

Day 8 (Survey 3)

Processing Report
13 February 2018



Survey Data

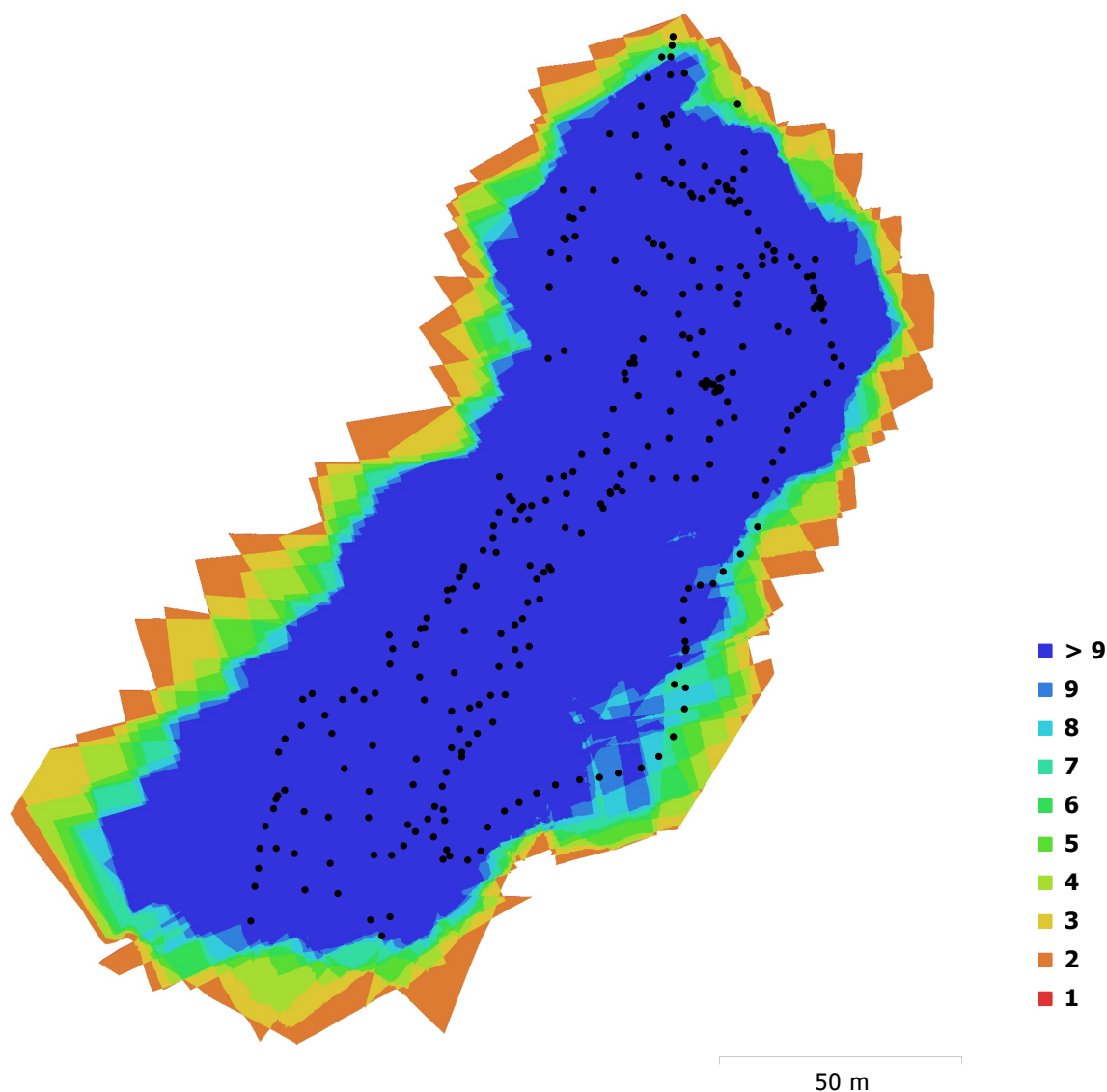


Fig. 1. Camera locations and image overlap.

