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Acquisition and Processing Report For

Matanuska-Susitna Borough

350 East Dahlia Avenue

Palmer, Alaska 99645

LiDAR Collection Matanuska-Susitna Borough, Alaska

Prepared by

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Aerometric Project No. 6110401

Table of Contents

Matanuska-Susitna Borough

LiDAR Collection Matanuska-Susitna Borough

Aerometric Project No. 6110401

1 INTRODUCTION

This report contains a summary of the LiDAR data acquisition and processing in the vicinity of the Susitna River valley in Alaska. Data collection includes the cities of Palmer, Wasilla, Butte, Willow, Sutton-Alpine, Point Mackenzie, Meadow Lakes, and Talkeetna.

1.1 Contact Info

Questions regarding the technical aspects of this report should be addressed to:

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1.2 Purpose

The Matanuska-Susitna (Matsu) Borough had a requirement for high resolution LiDAR needed for mapping of the borough with sufficient quality and vertical accuracy to meet USGS, NDEP, and FEMA standards and to be placed into the National Elevation Dataset and in accordance with requirements specified to produce such a dataset as outlined for the project and as defined by United States Geological Survey National Geospatial Program Base LiDAR Specification, Version 1.0.

Aero-Metric, Inc. (AeroMetric) acquired LiDAR data for an area that comprises approximately 3,720 square miles. This acquisition was carried out to satisfy the need for high resolution elevation data in the region. AeroMetric's Optech Gemini and Leica ALS70 LiDAR systems were used in the collection of data for this project.

1.3 Project Locations

The project area extends from the mouth of the Susitna River, and follows the river north past Talkeetna, to the proposed Susitna dam site, then follows the river eastward to approximately 21 miles west-northwest of Tyrone Lake. From the mouth of the Susitna River the project extends northeast to Palmer, then follows the Knik River southeast until it terminates at the Knik Glacier, and follows the Matanuska River northeast, past the Matanuska Glacier to approximately 1.7 miles northeast of Trail Lake.

This area encompasses, Palmer, Wasilla, Butte, Willow, Talkeetna, Sutton-Alpine, Big Lake, Houston, Fishhook, Buffalo Soapstone, Point Mackenzie, Knik-Fairview, Meadow Lakes, Trapper Creek and the termini of the Matanuska and Knik glaciers.

The project area of interest was defined and supplied by the Matsu Borough in early 2011, and modified to include the dock at Point Mackenzie.

Item 3.3 shows a graphic of the approximate area of acquisition.

1.4 Time Period

LiDAR project planning was carried out in early 2011 and concluded in August 2012 with Hatcher Pass.

LiDAR data acquisition was completed between May 11th, 2011 and August 29th, 2012. Data was acquired in 82 flights. Particular flight mission dates can be found in the individual flight logs in Section 7.

Ground control check point surveys were completed between Martch 30th and August 18th, 2011 by Lounsbury and Associates, Inc. (Lounsbury) specifically for this project.

1.5 Project Scope

Data collection was accomplished with aircraft operated by AeroMetric utilizing an Optech Gemini and a Leica ALS70 airborne LiDAR system. Flights were performed at a nominal altitude of 1400 to 2000 meters above terrain with data collected to produce a data set with a nominal point spacing of 0.6 meters.

The data was to be calibrated such that all systematic errors were accounted for. The project required bare-earth, vegetation, building, bridge, major transmission line and water classification. Hydro-enforcement was required for flat and level water bodies of 1 acre or greater surface area, inland rivers and streams with a width of 100 feet or greater, as well as specific streams regardless of width, for the production of contours and digital elevation models (DEM). Buildings with a roof “footprint” of greater than 300 square feet were to be located and outlined.

Per USGS’ Lidar Base Specification v. 1.0, the unclassified LiDAR data was to conform to a Fundamental Vertical Accuracy of 24.5 cm at 95 percent confidence level in open terrain using $RMSE_Z$ x 1.96. The Supplemental and Consolidated Vertical Accuracy of the other land coverage classes was to conform to 36.3 cm at 95th percentile.

The horizontal accuracy of the data was to be compiled to meet 0.5 meters RMSE.

The accuracy as compiled, tested and published in this report has met vertical accuracy requirements as specified by the client. Section 5.6 of this report contains results of the vertical accuracy evaluation as tested against DEMs derived from the LiDAR data set. An Excel file with survey point data compared with LiDAR data and vertical differences will accompany this report. File name: Final_Project_Wide_Vertical_Accuracy_Assessment.xlsx

1.6 Project Spatial Reference System

The specific spatial reference system for this delivery is as follows:

Horizontal Datum:	North American Datum 1983 (CORS96 Epoch 2003.0)
Vertical Datum:	North American Vertical Datum 1988 (GEOID09)
Projection:	Alaska State Plane Zone 4
Measurement Units:	U.S. Survey Feet

2 GEODETIC CONTROL

QC surveys and ground control point readings were completed by Lounsbury and Associates, Inc between March 30 and August 18, 2011. Survey report, control summaries, and survey certification from Lounsbury are included in this submittal under the “Survey Report” directory.

3 LiDAR ACQUISITION AND PROCEDURES

3.1 Acquisition Time Period

LiDAR data acquisition and Airborne GPS control surveys were completed between May 11th, 2011 and August 29th, 2012. Eighty-three flight missions were required to cover the project area.

3.2 LiDAR Planning

The LiDAR data for this project was collected with AeroMetric’s Optech Gemini LiDAR systems (Serial Numbers 03SEN145 and 07SEN201) and Leica ALS70 LiDAR system (Serial Number 7161). Flight planning and acquisition was completed using Optech’s ALTM-NAV v. 5.95 and Leica’s FPES v. 10.2.10.5.

Flying Height (Above mean sea level)	Between 1400 and 2000 meters
Laser Pulse Rate	70 kHz
Mirror Scan Rate Frequency	40 Hz
Scan Angle (degrees)	34°
Side Lap	50%
Ground Speed	150 kts
Nominal Point Spacing/meter	0.6 m

Item 3.2 Acquisition details for the project acquisition flights utilizing Optech Gemini sensor.

Flying Height (Above mean sea level)	Between 1400 and 2000 meters
Laser Pulse Rate	163.6 kHz
Mirror Scan Rate Frequency	41 Hz
Scan Angle (degrees)	32°
Side Lap	Between 50 and 55%
Ground Speed	160 kts
Nominal Point Spacing/meter	0.6 m

Item 3.3 Acquisition details for the project acquisition flights utilizing the Leica ALS70 sensor.

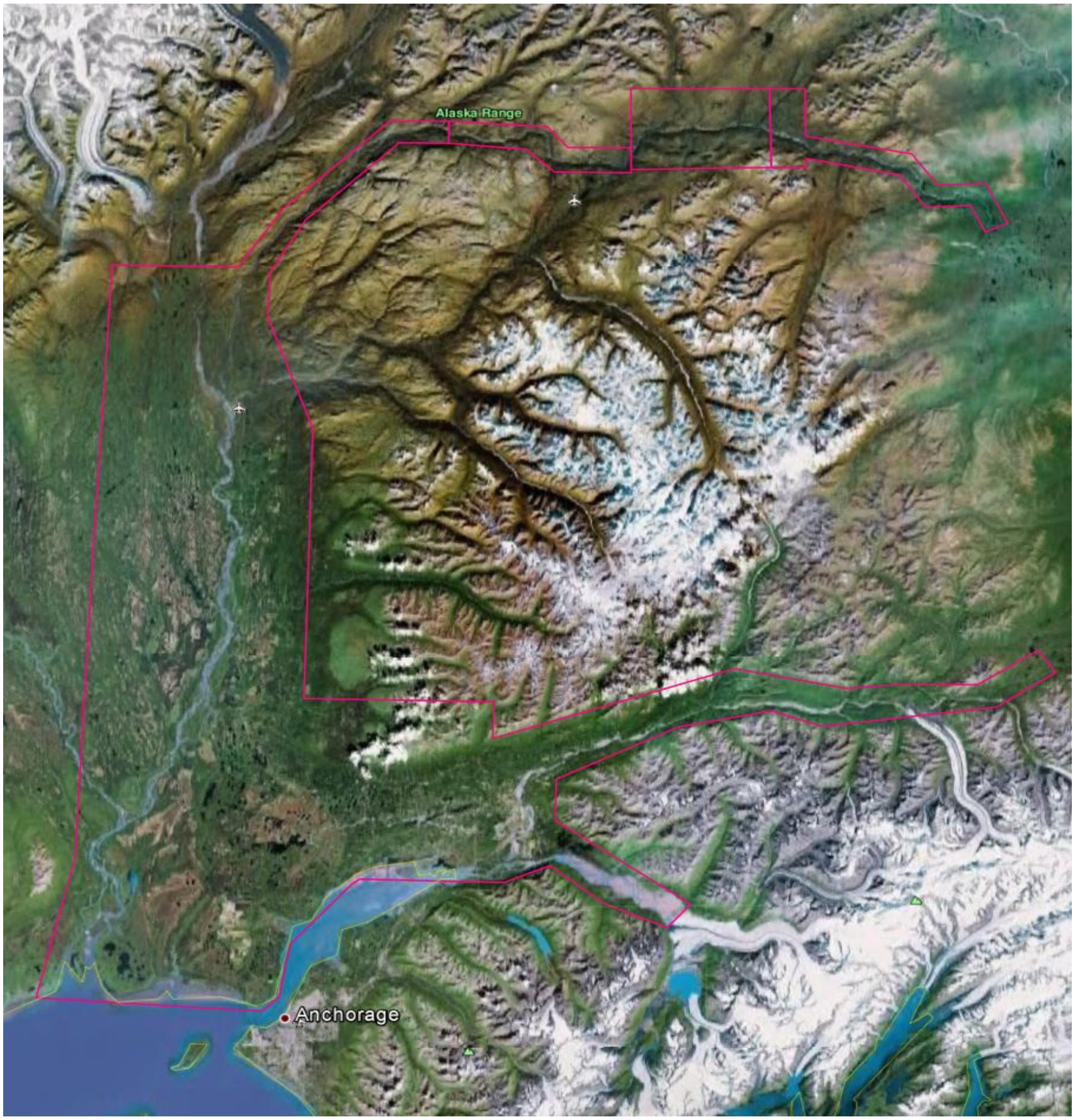
3.3 LiDAR Acquisition

A total of eighty-three flight missions were required to complete the project area. The missions were flown using the values in the charts above, items 3.2 and 3.3. Section 7 contains the flight logs.

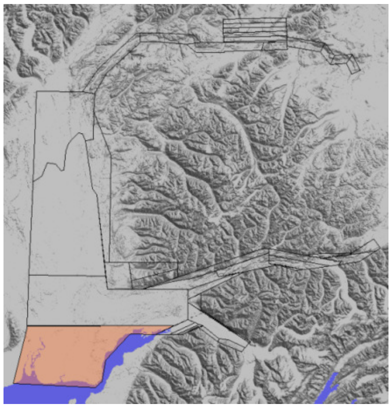
Airborne GPS and IMU position and trajectory data of the LiDAR sensors were also acquired during the time of flight.

Missions were typically four to five hours long. Before take-off, the LiDAR system and the Airborne

GPS and IMU system were initialized for a period of five minutes and in operation after landing for another five minutes. The missions acquired data according to the planned flight lines and included a minimum of one (usually two) cross flights. The cross flights were flown perpendicular to the planned flight lines and their data used in the in-situ calibration of the sensor.



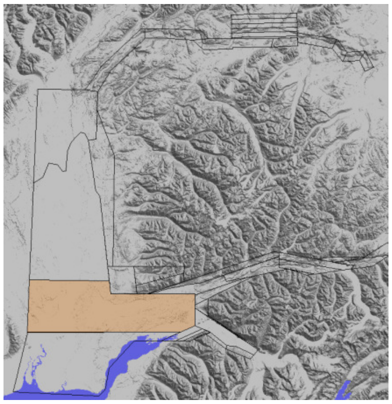
3.3 Red boundary indicates the approximate acquisition area. (Imagery Source: Google Earth)



South Tidal Area

- ○ Dates of Acquisition: May 10-12, 2011
- ○ Number of Planned Lines: 88
- ○ Line Miles: 2682

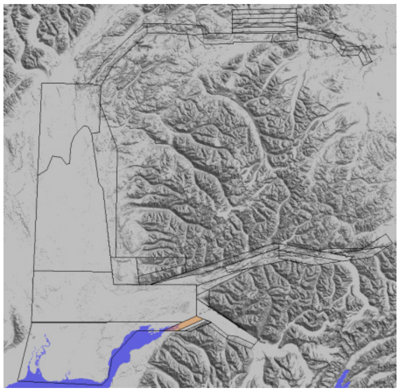
This area is located in the southern portion of the project. This area was one of the first areas to be snow free, and the leaf free window was short. Flight lines were oriented in an east-west direction in order to minimize stair stepping between adjacent flight lines acquired during a single mission (due to tidal changes).



South Non-Tidal Area

- ○ Dates of Acquisition: May 10-13, 2011
- ○ Number of Planned Lines: 75
- ○ Line Miles: 3266

This area is located to the north of the South Tidal Area. It encompassed the majority of the developed area of the project. Like the South Tidal area, it was snow free early during the collection season. The block did not include the Lazy Mountain Area, due to safety considerations during off-line turn arounds.



Knik River Tidal (Acquired May 12, 2011)

- ○ Date of Acquisition: May 12, 2011
- ○ Number of Planned Lines: 18
- ○ Line Miles: 97

This area is located to the east of the South Tidal Area. It isolated due to tidal influence on the Knik River and its orientation allowed the flight lines to be parallel to the surrounding terrain.

Knik River Non-Tidal

- ○ Date of Acquisition: May 10, 2011
- ○ Number of Planned Lines: 5
- ○ Line Miles: 44

This area is located adjacent to the Knik River Tidal area. Its orientation also allowed the flight lines to be parallel to the surrounding terrain.

Knik Valley Area

○ Dates of Acquisition: May 10 – August 29, 2011
○ Number of Planned Lines: 82
○ Line Miles: 456

This area is located along the Knik River Valley and Pioneer Peak. The blocks allow for flight line orientation which maximizes data acquisition and minimizes risk due to terrain proximity. A portion of these areas were acquired on August 29, 2011, due to snow being present in the data collected in the spring.

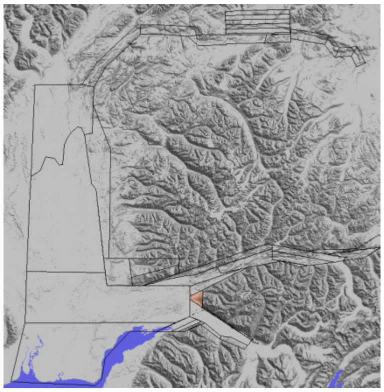
Matanuska Valley Area

○ Dates of Acquisition: May 13 – August 29, 2011
○ Number of Planned Lines: 239
○ Line Miles: 2863

This area is located along the Matanuska River Valley. The blocks allow for flight line orientation which maximizes data acquisition and minimizes risk due to terrain proximity. The major challenge of data collection in this area was timing snow and leaf free acquisition. The northern side of the valley was ready for acquisition earlier than the southern side due to solar heating of the south facing slopes.

Lazy Mountain Area

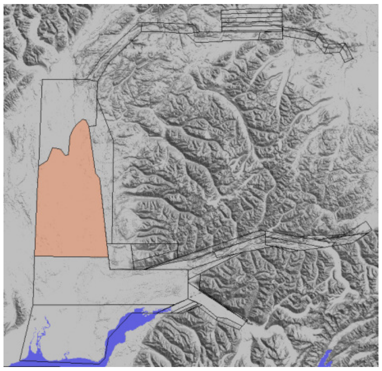
○ Date of Acquisition: May 24, 2011
○ Number of Planned Lines: 31
○ Line Miles: 117



This area is located at the foot of Lazy Mountain. Due the Matanuska and Knik River Valleys' configuration, there remained a small triangle of data remaining to be collected. This area could not be collected with the South Non-Tidal block due to the surrounding mountain peaks posing a potential hazard to flying. The flight lines were arranged in a north-south direction, and decreased in spacing as the terrain elevation increased.

Central Area

○ Dates of Acquisition: May 17-25, 2011
○ Number of Planned Lines: 113
○ Line Miles: 3761

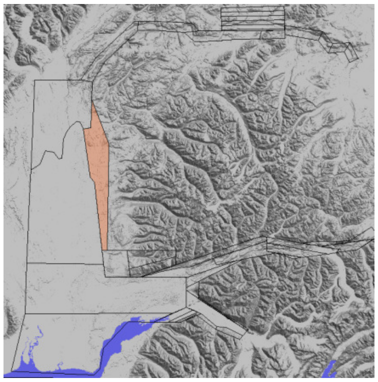


This area is located along the Susitna River. The maximum elevation in this area is approximately 610 feet, with the majority of the area less than 300 feet. It was selected due to its low elevations, which would yield an earlier acquisition date.

The flight lines were oriented north-south, and were not extended further north due to increases in elevation and the desire to keep the flight line length to less than 20 minutes. Lines which take longer than 20 minutes tend to show an increase in IMU drift, causing decreases in data accuracy.

East Central Area

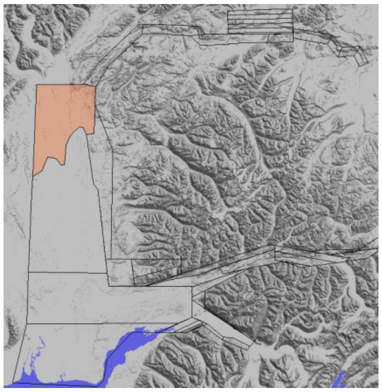
○ Dates of Acquisition: May 26-27, 2011
○ Number of Planned Lines: 41
○ Line Miles: 1109



This area is located along the eastern side of the Susitna River Valley. The area was isolated due to its slightly higher elevation compared to the adjoining Central Area, allowing for later acquisition due to snow conditions.

North Area

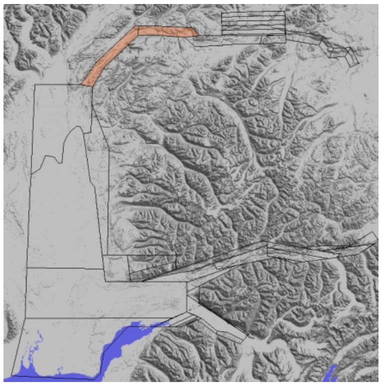
○ Dates of Acquisition: May 30 – June 17, 2011
○ Number of Planned Lines: 97
○ Line Miles: 1975



The North area was isolated due to its expected snow melt time to be later than the central regions due to elevation and latitude. Snow conditions were monitored in this primarily undeveloped area (particularly in the western portions) during the acquisition of the Central areas.

Curry and Devil's Canyon

○ Dates of Acquisition: June 17-24, 2011
○ Number of Planned Lines: 72
○ Line Miles: 1235

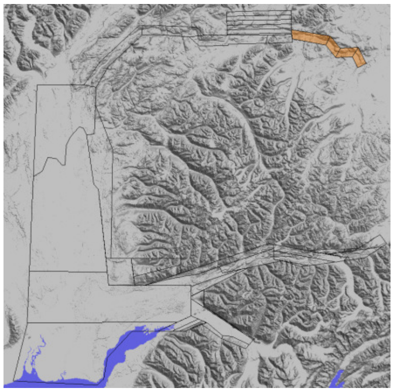


This area is comprised of the Susitna River between the proposed Watana Dam site and the North Block. This area, along with the remainder of the Upper Susitna River areas, posed challenges due to late snow melt, steep canyon walls, and lack of weather reporting.

Watana Dam Site

○ Dates of Acquisition: June 24- October 12, 2011
○ Number of Planned Lines: 128
○ Line Miles: 2182

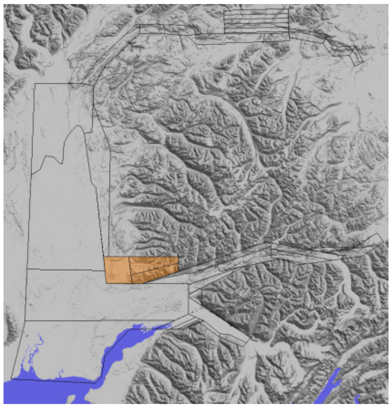
This area is comprised of eight (8) sub-areas. The areas were selected based on ground elevation and the flying height was adjusted accordingly.



Upper Susitna

○ Dates of Acquisition: August 16 - October 12, 2011
○ Number of Planned Lines: 115
○ Line Miles: 634

The Upper Susitna is the most remote area of the project. The area was subdivided into four (4) sub-areas in order to best follow the river channel and the surrounding terrain.



Hatcher Pass

○ 2011 Dates of Acquisition:
○ May 26 – 27, 2011
○ August 12 - October 12, 2011
○ Number of Lines Acquired: 116
○ Line Miles: 1002

○ 2012 Dates of Acquisition: August 22 – 29, 2012
○ Number of Planned Lines: 47
○ Line Miles: 721

Hatcher Pass was subdivided into three (3) blocks. The westernmost block was acquired using a north-south flight pattern and was acquired in the May of 2011 with the Optech Gemini. The two other blocks were flown in August of 2012 with the Leica ALS-70. It was flown in an east-west flight pattern, in order to compensate for varying terrain elevations. The snow-free timeframe in Hatcher Pass was very brief.

3.4 LiDAR GNSS Ground Control

During LiDAR acquisition, twelve GNSS ground control stations were operated to provide position data during flights. These base stations were to setup to collect L1 and L2 GPS frequencies at a rate of 2 Hz. The location of the stations allowed for 97% of the project area to have a base station within 30 km of the aircraft during acquisition. Ten (10) stations were road accessible. The station located in the Watana Dam area, as well as the station further northeast along the Susitna River were accessed via helicopter.

Lounsbury was responsible for establishing and operating these control stations. During data acquisition, AeroMetric's flight operations coordinated with Lounsbury's ground operations regarding base station activities mission timing.

During data processing, it was apparent some of the GNSS data from the ground stations produced insufficient positional accuracy in some missions. AeroMetric used TerraPos, a processing package by Frontier Geomatics, Inc. to provide a Precise Point Position (PPP) solution for these missions. TerraPos utilizes precise GNSS orbit data and other relevant ephemerides to compute positions without the use of base stations.

4 QC SURVEYS

Field surveys for this project were performed by Lounsbury between March 30th and August 18th, 2011. More than eleven thousand check points were recorded during the course of these survey activities. These check points were used in the verification of the vertical placement of the LiDAR data.

Additionally, check points were collected in various land coverage categories through the project area to be used to evaluate the vertical accuracy of the airborne LiDAR data. Coverage categories included "barren" terrain, wetlands, urban regions, shrubbery, and forested areas. The results of these evaluations are discussed in section 5.7 of this report.

5 FINAL LiDAR PROCESSING

5.1 ABGPS and IMU Processing

Airborne GPS

Applanix – POSGPS

Utilizing carrier phase ambiguity resolution on the fly (i.e., without initialization), the solution to sub-decimeter kinematic positioning without the operational constraint of static initialization as used in semi-kinematic or stop-and-go positioning was utilized for the airborne GPS post-processing.

The processing technique used by Applanix, Inc. for achieving the desired accuracy is Kinematic Ambiguity Resolution (KAR). KAR searches for ambiguities and uses a special method to evaluate the relative quality of each intersection (RMS). The quality indicator is used to evaluate the accuracy of the solution for each processing computation. In addition to the quality indicator, the software will compute separation plots between any two solutions, which will ultimately determine the acceptance of the airborne GPS post processing.

TerraPos

TerraPos represents a state-of-the-art solution to Precise Point Positioning (PPP). TerraPos has been implemented to be fully compliant with data and products from leading international organizations, e.g. the International Earth Rotation and Reference Systems Service (IERS) and the International GNSS Service (IGS). TerraPos thus allows kinematic positioning with sub decimeter accuracy within the globally consistent and long-term stable reference frames maintained by the IERS.

In the PPP solution the carrier phase biases are estimated as real numbers (a so-called "float solution"). This confirms that the precision of the solution benefits from an increased data rate using an increased number of observations. However, this gain is ultimately limited by the time correlated errors in the observations that include but not limited to multipath and residual satellite clock errors. The data requires both dual-frequency code and carrier phase observations and uses respective ionosphere-free linear combinations. Doppler observations are also included in the computation for all kinematic profiles which assists the algorithm in the pre-processing to aid cycle slip detection and also helps to improve the position estimates.

Inertial Data

The post-processing of inertial and aiding sensor data (i.e. airborne GPS post processed data) is to compute an optimally blended navigation solution. The Kalman filter-based aided inertial navigation algorithm generates an accurate (in the sense of least-square error) navigation solution that will retain the best characteristics of the processed input data. An example of inertial/GPS sensor blending is the following: inertial data is smooth in the short term. However, a free- inertial navigation solution has errors that grow without bound with time. A GPS navigation solution exhibits short-term noise but has errors that are bounded. This optimally blended navigation solution will retain the best features of both, i.e. the blended navigation solution has errors that are smooth and bounded. The resultant processing generates the following data:

Position:	Latitude, Longitude, Altitude
Velocity:	North, East, and Down components
Attitude:	roll, pitch, true heading
Acceleration:	x, y, z components
Angular rates:	x, y, z components

The Applanix software, version 4.4, was used to determine both the ABGPS trajectory and the blending of inertial data. The airborne GPS and blending of inertial and GPS post-processing were completed in multiple steps.

1. The collected data was transferred from the field data collectors to the main computer. Data was saved under the project number and separated between LiDAR mission dates. Inside each mission date, a sub-directory was created with the aircraft's tail number and an A or B suffix was attached for the time of when the data was collected. Inside the tail number sub-directory, five sub-directories were also created EO, GPS, IMU, PROC, and RAW.

2. The aircraft raw data (IMU and GPS data combined) was run through a data extractor program. This separated the IMU and GPS data. In addition to the extracting of data, it provided the analyst the first statistics on the overall flight. The program was POSPac (POS post-processing PACkage).

3. Executing POSGPS program to derive accurate GPS positions for all flights: Applanix POSGPS

The software utilized for the data collected was PosGPS, a kinematic on- the-fly (OTF) processing software package. Post processing of the data is computed from each base station (Note: only base stations within the flying area were used) in both a forward and backward direction. This provides the analyst the ability to Quality Check (QC) the post processing, since different ambiguities are determined from different base stations and also with the same data from different directions.

The trajectory separation program is designed to display the time of week that the airborne or roving antenna traveled, and compute the differences found between processing runs. Processed data can be compared between a forward/reverse solution from one base station, a reverse solution from one base station and a forward solution from the second base station, etc. For the Applanix POSGPS processing, this is considered the final QC check for the given mission. If wrong ambiguities were found with one or both runs, the analyst would see disagreements from the trajectory plot, and re-processing would continue until an agreement was determined.

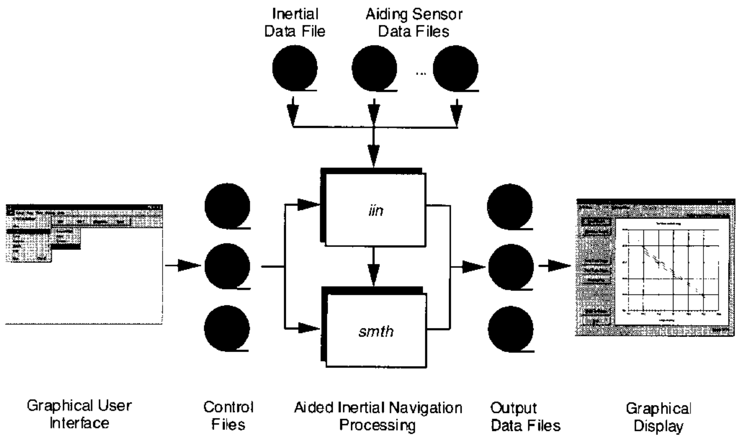
Once the analyst accepts a forward and reverse processing solution, the trajectory plot is analyzed and the combined solution is stored in a file format acceptable for the IMU post processor.

Please see Section 8 of the control report for the final accepted trajectory plots.

4. When the processed trajectory (either through POSGPS) data was accepted after quality control analysis, the combined solution is stored in a file format acceptable for the IMU post processor (i.e. POSProc).

5. Execute POS Proc. POS Proc comprises a set of individual processing interface tools that execute and provide the following functions:

The diagram below shows the organization of these tools, and is a function of the POSProc processing components.



Integrated Inertial Navigation (iin) Module.

The name *iin* is a contraction of Integrated Inertial Navigation. *iin* reads inertial data and aiding data from data files specified in a processing environment file and computes the aided inertial navigation solution. The inertial data comes from a strapdown IMU. *iin* outputs the navigation data between start and end times at a data rate as specified in the environment file. *iin* also outputs Kalman filter data for analysis of estimation error statistics and smoother data that the smoothing program *smth* uses to improve the navigation solution accuracy.

iin implements a full strapdown inertial navigator that solves Newton's equation of motion on the earth using inertial data from a strapdown IMU. The inertial navigator implements coning and sculling compensation to handle potential problems caused by vibration of the IMU.

Smoother Module (*smth*).

smth is a companion processing module to *iin*. *smth* is comprised of two individual functions that run in sequence. *smth* first runs the *smoother function* and then runs the *navigation correction function*.

The *smth* smoother function performs backwards-in-time processing of the forwards-in-time blended navigation solution and Kalman filter data generated by *iin* to compute smoothed error estimates. *smth* implements a modified Bryson-Frazier smoothing algorithm specifically designed for use with the *iin* Kalman filter. The resulting smoothed strapdown navigator error estimates at a given time point are the optimal estimates based on all input data before and after the given time point. In this sense, *smth* makes use of all available information in the input data. *smth* writes the smoothed error estimates and their RMS estimation errors to output data files.

The *smth* navigation correction function implements a feed forward error correction mechanism similar to that in the *iin* strapdown navigation solution using the smoothed strapdown navigation errors. s*mth* reads in the smoothed error estimates and with these, corrects the strapdown navigation data. The resulting navigation solution is called a Best Estimate of Trajectory (BET), and is the best obtainable estimate of vehicle trajectory with the available inertial and aiding sensor data.

The above mentioned modules provide the analyst the following statistics to ensure that the most optimal solution was achieved: a log of the *iin* processing, the Kalman filter Measurement Residuals, Smoothed RMS Estimation Errors, and Smoothed Sensor Errors and RMS.

5.2 LiDAR “Point Cloud” Processing

The ABGPS/IMU post processed data along with the LiDAR raw measurements were processed using Leica’s ALS Post-Processor v. 2.74. software and Optech’s DashMap v. 5.2. These software packages were used to match the raw LiDAR measurements with the computed ABGPS/IMU positions and attitudes of the LiDAR sensor. The result was a “point cloud” of LiDAR measured points referenced to the ground control system, formatted as LAS 1.2 files per flightline.

5.3 LiDAR CALIBRATION

Introduction

The purpose of the LiDAR system calibration is to refine the system parameters in order for the post-processing software to produce a “point cloud” that best fits the actual ground. The following report outlines the calibration techniques employed for this project.

Calibration Procedures

AreoMetric routinely performs two types of calibrations on its airborne LiDAR system. The first calibration, system calibration, is performed whenever the LiDAR system is installed in the aircraft. This calibration is performed to define the system parameters affected by the physical misalignment of the system versus aircraft. The second calibration, in-situ calibration, is performed for each mission using that missions data. This calibration is performed to refine the system parameters that are affected by the on site conditions as needed.

System Calibration

The system calibration is performed by collecting data over a known test site that incorporates a flat surface and a large, flat roofed building. A ground survey is completed to define the flat surface and the building corners. The processed LiDAR data and ground survey data is input into TerraSolid's TerraMatch software to determine the systematic errors. The system parameters are then corrected according to the determined errors and used in the processing of future LiDAR acquisition missions

In-situ Calibration

The in-situ calibration is performed as needed using the mission's data. This calibration is performed to refine the system parameters that are affected by the on site conditions.

For each mission, LiDAR data for at least one cross flight is acquired over the mission's acquisition site. The processed data of the cross flight is compared to the perpendicular flight lines using either the Optech's or Leica's proprietary software or TerraSolid's TerraMatch software to determine if any systematic errors are present. In this calibration, the data of individual flight lines are compared against each other and their systematic errors are corrected in the final processed data.

5.4 LiDAR Processing

The LAS files were then imported, verified, and parsed into manageable, tiled grids using GeoCue version 7.0.34.0 (GeoCue). GeoCue allows for ease of data management and process tracking.

After the data has been processed and calibrated a relative accuracy assessment is performed analyzing the flightline to flightline vertical alignment. GeoCue is utilized to create images indicating elevation differences that provide a visual interpretation of how well flight lines match, and are a useful tool in determining either the success or need to re-evaluate the in-situ calibration procedure..

Areas containing dense vegetation coverage or inundation from water will show a greater elevation offset then is actually present in the ground data. This is due to these regions having a high number of returns from vegetation or non-ground objects and fewer returns from the ground, relative to open ground areas, causing the elevation offset to be exaggerated in areas of heavy vegetation. It is generally understood that flightlines should be matched tightly in areas of open, moderate terrain, and will not match as well in steeper terrain due to less predictable angles of pulse return.

Aerometric also reviews sample tiles to ensure that the desired point density has been met. Proprietary software is used to complete this task. According to USGS-NGP Lidar Base Specification v. 1.0, a grid with cell size of 2 times the nominal post spacing is overlaid onto the LiDAR data. A passing tile has at least one point within a minimum of 90% of the resultant cells. This assessment was carried out using first return LiDAR data points only.

Once both the accuracy between swaths and data density are accepted an automated classification algorithm is performed using TerraSolid's TerraScan, version 012.017 (TerraScan). This will produce the majority of the bare-earth datasets.

The remainder of the data was classified using manual classification techniques. The majority of the manual editing involved changing points initially misclassified as ground (class 2) to unclassified (class 1). Erroneous low points, high points, including clouds are classified to class 7. Additional, project-specific classes were utilized and are listed and discussed in section 5.8 of this report.

5.5 Breakline Acquisition

For this project, river and lake features were digitized in Bentley's MicroStation v 8.05.02.27 (MicroStation) while the point cloud data was loaded using TerraScan. The lake breakline features were set to the lowest elevation along the shoreline.

"XBars", or crossing lines at a fixed elevation, were used to drape the river breakline features. Setting XBars along the length of a river at fixed intervals of elevation change ensures downstream flow. Additional XBars can be set between intervals to fix the draping of island features and other abnormalities.

Once all breakline features were collected, lidar points near the surface within the breaklines were classified as water, which keeps them from being used in the generation of deliverable products such as contours and DEMs. This process was done to satisfy the hydro-flattening requirements for this project, which called for the flattening of lakes whose area was equal to or greater than 1 acre, rivers with a nominal width of 100' or greater, and other streams and rivers specified in the contract, regardless of width.

5.6 Check Point Validation

The data was then verified against ground control check point data. A comparison is made between the elevations of the surveyed ground control points and the LiDAR derived elevations. This comparison was completed against road-profile check points to confirm vertical placement of LiDAR data.

5.7 Vertical Accuracy Assessment

Vertical accuracy assessment is conducted by comparing ground survey check point z values to processed LiDAR data z values by horizontal proximity. Differences in z values are calculated to express an RMSEz value. This assessment is also performed on raw swath data to further analyze vertical accuracy.

Based on a TIN of all swath data the FVA achieved 13.7 cm at a 95% confidence level with an RMSE of 7.0 cm utilizing open terrain ground survey check points in the evaluation. This assessment was carried out using Spatial Information Solution's Topo Analyst; the resultant report is included in this delivery as the document MatSu_Vertical_Accuracy_Report_Raw_Swath.pdf.

Based on DEM files from the data set the following results were achieved.

RMSE 95%	Barren	18.2 cm	(275) checkpoints
SVA	Forest	39.9 cm	(52) checkpoints
SVA	Shrub	53.3 cm	(54) checkpoints
SVA	Developed	27.5 cm	(58) checkpoints
SVA	Wetlands	48.3 cm	(49) checkpoints
CVA	all categories	35.1 cm	(488) checkpoints

The accompanying Excel file, Final_Project_Wide_Vertical_Accuracy_Assessment.xlsx, lists point coordinates and elevation differences.

Omitted Control Points

After completing the vertical accuracy assessment of the surveyed control points versus the LiDAR surface it was observed that there were a number of outlier points with vertical differences of greater than one foot. All of the points greater than 1.5' difference were examined to determine the source of the difference. In several cases it was found that there were discrepancies in the antenna height logged in the field book versus the value used in the RINEX file.

In some other cases the placement of the surveyed point did not meet the placement criteria for checkpoints set forth in the NDEP "Guidelines for Digital Elevation Data" v1.0. The points listed below were omitted from the final vertical accuracy assessment.

Point ID	Reason for Omission
8016	Antenna height error
9007	Collected in standing water
9019	No field notes or documentation available
3-655	Antenna height error & positioned on terrain slope change
4-953	Antenna height error
4-955	Antenna height error
4-959	Antenna height error & collected in standing water
4-960	Antenna height error & collected in standing water
32-604	Terrain slope exceeds 20% grade
32-605	Terrain slope exceeds 20% grade
32-606	Terrain slope exceeds 20% grade
32-612	Error exceeds 3x the standard deviation (3 sigma) of the error

5.8 LiDAR Data Delivery

All deliverables listed below use the following spatial reference per the project specifications:

Horizontal Datum:	NAD83 (CORS96 Epoch 2003.0)
Coordinate System:	Alaska State Plane Zone 4
Vertical Datum:	NAVD88 (GEOID09)
Project Units:	US Survey Feet

LiDAR Flightline Footprints – Provided in ESRI shapefile format.

Unclassified Point Cloud Data – Provided in LAS 1.2 format with absolute GPS timestamps and georeference tags in file headers; 1 file per swath.

Building Footprints – Provided in ESRI Geodatabase and shapefile format, per project block.

Bare Earth Digital Elevation Models – Provided in GeoTiff format in accordance with the full tile index. DEM resolution is 3.2808 feet.

First-Return Digital Surface Models – Provided in GeoTiff format in accordance with the full tile index. DSM resolution is 3.2808 feet.

Contours – Provided in the following formats:

> <u>ESRI Geodatabase</u> - Contains contours provided as project blocks in 10, 20, 50, and 100 foot intervals and in accordance with the full tile index in 2 foot contour intervals.
>
> <u>ESRI Shapefiles</u> - are provided as project blocks, and are available in 10, 20, 50, and 100 foot contour intervals.
>
> <u>AutoCAD DXF</u> - contours are provided in 2 foot contour intervals in accordance with the quarter-tile index.

Hillshades – Provided in 8-bit grayscale GeoTiff format, displays surface relief in both the DSM and DEM deliverables in accordance with the full tile index.

Hydrological Breaklines – Provided as project blocks in ESRI Shapefile and Geodatabase formats, in the following categories:

> <u>Double Line Hydro</u> – Rivers and streams with a nominal width of 100 feet or greater, contractually specified streams regardless of width. Both sides of the shoreline and islands within the shore were digitized as 3D polylines (Polyline Z)
>
> <u>Lakes</u> – Lakes with a surface area of 1 acre or greater. Digitized as 3D polygons (Polygon Z)
>
> <u>Single Line Hydro</u> – Centerlines of streams less than with a nominal width of less than 100 feet. Digitized in as 2D polylines.

Intensity Imagery – Provided in 8-bit grayscale GeoTiff format in accordance with the quarter-tile index. Resolution is 3.2808 feet.

Classified Point Cloud Data – Provided in LAS 1.2 format with absolute GPS timestamps and georeference tags in file headers. Delivery is tiled in accordance with the quarter-tile index layout and follows the provided classification scheme of:

Class 1 – Processed, but unclassified
Class 2 – Bare-earth ground
Class 3 – Low Vegetation (less than 6 feet above ground surface)
Class 4 – Medium Vegetation (between 6 and 15 feet above ground surface)
Class 5 – High Vegetation (greater than 15 feet above ground surface)
Class 6 – Buildings
Class 7 – Error Points
Class 8 – Contour Keypoints
Class 9 – Water
Class 10 – Ignored Ground (Breakline Proximity)
Class 11 – Major Transmission Lines
Class 13 – Noise (unclassified data 1 foot or less above ground)
Class 14 – Bridge decks
Class 18 – May 24, 2011 data from the Matanuska Glacier withheld from ground/vegetation classification due to movement
Class 19 – May 31, 2011 data from the Matanuska Glacier withheld from ground/vegetation classification due to movement
Class 26 – May 13, 2011 data from the Knik Glacier withheld from ground/vegetation classification due to movement
Class 27 – May 24, 2011 data from the Knik Glacier withheld from ground/vegetation classification due to movement
Class 28 – August 26, 2011 data from the Knik Glacier withheld from ground/vegetation classification due to movement

Boundaries – Provided in ESRI shapefile format, in the following categories:

a) LiDAR and Imagery Boundary
b) Project Block Boundaries
c) Project Tile Layout (full and quarter-tile)

Acquisition, Processing, QA/QC and Survey Reports – Provided as this document, outlining acquisition, processing, and QC procedures, and all other relevant project information, as well as all other documents reference herein.

5.9 Deliverable Generation Methodology

Raw Point Cloud Data – Generated from calibrated LAS data; data was extracted to "strips" by flight ID with all points classified as Code 0 using TerraScan. Georeference tags and Adjusted GPS Timestamps were added to files using proprietary in-house software.

Classified Point Cloud Data – Generated in GeoCue, classified in TerraScan. Georeference tags and Adjusted GPS Timestamps were added to files using proprietary in-house software.

Bare-Earth DEMs – Generated from classified LAS data and breaklines utilizing QCoherent's LP360 and TerraScan.

Intensity Imagery – Generated from LAS data utilizing TerraScan. Output in 8-bit gray scale GeoTiff format.

Breaklines – Digitized in MicroStation and draped utilizing classified LAS data in TerraScan. Converted to ESRI Shapefile format using Global Mapper v 13.

Contours – Classified LAS data was run through a "contour keypoints" routine with settings appropriate for the generation of the desired contour interval. The resultant keypoints were used to generate contours at that interval in ESRI Shapefile format using proprietary in-house software.

5.9 Conditions Affecting Final Data

The project area includes coastal zones subject to changing water levels due to tidal variations. Therefore, breaklines on water edges may shift where neighboring flightlines meet as hydro-breaklines are placed according to the conditions present at the time of data collection.

Areas of high elevation included in the project may have snowpack present throughout the year.

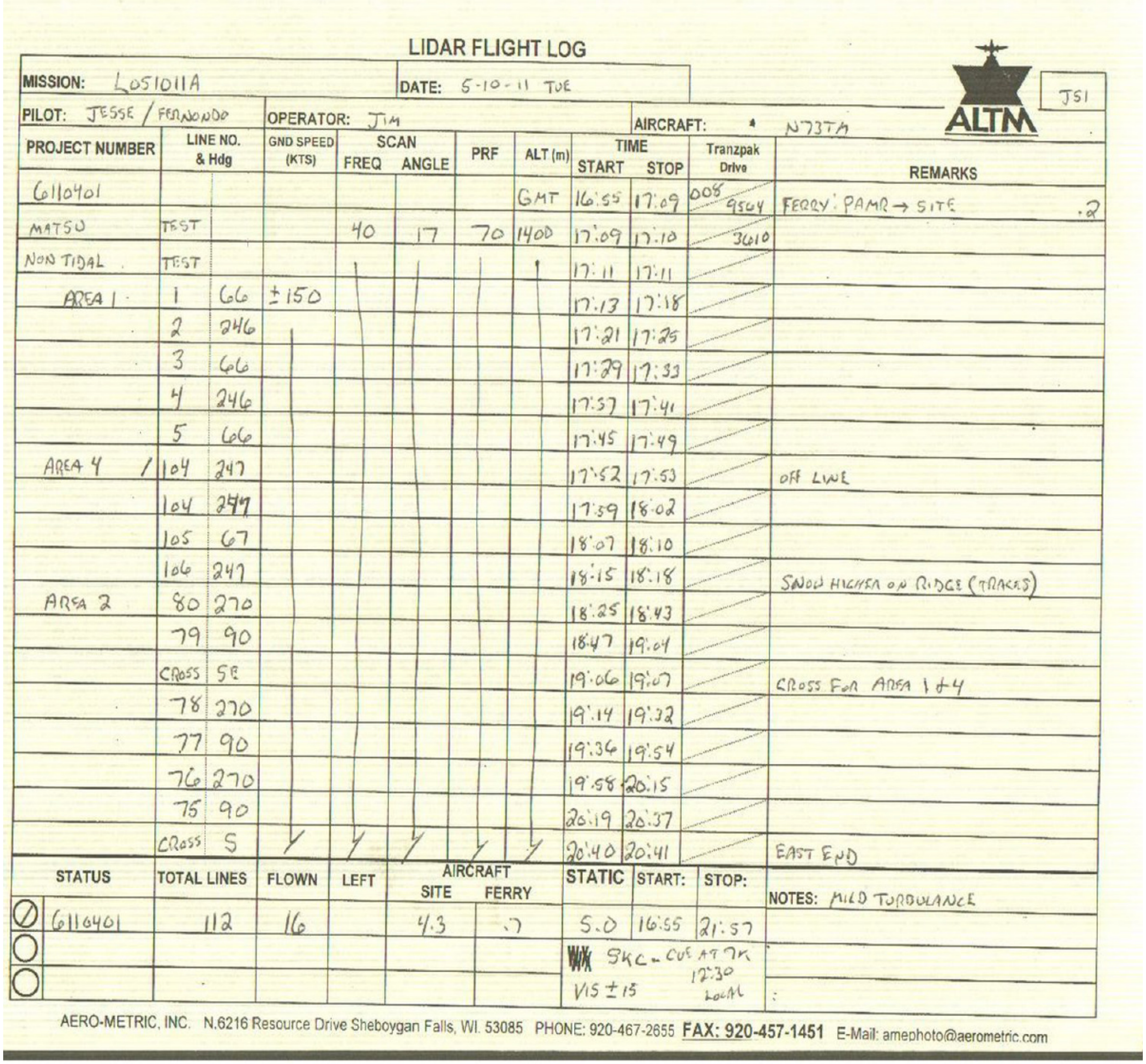
6 CONCLUSION

The LiDAR data and derivative products discussed in this report were processed and produced in accordance with provided guidelines and established practices. The accuracy criteria set forward by the Borough and other Government / Industry standards have been demonstrated to be met throughout this report and it's supporting documents. As such, the resultant data and derivative products satisfy the request and needs of the Mat-Su Borough, and may be considered useful and reliable to additional end users upon distribution.

7 FLIGHT LOGS

AeroMetric names its flight missions beginning with a sensor identifier, followed by the date, and ending with a mission identifier. The sensor identifiers are as follows: M = Optech Gemini #03SEN145, L = Optech Gemini #07SEN201, and V = Leica ALS70 #7161. The mission identifier is simply sequential, so an "A" is used for the first flight per sensor per day, "B" for the second, and so on.

May 2011 Logs



LIDAR FLIGHT LOG

MISSION: L051011A
DATE: 5-10-11 TUE
JSI
PILOT: JESSE / FERNONDO
OPERATOR: JIM
AIRCRAFT: N73TA

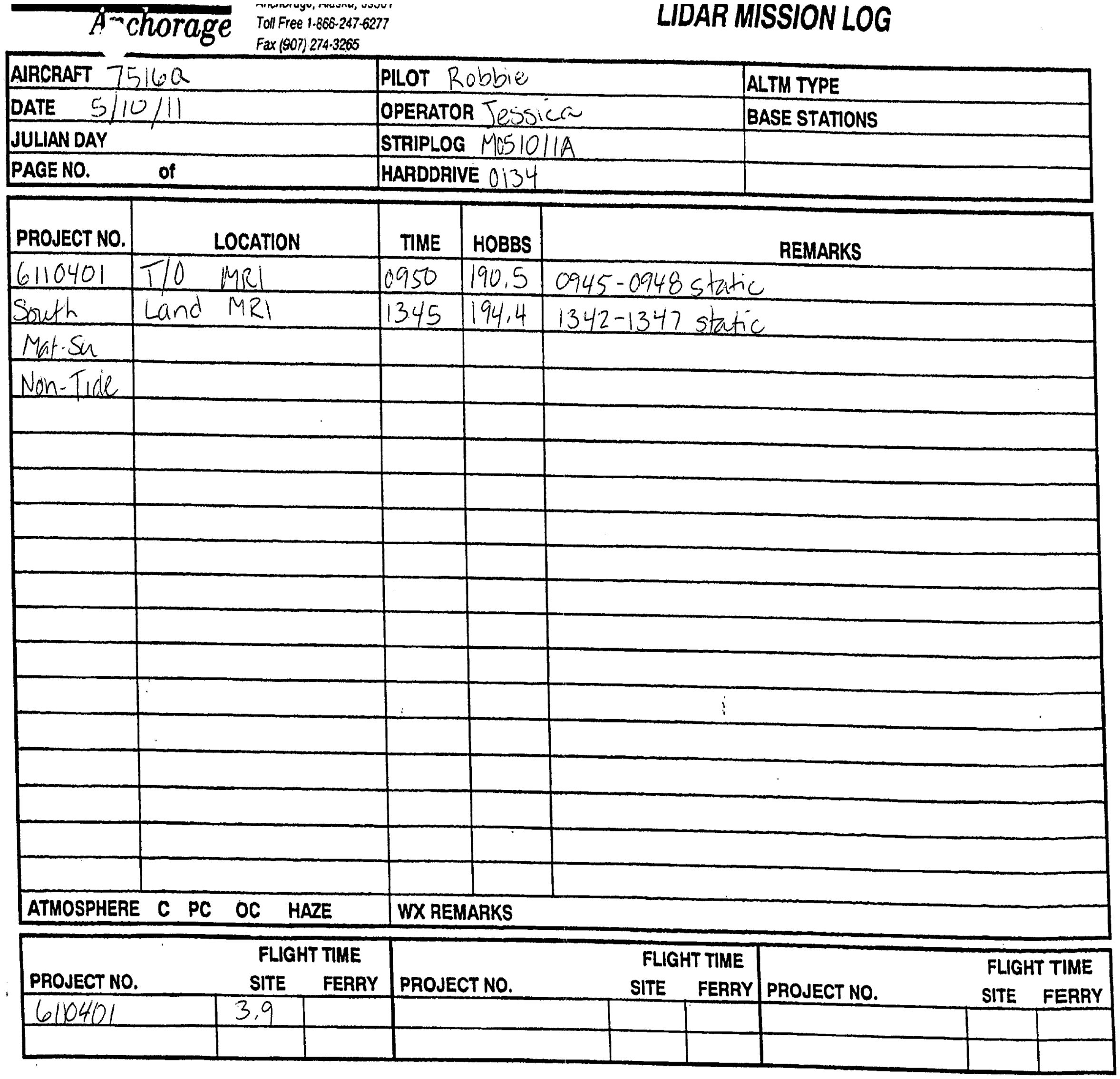
PROJECT NUMBER	LINE NO.	& Hdg	GND SPEED (KTS)	SCAN FREQ	SCAN ANGLE	PRF	ALT (m)	TIME START	TIME STOP	Tranzpak Drive	REMARKS
6110401							GMT	16:55	17:09	008 9564	FERRY: PAMR → SITE .2
MATSU	TEST			40	17	70	1400	17:09	17:10	3610	
NON TIDAL	TEST							17:11	17:11		
AREA 1	1	66	±150					17:13	17:18		
	2	246						17:21	17:25		
	3	66						17:29	17:33		
	4	246						17:37	17:41		
	5	66						17:45	17:49		
AREA 4 /	104	247						17:52	17:53		OFF LINE
	104	247						17:59	18:02		
	105	67						18:07	18:10		
	106	247						18:15	18:18		SNOW HIGHER ON RIDGE (TRACKS)
AREA 2	80	270						18:25	18:43		
	79	90						18:47	19:04		
	CROSS	SE						19:06	19:07		CROSS FOR AREA 1 + 4
	78	270						19:14	19:32		
	77	90						19:36	19:54		
	76	270						19:58	20:15		
	75	90						20:19	20:37		
	CROSS	S						20:40	20:41		EAST END

STATUS		TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START:	STOP:
⊘	6110401	112	16		4.3	.7	5.0	16:55	21:57
○									
○									

WX SKC - CUS AT 7K 12:30 LOCAL
VIS ±15

NOTES: MILD TURBULANCE

AERO-METRIC, INC. N.6216 Resource Drive Sheboygan Falls, WI. 53085 PHONE: 920-467-2655 **FAX: 920-457-1451** E-Mail: amephoto@aerometric.com



Anchorage
Toll Free 1-866-247-6277
Fax (907) 274-3265

LIDAR MISSION LOG

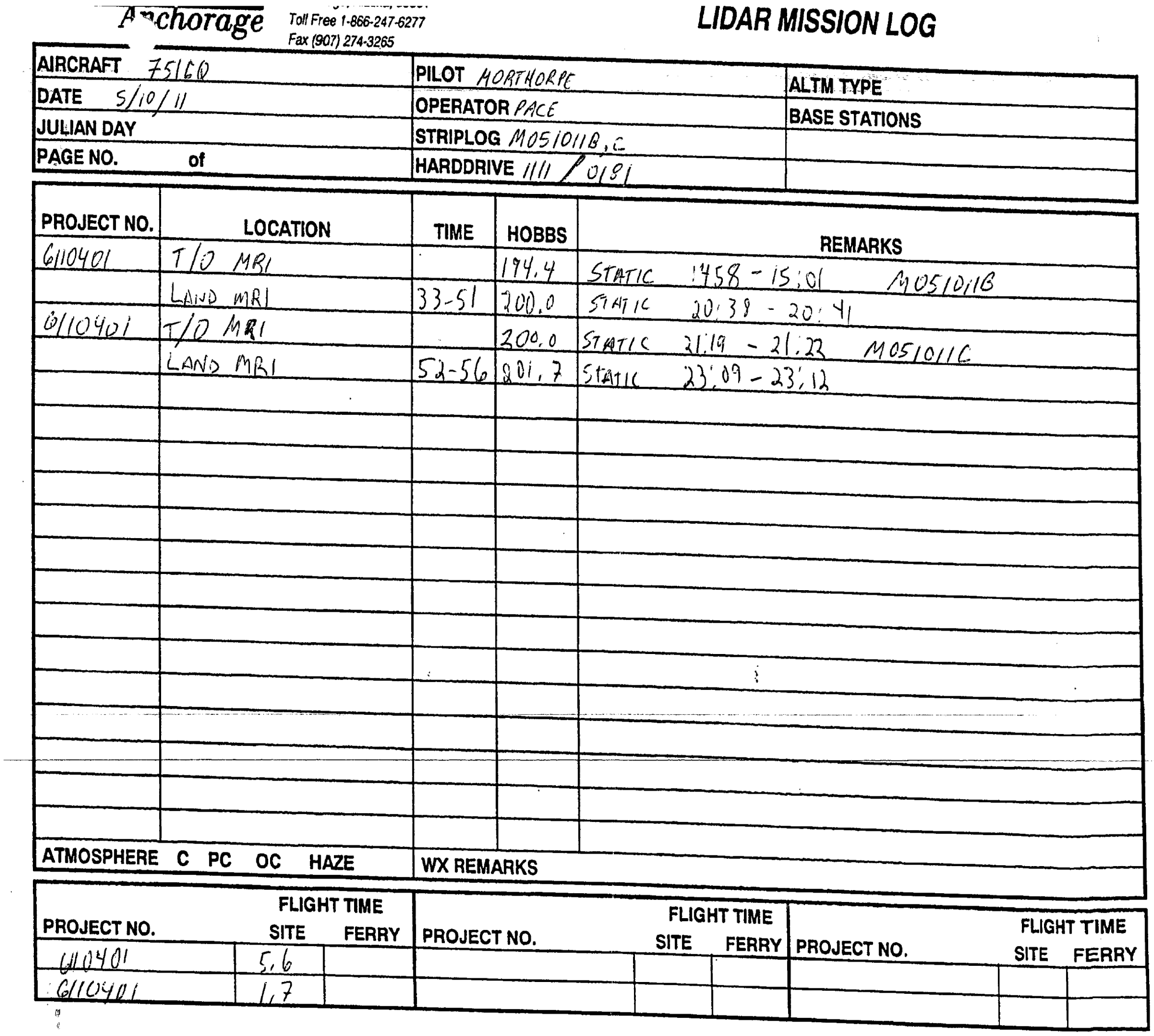
AIRCRAFT 7516a	PILOT Robbie	ALTM TYPE
DATE 5/10/11	OPERATOR Jessica	BASE STATIONS
JULIAN DAY	STRIPLOG M051011A	
PAGE NO. of	HARDDRIVE 0134	

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	T/O MRI	0950	190.5	0945-0948 static
South	Land MRI	1345	194.4	1342-1347 static
Mat-Su				
Non-Tide				

ATMOSPHERE C PC OC HAZE

WX REMARKS

PROJECT NO.	FLIGHT TIME		PROJECT NO.	FLIGHT TIME		PROJECT NO.	FLIGHT TIME	
	SITE	FERRY		SITE	FERRY		SITE	FERRY
6110401	3.9							



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LIDAR MISSION LOG

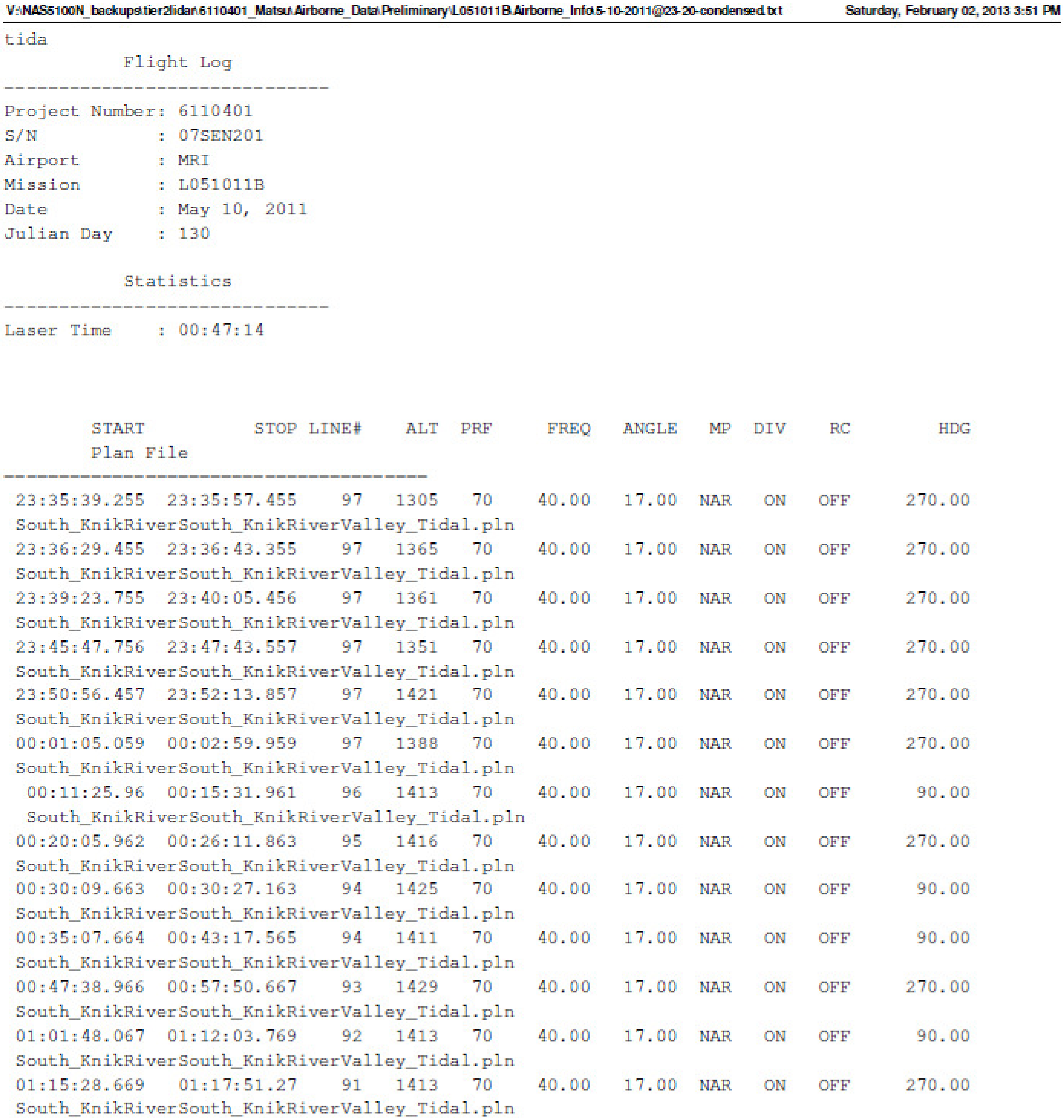
AIRCRAFT 75160
DATE 5/10/11
JULIAN DAY
PAGE NO. of
PILOT MORTHORPE
OPERATOR PACE
STRIPLOG M051011B,C
HARDDRIVE 1111 / 0181
ALTM TYPE
BASE STATIONS

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	T/O MRI		174.4	STATIC 1458 - 15:01 M051011B
	LAND MRI	33-51	200.0	STATIC 20:38 - 20:41
6110401	T/O MRI		200.0	STATIC 21:19 - 21:22 M051011C
	LAND MRI	52-56	201.7	STATIC 23:09 - 23:12

ATMOSPHERE C PC OC HAZE **WX REMARKS**

PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY
6110401	5.6							
6110401	1.7							

L051011B Paper Log Unavailable - Digital Log Included Here



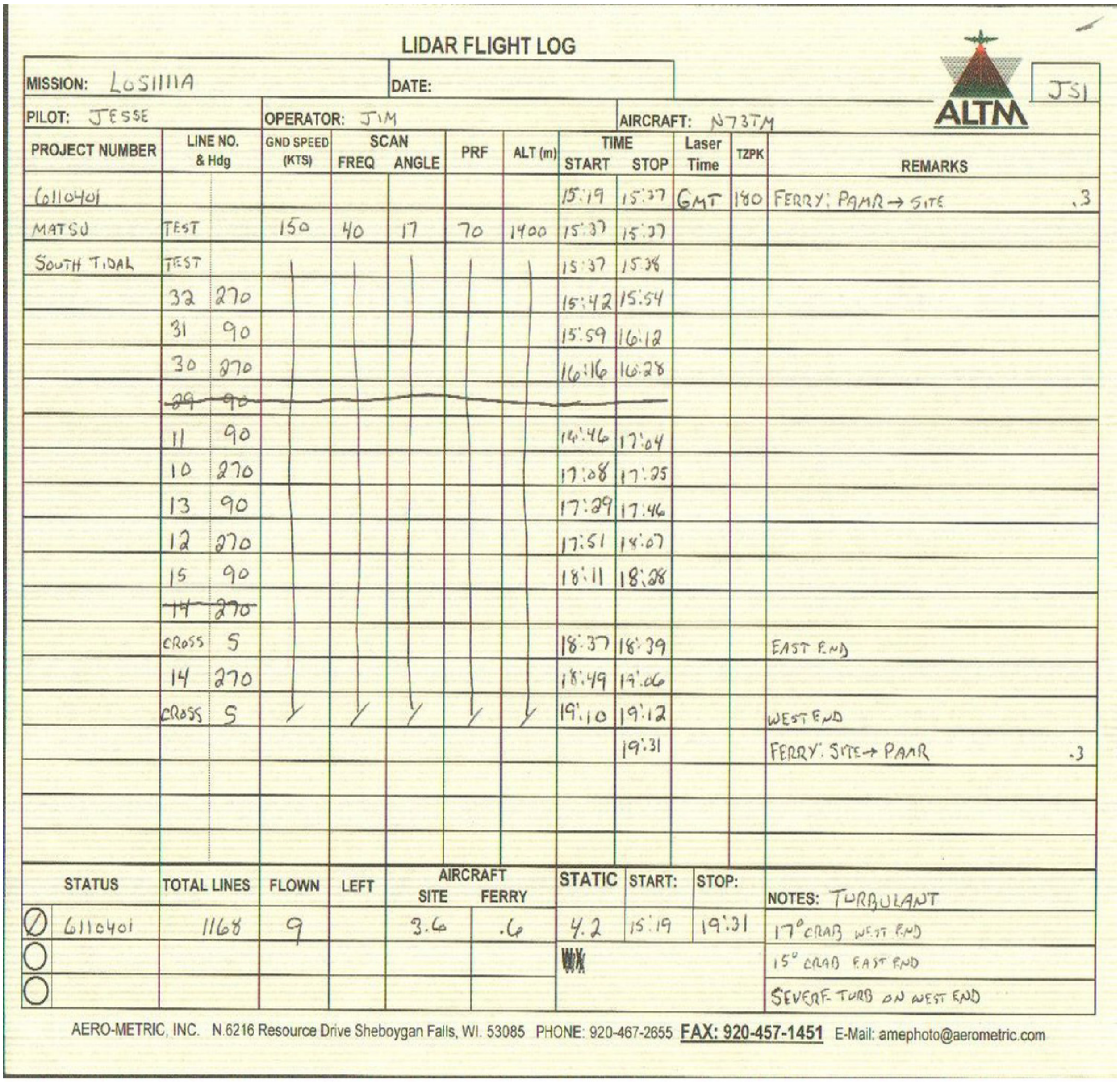
V:\NAS5100N_backups\tier2lidar\6110401_Matsu\Airborne_Data\Preliminary\L051011B\Airborne_Info\5-10-2011@23-20-condensed.txt Saturday, February 02, 2013 3:51 PM

```
tida
           Flight Log
------------------------------
Project Number: 6110401
S/N           : 07SEN201
Airport       : MRI
Mission       : L051011B
Date          : May 10, 2011
Julian Day    : 130

           Statistics
------------------------------
Laser Time    : 00:47:14



        START          STOP LINE#    ALT  PRF     FREQ   ANGLE   MP  DIV    RC        HDG
        Plan File
---------------------------------------
 23:35:39.255  23:35:57.455    97   1305   70    40.00   17.00  NAR   ON   OFF     270.00
 South_KnikRiverSouth_KnikRiverValley_Tidal.pln
 23:36:29.455  23:36:43.355    97   1365   70    40.00   17.00  NAR   ON   OFF     270.00
 South_KnikRiverSouth_KnikRiverValley_Tidal.pln
 23:39:23.755  23:40:05.456    97   1361   70    40.00   17.00  NAR   ON   OFF     270.00
 South_KnikRiverSouth_KnikRiverValley_Tidal.pln
 23:45:47.756  23:47:43.557    97   1351   70    40.00   17.00  NAR   ON   OFF     270.00
 South_KnikRiverSouth_KnikRiverValley_Tidal.pln
 23:50:56.457  23:52:13.857    97   1421   70    40.00   17.00  NAR   ON   OFF     270.00
 South_KnikRiverSouth_KnikRiverValley_Tidal.pln
 00:01:05.059  00:02:59.959    97   1388   70    40.00   17.00  NAR   ON   OFF     270.00
 South_KnikRiverSouth_KnikRiverValley_Tidal.pln
  00:11:25.96  00:15:31.961    96   1413   70    40.00   17.00  NAR   ON   OFF      90.00
  South_KnikRiverSouth_KnikRiverValley_Tidal.pln
 00:20:05.962  00:26:11.863    95   1416   70    40.00   17.00  NAR   ON   OFF     270.00
 South_KnikRiverSouth_KnikRiverValley_Tidal.pln
 00:30:09.663  00:30:27.163    94   1425   70    40.00   17.00  NAR   ON   OFF      90.00
 South_KnikRiverSouth_KnikRiverValley_Tidal.pln
 00:35:07.664  00:43:17.565    94   1411   70    40.00   17.00  NAR   ON   OFF      90.00
 South_KnikRiverSouth_KnikRiverValley_Tidal.pln
 00:47:38.966  00:57:50.667    93   1429   70    40.00   17.00  NAR   ON   OFF     270.00
 South_KnikRiverSouth_KnikRiverValley_Tidal.pln
 01:01:48.067  01:12:03.769    92   1413   70    40.00   17.00  NAR   ON   OFF      90.00
 South_KnikRiverSouth_KnikRiverValley_Tidal.pln
 01:15:28.669   01:17:51.27    91   1413   70    40.00   17.00  NAR   ON   OFF     270.00
 South_KnikRiverSouth_KnikRiverValley_Tidal.pln
```



LIDAR FLIGHT LOG

JSI

MISSION: LOSIIIA
DATE:
PILOT: JESSE
OPERATOR: JIM
AIRCRAFT: N73TM

PROJECT NUMBER	LINE NO. & Hdg		GND SPEED (KTS)	SCAN		PRF	ALT (m)	TIME		Laser Time	TZPK	REMARKS
				FREQ	ANGLE			START	STOP			
6110401								15:19	15:37	GMT	180	FERRY: PAMR → SITE .3
MATSU	TEST		150	40	17	70	1400	15:37	15:37			
SOUTH TIDAL	TEST							15:37	15:38			
	32	270						15:42	15:54			
	31	90						15:59	16:12			
	30	270						16:16	16:28			
	~~29~~	~~90~~										
	11	90						16:46	17:04			
	10	270						17:08	17:25			
	13	90						17:29	17:46			
	12	270						17:51	18:07			
	15	90						18:11	18:28			
	~~14~~	~~270~~										
	CROSS	5						18:37	18:39			EAST END
	14	270						18:49	19:06			
	CROSS	5						19:10	19:12			WEST END
									19:31			FERRY: SITE → PAMR .3

	STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	FERRY	STATIC	START:	STOP:
⊘	6110401	1168	9		3.6	.6	4.2	15:19	19:31
○							WX		
○									

NOTES: TURBULANT
17° CRAB WEST END
15° CRAB EAST END
SEVERE TURB ON WEST END

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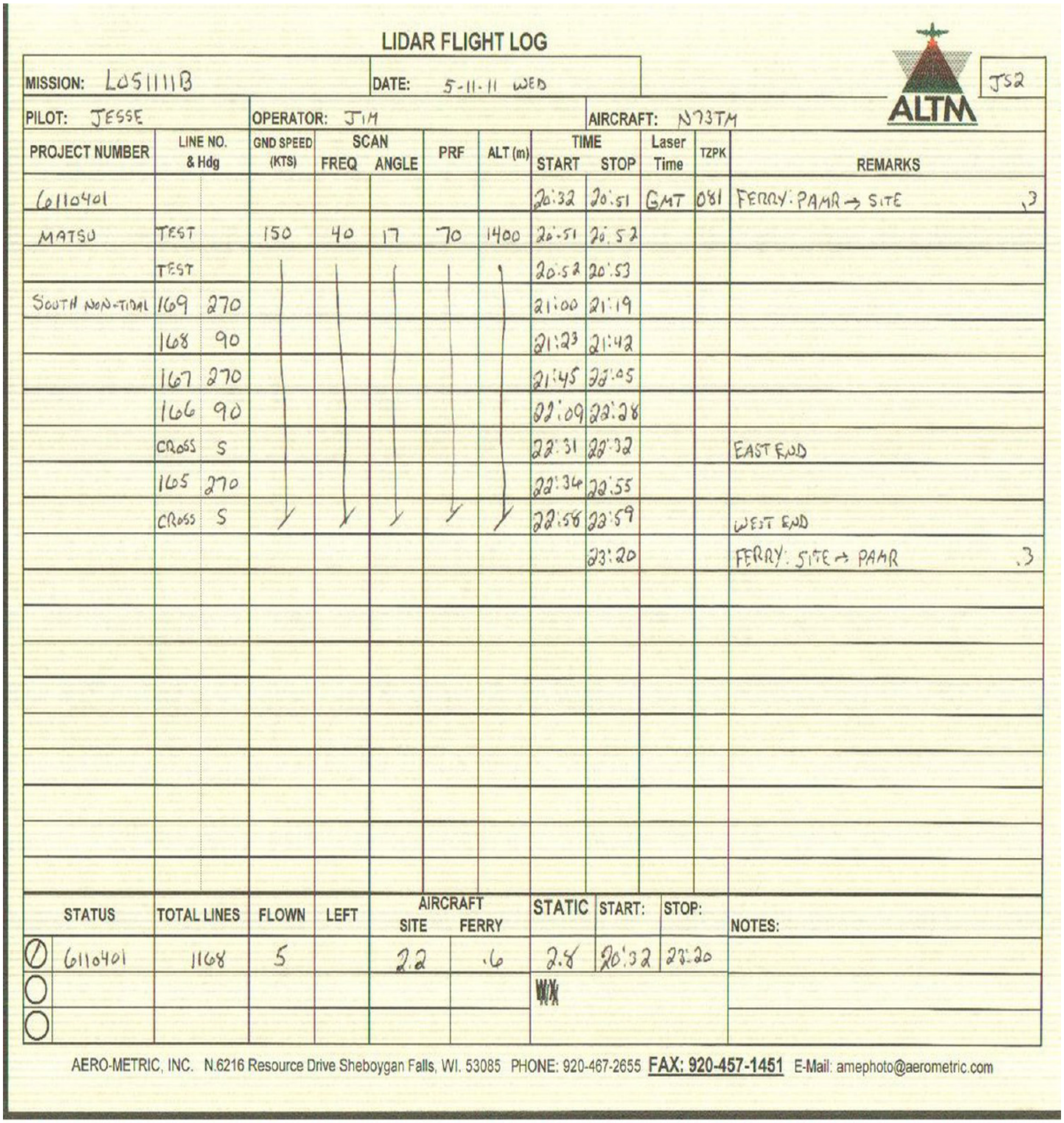

LIDAR FLIGHT LOG

ALTM

JS2

MISSION: L0S1111B

DATE: 5-11-11 WED

PILOT: JESSE

OPERATOR: JIM

AIRCRAFT: N73TM

PROJECT NUMBER	LINE NO. & Hdg		GND SPEED (KTS)	SCAN		PRF	ALT (m)	TIME		Laser Time	TZPK	REMARKS
				FREQ	ANGLE			START	STOP			
6110401								20:32	20:51	GMT	081	FERRY: PAMR → SITE .3
MATSU	TEST		150	40	17	70	1400	20:51	20:52			
	TEST							20:52	20:53			
SOUTH NON-TIDAL	169	270						21:00	21:19			
	168	90						21:23	21:42			
	167	270						21:45	22:05			
	166	90						22:09	22:28			
	CROSS	S						22:31	22:32			EAST END
	165	270						22:34	22:55			
	CROSS	S						22:58	22:59			WEST END
									23:20			FERRY: SITE → PAMR .3

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT		STATIC	START:	STOP:	NOTES:
				SITE	FERRY				
⊘ 6110401	1168	5		2.2	.6	2.8	20:32	23:20	
○						WX			
○									

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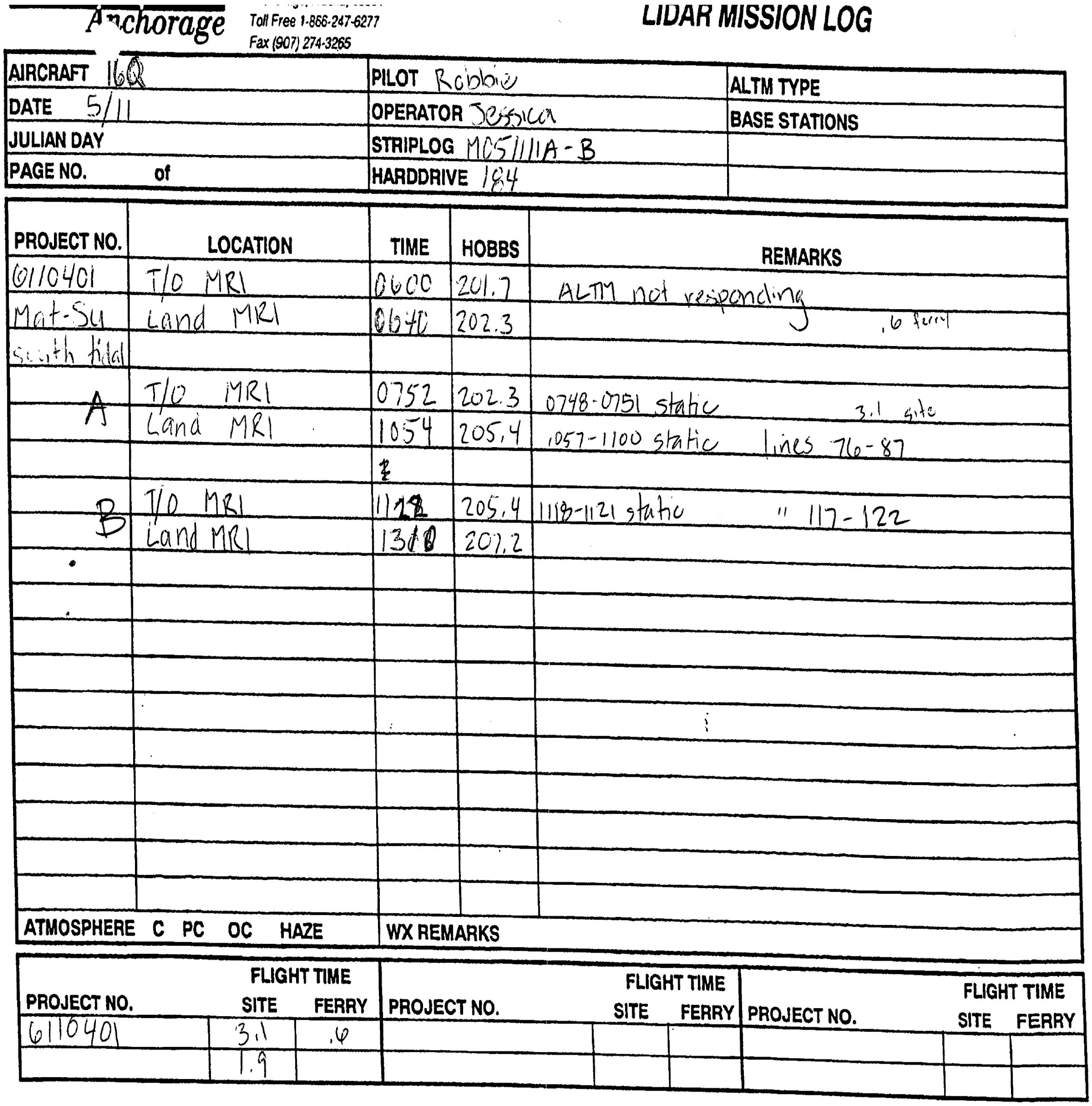

