Project Report

TASK ORDER NAME: NM_SouthEast_2018_D19
TASK ORDER NUMBER: 140G219F0006
CONTRACT NUMBER: G16PC00042
ATLANTIC PROJECT NUMBER: 18079
PROJECT BLOCK NUMBER: Block 3

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SECTION I: PROJECT OVERVIEW & PURPOSE

1. Aerial LiDAR Project

a. Project Overview

USGS task order 140G0219F0006-NM_SouthEast_2018_D19 required Fall 2018/Spring 2019 leaf-off LiDAR surveys to be collected over 26,650 square miles covering part or all of thirteen (13) counties in Southeast New Mexico. Aerial LiDAR data for this task order was planned, acquired, processed and produced at an aggregate nominal pulse spacing (ANPS) of 0.71 meters and in compliance with USGS National Geospatial Program LiDAR Base Specification version 1.3. The Block 3 portion of this project encompasses part of Eddy and Lea counties, covering approximately 3,440 square miles.

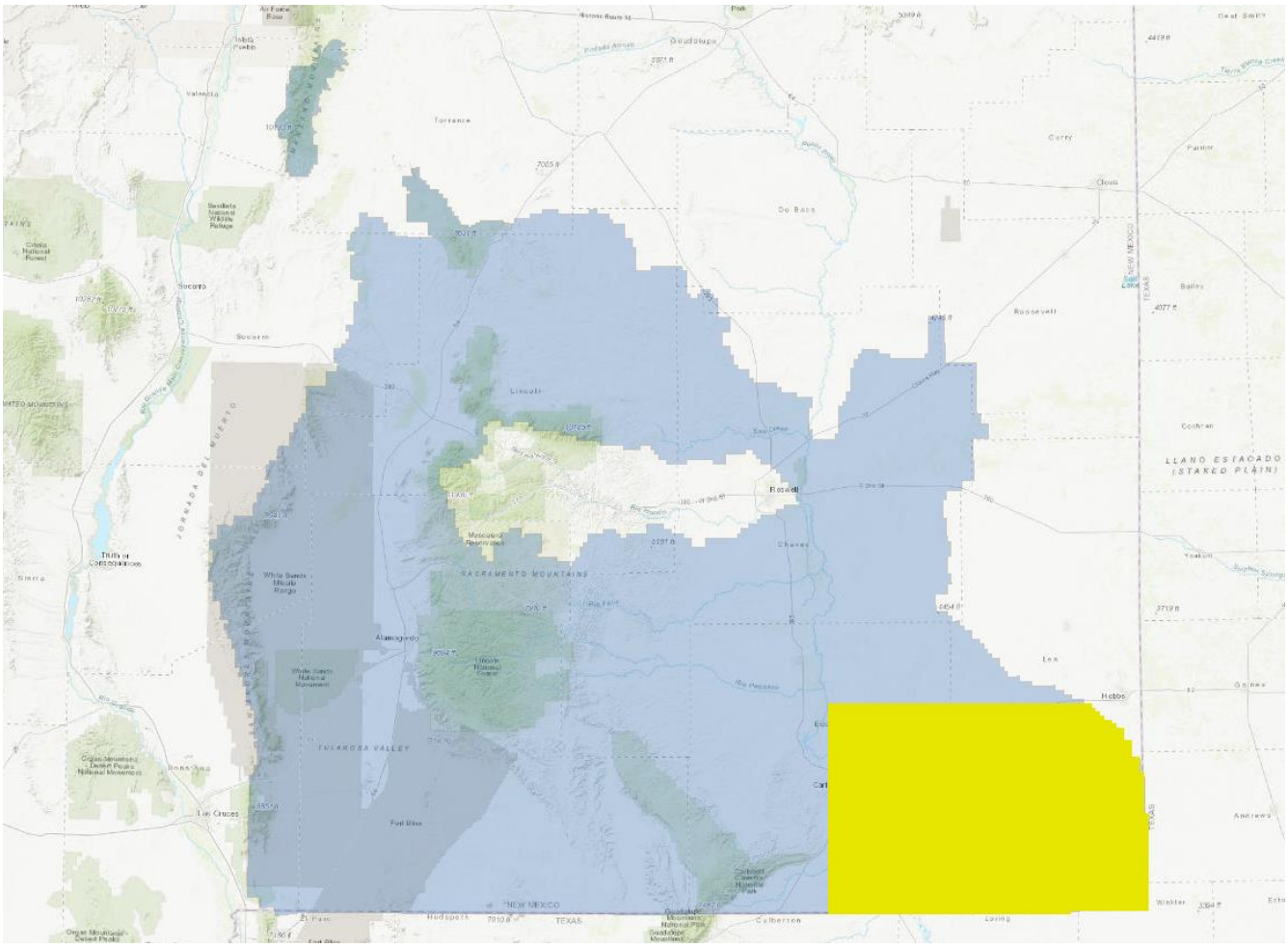


Figure 1: Aerial LiDAR Project Overview – Defined Project Area (DPA) and Associated Areas of Interest (AOIs) Block 3 is delineated in Yellow.

b. Project Purpose

The collected QL2 LiDAR data will support the 3DEP mission, the Natural Resources Conservation Services (NRCS) high resolution elevation enterprise program and the Federal Emergency Management Agency (FEMA) Risk Mapping, Assessment and Planning (MAP) program.

c. Client Contact Information

Client Contact Information	
Name of Contact	Brent Marz
Organization	United States Geological Survey
Position	Government Point of Contact
Telephone	573-308-3538
E-Mail Address	bmarz@usgs.gov
Mailing Address	1400 Independence Road
City	Rolla
State or Province	Missouri
Postal Code	65401

Table 1: Aerial LiDAR Client Contact Information

d. Contract Deliverables

Item	Specification/Format
Classified Point Cloud	LAS 1.4
Bare Earth Surface (Raster DEM)	1m cell size, GeoTIFF format, hydroflattened
Hydro Breaklines	.gdb format
Intensity Imagery	1m cell size, GeoTIFF format
Control	.txt
Delivery Diagram	ESRI Shapefile
Metadata	.xml format, FGDC compliant
Project Report	.pdf format

Table 2: Aerial LiDAR Contract Deliverables

SECTION II: FIELD OPERATIONS

1. Aerial LiDAR Project – Aerial Acquisition

a. Aircraft & Sensor Information

Atlantic operated a PACDV (N750DV) outfitted with an Optech Galaxy Prime LiDAR system during the collection of the project area. The specifications of this system are presented in the following table:

Parameter	Specification
Model	Galaxy Prime
Manufacturer	Optech
Performance Envelope	150 – 4700 m AGL, nominal
Absolute Horizontal Accuracy	1/10,000 x altitude
Absolute Elevation Accuracy	< 0.03 – 0.20 m RMSE from 150 – 4700 m AGL
Topographic Laser	1064-nm near-infrared
Laser Classification	Class IV
Pulse Repetition Frequency (Effective)	Programmable, 50 – 1000 kHz
Beam Divergence	0.25 mrad (1/e)
Laser Range Precision	< 0.008 m
Minimum Target Separation Distance	< 0.7 m (discrete)
Range Capture	Up to 8 range measurements, including last
Intensity Capture	Up to 8 intensity measurements, including last (12-bit)
Scan Angle (Fov)	10 – 60°
Swath Width	10 – 115% of altitude AGL
Scan Frequency	0 – 120 Hz advertised (0 – 240 scan lines/sec)
Scan Product	2000 maximum
Roll Compensation	±5° minimum
Data Storage	Internal solid-state drive (SSD)
Power Requirements	28 V; 300 W
Dimensions and Weight	Sensor: 0.34 x 0.34 x 0.25 m, 27 kg PDU: 0.42 x 0.33 x 0.10 m, 6.5 kg
Operation Temperature	0 to +35°C

Table 3: System Specifications – Galaxy Prime

b. Sensor Acquisition Information

The following table illustrates project specific system parameters for LiDAR acquisition on this project:

Parameter	Specification
System	Optech Galaxy Prime
Nominal Pulse Density (pls/m²)	2.33
Nominal Flight Height (AGL meters)	4000
Nominal Flight Speed (kts)	150
Pass Heading (°)	360/180

Parameter	Specification
Sensor Scan Angle (°)	45
Scan Frequency (Hz)	60
Pulse Rate of Scanner (kHz)	350
Sensor Operated with Multiple Pulses	Yes
Nominal Swath Width (m)	1740
Nominal Swath Overlap (%)	20

Table 4: Aerial LiDAR Sensor Acquisition Parameters

c. Flight Plan Execution

Atlantic acquired one hundred two (102) passes of the AOI as a series of perpendicular and/or adjacent flight-lines executed in nine (9) flight missions conducted between December 5, 2018 and April 29, 2019. Onboard differential Global Navigation Satellite System (GNSS) unit(s) recorded sample aircraft positions at 2 hertz (Hz) or more frequency. LiDAR data was only acquired when a minimum of six (6) satellites were in view.

