.4m Rk
218	40 52.80750	073 44.09113	7.13	ROCK	1	in 7.9m on slope, 20m horiz. dist. from 7.1m depth
225	40 52.62519	073 44.16437	6.92	ROCK	1	in 8.0m, 40m horiz. dist. from #269, 6.3m Rk
254	40 52.86879	073 44.39905	6.97	ROCK	1	in 7.5m on slope, 10m horiz. dist. from 6.6m depth
255	40 52.89061	073 44.36522	5.73	ROCK	1	in 6.8m, 10m horiz. dist. from 5.7m depth
265	40 51.51576	073 44.92588	19.72	ROCK	1	in 19.8m
282	40 52.38838	073 44.25638	16.35	ROCK	1	in 16.5m
284	40 52.94269	073 44.43244	14.35	ROCK	1	in 15.1m on slope, 10m horiz. dist. from 14.3m depth
290	40 53.87779	073 44.04864	27.03	ROCK	1	in 27.7m on slope, 5m horiz. dist. from 27.0m depth
291	40 53.90574	073 43.98617	30.8	ROCK	1	in 32m on slope, 10m horiz. dist. from 30.8m depth
293	40 53.54479	073 43.81617	13.53	OBSTR	1	depression in 13.1m
296	40 52.59260	073 45.43901	6.55	ROCK	1	in 6.8m
299	40 52.46446	073 45.53891	11.1	ROCK	1	in 11.8m on slope, 25m horiz. dist. from 11.1m depth
300	40 52.45444	073 45.56327	11.8	ROCK	1	in 12.9m on slope, 10m horiz. dist. from 11.8m depth
302	40 52.49144	073 45.58318	5.59	ROCK	1	on slope
309	40 53.11090	073 45.04321	17.29	ROCK	1	in 17.6m on slope
311	40 53.78933	073 44.11235	25.38	ROCK	1	in 25.6m
313	40 53.48574	073 44.76766	20.32	ROCK	1	in 20.6m
317	Miss-correlated, actually Feature #316 WRECK					
329	40 52.76982	073 45.18860	18.25	ROCK	1	in 18.8m on slope, 15m horiz. dist. from 18.8m depth
343	40 52.16888	073 44.20577	13.63	ROCK	1	in 14.5m on slope, 15m horiz. dist. from 13.5m depth
349	40 52.43631	073 45.64116	12.15	ROCK	1	in 12.5m
352	40 52.24605	073 45.74019	9.96	ROCK	2	in 10.3m
354	40 52.29526	073 45.69074	10.78	ROCK	1	in 11.0m on slope
355	40 52.39081	073 45.42481	15.27	ROCK	1	in 15.4m
357	40 53.36558	073 44.75568	23.48	ROCK	1	25m horiz. dist. from #320, 20.6m Rk

* Features were analyzed during office processing. Evaluator concurs with hydrographer as non-significant.

Side Scan Coverage Analysis

The side scan lines in Sheet B were, in general, run with a line spacing of 50 m and a side scan range setting of 75 m, providing the required 200% side scan coverage with at least a 50% overlap of lines, as shown on the side scan coverage plot. Side scan coverage for Sheet B is 300% or more for at least 95% of the area. This coverage was calculated using the **new_ss_cover** program (see processing summary for discussion of parameter settings) with settings of a=20, r=30, p=30, and b=10, with the *bssl.p00* and *beos.lst* files as input.

F. SOUNDING EQUIPMENT

The following components were used for acquisition of multibeam bathymetric data:

- RESON SeaBat 9002 multibeam system consisting of:
  - Three SeaBat Transducers, Serial Numbers 332217, 332202 and 214010
  - Two SeaBat 9001 Processors, Serial Numbers 6597 and 5230
  - SeaBat 6042 Controller and Processing Unit, Serial Number 590 P0 794-387

On Julian Day 314 (Nov 10) the Port Transducer Head was replaced. Alignment tests were run on this day and the new head was used for survey beginning on Julian Day 315 (Nov 11).

A lead line made of Kevlar line with a 35-pound steel plate as a weight was used for checking the center beams of the multibeam echo sounder. The line was marked in feet and was calibrated against a steel tape.

G. CORRECTIONS TO SOUNDINGS

SEE EVAL. RPT., SECT. G

Speed of sound

ALSO, SEE SECTION O.

The following systems were used to determine sound velocity profiles for corrections to multibeam sonar soundings.

- Sea-Bird Electronics, Inc., Model 19 CTD, Serial Number 1801, Calibration Date 08 March 1995, (CTW in file names).
- Sea-Bird Electronics, Inc., Model 19 CTD, Serial Number 565, Calibration Date 11 April 1995, (CTG in file names).

Speed of sound profiles were computed from casts taken with the Sea-Bird Electronics, Inc. Model 19 CTD's. The primary unit was SBE19 #1801. Daily confidence checks were obtained from simultaneous casts with the primary CTD and with SBE19 #565. During the autumn deployment, confidence casts were taken only on days 305, 307 (2 casts), 309 and 312. Because the survey progressed through several sheets during a day, confidence checks did not occur on every sheet. Every confidence check taken showed agreement of the profiles from the two CTD's. All profiles were computed using **SBE Term19** software. Computed profiles were copied to the **IHSS** for comparison on the screen. A selected profile was applied to the system, recorded, and sent to the RESON 6042 where a refraction lookup table was computed for application of depth, angle and range correctors to the multibeam sounding data. If sounding depths exceeded the cast depth, the 6042 used the bottom of the table to extend correctors below the table.

Positions and dates of all casts are shown in Table G-1. Confidence check profiles from simultaneous casts were compared using the multibeam display program and were, in general,

identical. If the comparison was not satisfactory, at least one more comparison cast was done, and the profiles were identical.

Table G-1. CTD Files and Locations

CTD File Name	~~Calibration~~ CONFIDENCE CHECK	Apply to Reson	Cast Depth (m)	Latitude	Longitude
CTW16501.CNV		X	15	40 56.40N	73 34.04W
CTW16502.CNV		X	16	40 54.43N	73 41.52W
CTW16503.CNV	X	X	30	40 53.80N	73 44.00W
CTG16504.CNV	X		30	40 53.80N	73 44.00W
CTW16601.CNV	X		37	40 53.85N	73 44.00W
CTG16601.CNV	X	X	37	40 53.85N	73 44.00W
CTW16602.CNV		X	37	40 53.85N	73 44.00W
CTW16603.CNV			28	40 52.90N	73 43.27W
CTW16604.CNV		X	28	40 52.90N	73 43.27W
CTW16701.CNV		X	26	40 52.90N	73 45.25W
CTW16702.CNV	X	X	29	40 52.97N	73 43.09W
CTG16703.CNV	X		29	40 52.97N	73 43.09W
CTW16801.CNV		X	30	40 52.90N	73 43.25W
CTW16802.CNV	X		36	40 52.40N	73 44.30W
CTG16803.CNV	X	X	36	40 52.40N	73 44.30W
CTW16901.CNV		X	35	40 53.90N	73 43.90W
CTW17001.CNV		X	31	40 52.30N	73 44.30W
CTW17002.CNV		X	26	40 52.22N	73 44.22W
CTW17101.CNV		X	28	40 52.20N	73 44.10W
CTW17102.CNV		X	28	40 52.30N	73 44.10W
CTW17103.CNV		X	32	40 52.27N	73 44.15W
CTW17104.CNV			25	40 51.17N	73 45.65W
CTW17105.CNV		X	30	40 51.14N	73 45.61W
CTW17106.CNV		X	21	40 52.26N	73 44.28W
CTW17201.CNV		X	32	40 52.30N	73 44.30W
CTW17202.CNV	X	X	32	40 52.22N	73 44.39W
CTG17201.CNV	X		32	40 52.22N	73 44.39W
CTW17203.CNV		X	32	40 52.81N	73 43.86W
CTW17204.CNV		X	32	40 52.49N	73 45.09W
CTW17402.CNV	X	X	30	40 51.14N	73 45.58W
CTG17401.CNV	X		30	40 51.14N	73 45.58W
CTW17403.CNV		X	32	40 52.29N	73 44.24W
CTW17404.CNV	X		33	40 53.83N	73 44.03W
CTG17405.CNV	X	X	33	40 53.83N	73 44.03W
CTW17503.CNV		X	13	40 54.13N	73 40.47W
CTW17504.CNV		X	37	40 53.88N	73 43.96W
CTW17601.CNV	X	X	28	40 52.29N	73 44.20W
CTG17602.CNV	X		28	40 52.29N	73 44.20W
CTW17603.CNV		X	30	40 51.17N	73 45.59W
CTW17701.CNV	X	X	30	40 51.17N	73 45.55W
CTG17702.CNV	X		30	40 51.17N	73 45.55W
CTW17702.CNV		X	36	40 53.88N	73 43.94W
CTW17703.CNV		X	36	40 53.86N	73 44.15W
CTW17704.CNV		X	31	40 53.75N	73 44.65W

CTW18002.CNV		X	35	40 51.65N	73 44.99W
CTW30802.CNV		X	31	40 53.80N	73 44.20W
CTW30803.CNV		X	34	40 53.80N	73 44.20W
CTW30901.CNV		X	40	40 53.90N	73 44.00W
CTW30902.CNV		X	35	40 52.20N	73 44.50W
CTW31002.CNV		X	54	40 59.50N	73 25.40W
CTW31304.CNV		X	35	40 50.50N	73 45.80W
CTW31501.CNV		X	34	40 52.30N	73 44.30W
CTW31505.CNV		X	17	40 56.80N	73 33.00W
CTW31506.CNV		X	15	40 54.50N	73 43.00W

Corrections determined from vertical casts ✓

Leadline comparisons to multibeam center beam soundings were made weekly to verify the transducer draft and echo sounder instrument correctors. For each comparison, a CTD cast was taken and the sound velocity profile loaded into the **IHSS** and the RESON 6042. Ten leadline readings were recorded along with the UTC time of observation while the **IHSS** recorded the multibeam readings. **Exammb** was used to find the port and starboard center beam readings for the time of each leadline reading.

The results of these readings were entered into a spreadsheet along with the draft reading from the transducer pole and any squat corrector which may have been entered in the **IHSS**. The spreadsheet applied a calibration corrector to the leadline readings and converted the readings from feet to meters. It also applied correctors to the port and starboard multibeam readings for the difference between the observed draft and reference point (2.20 meter - spring, 2.30 meter - fall), and for any settlement and squat inadvertently left in the **IHSS**.

Each corrected cast depth was compared to the simultaneous multibeam readings and correctors were calculated by the spreadsheet. The ten comparisons were averaged for each transducer and the standard deviations were computed.

During the May - July, 1995, deployment, comparisons revealed a consistent system bias with the multibeam soundings being too shallow by 0.11 meters. Correctors of +0.11 meters were applied to all May - July, 1995, multibeam soundings in post processing. Records of the comparisons are included in the Phase IIA Summary Report.

During the autumn 1995 deployment, the mean of the results for six sets of comparisons resulted in a corrector of 0.006 meters for each transducer. Therefore, no instrument or draft corrector was applied to soundings for this deployment. The leadline comparisons are included in the Phase IIA Summary Report.

Static draft ✓

At a minimum, the static draft was observed on a daily basis by reading the markings on the transducer pole while the vessel was stationary. If the static draft value changed from the previously noted value, the new value was entered into the RESON system. The static draft value was recorded at the beginning of a GSF file or whenever values in the header were changed. All results are reported in the Processing and Multibeam Data Summary.

Settlement and squat

Measurements of settlement and squat were conducted at the breakwater north of Coddington Cove, Narragansett Bay, Rhode Island on May 5, 1995, in 14 meters of water. The results were compiled into a lookup table of the vessel's engine rpm vs settlement and squat. Rpm settings were entered into the Multibeam parameters by the real-time system operator, the computer applied settlement and squat correctors interpolated from the lookup table, and recorded it in the "Depth Corrector" field of the GSF data file for each ping. All results are reported in the Phase IIA Summary Report.

Roll, Pitch and Heading

The following sensors were used for acquisition of Roll, Pitch and Heading data:

- TSS-335B Vertical Reference Units, Serial Numbers 001615, 536 and 583
- Sperry MK32 Gyrocompass, Serial Number 208

The TSS-335B Vertical Reference Units and their corresponding junction boxes, were used for heave, roll, and pitch. The accuracy of the sensor is 5 percent of 1 m or 5 cm for heave; ± 0.10° dynamic accuracy for roll and pitch, and ± 0.05° static accuracy for roll and pitch. The Sperry MK32 was used for heading. The dynamic heading accuracy of the unit at 3 sigma was 0.6° times the secant of latitude.

Occasional power fluctuations affected the Sperry MK 32 gyrocompass for periods of approximately 0.01 seconds. These fluctuations were identified and corrected in processing using the program **examgyro**.

Heading, roll, and pitch biases were determined in a series of tests performed in Long Island Sound for the spring survey, and in Narragansett Bay for the fall survey prior to the start of the surveys. Appropriate biases were redetermined each time a transducer or Vertical Reference Unit was changed. Prior to conducting any of the tests, a CTD cast was taken to determine the sound velocity profile and entered into the RESON system. In the RESON 6042 the port and starboard roll biases were initially set to +30° and -30° respectively, heading biases were initially set to 0° and 180°, and pitch biases were set to 0. In the IHSS heading biases were set to 0. The roll bias test was run first in an area with relatively flat bottom. The range scale was set to 100 meters. Three lines were run spaced 40 meters apart and each line was run in both directions. The data from parallel lines in the same direction were used for roll bias calculations for each head separately; the ideal data set was positioned so that the depths from the center beams from a transducer were compared against the depths of the mid-swath beams. Tidal corrections were applied to all data before roll corrections were calculated using routines in the **MBHAT** software. Results are reported in the Phase IIA Accuracy and Alignment Report and in the Phase IIA Summary Report.

After the roll biases were calculated and entered into the RESON system, the pitch bias test was conducted. The pitch test was conducted on multiple reciprocal runs of a single line perpendicular to a slope of approximately five degrees. The range scale of the RESON was set to 50 meters and vessel's speed was maintained approximately constant. Pitch biases were computed by comparing runs in opposite directions. Tidal corrections were applied to all data

before pitch corrections were calculated using routines in the **MBHAT** software. Results are reported in the Phase IIA Accuracy and Alignment Report and in the Phase IIA Summary Report.

After measurement, calculation, and entry of the pitch bias correctors, heading bias tests were conducted. For the heading bias test 5 parallel lines were run in opposing directions so that the inner beams from a transducer head overlay the intermediate or outer beams of the same head. The heading bias was then determined by measuring the distance between equal depths and calculating the angle subtended by that distance. Tidal corrections were applied to all data before heading corrections were calculated using routines in the **MBHAT** software. Results are reported in the Phase IIA Accuracy and Alignment Report and in the Phase IIA Summary Report.

Roll, pitch, and heading biases applied in H-10617 are shown in Table G-2.

Table G-2. Roll, Pitch, and Heading Bias

	Days 165-180		**Day 308-311**		**Day 313**		**Days 315-316**	
	Port	Starboard	Port	Starboard	Port	Starboard	Port	Starboard
Roll	+29.98	-29.59	+30.095	-29.051	+29.795	-29.180	+29.985	-29.044
Pitch	-0.16	-0.13	-1.079	-0.511	-1.887	-1.428	-2.062	-1.847
Heading	-1.65	-1.65	+1.25	+1.25	+1.25	+1.25	+1.25	+1.25

Tide and water level correctors

The reference stations for H-10617 were Willets Point, NY (851-6990) and Bridgeport, CT (846-7150).

Smooth sheet soundings were corrected for water level through application of observed data from the Long Neck Point, CT (846-8799), New Rochelle, NY (851-8490) and Willets Point, NY (851-6990) stations. A new staff datum for MLLW was computed for each station from simultaneous comparison with Willets Point, NY (851-6990) and with Bridgeport, CT (846-7150) using the NOAA Form 248 method prescribed by Marmer (Tidal Datum Planes, Spec. Pub. 135, U.S. Dept of Commerce). The simultaneous comparison computations are included in the Phase IIA Summary Report - Tides.

The boundaries of tide zones used are listed in the Phase IIA Summary Report - Tides. Gage readings were recorded in relation to staff zero; therefore, the MLLW datum height was subtracted from gage readings before applying the time and ratio correctors.

Full data for all project water level gages are in the Phase IIA Summary Report - Tides.

H. CONTROL STATIONS

SEE EVAL. RPT., SECT. H

Horizontal datum is the North American Datum (NAD) 1983. Two existing first order horizontal control stations were used. A DGPS reference station was established at station MANRESA 1983 (LX7443) to provide primary navigation control for hydrographic positioning. Station ZIEGLER 1932 (LX3804) was used to check the DGPS performance. Horizontal control data are included in the Phase IIA Summary Reports.

I. HYDROGRAPHIC POSITION CONTROL

SEE EVAL. RPT., SECTION I

The following equipment was used for positioning:

- Trimble 4000 GPS Receiver, Serial Numbers 3504A09516, antenna 0080176651
- Magnavox MX50R Differential Beacon Receiver, Serial Number 154
- Trimble 4000 GPS Receiver, Serial Number 3430A07030
- DGPS shore station [OSI], Serial Number 3433A07356

The primary hydrographic positioning control equipment was a Trimble 4000 GPS using differential correctors from the contractor established station at MANRESA 1983 (LX7443). HDOP, number of satellites, elevation of satellites, and age of correctors were monitored so that the resulting hydrographic positioning control met the specifications.

Positioning confidence checks were established by recording a separate (reference) Trimble DGPS using correctors from the U.S. Coast Guard station at Montauk, NY. A real time monitor raised an alarm when the two DGPS positions differed by more than 10 meters horizontally. During all times when differential correctors were being received, positioning confidence checks were well within tolerance. In daily post processing, the reference DGPS positioning was substituted for the primary DGPS positioning during those times when the reference met the specifications but the primary did not.

