

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

H11561

Type of Survey Hydrographic/Lidar

Project No. OPR-I305-KRL-06

Registry No. H11561

LOCALITY

State Puerto Rico

General Locality Southwest Puerto Rico

Sublocality Vicinity of Punta Carenero

2006

HYDROGRAPHER

..... MARK SINCLAIR

CHIEF OF PARTY

..... DARREN STEPHENSON

LIBRARY & ARCHIVES

DATE

HYDROGRAPHIC TITLE SHEET

NOAA FORM 77-28 U.S. DEPARTMENT OF COMMERCE (11-72) NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION HYDROGRAPHIC TITLE SHEET	REGISTRY NO. H11561
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. N/A
<p> State: <u>Puerto Rico</u> General Locality: <u>Southwest Puerto Rico</u> Sub-Locality: <u>Vicinity of Punta Carenero</u> Scale: <u>1:10,000</u> Date of Survey: <u>April 7 to May 15, 2006</u> Instructions dated: <u>February 8, 2006</u> Project No: <u>OPR-I305-KRL-06</u> Vessel: <u>Tenix LADS Aircraft, VH – LCL</u> Hydrographer: <u>M.J. Sinclair</u> Chief of Party: <u>D.J. Stephenson</u> Surveyed by: <u>M.S. Hawkins, J.K. Young, B. McWilliam, M. Blackbourn</u> Soundings taken by echo sounder, hand lead, pole: <u>Laser Airborne Depth Sounder</u> Graphic record scaled by: <u>J.K. Young, L.R. Chamberlain, V. Sicari and B.A. Weidman</u> Graphic records checked by: <u>S.R. Ramsay and J.G. Guilford</u> Protracted by: <u>N/A</u> Automated plot: <u>N/A</u> Verification by: _____ Soundings in: <u>Meters at MLLW</u> </p>	
<p> REMARKS: <u>Contract # NC-NJ3000-4-00010 01</u> Contractor: <u>Tenix LADS, Incorporated, 925 Tommy Munro Dr., Suite J, Biloxi, MS 39532</u> Sub contractor: <u>John Oswald and Associates, 12001 Audubon Dr, Anchorage, AK 99516</u> Times: <u>All times are recorded in UTC.</u> Purpose: <u>The purpose of this survey is to provide NOAA with modern, accurate hydrographic survey data with which to update the nautical charts of the assigned area.</u> <u>Projection is UTM Zone 19.</u> <i>Red, Bold, Italic notes were made during office processing.</i> </p>	

TABLE OF CONTENTS

COVER SHEET	
HYDROGRAPHIC TITLE SHEET	i
TABLE OF CONTENTS	ii
A. AREA SURVEYED	A-1
B. ACQUISITION AND PROCESSING	B-1
B.1 EQUIPMENT	B-1
<i>B.1.1 Airborne System</i>	<i>B-1</i>
<i>B.1.2 Ground System</i>	<i>B-1</i>
B.2 QUALITY CONTROL	B-2
<i>B.2.1 Data Density.....</i>	<i>B-2</i>
<i>B.2.2 Water Clarity.....</i>	<i>B-2</i>
<i>B.2.3 Uncertainty values</i>	<i>B-2</i>
<i>B.2.4 Data Management.....</i>	<i>B-2</i>
<i>B.2.5 Data Acquisition.....</i>	<i>B-3</i>
<i>B.2.6 Sea Conditions - Sea State, Waves, Swell, White Water</i>	<i>B-3</i>
<i>B.2.7 Gaps and Features in the Data</i>	<i>B-3</i>
<i>B.2.8 Nature of the Seabed</i>	<i>B-5</i>
<i>B.2.9 Topography</i>	<i>B-6</i>
<i>B.2.10 Datums</i>	<i>B-6</i>
<i>B.2.11 Wind</i>	<i>B-6</i>
<i>B.2.12 Cloud.....</i>	<i>B-6</i>
<i>B.2.13 Effects of High Ground</i>	<i>B-7</i>
<i>B.2.14 Receiver Gain.....</i>	<i>B-7</i>
<i>B.2.15 Raw Laser Waveforms.....</i>	<i>B-7</i>
<i>B.2.16 Data Processing</i>	<i>B-7</i>
<i>B.2.17 Progress Sketches.....</i>	<i>B-7</i>
B.3 CORRECTIONS TO SOUNDINGS	B-7
B.4 DATA PROCESSING	B-7
B.5 DATA FORMATS	B-8
B.6 BENCHMARKS	B-8
<i>B.6.1 Mean Depth Differences (MDD) and Standard Deviation (SD).....</i>	<i>B-8</i>
B.7 CROSSLINES	B-9
<i>B.7.1 Mean Depth Differences (MDD) and Standard Deviation (SD).....</i>	<i>B-9</i>
B.8 POSITION CHECKS	B-10
C. VERTICAL AND HORIZONTAL CONTROL.....	C-1
C.1 VERTICAL CONTROL	C-1
C.2 ZONING.....	C-1
C.3 HORIZONTAL CONTROL	C-2
<i>C.3.1 LADS Local GPS Base Station – Puerto Rico</i>	<i>C-3</i>
D. RESULTS AND RECOMMENDATIONS.....	D-1
D.1 CHART COMPARISON – REGISTRY NUMBER H11561.....	D-2

<i>D.1.1 Dangers to Navigation</i>	<i>D-2</i>
<i>D.1.2 Charted Depths and Features</i>	<i>D-5</i>
<i>D.1.3 AWOIS</i>	<i>D-7</i>
<i>D.1.4 Chart Comparison Spreadsheet</i>	<i>D-8</i>
<i>D.1.5 Additional Boatwork Inside Lidar Area</i>	<i>D-18</i>
<i>D.1.5.1 Features Requiring Investigation</i>	<i>D-18</i>
<i>D.1.5.2 Gaps in the Data</i>	<i>D-18</i>
<i>D.1.6 Aid to Navigation</i>	<i>D-20</i>
<i>D.1.7 Recommended Overlap With Lidar Data</i>	<i>D-20</i>
E. APPROVAL SHEET	E-1
APPENDIX I – Dangers to Navigation	Appendix I-1
APPENDIX II – List of Geographic Names.....	Appendix II-1
APPENDIX III – Progress Sketch	Appendix III-1
APPENDIX IV – Tides and Water Levels	Appendix IV-1
APPENDIX V – Supplemental Survey Records and Correspondence	Appendix V-1
APPENDIX VI – AWOIS	Appendix VI-1

DESCRIPTIVE REPORT TO ACCOMPANY**HYDROGRAPHIC SURVEY H11561****SCALE 1:10,000, SURVEYED IN 2006****TENIX LADS AIRCRAFT, VH-LCL****TENIX LADS, INC. (TLI)****MARK SINCLAIR, HYDROGRAPHER****PROJECT****Project Number:** OPR-I305-KRL-06
Date of Instructions: February 8, 2006**Original:** DG 133C-03-CQ-0011
Task Order: T0008**Date of Supplemental Instructions*:**

- Site visit by NOAA on September 12–13, 2006 to TLI to discuss the data delivery under the new Specifications and deliverables
- Email dated January 07, 2006 regarding rocks awash
- Email dated May 2, 2007 regarding the reporting of cultural features
- Email dated May 3, 2007 regarding the reporting of pontoons

Sheet Number: E**Registry Number:** H11561**PURPOSE**

To provide NOAA with modern, accurate hydrographic survey data with which to update the nautical charts of the assigned area.

A. AREA SURVEYED

Between April 7 and May 15, 2006, the LADS Mk II aircraft deployed to Puerto Rico for the project OPR-I305-KRL-06. During this period 21 survey sorties were flown under Task Order 8, Southwest Puerto Rico. Survey operations covered 11 survey registry numbers. This Descriptive Report describes H11561, which covers the area in the Vicinity of Punta Carenero, Southwest Puerto Rico (See Figure 1 and Figure 2).

Environmental factors such as wind strength and direction, cloud cover, and water clarity influenced the area of data acquisition on a daily basis. See section B.2 Quality.

**Filed with original field records.*

The planned and actual linear miles sounded for the areas are provided at Appendix III*. The sheet limits are as follows for H11561:

	Latitude (NAD83)	Longitude (NAD83)
NW corner	18° 06' 46.39" N	67° 18' 32.57" W
SE corner	18° 02' 34.56" N	67° 10' 04.96" W

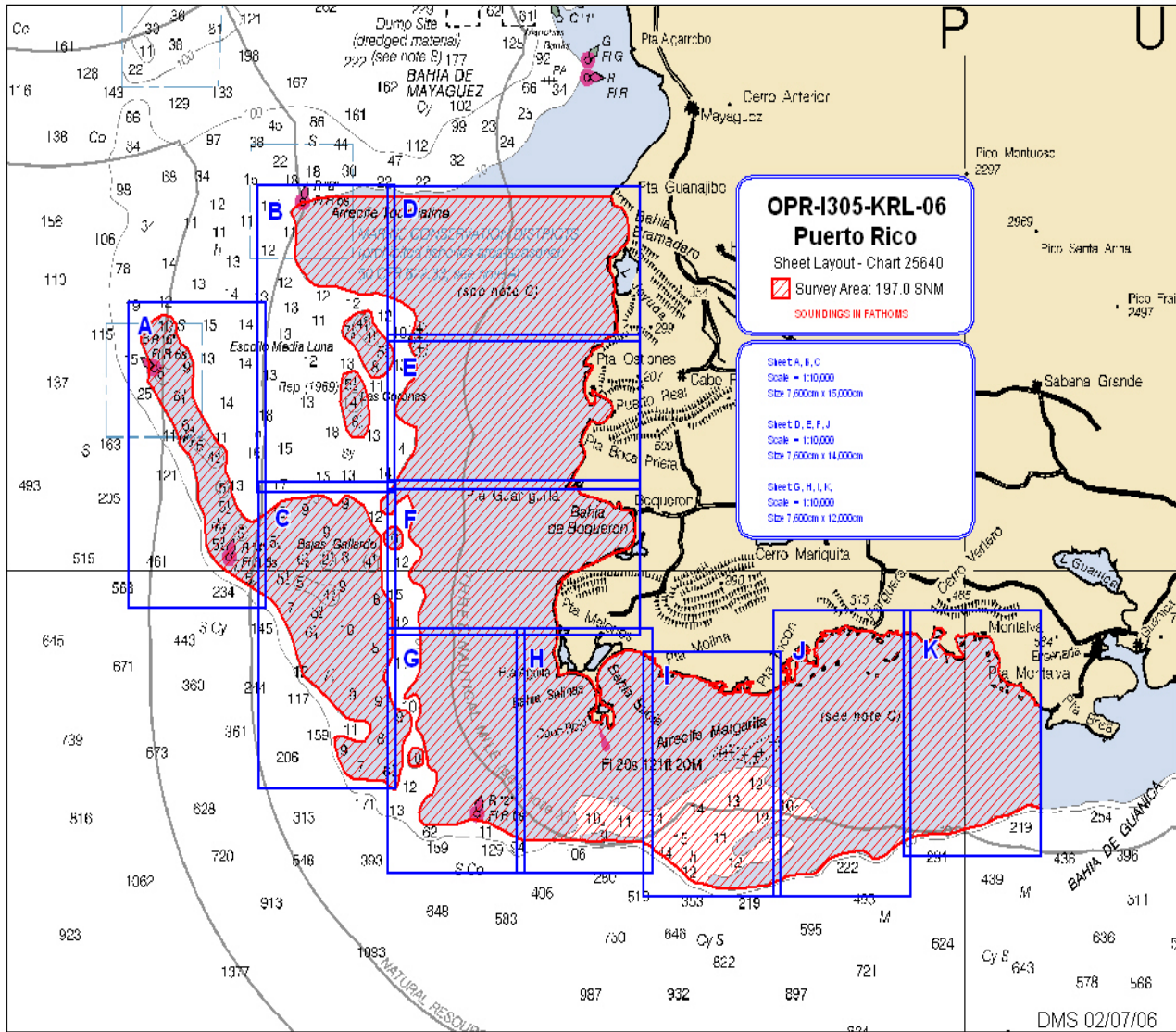


Figure 1 - Task Order 8 OPR-I305-KRL-06

**Filed with original field records.*

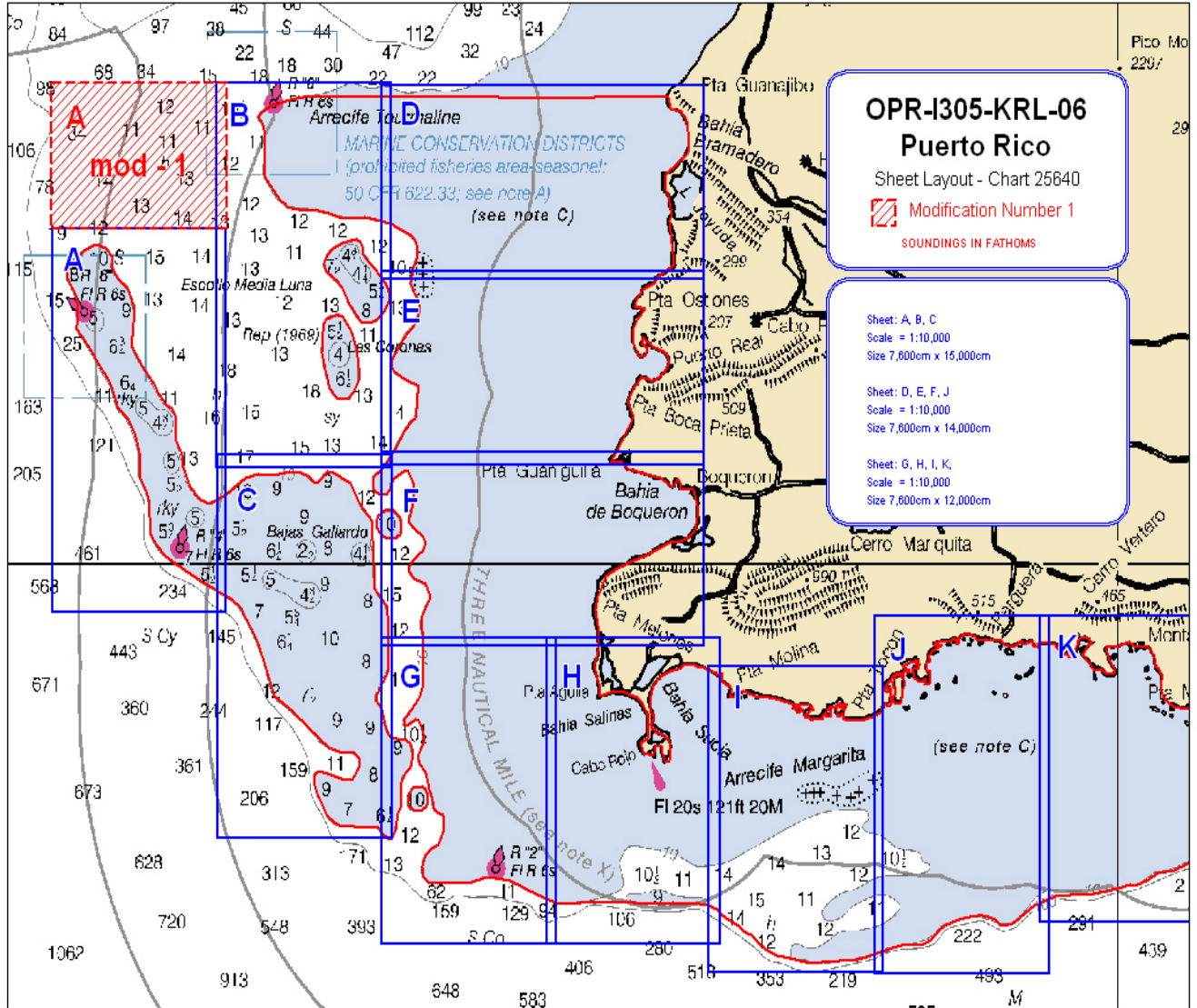


Figure 2 – Task Order 8 OPR-I305-KRL-06 Modification 1

B. ACQUISITION AND PROCESSING

Refer to the Data Acquisition and Processing Report* for a detailed description of the equipment, processing and quality control procedures. A general description and items specific to this survey are discussed in the following sections.

B.1 EQUIPMENT

Data collection was conducted using the LADS Mk II Airborne System, data processing using the LADS Mk II Ground System and data visualization, quality control and final products using CARIS HIPS and SIPS 6.0.2 and CARIS BASE Editor 2.0.

A prototype Digital Imagery Capture system was installed at the commencement of this survey, which allowed digital images from the downward looking video to be captured.

B.1.1 Airborne System

The LADS Mk II Airborne System (AS) consists of a Dash 8-200 series aircraft, which has a transit speed of 250 knots at altitudes of up to 25,000ft and an endurance of up to eight hours. Survey operations are conducted from heights between 1,200 and 2,200ft at ground speeds between 140 and 175 knots. The aircraft is fitted with a Nd: YAG laser, which is eye safe in accordance with ANSI Z136.1-2000, American National Standard for Safe Use of Lasers. The laser operates at 900 Hertz from a stabilized platform to provide a number of different spot spacings.

Green laser pulses are scanned beneath the aircraft in a rectilinear pattern. The pulses are reflected from the land, sea surface, within the water column and from the seabed. The height of the aircraft is determined by the infrared laser return, which is supplemented by the inertial height from the Attitude and Heading Reference System and GPS height. Real-time positioning is obtained by an Ashtech GG24 GPS receiver combined with Wide Area DGPS provided by the Fugro Omnistar to provide a differentially corrected position. Ashtech Z12 GPS receivers are also provided as part of the Airborne System and Ground Systems to log KGPS data on the aircraft and at a locally established GPS base station. For more details on the airborne system, refer to the Data Acquisition and Processing Report*.

B.1.2 Ground System

The LADS Mk II Ground System (GS) 'Gandalf' was used to conduct data processing in the field. Gandalf consists of a portable Compaq Alpha ES40 Series 3 processor server with 1 GB EEC RAM, 764 GB disk space, digital linear tape (DLT) drives and magazines, digital audio tape (DAT) drive, CD ROM drive and is networked to up to 12 Compaq 1.5 GHz PCs and a HP 800ps Design Jet Plotter, printers and QC workstations. Gandalf was transported to the deployment site. Quality control checks and editing of the data were conducted on GS 'Katrina' in the Biloxi office upon completion of the data collection phase of the survey.

**Filed with original field records.*

The GS supports survey planning, data processing, quality control and data export. The GS component also includes a KGPS base station, which provides independent post-processed position and height data. A comprehensive description of the GS is provided in the Data Acquisition and Processing Report*.

B.2 QUALITY CONTROL *SEE EVALUATION REPORT*

B.2.1 Data Density

The survey area was sounded at 4x4m laser spot spacing with main lines of sounding spaced at 80m, which provided the required 200% coverage. **Concur.**

At the sea surface the footprint of the laser beam is approximately 2.5m in diameter. As the beam passes through the water column, it slowly diverges due to scattering. It should be noted that at 4x4m laser spot spacing, there is a gap of between 1 to 1.5m between the illuminated area of adjacent soundings at the sea surface. There is a possibility that small objects in shallow water along the coastline may fall between consecutive 4x4m soundings and not be detected. **Concur.**

B.2.2 Water Clarity

The water clarity in the survey area was ideal for laser bathymetry as the water was very clear, except where persistent turbidity occurred and water depths to 28m were achieved. The areas of turbidity did vary on a daily basis and additional survey lines were planned and flown to minimize the extent of these gaps. There are multiple areas throughout the survey area where no depths were achieved due to turbidity, and they are described in section B.2.7. **Concur.**

B.2.3 Uncertainty values

For this survey area, global horizontal and vertical uncertainties have been assigned based on the defined horizontal and vertical error budget as determined and stated in the Vertical and Horizontal Control Report*. The assigned horizontal uncertainty is 2.80m and the assigned vertical uncertainty is 0.40m. **Concur.**

However, when the calculated grid node standard deviation is greater than the assigned vertical uncertainty, the standard deviation is used as the uncertainty value. This has occurred in areas of high relief such as the predominant reef existing in the south of the survey area. In some cases the standard deviation may exceed IHO order 1 limits this could be attributed to the fact that a 3m grid resolution has been used. **Concur.**

B.2.4 Data Management

The database is identified as follows:

Database Name	General Locality	Sheet(s)
06_3CaboRojo	Vicinity of Punta Carenero	E

A detailed table of survey line numbers is presented in the Data Acquisition and Processing Report*.

