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Dewberry Response to USGS/FEMA Region 2 Review of the NY Great Lakes Area QL2 LiDAR - Orleans County Processing Project

Produced for U.S. Geological Survey

USGS Contract: G10PC00013

Task Order:G14PD00043

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Executive Summary

The primary purpose of this project was to develop a consistent and accurate surface elevation dataset derived from high-accuracy Light Detection and Ranging (LiDAR) technology for the USGS/FEMA Region 2 NY Great Lakes - Orleans County LiDAR Project Area.

The LiDAR data were processed to digital surface models (DSM) and bare-earth digital terrain models (DTM). Detailed breaklines and bare-earth digital elevation Models (DEMs) were produced for the project area.

Deliverables for this project included raw point cloud data, classified point cloud data, bare earth not hydro-enforced digital terrain models, bare earth hydro enforced digital elevation models, intensity images, breaklines, control points, metadata, project report, and project extent shapefiles.

The USGS review of these deliverables resulted in seven calls to remove bridges or bridge related artifacts, one call to replace culverts, twenty five calls to add ground points where tinning in the terrain occurs, seven calls to flatten hydro features, two calls to remove building artifacts, one call to remove manmade feature, one metadata call and four general classification calls.

PROJECT AREA

Data was formatted according to tiles with each tile covering an area of 1500m by 1500m. A total of 507 tiles were produced for the project encompassing an area of approximately 393 sq. miles.

Figure 1- Project Map

Edit Calls

METADATA

USGS reported one error generated by the metadata parser. Dewberry has fixed the file.

LAS RAW SWATHS

USGS reported that the number of points does not equal total points by return. This is because the software is only looking at the first 4 or 5 returns the las files have up to 7 returns. If las info is used to look it gives a warning about extra returns but reports them. When all 7 returns are added together it equals the total found in the header. It is not recommended that the extra returns be removed because they are later returns and more than likely ground returns.

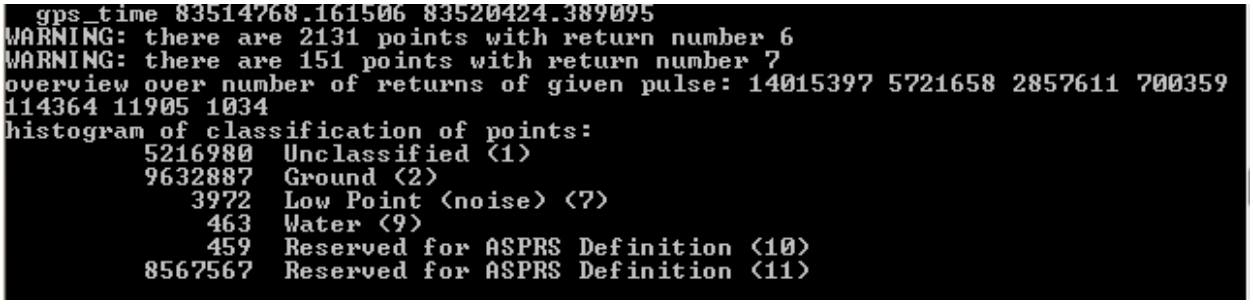

Figure 1- Tile 17TQH195825. Screen shot of warning and overview of all 7 returns that matches total found in header.

LAS TILES

USGS reported that the number of points does not equal total points by return. As stated above on the swath level data, This is because the software is only looking at the first 4 or 5 returns the las files have up to 7 returns.

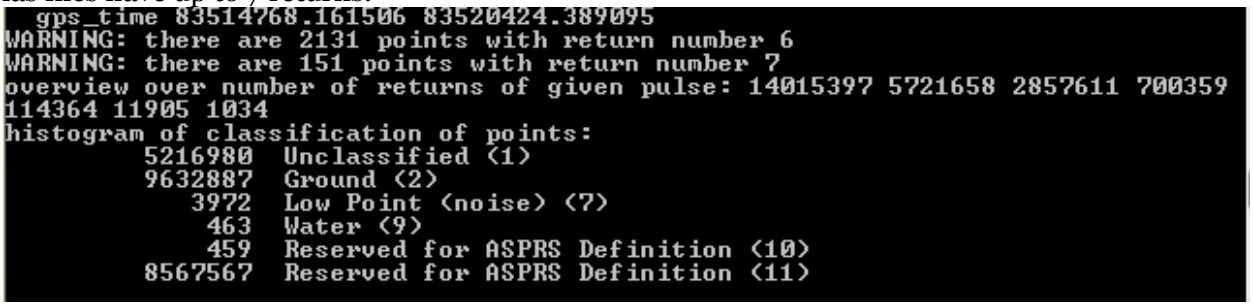

Figure 2- Tile 17TQH195825. Screen shot of warning and overview of all 7 returns that matches total found in header.

