

H10937

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Hydrographic /
Type of Survey Side Scan Sonar / Multibeam
Field No. RU-5-2-99
Registry No. H10937

LOCALITY

State New York - New Jersey
General Locality Hudson River
Locality George Washington Bridge to
Edgewater

1999

CHIEF OF PARTY
LCDR J. S. Verlaque

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

REGISTER NO.

H-10937

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.

RU-05-02-99

State New York - New Jersey

General locality ~~Lower~~ Hudson River

Locality ~~1 NM South of~~ George Washington Bridge To Edgewater, New Jersey

Scale 1:5,000

Date of survey September 19 - October 15, 1999

Instructions dated September 27, 1999

Project No. OPR-B330-RU-99

Vessel NOAA Ship RUDE s590, EDP # 9040

Chief of party Lieutenant Commander James S. Verlaque, NOAA

LCDR J. Verlaque, LT E. Berkowitz, Ens K. Slover, ENS B. Goodwin, PS E. Owens, PS C. Parker, ST S. Rooney,
St M. Chandler

Surveyed by _____

Soundings taken by:(echo sounder, hand lead, pole) Raytheon DSG 6000N Echosounder, Reson Seabat 9003 SWMB

Graphic record scaled by RUDE Personnel

Graphic record checked by RUDE Personnel

Protracted by N/A

HP Design Jet 2500CP
Automated plot by HP 2500CM, HP 750C

Verification by Atlantic Hydrographics ~~Surveys~~ Branch Personnel

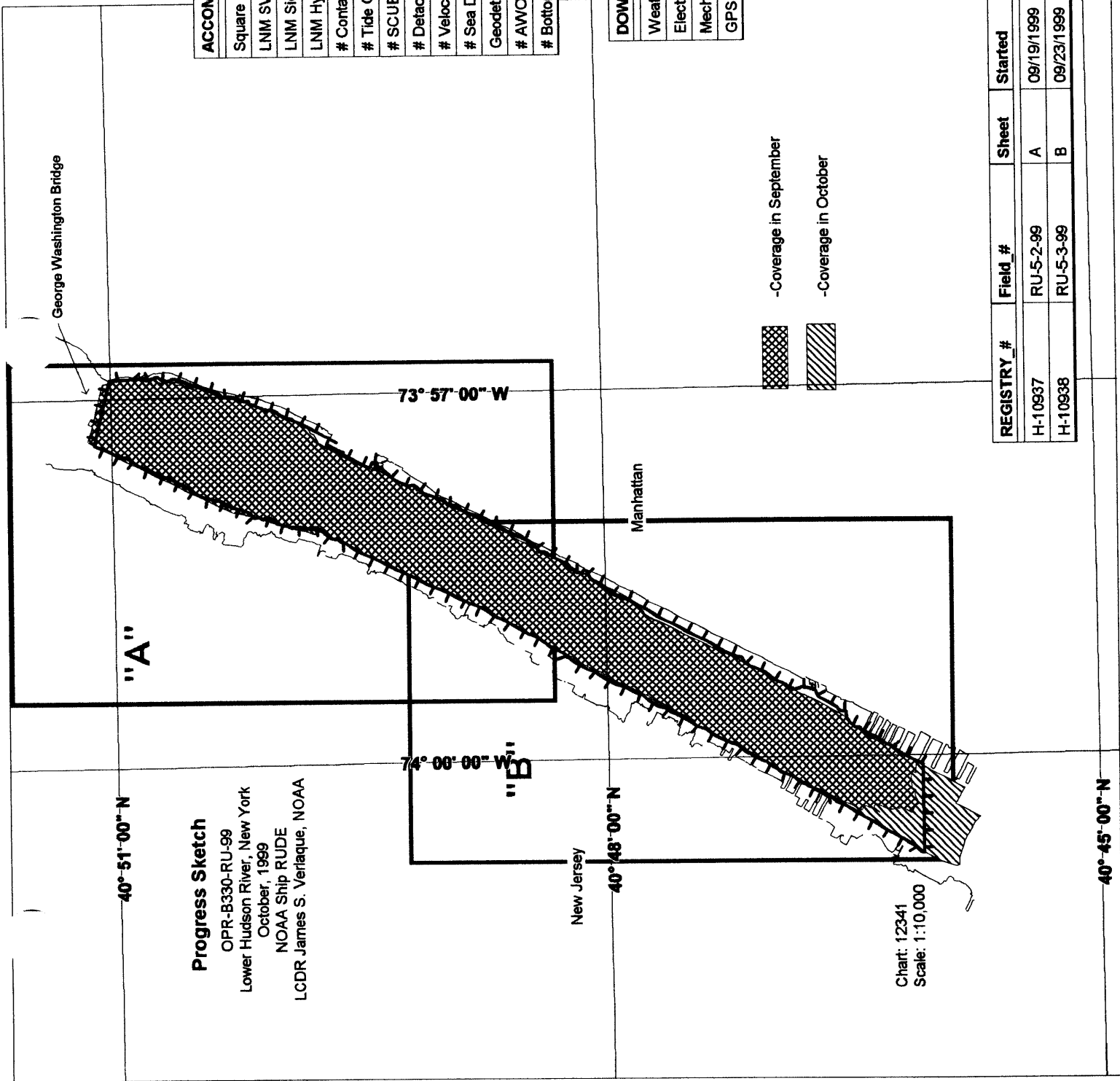
Soundings in (~~fathoms, feet, or meters~~ at MLW or MLLW) Meters at MLLW

REMARKS: Time Zone Used, 0(UTC)

Hand written notes in the Descriptive Report
were made during office processing

1W012/SIZE check

3/27/00 MCR



Progress Sketch

OPR-B330-RU-99
 Lower Hudson River, New York
 October, 1999
 NOAA Ship RUDE
 LCDR James S. Verlaque, NOAA

Chart: 12341
 Scale: 1:10,000

ACCOMPLISHMENTS	September	October
Square NM Surveyed	2	1
LNIM SVMB	300	48
LNIM Side Scan Sonar	49	13
LNIM Hydrography	0	0
# Contact Investigations	0	147
# Tide Gauges	0	0
# SCUBA Dives	1	2
# Detached Positions	0	2
# Velocity Casts	27	14
# Sea Days	13	9
Geodetic Control Stations	0	0
# AWOIS Items	0	5
# Bottom Samples	0	26

DOWNTIME_Hrs	September	October
Weather	24	0
Electronics	3	0
Mechanical	0	0
GPS	0	0

-Coverage in September

-Coverage in October

REGISTRY_#	Field_#	Sheet	Started	PercentCompleted	Completed
H-10937	RU-5-2-99	A	09/19/1999	100%	10/15/1999
H-10938	RU-5-3-99	B	09/23/1999	100%	10/14/1999

