

LIDAR Accuracy Re-Assessment Report—Pender County

Pender County, Cape Fear Basin

The initial assessment report for Pender County, dated 3/29/2002, indicated that the data did not meet the RMSE criteria. Although the data only failed by a small margin (less than 1 cm), the RMSE values exhibited a wide dispersion of error. Some areas appeared to have artifacts left within the data as it contained both good and weak differences in close proximity to each other. However other outliers such as in "grass" failed by as much as 3.6 meters. This discrepancy warranted further review of both the LIDAR and survey data. To isolate the potential problem, 3D models were created of the LIDAR data and then compared to the survey checkpoints. All indications at this stage pointed to the survey checkpoints as being in error. The survey data was further reviewed with the end result indicating that there were errors in the data. The survey data was then corrected and a new interpolation of the TIN data along with the associated spreadsheets was performed.

The revised checkpoint spreadsheets were received from NCGS on April 22, 2002. Two spreadsheets were included which compared the independent QA/QC survey checkpoints with the interpolated LIDAR "Z" value as provided by the contractors. The spreadsheet summaries included:

1. All the checkpoints with the RMSE calculation for combined land cover
2. 95% of the checkpoints with the RMSE calculation (5% of points having the largest error removed)

All data was reviewed and further analyzed to assess the quality of the data. The review process examined the statistics for the combined land cover and the trends for each specific land cover type. The following graphs and figures illustrate the data quality as per the RMSE criteria.

Table 1 summarizes the RMSE using:

- 100% of the checkpoints
- 95% of the checkpoints
- Checkpoints categorized by land cover type

%	RMSE (cm)	# of Points	Land Class	RMSE Criteria (cm)
100	20.5	133	All	
95	18.5	126	All	20
25	15.2	34	Grass	
15	19.6	20	Weeds/Crop	
5	21.5	10	Scrub	
33	20.9	39	Forest	
17	16.1	23	Built-up	

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The LIDAR data for Pender County, Cape Fear Basin meet the specification as per the RMSE criteria of 20 cm.

All figures represent the data with the 95% data set. The data is of good quality.

Figure 1 illustrates the RMSE by specific land cover type.

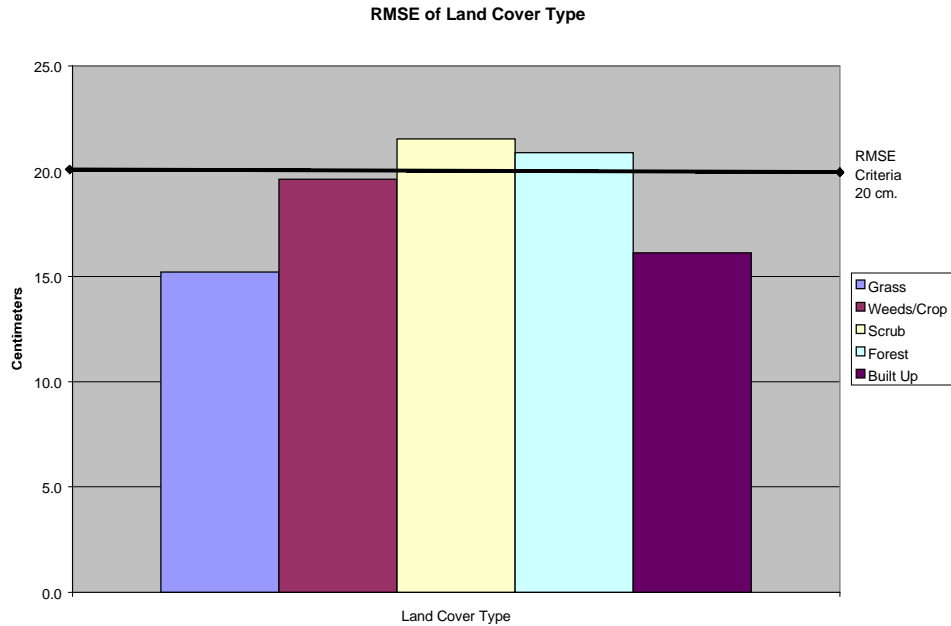


Figure 1

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Figure 2 illustrates the magnitude of the differences between the checkpoints and LIDAR data by specific land cover type and sorted from lowest to highest.