Number of images:	298	Camera stations:	298
Flying altitude:	34.5 m	Tie points:	1,452,172
Ground resolution:	9.78 mm/pix	Projections:	8,002,133
Coverage area:	0.0202 km ²	Reprojection error:	0.697 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

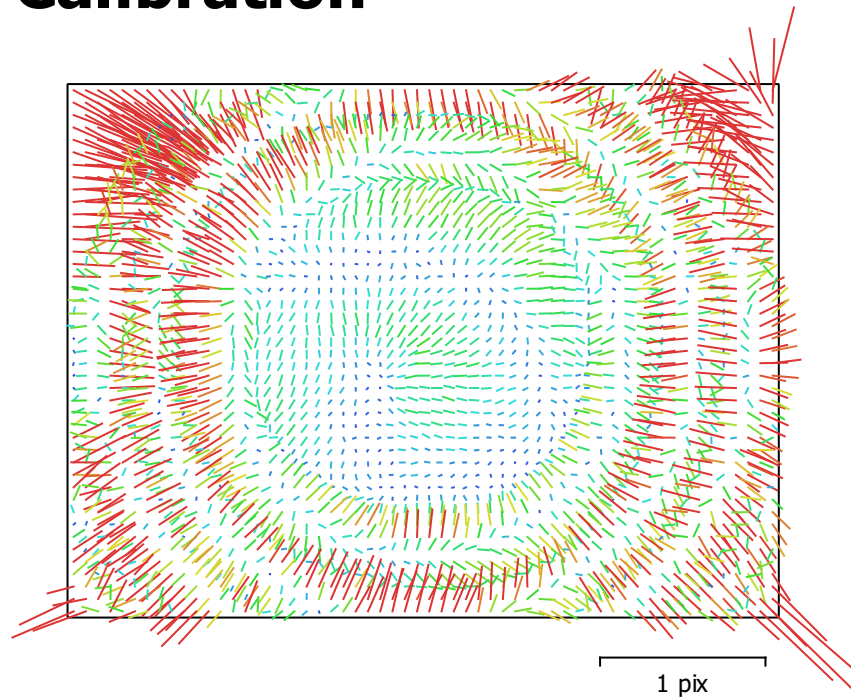


Fig. 2. Image residuals for Canon PowerShot D30 (5 mm).

Canon PowerShot D30 (5 mm)

298 images

Type
Frame

Resolution
4000 x 3000

Focal Length
5 mm

Pixel Size
1.55 x 1.55 μm

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	3292.85	0.029	1.00	0.39	-0.09	-0.25	0.09	-0.08	0.13	-0.14	0.14	0.17	-0.14
Cx	-28.2538	0.032		1.00	0.03	-0.50	-0.14	0.02	0.03	-0.04	0.04	0.92	0.01
Cy	3.39421	0.03			1.00	0.14	-0.46	0.00	-0.01	0.01	-0.00	0.04	0.95
B1	-1.48238	0.004				1.00	-0.01	-0.00	-0.02	0.02	-0.02	-0.34	0.13
B2	0.0530544	0.0039					1.00	0.01	-0.00	0.00	-0.00	-0.14	-0.33
K1	-0.004668	2.7e-05						1.00	-0.97	0.92	-0.87	0.02	-0.01
K2	0.0444225	0.00019							1.00	-0.99	0.96	0.03	-0.01
K3	-0.170559	0.00051								1.00	-0.99	-0.03	0.00
K4	0.172414	0.00048									1.00	0.04	-0.00
P1	-0.00343529	2.1e-06										1.00	0.03
P2	-0.00104095	2.1e-06											1.00

Table 2. Calibration coefficients and correlation matrix.

