

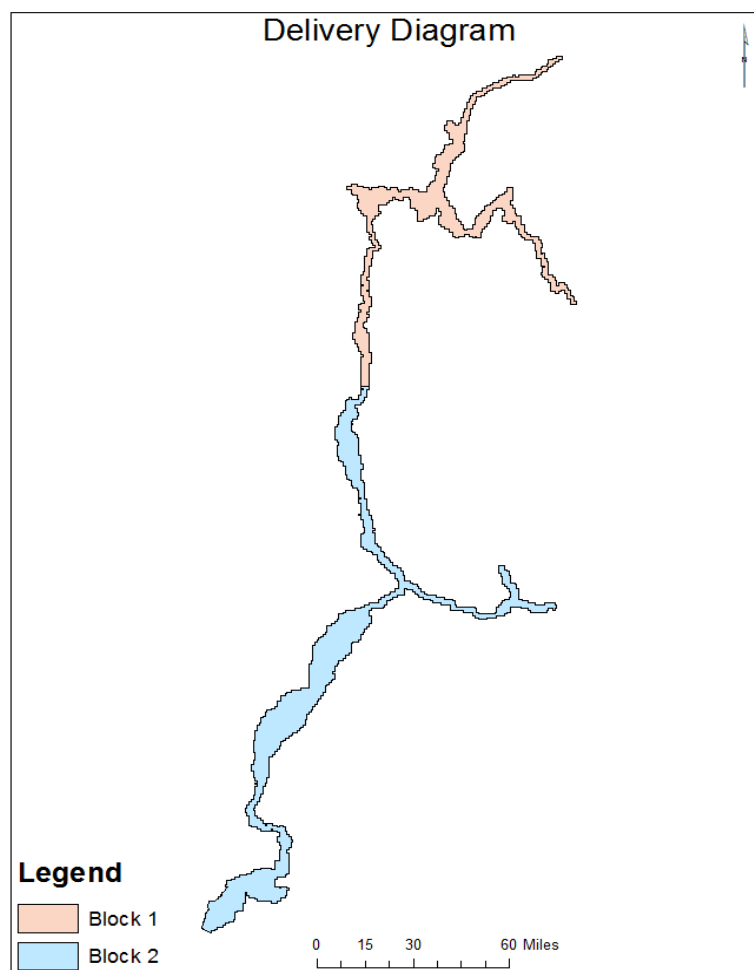


# LiDAR Quality Assessment Report

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.

## AZ\_LowerColoradoRiver\_2018\_B18

NGTOC  
2019-03-11  
Annalisa Stasey



# Project Information

Project: AZ\_LowerColoradoRiver\_2018\_B18

Contractor: Woolpert, Inc.

Project Type:  
GPSC

Applicable Specification:  
Other

NGP Lidar Base Specification Version 1.3

## Project Points of Contact:

Name:	Type:	Email:
Leslie Lansbery	CPT	llansbery@usgs.gov

REPORT QUALIFICATION SUMMARY:
<b>Task Order Overall:</b> <i>Meets Requirements</i>
<b>Metadata:</b> 1 of 1 Reviews Accepted 0 Reviews Not Accepted
<b>Vertical Accuracy:</b> 0 of 1 Reviews Accepted 0 Reviews Not Accepted
<b>Swath/Raw LAS:</b> 0 of 1 Reviews Accepted 0 Reviews Not Accepted
<b>Tiled/Classified LAS:</b> 1 of 1 Reviews Accepted 0 Reviews Not Accepted
<b>Breakline:</b> 1 of 1 Reviews Accepted 0 Reviews Not Accepted
<b>DEM(s):</b> 1 of 1 Reviews Accepted 0 Reviews Not Accepted
<b>NED Review:</b> 1 of 1 DEM tile reviews recommended for NED 1/3rd 0 of 1 DEM tile reviews recommended for NED 1/9th

Project Subdivision: Lots

List Subdivision:

- 1

of: 2

Dates Collected Range:

Collection Start: 9/2/2018

Collection End: 9/23/2018

Project Aliases:

AZ\_LowerColoradoRiver\_2018\_B18 Block 1

Licensing:

Other...

Restricted at this time.

