

Ground Control Report

Wisconsin WROC - 3DEP | Pepin County Lidar 2019

1.1 Ground Control Design and Methodology

The ground control network and design used for the Pepin County lidar acquisition was made up of calibration points, GPS base stations, NGS base stations, and independent check points from the vertical accuracy ground control survey. This report will focus on the lidar calibration points that were collected at 10 locations in and around the Pepin County project area. The control points are used for QC checks and calibration of the raw point cloud and for additional vertical checks against the processed bare earth surface.

The ground control calibration survey was done in Wisconsin County Coordinate System-Pepin County, NAD83 (2011), US survey feet; NAVD88 (Geoid 12B), US survey feet. The field work was conducted by Ayres surveyors. All field work was completed between May 6, 2019, and May 16, 2019.

Control Summary and Methodology

Control Summary

Horizontal Datum:	NAD83 (2011)
Vertical Datum:	NAVD88 (2012), Wisconsin GEOID12B
Rectangular Coordinate System:	WISCRS Pepin County
Used NGS Control?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
List any NGS control points used:	
Summary of control checks and calibration (if applicable):	(See Field Notes for control checks on NGS monuments – No calibration was needed)
Survey Methods Used:	WISCORS Network through VRS connection was the origination of the control used with checks and calibration as discussed. GPS methods were used where VRS connection and obstructions permitted. Other areas used control set by VRS RTK methods and robotic total station methods were used.
Equipment Used:	GPS Trimble R10 GNSS S/N 5736470271– (Ayres #70.58) Total station Trimble S6 S/N 93410505 – (Ayres #75.53) Data Collector Trimble TSC3 S/N RS17C22013 (Ayres #75.37)

Utilities

Diggers Hotline Ticket #:	N/A
Locator Contact Info:	N/A
General Notes:	

Crew Chief Notes

All aerial targets were measured using 2 - 180 Epoch averaged solutions.
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Survey Methods (continued)

All work was performed in and referenced to NAD83 (2011), NAVD 88(2012), Geoid 12B, Wisconsin County Reference System, Pepin Zone in US Survey Feet.

Established horizontal and vertical coordinate values on the points by a minimum of two – 180 epoch observations with separate initializations using RTK GPS and the WISCORS network. The resultant coordinates and elevations provided in the deliverables are an average of the two observations.

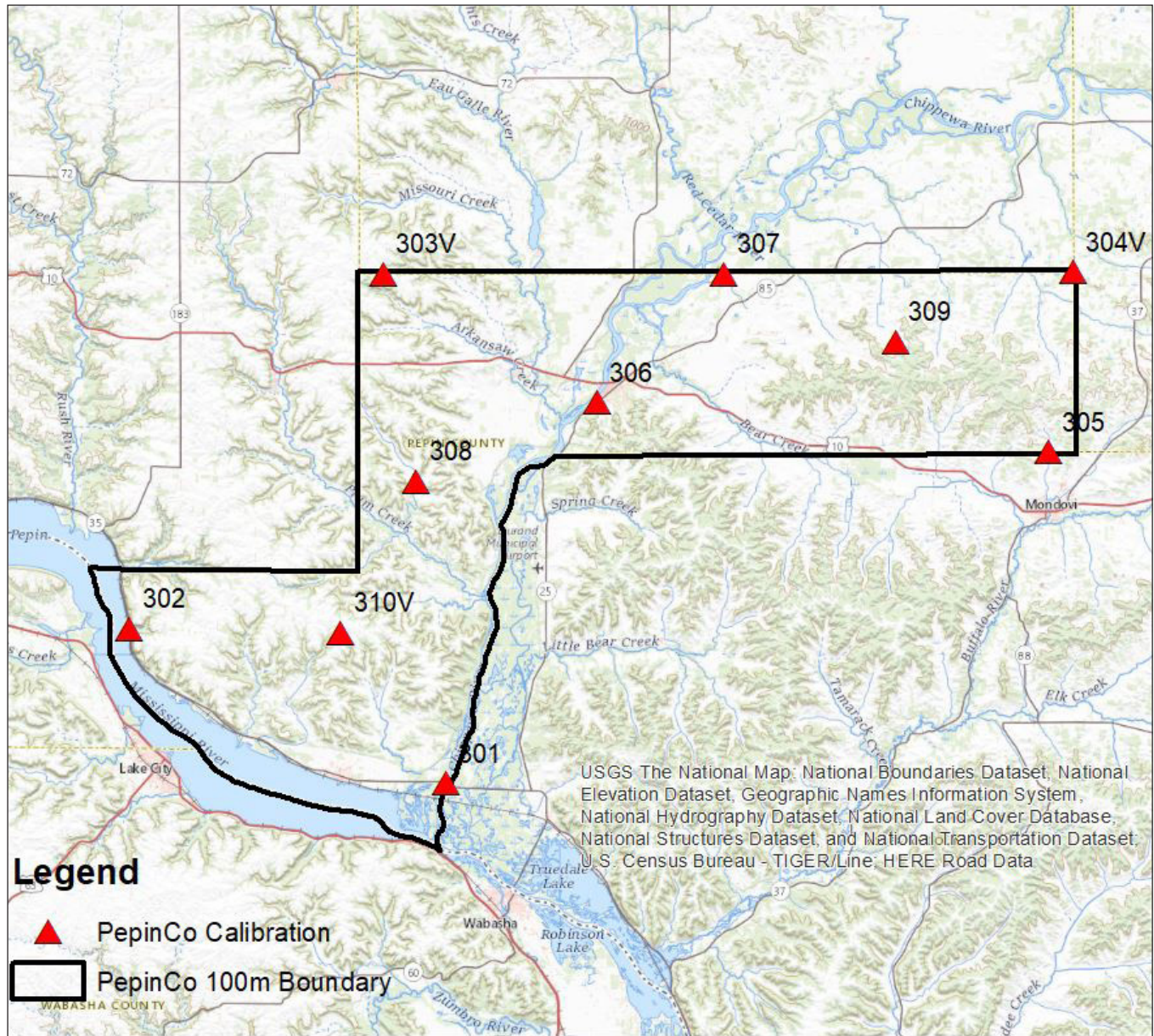
Check shots were taken on numerous NGS control points (see field notes) to verify that the values obtained are consistent with the datum/adjustment as described herein and meet the ± 3 centimeter vertical accuracy requirement at the 95% confidence level.

