

# Drone survey Calibration report



Photo: Mischa Keijser



Adaptation  
to climate  
change

# **Drone survey Calibration report**

**Version:**

1.0

**Authors:**

# Interreg Dijk NL

19/06/2020

19 August 2020





# Survey Data

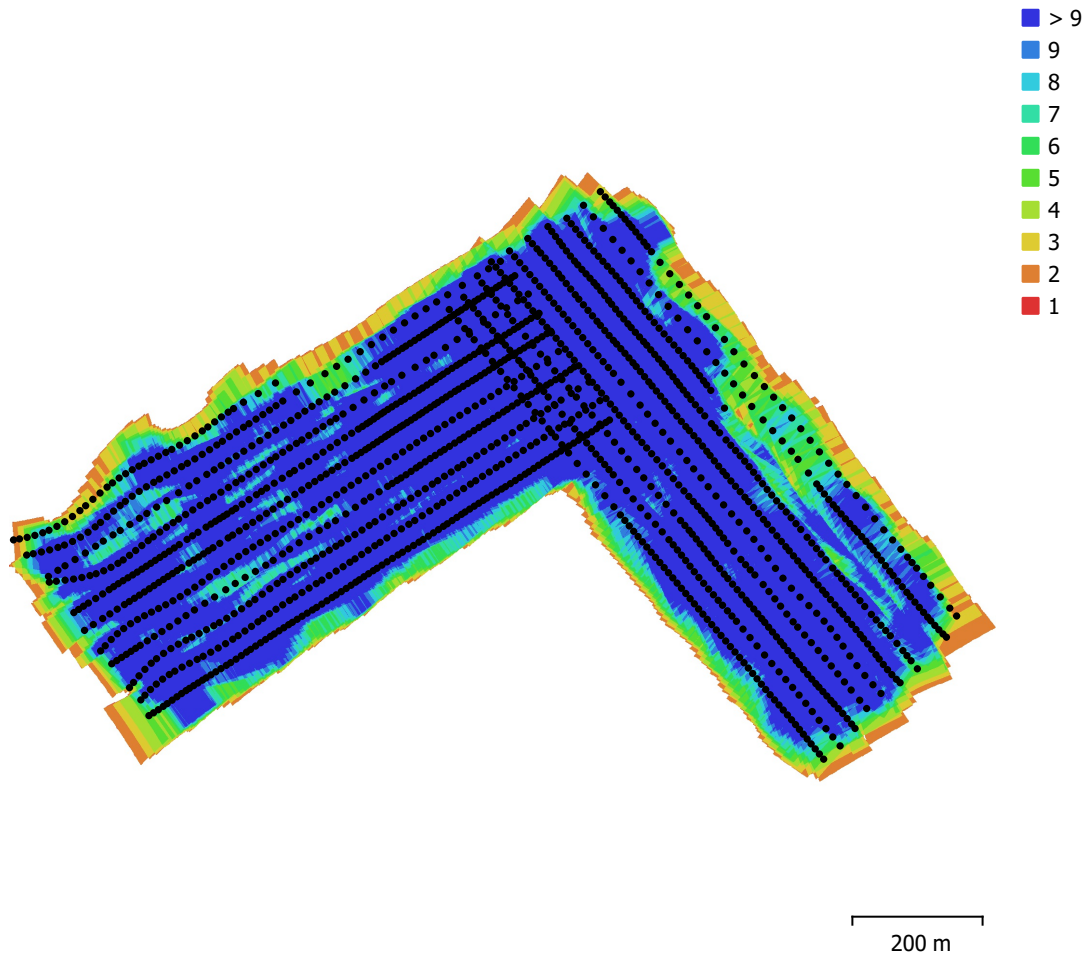


Fig. 1. Camera locations and image overlap.

Number of images:	1,455	Camera stations:	1,455
Flying altitude:	86.2 m	Tie points:	396,002
Ground resolution:	1.1 cm/pix	Projections:	1,668,619
Coverage area:	0.668 km <sup>2</sup>	Reprojection error:	0.415 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
DSC-RX1RM2 (35mm)	7952 x 5304	35 mm	4.53 x 4.53 $\mu$ m	No

Table 1. Cameras.

# Camera Calibration

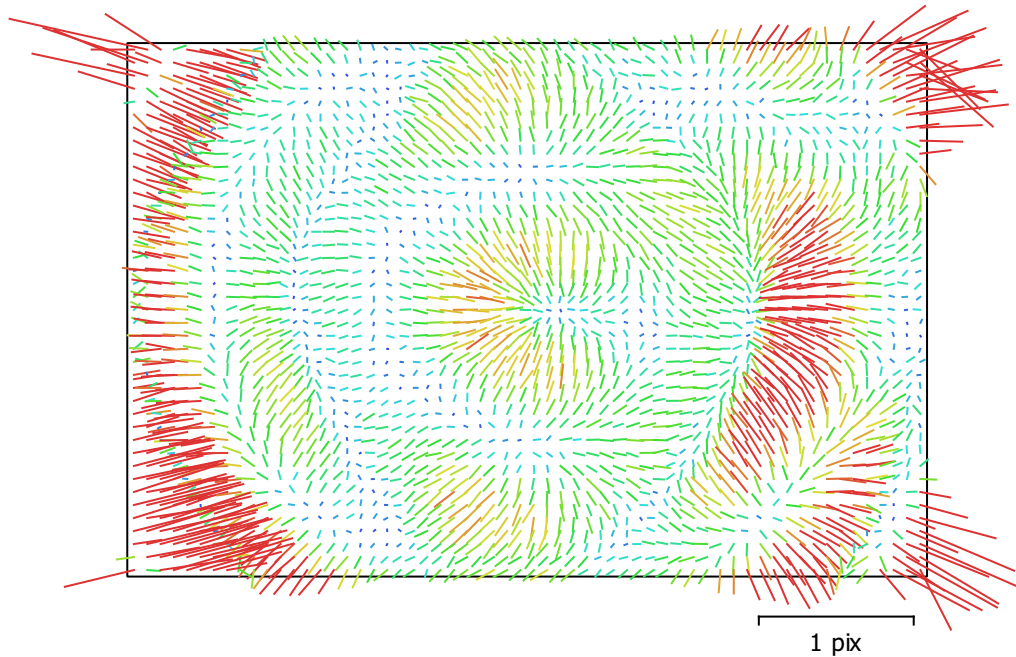


Fig. 2. Image residuals for DSC-RX1RM2 (35mm).

