

Sawyer County WROC – 3DEP  
Sawyer County  
LiDAR 2017

Vertical Accuracy Report

March 2018



## Project Information

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**Prepared By:** Ayres Associates

**Project Name:** Wisconsin WROC - 3DEP Sawyer County LiDAR 2017

**Sensor Info:** Leica ALS70 SN 7161 and 7178

**Required Nominal Pulse Spacing:** 0.7

**Contractor Name:** Ayres Associates

**Units:** US Survey Feet

**Date of Acquisition:** Start: 4/21/2017 Finish: 4/22/2017

## Report Information

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This report documents the absolute vertical accuracy of the LiDAR data collected for the Sawyer County, WI, QL2 LiDAR project. Independent ground control checkpoints were collected by land surveyors using Trimble GNSS equipment connected to WISCORS base stations. The checkpoints were collected in April 2017.

The checkpoints were collected under various land cover types that are predominant in the County. Each land cover type falls into either the Non-vegetated Vertical Accuracy (NVA) or the Vegetated Vertical Accuracy (VVA) group. For this project, 69 NVA points and 50 VVA points were collected throughout the County.

The following report shows the final statistics for the NVA checkpoints compared against the raw swath point cloud and the bare earth DEM, and the VVA statistics compared against the DEM. Statistics are reported for LAS and DEM by NVA and VVA categories and by land cover type.

Vertical Accuracy Specifications per USGS QL2 level:

### **LAS:**

NVA equates to 10 cm RMSEz, or 19.6 cm (0.64 ft) at the 95% confidence level.

### **DEM:**

NVA equates to 10 cm RMSEz, or 19.6 cm (0.64 ft) at the 95% confidence level.

VVA equates to 29.4 cm (0.96 ft) at the 95th percentile.

The NVA and VVA statistics for this project are within the above stated specifications.



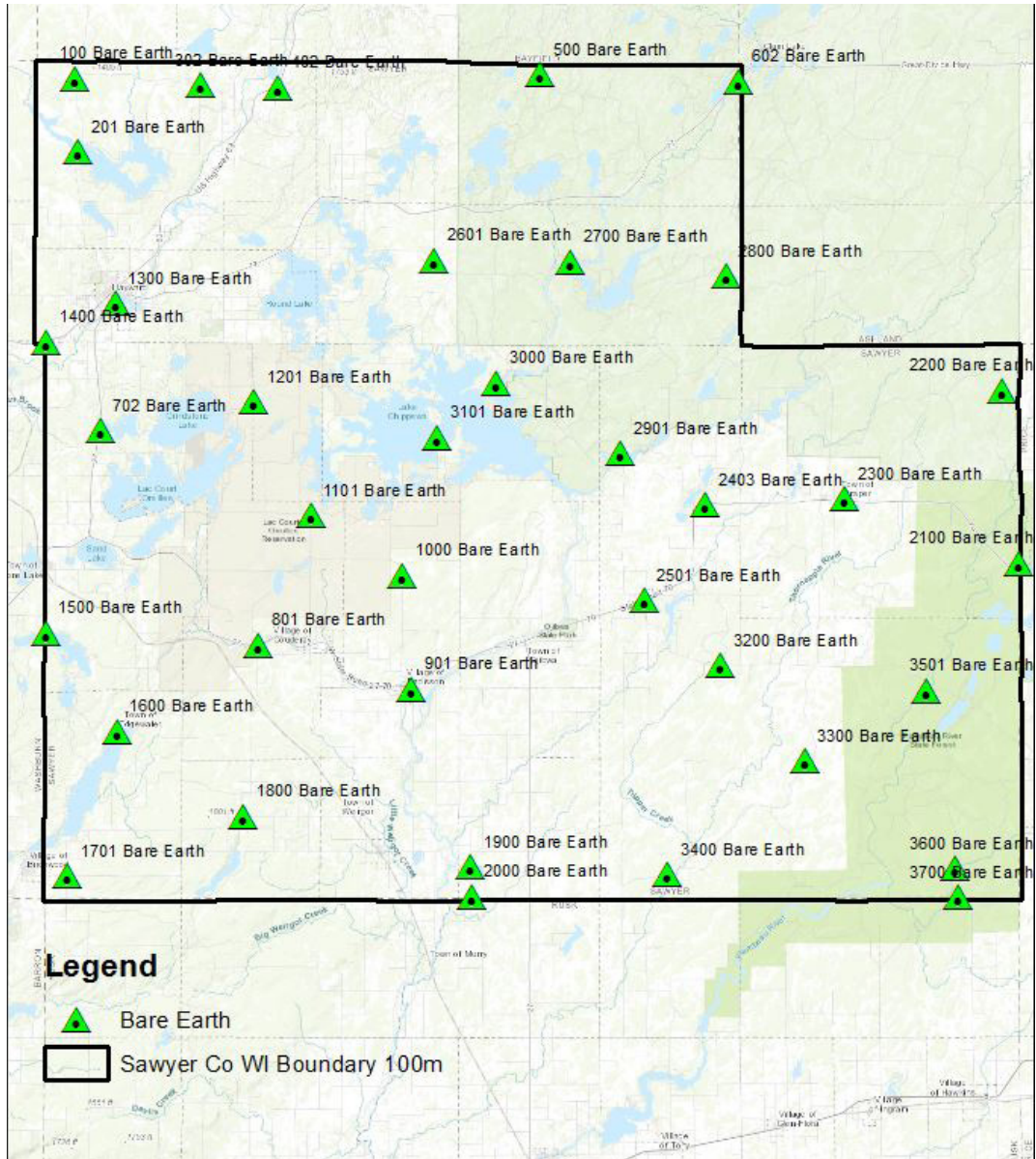
## LiDAR Accuracy Assessment Summary

LAND COVER TYPE	# OF POINTS	NVA	VVA
<b>LAS</b>		95% confidence level	N/A
1. Bare Earth	37	0.282	N/A
2. Urban Areas	32	0.243	N/A
3. Tall Weeds	22	N/A	N/A
5. Forest	23	N/A	N/A
7. Swamp	5	N/A	N/A
<b>TOTAL</b>	<b>119</b>	<b>0.264</b>	N/A
<b>DEM</b>		95% confidence level	95th percentile
1. Bare Earth	37	0.265	N/A
2. Urban Areas	32	0.220	N/A
3. Tall Weeds	22	N/A	0.582
5. Forest	23	N/A	0.513
7. Swamp	5	N/A	0.542
<b>TOTAL</b>	<b>119</b>	<b>0.246</b>	<b>0.542</b>

