

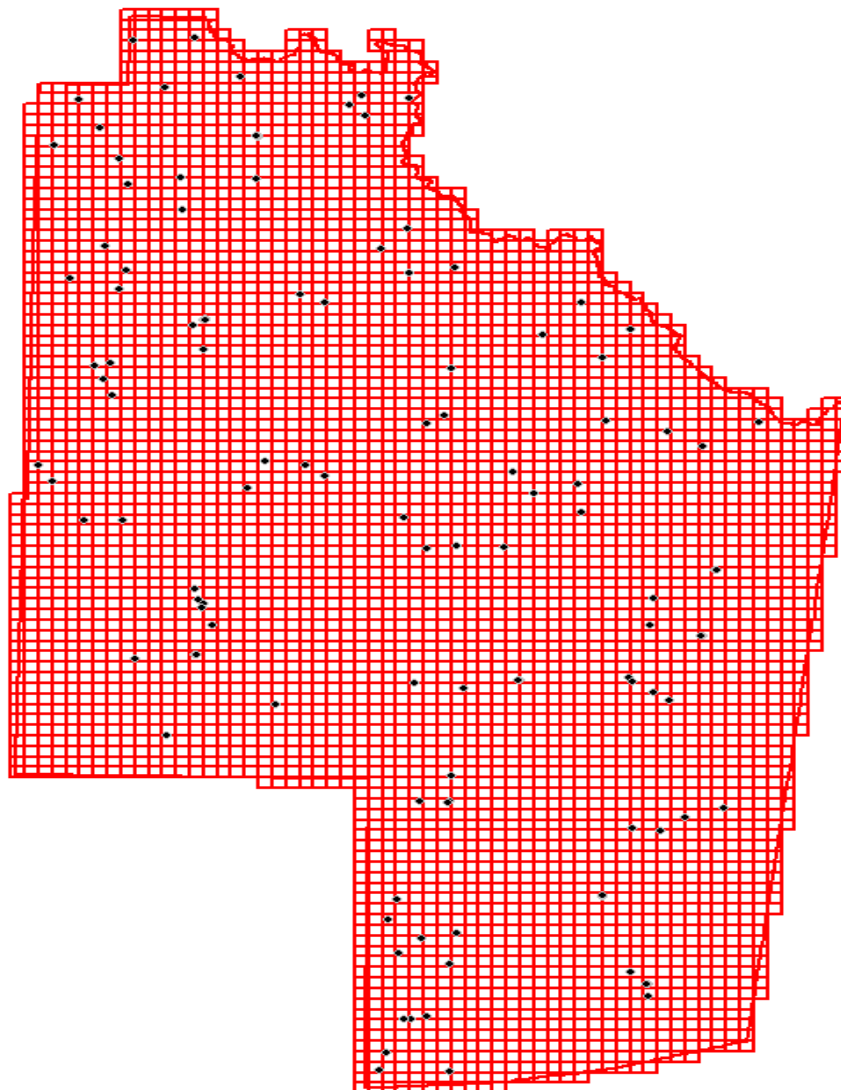


LiDAR Quality Assessment Report

The USGS National Geospatial Technical Operations Center, Data Operations Branch is responsible for conducting reviews of all Light Detection and Ranging (LiDAR) point-cloud data and derived products delivered by a data supplier before it is approved for inclusion in the National Elevation Dataset. The USGS recognizes the complexity of LiDAR collection and processing performed by the data suppliers and has developed this Quality Assessment (QA) procedure to accommodate USGS collection and processing specifications with flexibility. The goal of this process is to assure LiDAR data are of sufficient quality for database population and scientific analysis. Concerns regarding the assessment of these data should be directed to the Chief, Data Operations Branch, 1400 Independence Road, Rolla, Missouri 65401.

NRCS Lauderdale MS 0.7m NPS Lidar

NGTOC
2014-02-13



Project Information

Project:

Contractor:

Project Type:
GPSC

Applicable Specification:
Other

Project Points of Contact:

Name:	Type:	Phone:	Email:
Robert Kelly	CPT	5735786576	rkelly@usgs.gov

REPORT QUALIFICATION SUMMARY:

Task Order Overall: <i>meets requirements</i>
Metadata: 1 of 1 Reviews Accepted 0 Reviews Not Accepted
Vertical Accuracy: 1 of 1 Reviews Accepted 0 Reviews Not Accepted
Swath/Raw LAS: 1 of 1 Reviews Accepted 0 Reviews Not Accepted
Tiled/Classified LAS: 1 of 1 Reviews Accepted 0 Reviews Not Accepted
Breakline: 1 of 1 Reviews Accepted 0 Reviews Not Accepted
DEM(s): 1 of 1 Reviews Accepted 0 Reviews Not Accepted
Intensity Image(s): 0 of 0 Reviews Accepted 0 Reviews Not Accepted
NED Review: 1 of 1 DEM tile reviews recommended for NED 1/3rd 1 of 1 DEM tile reviews recommended for NED 1/9th

Project Subdivision: None

Dates Collected Range:

Collection Start:

Collection End:

Project Aliases:

Licensing:

Project Description:

This **NRCS Lauderdale MS 0.7m NPS Lidar Task Order** is for Planning, Acquisition, processing, and derivative products of lidar data to be collected at a nominal pulse spacing (NPS) of 0.7 meters. Specifications listed below are based on the **“National Geospatial Program Lidar Base Specification Version 1.0”**, which is incorporated by reference to this task order. This specification may be viewed at <http://pubs.usgs.gov/tm/11b4/>. These lidar specifications are required minimum baseline specifications. In addition to the Specification Requirements, this task order shall meet NEEA QL2. For any item which is not specifically addressed, the referenced Specification Version 1 will be the required specification authority. This task is for lidar for a **high resolution data set of lidar of approximately 3,518 square miles, in SE Mississippi.**

