



North Carolina Department of Public Safety

Emergency Management North Carolina Geodetic Survey

Roy Cooper, Governor
Erik A. Hooks, Secretary

Michael A. Sprayberry, Director

LiDAR Quality Control Report – Statewide LiDAR Project Phases Four (4) and Five (5)

The North Carolina Geodetic Survey performed a vertical quality control (QC) survey in Phases 4 and 5 of the statewide LiDAR elevation project. The purpose of the survey was to test the elevation points contained in a dataset that was obtained by utilizing airborne Light Detection And Ranging (LiDAR) technology. The attached report contains the results of the vertical QC survey.

The QC test points were collected utilizing the North Carolina Real Time Network (NCRTN), and with conventional survey methods in areas unsuitable for GNSS observations.

The field survey data that was used to generate the attached report was performed by the North Carolina Geodetic Survey (NCGS) under the supervision of James Gay (L-3851). The review of the field data and the generation of the final QC report were performed under the supervision of Gary W. Thompson (L-2694).

The GNSS portion of the survey (performed by NCGS) was performed to the following parameters:

Class of survey:	Class B
Positional accuracy:	Vertical 0.04 USft Horizontal 0.02 USft
Type of field procedure used:	NCRTN, OPUS, and traditional trigonometric leveling
Dates of survey:	Phase Four:4/19/2016-6/27/2018, Phase Five:12/3/2019-4/3/2019
Horizontal datum/epoch	North American Datum 83(2011) epoch 2010.0
Vertical datum/epoch	North American Vertical Datum of 1988 (NAVD88)
Published fixed control used:	North Carolina Continuously Operating Reference Station (CORS) Network and NCRTN
Geoid model:	Geoid 12B
Combined grid factor:	See control datasheets
Units:	US Survey Feet

Trigonometric leveling was performed to Class C (56.1605) standards at any QC point that was in a location not suitable for GNSS observations.

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2018 Phase 5 NC LiDAR Independent Quality Control Summary - DEM10 Data

Non-Vegetated Area

County	NVA Type	NVA Minimum DZ	NVA Maximum DZ	NVA Mean DZ	NVA Mean Magnitude DZ	NVA Observations	NVA Standard Deviation DZ	NVA RMSE Z	95% Confidence Level Z
Ashe	2U, 2B	-0.634	0.892	0.045	0.480	62	0.298	0.299	0.586
Avery	2U, 2B	-0.445	0.627	0.074	0.446	61	0.238	0.247	0.484
Buncombe	2U, 2B	-0.868	1.097	0.120	0.521	102	0.359	0.377	0.739
Burke	2U, 2B	-0.796	0.875	0.081	0.500	57	0.331	0.338	0.662
Caldwell	2U, 2B	-0.451	1.024	0.032	0.440	73	0.268	0.268	0.526
Cherokee	2U, 2B	-0.768	1.369	0.172	0.518	86	0.327	0.368	0.721
Clay	2U, 2B	-0.763	1.843	0.223	0.575	91	0.352	0.415	0.813
Graham	2U, 2B	-1.904	0.816	-0.017	0.496	78	0.360	0.358	0.701
Haywood	2U, 2B	-1.599	0.916	0.021	0.540	71	0.384	0.382	0.748
Henderson	2U, 2B	-0.536	1.077	0.184	0.518	89	0.303	0.353	0.692
Jackson	2U, 2B	-0.708	1.145	-0.011	0.509	72	0.339	0.337	0.660
Macon	2U, 2B	-0.764	0.646	-0.201	0.553	68	0.300	0.359	0.704
Madison	2U, 2B	-0.983	1.090	0.003	0.515	34	0.403	0.397	0.779
Mcdowell	2U, 2B	-0.583	0.962	0.053	0.443	58	0.274	0.276	0.542
Mitchell	2U, 2B	-0.947	0.887	0.019	0.531	60	0.365	0.363	0.711
Polk	2U, 2B	-1.052	0.988	0.147	0.500	73	0.285	0.319	0.626
Rutherford	2U, 2B	-0.763	0.852	0.186	0.530	62	0.281	0.335	0.657
Swain	2U, 2B	-0.688	0.828	-0.011	0.495	65	0.310	0.308	0.604
Transylvania	2U, 2B	-0.598	1.060	0.130	0.528	80	0.333	0.355	0.696
Watauga	2U, 2B	-0.934	0.961	0.058	0.512	61	0.351	0.353	0.692
Yancey	2U, 2B	-1.784	0.680	-0.138	0.517	61	0.356	0.379	0.744

Vegetated Area

County	VVA Class	VVA Minimum DZ	VVA Maximum DZ	VVA Mean DZ	VVA Mean Magnitude DZ	VVA Observations	VVA Standard Deviation DZ	VVA RMSE Z	95th Percentile
Ashe	2L, 2M, 2H	-4.481	3.116	0.148	0.777	82	0.868	0.876	1.339
Avery	2L, 2M, 2H	-1.150	2.702	0.181	0.692	87	0.635	0.657	1.541
Buncombe	2L, 2M, 2H	-1.470	1.794	0.096	0.668	100	0.610	0.614	1.422
Burke	2L, 2M, 2H	-1.015	2.375	0.199	0.564	86	0.416	0.458	0.789
Caldwell	2L, 2M, 2H	-1.715	1.685	0.117	0.540	86	0.407	0.421	0.934
Cherokee	2L, 2M, 2H	-1.873	1.568	0.223	0.690	85	0.600	0.637	1.384
Clay	2L, 2M, 2H	-1.093	1.872	0.476	0.765	73	0.514	0.698	1.125
Graham	2L, 2M, 2H	-5.573	1.443	0.063	0.703	85	0.829	0.826	1.295
Haywood	2L, 2M, 2H	-2.935	3.505	0.143	0.953	86	1.186	1.188	2.474
Henderson	2L, 2M, 2H	-1.085	1.451	0.325	0.667	84	0.432	0.538	1.074
Jackson	2L, 2M, 2H	-5.675	1.714	0.061	0.799	85	0.968	0.965	1.498
Macon	2L, 2M, 2H	-2.076	2.373	0.016	0.716	85	0.701	0.697	1.436
Madison	2L, 2M, 2H	-4.198	1.492	-0.140	0.761	31	0.987	0.981	1.492
Mcdowell	2L, 2M, 2H	-2.685	2.632	0.050	0.659	86	0.684	0.682	1.468
Mitchell	2L, 2M, 2H	-3.351	1.738	-0.029	0.808	83	0.906	0.901	1.696
Polk	2L, 2M, 2H	-3.870	1.237	0.193	0.662	77	0.649	0.673	1.073
Rutherford	2L, 2M, 2H	-0.987	1.422	0.289	0.644	92	0.437	0.522	0.987
Swain	2L, 2M, 2H	-1.982	2.147	0.070	0.679	84	0.659	0.659	1.518
Transylvania	2L, 2M, 2H	-1.131	1.590	0.382	0.716	84	0.505	0.631	1.184
Watauga	2L, 2M, 2H	-1.582	2.573	0.224	0.807	84	0.801	0.827	1.612
Yancey	2L, 2M, 2H	-4.292	2.985	0.045	0.697	90	0.819	0.816	1.845

All values except observations in US Feet

Phase 5 Overall Results			
Non-Vegetated Area	Vegetated Area		
Minimum DZ:	-1.904	Minimum DZ:	-5.675
Maximum DZ:	1.843	Maximum DZ:	3.505
Mean DZ:	0.065	Mean DZ:	0.155
Mean Magnitude DZ:	0.511	Mean Magnitude DZ:	0.716
Observations:	1464	Observations:	1735
Standard Deviation DZ:	0.341	Standard Deviation DZ:	0.724
RMSE Z:	0.347	RMSE Z:	0.740
95% Confidence Level Z:	0.679	95th Percentile:	1.468

NORTH CAROLINA GEODETIC SURVEY

Claude T Bowers Building
4105 Reedy Creek Road
Raleigh, North Carolina 27607
(919)733-3836



Project Information

Prepared By: Watson Ross
Project Name: 2018 Phase 5 LiDAR QC
Sensor Info: GmAPD Geiger-mode
Required Nominal Pulse Spacing: 0.35
Vendor Name: NA
Units: US Survey Feet
Percent of Extent Tolerance: Extents Not Checked
Date of Aquisition: Start: 8/17/2018 Finish: 8/17/2018

Metadata Information

Tile Index:

Filename: ashe_tiles.shp

Number of Polys: 0

Intensity:

Tile Index Attribute: Not Specified

Data Filename: Not Specified

Number of Data Files Matching Attribute: Not Specified

DEM:

Tile Index Attribute: dem10_file

Data Filename: DEM10

Number of Data Files Matching Attribute: Not Specified

LAS:

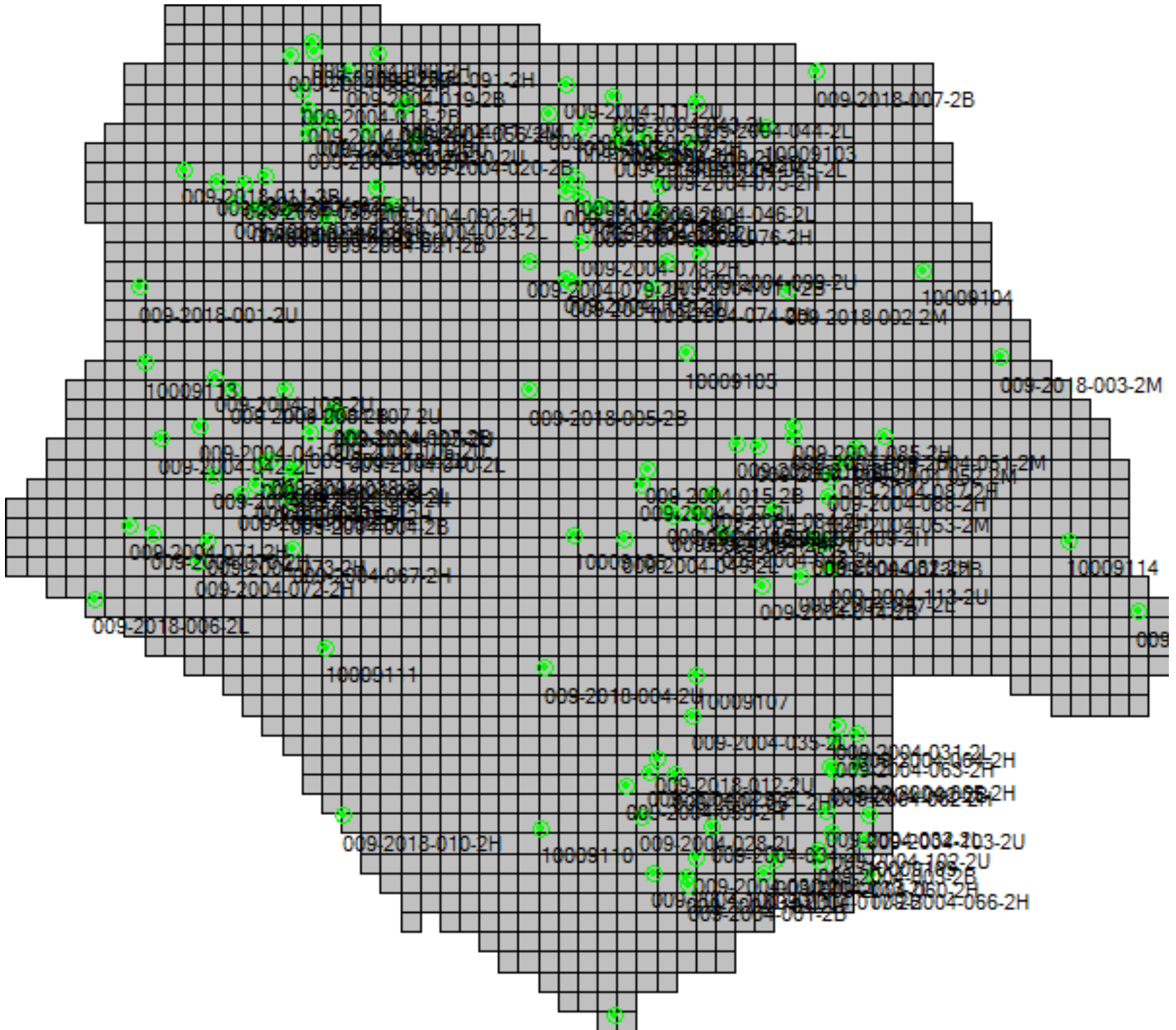
Tile Index Attribute:

Data Filename:

Number of Data Files Matching Attribute: Not Specified



Tiled-Data Area





LiDAR Accuracy Assessment Summary

LC Type	# of Points	NVA	VVA
DEM			
2B	24	0.644	
2H	41		2.293
2L	30		0.638
2M	11		1.240
2U	38	0.547	
Total	144		

Units: US Survey Feet



DEM

Nonvegetated Vertical Accuracy

LandCover Type: 2B, 2U

Minimum DZ: -0.634

Maximum DZ: 0.892

Mean DZ: 0.045

Mean Magnitude DZ: 0.48

Number Observations: 62

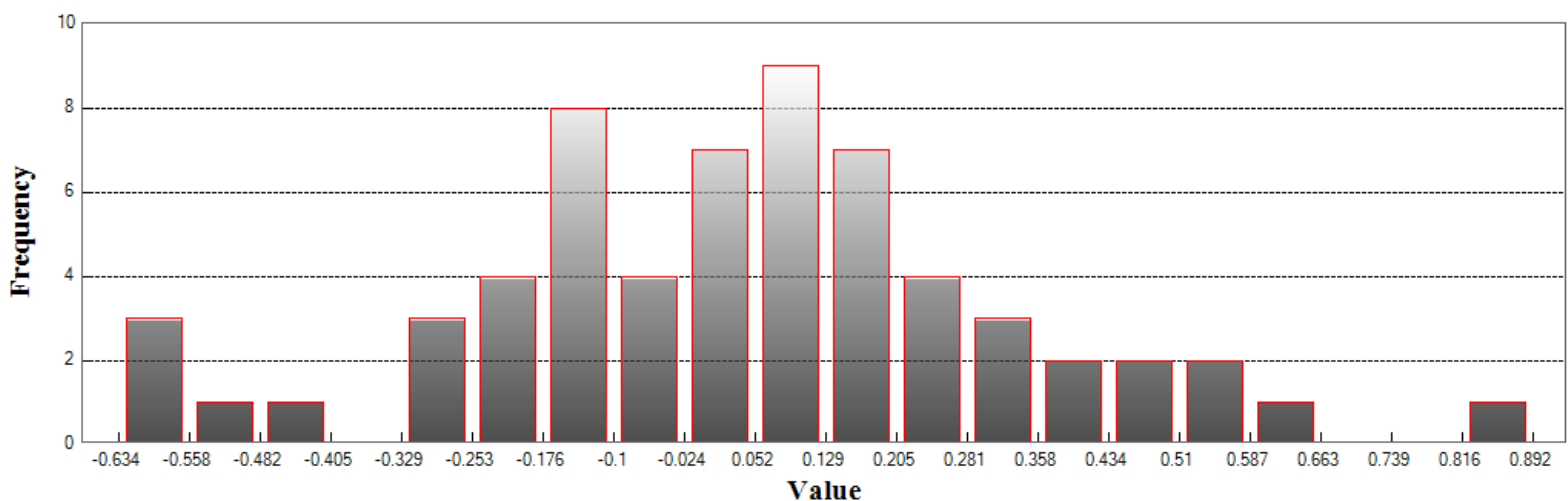
Standard Deviation DZ: 0.298

RMSE Z: 0.299

95% Confidence Level Z: 0.586

Units: US Survey Feet

Histogram



Min: -0.634

Max: 0.892

Number Of Bins: 20

Bin Interval: 0.076

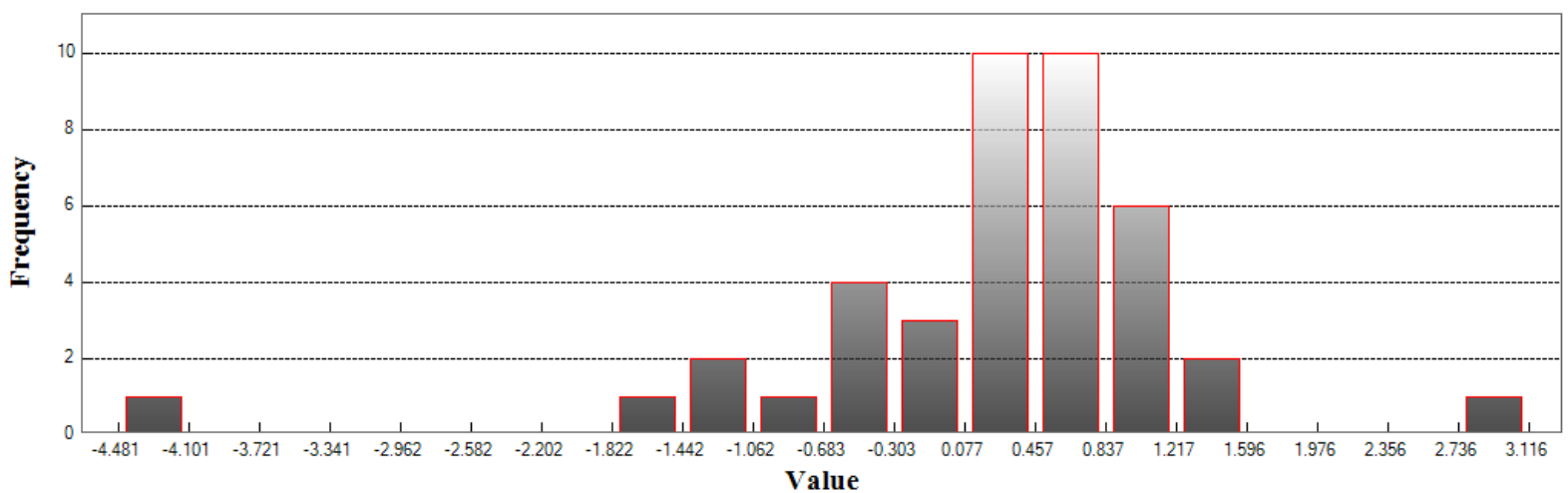


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2H
Minimum DZ: -4.481
Maximum DZ: 3.116
Mean DZ: 0.233
Mean Magnitude DZ: 0.894
Number Observations: 41
Standard Deviation DZ: 1.119
RMSE Z: 1.129
95th Percentile: 2.293
Units: US Survey Feet

Histogram



Min: -4.481

Max: 3.116

Number Of Bins: 20

Bin Interval: 0.38

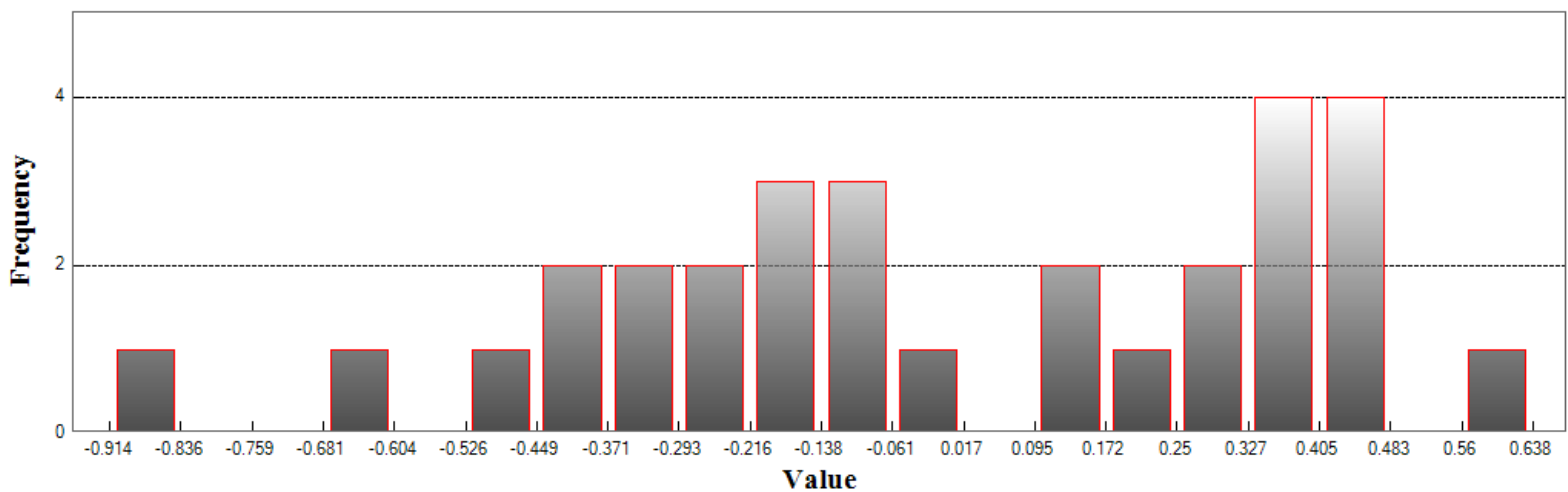


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2L
Minimum DZ: -0.914
Maximum DZ: 0.638
Mean DZ: 0.001
Mean Magnitude DZ: 0.571
Number Observations: 30
Standard Deviation DZ: 0.382
RMSE Z: 0.375
95th Percentile: 0.638
Units: US Survey Feet

Histogram



Min: -0.914

Max: 0.638

Number Of Bins: 20

Bin Interval: 0.078

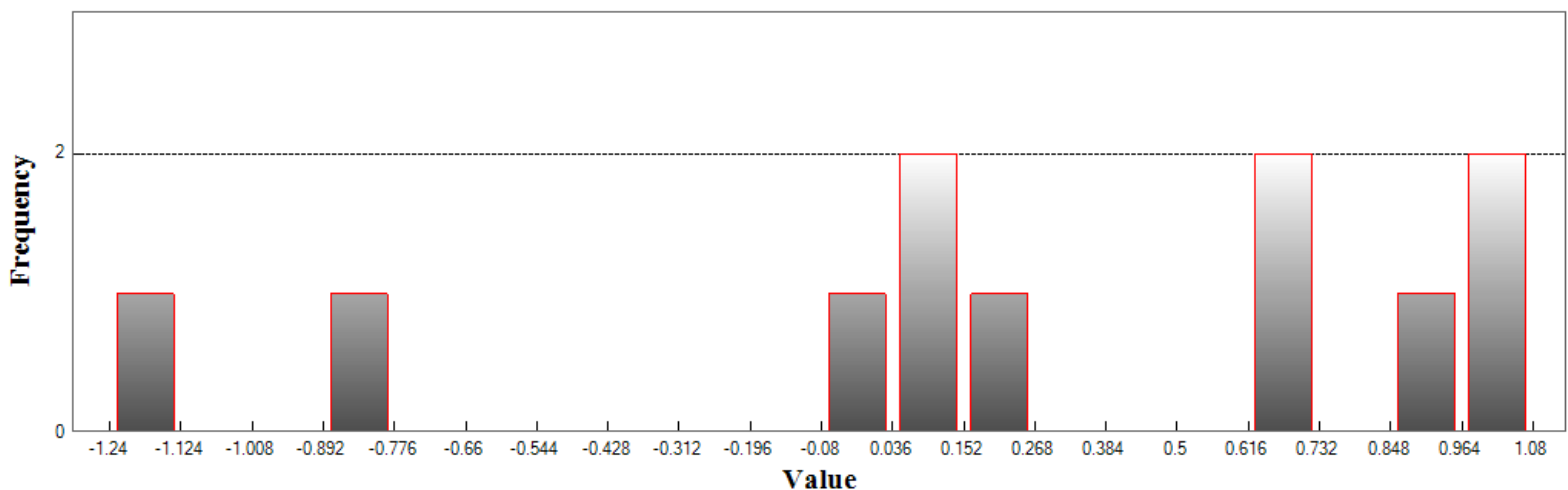


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2M
Minimum DZ: -1.24
Maximum DZ: 1.08
Mean DZ: 0.235
Mean Magnitude DZ: 0.794
Number Observations: 11
Standard Deviation DZ: 0.759
RMSE Z: 0.761
95th Percentile: 1.24
Units: US Survey Feet

Histogram



Min: -1.24
Max: 1.08
Number Of Bins: 20
Bin Interval: 0.116

NORTH CAROLINA GEODETIC SURVEY

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Raleigh, North Carolina 27607
(919)733-3836



Project Information

Prepared By: Watson Ross
Project Name: 2018 Phase 5 LiDAR QC
Sensor Info: GmAPD Geiger-mode
Required Nominal Pulse Spacing: 0.35
Vendor Name: NA
Units: US Survey Feet
Percent of Extent Tolerance: Extents Not Checked
Date of Aquisition: Start: 8/17/2018 Finish: 8/17/2018

Metadata Information

Tile Index:

Filename: avery_tiles.shp

Number of Polys: 0

Intensity:

Tile Index Attribute: Not Specified

Data Filename: Not Specified

Number of Data Files Matching Attribute: Not Specified

DEM:

Tile Index Attribute: dem10_file

Data Filename: DEM10

Number of Data Files Matching Attribute: Not Specified

LAS:

Tile Index Attribute:

Data Filename:

Number of Data Files Matching Attribute: Not Specified



LiDAR Accuracy Assessment Summary

LC Type	# of Points	NVA	VVA	
DEM				
2B	22	0.627		
2H	43		1.596	
2L	22		0.713	
2M	22		1.050	
2U	39	0.381		
Total	148			

Units: US Survey Feet



DEM

Nonvegetated Vertical Accuracy

LandCover Type: 2B, 2U

Minimum DZ: -0.445

Maximum DZ: 0.627

Mean DZ: 0.074

Mean Magnitude DZ: 0.446

Number Observations: 61

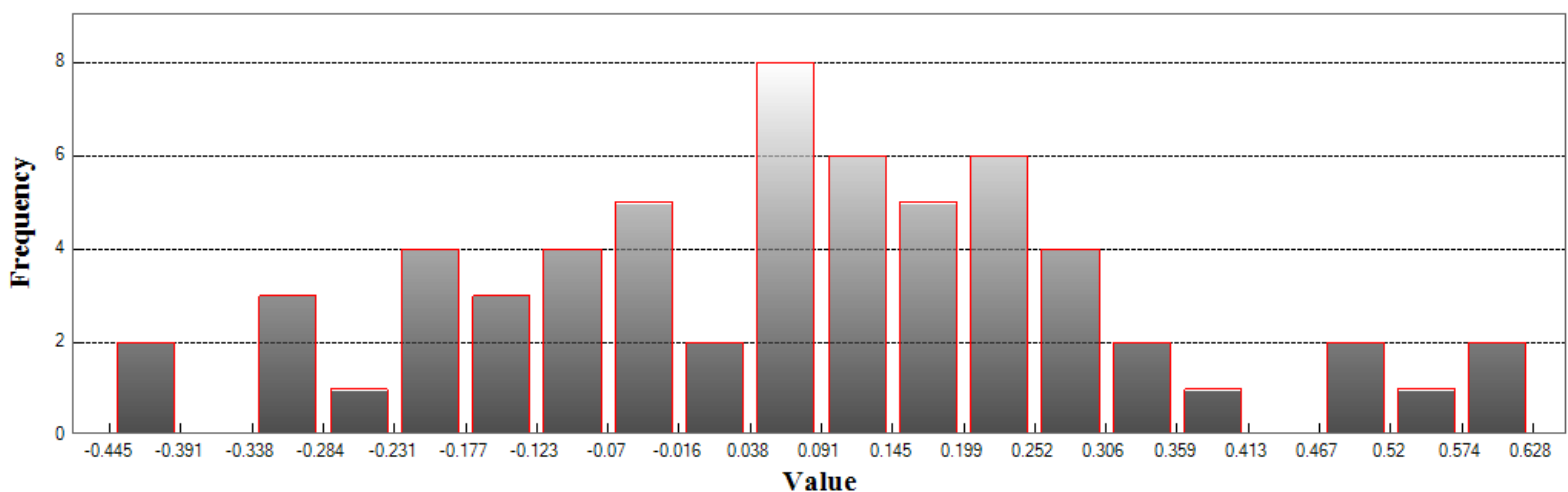
Standard Deviation DZ: 0.238

RMSE Z: 0.247

95% Confidence Level Z: 0.484

Units: US Survey Feet

Histogram



Min: -0.445

Max: 0.627

Number Of Bins: 20

Bin Interval: 0.054

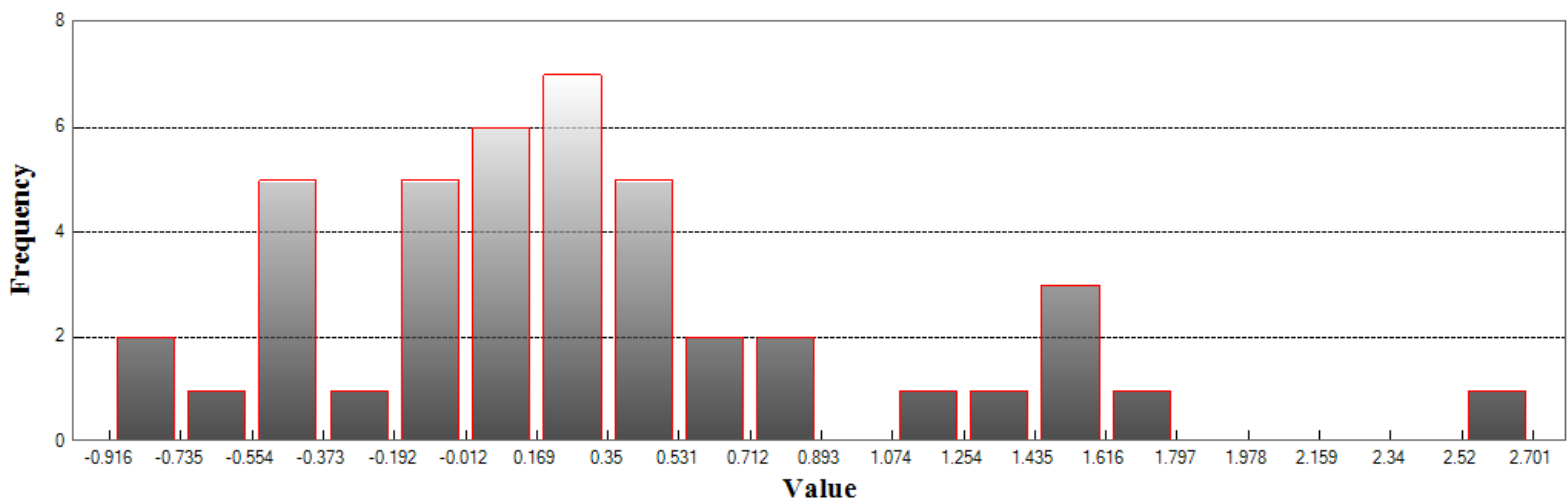


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2H
Minimum DZ: -0.915
Maximum DZ: 2.702
Mean DZ: 0.3
Mean Magnitude DZ: 0.754
Number Observations: 43
Standard Deviation DZ: 0.745
RMSE Z: 0.795
95th Percentile: 1.596
Units: US Survey Feet

Histogram



Min: -0.915
Max: 2.702
Number Of Bins: 20
Bin Interval: 0.181

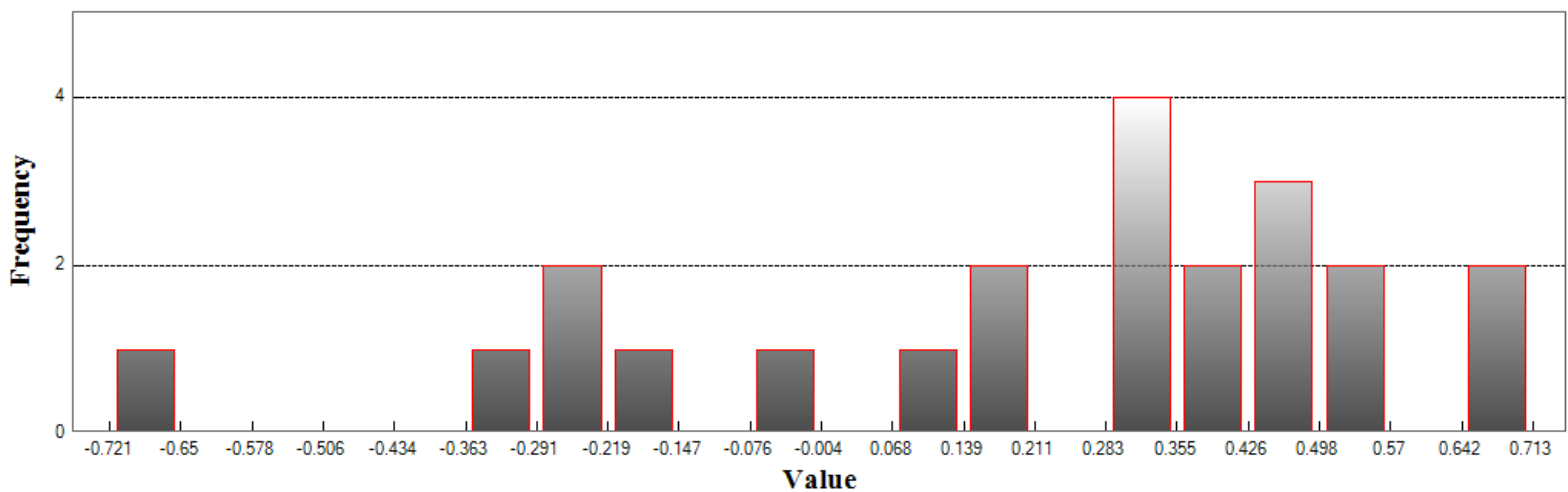


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2L
Minimum DZ: -0.721
Maximum DZ: 0.713
Mean DZ: 0.21
Mean Magnitude DZ: 0.61
Number Observations: 22
Standard Deviation DZ: 0.366
RMSE Z: 0.415
95th Percentile: 0.713
Units: US Survey Feet

Histogram



Min: -0.721
Max: 0.713
Number Of Bins: 20
Bin Interval: 0.072

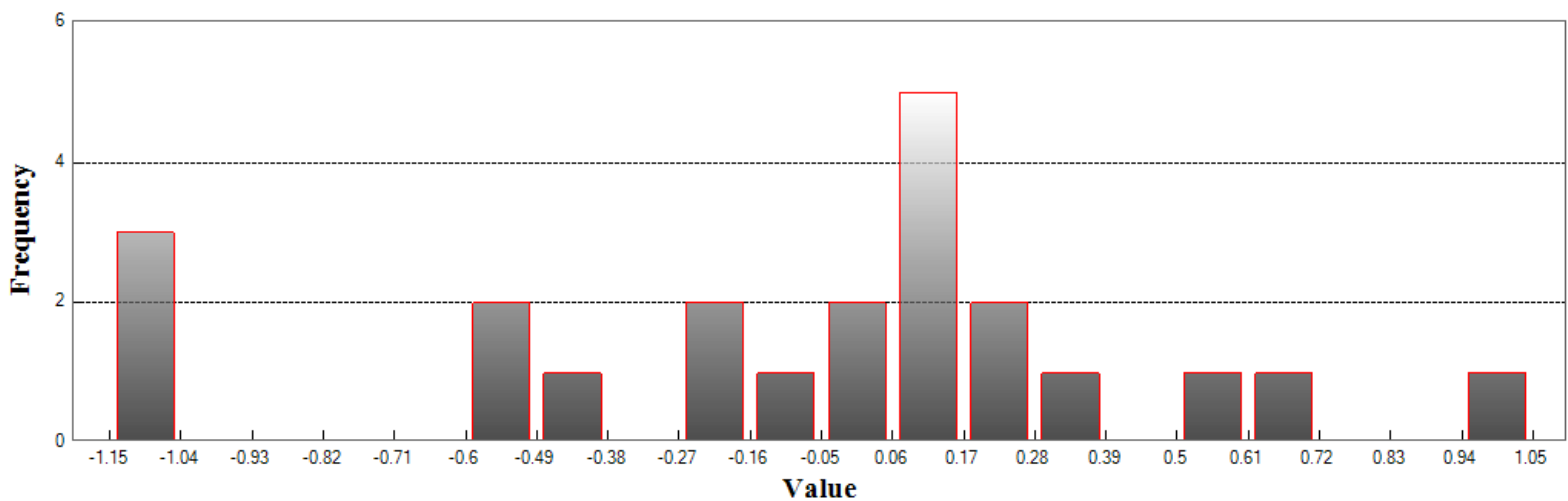


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2M
Minimum DZ: -1.15
Maximum DZ: 1.05
Mean DZ: -0.08
Mean Magnitude DZ: 0.64
Number Observations: 22
Standard Deviation DZ: 0.552
RMSE Z: 0.545
95th Percentile: 1.05
Units: US Survey Feet

Histogram



Min: -1.15

Max: 1.05

Number Of Bins: 20

Bin Interval: 0.11

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Project Information

Prepared By: Watson Ross
Project Name: 2018 Phase 5 LiDAR QC
Sensor Info: GmAPD Geiger-mode
Required Nominal Pulse Spacing: 0.35
Vendor Name: NA
Units: US Survey Feet
Percent of Extent Tolerance: Extents Not Checked
Date of Aquisition: Start: 8/17/2018 Finish: 8/17/2018

Metadata Information

Tile Index:

Filename: buncombe_tiles.shp
Number of Polys: 0

Intensity:

Tile Index Attribute: Not Specified
Data Filename: Not Specified
Number of Data Files Matching Attribute: Not Specified

DEM:

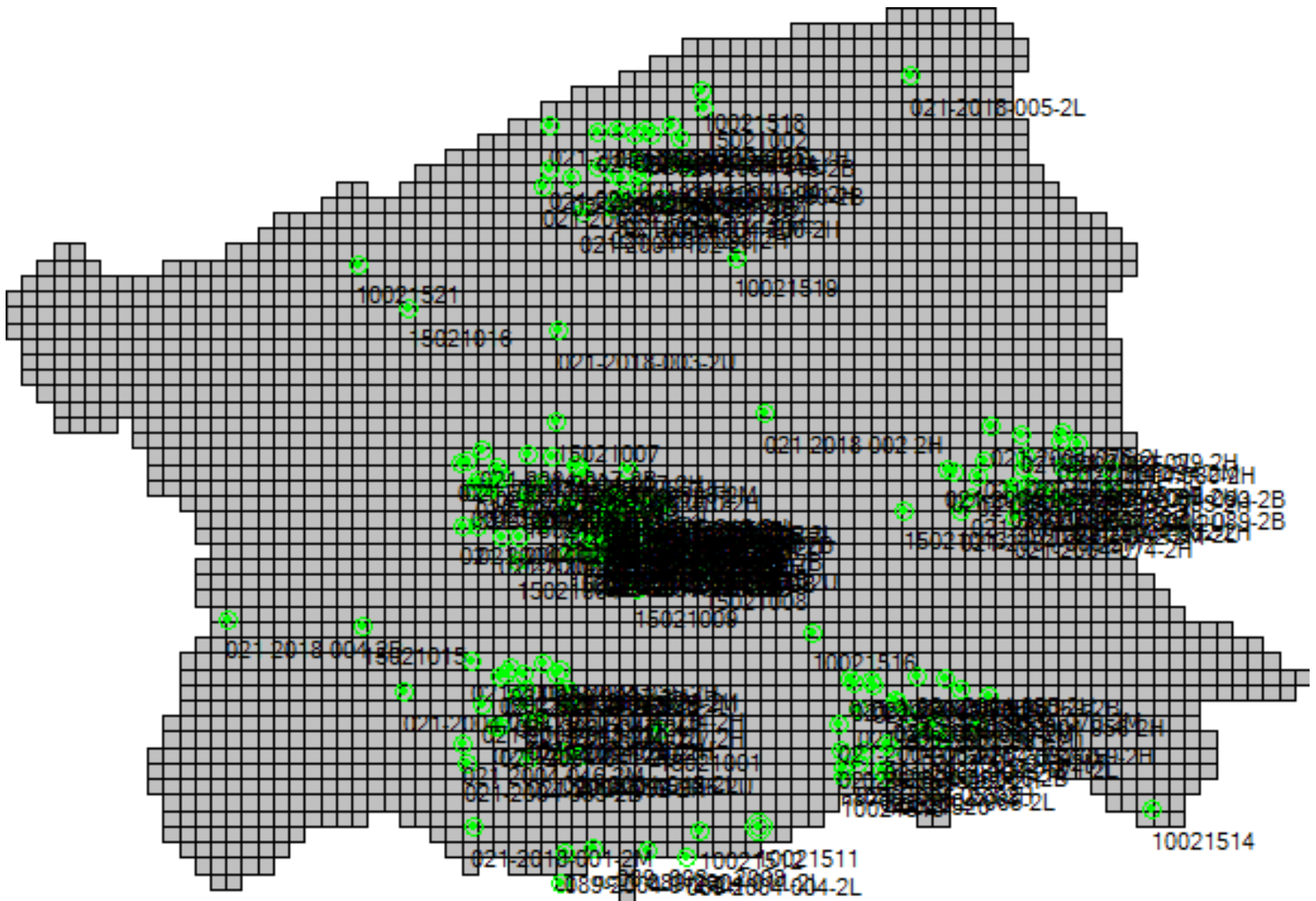
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Data Filename: DEM10
Number of Data Files Matching Attribute: Not Specified

LAS:

Tile Index Attribute:
Data Filename:
Number of Data Files Matching Attribute: Not Specified



Tiled-Data Area





LiDAR Accuracy Assessment Summary

LC Type	# of Points	NVA	VVA	
DEM				
2B	39	1.005		
2H	47		1.442	
2L	26		0.719	
2M	27		1.429	
2U	63	0.508		
Total	202			

