

# Day 5 (Survey 1)

Processing Report

13 February 2018



# Survey Data

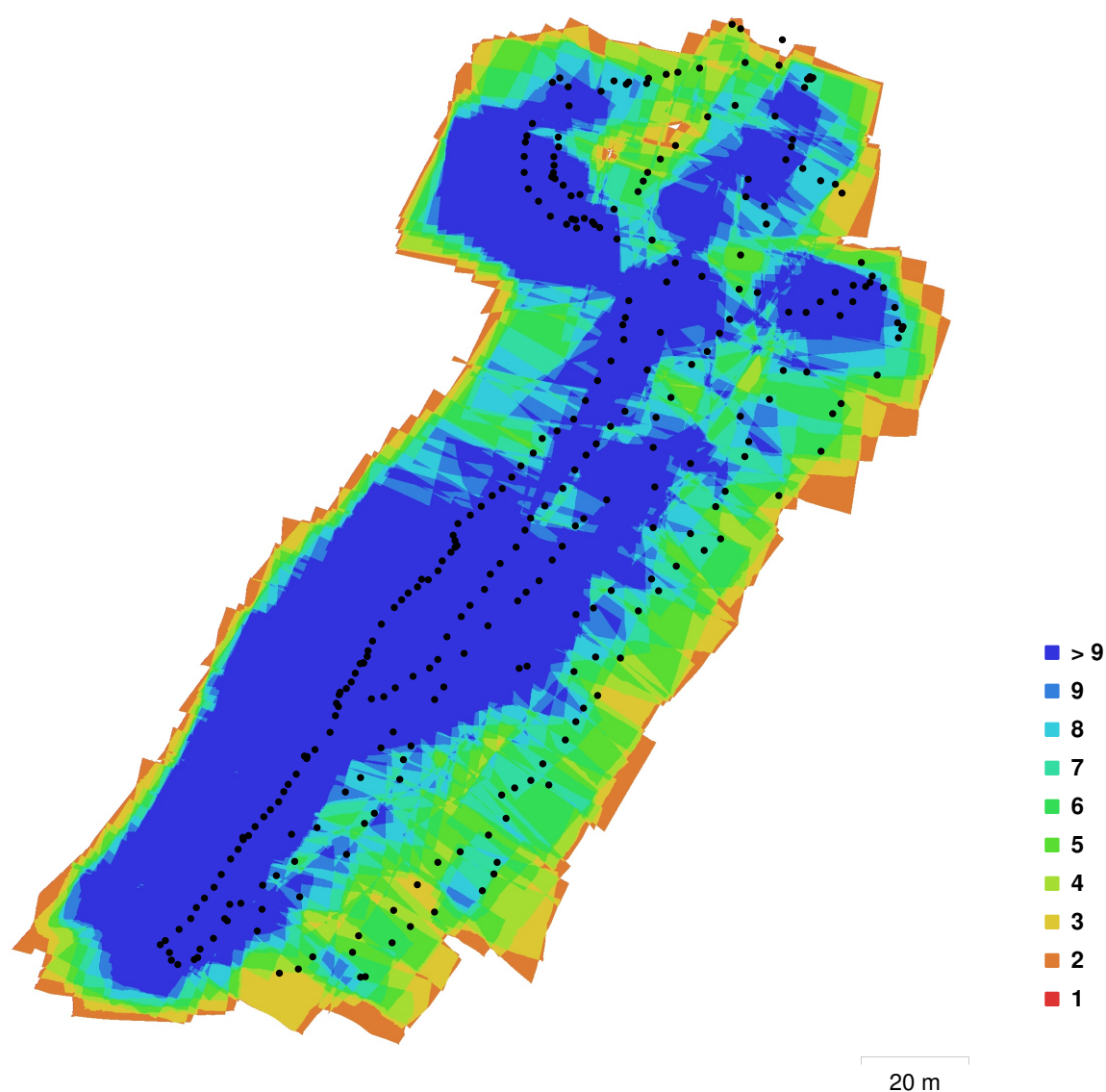


Fig. 1. Camera locations and image overlap.

