

Forest County WROC – 3DEP  
Forest County  
Lidar 2017

Vertical Accuracy Report

April 2018

## Project Information

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**Prepared By:** Ayres Associates

**Project Name:** Wisconsin WROC - 3DEP Forest County Lidar 2017

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

**Required Nominal Pulse Spacing:** 0.7

**Contractor Name:** Ayres Associates

**Units:** US Survey Feet

**Date of Acquisition:** Start: 4/22/2017 Finish: 4/25/2017

## Report Information

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This report documents the absolute vertical accuracy of the lidar data collected for the Forest 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 from May 8, 2017, to May 17, 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, 59 NVA points and 47 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.

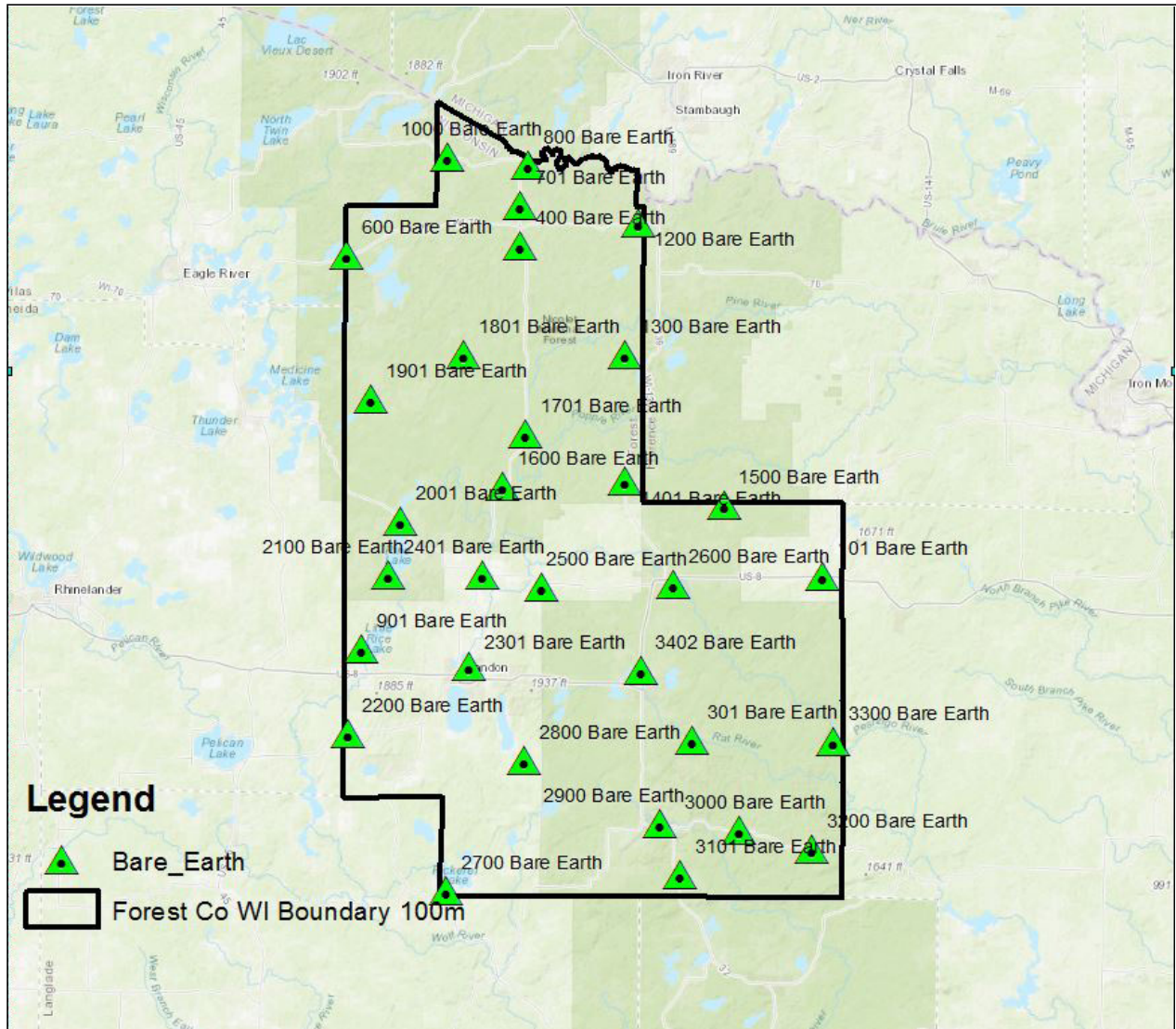


## Lidar Accuracy Assessment Summary

LAND COVER TYPE	# OF POINTS	NVA	VVA
<b>LAS</b>		95% confidence level	N/A
1. Bare Earth	31	0.340	N/A
2. Urban Areas	28	0.285	N/A
3. Tall Weeds	20	N/A	N/A
5. Forest	22	N/A	N/A
7. Swamp	52	N/A	N/A
<b>TOTAL</b>	<b>106</b>	<b>0.364</b>	N/A
<b>DEM</b>		95% confidence level	95th percentile
1. Bare Earth	31	0.368	N/A
2. Urban Areas	28	0.290	N/A
3. Tall Weeds	20	N/A	0.970
5. Forest	22	N/A	0.609
7. Swamp	5	N/A	0.833
<b>TOTAL</b>	<b>106</b>	<b>0.333</b>	<b>0.833</b>

