## AIRBORNE LIDAR TASK ORDER REPORT



# NEW ENGLAND CMGP SANDY LIDAR UNITED STATES GEOLOGICAL SURVEY (USGS)

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## PROJECT REPORT

## USGS NEW ENGLAND CMGP SANDY LIDAR PROCESSING

## **WOOLPERT PROJECT #73667**

For:

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## **SECTION 1: OVERVIEW**

#### PROJECT NAME: NEW ENGLAND CMGP LIDAR

#### **WOOLPERT PROJECT #73667**

This report contains a comprehensive outline of the New England CMGP Lidar Processing task order for the United States Geological Survey (USGS). This task order requires lidar data to be acquired over several AOIs in central to eastern Massachusetts. The combined area of both AOI's is approximately 2,120 square miles. The lidar was collected and processed to meet a maximum Nominal Post Spacing (NPS) of 0.7 meters. The NPS assessment is made against single swath, first return data located within the geometrically usable center portion (typically ~90%) of each swath.

The data was collected using a Leica ALS70 and an Optech ALTM Gemini lidar sensor. Both sensors collect up to four returns (echo) per pulse, as well as intensity data, for the first three returns. If a fourth return was captured, the system does not record an associated intensity value. The aerial lidar was collected at the following sensor specifications:

#### **ALS70 SPECIFICATIONS**

Post Spacing (Minimum): 2.3 ft / 0.7m AGL (Above Ground Level) average flying height: 6,500 ft / 1,981 m

MSL (Mean Sea Level) average flying height: variable

Average Ground Speed: 150 knots / 173 mph

Field of View (full):

Pulse Rate:

Scan Rate:

40 degrees

272 kHz

42.3 Hz

Side Lap (Average):

25%

#### OPTECH ALTM GEMINI SPECIFICATIONS

Post Spacing (Minimum): 2.3 ft / 0.7m AGL (Above Ground Level) average flying height: 5,000 ft / 1,524 m

MSL (Mean Sea Level) average flying height: variable

Average Ground Speed: 130 knots / 149 mph

Field of View (full):

Pulse Rate:

Scan Rate:

Side Lap (Average):

25 degrees

125 kHz

46 Hz

30%

The lidar data for this AOI was processed and projected in UTM, Zone 19N, North American Datum of 1983 (2011) in units of meters. The vertical datum used for the task order was referenced to NAVD 1988, GEOID12A, in units of meters. However, a portion of the AOI crossed into the UTM18N Zone. AII products for this portion of the AOI will be referenced to UTM18N American Datum of 1983 (2011). The vertical datum used for the task order was referenced to NAVD 1988, meters, GEOID12A. Coordinate positions were specified in units of meters.

Figure 1.1 Lidar Task Order AOI



## **SECTION 2: ACQUISITION**

The existing lidar data was acquired with a Leica ALS70 500 kHz Multiple Pulses in Air (MPiA) lidar sensor system and an Optech Gemini Lidar System, on board a Cessna 404 and Cessna 310 aircraft. The ALS70 lidar system, developed by Leica Geosystems of Heerbrugg, Switzerland includes the simultaneous first, intermediate and last pulse data capture module, the extended altitude range module, and the target signal intensity capture module. The Optech Gemini Lidar System developed by Optech of Canada collects up to four returns (echo) per pulse, recording attributes such as time stamp and intensity data, for the first three returns.

Table 2.1: ALS70 Lidar System Specifications

The ALS70 500 kHz Multiple Pulses in Air (MPiA) Lidar System has the following specifications:

Specification				
Operating Altitude	200 - 3,500 meters			
Scan Angle	0 to 75° (variable)			
Swath Width	0 to 1.5 X altitude (variable)			
Scan Frequency	0 - 200 Hz (variable based on scan angle)			
Maximum Pulse Rate	500 kHz (Effective)			
Range Resolution	Better than 1 cm			
Elevation Accuracy	7 - 16 cm single shot (one standard deviation)			
Horizontal Accuracy	5 - 38 cm (one standard deviation)			
Number of Returns per Pulse	7 (infinite)			
Number of Intensities	3 (first, second, third)			
Intensity Digitization	8 bit intensity + 8 bit AGC (Automatic Gain Control) level			
MPiA (Multiple Pulses in Air)	8 bits @ 1nsec interval @ 50kHz			
Laser Beam Divergence	0.22 mrad @ 1/e <sup>2</sup> (~0.15 mrad @ 1/e)			
Laser Classification	Class IV laser product (FDA CFR 21)			
Eye Safe Range	400m single shot depending on laser repetition rate			
Roll Stabilization	Automatic adaptive, range = 75 degrees minus current FOV			
Power Requirements	28 VDC @ 25A			
Operating Temperature	0-40°C			
Humidity	0-95% non-condensing			
Supported GNSS Receivers	Ashtech Z12, Trimble 7400, Novatel Millenium			

Table 2.2: Optech ALTM Gemini Lidar System Specifications

The ALTM Gemini Multiple Pulses in Air (MPiA) Lidar System has the following specifications:

Specification				
Operating Altitude	150 - 4,000m AGL nominal, 10% reflective target			
Scan Angle	0 to 50° (variable)			
Swath Width	0 to 1.5 X altitude (variable)			
Scan Frequency	0 - 70 Hz (variable based on scan angle)			
Maximum Pulse Rate	167kHz			
Range Resolution	Better than 1 cm			
Elevation Accuracy	5 - 35 cm single shot (one standard deviation)			
Horizontal Accuracy	1/5,500 x altitude (m AGL)			
Number of Returns per Pulse	4 (first, second, third, last)			
Number of Intensities	3 (first, second, third)			
Intensity Digitization	12 bit dynamic measurement range			
Laser Beam Divergence	Dual Divergence: .25 mrad (1/e) and 0.8 mrad(1/e) nominal			
Laser Classification	Class IV laser product (FDA CFR 21)			
Eye Safe Range	400m single shot depending on laser repetition rate			
Roll Compensation	±5° at full FOV			
Power Requirements	28 VDC @ 35A			
Operating Temperature	0-40°C			
Humidity	0-95% non-condensing			

Prior to mobilizing to the project site, Woolpert flight crews coordinated with the necessary Air Traffic Control personnel to ensure airspace access.

Woolpert survey crews were onsite, operating multiple Global Navigation Satellite System (GNSS) Base Stations for the airborne GPS support.

The lidar data was collected in thirty-five (35) separate missions, flown as close together as the weather permitted, to ensure consistent ground conditions across the project area.

An initial quality control process was performed immediately on the lidar data to review the data coverage, airborne GPS data, and trajectory solution. Any gaps found in the lidar data were relayed to the flight crew, and the area was re-flown.

New Hampshire Jeffreys Ledge Manchester Sanctuary HIII Lowell Little Tilles Bank Massachusetts Boston East Breakwater Bank Framingham Worcester Little Stellwagen Basin Springfield Brockton Cape Cod Bay Providence Hartford New Bedford Rhode Island New Haven Fishers Fishers Island RidgBlock Island Nantucket de Island Shelf Valley Gardiners Island Block Island Ridge and Sound

Figure 2.1: Lidar Flight Layout: New England CMGP Sandy Lidar

Table 2.3: Airborne Lidar Acquisition Flight Summary

Airborne Lidar Acquisition Flight Summary				
Date of Mission	Lines Flown	Mission Time (UTC) Wheels Up/ Wheels Down	Mission Time (Local = EDT)  Wheels Up/ Wheels Down	
November 16, 2013 - SensorOP108	1-17	22:50 - 02:15	05:04PM - 09:15PM	
November 18, 2013 - SensorOP108	191-226	20:30 - 01:10	03:30PM - 08:10PM	
November 20, 2013 - SensorOP108A	272,273,300-313	11:45 - 15:50	06:45AM - 10:50AM	
November 20, 2013 - SensorOP108B	385-397	17:20 - 22:02	12:20PM- 05:02PM	
November 21, 2013 - SensorOP108A	274-289	14:10 - 17:30	09:10AM - 12:30PM	
November 21, 2013 - SensorOP108B	347-358,398,399,400- 408	18:30 - 23:30	10:30AM - 06:30PM	
November 23, 2013 - SensorOP108A	290-299	12:50 - 15:10	07:50AM - 10:10AM	
November 23, 2013 - SensorOP108B	314-332,346,345,359- 361	20:40 - 01:20	03:40PM - 08:15PM	
November 25, 2013 - SensorOP108A	333-344	11:40 - 14:25	06:40AM - 09:25AM	
November 25, 2013 - SensorOP108B	409-421	21:01 - 00:30	04:01PM - 07:30PM	
November 28, 2013 - SensorOP108A	422-444	15:30 - 20:45	10:30AM - 03:45PM	
November 28, 2013 - SensorOP108B	445-457	21:15 - 01:15	04:15PM - 08:15PM	
November 29, 2013 - SensorOP108	458,535-554,576-579	16:30 - 20:40	11:30AM - 03:40PM	
December 03, 2013 - SensorOP108	459-471	19:55 - 22:50	02:55PM - 05:50PM	
December 03, 2013 - Sensor7177	48-52	20:14 - 20:57	03:14PM - 03:57PM	
December 04, 2013 - SensorOP108	555-575	21:05 - 01:55	03:05PM - 08:55PM	
December 04, 2013 - Sensor7177	1-11,17-30	20:40 - 02:40	03:40PM - 09:40PM	
December 08, 2013 - Sensor7177A	105,106-123,207-216	14:25 - 19:26	09:25AM - 02:26PM	
December 08, 2013 - Sensor7177B	145-164	00:05 - 04:10	07:05PM - 11:10PM	
April 03, 2014 - Sensor7177	67-75	22:35 - 23:14	05:35PM - 06:14PM	

Airborne Lidar Acquisition Flight Summary				
Date of Mission	Lines Flown	Mission Time (UTC) Wheels Up/ Wheels Down	Mission Time (Local = EDT)  Wheels Up/ Wheels Down	
April 04, 2014 - Sensor7177	217-239	13:02 - 16:07	08:02AM - 11:07AM	
April 06, 2014 - Sensor7177	240-256,355,365	13:32 - 17:31	08:32 AM - 12:31PM	
April 07, 2014 - Sensor7177A	266-272,285-287,K1-K8	11:49 - 15:09	06:49AM - 10:09AM	
April 07, 2014 - Sensor7177B	257-259,273-277,K57- K62	16:30 - 18:23	11:30AM - 01:23PM	
April 09, 2014 - Sensor7177	217,278-284,K52	14:43 - 15:54	09:43AM - 10:54AM	
April 10, 2014 - Sensor7177A	44-51	12:22 - 14:52	07:22AM - 09:52AM	
April 10, 2014 - Sensor7177B	K10-K17,K43-K56	16:45 - 20:38	11:45AM - 03:10PM	
April 12, 2014 - Sensor7177A	34-43	14:01 - 17:11	09:01AM - 12:11PM	
April 12, 2014 - Sensor7177B	K7,K8,K18-K31	19:02 - 21:35	02:02PM - 04:35PM	
April 13, 2014 - Sensor7177	K32-K42	21:04 - 21:56	04:04PM - 04:56PM	
April 14, 2014 - Sensor7177	52-61,66	13:24 - 15:15	08:24AM - 10:15AM	
April 16, 2014 - Sensor7177A	31-34,49,54,60,62- 66,76-86	19:02 - 22:29	02:02PM - 05:29PM	
April 16, 2014 - Sensor7177B	K9,280,282,284	23:34 - 00:11	06:29PM - 07:11PM	
April 20, 2014 - Sensor7177	76,280,282,284	19:59 - 21:02	02:59PM - 04:02PM	
December 27, 2014- Sensor7108	3001-3008	19:25 - 23:30	02:25PM - 06:30PM	

## **SECTION 3: LIDAR DATA PROCESSING**

#### APPLICATIONS AND WORK FLOW OVERVIEW

Resolved kinematic corrections for three subsystems: inertial measurement unit (IMU), sensor
orientation information and airborne GPS data. Developed a blending post-processed aircraft
position with attitude data using Kalman filtering technology or the smoothed best estimate
trajectory (SBET).

Software: POSPac Software v. 5.3, IPAS Pro v.1.35.

- Calculated laser point position by associating the SBET position to each laser point return time, scan angle, intensity, etc. Created raw laser point cloud data for the entire survey 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.
   Software: ALS Post Processing Software v.2.75 build #25, Proprietary Software, TerraMatch v. 14.01.
- 3. Imported processed LAS point cloud data into the task order tiles. Resulting data were 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.

Software: TerraScan v.14.011.

4. The LAS files were evaluated through a series of manual QA/QC steps to eliminate remaining artifacts from the ground class.

Software: TerraScan v.14.011.

# GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS)-INERTIAL MEASUREMENT UNIT (IMU) TRAJECTORY PROCESSING

#### **EQUIPMENT**

Flight navigation during the lidar data acquisition mission is 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.

