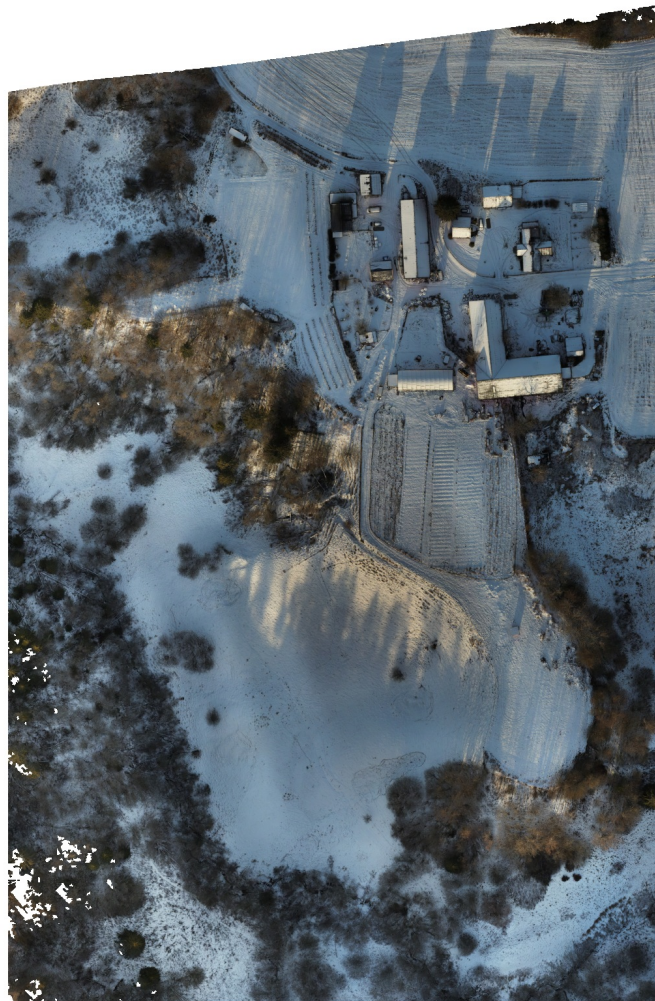


Sander_2024-12-09_P1SmartOblique

Processing Report
12 December 2024



Survey Data

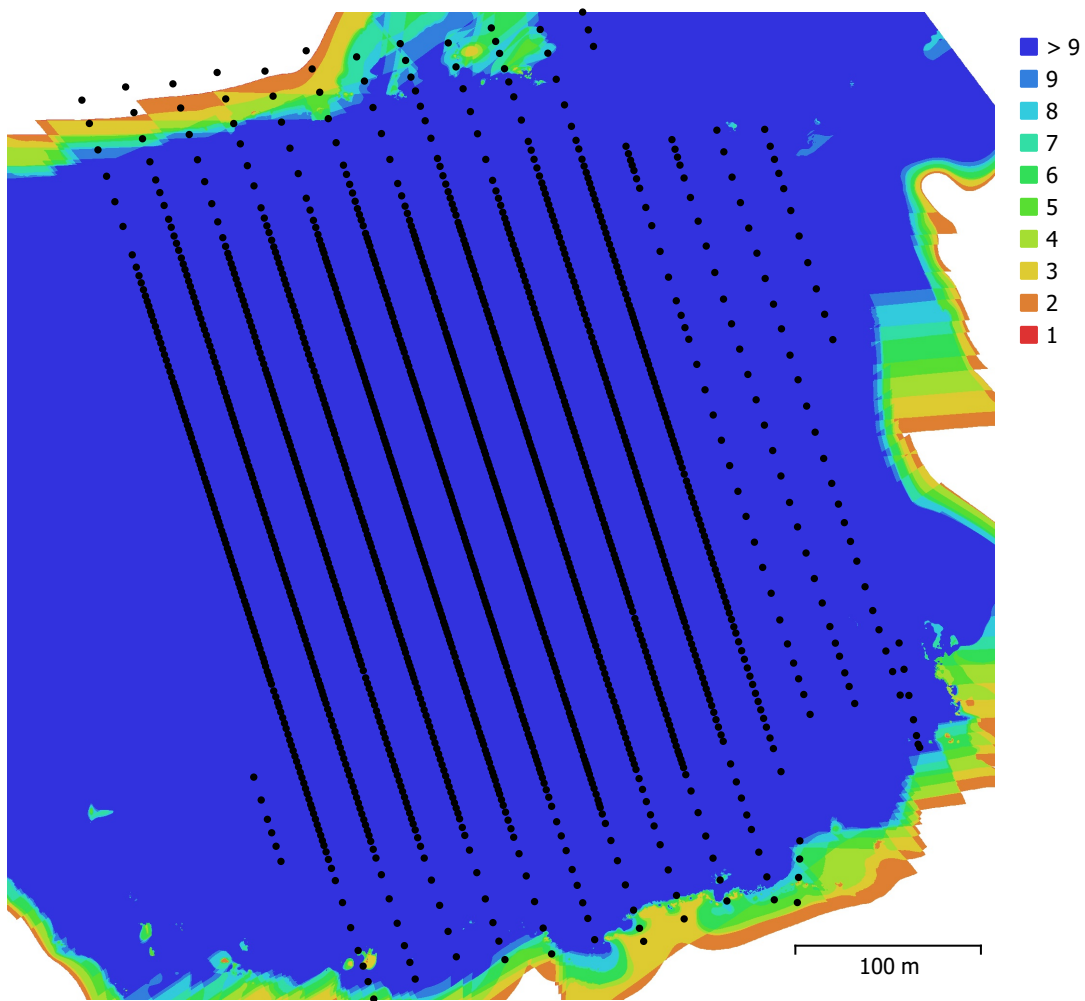


Fig. 1. Camera locations and image overlap.

Number of images:	1,718	Camera stations:	1,695
Flying altitude:	95.6 m	Tie points:	580,332