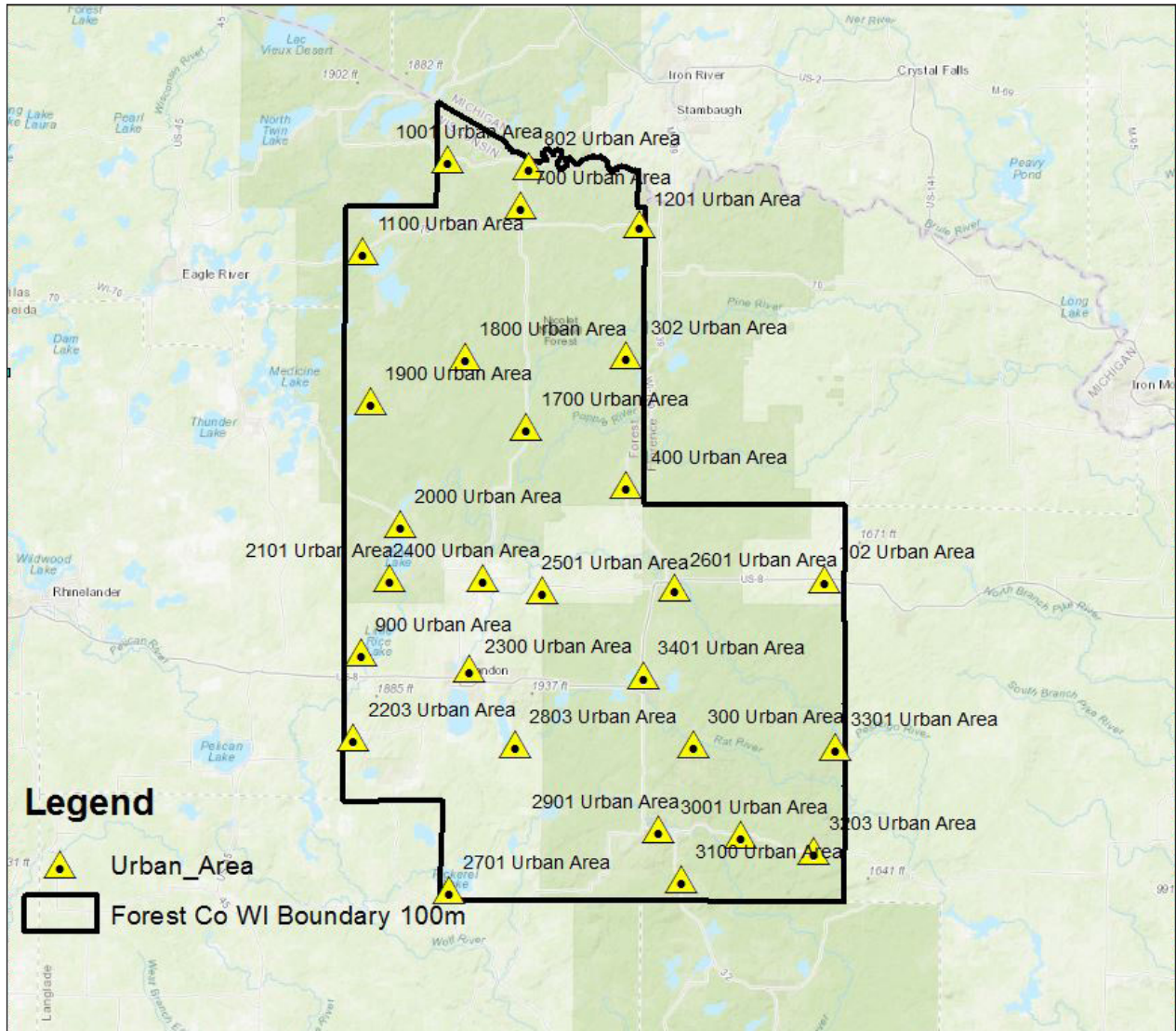
Units: US Survey Feet

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

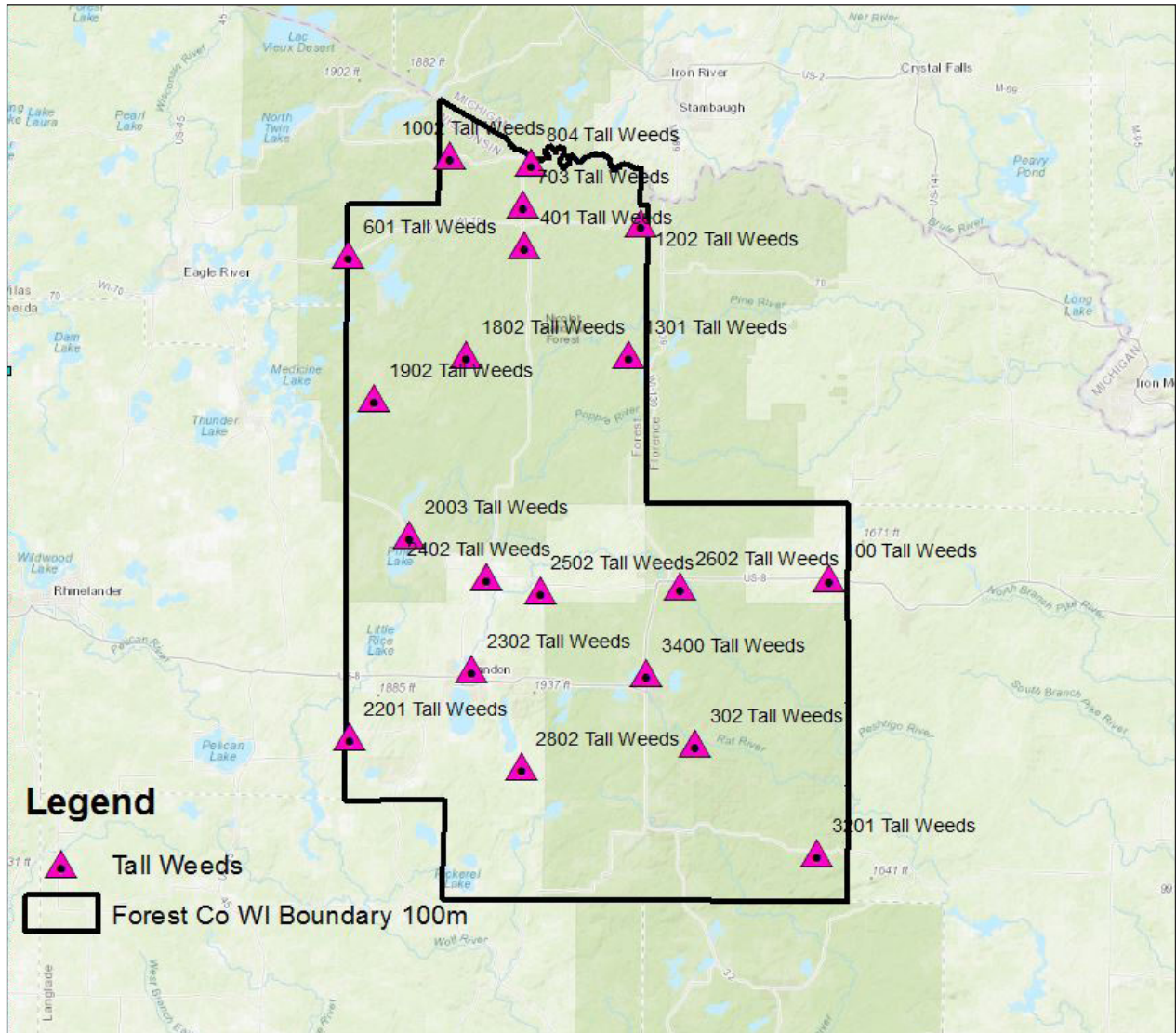




## Map of NVA Checkpoint Locations - 2. Urban Area

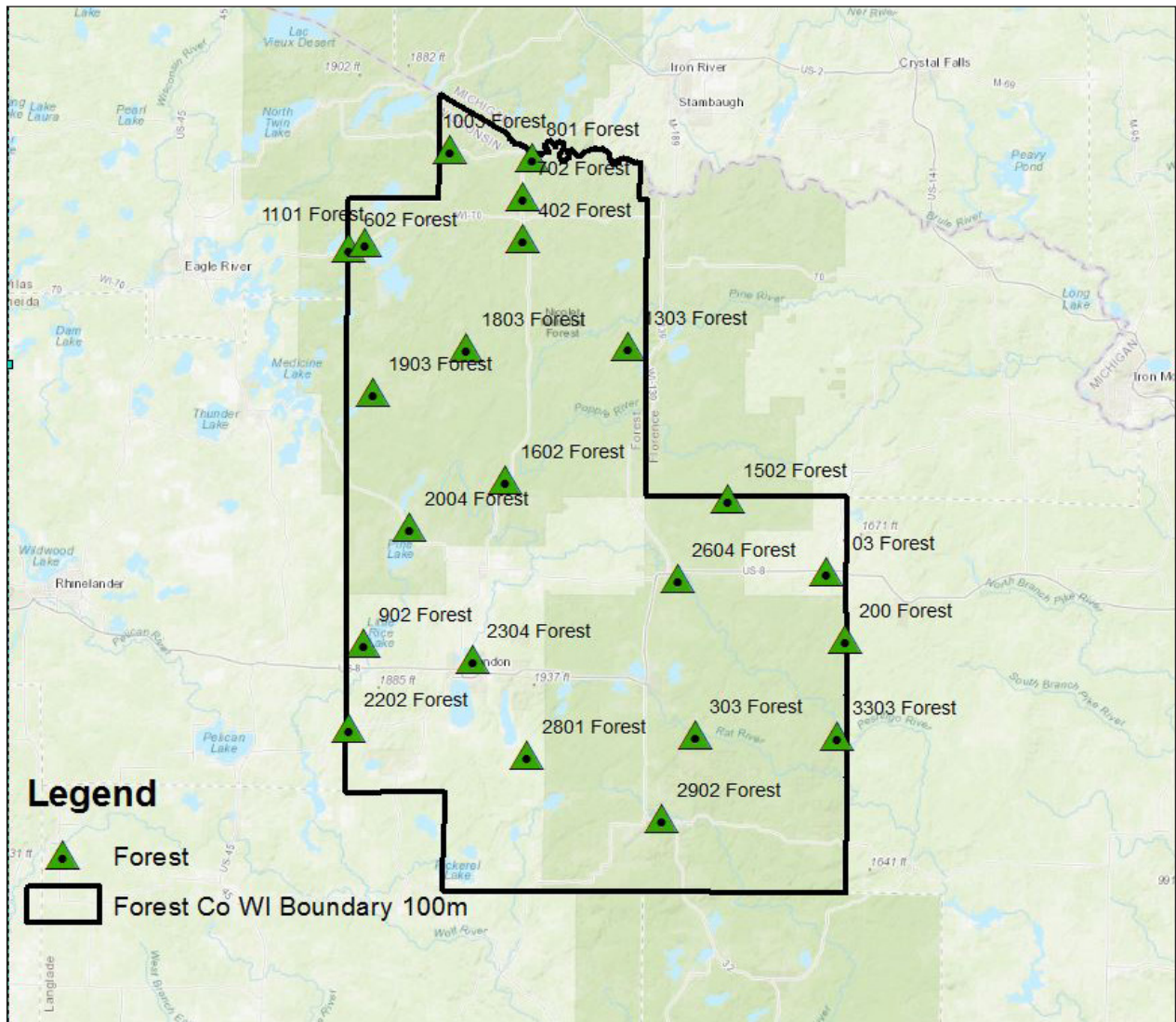


## Map of VVA Checkpoint Locations - 3. Tall Weeds

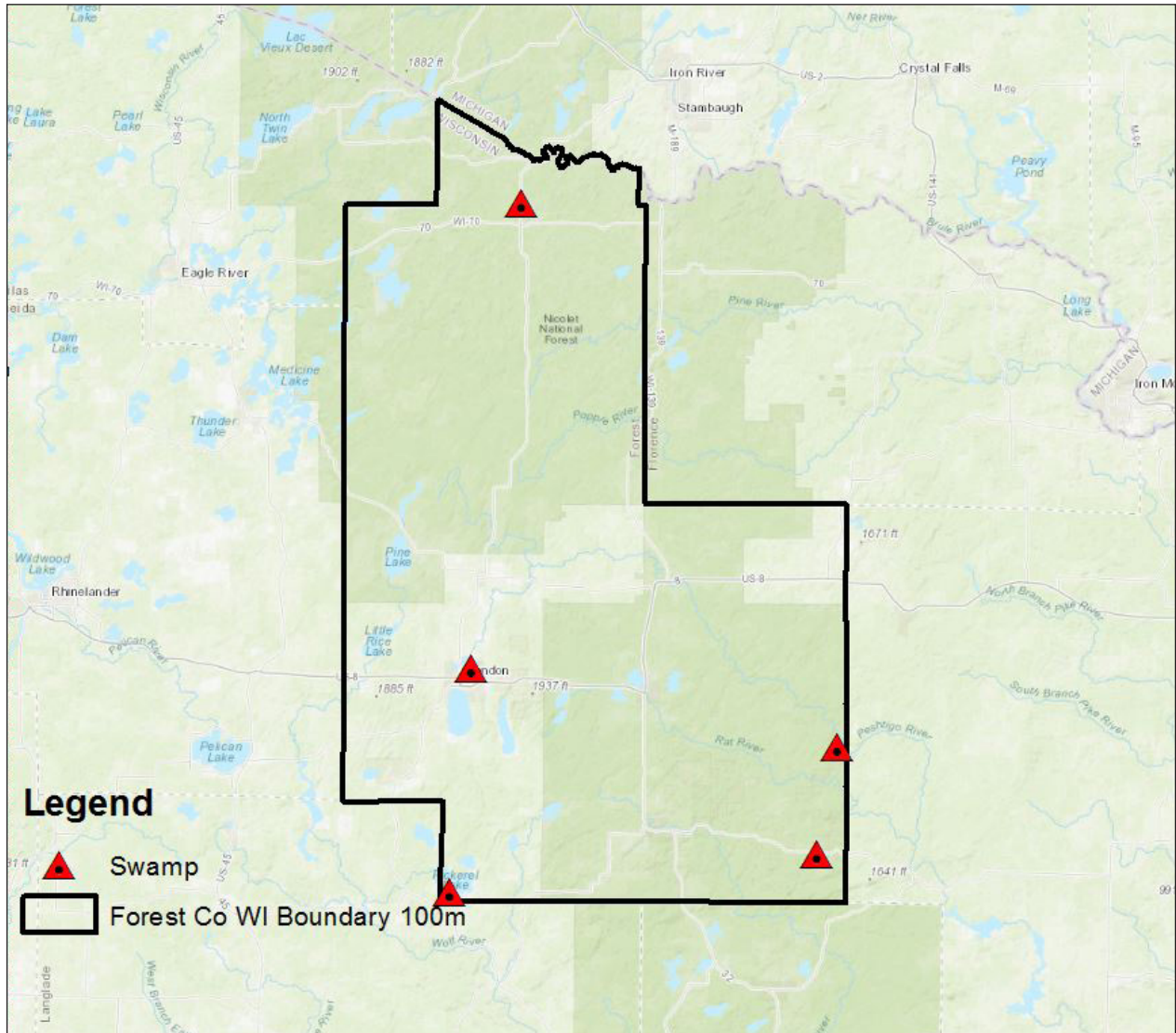




## Map of VVA Checkpoint Locations - 5. Forested Areas



## 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	-0.451
Maximum DZ	0.408
Mean DZ	-0.013
Mean Magnitude DZ	0.373
Number Observations	59
Standard Deviation DZ	0.187
RMSE Z	0.186
95% Confidence Level Z	0.364
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	-0.464
Maximum DZ	0.307
Mean DZ	0.005
Mean Magnitude DZ	0.364
Number Observations	59
Standard Deviation DZ	0.171
RMSE Z	0.17
95% Confidence Level Z	0.333
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	1.112
Mean DZ	0.431
Mean Magnitude DZ	0.659
Number Observations	20
Standard Deviation DZ	0.29
RMSE Z	0.515
95th Percentile	0.97
Units	US Survey Feet

## DEM (Continued)

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VEGETATED VERTICAL ACCURACY	
Land Cover Type	5. Forest
Minimum DZ	-0.04
Maximum DZ	0.61
Mean DZ	0.247
Mean Magnitude DZ	0.501
Number Observations	22
Standard Deviation DZ	0.197
RMSE Z	0.313
95th Percentile	0.609
Units	US Survey Feet