Project Description:

This task order requests a **leaf-on** late summer/early fall 2018 lidar surveys to be collected over approximately **2,122 square miles** of the Lower Colorado River in Arizona, Nevada and California as depicted in the Area of Interest (AOI) in Attachment "A". Portions of the AOI in Arizona and California are along the U.S. and Mexico border. Lidar shall be acquired up to the border, but shall not extend acquisition across the border into Mexico. The AZ\_LowerColoradoRiver\_2018\_B18 AOI has been expanded to the Albers National Indexing Scheme - <https://pubs.usgs.gov/fs/2017/3073/fs20173073.pdf>. Tile index download -

[https://nationalmap.gov/3DEP/3dep\\_national\\_indexing\\_scheme.html](https://nationalmap.gov/3DEP/3dep_national_indexing_scheme.html).

This project will support the 3DEP mission, the United States Bureau of Reclamation (USBR) Boulder Canyon Operations Office (BCOO) and the Lower Colorado River Multi-Species Conservation Program (LCR MSCP) vegetation mapping projects. The Defined Project Area (DPA) and associated AOIs are delineated in "Attachment A" and are further defined in "Attachment B." Contractor shall supply a proposed Delivery Diagram as defined in Section C.1.d. (vii)

**Delivery Diagram.** The **final**, approved delivery diagram will be delineated in "Attachment C" of the executed task order. This project will require hydro-flattening.

This report is for Block 1 of the project.

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## Review Information

Reviewer:

Date

Delivered:

3rd Party QA

Date

Performed:

Assigned:

Action To Contractor Date:	Issue Description:	Return Date:
3/11/2019	<p>Rejectable errors are described in <b>RED</b>, corrections in <b>GREEN</b>, and notes in <b>BLACK</b>.</p> <p style="text-align: center;"><b><u>SUMMARY</u></b></p> <p><b>Project Materials:</b></p> <ul style="list-style-type: none"> <li>All reports and metadata to be delivered with final block data</li> </ul> <p><b>Metadata:</b></p> <p><b>Tiles/Classified LiDAR review:</b></p> <ul style="list-style-type: none"> <li>2 different SRS found</li> <li>3 point misclassifications (bridge)</li> <li>10 point misclassifications (ground)</li> <li>3 areas with undulations</li> <li>Missing classes 3, 4, 5 as required by task order</li> <li>4 tiles with non-zero file source ID's</li> </ul> <p><b>Breakline Review:</b></p> <ul style="list-style-type: none"> <li>1 feature requires breakline enforcement</li> <li>1 feature requires monotonic downhill treatment</li> </ul> <p><b>DEM Review:</b></p> <ul style="list-style-type: none"> <li>7 unknown anomalies</li> <li>1 feature requires hydroflattening</li> </ul>	4/11/2019
4/24/2019	<p>Rejectable errors are described in <b>RED</b>, corrections in <b>GREEN</b>, and notes in <b>BLACK</b>.</p> <p style="text-align: center;"><b><u>SUMMARY</u></b></p> <p><b>Tiles/Classified LiDAR review:</b></p> <ul style="list-style-type: none"> <li>2 different SRS found</li> <li>Missing classes 3, 4, 5 as required by task order</li> <li>4 tiles with non-zero file source ID's</li> <li>Scan direction flag format</li> </ul> <p><b>Breakline Review:</b></p> <ul style="list-style-type: none"> <li>1 feature requires breakline enforcement</li> </ul>	5/13/2019
5/14/2019	<b>Project meets requirements</b>	5/14/2019

