![USGS logo - science for a changing world]

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 NGTOCoperations@usgs.gov.

Materials Received:
8/31/2012

Project Type: Donated Data

Project ID:
GSL_BearRiver_UT

Project Description:
This project encompasses five areas in five Utah counties and encompasses about 1147 square miles shown below. Data was collected on September and October, 2011.
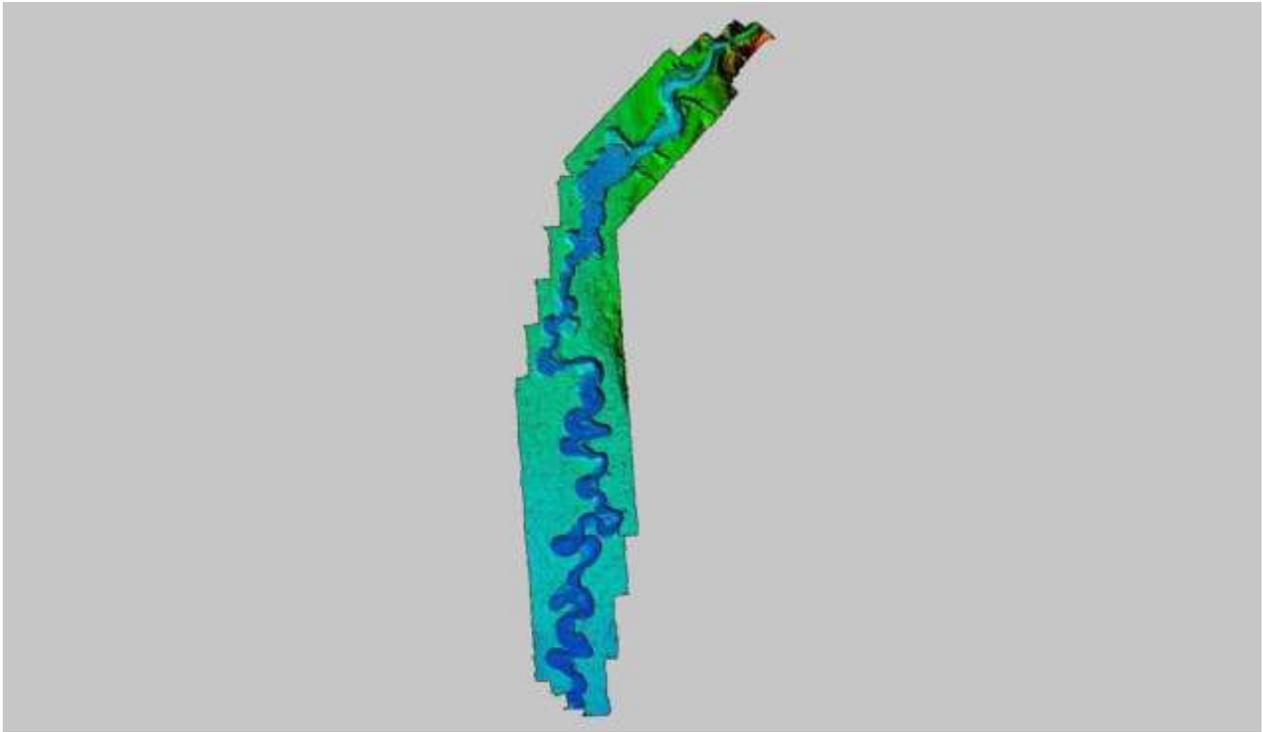
Project Alias(es):