Units: US Survey Feet



DEM

Nonvegetated Vertical Accuracy

LandCover Type: 2B, 2U

Minimum DZ: -0.868

Maximum DZ: 1.097

Mean DZ: 0.12

Mean Magnitude DZ: 0.521

Number Observations: 102

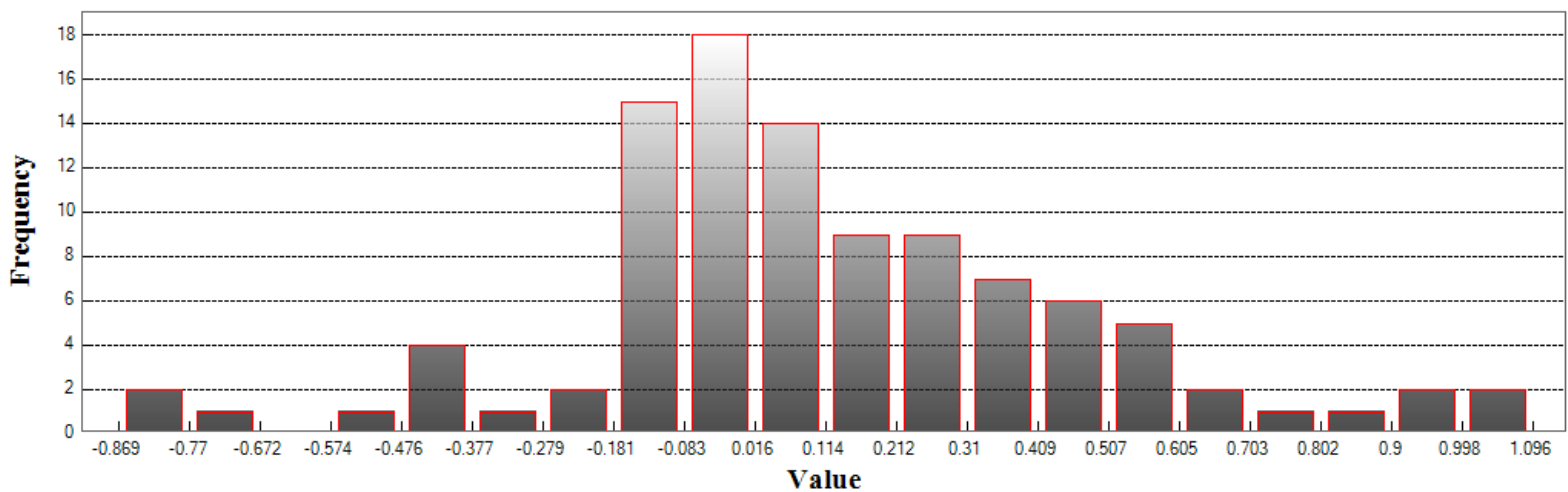
Standard Deviation DZ: 0.359

RMSE Z: 0.377

95% Confidence Level Z: 0.739

Units: US Survey Feet

Histogram



Min: -0.868

Max: 1.097

Number Of Bins: 20

Bin Interval: 0.098

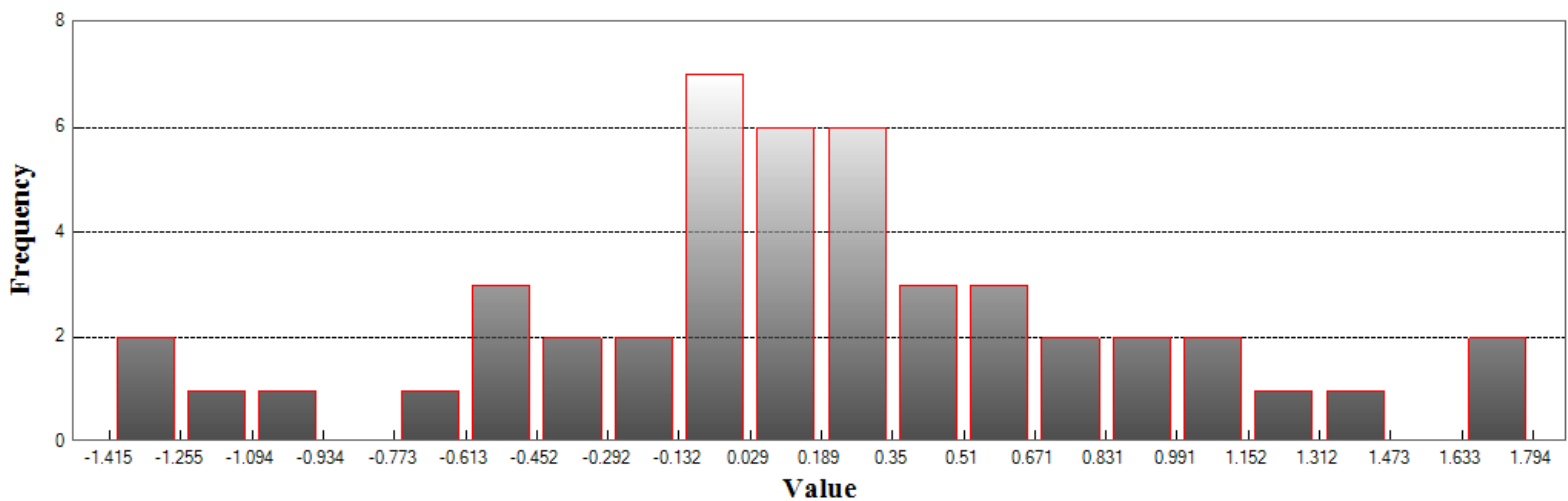


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2H
Minimum DZ: -1.415
Maximum DZ: 1.794
Mean DZ: 0.184
Mean Magnitude DZ: 0.741
Number Observations: 47
Standard Deviation DZ: 0.708
RMSE Z: 0.724
95th Percentile: 1.442
Units: US Survey Feet

Histogram



Min: -1.415
Max: 1.794
Number Of Bins: 20
Bin Interval: 0.16

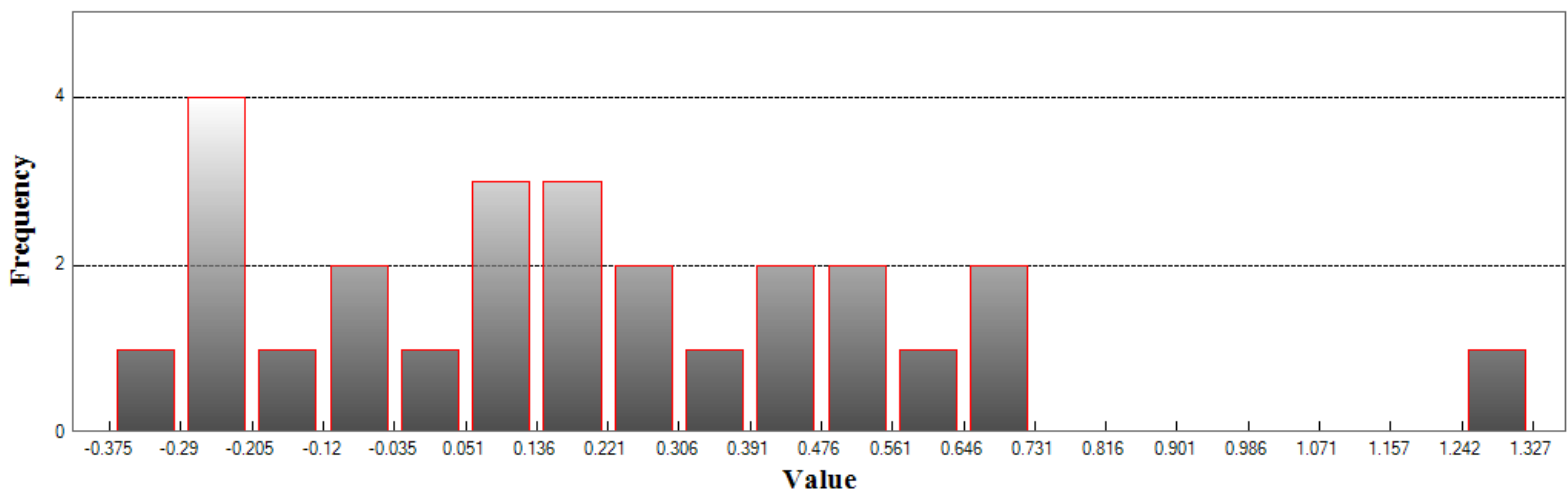


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2L
Minimum DZ: -0.375
Maximum DZ: 1.326
Mean DZ: 0.202
Mean Magnitude DZ: 0.577
Number Observations: 26
Standard Deviation DZ: 0.389
RMSE Z: 0.432
95th Percentile: 0.719
Units: US Survey Feet

Histogram



Min: -0.375

Max: 1.326

Number Of Bins: 20

Bin Interval: 0.085

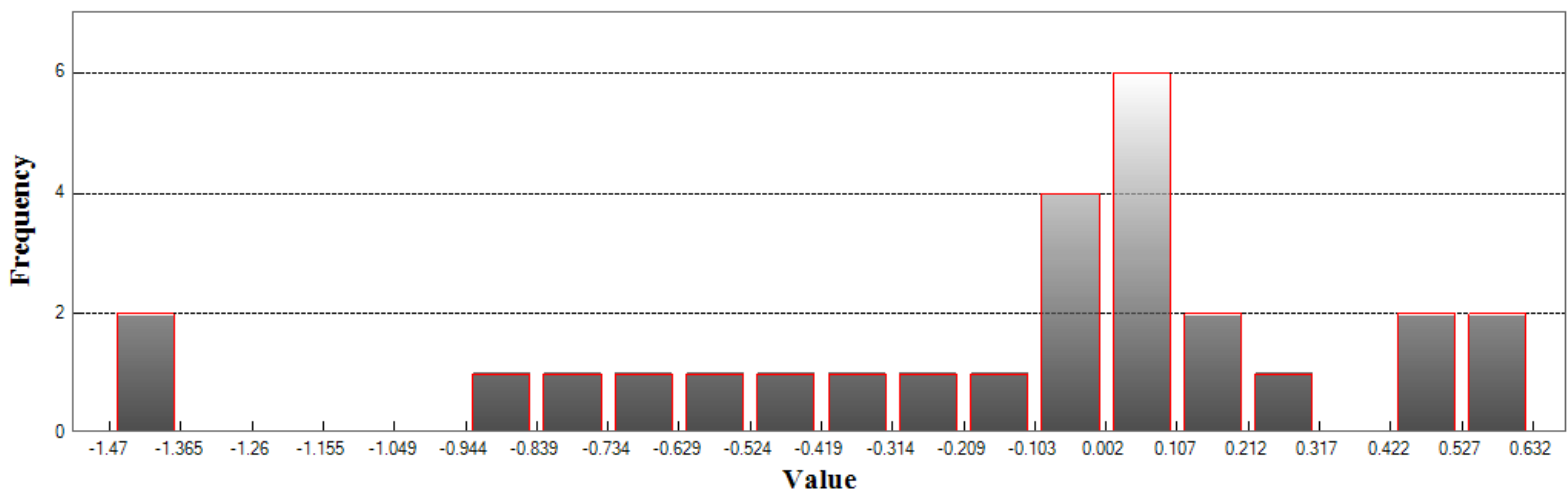


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2M
Minimum DZ: -1.47
Maximum DZ: 0.632
Mean DZ: -0.159
Mean Magnitude DZ: 0.614
Number Observations: 27
Standard Deviation DZ: 0.54
RMSE Z: 0.553
95th Percentile: 1.429
Units: US Survey Feet

Histogram



Min: -1.47

Max: 0.632

Number Of Bins: 20

Bin Interval: 0.105

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(919)733-3836



Project Information

Prepared By: Watson Ross
Project Name: 2018 Phase 5 LiDAR QC
Sensor Info: GmAPD Geiger-mode
Required Nominal Pulse Spacing: 0.35
Vendor Name: NA
Units: US Survey Feet
Percent of Extent Tolerance: Extents Not Checked
Date of Aquisition: Start: 8/17/2018 Finish: 8/17/2018

Metadata Information

Tile Index:

Filename: burke_tiles.shp

Number of Polys: 0

Intensity:

Tile Index Attribute: Not Specified

Data Filename: Not Specified

Number of Data Files Matching Attribute: Not Specified

DEM:

Tile Index Attribute: dem10_file

Data Filename: DEM10

Number of Data Files Matching Attribute: Not Specified

LAS:

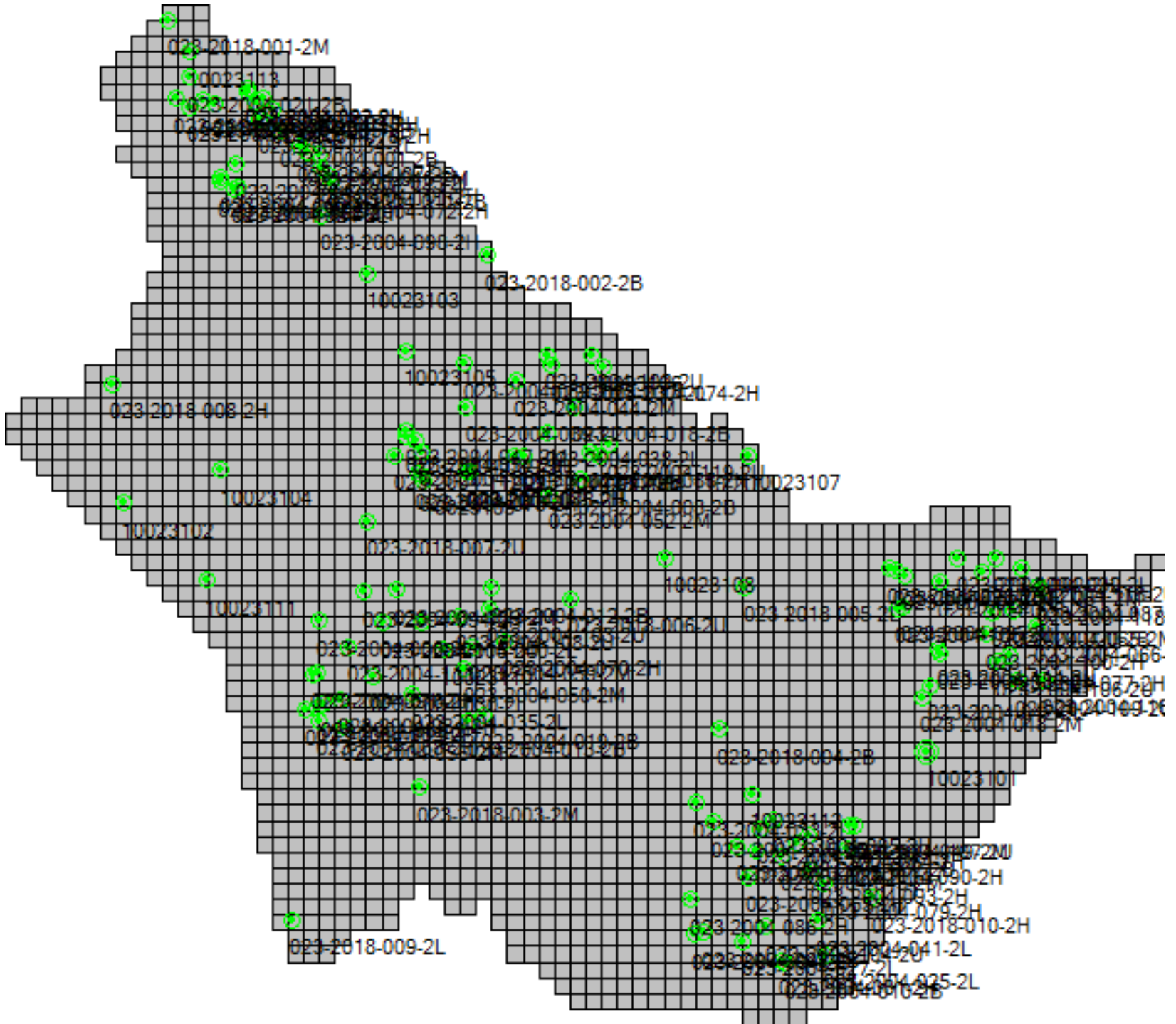
Tile Index Attribute:

Data Filename:

Number of Data Files Matching Attribute: 2333 out of 2333



Tiled-Data Area





LiDAR Accuracy Assessment Summary

LC Type	# of Points	NVA	VVA	
DEM				
2B	23	0.838		
2H	42		0.710	
2L	23		0.520	
2M	21		0.982	
2U	34	0.510		
Total	143			

Units: US Survey Feet



DEM

Nonvegetated Vertical Accuracy

LandCover Type: 2B, 2U

Minimum DZ: -0.796

Maximum DZ: 0.875

Mean DZ: 0.081

Mean Magnitude DZ: 0.5

Number Observations: 57

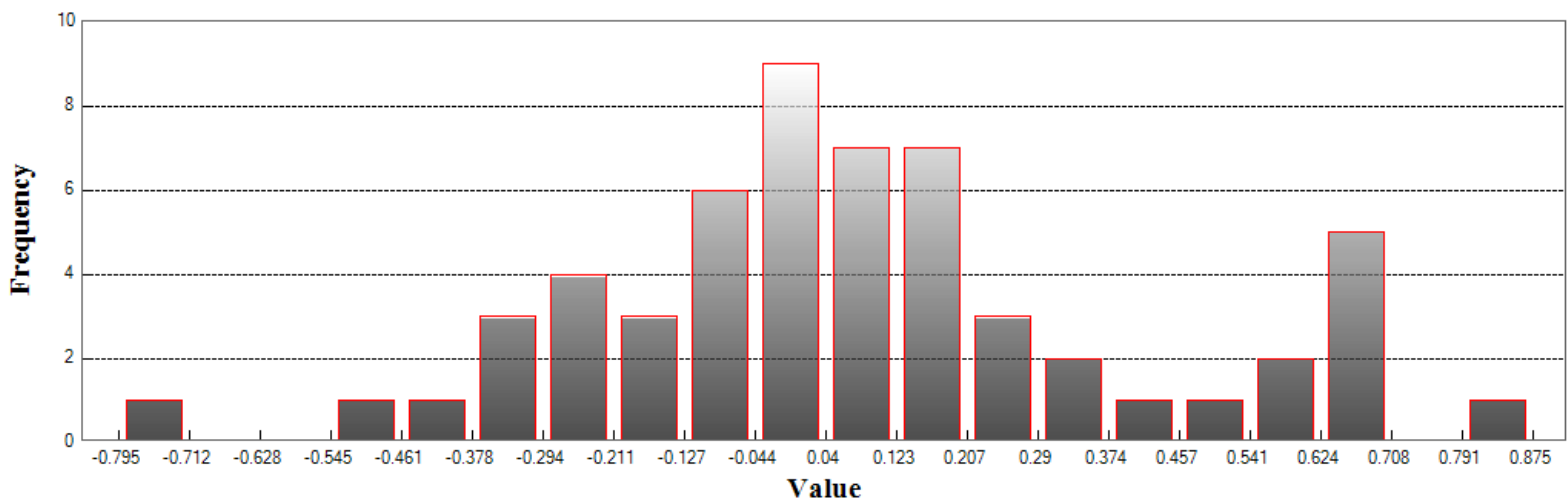
Standard Deviation DZ: 0.331

RMSE Z: 0.338

95% Confidence Level Z: 0.662

Units: US Survey Feet

Histogram



Min: -0.796

Max: 0.875

Number Of Bins: 20

Bin Interval: 0.084

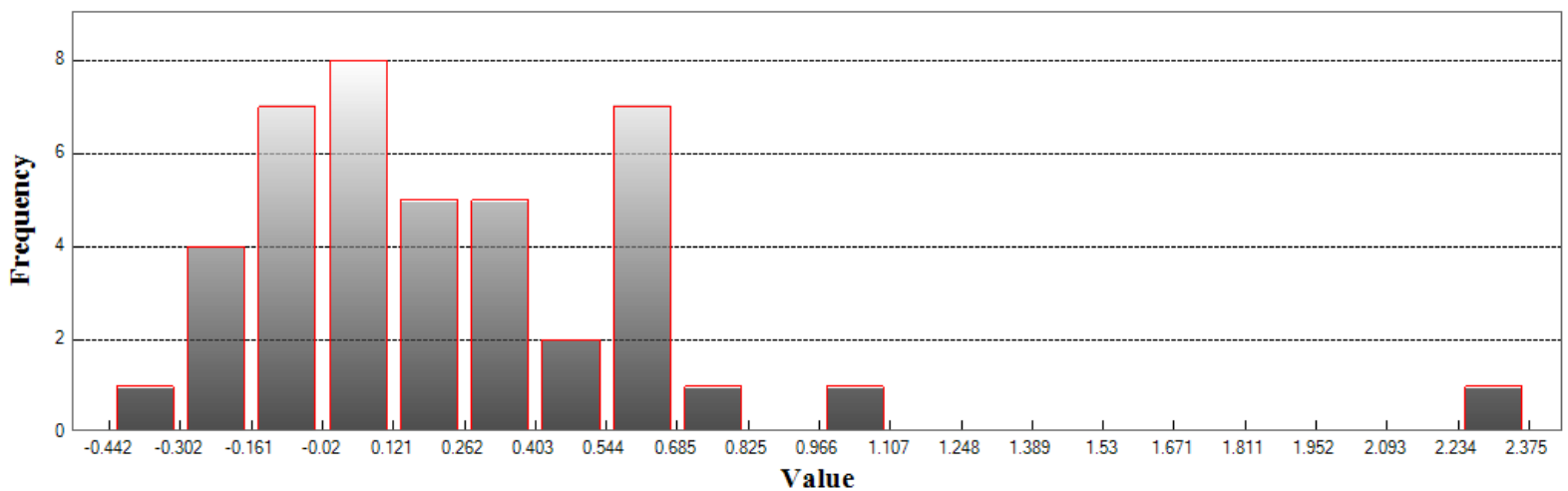


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2H
Minimum DZ: -0.442
Maximum DZ: 2.375
Mean DZ: 0.245
Mean Magnitude DZ: 0.586
Number Observations: 42
Standard Deviation DZ: 0.472
RMSE Z: 0.527
95th Percentile: 0.71
Units: US Survey Feet

Histogram



Min: -0.442

Max: 2.375

Number Of Bins: 20

Bin Interval: 0.141

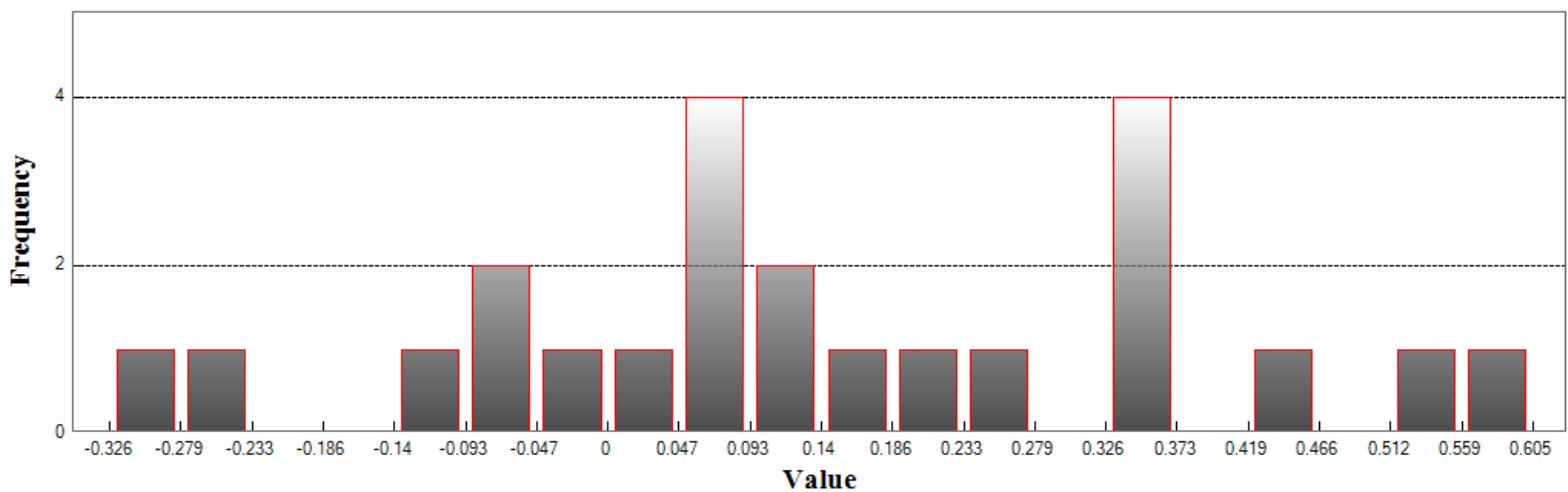


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2L
Minimum DZ: -0.326
Maximum DZ: 0.606
Mean DZ: 0.144
Mean Magnitude DZ: 0.468
Number Observations: 23
Standard Deviation DZ: 0.241
RMSE Z: 0.276
95th Percentile: 0.52
Units: US Survey Feet

Histogram



Min: -0.326

Max: 0.606

Number Of Bins: 20

Bin Interval: 0.047

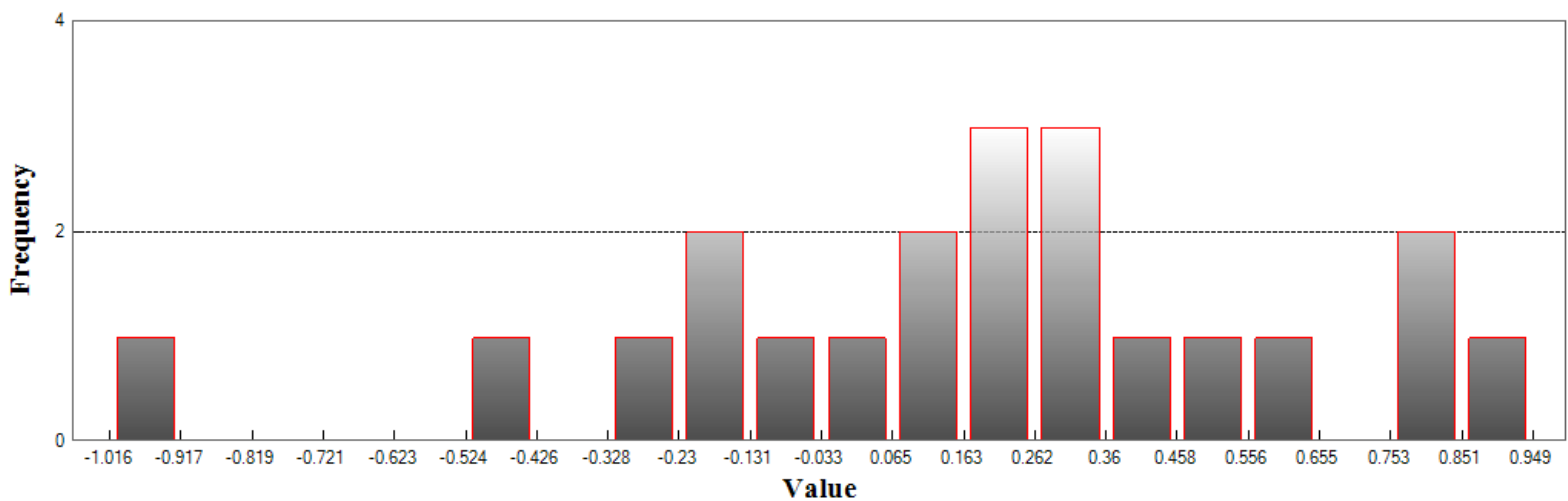


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2M
Minimum DZ: -1.015
Maximum DZ: 0.949
Mean DZ: 0.166
Mean Magnitude DZ: 0.614
Number Observations: 21
Standard Deviation DZ: 0.452
RMSE Z: 0.472
95th Percentile: 0.982
Units: US Survey Feet

Histogram



Min: -1.015

Max: 0.949

Number Of Bins: 20

Bin Interval: 0.098

NORTH CAROLINA GEODETIC SURVEY

Claude T Bowers Building
4105 Reedy Creek Road
Raleigh, North Carolina 27607
(919)733-3836



Project Information

Prepared By: Watson Ross
Project Name: 2018 Phase 5 LiDAR QC
Sensor Info: GmAPD Geiger-mode
Required Nominal Pulse Spacing: 0.35
Vendor Name: NA
Units: US Survey Feet
Percent of Extent Tolerance: Extents Not Checked
Date of Aquisition: Start: 8/17/2018 Finish: 8/17/2018

Metadata Information

Tile Index:

Filename: caldwell_tiles.shp

Number of Polys: 0

Intensity:

Tile Index Attribute: Not Specified

Data Filename: Not Specified

Number of Data Files Matching Attribute: Not Specified

DEM:

Tile Index Attribute: dem10_file

Data Filename: DEM10

Number of Data Files Matching Attribute: Not Specified

LAS:

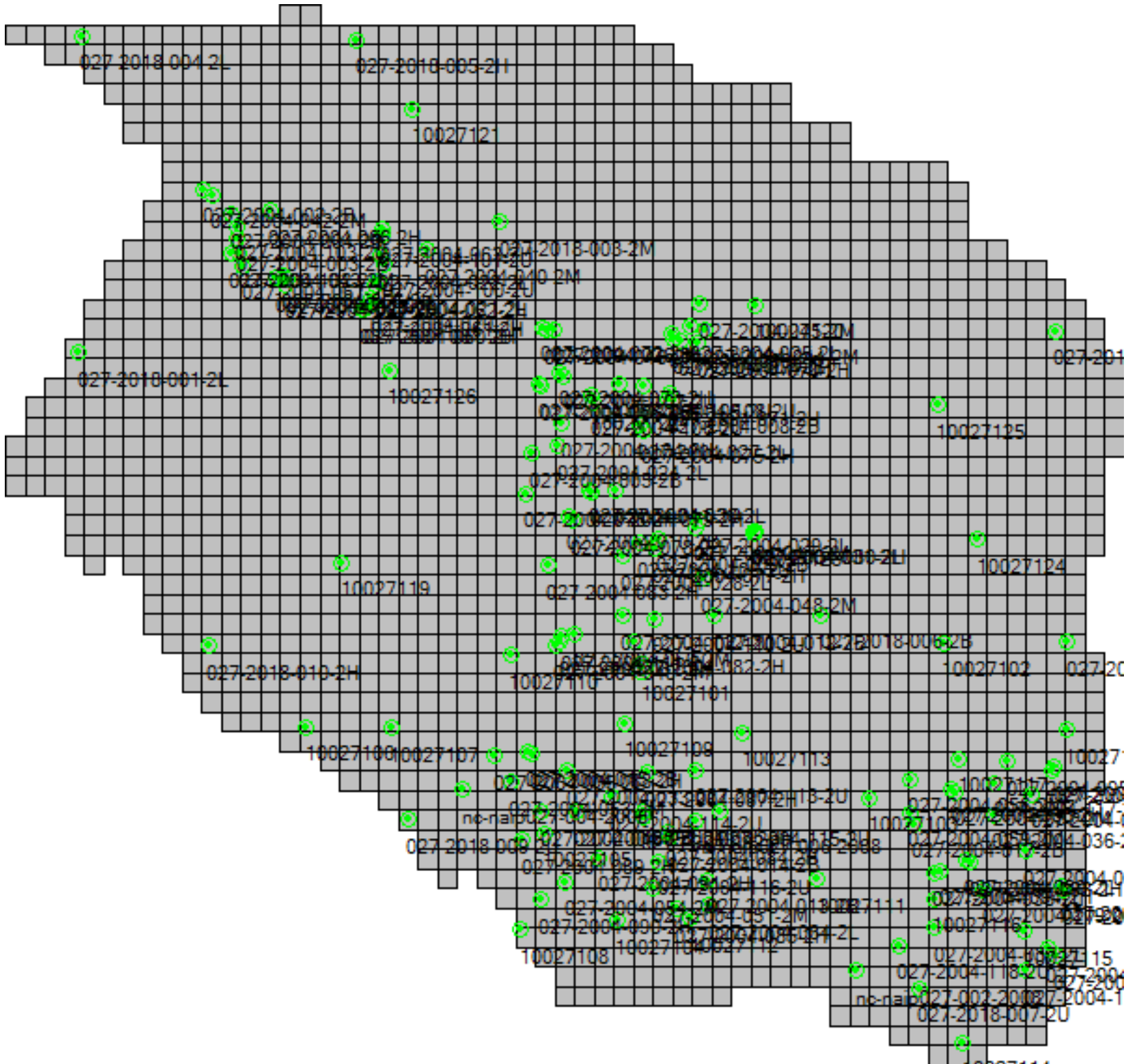
Tile Index Attribute:

Data Filename:

Number of Data Files Matching Attribute: 2153 out of 2153



Tiled-Data Area





LiDAR Accuracy Assessment Summary

LC Type	# of Points	NVA	VVA	
DEM				
2B	21	0.785		
2H	42		0.944	
2L	22		0.390	
2M	22		0.431	
2U	52	0.373		
Total	159			

Units: US Survey Feet

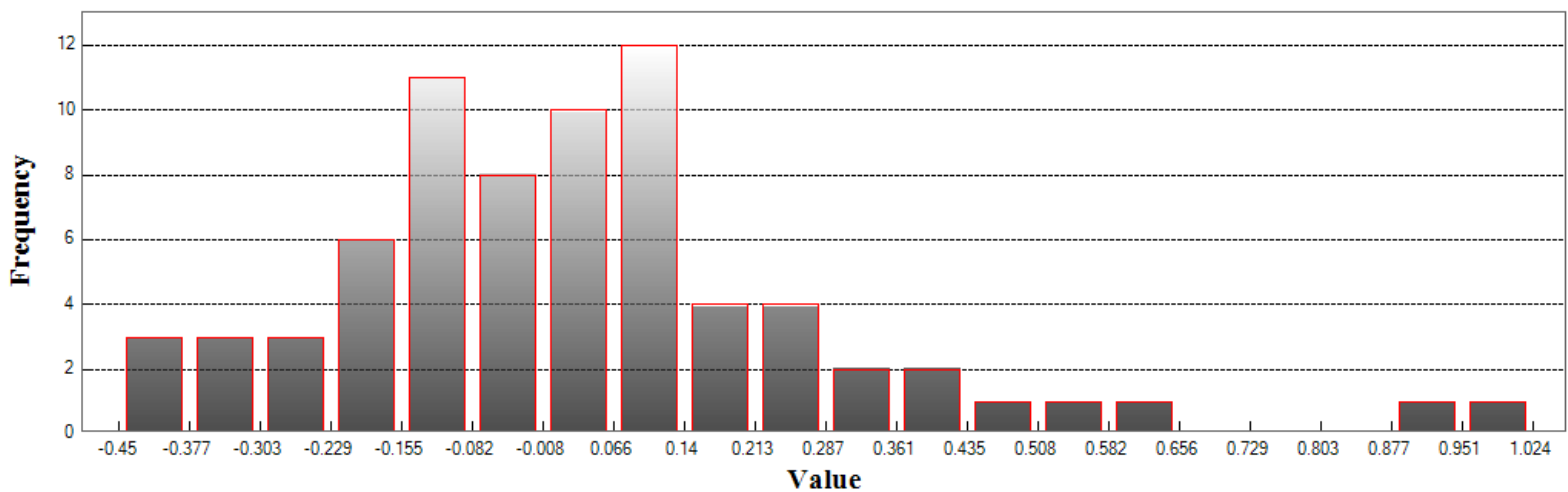


DEM

Nonvegetated Vertical Accuracy

LandCover Type: 2B, 2U
Minimum DZ: -0.451
Maximum DZ: 1.024
Mean DZ: 0.032
Mean Magnitude DZ: 0.44
Number Observations: 73
Standard Deviation DZ: 0.268
RMSE Z: 0.268
95% Confidence Level Z: 0.526
Units: US Survey Feet

Histogram



Min: -0.451

Max: 1.024

Number Of Bins: 20

Bin Interval: 0.074

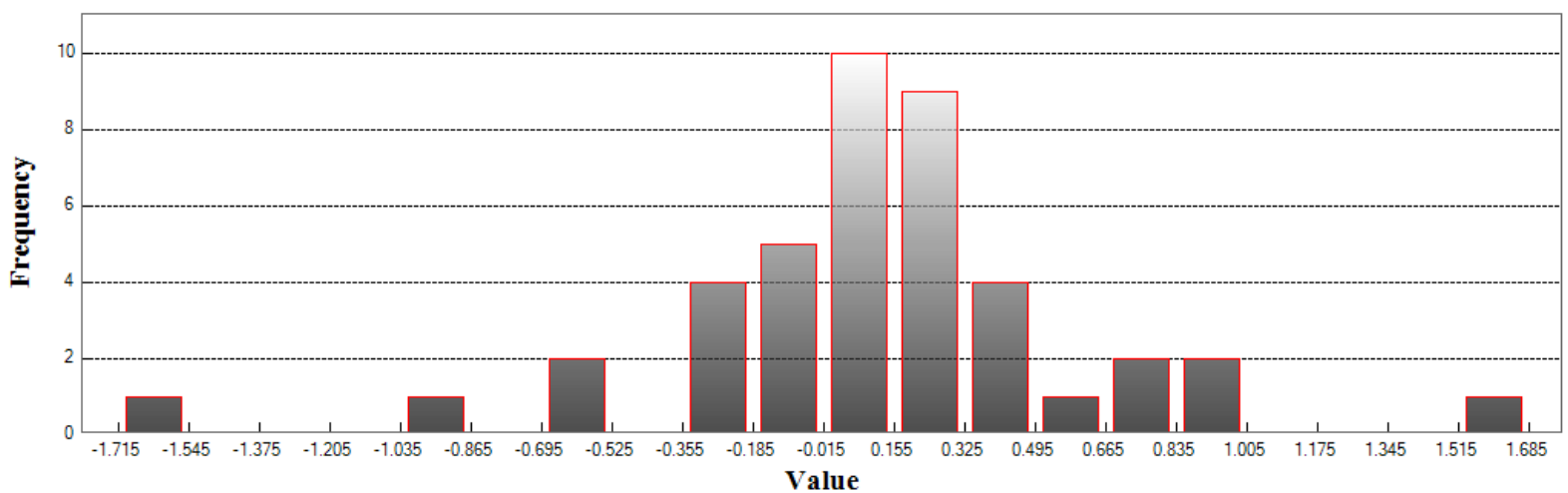


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2H
Minimum DZ: -1.715
Maximum DZ: 1.685
Mean DZ: 0.12
Mean Magnitude DZ: 0.609
Number Observations: 42
Standard Deviation DZ: 0.528
RMSE Z: 0.535
95th Percentile: 0.944
Units: US Survey Feet

Histogram



Min: -1.715

Max: 1.685

Number Of Bins: 20

Bin Interval: 0.17

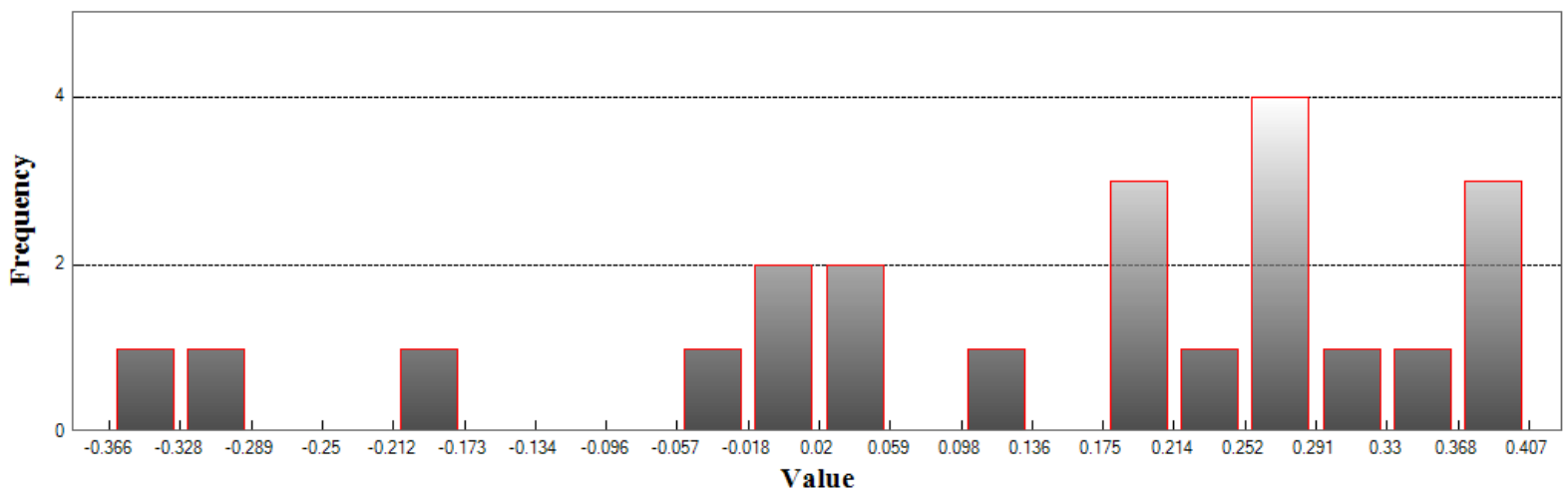


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2L
Minimum DZ: -0.366
Maximum DZ: 0.407
Mean DZ: 0.138
Mean Magnitude DZ: 0.467
Number Observations: 22
Standard Deviation DZ: 0.217
RMSE Z: 0.253
95th Percentile: 0.39
Units: US Survey Feet

Histogram



Min: -0.366

Max: 0.407

Number Of Bins: 20

Bin Interval: 0.039

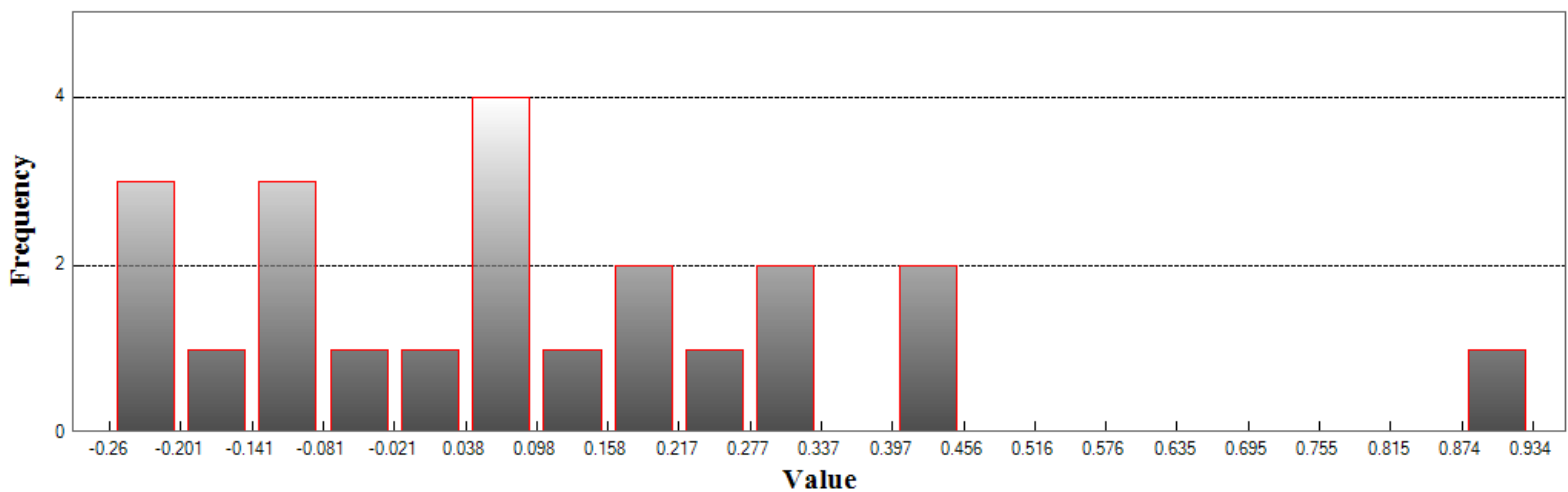


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2M
Minimum DZ: -0.26
Maximum DZ: 0.934
Mean DZ: 0.089
Mean Magnitude DZ: 0.461
Number Observations: 22
Standard Deviation DZ: 0.28
RMSE Z: 0.287
95th Percentile: 0.431
Units: US Survey Feet

Histogram



Min: -0.26

Max: 0.934

Number Of Bins: 20

Bin Interval: 0.06

NORTH CAROLINA GEODETIC SURVEY

Claude T Bowers Building
4105 Reedy Creek Road
Raleigh, North Carolina 27607
(919)733-3836



Project Information

Prepared By: Watson Ross
Project Name: 2018 Phase 5 LiDAR QC
Sensor Info: GmAPD Geiger-mode
Required Nominal Pulse Spacing: 0.35
Vendor Name: NA
Units: US Survey Feet
Percent of Extent Tolerance: Extents Not Checked
Date of Aquisition: Start: 8/17/2018 Finish: 8/17/2018

Metadata Information

Tile Index:

Filename: cherokee_tiles.shp

Number of Polys: 0

Intensity:

Tile Index Attribute: Not Specified

Data Filename: Not Specified

Number of Data Files Matching Attribute: Not Specified

DEM:

Tile Index Attribute: dem10_file

Data Filename: DEM10

Number of Data Files Matching Attribute: Not Specified

LAS:

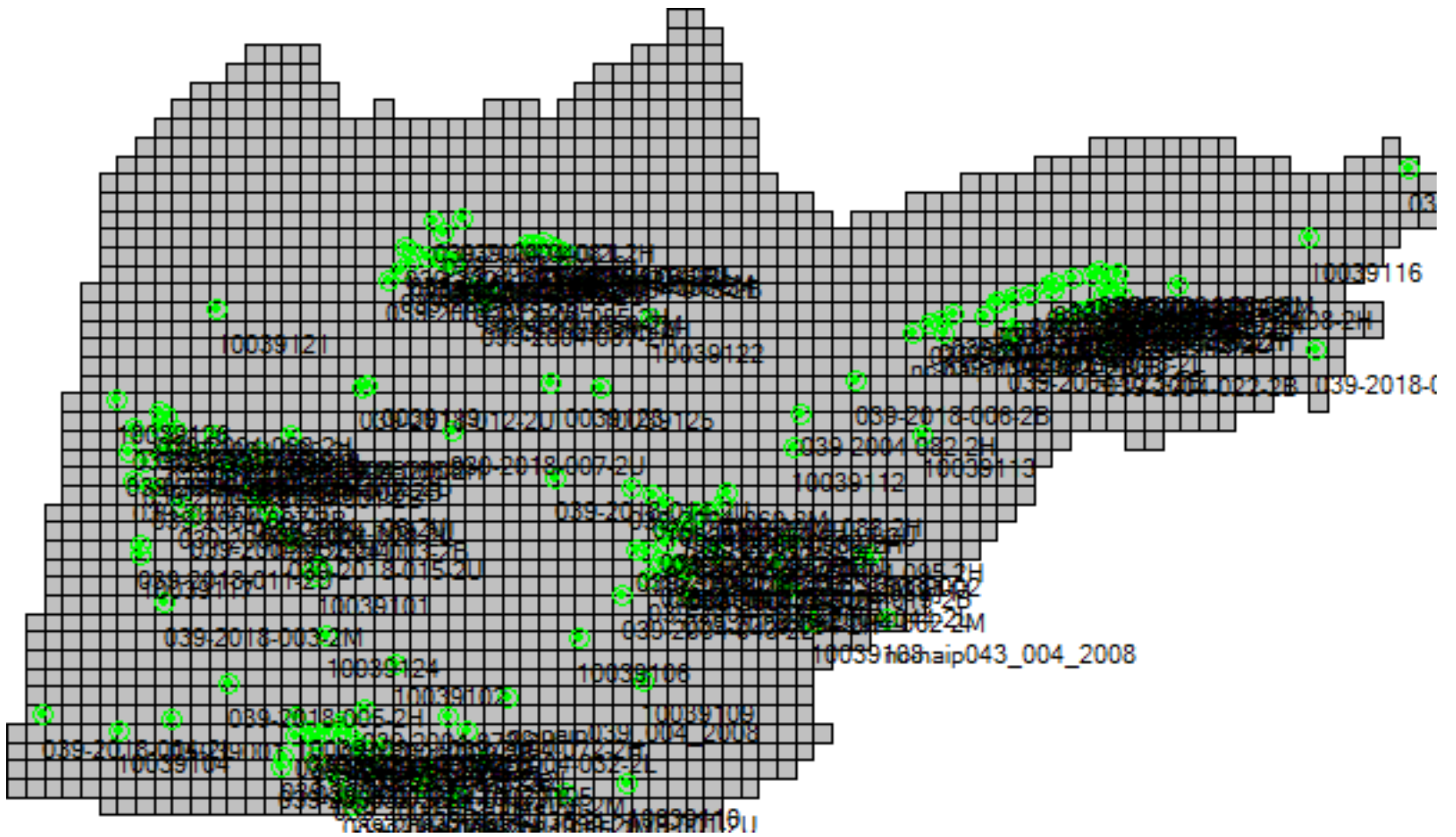
Tile Index Attribute:

Data Filename:

Number of Data Files Matching Attribute: 1749 out of 1749



Tiled-Data Area





LiDAR Accuracy Assessment Summary

LC Type	# of Points	NVA	VVA	
DEM				
2B	28	0.600		
2H	42		1.509	
2L	25		0.911	
2M	18		1.176	
2U	58	0.773		
Total	171			

Units: US Survey Feet



DEM

Nonvegetated Vertical Accuracy

LandCover Type: 2B, 2U

Minimum DZ: -0.768

Maximum DZ: 1.369

Mean DZ: 0.172

Mean Magnitude DZ: 0.518

Number Observations: 86

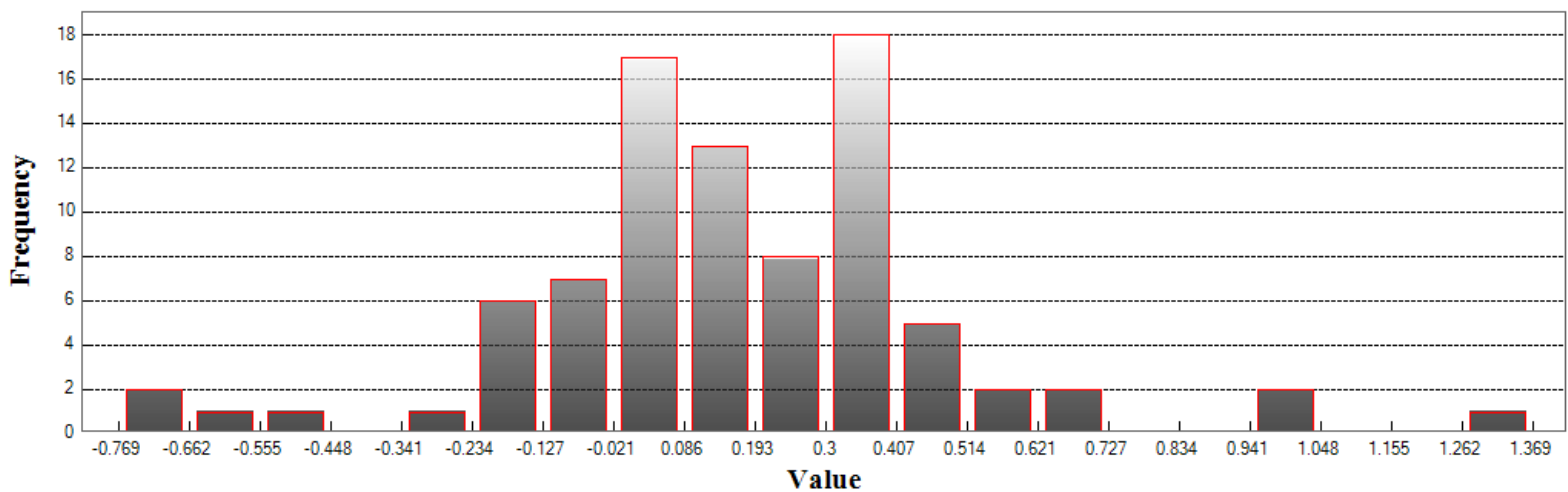
Standard Deviation DZ: 0.327

RMSE Z: 0.368

95% Confidence Level Z: 0.721

Units: US Survey Feet

Histogram



Min: -0.768

Max: 1.369

Number Of Bins: 20

Bin Interval: 0.107

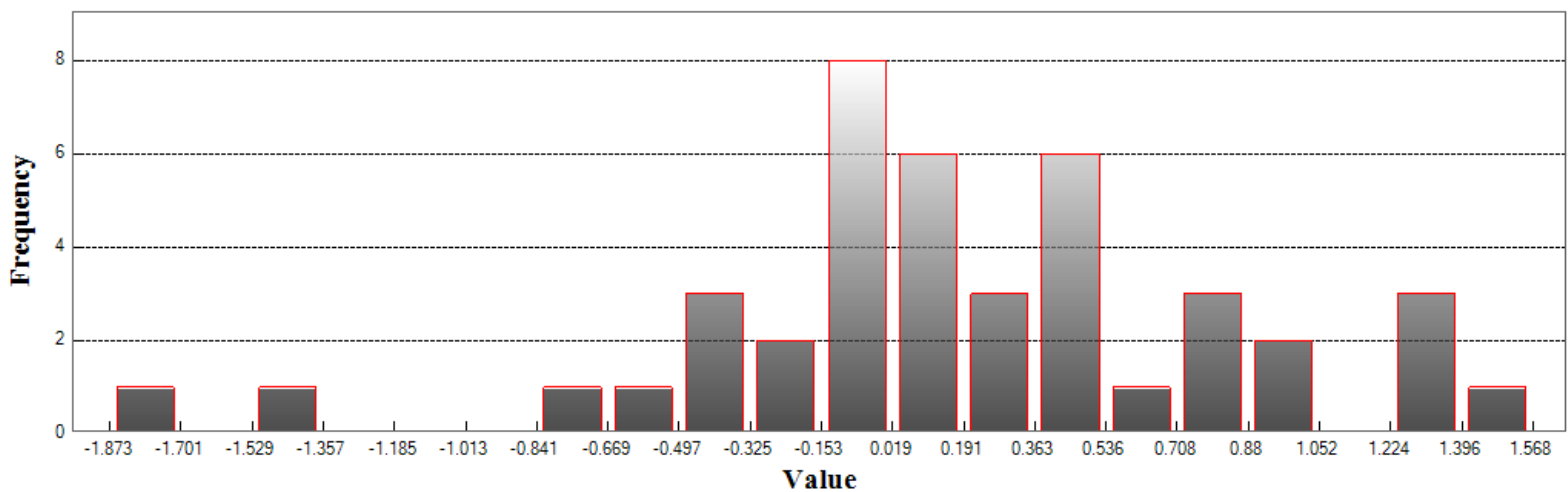


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2H
Minimum DZ: -1.873
Maximum DZ: 1.568
Mean DZ: 0.184
Mean Magnitude DZ: 0.721
Number Observations: 42
Standard Deviation DZ: 0.69
RMSE Z: 0.706
95th Percentile: 1.509
Units: US Survey Feet

Histogram



Min: -1.873

Max: 1.568

Number Of Bins: 20

Bin Interval: 0.172

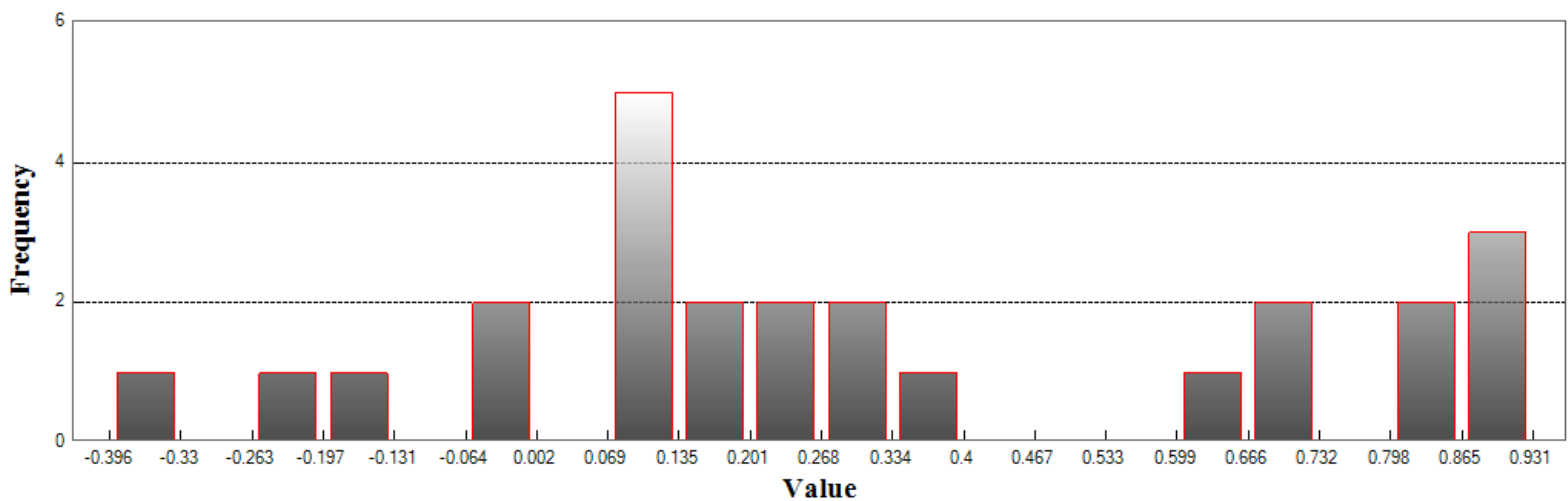


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2L
Minimum DZ: -0.396
Maximum DZ: 0.931
Mean DZ: 0.318
Mean Magnitude DZ: 0.617
Number Observations: 25
Standard Deviation DZ: 0.379
RMSE Z: 0.489
95th Percentile: 0.911
Units: US Survey Feet

Histogram



Min: -0.396

Max: 0.931

Number Of Bins: 20

Bin Interval: 0.066

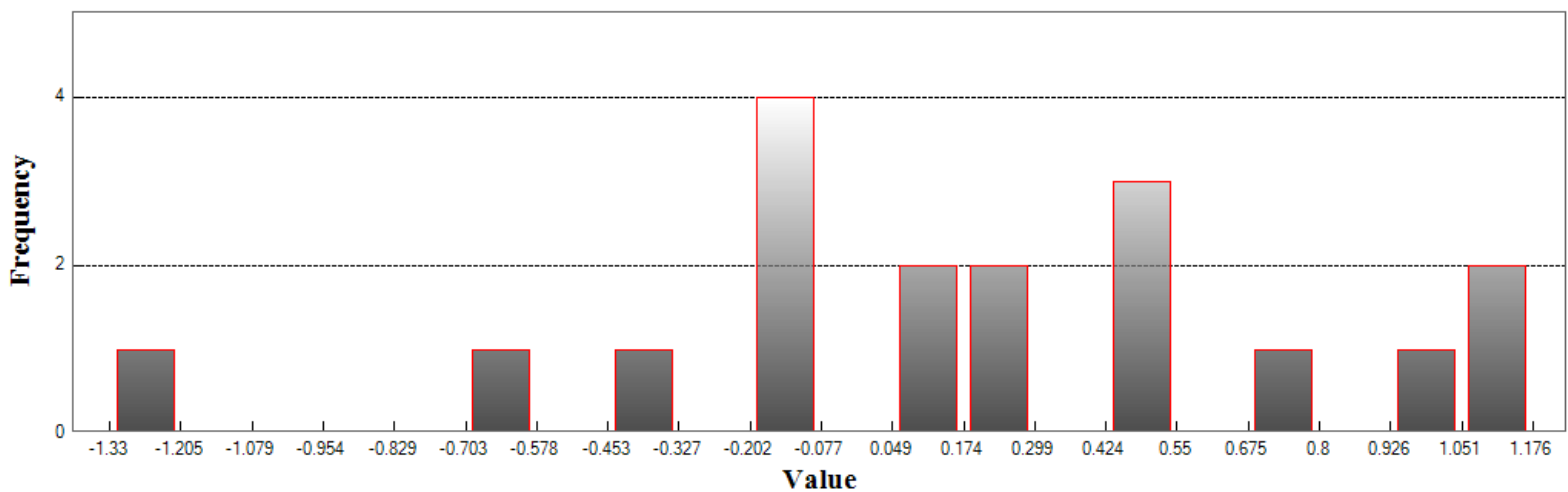


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2M
Minimum DZ: -1.33
Maximum DZ: 1.176
Mean DZ: 0.183
Mean Magnitude DZ: 0.713
Number Observations: 18
Standard Deviation DZ: 0.638
RMSE Z: 0.647
95th Percentile: 1.176
Units: US Survey Feet

Histogram



Min: -1.33

Max: 1.176

Number Of Bins: 20

Bin Interval: 0.125

NORTH CAROLINA GEODETIC SURVEY

Claude T Bowers Building
4105 Reedy Creek Road
Raleigh, North Carolina 27607
(919)733-3836



Project Information

Prepared By: Watson Ross
Project Name: 2018 Phase 5 LiDAR QC
Sensor Info: GmAPD Geiger-mode
Required Nominal Pulse Spacing: 0.35
Vendor Name: NA
Units: US Survey Feet
Percent of Extent Tolerance: Extents Not Checked
Date of Aquisition: Start: 8/17/2018 Finish: 8/17/2018

Metadata Information

Tile Index:

Filename: clay_tiles.shp

Number of Polys: 0

Intensity:

Tile Index Attribute: Not Specified

Data Filename: Not Specified

Number of Data Files Matching Attribute: Not Specified

DEM:

Tile Index Attribute: dem10_file

Data Filename: DEM10

Number of Data Files Matching Attribute: Not Specified

LAS:

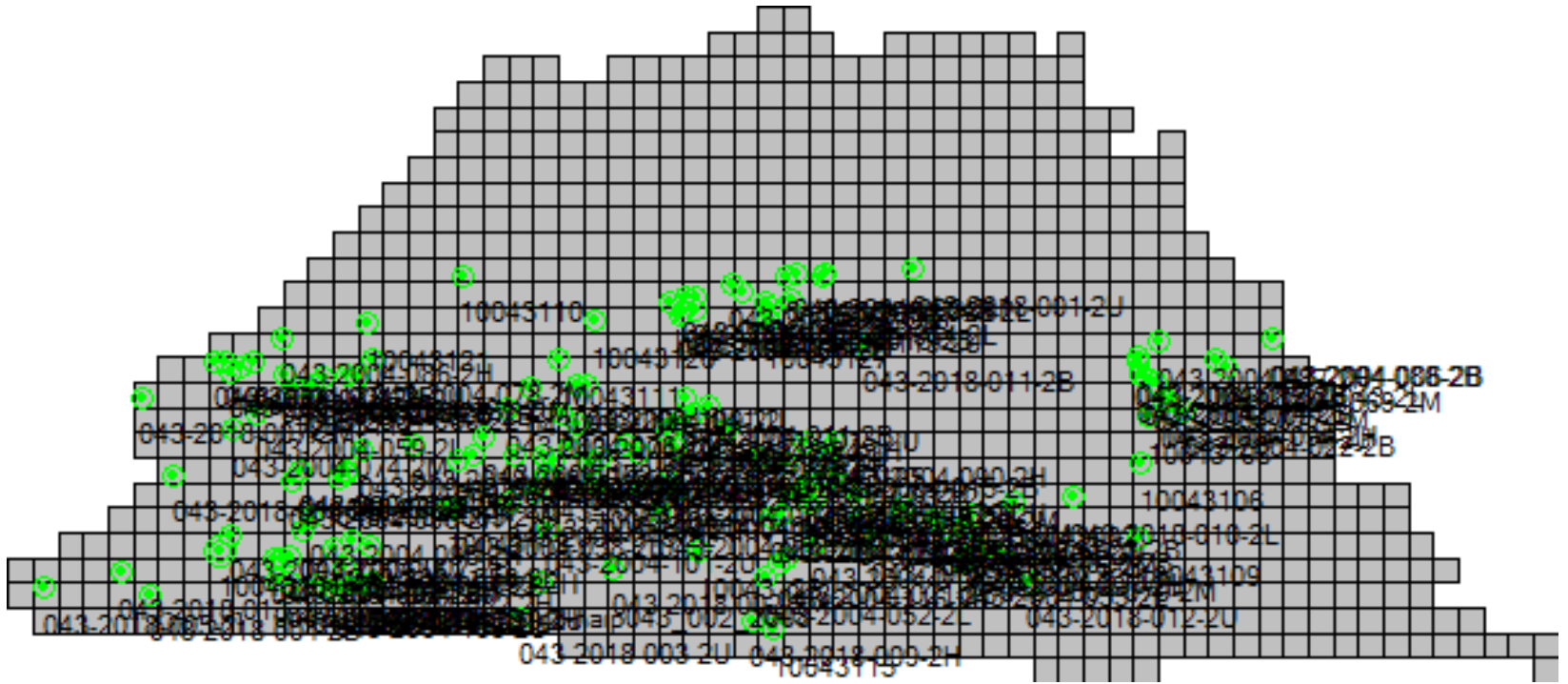
Tile Index Attribute:

Data Filename:

Number of Data Files Matching Attribute: 1749 out of 1749



Tiled-Data Area





LiDAR Accuracy Assessment Summary

LC Type	# of Points	NVA	VVA	
DEM				
2B	34	1.018		
2H	21		1.516	
2L	33		0.839	
2M	19		1.095	
2U	57	0.660		
Total	164			

Units: US Survey Feet



DEM

Nonvegetated Vertical Accuracy

LandCover Type: 2B, 2U

Minimum DZ: -0.763

Maximum DZ: 1.843

Mean DZ: 0.223

Mean Magnitude DZ: 0.575

Number Observations: 91

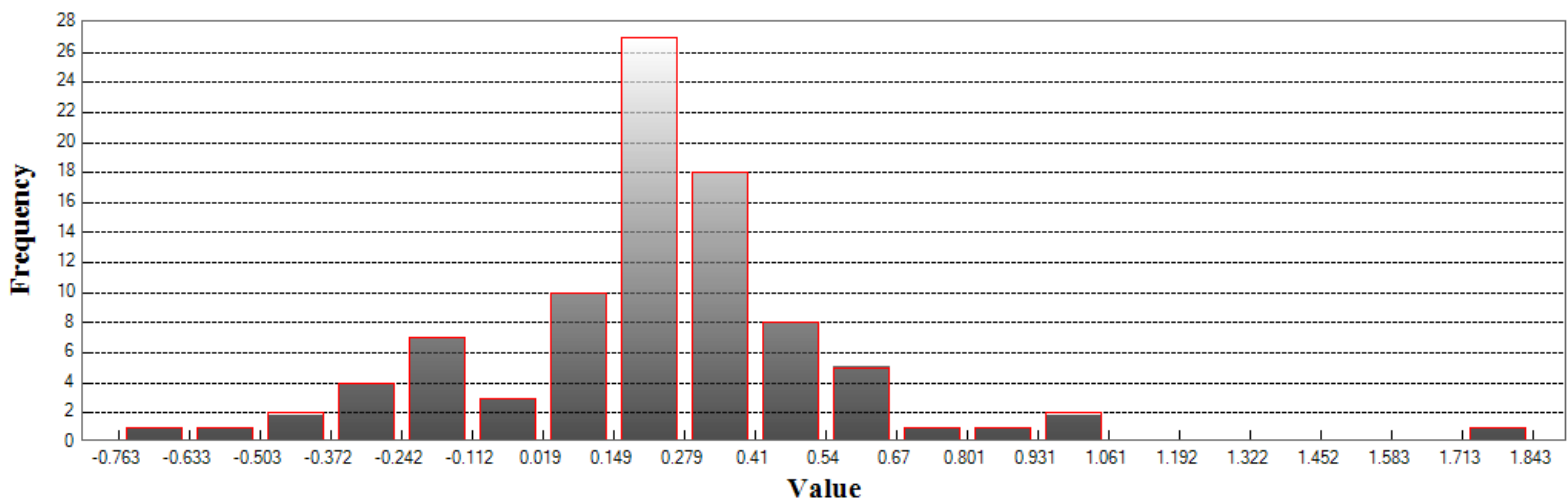
Standard Deviation DZ: 0.352

RMSE Z: 0.415

95% Confidence Level Z: 0.813

Units: US Survey Feet

Histogram



Min: -0.763

Max: 1.843

Number Of Bins: 20

Bin Interval: 0.13

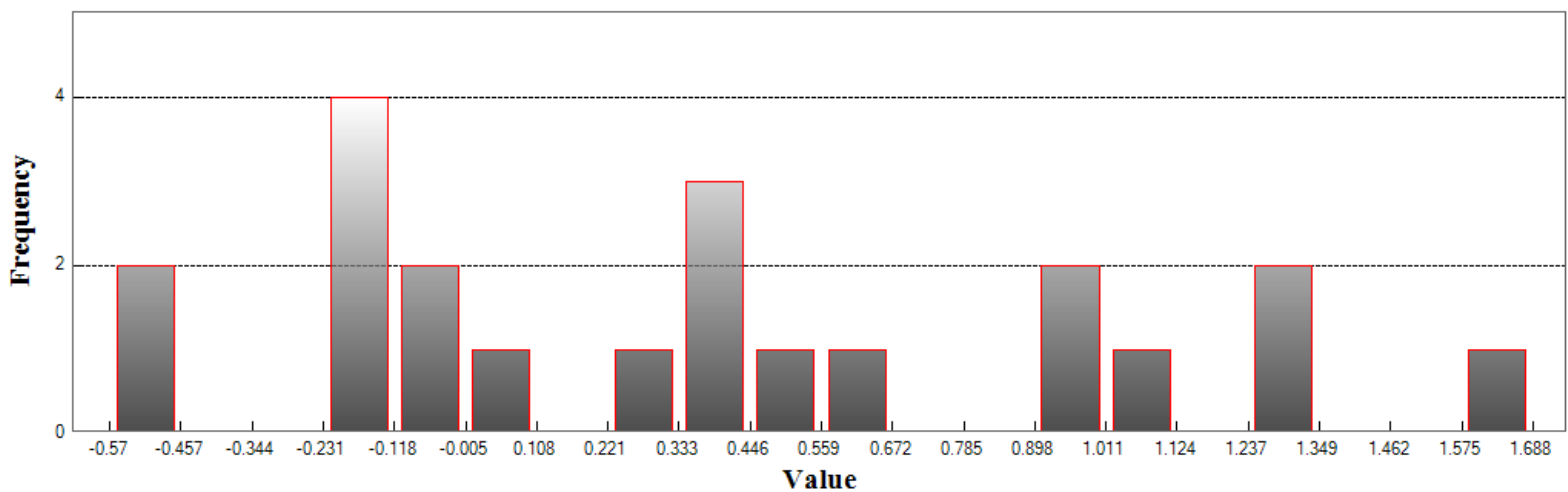


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2H
Minimum DZ: -0.569
Maximum DZ: 1.688
Mean DZ: 0.377
Mean Magnitude DZ: 0.749
Number Observations: 21
Standard Deviation DZ: 0.641
RMSE Z: 0.731
95th Percentile: 1.516
Units: US Survey Feet

Histogram



Min: -0.569
Max: 1.688
Number Of Bins: 20
Bin Interval: 0.113

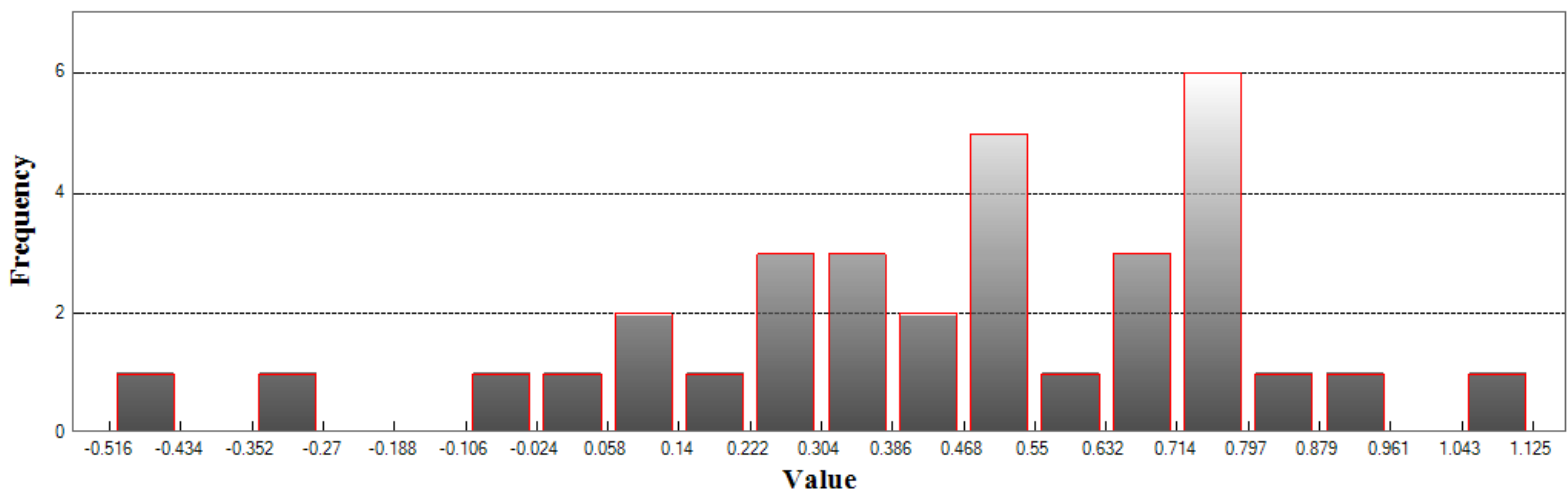


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2L
Minimum DZ: -0.516
Maximum DZ: 1.125
Mean DZ: 0.444
Mean Magnitude DZ: 0.705
Number Observations: 33
Standard Deviation DZ: 0.356
RMSE Z: 0.565
95th Percentile: 0.839
Units: US Survey Feet

Histogram



Min: -0.516

Max: 1.125

Number Of Bins: 20

Bin Interval: 0.082

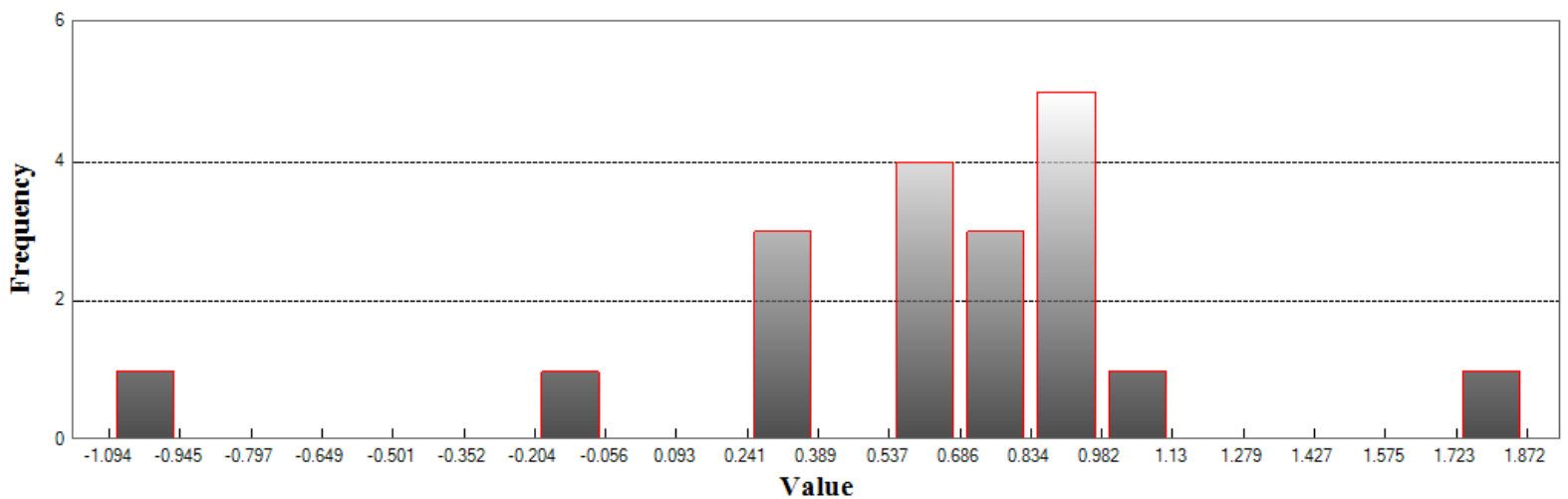


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2M
Minimum DZ: -1.093
Maximum DZ: 1.872
Mean DZ: 0.64
Mean Magnitude DZ: 0.875
Number Observations: 19
Standard Deviation DZ: 0.579
RMSE Z: 0.853
95th Percentile: 1.095
Units: US Survey Feet

Histogram



Min: -1.093

Max: 1.872

Number Of Bins: 20

Bin Interval: 0.148

NORTH CAROLINA GEODETIC SURVEY

Claude T Bowers Building
4105 Reedy Creek Road
Raleigh, North Carolina 27607
(919)733-3836



Project Information

Prepared By: Watson Ross
Project Name: 2018 Phase 5 LiDAR QC
Sensor Info: GmAPD Geiger-mode
Required Nominal Pulse Spacing: 0.35
Vendor Name: NA
Units: US Survey Feet
Percent of Extent Tolerance: Extents Not Checked
Date of Aquisition: Start: 8/17/2018 Finish: 8/17/2018

Metadata Information

Tile Index:

Filename: graham_tiles.shp

Number of Polys: 0

Intensity:

Tile Index Attribute: Not Specified

Data Filename: Not Specified

Number of Data Files Matching Attribute: Not Specified

DEM:

Tile Index Attribute: dem10_file

Data Filename: DEM10

Number of Data Files Matching Attribute: Not Specified

LAS:

Tile Index Attribute:

Data Filename:

Number of Data Files Matching Attribute: Not Specified



LiDAR Accuracy Assessment Summary

LC Type	# of Points	NVA	VVA	
DEM				
2B	22	0.483		
2H	41		1.254	
2L	22		0.496	
2M	22		1.359	
2U	56	0.770		
Total	163			

Units: US Survey Feet



DEM

Nonvegetated Vertical Accuracy

LandCover Type: 2B, 2U

Minimum DZ: -1.904

Maximum DZ: 0.816

Mean DZ: -0.017

Mean Magnitude DZ: 0.496

Number Observations: 78

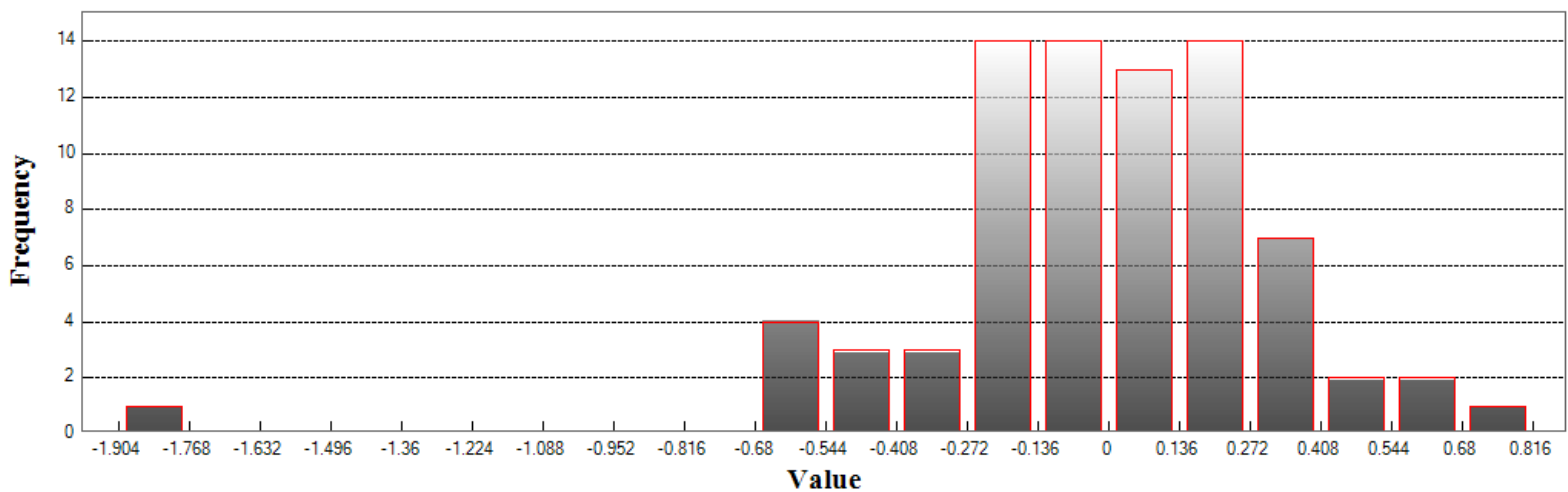
Standard Deviation DZ: 0.36

RMSE Z: 0.358

95% Confidence Level Z: 0.701

Units: US Survey Feet

Histogram



Min: -1.904

Max: 0.816

Number Of Bins: 20

Bin Interval: 0.136

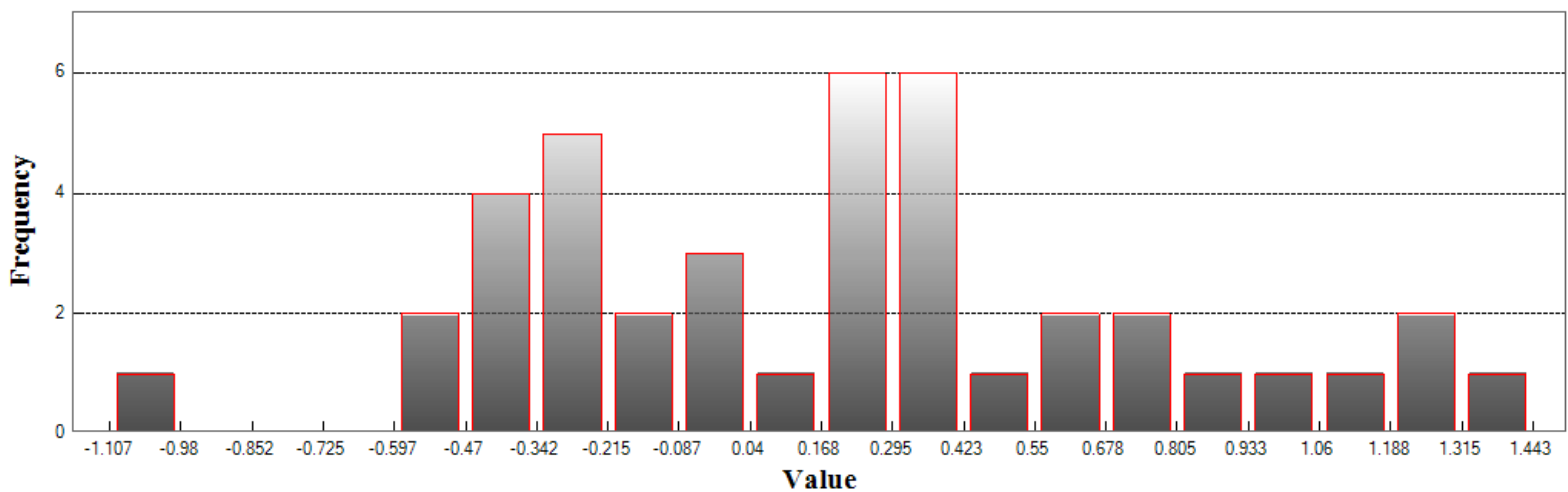


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2H
Minimum DZ: -1.108
Maximum DZ: 1.443
Mean DZ: 0.205
Mean Magnitude DZ: 0.689
Number Observations: 41
Standard Deviation DZ: 0.566
RMSE Z: 0.596
95th Percentile: 1.254
Units: US Survey Feet

Histogram



Min: -1.108
Max: 1.443
Number Of Bins: 20
Bin Interval: 0.128

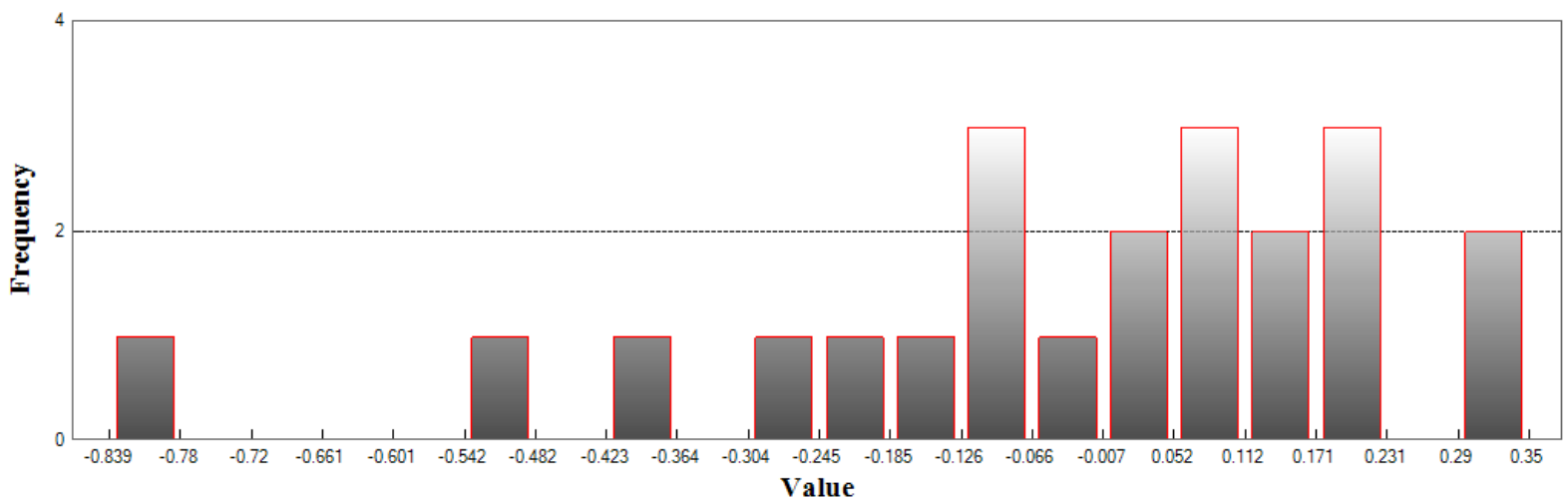


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2L
Minimum DZ: -0.839
Maximum DZ: 0.349
Mean DZ: -0.042
Mean Magnitude DZ: 0.453
Number Observations: 22
Standard Deviation DZ: 0.28
RMSE Z: 0.277
95th Percentile: 0.496
Units: US Survey Feet

Histogram



Min: -0.839

Max: 0.349

Number Of Bins: 20

Bin Interval: 0.059

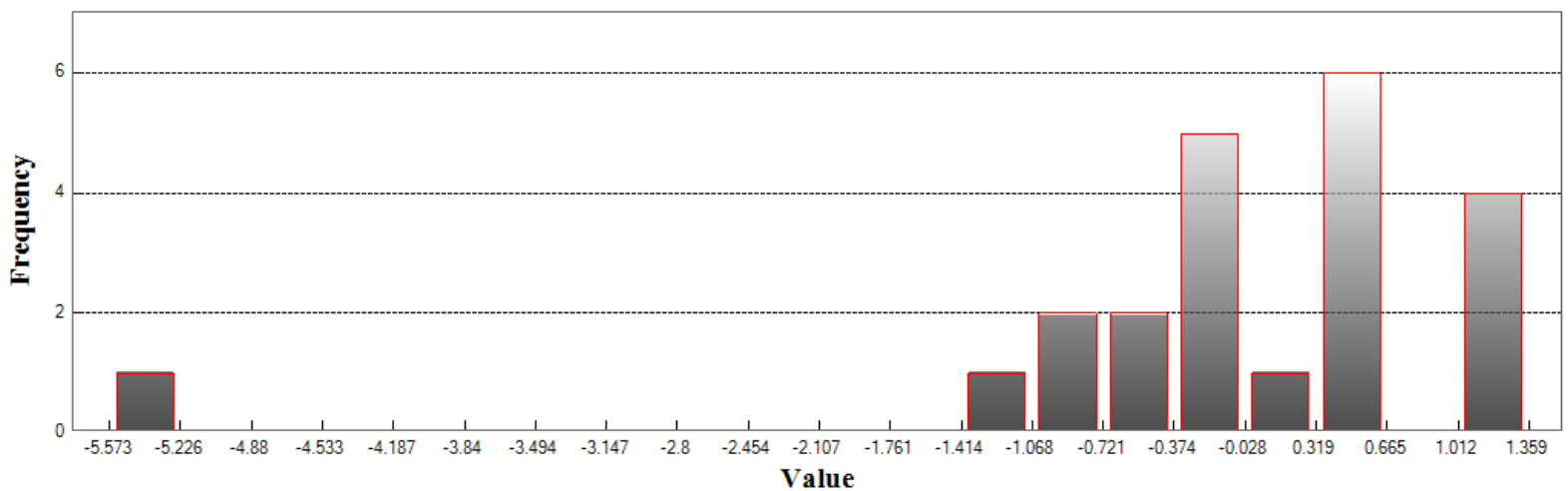


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2M
Minimum DZ: -5.573
Maximum DZ: 1.359
Mean DZ: -0.096
Mean Magnitude DZ: 0.904
Number Observations: 22
Standard Deviation DZ: 1.407
RMSE Z: 1.378
95th Percentile: 1.359
Units: US Survey Feet