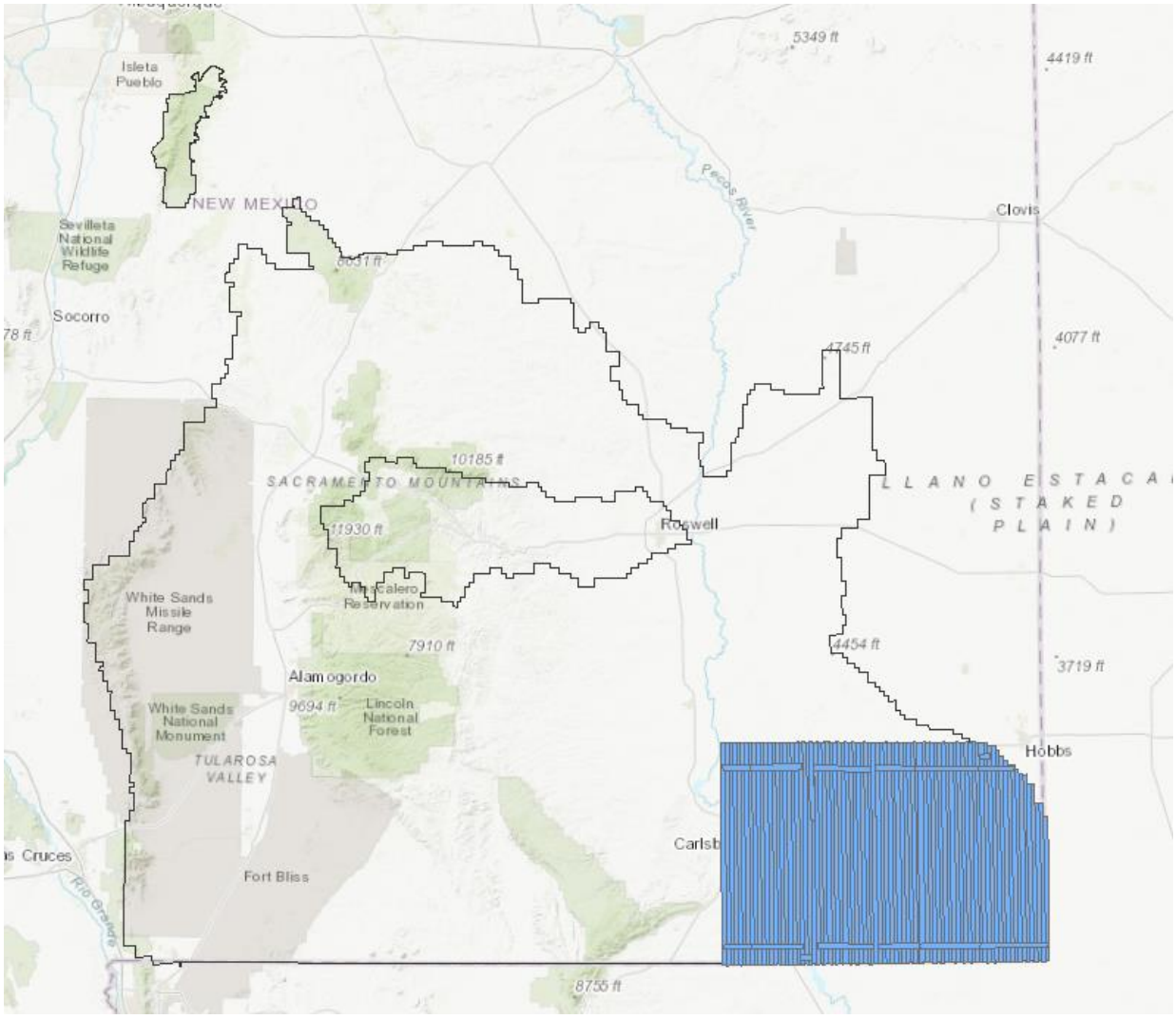


Figure 2: Orientation of Executed Flight-lines and LiDAR DPA

d. GNSS Reference Stations

Thirteen (13) Continuously Operating Reference Stations (CORS) were used to control the LiDAR acquisition for the defined project area. The coordinates provided in below are in NAD83 (2011), Geographic Coordinate System, Ellipsoid, Meters.

Designation	Type	PID	Latitude (N)	Longitude (W)	Elevation
MDO1	CORS	MDO1	N30°40'49.83612"	W104°00'53.98146"	2004.481
NMRO	CORS	NMRO	N33°23'41.84849"	W104°35'20.78286"	1094.692
TXAD	CORS	TXAD	N32°18'28.83144"	W102°32'36.98767"	946.850
TXKM	CORS	TXKM	N31°50'33.37093"	W103°06'31.30084"	847.989
TXP2	CORS	TXP2	N33°10'55.80241"	W102°49'05.38310"	1089.713
TXS3	CORS	TXS3	N32°42'42.42331"	W102°37'47.28509"	977.768
P035	CORS	P035	N34°36'05.01236"	W105°11'00.97400"	1780.346
RG08	CORS	RG08	N32°43'42.06802"	W104°59'38.62992"	1488.649
TXMH	CORS	TXMH	N31°33'27.83657"	W102°53'38.43987"	773.390
P027	CORS	P027	N32°48'06.68833"	W105°48'14.98119"	2896.720
RG03	CORS	RG03	N33°39'16.88772"	W105°09'14.99551"	1572.577
TXEL	CORS	TXEL	N31°41'29.45148"	W106°16'17.64926"	1122.011
TXWT	CORS	TXWT	N31°52'12.41218"	W106°26'33.66163"	1193.342

Table 5: GNSS Reference Stations

2. Aerial LiDAR Project – Ground Acquisition

a. Ground Control Survey

A total of 145 ground survey points were collected in support of this project, including 20 LiDAR Control Points (LCP), 49 Non-vegetated Vertical Accuracy (NVA) and 76 Vegetated Vertical Accuracy (VVA).

Point cloud data accuracy was tested against a Triangulated Irregular Network (TIN) constructed from LiDAR points in clear and open areas. A clear and open area can be characterized with respect to topographic and ground cover variation such that a minimum of five (5) times the Nominal Pulse Spacing (NPS) exists with less than 1/3 of the RMSEZ deviation from a low-slope plane. Slopes that exceed ten (10) percent were avoided.

Each land cover type representing ten (10) percent or more of the total project area were tested and reported with a VVA. In land cover categories other than dense urban areas, the tested points did not have obstructions forty-five (45) degrees above the horizon to ensure a satisfactory TIN surface. The VVA value is provided as a target. It is understood that in areas of dense vegetation, swamps, or extremely difficult terrain, this value may be exceeded.

The NVA value is a requirement that must be met, regardless of any allowed "busts" in the VVA(s) for individual land cover types within the project. Checkpoints for each assessment (NVA & VVA) are required to be well-distributed throughout the land cover type, for the entire project area.

