H13384

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Ocean Service

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13384

LOCALITY

State(s):	New York
General Locality:	New York and Connecticut
Sub-locality:	Execution Rocks to East River

2020

CHIEF OF PARTY
John R. Bean

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13384**

INSTRUCTIONS: The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.

State(s):	**New York**
General Locality:	**New York and Connecticut**
Sub-Locality:	**Execution Rocks to East River**
Scale:	**5000**
Dates of Survey:	**08/23/2020 to 03/10/2021**
Instructions Dated:	**06/26/2020**
Project Number:	**OPR-B300-KR-20**
Field Unit:	**Ocean Surveys**
Chief of Party:	**John R. Bean**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	**Multibeam Echo Sounder Backscatter**
Verification by:	**Atlantic Hydrographic Branch**
Soundings Acquired in:	**meters at Mean Lower Low Water**

Remarks:

Any revisions to the Descriptive Report (DR) applied during office processing are shown in red italic text. The DR is maintained as a field unit product, therefore all information and recommendations within this report are considered preliminary unless otherwise noted. The final disposition of survey data is represented in the NOAA nautical chart products. All pertinent records for this survey are archived at the National Centers for Environmental Information (NCEI) and can be retrieved via https://www.ncei.noaa.gov/. Products created during office processing were generated in NAD83 UTM 18N, MLLW. All references to other horizontal or vertical datums in this report are applicable to the processed hydrographic data provided by the field unit.

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Descriptive Report to Accompany Survey H13384

Project: OPR-B300-KR-20

Locality: New York and Connecticut

Sublocality: Execution Rocks to East River

Scale: 1:5000

August 2020 - March 2021

Ocean Surveys

Chief of Party: John R. Bean

A. Area Surveyed

This survey provides hydrographic data for the waters of western Long Island Sound and the eastern East River. The general locations of the survey limits are presented in Table 1.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
40° 54' 35.91" N 73° 54' 38.93" W	40° 45' 31.56" N 73° 42' 28.3" W

Table 1: Survey Limits

Survey limits were acquired in accordance with the requirements in the Project Instructions and the HSSD.

A.2 Survey Purpose

The following text is quoted from the Project Instructions' Purpose and Location section:

As the second largest port in the U.S., handling more $187.3 billion in cargo in a year mostly of foreign imports (1), within one of most densely populated areas in the U.S. with 23.3 million people living within a 50-mile radius of Long Island Sound (2), the Port of New York / New Jersey stands as an important international commercial gateway to the U.S. As a result, increasing demand for larger cargo ships with ever deeper drafts demand precise and safe navigation.

The primary purpose of this project is to provide contemporary hydrographic data to update National Ocean Service (NOS) nautical charting products and services in the U.S. that support commerce and water transportation in the regions of New York, New Jersey, and Connecticut.

Data will inform scientific studies including Office of Coast Survey's precision navigation program, and the management and planning of state agencies and private consortia monitoring the health of benthic habitats and environmental quality of Long Island Sound (3).

The survey area occupies 90 square nautical miles of estuarine water from the East River at Randalls Island, through Throgs Neck, and western Long Island Sound.

Western Long Island Sound and the eastern portion of the East River were last surveyed in the late 1990s and early 2000s. Survey data from this project is intended to supersede all prior survey data in the common area.

Sources:
1. U.S. Department of Transportation, Bureau of Transportation Statistics, Transportation Statistics Annual Report 2018 (Washington, DC: 2018).
2. Mackun, Paul; Wilson, Steven, "Population Distribution and Change: 2010 Census Briefs." U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, March 2011. http://longislandsoundstudy.net/wp-content/uploads/2010/08/c2010br-01.pdf.
3. Long Island Sound Research Collaborative, "Status and Trends LIS Environmental Indicators" Long Island Sound Study, http://longislandsoundstudy.net/2010/08/population-within-50-mile-radius-of-lis/. Accessed 23 January, 2020.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

A.4 Survey Coverage

The following table lists the coverage requirements for this survey as assigned in the project instructions:

Water Depth	Coverage Required
All waters in survey area	Complete Coverage (Refer to HSSD Section 5.2.2.3)
All waters in survey area	Acquire backscatter data during all multibeam data acquisition (Refer to HSSD Section 6.2)

Table 2: Survey Coverage

A small coverage gap exists at the Floating Pool, a public swimming pool at Barretto Point Park that is located on a permanently moored barge. The barge is within survey limits and not present on the chart; the survey vessel was not able to collect data in this area.

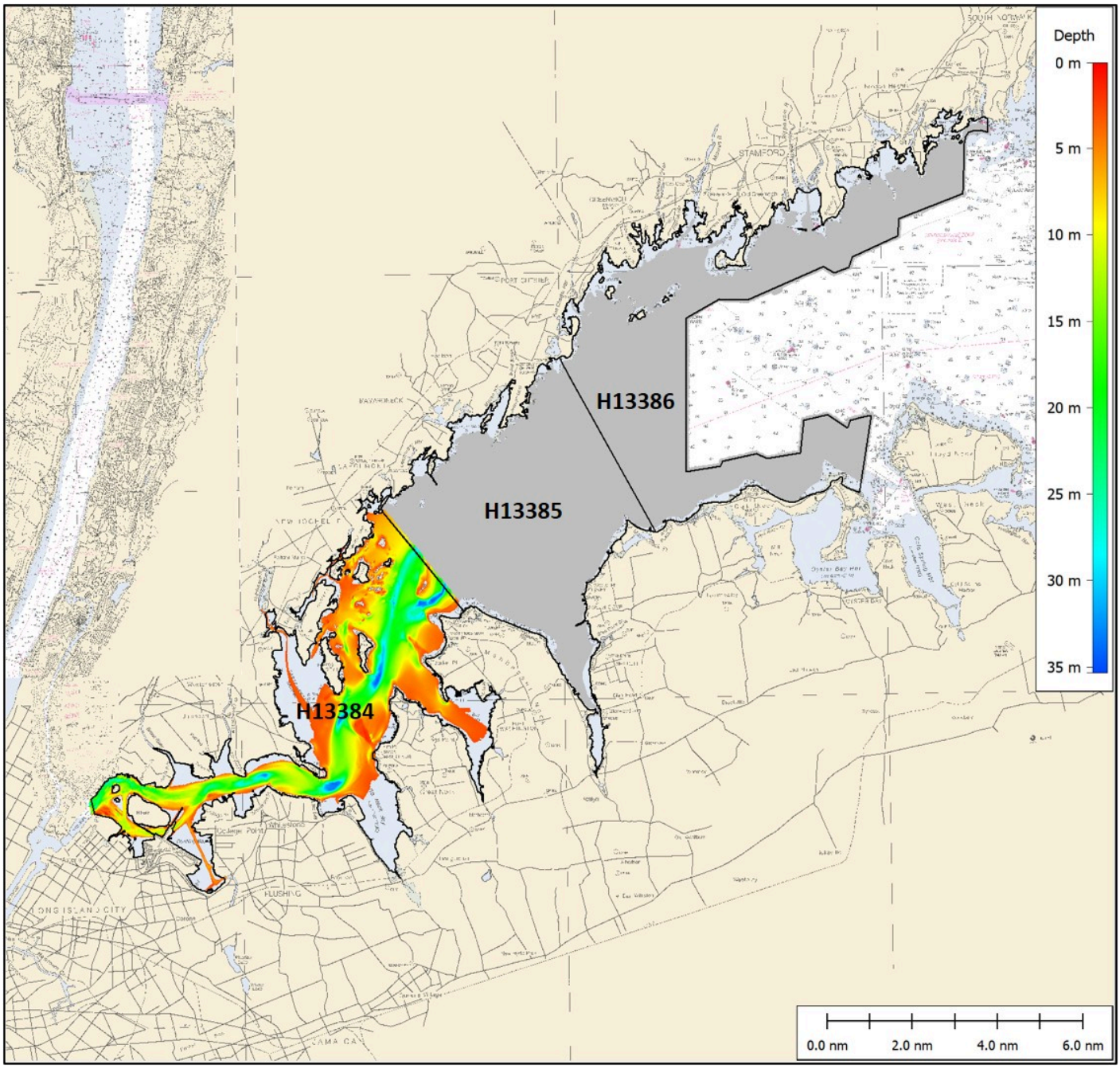

Figure 1: Survey H13384 coverage overlaid on a composite of RNCs

A.6 Survey Statistics

The following table lists the mainscheme and crossline acquisition mileage for this survey:

