

Survey and Map Report

For a

TOPOGRAPHIC SURVEY

Of

**I-20 WATEREE RIVER
Kershaw County , South Carolina**

By

GPI

**508 W 5th Street, Suite 150
Charlotte, NC 28202
Voice 704-540-0087**

Survey and Map Report
of a
TOPOGRAPHIC SURVEY
by Photogrammetric Methods

Produced By:

GPI Geospatial, Inc.
508 W 5th Street, Suite 150
Charlotte, NC 28202
Voice 704-540-0087

Photogrammetrist in Responsible Charge:
Scott Williams, PPS (#22609)

Project Name: I-20 Wateree River Bridge Repairs, Project #2020466.00

Client of Record for Project:
Kenneth Herring
RS&H
10748 Deerwood Park Blvd South
Jacksonville, FL 32256--0597
904-256-2500

Delivered Files:

Aerial Survey CAD Files:

- Wateree_Bridge_Data.dgn
- Wateree_DTM.dgn
- Wateree_Plan.dgn

Ortho Imagery:

- Digital Color Orthophotos in TIF and SID Format

LiDAR Data:

- Tiled LAS Data
- Bare earth LAS LiDAR Data

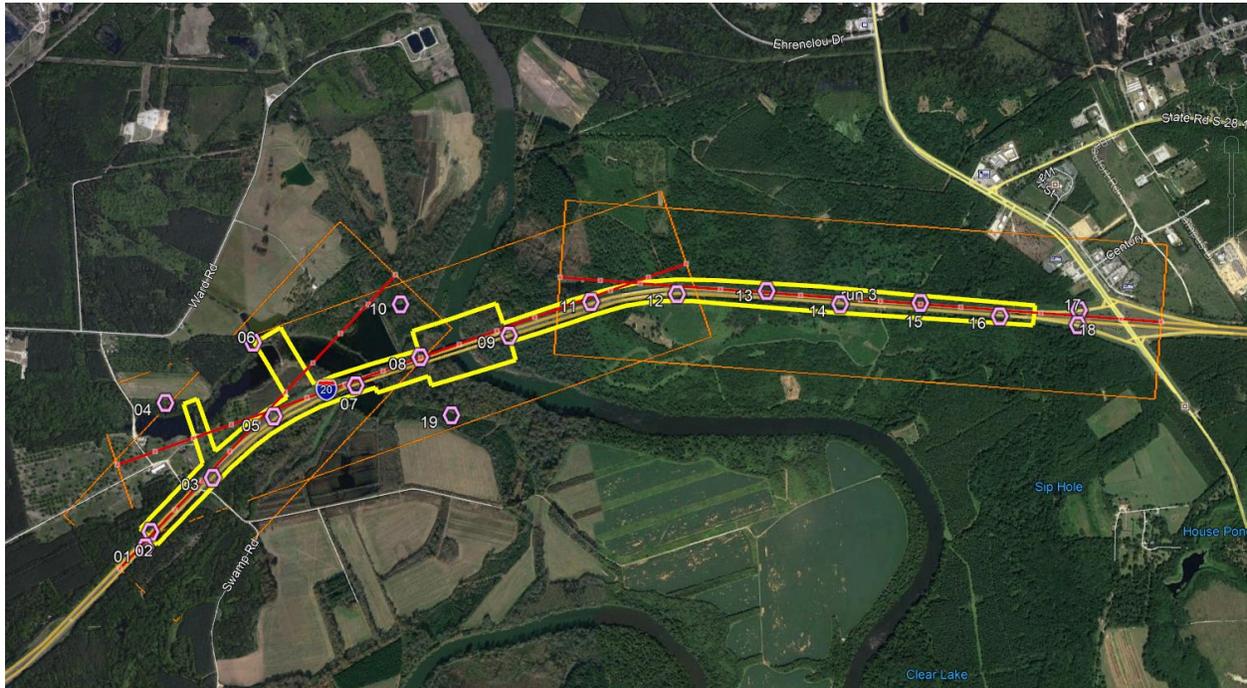
Notes:

- All notes and remarks in this report are project specific.
- This map is intended to be displayed at a scale of 1" =50' or smaller.
- This map is neither full nor complete without the original, unaltered digital data files listed above. No paper plot or other format hardcopy map was produced for this project.

