



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 and the Center for LiDAR Information Coordination and Knowledge. 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 or NGTOCooperations@usgs.gov.

Materials Received:

8/31/2012

Project Type: Donated Data

Project ID:

UT-Cedar Valley

Project Description:

The Cedar Valley LiDAR data set is a mass point dataset composed of LiDAR point data. This data set was collected from airborne surveys completed between October 24, 2011 and October 27, 2011 and covers approximately 498 square miles

Project Alias(es):

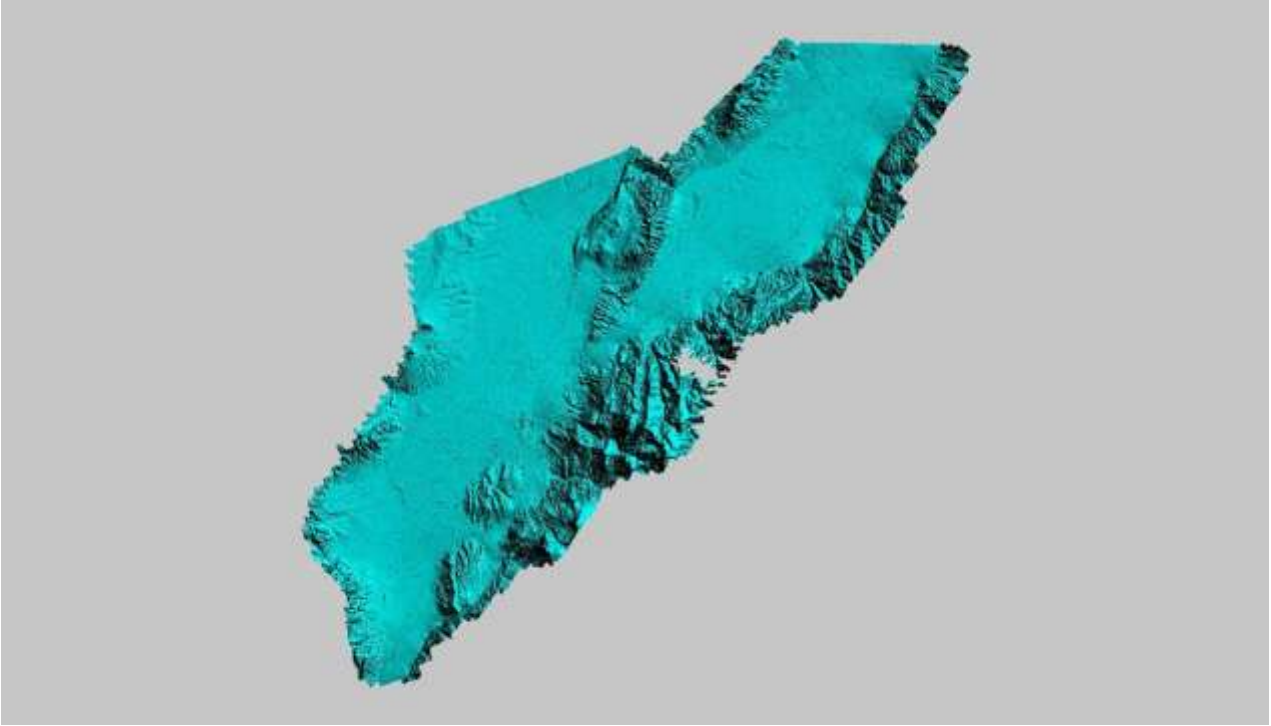
N/A

Year of Collection: 2011

Lot 1 of 4 lots.

Project Extent:

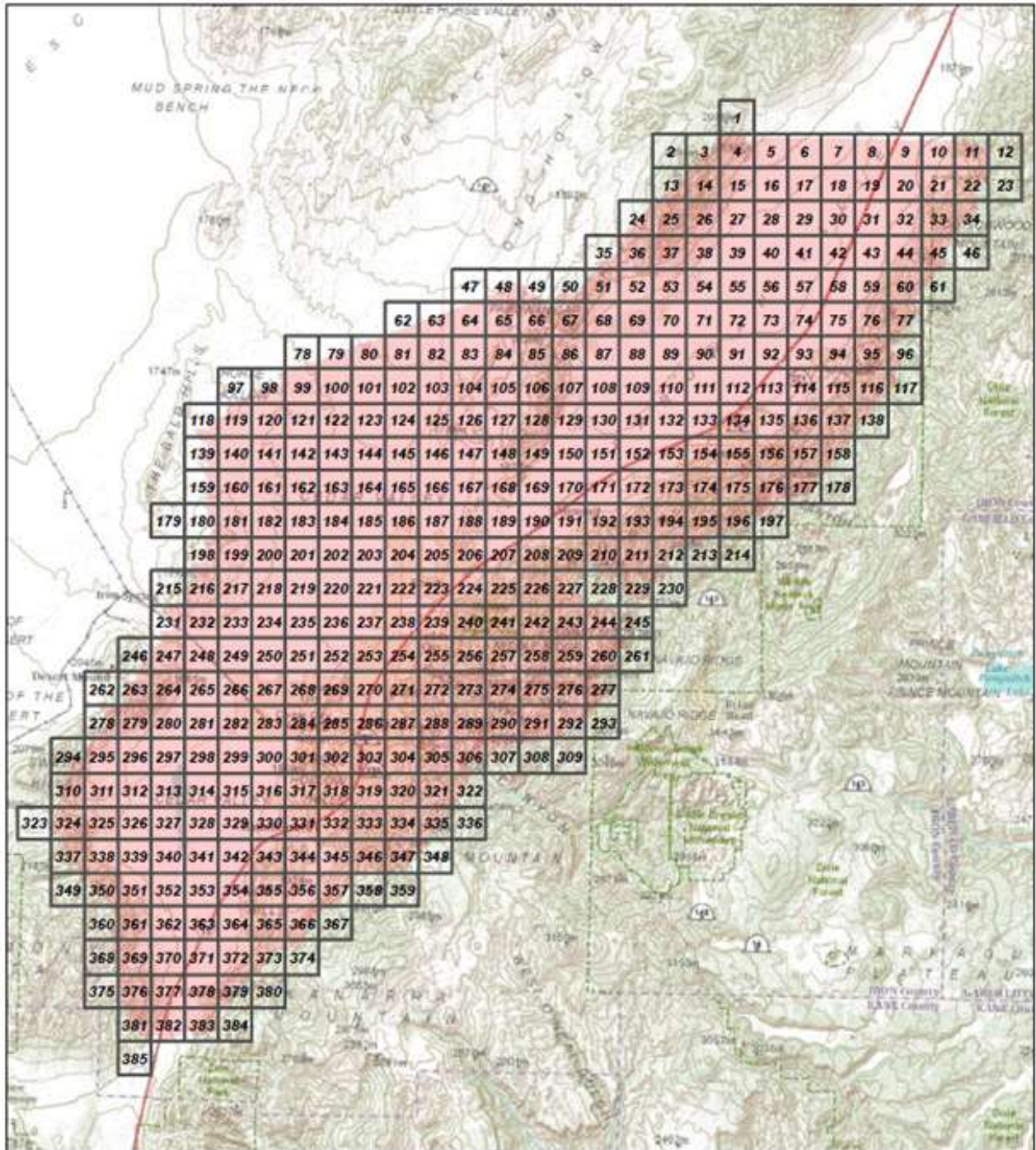
Project Extent image?



Project Tiling Scheme:

Project Tiling Scheme image?

Cedar Valley



Base Map by ESRI. Available through the ArcGIS Resource Centers.
http://go.to.arcgisonline.com/maps/World-Topo_Map

Utah State University
 LASSI Service Center

Contractor:
 (Utah AGRC) & Utah State University

Applicable Specification:
 NSSDA & V13

Licensing Restrictions:

| |
|--|
| |
|--|

Third Party Performed QA?

Project Points of Contact:

| POC Name | Type | Primary Phone | E-Mail |
|-----------------------|-------------------|----------------|---------------------|
| Robert T. Pack, Ph... | Select or type... | 1-435-797-7049 | robert.pack@usu.edu |

Project Deliverables

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/Orthoimagery Section supervisor and informed of the problem. Processing will resume after the COTR has coordinated the deposition of remaining deliverables.