Review Information

Reviewer:

Date

Delivered:

3rd Party QA

Date

Performed:

Assigned:

Action To Contractor Date:	Issue Description:	Return Date:
<input type="text" value="12/19/2013"/>	Swath data contains class 1 points; should all be class 0. No project extent metadata Dem Errors	<input type="text" value="12/19/2013"/>
<input type="text" value="2/13/2014"/>	Project metadata issues	<input type="text" value="2/13/2014"/>

Review Complete:

Dates Project Worked:

Start:	<input type="text" value="11/12/2013"/>
End:	<input type="text" value="2/13/2014"/>

Project Materials Received

All project deliverables must be supplied according to collection and processing specifications. The USGS will postpone the QA process when any of the required deliverables are missing. When deliverables are missing, the Contracting Officer Technical Representative (COTR) will be contacted by the Elevation Section supervisor and informed of the problem. Processing will resume after the COTR has coordinated the deposition of remaining deliverables.

METADATA

Deliverables	Delivered	XML Metadata	Required	Format	Quantity	Additional Details
Collection Report:	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	PDF	<input type="text" value="1"/>	<input type="text" value="Combined*"/>
Survey Report:	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	PDF	<input type="text" value="1"/>	<input type="text"/>
Processing Report:	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	PDF	<input type="text" value="1"/>	<input type="text" value="Combined*"/>
QA/QC Report:	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	PDF	<input type="text" value="1"/>	<input type="text" value="Combined*"/>
Project Level XML Metadata:	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	XML	<input type="text" value="1"/>	<input type="text"/>
Project Extent:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	.shp	<input type="text" value="1"/>	<input type="text"/>
Tile Scheme:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	.shp	<input type="text" value="1"/>	<input type="text"/>

Control (Calibration) Points:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.shp	45	
Check (Validation) Points:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	.shp	139	Excess points collected
Additional Comments:						

LIDAR DATA

Deliverables	Delivered	XML Metadata	Required	Format	Quantity	Additional Details
Swath Data:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	.las	970	
Classified/ Tiled Data:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	.las	4,256	Count is incorrect
Additional Comments:	Classified tile count is less than DEM count by one.					

NED

Deliverables	Delivered	XML Metadata	Required	Format	Quantity	Additional Details
DEM Tiles:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	IMG	4,257	
Breaklines:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	.shp	2	Polygon and polyline files
Additional Comments:						

OTHER

Deliverables	Delivered	XML Metadata	Required	Format	Quantity	Additional Details
DSM(s):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Select...		
Intensity Image (s):	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	IMG	4,256	
Flightline (SBETs):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Select...		

Additional Comments:	
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Geographic Information

Area Extent: *Sq. Miles*

Tile Size: *Meters*

DEM/DTM Grid Spacing: *Meters*

Coordinate Reference System:

Projection:

Horizontal Datum:

 Meters
 U.S. Feet
 Int'l Feet

Vertical Datum:

 Meters
 U.S. Feet
 Int'l Feet

THIS PROJECTION COORDINATE REFERENCE SYSTEM IS CONSISTENT ACROSS THE FOLLOWING DELIVERABLES

- | | |
|---|---|
| <input checked="" type="checkbox"/> Project Extent
<input type="checkbox"/> Project Extent XML Metadata
<input style="width: 350px;" type="text"/>
<input checked="" type="checkbox"/> Project Tile Scheme
<input checked="" type="checkbox"/> Project Tile Scheme XML Metadata
<input checked="" type="checkbox"/> Control Points
<input checked="" type="checkbox"/> Checkpoints
<input checked="" type="checkbox"/> Checkpoint XML Metadata
<input checked="" type="checkbox"/> Project Level XML Metadata
<input checked="" type="checkbox"/> Swath/Raw LiDAR
<input checked="" type="checkbox"/> Swath/Raw LiDAR XML Metadata
<input checked="" type="checkbox"/> Tiled/Classified LiDAR
<input checked="" type="checkbox"/> Tiled/Classified XML Metadata | <input checked="" type="checkbox"/> DEM(s)
<input checked="" type="checkbox"/> DEM XML Metadata
<input checked="" type="checkbox"/> Breakline(s)
<input checked="" type="checkbox"/> Breakline XML Metadata
<input checked="" type="checkbox"/> Intensity Image(s)
<input checked="" type="checkbox"/> Intensity Image(s) XML Metadata |
|---|---|

Additional Comments:

Collection Information

Configured Project Nominal Pulse Spacing:
 Meters

Sensor Information:
 Sensor Type:
 Aerial

Sensor Used:

Configured Scan Angle ± from nadir:

 Degrees

Additional Comments:

Metadata Review **Accepted**

Provided metadata files have been parsed using 'mp' metadata parser. Any errors generated by the parser are documented below for reference and/or corrective action.

The Project Level XML Metadata parsed without errors.

Check if 'Best Use' metadata for NED:

The Project Extent XML Metadata parsed select... errors.

Check if 'Best Use' metadata for NED:

The Project Tile Scheme XML Metadata parsed without errors.

Check if 'Best Use' metadata for NED: Project Level Tile Level

The Check Point XML Metadata parsed without errors.

Check if 'Best Use' metadata for NED: Project Level Tile Level

The Swath XML Metadata parsed without errors.

Check if 'Best Use' metadata for NED: Project Level Swath Level

The Classified XML Metadata parsed without errors.

Check if 'Best Use' metadata for NED: Project Level Tile Level

The DEM XML Metadata parsed without errors.