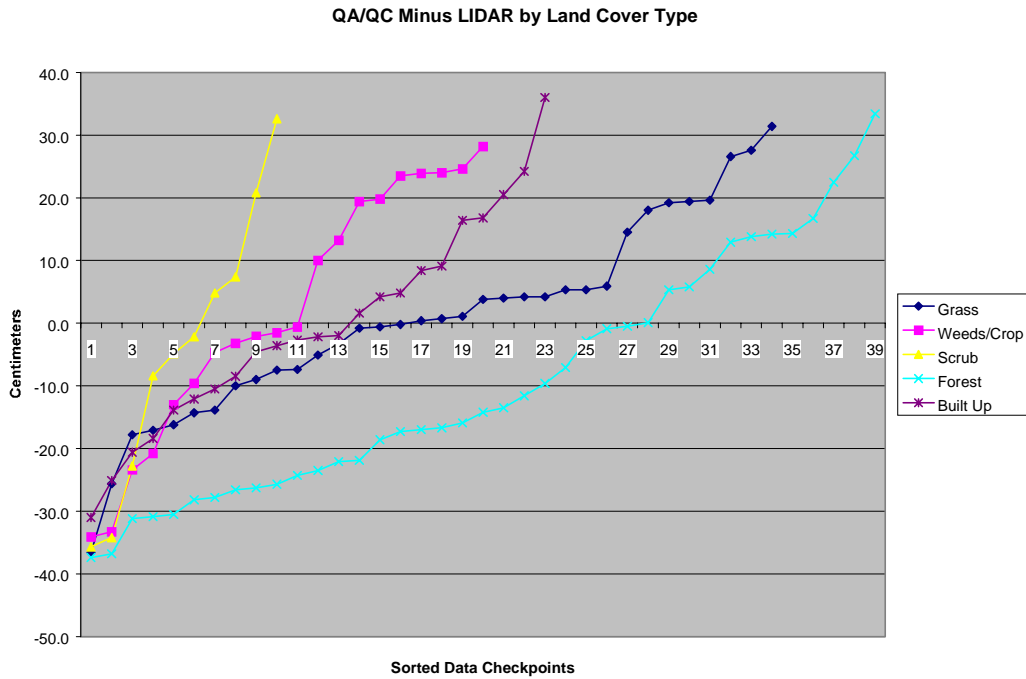


Figure 2

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Table 2 illustrates the Delta between the QA/QC survey checkpoints and that of the interpolated LIDAR.

Table 2. Elevation Delta			
Delta (cm)	Land Cover		
-36.6	Grass	-2.1	Weeds/Crop
-25.6	Grass	-1.5	Weeds/Crop
-17.8	Grass	-0.6	Weeds/Crop
-17.1	Grass	10.0	Weeds/Crop
-16.2	Grass	13.2	Weeds/Crop
-14.3	Grass	19.4	Weeds/Crop
-13.9	Grass	19.8	Weeds/Crop
-10.0	Grass	23.5	Weeds/Crop
-9.0	Grass	23.9	Weeds/Crop
-7.5	Grass	24.0	Weeds/Crop
-7.4	Grass	24.6	Weeds/Crop
-5.1	Grass	28.2	Weeds/Crop
-3.3	Grass	-35.7	Scrub
-0.8	Grass	-34.2	Scrub
-0.6	Grass	-22.8	Scrub
-0.2	Grass	-8.4	Scrub
0.4	Grass	-4.9	Scrub
0.7	Grass	-2.2	Scrub
1.1	Grass	4.8	Scrub
3.8	Grass	7.4	Scrub
4.0	Grass	20.8	Scrub
4.2	Grass	32.6	Scrub
4.2	Grass	-37.4	Forest
5.3	Grass	-36.8	Forest
5.3	Grass	-31.2	Forest
5.9	Grass	-30.9	Forest
14.5	Grass	-30.5	Forest
18.0	Grass	-28.2	Forest
19.2	Grass	-27.8	Forest
19.4	Grass	-26.6	Forest
19.6	Grass	-26.3	Forest
26.6	Grass	-25.7	Forest
27.6	Grass	-24.3	Forest
31.4	Grass	-23.5	Forest
-34.1	Weeds/Crop	-22.1	Forest
-33.3	Weeds/Crop	-21.9	Forest
-23.4	Weeds/Crop	-18.6	Forest
-20.8	Weeds/Crop	-17.3	Forest
-13.0	Weeds/Crop	-17.0	Forest
-9.6	Weeds/Crop	-16.7	Forest
-4.7	Weeds/Crop	-15.9	Forest
-3.2	Weeds/Crop	-14.2	Forest
		-13.5	Forest
		-11.6	Forest
		-9.6	Forest
		-7.1	Forest
		-2.8	Forest
		-0.9	Forest
		-0.5	Forest
		0.1	Forest
		5.3	Forest
		5.8	Forest
		8.6	Forest
		12.9	Forest
		13.8	Forest
		14.2	Forest
		14.3	Forest
		16.7	Forest
		22.5	Forest
		26.7	Forest
		33.4	Forest
		-31.0	Built-up
		-25.1	Built-up
		-20.6	Built-up
		-18.4	Built-up
		-13.9	Built-up
		-12.1	Built-up
		-10.5	Built-up
		-8.5	Built-up
		-4.6	Built-up
		-3.6	Built-up
		-2.7	Built-up
		-2.2	Built-up
		-2.0	Built-up
		1.6	Built-up
		4.2	Built-up
		4.8	Built-up
		8.4	Built-up
		9.1	Built-up
		16.4	Built-up
		16.8	Built-up
		20.5	Built-up
		24.2	Built-up
		36.0	Built-up

