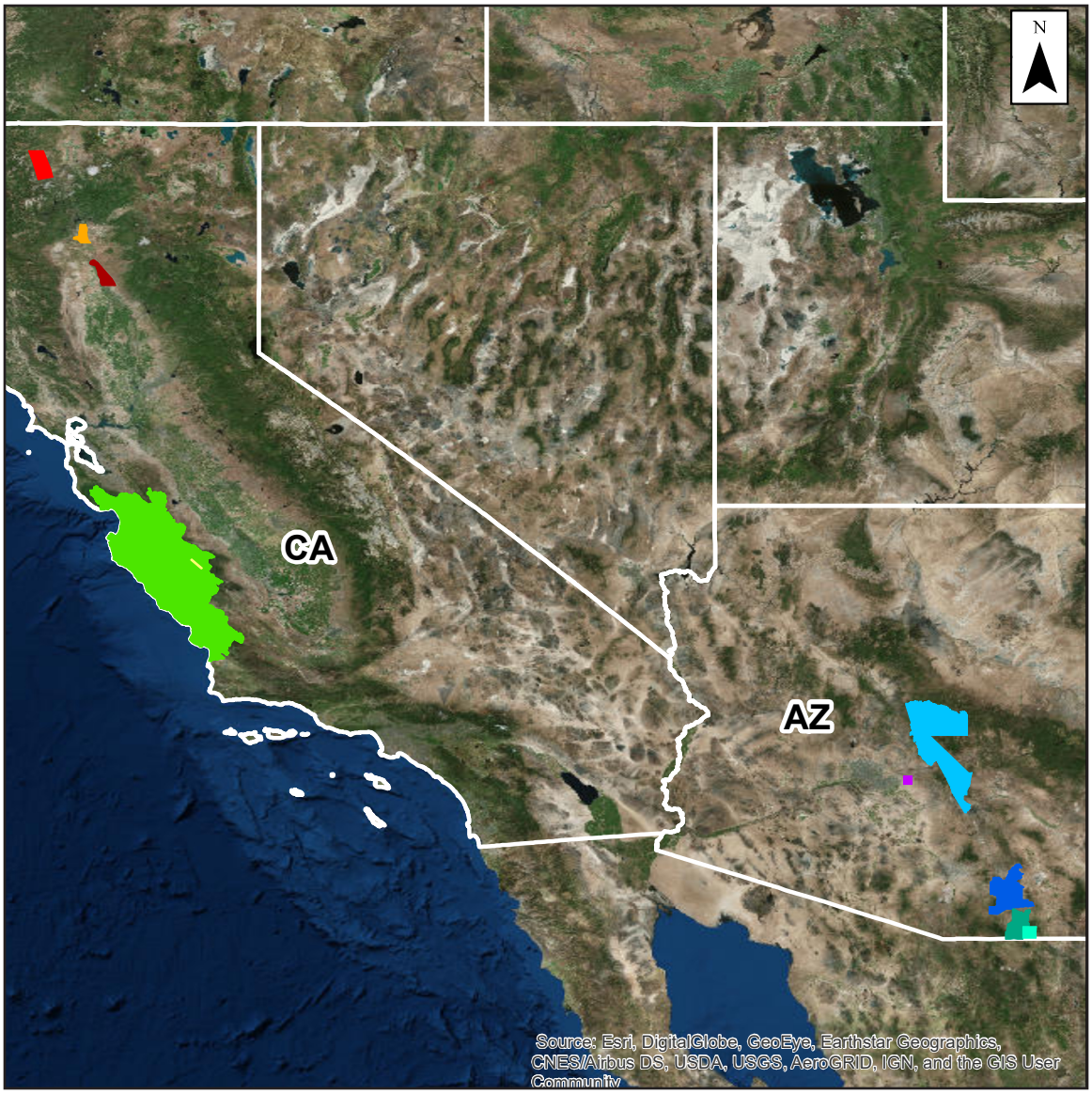
CA AZ FEMA R9 2017 D18

Airborne Lidar Report

July 2019



Contract # G16PC00022
Task Order # 140G0218F0027

Contractor Woolpert
Project # 78262

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1. Overview

About

This project contains a comprehensive outline of the 140G0218F0027 CA AZ FEMA R9 2017 D18 task order issued by the United States Geological Survey's National Geospatial Technical Operations Center (USGS-NGTOC). This task order called for the acquisition and processing of QL1 and QL2 data over 10 areas of interest covering approximately 10,547 total square miles in California and Arizona.

Data partially covers the following counties:

California AOIs

- Red Bluff QL2 - Tehama County
- Scott Valley QL2 - Siskiyou County
- Stillwater QL2 - Shasta County
- Salinas Watershed QL1 - Monterey County
- Salinas Watershed QL2 - Monterey, San Benito, San Luis Obispo, Santa Clara, and Santa Cruz Counties

Arizona AOIs

- Apache Junction QL2 - Pinal County
- Bisbee QL2 - Cochise County
- Central Gila QL2 - Gila County
- Upper San Pedro South QL2 - Cochise County
- Whetstone QL2 - Cochise County

Purpose

High quality elevation data products are critical for riverine floodplain study and mapping for the National Flood Insurance Program. This acquisition allows FEMA Region IX to produce floodplain analysis where it is needed, to provide updates to flood insurance rate maps, and to produce floodplain administration decision support tools. FEMA, in administration of the National Flood Insurance Program and under FEMAs Risk Mapping Assessment and Planning (Risk MAP) program, orders these elevation products to meet or exceed the quality specifications published by the US Geological Survey for acceptance into the 3-D Elevation Program (3-DEP). Data of this quality is interpreted as sufficient for floodplain engineering studies, analysis, and mapping of flood hazard.

Specifications

Data for this task order was acquired and produced to meet USGS Lidar Base Specification v1.2 standards and the American Society of Photogrammetry and Remote Sensing (ASPRS) Positional Accuracy Standards for Digital Geospatial Data (Edition 1, Version 1.0).

Spatial Reference

Geospatial data products were produced using the following horizontal and vertical spatial data reference systems.

Table 1-1. Spatial Reference System - CA Zone I

Areas of Interest - Red Bluff, Scott Valley, and Stillwater		
Horizontal	**EPSG Code**	6146
	Datum	NAD83 (2011)
	Projection	State Plane California I (FIPS Zone 0401)
	Units	US Survey Feet
Vertical	**Datum**	NAVD88
	Geoid	GEOID12B
	Units	US Survey Feet
	Height Type	Orthometric

Table 1-2. Spatial Reference System - CA Zone IV

Areas of Interest - Salinas Watershed QL1 and QL2		
Horizontal	**EPSG Code**	6422
	Datum	NAD83 (2011)
	Projection	State Plane California IV (FIPS Zone 0404)
	Units	US Survey Feet
Vertical	**Datum**	NAVD88
	Geoid	GEOID12B
	Units	US Survey Feet
	Height Type	Orthometric

Table 1-3. Spatial Reference System - AZ Central

Area of Interest - Apache Junction		
Horizontal	**EPSG Code**	2223
	Datum	NAD83
	Projection	State Plane Arizona Central Zone (FIPS Zone 0202)
	Units	International Feet
Vertical	**Datum**	NAVD88
	Geoid	GEOID12B
	Units	International Feet
	Height Type	Orthometric

Table 1-4. Spatial Reference System - AZ East

Areas of Interest - Bisbee, Central Gila, Upper San Pedro South, and Whetstone		
Horizontal	**EPSG Code**	2222
	Datum	NAD83
	Projection	State Plane Arizona Eastern Zone (FIPS Zone 0201)
	Units	International Feet
Vertical	**Datum**	NAVD88
	Geoid	GEOID12B
	Units	International Feet
	Height Type	Orthometric

Deliverables

All data products produced as part of this task order are listed below. All tiled deliverables had a tile size of 4,500-feet x 4,500-feet. Tile names are derived from the X- and Y-coordinate values of the lower left corner of the tile.

Table 1-5. Deliverables

Lidar Data	
Classified lidar point cloud data	Tiles in .las v1.4 format Classes • 1 – Processed, not Classified • 2 – Ground • 7 – Noise • 9 – Water • 10 – Ignored Ground • 17 – Bridge Decks • 18 – High Noise

Breaklines used for hydro-flattening	• Lake and River features as feature classes in an Esri file geodatabase
	  • Water bodies greater than 2 acres as polygon features
	  • Rivers 30.5 meters / 100 feet and greater in width as polyline features
	• Bridges used in DEM generation as point features in Esri shapefile format

Hydro-flattened bare earth digital elevation model (DEM)	3-foot pixel size, 32-bit floating-point; no bridges or overpass structures ERDAS IMG format
Intensity Imagery	3-foot pixel size, 8-bit gray-scale (linear rescaling from 16-bit intensity) GeoTIFF format
Flight Line Index	Polygon features in an Esri file geodatabase
Control Data	
Lidar calibration points	Esri shapefile format
Lidar NVA checkpoints	Esri shapefile format
Lidar VVA checkpoints	Esri shapefile format
Other Data	
Data Extent	Esri shapefile format
Delivery Diagram	Esri shapefile format
Tile Index	Esri shapefile format
Metadata and Reports	
Metadata	Project-, deliverable-, and lift-level FGDC CSDGM/USGS MetaParser Compliant metadata in .xml format
Lidar Project Report	Project report with flight logs in .pdf format
Survey Report	Survey report in .pdf format

Figure 1-1. Project Area - CA I AOIs

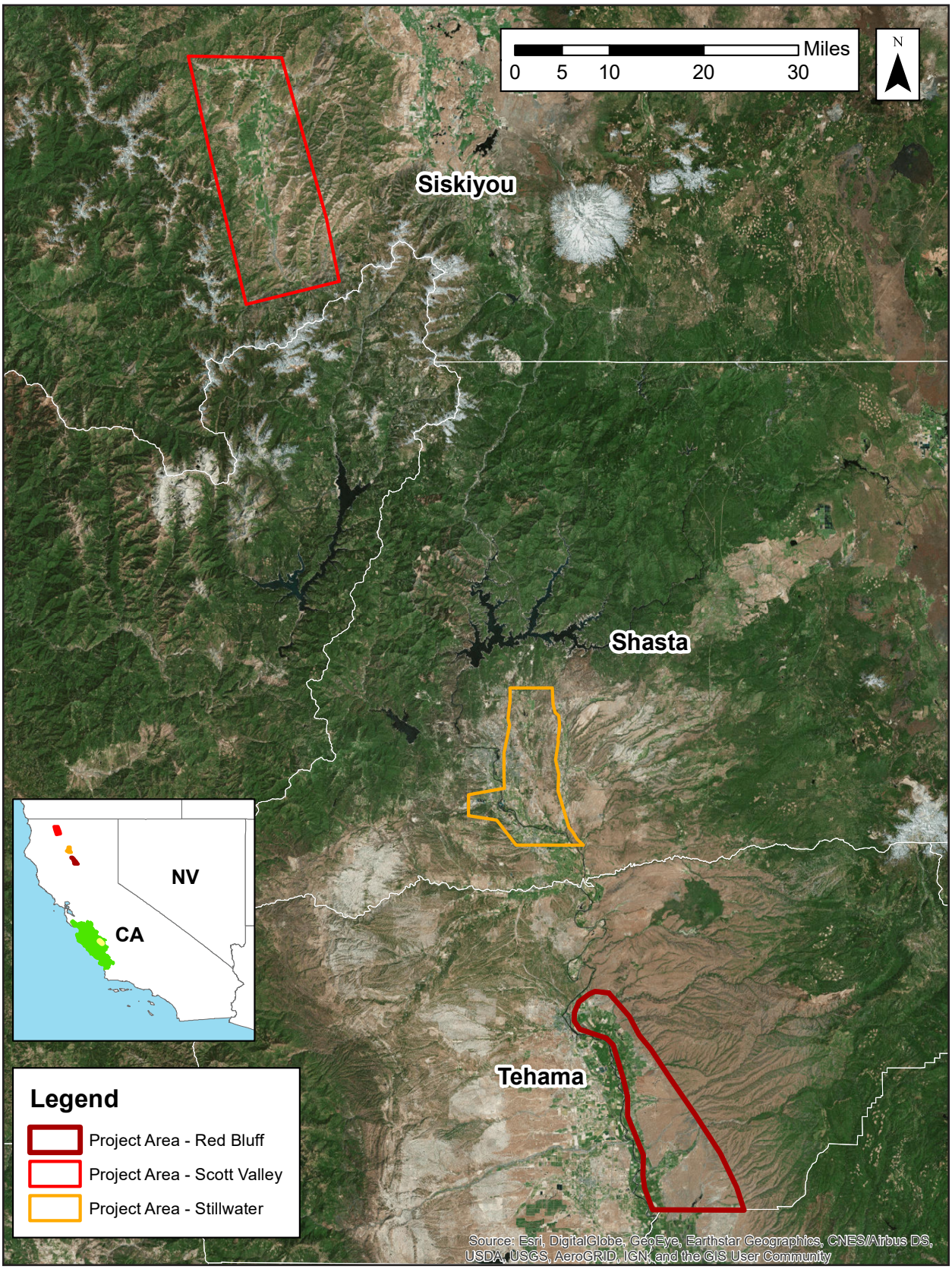


Figure 1-2. Project Area - CA IV AOIs

Figure 1-3. Project Area - AZ Central AOI

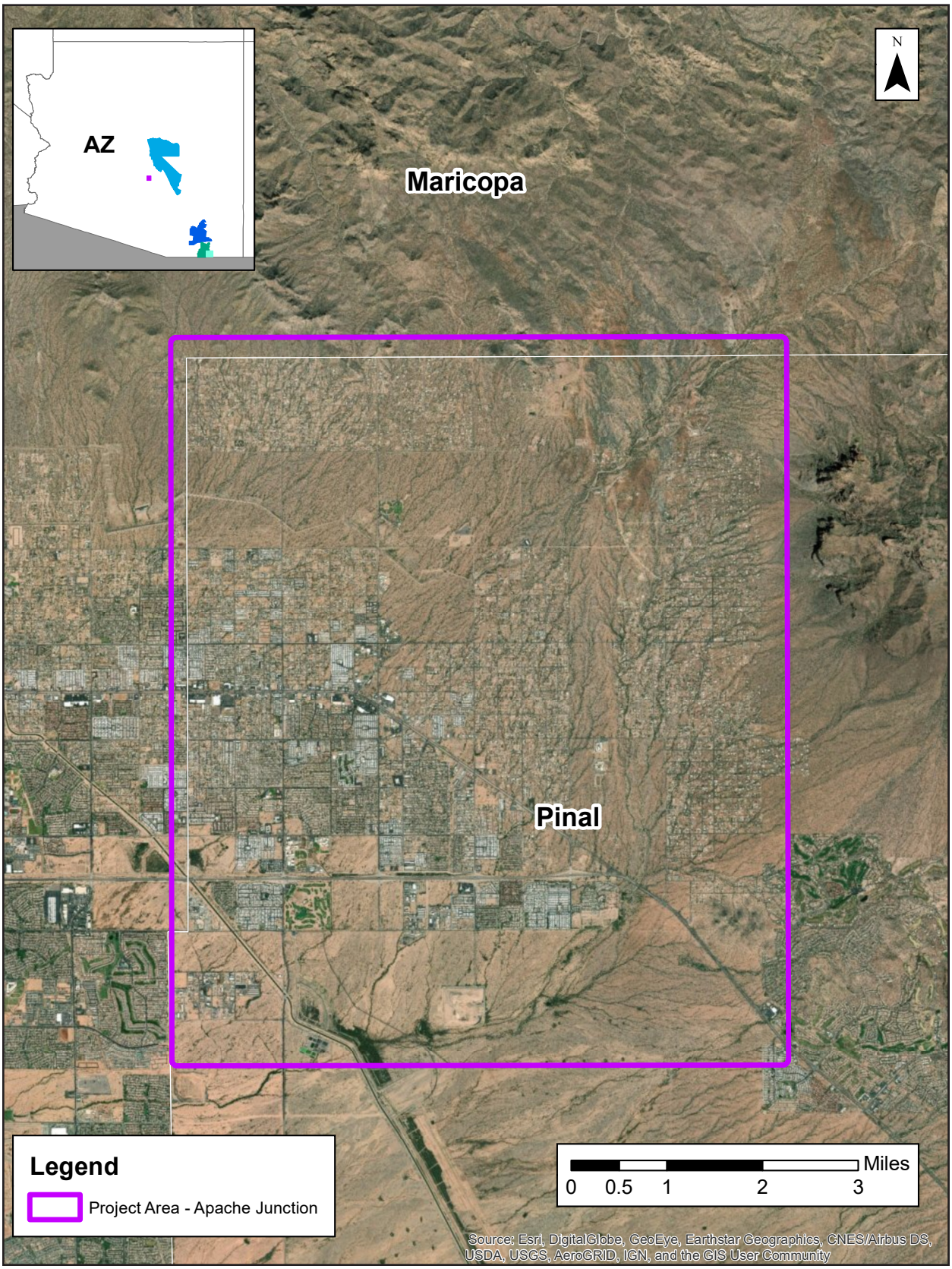
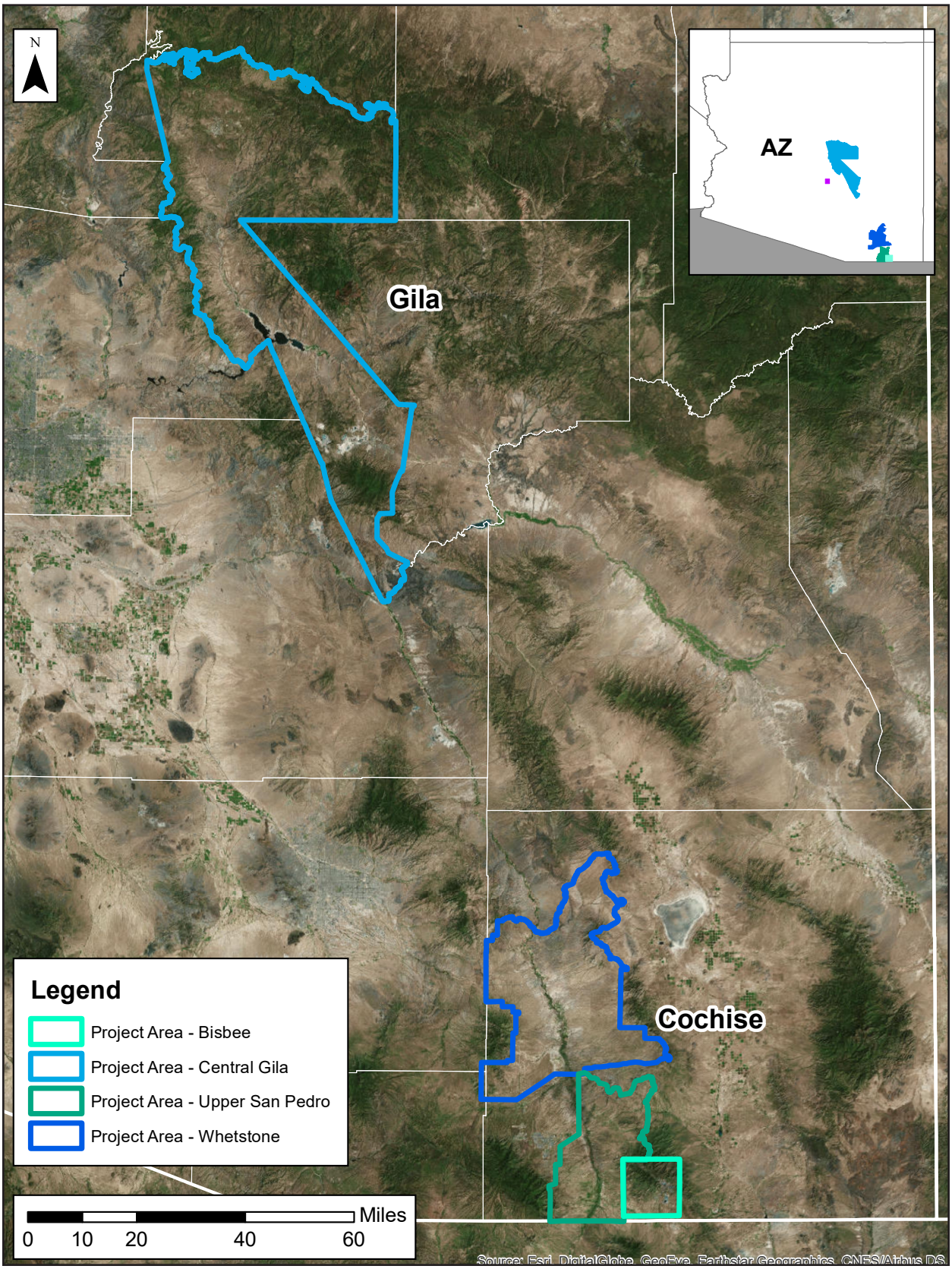


Figure 1-4. Project Area - AZ East AOIs



2. Acquisition

Flight Planning

Aerial lidar data was collected using the specifications listed below.

Table 2-1. Acquisition Requirements

Specification	Target
Resolution	QL1 • 8 points per square meter • 0.35-meter nominal point spacing QL2 • 2 points per square meter • 0.7-meter nominal point spacing
Overlap	At contractor's discretion, but enough to ensure there are no data gaps between usable portions of the swath and nominal point density is achieved
Acquisition Window	Period of annual minimum water level in the fall/winter 2017/2018 leaf-off window
Acquisition Conditions	• Cloud and fog-free between the aircraft and ground • Ground is snow free • Ground has no unusual flooding or inundation, except in cases where the goal of the collection is to map the inundation • Preference of vegetation is leaf-off
Data Voids	Not allowed except • Where caused by water bodies • Where caused by areas of low near infra-red (NIR) reflectivity (i.e. asphalt or composition roofing) • Where appropriately filled-in by another swath
Control	Airborne Global Positioning System (ABGPS) and Inertial Measurement Unit (IMU) data to be used along with differentially-corrected GPS ground control points

Lidar Sensor Information

Aerial lidar data was acquired using the Optech Orion H300, Optech Galaxy, Leica ALS70, and Leica Chiroptera 4X lidar sensor systems. A total of 1,426 flight lines were collected.

California AOIs

- **Red Bluff:** 26 lines
- **Scott Valley:** 29 lines
- **Stillwater:** 34 lines
- **Salinas Watershed QL1:** 9 lines
- **Salinas Watershed QL2:** 638 lines

Arizona AOIs

- **Apache Junction:** 12 lines
- **Bisbee:** 40 lines
- **Central Gila:** 437 lines
- **Upper San Pedro South:** 69 lines
- **Whetstone:** 132 lines

Table 2-2. Optech Orion H300 Sensor Info

Optech Orion H-300	
Operational envelope [1, 2, 3, 4]	150-4000 m AGL, nominal
Effective laser repetition rate	Programmable, 35-300 kHz
Laser wavelength	1064 nm
Elevation accuracy [2, 3]	<3-15 cm; 1 σ
Horizontal accuracy [2, 3]	1/7500 x altitude; 1 σ
Position and orientation system	POS AV™ AP50 (OEM)
Sensor range precision [5]	<8 mm, 1 σ
Scan width (FOV)	Programmable, 0-50 degrees
Scan frequency	Programmable, 0-90 Hz
Sensor scan product	1000 maximum
Beam divergence	0.25 mrad (1/e)
Roll compensation	Programmable, ±30° (FOV dependent)
Vertical target separation distance	<0.7 m
Multipulse	Yes
Range capture	Up to 4 range measurements, including 1st, 2nd, 3rd, and last returns
Intensity capture	Up to 4 intensity returns for each pulse, including last (12 bit)
Data storage	Internal solid state drive SSD (SATA II); Removable SSD (optional)
Image capture	Compatible with Optech CS-Series digital metric cameras
Full waveform capture	12-bit Optech IWD-2 Intelligent Waveform Recorder (optional)
Gyro-stabilization	SOMAG GSM 3000 integration kit (optional)
Power requirements	28 V; 300 W; 12 A
Dimensions and weight	Sensor: 340 x 340 x 250 mm, 25 kg; PDU: 415 x 328 x 100 mm, 6.5 kg
Operating temperature	0 to +35°C
Relative humidity	0-95% non-condensing

1. Target reflectivity ≥20%.
2. Dependent on selected operational parameters using nominal FOV of up to 50° and Optech LMS Professional software suite in standard atmospheric conditions (i.e., 23 km visibility).
3. Angle of incidence ≤25°.
4. Target size ≥ laser footprint.
5. Under Optech test conditions, 1 sigma.

Source: Optech Orion H300 Airborne Lidar Summary Specification Sheet
http://info.teledyneoptech.com/acton/attachment/19958/f-02a8/1/-/-/-/-/ORION-H-Specsheet-140624-WEB.pdf

Table 2-3. Optech Galaxy PRIME Sensor Info

Optech Galaxy PRIME	
Sensor Performance	
Performance envelope [1, 2, 3, 4]	150-6000 m AGL, nominal
Absolute horizontal accuracy [2, 3]	1/10,000 × altitude; 1 σ
Absolute elevation accuracy [2, 3]	< 0.03-0.25 m RMSE from 150-6000 m AGL
Laser Configuration	
Topographic laser	1064-nm near-infrared
Laser classification	Class IV (US FDA 21 CFR 1040.10 and 1040.11; IEC/EN 60825-1)
Pulse repetition frequency (effective)	Programmable, 50-1000 kHz
Beam divergence	0.25 mrad (1/e)
Laser range precision [5]	< 0.008 m, 1 σ
Minimum target separation distance	< 0.7 m (discrete)
Range capture	Up to 8 range measurements, including last
Intensity capture	Up to 8 intensity measurements, including last (12-bit)
Sensor Configuration	
Position and orientation system	POS AV™ AP60 (OEM); 220-channel dual frequency GNSS receiver; GNSS airborne antenna with Iridium filters; high-accuracy AIMU (Type 57); non-ITAR
Scan angle (FOV)	10-60°
Swath width	10-115% of altitude AGL
Scan frequency	0-120 Hz advertised (0-240 scan lines/sec)
Scan product	2000 maximum
Flight management system	Optech FMS (Airborne Mission Manager and Nav) with operator console
SwathTRAK™	Dynamic FOV for fixed-width data swaths in variable terrain
PulseTRAK™	Multipulse tracking algorithm with no density loss across PIA transition zones
Roll compensation	±5° minimum
Data storage	Removable SSD (primary); internal SSD (spare)
Power requirements	28 V; 400 W
Dimensions and weight	Sensor: 0.34 × 0.34 × 0.25 m, 27 kg PDU: 0.42 × 0.33 × 0.10 m, 6.5 kg
Operating temperature	0 to +35°C

1. Target reflectivity ≥20%; 99% detection probability
2. Dependent on selected operational parameters; assumes nominal FOV of up to 40° in standard atmospheric conditions (i.e. 23-km visibility) and use of Optech LMS Professional software suite
3. Angle of incidence ≤20°
4. Target size ≥ laser footprint
5. Under Teledyne Optech test conditions, 1 sigma

Source: Optech Galaxy PRIME Airborne Lidar Terrain Mapper Specification Sheet
http://info.teledyneoptech.com/acton/attachment/19958/f-0278/1/-/-/-/-/Galaxy%20PRIME%20Brochure.pdf

Table 2-4. Leica ALS70 Sensor Info

Leica ALS70	
System Performance	
Maximum Flying Height (m AGL)	3,500
Maximum Measurement Rate (kHz)	500
Field of view (degrees)	0 - 75 (full angle, user adjustable)
Roll stabilization (automatic adaptive, degrees)	70 - active FOV
Scan patterns (user selectable)	sine, triangle raster
Maximum Scan Rate (Hz) • Scan • Triangle • Raster	 • 200 • 158 • 120
Number of Returns	unlimited
Number of intensity measurements	3 (first, second, third)
Physical Specifications	
Size (cm), Weight (kg) • Scanner • Control Electronics	 • 45 W x 47 D x 36 H • 45 kg
Operating Temperature Scanner Control Electronics	 0 - 40°C
Flight Management	FCMS
Power Consumption	910 W @ 22.0 – 30.3 VDC

Table 2-5. Leica Chiroptera 4X Sensor Info

Leica Chiroptera 4X	
Laser Characterization	
Bathymetric capability	140,000 points/second green, digital full waveform capture
Topographic capability	Up to 500,000 points/second infrared
Operation altitude	Bathymetry 400 – 600 m AGL Topography up to 1,600 m AGL
Depth range [1]	$D_{max} = 2.7/k$
Scanner pattern	Oblique scanner
Field of view	±14° front/back, ±20° left/right
Swath width	70 % of AGL
Point density [2]	Bathymetry: >5 pts/m² Topography: >10 pts/m²
Bathymetric accuracy [2, 3]	Elevation accuracy: 0.15 m (2σ)
Topographic accuracy [2, 3, 4]	Elevation accuracy: 5 cm (1σ) Horizontal accuracy: 15 cm (1σ)
Optical Characterization	
Q/A camera	5 MP, 2,448 x 2,050 pixels, 1 frame per second (fps), RGB
Leica RCD30 medium format camera (optional)	80 MP, 10,320 x 7,752 pixels, 1 frame per second (fps), RGBN
Physical & Operation Interface	
GNSS/IMU	Novatel SPAN with LCI-100c IMU (non-export restricted)
Mission planning	Leica MissionPro
Flight navigation	Leica FlightPro
Post-processing	Novatel Inertial Explorer – GNSS/IMU processing software Leica LiDAR Survey Studio Leica HxMap image processing
Storage capacity	> 1 sortie recording in ruggedized removable SSD
Sensor stabilization (optional)	Leica PAV100 gyro-stabilized sensor mount
Operation temperature	0 °C to +35 °C
Storage temperature	-10 °C to +50 °C
Power consumption	30A @ 28 V DC
Internal battery module	Battery supports GNSS/IMU unit operation up to 30 min without external power

1 k is the diffuse attenuation coefficient. Depth penetration formula is valid for the diffuse attenuation coefficient in the interval $0.1 < k < 0.3$, but data is normally captured for $k < 1.0$. Depth penetration is subject to several other parameters aside from the diffuse attenuation coefficient k. For this specification normal sea-state and 15% sea-bed reflectance has been assumed.

2 Accuracy and point density stated in the table is acquired @400 m AGL, 60 m/s aircraft speed

3 The 2σ value represents the 95% confidence interval, the 1σ value represents the 68% confidence interval. Typically, the RMSE value is equal to 1σ accuracy value, or half of 2σ accuracy value.

4 GNSS/IMU error of < 4 cm has been assumed

GNSS and IMU Equipment

Prior to mobilizing to the project site, flight crews coordinated with the necessary air traffic control personnel to ensure airspace access. Crews were on-site, operating a Global Navigation Satellite System (GNSS) Base Station for the airborne GPS support.

Flight navigation during acquisition was performed using IGI CCNS (Computer Controlled Navigation System). The pilots are skilled at maintaining their planned trajectory, while holding the aircraft steady and level. If atmospheric conditions are such that the trajectory, ground speed, roll, pitch and/or heading cannot be properly maintained, the mission is aborted until suitable conditions occur.

Base stations were set by acquisition staff and was used to support the aerial data acquisition.

Lifts acquired with the Optech Orion H300 used CORS base stations and statically-collected survey data at strategic points throughout the project area to ensure that the lidar data maintained its true geographic integrity. A single-base solution was used to differentially correct the aircraft's trajectory data.

Lifts acquired with the Optech Galaxy used a Novatel 702 GG, 2.00 m antenna height (ref. bottom antenna mount).

Lifts acquired with the Leica ALS70 used a Spectra Precision SP-80 GNSS receiver as a base station during flight operations.

See the table below for stations operated during acquisition.

Table 2-6. GNSS Base Stations - CA AOIs

Station Name	Latitude (DMS)	Longitude (DMS)	Ellipsoid Height (Meters)
DN5715 P060	40° 59' 51.46272" N	122° 24' 53.52821" W	431.359
DN7533 P154	41° 48' 25.48411" N	123° 21' 36.12405" W	320.323
DN7387 P332	40° 32' 47.92862" N	123° 10' 28.15913" W	684.949
DN7393 P345	40° 16' 16.43056" N	122° 16' 14.84864" W	134.563
DM7548 P349	40° 43' 51.89420" N	122° 19' 09.60928" W	275.864
ND5668 P663	41° 31' 54.96903" N	122° 09' 10.46581" W	2238.470
DN5671 P671	40° 24' 32.89435" N	121° 25' 41.49484" W	1959.299
DN7470 P784	41° 49' 50.92289" N	122° 25' 13.58557" W	802.702

Table 2-7. GNSS Base Stations - AZ AOIs

Station Name	Latitude (DMS)	Longitude (DMS)	Ellipsoid Height L1 Phase Center (Meters)
NGS PID DU2312	33° 26' 33.37039"	111° 44' 11.36993"	382.093
NGS PID ES1181	34° 15'2 3.92432"	111° 20' 21.17979"	1538.187
AZSV CORS	34° 15' 53.96835"	111° 14' 25.80943"	1466.192
AZGB CORS	33° 23' 43.27649"	110° 46' 17.19052"	1098.741
AZSF CORS	32° 48' 07.31616"	109° 42' 42.84603"	897.952
P014 CORS	31° 58' 22.40600"	111° 05' 54.90207"	1068.966
AZCO CORS	31° 23' 27.77133"	109° 55' 44.85297"	1474.233
COT2 CORS	32° 14' 14.92594"	110° 49' 51.31377"	759.836

Timeline

Lidar data was collected on the dates listed below. Acquisition specifications are listed in the following tables. An initial quality control process was immediately performed on to review the data coverage, airborne GPS data, and trajectory solution.

There were a total of 93 lifts flown from January 6, 2018 through February 22, 2019.

California AOIs

- **Red Bluff:** 1 lift on March 28, 2018
- **Scott Valley:** 2 lifts from March 30, 2018 through March 31, 2018
- **Stillwater:** 1 lift on March 29, 2018
- **Salinas Watershed QL1:** 2 lifts from February 16, 2018 through February 18, 2018
- **Salinas Watershed QL2:** 50 lifts from January 22, 2018 through April 21, 2018

Arizona AOIs

- **Apache Junction:** 1 lift on January 6, 2018
- **Bisbee:** 3 lifts from May 25, 2018 through May 29, 2018
- **Central Gila:** 22 lifts from January 11, 2018 through February 22, 2019
- **Upper San Pedro:** 4 lifts from May 26, 2018 through May 30, 2018
- **Whetstone:** 7 lifts from May 8, 2018 through May 25, 2018

For more information, see the Flight Logs in Appendix 1.

Note: Due to a time difference of approximately one month between adjacent flight lines, there are two instances, a reservoir and a river bed, that show elevation drop-offs. Initial acquisition occurred when these features were dry, with the features containing water at the time of the follow-up flights. The feature portions that contain water were digitized, hydro-flattened, and incorporated into the DEM.

Table 2-8. Acquisition Specifications - CA I AOIs

Red Bluff, Scott Valley, and Stillwater

Settings	Optech ALTM Orion H300
Max. Number of Returns	4
Nominal Point Spacing	0.7 m
Nominal Point Density	2.07 ppsm
Flying Height Above Ground Level	1,800 m
Flight Speed	110 knots
Scan Angle	29°
Scan Rate Used	40.3 Hz
Pulse Rate Used	125 kHz
Multi-Pulse in Air	Enabled
Swath Width	931 m
Swath Overlap	30%

Table 2-9. Acquisition Specifications - CA IV AOIs

Salinas QL1 and QL2

Settings	QL1 Optech Galaxy	QL2 Optech Galaxy Unrestricted Airspace	QL2 Optech Galaxy Restricted Airspace
Max. Number of Returns	8	8	8
Nominal Point Spacing	0.35 m	0.7 m	0.7 m
Nominal Point Density	8 ppsm	2 ppsm	2 ppsm
Flying Height Above Ground Level	975 m	1,575 m	1,950 m
Flight Speed	145 kts	155 kts	160 kts
Scan Angle	35°	30°	25°
Scan Rate Used	96 Hz	64 Hz	63 Hz
Pulse Rate Used	400 kHz	200 kHz	200 kHz
Multi-Pulse in Air	Enabled	Enabled	Enabled
Swath Width	615 m	844 m	865 m
Swath Overlap	25%	30%	25%

Table 2-10. Acquisition Specifications - AZ AOIs

Apache Junction, Bisbee, Central Gila, Upper San Pedro, Whetstone

Settings	Leica ALS70	Leica Chiroptera 4X
Max. Number of Returns	4	4
Nominal Point Spacing	0.6 m	0.26 m
Nominal Point Density	2 ppsm	15 ppsm
Flying Height Above Ground Level	1,500 m	500 m
Flight Speed	145	130 knots
Scan Angle	50°	20°
Scan Rate Used	47 Hz	70 Hz
Pulse Rate Used	354 kHz	500 kHz
Multi-Pulse in Air	Enabled	Disabled
Swath Width	1,399 m	365 m
Swath Overlap	30%	60%

Acquisition Quality Assurance

Woolpert developed a quality assurance and validation plan to ensure the acquired lidar data meets the USGS Base Specification Version 1.2. For quality assurance purposes, the lidar data was processed immediately following acquisition to verify the coverage has appropriate density, distribution, and no unacceptable data voids. Accompanying GPS data was post processed using differential and Kalman filter algorithms to derive a best estimate of trajectory. The quality of the solution was verified to be consistent with the accuracy requirements of the task order. Any required re-flights were scheduled at the earliest opportunity.

The spatial distribution of the geometrically usable first return lidar points was reviewed for density requirements as well as regular and uniform point distribution - verifying the lidar data is spaced so that 90% of the cells in a 2*NPS grid placed over the data contain at least one lidar point. The NPS assessment is made against single swath, first return data located within the geometrically usable center portion (typically ~90%) of each swath. Additionally, the data was reviewed for unacceptable data voids – verifying no area greater than or equal to $(4 \times ANPS)^2$ exhibited data coverage gaps.