Check if 'Best Use' metadata for NED: Project Level Tile Level

The Breakline XML Metadata parsed without errors.

Check if 'Best Use' metadata for NED: Project Level Tile Level

The Intensity Image XML Metadata parsed select... errors.

Check if 'Best Use' metadata for NED: Project Level Tile Level

Based on this review, the USGS accepts the xml metadata provided.

Additional
Comments:

End of Metadata Review

Vertical Accuracy Review **Accepted**

ASPRS recommends that checkpoint surveys be used to verify the vertical accuracy of LiDAR data sets. Checkpoints are to be collected by an independent survey firm licensed in the particular state(s) where the

project is located. While subjective, checkpoints should be well distributed throughout the dataset. National Standards for Spatial Data Accuracy (NSSDA) guidance states that checkpoints may be distributed more densely in the vicinity of important features and more sparsely in areas that are of little or no interest. Checkpoints should be distributed so that points are spaced at intervals of at least ten percent of the diagonal distance across the dataset and at least twenty percent of the points are located in each quadrant of the dataset.

NSSDA and ASPRS require that a minimum of twenty checkpoints (thirty is preferred) are collected for each major land cover category represented in the LiDAR data. Checkpoints should be selected on flat terrain, or on uniformly sloping terrain in all directions from each checkpoint. They should not be selected near severe breaks in slope, such as bridge abutments, edges of roads, or near river bluffs. Checkpoints are an important component of the USGS QA process. There is the presumption that the checkpoint surveys are error free and the discrepancies are attributable to the LiDAR dataset supplied.

For this dataset, USGS checked the spatial distribution of checkpoints with an emphasis on the bare-earth (open terrain) points; the number of points per class; the methodology used to collect these points; and the relationship between the data supplier and checkpoint collector. When independent control data are available, USGS has incorporated this into the analysis.

Required Vertical Accuracy

Yes No

REQUIRED FUNDAMENTAL VERTICAL ACCURACY FOR SWATH AND DEM FILES

Confidence Interval Required: th % CI
 Required Unit:
 Required # of checkpoints:
 Required RMSEz:
 Required Vertical Accuracy (RMSEz * .% CI)

REQUIRED SUPPLEMENTAL VERTICAL ACCURACY FOR DEM FILES

SVA Statistic Required: Percentile

SVA Confidence Level/Percentile Required:

Class	# of Checkpoints	SVA Required 95 th Percentile	
Urban Areas with Dense Man Made Structures	<input type="text" value="25"/>	<input type="text" value="26.9"/>	<input type="text" value="Centimeters"/>
Tall Weeds & Crops	<input type="text" value="25"/>	<input type="text" value="26.9"/>	<input type="text" value="Centimeters"/>
Brushlands & Low Trees	<input type="text" value="27"/>	<input type="text" value="26.9"/>	<input type="text" value="Centimeters"/>
Forested Areas Fully Covered by Trees	<input type="text" value="36"/>	<input type="text" value="26.9"/>	<input type="text" value="Centimeters"/>

REQUIRED CONSOLIDATED VERTICAL ACCURACY FOR DEM FILES

CVA Statistic Required: Percentile

CVA Confidence Level/Percentile Required:

Total number of checkpoints:

Required CVA: at the 95 th Percentile

Additional Required Vertical Accuracy Information:

Points in excess of required 20 points were collected.

Reported Vertical Accuracy

Yes No

REPORTED FUNDAMENTAL VERTICAL ACCURACY FOR SWATH LIDAR FILES

Confidence Interval Reported: th % CI

Reported Unit:

Reported # of checkpoints:

Reported RMSEz:

Reported Vertical Accuracy (RMSEz * .% CI)

REPORTED FUNDAMENTAL VERTICAL ACCURACY FOR DEM FILES

Confidence Interval Reported: th % CI

Reported Unit:

Reported # of checkpoints:

Reported RMSEz:

Reported Vertical Accuracy (RMSEz * .% CI)

REPORTED SUPPLEMENTAL VERTICAL ACCURACY FOR DEM FILES

SVA Statistic Reported: Percentile

SVA Confidence Level/Percentile Reported:

Class	# of Checkpoints	SVA Reported 95 th Percentile	
Urban Areas with Dense Man Made Structures	<input type="text" value="25"/>	<input type="text" value="0.135"/>	<input type="text" value="Meters"/>
Tall Weeds & Crops	<input type="text" value="25"/>	<input type="text" value="0.289"/>	<input type="text" value="Meters"/>
Brushlands & Low Trees	<input type="text" value="27"/>	<input type="text" value="0.248"/>	<input type="text" value="Meters"/>
Forested Areas Fully Covered by Trees	<input type="text" value="36"/>	<input type="text" value="0.186"/>	<input type="text" value="Meters"/>

REPORTED CONSOLIDATED VERTICAL ACCURACY FOR DEM FILES

CVA Statistic Reported: Percentile

CVA Confidence Level/Percentile Reported:

Total number of checkpoints:

Reported CVA: at the 95 th Percentile

Additional Reported Vertical Accuracy Information:

Reviewed Vertical Accuracy

Yes No

CHECKPOINT REVIEW

- Checkpoints are well distributed?
- Enough checkpoints for task order?
- Checkpoints meet USGS LiDAR base-spec in quantity and quality?

