

Day 10 (Survey 5)

Processing Report

13 February 2018



Survey Data

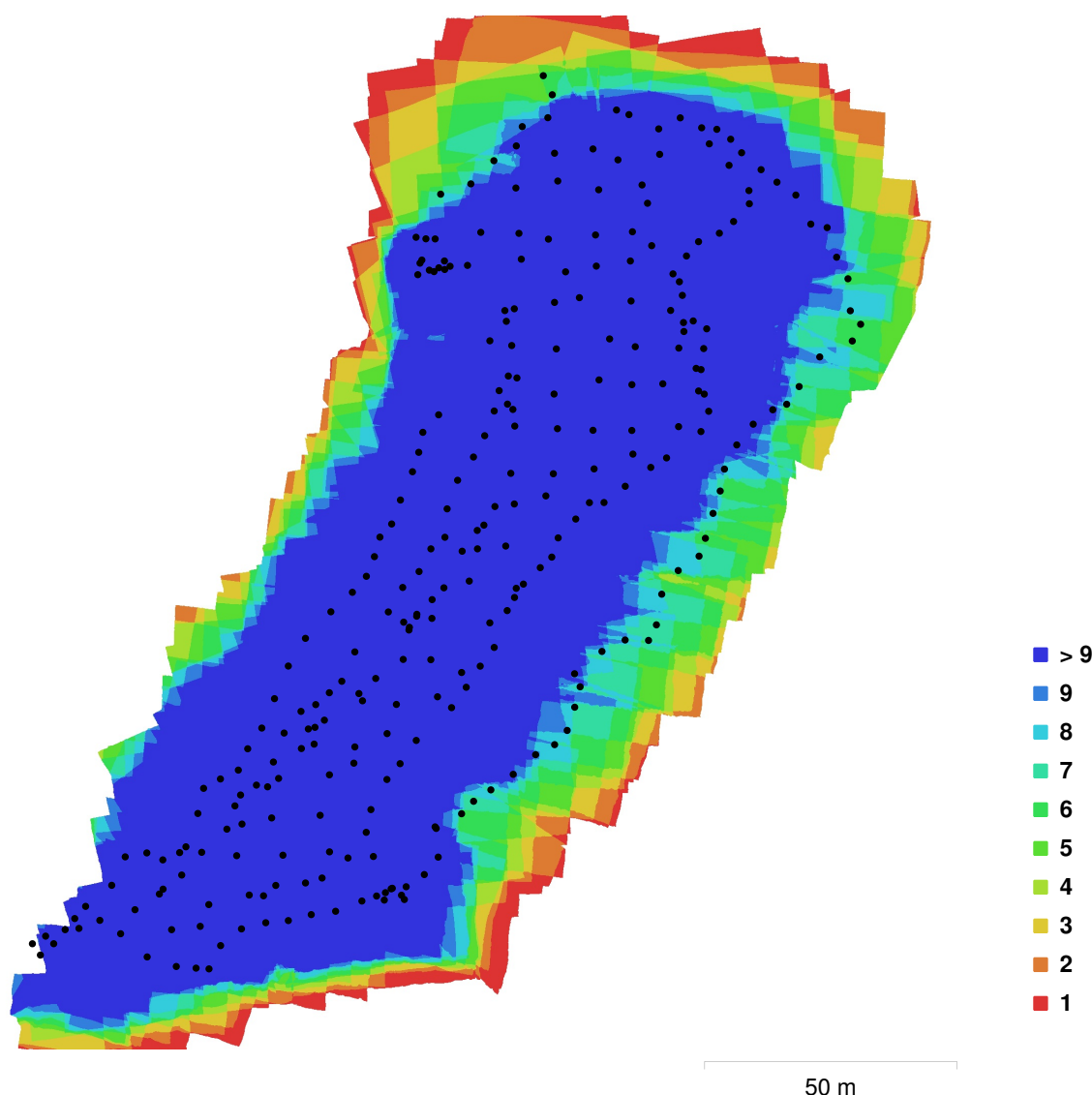


Fig. 1. Camera locations and image overlap.

