

USA - FLORIDA

Approaches to Miami

NOAA Descriptive Report to accompany Hydrographic Survey H12008



Surveyed by Tenix LADS, Incorporated
2008

OPR-H328-KRL-08
June 5, 2009

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey Hydrographic Lidar
Project No. OPR-H328-KRL-08
Registry No. H12008

LOCALITY

State Florida
General Locality Approaches to Miami
Sub-Locality Vicinity of Soldier Key

2008

HYDROGRAPHER
..... MARK SINCLAIR

CHIEF OF PARTY
..... SCOTT RAMSAY

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DATE

NOAA FORM 77-28 (11-72) <div style="text-align: center; margin-top: 10px;"> U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION </div> <div style="text-align: center; font-weight: bold; font-size: 1.2em; margin-top: 20px;"> HYDROGRAPHIC TITLE SHEET </div>	REGISTRY No. <div style="text-align: center; font-weight: bold; font-size: 1.2em; margin-top: 20px;"> H12008 </div>
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State Florida

General Locality Approaches to Miami

Sub-Locality Vicinity of Soldier Key *

Scale 1:10,000 Date of Survey July 13 to August 26, 2008

Instructions dated March 25, 2008 Project No. OPR-H328-KRL-08

Vessel Tenix LADS Aircraft, call sign VH-LCL

Hydrographer M.J. Sinclair Chief of Party S.R. Ramsay

Surveyed by J.G. Guilford, W.T. Newsham, K.J. Oberhofer, B.A. Weidman,
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R.B. Touchstone.

Soundings by Laser Airborne Depth Sounder

Graphic record scaled by B.A. Weidman

Graphic record checked by S.R. Ramsay, J.G. Guilford Automated Plot N/A

Verification by *Atlantic Hydrographic Branch Personnel*

Soundings in Meters *Feet* at MLLW

REMARKS * The sub-locality was amended in accordance with email at Appendix V.

Requisition / Purchase Req. # NCNJ3000-8-37170

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

Sub-Contractor John Oswald and Associates, 12001 Audubon Dr., Anchorage, AK 99516

Times All times are recorded in UTC.

Datum and Projection NAD83, UTM (N) Zone 17

Purpose 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.

Acronyms A complete list of all acronyms used throughout this report is provided at Appendix I of the Separates Report. * *Included as part of AHB H-Cell Deliverables*

Bold, Italic, Red notes in the Descriptive Report were made during office processing.

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DESCRIPTIVE REPORT TO ACCOMPANY**HYDROGRAPHIC SURVEY H12008****SCALE 1:10,000, SURVEYED IN 2008****TENIX LADS AIRCRAFT, VH-LCL****TENIX LADS, INC. (TLI)****MARK SINCLAIR, HYDROGRAPHER****PROJECT****Project Number:** OPR-H328-KRL-08**Original:** DG 133C-06-CQ-0066**Date of Instructions:** March 25, 2008 *Concur***Task Order:** T0004**Date of Supplemental Instructions:**

- August 4, 2008 – Email from Dave Scharff (NOAA COTR) approving proposed modification to required survey area.
- January 29, 2009 – Email from Dave Scharff (NOAA COTR) approving sub-locality name change in Statement of Work Attachment #4B.

Registry Number: H12008**Sheet:** E**A. AREA SURVEYED**

Survey operations covered five registered sheets over the OPR-H328-KRL-08 project area, Approaches to Miami, FL (see Figure 1 and Figure 2).

A total of 2836 lineal nautical miles were illuminated in the process of flying 375 main scheme survey lines. An additional 1512 lineal nautical miles were illuminated flying 193 reflies and 252 lineal nautical miles flying 60 crosslines / investigations. The total seabed area surveyed across the project area, from the Mean High Water (MHW) line to geographical extents of the survey area, was approximately 63 square nautical miles. Refer to Appendix III for further information.

Between July 13 and August 26, 2008, the LADS Mk II aircraft conducted 21 sorties in the vicinity of the Approaches to Miami, based out of Fort Lauderdale, FL. All survey flights were conducted between the hours of 22:30 and 06:00, due to the close proximity of the survey area to Miami International Airport. The specific dates of data acquisition for OPR-H328-KRL-08, hours flown and time on task were as follows:

Date (UTC)	Sortie No.	Hours Flown	Time on Task
15-Jul-08	2	5:31	4:32
17-Jul-08	3	6:39	5:26
20-Jul-08	4	2:41	1:58
21-Jul-08	5	3:05	1:45
23-Jul-08	6	6:30	5:42
24-Jul-08	7	2:26	1:33
27-Jul-08	8	2:50	1:03
29-Jul-08	9	4:30	3:40
01-Aug-08	10	7:08	6:29
02-Aug-08	11	7:13	6:38
05-Aug-08	12	7:16	6:22
07-Aug-08	13	5:26	4:36
08-Aug-08	14	6:05	5:28
10-Aug-08	16	7:36	6:52
14-Aug-08	18	7:04	6:27
16-Aug-08	19	1:38	0:53
17-Aug-08	20	4:33	3:47
18-Aug-08	21	4:19	3:20
23-Aug-08	23	6:25	5:43
24-Aug-08	24	2:56	2:21
25-Aug-08	25	6:15	5:35

Table 1: Specific Dates of Data Acquisition

Environmental factors such as water clarity, tide, wind strength and direction and cloud base height influenced the area and duration of data acquisition on a daily basis. See Section B.2.3 for further details.

This Descriptive Report describes Sheet E, which covers the Vicinity of Soldier Key (see Figure 2).

The sheet limits are as follows for Sheet E (coordinates are NAD83): *Concur*

H12008 (E)	Latitude (N)	Longitude (W)
NW corner	25° 37' 05.89"	80° 13' 32.95"
SW corner	25° 32' 58.84"	80° 13' 34.54"
SE corner	25° 32' 56.17"	80° 05' 48.71"
NE corner	25° 37' 03.21"	80° 05' 46.86"



Figure 1 – General Locality of OPR-H328-KRL-08

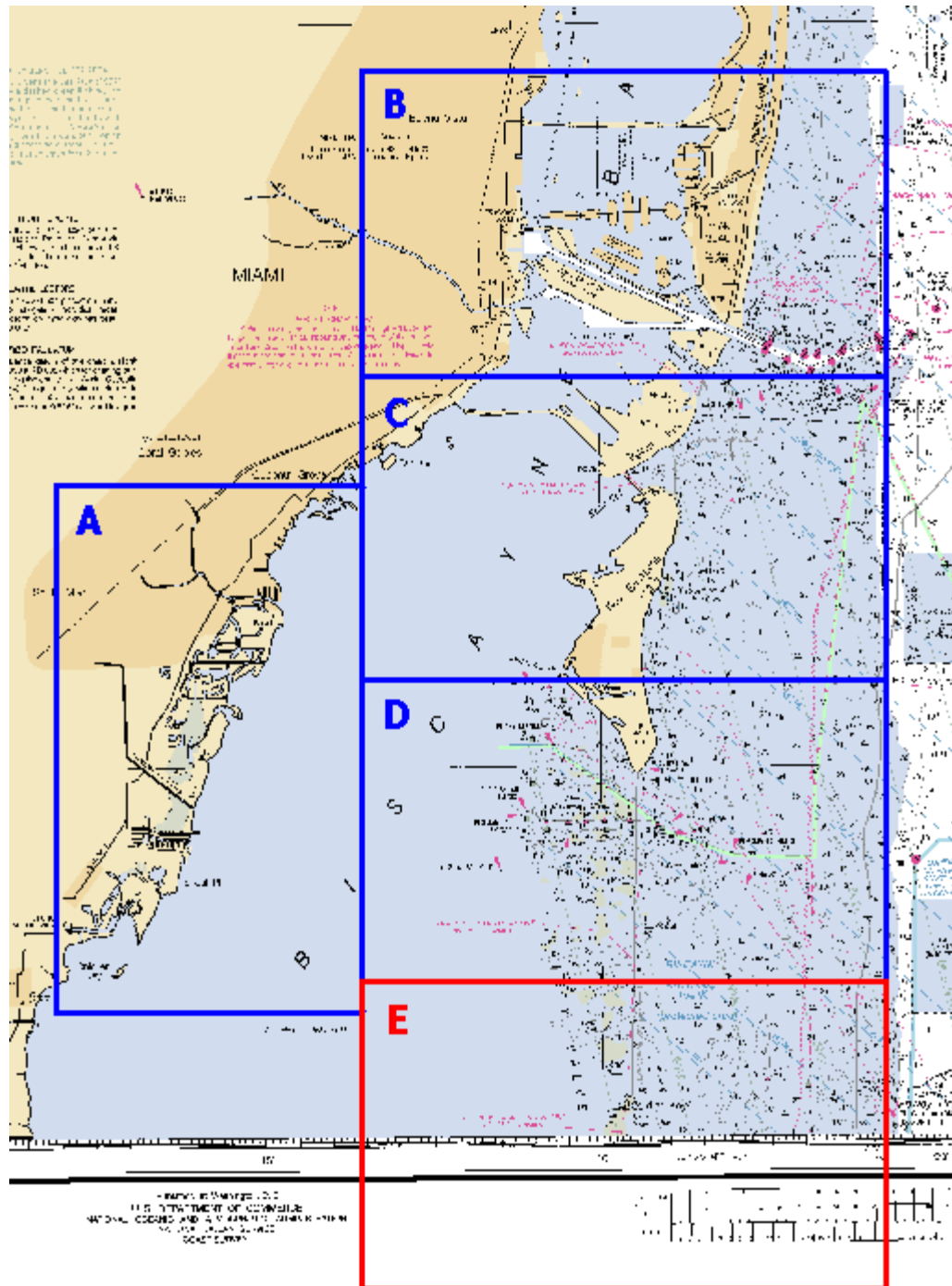


Figure 2 – Sub-Locality of H12008 (Sheet E)

B. DATA ACQUISITION AND PROCESSING *See also Evaluation Report*

Refer to the *Data Acquisition and Processing Report for a detailed description of the equipment, processing, and quality control procedures used during LADS surveys. 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 (AS), data processing using the LADS Mk II Ground System (GS), and data visualization, quality control and final products using CARIS HIPS and SIPS 6.1 and CARIS BASE Editor 2.1.

B.1.1 Airborne System

The LADS Mk II AS platform consists of a De Havilland Dash 8-200 Series aircraft, which has a transit speed of 250kts 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 of between 140 and 210kts. The aircraft is fitted with an 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 across the seabed.