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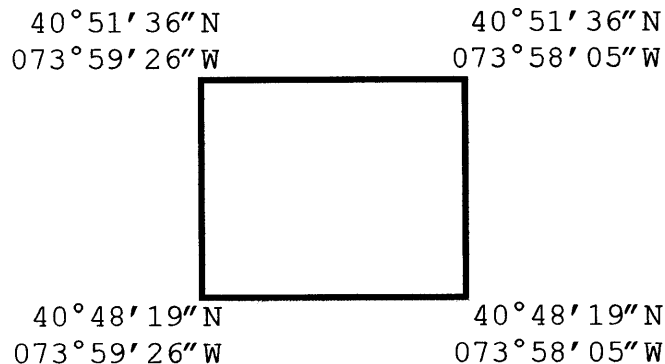
* Data filed with the original field records

A. Project

- A.1 This survey was conducted in accordance with Hydrographic Project Instructions OPR-B330-RU-99, Lower Hudson River, New York.
- A.2 The original instructions are dated September 27, 1999.
- A.3 There are no amendments to the instructions.
- A.4 This survey is designated as sheet "A", registry number H10937.
- A.5 This project responds to a request from the Department of the Navy, Northeast Region Fleet Support. This project will provide modern hydrography in support of Naval activities during "Opsail 2000" and the International Naval Revue scheduled for July 4, 2000. U.S. and Foreign Naval Ships as well as "tall" sailing ships will be maneuvering and anchoring in the project area. The Port of New York and New Jersey, Harbor Safety, Navigation, and Operations Committee has also requested these surveys in support of the increased number of deep draft vessels transiting these waters. The latest Nation Ocean Service hydrographic surveys in the project area date from 1939.

B. Area Surveyed

- B.1 Survey H10937 encompasses an area from the George Washington Bridge south to 128th Street. The survey area covers approximately 4.2 square kilometers or 1.3 square nautical miles.
- B.2 The survey is comprised of one sheet with the following approximate boundaries (not to scale):



B.3 Data acquisition for this survey began September 19, 1999 (DN 262) and ended October 15, 1999 (DN 288).

C. Survey Vessels

C.1 All H10937 hydrography, side scan, and multibeam investigations were conducted from NOAA Ship RUDE (S-590, EDP #9040). The RUDE acquired 100% side scan and 100% multibeam coverage from the 30-foot contour and deeper. Multibeam sonar was solely used from the 18-foot contour to the 30-foot contour, acquiring 100% multibeam sonar coverage.

C.2 The transducer for the multibeam sonar was deployed on a pivoting pole mounted on the port side, approximately amidships. The multibeam transducer was rotated into the water only during times of data acquisition.

D. Automated Data Acquisition and Processing *See Also Evaluation Report*

D.1a Coastal Oceanographics' Hypack for Windows, Version 7.1a (12/02/97) was used for data acquisition during the survey. Post processing included the use of HPTools, Version 9.4.0 (04/22/99), for all Hypack data conversion. Data processing was conducted using Hydrographic Process System (HPS) Version 8.2 (03/02/98) supplied by Atlantic Hydrographic Branch Computer Support Group on the HydroSoft CD, Version 8.9. MapInfo Version 5.0 (08/18/98) was utilized for data display during the valuation process and completion of the field sheet. All software versions used for data processing are listed in Appendix H. *

D.1b Triton Corporations ISIS software Version 4.3.2 (06/01/99) was used to acquire SeaBat multibeam and digital side scan sonar data. SeaBat data was processed on the CARIS-HIPS System, Version 4.2.7 (01/17/97).

D.1c The SEABIRD SBE-19 sound velocity profiler unit was utilized with SEASOFT 3.3M (11/27/99) and SEACAT 3.1 (03/01/99) software. The program VELWIN Version 4.0 (03/01/99) was used to process the acquired data and calculate velocity corrections.

D.2a Multibeam and side scan sonar data (XTF Format) conversion within the CARIS-HIPS System entailed

* *Data filed with the original field records*

specific conversion selections. Conversion selection for origin of sensor information differs between side scan data and multibeam data. Multibeam data conversion utilized the standard, or default selections. "Ship Nav" from Sensor; "Ship Gyro" from Attitude; "Fish Nav" from Sensor; "Fish Gyro" from Attitude. Data decimation was not selected and image correction was selected during conversion.

Side scan sonar data conversion entailed selecting "Ship Nav" from sensor; "Ship Gyro" from Ship or Attitude; "Fish Nav" from Ship; "Fish Gyro" from Ship or Attitude. Data decimation was not selected and image correction was selected during conversion.

D.2b SeaBat depth data were monitored using ISIS during acquisition and processed utilizing CARIS-HIPS multibeam data cleaning programs. Digital multibeam depth profiles were visually reviewed and fliers were identified and manually flagged as "rejected"; no SEABAT quality flags were used to automatically "reject" data. Vessel navigation data from DGPS and attitude data from heave, pitch, roll, and gyro sensors were displayed and manually cleaned (see Sections G and I).

D.2c After reviewing and cleaning, the depth, navigation, and attitude data were merged with sound velocity, tide, and vessel configuration data to compute the true depth and position of each sonar beam footprint. Work file processing for evaluation during survey operations included importing the multibeam depths into a WorkFile, selecting "extended no key" and "group by beam number". Processed depths were thinned by shoal bias binning with a 3 meter x 3 meter sounding grid determined by selecting the "Line by Line Binning" method. A digital terrain model (DTM) at 5-millimeter resolution was produced within CARIS-HIPS to evaluate multibeam coverage. Development lines were produced and run based on gaps observed within the DTM. Soundings were suppressed at 15 meter in order to facilitate the exportation process to HPS (using HP Tools). The exported soundings were then plotted within MapInfo. This yields soundings approximately every 45 meters. The plotted sounding were used for preliminary field evaluations.

WorkFile processing for data submission to Atlantic Hydrographic Branch (N/CS33) included binning the same multibeam data set at a grid level of 7.5 meters x 7.5 meters at a scale of 1:1000, yielding approximately one sounding every seven and a half meters.

D.2d Sounding evaluation included the use of a text file (.txt) created during the multibeam sounding export process. This text file was used to display the soundings within MapInfo. The data file (.dat) created during the sounding exportation process was later converted into HPS via HP Tools, generating a HPS multibeam only data file for each day of acquisition. The final field sheet contains only soundings that originate from these HPS multibeam only data files.

D.2e Final plots were created in MapInfo, a PC-based GIS package, with assistance from HPS-MI MapInfo tools supplied by Hydrographic Survey Division (HSD). These tools produced depth, track, and swath plots from HPS data and allowed plotting on a HP750C Designjet Plotter and a HP2500CM Inkjet printer. Data could also be overlaid on a raster image of the applicable chart.

D.2f The total number of multibeam sounding used and processed during post processing evaluation does not reflect the total number of multibeam sounding provided to N/CS33. Verification sounding grid size of 7.5 meters at a scale of 1:1000 was selected. Sounding excessing will be conducted during the verification process using HPS.

E. Sonar Equipment

E.1 All side scan sonar data was acquired using an Edgetech (EG&G) model 272 towfish (S/N 1159) and an Edgetech Model 260-TH slant-range correcting side scan sonar recorder (S/N 12106). Additionally, all side scan sonar data were recorded digitally using the Triton ISIS software and archived in the Extended Triton Format (*.XTF) files.

E.2 The side scan towfish used a 50° vertical beam width tilted down 20° from horizontal.