Histogram



Min: -5.573

Max: 1.359

Number Of Bins: 20

Bin Interval: 0.347

NORTH CAROLINA GEODETIC SURVEY

Claude T Bowers Building
4105 Reedy Creek Road
Raleigh, North Carolina 27607
(919)733-3836



Project Information

Prepared By: Watson Ross
Project Name: 2018 Phase 5 LiDAR QC
Sensor Info: GmAPD Geiger-mode
Required Nominal Pulse Spacing: 0.35
Vendor Name: NA
Units: US Survey Feet
Percent of Extent Tolerance: Extents Not Checked
Date of Aquisition: Start: 8/17/2018 Finish: 8/17/2018

Metadata Information

Tile Index:

Filename: haywood_tiles.shp

Number of Polys: 0

Intensity:

Tile Index Attribute: Not Specified

Data Filename: Not Specified

Number of Data Files Matching Attribute: Not Specified

DEM:

Tile Index Attribute: dem10_file

Data Filename: DEM10

Number of Data Files Matching Attribute: Not Specified

LAS:

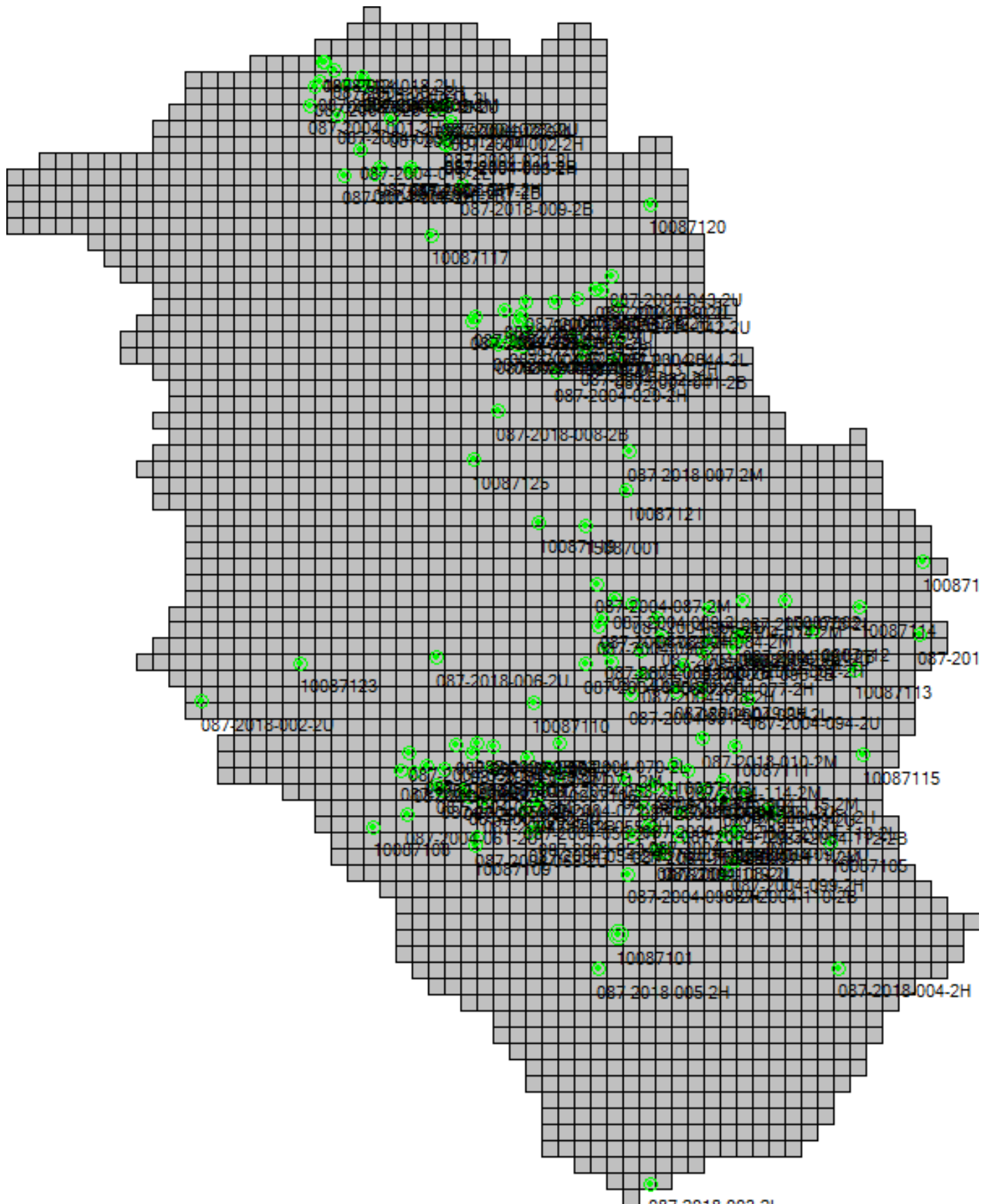
Tile Index Attribute: las_file

Data Filename:

Number of Data Files Matching Attribute: 2221 out of 2221



Tiled-Data Area





LiDAR Accuracy Assessment Summary

LC Type	# of Points	NVA	VVA	
DEM				
2B	22	0.874		
2H	42		2.335	
2L	22		1.038	
2M	22		2.657	
2U	49	0.684		
Total	157			

Units: US Survey Feet

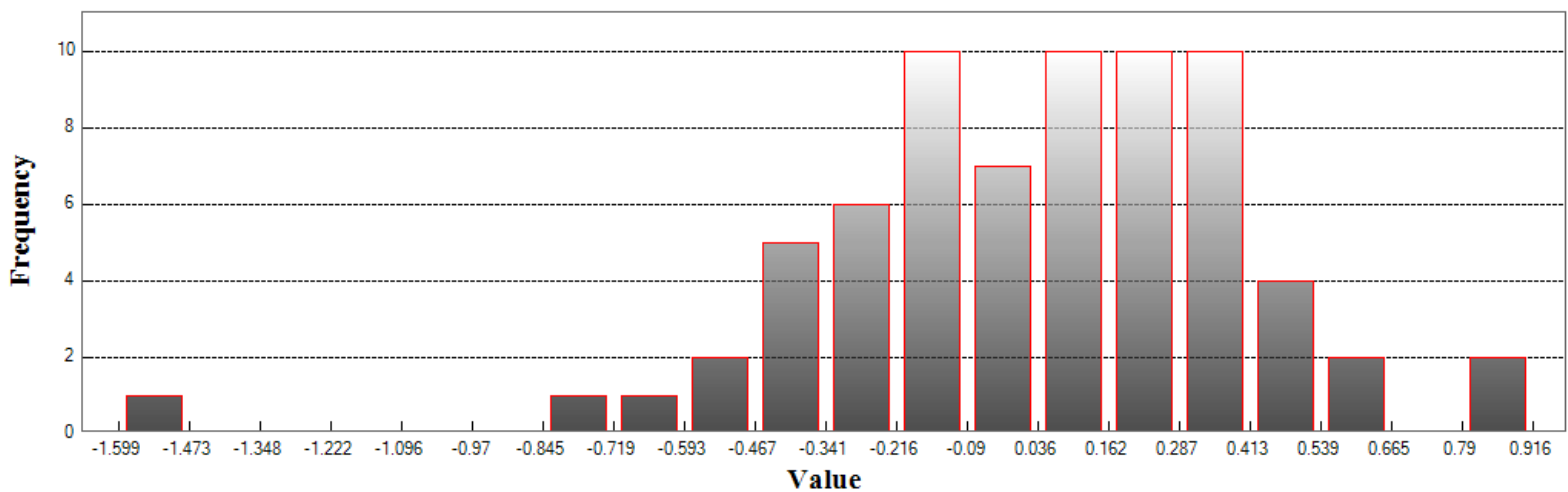


DEM

Nonvegetated Vertical Accuracy

LandCover Type: 2B, 2U
Minimum DZ: -1.599
Maximum DZ: 0.916
Mean DZ: 0.021
Mean Magnitude DZ: 0.54
Number Observations: 71
Standard Deviation DZ: 0.384
RMSE Z: 0.382
95% Confidence Level Z: 0.748
Units: US Survey Feet

Histogram



Min: -1.599
Max: 0.916
Number Of Bins: 20
Bin Interval: 0.126

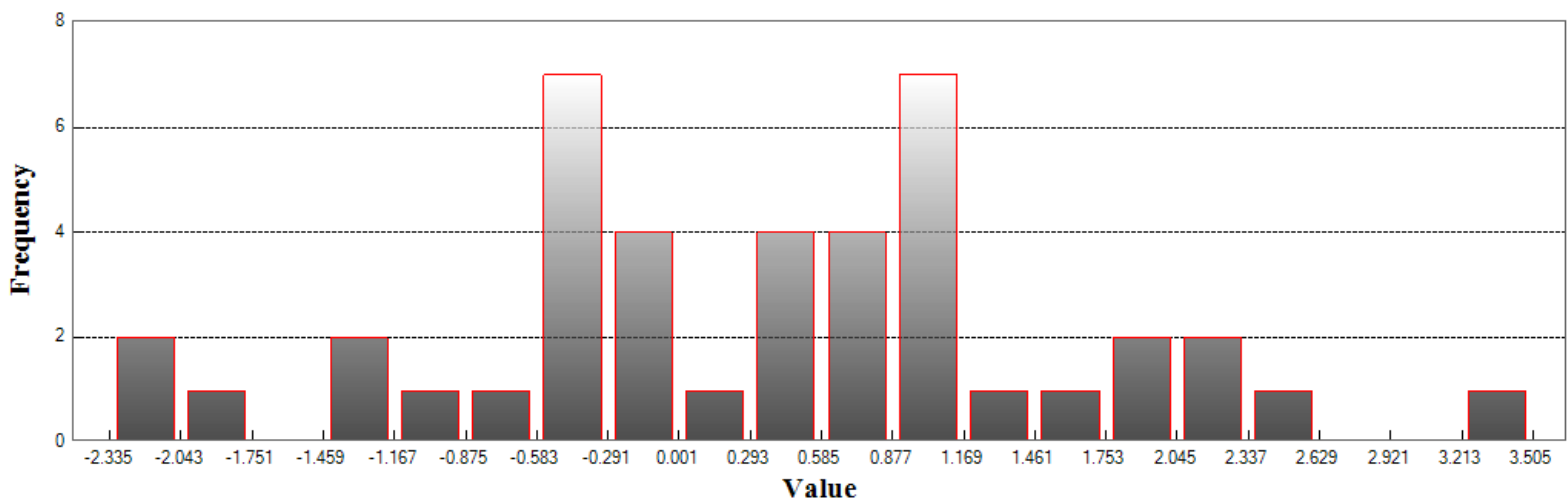


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2H
Minimum DZ: -2.335
Maximum DZ: 3.505
Mean DZ: 0.357
Mean Magnitude DZ: 1.02
Number Observations: 42
Standard Deviation DZ: 1.262
RMSE Z: 1.297
95th Percentile: 2.335
Units: US Survey Feet

Histogram



Min: -2.335
Max: 3.505
Number Of Bins: 20
Bin Interval: 0.292

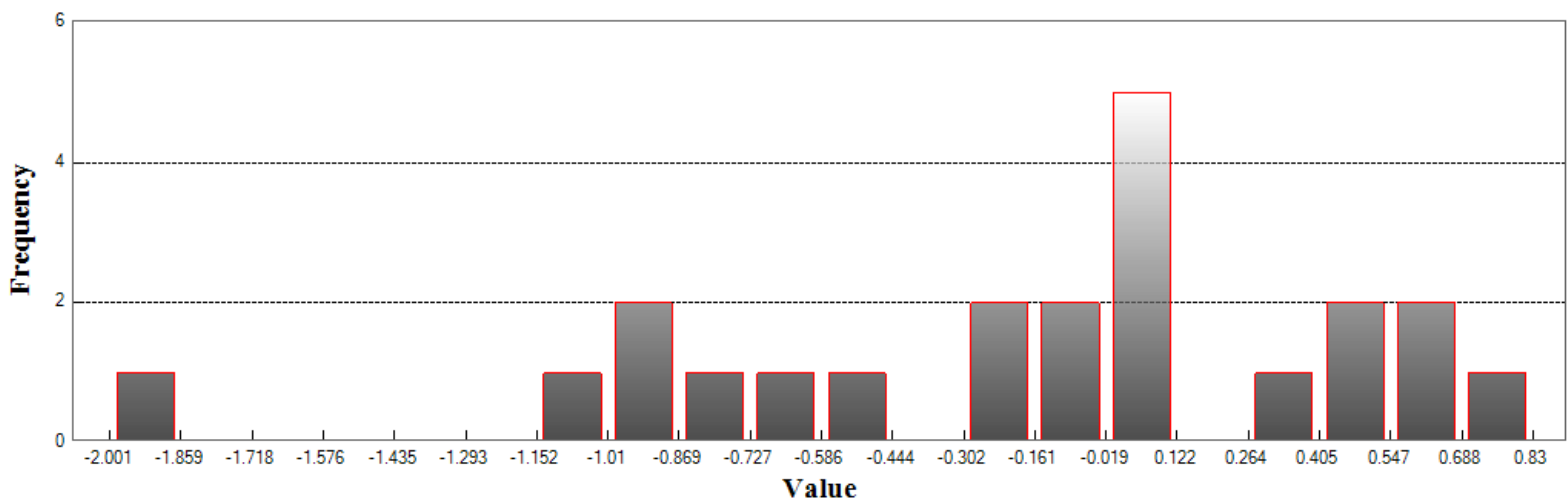


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2L
Minimum DZ: -2.001
Maximum DZ: 0.83
Mean DZ: -0.177
Mean Magnitude DZ: 0.71
Number Observations: 22
Standard Deviation DZ: 0.681
RMSE Z: 0.689
95th Percentile: 1.038
Units: US Survey Feet

Histogram



Min: -2.001

Max: 0.83

Number Of Bins: 20

Bin Interval: 0.142

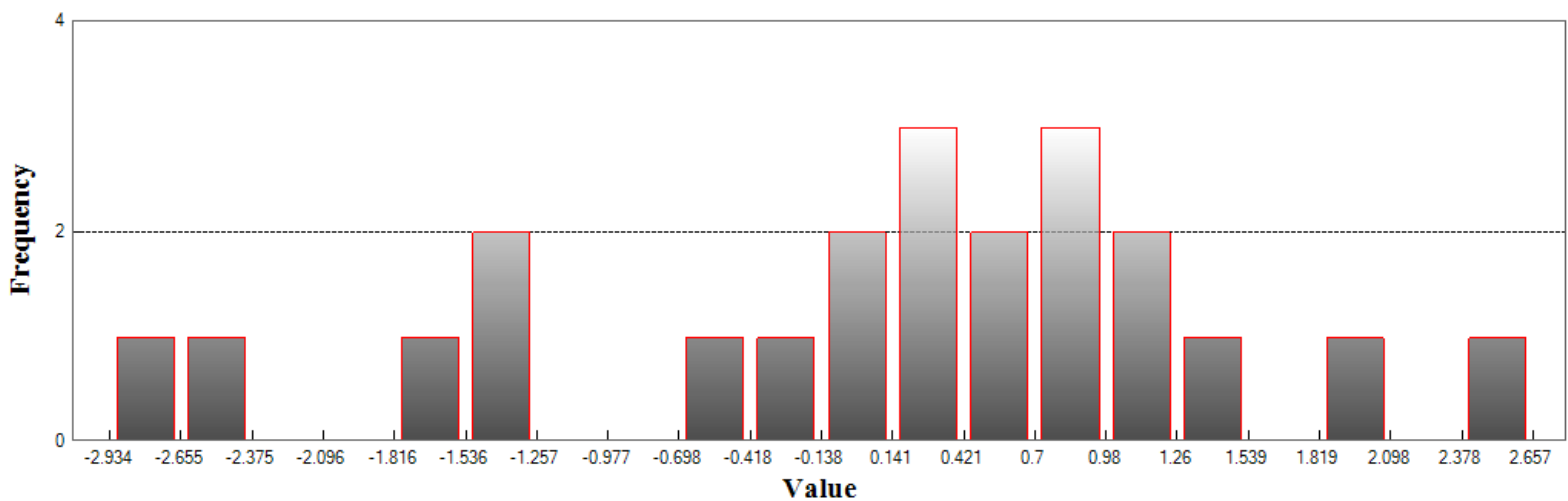


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2M
Minimum DZ: -2.935
Maximum DZ: 2.657
Mean DZ: 0.053
Mean Magnitude DZ: 1.03
Number Observations: 22
Standard Deviation DZ: 1.384
RMSE Z: 1.353
95th Percentile: 2.657
Units: US Survey Feet

Histogram



Min: -2.935

Max: 2.657

Number Of Bins: 20

Bin Interval: 0.28

NORTH CAROLINA GEODETIC SURVEY

Claude T Bowers Building
4105 Reedy Creek Road
Raleigh, North Carolina 27607
(919)733-3836



Project Information

Prepared By: Watson Ross
Project Name: 2018 Phase 5 LiDAR QC
Sensor Info: GmAPD Geiger-mode
Required Nominal Pulse Spacing: 0.35
Vendor Name: NA
Units: US Survey Feet
Percent of Extent Tolerance: Extents Not Checked
Date of Aquisition: Start: 8/17/2018 Finish: 8/17/2018

Metadata Information

Tile Index:

Filename: henderson_tiles.shp

Number of Polys: 0

Intensity:

Tile Index Attribute: Not Specified

Data Filename: Not Specified

Number of Data Files Matching Attribute: Not Specified

DEM:

Tile Index Attribute: dem10_file

Data Filename: DEM10

Number of Data Files Matching Attribute: Not Specified

LAS:

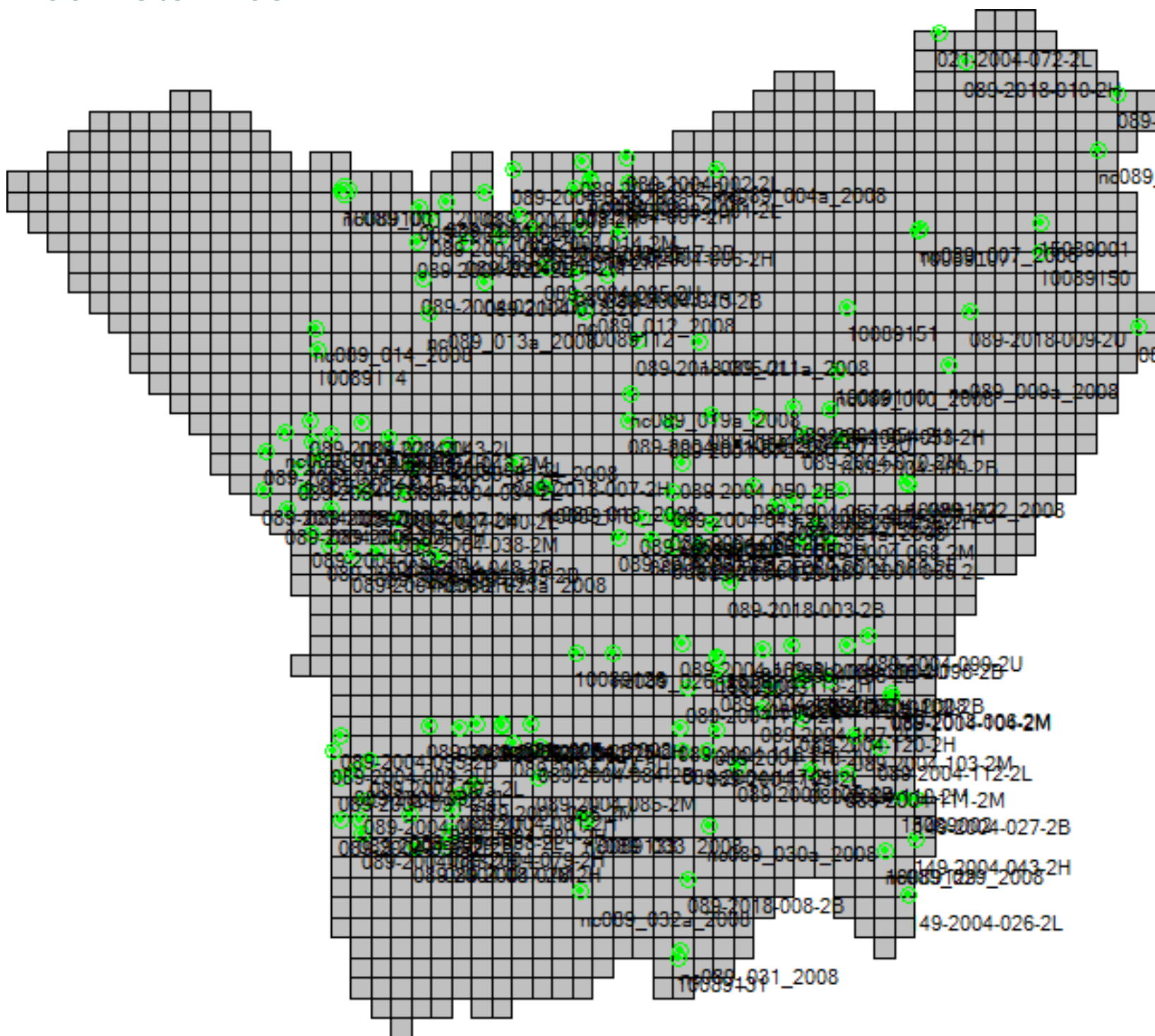
Tile Index Attribute:

Data Filename:

Number of Data Files Matching Attribute: Not Specified



Tiled-Data Area





LiDAR Accuracy Assessment Summary

LC Type	# of Points	NVA	VVA	
DEM				
2B	22	0.733		
2H	42		1.209	
2L	21		0.893	
2M	21		0.925	
2U	67	0.678		
Total	173			

Units: US Survey Feet



DEM

Nonvegetated Vertical Accuracy

LandCover Type: 2B, 2U

Minimum DZ: -0.536

Maximum DZ: 1.077

Mean DZ: 0.184

Mean Magnitude DZ: 0.518

Number Observations: 89

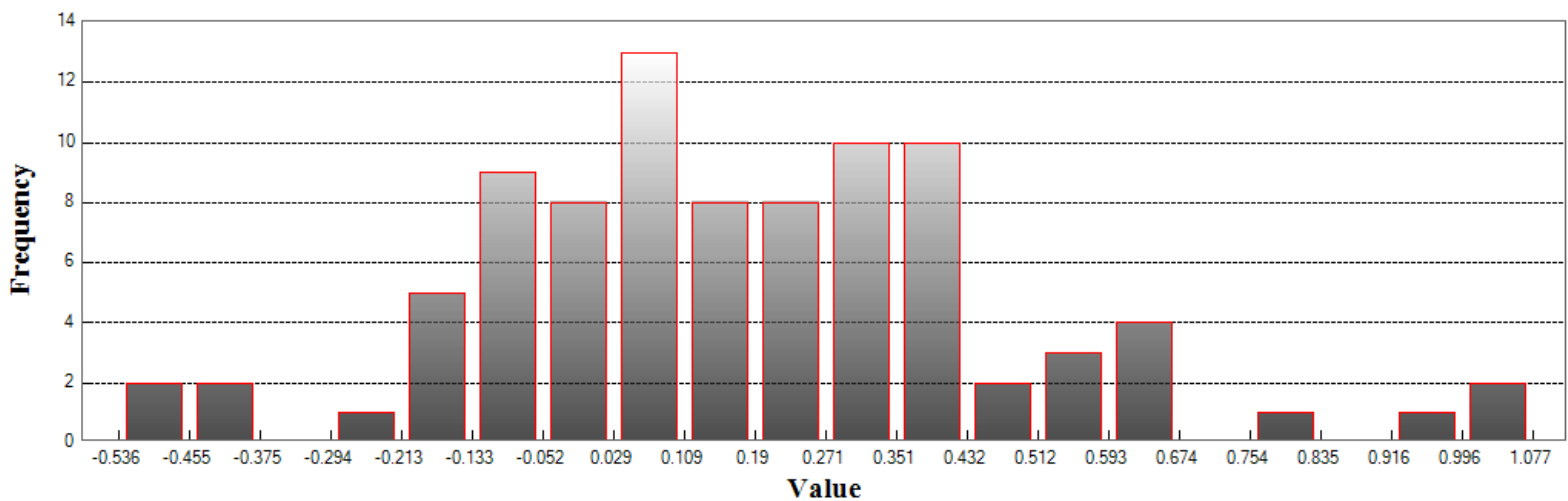
Standard Deviation DZ: 0.303

RMSE Z: 0.353

95% Confidence Level Z: 0.692

Units: US Survey Feet

Histogram



Min: -0.536

Max: 1.077

Number Of Bins: 20

Bin Interval: 0.081

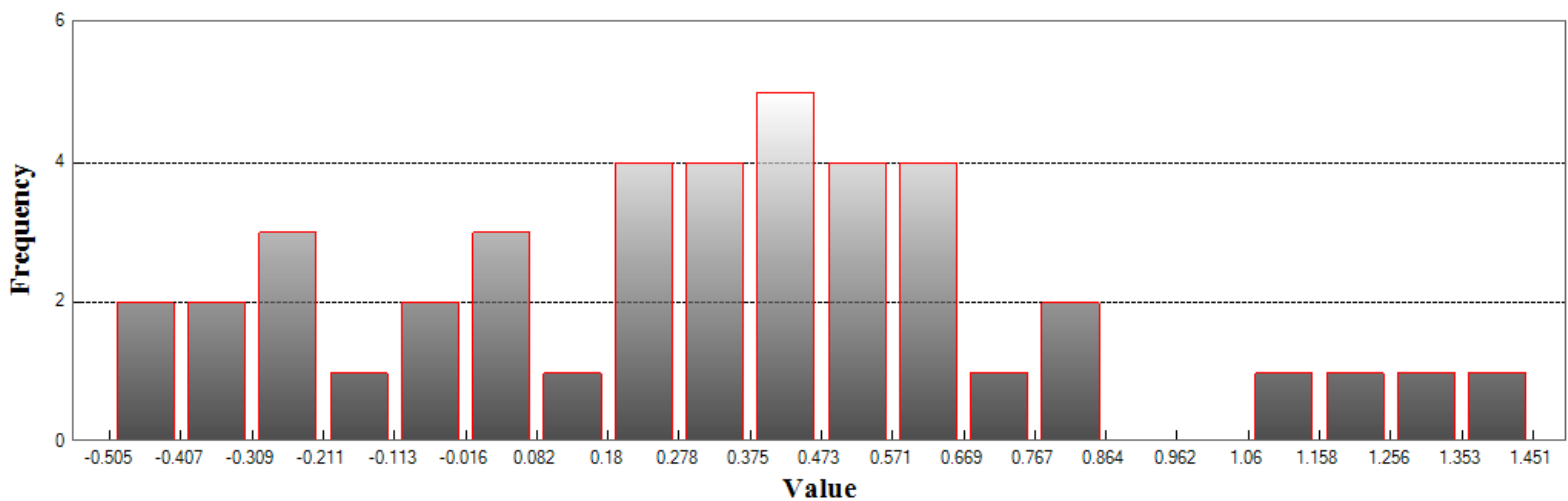


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2H
Minimum DZ: -0.505
Maximum DZ: 1.451
Mean DZ: 0.331
Mean Magnitude DZ: 0.676
Number Observations: 42
Standard Deviation DZ: 0.465
RMSE Z: 0.566
95th Percentile: 1.209
Units: US Survey Feet

Histogram



Min: -0.505

Max: 1.451

Number Of Bins: 20

Bin Interval: 0.098

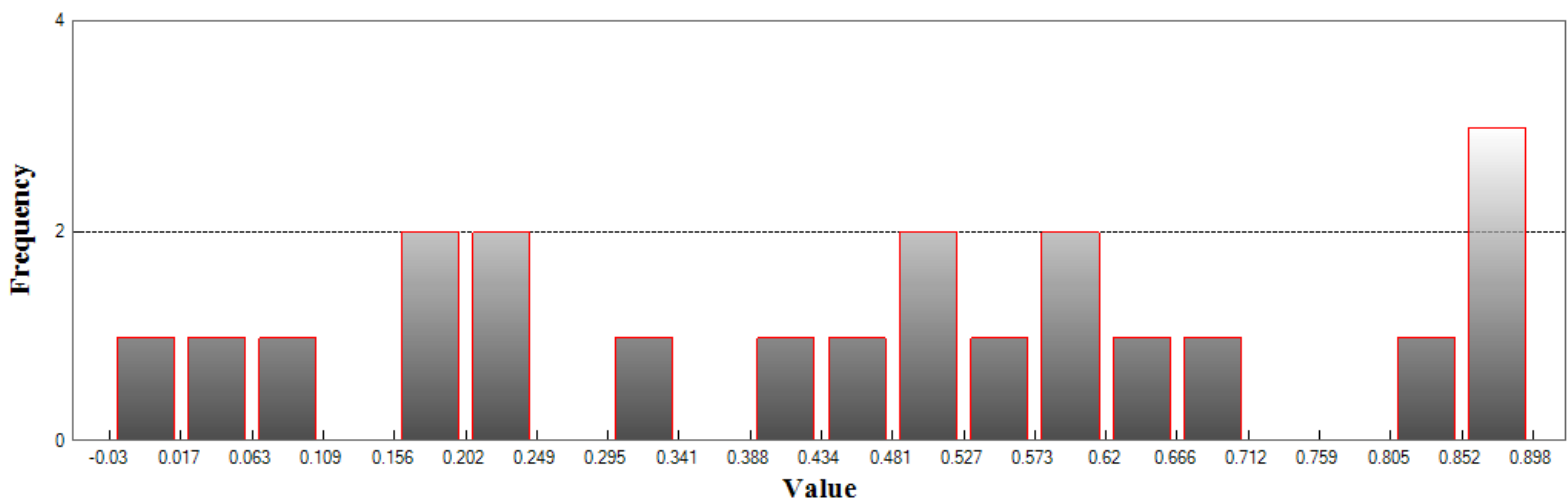


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2L
Minimum DZ: -0.03
Maximum DZ: 0.898
Mean DZ: 0.463
Mean Magnitude DZ: 0.683
Number Observations: 21
Standard Deviation DZ: 0.291
RMSE Z: 0.543
95th Percentile: 0.893
Units: US Survey Feet

Histogram



Min: -0.03

Max: 0.898

Number Of Bins: 20

Bin Interval: 0.046

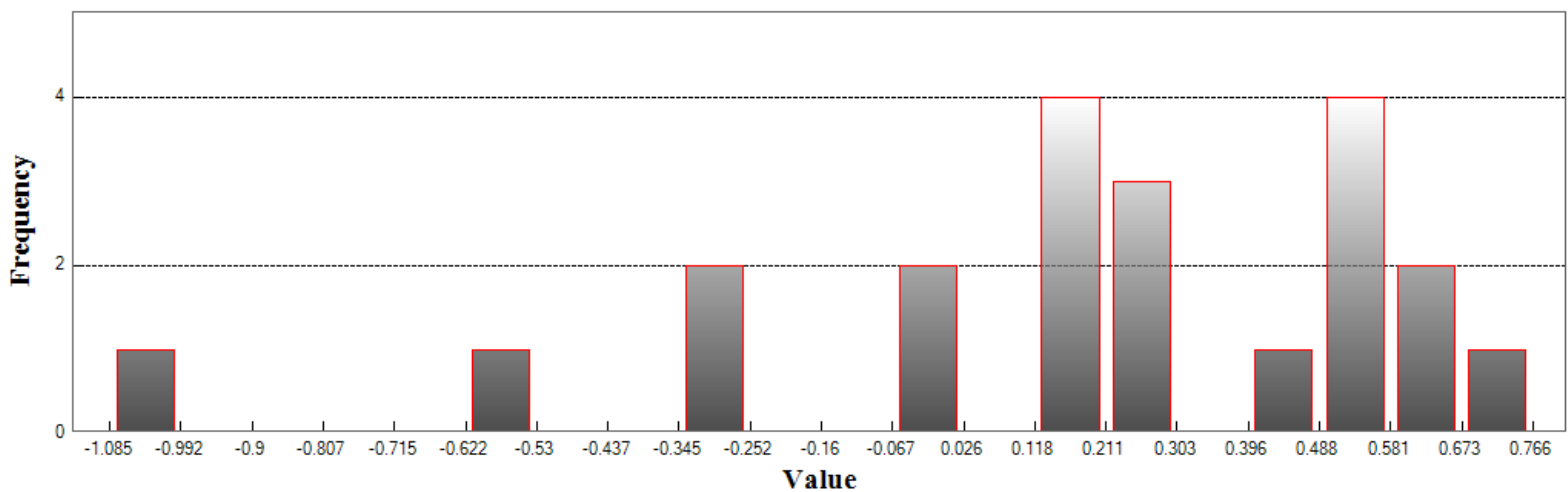


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2M
Minimum DZ: -1.085
Maximum DZ: 0.766
Mean DZ: 0.176
Mean Magnitude DZ: 0.631
Number Observations: 21
Standard Deviation DZ: 0.45
RMSE Z: 0.473
95th Percentile: 0.925
Units: US Survey Feet

Histogram



Min: -1.085

Max: 0.766

Number Of Bins: 20

Bin Interval: 0.093

NORTH CAROLINA GEODETIC SURVEY

Claude T Bowers Building
4105 Reedy Creek Road
Raleigh, North Carolina 27607
(919)733-3836



Project Information

Prepared By: Watson Ross
Project Name: 2018 Phase 5 LiDAR QC
Sensor Info: GmAPD Geiger-mode
Required Nominal Pulse Spacing: 0.35
Vendor Name: NA
Units: US Survey Feet
Percent of Extent Tolerance: Extents Not Checked
Date of Aquisition: Start: 8/17/2018 Finish: 8/17/2018

Metadata Information

Tile Index:

Filename: jackson_tiles.shp

Number of Polys: 0

Intensity:

Tile Index Attribute: Not Specified

Data Filename: Not Specified

Number of Data Files Matching Attribute: Not Specified

DEM:

Tile Index Attribute: dem10_file

Data Filename: DEM10

Number of Data Files Matching Attribute: Not Specified

LAS:

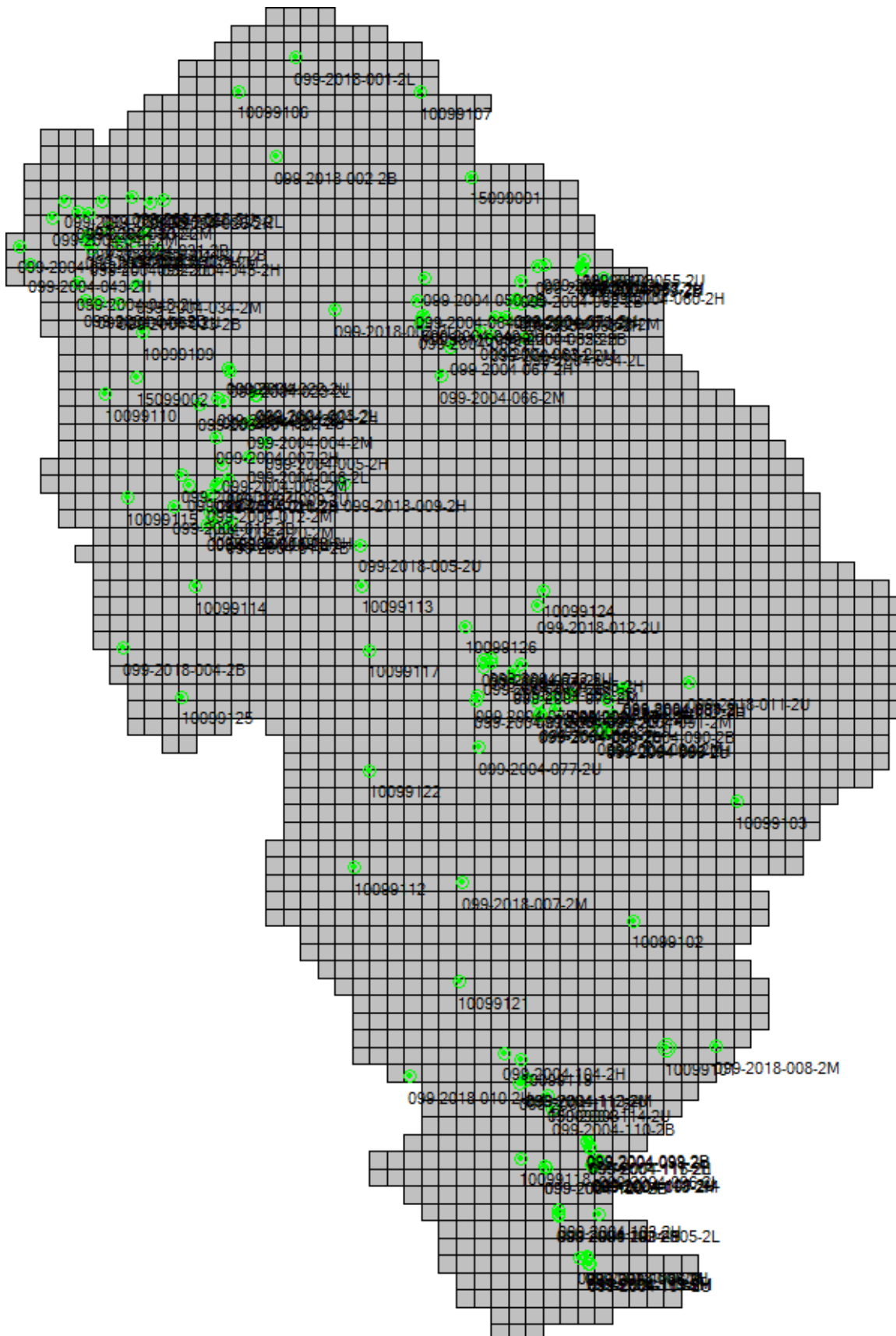
Tile Index Attribute: las_file

Data Filename:

Number of Data Files Matching Attribute: 2221 out of 2221



Tiled-Data Area





LiDAR Accuracy Assessment Summary

LC Type	# of Points	NVA	VVA	
DEM				
2B	22	0.676		
2H	42		1.714	
2L	21		1.061	
2M	22		1.393	
2U	50	0.653		
Total	157			

Units: US Survey Feet

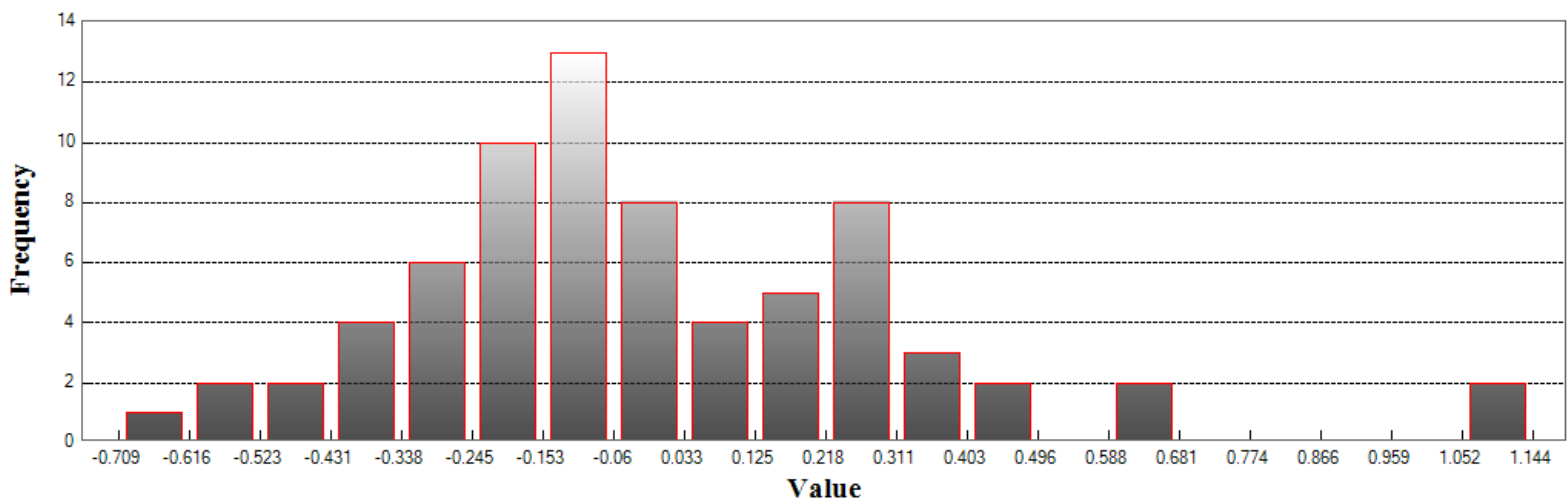


DEM

Nonvegetated Vertical Accuracy

LandCover Type: 2B, 2U
Minimum DZ: -0.708
Maximum DZ: 1.145
Mean DZ: -0.011
Mean Magnitude DZ: 0.509
Number Observations: 72
Standard Deviation DZ: 0.339
RMSE Z: 0.337
95% Confidence Level Z: 0.66
Units: US Survey Feet

Histogram



Min: -0.708
Max: 1.145
Number Of Bins: 20
Bin Interval: 0.093

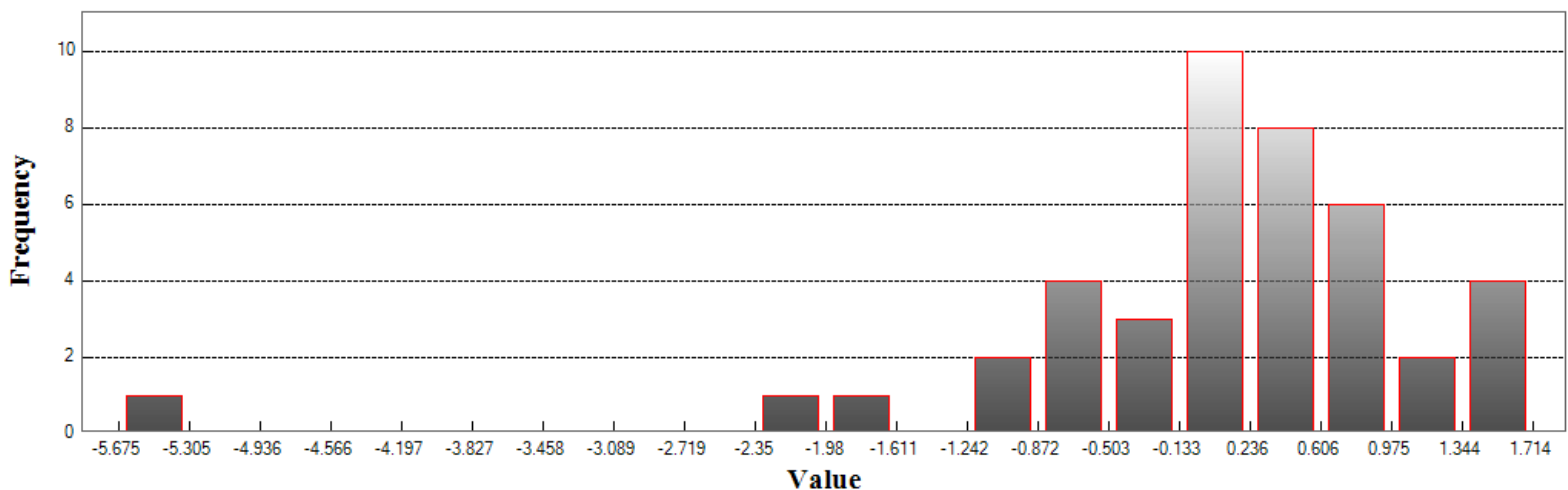


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2H
Minimum DZ: -5.675
Maximum DZ: 1.714
Mean DZ: 0.044
Mean Magnitude DZ: 0.895
Number Observations: 42
Standard Deviation DZ: 1.239
RMSE Z: 1.225
95th Percentile: 1.714
Units: US Survey Feet