Number of images:	298	Camera stations:	298
Flying altitude:	30.4 m	Tie points:	1,166,275
Ground resolution:	8.79 mm/pix	Projections:	3,931,742
Coverage area:	0.02 km²	Reprojection error:	1.24 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
Canon PowerShot D30 (5 mm)	4000 x 3000	5 mm	1.55 x 1.55 µm	No

Table 1. Cameras.

Camera Calibration

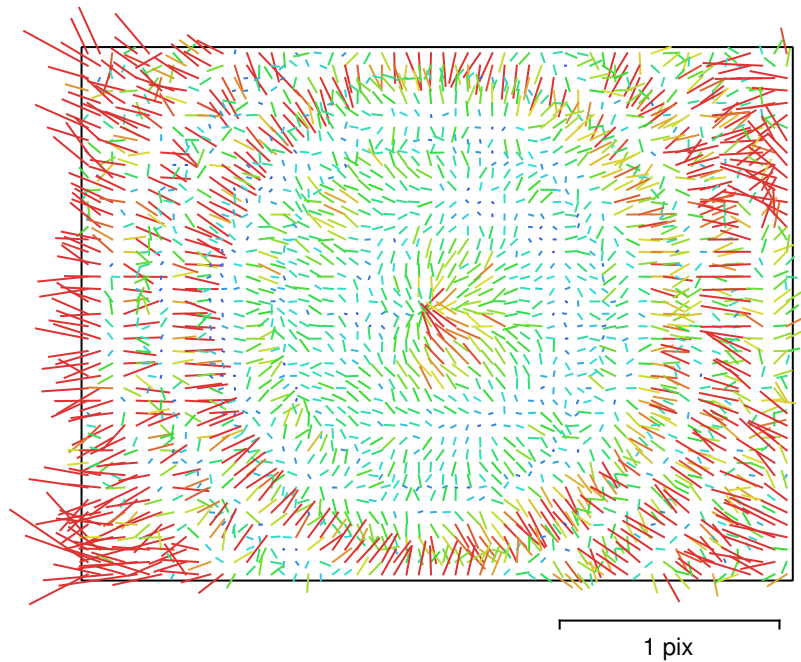


Fig. 2. Image residuals for Canon PowerShot D30 (5 mm).

Canon PowerShot D30 (5 mm)

298 images

Type	Resolution	Focal Length	Pixel Size
Frame	4000 x 3000	5 mm	1.55 x 1.55 μm

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	P1	P2
F	3276.74	0.092	1.00	-0.15	-0.13	0.02	-0.02	0.03	0.06	-0.05	-0.23	-0.08
Cx	-15.4309	0.087		1.00	0.01	-0.26	0.03	-0.02	-0.01	0.01	0.92	0.01
Cy	-8.66948	0.092			1.00	-0.02	-0.32	-0.02	-0.00	0.00	0.01	0.93
B1	-0.996932	0.011				1.00	-0.02	0.04	-0.04	0.04	-0.30	-0.02
B2	0.583552	0.01					1.00	0.01	-0.01	0.00	0.05	-0.36
K1	0.00243633	4.2e-05						1.00	-0.94	0.89	-0.02	-0.02
K2	-0.027078	0.00018							1.00	-0.98	-0.01	-0.00
K3	0.0235598	0.00023								1.00	0.01	0.00
P1	-0.00173149	6.2e-06									1.00	0.00
P2	-0.000270998	6.3e-06										1.00

Table 2. Calibration coefficients and correlation matrix.