REVIEWED FUNDAMENTAL VERTICAL ACCURACY FOR SWATH LIDAR FILES

Confidence Interval Reviewed: th % CI

Reviewed Unit:

Reviewed # of checkpoints:

Reviewed RMSEz:

Reviewed Vertical Accuracy (RMSEz * .% CI)

REVIEWED FUNDAMENTAL VERTICAL ACCURACY FOR DEM FILES

Confidence Interval Reviewed: th % CI

Reviewed Unit:

Reviewed # of checkpoints:

Reviewed RMSEz:

Reviewed Vertical Accuracy (RMSEz * .% CI)

REVIEWED SUPPLEMENTAL VERTICAL ACCURACY

SVA Statistic Reviewed: Percentile

SVA Confidence Level/Percentile Reviewed:

Class	# of Checkpoints	SVA Reported	
		95 th Percentile	
Brushlands & Low Trees	<input type="text" value="27"/>	<input type="text" value="23.9"/>	<input type="text" value="Centimeters"/>
Forested Areas Fully Covered by Trees	<input type="text" value="36"/>	<input type="text" value="13.9"/>	<input type="text" value="Centimeters"/>
Tall Weeds & Crops	<input type="text" value="25"/>	<input type="text" value="26.1"/>	<input type="text" value="Centimeters"/>
Urban Areas with Dense Man Made Structures	<input type="text" value="25"/>	<input type="text" value="13.0"/>	<input type="text" value="Centimeters"/>

REVIEWED CONSOLIDATED VERTICAL ACCURACY

CVA Statistic Reviewed: Percentile

CVA Confidence Level/Percentile Reviewed:

Total number of checkpoints:

Reviewed CVA: at the 95 th Percentile

Checkpoint Distribution Image



Vertical Accuracy Results:

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Additional Reviewed
Vertical Accuracy
Information:

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Based on this review, the USGS accepts the vertical accuracy.

End of Vertical Accuracy Review

Swath/Raw LiDAR Review Accepted

LAS swath files or raw unclassified LiDAR data are reviewed to assess the quality control used by the data supplier during collection. Furthermore, LAS swath data are checked for positional accuracy. The data supplier should have calculated the Fundamental Vertical Accuracy using ground control checkpoints measured in clear open terrain (see Vertical Accuracy Review Section).

Review Required: Yes No

SWATH LIDAR FILE CHARACTERISTICS

Separate folder for swath/raw LiDAR files

LAS Version: 1.2

Point Record Format: Select...

Each swath file ≤ 2 GB and properly segmented

Correct and properly formatted georeference information is included in all LAS file headers

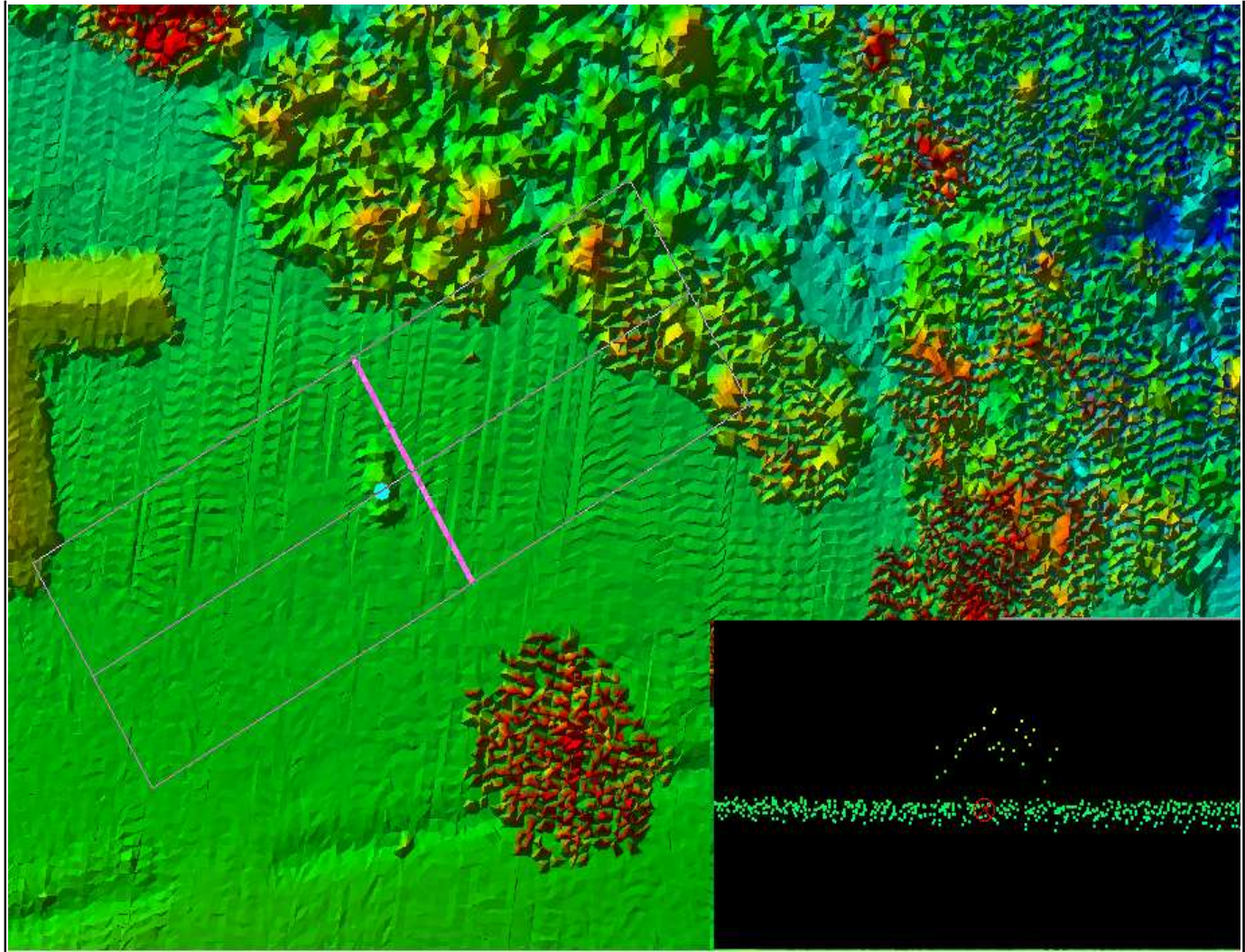
Adjusted GPS time used with the global encoder id set to 1

Scan Angles conform to USGS base-spec recommendations

All points set to class '0'

Based on this review, the USGS accepts the swath/raw LiDAR data.