The following tables and figures outline the coordinate values and distribution of LCP, NVA and VVA points collected in support of this project:

ID	Easting	Northing	Elevation
LCP_N	602366.16	3561163.718	981.287
LCP_N	591330.069	3615973.905	1034.433
LCP_N	572697.585	3605659.724	1011.685
LCP_N	616291.86	3593515.345	1084.665
LCP_N	600683.9	3601154.885	1082.487
LCP_N	584010.018	3608493.557	998.876
LCP_N	590571.376	3599705.162	1019.494
LCP_N	634229.775	3596236.774	1171.043
LCP10	595539.988	3551314.595	910.103
LCP10	603194.142	3613431.065	1043.215
LCP10	601567.267	3604047.445	1054.038
LCP10	643179.389	3579563.658	1039.511
LCP11	573520.983	3573904.092	970.583
LCP50	633226.957	3564657.029	1088.402
LCP50	603429.327	3585800.5	960.777
LCP50	586976.206	3601332.077	997.354
LCP50	616789.417	3554724.952	1025.818
LCP50	627622.871	3581222.54	1135.706

ID	Easting	Northing	Elevation
XLCP1	570625.948	3563310.658	982.794
XLCP1	590321.944	3570635.031	912.587

Table 6: LiDAR Control Point Coordinates

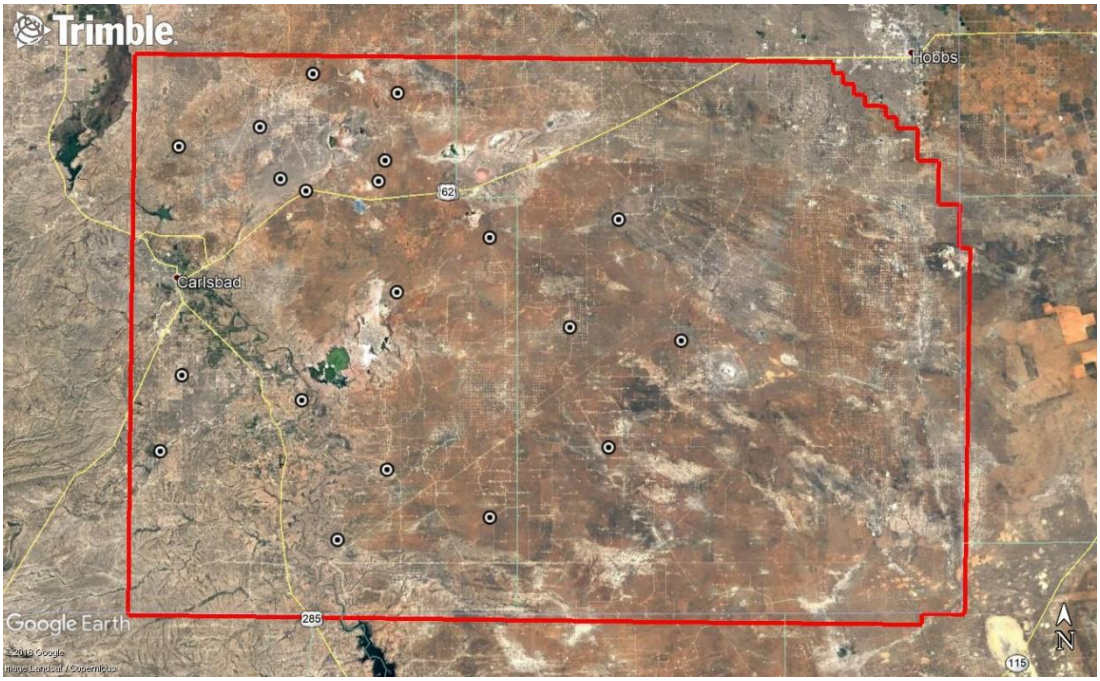


Figure 3: LiDAR Control Point Distribution

ID	Easting	Northing	Elevation
BE_N0	634227.919	3596227.654	1171.066
BE_N0	591324.764	3615967.141	1034.346
BE_N0	584023.912	3608479.864	998.898
BE_N0	572699.325	3605701.935	1012.105
BE_N0	600683.68	3601165.151	1082.573
BE_N0	616289.433	3593513.985	1084.576
BE_N0	620141.303	3577183.343	1067.57
BE_N0	602380.356	3561182.667	981.282
BE_N1	590993.152	3610684.717	1017.394
BE_N1	590576.558	3599697.56	1019.65
BE017	595547.56	3551289.977	910.102
BE022	573522.514	3573943.589	970.665
BE076	601564.098	3604070.382	1053.938
BE077	603212.083	3613422.969	1043.228
BE18	616787.498	3554733.85	1025.822
BE19	633230.728	3564668.542	1088.482
BE72	603427.185	3585791.322	960.46

ID	Easting	Northing	Elevation
OT_N0	598736.6	3559514.716	936.093
OT_N0	640659.182	3587824.306	1100.973
OT_N0	632628.385	3594581.3	1158.64
OT_N0	615274.708	3561357.29	1059.43
OT_N1	587606.512	3597788.484	1005.204
OT_N1	584159.679	3615930.192	1030.912
OT_N1	605338.191	3594293.162	1007.764
OT028	621855.955	3605346.78	1074.725
OT115	573099.514	3614984.335	1071.558
OT117	638794.421	3601415.581	1130.427
OT117	638794.358	3601415.566	1130.429
OT118	652529.779	3581586.925	1086.525
OT120	580969.653	3560621.642	947.653
OT22	577694.722	3598120.337	980.177
OT29	613658.8	3572983.574	1020.021
OT94	673385.025	3548433.964	906.632
UR_N0	585308.624	3606502.358	1001.352
UR_N0	575358.571	3605275.807	997.965
UR_N0	603245.004	3598953.73	1085.502
UR_N0	608501.501	3560157.297	1040.281
UR_N1	631037.369	3600842.991	1124.308
UR062	570966.294	3579716.361	980.262
UR099	583099.995	3565755.833	930.728
UR103	577754.838	3616192.455	1076.551
UR104	598162.48	3584216.037	960.39
UR105	618635.21	3569009.267	1074.329
UR106	588934.11	3543702.495	898.888
UR134	570610.906	3563303.437	982.939
UR46	570873.216	3587348.009	956.846
UR86	610329.663	3577451.646	1003.677
UR88	659763.646	3601751.282	1077.503
UR89	667025.281	3547439.72	893.736

Table 7: Non-Vegetated Vertical Accuracy (NVA) Point Coordinates

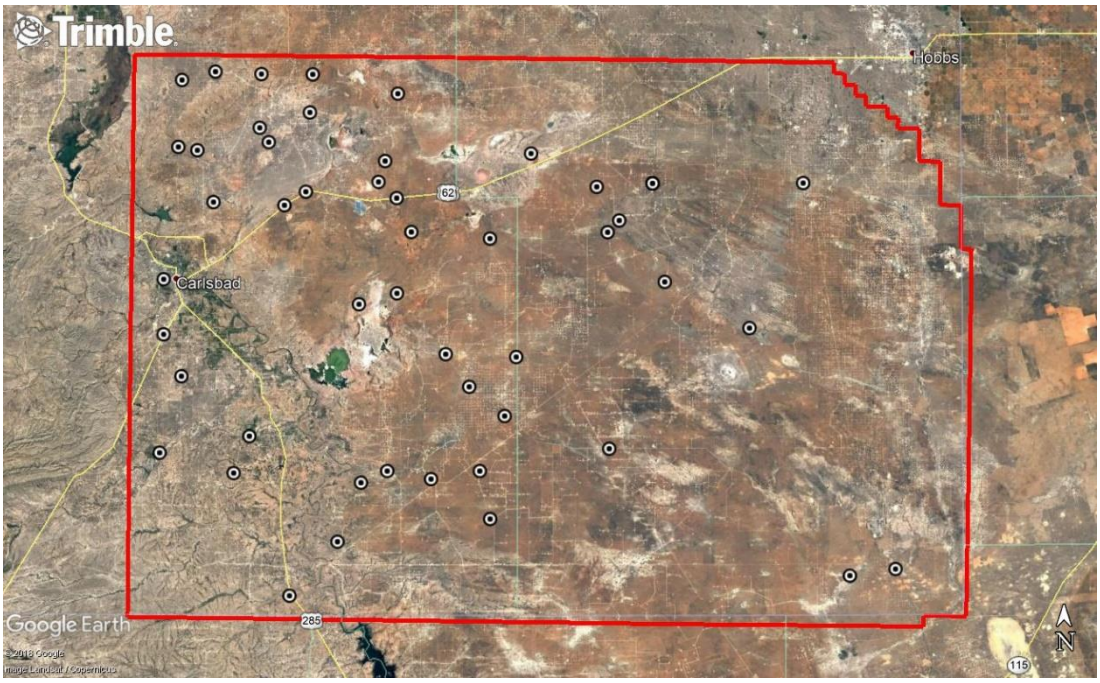


Figure 4: Non-Vegetated Vertical Accuracy (NVA) Point Distribution

ID	Easting	Northing	Elevation
BR_N0	598789.763	3616309.412	1035.892
BR_N0	587289.264	3607405.481	1013.039
BR_N0	641178.042	3585736.439	1074.59
BR_N0	607856.24	3563221.191	1042.717
BR_N0	620151.547	3585571.171	1106.472
BR_N0	622944.039	3567112.668	1104.649
BR_N0	633164.453	3600124.024	1140.095
BR_N1	617603.754	3563713.619	1085.146
BR_N1	637689.558	3592735.615	1156.975
BR059	590306.555	3570633.642	912.79
BR060	649749.119	3590385.678	1106.813
BR064	580734.065	3571214.922	948.313
BR08	596888.608	3567633.104	929.468
BR17	613037.988	3581833.318	1033.546
BR18	670400.072	3555515.31	939.072
BR27	627269.861	3573337.879	1125.255
BR28	585974.19	3603395.373	996.985
BR43	574005.783	3592017.426	976.329
BR77	572393.787	3601137.527	1020.145
BR84	616004.257	3587727.143	1062.836