Ground Control Points

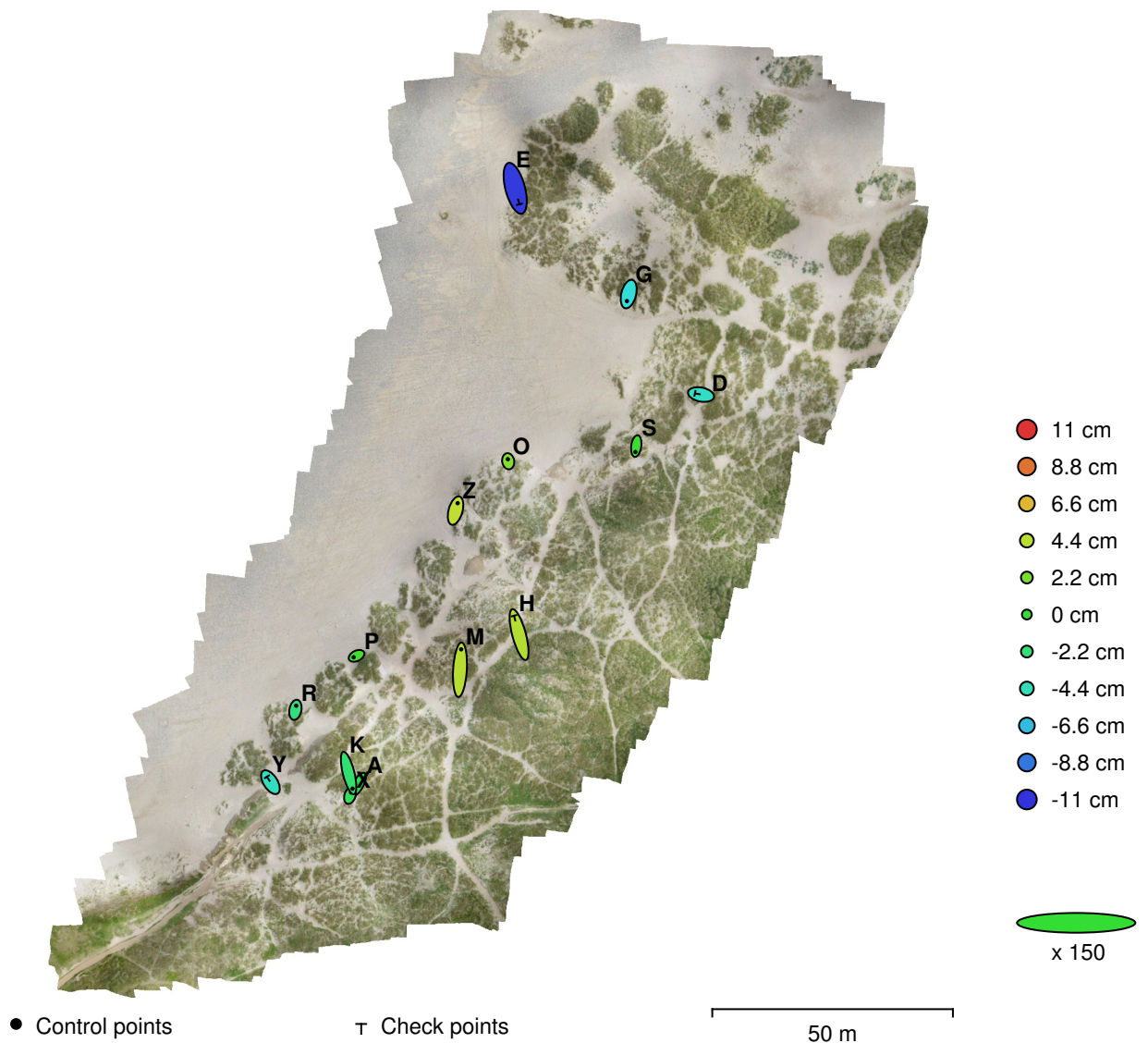


Fig. 3. GCP locations and error estimates.

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)
10	0.620125	2.60326	2.9376	2.6761	3.97379

Table 3. Control points RMSE.