Year of Collection: 2011
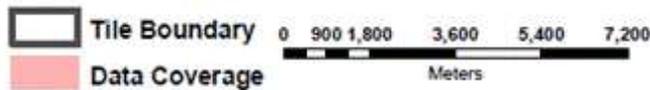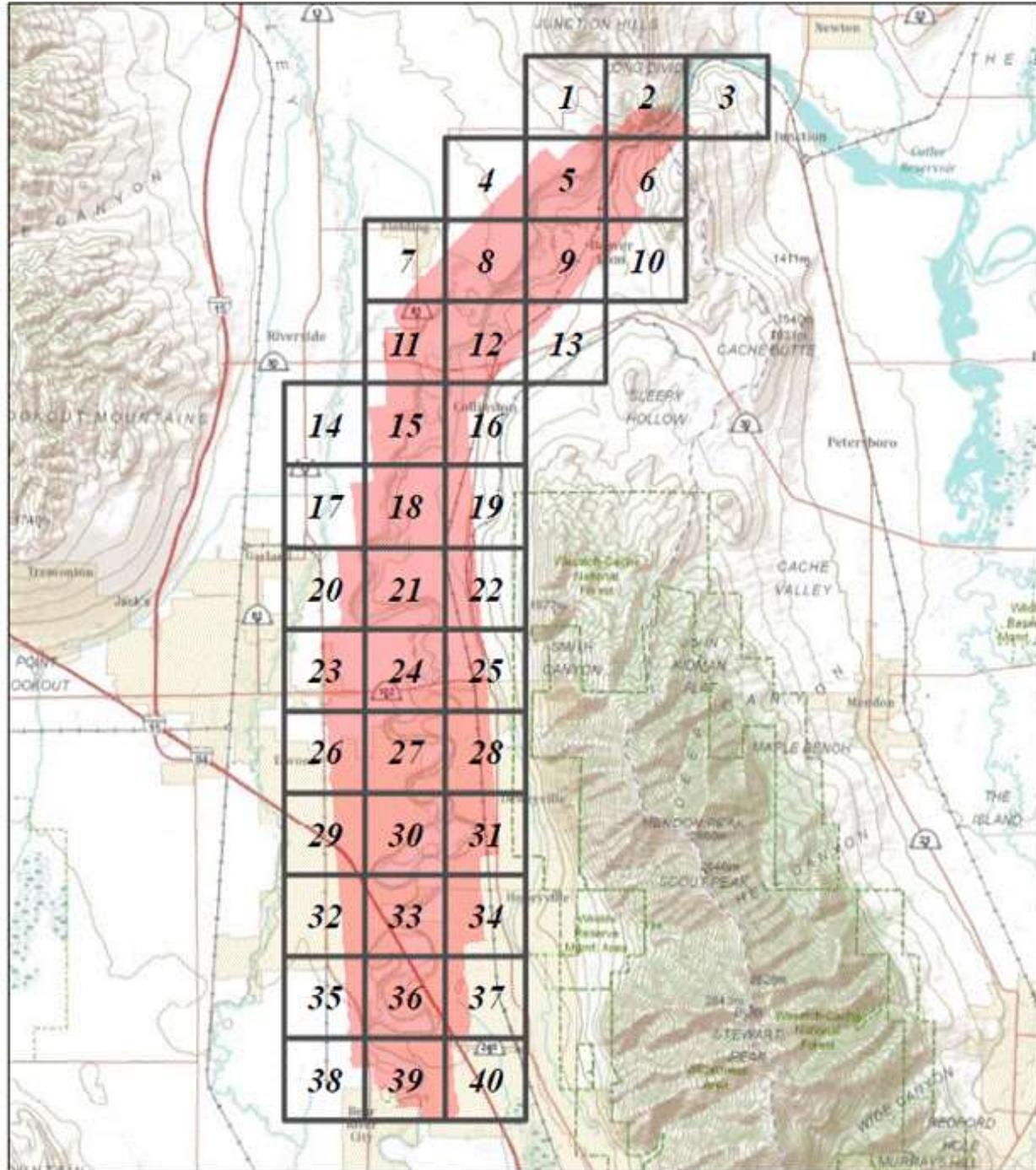
Lot 1 of 5 lots.

Project Extent:
☑ Project Extent image?

Project Tiling Scheme:
☑ Project Tiling Scheme image?

Bear River

Tile Boundary
Data Coverage

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

UtahStateUniversity
LASSI Service Center

0   900 1,800   3,600   5,400   7,200
Meters

Contractor:
Utah AGRC and 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...	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.

