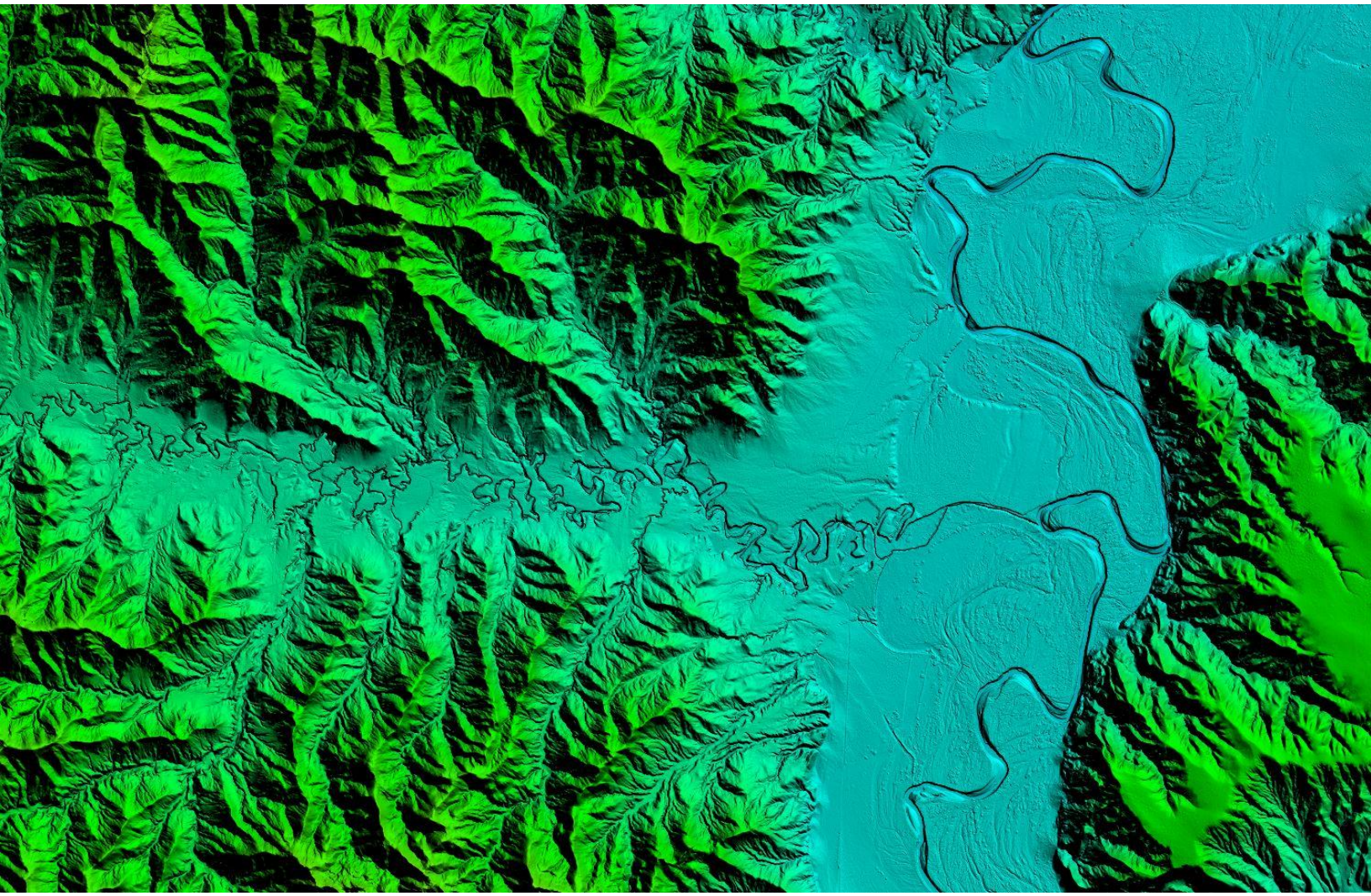

MT Statewide Phase4 B22 LIDAR PROCESSING REPORT

2023

Submitted: July 12, 2023

Project ID: 231442
Work Unit: 300247

Prepared for:

USGS
science for a changing world

Prepared by:

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1. Summary / Scope

1.1. Summary

This report contains a summary of the Montana Phase4 B22, Work Unit 300247 LiDAR acquisition task order, issued by USGS under their Contract 140G0221D0016 on May 6, 2022. This Work Unit yielded a project area covering 5405 square miles over Montana at Quality Level 2. The intent of this document is only to provide specific validation information for the data acquisition/collection, processing, and production of deliverables completed as specified in the task order.

1.2. Scope

Aerial topographic LiDAR was acquired using state of the art technology along with the necessary surveyed ground control points (GCPs) and airborne GPS and inertial navigation systems. The aerial data collection was designed with the following specifications listed in Table 1 below.

Table 1. Originally Planned LiDAR Specifications

Average Point Density	Flight Altitude (AGL)	Field of View	Minimum Side Overlap	RMSEz
2 pts / m2	1798 m	58.5°	30%	≤ 10 cm

1.3. Coverage

The Work Unit boundary covers 5405 square miles over Montana. Project extents are shown in Figure 1.

1.4. Duration

LiDAR data was acquired from June 16, 2022, to August 27, 2022, in 23 total lifts. *See Section: 2.4. Time Period for more details.*

1.5. Issues

Tiles 725366, 787383, 798391, and 812395 are empty due to being over water.

MT Statewide Phase4 B22 Work Unit 300247 Projected Coordinate System: State Plane Montana FIPS 2500 Horizontal Datum: NAD83 (2011) Vertical Datum: NAVD88 (GEOID 18) Units: Meters	
LiDAR Point Cloud	Classified Point Cloud in .LAS 1.4 format
Rasters	• 1-meter Hydro-flattened Bare-earth Digital Elevation Model (DEM) in GeoTIFF format • 1-meter Intensity images in GeoTIFF format • 2-meter Swath Separation Images • 1-meter Maximum Surface Height Raster
Vectors *(*.shp)*	• Project Boundary • LiDAR Tile Index • Continuous Hydro-flattened Breaklines • Flightline Swath
Reports *(*.pdf)*	• LiDAR Mapping Report
Metadata *(*.xml)*	• Breaklines • Classified Point Cloud • DEM • Intensity Imagery

MT Statewide Phase4 QL2
Work Unit 300247 Boundary

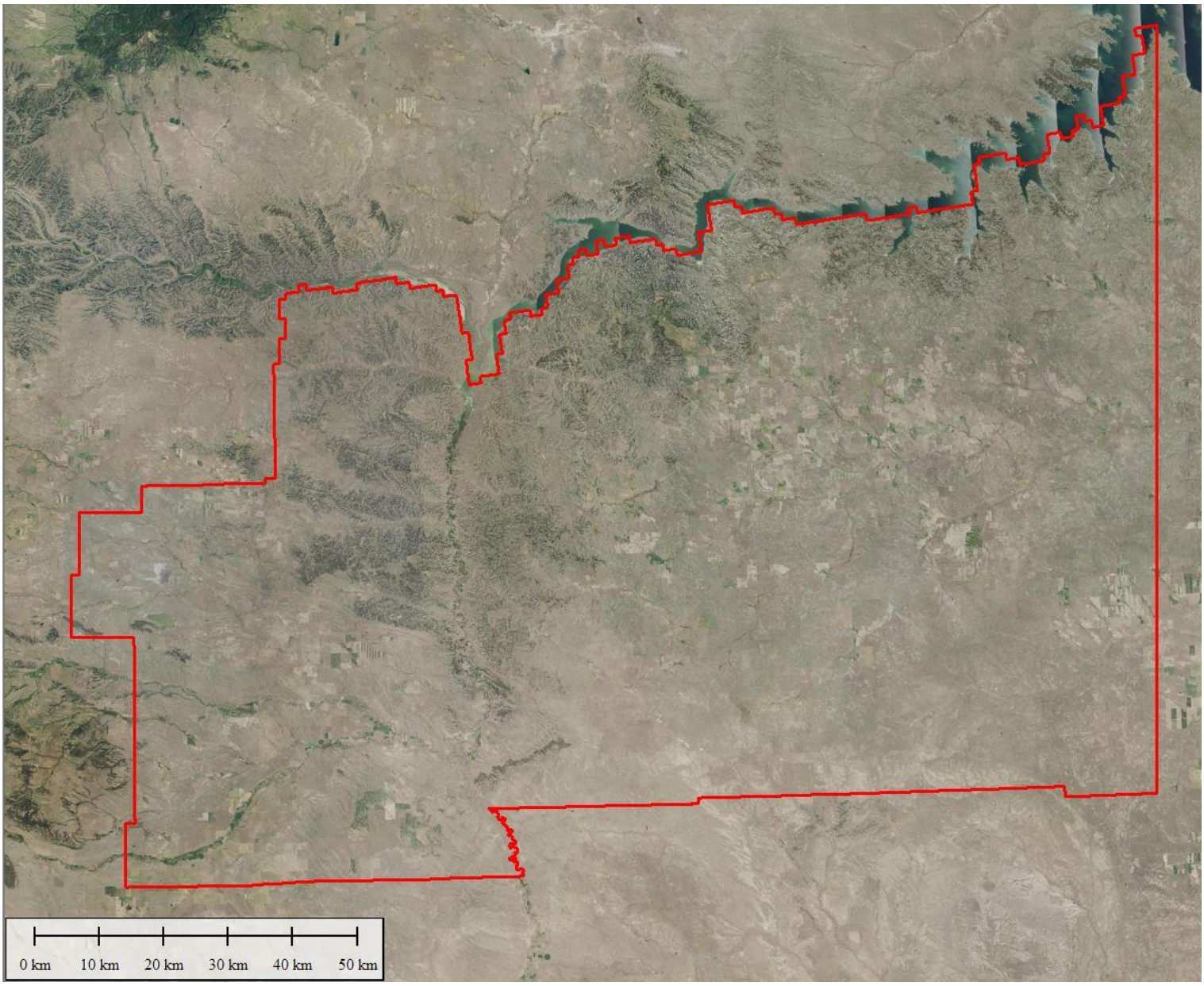

Figure 1. Work Unit Boundary

2. Planning / Equipment

2.1. Flight Planning

Flight planning was based on the unique project requirements and characteristics of the project site. The basis of planning included: required accuracies, type of development, amount / type of vegetation within project area, required data posting, and potential altitude restrictions for flights in project vicinity.

Detailed project flight planning calculations were performed for the project using RiPARAMETER planning software.

2.2. LiDAR Sensor

AXIS Geospatial utilized Riegl VQ1560i LiDAR sensors, serial number 2222593 and 2223544, for data acquisition.

The Riegl 1560i system is a dual channel waveform processing airborne scanning system. It has a laser pulse repetition rate of up to 2 MHz resulting in up to 600 lines per second. The system utilizes an integrated IMU/GNSS unit.

A summary of the aerial acquisition parameters for the project are shown in the LiDAR System Specifications in Table 2.

Minimum Range [8]	100 m
Accuracy [9] [10]	20 mm
Precision [10] [11]	20 mm
Laser Pulse Repetition Rate	up to 2 MHz
Effective Measurement Rate	up to 1.33 MHz @ 60° scan angle
Echo Signal Intensity	provided for each echo signal
Laser Wavelength	near infrared
Laser Beam Divergence	≤ 0.18 mrad @ 1/e [12], ≤ 0.25 mrad @ 1/e² [13]
Number of Targets per Pulse	with online waveform processing: practically unlimited [14] [15] monitoring data output: first pulse
Scanner Performance	
Scanning Mechanism	rotating polygon mirror
Scan Pattern	parallel scan lines per channel, crossed scan lines between channels
Tilt Angle of Scan Lines	± 14° = 28°
Forward/ Backward Scan Angle in Non-Nadir Direction	± 8° at the edges
Scan Angle Range	60° total per channel, resulting in an effective FOV of 58°
Total Scan Rate	40 [16] - 600 lines/sec
Angular Step Width Δϑ	0.006° ≤ Δϑ ≤ 0.180° [17] [18]
Angle Measurement Resolution	0.001°

Figure 3. Riegl VQ1560i LiDAR Sensor Specifications

		Riegl VQ1560i (SN2222593 and SN2223544)
Terrain and Aircraft Scanner	Flying Height	1798 m
	Recommended Ground Speed	155 kts
Scanner	Field of View	58.5°
	Scan Rate Setting Used	2 x 132 lps
Laser	Laser Pulse Rate Used	2 x 700 kHz
Coverage	Full Swath Width	2015 m
	Line Spacing	0.58 m
Point Spacing and Density	Average Point Spacing	0.71 m
	Average Point Density	2 pts / m^2

Table 2. LiDAR System Specifications

2.3. Aircraft

All flights for the project were accomplished using customized aircraft. Plane type and tail numbers are listed below.

LiDAR Collection Planes

- VulcanAir P-68C (small twin engine), Tail Number(s): N89LT
- Piper Navajo PA-31 (twin engine), Tail Number(s): N359RX

These aircraft provided an ideal, stable aerial base for LiDAR acquisition. These aerial platforms have relatively fast cruise speeds, which are beneficial for project mobilization / demobilization while maintaining relatively slow stall speeds, proving ideal for collection of high-density, consistent data posting using a state-of-the-art Riegl LiDAR system.

Figure 4. AXIS Plane VulcanAir P-68C (N89LT)

Figure 5. AXIS Plane Piper Navajo PA-31 (N359RX)

2.4. Time Period

Project specific flights were conducted between June 16, 2022, and August 27, 2022. Twenty-three aircraft lifts were completed. Accomplished lifts are listed below.

Lift	Start UTC	End UTC
06162022 (SN2222593, N89LT)	06/16/2022 9:10 AM	06/16/2022 12:49 PM
06162022 (SN2222593, N89LT)	06/16/2022 14:14 PM	06/16/2022 17:20 PM
06172022 (SN2222593, N89LT)	06/17/2022 8:46 AM	06/17/2022 12:39 PM
06172022 (SN2222593, N89LT)	06/17/2022 14:34 PM	06/17/2022 14:45 PM
06182022 (SN2222593, N89LT)	06/18/2022 8:39 AM	06/18/2022 8:52 AM
06182022 (SN2222593, N89LT)	06/18/2022 14:13 PM	06/18/2022 16:43 PM
06222022 (SN2222593, N89LT)	06/22/2022 8:31 AM	06/22/2022 12:20 PM
06222022 (SN2222593, N89LT)	06/22/2022 14:14 PM	06/22/2022 16:15 PM
06232022 (SN2222593, N89LT)	06/23/2022 8:47 AM	06/23/2022 12:52 PM
06232022 (SN2222593, N89LT)	06/23/2022 14:19 PM	06/23/2022 15:13 PM
06262022 (SN2222593, N89LT)	06/26/2022 7:21 AM	06/26/2022 11:22 AM
06272022 (SN2222593, N89LT)	06/27/2022 8:36 AM	06/27/2022 13:49 PM
06282022 (SN2222593, N89LT)	06/28/2022 8:44 AM	06/28/2022 12:56 PM
06292022 (SN2222593, N89LT)	06/29/2022 8:47 AM	06/29/2022 13:13 PM
07092022 (SN2222593, N89LT)	07/09/2022 8:45 AM	07/09/2022 13:25 PM
07092022 (SN2222593, N89LT)	07/09/2022 15:32 PM	07/09/2022 16:24 PM
08102022 (SN2223544, N359RX)	08/10/2022 13:56 PM	08/10/2022 20:54 PM
08192022 (SN2222593, N89LT)	08/19/2022 9:20 AM	08/19/2022 10:55 AM
08192022 (SN2223544, N359RX)	08/19/2022 14:38 PM	08/19/2022 17:41 PM
08202022 (SN2222593, N89LT)	08/20/2022 8:59 AM	08/20/2022 14:48 PM
08202022 (SN2223544, N359RX)	08/20/2022 14:30 PM	08/20/2022 21:00 PM
08262022 (SN2223544, N359RX)	08/26/2022 15:36 PM	08/26/2022 18:43 PM
08272022 (SN2223544, N359RX)	08/27/2022 15:15 PM	08/27/2022 18:13 PM

Table 3. Lifts for 300247

3. Processing Summary

3.1. Flight Logs

Flight logs were completed by LiDAR sensor technicians for each mission during acquisition. These logs depict a variety of information, including:

- Job / Project #
- Flight Date / Lift Number
- Scan Rate (HZ)
- Pulse Rate Frequency (Hz)
- Ground Speed
- Altitude
- Flight Line #
- Flight Line Start and Stop Times
- Flight Line Altitude (AMSL)
- Heading
- Speed
- Notes (includes visibility, winds, ride, weather, temperature, dew point, pressure, etc.)

Project specific flight logs for each sortie are available in Appendix A.

3.2. LiDAR Processing

Applanix + POSPac software was used for post-processing of airborne GPS and inertial data (IMU), which is critical to the positioning and orientation of the LiDAR sensor during all flights. Applanix POSPac combines aircraft raw trajectory data with stationary GPS base station data yielding a "Smoothed Best Estimate Trajectory" (SBET) necessary for additional post processing software to develop the resulting geo-referenced point cloud from the LiDAR missions.

During the sensor trajectory processing (combining GPS & IMU datasets) certain statistical graphs and tables are generated within the Applanix POSPac processing environment which are commonly used as indicators of processing stability and accuracy. This data for analysis includes max horizontal / vertical GPS variance, separation plot, altitude plot, PDOP plot, processing mode, number of satellite vehicles, and mission trajectory.

Project specific POSPac graphics for each mission are available in Appendix B.

Point clouds were created using the RiPROCESS software. The generated point cloud is the mathematical three dimensional composite of all returns from all laser pulses as determined from the aerial mission. The point cloud is imported into TerraSolid distributive processing software. Imported data is tiled and then calibrated using TerraMatch. Using TerraScan, the vertical accuracy of the surveyed ground control is tested, and any bias is removed from the data. TerraScan and TerraModeler are then used for automated data classification and manual cleanup.

Actual acquired point density has been evaluated and confirmed to meet USGS standards for the relevant Quality Level. LAStools is used to calculate point density and spacing average per swath. Additional checks are made by loading LAS data directly into TerraScan and sampling open, flat areas in the acquired LAS.

After verification of accuracy and point density are complete, the calibration phase begins. Terrasolid is used to analyze and test data for discrepancies between overlapping flightlines. Tie Lines or representations of the dense lidar point cloud per scanner along every swath. Tie Lines are used to determine the best correction solution for Heading/Roll/Pitch, to eliminate or minimize discrepancies, resulting in a highly accurate and seamless transition between flight lines.

DEMs and Intensity Images are then generated using TerraScan and Global Mapper software. In the bare-earth surface model, above-ground features are excluded from the data set. Global Mapper is used as a final check of the bare-earth dataset.

Swath Separation images at the required Quality Level are generated to confirm the calibration corrections that have been applied and data meets USGS standards. Overlapping flightlines are used to compare the elevation differences between flightlines and colorized to show any differences larger than the tolerances described in the latest Lidar Base Specification. This colorization is overlaid onto the existing Intensity images for each tile.

Finally, proprietary software is used to perform statistical analysis of the LAS files.

Software	Version
Applanix + POSPac	8.6
RiPROCESS	1.8.6
Global Mapper	23.1;24.1
TerraModeler	21.008
TerraScan	22.007
TerraMatch	22.008

Table 4. Software Versions

3.3. LAS Classification Scheme

Classification is determined by LiDAR Base Specification 2022, Revision A and are an industry standard for the processing of LiDAR point clouds. All data start the process as Class 1 (Unclassified). Then classification is determined through automated classification routines utilizing TerraScan macro processing.

The classes used in the dataset are as follows and have the following descriptions:

	Classification Name	Description
1	Processed, but Unclassified	Laser returns that are not included in the ground class, or any other project classification
2	Bare-Earth	Laser returns that are determined to be ground using automated and manual cleaning algorithms
7	Low Noise	Laser returns that are often associated with scattering from reflective surfaces, or artificial points below the ground surface
9	Water	Laser returns that are found inside of hydro features
17	Bridge Deck	Laser returns falling on bridge decks
18	High Noise	Laser returns that are often associated with birds or artificial points above the ground surface
20	Ignored Ground	Ground points that fall within the given threshold of a collected hydro feature.

Table 5. LAS Classifications

3.4. Classified LAS Processing

The bare-earth class is then manually reviewed to ensure correct classification of Class 2 (Ground) points. Individual TerraScan routines are combined to form an overall macro to segment and classify the LiDAR point cloud. The key focus of these routines is the accurate classification of bare earth ground points. Automated macros are run that classify most of the point cloud. Visual QC and edits are performed to ensure automated techniques worked properly and that data confirms to USGS Quality Level standards. After the initial automated bare earth surface is established, hydro collection begins through heads up digitizing, utilizing the bare earth surface and intensity information.