ID	Easting	Northing	Elevation
BR85	645689.245	3590417.55	1120.518
BR85	645689.244	3590417.548	1120.517
XVVA1	570946.223	3579718.494	980.594
XVVA1	580982.593	3560640.007	947.481
HG_N0	582392.184	3600348.292	986.211
HG_N0	606997.097	3589453.369	969.83
HG_N0	592154.931	3557809.47	886.436
HG_N0	619564.185	3572216.361	1074.524
HG_N0	619495.864	3581858.901	1080.337
HG_N0	630448.337	3567635.936	1100.66
HG_N0	635183.612	3585327.924	1081.154
HG_N0	606550.027	3561300.663	1021.186
HG_N0	607480.723	3571350.999	1021.79
HG_N1	601520.378	3603918.301	1055.658
HG_N1	579624.64	3615740.018	1054.095
HG_N1	607394.577	3569033.229	1064.707
HG056	601000.625	3579239.041	916.87
HG058	657369.614	3568197.203	1059.87
HG062	613719.23	3604052.899	1071.41
HG51	566215.802	3609457.032	1046.516
HG57	625261.264	3551717.151	1027.603
HG59	675114.422	3571022.737	991.825
HG60	639216.984	3608733.73	1124.734
HG60	639216.981	3608733.73	1124.733
HG61	620049.783	3593674.265	1097.694
HG64	579784.564	3615983.286	1052.76
HG93	659481.506	3612622.724	1125.554
TR_N0	605541.568	3590890.158	957.222
TR_N0	628988.723	3583710.77	1129.473
TR_N0	600516.127	3562887.382	941.995
TR_N0	634770.364	3591014.245	1123.37
TR_N0	632426.895	3577209.31	1127.181
TR_N0	616278.589	3591991.849	1065.752
TR_N0	616040.824	3572424.22	1033.513
TR_N0	624704.273	3577844.65	1121.807
TR_N1	592430.589	3603490.911	1010.764
TR_N1	588999.77	3598618.663	1012.274
TR_N1	590102.314	3605835.054	1009.64
TR_N1	578482.094	3602496.909	984.625

ID	Easting	Northing	Elevation
TR_N1	584132.807	3610415.333	1007.293
TR044	628973.365	3610205.55	1097.851
TR044	628973.359	3610205.55	1097.849
TR046	604954.846	3575660.308	943.046
TR05	593942.808	3556918.616	903.362
TR06	622852.22	3561310.396	1063.971
TR07	645963.763	3571214.711	1052.724
TR08	621585.201	3601691.96	1092.403
TR08	621585.255	3601691.956	1092.391
TR082	587127.955	3570588.888	931.673
TR083	652438.725	3573930.22	1030.383
TR084	643221.42	3554842.351	1022.286
TR09	620068.444	3614420.503	1107.224
TR09	620068.439	3614420.505	1107.223
TR45	599901.498	3592697.922	1000.097
TR47	666605.701	3575034.879	1025.432
TR48	673289.311	3591429.342	1040.565

Table 8: Vegetated Vertical Accuracy (VVA) Point Coordinates

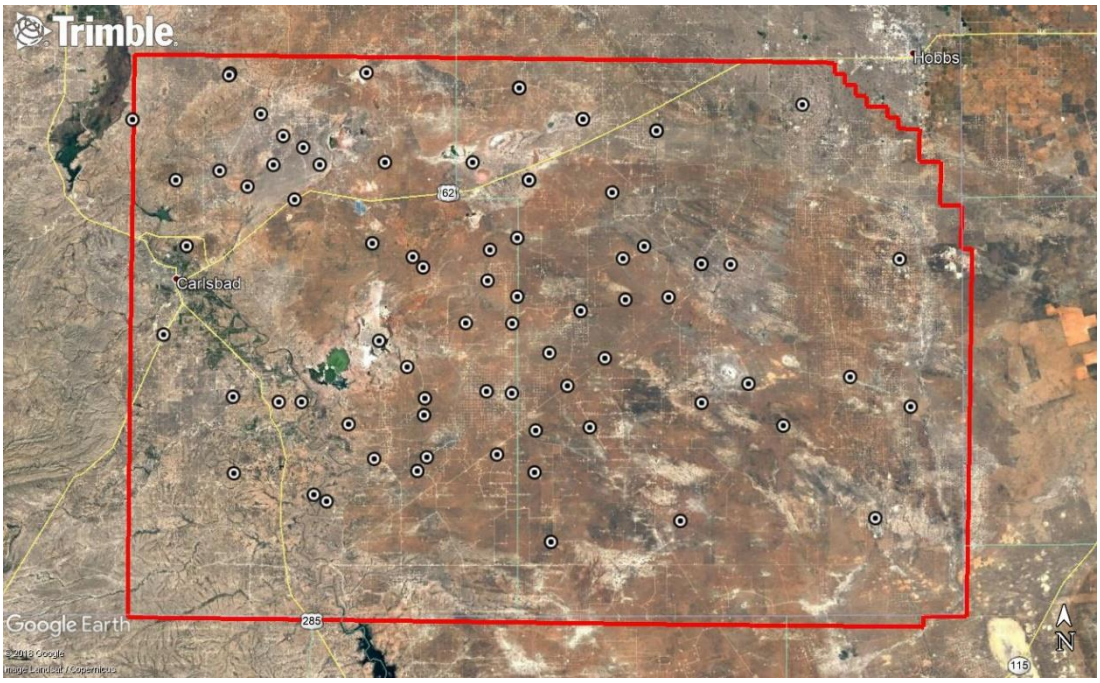


Figure 5: Vegetated Vertical Accuracy (VVA) Point Distribution

SECTION III: DATA PRODUCTION

3. Aerial LiDAR Project – Calibration/Classification

a. LiDAR Point Cloud Generation

Atlantic used Leica software products to download the IPAS ABGNSS/IMU data and raw laser scan files from the airborne system. Waypoint Inertial Explorer is used to extract the raw IPAS ABGNSS/IMU data, which is further processed in combination with controlled base stations to provide the final Smoothed Best Estimate Trajectory (SBET) for each mission. The SBETs are combined with the raw laser scan files to export the LiDAR ASCII Standard (*.las) formatted swath point clouds.

b. Coordinate Reference System

Horizontal Datum: NAD83(NSRS2011)
Coordinate System: UTM 13N
Vertical Datum: NAVD88
Geoid Model: 12B
Units of Reference: Meter

c. LiDAR Point Cloud Statistics

Category	Value
Total Points	30,392,955,245
Nominal Pulse Spacing (m)	0.6224
Nominal Pulse Density (pls/m²)	2.5818
Nominal Pulse Spacing (ft)	2.0418
Nominal Pulse Density (pls/ft²)	0.2399
Aggregate Total Points	29,356,802,635
Aggregate Nominal Pulse Spacing (m)	0.5508
Aggregate Nominal Pulse Density (pls/m²)	3.2957
Aggregate Nominal Pulse Spacing (ft)	1.8072
Aggregate Nominal Pulse Density (pls/ft²)	0.3062

Table 9: LiDAR Point Cloud Statistics

d. Smooth Surface Repeatability (Interswath)

Departures from planarity of first returns within single swaths in non-vegetated areas were assessed at multiple locations with hard surface areas (parking lots or large rooftops) inside the project area. Each area was evaluated using signed difference rasters (maximum elevation – minimum elevation) at a cell size equal to 2 x ANPS, rounded to the next integer. The following figure depicts a sample of the assessment.

e. LiDAR Calibration

Using a combination of GeoCue, TerraScan and TerraMatch; overlapping swath point clouds are corrected for any orientation or linear deviations to obtain the best fit swath-to-swath calibration. Relative calibration was evaluated using advanced plane-matching analysis and parameter corrections derived. This process was repeated interactively until residual errors between overlapping swaths, across all project missions, was reduced to ≤2cm. A final analysis of the calibrated lidar is preformed using a TerraMatch tie line report for an overall statistical model of the project area. Individual control point assessments for this project can be found in Section VI of this report.