Figure 2-1: Flown Flight Lines - Red Bluff

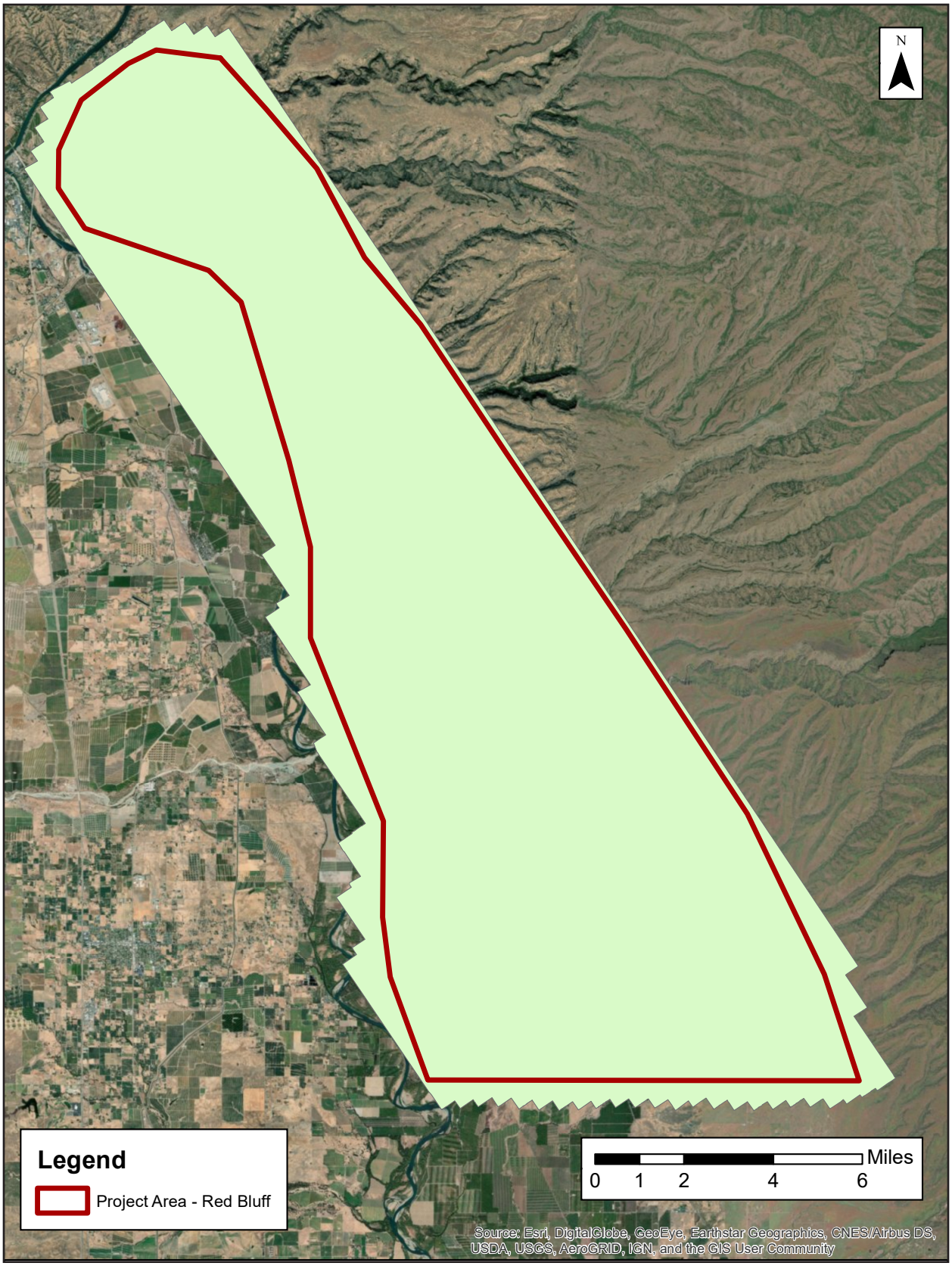


Figure 2-2: Flown Flight Lines - Scott Valley

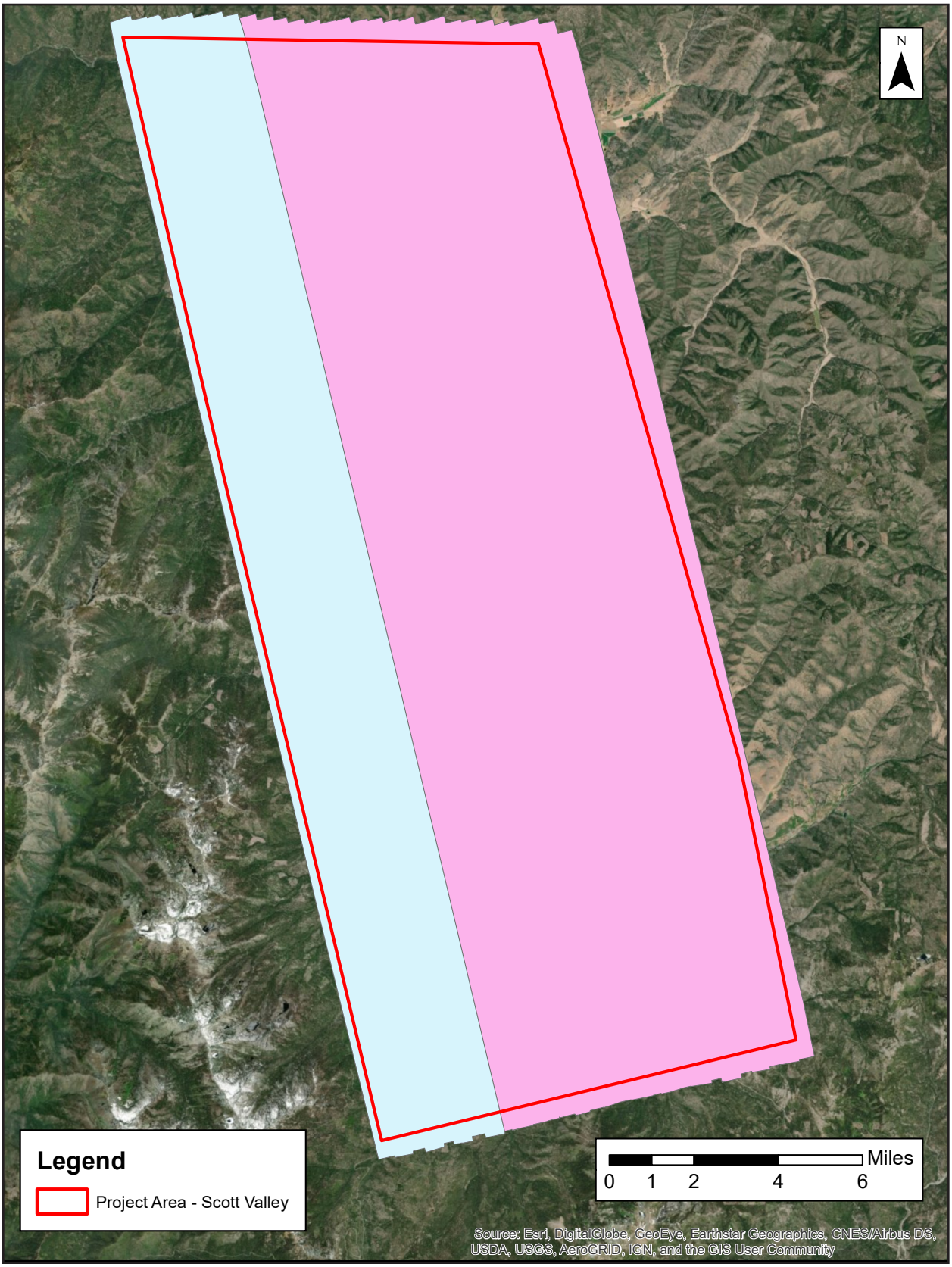


Figure 2-3: Flown Flight Lines - Stillwater

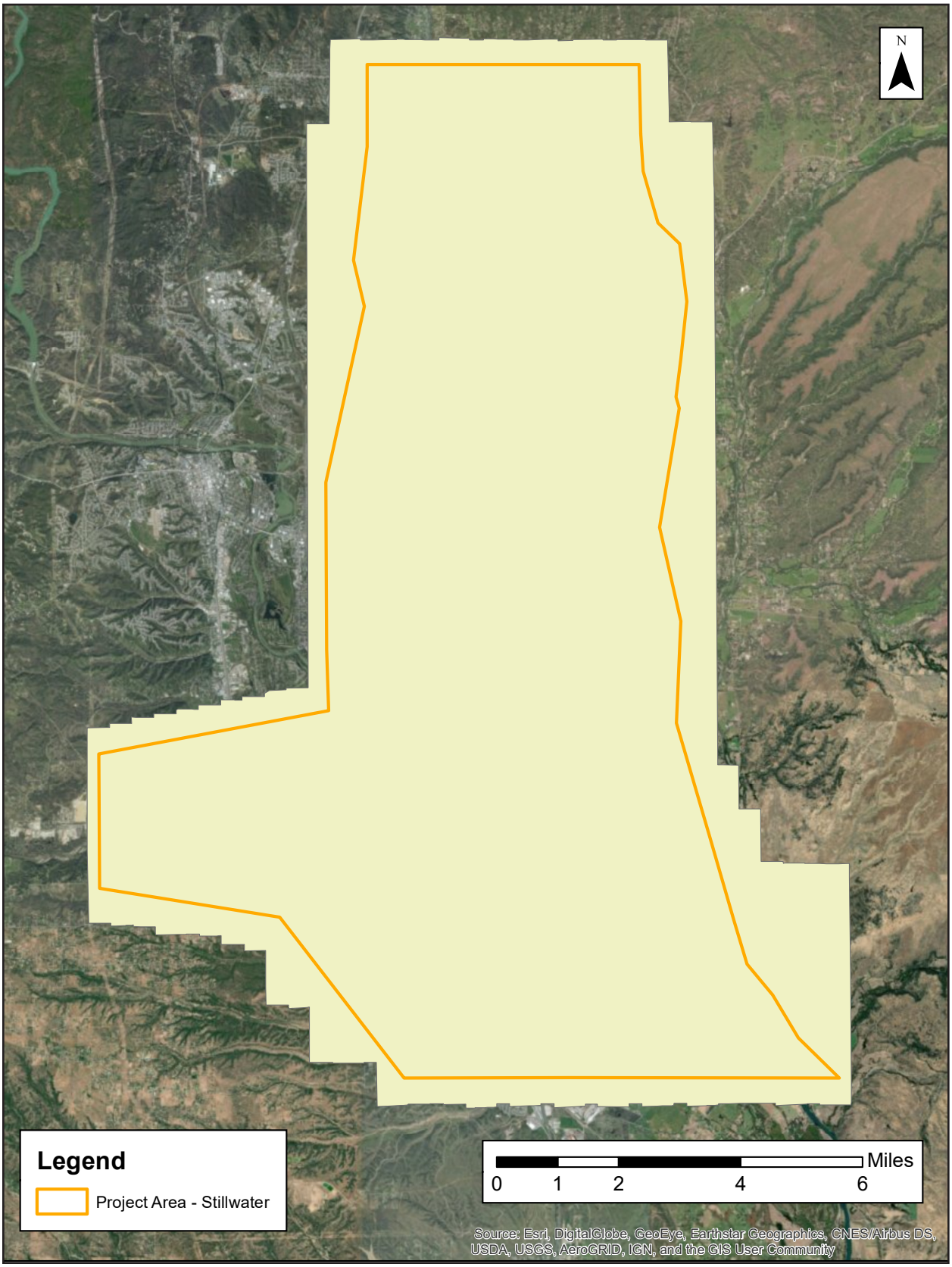


Figure 2-4: Flown Flight Lines - Salinas Watershed QL1

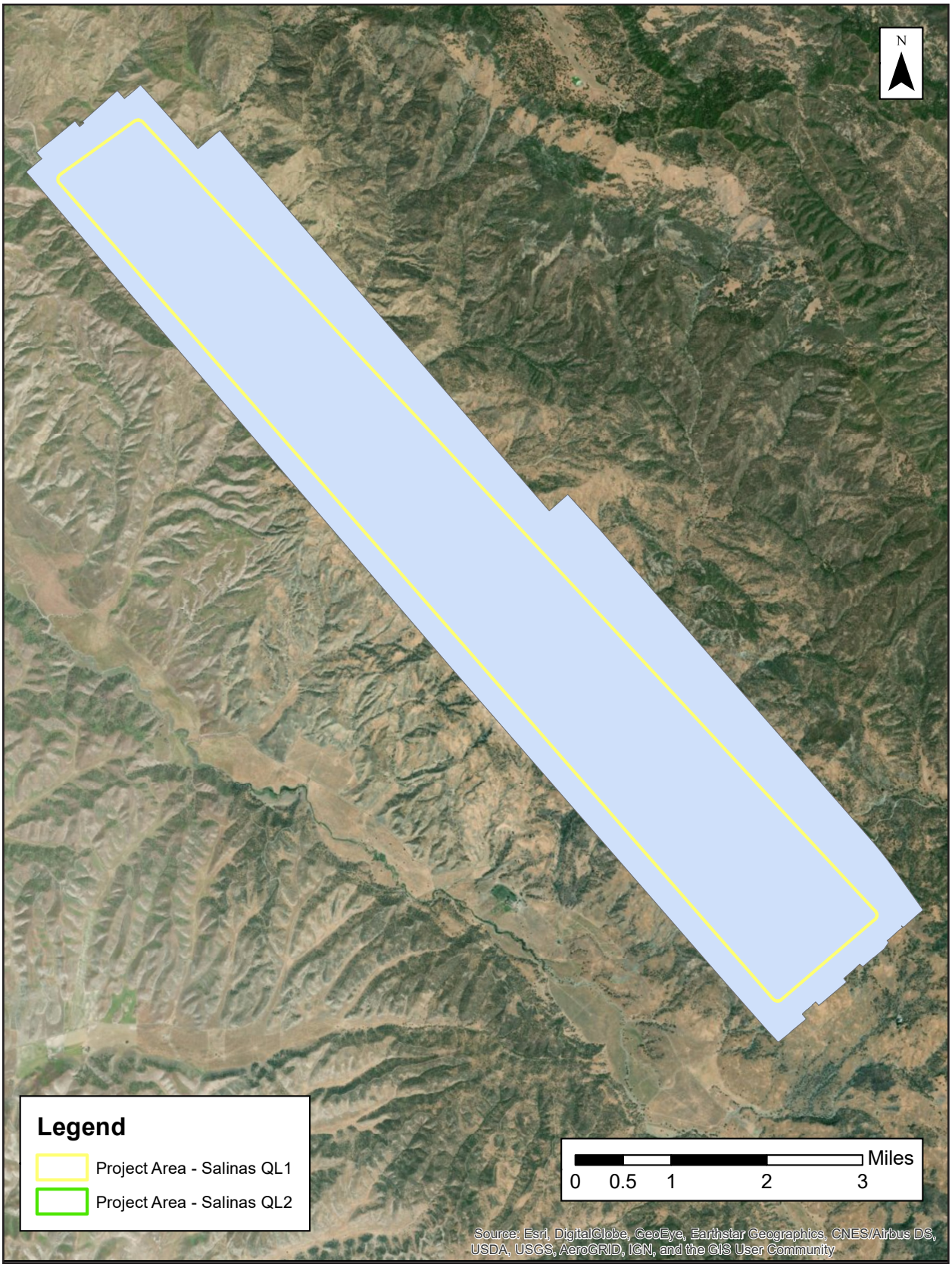


Figure 2-5: Flown Flight Lines - Salinas Watershed QL2

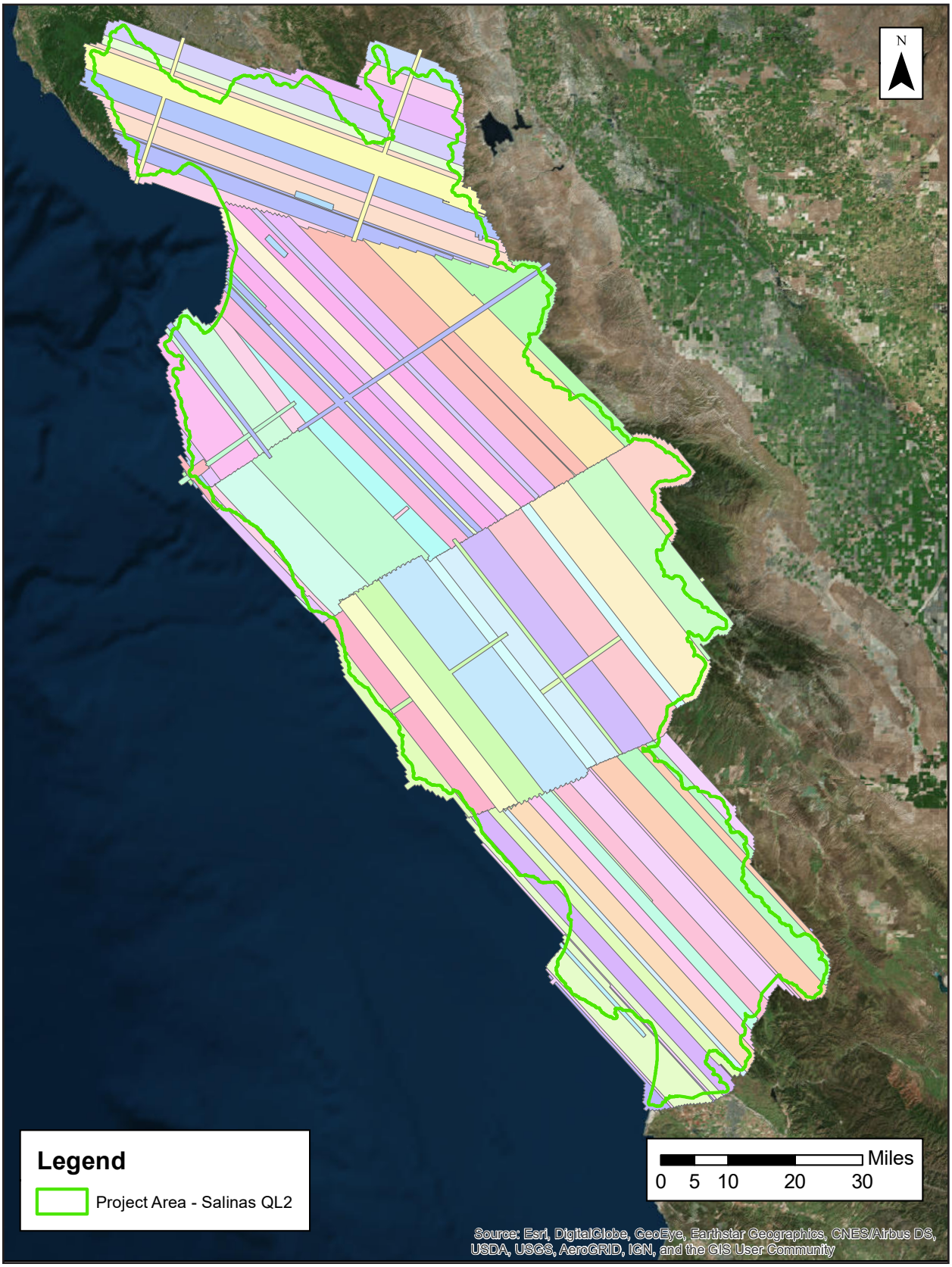


Figure 2-6: Flown Flight Lines - Apache Junction

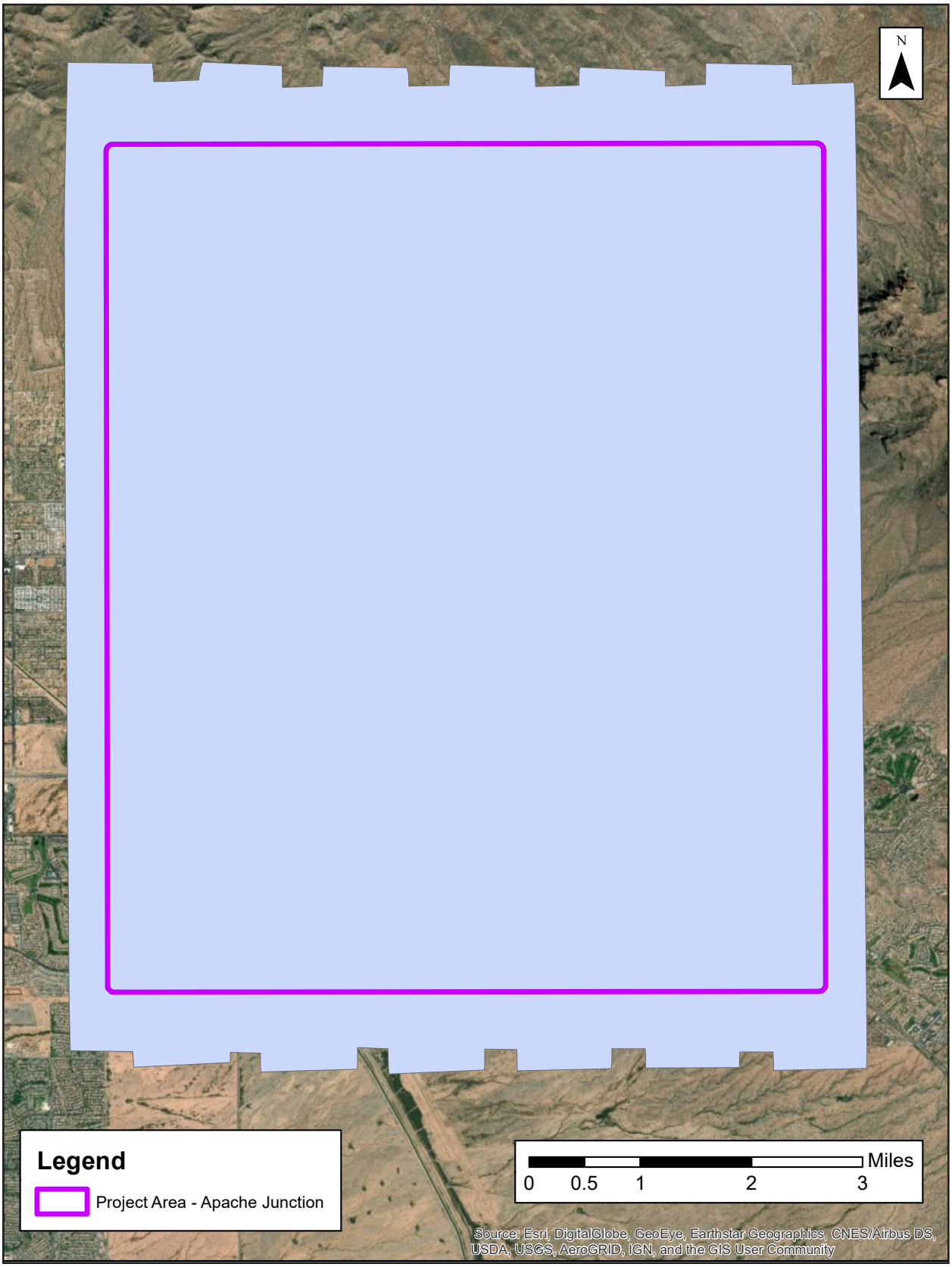


Figure 2-7: Flown Flight Lines - Bisbee

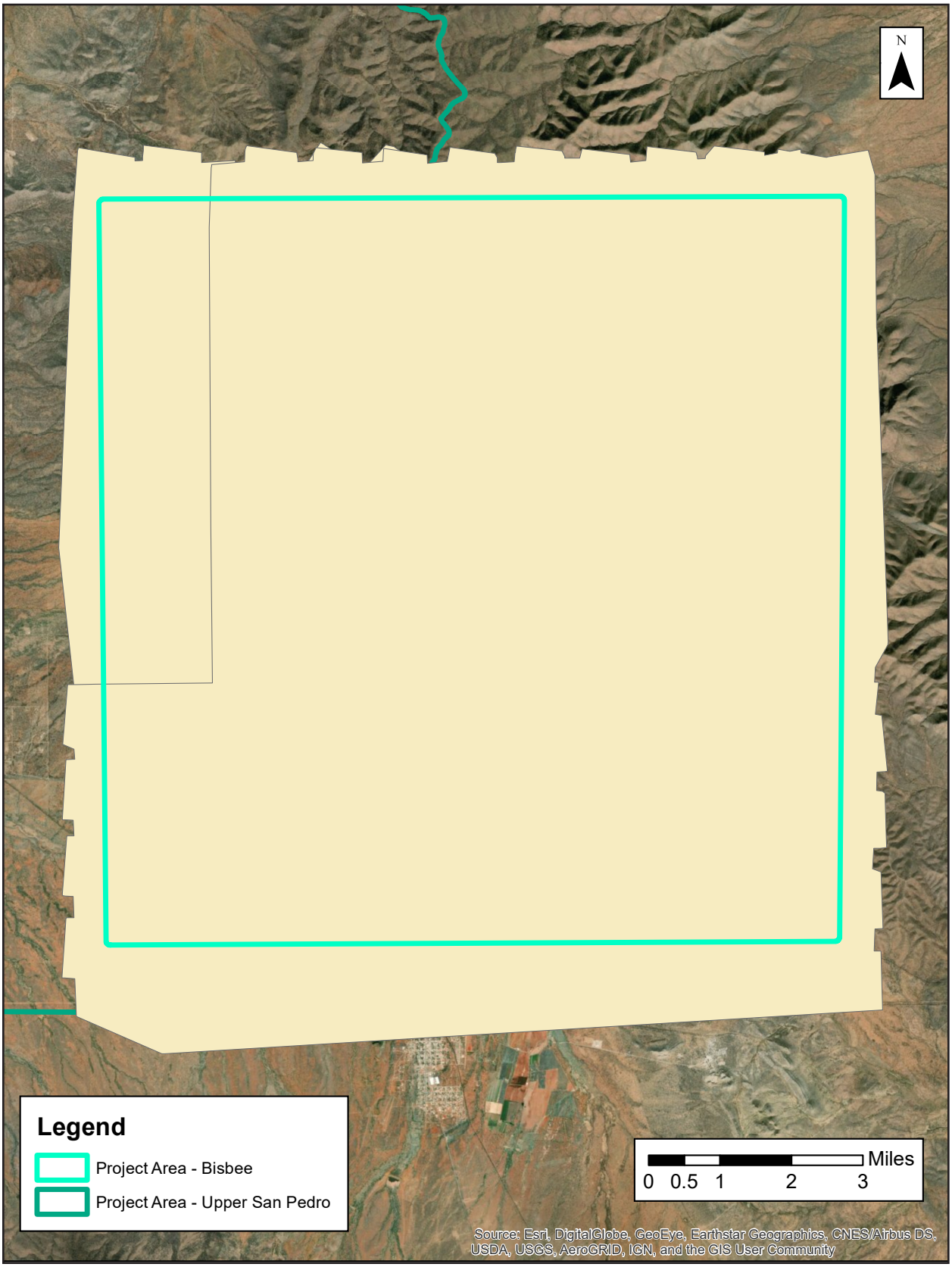


Figure 2-8: Flown Flight Lines - Central Gila

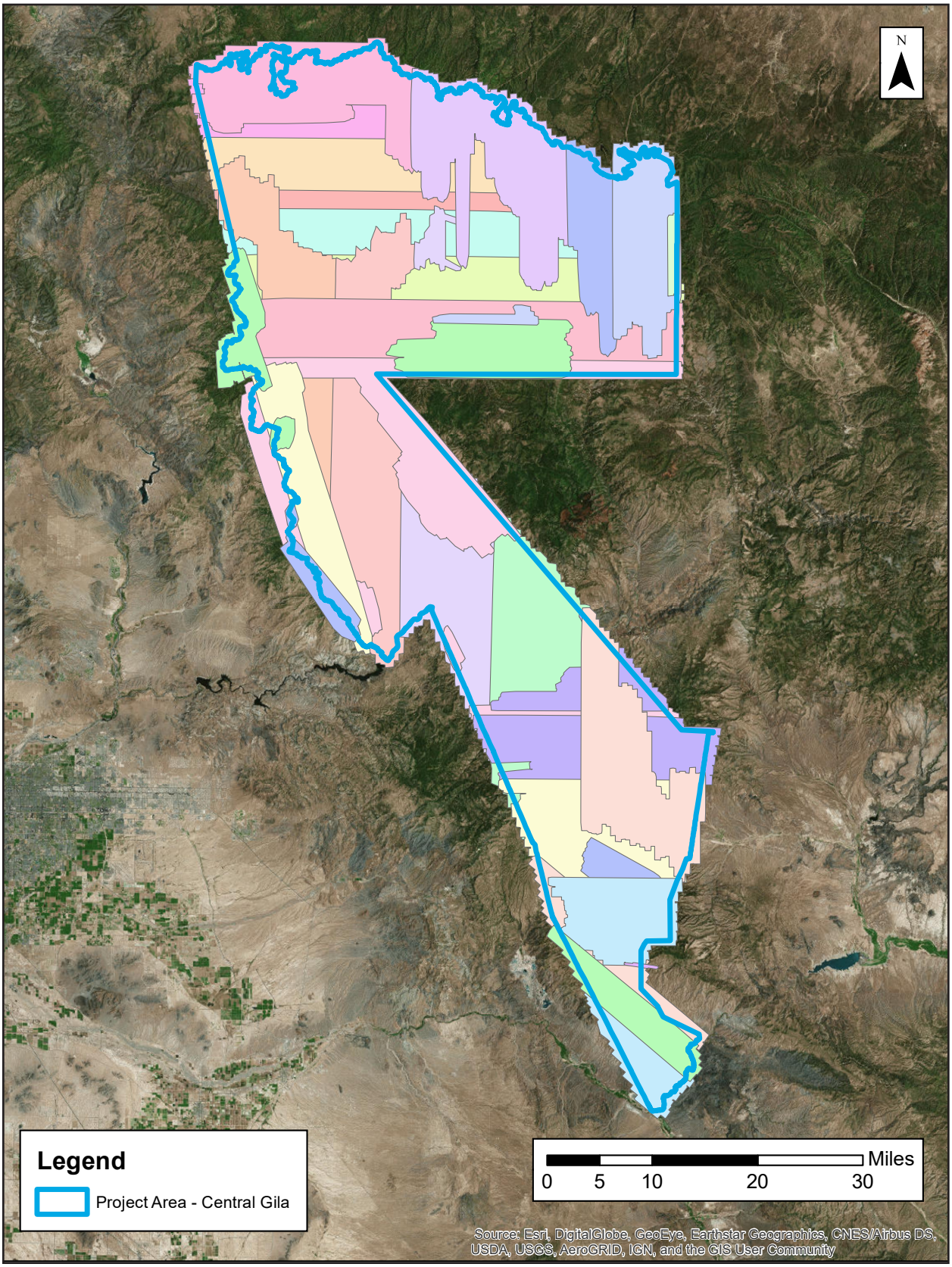


Figure 2-9: Flown Flight Lines - Upper San Pedro South

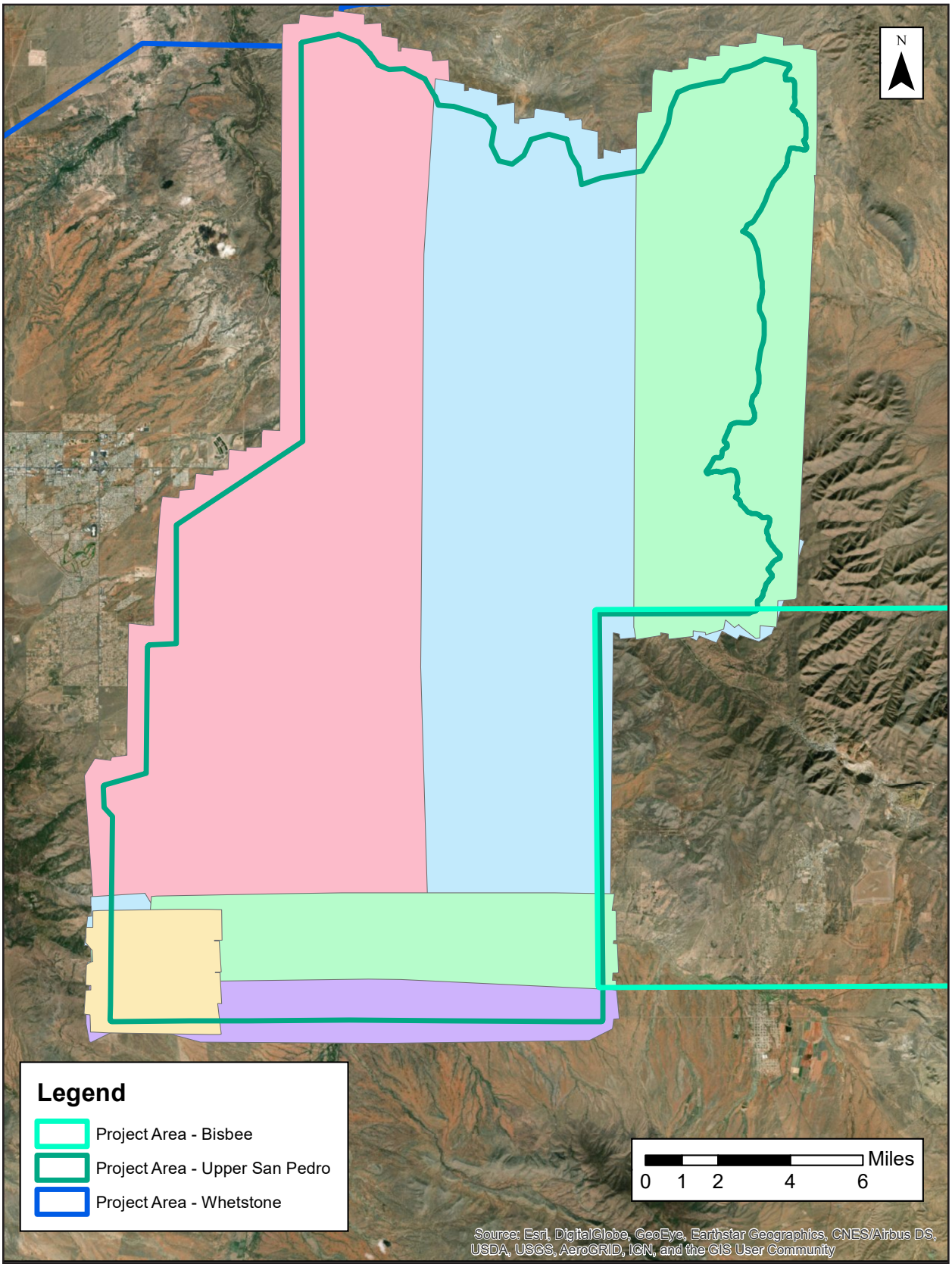
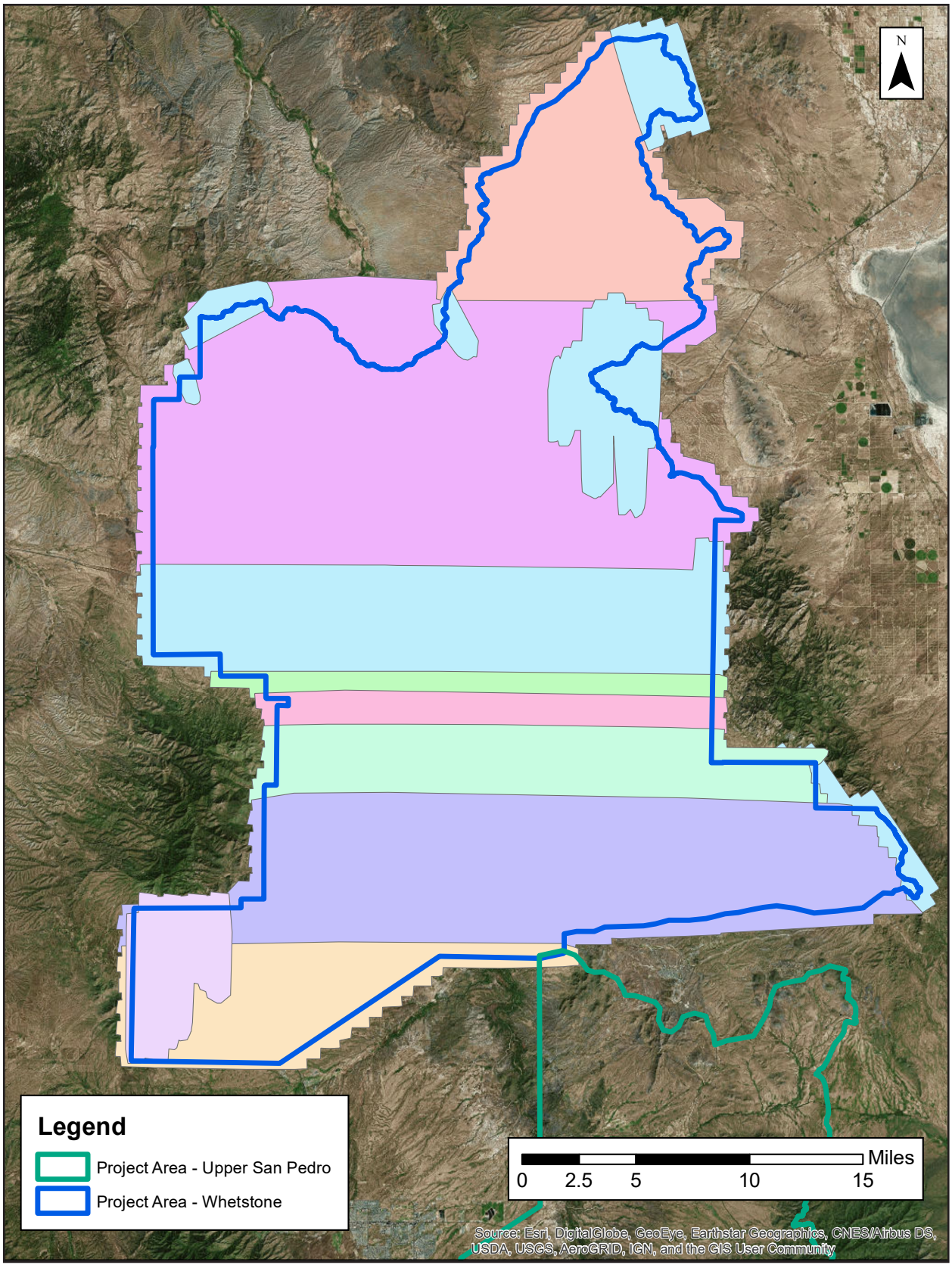


Figure 2-10: Flown Flight Lines - Whetstone



3. Processing

Processing Summary

Once the lidar data passed initial QC, the dataset was corrected for aircraft orientation and movement. This process used airborne inertial, orientation, and GPS data collected during acquisition along with ground-based GPS data. The data went through a geometric calibration that further corrected each laser point. This calibrated data set was used to create the LAS point cloud. The LAS point data was initially classified into “ground” and “non-ground”, then further refined using the classes specified in this task order. Breaklines were drawn to denote hydrological features. After the hydro-flattening process, the final deliverables products were created.

GNSS-IMU Trajectory Processing

Kinematic corrections for the aircraft position were resolved using aircraft GPS and static ground GPS (1-Hz) for each geodetic control (base station) for three subsystems: inertial measurement unit (IMU), sensor orientation information, and airborne GPS data.

Post-processing of the IMU system data and aircraft position with attitude data was completed to compute an optimally accurate, blended navigation solution based on Kalman filtering technology, or the smoothed best estimate of trajectory (SBET).

Software: POSPac Software v. 5.3, IPAS Pro v.1.35., Novatel Inertial Explorer v8.60.6129

Trajectory Quality

The GNSS trajectory and high-quality IMU data are key factors in determining the overall positional accuracy of the final sensor data. Within the trajectory processing, there are many factors that affect the overall quality, but the most indicative are the combined separation, the estimated positional accuracy, and the positional dilution of precision (PDOP).

Combination Separation

Combined separation is a measure of the difference between the forward-run and the backward-run solution of the trajectory. The Kalman filter was processed in both directions to remove the combined directional anomalies. In general, when these two solutions match closely, an optimally accurate and reliable solution is achieved.

The data for this task order was processed with a goal to maintain a combined separation difference of less than ten (10) centimeters.

Estimated Positional Accuracy

Estimated positional accuracy plots the standard deviations of the east, north, and vertical directions along a time scale of the trajectory. It illustrates loss of satellite lock issues, as well as issues arising from long baselines, noise, and/or other atmospheric interference.

PDOP

The PDOP measures the precision of the GPS solution in regard to the geometry of the satellites acquired and used for the solution.

The data for this task order was processed with a goal to maintain an average PDOP value below 3.0. Brief periods of PDOP over 3.0 are acceptable due to the calibration and control process if other metrics are within specification.

Geometric Calibration

After the initial phase was complete, a formal reduction process was performed on the data. Laser point position was calculated by associating the SBET position to each laser point return time, scan angle, intensity, etc. Raw laser point cloud data was created for the whole project area in LAS format. Automated line-to-line calibrations were then performed for system attitude parameters (pitch, roll, heading), mirror flex (scale) and GPS/IMU drift. Statistical reports were generated for comparison and used to make the necessary adjustments to remove any residual systematic error.

Software: Proprietary Software, TerraMatch v18, Leica CloudPro 1.2.4

Lidar Data Classification

LAS data was classified as ground and non-ground points with additional filters created to meet the task order classification specifications. Statistical absolute accuracy was assessed via direct comparisons of ground classified points to ground RTK survey data. Based on the statistical analysis, the lidar data was then adjusted to reduce the vertical bias when compared to the survey ground control of higher accuracy.

Calibrated LAS files were imported into the task order tiles and initially filtered to create a ground and non-ground class. Then additional classes were filtered as necessary to meet the following client-specified classes:

- Class 1 – Default / Processed, but not Classified
- Class 2 – Bare Earth Ground
- Class 7 – Low Noise
- Class 9 – Water
- Class 10 – Ignored Ground
- Class 17 – Bridge Decks
- Class 18 – High Noise

Classified LAS files were evaluated through a series of manual QA/QC steps as well as a peer-based review to eliminate remaining artifacts from the ground class. This included a review of the DEM surface to remove artifacts and ensure topographic quality.

Software: Proprietary Software, TerraScan v18

Hydrologic Flattening

The lidar task order required compilation of breaklines defining the following types of water body features:

Lakes, reservoirs, ponds	Minimum of 2-acres or greater Compiled as closed polygons, collected at a constant elevation
Rivers, streams	Nominal width of 30.5 meters / 100 feet Compiled in direction of flow, with both sides maintaining an equal elevation gradient
Bridge breaklines	Breaklines used to enforce a logical terrain surface below a bridge

Woolpert utilized the following steps to hydrologically flatten the water bodies and for gradient hydrologic flattening of the double line streams within the existing lidar data:

1. The newly acquired lidar data was utilized to manually compile the hydrologic features in a 2D environment using the lidar intensity and bare earth surface. Open Source imagery was used as reference when necessary.