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 (AHRS) and a Global Positioning System (GPS) receiver. Real-time positioning is obtained by an Ashtech GG24 GPS receiver providing autonomous GPS, or is combined with WADGPS (Fugro Omnistar), to provide a differentially corrected position, when coverage is available. Ashtech Z12 GPS receivers are also provided as part of the AS and GS to log data on the aircraft and at a locally established GPS base station.

A digital camera installed on the LADS Mk II system platform allows high quality images to be captured in real-time. These images are georeferenced and can be overlaid with the processed survey data. The specifications for the Redlake MegaPlus II ES 2020 digital camera are provided in the *Data Acquisition and Processing Report.

B.1.2 Ground System

The LADS Mk II GS 'Frodo' was used to conduct data processing in the field. Frodo 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, a digital audio tape (DAT) drive, a 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. The GS supports survey planning, data processing, quality control and data export. The GS also includes a KGPS base station, which provides independent post-processed position and height data. Quality control checks and editing of the data were conducted on GS 'Katrina', at the TLI office in Biloxi, MS, upon completion of the data collection phase of the survey. * *Included as part of AHB H-Cell Deliverables*

B.2 QUALITY CONTROL

B.2.1 Quality Control Checks

The internal relative consistency of the survey data was checked with crossline depth comparisons, depth benchmark comparisons, dynamic position checks and by observing position confidence quality factors on the GS. System integrity was checked, in an absolute sense, with the local GPS base station site confirmation and the static position check.

B.2.1.1 Crosslines

No specific crosslines were planned due to many investigation / additional coverage lines being flown perpendicular to main scheme survey runs. Additionally, main scheme lines flown perpendicular to each other, were used in these comparisons. Below are the overall depth comparison results for the 448 crossline / main scheme line intersections. A complete summary is presented in the *Separates Report.

Very few lines that qualify as crosslines were run over H12008. However, since the surveys is within the project OPR-H328-KRL-08 junction and were acquired during the same relative time frame the crossline requirement for H12008 has been met adequately.

Total Number of Comparisons	Mean Depth Difference (m)	Mean Standard Deviation (m)
386500	-0.01 +/- 0.06	0.05 +/- 0.03

B.2.1.2 Depth Benchmarks

Six gridded depth benchmark areas were created from bathymetry collected over benchmark run 4.0, which was flown west of Fowey Rocks Lighthouse on July 23, 2008. Comparisons between the gridded benchmark areas and bathymetry collected on benchmark runs flown during each sortie were used to check the relative depth accuracy of the LADS Mk II system for the H12008 survey. Center coordinates for the benchmark areas are as follows:

Benchmark Name	Nominal Depth	UTM (N) Zone 17	
		Easting	Northing
BM_1	7m	589 776	2 835 064
BM_2	5m	590 426	2 831 735
BM_3	3m	590 662	2 830 568
BM_4	13m	590 955	2 829 053
BM_5	20m	591 100	2 828 298
BM_6	25m	591 169	2 827 951

** Included as part of AHB H-Cell Deliverables*

Depth benchmark areas and benchmark flight lines were reduced to MLLW using Virginia Key verified tides, with time and range correctors as specified in Section C.2.

The LADS survey 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 noisy outliers are flagged as the shoalest and deepest differences.

A summary of the average of the MDD and SD for all depth benchmark area comparisons is presented below. Refer to the *Separates Report for detailed results of the depth benchmark comparison results.

GS ID	BM Name	Nominal Depth	Mean MDD (m)	Mean SD (m)
1	BM_1	7m	0.04 +/- 0.07	0.06 +/- 0.01
2	BM_2	5m	0.00 +/- 0.06	0.03 +/- 0.01
3	BM_3	3m	-0.02 +/- 0.05	0.06 +/- 0.01
8	BM_4	13m	0.12 +/- 0.08	0.04 +/- 0.01
5	BM_5	20m	0.16 +/- 0.10	0.07 +/- 0.01
6	BM_6	25m	0.19 +/- 0.12	0.08 +/- 0.02

The depth benchmark comparison results and the crossline comparisons results are within expected tolerances and show that the LADS Mk II depth performance was within specifications throughout the survey period.

B.2.1.3 Positioning Checks

Two independent positioning systems were used during the survey. Real-time positions were determined using an Ashtech GG24 GPS receiver, differentially corrected in real-time by a Fugro Omnistar GPS receiver on the aircraft, termed Wide Area Differential GPS (WADGPS) mode. Post-processed KGPS positions were determined relative to a local GPS base station that was established by Coastal Planning and Engineering (CPE) on the top of a light pole at the Fort Lauderdale Executive Airport. The post-processed KGPS positions were applied to each sounding during processing and the KGPS height was used in the topographic datum filter.

**** Included as part of AHB H-Cell Deliverables***

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

- Local GPS Base Station Site Confirmation. A 24-hour certification of the local GPS base station established was conducted on July 18-19, 2008. The results reveal that the local GPS base station is free from site specific problems such as multipath and obstructions. Details are provided in the *Horizontal and Vertical Control Report and scatter plots in the *Separates Report.
- Static Position Check. Prior to commencing data collection, the coordinates of the aircraft GPS antenna were determined relative to three marks, which were surveyed by CPE on the tarmac at the Fort Lauderdale Executive Airport. Data was logged by each LADS Mk II positioning system while the aircraft was static, enabling the positions to be checked against the known GPS antenna point. The absolute accuracy of the post-processed KGPS

solution during the static position check was 0.171m (95% confidence). The results and details of the static position check are enclosed in the *Horizontal and Vertical Control Report and *Separates 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 positions. The mean difference between the real-time and post-processed positions was 0.901m, with an average SD of 0.096m. Details are provided in the *Horizontal and Vertical Control Report.
- d. Position Confidence. The position quality was also monitored on the GS 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 demonstrated that the positioning systems were functioning correctly throughout the survey period.

B.2.2 Uncertainty Values

For this survey area, global horizontal and vertical uncertainties have been assigned based on the defined horizontal and vertical error budget, as stated in the Horizontal and Vertical Control Report. The assigned horizontal uncertainty is 1.96m and the assigned vertical uncertainty is 0.39m.

However, when the calculated grid node SD is greater than the assigned vertical uncertainty, the SD is used as the uncertainty value. This has occurred in areas of high relief, such as along the limit of a channel or dredged area. In some cases the SD may exceed IHO Order-1 limits. This could be attributed to the seabed gradient and a 3m grid resolution being used.

B.2.3 Environmental Factors

B.2.3.1 Sea Conditions - Sea State, Waves, Swell, White Water

Adverse sea conditions were not a significant issue during this project. Apart from the period when Tropical Storm “Fay” hit the Florida coast, between the August 18 and 20, 2008 (no flights were conducted during this time), seas were generally slight. In fact, the absence of a slight to moderate chop on the sea surface during many flights was more of a concern than large sea state and white water. On a number of occasions glassy seas made lidar data acquisition difficult, and in a few cases sorties were terminated prematurely due to the “mirror-like” sea surface.

*** Included as part of AHB H-Cell Deliverables**

B.2.3.2 Water Clarity

Water clarity varied significantly throughout the survey area. Poor conditions were typically driven by storm activity, high rainfall and tidal state. The worst period of water clarity was observed following landfall of Tropical Storm “Fay” on August 18, 2008. The first flight conducted following this major storm was on August 22, 2008 and water conditions were generally unsuitable for lidar during this short flight (aborted prematurely for low cloud and poor water clarity). However, by the next evening water clarity had improved considerably.

By the third flight following the tropical storm, conducted on August 24, water clarity conditions were generally back to normal.

Under good weather conditions, areas of poor water clarity were typically localized to Miami Main Channel, the channels north, west and south of Virginia Key and a wide area west of Key Biscayne. These regions generally exhibited improved water clarity during the flooding tide and coverage was maximized by flying these areas during optimal tide periods. The turbidity observed in some areas did not improve with tidal state, such as the small bay adjacent to Marine Stadium on Virginia Key and the inlets on the south end of Key Biscayne. The water clarity through most of Biscayne Bay, and east and south of Virginia Key and Key Biscayne was very good throughout the survey period.

Water clarity did not affect the maximum lidar depth achieved along the eastern edge of the survey area, as maximum depths were only ~15m within the geographical extents of the flight lines. It is worth noting that depths beyond 45m were typically observed on the benchmark line flown west of Fowey Rocks on each survey flight.

B.2.3.3 Sea Grass

Sea grass is present throughout much of Biscayne Bay. The automated gain control for the green receiver component of the LADS Mk II AS handled the transition from sandy to sea grass covered seabed very well. However, on occasion, returns from the sandy seabed were quite saturated and caused a false Bottom Object Detection (see B.2.4.3 for further details) that would have to be rejected by a surveyor during data cleaning. Typically, laser returns from sea grass areas were slightly more attenuated, but this only adversely affected data coverage in very shallow water (refer to B.2.4.2).

B.2.3.4 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. During the processing stage, a maximum height of ~3m above the sea surface was used to remove areas where trees, buildings or other cultural features exist in close proximity to the high waterline. In areas where the MHW line could not be determined due to trees, mangroves, buildings or other cultural features, the appropriate 'gap' tag was inserted in the GS. With the use of publicly available imagery (Florida Department of Environmental Protection) and exported tags, the MHW line has been interpolated in these areas and attributed to indicate an approximate location.

B.2.3.5 Buildings / Towers

For this survey the presence of tall buildings and towers was a significant issue. With all sorties being flown at night and the survey area being in close proximity to Miami International Airport, survey lines were flown at 2200ft to adhere to night operation lowest safe altitude guidelines.

B.2.3.6 Wind

Survey operations were conducted in wind strengths of up to 20kts during the survey. In general, the wind strength during sorties was between 0 and 15kts from the SE. In circumstances when wind speeds were forecast to be greater than 20kts, no flights were planned due to the possibility of dangerous levels of turbulence. On occasions where wind speeds at Fowey Rocks Lighthouse were reported at less than 5kts, sorties were cancelled due to the high likelihood of glassy seas throughout the survey area.

B.2.3.7 Cloud

Low cloud coverage, rain and thunderstorms were a significant factor during the survey. Low cloud coverage was often prevalent within the survey area, sometimes resulting in aborted lines and subsequent reflies, and premature termination of sorties. On many occasions a cloud base formed at 1800 – 2000ft in the early hours of each morning, and due to the limitations of the night operation lowest safe altitude guidelines, the aircraft could not descend to a lower survey altitude below the cloud base.