All ground (ASPRS Class 2) LiDAR data inside of the lake / ponds and Double Line Drain hydro flattening breaklines were classified to water (ASPRS Class 9) using TerraScan macro functionality. A buffer of 0.5 meters was used around each hydro flattened feature to classify these ground (ASPRS Class 2) points to ignored ground (ASPRS Class 20). All lake / ponds Island and Double Line Drain Island features were checked to ensure that the ground (ASPRS Class 2) points were reclassified to the correct class of Water after the automated classification was completed. These classes were created through automated processes only and were verified for classification accuracy via visual inspection.

Any noise that was identified either through manual review or automated routines was classified to the appropriate class (ASPRS Class 7 and/or ASPRS Class 18) followed by flagging as withheld bit for those points.

All data was manually reviewed, and any remaining artifacts removed, using functionality provided by TerraScan and TerraModeler. Global Mapper is used as a final check of the bare-earth dataset. TerraScan was then used to create the deliverable industry standard LAS files for all point cloud data. Global Mapper, along with LP360 software, was used to perform final statistical analysis of the classes in the LAS files, on a per tile level to verify final classification metrics and full LAS header information.

3.5. Hydro-Flattened Breakline Processing

Using heads-up digitization, all hydro breaklines are collected for lakes/ponds greater than 2 acres in size and inland streams and rivers with a width of 30 meters or greater. Islands greater than 1 acre in size within a collected hydro feature were also captured. LiDAR intensity imagery and bare-earth surface models are used to ensure appropriate and complete collection of these features.

Breakline vector data was then draped to the ground surface elevation. Lakes/ponds were set to an appropriate, single elevation to allow for the generation of hydro-flattened digital elevation models (DEM). Double Line Drain elevations are assigned based on LiDAR elevations and surrounding terrain features to ensure all breaklines match the LiDAR within acceptable tolerances. Some deviation is expected between breaklines and LiDAR elevations due to monotonicity, connectivity, and flattening rules that are enforced on the breaklines. Once completeness, horizontal placement, and vertical variances are reviewed, all breaklines are evaluated for topological consistency and data integrity using a combination of ESRI's ArcGIS, Global Mapper, and manual review of hydro-flattened DEMs.

Breaklines are combined into one seamless shapefile, clipped to the project boundary, and imported into an Esri file geodatabase.

3.6. Hydro-Flattened Raster DEM Processing

Hydro-Flattened DEMs (topographic) represent a LiDAR-derived product illustrating the grounded terrain and associated breaklines (*as described above*) in raster form. Global Mapper was used to take all input sources (bare-earth LiDAR points, bridge and hydro breaklines, etc.) and create a Triangulated Irregular Network (TIN) on a tile-by-tile basis. Data extending past the tile edge is incorporated in this process so proper triangulation can occur. From the TIN, linear interpolation is used to calculate the cell values for the raster product. The raster product is then clipped back to the tile edge ensuring no overlapping cells remain across the project area. A 32-bit floating point GeoTIFF DEM is generated for each tile with a pixel size of 1 meters. AXIS Geospatial's proprietary software is then used to write appropriate horizontal and vertical projection information as well as applicable header values into the file during product generation. Each DEM is reviewed in Global Mapper to check for any surface anomalies and to ensure a seamless dataset. AXIS Geospatial uses a proprietary tool to check all formatting requirements of the DEMs to meet specifications.

GDAL version 3.1.4, was used to populate and verify that the correct CRS was applied to all files.

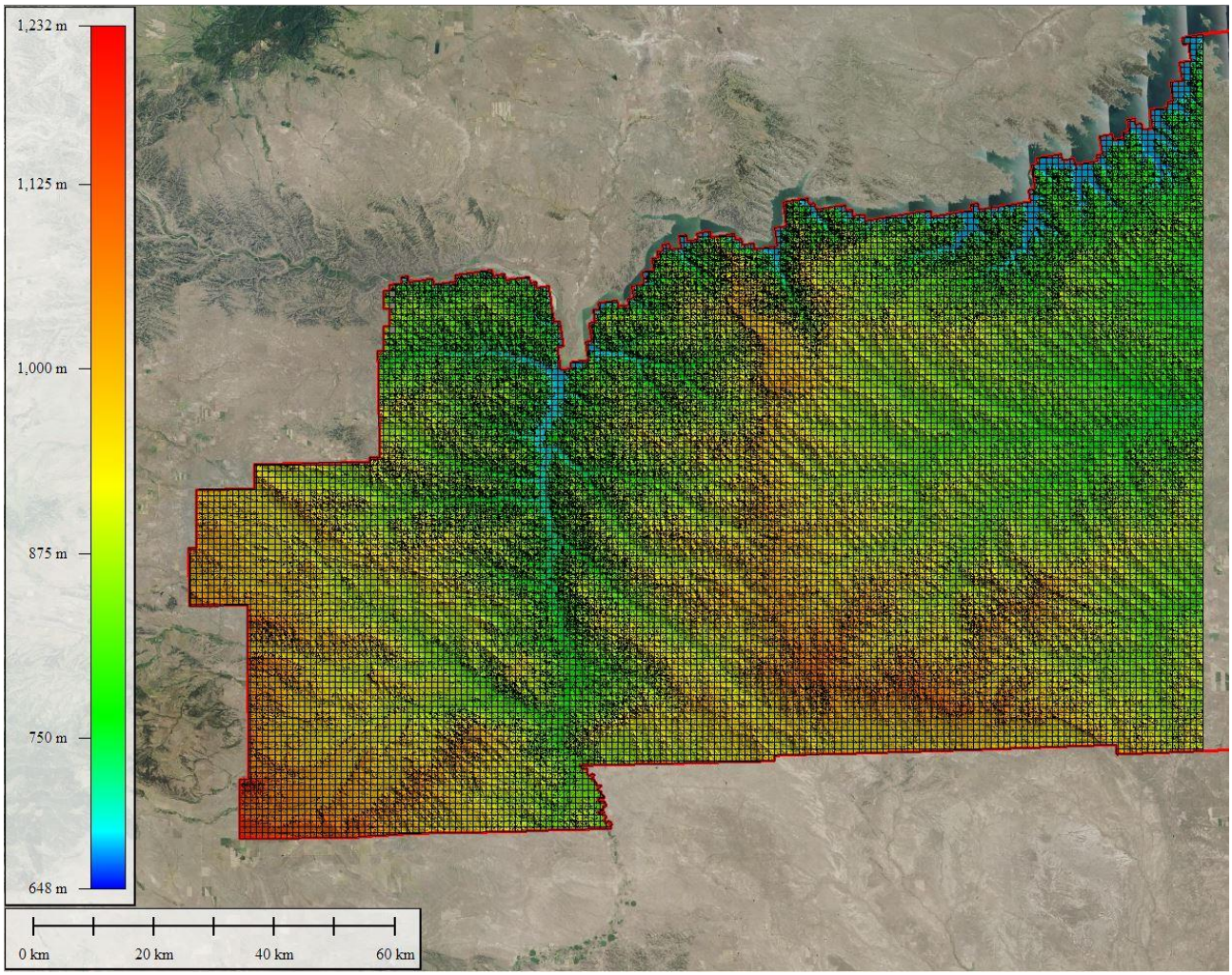

Figure 6. Work Unit 300247 Bare-Earth DEM

3.7. Intensity Image Processing

Intensity images represent reflectivity values collected by the LiDAR sensor during acquisition. TerraScan was used to export intensity images at 1 meter resolution. Intensity images were produced as 8-bit, 256 grayscale images in GeoTiff format. Appropriate horizontal projection information as well as applicable header values were written during product generation.

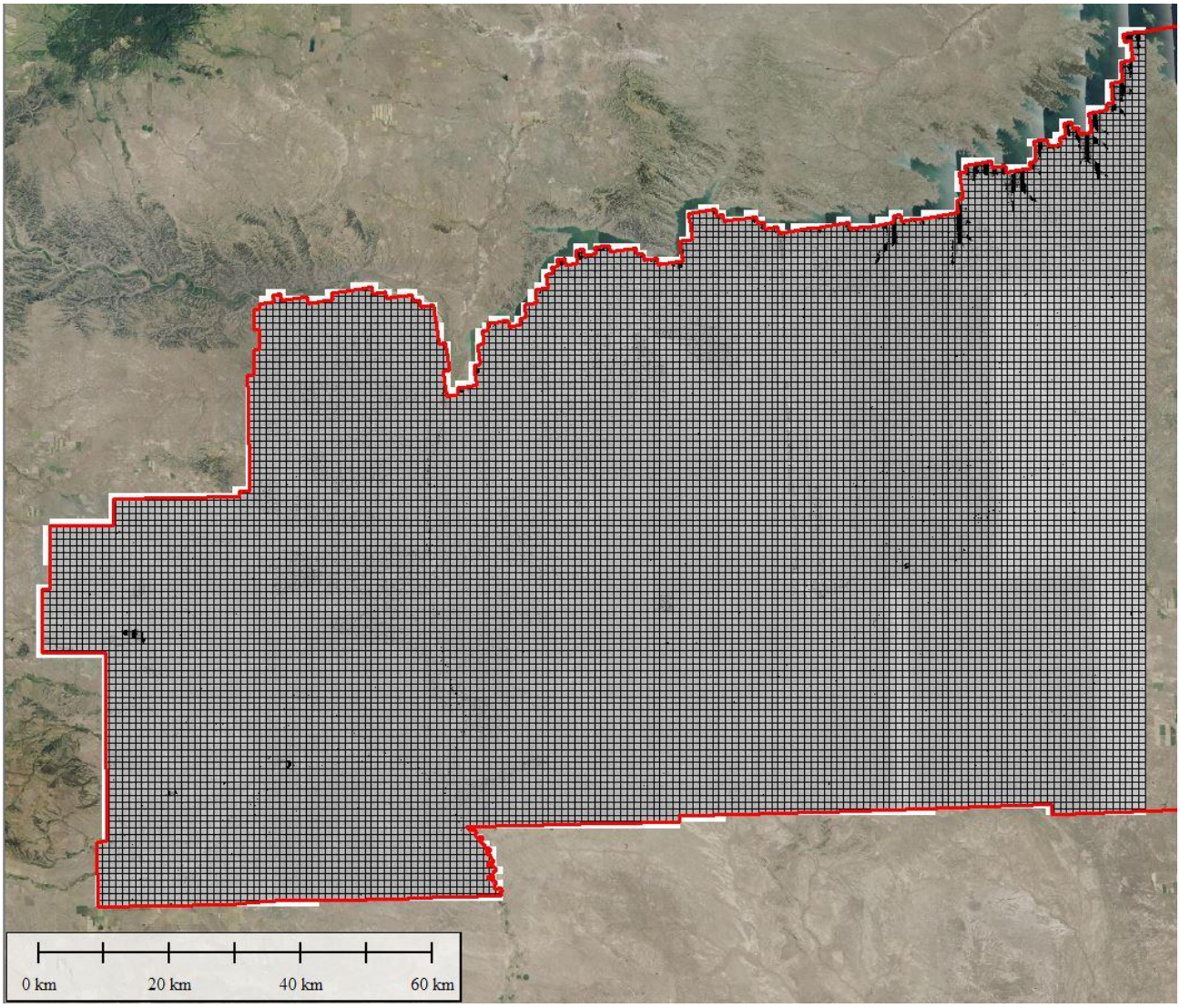

Figure 7. Work Unit 300247 Intensity Images

3.8. Swath Separation Raster Processing

Swath Separation Imagery was produced for the entire project area. Swath separation images use color-coding to illustrate differences in elevation (z-) values where swaths overlap. The color-coded images are semi-transparent and overlay the LiDAR intensity image. They are ancillary data used as visual aids to identify regions more easily within point cloud datasets that may have suspect interswath alignment or other geometric issues. Imagery was created using last returns with all classification and bit flags, except for noise and withheld bit flag are included. Images are derived from a TIN and have a 50% transparent RGB layer over lidar intensity. Color intervals are as follows for QL2 data: 0-8cm, green; 8-16cm, yellow; >16cm, red. These files were produced as GeoTIFF tiles using a cell size of 2 meter. SSI are generated from the point cloud data and will not be altered after creation, nor will there be further maintenance on this product. Appropriate horizontal projection information as well as applicable header values are written to the file during product generation. AXIS Geospatial uses a proprietary tool to check all formatting requirements of the images against specifications.

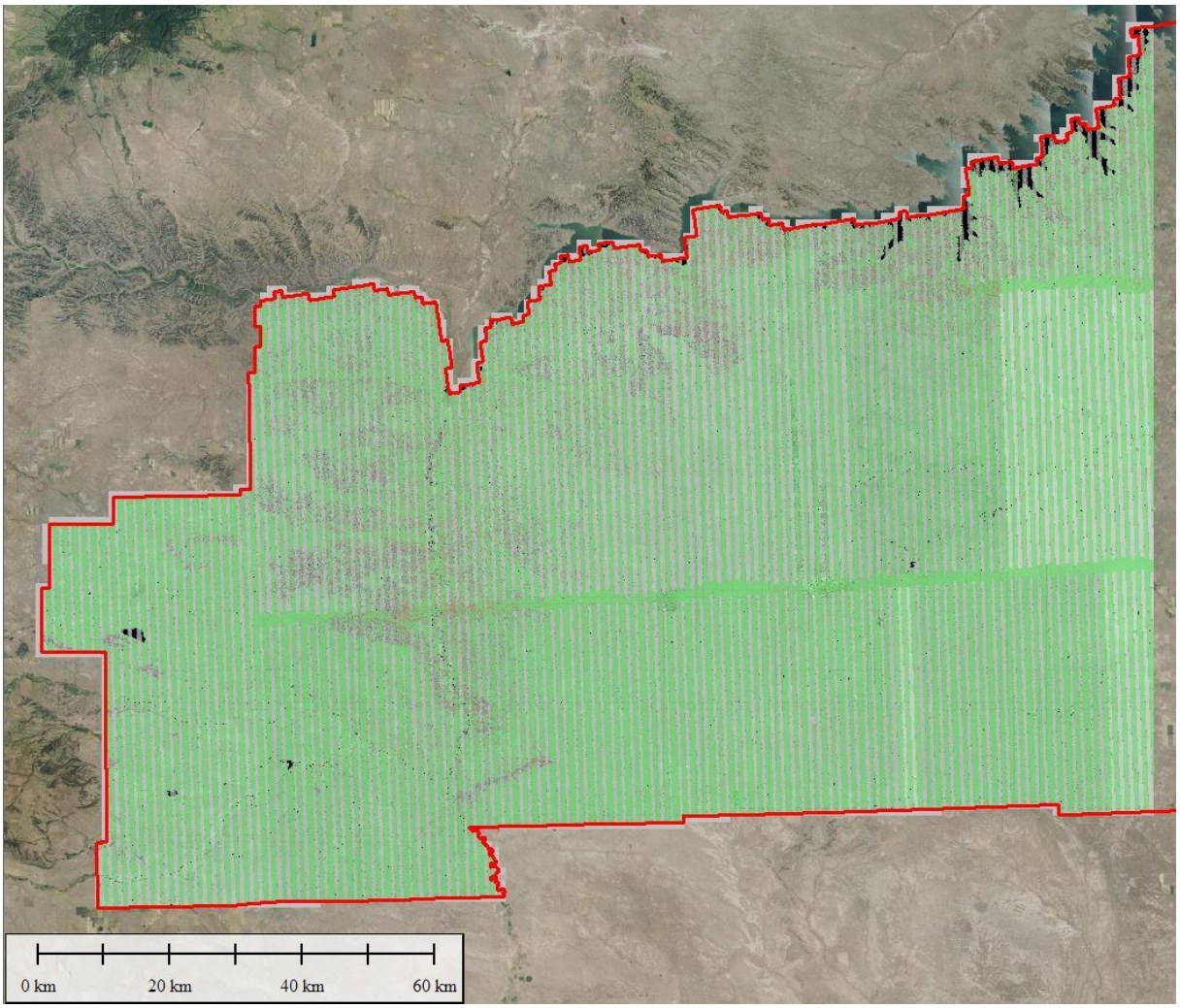

Figure 8. Work Unit 300247 Swath Separation Images

3.9. Maximum Surface Height Raster Processing

Maximum Surface Height rasters (topographic) represent a LiDAR-derived product illustrating natural and built-up features. Global Mapper is used to take all first-return classified LiDAR points, excluding those flagged with a withheld bit, to create a raster on a tile-by-tile basis. Data extending past the tile edge is incorporated in this process so that proper gridding can occur. The raster product is then clipped back to the tile edge so that no overlapping cells remain across the project area. A 32-bit floating point GeoTIFF is generated for each tile with a pixel size of 1 meter. GDAL was used to write appropriate horizontal and vertical projection information as well as applicable header values into the file after product generation. Each maximum surface height raster was reviewed in Global Mapper to check for any anomalies and to ensure a seamless dataset. AXIS Geospatial uses a proprietary tool to check all formatting requirements of the DEMs against specifications.

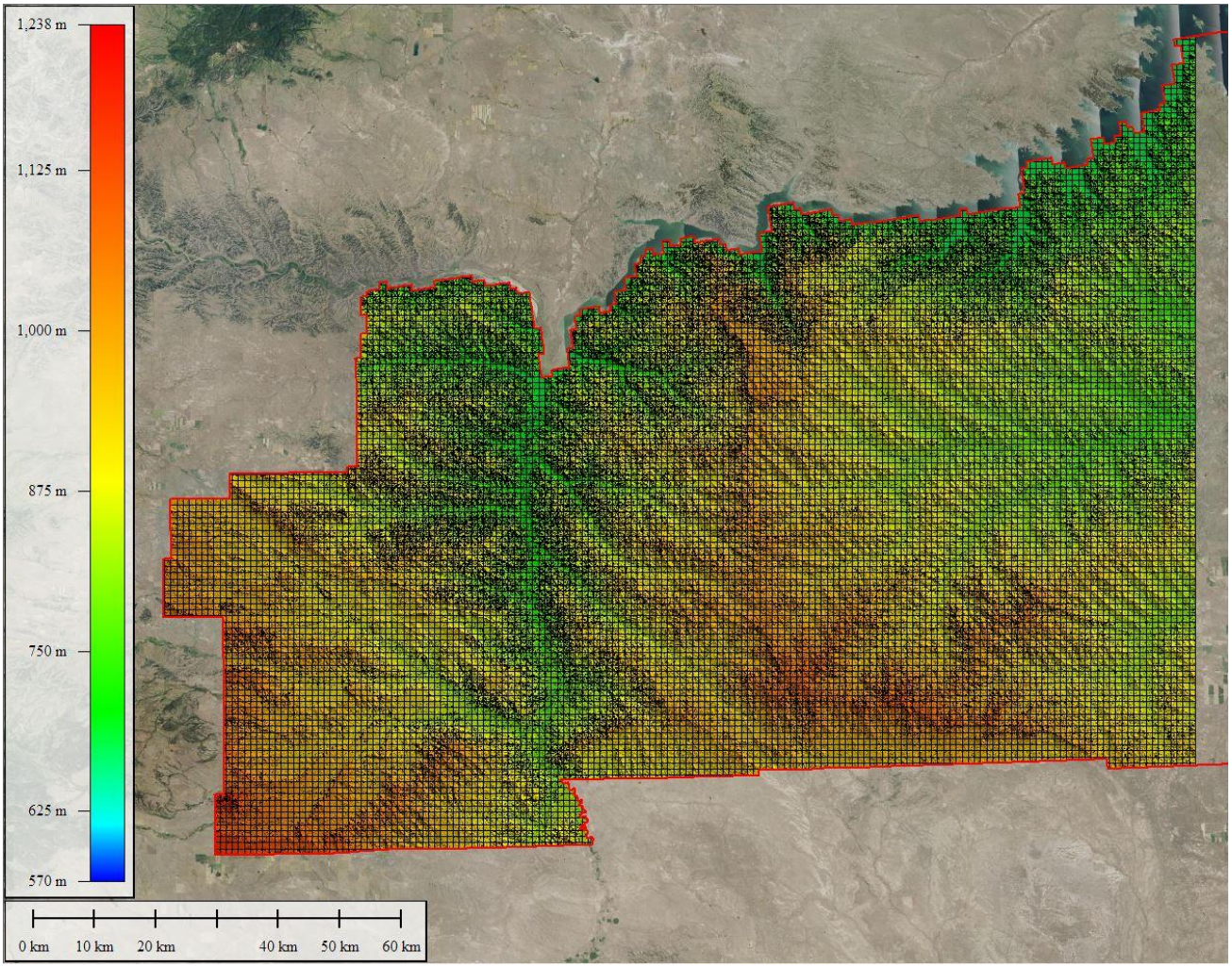

Figure 9. Work Unit 300247 MSHR Images

3.10. Contour Processing

The LAS Ground Class, along with breakline data, was used to create a surface of hydro flattened bare-earth DEMs. Contours were produced at 1-foot intervals in shapefile format using Global Mapper. Automated smoothing techniques were applied. No manual editing of contours was performed. Contours were attributed with every fifth contour as Index and all others as Intermediate. Contours were cut into 1000 m by 1000 m tiles to match the LAS and Bare-earth DEM deliverables. Tiled contour shapefiles were combined into one continuous dataset within an Esri File Geodatabase. There are no spot elevations or depressions on separate layers.

