Ground Control Report

Wisconsin WROC – 3DEP

Eau Claire County Lidar 2020

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1.1 Ground Control Design and Methodology

The ground control network and design used for the Eau Claire 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 24 locations in and around the Eau Claire 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-Eau Claire County, NAD83 (2011), U.S. survey feet; NAVD88 (Geoid 12B), U.S. survey feet. The field work was conducted by Ayres surveyors. All field work was completed between April 6 and April 13, 2020.

Control Summary and Methodology

Control Summary

Horizontal Datum:	NAD83 (2011)
Vertical Datum:	NAVD88 (2012), GEOID12B
Rectangular Coordinate System:	WISCRS-Eau Claire County
Used NGS Control?	☒ Yes ☐ 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:	RTK-GPS using WISCORS Network through VRS connection were used for direct observations and to set control pairs for Robotic Total Station observations
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 TSC 3 S/N RS17C22013 (Ayres #75.37)

Survey Methods (continued)

All work was performed in and referenced to NAD83 (2011), NAVD 88(2012), Geoid 12B, Wisconsin Coordinate Reference System-Eau Claire Zone in U.S. Survey Feet.

Established horizontal and vertical coordinate values on the points by a minimum of two – 90 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. OPUS observations of a 30 minute minimum were taken on control points when necessary.

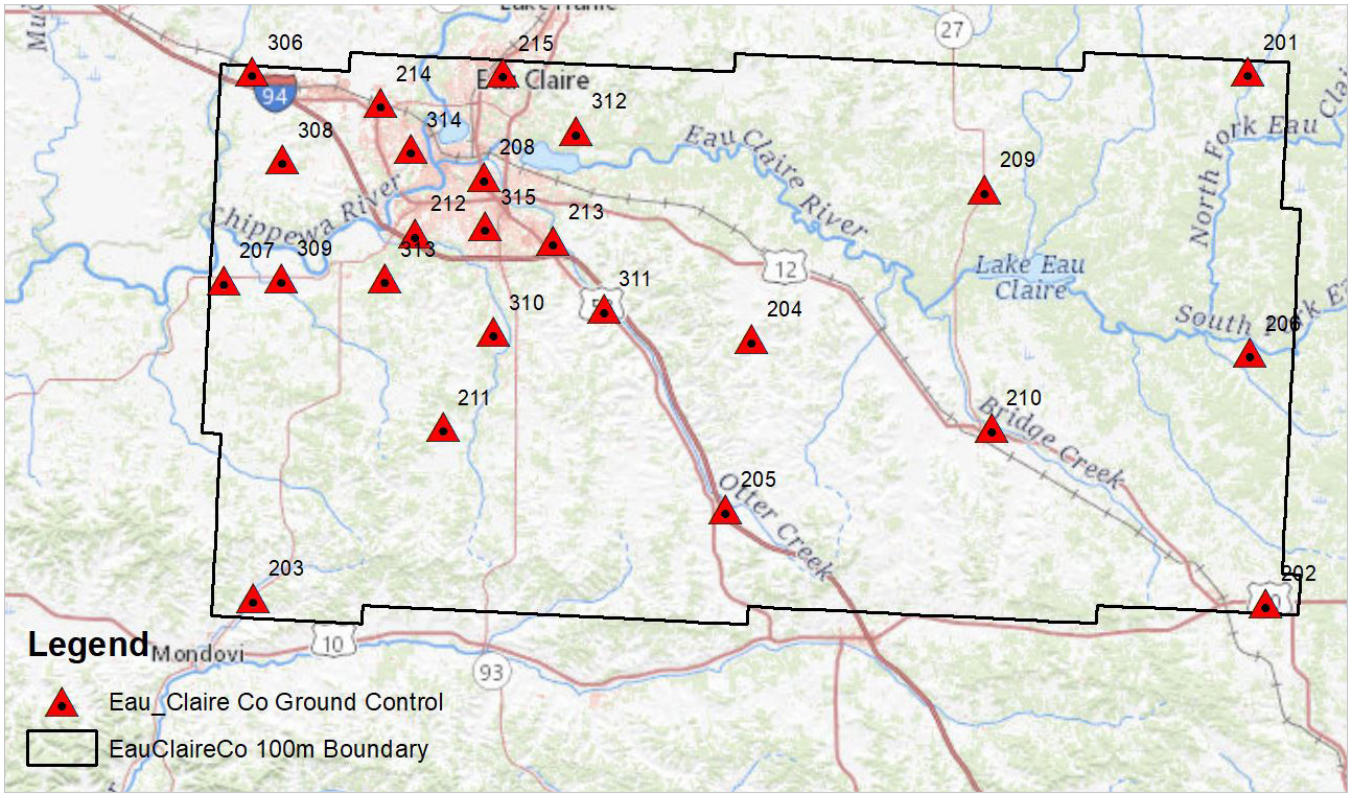
Check shots were taken on numerous NGS control points (see above and field notes) to verify that the values obtained are consistent with the datum/adjustment as described herein and meet the ±3 centimeter vertical accuracy requirement at the 95% confidence level.