Units: US Survey Feet

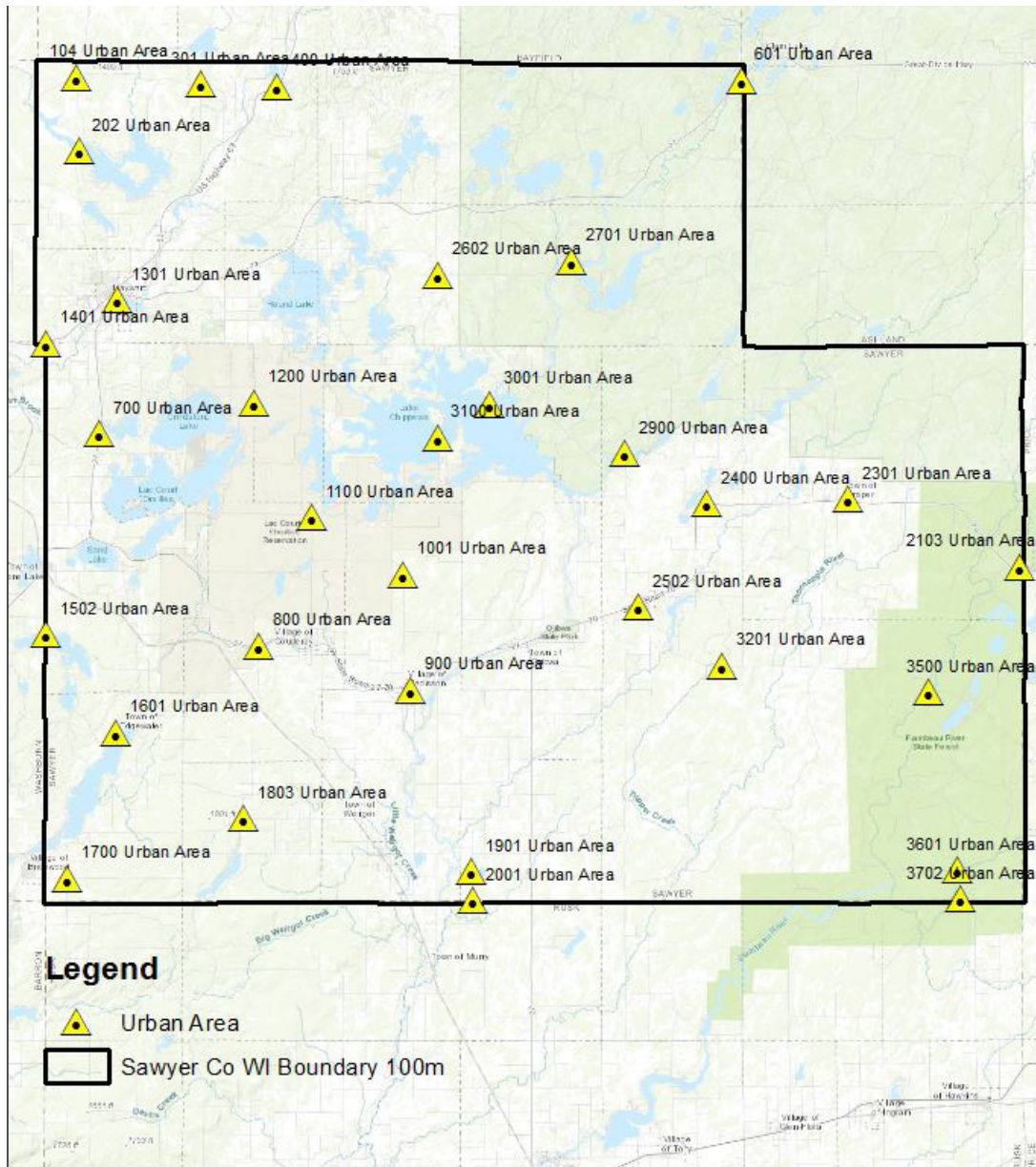


## Map of NVA Checkpoint Locations - 1. Bare Earth



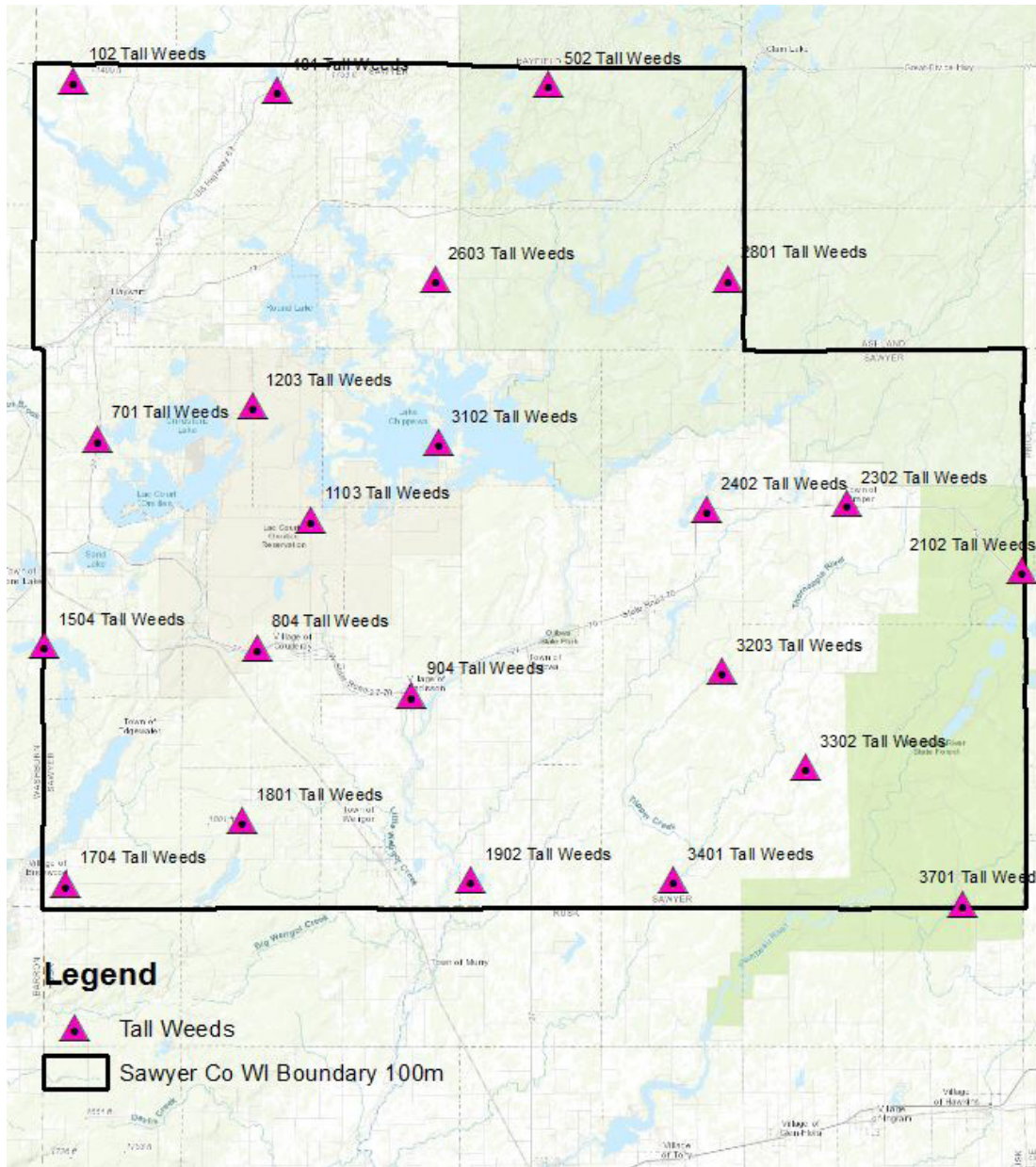


## Map of NVA Checkpoint Locations - 2. Urban Area

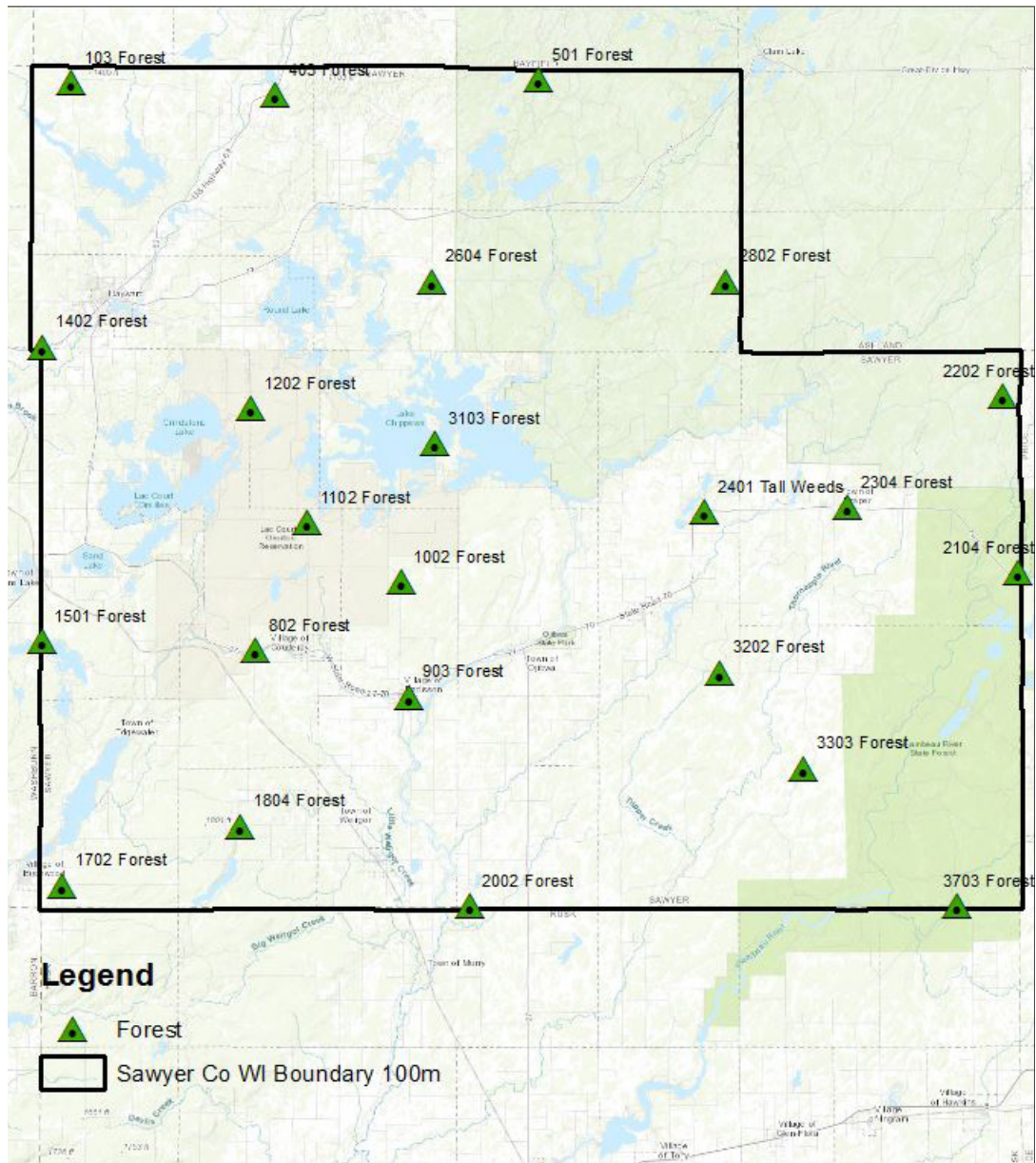




## Map of VVA Checkpoint Locations - 3. Tall Weeds

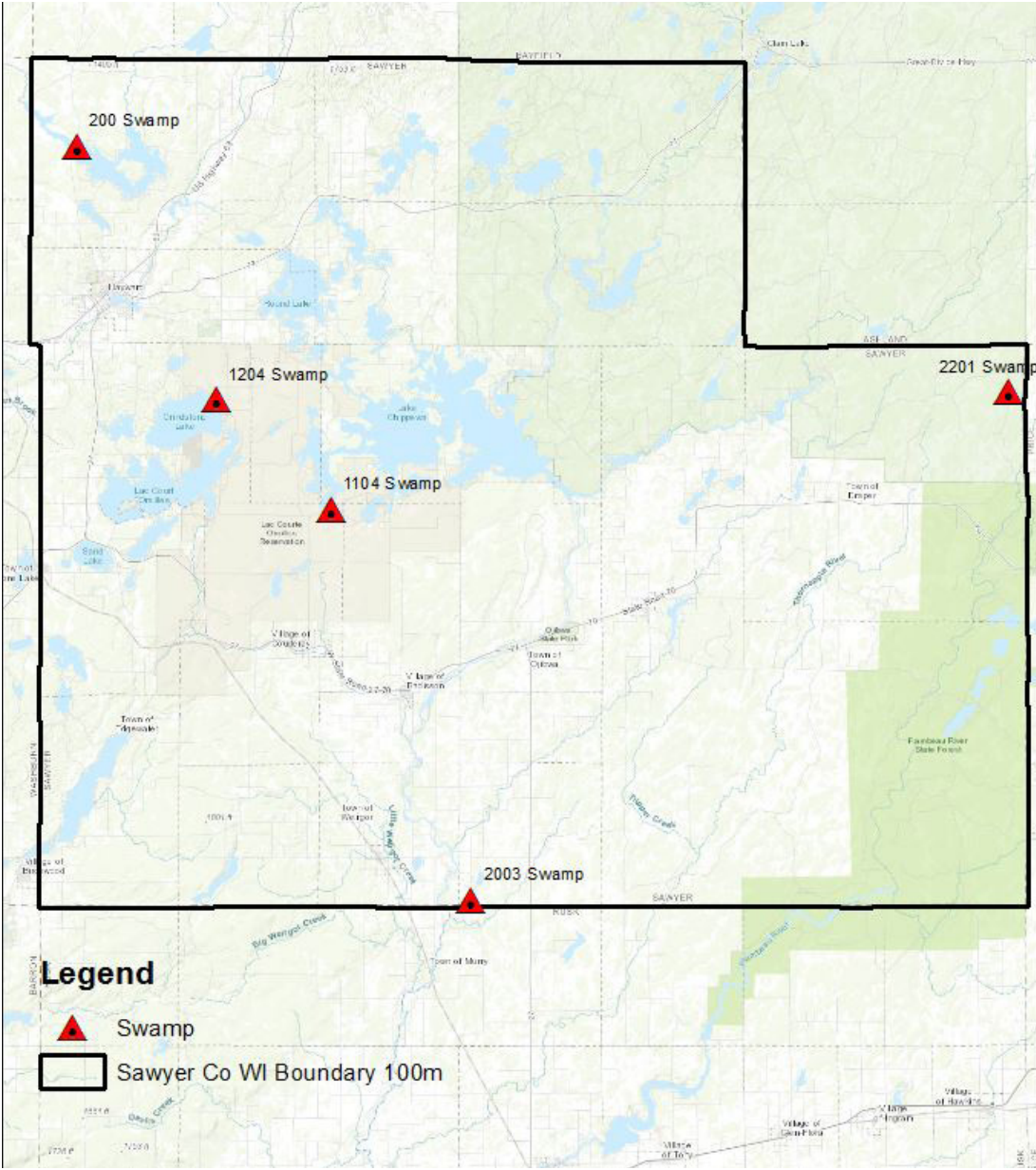


## Map of VVA Checkpoint Locations - 5. Forested Areas





# Map of VVA Checkpoint Locations - 7. Swamp



## LAS

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<b>NONVEGETATED VERTICAL ACCURACY—OVERALL</b>	
Land Cover Type	1. Bare Earth, 2 Urban Areas
Minimum DZ	-0.273
Maximum DZ	0.465
Mean DZ	-0.001
Mean Magnitude DZ	0.315
Number Observations	69
Standard Deviation DZ	0.136
RMSE Z	0.135
95% Confidence Level Z	0.264
Units	US Survey Feet

## DEM

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<b>NONVEGETATED VERTICAL ACCURACY—OVERALL</b>	
Land Cover Type	1. Bare Earth, 2. Urban Area
Minimum DZ	-0.237
Maximum DZ	0.457
Mean DZ	0.018
Mean Magnitude DZ	0.306
Number Observations	69
Standard Deviation DZ	0.125
RMSE Z	0.125
95% Confidence Level Z	0.246
Units	US Survey Feet

## DEM (Continued)

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VEGETATED VERTICAL ACCURACY	
Land Cover Type	3. Tall Weeds
Minimum DZ	-0.038
Maximum DZ	0.973
Mean DZ	0.331
Mean Magnitude DZ	0.578
Number Observations	22
Standard Deviation DZ	0.222
RMSE Z	0.395
95th Percentile	0.582
Units	US Survey Feet

## DEM (Continued)

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VEGETATED VERTICAL ACCURACY	
Land Cover Type	5. Forest
Minimum DZ	-0.211
Maximum DZ	0.612
Mean DZ	0.182
Mean Magnitude DZ	0.499
Number Observations	23
Standard Deviation DZ	0.239
RMSE Z	0.296
95th Percentile	0.513
Units	US Survey Feet

## DEM (Continued)

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<b>VEGETATED VERTICAL ACCURACY</b>	
Land Cover Type	7. Swamp
Minimum DZ	-0.238
Maximum DZ	0.542
Mean DZ	0.382
Mean Magnitude DZ	0.618
Number Observations	5
Standard Deviation DZ	0.131
RMSE Z	0.399
95th Percentile	0.542
Units	US Survey Feet



## Point: 100 Bare Earth

Survey X: 609311.17, Survey Y: 486438.6, Z1: 1284.16, Z DEM: 1284.09, Z LAS: 1284.06, LC Type: 1,  $\Delta Z$  DEM: -0.07,  $\Delta Z$  LAS: -0.1



North



South



East



West





## Point: 102 Tall Weeds

Survey X: 609470.97, Survey Y: 486387.26, Z1: 1281.75, Z DEM: 1282.04, Z LAS: 1281.99, LC Type: 3, ΔZ DEM: 0.29, ΔZ LAS: 0.24