Upon completion of the data calibration, a complete set of elevation difference intensity rasters (dZ Orthos) are produced. A user-defined color ramp is applied depicting the offsets between overlapping swaths based on project specifications. The dZ orthos provide an opportunity to review the data calibration in a qualitative manner. Atlantic assigns green to all offset values that fall below the required RMSDz requirement of the project. A yellow color is assigned for offsets that fall between the RMSDz value and 1.5x of that value. Finally, red values are assigned to all values that fall beyond 1.5x of the RMSDz requirements of the project.

f. LiDAR Classification

Multiple automated filtering routines are applied to the calibrated LiDAR point cloud identifying and extracting bare-earth and above ground features. GeoCue, TerraScan, and TerraModeler software was used for the initial batch processing, visual inspection and any manual editing of the LiDAR point clouds. Atlantic utilized collected breakline data to preform classification for classes 9 (Water) and 20 (Ignored Ground).

Code	Description
1	Processed, but unclassified
2	Bare-earth ground
7	Low Noise
9	Water
17	Bridge Decks
18	High Noise
20	Ignored Ground (breakline proximity)
21	Snow (if present and identifiable)
22	Temporal exclusion

Table 10: LiDAR Point Classification Codes and Descriptions

g. LiDAR Intensity Imagery

LiDAR intensity imagery was created from the final calibrated and classified lidar point cloud. Intensity images were produced from all classified points and posted to a 1.0-meter cell size. Intensity images were cut to match the tile index and its corresponding tile names and delivered in .tif format.

h. Hydro-line Collection/Conflation

Hydro breaklines were compiled using LiDAR intensity data and surface terrain models of the entire project area. After the collection, all delineated hydro features were validated for monotonicity and vertical variance. This procedure ensures that no points were floating above ground. Hydro-lines were then encoded into the LiDAR surface and used to hydro-enforce/flatten all significant water bodies. These final hydro-lines were then used in the production of bare Earth digital models to hydro flatten significant water bodies. This product was delivered as an ESRI geodatabase for the entire project area.

i. Bare-Earth Surface – Digital Elevation Model (DEM)

Bare earth Digital Elevation Models (DEMs) were derived using the hydro-lines and bare earth (ground) LiDAR points. All DEMs were created with a grid spacing of 1.0 meter. DEMs for this project were cut to match the tile index and its corresponding tile names and delivered in 32-bit floating point .tif format.

SECTION IV: ACCURACY ASSESSMENT

1. Aerial LiDAR Project – Vertical Accuracy Assessment

a. Requirements

Per the table below, the Vertical Accuracy Assessment utilized the required parameters for Vertical Data Accuracy Class IV.

Vertical Data Accuracy Class	RMSEz in Non-Vegetated Terrain (cm)	Non-Vegetated Vertical Accuracy (NVA) at 95% Confidence Level (cm)	Vegetated Vertical Accuracy (VVA) at 95th Percentile (cm)
I	1.0	2.0	2.9
II	2.5	4.9	7.4
III	5.0	9.8	14.7
IV	10.0	19.6	29.4
V	12.5	24.5	36.8
VI	20.0	39.2	58.8
VII	33.3	65.3	98.0
VIII	66.7	130.7	196.0
IX	100.0	196.0	294.0
X	333.3	653.3	980.0

Table 11: Vertical Accuracy Standards, Source: ASPRS Positional Accuracy Standards for Digital Geospatial Data v1.0 (2014)

*The terms NVA and VVA are from the American Society for Photogrammetry and Remote Sensing (ASPRS) Positional Accuracy Standards for Digital Geospatial Data v1.0 (2014). The term NVA refers to assessments in clear, open areas (which typically produce only single LiDAR returns); the term VVA refers to assessments in vegetated areas (typically characterized by multiple return LiDAR).

b. Results

An overall statistical assessment of the check points can be found in the following two tables (values provided in meters):

Broad Land Cover Type	# of Points	RMSEz	95% Confidence Level	95th Percentile
NVA of Point Cloud	49	0.0998	0.1957	0.1250
VVA of Point Cloud	76	0.1666	0.3266	0.2578
NVA of DEM	49	0.0427	0.0836	0.0036
VVA of DEM	76	0.0611	0.1197	0.1024

Table 12: NVA/VVA Accuracies

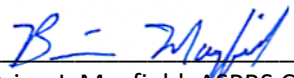
SECTION V: CERTIFICATION STATEMENTS

1. Aerial LiDAR Project

This accuracy assessment confirms that the data may be used for the intended applications stated in Section I of this document. This dataset may also be used as a topographic input for other applications, but the user should be aware that this LiDAR dataset was designed with a specific purpose and was not intended to meet specifications and/or requirements of users outside of the United States Geological Survey.

It should also be noted that LiDAR points do not represent a continuous surface model. LiDAR points are discrete measurements of the surface and any values derived within a triangle of three LiDAR points are interpolated. As such, the user should not use the resultant LiDAR dataset for vertical placement of a planimetric feature such as a headwall, building footprint or any other planimetric feature unless there is an associated LiDAR point that can be reasonably located on this structure.

Consideration should be given by the end user of this dataset to the fact that this LiDAR dataset was developed differently and separately than previous LiDAR datasets that may be available for this geographic location. It is likely that the data in this project was created using different geodetic control, a different Geoid, newer LiDAR technology and more up-to-date processing techniques. As such, any direct comparative analysis performed between this dataset and previous datasets could result in misleading or inaccurate results. Users are encouraged to proceed with caution while performing this type of comparative analysis and to completely understand the variables that make each of these datasets unique and not corollary.
It is encouraged that the user refers to the full FGDC Metadata and project reports for a complete understanding on the content of this dataset.
I, hereby, certify to the extent of my knowledge that the statements and statistics represented in this document are true and factual.



Brian J. Mayfield, ASPRS Certified Photogrammetrist #R1276

SECTION VI: CONTROL POINT ASSESSMENTS

1. Aerial LiDAR Project

a. Point Cloud Check Point Assessment

Point ID	Easting	Northing	KnownZ	LaserZ	Description	DeltaZ
UR_N0	585308.6240	3606502.3580	1001.3520	1001.3910	URBAN TERRAIN	0.0390
UR46	570873.2160	3587348.0090	956.8460	956.8890	URBAN TERRAIN	0.0430
UR062	570966.2940	3579716.3610	980.2620	980.3160	URBAN TERRAIN	0.0540
UR134	570610.9060	3563303.4370	982.9390	982.9930	URBAN TERRAIN	0.0540
BE_N0	634227.9190	3596227.6540	1171.0660	1171.1210	BARE EARTH	0.0550
BE_N0	591324.7640	3615967.1410	1034.3460	1034.4040	BARE EARTH	0.0580
BE022	573522.5140	3573943.5890	970.6650	970.7230	BARE EARTH	0.0580
OT115	573099.5140	3614984.3350	1071.5580	1071.6160	OPEN TERRAIN	0.0580
OT_N0	598736.6000	3559514.7160	936.0930	936.1570	OPEN TERRAIN	0.0640
UR_N0	575358.5710	3605275.8070	997.9650	998.0320	URBAN TERRAIN	0.0670
UR_N1	631037.3690	3600842.9910	1124.3080	1124.3760	URBAN TERRAIN	0.0680
OT22	577694.7220	3598120.3370	980.1770	980.2510	OPEN TERRAIN	0.0740
UR89	667025.2810	3547439.7200	893.7360	893.8130	URBAN TERRAIN	0.0770
UR103	577754.8380	3616192.4550	1076.5510	1076.6330	URBAN TERRAIN	0.0820
OT_N1	587606.5120	3597788.4840	1005.2040	1005.2900	OPEN TERRAIN	0.0860
OT028	621855.9550	3605346.7800	1074.7250	1074.8120	OPEN TERRAIN	0.0870
OT118	652529.7790	3581586.9250	1086.5250	1086.6130	OPEN TERRAIN	0.0880
BE_N0	584023.9120	3608479.8640	998.8980	998.9880	BARE EARTH	0.0900
UR_N0	603245.0040	3598953.7300	1085.5020	1085.5950	URBAN TERRAIN	0.0930
BE18	616787.4980	3554733.8500	1025.8220	1025.9190	BARE EARTH	0.0970
OT_N0	640659.1820	3587824.3060	1100.9730	1101.0700	OPEN TERRAIN	0.0970
UR104	598162.4800	3584216.0370	960.3900	960.4890	URBAN TERRAIN	0.0990
BE017	595547.5600	3551289.9770	910.1020	910.2040	BARE EARTH	0.1020
BE_N0	572699.3250	3605701.9350	1012.1050	1012.2090	BARE EARTH	0.1040
OT120	580969.6530	3560621.6420	947.6530	947.7600	OPEN TERRAIN	0.1070
BE_N1	590993.1520	3610684.7170	1017.3940	1017.5020	BARE EARTH	0.1080
OT_N0	632628.3850	3594581.3000	1158.6400	1158.7490	OPEN TERRAIN	0.1090
UR099	583099.9950	3565755.8330	930.7280	930.8400	URBAN TERRAIN	0.1120
UR106	588934.1100	3543702.4950	898.8880	899.0000	URBAN TERRAIN	0.1120
BE_N0	600683.6800	3601165.1510	1082.5730	1082.6860	BARE EARTH	0.1130
BE077	603212.0830	3613422.9690	1043.2280	1043.3410	BARE EARTH	0.1130
BE076	601564.0980	3604070.3820	1053.9380	1054.0520	BARE EARTH	0.1140
OT29	613658.8000	3572983.5740	1020.0210	1020.1360	OPEN TERRAIN	0.1150
UR_N0	608501.5010	3560157.2970	1040.2810	1040.3960	URBAN TERRAIN	0.1150
BE_N1	590576.5580	3599697.5600	1019.6500	1019.7660	BARE EARTH	0.1160

