

CastleRocks Site1 June 2021

Processing Report
11 January 2022



Survey Data

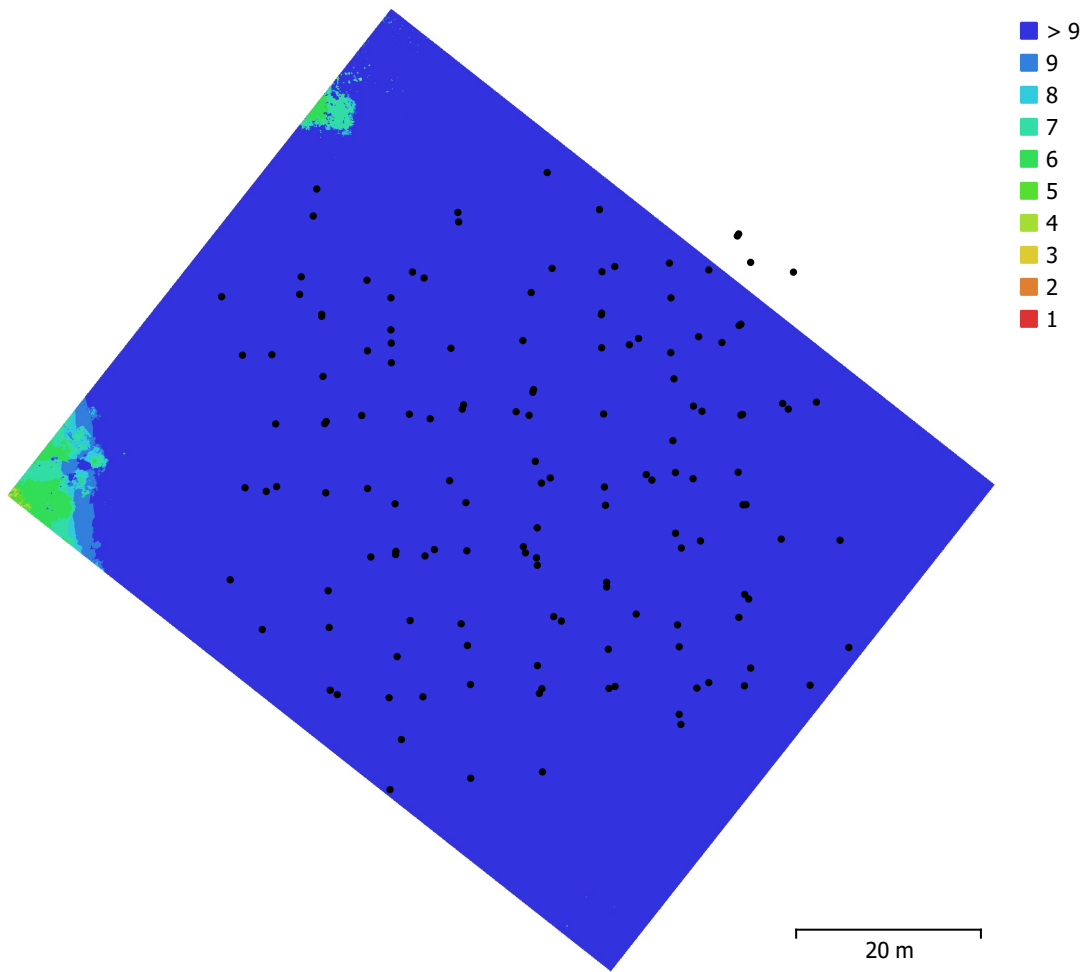


Fig. 1. Camera locations and image overlap.

Number of images:	144	Camera stations:	144
Flying altitude:	45.6 m	Tie points:	876,504
Ground resolution:	9.63 mm/pix	Projections:	2,672,932
Coverage area:	5.57e+03 m ²	Reprojection error:	1.25 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
Test_Pro (10.26mm)	5464 x 3640	10.26 mm	2.41 x 2.41 μm	No

Table 1. Cameras.