Additional comments:



End of Swath/Raw LiDAR Review

Tiled/Classified LiDAR Review **Accepted**

Classified LAS tile files are used to build digital terrain models using the points classified as ground. Therefore, it is important that the classified LAS are of sufficient quality to ensure that the derivative product accurately represents the landscape that was measured. Classified LAS Tiles are comprised as follows, "all project swaths, returns, and collected points, fully calibrated, adjusted to ground, and classified and cut, by tiles, excluding calibration swaths, cross-ties, and other swaths not used, or intended to be used, in product generation".

Review Required: Yes No

CLASSIFIED LIDAR TILE CHARACTERISTICS

Separate folder for classified/tiled LiDAR files

LAS Version: 1.2

Point Record Format: Select...

Classified LAS tile files conform to project tiling scheme

Quantity of classified LAS tile files conforms to project tiling scheme

LAS tile count and DEM tile count to not agree.

Classified LAS tile files do not overlap

- Classified LAS tile files are uniform in size
- Correct and properly formatted georeference information is included in all LAS file headers

- Adjusted GPS time used with the global encoder id set to 1

- Classified LAS tile files have no points classified as '12'

- Point classifications are limited to the standard values listed below:

Code	Description	Used
1	Processed, but unclassified	<input checked="" type="checkbox"/>
2	Bare-earth/Ground	<input checked="" type="checkbox"/>
7	Noise(low or high, manually identified, if needed)	<input checked="" type="checkbox"/>
8	Model key points	<input checked="" type="checkbox"/>
9	Water	<input checked="" type="checkbox"/>
10	Ignored ground (breakline proximity)	<input checked="" type="checkbox"/>
11	Withheld (if the "Withheld Bit" is not implemented in the processing software)	<input type="checkbox"/>

Additional Classes:

Class	Description
17	Overlap Default
18	Overlap Ground

Based on this review, the USGS accepts classified/tiled LiDAR data.

Additional comments:

End of Tiled/Classified LiDAR Review

Breakline Review Accepted

Breaklines are vector feature classes that are used to hydro-flatten the bare earth Digital Elevation Models.

Review Required: Yes No

BREAKLINE FILE CHARACTERISTICS:

- Separate folder for breakline files.
- Breaklines contain elevation values.

Elevation values stored in Geometry (ZEnabled)

Units: Meters

- Waterbody Breaklines.

Polyline Polygon

- Single elevation value per waterbody feature.

Required.

Waterbody Elevations were created via Select... waterbody level techniques.

- Double Line Stream Breaklines (Streams Approximately > 100 ft).
 Single Line Breaklines.
 No missing or misplaced breaklines.

Based on this review, the USGS accepts the breakline files.

ADDITIONAL COMMENTS, ERRORS, ANOMALIES, OR OTHER ISSUES:

Deliverables include polygon and polyline shapefiles.

End of Breakline Review

DEM Review Accepted

The derived bare-earth file(s) receive a review of the vertical accuracies provided by the data supplier, vertical accuracies calculated by the USGS using supplied and independent checkpoints (*see the prior Vertical Accuracy Review Section*), and a thorough visual review for any anomalies or inconsistencies in assessing the quality of the DEM(s).

BARE-EARTH DEM TILE CHARACTERISTICS:

Separate folder for bare-earth DEM files

Raster File Type: IMG

Raster Cell Size: 1 Meters

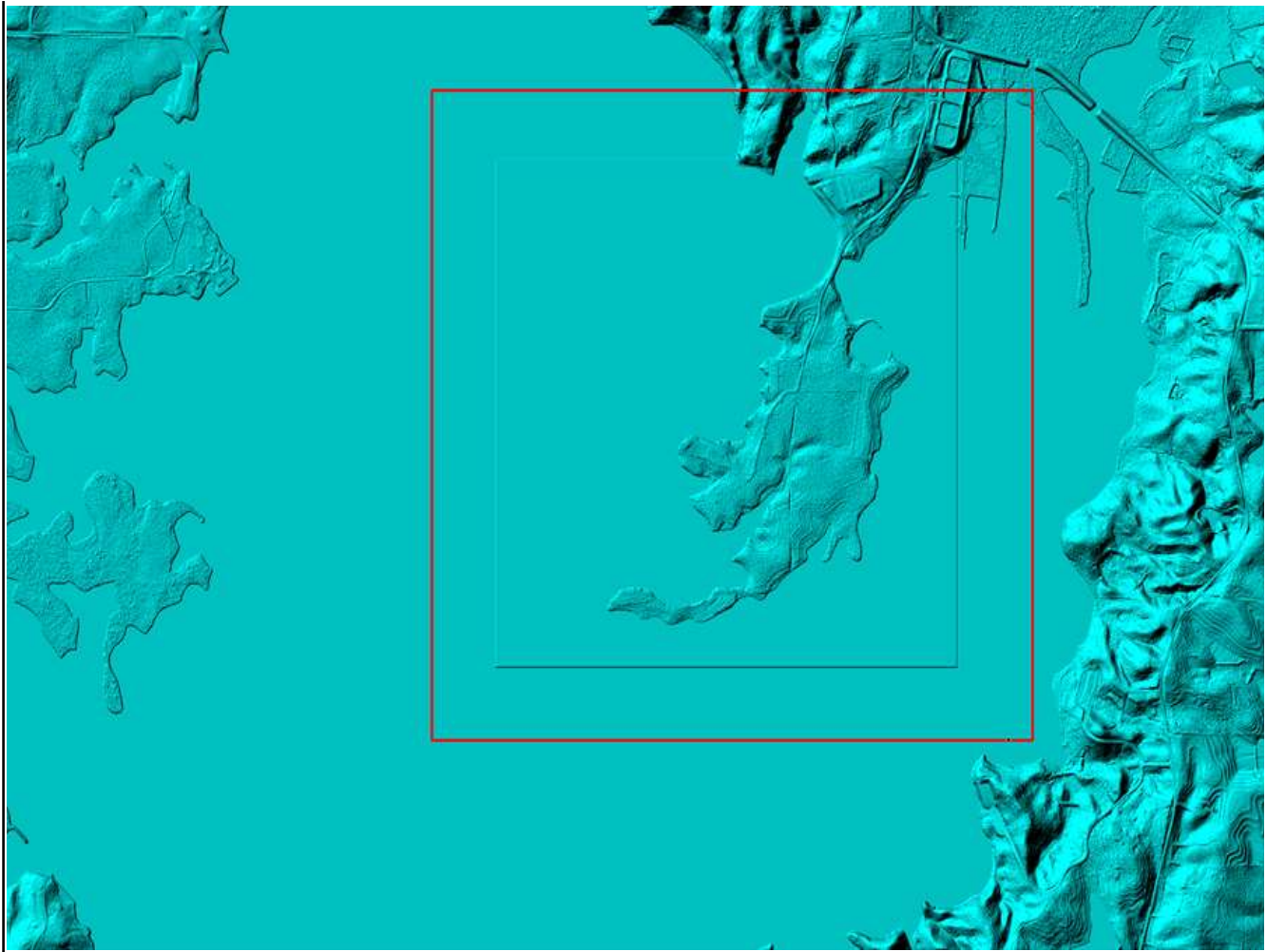
Tile bit depth/pixel Type: 32_BIT_FLOAT

Interpolation or Resampling Technique: Unknown

- DEM tiles do not overlap
 DEM tiles conform to Project Tiling Scheme
 Quantity of DEM files conforms to Project Tiling Scheme
 DEM tiles are uniform in size

DEM tiles properly edge match and free of edge artifacts

Edge mismatch along tiles 16SCA300985 and 16SCA315955 (pictured)



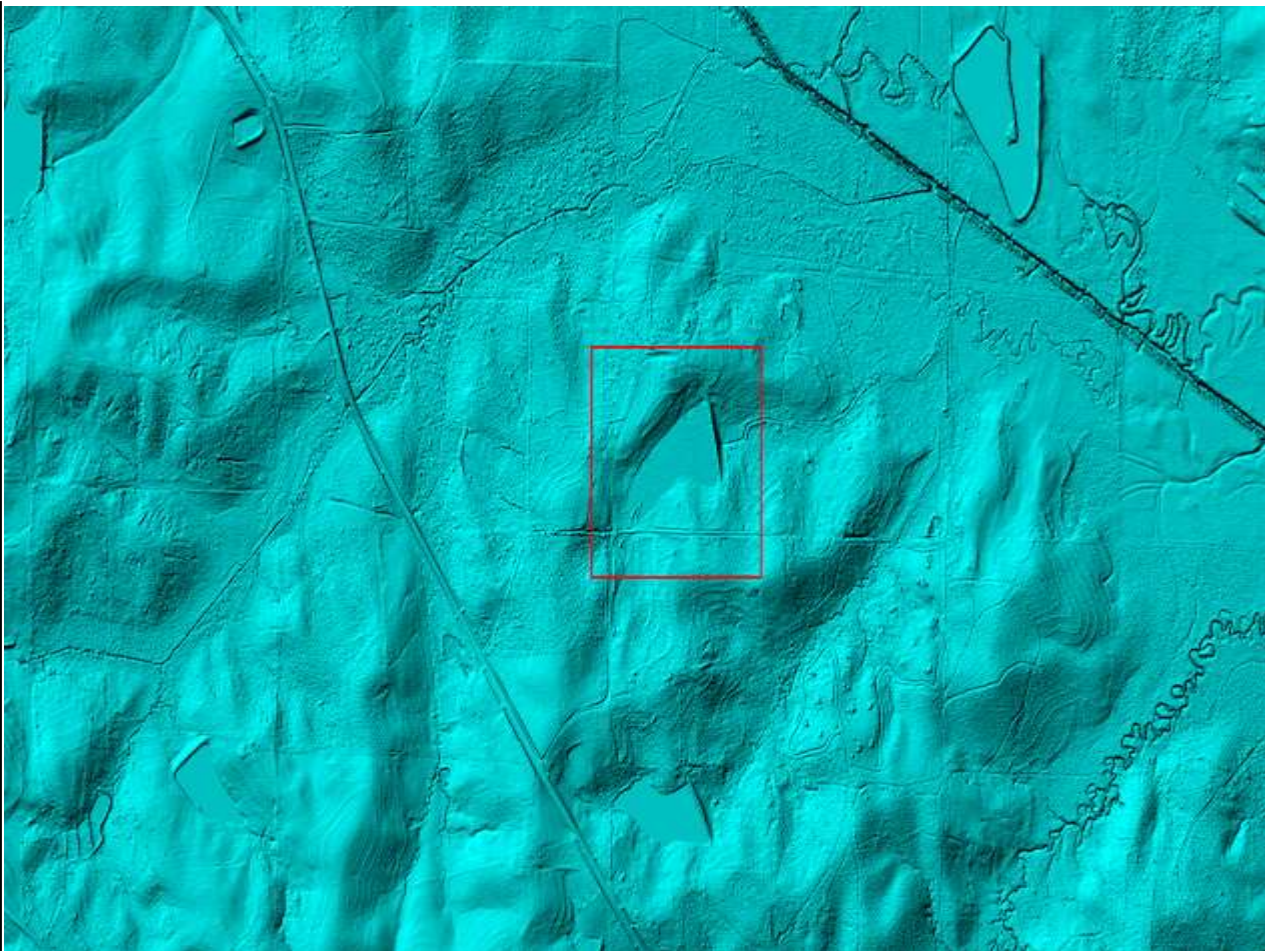
- Tiles are free from Spikes and Pits
- Tiles are free from Data Holidays
- Tiles do not exhibit systematic sensor error or comrowing