- | | |
|---|---|
| <input checked="" type="checkbox"/> Collection Report | <input checked="" type="checkbox"/> Project Shapefile/Geodatabase |
| <input checked="" type="checkbox"/> Survey Report | <input checked="" type="checkbox"/> Project Tiling Scheme Shapefile/Gdb |
| <input checked="" type="checkbox"/> Processing Report | <input type="checkbox"/> Control Point Shapefile/Gdb |
| <input type="checkbox"/> QA/QC Report | <input type="checkbox"/> Breakline Shapefile/Gdb |
| <input type="checkbox"/> Control and Calibration Points | <input type="checkbox"/> Project XML Metadata |

Multi-File Deliverables

| File Type | Quantity |
|--|----------|
| <input checked="" type="checkbox"/> Swath LAS Files <input type="checkbox"/> Required? <input checked="" type="checkbox"/> XML Metadata? | 203 |
| <input type="checkbox"/> Intensity Image Files <input type="checkbox"/> Required? | ↓ |
| <input checked="" type="checkbox"/> Tiled LAS Files <input type="checkbox"/> Required? <input checked="" type="checkbox"/> XML Metadata? | 384 |
| <input type="checkbox"/> Breakline Files <input type="checkbox"/> Required? <input type="checkbox"/> XML Metadata? | ↓ |
| <input checked="" type="checkbox"/> Bare-Earth DEM Files <input checked="" type="checkbox"/> Required? <input checked="" type="checkbox"/> XML Metadata? | 384 |

Additional Deliverables

| | Item |
|-------------------------------------|--|
| <input type="checkbox"/> | DSM Files 384 IMG files |
| <input checked="" type="checkbox"/> | Shapefile Folder containing Index and Extent shape files |

Errors, Anomalies, Other Issues to document? Yes No

Reviewer received Project Shapefile but created another using Global Mapper to match exact extent of Project. Also, examples of errors will be attached to report below. Bare Earth Dems were delivered but not required (required box is only checked in order to bring up image area below for error jpegs) this is Over-the-fence data.

Project Geographic Information

Areal Extent:

498

Sq Mi

Grid Size:

2000 x 2000

meters

Tile Size:

2 x 2

meters

Nominal Pulse Spacing:

Select...

Vertical Datum: NAVD88 meters

Horizontal Datum: NAD83 meters

Project Projection/Coordinate Reference System: meters.

This Projection Coordinate Reference System is consistent across the following deliverables:

- | | |
|---|--|
| <input checked="" type="checkbox"/> Project Shapefile/Geodatabase | <input type="checkbox"/> Breaklines XML Metadata File |
| <input checked="" type="checkbox"/> Project Tiling Scheme Shapefile/Gdb | <input checked="" type="checkbox"/> Bare-Earth DEM XML Metadata File |
| <input type="checkbox"/> Checkpoints Shapefile/Geodatabase | <input checked="" type="checkbox"/> Swath LAS Files |
| <input checked="" type="checkbox"/> Project XML Metadata File | <input checked="" type="checkbox"/> Classified LAS Files |
| <input checked="" type="checkbox"/> Swath LAS XML Metadata File | <input type="checkbox"/> Breaklines Files |
| <input checked="" type="checkbox"/> Classified LAS XML Metadata File | <input checked="" type="checkbox"/> Bare-Earth DEM Files |

Check Point Shapefile/Geodatabase CRS

N/A

Breakline XML Metadata CRS

N/A

Breakline Files CRS

N/A

Review Cycle

This section documents who performed the QA Review on a project as well as when QA reviews were started, actions passed, received, and completed.

Reviewer:

K. Romero

Review Start Date:

8/31/2012

| Action to Contractor Date | Issue Description | Return Date |
|---------------------------|-------------------|-------------|
| | | |

Review Complete: 9/26/2012

Metadata Review

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 XML Metadata file parsed with errors.

No project XML delivered, reviewer determined the Best Use File and named it Cedar Valley_Best_Use_Metadata

The Swath LAS XML Metadata file parsed without errors.

The Classified LAS XML Metadata file parsed without errors.

The Bare-Earth DEM XML Metadata file parsed without errors.

Project QA/QC Report Review

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.

Checkpoint Shapefile or Geodatabase:

Checkpoint Distribution Image?

The following land cover classes are represented in this dataset (uncheck any that do not apply):

- Bare Earth
- Tall Weeds and Crops
- Brush Lands and Low Trees
- Forested Areas Fully Covered by Trees
- Urban Areas with Dense Man-Made Structures

There are a minimum of 20 checkpoints for each land cover class represented. Points

within each class are uniformly distributed throughout the dataset. USGS Select... able to locate independent checkpoints for this analysis. USGS accepts the quality of the checkpoint data for these LiDAR datasets.

Errors, Anomalies, Other Issues to document? Yes No

Image?

Control points were not available with the Cedar Valley Project. Vertical accuracy was checked by measuring the relative vertical accuracy by RTK survey, calculating the within swath overlap accuracy, and measuring the fundamental vertical accuracy with LiDAR targets. Relative vertical accuracy was checked for the four typical terrain types within this project using RTK GPS surveys.

Image?