North



South



East



West



# Point: 103 Forest

Survey X: 609396.84, Survey Y: 486606.41, Z1: 1284.89, Z DEM: 1285.5, Z LAS: 1285.09, LC Type: 5, ΔZ DEM: 0.61, ΔZ LAS: 0.2



North



South



East



West





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## Point: 104 Urban Area

Survey X: 609566.73, Survey Y: 486490.92, Z1: 1286.6, Z DEM: 1286.73, Z LAS: 1286.62, LC Type: 2, ΔZ DEM: 0.14, ΔZ LAS: 0.02



North



South



East



West





# Point: 200 Swamp

Survey X: 610738.14, Survey Y: 470675.4, Z1: 1248.43, Z DEM: 1248.68, Z LAS: 1248.93, LC Type: 7, ΔZ DEM: 0.25, ΔZ LAS: 0.51



North



South



East



West



# Point: 201 Bare Earth

Survey X: 610207.7, Survey Y: 469749.43, Z1: 1253.47, Z DEM: 1253.45, Z LAS: 1253.5, LC Type: 1, ΔZ DEM: -0.01, ΔZ LAS: 0.03



North



South



East



West





# Point: 202 Urban Area

Survey X: 610231.51, Survey Y: 469842.92, Z1: 1257.68, Z DEM: 1257.71, Z LAS: 1257.67, LC Type: 2, ΔZ DEM: 0.04, ΔZ LAS: -0.01



North



South



East



West



# Point: 301 Urban Area

Survey X: 637689.24, Survey Y: 484822.02, Z1: 1337.73, Z DEM: 1337.51, Z LAS: 1337.46, LC Type: 2, ΔZ DEM: -0.22, ΔZ LAS: -0.27



North



South



East



West





# Point: 302 Bare Earth

Survey X: 637656.61, Survey Y: 484845.93, Z1: 1336.96, Z DEM: 1337.08, Z LAS: 1337.15, LC Type: 1, ΔZ DEM: 0.12, ΔZ LAS: 0.2



North



South



East



West





# Point: 400 Urban Area

Survey X: 655010.84, Survey Y: 484369.48, Z1: 1281.03, Z DEM: 1280.8, Z LAS: 1280.79, LC Type: 2, ΔZ DEM: -0.23, ΔZ LAS: -0.24



North



South



East



West



## Point: 401 Tall Weeds

Survey X: 655228.41, Survey Y: 484175.29, Z1: 1278.52, Z DEM: 1278.49, Z LAS: 1278.59, LC Type: 3,  $\Delta Z$  DEM: -0.04,  $\Delta Z$  LAS: 0.06



North



South



East



West





## Point: 402 Bare Earth

Survey X: 655251.44, Survey Y: 484296.61, Z1: 1280.92, Z DEM: 1280.85, Z LAS: 1280.85, LC Type: 1, ΔZ DEM: -0.08, ΔZ LAS: -0.08



North



South



East



West



## Point: 403 Forest

Survey X: 655293.16, Survey Y: 483847.38, Z1: 1284.95, Z DEM: 1284.77, Z LAS: 1284.82, LC Type: 5, ΔZ DEM: -0.18, ΔZ LAS: -0.12



North



South



East



West





## Point: 500 Bare Earth

Survey X: 714622.04, Survey Y: 487247.86, Z1: 1451.28, Z DEM: 1451.04, Z LAS: 1451.02, LC Type: 1, ΔZ DEM: -0.24, ΔZ LAS: -0.26