☑ Collection Report
☑ Survey Report
☑ Processing Report
☐ QA/QC Report
☐ Control and Calibration Points

☑ Project Shapefile/Geodatabase
☑ Project Tiling Scheme Shapefile/Gdb
☐ Control Point Shapefile/Gdb
☐ Breakline Shapefile/Gdb
☐ Project XML Metadata

Multi-File Deliverables

File Type	Quantity
☑ Swath LAS Files ☐ Required? ☑ XML Metadata?	12
☐ Intensity Image Files ☐ Required?	
☑ Tiled LAS Files ☐ Required? ☑ XML Metadata?	40
☐ Breakline Files ☐ Required? ☐ XML Metadata?	
☑ Bare-Earth DEM Files ☑ Required? ☑ XML Metadata?	40

Additional Deliverables

	Item
☑	DSM_IMG Folder…40 Files
☑	Shapefile Folder containing Index and Extent shape files

Errors, Anomalies, Other Issues to document? ● Yes ○ No

Project Geographic Information

Areal Extent:

62

Sq Mi

Grid Size:

Select...

Tile Size:

2000 x 2000

meters

Nominal Pulse Spacing:

Select...

Vertical Datum: NAVD88 Select...

Horizontal Datum: NAD83 Select...

Project Projection/Coordinate Reference System: ⎸ meters.

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

☑ Project Shapefile/Geodatabase   ☐ Breaklines XML Metadata File
☑ Project Tiling Scheme Shapefile/Gdb   ☑ Bare-Earth DEM XML Metadata File
☐ Checkpoints Shapefile/Geodatabase   ☑ Swath LAS Files
☑ Project XML Metadata File   ☑ Classified LAS Files
☑ Swath LAS XML Metadata File   ☐ Breaklines Files
☑ Classified LAS XML Metadata File   ☑ 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: 9/10/2012

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 GSL -Bear River_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 was notable 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 Bear River 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?

.081m 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: meters

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

The reported FVA of the LAS Swath data is | meters |.

The reported FVA of the Bare-Earth DEM data is | meters |.

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: | meters .

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: Erdas Imagine *.img

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 meters .

Reported Accuracies

Land Cover Category	# of Points	Fundamental Vertical Accuracy @95% Confidence Interval (Accuracy$_z$) Required FVA = [ ] or less.	Supplemental Vertical Accuracy @95th Percentile Error Target SVA = [ ] or less.	Consolidated Vertical Accuracy @95th Percentile Error Required CVA = [ ] or less.
Open Terrain	[ ]	[ ]		
Tall Weeds and Crops	[ ]		[ ]	
Brush Lands and Low Trees	[ ]		[ ]	

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

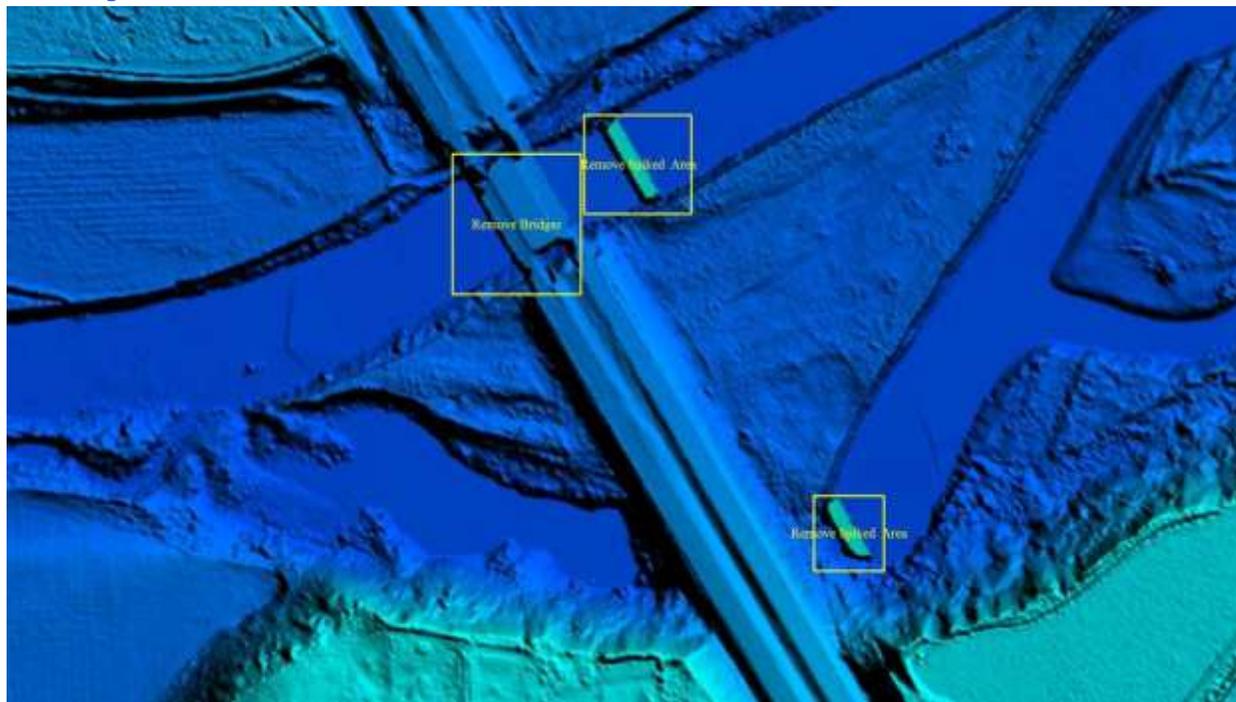☐ QA performed Accuracy Calculations?