DEM tiles are properly Hydro Flattened Yes No

Waterbodies 2 Acers or greater are flattened

Several waterbodies greater than 2 acres need hydroflattening:

Waterbody at 33° 05' 43.8346" N, 89° 00' 23.3096" W, tile 16SCB120630 - representative image



Waterbody at 32° 46' 4.0747" N, 88° 39' 34.0361" W; tile 16SCB435255

Waterbody at 32° 24' 57.2757" N, 88° 38' 0.8460" W; tile 16SCA450865

Waterbody at 32° 21' 42.8464" N, 89° 19' 10.9189" W; tile 16SBA805820

Waterbody at 32° 18' 0.5270" N, 89° 12' 28.1040" W; tile 16SBA910745

Waterbody at 32° 14' 12.0394" N, 89° 16' 54.6302" W; tile 16SBA850685

Waterbody at 32° 13' 36.8504" N, 89° 04' 41.0633" W; tile 16SCA030670

Waterbody at 32° 19' 3.7388" N, 88° 32' 2.3961" W; tile 16SCA555760

Waterbody at 32° 08' 46.1251" N, 88° 29' 5.7919" W; tile 16SCA600565

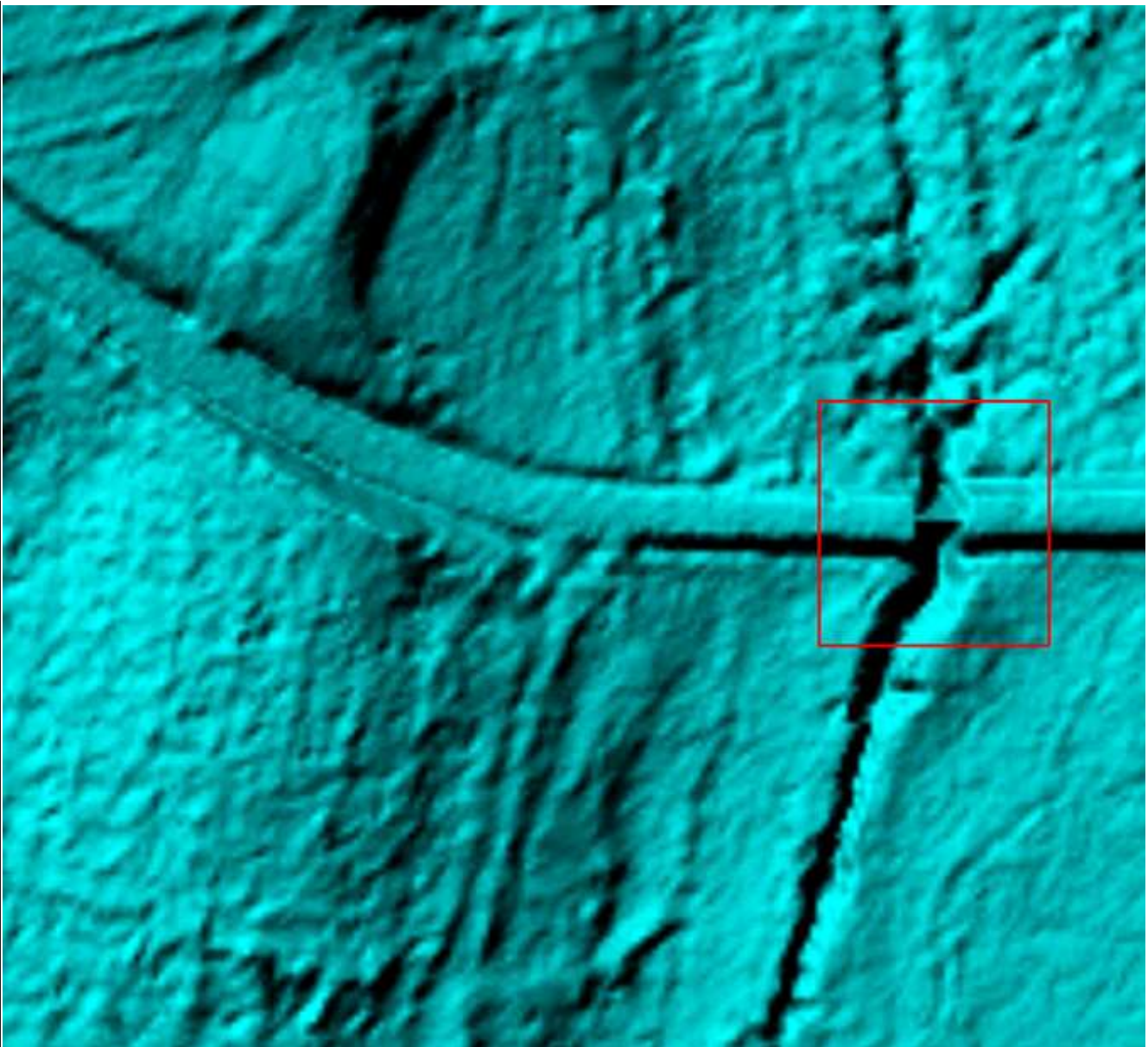
Streams 100 ft or greater are flattened in a downstream manner