North



South



East



West





## Point: 501 Forest

Survey X: 714507.86, Survey Y: 487281.63, Z1: 1448.85, Z DEM: 1448.75, Z LAS: 1448.82, LC Type: 5, ΔZ DEM: -0.1, ΔZ LAS: -0.03



North



South



East



West



# Point: 502 Tall Weeds

Survey X: 716255.63, Survey Y: 485503.24, Z1: 1460.08, Z DEM: 1460.32, Z LAS: 1460.2, LC Type: 3, ΔZ DEM: 0.24, ΔZ LAS: 0.12



North



South



East



West





# Point: 601 Urban Area

Survey X: 759580.79, Survey Y: 485760.78, Z1: 1471.54, Z DEM: 1471.56, Z LAS: 1471.59, LC Type: 2, ΔZ DEM: 0.02, ΔZ LAS: 0.05



North



South



East



West





# Point: 602 Bare Earth

Survey X: 759547.8, Survey Y: 485805.2, Z1: 1471.23, Z DEM: 1471.21, Z LAS: 1471.2, LC Type: 1, ΔZ DEM: -0.02, ΔZ LAS: -0.03



North



South



East



West





# Point: 700 Urban Area

Survey X: 614846.91, Survey Y: 406118.54, Z1: 1303.87, Z DEM: 1303.88, Z LAS: 1303.84, LC Type: 2, ΔZ DEM: 0.01, ΔZ LAS: -0.02



North



South



East



West





# Point: 701 Tall Weeds

Survey X: 614805.1, Survey Y: 405928.79, Z1: 1305.87, Z DEM: 1305.94, Z LAS: 1306.01, LC Type: 3, ΔZ DEM: 0.08, ΔZ LAS: 0.14



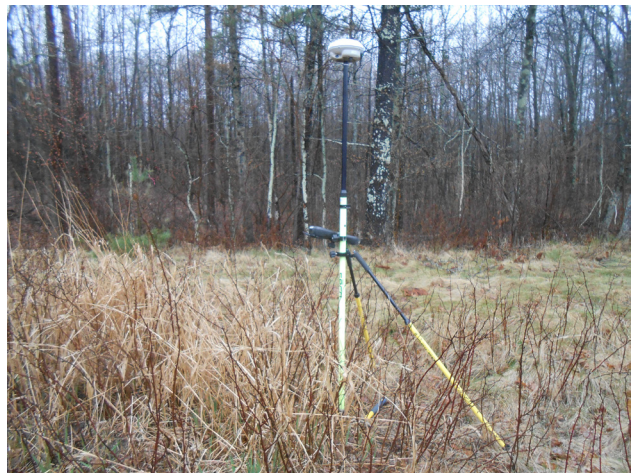
North



South



East



West





# Point: 702 Bare Earth

Survey X: 615095.37, Survey Y: 406808.52, Z1: 1314.19, Z DEM: 1314.21, Z LAS: 1314.17, LC Type: 1, ΔZ DEM: 0.02, ΔZ LAS: -0.02



North



South



East



West



# Point: 800 Urban Area

Survey X: 650837.21, Survey Y: 358286.95, Z1: 1270.65, Z DEM: 1270.83, Z LAS: 1270.68, LC Type: 2, ΔZ DEM: 0.18, ΔZ LAS: 0.03



North



South



East



West





## Point: 801 Bare Earth

Survey X: 650879.64, Survey Y: 358389.45, Z1: 1269.85, Z DEM: 1269.79, Z LAS: 1269.8, LC Type: 1,  $\Delta Z$  DEM: -0.07,  $\Delta Z$  LAS: -0.06



North



South



East



West





## Point: 802 Forest

Survey X: 650903.83, Survey Y: 358820.07, Z1: 1269, Z DEM: 1269.3, Z LAS: 1269.32, LC Type: 5, ΔZ DEM: 0.3, ΔZ LAS: 0.32



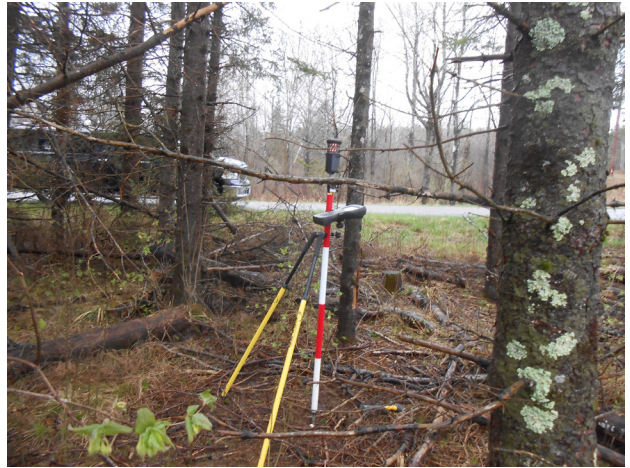
North



South



East

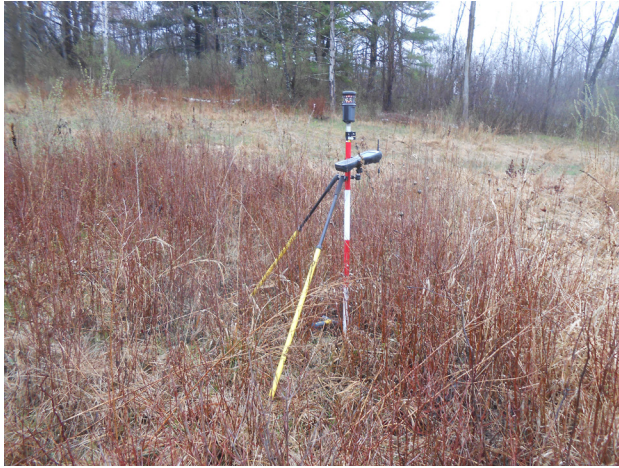


West

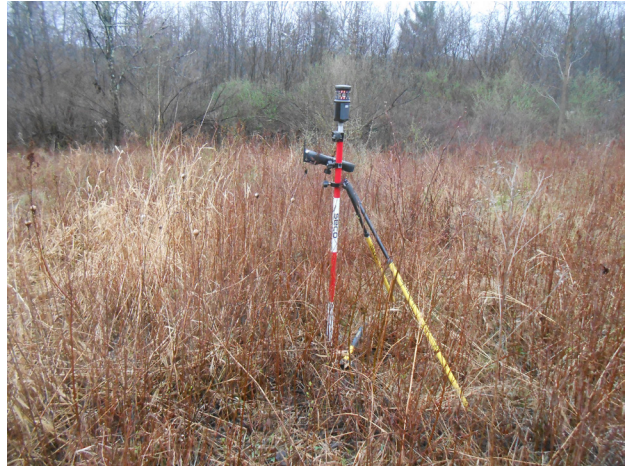


# Point: 804 Tall Weeds

Survey X: 650746.52, Survey Y: 358949.93, Z1: 1282.79, Z DEM: 1283.08, Z LAS: 1283.26, LC Type: 3, ΔZ DEM: 0.29, ΔZ LAS: 0.47



North



South



East



West



# Point: 900 Urban Area

Survey X: 685089.47, Survey Y: 348341.58, Z1: 1243.92, Z DEM: 1244, Z LAS: 1243.99, LC Type: 2, ΔZ DEM: 0.08, ΔZ LAS: 0.07



North



South



East



West





# Point: 901 Bare Earth

Survey X: 685435.19, Survey Y: 348357.77, Z1: 1244.67, Z DEM: 1244.94, Z LAS: 1244.79, LC Type: 1, ΔZ DEM: 0.28, ΔZ LAS: 0.12



North



South



East



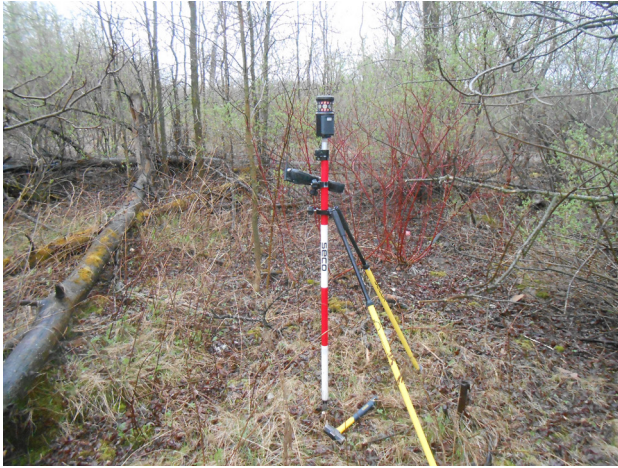
West





# Point: 903 Forest

Survey X: 685569.71, Survey Y: 348365.02, Z1: 1243.38, Z DEM: 1243.54, Z LAS: 1243.75, LC Type: 5, ΔZ DEM: 0.16, ΔZ LAS: 0.37



North



South



East



West





# Point: 904 Tall Weeds

Survey X: 685462.91, Survey Y: 348405.01, Z1: 1244.64, Z DEM: 1245.13, Z LAS: 1245.04, LC Type: 3, ΔZ DEM: 0.49, ΔZ LAS: 0.4



North



South



East



West





# Point: 1000 Bare Earth

Survey X: 683458.86, Survey Y: 374062.5, Z1: 1585.87, Z DEM: 1585.88, Z LAS: 1585.78, LC Type: 1, ΔZ DEM: 0.01, ΔZ LAS: -0.09



North



South



East



West





# Point: 1001 Urban Area

Survey X: 683440.07, Survey Y: 374360.9, Z1: 1589.64, Z DEM: 1589.45, Z LAS: 1589.43, LC Type: 2, ΔZ DEM: -0.19, ΔZ LAS: -0.22