2. An integrated software approach was applied to combine the lidar data and 2D breaklines. This process “drapes” the 2D breaklines onto the 3D lidar surface model to assign an elevation. A monotonic process is performed to ensure the streams are consistently flowing in a gradient manner. A secondary step within the program verifies an equally matching elevation of both stream edges. The breaklines that characterize the closed water bodies are draped onto the 3D lidar surface and assigned a constant elevation at or just below ground elevation.

3. All classified ground points from inside the hydrologic feature polygons were reclassified to water, class nine (9).

4. All classified ground points were reclassified from within a buffer along the hydrologic feature breaklines to buffered ground, class ten (10). The buffer distance was approximately the task order designed nominal pulse spacing distance.

5. Breaklines used for bridge removal during the hydrologic flattening were included with the hydrologic breakline geodatabase deliverable. The purpose of these breaklines is for a more aesthetically pleasing DEM appearance.

6. The lidar ground points and breaklines were used to generate a digital elevation model (DEM).

7. QA/QC for this task was performed by reviewing the hydrologically flattened DEM and hydrologic breakline features. Additionally, a combined approach utilizing commercial off the shelf software and proprietary methods were used to review the overall connectivity of the hydrologic breaklines.

TerraScan was used to add the hydrologic breakline vertices and export the lattice models.

Breaklines defining the water bodies greater than 2-acres were provided as polygon features. Rivers and streams with a nominal minimum width of 30.5 meters (100 feet) were provided as polyline features. All lake and river breaklines compiled as part of the flattening process were provided in an Esri file geodatabase.

Breaklines used for bridge removal were provided as point features in Esri shapefile format.

Software: TerraScan v18, TerraModeler v18, Esri ArcMap v10.4, LP360 v2018.1.57.4

Digital Elevation Model

TerraScan was used to add the hydrologic breakline vertices and export the lattice models. Class 2 (ground) lidar points in conjunction with the hydro breaklines and bridge breaklines were used to create a 3-foot hydro-flattened bare-earth raster DEM. Using automated scripting routines within ArcMap, an 32-bit floating point raster ERDAS IMG file was created for each tile. Files were clipped to match the task order tiling scheme. Each surface is reviewed using Global Mapper to check for any surface anomalies or incorrect elevations found within the surface.

Note: Two stream beds near Greenfield, CA and a part of Lake Nacimiento, are affected by a difference in water levels between adjacent flight lines. During original acquisition, the levels were lower/dry, but contained water during the time of follow-up flights approximately one month later. The feature portions containing water were digitized as hydro features. The feature portions that contain water were digitized.

Intensity Imagery

Lidar intensity data derived from the acquired lidar data was linearly rescaled from 16-bit intensity and provided as a 3-foot pixel, 8-bit, 256 gray scale GeoTIFF format intensity images. Files were clipped to match the task order tiling scheme.

Software: TerraScan v18

Metadata

FGDC CSDGM/USGS MetaParser-compliant metadata was produced in XML format. The metadata includes a complete description of the task order client information, contractor information, project purpose, lidar acquisition and ground survey collection parameters, lidar acquisition and ground survey collection dates, spatial reference system information, data processing including acquisition quality assurance procedures, GPS and base station processing, geometric calibration, lidar classification, hydrologic flattening, intensity imagery development, and final product development.

Other metadata deliverables included Esri shapefiles of the ground control and QA/QC points, delivery tile index, delivery extent, and delivery diagram. A georeferenced, polygonal representation of the detailed extents of each acquired lidar swath was produced as a polygon feature class in an Esri file geodatabase.

4. Accuracy Assessment

Results Summary

The tables below show a summary of all test results. The following sections describe the testing methods used.

Software: TerraScan v18, Esri ArcMap v10.4

Table 4-1. Vertical Accuracy Summary - CA AOIs

Testing Categories	Target	Measured	Points Used
Raw Swath NVA RMSEz 95% at Confidence Level	0.196 m	0.096 m	145
DEM NVA RMSEz at 95% Confidence Level	0.196 m	0.099 m	145
DEM VVA RMSEz at 95th Percentile	0.294 m	0.216 m	113

Table 4-2. Vertical Accuracy Summary - AZ AOIs

Testing Categories	Target	Measured	Points Used
Raw Swath NVA RMSEz 95% at Confidence Level	0.196 m	0.119 m	94
DEM NVA RMSEz at 95% Confidence Level	0.196 m	0.094 m	94
DEM VVA RMSEz at 95th Percentile	0.294 m	0.220 m	52

Raw Lidar Swath Testing

This project required Non-Vegetated Vertical Accuracy (NVA) to be tested on the raw lidar point cloud swath data. The dataset was required to meet a target value of 19.6 cm at a 95% confidence level using an RMSEz target value of 10 cm x 1.9600. Testing was assessed and reported using guidelines developed by the National Digital Elevation Program (NDEP) and the American Society for Photogrammetry and Remote Sensing (ASPRS).

The raw NVA was to be calculated with independent checkpoints that were not used in the calibration or post processing of the lidar point cloud data. Checkpoints were to be distributed throughout the project area and located in bare earth and urban (non-vegetated) land cover classes.

Testing was performed using TINs created from the final calibrated and controlled swath data. For each NVA checkpoint, an elevation value was derived from the TIN at the point's x,y location. This value was compared to the checkpoint's surveyed elevation value.

For the California AOIs, the raw NVA was tested using 145 checkpoints. These checkpoints were surveyed

using GPS techniques. See the survey report for acquisition methodologies. This dataset was tested to be 0.049 meters using an RMSEz of 0.096 meters x 1.9600.

For the Arizona AOIs, the raw NVA was tested using 94 checkpoints. These checkpoints were surveyed using GPS techniques. See the survey report for acquisition methodologies. This dataset was tested to be 0.119 meters using an RMSEz of 0.061 meters x 1.9600.

For full checkpoint results, see the tables in Appendix 2.

Digital Elevation Model Testing

This project required Non-Vegetated Accuracy (NVA) and Vegetated Vertical Accuracy (VVA) testing of the digital elevation model (DEM) dataset. The calculated NVA value was required to meet 19.6 cm at a 95% confidence level using an RMSEz target value of 10 cm x 1.9600. VVA was required to meet 29.4 cm at the 95th percentile error. Testing was assessed and reported using guidelines developed by the National Digital Elevation Program (NDEP) and the American Society for Photogrammetry and Remote Sensing (ASPRS).

Testing was performed using the bare earth DEM created as part of this task order. For each checkpoint, an elevation value was derived from the DEM at the point's x,y location. This value was compared to the checkpoint's surveyed elevation value.

The NVA was to be calculated with independent checkpoints falling on bare earth and urban (non-vegetated) classes. VVA was to be calculated with independent checkpoints falling in brush/tall grass/ weeds (vegetated) land cover classes. These points were not used in the calibration or post processing of the lidar point cloud data and distributed throughout the project area. Checkpoints were surveyed using GPS techniques. See the survey report for acquisition methodologies.

For the California AOIs, the DEM NVA measured 0.099 meters using an RMSEz of 0.051 meters x 1.9600 using 145 checkpoints. VVA tested 0.216 meters at the 95th percentile using 113 checkpoints.

For the Arizona AOIs, the DEM NVA measured 0.094 meters using an RMSEz of 0.048 meters x 1.9600 using 94 checkpoints. VVA tested 0.220 meters at the 95th percentile using 52 checkpoints.

VVA errors larger than the 95th percentile are listed below.

For full checkpoint results, see the tables in Appendix 3 and 4.

Table 4-3. VVA Errors - CA AOIs

Point ID	Easting (ft)	Northing (ft)	Z-Error (m)
3057_2018_CA	5830209.46	2204296.40	0.299
3058_2018_CA	5863752.37	2231806.72	0.265
3113_2018_CA	5901467.27	2011304.76	0.225
3119_2018_CA	5701126.06	2061299.62	0.227
3121_2018_CA	5700896.51	2092941.07	0.243
3140_2018_CA	5633033.09	2314166.13	0.279

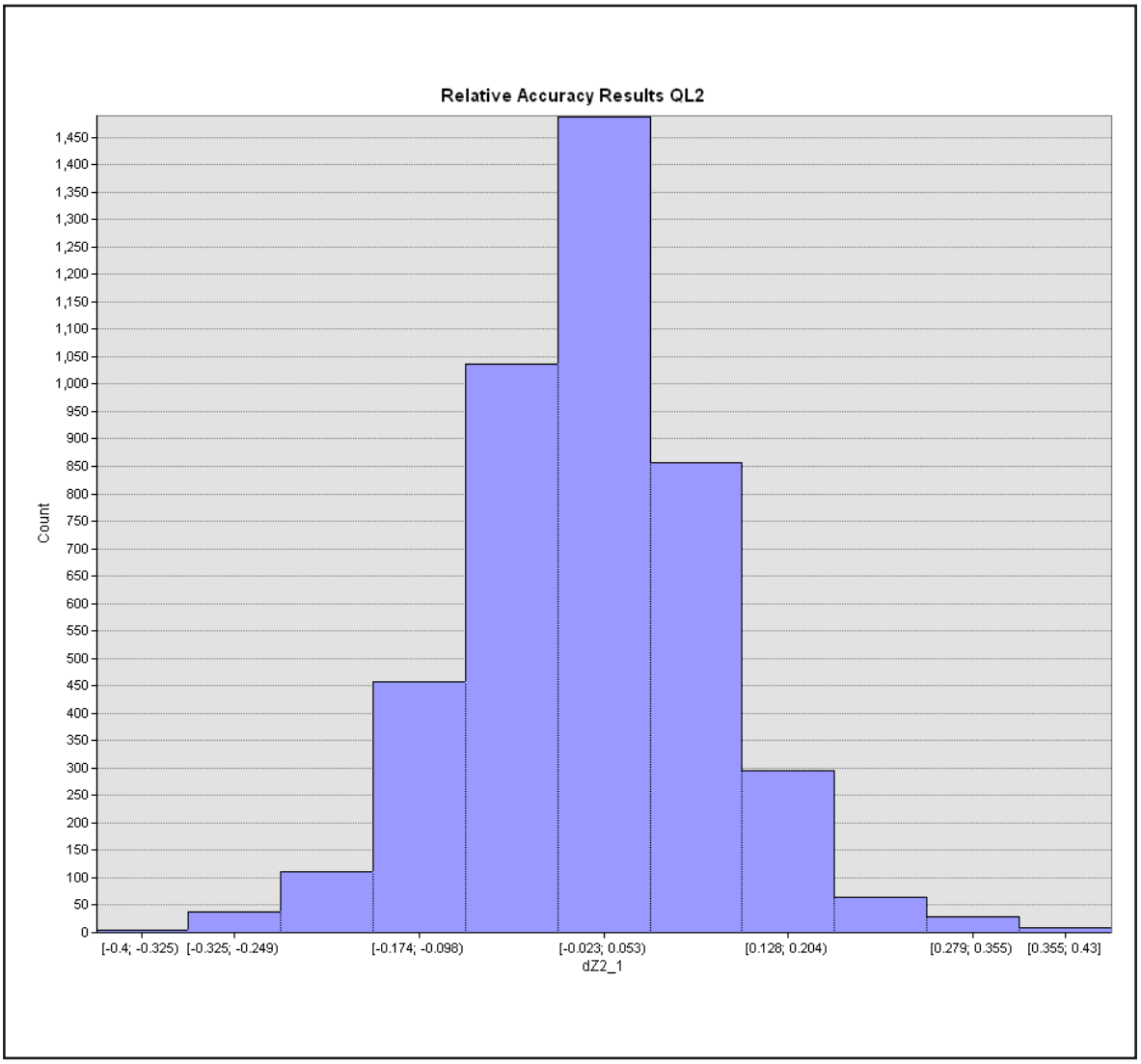
Table 4-4. VVA Errors - AZ AOIs

Point ID	Easting (ft)	Northing (ft)	Z-Error (m)
3033_2018_AZ	621197.66	376495.53	0.234
3039A_2018_AZ	660612.17	396172.67	0.265

Inter-Swath Testing

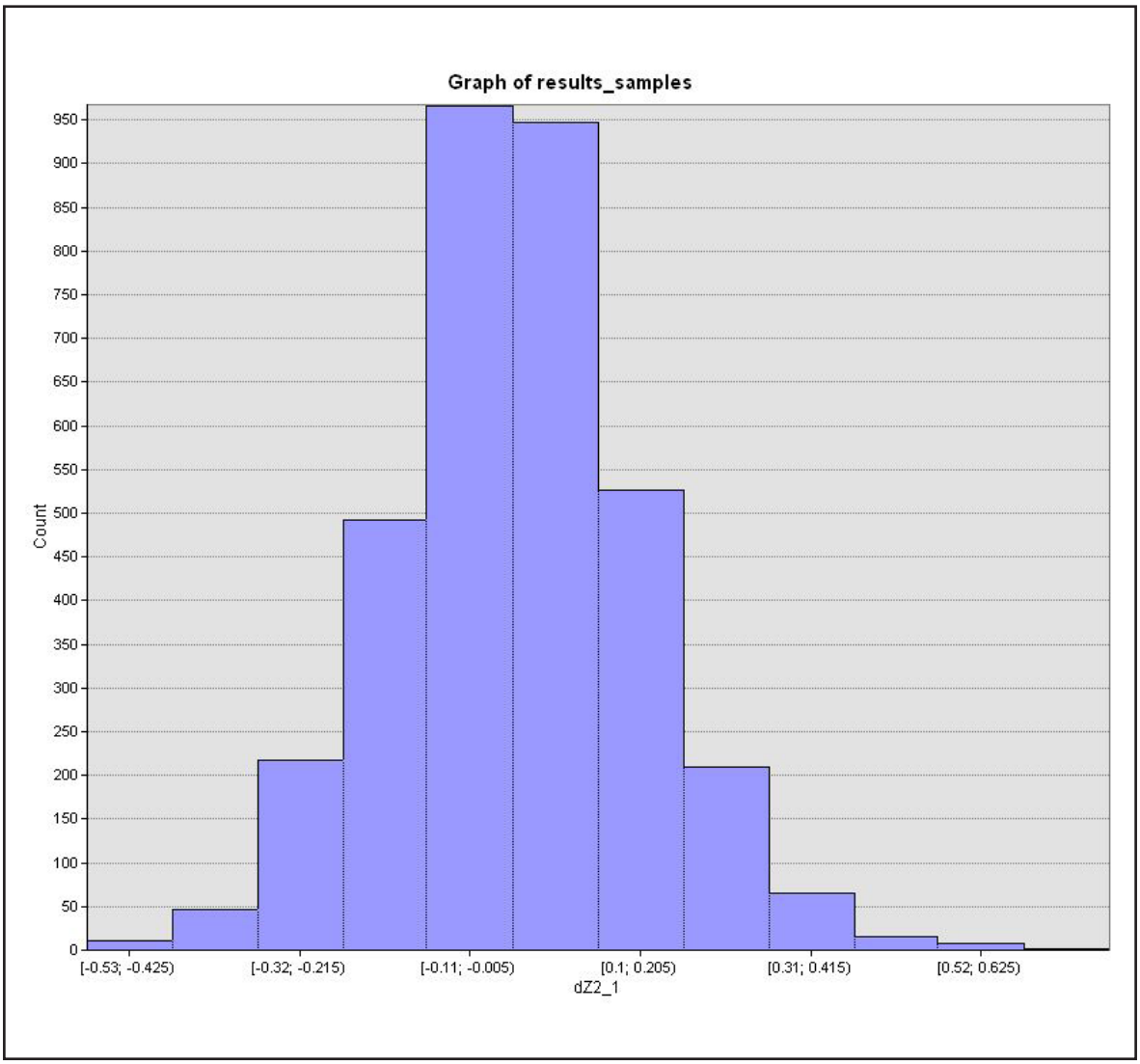
Inter-swath accuracy was tested against well-distributed flight line overlap locations. The relative accuracy for the lidar measured at 0.098 meters RMSE for the California AOIs and 0.047 meters for the Arizona AOIs.

Figure 4-1: Inter-Swath Testing Histogram - CA AOIs



Values are in feet.

Figure 4-2: Inter-Swath Testing Histogram - AZ AOIs



Values are in feet.

Approved By	Name	Signature	Date
Associate Member, Lidar Specialist Certified Photogrammetrist #1381	Qian Xiao		July 2019

Appendix 1: Flight Logs

Red Bluff, CA

Woolpert

Optech Orion H-300	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	3/28/2018	87	78262		CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base

Pilot	Sensor Type	HOBBS END	Local End Time	Zulu End Time	PID

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	
								Arriving	

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
29	40.3	125		Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
110	Kts	1800	Ft		Ft	Yes		No		@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments		
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:		
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes	No
1		16:44:00	16:50:00	0:06:00						
3		16:53:00	17:01:00	0:08:00						
5		17:05:00	17:11:00	0:06:00						
7		17:13:00	17:18:00	0:05:00						
8		17:18:00	17:23:00	0:05:00						
9		17:23:00	17:29:00	0:06:00						
10		17:29:00	17:35:00	0:06:00						
11		17:35:00	17:41:00	0:06:00						
12		17:41:00	17:48:00	0:07:00						
13		17:48:00	17:56:00	0:08:00						
14		17:56:00	18:04:00	0:08:00						
16		18:04:00	18:13:00	0:09:00						
17		18:13:00	18:22:00	0:09:00						
18		18:22:00	18:31:00	0:09:00						
19		18:31:00	18:46:00	0:15:00						
20		18:46:00	19:00:00	0:14:00						
21		19:00:00	19:14:00	0:14:00						
22		19:14:00	19:29:00	0:15:00						
23		19:29:00	19:44:00	0:15:00						
24		19:44:00	19:59:00	0:15:00						
25		19:59:00	20:15:00	0:16:00						
26		20:15:00	20:29:00	0:14:00						
27		20:29:00	20:45:00	0:16:00						
28		20:45:00	21:01:00	0:16:00						
29		21:01:00	21:16:00	0:15:00						
31		21:16:00	21:31:00	0:15:00						
32		21:31:00	21:47:00	0:16:00						
33		21:47:00	22:01:00	0:14:00						
34		22:01:00	22:15:00	0:14:00						
36		22:16:00	22:20:00	0:04:00						
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes	No

Additional Comments:

Drive #

Appendix 1: Flight Logs

Scott Valley, CA

Woolpert

Optech Orion H-300	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	3/30/2018	89	78262		CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base

Pilot	Sensor Type	HOBBS END	Local End Time	Zulu End Time	PID

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	
								Arriving	

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
29	40.3	125		Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
110	Kts	1800	Ft		Ft	Yes		No		@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments			
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:			
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes		No
12		18:13:00	18:28:00	0:15:00							
13		18:28:00	18:43:00	0:15:00							
14		18:43:00	18:57:00	0:14:00							
15		18:57:00	19:11:00	0:14:00							
16		19:11:00	19:26:00	0:15:00							
17		19:26:00	19:41:00	0:15:00							
18		19:41:00	19:56:00	0:15:00							
19		19:56:00	20:11:00	0:15:00							
20		20:11:00	20:26:00	0:15:00							
21		20:26:00	20:41:00	0:15:00							
22		20:41:00	20:56:00	0:15:00							
23		20:56:00	21:11:00	0:15:00							
24		21:11:00	21:26:00	0:15:00							
25		21:26:00	21:41:00	0:15:00							
26		21:41:00	21:55:00	0:14:00							
27		21:55:00	22:11:00	0:16:00							
28		22:11:00	22:25:00	0:14:00							
29		22:25:00	22:40:00	0:15:00							
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes		No

Additional Comments:

Drive #

Woolpert

Optech Orion H-300	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	3/31/2018	90	78262		CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base

Pilot	Sensor Type	HOBBS END	Local End Time	Zulu End Time	PID

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	
								Arriving	

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
29	40.3	125		Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
110	Kts	1800	Ft		Ft	Yes		No		@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments			
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:			
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes		No
33		16:20:00	16:34:00	0:14:00							
34		16:34:00	16:49:00	0:15:00							
35		16:49:00	17:04:00	0:15:00							
36		17:04:00	17:19:00	0:15:00							
37		17:19:00	17:35:00	0:16:00							
38		17:35:00	17:51:00	0:16:00							
39		17:51:00	18:04:00	0:13:00							
43		18:12:00	18:27:00	0:15:00							
9		17:27:00	17:42:00	0:15:00							
10		17:42:00	17:58:00	0:16:00							
11		17:58:00	18:13:00	0:15:00							
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes		No

Additional Comments:	Drive #

Appendix 1: Flight Logs

Stillwater, CA

Woolpert

Optech Orion H-300	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	3/29/2018	88	78262		CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base

Pilot	Sensor Type	HOBBS END	Local End Time	Zulu End Time	PID

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	
								Arriving	

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
29	40.3	125		Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
110	Kts	1800	Ft		Ft	Yes		No		@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments			
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:			
		↕ Times entered are Zulu / GMT ↕						Verify S-Turns Before Mission	Yes		No
5		18:14:00	18:18:00	0:04:00							
6		18:18:00	18:22:00	0:04:00							
7		18:22:00	18:27:00	0:05:00							
45		18:28:00	18:30:00	0:02:00							
9		18:31:00	18:35:00	0:04:00							
10		18:35:00	18:40:00	0:05:00							
11		18:40:00	18:45:00	0:05:00							
12		18:45:00	18:49:00	0:04:00							
14		18:50:00	18:55:00	0:05:00							
15		18:55:00	18:59:00	0:04:00							
16		18:59:00	19:10:00	0:11:00							
17		19:10:00	19:19:00	0:09:00							
18		19:19:00	19:29:00	0:10:00							
19		19:29:00	19:39:00	0:10:00							
20		19:39:00	19:49:00	0:10:00							
21		19:49:00	19:59:00	0:10:00							
22		19:59:00	20:09:00	0:10:00							
23		20:09:00	20:19:00	0:10:00							
24		20:19:00	20:29:00	0:10:00							
26		20:29:00	20:38:00	0:09:00							
27		20:38:00	20:48:00	0:10:00							
28		20:48:00	20:58:00	0:10:00							
29		20:58:00	21:08:00	0:10:00							
30		21:08:00	21:18:00	0:10:00							
31		21:18:00	21:28:00	0:10:00							
32		21:28:00	21:37:00	0:09:00							
34		21:37:00	21:47:00	0:10:00							
35		21:47:00	21:56:00	0:09:00							
36		21:56:00	22:00:00	0:04:00							
38		22:00:00	22:04:00	0:04:00							
39		22:04:00	22:08:00	0:04:00							
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes		No

Additional Comments:

Drive #

Woolpert

Optech Orion H-300	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	3/29/2018	88	78262		CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base

Pilot	Sensor Type	HOBBS END	Local End Time	Zulu End Time	PID

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	
								Arriving	

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
29	40.3	125		Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode	Pre-Trigger Dist.	
110	Kts	1800	Ft		Ft	Yes		No		@ NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments			
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:			
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes		No
40		22:08:00	22:11:00	0:03:00							
41		22:11:00	22:15:00	0:04:00							
42		22:15:00	22:18:00	0:03:00							

↑ Times entered are Zulu / GMT ↑		Page	2	Verify S-Turns After Mission	Yes		No	

Additional Comments:

Drive #

Appendix 1: Flight Logs

Salinas Watershed QL1, CA

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	2/17/2018	48	18CA-1002B	Mission 20	CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
Other	N69622	6240.1	16:46:00	0:46:00	
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
KNIGHT	Galaxy	6241.4	18:27:00	2:27:00	N/A

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	PRB
190/10	10		Clear	21	-6	3003		Arriving	PRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	96	400	High	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode	Pre-Trigger Dist.
155	kts	5200	Ft		Ft	Yes		No	X	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	0:50:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
7	318	1:20:00	1:24:00	0:04:00	17	0.56	1.15		
6	138	1:27:00	1:31:00	0:04:00	17	0.56	1.1		
5	318	1:33:00	1:38:00	0:05:00	17	0.55	1.03		
4	138	1:40:00	1:44:00	0:04:00	16	0.58	1.06		
3	318	1:47:00	1:51:00	0:04:00	16	0.59	1.06		
2	138	1:54:00	1:58:00	0:04:00	19	0.48	0.86		
1	318	2:00:00	2:02:00	0:02:00	20	0.48	0.83		
8(TIE)	229	2:05:00	2:06:00	0:01:00	19	0.5	0.86		
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes X No

Additional Comments:

Drive #

A

Appendix 1: Flight Logs

Salinas Watershed QL2, CA

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	1/22/2018	22	18CA-1002A	Mission 1	CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
Other	N69622	6167.6	12:25:00	20:25:00	
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
KLINCHEV	Galaxy	6169.2	14:50:00	22:50:00	N/A

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
350/9, GUSTS 16	10			18	4	3031		Departing	SBP
								Arriving	SBP

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	High	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
155	kts	5200	Ft		Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	20:54:00
		↕ Times entered are Zulu / GMT ↕						Verify S-Turns Before Mission	Yes X No
191	137	21:23:30	21:32:18	0:08:48	15	0.67	1.12		
192	317	21:35:20	21:37:12	0:01:52	14	0.75	1.31		
193	137	21:39:48	21:41:14	0:01:26	14	0.74	1.3		
194	317	21:44:02	21:45:24	0:01:22	14	0.72	1.26		
195	137	21:48:01	21:49:06	0:01:05	15	0.65	1.23		
196	317	21:51:41	21:52:37	0:00:56	16	0.67	1.1		
197	137	21:54:40	21:55:19	0:00:39	16	0.67	1.1		
199	42	21:57:43	22:10:48	0:13:05	16	0.67	1.1	FMSNAV ALTITUDE FLUCTUATIONS	
176	317	22:22:45	22:33:09	0:10:24	16	0.66	1.09	CLOUDS IN NORTH 10 MILES	
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes X No

Additional Comments:

Drive #

A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	1/23/2018	23	18CA-1002A	Mission 2	CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
Other	N69622	6169.4	13:01:00	21:01:00	
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
KLINCHEV	Galaxy	6174.4	18:24:00	2:24:00	N/A

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
080/10	10		Clear	17	6	3019		Departing	PRB
								Arriving	PRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	High	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
155	kts	5200	Ft		Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	21:05:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
90	137	21:24:21	21:29:47	0:05:26	14	0.67	1.12		
91	317	21:32:31	21:38:06	0:05:35	14	0.67	1.1		
92	137	21:40:55	21:47:55	0:07:00	15	0.72	1.24		
93	317	21:50:28	21:57:30	0:07:02	16	0.62	1.03		
94	137	21:59:47	22:07:08	0:07:21	17	0.57	0.95		
95	317	22:09:51	22:17:16	0:07:25	16	0.58	1		
123	137	22:25:29	22:40:22	0:14:53	16	0.59	1.13		
124	317	22:43:35	22:58:16	0:14:41	14	0.65	1.29		
125	137	23:00:43	23:14:45	0:14:02	16	0.6	1.13		
126	317	23:17:26	23:31:46	0:14:20	17	0.55	1.1		
127	137	23:34:12	23:48:37	0:14:25	16	0.63	1.17		
128	317	23:51:04	0:05:51	0:14:47	16	0.61	1.18		
129	137	0:08:27	0:23:00	0:14:33	16	0.57	1.09		
130	317	0:25:29	0:40:22	0:14:53	17	0.57	1.14		
131	137	0:43:00	0:57:35	0:14:35	17	0.56	1.09		
132	317	1:00:17	1:15:21	0:15:04	18	0.52	1.04		
175	137	1:21:11	1:37:55	0:16:44	18	0.52	1.08		
190	317	1:41:03	1:50:07	0:09:04	19	0.49	1.03		
198	45	1:52:31	2:04:40	0:12:09	20	0.48	1.02		
↑ Times entered are Zulu / GMT ↑			Page		1			Verify S-Turns After Mission	Yes X No

Additional Comments:

Drive #

A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	1/24/2018	24	18CA-1002A	Mission 3	CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
Other	N69622	6174.4	12:45:00	20:45:00	
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
KLINCHEV	Galaxy	6177.2	15:53:00	23:53:00	N/A

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
								Departing	PRB
CALM	10			16	6	3007		Arriving	PRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
				Gain - Course/Up		Single		A	
30	64	200	High	Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
155	kts	5200	Ft		Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	20:49:00
		↕ Times entered are Zulu / GMT ↕						Verify S-Turns Before Mission	Yes X No
133	137	21:13:22	21:28:19	0:14:57	15	0.62	1.1		
134	317	21:31:10	21:46:18	0:15:08	15	0.63	1.12		
135	137	21:48:57	22:04:00	0:15:03	15	0.61	1.07		
136	317	22:07:09	22:22:32	0:15:23	16	0.58	1.04		
137	137	22:25:06	22:40:39	0:15:33	16	0.57	0.99		
138	317	22:43:16	22:58:47	0:15:31	15	0.63	1.14		
139	137	23:01:19	23:17:27	0:16:08	17	0.54	0.92		
140	317	23:20:01	23:30:42	0:10:41	17	0.58	0.99	CLOUD- BROKE OFF EARLY	
↑ Times entered are Zulu / GMT ↑			Page		1			Verify S-Turns After Mission	Yes X No

Additional Comments:

Drive #

A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	1/26/2018	26	18CA-1002A	Mission 4	CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
Other	N69622	6177.2	11:59:00	19:59:00	
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
KLINCHEV	Galaxy	6181.8	16:58:00	0:58:00	N/A

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	PRB
CALM	10			16	6	3007		Arriving	PRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	High	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode	Pre-Trigger Dist.
155	kts	5200	Ft		Ft	Yes		No	X	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	20:03:00
		↕ Times entered are Zulu / GMT ↕						Verify S-Turns Before Mission	Yes X No
149	137	20:30:12	20:30:17	17:18:11				CLOUD- ABORTED	
176	137	20:37:20	20:40:51	0:00:00	16	0.62	1.18	LINE PICKUP	
177	137	20:46:51	20:57:24	0:00:00	16	0.62	1.13		
178	317	21:00:18	21:10:37	0:00:00	14	0.71	1.38		
179	137	21:13:44	21:24:04	0:00:00	15	0.63	1.13		
180	317	21:26:53	21:37:08	0:00:00	15	0.6	1.14		
181	137	21:39:47	21:49:46	0:00:00	16	0.6	1.04		
182	317	21:52:39	22:02:49	0:00:00	15	0.6	1.19		
183	137	22:05:14	22:15:06	0:00:00	16	0.6	1.09		
189	317	22:17:00	22:26:20	0:00:00	16	0.61	1.1		
184	137	22:28:10	22:37:55	0:00:00	14	0.62	1.11		
188	317	22:40:02	22:49:19	0:00:00	15	0.6	1.07		
185	137	22:52:15	23:01:41	0:00:00	16	0.6	1.07		
187	317	23:04:24	23:13:54	0:00:00	17	0.6	1.06		
186	137	23:16:43	23:25:51	0:00:00	17	0.58	1.03		
174	317	23:28:26	23:45:57	0:00:00	17	0.59	1.06		
173	137	23:49:06	0:07:21	0:00:00	16	0.64	1.25		
172	317	0:10:03	0:28:26	0:00:00	17	0.61	1.23		
140	137	0:33:42	0:41:29	0:00:00	17	0.59	1.17	LINE PICKUP	
				0:00:00					
				0:00:00					
				0:00:00					
				0:00:00					
				0:00:00					
				0:00:00					
				0:00:00					
				0:00:00					
				0:00:00					
				0:00:00					
				0:00:00					
				0:00:00					
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes X No

Additional Comments:

Drive #: A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	1/26/2018	26	18CA-1002A	Mission 5	CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
Other	N69622	6181.8	17:29:00	1:29:00	
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
KLINCHEV	Galaxy	6181.8	20:00:00	4:00:00	N/A

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
080/09	10			11	3	3029		Departing	PRB
								Arriving	PRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	High	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode	Pre-Trigger Dist.
155	kts	5200	Ft		Ft	Yes		No	X	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At: 1:33:00
		↕ Times entered are Zulu / GMT ↕						Verify S-Turns Before Mission Yes X No
141	137	1:55:18	2:10:34	0:15:16	20	0.51	1.02	
142	317	2:13:51	2:29:56	0:16:05	17	0.57	1.21	
143	137	2:33:09	2:48:36	0:15:27	17	0.59	1.26	
144	317	2:52:18	3:08:21	0:16:03	17	0.6	1.15	
145	137	3:11:18	3:26:57	0:15:39	17	0.58	1	
146	317	3:30:27	3:30:27					LASER DID NOT FIRE/
								TZERO DROPOUT ERROR

↑ Times entered are Zulu / GMT ↑		Page	1	Verify S-Turns After Mission	Yes	X	No	

Additional Comments:

Drive #: A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	1/27/2018	27	18CA-1002A	Mission 6	CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
Other	N69622	6184.0	9:26:00	17:26:00	
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
KLINCHEV	Galaxy	6187.1	12:54:00	20:54:00	N/A

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
330/05	10		Clear	6	3	3041		Departing	PRB
								Arriving	PRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	High	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode	Pre-Trigger Dist.	
155	kts	5200	Ft		Ft	Yes		No	X	@ NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	17:31:00
		↕ Times entered are Zulu / GMT ↕						Verify S-Turns Before Mission	Yes X No
171	137	17:57:15	18:15:45	0:18:30	19	0.61	1.12		
170	317	18:18:46	18:37:47	0:19:01	19	0.56	1.09		
169	137	18:40:55	18:59:09	0:18:14	18	0.55	1.11		
168	317	19:02:01	19:20:40	0:18:39	18	0.52	0.98		
167	137	19:24:12	19:42:18	0:18:06	18	0.52	0.92		
166	317	19:45:21	20:04:09	0:18:48	14	0.61	1.06		
165	137	20:06:52	20:24:52	0:18:00	17	0.51	0.85		
164	317							TZERO DROPOUT ERROR	

↑ Times entered are Zulu / GMT ↑		Page	1	Verify S-Turns After Mission	Yes X No	

Additional Comments:

Drive #

A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	1/27/2018	27	18CA-1002A	Mission 7	CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
Other	N69622	6187.1	13:35:00	21:35:00	
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
KLINCHEV	Galaxy	6191.0	17:54:00	1:54:00	N/A

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
080/16	10		Clear	16	2	3032		Departing	PRB
								Arriving	PRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	High	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode	Pre-Trigger Dist.	
155	kts	5200	Ft		Ft	Yes		No	X	@ NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	21:41:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
146	137	23:41:50	23:57:54	0:16:04	16	0.61	1.15		
147	317	0:00:54	0:17:18	0:16:24	17	0.58	1.16		
148	137	0:19:50	0:36:26	0:16:36	17	0.58	1.19		
149	317	0:39:34	0:59:24	0:19:50	19	0.53	1.04		
150	137	0:59:16	1:16:12	0:16:56	18	0.52	1.03		
122	317	1:20:59	1:36:20	0:15:21	18	0.53	1.01		

↑ Times entered are Zulu / GMT ↑		Page	1	Verify S-Turns After Mission	Yes X No	
Additional Comments:						Drive #
						A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	1/28/2018	28	18CA-1002A	Mission 8	CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
Other	N69622	6191.0	10:48:00	18:48:00	
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
KLINCHEV	Galaxy	6195.8	15:56:00	23:56:00	N/A

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
320/03	10		Clear	13	6	3035		Departing	PRB
								Arriving	PRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	High	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
155	kts	5200	Ft		Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	18:52:00
		↕ Times entered are Zulu / GMT ↕						Verify S-Turns Before Mission	Yes X No
121	137	19:14:00	19:29:30	0:15:30	17	0.51	0.91		
120	317	19:32:30	19:48:14	0:15:44	17	0.54	0.93		
119	137	19:51:16	20:06:49	0:15:33	15	0.6	1.05		
118	317	20:09:41	20:25:26	0:15:45	17	0.56	0.96		
117	137	20:28:54	20:44:41	0:15:47	16	0.59	1.03		
116	317	20:47:34	21:03:16	0:15:42	13	0.69	1.27		
115	137	21:07:28	21:23:13	0:15:45	14	0.69	1.08		
114	317	21:25:52	21:41:21	0:15:29	16	0.63	1.07		
113	137	21:44:48	22:00:33	0:15:45	16	0.58	0.95		
112	317	22:03:12	22:18:40	0:15:28	16	0.62	1.03		
111	137	22:21:22	22:32:46	0:11:24	14	0.66	1.14	EYESAFE SHUTOFF	
111	317	22:38:37	22:42:53	0:04:16	15	0.62	1.08		
100	317	22:45:51	22:53:57	0:08:06	16	0.61	1.03		
101	137	22:56:41	23:09:58	0:13:17	16	0.59	1		
102	317	23:13:01	23:26:51	0:13:50	18	0.56	0.92		
99	137	23:30:03	23:38:02	0:07:59	16	0.57	1.07		
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes X No

Additional Comments:

Drive #

A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	1/28/2018	28	18CA-1002A	Mission 9	CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
Other	N69622	6195.8	16:35:00	0:35:00	
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
KLINCHEV	Galaxy	6199.0	20:04:00	4:04:00	N/A

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
080/11	10		Clear	18	4	3023		Departing	PRB
								Arriving	PRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	High	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode	Pre-Trigger Dist.
155	kts	5200	Ft		Ft	Yes		No	X	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At: 0:39:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission Yes X No
110	137	0:59:48	1:14:56	0:15:08	17	0.49	1.07	
109	317	1:17:55	1:32:51	0:14:56	18	0.47	1.01	
108	137	1:36:22	1:51:15	0:14:53	20	0.47	1	
107	317	1:54:08	2:08:53	0:14:45	19	0.47	1.02	
106	137	2:12:07	2:26:43	0:14:36	17	0.51	1.12	
105	317	2:29:48	2:44:13	0:14:25	17	0.54	1.15	
104	137	2:47:10	3:01:18	0:14:08	17	0.54	1.03	
103	317	3:04:21	3:18:11	0:13:50	17	0.54	0.97	
98	137	3:20:13	3:28:08	0:07:55	17	0.52	0.89	
97	317	3:30:47	3:38:29	0:07:42	18	0.51	0.88	
96	137	3:41:33	3:49:10	0:07:37	16	0.56	0.95	
↑ Times entered are Zulu / GMT ↑			Page		1			Verify S-Turns After Mission Yes X No

Additional Comments:

Drive # A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	1/29/2018	29	18CA-1002A	Mission 10	CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
Other	N69622	6199.0	10:39:00	18:39:00	
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
KLINCHEV	Galaxy	6202.3	14:18:00	22:18:00	N/A

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
280/04	10		Clear	12	4	3027		Departing	PRB
								Arriving	PRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	High	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode	Pre-Trigger Dist.	
155	kts	5200	Ft		Ft	Yes		No	X	@ NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	18:43:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
151	137	19:09:16	19:26:27	0:17:11	16	0.57	1		
152	317	19:29:37	19:46:36	0:16:59	17	0.51	0.89		
153	137	19:49:44	20:06:52	0:17:08	16	0.56	0.96		
154	317	20:10:06	20:27:16	0:17:10	17	0.53	0.9		
155	137	20:30:34	20:47:41	0:17:07	16	0.66	1.07		
156	317	20:51:39	20:58:20	0:06:41	13	0.7	1.24	EYESAFE SHUTOFF	
156	317	21:02:37	21:13:52	0:11:15	14	0.73	1.32		
157	137	21:17:32	21:34:44	0:17:12	16	0.65	1.08		
158	317	21:38:02	21:55:15	0:17:13	18	0.58	0.94		

↑ Times entered are Zulu / GMT ↑		Page	1	Verify S-Turns After Mission	Yes X No	
Additional Comments:						Drive #
						A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	2/6/2018	37	18CA-1002A	Mission 11	CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
Other	N69622	6204.2	14:26:00	22:26:00	
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
KNIGHT	Galaxy	6208.3	18:58:00	2:58:00	N/A