## DEM (Continued)

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<b>VEGETATED VERTICAL ACCURACY</b>	
Land Cover Type	7. Swamp
Minimum DZ	0.498
Maximum DZ	0.833
Mean DZ	0.665
Mean Magnitude DZ	0.816
Number Observations	5
Standard Deviation DZ	0.123
RMSE Z	0.674
95th Percentile	0.833
Units	US Survey Feet

# Point: 100 Tall Weeds

Survey X: 952497.97, Survey Y: 602698.69, Z1: 1524.06, Z DEM: 1524.18, Z LAS: 1524.66, LC Type: 3, ΔZ DEM: 0.12, ΔZ LAS: 0.6



North



South



East



West



# Point: 101 Bare Earth

Survey X: 952273.01, Survey Y: 602699.22, Z1: 1526.95, Z DEM: 1527.14, Z LAS: 1527.08, LC Type: 1, ΔZ DEM: 0.18, ΔZ LAS: 0.13



North



South



East



West





# Point: 102 Urban Area

Survey X: 952213.97, Survey Y: 602484.93, Z1: 1531.33, Z DEM: 1531.29, Z LAS: 1531.21, LC Type: 2, ΔZ DEM: -0.04, ΔZ LAS: -0.12



North



South



East



West





# Point: 103 Forest

Survey X: 952223.26, Survey Y: 602325.22, Z1: 1531.94, Z DEM: 1532.08, Z LAS: 1532.01, LC Type: 5, ΔZ DEM: 0.15, ΔZ LAS: 0.08



North



South



East



West



# Point: 200 Forest

Survey X: 958037.08, Survey Y: 580700.52, Z1: 1437.98, Z DEM: 1438.16, Z LAS: 1438.2, LC Type: 5, ΔZ DEM: 0.17, ΔZ LAS: 0.22



North



South



East



West



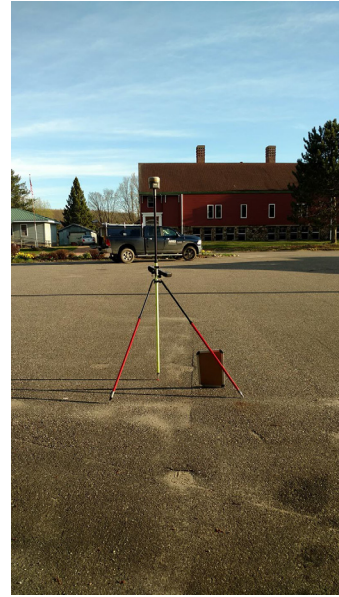


# Point: 300 Urban Area

Survey X: 910385.92, Survey Y: 550207.37, Z1: 1479.08, Z DEM: 1479.13, Z LAS: 1479.06, LC Type: 2, ΔZ DEM: 0.05, ΔZ LAS: -0.01