Points not able to be directly occupied by GPS means were measured using Total Station methods from control point pairs set utilizing GPS methods outlined above.

1.1.2 Control Layout

The locations were selected around the outer geometry of the project boundary and on major roads within the project area. This layout design is preferred when the calibration points will be used to check different areas across a large flight block. The control survey was conducted with a Trimble R-8 GPS receiver and a VRS connection with a TSC3 data collector.

1.1.2.1 Map of Pepin County Calibration Points



1.1.3 Pepin County Lidar, Calibration Point Statistics

The final step in using the calibration points is to run a statistical comparison against the bare earth ground surface to confirm that the vertical accuracy is within specification. The following results indicate that the overall RMSEz of the calibration points is 0.052'. This is a separate check as compared to the Vertical Accuracy Survey QA/QC report. These points are used in the calibration of the raw point cloud, and therefore are not an independent set of checkpoints like those used in the vertical accuracy testing.

1.1.3.1 Statistical Report for Calibration Points

NUMBER	EASTING	NORTHING	KNOWN Z	LASER Z	DZ
301	589401.822	209978.413	689.538	689.520	-0.018
302	533662.360	237229.658	727.217	727.190	-0.027
303V	578470.641	299834.322	1187.916	1187.890	-0.026
304V	700191.373	300104.856	904.895	904.800	-0.095
305	695893.811	268372.997	844.379	844.410	0.031
306	616196.657	277145.808	732.097	732.020	-0.077
307	638552.267	299839.705	754.965	754.900	-0.065
308	584306.181	263182.054	795.408	795.430	0.022
309	668896.358	287827.429	934.236	934.190	-0.046
310V	570981.099	236561.078	1165.701	1165.750	0.049

Average Dz	-0.025 ft
Minimum Dz	-0.095 ft
Maximum Dz	+0.049 ft
Average Magnitude	0.046 ft
Root Mean Square	0.052 ft
Std Deviation	0.048 ft

1.1.4 Field Notes

POINT CODE	TH	PI	LOCATION
301 CA	500	✓	FOG LINE @ BRIDGE DECK JOINT

POINT CODE	TH	PI	LOCATION
306 CA	2M	✓	NE END OF FOG LINE, STH 25 + CHURCH DRIVEWAY

POINT CODE	TH	PI	LOCATION
302 CA	2M	✓	EAST END OF PARKING STRIPE, SOUTH MOST PARKING SPOT

POINT CODE	TH	PI	LOCATION
307 CA	2M	✓	EAST END OF FOG LINE CTH N + 50 th AVE

POINT CODE	TH	PI	LOCATION
303V CA	500	✓	☐ OF 10 th AVE, 880' W/☐ WEBER AVE.

POINT CODE	TH	PI	LOCATION
308 CA	2M	✓	NE END OF CENTER LINE, CTH 55 + CTH D

POINT CODE	TH	PI	LOCATION
304V CA	500	✓	☐ OF COON CREEK RD + ALBANY D

POINT CODE	TH	PI	LOCATION
309 CA	2M	✓	EAST END OF SOLID YELLOW CENTER LINE, CTH R.

POINT CODE	TH	PI	LOCATION
305 CA	2M	✓	SOUTH END OF FOG LINE ON EAST SIDE OF CTH H @ COUNTY LINE

POINT CODE	TH	PI	LOCATION
310V CA	500	✓	☐ OF CTH I @ DRIVEWAY TO NORTH

1.1.5 Field Photos



Point 301



Point 302



Point 303V



Point 304V



Point 305



Point 306

1.1.5 Field Photos (Continued)



Point 307



Point 308



Point 309



Point 310V