MT Statewide Phase4 B22
Work Unit 300247 Tile Layout

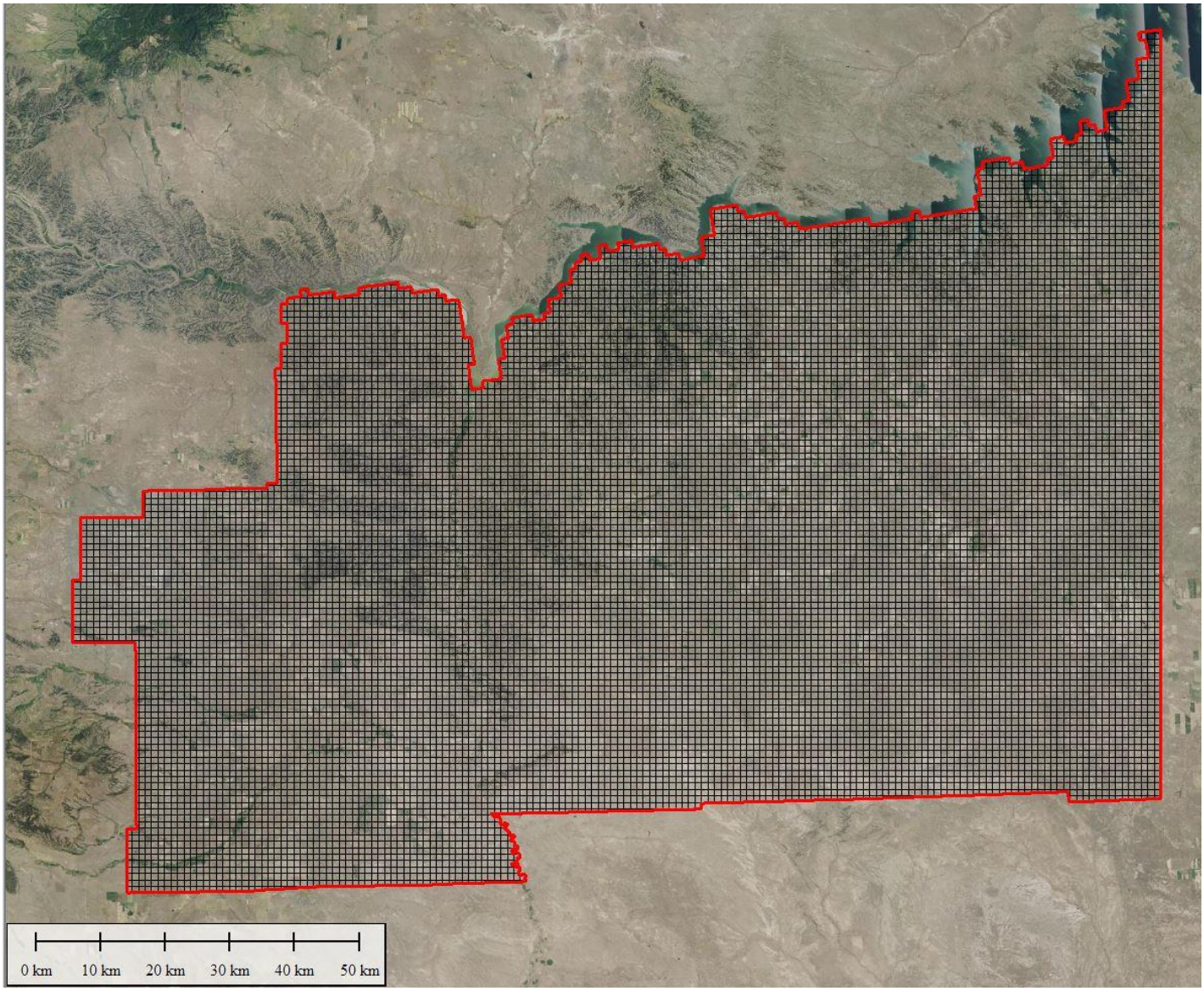

Figure 10. LiDAR Tile Layout

4. Project Coverage Verification

4.1. Swath Polygon Boundaries

Swath polygons of each flightline, depicting the boundary of LiDAR points, are exported using LAStools. These swath polygons were reviewed against the project boundary to verify adequate project coverage. *Please refer to Figure 11*.

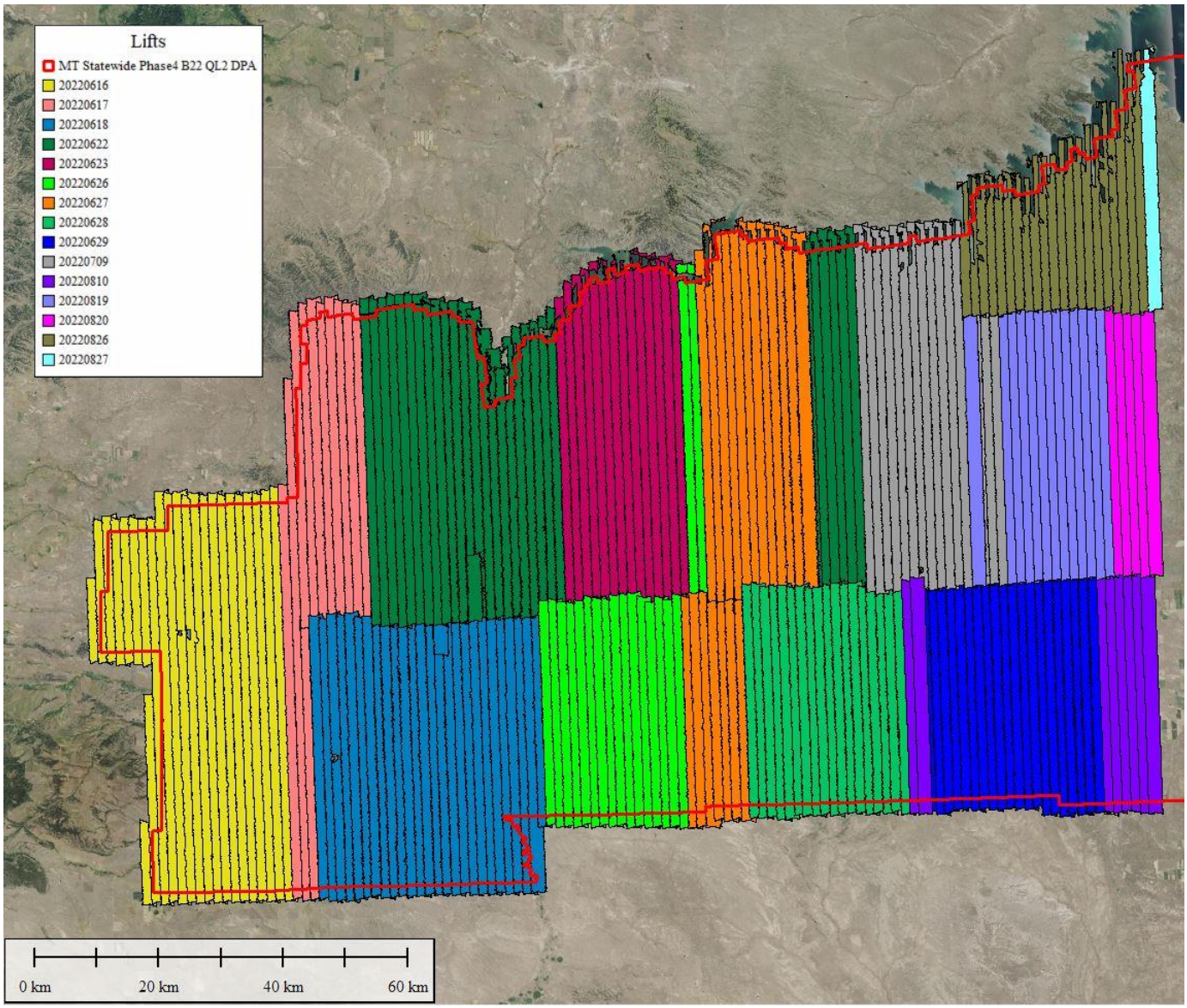

Figure 11. Work Unit 300247 LiDAR Coverage

5. Geometric Accuracy

5.1. Horizontal Accuracy

LiDAR horizontal accuracy is a function of Global Navigation Satellite System (GNSS) derived positional error, flying altitude, and INS derived attitude error. The obtained $RMSE_r$ value is multiplied by a conversion factor of 1.7308 to yield the horizontal component of the National Standards for Spatial Data Accuracy (NSSDA) reporting standard where a theoretical point will fall within the obtained radius 95% of the time. Based on a flying altitude of 1798 meters, an IMU error of 0.0025 decimal degrees, and a GNSS positional error of 0.05 meters, this project was compiled to meet 0.25 meter horizontal accuracy at 95% confidence level. A summary is shown below.

Horizontal Accuracy	
$RMSE_r$	0.49 ft
	0.15 m
ACC_r	0.82 ft
	0.25 m

5.2. Relative Vertical Accuracy

Relative vertical accuracy refers to the internal consistency of the data set as a whole: the ability to place an object in the same location given multiple flight lines, GPS conditions, and aircraft attitudes. When the LiDAR system is well calibrated, the swath-to-swath vertical divergence is low (<0.08 meters). The relative vertical accuracy was computed by comparing the ground surface model of each individual flight line with its neighbors in overlapping regions. The average (mean) line to line relative vertical accuracy for the MT Statewide Phase4 B22 project was -0.0043 feet (-0.0013 meters). *A summary is shown below*.

Relative Vertical Accuracy	
Sample	50 flight line surfaces
Average	0.109635673 ft
	0.03341532 m
Median	0.124678 ft
	0.038 m
RMSE	0.242794 ft
	0.074 m
Standard Deviation (1σ)	0.21643755 ft
	0.06596695 m
1.96σ	0.026937349 ft
	0.0082101 m

Project Report Appendices

The following section contains the appendices as listed in the MT Statewide Phase4 B22 LiDAR Project Report.

Flight Logs

LiDAR and Imagery Flight Report												Project(s):	20220616_LT_II_STTC_PM								
Pilot:	ES					Project Number(s):	see below						Date:	20220616_LT_II_STTC_PM							
Operator:	PM					Project Name(s):	see below						Mission Start (LT):	9:10							
Aircraft:	N89LT					Hobbs Start:	3113.3			Hobbs Stop:	3117.0		Mission End (LT):	12:50							
LiDAR Unit:	VQ-1560i - II					Scan Rate:				Camera Unit:	Phase One		Drive:	VQ II L1							
MTA Zones:						Gmd Spd Max (kts):	155 kts			FOV (deg):	58.52		Sun Angle:	> 30°							
PRR (kHz):	700 x 2					Altitude (feet AMT):	5950'			Lateral Overlap (%):			Lens:	50mm							
Laser Power (%):	100%					Point Spacing (m):				Forward Overlap (%):			Point Density (ppms):								
	Camera Counter		Line Start/Stop																		
	Time	Hobbs	20078-21b				Time	Hobbs		20078-21b			Time	Hobbs							Time
MOB START	8:20	3112.6	BIL	PECK			13:40	3117.3	LWT	PECK			17:55	3121.6							0:00
t on station	9:10	3113.3		TOT	4.7		14:10	3117.9		TOT	4.3						TOT	-3121.6			
t off station	12:50	3117.0		MSN	3.7		17:25	3121.0		MSN	3.1						MSN	0.0			
MOB END	13:10	3117.3	LWT	MOB	1.0		17:55	3121.6	BIL	MOB	1.2						MOB	-3121.6			
Line #	Direction	Start	End	Start Time	Stop Time	Altitude (Planned)	Altitude (Actual)			Remarks							Clouds	Aperture	Shutter Speed		
				MTN ZONE																	
20078: Montana: Fort Peck: Lift 1																					
X 9492	W 260			9:10	9:12		9501'			2 X 700		100%	155 kts	5950'							
6	S 169			9:20	9:23		10351'			LOOKS GOOD - NO SIGNS OF FLOODING											
8	N 349			9:27	11:35		10023'														
9	N 349			9:37	9:41		9898'														
7	S 169			9:45	9:51		9918'														
5	N 349			9:54	10:00		9927'														
4	S 169			10:03	10:09		9947'														
3	N 349			10:12	10:17		9967'														
2	S 169			10:19	10:25		9977'														
1	N 349			10:28	10:30		10049'														
10	S 169			10:36	10:52		9865'														
11	N 349			10:55	11:10		9855'														
12	S 169			11:14	11:30		9822'														
13	N 349			11:33	11:48		9783'														
14	S 169			11:51	11:54		9776'			DNU - 100+ ALT											
14	S 169			11:58	12:14		9776'			some line deviation - QC!!											
15	N 349			12:18	12:32		9750'														
X 9487	W 260			12:42	12:49		9212'														
20078: Montana: Fort Peck: Lift 2																					
X 9486	E 79			14:14	14:21		9117'			NO AUTOPILOT											
16	S 169			14:29	14:47		9734'			MT WAVE, OCCASIONALLY PITCH HIGH + 6°											
17	N 349			14:50	15:05		9717														
18	S 169			15:07	15:25		9642			MT WAVE, OCCASIONALLY PITCH HIGH + 6°											
19	N 349			15:28	15:43		9635														
20	S 169			15:46	16:04		9655			MT WAVE, OCCASIONALLY PITCH HIGH + 6°											
21	N 349			16:06	16:20		9635														
22	S 169			16:24	16:41		9612														
23	N 349			16:44	16:59		9603														
24	S 169			17:02	17:20		9586														

	Time	Hobbs	20078-21b				Time	Hobbs	20078-21b				Time	Hobbs				
MOB START	8:00	3121.6	BIL	PECK			13:50	3126.7	LWT	PECK			16:00	3128.8				
t on station	8:45	3122.2		TOT	5.1		14:30	3127.4		TOT	2.1						TOT	-3128.8
t off station	12:40	3126.2		MSN	4.0		14:55	3127.8		MSN	0.4						MSN	0.0
MOB END	13:15	3126.7	LWT	MOB	1.1		16:00	3128.8	BIL	MOB	1.7						MOB	-3128.8

Line #	Direction	Start	End	Start Time	Stop Time	Altitude (Planned)	Altitude (Actual)	Remarks	9486	9488				Clouds
				MTN ZONE				9486	9488					
20078: Montana: Fort Peck: Lift 1														
25	N 349			8:46	9:00		9563	700 X 2	100%	5950'	155 kts	tailwind heading north		
26	S 169			9:07	9:33		9360	CHECK GPS - HEADWIND - 30 MIN LINE						
27	N 349			9:36	9:46		9642							
28	N 349			9:52	10:03		9042							
30	S 169			10:06	10:23		9045	south third slight ln deviation						
32	N 349			10:26	10:37		9065							
34	S 169			10:42	10:58		9055							
36	N 349			11:01	11:12		9058							
38	S 169			11:17	11:33		9068							
40	N 349			11:35	XX		9068	ROUGH ENTRY - HIGH - DNU						
40	N 349			11:40	11:51		9544							
42	S 169			11:55	12:10		9055							
X 9486	W 259			12:17	12:24		9117							
X 9488	E 79			12:33	12:39		9301							
20078: Montana: Fort Peck: Lift 2														
44	N 349			14:34	14:45		9055	virga developing, we'll see -- LN 44						
46	S 169			14:49	XX	ABORT	9048	50 kt wind from 150° (south)						
X 9486	W 259			XX	XX			ROUGH AIR / CHOPPY						
								CALLING IT - WOULD LIKE FEEDBACK ON DATA						
								SORRY NO X TIE, TOO ROUGH						

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LiDAR and Imagery Flight Report

Project(s): 20220618_LT_II_STTC_PM

Pilot:	JT	Project Number(s):	see below			Date:	20220618_LT_II_STTC_PM
Operator:	PM	Project Name(s):	see below			Mission Start (LT):	8:35
Aircraft:	N89LT	Hobbs Start:	3129.6	Hobbs Stop:	3133.9	Mission End (LT):	12:55

LiDAR Unit:	VQ-1560i - II	Scan Rate:		Camera Unit:	Phase One	Drive:	VQ II L1
MTA Zones:		Gmd Spd Max (kts):	155 kts	FOV (deg):	58.52	Sun Angle:	> 30°
PRR (kHz):	700 x 2	Altitude (feet AMT):	5950'	Lateral Overlap (%):		Lens:	50mm
Laser Power (%):	100%	Point Spacing (m):		Forward Overlap (%):		Point Density (ppms):	

Camera Counter | Line Start/Stop

	Time	Hobbs	20078-21b				Time	Hobbs		20078-21b			Time	Hobbs				Time
MOB START	7:45	3128.8	BIL	PECK			13:45	3134.3	RPX	PECK			17:30	3138.0				0:00
t on station	8:35	3129.6		TOT	5.5		14:10	3134.7		TOT	3.7						TOT	-3138.0
t off station	12:55	3133.9		MSN	4.3		16:50	3137.3		MSN	2.6						MSN	0.0
MOB END	13:20	3134.3	RPX	MOB	1.2		17:30	3138.0	BIL	MOB	1.1						MOB	-3138.0

Line #	Direction	Start	End	Start Time	Stop Time	Altitude (Planned)	Altitude (Actual)	Remarks	0	0				Clouds	Aperture	Shutter Speed
				MTN ZONE												
20078: Montana: Fort Peck: Lift 1																
X 9492	W 259			8:39	8:52		9501	700 X 2	100%	5950'	155 kts					
29	N 348			8:56	9:07		9622	GPS ORANGE IN TURN TO 31								
31	S 169			9:10	9:22		9612	HAZE DEVELOPING - STILL 100% RANGE R								
33	N 349			9:25	9:36		9583									
35	S 169			9:39	9:51		9586	MILD CHOP DEVELOPING								
37	N 349			9:54	10:04		9589									
39	S 169			10:08	10:20		9563	MILD CHOP GETTING STRONGER								
41	N 350			10:23	10:33		9544									
43	S 170			10:36	10:49		9527									
45	N 350			10:51	11:02		9517									
47	S 170			11:05	11:17		9511	SMALL COURSE DEVIATION								
49	N 351			11:20	11:31		9478									
51	S 171			11:34	11:46		9458									
53	N 351			11:50	12:00		9406									
55	S 171			12:04	12:16		9363									
57	N 352			12:19	12:29		9337									
57	S 171			12:35	12:37		9045	PATCH IN - USE BOTH								
59	S 172			12:41	12:54		9304									
20078: Montana: Fort Peck: Lift 2																
61	N 353			14:13	14:23		9265									
63	S 173			14:27	14:40		9196									
65	N 353			14:43	14:55		9212									
67	S 173			14:57	15:10		9212									
69	N 354			15:13	15:24		9278		45	225	270	2.25				
71	S 174			15:28	15:40		9311									
73	N 353			15:43	15:54		9314									
75	S 173			15:58	16:11		9337									
77	N 353			16:14	16:24		9366									
79	S 173			16:27	16:38		9432									
X 9489	W 259			16:43			8960									

LiDAR and Imagery Flight Report													Project(s):	20220622_LT_II_STTC_PM		
Pilot:	JT			Project Number(s):	see below								Date:	20220622_LT_II_STTC_PM		
Operator:	PM			Project Name(s):	see below								Mission Start (LT):	8:30		
Aircraft:	N8XLT			Hobbs Start:	3138.0		Hobbs Stop:	3143.0					Mission End (LT):	12:30		
LiDAR Unit:	VQ-1560i - II		Scan Rate:			Camera Unit:	Phase One						Drive:	VQ II L 1		
MTA Zones:			Grnd Spd Max (kts):	155 kts		FOV (deg):	58.52						Sun Angle:	> 30°		
PRR (kHz):	700 x 2		Altitude (feet AMT):	5950'		Lateral Overlap (%):							Lens:	50mm		
Laser Power (%):	100%		Point Spacing (m):			Forward Overlap (%):							Point Density (ppms):			
	Camera Counter	Line Start/Stop														

	Time	Hobbs	20078-21b			Time	Hobbs	20078-21b				Time	Hobbs				Time
MOB START	7:30	3138.1	BIL	PECK		13:35	3143.5	RPX	PECK			17:10	3147.0				0:00
t on station	8:30	3139.0		TOT	5.4	14:10	3144.0		TOT	3.5					TOT	-3147.0	
t off station	12:30	3143.0		MSN	4.0	16:20	3146.1		MSN	2.1					MSN	0.0	
MOB END	13:00	3143.5	RPX	MOB	1.4	17:10	3147.0	BIL	MOB	1.4					MOB	-3147.0	