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
120/10	10		Clear	24	1	3000		Departing	PRB
								Arriving	PRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	High	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
155	kts	5200	Ft		Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	22:32:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
159	137	23:03:00	23:15:00	0:12:00	16	0.61	1.17	EYESAFE SHUTOFF	
159	137	23:23:00	23:31:00	0:08:00	17	0.58	1.16		
160	317	23:34:00	23:52:00	0:18:00	17	0.57	1.19		
527	321	0:07:00	0:20:00	0:13:00	17	0.54	1.09		
526	141	0:23:00	0:36:00	0:13:00	17	0.53	1.12		
525	321	0:39:00	0:52:00	0:13:00	17	0.53	1.08		
524	141	0:55:00	1:07:00	0:12:00	18	0.54	1.09		
523	321	1:10:00	1:23:00	0:13:00	19	0.48	0.95		
522	141	1:26:00	1:39:00	0:13:00	18	0.53	1.1		
521	321	1:41:00	1:54:00	0:13:00	17	0.55	1.16		
520	141	1:57:00	2:10:00	0:13:00	17	0.55	1.14		
519	321	2:12:00	2:25:00	0:13:00	17	0.55	1.05		
518	141	2:28:00	2:41:00	0:13:00	17	0.56	1.01		

↑ Times entered are Zulu / GMT ↑		Page	1	Verify S-Turns After Mission	Yes X No	

Additional Comments:

Drive #

A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	2/7/2018	38	18CA-1002A	Mission 12	CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
Other	N69622	6208.3	11:43:00	19:43:00	
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
KLINCHEV	Galaxy	6213.2	17:04:00	1:04:00	N/A

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
VARI/03	10		Clear	19	2	3025		Departing	PRB
								Arriving	PRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	High	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
155	kts	5200	Ft		Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	19:50:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
503	321	20:33:00	20:46:00	0:13:00	15	0.71	1.18		
502	141	20:49:00	21:02:00	0:13:00	16	0.68	1.08		
501	321	21:05:00	21:19:00	0:14:00	16	0.59	0.94		
500	141	21:22:00	21:36:00	0:14:00	16	0.61	0.99		
499	321	21:38:00	21:52:00	0:14:00	14	0.68	1.17		
498	141	21:55:00	22:08:00	0:13:00	15	0.64	1.1		
497	321	22:11:00	22:24:00	0:13:00	17	0.61	1.02		
496	141	22:27:00	22:40:00	0:13:00	16	0.62	1.09		
495	321	22:42:00	22:55:00	0:13:00	17	0.59	1.03		
494	141	22:58:00	23:11:00	0:13:00	16	0.56	1		
493	321	23:14:00	23:27:00	0:13:00	17	0.54	1.03		
492	141	23:30:00	23:43:00	0:13:00	17	0.56	1.05		
491	321	23:45:00	23:58:00	0:13:00	18	0.49	0.93		
490	141	0:00:00	0:13:00	0:13:00	17	0.5	1		
489	321	0:15:00	0:28:00	0:13:00	17	0.5	1.09		
488	141	0:30:00	0:43:00	0:13:00	18	0.48	1.06		
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes X No

Additional Comments:

Drive #

A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	2/7/2018	38	18CA-1002A	Mission 13	CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
Other	N69622	6213.2	18:10:00	2:10:00	
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
KLINCHEV	Galaxy	6217.2	22:35:00	6:35:00	N/A

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
140/05	10		Clear	19	-1	3018		Departing	PRB
								Arriving	PRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	High	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
155	kts	5200	Ft		Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	2:16:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
517	321	2:41:00	2:54:00	0:13:00	19	0.49	0.85		
516	141	2:57:00	3:11:00	0:14:00	1	0.59	1.06		
515	321	3:13:00	3:26:00	0:13:00	15	0.61	1.14		
514	141	3:29:00	3:42:00	0:13:00	17	0.57	1.04		
513	321	3:44:00	3:57:00	0:13:00	16	0.61	1.12		
512	141	4:00:00	4:13:00	0:13:00	15	0.62	1.12		
511	321	4:15:00	4:28:00	0:13:00	16	0.61	1.03		
510	141	4:31:00	4:44:00	0:13:00	14	0.67	1.12		
509	321	4:47:00	5:00:00	0:13:00	13	0.72	1.19		
508	141	5:03:00	5:16:00	0:13:00	13	0.77	1.25		
507	321	5:19:00	5:31:00	0:12:00	13	0.96	1.58		
506	141	5:34:00	5:48:00	0:14:00	13	0.95	1.6		
505	321	5:55:00	6:03:00	0:08:00	15	0.69	1.09		
504	141	6:06:00	6:20:00	0:14:00	17	0.64	1		
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes X No

Additional Comments:

Drive #

A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	2/8/2018	39	18CA-1002A	Mission 14	CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
Other	N69622	6217.2	14:41:00	22:41:00	
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
KNIGHT	Galaxy	6221.4	19:16:00	3:16:00	N/A

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	PRB
100/08	10		Clear	28	2	3008		Arriving	PRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	High	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode	Pre-Trigger Dist.
155	##	5200	Ft		Ft	Yes		No	X	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At: 22:45:00
		↕ Times entered are Zulu / GMT ↕						Verify S-Turns Before Mission Yes X No
161	137	23:15:00	23:32:00	23:11:00	17	0.58	1.18	
162	317	23:35:00	23:36:00	0:00:00				TZERO DROPOUT- NO LASER
162	317	23:41:00	23:59:00	0:00:00	18	0.54	1.03	
163	137	0:02:00	0:20:00	0:00:00	17	0.56	1.12	
164	317	0:24:00	0:42:00	0:00:00	18	0.54	1.11	
580	321	0:46:00	0:58:00	0:00:00	20	0.48	1	
581	141	1:00:00	1:11:00	0:00:00	20	0.49	1.04	
582	321	1:15:00	1:24:00	0:00:00	19	0.5	1.11	
583	141	1:27:00	1:35:00	0:00:00	17	0.53	1.27	
584	321	1:38:00	1:46:00	0:00:00	17	0.52	1.28	
585	141	1:49:00	1:57:00	0:00:00	17	0.52	1.24	
586	321	2:00:00	2:08:00	0:00:00	17	0.52	1.16	
587	141	2:14:00	2:17:00	0:00:00	17	0.55	1.15	
588	321	2:20:00	2:22:00	0:00:00	16	0.57	1.21	
589	141	2:25:00	2:27:00	0:00:00	17	0.53	1.06	
590	321	2:29:00	2:30:00	0:00:00	18	0.51	0.99	
591	141	2:33:00	2:34:00	0:00:00	18	0.5	1.02	
592	321	2:36:00	2:56:00	0:00:00	19	0.49	0.9	
↑ Times entered are Zulu / GMT ↑			Page		1			Verify S-Turns After Mission Yes X No

Additional Comments:

Drive #: A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	2/9/2018	40	18CA-1002A	Mission 15	CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
Other	N69622	6221.4	11:56:00	19:56:00	
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
KNIGHT	Galaxy	6224.7	15:39:00	23:39:00	N/A

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
340/04	10		Clear	22	5	3004		Departing	PRB
								Arriving	PRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	High	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode	Pre-Trigger Dist.
155	##	5200	Ft		Ft	Yes		No	X	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	20:00:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
569	321	20:24:00	20:38:00	0:14:00	15	0.67	1.11		
570	141	20:40:00	20:52:00	0:12:00	15	0.68	1.12		
571	321	20:55:00	21:08:00	0:13:00	16	0.62	1.03		
572	141	21:11:00	21:23:00	0:12:00	16	0.62	1.07		
573	321	21:26:00	21:39:00	0:13:00	14	0.68	1.24		
574	141	21:42:00	21:54:00	0:12:00	15	0.65	1.15		
575	321	21:57:00	22:10:00	0:13:00	17	0.63	1.02		
576	141	22:12:00	22:24:00	0:12:00	17	0.58	1.01		
577	321	22:28:00	22:41:00	0:13:00	17	0.59	1.02		
578	141	22:43:00	22:55:00	0:12:00	16	0.6	1.11		
579	321	22:58:00	23:11:00	0:13:00	16	0.62	1.15		

↑ Times entered are Zulu / GMT ↑		Page	1	Verify S-Turns After Mission	Yes X No	

Additional Comments:

Drive #

A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	2/14/2018	45	18CA-1002A	Mission 16	CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
Other	N69622	6224.7	17:54:00	1:54:00	
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
KNIGHT	Galaxy	6227.6	21:09:00	5:09:00	N/A

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	PRB
330/10	10		Clear	16	-3	3008		Arriving	PRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	High	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode	Pre-Trigger Dist.
155	##	5200	Ft		Ft	Yes		No	X	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	2:00:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
533	321	2:21:00	2:34:00	0:13:00	18	0.51	0.93		
532	141	2:36:00	2:49:00	0:13:00	16	0.55	1.01		
531	321	2:52:00	3:04:00	0:12:00	16	0.55	1.01		
530	141	3:07:00	3:20:00	0:13:00	17	0.54	0.98		
529	321	3:22:00	3:35:00	0:13:00	15	0.59	1.09		
528	141	3:38:00	3:50:00	0:12:00	15	0.58	0.99		
487	321	3:56:00	4:09:00	0:13:00	15	0.73	1.25		
486	141	4:12:00	4:24:00	0:12:00	14	0.66	1.11		
485	321	4:26:00	4:39:00	0:13:00	13	0.7	1.19		
484	141	4:41:00	4:54:00	0:13:00	12	0.86	1.64		
↑ Times entered are Zulu / GMT ↑			Page		1			Verify S-Turns After Mission	Yes X No

Additional Comments:

Drive #

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Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	2/15/2018	46	18CA-1002A	Mission 17	CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
Other	N69622	6227.6	13:16:00	21:16:00	
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
KNIGHT	Galaxy	6232.4	18:30:00	2:30:00	N/A

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	PRB
070/09	10		Clear	18	-1	3017		Arriving	PRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	High	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode	Pre-Trigger Dist.
155	kts	5200	Ft		Ft	Yes		No	X	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	21:25:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
483	321	21:45:00	21:58:00	0:13:00	16	0.62	1.09		
482	141	22:01:00	22:14:00	0:13:00	17	0.58	1.01		
481	321	22:16:00	22:29:00	0:13:00	16	0.65	1.18		
480	141	22:32:00	22:45:00	0:13:00	16	0.62	1.2		
479	321	22:47:00	23:01:00	0:14:00	17	0.6	1.2		
478	141	23:03:00	23:16:00	0:13:00	17	0.6	1.2		
477	321	23:18:00	23:31:00	0:13:00	18	0.55	1.04		
476	141	23:34:00	23:46:00	0:12:00	17	0.57	1.15		
475	321	23:49:00	0:02:00	0:13:00	17	0.53	1.09		
474	141	0:04:00	0:16:00	0:12:00	18	0.51	1.03		
473	321	0:19:00	0:32:00	0:13:00	20	0.52	0.96		
472	141	0:34:00	0:46:00	0:12:00	19	0.52	1.06		
471	321	0:49:00	1:01:00	0:12:00	18	0.54	1.09		
470	141	1:03:00	1:15:00	0:12:00	17	0.58	1.21		
469	321	1:18:00	1:31:00	0:13:00	17	0.61	1.25		
468	141	1:33:00	1:45:00	0:12:00	17	0.62	1.16		
467	321	1:48:00	1:59:00	0:11:00	16	0.65	1.13		
466	141	2:02:00	2:13:00	0:11:00	20	0.51	0.87		
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes X No

Additional Comments:

Drive #: A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	2/16/2018	47	18CA-1002A	Mission 18	CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
Other	N69622	6232.4	10:22:00	18:22:00	
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
KNIGHT	Galaxy	6237.1	15:33:00	23:33:00	N/A

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
290/03	10		Clear	12	-3	3025		Departing	PRB
								Arriving	PRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	High	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode	Pre-Trigger Dist.	
155	kts	5200	Ft		Ft	Yes		No	X	@ NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	18:28:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
465	321	19:01:00	19:13:00	0:12:00	16	0.59	0.98		
464	141	19:15:00	19:26:00	0:11:00	16	0.59	0.94		
463	321	19:28:00	19:39:00	0:11:00	14	0.66	1.08		
462	141	19:41:00	19:52:00	0:11:00	14	0.66	1.15		
461	321	19:54:00	20:06:00	0:12:00	14	0.7	1.22		
460	141	20:08:00	20:18:00	0:10:00	16	0.62	1.04		
459	321	20:21:00	20:32:00	0:11:00	17	0.58	0.95		
458	141	20:34:00	20:44:00	0:10:00	16	0.59	1.02		
457	321	20:47:00	20:58:00	0:11:00	16	0.6	1.04		
456	141	21:00:00	21:10:00	0:10:00	14	0.66	1.22		
455	321	21:37:00	21:49:00	0:12:00	17	0.59	1.01		
454	141	21:51:00	22:01:00	0:10:00	17	0.57	0.96		
453	321	22:03:00	22:15:00	0:12:00	16	0.6	1.03		
452	141	22:17:00	22:27:00	0:10:00	16	0.64	1.17		
451	321	22:30:00	22:41:00	0:11:00	16	0.61	1.18		
450	141	22:43:00	22:53:00	0:10:00	17	0.59	1.17		
449	321	22:56:00	23:07:00	0:11:00	17	0.59	1.18		
448	141	23:09:00	23:14:00	0:05:00	18	0.55	1.04		
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes X No

Additional Comments:

Drive #

A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	2/16/2018	47	18CA-1002A	Mission 19	CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
Other	N69622	6237.1	16:33:00	0:33:00	
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
KNIGHT	Galaxy	6240.1	19:57:00	3:57:00	N/A

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	PRB
090/12	10		Clear	19	-5	3011		Arriving	PRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	High	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode	Pre-Trigger Dist.
155	kts	5200	Ft		Ft	Yes		No	X	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At: 0:39:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission Yes X No
447	321	1:10:00	1:16:00	0:06:00	17	0.59	1.31	
446	141	1:18:00	1:23:00	0:05:00	17	0.59	1.27	
445	321	1:26:00	1:31:00	0:05:00	17	0.58	1.22	
444	141	1:34:00	1:39:00	0:05:00	17	0.59	1.15	
443	321	1:41:00	1:46:00	0:05:00	17	0.59	1.1	
442	141	1:49:00	1:53:00	0:04:00	16	0.6	1.1	
441	321	1:56:00	2:00:00	0:04:00	18	0.57	1.04	
440	141	2:02:00	2:05:00	0:03:00	19	0.55	0.98	
439	321	2:08:00	2:11:00	0:03:00	19	0.55	0.97	
438	141	2:13:00	2:16:00	0:03:00	19	0.54	0.93	
437	321	2:18:00	2:21:00	0:03:00	16	0.61	1.07	
436	141	2:23:00	2:26:00	0:03:00	16	0.61	1.07	
435	321	2:29:00	2:32:00	0:03:00	17	0.58	1.01	
434	141	2:34:00	2:37:00	0:03:00	16	0.61	1.08	
433	321	2:39:00	2:42:00	0:03:00	15	0.64	1.16	
432	141	2:45:00	2:48:00	0:03:00	15	0.63	1.15	
431	321	2:50:00	2:53:00	0:03:00	16	0.6	1.07	
430	141	2:56:00	2:59:00	0:03:00	16	0.6	1.07	
429	321	3:01:00	3:04:00	0:03:00	17	0.6	1.06	
428	141	3:06:00	3:09:00	0:03:00	17	0.59	1.05	
427	321	3:11:00	3:14:00	0:03:00	16	0.63	1.15	
426	141	3:16:00	3:19:00	0:03:00	15	0.65	1.21	
425	321	3:21:00	3:24:00	0:03:00	15	0.64	1.2	
424	141	3:26:00	3:28:00	0:02:00	15	0.64	1.19	
423	321	3:31:00	3:32:00	0:01:00	15	0.64	1.18	
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission Yes X No

Additional Comments:

Drive #

A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	2/21/2018	52	18CA-1002A	Mission 21	CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
Other	N69622	6242.3	12:47:00	20:47:00	
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
KNIGHT	Galaxy	6245.7	16:33:00	0:33:00	N/A

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
CALM	10		SCT	12		3012		Departing	KIC
								Arriving	KIC

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	High	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode	Pre-Trigger Dist.	
155	kts	5200	Ft		Ft	Yes		No	X	@ NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	20:52:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
355	314	21:17:00	21:32:00	0:15:00	16	0.59	1		
380	134	21:42:00	22:03:00	0:21:00	16	0.61	1.12		
381	314	22:06:00	22:27:00	0:21:00	16	0.57	1.13		
382	134	22:29:00	22:50:00	0:21:00	17	0.52	1.07		
383	314	22:52:00	23:13:00	0:21:00	19	0.48	0.96		
384	134	23:15:00	23:35:00	0:20:00	17	0.5	1.07		
385	314	23:37:00	23:58:00	0:21:00	18	0.47	0.96		
386	134	0:00:00	0:19:00	0:19:00	20	0.46	0.93		

↑ Times entered are Zulu / GMT ↑		Page	1	Verify S-Turns After Mission	Yes X No	

Additional Comments:

Drive #: A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	3/4/2018	63	18CA-1002A	Mission 22	CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
Other	N69622	6246.1	12:49:00	20:49:00	
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
KNIGHT	Galaxy	6247.5	14:44:00	22:44:00	N/A

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
300/10	10		SCT	12	3	3033		Departing	KIC
								Arriving	KIC

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	High	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
155	kts	5200	Ft		Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	20:54/21:38
		↕ Times entered are Zulu / GMT ↕						Verify S-Turns Before Mission	Yes X No
303		21:21:00	21:21:00	0:00:00				LASER DID NOT FIRE	
303		21:24:00	21:24:00	0:00:00				LASER DID NOT FIRE	
303		21:27:00	21:28:00	0:01:00				LASER DID NOT FIRE	
304		21:32:00	21:32:00	0:00:00				LASER DID NOT FIRE	
X	X	X	X		X	X	X	*SYSTEM REBOOT*	
TEST	X	21:48:00	21:48:00	0:00:00				LASER FUNCTIONAL	
303	141	21:51:00	21:52:00	0:01:00	17	0.56	1.15		
302	321	21:55:00	21:56:00	0:01:00	17	0.53	1.05		
301	141	21:59:00	22:01:00	0:02:00	17	0.53	1.05		
300	321	22:04:00	22:06:00	0:02:00	18	0.53	1.03		
299	141	22:13:00	22:15:00	0:02:00	18	0.53	1.02		
298	321	22:19:00	22:21:00	0:02:00	18	0.53	1.01		

↑ Times entered are Zulu / GMT ↑		Page	1	Verify S-Turns After Mission	Yes X No	

Additional Comments:

Drive #: A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	3/5/2018	64	18CA-1002A	Mission 23	CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
Other	N69622	6247.5	9:58:00	17:58:00	
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
BESSELMAN	Galaxy	6252.4	15:15:00	23:15:00	N/A

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	MRY
030/10	10		CLEAR	13	2	3025		Arriving	MRY

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	High	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode	Pre-Trigger Dist.
155	kts	5200	Ft		Ft	Yes		No	X	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At: 18:04:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission Yes X No
305	134	18:42:00	18:43:00	0:01:00	15	0.6	1.06	
306	314	18:46:00	18:47:00	0:01:00	15	0.6	1.05	
307	134	18:51:00	18:53:00	0:02:00	14	0.64	1.16	
308	314	18:56:00	18:58:00	0:02:00	15	0.62	1.09	
309	134	19:01:00	19:04:00	0:03:00	16	0.59	1.01	
310	314	19:07:00	19:09:00	0:02:00	15	0.61	1.05	
311	134	19:13:00	19:16:00	0:03:00	15	0.61	1.04	
312	314	19:19:00	19:22:00	0:03:00	16	0.57	0.97	
313	134	19:25:00	19:28:00	0:03:00	16	0.57	0.97	
314	314	19:31:00	19:34:00	0:03:00	16	0.58	1.01	
315	134	19:38:00	19:42:00	0:04:00	16	0.59	1.02	
316	314	19:45:00	19:49:00	0:04:00	15	0.58	1	
317	134	19:51:00	19:55:00	0:04:00	15	0.59	1.01	
318	314	19:59:00	20:03:00	0:04:00	14	0.65	1.16	
319	134	20:06:00	20:10:00	0:04:00	15	0.63	1.1	
320	314	20:13:00	20:18:00	0:05:00	15	0.63	1.11	
321	134	20:21:00	20:25:00	0:04:00	16	0.56	0.93	
322	314	20:28:00	20:33:00	0:05:00	16	0.55	0.93	
323	134	20:36:00	20:41:00	0:05:00	17	0.56	0.95	
324	314	20:44:00	20:49:00	0:05:00	17	0.54	0.94	
325	134	20:52:00	20:57:00	0:05:00	17	0.54	0.96	
326	314	21:00:00	21:06:00	0:06:00	16	0.57	1.05	
327	134	21:09:00	21:21:00	0:12:00	16	0.55	1.13	
328	314	21:23:00	21:36:00	0:13:00	16	0.55	1.15	
329	134	21:40:00	21:53:00	0:13:00	17	0.54	1.14	
330	314	21:56:00	22:09:00	0:13:00	18	0.49	0.95	
331	134	22:12:00	22:25:00	0:13:00	18	0.5	0.99	
332	314	22:28:00	22:41:00	0:13:00	17	0.51	1.03	
333	134	22:45:00	22:51:00	0:06:00	18	0.5	1	LINE BREAK- LATERAL DEVIATION
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission Yes X No

Additional Comments:

Drive #: A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	3/5/2018	64	18CA-1002A	Mission 24	CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
Other	N69622	6252.4	16:01:00	0:01:00	
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
BESSELMAN	Galaxy	6254.0	18:05:00	2:05:00	N/A

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
310/4	10		CLEAR	16	3	3015		Departing	MRY
								Arriving	MRY

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	High	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
155	kts	5200	Ft		Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	0:08:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
297	141	0:29:00	0:31:00	0:02:00				BAD RANGE READING	
297	321	0:35:00	0:37:00	0:02:00	16	0.63	1.16		
296	141	0:39:00	0:42:00	0:03:00	16	0.63	1.12		
295	321	0:45:00	0:48:00	0:03:00	19	0.52	0.9		
294	141	0:50:00	0:54:00	0:04:00	20	0.5	0.86		
293	321	0:56:00	1:00:00	0:04:00	19	0.52	0.88		
249	135	1:04:00	1:13:00	0:09:00	18	0.54	0.91		
248	315	1:15:00	1:23:00	0:08:00	17	0.55	0.94		
247	135	1:26:00	1:35:00	0:09:00	15	0.59	1		
246	315	1:37:00	1:46:00	0:09:00	16	0.59	0.99		
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes X No

Additional Comments:

Drive #

A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	3/6/2018	65	18CA-1002A	Mission 25	CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
Other	N69622	6254.0	9:51:00	17:51:00	
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
BESSELMAN	Galaxy	6259.8	16:02:00	0:02:00	N/A

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	MRY
CALM	10		CLEAR	17	3	3010		Arriving	MRY

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	High	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode	Pre-Trigger Dist.
155	kts	5200	Ft		Ft	Yes		No	X	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	17:56:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
333	134	18:30:00	18:41:00	0:11:00	14	0.67	1.28		
334	314	18:43:00	18:57:00	0:14:00	15	0.66	1.21		
335	134	18:59:00	19:14:00	0:15:00	16	0.57	0.99		
336	314	19:17:00	19:17:00	0:00:00				BROKE OFF AT START	
336	314	19:19:00	19:32:00	0:13:00	16	0.56	1.03		
337	134	19:36:00	19:51:00	0:15:00	15	0.59	1.11		
338	314	19:54:00	20:08:00	0:14:00	14	0.63	1.23		
339	134	20:11:00	20:26:00	0:15:00	16	0.58	1.04		
340	314	20:28:00	20:43:00	0:15:00	18	0.54	0.94		
341	134	20:46:00	21:01:00	0:15:00	17	0.56	0.98		
342	314	21:04:00	21:19:00	0:15:00	17	0.58	1.04		
343	134	21:22:00	21:38:00	0:16:00	18	0.56	1.03		
344	314	21:41:00	21:56:00	0:15:00	17	0.56	1.11		
345	134	21:59:00	22:15:00	0:16:00	19	0.49	0.95		
346	314	22:17:00	22:32:00	0:15:00	17	0.52	1.11		
347	134	22:35:00	22:52:00	0:17:00	18	0.49	1.03		
348	314	22:54:00	23:09:00	0:15:00	19	0.46	1		
349	134	23:12:00	23:29:00	0:17:00	20	0.48	0.98		
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes X No

Additional Comments:

Drive #

A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	3/6/2018	65	18CA-1002A	Mission 26	CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
Other	N69622	6259.8	17:46:00	1:46:00	
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
BESSELMAN	Galaxy	6263.1	21:31:00	5:31:00	N/A

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
280/7	10		CLEAR	17	-1	3004		Departing	MRY
								Arriving	MRY

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	High	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
155	kts	5200	Ft		Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	17:56:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
421	134	2:17:00	2:19:00	0:02:00				BAD LINE	
421	134	2:19:00	2:19:00	0:00:00				BAD LINE	
421	134	2:24:00	2:34:00	0:10:00	15	0.68	1.24	NORTH EXTENDED ABOVE TIE	
420	314	2:37:00	2:46:00	0:09:00	15	0.68	1.21		
419	134	2:50:00	3:00:00	0:10:00	13	0.74	1.34	LINE BROKEN	
419	134	3:00:00	3:01:00	0:01:00				BAD LINE	
419	134	3:04:00	3:07:00	0:03:00	13	0.76	1.34	PICK UP	
418	314	3:09:00	3:20:00	0:11:00	13	0.67	1.06		
417	134	3:24:00	3:38:00	0:14:00	12	0.86	1.5		
416	314	3:40:00	3:53:00	0:13:00	13	0.82	1.37		
415	134	3:56:00	4:13:00	0:17:00	15	0.62	1		
414	314	4:15:00	4:30:00	0:15:00	15	0.6	1.01		
413	134	4:32:00	4:50:00	0:18:00	16	0.58	1.01		
412	314	4:52:00	5:07:00	0:15:00	16	0.59	1.05		

↑ Times entered are Zulu / GMT ↑		Page	1	Verify S-Turns After Mission	Yes X No	
Additional Comments:						Drive #
						A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	3/7/2018	66	18CA-1002A	Mission 27	CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
Other	N69622	6263.0	10:31:00	18:31:00	
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
BESSELMAN	Galaxy	6268.7	16:31:00	0:31:00	N/A

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	MRY
290/8	10		CLEAR	13	4	3005		Arriving	MRY

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	High	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
155	kts	5200	Ft		Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	18:36:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
350	134	19:02:00	19:19:00	0:17:00	16	0.59	1.02		
351	314	19:22:00	19:38:00	0:16:00	16	0.61	1.09		
352	134	19:41:00	19:58:00	0:17:00	14	0.62	1.1		
353	314	20:02:00	20:19:00	0:17:00	16	0.6	1.05		
354	134	20:21:00	20:40:00	0:19:00	16	0.62	1.11		
356	314	20:43:00	21:00:00	0:17:00	17	0.59	1.05		
357	134	21:03:00	21:21:00	0:18:00	17	0.62	1.18		
358	314	21:24:00	21:41:00	0:17:00	17	0.61	1.22		
359	134	21:44:00	22:02:00	0:18:00	18	0.56	1.02		
360	314	22:05:00	22:22:00	0:17:00	18	0.53	1		
361	134	22:25:00	22:43:00	0:18:00	17	0.53	1.05		
362	314	22:46:00	23:03:00	0:17:00	18	0.5	1.01		
363	134	23:07:00	23:25:00	0:18:00	19	0.52	1.03		
364	314	23:27:00	23:45:00	0:18:00	18	0.53	1.06		
355	134	23:49:00	23:57:00	0:08:00	17	0.59	1.24	PICK UP	
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes X No

Additional Comments:

Drive #

A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	3/11/2017	70	18CA-1002A	Mission 28	CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
Other	N69622	6268.7	11:06:00	18:06:00	
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
BESSELMAN	Galaxy	6271.1	14:01:00	21:01:00	N/A

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
300/3	10		CLEAR	16	11	3010		Departing	MRY
								Arriving	MRY

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	High	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
155	kts	5200	Ft		Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	18:13:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
1	288	19:19:00	19:22:00	0:03:00	14	0.65	1.1		
2	108	19:25:00	19:29:00	0:04:00	14	0.65	1.11		
3	288	19:31:00	19:36:00	0:05:00	13	0.67	1.17		
4	108	19:39:00	19:43:00	0:04:00	13	0.68	1.19		
5	288	19:47:00	19:51:00	0:04:00	14	0.64	1.1		
6	108	19:55:00	20:00:00	0:05:00	15	0.59	0.99		
7	288	20:02:00	20:07:00	0:05:00	15	0.6	1.01		
8	108	20:10:00	20:15:00	0:05:00	16	0.59	1.01		
9	288	20:18:00	20:22:00	0:04:00	15	0.62	1.08		
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes X No

Additional Comments:

Drive #

A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	3/19/2018	78	18CA-1002		CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
BENTLEY	N69622	6271.1	10:09:00	17:09:00	MRY
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
BESSELMAN	GALAXY	6275.1	14:37:00	21:37:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	MRY
CALM	10		CLEAR	13	3	3010		Arriving	MRY

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	HIGH	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
155	Kts	5200	Ft		Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	17:16:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
297	141			0:00:00				LASER DID NOT START	
297	141			0:00:00				LASER WORKED - BAD LINE	
297	141	17:46:00	17:49:00	0:03:00	14	0.64	1.13	LASER STARTED LATE OVER WATER	
296	321	17:52:00	17:54:00	0:02:00	14	0.64	1.11		
295	141	17:57:00	18:01:00	0:04:00	15	0.7	1.2		
294	321	18:04:00	18:07:00	0:03:00	16	0.68	1.11		
293	141	18:09:00	18:13:00	0:04:00	16	0.69	1.11		
292	321	18:16:00	18:20:00	0:04:00	17	0.63	0.97		
291	141	18:23:00	18:28:00	0:05:00	16	0.62	0.94		
290	321	18:31:00	18:35:00	0:04:00	17	0.6	0.91		
289	141	18:38:00	18:43:00	0:05:00	16	0.61	0.93		
288	321	18:46:00	18:51:00	0:05:00	15	0.64	1.04		
287	141	18:54:00	19:01:00	0:07:00	14	0.67	1.12		
286	321	19:03:00	19:09:00	0:06:00	14	0.68	1.14		
285	141	19:12:00	19:18:00	0:06:00	15	0.63	1.06		
284	321	19:21:00	19:27:00	0:06:00	14	0.63	1.15		
283	141	19:30:00	19:37:00	0:07:00	16	0.61	1.04		
282	321	19:40:00	19:46:00	0:06:00	16	0.61	1.03		
281	141	19:49:00	19:50:00	0:01:00				BAD LINE	
281	141	19:50:00	19:50:00	0:00:00				BAD LINE	
281	141	19:53:00	20:01:00	0:08:00	17	0.55	0.95		
280	321	20:04:00	20:11:00	0:07:00	16	0.56	1.01		
279	141	20:13:00	20:22:00	0:09:00	16	0.55	1.02		
278	321	20:24:00	20:32:00	0:08:00	16	0.53	1.01		
277	141	20:35:00	20:43:00	0:08:00	17	0.52	1.02		
276	321	20:46:00	20:54:00	0:08:00	17	0.52	1.04		
275	141	20:57:00	21:01:00	0:04:00	17	0.46	0.6	NORTHERN HALF	
275	141	21:02:00	21:02:00	0:00:00				BAD LINE	
275	141	21:04:00	21:09:00	0:05:00	18	0.46	0.6	SOUTHERN HALF	
274	321	21:12:00	21:20:00	0:08:00	17	0.47	0.61		
TIE	199	21:22:00	21:23:00	0:01:00	16	0.48	1.01	NON-PLANNED TIE	
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes X No

Additional Comments:

Drive #

A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	3/19/2018	78	18CA-1002		CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
BENTLEY	N69622	6275.1	15:27:00	22:27:00	MRY
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
BESSELMAN	GALAXY	6278.5	19:12:00	2:12:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	MRY
230/9	10		CLEAR	18	3	3003		Arriving	MRY

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	HIGH	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
155	Kts	5200	Ft		Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	22:31:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
273	141			0:00:00				LASER DID NOT START	
273	141	22:58:00	23:07:00	0:09:00	17	0.53	1.17	GAP BETWEEN LINES ON S. END	
PICKUP	141	23:11:00	23:13:00	0:02:00	17	0.53	1.13	GAP COVERAGE PICKUP	
272	321	23:17:00	23:24:00	0:07:00	17	0.53	1.07		
271	141	23:27:00	23:36:00	0:09:00	17	0.54	0.99		
270	321	23:39:00	23:47:00	0:08:00	17	0.55	0.94		
269	141	23:50:00	23:59:00	0:09:00	19	0.47	0.8		
268	321	0:02:00	0:10:00	0:08:00	20	0.47	0.81		
267	141	0:13:00	0:21:00	0:08:00	18	0.56	0.96		
266	321	0:24:00	0:32:00	0:08:00	16	0.58	0.95		
265	141	0:35:00	0:44:00	0:09:00	15	0.59	1.05		
264	321	0:47:00	0:55:00	0:08:00	17	0.57	1.02		
263	141	0:59:00	1:08:00	0:09:00	16	0.62	1.17		
262	321	1:11:00	1:19:00	0:08:00	15	0.64	1.26		
261	141	1:22:00	1:30:00	0:08:00	15	0.64	1.21		
260	321	1:33:00	1:40:00	0:07:00	16	0.62	1.11		
259	141	1:43:00	1:50:00	0:07:00	16	0.63	1.06		
258	321	1:53:00	1:59:00	0:06:00	14	0.69	1.23		
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes X No

Additional Comments:

Drive #

A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	3/26/2018	85	18CA-1002		CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
BENTLEY	N69622	6278.5	11:19:00	18:19:00	MRY
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
BESSELMAN	GALAXY	6283.9	17:06:00	0:06:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	MRY
260/10	10		CLEAR	13	4	3023		Arriving	MRY

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	HIGH	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
155	Kts	5200	Ft		Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	18:26:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
10	108	18:59:00	18:59:00	0:00:00				BAD LINE	
10	108	19:03:00	19:08:00	0:05:00	16	0.6	107		
11	288	19:11:00	19:16:00	0:05:00	18	0.55	0.95		
12	108	19:18:00	19:24:00	0:06:00	17	0.54	0.95		
13	288	19:26:00	19:32:00	0:06:00	17	0.55	0.97		
14	108	19:35:00	19:40:00	0:05:00	16	0.58	1.03		
15	288	19:43:00	19:48:00	0:05:00	16	0.58	1.06		
16	108	19:51:00	19:56:00	0:05:00	16	0.59	1.1		
87	288	20:16:00	20:16:00	0:00:00	17	0.55	1.06		
86	108	20:19:00	20:20:00	0:01:00	17	0.55	1.06		
85	108	20:25:00	20:31:00	0:06:00	18	0.51	0.98		
84	288	20:34:00	20:40:00	0:06:00	18	0.5	0.95		
83	108	20:43:00	20:50:00	0:07:00	17	0.5	0.97		
82	288	20:54:00	21:02:00	0:08:00	18	0.51	1.01		
81	108	21:05:00	21:14:00	0:09:00	17	0.52	1.06		
80	288	21:17:00	21:28:00	0:11:00	19	0.48	0.95		
79	108	21:31:00	21:42:00	0:11:00	19	0.48	0.96		
252	141	21:56:00	21:56:00	0:00:00				BAD LINE	
252	141	21:58:00	22:05:00	0:07:00	20	0.47	0.94		
253	321	22:09:00	22:16:00	0:07:00	19	0.5	1.02		
254	141	22:18:00	22:25:00	0:07:00	19	0.51	1.05		
255	321	22:28:00	22:36:00	0:08:00	18	0.53	1.15		
256	141	22:38:00	22:45:00	0:07:00	18	0.53	1.1		
257	321	22:47:00	22:55:00	0:08:00	18	0.52	1.05		
245	141	23:03:00	23:11:00	0:08:00	18	0.52	0.98		
244	321	23:13:00	23:22:00	0:09:00	18	0.49	0.89		
243	141	23:25:00	23:32:00	0:07:00	18	0.5	0.88	CLOUD 10 MI. FROM S. END	
251-TIE	48	23:36:00	23:44:00	0:08:00	19	0.49	0.86		
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes X No

Additional Comments:

Drive #

A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	3/27/2018	86	18CA-1002		CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
BENTLEY	N69622	6283.9	11:26:00	18:26:00	MRY
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
BESSELMAN	GALAXY	6289.8	17:44:00	0:44:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	MRY
300/4	10		CLEAR	16	4	3026		Arriving	MRY

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	HIGH	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
155	Kts	5200	Ft		Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	18:31:00
		↕ Times entered are Zulu / GMT ↕						Verify S-Turns Before Mission	Yes X No
304-TIE	54	18:54:00	18:55:00	0:01:00				BAD LINE	
304-TIE	54	18:55:00	18:56:00	0:01:00				TEST	
304-TIE	54	19:00:00	19:07:00	0:07:00	16	0.6	1.07		
200	135	19:10:00	19:19:00	0:09:00	16	0.61	1.1		
201	315	19:22:00	19:31:00	0:09:00	17	0.57	1.01		
202	135	19:34:00	19:43:00	0:09:00	16	0.64	1.16		
203	315	19:45:00	19:55:00	0:10:00	16	0.62	1.17		
204	135	19:57:00	20:06:00	0:09:00	16	0.62	1.23		
205	315	20:08:00	20:18:00	0:10:00	17	0.6	1.19		
206	135	20:20:00	20:29:00	0:09:00	17	0.59	1.2		
207	315	20:32:00	20:42:00	0:10:00	18	0.54	1.03		
208	135	20:46:00	20:55:00	0:09:00	17	0.55	1.09		
209	315	20:58:00	21:08:00	0:10:00	17	0.54	1.15		
210	135	21:11:00	21:20:00	0:09:00	18	0.49	1		
211	315	21:23:00	21:33:00	0:10:00	18	0.48	1.02		
212	135	21:36:00	21:44:00	0:08:00	21	0.45	0.92		
213	315	21:48:00	21:57:00	0:09:00	20	0.47	0.96		
214	135	22:00:00	22:09:00	0:09:00	20	0.47	0.96		
215	315	22:12:00	22:22:00	0:10:00	19	0.48	0.98		
216	135	22:25:00	22:33:00	0:08:00	18	0.5	0.99		
217	315	22:36:00	22:46:00	0:10:00	18	0.53	1.07		
218	135	22:49:00	22:57:00	0:08:00	18	0.54	1.03		
219	315	23:01:00	23:11:00	0:10:00	18	0.55	0.97		
220	135	23:14:00	23:22:00	0:08:00	20	0.5	0.85		
221	315	23:25:00	23:35:00	0:10:00	20	0.5	0.84		
222	135	23:38:00	23:47:00	0:09:00	18	0.54	0.93		
223	315	23:50:00	0:00:00	0:10:00	15	0.61	1.07		
224	135	0:03:00	0:12:00	0:09:00	15	0.58	1.06		
225	315	0:15:00	0:25:00	0:10:00	17	0.54	0.97		
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes X No

Additional Comments:

Drive #: A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	3/30/2018	89	18CA-1002		CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
BENTLEY	N69622	6289.8	10:29:00	17:29:00	MRY
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
BESSELMAN	GALAXY	6293.8	14:50:00	21:50:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	MRY
CALM	10		CLEAR	20	9	3008		Arriving	MRY