ARTIFACT IN DEM SURFACE

There were two locations where the USGS identified places that had what appeared to be artifacts and not represent the true ground surface.

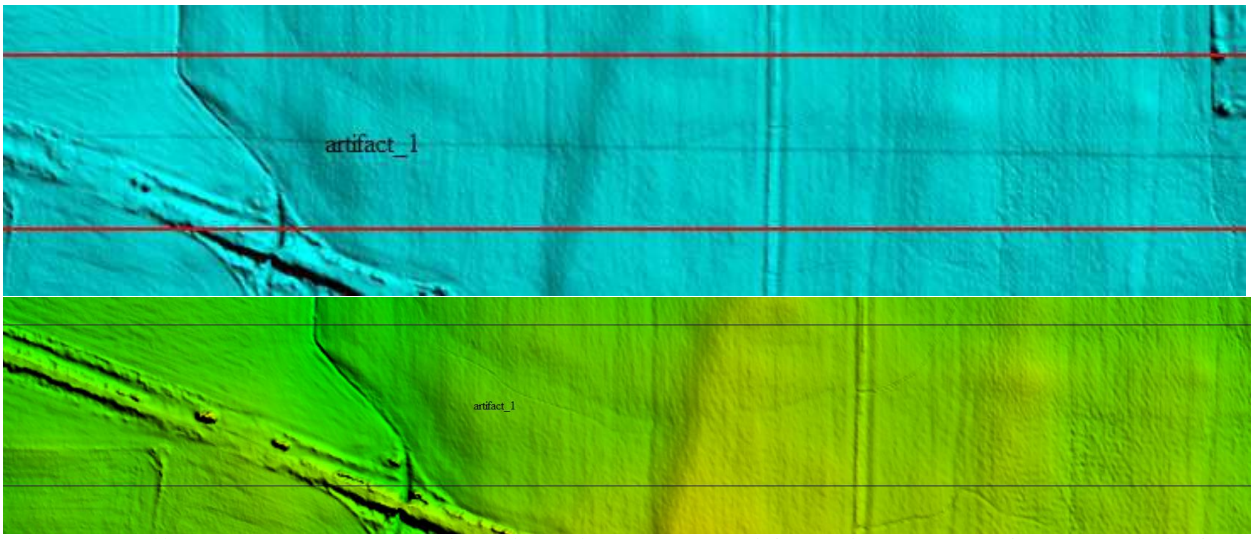

Figure 3- Tile 17TQJ555005. Artifacts have been removed from the DEM surface. Top is before bottom is after.

BRIDGE REMOVAL ARTIFACTS

There were seven locations where USGS made calls regarding visual artifacts. The DEM surface models are created from TINs or Terrains. TIN and Terrain models create continuous surfaces from the inputs. Because a continuous surface is being created, the TIN or Terrain will use interpolation to triangulate across a bridge opening from legitimate ground points on either side of the actual bridge. This can cause visual artifacts or "saddles." These "artifacts" are only visual and do not exist in the LiDAR points or breaklines. No points were modified in these locations. Breaklines where placed to remove the "saddles" in the DEM.

Figure 4-Tile 17TQJ450020. No additional points can be removed from ground classification. Bridge "saddles" are a visual artifact resulting from interpolation of a continuous surface. Breaklines are placed to remove "saddles" in the DEM.

CULVERT REPLACEMENT

There was one locations where Dewberry interpreted a feature as a bridge and removed it from the ground surface. USGS identified these features as culverts, not bridges. Dewberry has modified the points and added these features to the ground surface. An example is shown below.