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.

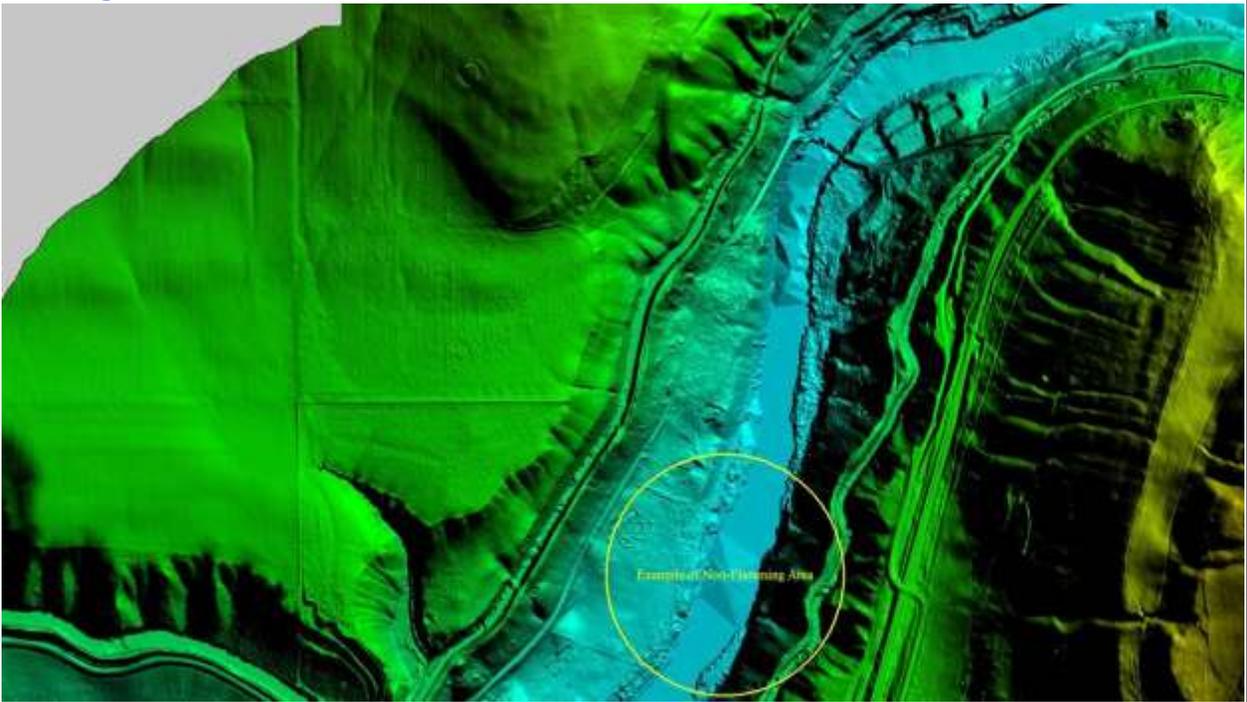Bare-Earth DEM Anomalies, Errors, Other Issues

Errors, Anomalies, Other Issues to document? ⦿ Yes ○ No

☑ Image?

Remove Bridges & Spiked Areas

☑ Image?

Flatten Water Area

☑ Image?

Tinning

Internal Note:

<u>This is the end of the report.</u>

QA Form V1.4 12OCT11.xsn