J. SHORELINE - Not Applicable ✓

K. CROSSLINES ✓

Crosslines constituted approximately 5% of the mainscheme length. Comparisons of all crossing data in the 1xIHO swaths, using **MBHAT** software, show that more than 92% of comparisons were within 20cm, and more than 99.4% were within 50cm. These comparisons include all junction survey data, not just those over relatively flat bottom. Larger differences occurred in areas of steep relief or wrecks, rocks and obstructions..Table K-1 shows the results of the mainscheme crossline comparisons.

Table K-1. Junction Analysis Mainscheme - Crosslines

Category	Count	Percent	Total Percent
to 10 cm	522548	64.10	64.10
to 20 cm	227947	27.96	92.06
to 30 cm	47864	5.87	97.93
to 40 cm	9381	1.15	99.08
to 50 cm	2914	0.36	99.44
to 60 cm	1285	0.16	99.60
to 70 cm	794	0.10	99.69
to 80 cm	517	0.06	99.76
to 90 cm	358	0.04	99.80
to 100 cm	264	0.03	99.83
> 100 cm	1357	0.17	100.00
Total Counts = 815229			

L. JUNCTIONS See Eval Rpt, Section L.

Junction comparisons were made with surveys:

H-10625	1:10,000	1995 *
H-10346	1:10,000 scale	1990
H-10347	1:10,000 scale	1990
H-10612	1:10,000 scale	1995
H-10588	1:10,000 scale	1995
~~H-10612~~	~~1:10,000 scale~~	~~1995~~

whose relative locations are shown in Figure L-1 and in the INDEX OF SHEETS, p. iv.

Comparisons were accomplished using **MBHAT** software to compare each junction survey sounding to all H-10618 soundings occurring within a 5x5 meter cell encompassing the junction sounding. The junctioning comparisons of H-10618 and H-10347 are shown in Table L-1. More than 94.6% of comparisons were within 30cm, and more than 97.8% of comparisons were within 50cm. These comparisons include all crossline data, not just those over relatively flat bottom. Larger differences occurred in areas of steep relief or wrecks, rocks and obstructions. Differences are nearly equally divided among positive and negative values.

Table L-1. Junction Analysis H-10618 & H-10347

Category	Count	Percent	Total Percent
to 10 cm	27512	62.07	62.07
to 20 cm	10960	24.73	86.80
to 30 cm	3493	7.88	94.68
to 40 cm	1004	2.27	96.95
to 50 cm	389	0.88	97.82
to 60 cm	214	0.48	98.31
to 70 cm	161	0.36	98.67
to 80 cm	178	0.40	99.07
to 90 cm	145	0.33	99.40
to 100 cm	93	0.21	99.61
> 100 cm	174	0.39	100.00
Total Counts = 44323			

* SEE DESCRIPTIVE REPORT FOR H-10625 FOR JUNCTION ANALYSIS FOR H-10611 ↔ H-10625.

The junctioning comparisons of H-10618 and H-10346 are shown in Table L-2. The comparisons show a shoaling of 0.5 to 0.6 m since 1990. Comparison to the 1934 surveys indicate a continued shoaling in this area of as much as 4.9 m since 1934.

Table L-2. Junction Analysis H-10618 & H-10346

Category	Count	Percent	Total Percent
to 10 cm	6	0.29	0.29
to 20 cm	67	3.24	3.53
to 30 cm	209	10.10	13.63
to 40 cm	382	18.46	32.09
to 50 cm	506	24.46	56.55
to 60 cm	522	25.23	81.78
to 70 cm	267	12.90	94.68
to 80 cm	59	2.85	97.54
to 90 cm	19	0.92	98.45
to 100 cm	7	0.34	98.79
> 100 cm	25	1.21	100.00
Total Counts = 2069			

Junction comparison of H-10612 and H-10618 shows more than 94.4% of comparisons within 20cm, more than 99.3% within 30cm and more than 99.7% within 50cm. Table L-3 shows the results of comparisons of all soundings common to the two surveys.

Table L-3. Junction Analysis H-10612 & H-10618

Category	Count	Percent	Total Percent
to 10 cm	117913	64.32	64.32
to 20 cm	55189	30.10	94.42
to 30 cm	9022	4.92	99.34
to 40 cm	612	0.34	99.68
to 50 cm	189	0.10	99.78
to 60 cm	128	0.07	99.85
to 70 cm	83	0.05	99.90
to 80 cm	40	0.02	99.92
to 90 cm	33	0.02	99.94
to 100 cm	15	0.01	99.95
> 100 cm	107	0.05	100.00
Total Counts = 183331			

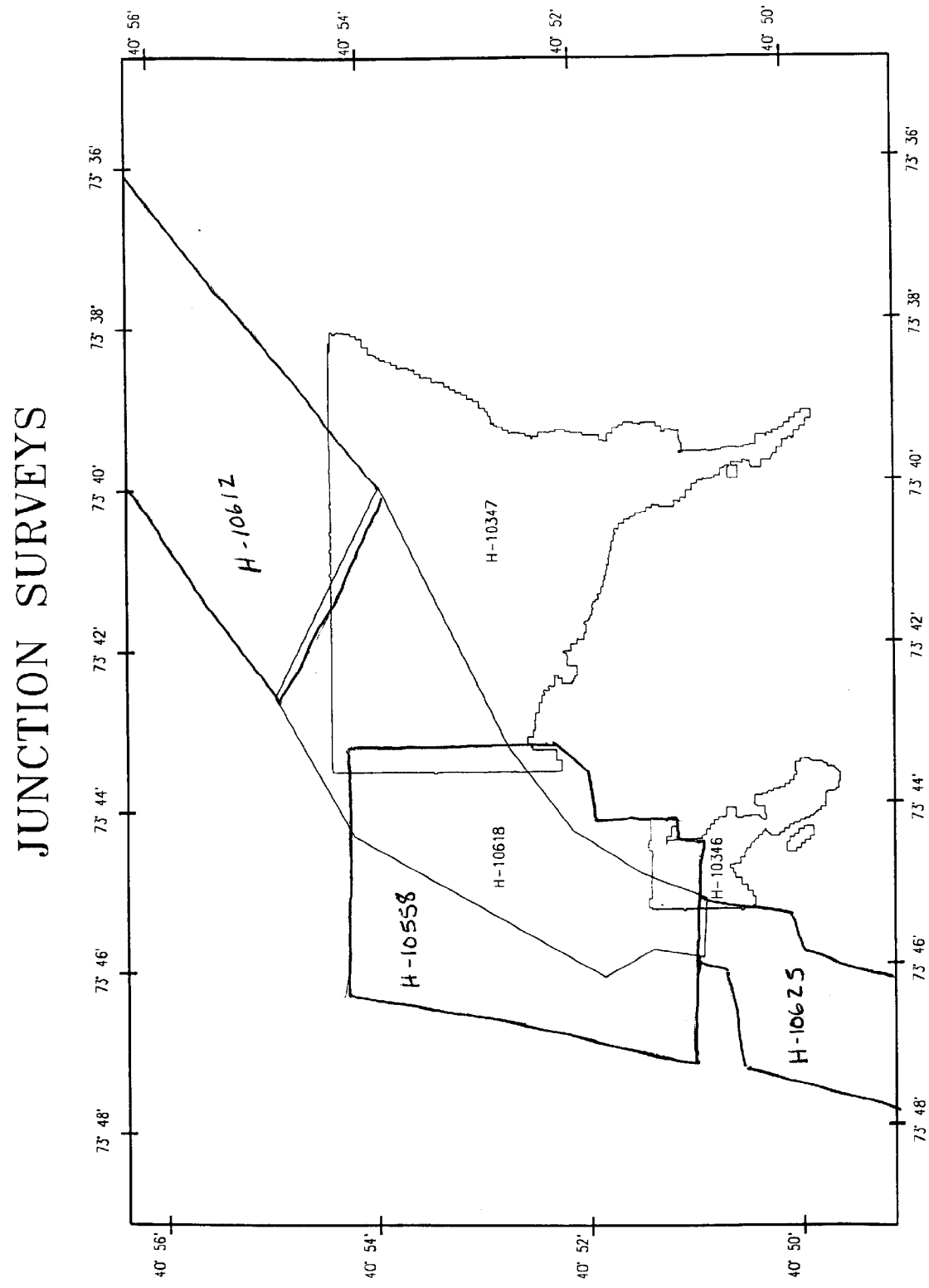


Figure L-1. Junction Survey

M. COMPARISON WITH PRIOR SURVEYS See Eval Rpt., Section M.

Data for H-10618 (1995) were compared with previous surveys H-5407, H-5545, and H-5546 (1934) Scale 1:10,000

The region around 40° 51.50'N, 073° 44.78'W shows depths to be 7 - 16 ft (2.1-4.9 m) greater than the depths shown in 1934. CONCUR

Around 40° 51.83'N, 073° 44.67'W is an area of significant shoaling showing depths to be 9 - 22 ft (2.7-4.9 m) shoaler than the 1934 data. This shoaling extends north and west to 40° 52.08'N, 073° 44.92'W. The comparisons with the 1934 surveys and junctons with the 1990 data show progressive shoaling in the area with a change of up to 4.9 m since 1934 and a change of approximately 0.5 m since 1990. CONCUR

Surrounding the "G 25" channel buoy, near 40° 52.17'N, 073° 44.23'W depths are 4 - 14 ft (1.2-4.2 m) greater than the depths in 1934. Northeast of buoy "G 25" the depths are 5 - 18 ft (1.5-5.5 m) shoaler than the depths in 1934. CONCUR

Along the west side of Execution Rocks the depths are 9 - 15 ft (2.7-4.6 m) greater than the surveys of 1934. The 30 foot contour is now somewhat closer to the rocks. Along the 073° 44.75'W meridian, the depths are 6-10 ft (1.8 - 3m) shoaler than the 1934 survey. Along the eastern side of Execution Rocks depths are now 4 - 9 ft (1.2-2.7 m) shoaler than in 1934. CONCUR

Off the eastern shore of Hart Island (40° 51.50'N 73° 45.80'W) there is some shoaling. Depths in this area are 5 - 15 ft (1.5-4.6 m) shoaler than in 1934. A small area of shoaling is shown near 40° 51.97'N, 073° 45.38'W with depths 8 - 13 ft (2.4-4 m) shoaler than the 1934 data. CONCUR

Due east of the East Nonations (40° 52.1'N), is an area of shoaling. The 1995 data show the depth to be 6 - 13 ft (1.8-4 m) shoaler than in 1934. East of Pea Island lies an area of shoaling with depths 6 - 23 ft (1.8-7 m) shoaler than the 1934 surveys. This area extends north and east from 40 52.25'N, 073 45.37'W to 40 53.50'N, 073 45.00'W. CONCUR

Near 40° 52.83'N, 073° 42.87'W the 1995 data show a depth of 61 ft (18.6 m) and the 1934 survey data show a depth of 34 ft (10.4 m). Investigation with 100% multibeam and 200% side scan sonar coverage did not reveal any elevated objects in the area of this item. See also AWOIS #4398. 34 Ft depth discussed above plots outside the survey limits. CONCUR

There is a region of shoaling surrounding 40° 52.87'N, 073° 43.33'W where the 1995 survey depths are 8 - 20 ft (2.4-6 m) shoaler than the data from 1934. CONCUR

The remainder of sheet B, not specifically discussed here, contains depth data that correspond to plus or minus 1 to 5 ft (0.3-1.5 m) compared to the data collected in 1934. CONCUR

There were eight AWOIS Items within the bounds of Sheet B. All were investigated with 100% multibeam and 200% side scan sonar coverage. CONCUR

AWOIS # 1729 TYPE: Information RADIUS: 100m

Wreck with a least depth of 12.4 m (40 ft) by multibeam echosounder (feature #78, 1xIHO), found in 40° 53.60013'N, 073° 43.42149'W. The position is 9 m (30 ft) at 015° true from the reported AWOIS position.

Recommend removal of danger circle, blue tint and sounding 40 ft with type Wreck charted in 40° 53.595'N, 073° 43.423'W, and charting a sounding 12.4 m (40 ft) with type Wk in survey position. CONCUR. REVISE CHARTED WRECK (40' WK) TO SURVEY POSITION AND RETAIN ASSOCIATED DANGER CIRCLE AND BLUE TINT JL

AWOIS # 1731 TYPE: Information RADIUS: 100m

Wreck with a least depth of 12.6 m (41 ft) by multibeam echosounder (feature #79, 1xIHO) found in 40° 53.80783'N, 073° 42.99440'W. The position is 4 m (13 ft) at 112° true from the reported AWOIS position.

Recommend removal of danger circle, blue tint and sounding 40 ft with type Wreck charted in 40° 53.809'N, 073° 42.997'W, and charting a sounding 12.6 m (41 ft) with type Wk in survey position. CONCUR. REVISE CHARTED WRECK (40' WK) TO CHARTED WRECK (41' WK) USING SURVEY POSITION. RETAIN DANGER CIRCLE AND BLUE TINT. JL

AWOIS # 4398 TYPE: Information RADIUS: 100m

Investigation with 100% multibeam and 200% side scan sonar coverage did not reveal any elevated objects in the area of this item. Depths in this area are 17.0 m (55 ft) on a slope which is up to the south (13.5 m depth at about 100 m distance) and down to the north (19 m depth in about 50 m distance).

Recommend removal of danger circle, blue tint and sounding 23 ft with type Rk charted in 40° 52.781'N, 073° 42.878'W. CONCUR. CHART DEPTHS AS FOUND BY THE PRESENT SURVEY. JL

AWOIS # 6503 TYPE: None RADIUS: 125m

Obstruction with a least depth of 12.3m (40 ft) by multibeam echosounder (feature #147, 1xIHO) found in 40° 53.21592'N, 073° 43.91744'W. The position is 11m (36 ft) at 320° true from the reported AWOIS position.

Recommend removal of danger circle, blue tint and sounding 41 ft with type Obstn charted in 40° 53.211'N, 073° 43.912'W, and charting a sounding 12.3 m (40 ft) with type Obstn in survey position. CONCUR. CHART 40' OBSTN FROM SURVEY AND RETAIN ASSOCIATED DANGER CIRCLE AND BLUE TINT. JL

AWOIS # 6507 TYPE: Information RADIUS: 50m

Rock with a least depth of 11.9 m (39 ft) by multibeam echosounder (Feature #107, 1xIHO) found in 40° 52.74169'N, 073° 42.97233'W. The position is 9 m (29 ft) at 004° true from the reported AWOIS position. Investigation with 100% multibeam and 200% side scan sonar coverage did not reveal any shoaler objects in the area.

Recommend removal of danger circle, blue tint and sounding 16 ft rep charted in 40° 52.737'N, 073° 42.973'W, and charting a sounding 11.9 m (39 ft) Rk in survey position. Chart 39 Rk with Danger Circle and blue tint. CONCUR

AWOIS # 6508 TYPE: Full RADIUS: 100m

Investigation with 100% multibeam and 200% side scan sonar coverage revealed depths of 14.8 m in the area. The nearest feature is #95, a 13.3 m (43 ft) rock in 40° 52.87349'N, 073° 42.91636'W. This is 24 m (79 ft) at 140° true from the reported AWOIS position.

Recommend removal of danger circle, blue tint and sounding 28 ft rep charted in 40° 52.88367'N, 073° 42.92750'W, and charting a sounding 13.3 m (43 ft) Rk in survey position. CONCUR → with danger circle and blue tint,

AWOIS # 6509 TYPE: Information RADIUS: 100m

AT 40° 53 15.09 N 73° 43 17.5 W

A depression with depth 18.9 m (62 ft) was found at the listed position of this deteriorated wreck. Investigation with 100% multibeam and 200% side scan sonar coverage did not reveal any elevated objects in the area of this item. The entire depression is covered by 1xIHO soundings, and several side scan targets were selected on the depression. Electric power cables have been placed through this area, and it appears that an attempt was made to lay one cable directly through this buried wreck. The cable layer backed off about 100 meters to the west, deviated to the north about 20 meters, and continued with the cable run. After several hundred meters, the cable run jogs south 20 meters to the original track.

Recommend removal of danger circle, blue tint and sounding 56 ft with type Wreck charted in 40° 53.322'N, 073° 43.273'W, and charting of a sounding 18.9 m (62 ft) with type Wreck in the same position. Retain danger circle and blue tint with 62 WK. CONCUR

AWOIS # 6510 TYPE: Information RADIUS: 100m

Wreck with a least depth of 12.3m (40 ft) by multibeam echosounder (Feature #81, 1xIHO) found in 40° 53.85716'N, 073° 43.05899'W. The position is 25 m (82 ft) at 092° true from the reported AWOIS position.

Recommend removal of danger circle, blue tint and sounding 37 ft charted in 40° 53.858'N, 073° 43.076'W, and charting of a sounding 12.3m (40 ft) Wk in survey position. CONCUR. CHART (40 WK) WITH DANGER CIRCLE AND BLUE TINT

N. COMPARISON WITH THE CHART SEE EVAL RPT, SECT O

H-10618 was compared to Charts 12366, 24th Edition, Mar 25, 1995 and 12367, 20th edition, Feb 18, 1995 with updates from Notice to Mariners through January 1996.

The 1995 data indicate shoaling of 1 to 3 m (3-10 ft) in an area bounded approximately by:

NW - 40° 52.40'N, 073° 44.75'W	NE - 40° 52.25'N, 073° 44.10'W
SW - 40° 51.40'N, 073° 45.60'W	SE - 40° 51.30'N, 073° 45.00'W

CONCUR

A 38 ft (11.6 m) Obstn charted in 40° 53.95'N, 073° 42.20'W (no associated AWOIS Item) is in depths of 12.4 m surrounded by depths of 12 m (40 ft). No elevated feature was identified

in this immediate area. The only feature is a deep of 13.0 m in 40° 53.969'N, 073° 42.212'W. However, there is an elevated feature, #83, in 40° 53.93982'N, 073° 41.94617'W (1xIHO, Obstruction) with a least depth of 11.6m (38 ft). Its position is 357 m (1171 ft) at 093° true from the charted obstruction. Recommend removal of danger circle, blue tint and sounding 38 ft Obstn charted in 40° 53. 95'N, 073° 43. 20'W, and charting of a sounding 11.6m (38 ft) Obstn in survey position. CONCUR Retain danger circle and blue tint with 38 obstn.