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LIDAR MISSION LOG

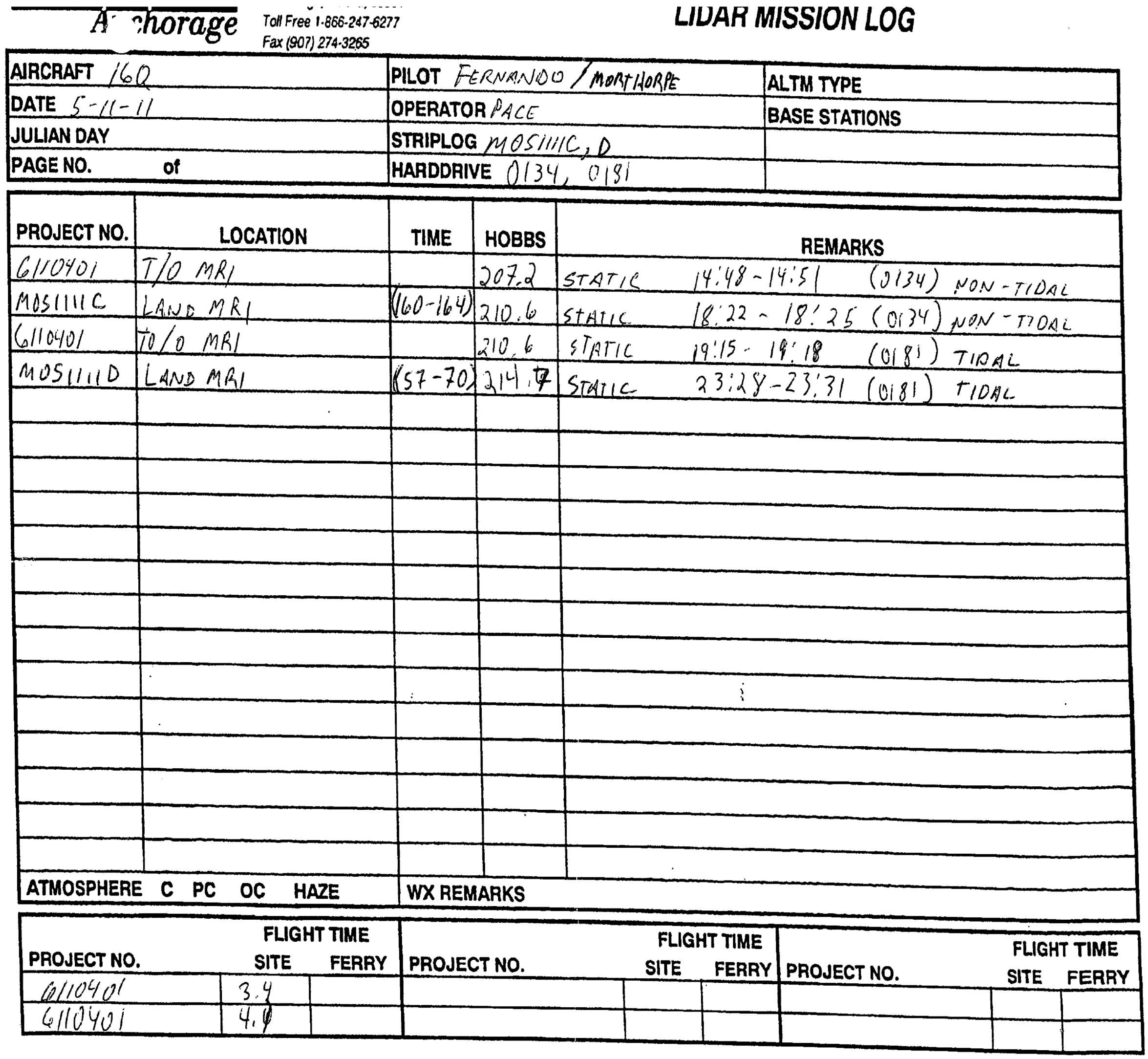
AIRCRAFT 16Q	PILOT Robbie	ALTM TYPE
DATE 5/11	OPERATOR Jessica	BASE STATIONS
JULIAN DAY	STRIPLOG MC51111A-B	
PAGE NO. of	HARDDRIVE 184	

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	T/O MRI	0600	201.7	ALTM not responding
Mat-Su	Land MRI	0640	202.3	.6 ferry
south tidal				
A	T/O MRI	0752	202.3	0748-0751 static 3.1 site
	Land MRI	1054	205.4	1057-1100 static lines 76-87
B	T/O MRI	1128	205.4	1118-1121 static " 117-122
	Land MRI	1310	207.2	

ATMOSPHERE C PC OC HAZE

WX REMARKS

PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY
6110401	3.1	.6						
	1.9							



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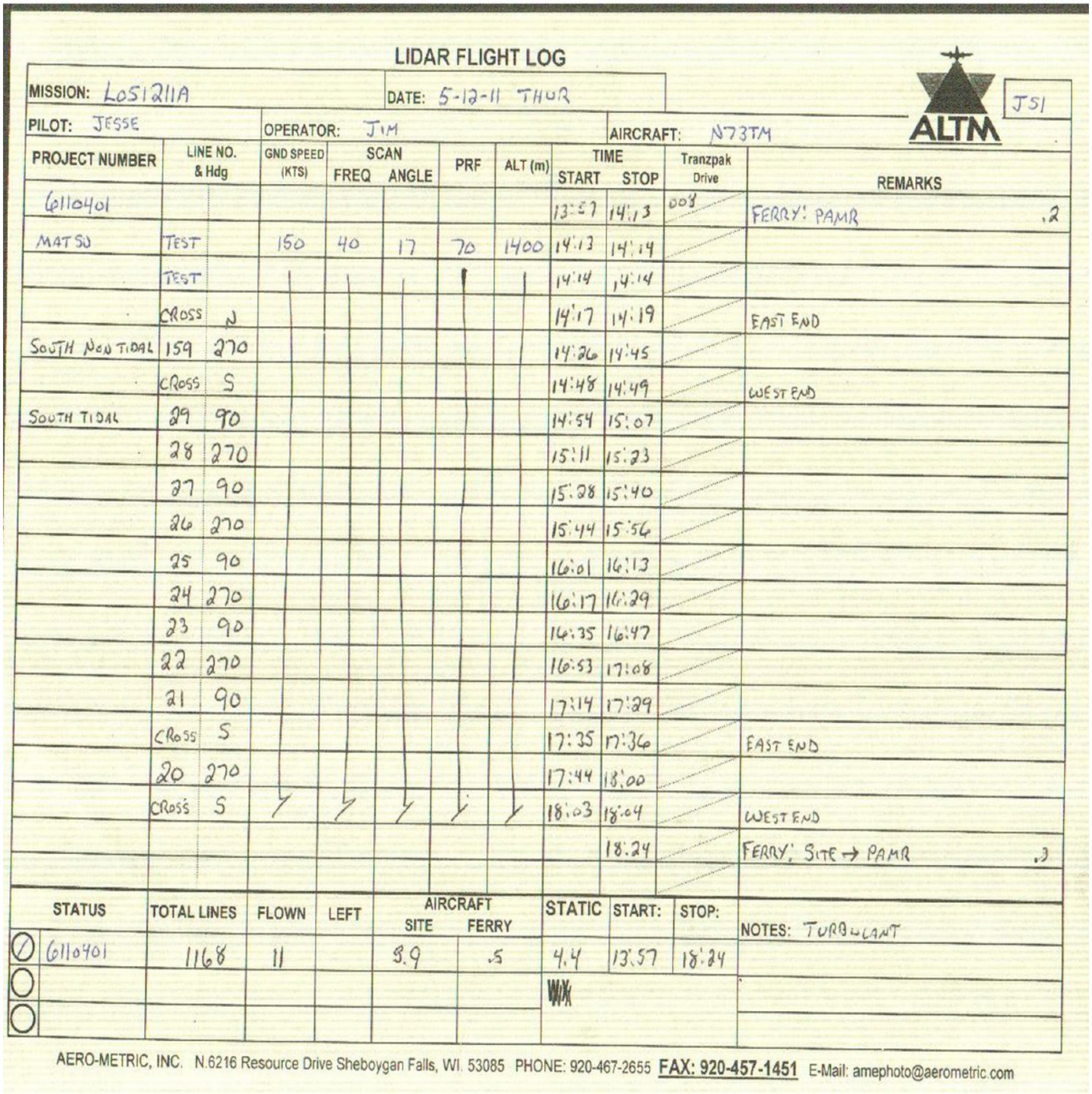
LIDAR MISSION LOG

AIRCRAFT 16Q
DATE 5-11-11
JULIAN DAY
PAGE NO. of
PILOT FERNANDO / MORTHORPE
OPERATOR PACE
STRIPLOG MOS1111C, D
HARDDRIVE 0134, 0181
ALTM TYPE
BASE STATIONS

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	T/O MRI		207.2	STATIC 14:48 - 14:51 (0134) NON-TIDAL
MOS1111C	LAND MRI	(160-164)	210.6	STATIC 18:22 - 18:25 (0134) NON-TIDAL
6110401	T0/0 MRI		210.6	STATIC 19:15 - 19:18 (0181) TIDAL
MOS1111D	LAND MRI	(57-70)	214.7	STATIC 23:28 - 23:31 (0181) TIDAL

ATMOSPHERE C PC OC HAZE
WX REMARKS

PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY
6110401	3.4							
6110401	4.0							



LIDAR FLIGHT LOG

ALTM

J51

MISSION: L051211A
DATE: 5-12-11 THUR
PILOT: JESSE
OPERATOR: JIM
AIRCRAFT: N73TM

PROJECT NUMBER	LINE NO. & Hdg		GND SPEED (KTS)	SCAN FREQ	SCAN ANGLE	PRF	ALT (m)	TIME START	TIME STOP	Tranzpak Drive	REMARKS
6110401								13:57	14:13	008	FERRY: PAMR .2
MATSU	TEST		150	40	17	70	1400	14:13	14:14		
	TEST							14:14	14:14		
	CROSS	N						14:17	14:19		EAST END
SOUTH NON TIDAL	159	270						14:26	14:45		
	CROSS	S						14:48	14:49		WEST END
SOUTH TIDAL	29	90						14:54	15:07		
	28	270						15:11	15:23		
	27	90						15:28	15:40		
	26	270						15:44	15:56		
	25	90						16:01	16:13		
	24	270						16:17	16:29		
	23	90						16:35	16:47		
	22	270						16:53	17:08		
	21	90						17:14	17:29		
	CROSS	S						17:35	17:36		EAST END
	20	270						17:44	18:00		
	CROSS	S						18:03	18:04		WEST END
									18:24		FERRY: SITE → PAMR .3

STATUS		TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START:	STOP:
⊘	6110401	1168	11		3.9	.5	4.4	13.57	18:24
○							WX		
○									

NOTES: TURBULANT

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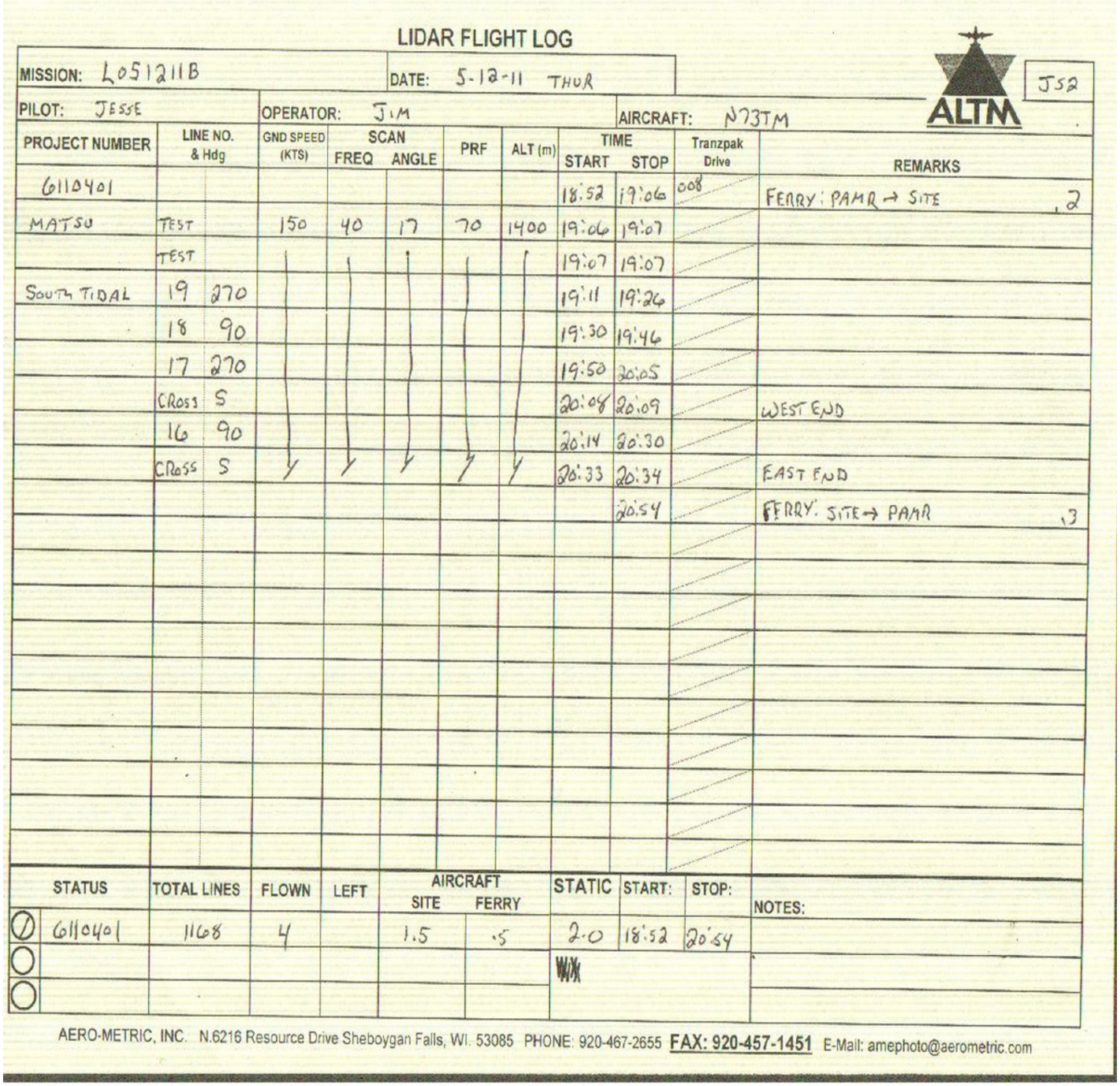

LIDAR FLIGHT LOG

ALTM

J52

MISSION: L051211B

DATE: 5-12-11 THUR

PILOT: JESSE

OPERATOR: JIM

AIRCRAFT: N73TM

PROJECT NUMBER	LINE NO. & Hdg		GND SPEED (KTS)	SCAN		PRF	ALT (m)	TIME		Tranzpak Drive	REMARKS
				FREQ	ANGLE			START	STOP		
6110401								18:52	19:06	008	FERRY: PAMR → SITE .2
MATSU	TEST		150	40	17	70	1400	19:06	19:07		
	TEST							19:07	19:07		
SOUTH TIDAL	19	270						19:11	19:26		
	18	90						19:30	19:46		
	17	270						19:50	20:05		
	CROSS	S						20:08	20:09		WEST END
	16	90						20:14	20:30		
	CROSS	S						20:33	20:34		EAST END
									20:54		FERRY: SITE → PAMR .3

STATUS		TOTAL LINES	FLOWN	LEFT	AIRCRAFT		STATIC	START:	STOP:	NOTES:
					SITE	FERRY				
⊘	6110401	1168	4		1.5	.5	2.0	18:52	20:54	
○							WX			
○										

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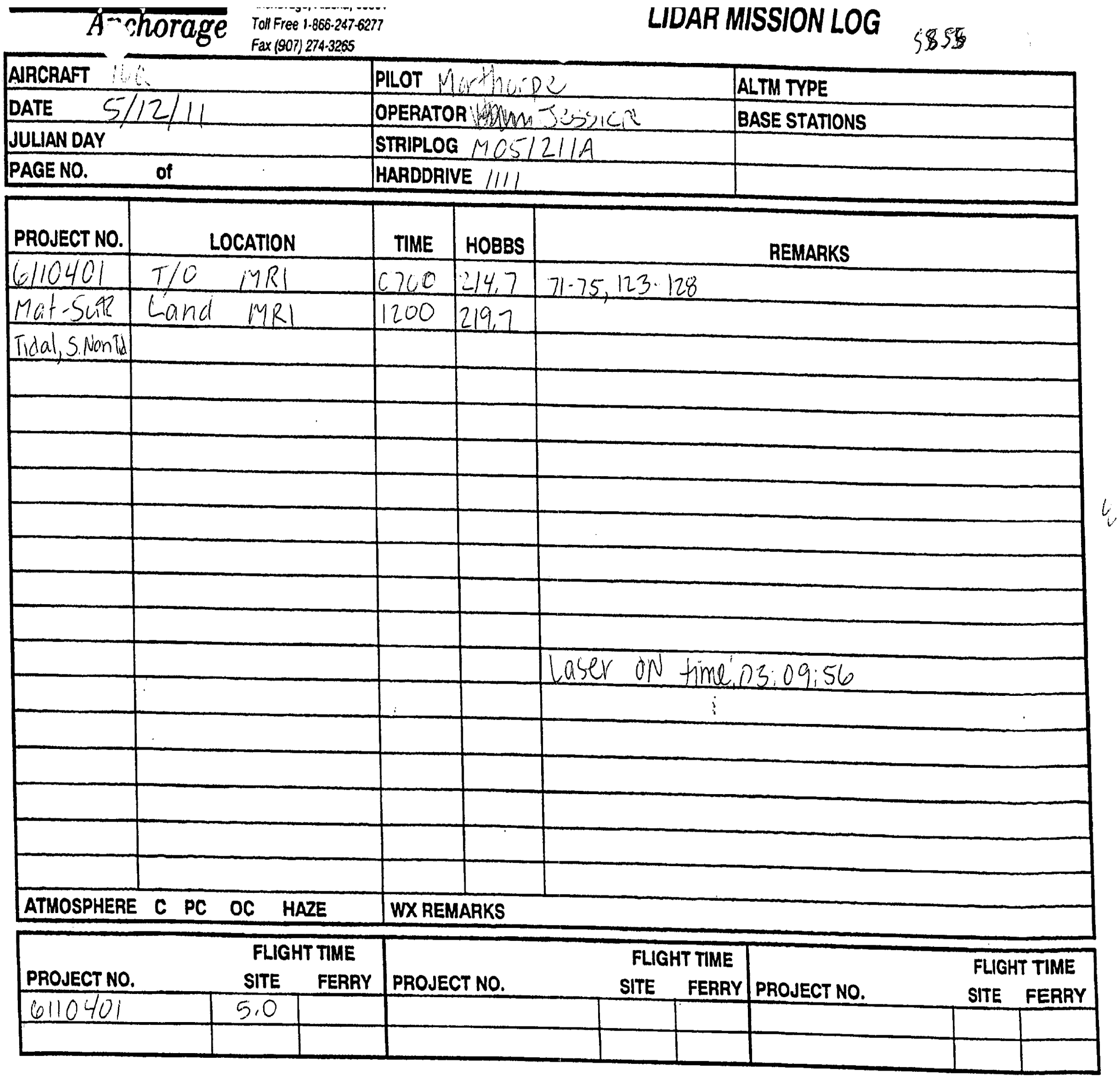

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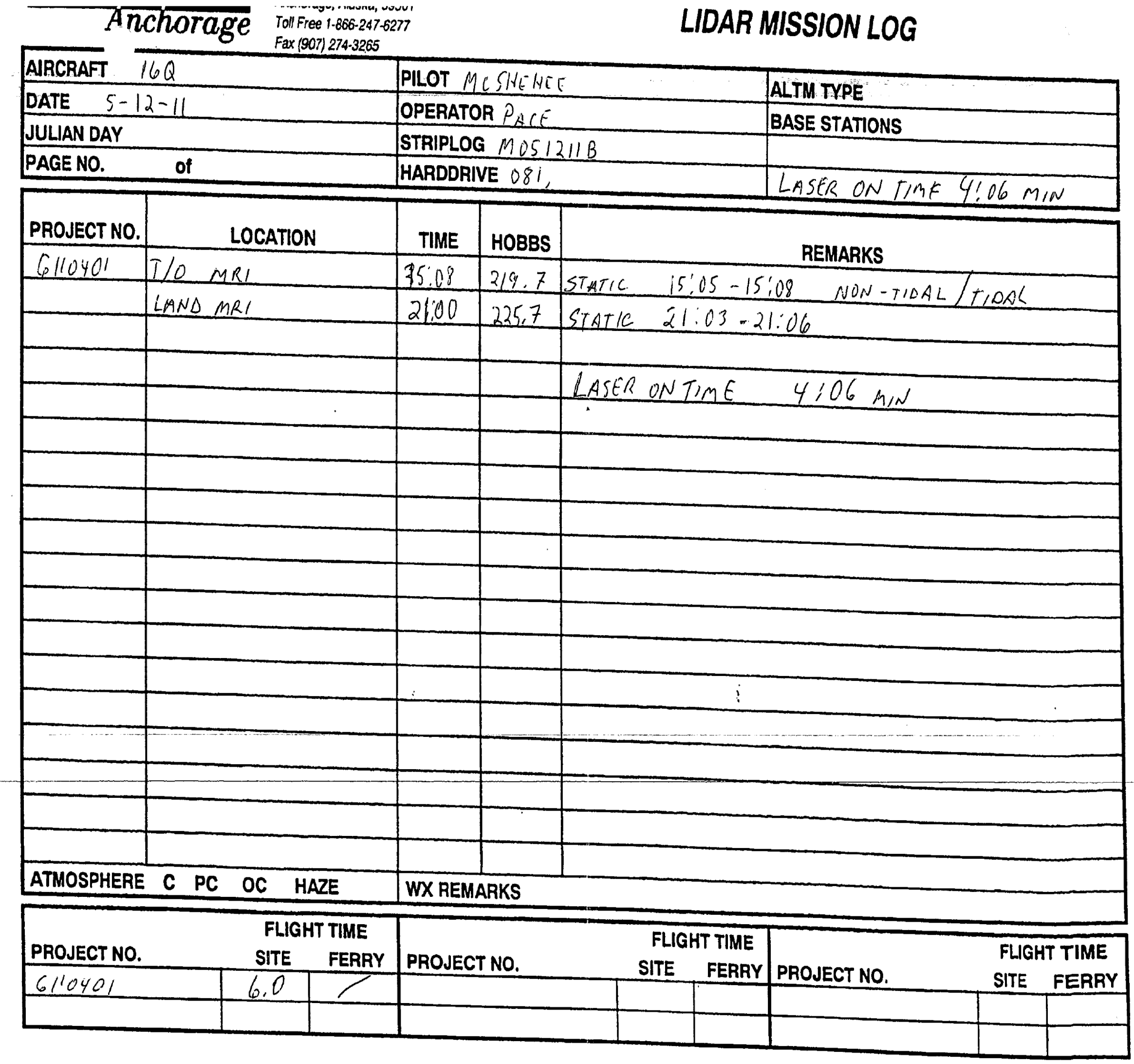
LIDAR MISSION LOG 5855

AIRCRAFT [illegible]	PILOT Marthorpe	ALTM TYPE
DATE 5/12/11	OPERATOR Jessica	BASE STATIONS
JULIAN DAY	STRIPLOG M051211A	
PAGE NO. of	HARDDRIVE 1111	

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	T/O MRI	0700	214.7	71-75, 123-128
Mat-Su	Land MRI	1200	219.7	
Tidal, S. NonTd				
				Laser ON time: 03:09:56

ATMOSPHERE C PC OC HAZE
WX REMARKS

PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY
6110401	5.0							



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LIDAR MISSION LOG

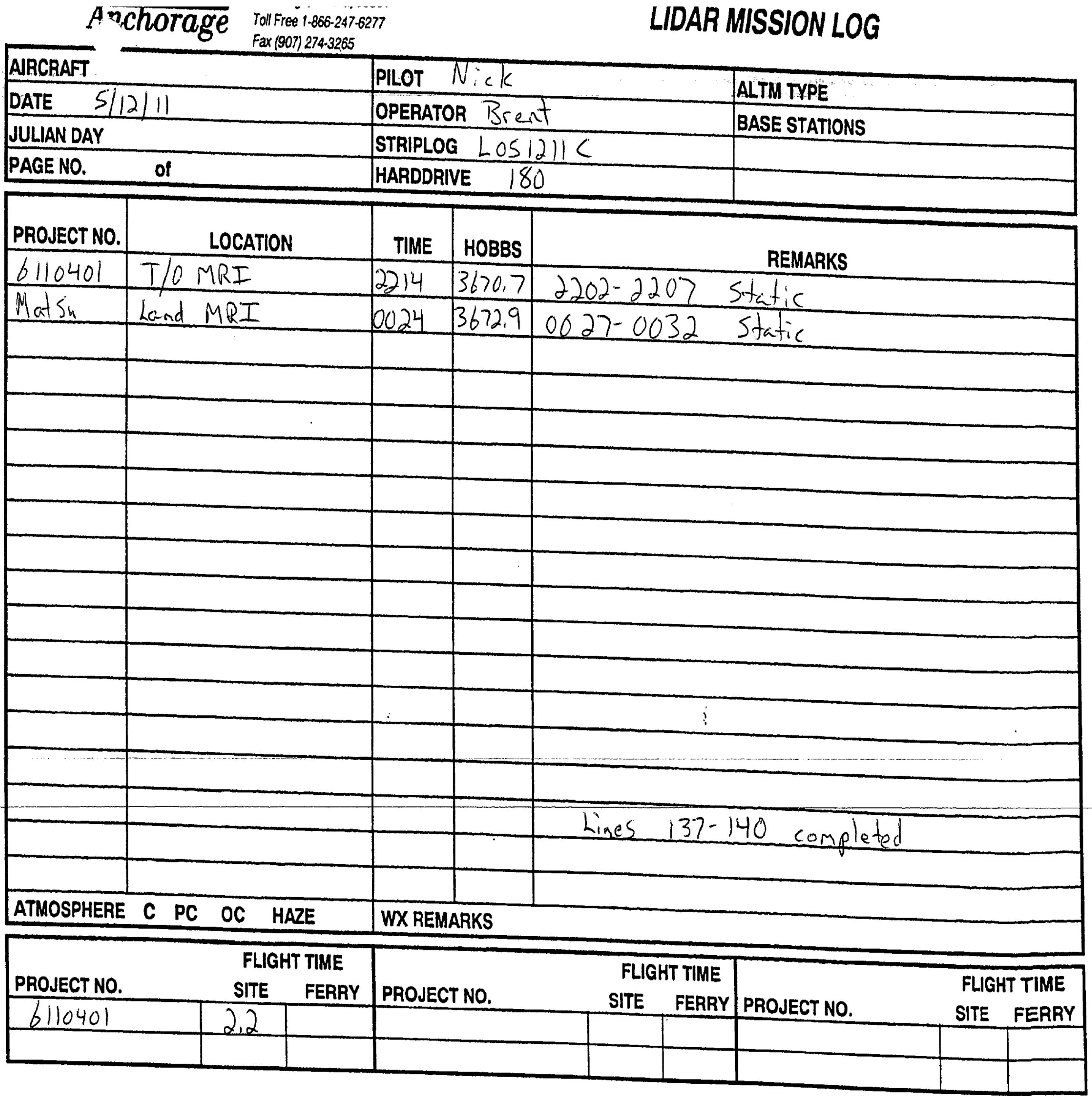
AIRCRAFT 16Q	**PILOT** MCSHEHEE	**ALTM TYPE**
DATE 5-12-11	**OPERATOR** PACE	**BASE STATIONS**
JULIAN DAY	**STRIPLOG** M051211B	
PAGE NO. of	**HARDDRIVE** 081,	LASER ON TIME 4:06 MIN

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
G110401	T/O MRI	15:08	219.7	STATIC 15:05 - 15:08 NON-TIDAL / TIDAL
	LAND MRI	21:00	225.7	STATIC 21:03 - 21:06
				LASER ON TIME 4:06 MIN

ATMOSPHERE C PC OC HAZE

WX REMARKS

PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY
G110401	6.0	/						



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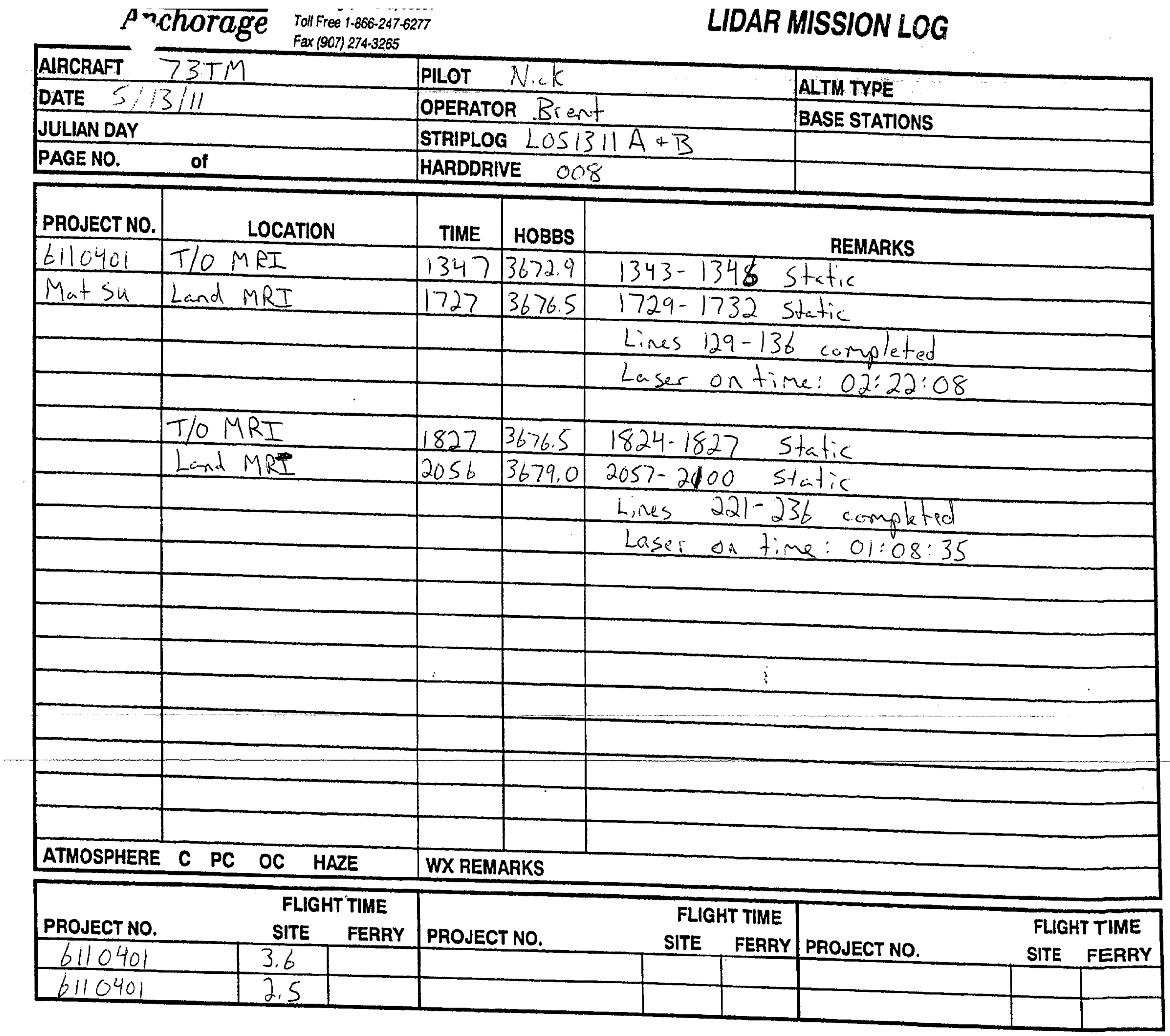
LIDAR MISSION LOG

AIRCRAFT	**PILOT** Nick	**ALTM TYPE**
DATE 5/12/11	**OPERATOR** Brent	**BASE STATIONS**
JULIAN DAY	**STRIPLOG** LOS1211C	
PAGE NO. of	**HARDDRIVE** 180	

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	T/O MRI	2214	3670.7	2202-2207 Static
MatSu	Land MRI	0024	3672.9	0027-0032 Static
				Lines 137-140 completed

ATMOSPHERE C PC OC HAZE **WX REMARKS**

PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY
6110401	2.2							



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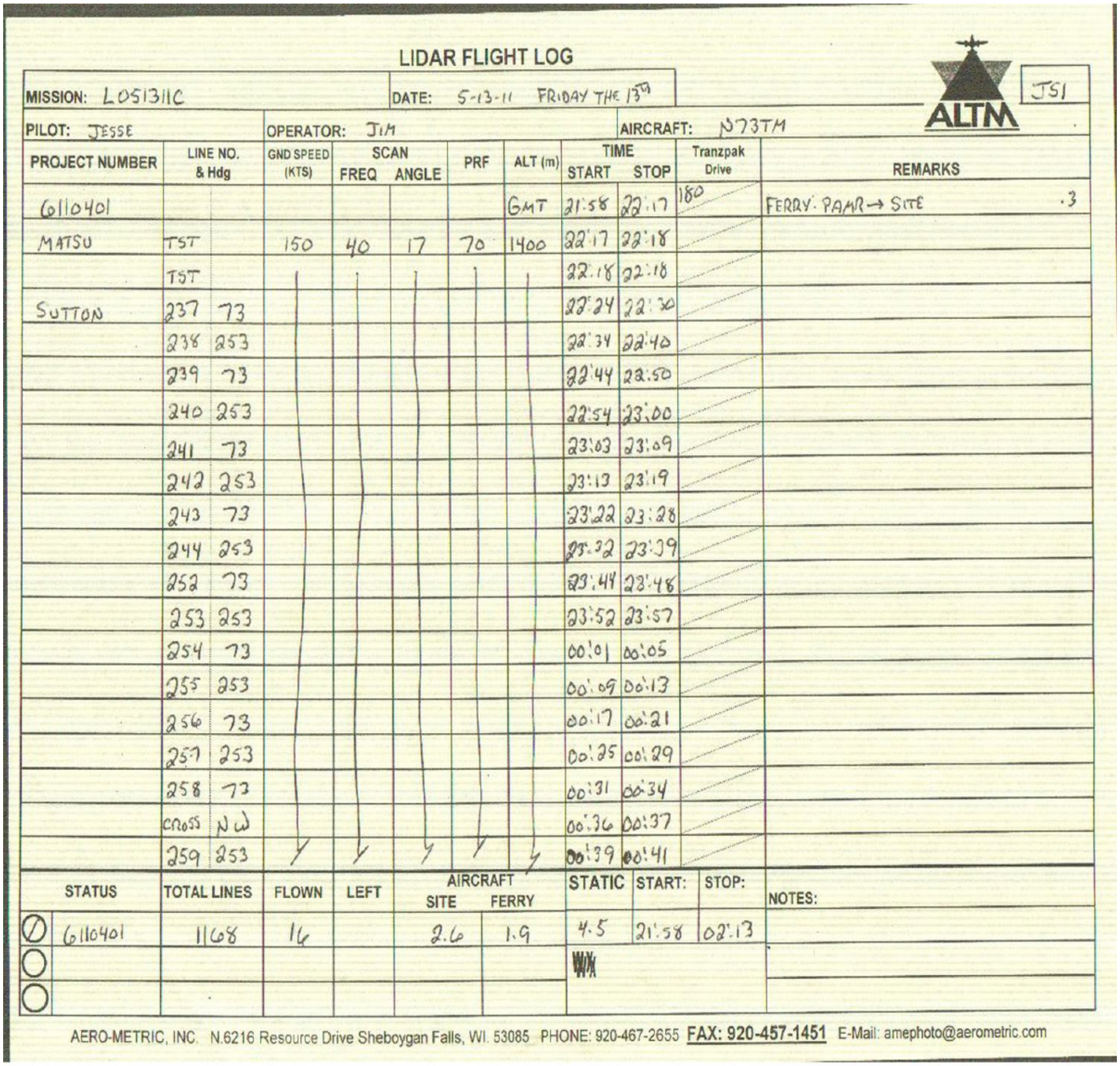
LIDAR MISSION LOG

AIRCRAFT 73TM	**PILOT** Nick	**ALTM TYPE**
DATE 5/13/11	**OPERATOR** Brent	**BASE STATIONS**
JULIAN DAY	**STRIPLOG** LOS1311 A+B	
PAGE NO. of	**HARDDRIVE** 008	

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	T/O MRI	1347	3672.9	1343-1348 Static
Mat Su	Land MRI	1727	3676.5	1729-1732 Static
				Lines 129-136 completed
				Laser on time: 02:22:08
	T/O MRI	1827	3676.5	1824-1827 Static
	Land MRI	2056	3679.0	2057-2100 Static
				Lines 221-236 completed
				Laser on time: 01:08:35

ATMOSPHERE C PC OC HAZE **WX REMARKS**

PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY
6110401	3.6							
6110401	2.5							



LIDAR FLIGHT LOG

ALTM JSI

MISSION: L051311C

DATE: 5-13-11 FRIDAY THE 13TH

PILOT: JESSE

OPERATOR: JIM

AIRCRAFT: N73TM

PROJECT NUMBER	LINE NO. & Hdg		GND SPEED (KTS)	SCAN FREQ	SCAN ANGLE	PRF	ALT (m)	TIME START	TIME STOP	Tranzpak Drive	REMARKS
6110401							GMT	21:58	22:17	180	FERRY · PAMR → SITE .3
MATSU	TST		150	40	17	70	1400	22:17	22:18		
	TST							22:18	22:18		
SUTTON	237	73						22:24	22:30		
	238	253						22:34	22:40		
	239	73						22:44	22:50		
	240	253						22:54	23:00		
	241	73						23:03	23:09		
	242	253						23:13	23:19		
	243	73						23:22	23:28		
	244	253						23:32	23:39		
	252	73						23:44	23:48		
	253	253						23:52	23:57		
	254	73						00:01	00:05		
	255	253						00:09	00:13		
	256	73						00:17	00:21		
	257	253						00:25	00:29		
	258	73						00:31	00:34		
	CROSS	NW						00:36	00:37		
	259	253						00:39	00:41		

	STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START:	STOP:	NOTES:
⊘	6110401	1168	16		2.6	1.9	4.5	21:58	02:13	
○							WX			
○										

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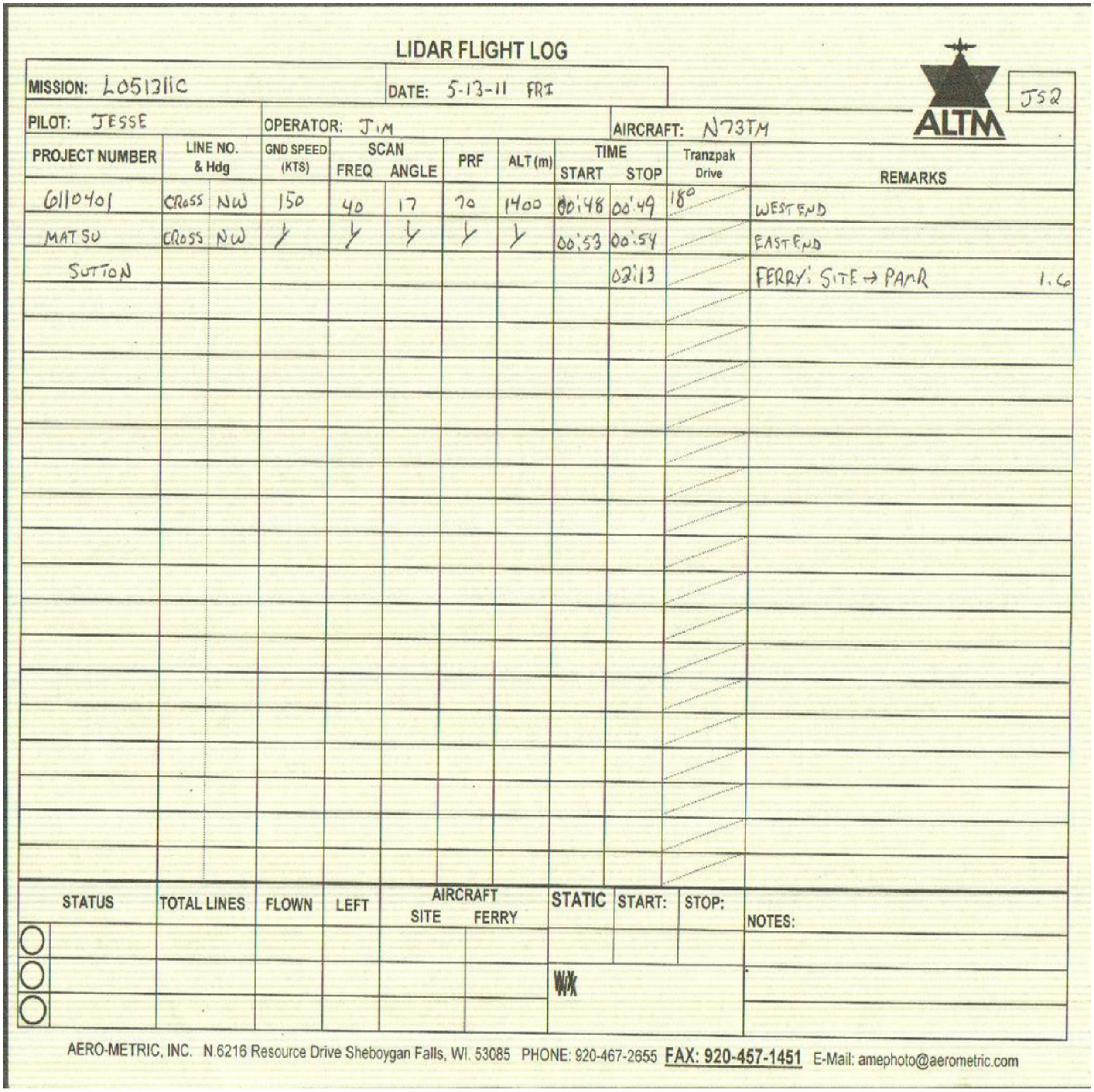

LIDAR FLIGHT LOG

ALTM J52

MISSION: L051311C **DATE:** 5-13-11 FRI

PILOT: JESSE **OPERATOR:** JIM **AIRCRAFT:** N73TM

PROJECT NUMBER	LINE NO. & Hdg	GND SPEED (KTS)	SCAN FREQ	SCAN ANGLE	PRF	ALT (m)	TIME START	TIME STOP	Tranzpak Drive	REMARKS
6110401	CROSS NW	150	40	17	70	1400	00:48	00:49	18°	WEST END
MAT SU	CROSS NW	✓	✓	✓	✓	✓	00:53	00:54		EAST END
SUTTON								02:13		FERRY: SITE → PAMR 1.6

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START:	STOP:	NOTES:
○									
○						WX			
○									

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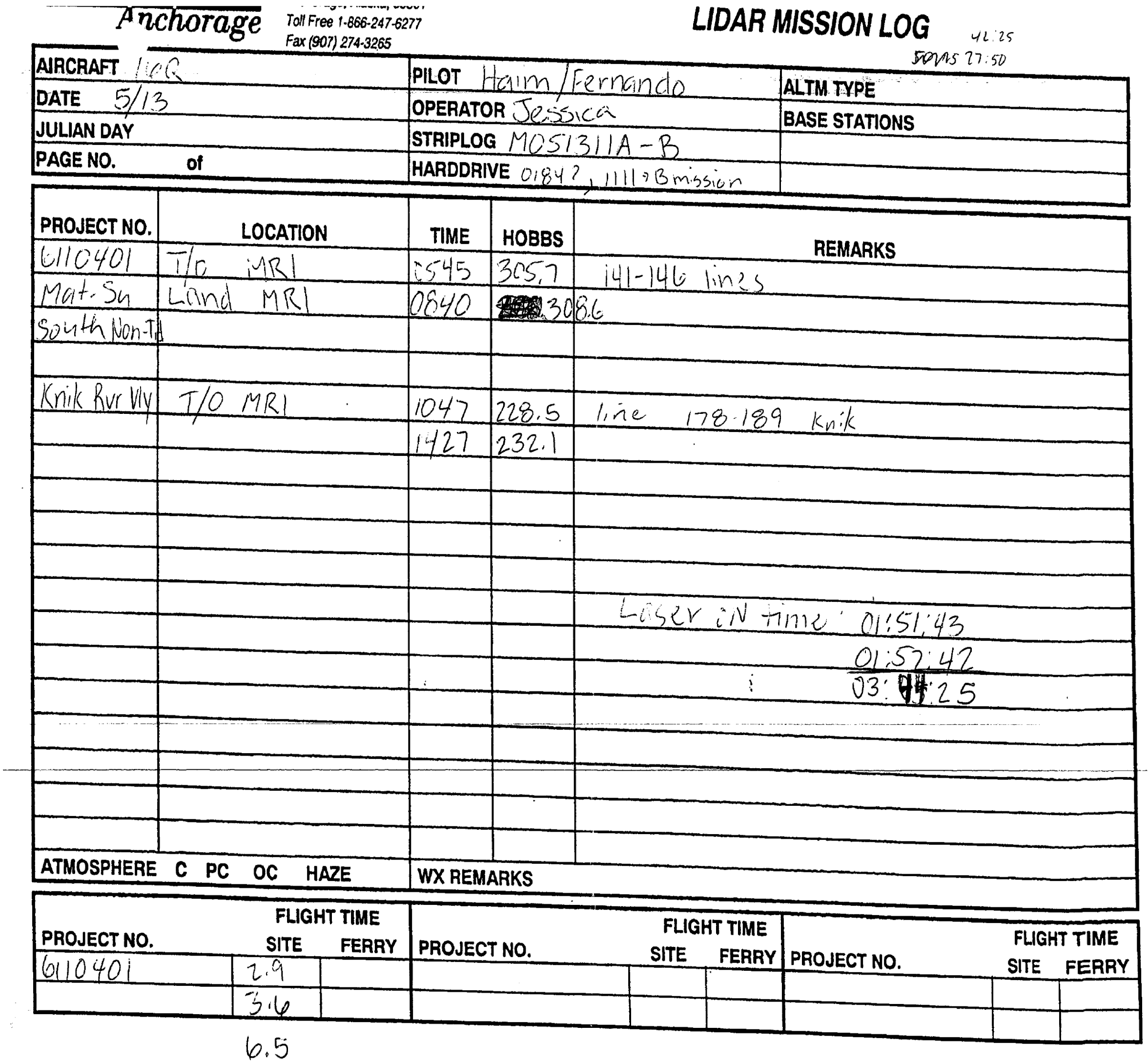

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LIDAR MISSION LOG

42:25
[illegible] 27:50

AIRCRAFT	1CQ	PILOT	Haim / Fernando
DATE	5/13	OPERATOR	Jessica
JULIAN DAY		STRIPLOG	MO51311A - B
PAGE NO. of		HARDDRIVE	0184?, 1111 ? B mission

ALTM TYPE

BASE STATIONS

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	T/O MRI	0545	305.7	141-146 lines
Mat-Su	Land MRI	0840	308.6	
South Non-Td				
Knik Rvr Vly	T/O MRI	1047	228.5	line 178-189 Knik
		1427	232.1	
				Laser in time: 01:51:43
				01:52:42
				03:44:25

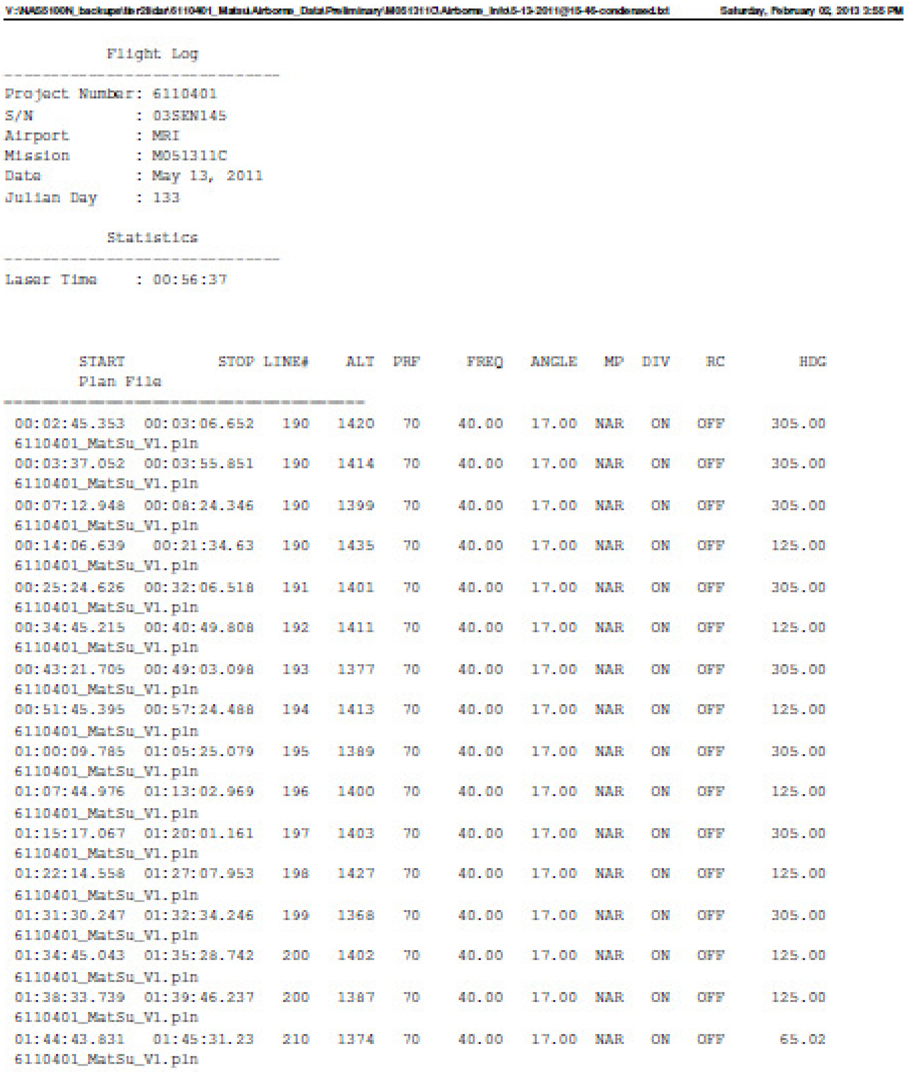
ATMOSPHERE C PC OC HAZE

WX REMARKS

PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY
6110401	2.9							
	3.6							

6.5

M051311C Paper Log Unavailable - Digital Log Included Here



```
           Flight Log
------------------------------
Project Number: 6110401
S/N           : 03SEN145
Airport       : MRI
Mission       : M051311C
Date          : May 13, 2011
Julian Day    : 133

           Statistics
------------------------------
Laser Time    : 00:56:37



        START          STOP LINE#    ALT  PRF     FREQ   ANGLE   MP  DIV    RC        HDG
        Plan File
=======================================
 00:02:45.353  00:03:06.652   190   1420   70    40.00   17.00  NAR   ON   OFF     305.00
 6110401_MatSu_V1.pln
 00:03:37.052  00:03:55.851   190   1414   70    40.00   17.00  NAR   ON   OFF     305.00
 6110401_MatSu_V1.pln
 00:07:12.948  00:08:24.346   190   1399   70    40.00   17.00  NAR   ON   OFF     305.00
 6110401_MatSu_V1.pln
 00:14:06.639   00:21:34.63   190   1435   70    40.00   17.00  NAR   ON   OFF     125.00
 6110401_MatSu_V1.pln
 00:25:24.626  00:32:06.518   191   1401   70    40.00   17.00  NAR   ON   OFF     305.00
 6110401_MatSu_V1.pln
 00:34:45.215  00:40:49.808   192   1411   70    40.00   17.00  NAR   ON   OFF     125.00
 6110401_MatSu_V1.pln
 00:43:21.705  00:49:03.098   193   1377   70    40.00   17.00  NAR   ON   OFF     305.00
 6110401_MatSu_V1.pln
 00:51:45.395  00:57:24.488   194   1413   70    40.00   17.00  NAR   ON   OFF     125.00
 6110401_MatSu_V1.pln
 01:00:09.785  01:05:25.079   195   1389   70    40.00   17.00  NAR   ON   OFF     305.00
 6110401_MatSu_V1.pln
 01:07:44.976  01:13:02.969   196   1400   70    40.00   17.00  NAR   ON   OFF     125.00
 6110401_MatSu_V1.pln
 01:15:17.067  01:20:01.161   197   1403   70    40.00   17.00  NAR   ON   OFF     305.00
 6110401_MatSu_V1.pln
 01:22:14.558  01:27:07.953   198   1427   70    40.00   17.00  NAR   ON   OFF     125.00
 6110401_MatSu_V1.pln
 01:31:30.247  01:32:34.246   199   1368   70    40.00   17.00  NAR   ON   OFF     305.00
 6110401_MatSu_V1.pln
 01:34:45.043  01:35:28.742   200   1402   70    40.00   17.00  NAR   ON   OFF     125.00
 6110401_MatSu_V1.pln
 01:38:33.739  01:39:46.237   200   1387   70    40.00   17.00  NAR   ON   OFF     125.00
 6110401_MatSu_V1.pln
 01:44:43.831   01:45:31.23   210   1374   70    40.00   17.00  NAR   ON   OFF      65.02
 6110401_MatSu_V1.pln
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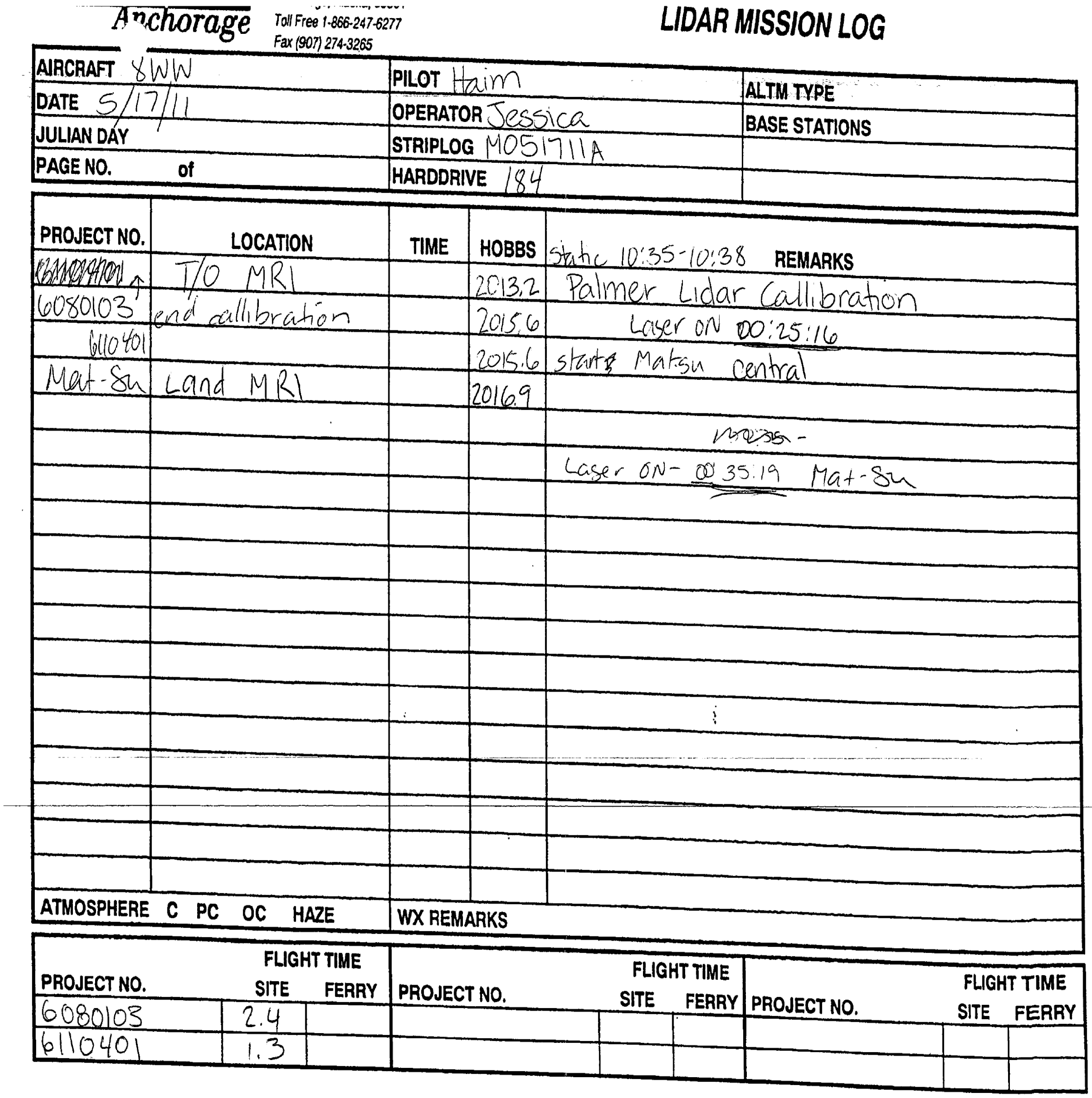

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LIDAR MISSION LOG

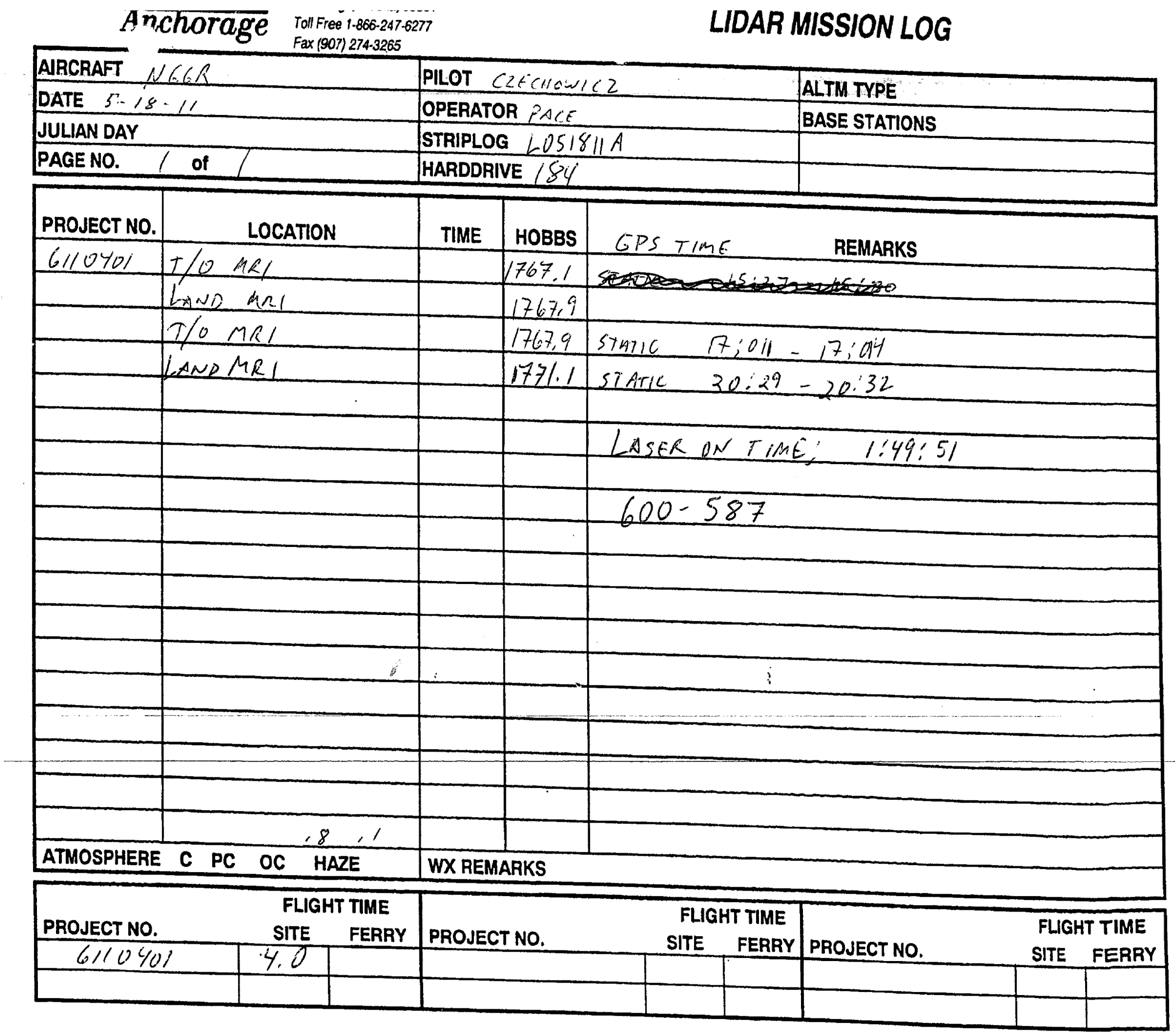
AIRCRAFT 8WW	PILOT Haim	ALTM TYPE
DATE 5/17/11	OPERATOR Jessica	BASE STATIONS
JULIAN DAY	STRIPLOG M051711A	
PAGE NO. of	HARDDRIVE 184	

PROJECT NO.	LOCATION	TIME	HOBBS	Static 10:35-10:38 REMARKS
[illegible] ↑	T/O MRI		2013.2	Palmer Lidar Callibration
6080103	end callibration		2015.6	Laser ON 00:25:16
6110401			2015.6	start Matsu central
Mat-Su	Land MRI		2016.9	
				[illegible] -
				Laser ON- 00 35:19 Mat-Su

ATMOSPHERE C PC OC HAZE

WX REMARKS

PROJECT NO.	FLIGHT TIME		PROJECT NO.	FLIGHT TIME		PROJECT NO.	FLIGHT TIME	
	SITE	FERRY		SITE	FERRY		SITE	FERRY
6080103	2.4							
6110401	1.3							



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LIDAR MISSION LOG

AIRCRAFT N66R	PILOT CZECHOWICZ	ALTM TYPE
DATE 5-18-11	OPERATOR PACE	BASE STATIONS
JULIAN DAY	STRIPLOG L051811A	
PAGE NO. 1 of 1	HARDDRIVE 184	

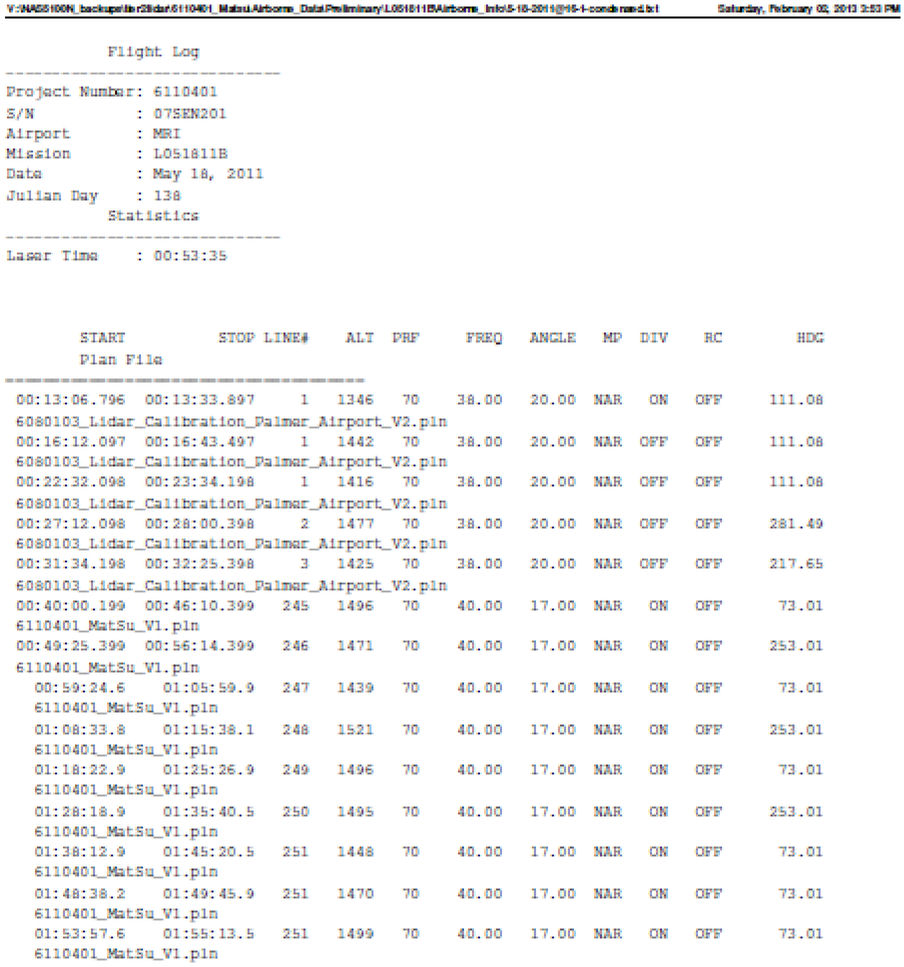
PROJECT NO.	LOCATION	TIME	HOBBS	GPS TIME REMARKS
6110401	T/O MRI		1767.1	~~[illegible]~~
	LAND MRI		1767.9	
	T/O MRI		1767.9	STATIC 17:011 - 17:04
	LAND MRI		1771.1	STATIC 20:29 - 20:32
				LASER ON TIME; 1:49:51
				600-587
	.8 .1			

ATMOSPHERE C PC OC HAZE

WX REMARKS

PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY
6110401	4.0							

L051811B Paper Log Unavailable - Digital Log Included Here



V:\NAS5100N_backups\lidar2\lidar\6110401_MatsuAirborne_Data\Preliminary\L051811B\Airborne_Info\5-18-2011@15-1-condensed.txt Saturday, February 02, 2013 3:53 PM

```
           Flight Log
------------------------------
Project Number: 6110401
S/N           : 07SEN201
Airport       : MRI
Mission       : L051811B
Date          : May 18, 2011
Julian Day    : 138
           Statistics
------------------------------
Laser Time    : 00:53:35



        START          STOP LINE#    ALT  PRF     FREQ   ANGLE   MP  DIV    RC        HDG
        Plan File
=======================================
 00:13:06.796  00:13:33.897     1   1346   70    38.00   20.00  NAR   ON   OFF     111.08
 6080103_Lidar_Calibration_Palmer_Airport_V2.pln
 00:16:12.097  00:16:43.497     1   1442   70    38.00   20.00  NAR  OFF   OFF     111.08
 6080103_Lidar_Calibration_Palmer_Airport_V2.pln
 00:22:32.098  00:23:34.198     1   1416   70    38.00   20.00  NAR  OFF   OFF     111.08
 6080103_Lidar_Calibration_Palmer_Airport_V2.pln
 00:27:12.098  00:28:00.398     2   1477   70    38.00   20.00  NAR  OFF   OFF     281.49
 6080103_Lidar_Calibration_Palmer_Airport_V2.pln
 00:31:34.198  00:32:25.398     3   1425   70    38.00   20.00  NAR  OFF   OFF     217.65
 6080103_Lidar_Calibration_Palmer_Airport_V2.pln
 00:40:00.199  00:46:10.399   245   1496   70    40.00   17.00  NAR   ON   OFF      73.01
 6110401_MatSu_V1.pln
 00:49:25.399  00:56:14.399   246   1471   70    40.00   17.00  NAR   ON   OFF     253.01
 6110401_MatSu_V1.pln
   00:59:24.6    01:05:59.9   247   1439   70    40.00   17.00  NAR   ON   OFF      73.01
   6110401_MatSu_V1.pln
   01:08:33.8    01:15:38.1   248   1521   70    40.00   17.00  NAR   ON   OFF     253.01
   6110401_MatSu_V1.pln
   01:18:22.9    01:25:26.9   249   1496   70    40.00   17.00  NAR   ON   OFF      73.01
   6110401_MatSu_V1.pln
   01:28:18.9    01:35:40.5   250   1495   70    40.00   17.00  NAR   ON   OFF     253.01
   6110401_MatSu_V1.pln
   01:38:12.9    01:45:20.5   251   1448   70    40.00   17.00  NAR   ON   OFF      73.01
   6110401_MatSu_V1.pln
   01:48:38.2    01:49:45.9   251   1470   70    40.00   17.00  NAR   ON   OFF      73.01
   6110401_MatSu_V1.pln
   01:53:57.6    01:55:13.5   251   1499   70    40.00   17.00  NAR   ON   OFF      73.01
   6110401_MatSu_V1.pln
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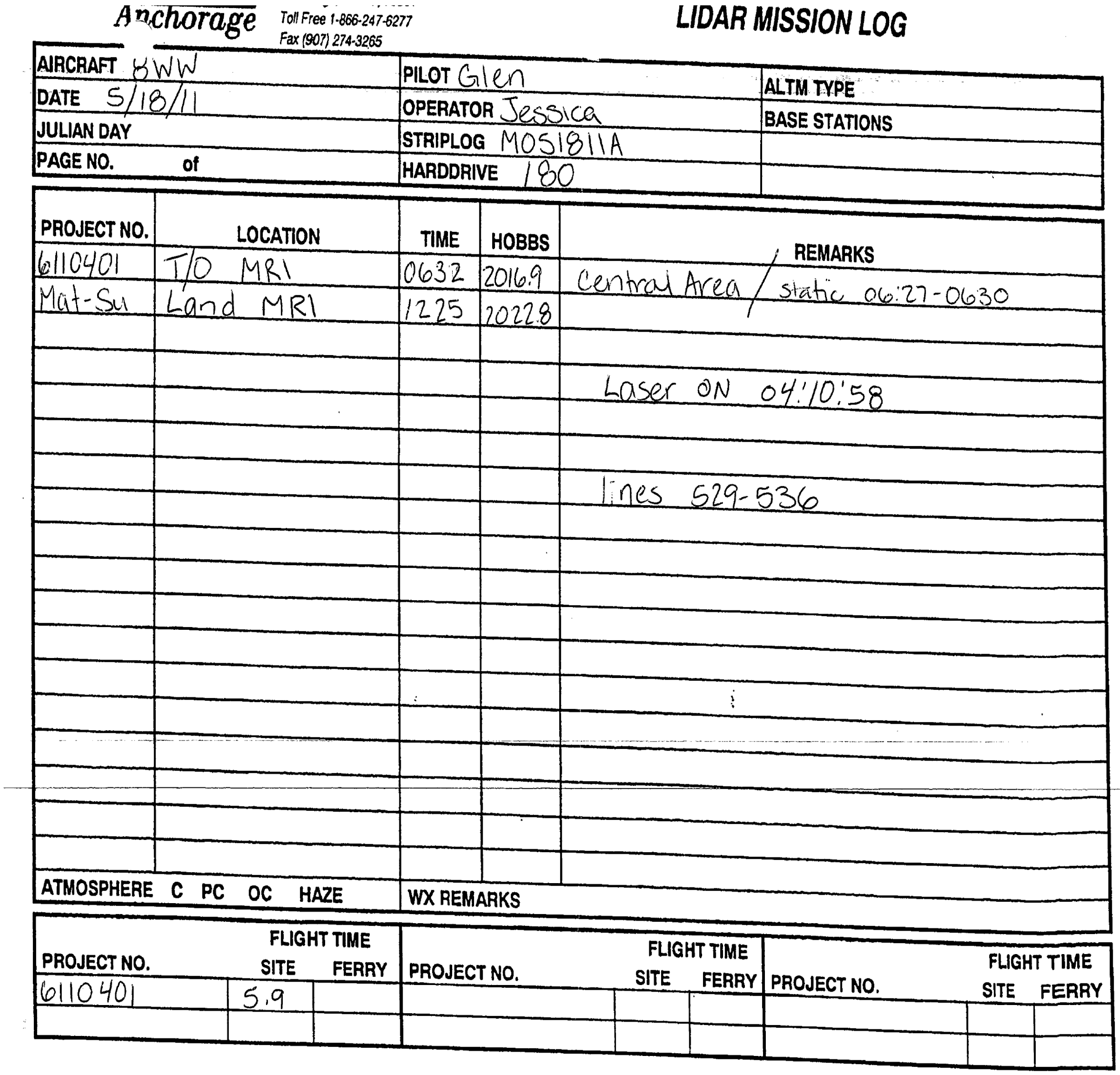

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LIDAR MISSION LOG

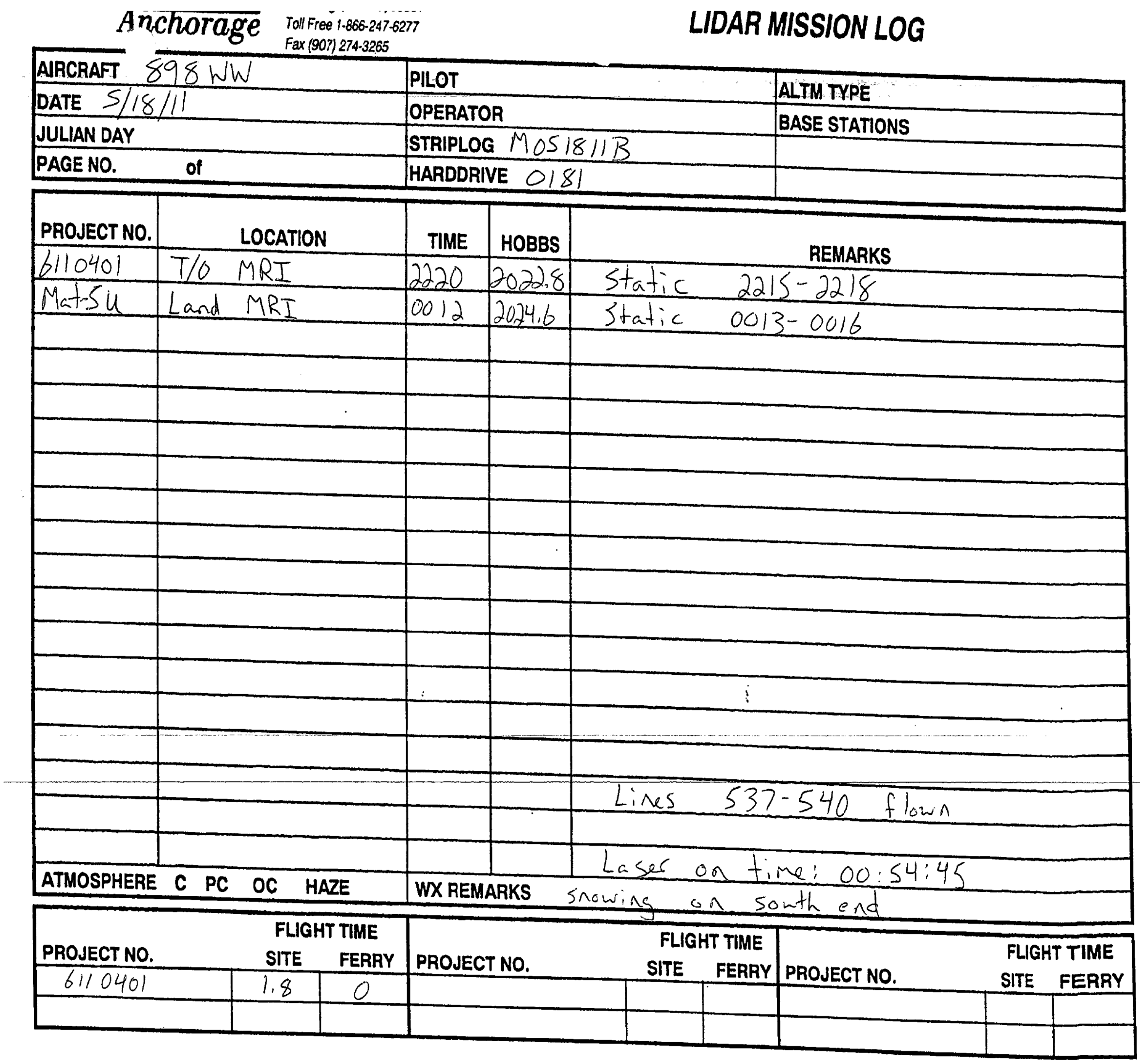
AIRCRAFT 8WW	PILOT Glen	ALTM TYPE
DATE 5/18/11	OPERATOR Jessica	BASE STATIONS
JULIAN DAY	STRIPLOG MO51811A	
PAGE NO. of	HARDDRIVE 180	

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	T/O MRI	0632	2016.9	Central Area / static 06:27-0630
Mat-Su	Land MRI	1225	2022.8	
				Laser ON 04:10:58
				lines 529-536

ATMOSPHERE C PC OC HAZE

WX REMARKS

PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY
6110401	5.9							



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LIDAR MISSION LOG

AIRCRAFT 898 WW
DATE 5/18/11
JULIAN DAY
PAGE NO. of

PILOT
OPERATOR
STRIPLOG M051811B
HARDDRIVE 0181

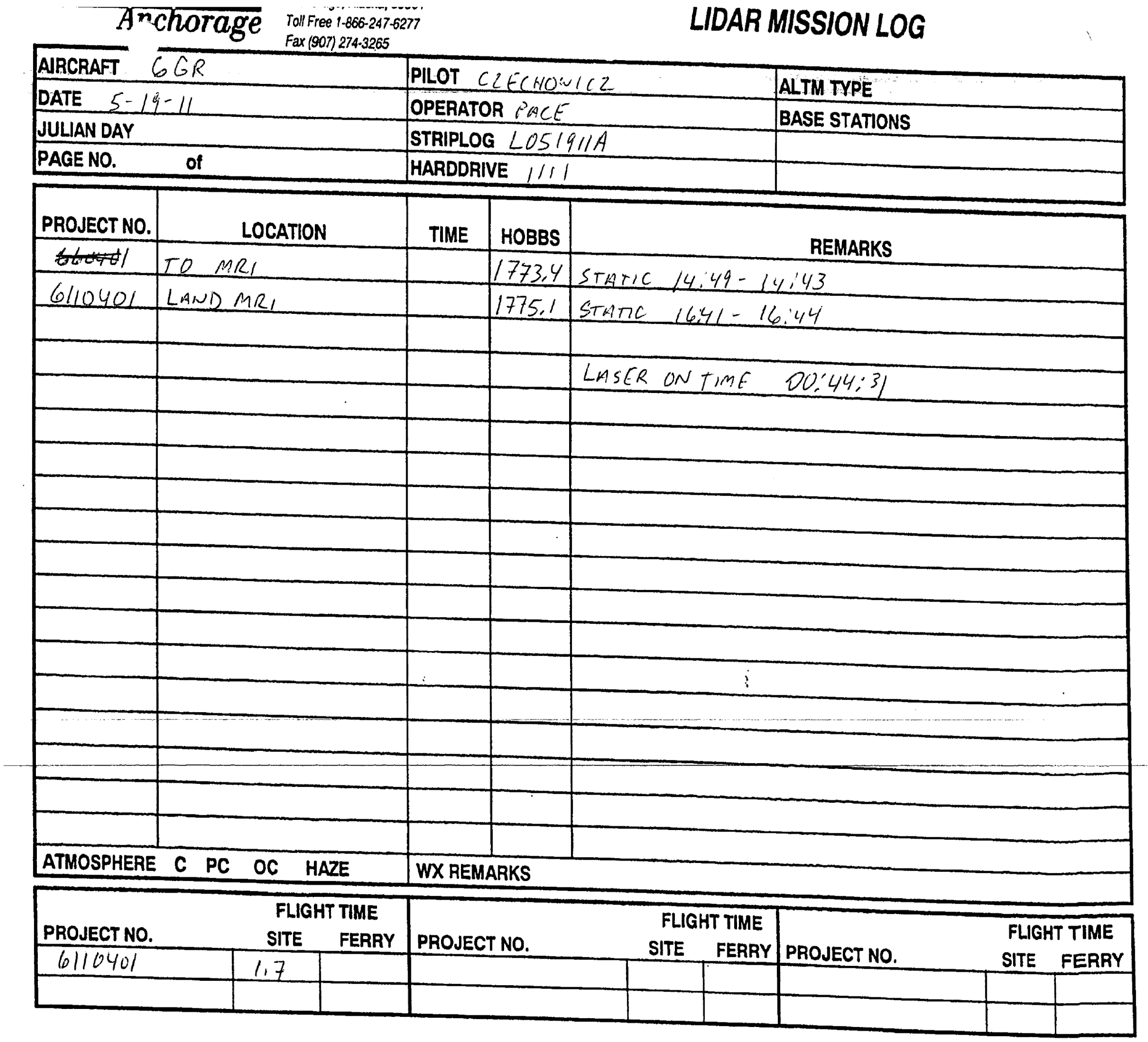
ALTM TYPE
BASE STATIONS

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	T/O MRI	2220	2022.8	Static 2215-2218
Mat-Su	Land MRI	0012	2024.6	Static 0013-0016
				Lines 537-540 flown
				Laser on time: 00:54:45

ATMOSPHERE C PC OC HAZE

WX REMARKS snowing on south end

PROJECT NO.	FLIGHT TIME		PROJECT NO.	FLIGHT TIME		PROJECT NO.	FLIGHT TIME	
	SITE	FERRY		SITE	FERRY		SITE	FERRY
6110401	1.8	0						