	HULL ID	*RV Able 2*	*RV Osprey*	*RV Ready 2*	*Total*
LNM	**SBES Mainscheme**	0	0	0	0
	MBES Mainscheme	856.2	446.9	513.2	1816.3
	Lidar Mainscheme	0	0	0	0
	SSS Mainscheme	0	0	0	0
	SBES/SSS Mainscheme	0	0	0	0
	MBES/SSS Mainscheme	0	0	0	0
	SBES/MBES Crosslines	38.5	26.5	14.1	79.1
	Lidar Crosslines	0	0	0	0
Number of Bottom Samples					11
Number Maritime Boundary Points Investigated					0
Number of DPs					0
Number of Items Investigated by Dive Ops					0
Total SNM					16.4

Table 3: Hydrographic Survey Statistics

The following table lists the specific dates of data acquisition for this survey:

Survey Dates	Day of the Year
08/23/2020	236
08/24/2020	237
08/25/2020	238
08/27/2020	240
08/28/2020	241
08/31/2020	244
09/02/2020	246
09/03/2020	247
09/04/2020	248
09/08/2020	252
09/09/2020	253
09/10/2020	254
09/11/2020	255
09/13/2020	257
09/14/2020	258
09/15/2020	259
09/16/2020	260
09/17/2020	261
09/20/2020	264
09/21/2020	265
09/22/2020	266
09/23/2020	267
09/24/2020	268
09/25/2020	269
09/26/2020	270
09/27/2020	271
09/28/2020	272
09/29/2020	273
10/02/2020	276
10/03/2020	277
10/04/2020	278
10/05/2020	279

Survey Dates	Day of the Year
10/06/2020	280
10/09/2020	283
10/11/2020	285
10/13/2020	287
10/14/2020	288
10/15/2020	289
10/16/2020	290
10/17/2020	291
10/18/2020	292
10/19/2020	293
10/20/2020	294
10/21/2020	295
11/02/2020	307
11/03/2020	308
12/04/2020	339
12/07/2020	342
12/08/2020	343
12/09/2020	344
12/10/2020	345
12/11/2020	346
03/10/2021	69

Table 4: Dates of Hydrography

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Refer to the Data Acquisition and Processing Report (DAPR) for a complete description of data acquisition and processing systems, survey vessels, quality control procedures and data processing methods. Additional information to supplement sounding and survey data, and any deviations from the DAPR are discussed in the following sections.

B.1.1 Vessels

The following vessels were used for data acquisition during this survey:

Hull ID	*RV Able 2*	*RV Osprey*	*RV Ready 2*
LOA	7.6 meters	7.9 meters	7.6 meters
Draft	0.4 meters	0.6 meters	0.4 meters

Table 5: Vessels Used

B.1.2 Equipment

The following major systems were used for data acquisition during this survey:

Manufacturer	Model	Type
Teledyne RESON	SeaBat T50-R	MBES
Applanix	POS MV 320 v5	Positioning and Attitude System
Velodyne LiDAR	VLP-16	Lidar System
Trimble	NetR9	Positioning System
AML Oceanographic	MicroX SV	Sound Speed System
AML Oceanographic	BaseX	Sound Speed System
AML Oceanographic	BaseX2	Sound Speed System

Table 6: Major Systems Used

All equipment was installed, calibrated, and operated in accordance with the DAPR.

B.2 Quality Control

B.2.1 Crosslines

Multibeam crosslines acquired for this survey total 4.4% of mainscheme acquisition. Crosslines were collected on an ongoing basis throughout the survey as the vessels progressed through 6 geographic sections that were defined to assist with data management. Within each section the majority of the mainscheme data was collected over several consecutive days followed by 1-2 days of crossline acquisition. Figure 2 shows the layout of the crosslines within the survey.

A difference surface was generated in CARIS HIPS comparing the crosslines to the mainscheme data, and a histogram of the depth differences was plotted to show the relative agreement of surveyed depths. Depth discrepancies were minimal, as shown in the histogram in Figure 3. Areas of greater depth difference occurred in the East River at the western end of the survey over some apparent sand waves, and in the northeast end of the survey near rocks and features.

