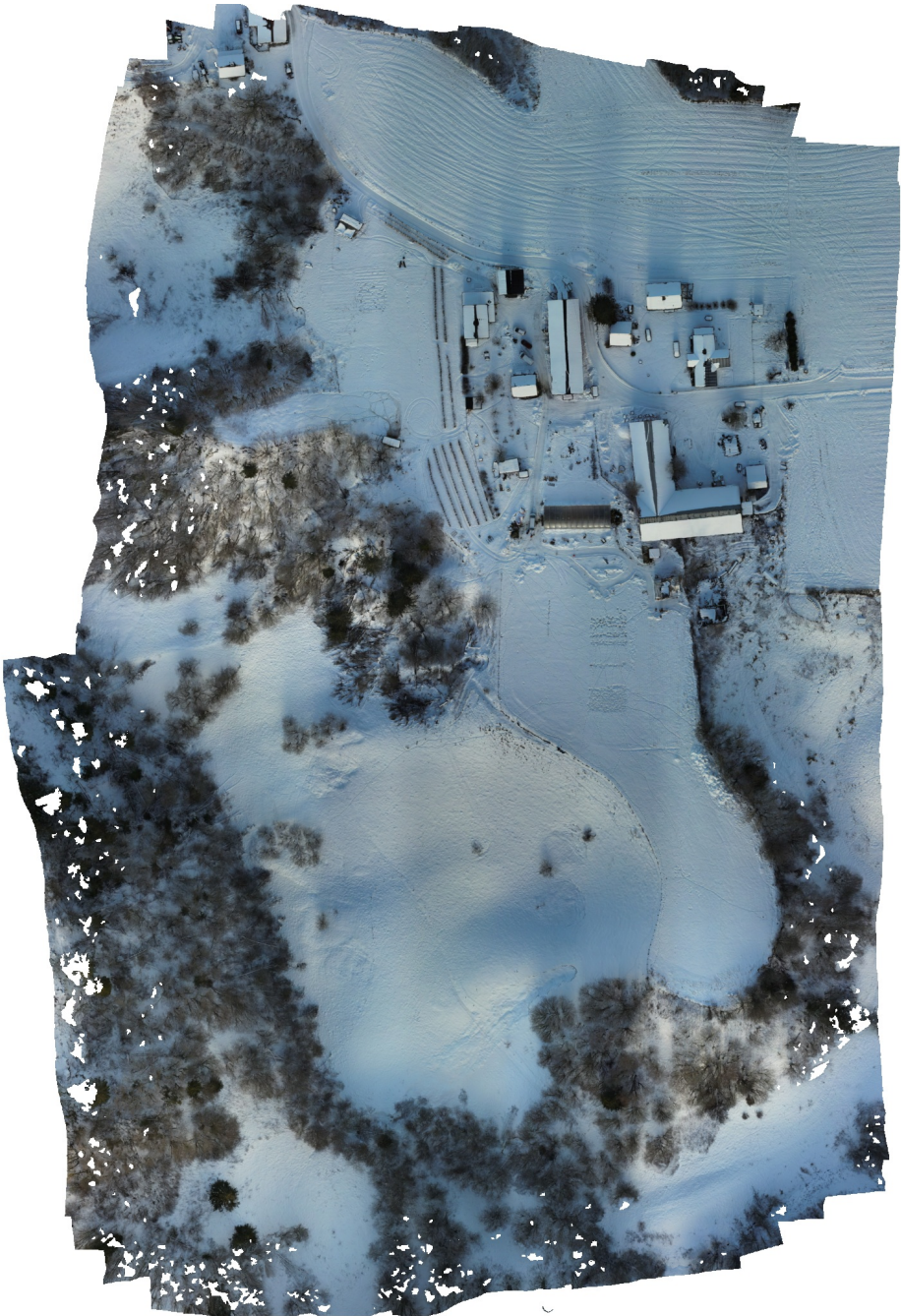


# Sander\_2022-01-13\_1147\_P1

Processing Report

27 June 2024



# Survey Data

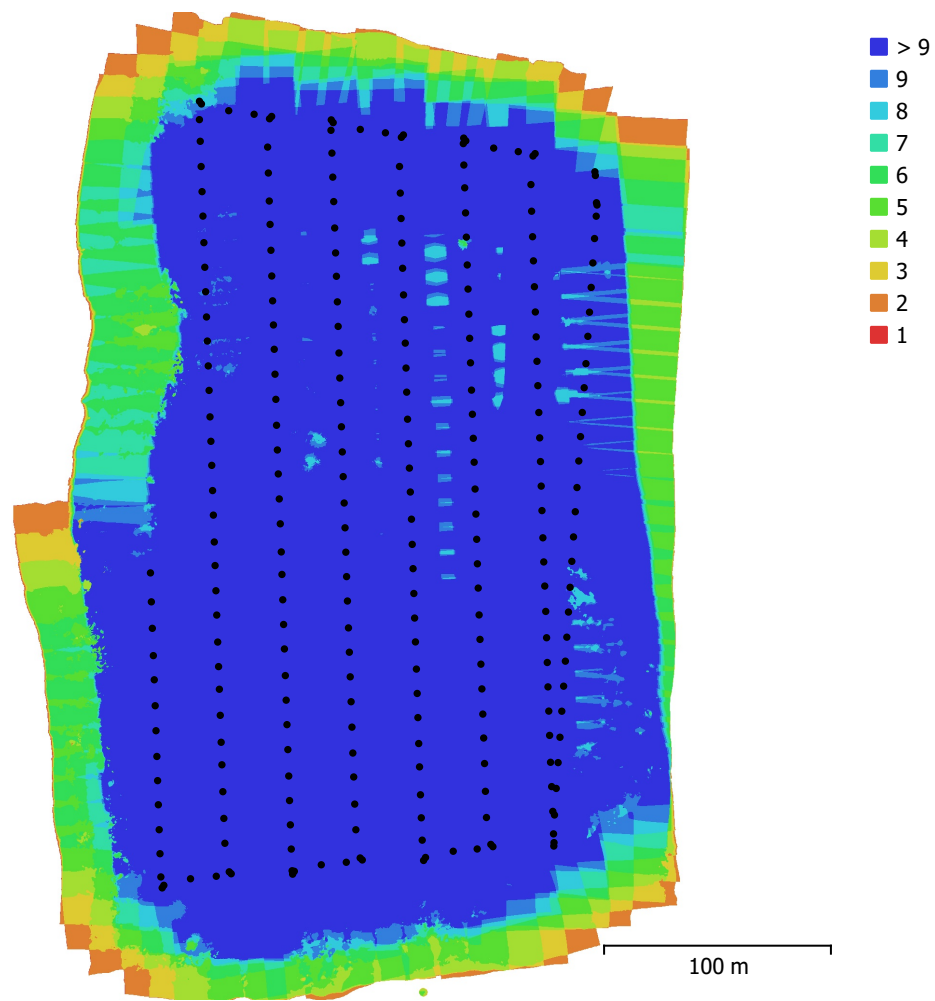


Fig. 1. Camera locations and image overlap.

Number of images:	252	Camera stations:	252
Flying altitude:	83.5 m	Tie points:	114,184
