## New Hanover County, Cape Fear Basin

Subsequent to the first assessment and the failure to initially satisfy the 20-cm RMSE criteria, the LIDAR vendor (3Di) performed an exhaustive analysis of the data. The end result as outlined in the document "Corrective and Preventive Action Report-- New Hanover County, 1/07/02" was that two systematic errors were detected within the processing stage after reexamination of the calibration flight data. The end result entailed that a systematic shift be applied to the two days in question of 6 and 16 centimeters respectively. In order to verify the newly computed LIDAR values, additional secondary independent QAQC survey checkpoints were provided by NCGS for comparison along with the original primary 134 checkpoints. For both the primary and secondary checkpoints, comparisons were made with the Z values as interpolated by the LIDAR contractor. A series of secondary checkpoint spreadsheets were received from NCGS on January 30, 2002 which included:

- 1. The original 134 checkpoints (100%) compared with the newly adjusted TIN
- 2. The original 127 checkpoints (95%) compared with the newly adjusted TIN
- 3. The additional 26 secondary checkpoints (100%)
- 4. The additional 25 secondary checkpoints (95%)
- 5. The combined primary and secondary checkpoints (100%)
- 6. The combined primary and secondary checkpoints (95%)

All data was reviewed and further analyzed to assess the quality of the data based on the original checkpoints and the newly acquired checkpoints. The review process examined the statistics for the combined land cover and trends for each specific land cover type.

Table 1 summarizes the RMSE of the original checkpoints with the corrected TIN based on all land classes using:

- 100% of the checkpoints
- 95% of the checkpoints

Table 1. RMSE of Original TIN with Original Checkpoints								
%	% RMSE (cm) # of Points Land Class RMSE Criteria (cm)							
100	28.2	134	All					
95 17.9 127 All 20								

Table 2 summarizes the RMSE of the secondary checkpoints with the corrected TIN using:

- 100% of the checkpoints
- 95% of the checkpoints

Note: All Checkpoints are located in the land class of "Grass"

Table 2. RMSE of Corrected TIN with Secondary Checkpoints							
% RMSE (cm) # of Points Land Class RMSE Criteria (cm)							
100	23.8	26	All				
95 21.9 25 All 20							

Table 3 summarizes the RMSE of the primary and secondary checkpoints with the corrected TIN using:

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

Table 3. RMSE of Corrected TIN with All Checkpoints						
%	RMSE (cm)	# of Points	RMSE Criteria (cm)			
100	27.5	27.5 160				
95	18.6	All	20			
42	18.7	67	Grass			
13	17.5	20	Weeds/Crop			
6	15.2	10	Scrub			
22	20.3	35	Forest			
12	17.9	20	Built-up			

# The LIDAR data for New Hanover County, Cape Fear Basin <u>meets the</u> <u>specification</u> as per the RMSE criteria of 20 centimeters.

All figures represent the data with the 95% data set. The corrected data is of satisfactory quality and slightly exceeds the RMSE criteria. The land cover "Grass" indicates a higher than anticipated value with the additional checkpoints but when averaged with other land cover types, falls within specifications.

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Figure 1 illustrates the RMSE by specific land cover type.





### Figure 1

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.

#### QA/QC Minus LIDAR by Land Cover Type



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Table 4 illustrates the elevation difference (delta) between the QAQC survey checkpoints and that of the interpolated LIDAR.