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Table 3 illustrates the overall statistics for the checkpoint data.

Table 3. Overall Descriptive Statistics								
	RMSE (cm)	Mean (cm)	Median (cm)	Skew (cm)	Std Dev (cm)	# of Points	Min (cm)	Max (cm)
Total	18.5	-2.8	-2.2	0.1	18.4	126	-37.4	36.0
Grass	15.2	0.8	0.5	0.0	15.4	34	-36.6	31.4
Weeds/Crop	19.6	2.0	-1.0	-0.4	20.0	20	-34.1	28.2
Scrub	21.5	-4.3	-3.5	0.0	22.2	10	-35.7	32.6
Forest	20.9	-9.3	-14.2	0.5	18.9	39	-37.4	33.4
Built Up	16.1	-0.6	-2.2	0.3	16.5	23	-31.0	36.0

Figure 3 illustrates a histogram of the associated delta errors between the data checkpoints and the interpolated TIN values.

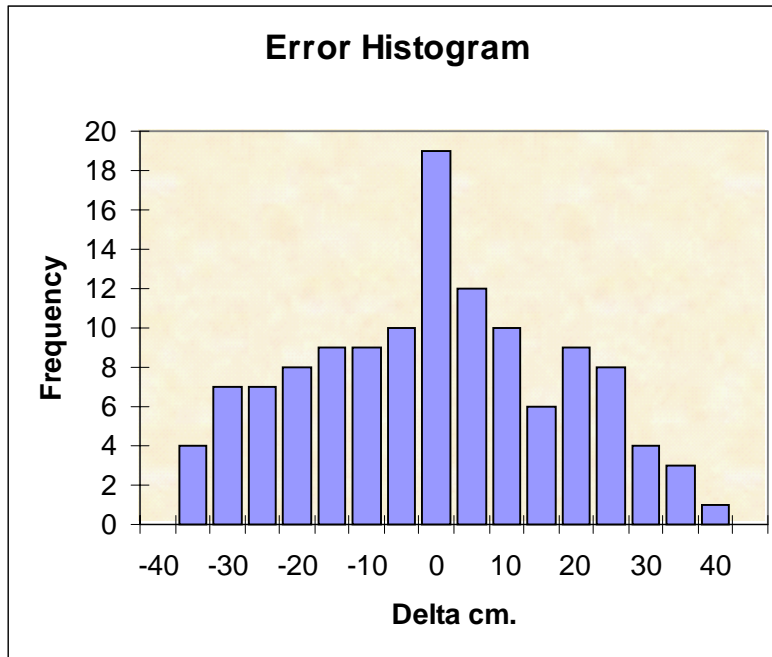


Figure 3