## DSC-RX1RM2 (35mm)

1455 images

Type	Resolution	Focal Length	Pixel Size
<b>Frame</b>	<b>7952 x 5304</b>	<b>35 mm</b>	<b>4.53 x 4.53 <math>\mu</math>m</b>

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
<b>F</b>	<b>7538.27</b>	0.034	1.00	0.04	-0.25	-0.03	-0.01	-0.30	0.26	-0.26	0.26	-0.01	0.09
<b>Cx</b>	<b>-4.18911</b>	0.03		1.00	-0.05	-0.03	0.37	0.03	-0.03	0.04	-0.05	0.34	-0.01
<b>Cy</b>	<b>22.5083</b>	0.031			1.00	-0.31	-0.05	-0.01	0.02	-0.01	0.01	0.00	0.45
<b>B1</b>	<b>0.487586</b>	0.0095				1.00	0.03	0.01	-0.01	0.01	0.00	-0.02	0.14
<b>B2</b>	<b>0.750061</b>	0.0091					1.00	0.02	-0.02	0.02	-0.02	-0.16	-0.01
<b>K1</b>	<b>-0.121904</b>	4e-05						1.00	-0.97	0.92	-0.87	-0.02	-0.01
<b>K2</b>	<b>0.594721</b>	0.00039							1.00	-0.99	0.95	0.01	0.01
<b>K3</b>	<b>-2.88137</b>	0.0015								1.00	-0.99	-0.01	-0.02
<b>K4</b>	<b>4.21051</b>	0.002									1.00	0.00	0.03
<b>P1</b>	<b>-7.74692e-05</b>	8.5e-07										1.00	-0.03
<b>P2</b>	<b>0.000445567</b>	1e-06											1.00

Table 2. Calibration coefficients and correlation matrix.

# Camera Locations

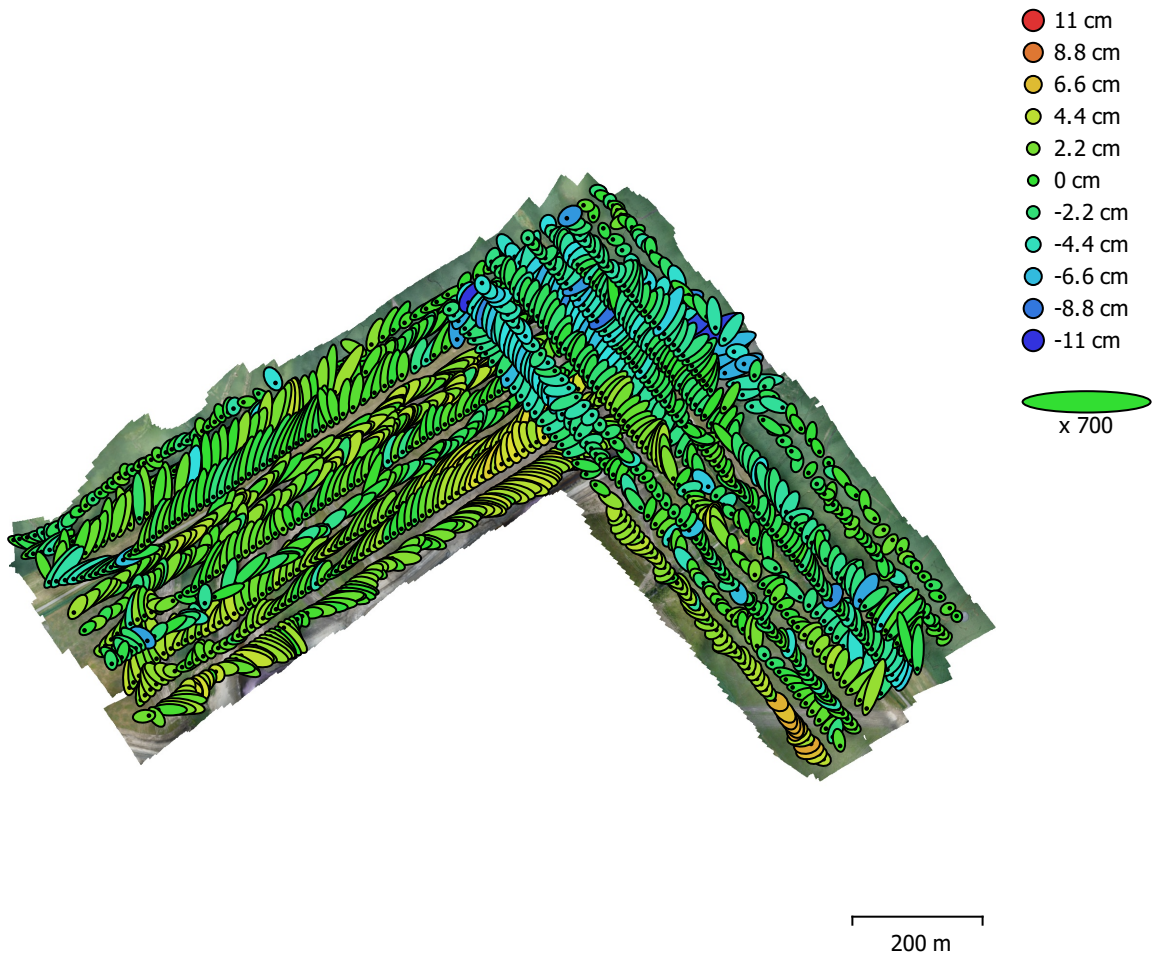


Fig. 3. Camera locations and error estimates.

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

Estimated camera locations are marked with a black dot.

<b>X error (cm)</b>	<b>Y error (cm)</b>	<b>Z error (cm)</b>	<b>XY error (cm)</b>	<b>Total error (cm)</b>
3.01141	3.77042	2.76484	4.82542	5.56138

Table 3. Average camera location error.

