



## LiDAR Classification Procedures

### Processing Procedures

Source LAS is imported into GeoCue with proper projection and datum set. Project coverage is observed against the desired boundary to verify coverage. A basic ground routine is done per line on a separate set of these tiles to use for dZ ortho rasters which when imported into GeoCue identifies swath-to-swath tie errors if they exist. If the rasters pass, further processing can proceed on the main tile set. If fail, reasons for the error must be deduced and more work on calibration may be needed. After dZ ortho rasters have passed testing, a more robust set of macros can be run on the main tiles which identify low (Low Noise – 7) and high points (High Noise – 18), withheld points (W-class), and create the working ground set for further editing. Project control was run against the ground to ensure the elevation values were hitting the laser points' elevation. NVA & VVA testing to pass QL2 requirements was performed to further verify elevation accuracy of the LAS data. Shapefiles of the control points, tile index, project boundary, trajectory data and swath index were created or edited in part by GeoCue and/or ArcMap with further attribution editing in ArcMap. Working tiles are cut from the source into 5,000 ft X 5,000 ft tiles with all points set to Unclassified – 1 and exported for use in processing.

Below is the classification scheme required for Branch County.

- 1 as Unclassified
- 2 as Bare earth
- 7 as Low noise
- 9 as Water
- 10 as Ignored ground
- 17 as Bridge deck
- 18 as High noise

Tiles are further observed for potential cloud or void areas before continuing, which could prohibit further processing. Manual ground-point editing proceeded on all tiles in effort to classify valid points into or out of the ground class (Bare Earth – 2). Neighbor tiles are loaded and editors apply Terrain Shaded Surface in TerraScan to search for anomalies of excess high ground points or for longer triangles which could indicate malformation of the ground where additional points are to be classified into ground from unclassified points. Points were also manually classified to remove bridge decks from the ground class over hydro features and put to a bridge deck class (Bridge Deck - 17) when identified.

Hydro breaklines (see Breakline\_Processing document) were digitized at water elevation for any bodies of water over the entire project area including streams greater than 100ft in nominal width, water bodies greater than 2 acres in area, and islands greater than 1 acre. A macro was then run to classify points that lay at nominal water elevation to water class (Water – 9) that fell within the polygons representing bodies of water. Concurrently a 3-foot buffer zone around water polygons was derived from the ground class in TerraScan which put ground to a reserved ground class (Ignored Ground – 10). Upon completion of point classification the overlap was cut

in TerraScan which applies the appropriate overlap bit flag settings and an automated process was executed to remove any point outside of the provided project's buffered boundary from the project edge tiles.

### Quality Control

Peer review of the edited tiles was completed. In another Q/C measure, LAS with edited ground class was imported into Global Mapper where an elevation grid was created of the project data using ground class data and hydro breaklines. Once the elevation grid was created the data was then exported into GeoTiff format at a desired resolution to sample elevation of the ground class where through the use of proprietary software highly errant ground points were flagged and poor signatures were resolved manually. All LAS points were run in TerraScan to report statistics and observe that all points landed on proper classification levels and that no points were removed from start to finish during processing. After Q/C, LAS files are repopulated in GeoCue to conform headers to correct project Coordinate reference System. Repopulated tiles are then run through LAS Tools (LAS Info and LAS Validate) to observe proper header structure and header attribution.