Dewberry Response to USGS Review Middle Counties Acquisition and Classification for FEMA VA LiDAR

Produced for U.S. Geological Survey

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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 Virginia LiDAR project area.

Deliverables for this project included LAS, breaklines, and bare-earth Digital Elevation Models (DEMs). The USGS's review of these deliverables resulted in 10 edit calls. Of the 10 edit calls, 8 resulted in modifications to the dataset. A total of 13 DEMs were reprocessed as a result of these calls. In summary, 1 DEM was reprocessed due to a processing error that resulted in a data void, 5 modifications were made to the breaklines, and 8 DEMs were reprocessed to remove seam lines from the dataset. Detailed comments for the edit calls are provided in the following report.

DATA VOID

The USGS identified a tile with a void due to a processing error. The DEM was recreated to remove this error from the data.
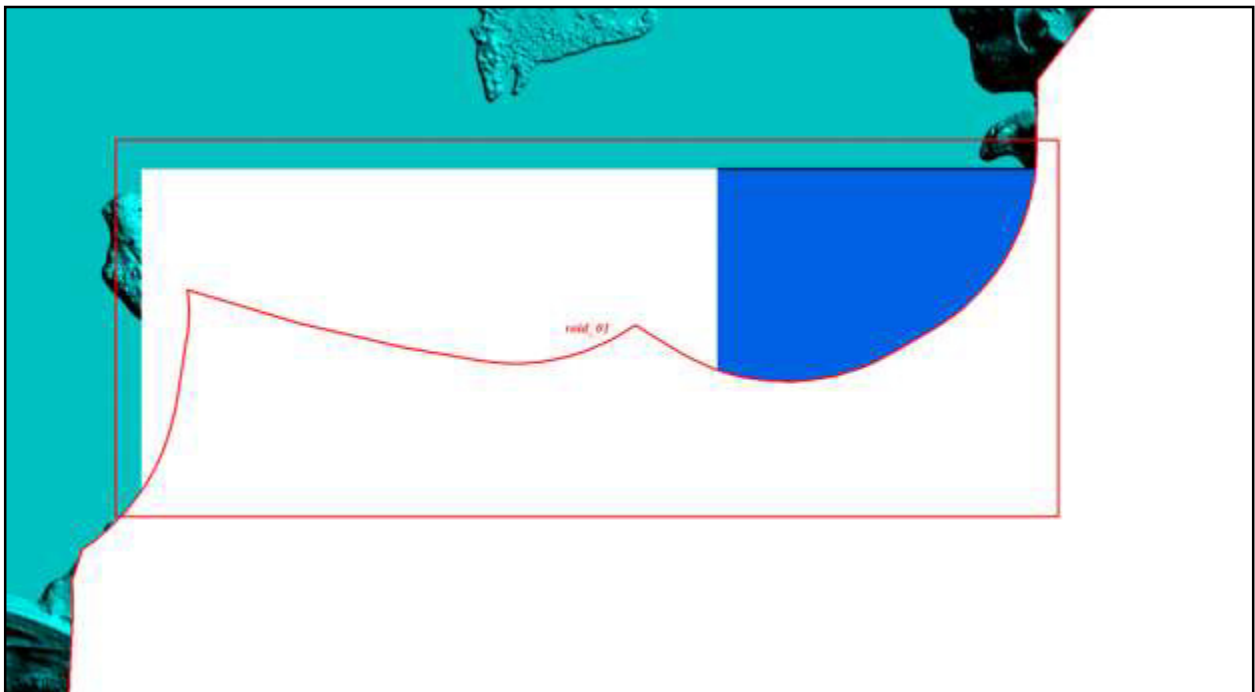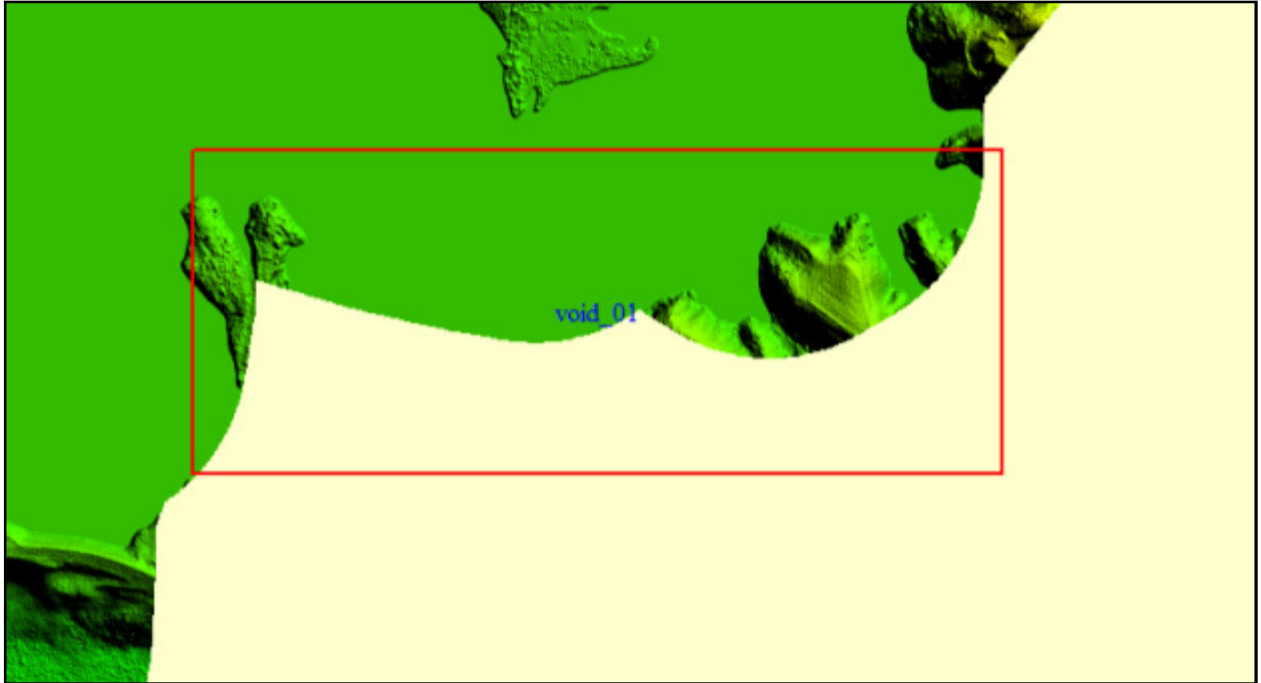
Figure 1 - Before/After image of DEM_S13_9658_20 showing that the data gap is addressed in the new delivery.