North



South



East



West





# Point: 301 Bare Earth

Survey X: 910321.05, Survey Y: 550219.28, Z1: 1478.64, Z DEM: 1478.77, Z LAS: 1478.88, LC Type: 1, ΔZ DEM: 0.12, ΔZ LAS: 0.24



North



South



East



West



## Point: 302 Tall Weeds

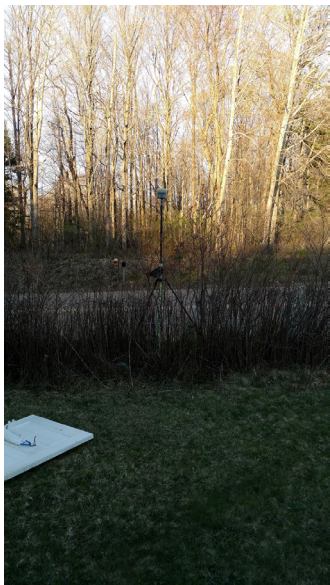
Survey X: 910189.98, Survey Y: 550312.88, Z1: 1473.71, Z DEM: 1474.68, Z LAS: 1474.27, LC Type: 3, ΔZ DEM: 0.97, ΔZ LAS: 0.56



North



South



East



West





## Point: 303 Forest

Survey X: 910333.23, Survey Y: 550286.27, Z1: 1475.71, Z DEM: 1475.74, Z LAS: 1475.75, LC Type: 5,  $\Delta Z$  DEM: 0.04,  $\Delta Z$  LAS: 0.04



North



South



East



West





# Point: 400 Bare Earth

Survey X: 855468.28, Survey Y: 708670.15, Z1: 1708.09, Z DEM: 1708.08, Z LAS: 1708.08, LC Type: 1, ΔZ DEM: -0.01, ΔZ LAS: -0.01



North



South



East



West



## Point: 401 Tall Weeds

Survey X: 855636.94, Survey Y: 708621.57, Z1: 1719.68, Z DEM: 1719.85, Z LAS: 1719.77, LC Type: 3, ΔZ DEM: 0.17, ΔZ LAS: 0.09



North



South



East



West



## Point: 402 Forest

Survey X: 855433.96, Survey Y: 708625.82, Z1: 1706.65, Z DEM: 1706.66, Z LAS: 1706.78, LC Type: 5, ΔZ DEM: 0.01, ΔZ LAS: 0.13



North



South



East



West





# Point: 600 Bare Earth

Survey X: 799957.02, Survey Y: 705401.07, Z1: 1749.64, Z DEM: 1749.62, Z LAS: 1749.65, LC Type: 1, ΔZ DEM: -0.02, ΔZ LAS: 0.01