Poor weather was monitored using, and decisions on the flying program were based on:

- Real-time satellite imagery
- Radar data
- Weather buoy data
- On the ground personnel reports

B.2.4 Data Coverage and Object Detection

B.2.4.1 Nature of the Seabed

The nature of the seabed to the southeast and southwest of Key Biscayne is generally undulating with the occasional small seabed object. Directly south of Key Biscayne is an extremely shallow reef. Maximum depths within the extents of this sheet are in the order of 10m.

B.2.4.2 Data Coverage

The survey area was illuminated at 2.5x2.5m laser spot spacing, resulting in a 75m swath width. Mainlines of sounding were spaced at 60 / 70m, which provided the required 100% coverage. Initially the survey was planned with 70m line spacing, but after analyzing coverage from the first flights, it was determined that some small coverage gaps were apparent between successive lines, due aircraft heading-track differences (drift) of up to 10 degrees. These small gaps were filled by flying new runs between the original lines. All un-flown survey sub areas were regenerated with 60m line spacing to avoid further data “holidays” due to aircraft drift.

Full coverage within the very shallow regions of the project area was difficult to achieve primarily due to bathymetric lidar limitations in discriminating between “mixed” sea surface and seabed returns. The inaccurate data that is recorded in very shallow water is

automatically removed during data processing with the Secondary Exclusion Zone (SEZ) algorithm. This depth filter effectively removes erroneous data from the sea surface down to a depth of 0.5m. The SEZ gap is typically filled by flying 200% coverage lines, with each successive line at a significantly different tidal state (high tide, then low tide), or with additional very low or very high tide lines along the coast.

However, with a tide range in the order of just 0.7m at Virginia Key, the flight window limited to between 22:30 and 06:00 each night, and 100% lidar main line coverage across the project area, effective management of tides to fill the SEZ gaps in very shallow water proved extremely difficult. In fact, the limitations of the mixed sea surface / seabed return were further compounded by attenuated sea grass returns in Biscayne Bay and saturated glassy sea returns along most coastlines. This meant that in some areas, accurate detection of the seabed was not possible until the water depth was between 1 and 2m.

Once these unusually large shallow water gaps had been identified, the COTR was contacted in order to explain that lidar coverage in the shallow coastal areas of the project would be very limited. The option of not flying the most inshore main scheme survey lines was discussed and approved by the COTR. In lieu of flying these lines, where coverage would have been extremely poor, an expansion of the project area to the north, east and south was conducted. This modification meant that a greater area of seabed would be illuminated than that proposed in the Statement of Work. It also resulted in the requirement for a revised sheet layout and for an additional sheet to be created (H12008). See Appendix V for further details. *Data attached to this report.*

For Sheet E, full seabed coverage within the geographical extents of flight lines was achieved.

B.2.4.3 Object Detection

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. At 2.5x2.5m laser spot spacing, complete seabed illumination is achieved. However, there are areas within the survey area where object detection was not possible due to water clarity issues. When the noise within the water column due to turbidity reaches a level where discrimination of a small seabed object from the noise in the laser waveform becomes impossible, object detection capability cannot be claimed.

By considering the laser spot spacing, coverage achieved and the calculated Signal to Noise Ratio of the seabed laser return (measure of water clarity), a quantification of IHO Order 1A object detection specifications has been assigned to the survey area. Bathymetric coverage of each sheet has been attributed as “bottom object detection achieved” or “bottom object detection not achieved” using the following S-57 feature object and attributes:

	S-57 Feature Object	S-57 Attribute CATZOC value	S-57 Attribute CATQUA value
IHO Order 1A bottom object detection achieved	M_QUAL	3 (zone of confidence B)	1 (data quality A)
IHO Order 1A bottom object detection not achieved	M_QUAL	3 (zone of confidence B)	2 (data quality B)

A description of the Bottom Object Detection (BOD) algorithm used in data processing is presented in the *Data Acquisition and Processing Report.

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.

B.4 DATA PROCESSING

B.4.1 Data Management

The database is identified as follows:

Database Name	Sub-Locality	Sheet
08_4FL	Vicinity of Soldier Key	E

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

B.4.2 Data Processing Sites

The data acquired during survey flights was processed at the operating site in Fort Lauderdale following each sortie. Final validation, checking, approving, reports and products were conducted at the office in Biloxi, MS. The quality control of the data was conducted using CARIS software in the Biloxi, MS office.

B.4.3 CARIS BASE Surface

One BASE Surface covers the extents of each sheet area. The “Shoal” layer of the BASE Surface is to be considered the official record of hydrography for the survey. 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 constant irrespective of aircraft altitude. The 3m grid provides the largest amount of detail that can be supported by the lidar density.

*** Included as part of AHB H-Cell Deliverables**

B.4.4 Tagging

During data processing on the GS, the operators have the ability to assign S-57 and user-defined tags to gaps and features in the data. This enables accurate delineation and attribution of unsurveyed polygons, cultural features, artificial shoreline and navigation aids for the S-57 feature file (US512008.000).

For this survey, the following tags were used:

Tag	Abbrv	Description
BCNSPP	BC	Beacon, special purpose / general
BOYSPP	BY	Buoy, special purpose / general
BRIDGE	BR	Bridge
BRKWTR	BW	Breakwater
JETTY	JE	Jetty
OBSTRN	OB	Obstruction
PILPNT	PL	Pile
PIPSOL	PI	Pipeline, submerged / on land
SNDWAV	SW	Sand waves
UWTROC	RK	Underwater / awash rock
GROYNE	GR	Groyne
DSTRUCT	HO	Dry structure / house on water
HULKES	HU	Permanently moored vessel
DMPGRD	DG	Dumping ground / spoil area
SEAWALL	SE	Seawall
BLDG	BLDG	Building
GAPBOAT	GB	Gap due to boat, boat wake and / or dragged nets
GAPTURBID	GT	Gap due to poor water clarity
GLASSYSEAS	GGS	Gap due to glassy seas
SEZ	SEZ	Gap due to the secondary exclusion zone (SEZ)
MANGROVE	GM	Gap due to mangroves
GAPTREE	GTR	Gap due to trees (not mangroves)

Detailed descriptions of the gaps in seabed coverage are presented in Section B.8 of the **Data Acquisition and Processing Report*.

** Included as part of AHB H-Cell Deliverables*

B.4.5 Georeferenced Imagery

Due to nighttime operations, no digital imagery was available for the validating, checking, and approval stages of survey data cleaning. No georeferenced mosaics were produced for the survey area. However, publicly available imagery from the Florida Department of

Environmental Protection was used as a guide during product compilation. The imagery used can be downloaded from the following website:

- http://data.labins.org/2003/MappingData/DOQQ/doqq_04_utm_sid.cfm

Google Earth coupled with EarthNC was also used extensively during the data validation, checking and approval process, in lieu of the LADS digital imagery typically acquired during daylight operations.

B.4.6 Progress Sketches

Progress sketches were provided to NOAA on a monthly basis. The final progress sketch can be found at Appendix III. ***Data attached to this report.***

B.4.7 Deliverables Data Formats

Data is provided in the following formats:

- Digital S-57 feature file
- CARIS BASE Surface
- Lidar coverage and Lidar uncertainty images in geo .tif format
- Chart comparison file in CARIS .hob format
- CARIS compatible data – CAF Format – LADS soundings and waveforms, which can be imported into CARIS HIPS
- CARIS compatible data – HDCS Format – LADS soundings in CARIS HIPS native format
- Tidal data provided in ASCII, .xls and .csv formats

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

**** Included as part of AHB H-Cell Deliverables***

C. VERTICAL AND HORIZONTAL CONTROL *See also Evaluation Report*

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

C.1 VERTICAL CONTROL

Vertical control for this survey was based on MLLW at the National Water Level Observation Network (NWLON) station at Virginia Key, FL (8723214). *Concur*

Station details are as follows:

Gauge	Location	NAD83	
		Latitude (N)	Longitude (W)
8723214	Virginia Key, FL	25° 43.9'	80° 09.7'

C.2 ZONING

Tide zones that cover the extent of the survey were derived from tide zone coordinates supplied by NOAA. Each of these tide zones use time and range correctors relative to the Virginia Key tide station. These are as follows:

Tide Zone	GS Identifier	Time Corrector	Range Corrector	Reference Station
FSE1	TA1	-48 minutes	x1.12	8723214
FSE2	TA2	-48 minutes	x1.12	8723214
FSE5	TA3	-30 minutes	x1.05	8723214
FSE6	TA4	-30 minutes	x1.07	8723214
FSE8	TA5	-18 minutes	x1.02	8723214
FSE9	TA6	-6 minutes	x1.00	8723214
FSE10	TA7	-18 minutes	x1.02	8723214
FSE11	TA8	-18 minutes	x1.00	8723214
FSE14	TA9	-6 minutes	x0.98	8723214
FSE16	TA10	+12 minutes	x0.98	8723214
FSE18	TA11	+24 minutes	x0.98	8723214
FSE18A	TA12	+36 minutes	x0.95	8723214
FSE20	TA13	+42 minutes	x0.98	8723214
FSE21	TA14	+36 minutes	x1.00	8723214
FSE21A	TA15	+42 minutes	x0.98	8723214
FSE22	TA16	+24 minutes	x1.00	8723214
FSE23	TA17	+12 minutes	x1.00	8723214
FSE24	TA18	+6 minutes	x1.00	8723214

Tide Zone	GS Identifier	Time Corrector	Range Corrector	Reference Station
FSE25	TA19	+24 minutes	x1.02	8723214
FSE26	TA20	+18 minutes	x1.02	8723214
FSE27	TA21	+6 minutes	x1.02	8723214
FSE28	TA22	-6 minutes	x1.05	8723214
FSE29	TA23	-18 minutes	x1.07	8723214
FSE34	TA24	+12 minutes	x1.07	8723214
SA227	TA25	-54 minutes	x1.22	8723214
SA228	TA26	-48 minutes	x1.20	8723214

For final tide application, the time and range correctors were applied to the smoothed tidal data provided by JOA. Soundings were then reduced to MLLW using these corrected tides. An analysis of depth benchmark and crossline comparisons, and overlaps of the mainlines of sounding concluded that final tide zoning was adequate. *Approved tides and zoning were applied by the field.*

The derived value for the difference between MLLW and MHW at the Virginia Key tide gauge is 0.66m. From the final zoning, a range factor of 0.95, 0.98, 0.98, 0.98, 1.00, 1.05, and 1.12 was applicable for Sheet E, resulting in a MHW value of 0.67m.