- If this report states “Preliminary” and/or does not bear the signature and original seal of a Licensed Surveyor, this report is for informational purposes only and is not valid.
- Additions or deletions to this report and/or accompanying data files are prohibited without written consent of the Photogrammetrist in Responsible Charge. The signing party is not responsible for additions, deletions or changes to the information contained in this digital file or Survey and Map Report. Digital copies of this report in any digital format are for information purposes only.
- This mapping conforms to Minimum Technical Standards for a Topographic Survey in accordance with the National Map Accuracy Standards and was produced by Photogrammetric methods.

Approximate Location of mapping areas:

I-20 over Wateree River approximately from MM 94.05 (3,137 LF south of the twin bridges over Swamp Road) to MM 97.63 in Kershaw County, South Carolina.



Control for Aerial Targets- This digital vector mapping is based on acceptable residuals from aerial triangulation using coordinates supplied on aerial targets for this project. The ground control survey was by CH Engineering.

- The signing party of this report is not responsible for the Ground Control Survey.

The Aerial LiDAR was controlled with the same ground control and fit to the following residuals:

Target	Easting	Northing	Known Z	Laser Z	Dz
P01	2106361.72	864527.446	163.05	163.05	0.000
P02	2106466.111	864791.708	163.78	163.754	-0.026
P03	2107568.193	865647.989	166.16	166.112	-0.048
P04	2106864.874	866964.142	163.85	163.914	0.064
P05	2108654.103	866625.858	165.85	165.845	-0.005
P06	2108410.665	867873.058	157.52	157.56	0.040
P07	2110058.254	867084.515	161.36	161.343	-0.017
P08	2111184.583	867505.739	162.01	161.998	-0.012
P09	2112700.018	867784.581	161.63	161.595	-0.035
P10	2110891.126	868410.153	143.09	143.117	0.027
P11	2114112.313	868283.544	161.23	161.245	0.015
P12	2115581.41	868343.238	158.98	158.953	-0.027
P13	2117093.812	868311.947	159.54	159.528	-0.012
P14	2118329.705	868031.668	159.26	159.26	0.000
P15	2119689.016	867978.547	157.46	157.486	0.026
P16	2121020.049	867685.939	157.36		*
P17	2122266.678	867712.251	162.5	162.502	0.002
P18	2122326.228	867458.832	162.78	162.789	0.009
P19	2111551.403	866578.492	141.83		*
P20	2111749.362	866123.468	142.12		*
Average dz		0			
Minimum dz		-0.048			
Maximum dz		0.064			
Average Magnitude		0.022			
RMSE		0.028			
Std Deviation		0.028			

The aerial ortho imagery was controlled with the same ground control and fit to the following residuals

2020466.00 CH Wateree - Final Imagery Control Report								
TARGET #	EASTING	NORTHING	EASTING	NORTHING	X DIFFERENCE	Y DIFFERENCE		DIRECT
P01	2106361.720	864527.446	2106361.768	864527.494	-0.048	-0.048		0.068
P02	2106466.111	864791.708	2106466.063	864791.756	0.048	-0.048		0.068
P03	2107568.193	865647.989	2107568.193	865647.989	0.000	0.000		0.000
P04	2106864.874	866964.142	2106864.898	866964.178	-0.024	-0.036		0.043
P05	2108654.103	866625.858	2108654.079	866625.930	0.024	-0.072		0.076
P06	2108410.665	867873.058	2108410.605	867872.998	0.060	0.060		0.085
P07	2110058.254	867084.515	2110058.338	867084.479	-0.084	0.036		0.091
P08	2111184.583	867505.739	2111184.583	867505.739	0.000	0.000		0.000
P09	2112700.018	867784.581	2112700.066	867784.581	-0.048	0.000		0.048
P11	2114112.313	868283.544	2114112.313	868283.520	0.000	0.024		0.024
P12	2115581.410	868343.238	2115581.338	868343.253	0.072	-0.015		0.074
P13	2117093.812	868311.947	2117093.809	868311.947	0.003	0.000		0.003
P14	2118329.705	868031.668	2118329.702	868031.722	0.003	-0.054		0.054
P15	2119689.016	867978.547	2119689.016	867978.547	0.000	0.000		0.000
P16	2121020.049	867685.939	2121019.953	867685.939	0.096	0.000		0.096
				AVERAGE (ABS)	0.007	-0.010		0.049
				MINIMUM	-0.084	-0.072		0.000
				MAXIMUM	0.096	0.060		0.096
				RMSe	0.047	0.036		0.059
				95%	RMSErx 1.7308			0.103