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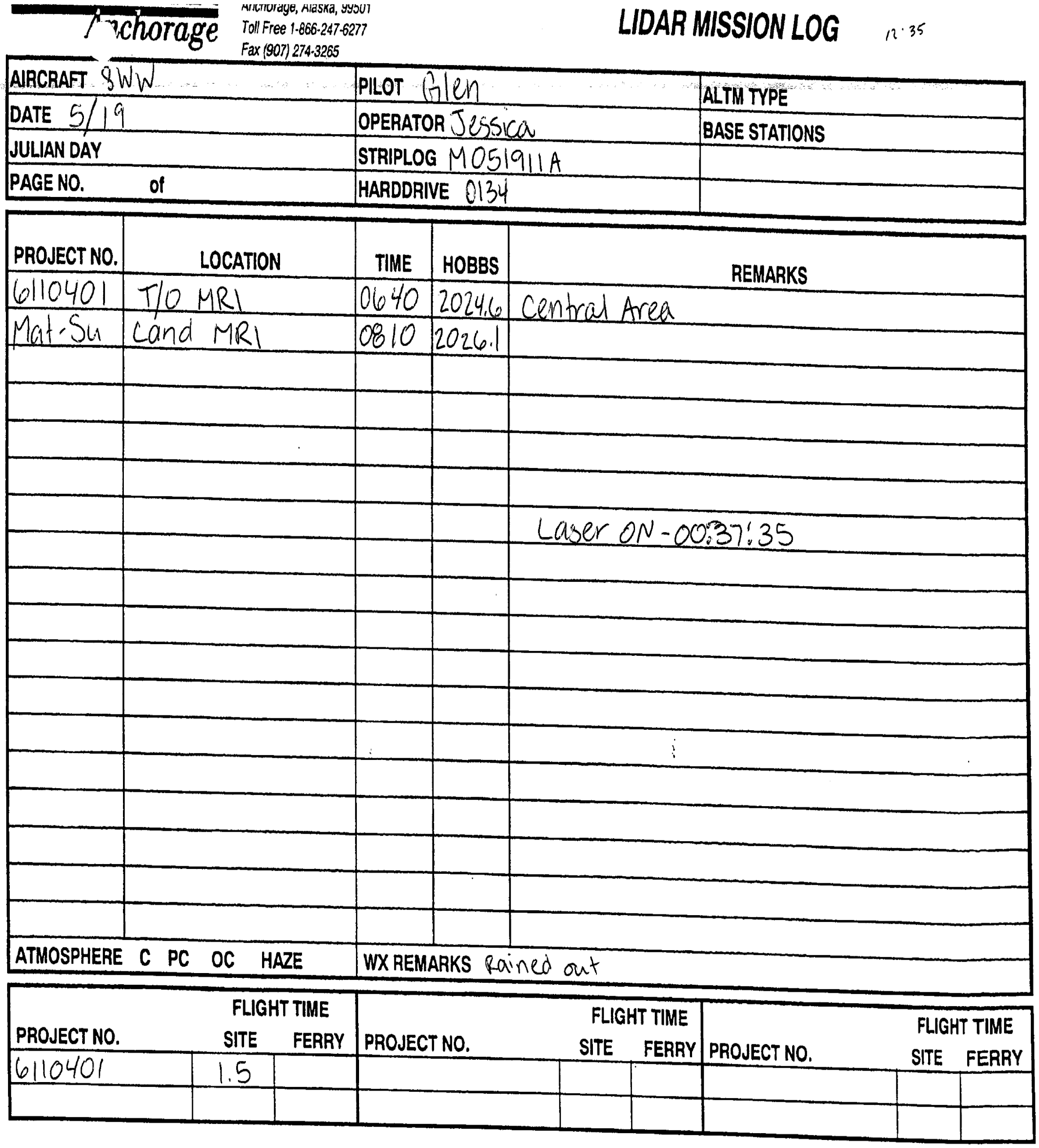
LIDAR MISSION LOG

AIRCRAFT 6GR
DATE 5-19-11
JULIAN DAY
PAGE NO. of
PILOT CZECHOWICZ
OPERATOR PACE
STRIPLOG L051911A
HARDDRIVE 1111
ALTM TYPE
BASE STATIONS

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
~~61104~~01	TO MRI		1773.4	STATIC 14:49 - 14:43
6110401	LAND MRI		1775.1	STATIC 16:41 - 16:44
				LASER ON TIME 00:44:31

ATMOSPHERE C PC OC HAZE
WX REMARKS

PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY
6110401	1.7							



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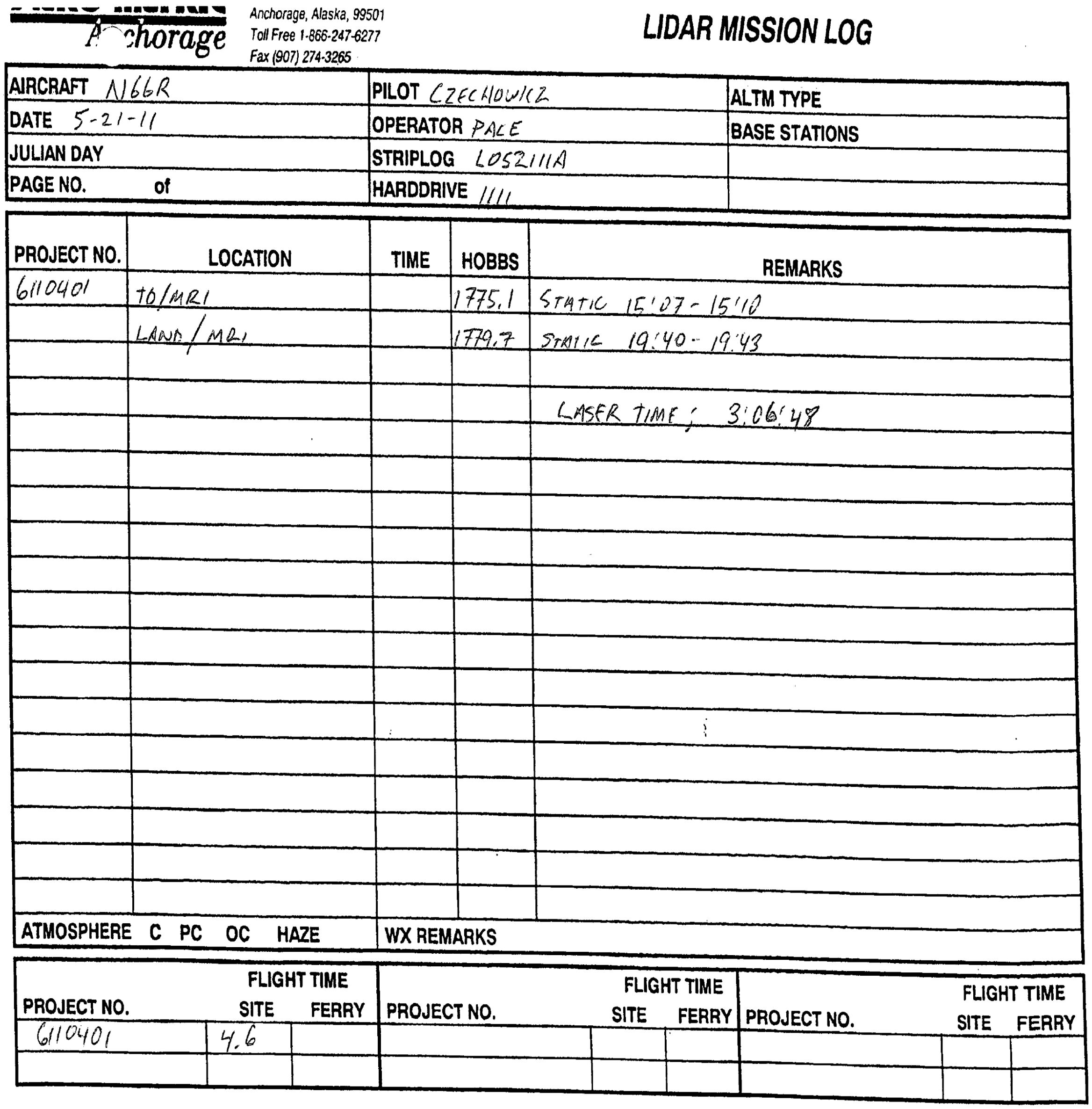
LIDAR MISSION LOG 12:35

AIRCRAFT 8WW	PILOT Glen	ALTM TYPE
DATE 5/19	OPERATOR Jessica	BASE STATIONS
JULIAN DAY	STRIPLOG M051911A	
PAGE NO. of	HARDDRIVE 0134	

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	T/O MR1	0640	2024.6	Central Area
Mat-Su	Land MR1	0810	2026.1	
				Laser ON-00:37:35

ATMOSPHERE C PC OC HAZE | WX REMARKS Rained out

PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY
6110401	1.5							



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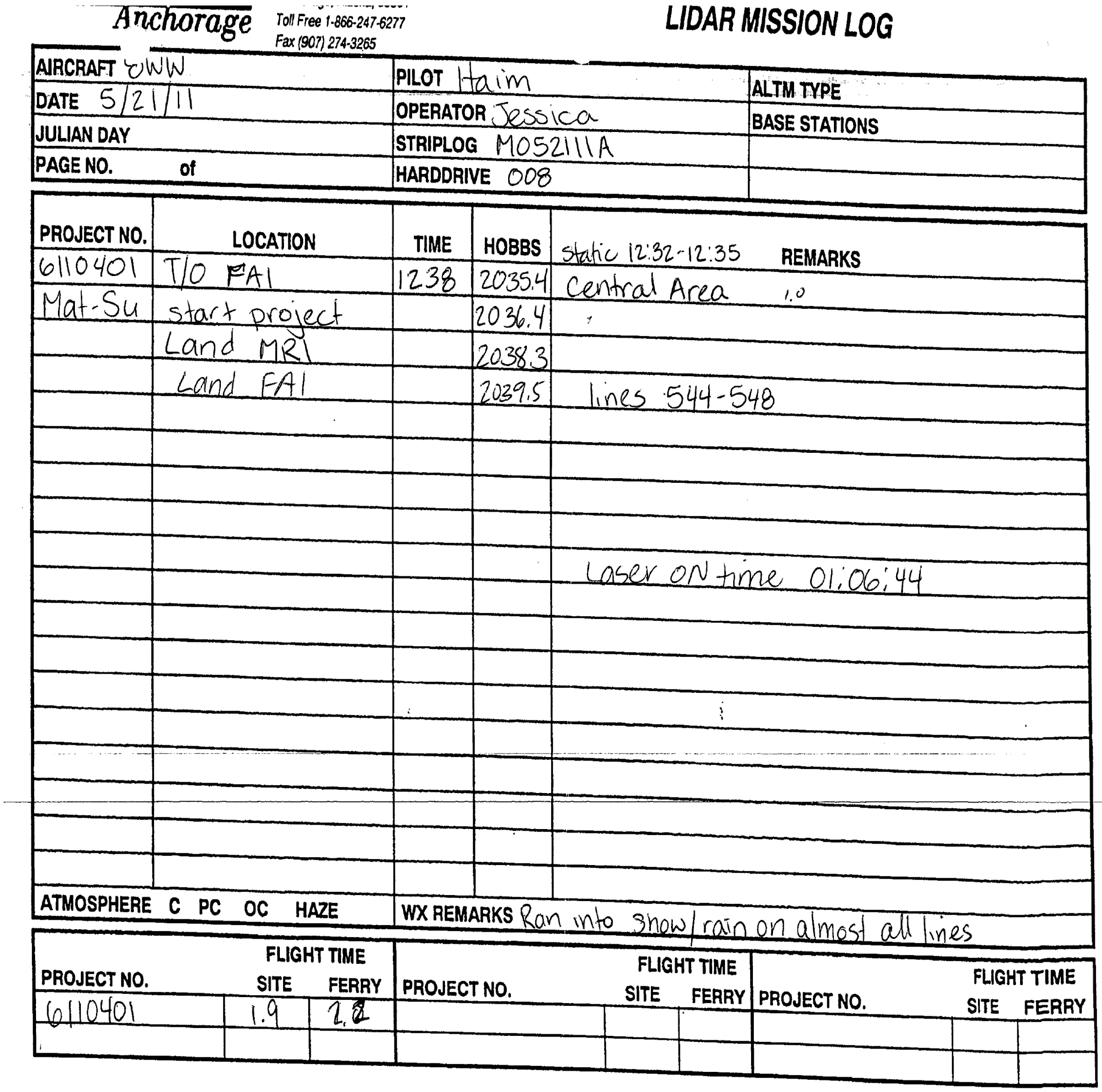
LIDAR MISSION LOG

AIRCRAFT N16R	PILOT CZECHOWICZ	ALTM TYPE
DATE 5-21-11	OPERATOR PACE	BASE STATIONS
JULIAN DAY	STRIPLOG L052111A	
PAGE NO. of	HARDDRIVE 1111	

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	TO/MRI		1775.1	STATIC 15'07 - 15'10
	LAND/MRI		1779.7	STATIC 19:40 - 19:43
				LASER TIME; 3:06:48

ATMOSPHERE C PC OC HAZE	WX REMARKS

PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY
6110401	4.6							



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LIDAR MISSION LOG

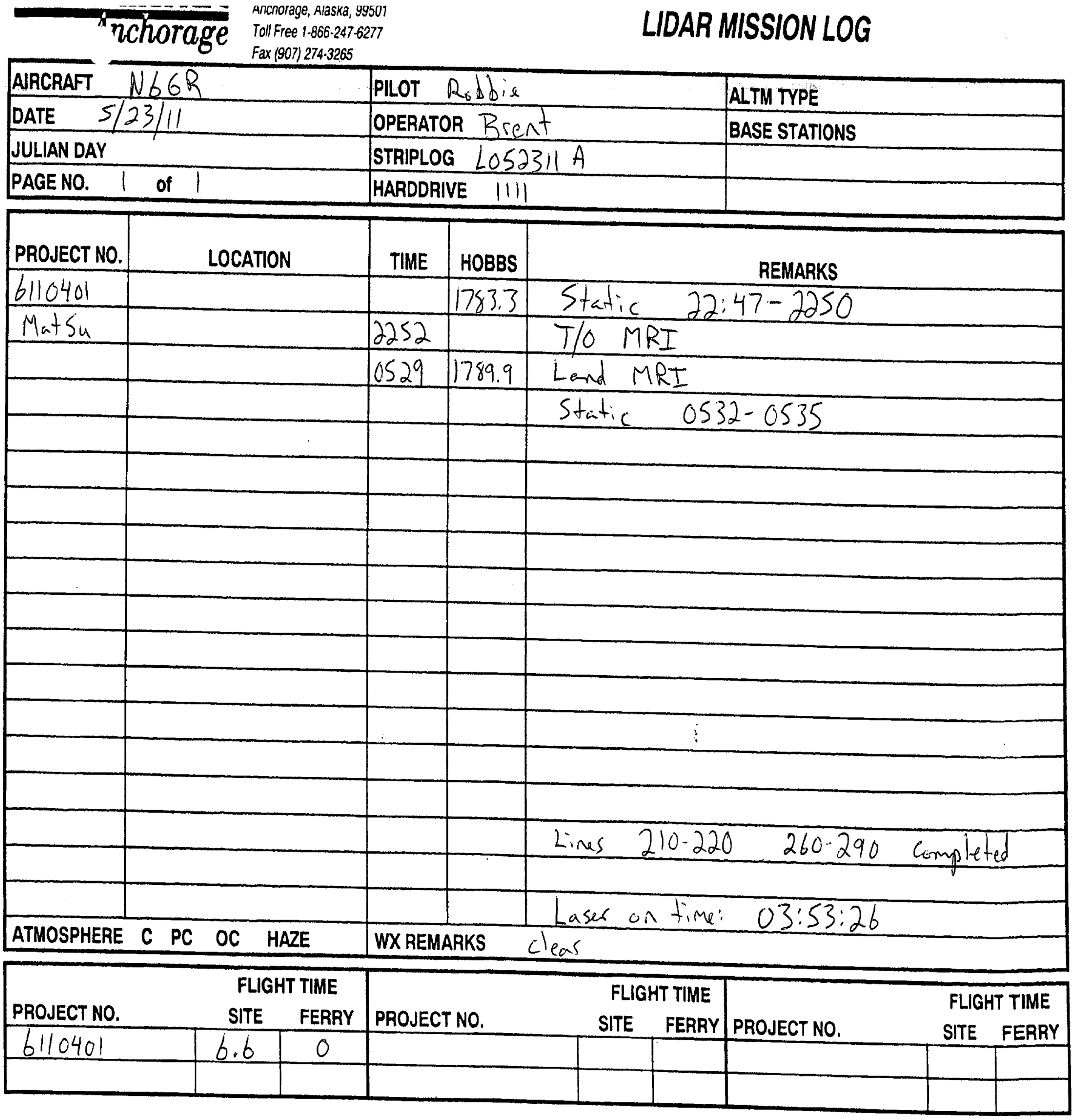
AIRCRAFT 8WW	PILOT Haim	ALTM TYPE
DATE 5/21/11	OPERATOR Jessica	BASE STATIONS
JULIAN DAY	STRIPLOG M052111A	
PAGE NO. of	HARDDRIVE 008	

PROJECT NO.	LOCATION	TIME	HOBBS	Static 12:32-12:35 REMARKS
6110401	T/O FAI	1238	2035.4	Central Area 1.0
Mat-Su	start project		2036.4	
	Land MRI		2038.3	
	Land FAI		2039.5	lines 544-548
				Laser ON time 01:06:44

ATMOSPHERE C PC OC HAZE

WX REMARKS Ran into snow/rain on almost all lines

PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY
6110401	1.9	2.8						



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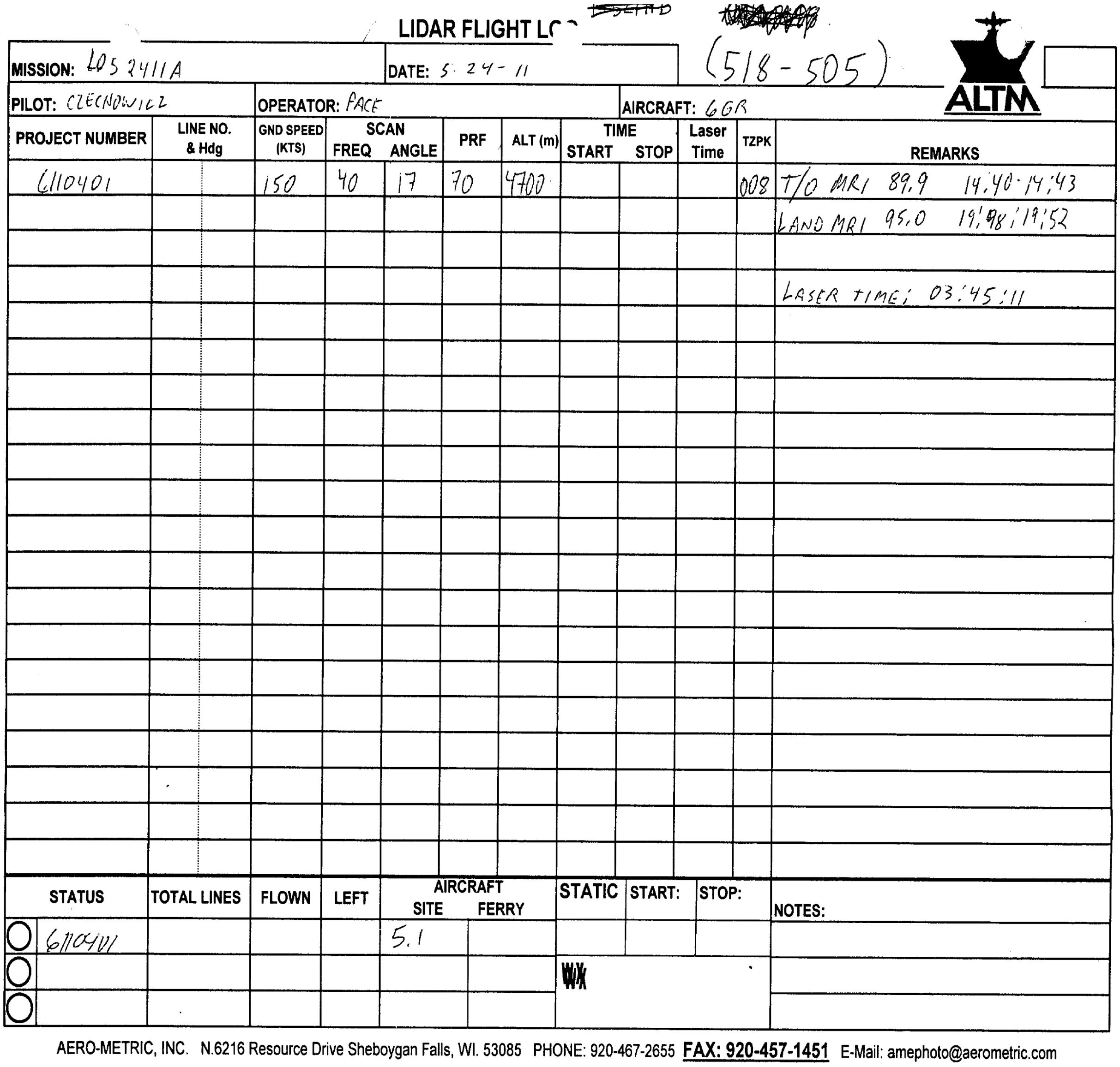
LIDAR MISSION LOG

AIRCRAFT N66R	PILOT Robbie	ALTM TYPE
DATE 5/23/11	OPERATOR Brent	BASE STATIONS
JULIAN DAY	STRIPLOG L052311 A	
PAGE NO. 1 of 1	HARDDRIVE 1111	

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401			1783.3	Static 22:47-2250
MatSu		2252		T/O MRI
		0529	1789.9	Land MRI
				Static 0532-0535
				Lines 210-220 260-290 Completed
				Laser on time: 03:53:26

ATMOSPHERE C PC OC HAZE	WX REMARKS clear

PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY
6110401	6.6	0						



LIDAR FLIGHT L

(518 - 505)

ALTM

MISSION: L05 2411A
DATE: 5 24 - 11
PILOT: CZECNOWICZ
OPERATOR: PACE
AIRCRAFT: 6GR

PROJECT NUMBER	LINE NO. & Hdg	GND SPEED (KTS)	SCAN		PRF	ALT (m)	TIME		Laser Time	TZPK	REMARKS
			FREQ	ANGLE			START	STOP			
6110401		150	40	17	70	4700				008	T/O MRI 89.9 14:40·14:43
											LAND MRI 95.0 19:48 / 19:52
											LASER TIME: 03:45:11

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	FERRY	STATIC	START:	STOP:	NOTES:
○ 6110401				5.1					
○						WX			
○									

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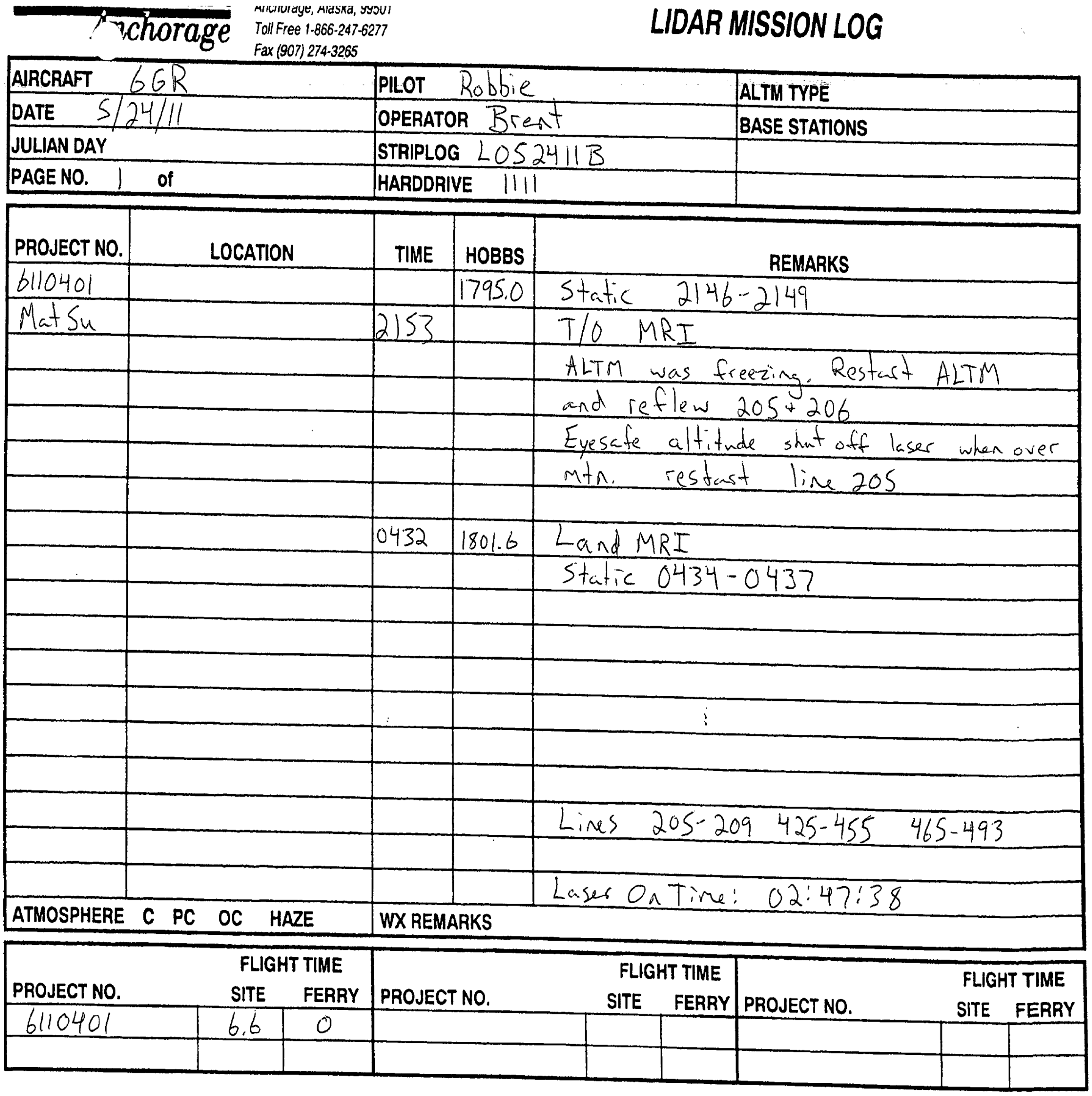

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LIDAR MISSION LOG

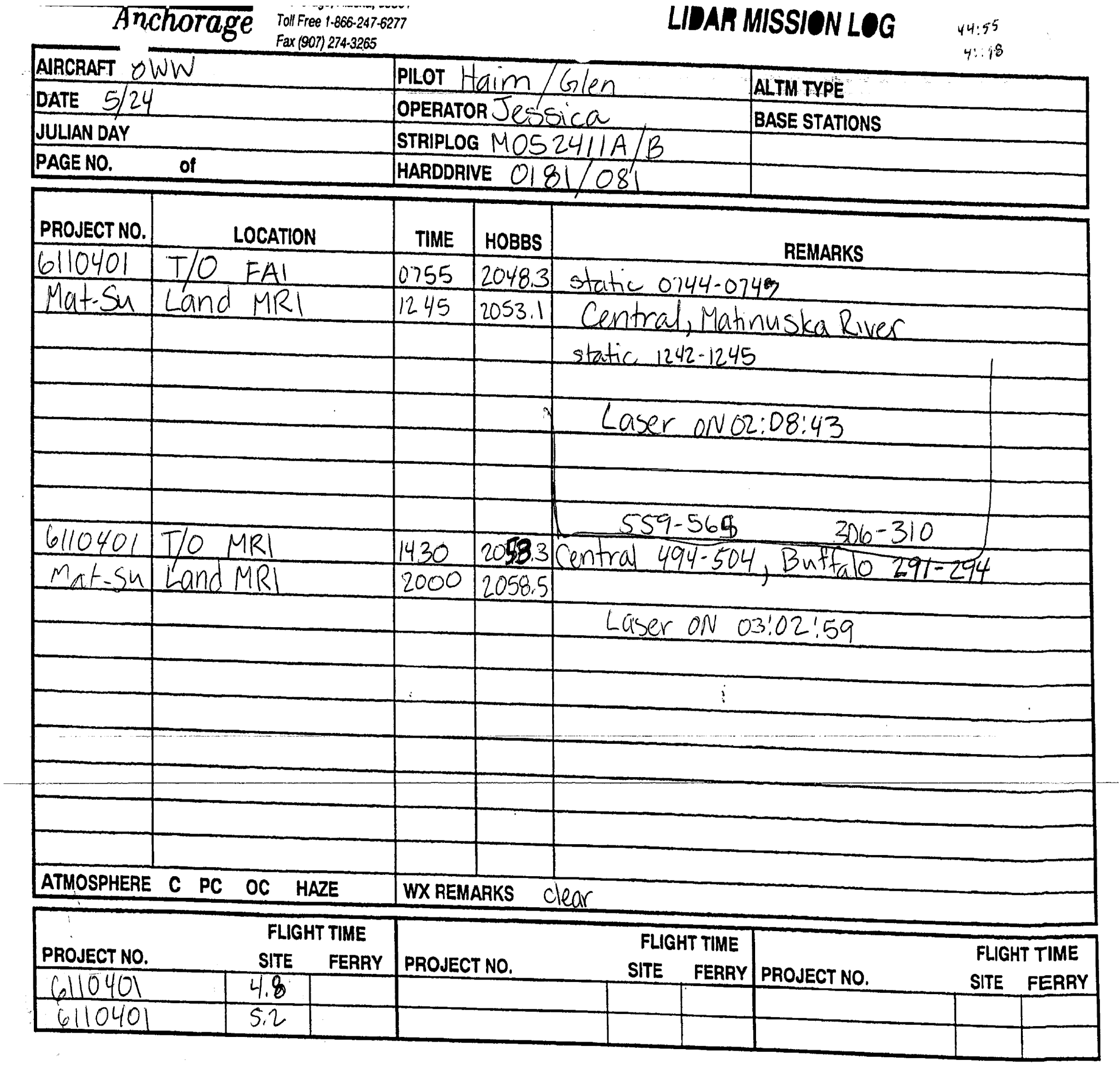
AIRCRAFT 6GR	**PILOT** Robbie	**ALTM TYPE**
DATE 5/24/11	**OPERATOR** Brent	**BASE STATIONS**
JULIAN DAY	**STRIPLOG** L052411B	
PAGE NO. 1 **of**	**HARDDRIVE** 1111	

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401			1795.0	Static 2146-2149
MatSu		2153		T/O MRI
				ALTM was freezing. Restart ALTM
				and reflew 205+206
				Eyesafe altitude shut off laser when over
				mtn. restart line 205
		0432	1801.6	Land MRI
				Static 0434-0437
				Lines 205-209 425-455 465-493
				Laser On Time: 02:47:38

ATMOSPHERE C PC OC HAZE

WX REMARKS

PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY
6110401	6.6	0						



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LIDAR MISSION LOG

44:55
41:18

AIRCRAFT oWW	PILOT Haim / Glen	ALTM TYPE	
DATE 5/24	OPERATOR Jessica	BASE STATIONS	
JULIAN DAY	STRIPLOG M052411A/B		
PAGE NO. of	HARDDRIVE 0181/081		

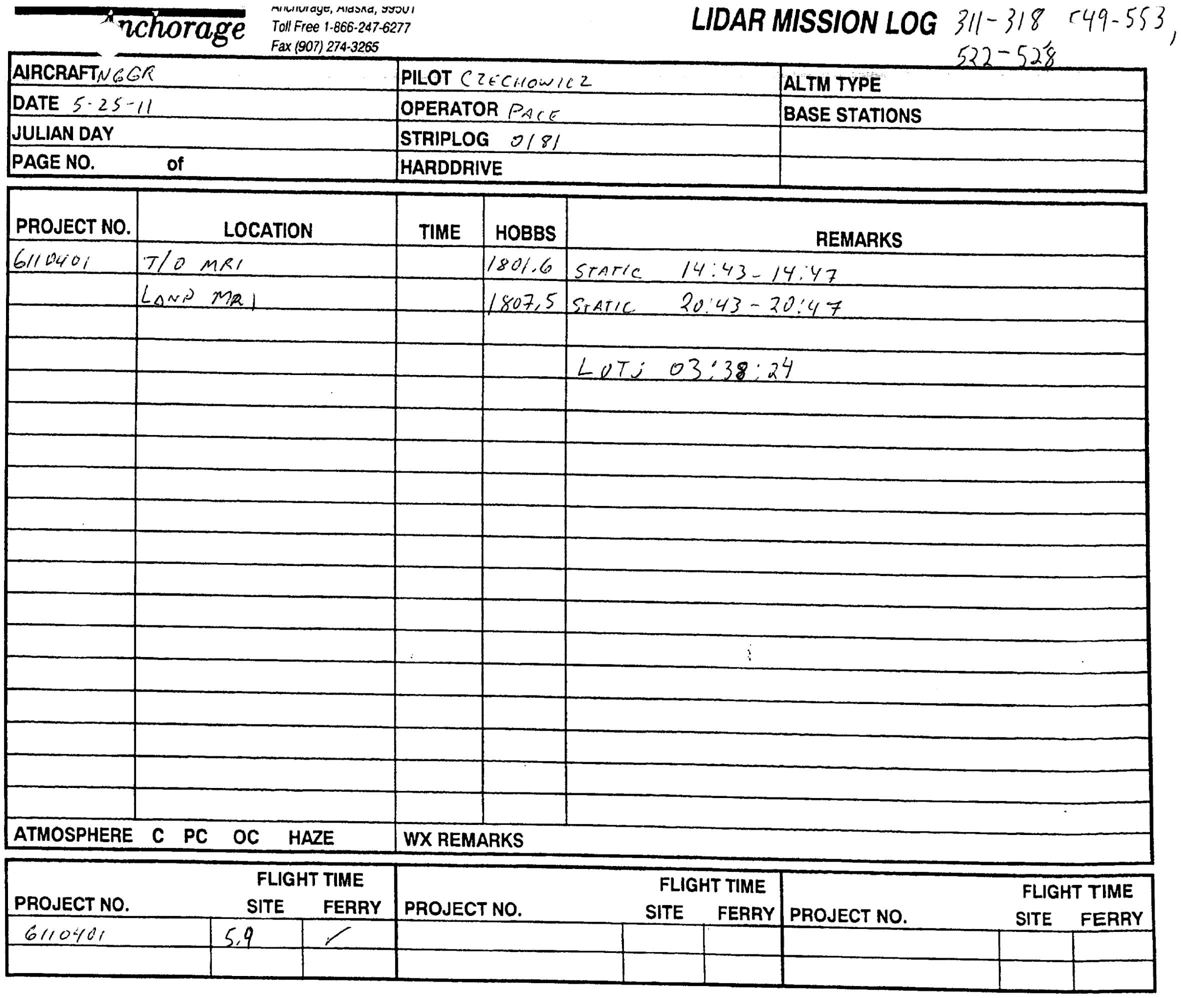
PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	T/O FAI	0755	2048.3	static 0744-0749
Mat-Su	Land MRI	1245	2053.1	Central, Matinuska River
				static 1242-1245
				Laser ON 02:08:43
				559-569 306-310
6110401	T/O MRI	1430	2053.3	Central 494-504, Buffalo 291-294
Mat-Su	Land MRI	2000	2058.5	
				Laser ON 03:02:59

ATMOSPHERE C PC OC HAZE

WX REMARKS clear

PROJECT NO.	FLIGHT TIME		PROJECT NO.	FLIGHT TIME		PROJECT NO.	FLIGHT TIME	
	SITE	FERRY		SITE	FERRY		SITE	FERRY
6110401	4.8							
6110401	5.2							

59:10



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LIDAR MISSION LOG 311-318 549-553, 522-528

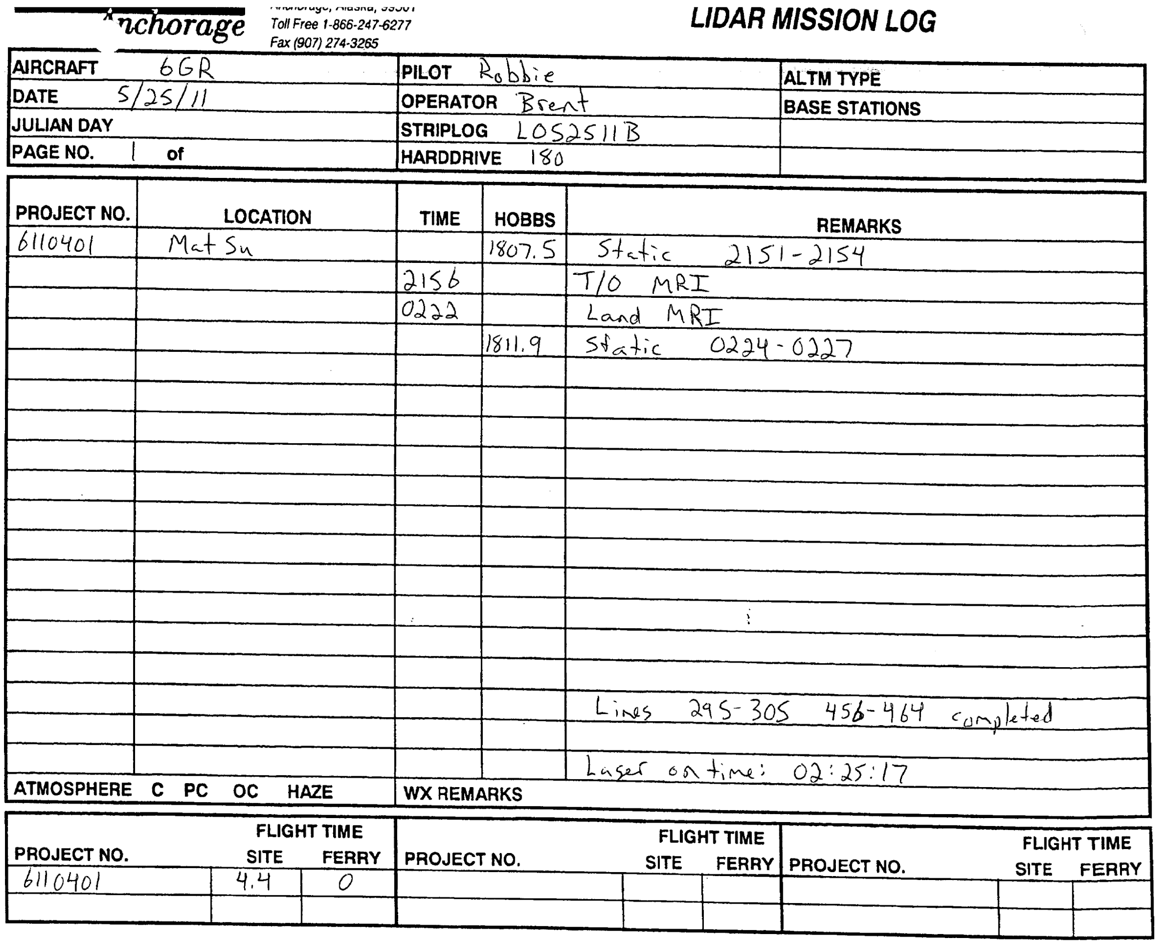
AIRCRAFT N6GR	**PILOT** CZECHOWICZ	**ALTM TYPE**
DATE 5-25-11	**OPERATOR** PACE	**BASE STATIONS**
JULIAN DAY	**STRIPLOG** 0181	
PAGE NO. of	**HARDDRIVE**	

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	T/O MRI		1801.6	STATIC 14:43-14:47
	LAND MRI		1807.5	STATIC 20:43-20:47
				LOTJ 03:38:24

ATMOSPHERE C PC OC HAZE

WX REMARKS

PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY
6110401	5.9	✓						



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LIDAR MISSION LOG

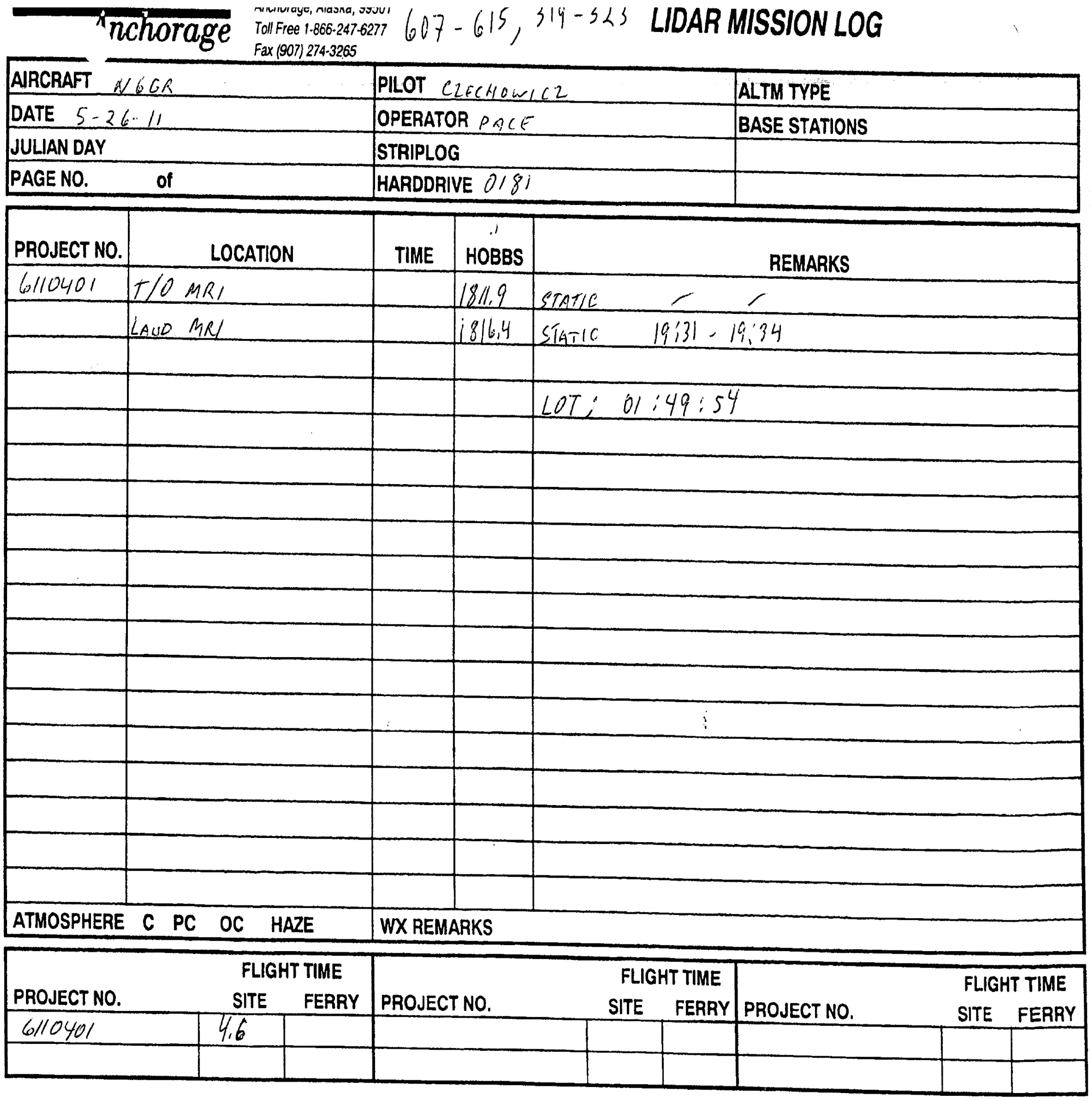
AIRCRAFT 6GR	PILOT Robbie	ALTM TYPE
DATE 5/25/11	OPERATOR Brent	BASE STATIONS
JULIAN DAY	STRIPLOG L052511B	
PAGE NO. 1 of	HARDDRIVE 180	

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	Mat Su		1807.5	Static 2151-2154
		2156		T/O MRI
		0222		Land MRI
			1811.9	Static 0224-0227
				Lines 295-305 456-464 completed
				Laser on time: 02:25:17

ATMOSPHERE C PC OC HAZE

WX REMARKS

PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY
6110401	4.4	0						



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607 - 615, 319 - 323 **LIDAR MISSION LOG**

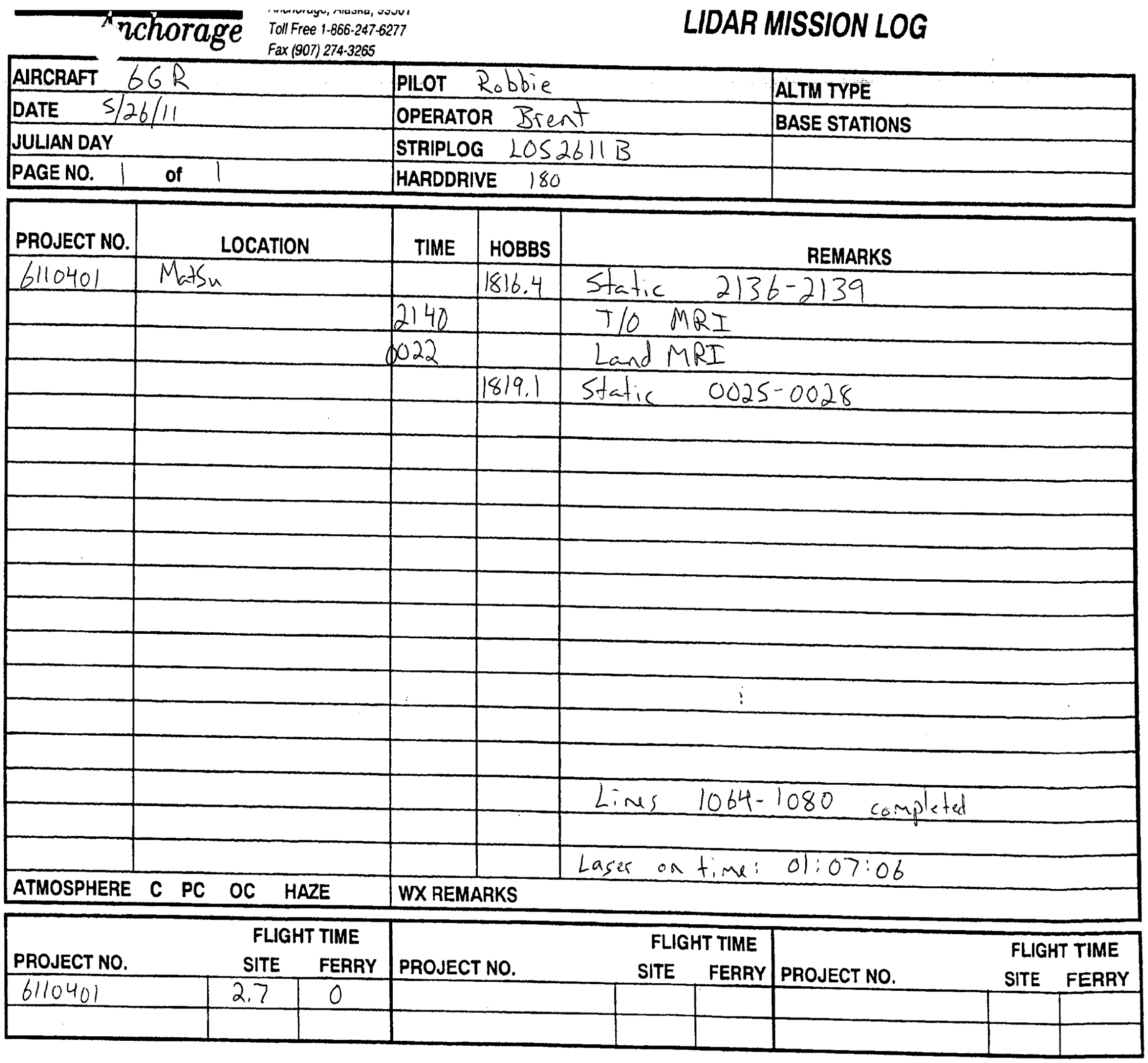
AIRCRAFT N6GR	PILOT CZECHOWICZ	ALTM TYPE
DATE 5-26-11	OPERATOR PACE	BASE STATIONS
JULIAN DAY	STRIPLOG	
PAGE NO. of	HARDDRIVE 0181	

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	T/O MRI		1811.9	STATIC ✓ ✓
	LAND MRI		1816.4	STATIC 19:31 - 19:34
				LOT; 01:49:54

ATMOSPHERE C PC OC HAZE

WX REMARKS

PROJECT NO.	FLIGHT TIME		PROJECT NO.	FLIGHT TIME		PROJECT NO.	FLIGHT TIME	
	SITE	FERRY		SITE	FERRY		SITE	FERRY
6110401	4.6							



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LIDAR MISSION LOG

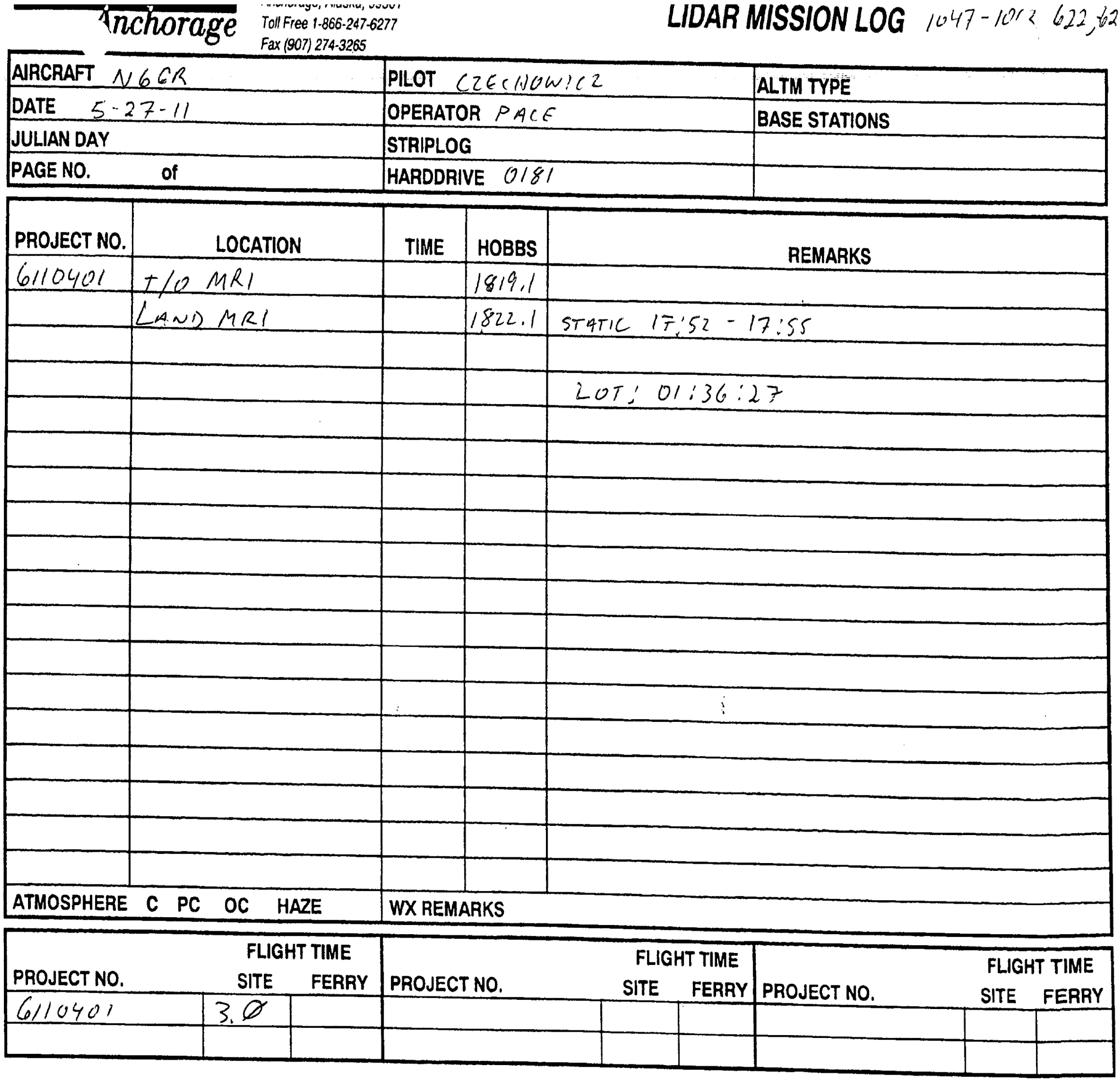
AIRCRAFT 66R	PILOT Robbie	ALTM TYPE
DATE 5/26/11	OPERATOR Brent	BASE STATIONS
JULIAN DAY	STRIPLOG LOS2611B	
PAGE NO. 1 of 1	HARDDRIVE 180	

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	MatSu		1816.4	Static 2136-2139
		2140		T/O MRI
		0022		Land MRI
			1819.1	Static 0025-0028
				Lines 1064-1080 completed
				Laser on time: 01:07:06

ATMOSPHERE C PC OC HAZE

WX REMARKS

PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY
6110401	2.7	0						



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LIDAR MISSION LOG 1047-1012 622,623

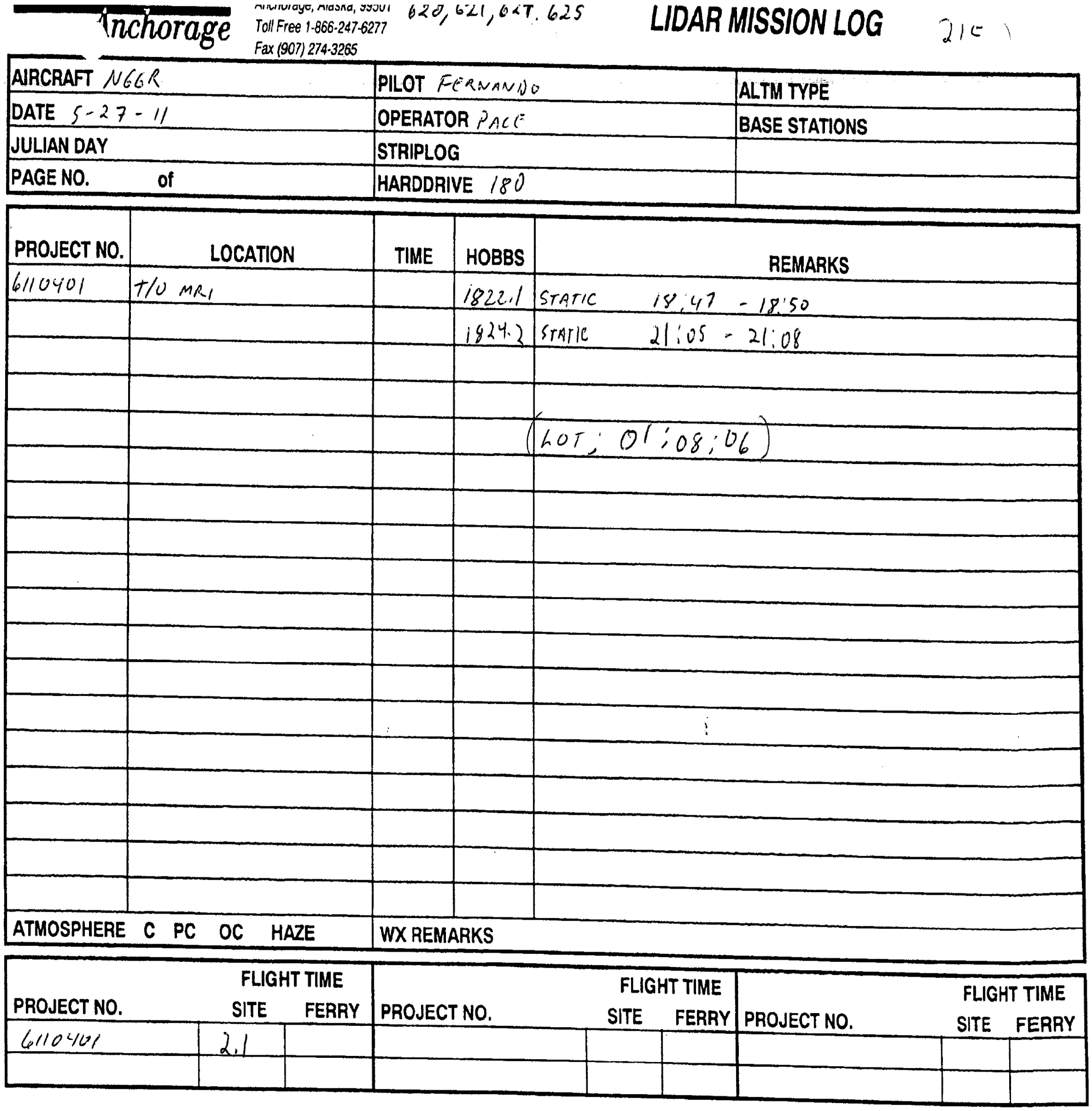
AIRCRAFT N6CR	PILOT CZECNOWICZ	ALTM TYPE
DATE 5-27-11	OPERATOR PACE	BASE STATIONS
JULIAN DAY	STRIPLOG	
PAGE NO. of	HARDDRIVE 0181	

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	T/O MRI		1819.1	
	LAND MRI		1822.1	STATIC 17:52 - 17:55
				LOT: 01:36:27

ATMOSPHERE C PC OC HAZE

WX REMARKS

PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY
6110401	3.0							



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620, 621, 62T. 625

LIDAR MISSION LOG

21C)

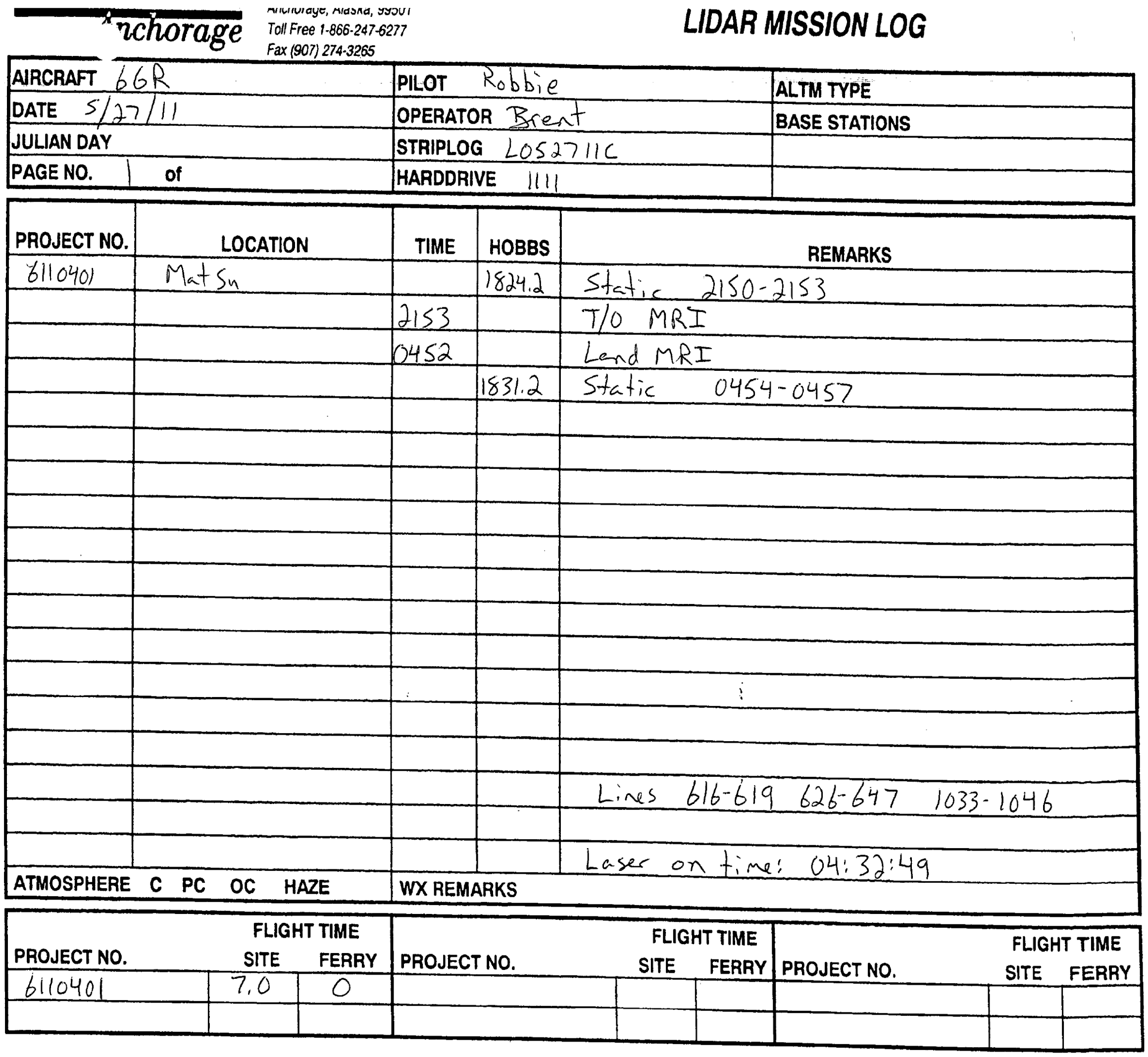
AIRCRAFT N66R	PILOT FERNANDO	ALTM TYPE
DATE 5-27-11	OPERATOR PACE	BASE STATIONS
JULIAN DAY	STRIPLOG	
PAGE NO. of	HARDDRIVE 180	

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	T/O MRI		1822.1	STATIC 18:47 - 18:50
			1824.2	STATIC 21:05 - 21:08
				(LOT; 01;08;06)

ATMOSPHERE C PC OC HAZE

WX REMARKS

PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY
6110401	2.1							



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LIDAR MISSION LOG

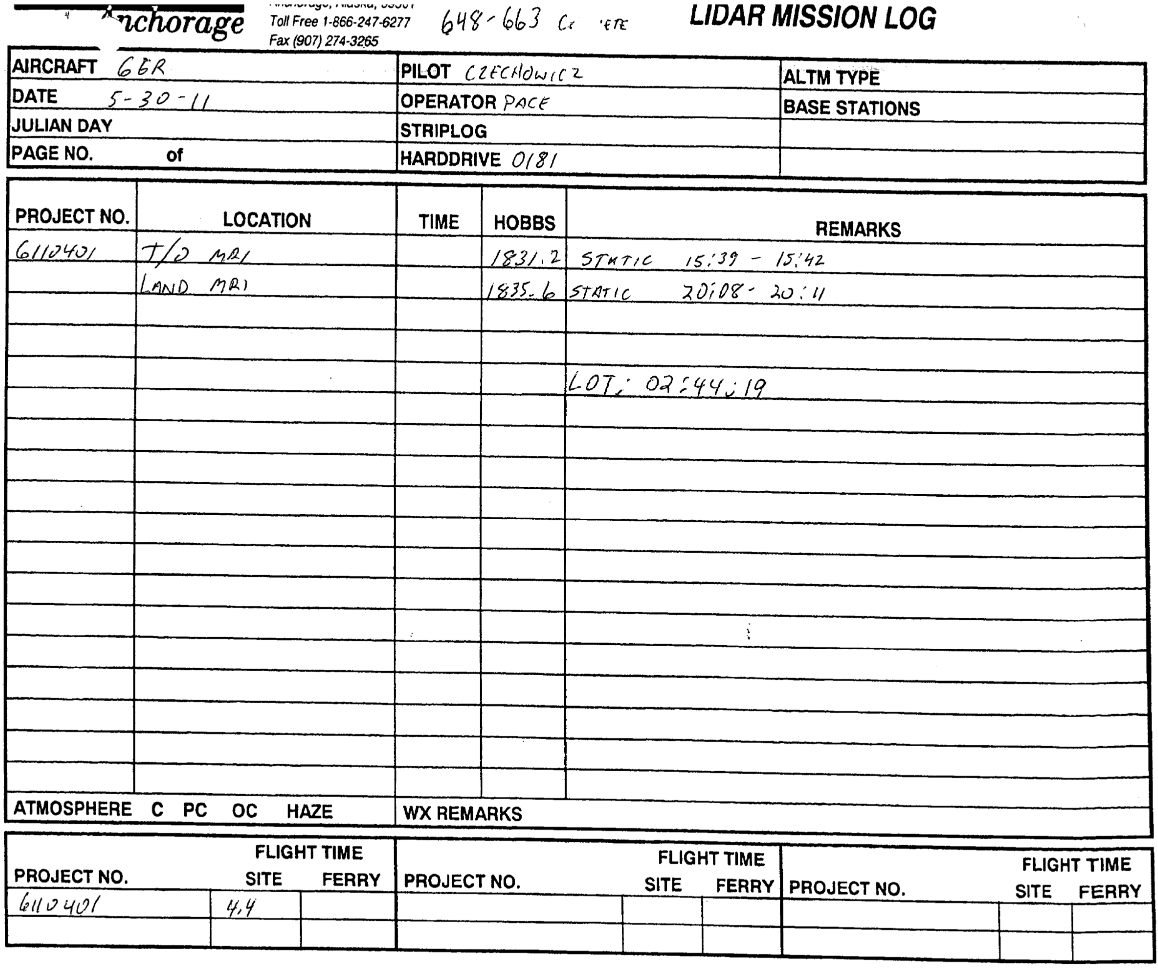
AIRCRAFT 66R	PILOT Robbie	ALTM TYPE
DATE 5/27/11	OPERATOR Brent	BASE STATIONS
JULIAN DAY	STRIPLOG L052711C	
PAGE NO. 1 of	HARDDRIVE 1111	

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	Mat Su		1824.2	Static 2150-2153
		2153		T/O MRI
		0452		Land MRI
			1831.2	Static 0454-0457
				Lines 616-619 626-647 1033-1046
				Laser on time: 04:32:49

ATMOSPHERE C PC OC HAZE

WX REMARKS

PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY
6110401	7.0	0						



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648-663 Cc 'ete

LIDAR MISSION LOG

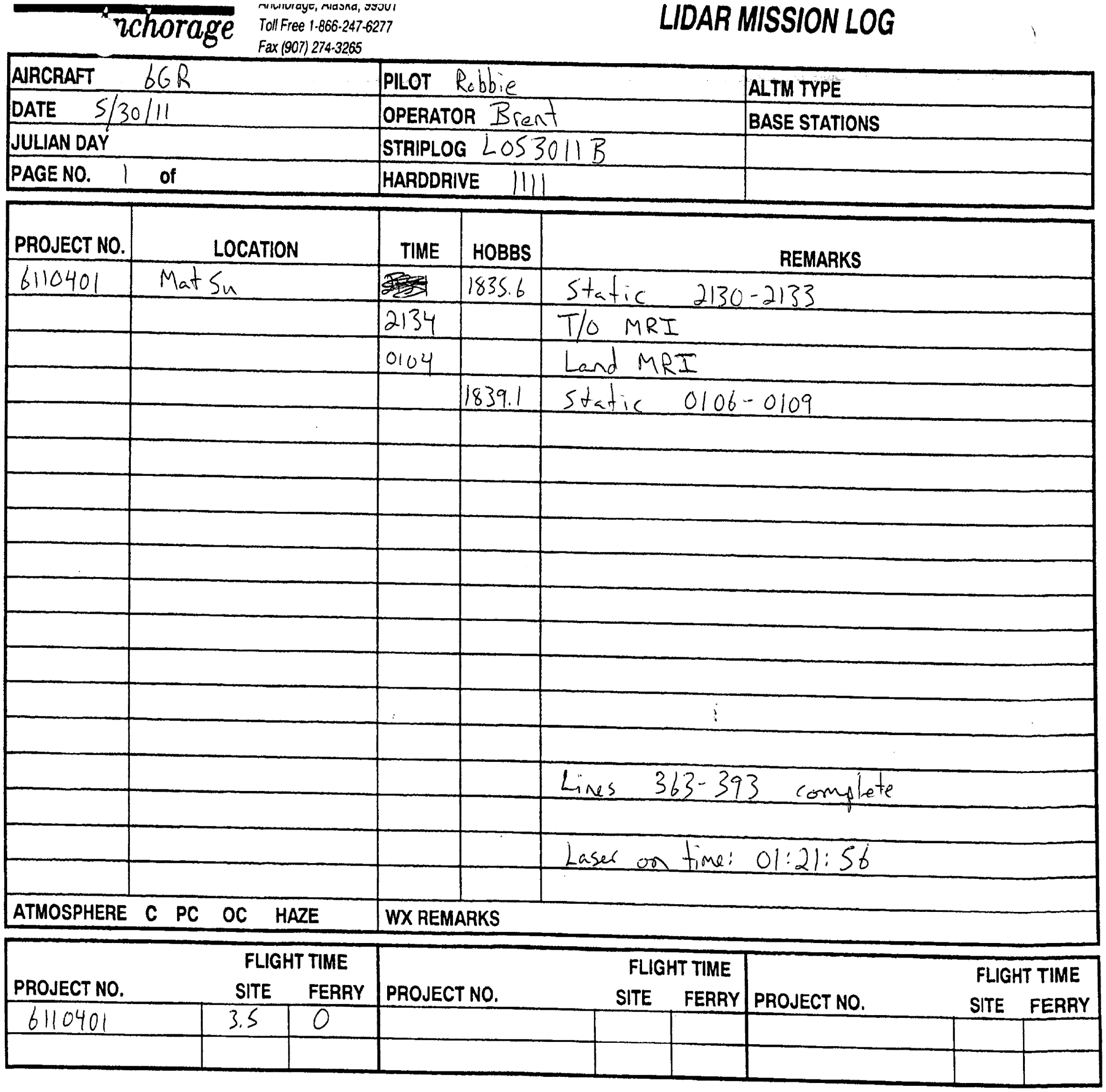
AIRCRAFT 6ER	**PILOT** CZECHOWICZ	**ALTM TYPE**
DATE 5-30-11	**OPERATOR** PACE	**BASE STATIONS**
JULIAN DAY	**STRIPLOG**	
PAGE NO. of	**HARDDRIVE** 0181	

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	T/O MRI		1831.2	STATIC 15:39 - 15:42
	LAND MRI		1835.6	STATIC 20:08 - 20:11
				LOT: 02:44:19

ATMOSPHERE C PC OC HAZE

WX REMARKS

PROJECT NO.	FLIGHT TIME		PROJECT NO.	FLIGHT TIME		PROJECT NO.	FLIGHT TIME	
	SITE	FERRY		SITE	FERRY		SITE	FERRY
6110401	4.4							



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LIDAR MISSION LOG

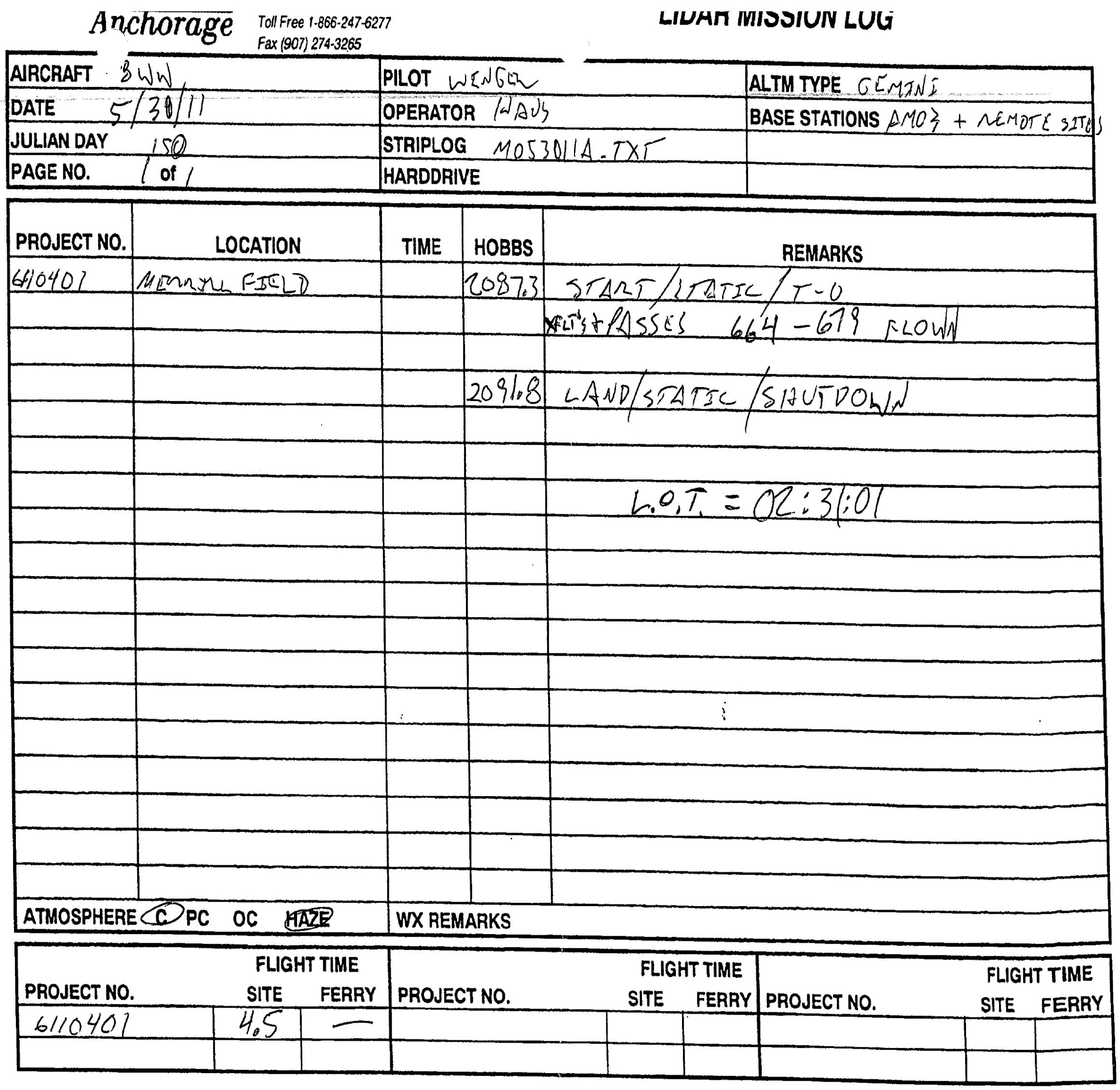
AIRCRAFT 6GR	PILOT Robbie	ALTM TYPE
DATE 5/30/11	OPERATOR Brent	BASE STATIONS
JULIAN DAY	STRIPLOG L053011B	
PAGE NO. 1 of	HARDDRIVE 1111	

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	Mat Su	~~[illegible]~~	1835.6	Static 2130-2133
		2134		T/O MRI
		0104		Land MRI
			1839.1	Static 0106-0109
				Lines 363-393 complete
				Laser on time: 01:21:56

ATMOSPHERE C PC OC HAZE

WX REMARKS

PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY
6110401	3.5	0						



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LIDAR MISSION LOG

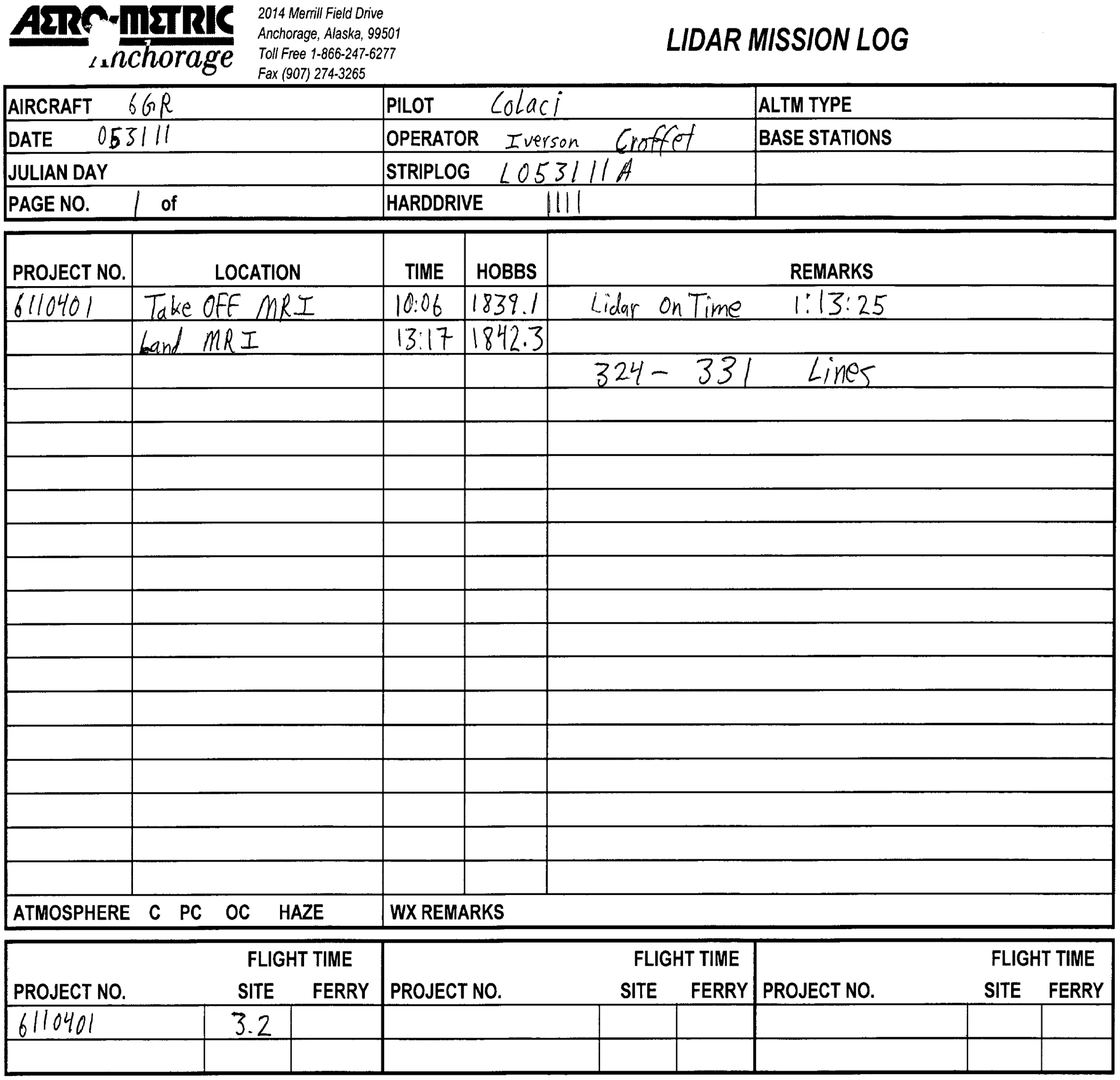
AIRCRAFT	BWW	PILOT	WENGER	ALTM TYPE	GEMINI
DATE	5/30/11	OPERATOR	WAUS	BASE STATIONS	AMO3 + REMOTE SITES
JULIAN DAY	150	STRIPLOG	M053011A-TXT		
PAGE NO.	1 of 1	HARDDRIVE			

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	MERRILL FIELD		2087.3	START/STATIC/T-O
				FLT'S+PASSES 664-679 FLOWN
			2091.8	LAND/STATIC/SHUTDOWN
				L.O.T. = 02:31:01

ATMOSPHERE [✓ C] PC OC [✓ HAZE]