Point ID	Easting	Northing	KnownZ	LaserZ	Description	DeltaZ
UR86	610329.6630	3577451.6460	1003.6770	1003.7940	URBAN TERRAIN	0.1170
UR105	618635.2100	3569009.2670	1074.3290	1074.4470	URBAN TERRAIN	0.1180
BE19	633230.7280	3564668.5420	1088.4820	1088.6010	BARE EARTH	0.1190
OT117	638794.4210	3601415.5810	1130.4270	1130.5460	OPEN TERRAIN	0.1190
OT117	638794.3580	3601415.5660	1130.4290	1130.5480	OPEN TERRAIN	0.1190
BE_N0	616289.4330	3593513.9850	1084.5760	1084.6970	BARE EARTH	0.1210
OT_N1	584159.6790	3615930.1920	1030.9120	1031.0330	OPEN TERRAIN	0.1210
OT_N1	605338.1910	3594293.1620	1007.7640	1007.8860	OPEN TERRAIN	0.1220
OT94	673385.0250	3548433.9640	906.6320	906.7540	OPEN TERRAIN	0.1220
UR88	659763.6460	3601751.2820	1077.5030	1077.6250	URBAN TERRAIN	0.1220
BE72	603427.1850	3585791.3220	960.4600	960.5850	BARE EARTH	0.1250
OT_N0	615274.7080	3561357.2900	1059.4300	1059.5550	OPEN TERRAIN	0.1250
BE_N0	620141.3030	3577183.3430	1067.5700	1067.6960	BARE EARTH	0.1260
BE_N0	602380.3560	3561182.6670	981.2820	981.4080	BARE EARTH	0.1260
BR059	590306.5550	3570633.6420	912.7900	912.7950	BRUSH	0.0050
TR_N1	592430.5890	3603490.9110	1010.7640	1010.8090	TREE	0.0450
TR_N0	605541.5680	3590890.1580	957.2220	957.2740	TREE	0.0520
HG062	613719.2300	3604052.8990	1071.4100	1071.4760	HIGH GRASS	0.0660
HG_N0	582392.1840	3600348.2920	986.2110	986.2910	HIGH GRASS	0.0800
BR_N0	598789.7630	3616309.4120	1035.8920	1035.9740	BRUSH	0.0820
BR77	572393.7870	3601137.5270	1020.1450	1020.2280	BRUSH	0.0830
TR083	652438.7250	3573930.2200	1030.3830	1030.4690	TREE	0.0860
BR_N1	617603.7540	3563713.6190	1085.1460	1085.2370	BRUSH	0.0910
TR_N0	628988.7230	3583710.7700	1129.4730	1129.5640	TREE	0.0910
TR07	645963.7630	3571214.7110	1052.7240	1052.8150	TREE	0.0910
XVVA1	570946.2230	3579718.4940	980.5940	980.6880	BRUSH	0.0940
HG_N1	601520.3780	3603918.3010	1055.6580	1055.7530	HIGH GRASS	0.0950
TR_N1	588999.7700	3598618.6630	1012.2740	1012.3740	TREE	0.1000
BR_N0	587289.2640	3607405.4810	1013.0390	1013.1420	BRUSH	0.1030
HG_N0	606997.0970	3589453.3690	969.8300	969.9340	HIGH GRASS	0.1040
BR85	645689.2450	3590417.5500	1120.5180	1120.6250	BRUSH	0.1070
HG64	579784.5640	3615983.2860	1052.7600	1052.8670	HIGH GRASS	0.1070
BR85	645689.2440	3590417.5480	1120.5170	1120.6250	BRUSH	0.1080
TR48	673289.3110	3591429.3420	1040.5650	1040.6740	TREE	0.1090
BR27	627269.8610	3573337.8790	1125.2550	1125.3650	BRUSH	0.1100
TR084	643221.4200	3554842.3510	1022.2860	1022.3960	TREE	0.1100
BR43	574005.7830	3592017.4260	976.3290	976.4420	BRUSH	0.1130
BR84	616004.2570	3587727.1430	1062.8360	1062.9530	BRUSH	0.1170
TR08	621585.2010	3601691.9600	1092.4030	1092.5220	TREE	0.1190

Point ID	Easting	Northing	KnownZ	LaserZ	Description	DeltaZ
TR_N0	600516.1270	3562887.3820	941.9950	942.1150	TREE	0.1200
HG_N0	592154.9310	3557809.4700	886.4360	886.5610	HIGH GRASS	0.1250
HG_N0	619564.1850	3572216.3610	1074.5240	1074.6520	HIGH GRASS	0.1280
TR08	621585.2550	3601691.9560	1092.3910	1092.5210	TREE	0.1300
BR_N1	637689.5580	3592735.6150	1156.9750	1157.1060	BRUSH	0.1310
HG_N0	619495.8640	3581858.9010	1080.3370	1080.4680	HIGH GRASS	0.1310
BR060	649749.1190	3590385.6780	1106.8130	1106.9450	BRUSH	0.1320
BR_N0	641178.0420	3585736.4390	1074.5900	1074.7330	BRUSH	0.1430
TR_N0	634770.3640	3591014.2450	1123.3700	1123.5130	TREE	0.1430
TR_N1	590102.3140	3605835.0540	1009.6400	1009.7840	TREE	0.1440
BR08	596888.6080	3567633.1040	929.4680	929.6180	BRUSH	0.1500
TR_N1	578482.0940	3602496.9090	984.6250	984.7790	TREE	0.1540
HG59	675114.4220	3571022.7370	991.8250	991.9810	HIGH GRASS	0.1560
TR_N0	632426.8950	3577209.3100	1127.1810	1127.3370	TREE	0.1560
HG_N1	579624.6400	3615740.0180	1054.0950	1054.2560	HIGH GRASS	0.1610
HG93	659481.5060	3612622.7240	1125.5540	1125.7170	HIGH GRASS	0.1630
BR17	613037.9880	3581833.3180	1033.5460	1033.7110	BRUSH	0.1650
TR06	622852.2200	3561310.3960	1063.9710	1064.1380	TREE	0.1670
TR47	666605.7010	3575034.8790	1025.4320	1025.5990	TREE	0.1670
BR_N0	607856.2400	3563221.1910	1042.7170	1042.8860	BRUSH	0.1690
HG60	639216.9840	3608733.7300	1124.7340	1124.9030	HIGH GRASS	0.1690
HG60	639216.9810	3608733.7300	1124.7330	1124.9030	HIGH GRASS	0.1700
HG_N0	630448.3370	3567635.9360	1100.6600	1100.8310	HIGH GRASS	0.1710
TR_N0	616278.5890	3591991.8490	1065.7520	1065.9230	TREE	0.1710
HG61	620049.7830	3593674.2650	1097.6940	1097.8670	HIGH GRASS	0.1730
BR_N0	620151.5470	3585571.1710	1106.4720	1106.6470	BRUSH	0.1750
TR046	604954.8460	3575660.3080	943.0460	943.2210	TREE	0.1750
TR044	628973.3650	3610205.5500	1097.8510	1098.0310	TREE	0.1800
BR064	580734.0650	3571214.9220	948.3130	948.4940	BRUSH	0.1810
TR044	628973.3590	3610205.5500	1097.8490	1098.0320	TREE	0.1830
TR_N0	616040.8240	3572424.2200	1033.5130	1033.7000	TREE	0.1870
XVVA1	580982.5930	3560640.0070	947.4810	947.6730	BRUSH	0.1920
HG57	625261.2640	3551717.1510	1027.6030	1027.7980	HIGH GRASS	0.1950
TR05	593942.8080	3556918.6160	903.3620	903.5590	TREE	0.1970
TR_N0	624704.2730	3577844.6500	1121.8070	1122.0060	TREE	0.1990
HG058	657369.6140	3568197.2030	1059.8700	1060.0700	HIGH GRASS	0.2000
TR_N1	584132.8070	3610415.3330	1007.2930	1007.4950	TREE	0.2020
BR_N0	622944.0390	3567112.6680	1104.6490	1104.8520	BRUSH	0.2030
BR28	585974.1900	3603395.3730	996.9850	997.1880	BRUSH	0.2030