E.3 The 100 kHz frequency was used throughout the survey.

- E.4a The 75-meter range scale was used with line spacing of 120 meters, allowing the hydrographer to maintain proper side scan fish altitude. In areas of shoaler depths, the 50-meter range scale was utilized with 80-meter line spacing. Swath coverage was checked in MapInfo utilizing the Hps_mi.mbx program to ensure 100% side scan sonar coverage.
- E.4b Confidence checks were conducted by means of verifying benthic features. Rocks, pipelines, submerged logs, piers, and bulkheads were identifiable within the survey limits and used for confidence checks. These features were identified from inner to outer limits of the range scale. Graphic record annotations indicate the confidence checks. The hydrographer's confidence in side scan sonar area coverage was continuously verified.
- E.4c One hundred percent side scan sonar coverage was conducted in depths greater than 30 feet. Holiday lines were run to fill in any gaps in coverage. All coverage was checked with on-screen-zoomable coverage displays within MapInfo to ensure overlap between lines.
- E.4d The towfish was deployed exclusively from the stern. An electronic cable counter (M/D Totco) was employed to determine the amount of side scan cable deployed.
- E.5 Sonar records were monitored on-line and reviewed by two persons during processing to identify contacts. Contact offsets and shadow heights were measured on sonar paper records, checked, and entered into the HPS Contact Table to compute contact heights and positions.
- E.6 All side scan contacts with computed heights greater than 10% of the water depth in depths greater than 20 meters, or greater than 1.0 meters off the bottom in depths shoaler than 20 meters, and all contacts which appeared man-made were deemed significant. All significant contacts were further developed with multibeam sonar nadir coverage.

F. Sounding Equipment

- F.1a Single-frequency (455 kHz) multibeam data were acquired with a Reson SeaBat 9003 (S/N 10496-447020) shallow-water sonar system. The 9003's combined

transmit and receive beams yield forty (40) soundings per ping, each formed from a 3° crosstrack x 1.5° alongtrack bottom footprint. During multibeam data processing, the outermost two beams on each side of the swath (1, 2, 39, and 40) were not processed, reducing the effective swath width to 108° (3° x 36 beams). Proper overlap between multibeam sonar coverage lines was verified using a conservative swath width assumption of 100°.

- F.1b SeaBat 9003 (455 kHz) multibeam data were continuously recorded during data acquisition and served as RUDE's primary source of hydrographic digital soundings in the offshore area. Sounding depths ranged from 5 to 78 feet of water, utilizing the 10, 25, and 50-meter range scales. One hundred percent multibeam coverage was based on 10-meter line spacing in depths shoaler than 30 feet, and 40-meter line spacing for depths greater than 30 feet. Additional lines were added utilizing the Line Offset function in Hps_mi.mbx within MapInfo to ensure 100% multibeam coverage.
- F1.c Vessel speed during the mainscheme sounding collection consisted of maintaining standards for side scan operations. Multibeam mainscheme lines included vessels speeds between 4 and 7 knots; item and contact investigation speeds were generally slower (3 to 5 knots), allowing for an increase in the data density along track over the feature.
- F.2a Dual-frequency (24 and 100 kHz) vertical beam echo sounding data were acquired with an Odom Echo-Trac echosounder (S/N 9641). The echosounder did not record the low frequency returns.
- F.2b Single beam echograms were monitored on-line. Anomalous echogram traces were immediately cross-referenced to the ISIS multibeam acquisition display on-line.
- F.2c Single beam edits were not made during survey operations. Single beam vertical correctors were applied to the raw single beam digital soundings (see Section G). The archived HPS fixes from the single beam soundings do not represent the entire character of the seafloor because shoal bias inserts were not selected; graphic records were not scanned for depth edits. Single beam data was not used in any processing

during survey operations. **Echo-Trac single beam data should not be included on the final field sheet.**

F.3 No diver investigations were performed during H-10937.

F.4 There were no observed faults in sounding equipment that affected the accuracy or quality of the data.

G. Corrections to Soundings *See Also Evaluation Report*

G.1a Sounding velocity correctors were computed from a SeaBird SBE19 SEACAT Profiler (S/N 196723-1251). Data quality assurance tests using the CAT programs based on data acquired by the Odom Digibar (S/N 168). During survey H10938, the Digibar experienced errors, and was shipped off for repair. The quality assurance tests were then performed using inputted hydrometer and thermometer data. The digibar is calibrated at the ~~x~~ beginning and end of each field season. See Appendix E for data records.

The following velocity casts were used for this survey:

Velocity Cast	Day Number
1, 2, 3	262
4, 5	263
6, 7, 8	264
9, 10, 11	266
24	273
29	278
30	279
37	288

Sound velocities were applied to the SeaBat data in HIPS (incorporating the Nautical Charting Development Lab REFRACT Algorithm). Sound velocity correctors for the vertical beam soundings were computed using VELWIN and applied to the single beam data using HPS.

** Data filed with the original field records*

Tide Station 851-8750, The Battery, New York City, New York			
Zone Station	HR2	HR3	HR4
Time Correctors	+18 mins	+36 mins	+48 mins
Range Corrector	x 0.94	x 0.90	x 0.86
Reference #	851-8750	851-8750	851-8750

- G.1b Single beam leadline comparison were not completed during survey operations as single beam data was not used during any aspect of processing, nor will single beam data be included in the final data set.
- G.1c Sensor offsets and transducer static drafts were measured during the December 1996 dry-dock period. Sensor offsets were stored in the CARIS-HIPS Vessel Configuration File and HPS Offset Table for use in data processing. See Appendix E* for data records.
- G.1d Transducer dynamic draft was measured on March 5, 1999 (DN 064) during opening calibration "Patch Test" utilizing Real Time Kinematic on the Fly settlement and squat method. Dynamic draft correctors were stored in the CARIS-HIPS Vessel Configuration File and HPS Offset Table for use in data processing. The HPS Offset Table is Table 01. See Separate IV* for data records.
- G.1e Heading data were acquired with Seatex Seapath and applied to determine both multibeam transducer and side scan towfish azimuth and position. Multibeam heave, pitch, roll, and heading sensor data were adjusted using biases as determined during a patch test completed on September 8th, 10th, and 12th, 1999 (DN 251, 253, 255). See the CARIS-HIPS Vessel Configuration File in Appendix E* for data records.
- G.1f Heave, pitch, and roll data were acquired using a Seatex Seapath Motion Reference Unit (MRU-5) (S/N 0544). Heave, pitch, and roll data were applied to SeaBat multibeam data; only heave data were applied to vertical single beam data during post processing.
- G.2 No unusual or unique methods or instruments were used to correct for sounding data.
- G.3 No velocity zoning was performed during H-10937.

* Data filed with the original field records

- G.4 The divers least depth gauge was not used for this survey.
- G.5 No significant systematic errors were detected during this survey.
- G.6a The vertical reference surface for this survey is Mean Lower Low Water (MLLW).
- G.6b Tide zoning for this survey is consistent with Project Instructions. During data collection, tide station The Battery, New York (851-8750) was used as the reference station utilizing predicted tides.