**Review Complete:**

3/11/2019

**Dates Project Worked:**

Start:	3/1/2019	4/24/2019	5/14/2019
End:	3/11/2019	4/24/2019	5/14/2019

## 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

<i>Deliverables</i>	<i>Delivered</i>	<i>XML Metadata</i>	<i>Required</i>	<i>Format</i>	<i>Quantity</i>	<i>Additional Details</i>
<i>Collection Report:</i>	<input type="checkbox"/>		<input type="checkbox"/>	<u>Select...</u>	0	Will be delivered with final block data.
<i>Survey Report:</i>	<input type="checkbox"/>		<input type="checkbox"/>	<u>Select...</u>	0	Will be delivered with final block data.
<i>Processing Report:</i>	<input type="checkbox"/>		<input type="checkbox"/>	<u>Select...</u>	0	Will be delivered with final block data.
<i>QA/QC Report:</i>	<input type="checkbox"/>		<input type="checkbox"/>	<u>Select...</u>	0	Will be delivered with final block data.
<i>Project Level XML Metadata:</i>	<input type="checkbox"/>		<input type="checkbox"/>	XML	0	Not required under V 1.3
<i>Project Extent:</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<u>.shp</u>	2	Full project extent and block extent.
<i>Tile Scheme:</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<u>.shp</u>	1	
<i>Control (Calibration) Points:</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<u>.shp</u>	1	
<i>Check (Validation) Points:</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<u>.shp</u>	2	NVA and VVA separate
<i>Additional Comments:</i>	<b>All reports to be delivered with final block data.</b>					

### LIDAR DATA

<i>Deliverables</i>	<i>Delivered</i>	<i>XML</i>	<i>Required</i>	<i>Format</i>	<i>Quantity</i>	<i>Additional Details</i>
---------------------	------------------	------------	-----------------	---------------	-----------------	---------------------------

		Metadata				
Swath Data:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Select...	0	not required under V 1.3
Classified/ Tiled Data:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	.las	1,946	See comment in Tiled/Classified section
Additional Comments:		<p><b>Preliminary metadata delivered for this block. Final metadata to be delivered with final block data.</b></p> <p><b>Classified .las has extra classes required: Class 3 (low veg, &lt;0.6 m), Class 4 (medium veg, 0.6 - 4.5 m) and Class 5 (high veg, &gt;4.5 m).</b></p>				

**DERIVED DELIVERABLES**

Deliverables	Delivered	XML Metadata	Required	Format	Quantity	Additional Details
DEM Tiles:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	IMG	1,947	
Breaklines:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	FGD	1	
Additional Comments:		<p><b>Preliminary metadata delivered for this block. Final metadata to be delivered with final block data.</b></p>				

**OTHER**

Additional Deliverables	Delivered	XML Metadata	Required	Format	Quantity	Additional Details
Intensities	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	.tif	1,946	See comment in Tiled/Classified section
DSM	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	.img	1,947	Required deliverable per task order
Additional Comments:		<p><b>Other deliverables to be provided with final block data.</b></p>				

**Geographic Information**

Area Extent:  Sq. Miles

Tile Size:  Meters

DEM/DTM Grid Spacing:  Meters

Coordinate Reference System:

Projection:

Horizontal   Meters

Datum:   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 checked="" type="checkbox"/> Tiled/Classified XML Metadata |
| <input type="checkbox"/> Project Extent XML Metadata      | <input checked="" type="checkbox"/> Tiled/Classified LiDAR        |
| <input type="text"/>                                      | <input checked="" type="checkbox"/> DEM(s)                        |
| <input checked="" type="checkbox"/> Project Tile Scheme   | <input checked="" type="checkbox"/> DEM XML Metadata              |
| <input type="checkbox"/> Project Tile Scheme XML Metadata | <input checked="" type="checkbox"/> Breakline(s)                  |
| <input type="text"/>                                      | <input checked="" type="checkbox"/> Breakline XML Metadata        |
| <input checked="" type="checkbox"/> Control Points        |   |
| <input type="checkbox"/> Control Points XML Metadata      |   |
| <input type="text"/>                                      |   |
| <input checked="" type="checkbox"/> Checkpoints           |   |
| <input type="checkbox"/> Checkpoint XML Metadata          |   |
| <input type="text"/>                                      |   |

Additional  
Comments:

**Other deliverables to be provided with final block data.**

## Collection Information

Quality Level: 1

Configured Nominal Pulse Spacing:

Meters

Sensor Information:

Sensor Type:

Aerial Oscillating Mirror

Sensor Used:

Configured Scan Angle  $\pm$  from nadir:

Degrees

Additional Comments:

## Metadata Review Accepted

Vendor 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.