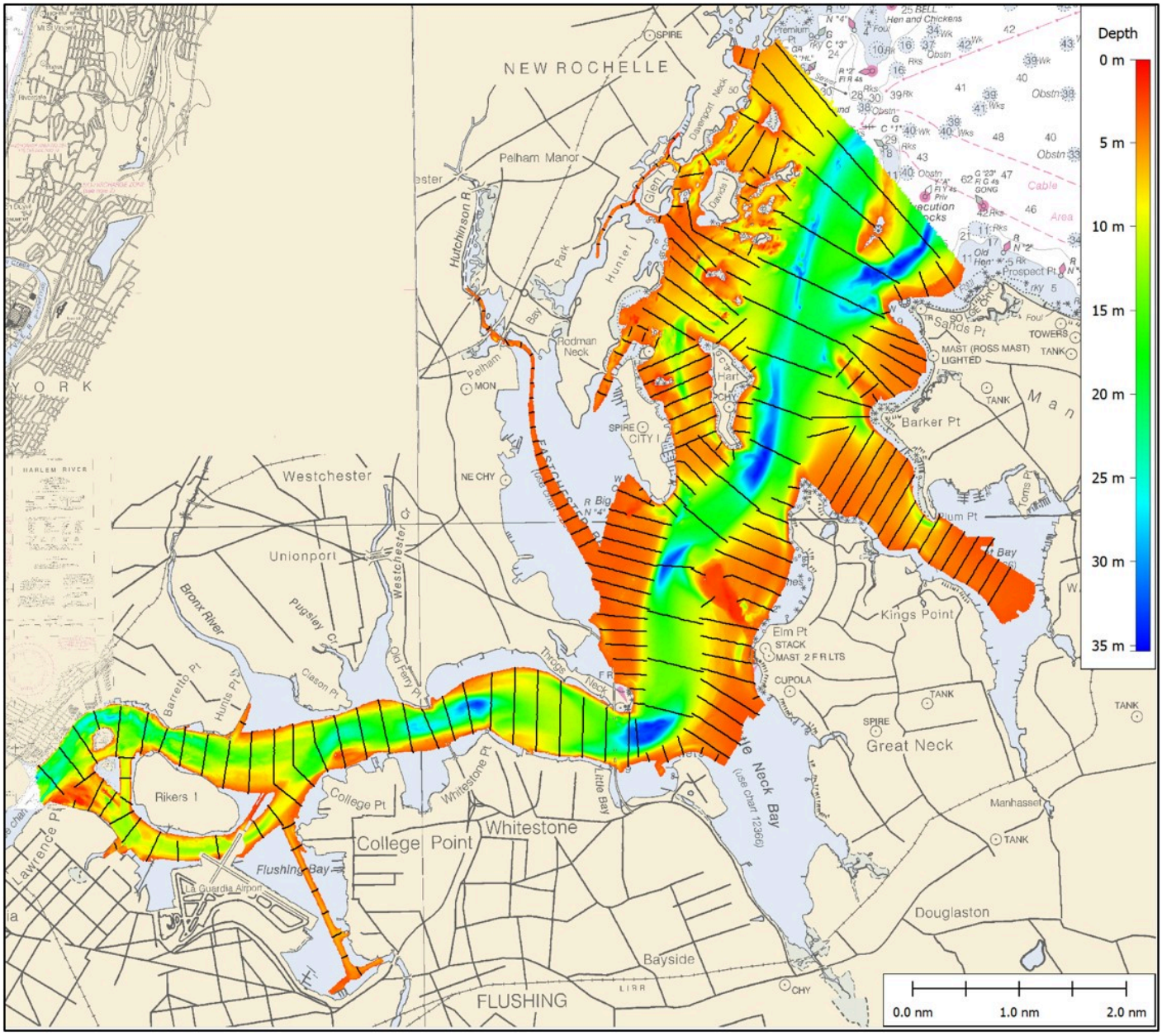

Figure 2: An overview of crossline layout on a 1m surface created from mainscheme MBES data and colored by depth, with a composite image of RNCs in the background.

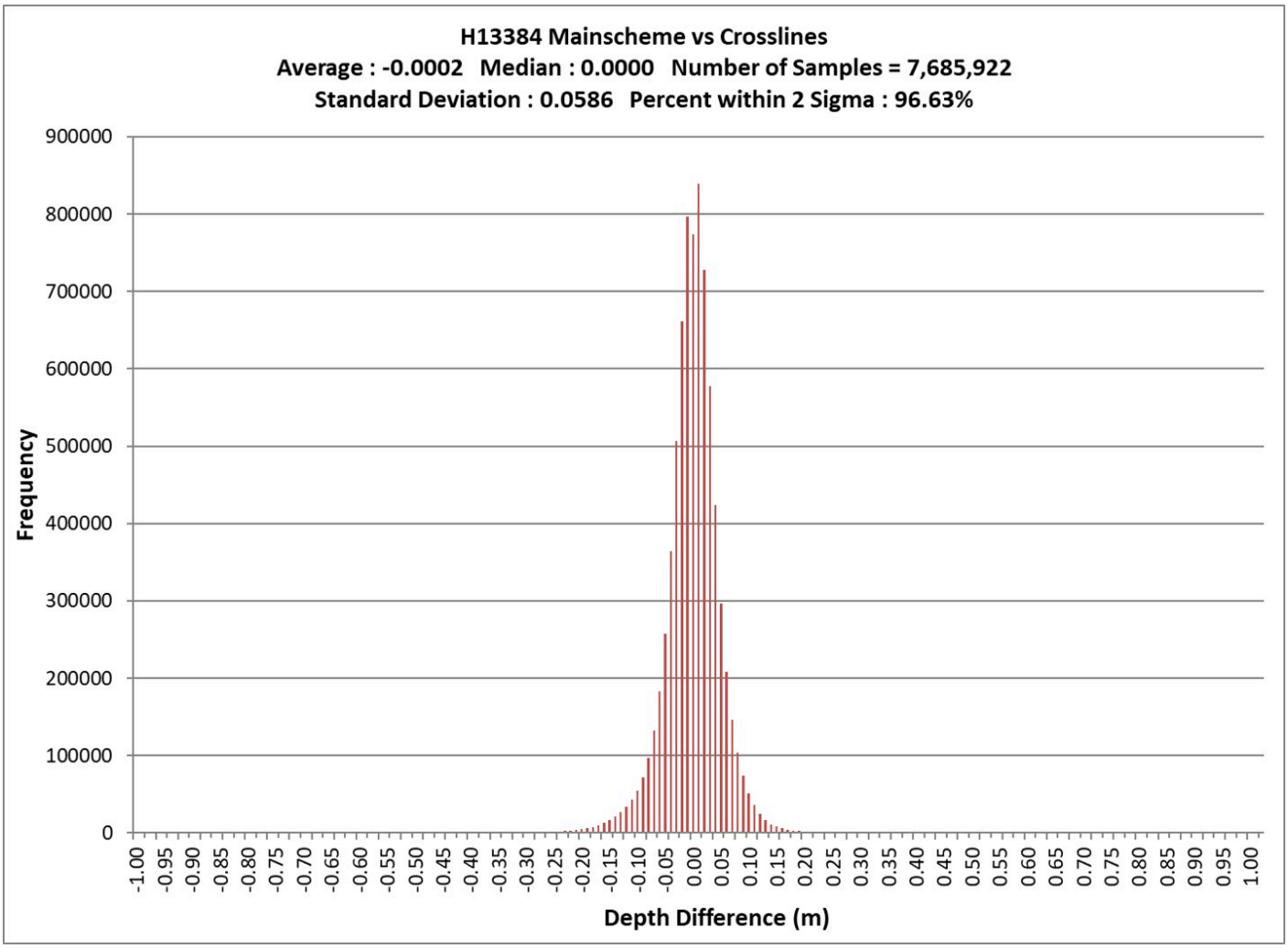

Figure 3: A frequency distribution of the depth differences between H13384 crossline vs mainscheme MBES data. Statistics from the depth difference sample set are displayed above the graph.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0 meters	0.0945 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Surface
RV Able 2	4 meters/second	N/A	1 meters/second
RV Osprey	4 meters/second	N/A	1 meters/second
RV Ready 2	4 meters/second	N/A	1 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

The methods used to minimize the uncertainty in the corrections to echo soundings are described in detail in the project DAPR.

The HydrOffice "QC Tools" application was used to calculate TVU QC, determined by a ratio of uncertainty to the allowable error per NOAA and IHO specifications. The finalized surface for Survey H13384 passed the uncertainty check, with 99.5+% of the nodes meeting uncertainty standards (Figure 4).