Histogram



Min: -5.675
Max: 1.714
Number Of Bins: 20
Bin Interval: 0.369

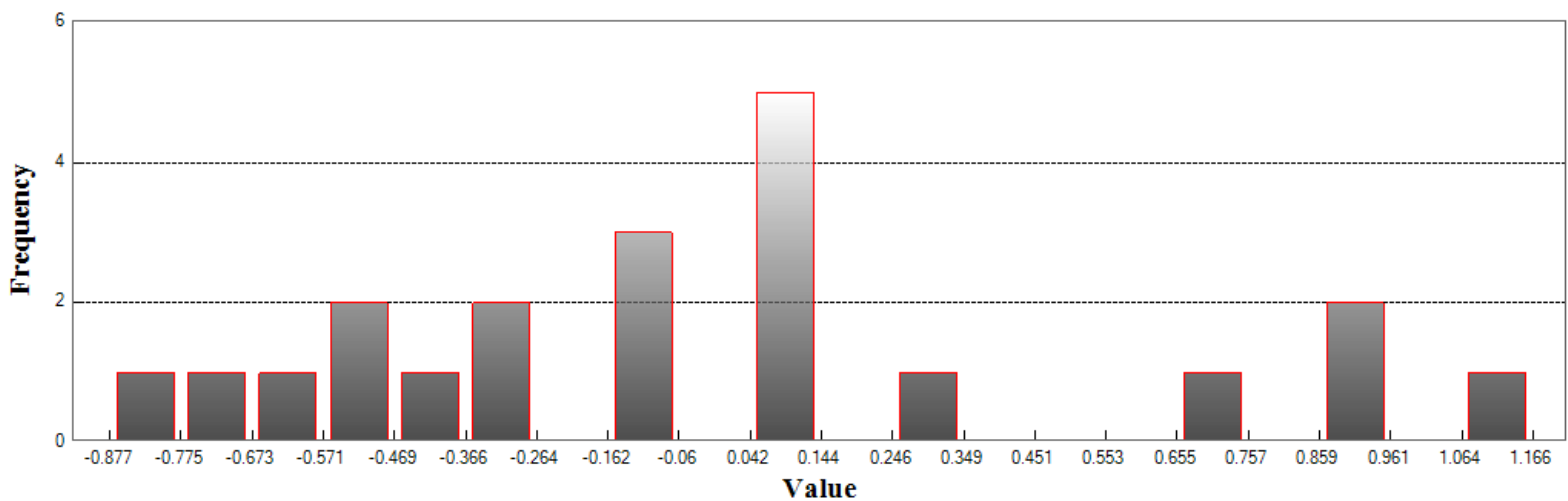


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2L
Minimum DZ: -0.877
Maximum DZ: 1.166
Mean DZ: 0.004
Mean Magnitude DZ: 0.663
Number Observations: 21
Standard Deviation DZ: 0.566
RMSE Z: 0.553
95th Percentile: 1.061
Units: US Survey Feet

Histogram



Min: -0.877

Max: 1.166

Number Of Bins: 20

Bin Interval: 0.102

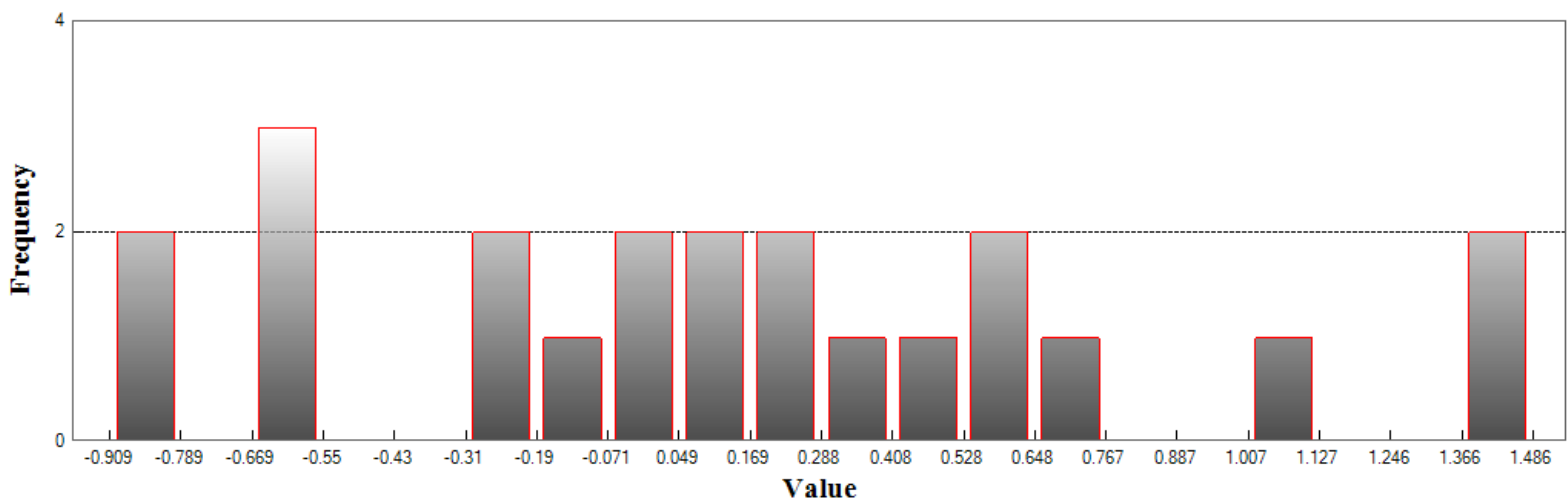


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2M
Minimum DZ: -0.909
Maximum DZ: 1.486
Mean DZ: 0.147
Mean Magnitude DZ: 0.723
Number Observations: 22
Standard Deviation DZ: 0.663
RMSE Z: 0.664
95th Percentile: 1.393
Units: US Survey Feet

Histogram



Min: -0.909

Max: 1.486

Number Of Bins: 20

Bin Interval: 0.12

NORTH CAROLINA GEODETIC SURVEY

Claude T Bowers Building
4105 Reedy Creek Road
Raleigh, North Carolina 27607
(919)733-3836



Project Information

Prepared By: Watson Ross
Project Name: 2018 Phase 5 LiDAR QC
Sensor Info: GmAPD Geiger-mode
Required Nominal Pulse Spacing: 0.35
Vendor Name: NA
Units: US Survey Feet
Percent of Extent Tolerance: Extents Not Checked
Date of Aquisition: Start: 8/17/2018 Finish: 8/17/2018

Metadata Information

Tile Index:

Filename: macon_tiles.shp

Number of Polys: 0

Intensity:

Tile Index Attribute: Not Specified

Data Filename: Not Specified

Number of Data Files Matching Attribute: Not Specified

DEM:

Tile Index Attribute: dem10_file

Data Filename: DEM10

Number of Data Files Matching Attribute: Not Specified

LAS:

Tile Index Attribute:

Data Filename:

Number of Data Files Matching Attribute: Not Specified



LiDAR Accuracy Assessment Summary

LC Type	# of Points	NVA	VVA	
DEM				
2B	24	0.727		
2H	39		1.501	
2L	22		0.572	
2M	24		1.196	
2U	44	0.692		
Total	153			

Units: US Survey Feet



DEM

Nonvegetated Vertical Accuracy

LandCover Type: 2B, 2U

Minimum DZ: -0.764

Maximum DZ: 0.646

Mean DZ: -0.201

Mean Magnitude DZ: 0.553

Number Observations: 68

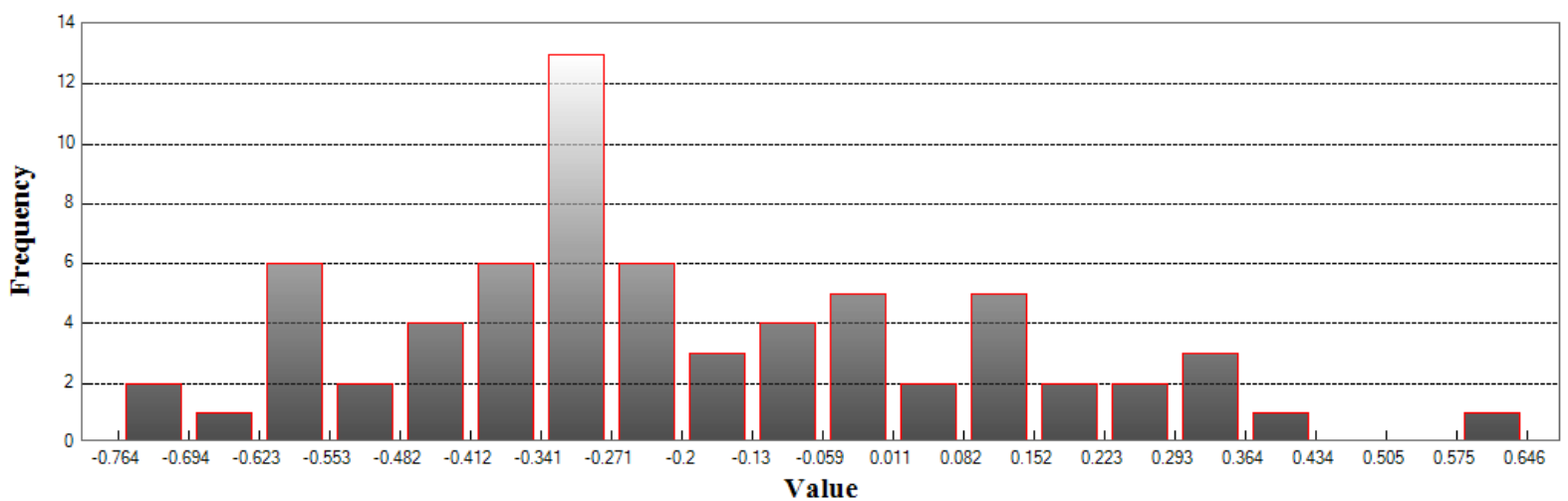
Standard Deviation DZ: 0.3

RMSE Z: 0.359

95% Confidence Level Z: 0.704

Units: US Survey Feet

Histogram



Min: -0.764

Max: 0.646

Number Of Bins: 20

Bin Interval: 0.071

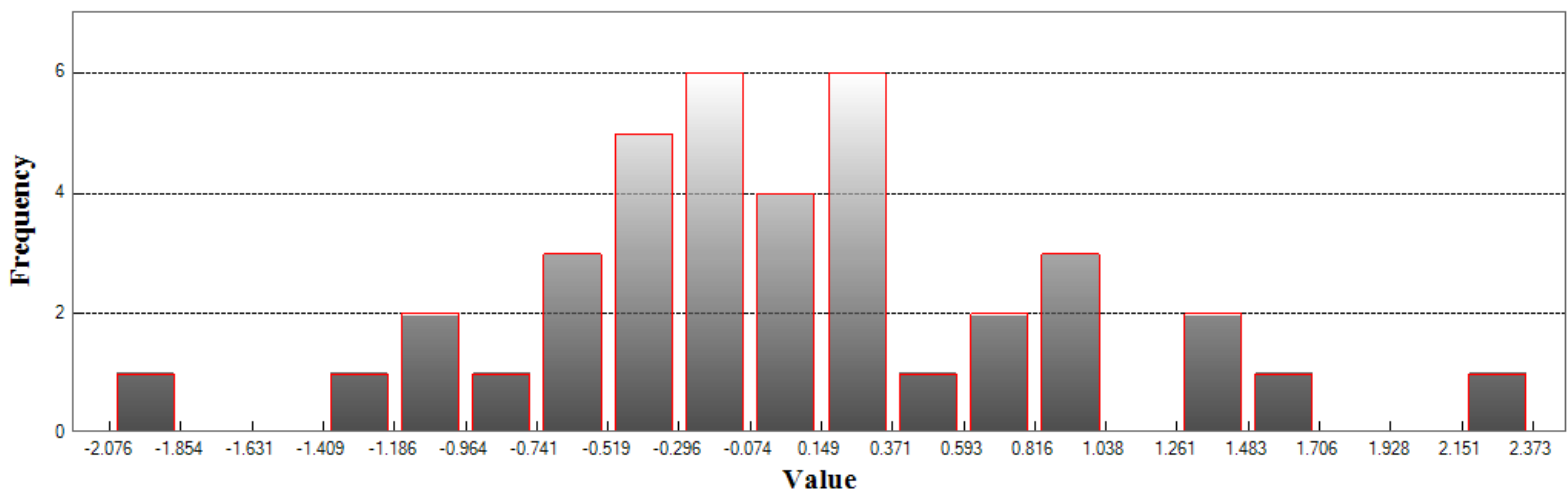


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2H
Minimum DZ: -2.076
Maximum DZ: 2.373
Mean DZ: 0.029
Mean Magnitude DZ: 0.791
Number Observations: 39
Standard Deviation DZ: 0.852
RMSE Z: 0.841
95th Percentile: 1.501
Units: US Survey Feet

Histogram



Min: -2.076

Max: 2.373

Number Of Bins: 20

Bin Interval: 0.222

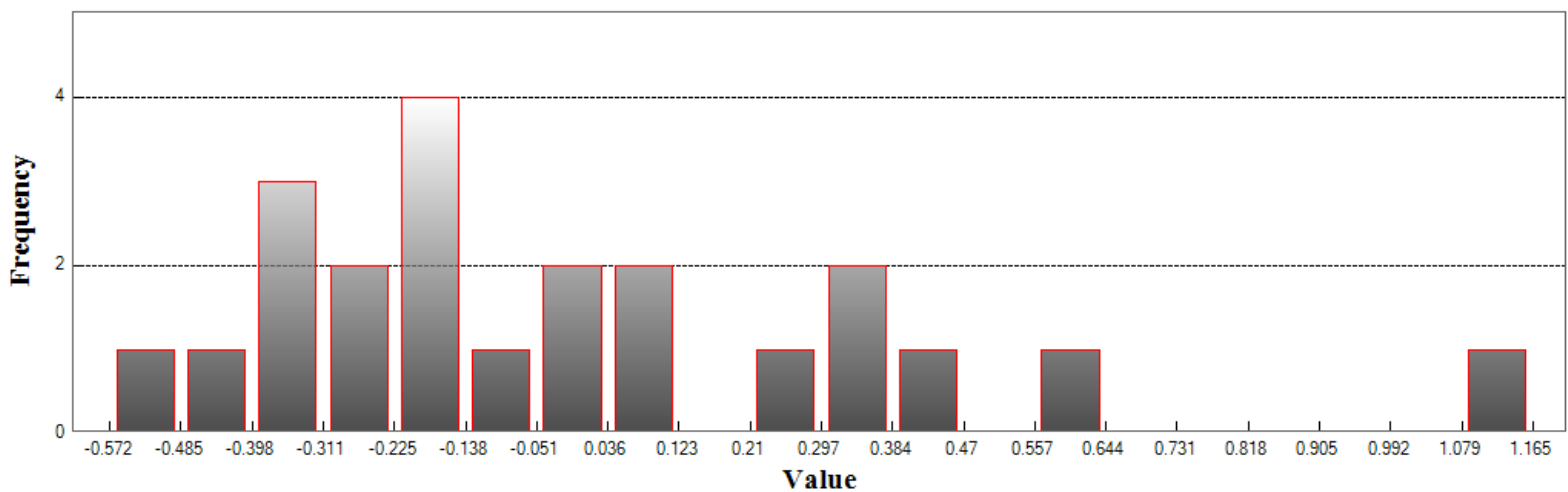


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2L
Minimum DZ: -0.572
Maximum DZ: 1.166
Mean DZ: 0
Mean Magnitude DZ: 0.544
Number Observations: 22
Standard Deviation DZ: 0.392
RMSE Z: 0.383
95th Percentile: 0.572
Units: US Survey Feet

Histogram



Min: -0.572

Max: 1.166

Number Of Bins: 20

Bin Interval: 0.087

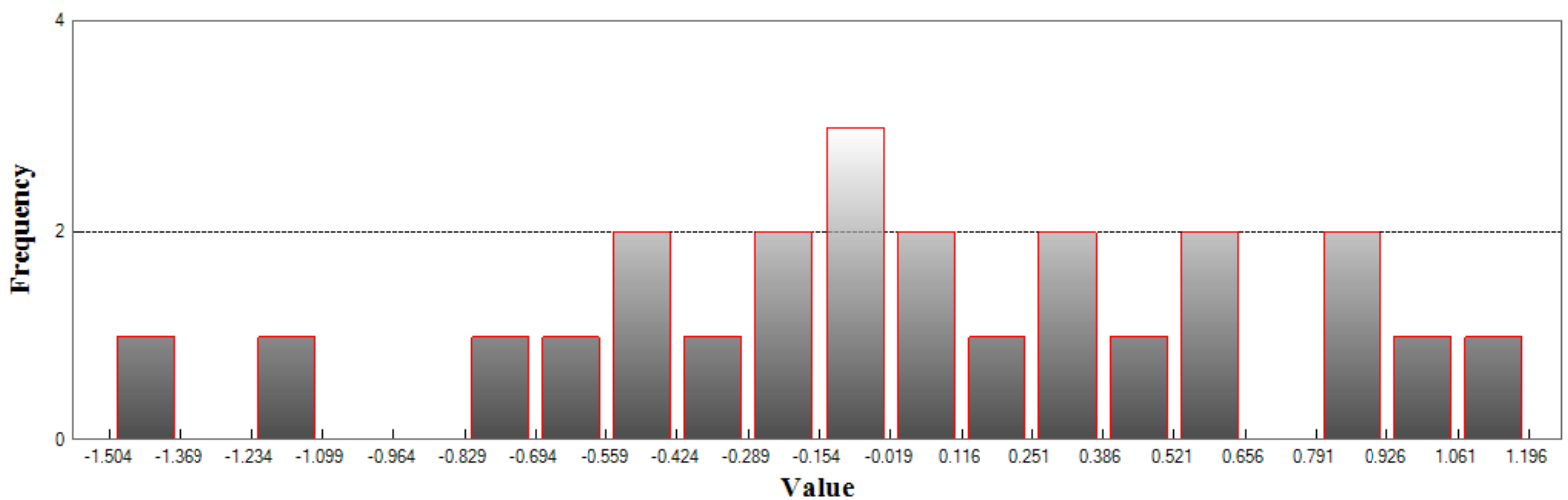


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2M
Minimum DZ: -1.503
Maximum DZ: 1.196
Mean DZ: 0.009
Mean Magnitude DZ: 0.726
Number Observations: 24
Standard Deviation DZ: 0.674
RMSE Z: 0.66
95th Percentile: 1.196
Units: US Survey Feet

Histogram



Min: -1.503
Max: 1.196
Number Of Bins: 20
Bin Interval: 0.135

NORTH CAROLINA GEODETIC SURVEY

Claude T Bowers Building
4105 Reedy Creek Road
Raleigh, North Carolina 27607
(919)733-3836



Project Information

Prepared By: Watson Ross
Project Name: 2018 Phase 5 LiDAR QC
Sensor Info: GmAPD Geiger-mode
Required Nominal Pulse Spacing: 0.35
Vendor Name: NA
Units: US Survey Feet
Percent of Extent Tolerance: Extents Not Checked
Date of Aquisition: Start: 8/17/2018 Finish: 8/17/2018

Metadata Information

Tile Index:

Filename: madison_tiles.shp

Number of Polys: 0

Intensity:

Tile Index Attribute: Not Specified

Data Filename: Not Specified

Number of Data Files Matching Attribute: Not Specified

DEM:

Tile Index Attribute: dem10_file

Data Filename: DEM10

Number of Data Files Matching Attribute: Not Specified

LAS:

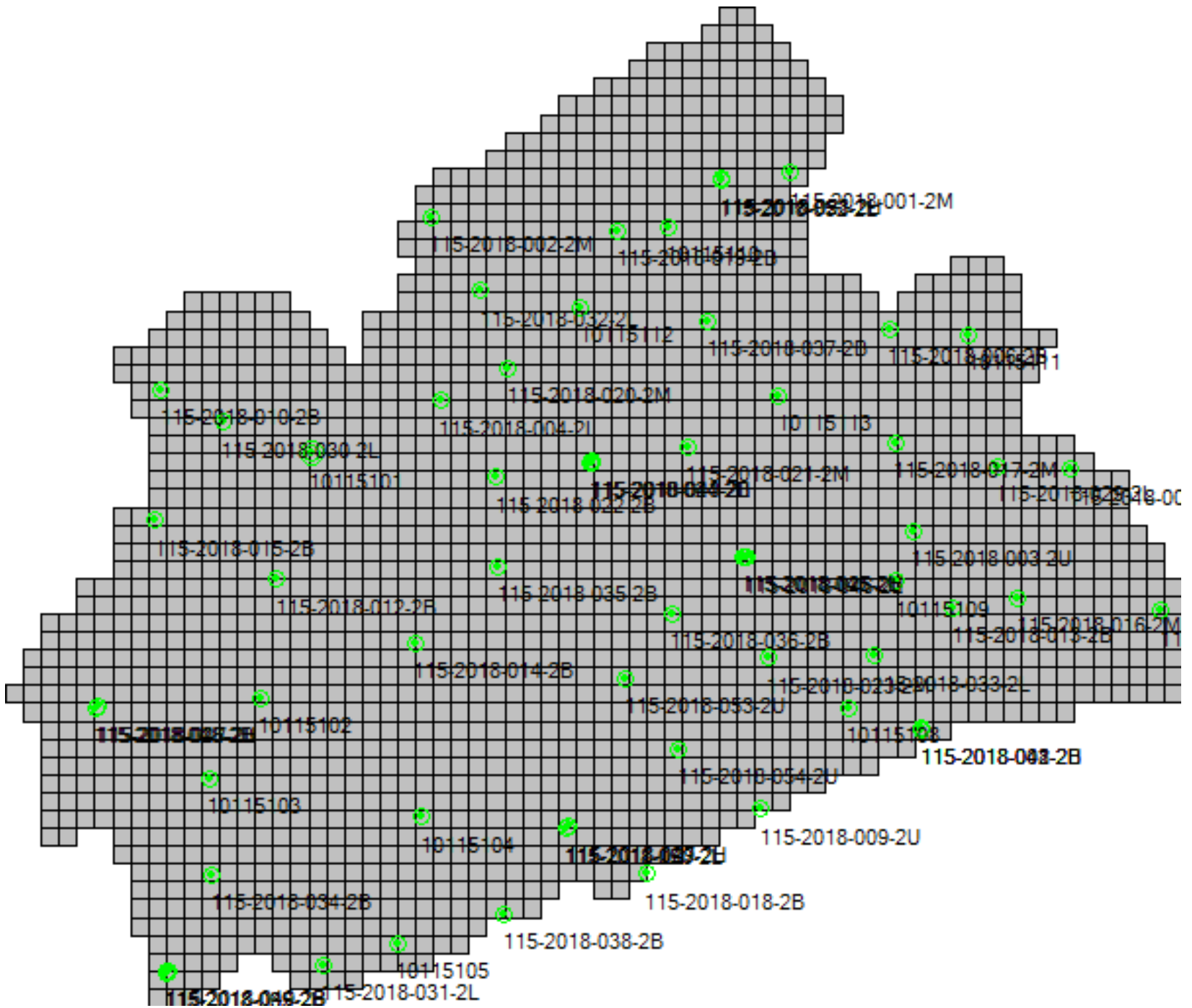
Tile Index Attribute: las_file

Data Filename:

Number of Data Files Matching Attribute: Not Specified



Tiled-Data Area





LiDAR Accuracy Assessment Summary

LC Type	# of Points	NVA	VVA	
DEM				
2B	19	0.875		
2H	7		4.198	
2L	17		0.490	
2M	7		1.492	
2U	15	0.637		
Total	65			

Units: US Survey Feet



DEM

Nonvegetated Vertical Accuracy

LandCover Type: 2B, 2U

Minimum DZ: -0.983

Maximum DZ: 1.09

Mean DZ: 0.003

Mean Magnitude DZ: 0.515

Number Observations: 34

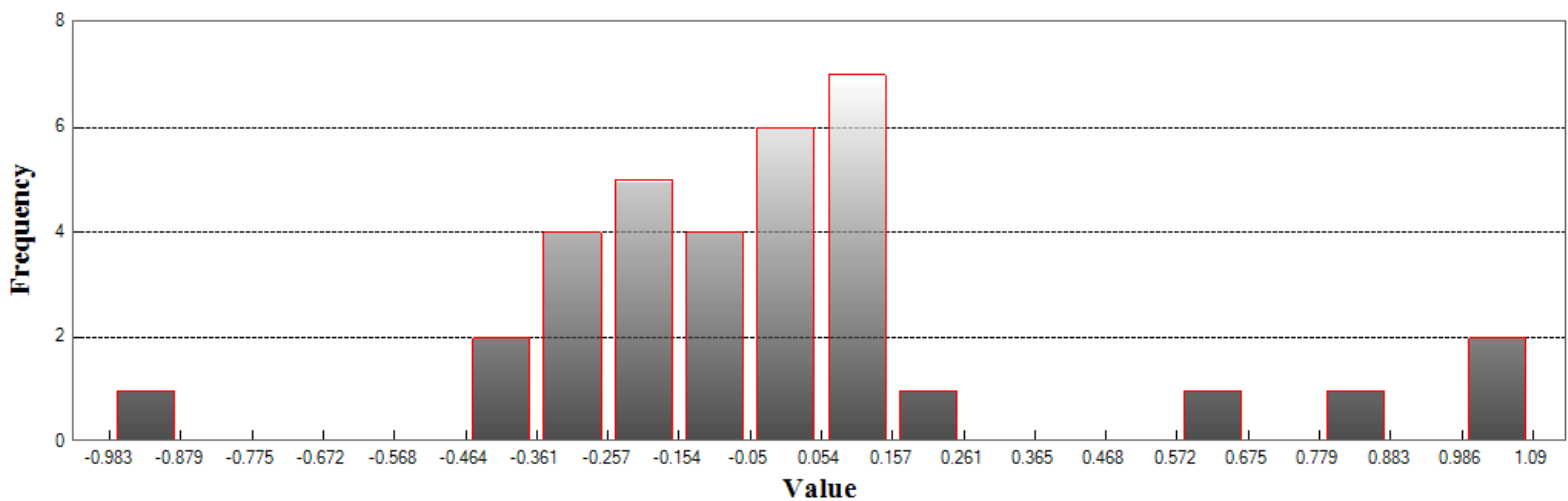
Standard Deviation DZ: 0.403

RMSE Z: 0.397

95% Confidence Level Z: 0.779

Units: US Survey Feet

Histogram



Min: -0.983

Max: 1.09

Number Of Bins: 20

Bin Interval: 0.104

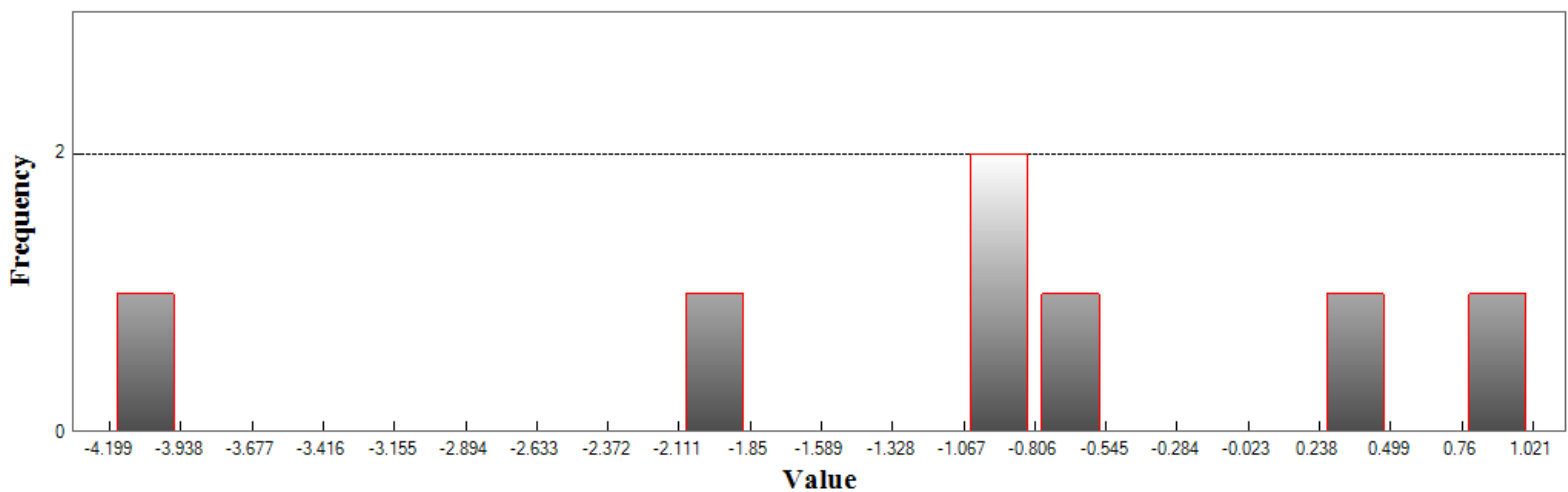


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2H
Minimum DZ: -4.198
Maximum DZ: 1.022
Mean DZ: -1.003
Mean Magnitude DZ: 1.179
Number Observations: 7
Standard Deviation DZ: 1.685
RMSE Z: 1.855
95th Percentile: 4.198
Units: US Survey Feet

Histogram



Min: -4.198

Max: 1.022

Number Of Bins: 20

Bin Interval: 0.261

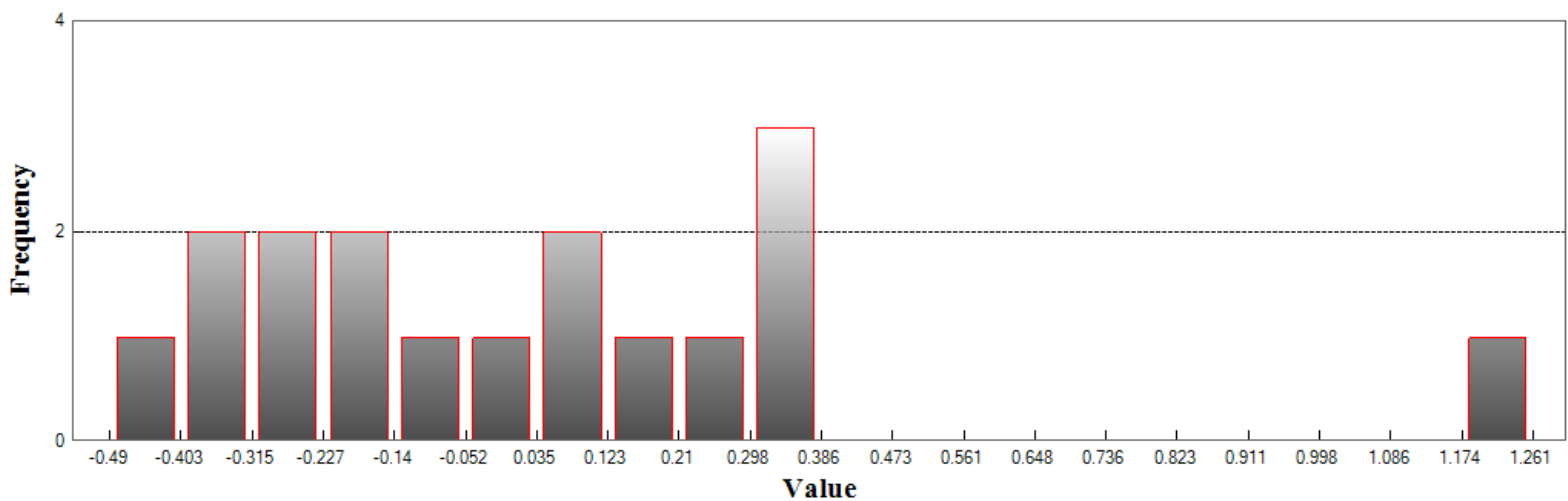


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2L
Minimum DZ: -0.49
Maximum DZ: 1.261
Mean DZ: 0.042
Mean Magnitude DZ: 0.552
Number Observations: 17
Standard Deviation DZ: 0.418
RMSE Z: 0.408
95th Percentile: 0.49
Units: US Survey Feet

Histogram



Min: -0.49

Max: 1.261

Number Of Bins: 20

Bin Interval: 0.088

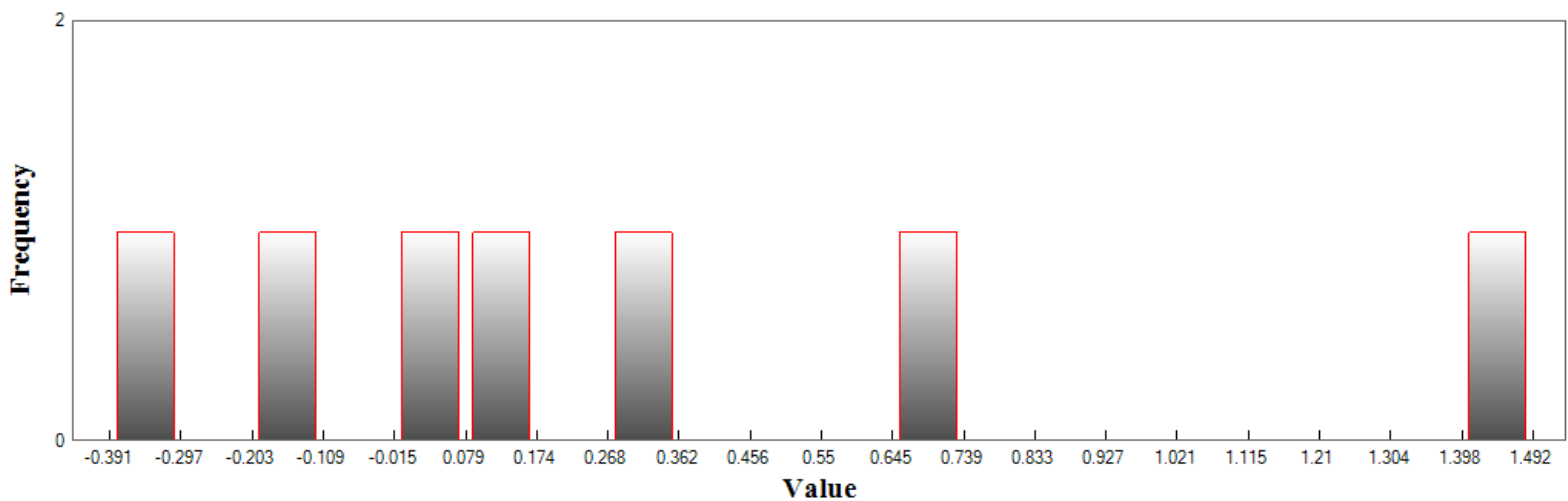


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2M
Minimum DZ: -0.391
Maximum DZ: 1.492
Mean DZ: 0.282
Mean Magnitude DZ: 0.663
Number Observations: 7
Standard Deviation DZ: 0.627
RMSE Z: 0.645
95th Percentile: 1.492
Units: US Survey Feet

Histogram



Min: -0.391

Max: 1.492

Number Of Bins: 20

Bin Interval: 0.094

NORTH CAROLINA GEODETIC SURVEY

Claude T Bowers Building
4105 Reedy Creek Road
Raleigh, North Carolina 27607
(919)733-3836



Project Information

Prepared By: Watson Ross
Project Name: 2018 Phase 5 LiDAR QC
Sensor Info: GmAPD Geiger-mode
Required Nominal Pulse Spacing: 0.35
Vendor Name: NA
Units: US Survey Feet
Percent of Extent Tolerance: Extents Not Checked
Date of Aquisition: Start: 8/17/2018 Finish: 8/17/2018

Metadata Information

Tile Index:

Filename: mcdowell_tiles.shp

Number of Polys: 0

Intensity:

Tile Index Attribute: Not Specified

Data Filename: Not Specified

Number of Data Files Matching Attribute: Not Specified

DEM:

Tile Index Attribute: dem10_file

Data Filename: DEM10

Number of Data Files Matching Attribute: Not Specified

LAS:

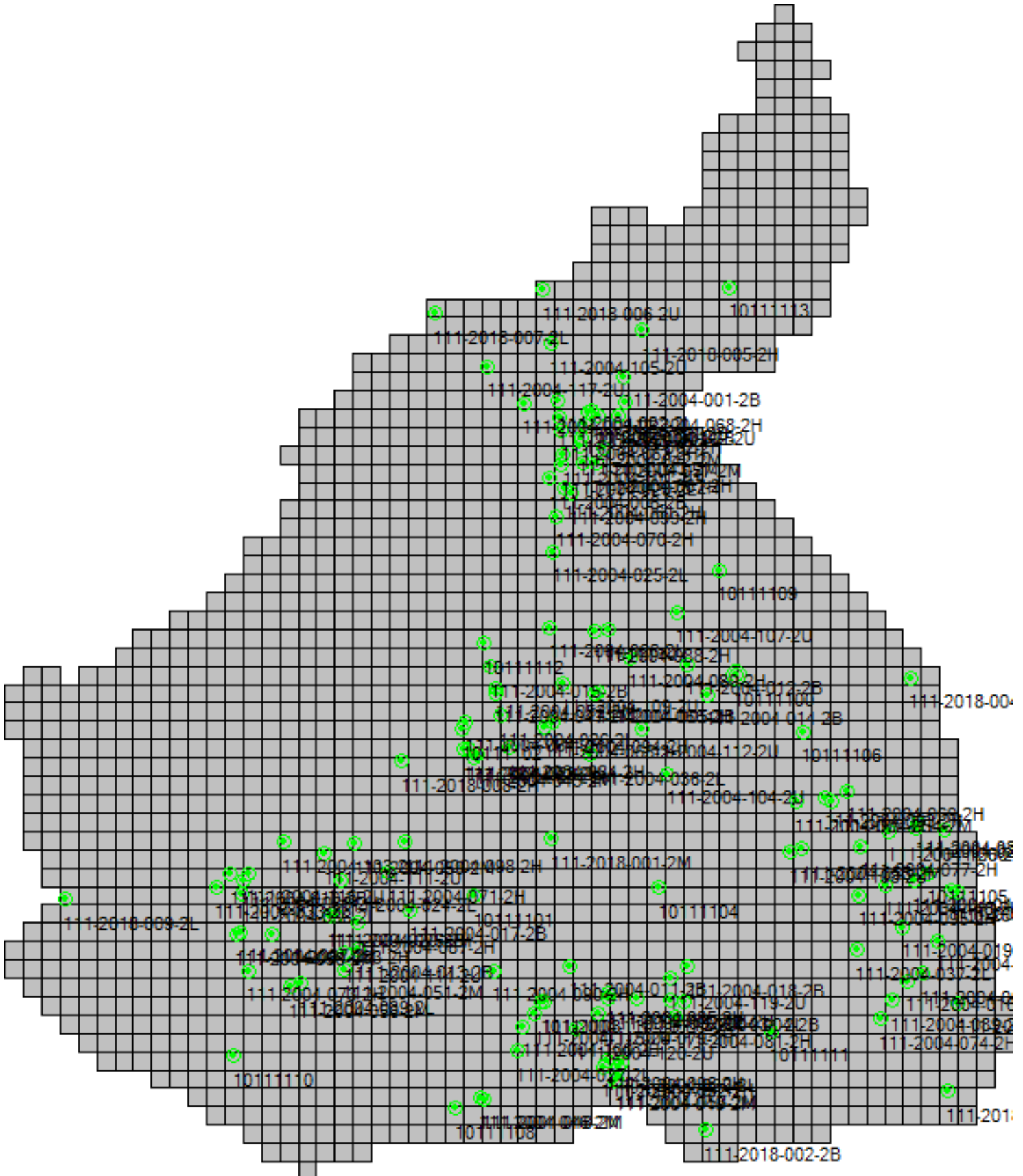
Tile Index Attribute:

Data Filename:

Number of Data Files Matching Attribute: Not Specified



Tiled-Data Area





LiDAR Accuracy Assessment Summary

LC Type	# of Points	NVA	VVA
DEM			
2B	23	0.741	
2H	42		1.468
2L	22		0.670
2M	22		0.656
2U	35	0.354	
Total	144		