Parser can be found @ <http://geo-nsdi.er.usgs.gov/validation/>

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

Check if 'Best Use' metadata for NED:

**The Project Tile Scheme XML Metadata parsed select... errors.**

Check if 'Best Use' metadata for NED:

**The Control Point XML Metadata parsed select... errors.**Check if 'Best Use' metadata for NED: **The Check Point XML Metadata parsed select... errors.**Check if 'Best Use' metadata for NED: **The Classified XML Metadata parsed without errors.**Check if 'Best Use' metadata for NED: **The DEM XML Metadata parsed without errors.**Check if 'Best Use' metadata for NED: **The Breakline XML Metadata parsed without errors.**Check if 'Best Use' metadata for NED: Additional  
Comments:**DSM and Intensity XML parsed without errors.****Based on this review, the USGS accepts the xml metadata provided.**

End of Metadata Review

## Vertical Accuracy 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.

## Required Vertical Accuracy

 Yes  No**REQUIRED NON-VEGETATED VERTICAL ACCURACY FOR SWATH AND DEM FILES**Required Unit: Required # of checkpoints: Required RMSEz:



Required Vertical Accuracy (RMSEz \* 95th CI)

### REQUIRED VEGETATED VERTICAL ACCURACY FOR DEM FILES

Required Unit:

Required # of checkpoints:

Required Vertical Accuracy (@ 95th percentile)

Additional Required Vertical Accuracy Information:

The checkpoints listed above are for the total square miles of the project area and not by block areas.

## Reported Vertical Accuracy

Yes  No

### REPORTED NON-VEGETATED VERTICAL ACCURACY FOR SWATH LIDAR FILES

Reported Unit:

Reported # of checkpoints:

Reported RMSEz:

Reported Vertical Accuracy (RMSEz \* 95th CI)

### REPORTED NON-VEGETATED VERTICAL ACCURACY FOR DEM FILES

Reported Unit:

Reported # of checkpoints:

Reported RMSEz:

Reported Vertical Accuracy (RMSEz \* 95th CI)

### REPORTED VEGETATED VERTICAL ACCURACY FOR DEM FILES

Reported Unit:

Reported # of checkpoints:

Reported Vertical Accuracy (95th percentile)

Additional Reported Vertical Accuracy

Information:

## Reviewed Vertical Accuracy

Yes  No

Vertical Accuracy information was not or could not be reviewed.

**Based on this review, the USGS Select... the vertical accuracy.**

End of Vertical Accuracy Review

### Raw-Swath LiDAR Review

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 Non-Vegetated Vertical Accuracy using ground control checkpoints measured in clear open terrain (see *Vertical Accuracy Review Section*).

Review Required:  Yes  No *Not Delivered*

### 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: 1.4

Point Record Format: 6

If specified, \*.wpd files for full waveform data have been provided: Not Required

*Classified LAS tile files conform to project tiling scheme*

*Quantity of classified LAS tile files conforms to project tiling scheme*

**CPT Comment: Contractor noted that Tile w1626n1635 was excluded from the Classified Lidar Point Cloud and Intensity Imagery data sets as it falls over a large, open water body that did not produce any returns.**

*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, including the use of OGC 2001 Well Known Text (WKT).*

**Two WKT's were returned by LAS analysis tools; both WKT's were run through the WKT parser. File w1641n1615 has different EPSG codes than other files in the project because it's in NAD83 not NAD83 (2011). The task order requires deliverables in NAD83 (2011) as below:**

```
PROJ.4 : '+proj=aea +lat_1=29.5 +lat_2=45.5 +lat_0=23 +lon_0=-96 +x_0=0 +y_0=0 +ellps=GRS80 +units=m +vunits=m +no_defs '
```