The aircraft are all configured with a NovAtel Millennium 12-channel, L1/L2 dual frequency Global Navigation Satellite System (GNSS) receivers collecting at 2 Hz.

All Woolpert aerial sensors are equipped with a Litton LN200 series Inertial Measurement Unit (IMU) operating at 200 Hz.

A base-station unit was mobilized for each acquisition mission, and was operated by a member of the Woolpert acquisition team. Each base-station setup consisted of one Trimble 4000 - 5000 series dual frequency receiver, one Trimble Compact L1/L2 dual frequency antenna, one 2-meter fixed-height tripod, and essential battery power and cabling. Ground planes were used on the base-station

antennas. Data was collected at 1 or 2 Hz.

Woolpert's acquisition team was on site operating GNSS base stations at KOQU, KOWD, KLWM, KFIT, KORH airports along with utilizing MASA, MATU, and MAWM CORS stations.

The GNSS base station operated during the lidar acquisition missions are listed below:

Table 3.1: GNSS Base Stations

Station	Latitude	Longitude	Ellipsoid Height (L1 Phase center)
Name	(DMS)	(DMS)	(Meters)
KOQU_Arpt_Base	41°35'38.50261"	71°24'44.77775"	-27.546
KOWD_Arpt_Base	42°11'28.54987"	71°10'43.65760"	-14.216
KLWM_Arpt_Base	42°42'50.89145"	71°07'16.09907"	20.086
KFIT_Arpt_Base	42°33'27.60544"	71°48'22.47957"	76.391
KORH_Arpt_Base	42°16'03.63503"	71°52'10.52484"	272.057
MASA_CORS	42°51'45.88625"	70°53'24.94600"	-10.236
MATU_CORS	41°58'51.70825"	70°02'36.89124"	13.400
MAWM_CORS	42°33'40.62118"	71°55'59.20777"	317.420
NGS_PID_AI5585	41°40'11.43252"	70°02'36.89124"	13.400

#### **DATA PROCESSING**

All airborne GNSS and IMU data was post-processed and quality controlled using Applanix MMS software. GNSS data was processed at a 1 and 2 Hz data capture rate and the IMU data was processed at 200 Hz.

#### TRAJECTORY QUALITY

The GNSS Trajectory, along with 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).

#### **Combined Separation**

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

Woolpert's goal is to maintain a Combined Separation Difference of less than ten (10) centimeters. In most cases we achieve results below this threshold.

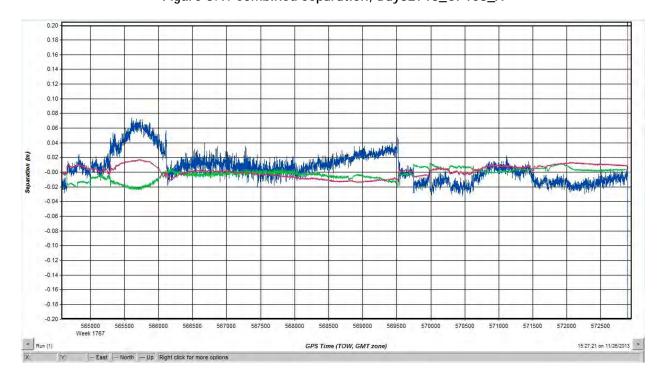


Figure 3.1: Combined Separation, Day32713\_OP108\_A

#### **Estimated Positional Accuracy**

The 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.

Woolpert's goal is to maintain an Estimated Positional Accuracy of less than ten (10) centimeters, often achieving results well below this threshold.

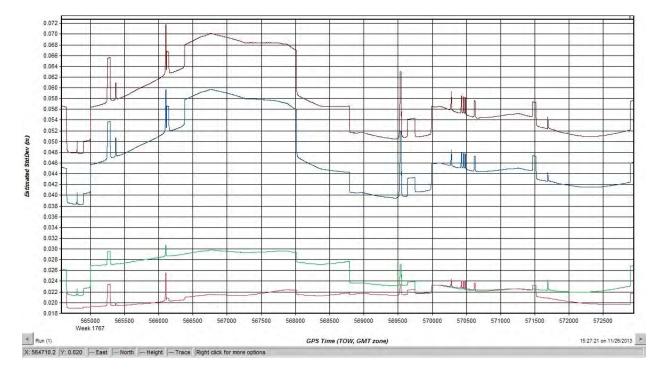


Figure 3.2: Estimated Positional Accuracy, Day32713\_OP108\_A

#### **PDOP**

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

Woolpert's goal is 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.

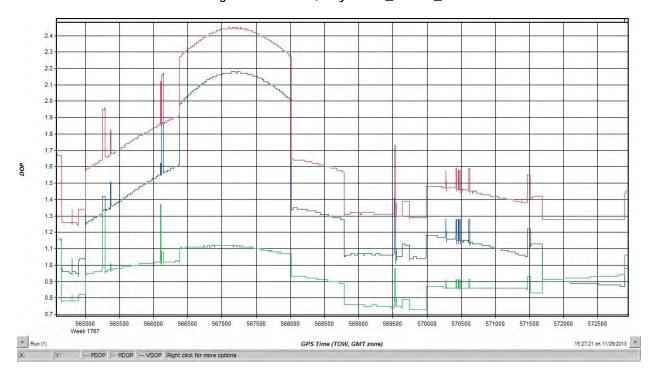


Figure 3.3: PDOP, Day32713\_OP108\_A

#### LIDAR DATA PROCESSING

When the sensor calibration, data acquisition, and GPS processing phases were complete, the formal data reduction processes by Woolpert lidar specialists included:

- Processed individual flight lines to derive a raw "Point Cloud" LAS file. Matched overlapping flight lines, generated statistics for evaluation comparisons, and made the necessary adjustments to remove any residual systematic error.
- 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 client
  specified classes.
- Once all project data was imported and classified, survey ground control data was imported
  and calculated for an accuracy assessment. As a QC measure, Woolpert has developed a routine
  to generate accuracy statistical reports by comparisons against the TIN and the DEM using
  surveyed ground control of higher accuracy. The lidar is adjusted accordingly to meet or
  exceed the vertical accuracy requirements.
- The lidar tiles were reviewed using a series of proprietary QA/QC procedures to ensure it fulfills the task order requirements. A portion of this requires a manual step to ensure anomalies have been removed from the ground class.
- The lidar LAS files are classified into the Default (Class 1), Ground (Class 2), Noise (Class 7), Water (Class 9), Ignored Ground (Class 10), Overlap default (Class 17), and Overlap Ground (Class 18) classifications.
- FGDC Compliant metadata was developed for the task order in .xml format for the final data products.
- The horizontal datum used for the task order was referenced to UTM19N American Datum of 1983 (2011). The vertical datum used for the task order was referenced to NAVD 1988, meters, GEOID12A. Coordinate positions were specified in units of meters. However, a portion of the AOI crossed into the UTM18N Zone. All products for this portion of the AOI will be referenced to UTM18N American Datum of 1983 (2011). The vertical datum used for the task order was referenced to NAVD 1988, meters, GEOID12A. Coordinate positions were specified in units of meters.

## SECTION 4: HYDROLOGIC FLATTENING

#### HYDROLOGIC FLATTENING OF LIDAR DEM DATA

New England CMGP Sandy Lidar Processing task order required the compilation of breaklines defining water bodies and rivers. The breaklines were used to perform the hydrologic flattening of water bodies, and gradient hydrologic flattening of double line streams and rivers. Lakes, reservoirs and ponds, at a minimum size of 2-acres or greater, were compiled as closed polygons. The closed water bodies were collected at a constant elevation. Rivers and streams, at a nominal minimum width of 30.5 meters (100 feet), were compiled in the direction of flow with both sides of the stream maintaining an equal gradient elevation.

#### LIDAR DATA REVIEW AND PROCESSING

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. Woolpert used the newly acquired Lidar data to manually draw 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. Woolpert utilizes an integrated software approach 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. The lakes, reservoirs and ponds, at a minimum size of 2-acres or greater, were compiled as closed polygons. Figure 4.1 illustrates a good example of 2-acre lakes and 30.5 meters (100 feet) nominal streams identified and defined with hydrologic breaklines. The breaklines defining rivers and streams, at a nominal minimum width of 30.5 meters (100 feet), were draped with both sides of the stream maintaining an equal gradient elevation.

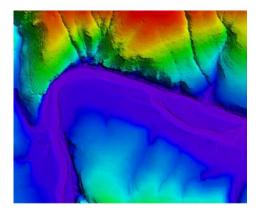


Figure 4.1

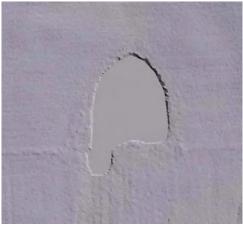
4. All ground points were reclassified from inside the hydrologic feature polygons to water, class nine (9).

- 5. All ground points were reclassified from within a buffer along the hydrologic feature breaklines to buffered ground, class ten (10).
- 6. The lidar ground points and hydrologic feature breaklines were used to generate a new digital elevation model (DEM).

Figure 4.2

Figure 4.3





**Figure 4.2** reflects a DEM generated from original lidar bare earth point data prior to the hydrologic flattening process. Note the "tinning" across the lake surface.

**Figure 4.3** reflects a DEM generated from lidar with breaklines compiled to define the hydrologic features. This figure illustrates the results of adding the breaklines to hydrologically flatten the DEM data. Note the smooth appearance of the lake surface in the DEM.

Terrascan was used to add the hydrologic breakline vertices and export the lattice models. The hydrologically flattened DEM data was provided to USGS in ERDAS .IMG format at a 1-meter cell size.

The hydrologic breaklines compiled as part of the flattening process were provided to the USGS as an ESRI shapefile. The breaklines defining the water bodies greater than 2-acres were provided as a PolygonZ file. The breaklines compiled for the gradient flattening of all rivers and streams at a nominal minimum width of 30.5 meters (100 feet) were provided as a PolylineZ file.

#### DATA QA/QC

Initial QA/QC for this task order was performed in Global Mapper v15, by reviewing the grids and hydrologic breakline features. Additionally, ESRI software and proprietary methods were used to review the overall connectivity of the hydrologic breaklines.

Edits and corrections were addressed individually by tile. If a water body breakline needed to be adjusted to improve the flattening of the DEM data, the area was cross referenced by tile number, corrected accordingly, a new DEM file was regenerated and reviewed.

## **SECTION 5: FINAL ACCURACY ASSESSMENT**

## FINAL VERTICAL ACCURACY ASSESSMENT

The vertical accuracy statistics were calculated by comparison of the lidar bare earth points to the ground surveyed quality check points.

Table 5.1: Overall Vertical Accuracy Statistics

Average error	0.024	meters
Minimum error	-0.099	meters
Maximum error	0.127	meters
Root mean square	0.052	meters
Standard deviation	0.047	meters

Table 5.2: Swath Quality Check Point Analysis, FVA, UTM 19N, NAD83, NAVD88 GEOID12A, New England CMGP Sandy Lidar

Point ID	Easting (UTM meters)	Northing (UTM meters)	TIN Elevation (meters)	Dz (meters)
2000	238808.593	4729756.684	314.18	0.003
2001	252759.177	4729893.198	326.87	0.067
2002	237618.673	4708622.584	323.81	0.086
2003	253465.281	4712370.364	314.24	0.025
2004	243974.963	4696601.057	176.47	0.017
2005	235652.093	4689464.52	166.6	0.031
2006	255894.516	4682504.737	305.19	0.052
2007	246531.315	4678704.569	188.77	-0.015
2008	236426.37	4678344.342	184.64	-0.023
2009	244533.427	4666949.275	176.48	0.015
2010	254643.417	4670174.208	273.62	0.054
2011	262845.434	4661671.384	158.91	0.019
2012	266140.096	4690653.403	217.4	-0.029
2013	269551.403	4683276.298	145.64	-0.04
2014	331635.343	4663356.124	52.54	0.026

Point ID	Easting (UTM meters)	Northing (UTM meters)	TIN Elevation (meters)	Dz (meters)
2015	272371.509	4680766.15	147.67	-0.046
2016	354345.284	4772155.384	14.94	0.038
2017	348903.617	4747615.689	10.2	0.006
2018	348765.111	4727425.284	12.32	-0.007
2019	355666.19	4715570.539	5.39	0.032
2020	346321.445	4710788.537	5.81	0.082
2021	334260.606	4696641.591	2.67	0.029
2022	332048.784	4682896.277	5.06	0.062
2023	313582.502	4674808.346	89.01	0.116
2024	359291.041	4653578.747	22.26	-0.002
2025	401506.667	4656352.653	12.29	-0.025
2026	375010.975	4606304.672	15.21	0.008
2027	418525.474	4567325.331	4.1	0.067
2027A	417360.834	4568379.525	6.4	0.127
2028	376950.144	4581313.943	6.38	0.078
2028A	369525.441	4582995.29	11	0.037
2029	285229.732	4560128.137	32.59	-0.017
2030	268325.483	4580419.341	10.01	0.058
2031	196027.548	4696458.637	126.19	-0.099
2032	195575.274	4691688.981	86.68	0.001

### **VERTICAL ACCURACY CONCLUSIONS**

LAS Swath Fundamental Vertical Accuracy (FVA) Tested 0.101 meters fundamental vertical accuracy at 95 percent confidence level, derived according to NSSDA, in open terrain in open using (RMSEz) x 1.9600, tested against the TIN.