Number of images:	298	Camera stations:	297
Flying altitude:	21 m	Tie points:	1,856,820
Ground resolution:	6.04 mm/pix	Projections:	6,235,153
Coverage area:	0.0161 km <sup>2</sup>	Reprojection error:	0.727 pix

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

Table 1. Cameras.

# Camera Calibration

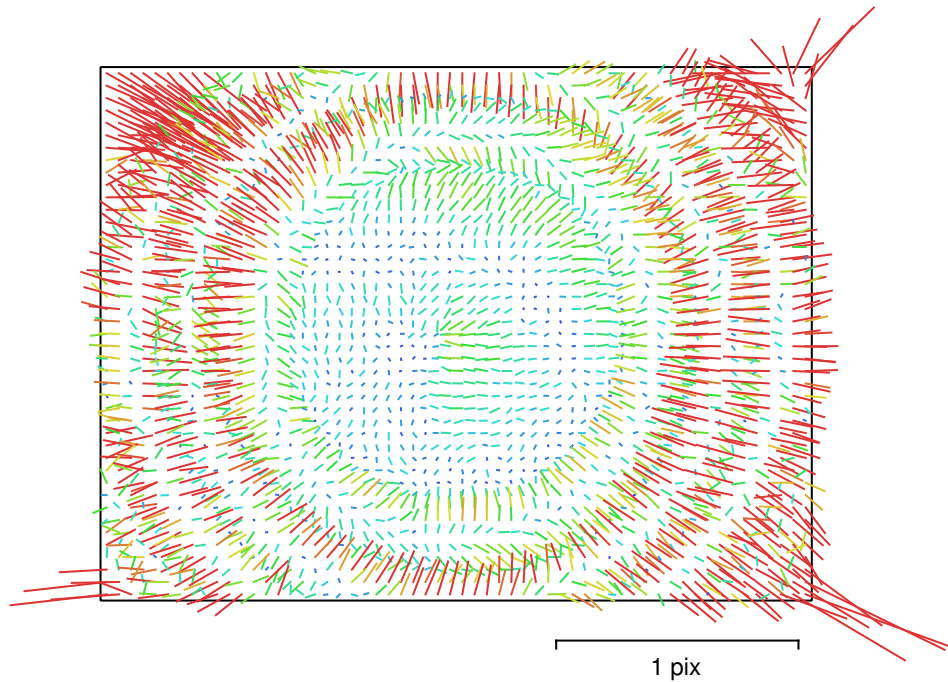


Fig. 2. Image residuals for Canon PowerShot D30 (5 mm).

## Canon PowerShot D30 (5 mm)

298 images

Type	Resolution	Focal Length	Pixel Size
Frame	4000 x 3000	5 mm	1.55 x 1.55 $\mu\text{m}$

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	3293.92	0.042	1.00	-0.09	-0.05	-0.13	-0.01	-0.07	0.13	-0.12	0.12	-0.24	0.03
Cx	-32.2416	0.052		1.00	-0.02	-0.36	0.05	-0.04	0.02	-0.03	0.04	0.92	-0.01
Cy	3.08695	0.05			1.00	-0.02	-0.35	-0.00	-0.01	0.02	-0.02	-0.03	0.92
B1	-1.45392	0.0087				1.00	-0.05	0.03	-0.02	0.02	-0.02	-0.39	0.00
B2	0.543809	0.0083					1.00	-0.00	0.01	-0.01	0.01	0.02	-0.43
K1	-0.00469349	4.1e-05						1.00	-0.96	0.92	-0.86	-0.04	-0.00
K2	0.0464851	0.00028							1.00	-0.99	0.96	0.02	-0.01
K3	-0.169397	0.00077								1.00	-0.99	-0.02	0.01
K4	0.168952	0.00072									1.00	0.03	-0.02
P1	-0.00371738	3.8e-06										1.00	-0.04
P2	-0.000954705	3.6e-06											1.00

Table 2. Calibration coefficients and correlation matrix.