C.3 HORIZONTAL CONTROL

Data collection and processing were conducted on the AS and GS in World Geodetic System (WGS84) on Universal Transverse Mercator (Northern Hemisphere) projection UTM (N) in Zone 17, Central Meridian 81° W. This data was post-processed and all soundings are positioned relative to the North American Datum 1983 (NAD83). All units are in meters.

Concur

C.3.1 LADS Local GPS Base Station – Fort Lauderdale

Real-time positions were determined using an Ashtech GG24 GPS receiver, differentially corrected in real-time by a Fugro Omnistar GPS receiver on the aircraft (WADGPS mode). A local GPS base station was coordinated by Coastal Planning and Engineering (CPE) on the top of a light pole at the Fort Lauderdale Executive Airport on July 10, 2008, in order to post-process more accurate KGPS positions following survey flights.

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

NAD83		UTM (N) Zone 17		
Latitude (N)	Longitude (W)	Easting (m)	Northing (m)	Ellipsoidal Height (m)
26° 11' 42.4877"	80° 10' 17.4843"	582776.318	2897558.340	-14.957

Post-processed KGPS positions were determined offline using data logged at the local GPS base station and on the aircraft. This data was processed with Waypoint GrafNav Software to calculate a KGPS position solution for the survey flights. The post-processed KGPS positions were imported into the GS and applied to all soundings. This provided increased sounding position accuracy from the real-time WADGPS.

D. RESULTS AND RECOMMENDATIONS *See also Evaluation Report*

The results for the H12008 survey are submitted separately to this Descriptive Report as the S-57 feature file, BASE Surface, CARIS .hob files, Chart Comparison Spreadsheet, etc. on the USB hard drive. Refer to Appendix II of the **Data Acquisition and Processing Report* for a list of all the deliverable files from H12008.

Below is a table listing the S-57 feature objects found in the S-57 feature file (US512008.000): *Concur*

** Included as part of AHB H-Cell Deliverables*

S-57 Object Class	S-57 Object Acronym	Geometry	Description	Spatial Attribute	Attribute 1	Attribute 2	Attribute 3	Attribute 4	Comments
Depth Contour	DEPCNT	L	A line connecting points of equal water depth.		Value of contour (VALDCO)				DEPCNT used to define the MLLW line.
Sounding	SOUNDG	P	A measured water depth or spot which has been reduced to a vertical datum.						Used for defining surveyed depths that differ significantly from the chart.
Underwater/awash Rock	UWTROC	P	A concreted mass of stony material or coral which dries, is awash or is below the water surface.		Value of Sounding (VALSOU)	Water Level Effect (WATLEV)			Some of the Rocks may have been man made objects. Bottom objects were not investigated.
<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)	Category of quality of data (CATQUA)			CATQUA=1 is used to identify areas where object detection is achieved, CATQUA=2 is used to identify areas where object detection is not achieved.

Table 2: S-57 Attribution for the S-57 feature file (US512008.000)

Recommendations for registry number H12008 are divided into 2 components:

1. Recommended charting action, primarily for MCD.
2. Recommended further boatwork to sufficiently junction with lidar seabed coverage and examine uncertain lidar features.

Recommendations for charting action for registry number H12008 are provided in Sections D.1.1 to D.1.6 below. Recommendations for ship junctioning are provided in Section D.2.1. There are no features recommended for investigation for sheet H12008. A summary of charting actions is provided in Section D.2.2.

D.1 CHART COMPARISON *See also Evaluation Report*

H12008 LADS survey deliverables were compared to:

ENC US5FL21M Edition 12 compiled from Raster Chart 11465 38th Edition, ENC issue date May 18, 2009, at scale 1:40,000.

The chart was downloaded from the NOAA Office of Coast Survey – NOAA Electronic Navigational Charts download website on May 28, 2009.
(<http://chartmaker.ncd.noaa.gov/mcd/ENC/download.htm>)

D.1.1 Dangers to Navigation

Two (2) Dangers to Navigation (DTON) were submitted to Atlantic Hydrographic Branch (AHB) for Sheet H12008 following data collection. No further DTONs were submitted during product compilation. *Concur – See also Appendix 1 of this report.*

D.1.2 AWOIS

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

D.1.3 Aids to Navigation

Seven (7) Aids to Navigation are charted within the survey area for H12008. One (1) Aid to Navigation was detected by lidar and is presented in the following table: *Recommend retaining all ATON's as charted. Defer final disposition of ATON's to MCD Update Services Branch.*

No.	Navigation Aid Identifier	Charted Position		Surveyed Position		Lidar Hits	Diff. in Positions (m)	Comments
		NAD83 Latitude N (DMS)	NAD83 Longitude W (DMS)	NAD83 Latitude N (DMS)	NAD83 Longitude W (DMS)			
1	Saftey Valve Bank Light 1A	25°37'01.10"	80°11'31.51"	25°37'01.30"	080°11'31.53"	3	2	
2	Saftey Valve Bank Light 1B	25°34'13.20"	80°11'31.30"					Outside area of lidar coverage.
3	Biscayne National Park Boundry Light C (private)	25°36'05.00"	80°13'04.70"					Outside area of lidar coverage.
4	Soldier Key Daybeacon 2	25°35'46.60"	80°07'33.40"					Outside area of lidar coverage.
5	Soldier Key Daybeacon 4	25°34'15.06"	80°07'57.12"			0		Not detected by lidar.
6	Fowey Rocks Daybeacon 3	25°35'41.50"	80°06'57.00"					Outside area of lidar coverage.
7	Fowey Rocks Light	25°35'26.25"	80°05'48.24"					Outside area of lidar coverage.

Table 3: H12008 Aids to Navigation

D.1.4 Charted Depths and Features

Registry number H12008 lies over part of NOAA chart 11465, in the vicinity of Soldier Key. From the Source Diagrams, the area covered by H12008 was covered by NOS surveys between 1990 and 1998, probably using an echo sounder. Partial bottom coverage was achieved. The chart in this area appears to be well surveyed. **Concur**

The area surveyed is represented by the BASE Surface and S-57 feature file in considerably more detail than is currently shown on the chart. The following general recommendations are relevant:

- a. Coastline. Coastline is not present on this sheet. **Concur**
- b. Inshore Islets. No islets were surveyed within Sheet H12008 **Concur**
- c. Rocks. The seafloor covering H12008 was generally undulating with some areas exhibiting some seabed objects. No drying rocks were identified for the area covered by this sheet. There are however, several shoals that are awash. Where a significant difference in depth existed between the chart and the BASE Surface, a sounding or rock was placed in the S-57 feature file and was referenced in the Chart Comparison Spreadsheet in Section D.1.6. **Concur**

D.1.5 Detailed Chart Comparison

In addition to the general recommendations above, 7 specific differences between the chart and the LADS survey have been identified and are described in Section D.1.6. An expanded version of the spreadsheet is included digitally on the USB hard drive (H12008_ChartComp.xls). A CARIS .hob file containing just the chart comparison items has also been compiled and is provided as part of survey deliverables (H12008_ChartComp.hob). The attribution methodology for this file is presented below:

S-57 Object Class	S-57 Object Acronym	Geometry	Description	Attribute 1	Attribute 2	Attribute 3	Attribute 4
Built-up Area	BUAARE	P	Used as a placeholder to store information relating to the chart comparison	OBJNAM (used for storing a unique chart comparison ID)	INFORM (used for storing the charting recommendation)	NINFOM (used for storing a reference to a Feature for Investigation)	PICREP (used for storing a link to GS screen captures)

The chart comparison was conducted by reviewing the chart and the LADS survey deliverable. For each item identified, screen dumps of the Local Area Display and Raw Waveform Display were extracted from the LADS Mk II GS.

These have been reviewed in order to make the following assessments:

- a. Type of Feature
- b. Least Depth Found

c. Charting Recommendation

d. Remarks

When the least depth has been adequately surveyed by lidar, the LDF Column is populated with a 'Y' for yes. The charting recommendation for a feature that has an adequately surveyed least depth will be either 'Insert' for a new feature, 'Replace' for an amendment to an existing charted feature or 'Remove' for a disproved charted feature.

When the least depth has NOT been found by lidar (populated with an 'N'), the chart comparison number has been used as the identifier within the S-57 feature file that contains the features for examination. If a chart comparison item had previously been identified as a feature for examination during data processing, a reference is made in the 'Remarks' column to the S-57 feature for examination item.

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 in Alaska, witnessing survey operations aboard NOAA ship Rainier, from meetings at PHB and UNH and the 2007 NOAA Field Procedures Workshop. 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 to achieve further efficiencies in data handling.

D.1.6 Chart Comparison Spreadsheet *Concur with clarification. See also Appendix 1 or Evaluation Report.*

Sequence No	Shoal No	Category	CHARTED			SURVEYED			Type of Feature	Full Coverage	Least Depth Found	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				4.82	25° 37' 1.67"	80° 6' 58.77"	Rk	Y	Y	Insert	See Danger to Navigation Report. Item 1. Submitted following field operations. Note: DTON has been inserted on chart as a 4.50m Rk. <i>Concur with clarification - See also Appendix 1.</i>
2	E2	1				4.12	25° 33' 31.58"	80° 7' 52.19"	Rk	Y	Y	Insert	See Danger to Navigation Report. Item 2. Submitted following field operations. Note: DTON has been inserted on chart as a 3.90m Rk. <i>Concur with clarification - See also Appendix 1.</i>
3	E3	2	3.0	25° 37' 0.14"	80° 9' 58.6"	0.01	25° 36' 59.07"	80° 9' 57.54"	Shoal	Y	Y	Replace	<i>Revise to intertidal area</i>
4	E4	1				2.03	25° 35' 29.29"	80° 8' 10.98"	Shoal	Y	Y	Insert	<i>Chart shoal 6 ft depth</i>
5	E5	1				1.72	25° 35' 15.4"	80° 9' 13.28"	Rk	Y	Y	Insert	<i>Chart shoal 5 ft depth</i>
6	E6	1				1.92	25° 34' 54.08"	80° 9' 15.13"	Shoal	Y	Y	Insert	<i>Chart shoal 6 ft depth</i>
7	E7	2	5.1	25° 33' 27.36"	80° 7' 43.09"	4.11	25° 33' 26.3"	80° 7' 42.67"	Rk	Y	Y	Replace	<i>Chart 13 Rk and danger curve</i>

Shoal Categories

1-New Shoal Found

2-Charted Shoal Disproved / Not Found

Table 4: Chart Comparison Spreadsheet*Features included in Features *.000 file not addressed in Table 4 (above)*

<i>Feature</i>	<i>Latitude</i>	<i>Longitude</i>	<i>Depth (Feet)</i>	<i>Remarks</i>
<i>UWTROC</i>	<i>25-35-13.243600N</i>	<i>080-08-06.299900W</i>	<i>8.76</i>	<i>Chart shoal 9 ft depth</i>
<i>UWTROC</i>	<i>25-35-06.23544N</i>	<i>080-09-13.68612W</i>	<i>4.13</i>	<i>Chart shoal 4 ft depth</i>
<i>UWTROC</i>	<i>25-36-02.51532N</i>	<i>080-09-08.78328W</i>	<i>4.10</i>	<i>Chart shoal 4 ft depth</i>

Shoal Categories

1-New Shoal Found

2-Charted Shoal Disproved / Not Found

D.2 ADDITIONAL RESULTS

D.2.1 Supplemental Information for Boatwork

For the H12008 survey, the supplemental information for further boatwork was compiled by defining the seaward limit of good lidar seabed coverage as a M_COVR, CATCOV=1 polygon.