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 Eau Claire County Calibration Points



1.1.3 Eau Claire County Lidar, Calibration Point Statistics

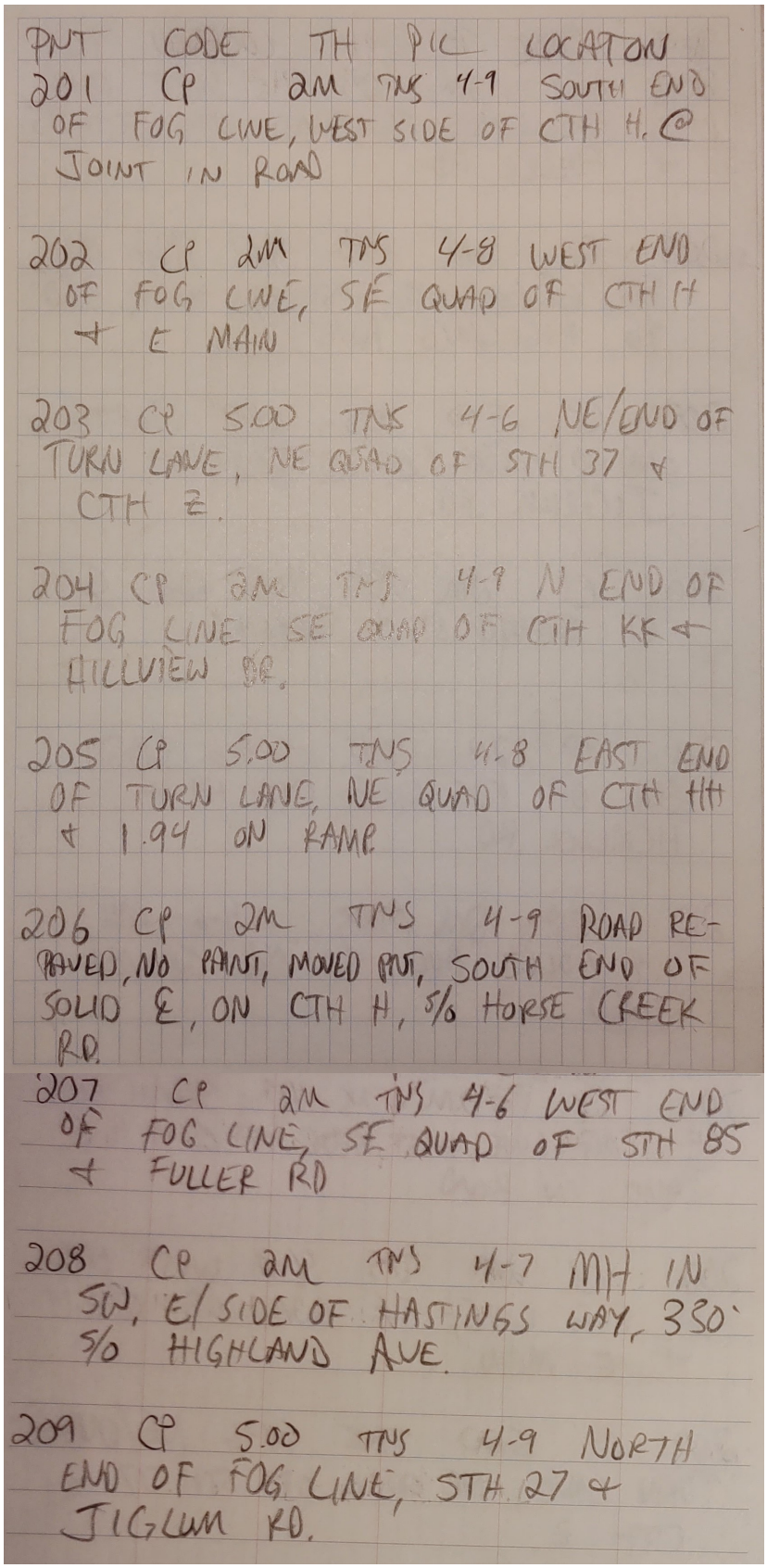
The final step in using the calibration points is to run a statistical comparison against the bare earth ground surface to confirm that the vertical accuracy is within specification. The following results indicate that the overall RMSEz of the calibration points is 0.087'. This is a separate check as 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
201	483794.407	295643.918	1057.694	1057.620	-0.074
202	486915.892	200422.873	1083.846	1083.850	0.004
203	305439.104	201270.005	858.347	858.420	0.073
204	394766.373	247812.624	961.244	961.230	-0.014
205	390062.039	217217.186	987.738	987.810	0.072
206	484241.859	245215.305	995.011	995.070	0.059
207	300210.807	258241.756	760.258	760.190	-0.068
208	346748.707	276858.344	880.847	880.900	0.053
209	436565.612	274571.479	1083.920	1084.060	0.140
210	437797.049	231813.364	965.278	965.340	0.062
211	339446.449	231993.876	955.690	955.830	0.140
212	334450.163	266690.744	868.474	868.500	0.026
213	359283.469	265334.714	895.362	895.530	0.168
214	328238.635	290061.535	912.632	912.790	0.158
215	350282.676	295435.806	891.010	891.140	0.130
306	305255.828	295617.776	893.831	893.970	0.139
308	310750.024	279911.127	892.594	892.690	0.096
309	310464.126	258673.940	774.112	774.140	0.028
310	348561.736	249035.625	903.270	903.300	0.030
311	368295.339	253248.489	917.852	917.810	-0.042
312	363302.759	285043.530	900.953	900.980	0.027
313	329062.148	258509.207	864.890	864.900	0.010
314	333788.926	281803.608	866.602	866.700	0.098
315	346964.767	267956.009	906.843	906.830	-0.013