Ground resolution:	1.34 cm/pix	Projections:	3,942,654
Coverage area:	0.258 km ²	Reprojection error:	1.04 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
ZenmuseP1 (35mm)	8192 x 5460	35 mm	4.39 x 4.39 μ m	No

Table 1. Cameras.

Camera Calibration

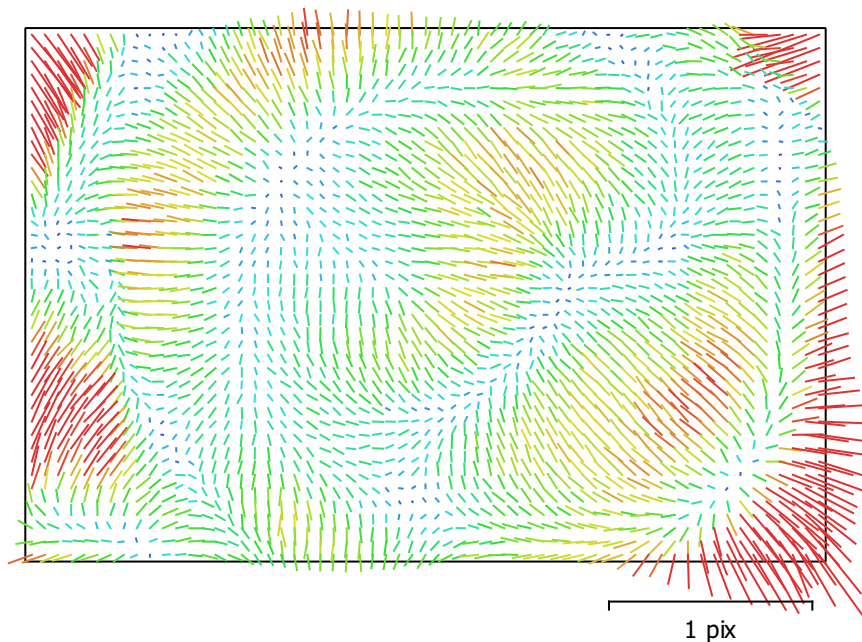


Fig. 2. Image residuals for ZenmuseP1 (35mm).