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	HIGH	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
155	Kts	5200	Ft		Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	17:35:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
242	135	17:57:00	18:05:00	0:08:00	15	0.69	1.21		
243	315	18:08:00	18:13:00	0:05:00	14	0.75	1.33	PICK UP LINE	
250	135	18:16:00	18:17:00	0:01:00	14	0.76	1.35		
241	315	18:21:00	18:28:00	0:07:00	15	0.71	1.21		
240	135	18:32:00	18:40:00	0:08:00	15	0.7	1.2		
239	315	18:43:00	18:52:00	0:09:00	16	0.67	1.13		
238	135	18:54:00	19:03:00	0:09:00	18	0.58	0.94		
237	315	19:05:00	19:14:00	0:09:00	17	0.6	0.99		
236	135	19:16:00	19:25:00	0:09:00	15	0.68	1.19		
235	315	19:28:00	19:36:00	0:08:00	17	0.63	1.1		
234	135	19:39:00	19:48:00	0:09:00	17	0.61	1.1		
233	315	19:50:00	19:59:00	0:09:00	17	0.59	1.12		
232	135	20:01:00	20:02:00	0:01:00				ATC DIVERTED	
232	135	20:07:00	20:16:00	0:09:00	17	0.58	1.16		
231	315	20:19:00	20:27:00	0:08:00	18	0.54	1.04		
230	135	20:30:00	20:38:00	0:08:00	18	0.53	1.04		
229	315	20:41:00	20:49:00	0:08:00	18	0.55	1.1		
228	135	20:52:00	21:01:00	0:09:00	17	0.56	1.15		
227	315	21:03:00	21:12:00	0:09:00	19	0.52	1.01		
226	135	21:14:00	21:23:00	0:09:00	19	0.52	1.03		
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes X No

Additional Comments:

Drive #

A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	3/30/2018	89	18CA-1002		CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
BENTLEY	N69622	6293.8	16:22:00	23:22:00	MRY
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
BESSELMAN	GALAXY	6296.5	19:31:00	2:31:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	MRY
220/11	10		CLEAR	25	9	3003		Arriving	MRY

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	HIGH	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
155	Kts	5200	Ft		Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	23:28:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
411	134	23:49:00	23:49:00	0:00:00				BAD LINE - NO RANGE	
411	134	23:52:00	0:08:00	0:16:00	16	0.56	0.98		
410	314	0:11:00	0:27:00	0:16:00	16	0.6	1.05		
409	134	0:29:00	0:46:00	0:17:00	15	0.66	1.15		
408	314	0:48:00	1:04:00	0:16:00	15	0.74	1.28		
407	134	1:07:00	1:23:00	0:16:00	14	0.74	1.24		
406	314	1:26:00	1:42:00	0:16:00	13	0.76	1.23		
405	134	1:44:00	2:00:00	0:16:00	12	0.92	1.66		
404	314	2:03:00	2:19:00	0:16:00	13	0.86	1.48		

↑ Times entered are Zulu / GMT ↑		Page	1	Verify S-Turns After Mission	Yes X No	

Additional Comments:

Drive #

A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	3/31/2018	90	18CA-1002		CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
BENTLEY	N69622	6296.7	12:22:00	19:22:00	MRY
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
BESSELMAN	GALAXY	6301.9	18:04:00	1:04:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	MRY
310/5	10		CLEAR	16	12	3007		Arriving	MRY

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	HIGH	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
155	Kts	5200	Ft		Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	19:32:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
387	134	19:58:00	20:16:00	0:18:00	17	0.56	1.15		
388	314	20:19:00	20:34:00	0:15:00	18	0.52	1.05	EYESAFE SHUTOFF	
388	314	20:38:00	20:45:00	0:07:00	16	0.56	1.19		
TIE	62	20:48:00	20:48:00	0:00:00	16	0.55	1.21	NONPLANNED TIE FOR 388	
389	134	20:52:00	21:10:00	0:18:00	18	0.52	1.07		
390	314	21:13:00	21:33:00	0:20:00	21	0.49	0.98		
365	134	21:38:00	21:56:00	0:18:00	20	0.53	1.06		
366	314	21:59:00	22:19:00	0:20:00	18	0.59	1.22		
367	134	22:22:00	22:41:00	0:19:00	18	0.57	1.08		
368	314	?	?					MULTIPLE ISSUES	
								SYSTEM REBOOT	
TEST		23:09:00	23:09:00	0:00:00				LASER FUNCTIONAL	
368	134	23:20:00	23:38:00	0:18:00	17	0.53	0.95		
369	314	23:41:00	0:02:00	0:21:00	15	0.6	1.11		
370	134	0:04:00	0:23:00	0:19:00	16	0.63	1.16		
371	314	0:26:00	0:47:00	0:21:00	15	0.66	1.17	CLOUDS AT NORTH END	

↑ Times entered are Zulu / GMT ↑		Page	1	Verify S-Turns After Mission	Yes X No	

Additional Comments:

ON LINE 368 - EYESAFETY SHUTOFF, TZERO DROPOUT, SENSOR CARRIER BUFFER INDEX ERROR, HSDA CANNOT COMMUNICATE WITH SN LASER, CARRIER IF BUFFER OVERWRITTEN, HSDA CANNOT CONFIRM STOP COMMAND - LAST POS FILE FOR FIRST HALF IS .761, FIRST POS FILE FOR SECOND HALF IS .762 - GPS BEGAN LOGGING FOR SECOND HALF: 23:01

Drive #: A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	3/31/2018	90	18CA-1002		CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
BENTLEY	N69622	6301.9	19:20:00	2:25:00	MRY
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
BESSELMAN	GALAXY	6304.8	22:39:00	5:39:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	MRY
260/6	10		CLEAR	14	10	3003		Arriving	MRY

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	HIGH	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
155	Kts	5200	Ft		Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	2:25:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
17	108	2:57:00	3:02:00	0:05:00	15	0.7	1.16		
18	288	3:05:00	3:11:00	0:06:00	16	0.65	1.05		
19	108	3:13:00	3:19:00	0:06:00	16	0.65	1.05		
20	288	3:22:00	3:26:00	0:04:00	15	0.62	1.03	BROKE EARLY FOR TRAFFIC	
20	288	3:29:00	3:32:00	0:03:00	16	0.59	1	PICK UP	
21	108	3:34:00	3:40:00	0:06:00	15	0.59	1.02		
22	288	3:43:00	3:52:00	0:09:00	16	0.57	1.03		
23	108	3:54:00	4:03:00	0:09:00	16	0.55	1.02		
24	288	4:06:00	4:16:00	0:10:00	16	0.54	1.04		
25	108	4:19:00	4:27:00	0:08:00	16	0.54	1.1		
26	288	4:30:00	4:41:00	0:11:00	17	0.52	1.09		
27	108	4:44:00	4:44:00	0:00:00				TRAFFIC UNDERNEATH	
27	108	4:53:00	5:03:00	0:10:00	17	0.5	1.16		
↑ Times entered are Zulu / GMT ↑			Page		1			Verify S-Turns After Mission	Yes X No

Additional Comments:

Drive #

A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	4/1/2018	91	18CA-1002		CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
BENTLEY	N69622	6304.8	13:00:00	20:00:00	MRY
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
BESSELMAN	GALAXY	6310.1	18:43:00	1:43:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	MRY
VARI/3	10		CLEAR	16	11	2996		Arriving	MRY

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	HIGH	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode	Pre-Trigger Dist.	
155	Kts	5200	Ft		Ft	Yes		No	X	@ NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	20:05:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
372	134	20:30:00	20:50:00	0:20:00	18	0.49	0.94		
373	314	20:52:00	21:14:00	0:22:00	18	0.49	0.98		
77	108	21:25:00	21:26:00	0:01:00				CLOUD	
72	108	21:31:00	21:50:00	0:19:00	20	0.48	0.99		
28	288	21:58:00	22:10:00	0:12:00	19	0.5	1.03		
29	108	22:20:00	22:37:00	0:17:00	18	0.55	1.11		
30	288	22:40:00	22:59:00	0:19:00	18	0.54	0.99		
31	108	23:01:00	23:07:00	0:06:00	18	0.59	0.89	ATC DIVERTED	
31	108	23:15:00	23:29:00	0:14:00	18	0.5	0.85	PICK UP	
32	288	23:32:00	23:51:00	0:19:00	15	0.59	1.02		
33	108	23:53:00	0:12:00	0:17:00	17	0.59	1.01		
34	288	0:14:00	0:34:00	0:20:00	15	0.68	1.24		
35	108	0:36:00	0:54:00	0:18:00	15	0.67	1.13		
36	288	0:56:00	1:16:00	0:20:00	13	0.81	1.39		
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes X No

Additional Comments:

Drive #

B

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	4/3/2018	93	18CA-1002		CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
BENTLEY	N69622	6310.1	11:03:00	18:03:00	MRY
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
BESSELMAN	GALAXY	6315.5	16:44:00	23:44:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	MRY
290/6	10		CLEAR	14	9	3003		Arriving	MRY

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	HIGH	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
155	Kts	5200	Ft		Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	18:07:00
		↕ Times entered are Zulu / GMT ↕						Verify S-Turns Before Mission	Yes X No
371	134	18:31:00	18:50:00	0:19:00	17	0.56	1.03		
374	314	18:52:00	18:52:00	0:00:00				LASER TURNED OFF - NO WARNING	
374	314	18:54:00	19:15:00	0:21:00	16	0.6	1.14		
375	134	19:17:00	19:37:00	0:20:00	16	0.56	1.08		
376	314	19:41:00	20:01:00	0:20:00	17	0.57	1.14		
377	134	20:03:00	20:23:00	0:20:00	17	0.56	1.07		
378	314	20:26:00	20:46:00	0:20:00	17	0.53	1.11		
379	134	20:48:00	21:08:00	0:20:00	18	0.5	1.08		
391	314	21:11:00	21:29:00	0:18:00	21	0.47	0.96		
392	134	21:32:00	21:50:00	0:18:00	19	0.49	1.03		
393	314	21:53:00	22:11:00	0:18:00	18	0.51	1.1		
394	134	22:14:00	22:31:00	0:17:00	18	0.52	1.06		
395	314	22:34:00	22:52:00	0:18:00	18	0.52	0.94		
396	134	22:55:00	23:12:00	0:17:00	19	0.51	0.86		
397	314	23:15:00	23:30:00	0:15:00	16	0.59	1.01	STOPPED EARLY FOR CLOUD	

↑ Times entered are Zulu / GMT ↑		Page	1	Verify S-Turns After Mission	Yes X No	
Additional Comments:						Drive #
						B

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	4/3/2018	93	18CA-1002		CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
BENTLEY	N69622	6315.5	17:38:00	0:38:00	MRY
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
BESSELMAN	GALAXY	6318.1	20:41:00	3:41:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	MRY
290/7	10		CLEAR	16	10	3001		Arriving	MRY

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	HIGH	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
155	Kts	5200	Ft		Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	0:43:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
401	134	1:01:00	1:18:00	0:17:00	14	0.67	1.08	POTENTIAL THIN CLOUD @ N. END	
400	314	1:21:00	1:36:00	0:15:00	12	0.81	1.48	STOPPED EARLY FOR CLOUD	
37	108	1:52:00	2:11:00	0:19:00	13	0.7	1.26		
38	288	2:13:00	2:32:00	0:19:00	16	0.58	1.03		
39	108	2:34:00	2:52:00	0:18:00	18	0.55	1		
40	288	2:55:00	3:13:00	0:18:00	16	0.57	1.07		

↑ Times entered are Zulu / GMT ↑		Page	1	Verify S-Turns After Mission	Yes X No	

Additional Comments:

Drive #: B

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	4/4/2018	94	18CA-1002		CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
BENTLEY	N69622	6318.1	18:06:00	1:06:00	MRY
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
BESSELMAN	GALAXY	6320.7	21:01:00	4:01:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	MRY
300/6	10		CLEAR	14	2	3008		Arriving	MRY

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	HIGH	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
155	Kts	5200	Ft		Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	1:12:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
397	134	3:31:00	3:33:00	0:02:00	16	0.55	1.04	PICK UP	
400	314	3:36:00	3:39:00	0:03:00	16	0.55	1.05	PICK UP	
TIE		3:42:00	3:43:00	0:01:00	16	0.56	1.05	NONPLANNED TIE LINE	

↑ Times entered are Zulu / GMT ↑		Page	1	Verify S-Turns After Mission	Yes X No	

Additional Comments:

Drive #

B

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	4/9/2018	99	18CA-1002		CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
BENTLEY	N69622	6323.0	10:17:00	17:17:00	MRY
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
BESSELMAN	GALAXY	6328.2	15:49:00	22:49:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	MRY
120/5	10		CLEAR	16	7	3007		Arriving	MRY

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	HIGH	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
155	Kts	5200	Ft		Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	17:23:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
271	141	17:48:00	17:56:00	0:08:00	14	0.72	1.28		
403	134	18:08:00	18:25:00	0:17:00	16	0.62	1.05		
402	314	18:28:00	18:44:00	0:16:00	16	0.59	1.01		
399	134	18:46:00	19:03:00	0:17:00	16	0.58	1.08		
398	314	19:06:00	19:19:00	0:13:00	17	0.55	1.09	EYESAFETY SHUTOFF	
398	134	19:26:00	19:34:00	0:08:00	17	0.54	1.11		
422-TIE	55	19:41:00	19:56:00	0:15:00	17	0.5	0.99		
71	288	20:05:00	20:24:00	0:19:00	18	0.51	1.05		
73	108	20:30:00	20:48:00	0:18:00	19	0.47	0.94		
74	288	20:52:00	21:07:00	0:15:00	20	0.47	0.97		
75	108	21:11:00	21:27:00	0:16:00	19	0.47	1		
76	288	21:30:00	21:34:00	0:04:00	18	0.48	1.09	BROKE FOR TRAFFIC	
76	288	21:40:00	21:51:00	0:11:00	18	0.49	1.07		
77	108	21:54:00	22:07:00	0:13:00	18	0.49	1		
78	288	22:10:00	22:22:00	0:12:00	18	0.53	1.02		
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes X No

Additional Comments:

Drive #

B

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	4/9/2018	99	18CA-1002		CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
BENTLEY	N69622	6328.2	16:27:00	23:27:00	MRY
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
BESSELMAN	GALAXY	6332.3	20:58:00	3:58:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
230/4	10		CLEAR	22	8	2997		Departing	MRY
								Arriving	MRY

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	HIGH	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
155	Kts	5200	Ft		Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	23:32:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
70	108	0:00:00	0:21:00	0:21:00	15	0.65	1.1		
69	288	0:23:00	0:44:00	0:21:00	13	0.76	1.3		
68	108	0:46:00	1:07:00	0:21:00	13	0.74	1.18		
67	288	1:10:00	1:30:00	0:20:00	13	0.84	1.4		
66	108	1:33:00	1:53:00	0:20:00	14	0.68	1.11		
65	288	1:55:00	2:16:00	0:21:00	15	0.65	1.07		
64	108	2:19:00	2:39:00	0:20:00	15	0.59	1.02		
41	288	2:45:00	3:04:00	0:19:00	16	0.58	1.04		
42	108	3:06:00	3:25:00	0:19:00	16	0.56	1.05		

↑ Times entered are Zulu / GMT ↑		Page	1	Verify S-Turns After Mission	Yes X No	
Additional Comments:						Drive #
						B

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	4/10/2018	100	18CA-1002		CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
BENTLEY	N69622	6332.3	11:43:00	18:43:00	MRY
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
BESSELMAN	GALAXY	6334.5	14:18:00	21:18:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	MRY
330/3	10		CLEAR	17	11	3010		Arriving	MRY

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	HIGH	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
155	Kts	5200	Ft		Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	18:48:00
		↕ Times entered are Zulu / GMT ↕						Verify S-Turns Before Mission	Yes X No
63	108	19:18:00	19:38:00	0:20:00	18	0.54	1.11	**FLOODED FIELDS	
62	288	19:42:00	20:04:00	0:22:00	17	0.54	1.15	**FLOODED FIELDS	
61	108	20:06:00	20:27:00	0:21:00	18	0.51	1.11	**FLOODED FIELDS	
60	288	20:30:00	20:52:00	0:22:00	20	0.49	1.05	**FLOODED FIELDS/***CLOUD	

↑ Times entered are Zulu / GMT ↑		Page	1	Verify S-Turns After Mission	Yes X No	

Additional Comments:

**FLOODED FIELDS STARTED @ 27 MILES FROM THE EAST END OF THE LINES. - ***POTENTIAL SMALL CLOUD ON LINE 60 @ 20-22 MILES FROM WEST END

Drive #: A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	4/13/2018	103	18CA-1002		CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
BENTLEY	N69622	6334.5	11:31:00	18:31:00	MRY
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
CROWTHER	GALAXY	6339.1	16:43:00	23:43:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	MRY
300/8	10		CLEAR	14	3	3041		Arriving	MRY

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	HIGH	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
155	Kts	5200	Ft		Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	18:46:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
59	288	19:22:00	19:34:00	0:12:00	17	0.58	1.08		
59	288	19:35:00	19:35:00	0:00:00				BAD LINE - **MULTIPLE ISSUES	
59	288	20:04:00	20:12:00	0:08:00	18	0.56	1.14	BROKE FOR TRAFFIC	
59	288	20:17:00	20:21:00	0:04:00	19	0.54	1.1		
58	108	20:22:00	20:43:00	0:21:00	22	0.47	0.96		
57	288	20:46:00	20:46:00	0:00:00				BAD LINE	
57	288	20:49:00	21:10:00	0:21:00	19	0.52	1.17		
56	108	21:12:00	21:32:00	0:20:00	18	0.55	1.32		
55	288	21:35:00	21:55:00	0:20:00	18	0.56	1.18		
54	108	21:57:00	22:18:00	0:21:00	19	0.51	0.92		
53	288	22:20:00	22:40:00	0:20:00	18	0.57	0.95		
52	108	22:41:00	23:02:00	0:21:00	15	0.62	1.1		
PICKUP	350	23:05:00	23:06:00	0:01:00	17	0.59	1.01	***FOR GAPS IN COVERAGE	
PICKUP	170	23:09:00	23:10:00	0:01:00	17	0.6	1.04	***FOR GAPS IN COVERAGE	
PICKUP	345	23:13:00	23:14:00	0:01:00	17	0.62	1.06	***FOR GAPS IN COVERAGE	
PICKUP	180	23:16:00	23:18:00	0:02:00	17	0.62	1.05	***FOR GAPS IN COVERAGE	
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes X No

Additional Comments: Drive #

**MULTIPLE ISSUES: CONNECTION FOR PILOT DISPLAY IS MALFUNCTIONING, IT CAME LOOSE MULTIPLE TIMES ON THE FIRST LINE. THIS CAUSED AN ERROR WITH THE PILOT DISPLAY WINDOW OF FMSNAV THAT REQUIRED SYSTEM REBOOT; REBOOTED MIDDAIR - NEW POS START 19:57

A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	4/13/2018	103	18CA-1002		CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
BENTLEY	N69622	6339.1	17:36:00	0:36:00	MRY
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
CROWTHER	GALAXY	6343.9	22:46:00	5:46:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
330/10	10		CLEAR	17	7	3035		Departing	MRY
								Arriving	MRY

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	HIGH	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
155	Kts	5200	Ft		Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	0:41:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
PICKUP	108	1:13:00	1:16:00	0:03:00	13	0.76	1.43	**COVERAGE OF GAP	
51	288	1:18:00	1:38:00	0:20:00	14	0.66	1.2		
50	108	1:39:00	1:59:00	0:20:00	16	0.59	1.04		
49	288	2:01:00	2:21:00	0:20:00	15	0.61	1.15		
48	108	2:23:00	2:42:00	0:19:00	16	0.59	1.14		
47	288	2:44:00	3:04:00	0:20:00	16	0.59	1.11		
46	108	3:06:00	3:26:00	0:20:00	16	0.55	1		
45	288	3:28:00	3:48:00	0:20:00	17	0.56	1.04		
44	108	3:50:00	4:08:00	0:18:00	15	0.59	1.23		
43	288	4:10:00	4:29:00	0:19:00	18	0.55	1.1		
89-TIE	197	4:36:00	4:43:00	0:07:00	17	0.54	1.13		
88-TIE	18	4:56:00	5:06:00	0:10:00	18	0.52	1.08		
PICKUP	180	5:15:00	5:16:00	0:01:00	18	0.54	1.1	**COVERAGE OF GAP	
PICKUP	108	5:20:00	5:22:00	0:02:00	18	0.54	1.08	**COVERAGE OF GAP	

↑ Times entered are Zulu / GMT ↑		Page	1	Verify S-Turns After Mission	Yes X No	

Additional Comments:

Drive #

A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	4/14/2018	104	18CA-1002D		CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
BENTLEY	N69622	6344.5	12:04:00	19:04:00	PRB
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
CROWTHER	GALAXY	6349.1	17:08:00	0:08:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
010/03	10		CLEAR	22	8	3024		Departing	PRB
								Arriving	PRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
25	63	200	HIGH	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
160	Kts	6400	Ft		Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	19:10:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
1	321	19:38:00	19:50:00	0:12:00	18	0.53	1.01		
2	141	19:52:00	20:05:00	0:13:00	17	0.53	1.05		
3	321	20:07:00	20:19:00	0:12:00	18	0.5	0.96		
4	141	20:21:00	20:33:00	0:12:00	20	0.5	0.95		
5	321	20:36:00	20:48:00	0:12:00	21	0.49	0.98		
6	141	20:50:00	21:02:00	0:12:00	19	0.51	1.02		
7	321	21:04:00	21:17:00	0:13:00	18	0.55	1.17		
8	141	21:19:00	21:31:00	0:12:00	17	0.56	1.14		
9	321	21:33:00	21:46:00	0:13:00	18	0.56	1.06		
10	141	21:48:00	22:00:00	0:12:00	17	0.63	1.16		
11	321	22:02:00	22:14:00	0:12:00	19	0.52	0.9		
12	141	22:17:00	22:29:00	0:12:00	19	0.53	0.91		
13	321	22:31:00	22:43:00	0:12:00	15	0.63	1.09		
14	141	22:46:00	22:58:00	0:12:00	15	0.64	1.15		
15	321	23:00:00	23:12:00	0:12:00	17	0.59	1.01		
16	141	23:14:00	23:26:00	0:12:00	16	0.63	1.1		
17	321	23:28:00	23:41:00	0:13:00	15	0.65	1.12		
18	141	23:42:00	23:55:00	0:13:00	16	0.65	1.11		
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes X No

Additional Comments:

Drive #

A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	4/15/2018	105	18CA-1002D		CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
BENTLEY	N69622	6350.1	12:23:00	19:23:00	PRB
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
CROWTHER	GALAXY	6355.0	17:22:00	0:22:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
190/09	10		CLEAR	21	10	2997		Departing	PRB
								Arriving	PRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
25	63	200	HIGH	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
160	Kts	6400	Ft		Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	19:28:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
19	321	19:52:00	20:04:00	0:12:00	18	0.51	1.04		
20	141	20:06:00	20:18:00	0:12:00	19	0.47	0.95		
21	321	20:20:00	20:33:00	0:13:00	21	0.43	0.87		
22	141	20:35:00	20:47:00	0:12:00	21	0.47	0.96		
23	321	20:49:00	21:02:00	0:13:00	19	0.51	1.08		
24	141	21:04:00	21:17:00	0:13:00	18	0.54	1.19		
25	321	21:18:00	21:31:00	0:13:00	18	0.53	1.1		
26	141	21:33:00	21:46:00	0:13:00	18	0.53	1.04		
27	321	21:48:00	22:00:00	0:12:00	18	0.49	0.9		
28	141	22:03:00	22:16:00	0:13:00	17	0.5	0.92		
29	321	22:18:00	22:30:00	0:12:00	16	0.56	1.01	POSS. CLOUD @ 5 MI. FROM N. END	
30	141	22:32:00	22:45:00	0:13:00	15	0.57	1.04	PROB. CLOUD @ 5-10 MI. FROM N. END	
36-TIE	54	22:54:00	23:01:00	0:07:00	17	0.55	0.99		
517	141	23:09:00	23:22:00	0:13:00	16	0.58	1.07	**18CA1002A RE-FLIGHT	
31	321	23:32:00	23:44:00	0:12:00	15	0.6	1.06	POSS. CLOUD @ 5 MI. FROM N. END	
32	141	23:46:00	23:58:00	0:12:00	15	0.62	1.09	CLOUD @ 5 MI. FROM N. END	
33	321	0:00:00	0:12:00	0:12:00	14	0.73	1.32	CLOUD @ 5-7 MI. FROM N. END	
34	141	0:14:00	0:18:00	0:04:00	13	0.78	1.42	ABORTED - MULTIPLE CLOUDS	
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes X No

Additional Comments:

Drive #

A

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	4/20/2018	110	18CA-1002 PICKUPS		CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
BENTLEY	N69622	6359.8	11:38:00	18:38:00	MRY
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
CROWTHER	GALAXY	6360.6	12:51:00	19:51:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	MRY
330/4	10		CLEAR	14	9	3020		Arriving	MRY

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	HIGH	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
155	Kts	6400	Ft		Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	18:45:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
10	314	19:22:00	19:24:00	0:02:00	17	0.56	1.2		
9	134	19:26:00	19:27:00	0:01:00	17	0.56	1.21		
8	289	19:32:00	19:34:00	0:02:00	17	0.56	1.23		
7	109	19:36:00	19:38:00	0:02:00	18	0.53	1.11		

↑ Times entered are Zulu / GMT ↑		Page	1	Verify S-Turns After Mission	Yes X No	
Additional Comments:						Drive #
						B

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	4/20/2018	110	18CA-1002D		CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
BENTLEY	N69622	6361.1	15:07:00	22:07:00	PRB
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
CROWTHER	GALAXY	6364.5	18:49:00	1:49:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
CALM	10		CLEAR	24	6	3010		Departing	PRB
								Arriving	PRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
25	63	200	HIGH	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
160	Kts	6400	Ft		Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	22:11:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
35	321	22:34:00	22:46:00	0:12:00	17	0.6	1.09	CLOUD @ START - POSS. COVERED IN OVERLAP	
34	141	22:48:00	23:00:00	0:12:00	16	0.66	1.27		
33	321	23:02:00	23:14:00	0:12:00	15	0.68	1.3		
32	141	23:16:00	23:28:00	0:12:00	16	0.66	1.16		
31	321	23:30:00	23:43:00	0:13:00	16	0.66	1.09		
30	141	23:45:00	23:57:00	0:12:00	13	0.81	1.46		
29	321	23:59:00	0:11:00	0:12:00	13	0.75	1.18		
593	54	0:17:00	0:36:00	0:19:00	12	0.96	1.79	18CA1002A - FLEW HIGH FOR RESTRICTED	
35	321	0:55:00	1:02:00	0:07:00	14	0.75	1.21	PICKUP - SOUTHERN HALF	
179	137	1:15:00	1:25:00	0:10:00	17	0.63	0.99	18CA1002 - REFLIGHT - **	

↑ Times entered are Zulu / GMT ↑		Page	1	Verify S-Turns After Mission	Yes X No	
Additional Comments:						Drive #
**LINE 179 REFLIGHT HAD MANY CLOUDS ON THE NORTH SIDE AND SOME POSSIBLE CLOUDS TOWARD SOUTHERN END. CHECK FOR GAPS.						B

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	4/21/2018	111	18CA-1002 PICKUPS		CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
BENTLEY	N69622	6365.0	14:04:00	21:04:00	MRY
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
CROWTHER	GALAXY	6365.9	15:24:00	22:24:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
330/6	10		CLEAR	16	10	3010		Departing	MRY
								Arriving	MRY

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	HIGH	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
155	Kts	6400	Ft		Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	21:09:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
1	140	21:33:00	21:33:00	0:00:00				LASER DIDNT FIRE	
1	140	21:36:00	21:36:00	0:00:00				...AGAIN	
6	231	21:38:00	21:39:00	0:01:00	19	0.49	0.86		
5	231	21:43:00	21:44:00	0:01:00	18	0.51	0.88		
4	231	21:47:00	21:48:00	0:01:00	18	0.51	0.87		
3	231	21:52:00	21:53:00	0:01:00	18	0.51	0.86		
1	320	21:56:00	21:59:00	0:03:00	16	0.54	0.92		
2	140	22:01:00	22:04:00	0:03:00	16	0.54	0.91		

↑ Times entered are Zulu / GMT ↑		Page	1	Verify S-Turns After Mission	Yes X No	
Additional Comments:						Drive #
						B

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	4/21/2018	111	18CA-1002A		CA AZ FEMA R9 Lidar 2017 D8

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
BENTLEY	N69622	6366.4	17:54:00	0:54:00	PRB
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
CROWTHER	GALAXY	6367.0	18:58:00	1:58:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
CALM	10		CLEAR	29	7	2998		Departing	PRB
								Arriving	PRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
30	64	200	HIGH	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
155	Kts		Ft		Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	0:59:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
179	137	1:23:00	1:23:00	0:00:00				LASER DID NOT FIRE	
TEST		1:24:00	1:24:00	0:00:00				LASER WORKED	
179	137	1:26:00	1:32:00	0:06:00	16	0.66	1.1	NORTH SIDE COVERAGE - EYESAFE SHUTOFF OVER WATER	
179	137	1:35:00	1:35:00	0:00:00				LASER DID NOT FIRE - EYESAFE	

↑ Times entered are Zulu / GMT ↑		Page	1	Verify S-Turns After Mission	Yes X No	
Additional Comments:						Drive #
**SOUTH SIDE OF 179 WAS CAPTURED ON 4/20/2018, MISSION 49						B

Appendix 1: Flight Logs

Apache Junction, AZ

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	1/6/2018	6			AZ 3DEP - Apache AZ

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
W. Rose	35AS	68.4			
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
S. Robertson	ALS70				

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	
280 @ 6	10	clr	10	55			no	Arriving	

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode	Pre-Trigger Dist.	
150	Kts	7900	Ft	7700	Ft	Yes		No		@ NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission: Yes X No
12	350	16:16:30	16:20:00	0:03:30	16	0.7	1.5	
11	170	16:22:45	16:25:45	0:03:00	16	0.7	1.5	
10	350	16:29:00	16:32:00	0:03:00	16	0.7	1.5	
9	170	16:35:00	16:38:00	0:03:00	16	0.7	1.5	
8	350	16:41:00	16:44:00	0:03:00	17	0.7	1.3	
7	170	16:47:00	16:50:00	0:03:00	18	0.7	1.3	
6	350	16:53:00	16:56:00	0:03:00	18	0.7	1.3	
5	170	16:59:00	17:02:00	0:03:00	19	0.7	1.3	
4	350	17:05:00	17:08:00	0:03:00	19	0.6	1	
3	170	17:11:00	17:14:00	0:03:00	19	0.6	1.1	
2	350	17:16:30	17:19:30	0:03:00	19	0.6	1.1	
1	170	17:22:00	17:23:00	0:01:00	19	0.6	1.1	Gap in data- Line 1 reflight needed
1	170	17:27:00	17:30:00	0:03:00	20	0.6	1.1	Line 1 reflight
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission: Yes No

Additional Comments:

Drive #

Appendix 1: Flight Logs

Bisbee, AZ

LiDAR Flight Log

Subcontractor:	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	5/25/2018				Arizona 3dep

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
k. paschke	92hc	5229.3	6:30:00	13:30:00	
Pilot	**Sensor Type / Number**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
b. viets	als 70	5232.1	9:12	16:12	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	p33
120@4	10	clear	0	17	-7	30.06	n/a	Arriving	p33

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed	AGL	MSL	Waveform Used	Waveform Mode	Pre-Trigger Dist.
150 Kts	Ft	Ft	Yes / No	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:
		↕ Times entered are Zulu / GMT ↕						Verify S-Turns Before Mission: Yes X No
24	116	15:01:00	15:02:00	0:01:00	17	0.7	1.3	bisbee lines start
25	297	15:06:00	15:07:00	0:01:00	17	0.7	1.2	
26	116	15:10:00	15:12:00	0:02:00	19	0.6	1.2	
32	75	15:15:00	15:16:00	0:01:00	19	0.6	1.2	
27	297	15:20:00	15:22:00	0:02:00	19	0.6	1.2	
28	116	15:25:00	15:26:00	0:01:00	18	0.6	1.2	
29	297	15:29:00	15:32:00	0:03:00	18	0.6	1.3	
30	116	15:35:00	15:38:00	0:03:00	19	0.6	1.1	
31	297	15:41:00	15:42:00	0:01:00	20	0.6	1	
		↑ Times entered are Zulu / GMT ↑		Page		1		Verify S-Turns After Mission: Yes X No

Additional Comments:

Drive #

LiDAR Flight Log

Subcontractor:	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	5/28/2018			San pedro/ bisbee	Arizona 3dep

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
k. paschke	92hc	5240.6	6:12:00	13:12:00	
Pilot	**Sensor Type / Number**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
b. viets	als 70		10:20	17:20	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
120@5	10	clear	0	15	-6	29.93	n/a	Departing	p33
								Arriving	p33

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
150	Kts	5500	Ft	9500	Ft	Yes		No		@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:
								Verify S-Turns Before Mission: Yes X No
1	170	16:47:00	16:51:00	0:04:00	20	0.6	1.1	bisbee, cut 3nm short S.
2	350	16:53:00	16:57:00	0:04:00	20	0.6	1.1	
3	170	16:59:00	17:03:00	0:04:00	20	0.6	1.1	
4	350	17:05:00	17:08:00	0:03:00	19	0.6	1.2	

↑ Times entered are Zulu / GMT ↑	Page	1	Verify S-Turns After Mission: Yes X No

Additional Comments:

Drive #

LiDAR Flight Log

Subcontractor:	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	5/29/2018			Bisbee	Arizona 3dep

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
k. paschke	92hc	5245.1	6:20:00	13:20:00	
Pilot	**Sensor Type / Number**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
b. viets	als 70		10:00	17:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	p33
100@3	10	clear	0	17	-5	29.89	n/a	Arriving	p33

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed	AGL	MSL	Waveform Used				Waveform Mode	Pre-Trigger Dist.
150 Kts	5200 Ft	10200 Ft	Yes		No		@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:
		↕ Times entered are Zulu / GMT ↕						Verify S-Turns Before Mission: Yes X No
1	80	13:58:00	14:03:00	0:05:00	17	0.6	1.1	cross lines
2	260	14:05:00	14:11:00	0:06:00	17	0.6	1.1	cross lines
3	80	14:13:00	14:18:00	0:05:00	17	0.6	1.1	cross lines
4	260	14:20:00	14:25:00	0:05:00	17	0.6	1.2	cross lines
5	80	14:28:00	14:32:00	0:04:00	17	0.6	1.2	cross lines
6	260	14:36:00	14:40:00	0:04:00	17	0.6	1.2	cross lines
7	80	14:43:00	14:47:00	0:04:00	17	0.6	1.2	cross lines
8	260	14:51:00	14:56:00	0:05:00	17	0.6	1.2	cross lines
5	350	15:02:00	15:06:00	0:04:00	17	0.6	1.2	
6	170	15:08:00	15:12:00	0:04:00	18	0.6	1.2	
7	350	15:15:00	15:18:00	0:03:00	19	0.6	1.2	
8	170	15:20:00	15:24:00	0:04:00	20	0.6	1.1	
9	350	15:27:00	15:30:00	0:03:00	19	0.6	1.1	
10	170	15:32:00	15:36:00	0:04:00	18	0.6	1.2	
11	350	15:39:00	15:42:00	0:03:00	18	0.6	1.2	
12	170	15:45:00	15:49:00	0:04:00	17	0.7	1.3	
13	350	15:51:00	15:54:00	0:03:00	17	0.7	1.4	
14	170	15:56:00	16:00:00	0:04:00	17	0.7	1.4	
15	350	16:02:00	16:06:00	0:04:00	17	0.7	1.4	
16	170	16:08:00	16:12:00	0:04:00	18	0.6	1.3	
17	350	16:14:00	16:17:00	0:03:00	19	0.6	1.2	
18	170	16:19:00	16:22:00	0:03:00	19	0.6	1.2	
19	350	16:25:00	16:28:00	0:03:00	20	0.6	1.2	
20	170	16:30:00	16:33:00	0:03:00	20	0.6	1.1	
21	350	16:36:00	16:39:00	0:03:00	20	0.6	1.1	
22	170	16:41:00	16:45:00	0:04:00	20	0.6	1.2	
23	350	16:47:00	16:50:00	0:03:00	20	0.6	1.1	
		↑ Times entered are Zulu / GMT ↑		Page		1		Verify S-Turns After Mission: Yes X No

Additional Comments: bisbee completed

Drive #

Appendix 1: Flight Logs

Central Gila, AZ

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	1/11/2018	11			AZ 3DEP - GilaAZ_QL2_A

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
W. Rose	35AS	70.6			
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
S. Robertson	ALS70				

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	
030 @ 08	10	clr	10	11	-4	30.25	no	Arriving	

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed	AGL	MSL	Waveform Used	Waveform Mode	Pre-Trigger Dist.
150 Kts	10300 Ft	10300 Ft	Yes [ ] No [ ]	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At: 16:45:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission Yes X No
B001	260	17:01:00	17:02:00	0:01:00	20	0.6	1.1	
B002	080	17:05:00	17:09:00	0:04:00	20	0.6	1	
B003	260	17:12:00	17:19:00	0:07:00	20	0.6	1	
B004	080	17:21:30	17:28:30	0:07:00	20	0.6	1.1	
B005	260	17:31:00	17:38:00	0:07:00	19	0.7	1.3	
B006	080	17:41:00	17:48:00	0:07:00	19	0.7	1.3	
B007	260	17:50:30	17:58:00	0:07:30	20	0.6	1.2	
B008	080	18:00:00	18:07:30	0:07:30	20	0.6	1.2	
B009	260	18:10:00	18:18:00	0:08:00	18	0.8	1.3	
B010	080	18:21:00	18:30:00	0:09:00	20	0.7	1.1	
B011	260	18:32:00	18:42:00	0:10:00	19	0.7	1.2	
B012	080	18:44:30	18:53:30	0:09:00	20	0.7	1.2	
B013	260	18:57:30	19:07:30	0:10:00	19	0.6	1.2	
B014	080	19:09:30	19:19:30	0:10:00	20	0.7	1.3	
B015	260	19:22:00	19:32:00	0:10:00	19	0.6	1.3	
B016	080	19:34:00	19:44:30	0:10:30	19	0.6	1.3	
B017	260	19:47:30	19:58:30	0:11:00	20	0.6	1.2	fuel stop
↑ Times entered are Zulu / GMT ↑			Page		1			Verify S-Turns After Mission Yes X No

Additional Comments:

Drive #

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	1/11/2018	11			AZ 3DEP - GilaAZ_QL2_B

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
W. Rose	35AS	70.6			
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
S. Robertson	ALS70				

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	
030 @ 08	10	clr	10	11	-4	30.25	no	Arriving	

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
150	Kts	10300	Ft	10300	Ft	Yes		No		@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	16:45:00
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
B018	260	21:01:30	21:12:20	0:10:50	16	0.7	1.2		
B019	080	21:15:30	21:27:00	0:11:30	15	0.8	1.2		
B020	260	21:29:30	21:41:00	0:11:30	16	0.8	1.2		
B021	080	21:43:30	21:54:30	0:11:00	16	0.7	1.1		
B022	260	21:57:00	22:06:30	0:09:30	15	0.8	1.2		
B023	080	22:08:00	22:19:30	0:11:30	15	0.7	1.2		
B024	260	22:22:00	22:33:00	0:11:00	16	0.7	1.2		
B025	080	22:35:30	22:47:00	0:11:30	15	0.8	1.5		
B026	260	22:49:30	23:01:30	0:12:00	16	0.7	1.4		
B027	080	23:03:30	23:15:30	0:12:00	17	0.6	1.1		
B028	260	23:28:00	23:30:30	0:02:30	17	0.6	1.1		
B029	080	23:33:00	23:46:00	0:13:00	17	0.6	1.1	5 miles left on line- no points collected	
B030	260	23:49:00	0:01:00	0:11:00	18	0.6	1.1	reflight need- no points collected	
↑ Times entered are Zulu / GMT ↑			Page		1			Verify S-Turns After Mission	Yes X No

Additional Comments:

Drive #

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	3/29/2018	88	18-6739-01-102		3DEP Arizona - Gila Block B - Lift A

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
K.Paschke	35AS	239.3	12:30:00		Temporary Base
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
B. Viets	OTHER	244.9	4:30:00		ES1181

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
190 @ 6	10 SM	CLR	0%	31C	-4c	29.97		Departing	KPAN
								Arriving	KPAN

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
				Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
	Kts	10333	Ft		Ft	Yes		No		@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	Speed	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	n/a	GPS Began Logging At:	
↕ Times entered are Zulu / GMT ↕									Verify S-Turns Before Mission	Yes X No
B029	270	12:45:00	1:00:00	0:15:00						
B030	90	1:03:00	1:14:00	0:11:00						
B031	270	1:16:00	1:27:00	0:11:00						
B032	90	1:29:00	1:39:00	0:10:00						
B032	270	1:49:00	1:59:00	0:10:00						