***Filed with original field records.**

B.2.5 Data Acquisition

Survey operations were conducted when suitable weather conditions prevailed. The first survey sortie was flown on April 9, 2006.

In general, the aircraft departed at 7 a.m. local time, prior to the build up of thunderstorms in the early afternoon.

B.2.6 Sea Conditions - Sea State, Waves, Swell, White Water

The sea state ranged from 1 to 3 throughout the survey and was generally between states 1 and 2 as determined from the Beaufort Wind Scale. This did not affect data quality.

Calm seas were experienced on occasions in the sheltered bays along the west and south coasts. Depending on the wind direction, calm seas occurred inshore of exposed reefs as well. Under such calm conditions, the sea may become glassy which degrades the sea surface model.

Long period swell was not significant during the survey, however an allowance has been made in the assessment of accuracy.

B.2.7 Gaps and Features in the Data

During the data processing, the operators have the ability to assign S-57 and user-defined tags to gaps and features in the data. For this survey area, no features were identified within the GS that require further examination. Tagging also allows for accurate delineation and attribution of unsurveyed polygons for the S-57 features file (US511561.000). The following gaps were tagged in the ground system.

Data gap due to mangroves	GM
Data gap due to Secondary Exclusion Zone	GS
Data gap due to turbidity	GT
Data gap due to buildings	GB

Gaps, such as possible pontoons that were tagged in the GS, may require further investigation to determine their presence. The following GS tag was used:

Possible pontoon / platform	FEPV
-----------------------------	------

Data gaps exported from the GS have been compiled as lines, polygons or points [in case of possible pontoons] and defined in the S-57 features file (US511561.000). The type of tag determines the type of S-57 object that is compiled.

GS Tag Type	Primitive	S-57 Object	S-57 Attribute
GM	Line	COALNE	CATCOA = Mangroves
GS	Polygon	UNSARE	INFORM = Secondary Exclusion Zone
GT	Polygon	UNSARE	INFORM = Turbidity
FEPV	Point	MORFAC	CATMOR = Mooring Buoy
GB	Line	SLCONS	CATSLC = Seawall

Secondary Exclusion Zone. A gap due to the secondary exclusion zone occurs in very shallow areas near the land / sea interface. The depth or height cannot be accurately determined from the waveform when the bottom and sea surface returns merge. There are 27 areas where no data exists due to the secondary exclusion zone. These areas exist in very shallow water. These shallow areas extend along many parts of the coastline. The majority of the areas are close to the coast, except for the very shallow areas around the mangroves, which are located offshore between Punta Ostiones and Punta Carenero and a small area located around Cayo Fanduca. No gaps due to a secondary exclusion zone exist in the bay at Puerto Real, because the gaps in the bay are due to turbidity. ***Concur with clarification. The Secondary Exclusion areas along the coast were excluded from the survey for the purposes of the H-cell they all fall within the blue tinted area.***

It should be noted that gaps due to the Secondary Exclusion Zone exist in extremely shoal water in the order of decimeters. Depths within these gaps are most likely shoaler than surrounding data. ***Concur.***

Turbidity. A gap due to turbidity occurs when extremely poor water clarity prevents accurate determination of the water depth. There are 67 of these areas that exist in the survey area for H11561. There are two distinct regions of turbidity that exist within the survey area. Firstly, there are turbid areas, which are present along the coast. Most of these areas are located along the coast in the north of the survey area. These turbid areas exist because of their close proximity to one of two river mouths. One of the river mouths is located to the northeast of Punta Ostiones, and the other river mouth is located at Punta Real. ***Concur with clarification. The areas of coastal turbidity were excluded from the survey for the purposes of the H-cell they all fall within the blue tinted area.***

Secondly, turbid areas exist offshore due to the turbid areas being trapped by the shallow reef structures of Escollo Negro, Las Coronas and Bajo Corona Larga. These offshore turbid areas will have navigational significance due to their location and size. ***Concur with clarification. One turbid area near Las Coronas was of significant enough size so as to be excluded from the final H-cell. Depths surrounding this area are consistent with currently charted depths.***

Additional survey lines were planned and flown on different days to minimize the effect of gaps in the data due to the presence of turbidity. These areas are described in more detail in section D.1.5.2.

Pontoons. A total of 3 small gaps are in the data due to the existence of what appear to be permanently moored pontoons. These features have been tagged in the GS and are presented in the S-57 features file (US511561.000). These features have been identified where an item is present in the data or imagery on multiple days. These features were also observed on Google Earth. ***Do not concur. Imagery from the USGS Seamless database does not support the existence of moored pontoons. See individual items below.***

These features exist in very shallow water along the coast in the vicinity of the township of Puerto Real in the following locations:

-
- 18° 04' 34" N, 067° 11' 29" W - *A boat is visible on the USGS imagery, but no evidence of a moored pontoon was seen.*
 - 18° 04' 03" N, 067° 11' 17" W – *No moored pontoon was seen in the USGS imagery.*
 - 18° 04' 30" N, 067° 11' 28" W - *Nothing was seen in the vicinity of this position on the USGS imagery.*

Their permanency is put into question due to their small size, and conversely other such features may exist that weren't detected by the lidar or identified by imagery. These features may be a potential hazard to the local recreational boater. *Concur with clarification. See each individual item above.*

Cultural Features. A number of jetties, ranging from small recreational jetties to larger commercial jetties, exist along the coastline. The more substantial jetties are located in the vicinity of the township of Puerto Real and extend 80m offshore in some cases. A total of 48 jetties have been surveyed in more detail than shown on the chart. These cultural features have been identified where an item is present in the data or imagery on multiple days. The features were also observed on Google Earth. *Concur with clarification. Due to the scale of the chart no cultural features were included in the H-cell final products.*

B.2.8 Nature of the Seabed

The seabed throughout the survey area is very complex in places, as it is strewn with coral reefs, small coral outcrops protruding from the seabed and coral heads. *Concur.*

Las Coronas is a large shallow complex reef structure, which runs from Punta Ostiones, west for approximately 5 miles. It is orientated east / west and is located in the middle of the survey area. *Concur.*

Another large shallow complex reef structure meets the Las Coronas reef structure and is orientated north / south. This north / south reef structure is made up from the southern portion of Escollo Negro and the northern portion of Bajo Corona Larga. The seabed to the west of this north / south orientated reef is strewn with small coral outcrops and small coral heads, which in many cases are not charted, and this is addressed in section D. The channels between the reef structures leading to Canal De Guanajibo are also strewn with small coral outcrops and small coral heads. *Concur.*

The reef structures themselves are quite complex and very undulating. *Concur.*

Inshore of the north / south orientated reef structure, the seabed is quite regular as it slopes gently to the coast. *Concur.*

The coastline is quite regular with a number of shallow ledges close to the coastline resulting in drying rocks and rocks awash. *Concur.*

B.2.9 Topography

The LADS Mk II system can measure topographic heights up to 50m elevation, subject to the depth / topographic logging window selected. For this survey, a 20m topographic height logging window was selected. As a result, the coastline was surveyed and elevations up to 20m were measured.

Mangroves were detected along the majority of the coastline. It was evident that many topographic returns were from foliage in these areas. Returns from the foliage were deleted from the data and tagged appropriately.

Buildings and other cultural features were detected along the coastline. It was evident from the waveform that returns were from manmade objects, and these returns were deleted and tagged appropriately.

Some topographic returns from beach areas were valid and left in the data, resulting in the delineation of the mean high water line. In general, heights along the coastline above 1.5m were deleted from the data.

B.2.10 Datums

Upon the completion of each flight, the GPS data logged on the aircraft and at the base station was processed to determine the post-processed KGPS position and height of the aircraft. This data is used in the calculation of the sea surface datum.

B.2.11 Wind

Survey operations were conducted in wind strengths of up to 20 knots during the survey. In general, the wind strength during the time of survey was around 10 knots from the SW.

During the morning wind strengths would increase slightly.

B.2.12 Cloud

Low cloud coverage was not a significant factor for the survey. During the early afternoon the clouds would build up over land and move offshore. The occurrence of cloud buildup offshore increased towards the end of the survey. The effects of low cloud coverage were managed as follows upon completion of the data collection phase of the survey:

- a. Limited weather forecasts were available for the actual survey area. Weather conditions were interpolated from generic weather Internet sites and local media weather forecasts.
- b. For long-term trends the National Weather Service in San Juan provided information.
- c. An Internet site showed the current San Juan radar. This proved invaluable during the later part of the survey to monitor the movement of thunderstorms. This Internet site is <http://www.wunderground.com/radar/>.

B.2.13 Effects of High Ground

For this survey the high ground was not an issue and the majority of the survey lines were flown at 1,600ft.

B.2.14 Receiver Gain

Changes in gain levels in the Airborne System automatically accommodate for changes in the sea surface, water column and seabed conditions. In some areas, after long over land passages, low gain levels were initially set on passing back over the water. Where this has been identified in the data, these lines were reflown from the opposite direction to improve the coverage.

B.2.15 Raw Laser Waveforms

The raw laser waveforms become dispersed in very complex areas, such as coral reefs, and in such areas the bottom object detection algorithm in the GS was used to define the extents and least depth of features.

The raw laser waveform is analyzed to determine areas of mangroves, turbidity and secondary exclusion zone and tagged appropriately using the GS gap tagging functions. It is also used in the decision making process of removing noise and data artifacts from the final dataset.

B.2.16 Data Processing

The data was processed at the operating site in San Juan on the return from each sortie. Final validation, checking, approving, reporting and the generation of products were conducted in Biloxi, MS.

The quality control of the data was done independently in Adelaide, South Australia.

B.2.17 Progress Sketches

Progress sketches were provided to NOAA on a biweekly basis. The final progress sketch can be found in Appendix III*. **Concur.**

B.3 CORRECTIONS TO SOUNDINGS

Refer to the Data Acquisition and Processing Report* for a description of corrections to soundings. There were no deviations from the corrections described therein. **Concur.**

B.4 DATA PROCESSING

One BASE Surface covers the entire survey area. A grid resolution of 3m was used for the BASE Surface. Grid resolution does not change relative to depth, as the laser pulse footprint stays relatively constant regardless of depth and the laser spot spacing is consistent irrespective of aircraft altitude. The 3m grid provides the largest amount of detail that can be supported by the lidar data density. **Concur.**

****Filed with original field records.***

B.5 DATA FORMATS

Data is provided in the following formats:

- Digital S-57 feature file
- CARIS BASE surface
- CARIS chart comparison file in .hob format
- CARIS compatible data - LADS soundings and waveforms, which can be imported into CARIS HIPS (.CAF File)
- Tidal Data provided in ASCII, .xls and .csv formats
- Digital georeferenced orthophoto image in .tif / .tfw format

Refer to the Data Acquisition and Processing Report* for specific details. *Concur.*

B.6 BENCHMARKS

The depth benchmark areas were identified on the first survey sortie and two benchmark lines were planned. The benchmark areas were used to check the performance of the LADS Mk II system for the I305 project, including this H11561 survey. These benchmarks were surveyed to check the repeatability of the LADS Mk II system accuracy.

The location of the benchmark lines and the position of the benchmark areas are detailed in the ~~Separates~~ *Appendix IV**.

Either one or both benchmark lines were flown during each sortie. The total number of benchmarks compared during the survey was 86. Benchmark comparisons were conducted after the application of final verified tides. Comparison summaries are also provided in the ~~Separates~~ *Appendix IV**.

The LADS data is compared against the gridded benchmark surface in the GS and statistics are generated which include the number of points compared, the mean depth difference (MDD) and the standard deviation (SD) between the data sets. The benchmark comparison function compares the data against the benchmark surface, and as this data is unedited it may contain noise normally removed during the validation process. These outliers are flagged as the shoalest and deepest differences.

B.6.1 Mean Depth Differences (MDD) and Standard Deviation (SD)

The averages of the mean depth differences and standard deviation for each benchmark run are as follows:

**Filed with original field records.*

Benchmarks on the first line

GS ID	BM Name	Nominal Depth	MDD	SD
1	BM_1	13m	-0.02 +/- 0.05	0.14 +/- 0.02
2	BM_2	8m	-0.13 +/- 0.10	0.09 +/- 0.01
3	BM_3	22m	-0.08 +/- 0.07	0.09 +/- 0.01

Benchmarks on the second line

GS ID	BM Name	Nominal Depth	MDD	SD
4	BM_4	12m	-0.11 +/- 0.09	0.10 +/- 0.01
5	BM_5	9m	-0.03 +/- 0.05	0.09 +/- 0.01

These results are within expected tolerances and show that the LADS Mk II depth performance was within specifications.

B.7 CROSSLINES

Seven crosslines were planned across the (I305) survey extents to be used for crossline comparisons against the main lines of survey. Areas were selected where common data existed and ideally, where the seabed was reasonably flat. This minimizes the apparent differences in depths due to minor positional differences in steeper areas of seabed.

Due to the tethered TARS balloon located on the southwest coast of Puerto Rico, the two planned crosslines were not flown. *Concur.*

Two crosslines were selected for comparison against main survey lines within the H11561 survey area as follows:

Line 1002.0.1	86 crossline intersections.	Commencing in the west of the survey area heading into the coast just south of Punta Ostiones.
Line 1007.0.1	14 crossline intersections.	Commencing in the south of the survey area heading NE through the survey area.

B.7.1 Mean Depth Differences (MDD) and Standard Deviation (SD)

The averages of the mean depth differences and standard deviation for this crossline are as follows:

Run No.	Comparisons	Mean Confidence	Average MDD	Average SD
1002.0.1	122053	7.4	0.03 +/- 0.09	0.17 +/- 0.08
1007.0.1	35854	6.5	0.03 +/- 0.09	0.16 +/- 0.04

Crossline comparison details are provided in Appendix V* of the Separates. *Do not concur. Crossline comparison details were not submitted with the project files.*

All results are consistent with IHO Order-1 depth accuracy. *Concur.*

B.8 POSITION CHECKS

Two independent positioning systems were used during the survey. Real-time positions were aided by WADGPS. A post-processed KGPS position was also determined relative to a local GPS base station that was established on the rooftop of the Courtyard Marriott Hotel in San Juan. The post-processed KGPS position solutions were applied to each sounding during post-processing and the height used in the datum filter.

Position checks were conducted prior to, during and following data collection as follows:

- a. DGPS Site Confirmation. A 24-hour certification was conducted of the local GPS base station established on the roof of the Courtyard Marriott Hotel in San Juan. The results reveal that the local GPS base station is free from site specific problems such as multipath and obstructions.
- b. Static Position Check. Prior to commencing data collection, the coordinates of the aircraft GPS antenna were determined relative to four NGS-CORS Base Stations in the southeast Puerto Rico area. Data was then logged by each LADS Mk II positioning system, enabling the positions to be checked against the NGS-CORS coordinated position of the aircraft GPS antenna. The accuracy of the post-processed KGPS solution during the static position check was 0.133m (95% confidence). The results and details of the static position check are enclosed in the Vertical and Horizontal Control Report*.
- c. Dynamic Position Check. During each sortie, GPS data was logged on the aircraft and at the local GPS base station. This provided a check between the real-time and post-processed GPS position solutions. The mean difference between the real-time and post-processed position was 0.873m, with an average standard deviation of 0.206. Details are provided in the Vertical and Horizontal Control Report*.
- d. Navigation Position Check. Navigation checks were also conducted over a coordinated point on the roof of the terminal at Mayaguez airport. This enabled the known position of the structure to be checked against the image on the downward looking video. This provided a gross error check of position. The mean error was 1.9m with a standard deviation of 3.62m. Details are provided in the Separates*. *Do not concur. Navigation position check details were not submitted with the project files.*
- e. Position Confidence. The position quality was also monitored by checking a post-processed position confidence (C3), which is determined from the AS platform error, GPS error and residual errors between the actual GPS positions and aircraft position as determined from the line of best fit. No position anomalies were detected.

The position checks were within the expected tolerances and showed that the positioning systems were functioning correctly during the survey.

**Filed with original field records.*

C. VERTICAL AND HORIZONTAL CONTROL

Refer to the Vertical and Horizontal Control Report* for a detailed description of the vertical and horizontal control used during this survey. A summary of vertical and horizontal control for the survey follows.

C.1 VERTICAL CONTROL

Vertical control for the survey was based on the Mean Lower Low Water tidal datum (MLLW). The operating National Water Level Observation Network (NWLON) station at Magueyes Island, PR (9759110) located at the eastern extent of the survey area served as preliminary vertical control. *Concur.*

A subordinate tide station at Punta Guanajibo (9759421) located at the northern extent of the survey area was installed and operated for the duration of the survey. Upon completion of the survey, the datum was established for the subordinate gauge and the final verified tides for both the subordinate and NWLON tide gauges provided the vertical control. *Concur.*

Station details are as follows:

Gauge	Location	WGS84	
		Latitude	Longitude
975 9110	Magueyes Island	17° 58.3' N	67° 02.8' W
975 9421	Punta Guanajibo	18° 09.6' N	67° 10.9' W

C.2 ZONING

NOAA supplied tide zones that cover the extent of the survey area, with time and range correctors relative to the Magueyes Island tide station. These are as follows:

Tide Zone	GS Identifier	Time Corrector	Range Corrector	Reference Station
PRS15	1	-18 minutes	1.59	9759110
PRS14	2	-18 minutes	1.45	9759110
PRS13	3	-18 minutes	1.23	9759110
PRS12	4	-18 minutes	1.09	9759110
PRS11	5	-24 minutes	1.01	9759110
PRS10	6	-24 minutes	0.94	9759110
PRS9	7	-24 minutes	0.94	9759110
PRS9A	8	-18 minutes	0.94	9759110
PRS8	9	-6 minutes	0.94	9759110
PRS7	10	0 minutes	0.94	9759110

**Filed with original field records.*

The proposed final tide zoning was computed once the datum for the subordinate tide gauge was established. The proposed final zoning is a combination of both the NWLON gauge, in which the zoning for the southern part of the survey area was derived, and the subordinate gauge, which provided zoning for the western part of the survey area. The proposed final zoning areas are as follows:

Tide Zone	GS Identifier	Time Corrector	Range Corrector	Reference Station
JOA14	1/2	0 minutes	x 1.00	9759421
JOA13	3	0 minutes	x 0.90	9759421
JOA12	4	0 minutes	x 0.85	9759421
JOA11	5	-6 minutes	x 0.81	9759421
JOA10	6	-6 minutes	x 0.77	9759421
JOA09	7	-24 minutes	x 0.94	9759110
JOA09A	8	-18 minutes	x 0.94	9759110
JOA08	9	-6 minutes	x 0.94	9759110
JOA07	10	0 minutes	x 0.94	9759110

An analysis of crosslines and overlaps of the mainlines of soundings concluded that tide zoning was adequate and therefore the proposed final tide zoning correctors have been considered to be the final zoning correctors for the survey. *Concur.*

The verified tides supplied by NOAA were independently checked by John Oswald and Associates. Once the data was checked, a fifth degree polynomial was applied to the tidal data and this data was then supplied to Tenix LADS Inc. for the application of tides. *Concur.*

The preliminary tide zone areas were adopted as the final tide zone areas. The range and time correctors changed, as zones JOA10-JOA14 are relative to the subordinate tide station. *Concur.*

For final processing, the time and amplitude correctors were applied to the tidal data delivered by John Oswald and Associates. Soundings were then reduced to MLLW using these corrected tides. *Concur.*

The data was viewed across the zone boundaries, which once again, validated the final verified tides and zoning. *Concur.*

C.3 HORIZONTAL CONTROL

Data collection and processing were conducted on the Airborne and Ground Systems in World Geodetic System (WGS84) on Universal Transverse Mercator (Northern Hemisphere) projection UTM (N) in Zone 19, Central Meridian 69° West. All units are in meters. This data was post-processed and all soundings are relative to the North American Datum 1983 (NAD83). *Concur.*

C.3.1 LADS Local GPS Base Station – Puerto Rico

Real-time positions were determined using an Ashtech GG24 GPS receiver aided by Wide Area Differential GPS (WADGPS). A local GPS base station was coordinated by John Oswald and Associates on the roof of the Courtyard Marriott Hotel, San Juan on March 7, 2006.