Camera Calibration

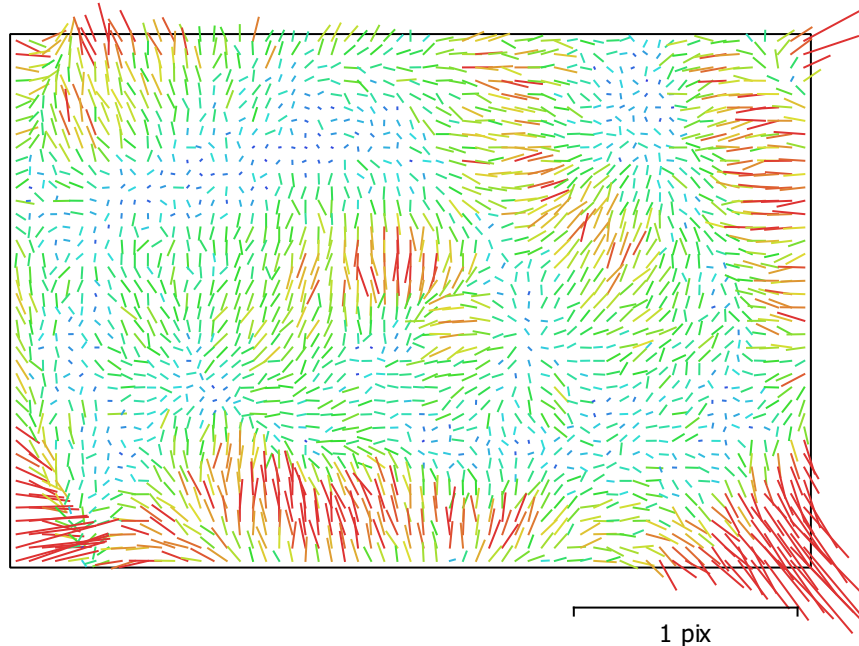


Fig. 2. Image residuals for Test_Pro (10.26mm).

Test_Pro (10.26mm)

144 images

Type	Resolution	Focal Length	Pixel Size
Frame	5464 x 3640	10.26 mm	2.41 x 2.41 μm

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	4314.41	0.051	1.00	-0.03	-0.61	-0.17	-0.02	-0.23	0.15	-0.14	0.14	0.06	0.35
Cx	-6.29115	0.023		1.00	-0.02	0.09	0.28	0.00	-0.00	0.00	-0.00	0.15	0.05
Cy	-11.9188	0.025			1.00	-0.30	0.05	0.02	0.01	-0.01	0.00	-0.06	-0.45
B1	-12.1406	0.0052				1.00	0.02	0.02	-0.04	0.04	-0.04	-0.00	0.40
B2	0.739988	0.0043					1.00	0.00	-0.00	0.00	-0.01	-0.40	0.01
K1	-0.18664	3.8e-05						1.00	-0.97	0.92	-0.87	0.00	-0.07
K2	0.00604259	0.0002							1.00	-0.99	0.96	-0.01	0.00
K3	-0.00219564	0.00042								1.00	-0.99	0.00	0.00
K4	0.0343296	0.0003									1.00	-0.00	-0.00
P1	0.00155398	7.5e-07										1.00	0.02
P2	0.00073291	1e-06											1.00

Table 2. Calibration coefficients and correlation matrix.