Line #	Direction	Start	End	Start Time	Stop Time	Altitude (Planned)	Altitude (Actual)	Remarks	0	0			Clouds	Aperture	Shutter Speed
				MTN ZONE											
20078: Montana: Fort Peck: Lift 1															
44	N 348			8:31	8:43		9055	700 X 2	100%	5950'	155 kts	134 LPS			
46	S 169			8:46	9:00		9048	winds: 19 kts @ 275°							
48	N 349			9:03	9:15		9071								
50	S 169			9:18	9:32		9048								
52	N 349			9:35	9:47		9042								
54	S 169			9:50	10:04		9055								
56	N 350			10:07	10:18		9035								
58	S 170			10:22	10:36		9045	mild chop begins, north quarter southbound							
60	N 348			10:39	10:51		9042	clouds starting to pop at msn alt - non observed below							
62	S 169			10:54	11:06		9045	air activity increasing intensity = bumpy							
64	N 349			11:09	11:21		9042	air activity increasing intensity = more bumpy							
66	S 169			11:24	11:36		9045	line deviation							
66	N 349			11:42	11:45		9045	partial refly, lower 3 rd							
68	N 349			11:50	12:01		8861								
70	S 169			12:05	12:16		8855	some line deviation, should be ok							
X 9486	W 259			12:19	12:28		9117								
20078: Montana: Fort Peck: Lift 2															
72	N 348			14:14	14:24		9028	NASTY TURB BUMP MID LINE							
74	S 169			14:28	14:38		9015								
76	N 349			14:41	14:52		8989								
78	S 169			14:54	15:06		9002	alt deviation midline							
80	N 348			15:09	15:-20		9038								
82	S 169			15:23	15:35		9035								
84	N 349			15:38	15:49		9038								
86	S 169			15:52	16:05		9035								
X 9486	W 259			16:10	16:15		9117								

LiDAR and Imagery Flight Report													Project(s):	20220623_LT_II_STTC_PM		
Pilot:	JT			Project Number(s):	see below								Date:	20220623_LT_II_STTC_PM		
Operator:	PM			Project Name(s):	see below								Mission Start (LT):	8:45		
Aircraft:	N8XLT			Hobbs Start:	3147.9		Hobbs Stop:	3152.1					Mission End (LT):	12:55		
LiDAR Unit:	VQ-1560i - II		Scan Rate:			Camera Unit:	Phase One						Drive:	VQ II L 1		
MTA Zones:			Grnd Spd Max (kts):	155 kts		FOV (deg):	58.52						Sun Angle:	> 30°		
PRR (kHz):	700 x 2		Altitude (feet AMT):	5950'		Lateral Overlap (%):							Lens:	50mm		
Laser Power (%):	100%		Point Spacing (m):			Forward Overlap (%):							Point Density (ppms):			
	Camera Counter	Line Start/Stop														

	Time	Hobbs	20078-21b			Time	Hobbs	20078-21b				Time	Hobbs				Time
MOB START	7:45	3147.0	BIL	PECK		13:50	3152.6	RPX	PECK			15:55	3154.7				0:00
t on station	8:45	3147.9		TOT	5.6	14:15	3153.1		TOT	2.1					TOT	-3154.7	
t off station	12:55	3152.1		MSN	4.2	15:15	3154.1		MSN	1.0					MSN	0.0	
MOB END	13:30	3152.6	RPX	MOB	1.4	15:55	3154.7	BIL	MOB	1.1					MOB	-3154.7	

Line #	Direction	Start	End	Start Time	Stop Time	Altitude (Planned)	Altitude (Actual)	Remarks	0	0			Clouds	Aperture	Shutter Speed
				MTN ZONE											
20078: Montana: Fort Peck: Lift 1															
88	N 348			8:47	8:59		9028	700 X 2	100%	5950'	155 kts	134 LPS			
90	S 169			9:03	9:16		9038								
92	N 349			9:19	9:32		9038								
94	S 169			9:36	9:49		9038								
96	N 349			9:52	10:06		9035								
98	S 169			10:09	10:24		9038								
100	N 350			10:27	10:40		9038								
102	S 170			10:44	10:58		9035								
104	N 348			11:01	11:14		9035								
106	S 169			11:18	11:33		9038								
108	N 349			11:36	11:48		9038								
110	S 169			11:52	12:07		9038								
112	N 349			12:10	12:23		9038	TURB STARTING TO PICK UP							
114	S 168			12:26	12:43		9038								
X 9486	W 259			12:46	12:52		9117								
20078: Montana: Fort Peck: Lift 2															
81	N 348			14:19	14:28		9491	bumpy, clouds overhead / VIRGA TO OUR NW							
83	S 169			14:31	14:42		9527	rough - pitch / alt							
85	N 349			14:45	14:54		9596	air challenging to work with - 160 kts							
87	S 169			14:57	16:06		9596								
X 9489	W 260			15:10	15:13		8960								

LiDAR and Imagery Flight Report

Project(s): 20220626_LT_II_STTC_PM

Pilot:	JT	Project Number(s):	see below			Date:	20220626_LT_II_STTC_PM		
Operator:	PM	Project Name(s):	see below			Mission Start (LT):	7:15		
Aircraft:	N89LT	Hobbs Start:	3158.4	Hobbs Stop:	3162.5	Mission End (LT):	11:25		
LiDAR Unit:	VQ-1560i - II	Scan Rate:		Camera Unit:	Phase One	Drive:	VQ II L 2		
MTA Zones:		Grnd Spd Max (kts):	155 kts	FOV (deg):	58.52	Sun Angle:	> 30°		
PRR (kHz):	700 x 2	Altitude (feet AMT):	5950'	Lateral Overlap (%):		Lens:	50mm		
Laser Power (%):	100%	Point Spacing (m):		Forward Overlap (%):		Point Density (ppms):			

		Camera Counter	Line Start/Stop

	Time	Hobbs		20078-21b			Time	Hobbs		20078-21b			Time	Hobbs				Time
MOB START	6:30	3157.6	BIL	PECK				3163.3	BIL	PECK			0:00	0.0				0:00
t on station	7:15	3158.4		TOT	5.7					TOT	-3163.3					TOT	0.0	
t off station	11:25	3162.5		MSN	4.1					MSN	0.0					MSN	0.0	
MOB END	12:20	3163.3	BIL	MOB	1.6				BIL	MOB	-3163.3					MOB	0.0	

Line #	Direction	Start	End	Start Time	Stop Time	Altitude (Planned)	Altitude (Actual)	Remarks	0	0			Clouds	Aperture	Shutter Speed
				MTN ZONE											
20078: Montana: Fort Peck: Lift 1															
81	N 348			7:21	7:30		9491	700 X 2	100%	5950'	155 kts	134 LPS			
83	S 169			7:33	7:42		9527								
85	N 349			7:45	7:53		9570								
87	S 169			7:56	8:05		9596								
89	N 349			8:08	8:16		9606								
91	S 169			8:19	8:28		9622								
93	N 350			8:31	8:40		9649								
95	S 170			8:43	8:51		9668								
97	N 348			8:54	9:03		9688								
99	S 169			9:06	9:15		9714								
101	N 349			9:18	9:27		9721								
103	S 169			9:30	9:38		9747								
105	N 349			9:41	9:50		9760								
107	S 168			9:53	10:01		9780								
109	N 348			10:04	10:13		9806								
111	S 169			10:16	10:25		9832	CLOUDS AT SOUTHERN END OF LINE							
X 9489	W 260			10:29	10:35		8960	LINES SHOULD BE OK							
116	N 348			10:47	10:59		9038	CHOPPY / CLOUDS EAST OF US - GAME OVER							
118	S 169			11:02	11:15		9035								
X 9486	W 259			11:20	11:22		9117								

MOB START	7:30	3163.3	BIL	PECK			15:00	3170.1	RPX	PECK			15:40	3170.7				0:00
t on station	8:35	3164.4		TOT	6.8					TOT	0.6					TOT	-3170.7	
t off station	13:50	3169.6		MSN	5.2					MSN	0.0					MSN	0.0	
MOB END	14:20	3170.1	RPX	MOB	1.6		15:40	3170.7	BIL	MOB	0.6					MOB	-3170.7	

Line #	Direction	Start	End	Start Time	Stop Time	Altitude (Planned)	Altitude (Actual)	Remarks	0	0			Clouds	Aperture	Shutter Speed
				MTN ZONE											
20078: Montana: Fort Peck: Lift 1															
120	N 348			8:36	8:51		9038	700 X 2	100%	5950'	155 kts	134 LPS			
122	S 169			8:55	9:09		9035								
124	N 349			9:12	9:27		9032								
126	S 169			9:30	9:45		9038								
128	N 349			9:50	10:05		9035								
130	S 169			10:08	10:23		9038								
132	N 350			10:25	10:40		9038								
134	S 170			10:43	10:58		9038								
136	N 348			11:01	11:15		9035								
138	S 169			11:19	11:33		9038	TURB BUILDING, BEGIN TO BOUNCE AROUND							
140	N 349			11:36	11:51		9038	CLOUDS POPPING IN AREA // HARD TO HOLD ALT							
142	S 169			11:54	12:07		9038								
X 9486	W 259			12:13	12:18		9117								
113	S 168			12:22	12:30		9845								
115	N 348			12:34	12:43		9849								
117	S 169			12:46	12:55		9826	CLOUDS BUILDING TO THE EAST							
119	N 349			12:58	13:07		9809								
121	S 169			13:10	13:18		9793								
123	N 350			12:22	13:31		9790								
125	S 170			13:34	13:43		9796								
X 9489	W 259			13:46	13:49		8960								

MOB START	7:45	3170.7	BIL	PECK			13:50	3176.2	RPX	PECK			14:30	3176.8					0:00
t on station	8:40	3171.5		TOT	5.5					TOT	0.6					TOT	-3176.8		
t off station	13:00	3175.8		MSN	4.3					MSN	0.0					MSN	0.0		
MOB END	13:30	3176.2	RPX	MOB	1.2		14:30	3176.8	BIL	MOB	0.6					MOB	-3176.8		
Line #	Direction	Start	End	Start Time	Stop Time	Altitude (Planned)		Altitude (Actual)		Remarks	0	0				Clouds	Aperture	Shutter Speed	
				MTN ZONE															
20078: Montana: Fort Peck: Lift 1																			
127	N 348			8:44	8:54			9796		700 X 2	100%	5950'	155 kts	134 LPS					
129	S 169			8:57	9:05			9803		MILD BUMPY FROM THE GET-GO									
131	N 349			9:09	9:19			9783											
133	S 169			9:22	9:31			9767											
135	N 349			9:34	9:44			9747											
137	S 169			9:47	9:55			9724											
139	N 350			9:59	10:08			9717											
141	S 170			10:11	10:19			9704											
143	N 348			10:22	10:32			9688		DEVIATED MID-LINE									
145	S 169			10:35	10:44			9678											
147	N 349			10:47	10:56			9668											
149	S 169			10:59	11:08			9649											
151	W 259			11:10	11:20			9685											
153	S 168			11:23	11:31			9698											
155	N 348			11:34	11:43			9701		AIR IS INCREASINGLY MORE DIFFICULT									
157	S 169			11:47	11:56			9662											
159	N 349			11:59	12:08			9622											
161	S 169			12:11	12:20			9586											
163	N 350			12:23	12:32			9570		BUMPY									
165	S 170			12:35	12:44			9550											
X 9489	W 259			12:47	12:56			8960											

MOB START	7:45	3176.8	BIL	PECK			13:50	3183.0	BIL	PECK			0:00	0.0					0:00
t on station	8:45	3177.8		TOT	6.2					TOT	-3183.0					TOT	0.0		
t off station	13:15	3182.2		MSN	4.4					MSN	0.0					MSN	0.0		
MOB END	14:00	3183.0	BIL	MOB	1.8				BIL	MOB	-3183.0					MOB	0.0		
Line #	Direction	Start	End	Start Time	Stop Time	Altitude (Planned)		Altitude (Actual)		Remarks	0	0				Clouds	Aperture	Shutter Speed	
				MTN ZONE															
20078: Montana: Fort Peck: Lift 1																			
167	N 348			8:47	8:57			9570		700 X 2	100%	5950'	155 kts	134 LPS					
169	S 169			9:00	9:10			9583		CLOUDS TO THE NORTH, WE'LL SEE									
171	N 349			9:13	9:22			9642		18° CRAB? - southbound									
173	S 169			9:26	9:36			9701		CRAB LOOKS MUCH BETTER NB									
175	N 349			9:39	9:48			9678											
177	S 169			9:52	10:02			9606		turb starting to pick up to mild									
179	N 350			10:04	10:13			9612											
182	S 170			10:17	10:27			9603											
185	N 348			10:30	10:38			9626											
188	S 169			10:42	10:52			9635		slight line deviation in the north									
191	N 349			10:55	11:04			9593											
194	S 169			11:08	11:17			9593											
197	N 349			11:21	11:29			9609											
200	S 168			11:32	11:43			9629		bumpy	beg	inn	ing	more					
203	N 348			11:46	11:55			9606											
206	S 169			11:59	12:09			9576											
209	N 349			12:13	12:22			9573											
212	S 169			12:26	12:36			9478		getting rougher and choppy - jump									
215	N 350			12:39	12:48			9537											
218	S 170			12:51	13:01			9504											
X 9489	W 259			13:04	13:13			8960											

LiDAR and Imagery Flight Report

Project(s): 20220709_LT_II_STTC_PM

Pilot:	JT	Project Number(s):	see below	Date:	20220709_LT_II_STTC_PM
Operator:	PM	Project Name(s):	see below	Mission Start (LT):	8:45
Aircraft:	N89LT	Hobbs Start: 3197.4	Hobbs Stop: 3202.1	Mission End (LT):	13:30

LiDAR Unit:	VQ-1560i - II	Scan Rate:		Camera Unit:	Phase One	Drive:	VQ II L 3
MTA Zones:		Grnd Spd Max (kts):	155 kts	FOV (deg):	58.52	Sun Angle:	> 30º
PRR (kHz):	700 x 2	Altitude (feet AMT):	5950'	Lateral Overlap (%):		Lens:	50mm
Laser Power (%):	100%	Point Spacing (m):		Forward Overlap (%):		Point Density (ppms):	

Camera Counter | Line Start/Stop

	Time	Hobbs	20078-21b		Time	Hobbs	20078-21b		Time	Hobbs			Time
MOB START	7:35	3196.3	BIL	PECK	14:35	3202.7	MLS	BILL EAST	16:50	3204.9			0:00
t on station	8:45	3197.4	TOT	6.4	15:30	3203.6	TOT	2.2			TOT	-3204.9	
t off station	13:30	3202.1	MSN	4.7	16:25	3204.5	MSN	0.9			MSN	0.0	
MOB END	14:00	3202.7	MLS MOB	1.7	16:50	3204.9	BIL MOB	1.3			MOB	-3204.9	

Line #	Direction	Start	End	Start Time	Stop Time	Altitude (Planned)	Altitude (Actual)	Remarks	Clouds	Aperture	Shutter Speed
				MTN ZONE				0 / 0			
20078: Montana: PECK											
156	N 351			8:45	9:00		9038	700 X 2 / 100% / 5900' / 155 kts / 134 LPS			
158	S 171			9:04	9:18		9038	clouds seem to be more prevalent to north			
160	N 351			9:21	9:36		9038	popping above msn alt			
162	S 171			9:39	9:52		9035				
164	N 351			9:55	10:09		9038				
166	S 171			10:12	12:27		9028				
168	N 351			10:31	10:45		9028				
170	S 171			10:48	11:02		9028				
172	N 351			11:05	11:20		9028				
174	S 171			11:24	11:37		9028				
176	N 351			11:41	11:55		9028				
178	S 171			11:58	12:13		9022				
180	N 351			12:13	12:27		9176				
183	S 171			12:30	12:41		9301				
186	N 351			12:45	12:55		9366				
189	S 171			12:59	13:10		9330				
X 9486	E 81			13:18	13:25		9117				
20078: Montana: BILLINGS EAST											
71	S 172			15:32	15:49		9593	700 X 2 / 100% / 5900' / 155 kts / 134 LPS			
70	N 351			15:56	16:08		9587	160 kt grsp at south start of line / nose high			
								air getting choppy			
89	W 261			16:22	16:24		9495	Please QC overlap for these - thx			

LiDAR and Imagery Flight Report

Project(s): 2007821B MONTANT QL2 FT PECK

Pilot:	ES	Project Number(s):	2007821B MONTANT QL2 FT PECK	Date:	8/10/2022
Operator:	AC	Project Name(s):		Mission Start (LT):	1239.9 / 1245.2
Aircraft:	N359RX	Hobbs Start: 1239.0 / 1244.7	Hobbs Stop: 1244.7 / 1247.4	Mission End (LT):	1244.4 / 1246.6

LiDAR Unit:	2) VQ-1560i S2222593	Scan Rate:	2*144	Camera Unit:	Phase One	Drive:	A 0/1
MTA Zones:	6 - 10	Grnd Spd Max (kts):	155	FOV (deg):	58.52	Sun Angle:	
PRR (kHz):	2*700	Altitude (feet AMT):	5985	Lateral Overlap (%):	30%	Lens:	
Laser Power (%):	100	Point Spacing (m):	0.321	Forward Overlap (%):		Point Density (ppms):	5.88

Camera Counter | Line Start/Stop | MOB: 2.5 | MSN: 5.9 | TOT: 8.4

Line #	Direction	To	From	Start Time UTC	Stop Time UTC	Altitude (Planned)	Altitude (Actual)	Remarks	Clouds	Aperture	Shutter Speed
163	N			13:56	14:04	9570+-		FT PECK			
165	S			14:09	14:18						
XTIE	E			14:22	14:24						
221	N			14:29	14:38						
224	S			14:45	14:53						
227	N			14:56	15:05						
230	S			15:07	15:18						
233	N			15:20	15:30						
236	S			15:33	15:42						
239	N			15:46	15:56						
242	S			15:59	16:10						
245	N			16:12	16:21						
248	S			16:26	16:24						
251	N			16:32	16:41						
254	S			16:43	16:58						
258	N			17:02	17:11						
259	S			17:14	17:25						
263	N			17:28	17:36						
266	S			17:39	17:47						
XTIE	W			17:55	18:00						
269	N			19:33	19:44						
272	S			19:47	19:57						
275	N			19:59	20:09						
278	S			20:11	20:20						
281	N			20:23	20:33						
284	S			20:37	20:46						
XTIE	W			20:50	20:54						

LiDAR and Imagery Flight Report

axis geospatial / AXIS GeoAviation		LiDAR and Imagery Flight Report		Project(s):	20220819_LT_II_STTC_DF
Pilot:	JT	Project Number(s):	see below	Date:	20220819_LT_II_STTC_DF
Operator:	DF	Project Name(s):	see below	Mission Start (LT):	9:20
Aircraft:	N89LT	Hobbs Start: 3263.0	Hobbs Stop: 3264.7	Mission End (LT):	11:00

LiDAR Unit:	VQ-1560i - II	Scan Rate:		Camera Unit:	Phase One	Drive:	VQ II L 3
MTA Zones:		Grnd Spd Max (kts):	155 kts	FOV (deg):	58.52	Sun Angle:	> 30º
PRR (kHz):	700 x 2	Altitude (feet AMT):	5950'	Lateral Overlap (%):		Lens:	50mm
Laser Power (%):	100%	Point Spacing (m):		Forward Overlap (%):		Point Density (ppms):	
	Camera Counter	Line Start/Stop					

	Time	Hobbs	20078-21b				Time	Hobbs	20078-21b				Time	Hobbs					Time
MOB START	8:10	3261.6	BIL	PECK			12:20	3265.0	GDV	PECK			14:00	3266.7					0:00
t on station	9:20	3263.0		TOT	3.4					TOT	1.7					TOT	-3266.7		
t off station	11:00	3264.7		MSN	1.7					MSN	0.0					MSN	0.0		
MOB END	11:30	3265.0	GDW	MOB	1.7		14:00	3266.7	BIL	MOB	1.7					MOB	-3266.7		

Line #	Direction	Start	End	Start Time	Stop Time	Altitude (Planned)	Altitude (Actual)	Remarks	0	0				Clouds	Aperture	Shutter Speed
				MTN ZONE			8996									
20078: Montana: Fort Peck																
								700 X 2	100%	5900'	155 kts	134 LPS				
439	N350			9:20	9:37											
441	S173			9:40	9:51											
443	N350			9:55	10:10											
445	S173			10:11	10:23											
447	N350			10:26	10:41			Cloud cover below MSN ALT								
9491	E83			10:52	10:55											

LiDAR and Imagery Flight Report

axis geospatial / AXIS GeoAviation		LiDAR and Imagery Flight Report		Project(s):	20220819_RX_III_GSM_CT
Pilot:	ES	Project Number(s):	20078-21B MT	Date:	20220819_RX_III_GSM_CT
Operator:	CT	Project Name(s):	see below	Mission Start (LT):	0:00
Aircraft:	N89LT	Hobbs Start:	Hobbs Stop: 1270.2	Mission End (LT):	0:00

LiDAR Unit:	VQ- III	Scan Rate:		Camera Unit:	Phase One	Drive:	VQ II L 3
MTA Zones:		Grnd Spd Max (kts):	155 kts	FOV (deg):	58.52	Sun Angle:	> 30º
PRR (kHz):	700 x 2	Altitude (feet AMT):	5950'	Lateral Overlap (%):		Lens:	50mm
Laser Power (%):	100%	Point Spacing (m):		Forward Overlap (%):		Point Density (ppms):	
	Camera Counter	Line Start/Stop					