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

# Ground Control Points

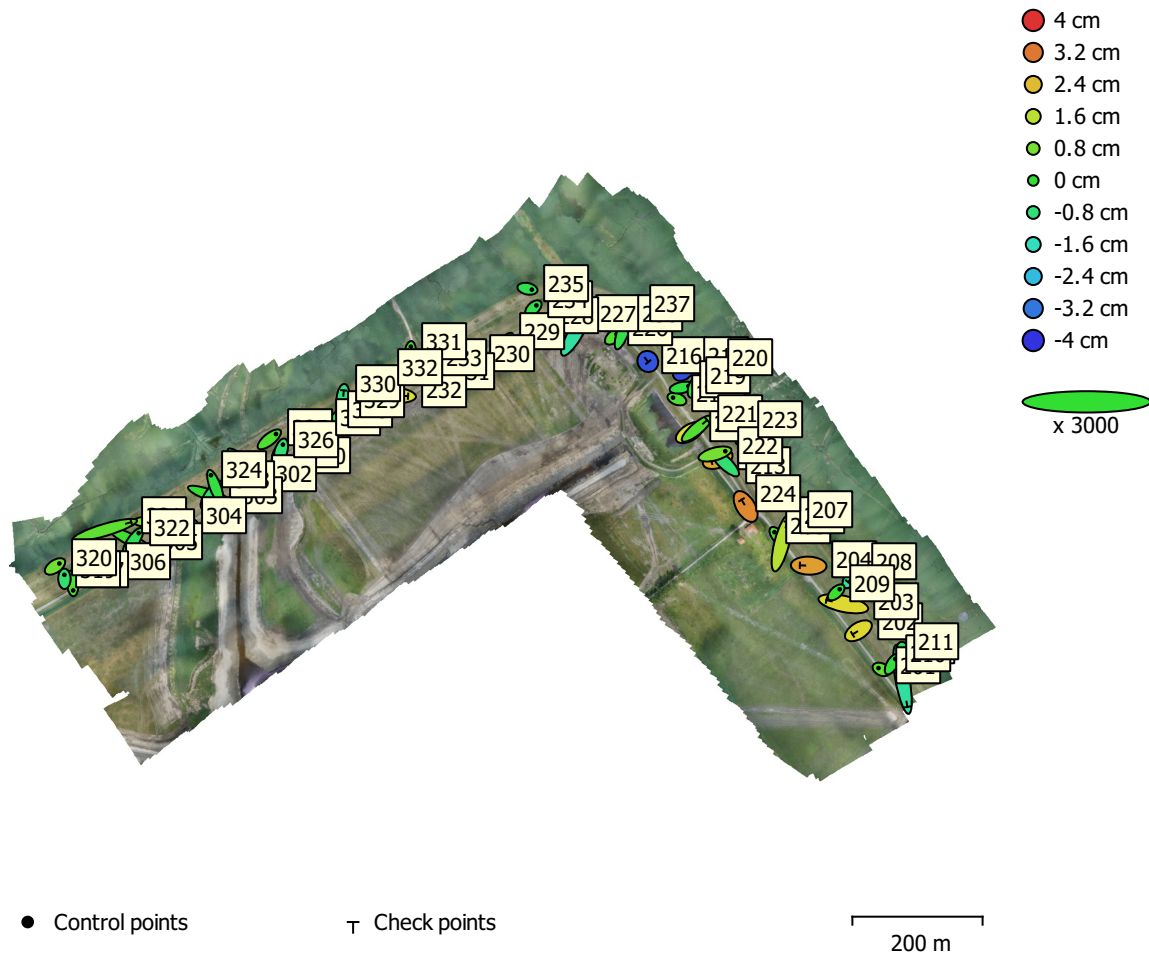


Fig. 4. GCP locations and error estimates.

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)
32	0.561756	0.632563	0.399003	0.845994	0.935366

Table 4. Control points RMSE.

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

Count	X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total (cm)
27	1.10406	0.999975	1.80872	1.4896	2.34315

Table 5. 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>
201	-0.291714	0.136917	0.566134	0.651423	0.441 (16)
205	-0.380557	0.467737	0.379309	0.712374	0.302 (15)
207	0.160704	-0.125763	-0.367913	0.420716	0.354 (8)
209	0.356882	0.323322	0.128194	0.498333	0.414 (12)
210	0.311126	0.533136	-0.0974898	0.62493	0.270 (12)
211	0.0543241	-0.196476	-0.390614	0.440606	0.346 (8)
213	-0.903018	0.855957	-0.728082	1.4416	0.375 (12)
215	-0.39219	0.142374	0.322268	0.5272	0.376 (13)
218	0.681236	0.138939	-0.154036	0.712119	0.286 (16)
219	0.179076	0.527626	-0.00662381	0.557227	0.456 (14)
222	1.0554	0.286016	0.76178	1.33266	0.527 (12)
223	-0.391999	-0.74156	-0.176283	0.857118	0.246 (6)
226	0.318404	0.268522	0.396465	0.575039	0.348 (18)
228	0.680971	1.26276	0.634697	1.5688	0.442 (21)
231	0.856693	-0.456589	-0.295399	1.01472	0.306 (17)
233	-0.127087	0.798731	0.121573	0.817864	0.379 (10)
234	0.305851	0.280751	-0.283966	0.502994	0.250 (13)
235	0.445961	-0.0893537	-0.306992	0.548734	0.322 (15)
236	0.451296	1.24372	-0.278417	1.35204	0.332 (21)
237	-0.331189	-0.106473	-0.102256	0.3626	0.333 (16)
300	-0.0271429	0.0642592	0.24595	0.255651	0.476 (17)
303	1.73355	-0.634955	0.0455059	1.84674	0.590 (7)
306	0.342913	0.170078	-0.00681478	0.382834	0.306 (17)
307	0.0494997	-0.737284	0.370302	0.826536	0.437 (11)
319	-0.00473438	0.405058	-0.673338	0.785798	0.413 (12)
320	0.447676	0.300472	0.716689	0.89685	0.357 (15)
322	0.593618	0.881643	-0.33462	1.11429	0.726 (10)
324	-0.443864	1.19743	-0.181512	1.28988	0.323 (12)
325	0.682559	0.544365	0.312525	0.927303	0.360 (12)
326	0.199398	0.671714	-0.70676	0.995223	0.522 (9)
328	0.758789	1.32436	-0.422009	1.5836	1.468 (12)



<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>
331	0.065266	0.580024	0.187774	0.613145	0.313 (10)
<b>Total</b>	<b>0.561756</b>	<b>0.632563</b>	<b>0.399003</b>	<b>0.935366</b>	<b>0.458</b>

Table 6. 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>
200	0.507963	-2.82563	-1.27091	3.13966	0.063 (2)
202	-0.600173	-0.369913	2.07212	2.18877	0.355 (15)
203	-1.73624	0.373176	2.04925	2.71168	0.281 (15)
204	-0.902162	0.0314689	2.7458	2.89039	0.397 (13)
206	0.547352	2.15312	1.54351	2.70517	0.304 (11)
208	-0.534876	-0.698974	-1.20614	1.49313	0.173 (12)
212	-0.643693	-0.237603	2.60579	2.69461	0.401 (13)
214	0.661546	0.402318	1.98884	2.13424	0.269 (13)
216	0.0459191	-0.057252	-3.61256	3.61331	0.206 (19)
217	0.337097	0.460575	-3.66115	3.70537	0.210 (19)
220	-0.711095	-0.806885	-1.70469	2.01561	0.295 (14)
221	1.04593	0.872655	0.398031	1.41913	0.368 (13)
224	-0.421289	0.684593	2.99656	3.10251	0.420 (10)
227	0.872437	1.47933	-1.29228	2.14931	0.366 (21)
229	0.464809	0.607143	-0.128745	0.7754	0.359 (28)
230	0.900083	0.463184	-0.802368	1.2917	0.334 (24)
232	1.59777	-0.118222	1.93875	2.51507	0.439 (20)
301	0.0678228	-0.726469	-2.4793	2.58443	0.261 (17)
302	1.4296	-1.30037	-0.744708	2.07106	0.272 (9)
304	2.63115	-0.0423153	1.01671	2.82107	0.235 (13)
305	1.68749	-0.888501	0.207043	1.91831	0.466 (16)
321	2.687	0.793199	0.51871	2.84924	0.188 (9)
323	0.6095	0.862282	-0.697055	1.26527	0.283 (11)
327	0.159225	1.6196	-0.109183	1.63106	0.449 (12)
329	0.0296289	0.860357	0.659296	1.08433	0.433 (17)
330	0.074971	0.789202	-0.8501	1.16238	0.322 (8)

<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>
332	1.16279	0.378887	1.34509	1.81793	0.403 (12)
<b>Total</b>	<b>1.10406</b>	<b>0.999975</b>	<b>1.80872</b>	<b>2.34315</b>	<b>0.340</b>

Table 7. Check points.  
X - Easting, Y - Northing, Z - Altitude.