Camera Locations

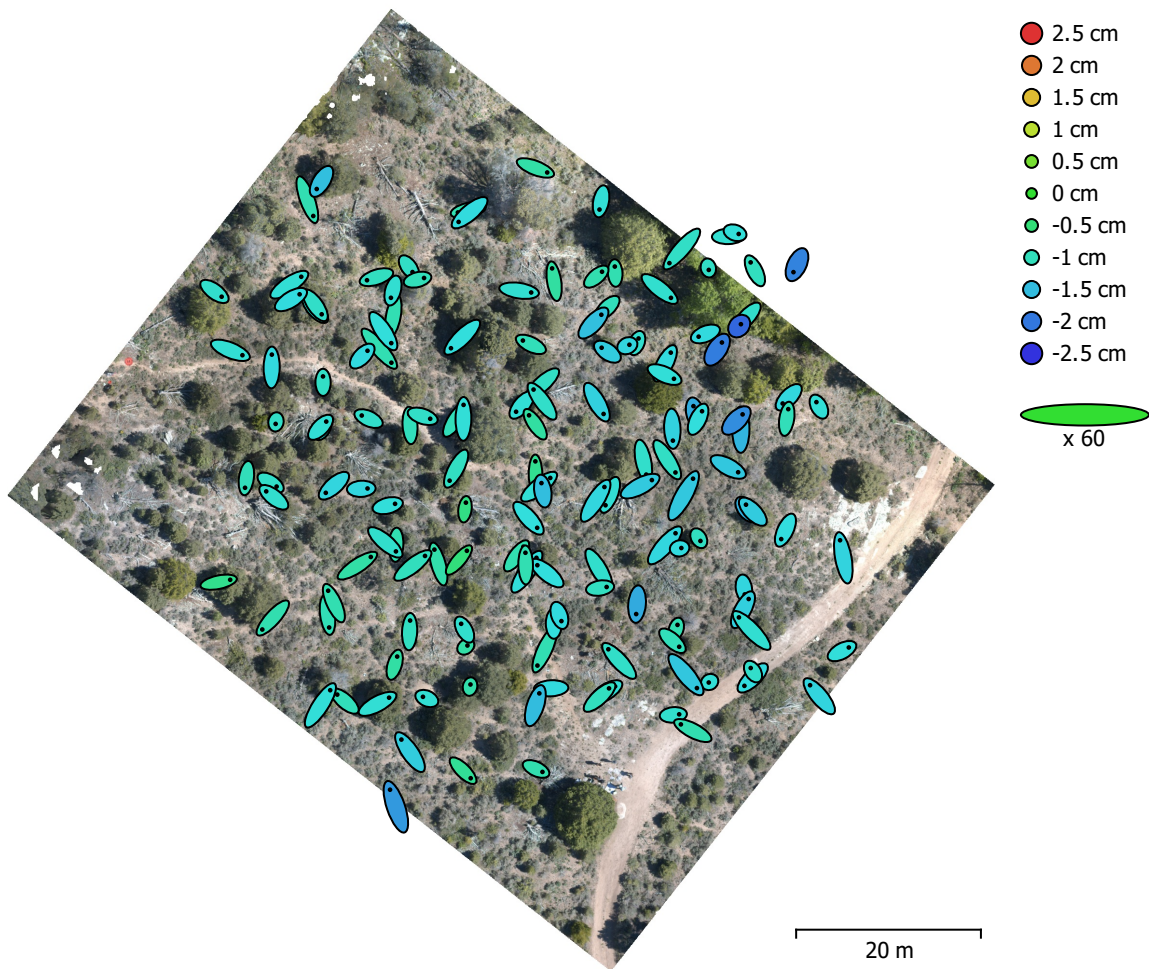


Fig. 3. Camera locations and error estimates.

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

Estimated camera locations are marked with a black dot.

X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total error (cm)
2.53459	3.19446	1.18462	4.07784	4.24642

Table 3. Average camera location error.

X - Longitude, Y - Latitude, Z - Altitude.