Applying zoning correctors to the preliminary unverified tidal data from The Battery tide gauge generated tide correctors. The conversion was generated within CARIS-HIPS, and resulting tide correctors were applied to SeaBat data. Preliminary unverified tides were also computed with HP_Tools and applied to single beam data within HPS.

A request for verified tides was mailed on October 18, 1999 to N/CS41.

- G.6c Note that multibeam data processing was accomplished using preliminary unverified tide values during data acquisition and post-processing.

Zone station time and height correctors provided by N/CS31, with the project instructions, were applied to all tidal correctors relative to reference station the Battery, New York (851-8750).

- G.6d **Do not reapply any correctors to multibeam data in HPS, including verified smooth tides. Note that only preliminary unverified tide values have been applied to H-10937 data. Verified smooth tide values and correctors need to be applied to the entire multibeam set in CARIS-HIPS prior to conversion to HPS.**

H. Hydrographic Position Control *See Also Evaluation Report*

- H.1 The horizontal reference station for this survey is the North American Datum of 1983 (NAD83). Geodesy parameters during data collection entailed the use of Universal Transverse Mercator (UTM) Zone 18, WGS-84,

Northern Hemisphere. No horizontal control stations were established for this survey.

- H.2 Positioning for this survey was obtained from the NAVSTAR Global Positioning System (GPS) augmented with the U.S. Coast Guard Differential GPS (DGPS) service. The following USCG reference station beacon was used:

USCG DGPS Radio Beacon Broadcast Sites						
Site	Freq	Tran. Rate BPS	Lat (N)	Long (W)	Range (NM)	Beacon ID
Sandy Hook, NJ	286	200	40°28.29'	74°00.71'	100	804

- H.3 Accuracy requirements were met as specified by the Hydrographic Manual, section 1.3 and 3.1, Field Procedures Manual, section 3.4, and National Ocean Service Specifications and Deliverables manual.
- H.4 GPS and DGPS signals were acquired with the following hardware equipment:

GPS and DGPS Hardware	SERIAL #
SeaPath 200	0347
StarLink, antenna Model MBA2	4202

- H.5 The GPS Horizontal Dilution of Precision (HDOP) was recorded during survey operations. HDOP values were checked and evaluated during data collection. When HDOP values exceeded four, survey operations were halted until values returned to acceptable levels. Any data collected while HDOP values exceeded that maximum allowable limit were rejected, and the affected survey area was reacquired.

Anomalous position data was either manually smoothed or flagged "rejected", depending on the extent of the affected data. Instantaneous vessel speed was manually cleaned in CARIS with an even tolerance of 1.0 knot to aid in the manual cleaning of multibeam navigation data.

DGPS performance checks were not conducted during H-10937. The necessity for control checks is eliminated when using the Seatex Seapath 200; quality positioning is supported by the continuous calibration routine inherent of Seapath.

- H.6 Calibration data are not required when using differential GPS.
- H.7a There were no unusual methods used to operate the positioning equipment.
- H.7b There were no positioning equipment malfunctions during H-10937.
- H.7c There were no unusual atmospheric conditions noted which might have affected data quality.
- H.7d No significant systematic errors were detected.
- H.7e Offsets for the GPS antenna were applied from the CARIS-HIPS Vessel Configuration File to compute the position of the SeaBat transducer. See Appendix E for Caris-HIPS Vessel Configuration File and HPS Echotrac offset data records.
- H.7f A-frame position (tow point), cable length, towfish height, and depth of water were applied to navigation data to compute the position of the towfish. This correction is applied in HPS via the offset table and Reapply Sounding Corrections. See Appendix E* for the offset table.

I. Shoreline *See Also Evaluation Report*

Shoreline verification was not performed during H-10937, as per Project Instructions.

J. Crosslines

- J.1 A total of 2.4 nautical miles of crosslines were acquired for this survey; equating to 14.3% of the total linear miles of hydrography. Cross line spacing was set at 700 meters apart.
- J.2 Crossline comparison yields excellent agreement. As H-10937 was a 100% multibeam survey, a Quality Control Report within CARIS-HIPS was utilized to compare multibeam mainscheme and multibeam crosslines. The mean error variance for all beams is equal to -0.7 and the standard deviation is equal to 0.1. A copy of the report is contained within Separate I.*

* Data filed with the original field records

A visual comparison was also conducted, comparing multibeam mainscheme lines and multibeam cross lines. This comparison yields excellent agreement, with depth differences ranging between one to two feet. A three-foot difference was noticed in a sloping region of the river bottom.

K. Junctions *See Also Evaluation Report*

K.1 H-10937 junctions with the northern section of H-10938 of OPR-B330-RU-99.

K.2 Soundings located in the junction area were in excellent agreement, with sounding variance between one and two feet.

L. Comparisons with Prior Surveys *See Also Evaluation Report*

Comparisons with prior surveys are not required when 100% shallow water multibeam sonar is acquired per section L of the National Ocean Service Hydrographic Survey Specifications and Deliverables.

M. Item Investigation Reports

There were no AWOIS items assigned within the limits of H-10937.

N. Comparison with the Chart *See Also Evaluation Report*

N.1 Three charts are affected by this survey:

- Chart 12341 23rd Ed. January 03, 1998 1:~~5,000~~ 10,000
- Chart 12345 9th Ed. July 07, 1990 1:~~5,000~~ 10,000
- Chart 12343 17th Ed. June 01, 1996 1:40,000

N.2a Chart 12341 has 432 soundings located with the survey limits. Approximately 127 depths from Chart 12341 are within two feet of the survey depths. This yields a 29.4% agreement between depths in common areas. Of the remaining common depths, 211 charted depths are shallower by two to four feet than the survey depths. The remaining 94 charted depths are deeper by two to three feet of the survey depths.

N.2b General shoaling trends can be seen in two distinct areas. The first area is on the New Jersey side of the river. The Danger to Navigation report submitted to

U.S. Coast Guard First District explains the eastward migration of the 18-foot contour on this side of the river. *Concur*

N.2c The second shoaling trend can be seen in the northeastern section of the survey area, at $40^{\circ}50'21.5''N$, $073^{\circ}56'56.7''W$, of H10937. Depth differences between the charted depths and depths found during the survey range from about one foot to seven feet. This trend is not as pronounced as found on the western side, as the 18-foot contour appears to have shifted about 50 meters westward. The 30-foot contour shows no significant changes in position. *Concur*

N.2d Significant differences in depths can also be seen in the center of the river. The results of H-10937 indicate that depths have become deeper within this area, from one foot to eight feet in some instances. The average is calculated to be between 4-5 feet. Further evidence of this deepening can be found by looking at the 30-foot contour. Migration of this contour as found within H-10937 shows a western migration on the New Jersey side of the river. The eastern side of the river shows an eastward migration of the 30-foot contour, though not as pronounced. *Concur*

N.2e The tabulation of the northern part of the Weekhawken-Edgewater channel from Edgewater Oil Terminal northward to $40^{\circ}49'30.5''N$, $073^{\circ}58'08.8''W$ states controlled depths range from 24.5 feet in the left outside quarter to a max of 28.8 feet in the right outside quarter. Survey depths found within the limits of the channel as charted are not in agreement with these tabulated controlling depths. Differences of depths seen ranged from one to three feet. The hydrographer recommends updating the tabulation with the depths found during H-10937. *Concur*