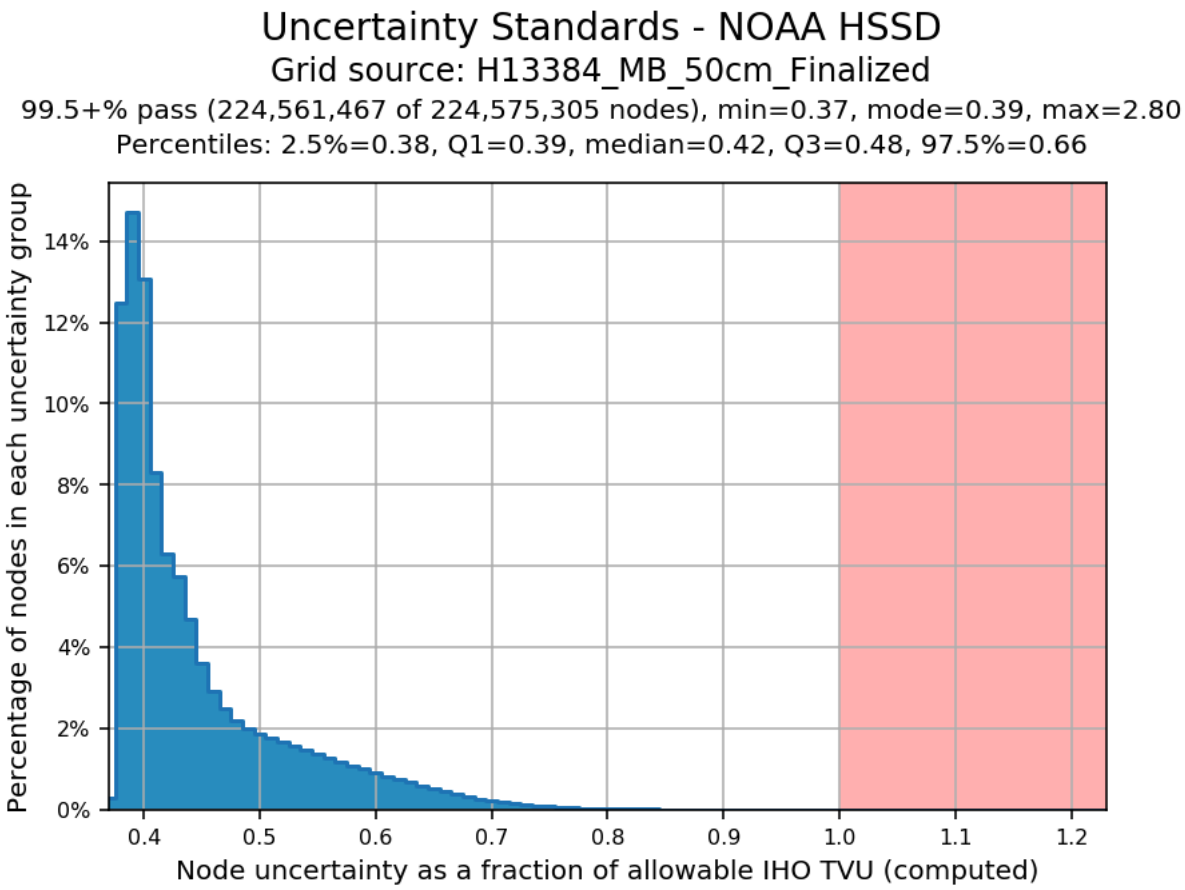

Figure 4: H13384 MBES surface uncertainty statistics

B.2.3 Junctions

No prior surveys and one contemporary survey junction with Survey H13384. The contemporary junction with Survey H13385 is discussed in the DR for that survey.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H13385	1:10000	2020	Ocean Surveys, Inc.	E

Table 9: Junctioning Surveys

H13385

The contemporary junction with Survey H13385 is discussed in the DR for that survey.

B.2.4 Sonar QC Checks

Sonar system quality control checks were conducted as detailed in the quality control section of the DAPR.

B.2.5 Equipment Effectiveness

There were no conditions or deficiencies that affected equipment operational effectiveness.

B.2.6 Factors Affecting Soundings

There were no other factors that affected corrections to soundings.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Sound speed profile data were acquired with the AML Base-X or AML Base-X2 at intervals of approximately 1-2 hours.

Hydrographers acquired more frequent sound speed profiles if high variability was noted in the surface sound speed from the AML Micro-X installed on the head of the transducer, or when the surface sound speed comparison threshold was exceeded (>2m/s change) between the profile reading at the draft of the transducer and the Micro-X. All MBES lines were sound speed corrected using CARIS HIPS' "Nearest in Time" method.

OSI submitted sound speed data in NetCDF format to the National Centers for Environmental Information (NCEI) on March 23, 2021 via the S2N tool.

B.2.8 Coverage Equipment and Methods

This survey was conducted to achieve Complete Coverage with multibeam, as specified in HSSD 5.2.2.3, Option A. This calls for 100% bathymetric bottom coverage with multibeam sonars, and complete coverage multibeam developments of features. The survey methods used to meet coverage requirements did not deviate from those described in the DAPR.

The HydrOffice "QC Tools" application was used to verify that the grid nodes met the density coverage requirements, with 99.5+% of the nodes meeting the requirement (Figure 5).

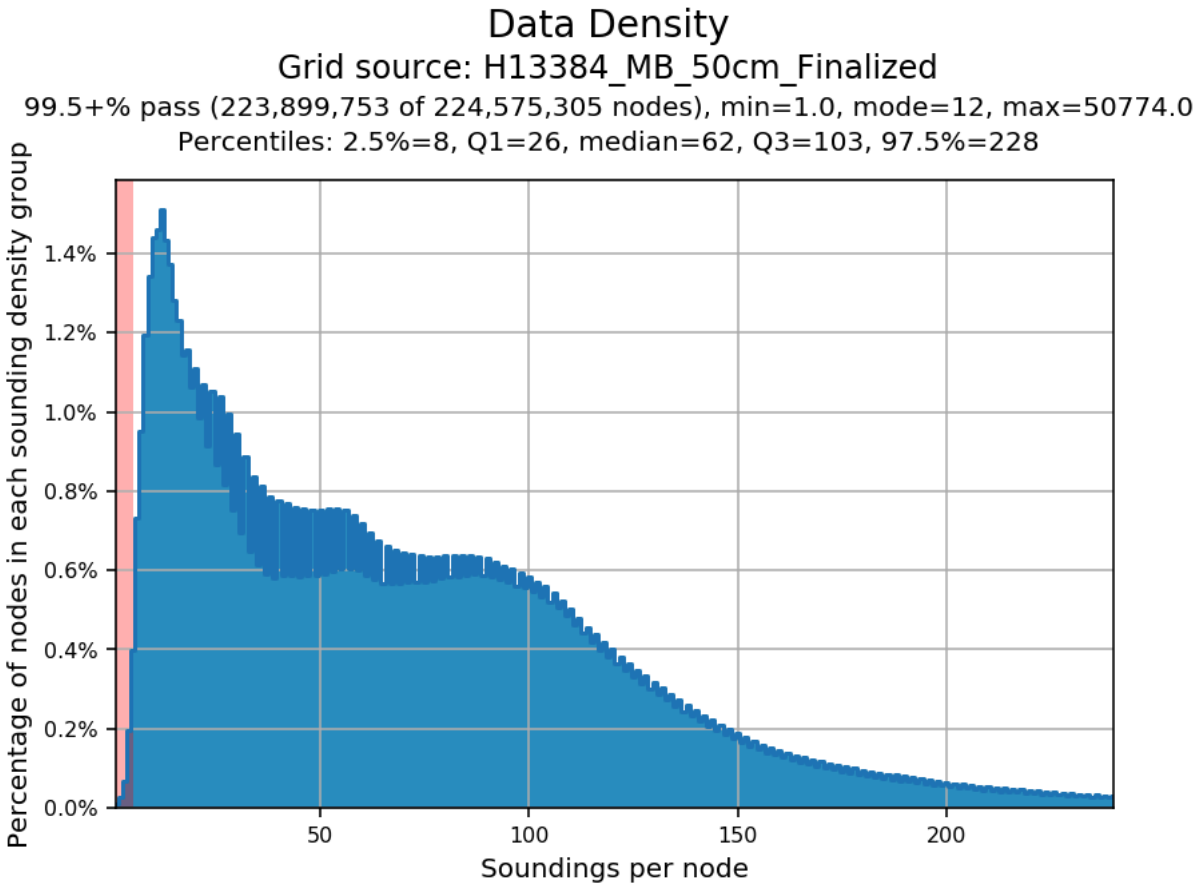

Figure 5: H13384 MBES surface data density statistics

B.3 Echo Sounding Corrections

B.3.1 Corrections to Echo Soundings

All data reduction procedures conform to those detailed in the DAPR.

B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR.

B.4 Backscatter

All equipment and survey methods were used as detailed in the DAPR.