Tidal Boundaries/Shorelines are flattened

No missing islands 1 acre or larger

Bridges/Overpasses are properly removed

Two partial bridge removals, one at 32° 52' 17.2253" N, 88° 52' 43.9374" W, tile 16SCB240375 (pictured) and tile 16SCA315700:



- Culverts are maintained (Not Hydro Enforced)
- Depressions, Sinks, are not filled in (Not Hydro Conditioned)
- Vegetation properly removed
- Manmade structures properly removed

Tiles recommended for NED 1/3rd: Yes. No.

Tiles recommended for NED 1/9th: Yes. No.

Based on this review, the USGS accepts the DEM tiles.

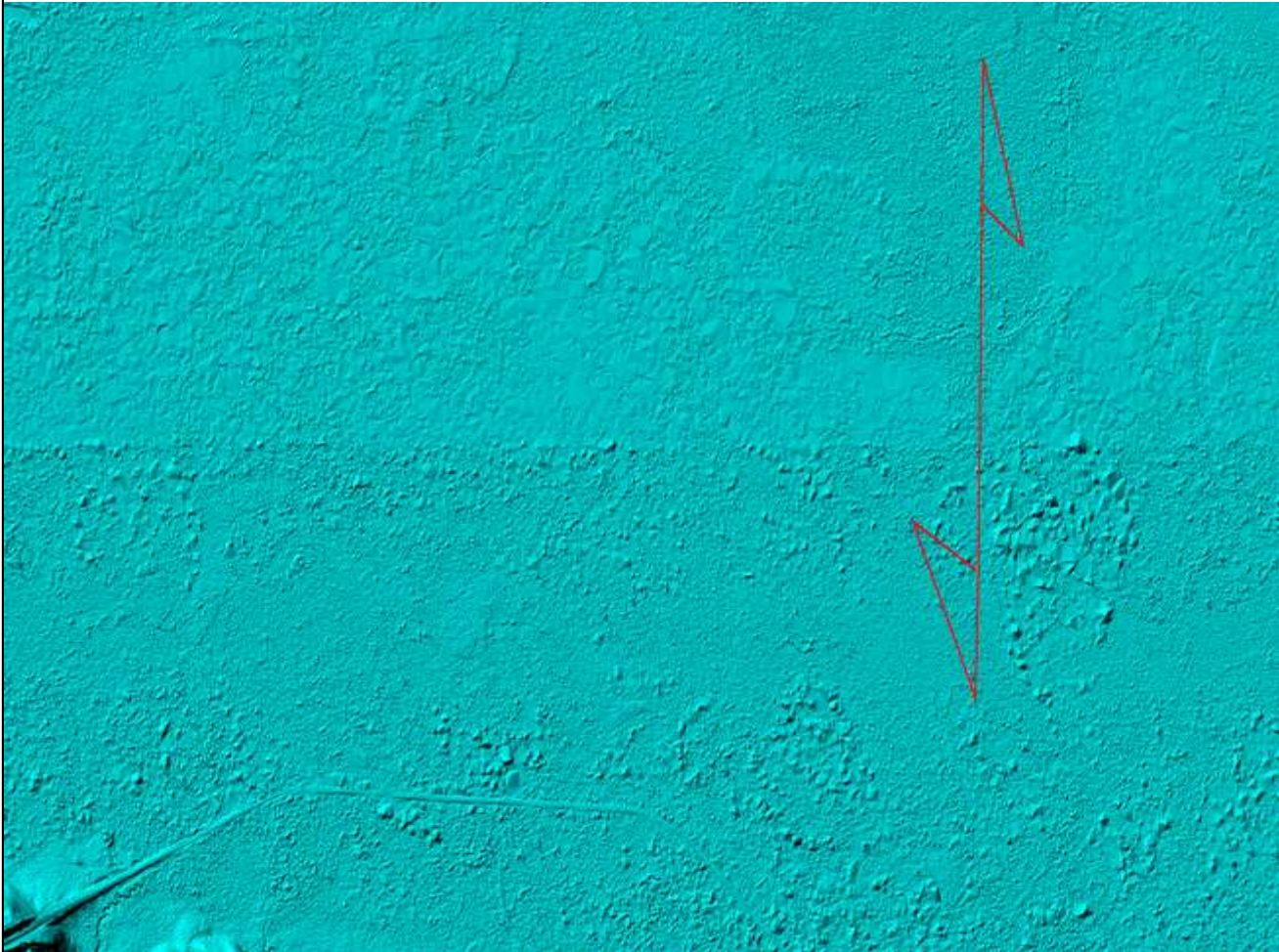
ADDITIONAL COMMENTS, ERRORS, ANOMALIES, OR OTHER ISSUES:

**** All issues were fixed by the contractor.**

DEM TILES Either Missing or have Missing Data (16SCB600195, 16SCB405420, 16RCA600295, 16SCB690120, 16SCa240910,

16SCB315000. Ridge between hydro flattened tiles at 16SCB315000 and vicinity

Edge match error; tiles possibly of different resolutions along tiles 16SBB895330 and 16SBB895345:



End of DEM Review

Based on this review, the provided delivery meets the Task Order requirements.

Additional Comments:

NED Information

Final to NED mosaic created: Yes No

Additional Comments:

END OF REPORT