# Ground Control Points

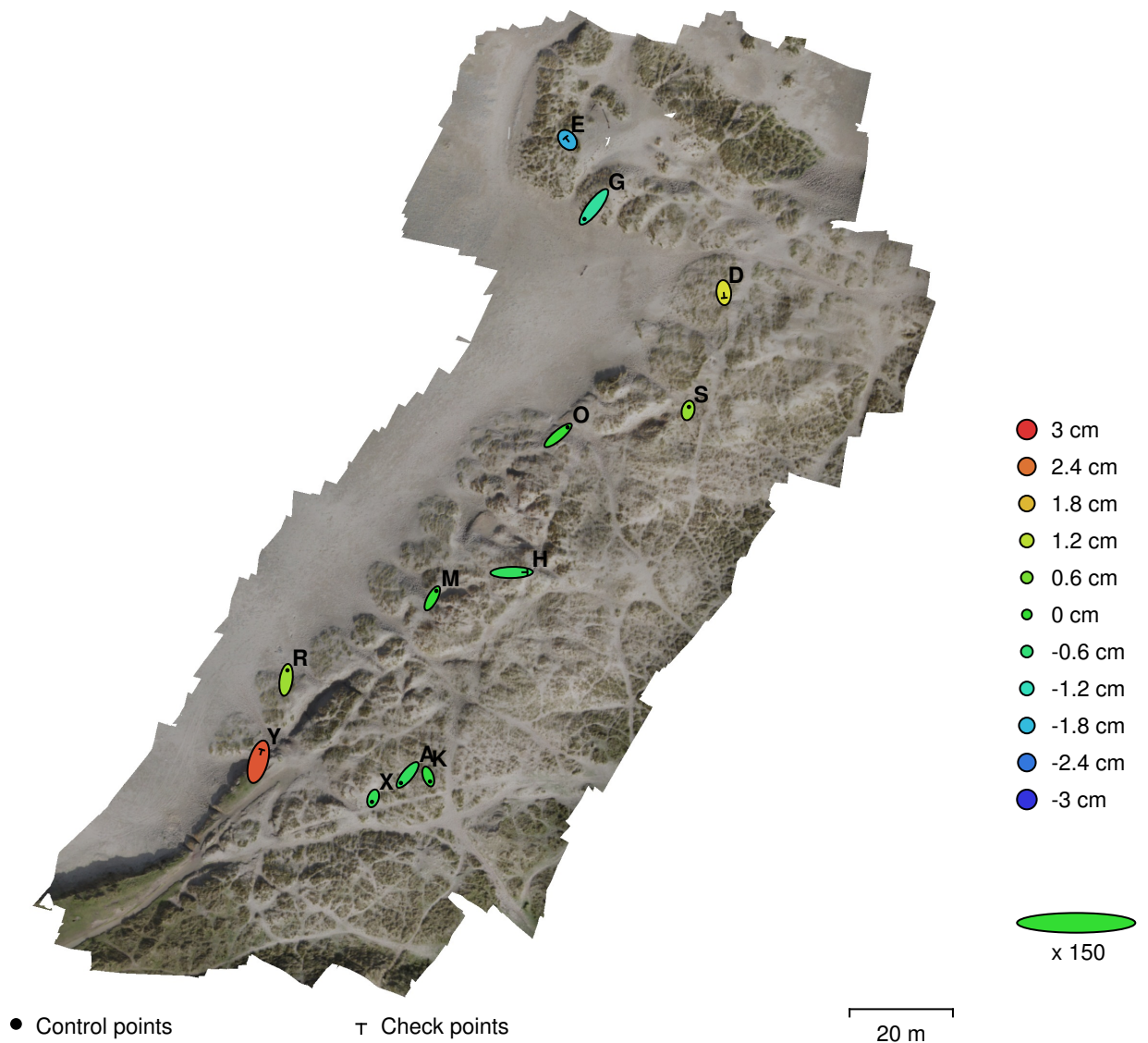


Fig. 3. GCP locations and error estimates.