North



South



East



West



# Point: 601 Tall Weeds

Survey X: 799969.11, Survey Y: 705334.66, Z1: 1748.25, Z DEM: 1748.71, Z LAS: 1748.71, LC Type: 3, ΔZ DEM: 0.46, ΔZ LAS: 0.45



North



South



East



West





# Point: 602 Forest

Survey X: 799969.11, Survey Y: 705334.84, Z1: 1748.26, Z DEM: 1748.71, Z LAS: 1748.7, LC Type: 5, ΔZ DEM: 0.45, ΔZ LAS: 0.44



North



South



East



West





# Point: 700 Urban Area

Survey X: 855175.52, Survey Y: 721771.94, Z1: 1677.09, Z DEM: 1677.1, Z LAS: 1677.21, LC Type: 2, ΔZ DEM: 0.01, ΔZ LAS: 0.12



North



South



East



West



# Point: 701 Bare Earth

Survey X: 855231.34, Survey Y: 721664.51, Z1: 1675.77, Z DEM: 1675.79, Z LAS: 1675.76, LC Type: 1, ΔZ DEM: 0.02, ΔZ LAS: 0



North



South



East



West





# Point: 702 Forest

Survey X: 855256.05, Survey Y: 721751.42, Z1: 1674.59, Z DEM: 1674.8, Z LAS: 1674.79, LC Type: 5, ΔZ DEM: 0.22, ΔZ LAS: 0.2



North



South



East



West





# Point: 703 Tall Weeds

Survey X: 855146.76, Survey Y: 721328.78, Z1: 1669.97, Z DEM: 1670.51, Z LAS: 1670.42, LC Type: 3, ΔZ DEM: 0.54, ΔZ LAS: 0.45



North



South



East



West



# Point: 800 Bare Earth

Survey X: 858001.51, Survey Y: 734388.67, Z1: 1562.32, Z DEM: 1561.94, Z LAS: 1562.01, LC Type: 1, ΔZ DEM: -0.38, ΔZ LAS: -0.31



North



South



East



West





# Point: 801 Forest

Survey X: 858250.08, Survey Y: 734437.18, Z1: 1555.94, Z DEM: 1555.9, Z LAS: 1555.97, LC Type: 5, ΔZ DEM: -0.04, ΔZ LAS: 0.03



North



South



East



West





# Point: 802 Urban Area

Survey X: 858084.04, Survey Y: 734273.88, Z1: 1566.18, Z DEM: 1565.96, Z LAS: 1565.93, LC Type: 2, ΔZ DEM: -0.22, ΔZ LAS: -0.25



North



South



East



West



## Point: 804 Tall Weeds

Survey X: 858054.11, Survey Y: 734600.18, Z1: 1559.28, Z DEM: 1559.97, LC Type: 3, ΔZ DEM: 0.69



North



South



East



West



# Point: 704 Swamp

Survey X: 855283.94, Survey Y: 722002.55, Z1: 1675.92, Z DEM: 1676.54, Z LAS: 1676.66, LC Type: 7, ΔZ DEM: 0.62, ΔZ LAS: 0.74



North



South



East



West





# Point: 900 Urban Area

Survey X: 804547.04, Survey Y: 579494.54, Z1: 1626.04, Z DEM: 1625.95, Z LAS: 1625.88, LC Type: 2, ΔZ DEM: -0.08, ΔZ LAS: -0.15



North



South



East



West



# Point: 901 Bare Earth

Survey X: 804511.92, Survey Y: 579446.73, Z1: 1627.88, Z DEM: 1627.81, Z LAS: 1627.79, LC Type: 1, ΔZ DEM: -0.07, ΔZ LAS: -0.1



North



South



East



West





# Point: 902 Forest

Survey X: 804481.03, Survey Y: 579401.88, Z1: 1632.88, Z DEM: 1633.02, Z LAS: 1633.02, LC Type: 5, ΔZ DEM: 0.14, ΔZ LAS: 0.14



North



South



East



West



## Point: 1000 Bare Earth

Survey X: 832068.16, Survey Y: 736753.5, Z1: 1649.53, Z DEM: 1649.76, Z LAS: 1649.83, LC Type: 1, ΔZ DEM: 0.23, ΔZ LAS: 0.3



North



South



East



West





# Point: 1001 Urban Area

Survey X: 832285.69, Survey Y: 736716.23, Z1: 1657.16, Z DEM: 1657.13, Z LAS: 1657.17, LC Type: 2, ΔZ DEM: -0.03, ΔZ LAS: 0.01



North



South



East



West



# Point: 1002 Tall Weeds

Survey X: 832267.89, Survey Y: 736773.25, Z1: 1653.94, Z DEM: 1654.06, Z LAS: 1654.19, LC Type: 3, ΔZ DEM: 0.12, ΔZ LAS: 0.25



North



South



East



West





# Point: 1003 Forest

Survey X: 832218.26, Survey Y: 736837.45, Z1: 1658.16, Z DEM: 1658.41, Z LAS: 1658.39, LC Type: 5, ΔZ DEM: 0.24, ΔZ LAS: 0.23



North



South



East



West



# Point: 1100 Urban Area

Survey X: 804938.4, Survey Y: 707145.77, Z1: 1733.87, Z DEM: 1733.4, Z LAS: 1733.51, LC Type: 2, ΔZ DEM: -0.46, ΔZ LAS: -0.36



North



South



East



West





# Point: 1101 Forest

Survey X: 805075.51, Survey Y: 707369.82, Z1: 1730.74, Z DEM: 1731.22, Z LAS: 1731.01, LC Type: 5, ΔZ DEM: 0.48, ΔZ LAS: 0.27



North



South



East



West



## Point: 1200 Bare Earth

Survey X: 893252.46, Survey Y: 715744.06, Z1: 1532.43, Z DEM: 1532.7, Z LAS: 1532.68, LC Type: 1, ΔZ DEM: 0.27, ΔZ LAS: 0.26



North



South



East



West





# Point: 1201 Urban Area

Survey X: 893170.44, Survey Y: 715684.17, Z1: 1532.17, Z DEM: 1532.27, Z LAS: 1532.28, LC Type: 2, ΔZ DEM: 0.09, ΔZ LAS: 0.11



North



South



East



West



## Point: 1202 Tall Weeds

Survey X: 892596, Survey Y: 715502.71, Z1: 1547.66, Z DEM: 1548.42, Z LAS: 1548.25, LC Type: 3, ΔZ DEM: 0.76, ΔZ LAS: 0.59



North



South



East



West





# Point: 1300 Bare Earth

Survey X: 888938.42, Survey Y: 673879.04, Z1: 1557.14, Z DEM: 1557.41, Z LAS: 1557.32, LC Type: 1, ΔZ DEM: 0.27, ΔZ LAS: 0.18



North



South



East



West



## Point: 1301 Tall Weeds

Survey X: 888970.4, Survey Y: 673685.94, Z1: 1568.39, Z DEM: 1568.74, Z LAS: 1568.79, LC Type: 3, ΔZ DEM: 0.35, ΔZ LAS: 0.4