N.2f The tabulation of the northern part of the Weekhawken-Edgewater channel from $40^{\circ}49'30.5''N$, $073^{\circ}58'08.8''W$, northward to opposite 156th Street, Manhattan, lists controlling depths from 15.8 feet on the left outside quarter to 23.8 feet on the right outside quarter. Comparisons between survey soundings and these depths show poor agreement. Depths in excess of 40 feet were found in the northern most section of the channel. The hydrographer recommends that survey depths found during

H-10937 supercede charted depths presently contained within the tabulation. *Concur*

N.2g Mr. Joseph Seebode of the Army Corps of Engineers confirmed that the designated channel on the west side of the river is used for navigation. However, the local pilots use the eastern one third of the river for navigation and stated that the Army Corps of Engineers maintains the channel for collecting silt. ~~Concur~~

N.2h Isolated soundings of 29 and 30 feet were found in the vicinity of 40°51'05.5"N, 073°57'11.0"W. Surrounding survey soundings were 32 to 33 feet. The 29 and 30 foot soundings are deeper than the charted sounding of 27 feet in that area. The hydrographer recommends charting the survey soundings. *Concur*

N.2i Isolated soundings of 27 feet were found in the vicinity of 40°51'01.6"N, 073°57'14.7"W and 40°51'00.6N, 073°57'16.3W. Surrounding survey soundings were 29 to 30. The 27-foot soundings can be attributed to a ridge on the river bottom. All soundings in this general vicinity are deeper than charted soundings by two feet. The hydrographer recommends charting the survey soundings. *Concur*

N.2j An intake is charted at 40°50'31.4"N, 073°56'54.0W. This intake was found during survey operations at 40°50'36.9"N, 073°56'50.51"N. Lines 321 and 216 on DN 263, 002 on DN 278, and 109 on DN 266 were used to determine the position. The hydrographer recommends removing the charted pipeline from position 40°50'31.4"N, 073°56'54.0W and charting the pipeline at position 40°50'36.9"N, 073°56'50.51"N. *Concur w/clarification*
Retain charted Intake. Add Intake in Lat 40°50'36.9" Long 73°56'50.51"

N.2k A submarine pipe is charted within the survey limits of H-10937. The pipeline is charted on the east side of the river at 40°49'18.2"N, 073°57'37.3"W and on the west of the river at 40°49'36.8N, 073°58'12.1W. Coverage in this area includes both 100% side scan sonar and 100% shallow water multibeam sonar. Evidence of the pipeline on the east side of the river can be seen on line 329 of DN 264. The pipeline cannot be seen on either side scan nor multibeam sonar images, suggesting that the majority of the pipeline is covered with sediment. The hydrographer recommends retaining the charted position of the pipeline. *Concur*

- N.51 The pilings charted at 40°49'43.7"N, 073°57'21.8"W were observed as dolphins during survey operations. The hydrographer suspects the dolphins are used as ice breakers. The hydrographer recommends the charted pilings label be replaced with the dolphin label. *Concur*
- N.3 Chart 12345 contains 13 soundings within the survey limits of H-10937. Of the 13 soundings, four charted depths are shoaler than two feet than the surrounding survey depths. This yields a 30.8% agreement between depths in common areas. This is consistent with the comparisons found with Chart 12341. The remaining charted depths within the common area are shoaler than the survey depths between two feet and eight feet. *Concur*
- N.4 Chart 12343 contains 16 soundings within the survey limits of H-10937. Of these 16 soundings, five charted depths agree within two feet of the surrounding survey depths. This yields a 31.3% agreement between depths in this common area. The remaining 11 charted depths are between two feet and 15 feet shoaler than the survey depths. *Concur*
- N.5a Five Dangers to Navigation were reported for H-10937. The reports of Dangers to Navigation letter can be viewed in Appendix I. *Appended to this Report*
- N.5b A 14-foot obstruction was located with multibeam sonar at position 40°50'^{39.65}36.0"N, 073°56'^{50.75}49.9"W. The least depth and position were based on multibeam sonar contacts observed during data processing. The hydrographer recommends adding the symbol "obs" at position 40°50'^{39.65}36.0"N, 073°56'^{50.75}49.9"W. *Concur w/Clarification Chart 14. Obstrn*
- N.5c An 8-foot sounding was observed at position 40°50'36.0"N, 073°56'50.7W. The least depth of the sounding was determined by multibeam sonar. The hydrographer recommends charting the survey sounding. *Concur*
- N.5d A wreck was located using side scan sonar at position 40°50'06.³⁶8"N, 073°57'03.⁴³2"W. A charted "dangerous wreck, depth unknown" is located approximately 50 meters to the south-southeast of the position found during survey operations. The wreck was observed in both 100% and 200% side scan sonar records and 100% multibeam records. Least depth and position were determined using multibeam sonar. The hydrographer recommends removing the charted "dangerous wreck, least

depth unknown". The hydrographer further recommends the addition of "charted wreck, least depth known by sounding" at position 40°50'06.8"N, 073°57'03.2"N. *Concur w/Clarification*

Retain charted subm dangerous wreck & Add 13: WK
N.5e A 32-foot sounding was observed at position 40°49'43.7"N, 073°57'^{24.96}~~22.0~~"W. There is no evidence that the sounding is a result of an obstruction, but the shoreline in that area has migrated. The location of the sounding is approximately 100 meters to the north of a charted bulkhead protruding 120 meters in the river. The migration of the shoreline in that area appears to be a direct result of sediment deposit caused by the protrusion of the bulkhead. The hydrographer recommends charting the survey sounding.

Chart 13:2: Obstrn

Concur w/Clarification

O. Adequacy of Survey

Survey H-10937 was completed with multibeam mainscheme and development hydrography in conjunction with 100% side scan sonar. It is recommended that H-10937 supercede all prior surveys in common areas.

P. Aids to Navigation

There were no aids to navigation located within the survey limits of H-10937.

Q. Statistics

Q.1a Nautical miles of sounding lines	.....	106.3
Q.1b Nautical miles of side scan sonar	.....	17.0
Q.1c Square nautical miles of sounding lines	.....	1.3
Q.1d Square nautical miles of side scan sonar	.....	1.0
Q.2a Days of acquisition	.....	11
Q.2b Total number of soundings	.....	28,120,000
Q.2c Number of detached positions	.....	0
Q.2d Number of bottom samples	.....	8
Q.2e Number of velocity casts	.....	15
Q.2f Number of tide stations installed	.....	0

R. Miscellaneous

- R.1 All relevant information pertaining to this section has been previously discussed.
- R.2 Bottom samples were required per project instructions and submitted to the Smithsonian Institution.

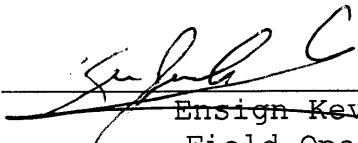
S. Recommendations

No additional fieldwork is required.