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)
8	1.43372	1.98663	0.584657	2.44995	2.51875

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	2.09432	1.72981	1.82185	2.71633	3.27071

Table 4. Check 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>
A	-1.71726	-2.0915	-0.376565	2.73225	0.410 (8)
G	-2.43147	-3.14958	-0.9572	4.09244	0.779 (16)
K	0.455657	-1.27709	-0.129827	1.36215	1.198 (7)
M	1.05183	1.92906	-0.0232849	2.19731	0.678 (21)
O	2.451	2.05947	0.0214492	3.20145	0.601 (13)
R	0.35565	2.45972	0.91559	2.64859	0.207 (18)
S	0.208919	0.908351	0.842774	1.25659	0.606 (11)
X	-0.302993	-0.900308	-0.331857	1.00622	0.422 (8)
<b>Total</b>	<b>1.43372</b>	<b>1.98663</b>	<b>0.584657</b>	<b>2.51875</b>	<b>0.639</b>

Table 5. 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>
D	0.121741	-1.34942	1.44302	1.97941	0.483 (8)
E	-0.505649	0.613345	-1.94736	2.10335	0.669 (9)
H	4.05717	0.0832759	-0.393885	4.07709	0.531 (18)
Y	0.901995	3.12489	2.69199	4.22201	0.419 (12)
<b>Total</b>	<b>2.09432</b>	<b>1.72981</b>	<b>1.82185</b>	<b>3.27071</b>	<b>0.527</b>