Bare-Earth DEM Fundamental Vertical Accuracy (FVA) Tested 0.096 meters fundamental vertical accuracy at a 95 percent confidence level, derived according to NSSDA, in open terrain using (RMSEz) x 1.96000 Tested against the DEM.

## SUPPLEMENTAL VERTICAL ACCURACY ASSESSMENTS

Table 5.3: Quality Check Point Analysis, Urban, UTM 19N, NAD83, NAVD88 GEOID12A, New England CMGP Sandy Lidar

Point ID	Easting (UTM meters)	Northing (UTM meters)	DEM Elevation (meters)	Dz (meters)
3000	234962.073	4720616.776	165.340	0.007
3001	250520.367	4730454.835	301.199	-0.023
3002	254527.833	4716169.511	303.449	0.051
3003	252207.457	4707627.623	311.790	-0.017
3004	244579.866	4701342.542	275.250	-0.072
3005	235615.322	4689492.95	168.639	-0.082
3006	259662.283	4681177.525	280.290	0.020
3007	247446.386	4679136.532	191.810	0.024
3008	236384.139	4678321.435	184.590	-0.049
3009	248887.338	4662666.915	154.810	0.030
3010	253893.341	4670334.432	264.720	-0.067
3011	263075.189	4660510.531	142.380	-0.055
3012	265332.983	4691362.992	226.319	-0.009
3013	269455.365	4683256.102	144.490	-0.107
3014	330473.031	4662531.222	51.680	0.055
3015	272375.124	4680831.624	147.160	-0.119
3016	354396.316	4772130.534	14.609	-0.019
3017	346652.013	4741321.474	18.550	-0.086
3018	349250.596	4726896.414	4.340	-0.022
3019	363306.846	4719622.13	14.760	-0.034
3020	346346.676	4710753.598	5.670	0.013
3021	334020.685	4696519.915	3.480	-0.003
3022	332131.62	4682886.051	3.230	-0.029

Point ID	Easting (UTM meters)	Northing (UTM meters)	DEM Elevation (meters)	Dz (meters)
3023	318584.559	4673872.131	42.250	0.052
3024	361875.6	4646249.882	29.520	-0.068
3024A	361880.557	4646260.955	29.690	-0.047
3025	401916.825	4656049.563	2.770	-0.079
3026	366665.258	4601719.152	4.790	-0.092
3027	408097.046	4569130.472	7.590	0.045
3028	372661.015	4583072.608	5.990	-0.051
3029	285561.929	4560723.93	18.199	-0.059
3030	268355.197	4580434.056	10.359	0.012
3031	197694.609	4693640.105	82.329	-0.067
3032	195571.531	4691666.238	86.159	-0.081

Urban Land Cover Classification Supplemental Vertical Accuracy (SVA) Tested 0.097 meters supplemental vertical accuracy at the 95th percentile, tested against the DEM. Urban errors larger than 95th percentile include:

- Point 3013, Easting 269455.365, Northing 4683256.102, Z-Error 0.107 meters
- Point 3015, Easting 272375.124, Northing 4680831.624, Z-Error 0.119 meters

Table 5.4: Quality Check Point Analysis, Tall Weeds and Crops, UTM 19N, NAD83, NAVD88 GEOID12A, New England CMGP Sandy Lidar

Point ID	Easting (UTM meters)			Dz (meters)
4000	238723.992	4729721.466	313.259	0.107
4001	250459.313	4730491.118	301.300	0.068
4002	237679.481	4708663.508	322.079	0.105
4003	253336.833	4711947.695	319.040	0.067

Point ID	Easting (UTM meters)	Northing (UTM meters)	DEM Elevation (meters)	Dz (meters)
4004	243867.582	4698561.629	261.610	0.007
4005	236684.257	4689435.696	193.270	0.019
4006	255819.676	4682601.761	306.819	0.072
4007	247469.866	4679132.207	192.090	0.020
4008	234830.924	4678817.96	174.050	0.182
4009	244358.441	4666836.576	173.180	0.112
4010	253545.004	4670163.681	251.210	0.116
4011	263527.355	4661327.512	161.729	-0.070
4012	266142.502	4690687.861	217.520	0.038
4013	270215.164	4683593.849	224.490	-0.156
4014	329971.02	4663911.847	74.069	0.039
4015	272504.744	4680798.618	145.960	-0.046
4016	354062.334	4771859.156	13.289	0.112
4017	349772.904	4747930.714	1.530	0.064
4018	350509.038	4728314.725	5.740	0.020
4019	357505.699	4715324.584	3.050	0.130
4020	345366.941	4709902.099	3.010	0.071
4021	336017.987	4695058.727	3.380	0.190
4022	332177.118	4678825.325	53.310	0.006
4023	313536.222	4674812.681	89.590	0.017
4024	357796.157	4651526.885	4.080	0.040
4025	401244.682	4656635.371	3.650	-0.049
4026	367203.481	4601992.273	2.120	-0.045
4027	417390.024	4568399.593	4.830	0.094
4028	374666.068	4582434.587	0.330	0.112
4028A	371618.162	4582722.953	7.240	0.120
4029	284738.546	4559504.572	41.770	0.090

Point ID	Easting (UTM meters)	Northing (UTM meters)	DEM Elevation (meters)	Dz (meters)
4030	268391.122	4580126.098	3.100	0.056
4031	196903.762	4693394.108	71.870	-0.051
4032	193686.868	4691584.482	102.660	-0.095

Tall Weeds and Crops Land Cover Classification Supplemental Vertical Accuracy (SVA) Tested 0.165 meters supplemental vertical accuracy at the 95th percentile, tested against the DEM. Tall Weeds and Crops Errors larger than 95th percentile include:

- Point 4008, Easting 234830.924, Northing 4678817.960, Z-Error 0.182 meters
- Point 4024, Easting 336017.987, Northing 4695058.727, Z-Error 0.190 meters

Table 5.5: Quality Check Point Analysis, Brushlands and Trees, UTM 19N, NAD83, NAVD88 GEOID12A, New England CMGP Sandy Lidar

Point ID	Easting (UTM meters)	Northing (UTM meters)	DEM Elevation (meters)	Dz (meters)
5000	238741.054	4729712.805	313.649	0.173
5002	237662.504	4708638.37	322.790	0.186
5003	254316.201	4715591.329	305.970	0.137
5004	243890.881	4698526.936	259.759	0.062
5005	236724.105	4689461.304	194.569	0.252
5006	255808.631	4682616.68	305.100	0.008
5007	246563.261	4678663.058	188.830	0.097
5008	234848.955	4678830.941	174.289	0.23
5010	254298.897	4671319.996	259.430	0.168
5011	263576.874	4661388.022	164.639	0.089
5013	270200.462	4683647.545	222.050	0.039
5013A	266134.279	4690692.919	217.259	0.151

Point ID	Easting (UTM meters)	Northing (UTM meters)	DEM Elevation (meters)	Dz (meters)
5014	329961.347	4663570.709	71.099	0.214
5016	354082.81	4771823.554	13.369	0.262
5018	350490.588	4728385.472	3.190	0.03
5020	345337.418	4709910.754	2.910	0.129
5020A	346166.375	4710631.192	4.750	0.037
5021	335996.154	4695100.172	3.220	0.185
5022	332189.868	4678831.404	53.200	0.182
5023	313515.349	4674809.804	89.810	0.174
5024	357559.55	4651610.213	3.150	0.13
5025	401264.123	4656637.305	4.000	0.103
5026	367202.022	4602030.601	1.580	0.184
5027	415204.015	4568456.29	21.809	0.15
5027A	400824.181	4570292.988	1.640	0.116
5028	370017.754	4582813.325	4.650	0.131
5028A	368146.555	4583071.973	12.440	0.274
5030	268387.719	4580110.127	2.290	0.188
5031	198839.963	4693965.995	76.120	-0.05
5032	193627.894	4691618.982	104.420	0.072

Brushlands and Trees Land Cover Classification Supplemental Vertical Accuracy (SVA) Tested 0.257 meters supplemental vertical accuracy at the 95th percentile, tested against the DEM. Brushlands and Trees Errors larger than 95th percentile include:

- Point 5016, Easting 354082.810, Northing 4771823.554, Z-Error 0.262 meters
- Point 5028A, Easting 368146.555, Northing 4583071.973, Z-Error 0.274 meters

Table 5.6: Quality Check Point Analysis, Forested and Fully Grown, UTM 19N, NAD83, NAVD88 GEOID12A, New England CMGP Sandy Lidar

Point ID	Easting	Northing	DEM Elevation	Dz
POIIIL ID	(UTM meters)	(UTM meters)	(meters)	(meters)
6000	238742.091	4729764.491	313.110	0.039
6001	252726.388	4729861.049	326.459	0.151
6002	237694.839	4708678.244	321.420	0.078
6003	253520.654	4712405.245	313.709	0.046
6004	243898.393	4698474.383	257.800	-0.039
6005	236723.033	4689433.755	192.680	-0.029
6006	255845.987	4682660.412	304.230	-0.088
6006A	255854.135	4682661.619	304.160	-0.004
6007	246556.723	4678618.124	187.310	0.048
6007A	246547.805	4678621.578	187.020	0.019
6008	234834.853	4678785.776	173.680	-0.022
6009	244323.527	4666819.685	174.840	0.018
6009A	244323.505	4666835.866	173.720	0.028
6010	254317.833	4671360.279	260.269	0.042
6010A	254292.26	4671340.715	259.720	-0.125
6011	263599.408	4661326.903	162.840	-0.084
6011A	263607.371	4661296.481	161.830	-0.121
6012	266104.481	4690660.81	216.960	-0.38
6013	270266.778	4683749.093	208.970	-0.189
6013A	270253.071	4683734.874	212.370	-0.109
6014	329966.803	4663480.088	71.859	0.095
6014A	329929.882	4663474.98	72.780	0.09
6015	272450.957	4680737.587	145.080	-0.119
6015A	272459.274	4680736.94	145.030	-0.114
6016	354206.167	4771989.72	13.710	-0.048

Point ID	Easting (UTM meters)	Northing (UTM meters)	DEM Elevation (meters)	Dz (meters)
6017	349783.635	4747894.696	2.170	0.066
6018	350444.718	4728315.389	6.780	-0.055
6019	357583.905	4715312.223	3.940	-0.063
6020	346155.551	4710454.603	8.300	0.088
6020A	346124.719	4710473.634	8.880	-0.008
6021	335919.132	4695161.956	3.760	-0.022
6021A	335941.799	4695161.76	3.800	0.049
6024	357634.708	4651322.514	4.260	-0.081
6024A	357643.728	4651344.29	4.630	-0.127
6025	401264.094	4656683.011	5.610	-0.025
6025A	401270.322	4656672.119	5.780	0.006
6026	367214.471	4602068.719	1.040	0.395
6026A	367222.678	4602068.581	0.370	0.156
6027	415067.026	4568367.474	21.600	0.121
6027A	415034.416	4568375.816	21.730	0.265
6028	370138.131	4582875.073	6.590	0.066
6028A	370170.643	4582872.686	6.720	0.022
6029	284782.199	4559374.558	45.000	0.067
6029A	284775.286	4559369.883	44.850	0.032
6030	268397.164	4580035.748	1.820	0.051
6030A	268410.843	4580037.999	1.360	0.161
6031	198988.543	4694035.977	73.519	-0.065
6032	193649.434	4691649.357	102.959	-0.023

Forested and Fully Grown Land Cover Classification Supplemental Vertical Accuracy (SVA) Tested 0.238 meters supplemental vertical accuracy at the 95th percentile, tested against the DEM. Forested and Fully Grown Errors larger than 95th percentile include:

- Point 6012, Easting 266104.481, Northing 4690660.810, Z-Error 0.380 meters
- Point 6026, Easting 367214.471, Northing 4602068.719, Z-Error 0.395 meters
- Point 6027A, Easting 415034.416, Northing 4568375.816, Z-Error 0.265 meters

#### CONSOLIDATED VERTICAL ACCURACY ASSESSMENT

#### **ACCURACY CONCLUSIONS**

Consolidated Vertical Accuracy (CVA) Tested 0.189 meters consolidated vertical accuracy at the 95th percentile level, tested against the DEM. Consolidated errors larger than 95th percentile include:

- Point 4021, Easting 336017.987, Northing 4695058.727, Z-Error 0.190 meters
- Point 5005, Easting 236724.105, Northing 4689461.304, Z-Error 0.252 meters
- Point 5008, Easting 234848.955, Northing 4678830.941, Z-Error 0.230 meters
- Point 5014, Easting 329961.347, Northing 4663570.709, Z-Error 0.214 meters
- Point 5016, Easting 354082.810, Northing 4771823.554, Z-Error 0.262 meters
- Point 5028A, Easting 368146.555, Northing 4583071.973, Z-Error 0.274 meters
- Point 6012, Easting 266104.481, Northing 4690660.810, Z-Error 0.380 meters
- Point 6013, Easting 270266.778, Northing 4683749.093, Z-Error 0.189 meters
- Point 6026, Easting 367214.471, Northing 4602068.719, Z-Error 0.395 meters
- Point 6027A, Easting 415034.416, Northing 4568375.816, Z-Error 0.265 meters

Approved By:			
Title	Name	Signature	Date
Associate Lidar Specialist Certified Photogrammetrist #1281	Qian Xiao	Q:	February 2015

## **SECTION 6: FLIGHT LOGS**

## **FLIGHT LOGS**

Flight logs for the project are shown on the following pages.