North



South



East



West





# Point: 1002 Forest

Survey X: 683543.64, Survey Y: 374319.67, Z1: 1584.64, Z DEM: 1584.56, Z LAS: 1584.52, LC Type: 5, ΔZ DEM: -0.08, ΔZ LAS: -0.12



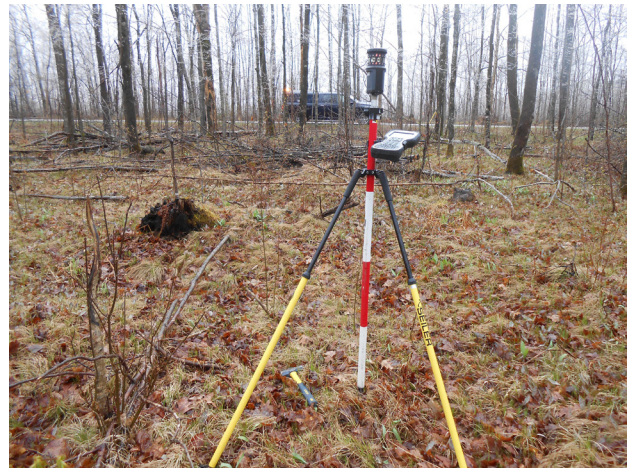
North



South



East



West





# Point: 1100 Urban Area

Survey X: 662810.16, Survey Y: 387316.31, Z1: 1345.31, Z DEM: 1345.47, Z LAS: 1345.44, LC Type: 2, ΔZ DEM: 0.16, ΔZ LAS: 0.12



North



South



East



West





# Point: 1101 Bare Earth

Survey X: 662663.28, Survey Y: 387591.79, Z1: 1344.86, Z DEM: 1344.92, Z LAS: 1345.01, LC Type: 1, ΔZ DEM: 0.06, ΔZ LAS: 0.15



North



South



East



West





# Point: 1102 Forest

Survey X: 662578.59, Survey Y: 387618, Z1: 1347.29, Z DEM: 1347.41, Z LAS: 1347.43, LC Type: 5, ΔZ DEM: 0.12, ΔZ LAS: 0.13



North



South



East



West





# Point: 1103 Tall Weeds

Survey X: 662700.63, Survey Y: 387760.35, Z1: 1344.75, Z DEM: 1345, Z LAS: 1344.89, LC Type: 3, ΔZ DEM: 0.25, ΔZ LAS: 0.14



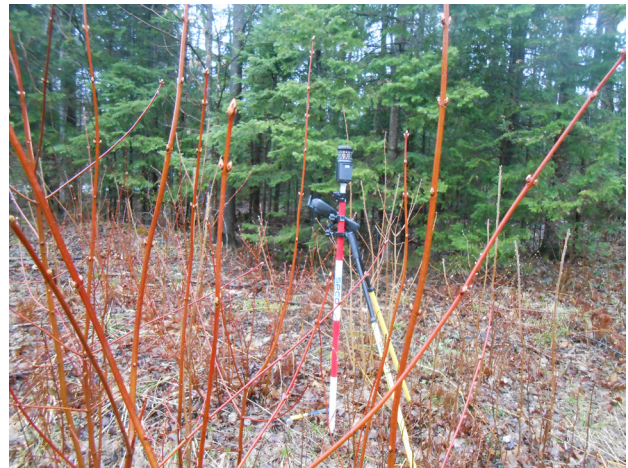
North



South



East



West



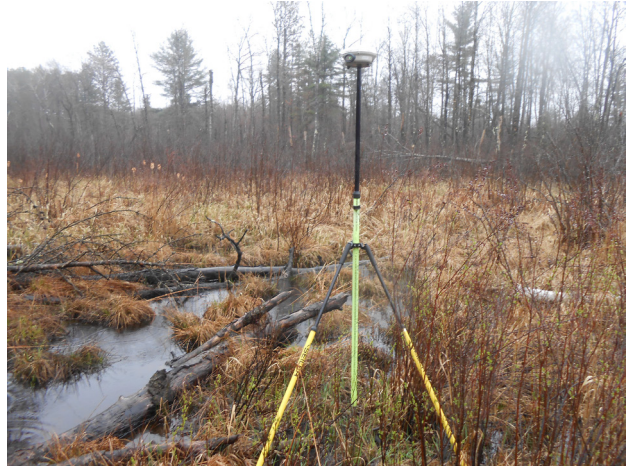


# Point: 1104 Swamp

Survey X: 667515.43, Survey Y: 389555.23, Z1: 1320.56, Z DEM: 1320.99, Z LAS: 1320.82, LC Type: 7, ΔZ DEM: 0.43, ΔZ LAS: 0.26



North



South



East



West





# Point: 1200 Urban Area

Survey X: 649776.91, Survey Y: 413155.44, Z1: 1323.63, Z DEM: 1323.73, Z LAS: 1323.7, LC Type: 2, ΔZ DEM: 0.1, ΔZ LAS: 0.08



North



South



East



West





## Point: 1201 Bare Earth

Survey X: 649764.32, Survey Y: 413308.03, Z1: 1324.57, Z DEM: 1324.69, Z LAS: 1324.68, LC Type: 1, ΔZ DEM: 0.12, ΔZ LAS: 0.11



North



South



East



West





# Point: 1202 Forest

Survey X: 649894.27, Survey Y: 413211.14, Z1: 1320.88, Z DEM: 1321.39, Z LAS: 1321.25, LC Type: 5, ΔZ DEM: 0.51, ΔZ LAS: 0.37



North



South



East



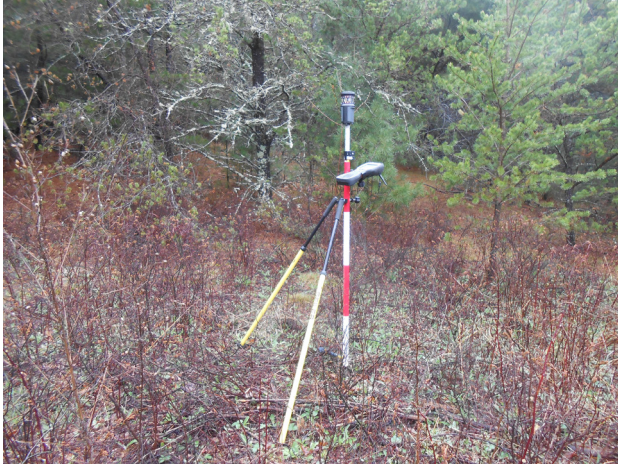
West





## Point: 1203 Tall Weeds

Survey X: 649646.85, Survey Y: 413250.03, Z1: 1334.91, Z DEM: 1335.05, Z LAS: 1334.99, LC Type: 3, ΔZ DEM: 0.14, ΔZ LAS: 0.08



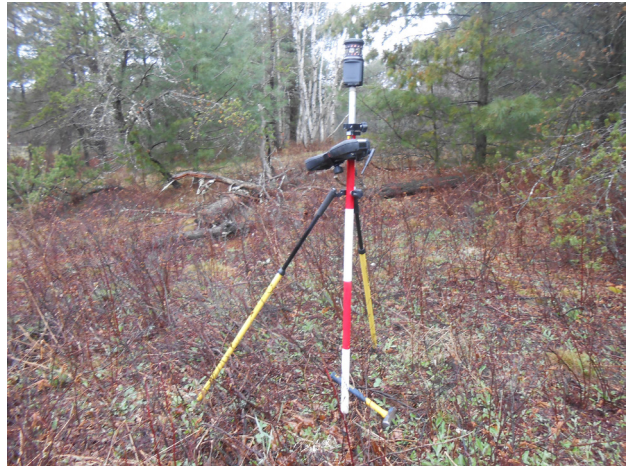
North



South



East



West



# Point: 1204 Swamp

Survey X: 641836.81, Survey Y: 413925.76, Z1: 1294.28, Z DEM: 1294.51, Z LAS: 1294.72, LC Type: 7, ΔZ DEM: 0.24, ΔZ LAS: 0.45



North



South



East



West





## Point: 1300 Bare Earth

Survey X: 618507.21, Survey Y: 435607.03, Z1: 1191.63, Z DEM: 1191.58, Z LAS: 1191.67, LC Type: 1, ΔZ DEM: -0.05, ΔZ LAS: 0.05



North



South



East



West



# Point: 1301 Urban Area

Survey X: 618989.51, Survey Y: 436148.09, Z1: 1191.48, Z DEM: 1191.42, Z LAS: 1191.39, LC Type: 2, ΔZ DEM: -0.07, ΔZ LAS: -0.09



North



South



East



West





# Point: 1400 Bare Earth

Survey X: 602873.39, Survey Y: 426834.87, Z1: 1172.04, Z DEM: 1172.17, Z LAS: 1172.27, LC Type: 1, ΔZ DEM: 0.13, ΔZ LAS: 0.23



North



South



East



West



# Point: 1401 Urban Area

Survey X: 602897.74, Survey Y: 426534.36, Z1: 1166.53, Z DEM: 1166.72, Z LAS: 1166.75, LC Type: 2, ΔZ DEM: 0.18, ΔZ LAS: 0.21



North



South



East



West





# Point: 1402 Forest

Survey X: 602803.78, Survey Y: 427108, Z1: 1174.72, Z DEM: 1175.11, Z LAS: 1175.27, LC Type: 5, ΔZ DEM: 0.39, ΔZ LAS: 0.55