In the vicinity of 40° 54.5'N, 073° 43.0'W the 1995 data are 1-2 m (3-6 ft) shoaler than the charted data. DO NOT CONCUR. GENERALLY, THE SOUNDINGS AGREE WELL IN THIS AREA WITH ONE SOUNDING BEING DEEPER THAN THE CHART.

A sounding of 13.1 m (43 ft), from H-5413 (1933), charted in 40° 53.45'N, 073° 44.8'W is not confirmed by the 1995 survey. Surrounding depths are 20.4 m (67 ft) on a slope. Depths of 13.1 m are about 100 m up slope to the north-west. Investigation with 100% multibeam and 200% side scan sonar coverage did not reveal any elevated objects in the area. Recommend removal of the sounding 43 ft charted in 40° 53.45'N, 073° 44.8'W, and reconstruction of common area of the chart from H-10618. CONCUR

H-10618 soundings are shoaler than the charted soundings in the shoal area north of Execution Rocks in 40° 53.1'N to 40° 53.4'N, around 073° 44.2'W. Recommend reconstruction of common area of the chart from H-10618. Concur

The sounding 18 ft Obstn charted* in 40° 52.43'N, 073° 45.41'W originated from the Danger to Navigation Report dated 23 June 1995, and is Feature #259 (1xIHO, Wreck) in 40° 52.42899'N, 073° 45.41064'W with a least depth of 5.3m (17 ft) after final data processing. Recommend removal of the sounding 18 ft Obstn charted in 40° 52.43'N, 073° ~~54.41~~ 45.47'W, and charting a sounding 5.3m (17 ft) Wk in survey position. Diver investigation confirmed the conclusion drawn from analysis of multibeam and side scan sonar records that this feature is a barge lying on its side. Pressure gage depth was 5.3 m in 40° 52.425'N, 073° 45.515'W. Accuracy of the multibeam sounding positions was better than the accuracy of the diver positions; therefore, the multibeam soundings were used to position the wreck. Numerous multibeam soundings were obtained on top of the wreck. The multibeam soundings were used to define the size, shape and depth of the wreck. Video transmitted from the diver showed the flat side of a barge in a near horizontal plane with marine growth about 0.3 m high covering the top of the wreck. * DEPTH ORIGINATING FROM THE DANGER TO NAVIGATION REPORT (23 JUNE 1995) IS NOT CURRENTLY CHARTED. CONCUR

The sounding 39 ft Wreck charted in 40° 51.9'N, 073° 45.6'W corresponds to feature #332 (1xIHO, Obstruction) in 40° 51.89433'N, 073° 45.65063'W with a least depth of 12.1m (38ft). Recommend removal of danger circle, blue tint and sounding 39 ft with type Wreck charted in 40° 51.9'N, 073° 45.6'W, and charting a sounding 12.1 m (38 ft) with type Wk in survey position. CONCUR Retain danger circle and blue tint with 39 wk.

The dangerous wreck symbol (29 ft 1988) in 40° 51.75'N, 073° 45.8'W corresponds to feature #359 (1xIHO, Obstruction) in 40° 51.77377'N, 073° 45.79812'W with a least depth of 9.0m (29 ft). Recommend removal of danger curve, blue tint and dangerous wreck, depth unknown, symbol charted in 40° 51.75'N, 073° 45.8'W, and charting a sounding 9.0 m (29 ft) with type Wk in survey position. CONCUR Retain danger circle and blue tint with 29 Wk.

The sounding 13 ft charted in 40° 54.183'N, 073° 44.033'W, from H-5078 (1931), corresponds to feature #22 (1xIHO, Rock) in 40° 54.19261'N, 073° 44.02338'W with a least depth of 5.0 m (16 ft). Recommend removal of danger circle, blue tint and sounding 13 ft with type Rk charted in 40° 54.183'N, 073° 44.033'W, and charting a sounding 5.0 m (16 ft) with danger circle, blue tint, and type Rk in survey position. Investigation with 100% multibeam and 200% side scan sonar coverage did not reveal any shoaler objects in the area. CONCUR

The sounding 40 ft charted in 40° 52.52'N, 073° 45.02'W originated from the Danger to Navigation Report dated 08 July 1995. Further investigation with 100% multibeam and 200% side scan sonar coverage did not reveal any elevated objects in the area, and has disproved this sounding. This position is in depths of 18.9 m (62 ft) on a gentle slope which tends up to the east and down to the west. THE 40 ft DEPTH READATED JULY 8, 1995 IS NOT CURRENTLY CHARTED. CHART DEPTHS AS FOUND BY THE PRESENT SURVEY

CONCUR

The sounding 21ft charted in 40° 54.838'N, 073° 42.613'W originated from the Danger to Navigation Report dated 08 July 1995. Further investigation with 100% multibeam and 200% side scan sonar coverage, and processing with local observed water levels, has shown the depth to be 7.2 m (23 ft) in 40° 54.83970'N, 073° 42.61890'W. Recommend removal of the sounding 21ft charted in 40° 54.838'N, 073° 42.613'W, and charting a sounding 7.2 m (23 ft) with type Rk in survey position. THE 21ft DEPTH REPORTED JULY 8, 1995 IS NOT CURRENTLY CHARTED. CONCUR WITH HYDROGRAPHER TO CHART 23' Rk AT SURVEY POSITION

The sounding 25 ft charted in 40° 54.770'N, 073° 42.627'W originated from the Danger to Navigation Report dated 08 July 1995. Further investigation with 100% multibeam and 200% side scan sonar coverage, and processing with local observed water levels, has show the depth to be 8.2 m (27 ft) in 40° 54.76092'N, 073° 42.62969'W. Recommend removal of the sounding ~~21ft charted in 40° 54.838'N, 073° 42.613'W~~ 25ft charted in 40° 54.770'N 073° 42.627'W, and charting a sounding 8.2 m (27 ft) with type Rk in survey position. THE 25ft DEPTH REPORTED JULY 8, 1995 IS NOT CURRENTLY CHARTED. CONCUR WITH HYDROGRAPHER TO CHART ~~27ft~~ 27' Rk AT SURVEY POSITION

~~A rock that covered 3.1 m (10 ft) was found in 40° 49.43470'N, 073° 46.52459'W. Recommend charting a sounding 3.1 m (10 ft) with type Rk in survey position.~~ THIS ROCK IS NOT WITHIN THE SURVEY AREA. IT PLOTS ON H-10625

O. ADEQUACY OF SURVEY ✓

This survey is complete and adequate to supersede prior surveys. CONCUR

Data for all tracks shown on the track plot are included in the accepted survey data. The decision was made to retain these data to provide more 1xIHO coverage. In many cases, the extra lines were run to fill in side scan gaps and the multibeam data were recorded simultaneously.

Soundings corresponding to wrecks, rocks, and obstructions were shown in bold print so that they may be easily related to the corresponding text label. The density of soundings on this survey, while necessary to fairly depict the bottom, made it difficult to place text within the sheet. For that reason, text for features (wrecks, rocks, and obstructions), for floating aids to navigation, and for bottom characteristics were shown in reduced height bold characters. This made them stand out from the soundings and eased their placement. Even so, it was often necessary to deviate from the traditionally preferred placement of text.

No plot on mylar or paper can fully represent the tremendous amount of data which are available in this survey. Manipulation of and viewing of the data with a computer is much more satisfactory for many applications. For example, the ***mbmz*** layer viewed with the **MBHAT** software gives an excellent picture of the shape and character of the bottom.

The designation of wreck, rock, or obstruction was assigned to features from examination of the side scan images and the multibeam data. If a feature could not be clearly judged a wreck or a rock it was designated an obstruction. Two or more side scan processors agreed upon the designation.

Eight significant features* were not plotted on the smooth sheet because they would have been overwritten by more critical features. These 8 features were:

* THESE SOUNDINGS ARE PLOTTED ON A CORRECTION OVERLAY. JV

Table O-1. Non-Plotted Features

Feat. #	Latitude North	Longitude West	Feature Least Depth	Feature Type	1x or 2x IHO	Multibeam File Name	Ping #	Beam #	MB Depth
77	40 54.40876	073 41.90951	13.15	WRECK	1	mba95166.d01	80092	86	13.1
99	40 52.76747	073 42.99817	13.43	ROCK	1	mba95168.d02	118842	11	13.43
145	40 51.14183	073 45.53800	27.27	WRECK	1	mba95170.d82	2753	57	27.27
190	40 53.26453	073 44.06477	9.26	ROCK	1	mba95170.d05	42220	39	9.26
224	40 52.60373	073 44.13213	7.99	ROCK	1	mba95170.d05	1525	30	7.99
267	40 52.60562	073 44.25520	4.94	ROCK	1	mba95171.d04	56729	38	4.94
268	40 52.57115	073 44.21810	6.78	ROCK	1	mba95176.d04	70872	17	6.78
312	40 53.66800	073 44.38244	24.00	WRECK	1	mba95174.d02	27765	32	24.00

The following discussion provides guidance for evaluation of this survey against the specifications.

Multibeam ✓

Multibeam coverage was 100%. A small section of the corner of Gangway Rock, and the dangerous rocky area near Pea Island were excluded from the survey.

Sound Velocity Corrections ✓

In some cases the sound velocity profile applied did not extend to 95% of the maximum depth observed in the data set. In those cases the RESON SeaBat used the bottom of the sound velocity table to extend corrections to the observed depths greater than the cast depth. To check the validity of this vertical extrapolation, the hydrographer made extrapolations to the bottom using the trend of the bottom of the sound velocity profile. The x, y, z coordinates of maximum soundings in the file were computed at nadir and at 45° off nadir. The following list shows the errors resulting from using the RESON extrapolation method compared to the trend extrapolation.

Table O-2. Depth and Position Errors Due to Sounding Depth Exceeding Sound Velocity Profile Depth

Dataset	Cast #	Cast Z	Data Z	Delta Z	Beam Angle	Error in Meters		
						X	Y	Z
mba95165.d85	ctw16502.cnv	14.64	38.15	23.51	0	0.000	0.000	-0.004
					45	0.000	-0.007	0.000
mba95165.d55	ctw16502.cnv	14.64	26.92	12.28	0	0.000	0.000	-0.001
					45	0.000	-0.002	0.000
mba95165.d06	ctw16502.cnv	14.64	33.87	19.23	0	0.000	0.000	-0.003
					45	0.000	-0.005	0.000
mba95165.d06	ctw16503.cnv	32.73	33.87	1.14	0	0.000	0.000	0.000
					45	0.000	0.000	0.000
mba95166.d07	ctw16503.cnv	32.73	37.93	5.20	0	0.000	0.000	0.000
					45	0.000	0.001	0.000
mba95167.d03	ctw16604.cnv	28.34	31.62	3.28	0	0.000	0.000	0.000
					45	0.000	0.000	0.000
mba95167.d03	ctw16701.cnv	23.49	31.62	8.13	0	0.000	0.000	0.000
					45	0.000	0.000	0.000
mba95168.d04	ctw16801.cnv	30.55	33.07	2.52	0	0.000	0.000	0.000
					45	0.000	0.000	0.000
mba95170.d82	ctw17001.cnv	30.33	35.57	5.24	0	0.000	0.000	0.000
					45	0.000	0.000	0.000
mba95170.d05	ctw17002.cnv	25.44	27.97	2.53	0	0.000	0.000	0.000
					45	0.000	0.001	0.000
mba95171.d04	ctw17105.cnv	29.68	34.25	4.57	0	0.000	0.000	0.000
					45	0.000	0.000	0.000
mba95171.d04	ctw17106.cnv	20.86	34.25	13.39	0	0.000	0.000	0.014
					45	0.000	0.026	0.001
mba95172.d05	ctw17203.cnv	31.84	37.99	6.15	0	0.000	0.000	0.000
					45	0.000	0.000	0.000
mba95174.d01	ctw17402.cnv	30.00	36.09	6.09	0	0.000	0.000	0.011
					45	0.000	0.021	0.001
mba95174.d02	ctw17402.cnv	30.00	35.40	5.40	0	0.000	0.000	0.009
					45	0.000	0.017	0.001
mba95174.d03	ctw17402.cnv	30.00	36.63	6.09	0	0.000	0.000	0.013
					45	0.000	0.025	0.001
mba95174.d03	ctw17403.cnv	31.21	36.63	5.42	0	0.000	0.000	0.014
					45	0.000	0.028	0.001
mba95174.d04	ctw17403.cnv	31.21	38.00	6.79	0	0.000	0.000	0.022
					45	0.000	0.043	0.001
mba95174.d04	ctg17405.cnv	33.78	38.00	4.22	0	0.000	0.000	0.001
					45	0.000	0.002	0.000
mba95176.d03	ctw17601.cnv	28.34	35.27	6.93	0	0.000	0.000	0.001
					45	0.000	0.002	0.000
mba95176.d04	ctw17601.cnv	28.34	33.61	5.27	0	0.000	0.000	0.001
					45	0.000	0.001	0.000
mba95176.d04	ctw17603.cnv	30.34	33.61	3.27	0	0.000	0.000	0.000
					45	0.000	0.000	0.000
mba95177.d06	ctw17704.cnv	30.45	34.91	4.46	0	0.000	0.000	0.000
					45	0.000	0.000	0.000

mba95308.d02	ctw30802.cnv	32.95	38.32	5.37	0	0.000	0.000	0.000
					45	0.000	0.001	0.000
mba95308.d02	ctw30803.cnv	34.43	38.32	3.89	0	0.000	0.000	0.000
					45	0.000	0.001	0.000
mba95308.d04	ctw30803.cnv	34.43	37.96	3.53	0	0.000	0.000	0.000
					45	0.000	0.001	0.000
mba95315.d02	ctw31505.cnv	16.61	33.24	16.63	0	0.000	0.000	0.002
					45	0.000	0.004	0.000
mba95315.d02	ctw31506.cnv	15.02	33.24	18.22	0	0.000	0.000	0.002
					45	0.000	0.003	0.000
mba95316.d01	ctw31506.cnv	15.02	23.90	8.88	0	0.000	0.000	0.000
					45	0.000	0.001	0.000

The results of these comparisons as shown in Table O-2 show the depth and position errors from extending the bottom of the sound velocity table are less than 5 cm and are within the budget for meeting 1xIHO standards. Concur

Side Scan ✓

Two areas at the south boundary of Sheet C are shown as having 100% side scan coverage. In both cases Sheet A coverage fully overlaps these areas providing 200% or greater side scan coverage. Side scan coverage is 200% or greater for Sheet B with the following exception: Between 40° 52.50'N and 40° 52.61'N and 73° 45.60'W - 73° 45.49 W near Pea Island, no survey was possible due to the presence of exposed rocks in the area.

Watch standers identified 78 targets as wrecks. During post processing and evaluation, the hydrographer judged that 6 were not wrecks and were non-significant. Therefore, only 72 of the targets initially labeled as "wreck" were correlated into wreck features. Twenty eight other targets were also correlated with the wreck targets. These 100 targets were correlated into 38 wreck features.

Contours ✓

One meter contours were generated from 1 x IHO data gridded to select the shoalest sounding in a 15 meter true cell size. This method has the potential for a small horizontal offset of contours if the shoal sounding occurs in the corner of the cell. However, it does generate contours corresponding to the least depths for the survey. Smooth sheet contours were compared to the selected soundings plotted on the smooth sheet, and were modified as necessary for a clear and safe hydrographic presentation. Shoal curves were enlarged when necessary to make them visible around the shoal sounding. Curves were also modified toward deeper water to ensure inclusion of soundings equal to the curve depth. Small deep curves were removed for clarity, but deep curves were sometimes retained on the smooth sheet even though the density of soundings precluded placing a deep sounding within them. The hydrographer felt that the shape of the bottom was more adequately defined by making use of these contours derived from the data too dense for depiction on the smooth sheet in numeric form. On small steep features the contours are too closely spaced for adequate depiction of the

CONTOUR LINES WERE REVISED, ON AN OVERLAY, BY THE HYDROGRAPHIC SURVEY BRANCH TO CONFORM WITH THE SOUNDINGS SHOWN ON THE SMOOTH SHEET JL

bottom while using contour labels. In those cases the shoalest contour label was offset with a leader pointing to the feature.

2xIHO Features ✓

Three features detected in the 2xIHO portion of the multibeam swath were not covered by 1xIHO soundings. These features and nearby 1xIHO soundings are listed below.

Feature #	Latitude	Longitude	2xIHO Depth	Category	1xIHO Closest	Depths Nearby	From Survey
3	40° 54.93712'N	073° 42.53367'W	9.1	Rock	10.0	8.7, 9.7	H-10612
47	40° 53.99587'N	073° 44.01792'W	13.2	Rock	14.3	12.1	
187	40° 53.24637'N	073° 44.08920'W	6.4	Rock	7.6	4.3, 6.7	

ITEMS NAVIGATIONALLY INSIGNIFICANT OR DUE TO SHOAL BIAS IN THE OUTER BEAMS. NOT ON SMOOTH SHEET

P. AIDS TO NAVIGATION See Eval Rpt., Section P.

All floating aids within this survey adequately serve their apparent purpose, and were on station in agreement with the chart and with the Light List, Volume I, Atlantic Coast as follows:

Prospect Point Lighted Gong Buoy "23" was on station at 40° 52.707'N, 073° 43.227'W with characteristics F1 G 4s and a green structure. LL#21435.

Execution Rocks Shoal North End Buoy "1" was on station at 40° 53.455'N, 073° 44.155'W, a green can. LL#21450.

Execution Rocks Shoal East Side Buoy "44" was on station at 40° 52.775'N, 073° 44.117'W, a red nun. LL#21455.