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nd Die So	10.00	Validity Coll.	2.00	er N. Tama	Daw Point	Fran		Haza/Fire/Cloud	Departing NO	
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305	N	14;29:00	14:30:00	0:01:00			1		PATCH	
304	5	14:36:00	14:36:00	0:00:00			100		ATCH	
304	5	14:42:00	14:43:00	0:01:00				- J	ATCH	
304	N	14:46:00	14:49:00	0:03:00					ATCH	
300	5	14:53:00	14:54:00	0:01:00					ATCH	
311	N	14:57:00	14:58:00	0:01:00			1	PATCH		
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389	5W	19:1	_	19:26:00	0:14:00			7 7 (			
390	NE	19:3	_	19:44:00	0:14:00						_
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279	5	15:2	6:00	15:32:00	0:06:00						
280	N	15:3		15:41:00	0:06:00						
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282	N	15:5		16:05:00	0:10:00						
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286	N	16:3	_	16:39:00	0:06:00						
287	5	16:4	_	16:48:00	0:06:00						
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330	@ 05	10 SA	A C	LR Conditions	1	Gen Point	Press	3063	Hant/Fles/Cloud	Departing 600
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398	NE	18:5		19:09:00	0:13:00	1				
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401	SW	19:4	_	19:59:00	0:12:00	100		11.24		
402	NE	20:0	_	20:14:00	0:11:00			11.1	E .	
403	SW	20:1	_	20:28:00	0:11:00					
404	NE	20:3		20:39:00	0:07:00				140	
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408	NE.	21:1	_	21:23:00	0:06:00			1 0		
347	5	21:4	_	21:51:00	0:04:00			F (	200	
348	N	21:5	5:00	21:59:00	0:04:00	-		=:	2 1	
349	5	20:0		22:06:00	2:04:00					
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	SIMMONS			MARKS PORTER	2010-4	-	7:50:0		12:50:00	WOODFEETPL
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290	N		6:00	13:23:00	0:07:00	-	1			
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and the	di lime		anajana.	By Stee	Fepalit	_	Francis			upal faces	
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314	E	21:30		21:39:00	0:09:00			10			
315	W	21:45	_	21:54:00	0:09:00		1 77	771			
316	E	21:59		22:09:00	0:10:00		4 4 1				
317	W	22:13	_	22:24:00	0:11:00	_			1-07		
318	E	22:27	_	22:37:00	0:10:00			Sec. 19	1		
319	E	22:41		22:51:00	0:10:00				7		
321	W	23:10	_	23:15:00	0:05:00				5		
322	E	23:19	_	23:21:00	0:02:00				2.0		
323	N	23:24	_	23:26:00	0:02:00		1		2.5		
324	5	23:31	:00	23:35:00	0:04:00						
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326	S	23:47	_	23:52:00	0:05:00		1.34	1, 1			
327	N	23:56		0:01:00	**********			5-1			
328	S	0:05	_	0:10:00	0:05:00			5	17		
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T Times	entered	are Zulu /	GMT T		Page Additional Comme		1		Verify 5-Turns After I	Mission Tre	X No

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Onte	di UDA		To spire!	Septime	Fepalit	=	Name )	-	fa,	par form
opie	Of Edition		11/25/2011	129	73667 HQ180 Rad	_	2 method		Name and Print	nclusto
	ANNEN		-	nima priin	2016.7		6:60:0		11:42:00	MS
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	PROCORE	-	Opted	- Garolini 108	2019.0		9:23:0	0	14:25:00	KYAA
d Dh/Se		APPROPRIES	Celly	Clearl Cove		Daw Point	_	W1	Haza/Hra/Closel	Departing
320	100	10	Cle			41		30.4		Arriving
reques	oy His	t-Augs	System PIS	Compensation	Divergence A Mode	Astopion		ARS	1	DESTRUCTION
46	All In	12	125			=	177.75	ON	Places Gata	Threshold
40		12	123	OM X			SAMP	ur 🖂		ner Trigger Rigo
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Test	A/a	123	4500	12:03	1/1	1/2	11/1	n/a	GPS Began Logging At	
	-			Sale/GENTI	0.03.00	=		Verify 2-Turn	a Tefora Ministr	Yes V 5s
333	E	12:13	_	12:15:00	0:02:00	-	-		Ked Swat	hs, disregard lin
334	W	12:25		12:28:00	0:03:00					
335	W	12:40		12:43:00	0:03:00	_	-			
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136 137	E W	12:58	_	13:04:00	0:06:00		_		1	
338	E	13:07	_	13:13:00	0:06:00	-	-			
339	W	13:18		13:24:00	0:06:00					
340	E	13:27	_	13:35:00	0:08:00					
341	w	13:37		13:43:00	0:06:00		-	-		
142	E	13:47	7:00	13:52:00	0:05:00			1. 0	5	
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44	E	14:06	5:00	14:10:00	0:04:00	-			2 1	
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	ANNEN			W11870	2019.5		16:01:0	90	21:41:00	MCS
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260		8	_	ear Clea		-21	_	30.34		Departing Arriving 1
Frequen	or ) lib	d-Angle	System Pill	Rell		Autopulse		ARF	-13 -	DOMEST
		-	170	Compensation	Made		OFF X	ON	Range Gata	Threshold
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409	E	21:4		21:49:00	0:02:00	1	1/_1			
410	W	21:5	5:00	21:57:00	0:02:00			5-1		
411	E	22:0	1:00	22:04:00	0:03:00	1	1	32 a C		
412	W	22:0	_	22:13:00	0:04:00		1	10.		
413	E	22:1		22:52:00	0:35:00		1 77	7 7 0	E .	
414	W	22:3	_	22:38:00	0:08:00	100				
415	E	22:4		22:51:00	0:08:00					
416	W	22:5		23:02:00	0:07:00	-		5 0	-	
417	E W	23:0		23:13:00	0:07:00	-			_	
419	E	23:2	_	23:24:00	0:06:00	-			-	
420	W	23:3	_	23:43:00	0:04:00				-	
421	E	23:5		23:54:00	0:02:00		-			
415	W	23:5	_	23:59:00	0:02:00				Gap fill b	etween 415/416
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Opte	ch UDA	R	25/11/13	Separties Stra	73667	-	Thank 3			apel term
	(Contra)	_	-99	No.	HOUSE BAR		los lar	See .	Hotel In	-
	ANNEN			MIJJIPQ	2023.0		10:50:0		15:30:00	rec.
	PROCORE		Dete	di-Geraini 308	2027.1	-	15:45:6		200 Hell Tiles 2005:00	im
nd Dir/Se	-	Validity	Kota	Clead Core	3000	Daw Point	Press		Hea/Hea/Cloud	Departing
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	130	-		5000	The Color	- 500	Mone	1000		Notes/Comments
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422	E	16:4		16:50:00	0:02:00	1	7_5			
423	W	16:54	4:00	16:57:00	0:03:00			1		
424	E	17:00	0:00	17:02:00	0:02:00		7.71	9 4 5		
425	W	17:00	5:00	17:09:00	0:03:00		1	10.00		
426	E	17:13	_	17:16:00	0:03:00	1	1 77	7.71	10	
427	W	17:20	_	17:24:00	0:04:00		1.0		1	
428	E	17:29	_	17:33:00	0:04:00				100	
429	W	17:3		17:41:00	0:04:00	5		C- H	1.7	
430	E W	17:43		17:49:00	0:04:00				_	
431	E	17:5:	_	17:57:00 18:05:00	0:04:00	-			-	
433	W	18:10		18:14:00	0:04:00				2.4	
434	E	18:18	_	18:22:00	0:04:00				5 %	
435	W	18:2	_	18:32:00	0:04:00					
436	E	18:36	_	18:41:00	0:05:00					
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438	E	18:54	4:00	19:01:00	0;07:00		-	3		
439	W	19:05	5:00	19:12:00	0:07:00	9		50		
440	E	19:10	5:00	19:23:00	0:07:00	$\equiv$			E	
441	W	19:2	_	19:35:00	0:08:00				.11	
442	E	19:39	_	19:46:00	0:07:00	-	1			
443	W	19:5:	$\rightarrow$	19:59:00	00:80:0					
444	E	20:0:		0:00:00	3:57:00					Charter C
434	N/S W	20:17		20:18:00	0:01:00				Cross	Can fill
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4	Times.	-	1/11/13	352 Noted	73667	-	2 Intelligen	-	Elizability	ichanico I la	
	ANNEN			K1117Q	2027.1		10:15:0	90	21:15:00	100	4
	risa.	=		Lance Tigor	H380 No.	=	Local Red		SEE THE TRUE	- 7	
_	PROCORE		_	cd- Gerahii 108	2030.0		20:15:0		1:15:00	in	_
290		10	Color	lear Clea		Gene Point	Frau	30.21	Higgs/Fire/Cloud	Departing	- 01
Frequenc	100	Magia	System Pi		Divergence 6	Autopular	_	ASS	13	Arriving Districts	
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46		12	125	ON X		=	SAMP			or Trigger Salge	7
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rigeed		100			100	_	Age. Day.		04.60	May James	
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Test	A/s	21:36 Illust		21:38	1/1	2/2	14	n/e Vertte S.Tem	GPS Began Logging At-		1:19 Fig.
445	E	21:43:		21:51:00	0:08:00	100	V_N				
446	W	21:56:	00	22:04:00	0:08:00			2-1			
447	E	22:08:	00	22:16:00	0:08:00	1	9 9 1	3 4 0			
448	W	22:20:	00	22:28:00	0:08:00			10.000			
449	E	22:32:	00	22:40:00	0:08:00			F F C	7.7		
450	W	22:46:		22:54:00	0:08:00						
451	E	22:59:		23:08:00	0:09:00						
452	W	23:13:	_	23:21:00	0:08:00	5-0	-	S 0			
453	E	23:26:		23:34:00	0:08:00						
454	w	23:40:		23:40:00	0:00:00	_			Need to	restart this li	10
454 455	E	23:45:	_	0:09:00	0:08:00						
456	W	0:14:0	_	0:24:00	0:10:00	_		$\overline{}$	_		
457	E	0:28:0		0:38:00	0:10:00					_	
121	_	0.10.0	~	0.50.00	0:00:00				Software	failure on lin	ne .
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Times	entered a	re Zulu / G	MT A		Page	$\neg$	2		Varify 5-Turns After Mis	uion Tes	No
	OFE	4.			Additional Commis	_	_		The second second second second		Drive #