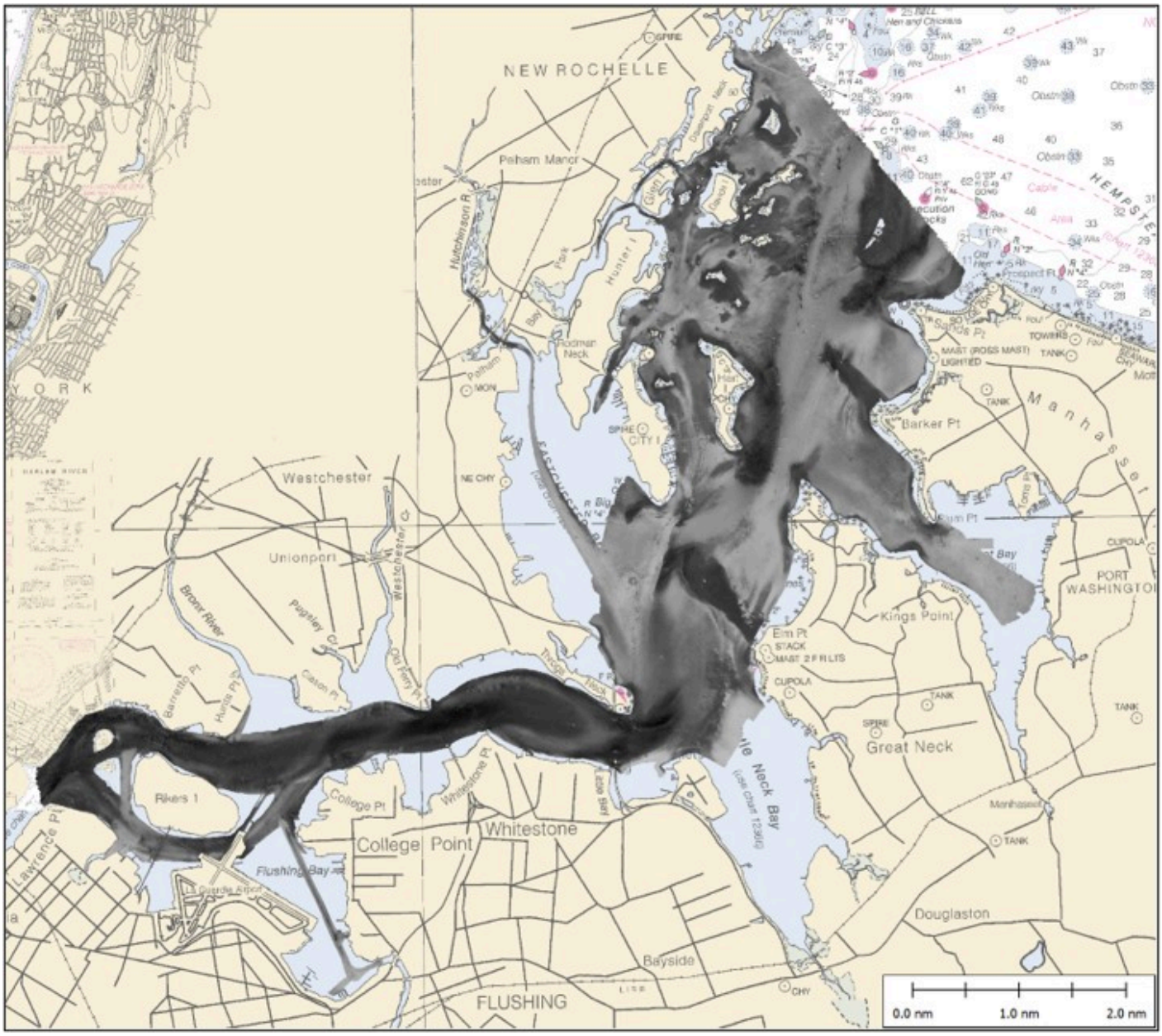

Figure 6: Survey H13384 backscatter mosaic overlaid on a composite of RNCs

B.5 Data Processing

B.5.1 Primary Data Processing Software

The following Feature Object Catalog was used: NOAA Profile Version 2020.

B.5.2 Surfaces

The following surfaces and/or BAGs were submitted to the Processing Branch:

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
H13384_MB_50cm_MLLW_Final.csar	CARIS Raster Surface (CUBE)	0.5 meters	-0.975 meters - 35.437 meters	NOAA_0.5m	Complete MBES
H13384_MB_50cm_MLLW.csar	CARIS Raster Surface (CUBE)	0.5 meters	-0.975 meters - 35.437 meters	NOAA_0.5m	Complete MBES
H13384_MBAB_2m_400kHz_1of1	MB Backscatter Mosaic	2 meters	-	N/A	Processed Backscatter

Table 10: Submitted Surfaces

C. Vertical and Horizontal Control

Additional information discussing the vertical or horizontal control for this survey can be found in the accompanying HVCR.

C.1 Vertical Control

The vertical datum for this project is Mean Lower Low Water.

ERS Datum Transformation

The following ellipsoid-to-chart vertical datum transformation was used:

Method	Ellipsoid to Chart Datum Separation File
ERS via VDATUM	buffer_newVdatum2_Merge_Diss_100m_NAD83-MLLW_geoid12b.csar buffer_newVdatum2_Merge_Diss_100m_NAD83-MHW_geoid12b.csar

Table 11: ERS method and SEP file

C.2 Horizontal Control

The horizontal datum for this project is North American Datum of 1983 (NAD 83).

The projection used for this project is Universal Transverse Mercator (UTM) Zone 18.

The following PPK methods were used for horizontal control:

- Smart Base

The user-installed station OSNR was used on all survey days except October 2, 2020 (DN 276). On this day, the base station antenna was temporarily disconnected and repositioned by an electrician at the host building. After the repositioning, no further interruptions in service occurred. See the HVCR for details.

The following CORS Stations were used for horizontal control:

HVCR Site ID	Base Station ID
Central Islip	NYCI
Valhalla	NYVH
Darien	CTDA
Brooklyn Pier	NYBR
NJ Inst of Tech 2	NJI2
New York WAAS 1	ZNY1
Lake Carmel	NYLC
Riverhead	NYRH
Brookfield	CTBR
NJMT	NJMT
Neptune Township	NJNT
Guilford	CTGU

Table 12: CORS Base Stations

The following user installed stations were used for horizontal control:

HVCR Site ID	Base Station ID
Ocean Surveys New Rochelle	OSNR

Table 13: User Installed Base Stations

D. Results and Recommendations

D.1 Chart Comparison

During the course of survey data collection and analysis, the Office of Coast Survey was actively implementing ENC rescheming in western Long Island Sound. The ENCs listed below provide complete coverage of the survey area and were the most recent charts available as of February 23, 2021. After this date, newly released ENCs were no longer considered in the chart comparison analysis for this survey.

D.1.1 Electronic Navigational Charts

The following are the largest scale ENCs, which cover the survey area:

ENC	Scale	Edition	Update Application Date	Issue Date
US5NY12M	1:10000	31	05/28/2020	05/28/2020
US5NY15M	1:20000	40	02/04/2021	02/04/2021
US5NY16M	1:20000	35	02/04/2021	02/04/2021
US5NY1DE	1:10000	1	05/28/2020	11/09/2020
US5NY1DG	1:10000	1	02/09/2021	02/09/2021
US5NYCFH	1:10000	1	05/28/2020	11/09/2020
US5NYCFJ	1:10000	1	02/09/2021	02/09/2021

Table 14: Largest Scale ENCs

D.1.2 Shoal and Hazardous Features

There were 89 DTONs accepted for Survey H13384, all of which are included in the FFF. The rocky nature of the seafloor and the high vessel traffic have given this area a large number of potentially dangerous rocks and submerged obstructions. Additionally, the ENC rescheming process resulted in some older soundings being removed from the new charts, so previously-charted hazards were reported as DTONS based on the published ENCs. Foul area obstructions are common within this survey, and their extents were not often covered with survey data due to their shallow depths. An evaluation of foul area obstructions based on aerial lidar data is recommended.