D.2.1.1 Seaward Limit of Lidar Coverage

The lidar coverage across H12008 is consistent with no gaps within the area covered by flight lines.

When planning multibeam junctioning with lidar seabed coverage, the NALL and the following must be taken into consideration:

- Lidar derived MHW line, MLLW line.
- Shallow features detected by lidar.
- Features for examination.

These are all provided in the S-57 feature file (US512008.000) for H12008.

The seaward limit of good lidar data coverage has been described by the S-57 feature object M_COVR in the S-57 feature file (US512008.000).

D.2.1.2 Lidar Features Requiring Further Investigation

There are no features requiring further investigation for sheet H12008. **Concur**

D.2.1.3 Comparison with prior Surveys

Comparison with prior surveys was not required under this Task Order. See Section D.1 for comparison to the nautical charts. **Concur**

*D.2.2 Summary of Charting Actions and Investigations – H12008**D.2.2.1 Summary of Charting Actions – H12008*

Total number of new significant islets recommended for insertion on chart: 0

Total number of new significant drying rocks recommended for insertion on chart: 0

Total number of new significant rocks awash recommended for insertion on chart: 0

Total number of new significant features recommended for insertion on chart: 5

Total number of charted features disproved by lidar (Remove): 0

Total number of charted features recommended for amendment by lidar (Replace): 2

Total number of chart comparison items requiring further investigation: 0

Total number of DTONs submitted to AHB during data acquisition: 2

Total number of DTONs submitted to AHB during data processing: 0

Total number of DTONs submitted to AHB for H12008: 2

D.2.2.2 Summary of Lidar Features Requiring Further Investigation – H12008

Total number of investigations recommended during data processing: 0

Total number of investigations recommended from chart comparison compilation: 0

Total number of recommended feature investigations: 0

E. APPROVAL SHEET**LETTER OF APPROVAL – OPR-H328-KRL-08**

This report and the accompanying LADS survey 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 LADS survey deliverables have been closely reviewed and are considered complete and adequate as per the Statement of Work.

Report

Descriptive Report – H12008

Submission Date

June 5, 2009



Mark Sinclair
Hydrographer
Tenix LADS, Incorporated

Date: June 5, 2009

H12008 DtoN #1

Registry Number: H12008
State: Florida
Locality: Approaches to Miami
Sub-locality: Vicinity of Soldier Key
Project Number: OPR-H328-KRL-08
Survey Dates: 07/23/2008 - 08/10/2008

Charts Affected

Number	Edition	Date	Scale (RNC)	RNC Correction(s)*
11465	38th	11/01/2007	1:40,000 (11465_1)	USCG LNM: 07/29/2008 (01/13/2009) NGA NTM: 08/14/1999 (01/24/2009)
11466	37th	08/01/2005	1:80,000 (11466_1)	[L]NTM: ?
11462	24th	03/16/2002	1:80,000 (11462_1)	[L]NTM: ?
11451	33rd	09/01/2007	1:495,362 (11451_17) 1:495,362 (11451_16) 1:80,000 (11451_1)	[L]NTM: ?
11469	8th	12/01/2007	1:100,000 (11469_1)	[L]NTM: ?
11450	10th	10/01/2007	1:180,000 (11450_1)	[L]NTM: ?
11460	40th	09/01/2005	1:466,940 (11460_1)	[L]NTM: ?
11013	47th	02/01/2008	1:1,200,000 (11013_1)	[L]NTM: ?
411	52nd	09/01/2007	1:2,160,000 (411_1)	[L]NTM: ?

* Correction(s) - source: last correction applied (last correction reviewed--"cleared date")

Features

No.	Name	Feature Type	Survey Depth	Survey Latitude	Survey Longitude	AWOIS Item
1.1	DtoN 1.1- 16ft Rock	Rock	4.80 m	25° 37' 01.7" N	080° 06' 58.8" W	---
1.2	DtoN 1.2 - 13ft Rock	Rock	4.10 m	25° 33' 31.6" N	080° 07' 52.2" W	---

1 - Danger To Navigation

1.1) GP No. - 1 from H11872_DtoN#1**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 25° 37' 01.7" N, 080° 06' 58.8" W
Least Depth: 4.82 m (= 15.81 ft = 2.635 fm = 2 fm 3.81 ft)
TPU ($\pm 1.96\sigma$): **THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp: 2008-205.05:00:39.000 (07/23/2008)
GP Dataset: H12008_DtoN#1.xls
GP No.: 1
Charts Affected: 11465_1, 11451_1, 11466_1, 11469_1, 11450_1, 11460_1, 11451_16, 11451_17, 11013_1, 411_1

Remarks:

Depths are in meters and reduced to Mean Lower Low Water using final verified tides. Drying heights are in meters relative to MLLW. Islets are related to MHW. Positions are based on the NAD83 horizontal datum. All times and dates are relative to UTC. Final verified tides have been applied from the Virginia Key tide gauge (8723214). The shoals were found using LIDAR.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H12008_DtoN#1.xls	1	0.00	000.0	Primary

Hydrographer Recommendations

Recommend charting 16ft Rock.

Cartographically-Rounded Depth (Affected Charts):

16ft (11465_1, 11451_1, 11466_1, 11451_16, 11451_17)

2 ½fm (11450_1, 11460_1, 11013_1, 411_1)

2fm 3ft (11469_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)

Attributes: QUASOU - 1:least depth known

H12008 DtoN #1

1 - Danger To Navigation

SORDAT - 20080623

SORIND - US,US,nsurf,H12008

TECSOU - 7:found by laser

VALSOU - 4.82 m

VERDAT - 12:Mean lower low water

WATLEV - 3:always under water/submerged

Office Notes

Concur with clarification. Shown on chart 11465 as a 15 Rk and danger curve. Delete 15 Rk and danger curve.

Add 16 Rk and danger curve.

Feature Images

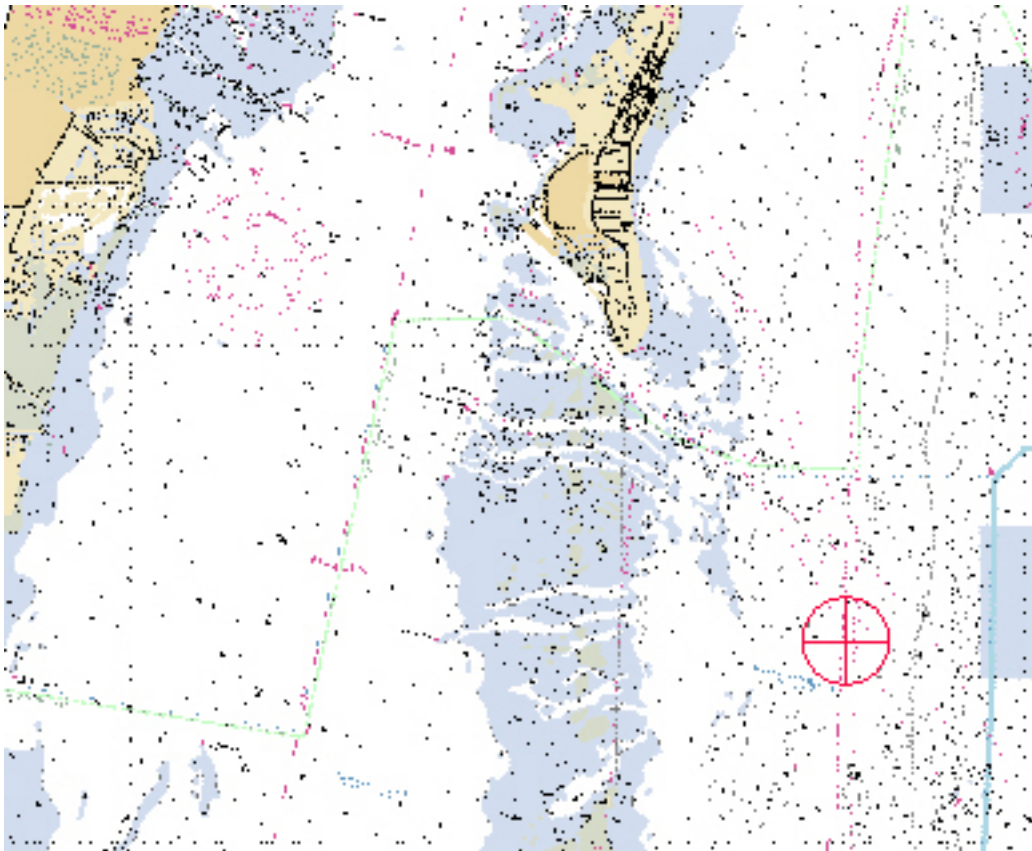


Figure 1.1.1

1.2) GP No. - 2 from H11872_DtoN#1**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 25° 33' 31.6" N, 080° 07' 52.2" W
Least Depth: 4.12 m (= 13.517ft = 2.253 fm = 2 fm 1.52 ft)
TPU ($\pm 1.96\sigma$): **THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp: 2008-223.05:56:28.000 (08/10/2008)
GP Dataset: H12008_DtoN#1.xls
GP No.: 2
Charts Affected: 11465_1, 11451_1, 11462_1, 11450_1, 11460_1, 11451_16, 11451_17, 11013_1, 411_1

Remarks:

Depths are in meters and reduced to Mean Lower Low Water using final verified tides. Drying heights are in meters relative to MLLW. Islets are related to MHW. Positions are based on the NAD83 horizontal datum. All times and dates are relative to UTC. Final verified tides have been applied from the Virginia Key tide gauge (8723214). The shoals were found using LIDAR.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H12008_DtoN#1.xls	2	0.00	000.0	Primary

Hydrographer Recommendations

Recommend charting 13ft Rock.