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



# Digital Elevation Model

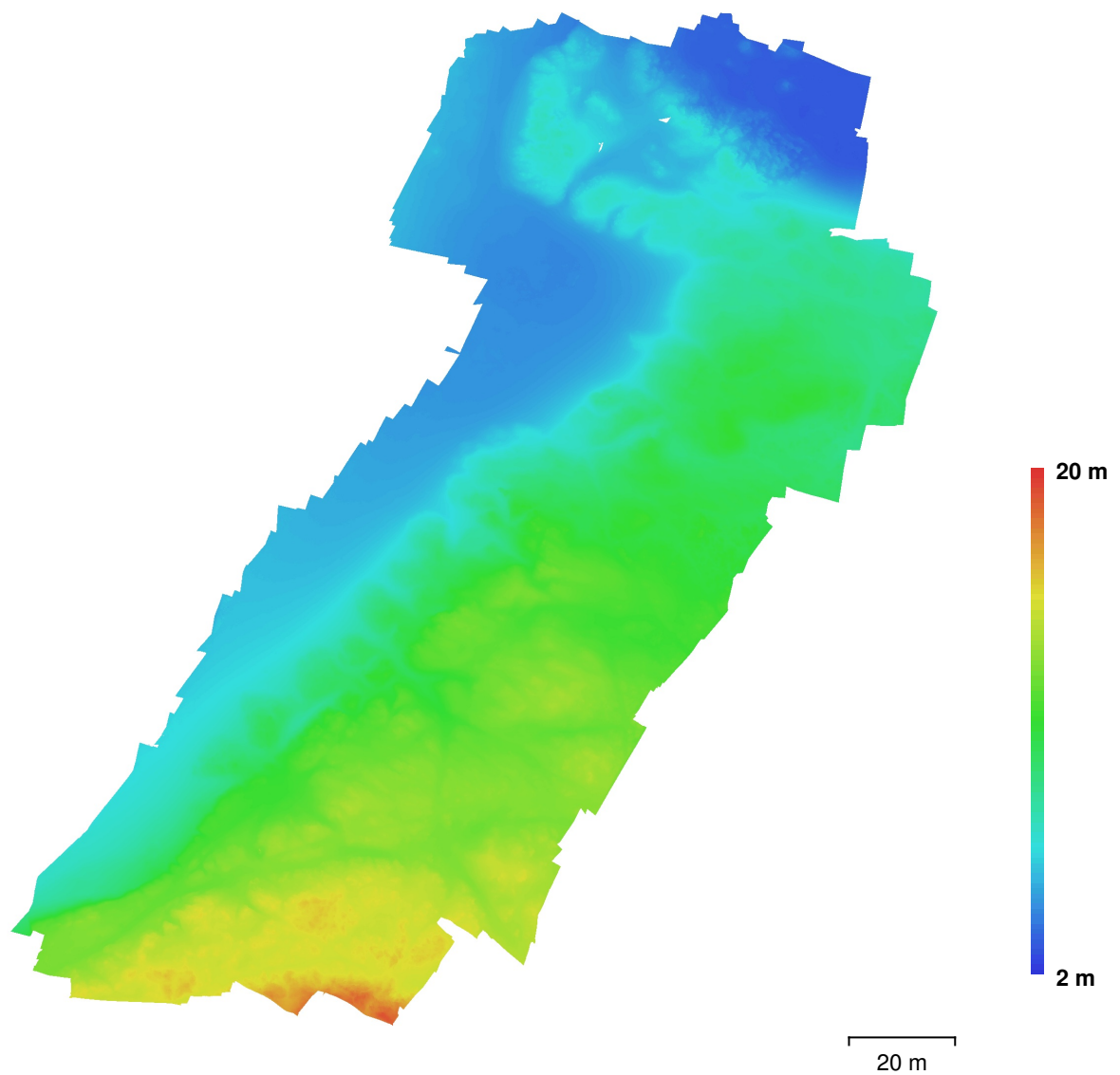


Fig. 4. Reconstructed digital elevation model.

Resolution: 1.21 cm/pix  
Point density: 68.6 points/cm<sup>2</sup>

# Processing Parameters

## General

Cameras	298
Aligned cameras	297
Markers	12
Coordinate system	OSGB 1936 / British National Grid (EPSG::27700)
Rotation angles	Yaw, Pitch, Roll

## Point Cloud

Points	1,856,820 of 1,978,333
RMS reprojection error	0.150065 (0.726912 pix)
Max reprojection error	0.556412 (34.8039 pix)
Mean key point size	4.5717 pix
Effective overlap	3.52432

### 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	47 minutes 25 seconds
Alignment time	11 minutes 54 seconds

### Optimization parameters

Parameters	f, b1, b2, cx, cy, k1-k4, p1, p2
Fit rolling shutter	No
Optimization time	35 seconds

## Depth Maps

Count	297
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### Reconstruction parameters

Quality	High
Filtering mode	Aggressive
Processing time	6 hours 29 minutes

## Dense Point Cloud

Points	130,432,521
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### Reconstruction parameters

Quality	High
Depth filtering	Aggressive
Depth maps generation time	6 hours 29 minutes
Dense cloud generation time	1 hours 3 minutes

## Model

Faces	25,784,033
Vertices	12,903,469
<b>Reconstruction parameters</b>	
Surface type	Height field
Source data	Dense
Interpolation	Enabled
Quality	High
Depth filtering	Aggressive
Face count	26,086,504
Processing time	12 minutes 1 seconds

## Orthomosaic

Size	28,940 x 31,625
Coordinate system	OSGB 1936 / British National Grid (EPSG::27700)
Channels	3, uint8
<b>Reconstruction parameters</b>	
Blending mode	Mosaic
Surface	Mesh



Enable color correction

Enable hole filling

Processing time

**Software**

Version

Platform

No

Yes

46 minutes 8 seconds

1.3.2 build 4205

Linux 64