Ground resolution:	1.02 cm/pix	Projections:	895,016
Coverage area:	0.11 km <sup>2</sup>	Reprojection error:	0.655 pix

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

Table 1. Cameras.

# Camera Calibration

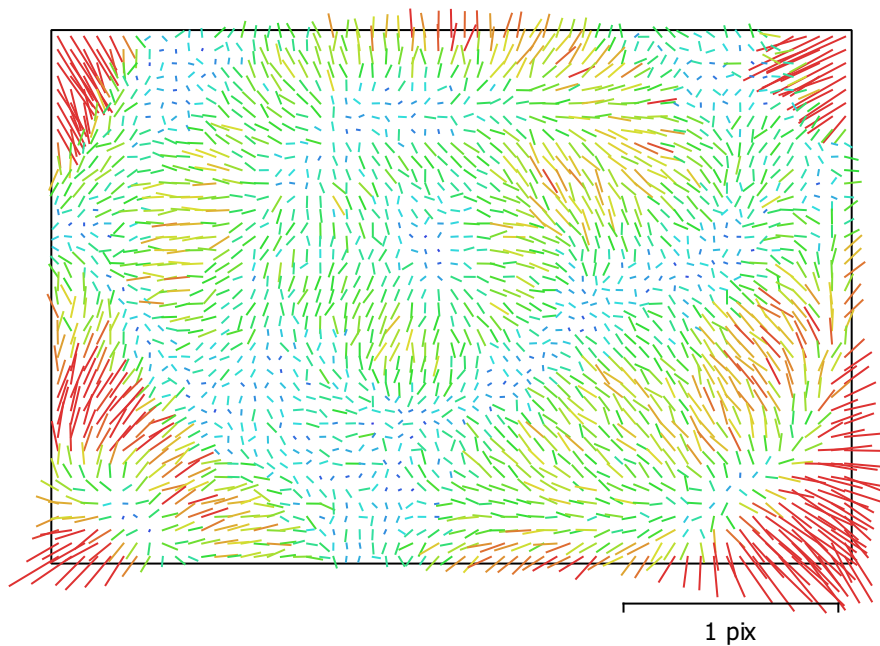


Fig. 2. Image residuals for ZenmuseP1 (35mm).