Table 4. Ele	evation Delta
Delta (cm)	Land Cover
-18.4	Grass
-17.8	Grass
-13.2	Grass
-9.7	Grass
-8.7	Grass
-5.8	Grass
-3.8	Grass
-3.8	Grass
-2.9	Grass
-2.1	Grass
-1.9	Grass
-1.1	Grass
0.8	Grass
1.1	Grass
2.3	Grass
2.6	Grass
2.9	Grass
3.4	Grass
3.8	Grass
5.3	Grass
5.4	Grass
6.7	Grass
7.6	Grass
9.4	Grass
9.6	Grass
10.0	Grass
10.2	Grass
10.9	Grass
11.4	Grass
12.2	Grass
12.4	Grass
12.4	Grass
12.6	Grass
13.0	Grass
14.0	Grass
14.2	Grass
14.3	Grass
14.4	Grass
15.4	Grass
17.2	Grass
17.3	Grass
17.3	Grass

17.3	Grass
17.9	Grass
17.9	Grass
18.0	Grass
18.8	Grass
20.8	Grass
21.3	Grass
21.5	Grass
21.6	Grass
22.0	Grass
23.0	Grass
23.0	Grass
23.1	Grass
23.9	Grass
24.0	Grass
24.2	Grass
25.8	Grass
28.6	Grass
30.1	Grass
30.3	Grass
30.5	Grass
41.1	Grass
41.8	Grass
44.1	Grass
45.0	Grass
-31.2	Weeds/Crop
-14.4	Weeds/Crop
-12.3	Weeds/Crop
-9.5	Weeds/Crop
-3.6	Weeds/Crop
-3.3	Weeds/Crop
3.2	Weeds/Crop
4.2	Weeds/Crop
4.7	Weeds/Crop
8.1	Weeds/Crop
8.4	Weeds/Crop
9.8	Weeds/Crop
10.4	Weeds/Crop
16.2	Weeds/Crop
16.4	Weeds/Crop
16.4	Weeds/Crop
17.0	Weeds/Crop
21.4	Weeds/Crop
36.6	Weeds/Crop
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27.0	Maada/Orea
37.9	weeds/Crop
-21.2	Scrub
-15.7	Scrub
-12.2	Scrub
-8.4	Scrub
-6.1	Scrub
-5.4	Scrub
5.3	Scrub
13.1	Scrub
16.8	Scrub
23.7	Scrub
-37.9	Forest
-31.9	Forest
-31.2	Forest
-30.0	Forest
-17.7	Forest
-17.0	Forest
-12.8	Forest
-12.3	Forest
-10.4	Forest
-9.4	Forest
-7.9	Forest
-6.9	Forest
-6.8	Forest
-4.0	Forest
-3.9	Forest
-3.0	Forest
-2.6	Forest
-2.3	Forest
-1.3	Forest
2.2	Forest
3.0	Forest
4.7	Forest
4.9	Forest
8.2	Forest
9,4	Forest
13.4	Forest
18.0	Forest
21.7	Forest
21.8	Forest
24.8	Forest
27.0	Forest
31.0	Forest
34.6	Forest
34.6	Forest

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36.8	Forest
48.9	Forest
-0.2	Built-up
2.1	Built-up
2.6	Built-up
4.3	Built-up
4.9	Built-up
6.6	Built-up

8.9	Built-up
9.6	Built-up
10.7	Built-up
11.8	Built-up
12.0	Built-up
13.2	Built-up
13.4	Built-up
15.6	Built-up

20.9	Built-up
22.4	Built-up
24.6	Built-up
27.0	Built-up
34.6	Built-up
40.5	Built-up

Table 5 illustrates the overall statistics for the total checkpoint data.

Table 5. Overall Descriptive Statistics								
	RMSE (cm)	Mean (cm)	Median (cm)	Skew	Std Dev (cm)	# of Points	Min (cm)	Max (cm)
Total	18.6	8.7	9.7	-0.2	16.5	152	-37.9	48.9
Grass	18.7	12.8	13.0	0.1	13.8	67	-18.4	45.0
Weeds/Crop	17.5	6.8	8.2	-0.2	16.6	20	-31.2	37.9
Scrub	15.2	-1.6	-5.8	0.2	16.0	10	-27.2	23.7
Forest	20.3	1.7	-2.3	0.2	20.6	35	-37.9	48.9
Built-up	17.9	14.3	11.9	0.9	11.0	20	-0.2	40.5

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