>.047m RMSEz Fundamental Vertical Accuracy

Accuracy values are reported in terms of Fundamental Vertical Accuracy (FVA), Supplemental Vertical Accuracy(s) (SVA), and Consolidated Vertical Accuracy (CVA).

Accuracy values are reported in:

Required FVA Value is or less.
Target SVA Value is or less.
Required CVA Value is or less.

The reported FVA of the LAS Swath data is .

The reported FVA of the Bare-Earth DEM data is .
SVA are required for each land cover type present in the data set with the exception of

bare-earth. SVA is calculated and reported as a 95th Percentile Error.

| Land Cover Type | SVA Value | Units |
|--|-----------|-------|
| Tall Weeds and Crops | | N/A |
| Brush Lands and Low Trees | | N/A |
| Forested Areas Fully Covered by Trees | | N/A |
| Urban Areas with Dense Man-Made Structu... | | N/A |

The reported CVA of this data set is: .

Bare-Earth DEM Tile File Review

The derived bare-earth DEM file receives a review of the vertical accuracies provided by the data supplier, vertical accuracies calculated by USGS using supplied and independent checkpoints, and a manual check of the appearance of the DEM layer.

Bare-Earth DEM files provided in the following format:

Bare-Earth DEM Tile File Characteristics

- Separate folder for bare-earth DEM files
- DEM files conform to Project Tiling Scheme
- Quantity of DEM files conforms to Project Tiling Scheme
- DEM files do not overlap
- DEM files are uniform in size
- DEM files properly edge match
- Independent check points are well distributed

All accuracy values reported in .

Reported Accuracies

| Land Cover Category | # of Points | Fundamental Vertical Accuracy @95% Confidence Interval (Accuracy _z) Required FVA = <input type="text" value=""/> or less. | Supplemental Vertical Accuracy @95th Percentile Error Target SVA = <input type="text" value=""/> or less. | Consolidated Vertical Accuracy @95th Percentile Error Required CVA = <input type="text" value=""/> or less. |
|---------------------------|-------------------------------|--|--|--|
| Open Terrain | <input type="text" value=""/> | <input type="text" value=""/> | | |
| Tall Weeds and Crops | <input type="text" value=""/> | | <input type="text" value=""/> | |
| Brush Lands and Low Trees | <input type="text" value=""/> | | <input type="text" value=""/> | |

| | | | | |
|--|---|--|---|--|
| Forested Areas Fully Covered by Trees | 1 | | 1 | |
| Urban Areas with Dense Man-Made Structures | 1 | | 1 | |
| Consolidated | 0 | | | |

QA performed Accuracy Calculations?

Based on this review, the USGS recommends the bare-earth DEM files for inclusion in the 1/3 Arc-Second National Elevation Dataset.

Based on this review, the USGS accepts the bare-earth DEM files.

Bare-Earth DEM Anomalies, Errors, Other Issues

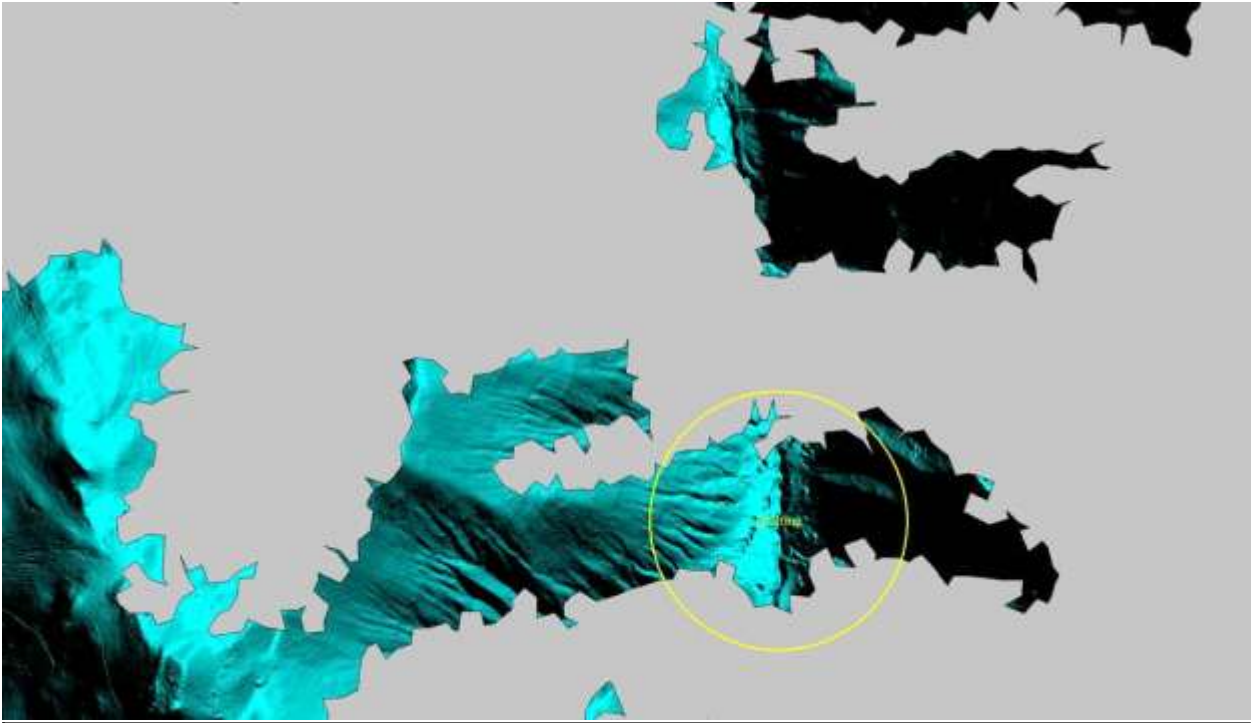
Errors, Anomalies, Other Issues to document? Yes No