## ZenmuseP1 (35mm)

252 images

Type	Resolution	Focal Length	Pixel Size
<b>Frame</b>	<b>8192 x 5460</b>	<b>35 mm</b>	<b>4.39 x 4.39 <math>\mu</math>m</b>

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	P1	P2
<b>F</b>	<b>8161.26</b>	0.97	1.00	-0.47	0.03	-0.01	0.10	-0.51	0.11	-0.33	-0.06	0.09
<b>Cx</b>	<b>-10.18</b>	0.026		1.00	-0.01	-0.07	-0.08	0.22	-0.04	0.14	0.64	-0.04
<b>Cy</b>	<b>15.777</b>	0.018			1.00	0.03	-0.07	-0.01	0.00	-0.01	-0.00	0.65
<b>B1</b>	<b>0.0432731</b>	0.0055				1.00	0.01	0.02	-0.02	0.03	-0.05	-0.03
<b>B2</b>	<b>-0.899138</b>	0.0054					1.00	-0.06	0.02	-0.04	0.01	-0.05
<b>K1</b>	<b>-0.0490659</b>	2.2e-05						1.00	-0.87	0.90	-0.01	-0.04
<b>K2</b>	<b>0.0269645</b>	0.00012							1.00	-0.96	0.04	0.01
<b>K3</b>	<b>-0.101904</b>	0.00022								1.00	-0.02	-0.03
<b>P1</b>	<b>-0.00105071</b>	8e-07									1.00	-0.00
<b>P2</b>	<b>0.00106314</b>	6.6e-07										1.00

Table 2. Calibration coefficients and correlation matrix.

