Columbus County - Lumber and Cape Fear Basins

Due to the limited number of checkpoints submitted for the LIDAR verification process for Columbus County, Cape Fear Basin, the checkpoints have been combined with Columbus County, Lumber Basin. The following statistics will reflect the additional ten survey checkpoints as measured for the Cape Fear Basin with the previous 134 survey checkpoints.

The preliminary checkpoint spreadsheets (Lumber Basin) and secondary spreadsheets (Cape Fear) were received from NCGS on June 26, 2001 and November 7, 2001 respectively . Two spreadsheets were included for each county, which compared the independent QAQC 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)

The exception is that the Cape Fear Basin only had one spreadsheet reflecting 100% of the ten points.

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

Table 1. RMSE by Land Class

%	RMSE (cm)	# of Points	Land Class	RMSE Criteria (cm)
100	39.9	144	All	
95	**12.5**	**137**	**All**	**25**
26	13.0	38	Grass	
18	13.5	26	Weeds/Crop	
5	17.2	7	Scrub	
31	11.9	44	Forest	
15	11.5	22	Built-up	

The LIDAR data for Columbus County <u>meets the specification</u> as per the RMSE criteria of 25 cm.

All figures represent the data with the 95% data set. The data is of good quality and exceeds the RMSE criteria. Although the additional ten survey points are within specification, geographically they are not situated to be ideal unique checks. There are three groups containing the ten points with a maximum distance of 42 meters between adjacent points. Ideally the point spacing should be a minimum of 150 meters so that the solution used to derive the LIDAR answer is slightly different, such as using a different GPS epoch or different hertz rate of the scan during the LIDAR processing.

Figure 1 illustrates the RMSE by specific land cover class.