North



South



East



West



# Point: 1302 Urban Area

Survey X: 888929.44, Survey Y: 673897.32, Z1: 1557.66, Z DEM: 1557.65, Z LAS: 1557.64, LC Type: 2, ΔZ DEM: -0.01, ΔZ LAS: -0.02



North



South



East



West



# Point: 1303 Forest

Survey X: 889011.35, Survey Y: 673976.9, Z1: 1555.45, Z DEM: 1555.63, Z LAS: 1555.58, LC Type: 5, ΔZ DEM: 0.18, ΔZ LAS: 0.13



North



South



East



West





## Point: 1400 Urban Area

Survey X: 888966.15, Survey Y: 632926.98, Z1: 1613.7, Z DEM: 1613.78, Z LAS: 1613.75, LC Type: 2, ΔZ DEM: 0.08, ΔZ LAS: 0.05



North



South



East



West



# Point: 1401 Bare Earth

Survey X: 888878.47, Survey Y: 633045.67, Z1: 1605.31, Z DEM: 1605.62, Z LAS: 1605.57, LC Type: 1, ΔZ DEM: 0.31, ΔZ LAS: 0.26



North



South



East



West





## Point: 1500 Bare Earth

Survey X: 920608.14, Survey Y: 625382.08, Z1: 1466.7, Z DEM: 1466.98, Z LAS: 1466.84, LC Type: 1, ΔZ DEM: 0.28, ΔZ LAS: 0.14



North



South



East



West



## Point: 1502 Forest

Survey X: 920762.03, Survey Y: 625358.75, Z1: 1472, Z DEM: 1472.61, Z LAS: 1472.58, LC Type: 5, ΔZ DEM: 0.61, ΔZ LAS: 0.58



North



South



East



West



# Point: 1600 Bare Earth

Survey X: 849857.82, Survey Y: 631632.55, Z1: 1652.37, Z DEM: 1652.48, Z LAS: 1652.45, LC Type: 1, ΔZ DEM: 0.11, ΔZ LAS: 0.07



North



South



East



West



## Point: 1602 Forest

Survey X: 849886.2, Survey Y: 631579.42, Z1: 1650.85, Z DEM: 1651.11, Z LAS: 1651.18, LC Type: 5, ΔZ DEM: 0.26, ΔZ LAS: 0.33



North



South



East



West



# Point: 1700 Urban Area

Survey X: 857167.85, Survey Y: 651168.28, Z1: 1619.83, Z DEM: 1619.97, Z LAS: 1620, LC Type: 2, ΔZ DEM: 0.14, ΔZ LAS: 0.17



North



South



East



West



## Point: 1701 Bare Earth

Survey X: 857116.53, Survey Y: 648124.24, Z1: 1640.83, Z DEM: 1641.03, Z LAS: 1641.05, LC Type: 1, ΔZ DEM: 0.2, ΔZ LAS: 0.22



North



South



East



West





# Point: 1800 Urban Area

Survey X: 837509.48, Survey Y: 673528.04, Z1: 1646, Z DEM: 1645.7, Z LAS: 1645.65, LC Type: 2,  $\Delta Z$  DEM: -0.3,  $\Delta Z$  LAS: -0.35



North



South



East



West



# Point: 1801 Bare Earth

Survey X: 837191.03, Survey Y: 673683.13, Z1: 1654.53, Z DEM: 1654.58, Z LAS: 1654.59, LC Type: 1, ΔZ DEM: 0.05, ΔZ LAS: 0.07



North



South



East



West





# Point: 1802 Tall Weeds

Survey X: 837373.86, Survey Y: 673622.28, Z1: 1652.32, Z DEM: 1652.58, Z LAS: 1652.56, LC Type: 3, ΔZ DEM: 0.26, ΔZ LAS: 0.23



North



South



East



West



# Point: 1803 Forest

Survey X: 837343.96, Survey Y: 673567.55, Z1: 1653.79, Z DEM: 1653.88, Z LAS: 1654.07, LC Type: 5, ΔZ DEM: 0.09, ΔZ LAS: 0.28



North



South



East



West





## Point: 1900 Urban Area

Survey X: 807586.43, Survey Y: 659480.46, Z1: 1684.96, Z DEM: 1684.85, Z LAS: 1684.86, LC Type: 2,  $\Delta Z$  DEM: -0.11,  $\Delta Z$  LAS: -0.1



North



South



East



West



# Point: 1901 Bare Earth

Survey X: 807652.38, Survey Y: 659648.02, Z1: 1678.62, Z DEM: 1678.48, Z LAS: 1678.58, LC Type: 1, ΔZ DEM: -0.14, ΔZ LAS: -0.05



North



South



East



West





# Point: 1902 Tall Weeds

Survey X: 807895.83, Survey Y: 659951.09, Z1: 1670.2, Z DEM: 1670.75, Z LAS: 1670.7, LC Type: 3, ΔZ DEM: 0.56, ΔZ LAS: 0.51



North



South



East



West



# Point: 1903 Forest

Survey X: 807493.36, Survey Y: 659615.7, Z1: 1693.58, Z DEM: 1693.71, Z LAS: 1693.74, LC Type: 5, ΔZ DEM: 0.13, ΔZ LAS: 0.16



North



South



East



West





## Point: 2000 Urban Area

Survey X: 817062.78, Survey Y: 620284.27, Z1: 1660.2, Z DEM: 1660.25, Z LAS: 1660.26, LC Type: 2, ΔZ DEM: 0.05, ΔZ LAS: 0.05



North



South



East



West



## Point: 2001 Bare Earth

Survey X: 817068.31, Survey Y: 620235.2, Z1: 1659.44, Z DEM: 1659.67, Z LAS: 1659.63, LC Type: 1, ΔZ DEM: 0.22, ΔZ LAS: 0.19



North



South



East



West





## Point: 2003 Tall Weeds

Survey X: 819039.11, Survey Y: 616476.19, Z1: 1665.27, Z DEM: 1666.38, Z LAS: 1666.27, LC Type: 3, ΔZ DEM: 1.11, ΔZ LAS: 1



North



South



East



West



# Point: 2004 Forest

Survey X: 819117.16, Survey Y: 616527.3, Z1: 1666.13, Z DEM: 1666.41, Z LAS: 1666.56, LC Type: 5, ΔZ DEM: 0.28, ΔZ LAS: 0.43



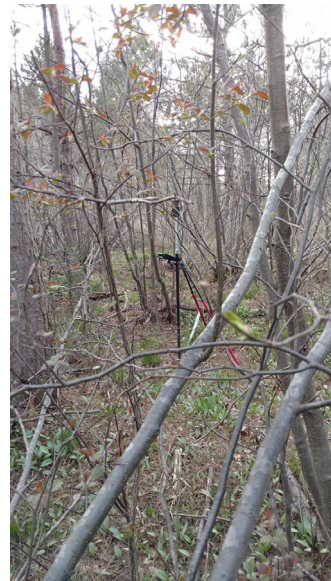
North



South



East



West





## Point: 2100 Bare Earth

Survey X: 813369.61, Survey Y: 603252.39, Z1: 1636.7, Z DEM: 1636.72, Z LAS: 1636.71, LC Type: 1, ΔZ DEM: 0.02, ΔZ LAS: 0