	_	_	- New York	Depti San	Fried	olpe	(Same)	_				
Opte	th LIDA	R 31	1/29/2011	333	73667		1		Man	chunits		_
	Consta	=		State L	2011.0	=	11:50:0	_	15:30:00	=	NGS.	=
	ANNEN	_	- 1	1.1870	20110	-	Lang Red		200 ted The	-	PEL	_
	PHOCORE	-	Opted	- Germini 208	2054.7		15:40:0		20:40:00		HYAA	_
ind Dir/Se	end	Validity	Celly	Clead Core		Daw Point	Press		Haza/Fira/Cloud	Deput	ne .	m
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Frequenc	y Ha	5-Angle	System PRF	Compensation		Astiguia	1	ABS	100	DIGITIZER		_
46	М	12	125		- 00		SAMP.		Range Gets	_ "	reshold	=
40			123	OFF X	1		BOUNDA	100		er Trigger fide	=	
rigeed	-		a.	CHA	NO.	-	Aug. Day.		104,00	1 PPS ada	904	
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Line #	Dir.		ID#	Una End Time	Time On Line	26,9	HDOP	PDOP	Line N	_	tb	
Test	A/s	16:5		16:55	14/1	2/2	11/1	n/e	GPS Began Logging At:		16:52	
579	E	17:05		17:10:00	0:05:00		7.2	vailfe2-lu	Clouds over	Martha's	Vinevar	rď
578	W	17:15	_	17:20:00	0:05:00	1		W		to Nanti		-
577	E	17:24	:00	17:29:00	0:05:00		1	9 4 5				_
576	W	17:33	:00	17:39:00	0:06:00		1/ 1	7.	4			_
535	E	17:44	_	17:46:00	0:02:00			7 7 (	Clouds developi	ng south	side of i	sla
536	W	17:51	:00	17:53:00	0:02:00		4.4		Moved	to north	side	
537	E	17:56	:00:	17:58:00	0:02:00							Ξ
538	W	18:03		18:05:00	0:02:00	5-7	-	0	++			
539	E	18:08		18:10:00	0:02:00							_
540	W	18:14	_	18:16:00	0:02:00	_						
541	E W	18:19		18:21:00	0:02:00			4 4 5				_
543	E	18:26		18:33:00	0:02:00		_		1			_
544	W	18:38	_	18:40:00	0:02:00							_
545	E	18:44	_	18:46:00	0:02:00				1.0			_
546	W	18:51	_	18:53:00	0:02:00				p==			_
547	E	18:57	:00	18:59:00	0:02:00		-	$V \rightarrow I$				_
548	W	19:03	:00	19:06:00	0:03:00			100				_
549	E	19:09	:00	19:11:00	0:02:00							Ξ
550	W	19:16	:00	19:18:00	0:02:00				.II			
551	E	19:22		19:24:00	0:02:00							
552	W	19:28	_	19:36:00	0:08:00							
553	E	19:40		19:48:00	0:08:00	-	_		Cloud on I			_
554	W	19:52	:00	20:00:00	0:08:00	-			Cloud on I			3-
AEO	NA.	20:04	-00	20:12:00	0:00:00				Moved back to	o Martha	s viney	di (
458	W	20:04	.00	20:13:00	0:09:00	-			Clouds dev	aloning b	ore too	_
	-		-		0:00:00	-			Ciddus dev	cioping I	ere too.	
			_		0:00:00							_
					0:00:00		7	7 _ 7				_
Times	entered i	re Zulu / (	GMT 个		Page	$\Box$	1		Verify 3-Turns After Mis	nion Tes	X 4s	T
					Additional Commi	2400					Det	.,

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Optes	di UDA	R	12/1/2013	Separtime:	73667	T	Flam)	-	Feb. 15	al fund	
	Contract of the last		-dalam	Model	73667 HDHD 1544	-	to a last	200	Market Day	T be	
	ANNEN			M1187Q	2034.7		14:531	90	19:55:00	HGS	)
	risa .			Same Type	H380 1/6	-	Local Red		SER Fed Time	- 10	=
and Dis /Sec	PROCORE	Valbility	Opti	edi-Geraini 108 Cloud Corr	2057.0	Daw Point	17:50:		72:50:00 Haza/Rea/Cloud	IMAA	_
140		10	- 0	lear Clea		-10	Press	29.82	elektriticasis.	Departing	
Frequenc	A-1-	- Angle	System Pi			Multipalie	_	AB	-	Distriction	_
		-			Made		OFFE X	CONT	Stange Gata	Threshold	_
46	. 13	12	125	OM X	wo o	=	SAMP			ner Trigger Balge	7
	100			OFF			BOUND	ARY C		1795 adgs	ī
Closed		=	101.	10000	100		Aus. Dire.		04.44	Siles Fores	=
	130			5,000	5,000					1 1 1	
Sing P	Dir.		at IDP	Una Drd Time	Time On Line	26.7	HDOF	PDOP	Line		
Test	n/s	20:	110	20:24 m 244/947 I	1/1	2/2	11/1	n/a	GPS Began Logging At na Before Milaton		00
459	W	20:3		20:39:00	0:09:00		7. 8	Valley 3-10	A SERVICE SHIPPING	fee v s	
460	E	20:4	_	20:49:00	0:05:00						_
461	W	20:5		21:00:00	0:06:00		1				_
462	E		3:00	21:07:00	0:04:00			100			_
463	W	21:1	_	21:16:00	0:04:00		-	77	7.1		_
464	E	21:1	_	21:23:00	0:04:00		100		7		_
465	W	21:2	_	21:31:00	0:03:00				1.00		_
466	E		4:00	21:37:00	0:03:00	K-7		(C	+ 1		_
467	W	21:4	2:00	21:44:00	0:02:00				1		
468	E	21:4	8:00	21:50:00	0:02:00		910	(			
469	W		5:00	21:57:00	0:02:00						
470	E	22;0		22:03:00	0:02:00			( + F	100		
471	W	22:0	8:00	22:10:00	0:02:00				2		
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1			-14		0:00:00		V"	II = 1			
Times	entered r	ere Zulu /	GMT 1		Page		1		Verify 5-Turns After Mi		No
					Additional Comm	ents:					Drive

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Leica	LIDAR	12/3/2013	35713	75667		2	-	Managhan State Sta	erlane Sandy	
	Desire		State L	10000		Lake	GI SIN	military may	100	
-	DALJAMBOS		47079F	2576.2	1	.15:	14:00	20:14:00	WOODERT PEN	
	RADIR		15-7177	2879.3	diam'r.	25:	57:90	20:57:00	KORN	
_	$\rightarrow$				-				Departing KH	
	0 6 light (FOV)		CLR y (Nz)	Pulse Rate (Mit)	-1	Power's.	Fland Galo	2984	Arriving KOI	
	_	-	4 luci			740-1-	Gala-Course,	No 6 Segle	A CHIMADOD V	
Speed	40	42.3	1981	272		00 Ded	Gain - Riss/Do Waveform Made	ien 12 Mutt	Y B Pro-Trigger Dist.	
-	50	6500	R	Varies	R Z		PROFESSION PROCE	-	Pre-Trigger Dist.	
-						-		@	MS	
Line 6	DA	Line Start Time	Line End Time	Time On Una	2/1	HOOF	PDOP	Line N	das/Comments	
Test.	9/0	20:09:57	20:01:00	1/0	n/e	r/x	1/1	GPS Septe Logging At:	20:05:45	
52	5	20:14:42	20-22-25	16:57:05	19	0.8	1.4	Cloud wpt 4? Ov		
51	N	20:25:03	20:32:02	0:00:00	19	0.8	1.4	CLOUD WPT 48		
50	5	20:35:00	20:42:30	0:00:00	21	0.7	1.2	48 START		
49	N	20:45:30	20:50:20	0:00:00	21	0.7	1.2	error on sensor	sborted line	
48	5	20:55:02	20:57:02	0:00:00	18	0.8	1.4			
				0:00:00		373	7			
		100		0:00:00		7 (1+1)			meout error due	
				0:00:00					ignal on I/O Aux	
1.7	7			0:00:00	100			Connection on TDC		
		1		0:00:00	100	1 7 7		Landing KORH 21:05:22		
	_			0:00:00	_			24.00.00		
-			-	0:00:00	-	200		end static: 21:08	:00	
		_	_	0:00:00		100	_	error on Trac Gu	i not on ECMS	
				0:00:00	-	-		erior on trac du	THOCON PCING	
$\rightarrow$				0:00:00		4 20 1 10				
				0:00:00	1	A 10				
				0:00:00	127	TIE	7	-		
		1.0		0:00:00	1	4		A Comment		
				0:00:00				1.0		
7 1		T 110		0:00:00		f K L				
				0:00:00				-		
	_	- 1	_	0:00:00	_	20.0	-	1		
_			_	0:00:00	+		-	+		
			-	0:00:00						
- 1			-	0:00:00		T I I	7	1		
- 4	100			0:00:00	1.7					
				0:00:00		37		A		
		Total Control		0:00:00		6 4 4 4		4	100	
				0:00:00	J. Herman	4		ALS FILE #201312	203_191816	
		re Zulu / GMT 个		P	age	1	1	Verify S-Turns After M	100	
	rt KPWI	M 2876.2 Lan	d KORH 2	877.0 Land	HYA 287	7.7 Overf	ly Base 287	78,3 Land ORH 28	379.3 ALS-70-	

						olpe	rt				
Opte	ch LIDA		12/4/2013	Separtime:	73667	-	(Same)			apal fame	
	Constant of the last		4	Street Land	HOND BUT	_	Local Start	See .	District Con-	1	Size.
	ANNEN			1387Q	2037.0		16:65:0	-	21:45:00		HGS
-	PROCORE			- Germini 308	2041.4	_	20:55:		1:53:00	+	IMAA
nd Dis/Se	-	Vacables	Kelly	Clead Cove	32.00	Daw Point		101	Higgs/Stra/Cloud	Departs	,,,,,,
330		10	Cle			-1		30,13		Arriving	
Fraquet	or ) its	Nage	System PRF	Rell		Autorior		ARF	-131	DESTRUCTION	
		-		Compensation	Made		OFF X	ON	Range Gata	Three	thoid
46	1 3	12	125	OM X	wo O		SAMP		100	Later Trigger Edge	
	A.			OFF	Ma X	X		ARY		1P95 sdgs	
Cond	130			.000	5,000	1	Age, Gay.	_	0.21,452	Max Jan	4
Dire P	130	Mission	iDe J	Line End Time	Time On Line	50	HDOF	PDOP	150	Notes/Comments	
Test	A/s	21:	_	21:36	1/2	2/2	n/a	n/a	GPS Began Logging		21:15
		I The		Sala/GMTI	- 4	_			a Tefon Minist	Tes v	- Fee
575	W	21:41		21:47:00	0:06:00		V				
574	E	21:51	1:00	21:58:00	0:07:00						
573	W	22:02		22:09:00	0:07:00		7 71	1 1 1			
572	E	22:13		22:20:00	0:07:00			11 -			
571	W	22:23		22:30:00	0:07:00		1 11	7.7	E .		
570	E	22:34	_	22:41:00	0:07:00						
569	W	22:45		22:52:00	0:07:00	-			100		
568	E	22:56		23:03:00	0:07:00		-	5 1	-		
567 566	W E	23:07		23:14:00	0:07:00	-			_		
565	W	23:30		23:38:00	0:08:00						
564	E	23:41	_	23:49:00	0:08:00			100	22 10		
563	W	23:54		0:01:00	0:07:00				2		
562	E	00:	_	0:13:00	0:07:00				)		
561	W	0:20:	:00	0:27:00	0:07:00			12-6	2 to 1		
560	E	0:31	:00	0:39:00	0:08:00	100	1- 1	h. 13	)-E		
559	W	0:42	:00	0:50:00	0:08:00			3-0			
558	E	0:54:		1:03:00	0:09:00			5			
557	W	1:06:		1:15:00	0:09:00						
556	E	1:18:		1:26:00	0:08:00			= 0	.11		
555	W	1:31:	:00	1:40:00	0:09:00						
			_		0:00:00		-				
	_				0:00:00	-		_			
-	_		_		0:00:00	-			-		
					0:00:00						
-			_		0:00:00	-	-				
			_	_	0:00:00	_					
			_		0:00:00						
	1.1	-			0:00:00		7	17		_	
Times	entered i	ere Zulu /	GMT 1		Page		1		Verify 5-Turns After A	Aission Tes	X 4s
					Additional Comm	-					Drive

				-	Woolp	ert			
Leica	LIDAR	11/20/2015	134	73667		Tax 1	- 1	7567 Man	
	Desire		ting	9000		Lecture	el Sine	200 000 000	99
	SHIMONS		M7079F	2884.9 Walte		15:4	0.00	20:40:00	WOOLPERT PEN
	SWWN	and and	N/5-7177	2890.6	Carry Day	71:8		2:40:00	
	-	Validity		Com N   1mg	_	-	Please	No. No./Cont	Departing KO
	@ 03	10 SM	CLR	- 3	-4		3009	haze	Arriving KO
_	ingle (FOV)	Score Freque	_	im Rate (Miz)	Later Po		Franci Galo Galo - Course,		- Investory
Speed	40	42.3	SEL SEL	272	Wavefore U		Gain - Rine/Do Wayeform Made	ws 12 Mutt	x 5
	50	6500	R	<b>—</b> [	+ 2		Watercent Image	_	Pro-Trigger Dist.
_		-			_	₽ X		@	NS
Line 6	Dir.	Line Start Time	Line find Time	Time On Line		HOOP	PDOP	Line Not	ы/Социяла
Test.	4/2	2 Three entered	are Zubi / GMT I	1/2	n/e	r/x	1/1	GPS Began Logging At: Verify S-Turns Before M	
1	W	21:16:00	21:19:00		A 1 45	171		A MISSION	HOLING CLASS
2	E	21:22:00	21:24:00			20.00			
3	W	21:28:00	21;30			( )			
4	E	21:33:00	21:36:00		100				
5	W	21:40:00	21:42:00	-		1 - 1		1, 1	
6	E	21:45:00	21:48:00	-	1				
7	W	21:51:00	21:55:00		1 1	1245		7.	
8	E	21:58:00	22:01:00		100	1.7			
9	W	22:05:00	22:08:00	-					
10	E	22:11:00	22:14:00		11/1	27 1 10		100	
11	W	22:17:00	22:18:00	-	1	- CH			2000
17	N.	22:28:00	22:31:00		100	V	1	ABORTED AT W/	
								REBOOT - OVER	LY BASE
17	N	23:15:00	23:26:00					B MISSION	
18	5	23:29:00	23:40:00		1	100			
19	N	23:43:00	23:54:00 0:12:00						
24	5	23:57:00	274244		-			_	
	N	0:15:00	0:17:00		-	-		-	
21	N	0:21:00	0:22:00		+	-		+	
20	5	0:25:00	0:27:00	_				_	
25	N	0:35:00	0:49:00		+		-		
26	5	0:53:00	1:06:00		1	1			
27	N	1:09:00	1:23:00					1	
28	5	1:27:00	1:42:00		100				
29	N	1:45:00	1-59:00				)	7	
30	5	2:02:00	2:16:00						
				100				-	
- 1				7	1 1	72.17		4	
6					.1 9	0.00			
			4		1	1 1		2	
Times	entered a	re Zuiu / GMT 🌴		Pa	age		1	Vertly 5-Turns After M	tation New X No
(dHeiral (	constit:							_	Drive d