The derived NAD83 coordinates for the local GPS base station, are:

NAD83		UTM (N) Zone 19		
Latitude (N)	Longitude (W)	Easting (m)	Northing (m)	Ellipsoidal Height (m)
18° 27' 20.277"	66° 04' 56.271"	808 179.880	2 043 081.721	13.599

Post-processed KGPS positions were determined off-line using data logged at the local GPS base station and on the aircraft. This data was processed through Ashtech PNAV software to calculate both a DGPS and KGPS position solution. The post-processed KGPS positions were then imported into the GS and applied to all soundings. This provided increased sounding position accuracy and horizontal redundancy.

The local GPS base station site was checked for obstructions and multipath over a 24-hour period on April 20 and April 21, 2006. The results outlined in the Vertical and Horizontal Control Report* reveal that the local GPS base station site is free from site specific problems such as multipath and obstructions.

On April 12, 2006 static position checks of the LADS Mk II positioning systems were undertaken. The results outlined in the Vertical and Horizontal Control Report* revealed no gross errors and that all positioning systems functioned correctly.

During each sortie, GPS data was logged both on the aircraft and at the local GPS base station, which enabled a post-processed KGPS position solution to be determined. These positions were then compared to the position determined by the real-time positioning system. This dynamic positioning check provided quality control of the positioning systems, and the positional differences were within tolerance for the survey. These differences are tabulated in the Vertical and Horizontal Control Report*.

Navigation position checks were attempted over the terminal at the Mayaguez airport during each sortie when suitable weather conditions prevailed. Following each sortie the logged aircraft position was processed against the downward looking video record to determine the difference in position at the time of overflight. This provided a gross error check on the aircraft positioning.

The tabulated results are presented in the Vertical and Horizontal Control Report* and revealed that the positioning systems functioned to within expectations.

***Filed with original field records.**

D. RESULTS AND RECOMMENDATIONS

The results for the H11561 survey are submitted separately and in conjunction with this Descriptive Report as the S-57 feature file, BASE surface, CARIS .hob file, orthophoto mosaic, chart comparison spreadsheet, etc. on the USB hard drive. Refer to Appendix III of the Data Acquisition and Processing Report* for a list of all the applicable results files from H11561. **Filed with original field records.*

Below is a table listing the S-57 feature objects found in the S-57 feature file (US511561.000):

S-57 Object Class	S-57 Object Acronym	Geometry	Description	Spatial Attribute	Attribute 1	Attribute 2	Attribute 3	Attribute 4	Comments
Coastline	COALNE	L	The high water line. Where depth equals 0 relative to MHW.	Quality of position (QUAPOS)	Category of Coastline (CATCOA)				The spatial attribute QUAPOS is used when coastline is interpolated from tags or the georeferenced orthophoto mosaic.
Depth Contour	DEPCNT	L	The approximate location of the line of equal depth. Also referred to as a depth curve.		Value of depth contour (VALDCO)				Tenix will only be responsible for defining the 0m curve.
Land Area	LNDARE	P	The solid portion of the Earth's surface, as opposed to sea, water.		Information (INFORM)				Used for defining islet point features. INFORM populated as mangrove where small mangrove features exist.
Land Elevation	LNDELV	P	The vertical distance of a point or level measured from a specified vertical datum.		Elevation (ELEVAT)				Used for defining islet heights related to MLLW.
Mooring Facility	MORFAC	P	The equipment or structure used to secure a vessel		Category of Mooring Facility (CATMOR)	Status (STATUS)			Used for identifying possible permanently moored pontoons.
Underwater / Awash Rock	UWTROC	P	A concreted mass of stony material or coral which dries, is awash or is below the water surface.		Water level effect (WATLEV)	Quality of sounding measurement (QUASOU)	Technique of sounding measurement (TECSOU)	Value of sounding (VALSOU)	
Unsurveyed Areas	UNSARE	A	Unsurveyed area.		Information (INFORM)				Define gaps in data coverage within polyline. INFORM has been identified as either Turbidity, Secondary Exclusion Zone.
Shoreline Construction	SLCONS	L	A fixed artificial structure between the water and the land.		Category of shoreline construction (CATSLC)				Used for defining jetties and seawalls.

S-57 Object Class	S-57 Object Acronym	Geometry	Description	Spatial Attribute	Attribute 1	Attribute 2	Attribute 3	Attribute 4	Comments
Buildings	BUISGL	L	Building						Used for defining buildings on the MHW line.
Wreck	WRECKS	P	The ruined remains of a stranded or sunken vessel, which has been rendered useless.		Water level effect (WATLEV)	Value of sounding (VALSOU)			Used for identifying sunken or stranded vessels.
<i>Meta Objects</i>									
Coverage	M_COVR	A	A geographical area that describes the coverage and the extent of spatial objects.		Category of coverage (CATCOV)				M_COVR: CATCOV = 1 polygons define the extents of good LIDAR data coverage.
Quality of Data	M_QUAL	A	An area within which a uniform assessment of the quality of the data exists.		Category of zone of confidence in data (CATZOC)				

Table 1: S-57 attribution for the S-57 feature file (US511561.000)

Recommendations for charting action are described in section D.1.2 Charted Depths and Features and in the Chart Comparison Spreadsheet under section D.1.4.

D.1 CHART COMPARISON – REGISTRY NUMBER H11561

H11561 was compared to:

ENC US4PR60M compiled from Raster Chart 25671, 18th Edition, updated application date March 2003, at scale 1:100,000, corrected through NM March 22, 2003 and LNM March 4, 2003.

These charts were downloaded from the NOAA Office of Coast Survey – NOAA ENC download website on August 5, 2007.

(<http://chartmaker.ncd.noaa.gov/mcd/ENC/download.htm>)

D.1.1 Dangers to Navigation

- Item Number 1 is a 13.8m Rk and is the shoalest point on a 60m x 30m coral head in 20m of water. This feature is in the middle of a channel between Escollo Media Luna and the western extent of a shallow reef structure. It is 900m E of Escollo Media Luna and 1200m W of the western extent of the shallow reef. Other features exist in the vicinity, and they could be a potential hazard to marine traffic approaching the southwest coast of Puerto Rico. **Concur with clarification. Item is currently charted. Retain as charted.**
- Item Number 2 is a 2.6m Rk and is the shoalest point on a 40m x 30m coral head in 8m of water. Other features similar in nature exist to the NE and SW. This feature is approximately 1400m NW of the coast and 2000m SW of the township of Joyuda and is a potential hazard for marine traffic along the coast and approaching Joyuda. **Do not concur. Item is in rocky area, chart representative soundings.**

-
- Item Number 3 is a 15.9m Rk in approximately 20m of water. This feature is in the middle of a channel between Escollo Media Luna and the western extent of a shallow reef structure. It is 700m SE of Escollo Media Luna and 1000m WSW of the western extent of the shallow reef. Other features exist in the vicinity, and they could be a potential hazard to marine traffic approaching the southwest coast of Puerto Rico. ***Do not concur. Item is in rocky area, chart representative soundings.***
 - Item Number 4 is an 8.4m Rk and is the shoalest point on a 400m x 200m coral outcrop in 20m of water, in the vicinity of a charted 12.8m. It exists at the western extent of the survey area with the western part of the feature being surveyed in registry number H11558. Other features similar in nature exist to the SE. This feature is approximately 600m SW of the southern extent of Escollo Media Luna and could be a potential hazard to marine traffic approaching the southwest coast of Puerto Rico. ***Do not concur. Item is in rocky area, chart representative soundings.***
 - Item Number 5 is an 11.2m Rk and is the shoalest point on a 400m x 200m coral outcrop in 20m of water. It exists at the western extent of the survey area, and a number of similar features in nature exist in the vicinity. This feature is approximately 1100m S of the southern extent of Escollo Media Luna and could be a potential hazard to marine traffic approaching the southwest coast of Puerto Rico. ***Do not concur. Item is in rocky area, chart representative soundings.***
 - Item Number 6 is a 7.9m Rk and is the shoalest point on a 70m x 50m coral head in 20m of water. It is located in the middle of the entrance to a channel through Las Coronas into Canal De Guanajibo. This feature is approximately 500m W of the western extent of the shallow Las Coronas reef structure. It should be noted that an area of turbidity exists directly to the SW of this feature. However, it is unlikely that shoaler features exist within this turbid area. ***Do not concur. Item is in rocky area, chart representative soundings.***
 - Item Number 7 is a 4.1m Rk in approximately 10m of water, at the entrance to the bay where Puerto Real is located. This feature is approximately 1600m W of Punta Guaniquilla. ***Concur with clarification. Item is currently charted. Retain as charted.***
 - Item Number 8 is an 11.6m Rk and is the shoalest point on a 80m x 40m coral head in approximately 22m of water, at the entrance to a bay which leads to a possible passage through Las Coronas and into Canal De Guanajibo. This feature is approximately 120m SW of the western extent of the shallow Las Coronas reef structure. ***Do not concur. Item is in rocky area, chart representative soundings.***
 - Item Number 9 is a 13.0m Rk and is the shoalest point on an 80m x 80m coral head in 20m of water. It exists at the western extent of the survey area, and a number of similar features in nature exist in the vicinity. This feature is approximately 1600m W of the western extent of the large shallow reef structure Las Coronas and could be a potential hazard to marine traffic approaching the southwest coast of Puerto Rico. ***Do not concur. Item is in rocky area, chart representative soundings.***
 - Item Number 10 is a 14.8m Rk and is the shoalest point on a 400m x 150m coral outcrop in approximately 20m of water. It exists at the western extent of the survey area, and a number of similar features in nature exist in the vicinity. This feature is approximately 2600m W of the western extent of the large shallow reef structure Las Coronas and could

be a potential hazard to marine traffic approaching the southwest coast of Puerto Rico. ***Do not concur. Item is in rocky area, chart representative soundings.***

- Item Number 11 is a 9.6m Rk and is the shoalest point on a 400m x 150m coral outcrop in approximately 20m of water in the vicinity of a charted 23.7m. It exists at the western extent of the survey area, and a number of similar features in nature exist in the vicinity. This feature is approximately 1800m SW of the western extent of the large shallow reef structure Las Coronas and could be a potential hazard to marine traffic approaching the southwest coast of Puerto Rico. ***Do not concur. Item is in rocky area, chart representative soundings.***
- Item Number 12 is a 0.7m Rk in approximately 6m of water. It is approximately 350m off the coast and is 1100m NE of Punta Ostiones. It is adjacent to turbid water and may be a hazard for local marine traffic. ***Do not concur. Item is in rocky area, chart representative soundings.***
- Item Number 13 is a 2.8m Rk in approximately 8m of water, at the entrance to the bay where Puerto Real is located. This feature is approximately 200m WNW of Punta La Mela. ***Do not concur. Item is in rocky area, chart representative soundings.***
- Item Number 14 is a 12.8m Rk and is the shoalest point on a 220m x 180m coral head in approximately 22m of water. It is located at the southern side of a channel, which passes through the shallow reef structure Las Coronas and into Canal De Guanajibo. ***Do not concur. Item is in rocky area, chart representative soundings.***
- Item Number 15 is a 7.1m Rk and is the shoalest point on a 70m x 50m coral head in approximately 22m of water. It is located at the entrance to a bay, which leads to a possible passage through Las Coronas and into Canal De Guanajibo. This feature is approximately 150m SW of the western extent of the shallow Las Coronas reef structure. Similar features exist inshore and to the E of this feature. ***Do not concur. Item is in rocky area, chart representative soundings.***
- Item Number 16 is a 7.9m Rk and is the shoalest point on a 70m x 50m coral head in approximately 22m of water, at the entrance to a bay which leads to a possible passage through Las Coronas and into Canal De Guanajibo. This feature is also located between a charted 9.5m and 3.6m. ***Do not concur. Item is in rocky area, chart representative soundings.***
- Item Number 17 is a 7.1m Rk and is the shoalest point on a 100m x 60m coral head in approximately 20m of water. It is located at the head of a bay within the Las Coronas reef structure, which leads to a possible passage through Las Coronas and into Canal De Guanajibo. ***Do not concur. Item is in rocky area, chart representative soundings.***
- Item Number 18 is a 10.6m Rk on a small coral ledge protruding S from the Las Coronas reef structure into a more significant channel, which leads into Canal De Guanajibo, thus giving marine access to the SW coast of Puerto Rico. ***Do not concur. Item is in rocky area, chart representative soundings.***
- Item Number 19 is a 9.7m Rk and is the shoalest point on a 60m x 60m coral head in approximately 20m of water. It is located at the head of a bay within the Bajo Corona Larga reef structure, and at the southern side of a significant channel, which leads into Canal De Guanajibo, thus giving marine access to the SW coast of Puerto Rico. ***Do not concur. Item is in rocky area, chart representative soundings.***

- Item Number 20 is a 12.1m Rk at the SE extent of a shallow reef at the northern extent of a channel, which leads into Canal De Guanajibo, thus giving marine access to the SW coast of Puerto. ***Do not concur. Item is in rocky area, chart representative soundings.***

D.1.2 Charted Depths and Features

Registry number H11561 covers part of NOAA ENC US4PR60M in the Vicinity of Punta Carenero. From the Source Diagram, the area covered by H11561 was covered by NOS surveys between 1900 and 1939, presumably by lead line. Partial bottom coverage was achieved in both areas. The area surveyed is represented by the LADS deliverables in considerably more detail than is currently shown on the chart. ***Concur.***

The following general recommendations are relevant:

- a. Coastline. The charted coastline is highly generalized. The majority of the coastline is dominated by mangroves to the waters edge. In these places, the MHW line has been determined by tags in the GS or the georeferenced orthophoto. This interpolated line differs to the ENC by up to 100m in some areas. Some areas along the coastline, such as Puerto Real, have buildings and infrastructure to the water line, and the MHW line has been determined by tags in the GS or the georeferenced orthophoto. There are some areas along the coastline where both the MHW and MLLW lines have been surveyed adequately. These mainly exist where there is a narrow beach before the coastal mangroves appear. Differences to the ENC of up to 100m occur in these areas. For the mangrove areas, the “coastline” (COALNE) S-57 objects have been attributed as mangrove using the attribute CATCOA. It is recommended that the coastline on the chart be amended to the LADS surveyed and extrapolated MHW line. ***Do not concur. No coastline changes are recommended for this survey.***
- b. Artificial Coastline. For the coastline where cultural features such as buildings and wharfs exist to the water line, the object shoreline construction (SLCONS) is used to delineate the MHW line. These have been given a value of “Seawall” using the attribute CATSLC. This MHW line has been derived from the georeferenced orthophoto and differs by up to 50m to the MHW line on the ENC in places. Approximately 600m of such a coastline exists at the township of Puerto Real. ***Concur with clarification. No shoreline construction items were included in the H-cell based on the scale of the chart.***
- c. Islets. No drying islets have been surveyed; however, islet areas where mangroves are present have been surveyed. These mangrove islets are located within 300m of the coast between Punta Ostiones and Punta Carenero. The extent of the mangroves has been determined from the tags in the GS and the georeferenced orthophoto. Where small isolated clumps of mangroves have been identified either through tags or orthophoto, a LNDARE point object attributed with INFORM = mangroves has been compiled in the S-57 feature file (US511561.000). Some of these islets are represented on the ENC, but in most cases they are not and the extent of these areas have been surveyed. Where significant, these islets are detailed in the Chart Comparison Spreadsheet in section D.1.4. ***Concur with clarification. See Chart Comparison Spreadsheet for individual item recommendations.***
- d. Cultural Features. A number of jetties, ranging from small recreational jetties to larger commercial jetties, exist along the coastline. The more substantial jetties are located in the

vicinity of the township of Puerto Real and extend 80m offshore in some cases. A total of 48 jetties have been surveyed, and one is represented on the ENC at Puerto Real. These cultural features have been surveyed in more detail than shown on the chart. The jetties and piers that could be identified exist in the S-57 Features File (US511561.000) as object shoreline construction (SLCONS) attributed with CATSLC = pier (jetty). **Concur with clarification. No cultural features were included in the H-cell based on the scale of the chart.**

- e. Drying rocks. A number of shallow ledges with drying rocks and rocks awash extend from the shore seaward in areas north of Punta Ostiones and from Punta La Mela to Punta Guaniquilla. Some of these rocks are charted but were not detected by the lidar or seen on imagery and other rocks were surveyed but weren't charted. It is recommended that the chart be amended to match the lidar survey. Where significant, these rocks are detailed in the Chart Comparison Spreadsheet in section D.1.4. **Concur with clarification. See Chart Comparison Spreadsheet for individual item recommendations.**
- f. Pontoons. Along the coast of the township of Puerto Real, three small possible pontoons were detected which appear to be moored. The pontoons that were detected and identified exist in the S-57 Features File (US5160.000) as point object MORFAC attributed with CATMOR = mooring buoy. **Do not concur. USGS Seamless Database imagery taken during the survey timeframe does not support the existence of any pontoons.**
- g. Wrecks. A wreck has been identified in the lidar data and from imagery and it is located in very shallow water between two jetties at Puerto Real. This wreck is in the S-57 Features File (US511561.000) as a point object WRECKS attributed with WATLEV = always dry. **Concur.**

In addition to the general recommendations above, some 113 significant differences between the chart and the survey have been identified. Specific recommendations for these differences are described in the Chart Comparison Spreadsheet in section D.1.4. An expanded version of the spreadsheet is included digitally with the survey report on the USB hard drive. The digital .xls version contains information that may be useful for planning of boat sounding and is easy to download into other survey packages (H11561_V1_ChartComp.xls). **Concur.**

A CARIS .hob file containing just the chart comparison items has also been compiled and is provided as part of survey deliverables (H11561_ChartComp.hob). The attribution methodology for this file is presented in the table below. **Concur.**

S-57 Object Class	S-57 Object Acronym	Geometry	Description	Attribute 1	Attribute 2	Attribute 3	Attribute 4
Nautical publication information	M_NPUB	P	Used to relate additional nautical information or publications to the data.	INFORM (used for storing a unique chart comparison ID)	NINFOM (used for storing the charting recommendation)	PUBREF (used for storing a reference to a Feature for Investigation)	PICREP (used for storing a link to waveform screen captures)

Table 2: S-57 attribution for the CARIS H11561_ChartComp.hob file

The chart comparison was conducted by reviewing the ENC, raster chart, BASE surface, S-57 feature file and the georeferenced orthophoto image. For each item identified, screen dumps of the Local Area Display and Raw Waveform Display were extracted from the LADS Mk II Ground System. These have been reviewed in order to make the following assessments:

- a. Type of Feature
- b. Further Examination Recommended
- c. Charting Recommendation
- d. Remarks

Each chart comparison was categorized as follows:

1. New shoal found
2. Charted shoal disproved / not found

The fields in the Chart Comparison Spreadsheet have been developed from experience learned and feedback received from previous lidar surveys, witnessing survey operations on NOAA ship Rainier and from meetings at PHB and UNH. They have been designed for ease of use and to minimize double handling of data and transcription. Continued feedback is welcomed in order to develop these formats in order to achieve further efficiencies in data handling.