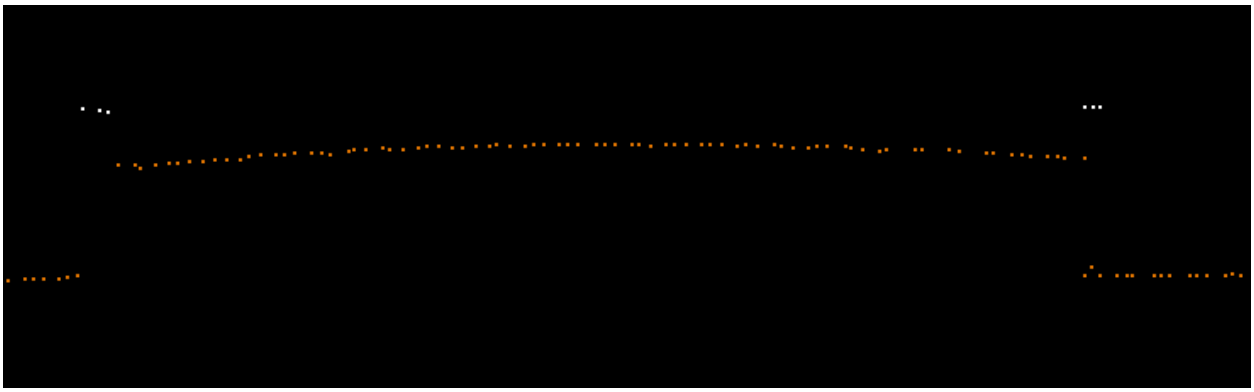

Figure 5-Tile 17TQH210885. Culverts have been reclassified from class 1 (white) to ground (orange).

ARTIFACTS TINNING VEGETATION

There were twenty five calls to bring back more ground in vegetated areas. In most areas there were no extra ground point to add back to the surface. Attempts were made to add points if possible, but DEM surfaces still look very similar. Examples are shown below.

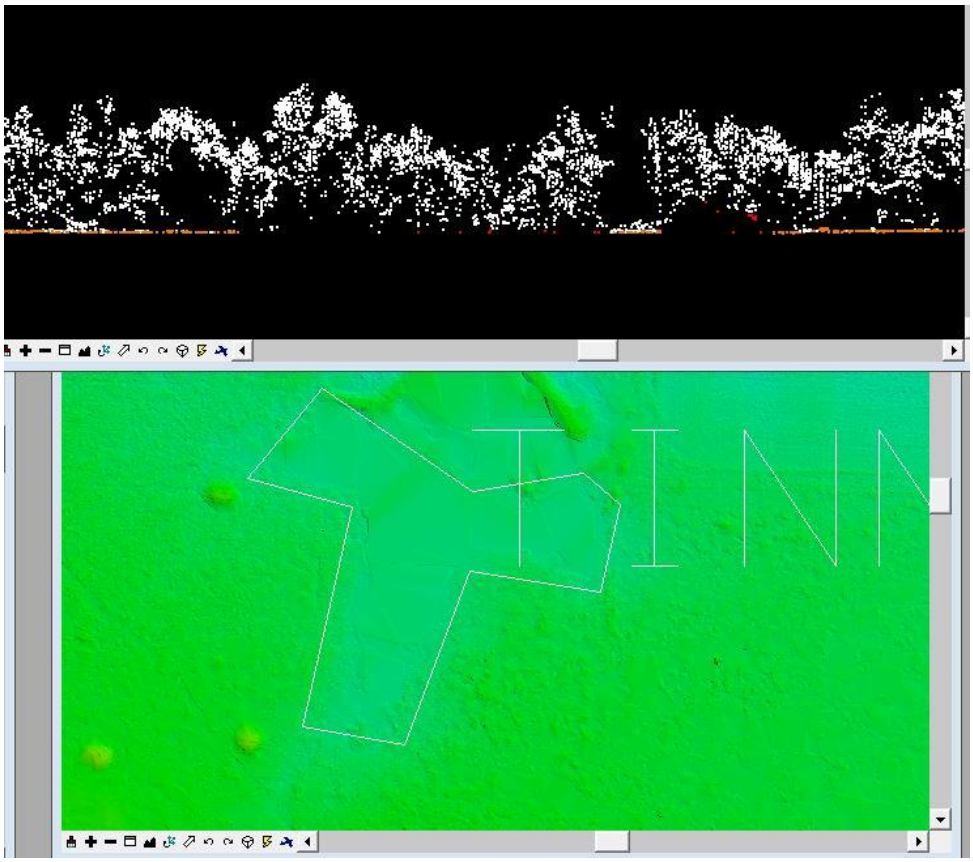

Figure 6-Tile 17TQH345975. All possible points have already been moved to ground (orange). No modification required as no new points to add to the ground surface.