					Woo	pert					
Leica	LIDAR	12/8/2013	34213	75667		1	- 1	Mancha	Francisco entry/Post Ho	ericane Sen	dy
	Desire	-	Sept.	sering			GT STA		and time		Tau.
	BAUAMBOS	-	(7079F	2990.4		20	KS:06	140	25:00	- 00	COURTPN
	RADIR		15-7177	2895.7	S	20	26:00	290	36:50		KLWM
200	05	10	LR .	-4	-10			_	3058	Depure	KOR.
	agla (FOV)		y ()tz)	Pulso Rate (Mts)		Power's	Fland Gain		Me Me	Arristo	Threshold Va
	40	42.3		272		100	Gain-Course	/Up 6	Single	1 0	A 1
Speed	-	AGE	181	-1-		Used	Gain - Fine/Do Waveform Mode	12 12	Mutt	ž Pre-	Different Dist.
15	50	6500	R	Varies	n ž	2 x		ര	16		
bed 1	Die	Line Start Time	Line End Time	Time On Line		HOOF	PROP	1	Line M	MS Tomas	erit.
Test	n/a		,,	n/a	n/s	e/s	1/1	GPS Began L		Т	14:15:00
-		2 Three entered to	Ziju/GMTZ	-			- 4-		rna Betters N	mion Tag	V No.
216	NE	14:45:25	14:51:06	5:53:05	19	0.6	11	TAKEOF	F 14:19	-	-0.77
215	SW	14:53:32	14:59:33	0:00:00	17	0.7	1.2	Overfly	base 14:	35:14-/3	37:44/40:1
214	NE	15:01:27	15:07:37	0:00:00	17	0.7	12	Slight de	usting of	snow	
213	SW	15:10:41	15:16:23		17	0.7	1.2	north si	de of tre	es	
212	NE	15:18:30	15:23:49		17	0.7	1.2	- 1			
211	SW	15:25:48	15:30:37		17	0.7	1.2	1			
210	NE	15:34:41	15:36:15		18	0.7	1				
209	SW	15:38:01	15:39:32		18	0.6	1	_			
208	NW	15:41:41	15:43:07		18	0.6	1	-			_
207	SW SE	15:44:50 15:51:00	15:45:07		19	0.6	11	Shoals			
2	NE NE	15:58:11	15:59:10		16	0.7	11		6 7	cene.	
3	W	16:02:25	16:03:25		16	0.7	11		ys line 2		e 2, CCNS
123	5	16:17:23	16:26:37		16	0.7	1.1	BLOCK A	_	July III	,
122	N	16:28:34	16:37:50		16	0.7	1.3	- CCC-III			
121	5	16:39:59	16:49:22	0:00:00	15	0.7	13				
120	N.	16:51:37	17:00:52	0:00:00	15	0.7	1.2				
119	5	17:02:58	17:11:26	0:00:00	15	0.7	1.2	-			
118	N	17:14:06	17:22:58	0:00:00	15	0.6	1				
117	5	17:24:59	17:33:36	0:00:00	17	0.6	1				
116	N	17:35:38	17:44:40		19	0.6	0.9				
115	5	17:46:30	17:55:20		19	0.6	0.9				
114	N	17:57:26	18:06:39		18	0.6	1	4			
113	5	18:08:22	18:11:12		18	0.6	12	1			
112	N	18:19:12	18:28:00		18	0.7	13				
111	S N	18:30:08 18:39:32	18:37:41		18	0.7	11	+-			
109	5	18:48:48	18:56:15	_	19	0.7	11	_			
108	N	18:58:11	19:05:34		18	0.7	1.1	India	2:36/19:	36	
107	5	19:07:33	19:14:58		18	0.7	1.2	static 19		20	
105	N	19:17:48	19:18:21		18	0.7	1.2	-			
		re Zulu / GMT 个	10.20.23		age	-	1	Verify 5-To	erro After M	Inion v	X No.
Attornal C		Camp / GWI T		P.	age.	1	1	1200			Drive #
				ALS file #1	31208 1	70258					
					7						
											ALS-60

Sometimes 40 rSpeed 150	orn was		Maria Ma Maria Maria Maria Maria Maria Maria Maria Maria Maria Maria Ma Ma Maria Maria Maria Maria Ma Ma Ma Ma Ma Ma Ma Ma Ma Ma Ma Ma Ma	73667 4380.56 2690.6	MILT C	2		Manchastra, Franchise Mills See No.	urkane Sondy
Scan Augle 40 ripeet 150	(FOV)		and Sec	7890.6		Lake	Self Size	THE REST WAS	-
Sometimes 40 rSpeed 150	(FOV)		and Sec	7890.4					
Scan Angle 40 Speed 150	(POV)			75000		2	45:00 In/ Una	1405500	WOOLPERTPA
Scan Augle 40 Speed 150	povy	a, c	US-7177	2695.7	South Tue		26:00	19:26:00	erwe.
150			afty 12	military feet	Dew Po		Please	Name / Columns	Deputing KOR
150		Scan Fraquesc	r (Hz)	Pulm Rate (Mit)	lent	Power's.	Fland Galo	-	Activing KLW
150		42.3	_	272	_	00	Gala-Course/	in 6 Suph	- A- 1
150	100	-200	188	212		lised	Gain - Rins/Do Waveform Made	ws 12 Mutt	X 8 1
line#	L.	6500	R	Varies 1	1 2	2 x		@	
_	Die Line	Start Time	Line End Time		20	HECE	PDOP		letse/Comments
Test o	9/9	SCARE LIMA	Titles lines (time	1/4	_	_	_	_	onary care position
144		trost entered to	n Zuju / GB/T X	1/1	n/e	)×/k	1/1	GPS Segue Logging At: Verify S-Turns Sefare A	Inter Park v I No.
106		-21:47	19:25:39	0:00:00	19	0.6	1		
	- 10-	- F		0:00:00		1	Dara .		
1.00		- 1		0:00:00	100	O. T.	0	V	
1				0:00:00	100	4	Q 2.	0.0	
		F		0:00:00		4.1			
-	_	$\overline{}$		0:00:00	_	+		_	
-		0:00:00	-	-	_	-			
-+-		0:00:00	+-	4-1-		-			
_			0:00:00		1		1		
- 11	_		1	0:00:00	100	7213		-	
			0:00:00	11			3 7.		
- 13			0:00:00		-	1			
-		0:00:00		1 4 4 4		200			
_	_	_		0:00:00	9	1	_		
_	_		_	0:00:00	-	-	-	+	
_	_		-	0:00:00	+-	+	-		
_	-			0:00:00				+	
3.10			1	0:00:00	1 1	f. 1	1	-	
mark land	100			0:00:00	11			A decision of	lane esta
				0:00:00		0		1	
				0:00:00	41	TIPLE		J	
			1	0:00:00	d Ata	1000	100		
				0:00:00	1	400		4	
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_	_	-		0:00:00				+	
-	-			0:00:00					
_	_			0:00:00					
Times ent	tered are Zuli	u/GMT A			ge		2	Varify S-Turns After N	Alasion va No
different Comm		, 34. 1		P.	2	-	- 4		Drives 4

					Woolp	ert			
Leica	LIDAR	12/8/2013	542	75667		1	-,1	7367 Ma	
	Desire		SHIP.	Selling		Lacette		SHIRE TO	98
	SHOWING	7	M707HF	7595.7		19:0	5:00 (Time	0:05:00	WOODFUTT THE
-	SWWN		N/5-7177	7599.1		23:10		4:50:00	
Why D		Visitity	Calling Daniel	Come S Temp	Dew Pole		Plants	Non/Re/Clini	Depuring KLW
	im	10 SM	CLR	-2		-10	3058	haze	Arriving ICLV
	ingle (FOV)	Scott Fraque		ins Kata (Miz)		ower's.	Flood Gain Gain - Course,		ode Threehold V
	40	42.		272		00	Gain - Rins/Do		
Speed	-0	AGE	NSI.	-	Waveform U		Waveform Made		Pre-Trigger Dist.
_	50	6500	R		R g	2 x		@	NES
lbe#	Dh:	Line Start Time	Line End Time	Time On Una	20	HOOF	PDOP	Line No	он/Сопиния
Sec.	0/2			1/6	n/e	r/x	1/1	GPS Segan Lagging At:	
164	5	0:32:05	0:34:00		A 10	JF L		The second second	Amion Has VI No
158	5	0:39:50	0:41:00			20.7			
157	N	0:43:19	0:44:00			V= = 7			
163	N .	0:49:25	0:52:00	- 1					
162	5	0:54:39	0:57:00			11 4 17		100	
156	5	1:02:16	1:03:00					1/2	
155	N	1:06:52	1:10:00	7				6	
161	N	1:13:01	1:15:00			1.4.1			
160	- 5	3	3	No. of Contrast of		1		FETCH ERROR -	REBOOT
160	5	1:55:50	1:59:00	-	11/1	27.11.20	1.0	4	
154	5	2:01:15	2:05:00			V8 84			
153	N	2:07:52	2:11:00		To the same	VV	4		
159	N	2:13:34	2:17:00			0.10			
152	5	2:20:36	2:29:00	No. 17					
151	N	2:32:15	2:41:00				7	War name	
150	5	2:44:34	2:53:00			7.17		GNSS IMU IN CO	OURSE ALIGN; POS
149	N	2:56:36	3:06:00						
148	S	3:09:11	3:19:00			-		-	
147	N.	3:21:30	3:31:00		_			evening extens	us and min to b
146	5	3:35:04	3:39:00		-	+			NG AROUND W/P
145	N	3:43:31	3:47:00	_	+-		-	MANUALSTART	ON W/P 17 DUE
								1	
-	$\vdash$				+			1	
			1		7		5	7	
			3					1	
	/				100			1 6	
1 1	ham. P				J 9	0.00		1 1	
							1	3.	-
Times	entered a	re Zulu / GMT 🕈		Pa	age	S	1	Verify 5-Turns After 8	Abston to X Nu
(Horal C	SOLDIERIE:			27.000					Defeat #
		POSSBLE CLO	IDS STAFFING ON LIN	E 150 ON SOUTHER	en chit; also it at	arraed all purply arrange	ong around the 150		
									4

TV	Leic	a ALS-70		12/27/	****	Day	FLT2			d/ Hans	com AFB
retse		Annen		MATSEC MASSACP MYSTAS	91-7177 91_6197		23	873.1	2:25		19:25
	ι	arocque		N475CP N1337Q Y	591-7100		1.00	376.8	18:30		23:30
- mgan				Yes X	No.		GPS Sam GPS Sam	-		PID PID	MAWM WESZ
N/	25	Violatiny Coding		Cloud Cover % To	ing.	Dew Point	Press	30.17	Hess/Few/Cloud	Deports	RICHO KOM
	40	42	-	272	LBA	100	)	Cocras/U Fine/Down	Multi		2+2 4+1
peed	150	κ <sub>α</sub> 7,30	0 <sub>R</sub>	7,300	Pt Thos	/		Warefaces M		NS.	Trigger Old.
les P	Dir.	Line Stort Time	Line D	od Diese Tie	ne On Line	W)	HDOP	POOP	the	Notas/Comm	erita
Test	4/1				1/1	1/2	1/4	2/8	GPS Bagan Loggi		
_		‡ Timo entend			GAP				Verify S-Turns Before M		X **
1	N	MA 21:22:00		3:00	GAP		-		CO	RS MAW 30001	IVI
2	5	21:26:00		7:00			7			30002	
3	N	21:30:00		1:00		-	= = =		0	30003	
4	5	21:34:00	21:3	6:00			1.11	4. 1		30004	
5	N	21:39:00	21:4	1:00	_	M	21		0	30005	
		HANSCOM		FB			9 11	4.5	C	ORS WES	2
1	5	21:57:00		8:00	_						
3	N 5	22:02:00		7:00				-			
		1 48/3/24	-	3		12.1	111				
	380	MA	FLC	OOD	GAP		77.0		CC	ORS MAF	A
6	5	22:57:00	22:5	8:00			J. E.		30006,	WITHIN	TIDES
7	N	23:01:00		2:00		-	111			30007	
8	S	23:06:00	23:0	7:00				1 1		30008	
	1 3			- 1		-	1+3	+ +1			
				1		-	1				
16						171	JT.	( 1)			
T,			1			100	7 15	1 1			
	Total	† Times entered	um Zulo / G	MT+ D	:00:00	Te	tal Time On L	-	Verify S-Turns After ME	intery the	X No
ditional C	ommerits:			SVET	W CENTRAL ME	MIT.		_			Drive #