	Time	Hobbs	20078-21b				Time	Hobbs	20078-21b				Time	Hobbs					Time
MOB START		1265.9	BIL	PECK				1270.6	GGW	PECK			0:00	1271.8					0:00
t on station		1267.0		TOT	4.7					TOT	1.2					TOT	-1271.8		
t off station		1270.2		MSN	3.2					MSN	0.0					MSN	0.0		
MOB END		1270.6	GGW	MOB	1.5			1271.8	BIL	MOB	1.2					MOB	-1271.8		

Line #	Direction	Start	End	Start Time	Stop Time	Altitude (Planned)	Altitude (Actual)	Remarks	0	0				Clouds	Aperture	Shutter Speed
				MTN ZONE												
20078: Montana: FORT PECK																
180	N			14:38	14:48			LINE ALREADY FLOWN. DNU								
192	S			14:56	15:06											
195	N			15:11	15:19											
198	S			15:23	15:33											
201	N			15:36	15:46											
204	S			15:49	15:58											
207	N			16:01	16:11											
210	S			16:13	16:23											
213	N			16:26	16:36											
216	S			16:38	16:48											
219	N			16:51	17:00											
X-TIE	E			17:08	17:13			LIGHT CHOP ON BEGINNING OF X-TIE								
222	S			17:19	17:29			CLOUDS BUILDING IN IMMEDIATE AREA								

LiDAR and Imagery Flight Report										Project(s):	20220820_LT_II_STTC_PM									
Pilot:	JT					Project Number(s):	see below				Date:	20220820_LT_II_STTC_PM								
Operator:	PM					Project Name(s):	see below				Mission Start (LT):	8:50								
Aircraft:	N89LT					Hobbs Start:	3268.0		Hobbs Stop:	3271.7	Mission End (LT):	12:35								
LiDAR Unit:	VQ-1560i - II			Scan Rate:			Camera Unit:	Phase One			Drive:	VQ II L 2								
MTA Zones:				Grnd Spd Max (kts):	155 kts		FOV (deg):	58.52			Sun Angle:	> 30°								
PRR (kHz):	700 x 2			Altitude (feet AMT):	5950'		Lateral Overlap (%):				Lens:	50mm								
Laser Power (%):	100%			Point Spacing (m):			Forward Overlap (%):				Point Density (ppms):									
MTN ZONE	Camera Counter		Line Start/Stop																	

	Time	Hobbs	20078-21b				Time	Hobbs	20078-21b				Time	Hobbs				Time
MOB START	7:30	3266.7	BIL	PECK			13:25	3272.1	MLS	PECK			16:00	3274.6				0:00
t on station	8:50	3268.0		TOT	5.4		13:50	3272.6		TOT	2.5					TOT	-3274.6	
t off station	12:35	3271.7		MSN	3.7		14:50	3273.5		MSN	0.9					MSN	0.0	
MOB END	13:05	3272.1	MLS	MOB	1.7		16:00	3274.6	BIL	MOB	1.6					MOB	-3274.6	

Line #	Direction	Start	End	Start Time	Stop Time	Altitude (Planned)	Altitude (Actual)	Remarks	0	0			Clouds	Aperture	Shutter Speed
				MTN ZONE											
20078: Montana: PECK															
								700 X 2	100%	5900'	155 kts	134 LPS			
449	N 351			8:54	XX		8992	sensor did not fire - op error							
449	N 351			8:59	9:12		8992	YAW ANGLE - + / - 12°							
450	S 171			9:16	9:31		8982	wind vs aircraft: challenge to control pitch / alt: +9°					82 airspeed / pitch		
450	N 351			9:36	9:47		8982	refly 450							
451	S 171			9:50	10:02		8848	good							
452	N 351			10:04	10:15		8838								
453	S 171			10:17	10:29		8963								
454	N 351			10:32	10:42		8940								
455	S 171			10:46	10:57		8963								
456	N 351			10:59	11:08		8923	clouds building to the north and east							
457	S 171			11:11	11:21		8960								
458	N 351			11:23	11:31		8966	rough southern start, got much better							
459	S 171			11:34	11:44		9084								
460	N 351			11:46	11:54		9130								
461	S 171			11:57	12:08		9153								
462	N 351			12:11	12:19		9176								
X 9490	W 263			12:25	12:32		8992	clouds building to the north and east							
								rough ride on the descent							
401	N 351			13:51	14:00		9268	some mild chop // 152 NB							
405	S 171			14:03	14:14		9242	some mild chop - not too bad							
409	N 351			14:17	14:26		9179								
413	S 171			14:29	14:41		9163	increased turb, may have low pd in areas							
X 9489	W			14:44	14:48		8960								

LiDAR and Imagery Flight Report										Project(s):	20220820_RX_III_GSM_CT									
Pilot:	ES					Project Number(s):	20078-21B MT				Date:	20220820_RX_III_GSM_CT								
Operator:	CT					Project Name(s):	see below				Mission Start (LT):	0:00								
Aircraft:	N359RX					Hobbs Start:	1270.6		Hobbs Stop:	1276.6	Mission End (LT):	0:00								
LiDAR Unit:	VQ- III			Scan Rate:			Camera Unit:	Phase One			Drive:	A								
MTA Zones:				Grnd Spd Max (kts):	155 kts		FOV (deg):	58.52			Sun Angle:	> 30°								
PRR (kHz):	700 x 2			Altitude (feet AMT):	5950'		Lateral Overlap (%):				Lens:	50mm								
Laser Power (%):	100%			Point Spacing (m):			Forward Overlap (%):				Point Density (ppms):									
	Camera Counter		Line Start/Stop																	

	Time	Hobbs	20078-21b				Time	Hobbs	20078-21b				Time	Hobbs				Time
MOB START		1270.6	BIL	PECK				1277.1	GGW	PECK			0:00	1279.4				0:00
t on station		1272.7		TOT	6.5			1277.6		TOT	2.3					TOT	-1279.4	
t off station		1276.6		MSN	3.9			1278.5		MSN	0.9					MSN	0.0	
MOB END		1277.1	GGW	MOB	2.6			1279.4	BIL	MOB	1.4					MOB	-1279.4	

Line #	Direction	Start	End	Start Time	Stop Time	Altitude (Planned)	Altitude (Actual)	Remarks	0	0			Clouds	Aperture	Shutter Speed
				MTN ZONE											
20078: Montana: FORT PECK															
228	N			14:30	14:41										
231	S			14:43	14:53										
234	N			14:56	15:05										
237	S			15:08	15:18										
240	N			15:21	15:30										
243	S			15:33	15:43			LIGHT CHOP ON THIS LINE							
246	N			15:46	15:55										
249	S			15:58	16:08										
252	N			16:12	16:21										
255	S			16:24	16:35										
256	N			16:38	16:47										
260	S			16:51	17:01										
264	N			17:05	17:14										
267	S			17:17	17:27										
270	N			17:30	17:39										
273	S			17:43	17:53										
276	N			17:56	18:06										
XTIE	W			18:13	18:20										
279	S			20:13	20:24			LIGHT CHOP STARTING							
282	N			20:28	20:39										
285	S			20:42	20:50										
XTIE	W			20:58	21:00										

LiDAR and Imagery Flight Report

Project(s):	20220826_RX_III_GSM_CT						
Pilot:	ES	Project Number(s):	20078-21B MT			Date:	20220826_RX_III_GSM_CT
Operator:	CT	Project Name(s):	see below			Mission Start (LT):	0:00
Aircraft:	N359RX	Hobbs Start:	1270.6	Hobbs Stop:	1291.0	Mission End (LT):	0:00
LiDAR Unit:	VQ- III	Scan Rate:		Camera Unit:	Phase One	Drive:	A
MTA Zones:		Grnd Spd Max (kts):	155 kts	FOV (deg):	58.52	Sun Angle:	> 30°
PRR (kHz):	700 x 2	Altitude (feet AMT):	5950'	Lateral Overlap (%):		Lens:	50mm
Laser Power (%):	100%	Point Spacing (m):		Forward Overlap (%):		Point Density (ppms):	

	Camera Counter	Line Start/Stop

	Time	Hobbs	20078-21b		Time	Hobbs	20078-21b		Time	Hobbs			Time
MOB START		1279.4	BIL	PECK			PECK		0:00	0.0			0:00
t on station		1287.8		TOT 12.7			TOT 0.0					TOT 0.0	
t off station		1291.0		MSN 3.2			MSN 0.0					MSN 0.0	
MOB END		1292.1	BIL	MOB 9.5			MOB 0.0					MOB 0.0	

Line #	Direction	Start	End	Start Time	Stop Time	Altitude (Planned)	Altitude (Actual)	Remarks	0	0				Clouds	Aperture	Shutter Speed
				MTN ZONE												
20078: Montana: FORT PECK																
341				15:36	15:48											
344				15:51	ABTD			Line aborted Lost GPS								
344				16:05	16:15											
347				16:18	16:29											
350				16:32	16:43											
353				16:47	16:58											
356				17:01	17:12			CLOUDS FORMING BELOW MISSION ALT								
359				17:16	17:27											
X-TIE				17:33	17:36											
247				17:48	17:56											
250				18:00	18:11			Moving west due to clouds								
253				18:14	18:22			Possible cloud, QC this line								
257				18:25	18:35											
X-TIE				18:41	18:43			T-Storms forming at FBO, RTB								

LiDAR and Imagery Flight Report

Project(s):	20220827_RX_III_GSM_CT						
Pilot:	ES	Project Number(s):	20078-21B MT			Date:	20220827_RX_III_GSM_CT
Operator:	CT	Project Name(s):	see below			Mission Start (LT):	0:00
Aircraft:	N359RX	Hobbs Start:	1270.6	Hobbs Stop:	1296.3	Mission End (LT):	0:00
LiDAR Unit:	VQ- III	Scan Rate:		Camera Unit:	Phase One	Drive:	A
MTA Zones:		Grnd Spd Max (kts):	155 kts	FOV (deg):	58.52	Sun Angle:	> 30°
PRR (kHz):	700 x 2	Altitude (feet AMT):	5950'	Lateral Overlap (%):		Lens:	50mm
Laser Power (%):	100%	Point Spacing (m):		Forward Overlap (%):		Point Density (ppms):	

	Camera Counter	Line Start/Stop

	Time	Hobbs	20078-21b		Time	Hobbs	20078-21b		Time	Hobbs			Time
MOB START		1292.1	BIL	N359RX			N359RX		0:00	0.0			0:00
t on station		1293.2		TOT 5.1			TOT 0.0					TOT 0.0	
t off station		1296.3		MSN 3.1			MSN 0.0					MSN 0.0	
MOB END		1297.2	BIL	MOB 2.0			MOB 0.0					MOB 0.0	

Line #	Direction	Start	End	Start Time	Stop Time	Altitude (Planned)	Altitude (Actual)	Remarks	0	0				Clouds	Aperture	Shutter Speed
				MTN ZONE												
20078: Montana: FORT PECK																
362	N			15:15	15:25											
365	S			15:29	15:40											
368	N			15:44	15:55			BIT OF CRAB TODAY								
371	S			15:59	16:09											
374	N			16:12	16:23											
377	S			16:26	16:38											
380	N			16:41	16:51											
383	S			16:55	17:06											
386	N			17:08	17:19			CHOP BEGINNING...								
389	S			17:23	17:34			CHOP AND CLOUDS INCREASING								
392	N			17:37	17:47											
395	S			17:51	18:02			HEAVY CHOP/SWAY								
XTIE	W			18:07	18:13											

POSPac Graphics

General Information

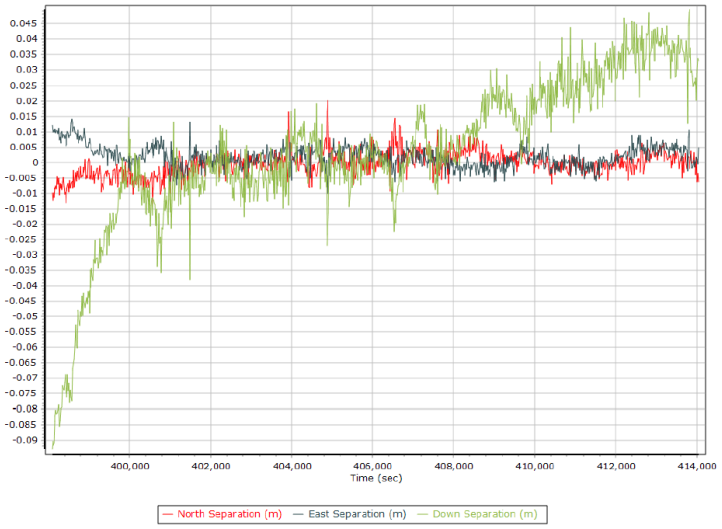
Mission Information

Project name	20078-21b_N89LT-S2222593-X_20220616_1
Processing date	2022-07-05 12:56:58
Mission date	2022-06-16 14:27:48
Mission duration	04:33:16.000
Processing mode	IN-Fusion PP-RTX

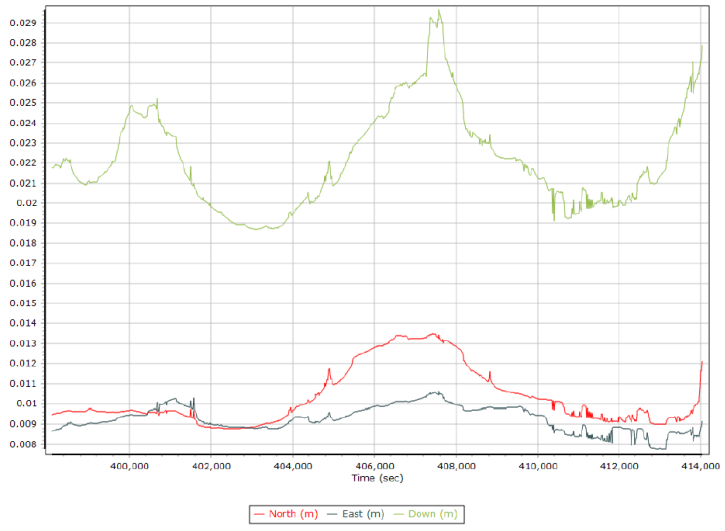
Rover Hardware Information

Product	POS AV 610 VER6 HW2.5-12
Serial number	S/N8223
IMU type	57
Receiver type	BD982
Antenna type	AV37

Forward/Reverse Separation



Estimated Position Accuracy



General Information

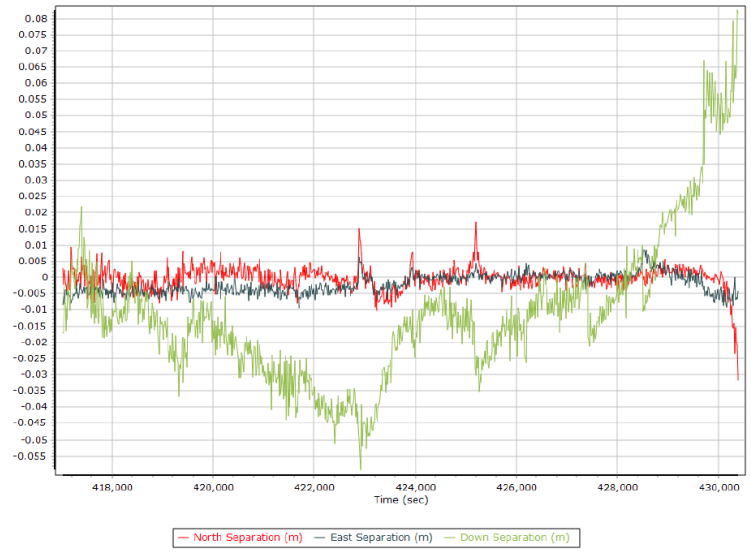
Mission Information

Project name	20078-21b_N89LT-S2222593-X_20220616_2
Processing date	2022-07-05 12:56:08
Mission date	2022-06-16 19:49:19
Mission duration	03:44:05.000
Processing mode	IN-Fusion PP-RTX

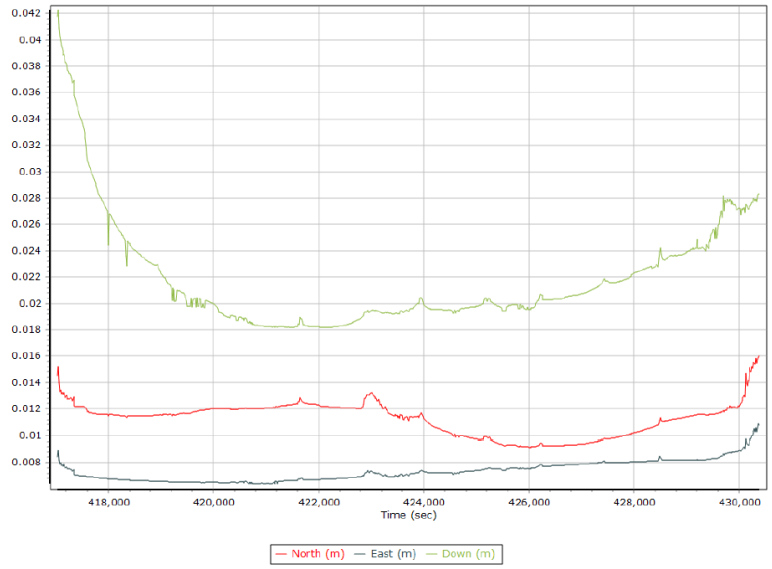
Rover Hardware Information

Product	POS AV 610 VER6 HW2.5-12
Serial number	S/N8223
IMU type	57
Receiver type	BD982
Antenna type	AV37

Forward/Reverse Separation



Estimated Position Accuracy



General Information

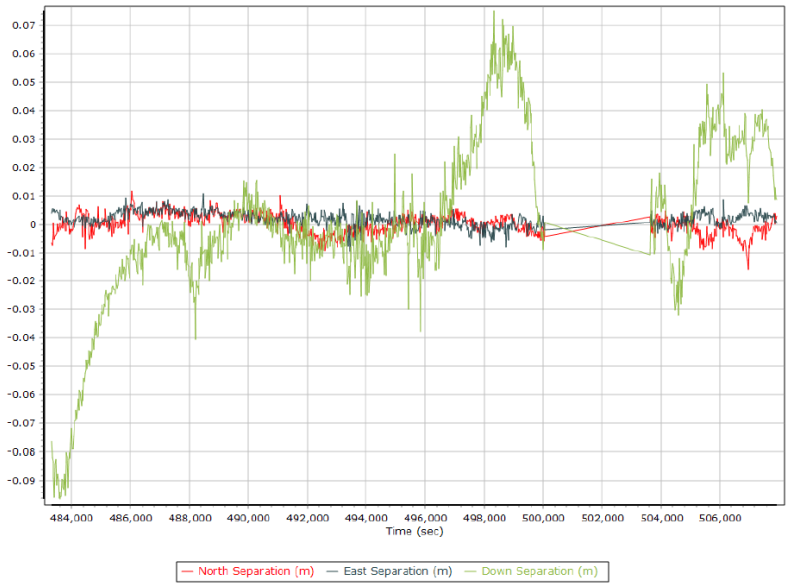
Mission Information

Project name	Lift 1
Processing date	2022-07-19 14:47:57
Mission date	2022-06-17 14:07:49
Mission duration	04:42:47.000
Processing mode	IN-Fusion PP-RTX

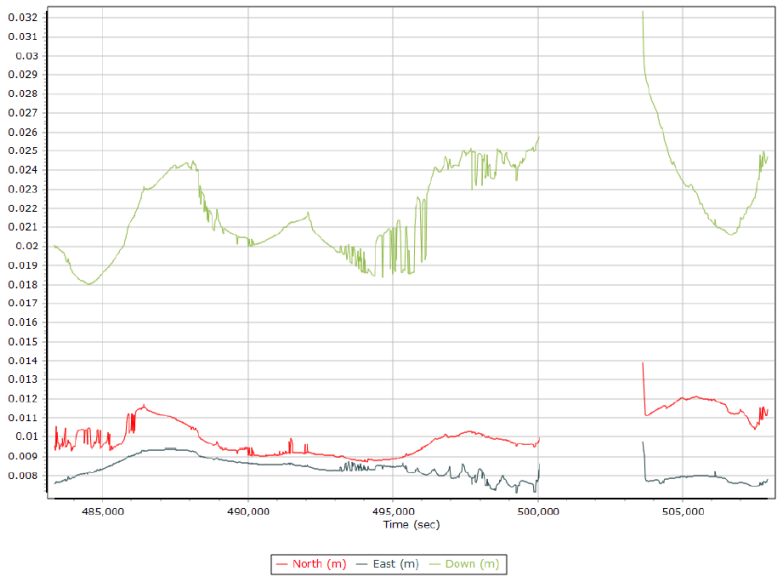
Rover Hardware Information

Product	POS AV 610 VER6 HW2.5-12
Serial number	S/N8223
IMU type	57
Receiver type	BD982
Antenna type	AV39