D.1.3 AWOIS

No AWOIS were assigned to this Task Order. *Concur.*

D.1.4 Chart Comparison Spreadsheet See Evaluation Report

Sequence No	Shoal No	Category	CHARTED			SURVEYED			Type of Feature	Further Examination Recommended	Charting Recommendation	Remarks
			Charted Depth (meters)	NAD83 Latitude N (DMS)	NAD83 Longitude W (DMS)	Surveyed Depth (meters)	NAD83 Latitude N (DMS)	NAD83 Longitude W (DMS)				
1	E1	1				18.89	18° 6' 26.29"	67° 18' 2.5"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
2	E2	1				13.77	18° 6' 6.74"	67° 17' 50.89"	Rk	N	Insert	See Danger to Navigation Report Item 1. <i>Concur. Chart Rock.</i>
3	E3	1				17.91	18° 6' 45.73"	67° 17' 52.12"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
4	E5	1				4.98	18° 6' 42.47"	67° 16' 21.46"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
5	E6	2	5.40	18° 6' 21.93"	67° 16' 28.24"	3.84	18° 6' 23.81"	67° 16' 28.42"	Rk	N	Replace	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
6	E7	2	1.80			0.34	18° 6' 5.14"	67° 16' 11.53"	Rk	N	Replace	<i>Concur. Chart Rock.</i>
7	E8	1				2.56	18° 6' 30.95"	67° 12' 4.71"	Rk	N	Insert	See Danger to Navigation Report Item 2. <i>Do not concur. Item is in rocky area, chart representative soundings.</i>
8	E9	1				2.72	18° 6' 23.27"	67° 12' 9.22"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
9	E11	1				0.22	18° 6' 34.57"	67° 10' 57.23"	Rk Awash	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
10	E12	1				-0.70	18° 6' 16.5"	67° 11' 5.38"	Islet	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
11	E13	2	5.40	18° 6' 16.47"	67° 11' 11.05"	0.40	18° 6' 17.16"	67° 11' 7.99"	Rk	N	Replace	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
12	E14	2	4.00	18° 5' 43.08"	67° 15' 29.04"	2.62	18° 5' 48.49"	67° 15' 28.99"	Rk	N	Replace	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
13	E15	1				15.95	18° 5' 37.41"	67° 17' 43.8"	Rk	N	Insert	See Danger to Navigation Report Item 3. <i>Do not concur. Item is in</i>

Shoal Categories

1–New Shoal Found

2-Charted Shoal Disproved / Not Found

Sequence No	Shoal No	Category	CHARTED			SURVEYED			Type of Feature	Further Examination Recommended	Charting Recommendation	Remarks
			Charted Depth (meters)	NAD83 Latitude N (DMS)	NAD83 Longitude W (DMS)	Surveyed Depth (meters)	NAD83 Latitude N (DMS)	NAD83 Longitude W (DMS)				
											All items covered by 4x4m laser spot spacing at 200% lidar coverage.	
											<i>rocky area, chart representative soundings.</i>	
14	E16	2	23.70	18° 5' 25.15"	67° 17' 29.03"	21.24	18° 5' 24.16"	67° 17' 23.87"	Rk	N	Replace	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
15	E17	1				8.71	18° 5' 47.28"	67° 18' 16.84"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
16	E18	2	21.90	18° 5' 42.32"	67° 18' 25.29"	20.02	18° 5' 38.74"	67° 18' 25.61"	Rk	N	Replace	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
17	E19	2	12.80	18° 5' 33.98"	67° 18' 31.51"	8.39	18° 5' 32.23"	67° 18' 32.71"	Rk	N	Replace	See Danger to Navigation Report Item 4. <i>Do not concur. Item is in rocky area, chart representative soundings.</i>
18	E20	1				11.21	18° 5' 2.62"	67° 18' 10.31"	Rk	N	Insert	See Danger to Navigation Report Item 5. <i>Do not concur. Item is in rocky area, chart representative soundings.</i>
19	E21	2	25.60	18° 5' 17.71"	67° 17' 3.3"	10.76	18° 5' 20.69"	67° 17' 1.3"	Rk	N	Replace	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
20	E22	1				7.95	18° 5' 10.55"	67° 16' 41.03"	Rk	N	Insert	See Danger to Navigation Report Item 6. <i>Do not concur. Item is in rocky area, chart representative soundings.</i>
21	E23	1				2.92	18° 5' 16.86"	67° 16' 19.76"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
22	E24	2	Islet	18° 5' 53.79"	67° 11' 42.48"					N	Remove	<i>Do not concur. Retain as charted.</i>
23	E25	2	Islet	18° 4' 53.54"	67° 12' 31.51"	-0.12	18° 4' 52.93"	67° 12' 29.94"	Rk Awash	N	Replace	<i>Do not concur. Retain as charted.</i>
24	E26	1				0.16	18° 5' 13.67"	67° 12' 0.6"	Rk Awash	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>

Shoal Categories

1–New Shoal Found

2-Charted Shoal Disproved / Not Found

Sequence No	Shoal No	Category	CHARTED			SURVEYED			Type of Feature	Further Examination Recommended	Charting Recommendation	Remarks
			Charted Depth (meters)	NAD83 Latitude N (DMS)	NAD83 Longitude W (DMS)	Surveyed Depth (meters)	NAD83 Latitude N (DMS)	NAD83 Longitude W (DMS)				
25	E27	1				0.31	18° 5' 20.33"	67° 12' 2.32"	Rk Awash	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
26	E28	1				0.02	18° 5' 13.83"	67° 11' 56.32"	Rk Awash	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
27	E29	2	Islet	18° 5' 5.38"	67° 12' 0.57"					N	Remove	Two islets surveyed as one large islet. <i>Do not concur. Retain as charted.</i>
28	E30	1				Islets	18° 4' 54.63"	67° 12' 2.54"	Islet	N	Insert	Note: Many uncharted mangrove islets in vicinity. <i>Do not concur. Retain as charted.</i>
29	E31	1				-0.60	18° 4' 34.35"	67° 11' 29.23"	Obstruction	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
30	E34	1				Islets	18° 4' 35.83"	67° 11' 58.66"	Islet	N	Insert	Note: Many uncharted mangrove islets in vicinity. <i>Do not concur. Retain as charted.</i>
31	E35	2	Islet	18° 4' 18.81"	67° 11' 51.19"					N	Remove	Charted islet surveyed as coastline. <i>Do not concur. Retain as charted.</i>
32	E36	2	9.50	18° 4' 30.15"	67° 12' 34.21"	7.88	18° 4' 33.07"	67° 12' 37.07"	Rk	N	Replace	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
33	E37	2	7.60	18° 4' 38.06"	67° 12' 42.61"	4.21	18° 4' 36.7"	67° 12' 38.21"	Rk	N	Replace	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
34	E38	1				4.14	18° 4' 31.66"	67° 12' 47.45"	Rk	N	Insert	See Danger to Navigation Report Item 7. <i>Concur. Chart Rock.</i>
35	E39	2	16.40	18° 4' 43.55"	67° 14' 31.81"	9.92	18° 4' 46.05"	67° 14' 31.89"	Rk	N	Replace	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
36	E40	2	23.70	18° 4' 31.84"	67° 16' 42.94"	11.63	18° 4' 35.42"	67° 16' 44.57"	Rk	N	Replace	See Danger to Navigation Report Item 8. <i>Do not concur. Item is in rocky area, chart representative soundings.</i>

Shoal Categories

1–New Shoal Found

2-Charted Shoal Disproved / Not Found

Sequence No	Shoal No	Category	CHARTED			SURVEYED			Type of Feature	Further Examination Recommended	Charting Recommendation	Remarks
			Charted Depth (meters)	NAD83 Latitude N (DMS)	NAD83 Longitude W (DMS)	Surveyed Depth (meters)	NAD83 Latitude N (DMS)	NAD83 Longitude W (DMS)				
37	E41	1				12.97	18° 4' 39.99"	67° 17' 47.35"	Rk	N	Insert	See Danger to Navigation Report Item 9. <i>Do not concur. Item is in rocky area, chart representative soundings.</i>
38	E42	2	20.10	18° 4' 38.92"	67° 18' 21.8"	17.00	18° 4' 39.63"	67° 18' 18.68"	Rk	N	Replace	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
39	E43	1				14.83	18° 4' 26.74"	67° 18' 16.02"	Rk	N	Insert	See Danger to Navigation Report Item 10. <i>Do not concur. Item is in rocky area, chart representative soundings.</i>
40	E44	1				15.59	18° 4' 13.75"	67° 18' 26.59"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
41	E45	1				15.32	18° 3' 56.25"	67° 18' 32.31"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
42	E46	1				18.60	18° 4' 12.32"	67° 18' 10.62"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
43	E47	2	23.70	18° 3' 52.71"	67° 17' 29.52"	9.60	18° 3' 56.94"	67° 17' 30.04"	Rk	N	Replace	See Danger to Navigation Report Item 11. <i>Do not concur. Item is in rocky area, chart representative soundings.</i>
44	E48	2	16.40	18° 4' 12.33"	67° 17' 30.17"	11.56	18° 4' 10.91"	67° 17' 36.07"	Rk	N	Replace	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
45	E49	1				19.12	18° 4' 18.47"	67° 17' 0.91"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
46	E50	2	18.80	18° 3' 56.49"	67° 17' 8.77"	14.92	18° 3' 55.32"	67° 17' 8.94"	Rk	N	Replace	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
47	E51	2	14.60	18° 4' 15.9"	67° 15' 46.02"	8.26	18° 4' 13.09"	67° 15' 45.43"	Rk	N	Replace	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
48	E52	2	4.00	18° 4' 11.73"	67° 12' 28.05"	2.82	18° 4' 8.99"	67° 12' 25.73"	Rk	N	Replace	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>

Shoal Categories

1–New Shoal Found

2-Charted Shoal Disproved / Not Found

Sequence No	Shoal No	Category	CHARTED			SURVEYED			Type of Feature	Further Examination Recommended	Charting Recommendation	Remarks
			Charted Depth (meters)	NAD83 Latitude N (DMS)	NAD83 Longitude W (DMS)	Surveyed Depth (meters)	NAD83 Latitude N (DMS)	NAD83 Longitude W (DMS)				
49	E53	2	3.60	18° 4' 15.74"	67° 12' 7.48"	2.19	18° 4' 18.73"	67° 12' 9.62"	Rk	N	Replace	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
50	E54	2	4.20	18° 3' 51.92"	67° 12' 1.29"	0.85	18° 3' 50.48"	67° 11' 57.1"	Rk	N	Replace	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
51	E55	1				0.32	18° 4' 13.35"	67° 11' 44.99"	Rk	N	Insert	<i>Concur. Chart Rock.</i>
52	E56	1				15.95	18° 3' 28.55"	67° 16' 0.91"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
53	E57	2	14.60	18° 3' 39.65"	67° 16' 9.5"	10.63	18° 3' 36.61"	67° 16' 11.68"	Rk	N	Replace	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
54	E58	2	20.10	18° 3' 11.67"	67° 16' 58.15"	17.56	18° 3' 14.02"	67° 16' 56.89"	Rk	N	Replace	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
55	E59	1				12.02	18° 3' 21.12"	67° 17' 19.29"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
56	E60	1				21.28	18° 3' 14.58"	67° 17' 51.96"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
57	E61	1				16.50	18° 3' 36.15"	67° 18' 27.95"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
58	E62	2	29.20	18° 3' 11.53"	67° 18' 35.15"	23.29	18° 3' 11.33"	67° 18' 29.97"	Rk	N	Replace	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
59	E63	1				19.80	18° 2' 40.94"	67° 18' 27.54"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
60	E64	1				19.75	18° 2' 59.84"	67° 18' 29.51"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
61	E65	2	20.10	18° 3' 0.42"	67° 16' 44.32"	18.06	18° 3' 0.08"	67° 16' 47.85"	Rk	N	Replace	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
62	E66	2	11.70	18° 3' 7.57"	67° 16' 21.74"	9.73	18° 3' 11.01"	67° 16' 25.23"	Rk	N	Replace	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
63	E67	2	18.20	18° 2' 49.17"	67° 16' 40.03"	16.38	18° 2' 48.94"	67° 16' 39.32"	Rk	N	Replace	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>

Shoal Categories

1–New Shoal Found

2-Charted Shoal Disproved / Not Found

Sequence No	Shoal No	Category	CHARTED			SURVEYED			Type of Feature	Further Examination Recommended	Charting Recommendation	Remarks
			Charted Depth (meters)	NAD83 Latitude N (DMS)	NAD83 Longitude W (DMS)	Surveyed Depth (meters)	NAD83 Latitude N (DMS)	NAD83 Longitude W (DMS)				
64	E68	1				0.20	18° 2' 53.13"	67° 11' 58.22"	Rk Awash	N	Insert	<i>Concur. Chart Rock.</i>
65	E69	1				-1.40	18° 4' 35.76"	67° 11' 27.92"	Wreck	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
66	E70	1				6.20	18° 5' 35.45"	67° 15' 27.58"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
67	E71	2	14.60	18° 5' 50.55"	67° 16' 27.52"	9.08	18° 5' 50.7"	67° 16' 27.32"	Rk	N	Replace	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
68	E72	1				0.49	18° 5' 45.53"	67° 17' 6"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
69	E73	1				17.25	18° 5' 49.03"	67° 17' 36.56"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
70	E74	1				17.89	18° 4' 46.75"	67° 17' 33.81"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
71	E75	2	14.60	18° 5' 1.77"	67° 13' 35.07"	9.63	18° 5' 2.96"	67° 13' 32.06"	Rk	N	Replace	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
72	E76	2	Drying Rk	18° 3' 56.06"	67° 11' 27.09"					N	Remove	Not detected by lidar, not observed in downward looking video. <i>Do not concur. Retain as charted.</i>
73	E77	1				2.55	18° 6' 40.79"	67° 11' 55.23"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
74	E78	1				0.69	18° 6' 19.79"	67° 11' 15.74"	Rk	N	Insert	See Danger to Navigation Report Item 12. <i>Do not concur. Item is in rocky area, chart representative soundings.</i>
75	E79	1				2.53	18° 4' 34.09"	67° 12' 22.08"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
76	E80	1				4.09	18° 4' 19.72"	67° 12' 15.56"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>

Shoal Categories

1–New Shoal Found

2-Charted Shoal Disproved / Not Found

Sequence No	Shoal No	Category	CHARTED			SURVEYED			Type of Feature	Further Examination Recommended	Charting Recommendation	Remarks
			Charted Depth (meters)	NAD83 Latitude N (DMS)	NAD83 Longitude W (DMS)	Surveyed Depth (meters)	NAD83 Latitude N (DMS)	NAD83 Longitude W (DMS)				
77	E81	1				3.09	18° 4' 5.16"	67° 12' 26.73"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
78	E82	1				2.78	18° 4' 0.82"	67° 11' 57.37"	Rk	N	Insert	See Danger to Navigation Report Item 13. <i>Do not concur. Item is in rocky area, chart representative soundings.</i>
79	E83	1				2.15	18° 3' 17.95"	67° 12' 13.56"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
80	E84	1				2.63	18° 3' 10.19"	67° 12' 11.16"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
81	E85	1				3.05	18° 4' 26.39"	67° 14' 45.14"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
82	E86	1				2.32	18° 4' 36.26"	67° 15' 7.06"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
83	E87	1				2.72	18° 4' 33.81"	67° 15' 10.2"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
84	E88	1				2.76	18° 3' 56.56"	67° 15' 41"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
85	E89	1				1.88	18° 6' 8.88"	67° 17' 8.72"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
86	E90	2	Rk	18° 5' 57.96 834 "	67° 17' 5.48 162 "	0.25	18° 5' 57.83"	67° 17' 7.16"	Rk Awash	N	Replace	<i>Concur. Chart Rock Awash.</i>
87	E91	2	Rk	18° 6' 41.42 12.429 "	67° 17' 3.03 00.638 "	0.13	18° 6' 12.43"	67° 17' 0.64"	Rk Awash	N	Replace	<i>Concur. Chart Rock Awash.</i>
88	E92	2	Rk	18° 6' 24.11 22.832 "	67° 16' 9.53 6.097 "	0.12	18° 6' 22.83"	67° 16' 6.1"	Rk Awash	N	Replace	<i>Concur. Chart Rock Awash.</i>
89	E93	1				18.68	18° 6' 22.46"	67° 17' 46.67"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
90	E94	1				13.63	18° 6' 13.75"	67° 17' 19.34"	Rk	N	Insert	<i>Do not concur. Item in rocky area.</i>

Shoal Categories

1–New Shoal Found

2-Charted Shoal Disproved / Not Found

Sequence No	Shoal No	Category	CHARTED			SURVEYED			Type of Feature	Further Examination Recommended	Charting Recommendation	Remarks
			Charted Depth (meters)	NAD83 Latitude N (DMS)	NAD83 Longitude W (DMS)	Surveyed Depth (meters)	NAD83 Latitude N (DMS)	NAD83 Longitude W (DMS)				
											All items covered by 4x4m laser spot spacing at 200% lidar coverage.	
											<i>Chart survey soundings.</i>	
91	E95	2	20.10	18° 6' 2.62"	67° 14' 53.22"	18.85	18° 6' 3.77"	67° 14' 54.74"	Rk	N	Replace	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
92	E96	1				18.76	18° 5' 42.04"	67° 15' 5.14"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
93	E97	1				16.15	18° 5' 45.11"	67° 17' 26.84"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
94	E98	1				17.60	18° 5' 47.52"	67° 17' 57.77"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
95	E99	1				17.80	18° 6' 1.1"	67° 18' 0.47"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
96	E100	1				5.59	18° 5' 26.31"	67° 16' 31.25"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
97	E101	1				10.40	18° 5' 16.65"	67° 15' 39.1"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
98	E102	1				2.83	18° 4' 58.64"	67° 16' 18.51"	Rk	N	Insert	See Danger to Navigation Report Item 14. <i>Do not concur. Item is in rocky area, chart representative soundings.</i>
99	E103	1				7.07	18° 5' 16.1"	67° 16' 33.82"	Rk	N	Insert	See Danger to Navigation Report Item 15. <i>Do not concur. Item is in rocky area, chart representative soundings.</i>
100	E104	1				7.88	18° 4' 58.44"	67° 16' 49.44"	Rk	N	Insert	See Danger to Navigation Report Item 16. <i>Do not concur. Item is in rocky area, chart representative soundings.</i>
101	E105	1				10.99	18° 4' 58.74"	67° 17' 5.52"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>

Shoal Categories

1–New Shoal Found

2-Charted Shoal Disproved / Not Found

Sequence No	Shoal No	Category	CHARTED			SURVEYED			Type of Feature	Further Examination Recommended	Charting Recommendation	Remarks
			Charted Depth (meters)	NAD83 Latitude N (DMS)	NAD83 Longitude W (DMS)	Surveyed Depth (meters)	NAD83 Latitude N (DMS)	NAD83 Longitude W (DMS)				
102	E106	1				17.47	18° 5' 0.51"	67° 17' 49.98"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
103	E107	1				16.61	18° 4' 21.37"	67° 18' 27.77"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
104	E108	1				17.69	18° 4' 28.4"	67° 17' 47.81"	Rk	N	Insert	See Danger to Navigation Report Item 17. <i>Do not concur. Item is in rocky area, chart representative soundings.</i>
105	E109	1				7.08	18° 4' 39.36"	67° 16' 20.53"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
106	E110	1				2.68	18° 3' 52.32"	67° 12' 2.53"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
107	E111	1				10.63	18° 3' 51.24"	67° 16' 7.99"	Rk	N	Insert	See Danger to Navigation Report Item 18. <i>Do not concur. Item is in rocky area, chart representative soundings.</i>
108	E112	1				6.39	18° 3' 55.95"	67° 15' 48.7"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
109	E113	1				12.59	18° 3' 41.94"	67° 16' 30.28"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
110	E114	1				13.49	18° 2' 47.84"	67° 17' 23.64"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
111	E115	1				9.74	18° 2' 52.32"	67° 17' 3.88"	Rk	N	Insert	See Danger to Navigation Report Item 19. <i>Do not concur. Item is in rocky area, chart representative soundings.</i>
112	E116	1				15.39	18° 3' 12.71"	67° 16' 51.72"	Rk	N	Insert	<i>Do not concur. Item in rocky area. Chart survey soundings.</i>
113	E117	1				12.14	18° 3' 3.75"	67° 16' 23.09"	Rk	N	Insert	See Danger to Navigation Report Item 20. <i>Do not concur. Item is in</i>

Shoal Categories

1–New Shoal Found

2-Charted Shoal Disproved / Not Found

Sequence No	Shoal No	Category	CHARTED			SURVEYED			Type of Feature	Further Examination Recommended	Charting Recommendation	Remarks
			Charted Depth (meters)	NAD83 Latitude N (DMS)	NAD83 Longitude W (DMS)	Surveyed Depth (meters)	NAD83 Latitude N (DMS)	NAD83 Longitude W (DMS)				
											<p>All items covered by 4x4m laser spot spacing at 200% lidar coverage.</p> <p><i>rocky area, chart representative soundings.</i></p>	

Shoal Categories

1–New Shoal Found

2-Charted Shoal Disproved / Not Found

D.1.5 Additional Boatwork Inside Lidar Area

Additional boatwork may be required to supplement the gaps in the lidar coverage.