Ground Control Points

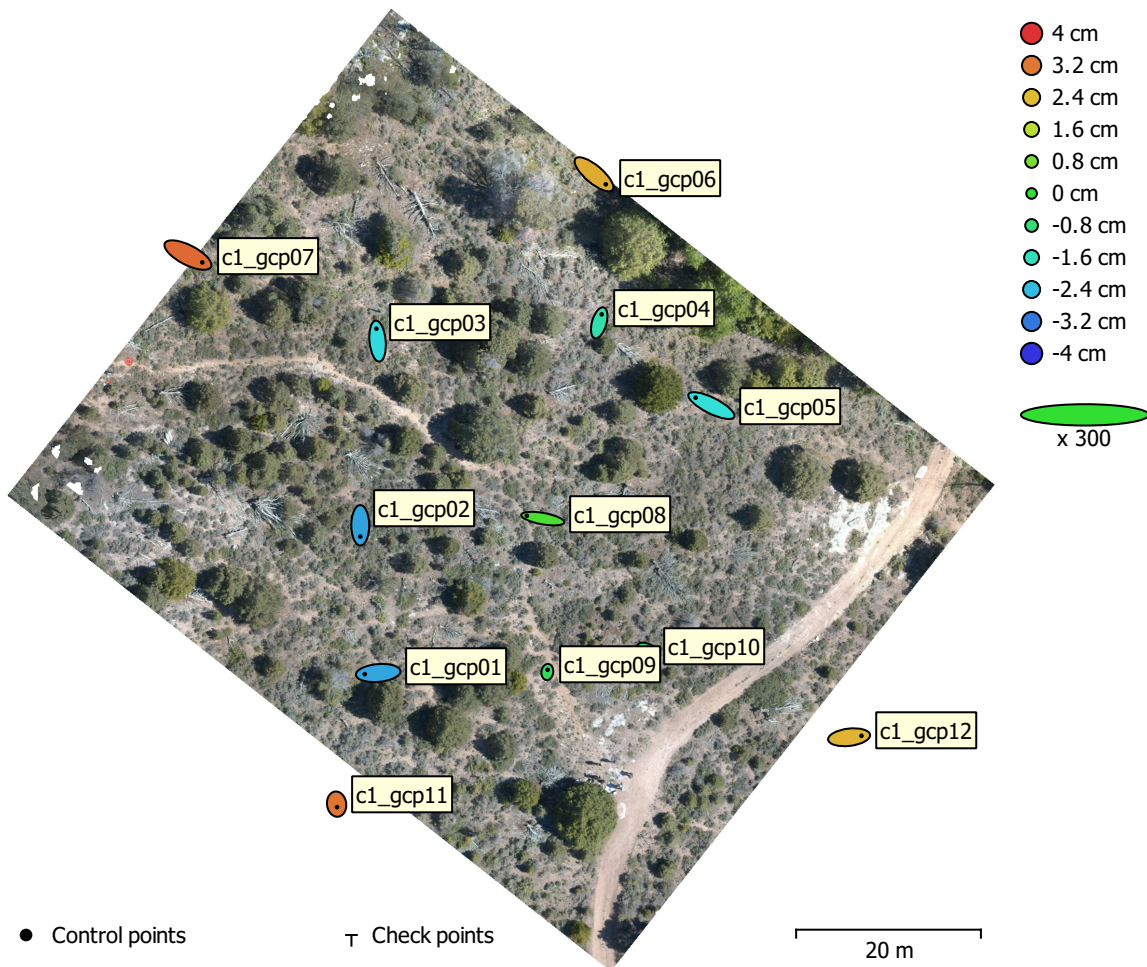


Fig. 4. GCP locations and error estimates.

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)
12	0.723734	0.510184	2.23036	0.885482	2.39971

Table 4. Control points RMSE.
 X - Longitude, Y - Latitude, Z - Altitude.