Execution Rocks Lighted Gong Buoy "44A" was on station at 40° 52.377'N, 073° 44.210'W with characteristics F1 R 4s and a red structure. LL#21460.

Execution Rocks Shoal Southwest End Buoy was on station at 40° 52.475'N, 073° 44.565'W with red and green bands, nun. LL#21465.

Sands Point Reef Lighted Buoy "25" was on station at 40° 52.122'N, 073° 44.283'W with characteristics F1 G 2.5s and a green structure. LL#21475.

Gangway Rock Gong Buoy "27" was on station at 40° 51.503'N, 073° 44.830'W with a green structure. LL#21485.

Hen and Chickens South Lighted Buoy "2" was on station at 40° 54.182'N, 073° 44.318'W with characteristics F1 R 4s and a red structure. LL#25730.

Hart Island East Side Gong Buoy "1" was on station at 40° 51.418'N, 073° 45.757'W with a green structure. LL#25850.

Q. STATISTICS ✓

Survey statistics are as follows:

1142	Lineal kilometers of sounding lines
22.6	Square kilometers of hydrography
13	Days of production
0.5	Days of weather downtime
2.5	Days of mechanical, electronic or operational downtime
5	Number of tide stations
54	Number of velocity casts
0	Number of XBT drops

R. MISCELLANEOUS ✓

The full bottom coverage provided by this survey reveals much more detail of the depth and character of the bottom than has been provided by other surveys. In rocky areas, many rocks were found with shoaler depths than those charted. Depths on rocks found by prior sounding were in agreement. Depths of rocks carried forward from 1930's wire drag were found to be deeper than charted as one might expect. The southeast portion of the survey shows a history of continual shoaling.

S. RECOMMENDATIONS

Based on comparisons with previous surveys and existing charts, it is recommended that the entire common area of charts 12366 and 12367 be reconstructed with data from this survey.

CONCUR JL

T. REFERRAL TO REPORTS ✓

FILED WITH THE HYDROGRAPHIC DATA

- Phase I - NOAA Acquisition of Sounding Data in Western Long Island Sound, Phase I Test Results, December 3, 1994. Submitted to NOAA COTR aboard M/V Beavertail.
- Phase IIA - Phase IIA Accuracy and Alignment Tests - submitted to NOAA COTR aboard M/V Atlantic Surveyor, May 14, 1995.
- Phase IIA - Survey Report - Calibration, Horizontal Control, Real-Time and Processing Procedures
- Phase IIA - Summary Report - Tides
- Sheet B Processing and Multibeam Data Summary
- Sheet B Real Time Log Notebook
- Sheet B Sound Velocity Notebook

- Sheet B Processing Notebook
- Sheet B Digital Data Listing Notebook
- Sheet B Digital Data
- Sheet B Side Scan Sonar Analog Records
- Sheet B Plots

FILED WITH

APPENDIX A:

DANGER TO NAVIGATION REPORTS

Science Applications International Corporation
An Employee-Owned Company

ADVANCE INFORMATION

June 23, 1995

Lieutenant David A. Cole, NOAA
Field Manager, Contract Hydrographic Surveys
Coast & Geodetic Survey, N/CG24x3
National Ocean Service
1315 East West Highway, SSMC3, Station 6856
Silver Spring, MD 20910

Dear Lieutenant Cole:

DANGER TO NAVIGATION REPORT

On June 23, 1995, an obstruction covered by 5.5 meters (18 feet) of water at MLLW discovered; Chart No. 12364, Chart No. 12366; Latitude 40^0 52.4324'N; Longitude 073^0 45.4097'W; NAD 1983; Distance 1650 meters Bearing 235.5^0 True from Execution Rocks Light, Fl 10s 62 ft 16 M.

Depth determined by application of observed tides at Willets Point NY with correctors of minus (-) 20 minutes and a height multiplier of 1.02 applied.

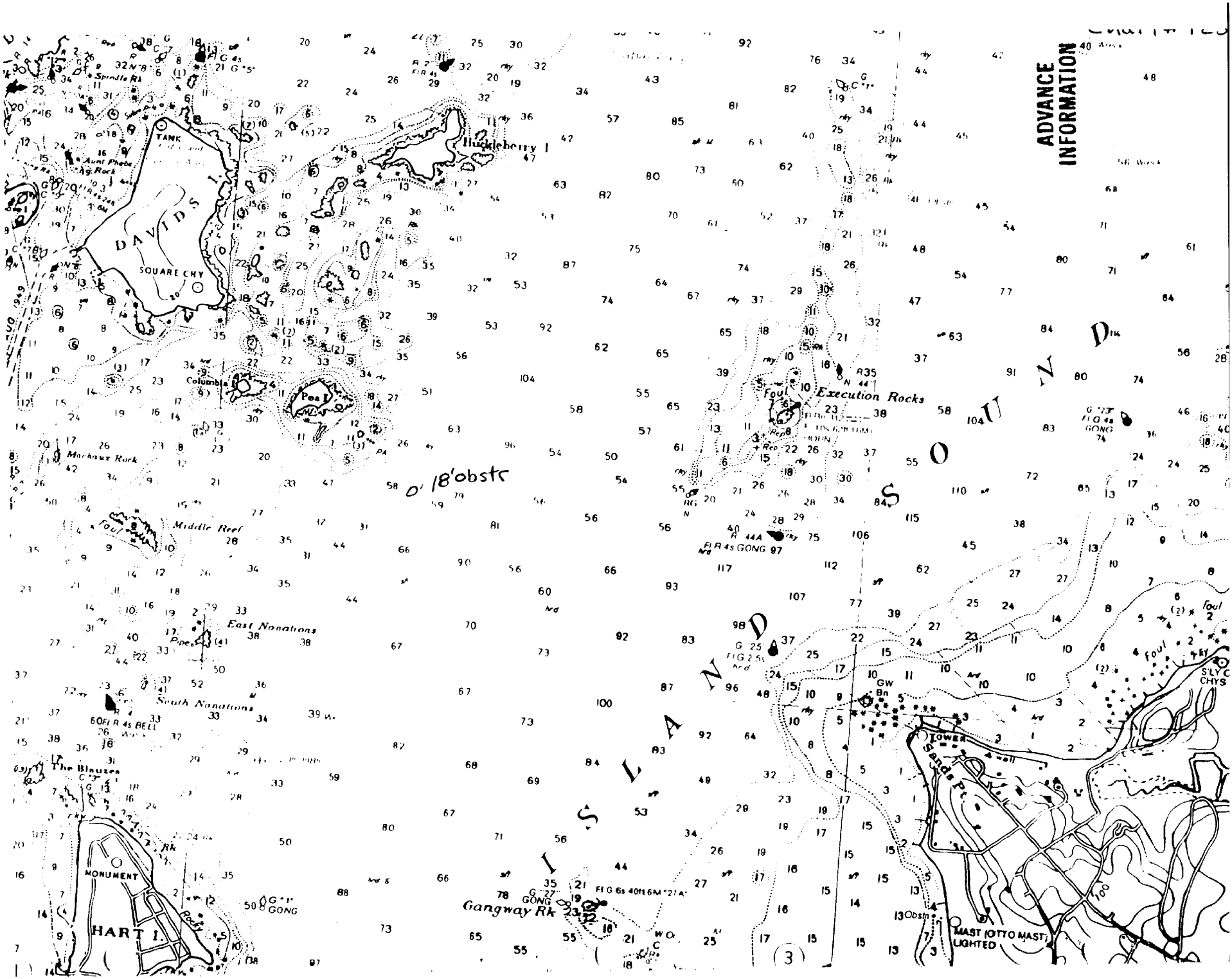
Sincerely,
Science Applications International Corporation

Walter S. Simmons
Program Manager

Enclosure

Admiral's Gate, 221 Third Street, Newport, Rhode Island 02840 Office: (401) 847-4210 FAX: (401) 849-1585

Other SAIC Offices: Albuquerque, Colorado Springs, Dayton, Falls Church, Huntsville, Las Vegas, Los Altos, Los Angeles, McLean, Oak Ridge, Orlando, San Diego, Seattle, Tucson


ADVANCE INFORMATION
DAVIDS I.
SQUARE CHY
Huckleberry I
Spindle Rk
Aunt Phebe Rock
TANK
Columbia
Pea I
Markaux Rock
Middle Reef
East Nonations
South Nonations
60 FI R 4s BELL
The Blauzes
MONUMENT
HART I.
Rocks
50 G "1" GONG
Gangway Rk
FIG 6s 40ft 6M "21A"
0' 18'obstr
Foul
Execution Rocks
R35
FIR 4s GONG 97
G 25
FIG 2.5s
GW Bn
LOWER SANDS PT
Foul
S'LY CHYS
Obstn
100
MAST IOTTO MAST LIGHTED
NORTH ISLAND
SOUND
(3)

Science Applications International Corporation
An Employee-Owned Company

ADVANCE INFORMATION

July 08, 1995

AMMENDED JAN 7, 1996

Lieutenant David A. Cole, NOAA
Field Manager, Contract Hydrographic Surveys
Coast & Geodetic Survey, N/CG24x3
National Ocean Service
1315 East West Highway, SSMC3, Station 6856
Silver Spring, MD 20910

Dear Lieutenant Cole:

DANGER TO NAVIGATION REPORT

During surveys in western Long Island Sound, the following obstructions were discovered:

Rock; covered by 1.5 meters (5 feet) at MLLW; Chart No. 12364, Chart No. 12366 ; Latitude 40^0 53.22822N; Longitude 073 44.12639W; NAD 1983; Distance 1008 meters Bearing 014^0 True from Execution Rocks Light, #21440, Fl W 10s.

Rock; covered by 1.1 meters (3 feet) at MLLW; Chart No. 12364, Chart No. 12366; Latitude 40^0 52.73494N; Longitude 073 44.13091W; NAD 1983; Distance 246 meters Bearing 075^0 True from Execution Rocks Light, #21440, Fl W 10s.

Rock; covered by 1.8 meters (6 feet) at MLLW; Chart No. 12364, Chart No. 12366; Latitude 40^0 52.99736N; Longitude 073 44.13584W; NAD 1983; Distance 597 meters Bearing 023^0 True from Execution Rocks Light, #21440, Fl W 10s.

Rock; covered by 2.2 meters (7 feet) at MLLW; Chart No. 12364, Chart No. 12366; Latitude 40^0 53.03091N; Longitude 073 44.13076W; NAD 1983; Distance 657 meters Bearing 021^0 True from Execution Rocks Light, #21440, Fl W 10s.

Rock; covered by 2.7 meters (9 feet) at MLLW; Chart No. 12364, Chart No. 12366; Latitude 40^0 52.50208N; Longitude 073 44.51491W; NAD 1983; Distance 475 meters Bearing 220^0 True from Execution Rocks Light, #21440, Fl W 10s.

Admiral's Gate. 221 Third Street. Newport, Rhode Island 02840 Office: (401) 847-4210 FAX: (401) 849-1585
Other SAIC Offices: Albuquerque, Colorado Springs, Dayton, Falls Church, Huntsville, Las Vegas, Los Altos, Los Angeles, McLean, Oak Ridge, Orlando, San Diego, Seattle, Tucson

Rock; covered by 6.5 meters (21 feet) at MLLW; Chart No. 12364, Chart No. 12367; Latitude 40^0 54.83869N; Longitude 073 42.61406W; NAD 1983; Distance 1869 meters Bearing 105^0 True from Larchmont Harbor Light "2", #25720, Fl R 4s 19ft 5M.

Rock; covered by 7.2 meters (23 feet) at MLLW; Chart No. 12364, Chart No. 12367; Latitude 40^0 54.83914N; Longitude 073 42.61919W; NAD 1983; Distance 1862 meters Bearing 105^0 True from Larchmont Harbor Light "2", #25720, Fl R 4s 19ft 5M.

Rock; covered by 7.7 meters (25 feet) at MLLW; Chart No. 12364, Chart No. 12367; Latitude 40^0 54.77041N; Longitude 073 42.62647W; NAD 1983; Distance 1889 meters Bearing 109^0 True from Larchmont Harbor Light "2", #25720, Fl R 4s 19ft 5M.

Rock; covered by 2.8 meters (9 feet) at MLLW; Chart No. 12364, Chart No. 12366; Latitude 40^0 49.48162N; Longitude 073 46.56576W; NAD 1983; Distance 99 meters Bearing 250^0 True from Stepping Stones Light, #21505, OcG 4s.

Rock; covered by 3.1 meters (10 feet) at MLLW; Chart No. 12364, Chart No. 12366; Latitude 40^0 49.47778N; Longitude 073 46.56657W; NAD 1983; Distance 102 meters Bearing 246^0 True from Stepping Stones Light, #21505, OcG 4s.

Obstruction; covered by 12.4 meters (40 feet) at MLLW; Chart No. 12364, Chart No. 12366; Latitude 40^0 52.51937N; Longitude 073 45.02353W; NAD 1983; Distance 1070 meters Bearing 252^0 True from Execution Rocks Light #21440, Fl W 10 s

Depth determined by application of observed tides at Willets Point NY.

In addition, preliminary analysis of the current survey reveals that there may be numerous areas within the 18 foot depth curve at Execution Rocks which are shoaler than the charted depths.

Sincerely,
Science Applications International Corporation

Walter S. Simmons
Program Manager

Enclosure

Science Applications International Corporation
An Employee-Owned Company

ADVANCE INFORMATION

January 07, 1996

Lieutenant Commander David A. Cole, NOAA
Field Manager, Contract Hydrographic Surveys
Office of Coast Survey, N/CG24x3
National Ocean Service
1315 East West Highway, SSMC3, Station 6856
Silver Spring, MD 20910

Subject: NOAA Contract 50-DGNC-4-00035
Reference: 1) Danger to Navigation Report dated July 08, 1995

Dear Lieutenant Commander Cole:

Science Applications International Corporation (SAIC) reported dangers to navigation found during surveys in Long Island Sound under the subject contract via Reference 1). These reports were based upon preliminary data before the completion of surveys, and before full processing and evaluation of data. This report was submitted early in the interest of safety of navigation, and at the urging of the COTR.

After completion of additional survey coverage with multibeam and side scan sonars, full processing, and the application of locally observed water levels, SAIC determined that some dangers previously reported were false indications in the outer beams of the swath, and that others should be corrected in position or depth. Therefore, SAIC submits this update to Reference 1). The order of listing is the same as in Reference 1). DEPTHS AS ORIGINALLY REPORTED ARE NOT CURRENTLY CHARTED. CHART DEPTHS AS REVISED AFTER FINAL PROCESSING JL

Rock: covered by ~~1.5 meters (5 feet)~~ 4.3 meters (14 feet) at MLLW; Chart No. 12364, Chart No. 12366; Latitude 40° 53.23771N; Longitude 073 44.13138W; Distance 1008 meters Bearing 014° True from Execution Rocks Light, #21440, Fl W 10s. Recommend removal of charted 5 feet and charting of 14 feet.

Rock: covered by ~~1.1 meters (3 feet)~~ 4.4 meters (14 feet) at MLLW; Chart No. 12364, Chart No. 12366; Latitude 40° 52.73338N; Longitude 073 44.12674W; Distance 246 meters Bearing 075° True from Execution Rocks Light, #21440, Fl W 10s. Recommend removal of charted 3 feet and charting of 14 feet.

Rock: covered by ~~1.8 meters (6 feet)~~ 4.9 meters (16 feet) at MLLW; Chart No. 12364, Chart No. 12366; Latitude 40° 52.99724N; Longitude 073 44.13381W; Distance 597 meters Bearing 023° True from Execution Rocks Light, #21440, Fl W 10s. Recommend removal of charted 6 feet and charting of 16 feet.

Rock: covered by ~~2.2 meters (7 feet)~~ 4.3 meters (14 feet) at MLLW; Chart No. 12364, Chart No. 12366; Latitude 40° 53.03131N; Longitude 073 44.13458W; Distance 657 meters Bearing 021° True from Execution Rocks Light, #21440, Fl W 10s. Recommend removal of charted 7 feet and charting of 14 feet.

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Other SAIC Offices: Albuquerque, Colorado Springs, Dayton, Falls Church, Huntsville, Las Vegas, Los Altos, Los Angeles, McLean, Oak Ridge, Orlando, San Diego, Seattle, Tucson

ADVANCE INFORMATION

Rock; covered by ~~2.7 meters (9 feet)~~ 2.6 meters (8 feet) at MLLW; Chart No. 12364, Chart No. 12366; Latitude 40° 52.50208N; Longitude 073 44.51491W; Distance 475 meters Bearing 220° True from Execution Rocks Light, #21440, Fl W 10s. Recommend removal of charted 9 feet and charting of 8 feet.

Rock; covered by ~~6.5 meters (21 feet)~~ 7.9 ~~meters (26 feet)~~ at MLLW; Chart No. 12364, Chart No. 12367; Latitude 40° 54.83869N; Longitude 073 42.61895W; Distance 1869 meters Bearing 105° True from Larchmont Harbor Light "2", #25720, Fl R 4s 19ft 5M. Recommend removal of charted 21 feet and charting of 26 feet. AMMENDED BELOW

Rock; covered by 7.2 meters (23 feet) at MLLW; Chart No. 12364, Chart No. 12367; Latitude 40° 54.83969N; Longitude 073 42.61895W; Distance 1862 meters Bearing 105° True from Larchmont Harbor Light "2", #25720, Fl R 4s 19ft 5M. No change. AMMENDS ABOVE STATEMENT

Rock; covered by ~~7.7 meters (25 feet)~~ 8.2 meters (27 feet) at MLLW; Chart No. 12364, Chart No. 12367; Latitude 40° 54.76094N; Longitude 073 42.62973W; Distance 1889 meters Bearing 109° True from Larchmont Harbor Light "2", #25720, Fl R 4s 19ft 5M. Recommend removal of charted 25 feet and charting of 27 feet.