Image?



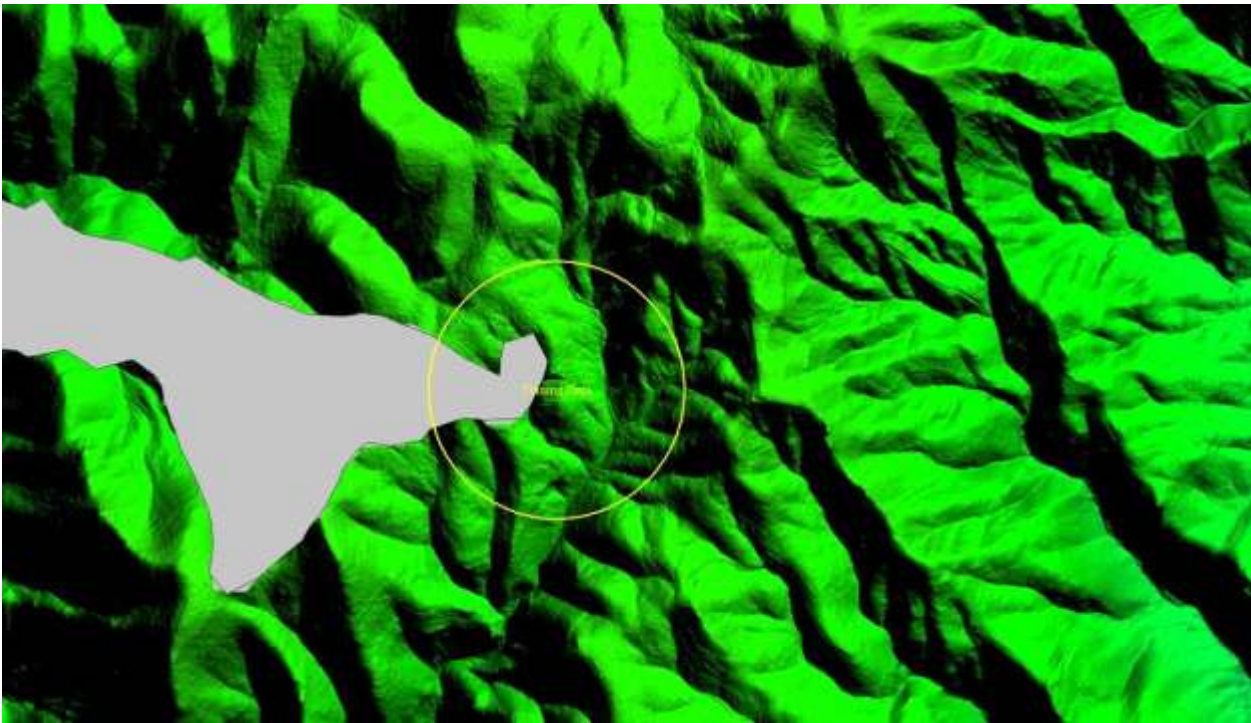
Bridges need to be leveled example

Image?



Quilting Area example

Image?



Tinning Area

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|----------------|
| Internal Note: |
| |

This is the end of the report.

QA Form V1.4 12OCT11.xsn