Label	X error (cm)	Y error (cm)	Z error (cm)	Total (cm)	Image (pix)
c1_gcp01	-0.96721	-0.0847311	-2.6702	2.84124	0.748 (45)
c1_gcp02	0.00177559	-0.813286	-2.70173	2.82148	0.606 (48)
c1_gcp03	-0.0834469	0.896963	-2.05842	2.24691	0.701 (48)
c1_gcp04	0.175044	0.607417	-1.42757	1.56127	0.652 (68)
c1_gcp05	-1.13858	0.569905	-1.90399	2.29048	0.707 (59)
c1_gcp06	0.851835	-0.721207	2.59054	2.82076	0.686 (41)
c1_gcp07	1.03485	-0.531965	3.36178	3.55745	0.579 (22)
c1_gcp08	-1.14548	0.202053	0.280748	1.19657	0.714 (80)
c1_gcp09	0.0197512	0.158014	-0.447243	0.474747	0.582 (62)
c1_gcp10	0.328508	-0.171048	-0.728234	0.817007	0.535 (53)
c1_gcp11	0.0289321	-0.217609	3.21693	3.22441	0.685 (22)
c1_gcp12	0.893435	0.10495	2.48888	2.64647	0.674 (22)
Total	0.723734	0.510184	2.23036	2.39971	0.660

Table 5. Control points.
X - Longitude, Y - Latitude, Z - Altitude.