Forward/Reverse Separation



Estimated Position Accuracy



General Information

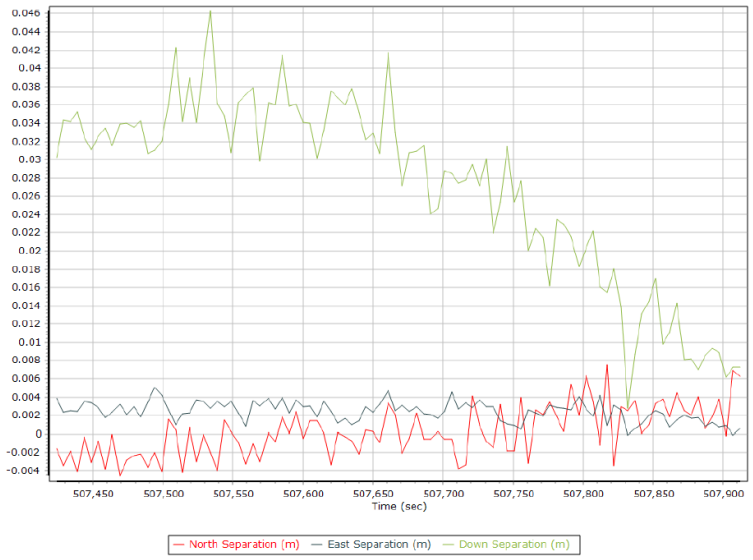
Mission Information

Project name	Lift 2
Processing date	2022-07-19 14:48:31
Mission date	2022-06-17 14:07:49
Mission duration	01:07:00.000
Processing mode	IN-Fusion PP-RTX

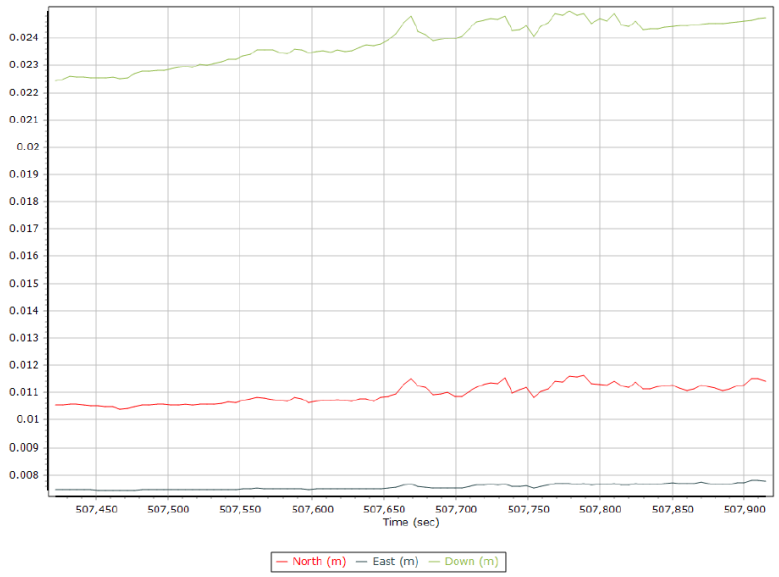
Rover Hardware Information

Product	POS AV 610 VER6 HW2.5-12
Serial number	S/N8223
IMU type	57
Receiver type	BD982
Antenna type	AV39

Forward/Reverse Separation



Estimated Position Accuracy



General Information

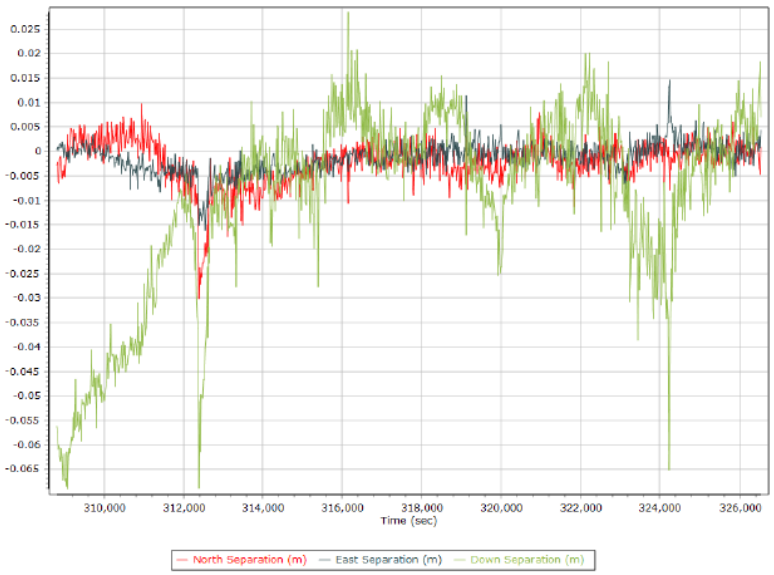
Mission Information

Project name	20220622_Lift_1
Processing date	2022-08-11 19:52:38
Mission date	2022-06-22 13:39:03
Mission duration	05:03:18.000
Processing mode	IN-Fusion PP-RTX

Rover Hardware Information

Product	POS AV 610 VER6 HW2.5-12
Serial number	S/N8223
IMU type	57
Receiver type	BD982
Antenna type	AV37

Forward/Reverse Separation



Estimated Position Accuracy

General Information

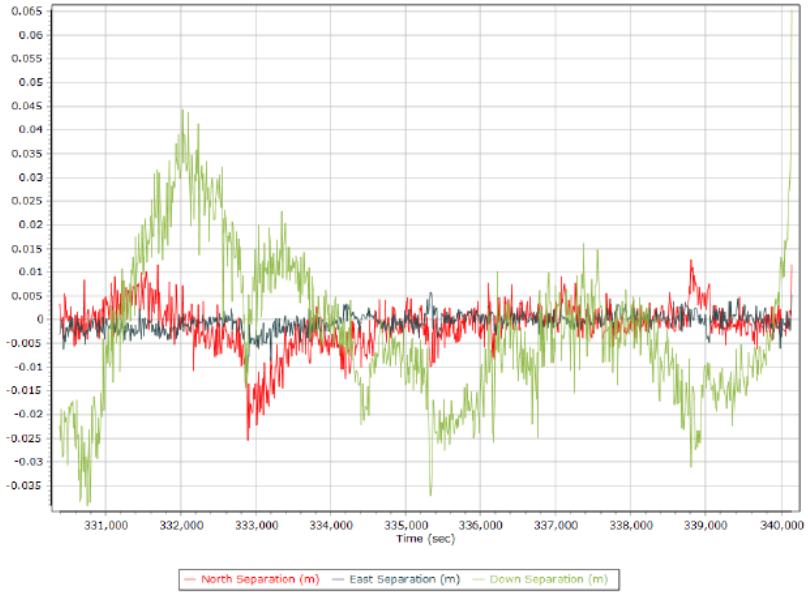
Mission Information

Project name	20220622_Lift_2
Processing date	2022-08-11 19:53:07
Mission date	2022-06-22 19:39:52
Mission duration	02:49:26.000
Processing mode	IN-Fusion PP-RTX

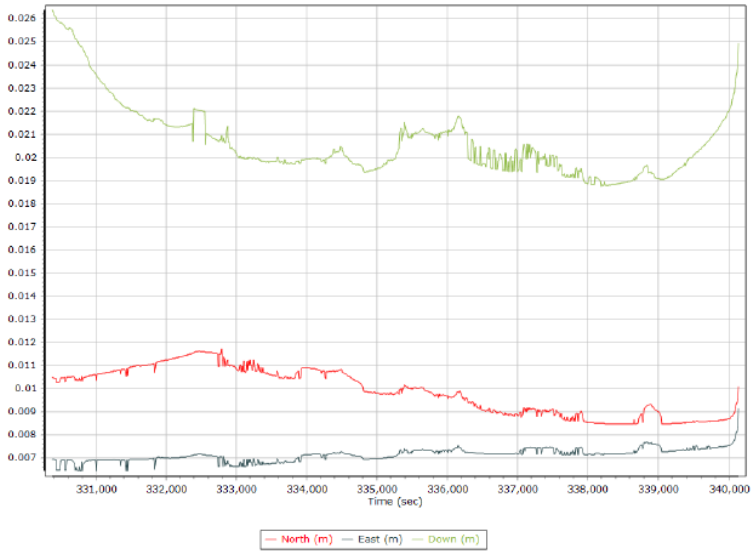
Rover Hardware Information

Product	POS AV 610 VER6 HW2.5-12
Serial number	S/N8223
IMU type	57
Receiver type	BD982
Antenna type	AV37

Forward/Reverse Separation



Estimated Position Accuracy



General Information

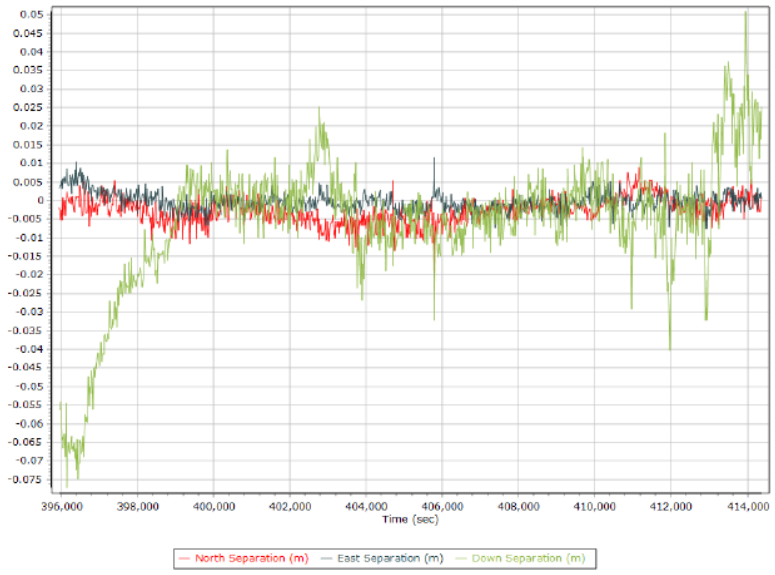
Mission Information

Project name	VQ2_20220623_1
Processing date	2022-11-30 15:50:26
Mission date	2022-06-23 13:52:17
Mission duration	05:14:12.000
Processing mode	IN-Fusion PP-RTX

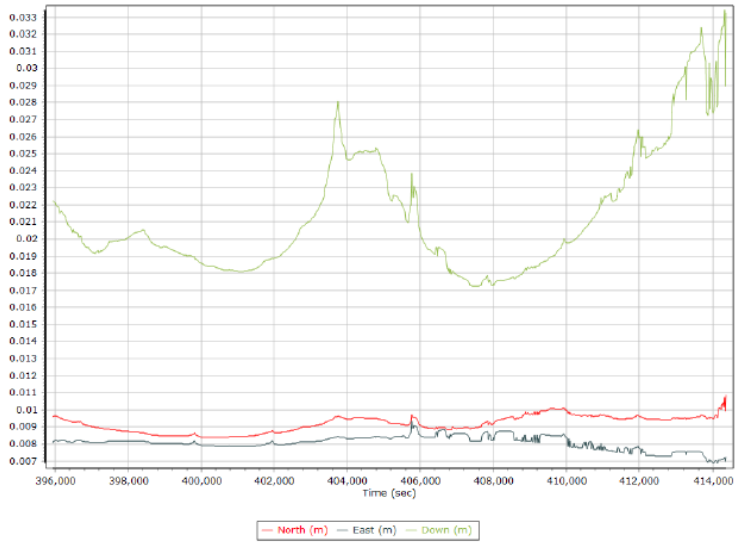
Rover Hardware Information

Product	POS AV 610 VER6 HW2.5-12
Serial number	S/N8223
IMU type	57
Receiver type	BD982
Antenna type	AV39

Forward/Reverse Separation



Estimated Position Accuracy



General Information

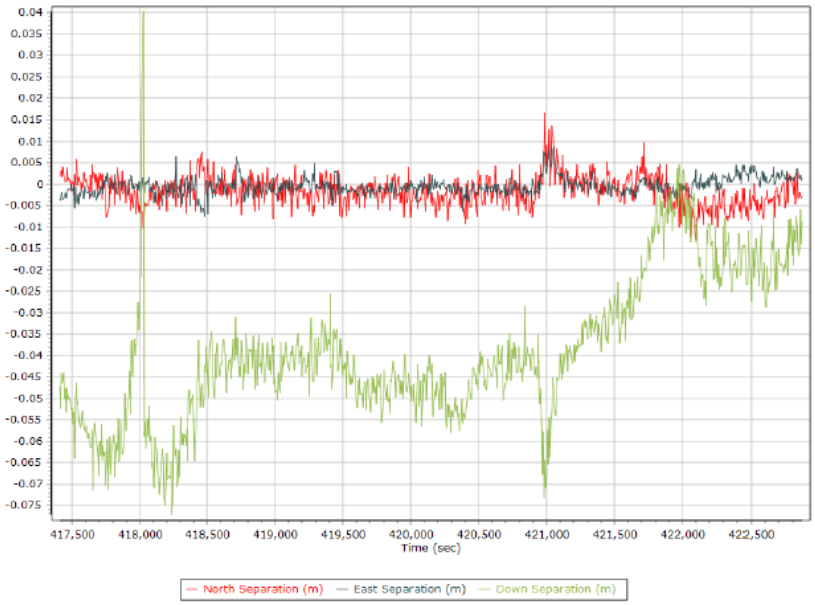
Mission Information

Project name	VQ2_20220623_2
Processing date	2022-11-30 15:50:48
Mission date	2022-06-23 19:50:33
Mission duration	01:37:36.000
Processing mode	IN-Fusion PP-RTX

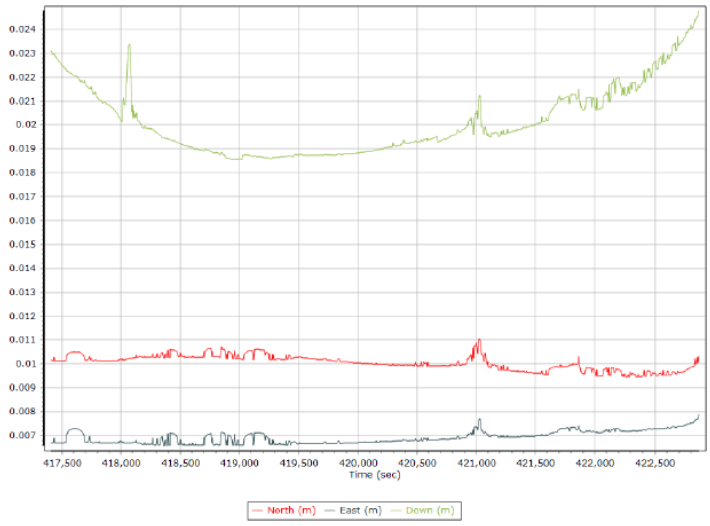
Rover Hardware Information

Product	POS AV 610 VER6 HW2.5-12
Serial number	S/N8223
IMU type	57
Receiver type	BD982
Antenna type	AV39

Forward/Reverse Separation



Estimated Position Accuracy



General Information

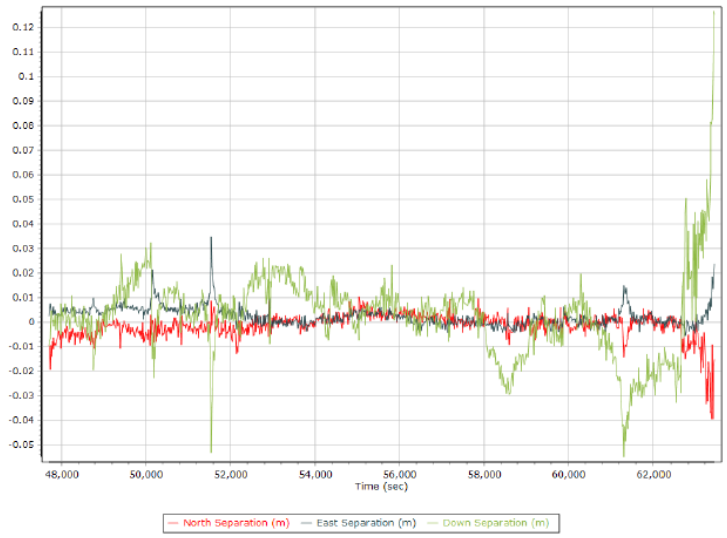
Mission Information

Project name	20078_20220626_LT_S2222593_STATIC_RTX
Processing date	2022-07-05 19:51:52
Mission date	2022-06-26 13:13:57
Mission duration	04:23:45.000
Processing mode	IN-Fusion PP-RTX

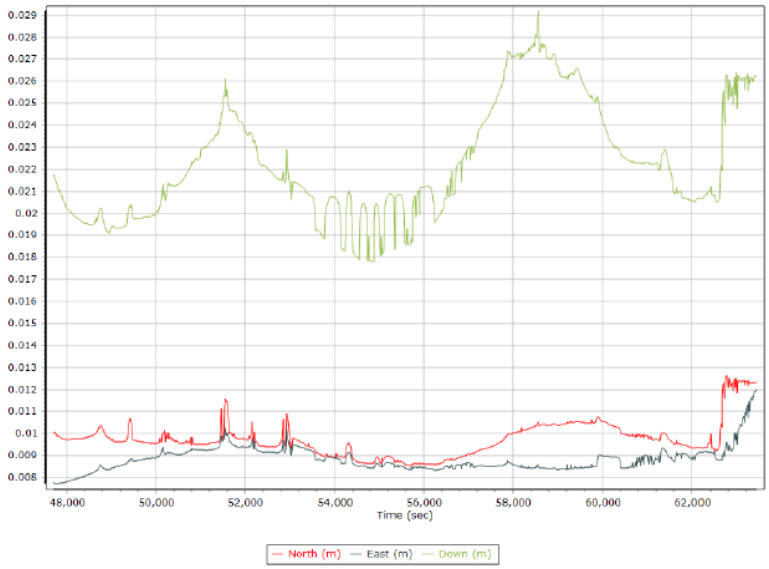
Rover Hardware Information

Product	POS AV 610 VER6 HW2.5-12
Serial number	S/N8223
IMU type	57
Receiver type	BD982
Antenna type	AV37

Forward/Reverse Separation



Estimated Position Accuracy



General Information

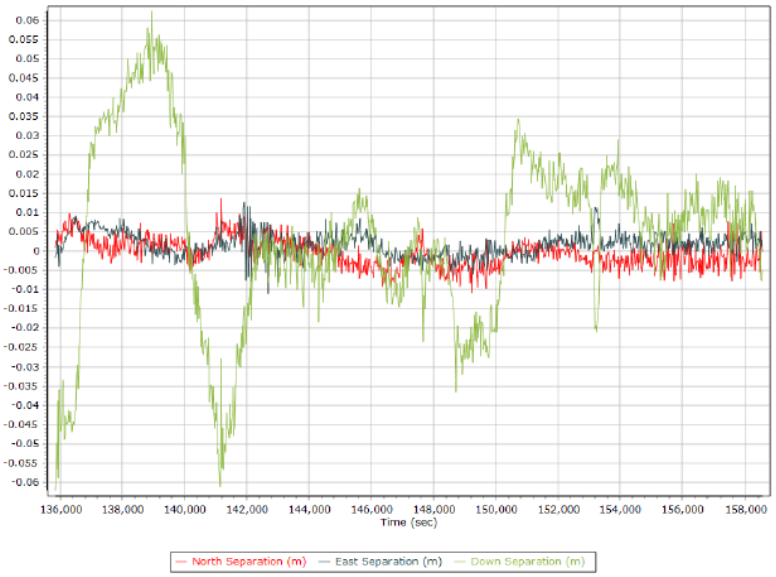
Mission Information

Project name	20078-21b_N89LT-S2222593-X_20220627
Processing date	2022-07-06 21:14:55
Mission date	2022-06-27 13:36:59
Mission duration	06:26:02.000
Processing mode	IN-Fusion PP-RTX

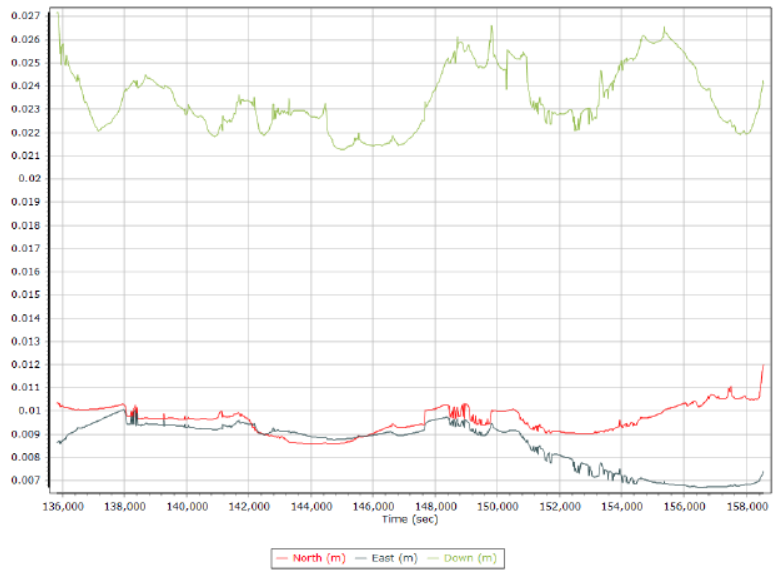
Rover Hardware Information

Product	POS AV 610 VER6 HW2.5-12
Serial number	S/N8223
IMU type	57
Receiver type	BD982
Antenna type	AV37