Cartographically-Rounded Depth (Affected Charts):

13ft (11465_1, 11451_1, 11462_1, 11451_16, 11451_17)

2 ¼fm (11450_1, 11460_1, 11013_1, 411_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)
Attributes: QUASOU - 1:least depth known
 SORDAT - 20080810
 SORIND - US,US,nsurf,H12008

H12008 DtoN #1

1 - Danger To Navigation

TECSOU - 7:found by laser

VALSOU - 4.2 m

VERDAT - 12:Mean lower low water

WATLEV - 3:always under water/submerged

Office Notes

Concur with clarification- A more significant 13 Rk found southeast of the charted rock during office processing.

Delete charted 13 Rk. See the Descriptive Report for charting recommendation on the southeast 13 Rk. Add 13 depth.

Feature Images

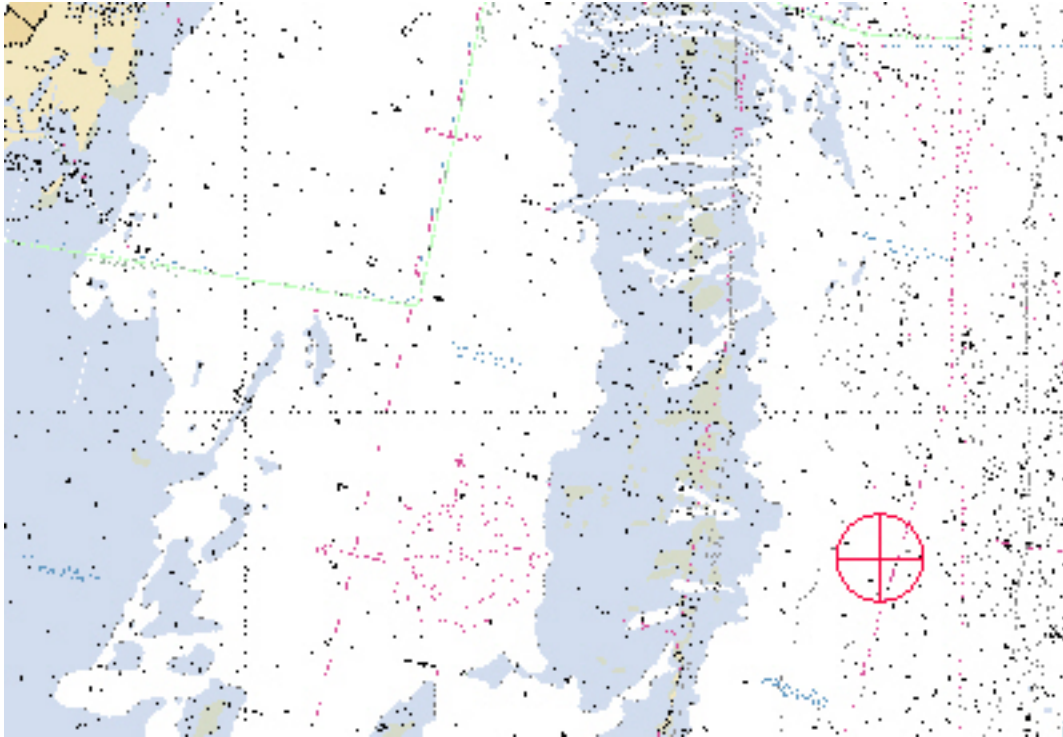


Figure 1.2.1

APPENDIX II – SURVEY FEATURE REPORT

No AWOIS were assigned to this task order.

APPENDIX III – FINAL PROGRESS SKETCH

FINAL PROGRESS SKETCH

July 13 – August 26, 2008

OPR-H328-KRL-08 Approaches to Miami, FL

Tenix LADS Inc.
Scott Ramsay, Project Manager

The Tenix LADS aircraft arrived in Fort Lauderdale on July 12, 2008, during a temporary suspension of operations in support of OPR-O190-KRL-08. The site mobilization was undertaken during the following day. The first survey flight was conducted in the OPR-H328-KRL-08 project area on July 14, 2008. A total of twenty-one survey flights were flown in the Approaches to Miami, FL project area during July and August. Operations were temporarily suspended on July 27, 2008, in order to conduct a sortie for Broward County. Demobilization of the site was conducted on August 26, 2008 and the aircraft departed Fort Lauderdale for Ketchikan, to complete OPR-O190-KRL-08 operations, on August 27, 2008.

Of the 21 survey flights, 14 were deemed fully effective. The remaining sorties were aborted prematurely for adverse environmental conditions in the survey area, such as low cloud, glassy seas or poor water clarity, or due to system problems. Following some early aborts from the project area, when weather conditions were suitable to the North, the Broward County survey was completed. All flight and on task times reported below are calculated for the Approaches to Miami, FL project only.

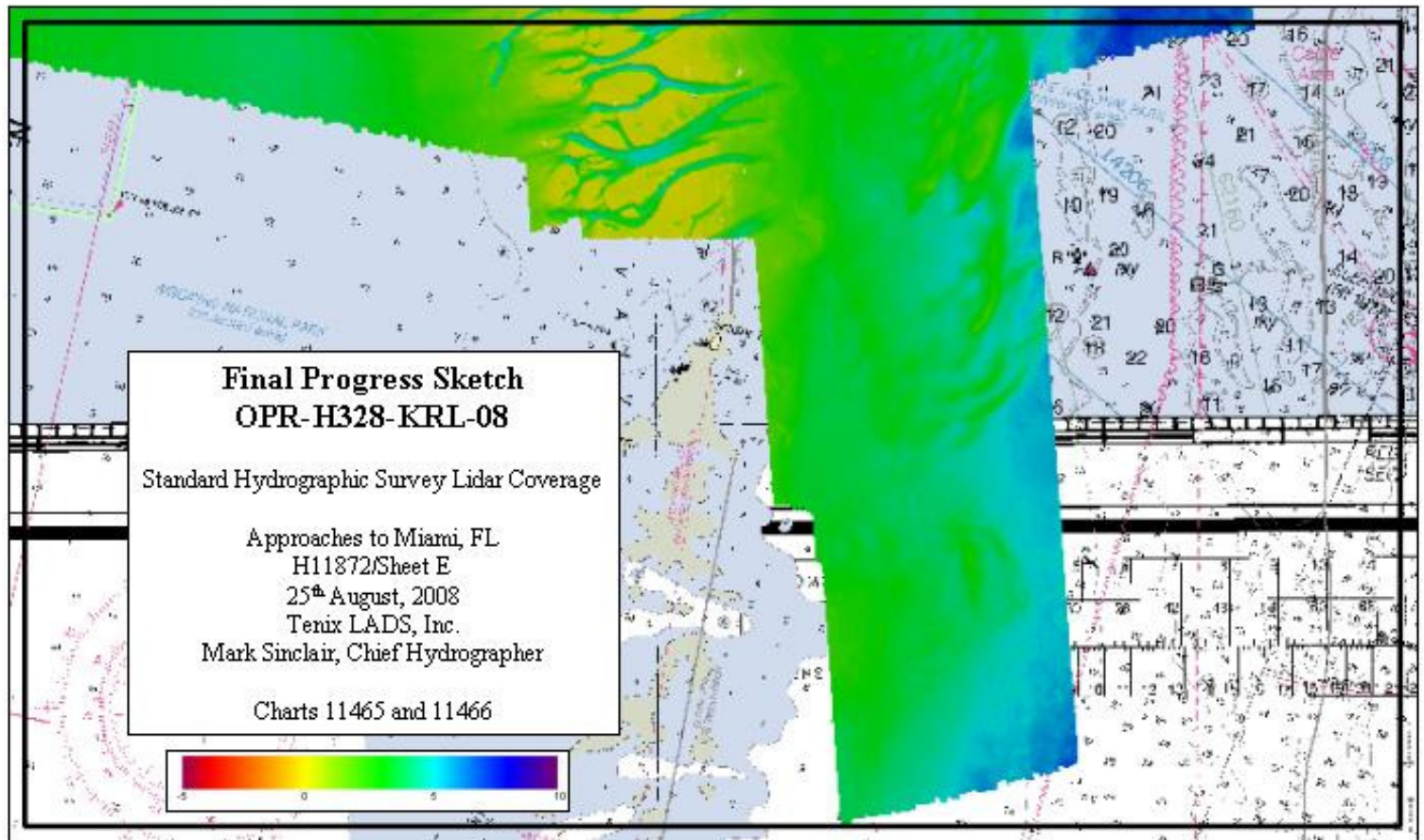
The total area covered is 63 SNM, from the Mean High Water line to the limits of the survey area, at 2.5m laser spot spacing, 100% coverage.

OPR-H328-KRL-08	July	August	Total 2008	Total Budgeted	% Budgeted
Days on project	18	26	44	30	147%
Days mob / demob	1	1	2	2	100%
Survey flights	9	12	21	12	175%
No flight - weather	2	3	5	-	-
No flight – pilot hours	6	10	16	-	-
Linear nautical miles flown	1365	3235	4600	3828	120%
Area surveyed (NM²)	20 *	43 *	63 *	55 **	115%
Aircraft flown hours	41:20	66:46	108:06	72:00	150%
Aircraft on task hours	32:08	58:02	90:10	57:30	157%
Hours lost to weather	1:06	0:00	1:06	-	-
Hours lost to system	2:11	0:22	2:33	-	-

<u>Effective</u> flights conducted	14	12	117%
Average time on task per <u>effective</u> flight	5:45	5:16	109%
Survey lines flown	628	506	124%

*Area surveyed value derived from CARIS BASE Surface at Aug 25, from MHWL to survey limits

** Total planned area sourced from OPR-H328-KRL-08 Statement of Work, Attachment #2



Progress Sketch OPR-H328-KRL-08-08: Lidar Coverage – H12008 at August 25, 2008

(Formerly depicted as H11872 in Final Progress Sketch)

APPENDIX V – SUPPLEMENTAL SURVEY RECORDS AND CORRESPONDENCE

FW Proposed modification_to_OPR-H328-KRL-08.txt

From: RAMSAY Scott
Sent: Monday, August 04, 2008 4:11 PM
To: 'David.Scharff'
Cc: SINCLAIR Mark - LADS; GUILFORD James
Subject: RE: Proposed modification to OPR-H328-KRL-08

Dave,

Thanks for considering our recommendation.