↑ Times entered are Zulu / GMT ↑		Page	1	Verify S-Turns After Mission	Yes X No

Additional Comments:

Drive #

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	3/29/2018	88	18-6739-01-102		3DEP Arizona - Gila Block B - Lift B

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
K.Paschke	35AS	239.3	12:30:00		Temporary Base
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
B. Viets	OTHER	244.9	4:30:00		ES1181

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
190 @ 6	10 SM	CLR	0%	31C	-4c	29.97		Departing	KPAN
								Arriving	KPAN

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
				Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
	Kts	10333	Ft		Ft	Yes		No		@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	Speed	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	n/a	GPS Began Logging At:
↕ Times entered are Zulu / GMT ↕									Verify S-Turns Before Mission: Yes X No
B033	90	2:03:00	2:14:00	0:11:00	160	17	0.6	1.3	
B034	270	2:17:00	2:29:00	0:12:00	159	16	0.7	1.4	
B035	90	2:31:00	2:42:00	0:11:00	155	15	0.7	1.5	
B036	270	2:45:00	2:57:00	0:12:00	160	16	0.7	1.3	
B037	90	3:00:00	3:14:00	0:14:00	160	19	0.6	1.1	
B038	270	3:17:00	3:30:00	0:13:00	157	17	1	1.3	
B039	90	3:33:00	3:45:00	0:12:00	162	14	0.8	1.4	
B040	270	3:48:00	4:00:00	0:12:00	158	15	0.8	1.5	
B041	90	4:04:00	4:18:00	0:14:00	158	15	0.8	1.5	
↑ Times entered are Zulu / GMT ↑				Page		1			Verify S-Turns After Mission: Yes X No

Additional Comments:

Drive #

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	3/30/2018	89	18-6739-01-102		3DEP Arizona - Gila Block B

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
K.Paschke	35AS	244.9	3:40:00		Temporary Base
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
B. Viets	Leica ALS70		6:50:00		ES1181

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
220 @ 8	10 SM	CLR	0%	23c	-11c	30.11		Departing	KPAN
								Arriving	KPAN

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
				Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
	Kts	10333	Ft		Ft	Yes		No		@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	Speed	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	n/a	GPS Began Logging At:
↕ Times entered are Zulu / GMT ↕									Verify S-Turns Before Mission: Yes X No
B042	270	3:55:00	4:10:00	0:15:00	156	14	0.7	1.3	
B043	90	4:12:00	4:27:00	0:15:00	156	15	0.7	1.3	
B044	270	4:30:00	4:44:00	0:14:00	156	17	0.7	1	
B045	90	4:48:00	5:02:00	0:14:00	160	16	0.7	1.1	
B046	270	5:04:00	5:20:00	0:16:00	160	19	0.6	1.1	
B047	90	5:22:00	5:34:00	0:12:00	160	17	0.6	1.3	
B066	270	5:37:00	5:43:00	0:06:00	159	16	0.7	1.4	
B067	90	5:46:00	5:51:00	0:05:00	155	15	0.7	1.5	
B048	270	5:54:00	6:08:00	0:14:00	160	16	0.7	1.3	
B049	90	6:10:00	6:24:00	0:14:00	160	19	0.6	1.1	
B050	270	6:28:00	6:42:00	0:14:00	157	17	0.6	1.3	
↑ Times entered are Zulu / GMT ↑				Page		1			Verify S-Turns After Mission: Yes X No

Additional Comments:

Drive #

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	4/6/2018	96	18-6739-01-102		3DEP Arizona

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
Other	35AS				
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
S. Robertson	ALS70				

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	
								Arriving	

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
	Kts		Ft		Ft	Yes		No		@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments			
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:			
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes	X	No
A003	169	11:54:00	11:56:00	0:02:00	19	0.6	1.1				
A004	349	11:59:00	12:02:30	0:03:30	20	0.6	1.1				
A005	169	12:04:00	12:08:00	0:04:00	19	0.6	1.1				
A006	349	12:10:00	12:12:30	0:02:30	18	0.6	1.2				
A007	169	12:15:30	12:18:00	0:02:30	18	0.6	1.2				
A008	349	12:20:00	12:23:00	0:03:00	17	0.7	1.3				
A009	169	12:25:30	12:30:00	0:04:30	17	0.7	1.3				
A010	349	12:37:00	12:45:30	0:08:30	16	0.7	1.5				
A011	169	12:49:00	12:58:30	0:09:30	18	0.7	1.3				
A012	349	1:00:00	1:09:00	0:09:00	19	0.6	1.2				
A013	169	1:12:00	1:19:30	0:07:30	20	0.6	1.1				
A014	349	1:22:00	1:29:00	0:07:00	19	0.6	1.2				
A015	169	1:31:30	1:40:30	0:09:00	19	0.6	1.2				
A016	349	1:43:00	1:51:00	0:08:00	19	0.6	1.2				
A001	349	1:55:00	1:56:30	0:01:30	19	0.6	1.2				
A002	169	1:58:30	2:03:00	0:04:30	19	0.6	1.2				
A017	349	2:06:30	2:15:00	0:08:30	20	0.6	1.1				
A018	349	2:20:00	2:30:00	0:10:00	20	0.6	1.2				
A019	169	2:33:00	2:43:00	0:10:00	19	0.6	1.1				
A020	349	2:46:00	2:57:00	0:11:00	19	0.6	1.1				
A021	169	3:00:00	3:10:00	0:10:00	20	0.6	1.1				
A022	349	3:13:00	3:23:00	0:10:00	18	0.7	1.1				
A023	169	3:26:00	3:38:00	0:12:00	18	0.6	1.2				
A024	349	3:40:30	3:52:00	0:11:30	18	0.6	1.2				
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes		No

Additional Comments:	Drive #

Woolpert

Leica LIDAR	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	4/7/2018	97	18-6739-01-102	#REF!	3DEP Arizona

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
W. Rose	N92HC				
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
S. Robertson	Leica ALS70				

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	
								Arriving	

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
	Kts		Ft		Ft	Yes		No		@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments			
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:			
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes	X	No
A025	169	7:30:00	7:42:00	15:42:00	19	0.6	1.1				
A026	349	7:44:30	7:57:30	0:00:00	17	0.8	1.3				
A027	169	8:00:30	8:13:00	0:00:00	16	0.6	1.4				
A028	349	8:15:30	8:29:00	0:00:00	16	0.7	1.2				
A029	169	8:33:00	8:47:00	0:00:00	16	0.7	1.1				
A030	349	8:50:00	9:01:00	0:00:00	16	0.8	1.2				
A031	169	9:04:00	9:19:00	0:00:00	18	0.6	1				
A032	349	9:22:00	9:38:00	0:00:00	17	0.7	1.1				
A033	169	9:40:30	9:56:00	0:00:00	14	0.8	1.6				
A049	349	9:59:00	10:09:00	0:00:00	16	0.7	1.4				
A050	169	10:12:00	10:22:00	0:00:00	17	0.6	1.2				
A051	349	10:24:30	10:34:00	0:00:00	17	0.6	1.2				
A052	169	10:37:00	10:45:30	0:00:00	17	0.6	1.2				
A053	349	10:48:15	10:57:00	0:00:00	17	0.7	1.3				
A034	349	10:59:30	11:04:30	0:00:00	17	0.7	1.2				
A035	169	11:07:00	11:11:11	0:00:00	17	0.7	1.3				
A036	349	11:14:15	11:16:30	0:00:00	17	0.7	1.3				
A037	169	11:19:30	11:22:00	0:00:00	17	0.6	1.2				
A038	349	11:24:30	11:27:00	0:00:00	16	0.7	1.4				
A039	169	11:30:00	11:31:30	0:00:00	17	0.7	1.2				
A040	349	11:34:00	11:35:30	0:00:00	17	0.7	1.2	fuel stop			
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes		No

Additional Comments:	Drive #

Woolpert

Leica LIDAR	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	4/7/2018	97	18-6739-01-102		3DEP Arizona

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
W. Rose	N92HC				
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
S. Robertson					

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	
								Arriving	

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
	Kts		Ft		Ft	Yes		No		@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission Yes X No
A041	169	1:26:30	1:28:00	0:01:30	19	0.7	1.3	
A042	349	1:31:00	1:32:00	0:01:00	19	0.7	1.3	
A043	169	1:34:30	1:36:30	0:02:00	19	0.7	1.3	
A044	349	1:39:00	1:41:00	0:02:00	18	0.7	1.5	
A045	169	1:44:00	1:46:30	0:02:30	19	0.6	1.2	
A046	349	1:49:30	1:51:30	0:02:00	20	0.6	1.2	
A047	098	1:54:00	1:55:00	0:01:00	20	0.6	1.2	
A048	286	1:58:30	1:59:00	0:00:30	20	0.6	1.1	
A054	169	2:06:30	2:14:30	0:08:00	20	0.6	1.2	
A055	286	2:17:00	2:24:30	0:07:30	20	0.6	1.1	
A056	169	2:27:30	2:35:00	0:07:30	20	0.7	1.1	
A057	349	2:37:15	2:43:30	0:06:15	19	0.7	1.1	
A058	169	2:46:30	2:52:30	0:06:00	19	0.6	1.2	
A059	349	2:54:45	3:00:00	0:05:15	18	0.7	1.3	
A060	169	3:03:00	3:09:00	0:06:00	18	0.7	1.4	
A061	349	3:12:00	3:19:00	0:07:00	18	0.6	1.1	
A062	169	3:22:00	3:27:00	0:05:00	18	0.6	1.1	
A063	349	3:30:00	3:35:15	0:05:15	18	0.6	1.1	
A064	169	3:38:30	3:45:00	0:06:30	18	0.6	1.1	
A065	349	3:47:30	3:54:30	0:07:00	17	0.6	1.1	
A066	169	3:57:15	4:06:30	0:09:15	18	0.6	1	
A067	349	4:08:15	4:16:30	0:08:15	17	0.6	1.1	
A068	169	4:19:00	4:28:00	0:09:00	16	0.7	1.1	
A069	349	4:31:00	4:39:00	0:08:00	16	0.7	1.2	
A070	169	4:41:45	4:50:00	0:08:15	16	0.7	1.2	
A071	349	4:52:30	5:01:00	0:08:30	16	0.7	1.2	Gap end of line A071
A072	169	5:03:15	5:13:00	0:09:45	16	0.7	1.2	
A071	349	5:14:30	5:22:45	0:08:15	16	0.7	1.1	line reflight A071
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission Yes No

Additional Comments:

Drive #

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	4/30/2018	120	18-6602-02-102		GilaAZ_QL2

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
W. Rose	N522AS	4443.0			
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
S. Robertson	ALS70				

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure		Departing	
200 @ 20	10	Clr	0			29.95	Haze	Arriving	

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
	Kts		Ft		Ft	Yes		No		@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission: Yes X No
B051	80	2:12:00	2:27:00	0:15:00	18	0.7	1.2	
B052	260	2:30:00	2:45:00	0:15:00	17	0.6	1.1	
B053	80	2:48:00	3:02:00	0:14:00	18	0.6	1.1	
B054	260	3:04:30	3:19:00	0:14:30	16	0.6	1.1	
B055	80	3:22:00	3:36:00	0:14:00	17	0.6	1	
B056	260	3:39:00	3:53:30	0:14:30	17	0.6	1	
B057	80	3:56:00	4:11:00	0:15:00	16	0.6	1	spacecam systems inc
B058	260	4:13:00	4:28:00	0:15:00	14	0.8	1.3	
B059	80	4:30:00	4:45:00	0:15:00	12	0.9	1.6	
B060	260	4:48:00	5:03:00	0:15:00	14	0.9	1.5	
B061	80	5:06:00	5:21:00	0:15:00	16	0.7	1.1	
B062	260	5:24:00	5:40:00	0:16:00	16	0.7	1.3	
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission: Yes No

Additional Comments:

Drive #

Woolpert

Leica LIDAR	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	5/1/2018	121			

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
W. Rose	522AS				
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
S. Robertson	ALS70				ES1182

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	
								Arriving	

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
	Kts		Ft		Ft	Yes		No		@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments		
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:		
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes	No
A073	s	9:10:00	9:20:00	0:10:00	17	0.7	1.2			
A074	n	9:23:00	9:33:00	0:10:00	17	0.7	1.2			
A075	s	9:35:00	9:35:00	0:00:00	17	0.7	1.2			
A076	n	9:48:00	9:50:00	0:02:00	18	0.7	1.2			
A077	s	9:51:00	10:01:00	0:10:00	17	0.7	1			
A078	n	10:04:00	10:15:00	0:11:00	16	0.7	1.1			
A079	s	10:17:00	10:26:00	0:09:00	17	0.6	1.1			
A080	n	10:29:00	10:39:00	0:10:00	16	0.6	1.2			
A081	s	10:42:00	10:51:00	0:09:00	16	0.7	1.2			
A082	n	10:54:00	11:04:00	0:10:00	18	0.7	1.2			
A083	s	11:06:00	11:16:00	0:10:00	17	0.7	1.3			
A084	n	11:18:00	11:28:00	0:10:00	17	0.7	1.2			
A085	s	11:30:00	11:37:00	0:07:00	17	0.8	1.2			
A086	n	11:39:00	11:45:00	0:06:00	17	0.7	1.1			
A087	s	11:47:00	11:59:00	0:12:00	17	0.7	1.2			
A088	n	12:02:00	12:09:00	0:07:00	16	0.6	1.2			
A089	s	12:13:00	12:22:00	0:09:00	16	0.6	1.2			
A090	n	12:24:00	12:34:00	0:10:00	18	0.6	1.2			
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes	No

Additional Comments:

Drive #

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	5/3/2018	123	18-6739-01-102		AZ 3EP

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
W. Rose	N522AS				
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
S. Robertson	ALS70				

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	
305@20	10	clr	0			30.09		Arriving	

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
	Kts		Ft		Ft	Yes		No		@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission: Yes X No
B063	80	8:39:00	8:54:30	0:15:30	16	0.7	1.3	
B064	260	8:57:30	9:13:00	0:15:30	15	0.7	1.4	
B065	80	9:16:00	9:31:00	0:15:00	15	0.7	1.4	
B084	310	9:38:00	9:46:00	0:08:00	13	0.8	1.6	
B085	130	9:49:00	9:56:00	0:07:00	15	0.7	1.3	
B086	310	9:58:30	10:06:00	0:07:30	16	0.7	1.2	
B087	130	10:08:30	10:15:30	0:07:00	18	0.7	1.1	
B088	310	10:18:00	10:25:00	0:07:00	17	0.7	1.2	
B089	130	10:29:00	10:34:30	0:05:30	17	0.7	1.3	
B090	310	10:37:30	10:42:00	0:04:30	16	0.7	1.4	
B091	130	10:44:30	10:49:00	0:04:30	16	0.8	1.5	
B092	310	10:53:00	10:57:00	0:04:00	16	0.8	1.5	
B093	130	11:00:00	11:03:30	0:03:30	18	0.7	1.2	
B094	310	11:06:00	11:10:00	0:04:00	18	0.7	1.2	
B095	130	11:12:00	11:14:30	0:02:30	19	0.6	1.1	
B096	310	11:17:30	11:18:30	0:01:00	19	0.6	1.1	Gap in data
B096	130	11:21:00	11:22:00	0:01:00	20	0.6	1.2	B096 Re-flight
B097	145	11:24:15	11:26:00	0:01:45	20	0.6	1.2	
B098	325	11:28:30	11:30:15	0:01:45	20	0.6	1	
B083	330	11:33:00	11:34:30	0:01:30	20	0.6	1.1	
B082	150	11:37:30	11:39:30	0:02:00	19	0.6	1.2	
B081	330	11:41:30	11:44:00	0:02:30	19	0.6	1.2	
B068	330	11:47:00	11:52:00	0:05:00	20	0.6	1.1	
B069	150	11:56:30	12:02:30	0:06:00	19	0.6	1.2	
B070	330	12:05:00	12:11:30	0:06:30	20	0.6	1.1	
B071	150	12:14:00	12:22:00	0:08:00	20	0.6	1.2	
B113	80	12:27:00	12:34:30	0:07:30	20	0.6	1.1	
B114	260	12:36:45	12:44:00	0:07:15	20	0.6	1.1	Fuel Stop
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission: Yes X No

Additional Comments:

Drive #

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	5/3/2018	123	18-6739-01-102		AZ 3EP

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
W. Rose	N522AS				
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
S. Robertson	ALS70				

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	
305@20	10	clr	0			30.09		Arriving	

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
	Kts		Ft		Ft	Yes		No		@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes X No
B112	80	2:05:00	2:11:00	0:06:00	18	0.6	1.1		
B111	260	2:16:00	2:21:30	0:05:30	17	0.6	1.1		
B110	80	2:24:00	2:29:30	0:05:30	17	0.6	1.1		
B109	260	2:32:00	2:36:00	0:04:00	17	0.6	1.1		
B108	80	2:38:30	2:41:30	0:03:00	17	0.6	1.2		
B107	260	2:44:00	2:47:00	0:03:00	17	0.7	1.2		
B106	80	2:49:30	2:52:30	0:03:00	17	0.7	1.3		
B105	260	2:55:00	2:57:30	0:02:30	16	0.7	1.2		
B104	80	3:01:00	3:02:45	0:01:45	16	0.7	1.2		
B103	260	3:05:00	3:06:30	0:01:30	16	0.7	1.2		
B102	80	3:09:00	3:10:15	0:01:15	17	0.7	1.1		
B101	260	3:13:00	3:14:00	0:01:00	16	0.9	1.5		
B100	80	3:17:00	3:18:00	0:01:00	16	0.7	1.2		
B099	130	3:22:30	3:24:00	0:01:30	17	0.7	1.1		
B115	260	3:29:30	3:37:00	0:07:30	17	0.7	1.1		
B116	80	3:39:00	3:46:30	0:07:30	15	0.8	1.2		
B117	260	3:51:00	3:59:00	0:08:00	13	0.9	1.5		
B118	80	4:02:00	4:10:00	0:08:00	13	1	1.9		
B119	260	4:12:30	4:20:30	0:08:00	13	0.9	1.6		
B120	80	4:23:30	4:31:30	0:08:00	13	0.9	1.6		
B121	260	4:33:45	4:41:30	0:07:45	15	1.1	2		
B122	80	4:44:00	4:50:00	0:06:00	15	0.7	1.3		
B123	260	4:53:00	4:59:00	0:06:00	15	0.7	1.3		
B124	80	5:02:00	5:07:30	0:05:30	16	0.7	1.3		
B125	260	5:10:30	5:16:30	0:06:00	16	0.7	1.3		
B126	80	5:20:00	5:27:00	0:07:00	16	0.7	1.4		
B127	260	5:29:30	5:37:00	0:07:30	16	0.7	1.4		
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes No

Additional Comments:

Drive #

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	5/4/2018	125	18-6739-01-102		3DEP AZ

Operator: W. Rose	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
W. Rose	N522AS				
Pilot		**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
S. Robertson	ALS70				

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	
						30.31		Arriving	

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode	Pre-Trigger Dist.
	Kts		Ft		Ft	Yes		No		@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments			
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:			
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes	X	No
D001	85	8:31:30	8:32:45	0:01:15	17	0.7	1.1				
D002	175	8:36:00	8:37:00	0:01:00	17	0.7	1.2				
D003	325	8:41:30	8:42:45	0:01:15	17	0.7	1.2				
C001	80	8:49:30	8:50:00	0:00:30	16	0.7	1.2				
C002	260	8:53:30	8:57:45	0:04:15	16	0.7	1.3				
C003	80	9:01:00	9:06:45	0:05:45	16	0.7	1.3				
C004	260	9:09:00	9:15:30	0:06:30	17	0.7	1.2				
C005	80	9:17:30	9:23:30	0:06:00	17	0.7	1.2				
C006	260	9:26:00	9:33:00	0:07:00	17	0.7	1.2				
C007	80	9:35:30	9:42:00	0:06:30	16	0.8	1.4				
C008	260	9:45:00	9:51:45	0:06:45	17	0.7	1.3				
C009	80	9:55:00	10:01:30	0:06:30	19	0.6	1.1				
C010	260	10:05:00	10:11:15	0:06:15	20	0.6	1				
C011	80	10:14:30	10:20:30	0:06:00	18	0.6	1.1				
C012	260	10:23:30	10:30:00	0:06:30	18	0.6	1.2				
C013	80	10:33:00	10:40:00	0:07:00	17	0.6	1.3				
C014	260	10:42:30	10:47:30	0:05:00	17	0.6	1.3				
C015	80	10:50:00	10:55:30	0:05:30	17	0.6	1.3				
C016	260	10:58:00	11:03:00	0:05:00	19	0.6	1.2				
C017	80	11:06:00	11:11:00	0:05:00	20	0.6	1.1				
C018	260	11:15:30	11:16:45	0:01:15	20	0.6	1.1				
C019	80	11:19:45	11:20:30	0:00:45	20	0.6	1.1				
C020	350	11:27:00	11:30:00	0:03:00	20	0.6	1.1				
C021	170	11:32:30	11:36:00	0:03:30	19	0.6	1.2				
C022	350	11:39:00	11:42:30	0:03:30	19	0.6	1.2				
C023	170	11:45:00	11:48:30	0:03:30	19	0.6	1.2				
C024	350	11:51:00	11:55:00	0:04:00	19	0.6	1.2	Fuel Stop			
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes		No

Additional Comments:	Drive #

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	5/4/2018	125	18-6739-01-102		3DEP AZ

Operator: W. Rose	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
W. Rose	N522AS				
Pilot		**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
S. Robertson	ALS70				

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	
						30.31		Arriving	

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
	Kts		Ft		Ft	Yes		No		@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes / No
C025	170	1:45:00	1:48:30	0:03:30	18	0.7	1.1		
C026	350	1:51:30	1:55:00	0:03:30	17	0.7	1.2		
C027	170	1:57:30	2:02:00	0:04:30	17	0.7	1.1		
C028	350	2:04:45	2:09:00	0:04:15	18	0.7	1.1		
C029	170	2:11:30	2:15:30	0:04:00	17	0.7	1.1		
C030	350	2:18:30	2:22:30	0:04:00	17	0.7	1.2		
C031	170	2:25:00	2:29:15	0:04:15	16	0.7	1.2		
C032	350	2:31:30	2:34:00	0:02:30	17	0.7	1.1		
C033	170	2:37:00	2:39:30	0:02:30	17	0.7	1.3		
C036	350	2:42:00	2:44:30	0:02:30	17	0.7	1.2		
C034	170	2:46:45	2:53:30	0:06:45	16	0.7	1.3		
C035	350	2:55:30	3:02:00	0:06:30	16	0.7	1.2		
C037	170	3:04:45	3:06:30	0:01:45	17	0.6	1.1		
C038	350	3:09:00	3:11:00	0:02:00	16	0.7	1.2		
C039	170	3:13:30	3:15:30	0:02:00	16	0.7	1.2		
C040	350	3:19:30	3:22:30	0:03:00	17	0.6	1.1		
C041	170	3:25:00	3:28:00	0:03:00	17	0.6	1.1		
C042	350	3:31:00	3:35:00	0:04:00	16	0.6	1.1		
C043	170	3:37:30	3:41:30	0:04:00	15	0.7	1.2		
C044	350	3:44:00	3:48:00	0:04:00	15	0.8	1.4		
C045	170	3:50:00	3:54:00	0:04:00	14	0.9	1.9		
C046	350	3:56:30	4:00:00	0:03:30	14	0.8	1.5		
C047	170	4:03:00	4:09:00	0:06:00	14	0.8	1.6		
C048	350	4:11:30	4:17:30	0:06:00	13	0.9	1.9		
C049	170	4:20:00	4:26:00	0:06:00	14	0.9	1.9		
C050	350	4:28:30	4:34:30	0:06:00	14	1	1.9		
C051	170	4:36:30	4:42:00	0:05:30	14	1.1	2.1		
C052	350	4:44:30	4:50:00	0:05:30	15	0.8	1.6		
C053	170	4:52:30	4:57:30	0:05:00	15	0.8	1.3		
C054	350	5:00:00	5:03:00	0:03:00	16	0.8	1.2		
C055	170	5:05:30	5:09:00	0:03:30	16	0.8	1.3		
C056	350	5:12:00	5:15:00	0:03:00	16	0.8	1.3		
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes / No

Additional Comments:

Drive #

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	5/5/2018	126	18-6739-01-102		

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
Other	N522AS	4467.5			
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
S. Robertson	ALS70				

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	
						30.29		Arriving	

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode	Pre-Trigger Dist.
	Kts		Ft		Ft	Yes		No		@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission Yes No
B072	150	8:35:00	8:43:00	0:08:00	17	0.6	1.1	
b073	330	8:46:30	8:55:00	0:08:30	16	0.7	1.2	
B074	150	8:58:00	9:07:00	0:09:00	16	0.7	1.3	
B075	330	9:10:00	9:19:30	0:09:30	17	0.6	1.2	
B076	150	9:22:30	9:32:30	0:10:00	17	0.6	1.2	
B077	330	9:35:00	9:46:00	0:11:00	16	0.7	1.4	
B079	150	9:48:00	9:51:00	0:03:00	20	0.6	1.1	
B080	330	9:53:00	9:54:00	0:01:00	20	0.6	1.1	
B078	150	9:57:30	10:07:00	0:09:30	19	0.6	1.1	
B128	080	10:12:00	10:19:00	0:07:00	18	0.7	1.2	
B129	260	10:22:00	10:28:00	0:06:00	17	0.7	1.3	
B130	080	10:31:30	10:36:30	0:05:00	17	0.7	1.4	
B131	260	10:39:00	10:44:30	0:05:30	17	0.7	1.4	
B132	080	10:47:00	10:52:30	0:05:30	18	0.7	1.3	
B133	260	10:55:30	11:01:30	0:06:00	19	0.6	1.2	
B134	080	11:04:00	11:07:30	0:03:30	20	0.6	1.2	
B135	260	11:12:00	11:16:00	0:04:00	20	0.6	1.1	
B136	080	11:18:00	11:22:30	0:04:30	20	0.6	1.1	
B137	260	11:26:00	11:30:30	0:04:30	19	0.6	1.1	
B138	080	11:33:45	11:38:30	0:04:45	19	0.6	1.1	
B139	260	11:41:00	11:46:00	0:05:00	18	0.7	1.3	
B140	080	11:49:00	11:54:00	0:05:00	18	0.7	1.3	
B141	260	11:56:30	12:01:30	0:05:00	20	0.7	1.1	
B142	080	12:05:00	12:10:00	0:05:00	20	0.6	1.1	
B143	260	12:13:00	12:18:00	0:05:00	19	0.7	1.2	
B144	080	12:20:30	12:26:00	0:05:30	20	0.7	1.2	
B145	260	12:29:00	12:35:00	0:06:00	19	0.6	1.2	
B146	080	12:37:00	12:42:00	0:05:00	19	0.6	1.2	
B147	260	12:44:00	12:49:00	0:05:00	19	0.6	1.2	Fuel Stop
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission Yes No

Additional Comments:

Drive #

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	5/5/2018	126	18-6739-01-102		

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
Other	N522AS	4467.5			
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
S. Robertson	ALS70				

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	
						30.29		Arriving	

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode	Pre-Trigger Dist.
	Kts		Ft		Ft	Yes		No		@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments		
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:		
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes	No
C109	160	2:06:00	2:07:00	0:01:00	17	0.7	1.2			
C110	340	2:10:00	2:11:00	0:01:00	17	0.7	1.2			
C111	130	2:13:00	2:17:00	0:04:00	17	0.6	1.1			
C112	310	2:20:00	2:24:00	0:04:00	17	0.6	1.1			
C113	130	2:27:00	2:30:30	0:03:30	17	0.6	1.1			
C114	310	2:38:00	2:41:00	0:03:00	17	0.7	1.2			
C115	290	2:44:00	2:46:30	0:02:30	16	0.7	1.3			
C116	110	2:49:00	2:52:00	0:03:00	16	0.7	1.2			
C117	290	2:54:30	2:57:00	0:02:30	16	0.7	1.2			
C118	110	3:00:00	3:03:00	0:03:00	17	0.6	1.1			
C119	290	3:05:30	3:08:30	0:03:00	16	0.7	1.2			
C120	110	3:11:00	3:14:00	0:03:00	16	0.7	1.2			
C121	290	3:16:00	3:18:00	0:02:00	17	0.7	1.1			
C122	110	3:21:00	3:23:00	0:02:00	17	0.7	1.2			
C123	290	3:25:00	3:26:00	0:01:00	17	0.6	1			
C063	350	3:39:00	3:45:00	0:06:00	16	0.6	1.1			
C057	170	3:49:00	3:52:30	0:03:30	14	0.9	1.3			
C058	350	3:55:00	3:59:00	0:04:00	15	0.9	1.3			
C059	170	4:01:30	4:07:00	0:05:30	14	0.9	1.7			
C060	350	4:09:30	4:15:00	0:05:30	14	0.9	1.5			
C061	170	4:18:00	4:24:00	0:06:00	14	0.9	1.7			
C062	350	4:26:00	4:31:30	0:05:30	14	0.8	1.4			
C063	170	4:34:00	4:40:30	0:06:30	14	0.8	1.7			
C064	350	4:43:00	4:49:30	0:06:30	15	0.8	1.4			
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes	No

Additional Comments:

Drive #

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	5/6/2018	127	18-6739-01-102		AZ 3DEP

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
Other	N522AS	4475.3			
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
S. Robertson	ALS 70				

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	
130@10	clr	clr	0	95		30.25		Arriving	

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
	Kts		Ft		Ft	Yes		No		@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments		
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:		
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes	No
A091	170	8:15:30	8:24:00	0:08:30	17	0.6	1.1			
A092	350	8:26:00	8:33:30	0:07:30	17	0.7	1.1			
A093	170	8:36:30	8:43:00	0:06:30	17	0.7	1.1			
A094	350	8:46:30	8:53:30	0:07:00	16	0.7	1.3			
A095	170	8:56:30	9:03:00	0:06:30	17	0.8	1.6			
A096	350	9:06:00	9:12:00	0:06:00	17	0.7	1.2			
A097	170	9:15:00	9:21:00	0:06:00	17	0.7	1.2			
A098	350	9:24:00	9:29:00	0:05:00	17	0.7	1.3			
A099	170	9:32:00	9:37:00	0:05:00	16	0.8	1.3			
A100	350	9:40:00	9:45:00	0:05:00	17	0.7	1.4			
A101	170	9:48:00	9:53:00	0:05:00	19	0.7	1.1			
A102	350	9:56:00	10:00:00	0:04:00	18	0.6	1.1			
A103	170	10:03:00	10:08:00	0:05:00	18	0.7	1.3			
A104	350	10:11:00	10:14:30	0:03:30	18	0.6	1.1			
A105	170	10:17:00	10:19:00	0:02:00	18	0.6	1.2			
A106	350	10:22:00	10:24:00	0:02:00	17	0.6	1.3			
A107	170	10:27:00	10:29:00	0:02:00	17	0.6	1.4			
A108	350	10:31:30	10:33:00	0:01:30	17	0.6	1.3			
A109	170	10:37:00	10:40:00	0:03:00	17	0.6	1.4			
A110	350	10:43:00	10:46:30	0:03:30	18	0.6	1.2			
A111	170	10:49:00	10:52:30	0:03:30	18	0.6	1.2			
A112	350	10:55:00	10:58:00	0:03:00	19	0.6	1.2			
A113	170	11:01:00	11:04:00	0:03:00	20	0.6	1.2			
A114	350	11:07:00	11:10:00	0:03:00	20	0.6	1.2			
A115	170	11:13:00	11:15:00	0:02:00	20	0.6	1.1			
A116	300	11:19:30	11:24:30	0:05:00	19	0.6	1.2			
A117	120	11:27:00	11:32:00	0:05:00	19	0.6	1.2			
A118	300	11:35:00	11:40:00	0:05:00	19	0.6	1.2			
A119	120	11:42:30	11:47:00	0:04:30	18	0.7	1.3			
A120	300	11:50:00	11:55:00	0:05:00	18	0.6	1.3			
A121	120	11:57:00	12:03:00	0:06:00	20	0.6	1.1			
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes	No

Additional Comments:	Drive #

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	5/6/2018	127	18-6739-01-102		AZ 3DEP

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
Other	N522AS	4475.3			
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
S. Robertson	ALS 70				

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	
130@10	clr	clr	0	95		30.25		Arriving	

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode	Pre-Trigger Dist.
	Kts		Ft		Ft	Yes		No		@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission Yes No
A122	300	12:07:00	12:14:00	0:41:00	20	0.6	1.1	
A123	120	12:17:00	12:24:00	0:00:00	20	0.6	1.1	
A124	300	12:27:00	12:33:00	0:00:00	20	0.6	1.1	Fuel Stop

↑ Times entered are Zulu / GMT ↑		Page	2	Verify S-Turns After Mission Yes No

Additional Comments:

Drive #

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	5/6/2018	127	18-6739-01-102		AZ 3DEP

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
Other	N522AS	4475.3			
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
S. Robertson	ALS 70				

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	
130@10	clr	clr	0	95		30.25		Arriving	

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode	Pre-Trigger Dist.
	Kts		Ft		Ft	Yes		No		@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes / No
B148	80	2:05:00	2:09:00	0:04:00	18	0.6	1.1		
B149	260	2:12:00	2:16:00	0:04:00	18	0.6	1.1		
B150	80	2:19:00	2:22:30	0:03:30	18	0.6	1.1		
B151	260	2:25:00	2:29:00	0:04:00	17	0.7	1.2		
B152	80	2:31:30	2:35:00	0:03:30	16	0.7	1.2		
B153	260	2:38:00	2:41:30	0:03:30	16	0.7	1.2		
B154	80	2:44:00	2:47:00	0:03:00	16	0.7	1.2		
B155	260	2:50:00	2:53:30	0:03:30	16	0.7	1.2		
B156	80	2:56:30	3:00:00	0:03:30	17	0.6	1.1		
B157	260	3:03:00	3:06:00	0:03:00	16	0.6	1.2		
B158	80	3:09:00	3:12:30	0:03:30	16	0.7	1.3		
B159	260	3:15:00	3:18:30	0:03:30	16	0.6	1.1		
B160	80	3:20:30	3:24:00	0:03:30	18	0.6	1		
B161	260	3:27:00	3:29:30	0:02:30	16	0.6	1.1		
B162	80	3:32:00	3:33:30	0:01:30	16	0.7	1.1		
B163	260	3:36:00	3:37:00	0:01:00	16	0.7	1.1		
B164	80	3:40:00	3:41:00	0:01:00	16	0.7	1.1		
B165	120	3:46:00	3:50:00	0:04:00	15	0.7	1.2		
B166	300	3:52:30	3:56:30	0:04:00	13	0.8	1.7		
B167	120	3:59:00	4:02:00	0:03:00	13	0.8	1.7		
B168	300	4:05:00	4:07:00	0:02:00	13	0.8	1.7		
B169	120	4:10:00	4:10:30	0:00:30	13	0.8	1.7		
A140	120	4:14:00	4:15:30	0:01:30	14	0.6	1.3		
A139	300	4:18:00	4:19:00	0:01:00	15	0.6	1.2		
A138	120	4:22:30	4:24:00	0:01:30	15	0.6	1.2		
A137	300	4:26:00	4:28:00	0:02:00	15	0.6	1.2		
A136	120	4:31:00	4:33:00	0:02:00	15	0.7	1.3		
A135	300	4:36:00	4:38:30	0:02:30	15	0.7	1.3		
A134	120	4:41:00	4:44:30	0:03:30	15	0.8	1.3		
A133	300	4:47:00	4:50:30	0:03:30	16	0.7	1.2		
A132	120	4:53:00	4:57:30	0:04:30	16	0.7	1.2		
A131	300	5:00:00	5:04:00	0:04:00	16	0.7	1.3		
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes / No

Additional Comments:

Drive #

LiDAR Flight Log

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	5/7/2018	127	18-6739-01-102	0	AZ 3DEP

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base

Pilot	Sensor Type	HOBBS END	Local End Time	Zulu End Time	PID

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	
								Arriving	

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
				Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode	Pre-Trigger Dist.
	Kts		Ft		Ft	Yes		No		@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments		
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:		
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes	No
A125	120	9:41:00	9:47:48	0:06:48	20	0.6	1.1			
A126	300	9:51:00	9:56:30	0:05:30	18	0.6	1.2			
A127	120	9:59:00	10:06:00	0:07:00	18	0.6	1.2			
A128	300	10:08:00	10:14:00	0:06:00	18	0.7	1.3			
A129	120	10:17:00	10:22:00	0:05:00	17	0.7	1.3			
A130	300	10:25:00	10:30:00	0:05:00	17	0.7	1.4			
C092	260	10:35:00	10:41:00	0:06:00	19	0.7	1.2			
C091	80	10:44:00	10:50:00	0:06:00	20	0.7	1.2			
C090	260	10:53:00	11:09:00	0:16:00	20	0.6	1.1			
C089	80	11:11:11	11:17:00	0:05:49	20	0.6	1.1			
C088	260	11:20:00	11:26:00	0:06:00	19	0.6	1.1			
C087	80	11:29:00	11:35:00	0:06:00	19	0.7	1.3			
C086	260	11:38:00	11:44:00	0:06:00	18	0.7	1.3			
C085	80	11:47:00	11:51:00	0:04:00	20	0.7	1.2			
C084	260	11:54:00	11:58:00	0:04:00	19	0.7	1.1			
C083	80	12:01:00	12:06:30	0:05:30	20	0.6	1.1			
C082	260	12:09:00	12:14:00	0:05:00	19	0.6	1.2			
C105	180	12:20:00	12:21:00	0:01:00	20	0.6	1.1			
C106	360	12:24:00	12:25:00	0:01:00	20	0.6	1.1			
C107	180	12:28:00	12:29:00	0:01:00	20	0.6	1.1			
C108	360	12:32:00	12:33:00	0:01:00	19	0.6	1.1			
C098	330	12:35:00	12:38:00	0:03:00	18	0.7	1.3			
C099	150	12:41:00	12:43:00	0:02:00	18	0.7	1.3			
C100	330	12:45:30	12:47:00	0:01:30	18	0.7	1.3			
C101	150	12:49:30	12:50:30	0:01:00	17	0.7	1.4			
C102	330	12:53:00	12:55:00	0:02:00	17	0.7	1.4			
C103	150	12:57:00	12:59:00	0:02:00	17	0.7	1.4			
C104	330	1:02:00	1:03:00	0:01:00	17	0.7	1.4			
C093	330	1:05:30	1:08:00	0:02:30	17	0.8	1.6			
C094	150	1:10:30	1:14:00	0:03:30	18	0.7	1.2			
C095	330	1:16:00	1:19:00	0:03:00	17	0.7	1.3			
				Page		1		Verify S-Turns After Mission	Yes	No

Additional Comments:

Drive #

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	5/7/2018	127	18-6739-01-102	0	AZ 3DEP

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base

Pilot	Sensor Type	HOBBS END	Local End Time	Zulu End Time	PID

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	
								Arriving	

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
				Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode	Pre-Trigger Dist.
	Kts		Ft		Ft	Yes		No		@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments			
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:			
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes		No
C096	150	1:21:30	1:24:30	0:03:00	17	0.7	1.3				
C097	330	1:28:30	1:32:30	0:04:00	18	0.6	1.3	Fuel Stop			

↑ Times entered are Zulu / GMT ↑		Page	2	Verify S-Turns After Mission	Yes		No	

Additional Comments:	Drive #

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	5/7/2018	127	18-6739-01-102	0	AZ 3DEP