# Digital Elevation Model

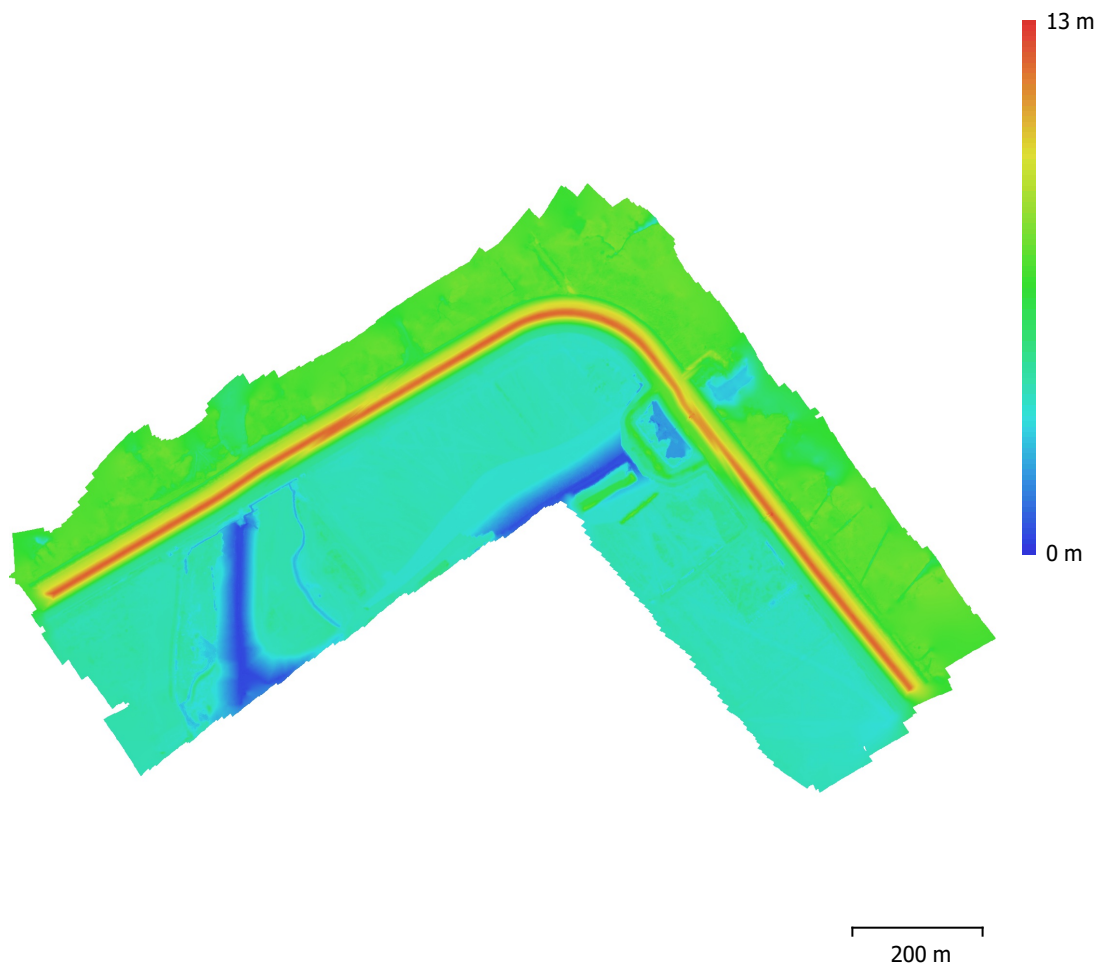


Fig. 5. Reconstructed digital elevation model.

Resolution: 2.2 cm/pix  
Point density: 0.207 points/cm<sup>2</sup>

# Processing Parameters

## General

Cameras	1455
Aligned cameras	1455
Markers	59
Coordinate system	Belge 1972 / Belgian Lambert 72 (EPSG::31370)
Rotation angles	Yaw, Pitch, Roll

## Point Cloud

Points	396,002 of 3,832,921
RMS reprojection error	0.095256 (0.415032 pix)
Max reprojection error	0.612783 (2.32274 pix)
Mean key point size	4.33323 pix
Point colors	3 bands, uint8
Key points	No
Average tie point multiplicity	3.74213

## Alignment parameters

Accuracy	Medium
Generic preselection	Yes
Reference preselection	Source
Key point limit	50,000
Tie point limit	10,000
Guided image matching	No
Adaptive camera model fitting	Yes
Matching time	12 minutes 33 seconds
Matching memory usage	1.50 GB
Alignment time	15 minutes 27 seconds
Alignment memory usage	1.23 GB

## Optimization parameters

Parameters	f, b1, b2, cx, cy, k1-k4, p1, p2
Adaptive camera model fitting	No
Optimization time	13 seconds
Software version	1.6.2.10247

## Depth Maps

Count	1424
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## Depth maps generation parameters

Quality	High
Filtering mode	Mild
Processing time	2 hours 5 minutes
Software version	1.6.2.10247