ZenmuseP1 (35mm)

1695 images

Type	Resolution	Focal Length	Pixel Size
Frame	8192 x 5460	35 mm	4.39 x 4.39 μm

	Value	Error	F	Cx	Cy	K1	K2	K3	P1	P2
F	8191.24	0.0081	1.00	-0.00	-0.00	-0.40	0.39	-0.35	-0.01	0.00
Cx	-25.4732	0.0095		1.00	0.05	-0.01	0.01	-0.02	0.92	0.04
Cy	19.9251	0.0071			1.00	0.00	-0.00	0.00	0.04	0.79
K1	-0.048856	9.5e-06				1.00	-0.97	0.92	-0.01	-0.00
K2	0.0260588	5.8e-05					1.00	-0.98	0.02	0.00
K3	-0.101526	0.00011						1.00	-0.02	0.00
P1	-0.00116676	3.6e-07							1.00	0.03
P2	0.00107137	2.8e-07								1.00

Table 2. Calibration coefficients and correlation matrix.

Camera Locations

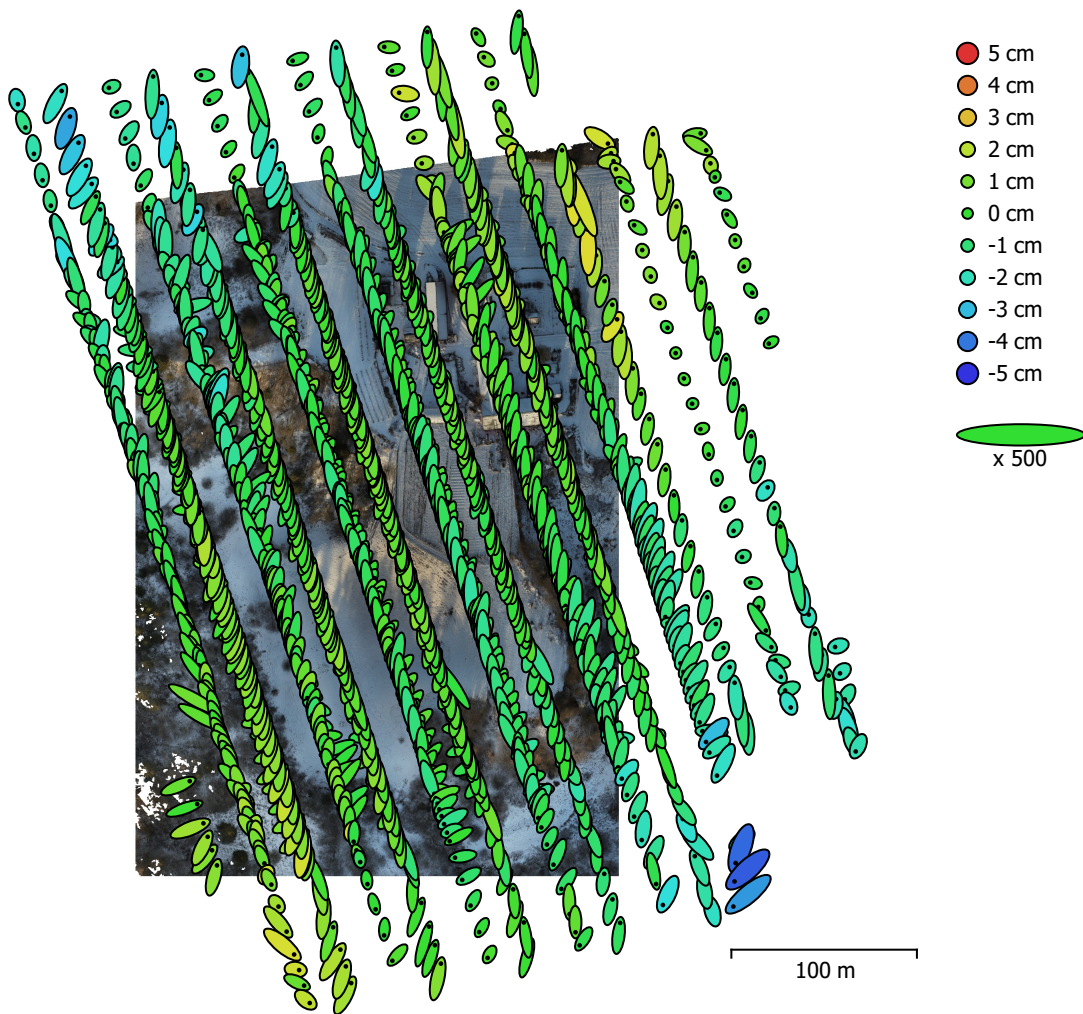


Fig. 3. Camera locations and error estimates.

Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.