T. Referrals to Reports

A copy of the Coast Pilot Report, User Evaluation, and Chart Inspection Report are included in the Separates.

This report and accompanying field sheets are respectfully submitted.



Ensign Kevin Slover, NOAA
Field Operations Officer
NOAA Ship RUDE

APPENDIX A

DANGER TO NAVIGATION REPORTS

Danger to Navigation Reports submitted within the limits of the survey area for H-10937 are included.



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Office of NOAA Corps Operations
NOAA Ship RUDE S-590
439 W. York Street
Norfolk, VA 23510-1114
November 4, 1999

Commander
First Coast Guard District
Aids to Navigation Office
408 Atlantic Avenue
Boston, Massachusetts 02110-3350

REPORT OF DANGERS TO NAVIGATION

Dear Sir:

The NOAA Ship RUDE has recently completed a hydrographic survey of the Hudson River, New York City, New York. The survey consisted of 2 sheets (Sheet 01 and Sheet 02), encompassing an area from the George Washington Bridge south to Pier 90:

Hydrographic Survey Registry No.	H-10937
State	New York
General Locality	Hudson River
Sublocality	1NM south of George Washington Bridge
Project Number	OPR-B330-RU-99

Hydrographic Survey Registry No.	H-10938
State	New York
General Locality	Hudson River
Sublocality	2 NM south of George Washington Bridge
Project Number	OPR-B330-RU-99

During the course of multibeam and sidescan sonar operations, ten dangers to navigation were discovered which merit immediate publication in to the Local Notice to Mariners. This information affects the following chart(s):

CHART 12335	1:10,000	9th Ed., July 07, 1990
CHART 12341	1:10,000	23rd Ed., January 03, 1998

Feature	Depth* (Feet)	Latitude (NAD83)	Longitude (NAD 83)	Charts Affected
Obstruction	14	40°50'39.40" N	073°56'49.91" W	12341
Sounding	8	40°50'36.01" N	073°56'50.73" W	12341
Wreck	8.3	40°50'06.79" N	073°57'03.19" W	12341
Sounding	32	40°49'43.72" N	073°57'21.96" W	12341
Wreck	5	40°48'20.67" N	073°59'01.57" W	12341
Wreck	-1	40°48'17.39" N	073°59'04.72" W	12341
Wreck	8	40°47'35.29" N	073°59'36.84" W	12341
Submerged piles	-3	40°46'47.15" N	073°59'29.73" W	12341
Wreck	21	40°46'37.77" N	074°00'14.48" W	12341
Wreck	17	40°46'05.88" N	074°00'43.69" W	12341, 12335

H10938

As shown in the attached chartlets, the 18-foot contour on the western side of the river in H-10937 is migrating westward.

* Updated depths are reduced to feet at MLLW using preliminary unverified tides and should be viewed as preliminary information, subject to office review.

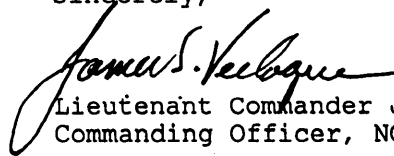


Contact either of the following personnel for further information:

Commanding Officer
NOAA Ship RUDE
439 West York Street
Norfolk, VA 23510-1145
(757) 615-6465

Chief, Atlantic Hydrographic Branch
Atlantic Marine Center
439 W. York Street
Norfolk, VA 23510-115
(757) 441-6746

Sincerely,



Lieutenant Commander James S. Verlaque, NOAA
Commanding Officer, NOAA Ship RUDE

Attachment

cc: N/CS; N/CS3, N/CS33, NIMA, Sandy Hook Pilots Association

73° 58' 30" W

73° 58' 00" W

73° 57' 30" W

73° 57' 00" W

73° 56' 30" W

GEORGE WASHINGTON BRIDGE
No bridge cables are marked with lights and day marks

Date of survey: September 19 - October 15, 1999
Multibeam soundings in feet at MLLW. The survey and chart have not been updated for the latest Local Notice to Mariners. Preliminary soundings subject to office review.

NOT TO BE USED FOR NAVIGATION

Chart 12341
23rd Ed., January 03, 1998

Lat- 40°50'39.40" N
Long- 073°56'49.91" W

Lat- 40°50'36.01" N
Long- 073°56'50.73" W

Lat- 40°50'06.79" N
Long- 073°57'03.19" W

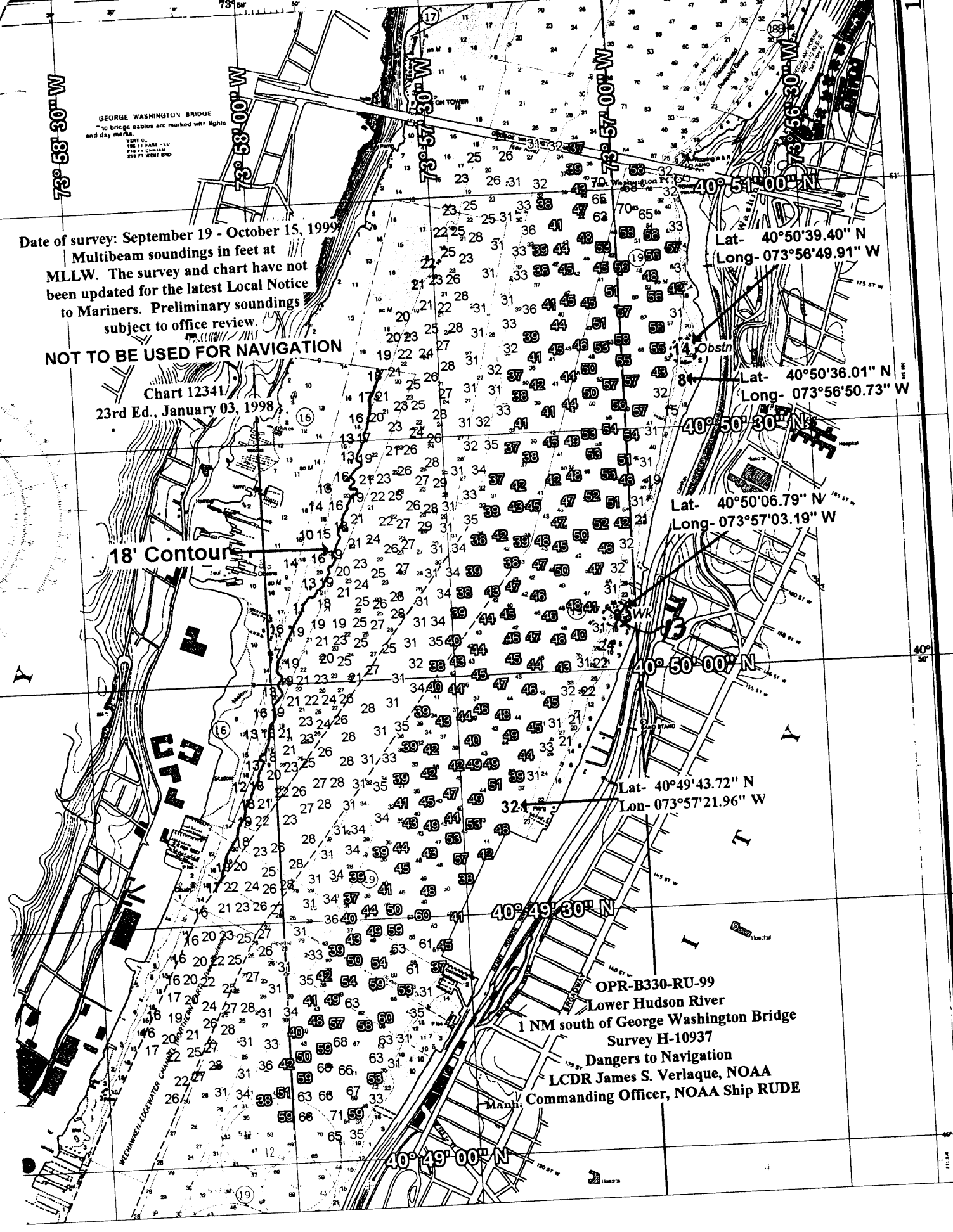
Lat- 40°49'43.72" N
Lon- 073°57'21.96" W