Rock; covered by ~~2.8 meters (9 feet)~~ 4.4 meters (14 feet) at MLLW; Chart No. 12364, Chart No. 12366; Latitude 40° 49.48107N; Longitude 073 46.56501W; Distance 99 meters Bearing 250° True from Stepping Stones Light, #21505, OcG 4s. Recommend removal of charted 9 feet and charting of 14 feet. PLOTS OUTSIDE SURVEY AREA

Rock; covered by ~~3.1 meters (10 feet)~~ 5.5 meters (18 feet) at MLLW; Chart No. 12364, Chart No. 12366; Latitude 40° 49.47303N; Longitude 073 46.57085W; Distance 102 meters Bearing 246° True from Stepping Stones Light, #21505, OcG 4s. PLOTS OUTSIDE SURVEY AREA

~~Obstruction; covered by 12.4 meters (40 feet) at MLLW; Chart No. 12364, Chart No. 12366; Latitude 40° 52.51937N; Longitude 073 45.02353W; NAD 1983; Distance 1070 meters Bearing 252° True from Execution Rocks Light #21440, Fl W 10 s Recommend removal of charted obstruction covered 40 feet.~~

In addition, SAIC reports a rock; covered 3.1 meters (10 feet) at MLLW; Chart No. 12364, Chart No. 12366; Latitude 40° 49.43470N; Longitude 073 46.52459W; NAD 1983. Plots outside survey area

Positions are NAD 1983, and depths are MLLW based upon observed water levels at New Rochelle, NY, with zoning correctors applied.

Sincerely,
Science Applications International Corporation

Walter S. Simmons

Walter S. Simmons
Program Manager

Admiral's Gate. 221 Third Street. Newport. Rhode Island 02840 Office: (401) 847-4210 FAX: (401) 849-1585

APPENDIX B:

LANDMARKS AND NON-FLOATING AIDS TO NAVIGATION LISTS

NOT APPLICABLE

APPENDIX C:

LIST OF HORIZONTAL CONTROL STATIONS

NAME	LATITUDE	LONGITUDE	ANTENNA ELEVATION	SOURCE	DATES & TIMES (UTC) OCCUPIED
MANRESA 1983 (LX7443)	41 04 22.81236N	073 24 38.93245W	52.56m	Published	28 March 1995 - 10 July 1995
ZIEGLER 1932 (LX3804)	41 02 38.71029N	073 28 40.45528W	16.46m	Published	28 March 1995, 1941 - 29 March 1995, 1623 29 March 1995, 2004 - 31 March 1995, 1312

APPENDIX D:

LIST OF GEOGRAPHIC NAMES

NOAA FORM 76-155
(11-72)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

SURVEY NUMBER

H-10618

GEOGRAPHIC NAMES

Name on Survey	A ON CHART NO.	B ON PREVIOUS SURVEY NO.	C ON U.S. QUADRANGLE MAPS	D FROM LOCAL INFORMATION	E ON LOCAL MAPS	F P.O. GUIDE OR MAP	G RAND MCNALLY ATLAS	H U.S. LIGHT LIST	K	
Long Island Sound	12366									1
Execution Rocks	12366									2
										3
										4
										5
										6
										7
										8
										9
										10
										11
										12
										13
										14
										15
										16
										17
										18
										19
										20
										21
										22
										23
NAMES HAVE NOT BEEN APPROVED BY										24
CHIEF GEOGRAPHER, NOAA										25

APPENDIX E:

TIDE NOTES

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
Office of Ocean and Earth Sciences
Rockville, Maryland 20852

September 17,1996

MEMORANDUM FOR: LTCDR David A. Cole
Hydrographic Surveys Division

FROM: Stephen K. Gill
Chief, Tidal Analysis Branch

Michael C. O'Hargan
Chief, Sea and Estuarine Section

SUBJECT: Final Evaluation of Contract Deliverables,
Project OPR-B389-

The Ocean and Lake Levels Division (OLLD), as requested, has reviewed information received from; the contractor in teleconference between the contractor, yourself, and Michael O'Hargan and Stephen Gill on July 24, 1996; and, the subsequent written submission from the contractor regarding project-wide compliance issues to you dated August 16, 1996.

The additional information received during the teleconference and the written submission completes the requests for detailed information from OLLD. Major errors noted have been corrected, and missing information has been provided. OLLD now has an acceptable understanding of the contractor's procedures related to the water level field collection, data reduction, data processing, and tidal datum determination.

Based on the review of the recent information in the context of the previous evaluation of the contractor's work on tides, OLLD has estimated a worst-case uncertainty in the tide-reducers applied to the soundings for the contract of 1.0 ft. This estimate includes datum recovery of MLLW datum on the bench marks (a bias error), and uncertainties in the raw tide gauge measurements, the staff-to-gauge settings applied to the data, and the tidal zoning correctors. It is our understanding that this maximum estimated error is within the 1.6 foot (0.50 meter) specified in the contract.

OLLD will provide details of the evaluation in a subsequent in-house program evaluation document. OLLD has determined, based on the evaluation, that the tide data collected for this survey are "single purpose data" for use as tide reducer only. Accepted tidal datums, bench mark elevations, and published bench mark sheets will not be updated or produced as result of the contractor data. This limitation does not affect acceptance of the contract deliverables.

cc:

Richard Barazotto
Philip Morris
Jim Hubbard
Mike Gibson

TIDE NOTES

SITE	LOCATION	PERIOD
Long Neck Point, CT	41° 02.3'N	19 April 1995 to 13 July 1995
8468788	73° 28.8'W	23 Oct 1995 to 17 Nov 1995
New Rochelle, NY	40° 53.5'N	20 April 1995 to 13 July 1995
8518490	73° 46.9'W	03 Nov 1995 to 15 Nov 1995
Willets Point, NY	40° 53.5'N	NOAA Station
8516990	73° 46.9'W	

Long Neck Point, CT

Sea Data Model TDR-3A (S/N 018) and Coastal Leasing Microtide (S/N 10302) gages were installed on 19 April 1995. The staff was installed and leveled on 24 April. The Long Neck primary gage, TDR #018, malfunctioned on 31 May and Coastal #10302 became the primary gage. A new backup gage, Coastal #10320, was installed. Both gages were removed 13 July 1995. Coastal Microtide (S/N 10357 and 10353) gages were installed on 23 October 1995. The staff was leveled on 23 October. Both gages were removed on 17 November 1995.

New Rochelle, NY

Sea Data Model TDR-3A (S/N 224) and Coastal Leasing Microtide (S/N 10321) gages were installed on 20 April 1995. The staff was installed on 20 April and leveled on 25 April. The primary gage, TDR #224, failed on 01 May. The backup gage, COASTAL #10321, was connected to the telemetry system as the new primary gage. The backup gage has a complete record of the deployment and no data were lost. TDR #510 was installed as the new secondary gage on 03 May. Both gages were removed 13 July 1995. Coastal Microtide (S/N 10307 and 10320) gages were installed on 3 November 1995 and the staff was leveled. Both gages and staff were removed 17 November 1995.

Tide and Water Level Correction

The reference stations for H-10612 were Willets Point, NY (851-6990) and Bridgeport, CT (846-7150).

Soundings for field sheets were corrected using observed water level data from NOAA Station Willets Point, NY (851-6990). Data were acquired by cellular phone modem using the NOAA REALDATA software.

Smooth sheet soundings were corrected for water level through application of observed data from the Long Neck Point, CT (846-8799), the New Rochelle, NY (851-8490) and the Willets Point, NY (851-6990)stations. A staff MLLW datum was computed at each station by simultaneous comparison with Willets Point, NY (851-6990) and with Bridgeport, CT (846-7150) using the NOAA Form 248 method prescribed by Marmer (Tidal Datum Planes, Spec. Pub. 135, U.S. Dept. of Commerce). The simultaneous comparison computations are included in the Phase IIA Summary Report* Tides.

* Filed with the hydrographic data.

The boundaries of tide zones used are listed in the Phase IIA Summary Report - Tides. Gage readings were recorded in relation to staff zero; therefore, the MLLW datum height was subtracted from gage readings before applying the time and ratio correctors.

Zoning correctors applied to the observed gage values were:

		Correctors			
Station	**Zone**	**Time (h min)**	**Ratio**	**Height**	**Staff MLLW Datum**
Long Neck Point	A2	+00 09	*1.01	0.496	0.496
New Rochelle	A3	-00 03	*0.99	0.983	0.983
Willets Point, NOAA	A8	-00 09	*1.01	0.000	0.000
New Rochelle	A9	00 00	*1.00	0.983	0.983

All data for project water level gages are reported in the Phase IIA Summary Report - Tides.

Table E-1. Abstract of Times of Hydrography

1995/165 04:23:44.88 to 1995/165 04:47:50.65
1995/165 04:50:51.89 to 1995/165 05:13:05.98
1995/165 05:21:13.83 to 1995/165 05:44:32.50
1995/165 05:48:33.57 to 1995/165 06:08:23.09
1995/165 06:12:17.94 to 1995/165 06:35:32.76
1995/170 00:38:00.04 to 1995/170 00:46:00.85
1995/170 00:49:14.82 to 1995/170 01:00:56.41
1995/170 01:12:00.02 to 1995/170 01:22:50.88
1995/170 01:25:21.59 to 1995/170 01:42:54.84
1995/175 22:32:33.14 to 1995/175 22:40:41.96
1995/175 22:43:05.34 to 1995/175 22:50:00.98
1995/175 22:52:03.92 to 1995/175 23:02:13.98
1995/175 23:04:00.03 to 1995/175 23:10:29.90
1995/175 23:16:09.92 to 1995/175 23:27:25.96
1995/175 23:32:50.06 to 1995/175 23:40:28.95
1995/175 23:42:56.78 to 1995/175 23:52:54.02
1995/165 06:48:52.86 to 1995/165 07:13:52.84
1995/165 07:22:16.10 to 1995/165 07:53:24.03
1995/165 08:07:49.30 to 1995/165 08:32:44.55
1995/165 08:50:19.43 to 1995/165 09:19:44.85
1995/165 09:25:12.73 to 1995/165 09:47:51.11
1995/165 09:55:10.67 to 1995/165 10:28:47.32
1995/165 10:35:21.85 to 1995/165 10:58:31.34
1995/165 12:02:27.41 to 1995/165 12:14:46.33
1995/165 12:19:36.58 to 1995/165 12:40:16.16
1995/165 12:44:26.72 to 1995/165 13:02:43.51
1995/165 13:06:19.99 to 1995/165 13:24:55.45
1995/165 13:29:21.11 to 1995/165 13:52:21.71
1995/165 14:08:22.30 to 1995/165 14:28:47.30
1995/165 14:36:43.07 to 1995/165 15:03:03.28
1995/165 15:08:42.41 to 1995/165 15:20:34.37
1995/165 15:27:47.12 to 1995/165 15:38:08.90
1995/165 15:46:17.76 to 1995/165 16:08:13.90
1995/165 16:15:47.38 to 1995/165 16:36:36.34
1995/165 16:41:17.49 to 1995/165 17:04:15.10
1995/165 17:09:22.24 to 1995/165 17:14:39.82
1995/165 17:30:42.04 to 1995/165 17:44:15.91
1995/166 01:43:26.02 to 1995/166 02:19:00.28
1995/166 02:32:06.75 to 1995/166 02:55:44.38
1995/166 03:04:37.26 to 1995/166 03:31:23.61
1995/166 03:37:47.25 to 1995/166 04:03:20.05
1995/166 04:10:11.17 to 1995/166 04:36:32.63
1995/166 04:43:15.16 to 1995/166 04:43:58.78
1995/166 04:51:41.74 to 1995/166 05:14:45.90
1995/166 05:19:53.92 to 1995/166 05:41:29.20
1995/166 05:46:52.34 to 1995/166 06:08:35.62
1995/166 06:15:46.29 to 1995/166 06:36:46.02
1995/166 06:42:46.48 to 1995/166 07:05:54.49
1995/166 07:12:50.05 to 1995/166 07:35:18.07
1995/166 07:41:16.75 to 1995/166 08:04:28.02
1995/166 08:44:30.23 to 1995/166 09:05:37.67

Table E-1. Abstract of Times of Hydrography (continued)

1995/166 09:10:39.17 to 1995/166 09:32:27.41
1995/166 09:38:16.40 to 1995/166 10:00:06.19
1995/166 10:25:54.62 to 1995/166 10:47:03.53
1995/166 10:52:06.52 to 1995/166 11:14:31.87
1995/166 11:32:08.22 to 1995/166 11:54:10.68
1995/166 11:59:46.33 to 1995/166 12:21:37.32
1995/166 12:27:29.78 to 1995/166 12:51:43.55
1995/166 12:55:56.18 to 1995/166 13:19:02.41
1995/166 13:25:00.20 to 1995/166 13:47:57.84
1995/166 13:52:27.94 to 1995/166 14:12:39.98
1995/166 22:14:32.21 to 1995/166 22:35:34.83
1995/166 22:42:13.21 to 1995/166 22:54:09.92
1995/166 23:12:25.97 to 1995/166 23:36:40.04
1995/166 23:42:20.65 to 1995/166 23:59:55.89
1995/166 23:59:55.97 to 1995/167 00:07:15.31
1995/167 00:19:08.31 to 1995/167 00:42:07.72
1995/167 00:47:50.41 to 1995/167 01:13:59.13
1995/167 01:20:00.18 to 1995/167 01:44:38.84
1995/167 01:51:28.78 to 1995/167 02:18:48.89
1995/167 02:24:18.25 to 1995/167 02:34:27.12
1995/167 02:43:34.22 to 1995/167 03:02:52.93
1995/167 03:10:11.30 to 1995/167 03:35:52.99
1995/167 03:46:38.51 to 1995/167 04:12:59.97
1995/167 04:18:48.58 to 1995/167 04:45:31.96
1995/167 04:51:01.32 to 1995/167 05:16:09.90
1995/167 05:22:58.35 to 1995/167 05:46:46.28
1995/167 05:54:25.17 to 1995/167 06:19:03.83
1995/167 06:24:52.44 to 1995/167 06:49:04.07
1995/167 06:56:00.00 to 1995/167 07:21:10.95
1995/167 07:26:18.68 to 1995/167 07:55:47.67
1995/167 08:00:52.43 to 1995/167 08:26:00.94
1995/167 08:33:59.98 to 1995/167 09:03:56.51
1995/167 09:40:46.17 to 1995/167 10:09:14.42
1995/167 10:16:41.09 to 1995/167 10:46:43.25
1995/167 10:54:08.15 to 1995/167 11:18:09.77
1995/167 11:36:37.67 to 1995/167 12:06:18.62
1995/167 12:27:37.75 to 1995/167 12:35:45.08
1995/167 12:40:07.25 to 1995/167 12:41:51.93
1995/167 12:45:05.38 to 1995/167 12:47:05.06
1995/167 13:19:39.77 to 1995/167 13:48:41.22
1995/167 21:34:56.18 to 1995/167 21:50:41.59
1995/167 21:54:13.33 to 1995/167 22:10:35.48
1995/167 22:24:21.05 to 1995/167 22:35:14.06
1995/167 22:38:58.84 to 1995/167 22:51:37.02
1995/167 22:55:28.31 to 1995/167 23:03:30.02
1995/167 23:03:34.17 to 1995/167 23:07:13.17
1995/167 23:10:57.65 to 1995/167 23:26:33.21
1995/167 23:29:19.41 to 1995/167 23:40:22.19
1995/167 23:44:52.59 to 1995/167 23:58:43.06
1995/168 00:04:20.71 to 1995/168 00:17:41.55
1995/168 00:31:03.12 to 1995/168 00:44:33.15

Table E-1. Abstract of Times of Hydrography (continued)

1995/168 00:50:52.94 to 1995/168 00:53:37.36
1995/168 01:00:29.07 to 1995/168 01:14:47.38
1995/168 01:23:15.08 to 1995/168 01:32:46.92
1995/168 01:36:56.29 to 1995/168 01:45:11.69
1995/168 01:56:46.03 to 1995/168 02:02:09.90
1995/168 02:06:59.56 to 1995/168 02:09:56.50
1995/168 02:42:20.49 to 1995/168 03:09:03.20
1995/168 03:14:24.26 to 1995/168 03:38:08.12
1995/168 03:46:15.08 to 1995/168 04:10:33.59
1995/168 04:15:36.28 to 1995/168 04:40:02.50
1995/168 05:06:45.44 to 1995/168 05:30:03.51
1995/168 05:34:20.88 to 1995/168 05:56:31.71
1995/168 06:01:39.14 to 1995/168 06:31:42.49
1995/168 06:41:39.66 to 1995/168 06:50:16.39
1995/168 06:54:16.28 to 1995/168 07:01:47.55
1995/168 07:09:35.84 to 1995/168 07:20:04.71
1995/168 07:23:53.35 to 1995/168 07:30:27.73
1995/168 07:38:44.76 to 1995/168 07:47:54.38
1995/168 07:50:35.17 to 1995/168 07:58:10.87
1995/168 08:17:25.29 to 1995/168 08:49:30.69
1995/168 09:01:17.77 to 1995/168 09:33:03.92
1995/168 09:55:12.23 to 1995/168 10:20:04.81
1995/168 10:25:57.86 to 1995/168 10:59:01.92
1995/168 11:07:07.70 to 1995/168 11:32:36.13
1995/168 11:36:39.57 to 1995/168 12:04:28.13
1995/168 12:34:13.55 to 1995/168 12:43:37.02
1995/168 12:56:42.95 to 1995/168 12:58:50.06
1995/168 13:06:40.14 to 1995/168 13:09:50.36
1995/168 13:15:28.21 to 1995/168 13:17:41.77
1995/168 13:25:58.47 to 1995/168 13:27:32.97
1995/168 22:30:30.78 to 1995/168 23:09:19.97
1995/168 23:16:27.69 to 1995/168 23:21:20.75
1995/168 23:30:56.89 to 1995/168 23:59:57.35
1995/168 23:59:57.43 to 1995/169 00:11:41.61
1995/169 00:29:22.12 to 1995/169 01:10:37.06
1995/169 01:24:31.53 to 1995/169 01:42:52.17
1995/169 01:47:16.65 to 1995/169 02:00:25.04
1995/169 02:14:49.72 to 1995/169 02:29:26.99
1995/169 02:40:00.01 to 1995/169 02:53:45.14
1995/169 03:05:59.76 to 1995/169 03:21:38.06
1995/169 03:28:27.18 to 1995/169 03:40:47.21
1995/169 03:47:01.01 to 1995/169 03:55:38.33
1995/169 04:01:08.88 to 1995/169 04:08:36.29
1995/169 04:14:41.49 to 1995/169 04:18:33.53
1995/169 04:25:29.09 to 1995/169 04:34:15.31
1995/169 04:40:56.95 to 1995/169 04:46:08.08
1995/169 04:53:22.91 to 1995/169 05:04:37.54
1995/169 05:09:56.23 to 1995/169 05:24:33.21
1995/169 05:31:23.81 to 1995/169 05:50:49.26
1995/169 06:04:36.02 to 1995/169 06:31:23.25
1995/169 06:36:40.76 to 1995/169 07:01:31.56