Point ID	Easting	Northing	KnownZ	LaserZ	Description	DeltaZ
HG_N0	635183.6120	3585327.9240	1081.1540	1081.3570	HIGH GRASS	0.2030
HG_N1	607394.5770	3569033.2290	1064.7070	1064.9100	HIGH GRASS	0.2030
HG_N0	606550.0270	3561300.6630	1021.1860	1021.3970	HIGH GRASS	0.2110
TR09	620068.4440	3614420.5030	1107.2240	1107.4520	TREE	0.2280
TR09	620068.4390	3614420.5050	1107.2230	1107.4520	TREE	0.2290
HG51	566215.8020	3609457.0320	1046.5160	1046.7650	HIGH GRASS	0.2490
HG056	601000.6250	3579239.0410	916.8700	917.1230	HIGH GRASS	0.2530
BR18	670400.0720	3555515.3100	939.0720	939.3290	BRUSH	0.2570
HG_N0	607480.7230	3571350.9990	1021.7900	1022.0500	HIGH GRASS	0.2600
BR_N0	633164.4530	3600124.0240	1140.0950	1140.4030	BRUSH	0.3080
TR082	587127.9550	3570588.8880	931.6730	931.9960	TREE	0.3230
TR45	599901.4980	3592697.9220	1000.0970	1000.4210	TREE	0.3240

Table 13: Point Cloud Check Point Assessment

b. Digital Elevation Model (DEM) Check Point Assessment

Point ID	Easting	Northing	KnownZ	DEMZ	Description	DeltaZ
BE_N0	634227.9190	3596227.6540	1171.0660	1170.9912	BARE EARTH	(0.0748)
BE_N0	591324.7640	3615967.1410	1034.3460	1034.2818	BARE EARTH	(0.0641)
BE_N0	584023.9120	3608479.8640	998.8980	998.8559	BARE EARTH	(0.0421)
BE_N0	572699.3250	3605701.9350	1012.1050	1012.0608	BARE EARTH	(0.0442)
BE_N0	600683.6800	3601165.1510	1082.5730	1082.5749	BARE EARTH	0.0019
BE_N0	616289.4330	3593513.9850	1084.5760	1084.5645	BARE EARTH	(0.0115)
BE_N0	620141.3030	3577183.3430	1067.5700	1067.5774	BARE EARTH	0.0075
BE_N0	602380.3560	3561182.6670	981.2820	981.2581	BARE EARTH	(0.0239)
BE_N1	590993.1520	3610684.7170	1017.3940	1017.3783	BARE EARTH	(0.0157)
BE_N1	590576.5580	3599697.5600	1019.6500	1019.6239	BARE EARTH	(0.0261)
BE017	595547.5600	3551289.9770	910.1020	910.0531	BARE EARTH	(0.0489)
BE022	573522.5140	3573943.5890	970.6650	970.5974	BARE EARTH	(0.0676)
BE076	601564.0980	3604070.3820	1053.9380	1053.9283	BARE EARTH	(0.0097)
BE077	603212.0830	3613422.9690	1043.2280	1043.2192	BARE EARTH	(0.0088)
BE18	616787.4980	3554733.8500	1025.8220	1025.7893	BARE EARTH	(0.0327)
BE19	633230.7280	3564668.5420	1088.4820	1088.4470	BARE EARTH	(0.0351)
BE72	603427.1850	3585791.3220	960.4600	960.4648	BARE EARTH	0.0048
OT_N0	598736.6000	3559514.7160	936.0930	936.0309	OPEN TERRAIN	(0.0621)
OT_N0	640659.1820	3587824.3060	1100.9730	1100.9430	OPEN TERRAIN	(0.0300)
OT_N0	632628.3850	3594581.3000	1158.6400	1158.6180	OPEN TERRAIN	(0.0220)
OT_N0	615274.7080	3561357.2900	1059.4300	1059.4243	OPEN TERRAIN	(0.0058)
OT_N1	587606.5120	3597788.4840	1005.2040	1005.1671	OPEN TERRAIN	(0.0369)
OT_N1	584159.6790	3615930.1920	1030.9120	1030.9088	OPEN TERRAIN	(0.0032)

Point ID	Easting	Northing	KnownZ	DEMZ	Description	DeltaZ
OT_N1	605338.1910	3594293.1620	1007.7640	1007.7608	OPEN TERRAIN	(0.0032)
OT028	621855.9550	3605346.7800	1074.7250	1074.6776	OPEN TERRAIN	(0.0474)
OT115	573099.5140	3614984.3350	1071.5580	1071.4965	OPEN TERRAIN	(0.0615)
OT117	638794.4210	3601415.5810	1130.4270	1130.4246	OPEN TERRAIN	(0.0024)
OT117	638794.3580	3601415.5660	1130.4290	1130.4256	OPEN TERRAIN	(0.0034)
OT118	652529.7790	3581586.9250	1086.5250	1086.5030	OPEN TERRAIN	(0.0220)
OT120	580969.6530	3560621.6420	947.6530	947.6377	OPEN TERRAIN	(0.0153)
OT22	577694.7220	3598120.3370	980.1770	980.1248	OPEN TERRAIN	(0.0522)
OT29	613658.8000	3572983.5740	1020.0210	1020.0222	OPEN TERRAIN	0.0012
OT94	673385.0250	3548433.9640	906.6320	906.6376	OPEN TERRAIN	0.0056
UR_N0	585308.6240	3606502.3580	1001.3520	1001.2612	URBAN TERRAIN	(0.0908)
UR_N0	575358.5710	3605275.8070	997.9650	997.8999	URBAN TERRAIN	(0.0651)
UR_N0	603245.0040	3598953.7300	1085.5020	1085.4570	URBAN TERRAIN	(0.0450)
UR_N0	608501.5010	3560157.2970	1040.2810	1040.2713	URBAN TERRAIN	(0.0097)
UR_N1	631037.3690	3600842.9910	1124.3080	1124.2457	URBAN TERRAIN	(0.0623)
UR062	570966.2940	3579716.3610	980.2620	980.1852	URBAN TERRAIN	(0.0768)
UR099	583099.9950	3565755.8330	930.7280	930.7269	URBAN TERRAIN	(0.0011)
UR103	577754.8380	3616192.4550	1076.5510	1076.5068	URBAN TERRAIN	(0.0442)
UR104	598162.4800	3584216.0370	960.3900	960.3093	URBAN TERRAIN	(0.0807)
UR105	618635.2100	3569009.2670	1074.3290	1074.3174	URBAN TERRAIN	(0.0116)
UR106	588934.1100	3543702.4950	898.8880	898.8650	URBAN TERRAIN	(0.0230)
UR134	570610.9060	3563303.4370	982.9390	982.8721	URBAN TERRAIN	(0.0669)
UR46	570873.2160	3587348.0090	956.8460	956.7623	URBAN TERRAIN	(0.0837)
UR86	610329.6630	3577451.6460	1003.6770	1003.6678	URBAN TERRAIN	(0.0092)
UR88	659763.6460	3601751.2820	1077.5030	1077.4993	URBAN TERRAIN	(0.0038)
UR89	667025.2810	3547439.7200	893.7360	893.6782	URBAN TERRAIN	(0.0578)
HG_N0	592154.9310	3557809.4700	886.4360	886.4190	HIGH GRASS	(0.0170)
TR05	593942.8080	3556918.6160	903.3620	903.4324	TREE	0.0704
BR059	590306.5550	3570633.6420	912.7900	912.6607	BRUSH	(0.1293)
HG056	601000.6250	3579239.0410	916.8700	916.9678	HIGH GRASS	0.0978
BR08	596888.6080	3567633.1040	929.4680	916.9678	BRUSH	0.0978
TR082	587127.9550	3570588.8880	931.6730	931.7324	TREE	0.0594
BR18	670400.0720	3555515.3100	939.0720	931.7324	BRUSH	0.0594
TR_N0	600516.1270	3562887.3820	941.9950	941.9851	TREE	(0.0099)
TR046	604954.8460	3575660.3080	943.0460	941.9851	TREE	(0.0099)
XVVA1	580982.5930	3560640.0070	947.4810	943.0853	BRUSH	0.0393
BR064	580734.0650	3571214.9220	948.3130	948.3452	BRUSH	0.0322
TR_N0	605541.5680	3590890.1580	957.2220	957.1560	TREE	(0.0660)
HG_N0	606997.0970	3589453.3690	969.8300	957.1560	HIGH GRASS	(0.0660)