40°49'30" N

40°49'00" N

18' Contour

OPR-B330-RU-99
Lower Hudson River
1 NM south of George Washington Bridge
Survey H-10937
Dangers to Navigation
LCDR James S. Verlaque, NOAA
Commanding Officer, NOAA Ship RUDE



Date of Survey: September 19 - October 15, 1999
 Multibeam soundings in feet at MLLW.
 The survey and chart have not been updated for the latest Local Notice to Mariners. Preliminary soundings subject to office review.

NOT TO BE USED FOR NAVIGATION

Chart 12341	
Scale	1:50,000
Projection	Transverse Mercator
Datum	North American 83
Units	Meters
Year of Edition	1998
Year of Revision	1998
Author	NOAA
Editor	NOAA
Printer	NOAA

23rd Ed., January 03, 1998

Lat- 40°48'20.67" N
 Lon- 073°59'01.57" W

Lat- 40°48'17.39" N
 Lon- 073°59'04.72" W

Lat- 40°47'35.29" N
 Lon- 073°59'36.84" W

Lat- 40°46'37.77" N
 Lon- 074°00'14.48" W

Lat- 40°46'47.15" N
 Lon- 073°59'29.73" W

Lat- 40°46'05.88" N
 Lon- 074°00'43.69" W

OPR-B330-RU-99
 Lower Hudson River
 2 NM south of George Washington Bridge
 Survey H-10938
 Dangers to Navigation
 LCDR James S. Verlaque, NOAA
 Commanding Officer, NOAA Ship RUDE



APPENDIX B

NON-FLOATING AIDS AND LANDMARKS FOR CHARTS

No corrections were discovered within the limits of the survey area for H-10937.



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
Silver Spring, Maryland 20910

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE: February 10, 2000

HYDROGRAPHIC BRANCH: Atlantic
HYDROGRAPHIC PROJECT: OPR-B330-RU-99
HYDROGRAPHIC SHEET: H-10937

LOCALITY: Lower Hudson River- 1 NM south of the George
Washington Bridge, NY/NJ
TIME PERIOD: September 19 - October 15, 1999


TIDE STATION USED: 851-8750 The Battery, NY
Lat. $40^{\circ} 42.0'N$ Lon. $74^{\circ} 0.9'W$
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 1.457 meters

REMARKS: RECOMMENDED ZONING

Use zone(s) identified as: HR3 & HR4.

Refer to attachments for zoning information.

Note 1: Provided time series data are tabulated in metric units
(meters), relative to MLLW and on Greenwich Mean Time.

For -----
CHIEF, REQUIREMENTS AND DEVELOPMENT DIVISION



Final tide zone node point locations for OPR B330-RU-99,
Sheet H-10937.

Format: Longitude in decimal degrees (negative value denotes
Longitude West),
Latitude in decimal degrees
Tide Station (in recommended order of use)
Average Time Correction (in minutes)
Range Correction

	Tide Station Order	AVG Time Correction	Range Correction
Zone HR3			
-73.991209 40.807877	851-8750	+36	0.90
-73.968462 40.854642			
-73.939917 40.849139			
-73.969814 40.800172			
-73.991209 40.807877			
Zone HR4			
-73.968462 40.854642	851-8750	+48	0.86
-73.929907 40.920626			
-73.905057 40.916163			
-73.92396 40.879819			
-73.925138 40.878671			
-73.926807 40.877264			
-73.939917 40.849139			
-73.968462 40.854642			

GEOGRAPHIC NAMES

H-10937

Name on Survey	<div style="display: flex; justify-content: space-between;"> ABCDEFGHK </div>											
	ON CHART NO. 12541	ON PREVIOUS SURVEY NO.	ON U.S. QUADRANGLE MAPS	FROM LOCAL INFORMATION	ON LOCAL MAPS	P.O. GUIDE OR MAP	RAND McNALLY ATLAS	U.S. LIGHT LIST				
EDGEWATER	X		X									1
FORT LEE (pp1)	X		X									2
FORT WASHINGTON PARK	X		X									3
FORT WASHINGTON POINT	X		X									4
GEORGE WASHINGTON BRIDGE	X		X									5
HAZARD BEACH	X		X									6
HUDSON RIVER	X		X									7
MANHATTANVILLE	X		X									8
NEW JERSEY (title)	X		X									9
NEW JERSEY	X		X									10
NEW YORK (title)	X		X									11
NEW YORK CITY	X		X									12
												13
												14
												15
												16
												17
												18
												19
												20
												21
												22
												23
												24
												25

Approved

Dennis J. Roesberg
Chief Geographer
FEB 1 - 2000

LETTER TRANSMITTING DATA

N/CS33-16-00

DATA AS LISTED BELOW WERE FORWARDED TO YOU BY
(Check):

ORDINARY MAIL AIR MAIL

REGISTERED MAIL EXPRESS

GBL (Give number) _____

DATE FORWARDED

March 24, 20000

NUMBER OF PACKAGES

ONE TUBE

TO:

CHIEF, DATA CONTROL GROUP, N/CS3x1
NOAA/NATIONAL OCEAN SERVICE
STATION 6815, SSMC3
1315 EAST-WEST HIGHWAY
SILVER SPRING, MARYLAND 20910-3282

NOTE: A separate transmittal letter is to be used for each type of data, as tidal data, seismology, geomagnetism, etc. State the number of packages and include an executed copy of the transmittal letter in each package. In addition the original and one copy of the letter should be sent under separate cover. The copy will be returned as a receipt. This form should not be used for correspondence or transmitting accounting documents.

H10937

NEW YORK-NEW JERSEY, HUDSON RIVER, GEORGE WASHINGTON BRIDGE TO EDGEWATER, N. J.