Forward/Reverse Separation



Estimated Position Accuracy



General Information

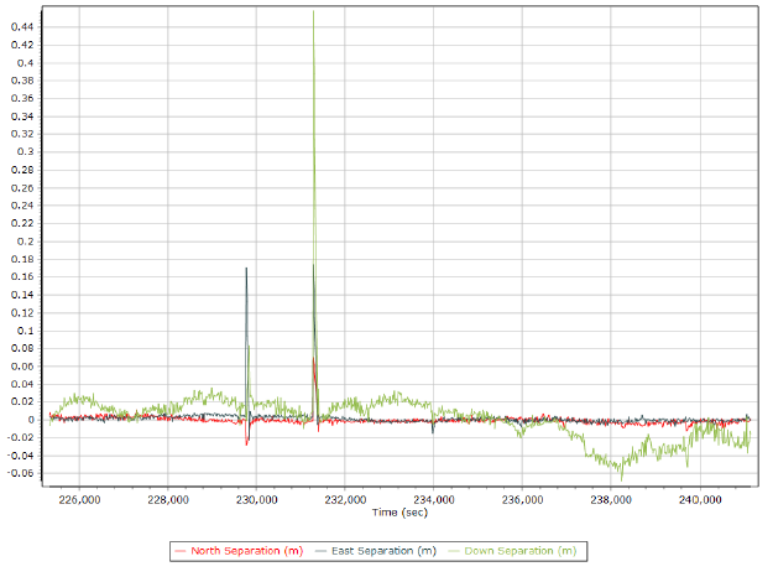
Mission Information

Project name	20078_20220628_LT_S2222593_STATIC_RTX
Processing date	2022-07-08 20:08:20
Mission date	2022-06-28 14:34:30
Mission duration	04:24:42.000
Processing mode	IN-Fusion PP-RTX

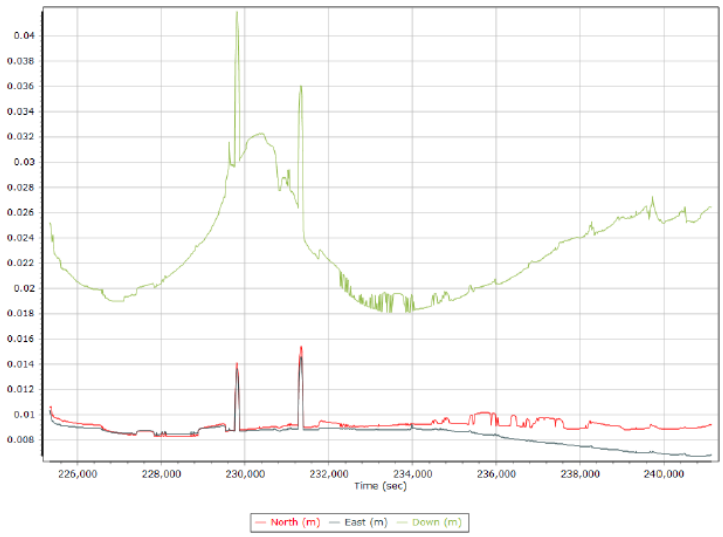
Rover Hardware Information

Product	POS AV 610 VER6 HW2.5-12
Serial number	S/N8223
IMU type	57
Receiver type	BD982
Antenna type	AV37

Forward/Reverse Separation



Estimated Position Accuracy



General Information

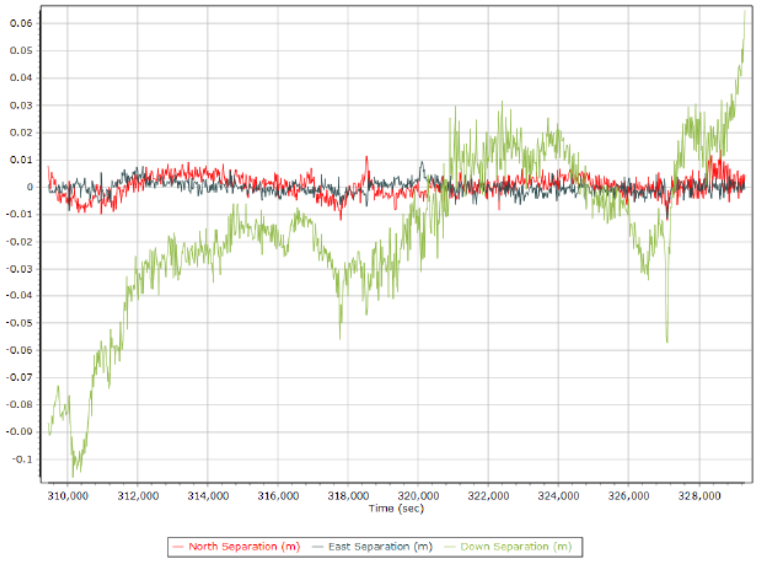
Mission Information

Project name	20078-21b_N89LT-S2222593-X_20220629
Processing date	2022-07-28 14:48:45
Mission date	2022-06-29 13:49:43
Mission duration	05:38:59.000
Processing mode	IN-Fusion PP-RTX

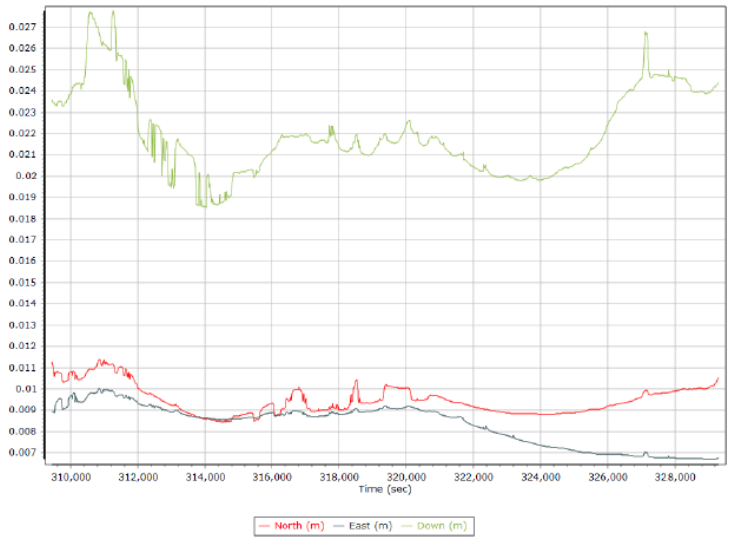
Rover Hardware Information

Product	POS AV 610 VER6 HW2.5-12
Serial number	S/N8223
IMU type	57
Receiver type	BD982
Antenna type	AV37

Forward/Reverse Separation



Estimated Position Accuracy



General Information

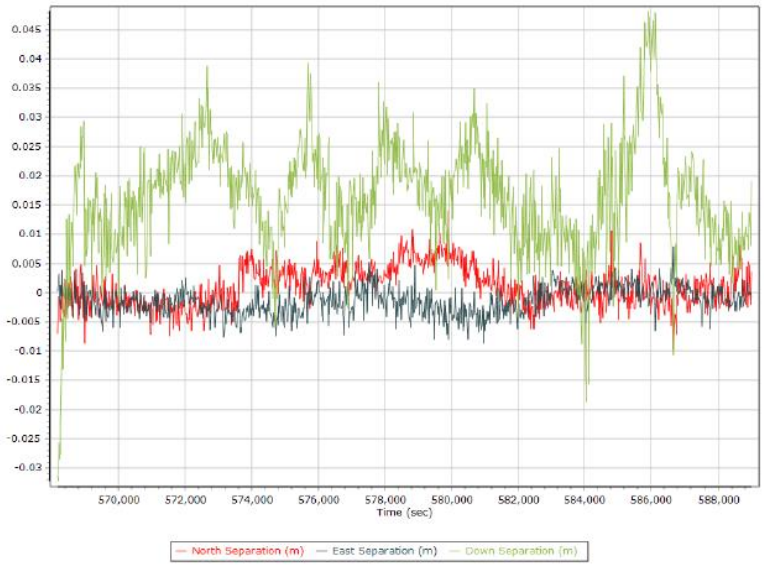
Mission Information

Project name	20078-21b_N89LT-S2222593-X_20220709_1
Processing date	2022-07-28 14:51:17
Mission date	2022-07-09 13:42:09
Mission duration	05:55:01.000
Processing mode	IN-Fusion PP-RTX

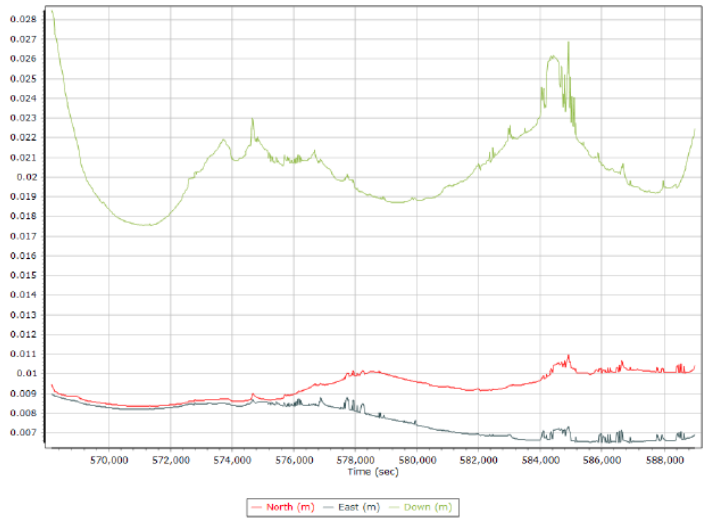
Rover Hardware Information

Product	POS AV 610 VER6 HW2.5-12
Serial number	S/N8223
IMU type	57
Receiver type	BD982
Antenna type	AV37

Forward/Reverse Separation



Estimated Position Accuracy



General Information

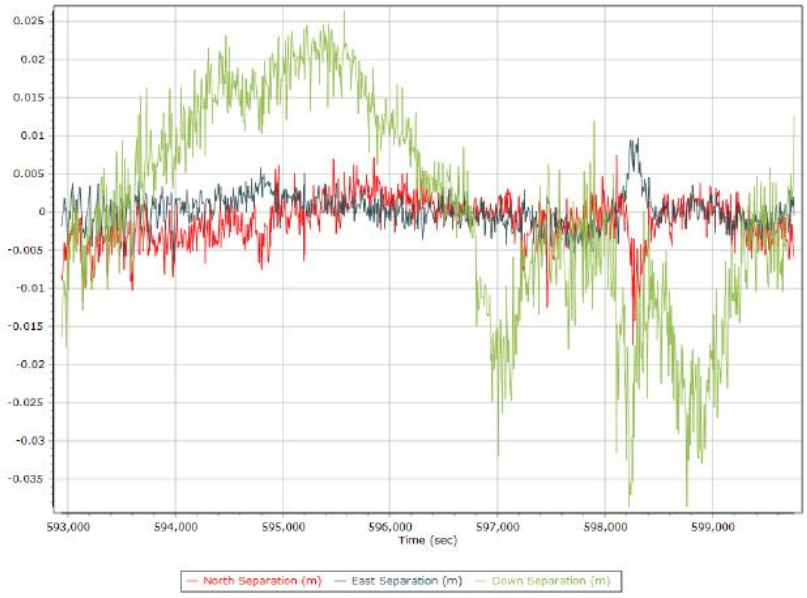
Mission Information

Project name	20078-21b_N89LT-S2222593-X_20220709_2
Processing date	2022-07-28 14:50:33
Mission date	2022-07-09 20:35:34
Mission duration	02:00:36.000
Processing mode	IN-Fusion PP-RTX

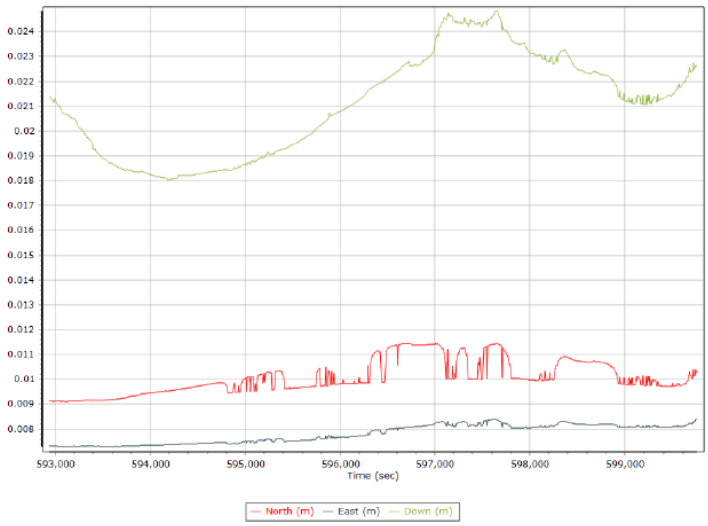
Rover Hardware Information

Product	POS AV 610 VER6 HW2.5-12
Serial number	S/N8223
IMU type	57
Receiver type	BD982
Antenna type	AV37

Forward/Reverse Separation



Estimated Position Accuracy



General Information

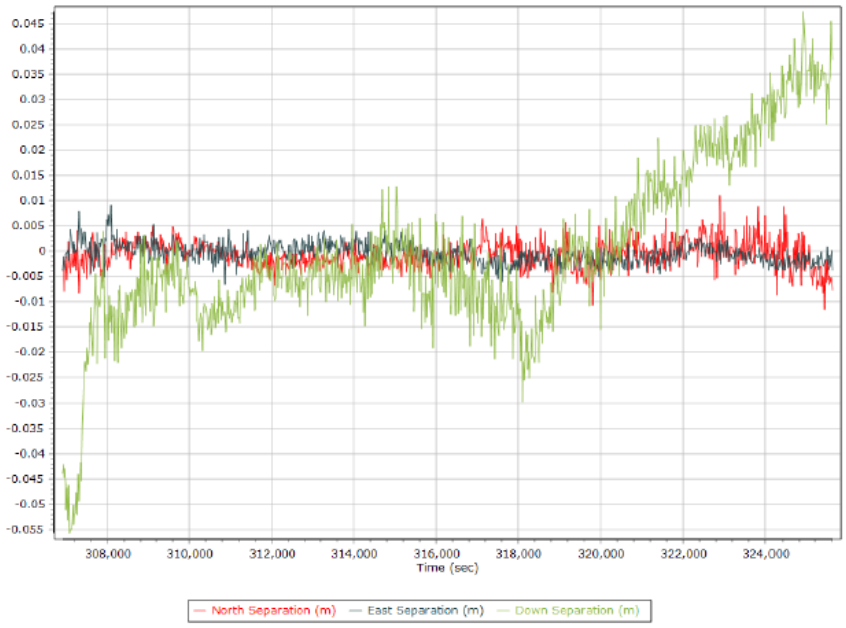
Mission Information

Project name	20078-21b_N359RX-S2223544-G_20220810_1
Processing date	2022-08-15 14:08:11
Mission date	2022-08-10 13:04:36
Mission duration	05:22:50.000
Processing mode	IN-Fusion PP-RTX

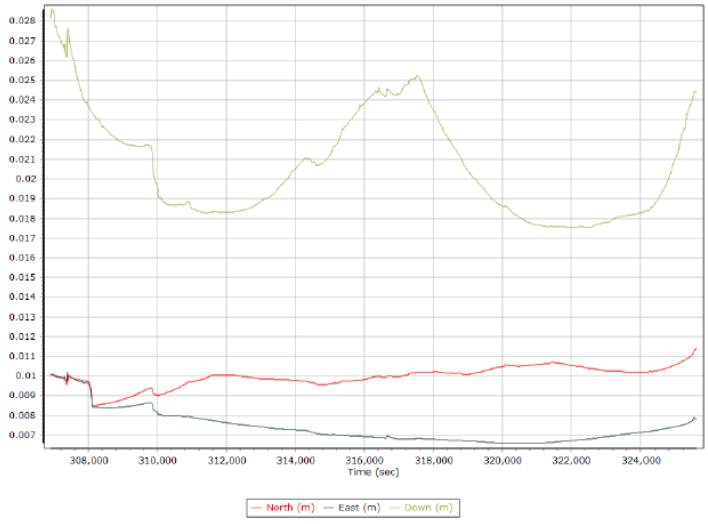
Rover Hardware Information

Product	POS AV 610 VER6 HW2.5-12
Serial number	S/N9865
IMU type	57
Receiver type	BD982
Antenna type	AV37

Forward/Reverse Separation



Estimated Position Accuracy



General Information

Mission Information

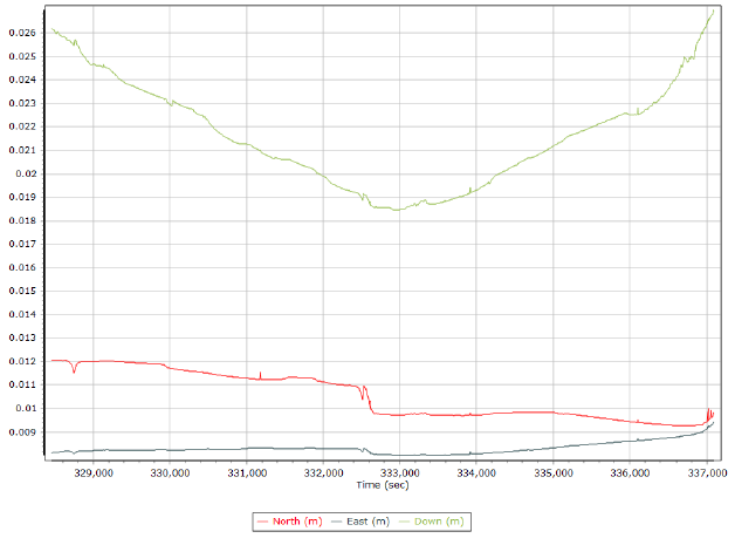
Project name	20078-21b_N359RX-S2223544-G_20220810_2
Processing date	2022-08-15 14:08:48
Mission date	2022-08-10 19:07:04
Mission duration	02:31:22.000
Processing mode	IN-Fusion PP-RTX

Rover Hardware Information

Product	POS AV 610 VER6 HW2.5-12
Serial number	S/N9865
IMU type	57
Receiver type	BD982
Antenna type	AV37

Forward/Reverse Separation

Estimated Position Accuracy



General Information

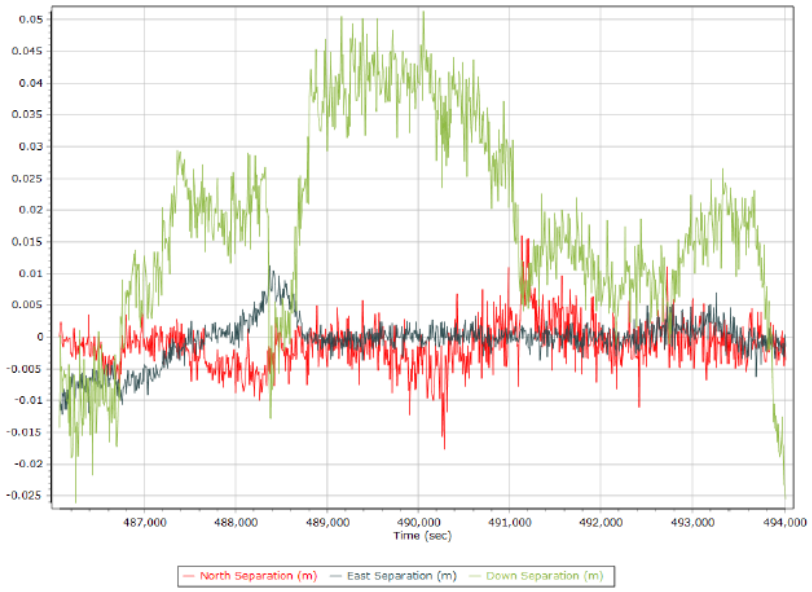
Mission Information

Project name	20078_20220819_LT_S2222593
Processing date	2022-08-23 18:43:57
Mission date	2022-08-19 14:59:59
Mission duration	02:13:58.000
Processing mode	IN-Fusion PP-RTX