Point ID	Easting	Northing	KnownZ	DEMZ	Description	DeltaZ
BR43	574005.7830	3592017.4260	976.3290	976.3167	BRUSH	(0.0123)
XVVA1	570946.2230	3579718.4940	980.5940	980.5613	BRUSH	(0.0327)
TR_N1	578482.0940	3602496.9090	984.6250	984.6113	TREE	(0.0137)
HG_N0	582392.1840	3600348.2920	986.2110	986.1666	HIGH GRASS	(0.0444)
HG59	675114.4220	3571022.7370	991.8250	986.1666	HIGH GRASS	(0.0444)
BR28	585974.1900	3603395.3730	996.9850	997.0541	BRUSH	0.0691
TR45	599901.4980	3592697.9220	1000.0970	1000.3238	TREE	0.2268
TR_N1	584132.8070	3610415.3330	1007.2930	1000.3238	TREE	0.2268
TR_N1	590102.3140	3605835.0540	1009.6400	1007.3731	TREE	0.0801
TR_N1	592430.5890	3603490.9110	1010.7640	1010.7060	TREE	(0.0580)
TR_N1	588999.7700	3598618.6630	1012.2740	1012.2563	TREE	(0.0177)
BR_N0	587289.2640	3607405.4810	1013.0390	1012.2563	BRUSH	(0.0177)
BR77	572393.7870	3601137.5270	1020.1450	1013.0120	BRUSH	(0.0270)
HG_N0	606550.0270	3561300.6630	1021.1860	1021.2379	HIGH GRASS	0.0519
HG_N0	607480.7230	3571350.9990	1021.7900	1021.8313	HIGH GRASS	0.0413
TR084	643221.4200	3554842.3510	1022.2860	1021.8313	TREE	0.0413
TR47	666605.7010	3575034.8790	1025.4320	1022.2867	TREE	0.0007
HG57	625261.2640	3551717.1510	1027.6030	1025.4669	HIGH GRASS	0.0349
TR083	652438.7250	3573930.2200	1030.3830	1027.6767	TREE	0.0737
TR_N0	616040.8240	3572424.2200	1033.5130	1033.5760	TREE	0.0631
BR17	613037.9880	3581833.3180	1033.5460	1033.5760	BRUSH	0.0631
BR_N0	598789.7630	3616309.4120	1035.8920	1035.8587	BRUSH	(0.0333)
TR48	673289.3110	3591429.3420	1040.5650	1040.5573	TREE	(0.0076)
BR_N0	607856.2400	3563221.1910	1042.7170	1040.5573	BRUSH	(0.0076)
HG51	566215.8020	3609457.0320	1046.5160	1042.7570	HIGH GRASS	0.0400
TR07	645963.7630	3571214.7110	1052.7240	1052.7009	TREE	(0.0231)
HG64	579784.5640	3615983.2860	1052.7600	1052.7009	HIGH GRASS	(0.0231)
HG_N1	579624.6400	3615740.0180	1054.0950	1054.0939	HIGH GRASS	(0.0011)
HG_N1	601520.3780	3603918.3010	1055.6580	1055.6257	HIGH GRASS	(0.0323)
HG058	657369.6140	3568197.2030	1059.8700	1059.9147	HIGH GRASS	0.0447
BR84	616004.2570	3587727.1430	1062.8360	1059.9147	BRUSH	0.0447
TR06	622852.2200	3561310.3960	1063.9710	1064.0094	TREE	0.0385
HG_N1	607394.5770	3569033.2290	1064.7070	1064.0094	HIGH GRASS	0.0385
TR_N0	616278.5890	3591991.8490	1065.7520	1065.8037	TREE	0.0517
HG062	613719.2300	3604052.8990	1071.4100	1065.8037	HIGH GRASS	0.0517
HG_N0	619564.1850	3572216.3610	1074.5240	1071.3535	HIGH GRASS	(0.0565)
BR_N0	641178.0420	3585736.4390	1074.5900	1074.6022	BRUSH	0.0122
HG_N0	619495.8640	3581858.9010	1080.3370	1074.6022	HIGH GRASS	0.0122
HG_N0	635183.6120	3585327.9240	1081.1540	1080.3510	HIGH GRASS	0.0140

Point ID	Easting	Northing	KnownZ	DEMZ	Description	DeltaZ
BR_N1	617603.7540	3563713.6190	1085.1460	1085.1245	BRUSH	(0.0215)
TR08	621585.2550	3601691.9560	1092.3910	1092.4140	TREE	0.0230
TR08	621585.2010	3601691.9600	1092.4030	1092.4156	TREE	0.0126
HG61	620049.7830	3593674.2650	1097.6940	1097.7367	HIGH GRASS	0.0427
TR044	628973.3590	3610205.5500	1097.8490	1097.8948	TREE	0.0458
TR044	628973.3650	3610205.5500	1097.8510	1097.8937	TREE	0.0427
HG_N0	630448.3370	3567635.9360	1100.6600	1097.8937	HIGH GRASS	0.0427
BR_N0	622944.0390	3567112.6680	1104.6490	1100.7078	BRUSH	0.0478
BR_N0	620151.5470	3585571.1710	1106.4720	1104.7387	BRUSH	0.0897
BR060	649749.1190	3590385.6780	1106.8130	1106.7927	BRUSH	(0.0203)
TR09	620068.4390	3614420.5050	1107.2230	1106.7927	TREE	(0.0203)
TR09	620068.4440	3614420.5030	1107.2240	1107.3403	TREE	0.1163
BR85	645689.2440	3590417.5480	1120.5170	1120.4917	BRUSH	(0.0253)
BR85	645689.2450	3590417.5500	1120.5180	1120.4917	BRUSH	(0.0262)
TR_N0	624704.2730	3577844.6500	1121.8070	1120.4917	TREE	(0.0262)
TR_N0	634770.3640	3591014.2450	1123.3700	1123.3763	TREE	0.0063
HG60	639216.9810	3608733.7300	1124.7330	1123.3763	HIGH GRASS	0.0063
HG60	639216.9840	3608733.7300	1124.7340	1124.7734	HIGH GRASS	0.0404
BR27	627269.8610	3573337.8790	1125.2550	1124.7734	BRUSH	0.0394
HG93	659481.5060	3612622.7240	1125.5540	1125.5920	HIGH GRASS	0.0380
TR_N0	632426.8950	3577209.3100	1127.1810	1125.5920	TREE	0.0380
TR_N0	628988.7230	3583710.7700	1129.4730	1127.2250	TREE	0.0440
BR_N0	633164.4530	3600124.0240	1140.0950	1140.2160	BRUSH	0.1210
BR_N1	637689.5580	3592735.6150	1156.9750	1156.9821	BRUSH	0.0071

Table 14: DEM Check Point Assessment