WX REMARKS

PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY
6110401	4.5	—						



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LIDAR MISSION LOG

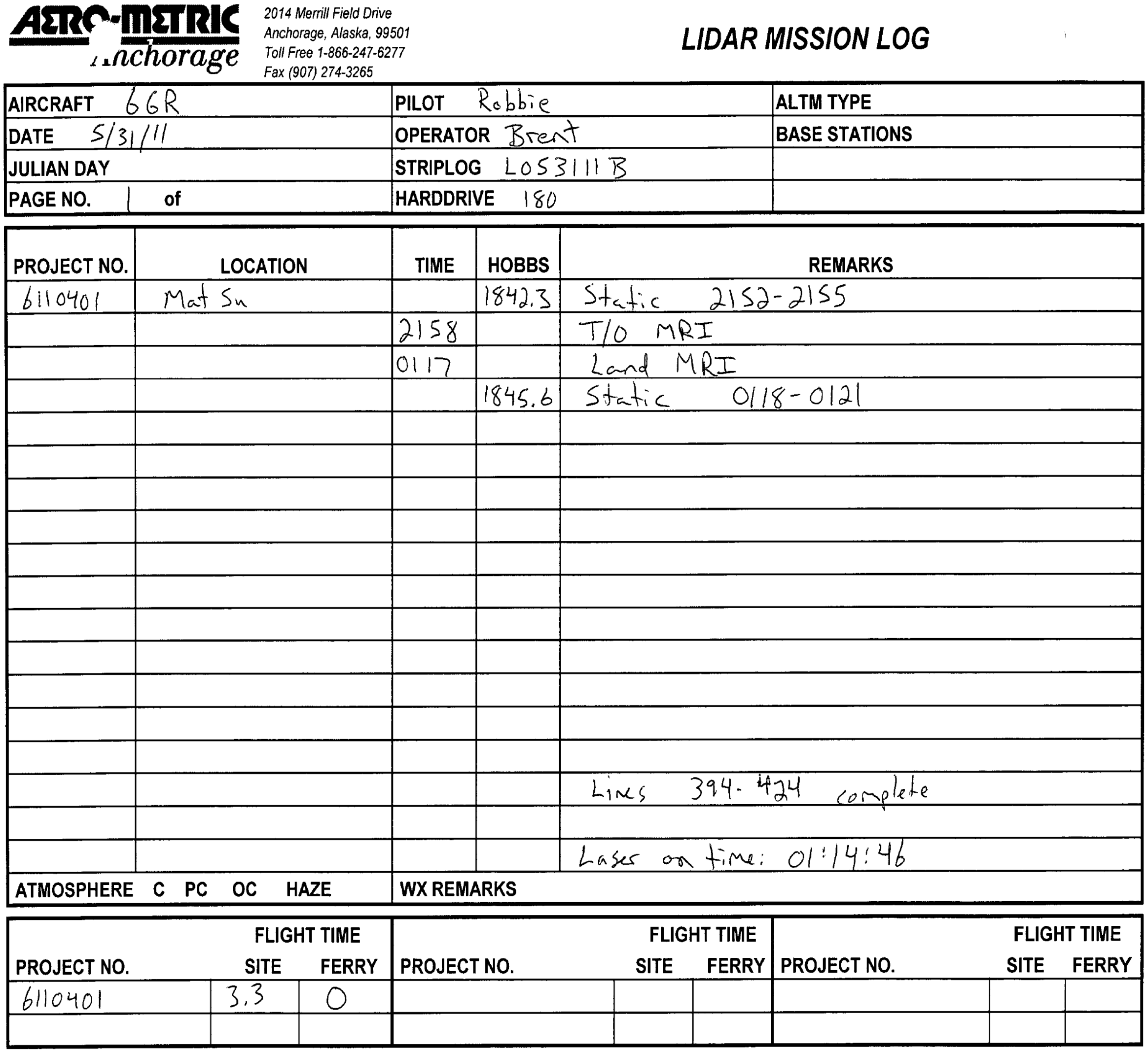
AIRCRAFT 66R	**PILOT** Colaci	**ALTM TYPE**
DATE 053111	**OPERATOR** Iverson Croffet	**BASE STATIONS**
JULIAN DAY	**STRIPLOG** L053111A	
PAGE NO. 1 **of**	**HARDDRIVE** 1111	

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	Take OFF MRI	10:06	1839.1	Lidar On Time 1:13:25
	Land MRI	13:17	1842.3	
				324 - 331 Lines

ATMOSPHERE C PC OC HAZE

WX REMARKS

	FLIGHT TIME			FLIGHT TIME			FLIGHT TIME	
PROJECT NO.	SITE	FERRY	PROJECT NO.	SITE	FERRY	PROJECT NO.	SITE	FERRY
6110401	3.2							



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LIDAR MISSION LOG

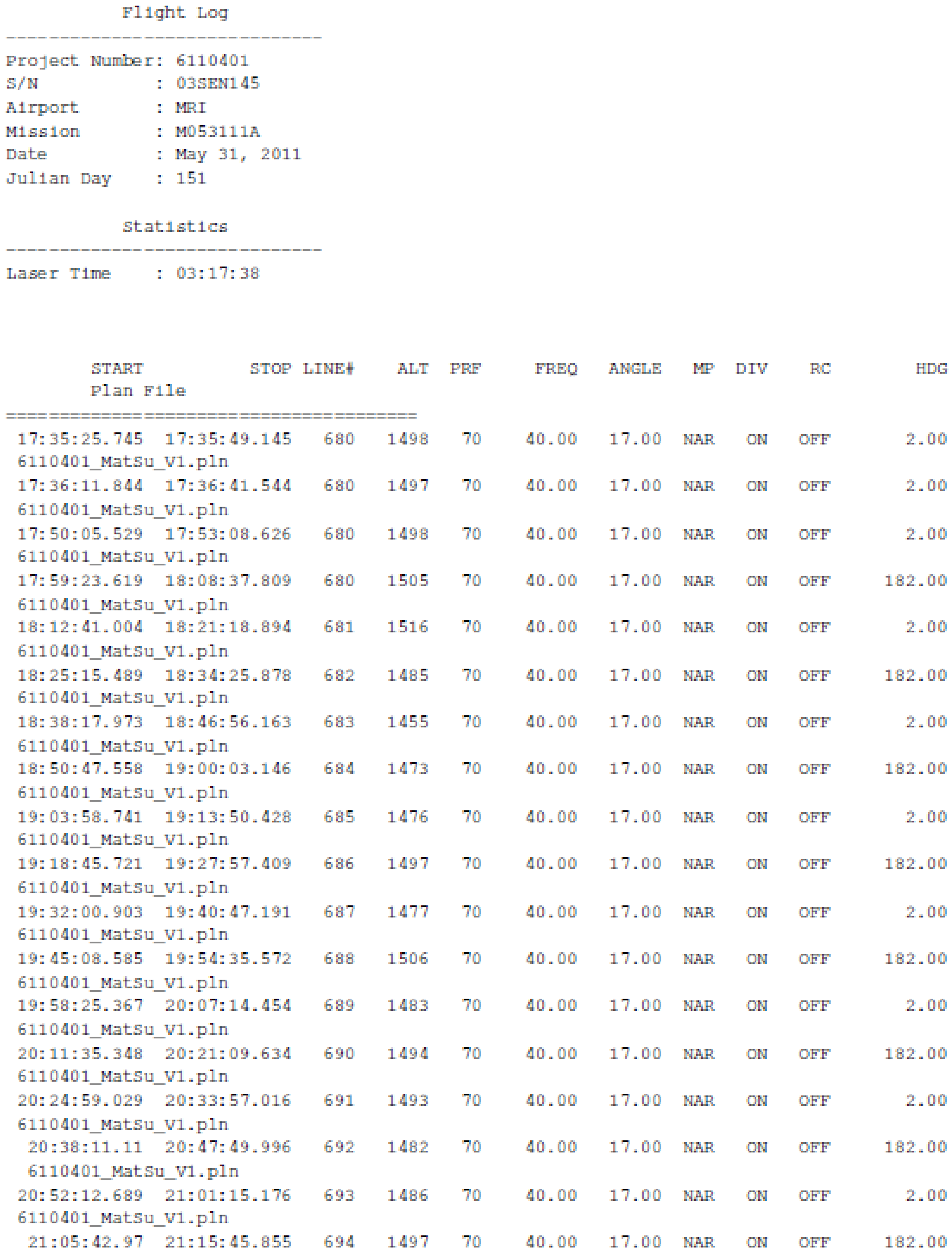
AIRCRAFT 66R	**PILOT** Robbie	**ALTM TYPE**
DATE 5/31/11	**OPERATOR** Brent	**BASE STATIONS**
JULIAN DAY	**STRIPLOG** L053111B	
PAGE NO. 1 **of**	**HARDDRIVE** 180	

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	Mat Su		1842.3	Static 2152-2155
		2158		T/O MRI
		0117		Land MRI
			1845.6	Static 0118-0121
				Lines 394-424 complete
				Laser on time: 01:14:46

ATMOSPHERE C PC OC HAZE **WX REMARKS**

	FLIGHT TIME			FLIGHT TIME			FLIGHT TIME	
PROJECT NO.	**SITE**	**FERRY**	**PROJECT NO.**	**SITE**	**FERRY**	**PROJECT NO.**	**SITE**	**FERRY**
6110401	3.3	0						

M053111A Paper Log Unavailable - Digital Log Included Here



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           Flight Log
------------------------------
Project Number: 6110401
S/N           : 03SEN145
Airport       : MRI
Mission       : M053111A
Date          : May 31, 2011
Julian Day    : 151

           Statistics
------------------------------
Laser Time    : 03:17:38



        START          STOP LINE#    ALT  PRF     FREQ   ANGLE   MP  DIV    RC         HDG
        Plan File
=======================================
 17:35:25.745  17:35:49.145   680   1498   70    40.00   17.00  NAR   ON   OFF        2.00
 6110401_MatSu_V1.pln
 17:36:11.844  17:36:41.544   680   1497   70    40.00   17.00  NAR   ON   OFF        2.00
 6110401_MatSu_V1.pln
 17:50:05.529  17:53:08.626   680   1498   70    40.00   17.00  NAR   ON   OFF        2.00
 6110401_MatSu_V1.pln
 17:59:23.619  18:08:37.809   680   1505   70    40.00   17.00  NAR   ON   OFF      182.00
 6110401_MatSu_V1.pln
 18:12:41.004  18:21:18.894   681   1516   70    40.00   17.00  NAR   ON   OFF        2.00
 6110401_MatSu_V1.pln
 18:25:15.489  18:34:25.878   682   1485   70    40.00   17.00  NAR   ON   OFF      182.00
 6110401_MatSu_V1.pln
 18:38:17.973  18:46:56.163   683   1455   70    40.00   17.00  NAR   ON   OFF        2.00
 6110401_MatSu_V1.pln
 18:50:47.558  19:00:03.146   684   1473   70    40.00   17.00  NAR   ON   OFF      182.00
 6110401_MatSu_V1.pln
 19:03:58.741  19:13:50.428   685   1476   70    40.00   17.00  NAR   ON   OFF        2.00
 6110401_MatSu_V1.pln
 19:18:45.721  19:27:57.409   686   1497   70    40.00   17.00  NAR   ON   OFF      182.00
 6110401_MatSu_V1.pln
 19:32:00.903  19:40:47.191   687   1477   70    40.00   17.00  NAR   ON   OFF        2.00
 6110401_MatSu_V1.pln
 19:45:08.585  19:54:35.572   688   1506   70    40.00   17.00  NAR   ON   OFF      182.00
 6110401_MatSu_V1.pln
 19:58:25.367  20:07:14.454   689   1483   70    40.00   17.00  NAR   ON   OFF        2.00
 6110401_MatSu_V1.pln
 20:11:35.348  20:21:09.634   690   1494   70    40.00   17.00  NAR   ON   OFF      182.00
 6110401_MatSu_V1.pln
 20:24:59.029  20:33:57.016   691   1493   70    40.00   17.00  NAR   ON   OFF        2.00
 6110401_MatSu_V1.pln
  20:38:11.11  20:47:49.996   692   1482   70    40.00   17.00  NAR   ON   OFF      182.00
  6110401_MatSu_V1.pln
 20:52:12.689  21:01:15.176   693   1486   70    40.00   17.00  NAR   ON   OFF        2.00
 6110401_MatSu_V1.pln
  21:05:42.97  21:15:45.855   694   1497   70    40.00   17.00  NAR   ON   OFF      182.00
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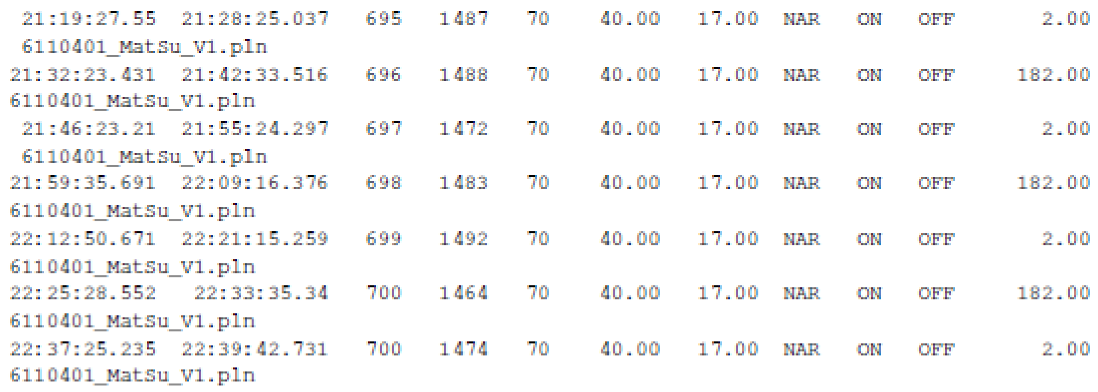

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 21:19:27.55  21:28:25.037   695   1487   70    40.00    17.00  NAR   ON   OFF       2.00
 6110401_MatSu_V1.pln
21:32:23.431  21:42:33.516   696   1488   70    40.00    17.00  NAR   ON   OFF     182.00
6110401_MatSu_V1.pln
 21:46:23.21  21:55:24.297   697   1472   70    40.00    17.00  NAR   ON   OFF       2.00
 6110401_MatSu_V1.pln
21:59:35.691  22:09:16.376   698   1483   70    40.00    17.00  NAR   ON   OFF     182.00
6110401_MatSu_V1.pln
22:12:50.671  22:21:15.259   699   1492   70    40.00    17.00  NAR   ON   OFF       2.00
6110401_MatSu_V1.pln
22:25:28.552   22:33:35.34   700   1464   70    40.00    17.00  NAR   ON   OFF     182.00
6110401_MatSu_V1.pln
22:37:25.235  22:39:42.731   700   1474   70    40.00    17.00  NAR   ON   OFF       2.00
6110401_MatSu_V1.pln
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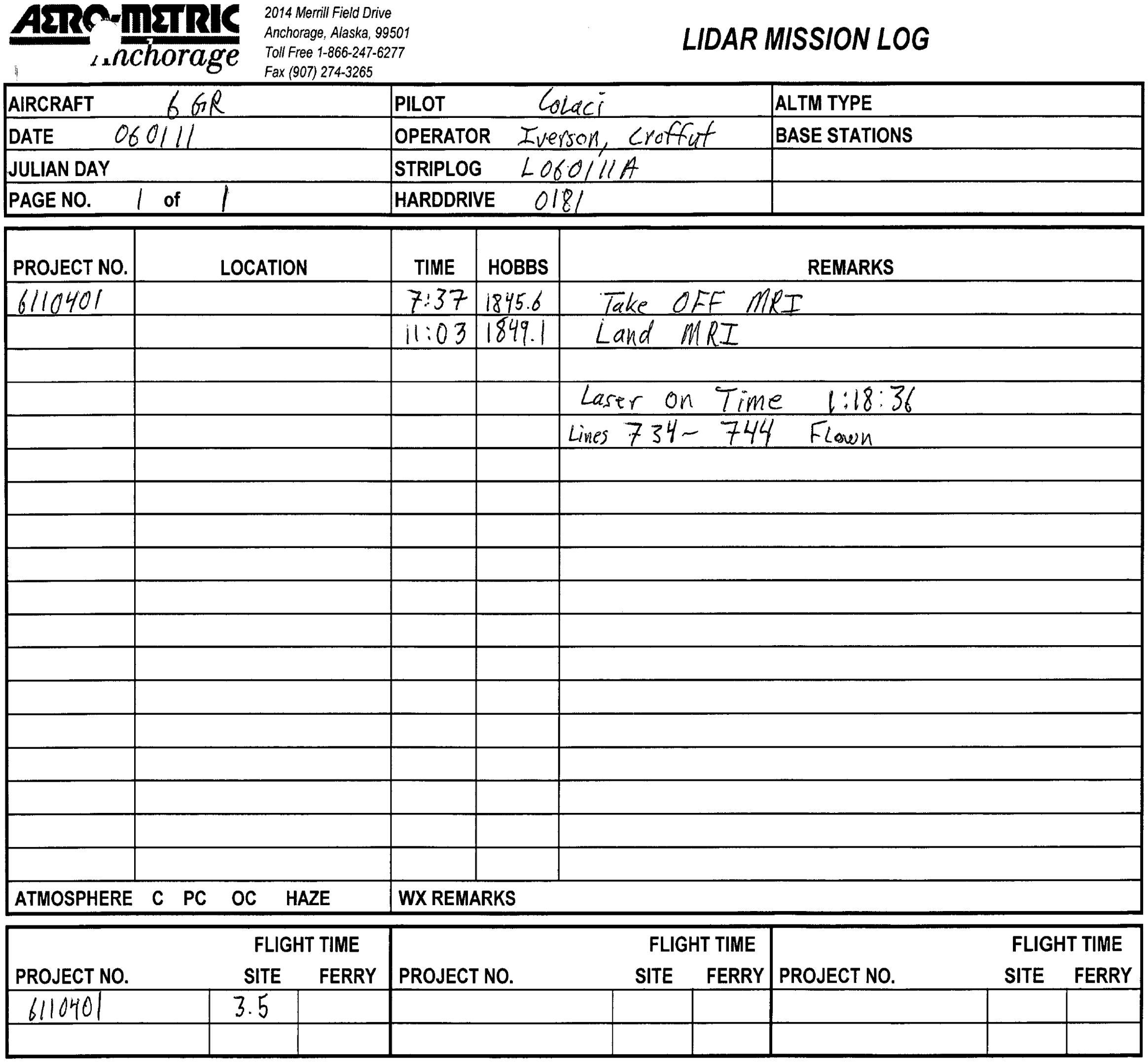
June 2011 Logs



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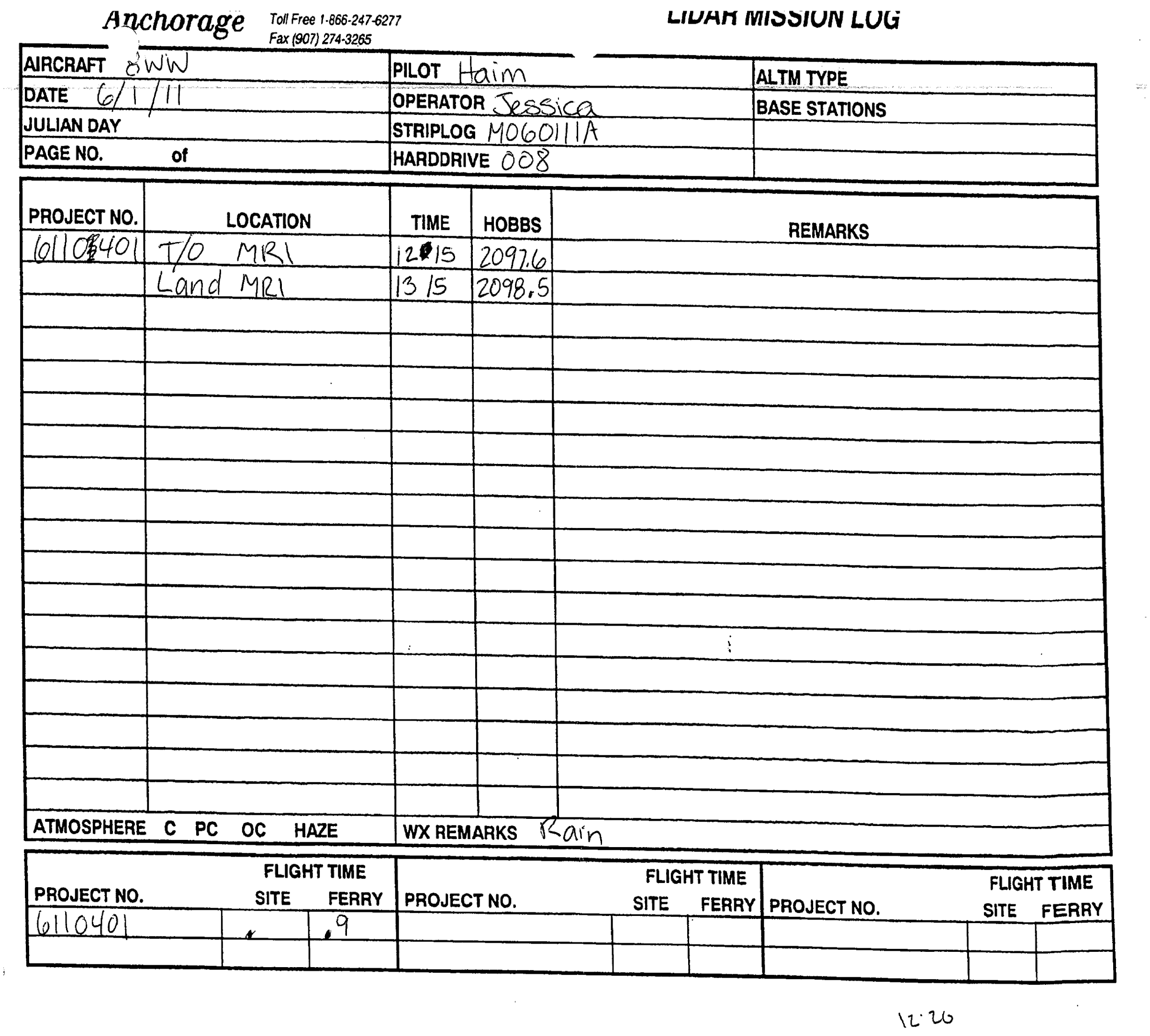
LIDAR MISSION LOG

AIRCRAFT 6 GR	PILOT Colaci	ALTM TYPE
DATE 060111	OPERATOR Iverson, Croffut	BASE STATIONS
JULIAN DAY	STRIPLOG L060111A	
PAGE NO. 1 of 1	HARDDRIVE 0181	

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401		7:37	1845.6	Take OFF MRI
		11:03	1849.1	Land MRI
				Laser on Time 1:18:36
				Lines 734- 744 Flown
ATMOSPHERE C PC OC HAZE		WX REMARKS		

	FLIGHT TIME			FLIGHT TIME			FLIGHT TIME	
PROJECT NO.	SITE	FERRY	PROJECT NO.	SITE	FERRY	PROJECT NO.	SITE	FERRY
6110401	3.5							



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LIDAR MISSION LOG

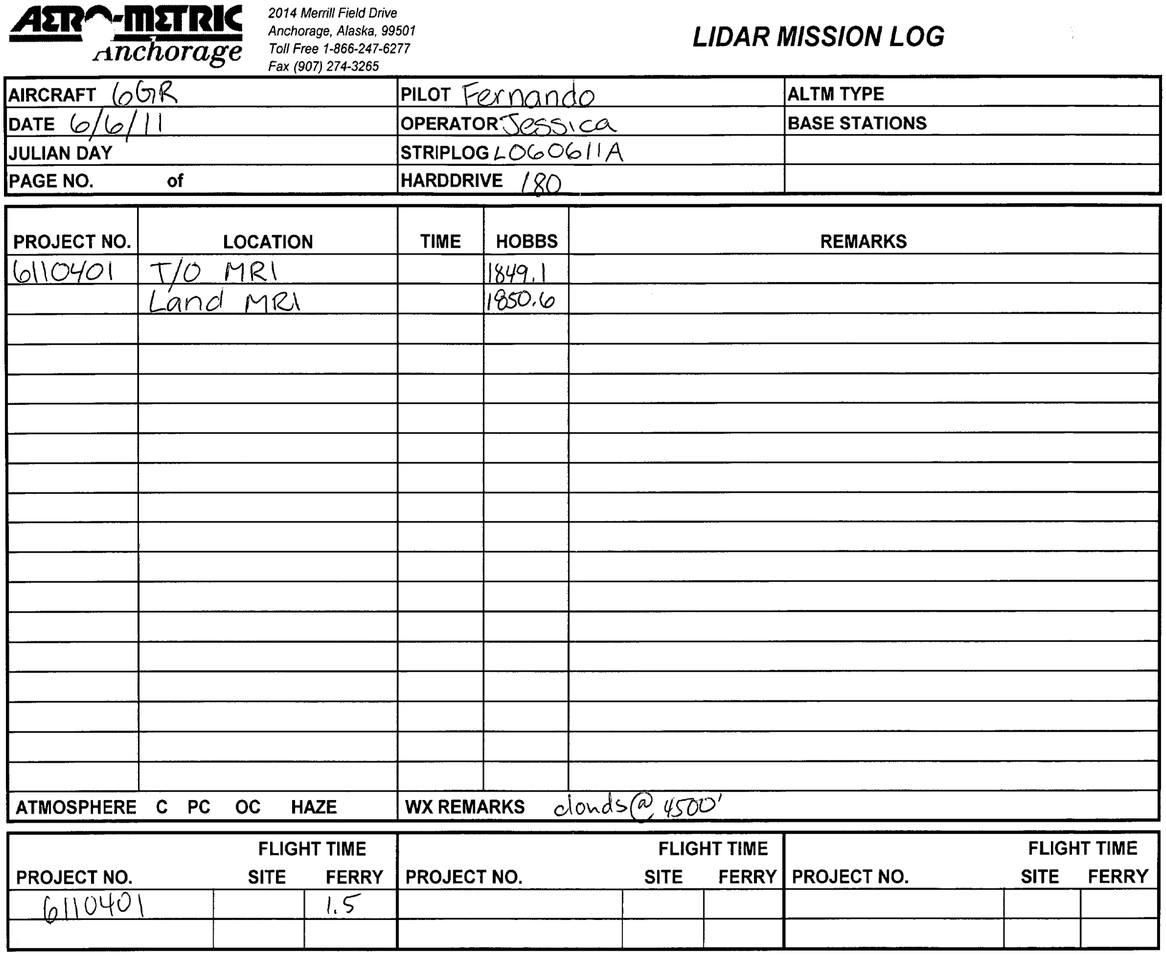
AIRCRAFT 8WW
DATE 6/1/11
JULIAN DAY
PAGE NO. of
PILOT Haim
OPERATOR Jessica
STRIPLOG M060111A
HARDDRIVE 008
ALTM TYPE
BASE STATIONS

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	T/O MRI	1215	2097.6	
	Land MRI	13 15	2098.5	

ATMOSPHERE C PC OC HAZE
WX REMARKS Rain

PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY
6110401	.	.9						

12:26



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LIDAR MISSION LOG

AIRCRAFT 6GR	PILOT Fernando	ALTM TYPE
DATE 6/6/11	OPERATOR Jessica	BASE STATIONS
JULIAN DAY	STRIPLOG L060611A	
PAGE NO. of	HARDDRIVE 180	

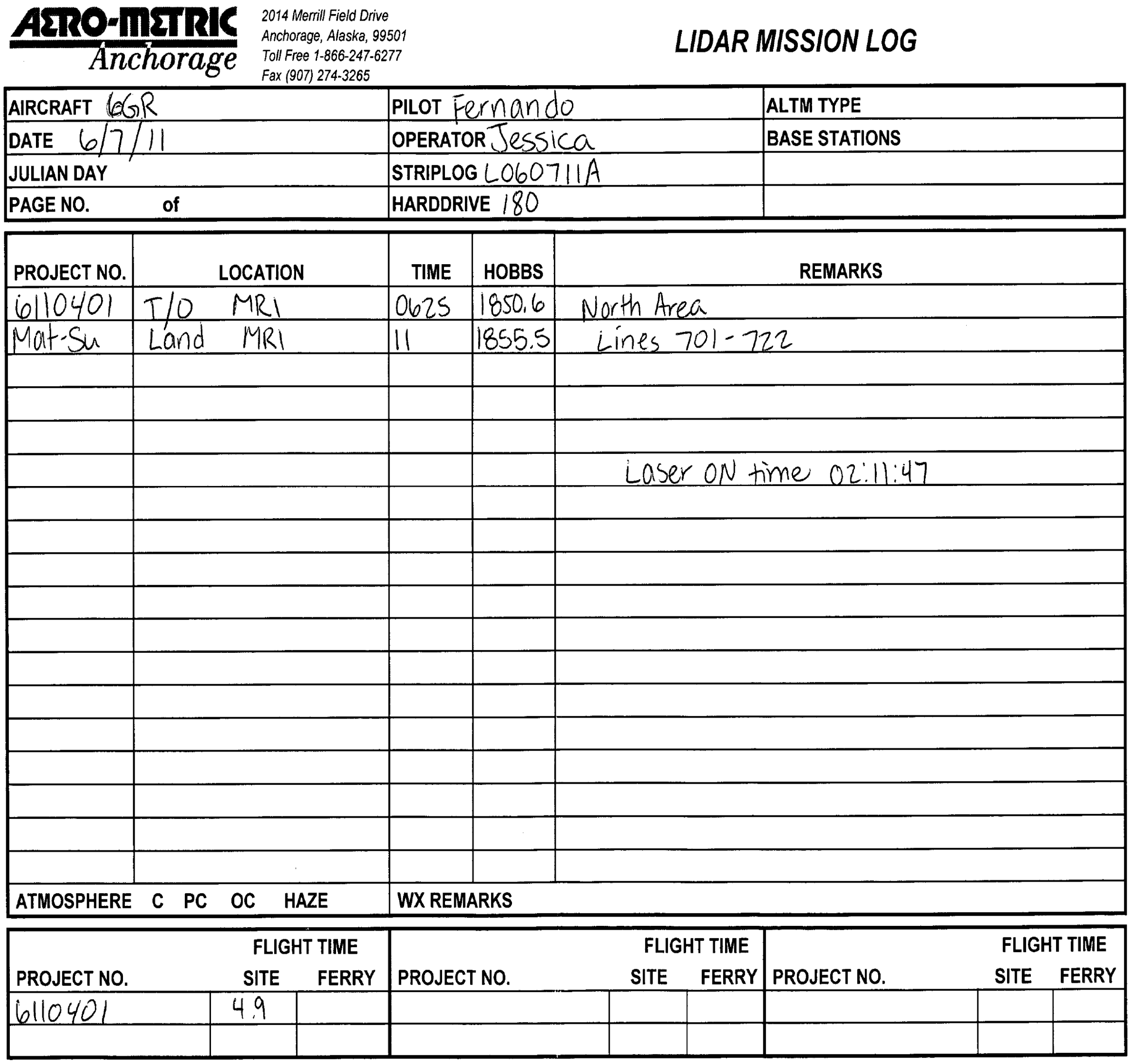
PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	T/O MRI		1849.1	
	Land MRI		1850.6	

ATMOSPHERE C PC OC HAZE

WX REMARKS clouds@ 4500'

PROJECT NO.	FLIGHT TIME		PROJECT NO.	FLIGHT TIME		PROJECT NO.	FLIGHT TIME	
	SITE	FERRY		SITE	FERRY		SITE	FERRY
6110401		1.5						

14'15



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LIDAR MISSION LOG

AIRCRAFT 6GR	PILOT Fernando	ALTM TYPE
DATE 6/7/11	OPERATOR Jessica	BASE STATIONS
JULIAN DAY	STRIPLOG L060711A	
PAGE NO. of	HARDDRIVE 180	

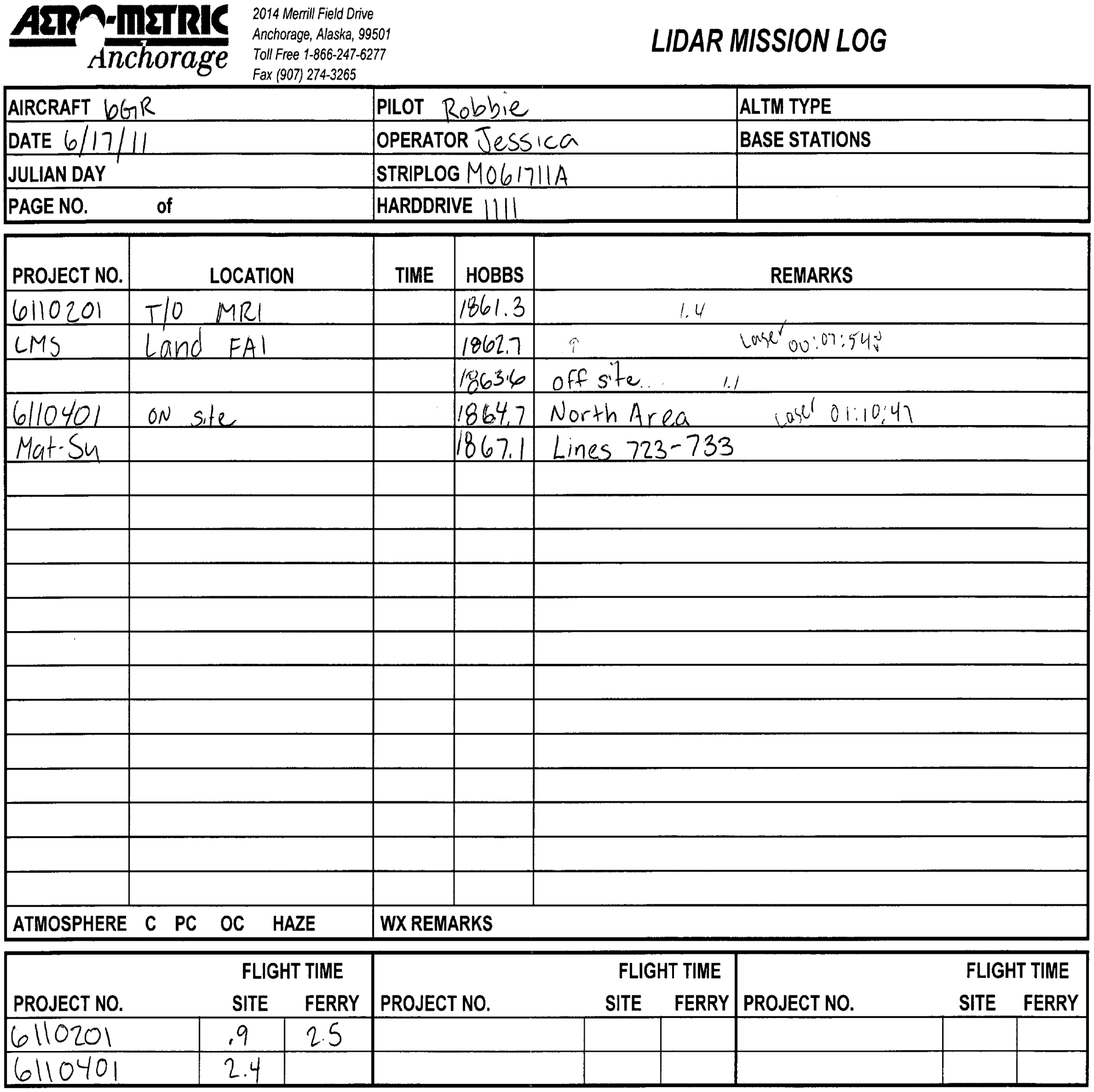
PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	T/O MR1	0625	1850.6	North Area
Mat-Su	Land MR1	11	1855.5	Lines 701-722
				Laser ON time 02:11:47

ATMOSPHERE C PC OC HAZE

WX REMARKS

PROJECT NO.	FLIGHT TIME		PROJECT NO.	FLIGHT TIME		PROJECT NO.	FLIGHT TIME	
	SITE	FERRY		SITE	FERRY		SITE	FERRY
6110401	4.9							

3020



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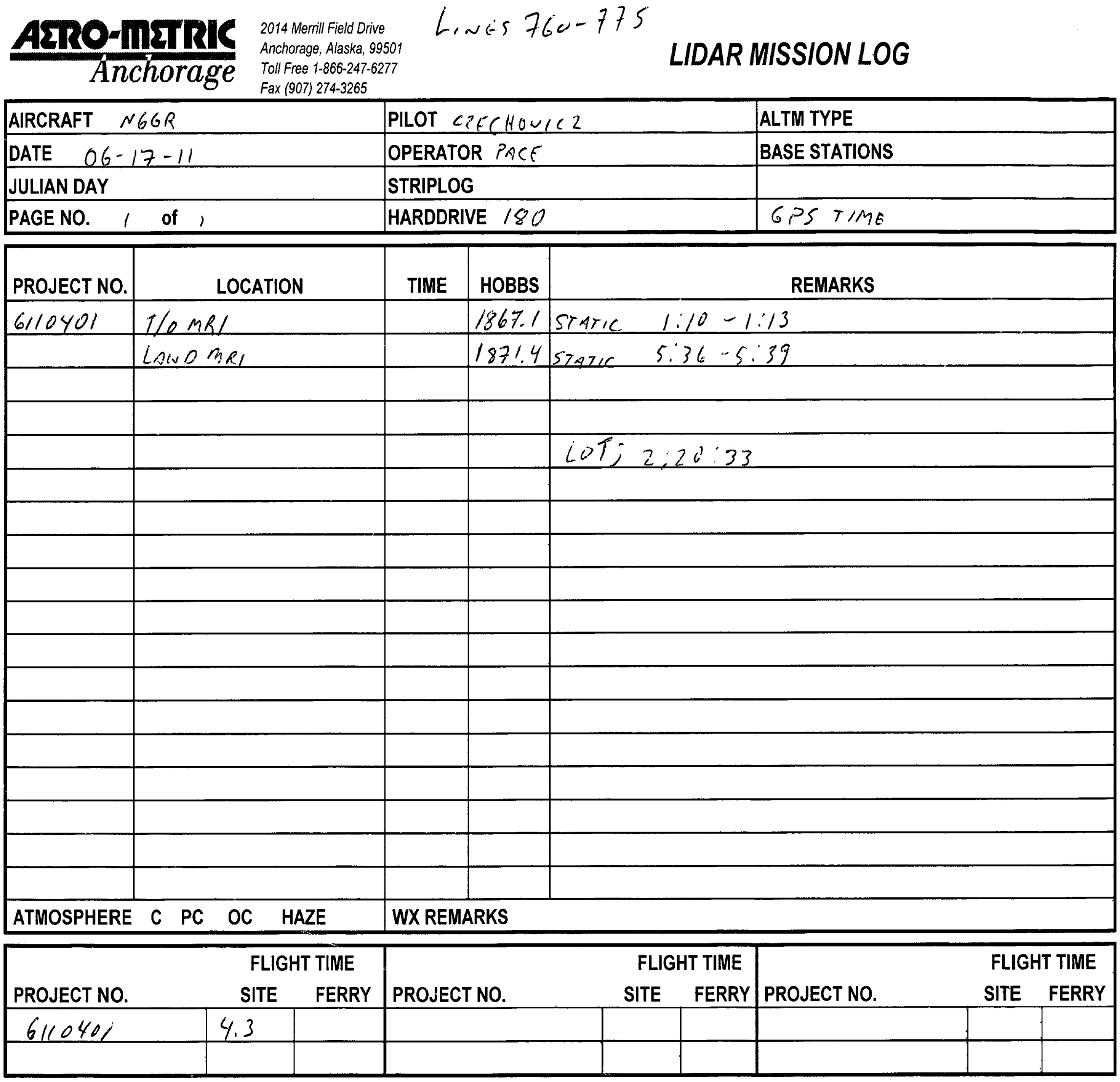
LIDAR MISSION LOG

AIRCRAFT 6GR	**PILOT** Robbie	**ALTM TYPE**
DATE 6/17/11	**OPERATOR** Jessica	**BASE STATIONS**
JULIAN DAY	**STRIPLOG** M061711A	
PAGE NO. of	**HARDDRIVE** 1111	

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110201	T/O MRI		1861.3	1.4
LMS	Land FAI		1862.7	Laser 00:07:54
			1863.6	off site 1.1
6110401	ON site		1864.7	North Area Laser 01:10:47
Mat-Su			1867.1	Lines 723-733

ATMOSPHERE C PC OC HAZE **WX REMARKS**

	FLIGHT TIME			FLIGHT TIME			FLIGHT TIME	
PROJECT NO.	**SITE**	**FERRY**	**PROJECT NO.**	**SITE**	**FERRY**	**PROJECT NO.**	**SITE**	**FERRY**
6110201	.9	2.5						
6110401	2.4							



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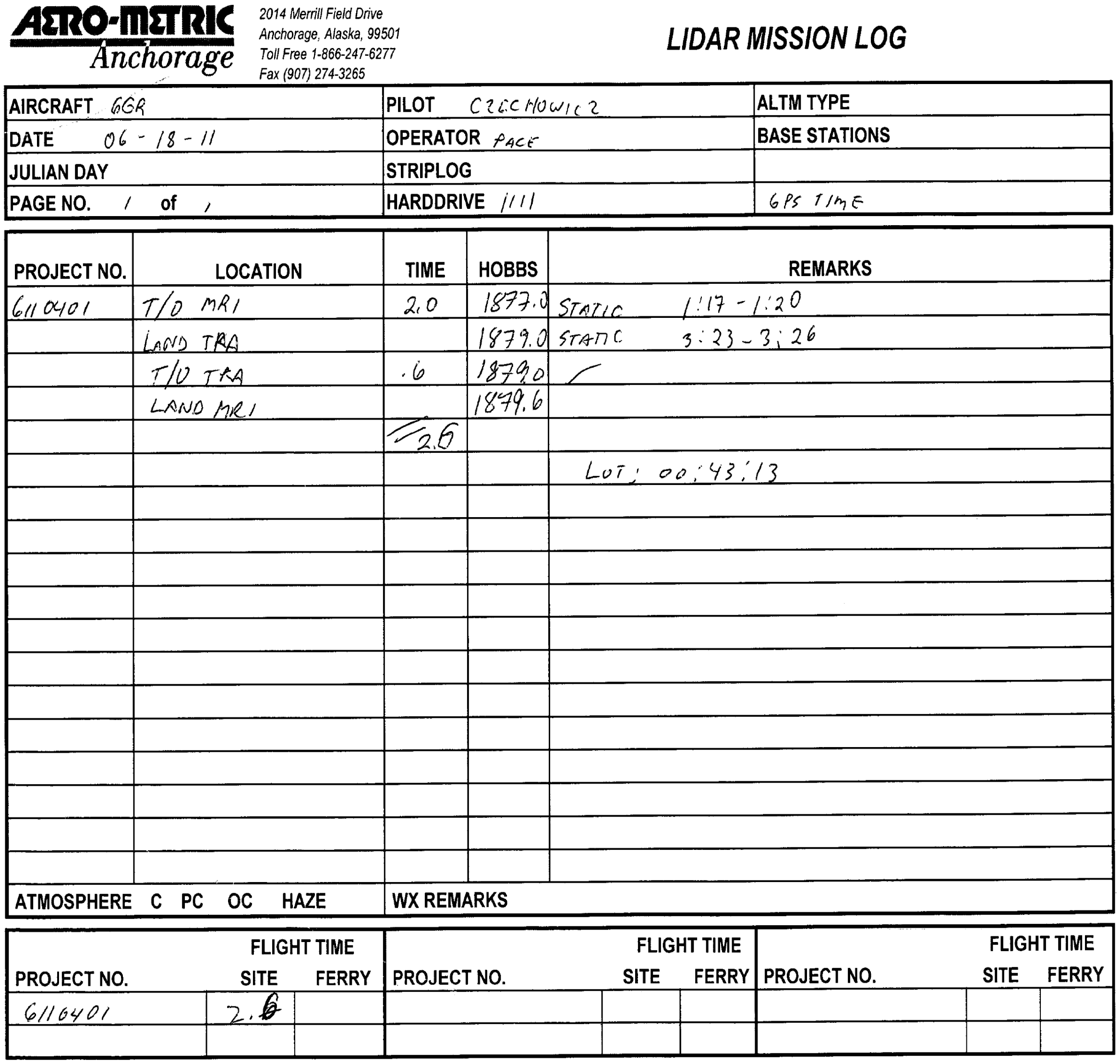
LINES 760-775

LIDAR MISSION LOG

AIRCRAFT N66R	PILOT CZECHOWICZ	ALTM TYPE
DATE 06-17-11	OPERATOR PACE	BASE STATIONS
JULIAN DAY	STRIPLOG	
PAGE NO. 1 of 1	HARDDRIVE 180	GPS TIME

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	T/O MRI		1867.1	STATIC 1:10 - 1:13
	LAND MRI		1871.4	STATIC 5:36 - 5:39
				LOT; 2:20:33
ATMOSPHERE C PC OC HAZE	WX REMARKS			

	FLIGHT TIME			FLIGHT TIME			FLIGHT TIME	
PROJECT NO.	SITE	FERRY	PROJECT NO.	SITE	FERRY	PROJECT NO.	SITE	FERRY
6110401	4.3							



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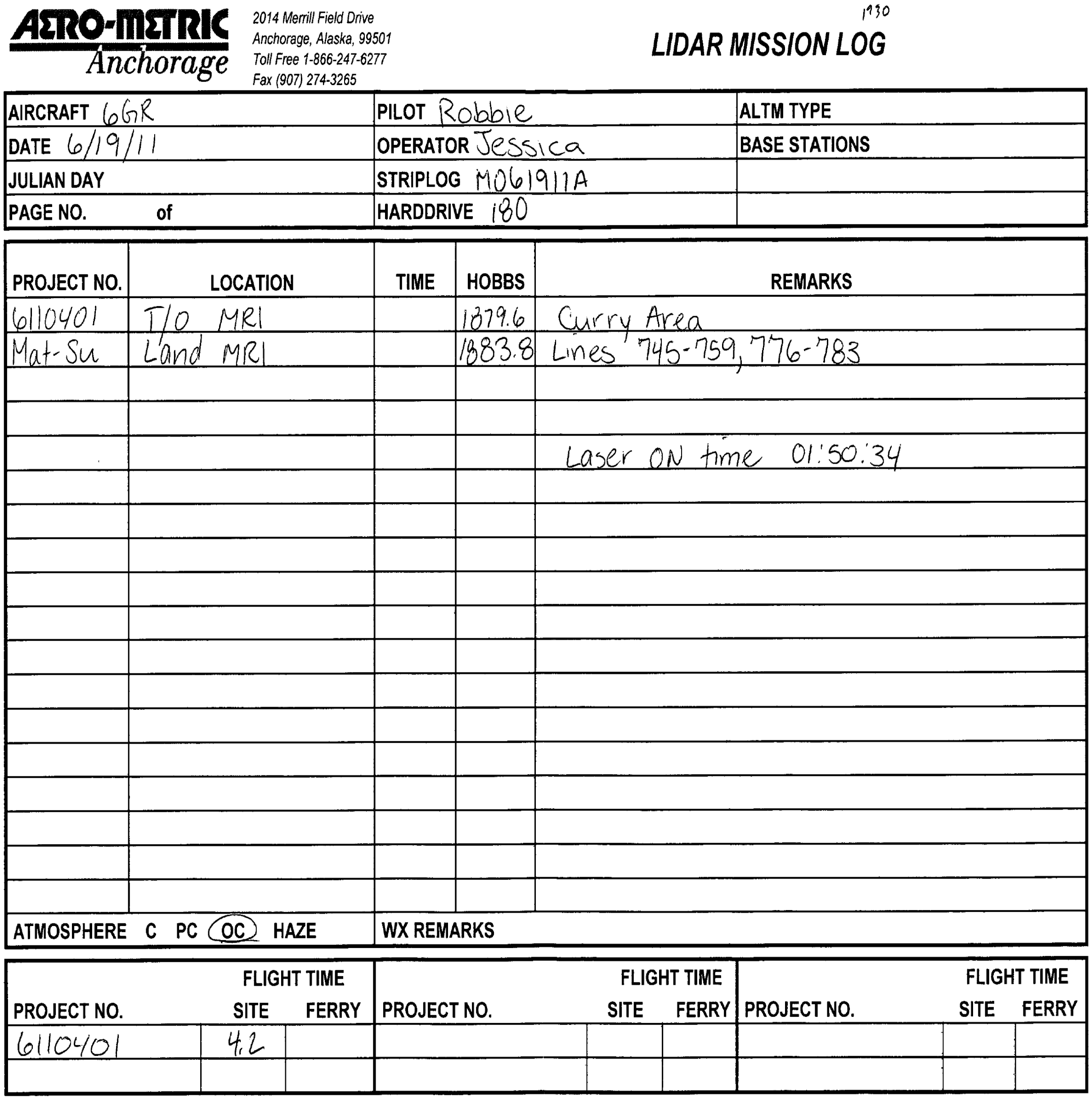
LIDAR MISSION LOG

AIRCRAFT 6GR	PILOT CZECHOWICZ	ALTM TYPE
DATE 06 - 18 - 11	OPERATOR PACE	BASE STATIONS
JULIAN DAY	STRIPLOG	
PAGE NO. 1 of 1	HARDDRIVE 1111	GPS TIME

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	T/O MRI	2.0	1877.0	STATIC 1:17 - 1:20
	LAND TRA		1879.0	STATIC 3:23 - 3:26
	T/O TRA	.6	1879.0	✓
	LAND MRI		1879.6	
		2.6		
				LOT: 00:43:13

ATMOSPHERE C PC OC HAZE	WX REMARKS

PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY
6110401	2.6							



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1930

LIDAR MISSION LOG

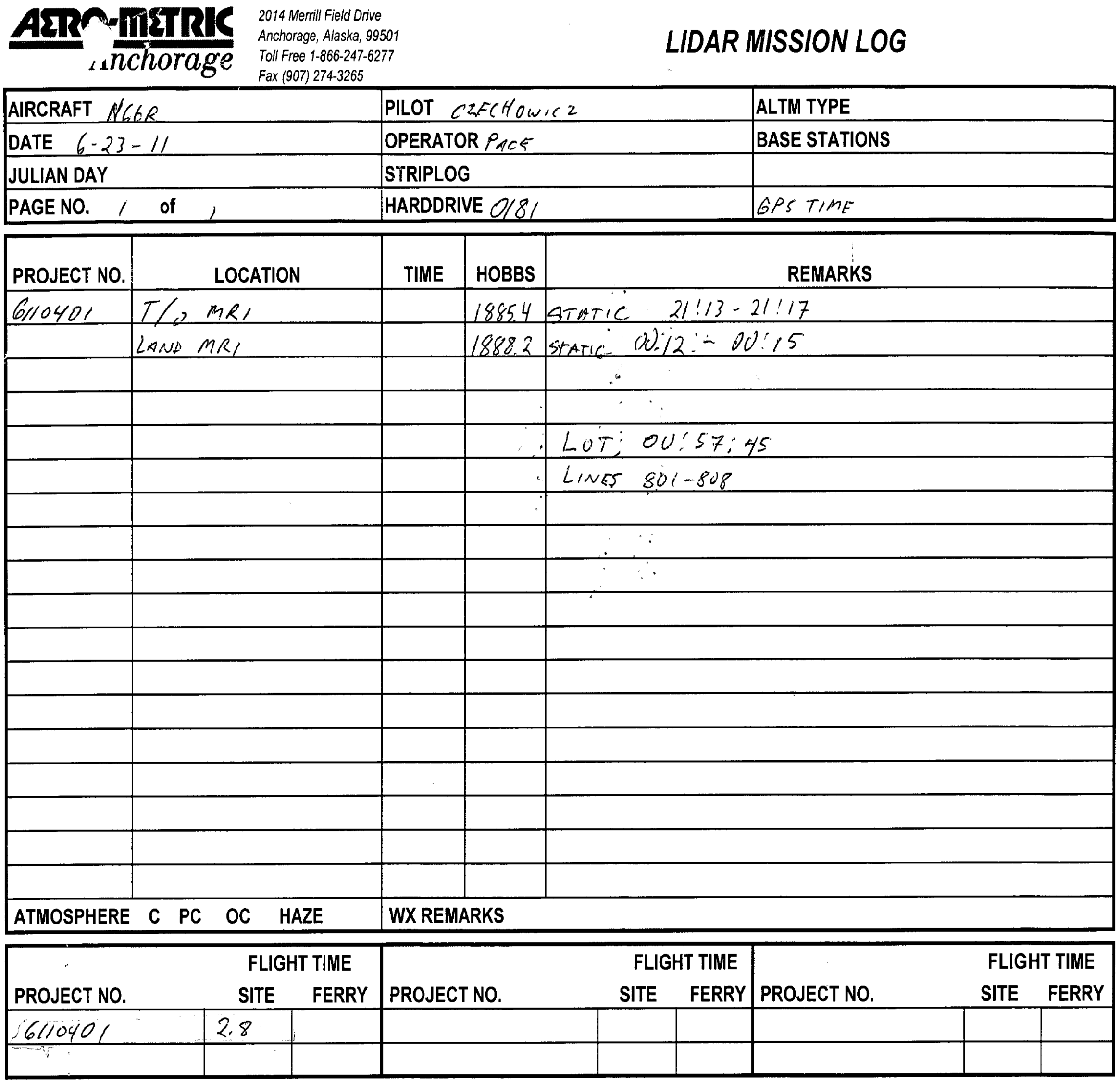
AIRCRAFT 6GR	PILOT Robbie	ALTM TYPE
DATE 6/19/11	OPERATOR Jessica	BASE STATIONS
JULIAN DAY	STRIPLOG M061911A	
PAGE NO. of	HARDDRIVE 180	

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	T/O MRI		1879.6	Curry Area
Mat-Su	Land MRI		1883.8	Lines 745-759, 776-783
				Laser ON time 01:50:34

ATMOSPHERE C PC [✓ OC] HAZE

WX REMARKS

PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY
6110401	4.2							



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LIDAR MISSION LOG

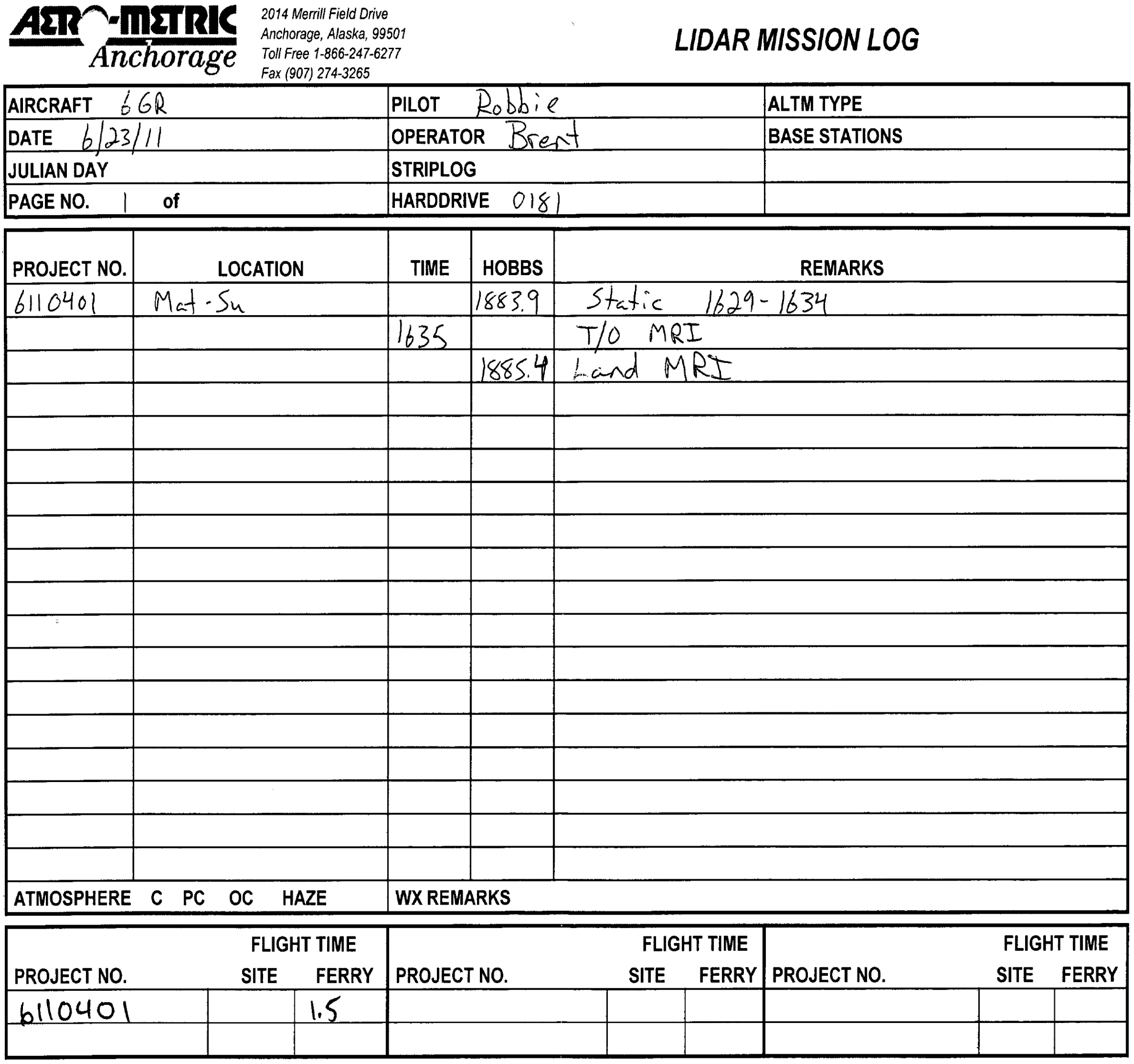
AIRCRAFT N66R	PILOT CZECHOWICZ	ALTM TYPE
DATE 6-23-11	OPERATOR PACE	BASE STATIONS
JULIAN DAY	STRIPLOG	
PAGE NO. 1 of 1	HARDDRIVE 0181	GPS TIME

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	T/O MRI		1885.4	STATIC 21:13 - 21:17
	LAND MRI		1888.2	STATIC 00:12 - 00:15
				LOT: 00:57:45
				LINES 801-808

ATMOSPHERE C PC OC HAZE

WX REMARKS

PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY
6110401	2.8							



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LIDAR MISSION LOG

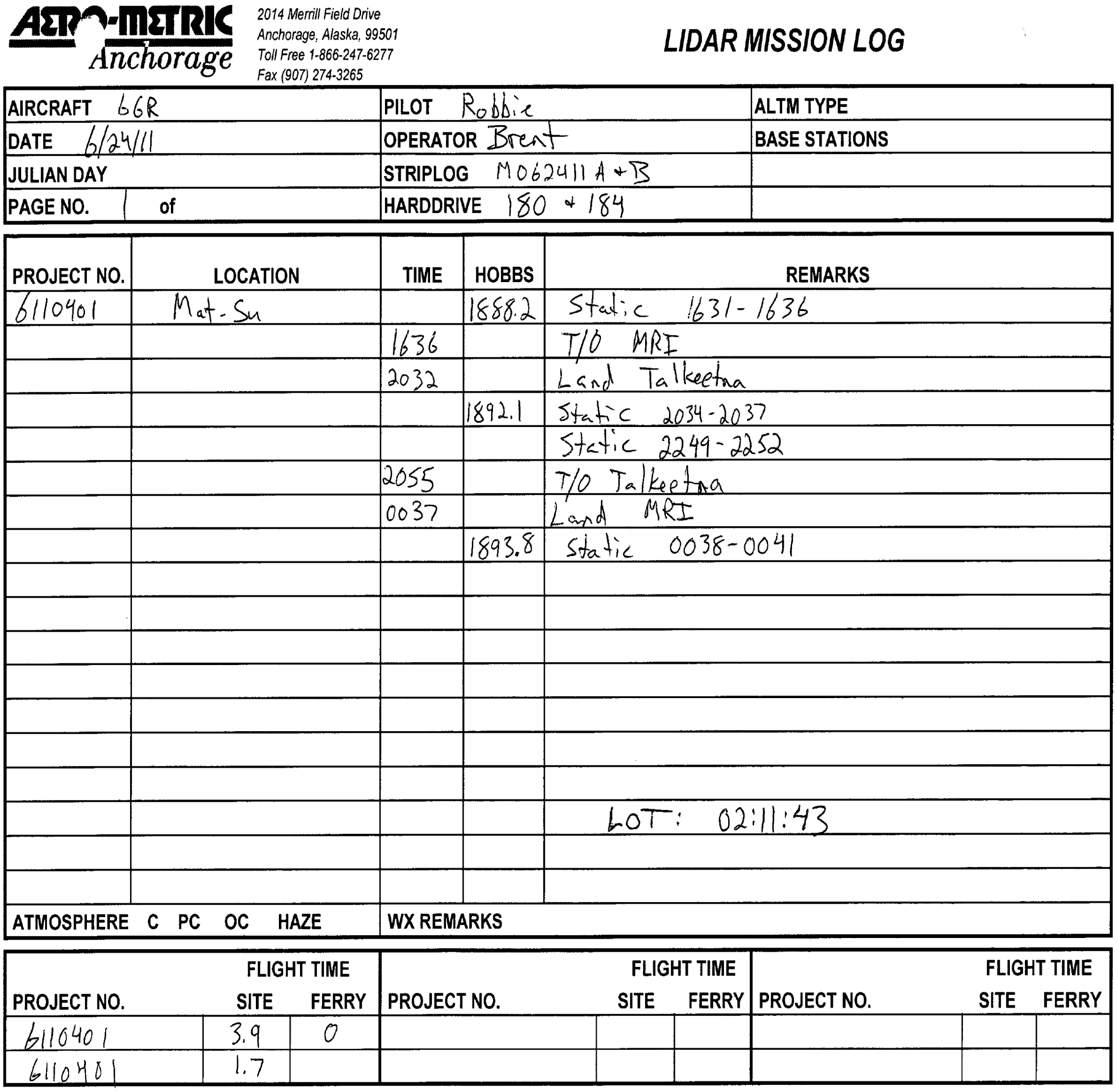
AIRCRAFT 6GR	PILOT Robbie	ALTM TYPE
DATE 6/23/11	OPERATOR Brent	BASE STATIONS
JULIAN DAY	STRIPLOG	
PAGE NO. 1 of	HARDDRIVE 0181	

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	Mat-Su		1883.9	Static 1629-1634
		1635		T/O MRI
			1885.4	Land MRI

ATMOSPHERE C PC OC HAZE

WX REMARKS

	FLIGHT TIME			FLIGHT TIME			FLIGHT TIME	
PROJECT NO.	SITE	FERRY	PROJECT NO.	SITE	FERRY	PROJECT NO.	SITE	FERRY
6110401		1.5						



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LIDAR MISSION LOG

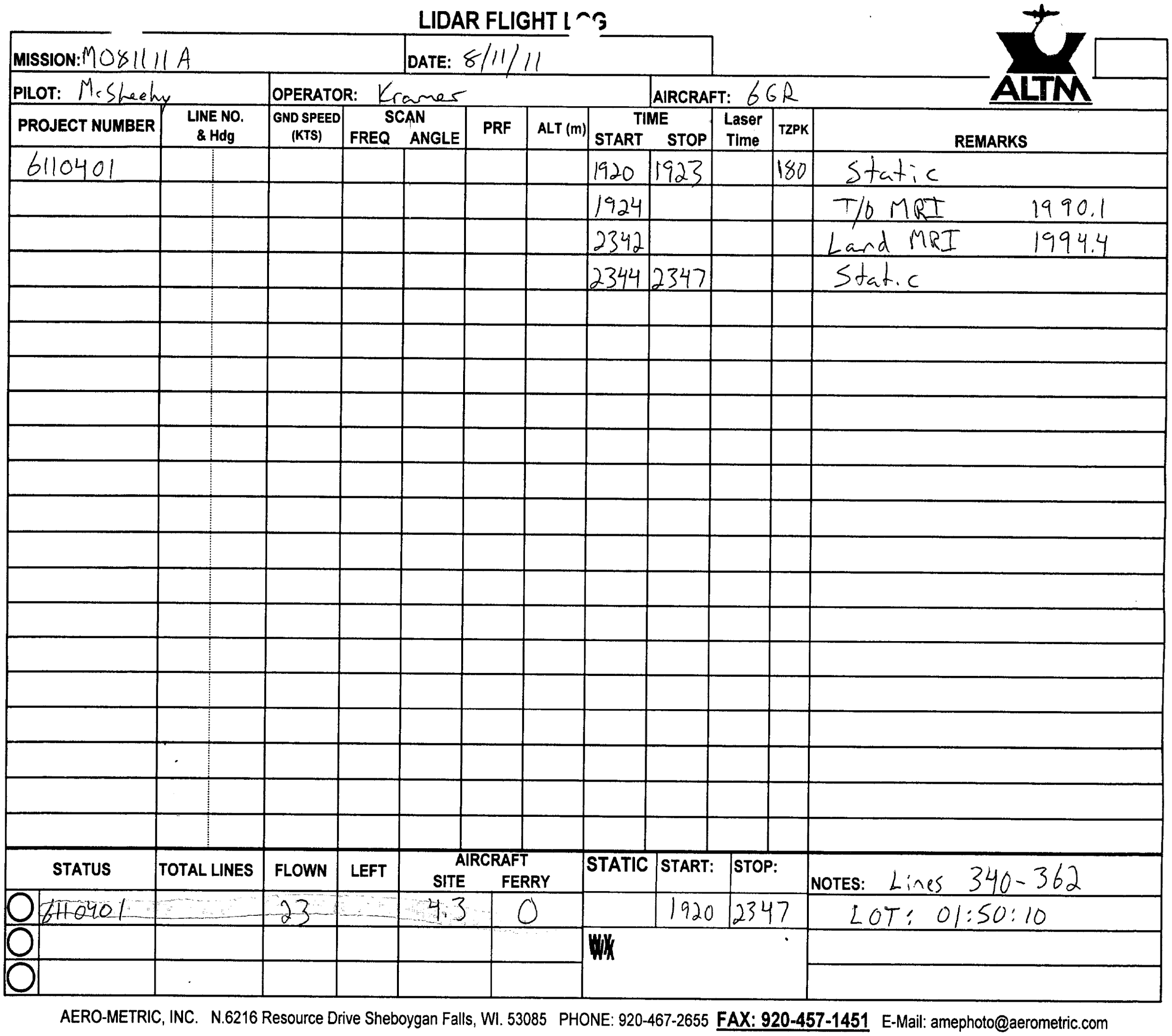
AIRCRAFT 66R	PILOT Robbie	ALTM TYPE
DATE 6/24/11	OPERATOR Brent	BASE STATIONS
JULIAN DAY	STRIPLOG M062411 A + B	
PAGE NO. 1 of	HARDDRIVE 180 + 184	

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	Mat-Su		1888.2	Static 1631-1636
		1636		T/0 MRI
		2032		Land Talkeetna
			1892.1	Static 2034-2037
				Static 2249-2252
		2055		T/0 Talkeetna
		0037		Land MRI
			1893.8	Static 0038-0041
				LOT: 02:11:43

ATMOSPHERE C PC OC HAZE	WX REMARKS

	FLIGHT TIME			FLIGHT TIME			FLIGHT TIME	
PROJECT NO.	SITE	FERRY	PROJECT NO.	SITE	FERRY	PROJECT NO.	SITE	FERRY
6110401	3.9	0						
6110401	1.7							

August 2011 Logs



LIDAR FLIGHT LOG

ALTM

MISSION: M081111 A

DATE: 8/11/11

PILOT: McSheehy

OPERATOR: Kramer

AIRCRAFT: 6GR

PROJECT NUMBER	LINE NO. & Hdg	GND SPEED (KTS)	SCAN FREQ	SCAN ANGLE	PRF	ALT (m)	TIME START	TIME STOP	Laser Time	TZPK	REMARKS
6110401							1920	1923		180	Static
							1924				T/0 MRI 1990.1
							2342				Land MRI 1994.4
							2344	2347			Stat.c

	STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START:	STOP:	NOTES: Lines 340-362
○	6110401		23		4.3	0		1920	2347	LOT: 01:50:10
○							WX			
○										

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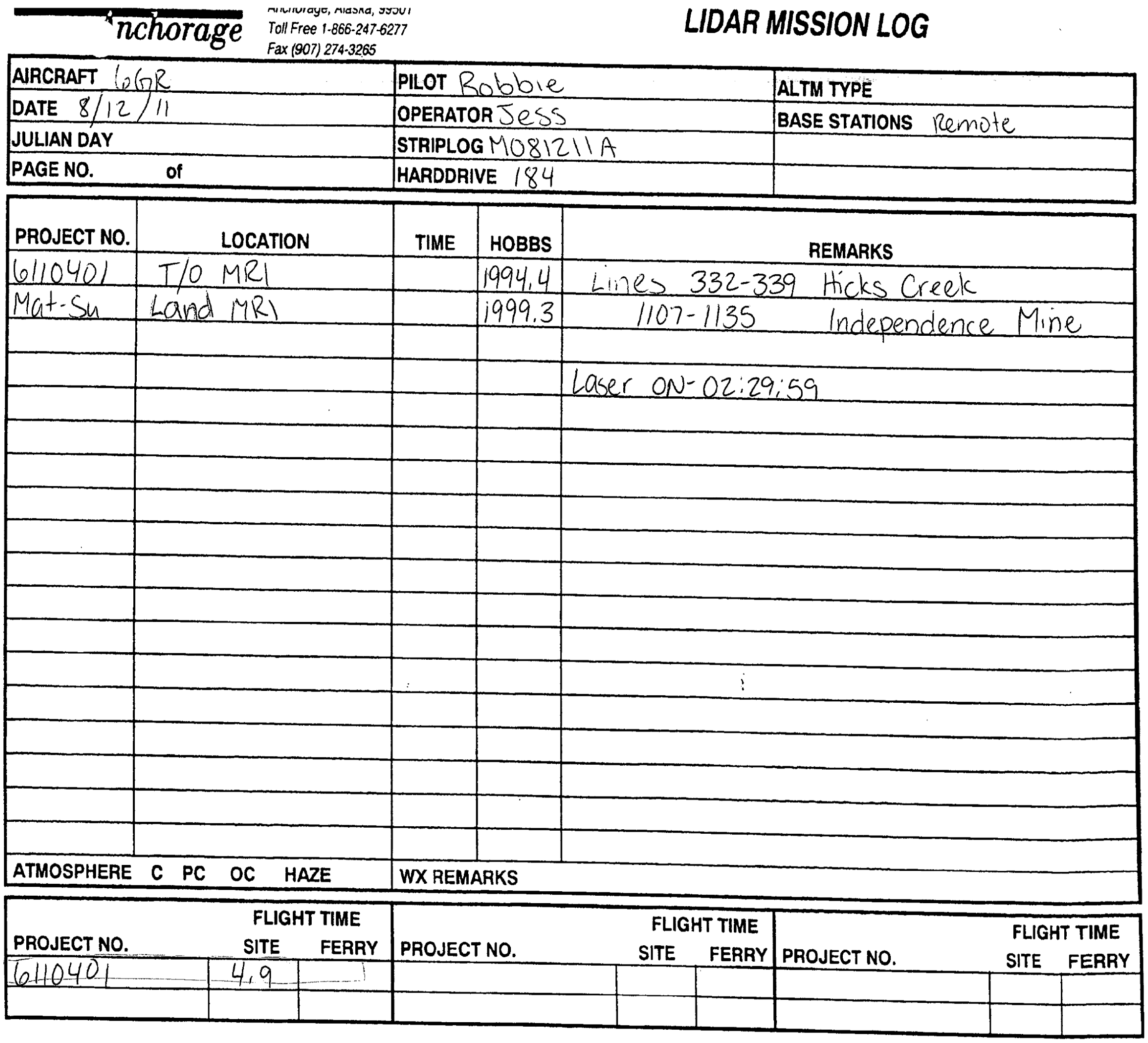

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LIDAR MISSION LOG

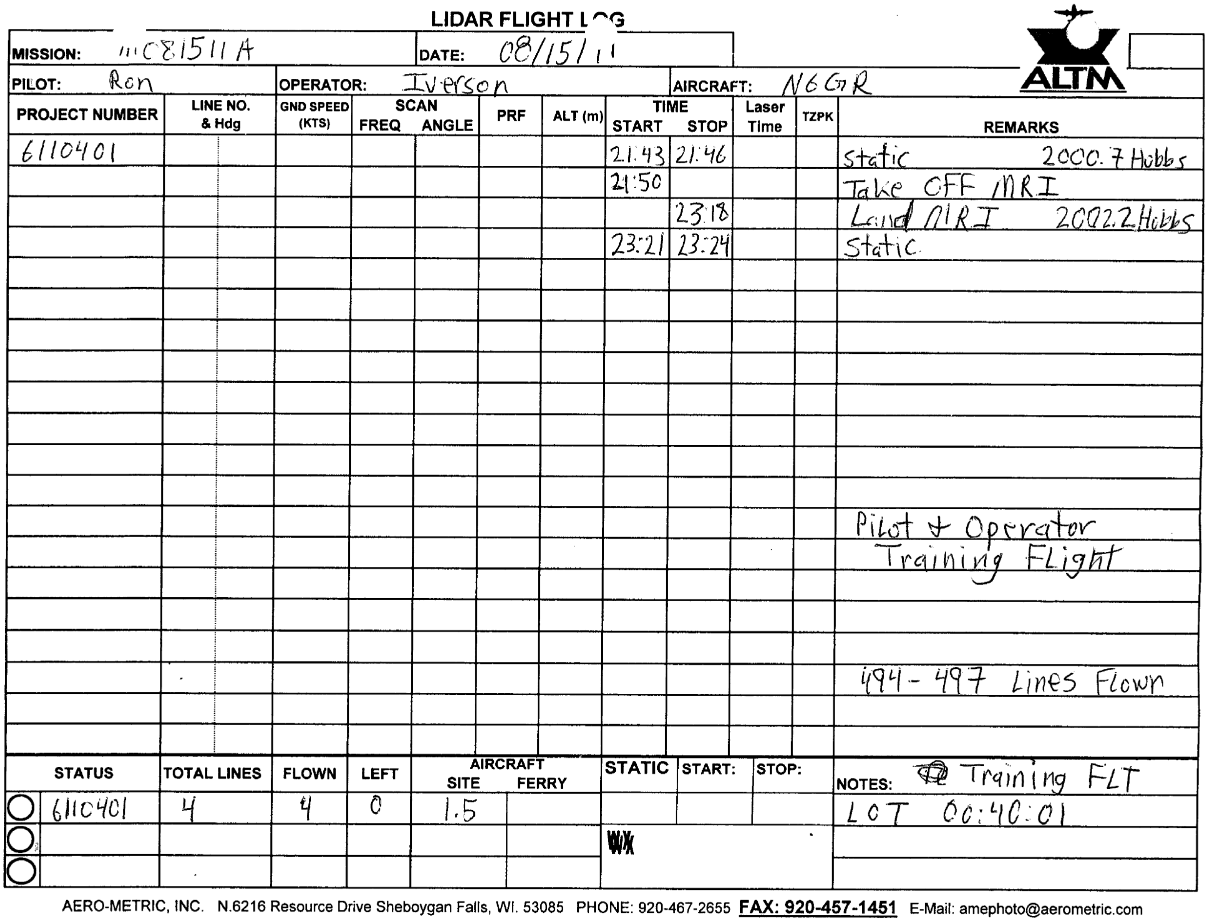
AIRCRAFT 66R	**PILOT** Robbie	**ALTM TYPE**
DATE 8/12/11	**OPERATOR** Jess	**BASE STATIONS** Remote
JULIAN DAY	**STRIPLOG** M081211A	
PAGE NO. of	**HARDDRIVE** 184	

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	T/O MRI		1994.4	Lines 332-339 Hicks Creek
Mat-Su	Land MRI		1999.3	1107-1135 Independence Mine
				Laser ON-02:29:59

ATMOSPHERE C PC OC HAZE

WX REMARKS

	FLIGHT TIME			FLIGHT TIME			FLIGHT TIME	
PROJECT NO.	SITE	FERRY	PROJECT NO.	SITE	FERRY	PROJECT NO.	SITE	FERRY
6110401	4.9							



LIDAR FLIGHT LOG

MISSION: mC81511A
DATE: 08/15/11
PILOT: Ron
OPERATOR: Iverson
AIRCRAFT: N6GR

ALTM

PROJECT NUMBER	LINE NO. & Hdg	GND SPEED (KTS)	SCAN FREQ	SCAN ANGLE	PRF	ALT (m)	TIME START	TIME STOP	Laser Time	TZPK	REMARKS
6110401							21:43	21:46			Static 2000.7 Hobbs
							21:50				Take OFF MRI
								23:18			Land MRI 2002.2 Hobbs
							23:21	23:24			Static
											Pilot + Operator
											Training Flight
											494 - 497 Lines Flown

	STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START:	STOP:	NOTES: Training FLT
○	6110401	4	4	0	1.5					LOT 00:40:01
○							WX			
○										

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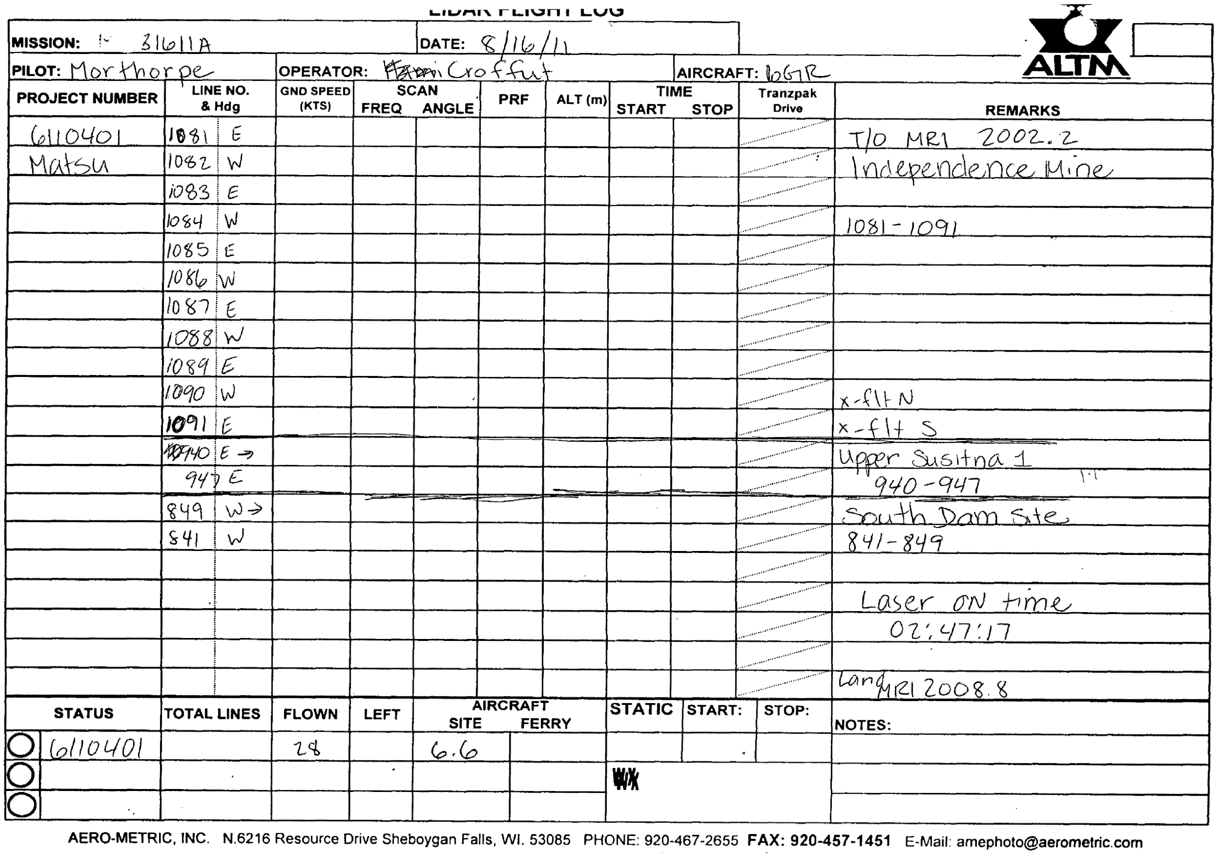

LIDAR FLIGHT LOG

ALTM

MISSION: 31611A

DATE: 8/16/11

PILOT: Morthorpe

OPERATOR: Croffut

AIRCRAFT: 6GR

PROJECT NUMBER	LINE NO. & Hdg		GND SPEED (KTS)	SCAN		PRF	ALT (m)	TIME		Tranzpak Drive	REMARKS
				FREQ	ANGLE			START	STOP		
6110401	1081	E									T/O MRI 2002.2
Matsu	1082	W									Independence Mine
	1083	E									
	1084	W									1081-1091
	1085	E									
	1086	W									
	1087	E									
	1088	W									
	1089	E									
	1090	W									x-flt N
	1091	E									x-flt S
	940	E →									Upper Susitna 1
	947	E									940-947
	849	W →									South Dam Site
	841	W									841-849
											Laser ON time
											02:47:17
											Land MRI 2008.8

STATUS		TOTAL LINES	FLOWN	LEFT	AIRCRAFT		STATIC	START:	STOP:	NOTES:
					SITE	FERRY				
○	6110401		28		6.6					
○							WX			
○										