Table E-1. Abstract of Times of Hydrography (continued)

1995/169 07:46:50.82 to 1995/169 07:54:51.41
1995/169 07:58:08.64 to 1995/169 08:04:49.07
1995/169 08:11:17.78 to 1995/169 08:19:42.95
1995/169 08:23:01.16 to 1995/169 08:29:49.20
1995/169 08:36:05.47 to 1995/169 08:43:08.32
1995/169 08:46:27.02 to 1995/169 08:51:19.19
1995/169 08:57:33.75 to 1995/169 09:04:29.08
1995/169 09:07:19.13 to 1995/169 09:12:25.09
1995/169 09:18:22.26 to 1995/169 09:25:36.90
1995/169 09:28:49.91 to 1995/169 09:34:41.98
1995/169 09:40:17.79 to 1995/169 09:47:22.31
1995/169 09:50:14.69 to 1995/169 09:56:35.62
1995/169 10:03:20.53 to 1995/169 10:10:04.70
1995/169 10:14:35.40 to 1995/169 10:22:13.89
1995/169 10:44:58.64 to 1995/169 11:26:40.55
1995/169 11:41:37.52 to 1995/169 12:05:40.04
1995/169 12:09:28.37 to 1995/169 12:36:07.31
1995/169 12:40:23.19 to 1995/169 13:04:59.78
1995/169 13:08:09.60 to 1995/169 13:27:59.93
1995/170 01:49:29.07 to 1995/170 02:05:06.18
1995/170 02:13:51.07 to 1995/170 02:27:40.94
1995/170 02:33:35.77 to 1995/170 02:46:58.39
1995/170 02:51:57.52 to 1995/170 02:57:17.55
1995/170 03:01:05.29 to 1995/170 03:03:23.71
1995/170 03:09:19.14 to 1995/170 03:24:13.59
1995/170 03:30:21.76 to 1995/170 03:33:37.65
1995/170 03:39:13.53 to 1995/170 03:52:09.78
1995/170 03:57:46.54 to 1995/170 04:16:21.70
1995/170 04:20:58.62 to 1995/170 04:37:41.79
1995/170 04:42:14.57 to 1995/170 04:53:59.72
1995/170 04:58:09.68 to 1995/170 05:07:53.66
1995/170 05:12:28.21 to 1995/170 05:15:28.70
1995/170 05:29:32.94 to 1995/170 05:46:57.89
1995/170 05:55:02.48 to 1995/170 05:57:34.53
1995/170 06:02:24.19 to 1995/170 06:04:50.61
1995/170 06:08:30.06 to 1995/170 06:11:17.81
1995/170 06:23:08.73 to 1995/170 06:24:43.61
1995/170 06:40:19.98 to 1995/170 06:42:39.00
1995/170 06:59:19.06 to 1995/170 07:06:16.26
1995/170 07:15:32.24 to 1995/170 07:28:03.02
1995/170 07:34:39.40 to 1995/170 07:48:22.97
1995/170 07:55:36.02 to 1995/170 08:06:04.70
1995/170 08:13:02.95 to 1995/170 08:19:16.01
1995/170 08:23:51.74 to 1995/170 08:40:52.55
1995/170 08:56:47.88 to 1995/170 09:09:19.54
1995/170 09:18:51.53 to 1995/170 09:34:39.96
1995/170 09:41:39.38 to 1995/170 09:58:35.01
1995/170 10:16:29.14 to 1995/170 10:30:28.77
1995/170 10:35:17.24 to 1995/170 10:51:37.38
1995/170 10:55:08.10 to 1995/170 11:09:49.07
1995/170 11:15:50.07 to 1995/170 11:36:27.08

Table E-1. Abstract of Times of Hydrography (continued)

1995/170 11:40:43.86 to 1995/170 11:55:25.50
1995/170 12:08:07.27 to 1995/170 12:24:39.17
1995/170 12:28:50.32 to 1995/170 12:43:48.22
1995/170 12:50:42.60 to 1995/170 13:08:11.99
1995/171 09:45:19.76 to 1995/171 10:01:01.90
1995/171 10:10:49.88 to 1995/171 10:17:35.75
1995/171 10:35:03.28 to 1995/171 10:50:04.25
1995/171 10:56:30.79 to 1995/171 11:09:28.22
1995/171 11:21:28.03 to 1995/171 11:37:03.67
1995/171 11:40:56.74 to 1995/171 11:55:05.57
1995/171 12:13:07.70 to 1995/171 12:28:30.59
1995/171 12:30:50.35 to 1995/171 12:42:39.05
1995/171 12:48:15.82 to 1995/171 13:00:13.70
1995/171 13:04:05.00 to 1995/171 13:13:46.61
1995/171 13:19:06.79 to 1995/171 13:29:57.13
1995/171 13:35:33.89 to 1995/171 13:43:03.08
1995/171 13:47:59.55 to 1995/171 13:54:36.60
1995/171 14:27:55.33 to 1995/171 14:31:52.40
1995/171 14:46:11.82 to 1995/171 14:50:23.64
1995/171 14:57:07.94 to 1995/171 15:02:26.78
1995/171 15:13:25.87 to 1995/171 15:24:37.54
1995/171 15:52:36.02 to 1995/171 15:56:49.09
1995/171 16:08:02.10 to 1995/171 16:11:59.17
1995/171 16:15:00.11 to 1995/171 16:20:44.13
1995/171 16:27:13.03 to 1995/171 16:32:57.82
1995/171 16:38:11.55 to 1995/171 16:48:35.45
1995/171 16:56:23.75 to 1995/171 17:08:35.56
1995/171 17:17:50.96 to 1995/171 17:30:47.71
1995/171 17:37:48.31 to 1995/171 17:53:39.64
1995/171 17:57:51.38 to 1995/171 18:03:06.67
1995/171 18:49:15.05 to 1995/171 18:58:06.30
1995/171 19:14:13.85 to 1995/171 19:25:04.42
1995/171 19:30:10.07 to 1995/171 19:31:39.91
1995/171 19:31:55.02 to 1995/171 19:39:47.24
1995/171 19:45:09.79 to 1995/171 19:55:31.69
1995/171 20:00:37.72 to 1995/171 20:09:59.70
1995/171 20:31:08.17 to 1995/171 20:36:15.08
1995/171 20:40:45.02 to 1995/171 20:46:13.75
1995/171 20:50:37.42 to 1995/171 20:55:52.51
1995/171 20:59:53.41 to 1995/171 21:06:09.41
1995/171 21:11:02.49 to 1995/171 21:17:17.21
1995/171 21:21:56.45 to 1995/171 21:28:26.13
1995/171 21:31:50.37 to 1995/171 21:38:27.55
1995/171 21:43:08.67 to 1995/171 21:49:51.30
1995/171 22:00:06.70 to 1995/171 22:04:01.56
1995/171 22:07:45.46 to 1995/171 22:12:27.29
1995/171 22:17:02.35 to 1995/171 22:21:09.53
1995/171 22:25:06.45 to 1995/171 22:30:20.62
1995/171 22:35:37.49 to 1995/171 22:40:02.60
1995/171 22:45:07.66 to 1995/171 22:50:04.05
1995/171 22:53:45.92 to 1995/171 22:57:44.94

Table E-1. Abstract of Times of Hydrography (continued)

1995/171 23:04:48.80 to 1995/171 23:09:13.35
1995/171 23:14:19.38 to 1995/171 23:18:01.64
1995/171 23:24:27.28 to 1995/171 23:31:59.73
1995/171 23:36:33.10 to 1995/171 23:42:58.30
1995/171 23:48:10.77 to 1995/171 23:55:38.09
1995/171 23:59:03.06 to 1995/171 23:59:58.65
1995/171 23:59:58.76 to 1995/172 00:04:45.50
1995/172 00:27:02.70 to 1995/172 00:35:07.15
1995/172 00:39:54.44 to 1995/172 00:48:55.39
1995/172 00:54:00.01 to 1995/172 01:03:50.95
1995/172 01:08:49.28 to 1995/172 01:19:59.99
1995/172 09:45:05.64 to 1995/172 09:46:43.77
1995/172 09:51:10.62 to 1995/172 09:52:29.79
1995/172 09:58:37.66 to 1995/172 10:00:18.10
1995/172 10:04:24.72 to 1995/172 10:05:38.04
1995/172 10:16:11.10 to 1995/172 10:17:32.47
1995/172 10:27:10.95 to 1995/172 10:28:35.24
1995/172 10:33:21.93 to 1995/172 10:55:20.62
1995/172 10:59:32.06 to 1995/172 11:27:30.98
1995/172 11:32:04.94 to 1995/172 11:53:09.63
1995/172 11:57:50.18 to 1995/172 12:24:58.74
1995/172 12:29:48.70 to 1995/172 12:49:29.92
1995/172 12:52:57.22 to 1995/172 13:16:15.00
1995/172 13:28:39.11 to 1995/172 13:47:15.75
1995/172 14:02:25.46 to 1995/172 14:25:03.17
1995/172 14:30:59.56 to 1995/172 14:53:23.43
1995/172 14:55:30.45 to 1995/172 15:23:40.63
1995/172 15:27:56.51 to 1995/172 15:53:42.12
1995/172 15:55:55.95 to 1995/172 16:30:53.77
1995/172 16:35:03.14 to 1995/172 16:50:59.83
1995/172 16:51:30.05 to 1995/172 17:08:38.03
1995/172 17:10:48.90 to 1995/172 17:16:17.82
1995/172 17:16:21.00 to 1995/172 17:29:32.88
1995/172 17:29:37.02 to 1995/172 17:35:34.89
1995/172 17:35:39.04 to 1995/172 17:45:40.10
1995/172 17:50:12.57 to 1995/172 17:52:59.96
1995/172 17:53:30.17 to 1995/172 18:00:59.96
1995/172 18:02:00.02 to 1995/172 18:07:59.96
1995/172 18:09:00.10 to 1995/172 18:17:59.95
1995/172 18:22:00.13 to 1995/172 18:23:20.78
1995/172 18:28:10.44 to 1995/172 18:31:27.82
1995/172 18:32:16.03 to 1995/172 18:36:08.89
1995/172 18:36:18.07 to 1995/172 18:57:59.95
1995/172 19:00:30.15 to 1995/172 19:02:38.20
1995/174 08:44:40.21 to 1995/174 08:45:40.13
1995/174 08:45:46.27 to 1995/174 09:20:24.84
1995/174 09:32:16.65 to 1995/174 10:05:29.60
1995/174 10:07:41.95 to 1995/174 10:41:29.86
1995/174 10:45:37.20 to 1995/174 11:18:20.34
1995/174 11:20:24.99 to 1995/174 11:54:38.47
1995/174 11:59:51.56 to 1995/174 12:31:31.54

Table E-1. Abstract of Times of Hydrography (continued)

1995/174 12:34:15.29 to 1995/174 13:09:51.03
1995/174 13:15:09.72 to 1995/174 13:31:18.24
1995/174 13:45:14.18 to 1995/174 14:18:49.94
1995/174 14:25:11.14 to 1995/174 14:26:46.90
1995/174 14:26:48.31 to 1995/174 14:54:13.46
1995/174 14:58:02.39 to 1995/174 15:28:59.06
1995/174 15:32:39.40 to 1995/174 16:03:13.26
1995/174 16:12:47.62 to 1995/174 16:18:47.34
1995/174 16:21:21.91 to 1995/174 16:43:56.44
1995/174 16:56:22.32 to 1995/174 17:06:28.52
1995/174 17:10:57.44 to 1995/174 17:21:17.27
1995/174 17:55:04.44 to 1995/174 17:55:39.76
1995/174 18:15:25.88 to 1995/174 18:23:29.73
1995/174 18:32:22.31 to 1995/174 18:40:34.75
1995/174 18:47:21.43 to 1995/174 18:49:12.30
1995/174 18:57:57.48 to 1995/174 19:00:34.27
1995/174 19:04:08.01 to 1995/174 19:08:07.93
1995/174 19:12:36.26 to 1995/174 19:14:49.65
1995/174 19:17:35.47 to 1995/174 19:19:27.53
1995/174 19:26:18.35 to 1995/174 19:35:33.90
1995/174 19:39:18.38 to 1995/174 19:47:07.42
1995/174 19:50:23.76 to 1995/174 19:55:24.53
1995/174 20:01:13.64 to 1995/174 20:04:23.34
1995/174 20:12:11.07 to 1995/174 20:14:26.86
1995/174 20:18:53.50 to 1995/174 20:21:33.26
1995/174 20:27:32.44 to 1995/174 20:39:09.57
1995/174 21:22:11.69 to 1995/174 21:27:00.53
1995/174 21:36:08.52 to 1995/174 21:46:04.35
1995/174 21:51:14.45 to 1995/174 21:57:23.95
1995/174 22:04:18.33 to 1995/174 22:16:12.66
1995/174 22:23:57.41 to 1995/174 22:36:00.92
1995/174 22:48:03.02 to 1995/174 22:54:34.33
1995/174 23:12:50.33 to 1995/174 23:19:58.78
1995/174 23:23:09.19 to 1995/174 23:30:58.49
1995/174 23:36:53.03 to 1995/174 23:44:08.48
1995/174 23:47:21.41 to 1995/174 23:55:07.11
1995/175 00:01:34.23 to 1995/175 00:07:49.91
1995/175 00:09:00.01 to 1995/175 00:16:04.43
1995/175 00:28:55.87 to 1995/175 00:35:29.90
1995/175 00:38:20.02 to 1995/175 00:45:19.92
1995/175 00:48:28.06 to 1995/175 00:55:09.99
1995/175 00:57:00.09 to 1995/175 01:04:42.98
1995/175 01:08:47.10 to 1995/175 01:16:09.77
1995/175 01:18:00.20 to 1995/175 01:26:21.83
1995/175 01:30:09.57 to 1995/175 01:38:44.82
1995/175 01:42:00.08 to 1995/175 01:49:27.91
1995/175 01:53:18.62 to 1995/175 01:59:44.93
1995/175 19:20:10.75 to 1995/175 19:27:53.68
1995/175 19:31:25.26 to 1995/175 19:36:08.85
1995/175 19:39:13.93 to 1995/175 19:42:30.42
1995/175 19:47:51.77 to 1995/175 19:53:23.62

Table E-1. Abstract of Times of Hydrography (continued)

1995/175 21:03:57.23 to 1995/175 21:32:32.89
1995/175 21:34:38.43 to 1995/175 21:49:54.21
1995/175 21:52:21.96 to 1995/175 21:59:10.86
1995/175 22:02:13.65 to 1995/175 22:09:58.39
1995/176 00:04:14.21 to 1995/176 00:09:35.72
1995/176 00:12:41.39 to 1995/176 00:18:29.86
1995/176 00:21:52.71 to 1995/176 00:25:10.68
1995/176 00:29:10.57 to 1995/176 00:34:16.38
1995/176 00:40:19.21 to 1995/176 00:44:28.13
1995/176 00:53:14.20 to 1995/176 00:57:07.13
1995/176 01:03:06.11 to 1995/176 01:07:36.95
1995/176 01:12:10.32 to 1995/176 01:18:45.00
1995/176 01:42:11.59 to 1995/176 01:54:37.85
1995/176 09:41:10.45 to 1995/176 09:42:45.62
1995/176 09:47:09.50 to 1995/176 09:49:11.04
1995/176 09:58:58.13 to 1995/176 10:00:49.89
1995/176 10:04:05.34 to 1995/176 10:06:19.62
1995/176 10:16:56.78 to 1995/176 10:20:58.30
1995/176 10:27:33.20 to 1995/176 10:31:01.76
1995/176 10:57:13.88 to 1995/176 10:59:47.12
1995/176 11:19:27.30 to 1995/176 11:21:57.72
1995/176 11:30:07.94 to 1995/176 11:32:31.83
1995/176 21:48:05.63 to 1995/176 22:00:04.40
1995/176 22:10:16.38 to 1995/176 22:17:10.91
1995/176 22:21:29.76 to 1995/176 22:27:16.15
1995/176 22:30:09.68 to 1995/176 22:36:03.48
1995/176 22:41:40.53 to 1995/176 22:46:29.16
1995/176 22:50:54.52 to 1995/176 22:54:48.93
1995/176 22:54:50.34 to 1995/176 22:54:53.00
1995/176 23:09:34.35 to 1995/176 23:16:19.98
1995/176 23:21:57.69 to 1995/176 23:24:50.89
1995/176 23:30:08.73 to 1995/176 23:37:48.07
1995/176 23:46:03.02 to 1995/176 23:50:36.74
1995/176 23:56:03.73 to 1995/176 23:59:55.99
1995/176 23:59:56.06 to 1995/177 00:01:24.02
1995/177 09:01:55.72 to 1995/177 09:09:47.94
1995/177 09:14:47.45 to 1995/177 09:23:47.88
1995/177 09:31:06.26 to 1995/177 09:39:00.93
1995/177 09:50:28.45 to 1995/177 09:59:58.81
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1995/177 10:17:39.73 to 1995/177 10:27:35.99
1995/177 10:30:11.41 to 1995/177 10:36:35.99
1995/177 10:57:07.71 to 1995/177 11:04:20.90
1995/177 11:09:47.30 to 1995/177 11:16:49.83
1995/177 11:22:55.10 to 1995/177 11:29:34.97
1995/177 11:34:37.73 to 1995/177 11:41:31.00
1995/177 11:46:09.18 to 1995/177 11:52:42.97
1995/177 11:57:10.12 to 1995/177 12:03:58.94
1995/177 12:20:57.20 to 1995/177 12:27:25.89
1995/177 12:32:19.40 to 1995/177 12:38:52.89
1995/177 12:43:06.24 to 1995/177 12:49:30.90