North



South



East



West





# Point: 1500 Bare Earth

Survey X: 602743.47, Survey Y: 361021.09, Z1: 1323.16, Z DEM: 1323.12, Z LAS: 1323.01, LC Type: 1, ΔZ DEM: -0.04, ΔZ LAS: -0.15



North



South



East



West





# Point: 1501 Forest

Survey X: 602754.71, Survey Y: 360847.72, Z1: 1321.37, Z DEM: 1321.4, Z LAS: 1321.46, LC Type: 5, ΔZ DEM: 0.03, ΔZ LAS: 0.09



North



South



East



West





# Point: 1502 Urban Area

Survey X: 602872.34, Survey Y: 360810.08, Z1: 1323.47, Z DEM: 1323.42, Z LAS: 1323.37, LC Type: 2, ΔZ DEM: -0.05, ΔZ LAS: -0.09



North



South



East



West





# Point: 1504 Tall Weeds

Survey X: 602889.99, Survey Y: 359481.56, Z1: 1336.1, Z DEM: 1336.33, Z LAS: 1336.35, LC Type: 3, ΔZ DEM: 0.23, ΔZ LAS: 0.24



North



South



East



West





# Point: 1600 Bare Earth

Survey X: 618797.99, Survey Y: 338800, Z1: 1266.4, Z DEM: 1266.43, Z LAS: 1266.45, LC Type: 1, ΔZ DEM: 0.03, ΔZ LAS: 0.05



North



South



East



West





# Point: 1601 Urban Area

Survey X: 618716.5, Survey Y: 338845.66, Z1: 1270.9, Z DEM: 1270.9, Z LAS: 1270.94, LC Type: 2, ΔZ DEM: -0.01, ΔZ LAS: 0.03



North



South



East



West



# Point: 1700 Urban Area

Survey X: 607574.39, Survey Y: 305904.28, Z1: 1259.82, Z DEM: 1259.8, Z LAS: 1259.81, LC Type: 2, ΔZ DEM: -0.02, ΔZ LAS: -0.01



North



South



East



West





# Point: 1701 Bare Earth

Survey X: 607588.51, Survey Y: 306094.95, Z1: 1264.05, Z DEM: 1264.34, Z LAS: 1264.38, LC Type: 1, ΔZ DEM: 0.29, ΔZ LAS: 0.33



North



South



East



West





# Point: 1702 Forest

Survey X: 607457.18, Survey Y: 305856.44, Z1: 1251.19, Z DEM: 1251.53, Z LAS: 1251.56, LC Type: 5, ΔZ DEM: 0.34, ΔZ LAS: 0.37



North



South



East



West





# Point: 1704 Tall Weeds

Survey X: 607605.92, Survey Y: 305843.91, Z1: 1254.23, Z DEM: 1254.78, Z LAS: 1254.76, LC Type: 3, ΔZ DEM: 0.54, ΔZ LAS: 0.53



North



South



East



West





# Point: 1800 Bare Earth

Survey X: 647466.08, Survey Y: 319549.29, Z1: 1580.01, Z DEM: 1580.09, Z LAS: 1580.02, LC Type: 1, ΔZ DEM: 0.09, ΔZ LAS: 0.01



North



South



East



West





## Point: 1801 Tall Weeds

Survey X: 647526.2, Survey Y: 320185.3, Z1: 1576.08, Z DEM: 1576.66, Z LAS: 1576.68, LC Type: 3, ΔZ DEM: 0.58, ΔZ LAS: 0.61



North



South



East



West



# Point: 1803 Urban Area

Survey X: 647484.72, Survey Y: 319368.38, Z1: 1580.9, Z DEM: 1580.87, Z LAS: 1580.9, LC Type: 2, ΔZ DEM: -0.04, ΔZ LAS: 0



North



South



East



West





# Point: 1804 Forest

Survey X: 647334.32, Survey Y: 319254.76, Z1: 1576.77, Z DEM: 1577, Z LAS: 1577.07, LC Type: 5, ΔZ DEM: 0.23, ΔZ LAS: 0.3



North



South



East



West





# Point: 1900 Bare Earth

Survey X: 698837.36, Survey Y: 308085.08, Z1: 1189.34, Z DEM: 1189.32, Z LAS: 1189.31, LC Type: 1, ΔZ DEM: -0.02, ΔZ LAS: -0.02



North



South



East



West





# Point: 1901 Urban Area

Survey X: 698849.6, Survey Y: 307391.94, Z1: 1188.9, Z DEM: 1188.87, Z LAS: 1188.84, LC Type: 2, ΔZ DEM: -0.04, ΔZ LAS: -0.06



North



South



East



West





# Point: 1902 Tall Weeds

Survey X: 698895.21, Survey Y: 306779.67, Z1: 1192.86, Z DEM: 1193.03, Z LAS: 1193.09, LC Type: 3, ΔZ DEM: 0.18, ΔZ LAS: 0.23



North



South



East



West





# Point: 2000 Bare Earth

Survey X: 698957.17, Survey Y: 301530.57, Z1: 1189.91, Z DEM: 1189.9, Z LAS: 1189.85, LC Type: 1, ΔZ DEM: -0.01, ΔZ LAS: -0.07



North



South



East



West





# Point: 2001 Urban Area

Survey X: 698969.01, Survey Y: 300904.15, Z1: 1191.76, Z DEM: 1191.75, Z LAS: 1191.64, LC Type: 2, ΔZ DEM: -0.01, ΔZ LAS: -0.12



North



South



East



West





# Point: 2002 Forest

Survey X: 698929.54, Survey Y: 301199.99, Z1: 1190.33, Z DEM: 1190.12, Z LAS: 1190.2, LC Type: 5, ΔZ DEM: -0.21, ΔZ LAS: -0.13



North



South



East



West





# Point: 2003 Swamp

Survey X: 698914.31, Survey Y: 302118.86, Z1: 1186.9, Z DEM: 1187.44, Z LAS: 1187.41, LC Type: 7, ΔZ DEM: 0.54, ΔZ LAS: 0.52



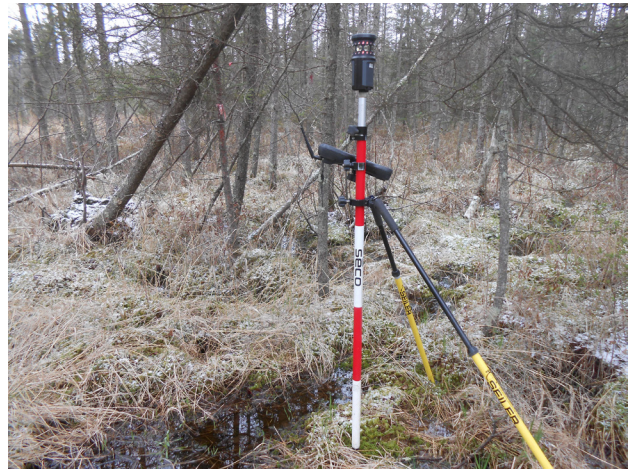
North



South



East



West



# Point: 2100 Bare Earth

Survey X: 822819.03, Survey Y: 376755.02, Z1: 1402.63, Z DEM: 1402.75, Z LAS: 1402.65, LC Type: 1, ΔZ DEM: 0.11, ΔZ LAS: 0.01



North



South



East



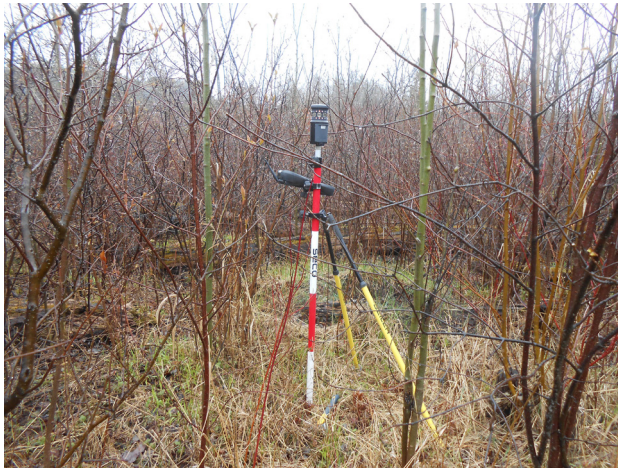
West





## Point: 2102 Tall Weeds

Survey X: 822915.5, Survey Y: 376356.8, Z1: 1397.52, Z DEM: 1398.09, Z LAS: 1398.12, LC Type: 3, ΔZ DEM: 0.57, ΔZ LAS: 0.6



North



South



East



West



# Point: 2103 Urban Area

Survey X: 822292.34, Survey Y: 376079.17, Z1: 1406.07, Z DEM: 1406.17, Z LAS: 1406.17, LC Type: 2, ΔZ DEM: 0.1, ΔZ LAS: 0.11