North



South



East



West



## Point: 2101 Urban Area

Survey X: 813413.32, Survey Y: 603262.24, Z1: 1636.66, Z DEM: 1636.55, Z LAS: 1636.64, LC Type: 2, ΔZ DEM: -0.1, ΔZ LAS: -0.02



North



South



East



West





# Point: 2200 Bare Earth

Survey X: 800082.46, Survey Y: 552476.45, Z1: 1702.69, Z DEM: 1702.5, Z LAS: 1702.57, LC Type: 1, ΔZ DEM: -0.2, ΔZ LAS: -0.12



North



South



East



West



# Point: 2201 Tall Weeds

Survey X: 800079.4, Survey Y: 552402.44, Z1: 1700.86, Z DEM: 1701, Z LAS: 1701.09, LC Type: 3, ΔZ DEM: 0.13, ΔZ LAS: 0.23



North



South



East



West





# Point: 2202 Forest

Survey X: 799933.98, Survey Y: 552372.92, Z1: 1698.87, Z DEM: 1699.41, Z LAS: 1699.36, LC Type: 5, ΔZ DEM: 0.54, ΔZ LAS: 0.49



North



South



East



West



# Point: 2203 Urban Area

Survey X: 802052.38, Survey Y: 552349.99, Z1: 1710.83, Z DEM: 1710.65, Z LAS: 1710.59, LC Type: 2, ΔZ DEM: -0.18, ΔZ LAS: -0.23



North



South



East



West



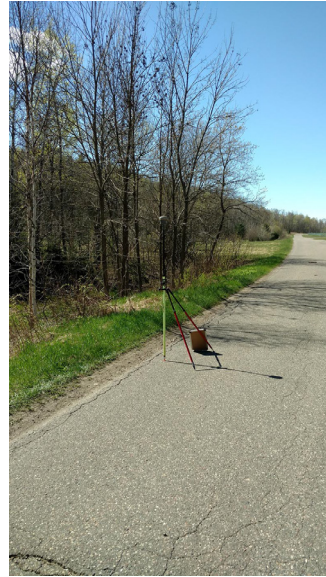


# Point: 2300 Urban Area

Survey X: 839207.58, Survey Y: 574198.11, Z1: 1611.01, Z DEM: 1610.95, Z LAS: 1611.01, LC Type: 2, ΔZ DEM: -0.06, ΔZ LAS: 0



North



South



East



West



# Point: 2301 Bare Earth

Survey X: 839101.46, Survey Y: 573859.78, Z1: 1615.55, Z DEM: 1615.48, Z LAS: 1615.46, LC Type: 1, ΔZ DEM: -0.07, ΔZ LAS: -0.09



North



South



East



West





# Point: 2302 Tall Weeds

Survey X: 839168.06, Survey Y: 573691.69, Z1: 1611.58, Z DEM: 1611.54, Z LAS: 1615.04, LC Type: 3, ΔZ DEM: -0.04, ΔZ LAS: 3.46



North



South



East



West



## Point: 2303 Swamp

Survey X: 839251.79, Survey Y: 574206.05, Z1: 1605.13, Z DEM: 1605.78, Z LAS: 1605.94, LC Type: 7, ΔZ DEM: 0.66, ΔZ LAS: 0.81



North



South



East



West



# Point: 2304 Forest

Survey X: 839311.27, Survey Y: 574249.32, Z1: 1606.19, Z DEM: 1606.64, LC Type: 5, ΔZ DEM: 0.45



North



South



East



West



# Point: 2400 Urban Area

Survey X: 843427.03, Survey Y: 603038.82, Z1: 1632.32, Z DEM: 1632.43, Z LAS: 1632.41, LC Type: 2, ΔZ DEM: 0.11, ΔZ LAS: 0.09



North



South



East



West





# Point: 2401 Bare Earth

Survey X: 843447.18, Survey Y: 603228.91, Z1: 1631.99, Z DEM: 1632.18, Z LAS: 1632.17, LC Type: 1, ΔZ DEM: 0.19, ΔZ LAS: 0.18



North



South



East



West



# Point: 2402 Tall Weeds

Survey X: 843814.95, Survey Y: 602924.97, Z1: 1629.55, Z DEM: 1630.07, Z LAS: 1630.14, LC Type: 3, ΔZ DEM: 0.52, ΔZ LAS: 0.58



North



South



East



West





# Point: 2500 Bare Earth

Survey X: 862329.72, Survey Y: 599171.66, Z1: 1581.33, Z DEM: 1581.27, Z LAS: 1581.3, LC Type: 1, ΔZ DEM: -0.07, ΔZ LAS: -0.04



North



South



East



West



## Point: 2501 Urban Area

Survey X: 862309.47, Survey Y: 599224.84, Z1: 1582.42, Z DEM: 1582.45, Z LAS: 1582.44, LC Type: 2, ΔZ DEM: 0.03, ΔZ LAS: 0.02



North



South



East



West





# Point: 2502 Tall Weeds

Survey X: 860898.92, Survey Y: 598954.75, Z1: 1580.1, Z DEM: 1580.47, Z LAS: 1580.53, LC Type: 3, ΔZ DEM: 0.37, ΔZ LAS: 0.43



North



South



East



West



# Point: 2600 Bare Earth

Survey X: 904394.66, Survey Y: 600095.36, Z1: 1476.32, Z DEM: 1476.28, Z LAS: 1476.25, LC Type: 1, ΔZ DEM: -0.03, ΔZ LAS: -0.07



North



South



East



West





# Point: 2601 Urban Area

Survey X: 904608.6, Survey Y: 600146.48, Z1: 1475.82, Z DEM: 1475.83, Z LAS: 1475.8, LC Type: 2, ΔZ DEM: 0.02, ΔZ LAS: -0.02



North



South



East



West

# Point: 2602 Tall Weeds

Survey X: 905398.87, Survey Y: 600115.31, Z1: 1478.71, Z DEM: 1479.01, Z LAS: 1478.98, LC Type: 3, ΔZ DEM: 0.3, ΔZ LAS: 0.28



North



South



East



West





# Point: 2604 Forest

Survey X: 904666.04, Survey Y: 600101.11, Z1: 1476.18, Z DEM: 1476.24, Z LAS: 1476.42, LC Type: 5, ΔZ DEM: 0.06, ΔZ LAS: 0.23



North



South



East



West





# Point: 2700 Bare Earth

Survey X: 831713.29, Survey Y: 501921.42, Z1: 1558.92, Z DEM: 1559.04, Z LAS: 1559.05, LC Type: 1, ΔZ DEM: 0.12, ΔZ LAS: 0.13