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

Count	X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total (cm)
4	1.33332	3.50651	6.63098	3.75145	7.61861

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)
Z	0.578724	2.05706	4.47689	4.96074	0.939 (25)
O	-0.0947407	0.575537	2.48116	2.5488	0.916 (29)
S	-0.23013	-1.62764	0.236824	1.6608	1.449 (22)
R	0.223678	1.13781	-2.4126	2.6768	0.862 (30)
G	-0.49421	-1.945	-5.46838	5.82499	1.024 (24)
M	0.33432	5.6629	4.24731	7.0866	1.231 (25)
P	-0.788089	-0.386959	0.532849	1.02701	0.902 (27)
A	-1.0725	-1.95393	-0.616591	2.31264	0.919 (22)
X	0.280116	0.836835	-1.38049	1.63845	0.873 (23)
K	1.09217	-4.32938	-1.92529	4.86242	0.898 (22)
Total	0.620125	2.60326	2.9376	3.97379	1.009

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

Label	X error (cm)	Y error (cm)	Z error (cm)	Total (cm)	Image (pix)
E	1.17514	-4.41802	-10.7705	11.7006	1.186 (18)
D	-1.68041	0.33325	-4.68066	4.98432	1.029 (21)
Y	-0.968789	1.50093	-4.58784	4.92337	1.042 (26)
H	-1.40276	5.22491	4.11322	6.79603	1.904 (17)
Total	1.33332	3.50651	6.63098	7.61861	1.294

Table 6. Check points.
X - Easting, Y - Northing, Z - Altitude.