Units: US Survey Feet



DEM

Nonvegetated Vertical Accuracy

LandCover Type: 2B, 2U

Minimum DZ: -0.583

Maximum DZ: 0.962

Mean DZ: 0.053

Mean Magnitude DZ: 0.443

Number Observations: 58

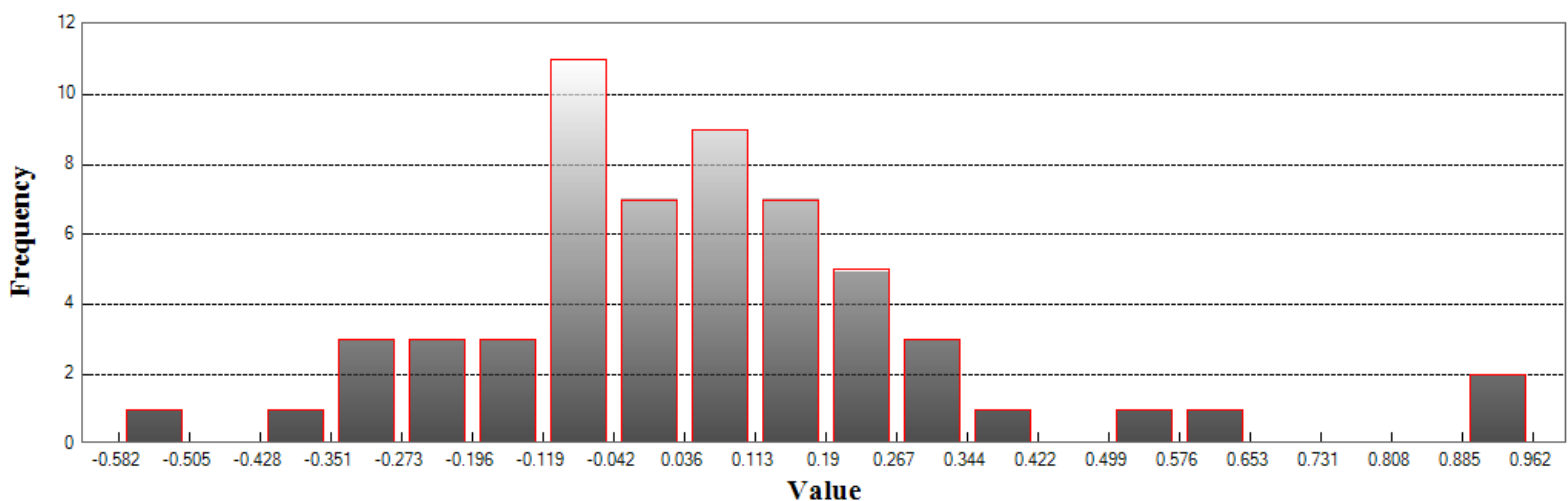
Standard Deviation DZ: 0.274

RMSE Z: 0.276

95% Confidence Level Z: 0.542

Units: US Survey Feet

Histogram



Min: -0.583

Max: 0.962

Number Of Bins: 20

Bin Interval: 0.077

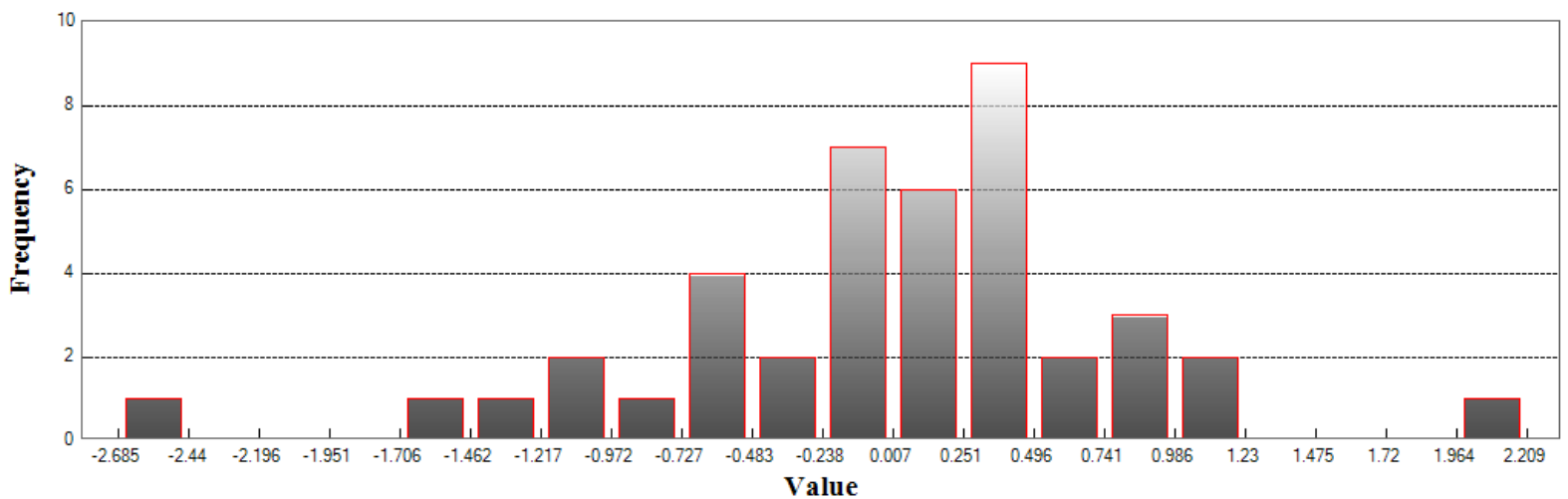


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2H
Minimum DZ: -2.685
Maximum DZ: 2.209
Mean DZ: -0.004
Mean Magnitude DZ: 0.767
Number Observations: 42
Standard Deviation DZ: 0.823
RMSE Z: 0.813
95th Percentile: 1.468
Units: US Survey Feet

Histogram



Min: -2.685

Max: 2.209

Number Of Bins: 20

Bin Interval: 0.245

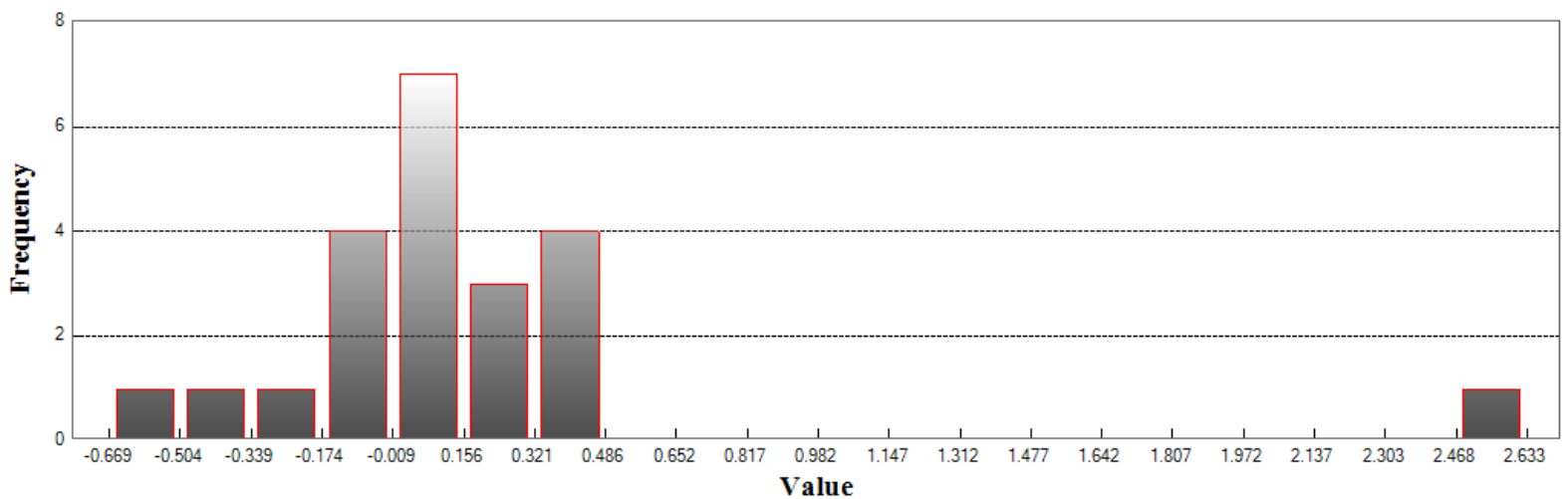


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2L
Minimum DZ: -0.67
Maximum DZ: 2.632
Mean DZ: 0.175
Mean Magnitude DZ: 0.559
Number Observations: 22
Standard Deviation DZ: 0.61
RMSE Z: 0.621
95th Percentile: 0.67
Units: US Survey Feet

Histogram



Min: -0.67

Max: 2.632

Number Of Bins: 20

Bin Interval: 0.165

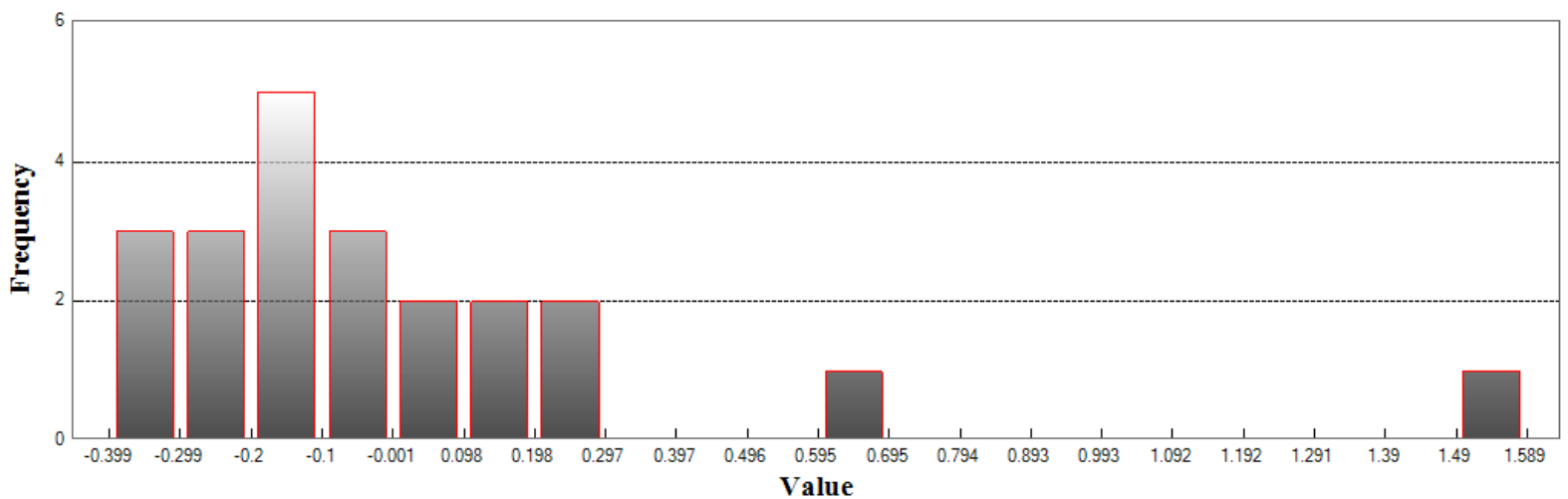


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2M
Minimum DZ: -0.399
Maximum DZ: 1.589
Mean DZ: 0.026
Mean Magnitude DZ: 0.511
Number Observations: 22
Standard Deviation DZ: 0.424
RMSE Z: 0.415
95th Percentile: 0.656
Units: US Survey Feet

Histogram



Min: -0.399

Max: 1.589

Number Of Bins: 20

Bin Interval: 0.099

NORTH CAROLINA GEODETIC SURVEY

Claude T Bowers Building
4105 Reedy Creek Road
Raleigh, North Carolina 27607
(919)733-3836



Project Information

Prepared By: Watson Ross
Project Name: 2018 Phase 5 LiDAR QC
Sensor Info: GmAPD Geiger-mode
Required Nominal Pulse Spacing: 0.35
Vendor Name: NA
Units: US Survey Feet
Percent of Extent Tolerance: Extents Not Checked
Date of Aquisition: Start: 8/17/2018 Finish: 8/17/2018

Metadata Information

Tile Index:

Filename: mitchell_tiles.shp

Number of Polys: 0

Intensity:

Tile Index Attribute: Not Specified

Data Filename: Not Specified

Number of Data Files Matching Attribute: Not Specified

DEM:

Tile Index Attribute: dem10_file

Data Filename: DEM10

Number of Data Files Matching Attribute: Not Specified

LAS:

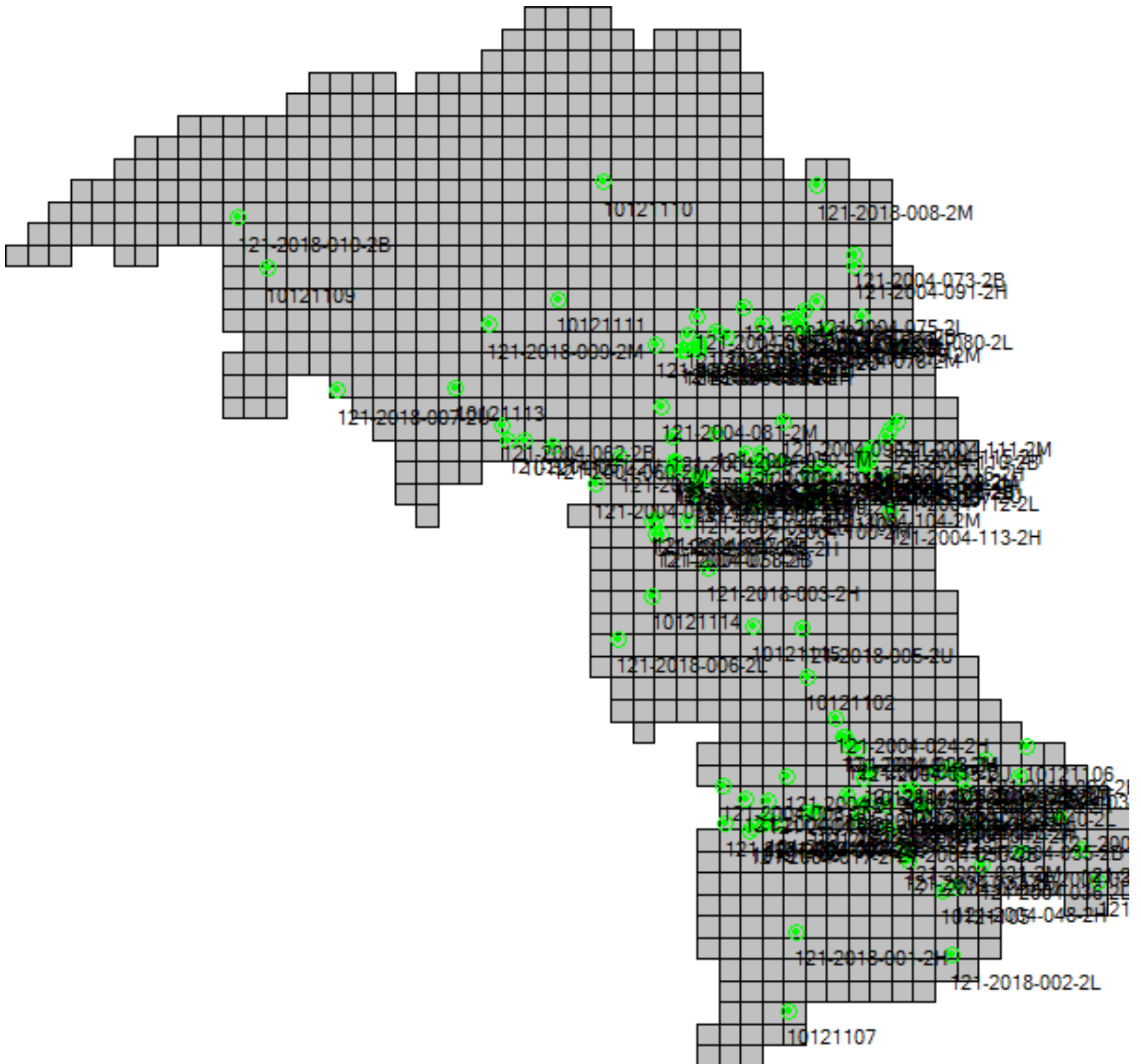
Tile Index Attribute: las_file

Data Filename:

Number of Data Files Matching Attribute: Not Specified



Tiled-Data Area





LiDAR Accuracy Assessment Summary

LC Type	# of Points	NVA	VVA	
DEM				
2B	21	0.714		
2H	42		1.696	
2L	20		0.860	
2M	21		2.463	
2U	39	0.709		
Total	143			

Units: US Survey Feet



DEM

Nonvegetated Vertical Accuracy

LandCover Type: 2B, 2U

Minimum DZ: -0.947

Maximum DZ: 0.887

Mean DZ: 0.019

Mean Magnitude DZ: 0.531

Number Observations: 60

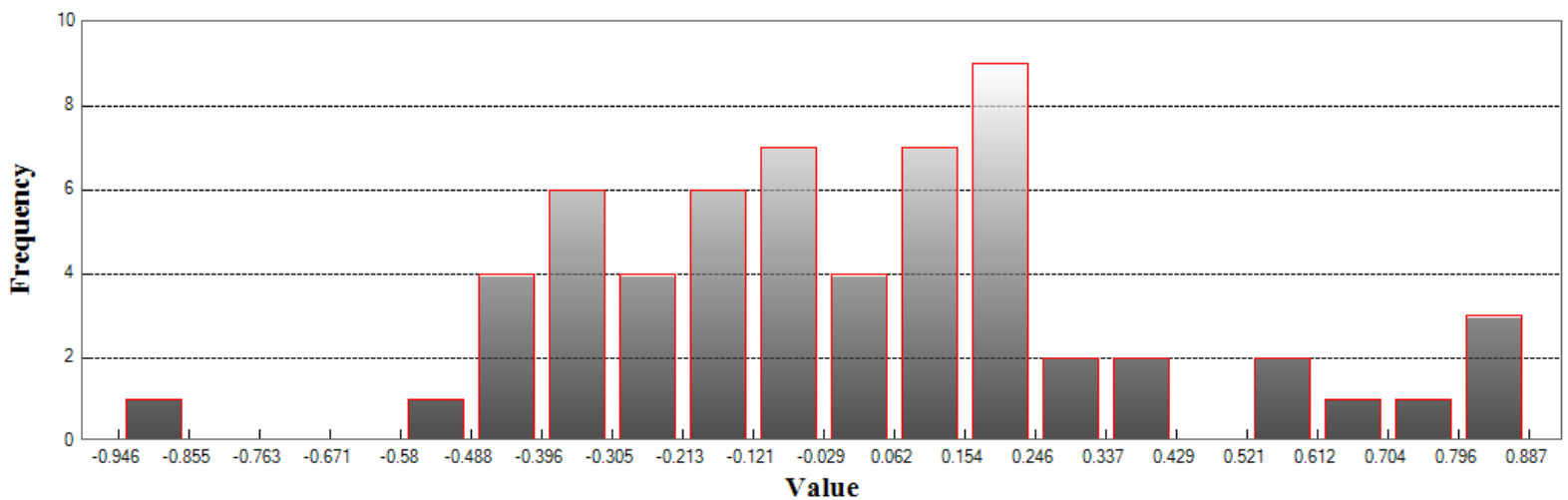
Standard Deviation DZ: 0.365

RMSE Z: 0.363

95% Confidence Level Z: 0.711

Units: US Survey Feet

Histogram



Min: -0.947

Max: 0.887

Number Of Bins: 20

Bin Interval: 0.092

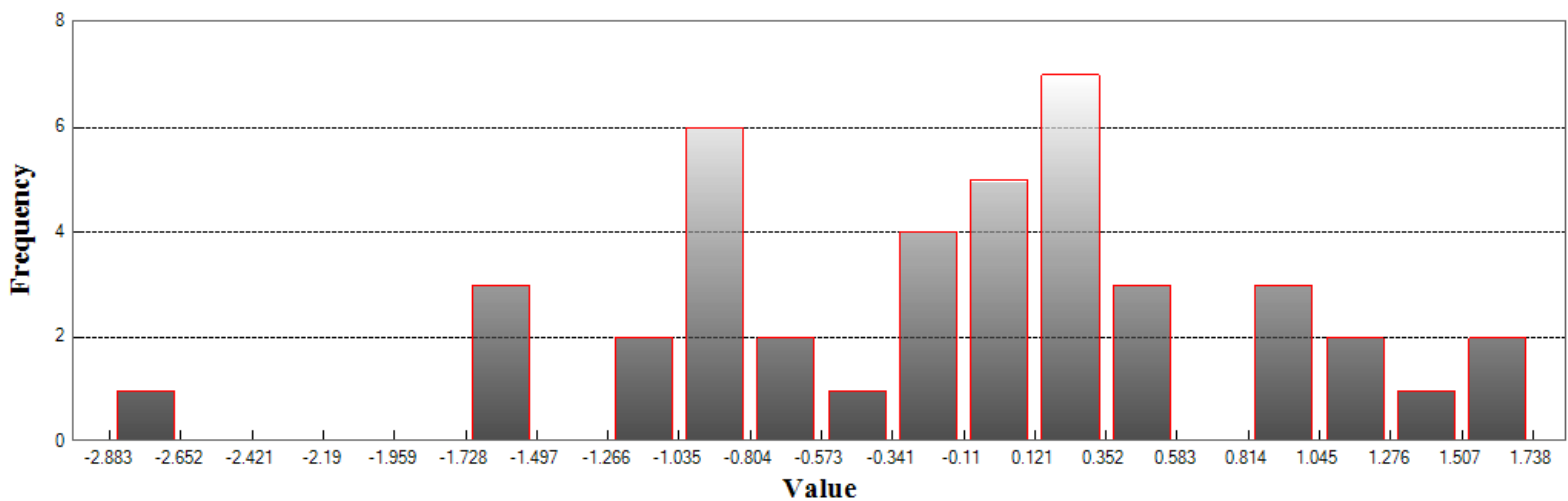


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2H
Minimum DZ: -2.884
Maximum DZ: 1.738
Mean DZ: -0.126
Mean Magnitude DZ: 0.862
Number Observations: 42
Standard Deviation DZ: 0.962
RMSE Z: 0.959
95th Percentile: 1.696
Units: US Survey Feet

Histogram



Min: -2.884

Max: 1.738

Number Of Bins: 20

Bin Interval: 0.231

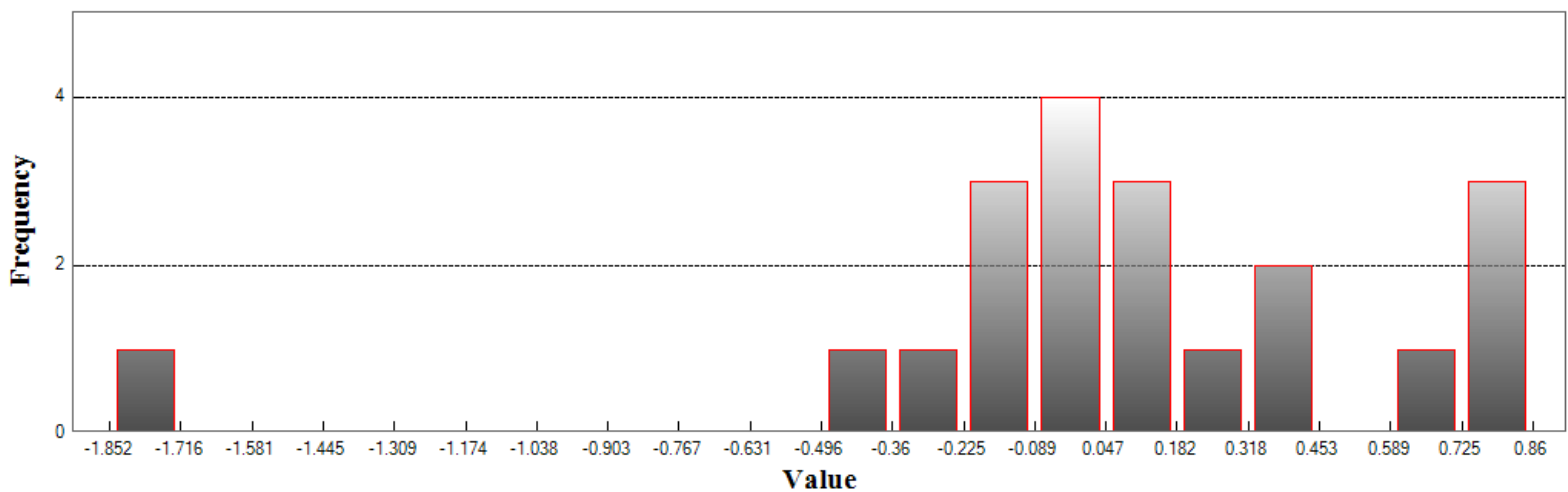


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2L
Minimum DZ: -1.852
Maximum DZ: 0.86
Mean DZ: 0.067
Mean Magnitude DZ: 0.617
Number Observations: 20
Standard Deviation DZ: 0.587
RMSE Z: 0.576
95th Percentile: 0.86
Units: US Survey Feet

Histogram



Min: -1.852

Max: 0.86

Number Of Bins: 20

Bin Interval: 0.136

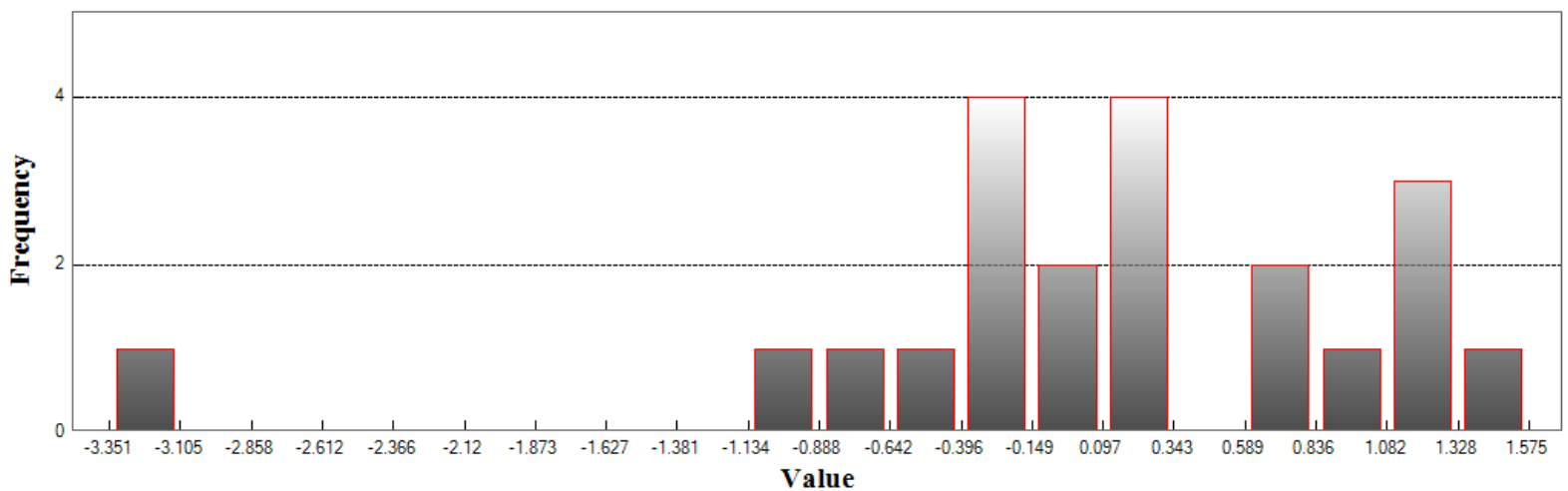


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2M
Minimum DZ: -3.351
Maximum DZ: 1.575
Mean DZ: 0.076
Mean Magnitude DZ: 0.853
Number Observations: 21
Standard Deviation DZ: 1.051
RMSE Z: 1.028
95th Percentile: 2.463
Units: US Survey Feet

Histogram



Min: -3.351

Max: 1.575

Number Of Bins: 20

Bin Interval: 0.246

NORTH CAROLINA GEODETIC SURVEY

Claude T Bowers Building
4105 Reedy Creek Road
Raleigh, North Carolina 27607
(919)733-3836



Project Information

Prepared By: Watson Ross
Project Name: 2018 Phase 5 LiDAR QC
Sensor Info: GmAPD Geiger-mode
Required Nominal Pulse Spacing: 0.35
Vendor Name: NA
Units: US Survey Feet
Percent of Extent Tolerance: Extents Not Checked
Date of Aquisition: Start: 8/17/2018 Finish: 8/17/2018

Metadata Information

Tile Index:

Filename: polk_tiles.shp

Number of Polys: 0

Intensity:

Tile Index Attribute: Not Specified

Data Filename: Not Specified

Number of Data Files Matching Attribute: Not Specified

DEM:

Tile Index Attribute: dem10_file

Data Filename: DEM10

Number of Data Files Matching Attribute: Not Specified

LAS:

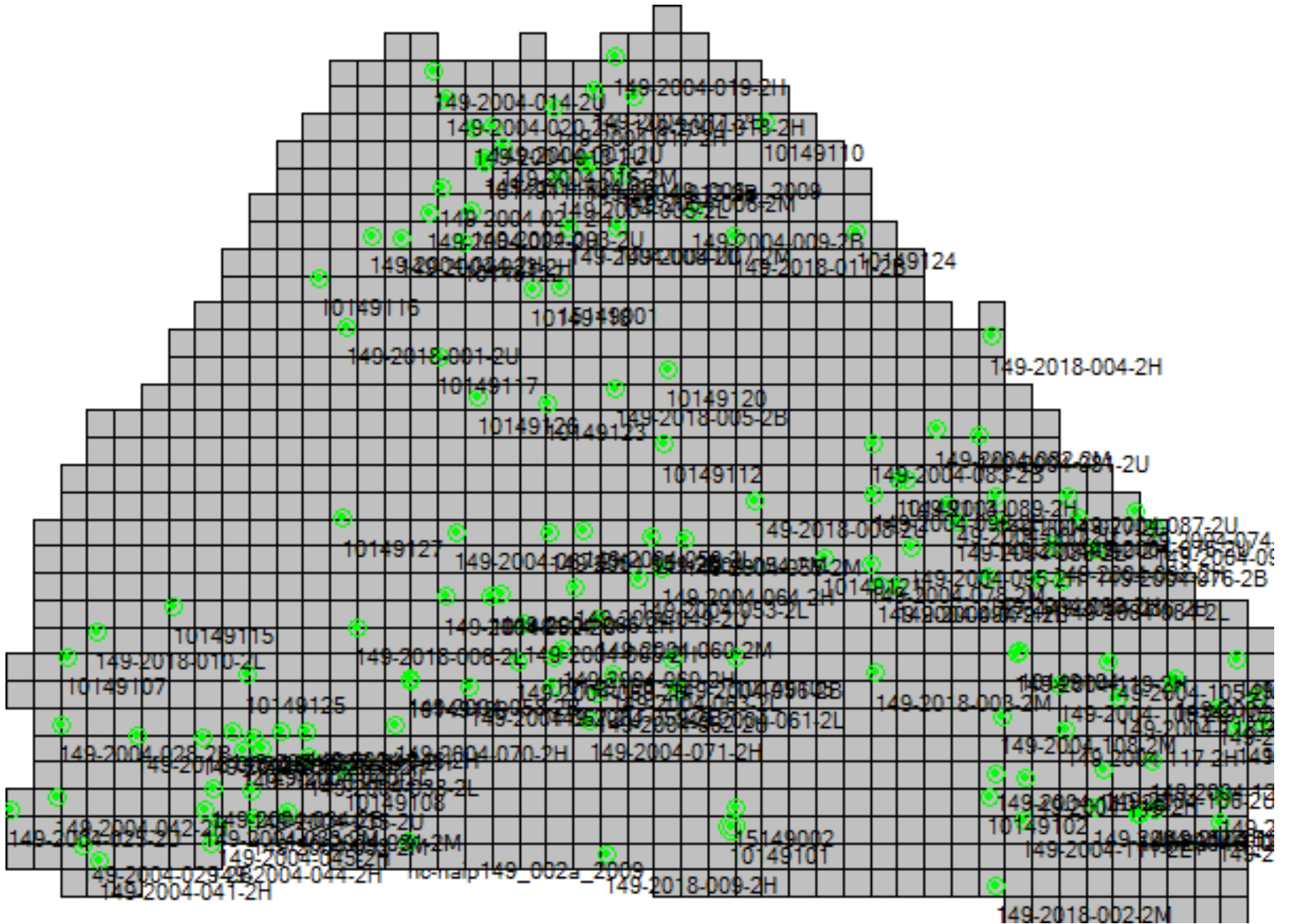
Tile Index Attribute:

Data Filename:

Number of Data Files Matching Attribute: Not Specified



Tiled-Data Area





LiDAR Accuracy Assessment Summary

LC Type	# of Points	NVA	VVA
DEM			
2B	20	0.763	
2H	40		0.900
2L	18		0.951
2M	19		1.166
2U	53	0.565	
Total	150		

Units: US Survey Feet

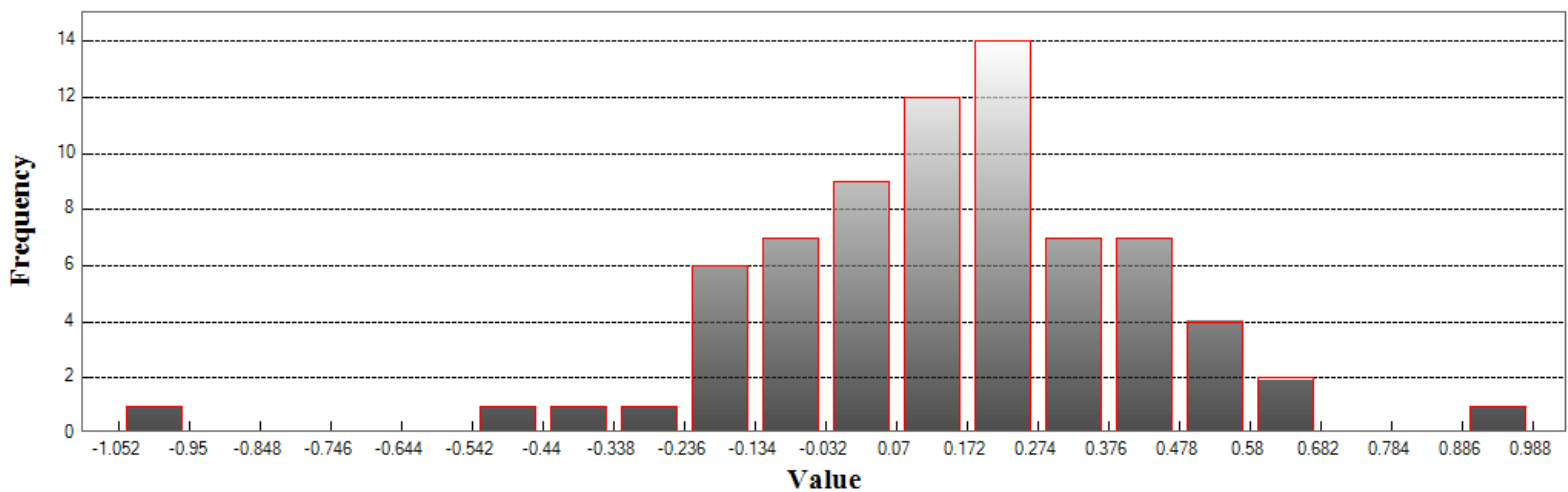


DEM

Nonvegetated Vertical Accuracy

LandCover Type: 2B, 2U
Minimum DZ: -1.052
Maximum DZ: 0.988
Mean DZ: 0.147
Mean Magnitude DZ: 0.5
Number Observations: 73
Standard Deviation DZ: 0.285
RMSE Z: 0.319
95% Confidence Level Z: 0.626
Units: US Survey Feet

Histogram



Min: -1.052
Max: 0.988
Number Of Bins: 20
Bin Interval: 0.102

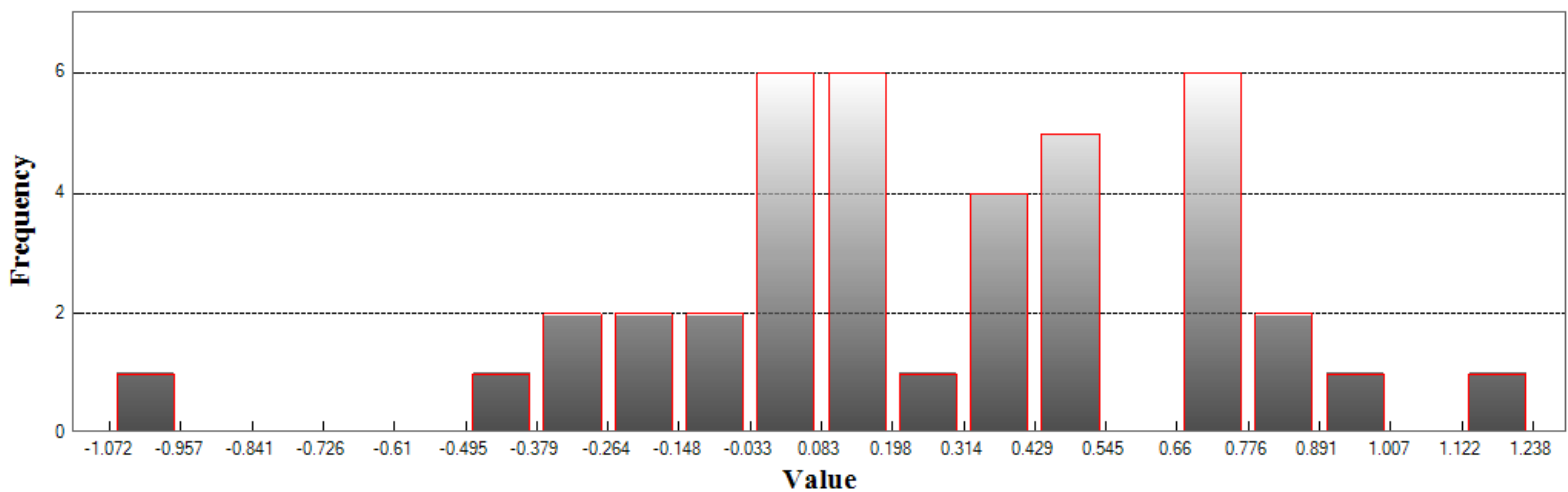


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2H
Minimum DZ: -1.073
Maximum DZ: 1.237
Mean DZ: 0.258
Mean Magnitude DZ: 0.637
Number Observations: 40
Standard Deviation DZ: 0.448
RMSE Z: 0.512
95th Percentile: 0.9
Units: US Survey Feet

Histogram



Min: -1.073

Max: 1.237

Number Of Bins: 20

Bin Interval: 0.115

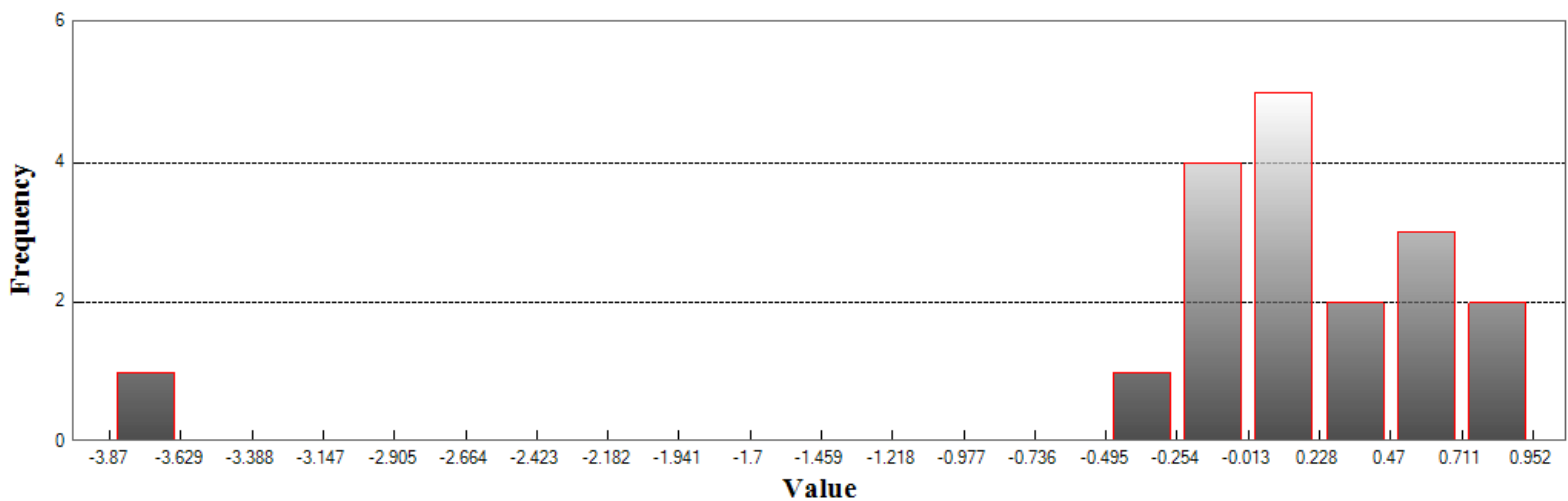


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2L
Minimum DZ: -3.87
Maximum DZ: 0.951
Mean DZ: 0.017
Mean Magnitude DZ: 0.713
Number Observations: 18
Standard Deviation DZ: 1.03
RMSE Z: 1.001
95th Percentile: 0.951
Units: US Survey Feet

Histogram



Min: -3.87

Max: 0.951

Number Of Bins: 20

Bin Interval: 0.241

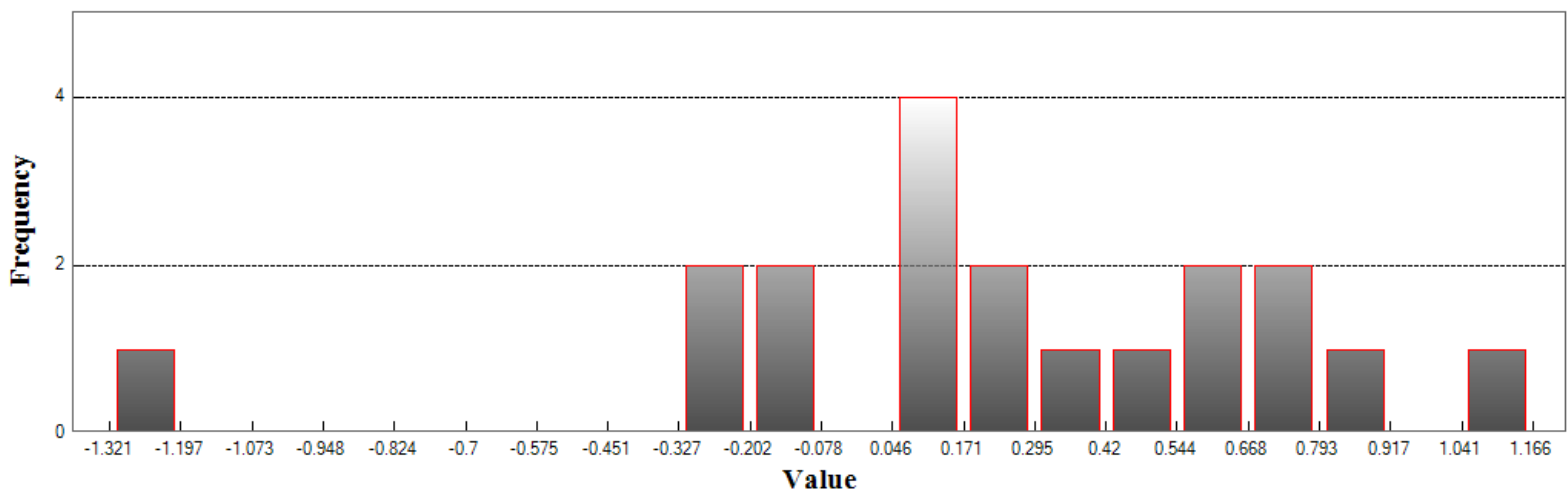


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2M
Minimum DZ: -1.321
Maximum DZ: 1.166
Mean DZ: 0.224
Mean Magnitude DZ: 0.663
Number Observations: 19
Standard Deviation DZ: 0.547
RMSE Z: 0.577
95th Percentile: 1.166
Units: US Survey Feet

Histogram



Min: -1.321

Max: 1.166

Number Of Bins: 20

Bin Interval: 0.124

NORTH CAROLINA GEODETIC SURVEY

Claude T Bowers Building
4105 Reedy Creek Road
Raleigh, North Carolina 27607
(919)733-3836



Project Information

Prepared By: Watson Ross
Project Name: 2018 Phase 5 LiDAR QC
Sensor Info: GmAPD Geiger-mode
Required Nominal Pulse Spacing: 0.35
Vendor Name: NA
Units: US Survey Feet
Percent of Extent Tolerance: Extents Not Checked
Date of Aquisition: Start: 8/17/2018 Finish: 8/17/2018

Metadata Information

Tile Index:

Filename: rutherford_tiles.shp

Number of Polys: 0

Intensity:

Tile Index Attribute: Not Specified

Data Filename: Not Specified

Number of Data Files Matching Attribute: Not Specified

DEM:

Tile Index Attribute: dem10_file

Data Filename: DEM10

Number of Data Files Matching Attribute: Not Specified

LAS:

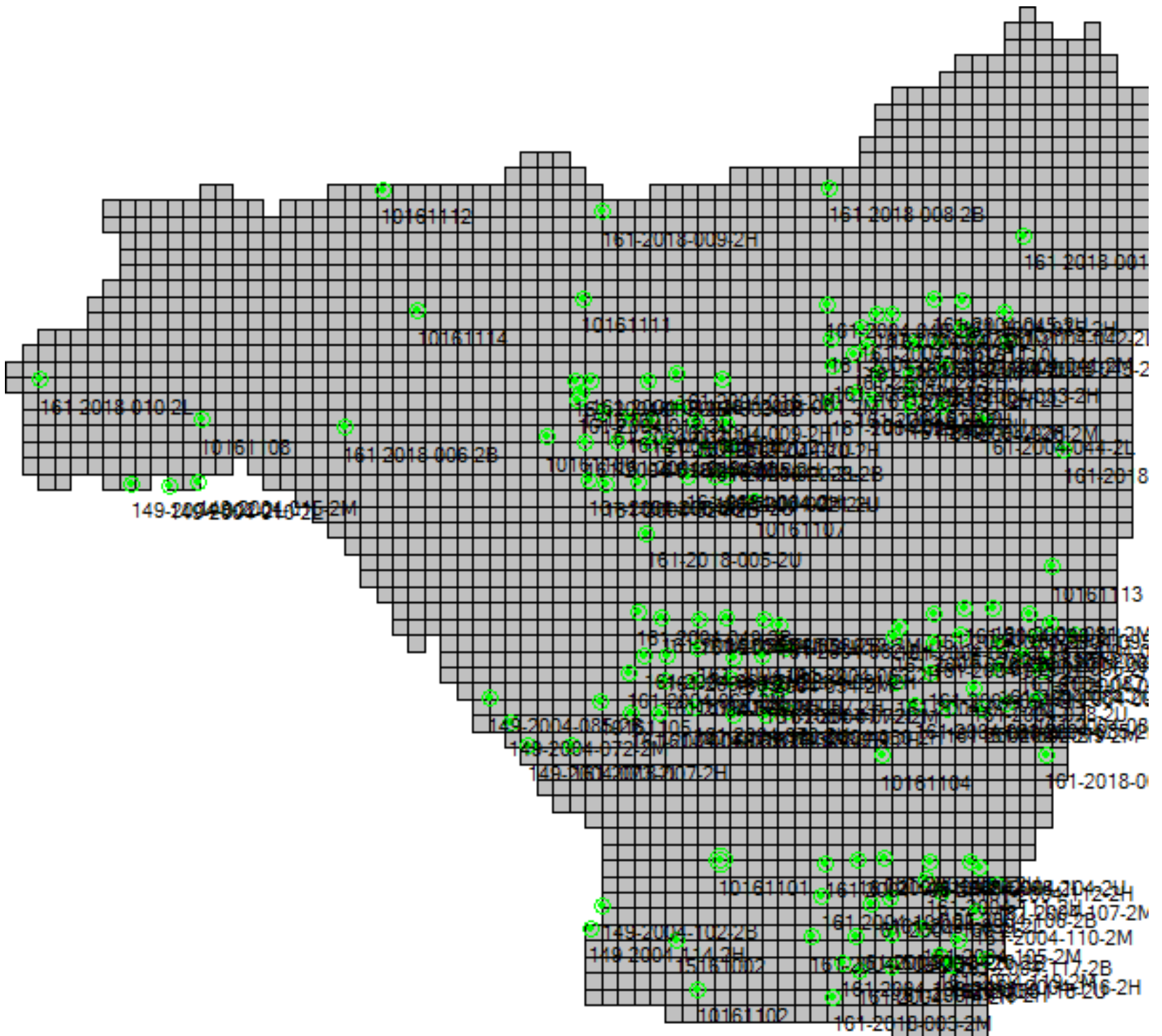
Tile Index Attribute:

Data Filename:

Number of Data Files Matching Attribute: Not Specified



Tiled-Data Area





LiDAR Accuracy Assessment Summary

LC Type	# of Points	NVA	VVA	
DEM				
2B	24	0.692		
2H	43		0.982	
2L	25		0.934	
2M	24		1.354	
2U	38	0.633		
Total	154			

Units: US Survey Feet



DEM

Nonvegetated Vertical Accuracy

LandCover Type: 2B, 2U

Minimum DZ: -0.763

Maximum DZ: 0.852

Mean DZ: 0.186

Mean Magnitude DZ: 0.53

Number Observations: 62

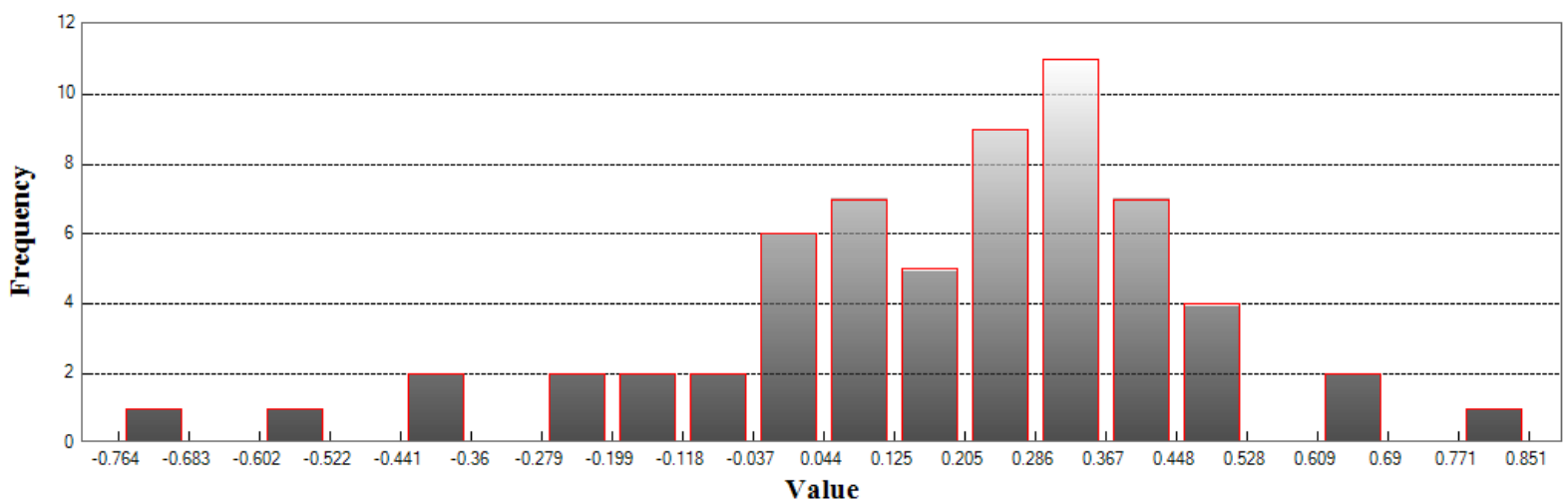
Standard Deviation DZ: 0.281

RMSE Z: 0.335

95% Confidence Level Z: 0.657

Units: US Survey Feet

Histogram



Min: -0.763

Max: 0.852

Number Of Bins: 20

Bin Interval: 0.081

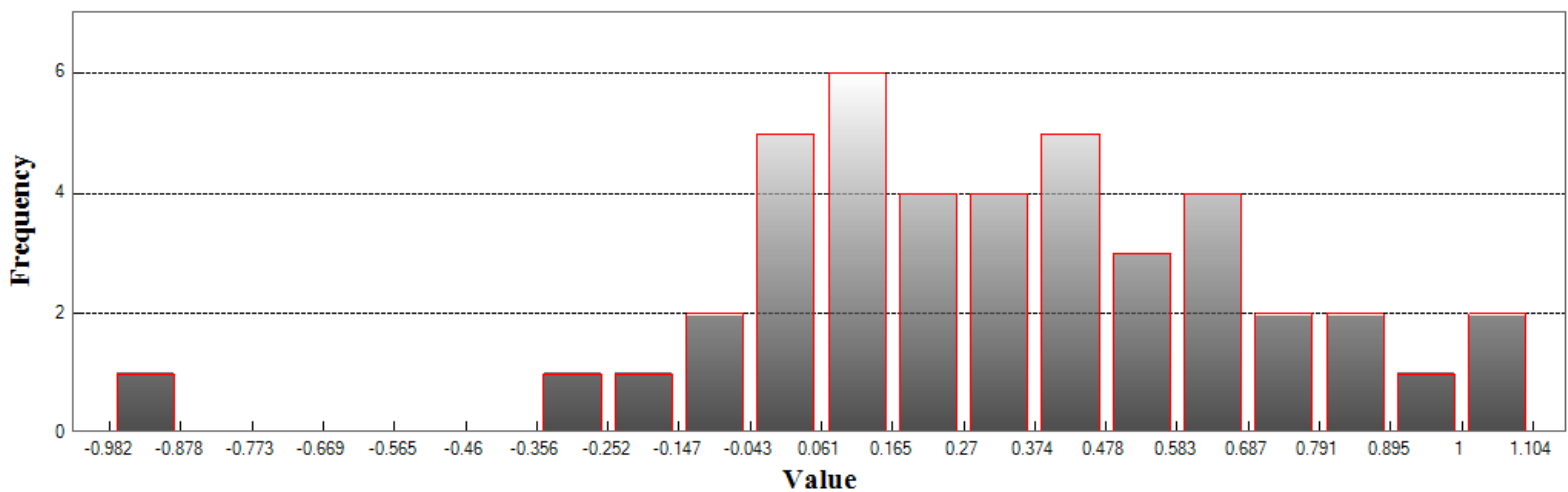


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2H
Minimum DZ: -0.982
Maximum DZ: 1.104
Mean DZ: 0.32
Mean Magnitude DZ: 0.631
Number Observations: 43
Standard Deviation DZ: 0.391
RMSE Z: 0.502
95th Percentile: 0.982
Units: US Survey Feet

Histogram



Min: -0.982
Max: 1.104
Number Of Bins: 20
Bin Interval: 0.104

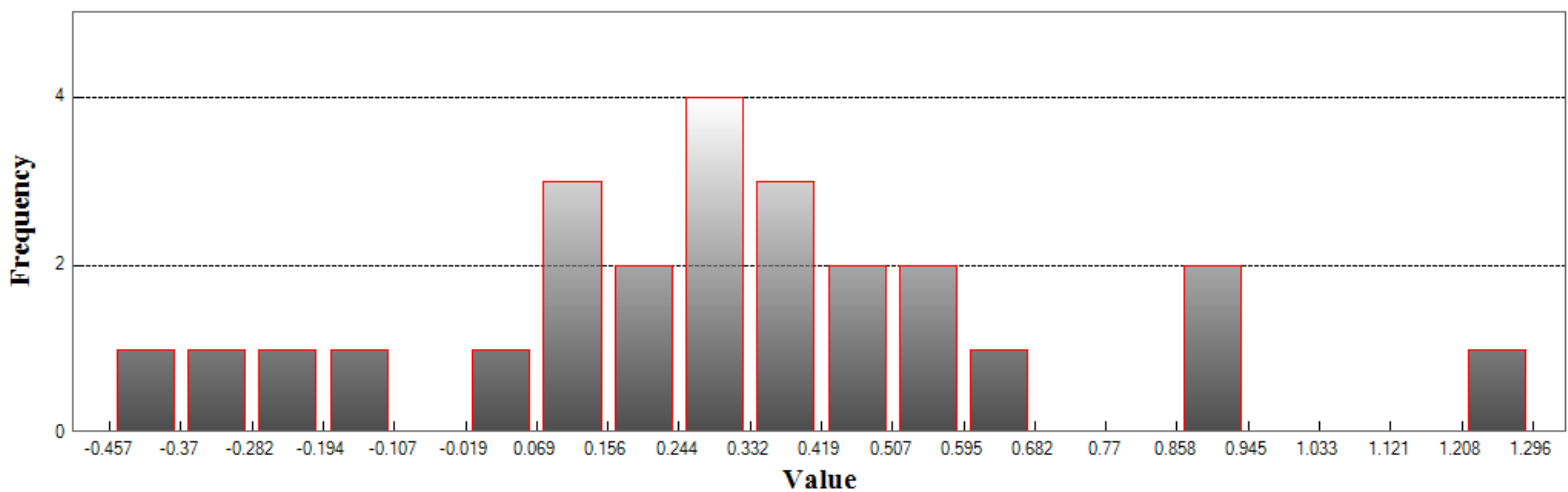


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2L
Minimum DZ: -0.457
Maximum DZ: 1.296
Mean DZ: 0.303
Mean Magnitude DZ: 0.634
Number Observations: 25
Standard Deviation DZ: 0.397
RMSE Z: 0.494
95th Percentile: 0.934
Units: US Survey Feet

Histogram



Min: -0.457

Max: 1.296

Number Of Bins: 20

Bin Interval: 0.088

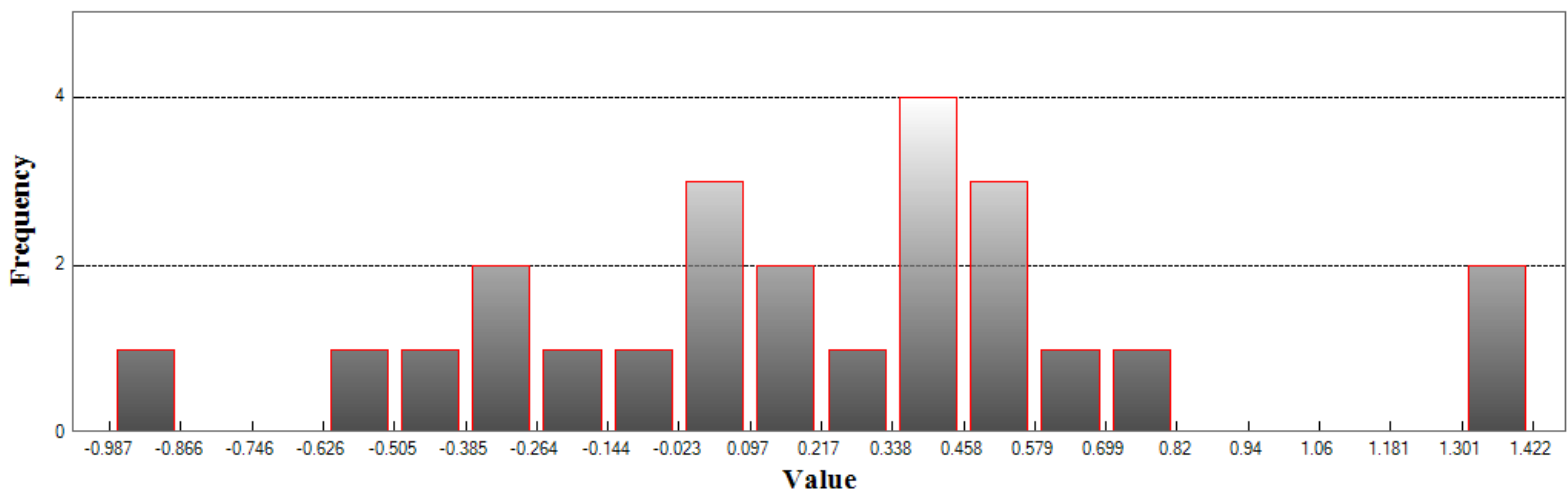


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2M
Minimum DZ: -0.987
Maximum DZ: 1.422
Mean DZ: 0.216
Mean Magnitude DZ: 0.675
Number Observations: 24
Standard Deviation DZ: 0.551
RMSE Z: 0.581
95th Percentile: 1.354
Units: US Survey Feet

Histogram



Min: -0.987

Max: 1.422

Number Of Bins: 20

Bin Interval: 0.12

NORTH CAROLINA GEODETIC SURVEY

Claude T Bowers Building
4105 Reedy Creek Road
Raleigh, North Carolina 27607
(919)733-3836



Project Information

Prepared By: Watson Ross
Project Name: 2018 Phase 5 LiDAR QC
Sensor Info: GmAPD Geiger-mode
Required Nominal Pulse Spacing: 0.35
Vendor Name: NA
Units: US Survey Feet
Percent of Extent Tolerance: Extents Not Checked
Date of Aquisition: Start: 8/17/2018 Finish: 8/17/2018

Metadata Information

Tile Index:

Filename: swain_tiles.shp
Number of Polys: 0

Intensity:

Tile Index Attribute: Not Specified
Data Filename: Not Specified
Number of Data Files Matching Attribute: Not Specified

DEM:

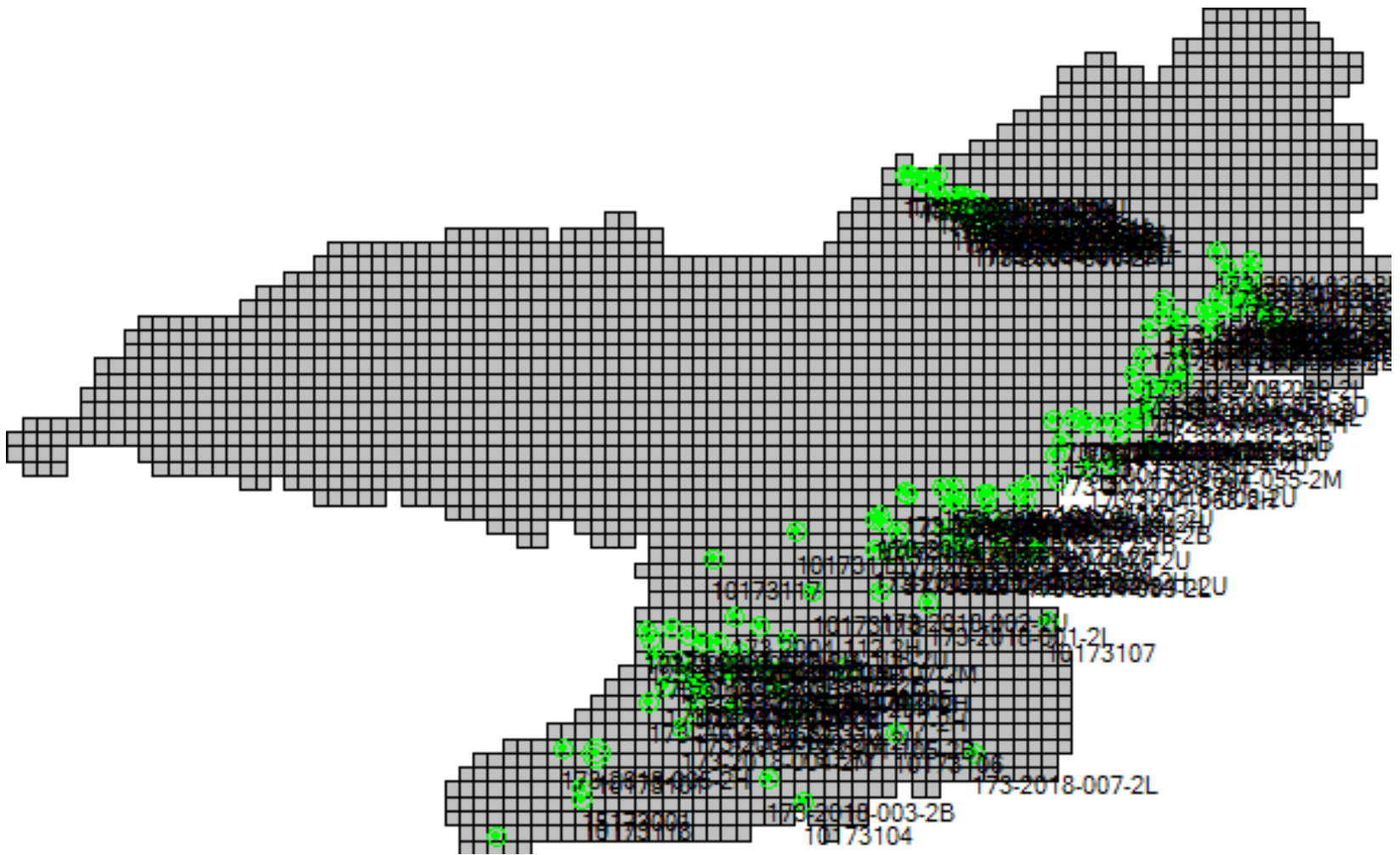
Tile Index Attribute: dem10_file
Data Filename: DEM10
Number of Data Files Matching Attribute: Not Specified

LAS:

Tile Index Attribute:
Data Filename:
Number of Data Files Matching Attribute: Not Specified



Tiled-Data Area





LiDAR Accuracy Assessment Summary

LC Type	# of Points	NVA	VVA
DEM			
2B	22	0.523	
2H	42		1.583
2L	22		0.586
2M	20		1.518
2U	43	0.642	
Total	149		

Units: US Survey Feet



DEM

Nonvegetated Vertical Accuracy

LandCover Type: 2B, 2U

Minimum DZ: -0.688

Maximum DZ: 0.828

Mean DZ: -0.011

Mean Magnitude DZ: 0.495

Number Observations: 65

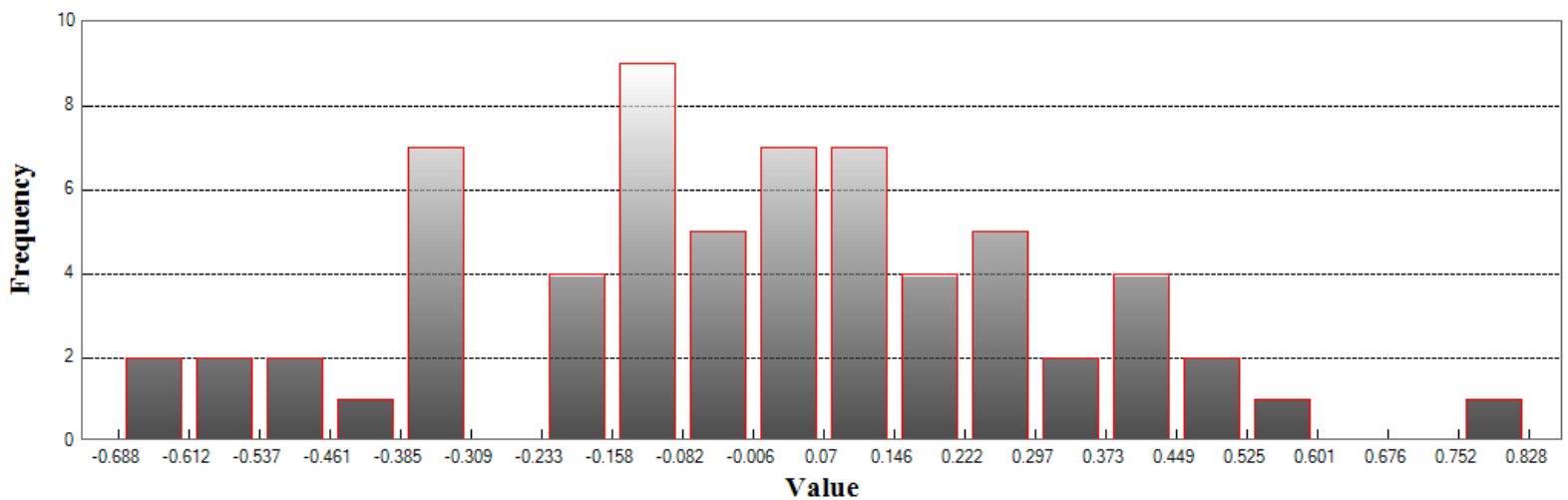
Standard Deviation DZ: 0.31

RMSE Z: 0.308

95% Confidence Level Z: 0.604

Units: US Survey Feet

Histogram



Min: -0.688

Max: 0.828

Number Of Bins: 20

Bin Interval: 0.076

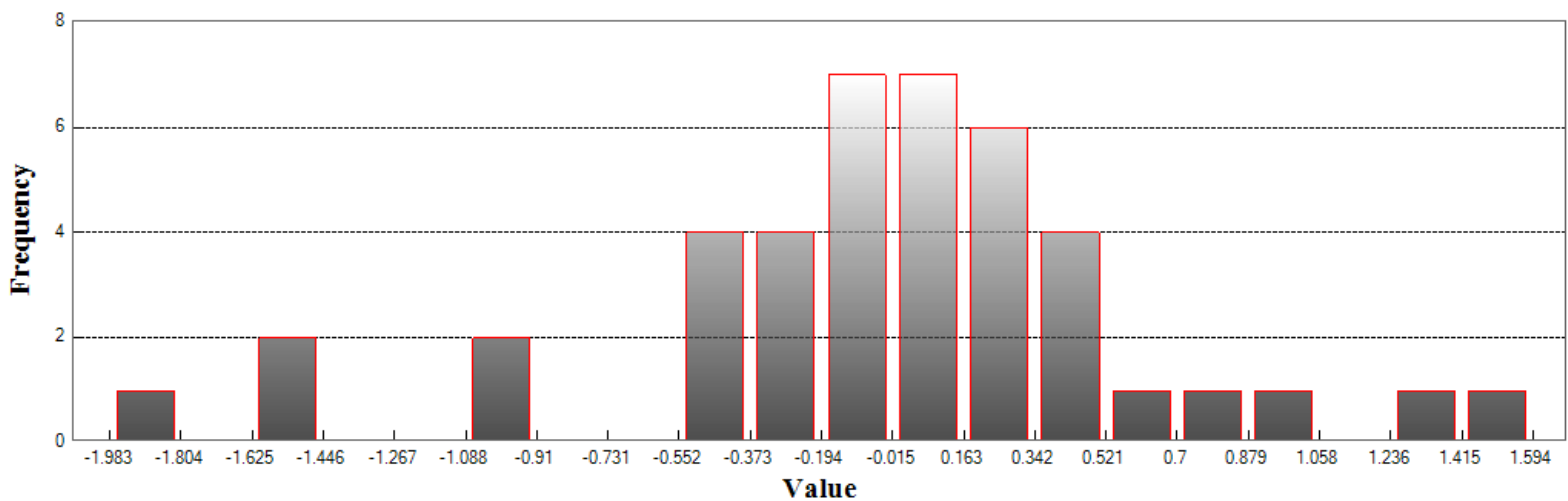


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2H
Minimum DZ: -1.982
Maximum DZ: 1.595
Mean DZ: -0.022
Mean Magnitude DZ: 0.692
Number Observations: 42
Standard Deviation DZ: 0.688
RMSE Z: 0.68
95th Percentile: 1.583
Units: US Survey Feet

Histogram



Min: -1.982
Max: 1.595
Number Of Bins: 20
Bin Interval: 0.179

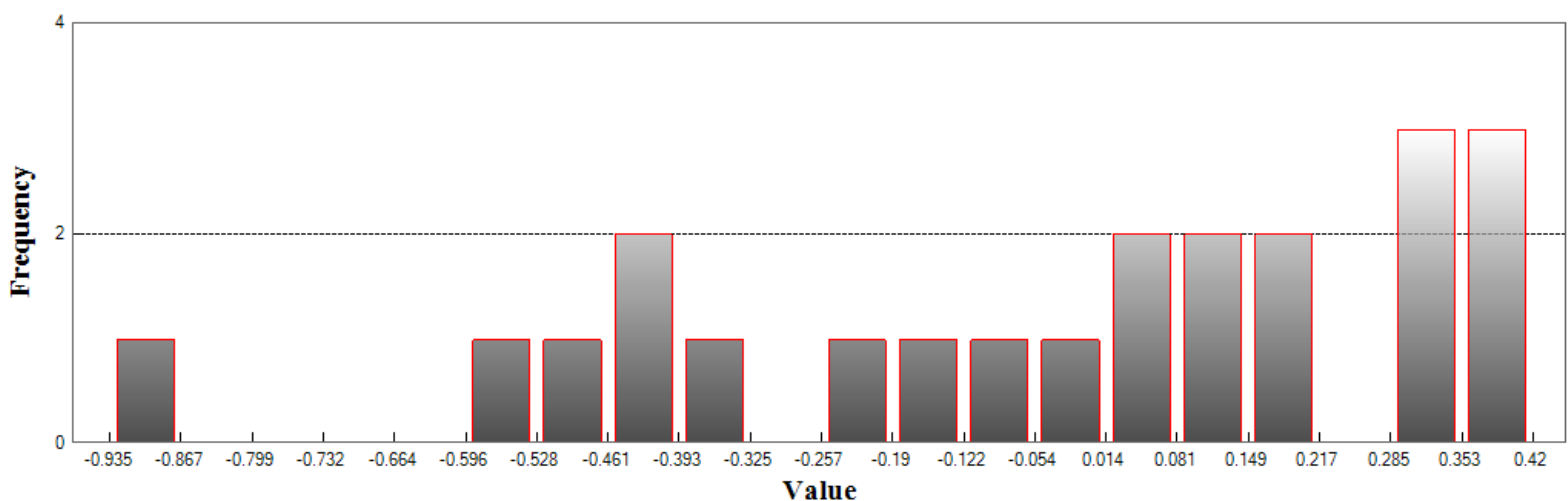


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2L
Minimum DZ: -0.935
Maximum DZ: 0.42
Mean DZ: -0.044
Mean Magnitude DZ: 0.547
Number Observations: 22
Standard Deviation DZ: 0.371
RMSE Z: 0.365
95th Percentile: 0.586
Units: US Survey Feet

Histogram



Min: -0.935

Max: 0.42

Number Of Bins: 20

Bin Interval: 0.068

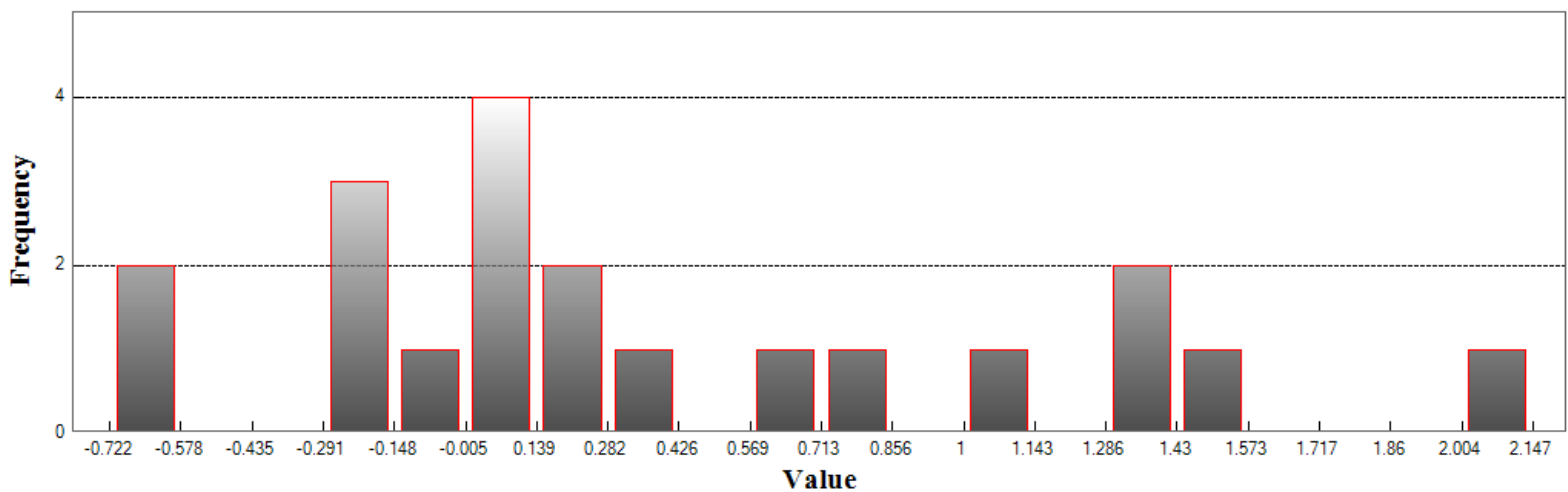


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2M
Minimum DZ: -0.722
Maximum DZ: 2.147
Mean DZ: 0.389
Mean Magnitude DZ: 0.775
Number Observations: 20
Standard Deviation DZ: 0.762
RMSE Z: 0.839
95th Percentile: 1.518
Units: US Survey Feet

Histogram



Min: -0.722

Max: 2.147

Number Of Bins: 20

Bin Interval: 0.143

NORTH CAROLINA GEODETIC SURVEY

Claude T Bowers Building
4105 Reedy Creek Road
Raleigh, North Carolina 27607
(919)733-3836



Project Information

Prepared By: Watson Ross
Project Name: 2018 Phase 5 LiDAR QC
Sensor Info: GmAPD Geiger-mode
Required Nominal Pulse Spacing: 0.35
Vendor Name: NA
Units: US Survey Feet
Percent of Extent Tolerance: Extents Not Checked
Date of Aquisition: Start: 8/17/2018 Finish: 8/17/2018

Metadata Information

Tile Index:

Filename: transylvania_tiles.shp

Number of Polys: 0

Intensity:

Tile Index Attribute: Not Specified

Data Filename: Not Specified

Number of Data Files Matching Attribute: Not Specified

DEM:

Tile Index Attribute: dem10_file

Data Filename: DEM10

Number of Data Files Matching Attribute: Not Specified

LAS:

Tile Index Attribute:

Data Filename:

Number of Data Files Matching Attribute: Not Specified



LiDAR Accuracy Assessment Summary

LC Type	# of Points	NVA	VVA	
DEM				
2B	24	0.798		
2H	49		1.296	
2L	19		0.701	
2M	16		0.705	
2U	56	0.648		
Total	164			

Units: US Survey Feet



DEM

Nonvegetated Vertical Accuracy

LandCover Type: 2B, 2U

Minimum DZ: -0.598

Maximum DZ: 1.06

Mean DZ: 0.13

Mean Magnitude DZ: 0.528

Number Observations: 80

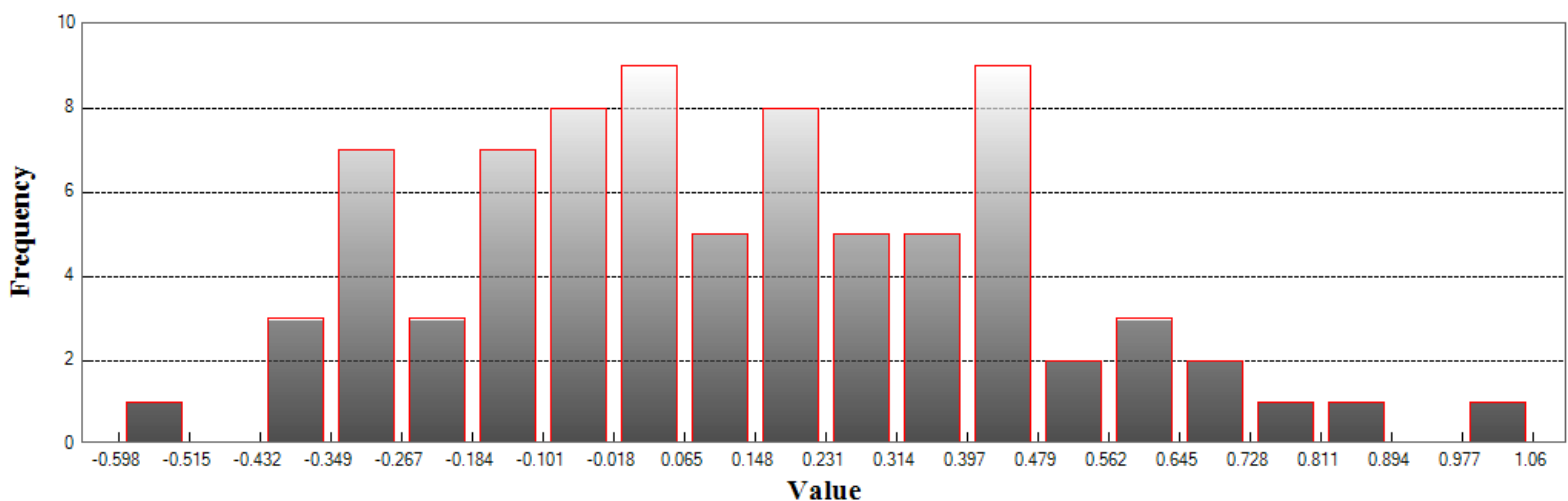
Standard Deviation DZ: 0.333

RMSE Z: 0.355

95% Confidence Level Z: 0.696

Units: US Survey Feet

Histogram



Min: -0.598

Max: 1.06

Number Of Bins: 20

Bin Interval: 0.083

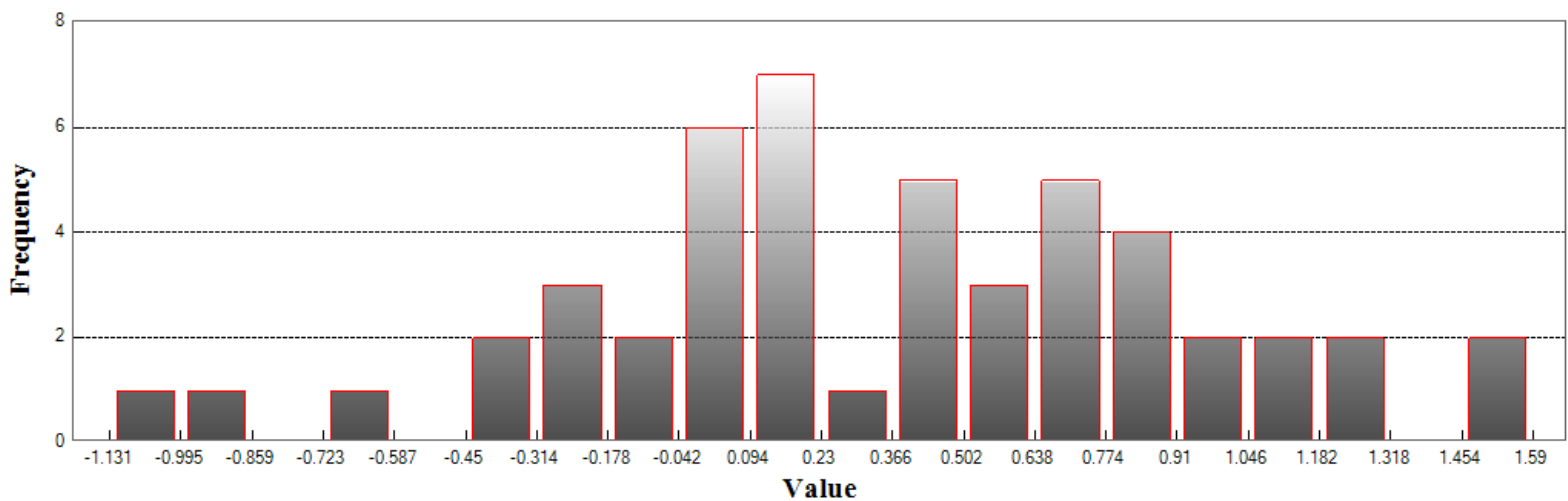


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2H
Minimum DZ: -1.131
Maximum DZ: 1.59
Mean DZ: 0.359
Mean Magnitude DZ: 0.733
Number Observations: 49
Standard Deviation DZ: 0.584
RMSE Z: 0.681
95th Percentile: 1.296
Units: US Survey Feet

Histogram



Min: -1.131

Max: 1.59

Number Of Bins: 20

Bin Interval: 0.136

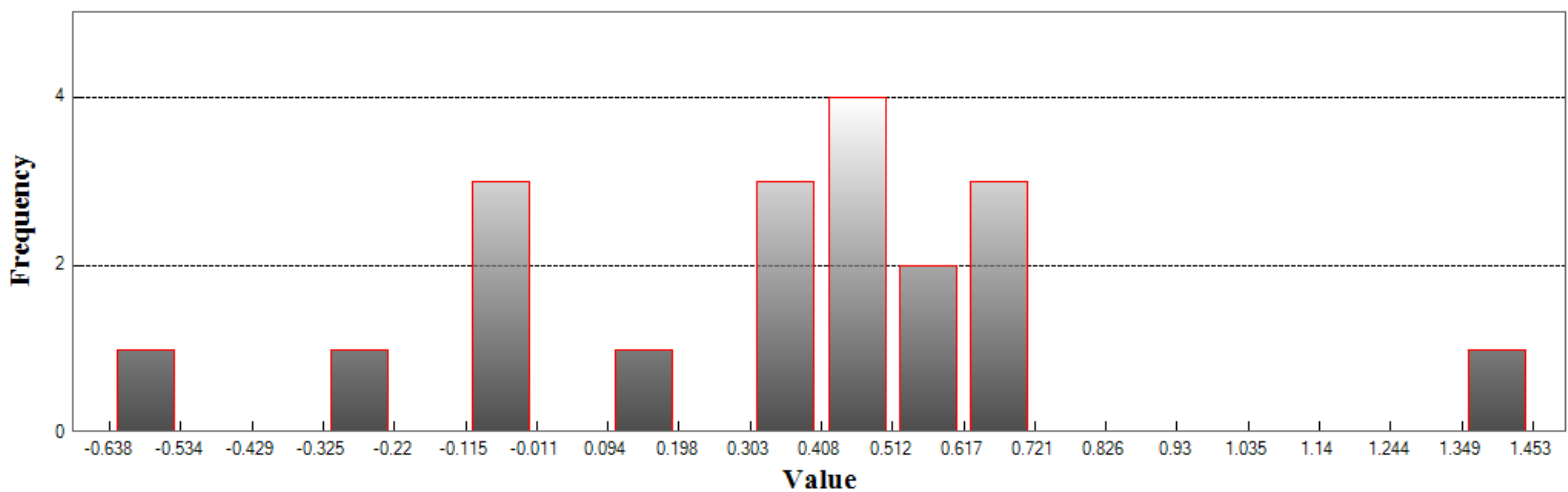


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2L
Minimum DZ: -0.638
Maximum DZ: 1.454
Mean DZ: 0.345
Mean Magnitude DZ: 0.678
Number Observations: 19
Standard Deviation DZ: 0.449
RMSE Z: 0.556
95th Percentile: 0.701
Units: US Survey Feet

Histogram



Min: -0.638

Max: 1.454

Number Of Bins: 20

Bin Interval: 0.105

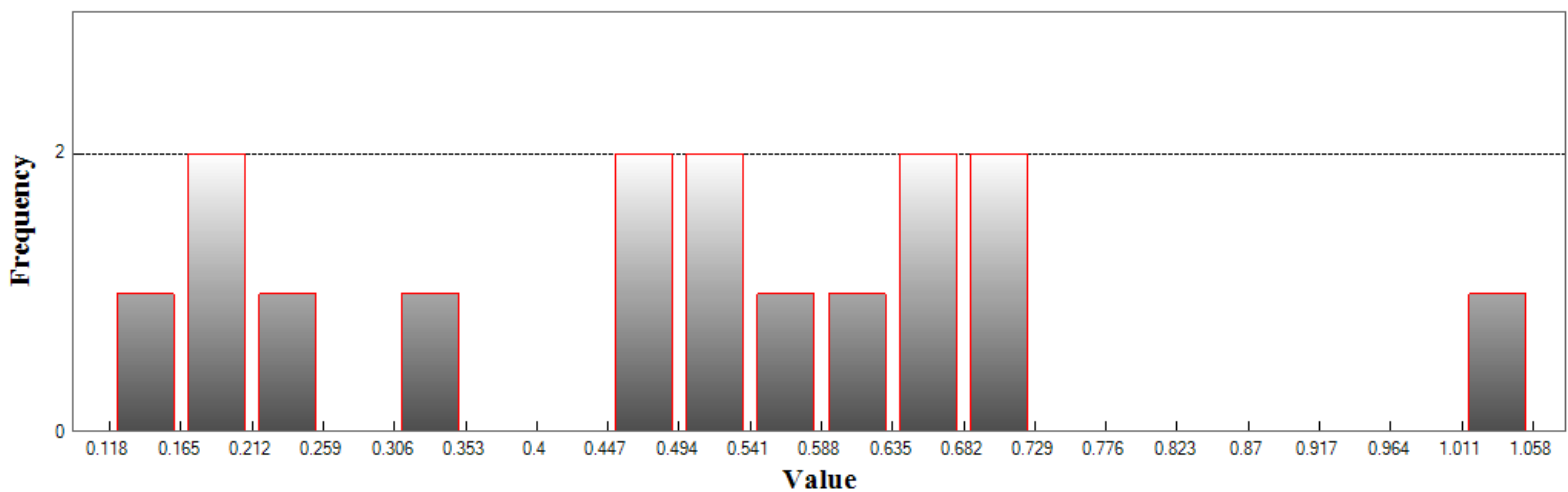


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2M
Minimum DZ: 0.117
Maximum DZ: 1.058
Mean DZ: 0.498
Mean Magnitude DZ: 0.706
Number Observations: 16
Standard Deviation DZ: 0.245
RMSE Z: 0.551
95th Percentile: 0.705
Units: US Survey Feet