## Dense Point Cloud

Points	225,603,876
Point colors	3 bands, uint8

## Depth maps generation parameters

Quality	High
Filtering mode	Mild
Processing time	2 hours 5 minutes

## Dense cloud generation parameters

Processing time	7 hours 31 minutes
Software version	1.6.2.10247

## Model

Faces	45,120,775
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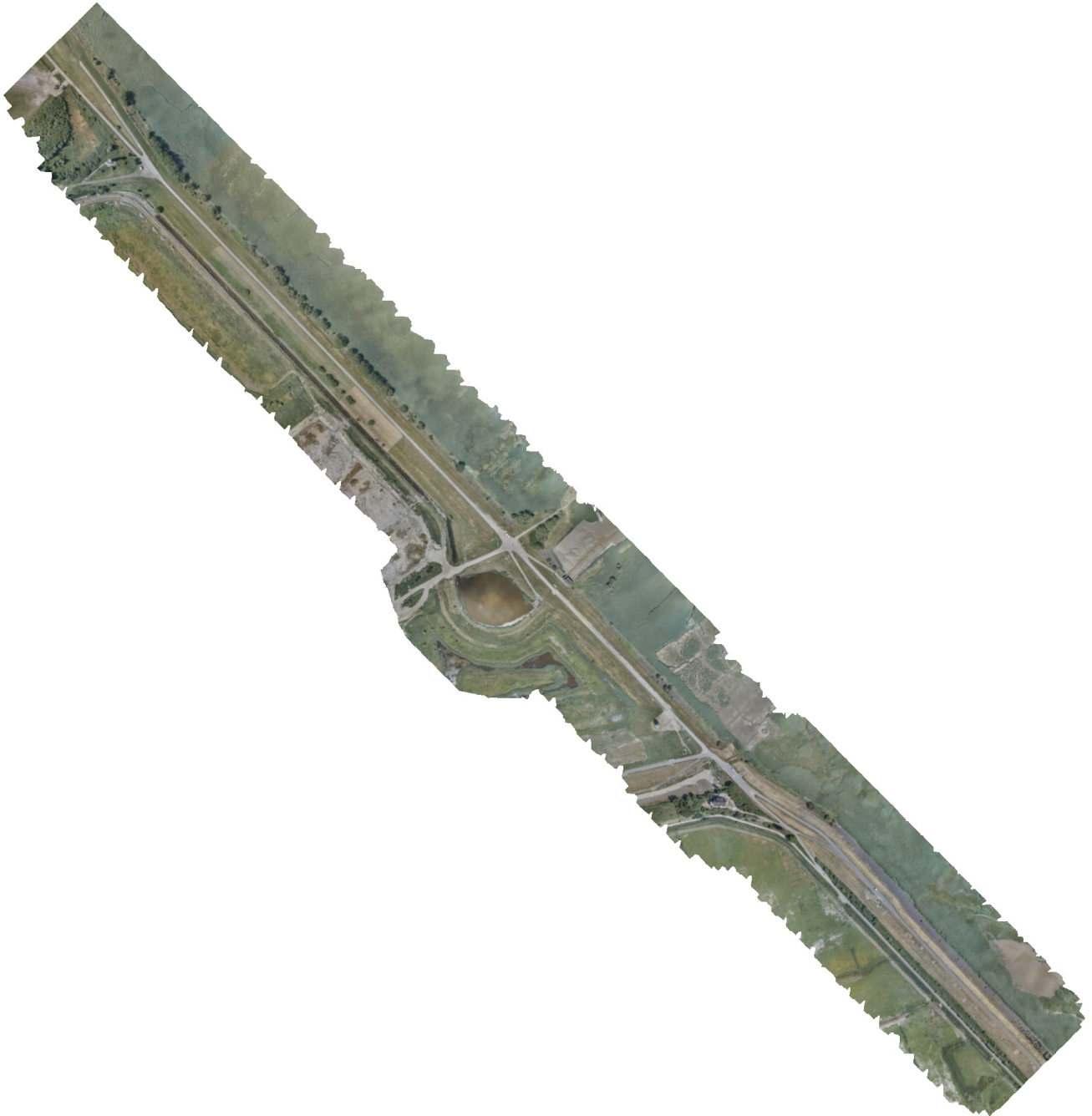
Vertices	22,577,351
Vertex colors	3 bands, uint8
<b>Depth maps generation parameters</b>	
Quality	High
Filtering mode	Mild
Processing time	2 hours 5 minutes
<b>Reconstruction parameters</b>	
Surface type	Arbitrary
Source data	Dense cloud
Interpolation	Enabled
Strict volumetric masks	No
Processing time	7 hours 21 minutes
Software version	1.6.2.10247
<b>DEM</b>	
Size	85,032 x 47,208
Coordinate system	Belge 1972 / Belgian Lambert 72 (EPSG::31370)
<b>Reconstruction parameters</b>	
Source data	Dense cloud
Interpolation	Enabled
Processing time	40 minutes 23 seconds
Software version	1.6.2.10247
<b>Orthomosaic</b>	
Size	138,080 x 85,218
Coordinate system	Belge 1972 / Belgian Lambert 72 (EPSG::31370)
Colors	3 bands, uint8
<b>Reconstruction parameters</b>	
Blending mode	Mosaic
Surface	DEM
Enable hole filling	Yes
Processing time	2 hours 31 minutes
Software version	1.6.2.10247
<b>System</b>	
Software name	Agisoft Metashape Professional
Software version	1.6.2 build 10247
OS	Windows 64 bit
RAM	255.88 GB
CPU	Intel(R) Xeon(R) CPU E5-2630 v4 @ 2.20GHz
GPU(s)	GeForce GTX 1080 GeForce GTX 1080 GeForce GTX 1080 GeForce GTX 1080



# Interreg Dijk BE

23/06/2020

19 August 2020



# Survey Data

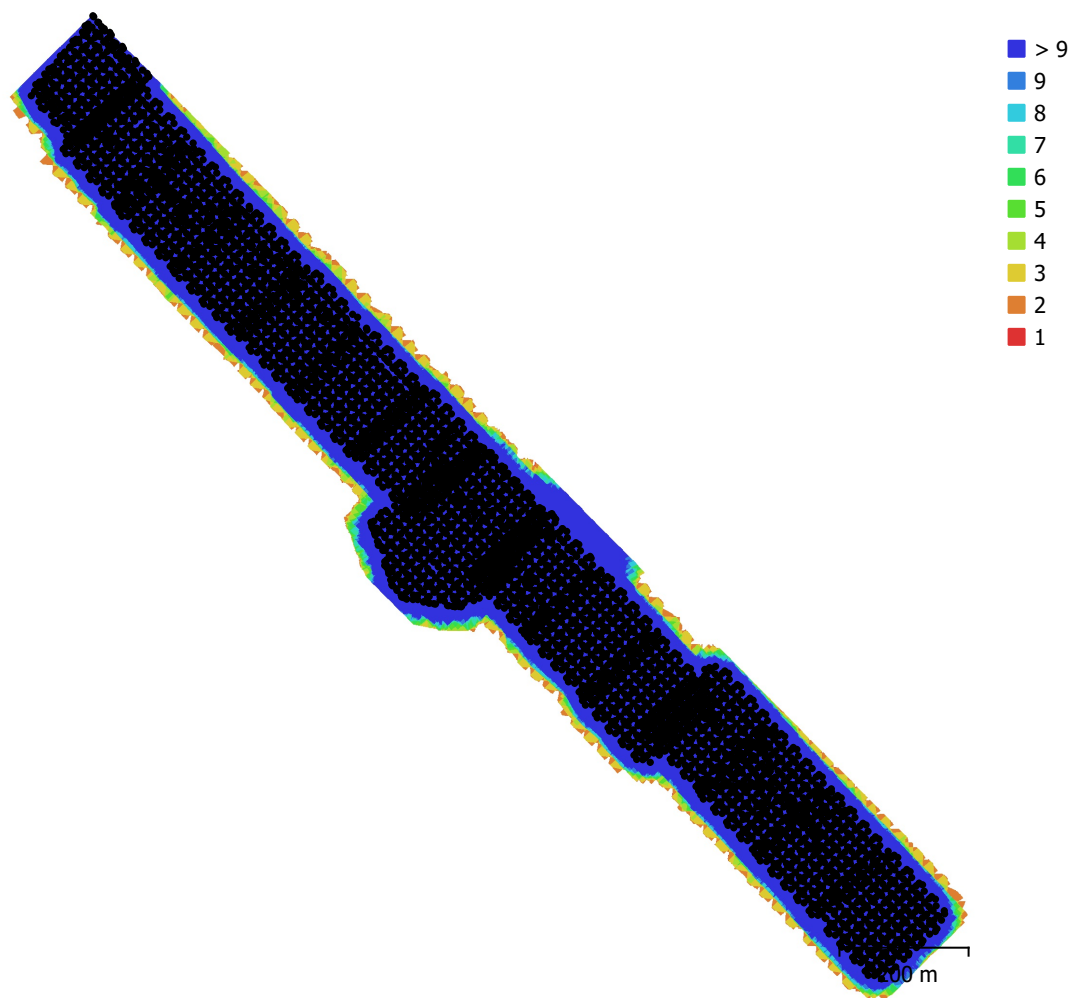


Fig. 1. Camera locations and image overlap.

Number of images:	5,803	Camera stations:	5,801
Flying altitude:	54.3 m	Tie points:	2,004,646
Ground resolution:	1.21 cm/pix	Projections:	11,925,151
Coverage area:	0.452 km <sup>2</sup>	Reprojection error:	0.361 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
E90 (8.29mm)	5472 x 3648	8.29 mm	2.4 x 2.4 $\mu$ m	No

Table 1. Cameras.