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base

Pilot	Sensor Type	HOBBS END	Local End Time	Zulu End Time	PID

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	
								Arriving	

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
				Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode	Pre-Trigger Dist.	
	Kts		Ft		Ft	Yes		No		@ NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments		
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:		
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes	No
C066	170	3:36:00	3:42:00	0:06:00	15	0.8	1.3			
C067	350	3:46:00	3:52:00	0:06:00	14	0.8	1.4			
C068	170	3:55:00	4:02:00	0:07:00	13	0.8	1.7			
C069	350	4:04:00	4:10:00	0:06:00	13	0.9	1.7			
C070	170	4:13:00	4:19:00	0:06:00	14	0.8	1.4			
C071	350	4:22:00	4:27:30	0:05:30	14	0.8	1.3			
C072	170	4:30:00	4:37:00	0:07:00	15	0.7	1.2			
C073	350	4:40:00	4:47:00	0:07:00	16	0.7	1.1			
C074	170	4:49:00	4:56:00	0:07:00	16	0.7	1.2			
C075	350	4:59:30	5:05:30	0:06:00	16	0.7	1.2			
C76	170	5:08:00	5:13:30	0:05:30	16	0.7	1.3			
C77	350	5:16:30	5:21:30	0:05:00	16	0.8	1.4			
C78	170	5:24:00	5:29:00	0:05:00	17	0.7	1.2			
C79	260	5:33:00	5:33:30	0:00:30	19	0.6	1			
C80	80	5:35:45	5:36:15	0:00:30	18	0.6	1.1			
C81	260	5:38:30	5:42:00	0:03:30	17	0.6	1.2			
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes	No

Additional Comments:

Drive #

Woolpert Lidar Acquisition Log

Project Info			Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #
78262	CA AZ FEMA R9 Lidar 2017 D18	---	02/24/2019	055	

Crew	Equipment		Time			Airports
Pilot	Aircraft Make/Model	Aircraft Tail #	Hobbs Start	Local Start	UTC Start	Departing
Operator	Sensor Make/Model	Sensor Serial #	Hobbs End	Local End	UTC End	Arriving
	Chiroptera 4x					

Conditions							
Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)

Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)
130	500		

Settings					
Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
	15	20	70	500	

Verify S-Turns Before Mission

Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
10010		19:16:00	19:18:00	00:02:00			
10020		19:21:00	19:22:00	00:01:00			

Verify S-Turns After Mission

Additional Comments

Appendix 1: Flight Logs

Upper San Pedro South, AZ

LiDAR Flight Log

Subcontractor:	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	5/26/2018			san pedro	Arizona 3dep

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
k. paschke	92HC	5232.1	6:11:00	13:11:00	
Pilot	**Sensor Type / Number**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
b. viets	als 70		10:20	17:20	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	p33
280@5	10	clear	0	21	-3	29.9	n/a	Arriving	p33

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed	AGL	MSL	Waveform Used	Waveform Mode	Pre-Trigger Dist.
150 Kts	5500 Ft	10700 Ft	Yes [ ] No [ ]	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:
		↕ Times entered are Zulu / GMT ↕						Verify S-Turns Before Mission: Yes [X] No [ ]
1	171	13:54:00	13:57:00	0:03:00	15	0.8	1.5	lines shortened by 3nm each
2	350	14:01:00	14:02:00	0:01:00	16	0.7	1.3	
3	171	14:06:00	14:10:00	0:04:00	17	0.7	1.4	
4	350	14:12:00	14:15:00	0:03:00	18	0.7	1.2	
5	171	14:19:00	14:25:00	0:06:00	17	0.7	1.3	
6	350	14:27:00	14:31:00	0:04:00	18	0.7	1.2	
7	171	14:34:00	14:39:00	0:05:00	17	0.7	1.3	
8	350	14:42:00	14:46:00	0:04:00	17	0.7	1.4	
9	171	14:50:00	14:55:00	0:05:00	17	0.7	1.4	
10	350	14:58:00	15:03:00	0:05:00	17	0.7	1.3	
11	171	15:06:00	15:12:00	0:06:00	17	0.7	1.5	
12	350	15:15:00	15:24:00	0:09:00	19	0.7	1.2	
13	171	15:27:00	15:39:00	0:12:00	19	0.7	1.1	
14	350	15:41:00	15:50:00	0:09:00	18	0.7	1.1	
15	171	15:53:00	16:05:00	0:12:00	18	0.6	1.2	
16	350	16:07:00	16:16:00	0:09:00	17	0.6	1.3	
17	171	16:20:00	16:31:00	0:11:00	19	0.6	1.1	
18	350	16:37:00	16:45:00	0:08:00	19	0.6	1.2	
19	171	16:49:00	17:00:00	0:11:00	20	0.6	1.3	
20	350	17:03:00	17:11:00	0:08:00	20	0.6	1.2	
		↑ Times entered are Zulu / GMT ↑	Page		1			Verify S-Turns After Mission: Yes [X] No [ ]

Additional Comments:

Drive #

LiDAR Flight Log

Subcontractor:	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	5/27/2018			San Pedro	Arizona 3dep

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
k. paschke	92hc	5236.5	6:15:00	13:15:00	
Pilot	**Sensor Type / Number**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
b. viets	als 70	5240	10:30	17:30	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	p33
100@3	10	clear	0	14	-8	29.89	n/a	Arriving	p33

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed	AGL	MSL	Waveform Used	Waveform Mode	Pre-Trigger Dist.
150 Kts	5200 Ft	10700 Ft	Yes [ ] No [ ]	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:
		↕ Times entered are Zulu / GMT ↕						Verify S-Turns Before Mission: Yes [X] No [ ]
48	261	14:01:00	14:02:00	0:01:00	15	0.7	1.4	
49	80	14:05:00	14:06:00	0:01:00	18	0.6	1.1	
50	261	14:09:00	14:10:00	0:01:00	18	0.6	1.1	
43	13	14:17:00	14:18:00	0:01:00	17	0.6	1.1	
44	194	14:21:00	14:23:00	0:02:00	18	0.6	1.2	
45	13	14:25:00	14:27:00	0:02:00	18	0.6	1.2	
46	194	14:30:00	14:32:00	0:02:00	17	0.6	1.2	
47	13	14:35:00	14:36:00	0:01:00	17	0.6	1.2	
21	171	14:43:00	14:54:00	0:11:00	17	0.6	1.3	lines cut 3NM short of southern end
22	351	14:57:00	15:06:00	0:09:00	17	0.6	1.2	
23	171	15:09:00	15:19:00	0:10:00	18	0.6	1.2	
24	351	15:22:00	15:30:00	0:08:00	17	0.7	1.3	
25	171	15:33:00	15:44:00	0:11:00	19	0.6	1.2	
26	351	15:47:00	15:55:00	0:08:00	18	0.6	1.2	
27	171	15:58:00	16:09:00	0:11:00	17	0.7	1.4	
28	351	16:11:00	16:20:00	0:09:00	17	0.7	1.4	
29	171	16:24:00	16:34:00	0:10:00	19	0.7	1.2	
30	351	16:37:00	16:44:00	0:07:00	19	0.7	1.2	
31	171	16:48:00	16:54:00	0:06:00	20	0.6	1.2	
32	351	16:57:00	17:02:00	0:05:00	20	0.6	1.2	
		↑ Times entered are Zulu / GMT ↑	Page		1			Verify S-Turns After Mission: Yes [X] No [ ]

Additional Comments:	Drive #

LiDAR Flight Log

Subcontractor:	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	5/28/2018			San pedro/ bisbee	Arizona 3dep

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
k. paschke	92hc	5240.6	6:12:00	13:12:00	
Pilot	**Sensor Type / Number**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
b. viets	als 70		10:20	17:20	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	p33
120@5	10	clear	0	15	-6	29.93	n/a	Arriving	p33

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
150	Kts	5500	Ft	9500	Ft	Yes		No		@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:
								Verify S-Turns Before Mission: Yes X No
1	261	13:58:00	13:59:00	0:01:00	15	0.8	1.8	ones 1-14 are cross lines added for cover
2	80	14:01:00	14:02:00	0:01:00	18	0.6	1.2	
6	80	14:17:00	14:22:00	0:05:00	17	0.6	1.2	
7	261	14:25:00	14:31:00	0:06:00	18	0.7	1.3	
8	80	14:34:00	14:39:00	0:05:00	17	0.7	1.2	
9	261	14:42:00	14:48:00	0:06:00	17	0.7	1.2	
10	80	14:51:00	14:55:00	0:04:00	17	0.7	1.2	
11	261	14:59:00	15:05:00	0:06:00	18	0.8	1.2	
33	351	15:14:00	15:20:00	0:06:00	18	0.8	1.3	
34	171	15:23:00	15:30:00	0:07:00	19	0.7	1.3	
35	351	15:33:00	15:39:00	0:06:00	20	0.7	1	
36	171	15:42:00	15:50:00	0:08:00	19	0.6	1.1	
37	351	15:52:00	15:59:00	0:07:00	17	0.6	1.3	
38	171	16:02:00	16:09:00	0:07:00	17	0.7	1.5	
39	351	16:11:00	16:18:00	0:07:00	18	0.7	1.2	
40	171	16:21:00	16:28:00	0:07:00	19	0.7	1.2	
41	351	16:31:00	16:36:00	0:05:00	19	0.7	1.2	
42	171	16:39:00	16:41:00	0:02:00	20	0.5	1.1	
		↑ Times entered are Zulu / GMT ↑		Page		1		Verify S-Turns After Mission: Yes X No

Additional Comments:

Drive #

LiDAR Flight Log

Subcontractor:	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	5/30/2018			San Pedro	Arizona 3dep

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
k. paschke	92hc	5249.1	6:30:00	13:30:00	
Pilot	**Sensor Type / Number**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
b. viets	als 70		8:00		

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	p33
190@6	10	clear	0	21	-3	29.86	n/a	Arriving	p33

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed	AGL	MSL	Waveform Used	Waveform Mode	Pre-Trigger Dist.
150 Kts	5200 Ft	10200 Ft	Yes [ ] No [ ]	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:
		↕ Times entered are Zulu / GMT ↕						Verify S-Turns Before Mission: Yes [X] No [ ]
3	261	14:26:00	14:28:00	0:02:00	18	0.6	1.1	cross lines
4	80	14:31:00	14:32:00	0:01:00	17	0.6	1.2	
13	260	14:39:00	14:45:00	0:06:00	17	0.6	1.2	
12	80	14:49:00	14:54:00	0:05:00	17	0.6	1.2	

		↑ Times entered are Zulu / GMT ↑	Page	1	Verify S-Turns After Mission: Yes [X] No [ ]

Additional Comments:

Drive #

Appendix 1: Flight Logs

Whetstone, AZ

Woolpert

	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	5/9/2018	129		18-6739-01-102	

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base

Pilot	Sensor Type	HOBBS END	Local End Time	Zulu End Time	PID

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	
								Arriving	

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
	Kts		Ft		Ft	Yes		No		@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments		
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:		
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes	No
B01	330	8:53:00	8:55:00	0:02:00	16	0.7	1.3			
B02	150	8:57:00	8:59:00	0:02:00	16	0.7	1.3			
B03	330	9:02:00	9:04:00	0:02:00	16	0.7	1.3			
B04	150	9:07:00	9:08:00	0:01:00	16	0.7	1.3			
b05	330	9:11:00	9:13:00	0:02:00	16	0.7	1.3			
B06	150	9:17:30	9:20:00	0:02:30	16	0.7	1.3			
B07	330	9:23:00	9:24:00	0:01:00	17	0.6	1.2			
B08	150	9:25:00	9:27:00	0:02:00	17	0.6	1.2			
B08	330	9:29:00	9:30:00	0:01:00	16	0.6	1.2			
B10	150	9:35:00	9:37:00	0:02:00	18	0.7	1.3			
B11	330	9:39:00	9:40:00	0:01:00	17	0.7	1.3			
B12	350	9:42:00	9:44:00	0:02:00	17	0.7	1.3			
B13	170	9:46:00	9:49:00	0:03:00	17	0.7	1.2			
B14	350	9:52:00	9:55:00	0:03:00	17	0.8	1.3			
B15	170	9:58:00	10:01:00	0:03:00	17	0.7	1.3			
B16	350	10:04:00	10:07:00	0:03:00	17	0.7	1.4			
B17	170	10:09:00	10:13:00	0:04:00	17	0.7	1.4			
B18	350	10:16:00	10:18:00	0:02:00	17	0.7	1.3			
B19	170	10:21:00	10:23:00	0:02:00	18	0.7	1.4			
B20	170	10:24:00	10:26:00	0:02:00	18	0.6	1.2			
B21	350	10:28:00	10:30:00	0:02:00	18	0.6	1.2			
B22	135	10:34:00	10:36:00	0:02:00	18	0.7	1.2			
B23	315	10:38:00	10:40:00	0:02:00	18	0.7	1.2			
B24	135	10:44:00	10:47:00	0:03:00	20	0.6	1.2			
B25	315	10:49:00	10:52:00	0:03:00	20	0.6	1.2			
B26	135	10:55:00	10:58:00	0:03:00	20	0.6	1.2			
A52	260	11:04:00	11:13:00	0:09:00	20	0.6	1.1			
A53	80	11:15:00	11:25:00	0:10:00	18	0.6	1.2			
A54	260	11:28:00	11:37:00	0:09:00	17	0.6	1.4			
A55	80	11:39:30	11:48:00	0:08:30	18	0.7	1.4			
A56	260	11:51:00	11:59:00	0:08:00	20	0.7	1.2			
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes	No

Additional Comments:

Drive #

Woolpert

Leica LIDAR	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	5/9/2018	129	18-6739-01-102		#REF!

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base

Pilot	Sensor Type	HOBBS END	Local End Time	Zulu End Time	PID

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	
								Arriving	

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
				Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode	Pre-Trigger Dist.
	Kts		Ft		Ft	Yes		No		@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments			
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:			
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes		No
A57	80	12:02:00	12:11:00	0:09:00	20	0.7	1.1				
A58	260	12:14:00	12:24:00	0:10:00	20	0.6	1.1				
A59	80	12:26:30	12:36:00	0:09:30	20	0.6	1.1				
A60	260	12:38:00	12:47:00	0:09:00	18	0.6	1.3				
A61	80	12:50:00	12:58:30	0:08:30	19	0.6	1.1	Fuel Stop			
↑ Times entered are Zulu / GMT ↑			Page		2			Verify S-Turns After Mission	Yes		No

Additional Comments:	Drive #

Woolpert

Leica LIDAR	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	5/9/2018	129	18-6739-01-102	0	

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base

Pilot	Sensor Type	HOBBS END	Local End Time	Zulu End Time	PID

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	
								Arriving	

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
				Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode	Pre-Trigger Dist.
	Kts		Ft		Ft	Yes		No		@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments		
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:		
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission	Yes	No
A62	260	2:09:00	2:15:00	0:06:00	17	0.6	1			
A63	80	2:19:00	2:32:00	0:13:00						

↑ Times entered are Zulu / GMT ↑		Page	1	Verify S-Turns After Mission	Yes	No

Additional Comments:

Drive #

LiDAR Flight Log

Subcontractor:	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	5/23/2018		18-		arizona 3dep

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
k. paschke	92hc	5217.8	9:30:00	16:30:00	
Pilot	**Sensor Type / Number**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
b. viets	als 70	5222.8	1:38	19:38	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	p33
							n/a	Arriving	p33

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	50	272		Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
150	Kts	5200	Ft	9728	Ft	Yes		No		@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:
		↕ Times entered are Zulu / GMT ↕						Verify S-Turns Before Mission: Yes X No
a64	261	17:06:00	17:15:00	0:09:00	19	0.6	1.2	
a65	80	17:18:00	17:28:00	0:10:00	20	0.6	1.2	
a66	261	17:31:00	17:39:00	0:08:00	18	0.6	1.3	
a67	80	17:42:00	17:50:00	0:08:00	19	0.6	1.2	
a68	261	17:52:00	18:02:00	0:10:00	20	0.6	1.2	
a69	80	18:05:00	18:15:00	0:10:00	20	0.6	1.2	
a70	261	18:17:00	18:28:00	0:11:00	20	0.6	1.2	
a71	80	18:31:00	18:41:00	0:10:00	20	0.6	1.1	
a72	261	18:45:00	18:54:00	0:09:00	18	0.7	1.4	
a73	80	18:57:00	19:07:00	0:10:00	18	0.7	1.4	
		↑ Times entered are Zulu / GMT ↑		Page		1		Verify S-Turns After Mission: Yes No

Additional Comments:	Drive #

LiDAR Flight Log

Subcontractor:	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	5/24/2018			whetstone a	Arizona 3dep

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
k. paschke	92hc	5222.8	6:25:00	13:25:00	
Pilot	**Sensor Type / Number**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
b. viets	als 70	5229.3	1:10	20:10	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	p33
calm	10	clear	0	16	-7	30.06	n/a	Arriving	p33

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed	AGL	MSL	Waveform Used				Waveform Mode	Pre-Trigger Dist.
150 Kts	5200 Ft	9700 Ft	Yes		No		@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:
		↕ Times entered are Zulu / GMT ↕						Verify S-Turns Before Mission: Yes X No
a74	261	13:49:00	14:00:00	0:11:00	15	0.8	1.6	
a75	80	14:03:00	14:13:00	0:10:00	16	0.7	1.3	
a76	261	14:16:00	14:28:00	0:12:00	17	0.7	1.1	
a77	80	14:30:00	14:42:00	0:12:00	17	0.7	1.1	
a78	261	14:44:00	14:56:00	0:12:00	17	0.7	1.2	
a79	80	14:59:00	15:10:00	0:11:00	17	0.7	1.2	
a80	261	15:13:00	15:25:00	0:12:00	18	0.7	1.1	
a81	80	15:28:00	15:39:00	0:11:00	18	0.6	1.2	
a82	261	15:41:00	15:54:00	0:13:00	19	0.6	1.1	
a83	80	15:57:00	16:09:00	0:12:00	18	0.6	1.2	
a84	261	16:13:00	16:27:00	0:14:00	17	0.7	1.4	
a85	80	16:30:00	16:40:00	0:10:00	19	0.7	1.2	
a86	261	16:44:00	16:54:00	0:10:00	19	0.7	1.2	
a87	80	16:57:00	17:04:00	0:07:00	20	0.7	1.1	
		↑ Times entered are Zulu / GMT ↑		Page		1		Verify S-Turns After Mission: Yes X No

Additional Comments:	Drive #

LiDAR Flight Log

Subcontractor:	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	5/24/2018			whetstone a	Arizona 3dep

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
k. paschke	92hc	5222.8	6:25:00	13:25:00	
Pilot	**Sensor Type / Number**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
b. viets	als 70	5229.3	1:10	20:10	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	p33
calm	10	clear	0	16	-7	30.06	n/a	Arriving	p33

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed	AGL	MSL	Waveform Used				Waveform Mode	Pre-Trigger Dist.
150 Kts	5200 Ft	9700 Ft	Yes		No		@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:
		↕ Times entered are Zulu / GMT ↕						Verify S-Turns Before Mission: Yes X No
a88	261	18:18:00	18:26:00	0:08:00	20	0.7	1.1	
a89	80	18:30:00	18:35:00	0:05:00	19	0.7	1.2	
a90	261	18:37:00	18:43:00	0:06:00	18	0.7	1.3	
a91	80	18:46:00	18:51:00	0:05:00	18	0.7	1.5	
a92	261	18:54:00	18:59:00	0:05:00	19	0.6	1.1	
a93	80	19:02:00	19:06:00	0:04:00	18	0.6	1.2	
a94	261	19:10:00	19:15:00	0:05:00	18	0.6	1.2	
a95	80	19:18:00	19:22:00	0:04:00	18	0.7	1.3	
a96	261	19:25:00	19:29:00	0:04:00	18	0.7	1.1	
a97	80	19:31:00	19:35:00	0:04:00	18	0.7	1.2	
a98	261	19:38:00	19:42:00	0:04:00	18	0.7	1.2	
		↑ Times entered are Zulu / GMT ↑		Page		1		Verify S-Turns After Mission: Yes X No

Additional Comments:

Drive #

LiDAR Flight Log

Subcontractor:	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	5/25/2018				Arizona 3dep

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
k. paschke	92hc	5229.3	6:30:00	13:30:00	
Pilot	**Sensor Type / Number**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
b. viets	als 70	5232.1	9:12	16:12	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	p33
120@4	10	clear	0	17	-7	30.06	n/a	Arriving	p33

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed	AGL	MSL	Waveform Used	Waveform Mode	Pre-Trigger Dist.
150 Kts	Ft	Ft	Yes [ ] No [ ]	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:
		↕ Times entered are Zulu / GMT ↕						Verify S-Turns Before Mission: Yes [X] No [ ]
b34	170	14:07:00	14:10:00	0:03:00	16	0.7	1.3	
b33	350	14:12:00	14:13:00	0:01:00	18	0.6	1.2	
b32	170	14:16:00	14:18:00	0:02:00	17	0.6	1.3	
b31	350	14:21:00	14:24:00	0:03:00	17	0.7	1.2	
b30	170	14:26:00	14:30:00	0:04:00	17	0.7	1.2	
b29	350	14:32:00	14:35:00	0:03:00	17	0.7	1.2	
b28	170	14:38:00	14:41:00	0:03:00	16	0.7	1.4	
b27	350	14:44:00	14:46:00	0:02:00	17	0.7	1.4	
		↑ Times entered are Zulu / GMT ↑		Page		1		Verify S-Turns After Mission: Yes [X] No [ ]

Additional Comments:	Drive #

Appendix 2: Raw Swath NVA Checkpoint Results

CA AOIs

Coordinate values are listed in the following spatial reference systems:

Horizontal: NAD83 (2011) State Plane California I or IV (based on AOI), US Survey Feet

Vertical: NAVD88 (GEOID12B) US Survey Feet

Summary	
Point Count	145
Average dZ	-0.021 ft
Minimum dZ	-0.440 ft
Maximum dZ	0.450 ft
Root Mean Square	0.162 ft -- 0.049 m
Standard Deviation	0.161 ft

CA IV - Salinas QL2

Point ID	Easting	Northing	Known Z	Laser Z	dZ
2008_2018_CA	6116587.25	1642837.31	1306.39	1306.34	0.050
2010_2018_CA	5997750.09	1620459.02	164.33	164.17	0.160
2015_2018_CA	5968558.73	1699301.07	79.29	79.44	-0.150
2016_2018_CA	6005197.58	1971719.84	1085.79	1085.50	0.290
2025A_2018_CA	5800189.93	2146129.22	134.36	134.59	-0.230
2025_2018_CA	5800377.34	2146584.16	132.66	132.88	-0.220
2027_2018_CA	5881530.26	2045714.08	227.13	226.86	0.270
2030A_2018_CA	5951977.84	1756334.56	677.79	677.89	-0.100
2030_2018_CA	5952060.74	1756209.11	678.19	678.17	0.020
2038-2018_CA	6171075.39	1622538.93	1547.66	1547.71	-0.050
2040_2018_CA	6114986.49	1624276.08	2074.14	2074.03	0.110
2045_2018_CA	6059389.14	1806827.25	663.66	663.82	-0.160
2048_2018_CA	5972212.18	1844910.42	809.43	809.36	0.070
2063_2018_CA	5910882.87	2186920.03	1934.54	1934.60	-0.060
2068_2018_CA	5894281.92	2225507.07	1890.90	1891.12	-0.220
2070_2018_CA	6140422.21	1660621.30	1910.93	1910.96	-0.030
2073A_2018_CA	5917381.14	1878929.57	2120.38	2120.54	-0.160

Point ID	Easting	Northing	Known Z	Laser Z	dZ
2073_2018_CA	5932226.18	1840606.72	959.48	959.03	0.450
2078_2018_CA	5760201.58	2131302.00	171.46	171.64	-0.180
2125_2018_CA	6085652.39	1566115.76	117.53	117.88	-0.350
2126_2018_CA	5988804.24	1989850.66	876.68	876.73	-0.050
2127_2018_CA	6045883.11	1956249.67	2525.75	2525.55	0.200
2128_2018_CA	5856664.38	2328253.23	2153.91	2153.77	0.140
2129_2018_CA	5653201.95	2356094.56	2634.35	2634.51	-0.160
2130_2018_CA	5628821.81	2334239.98	1698.51	1698.50	0.010
2131_2018_CA	5794451.68	2133443.54	65.63	65.83	-0.200
2132_2018_CA	5677371.05	2243518.28	34.92	34.91	0.010
2133_2018_CA	5746064.03	2190808.12	9.67	9.71	-0.040
2134_2018_CA	5706819.88	2091956.50	22.88	22.82	0.060
2135_2018_CA	5700485.53	2092690.20	35.16	35.44	-0.280
2136_2018_CA	5695054.65	2085322.72	75.65	75.63	0.020
2137_2018_CA	5701466.62	2060838.34	147.69	147.62	0.070
2138A_2018_CA	5757596.48	1967988.74	3552.32	3552.40	-0.080
2138_2018_CA	5775612.88	1966264.68	512.28	512.31	-0.030
2139_2018_CA	5802095.77	1901554.49	222.49	222.93	-0.440
2140_2018_CA	5870647.11	1811982.15	325.07	324.89	0.180
2141_2018_CA	5934041.42	1733159.42	32.65	32.94	-0.290
2142_2018_CA	5999618.88	1682520.38	13.99	13.92	0.070
2143_2018_CA	6032112.07	1611204.22	1088.55	1088.61	-0.060
2144_2018_CA	6191882.57	1640195.02	3183.55	3183.85	-0.300
2145_2018_CA	6166198.08	1655699.58	2646.81	2646.47	0.340
2146_2018_CA	6137249.53	1689319.25	1742.32	1742.24	0.080
2147_2018_CA	6053824.33	1723552.16	809.60	809.84	-0.240
2148_2018_CA	5965647.62	1936273.07	413.42	413.41	0.010
2149_2018_CA	5846202.77	2050946.92	397.16	396.90	0.260
2150_2018_CA	5979738.42	2021731.48	1450.19	1450.06	0.130
2151_2018_CA	5889877.76	2191217.16	641.09	641.08	0.010
2152_2018_CA	6071156.93	1909816.92	2122.14	2122.00	0.140
2153_2018_CA	5997220.87	1791361.77	814.03	813.96	0.070
2154_2018_CA	5902879.91	1849819.10	1130.13	1129.91	0.220
2155_2018_CA	5949843.50	2075328.01	1353.65	1353.81	-0.160

Point ID	Easting	Northing	Known Z	Laser Z	dZ
2156_2018_CA	5904225.01	2273974.03	1077.75	1077.94	-0.190
2157_2018_CA	5789251.20	2310583.86	369.37	369.56	-0.190
2158_2018_CA	5770502.91	2259361.42	1577.77	1577.76	0.010
2159_2018_CA	5872511.96	2144153.03	1375.07	1375.14	-0.070
2160_2018_CA	6005856.34	1880861.63	473.45	473.50	-0.050
2161A_2018_CA	5809390.50	1982589.08	1912.95	1913.03	-0.080
2161_2018_CA	5809540.82	1980318.61	2229.07	2229.26	-0.190
2162_2018_CA	5826626.70	1881507.10	179.06	179.01	0.050
2163_2018_CA	6083921.13	1831533.78	1203.89	1204.00	-0.110
2164A_2018_CA	6126368.57	1553741.45	582.31	582.27	0.040
2165_2018_CA	6147973.77	1597540.84	936.06	936.04	0.020
2166_2018_CA	6150767.44	1632483.80	1458.78	1458.97	-0.190
2167_2018_CA	6005273.74	1659403.96	15.63	15.67	-0.040
2168_2018_CA	6065530.23	1698514.64	877.36	877.34	0.020
2169_2018_CA	6058365.82	1796641.43	624.33	624.31	0.020
2170_2018_CA	6049798.18	1864804.12	1580.66	1580.59	0.070
2171_2018_CA	6009947.30	1994938.69	1360.36	1360.36	0.000
2172_2018_CA	5971162.85	2117510.82	2127.54	2127.51	0.030
2173_2018_CA	5941816.26	2129717.41	1507.10	1507.02	0.080
2174_2018_CA	5908478.44	2144298.63	798.11	798.26	-0.150
2175_2018_CA	5844783.50	2265576.18	1055.98	1056.02	-0.040
2176_2018_CA	5707720.67	2034466.84	144.98	145.26	-0.280
2177_2018_CA	5733841.84	2068006.91	2121.36	2121.41	-0.050
2178_2018_CA	5759705.43	2068485.24	405.93	405.72	0.210
2179_2018_CA	5802234.36	2039407.05	1600.22	1600.25	-0.030
2180_2018_CA	5910742.05	2020722.48	247.09	247.01	0.080
2181_2018_CA	5989656.01	2034067.29	1851.97	1851.94	0.030
2182_2018_CA	6043124.38	2019560.09	2603.41	2603.17	0.240
2183_2018_CA	6023832.76	2023964.54	2593.63	2593.45	0.180
2184_2018_CA	5874749.60	1916563.42	1243.64	1243.49	0.150
2185_2018_CA	6068698.03	1627274.26	263.65	263.45	0.200
2186_2018_CA	6081861.81	1664828.05	1016.78	1016.80	-0.020
2187_2018_CA	6079922.67	1596884.03	242.14	242.16	-0.020
2188_2018_CA	6114986.48	1537789.37	366.93	367.14	-0.210

Point ID	Easting	Northing	Known Z	Laser Z	dZ
2189_2018_CA	6077579.81	1533356.23	24.18	24.53	-0.350
2190_2018_CA	6124217.00	1592808.21	531.25	531.33	-0.080
2191_2018_CA	6069180.69	1757897.58	804.52	804.75	-0.230
2192_2018_CA	6027953.86	1838338.64	544.92	545.11	-0.190
2193_2018_CA	5931079.80	1966003.50	312.69	312.69	0.000
2194_2018_CA	5900647.83	2009433.60	281.23	281.53	-0.300
2195_2018_CA	5783498.88	2140233.52	50.23	50.49	-0.260
2196_2018_CA	5818764.15	2200222.15	212.01	212.11	-0.100
2197_2018_CA	5811624.89	2269214.05	213.76	213.67	0.090
2198_2018_CA	5691021.12	2300807.56	929.54	929.36	0.180
2199_2018_CA	5682379.41	2279453.61	555.95	555.87	0.080
2200_2018_CA	5651769.84	2307656.36	484.23	484.31	-0.080
2201_2018_CA	5721422.81	2269734.76	722.73	722.60	0.130
2202_2018_CA	5747094.06	2289774.92	1101.00	1101.16	-0.160
2203_2018_CA	5788672.12	2223018.20	126.68	126.56	0.120
2204_2018_CA	5867308.38	2077678.00	615.36	615.39	-0.030
2205_2018_CA	5967271.67	1879217.50	2277.85	2277.63	0.220
2206_2018_CA	5955584.41	1831963.78	1035.14	1034.98	0.160
2207_2018_CA	5913434.40	1815783.35	1916.74	1916.72	0.020
2208_2018_CA	5954838.74	1763682.65	1655.22	1655.61	-0.390
2209A_2018_CA	6021988.91	1769294.40	1044.62	1044.47	0.150
2209_2018_CA	6021976.96	1769311.03	1043.48	1043.29	0.190
2210_2018_CA	6017302.21	1719975.00	1369.58	1369.58	0.000
2211_2018_CA	6039816.46	1681459.53	924.93	924.61	0.320
2212_2018_CA	6034946.62	1649402.88	151.83	152.11	-0.280
2213_2018_CA	6125028.99	1732070.98	1507.69	1507.44	0.250
2214_2018_CA	6068101.13	1920470.41	1799.71	1799.79	-0.080
2215_2018_CA	6011876.21	1948539.61	1146.39	1146.42	-0.030
2216_2018_CA	5857563.01	2169522.74	871.25	871.29	-0.040
2217_2018_CA	5863719.58	2231816.48	206.78	207.02	-0.240
2218_2018_CA	5880652.88	2292081.93	1631.85	1631.82	0.030
2219_2018_CA	5725344.72	2245072.13	208.31	208.10	0.210
2220_2018_CA	5857323.50	1989526.75	608.64	608.57	0.070

CA I - Red Bluff, Scott Valley, Stillwater

Point ID	Easting	Northing	Known Z	Laser Z	dZ
2101_2018_CA	6335375.71	2476350.55	2772.91	2773.04	-0.130
2101A_2018_CA	6335454.39	2476435.11	2773.68	2773.81	-0.130
2102_2018_CA	6350335.89	2361532.67	3240.99	3241.01	-0.020
2103_2018_CA	6330385.22	2392803.88	2865.60	2865.65	-0.050
2104_2018_CA	6315159.14	2415489.76	2956.34	2956.34	0.000
2105_2018_CA	6314573.46	2448607.76	2801.23	2801.30	-0.070
2106_2018_CA	6288319.22	2482920.60	2663.18	2663.02	0.160
2107_2018_CA	6335528.87	2452263.36	2744.71	2744.80	-0.090
2108_2018_CA	6328837.75	2437988.34	2746.68	2746.70	-0.020
2109_2018_CA	6467849.67	2130772.60	753.76	753.88	-0.120
2110_2018_CA	6491106.75	2115016.00	691.58	691.76	-0.180
2111_2018_CA	6467909.45	2108020.23	672.18	672.14	0.040
2112_2018_CA	6464810.46	2095652.23	566.36	566.43	-0.070
2113_2018_CA	6445081.89	2061358.61	737.41	737.50	-0.090
2114_2018_CA	6470253.60	2045213.69	513.12	513.08	0.040
2115_2018_CA	6497399.55	2046761.18	392.47	392.44	0.030
2116_2018_CA	6492042.82	2088107.21	595.11	595.19	-0.080
2117_2018_CA	6506401.15	1952492.47	277.40	277.51	-0.110
2118_2018_CA	6522433.67	1936530.50	254.28	254.13	0.150
2119_2018_CA	6534680.42	1892705.08	229.60	229.55	0.050
2120_2018_CA	6550765.15	1841260.00	177.71	177.66	0.050
2121_2018_CA	6592404.88	1842294.04	394.89	395.06	-0.170
2122_2018_CA	6542087.70	1917957.95	285.81	286.01	-0.200
2123_2018_CA	6524371.09	1958236.92	507.01	506.97	0.040
2124_2018_CA	6557711.22	1875174.75	287.53	287.72	-0.190

CA IV - Salinas QL1

Point ID	Easting	Northing	Known Z	Laser Z	dZ
2127_2018_CA	6045883.11	1956249.67	2525.75	2525.69	0.060
2171_2018_CA	6009947.30	1994938.69	1360.36	1360.44	-0.080

AZ AOIs

Coordinate values are listed in the following spatial reference systems:

Horizontal: NAD83 State Plane Arizona Central or East Zone (based on AOI), International Feet

Vertical: NAVD88 (GEOID12B) International Feet

Summary	
Point Count	94
Average dZ	-0.096 ft
Minimum dZ	-0.560 ft
Maximum dZ	0.360 ft
Root Mean Square	0.203 ft -- 0.061 m
Standard Deviation	0.180 ft

AZ Central - Apache Junction

Point ID	Easting	Northing	Known Z	Laser Z	dZ
2221_2018_AZ	721526.060	253200.890	4520.660	4520.880	-0.220
2222_2018_AZ	752593.430	245085.630	4744.430	4744.710	-0.280
2223_2018_AZ	746428.960	188302.340	4772.310	4772.560	-0.250
2224_2018_AZ	725621.710	147073.680	4302.490	4302.490	0.000
2225_2018_AZ	699279.610	127627.920	4408.820	4408.810	0.010
2226_2018_AZ	736120.170	222312.500	4343.980	4343.930	0.050
2227_2018_AZ	692663.320	188474.010	4319.400	4319.490	-0.090
2229_2018_AZ	477553.060	1149927.930	5476.920	5477.410	-0.490
2230_2018_AZ	456607.420	1167398.520	5286.210	5286.030	0.180
2232_2018_AZ	307793.820	1237327.300	5643.060	5643.330	-0.270
2011_2018_AZ	834724.400	860117.410	1745.110	1745.460	-0.350
2012_2018_AZ	833294.410	897527.940	2065.240	2065.150	0.090
2013_2018_AZ	802415.880	897240.860	1922.570	1922.340	0.230
2014_2018_AZ	803192.490	860765.620	1530.520	1530.500	0.020
2017_2018_AZ	813400.800	888895.560	1817.950	1817.790	0.160
2018_2018_AZ	828803.660	882121.480	1857.890	1858.410	-0.520

AZ East - Bisbee, Central Gila, Upper San Pedro South, Whetstone

Point ID	Easting	Northing	Known Z	Laser Z	dZ
2001_2018_AZ	750945.550	136812.000	4521.830	4521.770	0.060
2002_2018_AZ	777233.310	134342.390	4719.620	4719.730	-0.110

Point ID	Easting	Northing	Known Z	Laser Z	dZ
2003_2018_AZ	792197.240	127132.870	4626.180	4626.230	-0.050
2004_2018_AZ	754263.390	180223.400	5002.870	5003.160	-0.290
2005_2018_AZ	745359.750	157471.130	4762.160	4762.290	-0.130
2006_2018_AZ	776141.530	161647.900	5431.750	5431.920	-0.170
2007_2018_AZ	794319.180	142591.420	4943.190	4943.130	0.060
2009_2018_AZ	766778.290	127660.830	4564.580	4564.610	-0.030
2019_2018_AZ	622449.010	252763.950	4661.920	4662.140	-0.220
2020_2018_AZ	670017.500	259003.070	4185.940	4186.170	-0.230
2021_2018_AZ	721723.910	272422.210	4297.100	4297.120	-0.020
2022_2018_AZ	739505.800	280378.070	4574.610	4574.630	-0.020
2023_2018_AZ	750718.790	308068.950	5070.980	5071.060	-0.080
2024_2018_AZ	736379.860	373219.940	4647.050	4647.110	-0.060
2026_2018_AZ	711338.820	467063.290	4914.900	4914.980	-0.080
2028_2018_AZ	689419.590	436520.020	4795.030	4795.020	0.010
2029_2018_AZ	612556.730	389868.360	3918.930	3918.980	-0.050
2031_2018_AZ	620976.830	335328.210	4608.760	4608.500	0.260
2032_2018_AZ	645772.970	323738.750	4511.940	4511.750	0.190
2033_2018_AZ	655510.530	355779.220	3630.270	3630.440	-0.170
2034_2018_AZ	721568.500	316650.990	4498.820	4498.460	0.360
2035_2018_AZ	701374.190	362838.850	4280.990	4281.040	-0.050
2036_2018_AZ	717293.920	460489.460	4953.030	4953.070	-0.040
2037_2018_AZ	643322.480	392698.910	3449.170	3449.360	-0.190
2039_2018_AZ	649754.750	375874.340	3590.560	3590.840	-0.280
2041_2018_AZ	670752.380	332354.680	3595.140	3595.700	-0.560
2042_2018_AZ	703276.720	290362.130	4041.120	4041.210	-0.090
2043_2018_AZ	644113.490	298912.460	4582.130	4582.420	-0.290
2044_2018_AZ	742220.330	291080.430	4640.580	4640.690	-0.110
2046_2018_AZ	648637.390	345091.060	4079.910	4080.000	-0.090
2047_2018_AZ	720307.080	343738.150	4452.830	4452.810	0.020
2049_2018_AZ	684550.220	336784.850	3842.330	3842.420	-0.090
2050_2018_AZ	728142.140	410139.320	5024.830	5025.100	-0.270
2051_2018_AZ	509902.400	731754.520	2101.850	2102.130	-0.280
2052_2018_AZ	527358.090	762942.610	2186.000	2186.010	-0.010
2053_2018_AZ	515073.430	769947.300	2330.520	2330.930	-0.410