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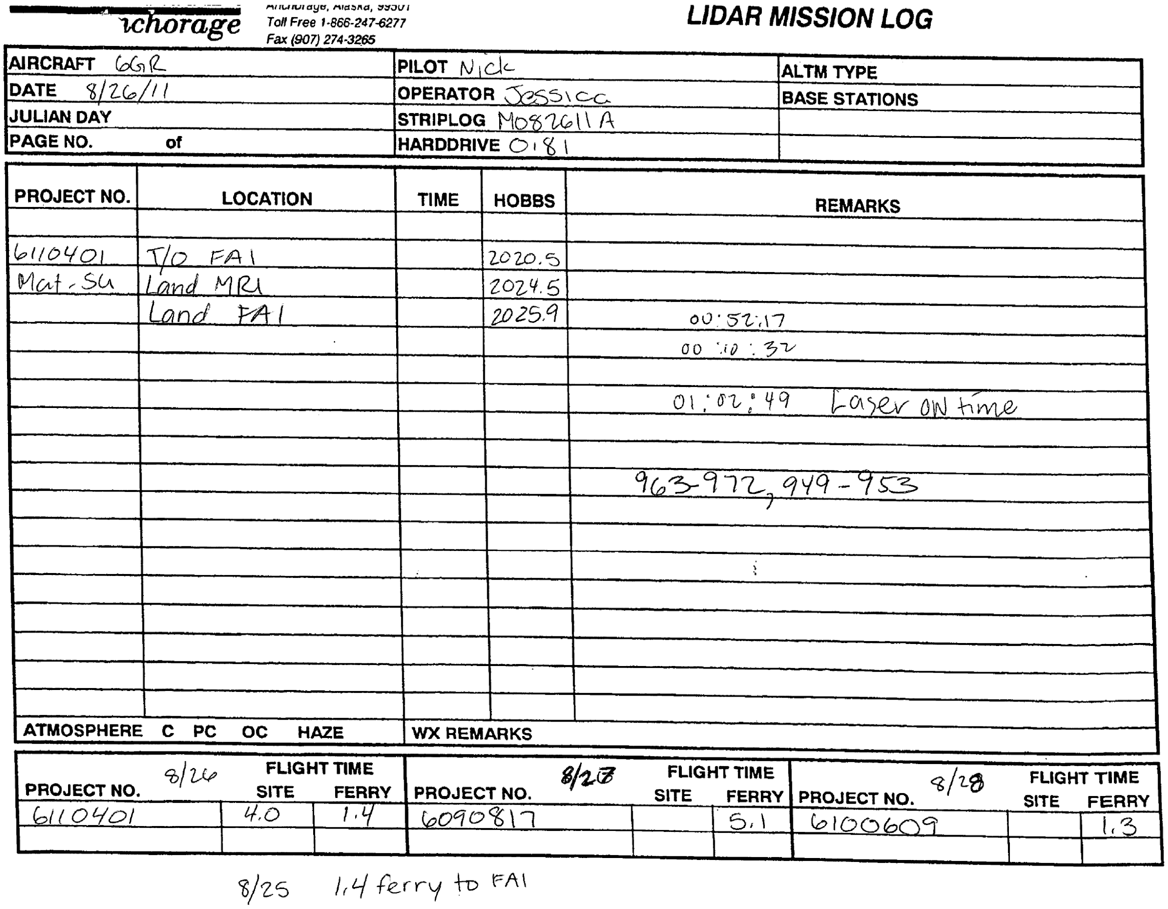

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LIDAR MISSION LOG

AIRCRAFT 6GR	PILOT Nick	ALTM TYPE
DATE 8/26/11	OPERATOR Jessica	BASE STATIONS
JULIAN DAY	STRIPLOG M082611A	
PAGE NO. of	HARDDRIVE 0181	

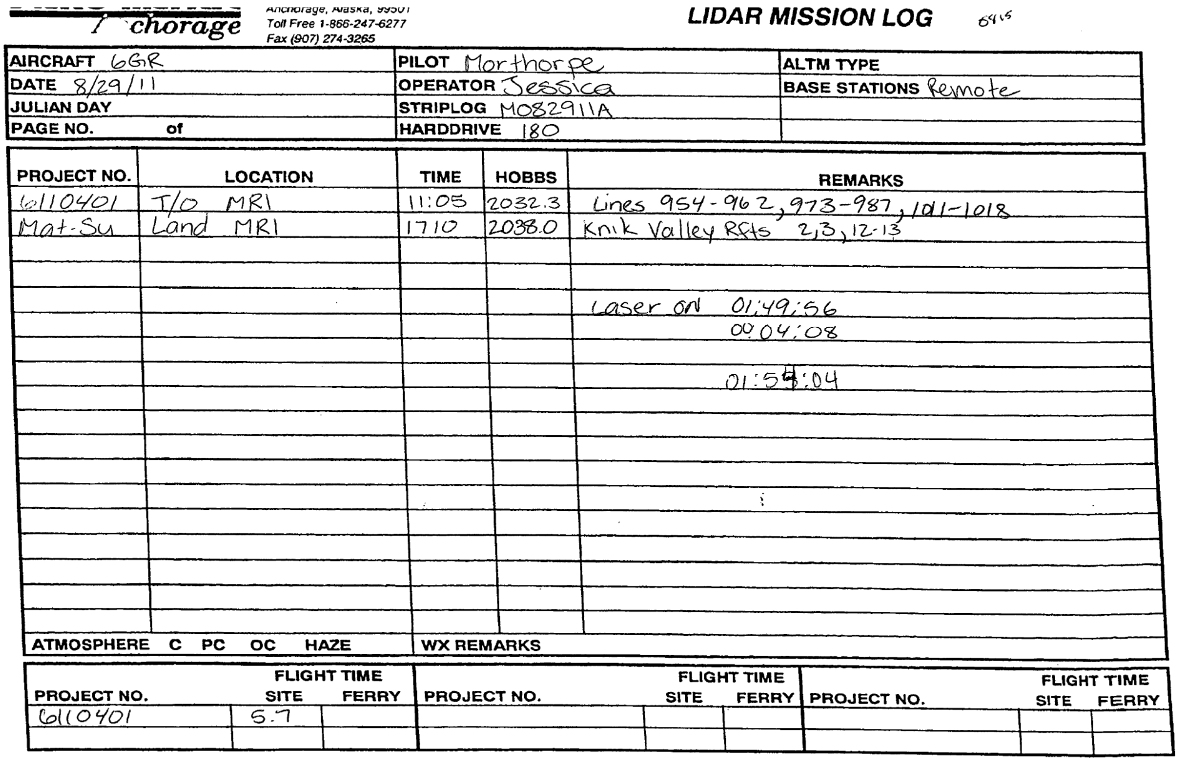
PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	T/O FAI		2020.5	
Mat-Su	Land MRI		2024.5	
	Land FAI		2025.9	00:52:17
				00:10:32
				01:02:49 Laser ON time
				963-972, 949-953

ATMOSPHERE C PC OC HAZE

WX REMARKS

PROJECT NO. 8/26	FLIGHT TIME SITE	FERRY	PROJECT NO. 8/27	FLIGHT TIME SITE	FERRY	PROJECT NO. 8/28	FLIGHT TIME SITE	FERRY
6110401	4.0	1.4	6090817		5.1	6100609		1.3

8/25 1.4 ferry to FAI



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LIDAR MISSION LOG 6915

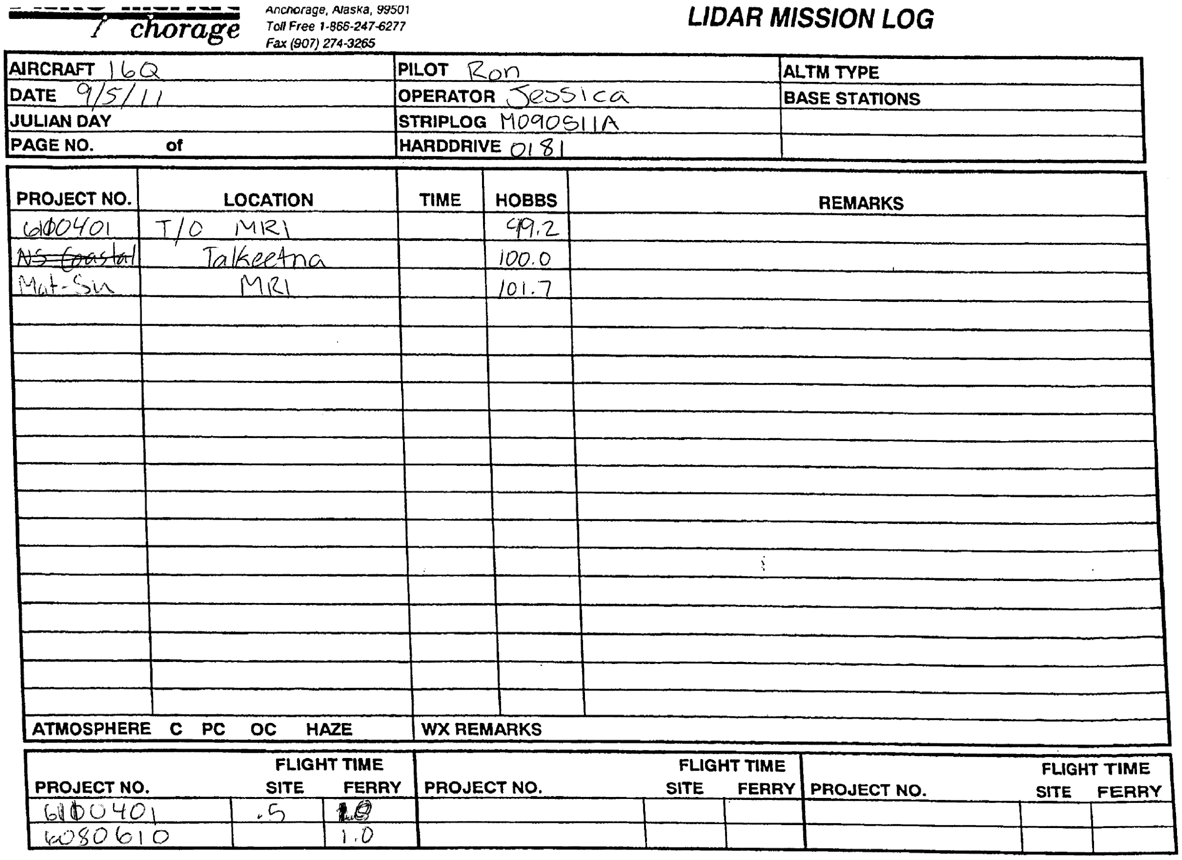
AIRCRAFT 6GR	PILOT Morthorpe	ALTM TYPE
DATE 8/29/11	OPERATOR Jessica	BASE STATIONS Remote
JULIAN DAY	STRIPLOG M082911A	
PAGE NO. of	HARDDRIVE 180	

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	T/O MRI	11:05	2032.3	Lines 954-962, 973-987, 1011-1018
Mat-Su	Land MRI	1710	2038.0	Knik Valley Rfts 2,3, 12-13
				Laser on 01:49:56
				00:04:08
				01:54:04

ATMOSPHERE C PC OC HAZE WX REMARKS

PROJECT NO.	FLIGHT TIME		PROJECT NO.	FLIGHT TIME		PROJECT NO.	FLIGHT TIME	
	SITE	FERRY		SITE	FERRY		SITE	FERRY
6110401	5.7							

September 2011 Logs



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LIDAR MISSION LOG

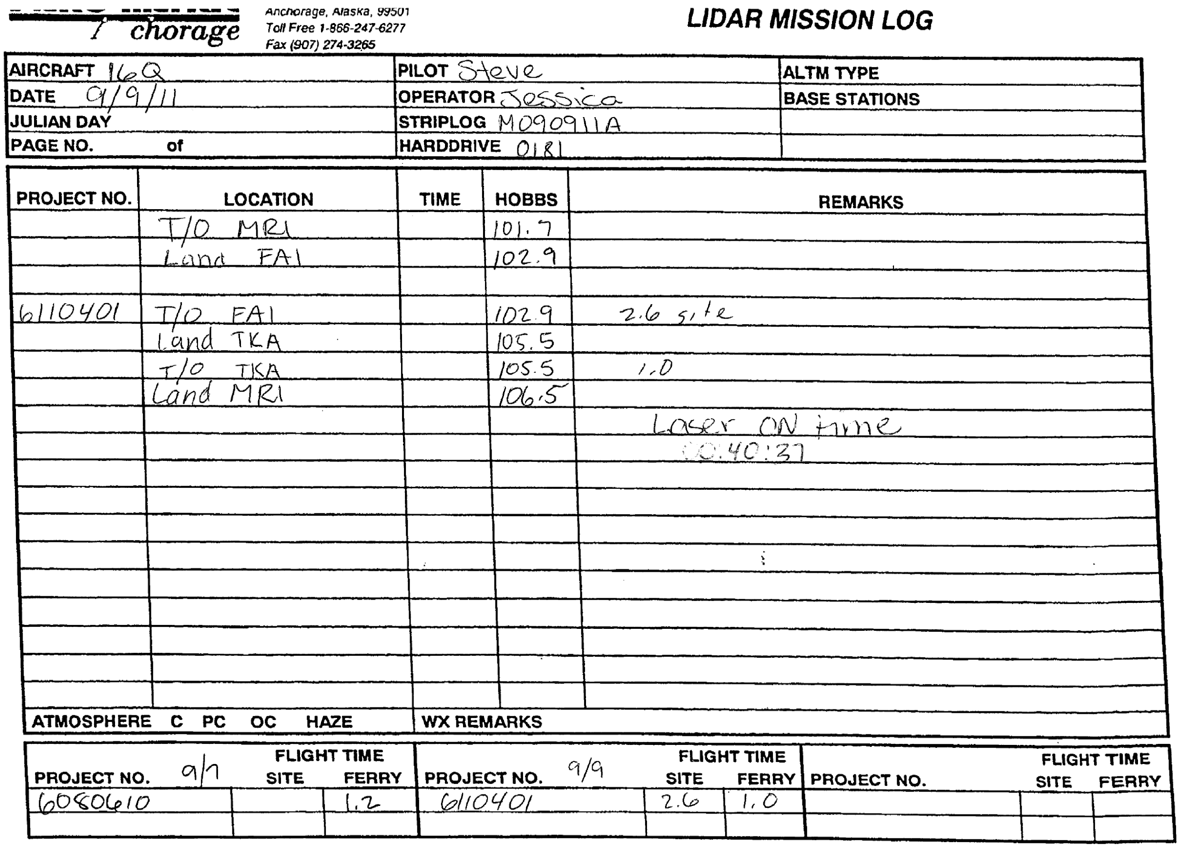
AIRCRAFT 16Q
DATE 9/5/11
JULIAN DAY
PAGE NO. of
PILOT Ron
OPERATOR Jessica
STRIPLOG M090511A
HARDDRIVE 0181
ALTM TYPE
BASE STATIONS

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6100401	T/O MRI		99.2	
~~NS Coastal~~	Talkeetna		100.0	
Mat-Su	MRI		101.7	

ATMOSPHERE C PC OC HAZE

WX REMARKS

PROJECT NO.	FLIGHT TIME		PROJECT NO.	FLIGHT TIME		PROJECT NO.	FLIGHT TIME	
	SITE	FERRY		SITE	FERRY		SITE	FERRY
6100401	.5	1.0						
6080610		1.0						



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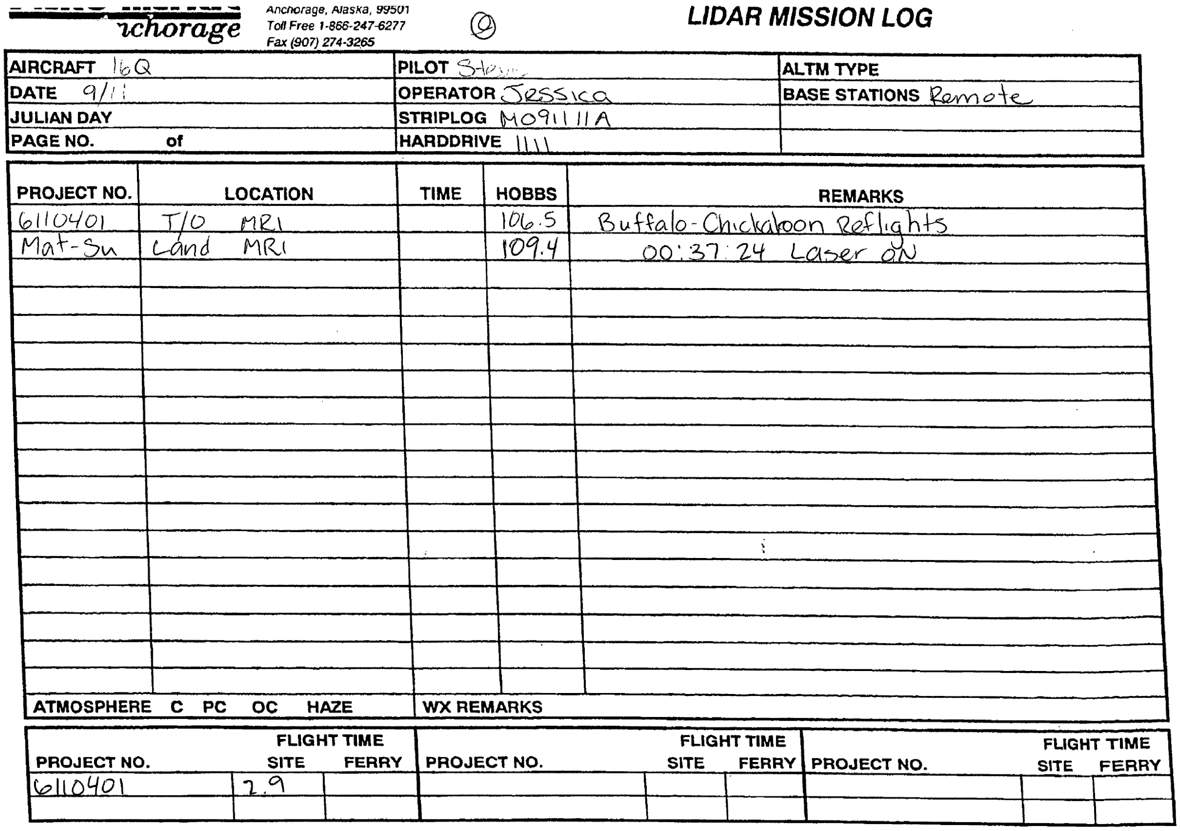
LIDAR MISSION LOG

AIRCRAFT 16Q	PILOT Steve	ALTM TYPE
DATE 9/9/11	OPERATOR Jessica	BASE STATIONS
JULIAN DAY	STRIPLOG M090911A	
PAGE NO. of	HARDDRIVE 0181	

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
	T/O MRI		101.7	
	Land FAI		102.9	
6110401	T/O FAI		102.9	2.6 site
	Land TKA		105.5	
	T/O TKA		105.5	1.0
	Land MRI		106.5	
				Laser ON time
				00:40:37
ATMOSPHERE C PC OC HAZE		WX REMARKS		

PROJECT NO. 9/7	FLIGHT TIME SITE	 FERRY	PROJECT NO. 9/9	FLIGHT TIME SITE	 FERRY	PROJECT NO.	FLIGHT TIME SITE	 FERRY
6080610		1.2	6110401	2.6	1.0			



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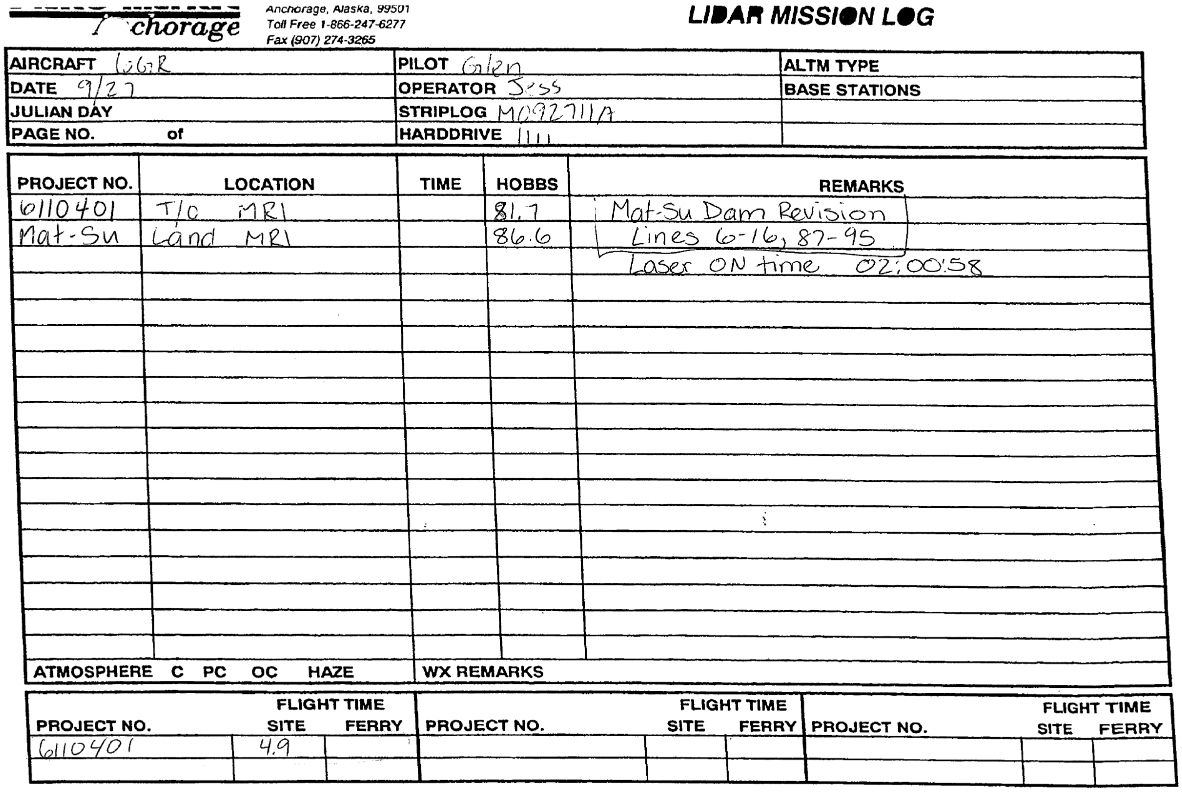
⑨

LIDAR MISSION LOG

AIRCRAFT 16Q	**PILOT** Steve	**ALTM TYPE**
DATE 9/11	**OPERATOR** Jessica	**BASE STATIONS** Remote
JULIAN DAY	**STRIPLOG** M091111A	
PAGE NO. of	**HARDDRIVE** 1111	

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	T/O MRI		106.5	Buffalo-Chickaloon Reflights
Mat-Su	Land MRI		109.4	00:37:24 Laser ON
ATMOSPHERE C PC OC HAZE	**WX REMARKS**			

PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY
6110401	2.9							



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LIDAR MISSION LOG

AIRCRAFT 6GR	PILOT Glen	ALTM TYPE
DATE 9/27	OPERATOR Jess	BASE STATIONS
JULIAN DAY	STRIPLOG M092711A	
PAGE NO. of	HARDDRIVE 111	

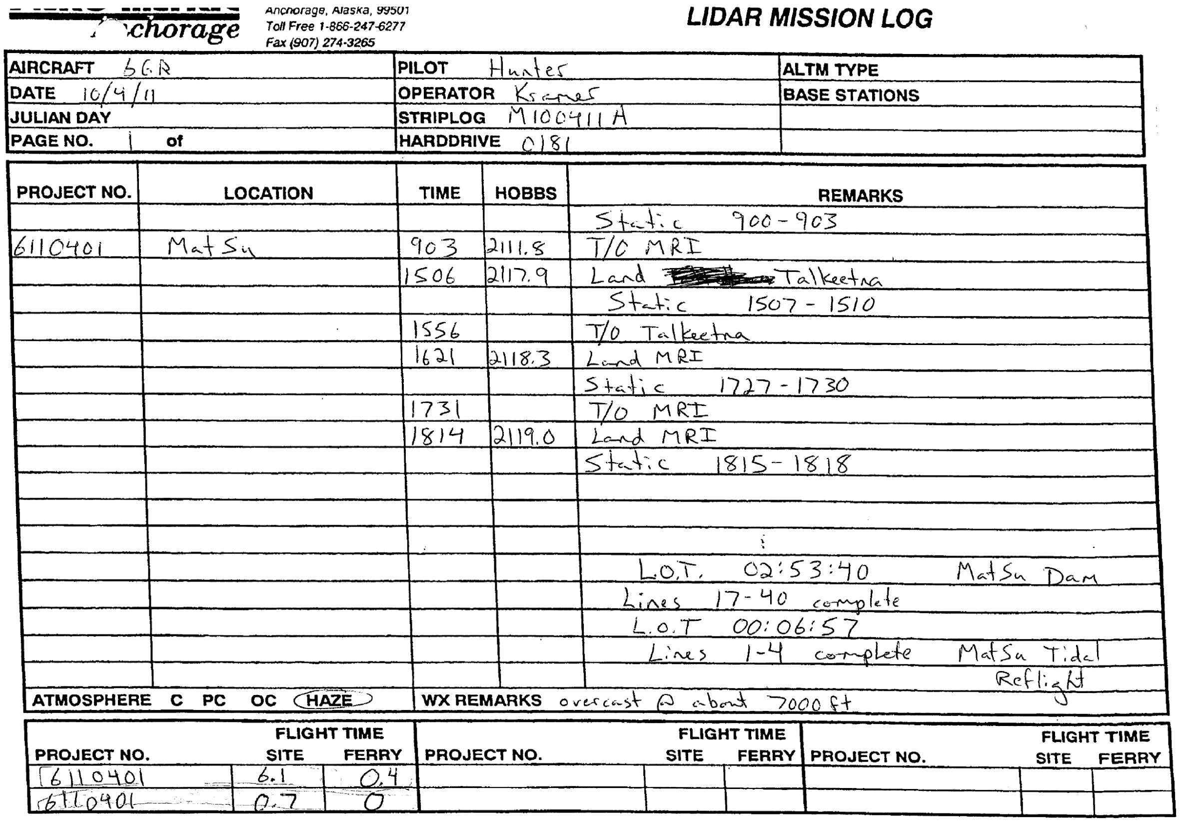
PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	T/O MRI		81.7	Mat-Su Dam Revision
Mat-Su	Land MRI		86.6	Lines 6-16, 87-95
				Laser ON time 02:00:58

ATMOSPHERE C PC OC HAZE

WX REMARKS

PROJECT NO.	FLIGHT TIME SITE	FERRY	PROJECT NO.	FLIGHT TIME SITE	FERRY	PROJECT NO.	FLIGHT TIME SITE	FERRY
6110401	4.9							

October 2011 Logs



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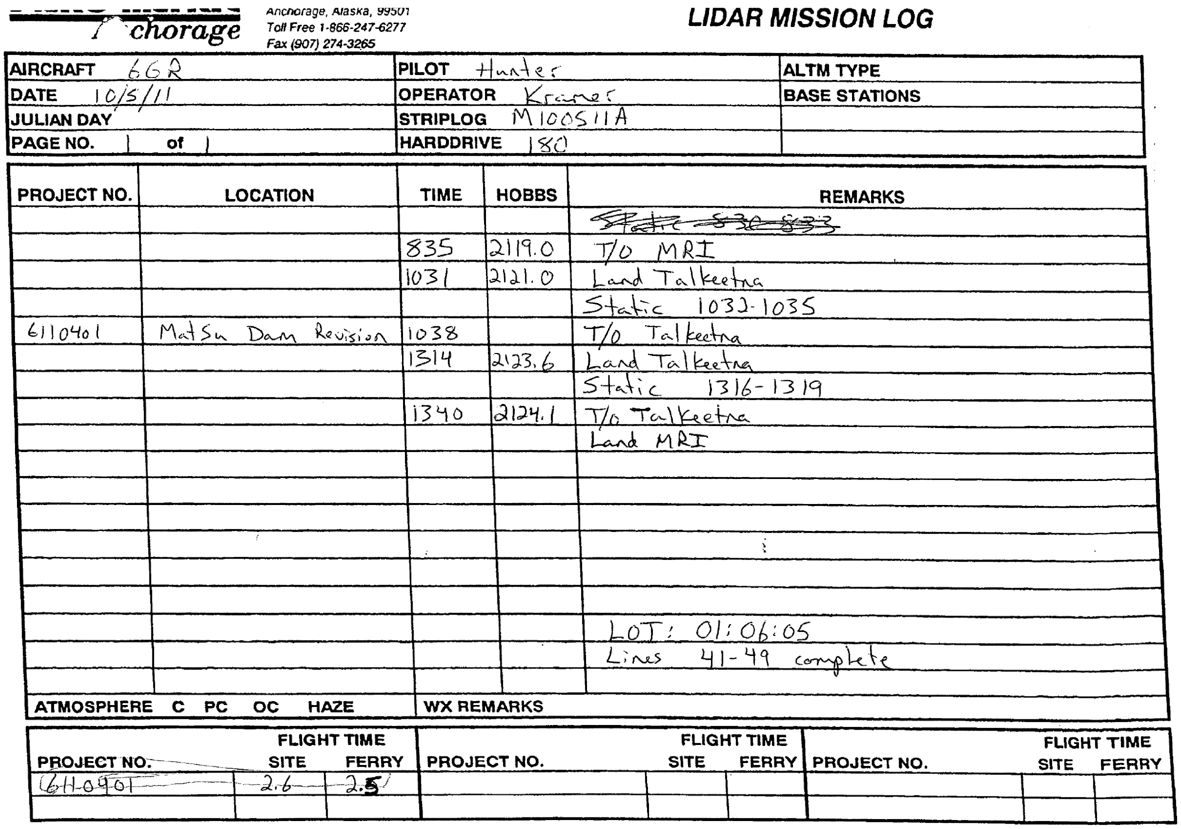
LIDAR MISSION LOG

AIRCRAFT 6GR	**PILOT** Hunter	**ALTM TYPE**
DATE 10/4/11	**OPERATOR** Kramer	**BASE STATIONS**
JULIAN DAY	**STRIPLOG** M100411A	
PAGE NO. 1 **of**	**HARDDRIVE** 0181	

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
				Static 900-903
6110401	MatSu	903	2111.8	T/O MRI
		1506	2117.9	Land ~~[illegible]~~ Talkeetna
				Static 1507 - 1510
		1556		T/O Talkeetna
		1621	2118.3	Land MRI
				Static 1727-1730
		1731		T/O MRI
		1814	2119.0	Land MRI
				Static 1815-1818
				L.O.T. 02:53:40 MatSu Dam
				Lines 17-40 complete
				L.O.T 00:06:57
				Lines 1-4 complete MatSu Tidal
				Reflight

ATMOSPHERE C PC OC [✓ HAZE] **WX REMARKS** overcast @ about 7000 ft

PROJECT NO.	FLIGHT TIME SITE	FERRY	PROJECT NO.	FLIGHT TIME SITE	FERRY	PROJECT NO.	FLIGHT TIME SITE	FERRY
6110401	6.1	0.4						
6110401	0.7	0						



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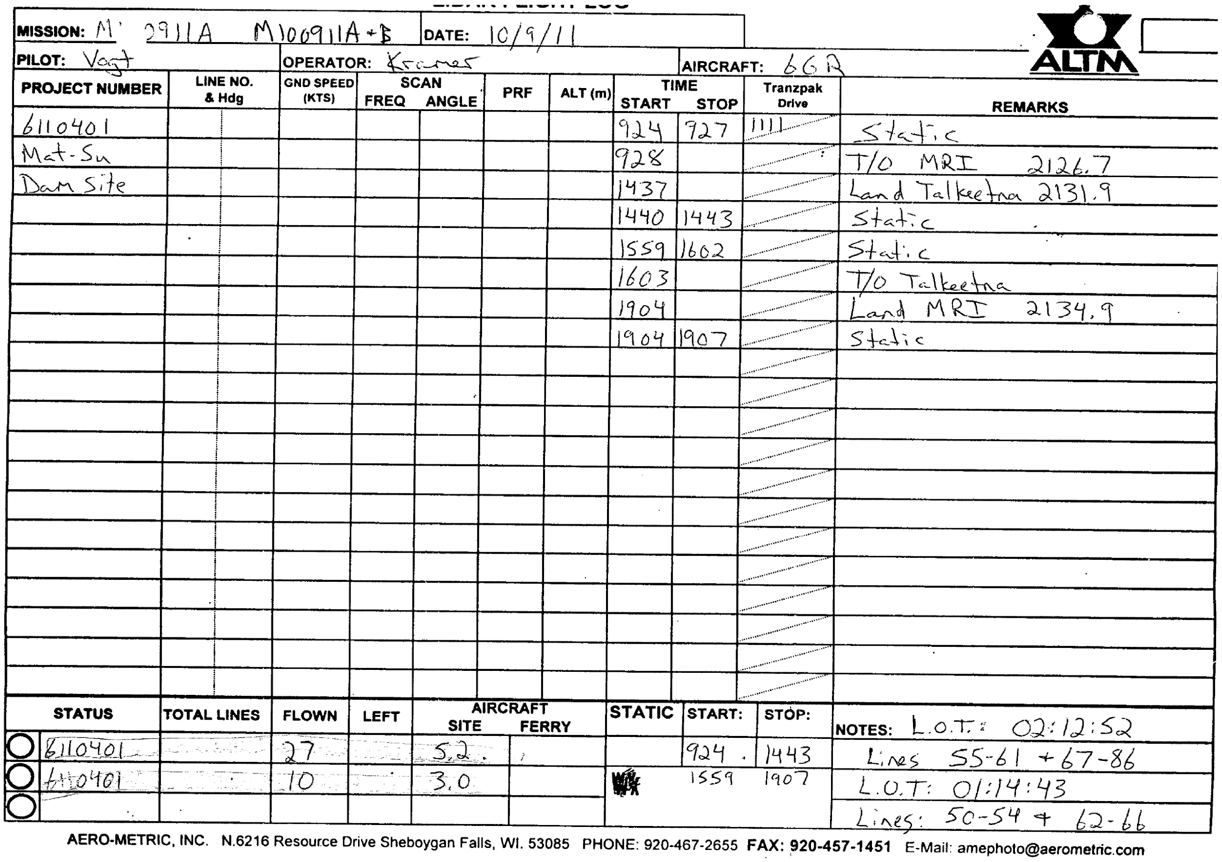
LIDAR MISSION LOG

AIRCRAFT 66R	**PILOT** Hunter	**ALTM TYPE**
DATE 10/5/11	**OPERATOR** Kramer	**BASE STATIONS**
JULIAN DAY	**STRIPLOG** M100511A	
PAGE NO. 1 **of** 1	**HARDDRIVE** 180	

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
				~~Static 830-833~~
		835	2119.0	T/O MRI
		1031	2121.0	Land Talkeetna
				Static 1032-1035
6110401	MatSu Dam Revision	1038		T/O Talkeetna
		1314	2123.6	Land Talkeetna
				Static 1316-1319
		1340	2124.1	T/O Talkeetna
				Land MRI
				LOT: 01:06:05
				Lines 41-49 complete

ATMOSPHERE C PC OC HAZE **WX REMARKS**

PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY
6110401	2.6	2.5						



MISSION: M' 2911A M100911A+B **DATE:** 10/9/11

PILOT: Vogt **OPERATOR:** Kramer **AIRCRAFT:** 66R

ALTM

PROJECT NUMBER	LINE NO. & Hdg	GND SPEED (KTS)	SCAN FREQ	SCAN ANGLE	PRF	ALT (m)	TIME START	TIME STOP	Tranzpak Drive	REMARKS
6110401							924	927	1111	Static
Mat-Su							928			T/O MRI 2126.7
Dam Site							1437			Land Talkeetna 2131.9
							1440	1443		Static
							1559	1602		Static
							1603			T/O Talkeetna
							1904			Land MRI 2134.9
							1904	1907		Static

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START:	STOP:	NOTES: L.O.T.: 02:12:52
○ 6110401		27		5.2			924	1443	Lines 55-61 + 67-86
○ 6110401		10		3.0			1559	1907	L.O.T: 01:14:43
○									Lines: 50-54 + 62-66

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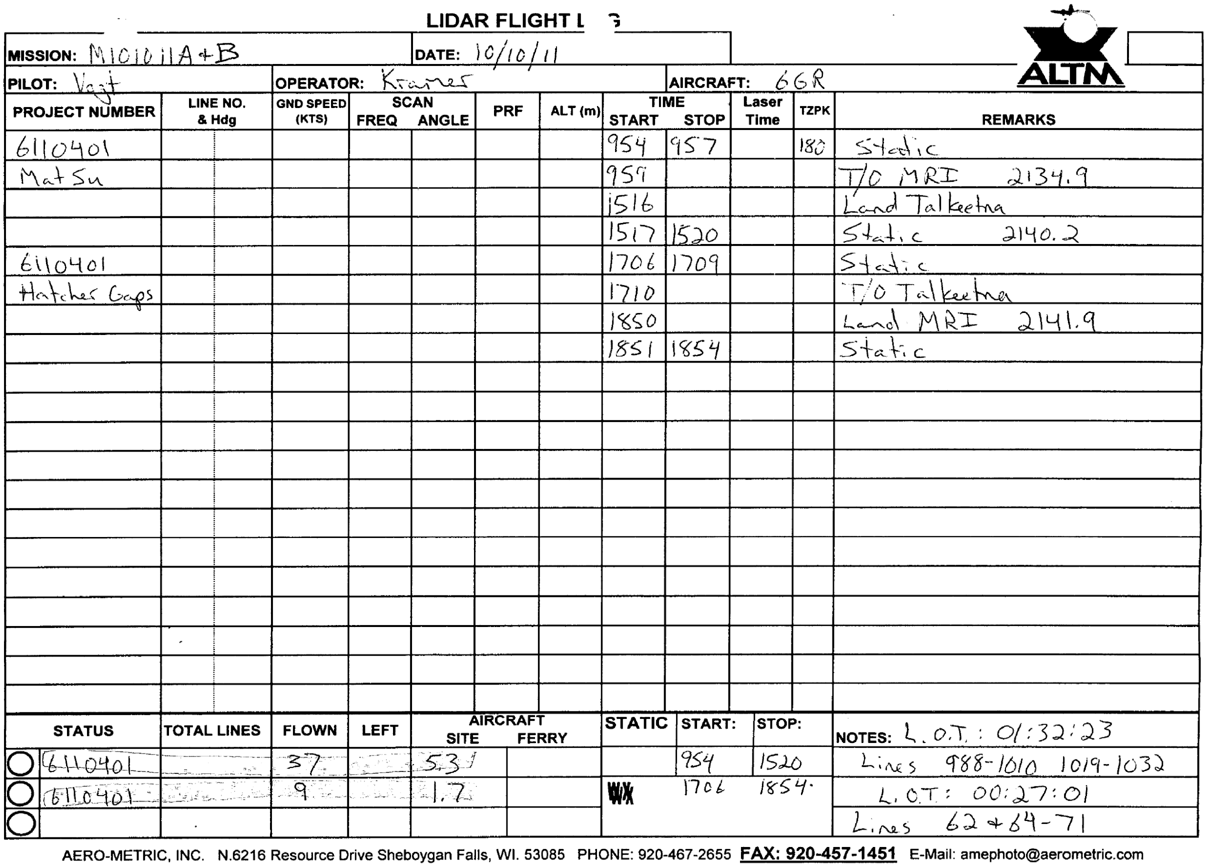

LIDAR FLIGHT L G

MISSION: M101011A+B		**DATE:** 10/10/11			
PILOT: Vogt		**OPERATOR:** Kramer		**AIRCRAFT:** 6GR	ALTM

PROJECT NUMBER	LINE NO. & Hdg	GND SPEED (KTS)	SCAN FREQ	SCAN ANGLE	PRF	ALT (m)	TIME START	TIME STOP	Laser Time	TZPK	REMARKS
6110401							954	957		180	Static
Mat Su							959				T/O MRI 2134.9
							1516				Land Talkeetna
							1517	1520			Static 2140.2
6110401							1706	1709			Static
Hatcher Gaps							1710				T/O Talkeetna
							1850				Land MRI 2141.9
							1851	1854			Static

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START:	STOP:	NOTES: L.O.T.: 01:32:23
○ 6110401		37		5.3			954	1520	Lines 988-1010 1019-1032
○ 6110401		9		1.7		WX	1706	1854.	L.O.T: 00:27:01
○									Lines 62 + 64-71

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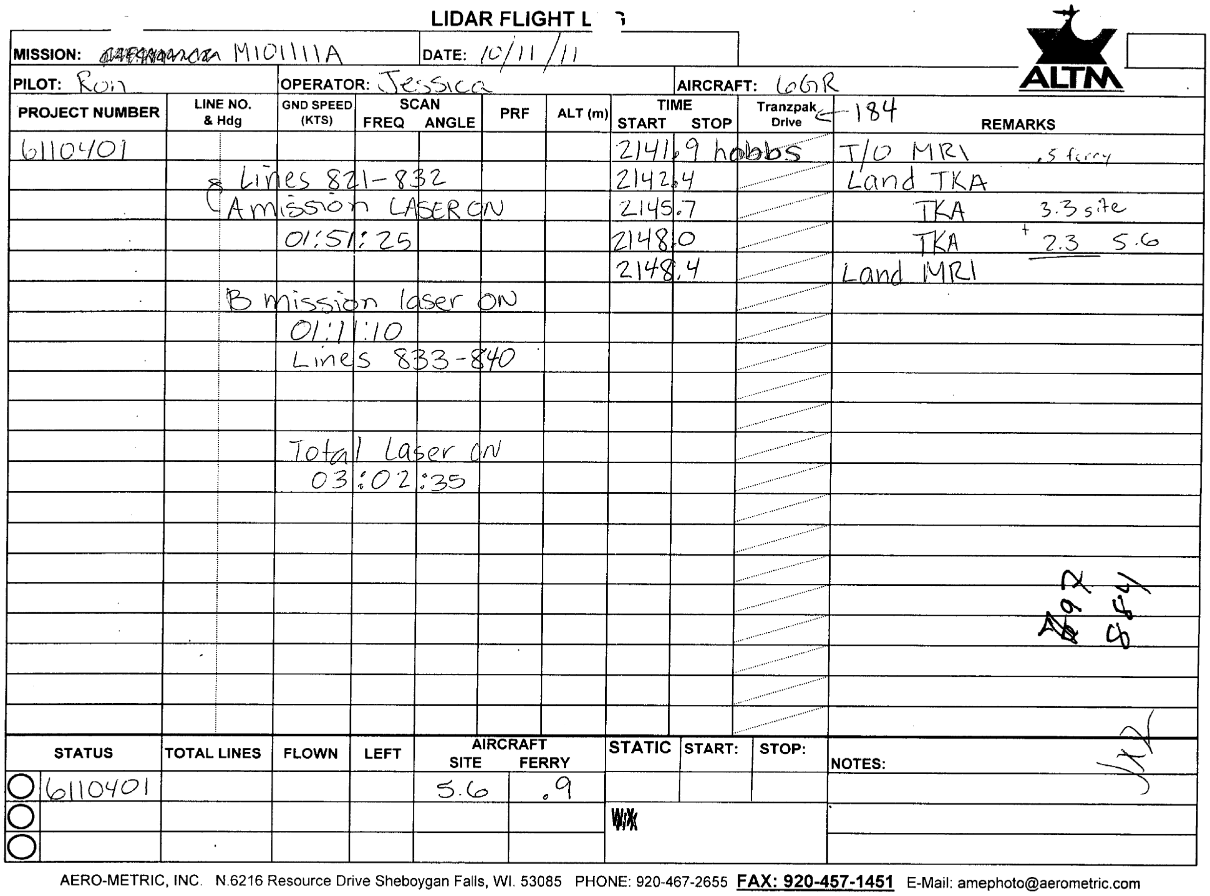

LIDAR FLIGHT L

MISSION: M101111A **DATE:** 10/11/11

PILOT: Ron **OPERATOR:** Jessica **AIRCRAFT:** 6GR

ALTM

PROJECT NUMBER	LINE NO. & Hdg	GND SPEED (KTS)	SCAN FREQ	SCAN ANGLE	PRF	ALT (m)	TIME START	TIME STOP	Tranzpak Drive ← 184	REMARKS
6110401							2141.9 hobbs			T/O MRI .5 ferry
	8 Lines 821-832						2142.4			Land TKA
	Amission LASER ON						2145.7			TKA 3.3 site
		01:51:25					2148.0			TKA + 2.3 5.6
							2148.4			Land MRI
	B mission laser ON									
		01:11:10								
		Lines 833-840								
		Total Laser ON								
		03:02:35								

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START:	STOP:	NOTES:
○ 6110401				5.6	.9				
○						WX			
○									

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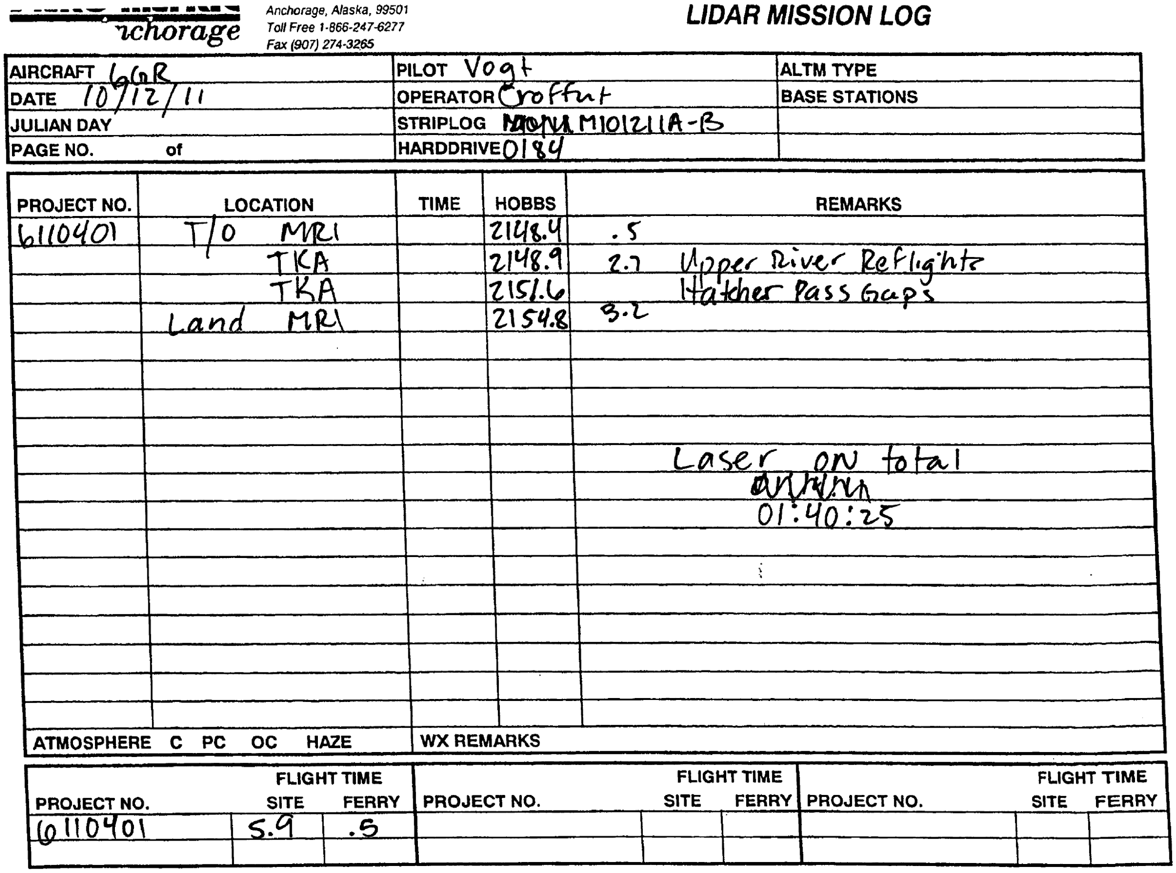

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LIDAR MISSION LOG

AIRCRAFT 6GR
DATE 10/12/11
JULIAN DAY
PAGE NO. of

PILOT Vogt
OPERATOR Croffut
STRIPLOG ~~[illegible]~~ M101211A-B
HARDDRIVE 0184

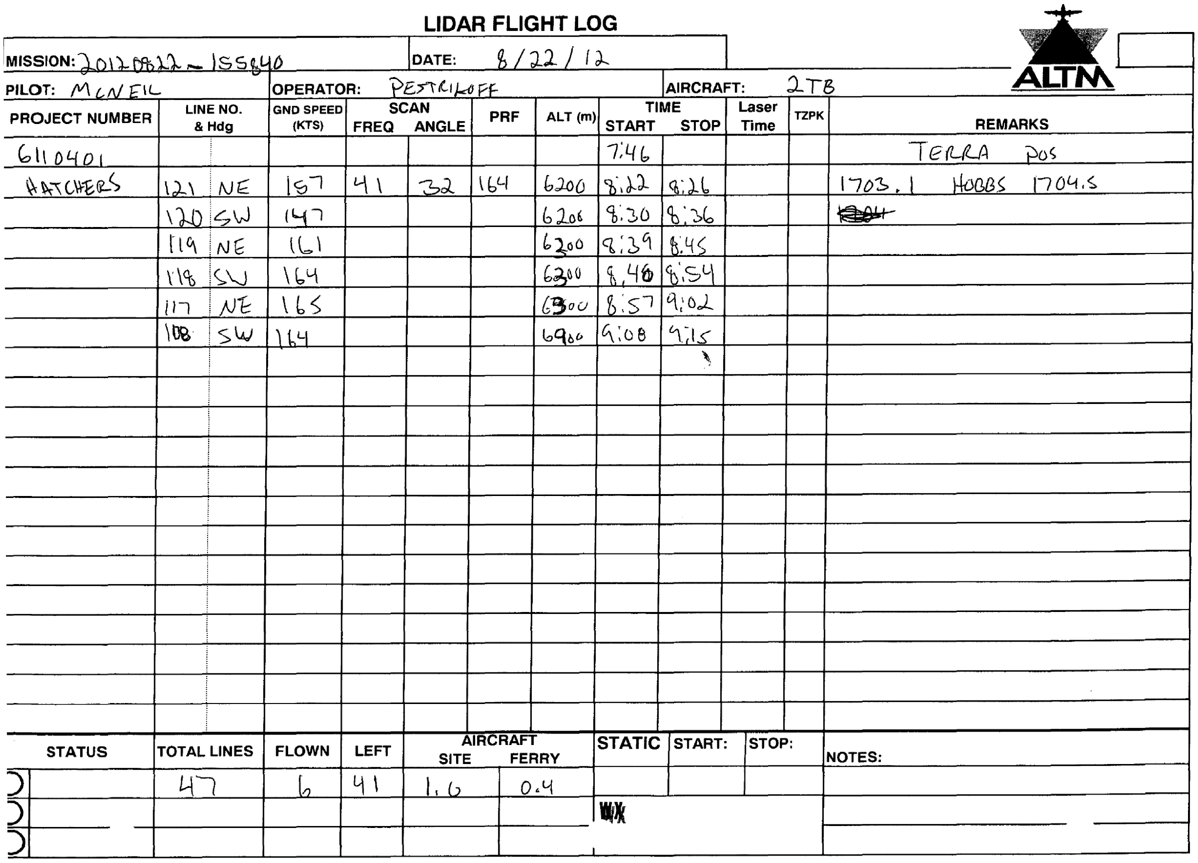
ALTM TYPE
BASE STATIONS

PROJECT NO.	LOCATION	TIME	HOBBS	REMARKS
6110401	T/O MRI		2148.4	.5
	TKA		2148.9	2.7 Upper River Reflights
	TKA		2151.6	Hatcher Pass Gaps
	Land MRI		2154.8	3.2
				Laser on total
				[illegible]
				01:40:25

ATMOSPHERE C PC OC HAZE
WX REMARKS

PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY	PROJECT NO.	FLIGHT TIME SITE	FLIGHT TIME FERRY
6110401	5.9	.5						

August 2012 Logs



LIDAR FLIGHT LOG

ALTM

MISSION: 20120822 – 155840

DATE: 8/22/12

PILOT: MCNEIL

OPERATOR: PESTRIKOFF

AIRCRAFT: 2TB

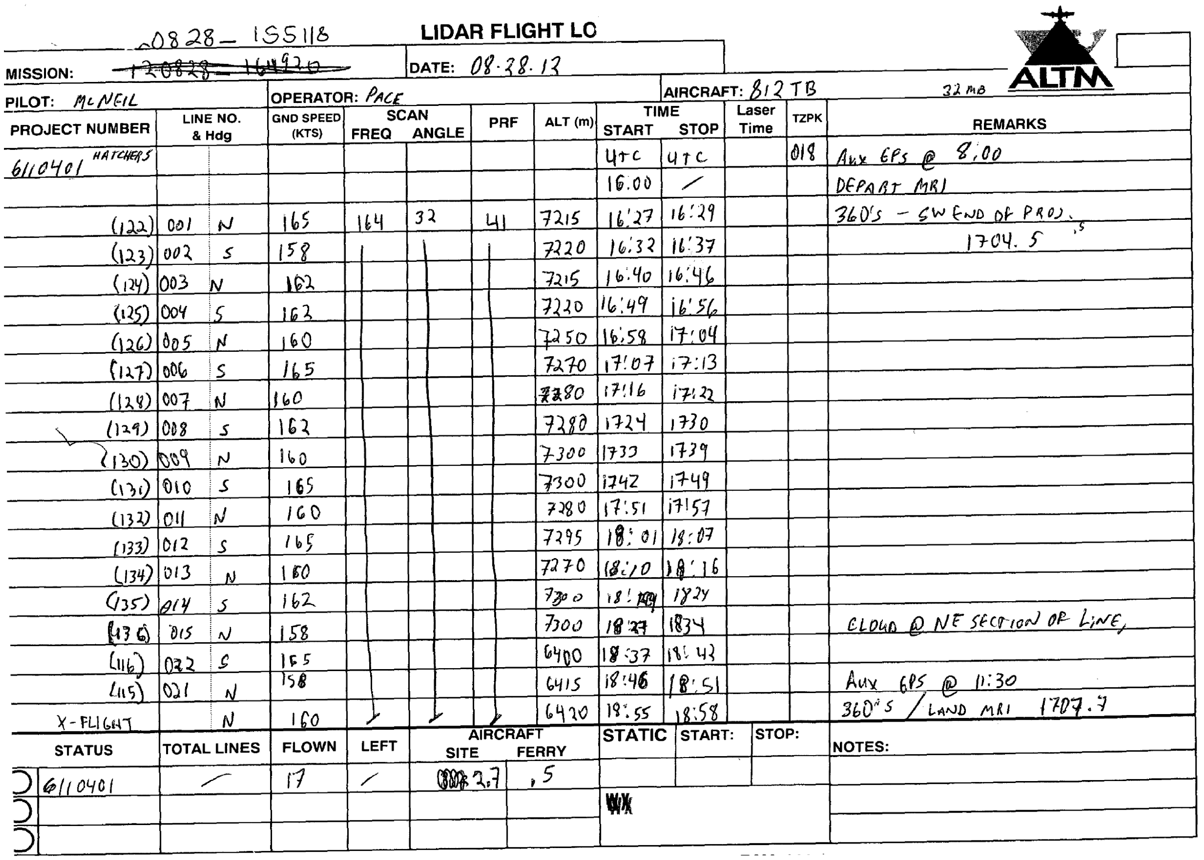
PROJECT NUMBER	LINE NO. & Hdg		GND SPEED (KTS)	SCAN FREQ	SCAN ANGLE	PRF	ALT (m)	TIME START	TIME STOP	Laser Time	TZPK	REMARKS
6110401								7:46				TERRA POS
HATCHERS	121	NE	157	41	32	164	6200	8:22	8:26			1703.1 HOBBS 1704.5
	120	SW	147				6200	8:30	8:36			~~[illegible]~~
	119	NE	161				6200	8:39	8:45			
	118	SW	164				6300	8:46	8:54			
	117	NE	165				6300	8:57	9:02			
	108	SW	164				6900	9:08	9:15			

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY
	47	6	41	1.6	0.4

STATIC START: STOP:

WX

NOTES:



LIDAR FLIGHT LO

MISSION: 0828– 155118 ~~120828– 164920~~

DATE: 08·28·13

PILOT: McNEIL

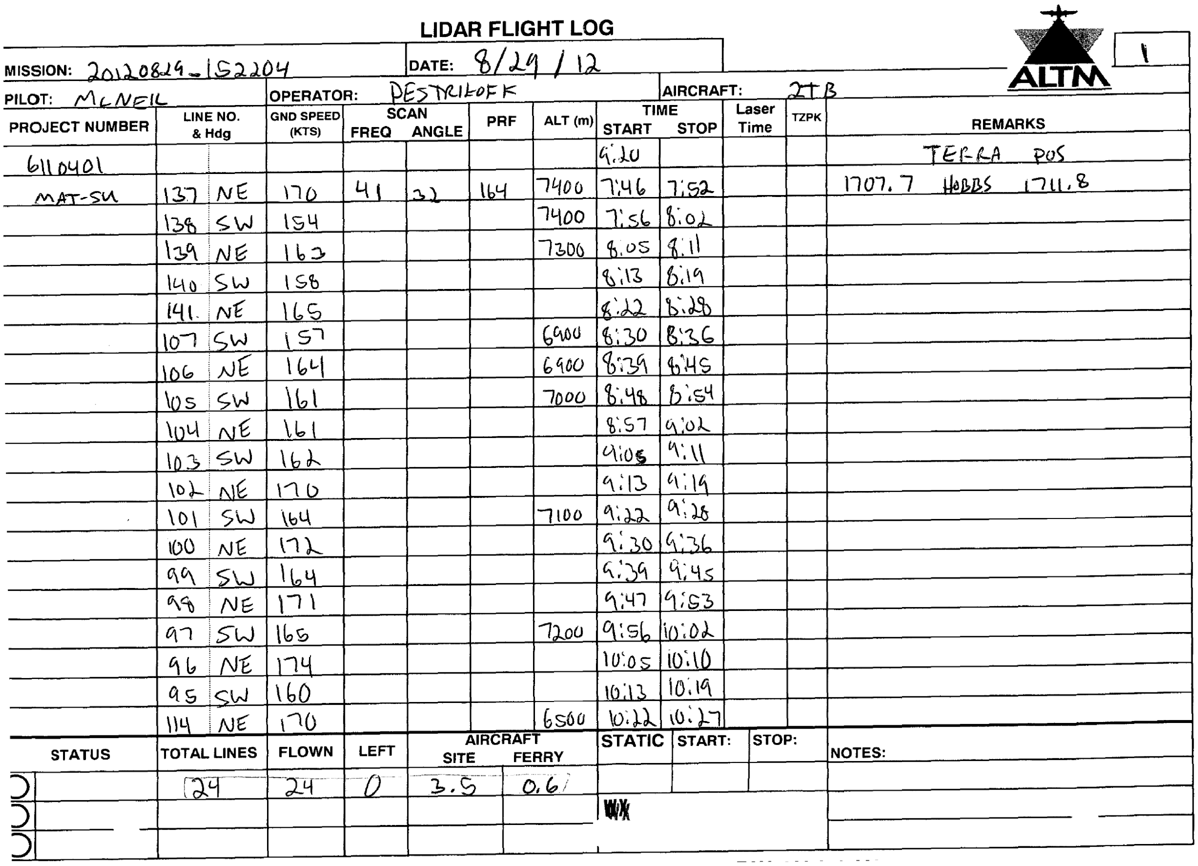
OPERATOR: PACE

AIRCRAFT: 812 TB

32 MB

PROJECT NUMBER	LINE NO. & Hdg		GND SPEED (KTS)	SCAN FREQ	SCAN ANGLE	PRF	ALT (m)	TIME START	TIME STOP	Laser Time	TZPK	REMARKS
6110401 HATCHERS								UTC	UTC		018	Aux GPS @ 8:00
								16.00	/			DEPART MRI
(122)	001	N	165	164	32	41	7215	16:27	16:29			360's – SW END OF PROJ.
(123)	002	S	158				7220	16:32	16:37			1704.5 ,5
(124)	003	N	162				7215	16:40	16:46			
(125)	004	S	163				7220	16:49	16:56			
(126)	005	N	160				7250	16:58	17:04			
(127)	006	S	165				7270	17:07	17:13			
(128)	007	N	160				7280	17:16	17:22			
(129)	008	S	162				7280	1724	1730			
(130)	009	N	160				7300	1733	1739			
(131)	010	S	165				7300	1742	1749			
(132)	011	N	160				7280	17:51	17:57			
(133)	012	S	165				7295	18:01	18:07			
(134)	013	N	160				7270	18:10	18:16			
(135)	014	S	162				7300	18:[illegible]	1824			
(136)	015	N	158				7300	18:27	1834			CLOUD @ NE SECTION OF LINE,
(116)	022	S	155				6400	18:37	18:43			
(115)	021	N	158				6415	18:46	18:51			Aux GPS @ 11:30
X-FLIGHT		N	160				6420	18:55	18:58			360's / LAND MRI 1707.7

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START:	STOP:	NOTES:
6110401	/	17	/	2.7	,5				
						WX			



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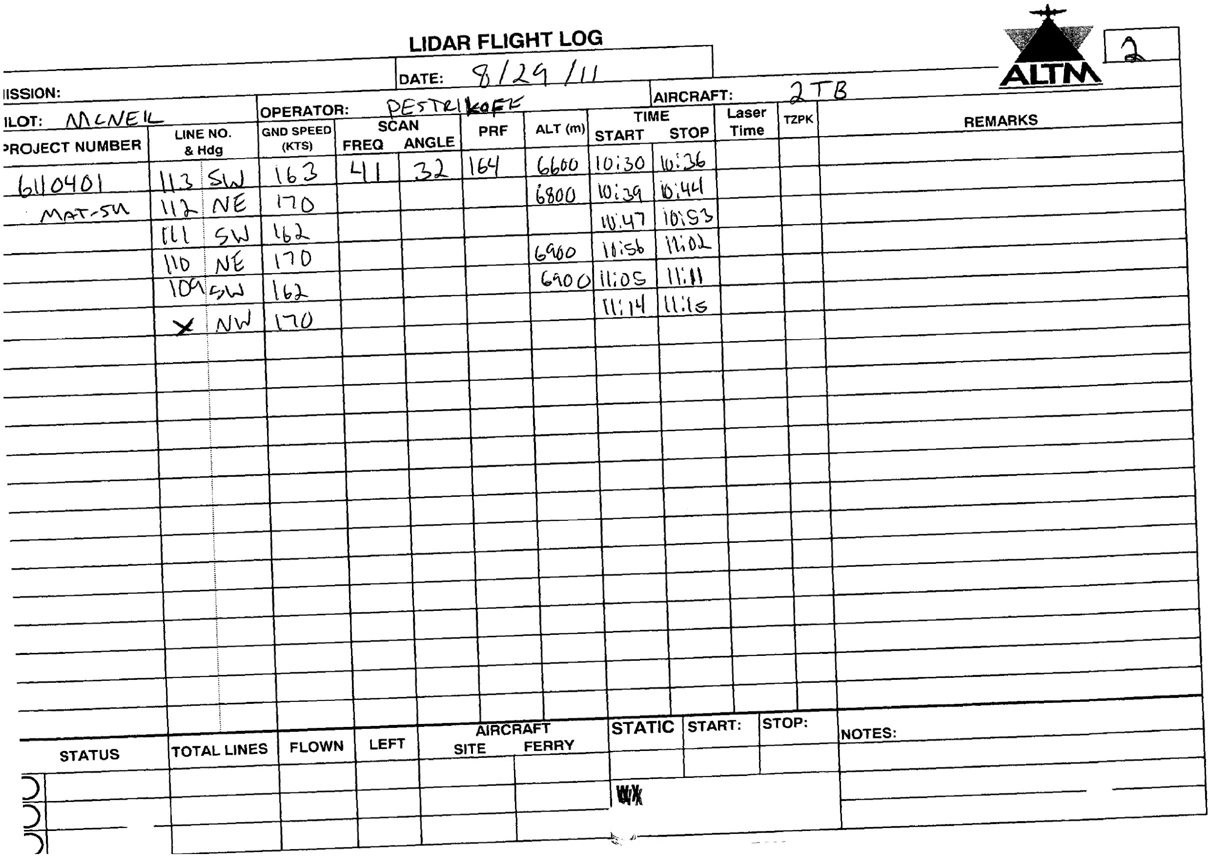
ALTM

LIDAR FLIGHT LOG

MISSION: 20120829_152204
DATE: 8/29/12
PILOT: McNEIL
OPERATOR: PESTRIKOFK
AIRCRAFT: 2TB

PROJECT NUMBER	LINE NO. & Hdg		GND SPEED (KTS)	SCAN		PRF	ALT (m)	TIME		Laser Time	TZPK	REMARKS
				FREQ	ANGLE			START	STOP			
6110401								9:20				TERRA POS
MAT-SU	137	NE	170	41	32	164	7400	7:46	7:52			1707.7 HOBBS 1711.8
	138	SW	154				7400	7:56	8:02			
	139	NE	162				7300	8:05	8:11			
	140	SW	158					8:13	8:19			
	141.	NE	165					8:22	8:28			
	107	SW	157				6900	8:30	8:36			
	106	NE	164				6900	8:39	8:45			
	105	SW	161				7000	8:48	8:54			
	104	NE	161					8:57	9:02			
	103	SW	162					9:05	9:11			
	102	NE	170					9:13	9:19			
	101	SW	164				7100	9:22	9:28			
	100	NE	172					9:30	9:36			
	99	SW	164					9:39	9:45			
	98	NE	171					9:47	9:53			
	97	SW	165				7200	9:56	10:02			
	96	NE	174					10:05	10:10			
	95	SW	160					10:13	10:19			
	114	NE	170				6500	10:22	10:27			

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT		STATIC	START:	STOP:	NOTES:
				SITE	FERRY				
	24	24	0	3.5	0.6				
						WX			



ALTM 2

LIDAR FLIGHT LOG

DATE: 8/29/11

IISSION:

AIRCRAFT: 2TB

ILOT: MCNEIL

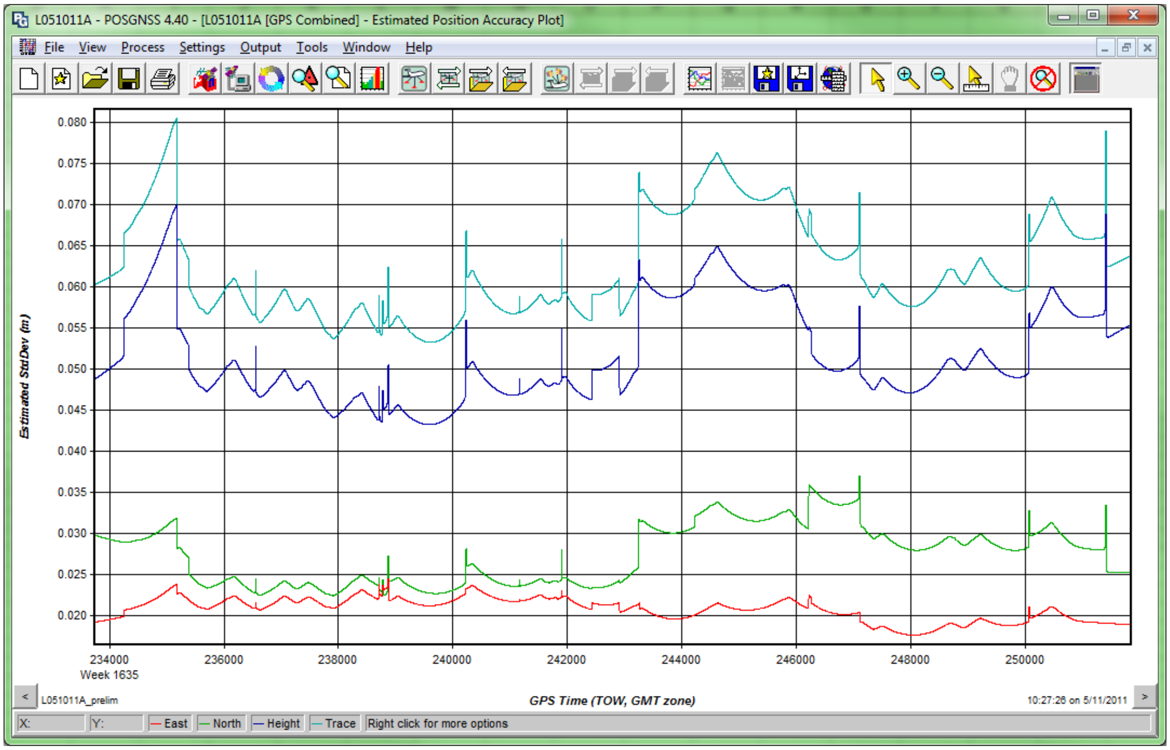
OPERATOR: PESTRIKOFF

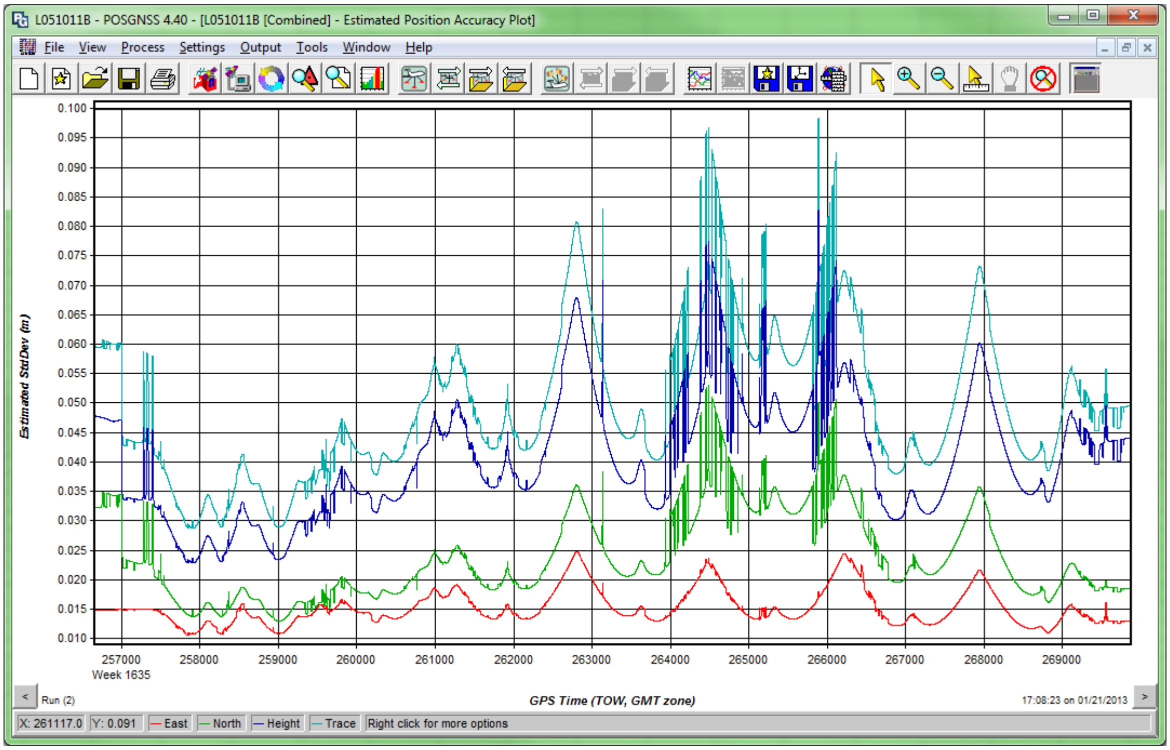
PROJECT NUMBER	LINE NO. & Hdg		GND SPEED (KTS)	SCAN		PRF	ALT (m)	TIME		Laser Time	TZPK	REMARKS
				FREQ	ANGLE			START	STOP			
6110401	113	SW	163	41	32	164	6600	10:30	10:36			
MAT-SU	112	NE	170				6800	10:39	10:44			
	111	SW	162					10:47	10:53			
	110	NE	170				6900	10:56	11:02			
	109	SW	162				6900	11:05	11:11			
								11:14	11:16			
	X	NW	170									

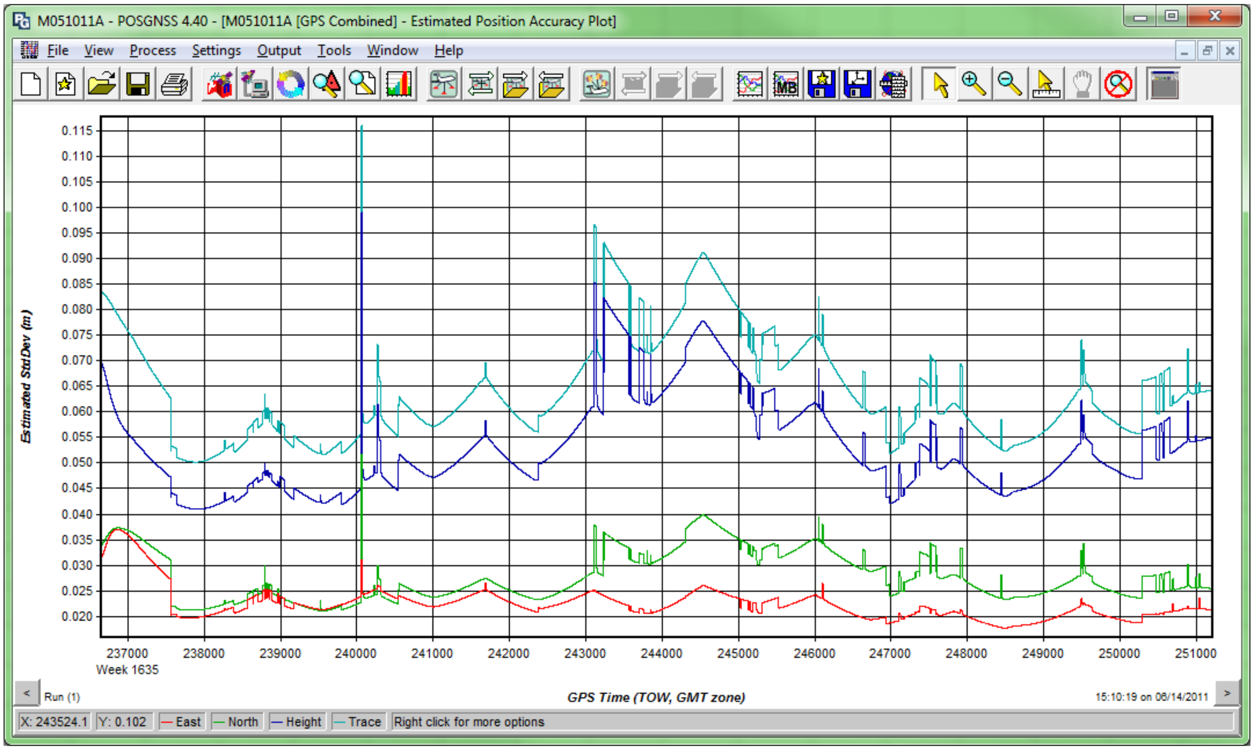
STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC START:	STOP:	NOTES:
						WX		

