Saginaw County, MI QL-2 Aerial LiDAR

Surveyor's Report for Ground Control Establishment

Project Description:
The Spicer Group was contracted to field survey LiDAR quality control points in support of Saginaw County, MI QL2 LiDAR. There are 20 calibration points that were surveyed by others and provided to Spicer Group by Kucera Inc. Spicer Group's responsibility is for the establishment of 40 non-vegetated (NVA) points and 30 vegetated (VVA) points throughout the project. In total 90 points have been established throughout the county to support the development of QL2 compliant data. The land cover breakdown has the NVA points as 5 bare earth and 35 urban area. VVA points are broken down as 3 Forested, 3 swamp/wetland points, and 24 tall weeds/crops. Fifty percent of the NVA points can be used for horizontal accuracy verification.

The VVA and NVA points were placed throughout the county to try and provide maximum coverage while adhering to the LiDAR Base Specification Version 1.2 (November, 2014).

Note: Calibration points provided by Kucera had elevation values provided in U.S. Survey Foot units, rather than International Feet. This does not affect the global spatial accuracy, as the change is only significant at the third decimal place, however it was relevant information to disclose.

Field Procedure:
Field work began on March 4th, 2016 and was completed on May 10th, 2016. A RTK GPS survey was performed using Leica GS14 GNSS receivers utilizing the Michigan Department of Transportation (MDOT) Continuously Operating Reference Stations (CORS) as base stations for the project. Each point was set on a flat surface at least five meters away from any significant elevation change. Points were occupied for 40 seconds, the GNSS rover was then rotated 180 degrees and occupied for 40 more seconds. Second, crews forced a loss of phase lock, and reacquired a fixed solution under a new set of ambiguities. The point was then occupied for 40 seconds, the GNSS rover was again rotated 180 degrees and occupied for another 40 seconds. This procedure was completed twice on all points for this project with a minimum of 4 hours of separation between each set of observations. In total each point has 320 seconds of continuous RTK observations. Data sheets for each point were completed, which include point type, general location, occupation time, equipment used, and photographs, final coordinates, point ties, and final RMSE values.

Office Procedure:
Upon completion of the field survey, all RTK observations were imported into Leica Geo Office (LGO) for processing and analysis. All redundant observations were reviewed in LGO for agreement and consistency. Observation averaging limits were set to 0.08' in XY & Z, and any points where the multiple observations exceeded the 0.08' deviation from the mean, were observed for a third set of observations. All final observations for all points from a minimum of two sets agree to within 0.08' of the mean in 3D position.

Final 3D coordinate values are the result of a least squares adjustment performed on the RTK network. The seven CORS stations used were held as 3D constraints in the final adjustment.

Reporting Procedure:
The North American Datum of 1983 (NAD83 (2011), Michigan South Zone projection was used for reporting the horizontal coordinates in international feet. The vertical elevations are North American Vertical Datum of 1988 (NAVD 88) utilizing the GEOID12A model and are reported in international feet.

The average Horizontal RMSE for all points at the 95% confidence level is 0.03 international feet or 0.009 meter.

The average Elevation RMSE for all points at the 95% confidence level is 0.01 international feet or 0.004 meter.

The average 3-Dimensional RMSE for all points at the 95% confidence level is 0.04 international feet or 0.013 meter.