# Camera Calibration

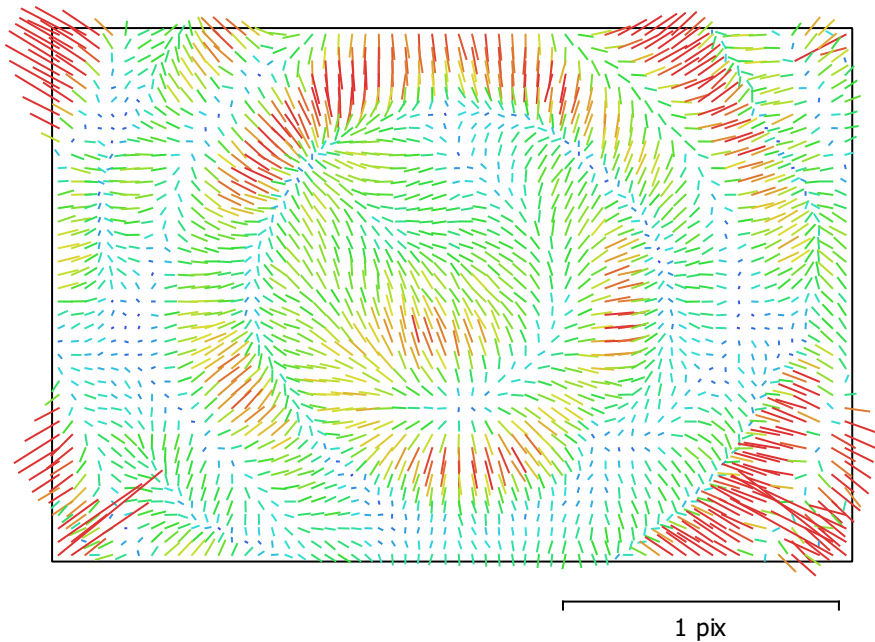


Fig. 2. Image residuals for E90 (8.29mm).

## E90 (8.29mm)

5803 images, rolling shutter

Type	Resolution	Focal Length	Pixel Size
<b>Frame</b>	<b>5472 x 3648</b>	<b>8.29 mm</b>	<b>2.4 x 2.4 <math>\mu\text{m}</math></b>

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
<b>F</b>	<b>4170.52</b>	0.077	1.00	-0.03	-0.24	0.04	0.02	-0.07	-0.53	0.63	-0.62	0.01	0.13
<b>Cx</b>	<b>-34.4857</b>	0.005		1.00	0.01	-0.01	-0.02	-0.00	0.02	-0.03	0.03	0.27	-0.00
<b>Cy</b>	<b>-119.65</b>	0.0045			1.00	0.00	-0.01	0.01	0.13	-0.15	0.16	-0.01	-0.00
<b>B1</b>	<b>2.99173</b>	0.00059				1.00	-0.00	0.04	-0.07	0.07	-0.06	-0.02	0.11
<b>B2</b>	<b>0.778186</b>	0.00058					1.00	0.00	-0.02	0.02	-0.02	-0.11	-0.02
<b>K1</b>	<b>-0.0123826</b>	8.4e-06						1.00	-0.78	0.67	-0.64	-0.00	0.01
<b>K2</b>	<b>-0.433552</b>	5.8e-05							1.00	-0.98	0.97	-0.00	-0.09
<b>K3</b>	<b>0.8265</b>	0.00014								1.00	-0.99	0.01	0.10
<b>K4</b>	<b>-0.465198</b>	0.00011									1.00	-0.01	-0.10
<b>P1</b>	<b>-0.000132778</b>	2.1e-07										1.00	0.00
<b>P2</b>	<b>9.43657e-05</b>	1.7e-07											1.00

Table 2. Calibration coefficients and correlation matrix.

# Ground Control Points

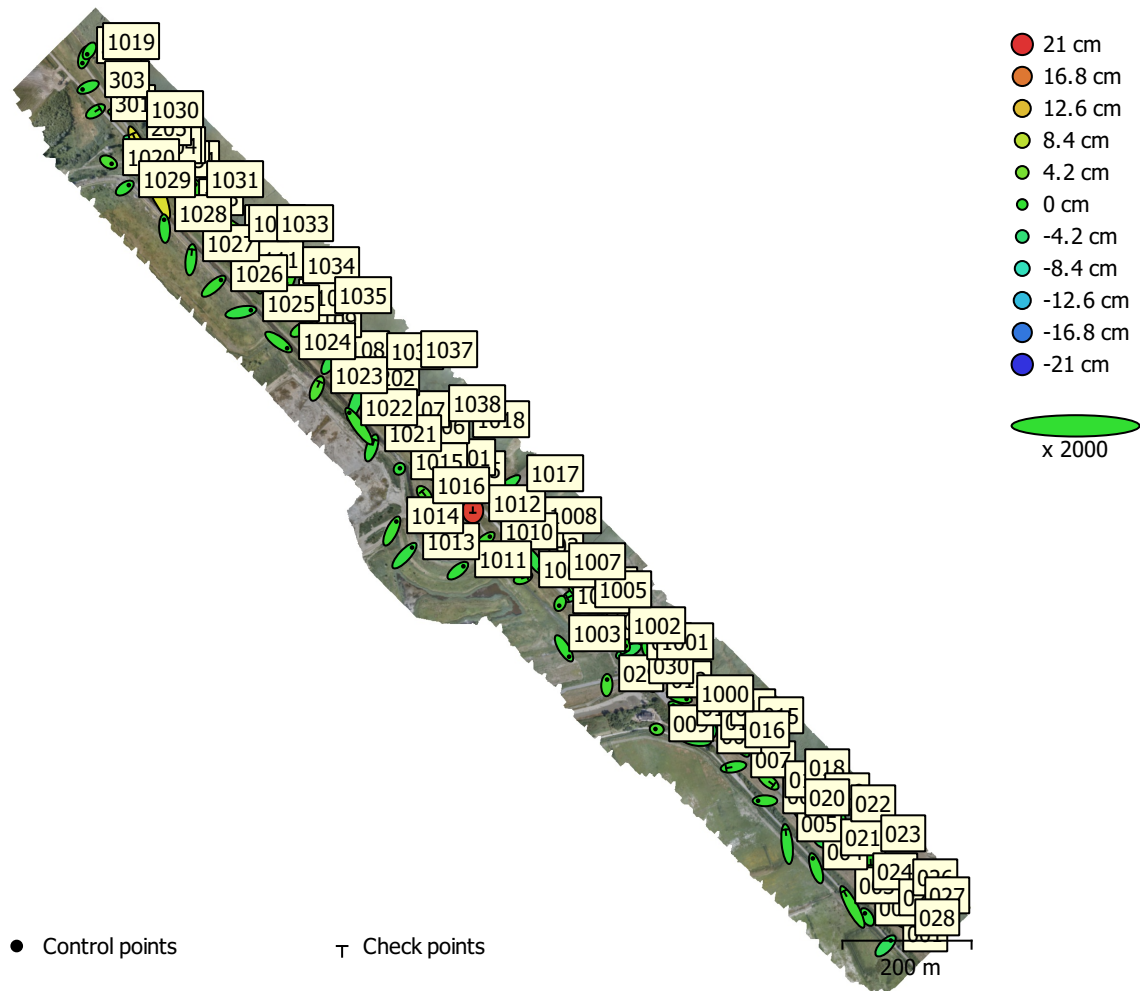


Fig. 3. GCP locations and error estimates.