# Ground Control Points

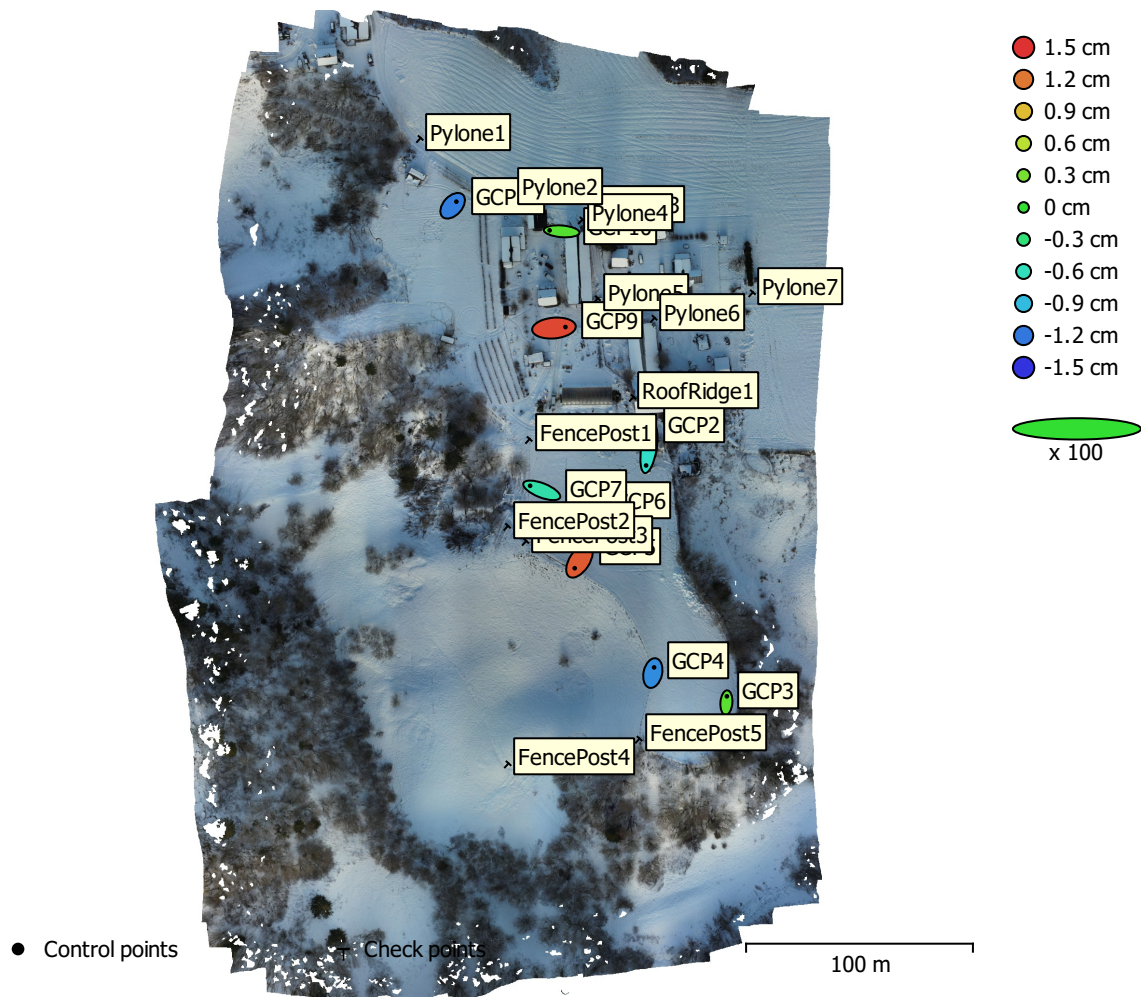


Fig. 3. GCP locations and error estimates.

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)
9	7.57267	6.35759	0.897325	9.88758	9.92821

Table 3. Control points RMSE.

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

<b>Label</b>	<b>X error (cm)</b>	<b>Y error (cm)</b>	<b>Z error (cm)</b>	<b>Total (cm)</b>	<b>Image (pix)</b>
GCP2	-2.50236	-15.2161	-0.65538	15.4344	0.221 (5)
GCP3	0.424851	5.59089	0.182352	5.60997	0.237 (6)
GCP4	1.11183	4.98033	-1.10977	5.2222	0.268 (7)
GCP5	-4.21354	-6.50835	1.32854	7.86623	0.463 (6)
GCP6	12.6496	1.77855	0.377159	12.7796	0.265 (6)
GCP7	-10.2669	4.0117	-0.514496	11.0348	0.400 (8)
GCP9	10.1201	0.912054	1.41147	10.2587	0.289 (7)
GCP10	-10.5907	0.841977	0.148872	10.6252	0.481 (6)
GCP11	3.26706	3.60891	-1.16875	5.00639	0.346 (7)
<b>Total</b>	<b>7.57267</b>	<b>6.35759</b>	<b>0.897325</b>	<b>9.92821</b>	<b>0.345</b>

Table 4. Control points.  
X - Easting, Y - Northing, Z - Altitude.

<b>Label</b>	<b>X error (cm)</b>	<b>Y error (cm)</b>	<b>Z error (cm)</b>	<b>Total (cm)</b>	<b>Image (pix)</b>
Pylone3					0.272 (9)
Pylone4					0.446 (8)
Pylone2					0.383 (9)
Pylone5					0.520 (8)
FencePost1					0.583 (9)
FencePost4					0.447 (11)
RoofRidge1					0.460 (9)
Pylone6					0.490 (8)
FencePost3					0.415 (8)
FencePost2					0.440 (8)
Pylone1					0.365 (10)
Pylone7					0.426 (8)
FencePost5					0.472 (10)
<b>Total</b>					