Table E-1. Abstract of Times of Hydrography (continued)

1995/177 12:57:38.16 to 1995/177 13:03:29.98
1995/177 13:08:00.16 to 1995/177 13:14:16.89
1995/177 13:20:23.87 to 1995/177 13:26:17.90
1995/177 13:31:24.17 to 1995/177 13:37:35.97
1995/177 13:43:40.38 to 1995/177 13:49:28.96
1995/177 13:54:16.22 to 1995/177 14:00:16.96
1995/177 14:07:10.52 to 1995/177 14:12:14.97
1995/177 14:17:16.32 to 1995/177 14:24:07.97
1995/177 14:32:03.06 to 1995/177 14:36:14.36
1995/177 14:44:32.69 to 1995/177 15:17:57.87
1995/177 15:37:25.32 to 1995/177 16:06:27.00
1995/177 16:09:18.19 to 1995/177 16:40:41.95
1995/177 16:50:46.23 to 1995/177 17:06:56.82
1995/177 17:07:03.04 to 1995/177 17:09:39.46
1995/177 17:19:40.18 to 1995/177 17:26:19.01
1995/177 17:36:01.65 to 1995/177 17:38:58.52
1995/177 17:58:15.08 to 1995/177 18:13:01.75
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1995/180 18:19:59.15 to 1995/180 18:22:37.99
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1995/180 18:33:03.00 to 1995/180 18:35:12.83
1995/180 18:38:46.65 to 1995/180 18:41:51.92
1995/180 18:47:19.12 to 1995/180 18:50:05.74
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1995/180 19:56:56.45 to 1995/180 20:01:25.97
1995/180 20:03:49.79 to 1995/180 20:06:03.99
1995/180 20:29:11.33 to 1995/180 20:30:26.95
1995/180 20:38:13.76 to 1995/180 20:40:12.93
1995/180 21:02:57.09 to 1995/180 21:09:29.89
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1995/180 21:27:19.51 to 1995/180 21:30:55.55
1995/180 21:30:56.96 to 1995/180 21:31:24.88
1995/308 10:24:14.03 to 1995/308 10:28:07.25
1995/308 10:34:32.59 to 1995/308 10:43:28.87
1995/308 10:51:55.76 to 1995/308 11:02:21.81
1995/308 11:07:01.40 to 1995/308 11:17:10.56
1995/308 11:22:30.72 to 1995/308 11:33:35.87
1995/308 11:38:06.87 to 1995/308 11:49:18.24
1995/308 11:55:14.55 to 1995/308 12:04:54.08

Table E-1. Abstract of Times of Hydrography (continued)

1995/308 12:08:51.89 to 1995/308 12:20:01.77
1995/308 13:06:38.05 to 1995/308 13:08:00.70
1995/308 13:11:28.30 to 1995/308 13:15:08.19
1995/308 13:20:18.06 to 1995/308 13:23:45.73
1995/308 13:28:34.20 to 1995/308 13:30:20.33
1995/308 13:41:10.82 to 1995/308 13:42:49.25
1995/308 13:58:12.06 to 1995/308 13:59:43.30
1995/308 14:10:40.60 to 1995/308 14:14:24.34
1995/308 14:22:12.63 to 1995/308 14:26:39.41
1995/308 14:38:06.01 to 1995/308 14:40:23.36
1995/308 15:01:30.70 to 1995/308 15:04:15.89
1995/308 15:12:03.53 to 1995/308 15:14:41.53
1995/308 15:21:26.43 to 1995/308 15:23:20.26
1995/308 15:32:29.43 to 1995/308 15:34:31.26
1995/308 15:45:19.67 to 1995/308 15:47:32.17
1995/308 15:59:58.84 to 1995/308 16:02:32.39
1995/308 16:10:15.01 to 1995/308 16:12:38.39
1995/308 16:25:24.71 to 1995/308 16:28:07.72
1995/308 16:34:24.18 to 1995/308 16:47:48.56
1995/308 17:38:56.72 to 1995/308 17:53:34.77
1995/308 18:00:48.69 to 1995/308 18:14:20.19
1995/308 18:42:52.42 to 1995/308 18:48:45.92
1995/308 19:24:10.31 to 1995/308 19:37:55.65
1995/308 19:42:31.68 to 1995/308 19:49:36.28
1995/308 20:03:18.59 to 1995/308 20:10:15.78
1995/308 20:17:19.34 to 1995/308 20:25:08.07
1995/308 20:35:54.71 to 1995/308 20:40:46.88
1995/308 20:49:54.57 to 1995/308 20:57:42.42
1995/308 21:09:49.33 to 1995/308 21:13:17.08
1995/308 21:28:12.26 to 1995/308 21:38:06.90
1995/308 21:43:00.11 to 1995/308 21:56:10.87
1995/308 22:03:49.68 to 1995/308 22:16:24.60
1995/308 22:28:08.41 to 1995/308 22:38:43.63
1995/308 22:52:50.53 to 1995/308 23:17:46.38
1995/308 23:21:10.13 to 1995/308 23:42:58.43
1995/308 23:45:20.55 to 1995/308 23:59:56.55
1995/308 23:59:56.63 to 1995/309 00:09:14.46
1995/309 00:21:13.73 to 1995/309 00:44:50.09
1995/309 00:47:19.77 to 1995/309 00:51:48.17
1995/309 00:53:37.70 to 1995/309 00:55:04.88
1995/309 01:01:49.77 to 1995/309 01:22:42.97
1995/309 01:50:04.40 to 1995/309 02:16:43.03
1995/309 02:18:58.63 to 1995/309 02:47:01.39
1995/309 02:50:18.32 to 1995/309 03:17:13.24
1995/309 03:19:05.44 to 1995/309 03:47:23.01
1995/309 03:54:03.82 to 1995/309 04:19:10.61
1995/309 04:19:12.02 to 1995/309 04:19:34.02
1995/309 04:22:37.39 to 1995/309 04:44:31.84
1995/309 04:50:14.82 to 1995/309 05:11:03.87
1995/309 05:28:37.85 to 1995/309 05:46:14.93
1995/309 05:50:09.49 to 1995/309 06:08:07.60

Table E-1. Abstract of Times of Hydrography (continued)

1995/309 06:11:36.38 to 1995/309 06:14:26.80
1995/309 06:28:16.21 to 1995/309 06:47:33.68
1995/309 06:50:32.32 to 1995/309 07:11:16.55
1995/309 07:14:34.37 to 1995/309 07:32:01.38
1995/309 07:35:45.87 to 1995/309 07:53:33.61
1995/309 07:58:12.31 to 1995/309 08:06:12.60
1995/309 08:13:49.63 to 1995/309 08:22:24.72
1995/309 08:34:51.48 to 1995/309 08:49:34.67
1995/309 08:56:41.27 to 1995/309 09:01:38.18
1995/309 09:08:50.42 to 1995/309 09:16:19.32
1995/309 09:20:16.65 to 1995/309 09:28:31.00
1995/309 09:33:58.40 to 1995/309 09:38:17.61
1995/309 09:55:01.04 to 1995/309 09:59:27.07
1995/309 10:34:10.05 to 1995/309 10:39:15.19
1995/309 10:46:36.48 to 1995/309 10:47:15.87
1995/309 11:08:09.05 to 1995/309 11:17:08.59
1995/309 11:23:13.79 to 1995/309 11:30:07.94
1995/309 11:36:58.02 to 1995/309 11:41:18.24
1995/309 11:45:24.69 to 1995/309 11:49:18.18
1995/309 11:54:38.05 to 1995/309 11:56:59.73
1995/309 12:02:19.60 to 1995/309 12:06:49.56
1995/309 12:16:29.84 to 1995/309 12:24:46.42
1995/309 13:42:19.80 to 1995/309 13:52:06.44
1995/309 13:58:59.63 to 1995/309 14:08:13.69
1995/309 14:15:38.87 to 1995/309 14:26:26.54
1995/309 14:38:09.17 to 1995/309 14:50:43.78
1995/309 14:54:36.04 to 1995/309 15:06:30.29
1995/309 15:10:13.00 to 1995/309 15:21:48.07
1995/309 15:26:32.09 to 1995/309 15:36:10.44
1995/309 15:40:02.62 to 1995/309 15:51:52.51
1995/309 15:55:04.40 to 1995/309 16:08:08.35
1995/309 16:19:30.01 to 1995/309 16:26:58.82
1995/309 16:34:20.75 to 1995/309 16:54:53.21
1995/309 16:59:31.31 to 1995/309 17:11:31.57
1995/309 17:13:00.07 to 1995/309 17:22:16.50
1995/309 17:38:31.67 to 1995/309 17:43:09.92
1995/309 17:43:10.73 to 1995/309 17:43:10.73
1995/309 17:44:04.16 to 1995/309 17:49:49.07
1995/309 18:18:23.84 to 1995/309 18:24:26.32
1995/309 18:28:58.63 to 1995/309 18:35:58.64
1995/309 18:59:02.66 to 1995/309 19:06:03.78
1995/309 19:25:09.76 to 1995/309 19:31:23.73
1995/309 19:55:12.70 to 1995/309 20:07:03.71
1995/313 16:52:33.57 to 1995/313 16:53:56.00
1995/313 16:58:11.00 to 1995/313 16:59:37.28
1995/313 17:02:53.62 to 1995/313 17:04:34.12
1995/313 17:12:49.37 to 1995/313 17:13:48.10
1995/313 17:14:19.13 to 1995/313 17:17:27.92
1995/313 17:38:18.79 to 1995/313 17:40:33.86
1995/313 17:42:06.59 to 1995/313 17:42:56.50
1995/313 17:46:42.28 to 1995/313 17:47:33.26

Table E-1. Abstract of Times of Hydrography (continued)

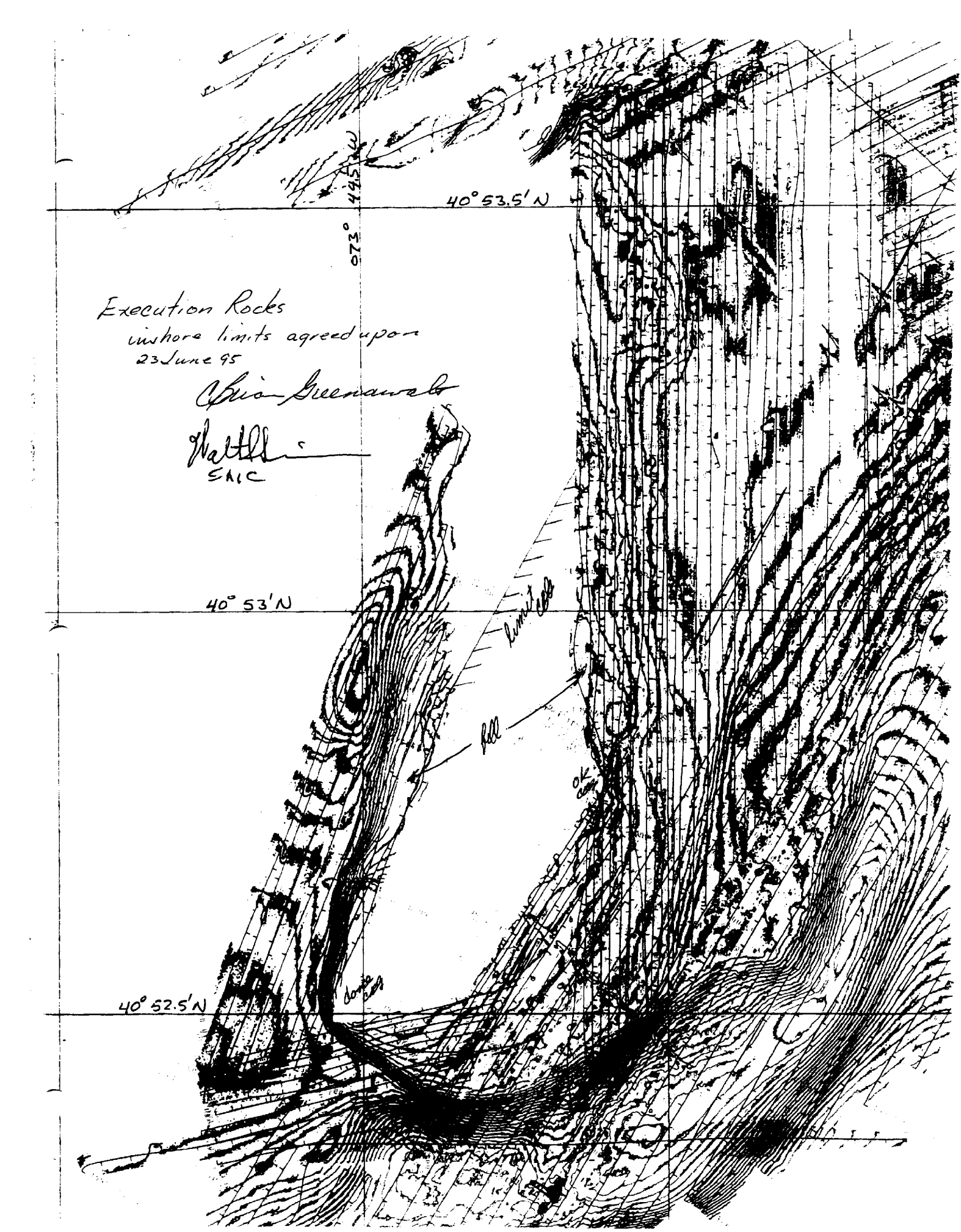
1995/313 17:55:00.03 to 1995/313 17:56:40.40
1995/313 18:02:45.62 to 1995/313 18:03:48.31
1995/313 18:10:38.39 to 1995/313 18:11:14.32
1995/313 18:12:40.81 to 1995/313 18:14:25.92
1995/313 18:25:35.89 to 1995/313 18:26:33.25
1995/313 18:34:32.98 to 1995/313 18:35:26.09
1995/313 18:45:48.00 to 1995/313 18:47:00.12
1995/313 18:48:05.17 to 1995/313 18:48:43.37
1995/313 18:56:27.18 to 1995/313 18:57:11.88
1995/313 19:11:30.10 to 1995/313 19:12:28.69
1995/313 19:19:23.34 to 1995/313 19:19:57.59
1995/313 19:25:33.62 to 1995/313 19:26:00.11
1995/313 19:28:48.56 to 1995/313 19:29:50.32
1995/313 19:35:30.06 to 1995/313 19:36:19.60
1995/313 19:47:50.08 to 1995/313 19:48:34.89
1995/313 19:54:05.43 to 1995/313 19:54:58.48
1995/313 20:03:05.19 to 1995/313 20:04:15.18
1995/313 20:10:13.71 to 1995/313 20:11:33.77
1995/313 20:18:29.32 to 1995/313 20:18:56.95
1995/313 20:36:59.06 to 1995/313 20:37:45.94
1995/313 20:46:43.63 to 1995/313 20:48:33.10
1995/313 20:56:15.38 to 1995/313 20:57:15.74
1995/313 21:03:26.81 to 1995/313 21:04:34.20
1995/313 21:36:21.25 to 1995/313 21:37:53.98
1995/313 21:43:55.51 to 1995/313 21:44:53.79
1995/313 21:52:19.22 to 1995/313 21:52:52.47
1995/313 22:08:31.80 to 1995/313 22:09:19.86
1995/315 03:03:14.20 to 1995/315 03:04:03.45
1995/315 03:08:25.86 to 1995/315 03:09:18.96
1995/315 03:22:21.29 to 1995/315 03:24:43.86
1995/315 03:28:47.97 to 1995/315 03:29:30.04
1995/315 03:34:00.15 to 1995/315 03:34:59.99
1995/315 03:39:10.03 to 1995/315 03:39:46.54
1995/315 03:45:42.56 to 1995/315 03:48:50.46
1995/315 03:59:00.97 to 1995/315 04:00:28.43
1995/315 04:15:58.00 to 1995/315 04:17:51.25
1995/315 18:56:11.11 to 1995/315 18:57:00.66
1995/315 19:04:45.40 to 1995/315 19:10:02.74
1995/315 19:15:10.34 to 1995/315 19:21:19.72
1995/315 19:27:07.80 to 1995/315 19:32:29.31
1995/315 19:39:18.04 to 1995/315 19:45:38.86
1995/315 19:52:28.34 to 1995/315 19:58:27.87
1995/315 20:05:41.07 to 1995/315 20:11:47.86
1995/315 20:19:22.55 to 1995/315 20:25:30.60
1995/315 20:33:23.95 to 1995/315 20:39:45.53
1995/315 20:49:00.08 to 1995/315 20:55:47.63
1995/315 21:03:37.67 to 1995/315 21:10:03.51
1995/315 21:16:34.59 to 1995/315 21:24:31.06
1995/315 21:29:43.83 to 1995/315 21:36:14.01
1995/315 21:51:40.31 to 1995/315 21:53:05.93
1995/315 22:02:17.26 to 1995/315 22:04:02.21

Table E-1. Abstract of Times of Hydrography (continued)