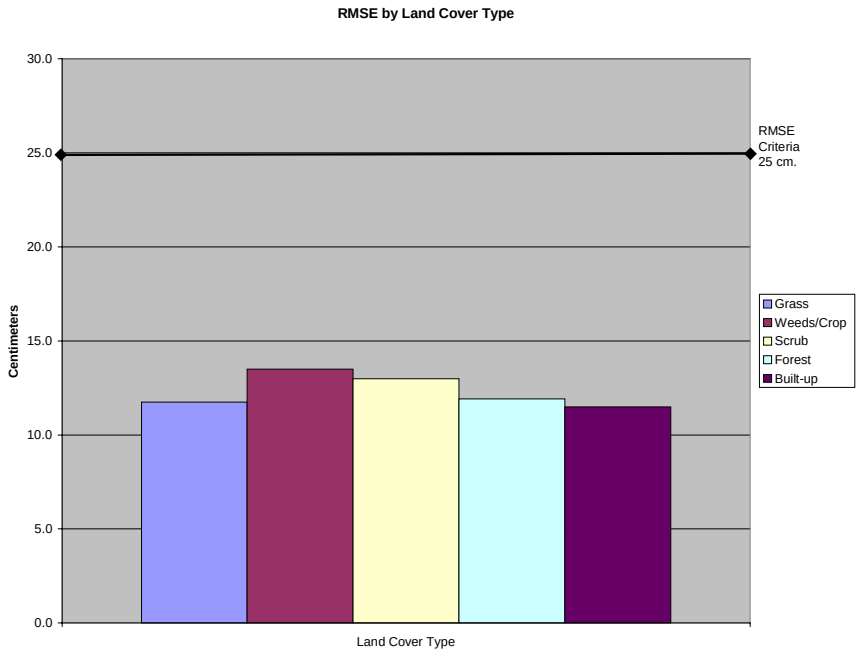

Figure 1

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

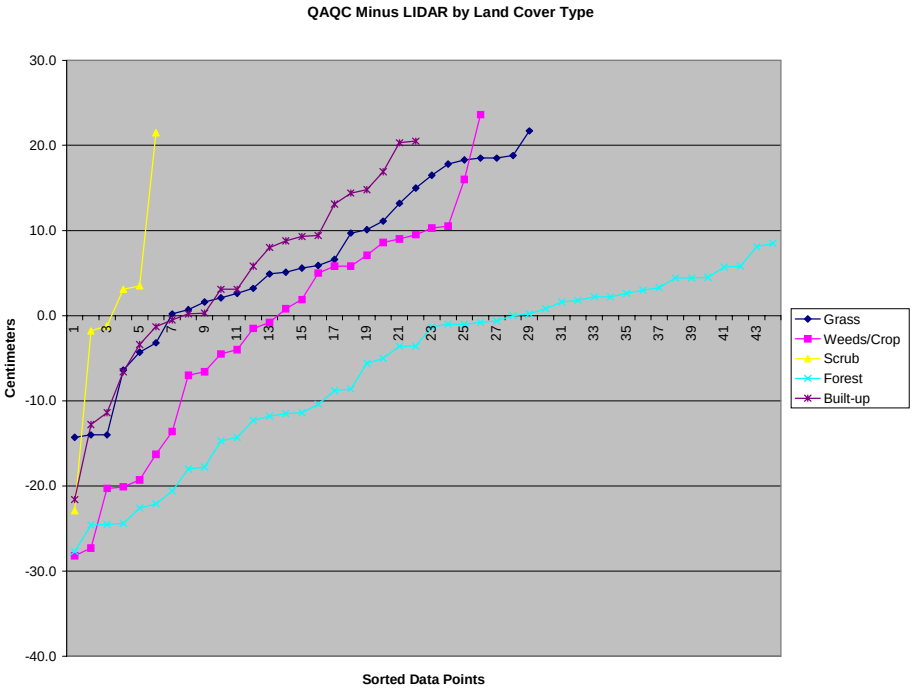

Figure 2

Table 2 illustrates the Delta between the QAQC survey checkpoints and that of the interpolated LIDAR.

Table 2. Elevation Delta	
Delta (cm)	**Land Cover**
-14.3	Grass
-14.0	Grass
-14.0	Grass
-6.4	Grass
-4.3	Grass
-3.2	Grass
0.2	Grass
0.7	Grass
1.6	Grass
2.1	Grass
2.6	Grass
3.2	Grass
4.9	Grass
5.1	Grass
5.6	Grass
5.9	Grass

6.6	Grass
7.6	Grass
7.9	Grass
9.7	Grass
10.1	Grass
10.5	Grass
10.5	Grass
11.1	Grass
13.2	Grass
14.7	Grass
15.0	Grass
15.2	Grass
16.5	Grass
17.8	Grass
18.3	Grass
18.5	Grass
18.5	Grass
18.8	Grass

18.8	Grass
21.7	Grass
25.4	Grass
25.4	Grass
-28.2	Weeds/Crop
-27.3	Weeds/Crop
-20.3	Weeds/Crop
-20.1	Weeds/Crop
-19.3	Weeds/Crop
-16.3	Weeds/Crop
-13.6	Weeds/Crop
-7.0	Weeds/Crop
-6.6	Weeds/Crop
-4.5	Weeds/Crop
-4.0	Weeds/Crop
-1.5	Weeds/Crop
-0.8	Weeds/Crop
0.8	Weeds/Crop

1.9	Weeds/Crop
5.0	Weeds/Crop
5.8	Weeds/Crop
5.8	Weeds/Crop
7.1	Weeds/Crop
8.6	Weeds/Crop
9.0	Weeds/Crop
9.5	Weeds/Crop
10.3	Weeds/Crop
10.5	Weeds/Crop
16.0	Weeds/Crop
23.6	Weeds/Crop
-32.4	Scrub
-22.9	Scrub
-1.8	Scrub
-1.2	Scrub
3.1	Scrub
3.5	Scrub
21.5	Scrub
-27.7	Forest
-24.6	Forest
-24.5	Forest
-24.4	Forest
-22.6	Forest
-22.1	Forest
-20.6	Forest
-18.0	Forest
-17.8	Forest
-14.7	Forest