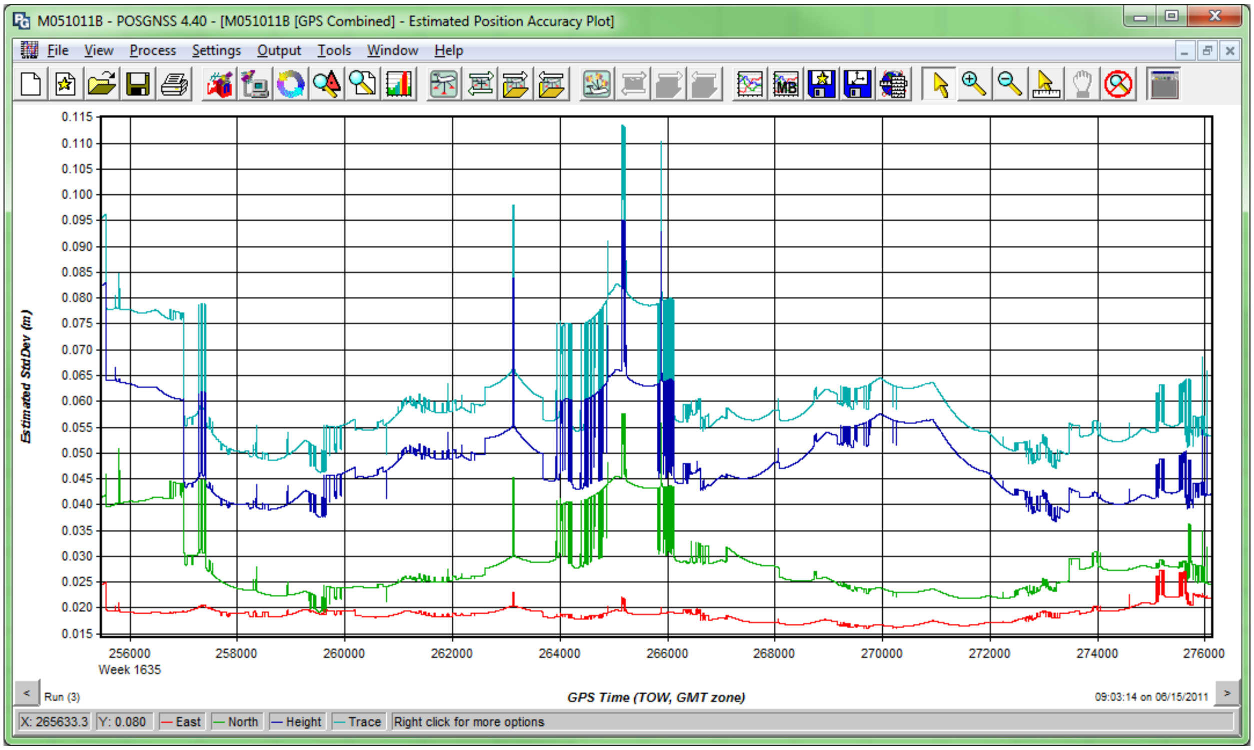
8 LiDAR GPS PROCESSING RMSE PLOTS

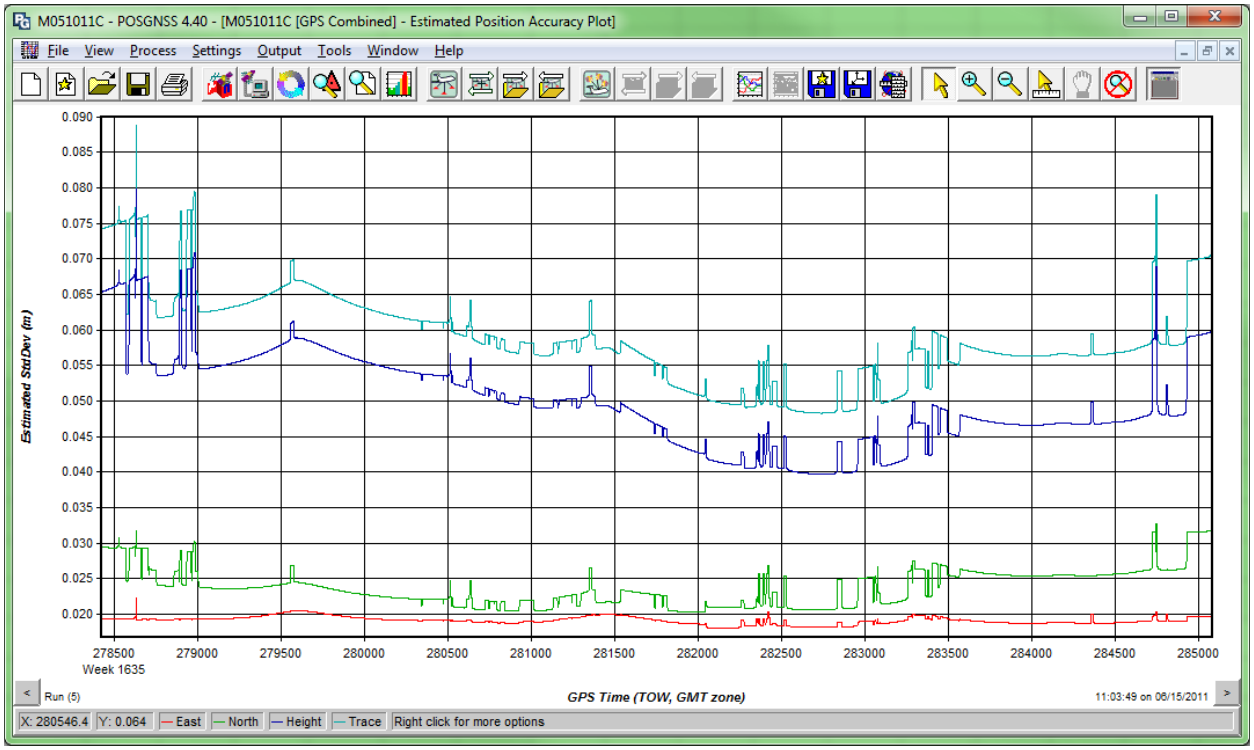
May 10 2011 Plots



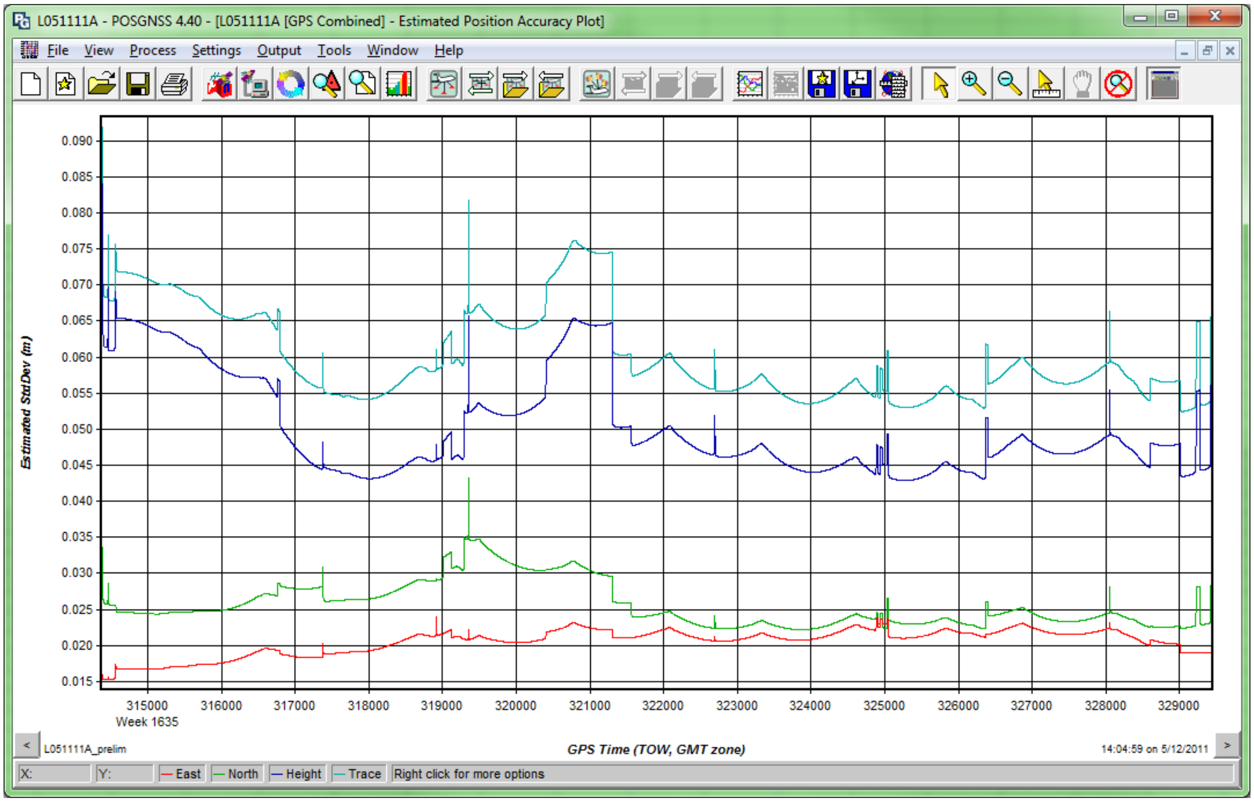


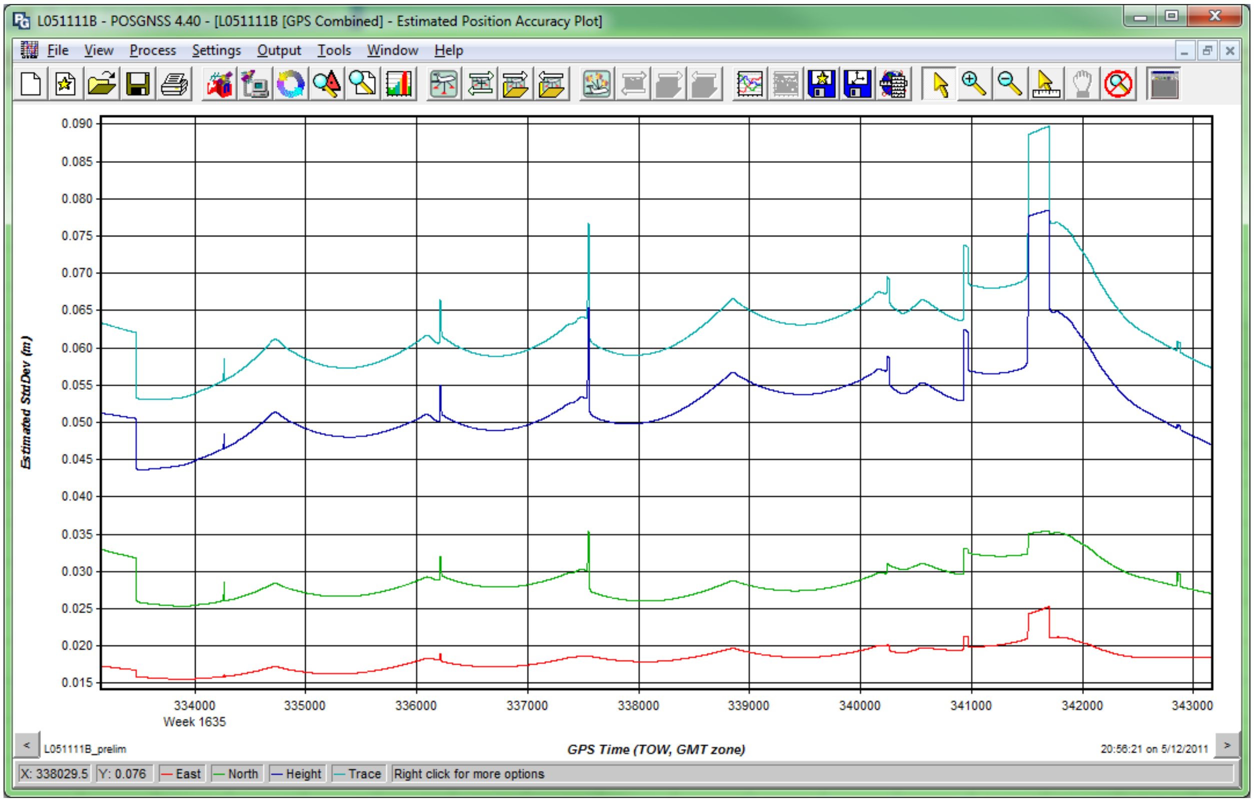

M051011A - POSGNSS 4.40 - [M051011A [GPS Combined] - Estimated Position Accuracy Plot]
File View Process Settings Output Tools Window Help
Estimated StdDev (m)
0.115
0.110
0.105
0.100
0.095
0.090
0.085
0.080
0.075
0.070
0.065
0.060
0.055
0.050
0.045
0.040
0.035
0.030
0.025
0.020
237000
238000
239000
240000
241000
242000
243000
244000
245000
246000
247000
248000
249000
250000
251000
Week 1635
Run (1)
GPS Time (TOW, GMT zone)
15:10:19 on 06/14/2011
X: 243524.1
Y: 0.102
East
North
Height
Trace
Right click for more options

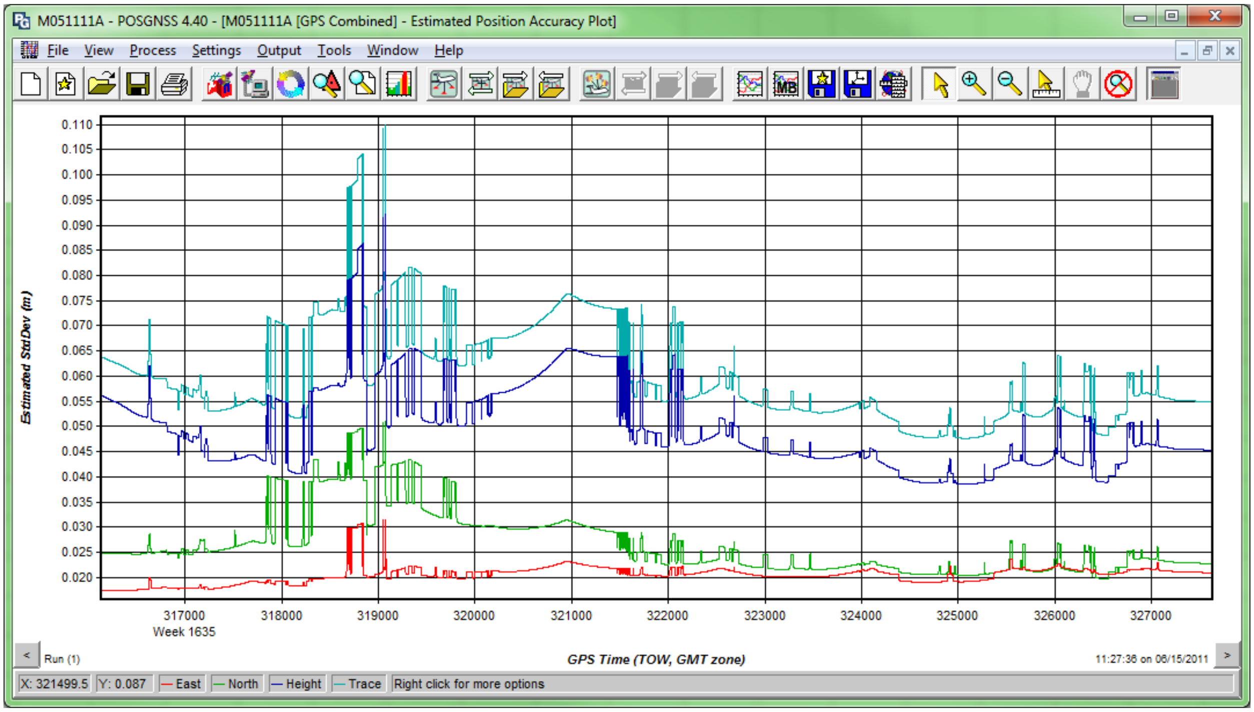

M051011B - POSGNSS 4.40 - [M051011B [GPS Combined] - Estimated Position Accuracy Plot]
File View Process Settings Output Tools Window Help
Estimated StdDev (m)
0.115
0.110
0.105
0.100
0.095
0.090
0.085
0.080
0.075
0.070
0.065
0.060
0.055
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
256000
258000
260000
262000
264000
266000
268000
270000
272000
274000
276000
Week 1635
Run (3)
GPS Time (TOW, GMT zone)
09:03:14 on 06/15/2011
X: 265633.3
Y: 0.080
East
North
Height
Trace
Right click for more options


M051011C - POSGNSS 4.40 - [M051011C [GPS Combined] - Estimated Position Accuracy Plot]
File View Process Settings Output Tools Window Help
Estimated StdDev (m)
0.090
0.085
0.080
0.075
0.070
0.065
0.060
0.055
0.050
0.045
0.040
0.035
0.030
0.025
0.020
278500
279000
279500
280000
280500
281000
281500
282000
282500
283000
283500
284000
284500
285000
Week 1635
Run (5)
GPS Time (TOW, GMT zone)
11:03:49 on 06/15/2011
X: 280546.4
Y: 0.064
East
North
Height
Trace
Right click for more options

May 11 2011 Plots

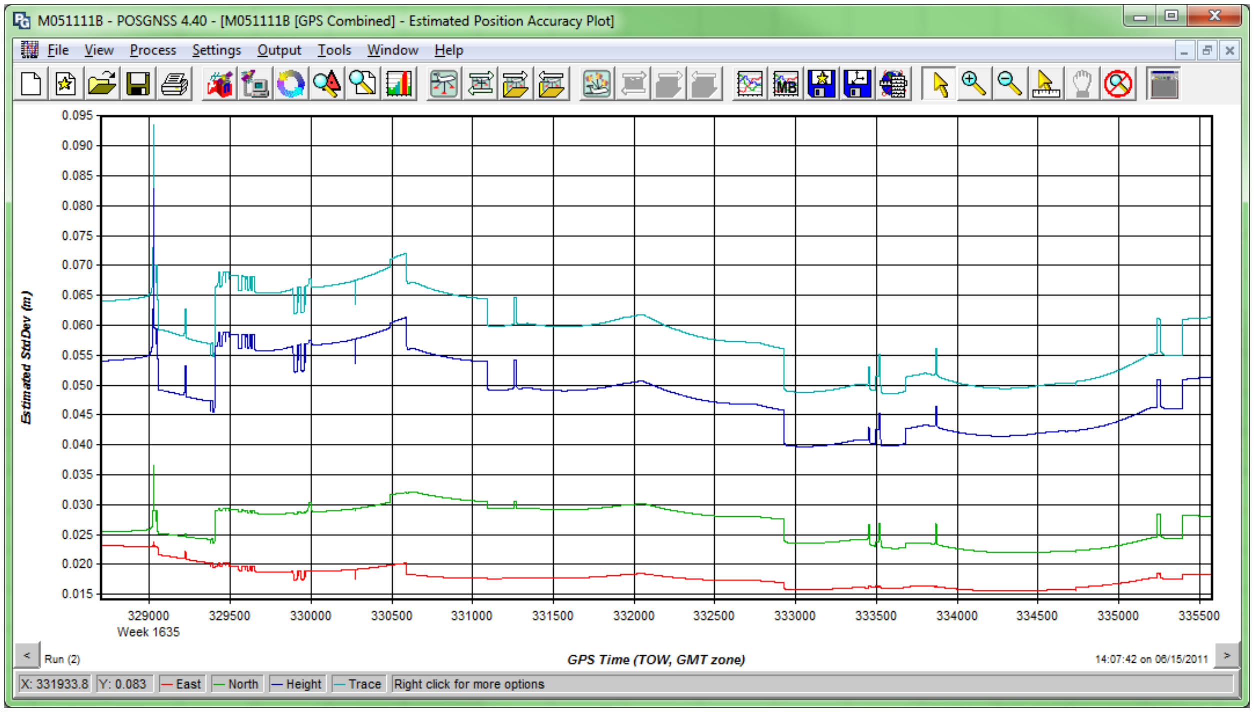






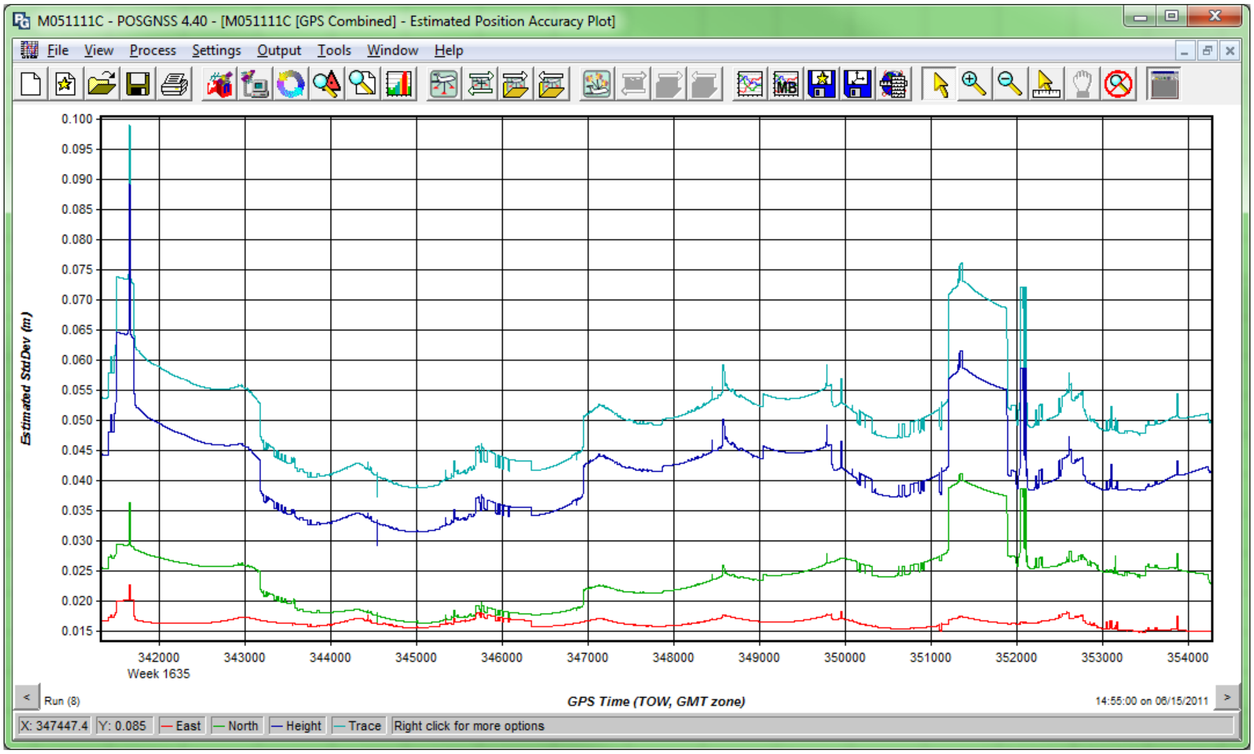
X: 321499.5 Y: 0.087

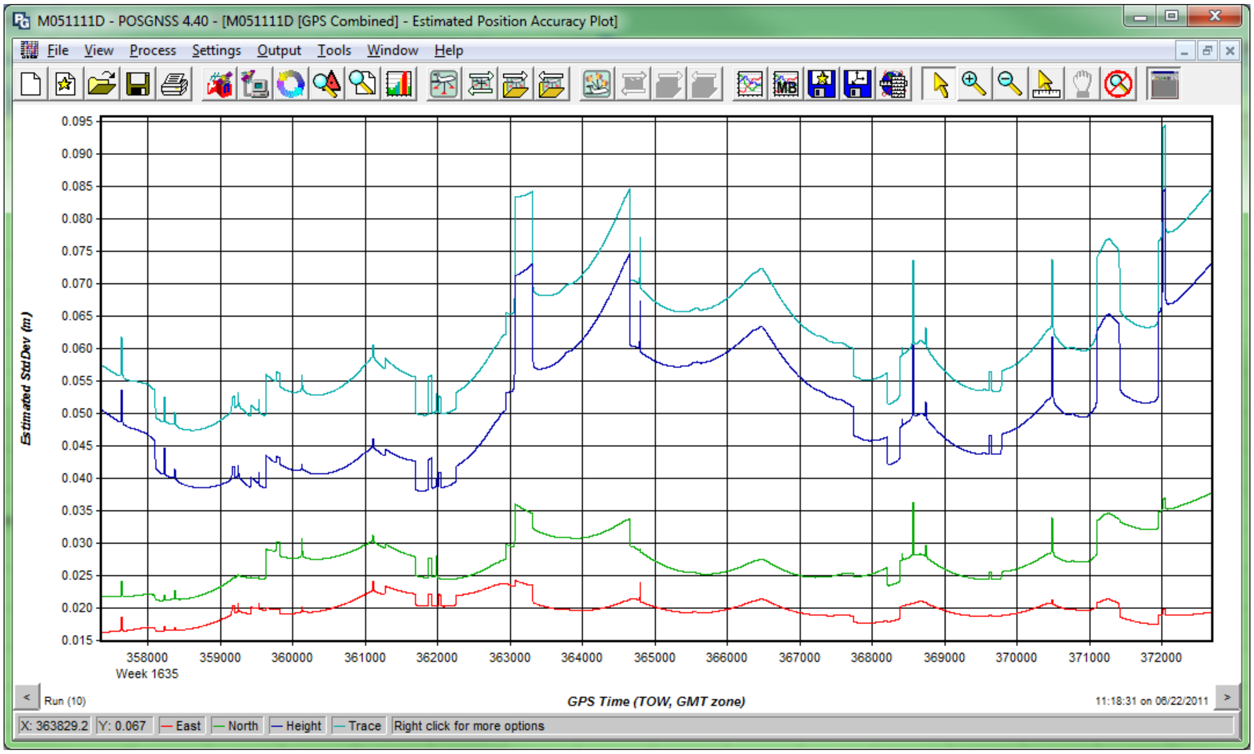
11:27:36 on 06/15/2011



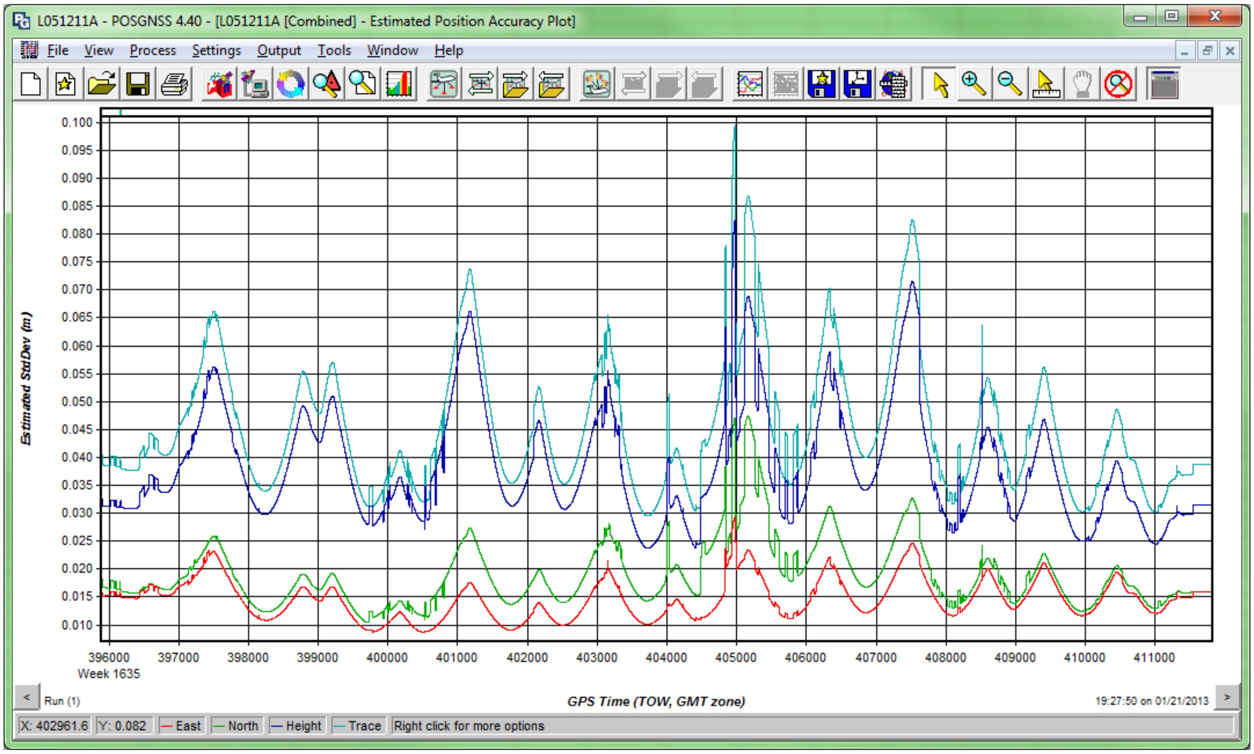
X: 331933.8 Y: 0.083

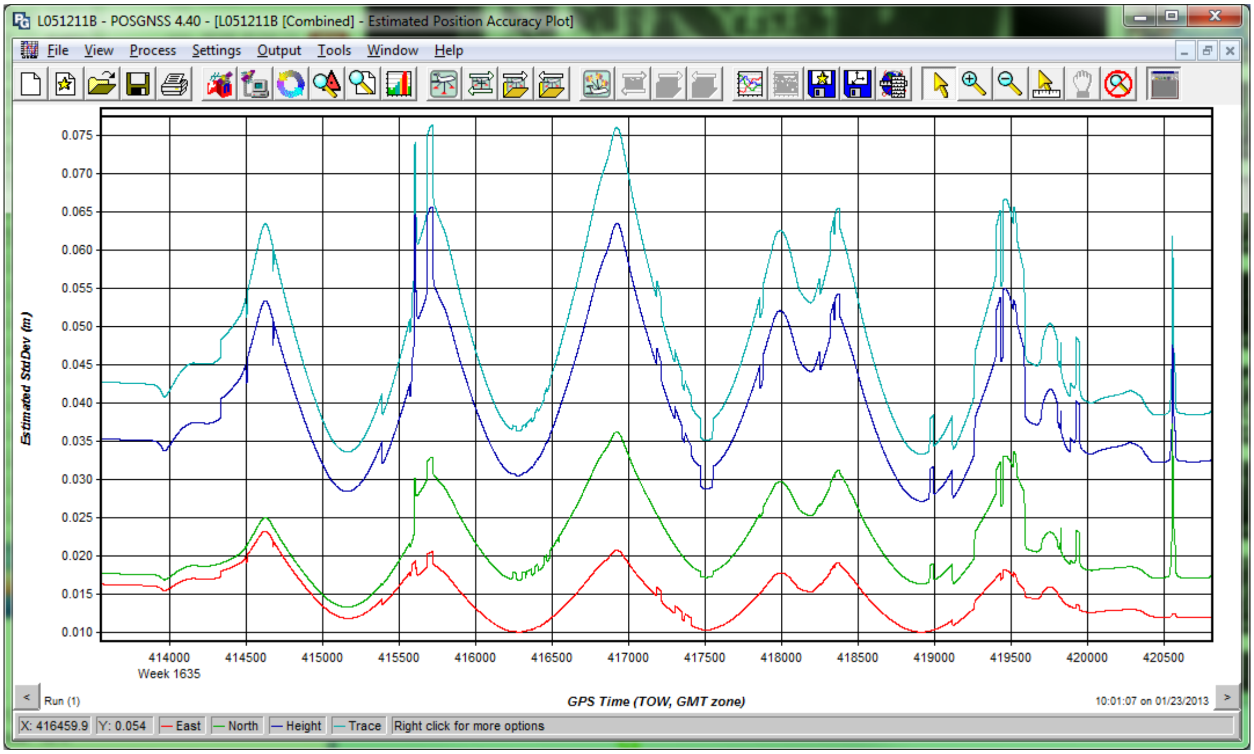
14:07:42 on 06/15/2011

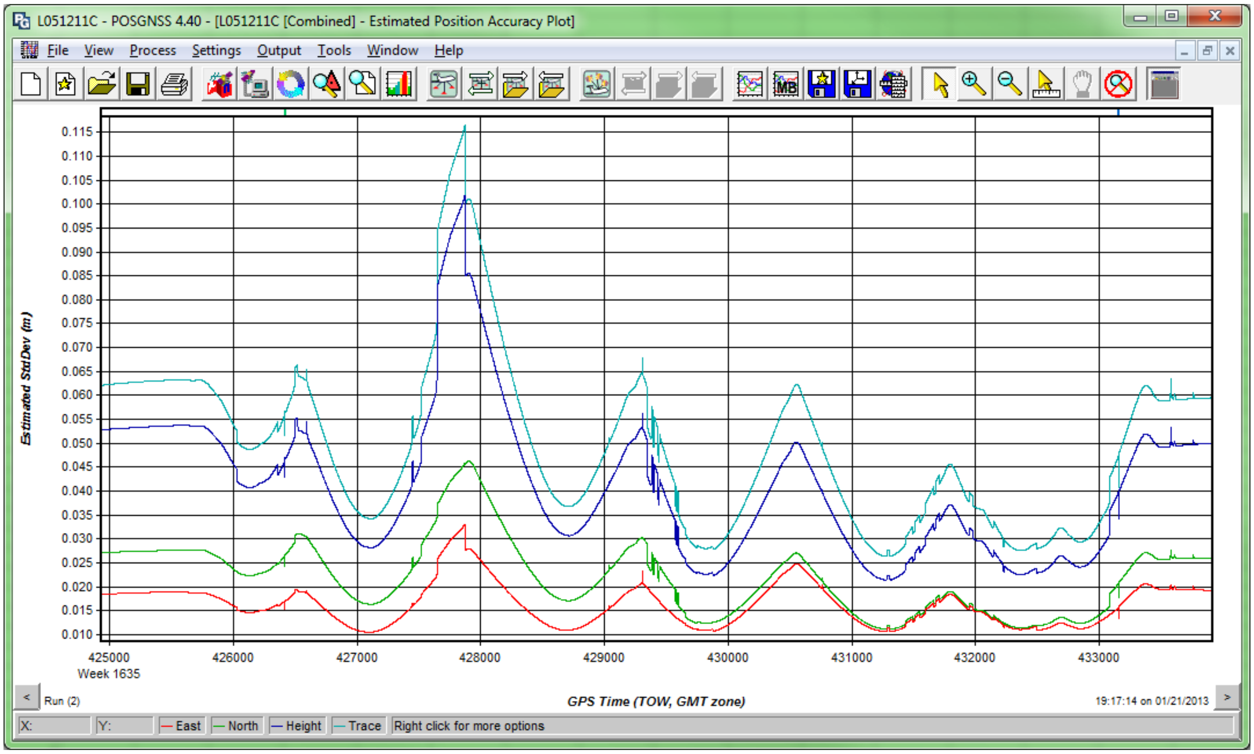

M051111C - POSGNSS 4.40 - [M051111C [GPS Combined] - Estimated Position Accuracy Plot]
File View Process Settings Output Tools Window Help
0.100
0.095
0.090
0.085
0.080
0.075
0.070
0.065
0.060
0.055
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
Estimated StdDev (m)
342000
343000
344000
345000
346000
347000
348000
349000
350000
351000
352000
353000
354000
Week 1635
Run (8)
GPS Time (TOW, GMT zone)
14:55:00 on 06/15/2011
X: 347447.4
Y: 0.085
East
North
Height
Trace
Right click for more options

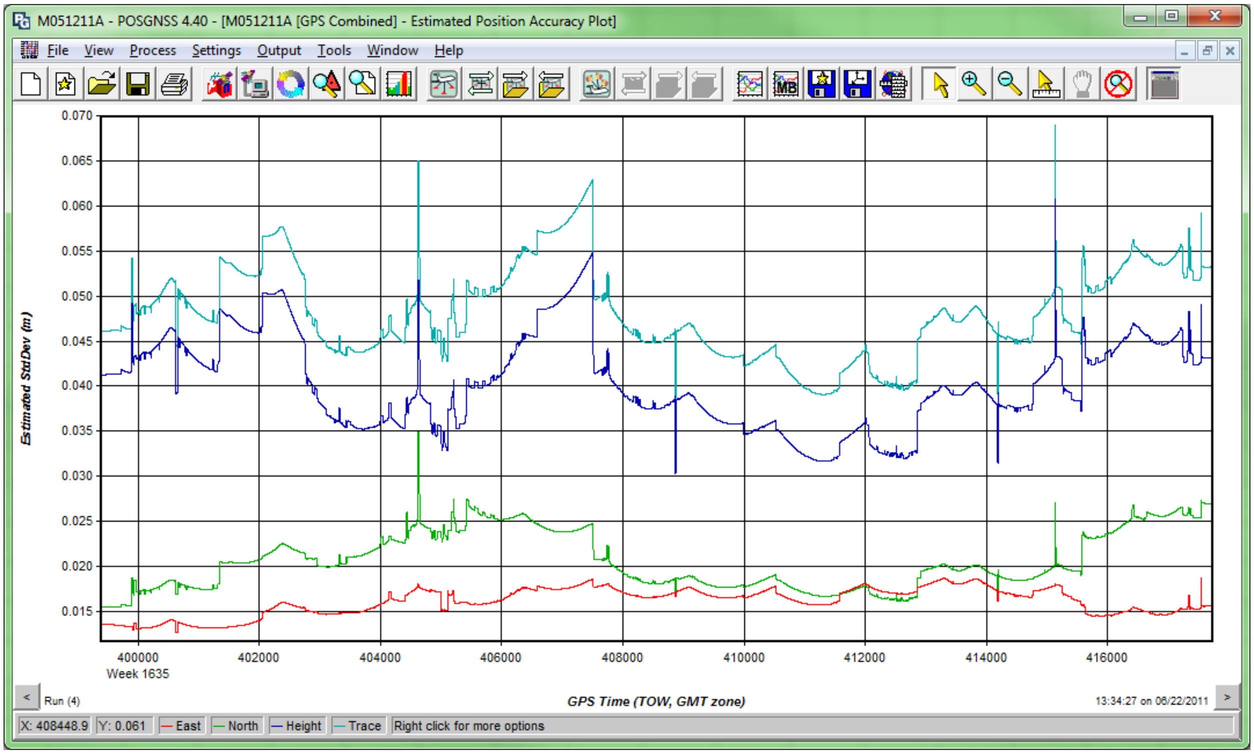

M051111D - POSGNSS 4.40 - [M051111D [GPS Combined] - Estimated Position Accuracy Plot]
File View Process Settings Output Tools Window Help
0.095
0.090
0.085
0.080
0.075
0.070
0.065
0.060
0.055
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
Estimated StdDev (m)
358000
359000
360000
361000
362000
363000
364000
365000
366000
367000
368000
369000
370000
371000
372000
Week 1635
Run (10)
GPS Time (TOW, GMT zone)
11:18:31 on 06/22/2011
X: 363829.2
Y: 0.067
East
North
Height
Trace
Right click for more options

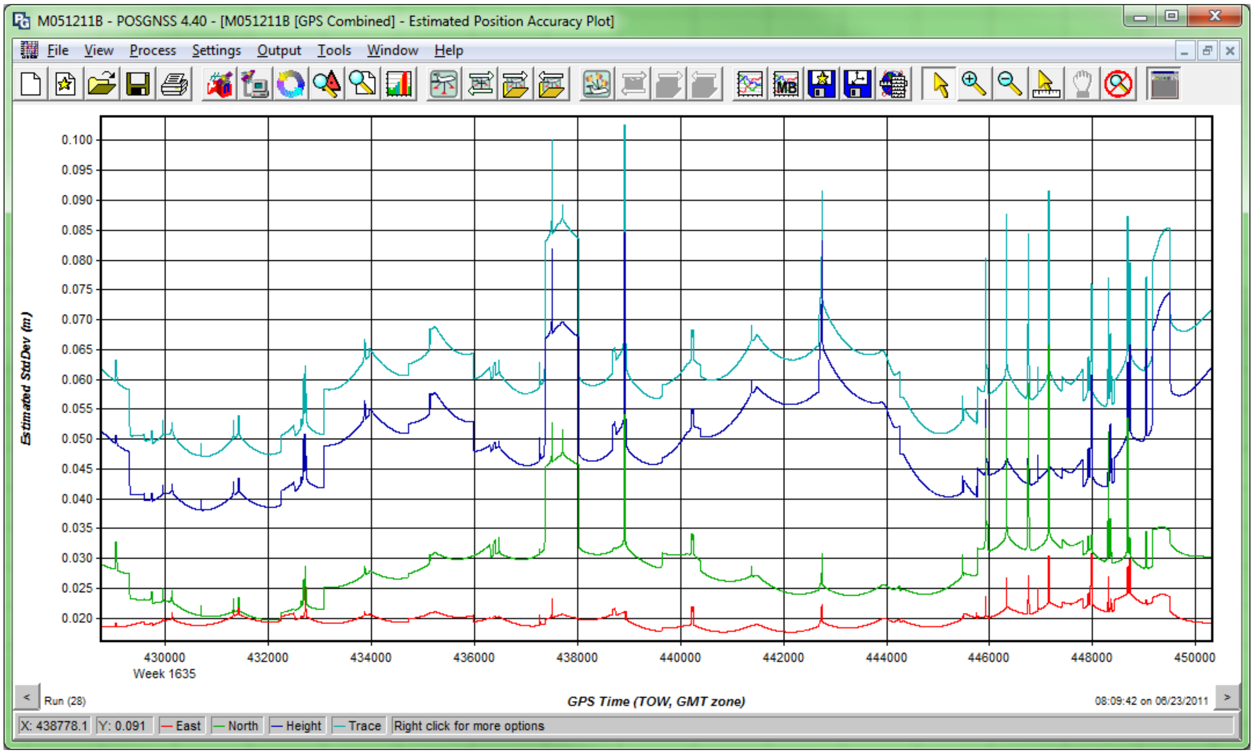
May 12 2011 Plots



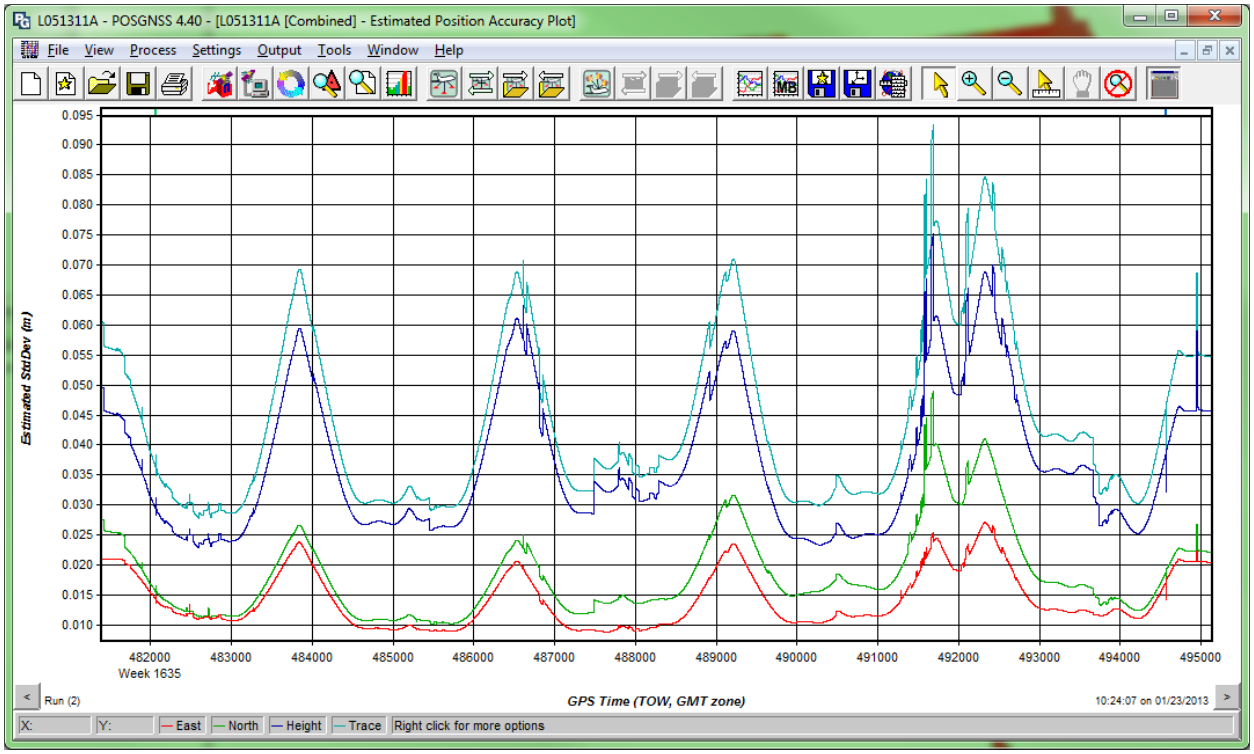


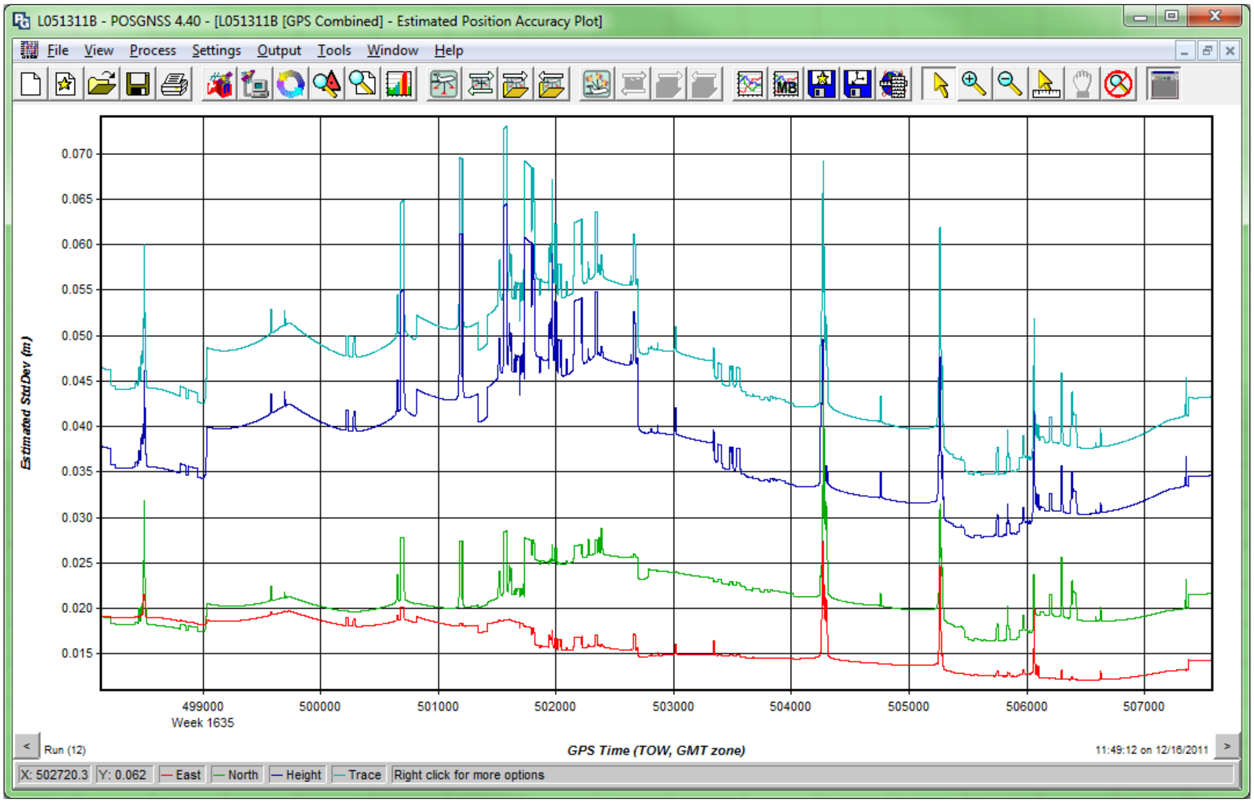

L051211C - POSGNSS 4.40 - [L051211C [Combined] - Estimated Position Accuracy Plot]
File
View
Process
Settings
Output
Tools
Window
Help
Estimated StdDev (m)
0.115
0.110
0.105
0.100
0.095
0.090
0.085
0.080
0.075
0.070
0.065
0.060
0.055
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
425000
Week 1635
426000
427000
428000
429000
430000
431000
432000
433000
Run (2)
GPS Time (TOW, GMT zone)
19:17:14 on 01/21/2013
X:
Y:
East
North
Height
Trace
Right click for more options

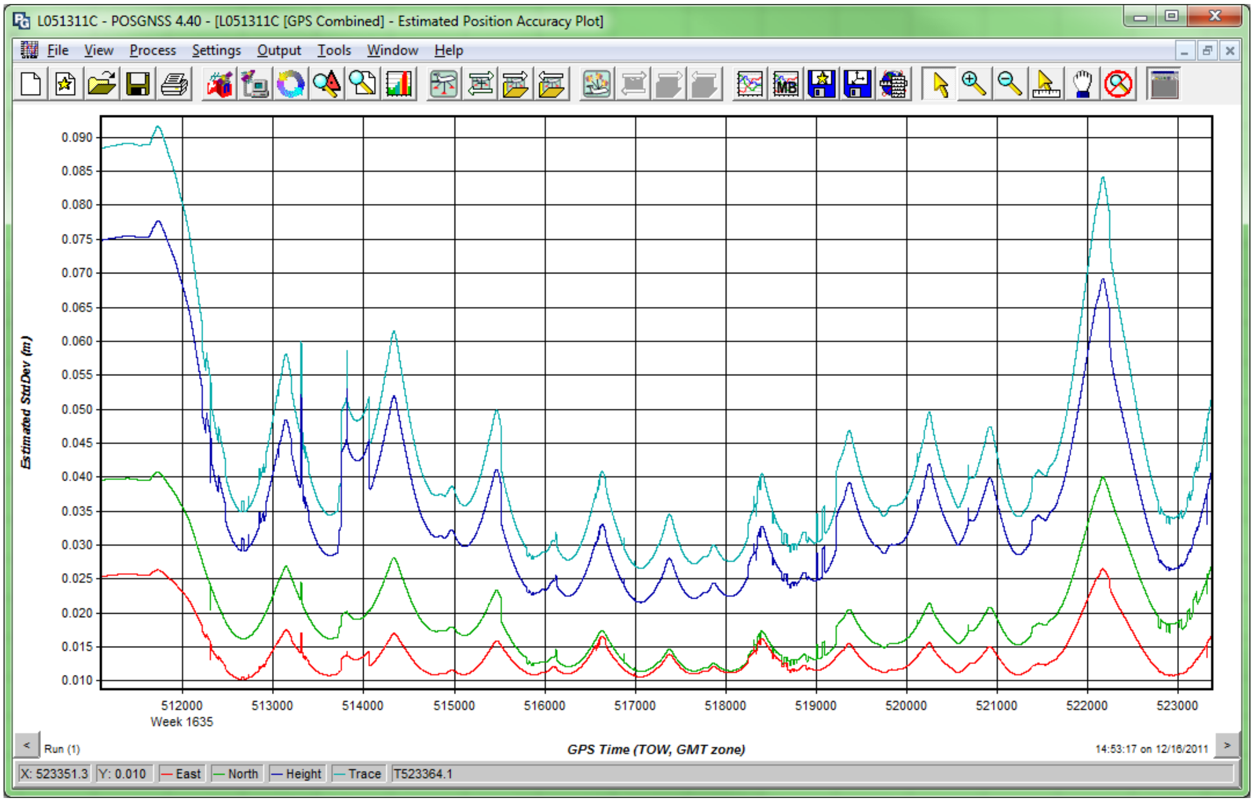

M051211A - POSGNSS 4.40 - [M051211A [GPS Combined] - Estimated Position Accuracy Plot]
File
View
Process
Settings
Output
Tools
Window
Help
Estimated StdDev (m)
0.070
0.065
0.060
0.055
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
400000
Week 1635
402000
404000
406000
408000
410000
412000
414000
416000
Run (4)
GPS Time (TOW, GMT zone)
13:34:27 on 06/22/2011
X: 408448.9
Y: 0.061
East
North
Height
Trace
Right click for more options

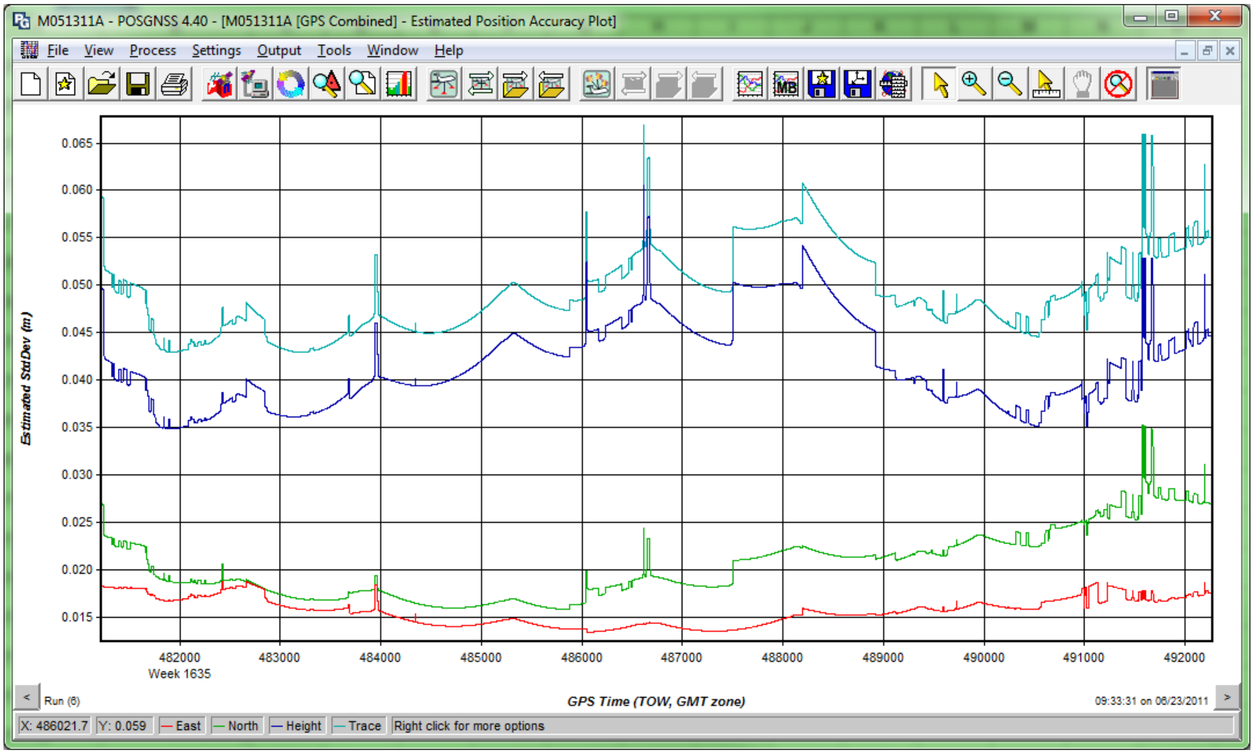

M051211B - POSGNSS 4.40 - [M051211B [GPS Combined] - Estimated Position Accuracy Plot]
File View Process Settings Output Tools Window Help
Estimated StdDev (m)
0.100
0.095
0.090
0.085
0.080
0.075
0.070
0.065
0.060
0.055
0.050
0.045
0.040
0.035
0.030
0.025
0.020
430000
Week 1635
432000
434000
436000
438000
440000
442000
444000
446000
448000
450000
Run (28)
GPS Time (TOW, GMT zone)
08:09:42 on 06/23/2011
X: 438778.1
Y: 0.091
East
North
Height
Trace
Right click for more options

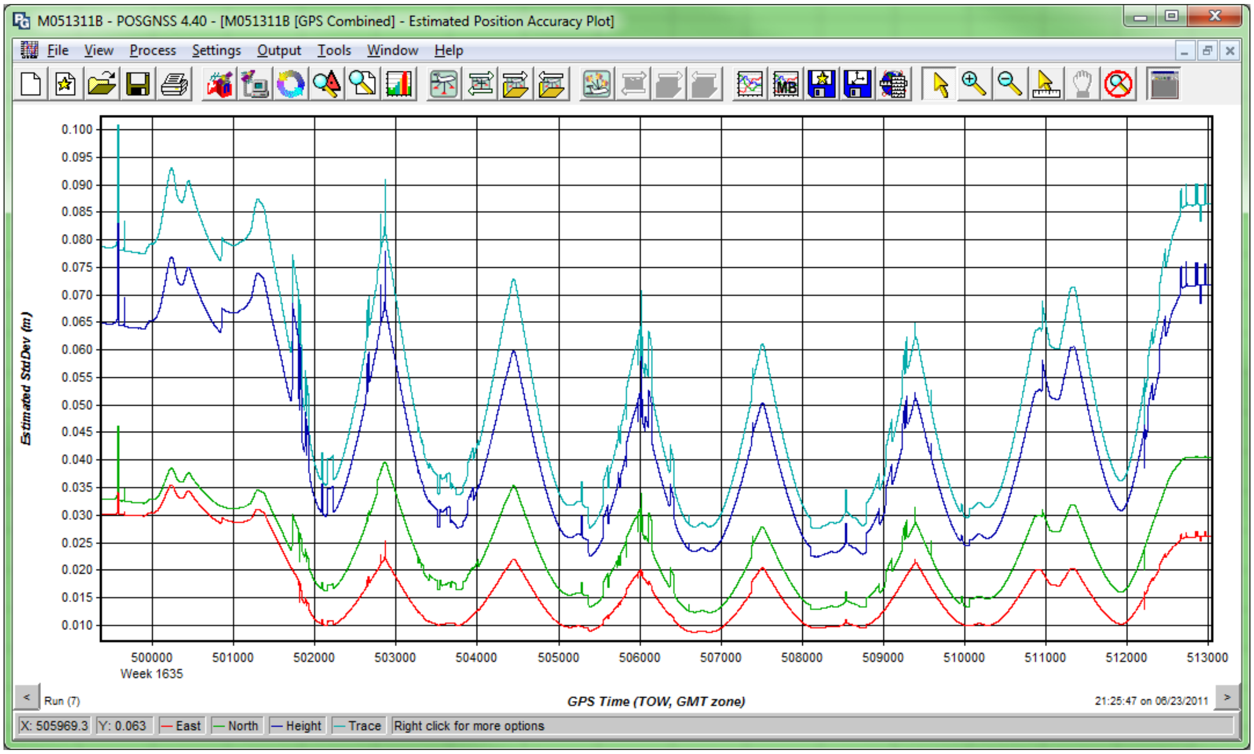
May 13 2011 Plots

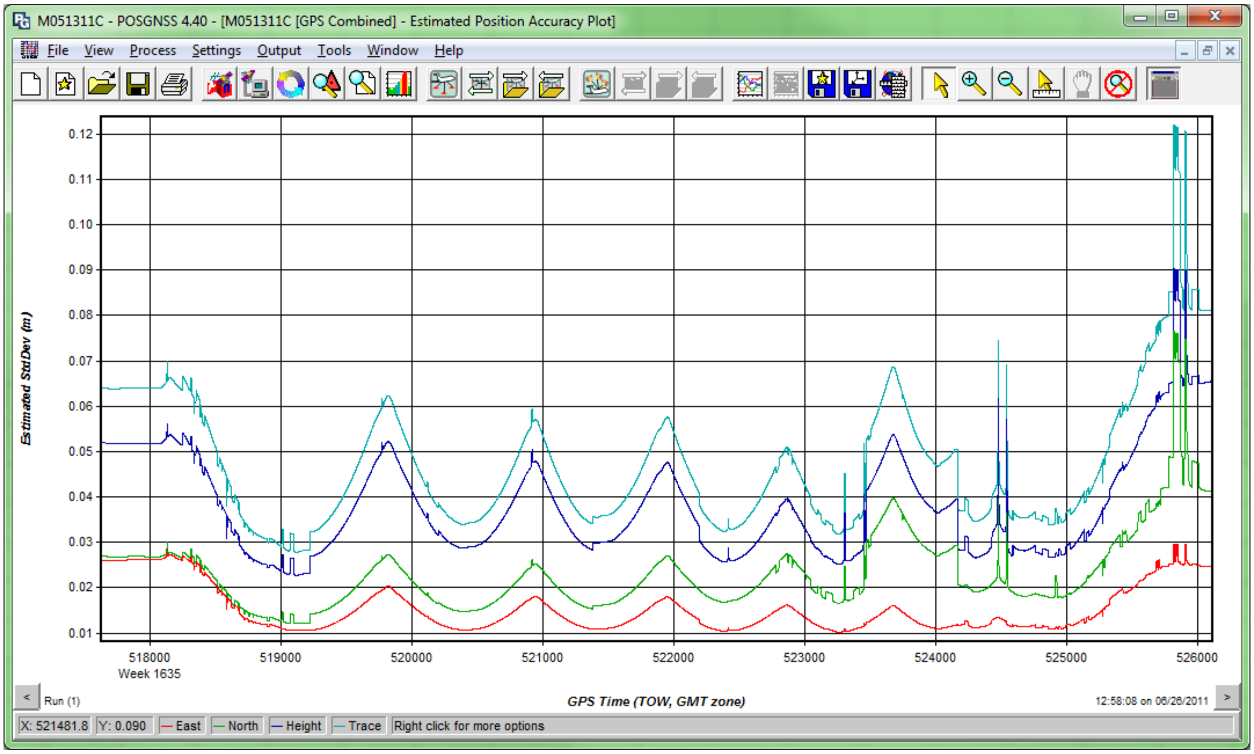




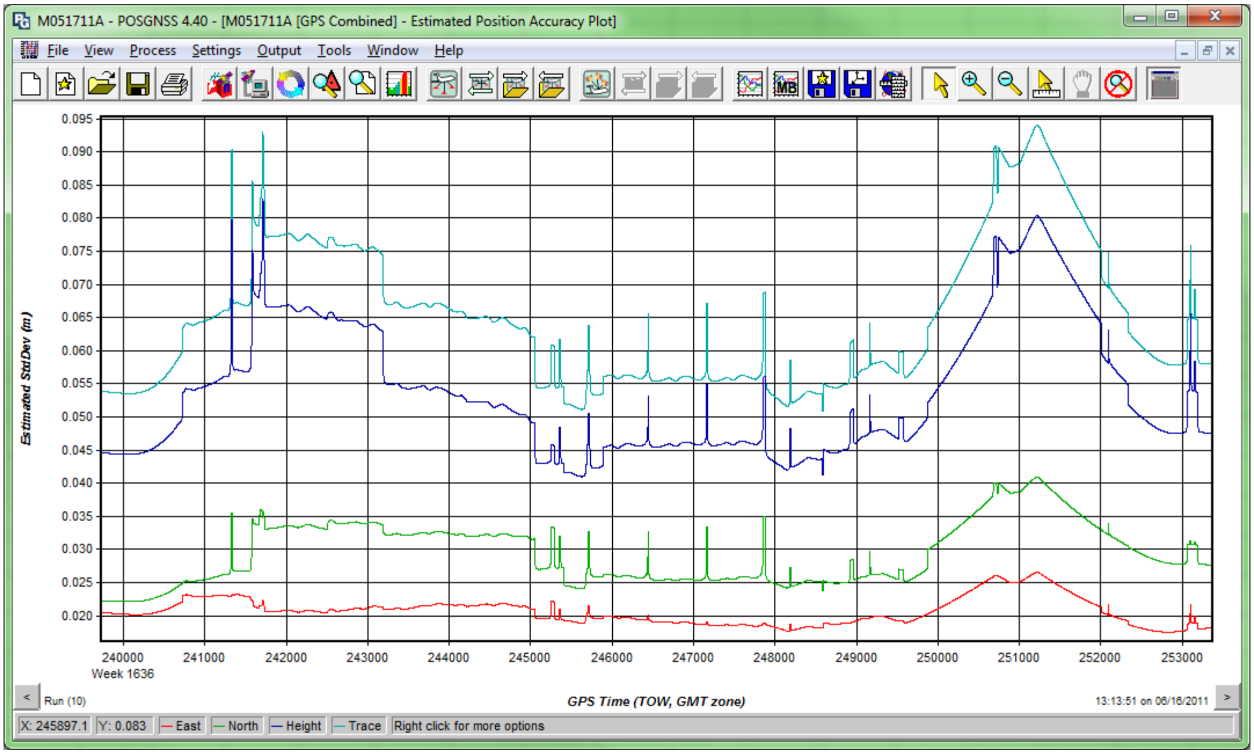

L051311C - POSGNSS 4.40 - [L051311C [GPS Combined] - Estimated Position Accuracy Plot]
File View Process Settings Output Tools Window Help
Estimated StdDev (m)
0.090
0.085
0.080
0.075
0.070
0.065
0.060
0.055
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
512000
Week 1635
513000
514000
515000
516000
517000
518000
519000
520000
521000
522000
523000
Run (1)
GPS Time (TOW, GMT zone)
14:53:17 on 12/16/2011
X: 523351.3
Y: 0.010
East
North
Height
Trace
T523364.1


M051311A - POSGNSS 4.40 - [M051311A [GPS Combined] - Estimated Position Accuracy Plot]
File View Process Settings Output Tools Window Help
Estimated StdDev (m)
0.065
0.060
0.055
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
482000
Week 1635
483000
484000
485000
486000
487000
488000
489000
490000
491000
492000
Run (6)
GPS Time (TOW, GMT zone)
09:33:31 on 06/23/2011
X: 486021.7
Y: 0.059
East
North
Height
Trace
Right click for more options

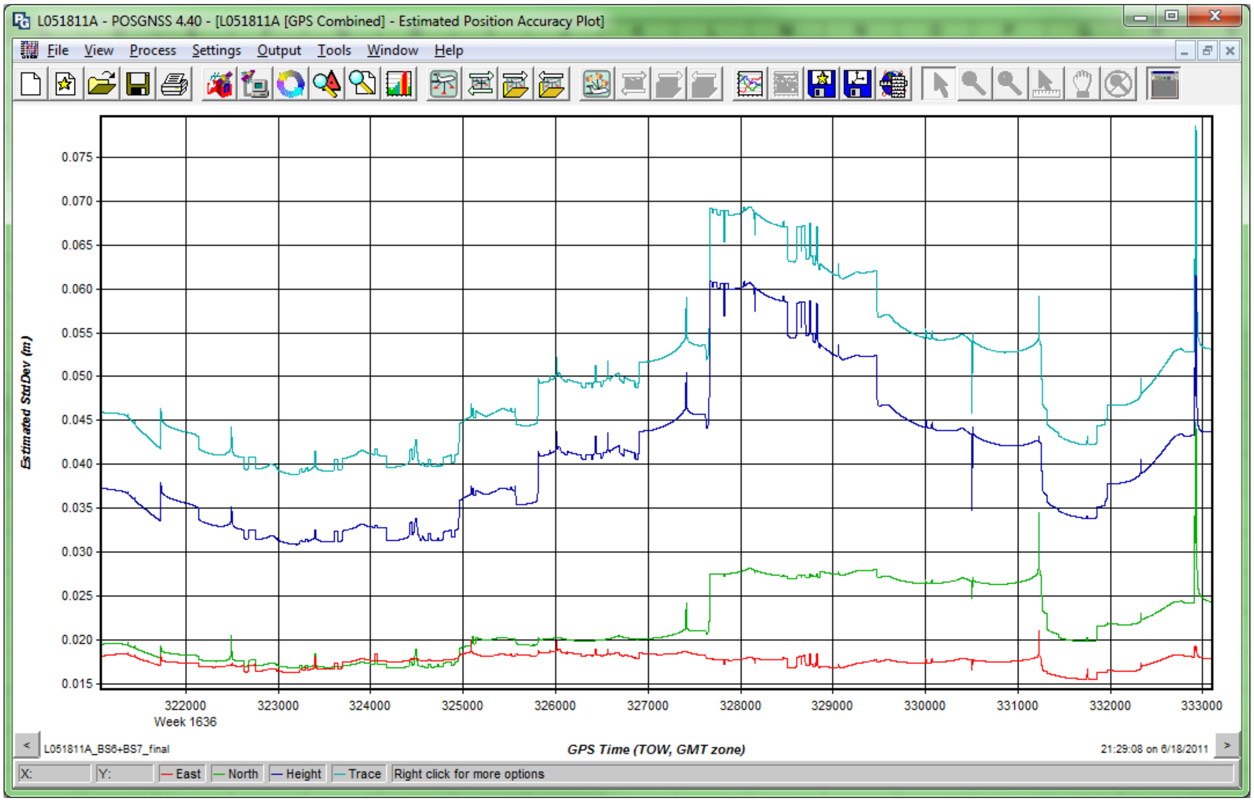

M051311B - POSGNSS 4.40 - [M051311B [GPS Combined] - Estimated Position Accuracy Plot]
File View Process Settings Output Tools Window Help
Estimated StdDev (m)
0.100
0.095
0.090
0.085
0.080
0.075
0.070
0.065
0.060
0.055
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
500000
Week 1635
501000
502000
503000
504000
505000
506000
507000
508000
509000
510000
511000
512000
513000
Run (7)
GPS Time (TOW, GMT zone)
21:25:47 on 06/23/2011
X: 505969.3
Y: 0.063
East
North
Height
Trace
Right click for more options

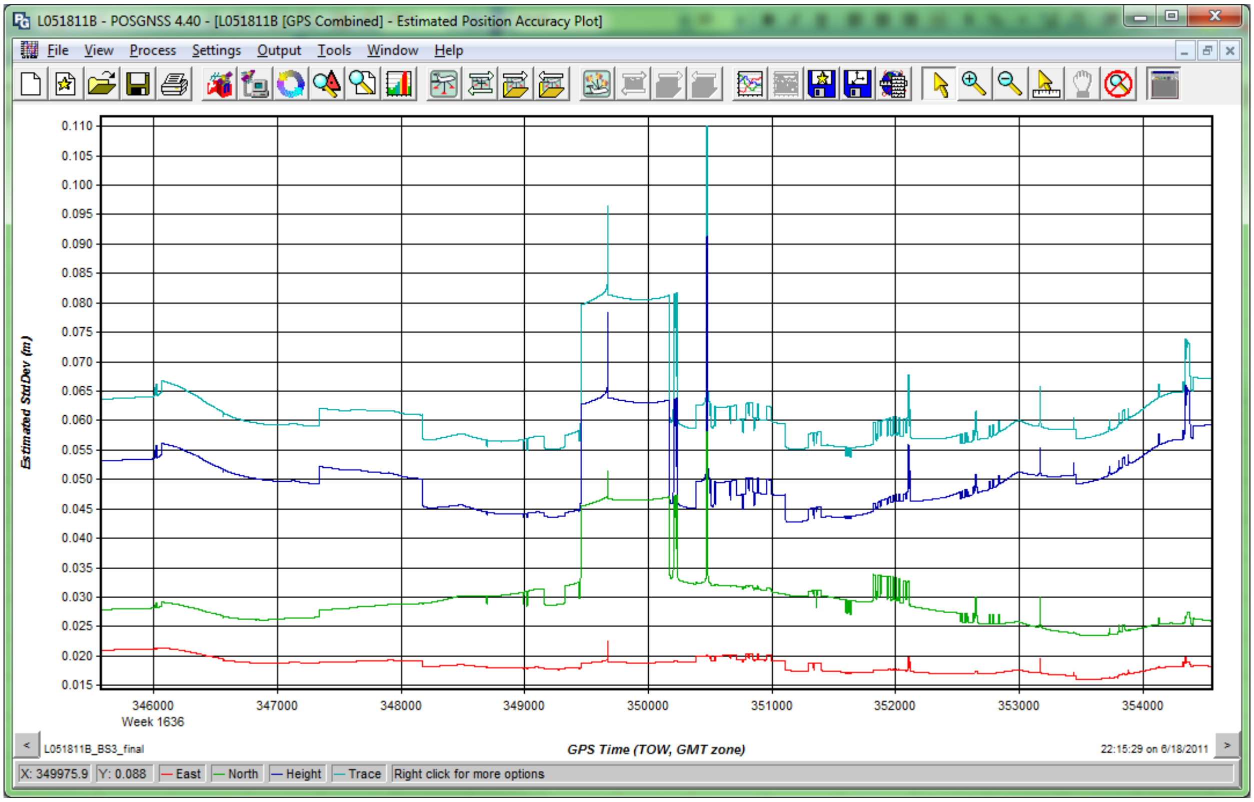

M051311C - POSGNSS 4.40 - [M051311C [GPS Combined] - Estimated Position Accuracy Plot]
File View Process Settings Output Tools Window Help
Estimated StdDev (m)
0.12
0.11
0.10
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
518000
Week 1635
519000
520000
521000
522000
523000
524000
525000
526000
Run (1)
GPS Time (TOW, GMT zone)
12:58:08 on 06/26/2011
X: 521481.8
Y: 0.090
East
North
Height
Trace
Right click for more options

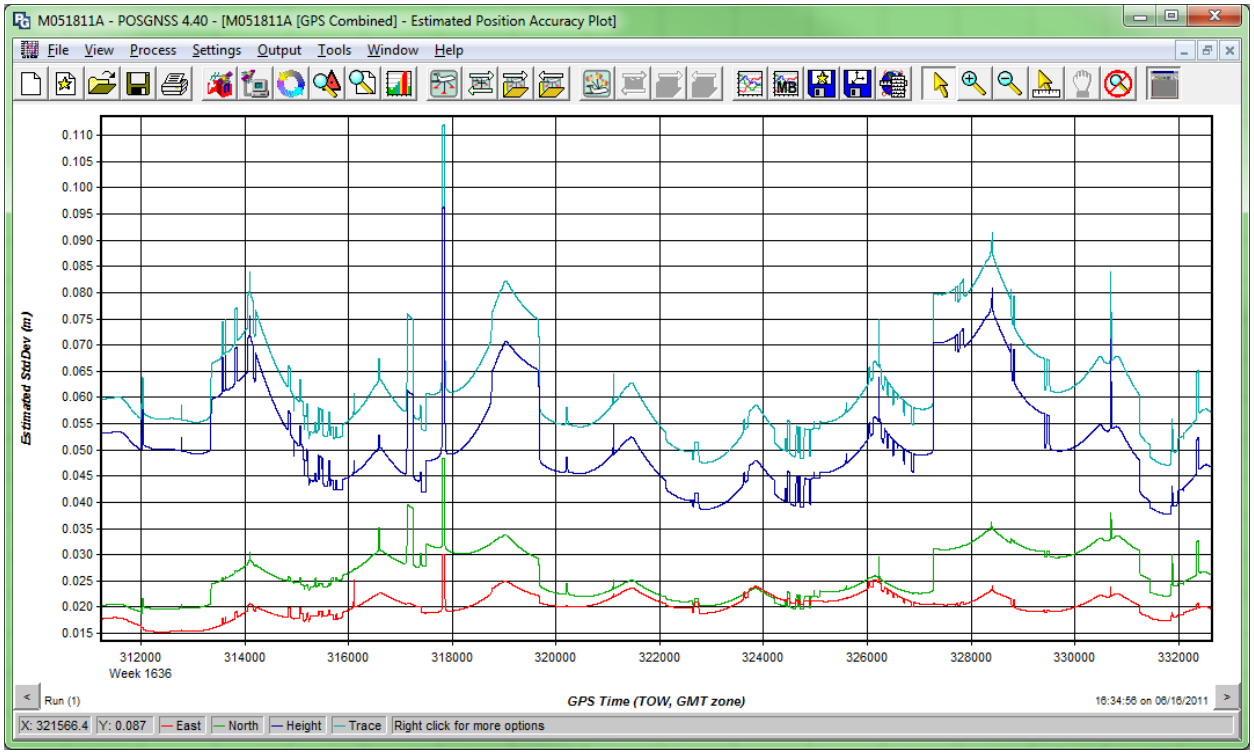
May 17 2011 Plot

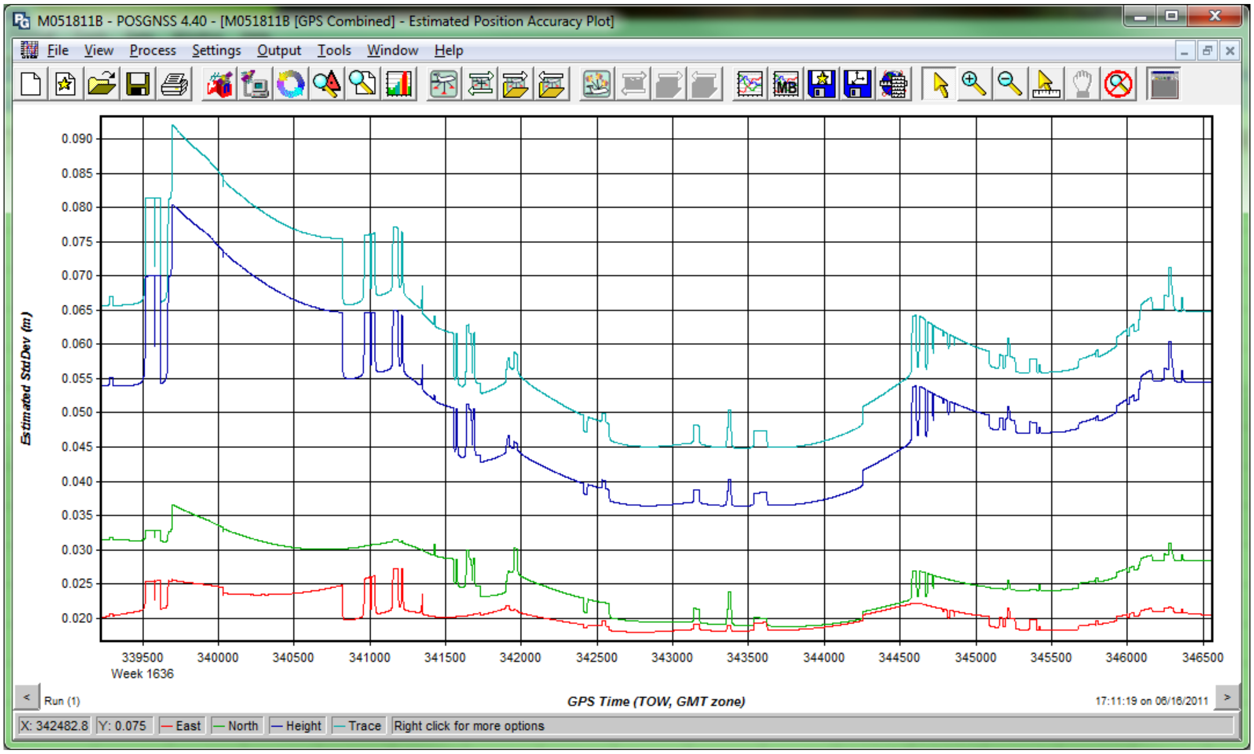


May 18 2011 Plots

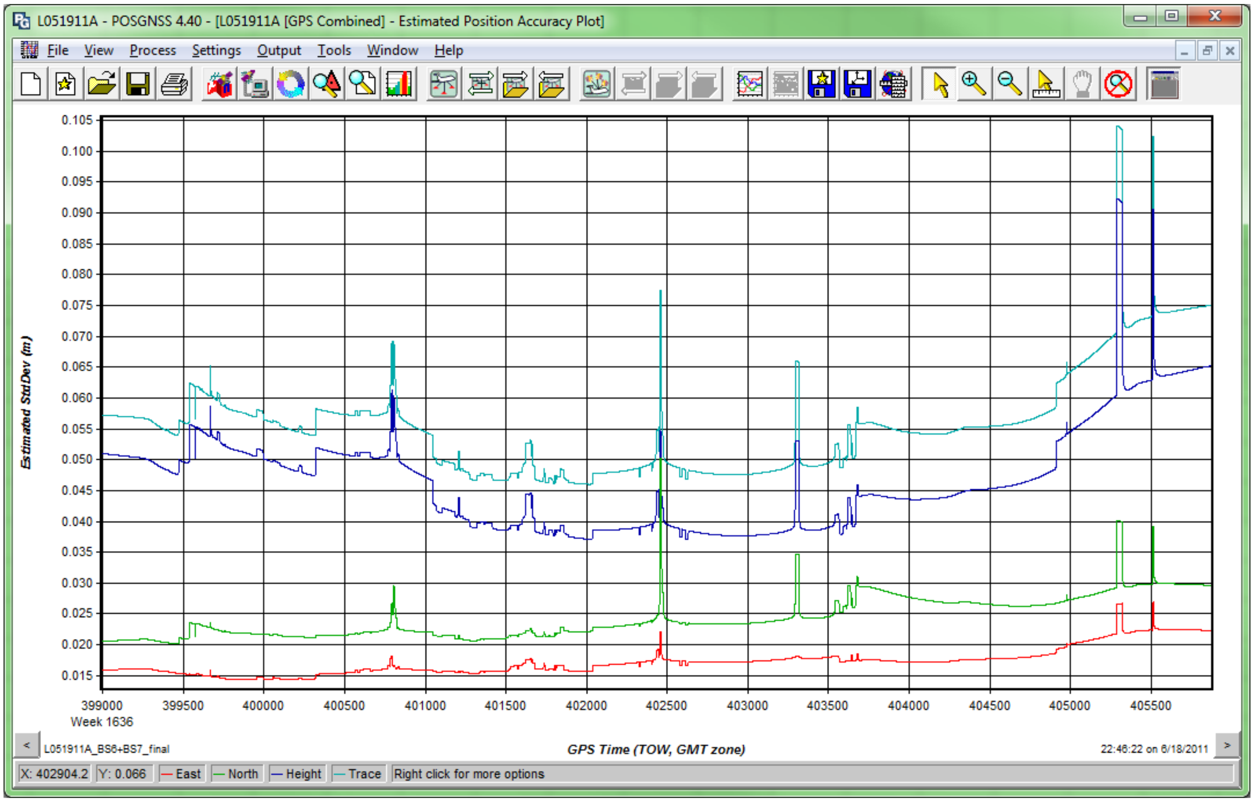


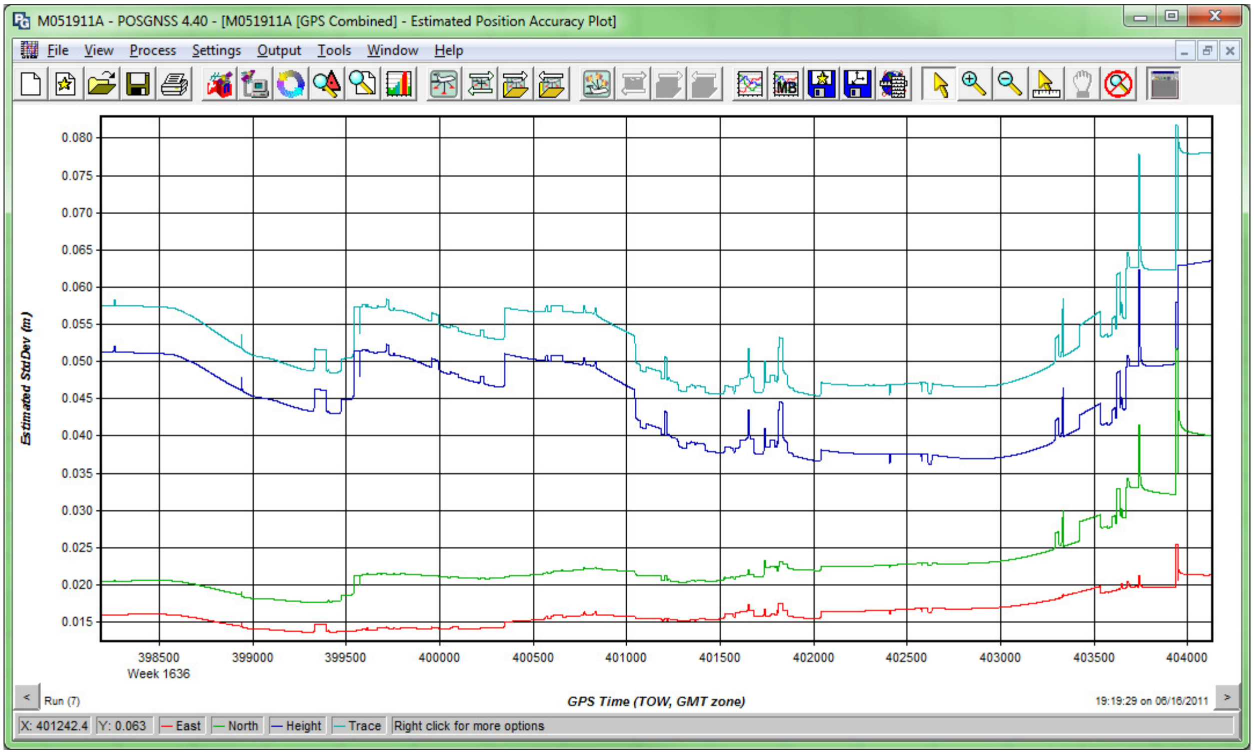



M051811A - POSGNSS 4.40 - [M051811A [GPS Combined] - Estimated Position Accuracy Plot]
File View Process Settings Output Tools Window Help
Estimated StdDev (m)
0.110
0.105
0.100
0.095
0.090
0.085
0.080
0.075
0.070
0.065
0.060
0.055
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
312000
Week 1636
314000
316000
318000
320000
322000
324000
326000
328000
330000
332000
Run (1)
GPS Time (TOW, GMT zone)
16:34:56 on 06/16/2011
X: 321566.4
Y: 0.087
East
North
Height
Trace
Right click for more options