North



South



East



West





# Point: 2701 Urban Area

Survey X: 832513.04, Survey Y: 503532.84, Z1: 1555.7, Z DEM: 1555.72, Z LAS: 1555.71, LC Type: 2, ΔZ DEM: 0.01, ΔZ LAS: 0.01



North



South



East



West





# Point: 2702 Swamp

Survey X: 832565.6, Survey Y: 503309.82, Z1: 1541.07, Z DEM: 1541.78, Z LAS: 1541.71, LC Type: 7, ΔZ DEM: 0.72, ΔZ LAS: 0.64



North



South



East



West





# Point: 2800 Bare Earth

Survey X: 856617.66, Survey Y: 543497.2, Z1: 1644.12, Z DEM: 1643.86, Z LAS: 1643.9, LC Type: 1, ΔZ DEM: -0.25, ΔZ LAS: -0.21



North



South



East



West





# Point: 2801 Forest

Survey X: 856718.81, Survey Y: 543530.5, Z1: 1647.3, Z DEM: 1647.61, Z LAS: 1647.57, LC Type: 5, ΔZ DEM: 0.31, ΔZ LAS: 0.27



North



South



East



West





# Point: 2802 Tall Weeds

Survey X: 854737.27, Survey Y: 542686.71, Z1: 1662.59, Z DEM: 1662.98, Z LAS: 1662.74, LC Type: 3, ΔZ DEM: 0.39, ΔZ LAS: 0.15



North



South



East



West





## Point: 2803 Urban Area

Survey X: 853442.31, Survey Y: 550008.62, Z1: 1648.26, Z DEM: 1648.26, Z LAS: 1648.29, LC Type: 2, ΔZ DEM: 0, ΔZ LAS: 0.03



**North**



**South**



**East**



**West**





# Point: 2900 Bare Earth

Survey X: 900024.63, Survey Y: 523320.86, Z1: 1530.28, Z DEM: 1530.3, Z LAS: 1530.32, LC Type: 1, ΔZ DEM: 0.02, ΔZ LAS: 0.03



North



South



East



West



## Point: 2901 Urban Area

Survey X: 899406.64, Survey Y: 523210.71, Z1: 1525.11, Z DEM: 1525.32, Z LAS: 1525.24, LC Type: 2, ΔZ DEM: 0.21, ΔZ LAS: 0.13



North



South



East



West





# Point: 2902 Forest

Survey X: 899897.15, Survey Y: 523505.16, Z1: 1519.49, Z DEM: 1520.1, Z LAS: 1520.25, LC Type: 5, ΔZ DEM: 0.61, ΔZ LAS: 0.76



North



South



East



West





# Point: 3000 Bare Earth

Survey X: 925665.71, Survey Y: 521237.53, Z1: 1370.58, Z DEM: 1370.73, Z LAS: 1370.69, LC Type: 1, ΔZ DEM: 0.15, ΔZ LAS: 0.11



North



South



East



West





# Point: 3001 Urban Area

Survey X: 925662.88, Survey Y: 521110.42, Z1: 1370.44, Z DEM: 1370.65, Z LAS: 1370.63, LC Type: 2, ΔZ DEM: 0.21, ΔZ LAS: 0.19



North



South



East



West





# Point: 3100 Urban Area

Survey X: 906497.54, Survey Y: 507263.96, Z1: 1546.9, Z DEM: 1546.87, Z LAS: 1546.92, LC Type: 2, ΔZ DEM: -0.03, ΔZ LAS: 0.02



North



South



East



West





# Point: 3101 Bare Earth

Survey X: 906531.37, Survey Y: 507218.48, Z1: 1546.56, Z DEM: 1546.49, Z LAS: 1546.55, LC Type: 1, ΔZ DEM: -0.07, ΔZ LAS: -0.01



North



South



East



West





# Point: 3200 Bare Earth

Survey X: 948866.27, Survey Y: 515139.52, Z1: 1318.57, Z DEM: 1318.29, Z LAS: 1318.28, LC Type: 1, ΔZ DEM: -0.28, ΔZ LAS: -0.29



North



South



East



West





# Point: 3201 Tall Weeds

Survey X: 948754.21, Survey Y: 515096.11, Z1: 1318.2, Z DEM: 1318.56, Z LAS: 1318.54, LC Type: 3, ΔZ DEM: 0.37, ΔZ LAS: 0.34



North



South



East



West





# Point: 3202 Swamp

Survey X: 949025.42, Survey Y: 515082.63, Z1: 1309.23, Z DEM: 1309.73, Z LAS: 1309.76, LC Type: 7, ΔZ DEM: 0.5, ΔZ LAS: 0.54



North



South



East



West





# Point: 3203 Urban Area

Survey X: 948880.14, Survey Y: 515975.05, Z1: 1315.93, Z DEM: 1315.72, Z LAS: 1315.73, LC Type: 2, ΔZ DEM: -0.2, ΔZ LAS: -0.19



North



South



East



West





# Point: 3300 Bare Earth

Survey X: 955548.23, Survey Y: 549488.98, Z1: 1267.9, Z DEM: 1267.66, Z LAS: 1267.67, LC Type: 1,  $\Delta Z$  DEM: -0.25,  $\Delta Z$  LAS: -0.24



North



South



East



West





# Point: 3301 Urban Area

Survey X: 955746.11, Survey Y: 549287.31, Z1: 1266.84, Z DEM: 1266.74, Z LAS: 1266.72, LC Type: 2, ΔZ DEM: -0.1, ΔZ LAS: -0.12



North



South



East



West





# Point: 3302 Swamp

Survey X: 955535.81, Survey Y: 549344.91, Z1: 1258.61, Z DEM: 1259.44, LC Type: 7, ΔZ DEM: 0.83



**North**



**South**



**East**



**West**





# Point: 3303 Forest

Survey X: 955611.53, Survey Y: 549522.26, Z1: 1272.11, Z DEM: 1272.17, Z LAS: 1272.15, LC Type: 5, ΔZ DEM: 0.06, ΔZ LAS: 0.04



North



South



East



West





# Point: 3400 Tall Weeds

Survey X: 894365.8, Survey Y: 572399.5, Z1: 1575.69, Z DEM: 1576.14, Z LAS: 1576.27, LC Type: 3, ΔZ DEM: 0.45, ΔZ LAS: 0.58



North



South



East



West





# Point: 3401 Urban Area

Survey X: 894345.97, Survey Y: 572248.04, Z1: 1579.53, Z DEM: 1579.55, Z LAS: 1579.54, LC Type: 2, ΔZ DEM: 0.02, ΔZ LAS: 0



North



South



East



West





# 3402 Bare Earth

893898.33, Survey Y: 572478.92, Z1: 1587.24, Z DEM: 1587.5, Z LAS: 1587.58, LC Type: 1, ΔZ DEM: 0.26, ΔZ LAS: 0.3



North



South



East



West