W00607

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

DESCRIPTIVE REPORT

Type of Survey:	Reconnaissance
Registry Number:	W00607

LOCALITY

State(s):	Texas
General Locality:	Western Gulf of Mexico
Sub-locality:	Vicinity of Corpus Christi Bay

2015

CHIEF OF PARTY
OCM Partners

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**W00607**

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

State(s):	**Texas**
General Locality:	**Western Gulf of Mexico**
Sub-Locality:	**Vicinity of Corpus Christi Bay**
Scale:	**10000**
Dates of Survey:	**01/31/2015 to 02/05/2015**
Instructions Dated:	**05/11/2021**
Project Number:	**ESD-PHB-21**
Field Unit:	**University of Texas at Austin**
Chief of Party:	**OCM Partners**
Soundings by:	**Unknown Unknown (Lidar System)**
Imagery by:	**N/A**
Verification by:	**Pacific Hydrographic Branch**
Soundings Acquired in:	**meters at Mean Lower Low Water**

Remarks:

Any revisions to the Descriptive Report (DR) applied during office processing are shown in red italic text. The DR is maintained as a field unit product, therefore all information and recommendations within this report are considered preliminary unless otherwise noted. The final disposition of survey data is represented in the NOAA nautical chart products. All pertinent records for this survey are archived at the National Centers for Environmental Information (NCEI) and can be retrieved via https://www.ncei.noaa.gov/. Products created during office processing were generated in NAD83 UTM 14N, MLLW. All references to other horizontal or vertical datums in this report are applicable to the processed hydrographic data provided by the field unit.

DESCRIPTIVE REPORT MEMO

October 15, 2021

MEMORANDUM FOR: Commander Briana Hillstrom, NOAA

FROM: Report prepared by PHB on behalf of field unit
OCM Partners
OCM Partners, University of Texas at Austin

SUBJECT: Submission of Survey W00607

The Bureau of Economic Geology (BEG) at the University of Texas at Austin (UT) used the Chiroptera aerial surveying system to provide elevation data of the Shamrock Cove area of Corpus Christi Bay and Mustang Island, Texas. The primary goal of the project is to provide high-resolution topographic and bathymetric lidar data and aerial photography of Shamrock Cove.

The data values in this data set have been rasterized and stored in a 32-bit Floating point GeoTIFF format. The data values in this data set have been projected. This projection is noted in another section of this metadata record. The projection library used was derived from the General Cartographic Transform Program developed by the United States Geological Survey, National Mapping Division. The cell values in this data set represent the average elevation measurement found within each cell, or if there were no values in the cell, a value may have been interpolated from surrounding cells with data values. The perimeter cells of a 3x3 box surrounding the empty cell is queried for known values - if less than three values are found, then the perimeter cells of a 5x5 box is searched for known values. This process is repeated for a 7x7 box if less than 3 values are found. If less than three accumulated known values were found, then the cell is assigned a no data value (usually -999999 for formats that have a tag for the nodata value, otherwise an IEEE NaN value). If at least 3 values were found in that search, the value in the empty cell is interpolated from the known values using an Inverse Distance Weighting (IDW) method.

During prioritization the geotiff was saved as a csar surface. These surfaces were reduced to MLLW via a VDatum model as described in the Vertical and Horizontal control section of this report.

Egregious fliers were identified and removed during survey review.

All soundings were reduced to Mean Lower Low Water using VDatum. The horizontal datum for this project is North American Datum of 1983 (NAD 83). The projection used for this project is Universal Transverse Mercator (UTM) Zone 14.

Selected portions from each lidar data set were used to generate a 1m x 1m digital elevation model (DEM). Data estimated to have a horizontal accuracy of 0.01-0.05 m from ground surveys using kinematic GPS techniques were superimposed on the lidar DEM and examined for any mismatch between the horizontal position of the ground GPS and the corresponding feature on the lidar DEM. Horizontal agreement between the ground kinematic GPS and the lidar was within the resolution of the 1m x 1m DEM. Opposing flight lines crossing the calibration target, roads within the survey area, and buildings with slanted roofs are examined to remove roll, pitch, and heading errors. Several iterations of adjustments were made to minimize these errors caused by IMU misalignment.