BREAKLINE MODIFICATIONS

The USGS identified five missing lake/pond features that meet project specifications for collection.   The lake/pond features have been added to the breaklines in the 2nd delivery and the LAS and DEMs were reprocessed to address the modifications. An example of the applied corrections can be seen below in Figure 2.
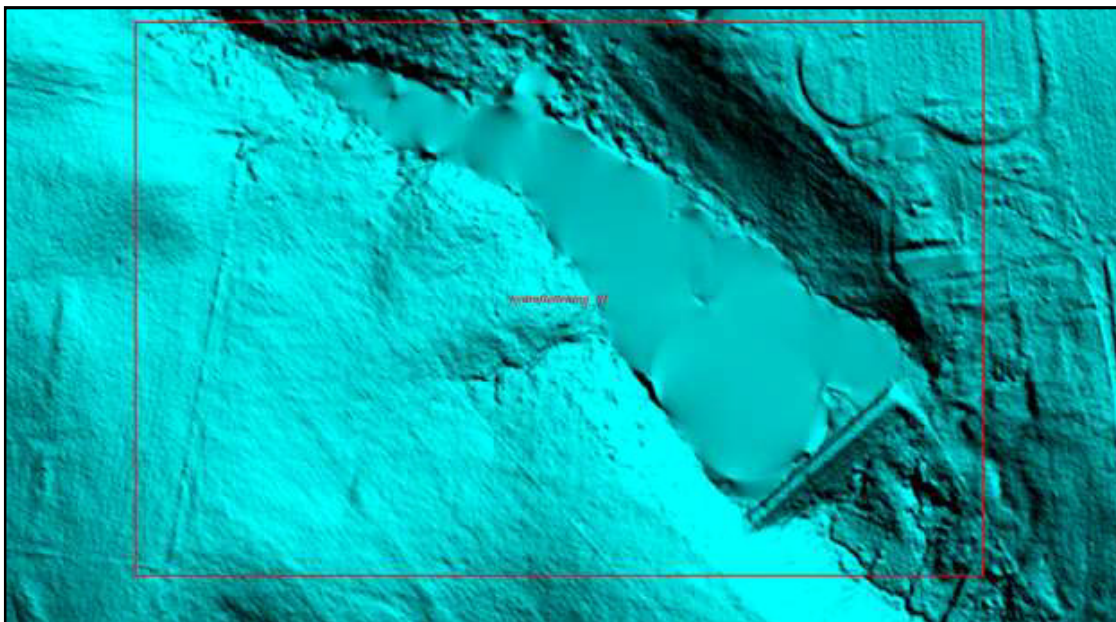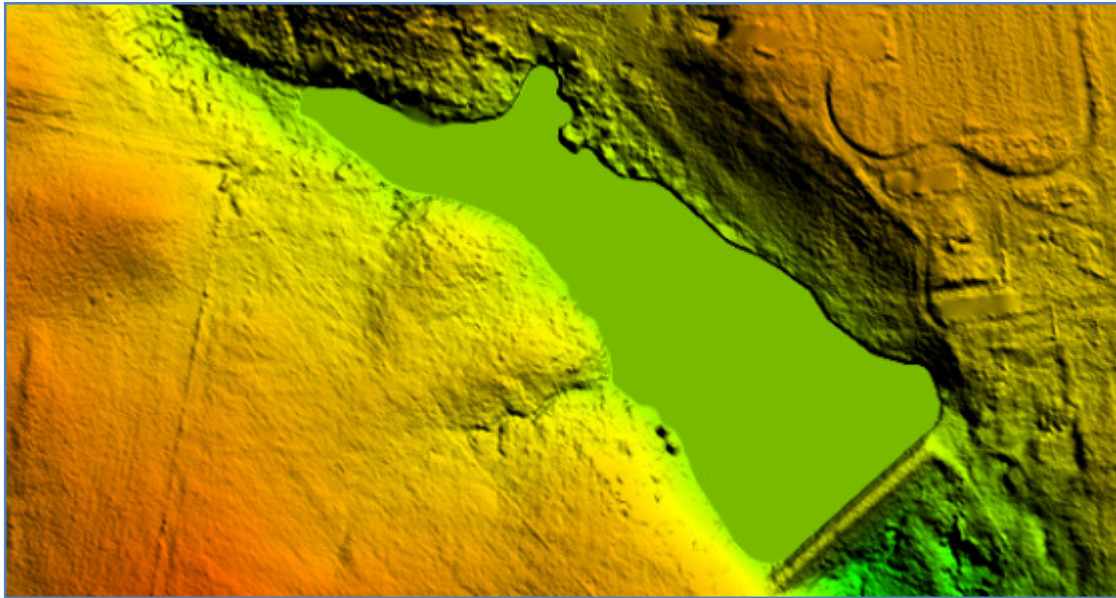
Figure 2 - Before/After of tile DEM_ S13_9626_40 showing that the lake/pond feature is now hydro-flattened in the DEM. The breakline features have been added to the breakline GDB.