Histogram



Min: 0.117

Max: 1.058

Number Of Bins: 20

Bin Interval: 0.047

NORTH CAROLINA GEODETIC SURVEY

Claude T Bowers Building
4105 Reedy Creek Road
Raleigh, North Carolina 27607
(919)733-3836



Project Information

Prepared By: Watson Ross
Project Name: 2018 Phase 5 LiDAR QC
Sensor Info: GmAPD Geiger-mode
Required Nominal Pulse Spacing: 0.35
Vendor Name: NA
Units: US Survey Feet
Percent of Extent Tolerance: Extents Not Checked
Date of Aquisition: Start: 8/17/2018 Finish: 8/17/2018

Metadata Information

Tile Index:

Filename: watauga_tiles.shp

Number of Polys: 0

Intensity:

Tile Index Attribute: Not Specified

Data Filename: Not Specified

Number of Data Files Matching Attribute: Not Specified

DEM:

Tile Index Attribute: dem10_file

Data Filename: DEM10

Number of Data Files Matching Attribute: Not Specified

LAS:

Tile Index Attribute:

Data Filename:

Number of Data Files Matching Attribute: Not Specified



LiDAR Accuracy Assessment Summary

LC Type	# of Points	NVA	VVA	
DEM				
2B	24	0.661		
2H	41		1.704	
2L	21		1.578	
2M	22		1.612	
2U	37	0.712		
Total	145			

Units: US Survey Feet



DEM

Nonvegetated Vertical Accuracy

LandCover Type: 2B, 2U

Minimum DZ: -0.934

Maximum DZ: 0.961

Mean DZ: 0.058

Mean Magnitude DZ: 0.512

Number Observations: 61

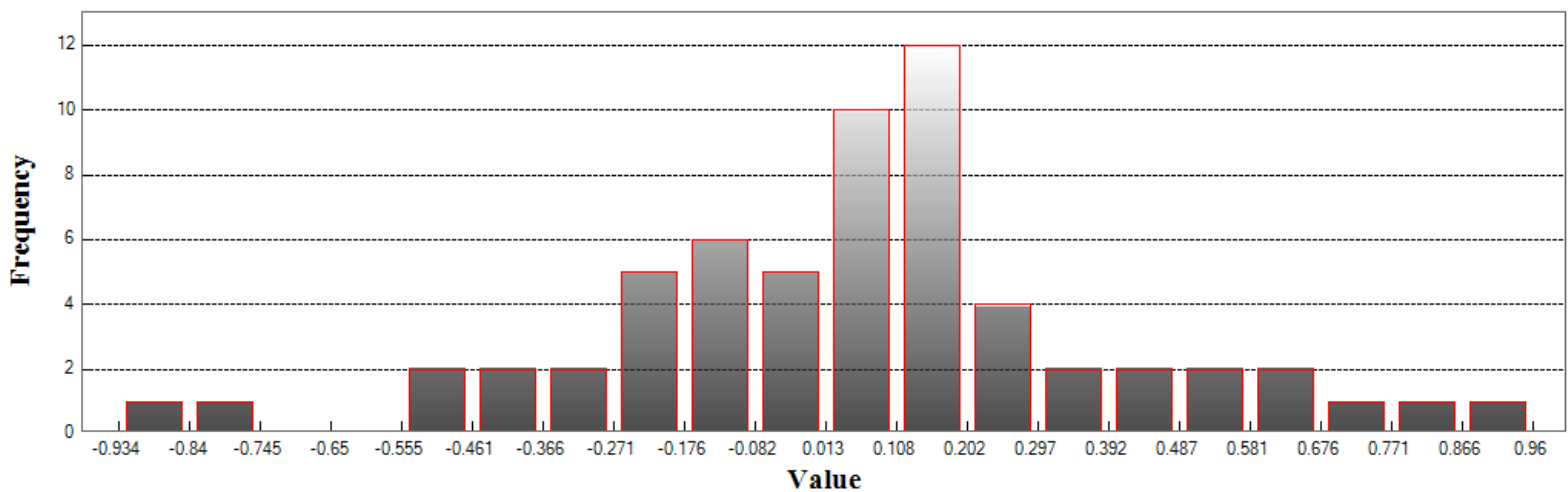
Standard Deviation DZ: 0.351

RMSE Z: 0.353

95% Confidence Level Z: 0.692

Units: US Survey Feet

Histogram



Min: -0.934

Max: 0.961

Number Of Bins: 20

Bin Interval: 0.095

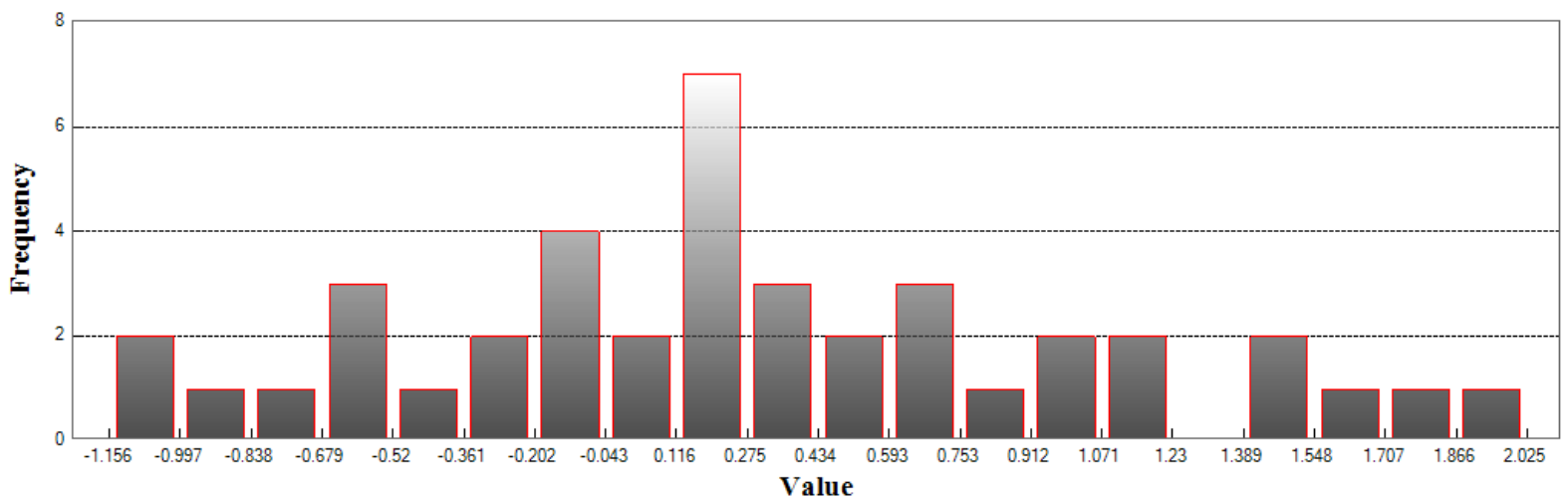


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2H
Minimum DZ: -1.157
Maximum DZ: 2.025
Mean DZ: 0.283
Mean Magnitude DZ: 0.805
Number Observations: 41
Standard Deviation DZ: 0.784
RMSE Z: 0.825
95th Percentile: 1.704
Units: US Survey Feet

Histogram



Min: -1.157
Max: 2.025
Number Of Bins: 20
Bin Interval: 0.159

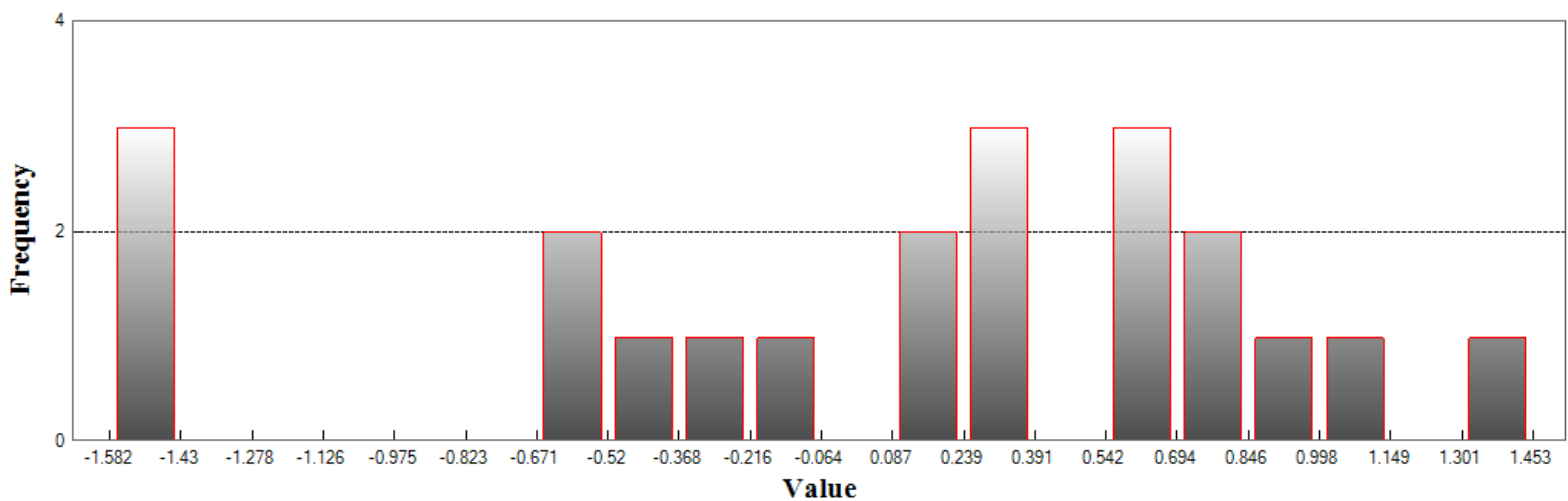


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2L
Minimum DZ: -1.582
Maximum DZ: 1.453
Mean DZ: 0.065
Mean Magnitude DZ: 0.836
Number Observations: 21
Standard Deviation DZ: 0.856
RMSE Z: 0.838
95th Percentile: 1.578
Units: US Survey Feet

Histogram



Min: -1.582
Max: 1.453
Number Of Bins: 20
Bin Interval: 0.152

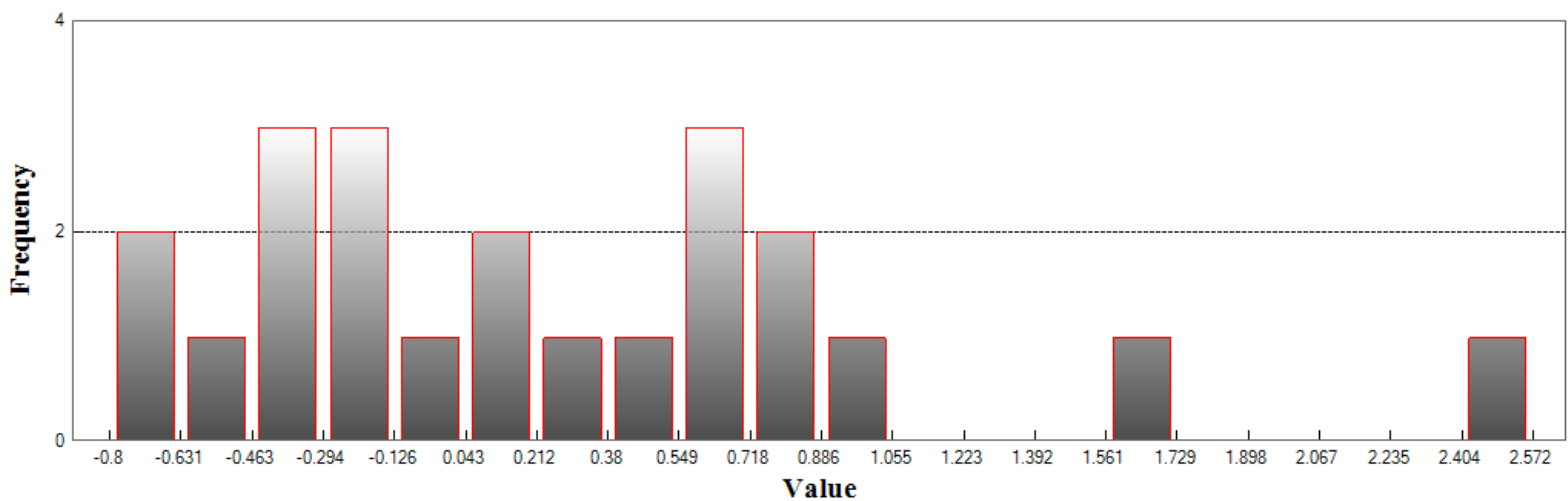


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2M
Minimum DZ: -0.8
Maximum DZ: 2.573
Mean DZ: 0.266
Mean Magnitude DZ: 0.781
Number Observations: 22
Standard Deviation DZ: 0.794
RMSE Z: 0.82
95th Percentile: 1.612
Units: US Survey Feet

Histogram



Min: -0.8

Max: 2.573

Number Of Bins: 20

Bin Interval: 0.169

NORTH CAROLINA GEODETIC SURVEY

Claude T Bowers Building
4105 Reedy Creek Road
Raleigh, North Carolina 27607
(919)733-3836



Project Information

Prepared By: Watson Ross
Project Name: 2018 Phase 5 LiDAR QC
Sensor Info: GmAPD Geiger-mode
Required Nominal Pulse Spacing: 0.35
Vendor Name: NA
Units: US Survey Feet
Percent of Extent Tolerance: Extents Not Checked
Date of Aquisition: Start: 8/17/2018 Finish: 8/17/2018

Metadata Information

Tile Index:

Filename: yancey_tiles.shp

Number of Polys: 0

Intensity:

Tile Index Attribute: Not Specified

Data Filename: Not Specified

Number of Data Files Matching Attribute: Not Specified

DEM:

Tile Index Attribute: dem10_file

Data Filename: DEM10

Number of Data Files Matching Attribute: Not Specified

LAS:

Tile Index Attribute:

Data Filename:

Number of Data Files Matching Attribute: Not Specified



LiDAR Accuracy Assessment Summary

LC Type	# of Points	NVA	VVA	
DEM				
2B	24	0.932		
2H	42		1.873	
2L	25		0.647	
2M	23		0.811	
2U	37	0.591		
Total	151			

Units: US Survey Feet



DEM

Nonvegetated Vertical Accuracy

LandCover Type: 2B, 2U

Minimum DZ: -1.784

Maximum DZ: 0.68

Mean DZ: -0.138

Mean Magnitude DZ: 0.517

Number Observations: 61

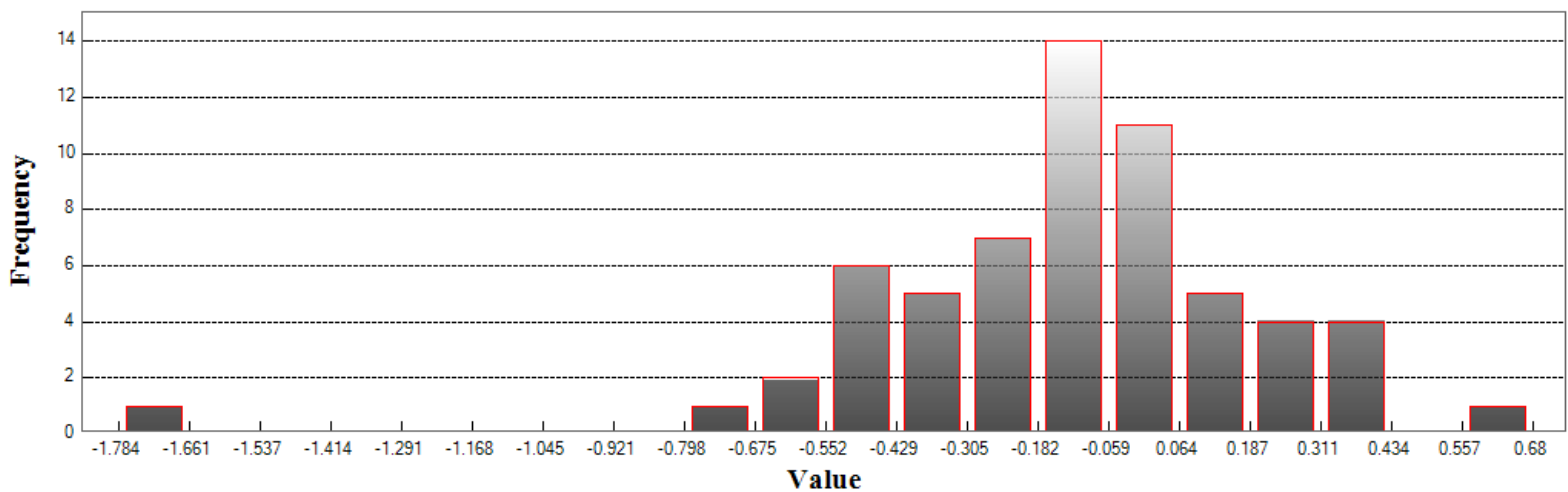
Standard Deviation DZ: 0.356

RMSE Z: 0.379

95% Confidence Level Z: 0.744

Units: US Survey Feet

Histogram



Min: -1.784

Max: 0.68

Number Of Bins: 20

Bin Interval: 0.123

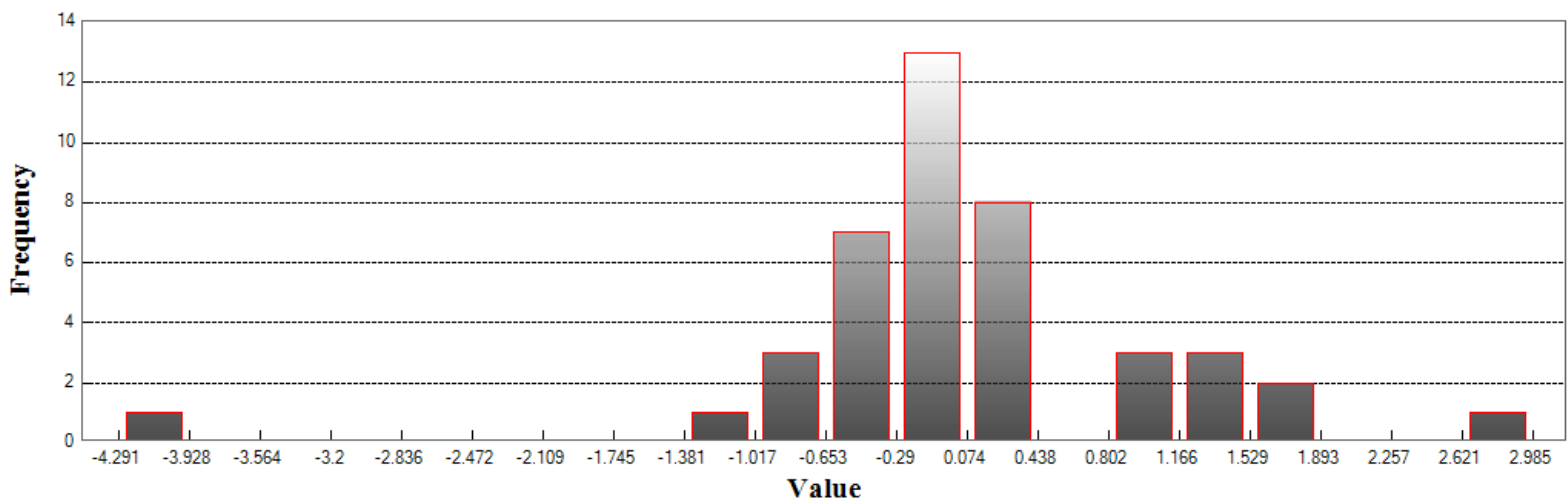


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2H
Minimum DZ: -4.292
Maximum DZ: 2.985
Mean DZ: 0.075
Mean Magnitude DZ: 0.823
Number Observations: 42
Standard Deviation DZ: 1.093
RMSE Z: 1.083
95th Percentile: 1.873
Units: US Survey Feet

Histogram



Min: -4.292
Max: 2.985
Number Of Bins: 20
Bin Interval: 0.364

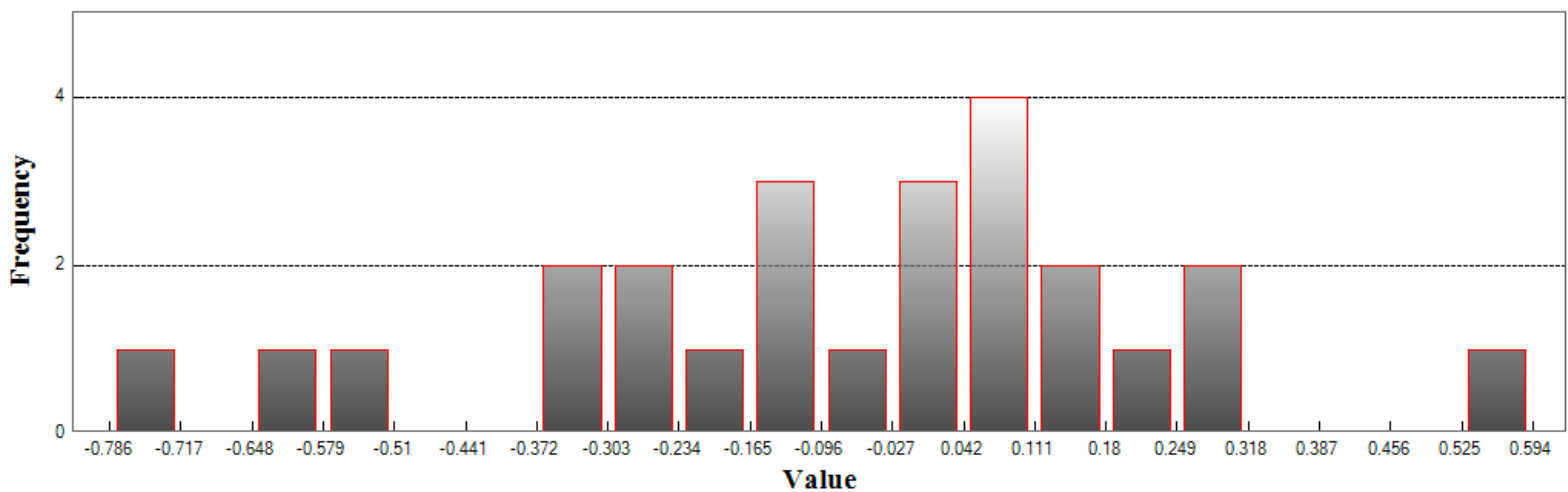


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2L
Minimum DZ: -0.787
Maximum DZ: 0.594
Mean DZ: -0.071
Mean Magnitude DZ: 0.485
Number Observations: 25
Standard Deviation DZ: 0.308
RMSE Z: 0.31
95th Percentile: 0.647
Units: US Survey Feet

Histogram



Min: -0.787

Max: 0.594

Number Of Bins: 20

Bin Interval: 0.069

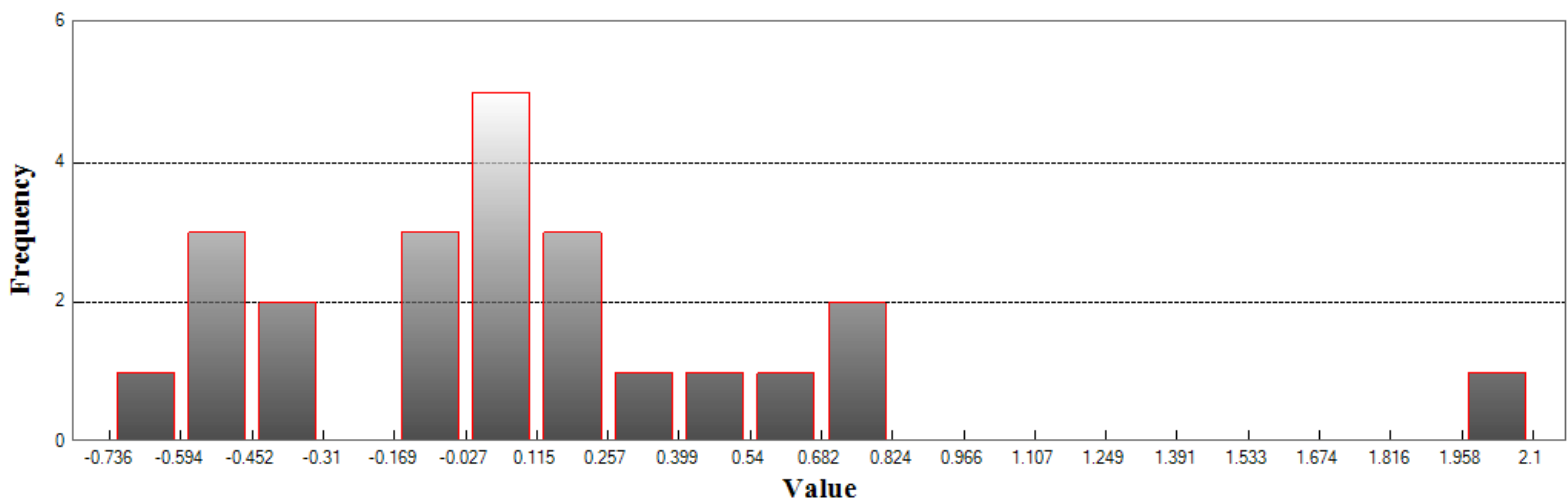


DEM (Continued)

Vegetated Vertical Accuracy

LandCover Type: 2M
Minimum DZ: -0.736
Maximum DZ: 2.1
Mean DZ: 0.115
Mean Magnitude DZ: 0.64
Number Observations: 23
Standard Deviation DZ: 0.602
RMSE Z: 0.6
95th Percentile: 0.811
Units: US Survey Feet

Histogram



Min: -0.736

Max: 2.1

Number Of Bins: 20

Bin Interval: 0.142

Station Name	PID	NAVD88			NAD83(2011) Epoch 2010.0			SPC Combined Factor
		Ellipsoid Height (m)	Orthometric Height (m)	Latitude DMS	Longitude DMS	SPC North (m)	SPC East (m)	
ALBEMARLE CORS ARP	DG5755	112.630	142.970	35 20 17.30339 N	080 12 48.52476 W	176846.600	499299.251	0.99985604
ASHEBORO 2 CORS ARP	DL6900	210.381	240.790	35 37 49.38501 N	079 45 53.75304 W	208859.939	540319.797	0.99986134
ASU-BOONE CORS ARP	DF4365	957.907	989.120	36 12 50.84473 N	081 40 54.64789 W	276616.959	368477.452	0.99986327
BEAUFORT CORS ARP	DK7561	-27.858	9.650	34 43 08.50895 N	076 40 18.99140 W	109995.822	822811.707	0.99991989
BODIE ISLAND CORS ARP	DO2877	-33.046	5.940	35 50 44.35730 N	075 33 48.94199 W	237848.248	919957.886	0.99993139
BRYSON CITY CORS ARP	DL2762	566.148	594.790	35 22 21.56251 N	083 30 23.37131 W	189293.916	200277.527	0.99978597
BURLINGTON CORS ARP	DF9213	173.401	203.610	36 05 29.58604 N	079 26 12.17620 W	259845.465	570271.809	0.99995269
BURNSVILLE 2007 CORS ARP	DL6201	748.693	778.830	35 54 29.30454 N	082 20 49.87834 W	244501.699	307532.708	0.99982060
BUXTON CORS ARP	DM5409	-25.445	13.270	35 15 58.08197 N	075 33 06.82885 W	173632.372	923246.647	0.99987661
CARTHAGE CORS ARP	DG5938	149.613	181.000	35 20 30.04880 N	079 23 05.08515 W	176632.942	574629.599	0.99985034
CASTLE HAYNE 2007 CORS ARP	DK7086	-22.806	13.900	34 20 40.22860 N	077 52 29.89892 W	66537.627	713112.699	1.00000500
CEDAR ISLAND CORS ARP	DL3071	-30.613	7.250	35 01 03.76013 N	076 18 55.28490 W	143939.877	854565.507	0.99988569
CLINTON CORS ARP	DK4041	23.862	58.490	34 59 25.65387 N	078 21 31.47816 W	137793.395	668139.845	0.99987918
CONCORD CORS ARP	DF7471	154.382	184.820	35 22 35.24392 N	080 33 51.11399 W	181542.684	467489.138	0.99985072
CRESWELL CORS ARP	DK7747	-28.220	8.918	35 54 56.93091 N	076 28 25.29176 W	243161.208	837585.924	0.99994407
DOBSON CORS ARP	DF5767	340.642	373.920	36 25 31.51455 N	080 43 11.71069 W	298143.588	455359.078	1.00002904
DUCK 3 CORS ARP	DK3334	-24.775	14.110	36 10 54.01098 N	075 45 04.79522 W	274539.934	901788.896	1.00000811
DURHAM COOP CORS ARP	DG9328	117.466	148.790	35 59 46.12942 N	078 53 58.03641 W	249177.805	618666.816	0.99993843
ELIZABETH CITY CORS ARP	DL6896	-29.750	7.600	36 20 28.79075 N	076 15 29.27386 W	290874.906	855730.326	1.00005810
ELIZABETHTOWN CORS ARP	DI1680	-9.537	25.460	34 39 13.60147 N	078 31 11.73447 W	100363.878	653606.669	0.99992817
FAYETTEVILLE 2006 CORS ARP	DH9594	16.914	50.450	35 02 02.48998 N	078 52 14.73160 W	142444.626	621393.108	0.99987712
FORT FISHER CORS ARP	DM3521	-29.165	8.320	33 57 38.26113 N	077 56 18.76581 W	23891.297	707718.933	1.00012861
FRANKLIN CORS ARP	DG4257	620.895	649.270	35 11 30.68622 N	083 23 41.74673 W	168802.916	209516.356	0.99977570
GASTON CORS ARP	DE8425	213.712	245.140	35 18 39.79151 N	081 11 19.54124 W	175361.640	410593.642	0.99983959
GATESVILLE CORS ARP	DL6898	-20.472	15.650	36 26 12.65517 N	076 43 16.51658 W	300420.808	813921.941	1.00008983
GOLDSBORO CORS ARP	DK5550	14.068	48.900	35 25 16.86892 N	078 03 30.57562 W	185808.939	695094.939	0.99987475
GREENVILLE NC CORS ARP	DL7337	4.907	40.810	35 36 18.30987 N	077 21 55.47952 W	207005.628	757690.324	0.99989078
HAYWOOD CORS ARP	DE8228	809.314	838.220	35 31 35.39633 N	082 55 30.12730 W	204104.221	253736.164	0.99975705
HENDERSONVILLE CORS ARP	DK7853	654.472	684.850	35 21 21.89173 N	082 30 03.99653 W	183772.967	291488.002	0.99977154
HICKORY CORS ARP	DM3523	326.299	358.470	35 44 31.01014 N	081 18 30.93483 W	223397.889	400811.751	0.99985789
HIGH POINT CORS ARP	AI4198	267.948	299.220	35 57 56.48686 N	080 00 48.93737 W	246260.723	518178.455	0.99990805
I77 WELCOME CNTR CORS ARP	DF6318	157.556	187.950	35 07 21.25422 N	080 54 58.46768 W	153944.753	434964.997	0.99985039
JACKSON NC CORS ARP	DH7133	13.257	47.680	36 24 30.56335 N	077 26 15.30879 W	296031.384	749749.096	1.00007439
JACKSONVILLE CORS ARP	DK6239	-26.125	10.950	34 44 46.81575 N	077 27 11.71789 W	111628.027	751216.799	0.99991534
JORDAN LAKE CORS ARP	DL3891	45.996	77.430	35 46 52.49646 N	079 02 03.92766 W	225330.877	606489.109	0.99990797
KENANSVILLE CORS ARP	DI1071	15.560	51.360	34 56 30.49763 N	077 58 49.94532 W	132685.360	702719.518	0.99988470
KINSTON CORS ARP	DM3989	-3.126	32.790	35 19 18.56728 N	077 36 49.27040 W	175242.563	735637.711	0.99987383
LEXINGTON CORS ARP	DG5757	194.102	225.340	35 48 53.14318 N	080 13 46.20206 W	229736.512	498497.891	0.99989030
LILLINGTON 2004 CORS ARP	DG5759	25.706	58.730	35 25 12.54674 N	078 48 40.33946 W	185286.626	626745.253	0.99987286
LUMBERTON CORS ARP	DI1682	15.824	49.560	34 37 36.33605 N	079 04 39.69481 W	97263.238	602477.201	0.99992918

Note: Published positional informaton of published Continuous Operating Reference Stations (CORS) are denoted in meters (m).

Station Name	PID	NAVD88			NAD83(2011) Epoch 2010.0		SPC North (m)	SPC East (m)	SPC Combined Factor
		Ellipsoid Height (m)	Orthometric Height (m)	Latitude DMS	Longitude DMS				
MARION CORS ARP	DE8230	366.984	398.800	35 39 13.38510 N	081 57 16.17206 W	215162.325	342120.619	0.99983954	
MARSHALL CORS ARP	DG7400	560.633	590.850	35 48 47.31356 N	082 41 22.67321 W	235064.443	276250.707	0.99983251	
MONROE CORS ARP	DF5880	144.332	174.600	34 58 54.77687 N	080 31 25.79009 W	137720.671	470484.517	0.99986097	
MOORESVILLE CORS ARP	DH3838	266.205	297.570	35 34 46.87707 N	080 48 12.53662 W	204453.424	446161.276	0.99984714	
MORGANTON CORS ARP	DH7137	344.831	377.000	35 42 27.07386 N	081 39 23.99857 W	220367.093	369236.777	0.99985003	
MURPHY CORS ARP	DL1890	476.123	504.800	35 04 06.77760 N	083 57 59.36142 W	157594.804	156842.278	0.99980296	
NASHVILLE CORS ARP	DK7576	34.500	68.960	35 58 09.06797 N	078 01 11.34161 W	246618.195	698006.712	0.99994546	
NCSA SALISBURY CORS ARP	DN5840	174.906	206.250	35 42 41.69212 N	080 25 55.99488 W	218535.902	480015.188	0.99987726	
NCSO SWANQUARTER2 CORS ARP	DQ9090	-29.912	8.020	35 23 40.93853 N	076 19 31.76835 W	185719.856	852514.443	0.99988038	
NEW BERN NCGS CORS ARP	DN8739	-16.105	21.070	35 06 45.99769 N	077 06 14.29783 W	152823.201	782416.342	0.99987805	
NEWLAND 2007 CORS ARP	DM3991	1124.527	1155.410	36 04 39.95811 N	081 54 40.29398 W	262073.985	347419.061	0.99979994	
NORTH WILKESBORO CORS ARP	DK4047	270.426	303.570	36 09 59.27542 N	081 07 57.22423 W	270132.288	417741.217	0.99985750	
PARI_OBS_NC_2008 CORS ARP	DM6192	880.094	909.630	35 12 06.96417 N	082 52 20.90284 W	167939.378	257095.138	0.99973486	
PEA ISLAND CORS ARP	DG5313	-31.109	7.780	35 41 02.04056 N	075 28 56.35040 W	220170.749	927930.973	0.99990584	
PITTSBORO CORS ARP	DE8234	102.804	133.850	35 43 11.21331 N	079 10 38.62673 W	218525.196	593551.641	0.99988974	
POLKTON CORS ARP	DG7402	84.929	115.530	34 59 33.17297 N	080 10 37.85763 W	138473.153	502143.744	0.99986944	
RALEIGH CORS ARP	AJ2913	142.997	175.910	35 47 12.85298 N	078 38 19.41118 W	226017.117	642259.673	0.99989367	
RALEIGH DOT CORS ARP	DG4687	51.789	85.400	35 45 49.50795 N	078 34 44.39448 W	223469.874	647669.715	0.99990429	
REIDSVILLE CORS ARP	DM3525	234.815	266.700	36 21 42.71489 N	079 39 56.54007 W	289954.707	549851.005	1.00002348	
ROBBINSVILLE CORS ARP	DM3993	606.659	635.150	35 19 15.69235 N	083 47 48.68948 W	184808.885	173646.886	0.99977812	
ROCKINGHAM CORS ARP	DM3995	91.872	122.950	34 57 51.98780 N	079 47 47.74087 W	135010.039	536859.244	0.99987067	
ROXBORO CORS ARP	DM3527	194.654	225.650	36 23 28.05620 N	078 59 54.41890 W	293001.606	609740.318	1.00003983	
SANFORD CORS ARP	AM7024	95.450	127.140	35 28 24.67784 N	079 09 28.98436 W	191202.330	595258.352	0.99986507	
SHALLOTTE CORS ARP	DK3336	-10.002	25.750	33 58 57.20129 N	078 23 24.30664 W	25972.444	665965.745	1.00011715	
SHELBY CORS ARP	DG7404	264.465	296.210	35 16 53.64241 N	081 29 28.11569 W	172739.799	383023.692	0.99983123	
SMITHFIELD CORS ARP	DK6525	24.469	58.660	35 33 49.60980 N	078 20 10.80495 W	201405.073	669760.307	0.99988353	
SPARTA CORS ARP	DL1707	839.991	871.970	36 29 51.90632 N	081 06 52.93270 W	306852.726	420130.758	0.99997742	
SPINDALE CORS ARP	DK4043	302.765	334.650	35 21 55.83430 N	081 54 57.34807 W	183099.887	344671.752	0.99982704	
STATESVILLE CORS ARP	DK7549	228.842	261.190	35 51 19.72891 N	080 50 55.47790 W	235120.895	442629.732	0.99989208	
SW COMMUNITY COLL CORS ARP	DH3874	645.113	673.650	35 20 52.40748 N	083 12 23.38897 W	185353.255	227392.744	0.99977276	
SWANNANOVA CORS ARP	DG5311	659.842	689.830	35 35 46.03847 N	082 25 24.22964 W	210140.053	299464.372	0.99978706	
SWANQUARTER CORS ARP	DL1892	-30.398	7.510	35 23 40.86368 N	076 19 33.37884 W	185716.456	852473.883	0.99988046	
TARBORO CORS ARP	DK7578	-0.513	34.830	35 52 56.96198 N	077 34 21.39610 W	237489.266	738477.556	0.99993315	
TROY CORS ARP	DK4045	144.044	174.590	35 22 01.84517 N	079 52 12.77094 W	179740.437	530528.389	0.99985200	
WALNUT COVE CORS ARP	DL1894	276.319	309.540	36 22 19.68806 N	080 11 05.62514 W	291528.706	503266.558	1.00002046	
WARRENTON CORS ARP	DM3529	76.208	109.530	36 23 41.68571 N	078 10 13.74958 W	293732.691	684023.061	1.00005974	
WASHINGTON 2007 CORS ARP	DK7551	-25.416	11.220	35 33 34.78484 N	077 03 31.44193 W	202467.748	785569.672	0.99989097	
WASHINGTON CORS ARP	AJ2915	-25.317	11.260	35 33 34.80249 N	077 03 31.54255 W	202468.242	785567.128	0.99989095	
WEST JEFFERSON CORS ARP	DL2082	934.802	966.060	36 23 34.94821 N	081 28 42.26843 W	295989.718	387260.230	0.99992435	
WHITEVILLE CORS ARP	DJ8943	-2.342	32.360	34 16 49.59006 N	078 42 59.33169 W	58881.567	635708.028	1.00001544	
WILLIAMSTON 2 CORS ARP	DN8741	-21.901	14.180	35 49 49.75739 N	077 02 06.20973 W	232550.205	787120.808	0.99992694	
WILLIAMSTON CORS ARP	DF8715	-20.544	15.530	35 49 48.75037 N	077 02 04.93157 W	232519.811	787153.494	0.99992667	
WILMINGTON CORS ARP	AJ2917	-24.775		34 14 09.45795 N	077 55 45.16083 W	54442.078	708252.321	1.00003228	
WILSON CORS ARP	DK7563	11.179	46.030	35 42 26.29637 N	077 55 57.08393 W	217645.964	706192.128	0.99990236	
WINSTON SALEM CORS ARP	DH5853	254.046	286.560	36 04 15.67829 N	080 13 37.75017 W	258164.236	499061.500	0.99993484	

Note: Published positional informaton of published Continuous Operating Reference Stations (CORS) are denoted in meters (m).

Acronyms, Abbreviations, and Definitions

ARP – Antenna Reference Point

CORS – Continuous Operating Reference Station

DMS – Degrees Minutes Seconds

m – Meter

PID – Permanent Identifier

SPC – State Plane Coordinates

Statistical Definitions:

Nonvegetated Vertical Accuracy (NVA) – The vertical accuracy at the 95-percent confidence level in nonvegetated open terrain, where errors should approximate a normal distribution.

Supplemental Vertical Accuracy (SVA) – Term for reporting the vertical accuracy at the 95th percentile in each separate land cover category where vertical errors may not follow a normal error distribution.

Vegetated Vertical Accuracy (VVA) – An estimate of the vertical accuracy, based on the 95th percentile, in vegetated terrain where errors do not necessarily approximate a normal distribution.

Minimum DZ – This statistic represents the change in value between the Z-coordinate location based on LiDAR and Z-coordinate location in the survey. The minimum of each simply represents the smallest value out of all of the analyzed locations. This component of the statistics can be used to show which locations most closely correspond to the surveyed points.

Maximum DZ – This statistic represents the change in value between the Z-coordinate location based on LiDAR and Z-coordinate location in the survey. The maximum value of each represents the largest value out of all of the analyzed locations. Maximum values can be used to show which locations most closely correspond to the surveyed points.

Mean DZ - The statistic of the mean DZ is intended to show the average values of the DZ. These statistics show the change in value between the Z-coordinate location based on LiDAR and Z-coordinate location in the survey. The mean values can be used to show the average off-sets of all of the analyzed locations

Mean Magnitude DZ - The statistic of the mean DZ is intended to show the average values of the DZ. These statistics show the change in value between the Z-coordinate location based on LiDAR and Z-coordinate location in the survey. The mean values can be used to show the average off-sets of all of the analyzed locations.

Number Observations – Number of observations

Standard Deviation DZ - A measure of spread or dispersion of a sample of errors around the sample mean error. It is a measure of precision, rather than accuracy; the standard deviation does not account for uncorrected systematic errors.

RMSE Z - The square root of the average of the set of squared differences between dataset coordinate values and coordinate values from an independent source of higher accuracy for identical points. The RMSE is used to estimate the absolute accuracy of both horizontal and vertical coordinates when standard or accepted values are known, as with GPS-surveyed check points of higher accuracy than the data being tested. In the United States, the independent source of higher accuracy is expected to be at least three times more accurate than the dataset being tested. RMSE Z measures RMSE in the Z direction only.

95th Percentile – A measure used in statistics indicating the value below which a given percentage of observations (absolute values of errors) in a group of observations fall. For example, the 95th percentile is the value (or score) below which 95 percent of the observations may be found.