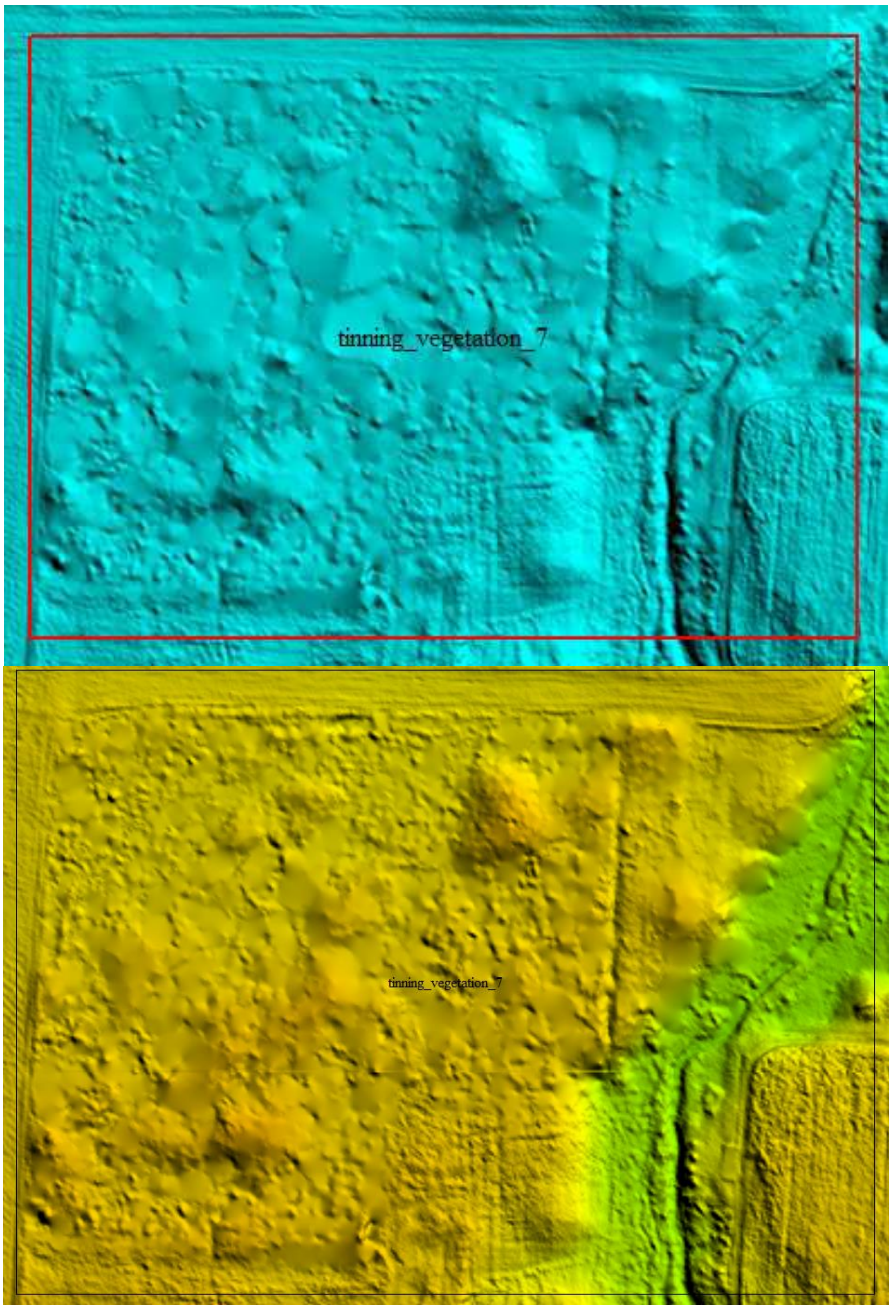

Figure 7-Tile 17TQH255055. Comparing the before (top) to after (bottom) showing no real change when adding points back to the ground surface.