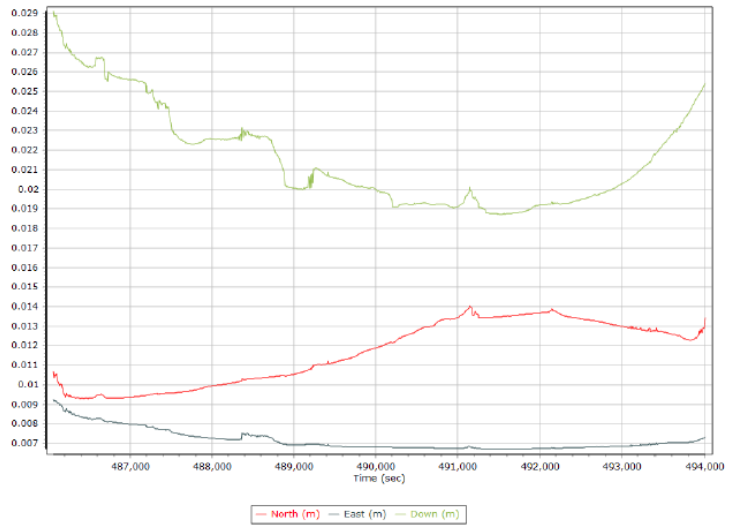
Rover Hardware Information

Product	POS AV 610 VER6 HW2.5-12
Serial number	S/N8223
IMU type	57
Receiver type	BD982
Antenna type	AV37

Forward/Reverse Separation



Estimated Position Accuracy



General Information

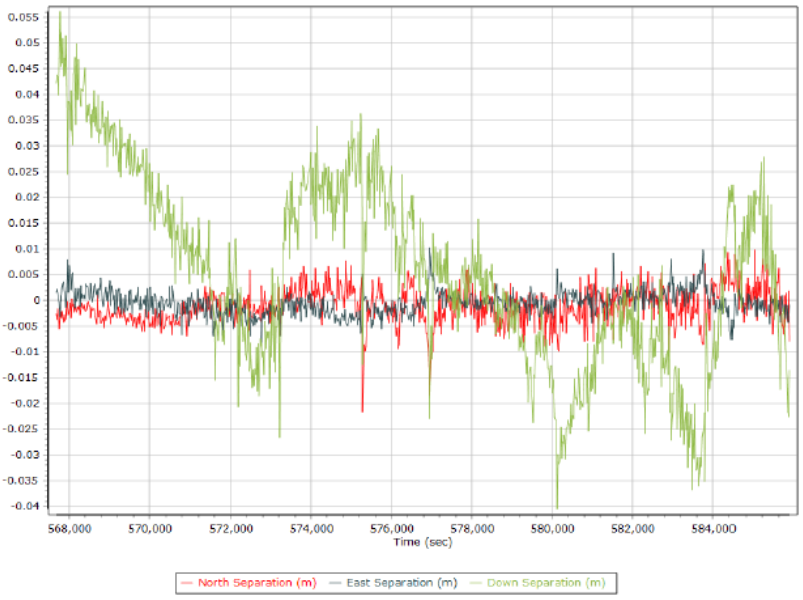
Mission Information

Project name	Lift 1
Processing date	2022-08-26 19:45:36
Mission date	2022-08-20 13:34:30
Mission duration	05:10:33.000
Processing mode	IN-Fusion PP-RTX

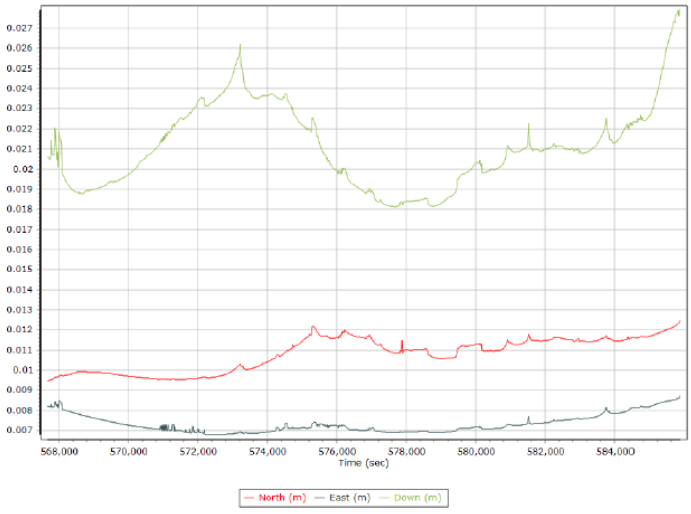
Rover Hardware Information

Product	POS AV 610 VER6 HW2.5-12
Serial number	S/N8223
IMU type	57
Receiver type	BD982
Antenna type	AV37

Forward/Reverse Separation



Estimated Position Accuracy



General Information

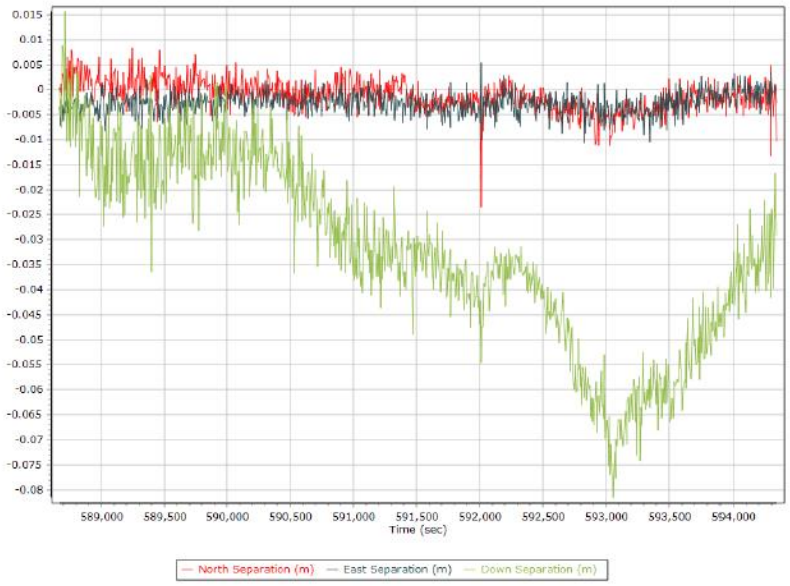
Mission Information

Project name	Lift 2
Processing date	2022-08-26 19:46:00
Mission date	2022-08-20 19:24:28
Mission duration	01:41:31.000
Processing mode	IN-Fusion PP-RTX

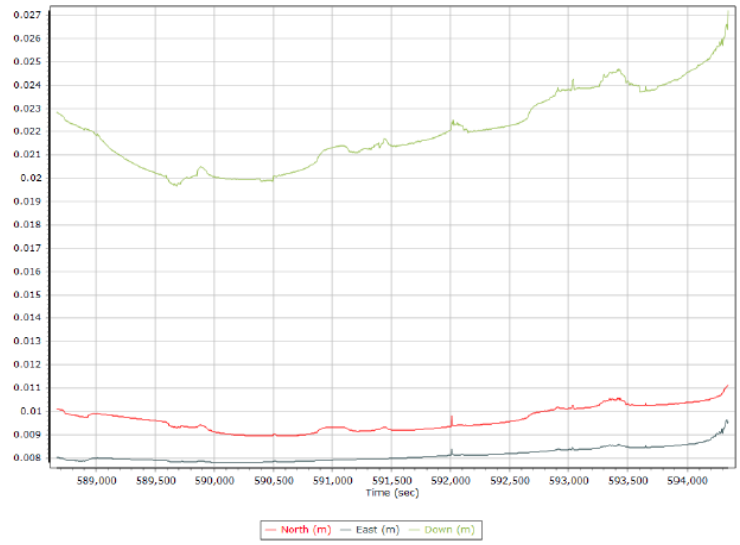
Rover Hardware Information

Product	POS AV 610 VER6 HW2.5-12
Serial number	S/N8223
IMU type	57
Receiver type	BD982
Antenna type	AV37

Forward/Reverse Separation



Estimated Position Accuracy



General Information

Mission Information

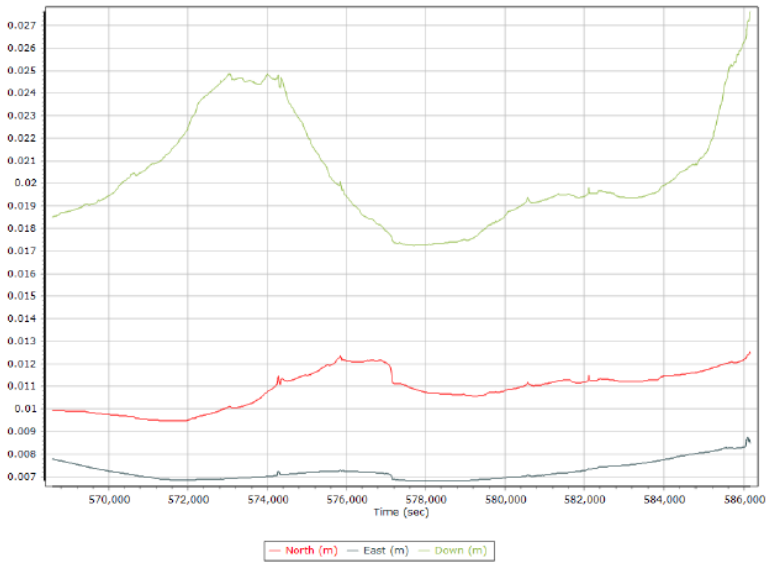
Project name	VQ3_20220820_F1
Processing date	2022-09-08 14:06:21
Mission date	2022-08-20 13:35:38
Mission duration	05:14:03.000
Processing mode	IN-Fusion PP-RTX

Rover Hardware Information

Product	POS AV 610 VER6 HW2.5-12
Serial number	S/N9865
IMU type	57
Receiver type	BD982
Antenna type	AV37

Forward/Reverse Separation

Estimated Position Accuracy



General Information

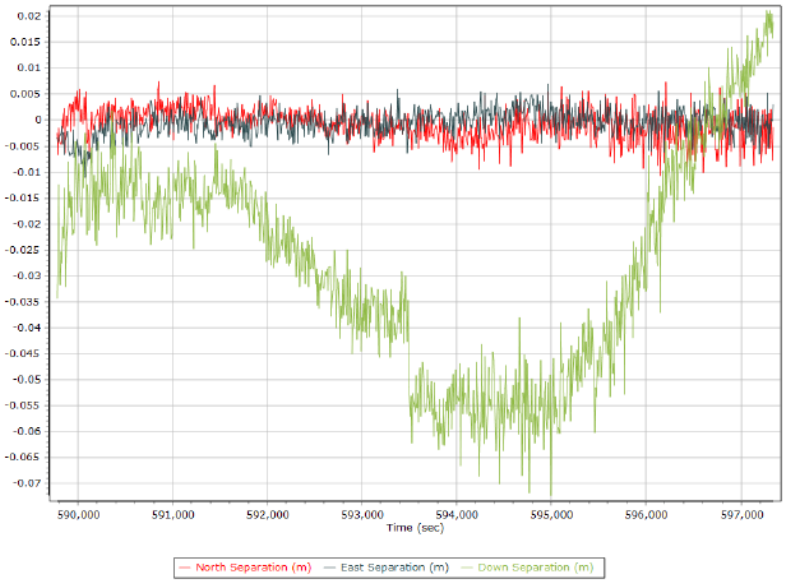
Mission Information

Project name	VQ3_20220820_F2
Processing date	2022-09-08 14:07:27
Mission date	2022-08-20 19:40:41
Mission duration	02:15:14.000
Processing mode	IN-Fusion PP-RTX

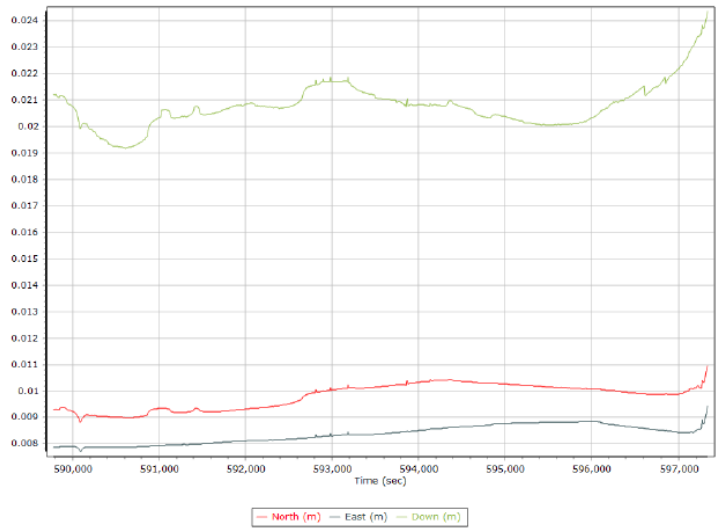
Rover Hardware Information

Product	POS AV 610 VER6 HW2.5-12
Serial number	S/N9865
IMU type	57
Receiver type	BD982
Antenna type	AV37

Forward/Reverse Separation



Estimated Position Accuracy



General Information

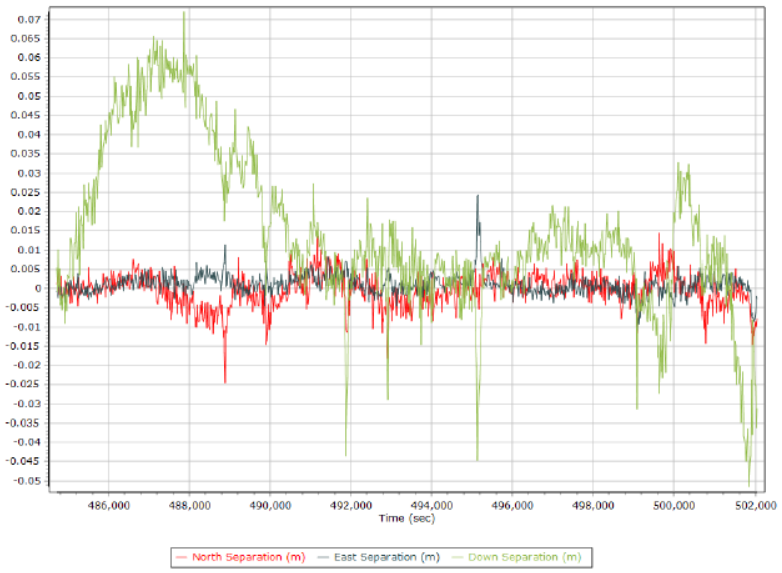
Mission Information

Project name	20078-21b_N89LT-S2222593-X_20220826
Processing date	2022-09-08 14:05:08
Mission date	2022-08-26 14:24:57
Mission duration	05:02:47.000
Processing mode	IN-Fusion PP-RTX

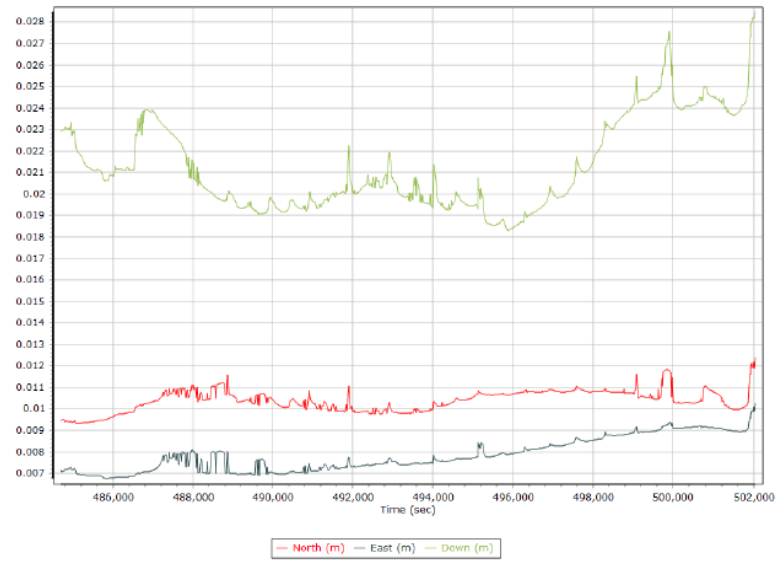
Rover Hardware Information

Product	POS AV 610 VER6 HW2.5-12
Serial number	S/N8223
IMU type	57
Receiver type	BD982
Antenna type	AV37

Forward/Reverse Separation



Estimated Position Accuracy



General Information

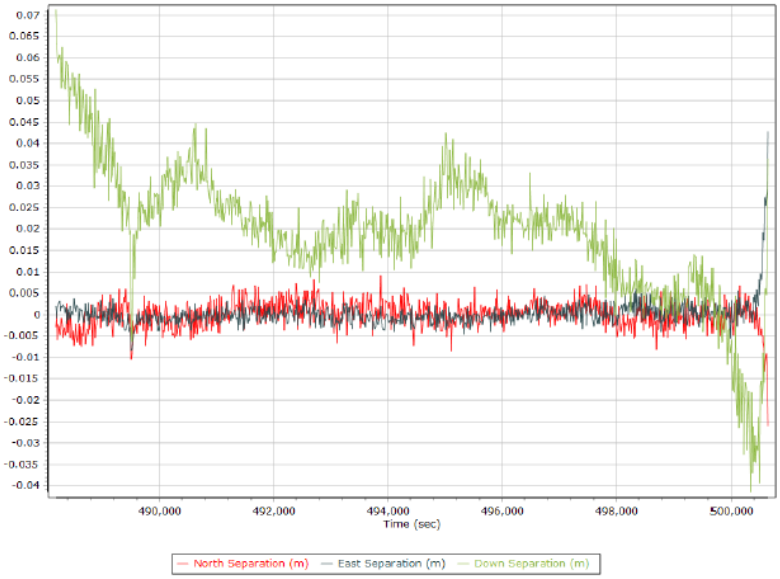
Mission Information

Project name	20078_20220826_RX_S2223544
Processing date	2022-09-09 14:16:11
Mission date	2022-08-26 15:25:20
Mission duration	03:13:09.860
Processing mode	IN-Fusion PP-RTX

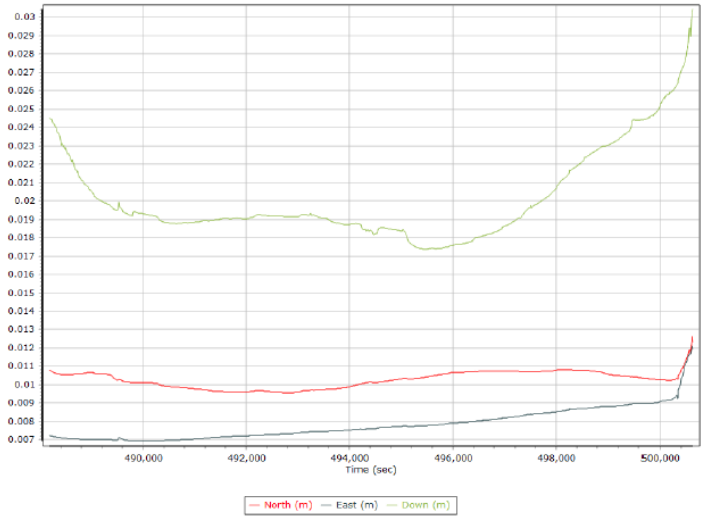
Rover Hardware Information

Product	POS AV 610 VER6 HW2.5-12
Serial number	S/N9865
IMU type	57
Receiver type	BD982
Antenna type	AV37

Forward/Reverse Separation



Estimated Position Accuracy



General Information

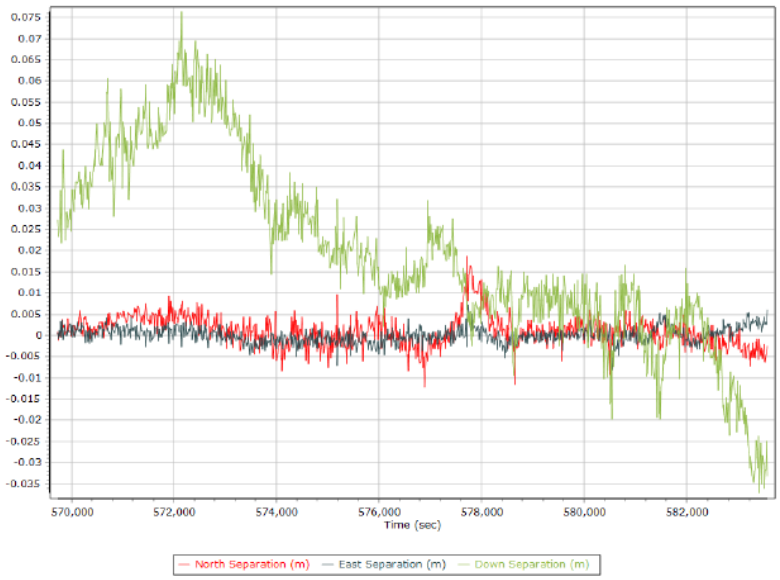
Mission Information

Project name	VQ2_20220827
Processing date	2022-09-25 00:16:34
Mission date	2022-08-27 14:07:18
Mission duration	03:59:01.000
Processing mode	IN-Fusion PP-RTX

Rover Hardware Information

Product	POS AV 610 VER6 HW2.5-12
Serial number	S/N8223
IMU type	57
Receiver type	BD982
Antenna type	AV37

Forward/Reverse Separation



Estimated Position Accuracy