D.1.5.1 Features Requiring Investigation

Features as described in section B.2.7 have a degree of uncertainty associated with them due to their size, and they could be considered as features requiring further investigation. The wreck described in section D.1.2 may also require further investigation to determine its significance. No other features have been identified to require further investigation. **Concur.**

D.1.5.2 Gaps in the Data

Areas where no lidar coverage exist are provided in the S-57 Feature File (US511561.000). Data gaps are listed below:

- Turbidity. Two regions of turbidity exist along the coast in the survey area. The first region is along the coast due to river outflow, and the second region is offshore between the shallow reef structures.

In the first region there are two distinct areas along the coast. The first area is to the northeast of Punta Ostiones due to the presence of a river, and the turbidity is present from the northeast of the survey area to Punta Ostiones. The second area is at the head of the bay at Puerto Real. These two areas could be considered as a hazard to the local boating community due to the gap in the data because of the turbidity. **Concur with clarification. See section B.2.7.**

These two areas are summarized below:

Area	Latitude (N)	Longitude (W)	Dimension (m)	Water Depth (m)	Remark
1	18° 06' 27"	67° 11' 20"	950 x 2200	7 - 9	950m S of Cayo Ratones
2	18° 04' 11"	67° 11' 14"	750 x 1200	1 - 2	Coastline of Puerto Real

The second distinct region relates to the offshore turbidity areas, which exist in Canal De Guanajibo and in the channels between the shallow offshore reefs. These areas pose a potential navigational hazard to marine traffic approaching the southwest of Puerto Rico. **Concur with clarification. See section B.2.7.**

These areas have been summarized below:

Area	Latitude (N)	Longitude (W)	Dimension (m)	Water Depth (m)	Remark
3	18° 05' 40"	67° 13' 59"	550 x 1150	17 - 18	3500m W of Punta Ostiones and 1000m N of Las Coronas. Small turbid patch S. <i>Not significant at chart scale.</i>
4	18° 05' 23"	67° 13' 19"	1650 x 50	10 - 18	1700m NW of Cayo Fanduca and directly N of Las Coronas. Two small turbid patches located N. <i>Not significant at chart scale.</i>
5	18° 05' 34"	67° 12' 34"	150 x 550	9 - 11	1200m N of Cayo Fanduca. <i>Not significant at chart scale.</i>
6	18° 04' 22"	67° 13' 15"	1500 x 2300	11 - 18	1200m W of Punta Carenero and directly S of Las Coronas. Many small turbid patches surrounding. <i>Area was excluded from H-cell.</i>
7	18° 03' 19"	67° 14' 17"	800 x 200	20 - 21	3700m W of Punta Carenero and 700m S of Las Coronas. Turbid patch S and small turbid patch NW. <i>Not significant at chart scale.</i>
8	18° 03' 20"	67° 15' 22"	450 x 450	22	5500m W of Punta Boca Pieta and 900m S of Las Coronas. Turbid patch NE. <i>Not significant at chart scale.</i>
9	18° 03' 53"	67° 16' 21"	50 x 150	23 - 24	In a channel between Las Coronas and Bajo Corona Larga. <i>Not significant at chart scale.</i>
10	18° 05' 10"	67° 16' 12"	60 x 130	23 - 25	Within a channel at Las Coronas. <i>Not significant at chart scale.</i>
11	18° 05' 55"	67° 15' 13"	150 x 250	20 - 22	5700m WNW of Punta Ostiones and 200m E of a reef. Turbid patches in vicinity. <i>Not significant at chart scale.</i>
12	18° 05' 52"	67° 14' 36"	100 x 110	20 - 21	4500m W of Punta Ostiones in the middle of Canal De Guanajibo. Turbid patches in vicinity. <i>Not significant at chart scale.</i>
13	18° 05' 04"	67° 15' 34"	400 x 500	20 - 22	6400m WSW of Punta

					Ostiones and at the entrance to a channel. Turbid patch W. <i>Not significant at chart scale.</i>
14	18° 04' 14"	67° 13' 57"	500 x 100	18 - 20	2800m SW of Cayo Fanduca. Other turbid patches in vicinity. <i>Not significant at chart scale.</i>

These gaps have been created as unsurveyed areas (UNSARE) and attributed as INFORM = Turbidity in the S-57 Features File (US511561.000). ***Only the area listed under number 6 above was excluded from the H-cell. All other areas were insignificant at chart scale.***

- Secondary Exclusion Zone. A gap due to the Secondary Exclusion Zone occurs in very shallow areas near the land / sea interface. The depth or height cannot be accurately determined from the waveform when the bottom and sea surface returns merge. There are 27 areas where no data exists due to the Secondary Exclusion Zone. Many of these areas exist in areas approaching beaches where the seabed has a very gentle slope. These gaps have been created as unsurveyed areas (UNSARE) and attributed as INFORM = Secondary Exclusion Zone in the S-57 feature file (US511561.000). It is possible that depths are shoaler within these gaps than the surrounding data, and least depth for these areas has not been determined. The gaps have not been recommended for further investigation, as all the gaps exist within charted foul areas or in close proximity to charted drying rocks or islets. ***Concur.***

D.1.6 Aid to Navigation

No aids to navigation exist within the H11561 survey area. ***Concur.***

D.1.7 Recommended Overlap With Lidar Data

The recommended overlap by surface vessels for smooth sheet H11561 is to seaward of the data coverage polygon defined by S-57 object M_COVR, CATCOV = 1. ***Concur.***

E. APPROVAL SHEET**LETTER OF APPROVAL – OPR-I305-KRL-06**

This report and the accompanying LADS deliverables are respectfully submitted.

Field operations contributing to the accomplishment of this survey were conducted under my direct supervision with frequent personal checks of progress and adequacy. This report and the accompanying digital data have been closely reviewed and are considered complete and adequate as per the Statement of Work.

ReportSubmission Date

Descriptive Report – H11561

September 25, 2007



Mark Sinclair
Hydrographer
Tenix LADS Incorporated

Date September 24, 2007

APPENDIX I – DANGERS TO NAVIGATION

*****For all items in this section, defer to Descriptive Report Section D.1. for charting recommendations.*****

DTONS Submitted to AHB

1.1. Danger to Navigation Report

Hydrographic Survey Registry Number: H11561

State: Puerto Rico

Locality: Southwest Puerto Rico

Sub-locality: Vicinity of Punta Carenero

Project Number: OPR-I305-KRL-06

Survey Dates: April – May 2006

Depths are in meters and reduced to Mean Lower Low Water using final verified tides. Drying heights are in meters relative to MLLW. Positions are based on the NAD83 horizontal datum. All times and dates are relative to UTC.

Charts Affected

Number	Version	Date	Scale
25671	18th Ed	March 22, 2003	1:100,000
25640	41st Ed	March 20, 2004	1:326,856

The following items were found during hydrographic survey operations:

No.	Feature	Depth	Latitude (N)	Longitude (W)	Time and Date	Investigate
1	Rk	13.8	18° 06' 06.74" N	67° 17' 50.89" W	12:31:04, April 24	No
2	Rk	2.5	18° 06' 30.95" N	67° 12' 04.71" W	16:29:43, April 9	No
3	Rk	15.9	18° 05' 37.41" N	67° 17' 43.80" W	11:30:08, April 29	No
4	Rk	8.4	18° 05' 32.23" N	67° 18' 32.71" W	15:34:34, April 22	No

No.	Feature	Depth	Latitude (N)	Longitude (W)	Time and Date	Investigate
5	Rk	11.2	18° 05' 02.62" N	67° 18' 10.31" W	12:16:56, April 24	No
6	Rk	7.9	18° 05' 10.55" N	67° 16' 41.03" W	12:21:49, April 18	No
7	Rk	4.1	18° 04' 31.66" N	67° 12' 47.45" W	15:47:37, April 18	No
8	Rk	11.6	18° 04' 35.42" N	67° 16' 44.57" W	12:44:49, April 18	No
9	Rk	13.0	18° 04' 39.99" N	67° 17' 47.35" W	12:30:29, April 24	No
10	Rk	14.8	18° 04' 26.74" N	67° 18' 16.02" W	12:39:26, April 24	No
11	Rk	9.6	18° 03' 56.94" N	67° 17' 30.04" W	14:39:23, April 18	No
12	Rk	0.7	18° 06' 19.79" N	67° 11' 15.74" W	14:53:37, April 10	No
13	Rk	2.8	18° 04' 00.82" N	67° 11' 57.37" W	16:54:36, April 9	No
14	Rk	2.8	18° 04' 58.64" N	67° 16' 18.51" W	12:24:19, April 11	No
15	Rk	7.1	18° 05' 16.10" N	67° 16' 33.82" W	15:07:20, May 10	No
16	Rk	7.9	18° 04' 58.44" N	67° 16' 49.44" W	14:07:01, April 18	No
17	Rk	7.1	18° 04' 39.36" N	67° 16' 20.53" W	12:01:37, April 11	No
18	Rk	10.6	18° 03' 51.24" N	67° 16' 07.99" W	13:20:11, April 18	No
19	Rk	9.7	18° 02' 52.32" N	67° 17' 03.88" W	15:15:14, April 18	No
20	Rk	12.1	18° 03' 03.75" N	67° 16' 23.09" W	12:00:57, April 11	No

COMMENTS: Final verified tides have been applied from the Magueyes Island (9759110) and the Punta Guanajibo (9759421) tide gauges. The shoals were found using LIDAR.

Questions concerning this report should be directed to the Survey Manager Mr. Darren Stephenson in the Tenix LADS Inc. office in Biloxi MS at (228) 594-6800.

DTONS Submitted to MCD**1.2. Danger to Navigation Report****H11561 DtoNs #1**

Registry Number: H11561
State: Puerto Rico
Locality: Southwest Puerto Rico
Sub-locality: Vicinity of Punta Carenero
Project Number: OPR-I305-KRL-06
Survey Dates: 04/09/2007 - 05/11/2007

Charts Affected

Number	Version	Date	Scale
25671	18th Ed.	03/01/2003	1:100000
25640	42nd Ed.	11/01/2006	1:326856

Features

No.	Name	Feature Type	Survey Depth	Survey Latitude	Survey Longitude	AWOIS Item
1.1	Rock 1	GP	13.80 m	18° 06' 06.740" N	067° 17' 50.890" W	---
1.2	Rock 2	GP	2.50 m	18° 06' 30.950" N	067° 12' 04.710" W	---
1.3	Rock 3	GP	15.90 m	18° 05' 37.410" N	067° 17' 43.800" W	---
1.4	Rock 4	GP	8.40 m	18° 05' 32.230" N	067° 18' 32.710" W	---
1.5	Rock 5	GP	11.20 m	18° 05' 02.620" N	067° 18' 10.310" W	---
1.6	Rock 6	GP	7.90 m	18° 05' 10.550" N	067° 16' 41.030" W	---
1.7	Rock 7	GP	4.10 m	18° 04' 31.660" N	067° 12' 47.450" W	---
1.8	Rock 8	GP	11.60 m	18° 04' 35.420" N	067° 16' 44.570" W	---
1.9	Rock 9	GP	13.00 m	18° 04' 39.990" N	067° 17' 47.350" W	---
1.10	Rock 10	GP	14.80 m	18° 04' 26.740" N	067° 18' 16.020" W	---
1.11	Rock 11	GP	9.60 m	18° 03' 56.940" N	067° 17' 30.040" W	---
1.12	Rock 12	GP	0.70 m	18° 06' 19.790" N	067° 11' 15.740" W	---
1.13	Rock 13	GP	2.80 m	18° 04' 00.820" N	067° 11' 57.370" W	---
1.14	Rock 14	GP	2.80 m	18° 04' 58.640" N	067° 16' 18.510" W	---
1.15	Rock 15	GP	7.10 m	18° 05' 16.100" N	067° 16' 33.820" W	---
1.16	Rock 16	GP	7.90 m	18° 04' 58.440" N	067° 16' 49.440" W	---
1.17	Rock 17	GP	7.10 m	18° 04' 39.360" N	067° 16' 20.530" W	---

Generated by Pydro v7.3 (r2143) on Fri Sep 21 19:23:34 2007 [UTC]

1.18	Rock 18	GP	10.60 m	18° 03' 51.240" N	067° 16' 07.990" W	---
1.19	Rock 19	GP	9.70 m	18° 02' 52.320" N	067° 17' 03.880" W	---
1.20	Rock 20	GP	12.10 m	18° 03' 03.750" N	067° 16' 23.090" W	---

1 - Danger To Navigation

1.1) Rock 1**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 18° 06' 06.740" N, 067° 17' 50.890" W
Least Depth: 13.80 m
Timestamp: 2007-131.17:40:54.000 (05/11/2007)
GP Dataset: H11561_DtoN#1.xls
GP No.: 1
Charts Affected: 25671_1, 25640_1

Remarks:

Depths are reduced to Mean Lower Low Water using final verified tides. Positions are based on the NAD83 horizontal datum. All times and dates are relative to UTC.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11561_DtoN#1.xls	1	0.00	000.0	Primary

Hydrographer Recommendations

Chart a 7 1/2 fm rock at the given location.

Cartographically-Rounded Depth (Affected Charts):

7 1/2 fm (25671_1, 25640_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)
Attributes: QUASOU - 6:least depth known
 RECDAT - 20070919
 SORDAT - 20060511
 SORIND - US,US,surve,H11561
 TECSOU - 7:found by laser
 VALSOU - 13.8 m

H11561 DtoNs #1

1 - Danger To Navigation

VERDAT - 12:Mean lower low water

WATLEV - 3:always under water/submerged

Concur. Chart 7 1/2 fm rock at the surveyed location.

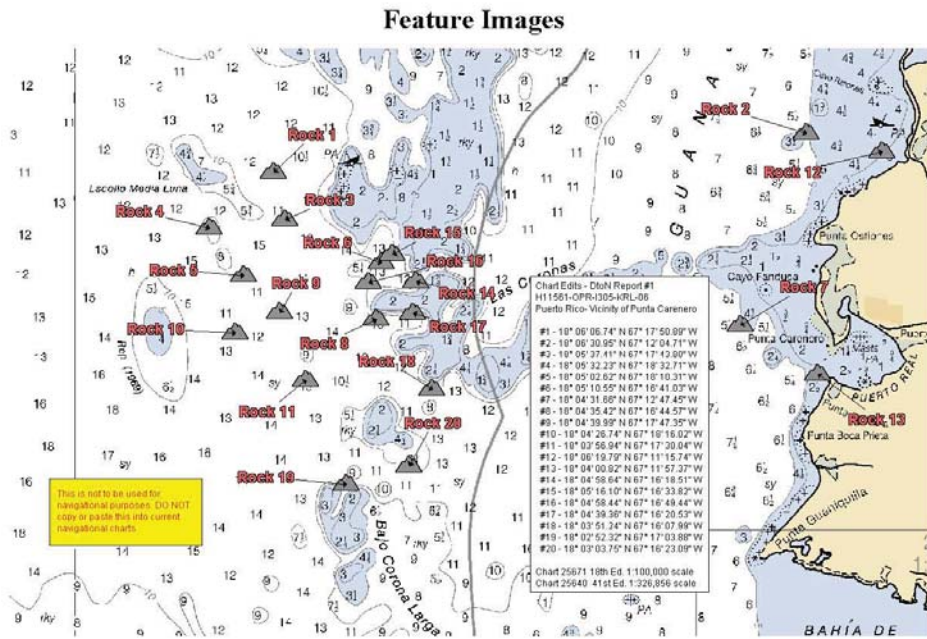


Figure 1.1.1

1.2) Rock 2**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 18° 06' 30.950" N, 067° 12' 04.710" W
Least Depth: 2.50 m
Timestamp: 2007-099.16:29:43.000 (04/09/2007)
GP Dataset: H11561_DtoN#1.xls
GP No.: 2
Charts Affected: 25671_1, 25640_1

Remarks:

Depths are reduced to Mean Lower Low Water using final verified tides. Positions are based on the NAD83 horizontal datum. All times and dates are relative to UTC.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11561_DtoN#1.xls	2	0.00	000.0	Primary

Hydrographer Recommendations

Chart a 1 1/4 fm rock at the given location.

Cartographically-Rounded Depth (Affected Charts):

1 1/4fm (25671_1, 25640_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)
Attributes: QUASOU - 6:least depth known
 RECDAT - 20070919
 SORDAT - 20060409
 SORIND - US,US,surve,H11561
 TECSOU - 7:found by laser
 VALSOU - 2.5 m

H11561 DtoNs #1

1 - Danger To Navigation

VERDAT - 12:Mean lower low water

WATLEV - 3:always under water/submerged

*Concur with clarification. Recommend to represent the rock as a 1 fm
2ft charted depth. Recommend to delete the 1 1/4 Rk from the chart.*

1.3) Rock 3**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 18° 05' 37.410" N, 067° 17' 43.800" W
Least Depth: 15.90 m
Timestamp: 2007-119.11:30:08.000 (04/29/2007)
GP Dataset: H11561_DtoN#1.xls
GP No.: 3
Charts Affected: 25671_1, 25640_1

Remarks:

Depths are reduced to Mean Lower Low Water using final verified tides. Positions are based on the NAD83 horizontal datum. All times and dates are relative to UTC.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11561_DtoN#1.xls	3	0.00	000.0	Primary

Hydrographer Recommendations

Chart a 8 3/4 fm rock at the given location.

Cartographically-Rounded Depth (Affected Charts):

8 3/4fm (25671_1, 25640_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)
Attributes: QUASOU - 6:least depth known
 RECDAT - 20070919
 SORDAT - 20060429
 SORIND - US,US,surve,H11561
 TECSOU - 7:found by laser
 VALSOU - 15.9 m

H11561 DtoNs #1

1 - Danger To Navigation

VERDAT - 12:Mean lower low water

WATLEV - 3:always under water/submerged

Concur with clarification. Recommend to represent the rock as a 8fm 4ft charted depth. Recommend to delete 8 fm Rk.

1.4) Rock 4**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 18° 05' 32.230" N, 067° 18' 32.710" W
Least Depth: 8.40 m
Timestamp: 2007-112.15:34:34.000 (04/22/2007)
GP Dataset: H11561_DtoN#1.xls
GP No.: 4
Charts Affected: 25671_1, 25640_1

Remarks:

Depths are reduced to Mean Lower Low Water using final verified tides. Positions are based on the NAD83 horizontal datum. All times and dates are relative to UTC.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11561_DtoN#1.xls	4	0.00	000.0	Primary

Hydrographer Recommendations

Chart a 4 1/2 fm rock at the given location.

Cartographically-Rounded Depth (Affected Charts):

4 ½fm (25671_1, 25640_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)
Attributes: QUASOU - 6:least depth known
 RECDAT - 20070919
 SORDAT - 20060422
 SORIND - US,US,surve,H11561
 TECSOU - 7:found by laser
 VALSOU - 8.4 m

H11561 DtoNs #1

1 - Danger To Navigation

VERDAT - 12:Mean lower low water

WATLEV - 3:always under water/submerged

*Concur with clarification. Recommend to represent the rock as a 4fm
3ft charted depth. Recommend to delete charted 4 1/2 Rk.*

1.5) Rock 5**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 18° 05' 02.620" N, 067° 18' 10.310" W
Least Depth: 11.20 m
Timestamp: 2007-114.12:16:56.000 (04/24/2007)
GP Dataset: H11561_DtoN#1.xls
GP No.: 5
Charts Affected: 25671_1, 25640_1

Remarks:

Depths are reduced to Mean Lower Low Water using final verified tides. Positions are based on the NAD83 horizontal datum. All times and dates are relative to UTC.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11561_DtoN#1.xls	5	0.00	000.0	Primary

Hydrographer Recommendations

Chart a 6 fm rock at the given location.