BREAKLINE ADJUSTMENTS

There were 7 locations where USGS identified areas of water that were not included in the collected breaklines. While the interpretation of the feature may be questionable in the intensity imagery, Dewberry agrees with all seven calls after reviewing color imagery and the available LiDAR points.

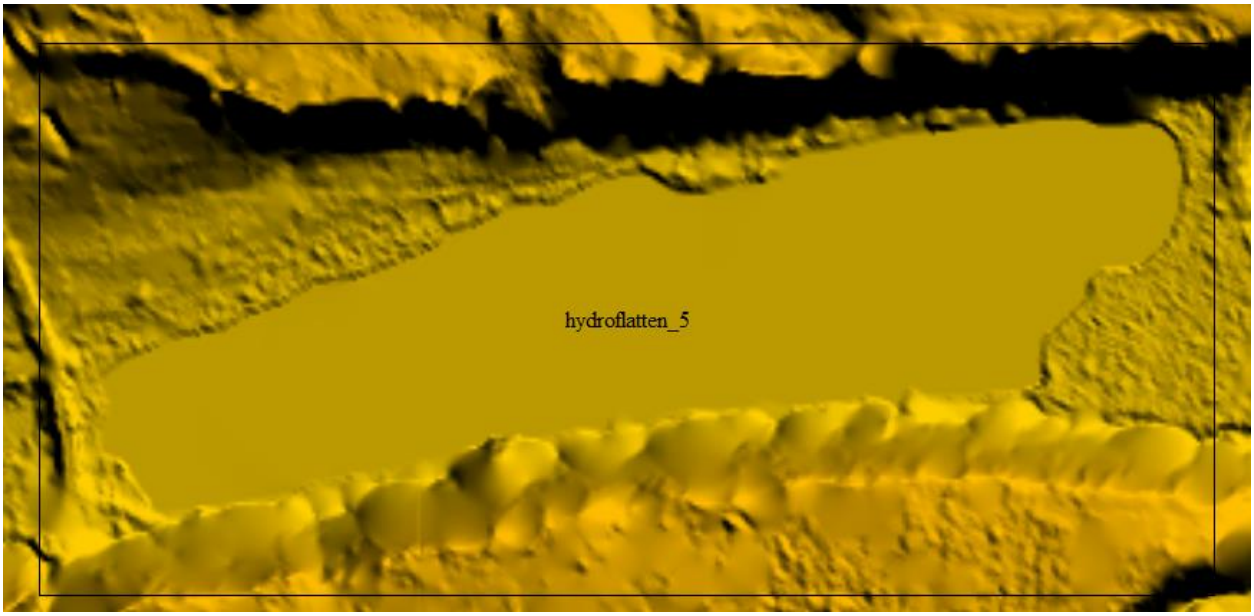

Figure 8 – Tile 17TQH300960. An additional pond breakline has been collected for this feature and used to flatten the feature in the redelivered DEM. The LAS has been corrected to reflect the addition of this feature.

BUILDING REMOVAL

There were three locations where the USGS identified places that had what appeared to be buildings left in the ground surface and not represent the true ground surface. Two of the calls had the point adjusted and one was not changed because the points are part of a ground feature see screen shot below.