SEAM LINES IN THE DEMS

The USGS identified two areas where seam lines between DEM tiles were causing small voids. These two errors occurred at the intersection of 4 DEM tiles each, therefore 8 DEM tiles were reprocessed to remove these errors. An example of the applied corrections can be seen below in Figure 3.
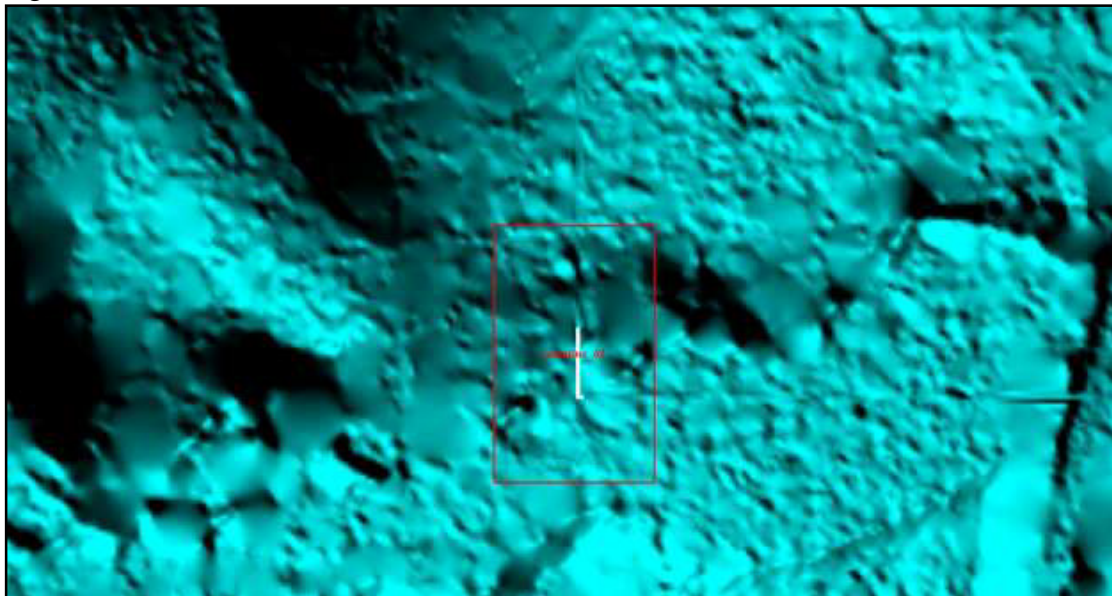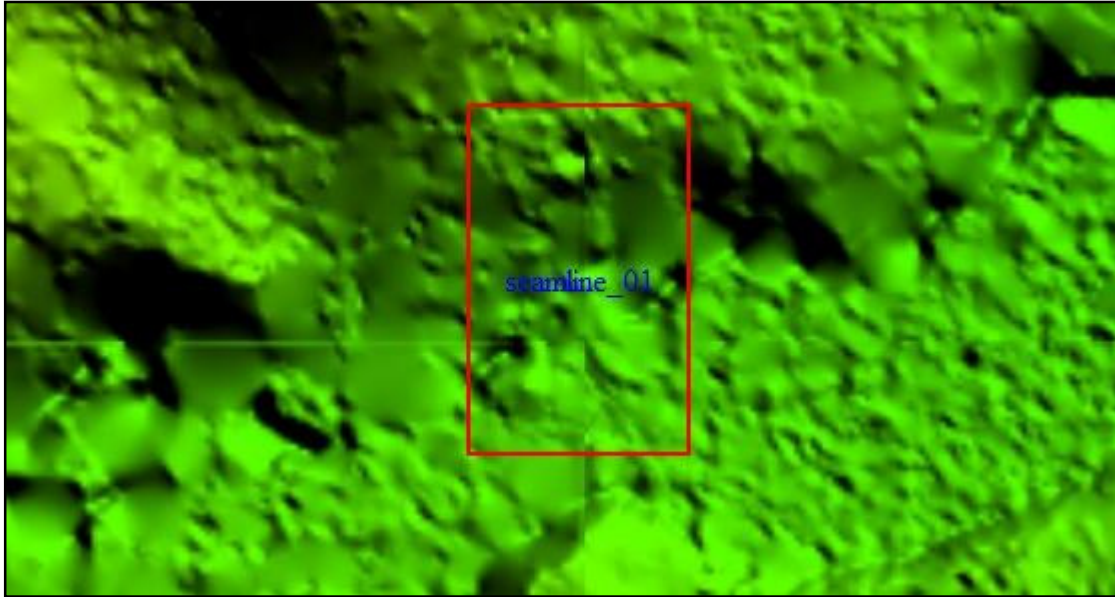
Figure 3 - Before/After of DEM tiles S13_8784_40, S13_8794_10, S13_8783_30, and 8793_20. The void caused by the seam line between the tiles has been removed.