Point ID	Easting	Northing	Known Z	Laser Z	dZ
2054_2018_AZ	505655.390	782081.090	2667.290	2667.590	-0.300
2055_2018_AZ	519839.300	829132.800	4474.970	4475.420	-0.450
2056_2018_AZ	528380.170	852507.540	3662.280	3662.500	-0.220
2057_2018_AZ	511903.540	862532.060	3738.980	3739.010	-0.030
2058_2018_AZ	535242.470	911310.260	4796.390	4796.300	0.090
2059_2018_AZ	456853.010	991176.750	3335.400	3335.430	-0.030
2060_2018_AZ	495102.910	1187348.540	7626.030	7625.880	0.150
2061_2018_AZ	501750.960	1175306.010	6942.480	6942.230	0.250
2064_2018_AZ	382366.740	1192891.740	5082.710	5082.650	0.060
2065_2018_AZ	336370.920	1184432.560	5145.710	5145.930	-0.220
2066_2018_AZ	338390.750	1206128.380	4604.260	4604.030	0.230
2067_2018_AZ	295049.970	1247424.610	6490.890	6490.960	-0.070
2067A_2018_AZ	295860.390	1242038.160	5835.300	5835.440	-0.140
2069_2018_AZ	283552.760	1241520.760	5851.690	5851.890	-0.200
2071_2018_AZ	314267.650	1074436.770	4012.820	4013.090	-0.270
2072_2018_AZ	356309.680	1031639.660	2288.660	2288.940	-0.280
2074_2018_AZ	368545.900	1007756.810	2217.390	2217.650	-0.260
2075_2018_AZ	366166.500	1016163.680	2216.330	2216.490	-0.160
2076_2018_AZ	384048.480	992228.610	2276.000	2276.270	-0.270
2077_2018_AZ	396547.980	976201.850	2195.430	2195.680	-0.250
2079_2018_AZ	414273.120	966853.590	2423.690	2423.860	-0.170
2080_2018_AZ	431360.970	964316.060	2245.780	2246.030	-0.250
2081_2018_AZ	454847.830	870314.860	3908.470	3908.490	-0.020
2082_2018_AZ	451646.260	857769.010	4610.350	4610.300	0.050
2083_2018_AZ	469717.340	849108.440	4935.900	4935.910	-0.010
2084_2018_AZ	461625.090	821220.950	3230.760	3231.080	-0.320
2085_2018_AZ	470676.770	803336.500	3460.250	3460.310	-0.060
2086_2018_AZ	486223.770	791235.270	3215.220	3215.110	0.110
2087_2018_AZ	515290.870	850149.900	3975.150	3975.280	-0.130
2088_2018_AZ	420498.910	1212203.590	5396.780	5396.970	-0.190
2089_2018_AZ	457351.730	1158242.840	5417.300	5417.230	0.070
2090_2018_AZ	363338.690	1134343.970	2969.300	2969.490	-0.190
2091_2018_AZ	360815.640	1218204.840	4876.420	4876.490	-0.070
2092_2018_AZ	368042.120	1243709.590	5708.020	5708.230	-0.210

Point ID	Easting	Northing	Known Z	Laser Z	dZ
2093_2018_AZ	365241.810	1233538.840	5345.350	5345.250	0.100
2094_2018_AZ	300191.040	1228130.560	6207.050	6207.230	-0.180
2095_2018_AZ	311921.400	1232596.200	5375.690	5375.760	-0.070
2096_2018_AZ	420871.060	1158309.880	5518.570	5518.530	0.040
2097_2018_AZ	372382.200	1071698.800	3141.280	3141.150	0.130
2098_2018_AZ	404679.010	1010873.290	3366.090	3365.990	0.100
2099_2018_AZ	464498.720	900459.410	4320.250	4320.220	0.030
2100_2018_AZ	422578.220	1130737.520	4182.580	4182.750	-0.170

Appendix 3: DEM NVA Checkpoint Results

CA AOIs

Coordinate values are listed in the following spatial reference systems:

Horizontal: NAD83 (2011) State Plane California I or IV (based on AOI), US Survey Feet

Vertical: NAVD88 (GEOID12B) US Survey Feet

Summary	
Point Count	145
Root Mean Square Error	0.168 ft -- 0.051 m
95% Confidence Level	0.323 ft -- 0.099 m
Mean of Residuals	-0.019 ft
Standard Deviation	0.168 ft

CA IV - Salinas QL2

Point ID	Easting	Northing	Known Z	Laser Z	dZ
2008_2018_CA	6116587.250	1642837.310	1306.390	1306.333	0.057
2010_2018_CA	5997750.090	1620459.020	164.330	164.380	-0.050
2015_2018_CA	5968558.730	1699301.070	79.290	79.420	-0.130
2016_2018_CA	6005197.580	1971719.840	1085.790	1085.542	0.248
2025A_2018_CA	5800189.930	2146129.220	132.660	132.860	-0.200
2025_2018_CA	5800377.340	2146584.160	134.360	134.610	-0.250
2027_2018_CA	5881530.260	2045714.080	227.130	226.860	0.270
2030A_2018_CA	5951977.840	1756334.560	677.790	678.171	-0.381
2030_2018_CA	5952060.740	1756209.110	678.190	677.751	0.439
2038-2018_CA	6171075.390	1622538.930	1547.660	1547.663	-0.003
2040_2018_CA	6114986.490	1624276.080	2074.140	2073.964	0.176
2045_2018_CA	6059389.140	1806827.250	663.660	663.831	-0.171
2048_2018_CA	5972212.180	1844910.420	809.430	809.422	0.008
2063_2018_CA	5910882.870	2186920.030	1934.540	1934.624	-0.084
2068_2018_CA	5894281.920	2225507.070	1890.900	1891.114	-0.214
2070_2018_CA	6140422.210	1660621.300	1910.930	1910.964	-0.034
2073_2018_CA	5917381.140	1878929.570	959.480	958.992	0.488
2073A_2018_CA	5932226.180	1840606.720	2120.380	2120.524	-0.144

Point ID	Easting	Northing	Known Z	Laser Z	dZ
2078_2018_CA	5760201.580	2131302.000	171.460	171.480	-0.020
2125_2018_CA	6085652.390	1566115.760	117.530	117.660	-0.130
2126_2018_CA	5988804.240	1989850.660	876.680	876.762	-0.082
2127_2018_CA	6045883.110	1956249.670	2525.750	2525.545	0.205
2128_2018_CA	5856664.380	2328253.230	2153.910	2153.774	0.136
2129_2018_CA	5653201.950	2356094.560	2634.350	2634.515	-0.165
2130_2018_CA	5628821.810	2334239.980	1698.510	1698.643	-0.133
2131_2018_CA	5794451.680	2133443.540	65.630	65.830	-0.200
2132_2018_CA	5677371.050	2243518.280	34.920	34.890	0.030
2133_2018_CA	5746064.030	2190808.120	9.670	9.680	-0.010
2134_2018_CA	5706819.880	2091956.500	22.880	22.820	0.060
2135_2018_CA	5700485.530	2092690.200	35.160	35.450	-0.290
2136_2018_CA	5695054.650	2085322.720	75.650	75.640	0.010
2137_2018_CA	5701466.620	2060838.340	147.690	147.720	-0.030
2138_2018_CA	5757596.480	1967988.740	512.280	512.331	-0.051
2138A_2018_CA	5775612.880	1966264.680	3552.320	3552.417	-0.097
2139_2018_CA	5802095.770	1901554.490	222.490	222.940	-0.450
2140_2018_CA	5870647.110	1811982.150	325.070	324.851	0.219
2141_2018_CA	5934041.420	1733159.420	32.650	32.830	-0.180
2142_2018_CA	5999618.880	1682520.380	13.990	13.920	0.070
2143_2018_CA	6032112.070	1611204.220	1088.550	1088.842	-0.292
2144_2018_CA	6191882.570	1640195.020	3183.550	3183.926	-0.376
2145_2018_CA	6166198.080	1655699.580	2646.810	2646.515	0.295
2146_2018_CA	6137249.530	1689319.250	1742.320	1742.263	0.057
2147_2018_CA	6053824.330	1723552.160	809.600	809.822	-0.222
2148_2018_CA	5965647.620	1936273.070	413.420	413.461	-0.041
2149_2018_CA	5846202.770	2050946.920	397.160	396.891	0.269
2150_2018_CA	5979738.420	2021731.480	1450.190	1450.073	0.117
2151_2018_CA	5889877.760	2191217.160	641.090	641.081	0.009
2152_2018_CA	6071156.930	1909816.920	2122.140	2121.954	0.186
2153_2018_CA	5997220.870	1791361.770	814.030	813.962	0.068
2154_2018_CA	5902879.910	1849819.100	1130.130	1129.922	0.208
2155_2018_CA	5949843.500	2075328.010	1353.650	1353.623	0.027
2156_2018_CA	5904225.010	2273974.030	1077.750	1077.952	-0.202

Point ID	Easting	Northing	Known Z	Laser Z	dZ
2157_2018_CA	5789251.200	2310583.860	369.370	369.551	-0.181
2158_2018_CA	5770502.910	2259361.420	1577.770	1577.733	0.037
2159_2018_CA	5872511.960	2144153.030	1375.070	1375.233	-0.163
2160_2018_CA	6005856.340	1880861.630	473.450	473.431	0.019
2161_2018_CA	5809390.500	1982589.080	2229.070	2229.314	-0.244
2161A_2018_CA	5809540.820	1980318.610	1912.950	1913.024	-0.074
2162_2018_CA	5826626.700	1881507.100	179.060	178.960	0.100
2163_2018_CA	6083921.130	1831533.780	1203.890	1203.982	-0.092
2164A_2018_CA	6126368.570	1553741.450	582.310	582.081	0.229
2165_2018_CA	6147973.770	1597540.840	936.060	936.042	0.018
2166_2018_CA	6150767.440	1632483.800	1458.780	1458.973	-0.193
2167_2018_CA	6005273.740	1659403.960	15.630	15.660	-0.030
2168_2018_CA	6065530.230	1698514.640	877.360	877.322	0.038
2169_2018_CA	6058365.820	1796641.430	624.330	624.291	0.039
2170_2018_CA	6049798.180	1864804.120	1580.660	1580.583	0.077
2171_2018_CA	6009947.300	1994938.690	1360.360	1360.323	0.037
2172_2018_CA	5971162.850	2117510.820	2127.540	2127.484	0.056
2173_2018_CA	5941816.260	2129717.410	1507.100	1507.063	0.037
2174_2018_CA	5908478.440	2144298.630	798.110	798.222	-0.112
2175_2018_CA	5844783.500	2265576.180	1055.980	1055.982	-0.002
2176_2018_CA	5707720.670	2034466.840	144.980	145.270	-0.290
2177_2018_CA	5733841.840	2068006.910	2121.360	2121.464	-0.104
2178_2018_CA	5759705.430	2068485.240	405.930	405.751	0.179
2179_2018_CA	5802234.360	2039407.050	1600.220	1600.233	-0.013
2180_2018_CA	5910742.050	2020722.480	247.090	247.070	0.020
2181_2018_CA	5989656.010	2034067.290	1851.970	1852.074	-0.104
2182_2018_CA	6043124.380	2019560.090	2603.410	2603.215	0.195
2183_2018_CA	6023832.760	2023964.540	2593.630	2593.565	0.065
2184_2018_CA	5874749.600	1916563.420	1243.640	1243.562	0.078
2185_2018_CA	6068698.030	1627274.260	263.650	263.401	0.249
2186_2018_CA	6081861.810	1664828.050	1016.780	1016.692	0.088
2187_2018_CA	6079922.670	1596884.030	242.140	242.100	0.040
2188_2018_CA	6114986.480	1537789.370	366.930	367.161	-0.231
2189_2018_CA	6077579.810	1533356.230	24.180	24.510	-0.330

Point ID	Easting	Northing	Known Z	Laser Z	dZ
2190_2018_CA	6124217.000	1592808.210	531.250	531.421	-0.171
2191_2018_CA	6069180.690	1757897.580	804.520	804.692	-0.172
2192_2018_CA	6027953.860	1838338.640	544.920	545.081	-0.161
2193_2018_CA	5931079.800	1966003.500	312.690	312.661	0.029
2194_2018_CA	5900647.830	2009433.600	281.230	281.521	-0.291
2195_2018_CA	5783498.880	2140233.520	50.230	50.390	-0.160
2196_2018_CA	5818764.150	2200222.150	212.010	212.120	-0.110
2197_2018_CA	5811624.890	2269214.050	213.760	213.680	0.080
2198_2018_CA	5691021.120	2300807.560	929.540	929.462	0.078
2199_2018_CA	5682379.410	2279453.610	555.950	555.851	0.099
2200_2018_CA	5651769.840	2307656.360	484.230	484.221	0.009
2201_2018_CA	5721422.810	2269734.760	722.730	722.591	0.139
2202_2018_CA	5747094.060	2289774.920	1101.000	1101.102	-0.102
2203_2018_CA	5788672.120	2223018.200	126.680	126.780	-0.100
2204_2018_CA	5867308.380	2077678.000	615.360	615.451	-0.091
2205_2018_CA	5967271.670	1879217.500	2277.850	2277.665	0.185
2206_2018_CA	5955584.410	1831963.780	1035.140	1034.972	0.168
2207_2018_CA	5913434.400	1815783.350	1916.740	1916.734	0.006
2208_2018_CA	5954838.740	1763682.650	1655.220	1655.373	-0.153
2209_2018_CA	6021988.910	1769294.400	1043.480	1043.282	0.198
2209A_2018_CA	6021976.960	1769311.030	1044.620	1044.492	0.128
2210_2018_CA	6017302.210	1719975.000	1369.580	1369.593	-0.013
2211_2018_CA	6039816.460	1681459.530	924.930	924.562	0.368
2212_2018_CA	6034946.620	1649402.880	151.830	152.090	-0.260
2213_2018_CA	6125028.990	1732070.980	1507.690	1507.263	0.427
2214_2018_CA	6068101.130	1920470.410	1799.710	1799.774	-0.064
2215_2018_CA	6011876.210	1948539.610	1146.390	1146.442	-0.052
2216_2018_CA	5857563.010	2169522.740	871.250	871.332	-0.082
2217_2018_CA	5863719.580	2231816.480	206.780	207.060	-0.280
2218_2018_CA	5880652.880	2292081.930	1631.850	1631.843	0.007
2219_2018_CA	5725344.720	2245072.130	208.310	208.100	0.210
2220_2018_CA	5857323.500	1989526.750	608.640	608.541	0.099

CA I - Red Bluff, Scott Valley, Stillwater

Point ID	Easting	Northing	Known Z	Laser Z	dZ
2101_2018_CA	6335375.710	2476350.550	2772.910	2773.156	-0.246
2101A_2018_CA	6335454.390	2476435.110	2773.680	2773.796	-0.116
2102_2018_CA	6350335.890	2361532.670	3240.990	3240.997	-0.007
2103_2018_CA	6330385.220	2392803.880	2865.600	2865.626	-0.026
2104_2018_CA	6315159.140	2415489.760	2956.340	2956.276	0.064
2105_2018_CA	6314573.460	2448607.760	2801.230	2801.306	-0.076
2106_2018_CA	6288319.220	2482920.600	2663.180	2663.105	0.075
2107_2018_CA	6335528.870	2452263.360	2744.710	2744.846	-0.136
2108_2018_CA	6328837.750	2437988.340	2746.680	2746.746	-0.066
2109_2018_CA	6467849.670	2130772.600	753.760	753.862	-0.102
2110_2018_CA	6491106.750	2115016.000	691.580	691.821	-0.241
2111_2018_CA	6467909.450	2108020.230	672.180	672.081	0.099
2112_2018_CA	6464810.460	2095652.230	566.360	566.411	-0.051
2113_2018_CA	6445081.890	2061358.610	737.410	737.471	-0.061
2114_2018_CA	6470253.600	2045213.690	513.120	513.091	0.029
2115_2018_CA	6497399.550	2046761.180	392.470	392.431	0.039
2116_2018_CA	6492042.820	2088107.210	595.110	595.191	-0.081
2117_2018_CA	6506401.150	1952492.470	277.400	277.511	-0.111
2118_2018_CA	6522433.670	1936530.500	254.280	254.151	0.129
2119_2018_CA	6534680.420	1892705.080	229.600	229.570	0.030
2120_2018_CA	6550765.150	1841260.000	177.710	177.600	0.110
2121_2018_CA	6592404.880	1842294.040	394.890	395.071	-0.181
2122_2018_CA	6542087.700	1917957.950	285.810	286.031	-0.221
2123_2018_CA	6524371.090	1958236.920	507.010	506.971	0.039
2124_2018_CA	6557711.220	1875174.750	287.530	287.681	-0.151

CA IV - Salinas QL1

Point ID	Easting	Northing	Known Z	Laser Z	dZ
2127_2018_CA	6045883.110	1956249.670	2525.750	2525.685	0.065
2171_2018_CA	6009947.300	1994938.690	1360.360	1360.373	-0.013

AZ AOIs

Coordinate values are listed in the following spatial reference system:

Horizontal: NAD83 State Plane Arizona Central or East Zone (based on AOI), International Feet

Vertical: NAVD88 (GEOID12B) International Feet

Summary	
Point Count	94
Root Mean Square Error	0.159 ft -- 0.048 m
95% Confidence Level	0.360 ft -- 0.094 m
Mean of Residuals	-0.035 ft
Standard Deviation	0.156 ft

AZ Central - Apache Junction

Point ID	Easting	Northing	Known Z	Laser Z	dZ
2011_2018_AZ	834724.400	860117.410	1745.110	1745.410	-0.300
2012_2018_AZ	833294.410	897527.940	2065.240	2065.150	0.090
2013_2018_AZ	802415.880	897240.860	1922.567	1922.320	0.247
2014_2018_AZ	803192.490	860765.620	1530.522	1530.310	0.212
2017_2018_AZ	813400.800	888895.560	1817.946	1817.770	0.176
2018_2018_AZ	828803.660	882121.480	1857.890	1858.180	-0.290

AZ East - Bisbee, Central Gila, Upper San Pedro South, Whetstone

Point ID	Easting	Northing	Known Z	Laser Z	dZ
2001_2018_AZ	750945.550	136812.000	4521.830	4521.710	0.120
2002_2018_AZ	777233.310	134342.390	4719.620	4719.790	-0.170
2003_2018_AZ	792197.240	127132.870	4626.180	4626.260	-0.080
2004_2018_AZ	754263.390	180223.400	5002.870	5002.980	-0.110
2005_2018_AZ	745359.750	157471.130	4762.160	4762.130	0.030
2006_2018_AZ	776141.530	161647.900	5431.750	5431.950	-0.200
2007_2018_AZ	794319.180	142591.420	4943.190	4943.340	-0.150
2009_2018_AZ	766778.290	127660.830	4564.580	4564.580	0.000
2019_2018_AZ	622449.010	252763.950	4661.920	4662.110	-0.190
2020_2018_AZ	670017.500	259003.070	4185.940	4186.210	-0.270
2021_2018_AZ	721723.910	272422.210	4297.100	4297.220	-0.120
2022_2018_AZ	739505.800	280378.070	4574.610	4574.550	0.060
2023_2018_AZ	750718.790	308068.950	5070.980	5071.030	-0.050

Point ID	Easting	Northing	Known Z	Laser Z	dZ
2024_2018_AZ	736379.860	373219.940	4647.050	4647.010	0.040
2026_2018_AZ	711338.820	467063.290	4914.900	4914.940	-0.040
2028_2018_AZ	689419.590	436520.020	4795.030	4794.980	0.050
2029_2018_AZ	758112.160	309260.850	3918.930	3918.930	0.000
2031_2018_AZ	620976.830	335328.210	4608.760	4608.470	0.290
2032_2018_AZ	645772.970	323738.750	4511.940	4511.930	0.010
2033_2018_AZ	655510.530	355779.220	3630.270	3630.590	-0.320
2034_2018_AZ	721568.500	316650.990	4498.820	4498.490	0.330
2035_2018_AZ	701374.190	362838.850	4280.990	4281.120	-0.130
2036_2018_AZ	717293.920	460489.460	4953.030	4953.030	0.000
2037_2018_AZ	643322.480	392698.910	3449.170	3449.330	-0.160
2039_2018_AZ	649754.750	375874.340	3590.560	3590.910	-0.350
2041_2018_AZ	670752.380	332354.680	3595.140	3595.430	-0.290
2042_2018_AZ	703276.720	290362.130	4041.120	4041.220	-0.100
2043_2018_AZ	644113.490	298912.460	4582.130	4582.200	-0.070
2044_2018_AZ	742220.330	291080.430	4640.580	4640.620	-0.040
2046_2018_AZ	648637.390	345091.060	4079.910	4080.000	-0.090
2047_2018_AZ	720307.080	343738.150	4452.830	4452.700	0.130
2049_2018_AZ	684550.220	336784.850	3842.330	3842.520	-0.190
2050_2018_AZ	728142.140	410139.320	5024.830	5024.740	0.090
2051_2018_AZ	509902.400	731754.520	2101.850	2102.050	-0.200
2052_2018_AZ	527358.090	762942.610	2186.000	2186.480	-0.480
2053_2018_AZ	515073.430	769947.300	2330.520	2330.980	-0.460
2054_2018_AZ	505655.390	782081.090	2667.290	2667.510	-0.220
2055_2018_AZ	519839.300	829132.800	4474.970	4474.810	0.160
2056_2018_AZ	528380.170	852507.540	3662.280	3662.700	-0.420
2057_2018_AZ	511903.540	862532.060	3738.980	3739.010	-0.030
2058_2018_AZ	535242.470	911310.260	4796.390	4796.340	0.050
2059_2018_AZ	456853.010	991176.750	3335.400	3335.330	0.070
2060_2018_AZ	495102.910	1187348.540	7626.030	7625.920	0.110
2061_2018_AZ	501750.960	1175306.010	6942.480	6942.260	0.220
2064_2018_AZ	382366.740	1192891.740	5082.710	5082.590	0.120
2065_2018_AZ	336370.920	1184432.560	5145.710	5145.930	-0.220
2066_2018_AZ	338390.750	1206128.380	4604.260	4603.970	0.290

Point ID	Easting	Northing	Known Z	Laser Z	dZ
2067_2018_AZ	295049.970	1247424.610	6490.890	6491.040	-0.150
2067A_2018_AZ	295860.390	1242038.160	5835.300	5835.370	-0.070
2069_2018_AZ	283552.760	1241520.760	5851.690	5851.880	-0.190
2071_2018_AZ	314267.650	1074436.770	4012.820	4012.890	-0.070
2072_2018_AZ	356309.680	1031639.660	2288.660	2289.040	-0.380
2074_2018_AZ	368545.900	1007756.810	2217.390	2217.690	-0.300
2075_2018_AZ	366166.500	1016163.680	2216.330	2216.530	-0.200
2076_2018_AZ	384048.480	992228.610	2276.000	2276.150	-0.150
2077_2018_AZ	396547.980	976201.850	2195.430	2195.660	-0.230
2079_2018_AZ	414273.120	966853.590	2423.690	2423.800	-0.110
2080_2018_AZ	431360.970	964316.060	2245.780	2246.020	-0.240
2081_2018_AZ	454847.830	870314.860	3908.470	3908.530	-0.060
2082_2018_AZ	451646.260	857769.010	4610.350	4610.220	0.130
2083_2018_AZ	469717.340	849108.440	4935.900	4935.860	0.040
2084_2018_AZ	461625.090	821220.950	3230.760	3231.140	-0.380
2085_2018_AZ	470676.770	803336.500	3460.250	3460.340	-0.090
2086_2018_AZ	486223.770	791235.270	3215.220	3215.380	-0.160
2087_2018_AZ	515290.870	850149.900	3975.150	3975.140	0.010
2088_2018_AZ	420498.910	1212203.590	5396.780	5396.850	-0.070
2089_2018_AZ	457351.730	1158242.840	5417.300	5417.150	0.150
2090_2018_AZ	363338.690	1134343.970	2969.300	2969.450	-0.150
2091_2018_AZ	360815.640	1218204.840	4876.420	4876.410	0.010
2092_2018_AZ	368042.120	1243709.590	5708.020	5707.970	0.050
2093_2018_AZ	365241.810	1233538.840	5345.350	5345.020	0.330
2094_2018_AZ	300191.040	1228130.560	6207.050	6207.010	0.040
2095_2018_AZ	311921.400	1232596.200	5375.690	5375.500	0.190
2096_2018_AZ	420871.060	1158309.880	5518.570	5518.400	0.170
2097_2018_AZ	372382.200	1071698.800	3141.280	3140.950	0.330
2098_2018_AZ	404679.010	1010873.290	3366.090	3366.010	0.080
2099_2018_AZ	464498.720	900459.410	4320.250	4319.900	0.350
2100_2018_AZ	422578.220	1130737.520	4182.580	4182.590	-0.010
2221_2018_AZ	721526.060	253200.890	4520.660	4520.910	-0.250
2222_2018_AZ	752593.430	245085.630	4744.430	4744.660	-0.230
2223_2018_AZ	746428.960	188302.340	4772.310	4772.590	-0.280

Point ID	Easting	Northing	Known Z	Laser Z	dZ
2224_2018_AZ	725621.710	147073.680	4302.490	4302.410	0.080
2225_2018_AZ	699279.610	127627.920	4408.820	4408.760	0.060
2226_2018_AZ	736120.170	222312.500	4343.980	4343.870	0.110
2227_2018_AZ	692663.320	188474.010	4319.400	4319.610	-0.210
2229_2018_AZ	477553.060	1149927.930	5476.920	5477.030	-0.110
2230_2018_AZ	456607.420	1167398.520	5286.210	5286.190	0.020
2232_2018_AZ	307793.820	1237327.300	5643.060	5643.230	-0.170

Appendix 4: DEM VVA Checkpoint Results

CA AOIs

Coordinate values are listed in the following spatial reference systems:

Horizontal: NAD83 (2011) State Plane California I or IV (based on AOI), US Survey Feet

Vertical: NAVD88 (GEOID12B) US Survey Feet

Summary	
Point Count	113
Root Mean Square Error	0.336 ft -- 0.102 m
95th Percentile	0.709 ft -- 0.216 m
Mean of Residuals	-0.134 ft
Standard Deviation	0.301 ft

CA IV - Salinas QL2

Point ID	Easting	Northing	Known Z	Laser Z	dZ
3049_2018_CA	5846199.383	2050786.025	408.294	407.931	0.363
3050_2018_CA	5889890.471	2191148.605	640.975	641.101	-0.126
3051_2018_CA	5652020.635	2308115.507	462.864	462.871	-0.007
3052_2018_CA	5747151.781	2289882.269	1087.233	1087.422	-0.189
3053_2018_CA	5882878.050	2284649.815	1424.900	1425.033	-0.133
3054_2018_CA	5859001.940	2326836.466	2200.899	2201.044	-0.145
3055_2018_CA	5721250.404	2269604.864	706.787	706.481	0.306
3056_2018_CA	5746446.949	2190883.848	6.929	7.210	-0.281
3057_2018_CA	5830209.464	2204296.399	208.777	209.760	-0.983
3058_2018_CA	5863752.370	2231806.719	204.512	205.380	-0.868
3059_2018_CA	5979839.428	2021604.110	1448.672	1448.863	-0.191
3060_2018_CA	5973616.545	2116742.891	2050.074	2049.744	0.330
3061_2018_CA	5948022.994	2072640.404	1418.284	1418.133	0.151
3061A_2018_CA	5927635.017	2090115.563	1363.717	1363.663	0.054
3062_2018_CA	6024028.018	2024044.803	2598.167	2598.005	0.162
3063_2018_CA	6046133.447	1956388.205	2537.535	2537.135	0.400
3064_2018_CA	6080400.002	1909573.093	2237.162	2236.734	0.428
3065_2018_CA	6059352.603	1806789.253	667.484	667.671	-0.187

Point ID	Easting	Northing	Known Z	Laser Z	dZ
3066_2018_CA	6061563.921	1797973.868	669.433	669.941	-0.508
3067_2018_CA	6064682.642	1758655.969	788.918	789.112	-0.194
3068_2018_CA	6125002.227	1731988.196	1501.652	1501.573	0.079
3069_2018_CA	6135693.219	1689385.199	1734.452	1734.813	-0.361
3070_2018_CA	6165983.326	1655637.434	2631.799	2631.525	0.274
3072_2018_CA	6153543.360	1632441.106	1476.137	1476.213	-0.076
3073_2018_CA	6147777.514	1597549.738	932.037	932.142	-0.105
3074_2018_CA	6123897.093	1593226.829	547.565	547.451	0.114
3076_2018_CA	6114950.393	1537935.145	364.095	364.251	-0.156
3077_2018_CA	6077481.567	1533554.992	22.314	22.900	-0.586
3078_2018_CA	6087124.302	1566648.578	100.861	100.820	0.041
3080_2018_CA	6064716.797	1620384.544	176.987	177.410	-0.423
3081_2018_CA	6031935.385	1611225.044	1069.642	1069.712	-0.070
3082_2018_CA	6034711.382	1649206.442	140.957	141.380	-0.423
3083_2018_CA	6005331.178	1659295.365	15.309	15.690	-0.381
3084_2018_CA	6087744.172	1665290.933	1048.243	1048.112	0.131
3085_2018_CA	6071064.029	1705234.051	836.733	836.942	-0.209
3086_2018_CA	6053257.459	1723749.598	826.190	826.382	-0.192
3087_2018_CA	6017125.320	1719852.788	1330.249	1330.463	-0.214
3088_2018_CA	6021953.927	1769233.849	1043.338	1043.382	-0.044
3089_2018_CA	5934014.054	1733102.586	26.360	26.990	-0.630
3090_2018_CA	5954364.617	1763588.709	1611.209	1611.133	0.076
3091_2018_CA	5997069.988	1791328.364	809.491	809.602	-0.111
3092_2018_CA	6023819.717	1838622.284	561.136	561.381	-0.245
3093_2018_CA	6049837.989	1864857.397	1584.297	1584.153	0.144
3094_2018_CA	6005941.501	1880770.692	474.216	474.221	-0.005
3095_2018_CA	5955597.604	1831947.822	1034.323	1034.262	0.061
3096_2018_CA	5912806.089	1816422.351	1927.231	1927.064	0.167
3096A_2018_CA	5913421.259	1815705.642	1923.158	1923.234	-0.076
3097_2018_CA	5870827.569	1811867.355	341.433	341.251	0.182
3098_2018_CA	5902636.141	1849687.486	1122.022	1121.862	0.160
3099_2018_CA	5967332.624	1879218.628	2281.600	2281.635	-0.035
3100_2018_CA	6068033.098	1920293.652	1781.207	1781.084	0.123
3103_2018_CA	5874745.340	1916748.599	1262.082	1262.233	-0.151

Point ID	Easting	Northing	Known Z	Laser Z	dZ
3104_2018_CA	5826567.710	1881530.182	176.622	177.310	-0.688
3105_2018_CA	5801948.589	1901662.464	224.749	225.390	-0.641
3106_2018_CA	6039755.781	1681539.337	923.456	923.302	0.154
3107_2018_CA	5935659.342	1969601.720	341.947	342.131	-0.184
3107A_2018_CA	5935548.263	1969530.303	341.528	341.781	-0.253
3108_2018_CA	5988729.521	1989877.408	875.332	875.552	-0.220
3109_2018_CA	6002601.234	1995952.410	1187.402	1187.502	-0.100
3110_2018_CA	6043061.899	2019649.339	2619.165	2618.855	0.310
3111_2018_CA	5988790.281	2033841.345	1796.299	1796.204	0.095
3112_2018_CA	5910839.526	2020748.025	251.384	251.431	-0.047
3113_2018_CA	5901467.274	2011304.755	274.510	275.251	-0.741
3114_2018_CA	5857388.644	1989692.280	629.305	629.331	-0.026
3115_2018_CA	5809784.366	1979001.884	1608.402	1608.183	0.219
3116_2018_CA	5757592.991	1967928.469	509.927	510.021	-0.094
3116A_2018_CA	5775549.182	1966444.886	3563.847	3563.607	0.240
3117_2018_CA	5706559.053	2032131.990	277.106	277.381	-0.275
3118_2018_CA	5805324.803	2036756.382	1612.572	1612.783	-0.211
3119_2018_CA	5701126.056	2061299.619	85.563	86.310	-0.747
3120_2018_CA	5695115.396	2085258.773	76.543	76.950	-0.407
3121_2018_CA	5700896.509	2092941.065	14.062	14.860	-0.798
3123_2018_CA	5731038.984	2068379.676	1964.482	1964.844	-0.362
3124_2018_CA	5759876.922	2068301.173	401.513	401.181	0.332
3125_2018_CA	5863281.328	2075196.388	515.011	515.091	-0.080
3126_2018_CA	5938350.053	2127306.949	1273.145	1272.813	0.332
3127_2018_CA	5906211.350	2144936.582	772.228	772.412	-0.184
3128_2018_CA	5872542.280	2144195.032	1378.553	1378.983	-0.430
3129_2018_CA	5785498.230	2143495.821	45.795	46.120	-0.325
3130_2018_CA	5857430.015	2169647.275	866.812	867.322	-0.510
3132_2018_CA	5913222.460	2278449.477	1346.474	1346.633	-0.159
3133_2018_CA	5839900.516	2259137.760	901.342	901.262	0.080
3134_2018_CA	5815878.248	2261159.722	189.805	190.160	-0.355
3135_2018_CA	5768409.870	2257048.212	1354.418	1354.933	-0.515
3136_2018_CA	5789284.331	2310453.122	372.188	372.411	-0.223
3136A_2018_CA	5789335.196	2310664.492	374.323	374.731	-0.408

Point ID	Easting	Northing	Known Z	Laser Z	dZ
3137_2018_CA	5680713.612	2280189.959	881.878	881.752	0.126
3138_2018_CA	5691037.432	2300869.694	931.882	931.492	0.390
3139_2018_CA	5677281.682	2243835.356	38.075	38.540	-0.465
3140_2018_CA	5633033.090	2314166.130	2312.050	2312.965	-0.915
3141_2018_CA	5629128.578	2334133.709	1716.398	1716.833	-0.435
3141A_2018_CA	5641691.694	2304845.089	2618.411	2618.325	0.086
3142_2018_CA	5653438.286	2356248.413	2630.854	2630.715	0.139
3152_2018_CA	5999615.495	1682644.445	13.258	13.250	0.008
3155_2018_CA	6023409.373	1956010.265	1258.011	1258.273	-0.262

CA I - Red Bluff, Scott Valley, Stillwater

Point ID	Easting	Northing	Known Z	Laser Z	dZ
3101_2018_CA	6533100.282	1937515.868	279.264	279.471	-0.207
3102_2018_CA	6493534.834	2050311.598	398.554	398.991	-0.437
3131_2018_CA	6330576.454	2392796.905	2860.467	2860.536	-0.069
3131A_2018_CA	6330222.804	2393537.177	2866.662	2866.726	-0.064
3143_2018_CA	6550769.869	1841466.669	177.209	177.210	-0.001
3144_2018_CA	6522400.162	1936775.317	255.178	255.601	-0.423
3145_2018_CA	6592534.837	1843994.894	399.690	399.931	-0.241
3145A_2018_CA	6592463.026	1844418.322	405.658	405.891	-0.233
3146_2018_CA	6489246.313	2114170.543	671.139	671.361	-0.222
3147_2018_CA	6467689.349	2130422.402	757.644	757.512	0.132
3148_2018_CA	6468227.984	2094179.836	559.490	559.541	-0.051
3149_2018_CA	6350494.579	2361143.428	3235.777	3235.796	-0.019
3149A_2018_CA	6350579.345	2361406.972	3241.902	3242.187	-0.285
3150_2018_CA	6287863.577	2482608.162	2648.274	2648.305	-0.031
3151_2018_CA	6339760.296	2453983.044	2792.301	2792.166	0.135
3153_2018_CA	6530839.394	1922827.084	238.792	239.140	-0.348
3154_2018_CA	6339002.491	2476047.077	2802.306	2802.236	0.070

CA IV - Salinas QL1

Point ID	Easting	Northing	Known Z	Laser Z	dZ
3063_2018_CA	6046133.450	1956388.210	2537.540	2537.285	0.255

AZ AOIs

Coordinate values are listed in the following spatial reference system:

Horizontal: NAD83 State Plane Arizona Central or East Zone (based on AOI), International Feet

Vertical: NAVD88 (GEOID12B) International Feet

Summary	
Point Count	52
Root Mean Square Error	0.258 ft -- 0.079 m
95th Percentile	0.576 ft -- 0.176 m
Mean of Residuals	-01.95 ft
Standard Deviation	0.235 ft

AZ Central - Apache Junction

Point ID	Easting	Northing	Known Z	Laser Z	dZ
3008_2018_AZ	807925.620	863594.090	1576.320	1576.350	-0.030
3009_2018_AZ	835114.970	859792.400	1747.050	1747.560	-0.510
3010_2018_AZ	834678.490	875612.710	1879.420	1879.860	-0.440
3011_2018_AZ	833225.340	897585.170	2063.680	2063.640	0.040
3012_2018_AZ	801984.960	886671.040	1690.630	1690.380	0.250

AZ East - Bisbee, Central Gila, Upper San Pedro South, Whetstone

Point ID	Easting	Northing	Known Z	Laser Z	dZ
3001_2018_AZ	751024.43	136847.83	4524.58	4524.95	-0.370
3002_2018_AZ	798902.41	157383.25	4770.65	4771.35	-0.700
3003_2018_AZ	758561.17	174143.45	5234.06	5234.27	-0.210
3004_2018_AZ	744367.72	162426.75	4791.48	4791.74	-0.260
3005_2018_AZ	766760.40	127629.79	4565.79	4566.26	-0.470
3006_2018_AZ	791385.82	151856.05	5005.33	5005.62	-0.290
3007_2018_AZ	792502.68	126624.22	4620.39	4620.50	-0.110
3013_2018_AZ	664338.74	359038.08	3512.41	3512.59	-0.180
3014_2018_AZ	652267.39	401999.12	3390.06	3390.48	-0.420
3015_2018_AZ	690687.05	304961.94	3738.94	3738.85	0.090
3016_2018_AZ	699489.93	361994.38	4238.64	4238.86	-0.220
3017_2018_AZ	315237.01	1237834.34	5712.32	5713.01	-0.690
3018_2018_AZ	365430.82	1233452.95	5361.04	5360.66	0.380
3019_2018_AZ	495209.54	1187423.37	7631.12	7630.91	0.210

Point ID	Easting	Northing	Known Z	Laser Z	dZ
3020_2018_AZ	313847.92	1071698.87	4281.18	4281.39	-0.210
3021_2018_AZ	323297.27	1077704.42	3367.73	3368.00	-0.270
3022_2018_AZ	495200.55	849150.51	4719.71	4719.97	-0.260
3024_2018_AZ	487511.39	838360.27	5673.68	5673.39	0.290
3025_2018_AZ	501592.50	858701.27	3874.61	3874.63	-0.020
3026_2018_AZ	470107.22	848591.84	5021.49	5021.85	-0.360
3027_2018_AZ	458035.81	1100110.65	6304.59	6304.72	-0.130
3028_2018_AZ	416446.09	1210655.29	5454.32	5454.28	0.040
3029_2018_AZ	338308.21	1206216.98	4610.87	4610.76	0.110
3030_2018_AZ	650179.68	252122.76	4314.44	4314.29	0.150
3031_2018_AZ	740642.61	282053.50	4570.55	4570.69	-0.140
3032_2018_AZ	698438.72	445418.71	4568.42	4568.59	-0.170
3033_2018_AZ	621197.66	376495.53	3891.43	3892.20	-0.770
3034_2018_AZ	620900.48	335774.49	4588.96	4589.22	-0.260
3035_2018_AZ	717657.15	315461.29	4406.99	4407.08	-0.090
3036_2018_AZ	721677.26	272374.31	4294.20	4294.48	-0.280
3037_2018_AZ	728176.06	410461.85	5011.18	5011.36	-0.180
3038_2018_AZ	729820.73	431758.45	4675.03	4675.00	0.030
3039A_2018_AZ	660612.17	396172.67	3551.72	3552.59	-0.870
3040_2018_AZ	648407.12	345286.43	4082.10	4082.02	0.080
3041_2018_AZ	305634.76	1173989.15	3449.01	3449.29	-0.280
3043_2018_AZ	535289.22	911377.39	4801.25	4801.37	-0.120
3044_2018_AZ	509428.88	729627.67	2018.04	2018.17	-0.130
3045_2018_AZ	421199.33	1158286.44	5532.24	5532.18	0.060
3046_2018_AZ	503766.19	796843.84	3695.50	3696.04	-0.540
3047_2018_AZ	486931.13	915228.74	3017.80	3018.11	-0.310
3048_2018_AZ	361293.56	1131745.18	2984.01	2983.93	0.080
3156_2018_AZ	678262.93	143619.65	5066.22	5066.15	0.070
3157_2018_AZ	737633.80	139255.45	4408.89	4408.99	-0.100
3158_2018_AZ	725779.01	196739.89	4329.36	4329.70	-0.340
3159_2018_AZ	757415.26	244462.47	4650.13	4650.40	-0.270
3160_2018_AZ	704908.81	235666.62	4146.77	4147.23	-0.460
3161_2018_AZ	413999.39	967151.52	2419.59	2419.82	-0.230