Just so we are clear, I don't think it is necessary to completely remove sub area 3 & 4 - just the 15 most inshore lines of both sub areas. A lot of data has already been collected within sub area 3.

I think that we could achieve the Option 1 area you have suggested, and about 1/3 of the area in Option 3, with one new sub area totaling 40 lines and the coverage we have already acquired in the east of the area.

Please see the attached diagram demonstrating the original eastern survey extent (from the SOW), our current coverage with the Option 3 area and the recommended sub area for further collection within the Option 1 area.

I hope this works for NOAA and the OSI contract, and that we can devise a suitable modification to the SOW for the H328 project, that still gets us up to more than 55sqNM lidar coverage.

Regards,
Scott

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

From: David.Scharff [mailto:David.Scharff@noaa.gov]
Sent: Monday, August 04, 2008 9:41 AM
To: RAMSAY Scott
Cc: SINCLAIR Mark - LADS; GUILFORD James
Subject: Re: Proposed modification to OPR-H328-KRL-08

Scott,

Attached are 3 optional coverage areas in order of priority. You may survey any part of the three areas indicated to replace sub areas 3-4. Please note that overlapping with OSI's assigned project is our lowest priority. Let me know what option you would be interested in pursuing.

FYI - I'm in training downtown all week if you need me I'll be checking my voice/email each morning or you can contact Crescent if you need help.

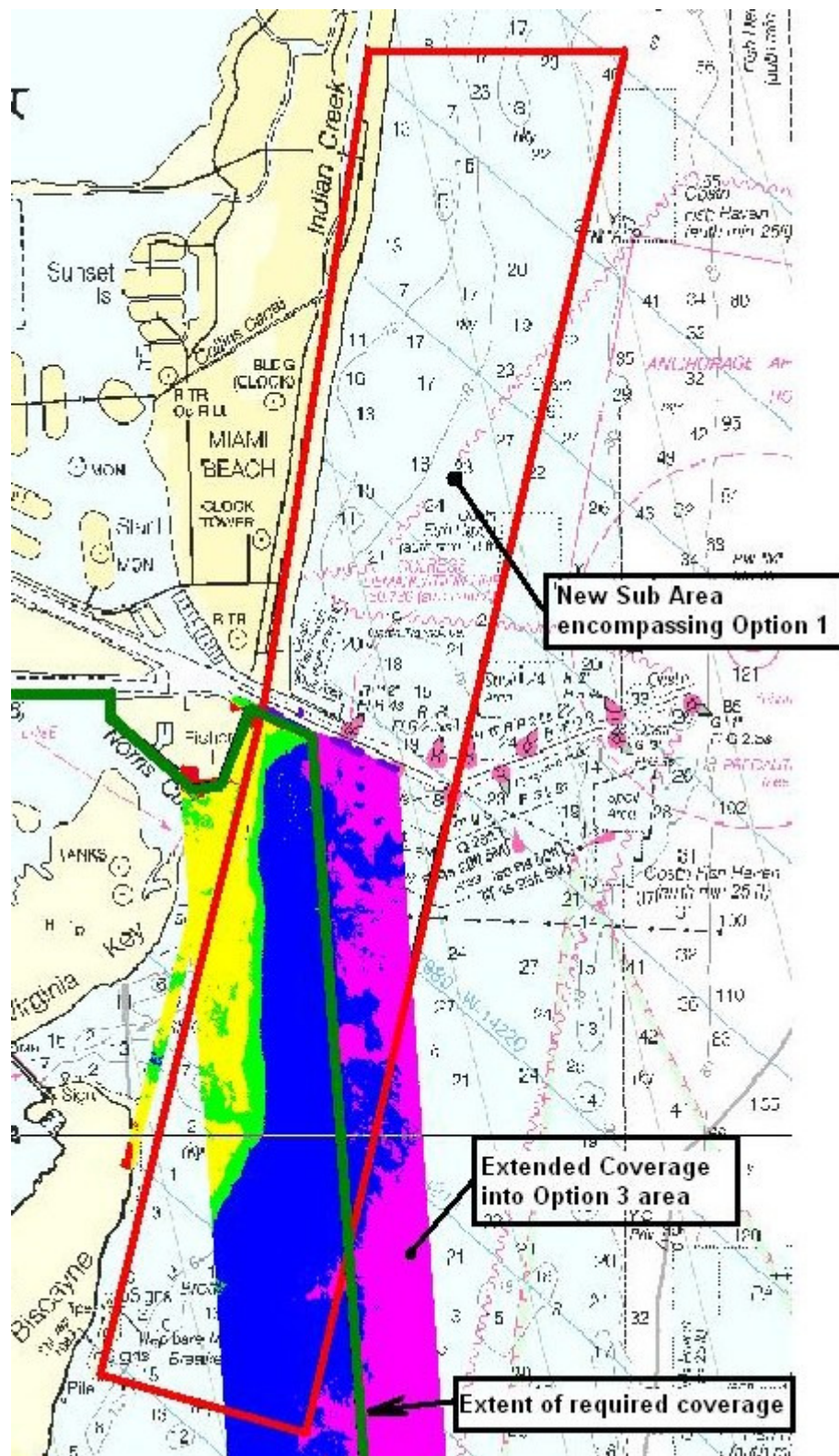
Regards,
Dave

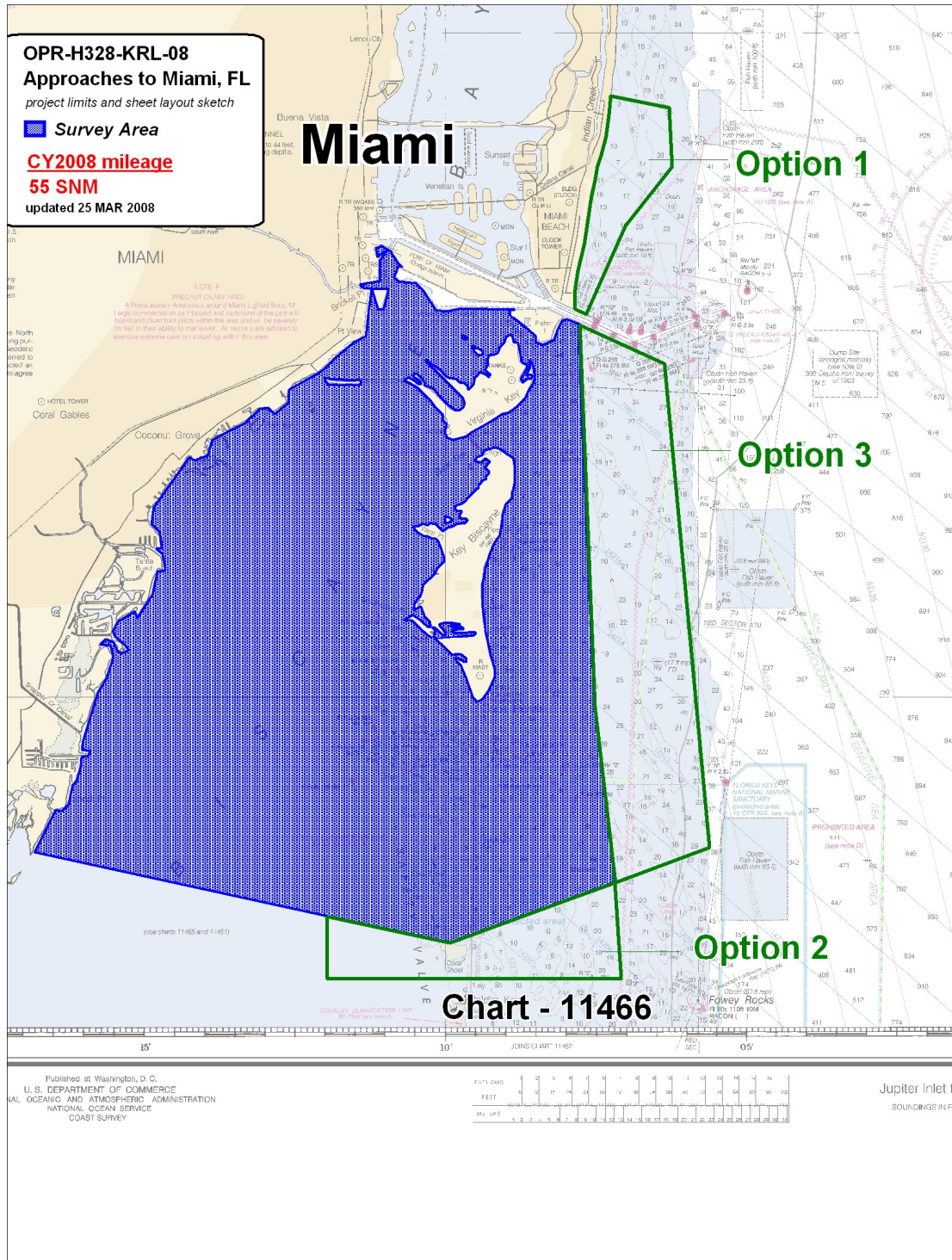
RAMSAY Scott wrote:

>
> Dave,
>
> Following our discussion this morning, attached is an image showing
> the contracted lidar survey sub areas 1-4 and proposed modification to
> areas (in black and dark green).
>
> As you are aware, we have limited capability in the very shallow,
> inshore areas of Biscayne Bay where seagrass is present (indicated as
> black on image in sub area 3 and 4). The coverage has been quite
> sparse throughout these regions, despite flying lines at the highest
> possible tide (tide range is only about 0.8m). At the Eastern edge of
> our area, which is the intended OSI junction line, we are still

Page 1

FW Proposed modification_to_OPR-H328-KRL-08.txt
> surveying 5-10m water depth. This is obviously not a very efficient
> depth for a multibeam platform to be operating in.
>
> I am proposing that lidar coverage across the Florida project area
> would be significantly improved if the "black" areas were removed from
> the required area (15 inshore lines from sub area 3 and 15 lines from
> sub area 4) and an additional 30 lines were planned to the East of the
> Eastern edge of sub area 1, indicated in dark green. This modification
> will actually improve the total SQNM coverage of lidar across the
> project area, as the offshore sub area 1 lines are significantly
> longer than those in sub area 3 and 4. I would propose that we still
> fly investigation lines down the middle of all the channels within sub
> area 3 and 4, as you mentioned this data was important to the survey.
>
> I have also attached coverage plots demonstrating the achieved lidar
> coverage up until July 30. We have had 2 very successful flights since
> this plot was produced, acquiring an additional 90 main scheme lines.
> We are currently about 50% through the required Florida data
> acquisition with the next flight programmed for Monday night.
>
> I look forward to your comments.
>
> Best Regards,
>
> Scott Ramsay
>
> Survey Manager
>
> Tenix LADS, Inc.
>





Re Modification to SOW OPR-H328-KRL-08 Sub Locality Names.txt
From: David.Scharff [David.Scharff@noaa.gov]
Sent: Thursday, 29 January 2009 12:32 PM
To: RAMSAY Scott
Cc: Edward.Owens@noaa.gov; james.guilford@tenix.com; WEIDMAN Brett;
NEWSHAM Wayne; BELL Rachel
Subject: Re: Modification to SOW OPR-H328-KRL-08 Sub Locality Names

Attachments: David_Scharff.vcf

Scott,

Thanks for the update. I have updated our system to reflect the new sub locality information you provided. Unfortunately registry number H11872 has already been assigned to a different project so we can't use it. The new number for sheet "*E*" will be *H12008*, please make the appropriate changes on your end.