Cartographically-Rounded Depth (Affected Charts):

6fm (25671_1, 25640_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)
Attributes: QUASOU - 6:least depth known
 RECDAT - 20070919
 SORDAT - 2006040424
 SORIND - US,US,surve,H11561
 TECSOU - 7:found by laser
 VALSOU - 11.2 m

H11561 DtoNs #1

1 - Danger To Navigation

VERDAT - 12:Mean lower low water

WATLEV - 3:always under water/submerged

Concur with clarification. Recommend to chart rock as a 6fm charted depth located in 18-04-59.388N, 067-18-09.205W. Recommend to delete charted 6fm Rk.

1.6) Rock 6**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 18° 05' 10.550" N, 067° 16' 41.030" W
Least Depth: 7.90 m
Timestamp: 2007-108.12:21:49.000 (04/18/2007)
GP Dataset: H11561_DtoN#1.xls
GP No.: 6
Charts Affected: 25671_1, 25640_1

Remarks:

Depths are reduced to Mean Lower Low Water using final verified tides. Positions are based on the NAD83 horizontal datum. All times and dates are relative to UTC.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11561_DtoN#1.xls	6	0.00	000.0	Primary

Hydrographer Recommendations

Chart a 4 1/4 fm rock at the given location.

Cartographically-Rounded Depth (Affected Charts):

4 1/4fm (25671_1, 25640_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)
Attributes: SORDAT - 20060418
 SORIND - US,US,surve,H11561
 VALSOU - 7.9 m
 WATLEV - 3:always under water/submerged

Concur with clarification. Recommend to delete charted 4 1/4 fm Rk. Recommend to represent the rock as a 4fm 2ft charted depth.

1.7) Rock 7**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 18° 04' 31.660" N, 067° 12' 47.450" W
Least Depth: 4.10 m
Timestamp: 2007-108.15:47:37.000 (04/18/2007)
GP Dataset: H11561_DtoN#1.xls
GP No.: 7
Charts Affected: 25671_1, 25640_1

Remarks:

Depths are reduced to Mean Lower Low Water using final verified tides. Positions are based on the NAD83 horizontal datum. All times and dates are relative to UTC.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11561_DtoN#1.xls	7	0.00	000.0	Primary

Hydrographer Recommendations

Chart a 2 1/4 fm rock at the given location.

Cartographically-Rounded Depth (Affected Charts):

2 1/4fm (25671_1, 25640_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)
Attributes: QUASOU - 6:least depth known
 RECDAT - 20070919
 SORDAT - 20060418
 SORIND - US,US,surve,H11561
 TECSOU - 7:found by laser
 VALSOU - 4.1 m

H11561 DtoNs #1

1 - Danger To Navigation

VERDAT - 12:Mean lower low water

WATLEV - 3:always under water/submerged

Concur. Retain charted 2 1/4fm Rk.

1.8) Rock 8**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 18° 04' 35.420" N, 067° 16' 44.570" W
Least Depth: 11.60 m
Timestamp: 2007-108.12:44:49.000 (04/18/2007)
GP Dataset: H11561_DtoN#1.xls
GP No.: 8
Charts Affected: 25671_1, 25640_1

Remarks:

Depths are reduced to Mean Lower Low Water using final verified tides. Positions are based on the NAD83 horizontal datum. All times and dates are relative to UTC.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11561_DtoN#1.xls	8	0.00	000.0	Primary

Hydrographer Recommendations

Chart a 6 1/4 fm rock at the given location.

Cartographically-Rounded Depth (Affected Charts):

6 1/4fm (25671_1, 25640_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)
Attributes: QUASOU - 6:least depth known
 RECDAT - 20070919
 SORDAT - 20060418
 SORIND - US,US,surve,H11561
 TECSOU - 7:found by laser
 VALSOU - 11.6 m

H11561 DtoNs #1

1 - Danger To Navigation

VERDAT - 12:Mean lower low water

WATLEV - 3:always under water/submerged

*Concur with clarification. Recommend to delete charted 6 1/4 fm
Rk. Recommend to represent the rock as a 6fm 2ft charted depth.*

1.9) Rock 9**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 18° 04' 39.990" N, 067° 17' 47.350" W
Least Depth: 13.00 m
Timestamp: 2007-114.12:30:39.000 (04/24/2007)
GP Dataset: H11561_DtoN#1.xls
GP No.: 9
Charts Affected: 25671_1, 25640_1

Remarks:

Depths are reduced to Mean Lower Low Water using final verified tides. Positions are based on the NAD83 horizontal datum. All times and dates are relative to UTC.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11561_DtoN#1.xls	9	0.00	000.0	Primary

Hydrographer Recommendations

Chart a 7 fm rock at the given location.

Cartographically-Rounded Depth (Affected Charts):

7fm (25671_1, 25640_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)
Attributes: QUASOU - 6:least depth known
 RECDAT - 20070919
 SORDAT - 20060424
 SORIND - US,US,surve,H11561
 TECSOU - 7:found by laser
 VALSOU - 13.0 m

H11561 DtoNs #1

1 - Danger To Navigation

VERDAT - 12:Mean lower low water

WATLEV - 3:always under water/submerged

*Concur with clarification. Recommend to delete charted 7fm Rk.
Recommend to represent the rock as a 7fm charted depth.*

1.10) Rock 10**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 18° 04' 26.740" N, 067° 18' 16.020" W
Least Depth: 14.80 m
Timestamp: 2007-114.12:39:26.000 (04/24/2007)
GP Dataset: H11561_DtoN#1.xls
GP No.: 10
Charts Affected: 25671_1, 25640_1

Remarks:

Depths are reduced to Mean Lower Low Water using final verified tides. Positions are based on the NAD83 horizontal datum. All times and dates are relative to UTC.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11561_DtoN#1.xls	10	0.00	000.0	Primary

Hydrographer Recommendations

Chart a 8 fm rock at the given location.

Cartographically-Rounded Depth (Affected Charts):

8fm (25671_1, 25640_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)
Attributes: QUASOU - 6:least depth known
 RECDAT - 20070919
 SORDAT - 20060424
 SORIND - US,US,surve,H11561
 TECSOU - 7:found by laser
 VALSOU - 14.8 m

H11561 DtoNs #1

1 - Danger To Navigation

VERDAT - 12:Mean lower low water

WATLEV - 3:always under water/submerged

*Concur with clarification. Recommend to delete charted 8fm Rk.
Recommend to represent the rock as a 8fm charted depth.*

1.11) Rock 11**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 18° 03' 56.940" N, 067° 17' 30.040" W
Least Depth: 9.60 m
Timestamp: 2007-108.14:39:23.000 (04/18/2007)
GP Dataset: H11561_DtoN#1.xls
GP No.: 11
Charts Affected: 25671_1, 25640_1

Remarks:

Depths are reduced to Mean Lower Low Water using final verified tides. Positions are based on the NAD83 horizontal datum. All times and dates are relative to UTC.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11561_DtoN#1.xls	11	0.00	000.0	Primary

Hydrographer Recommendations

Chart a 5 1/4 fm rock at the given location.

Cartographically-Rounded Depth (Affected Charts):

5 1/4fm (25671_1, 25640_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)
Attributes: QUASOU - 6:least depth known
 RECDAT - 20070919
 SORDAT - 20060418
 SORIND - US,US,surve,H11561
 TECSOU - 7:found by laser
 VALSOU - 9.6 m

H11561 DtoNs #1

1 - Danger To Navigation

VERDAT - 12:Mean lower low water

WATLEV - 3:always under water/submerged

*Concur with clarification. Recommend to delete charted 5 1/4 fm Rk.
Recommend to represent the rock as a 5fm 1ft charted depth.*

1.12) Rock 12**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 18° 06' 19.790" N, 067° 11' 15.740" W
Least Depth: 0.70 m
Timestamp: 2007-100.14:53:37.000 (04/10/2007)
GP Dataset: H11561_DtoN#1.xls
GP No.: 12
Charts Affected: 25671_1, 25640_1

Remarks:

Depths are reduced to Mean Lower Low Water using final verified tides. Positions are based on the NAD83 horizontal datum. All times and dates are relative to UTC.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11561_DtoN#1.xls	12	0.00	000.0	Primary

Hydrographer Recommendations

Chart a 1/4 fm rock at the given location.

Cartographically-Rounded Depth (Affected Charts):

0 1/4fm (25671_1, 25640_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)
Attributes: QUASOU - 6:least depth known
 RECDAT - 20070919
 SORDAT - 20060410
 SORIND - US,US,surve,H11561
 TECSOU - 7:found by laser
 VALSOU - 0.7 m

H11561 DtoNs #1

1 - Danger To Navigation

VERDAT - 12:Mean lower low water

WATLEV - 3:always under water/submerged

Concur. Retain charted 1/4 fm Rk. This Rk is located outside the area of H11561 H-Cell compilation.

1.13) Rock 13**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 18° 04' 00.820" N, 067° 11' 57.370" W
Least Depth: 2.80 m
Timestamp: 2007-099.16:54:36.000 (04/09/2007)
GP Dataset: H11561_DtoN#1.xls
GP No.: 13
Charts Affected: 25671_1, 25640_1

Remarks:

Depths are reduced to Mean Lower Low Water using final verified tides. Positions are based on the NAD83 horizontal datum. All times and dates are relative to UTC.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11561_DtoN#1.xls	13	0.00	000.0	Primary

Hydrographer Recommendations

Chart a 1 1/2 fm rock at the given location.

Cartographically-Rounded Depth (Affected Charts):

1 1/2fm (25671_1, 25640_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)
Attributes: QUASOU - 6:least depth known
 RECDAT - 20070919
 SORDAT - 20060409
 SORIND - US,US,surve,H11561
 TECSOU - 7:found by laser
 VALSOU - 2.8 m

H11561 DtoNs #1

1 - Danger To Navigation

VERDAT - 12:Mean lower low water

WATLEV - 3:always under water/submerged

Do not concur. Recommend to delete charted 1 1/2 fm Rk. Based upon compilation scale, a shoaler rock located within the charted danger curve is recommended for charting in lieu of the submitted DtoN (1 1/2fm Rk).

1.14) Rock 14**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 18° 04' 58.640" N, 067° 16' 18.510" W
Least Depth: 2.80 m
Timestamp: 2007-101.12:24:19.000 (04/11/2007)
GP Dataset: H11561_DtoN#1.xls
GP No.: 14
Charts Affected: 25671_1, 25640_1

Remarks:

Depths are reduced to Mean Lower Low Water using final verified tides. Positions are based on the NAD83 horizontal datum. All times and dates are relative to UTC.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11561_DtoN#1.xls	14	0.00	000.0	Primary

Hydrographer Recommendations

Chart a 1 1/2 fm rock at the given location.

Cartographically-Rounded Depth (Affected Charts):

1 1/2 fm (25671_1, 25640_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)
Attributes: QUASOU - 6:least depth known
 RECDAT - 20070919
 SORDAT - 20060411
 SORIND - US,US,surve,H11561
 TECSOU - 7:found by laser
 VALSOU - 2.8 m

H11561 DtoNs #1

1 - Danger To Navigation

VERDAT - 12:Mean lower low water

WATLEV - 3:always under water/submerged

*Concur with clarification. Recommend to delete charted 1 1/2 fm Rk.
Recommend to represent the rock as a 1fm 3ft charted depth.*

1.15) Rock 15**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 18° 05' 16.100" N, 067° 16' 33.820" W
Least Depth: 7.10 m
Timestamp: 2007-130.15:07:20.000 (05/10/2007)
GP Dataset: H11561_DtoN#1.xls
GP No.: 15
Charts Affected: 25671_1, 25640_1

Remarks:

Depths are reduced to Mean Lower Low Water using final verified tides. Positions are based on the NAD83 horizontal datum. All times and dates are relative to UTC.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11561_DtoN#1.xls	15	0.00	000.0	Primary

Hydrographer Recommendations

Chart a 3 3/4 fm rock at the given location.

Cartographically-Rounded Depth (Affected Charts):

3 3/4fm (25671_1, 25640_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)
Attributes: QUASOU - 6:least depth known
 RECDAT - 20070919
 SORDAT - 20060510
 SORIND - US,US,surve,H11561
 TECSOU - 7,8:found by laser,swept by vertical acoustic system
 VALSOU - 7.1 m

H11561 DtoNs #1

1 - Danger To Navigation

VERDAT - 12:Mean lower low water

WATLEV - 3:always under water/submerged

Concur with clarification. Recommend to delete charted 3 3/4 fm Rk. Based upon compilation scale, it is recommended to represent the rock as a 3fm 5ft charted depth.

1.16) Rock 16**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 18° 04' 58.440" N, 067° 16' 49.440" W
Least Depth: 7.90 m
Timestamp: 2007-108.14:07:01.000 (04/18/2007)
GP Dataset: H11561_DtoN#1.xls
GP No.: 16
Charts Affected: 25671_1, 25640_1

Remarks:

Depths are reduced to Mean Lower Low Water using final verified tides. Positions are based on the NAD83 horizontal datum. All times and dates are relative to UTC.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11561_DtoN#1.xls	16	0.00	000.0	Primary

Hydrographer Recommendations

Chart a 4 1/4 fm rock at the given location.

Cartographically-Rounded Depth (Affected Charts):

4 1/4fm (25671_1, 25640_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)
Attributes: QUASOU - 6:least depth known
 RECDAT - 20070919
 SORDAT - 20060418
 SORIND - US,US,surve,H11561
 TECSOU - 7:found by laser
 VALSOU - 7.9 m

H11561 DtoNs #1

1 - Danger To Navigation

VERDAT - 12:Mean lower low water

WATLEV - 3:always under water/submerged

Concur with clarification. Recommend to delete charted 4 1/4 fm Rk. Recommend to represent the rock as a 4fm 2ft charted depth.

1.17) Rock 17**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 18° 04' 39.360" N, 067° 16' 20.530" W
Least Depth: 7.10 m
Timestamp: 2007-101.12:01:37.000 (04/11/2007)
GP Dataset: H11561_DtoN#1.xls
GP No.: 17
Charts Affected: 25671_1, 25640_1

Remarks:

Depths are reduced to Mean Lower Low Water using final verified tides. Positions are based on the NAD83 horizontal datum. All times and dates are relative to UTC.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11561_DtoN#1.xls	17	0.00	000.0	Primary

Hydrographer Recommendations

Chart a 3 3/4 fm rock at the given location.

Cartographically-Rounded Depth (Affected Charts):

3 3/4fm (25671_1, 25640_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)
Attributes: QUASOU - 6:least depth known
 RECDAT - 20070919
 SORDAT - 20060411
 SORIND - US,US,surve,H11561
 TECSOU - 7:found by laser
 VALSOU - 7.1 m

H11561 DtoNs #1

1 - Danger To Navigation

VERDAT - 12:Mean lower low water

WATLEV - 3:always under water/submerged

Concur with clarification. Recommend to delete charted 3 3/4 fm Rk. Recommend to represent the rock as a 3fm 5ft charted depth.

1.18) Rock 18**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 18° 03' 51.240" N, 067° 16' 07.990" W
Least Depth: 10.60 m
Timestamp: 2007-108.13:20:11.000 (04/18/2007)
GP Dataset: H11561_DtoN#1.xls
GP No.: 18
Charts Affected: 25671_1, 25640_1

Remarks:

Depths are reduced to Mean Lower Low Water using final verified tides. Positions are based on the NAD83 horizontal datum. All times and dates are relative to UTC.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11561_DtoN#1.xls	18	0.00	000.0	Primary

Hydrographer Recommendations

Chart a 5 3/4 fm rock at the given location.

Cartographically-Rounded Depth (Affected Charts):

5 3/4fm (25671_1, 25640_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)
Attributes: QUASOU - 6:least depth known
 RECDAT - 20070919
 SORDAT - 20060418
 SORIND - US,US,surve,H11561
 TECSOU - 7:found by laser
 VALSOU - 10.6 m

H11561 DtoNs #1

1 - Danger To Navigation

VERDAT - 12:Mean lower low water

WATLEV - 3:always under water/submerged

Concur with clarification. Recommend to delete charted 5 3/4 fm Rk. Recommend to represent the rock as a 5fm 5ft charted depth.

1.19) Rock 19**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 18° 02' 52.320" N, 067° 17' 03.880" W
Least Depth: 9.70 m
Timestamp: 2007-108.15:15:14.000 (04/18/2007)
GP Dataset: H11561_DtoN#1.xls
GP No.: 19
Charts Affected: 25671_1, 25640_1

Remarks:

Depths are reduced to Mean Lower Low Water using final verified tides. Positions are based on the NAD83 horizontal datum. All times and dates are relative to UTC.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11561_DtoN#1.xls	19	0.00	000.0	Primary

Hydrographer Recommendations

Chart a 5 1/4 fm rock at the given location.

Cartographically-Rounded Depth (Affected Charts):

5 1/4fm (25671_1, 25640_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)
Attributes: QUASOU - 6:least depth known
 RECDAT - 20070919
 SORDAT - 20060418
 SORIND - US,US,surve,H11561
 TECSOU - 7:found by laser
 VALSOU - 9.7 m

H11561 DtoNs #1

1 - Danger To Navigation

VERDAT - 12:Mean lower low water

WATLEV - 3:always under water/submerged

Concur with clarification. Recommend to delete charted 5 1/4 fm Rk. Recommend to represent the rock as a 5fm 2ft charted depth.

1.20) Rock 20**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 18° 03' 03.750" N, 067° 16' 23.090" W
Least Depth: 12.10 m
Timestamp: 2007-101.12:00:57.000 (04/11/2007)
GP Dataset: H11561_DtoN#1.xls
GP No.: 20
Charts Affected: 25671_1, 25640_1

Remarks:

Depths are reduced to Mean Lower Low Water using final verified tides. Positions are based on the NAD83 horizontal datum. All times and dates are relative to UTC.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11561_DtoN#1.xls	20	0.00	000.0	Primary

Hydrographer Recommendations

Chart a 6 1/2 fm rock at the given location.

Cartographically-Rounded Depth (Affected Charts):

6 ½fm (25671_1, 25640_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)
Attributes: QUASOU - 6:least depth known
 RECDAT - 20070919
 SORDAT - 20060411
 SORIND - US,US,surve,H11561
 TECSOU - 7:found by laser
 VALSOU - 12.1 m

H11561 DtoNs #1

1 - Danger To Navigation

VERDAT - 12:Mean lower low water

WATLEV - 3:always under water/submerged

Concur with clarification. Recommend to delete charted 6 1/2 fm Rk. Recommend to represent the rock as a 6fm 4ft charted depth.

APPENDIX II – LIST OF GEOGRAPHIC NAMES

Geographical names were not checked during the survey, and no amendments are proposed.

APPENDIX III – PROGRESS SKETCH
PROGRESS SKETCH

15 May 2006

OPR-I305-KRL-06

Puerto Rico

Tenix LADS Inc.