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)
58	0.884076	0.992088	1.17209	1.32885	1.7719

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)
33	0.887055	1.72197	4.23488	1.93702	4.65685

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>
001	0.800852	0.840767	-2.52438	2.77863	0.337 (42)
002	-0.350463	0.565735	-0.750646	1.00317	0.336 (46)
004	-0.506175	1.5317	0.115138	1.61727	0.367 (46)
006	-1.06937	0.00117641	0.366342	1.13038	0.354 (52)
008	-1.45493	0.213477	-0.939358	1.74493	0.355 (55)
009	-0.205413	0.0371687	1.40292	1.41837	0.327 (76)
011	-0.943549	0.588993	-0.0880133	1.11577	0.401 (61)
013	-0.0231553	0.409315	-2.14992	2.18866	0.360 (41)
014	-0.267035	0.0031702	0.96045	0.996887	0.393 (52)
016	0.898072	-1.20911	-0.259031	1.52826	0.373 (63)
018	-0.585477	0.12455	1.31432	1.44421	0.315 (49)
020	0.857831	-1.13549	-1.45847	2.03773	0.488 (73)
022	0.114558	-1.75649	-1.02921	2.03904	0.319 (48)
024	-0.434312	0.801586	-0.462181	1.02214	0.332 (61)
026	-0.687389	-0.438086	1.28259	1.51969	0.317 (46)
027	0.026124	-0.698354	3.36087	3.43276	0.330 (46)
028	0.374877	-0.318941	-0.25201	0.55296	0.284 (38)
029	0.0364633	0.855568	1.15464	1.43754	0.415 (50)
030	-0.994786	1.217	0.233314	1.58906	0.672 (33)
302	-0.273241	-0.892213	0.307081	0.982346	0.364 (38)
303	-0.853024	-0.364727	-0.380522	1.00273	0.323 (48)
101	0.520809	0.711362	-1.45186	1.69858	0.323 (33)
103	0.867298	-1.27659	-1.17795	1.94151	0.302 (33)
105	1.52828	0.0466292	-0.753336	1.7045	0.328 (78)
107	0.911617	-0.147515	-1.78047	2.00571	0.342 (56)
108	0.7028	1.11284	-1.26032	1.82229	0.498 (51)
110	-0.759667	0.610604	1.43122	1.73157	0.439 (50)
112	-1.29597	-0.213622	-0.763985	1.51949	0.391 (56)
113	0.1921	0.915833	-0.733908	1.18923	0.390 (40)
114	-0.370969	-0.556315	0.27763	0.724005	0.360 (55)
115	-1.57109	0.896283	-3.6594	4.08202	0.430 (35)



<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>
1000	1.13092	-0.359014	0.286557	1.22065	0.371 (87)
1001	0.915801	-1.57981	-0.256829	1.84403	0.299 (46)
1002	0.584862	-1.12797	0.725214	1.46298	0.427 (59)
1003	0.798736	-1.28502	0.00923432	1.51305	0.301 (36)
1004	-0.142047	-0.345621	0.608983	0.714487	0.221 (65)
1005	-0.780439	0.542481	0.461888	1.05675	0.296 (55)
1008	-1.46415	-0.100082	2.18455	2.63173	0.298 (62)
1010	0.903303	0.807069	1.05579	1.60686	0.335 (65)
1011	0.862256	0.677696	-0.441593	1.18227	0.228 (49)
1013	1.17787	1.25828	-1.02941	2.00757	0.251 (34)
1014	0.706925	1.45825	0.642442	1.74327	0.322 (45)
1015	0.0752218	0.0913436	-0.583935	0.595803	0.275 (45)
1017	-1.6746	-1.29963	-0.978899	2.33486	0.224 (48)
1019	-0.345443	-0.52781	-0.0607467	0.633723	0.375 (47)
1020	0.47376	-0.257392	1.5802	1.66965	0.268 (41)
1022	-1.48534	2.08588	0.816671	2.68777	0.244 (52)
1024	1.32745	-0.95621	0.326263	1.6682	0.250 (51)
1025	1.54317	0.301427	-1.00393	1.86551	0.274 (66)
1026	1.13279	0.963591	0.315854	1.52036	0.287 (49)
1028	-0.0763696	1.37235	-0.20909	1.39029	0.276 (47)
1029	0.624838	0.455835	-0.278241	0.821965	0.213 (75)
1030	1.75484	-0.25656	1.32631	2.21459	0.305 (44)
1031	-0.742402	1.29547	1.28121	1.96746	0.261 (42)
1033	-0.368726	-2.43703	0.625581	2.54292	0.323 (43)
1035	-0.867747	-1.23902	0.372124	1.55777	0.353 (44)
1036	-0.699159	-1.26122	-0.133483	1.44821	0.309 (46)
1038	-0.679096	-2.22391	0.587912	2.39845	0.233 (44)
<b>Total</b>	<b>0.884076</b>	<b>0.992088</b>	<b>1.17209</b>	<b>1.7719</b>	<b>0.342</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>
003	-1.32803	2.45399	0.584539	2.85087	0.351 (54)
005	-0.24201	2.2484	-0.4924	2.31438	0.346 (65)
007	-1.14682	-0.195725	-0.267719	1.19381	0.407 (71)
012	-0.506403	0.25455	-0.467603	0.734773	0.379 (38)
015	0.746487	-1.48939	3.25267	3.6545	0.382 (70)
017	0.815256	-0.626065	0.879697	1.35295	0.370 (46)
019	0.304081	-0.903571	2.32733	2.51503	0.267 (79)
021	0.678238	-0.205888	-2.02829	2.14857	0.384 (43)
023	0.0766938	-1.89852	0.361503	1.93415	0.370 (49)
025	-0.534905	0.42675	0.155298	0.701681	0.293 (46)
031	-1.1123	-0.525752	-2.03546	2.37839	0.478 (54)
301	0.704957	0.431868	0.039041	0.827647	0.376 (74)
102	-1.11209	-0.549075	-1.08826	1.65001	0.334 (50)
104	0.040685	1.38723	-1.92335	2.37177	0.327 (76)
201	1.68939	-0.40399	1.47099	2.27619	0.467 (64)
106	0.651521	-1.08246	0.666989	1.42866	0.349 (40)
202	0.96777	2.40412	-1.60645	3.04911	0.553 (33)
109	0.866354	0.524515	0.686192	1.22333	0.395 (35)
111	-0.780322	1.81307	-0.822553	2.13839	0.439 (41)
203	0.272932	-0.0239346	-0.0238366	0.275015	0.356 (49)
204	-0.653612	0.516061	4.8867	4.95715	0.911 (34)
205	-2.55272	5.97983	10.2831	12.1662	0.757 (40)
1006	0.617675	0.242592	0.535866	0.852951	0.228 (58)
1007	-0.812163	0.475045	1.16261	1.49564	0.295 (39)
1012	-0.00209952	-0.316226	20.1552	20.1576	0.300 (48)
1016	-0.428013	0.52569	1.70858	1.83814	0.405 (67)
1018	-0.298412	-2.94121	-0.652701	3.0275	0.334 (86)
1021	0.428943	1.27274	-0.284906	1.37297	0.273 (66)
1023	0.425669	1.04263	1.8401	2.15737	0.287 (71)
1027	0.168364	1.58055	-0.192802	1.60114	0.298 (70)
1032	-1.59062	0.779048	2.45838	3.02996	0.302 (59)
1034	-0.475469	-1.31125	1.50866	2.05463	0.247 (62)