Aerial Imagery & LiDAR Acquisition

The aerial acquisition for this project was completed on February 8th, 2021 by:

GPI Geospatial, Inc.
 3051 E. Livingston Street, Suite 300
 Orlando, FL 3280.

The aerial acquisition for this project was accomplished using our Riegl VQ-1560i LiDAR Sensor at an altitude of 1800' AMT for a base LiDAR density of ~64 ppsm. The imagery was collected using our Vexcel Ultra Cam Eagle at an altitude of 2500' AMT for a nominal raw imagery GSD resolution of ~7.6cm.

Accuracies

The horizontal and vertical locations of well-identified planimetric features in this digital map were designed to meet FGDC standards of accuracy to the 95% confidence level. Some planimetric features shown in areas obscured by shadows, dirt, or dense vegetative canopy may have been interpolated. The horizontal and vertical accuracies of these features cannot be guaranteed because they are not clearly visible on the photography. Buildings, contours and other features depicted with short dashed lines in these areas are estimated.

Intended Completeness of Mapping

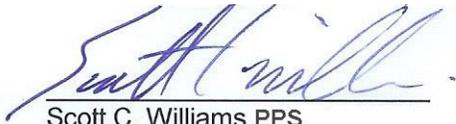
This mapping project was completed to normal GPI Geospatial standard specifications for 1" = 50' mapping. The features collected included:

- | | |
|-----------------------------------|-------------------------------------|
| 1' Interval Contours | Paved and Un-paved roads and drives |
| Spot Elevations | Paved and Un-paved parking areas |
| Gridded LiDAR points & Breaklines | Tree and Brush Lines |

Buildings, bridges and other structures
Fences, gates & guardrails
Rivers, lakes and streams

Poles, posts, light poles & visible utilities
Walls, headwalls and Culverts

I, Scott Williams, PPS (#22609) certify that this project was completed under my direct and responsible charge from an actual photogrammetric survey made under my supervision: that this survey was performed to meet Federal Geographic Data Committee Standards as applicable; that the photography was obtained on **February 8, 2021**; that the survey was completed on **April 1, 2021**; that contours shown as broken lines may not meet the stated standard; and all coordinates are based on **South Carolina State Plane, NAD83 (2011), International Feet**



Scott C. Williams, PPS
South Carolina Professional Land Surveyor



Date: 04.01.21

Aerial Triangulation Results

PhotoT Triangulation Options

Adjustment Mode : Absolute
Precision Computation : Enabled
Error Detection : Enabled
Camera Calibration : Disabled
Self-Calibration : Disabled
Given EO/GPS : Enabled
Antenna Offsets : Disabled
GPS Shift/Drift Correction : Enabled
INS Shift/Drift Correction : Enabled

Parameters

Parameter	X/Omega	Y/Phi	Z/Kappa	XY
RMS Control	0.027	0.018	0.006	0.023
RMS Check				
RMS Limits	0.100	0.100	0.100	
Max Ground Residual	0.097	0.059	0.025	
Residual Limits	0.200	0.200	0.200	
Mean Std Dev Object	0.038	0.046	0.122	
RMS Photo Position	0.077	0.066	0.091	
RMS Photo Attitude	0.002	0.002	0.004	
Mean Std Dev Photo Position	0.103	0.101	0.053	
Mean Std Dev Photo Attitude	0.002	0.002	0.001	