OGC WKT :

```
COMPD_CS["NAD83(2011) / Conus Albers + NAVD88 height - Geoid12B (metre)",
```

```
  PROJCS["NAD83(2011) / Conus Albers",
```

```
    GEOGCS["NAD83(2011)",
```

```
      DATUM["NAD83_National_Spatial_Reference_System_2011",
```

```
        SPHEROID["GRS 1980",6378137,298.257222101,
```

```
          AUTHORITY["EPSG","7019"]],
```

```

    AUTHORITY["EPSG","1116"],
    PRIMEM["Greenwich",0,
    AUTHORITY["EPSG","8901"],
    UNIT["degree",0.0174532925199433,
    AUTHORITY["EPSG","9122"],
    AUTHORITY["EPSG","6318"],
    PROJECTION["Albers_Conic_Equal_Area"],
    PARAMETER["standard_parallel_1",29.5],
    PARAMETER["standard_parallel_2",45.5],
    PARAMETER["latitude_of_center",23],
    PARAMETER["longitude_of_center",-96],
    PARAMETER["false_easting",0],
    PARAMETER["false_northing",0],
    UNIT["metre",1,
    AUTHORITY["EPSG","9001"],
    AXIS["X",EAST],
    AXIS["Y",NORTH],
    AUTHORITY["EPSG","6350"],
    VERT_CS["NAVD88 height - Geoid12B (metre)",
    VERT_DATUM["North American Vertical Datum 1988",2005,
    AUTHORITY["EPSG","5103"],
    UNIT["metre",1,
    AUTHORITY["EPSG","9001"],
    AXIS["Gravity-related height",UP],
    AUTHORITY["EPSG","5703"]]]]

```

Corrected (5/14/2019).

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

Set to 17 as per V1.3

Classified LAS tile files have no points classified as '12' (Overlap) and correctly use overlap bit.

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, manually identified, if needed)	<input checked="" type="checkbox"/>
8	Model key points	<input type="checkbox"/>
9	Water	<input checked="" type="checkbox"/>
10	Ignored ground (breakline proximity)	<input type="checkbox"/>
11	Withheld (if the "Withheld Bit" is not implemented in the processing software)	<input type="checkbox"/>
17	Bridges	<input checked="" type="checkbox"/>
18	Noise (high, manually identified, if needed)	<input checked="" type="checkbox"/>

Additional Classes:

Class	Description
20	Ignored ground

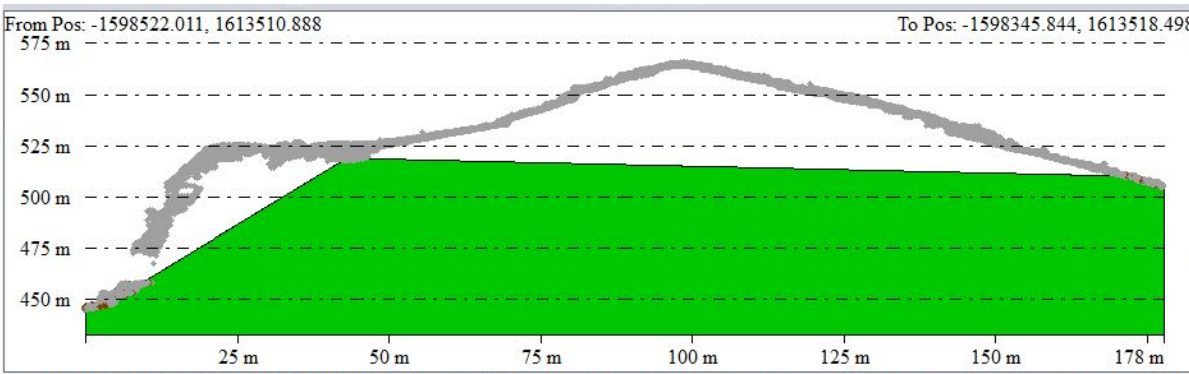
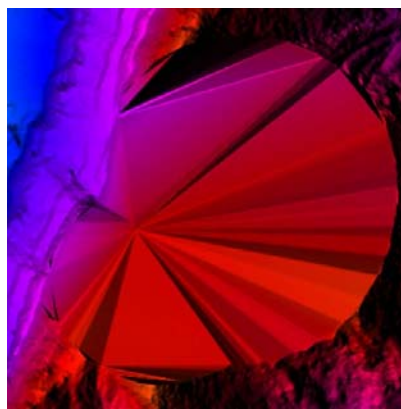
Additional comments:

**3 bridges need to be removed:**



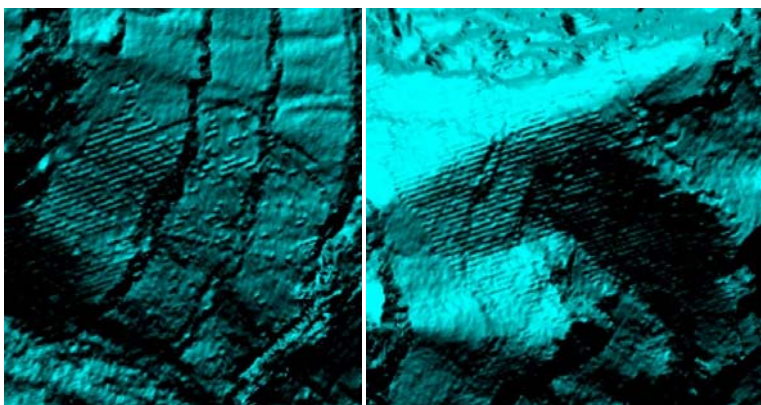
Corrected (4/24/2019).

10 instances where ground points were misclassified:



Corrected (4/24/2019).

3 instances of undulation:



Corrected (4/24/2019).

Missing classes 3, 4, 5 as required by the task order.

Corrected (5/14/2019).

4 LAS files with non zero file source ID's: w1526n1636, w1630m1614, w1631n1612, w1631n1615.

Corrected (5/14/2019).

Tile w1630n1614 scan direction flag format is 0:xxx. All other las tiles have scan direction flag set as xxx:xxx (4/24/2019).

Corrected (5/14/2019).

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

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 Proprietary waterbody level techniques.

- Double Line Stream Breaklines (Streams Approximately > 100 ft).

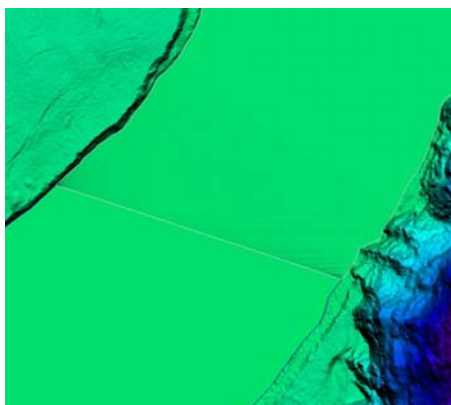
Polyline  Polygon

Downstream DLS Flow is Monotonic

- Required.

- Single Line Breaklines.
- No missing or misplaced breaklines.

ADDITIONAL COMMENTS, ERRORS, ANOMALIES, OR OTHER ISSUES:

**1 feature requires breakline enforcement:**

Corrected (4/24/2019).

**1 feature requires breakline enforcement (4/24/2019).**

Corrected (5/14/2019).

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

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: 0.5 Meters

Tile bit depth/pixel Type: 32\_BIT\_FLOAT

Interpolation or Resampling Technique: Triangulated Irregular Network (TIN)

DEM tiles do not overlap

DEM tiles conform to Project Tiling Scheme

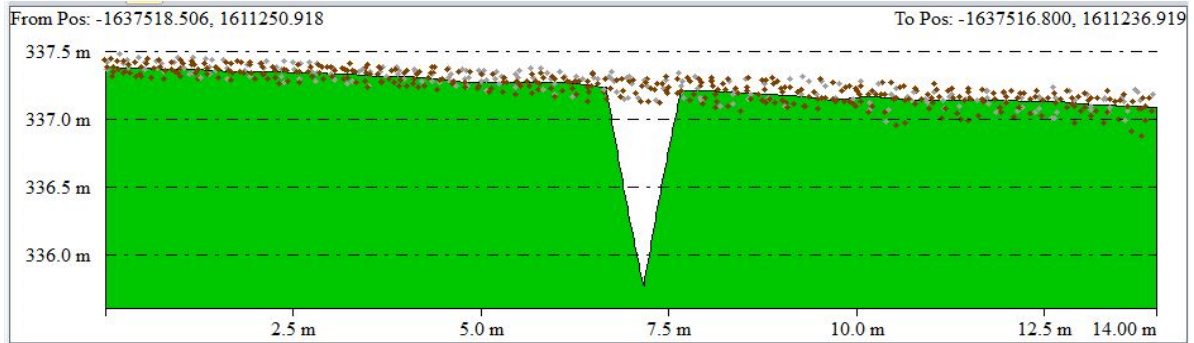
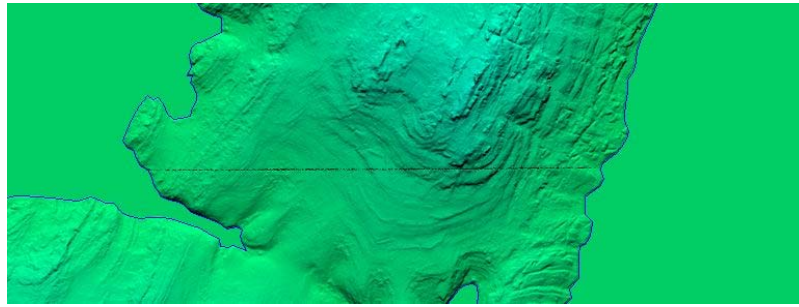
Quantity of DEM files conforms to Project Tiling Scheme