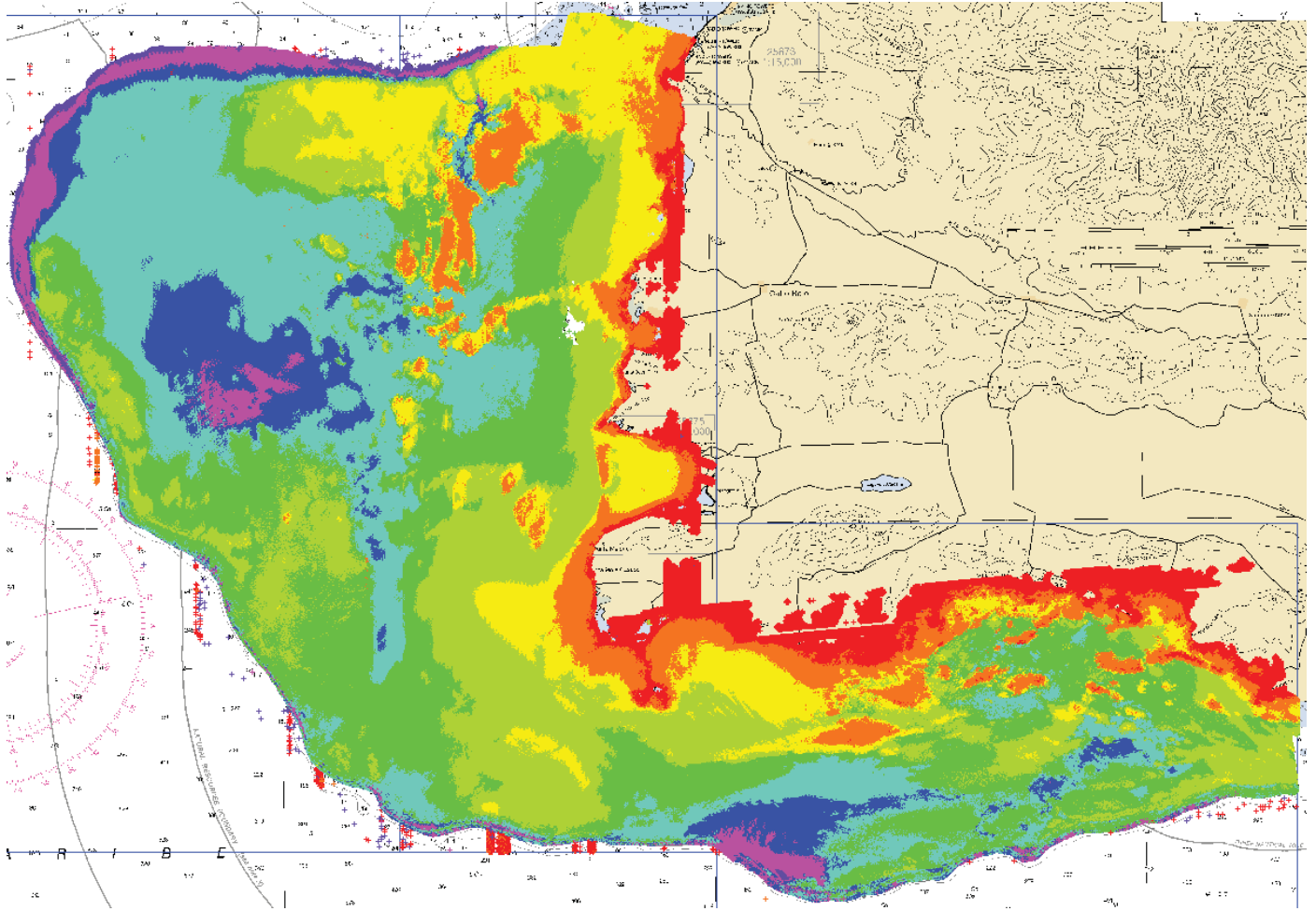
Darren Stephenson, Lead Hydrographer

Deployed to the field on April 07, 2006 and conducted the first survey sortie on April 09, 2006.

This status is of May 15, 2006 after 21 survey flights and the status includes an additional area to the west covered by the modification 1 to this task order T0008.

The area covered is 265SNM at 200% coverage.

	April	May	Total	Total Planned	% Complete
Days on project	22	15	37	36	
Line – nm - flown	7023.16	1264.44	8287.60	7581.26	109.3
Aircraft flown hours	111.1	23.0	134.1		
Aircraft on task hours	85.0	17.3	102.3		
Days with flight	17	4	21	23	91.3
No flight due to weather	0	0	0		
No flight due to system	0	0	0		
No flight due to aircraft	0	8	8		
Hours lost to weather	1.5		1.5		
Hours lost to system	2.5	1	3.5		



APPENDIX IV – TIDES AND WATER LEVELS

Abstract of Times of Hydrography

Start and End times refer to tidal applications requirement.

Time on Task indicates actual time of task in the survey area. All times and dates are in UTC.

06_3caborojo

Date Flown	JD	Sortie No	Start Time	End Time	Tide Duration	Time on Task
April-09-06	99	1	12:30	18:24	5:54	4:17
April-10-06	100	2	12:00	19:00	7:00	4:45
April-11-06	101	3	10:30	18:30	8:00	5:16
April-12-06	102	4	11:00	18:30	8:30	5:28
April-13-06	103	5	9:00	15:00	6:00	3:21
April-15-06	105	6	9:00	17:30	8:30	5:09
April-17-06	107	7	8:00	19:00	11:00	5:24
April-18-06	108	8	9:30	18:00	8:30	5:07
April-19-06	109	9	9:30	17:30	8:00	4:15
April-20-06	110	10	10:00	16:30	6:30	4:49
April-22-06	112	11	10:00	18:00	8:00	5:04
April-24-06	114	12	10:00	18:30	8:30	5:31
April-25-06	115	13	9:30	18:00	8:30	5:46
April-26-06	116	14	9:30	17:30	8:00	4:37
April-28-06	118	16	10:00	17:30	7:30	5:47
April-29-06	119	17	10:00	18:00	8:00	5:30
April-30-06	120	18	10:00	18:00	8:00	4:50
May-10-06	130	19	9:30	17:30	8:00	5:02
May-11-06	131	20	14:30	20:30	6:00	4:19
May-12-06	132	21	13:30	20:00	6:30	4:05
May-13-06	133	22	9:00	16:00	7:00	3:55

Magueyes Island, PR
Station ID: 9759110

Magueyes Island, PR: Data Inventory
Page Help

Datums

Click [HERE](#) for printable version

Data Units:

Feet Meters

Apply Change

Nov 8 2006 12:49

ELEVATIONS ON STATION DATUM
National Ocean Service (NOAA)

Station: 9759110

T.M.: 0

W

Name: MAGUEYES ISLAND, CARIBBEAN SEA, PR

Units:

Meters

Status: Accepted
 2001

Epoch: 1983-

Datum	Value	Description
MHHW	1.294	Mean Higher-High Water
MHW	1.292	Mean High Water
DTL	1.192	Mean Diurnal Tide Level
MTL	1.193	Mean Tide Level
MSL	1.191	Mean Sea Level
MLW	1.094	Mean Low Water
MLLW	1.091	Mean Lower-Low Water
GT	0.204	Great Diurnal Range
MN	0.198	Mean Range of Tide
DHQ	0.003	Mean Diurnal High Water Inequality
DLQ	0.003	Mean Diurnal Low Water Inequality
HWI		Greenwich High Water Interval (in Hours)
LWI		Greenwich Low Water Interval (in Hours)
NAVD		North American Vertical Datum
Maximum	1.781	Highest Water Level on Station Datum
Max Date	19980922	Date Of Highest Water Level
Max Time	05:48	Time Of Highest Water Level
Minimum	0.823	Lowest Water Level on Station Datum
Min Date	19680611	Date Of Lowest Water Level
Min Time	11:30	Time Of Lowest Water Level

To refer Water Level Heights to a Tidal Datum, apply the desired Datum Value.

Click [HERE](#) for further station information including New Epoch products.

T I D A L D A T U M S

Tidal datums at MAGUEYES ISLAND, CARIBBEAN SEA based on:

LENGTH OF SERIES: 19 Years
 TIME PERIOD: January 1983 - December 2001
 TIDAL EPOCH: 1983-2001
 CONTROL TIDE STATION:

Elevations of tidal datums referred to Mean Lower Low Water (MLLW), in METERS:

HIGHEST OBSERVED WATER LEVEL (09/22/1998) = 0.690
 MEAN HIGHER HIGH WATER (MHHW) = 0.204
 MEAN HIGH WATER (MHW) = 0.201
 MEAN TIDE LEVEL (MTL) = 0.102
 MEAN SEA LEVEL (MSL) = 0.101
 MEAN LOW WATER (MLW) = 0.003
 MEAN LOWER LOW WATER (MLLW) = 0.000
 LOWEST OBSERVED WATER LEVEL (06/11/1968) = -0.268

National Geodetic Vertical Datum (NGVD 29)

Bench Mark Elevation Information In METERS above:

Stamping or Designation	MLLW	MHW
TIDAL BM NO 1 CAMA UPR 1955 ELEV	3.664	3.463
TIDAL BM NO 2 CAMA UPR 1955 ELEV	6.959	6.758
TIDAL BM NO 3 CAMA UPR 1955 ELEV	10.246	10.045
9110 B 1980	3.183	2.982
9110 D 1980	0.671	0.470
9110 E 1980	0.937	0.736
9110 F 1982	1.746	1.545
9110 G 1982	3.244	3.042
9110 H 1998	3.019	2.818
975 9110 J 2000	1.424	1.223

Tide Station Report

Punta Guanajibo, Puerto Rico 975-9421

Position (NAD83):	18° 09' 36"	67° 10' 53"	Time Meridian = 0° (UTC)
Owner:	Dept. de Recursos Naturales y Ambientales Laboratoria de Investigaciones Pesqueras Aida Rosario Jimenez (Director) Juan De La Cruz Rasado Cruz (Admin. Dir)		P.O. Box 3665 (mailing) Mayaguez Puerto Rico, 00681 office: (787) 833-2025
Established:	March 14, 2006	Removed: June 1, 2006	
Type of station:	Tertiary	Density Observations: Yes	
Prime Contractor:	Tenix LADS Inc.	Darren Stephenson, project mgr.	
Tides Consultant:	John Oswald & Assoc, Anchorage, AK.	John Oswald, PLS, project mgr.	
Project Numbers:	OPR-1305-KRL-2006	JOA WO No: 81	
To Reach:	To reach the tide station by vehicle from the junction of Route 2 and Route 63 located about 1.6 km (1.0 mile) SW of the center of Mayaguez, proceed west on Route 63 (Avenida William C. Dunscombe) for 0.5 km (0.3 mile) to a T-intersection with Route 102, turn left on Route 102 and proceed southerly following the coast for 4.5 km (2.8 miles) to the top of a hill, continue down the hill for 0.40 km (0.25 miles) to a reverse turn on the right at the bottom of the hill, turn right on this reverse turn and proceed NWly for 0.32 km (0.20 mile) on a paved road to the security gate and guard shack. Check in with the guard to get access to the Fisheries Research property. The tide station, dock and all bench marks are inside this fenced and secured area.		
Tide House:	Established two digital bubbler tide gauges and the electronics for a radar tide gauge in 4' by 4' by 2' wood shed at the south end of a wooden dock. This dock is in poor condition, and is about 3 meters wide and 30 meters long, with a plank wood deck supported by concrete filled PVC and wood pilings. The radar gauge sensor was suspended off the damaged end of the dock, with wood and unistrut brackets. Orifices were mounted on the end of 3/4" iron pipe attached to treated 4 by 6 timbers. These orifice boards were in turn, banded to separate concrete filled PVC pilings about 25 meters from the shore.		
Tide Gauge(s):	Three gauges: Two digital bubblers: Design Analysis (DAA) H350XL, with H355 pump, and H222 (Signal Engineering) GOES radios, with Yagi antennas. One DAA H360 Radar gauge interfaced to a DAA H350XL DCP and H222 Goes Radio with Yagi Antenna. Bubbler range is 0 > 30 psi, and the radar gauge range is 0.3 > 22 m. Gauge #1 (Bubbler) H350XL S/N: 1042, Gauge #2 (Bubbler) H350XL S/N 1039, Gauge #3 (Radar) H360 S/N 1288 with H350XL S/N 1043. Two 12vdc batteries run each system are charged by individual 20 watt solar cells. GPS modules provide time syncing.		
Tide Staff	A 1.25 meter fiberglass survey rod, graduated in centimeters from 2.79 to 4.04 meters, was bolted to a 2" x 6" board which was banded to a dock piling about 15 meters from shore. A stilling well with orange float was placed next to the graduations. The tide staff was leveled directly into the primary bench mark (BM 1 1975). The base of the radar gauge was also directly leveled into the PBM.		
GPS Tie:	Static L1/L2 GPS observations made on bench mark 975 9421 A.		
Tidal Bench Marks:	4 recovered Tidal 1, Tidal 3, Tidal 4, Tidal 5	1 established 975 9421 A	Primary Bench Mark: 975 9421 Tidal 1 (975 9421 Tidal 2 searched for, not found)
Third Order Leveling:	Initial: March 13-14, 2006		Closeout: May 31, 2006

APPENDIX V – SUPPLEMENTAL SURVEY RECORDS AND CORRESPONDENCE




NOAA SITE VISIT – SEPTEMBER 12-13, 2006






NOAA Attendees:

David Scarff – COTR
 Gene Parker – AHB
 Toshi Uozumi – PHB
 Megan Palmer - PHB

Tenix LADS Inc.
 925 Tommy Munro Dr. Suite J
 Biloxi, MS 39532



Maneuvers		Distance	Maps
	1: Start out going WEST on BAYVIEW AVE toward FAYARD ST.	0.1 miles	Map
	2: Merge onto I-110 N / MS-15 N toward I-10.	2.9 miles	Map
	3: Merge onto I-10 W via EXIT 4B toward NEW ORLEANS.	2.4 miles	Map

	4: Take the CEDAR LAKE RD exit- EXIT 44- toward COAST COLISEUM / BILOXI NATIONAL CEMETERY / HOSPITAL. / 0.2 miles Map
	5: Turn LEFT onto CEDAR LAKE RD. 0.5 miles Map
	6: Turn RIGHT onto POPPS FERRY RD. 0.3 miles Map
	7: Turn RIGHT onto TOMMY MUNRO DR. 0.1 miles Map
	8: End at 925 Tommy Munro Drive Biloxi, MS 39532, US Map

Total Est. Time: 10 minutes **Total Est. Distance:** 6.78 miles

SCHEDULE

Tuesday, September 12, 2006

1.1. Morning – Scott Ramsay

- Waveform Analysis
- Signal to noise ratio (SNR)
- Choosing contenders
- Bottom Object Detection (BODs)
- No Bottoms (NBs)
- No Bottom At (NBAs)
- Topographic lidar

1.2. Lunch

1.3. Afternoon – James Guilford

- Overview of 2006 Deliverables Workflow
- BAG in detail
- Creating S-57 features/feature management
- Chart comparisons

1.4. Evening

- Dinner for 7pm at Mary Mahony's (can give directions at office)

Wednesday, September 13, 2006

1.5. Morning – NOAA

- Branch Processing

- Quick Survey Acceptance Review (SAR)
- CARIS data review

Lunch

1.6. Afternoon – Darren Stephenson

- Spec and Deliverable Requirements: compliant or not?
- How to use these deliverables
- Metadata
- Meeting wrap-up

Email regarding rocks awash

Original Message-----

From: GUILFORD James
Sent: Tuesday, 23 January 2007 4:38 AM
To: STEPHENSON Darren
Subject: FW: Visit

James Guilford
Senior Hydrographer
Tenix LADS Inc.
925 Tommy Munro Dr. Ste J
Biloxi, MS 39532

Ph (O): 228-594-6800
Ph (M): 228-342-3028
Fax: 228-594-6887

-----Original Message-----

From: GUILFORD James
Sent: Wednesday, September 06, 2006 6:44 AM
To: 'David.Scharff'
Cc: STEPHENSON Darren; RAMSAY Scott
Subject: Visit

Hi Dave,

I have attached directions to the office from the Imperial Palace (I think that's where you guys are staying). Also there is a rough schedule for the two days. I have left the second morning to you. There are some topics that morning where I wasn't sure what you wanted to see from our end.

Also, if you guys are interested I was thinking of making reservations for dinner for Tuesday night.

Could you please forward this to the people involved. If you have any questions, please don't hesitate to contact me.

See you in a week
James

James Guilford
Senior Hydrographer
Tenix LADS Inc.
925 Tommy Munro Dr. Ste J
Biloxi, MS 39532

Ph (O): 228-594-6800
Ph (M): 228-342-3028
Fax: 228-594-6887

-----Original Message-----

From: GUILFORD James
Sent: Tuesday, 23 January 2007 4:36 AM
To: STEPHENSON Darren
Subject: FW: [Fwd: Re: UWTROC WATLEV Thresholds]

 James Guilford
 Senior Hydrographer
 Tenix LADS Inc.
 925 Tommy Munro Dr. Ste J
 Biloxi, MS 39532

Ph (O): 228-594-6800
 Ph (M): 228-342-3028
 Fax: 228-594-6887

-----Original

From: gene_parker [mailto:Castle.E.Parker@noaa.gov]
Sent: Thursday, January 04, 2007 1:23 PM
To: GUILFORD James
Subject: [Fwd: Re: UWTROC WATLEV Thresholds]

James, If the attached file does not arrive (sent twice) try the following FTP site. You can copy, but you can't write! It's the following address:
ftp://205.156.4.84/4AHB_H115577_ShtA-FromTenix/ncm_voll.pdf

gene

----- Original Message -----

Subject: Re: UWTROC WATLEV Thresholds
Date: Thu, 04 Jan 2007 13:56:58 -0500
From: gene_parker <castle.e.parker@noaa.gov>
Organization: NOAA / Atlantic Hydrographic Branch
To: GUILFORD James <James.GUILFORD@Tenix.com>
CC: RAMSAY Scott <Scott.RAMSAY@Tenix.com>
References: <200701041625.104GP2n4020866@sprint2.tenix.com>

Back to ya James, I'm going to list a reference at which you may obtain the information. I could regurgitate the information as Cathleen Barry has done for the west coast, but this would take me some time to modify the document. Instead, I'll point you back to the source which is Marine Chart Division's Nautical Chart Manual which is available via web access and one may download.

The Nautical Chart Manual (NCM) is now considered source documents and specifications for raster charts and ENC when generating H-cells or BASE Cell Files. The documents are available at the following web site:

<http://chartmaker.noaa.gov/staff/ncum/ncum.htm>

The attached version should be the same as on the web site is attached in one complete document. Within the NCM go to page 386 of 787 in the attached pdf file, or reference

Figure 4-11a within chapter 4. Also reference page 383 of 787 through 386 of 787 of the attached document.

land area is -0.3047m above MHW (MHW reference in the final tide note from OCS COOPS or with SOW and tidal information provided with SOW.

MHW -----

Exposed == **covers and uncovers** (Any feature that is between -0.30479m above MLLW and -0.30479 above MHW)

-0.30479m (-1-ft) above MLLW

MLLW -----**awash** (0.30479 to -0.30479 MLLW)

0.30479m (1-ft) below MLLW

----- **submerged** (0.30479m and deeper MLLW)

The document that you provided from PHB sources values that are referenced in Figure 4-11a.

Hope this is what you needed, if not please reply.

Regards, Gene

GUILFORD James wrote:

Hey Gene,

How are you? Hope you had a Merry Christmas and a Happy New Year. I have

a question for you concerning WATLEV values to be used for UWTRC objects. We have been given depth ranges from PHB for determining WATLEV

attribute values and what is considered Covers and Uncovers, Awash, and Always Submerged as well as what is an islet.

These values don't mesh for the Puerto Rico surveys as a result of the large difference in tidal ranges between AK and PR. Would you be able to supply me with appropriate values for PR?

Attached is a document from PHB

All the best in 2007

Thanks

James

James Guilford
Senior Hydrographer
Tenix LADS Inc.
925 Tommy Munro Dr. Ste J
Biloxi, MS 39532

Ph (O): 228-594-6800
Ph (M): 228-342-3028
Fax: 228-594-6887

-----Original Message-----

From: gene_parker [mailto:Castle.E.Parker@noaa.gov]
Sent: Wednesday, December 13, 2006 6:04 AM
To: GUILFORD James
Cc: David.Scharff; Tod Schattgen
Subject: Re: US Hydro Call for Papers

Hey James, Sounds OK with me. I need to think about it and then let's talk. I'm going on leave till the first of the year starting Friday; it's a case of use or lose.