Estimated camera locations are marked with a black dot.

X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total error (cm)
0.740477	2.05571	0.87464	2.185	2.35356

Table 3. Average camera location error.

X - Easting, Y - Northing, Z - Altitude.

Ground Control Points

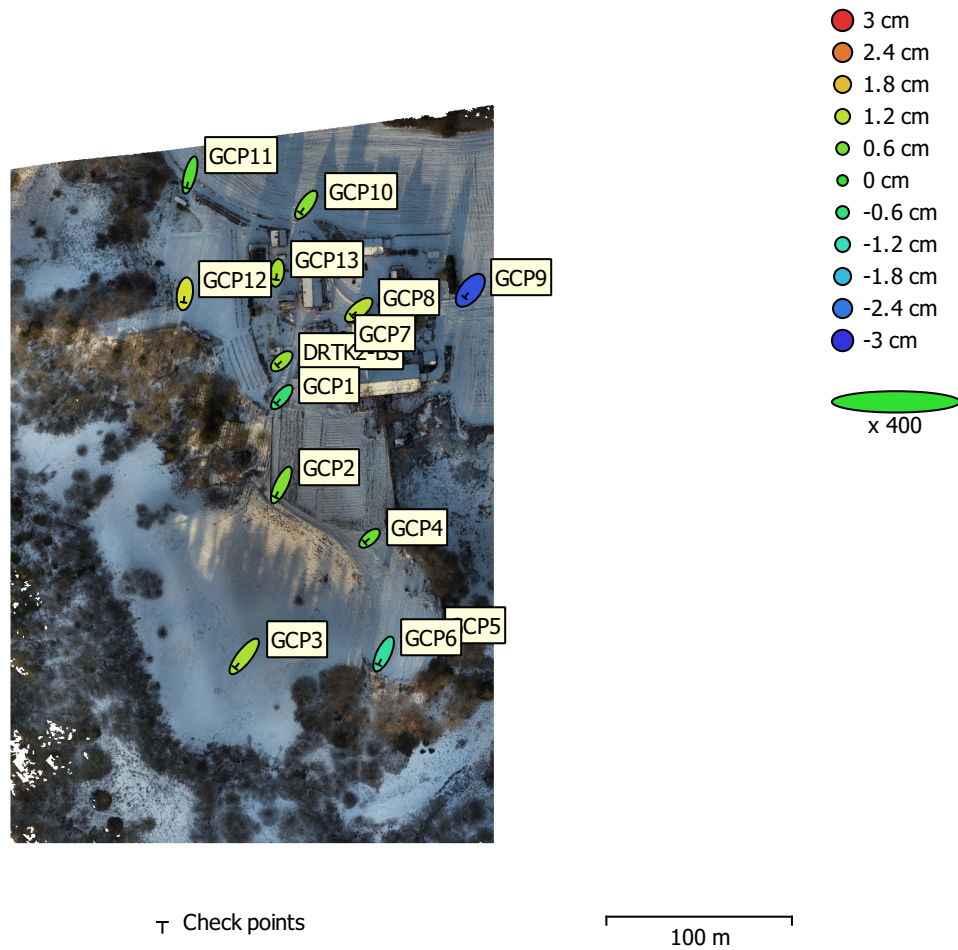


Fig. 4. GCP locations and error estimates.

Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.

Estimated GCP locations are marked with a dot or crossing.

Count	X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total (cm)
14	1.5188	2.38999	1.12347	2.83175	3.04648

Table 4. Check points RMSE.

X - Easting, Y - Northing, Z - Altitude.

Label	X error (cm)	Y error (cm)	Z error (cm)	Total (cm)	Image (pix)
DRTK2-BS	-1.27631	-1.12361	0.854952	1.90327	0.684 (3)
GCP1	-1.50863	-1.78237	-0.554089	2.39996	0.254 (6)
GCP2	-1.5823	-3.29507	0.662705	3.71488	0.225 (5)
GCP3	-2.46651	-3.12154	1.04272	4.11278	0.165 (5)
GCP4	-1.31675	-1.13985	0.454618	1.79994	0.191 (5)
GCP5	-2.01484	-1.65999	0.221346	2.61995	0.195 (7)
GCP6	-1.37237	-2.90072	-0.960649	3.34969	0.286 (6)
GCP7	-1.54977	-3.24496	-1.18624	3.78665	0.088 (3)
GCP8	-1.93749	-1.60551	1.15978	2.77067	0.319 (5)
GCP9	-1.55707	-1.94114	-2.7401	3.70144	0.192 (5)
GCP10	-1.57388	-2.21007	0.738232	2.81185	0.232 (5)
GCP11	-0.937517	-3.47445	0.299461	3.61115	0.315 (5)
GCP12	-0.345956	-2.29652	1.44108	2.7332	0.253 (5)
GCP13	-0.264133	-1.83125	0.977735	2.09265	0.233 (5)
Total	1.5188	2.38999	1.12347	3.04648	0.272