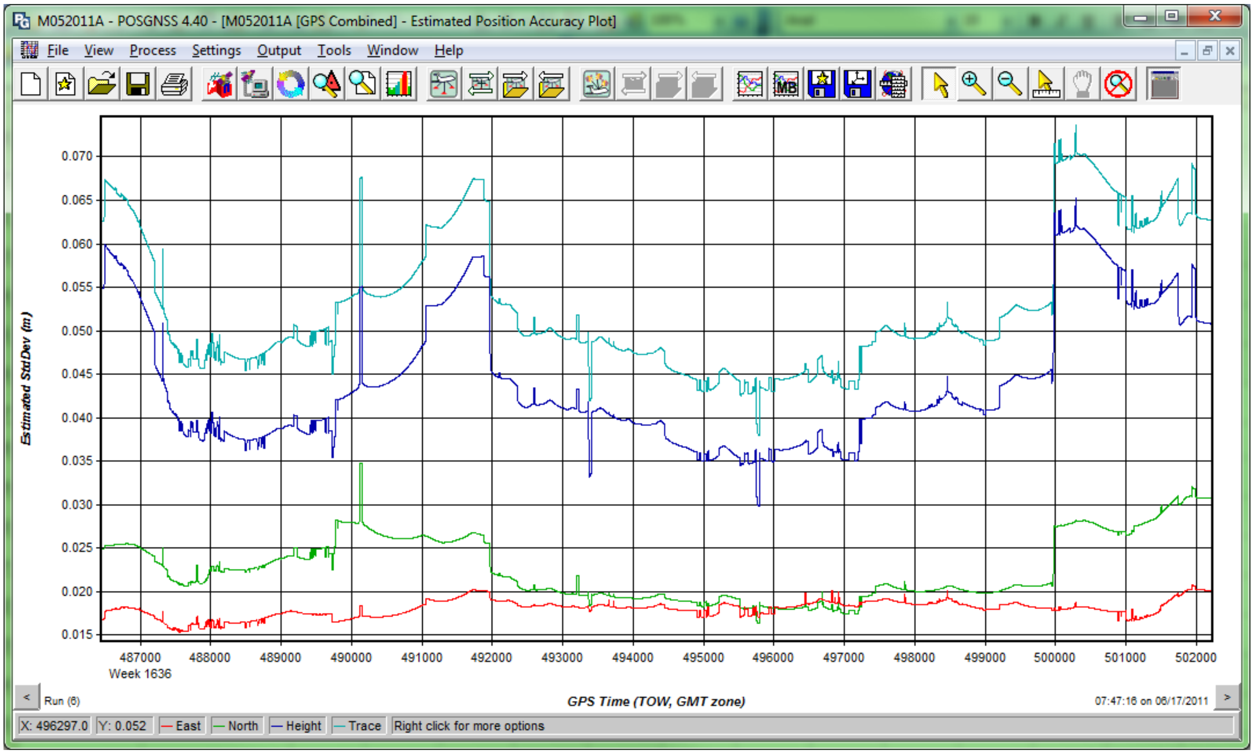

M051811B - POSGNSS 4.40 - [M051811B [GPS Combined] - Estimated Position Accuracy Plot]
File View Process Settings Output Tools Window Help
Estimated StdDev (m)
0.090
0.085
0.080
0.075
0.070
0.065
0.060
0.055
0.050
0.045
0.040
0.035
0.030
0.025
0.020
339500
Week 1636
340000
340500
341000
341500
342000
342500
343000
343500
344000
344500
345000
345500
346000
346500
Run (1)
GPS Time (TOW, GMT zone)
17:11:19 on 06/16/2011
X: 342482.8
Y: 0.075
East
North
Height
Trace
Right click for more options

May 19 2011 Plots

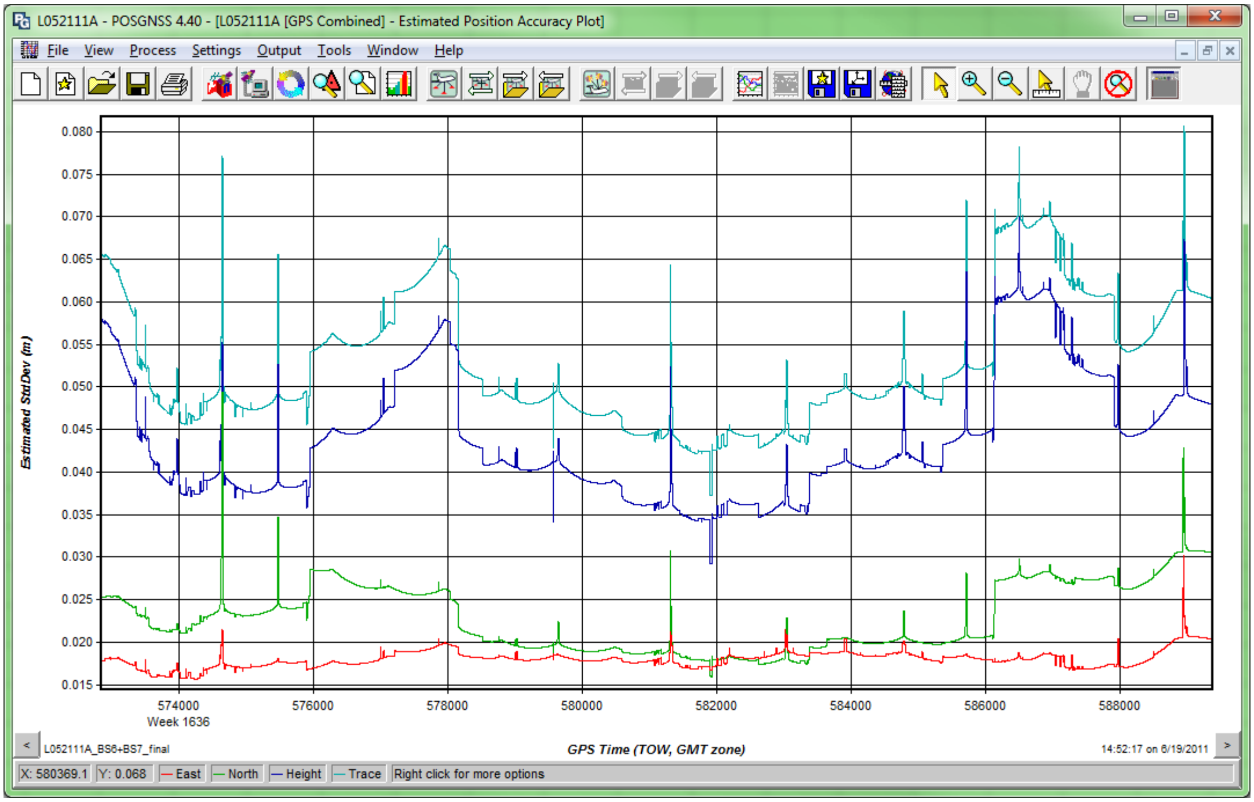


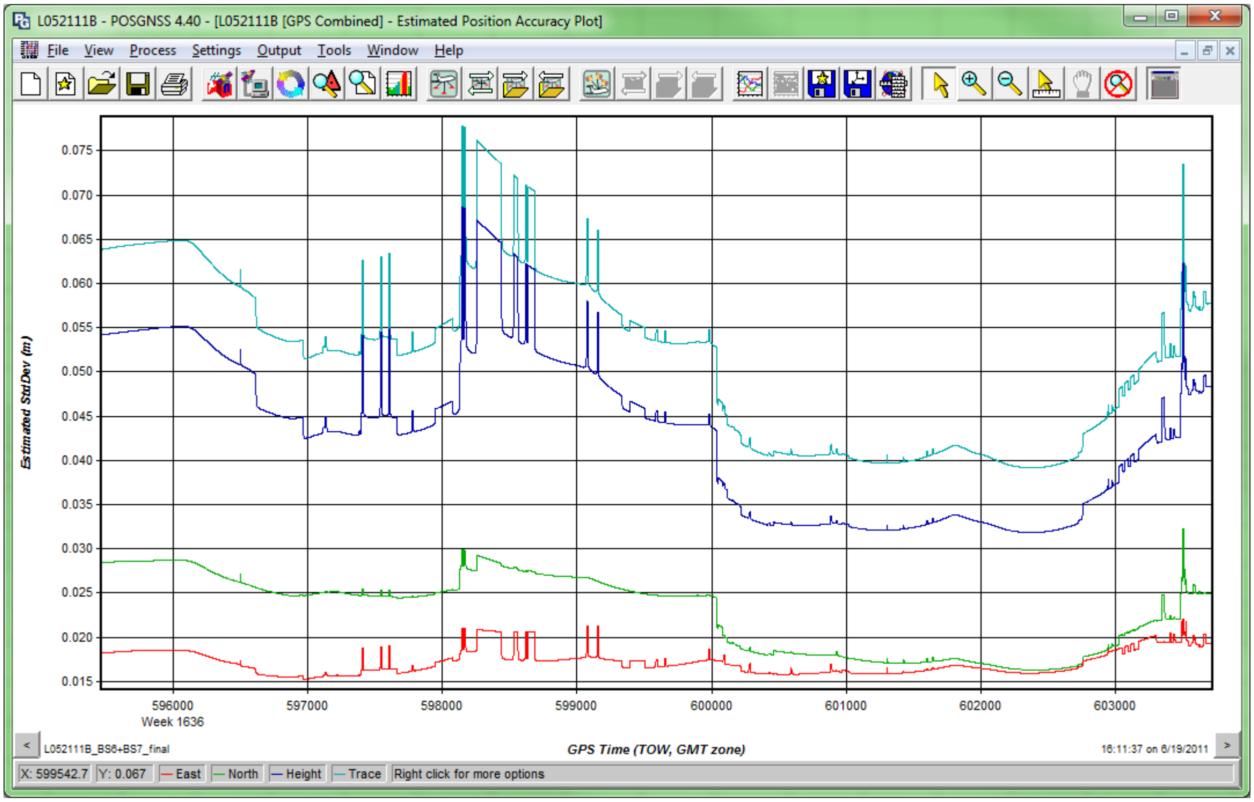


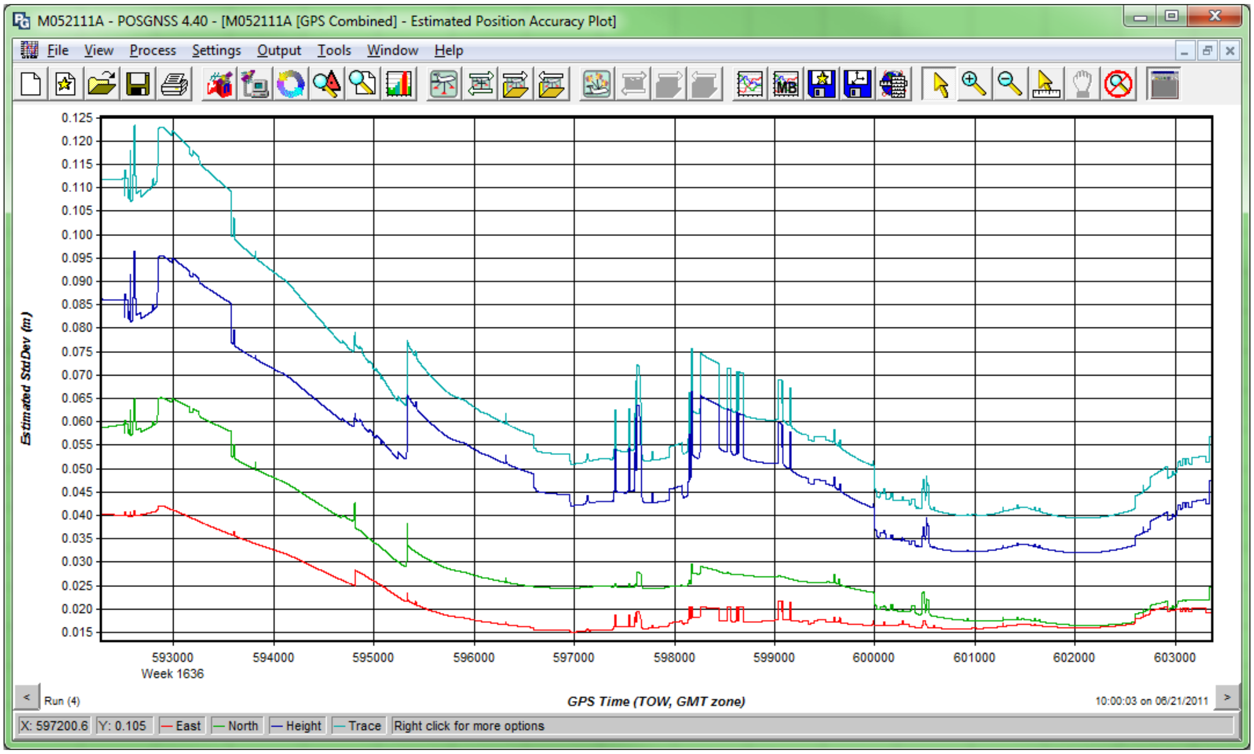
May 20 2011 Plot



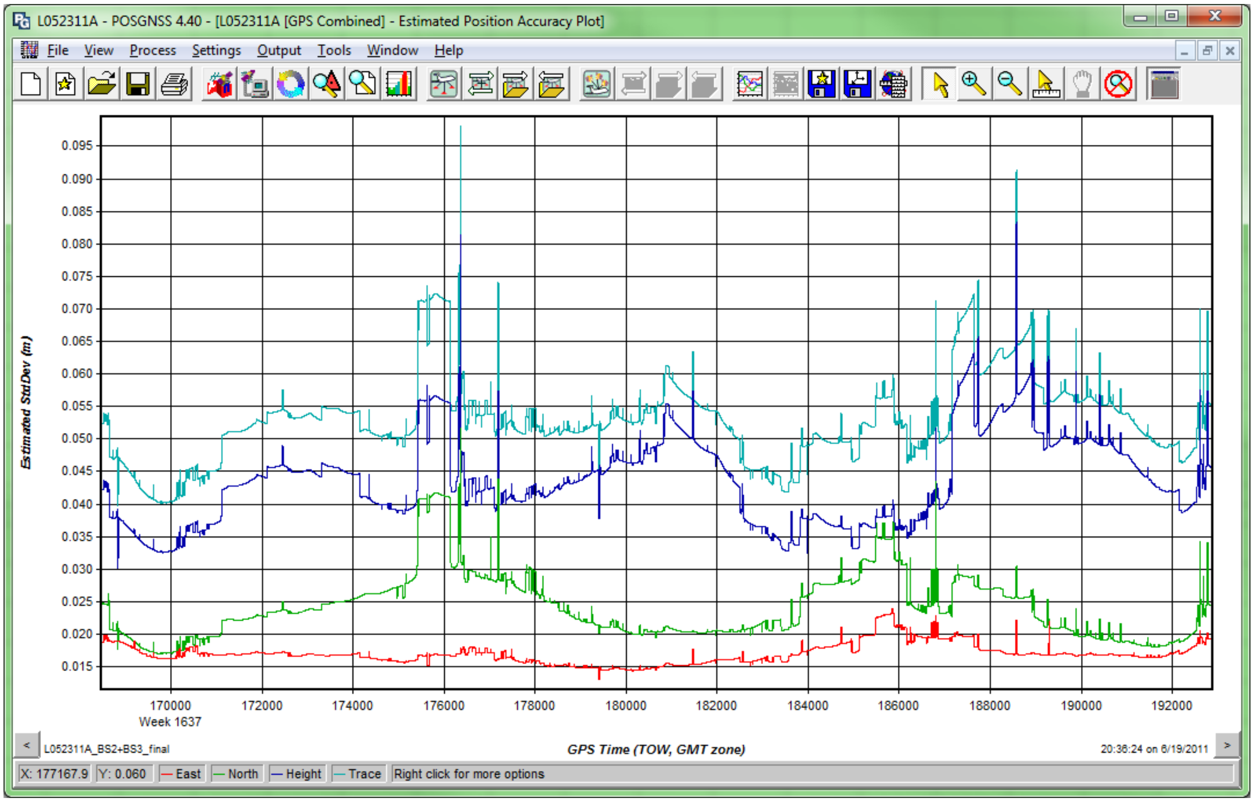
May 21 2011 Plots



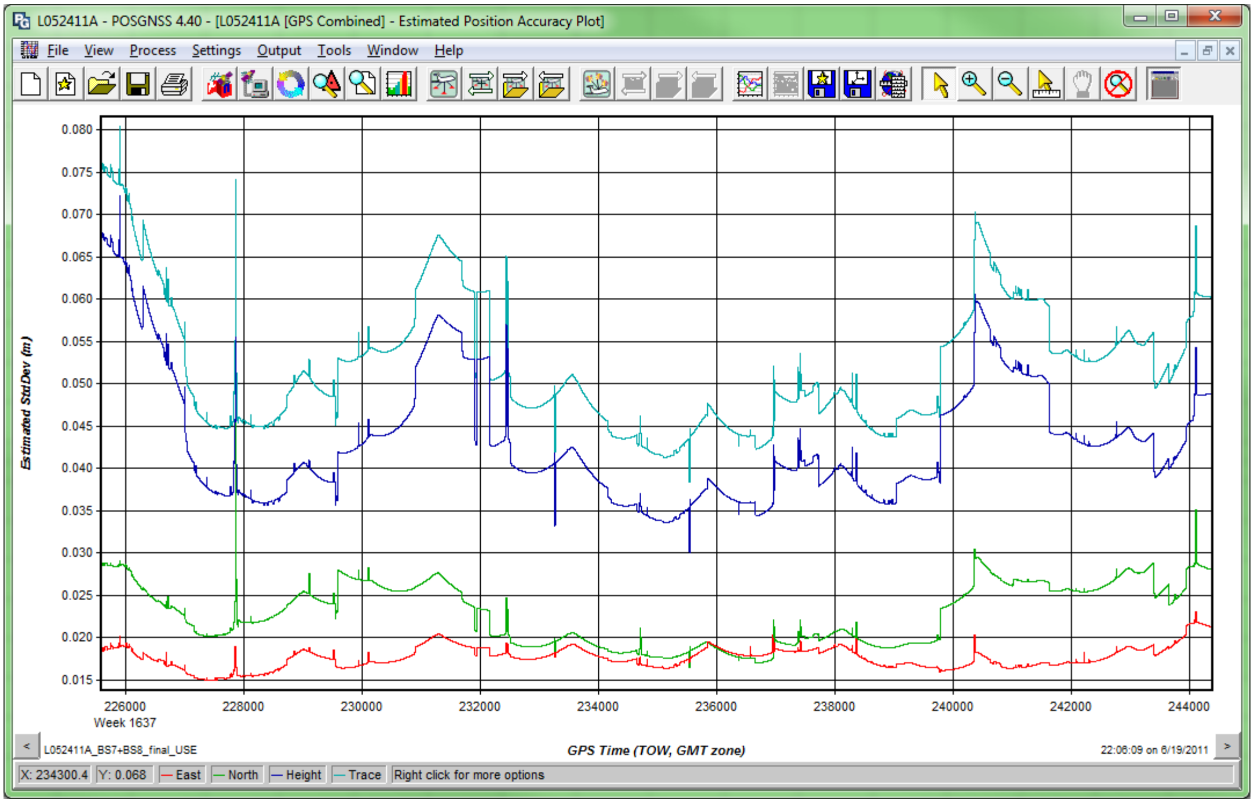


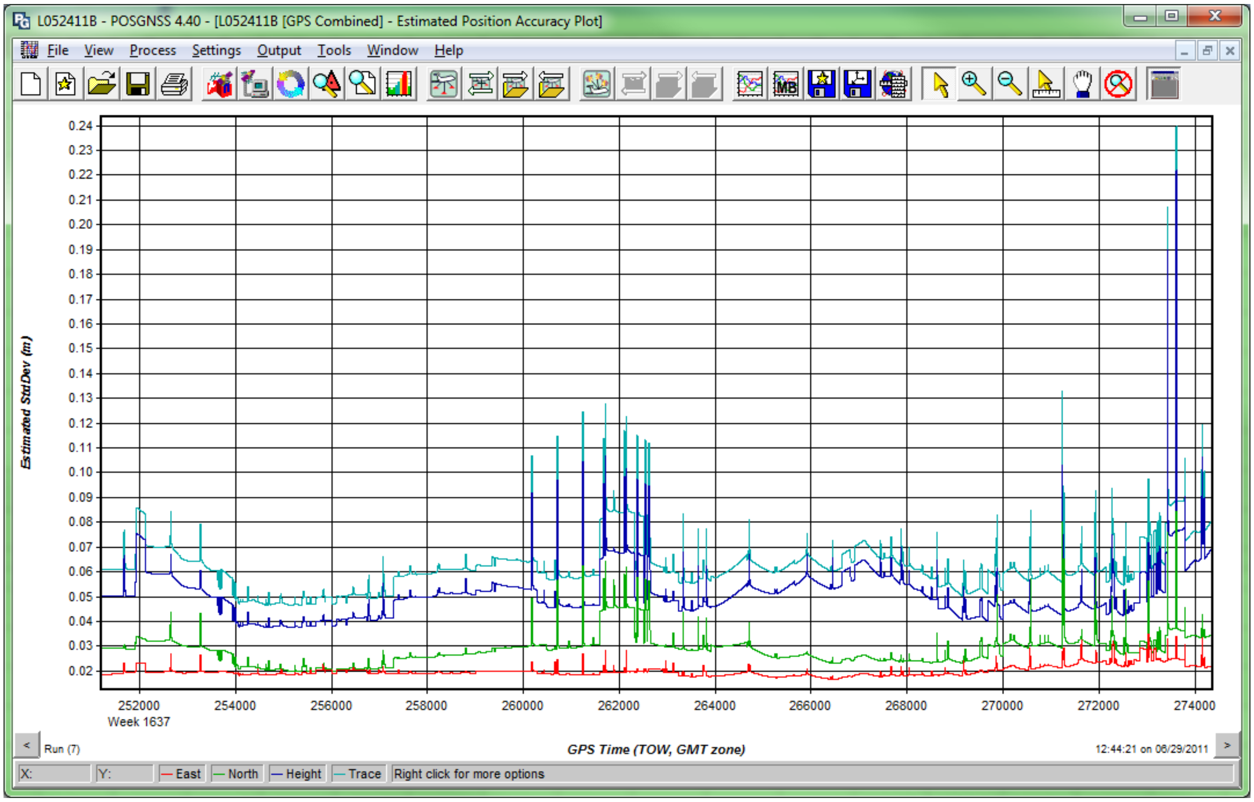

M052111A - POSGNSS 4.40 - [M052111A [GPS Combined] - Estimated Position Accuracy Plot]
File
View
Process
Settings
Output
Tools
Window
Help
Estimated StdDev (m)
0.125
0.120
0.115
0.110
0.105
0.100
0.095
0.090
0.085
0.080
0.075
0.070
0.065
0.060
0.055
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
593000
Week 1636
594000
595000
596000
597000
598000
599000
600000
601000
602000
603000
<
Run (4)
GPS Time (TOW, GMT zone)
10:00:03 on 06/21/2011
>
X: 597200.6
Y: 0.105
— East
— North
— Height
— Trace
Right click for more options

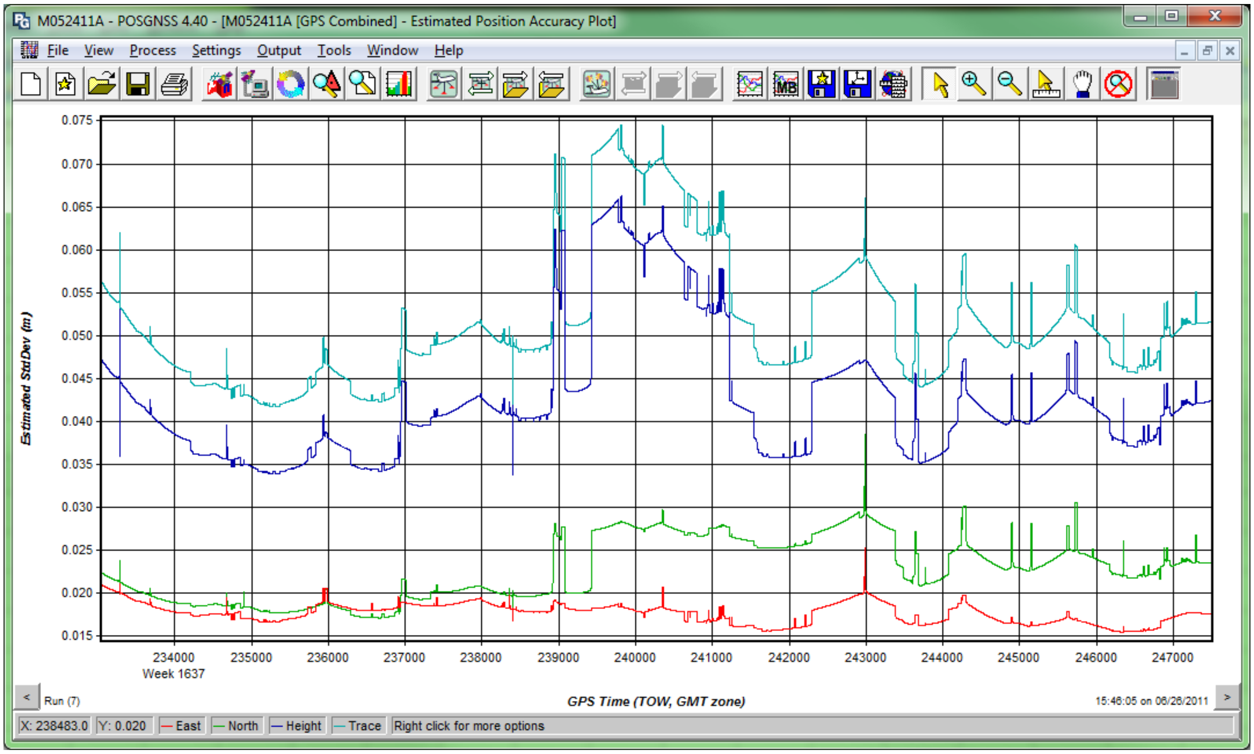
May 23 2011 Plot

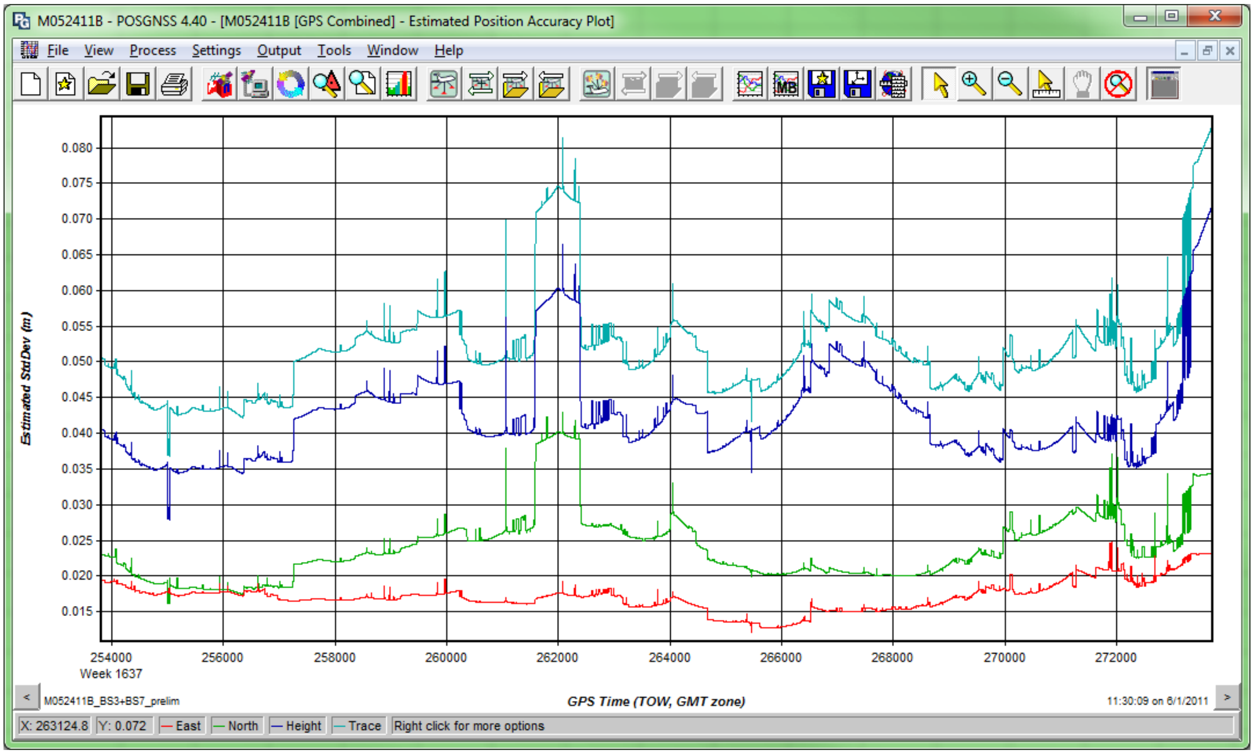


May 24 2011 Plots

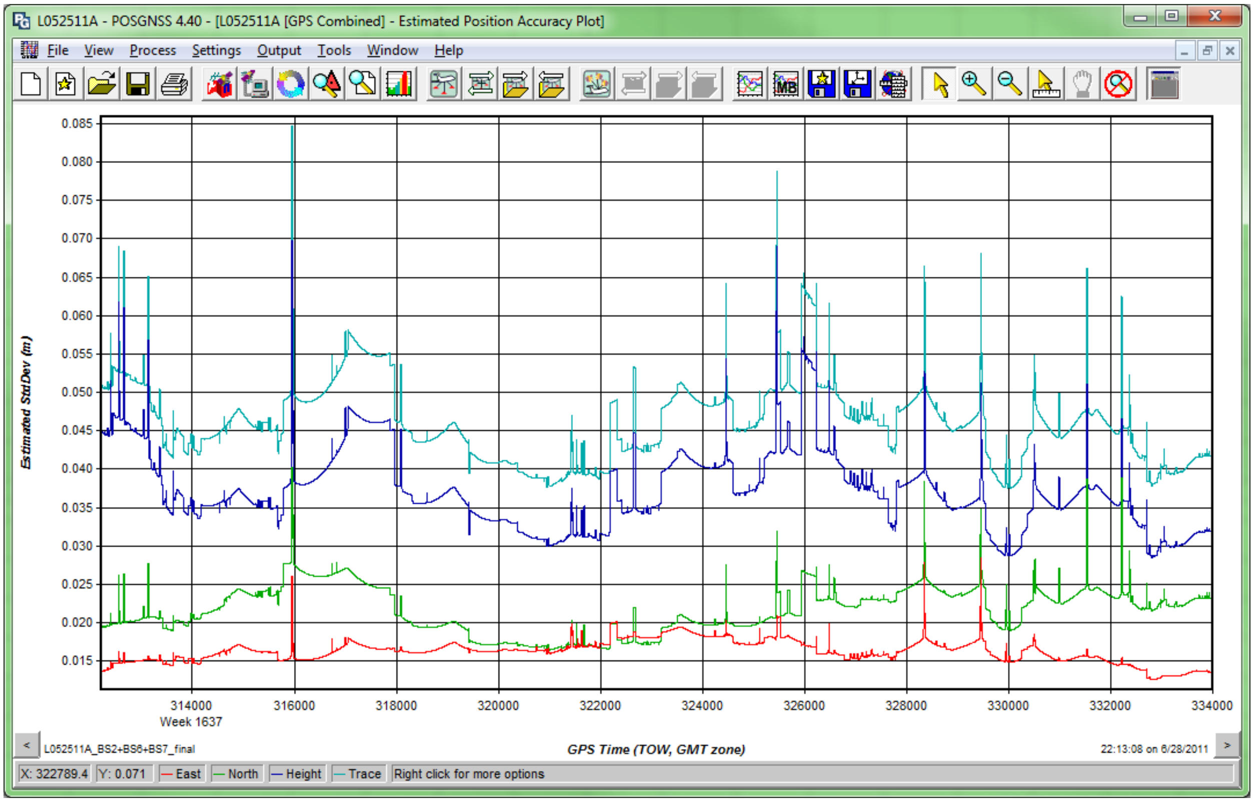


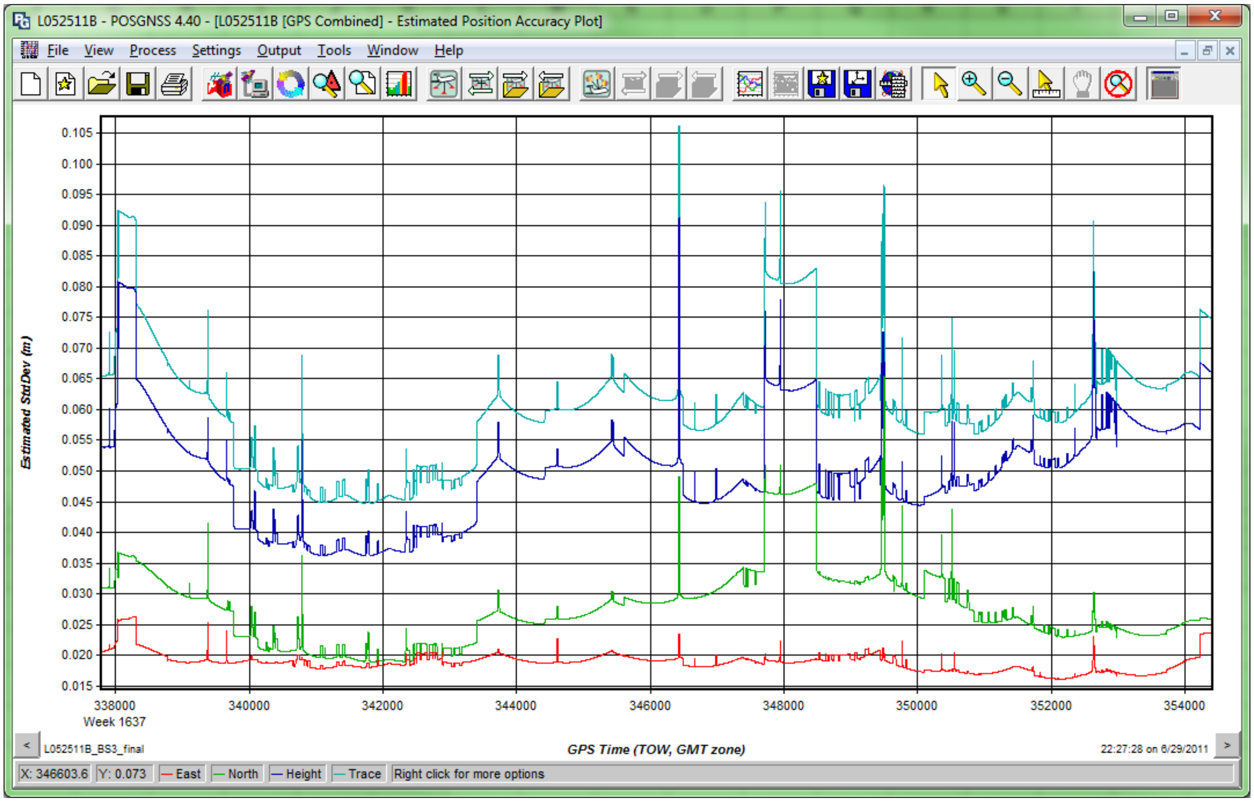



M052411A - POSGNSS 4.40 - [M052411A [GPS Combined] - Estimated Position Accuracy Plot]
File View Process Settings Output Tools Window Help
Estimated StdDev (m)
0.075
0.070
0.065
0.060
0.055
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
234000
Week 1637
235000
236000
237000
238000
239000
240000
241000
242000
243000
244000
245000
246000
247000
Run (7)
GPS Time (TOW, GMT zone)
15:46:05 on 06/26/2011
X: 238483.0
Y: 0.020
East
North
Height
Trace
Right click for more options

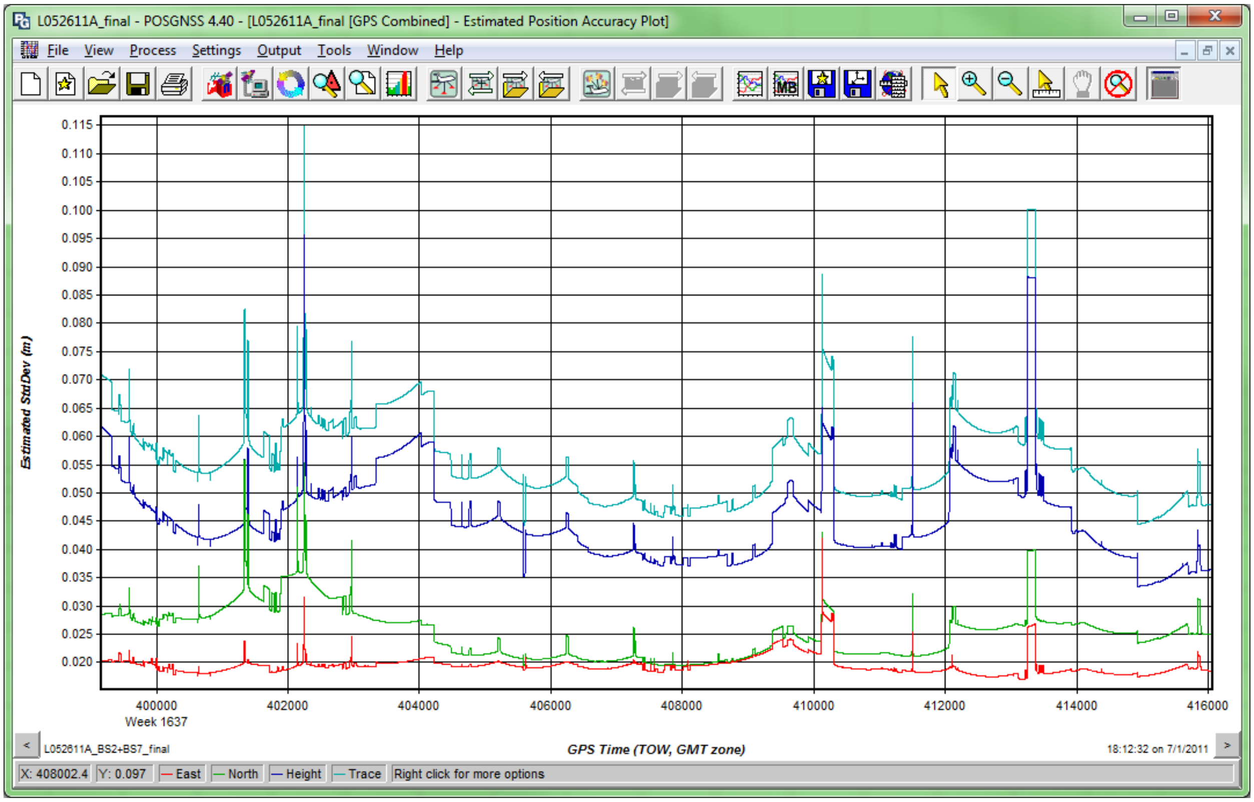

M052411B - POSGNSS 4.40 - [M052411B [GPS Combined] - Estimated Position Accuracy Plot]
File View Process Settings Output Tools Window Help
Estimated StdDev (m)
0.080
0.075
0.070
0.065
0.060
0.055
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
254000
Week 1637
256000
258000
260000
262000
264000
266000
268000
270000
272000
M052411B_BS3+BS7_prelim
GPS Time (TOW, GMT zone)
11:30:09 on 6/1/2011
X: 263124.8
Y: 0.072
East
North
Height
Trace
Right click for more options

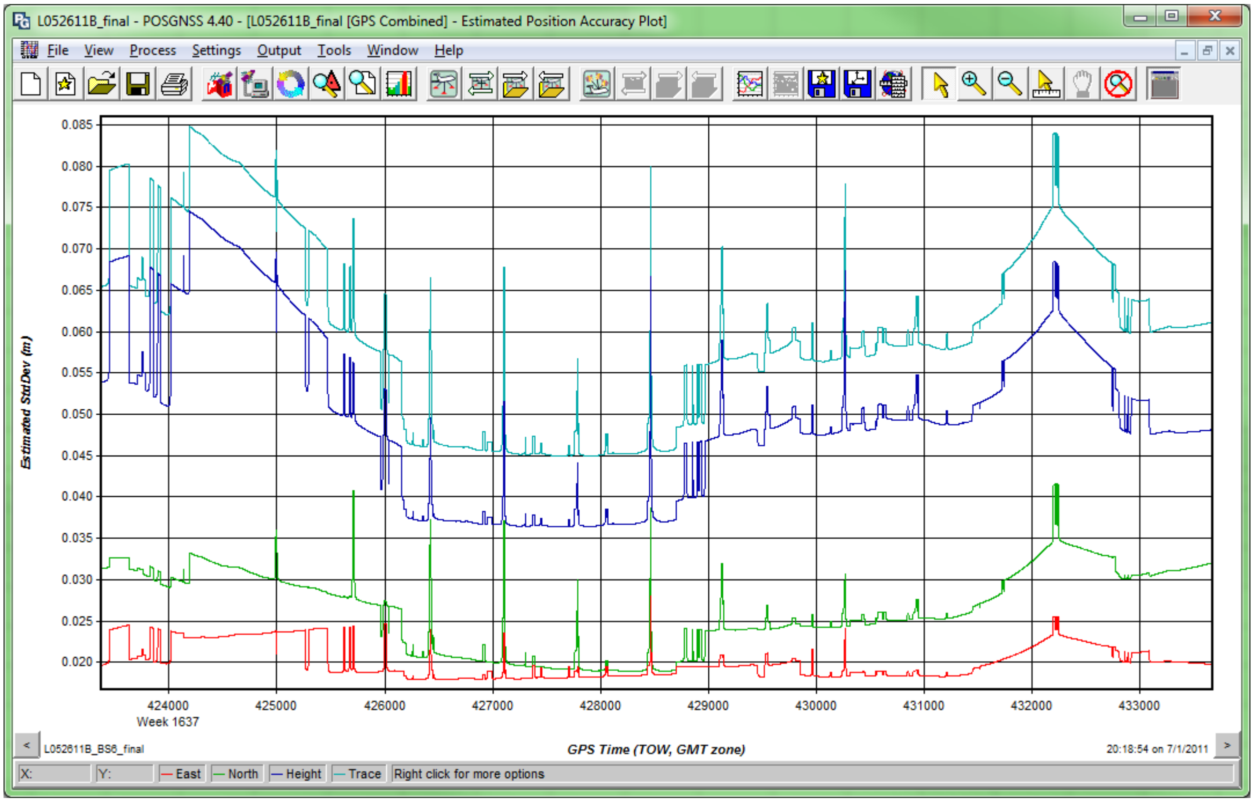
May 25 2011 Plots



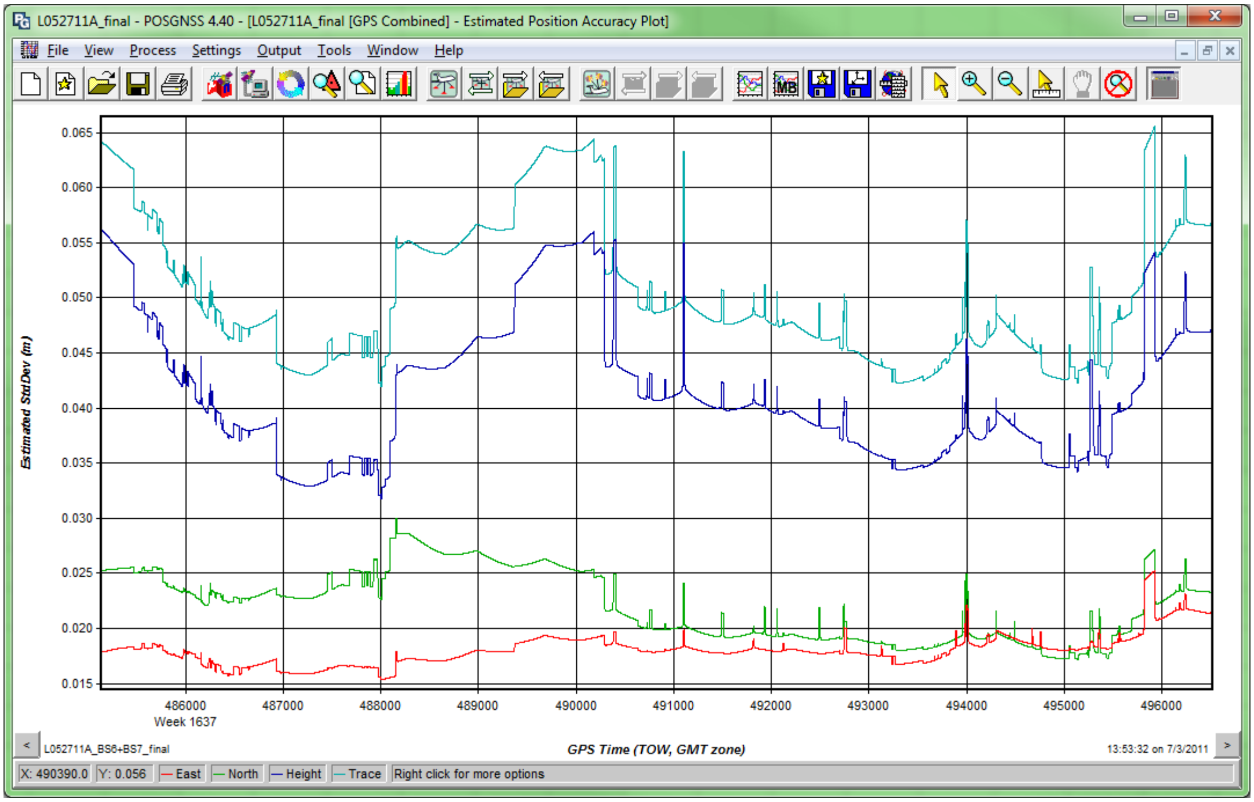


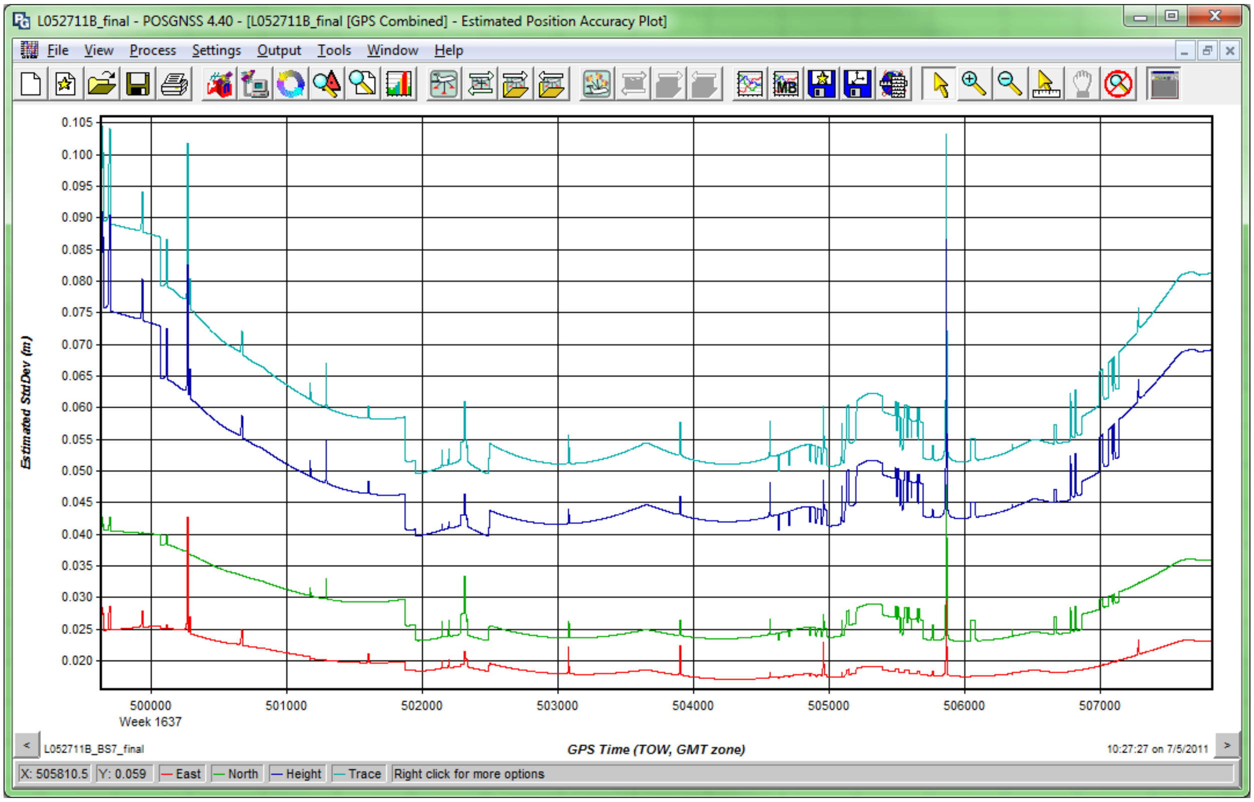
May 26 2011 Plots

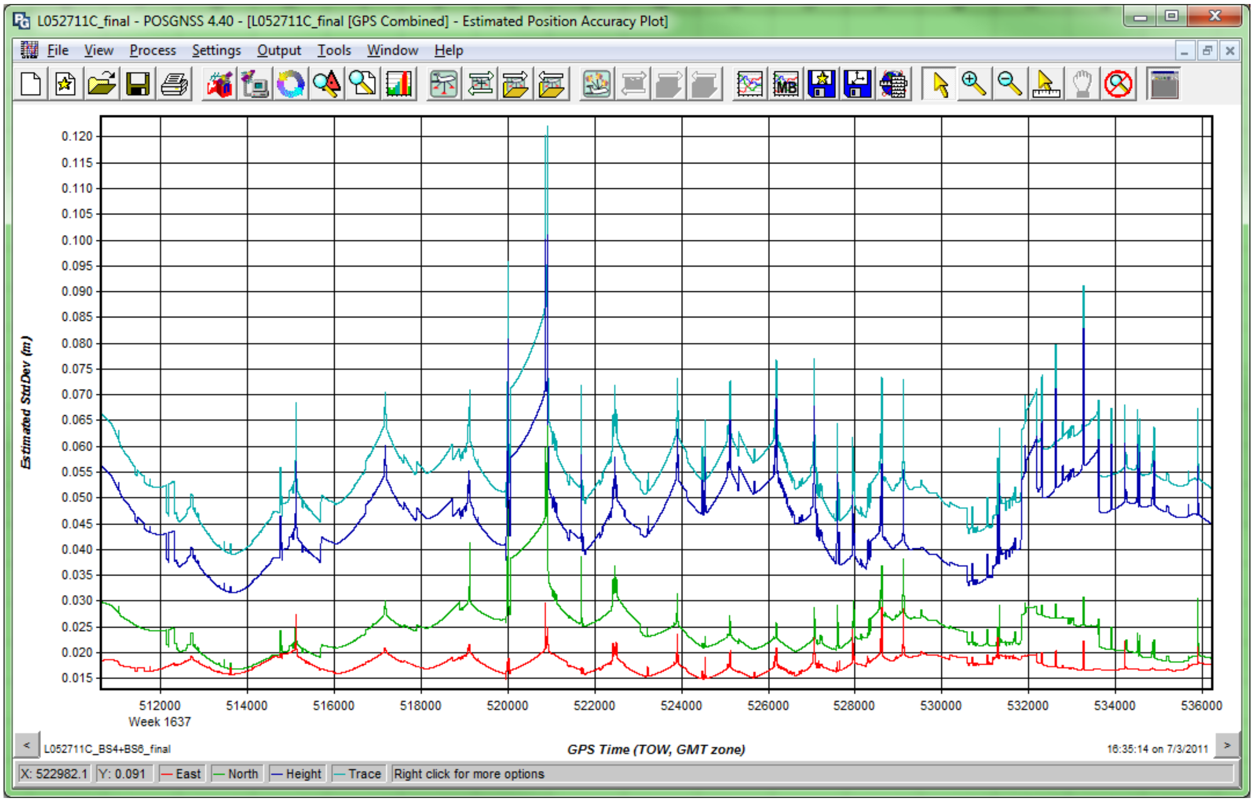




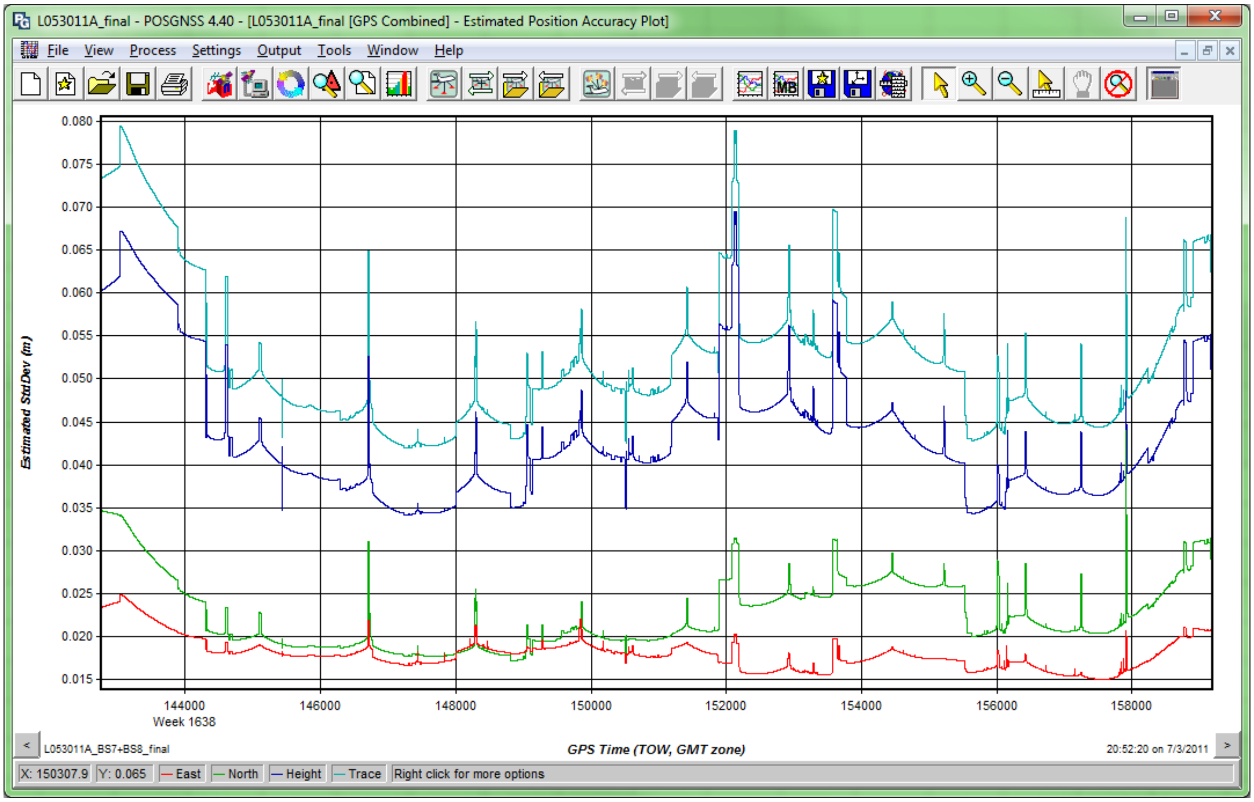
May 27 2011 Plots

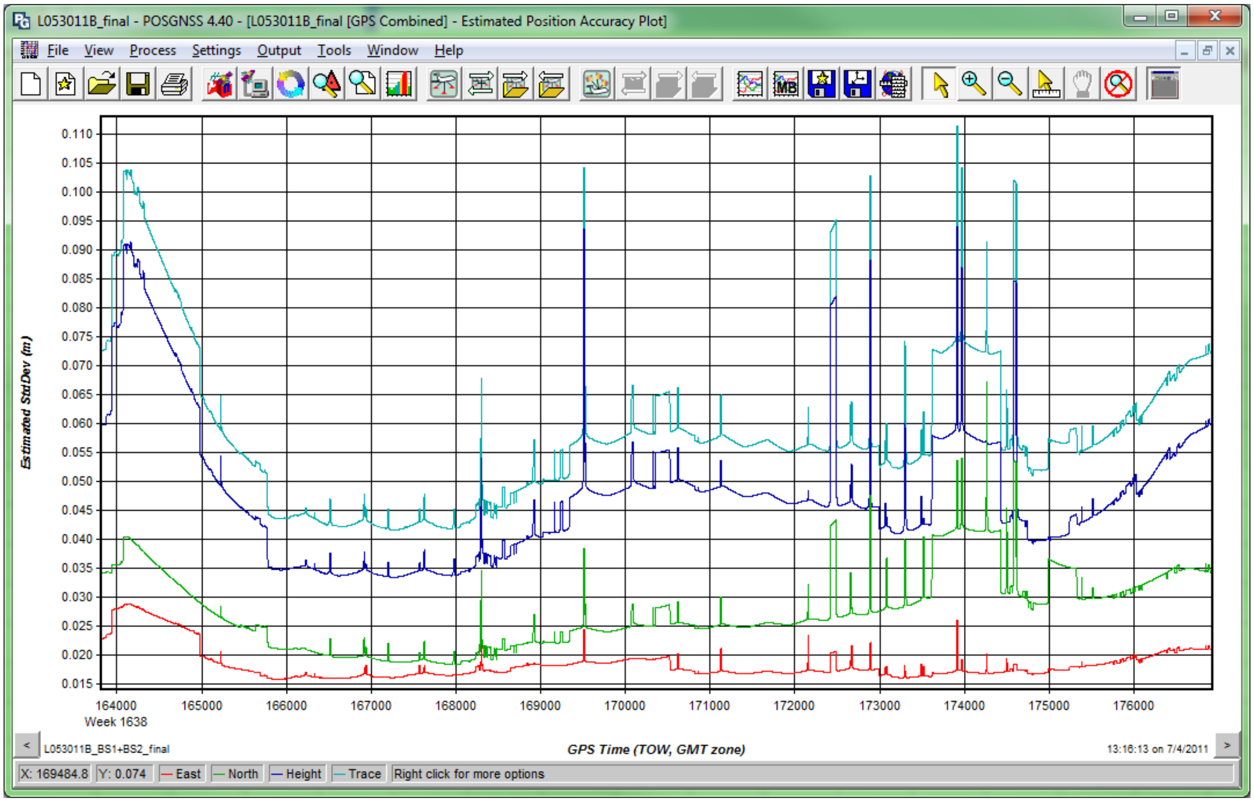


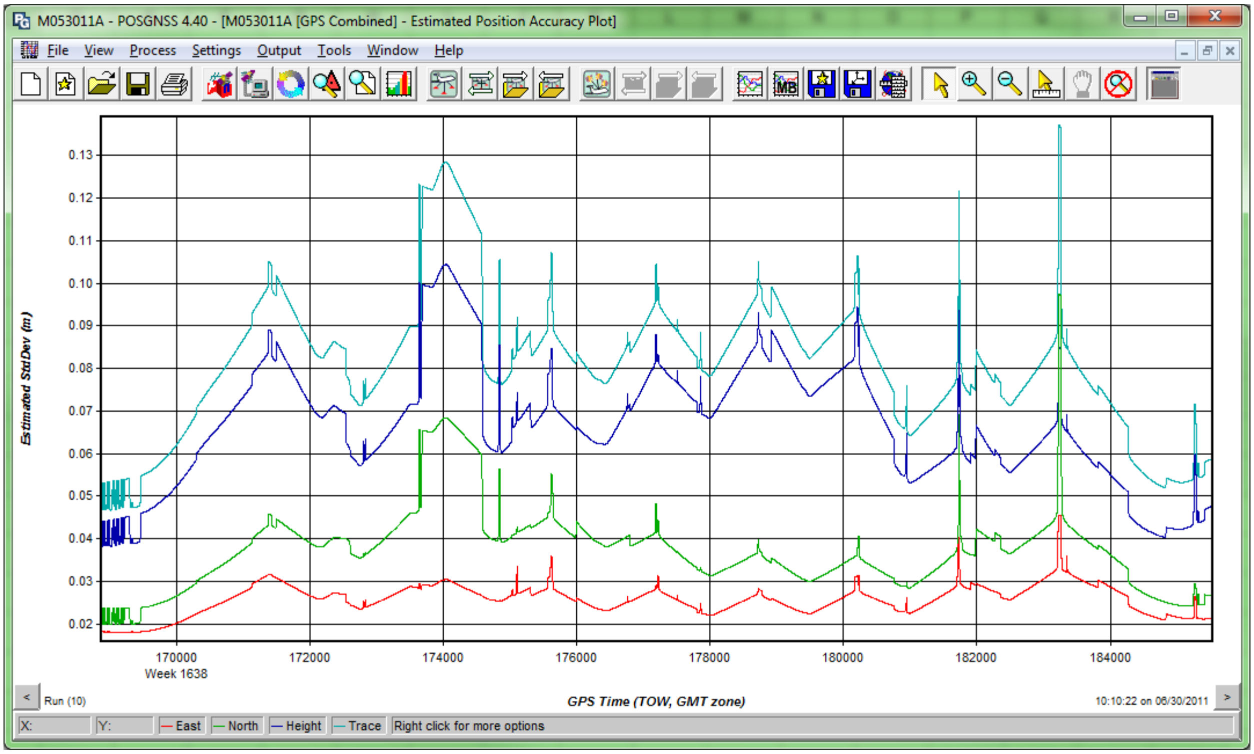



L052711C_final - POSGNSS 4.40 - [L052711C_final [GPS Combined] - Estimated Position Accuracy Plot]
File
View
Process
Settings
Output
Tools
Window
Help
Estimated StdDev (m)
0.120
0.115
0.110
0.105
0.100
0.095
0.090
0.085
0.080
0.075
0.070
0.065
0.060
0.055
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
512000
Week 1637
514000
516000
518000
520000
522000
524000
526000
528000
530000
532000
534000
536000
L052711C_BS4+BS6_final
GPS Time (TOW, GMT zone)
16:35:14 on 7/3/2011
X: 522982.1
Y: 0.091
East
North
Height
Trace
Right click for more options

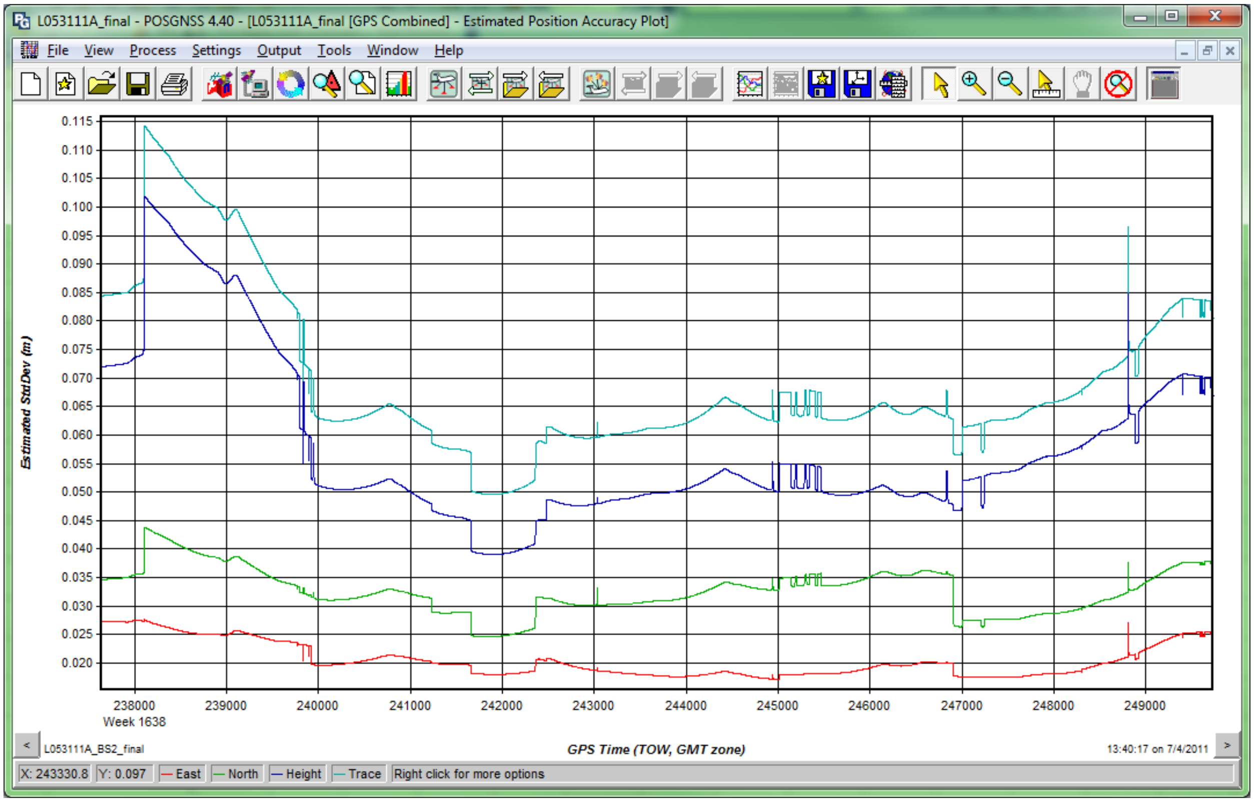
May 30 2011 Plots

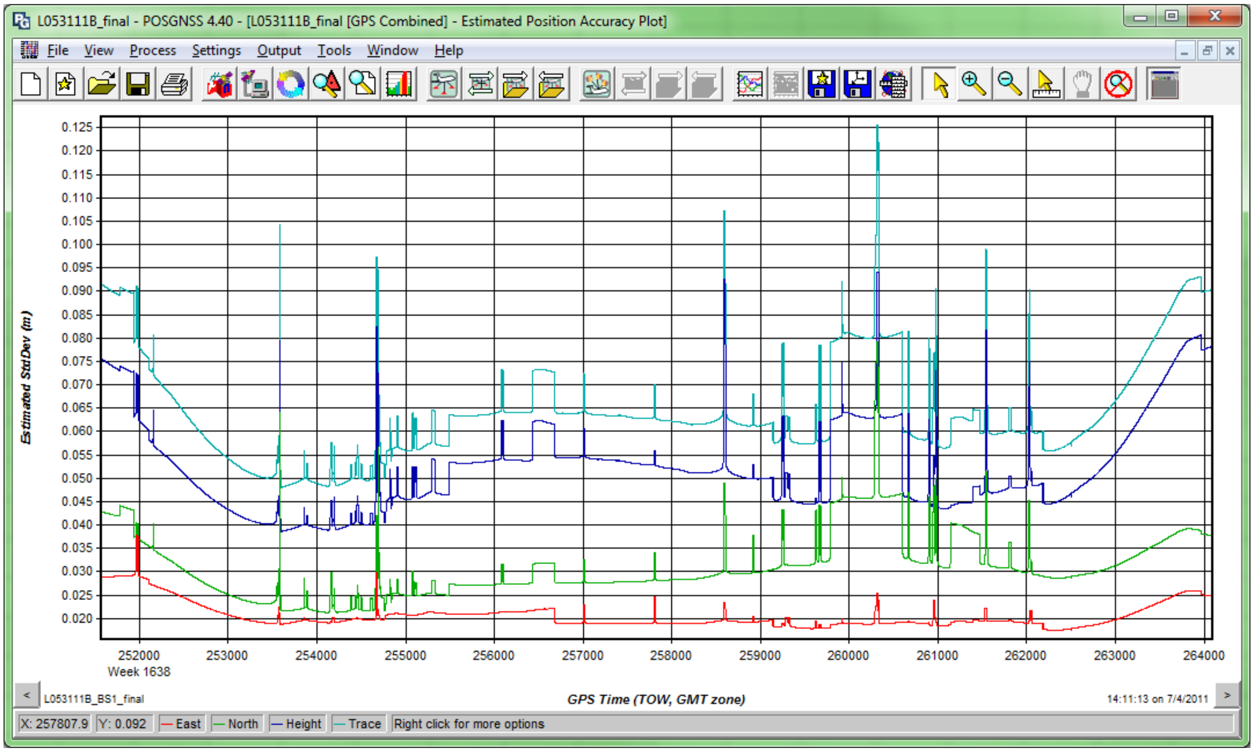


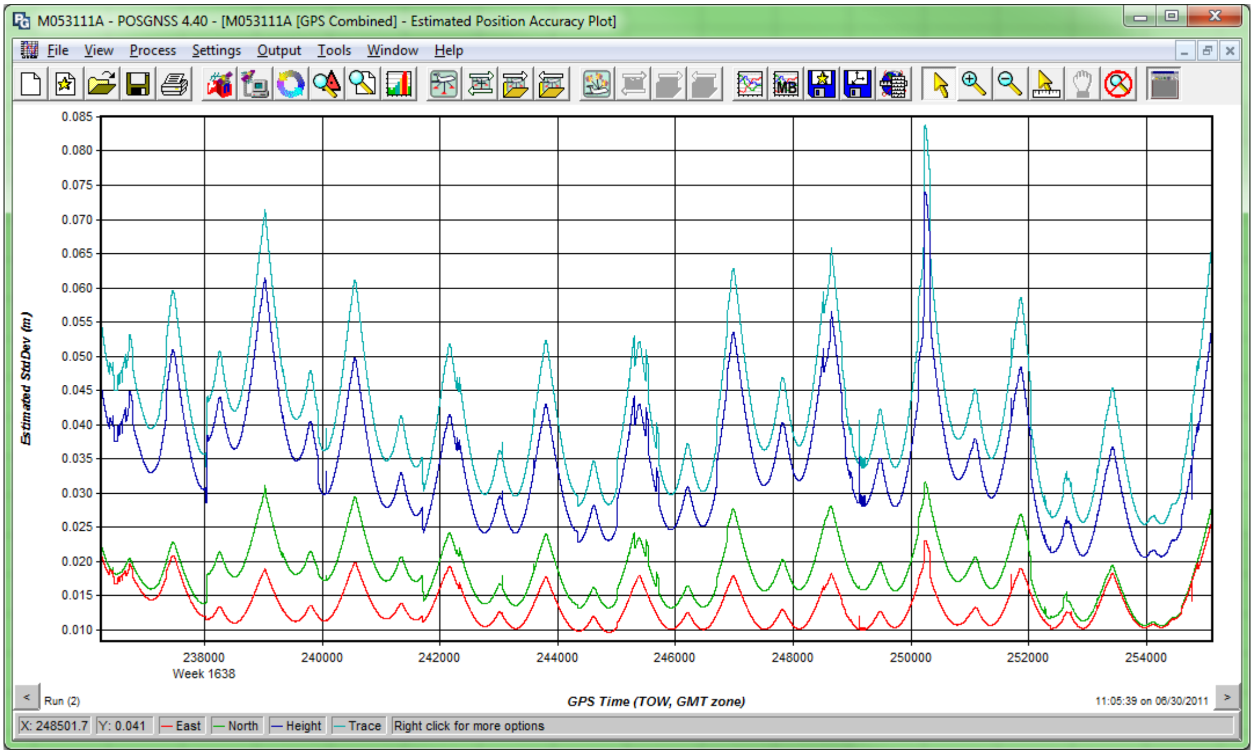



M053011A - POSGNSS 4.40 - [M053011A [GPS Combined] - Estimated Position Accuracy Plot]
File
View
Process
Settings
Output
Tools
Window
Help
Estimated StdDev (m)
0.13
0.12
0.11
0.10
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
170000
Week 1638
172000
174000
176000
178000
180000
182000
184000
Run (10)
GPS Time (TOW, GMT zone)
10:10:22 on 06/30/2011
X:
Y:
East
North
Height
Trace
Right click for more options

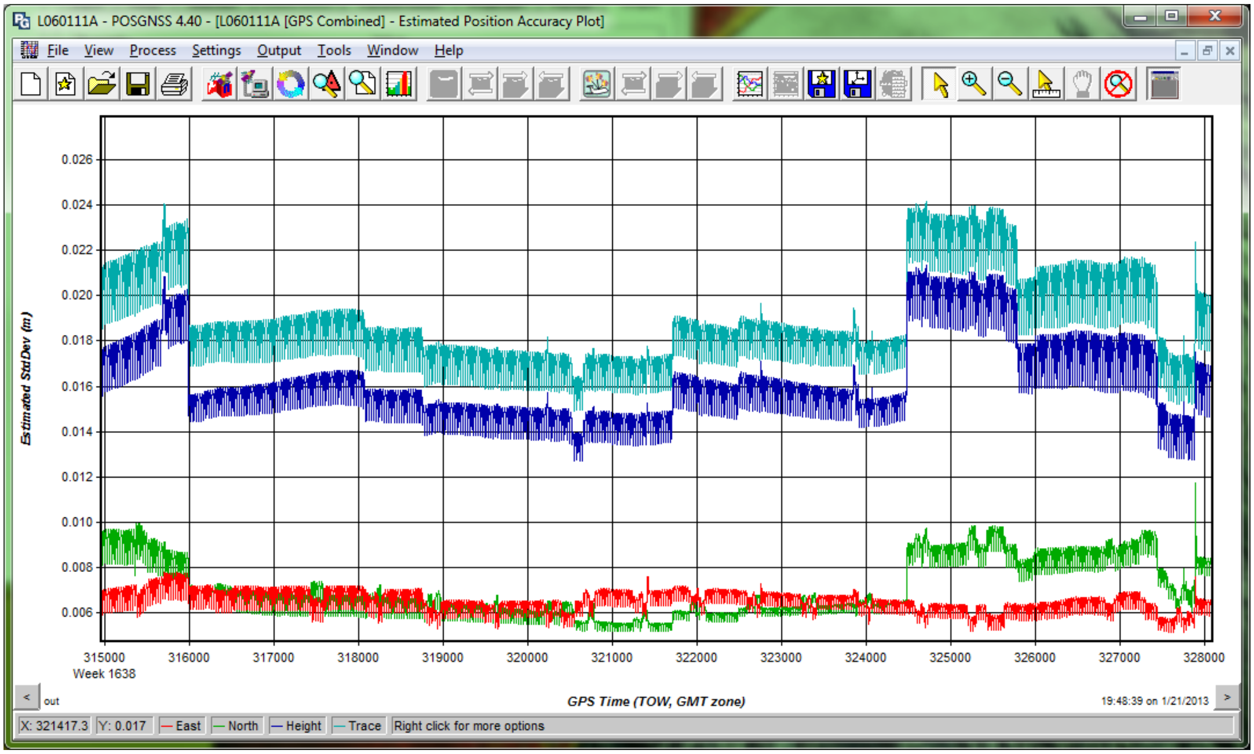
May 31 2011 Plot



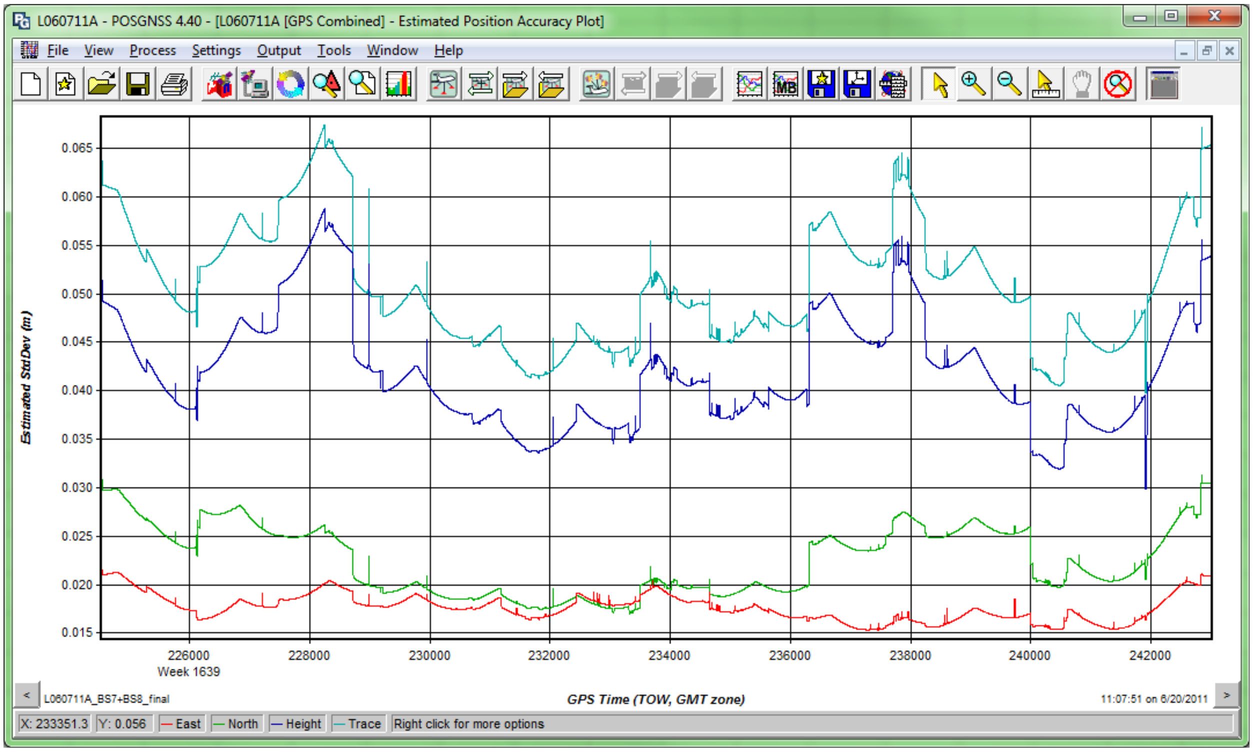



M053111A - POSGNSS 4.40 - [M053111A [GPS Combined] - Estimated Position Accuracy Plot]
File
View
Process
Settings
Output
Tools
Window
Help
Estimated StdDev (m)
0.085
0.080
0.075
0.070
0.065
0.060
0.055
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
238000
Week 1638
240000
242000
244000
246000
248000
250000
252000
254000
Run (2)
GPS Time (TOW, GMT zone)
11:05:39 on 06/30/2011
X: 248501.7
Y: 0.041
East
North
Height
Trace
Right click for more options