North



South



East



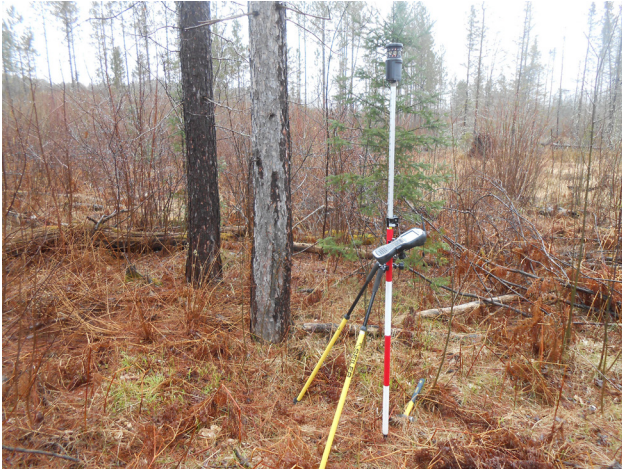
West





# Point: 2104 Forest

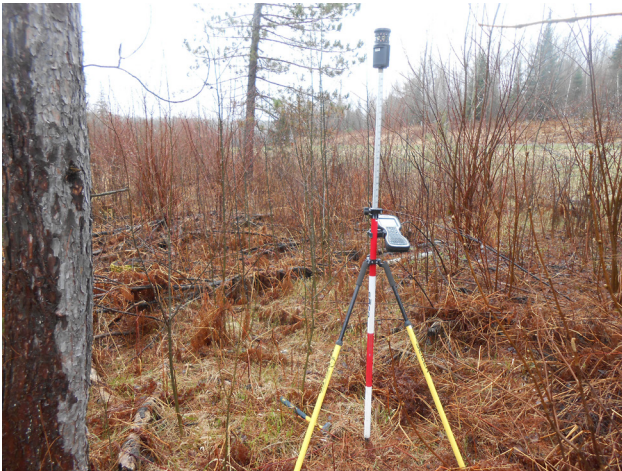
Survey X: 822519.03, Survey Y: 376248.32, Z1: 1394.58, Z DEM: 1394.95, Z LAS: 1395.38, LC Type: 5, ΔZ DEM: 0.38, ΔZ LAS: 0.8



North



South



East



West





# Point: 2200 Bare Earth

Survey X: 818965.61, Survey Y: 415795, Z1: 1547.86, Z DEM: 1547.97, Z LAS: 1548.02, LC Type: 1, ΔZ DEM: 0.12, ΔZ LAS: 0.16



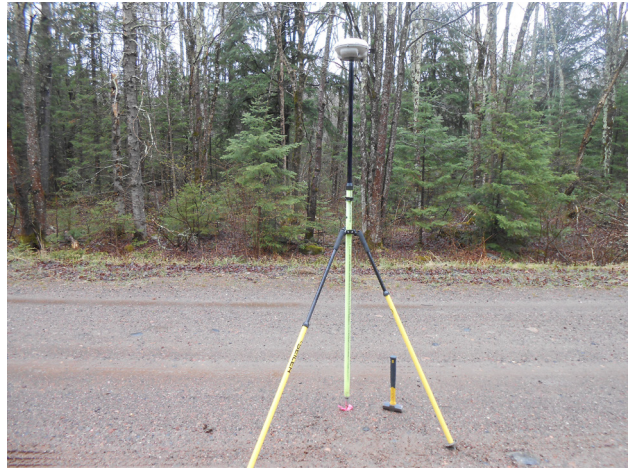
North



South



East



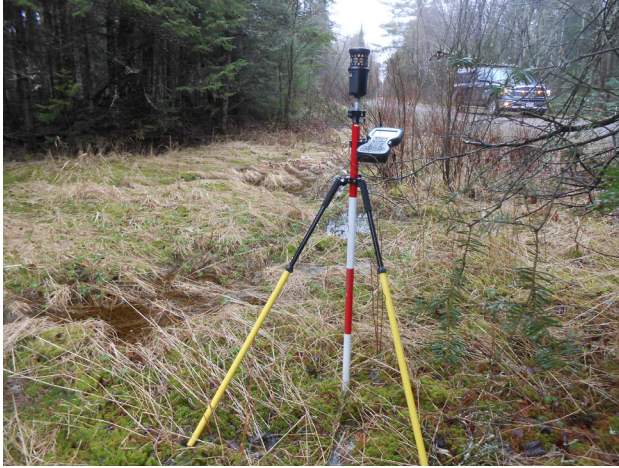
West





# Point: 2201 Swamp

Survey X: 818936.27, Survey Y: 415727.64, Z1: 1545.22, Z DEM: 1545.66, Z LAS: 1545.64, LC Type: 7, ΔZ DEM: 0.44, ΔZ LAS: 0.42



North



South



East



West





# Point: 2202 Forest

Survey X: 819108.8, Survey Y: 416085.69, Z1: 1547.11, Z DEM: 1547.52, Z LAS: 1547.54, LC Type: 5, ΔZ DEM: 0.4, ΔZ LAS: 0.42



North



South



East



West





## Point: 2300 Bare Earth

Survey X: 783422.98, Survey Y: 391361.13, Z1: 1478.96, Z DEM: 1479.09, Z LAS: 1478.98, LC Type: 1, ΔZ DEM: 0.14, ΔZ LAS: 0.02



North



South



East



West





# Point: 2301 Urban Area

Survey X: 783716.67, Survey Y: 391332.67, Z1: 1483.85, Z DEM: 1483.85, Z LAS: 1483.78, LC Type: 2, ΔZ DEM: 0, ΔZ LAS: -0.07



North



South



East



West





# Point: 2302 Tall Weeds

Survey X: 783376.09, Survey Y: 391411.28, Z1: 1479.8, Z DEM: 1480.02, Z LAS: 1479.96, LC Type: 3, ΔZ DEM: 0.22, ΔZ LAS: 0.16



North



South



East



West





## Point: 2304 Forest

Survey X: 784053.15, Survey Y: 391045.05, Z1: 1483.9, Z DEM: 1484.09, Z LAS: 1484.08, LC Type: 5, ΔZ DEM: 0.19, ΔZ LAS: 0.18



North



South



East



West



# Point: 2400 Urban Area

Survey X: 751864.54, Survey Y: 390294.05, Z1: 1368.04, Z DEM: 1368.08, Z LAS: 1368.02, LC Type: 2, ΔZ DEM: 0.04, ΔZ LAS: -0.02



North



South



East



West





# Point: 2401 Tall Weeds

Survey X: 751982.76, Survey Y: 390057.4, Z1: 1362.1, Z DEM: 1362.45, Z LAS: 1362.49, LC Type: 5, ΔZ DEM: 0.35, ΔZ LAS: 0.39



North



South



East



West





# Point: 2402 Tall Weeds

Survey X: 751954.33, Survey Y: 389956.22, Z1: 1362.13, Z DEM: 1362.42, Z LAS: 1362.45, LC Type: 3, ΔZ DEM: 0.29, ΔZ LAS: 0.31



North



South



East



West





# Point: 2403 Bare Earth

Survey X: 751833.41, Survey Y: 389918.75, Z1: 1364.31, Z DEM: 1364.24, Z LAS: 1364.24, LC Type: 1, ΔZ DEM: -0.07, ΔZ LAS: -0.06



North



South



East



West





## Point: 2501 Bare Earth

Survey X: 737996.39, Survey Y: 368411.12, Z1: 1360.85, Z DEM: 1360.99, Z LAS: 1360.99, LC Type: 1, ΔZ DEM: 0.14, ΔZ LAS: 0.14



North



South



East



West



## Point: 2502 Urban Area

Survey X: 736601.79, Survey Y: 366959.93, Z1: 1364.33, Z DEM: 1364.38, Z LAS: 1364.35, LC Type: 2, ΔZ DEM: 0.05, ΔZ LAS: 0.02



North



South



East



West



# Point: 2601 Bare Earth

Survey X: 690624.28, Survey Y: 445294.81, Z1: 1397.98, Z DEM: 1397.79, Z LAS: 1397.87, LC Type: 1, ΔZ DEM: -0.19, ΔZ LAS: -0.11



North



South



East



West





## Point: 2602 Urban Area

Survey X: 691263.71, Survey Y: 441809.01, Z1: 1393.48, Z DEM: 1393.29, Z LAS: 1393.23, LC Type: 2, ΔZ DEM: -0.19, ΔZ LAS: -0.25



North



South



East



West





# Point: 2603 Tall Weeds

Survey X: 690747.27, Survey Y: 441771.99, Z1: 1382.57, Z DEM: 1382.83, Z LAS: 1382.98, LC Type: 3, ΔZ DEM: 0.26, ΔZ LAS: 0.41



North



South



East



West





# Point: 2604 Forest

Survey X: 690680.95, Survey Y: 441874.95, Z1: 1386.21, Z DEM: 1386.34, Z LAS: 1386.23, LC Type: 5, ΔZ DEM: 0.13, ΔZ LAS: 0.02



North



South



East



West





# Point: 2700 Bare Earth

Survey X: 721479.88, Survey Y: 444882.56, Z1: 1375.56, Z DEM: 1375.61, Z LAS: 1375.59, LC Type: 1, ΔZ DEM: 0.05, ΔZ LAS: 0.03



North



South



East



West





# Point: 2701 Urban Area

Survey X: 721480.31, Survey Y: 444926.88, Z1: 1376.62, Z DEM: 1376.72, Z LAS: 1376.54, LC Type: 2, ΔZ DEM: 0.1, ΔZ LAS: -0.08



North



South



East



West





# Point: 2800 Bare Earth

Survey X: 756532.65, Survey Y: 441741.28, Z1: 1438.86, Z DEM: 1438.81, Z LAS: 1438.85, LC Type: 1, ΔZ DEM: -0.05, ΔZ LAS: -0.02



North



South



East



West





# Point: 2801 Tall Weeds

Survey X: 756537.12, Survey Y: 441883.44, Z1: 1433.83, Z DEM: 1434.37, Z LAS: 1434.27, LC Type: 3, ΔZ DEM: 0.54, ΔZ LAS: 0.44