						W	ool	pe	rt							
Leica	LIDAR	4/3/2014		The s	736	7	F	- 1	1	- 1		Man	Food Hurris	ana Sandy		=
	Desire	444	Sentes.		9000	_	-		Last	el lim			of The		Tan.	_
-	SORMALAN		NITISD		2490		1			500			5:00	W	OUPERT P	n.
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218	NW	13:07:42	13:11	:00	0:00:00		16	0.7	1.2						
219	SE	13:13:53	13:17	:42	0:00:00	1177	17	0.7	1.2						
220	NW	13:21:04	13:24		0:00:00	_	16	0.7	1.2						
221	SE	13:27:16	13:30		0:00:00		16	0.7	1.3						
222	NW	13:33:42	13:36		0:00:00	_	17	0.7	1.1	_					
223	SE	13:39:42	13:42		0:00:00	_	17	0.7	1.1	2.4					
224	NW	13:45:26	13:48		0:00:00	_	17	0.7	1.1	_					
225	5	13:52:45	13:57		0:00:00	_	16	0.8	1.2	-					
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230	N	14:21:10	14:24		0:00:00	_	15	0.8	1.4	-	_				_
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236	N	15:36:33	15:42		0:00:00	_	17	0.7	1.1						_
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271 5	s	12:33:50	12:40:	10	0:00:0	0	18	0.6	1.2				
272	N	12:42:50	12:48:	29	0:00:0	0	18	0.6	1.2	v3			
287 5	w	12:51:29	13:03:	33	0:00:0	0	18	0.6	1.2	46			
286 N	IE.	13:06:25	13:18:	23	0:00:0	0	18	0.6	1.1				
285 5	w	13:21:39	13:33:	33	0:00:0	0	17	0.6	1.2	1100			
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K5 5	5	14:35:52	14:43:	14	0:00:0	0	16	0.7	1.2	7500/3	2/41.6/2	39.0/1009	4/6-12/
K6 1	N	14:46:05	14:53:	17	0:00:0	0	16	0.7	1.2	7500/3	2/41.6/2	39.0/1009	6/6-12/
K7 5	5	14:56:21	15:03:	44	0:00:0	0	16	0.7	1.1	7500/3	2/41.6/2	39.0/1009	6/6-12/
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WHAT	09	10	celling the	Come N.   Temp	Description 2	-	3024		Departing KH
	ingle (FOV)	Scan Frequen		ulm Rate (Miz)		owers.	3024 Flast Gain		Arriving KH
		42.3		272		00	Gala-Course,	No 6 Single	A
Speed	40	AGE	1881	212		led.	Gain - Rrss/Do Waveform Made		Pre-Trigger Dist.
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Line 6			Time On Line	9/1	HDOF	PDOP			
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257	NW.		16:33:38	0:00:00	15	0.7	1.4	MISSION 2	
258	SE	16:36:14	16:38:54	0:00:00	15	0.7	1.4	takeoff: 16:212	
259	NW.	16:41:58	16:44:09	0:00:00	15	0.7	1.4		
K62	NW	16:50:54	16:55:37	0:00:00	14	0.8	1.4	7500/32/41.6/239.	0/100%/6-12/
K61	SE	16:58:17	17:03:22	0:00:00	17	0.7	1.3	7500/32/41.6/239.	0/100%/6-12/
K60	SE 1	17:06:10	17:11:28	0:00:00	18	0.7	1.2	7500/32/41.6/239.	0/100%/6-12/
K59			17:20:06	0:00:00	18	0.7	1.2	7500/32/41.6/239	100000000000000000000000000000000000000
K58	SE 17-39:48 17:49:41 SW 18:00:11 18:03:07	0:00:00	17	0.6	1	7500/32/41.6/239.			
K57		0:00:00	17	0.6	1	7500/32/41.6/239.	0/100%/6-12/		
277	SE 17:39:48 17:49:41 SW 18:00:11 18:03:07 NE 18:06:19 18:09:09	0:00:00	16	0.6	1.1				
276	SW 18:00:11 18:03:07 NE 18:06:19 18:09:09 SW 18:12:52 18:15:07	0:00:00	16	0.7	1.1	1			
275		SW 18:00:11 18:03:07 NE 18:06:19 18:09:09 SW 18:12:52 18:15:07	0:00:00	17	0.6	1.1	Y		
274	NE 18:06:19 18:09:09 SW 18:12:52 18:15:07 NE 18:18:06 18:19:12	0:00:00	17	0.6	1.1				
273	5W	18:22:54	18:23:13	0:00:00	17	0.6	- 11		
				0:00:00	7 1		7	Landing: 18:40z	
	- 5			0:00:00		-		Static: 18:42:27	
				0:00:00			-		
	-			0:00:00					
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- 4			1	0:00:00		2011/			
	entered a	re Zulu / GMT 1		P <sub>2</sub>	age		1	Verify S-Turns After Missis	on the X No
Times							-	and the second second second second	

until this ham a second of the	MRCS COLUT	Matheway Co	_		75667 2507.1	1	1 1		Man Foot Hur	
Mind Displayed 340 10g1 Scan Angle 40 ir Speed 150 Line 6 Text 6 217 A	ig (FOV)	Makeing G	15-7177 alleg		2507.1	_	Learn	Call Street		_
150  Line 6 150	ig (FOV)	Manage of 10 C Scan Fraquence	15-7177 alleg	-	-		-		400000	-
While the hand to	19 (FOV)	Value 5 10 C	15-7177 afteg	_	ARREST TIME	_		(1:00) (5(1))	14:03:00	WILL
340 10g1 Scan Angle 40 rSpeed 150 the 6	(POV)	10 C Scan Fraquesc	_		2508.0	ulik.		54:00	(558:00	
\$can Angle 40 150 Line 6 1 7act 1	(FOV)	Scan Frequence	lear '	Chroni Corner M.	10	Describe 2		2960	Maca/May/Climat	policies PUI
150 Ibn 6 I	_		y (Hz)	Pulse Rate (Id	_	Lame	ower's.	Flast Gain	-	Arriving KHY
150 Line # 15 Test #	_		1000	272	-		00	Gala-Course/L		- A-1:
150 Ibel I Tat I	-	78I	-	2/2	_	-	and .	Gain - Res/Dos Wayeform Mode	m 12 Mutt	Y 8 Pre-Trigger Dist.
Test s		6500	R	6854	R	ž	2 x			
7at 1									@	NES
217 N	_	Line Start Time	Line End Ti	_	On Line	9/1	HDOF	PDOP		Notac/Comments
	0/0	2 Thosa entered ar	Zahr/GMT		/•	n/e	r/x	1/1	GPS Began Logging At- Vertis S-Turns Better	
	w	14:43:45	14:46:2		0:00	18	0.8	1.2	t/o: 14:31z	Mary July V. Louis
278 5	SW	15:01:34	15:04:		0:00	18	0.8	1,2		
279 1	NE	15:07:29	15:10:2	28 0:0	0:00	17	0.7	1.1	OFFLINE TO M	SS CLOUD
	w	15:13:26	15:17:		0:00	17	0.7	1.1	THIN CL BEGIN	
281	NE	15:21:00	15:25:	35 0:0	0:00	17	0.7	1.1	8 MILES CL LEF	T SIDE
282 5	w	15:29:05	15:34:3	39 0:0	0:00	17	0.7	11	THIN CL BEGIN	NING
283	NE	15:37:27	15:43:	0:0	0:00	16	0.7	1.2	THIN CLOUDS	NEAR END
284 5	SW	15:45:56	15:53:	30 0:0	0:00	17	0.7	1.1	CLOUD THICK,	5 MILES INTO IT
K52 N	W			0:0	0:00			5	Landing: 16:11	Z
		- 1		0:0	0:00	-	1		STATIC: 16:13:	27
47.0	-4		7 =	0:0	0:00		100			
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† Times ent oldbook Comm	.,	Zulu / GMT 🌴	_		Pag	e		1	Varify 5-Turns After	Mission in X No