BRIDGE

The USGS identified two occurrences where it appeared bridges or portions of bridges were left in the bare-earth surface. Dewberry reviewed these bridges and verified that no bridge points were left in the ground surface. 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 at these locations. Figures 4 -6, below, show the bridge features are classified correctly.
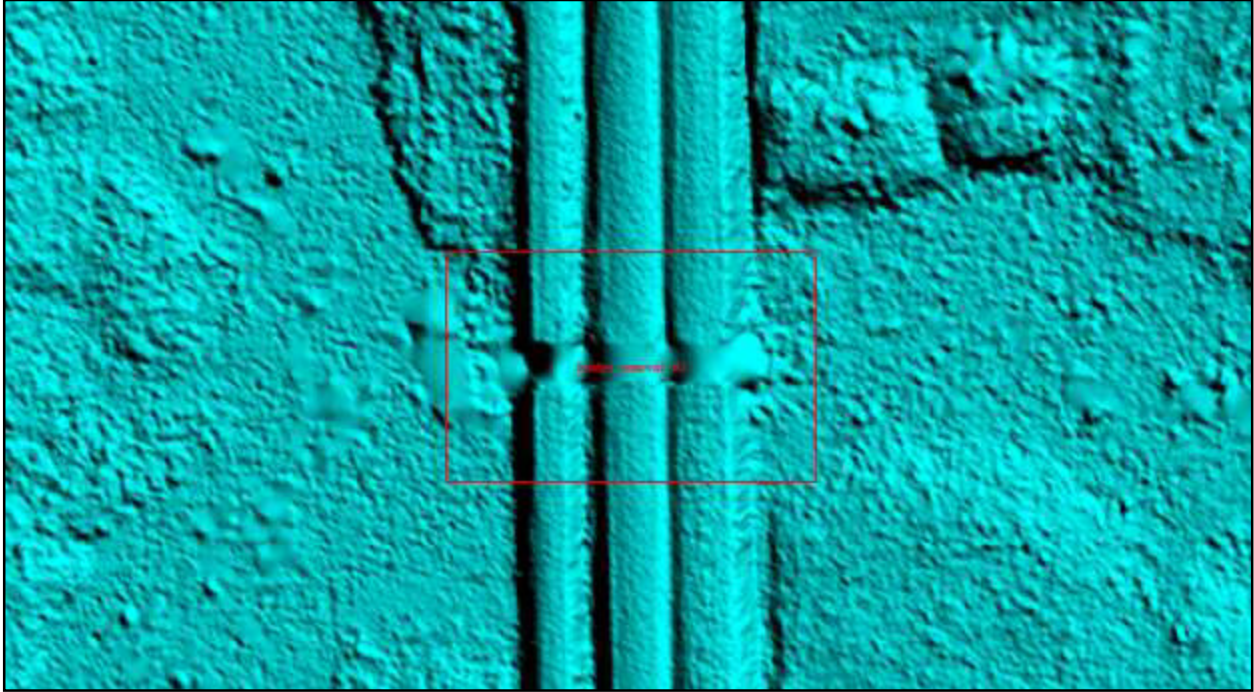
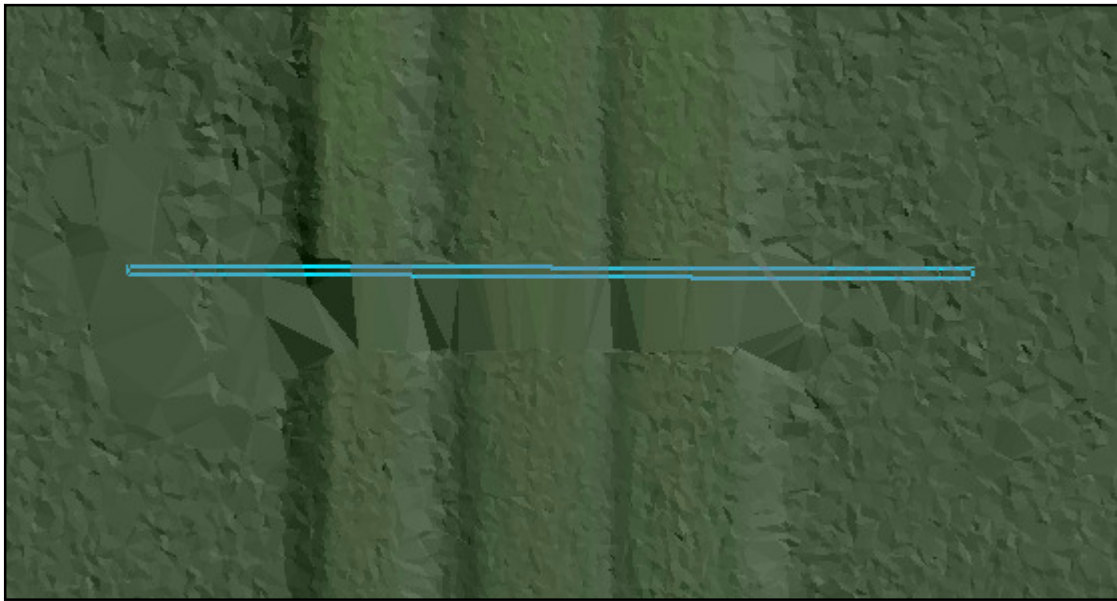Figure 4 - Image provided by USGS of digital elevation model for tile DEM_S13_8516_30.