Average Dz	0.054
Minimum Dz	-0.074
Maximum Dz	0.168
Average Magnitude	0.072
Root Mean Square	0.087
Std Deviation	0.070

1.1.4 Field Notes



PNT CODE TH PIC LOCATON

201 CP 2M TNS 4-9 SOUTH END OF FOG LINE, WEST SIDE OF CTH H @ JOINT IN ROAD

202 CP 2M TNS 4-8 WEST END OF FOG LINE, SE QUAD OF CTH H + E MAIN

203 CP 5.00 TNS 4-6 NE/END OF TURN LANE, NE QUAD OF STH 37 + CTH E.

204 CP 2M TNS 4-9 N END OF FOG LINE SE QUAD OF CTH KK + HILLVIEW DR.

205 CP 5.00 TNS 4-8 EAST END OF TURN LANE, NE QUAD OF CTH HH + I-94 ON RAMP

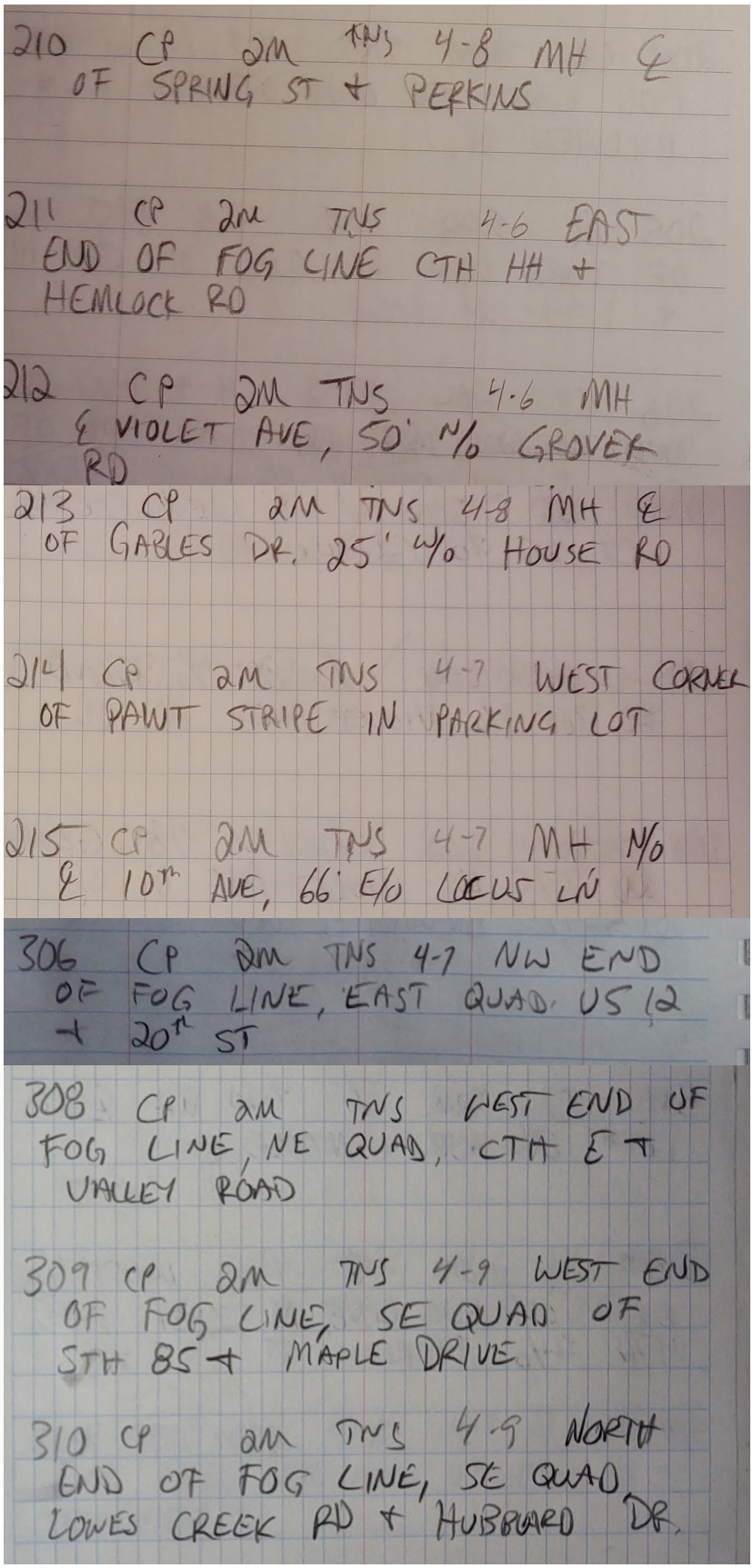
206 CP 2M TNS 4-9 ROAD RE-PAVED, NO PAINT, MOVED PNT, SOUTH END OF SOLID E, ON CTH H, S/O HORSE CREEK RD.