DEM tiles are uniform in size

DEM tiles properly edge match and free of edge artifacts

Tiles are free from Spikes and Pits

**7 unknown anomalies:**



Corrected (4/24/2019).

- Tiles are free from Data Holidays (voids due to processing or collection errors)
- Tiles do not exhibit systematic sensor error or corrowing

**3 instances of undulation/corrowing**

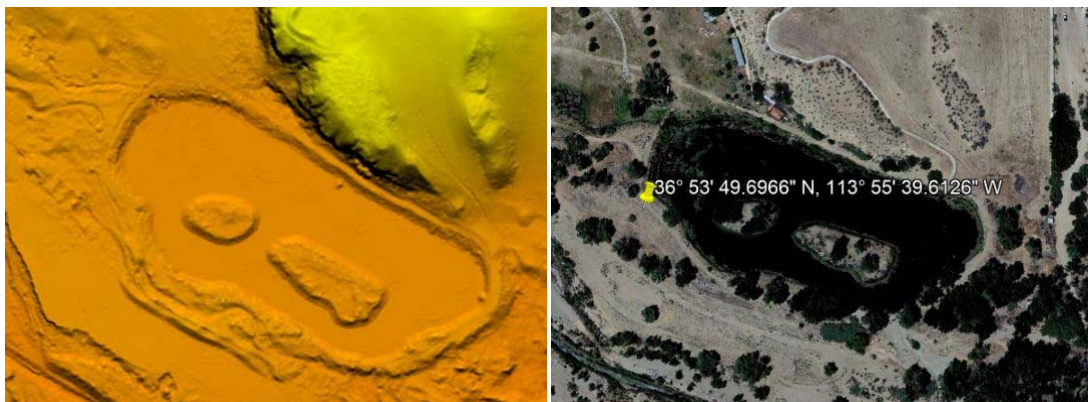
Corrected (4/24/2019).

Hydro Treatment: hydro-flattened

DEM tiles are properly Hydro Flattened  Yes  No

Waterbodies  or greater are flattened

**1 feature needs to be hydroflattened:**



Corrected (4/24/2019).

Streams  or greater are flattened in a downstream manner

**1 feature needs monotonic downhill treatment**

Corrected (4/24/2019).

Tidal Boundaries/Shorelines are flattened

- No missing islands  or larger
- Bridges/Overpasses are properly removed

**3 bridges need removal**

**Corrected (4/24/2019).**

- 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.

Tiles recommended for NED 1 Meter:  Yes.  No.

LAS dataset recommended for distribution: tile classified

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

End of DEM Review

**Based on this review, the provided delivery Meets the Contract and/or Task Order requirements.**

*Additional Comments:*

**This is a leaf-on collection. The task order has other delivery requirements: Digital Surface Model, vegetation classes 3 (low veg, <0.6 m), 4 (medium veg, 0.6 - 4.5 m) and 5 (high veg, >4.5 m). The delivery diagram has been updated from the task order Attachment C.**

**Corrected (5/14/2019).**

#### INTERNAL COMMENTS

Hoover Dam was not removed; Lake Mead is a reservoir but does not have downstream flow.

This project intersects tribal lands.

DEM SRS not well formed for all 1947 files; horizontal EPSG says "no authority tag found for projcs in WKT" for all 1947 files.

No tile index provided for block 1.

Task order incorrectly states that ignored ground is class 10.

END OF REPORT (v2.4.0)