Ground GPS surveys were conducted near the lidar survey area to acquire ground truth information to refine the processing calibration file to remove elevation biases. The ground survey points are estimated to have a vertical accuracy of 0.05-0.10m. Roads or runways, which are typically flat areas with an unambiguous surface, were surveyed using kinematic GPS techniques. The lidar data set is sorted to find data points that fall within 1 m of a ground GPS survey point. In the project calibration file, slant range correction is adjusted to remove the elevation biases. The standard deviation of the final elevation differences provides estimates of the lidar precision. Topographic lidar RMS for Shamrock Cove survey is 0.101 m.

Chiroptera system is installed in aircraft. GPS to laser offset values are measured using a survey grade Total Station (if first time installation). System is turned on using ground AC power connection to the aircraft for system check. Aircraft GPS receiver is turned on to start data collection. The pre-determined flight plan is uploaded to the Flight Management software. Ground GPS base stations are setup on geodetic reference points (with known precise Northing, Easting, and Elevation information) in or near the survey area. GPS receivers are set for continuous 1 second data collection rate. Aircraft GPS and Base GPS information needs to overlap each other for the duration of the survey flight. Aircraft takes off to begin the survey mission. Pilot follows the flight altitude, speed and the flight lines as directed by the flight plan. Raw laser point cloud data is collected with external solid state hard drives in the Chiroptera. High resolution raw images are collected using integrated medium format camera. VGA low resolution images are collected for operator and post-processing reference. GPS and attitude (INS) information is collected on an external storage device. Airborne survey is completed after all flight lines are flown.

All laser data and raw image files are downloaded to the field computer using its internal drive enclosures. GPS and INS data are downloaded using USB3.0 connections to the field computer. Preliminary GPS processing is completed by merging base GPS receiver with the remote to create a GPS trajectory (GrafNav). The preliminary GPS trajectory is combined with attitude information in AEROoffice to create a 7-parameter (TXYZ,roll,pitch,yaw) navigation file. The navigation solution is used to reference each laser pulse return with the 7-paramater information in LSS. Laser point cloud data is output by flight line in multiple segments. Point cloud data is examined to determine quality of the data coverage (i.e. sufficient overlap of flight lines and point spacing).

Upon return from the survey area, all files are transferred from the field computer to an in-house server. Compute base station coordinates using National Geodetic Survey's (NGS) Online Positioning User Service (OPUS). Setup project in AEROoffice software and covert Chiroptera GPS files to binary Novatel GPS files. Convert aircraft GPS file and base station GPS files to

GrafNav compatible format. Compute merged aircraft trajectory using GrafNav software. Solutions for base station coordinates and aircraft trajectories are in NAD83. Combine precise trajectories with aircraft attitude information in AEROoffice to create final precise 7-parameter navigation file (TXYZ,roll,pitch,yaw). Laser point data are generated in AHAB processing software Lidar Survey Studio (LSS) combining navigation file information and laser data. LSS also requires a calibration, processing settings, and system configuration files. LSS parameters are adjusted to minimize noisy data output. A configuration file is prepared by setting amplitude thresholds and backscatter threshold values. A water-refraction value based on salinity is computed to provide optimum performance (1.3429). The select map option is utilized to automatically determine the water surface elevation (within LSS). After initial processing, waveform information is analyzed to determine if the laser returns are being classified properly. Bathymetric laser-point data were output from LSS in LAS v1.2 format (a binary file format). A condition is set in LSS to output data in the proper UTM zone and hemisphere. The resultant points are referenced to the Geographic NAD83 horizontal datum and height above the NAD83 ellipsoid. Using the TerraScan utility of MicroStation, flight line segment files were concatenated and Class 6 (shallow bathymetric returns) and Class 7 (bottom/seafloor) were extracted. The 2012A geoid model was used to adjust the elevation data from ellipsoidal to orthometric heights (NAVD88) using a LAStools script called lasheight.