Ground Control Points

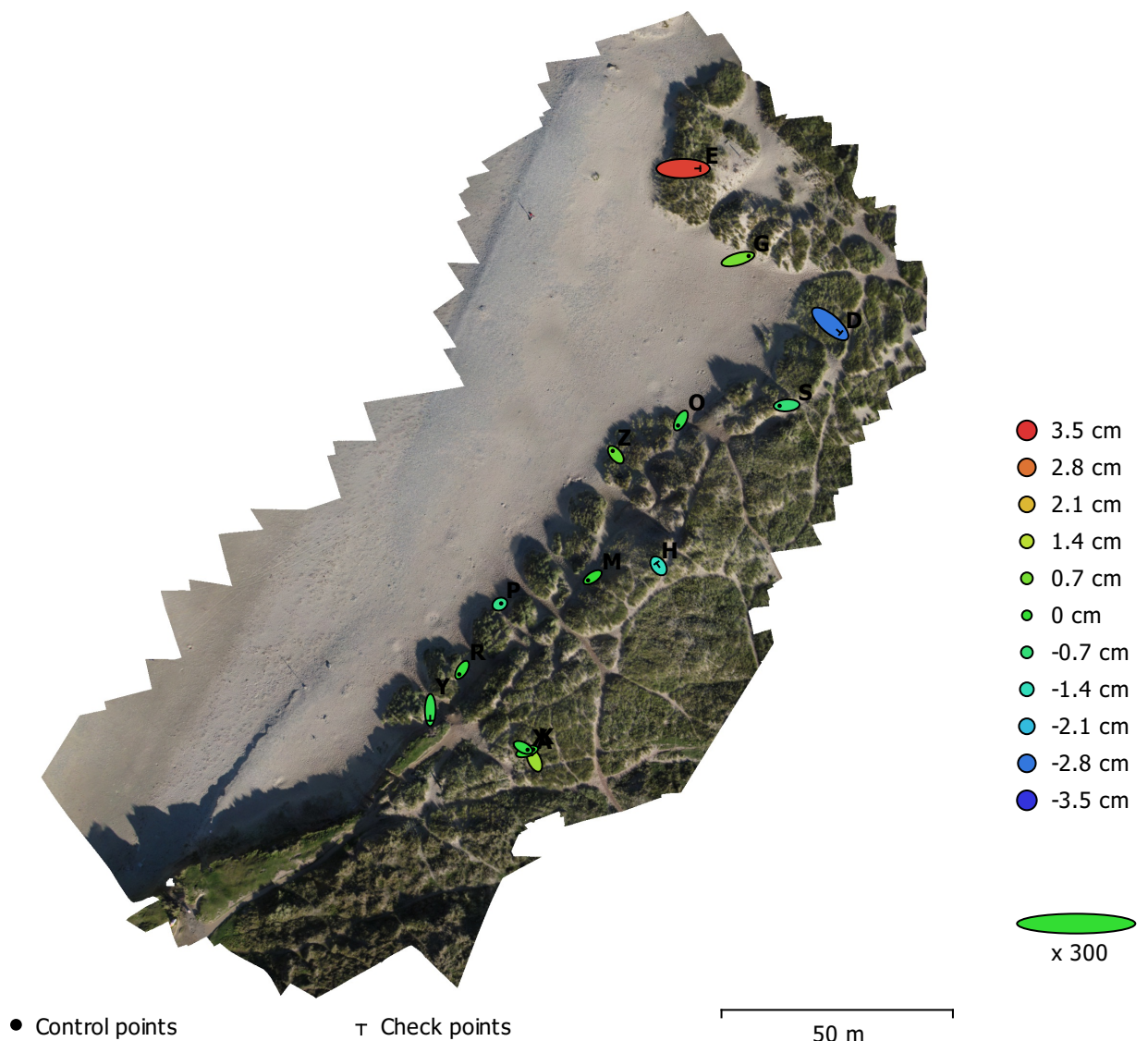


Fig. 3. GCP locations and error estimates.

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	0.759989	0.498983	0.572202	0.909158	1.07424

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	1.45671	1.03598	2.30506	1.78753	2.91695

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)
A	-0.36921	0.816325	1.0617	1.38921	1.263 (15)
G	1.54452	0.440257	0.683828	1.74556	0.652 (39)
K	0.898336	0.285822	-0.0256907	0.94306	1.166 (15)
M	-0.661162	-0.437746	-0.0353339	0.793728	1.201 (16)
O	-0.405125	-0.721398	-0.27356	0.871422	0.706 (51)
P	0.194715	0.0974953	-0.885361	0.911748	1.024 (36)
R	-0.405051	-0.642786	-0.102975	0.76671	0.822 (35)
S	-1.00736	-0.072878	-0.728787	1.24548	0.846 (26)
X	0.653102	-0.334027	-0.179462	0.755197	0.866 (16)
Z	-0.449907	0.544366	0.494743	0.862277	0.600 (38)
Total	0.759989	0.498983	0.572202	1.07424	0.866

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

Label	X error (cm)	Y error (cm)	Z error (cm)	Total (cm)	Image (pix)
D	1.52118	-1.31507	-2.82067	3.46405	0.686 (17)
E	2.46744	0.0132225	3.33091	4.14529	0.575 (30)
H	-0.292531	0.420601	-1.44513	1.53326	0.692 (10)
Y	-0.0144473	-1.54485	-0.337088	1.58126	0.859 (34)
Total	1.45671	1.03598	2.30506	2.91695	0.725