Figure 5 - Ground model of tile LAS_ S13_8516_30 showing the same area as image above. The rectangular box shows the location of the cross-section provided below.

Figure 6 - Profile of LAS from tile LAS_ S13_8516_30. The yellow points are Class 1 (unclassified) and purple points are Class 2 (ground). The bridge is completely removed from the ground points.

OTHER COMMENTS

USGS commented that the Fundamental Vertical Accuracy of the LiDAR exceeds the required value. The project area for the Middle Counties dataset contained 12 open terrain checkpoints. Dewberry removed one checkpoint (OT-100) from the RMSE calculations due to the checkpoint being located on a slope. It appears that the USGS used all 12 of the open terrain checkpoints while computing the FVA, instead of the 11 that Dewberry identified as valid checkpoints. The removal of the checkpoint from the RMSE calculations was noted in the project report that accompanied the original delivery of the dataset.

Vertical accuracy was calculated per block in an effort to show confidence in each individual block. However, as the individual blocks were small and do not provide a large enough statistical sampling, the final vertical accuracy values are calculated from all checkpoints located within the project area. These final vertical accuracy values, which could not be calculated until all data were processed and approved, will be provided in a subsequent report.

Summary of Edit Calls

- 1 DEM tile was reprocessed to remove a data void.

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

- There were two calls regarding the seam lines in the DEM.
    - 8 DEMs were reprocessed to remove seam lines

- There were 2 calls to remove bridges or bridge related artifacts.
    - No changes were necessary because the artifacts are only visual and do not exist in the data itself.