D.1.3 Charted Features

There were 3374 features assigned in Survey H13384. Underwater rocks were the most common, with 905 assigned; most of the addressed rocks were adequately represented by the bathymetry grid and not recommended for retention on the chart as individual features. Wrecks and obstructions accounted for 439 assigned features, 122 of which were area features. Per the HSSD, any wreck with a length greater than 1mm at survey scale was to be replaced with an area feature; however, OSI was granted an exception to this and area features were created for wrecks with a length greater than 2mm at survey scale, or 10m in length. Wrecks under this cutoff were represented by a point feature. See the correspondence in Appendix II for details.

D.1.4 Uncharted Features

There were 839 new features surveyed in H13384, as well as 257 features that required updates or changes in position from the chart. Most of these features were wrecks; there were 495 new or improperly charted wrecks surveyed. New wrecks and obstructions with any dimension greater than 2mm at survey scale were added as area features, per OSI's waiver to modify the HSSD requirement that features greater than 1mm at survey scale be made into areas (see the correspondence in Appendix II). Significant uncharted baring or exposed rocks were surveyed with lidar and included as new features, categorized as rocks or land areas based on their surveyed height. Uncharted docks and piers were added when sufficient lidar data was collected to position them. See the FFF for details.

Uncharted features of particular note that were surveyed and positioned with a combination of multibeam and lidar data include a new building in Flushing Bay (Figure 7) and the Barretto Point Park floating swimming pool (Figure 8).

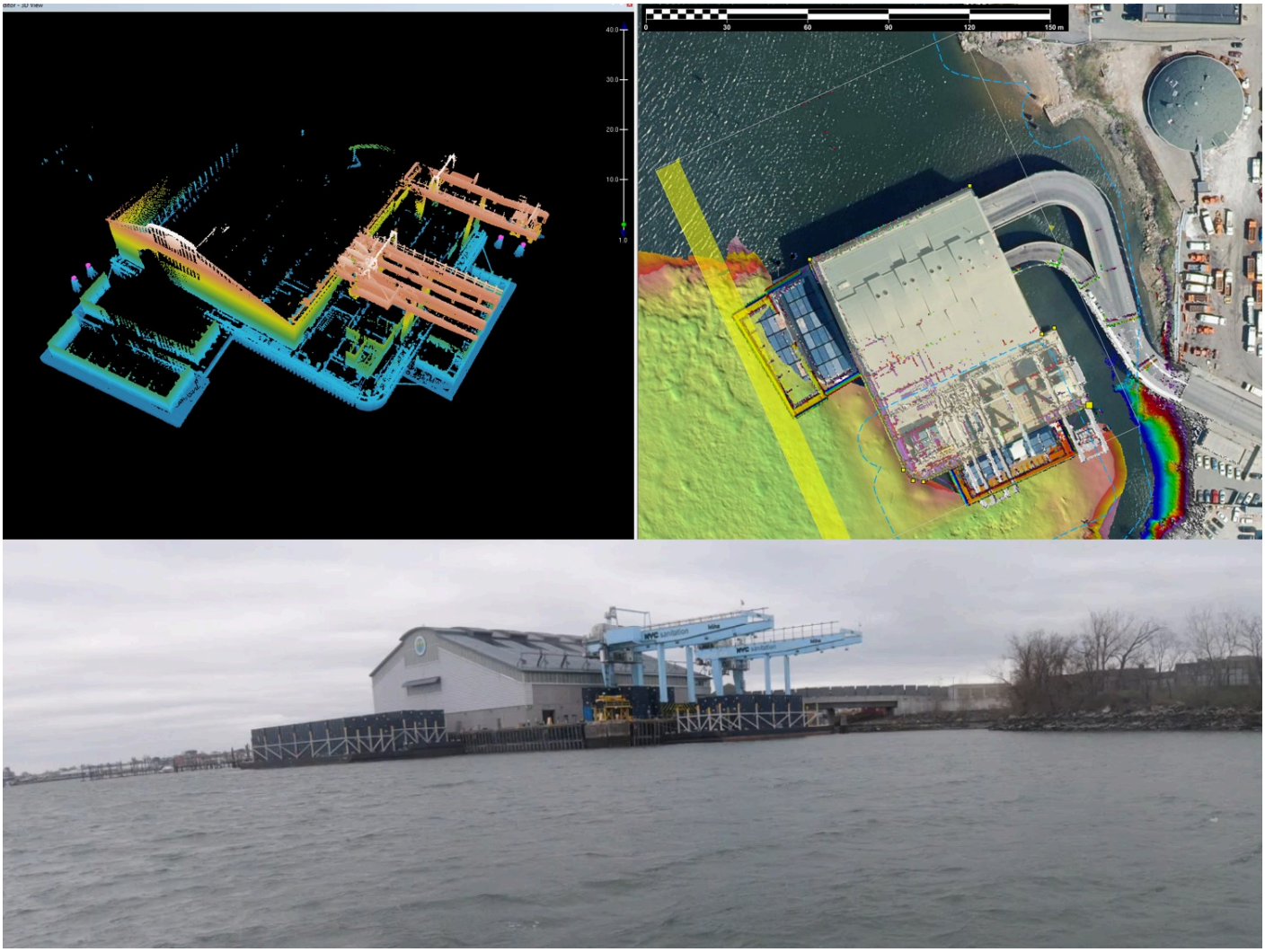

Figure 7: Lidar data, shoreline video, and an MBES/lidar surface overlaid on aerial imagery showing the position of a new building.