<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>
1037	-0.691407	-3.6306	-1.37421	3.94307	0.253 (56)
<b>Total</b>	<b>0.887055</b>	<b>1.72197</b>	<b>4.23488</b>	<b>4.65685</b>	<b>0.382</b>

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

# Digital Elevation Model

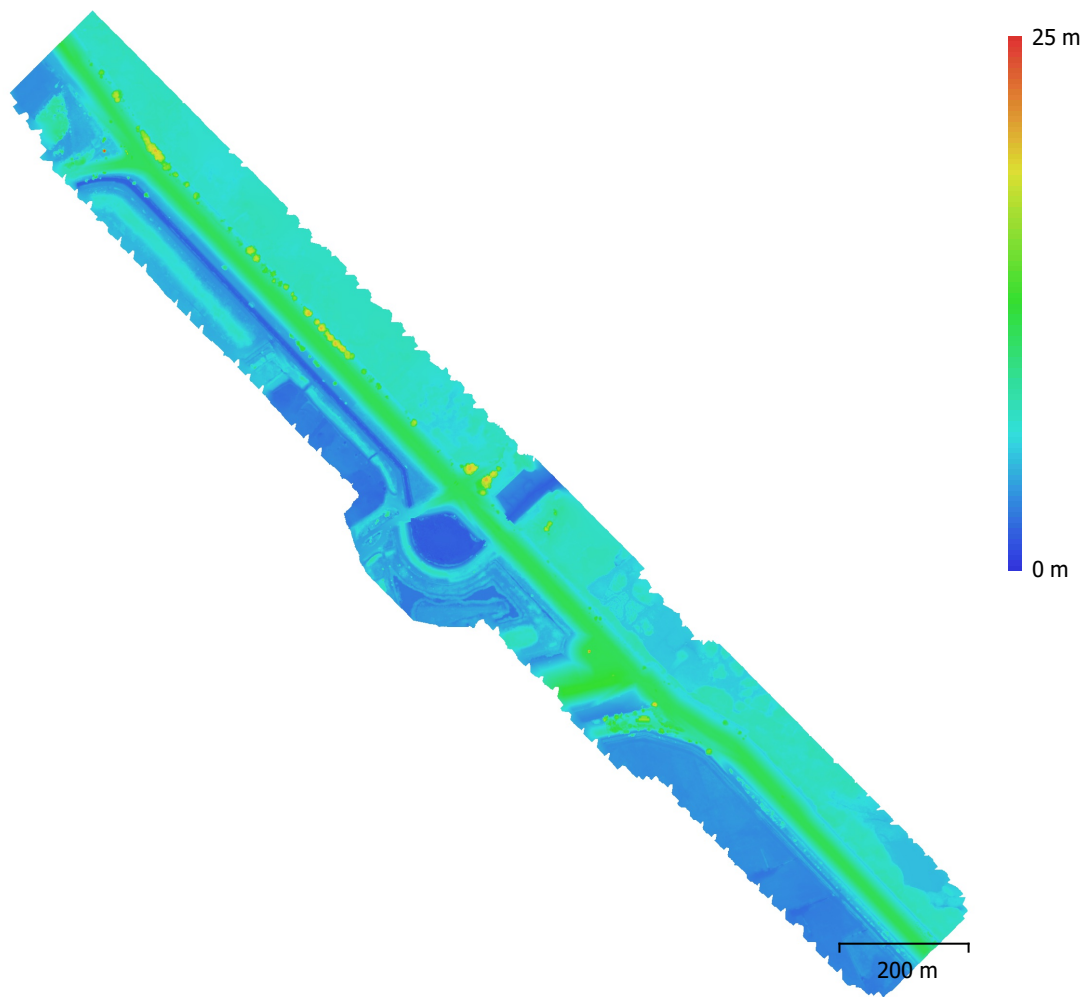


Fig. 4. Reconstructed digital elevation model.

Resolution: 4.84 cm/pix  
Point density: 428 points/m<sup>2</sup>

# Processing Parameters

## General

Cameras	5803
Aligned cameras	5801
Markers	91

## Shapes

Polygons	30
Coordinate system	Belge 1972 / Belgian Lambert 72 (EPSG::31370)
Rotation angles	Yaw, Pitch, Roll

## Point Cloud

Points	2,004,646 of 10,068,877
RMS reprojection error	0.128193 (0.361462 pix)
Max reprojection error	4.93628 (11.3199 pix)
Mean key point size	2.77984 pix
Point colors	3 bands, uint8
Key points	No
Average tie point multiplicity	4.54708

## Alignment parameters

Accuracy	High
Generic preselection	Yes
Reference preselection	Source
Key point limit	50,000
Tie point limit	10,000
Guided image matching	No
Adaptive camera model fitting	Yes
Matching time	30 minutes 53 seconds
Matching memory usage	26.52 GB
Alignment time	6 hours 3 minutes
Alignment memory usage	10.62 GB

## Optimization parameters

Parameters	f, b1, b2, cx, cy, k1-k4, p1, p2
Adaptive camera model fitting	No
Optimization time	21 minutes 42 seconds
Software version	1.6.2.10247

## Depth Maps

Count	5437
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## Depth maps generation parameters

Quality	Medium
Filtering mode	Mild
Processing time	5 hours 21 minutes
Software version	1.6.2.10247

## Dense Point Cloud

Points	174,087,277
Point colors	3 bands, uint8

## Depth maps generation parameters

Quality	Medium
Filtering mode	Mild
Processing time	5 hours 21 minutes

## Dense cloud generation parameters

Processing time	5 hours 49 minutes
Software version	1.6.2.10247



**Model**

Faces 34,817,426  
Vertices 17,423,154  
Vertex colors 3 bands, uint8

**Depth maps generation parameters**

Quality Medium  
Filtering mode Mild  
Processing time 5 hours 21 minutes

**Reconstruction parameters**

Surface type Arbitrary  
Source data Dense cloud  
Interpolation Enabled  
Strict volumetric masks No  
Processing time 8 hours 12 minutes  
Software version 1.6.2.10247

**DEM**

Size 32,977 x 33,195  
Coordinate system Belge 1972 / Belgian Lambert 72 (EPSG::31370)

**Reconstruction parameters**

Source data Dense cloud  
Interpolation Enabled  
Processing time 12 minutes 4 seconds  
Software version 1.6.2.10247

**Orthomosaic**

Size 122,928 x 126,432  
Coordinate system Belge 1972 / Belgian Lambert 72 (EPSG::31370)  
Colors 3 bands, uint8

**Reconstruction parameters**

Blending mode Mosaic  
Surface DEM  
Enable hole filling Yes  
Processing time 8 hours 34 minutes  
Software version 1.6.2.10247

**System**

Software name Agisoft Metashape Professional  
Software version 1.6.2 build 10247  
OS Windows 64 bit  
RAM 255.88 GB  
CPU Intel(R) Xeon(R) CPU E5-2630 v4 @ 2.20GHz  
GPU(s) GeForce GTX 1080  
GeForce GTX 1080  
GeForce GTX 1080  
GeForce GTX 1080