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

Digital Elevation Model

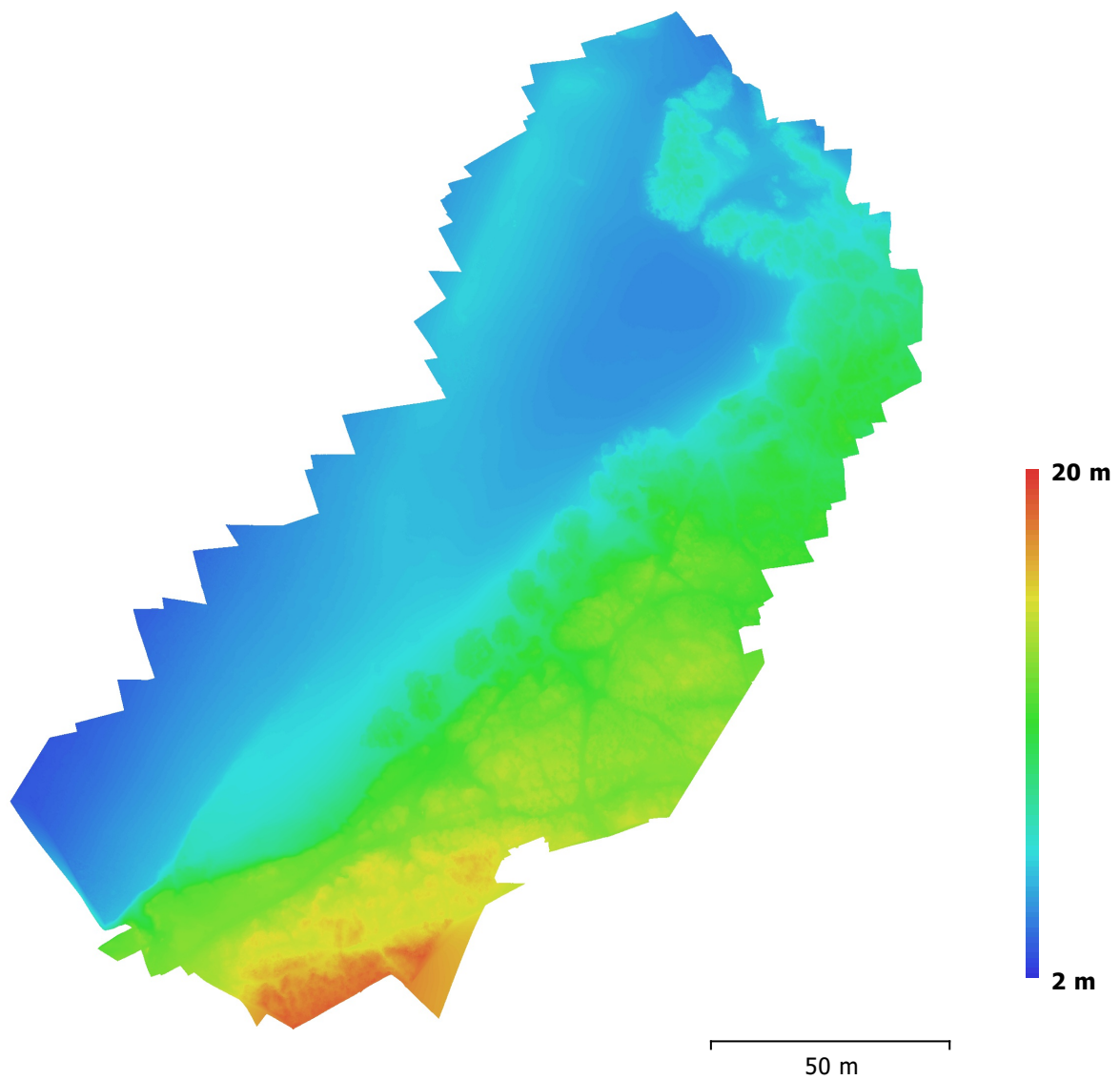


Fig. 4. Reconstructed digital elevation model.

Resolution: 1.96 cm/pix
Point density: 26.1 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	1,452,172 of 1,644,555
RMS reprojection error	0.184159 (0.696765 pix)
Max reprojection error	0.66681 (41.6067 pix)
Mean key point size	3.53177 pix
Effective overlap	6.86049

Alignment parameters

Accuracy	High
Generic preselection	Yes
Reference preselection	Yes
Key point limit	100,000
Tie point limit	0
Adaptive camera model fitting	Yes
Matching time	7 hours 58 minutes
Alignment time	1 hours 50 minutes

Optimization parameters

Parameters	f, b1, b2, cx, cy, k1-k4, p1, p2
Fit rolling shutter	No
Optimization time	1 minutes 15 seconds

Dense Point Cloud

Points	60,423,393
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Reconstruction parameters

Quality	High
Depth filtering	Aggressive
Depth maps generation time	13 hours 2 minutes
Dense cloud generation time	2 hours 29 minutes

Model

Faces	3,983,909
Vertices	1,996,638

Reconstruction parameters

Surface type	Height field
Source data	Dense
Interpolation	Enabled
Quality	High
Depth filtering	Aggressive
Face count	4,028,221
Processing time	2 minutes 49 seconds

Orthomosaic

Size	19,554 x 21,782
Coordinate system	OSGB 1936 / British National Grid (EPSG::27700)
Channels	3, uint8

Reconstruction parameters

Blending mode	Mosaic
Surface	Mesh
Enable color correction	No
Enable hole filling	Yes
Processing time	28 minutes 59 seconds

Software

Version	1.3.2 build 4205
Platform	Windows 64