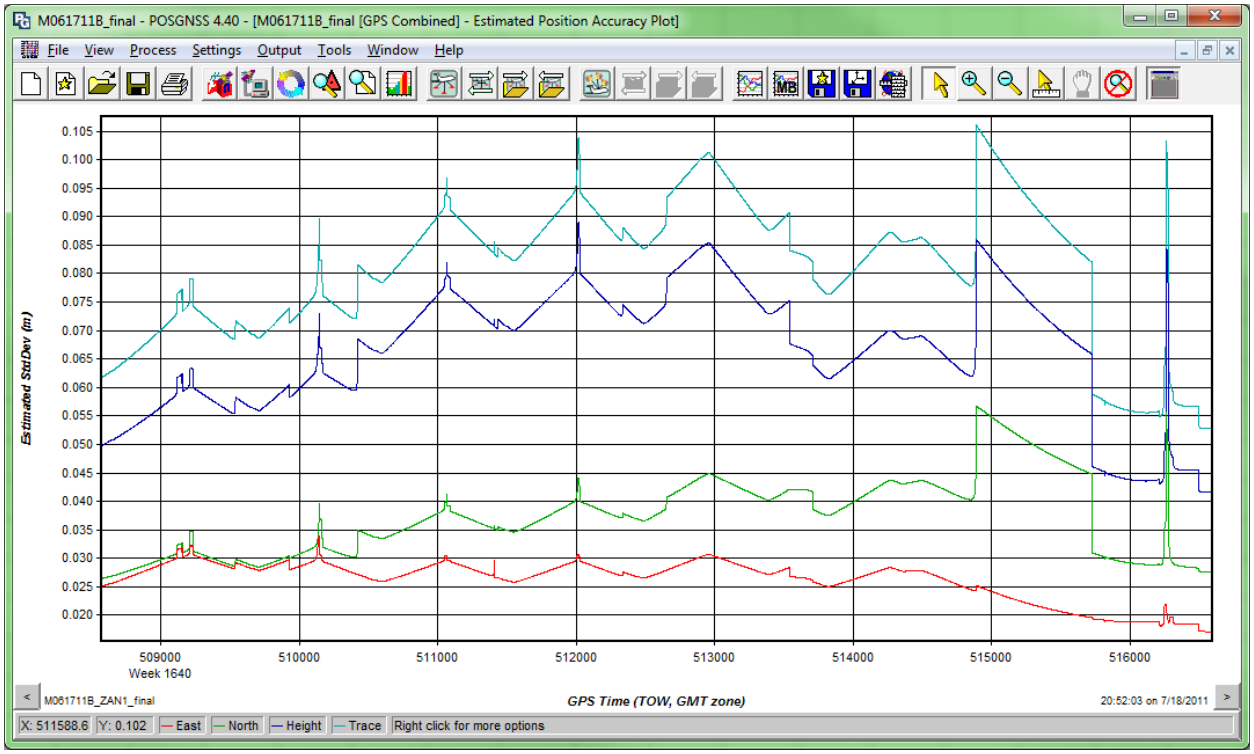
June 1 2011 Plot

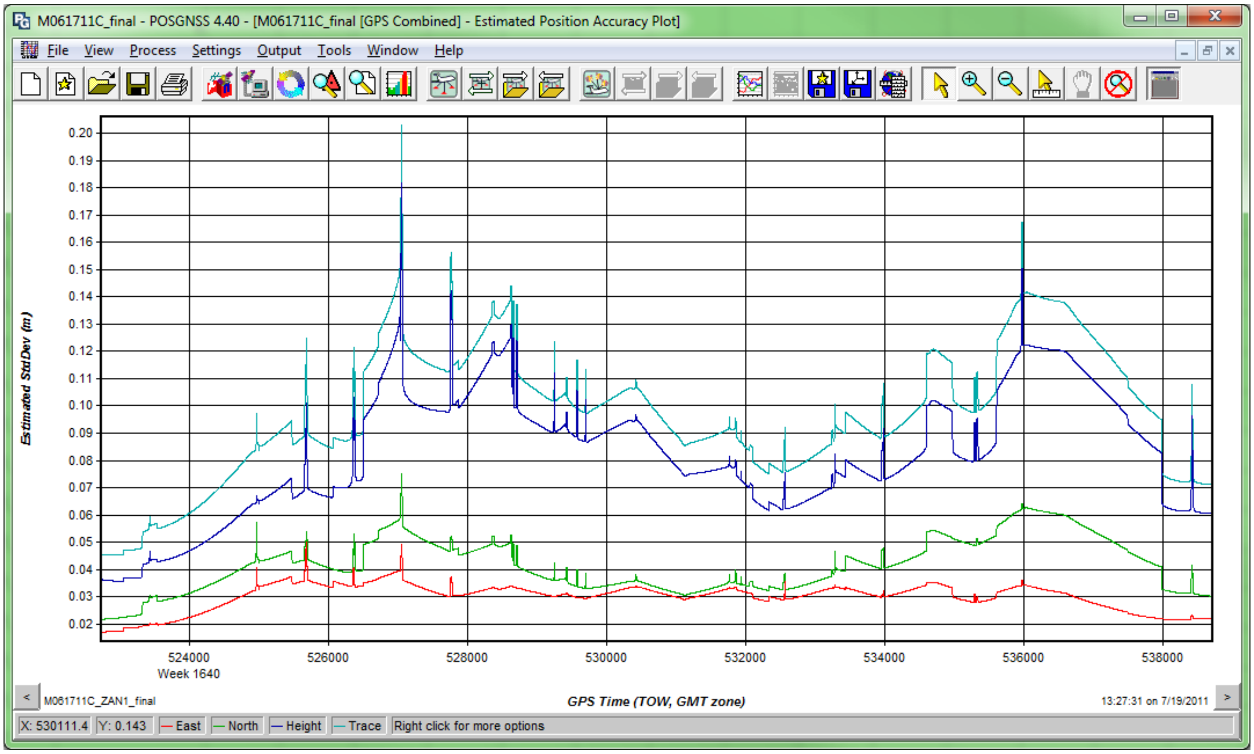


June 7 2011 Plot

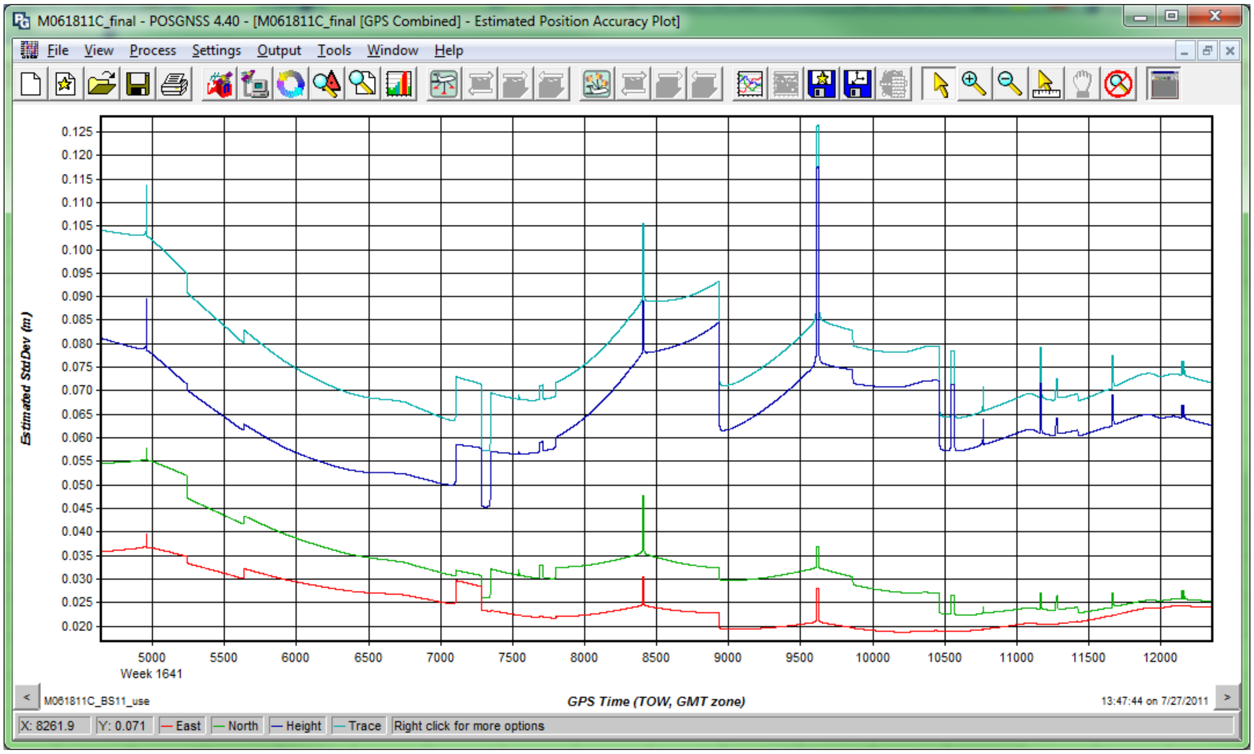


June 17 2011 Plots

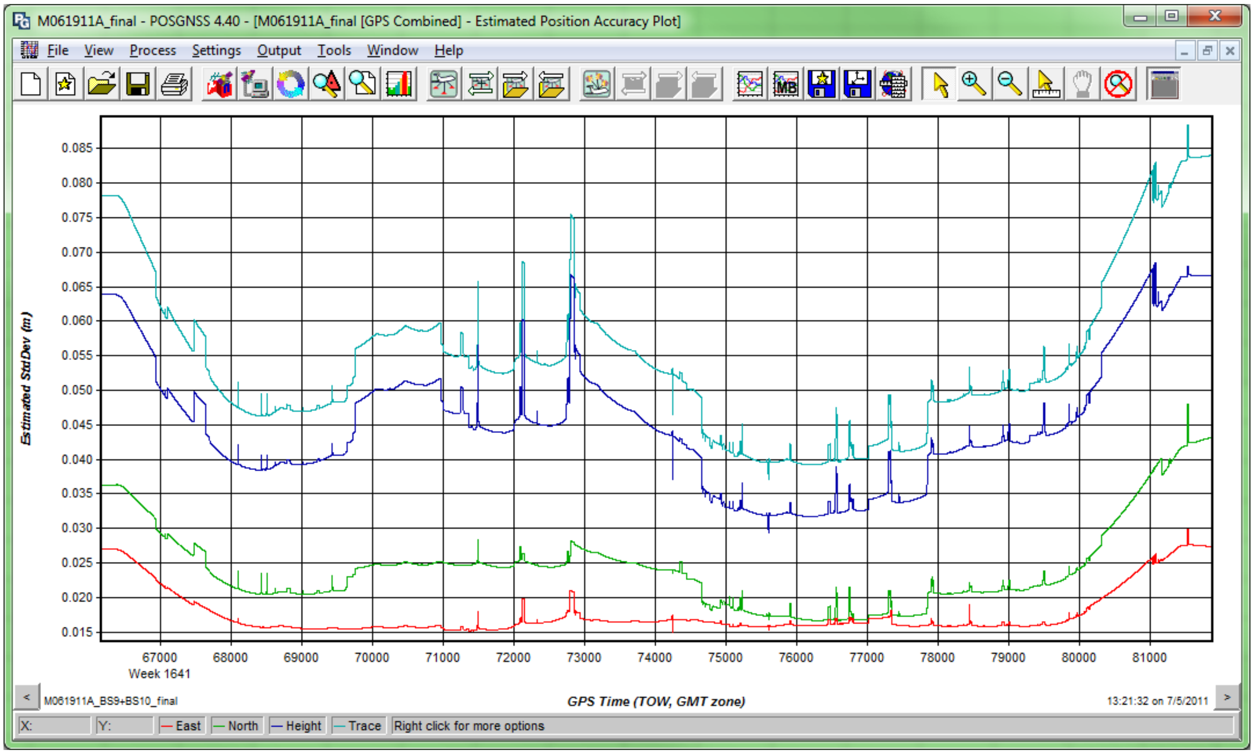




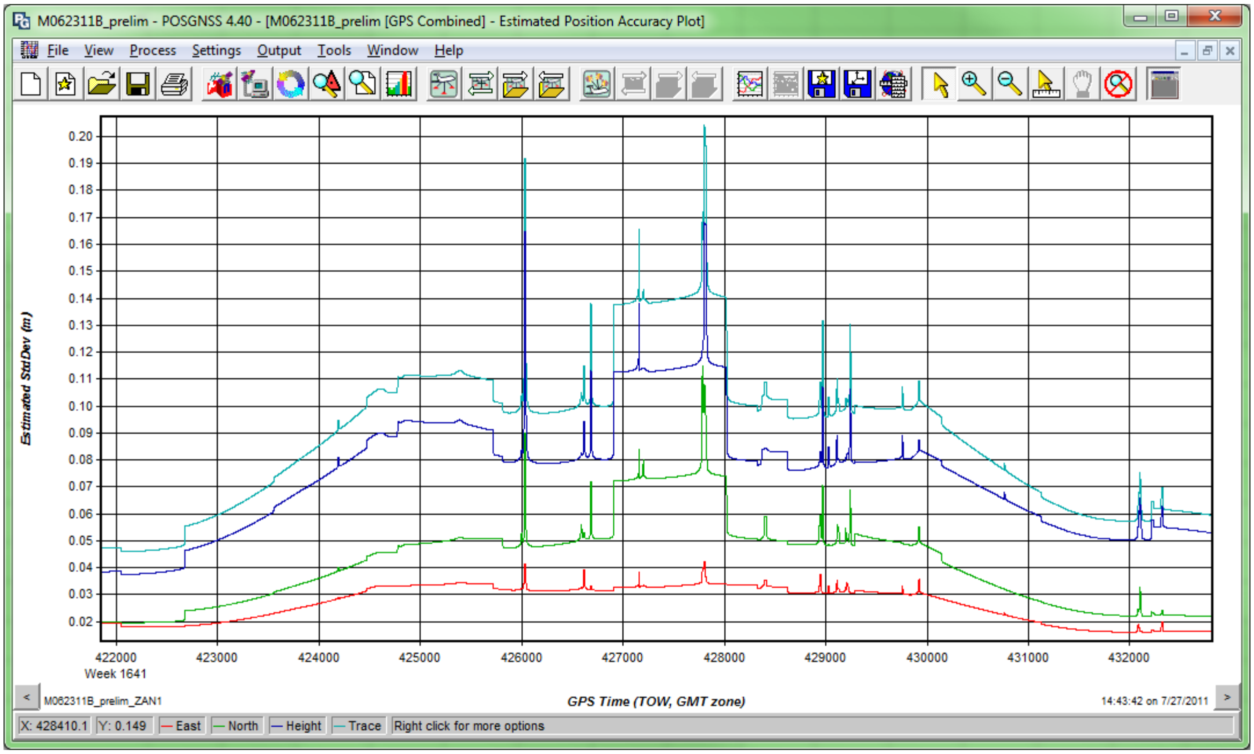
June 18 2011 Plot



June 19 2011 Plot

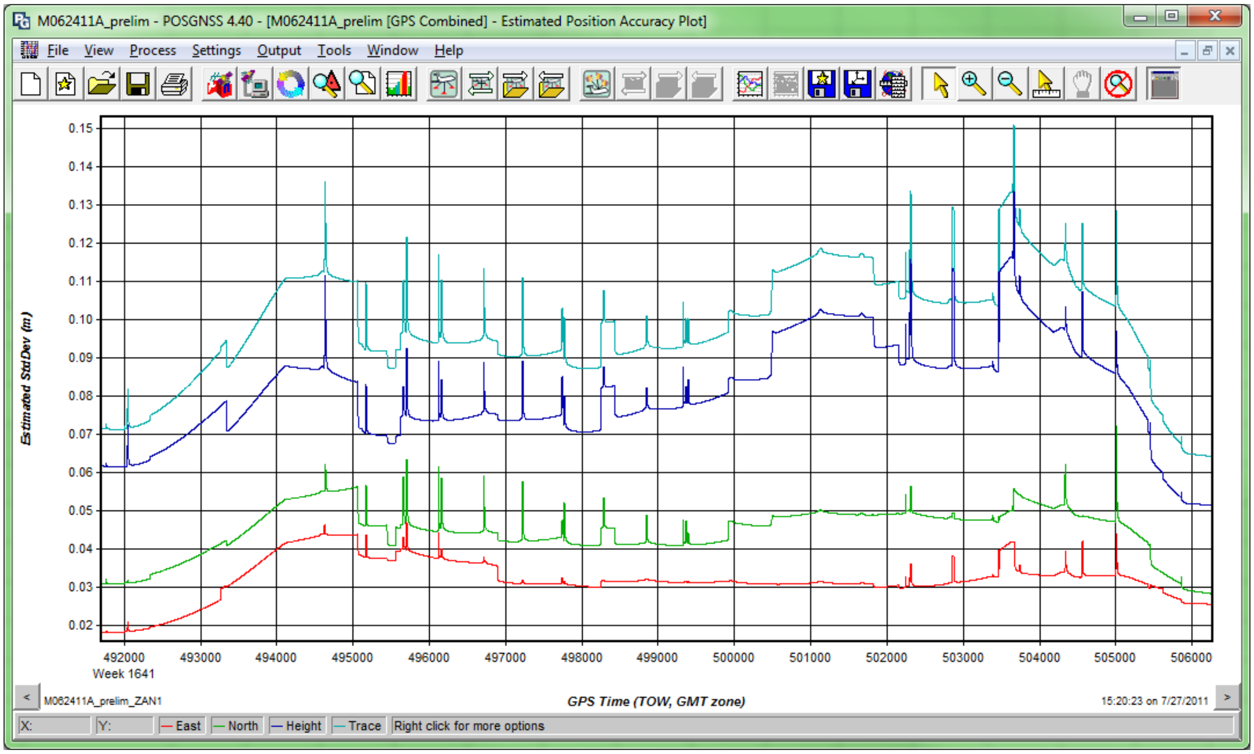


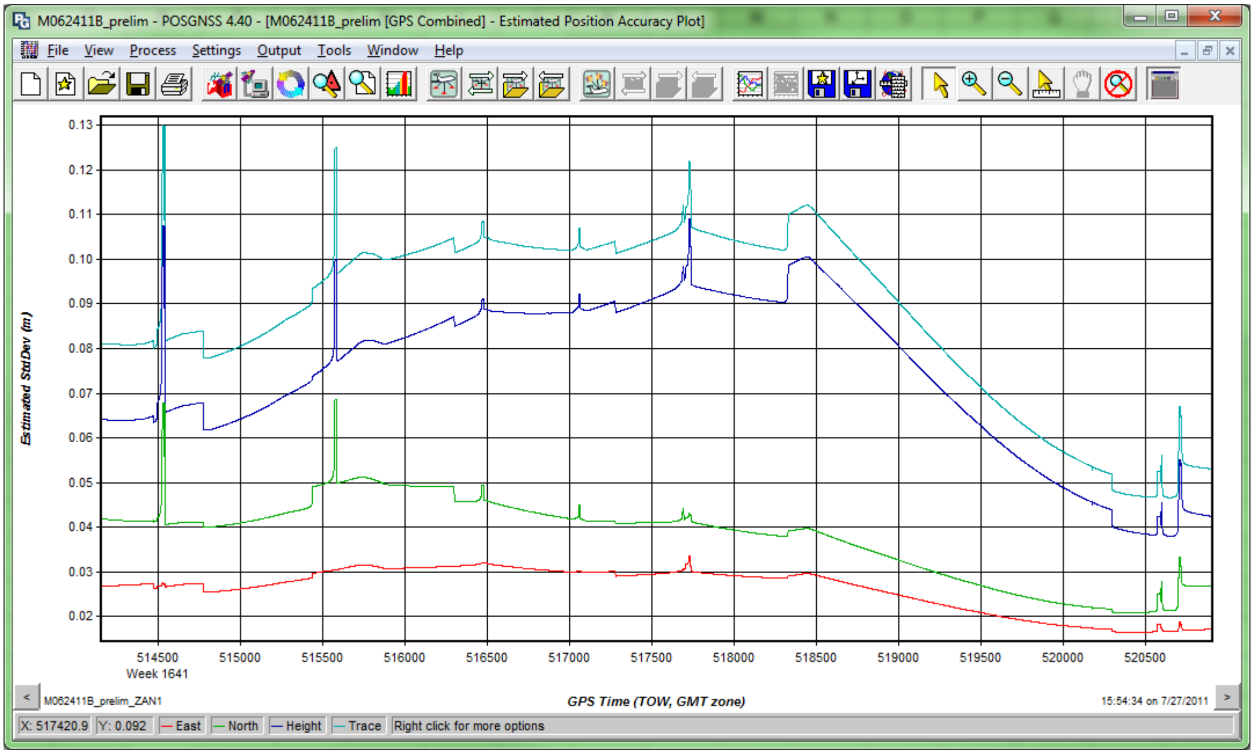
June 23 2011 Plot



(quality spikes are while plane was in turns; not while LiDAR data was being collected)

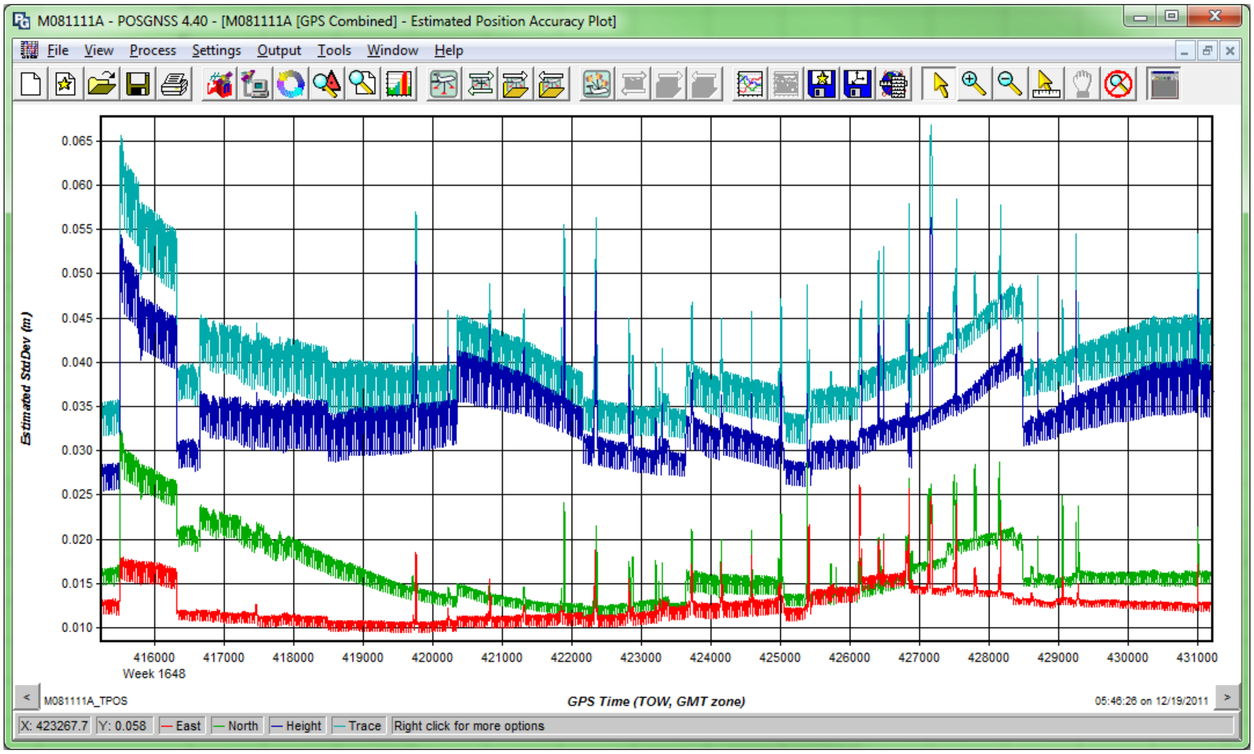
June 24 2011 Plots



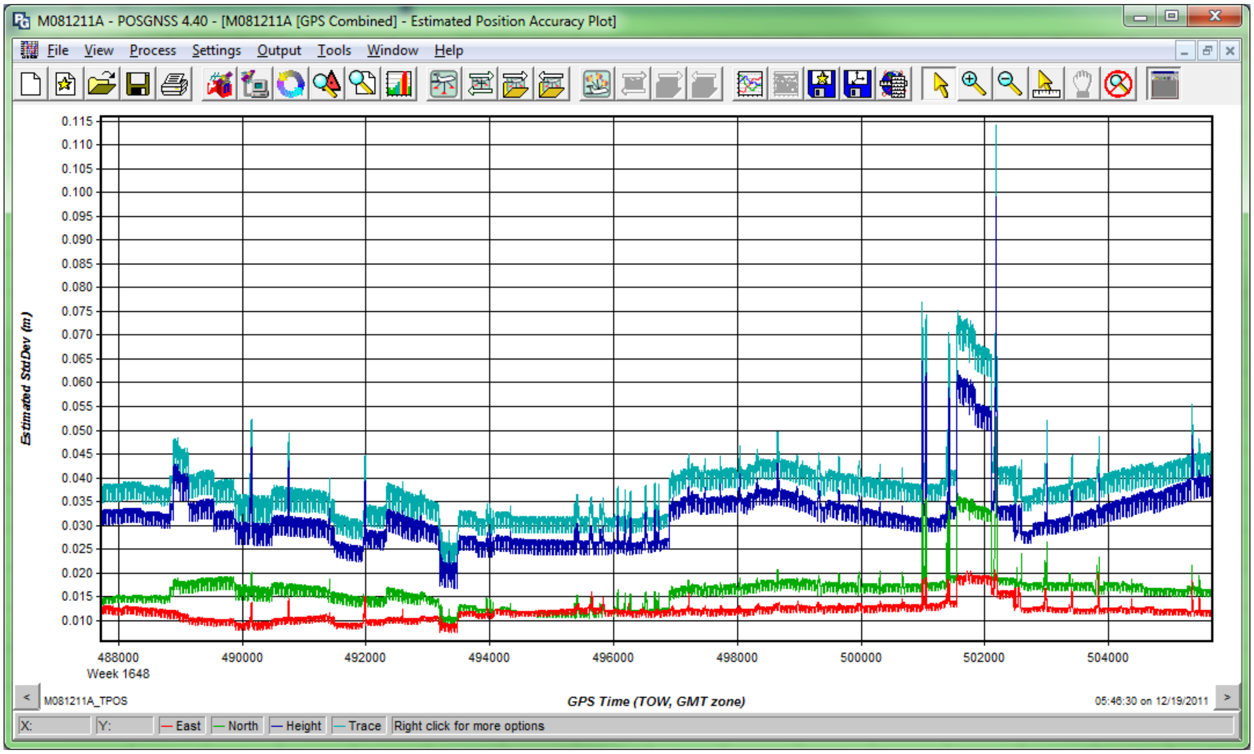


X: 517420.9 Y: 0.092

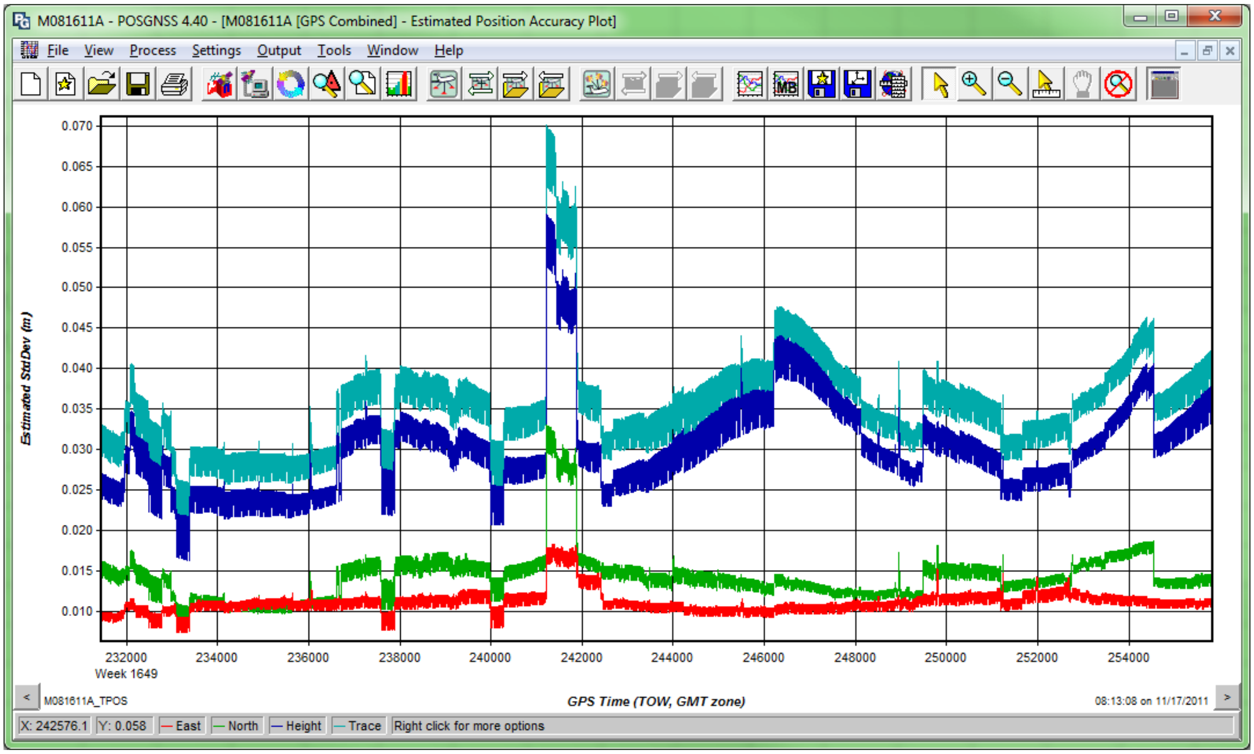
August 11 2011 Plot



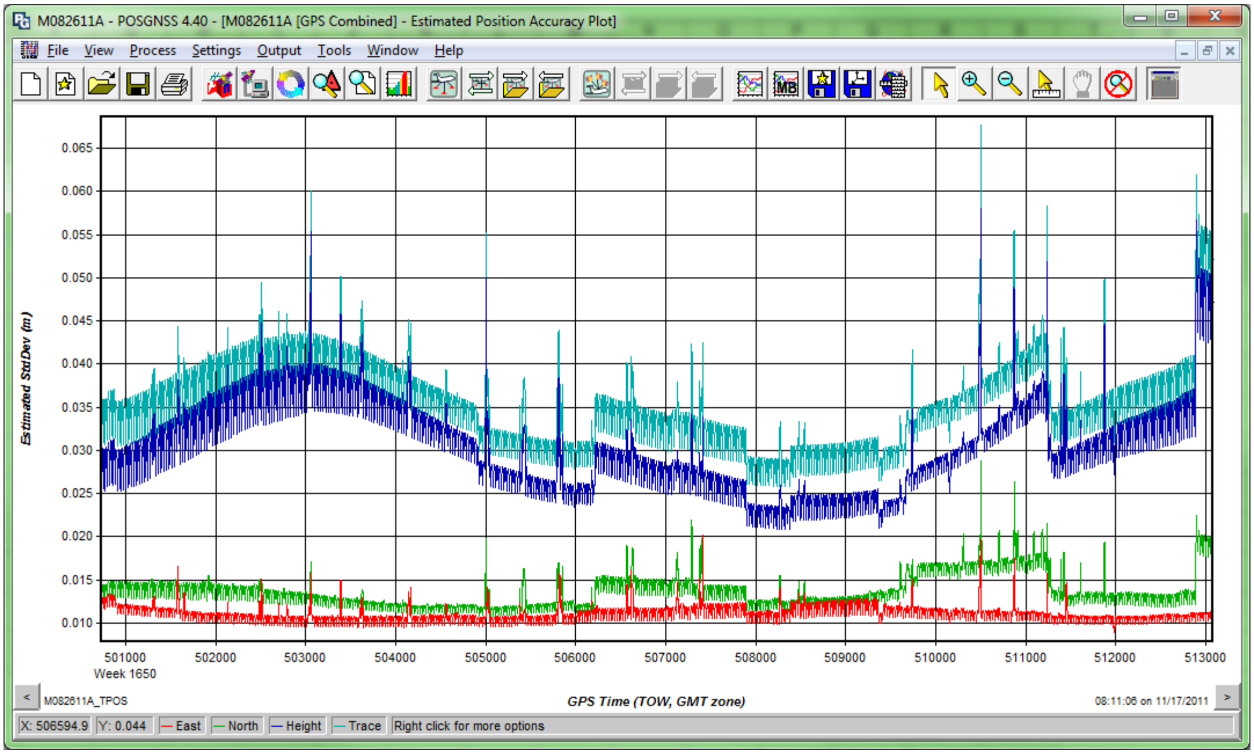
August 12 2011 Plot



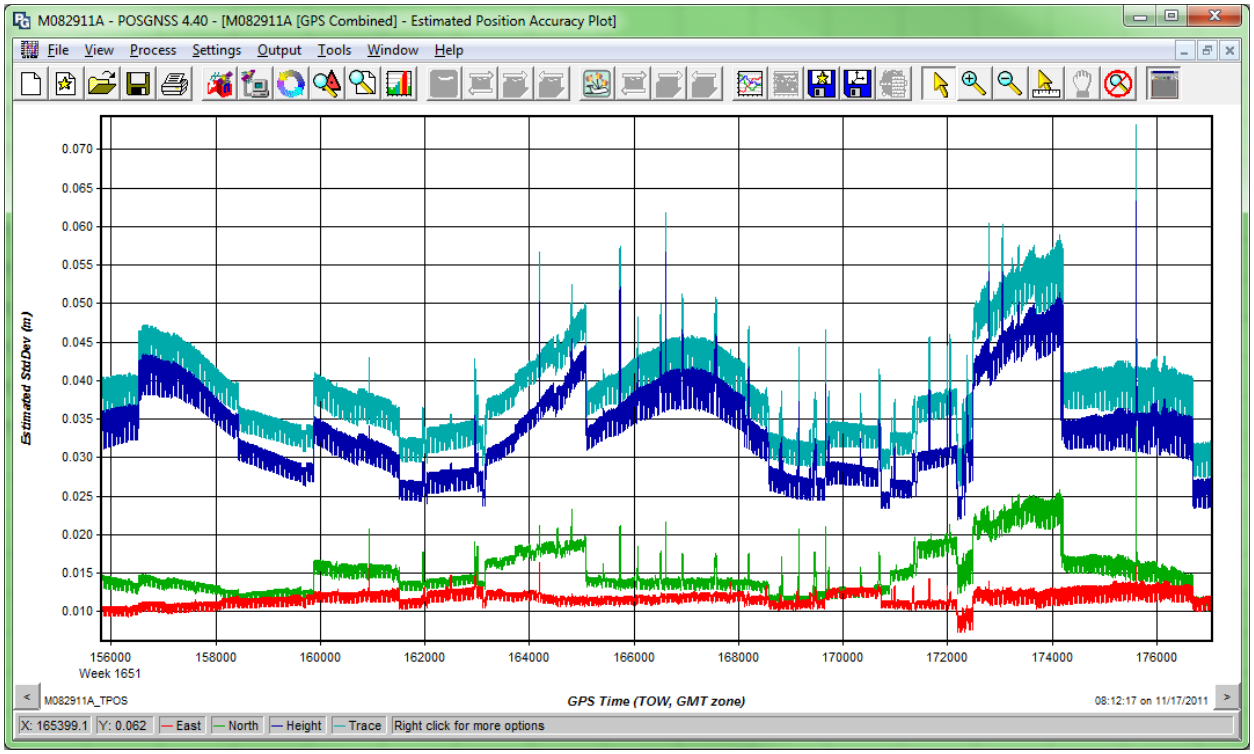
August 16 2011 Plot



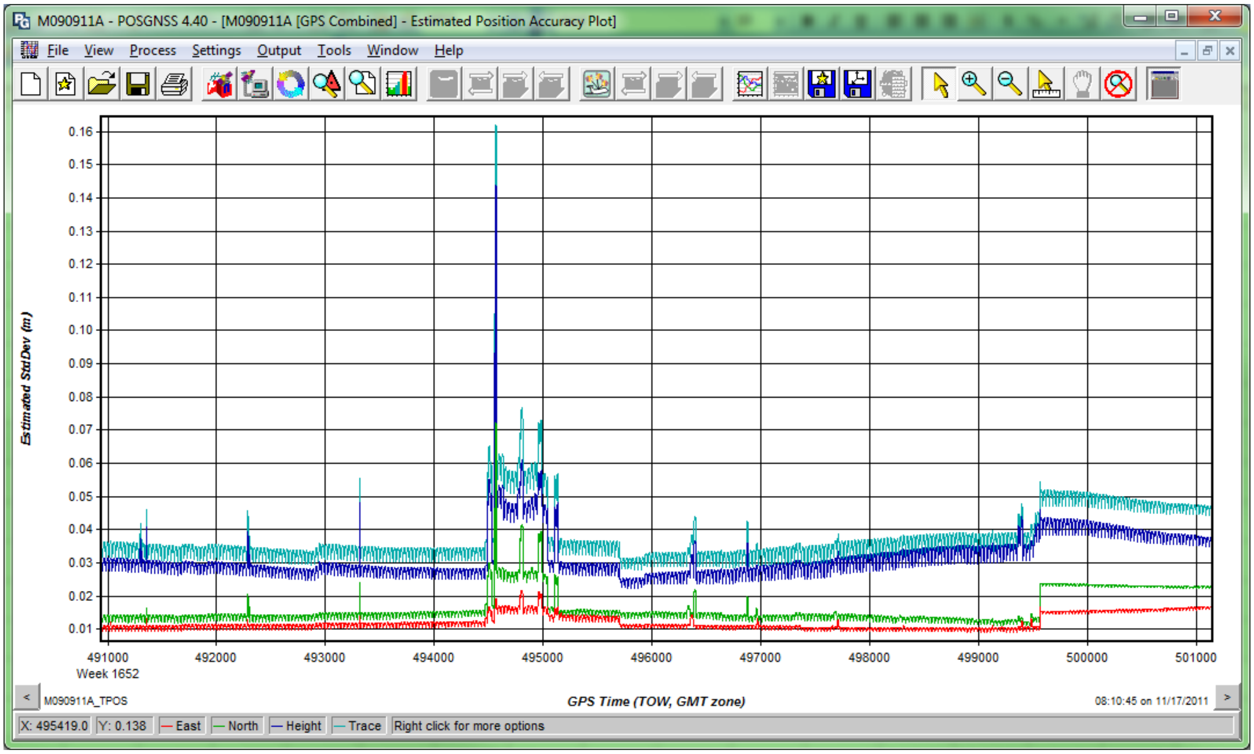
August 26 2011 Plot



August 29 2011 Plot

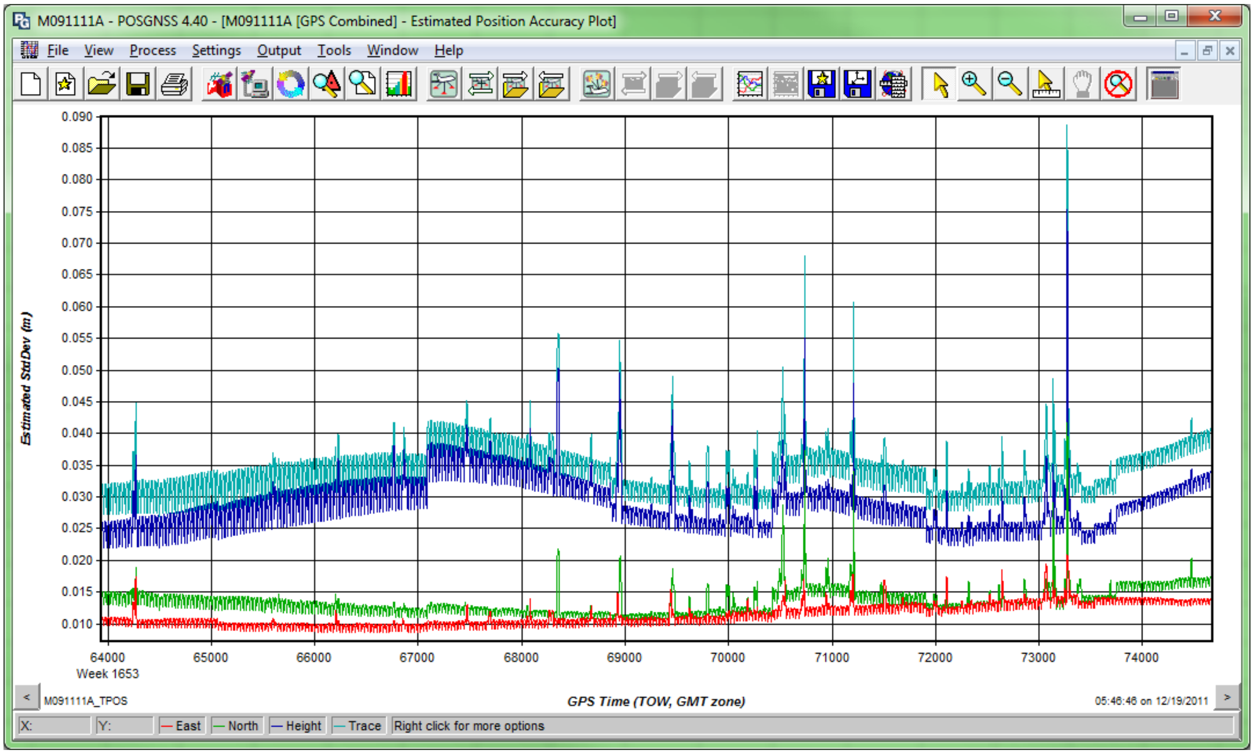


September 9 2011 Plot

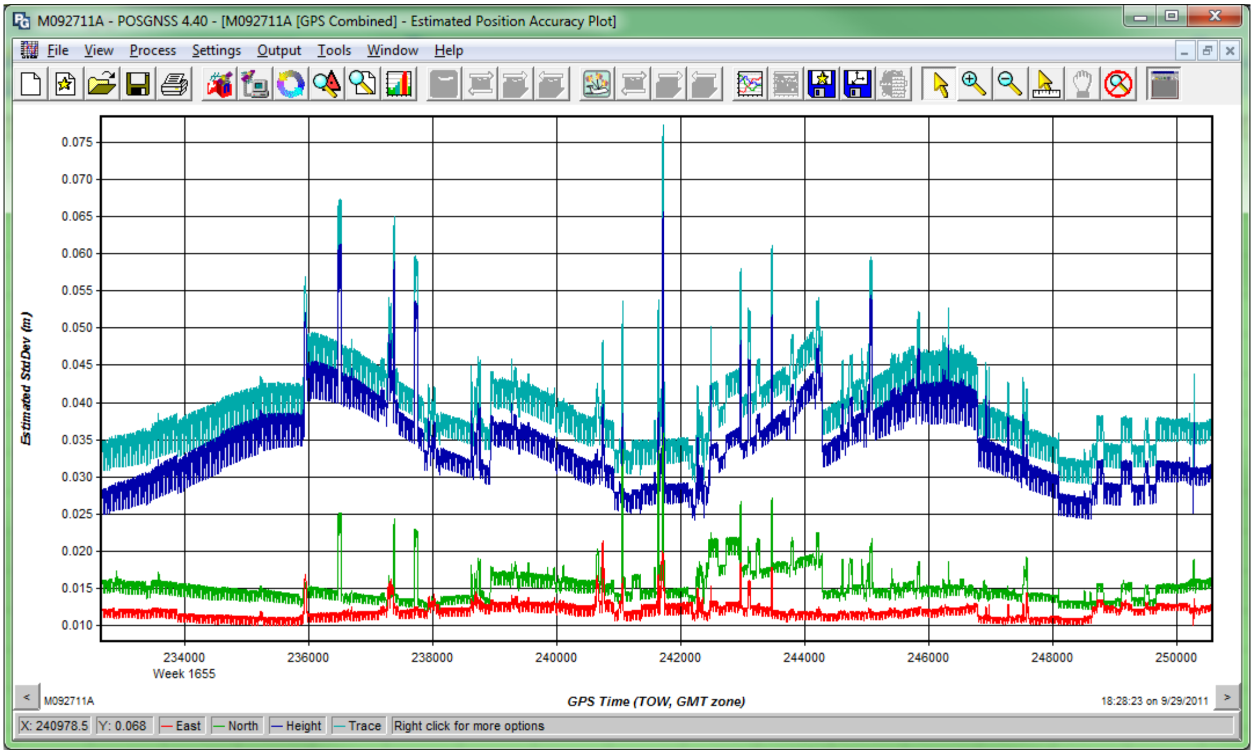


(quality spike is while plane was in a turn; not while LiDAR data was being collected)

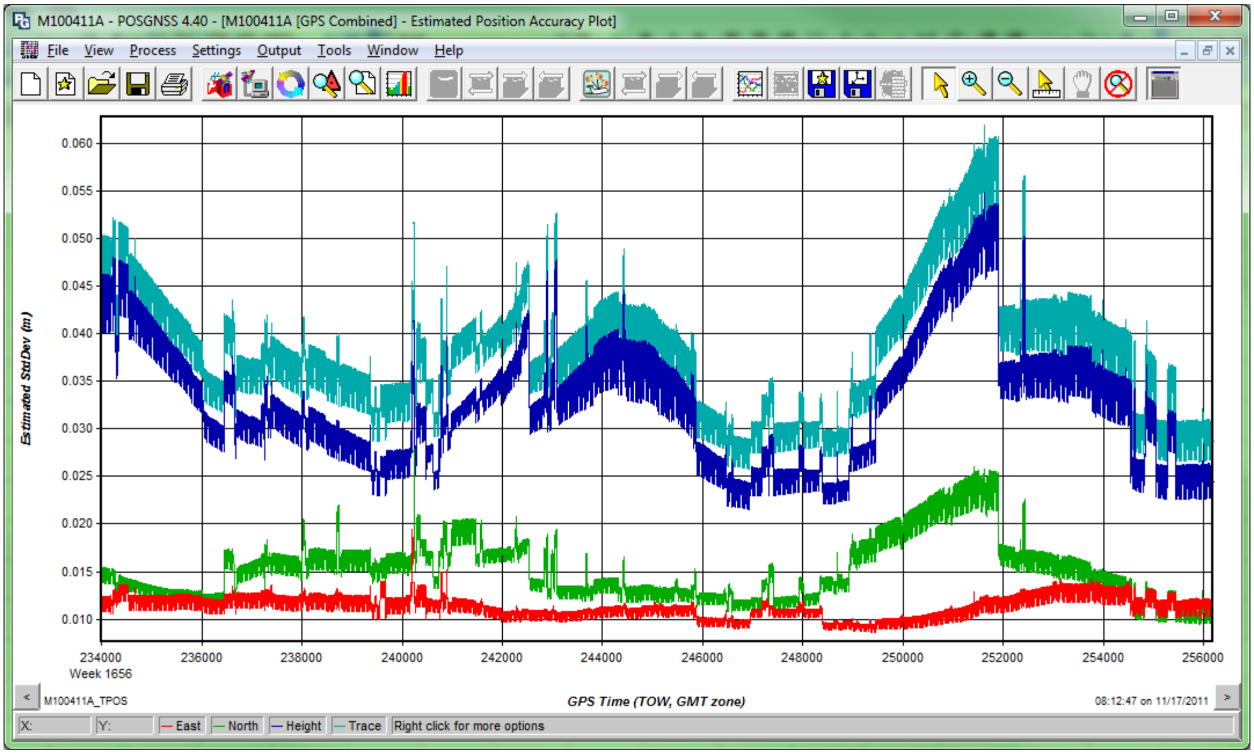
September 11 2011 Plot

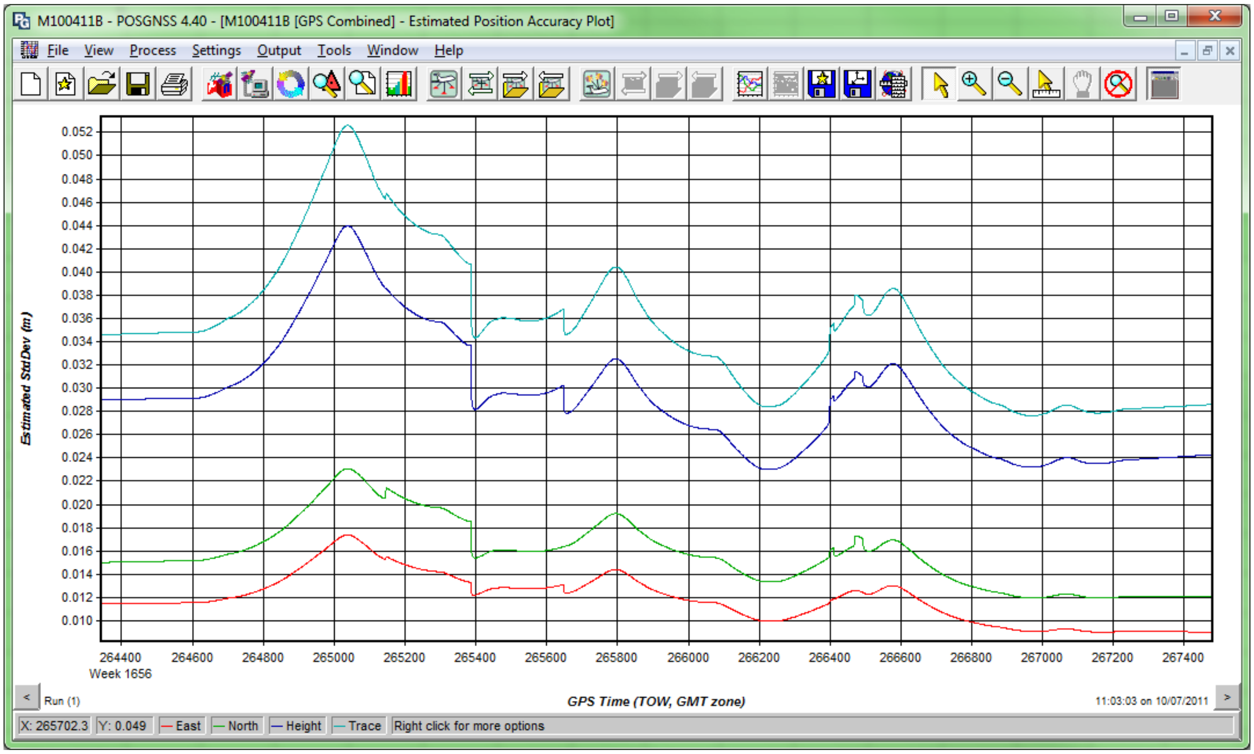


September 27 2011 Plot

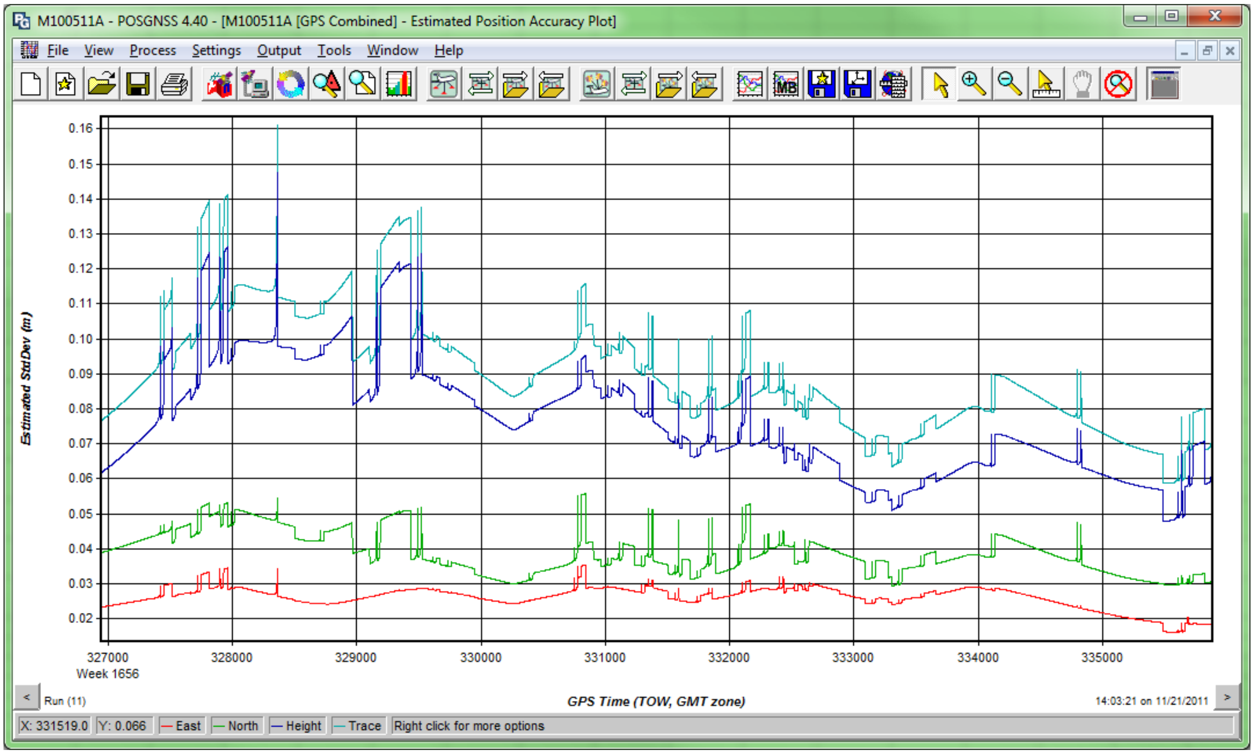


October 4 2011 Plots

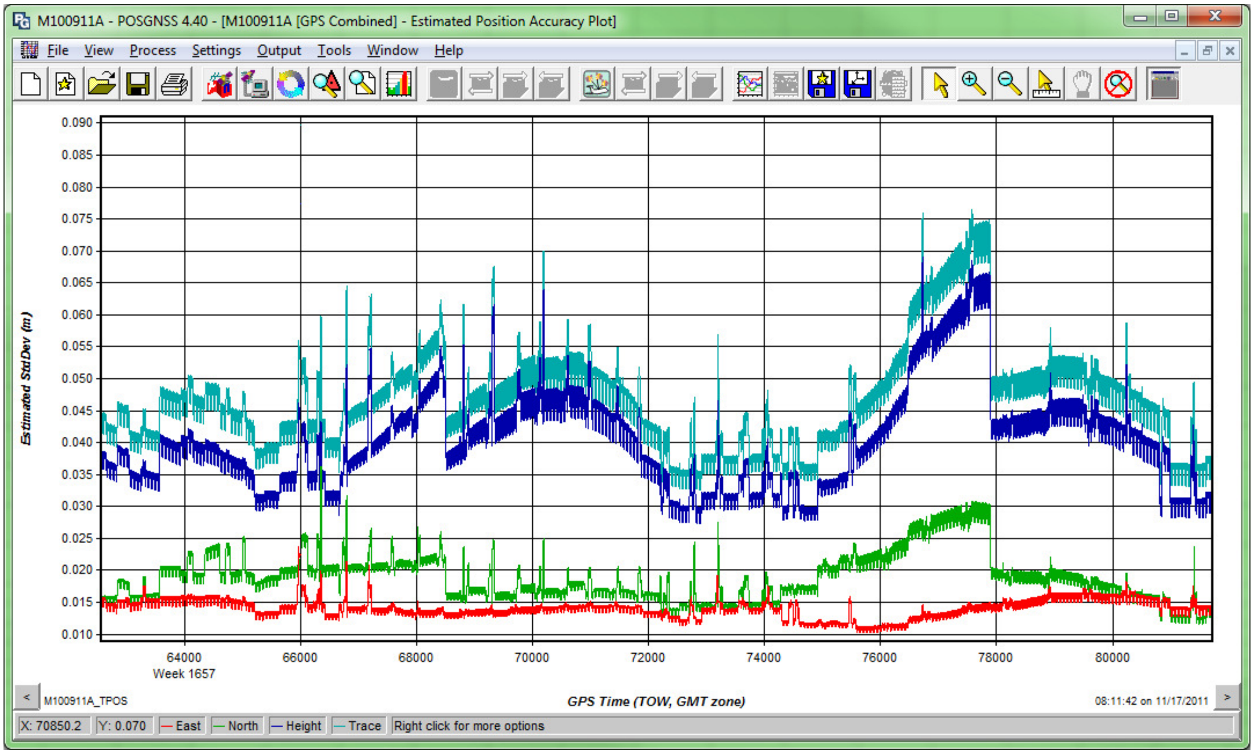


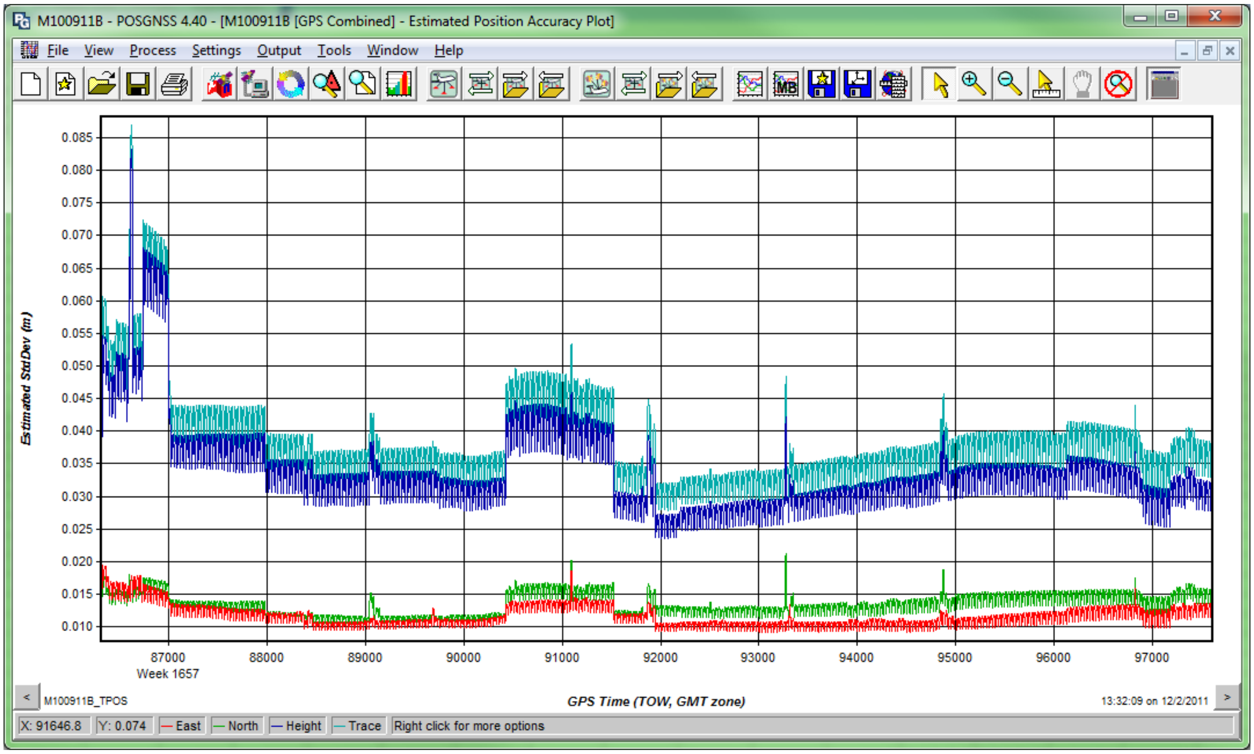


October 5 2011 Plot

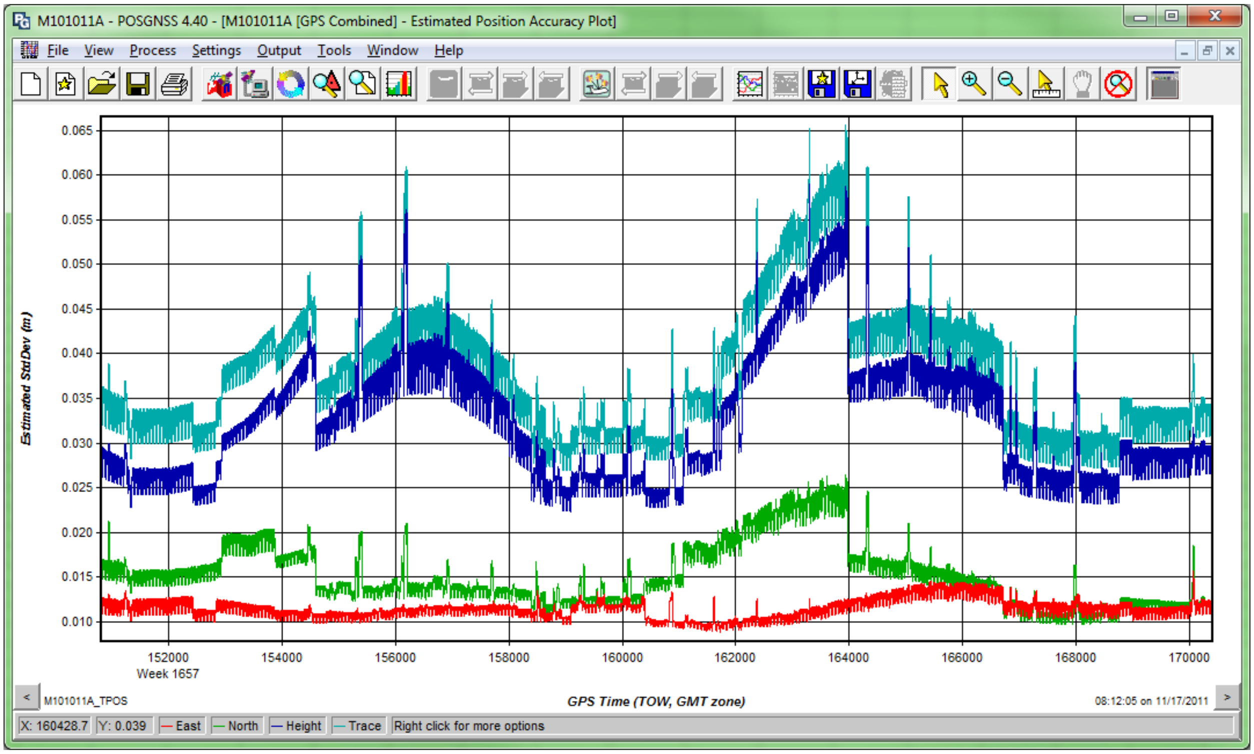


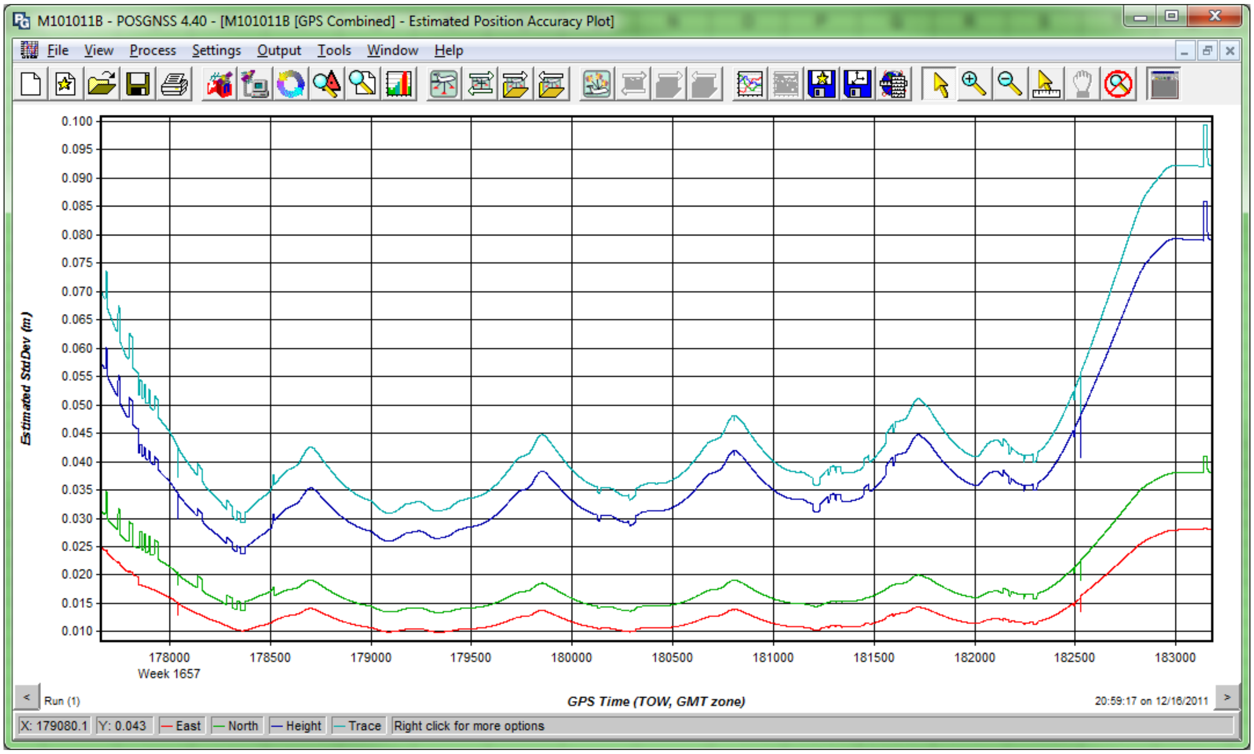
October 9 2011 Plots



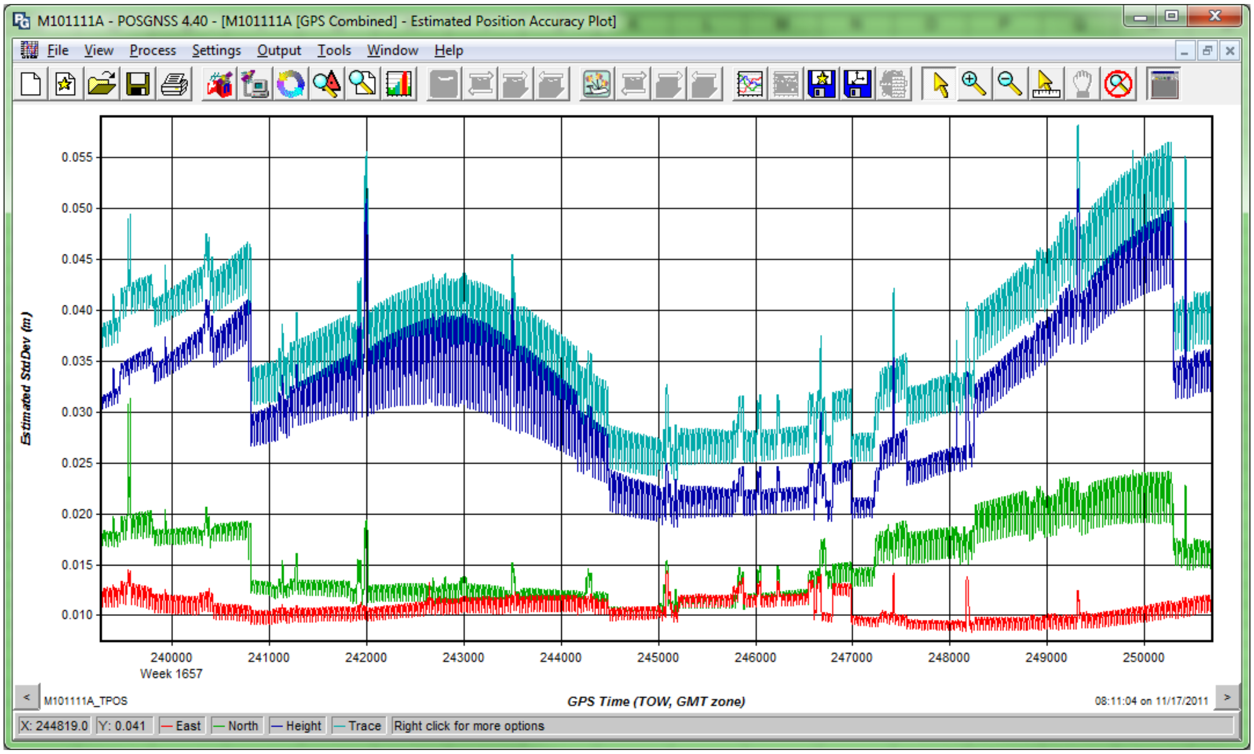


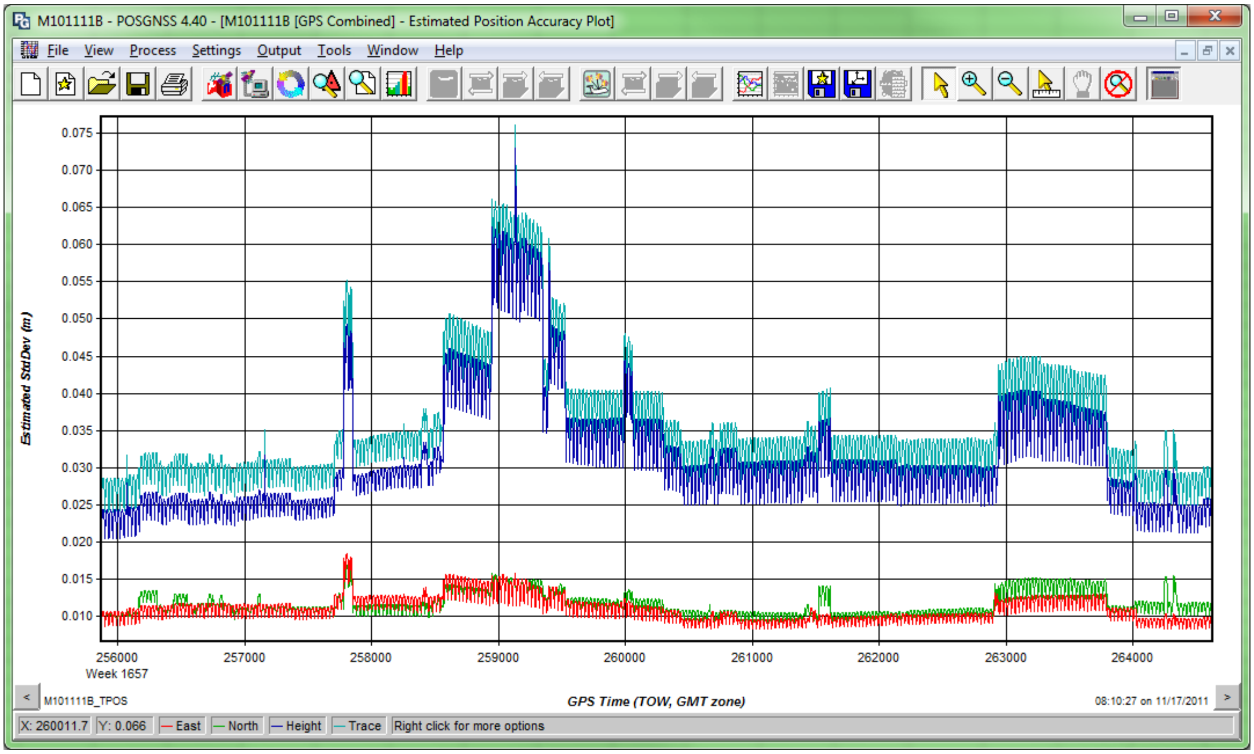
October 10 2011 Plots



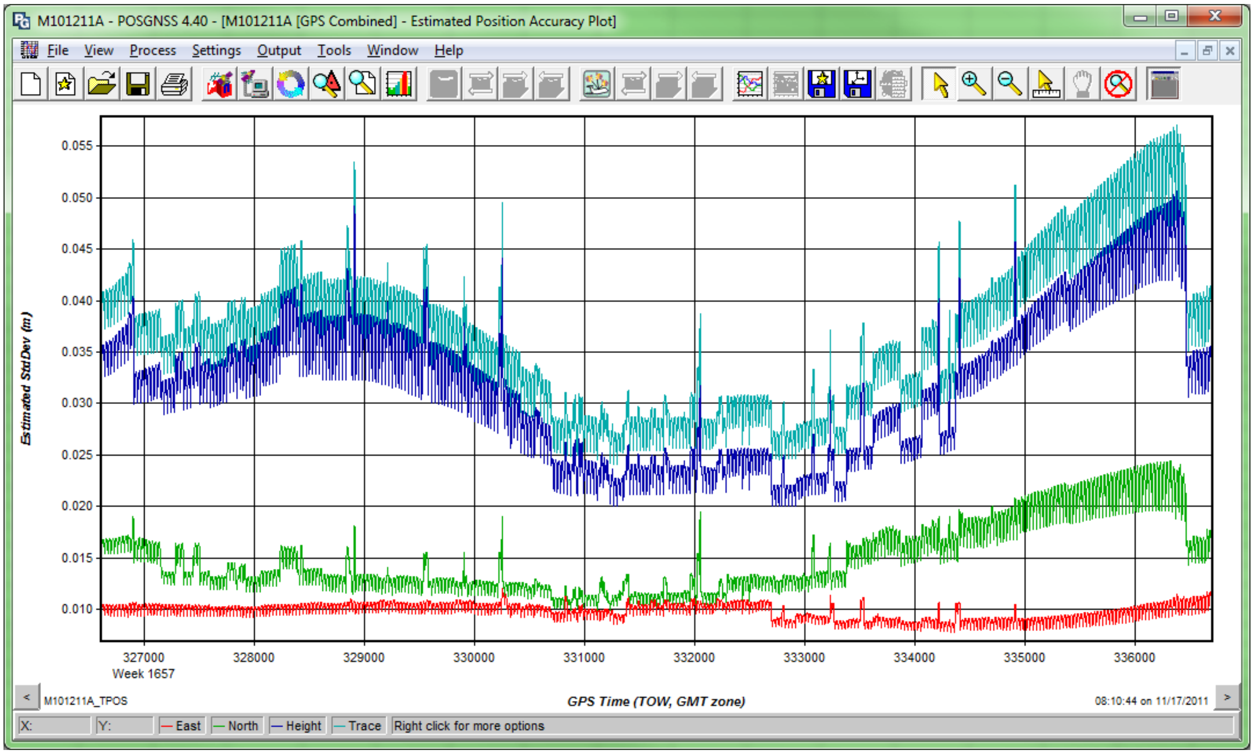


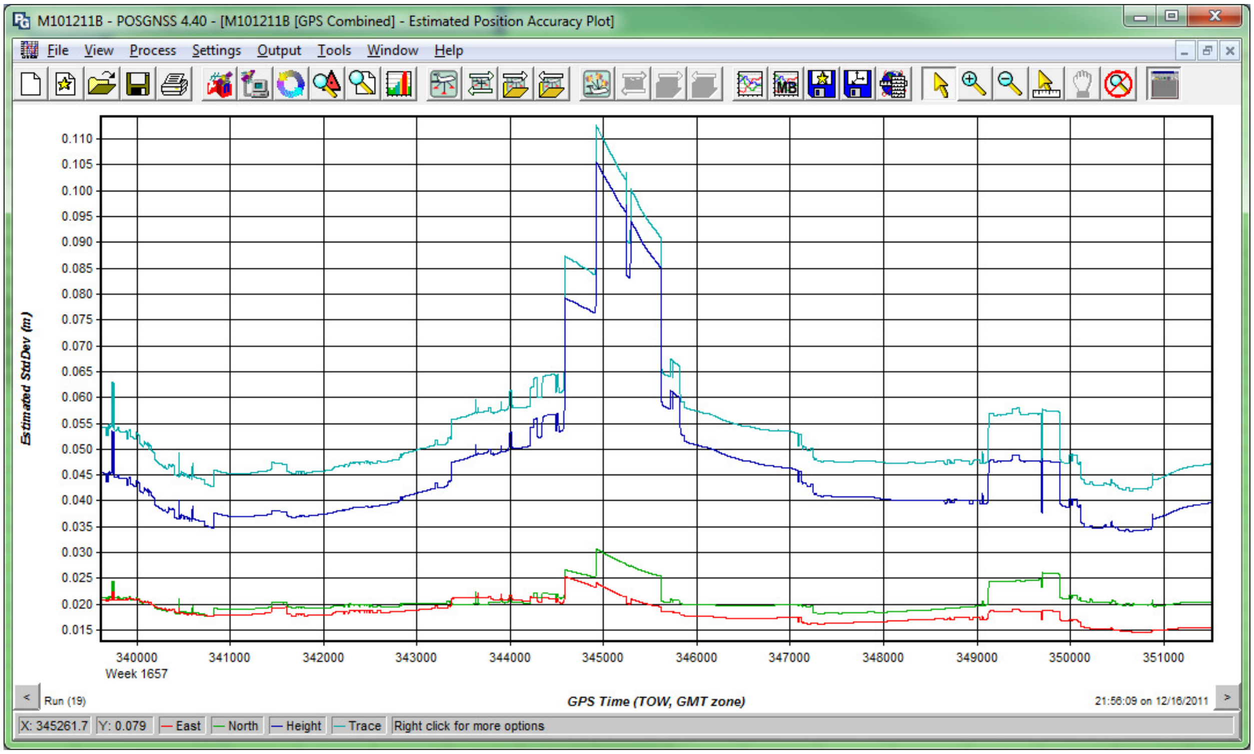
October 11 2011 Plots



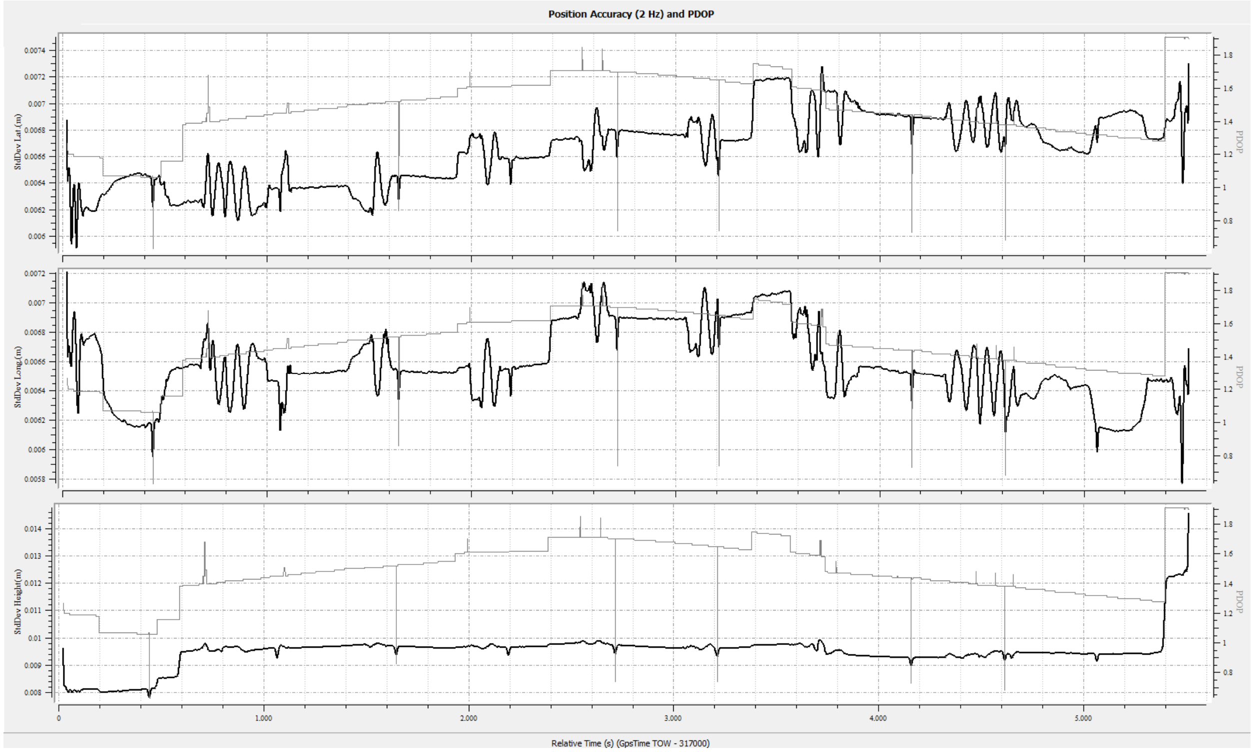


October 12 2011 Plots

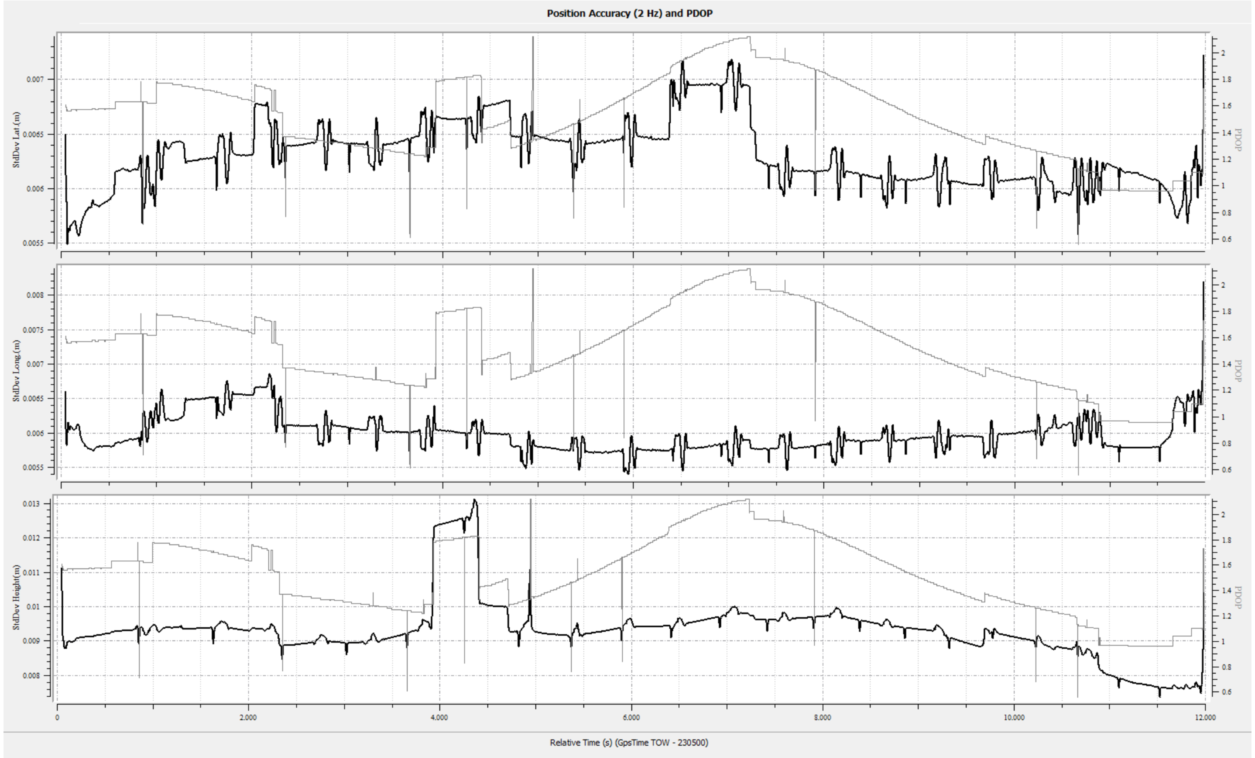




August 22 2012 Plot



August 28 2012 Plot



August 29 2012 Plot