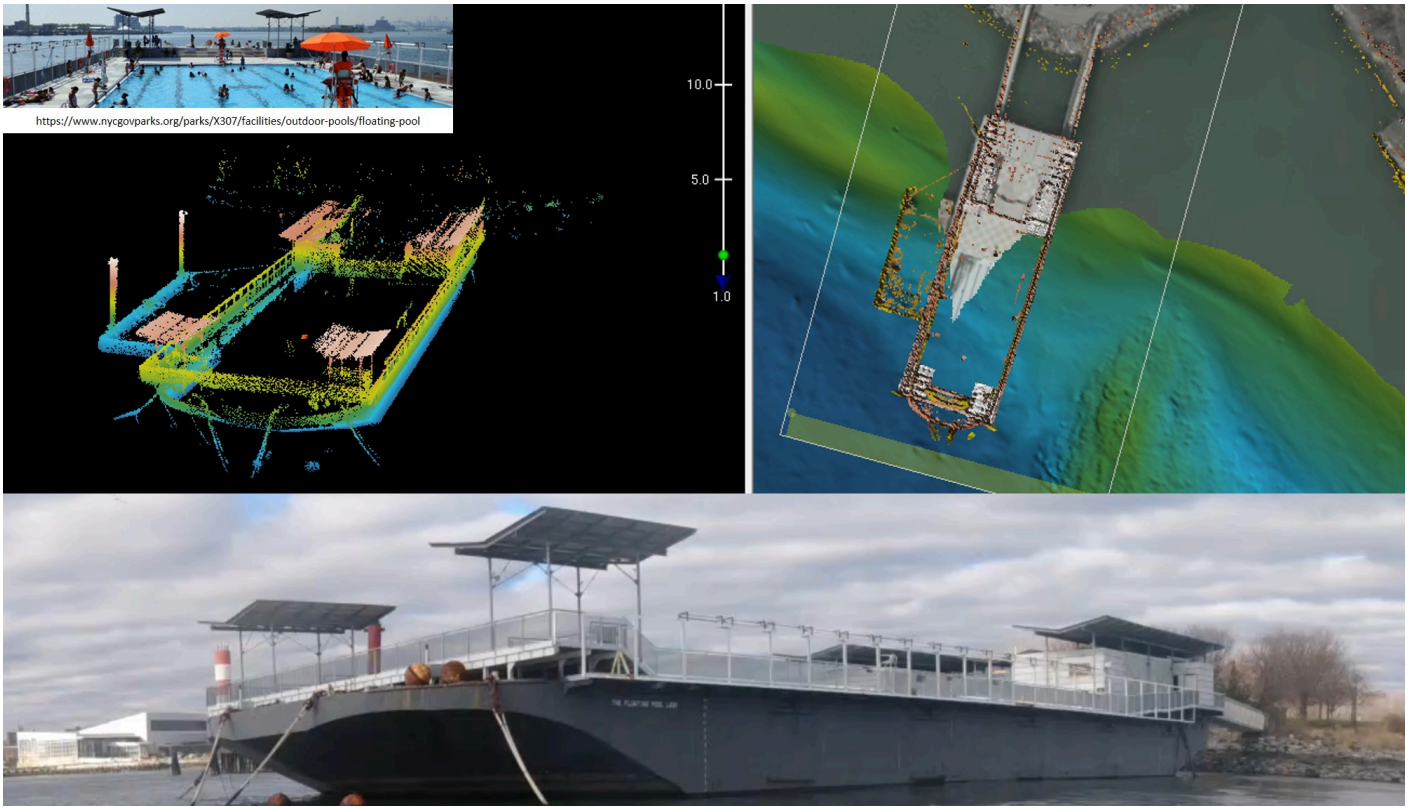

Figure 8: Lidar data, shoreline video, and an MBES/lidar surface overlaid on aerial imagery showing the Barretto Point Park floating pool. Pool photo from NYCgovparks.org.

D.1.5 Channels

There are 4 charted channels in the survey coverage of H13384: East River Channel, South Brother Island Channel, Flushing Bay and Creek Channel, and New Rochelle Harbor Channel. Additionally, survey data covered 3 dredged area features without channel names that were assigned in the CSF. Rikers Island Channel appears as a named water area but has no dredged area or maintained depth information so is not included in this discussion.

For the East River Channel, survey data covers part of Reach G and all of Reach H and Reach I. Controlling depths for these reaches are 27.5 ft, 24.8 ft, and 34.9 ft, respectively. The project depth is 35 ft. No survey data indicated areas shoaler than the controlling depth for the reach, and only a few places were shoaler than the project depth. Most of these were charted features or on the border of the channel. No uncharted depths in the channel were greater than 20cm above project depth.

South Brother Island Channel consists of a channel and a turning basin, both of which are entirely within the surveyed area and have project depths of 35 ft. Controlling depths in the channel range from 27 to 28.4 ft, and in the turning basin from 32.1 ft to 35.3 ft. No surveyed depths were shoaler than the controlling depths listed for the area. The turning basin is deeper, with just a few spots at 34 or 35 ft and the rest below project depth. The channel has broad shoaling through most of its length, deepening as it nears the turning basin.

Flushing Bay and Creek Channel has survey coverage over the entirety of the Main Channel, part of the Creek Channel, and a branch channel and maneuvering area. Project depth for all areas is 15 feet, and most of the middle half of the channels is at or near project depth. The channel outside quarters and maneuvering area range in depths from 4.5 ft to 11.8 ft, but all areas are below their controlling depths.

The New Rochelle Harbor Channel has survey coverage for approximately 450m north from the seaward end. The charted depth for the channel is 5.9 ft, and all but the edges were at or below that depth. The eastern slope of the channel was surveyed at 5.6ft in one area, and the western slope at the northern edge of the survey coverage shoals to 4.5 ft.

An irregularly-shaped dredge area feature south of South Brother Island Channel was disproved by survey data. The charted depth is 25ft, reported in 1999, and surveyed data showed depths ranging from 11ft to 31ft, in keeping with nearby soundings and contours with nothing indicating a defined dredged area. The other 2 charted dredged areas assigned connect Eastchester Bay to the Hutchinson River Channel and were found to be below their charted depth values.

D.2 Additional Results

D.2.1 Aids to Navigation

There were 180 ATONs assigned in Survey H13384. Most were found on station and operating as intended, and are included in the FFF. Field observations documented 9 ATONS that were not present and 20 that were off station by more than 2mm at survey scale. There was also 1 damaged structure and 1 mis-numbered buoy. All of these discrepancies were reported to the US Coast Guard and the reports are included in Appendix II.
There was 1 uncharted ATON observed that was not documented in the FFF as it was deemed temporary. A mooring structure charted alongside a pier was found collapsed and submerged, and a small buoy marked the dangerous area on the surface.

D.2.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.2.3 Bottom Samples

The 11 assigned bottom samples for Survey H13384 are documented in the FFF.

D.2.4 Overhead Features

There are 14 bridges and 1 overhead cable charted in Survey H13384. The cable was verified visually in the field.

Of the bridges, 1 was observed to have a discrepancy between its charted and observed position. A short bridge connecting a building to land in Flushing Bay was observed farther north than charted, and the building was also substantially different than charted. Vessel mounted lidar data matches the aerial imagery from NYGIS 2020. A comparison of the aerial imagery to the charted bridge is shown in Figure 8.

Another bridge, the City Island Causeway, is attributed as being under construction. The field crew did not observe any signs of construction activity, and a government press release states that construction was completed in 2017. There were 5 bridges located beyond the NALL and not visible from the survey area, and all other bridges were verified to exist as charted.