Table 5. Check points.
X - Easting, Y - Northing, Z - Altitude.

Digital Elevation Model

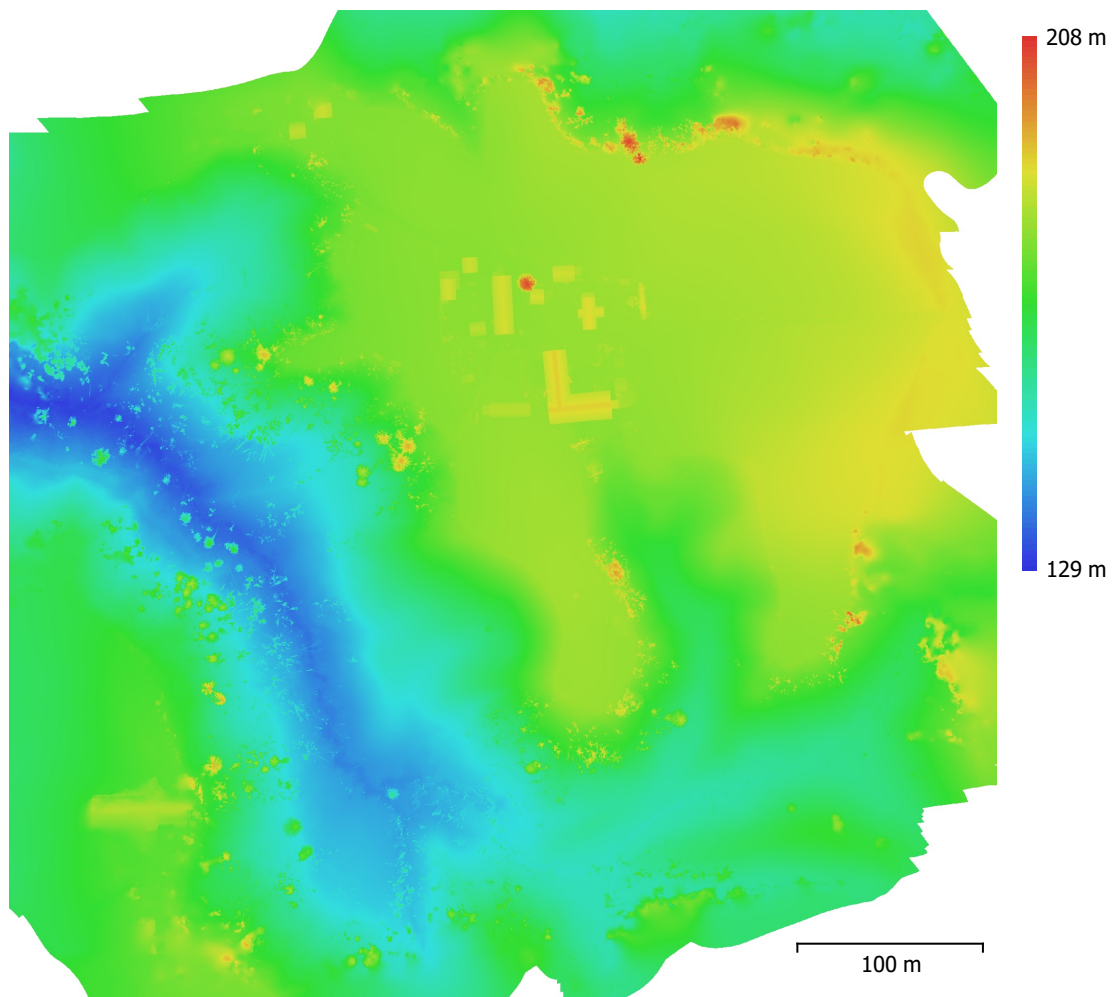


Fig. 5. Reconstructed digital elevation model.