						Nool	pert				
Leica	LIDAR	4/10/2014	300		TrainE7		Test 1	- 1	Mass Post Hurs		
	Desire		Sings.	-	rectinger.	_	1,000	Sel Sea	THE REST LESS		lia.
	TALAMBOS		NILLISTO	-	2500LB HORSE SEC	_		22:00 InClina	12:22:00 September 10:00	WOX	XPERT PAR
					2512.9	Seller Tree		57:00	18:52:00		-
				Charles Science M.	Tena 3	Description -7		Therete .	New / New / Climate	Departing	
	LanCOCINE   MS-7177			Pulsa Rate (			owrt.	3012 Flori Gain		Arriving	Threshold Va
			$\overline{}$	272			00	Gain-Course/	Up 6 Single	1	A 1 1
ripeed		1000			-1	_	land.	Gain - Res/Do Wayeform Made	ws 12 Multi		B T
		6500	B	6847	R	ž	2 x		@		
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line#		Line Start Time	Line End Ti	The The	o On Una	9/3	HOOF	PROP	_	Notac/Commen	42.54.42
Test .		2 Texas seriosof in	a fuls / GD/f		1/1	n/e	r/x	1/1	GPS Segan Logging At: Verify S-Turns Setters		12:04:12
51					00:00	17	0.7	1.3	Takeoff HYA: 1		
50		12:41:30	12:57:2	22 0:	00:00	17	0.7	1,3	arrive KFIT: 7:4	Blocal	
49		13:16:4	4 0:	00:00	17	0.7	1.3	LATE START - M	ANUAL		
48		13:36:1	7 0:	00:00	16	1	1.4	PDOP JUMPING			
47		13:39:21	13:55:4	11 0:	00:00	16	1.3	2.2			
46		13:58:27	14:14:1	3 0:	00:00	16	0.7	1.2	LIGHT TRACE O	FSNOW	
45		14:33:5	5 0:	00:00	16	0.7	1.1	HIGHER ELEVAT	TIONS		
44		19 0:	00:00	14	0.7	1.2					
		-	0:	00:00							
			0:	00:00		( )		Takeoff FIT: 12			
100		1.1			00:00		9411		LANDING FIT: 1	111767	2.4
				00:00				static:15:06:55	)z		
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	omments:						-			_	Drives #
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										- 1	78351
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	Desire	_	Boles		8000		=			-	alther			Tag.	=
-	DALAMBOS	_	NILLISTO		2512. R0001	-	-		2:45	-	1850	-		NGS:	_
	MOCHUE		N.S-7177	14.	2517.				18:00		2003				
			cally	Cheed !	_	_	Daw Print		Please	-	-	to/Chief	Departs		KHY
	12 ingle (FOV)		clear cy(Hz)	24	es Rate Oblizi	-	-Z	-	30.18 Frant Gain	-	-	16	Arrivin	Thresho	KHY
	32	41.6		-	239		10		Gain-Course,	Up.	6	Sept		A	
Speed	-	AGE 42.0		ISI	233	Way			Gain - Fine/Do Waveform Mode	MI :	12	Wett	X Pro-	B Drigger Do	Į
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Test	n/s	2 Those entered a	ra Zubi / GM	12	11/9		n/e	x/x	1/1			ogring At: na Bettern M	Index Ves	16:27	
K56	NW.	16:45:10			0:00:00		14	0.8	13				OFF: 16		-
K55	SE	16:57:44	17:06	:47	0:00:00		16	0.8	1.3						
K54	NW	17:10:15	17:18	:55	0:00:00	i i in	15	0.7	1.1						
K53	SE	17:21:43	17:29	:36	0:00:00		17	0.7	1.1						
K52	NW	17:33:10			0:00:00	_	16	0.8	1.1	-					
K43	NW	17:43:21		_	0:00:00	_	17	0.6	1.1	_					
K44	SE				0:00:00	_	15	0.7	1.3						
K45	NW				0:00:00	_	17	0.7	1.1	_					
K46	SE			-	0:00:00	_	16	0.6	1.1	-					
K47	NW				0:00:00	_	16	0.6	1.1	+	_				
K48 K49	SE		16:54:37 17:06:47 17:18:55 17:29:36 17:40:31 17:47:18 17:54:12 18:08:14 18:18:22 18:28:07 18:38:03 18:47:50 18:57:19 19:05:07 19:18:36 19:30:51 19:42:21 19:55:14 20:07:05 20:18:11 20:28:08	0:00:00	_	16	0.6	11	+	_					
K50	NW				0:00:00	_	16	0.6	1.6	+		_		_	
K51	SE	16:57:44 17:06:47 17:10:15 17:18:55 17:21:43 17:29:36 17:33:10 17:40:31 17:43:21 17:47:18 17:50:26 17:54:12 18:00:46 18:08:14 18:11:06 18:18:22 18:21:05 18:28:07 18:31:12 18:38:03 18:40:54 18:47:50 18:50:42 18:57:19 19:01:39 19:05:07 19:09:59 19:18:36 19:21:50 19:30:51 19:33:21 19:42:21 19:45:41 19:55:14 19:58:00 20:07:05 20:10:46 20:18:11 20:21:03 20:28:08		0:00:00	_	15	0.7	1.6	+	_			_	_	
K17	N				0:00:00	_	18	0.7	1.4	+		_			
K16	5				0:00:00	_	17	0.7	1.5	+	_				_
K15	N				0:00:00	_	17	0.6	13	+					_
K14	- 5	19:45:41	19:55	:14	0:00:00		18	0.6	1.3	-					_
K13	N	19:58:00	20:07	:05	0:00:00		18	0.6	1.3						_
K12	5		_		0:00:00	_	17	0.6	1.3						_
K11	N	20:21:03	20:28	:08	0:00:00		16	0.7	1.4						_
K10	5	20:30:30	20:37	:44	0:00:00		17	0.6	1.3						
K9	N				0:00:00					Land	ling:	20:54z			
K8	5				0:00:00	n ji				Stati	c 20	0:56:06			
* V		/ 1	5 mm		0:00:00	100		111							
- 4	1	Lam a. C	) 1-		0:00:00				0						
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						Woo	pert							
Leica	LIDAR	4/12/2014	100.00	Tax:	79607	=	Test 1	-1	=	Marie 24	Francisco et Hurrico	na Senste	=	=
	Desir	- Walante	Secret.	-	93000			el See		mile line			Tion.	
-	TALAMBOS	7	NILLISTO		2524.3	71		11:00		14:013		W	DOLPERT	PIR
	Langer Livit		N/S-7177	J	2578.2			100	-	D:11:		ļ	150	
What Di	7 -0-000	Validay	Calley	Cheed	Com N.   Temp	Desc P		Please	-	100/100	200	Departs		KOWE
330	07	10	clear		12	4	1	3014	- (*)			Arriving		KOW
Scott A	agis (FOV)	Scan Freque	scy (Hz)	Pub	ns Rate (Miz)	Lase	Power's.	Fland Gain Gain - Course/	$\Box$	$\Box$	Me	de	Threah	old Valu
	40	42.3	3		272		100	Gain - Rins/Do		12	Water	- x	- 6	17
Speed	_	AGL	1	ISI	=	_	Used	Wayeform Made				Pre-	a uni	
15	50	6500	R	6	854	· ž	2 x			@		MS		
line#	Die	Line Start Time	Line End	Time	Time On Line	9/1	HOOF	PDOP	Т		Line No	tur/Compa	nia	
Test	0/2				1/0	n/e	e/a	1/1	GPS 94	agon Log	nine At-	-1	13:3	4:25
		Three entered	are Zubs / GB/	12							Astara N	mion Find	VI No	- 74
43	N	14:00:56	14:17	_	0:00:00	14	0.7	1.4	-	13:42			-	
42	5	14:20:28	14:36	100	0:00:00	16	0.7	1.2	SLIG	HTLY	OFFLIN	E BEGIN	NING	
41	N	14:39:46	14:56	_	0:00:00	15	0.7	1.2						
40	5	14:58:37	15:14		0:00:00	17	0.6	1						
39	N	15:18:04	15:34		0:00:00	17	0.6	1						
38	- 5	15:37:10	15:53	_	0:00:00	15	0.7	13	_					
37	N	15:56:29	16:12		0:00:00	16	0.7	1.2						
36	S	16:15:38	16:32		0:00:00	13	0.7	15						
35	N	16:35:02	16:51	:38	0:00:00	13	0.7	1.5						
34	5	16:54:43	17:11	:24	0:00:00	15	0.7	1.1	_			BULENCE	Ē	
- 1	1 - 1	V		7	0:00:00	100				ding:1		-		
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_		re Zulu / GMT 🕆			Pa	ge		1	Varif	S-Turn	a After M	lation ve	X No	1
iditional C	omments:											-	- 10	ritora di

					Wool	pert			
Leica	LIDAR	4/12/2014	352	73667	N. I. I. P.	Tax!	- 1	Mass Poet Hurris	ane Sandy
	GALAMBOS		NILISD	2528.2		Lance I	TOTAL TOTAL	19402400	WOOLFERT PAR
	Field		MILLION TO SERVICE STATE OF THE PARTY OF THE	Ham In			ECT-	1910/10 1910/10 Tex	WILCOEN PIN
	IMPOCTIVE.		N/S-7177	2331.2	Complete Com	30	15:00	21:00:00	
	2 g18		clear to	19	Description -2	-	3012	No. of Principal Control	Arriving KOW
	ingle (FOV)	Scan Freque		Pulse Rate (Mix)		ower's.	Fland Galo	-	Arrising KOW
	32	41.6	_	239	1	00	Gain - Course, Gain - Fire/Do		A.
r Speed		ARE	188		Waveform I	and	Waveform Made		Pro-Trigger Dist.
15	50	7500	R	7542 P	1 2	2 x		a	es
lines	Die	Line Start Time	Line Red Time	Time On Line	9/1	Hoor	PDOP		idas/Compens
Test	0/6		, 100 100 100	1/2	n/e	e/a	1/1	GPS Segan Logging At:	18:43:15
	-0-	2 Threat entered	re Zuju / GMT X	-					Inter Stat V Lite I
K7	N	19:01:59	19:09:32		14	0.7	1.6	Mission 2	B-1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1
K8	5	19:12:50	19:20:09	0:00:00	16	0.7	1.2	t/o:18:51z	-1-1
K18	N	19:32:45	19:36:04	_	16	0.6	1.2	moderate turbu	lence
K19	5	19:39:06	19:45:50		16	0.6	1		
K20	N	19:48:48	19:55:57	_	16	0.6	1.2	_	
K21	5	19:58:38	20:05:37	_	16	0.6	1.2	+	
K22	N	20:08:44	20:16:40		16	0.6	1.2	· .	
K23	\$	20:19:44	20:27:34		13	0.7	1.5	_	
K24	N	20:30:56	20:39:13		14	0.7	1.3		
K25	5 N	20:42:12	20:50:09	_	16	0.6	11	+	
K27	5	21:04:06	21:11:50	1,000,000	16	0.6	1.1		
K28	N	21:14:45	21:17:54		16	0.6	1.1	-	
K29	5	21:21:00	21:24:00		17	0.6	1.1	-	
K30	N	21:26:54	21:29:45		14	0.8	1.3	+	
K31	5	21:32:33	21:35:00		14	0.8	13	_	
	-	-		0:00:00	-	-	-	Landing: 21:50z	
				0:00:00	1	1		Static 21:54:24	
		- 15		0:00:00	200	21.11			
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13	-			0:00:00	70/1				
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Times	entered a	re Zulu / GMT 个		Pa	age		1	Varify 5-Turns After &	Alation New X No

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Leica	LIDAR	4/13/2014	100 OF Face 183	75667		2001	-1	Mari	Frank Same	a Comple		
	Desir	4.4	Reside.	5000		-	and the last to	Mani Foot Hurricane Sendy				
- 0	TALAMBOS	7 1 - 1	NILLISTO		2531.2		5:04:00	21:00		WOO	PERTPA	
- 1	MOCHUT	-	U.S-7177	2532.9		_	35500	7129			-	
Why Di					Des	Palet	Please	No.	Ne/Chail	Departing	KOV	
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K34	N	21:14:15	21:16:46	0:00:00	- 1	0.6	1.1					
K35	5	21:19:24	21:22:00	0:00:00	1	0.6	1.1					
K36	N	21:24:40	21:27:13	0:00:00	1	0.6	1.1					
K37	- 5	21:30:01	21:32:36	0:00:00	- 1	0.6	1.1	1				
K38	N	21:35:23	21:37:40	0:00:00	12			wil .				
K39	5	21:40:39	21:42:46	0:00:00	12							
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K41	5	21:50:57	21:51:59	0:00:00	10	0.6	1.1					
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53	5	13:47:25	13:55	:46	0:00:00	0	16	0.7	1.2							
54	N	13:58:21	14:04	:23	0:00:00	0	16	0.7	1.2	LA	TE ST	ART MA	NUAL U	L001		
55	- 5	14:09:10	14:15	:18	0:00:00	0	16	0.7	1.1	11	MILE S	ML THI	N CLOUI	0		
56	N	14:18:03	14:23	:33	0:00:00	0	17	0.7	11	01	FFLINE	BEGIN	IING			
57	5	14:27:33	14:33	:21	0:00:00	0	16	0.7	1.2							
58	N	14:36:02	14:42	:46	0:00:00	0	16	0.7	1.2							
59	5	14:46:21	14:53	:38	0:00:00	0	17	0.7	1							
60	N	14:56:13	15:02	:43	0:00:00	0	16	0.7	25	FA	51					
61	S	15:05:47	15:14	:38	0:00:00	0	17	0.7	1.1	91	MILES	SMALL	CTOND	4 MII	ES	
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lbe f	Die	Line Start Time	Line End	Time	Time On Line	1	W)	HDOM	PDOP		Line N	otas/Comme	nio con
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49	5	19:01:54	19:04:		0:00:00	_	16	0.7	1.4		tminister		
76	N	19:10:46	19:18		0:00:00	_	17	0.6	1.2		LES INTO	7.5.1	THIN
77	5	19:21:35	19:23		0:00:00	_	17	0.6	1.2	TRACE	OF LIGHT	SNOW	
78	N	19:27:15	19:28:	_	0:00:00	_	17	0.6	1.2	-			
79	5	19:31:21	19:33:		0:00:00	_	16	0.7	1.4	-			
80	N	19:36:26	19:37:		0:00:00	_	17	0.7	12	-			
81	5	19:40:02	19:40:	-	0:00:00	_	17	0.7	1.2				
82	N	19:43:37	19:44	-	0:00:00		17	0.7	1.2	-			
B3	5	19:47:16	19:48		0:00:00	-	17	0.7	1				
84	N	19:51:52	19:54:		0:00:00	_	17	0.6	1	-			
85 86	5	19:57:33 20:01:14	19:58:	100	0:00:00		17	0.6	1	4			
62	N S		13.07.7		0:00:00	_			1.1	-			
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63	N 5	20:16:13	20:24:		0:00:00	_	17	0.6	11	+			
65	N	20:37:07	20:34		0:00:00	_	18	0.6	1	+-			
66	5	20:37:07	20:52	_	0:00:00	_	18	0.6	1	A AAI S	END/ ULO	101	
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54	5	20:55:37	21:02:		0:00:00	_	18	0.6	1	4 MIS	END/ UL	007	
33	N	21:00:12	21:02		0:00:00	_	17	0.6	12	2 MHZ 3	CHUJ UL	002	
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284	NW	23:59:37	0:05:5	_	00:00	17	0.7	1.1	1		
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280	5W	20:39:03	20:43:4		0:00	18	0.6	1				
282	NE	20:46:19	20:51:5	_	0:00	17	0.6	13				
284	SW	20:54:38	21:02:2	7 0:0	0:00	15	0.7	13				
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40	100	7 - 14	7 =	0:0	0:00		100					
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## **SECTION 7: FINAL DELIVERABLES**

## FINAL DELIVERABLES

The final lidar deliverables are listed below.

- LAS v1.2 classified point cloud
- LAS v1.2 raw unclassified point cloud flight line strips no greater than 2GB. Long swaths greater than 2GB will be split into segments)
- Hydrologically flattened Polygon z and Polyline z shapefiles
- Hydrologically flattened bare earth 1-meter DEM in ERDAS .IMG format
- 8-bit gray scale intensity images
- Tile layout and data extent provided as ESRI shapefile
- Control points provided as ESRI shapefile
- FGDC compliant metadata per product in XML format
- Lidar processing report in pdf format
- Survey report in pdf format