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

# Digital Elevation Model

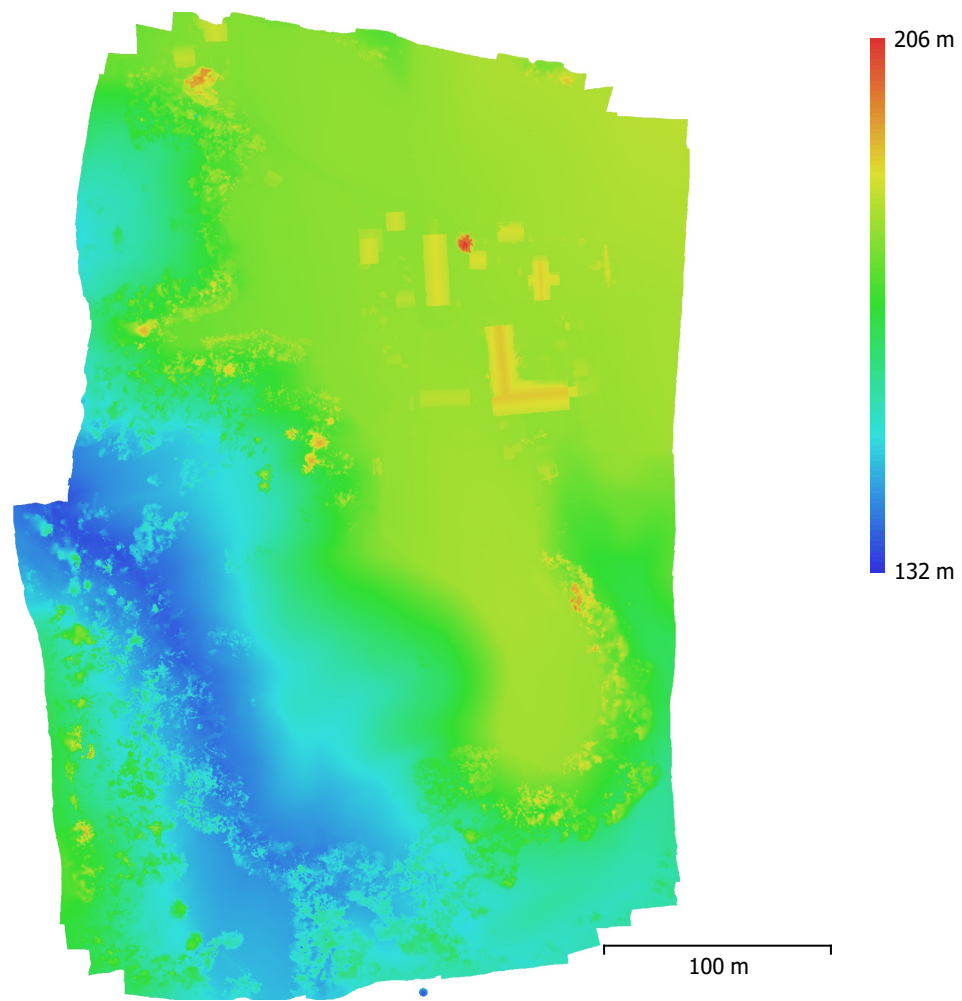


Fig. 4. Reconstructed digital elevation model.

Resolution: 2 cm/pix  
Point density: 0.25 points/cm<sup>2</sup>

# Processing Parameters

## General

Cameras	252
Aligned cameras	252
Markers	22
Coordinate system	ETRS89 / UTM zone 32N + NN2000 height (EPSG::5972)
Rotation angles	Yaw, Pitch, Roll

## Tie Points

Points	114,184 of 144,815
RMS reprojection error	0.126237 (0.655495 pix)
Max reprojection error	0.527104 (39.8444 pix)
Mean key point size	4.28778 pix
Point colors	3 bands, uint8
Key points	No
Average tie point multiplicity	7.83828

## 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	No
Adaptive camera model fitting	Yes
Matching time	1 minutes 17 seconds
Matching memory usage	601.25 MB
Alignment time	28 seconds
Alignment memory usage	161.68 MB

## Optimization parameters

Parameters	f, cx, cy, k1-k3, p1, p2
Adaptive camera model fitting	Yes
Optimization time	3 seconds
Date created	2024:06:27 13:04:54
Software version	2.1.0.17532
File size	20.38 MB

## Depth Maps

Count	252
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## Depth maps generation parameters

Quality	High
Filtering mode	Mild
Max neighbors	16
Processing time	17 minutes 47 seconds
Memory usage	8.49 GB
Date created	2024:06:27 13:50:19
Software version	2.1.0.17532
File size	3.02 GB

## DEM

Size	14,887 x 21,775
Coordinate system	ETRS89 / UTM zone 32N + NN2000 height (EPSG::5972)

## Depth maps generation parameters

Quality	High
Filtering mode	Mild
Max neighbors	16
Processing time	17 minutes 47 seconds
Memory usage	8.49 GB
<b>Reconstruction parameters</b>	
Source data	Depth maps
Interpolation	Enabled
Processing time	15 minutes 27 seconds
Memory usage	13.95 GB
Date created	2024:06:27 14:05:47
Software version	2.1.0.17532
File size	1.09 GB
<b>Orthomosaic</b>	
Size	29,700 x 43,500
Coordinate system	ETRS89 / UTM zone 32N + NN2000 height (EPSG::5972)
Colors	3 bands, uint8
<b>Reconstruction parameters</b>	
Blending mode	Mosaic
Surface	DEM
Enable hole filling	Yes
Enable ghosting filter	No
Processing time	7 minutes 28 seconds
Memory usage	2.98 GB
Date created	2024:06:27 14:28:20
Software version	2.1.0.17532
File size	11.42 GB
<b>System</b>	
Software name	Agisoft Metashape Professional
Software version	2.1.0 build 17532
OS	Windows 64 bit
RAM	127.15 GB
CPU	AMD Ryzen 9 7950X 16-Core Processor
GPU(s)	NVIDIA GeForce RTX 4080 SUPER