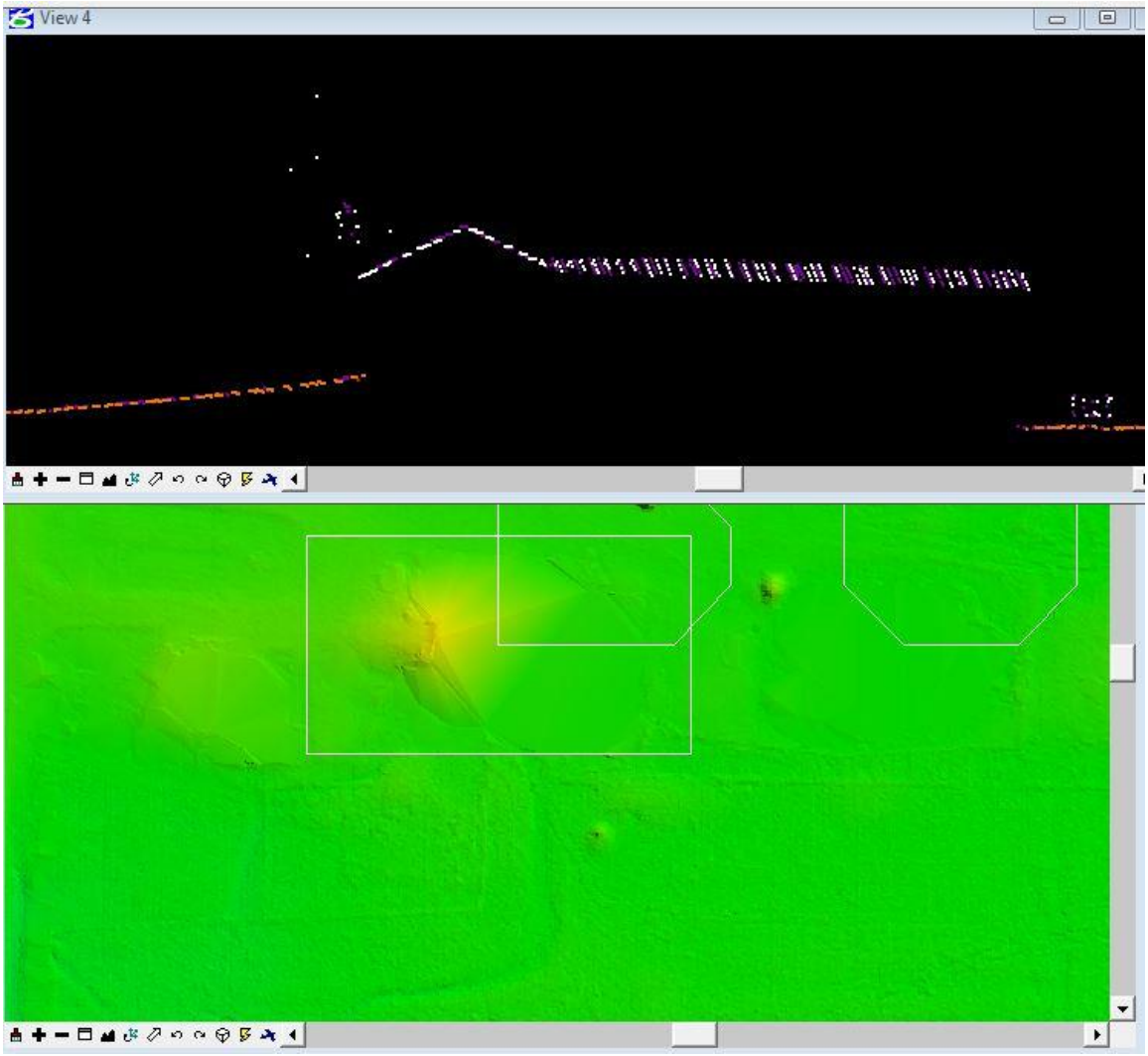

Figure 9 – Tile 17TQH210930. The area called out as part of a building being left in the ground (orange) is part of a berm built up behind the structure.

Summary of Edit Calls

- Calibration Points metadata has been corrected and delivered.

- One general LAS call for point counts not matching in the header.
  - All 507 classified LAS tiles have been redelivered with no changes since the issue is caused by extra point returns

- One general LAS swath call for point counts not matching in the header.
  - All 68 LAS swath have been redelivered with no changes since the issue is caused by extra point returns and they cannot be removed

- There were seven calls to remove bridges or bridge related artifacts.
  - All calls have been fixed.

- There was one call to replace culverts.
  - All available points have been added back to ground at this locations.

- There was two calls to address anomalies with the DEM surface
  - Both issues have been corrected.

- There were two calls to remove artifacts from ground.
  - Changes were made to fix both issues.

- There were seven calls to modify breaklines.
  - All seven of these issues have been corrected.

- There were three calls to remove buildings or part of buildings left in the ground surface
  - Two of the calls where fixed.
  - One of the calls was not fixed since it was a legitimate ground feature.

- There were 25 calls about tinning in vegetated areas.
  - Efforts were made to correct these places, but it seemed to have little effect on the final DEM.