Digital Elevation Model

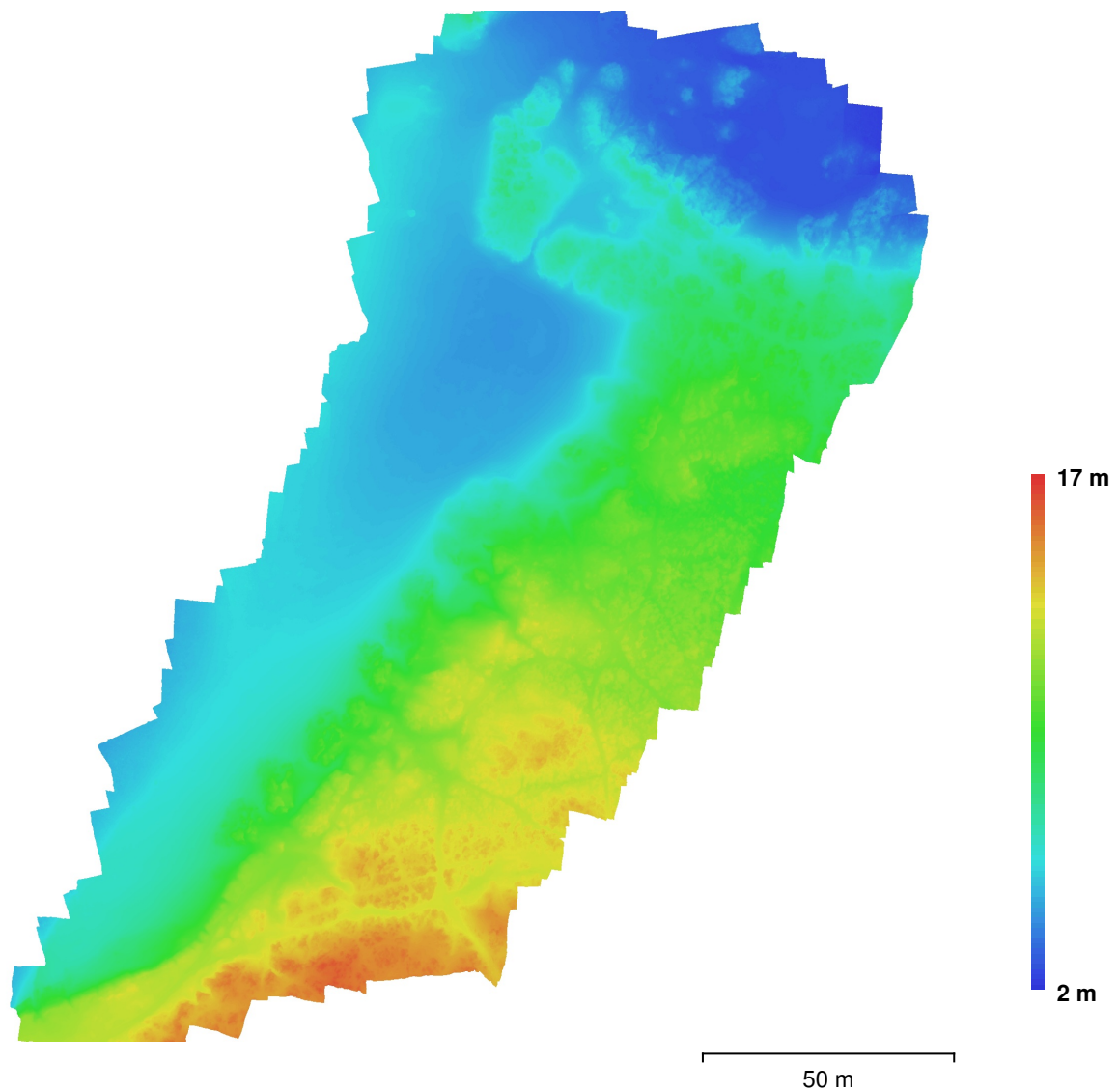


Fig. 4. Reconstructed digital elevation model.

Resolution: 1.76 cm/pix
Point density: 32.3 points/cm²

Processing Parameters

General

Cameras	298
Aligned cameras	298
Markers	14
Coordinate system	OSGB 1936 / British National Grid (EPSG::27700)
Rotation angles	Yaw, Pitch, Roll

Point Cloud

Points	1,166,275 of 1,242,920
RMS reprojection error	0.214948 (1.23753 pix)
Max reprojection error	0.764277 (41.2374 pix)
Mean key point size	5.55455 pix
Effective overlap	3.62198

Alignment parameters

Accuracy	High
Generic preselection	Yes
Key point limit	100,000
Tie point limit	0
Adaptive camera model fitting	Yes
Matching time	1 hours 20 minutes
Alignment time	11 minutes 45 seconds

Optimization parameters

Parameters	f, b1, b2, cx, cy, k1-k3, p1, p2
Fit rolling shutter	No
Optimization time	44 seconds

Depth Maps

Count	298
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Reconstruction parameters

Quality	High
Filtering mode	Aggressive
Processing time	13 hours 13 minutes

Dense Point Cloud

Points	84,385,355
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Reconstruction parameters

Quality	High
Depth filtering	Aggressive
Depth maps generation time	13 hours 13 minutes
Dense cloud generation time	2 hours 50 minutes

Model

Faces	16,744,417
Vertices	8,380,179

Reconstruction parameters

Surface type	Height field
Source data	Dense
Interpolation	Enabled
Quality	High
Depth filtering	Aggressive
Face count	16,877,068
Processing time	6 minutes 33 seconds

DEM

Size	14,699 x 17,680
Coordinate system	OSGB 1936 / British National Grid (EPSG::27700)

Reconstruction parameters

Source data	Dense cloud
Interpolation	Enabled
Processing time	7 minutes 54 seconds

Orthomosaic

Size	22,500 x 23,302
Coordinate system	OSGB 1936 / British National Grid (EPSG::27700)
Channels	3, uint8
Reconstruction parameters	
Blending mode	Mosaic
Surface	DEM
Enable color correction	No
Enable hole filling	Yes
Processing time	6 minutes 34 seconds
Software	
Version	1.3.2 build 4205
Platform	Linux 64