Resolution: 2.67 cm/pix
Point density: 0.14 points/cm²

Processing Parameters

General

Cameras	1695
Aligned cameras	1695
Markers	14
Coordinate system	ETRS89 / UTM zone 32N + NN2000 height (EPSG::5972)
Rotation angles	Yaw, Pitch, Roll

Tie Points

Points	580,332 of 863,711
RMS reprojection error	0.149248 (1.04095 pix)
Max reprojection error	0.461766 (56.8259 pix)
Mean key point size	3.56715 pix
Point colors	3 bands, uint8
Key points	No
Average tie point multiplicity	9.22427

Alignment parameters

Accuracy	High
Generic preselection	Yes
Reference preselection	Source
Key point limit	40,000
Key point limit per Mpx	1,000
Tie point limit	4,000
Exclude stationary tie points	Yes
Guided image matching	Yes
Adaptive camera model fitting	Yes
Matching time	11 minutes 54 seconds
Matching memory usage	2.37 GB
Alignment time	9 minutes 43 seconds
Alignment memory usage	3.66 GB
Date created	2024:12:09 17:56:32
Software version	2.0.2.16404
File size	198.11 MB

Depth Maps

Count	1695
Depth maps generation parameters	
Quality	High
Filtering mode	Mild
Max neighbors	16
Processing time	2 hours 53 minutes
Memory usage	16.50 GB
Date created	2024:12:09 21:12:11
Software version	2.0.2.16404
File size	21.58 GB

Point Cloud

Points	483,818,393
Coordinate precision	6.68 mm

Point attributes

Color	3 bands, uint8
Normal	

Point classes

Unclassified	1,591,546
--------------	-----------

Ground	273,135,576
High Vegetation	15,176,930
Building	45,803,457
Low Point (noise)	75,805,412
Road Surface	13,079,928
Car	59,099,115
Man-made Object	126,429
Depth maps generation parameters	
Quality	High
Filtering mode	Mild
Max neighbors	16
Processing time	2 hours 53 minutes
Memory usage	16.50 GB
Point cloud generation parameters	
Processing time	4 hours 53 minutes
Memory usage	62.48 GB
Ground points classification parameters	
Max angle (°)	45
Max distance (m)	1
Cell size (m)	50
Classification time	1 hours 36 minutes
Classification memory usage	19.75 GB
Date created	2024:12:10 02:05:36
Software version	2.0.2.16404
File size	6.24 GB
Model	
Faces	73,281,449
Vertices	36,703,057
Vertex colors	3 bands, uint8
Depth maps generation parameters	
Quality	High
Filtering mode	Mild
Max neighbors	16
Processing time	2 hours 53 minutes
Memory usage	16.50 GB
Reconstruction parameters	
Surface type	Arbitrary
Source data	Depth maps
Interpolation	Enabled
Strict volumetric masks	No
Processing time	1 hours 28 minutes
Memory usage	22.02 GB
Date created	2024:12:10 12:38:22
Software version	2.0.2.16404
File size	1.64 GB
DEM	
Size	29,994 x 22,973
Coordinate system	ETRS89 / UTM zone 32N + NN2000 height (EPSG::5972)
Reconstruction parameters	
Source data	Point cloud
Interpolation	Enabled
Processing time	2 minutes 48 seconds
Memory usage	346.34 MB
Date created	2024:12:12 11:34:11
Software version	2.0.2.16404
File size	1.78 GB

Orthomosaic

Size 26,000 x 40,000
Coordinate system ETRS89 / UTM zone 32N + NN2000 height (EPSG::5972)
Colors 3 bands, uint8

Reconstruction parameters

Blending mode Mosaic
Surface DEM
Enable hole filling Yes
Enable ghosting filter No
Processing time 1 hours 21 minutes
Memory usage 5.29 GB
Date created 2024:12:12 14:47:27
Software version 2.0.2.16404
File size 125.91 GB

System

Software name Agisoft Metashape Professional
Software version 2.0.2 build 16404
OS Windows 64 bit
RAM 127.74 GB
CPU AMD Ryzen 9 7950X 16-Core Processor
GPU(s) NVIDIA GeForce RTX 4090