-14.3	Forest
-12.3	Forest
-11.8	Forest
-11.5	Forest
-11.4	Forest
-10.4	Forest
-8.8	Forest
-8.6	Forest
-5.6	Forest
-5.0	Forest
-3.6	Forest
-3.6	Forest
-1.3	Forest
-1.0	Forest
-1.0	Forest
-0.8	Forest
-0.6	Forest
0.0	Forest
0.2	Forest
0.8	Forest
1.6	Forest
1.8	Forest
2.2	Forest
2.2	Forest
2.6	Forest
3.0	Forest
3.3	Forest
4.4	Forest
4.4	Forest

4.5	Forest
5.7	Forest
5.8	Forest
8.1	Forest
8.5	Forest
-21.6	Built-up
-12.8	Built-up
-11.4	Built-up
-6.6	Built-up
-3.4	Built-up
-1.3	Built-up
-0.5	Built-up
0.2	Built-up
0.3	Built-up
3.1	Built-up
3.1	Built-up
5.8	Built-up
8.0	Built-up
8.8	Built-up
9.3	Built-up
9.4	Built-up
13.1	Built-up
14.4	Built-up
14.8	Built-up
16.9	Built-up
20.3	Built-up
20.5	Built-up

Table 3 illustrates the overall statistics for the checkpoint data.

Table 3: Overall Descriptive Statistics

	RMSE (cm)	Mean (cm)	Median (cm)	Skew	Std Dev (cm)	# of Points	Min (cm)	Max (cm)
Total	**12.5**	0.3	1.9	-0.4	12.8	137	-32.4	25.4
Grass	**13.0**	8.1	8.8	-0.5	10.3	38	-14.3	25.4
Weeds/Crop	**13.5**	-2.1	0.0	-0.4	13.6	26	-28.2	23.6
Scrub	**17.2**	-4.3	-1.2	-0.4	17.9	7	-32.4	21.5
Forest	**11.9**	-6.1	-2.4	-0.6	10.4	44	-27.7	8.5
Built-up	**11.5**	4.1	4.5	-0.5	11.0	22	-21.6	20.5

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

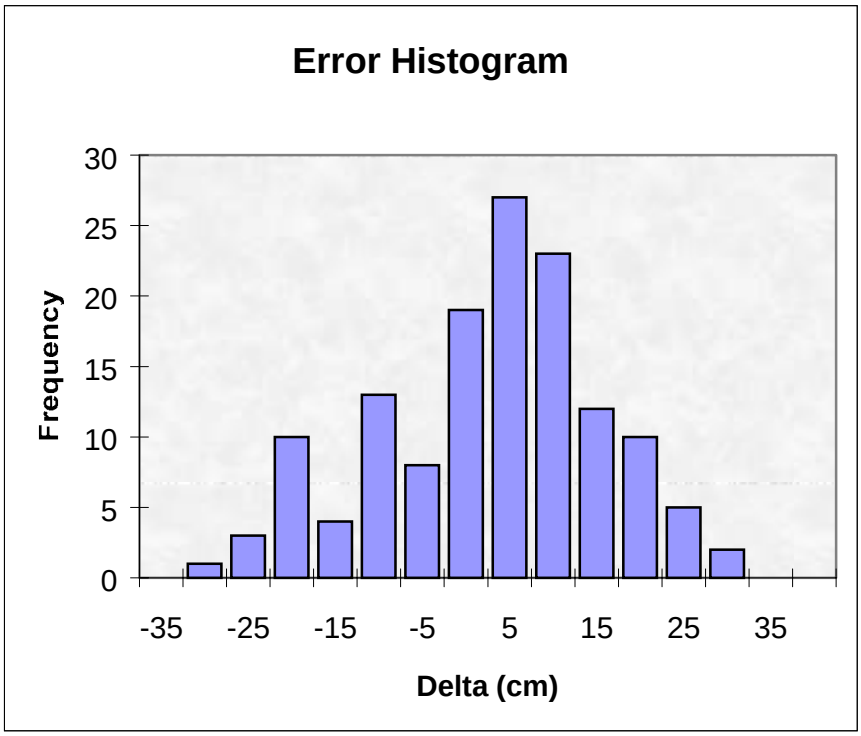

Figure 3