



Coastal Protection and Restoration Authority
LiDAR Topographic Survey for East and North Delacroix
Marsh Creation and Terracing Project
Saint Bernard Parish, LA



Survey Report by C.H. Fenstermaker & Associates L.L.C.

July 8, 2022

1. Project overview

Coastal Protection and Restoration Authority (CLIENT) requested C.H. Fenstermaker & Associates, L.L.C. (FENSTERMAKER) to provide topographic LiDAR survey services on the Delacroix and Wood Lake Levee, located in Saint Bernard Parish, Louisiana. *See figure 1*

Figure 1



2. Acquisition & Calibration

2.1. Airborne LiDAR Collection

A Riegl miniVUX-2UAV LiDAR system was used for acquisition of the LiDAR data. The system was installed on a DJI M600Pro Hex copter. In total 14 flight lines were required to cover the AOI. Nominal flying height was 75m above ground level (AGL) with a speed of 6m/s. The AOI was captured with at least 60% overlap.



DJI MATRICE 600PRO WITH RIEGL miniVUX2

LiDAR Acquisition Specifications	
Flight Altitude	75m AGL
Flight Speed	6 m/s
Scan Field of View	360°
Line Spacing	200m
Minimum Overlap	60% (double coverage +10%)
Scan Rate	200khz



2.1. GNSS Trajectory Processing

GNSS post-processing determines the position and altitude of the aircraft at a rate of 5k/sec along the entire flight path. This data is logged on the Riegl miniVUX2 via an NOVTEL STIM300 (IMU). Post processing requires data from the onboard GNSS and IMU as well as data from one or more static GNSS base station(s) with known coordinates.

Processing is performed with Waypoint Inertial Explorer v8.9 software (a Hexagon Novtel Product). Here the UAV/LiDAR inertial unit (GPS/IMU) data is referenced to the base station data to provide adjusted positions for the unit's latitude, longitude, height, roll, pitch, and yaw/heading. The final trajectory file is then exported to apply to RAW Scanner data for final export of LAS files.

Trajectory Position Accuracy				
Stat	East	North	Height	3D
Std:	0.00005m	0.00006m	0.00017m	0.00017m
RMS:	0.00164m	0.00179m	0.00243m	0.00378m
AVG:	0.00164m	0.00179m	0.00243m	0.00378m
Min:	0.00285m	0.00310m	0.00421m	0.00736m
Max:	0.00160m	0.00172m	0.00235m	0.00356m

2.2. Lidar Calibration

Lidar calibration is completed in a controlled environment at manufacturer. Last Bench calibration was completed March 16, 2022, for unit V2B-21460773.

3. Ground Control Survey

Ground survey was completed utilizing a Leica GS16 (Base) & GS18 (Rover) GNSS receivers to measure ground control points. A Base Point was established in the AOI, and static file was collected at a rate of 0.05 sec. This static file was used in the computation of the trajectory file.

Delecroix Levee			
GCP	X	Y	Z
119	0.00577	0.00312	0.16233
120	0.00334	0.00188	0.19173
121	-0.0117	-0.0174	0.32396
122	-0.0004	0.00021	0.00866
123	-0.0024	0.00136	0.05593
124	-0.0009	0.00031	0.03279
125	-0.0009	-0.0008	0.17286
126	0.0008	0.00131	0.27894
127	0.00273	-0.0013	0.05749
128	0.0048	0.00243	0.15915
129	0.00713	0.00733	0.25725
130	-0.0077	-0.0194	0.19251
AVG	0.00004	-0.00175	0.15780

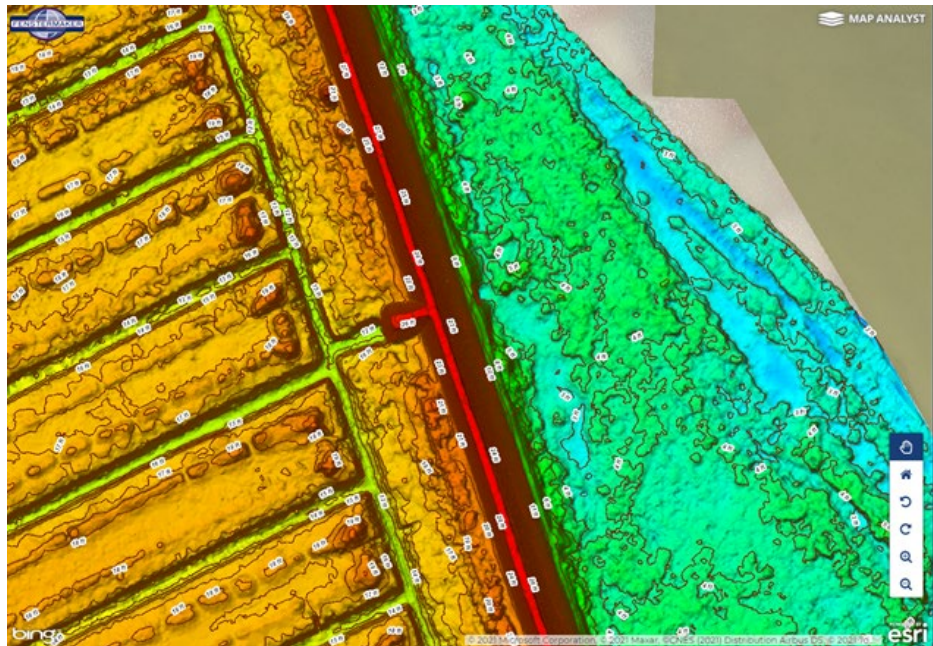
Wood Lake Levee			
GCP	X	Y	Z
113	0.0037	-0.0043	0.13396
114	-0.0028	-0.0031	0.19075
115	0.00167	0.00575	0.14599
116	0.00481	-0.0029	0.20938
117	-0.0087	-0.0098	0.15685
118	-0.0134	-0.0036	0.1756
AVG	-0.0025	-0.003	0.16876

As Per client’s request, the project control point BS32-SM-01 Monument was occupied as base point for survey.

For this project, 170 points were measured throughout the project area. 18 of the 170 points were set for ground control points (GCPs) as a 3D check. The remainder of the points were observed in cross section fashion around dike as vertical checks. See Table on left for LiDAR to Observe control points.

4. File Formats, Units, and Projection

- 4.1. Microsoft Excel spread sheets showing the x, y, z values of bare ground surface.
- 4.2. LAS file of all points collected with survey.
- 4.3. XYZ Files of Surfaces at 1ft,5ft, and 10ft spacing.
- 4.4. Survey report summarizing the work performed to create the final product.
- 4.5. Contours in KMZ format at 0.5- and 0.25-foot intervals



4.6. Map Projection info:

Map projection Information	
Horizontal Datum	NAD 83 LA S
Vertical Datum	NAVD88
Geoid	12B
Units	USFT