Thanks,
Dave

RAMSAY Scott wrote:

>
> Dave,
>
> Based on the final lidar coverage for OPR-H328-KRL-08 I would propose
> the following sub-locality name modifications from the original SOW,
> for each of the registered sheets:
>
> H11868 (Sheet A) - 76x131cm, 1:10,000
>
> Sub locality: Dinner Key Channel to Shoal Point
>
> H11869 (Sheet B) - 76x131cm, 1:10,000
>
> Sub locality: Miami Beach to Fisher Island
>
> H11870 (Sheet C) - 76x131cm, 1:10,000
>
> Sub locality: Virginia Key to Key Biscayne
>
> H11871 (Sheet D) - 76x131cm, 1:10,000
>
> Sub locality: Biscayne Channel (remains the same)
>
> _Additional Sheet:_
>
> H11872 (Sheet E) - 76x131cm, 1:10,000
>
> Sub locality: Vicinity of Soldier Key
>
> Please let me know if these sub locality names are suitable for us to
> proceed with. For sheet layout and limits see the attached files.
>
> Regards,
> Scott Ramsay
> Survey Manager
> Tenix LADS, Inc.

H12008 COMPILATION LOG

General Survey Information	
REGISTRY No.	<i>H12008</i>
PROJECT No.	<i>OPR-H328-KRL-08</i>
FIELD UNIT	<i>TENIX LADS</i>
DATE OF SURVEY	<i>July 35 to August 26, 2008</i>
LARGEST SCALE CHART	<i>11465, 38 Ed., 20071101</i>
ADDITIONAL CHARTS	<i>N/A</i>
SOUNDING UNITS	<i>Feet</i>
COMPILER	<i>James J. Miller II/Norris Wike</i>

Source Grids	File Name
	<i>H12008_3m_UNC_Final_shoal_Extract.hns</i>
Surfaces	File Name
<i>Combined</i>	<i>N/A</i>
<i>Interpolated TIN</i>	<i>H12008_12m_InterpTIN.hns</i>
<i>Shifted Interpolated TIN</i>	<i>H12008_12m_InterpTIN_shifted.hns</i>
<i>Product Surface</i>	<i>N/A</i>
Final HOBs	File Name
<i>Survey Scale Soundings</i>	<i>H12008_SS_Soundings.hob,</i>
<i>Chart Scale Soundings</i>	<i>H12008_CS_Soundings.hob</i>
<i>Contour Layer</i>	<i>H12008_Depth_Contours.hob</i>
<i>Feature Layer</i>	<i>H12008_Features.hob</i>
<i>Meta-Objects Layer</i>	<i>H12008_meta_Layers.hob</i>
<i>Blue Notes</i>	<i>H12008_BlueNotes.hob</i>
<i>ENC Retain Soundings</i>	<i>H12008_ENC-Retained.hob</i>

Meta-Objects Attribution	
Acronym	Value
M_COVR	
CATCOV	<i>1</i>
SORDAT	<i>20080826</i>
SORIND	<i>US,US,graph,H12008</i>
M_QUAL	
CATZOC	<i>6</i>
INFORM	<i>Tenix LADS Aircraft, call sign VH-LCL</i>
POSACC	<i>10</i>
SORDAT	<i>20080826</i>
SORIND	<i>US,US,graph,H12008</i>
SUREND	<i>20080826</i>
SURSTA	<i>20080713</i>
DEPARE	
DRVALV 1	<i>-1.0 ft</i>
DRVALV2	<i>25.0 ft</i>
SORDAT	<i>20080826</i>
SORIND	<i>US,US,graph,H12008</i>
M_CSCL	

CSCALE	<i>N/A</i>
SORDAT	<i>N/A</i>
SORIND	<i>N/A</i>

SPECIFICATIONS:

- I. COMBINED SURFACE:
 - a. Number of ESAR Final Grids: *1*
 - b. Resolution of Combined (m): *N/A*
- II. SURVEY SCALE SOUNDINGS (SS):
 - a. Radius
 - b. Shoal biased
 - c. Use Single-Defined Radius (mm at Map Scale) ; Radius Value = *1.00*
 - d. Queried Depth of All Soundings
 - i. Minimum: *-0.69m*
 - ii. Maximum: *25.23m*
- III. INTERPOLATED TIN SURFACE:
 - a. Resolution (m): *12*
 - b. Linear
 - c. Shifted value: *[-0.229m (feet), (≤ 10 fathoms)]*
[-1.372m (fathoms), (> 10 fathoms)]
- IV. CONTOURS:
 - a. Use a Depth List: *H12008_NOAA_depth_curves_list.txt*
 - b. Line Object: DEPCNT
 - c. Value Attribute: VALDCO
- V. FEATURES:
 - a. Total Number of Features: 12
 - b. Number of Insignificant Features: *0*
- VI. CHART SURVEY SOUNDINGS (CS):
 - a. Number of ENC CS Soundings: *0*
 - b. Radius
 - c. Shoal biased
 - d. Use Single-Defined Radius: m on the ground
 - i. Radius Value (m): *300*
 - ii. Or use a Sounding Space Range Table (if applicable): *N/A*
 - e. Filter: Interpolated != 1
 - f. Number Survey CS Soundings: *149*
- VII. Notes:

**ATLANTIC HYDROGRAPHIC BRANCH
EVALUATION REPORT to ACCOMPANY
SURVEY H12008 (2008)**

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 1-8
CARIS Bathy Manager version 2.1 SP1, HF 1-10
CARIS S-57 Composer version 2.1 HF 4
DKART INSPECTOR, version 5.0 Build 732 SP1
CARIS HOM ENC 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 a 3m shoal-extracted BASE surface derived from the field's original LIDAR 3m *.hns BASE surface. The survey scale soundings were created from the shoal-extracted surface at 1mm radius at 1:40,000. A 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 single defined radius at the 40,000 chart scale. 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 contours were created from a shifted interpolated TIN surface of 12m resolution and the contours were then derived from the interpolated and non-interpolated nodes. Therefore, using this method the contour are in harmony with the SS and CS soundings while maintaining the chart equivalent contour values as whole integers. The depth contours are being forwarded to MCD for reference only. The contours were utilized during

chart scale sounding selection and quality assurance efforts at AHB. The depth contours are incorporated into the SS H-Cell product as per 2009 H-Cell Specifications.

The compilation components (Stand Alone HOB files (SAHOB)) are detailed in the Compile Log attached at the end of this document. The SAHOB files included depth areas (DEPARE), depth contours (DEPCNT), sounding selections (SOUNDG), features (UWTROC, SBDARE, PILPNT), Meta objects (M_COVR, M_QUAL), and cartographic Blue Notes (\$CSYMB).

All of the components with the exception of the survey scale sounding selection and depth contours were inserted into one feature layer (including the Bluenotes, as dictated by Hydrographic Technical Directive 2008-8), and this layer was exported into 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, and then both S-57 files were processed in CARIS HOM to convert the metric units to feet. The final products are two S-57 files, in Lat/Lon NAD-83, one that contains the chart soundings, all the features, Meta objects, and Bluenotes (H12008_CS.000), and one that contains the sounding selection and depth contours (H12008_SS.000). Finally, quality assurance checks were made utilizing CARIS S-57 Composer version 2.1 validation checks and DKART INSPECTOR version 5.

H12008 CARIS H-Cell final deliverables include the following products:

H12008_CS.000	1:40,000 Scale	H12008 H-Cell with Chart Scale Selected Soundings
H12008_SS.000	1:10,000 Scale	H12008 Selected Soundings (Survey Scale)

B.2.2. Junctions

Survey H12008 (2008) junctions with survey H11868 (2008) to the northwest and survey H11871 (2008) to the north. Present survey soundings compare within less than 1 foot with junction surveys. Present survey depths are in harmony with the charted hydrography to the south, east, and west.

C. VERTICAL AND HORIZONTAL CONTROL

The Hydrographer makes adequate mention of tidal correction horizontal control in the Descriptive Report and the Horizontal and Vertical Control Report included as part of the H12008 H-Cell deliverables.

Horizontal control used for this survey during data acquisition is based upon the North American Datum of 1983 (NAD83), UTM projection zone 17.

D. RESULTS AND RECOMMENDATIONS

<u>D.1 CHART COMPARISON</u>	<u>11465 (38th Edition, Nov./07)</u>
	Corrected through NM 11/24/2007
	Corrected through LNM 11/20/2007
	Scale 1:40,000

<u>ENC Comparison</u>	<u>US5FL21M</u>
	Intracoastal Waterway Miami to Elliott Key
	Edition 16
	Application Date 2010-03-19
	Issue Date 2010-03-19
	Chart 11465

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 charted **Pipe** in Latitude 25°36'58.37"N, Longitude 080°10'34.16"W on NOS Chart 11465, 38th edition was neither verified nor disproved during present survey operations. The feature was brought forward from the ENCs (US5FL21M). No change in charting is recommended.

The field unit was not directed to obtain bottom samples in the Statement of Work, therefore all charted sea bed characteristic (SBDARE) objects were retained as charted. The spatial and feature attributes of the SBDARE point features were carried forward from the ENCs (US5FL21M).

D.3. MISCELLANEOUS

Chart compilation was done by Atlantic Hydrographic Branch personnel, in Norfolk, Virginia. Compilation data will be forwarded to Marine Chart Division, Silver Spring, Maryland. 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
H12008

Initial Approvals:

The completed survey has been inspected with regard to survey coverage, delineation of depth contours, disposition 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.

James J. Miller
Hydrographic Intern
Atlantic Hydrographic Branch

Norris A. Wike
Cartographer
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