The NOAA Office for Coastal Management (OCM) received 2 files (one for topo and one for bathy) in las format from UT BEG. The files contained elevation and intensity measurements along the coast of Texas. The data were in UTM Zone 14 NAD83 coordinates and NAVD88 (Geoid12A) elevations in meters The data were classified as: 6 (bathy/bathy vegetation), 7 (bathy), 9 (ground), 13 (low vegetation), 14 (medium vegetation), 15 (high vegetation) . OCM performed the following processing on the data for Digital Coast storage and provisioning purposes: 1. The LAStools software scripts lasinfo and lasvalidate, were run on the las files to check for errors. 2. The LAStools software script las2las was run to convert the classifications of: Class 6 (bathy/bathy vegetation) to Class 14 (bathy/bathy vegetation) Class 7 (bathy) to Class 26 (bathy) Class 9 (ground) to Class 2 (ground) Class 13, 14, 15 (low/medium/high vegetation) to Class 1 (unclassified) - these classes were converted due to the fact that many points with these classifications were actually structures. 3. Internal OCM scripts were run on the las files to convert from UTM Zone 14 NAD83 coordinates to geographic NAD83 coordinates, from orthometric (NAVD88) elevations to ellipsoid elevations using the Geoid 12A model, to assign the geokeys, and zip the data to database and to http.

During prioritization at the Pacific Hydrographic Branch, a VDatum separation model was generated and applied to reduce the data to MLLW. The VDatum model needed to be interpolated over areas where data was missing. This was achieved by creating a TIN which was further interpolated. The interpolated surface was thoroughly examined to confirm the correct values were applied across the surface.

This data set contains LAS v. 1.2 format points data from the Shamrock Cove, Texas (Mustang Island & Corpus Christi Bay). The data were collected January 30 and February 5, 2015 using the Bureau of Economic Geology's airborne system (Chiroptera) which can collect topographic lidar data, shallow bathymetric lidar data, and natural color/color infrared imagery. The X, Y,

and Z point data are generated by combining laser range and aircraft attitude data collected using an airborne light detection and ranging (lidar) instrument with once-per-second data collected using geodetic quality (dual phase) Global Positioning System (GPS) airborne and ground-based receivers. The equipment was installed in a twin engine Partenavia P68 aircraft (tail number N300LF) owned and operated by Aspen Helicopters, Inc., and operated locally out of Aransas County Airport in Rockport, Texas. This data set is a raster file of z values with 5562 columns and 10100 rows. The data set was extracted from a larger classified data set and only includes points classified as Bathymetric point and Ground within the requested geographic bounds.

The Chiroptera LiDAR system was developed and manufactured by Airborne Hydrography AB (AHAB). The topographic LiDAR scanner operates at a wavelength of 1 um, a pulse rate as high as 400 kHz, and swath width of 28 to 40 degrees. It can operate to a maximum height of about 1500 m, allowing the system to be used to rapidly scan large areas with a range accuracy of about 2 cm over a flat target. The bathymetric LiDAR scanner operates at a shorter wavelength (0.5 um) and a lower pulse rate (36 kHz). The shorter wavelength allows the laser to penetrate water of reasonable clarity. After the laser reflects off the bottom surface and back to the source, the transit-time delay between water-surface and water bottom reflections can be used to determine water depths to a flat-bottom accuracy of about 15 cm. Also mounted in the Chiroptera chassis is a Hasselblad DigiCAM 50 megapixel natural color or color infrared camera that acquires frame images at a resolution of 8,176 by 6,132 pixels.

All data were reviewed for DTONs and none were identified in this survey.

University of Texas at Austin via Digital Coast acquired the data outlined in this report. Data are available at https://www.fisheries.noaa.gov/inport/item/51864. Additional documentation from the data provider may be attached to this report.

This survey mainly covers intertidal zones. These areas lack soundings on the chart, therefore this data could be valuable in the compilation of the NBS in the region.

This survey does meet charting specifications and is adequate to supersede prior data.