I had been thinking about a paper from an AHB perspective but think we could approach from a different angle as you've mentioned. My original thoughts were similar to paper written in 2001 but an updated version of AHB QA/QC processing with the new deliverables. I would be interested in broadening the subject as it could be enlightening from the KR point of view and the issues that you've encountered with the new deliverables. Sounds good, let me think on it and let it bounce around for a little bit.

Hold that thought... Talk to you again, let's see if others approve. For me, I think it's a good idea and win-win situation for OCS.

Gene

GUILFORD James wrote:

> Hey Guys,
>
> How are things? I have been talking with Darren this morning and he mentioned that you guys might be interested in submitting a joint paper for the US Hydro conference.
>
> As far as a paper goes....I kind of want to avoid talking about the nitty gritty of processing using caris but rather focus on the shift made from how we used to deliver data to delivery of the new products. This is all still very preliminary but I was thinking for a title

something like:

- > Transitioning from the Paper to Digital Survey.
- >
- > The paper would overview how we used to deliver data and focus on how we are delivering data now and how it is being used by you guys.
- >
- > The paper would also touch on the use of internation standards and open source formats, challenges, advantages, disadvantages...
- >
- > What do you think?
- >
- > -----
- > James Guilford
- > Senior Hydrographer
- > Tenix LADS Inc.
- > 925 Tommy Munro Dr. Ste J
- > Biloxi, MS 39532
- >
- > Ph (O): 228-594-6800
- > Ph (M): 228-342-3028
- > Fax: 228-594-6887
- >
- > Disclaimer :
- > The contents of this e-mail including any attachments are intended only
- > for the person or entity to which this e-mail is addressed. If you are not,
- > or believe you may not be, the intended recipient, please advise the sender
- > immediately by return e-mail, delete this e-mail and destroy any copies.
- > Tenix does not warrant nor guarantee that this email communication is free
- > from errors, virus, interception or interference.

Disclaimer :

The contents of this e-mail including any attachments are intended only for the person or entity to which this e-mail is addressed. If you are not, or believe you may not be, the intended recipient, please advise the sender immediately by return e-mail, delete this e-mail and destroy any copies. Tenix does not warrant nor guarantee that this email communication is free from errors, virus, interception or interference.

Rock_Elevations.pdf	Name: S57_Encoding_Guide-
	Type: Portable Document Format

(application/pdf)

S57_Encoding_Guide-Rock_Elevations.pdf Encoding: base64

Description: S57_Encoding_Guide-

Rock_Elevations.pdf

Download Status: Not downloaded with message

Email regarding cultural features

-----Original
 Message-----
From: gene_parker [mailto:Castle.E.Parker@noaa.gov]
Sent: Wednesday, 2 May 2007 9:07 PM
To: STEPHENSON Darren
Cc: David Scharff (E-mail); GUILFORD James; Tod Schattgen; Norris A Wike
Subject: Re: Cultural features for H11566

Hello and good morning,

I talked with James on the phone yesterday while discussing the Hydro Conference poster. Since all of the cultural features are included in the S57 features file, we can query, filter, or isolate all the the pier/ jetty and other shoreline construction features based upon object feature code. I was thinking at first the separate file may be easier for processing and feature management to keep the cultural feature and bathy features separate, but after thinking about it and discussing with James, we can work with the one all inclusive feature file. Submitting the individual *.hob files would be nice to have. The jetty, buildings, and other cultural feature file would be an ancillary submission data type that might be good to have for AHB archive.

So, if you want to submit the all inclusive feature file for prelim review, it would give me an idea of what AHB would have to work with using Base Editor then to HOM. We'd like to make it as easy as possible due to the fact of so many features. The last thing we want is to have you document each feature in the DR!

Hope this agrees with you, but if it doesn't let's continue the discussion.

Have a great day! Gene

STEPHENSON Darren wrote:

Hi Gene

I agree that the best way would be to create an S-57 features file and then refer to this in the DR. As you know I am far from an expert with BASE editor so the I would have to refer the creation of a separate cultural features file to a discussion with James. Currently as you know, we have one S57.000 features file which includes all the individual .hob files including the ones for jetties, buildings and any other cultural features along the coastline. Is this acceptable? or as I mentioned above I will have to discuss with James how we can create another cultural features file from our existing features file and update the DR accordingly. Let me know your thoughts, maybe you can discuss this with James on Wednesday your time and I will touch base with James late Wednesday to see how we can move forward with this.

Regards

Darren

-----Original
 Message-----
From: gene_parker [mailto:Castle.E.Parker@noaa.gov]
Sent: Tuesday, 1 May 2007 8:55 PM
To: STEPHENSON Darren

Cc: David Scharff (E-mail); GUILFORD James; Tod Schattgen; Norris
A Wike
Subject: Re: Cultural features for H11566

Good Morning Darren,
I think your statement is adequate for DR explanation. In some sense I feel that the easiest way to document the identifiable cultural features, piers, and jetties would be to create an S57 cultural feature file (S57.000 format). I feel that it would be best to separate the bathy features from the cultural features as the bathy feature file probably contains *many* feature objects. This is based upon the bathy feature files that I have reviewed from previous PR surveys. If you do list the features individually in a table format, then place the table in Section D of the DR. In some sense, the digital feature file would work better for H-cell processing. That means that you would only have to briefly mention the features in the DR and reference to the cultural feature file. Either way you would have to detail many features in text format or digitally within the feature file.

Ultimately, AHB can recommend only so much and if not evident within the data we will defer the final charting disposition to Marine Chart Division Source Information Unit and Remote Sensing Division for most recent shoreline. Although I would like to use what content within the Tenix data is available and verifiable for charting application. I think that the features which are identifiable by the Lidar data should be included. If it doesn't show in the data, then we don't have source for the feature.

If the data supports the lengths of the features (jetties-piers), then creating an S57 line object would be acceptable and preferred. If you would like, create an S57 cultural feature file and only make reference in the DR to the file. If the feature file is generated, I would not list every feature in table format within the DR. However, if you do not create a feature file for these cultural features, a table within the DR is warranted. From that table, AHB would be able to create S57 feature objects for H-cell processing.

The final method of documenting the cultural feature can be left to your discretion. AHB can work with either format as table or S57 cultural feature file. If you generate the feature file, I think it will take less effort and work for AHB to incorporate the features into the Hcell.

Bearing in mind the number of features, what would you prefer? What is most efficient for you and the documentation would probably be the most efficient method for AHB.

Is this recommendation or guidance adequate and acceptable? If not, then let me know what you prefer.

Thanks for conferring and discussing the issue.

I hope all is well with you. Take care and let me know what you think.
Regards, Gene

STEPHENSON Darren wrote:

Gene

For survey H11566 especially along the east coast at the coastal town of La Parguera there are many cultural features along the water line and some of these are jetties. I have addressed these jetties in general terms by stating that jetties of various sizes exist along the coast which are not on the chart. These jetties vary from small household jetties which most likely have not been detected by lidar and are difficult to interpret from the orthophoto mosaic to larger jetties which extend up to 80m offshore.

The question is, how to report these?
Do you want a list of the jetties detected and verified in table format with latitude and longitude in the DR and state that possible small jetties exist along the coast from this point to that point?

kind regards

Darren Stephenson
Survey Manager Projects
Tenix LADS Incorporated

Disclaimer :

The contents of this e-mail including any attachments are intended only for the person or entity to which this e-mail is addressed. If you are not, or believe you may not be, the intended recipient, please advise the sender immediately by return e-mail, delete this e-mail and destroy any copies.
Tenix does not warrant nor guarantee that this email communication is free from errors, virus, interception or interference.

Email regarding Pontoons

-----Original Message-----

From: gene_parker [mailto:Castle.E.Parker@noaa.gov]
Sent: Thursday, 3 May 2007 10:52 PM
To: STEPHENSON Darren
Cc: David Scharff (E-mail); GUILFORD James
Subject: Re: Pontoons

Good Morning Darren,

I feel that you should enter these feature objects in the feature file. In review of the current ENC I don't find any reference to these pontoon features. Therefore, it is a new feature and you have data that supports the existence of these features. Therefore, we should append the raster chart and ENC with these features. Just because the chart scale in this area is not large enough to support a lot of the cultural features, doesn't mean we should exclude these features from the survey. I agree with you that it would be of interest to local small boaters. So, I would add to the features file and the only DR reference should be one sentence about the existence and list the general vicinity, then make statement to reference the S57 features file.

Thanks for your attention to the details! Good luck with final stages of the survey.
Gene

STEPHENSON Darren wrote:

> Gene

>

> We are getting close to finishing the H11566 report and the digital data and I think that I have one more question for you to ponder. During to survey in the very shallow waters along the coast in the vicinity of the township of La Parguera some permanent mooring structures of some description exist which appear in the same place on different sorties which tend to indicate that they may have some sort of permanency about them. However, due to there small size their permanency may come into question as they maybe removed during the monsoon season.

>

> Typically, they exist in 1.5 - 2.5 meters of water approximately 80 meters offshore between the coastline in the vicinity of La Parguera and offshore mangrove islets. They are small structures no bigger than 10 meters in size and from my point of view they pose no hazard to coastal shipping but may pose a hazard to the local recreational boater.

>

> I have identified a total of 7 of these structures.

>

> They do leave small gaps in the data.

>

> Should we attribute them in the S-57 feature file? Or just make a general statement in the DR that some these features may exist along the coast of La Parguera?

>

> Hopefully this should be my last question.

>
> kind regards
>
> Darren Stephenson
> Survey Manager - Projects
> Tenix LADS Incorporated
>
> Disclaimer :
> The contents of this e-mail including any attachments are intended only
> for the person or entity to which this e-mail is addressed. If you are
> not,
> or believe you may not be, the intended recipient, please advise the
> sender
> immediately by return e-mail, delete this e-mail and destroy any copies.
> Tenix does not warrant nor guarantee that this email communication is
> free
> from errors, virus, interception or interference.

APPENDIX VI – AWOIS

No AWOIS were assigned to this task order.

**ATLANTIC HYDROGRAPHIC BRANCH
EVALUATION REPORT to ACCOMPANY
SURVEY H11561 (2006)**

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.

B. DATA ACQUISITION AND PROCESSING

B.1 DATA PROCESSING

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

CARIS HIPS/SIPS version 6.1 SP2 HF 8
CARIS Bathy Manager version 2.1.0.0 SP1
CARIS S-57 Composer version 2.0 HF 3
DKART INSPECTOR, version 5.1 SP 1 Build 743
CARIS HOM version 3.3 SP3 HF 8

B.2. QUALITY CONTROL

B.2.1. H-Cell

The AHB source depth grid for the survey's nautical chart update product was the field's original 3m Lidar Base Surface (shoal layer). The survey scale soundings were extracted from the grid using an interval of 1mm at a scale of 100,000, which equates to approximately 100m spacing. A Triangulated Irregular Network TIN was created from the survey scale soundings from which an interpolated surface was generated. The chart scale soundings were selected from the filtered interpolated surface using a sounding spacing of approximately 600m. The chart scale selected soundings are a subset of the survey scale selected soundings. The surface model was referenced when selecting the chart scale soundings, to ensure that the selected soundings portrayed the bathymetry within the common area.

Depth curves were computer generated. A Triangulated Irregular Network (TIN) surface model was generated from the survey scale sounding set, then shifted vertically -0.229m from which the depth curves were drawn. The depth curves within the H11561_SS.00 included the 0, 1, 2, 3, 5, and 10 fathom curves. The depth curves are forwarded to MCD for reference only. The curves were utilized during chart scale sounding selection and quality assurance efforts at AHB. The depth curves are incorporated into the SS H-Cell product as per 2009 H-Cell Specifications.

The pre-compilation products or components (Stand Alone HOB files (SAHOB)) included depth areas (DEPARE), depth contours (DEPCNT), sounding

selections (SOUNDG), features (OBSTRN, SBDARE, WRECKS), US4PR60M_ENC Features (SOUNDG), Meta objects (M_COVR, M_QUAL), and cartographic Blue Notes (\$CSYMB).

All of the components with the exception of the sounding selection and depth contours were inserted into one feature layer (including the Bluenotes, as dictated by Hydrographic Technical Directive 2008-8), then exported to S-57 format in order to create the H-Cell deliverable. Similarly, the sounding selection and depth contours were exported into S-57 format separately, then converted the metric units to chart units of fathoms and feet.

Chart compilation was performed by Atlantic Hydrographic Branch personnel in Norfolk, Virginia. Compilation data will be forwarded to Marine Chart Division, Silver Spring, Maryland.

H11561 CARIS H-Cell final deliverables include the following products:

H11561_CS.000	1:100,000 Scale	H11561 H-Cell with Chart Scale Selected Soundings
H11561_SS.000	1:10,000 Scale	H11561 Selected Soundings (Survey Scale)

B.2.2. Junctions

Survey H11561 (2006) junctions with survey H11560 (2006) to the north, H11562 (2006) to the south, and H11558 (2006) to the west. H11561 survey depths compare within less than 1 foot with the junctional surveys. Present survey depths are in harmony with the charted hydrography to the east and west. For soundings that fall at the junction with H11560 defer to H11560 H-Cell for charting recommendation. For soundings that fall at the junction with H11562 defer to H11562 H-Cell for charting recommendation. For soundings that fall at the junction with H11558 defer to H11558 H-Cell for charting recommendation.

D. RESULTS AND RECOMMENDATIONS

D.1 CHART COMPARISON

25671 (18th Edition, Mar./03)

Corrected through NM 03/22/2003
 Corrected through LNM 03/04/2003
 Scale 1:100,000

ENC Comparison

US4PR60M

West Coast of Puerto Rico
 Edition 6
 Application Date 2007-10-22
 Issue Date 2007-10-22
 Chart 25671

D.1.1 Hydrography

The charted hydrography originates with prior surveys and requires no further consideration. The hydrographer makes adequate chart comparisons in section “D” and Appendix 1&2 of the Descriptive Report. The following exceptions are noted:

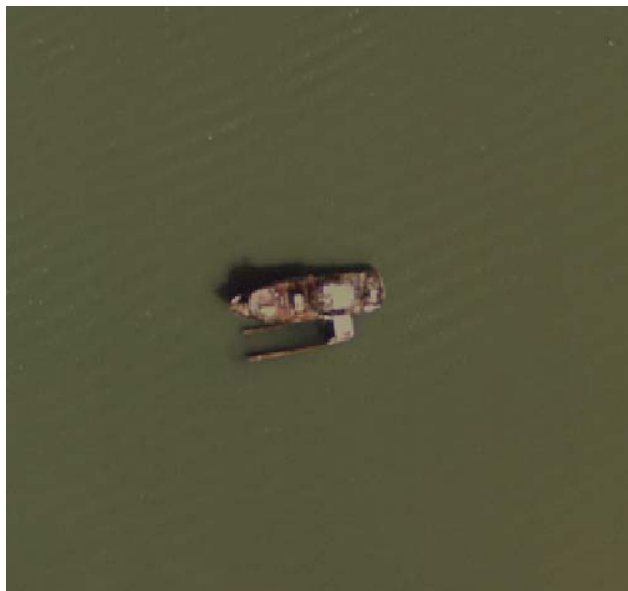
- a. A sunken dangerous wreck *Masts PA* charted on the ENC and raster chart located in 18/04/24.00N 067/11/30.0W was not disproved with the Lidar bathymetry data. Bearing in mind the charted wreck is not visible in the USGS ortho-imagery, it is recommended to retain the dangerous sunken wreck and delete the *Masts PA* legend.



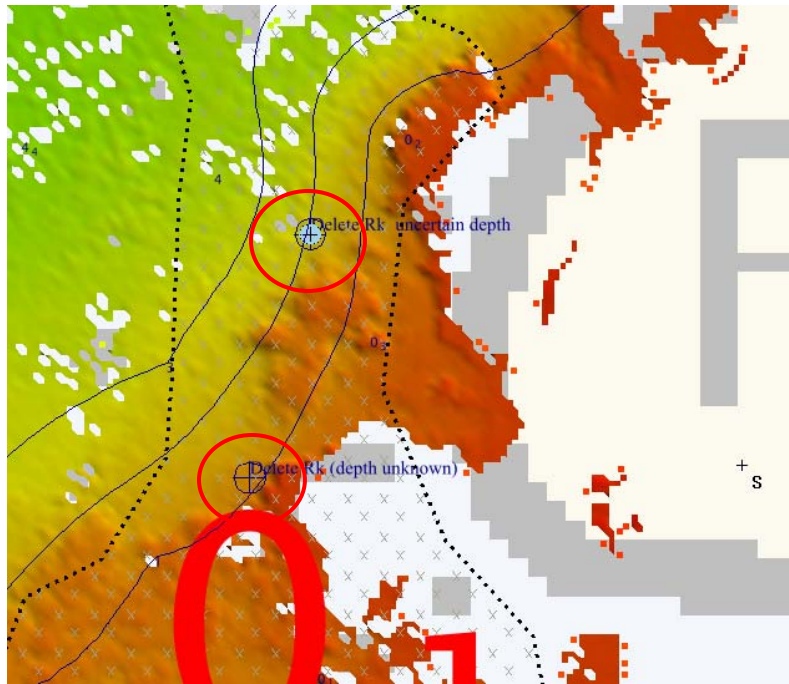
- b. A visible wreck was identified referenced from the USGS 30cm resolution imagery from 2006 (<http://seamless.usgs.gov/>). Recommend to append chart with a visible wreck located in at 18/04/20.16N 067/11/18.63W, height unknown.



- c. Uncharted wrecks were identified from the USGS 30cm resolution imagery. It is recommended to chart visible wrecks with the central location in 18/04/03.109N, 067/11/16.602W with wreck showing portions of the hull or superstructure.



- d. Two charted rocks of uncertain depth located in 18-05-27.964N, 067-12-02.570W and 18-05-23.831N, 067-12-03.643W were not supported by the bathymetric data as single stand alone rocks. The final grid model indicates elevated areas located to the south, east, and northeast. Recommend to delete the two charted rocks of uncertain depth and chart surveys depths within the common area. Both of the charted rocks of uncertain depth are within a seabed area polygon indicating rocky sea floor.



- e. A charted dangerous rock (uncertain depth) located in 18-05-35.603N, 067-11-54.859W was neither validated nor disproved. Recommend to retain as charted.

D.3. MISCELLANEOUS

Several blue notes were placed around the edges of the survey indicating retention or removal of current charted soundings. H11561 survey limits junctions with contemporary surveys from the same project. (See section B.2.2 for details). In all cases defer to the junction survey for charting recommendation.

Chart compilation was done by Atlantic Hydrographic Branch personnel, in Norfolk, Virginia. Compilation data will be forwarded to Marine Chart Division, Silver Spring, Maryland. See Section D.1. of this report for a list of the Raster Charts and Electronic Navigation Charts (ENC) used for compiling the present survey:

D.4. ADEQUACY OF SURVEY

The present survey is adequate to supersede the charted bathymetry within the common area. Any features not specifically addressed either in the H-Cell BASE Cell File or the Blue Notes should be retained as charted. Refer to the Descriptive Report for further recommendations by the hydrographer.

APPROVAL SHEET
H11561

Initial Approvals:

The completed survey has been inspected with regard to survey coverage, delineation of depth curves, representation of critical depths, cartographic symbolization, and verification or disproval of charted data. All revisions and additions made to the H-Cell files during survey processing have been entered in the digital data for this survey. The survey records and digital data comply with National Ocean Service and Office of Coast Survey requirements except where noted in the Descriptive Report and the Evaluation Report.

All final products have undergone a comprehensive reviews per the Hydrographic surveys Division Office Processing Manual and are verified to be accurate and complete except where noted.



Sarah M. Eggleston
Physical Scientist
Atlantic Hydrographic Branch

I have reviewed the H-Cell files, accompanying data, and reports. This survey and accompanying Marine Chart Division deliverables meet National Ocean Service requirements and standards for products in support of nautical charting except where noted.

Approved: _____
Richard T. Brennan
Lieutenant Commander, NOAA
Chief, Atlantic Hydrographic Branch