207 CP 2M TNS 4-6 WEST END OF FOG LINE, SE QUAD OF STH 85 + FULLER RD

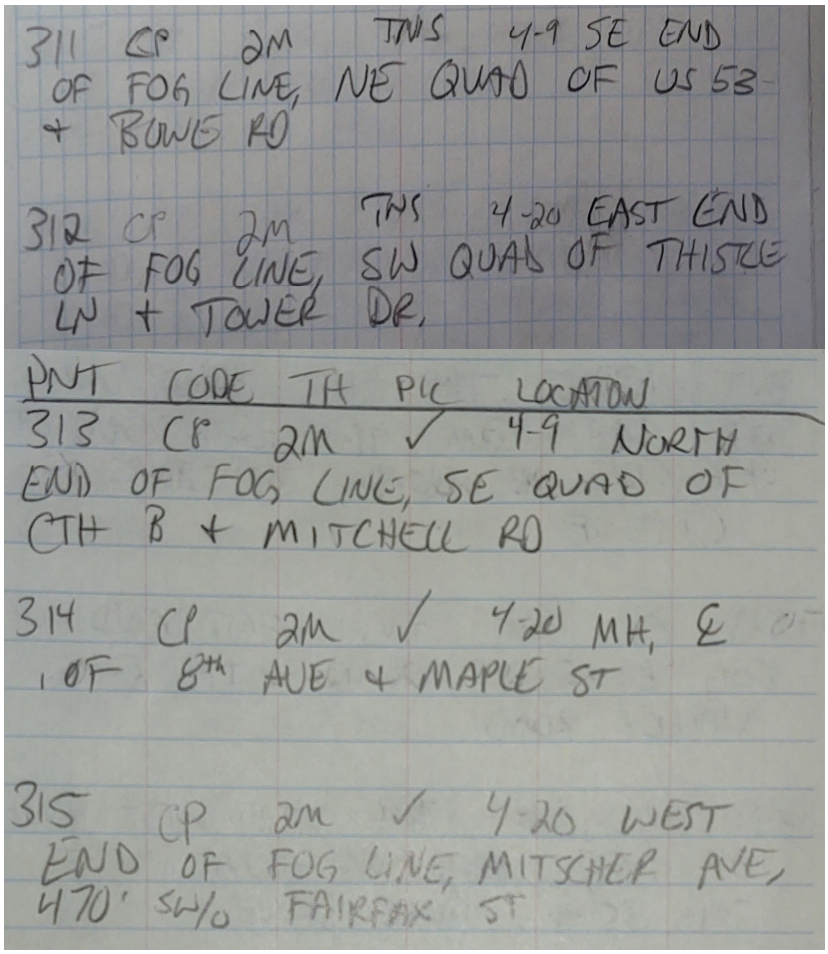
208 CP 2M TNS 4-7 MH IN SW, E/SIDE OF HASTINGS WAY, 350' S/O HIGHLAND AVE.

209 CP 5.00 TNS 4-9 NORTH END OF FOG LINE, STH 27 + JIGLUM RD.

1.1.4 Field Notes (Continued)



1.1.4 Field Notes (Continued)


311 CP 2M TNS 4-9 SE END OF FOG LINE, NE QUAD OF US 53 + BOWE RD

312 CP 2M TNS 4-20 EAST END OF FOG LINE, SW QUAD OF THISTLE LN + TOWER DR.

PNT CODE TH PIC LOCATION

313 CP 2M ✓ 4-9 NORTH END OF FOG LINE, SE QUAD OF CTH B + MITCHELL RD

314 CP 2M ✓ 4-20 MH, ℄ OF 8TH AVE + MAPLE ST

315 CP 2M ✓ 4-20 WEST END OF FOG LINE, MITSCHER AVE, 470' SW/O FAIRFAX ST

1.1.5 Field Photos

Point 201

Point 202

Point 203

Point 204

1.1.5 Field Photos (Continued)

Point 205

Point 206

Point 207

Point 208

1.1.5 Field Photos (Continued)

Point 209

Point 210

Point 211

Point 212

1.1.5 Field Photos (Continued)

Point 213

Point 214

Point 215

Point 306

1.1.5 Field Photos (Continued)

Point 308

Point 309

Point 310

Point 311

1.1.5 Field Photos (Continued)

Point 312

Point 313

Point 314

Point 315