1995/315 22:13:25.31 to 1995/315 22:15:02.26
1995/315 22:28:22.66 to 1995/315 22:29:33.54
1995/315 22:36:32.96 to 1995/315 22:37:15.39
1995/315 22:48:07.37 to 1995/315 22:48:47.21
1995/315 23:03:51.80 to 1995/315 23:05:03.86
1995/315 23:11:47.88 to 1995/315 23:12:38.61
1995/315 23:17:05.46 to 1995/315 23:18:25.52
1995/315 23:32:29.47 to 1995/315 23:33:33.93
1995/315 23:37:49.43 to 1995/315 23:38:55.57
1995/315 23:49:15.55 to 1995/315 23:50:21.69
1995/315 23:58:54.13 to 1995/315 23:59:57.01
1995/315 23:59:57.23 to 1995/316 00:00:10.94
1995/316 00:07:46.57 to 1995/316 00:12:06.62
1995/316 00:16:16.09 to 1995/316 00:17:18.33
1995/316 00:30:39.52 to 1995/316 00:31:15.45
1995/316 00:35:51.28 to 1995/316 00:36:57.17
1995/316 00:40:59.37 to 1995/316 00:41:44.18
1995/316 00:53:12.60 to 1995/316 00:54:16.37
1995/316 01:07:09.51 to 1995/316 01:07:50.77
1995/316 01:16:44.54 to 1995/316 01:17:38.53
1995/316 01:25:21.21 to 1995/316 01:26:14.31
1995/316 01:40:46.40 to 1995/316 01:43:27.05
1995/316 01:55:47.90 to 1995/316 01:57:19.81
1995/316 02:12:30.18 to 1995/316 02:13:02.00
1995/316 02:21:53.29 to 1995/316 02:22:19.91
1995/316 02:35:39.67 to 1995/316 02:36:08.22
1995/316 02:42:05.72 to 1995/316 02:43:00.01
1995/316 02:49:56.54 to 1995/316 02:50:29.43
1995/316 03:03:47.75 to 1995/316 03:04:39.80

APPENDIX F:

SUPPLEMENTAL CORRESPONDENCE


40° 53.5' N
073°
44.5' W
Execution Rocks
inshore limits agreed upon
23 June 95
Chris Greenawalt
Walt
SAIC
40° 53' N
limit of
fill
OK
40° 52.5' N

BARGE WRECK INVESTIGATION BY DIVER, JULY 09, 1995								DAY 190
SCIENCE APPLICATIONS INTERNATIONAL CORPORATION , ATLANTIC SURVEYOR								
	FEET	NUMO	NUMO	NUMO	GAGE		TIDE	METERS
	NUMO	CALIB.	CALIB.	DEPTH	HEIGHT	MLLW	CORR.	CORR.
UTC	DEPTH	CORR.	DEPTH	METERS	METERS	METERS	METERS	DEPTH
1729	19	-0.1	18.9	5.8	1.458	0.983	0.475	5.3
1730	19	-0.1	18.9	5.8	1.451	0.983	0.468	5.3
1731	19	-0.1	18.9	5.8	1.444	0.983	0.461	5.3
							MEAN	5.3
LATITUDE				LONGITUDE				
40	52.427			73	45.511			
40	52.424			73	45.514			
40	52.424			73	45.522			
40	52.424			73	45.512			
	209.699				182.060			
40	52.425		MEAN	73	45.515			
Position determination was by DGPS from the support boat which attempted to position itself over the diver Accuracy of the position is not a good as the multibeam sounding positions. *								

* THIS POSITION IS NOT AS ACCURATE AS THE MULTIBEAM POSITION. THIS POSITION WAS OBTAINED BY DEPLOYING A FLOAT ABOVE THE WRECK. THE SUPPORT BOAT ESTIMATED IT'S POSITION TO THE FLOAT AND TOOK A POSITION. IT IS DIFFICULT TO GET AS ACCURATE A POSITION USING THIS METHOD. ~~Reference danger to navigation, letter dated June 25, 1995 for positioning.~~

REFERENCE PAGE 28 FOR POSITIONING

NOAA FORM 77-27(H) (9-83)

U.S. DEPARTMENT OF COMMERCE

HYDROGRAPHIC SURVEY STATISTICS

REGISTRY NUMBER: H-10618

RECORDS ACCOMPANYING SURVEY: To be completed when survey is processed.

RECORD DESCRIPTION	AMOUNT	RECORD DESCRIPTION	AMOUNT
SMOOTH SHEET	1	SMOOTH OVERLAYS: POS., ARC, EXCESS	NA
DESCRIPTIVE REPORT	1	FIELD SHEETS AND OTHER OVERLAYS	NA

DESCRIPTION	DEPTH/POS RECORDS	HORIZ. CONT. RECORDS	SONAR-GRAMS	PRINTOUTS	ABSTRACTS/ SOURCE DOCUMENTS	
ACCORDION FILES						
ENVELOPES						
VOLUMES						
CAHIERS						
BOXES	1		2			

SHORELINE DATA

SHORELINE MAPS (List): NA

PHOTOBATHYMETRIC MAPS (List): NA

NOTES TO THE HYDROGRAPHER (List): NA

SPECIAL REPORTS (List): NA

NAUTICAL CHARTS (List): Chart 12366 24th ED 3/25/95, Chart 12367 20th ED 2/18/95

OFFICE PROCESSING ACTIVITIES

The following statistics will be submitted with the cartographer's report on the survey

PROCESSING ACTIVITY	AMOUNTS		
	VERIFICATION	*EVALUATION*	*TOTALS*
POSITIONS ON SHEET			
POSITIONS REVISED			
SOUNDINGS REVISED			
CONTROL STATIONS REVISED			

	TIME-HOURS		
	VERIFICATION	*EVALUATION*	*TOTALS*
PRE-PROCESSING EXAMINATION			
VERIFICATION OF CONTROL			
VERIFICATION OF POSITIONS			
VERIFICATION OF SOUNDINGS			
VERIFICATION OF JUNCTIONS			
APPLICATION OF PHOTOBATHYMETRY			
SHORELINE APPLICATION/VERIFICATION			
COMPILATION OF SMOOTH SHEET			
COMPARISON WITH PRIOR SURVEYS AND CHARTS		40	40
EVALUATION OF SIDE SCAN SONAR RECORDS		24	24
EVALUATION OF WIRE DRAGS AND SWEEPS			
EVALUATION REPORT		16	16
GEOGRAPHIC NAMES			
OTHER*			
*USE OTHER SIDE OF FORM FOR REMARKS — TOTALS		80	80

Pre-processing Examination by G. Nelson	*Beginning Date* 5/27/96	*Ending Date* 5/29/96
Verification of Field Data by G. Nelson	*Time (Hours)* 64	*Ending Date* 7/20/96
Verification Check by B. Olmstead	*Time (Hours)* 24	*Ending Date* 3/30/97
Evaluation and Analysis by G. Nelson	*Time (Hours)* 16	*Ending Date* 6/27/97
Inspection by B. Olmstead	*Time (Hours)* 10	*Ending Date* 6/28/97

EVALUATION REPORT
H-10618

A. PROJECT

The hydrographer's report contains a complete discussion of the project information.

B. AREA SURVEYED

The hydrographer's report lists the geographic coordinates outlining the survey area and lists the dates of data acquisition. The survey area is in western Long Island Sound, New York. Depths range from 7.2 feet (2.2 meters) to 121 feet (37 meters). Bottom characteristics are rocky and mud.

C. SURVEY VESSELS

Survey vessel information is found in the hydrographer's report.

D. AUTOMATED DATA ACQUISITION AND PROCESSING

Due to a contractor proprietary data format, final data processing and verification was accomplished using contractor supplied software and a contractor supplied HP workstation. The software, used for processing is discussed in the hydrographer's report. The final smooth sheet is an AutoCAD (version 12) drawing file submitted by the contractor. Data is plotted using a UTM projection and are depicted on a single sheet. A revision overlay was created at PHB during office processing. The overlay includes corrected contour lines and minor cartographic changes. Specifically, the revision overlay reflects the removal of depth curves around wrecks, revision of the depth curves to reflect plotted sounding data, correction of obstr labels to wk labels, addition of an AWOIS item, and plots of wrecks that would have been over plotted by more significant features on the smooth sheet.

At the time of the survey certification the format for archiving digital data had not been formally identified. In the interim, digital data for this survey exists in SAIC's Generic Sensor Format (GSF) for multibeam survey data. In addition, the smooth sheet is filed both in the AutoCAD drawing format, i.e., .dwg (extension); and in the more universally recognized graphics transfer format, .dxf (extension). Copies of these files will be retained at PHB until data transfer protocols are developed and approved.

E. SONAR EQUIPMENT

Side scan sonar was used on survey H-10618. The side scan sonar equipment, the method of operation, and disposition of significant sonar contacts are adequately discussed in the hydrographer's report.

F. SOUNDING EQUIPMENT

Sounding equipment is discussed in the hydrographer's report.

G. CORRECTIONS TO SOUNDINGS

The sounding data have been reduced to Mean Lower Low Water (MLLW). The reducers include corrections for actual tide, dynamic draft and sound velocity. Roll, pitch, and heading biases were computed and applied during data acquisition. The reducers have been reviewed and are consistent with NOS specifications.

H. CONTROL STATIONS

Sections H and I of the hydrographer's descriptive report contain adequate discussions of horizontal control and hydrographic positioning. The positions of horizontal control stations used during hydrographic operations are published and field values based on NAD83. The geographic positions of all survey data are based on NAD83.

Data based on NAD27 may be referenced to this survey by applying the following corrections:

Latitude: .35877 seconds (11.067 meters)
Longitude: -1.52998 seconds (-35.82 meters)

I. HYDROGRAPHIC POSITION CONTROL

Differential GPS (DGPS) was used to control this survey. The maximum allowable horizontal dilution of precision (HDOP) limit of 2.5 was used for this survey. The hydrographer's report adequately describes the methods used to insure all positions were within specifications.

NAD 83 is used as the horizontal datum for plotting and position computations. Additional information concerning calibrations and system checks can be found in the hydrographer's report and in the separates related to Horizontal Position Control and Corrections to Position Data.

J. SHORELINE

There is no shoreline within the survey limits.

K. CROSSLINES

Crosslines are adequately discussed in the hydrographer's report.

L. JUNCTIONS

Survey H-10618 junctions with the following surveys:

Survey	Year	Scale	Area
H-10346	1990	1:10,000	Southeast
H-10347	1990	1:10,000	Northeast
H-10558	1994	1:10,000	West
H-10612	1995	1:10,000	Northeast
H-10625	1995	1:10,000	Southwest

The junctions with surveys H-10612 and H-10625 are complete. Soundings within the common area are in good agreement. A "Joins" note has been shown on the corrections overlay within the common area.

The junctions with surveys H-10346, H-10347, and H-10588 were not formally completed since these surveys were previously processed and forwarded for charting. An "Adjoins" note has been shown on the correction overlay within the common areas. Limits of the common areas are listed below:

H-10346	Latitude (N)	Longitude (W)
	40° 51.35'	73° 44.84'
	40° 51.39'	73° 45.27'
	40° 50.79'	73° 45.15'
	40° 50.79'	73° 45.31'

H-10347	Latitude (N)	Longitude (W)
	40° 54.34'	73° 41.10'
	40° 54.30'	73° 43.50'
	40° 52.45'	73° 43.50'
	40° 53.84'	73° 40.00'

H-10588	Latitude (N)	Longitude (W)
	40° 54.26'	73° 43.29'
	40° 54.26'	73° 44.21'
	40° 54.19'	73° 44.42'
	40° 51.84'	73° 46.15'
	40° 51.37'	73° 45.81'
	40° 51.20'	73° 45.86'
	40° 51.20'	73° 44.98'
	40° 52.58'	73° 43.2

The hydrographer's report adequately discussed the junctions except for the following: Numerous rocks and shoal soundings were on H-10618 that are not shown on H-10588. In areas

with little relief, the junction between H-10618 and H-10588 shows good agreement, 1-2 feet, with H-10618 generally being shoaler.

As 100% multibeam coverage and 200% side scan coverage were used on H-10618 the sounding data from H-10618 should supersede the junction surveys within the common areas, with the exception of the area on H-10588 (Execution Rocks), not covered by H-10618, listed below:

Latitude (N)	Longitude (W)
40° 53.08'	73° 44.12'
40° 53.09'	73° 44.15'
40° 52.84'	73° 44.86'
40° 52.52'	73° 44.52'
40° 52.49'	73° 44.49'
40° 52.54'	73° 44.33'
40° 52.76'	73° 44.14'
40° 52.96'	73° 44.15'

M. COMPARISON WITH PRIOR SURVEYS

H-1732a (1916) 1:20,000
H-5547 (1934) 1:10,000
H-5407 (1933) 1:10,000
H-5545 (1934) 1:10,000
H-5546 (1934) 1:10,000

Comparison with prior surveys H-5407 (1933), H-5545 (1934), and H-5546 (1934) reveal a consistent pattern of shoaling from 3 to 5 feet throughout the survey area. However, there are several specific areas which depict much greater differences and have been discussed in section M of the hydrographer's report. All critical depths originating from the prior surveys were adequately addressed during survey operations.

Prior surveys H-5547 (1934) and H-1732a (1916) were not specifically addressed by the hydrographer. The following comments are made: H-10618 was generally shoaler by 4 to 13 feet west of Execution Rocks in the flatter areas. Close to Execution Rocks , on the west side, soundings were deeper by 1 to 8 feet. The flatter areas in the northern portion of the survey area are generally shoaler 1 to 5 feet.

Survey H-10618 is adequate to supersede the prior surveys within the common area.

N. ITEM INVESTIGATIONS

AWOIS items 1729, 1731, 4398, 6503, 6507, 6508 ,6509, and 6510 were assigned and investigated during this survey. These items have been adequately discussed and disposed of in the hydrographer's report.

O. COMPARISON WITH THE CHART

Survey H-10618 was compared with the following charts:

Chart	Edition	Date	Scale	Datum
12366	24th	March 25, 1995	1:20,000	NAD83
12367	20th	February 18, 1995	1:20,000	NAD83

a. Hydrography

Charted hydrography originates with miscellaneous sources, junction surveys H-10346, H-10347, H-10558 and the previously mentioned prior surveys. The prior surveys have been adequately discussed in section M and require no further discussion. Charted miscellaneous source data have been adequately discussed in the hydrographer's report and require no further discussion.

Charted cable areas on charts 12366 and 12367 should be retained.

Survey H-10618 is adequate to supersede charted hydrography within the common area of coverage.

b. Dangers to Navigation

The hydrographer reported ten submerged rocks and two unidentified submerged obstructions as dangers to navigation. During subsequent SAIC processing, one submerged obstruction was disproved and one submerged rock discovered. These dangers were reported to United States Coast Guard 1st District , DMAHTC, and N\CS261 through letters dated June 23, 1995 and January 7, 1996. Copies of these reports are attached.

P. ADEQUACY OF SURVEY

Hydrography on survey H-10618 is adequate to:

a. delineate the bottom configuration, determine least depths, and draw the standard depth curves;

b. Reveal there are no significant discrepancies or anomalies requiring further investigation; and

c. Show the survey was properly controlled and soundings are correctly plotted.

The hydrographic records and reports received for processing are adequate and conform to the contract specifications.

Survey H-10618 adequately complies with the project instructions.

Q. AIDS TO NAVIGATION

There are 9 floating aids within the survey limits. These aids were properly positioned and plotted and serve their intended purpose.

R. STATISTICS

Statistics are itemized in the hydrographer's report.

S. MISCELLANEOUS

Miscellaneous information is discussed in the hydrographer's report. No additional miscellaneous items were noted during office processing.

Geographic names were not approved by the Chief Geographer.

T. RECOMMENDATIONS

Recommendations are discussed in the hydrographer's report. This is a good hydrographic survey, no additional work is required.

U. REFERRAL TO REPORTS

Referral to reports is discussed in the hydrographer's report.

Gary G. Nelson
Cartographer

APPROVAL PAGE
H-10618

Initial Approvals:

The completed survey has been inspected with regard to survey coverage, delineation of the depth curves, development of critical depths, cartographic symbolization, comparison with prior surveys and verification or disproval of charted data. The survey records and digital data comply with NOS requirements except where noted in the Evaluation Report.

Bruce A. Olmstead Date: 6/28/97
Bruce A. Olmstead
Senior Cartographer, Cartographic Section
Pacific Hydrographic Branch

I have reviewed the smooth sheet, accompanying data, and reports. This survey and accompanying digital data meet or exceed NOS requirements and standards for products in support of nautical charting except where noted in the Evaluation Report.

Kathy Timmons Date: 6/29/97
Kathy Timmons
Commander, NOAA
Chief, Pacific Hydrographic Branch

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Final Approval

Approved:

Andrew A. Armstrong III Date: Oct. 21, 1997
Andrew A. Armstrong III
Captain, NOAA
Chief Hydrographic Surveys Division

NOAA FORM 75-96
(10-83)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

MARINE CHART BRANCH

RECORD OF APPLICATION TO CHARTS

FILE WITH DESCRIPTIVE REPORT OF SURVEY NO. H-10618

INSTRUCTIONS

A basic hydrographic or topographic survey supersedes all information of like nature on the uncorrected chart.
1. Letter all information.
2. In "Remarks" column cross out words that do not apply.
3. Give reasons for deviations, if any, from recommendations made under "Comparison with Charts" in the Review.

CHART	DATE	CARTOGRAPHER	REMARKS
12366	5/15/97	Gary C. Nelson	Full ~~Part Before~~ After Marine Center Approval Signed Via
			Drawing No. Full application of soundings and curves from smooth sheet.
12367	5/15/97	Gary C. Nelson	
			Full ~~Part Before~~ After Marine Center Approval Signed Via
			Drawing No. Full application of soundings and curves from smooth sheet.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
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			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via (C)
			Drawing No. RE BP 163114-15
			PRODUCTS
			12367
			12366
			12364 E+F INS ID
			12363
			12300 NC

SUPERSEDES C&GS FORM 8352 WHICH MAY BE USED.