North



South



East



West



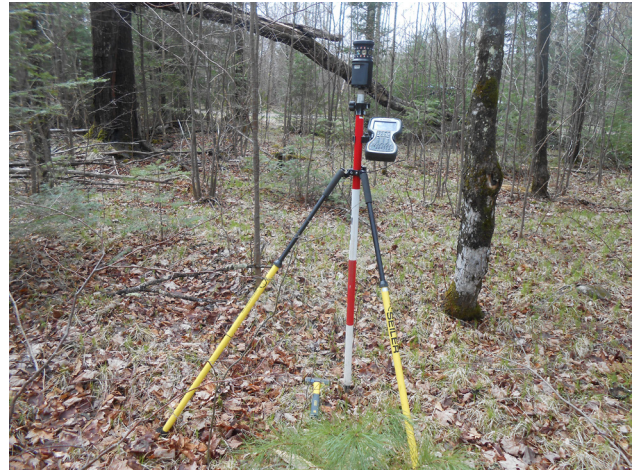


## Point: 2802 Forest

Survey X: 756602.57, Survey Y: 441823.9, Z1: 1438.64, Z DEM: 1439.09, Z LAS: 1439.07, LC Type: 5,  $\Delta Z$  DEM: 0.45,  $\Delta Z$  LAS: 0.43



North



South



East



West





# Point: 2900 Urban Area

Survey X: 733265.49, Survey Y: 401554.69, Z1: 1353.75, Z DEM: 1353.69, Z LAS: 1353.68, LC Type: 2, ΔZ DEM: -0.05, ΔZ LAS: -0.06



North



South



East



West





# Point: 2901 Bare Earth

Survey X: 732604.72, Survey Y: 401556.79, Z1: 1347.93, Z DEM: 1348.06, Z LAS: 1347.94, LC Type: 1, ΔZ DEM: 0.13, ΔZ LAS: 0.01



North



South



East



West





# Point: 3000 Bare Earth

Survey X: 704717.38, Survey Y: 417634.22, Z1: 1335.57, Z DEM: 1335.57, Z LAS: 1335.54, LC Type: 1, ΔZ DEM: -0.01, ΔZ LAS: -0.03



North



South



East



West





# Point: 3001 Urban Area

Survey X: 703020.46, Survey Y: 412759.72, Z1: 1327.03, Z DEM: 1327.04, Z LAS: 1327.1, LC Type: 2, ΔZ DEM: 0.01, ΔZ LAS: 0.07



North



South



East



West





# Point: 3100 Urban Area

Survey X: 691106.45, Survey Y: 405272.02, Z1: 1323.01, Z DEM: 1323.08, Z LAS: 1323, LC Type: 2, ΔZ DEM: 0.07, ΔZ LAS: 0



North



South



East



West





# Point: 3101 Bare Earth

Survey X: 691360.37, Survey Y: 405254.66, Z1: 1324.46, Z DEM: 1324.42, Z LAS: 1324.46, LC Type: 1, ΔZ DEM: -0.04, ΔZ LAS: 0



North



South



East



West





## Point: 3102 Tall Weeds

Survey X: 691464.14, Survey Y: 405121.36, Z1: 1322.17, Z DEM: 1322.31, Z LAS: 1322.2, LC Type: 3,  $\Delta Z$  DEM: 0.14,  $\Delta Z$  LAS: 0.03



North



South



East



West



# Point: 3103 Forest

Survey X: 691162.64, Survey Y: 405402.21, Z1: 1325.74, Z DEM: 1326.08, Z LAS: 1325.85, LC Type: 5, ΔZ DEM: 0.35, ΔZ LAS: 0.12



North



South



East



West





# Point: 3200 Bare Earth

Survey X: 755262.59, Survey Y: 353723.88, Z1: 1487.97, Z DEM: 1487.84, Z LAS: 1487.73, LC Type: 1, ΔZ DEM: -0.13, ΔZ LAS: -0.24



North



South



East



West





## Point: 3201 Urban Area

Survey X: 755366.14, Survey Y: 353771.31, Z1: 1490.26, Z DEM: 1490.07, Z LAS: 1490.01, LC Type: 2,  $\Delta Z$  DEM: -0.18,  $\Delta Z$  LAS: -0.25



North



South



East



West

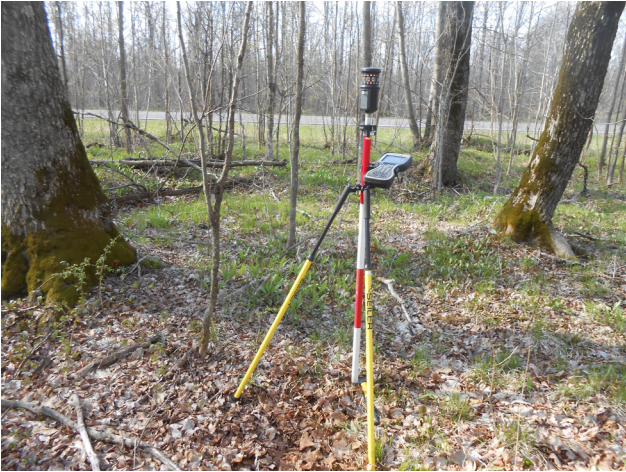


# Point: 3202 Forest

Survey X: 755344.62, Survey Y: 353858.69, Z1: 1491.5, Z DEM: 1491.34, Z LAS: 1491.5, LC Type: 5, ΔZ DEM: -0.16, ΔZ LAS: 0



North



South



East



West





# Point: 3203 Tall Weeds

Survey X: 755297.79, Survey Y: 353738.73, Z1: 1487.85, Z DEM: 1488.27, Z LAS: 1488.11, LC Type: 3, ΔZ DEM: 0.43, ΔZ LAS: 0.26



North



South



East



West





# Point: 3300 Bare Earth

Survey X: 774355.64, Survey Y: 332069.55, Z1: 1416.28, Z DEM: 1416.29, Z LAS: 1416.26, LC Type: 1, ΔZ DEM: 0.01, ΔZ LAS: -0.02



North



South



East



West





# Point: 3302 Tall Weeds

Survey X: 774250.04, Survey Y: 332123.47, Z1: 1423.23, Z DEM: 1423.39, Z LAS: 1423.71, LC Type: 3, ΔZ DEM: 0.17, ΔZ LAS: 0.49



North



South



East



West





# Point: 3303 Forest

Survey X: 774153.43, Survey Y: 332266.27, Z1: 1428.21, Z DEM: 1428.17, Z LAS: 1428.18, LC Type: 5, ΔZ DEM: -0.03, ΔZ LAS: -0.03



North



South



East



West





# Point: 3400 Bare Earth

Survey X: 743248.9, Survey Y: 306386.11, Z1: 1263.78, Z DEM: 1263.81, Z LAS: 1263.95, LC Type: 1, ΔZ DEM: 0.03, ΔZ LAS: 0.17



North



South



East



West





# Point: 3401 Tall Weeds

Survey X: 744372.4, Survey Y: 306786.95, Z1: 1258.59, Z DEM: 1259.56, Z LAS: 1259.66, LC Type: 3, ΔZ DEM: 0.97, ΔZ LAS: 1.08



North



South



East



West





# Point: 3500 Urban Area

Survey X: 801995.48, Survey Y: 347814.95, Z1: 1351.73, Z DEM: 1351.62, Z LAS: 1351.55, LC Type: 2, ΔZ DEM: -0.11, ΔZ LAS: -0.18



North



South



East



West





# Point: 3501 Bare Earth

Survey X: 801844.95, Survey Y: 347996.74, Z1: 1340.94, Z DEM: 1341.09, Z LAS: 1341.08, LC Type: 1, ΔZ DEM: 0.16, ΔZ LAS: 0.15



North



South



East



West





# Point: 3600 Bare Earth

Survey X: 808476.08, Survey Y: 307866.96, Z1: 1345.03, Z DEM: 1345.49, Z LAS: 1345.5, LC Type: 1, ΔZ DEM: 0.46, ΔZ LAS: 0.46



North



South



East



West



## Point: 3601 Urban Area

Survey X: 808224.36, Survey Y: 307810.99, Z1: 1350.02, Z DEM: 1350.12, Z LAS: 1350.09, LC Type: 2,  $\Delta Z$  DEM: 0.11,  $\Delta Z$  LAS: 0.08



North



South



East



West





# Point: 3700 Bare Earth

Survey X: 809022.82, Survey Y: 301269.45, Z1: 1387.82, Z DEM: 1387.79, Z LAS: 1387.86, LC Type: 1, ΔZ DEM: -0.03, ΔZ LAS: 0.03



North



South



East



West





# Point: 3701 Tall Weed

Survey X: 809271.13, Survey Y: 301516.27, Z1: 1390.27, Z DEM: 1390.68, Z LAS: 1390.7, LC Type: 3, ΔZ DEM: 0.41, ΔZ LAS: 0.43



North



South



East



West





# Point: 3702 Urban Area

Survey X: 808996.06, Survey Y: 301263.64, Z1: 1388.65, Z DEM: 1388.59, Z LAS: 1388.58, LC Type: 2, ΔZ DEM: -0.06, ΔZ LAS: -0.07



North



South



East



West





## Point: 3703 Forest

Survey X: 808833.1, Survey Y: 301308.86, Z1: 1383.93, Z DEM: 1383.91, Z LAS: 1383.94, LC Type: 5, ΔZ DEM: -0.02, ΔZ LAS: 0.01



North



South



East



West