(ONE) TUBE CONTAINING THE FOLLOWING:

- 1 SMOOTH SHEET FOR SURVEY H10937
- 1 ORIGINAL DESCRIPTIVE REPORT
- 1 DRAWING HISTORY FORMS (NOAA FORM #76-71) FOR NOS CHART 12341
- 1 RECORD OF APPLICATION TO CHART FORM (NOAA FORM #75-96)
- 1 H-DRAWING FOR NOS CHART 12341 ON MYLAR
- 2 COMPOSITE DRAWINGS FOR NOS CHART 12341

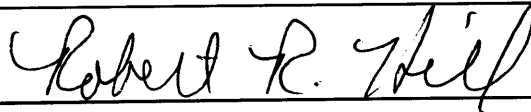
ALSO

H10804

- 1 H-DRAWING FOR NOS CHART 11332

FROM: (Signature)

ROBERT R. HILL



RECEIVED THE ABOVE

(Name, Division, Date)

Return receipted copy to:

ATLANTIC HYDROGRAPHIC BRANCH
N/CS33
439 WEST YORK STREET
NORFOLK, VA 23510-1114

03/24/2000

HYDROGRAPHIC SURVEY STATISTICS
REGISTRY NUMBER: H10937

NUMBER OF CONTROL STATIONS	2
NUMBER OF POSITIONS	102358
NUMBER OF SOUNDINGS	102358

	TIME-HOURS	DATE COMPLETED
PREPROCESSING EXAMINATION	34.0	01/21/2000
VERIFICATION OF FIELD DATA	42.0	03/09/2000
QUALITY CONTROL CHECKS	0.0	
EVALUATION AND ANALYSIS	2.0	
FINAL INSPECTION	14.0	03/11/2000
COMPILATION	85.0	03/24/2000
TOTAL TIME	177.0	
ATLANTIC HYDROGRAPHIC BRANCH APPROVAL		03/20/2000

**ATLANTIC HYDROGRAPHIC BRANCH
EVALUATION REPORT FOR H10937 (1999)**

This Evaluation Report has been written to supplement and/or clarify the original Descriptive Report. Sections in this report refer to the corresponding sections of the Descriptive Report.

D. AUTOMATED DATA ACQUISITION AND PROCESSING

The following software was used to process data at the Atlantic Hydrographic Branch:

Hydrographic Processing System
NADCON, version 2.10
MicroStation 95, version 5.05
I/RAS B, version 5.01
CARIS HIPS/SIPS

The smooth sheet was plotted using a Hewlett Packard DesignJet 2500CP plotter.

G. CORRECTIONS TO SOUNDINGS

The data provided for office processing used unverified tide values obtained from the NOAA website. A thorough comparison was made between the values used by the field unit and the approved tide and zoning values supplied by the Requirements and Development Division, Silver Spring, Maryland. There is no difference between these data. No additional office processing was required. Approved tides and zoning were not applied during office processing.

H. CONTROL STATIONS

Horizontal control used for this survey during data acquisition is based upon the North American Datum of 1983 (NAD 83). Office processing of this survey is based on these values. The smooth sheet has been annotated with ticks showing the computed mean shift between the NAD 83 and the North American Datum of 1927 (NAD 27).

To place this survey on the NAD 27, move the projection lines 0.361 seconds (11.142 meters or 2.23 mm at the scale of the survey) north in latitude, and 1.503 seconds (35.218 meters or 7.04 mm at the scale of the survey) east in longitude.

I. SHORELINE

Brown shoreline originates with National Ocean Service (NOS) chart 12341, (23rd Edition, Jan 3/98) and is for

orientation purposes only.

K. JUNCTIONS

H10938 (1999) to the south

A standard junction was effected between the present survey and survey H10938 (1999). There are no junctional surveys to the north. Present survey depths are in harmony with the charted hydrography to the north.

L. COMPARISON WITH PRIOR SURVEYS

H06428 (1939) 1:5,000

The prior survey listed above covers the present survey area in its entirety. A comparison with the prior survey was performed in areas not covered by 100% side scan sonar and 100% multibeam. In areas with 100% side scan sonar and 100% multibeam coverage no comparisons were done in accordance with section 4. of the memorandum titled "Changes to Hydrographic Survey Processing", dated May 24, 1995. The following should be noted:

A comparison with H06428 (1939) in the areas noted above shows some general agreement; however, the present survey depths are 2 to 5 feet deeper on the western side of the river and the 18 foot curve appears to be migrating shoreward. On the eastern side of the river, the general trend appears to be a seaward migration of the 18 foot curve, with present survey depths being 10 to 20 feet deeper.

The differences between the present and prior survey can be attributed to natural changes in the bottom configuration, cultural change, and/or improved hydrographic surveying methods.

Except as noted above, the present survey is adequate to supersede the prior surveys within the common area.

N. COMPARISON WITH CHART 12341 (23rd Edition, Jan 3/98)

1. Hydrography

The charted hydrography originates with the previously discussed prior survey. The prior survey requires no further consideration. The hydrographer makes adequate chart comparisons in Section N. of the Descriptive Report. Attention is directed to the following:

An uncharted dangerous submerged outfall, was located in Latitude 40°49'34.78, Longitude 73°57'29.95". This feature was not addressed by the hydrographer. It is recommended that this feature be charted as shown on the present survey.

Except as noted in this report, the present survey is adequate to supersede the charted hydrography in the common area.

2. Dangers to Navigation

One Danger to Navigation report was submitted to Commander(oan), First Coast Guard District, Boston, Massachusetts for inclusion in the Local Notice to Mariners, and to the Marine Chart Division, N/CS3x1, Silver Spring, Maryland. Copies of this report are appended to the Descriptive Report.

3. Controlling Depths

Conflicts exists with the charted controlling depths in Weehawken-Edgewater channel. In the portion of the channel north of Edgewater Oil Terminal to Latitude 40°50'19"N, the present survey depths are not in agreement with the charted controlling depths. Generally the present survey depths are 2 to 8 feet shoaler than the charted tabulated values. The greatest differences were found along the length of the left outside quarter of the channel.

O. ADEQUACY OF SURVEY

This is an adequate hydrographic/side scan sonar/multibeam survey. No additional work is recommended.

R. MISCELLANEOUS

Chart compilation was done by Atlantic Hydrographic Branch personnel, in Norfolk, Virginia. Compilation data will be forwarded to Marine Chart Division, Silver Spring, Maryland. The following NOS chart was used for compilation of the present survey:

12341 (23rd Edition, Jan 3/98)

Robert Snow

Robert Snow

Cartographic Technician
Verification of Field Data
Evaluation and Analysis

APPROVAL SHEET
H10937

Initial Approvals:

The completed survey has been inspected with regard to survey coverage, delineation of depth curves, development of critical depths, cartographic symbolization, and verification or disapproval of charted data. The digital data have been completed and all revisions and additions made to the smooth sheet during survey processing have been entered in the digital data for this survey. The survey records and digital data comply with NOS requirements except where noted in the Evaluation Report.

Robert R. Hill Jr. Date: 3-23-00
Robert R. Hill Jr.
Cartographer
Atlantic 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.

Andrew L. Beaver Date: 3/24/00
Andrew L. Beaver,
LCDR, NOAA
Chief, Atlantic Hydrographic Branch

Final Approval:

Approved: Samuel P. De Bow, Jr. Dated: March 29, 2000
Samuel P. De Bow, Jr.
Captain, NOAA
Chief, Hydrographic Surveys Division