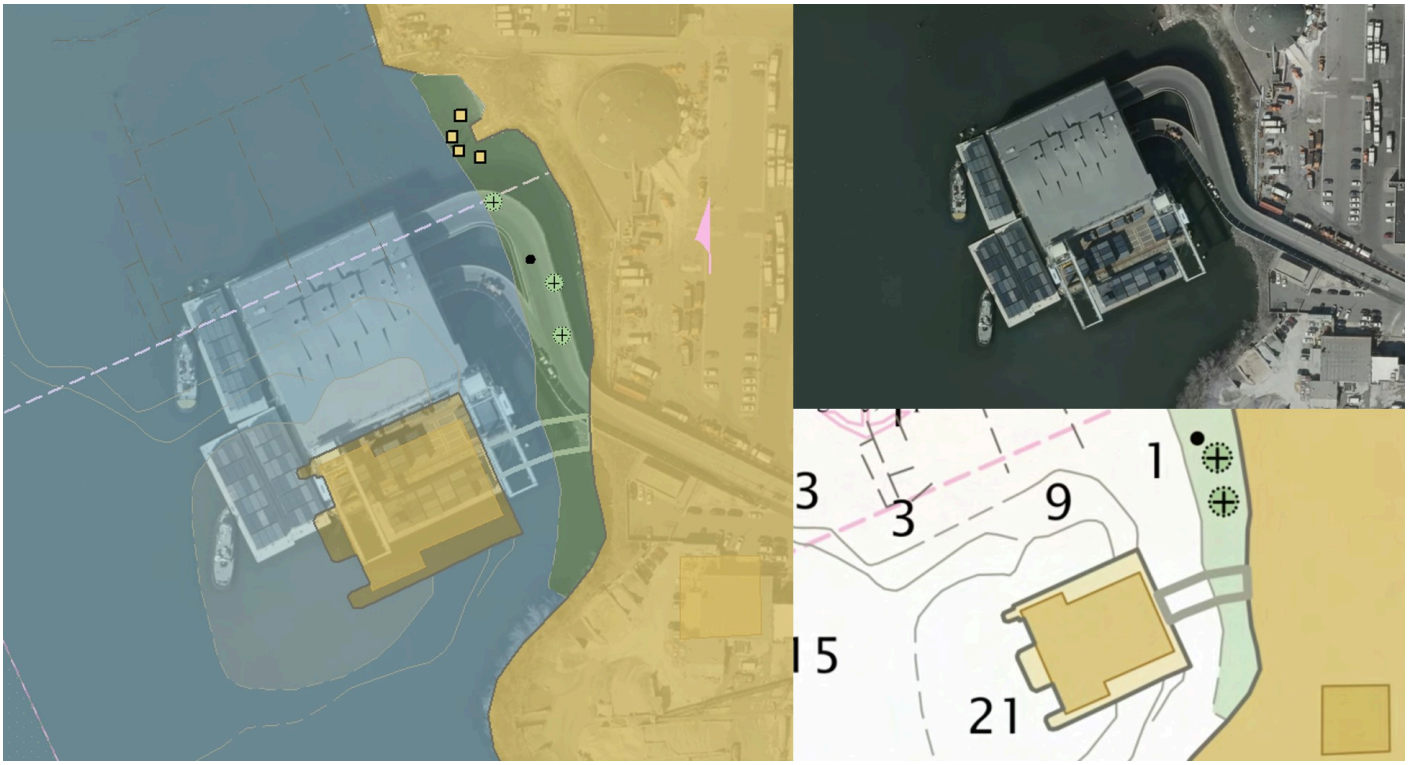

Figure 9: NYGIS 2020 aerial imagery compared to the charted position of a building and bridge

D.2.5 Submarine Features

A number of exposed cable or pipeline segments were surveyed in a charted cable and pipeline area in the East River, north of North Brother Island. These cables and pipelines are not individually charted and many appear bent, broken, and disjointed. None were observed to be suspended above the seafloor or otherwise hazardous. These features are documented in the non-DTON Pipe Report and the FFF, along with other non-DTON pipe segments observed throughout the survey. There were also 2 pipes surveyed that were submitted as DTONS.

The Iroquois Gas Transmission System pipeline is present as charted and runs approximately 18km along the length of the survey, from the Bronx River eastward and past the survey boundary. A trench is visible in the bathymetry for most of the pipeline's length, but at no point did the pipeline itself appear exposed.

D.2.6 Platforms

There were 2 platforms assigned for this survey, a point and an area feature. Both were described as ruined and were located near one another on the west side of North Brother Island. No platforms were found within the limits of bathymetry. Several ruined structures are present in this area but none were identifiable as platforms.

D.2.7 Ferry Routes and Terminals

No charted ferry routes or terminals exist for this survey. On 4 occasions during field operations, the field crew observed a ferry but its route and terminal were not investigated.

D.2.8 Abnormal Seafloor or Environmental Conditions

No abnormal seafloor or environmental conditions exist for this survey.

D.2.9 Construction and Dredging

No construction or dredging was observed within the survey limits.

D.2.10 New Survey Recommendations

No new surveys or further investigations are recommended for this area.

D.2.11 ENC Scale Recommendations

The re-schemed ENC tiles published so far within this survey are at a scale of 10,000. There are 4 new ENCs that are in progress for this survey area, 2 of which are at a scale of 10,000 and 2 at a scale of 20,000. Based on the complexity of the shoreline and rocky areas, and the high traffic of recreational watercraft, OSI recommends that all charts within this survey be released at a 10,000 scale.

E. Approval Sheet

As Chief of Party, field operations for this hydrographic survey were conducted under my direct supervision, with frequent personal checks of progress and adequacy. I have reviewed the attached survey data and reports.

All field sheets, this Descriptive Report, and all accompanying records and data are approved. All records are forwarded for final review and processing to the Processing Branch.

The survey data meets or exceeds requirements as set forth in the NOS Hydrographic Surveys Specifications and Deliverables (2020), Field Procedures Manual (2014), Letter Instructions, and all HSD Technical Directives. These data are adequate to supersede charted data in their common areas. This survey is complete and no additional work is required with the exception of deficiencies noted in the Descriptive Report.

Approver Name	Approver Title	Approval Date	Signature
John R. Bean	Chief of Party	05/27/2021	John R. Bean 2021.05.27 14:52:50 -04'00'
David T. Somers	Data Processing Manager	05/27/2021	David T. Somers 2021.05.27 14:53:09 -04'00'

F. Table of Acronyms

Acronym	Definition
AHB	Atlantic Hydrographic Branch
AST	Assistant Survey Technician
ATON	Aid to Navigation
AWOIS	Automated Wreck and Obstruction Information System
BAG	Bathymetric Attributed Grid
BASE	Bathymetry Associated with Statistical Error
CO	Commanding Officer
CO-OPS	Center for Operational Products and Services
CORS	Continuously Operating Reference Station
CTD	Conductivity Temperature Depth
CEF	Chart Evaluation File
CSF	Composite Source File
CST	Chief Survey Technician
CUBE	Combined Uncertainty and Bathymetry Estimator
DAPR	Data Acquisition and Processing Report
DGPS	Differential Global Positioning System
DP	Detached Position
DR	Descriptive Report
DTON	Danger to Navigation
ENC	Electronic Navigational Chart
ERS	Ellipsoidal Referenced Survey
ERTDM	Ellipsoidally Referenced Tidal Datum Model
ERZT	Ellipsoidally Referenced Zoned Tides
FFF	Final Feature File
FOO	Field Operations Officer
FPM	Field Procedures Manual
GAMS	GPS Azimuth Measurement Subsystem
GC	Geographic Cell
GPS	Global Positioning System
HIPS	Hydrographic Information Processing System
HSD	Hydrographic Surveys Division

Acronym	Definition
HSSD	Hydrographic Survey Specifications and Deliverables
HSTB	Hydrographic Systems Technology Branch
HSX	Hypack Hysweep File Format
HTD	Hydrographic Surveys Technical Directive
HVCR	Horizontal and Vertical Control Report
HVF	HIPS Vessel File
IHO	International Hydrographic Organization
IMU	Inertial Motion Unit
ITRF	International Terrestrial Reference Frame
LNM	Linear Nautical Miles
MBAB	Multibeam Echosounder Acoustic Backscatter
MCD	Marine Chart Division
MHW	Mean High Water
MLLW	Mean Lower Low Water
NAD 83	North American Datum of 1983
NALL	Navigable Area Limit Line
NTM	Notice to Mariners
NMEA	National Marine Electronics Association
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NRT	Navigation Response Team
NSD	Navigation Services Division
OCS	Office of Coast Survey
OMAO	Office of Marine and Aviation Operations (NOAA)
OPS	Operations Branch
MBES	Multibeam Echosounder
NWLON	National Water Level Observation Network
PDBS	Phase Differencing Bathymetric Sonar
PHB	Pacific Hydrographic Branch
POS/MV	Position and Orientation System for Marine Vessels
PPK	Post Processed Kinematic
PPP	Precise Point Positioning
PPS	Pulse per second

Acronym	Definition
PRF	Project Reference File
PS	Physical Scientist
RNC	Raster Navigational Chart
RTK	Real Time Kinematic
RTX	Real Time Extended
SBES	Singlebeam Echosounder
SBET	Smooth Best Estimate and Trajectory
SNM	Square Nautical Miles
SSS	Side Scan Sonar
SSSAB	Side Scan Sonar Acoustic Backscatter
ST	Survey Technician
SVP	Sound Velocity Profiler
TCARI	Tidal Constituent And Residual Interpolation
TPU	Total Propagated Uncertainty
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
UTM	Universal Transverse Mercator
XO	Executive Officer
ZDF	Zone Definition File