Digital Elevation Model

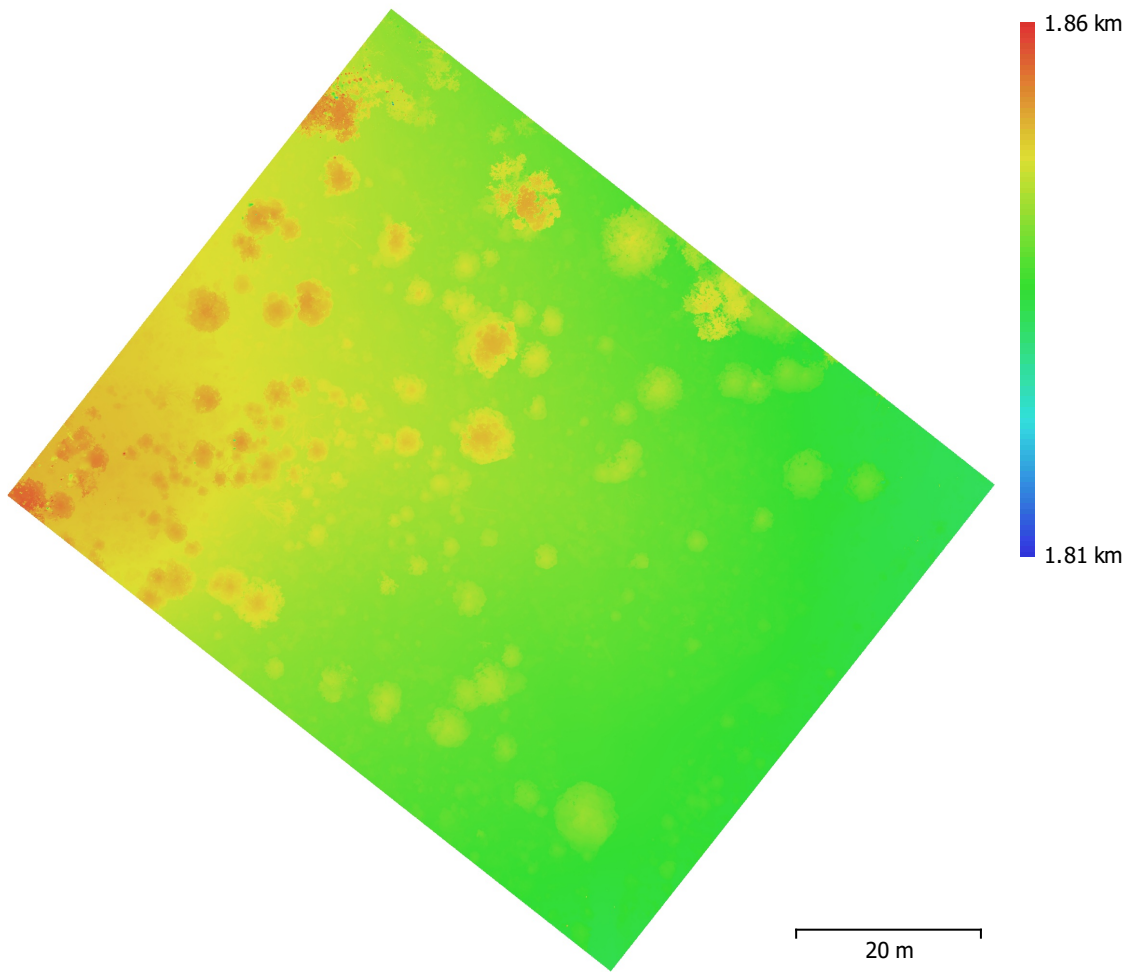


Fig. 5. Reconstructed digital elevation model.

Resolution: 9.63 mm/pix
Point density: 1.08 points/cm²

Processing Parameters

General

Cameras	144
Aligned cameras	144
Markers	12
Coordinate system	WGS 84 (EPSG::4326)
Rotation angles	Yaw, Pitch, Roll

Point Cloud

Points	876,504 of 1,000,324
RMS reprojection error	0.187222 (1.25055 pix)
Max reprojection error	2.2855 (49.1359 pix)
Mean key point size	4.69468 pix
Point colors	3 bands, uint16
Key points	No
Average tie point multiplicity	3.77187

Alignment parameters

Accuracy	High
Generic preselection	Yes
Reference preselection	Source
Key point limit	100,000
Key point limit per Mpx	1,000
Tie point limit	0
Exclude stationary tie points	Yes
Guided image matching	No
Adaptive camera model fitting	No
Matching time	3 minutes 8 seconds
Matching memory usage	1.35 GB
Alignment time	6 minutes 38 seconds
Alignment memory usage	400.11 MB

Optimization parameters

Parameters	f, b1, b2, cx, cy, k1-k4, p1, p2
Adaptive camera model fitting	No
Optimization time	21 seconds
Date created	2021:10:25 21:55:56
Software version	1.7.5.13229
File size	83.38 MB

Depth Maps

Count	144
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Depth maps generation parameters

Quality	Ultra High
Filtering mode	Disabled
Max neighbors	40
Processing time	1 hours 33 minutes
Memory usage	13.99 GB
Date created	2021:11:18 23:23:34
Software version	1.7.5.13229
File size	4.35 GB

Dense Point Cloud

Points	150,535,394
Point colors	3 bands, uint16

Depth maps generation parameters

Quality	Ultra High
Filtering mode	Disabled
Max neighbors	40
Processing time	1 hours 33 minutes
Memory usage	13.99 GB
Dense cloud generation parameters	
Processing time	2 hours 23 minutes
Memory usage	33.39 GB
Date created	2021:11:19 01:46:53
Software version	1.7.5.13229
File size	2.70 GB
Model	
Faces	6,598,463
Vertices	3,301,155
Vertex colors	3 bands, uint16
Depth maps generation parameters	
Quality	High
Filtering mode	Disabled
Max neighbors	40
Processing time	44 minutes 52 seconds
Memory usage	15.01 GB
Reconstruction parameters	
Surface type	Height field
Source data	Dense cloud
Interpolation	Enabled
Strict volumetric masks	No
Processing time	1 minutes 54 seconds
Memory usage	766.61 MB
Date created	2021:11:15 17:19:30
Software version	1.7.5.13229
File size	151.06 MB
DEM	
Size	11,094 x 10,890
Coordinate system	WGS 84 / UTM zone 12N (EPSG::32612)
Reconstruction parameters	
Source data	Dense cloud
Interpolation	Enabled
Processing time	1 minutes 46 seconds
Memory usage	314.36 MB
Date created	2021:12:07 19:11:26
Software version	1.7.5.13229
File size	188.94 MB
Orthomosaic	
Size	21,372 x 20,838
Coordinate system	WGS 84 (EPSG::4326)
Colors	3 bands, uint16
Reconstruction parameters	
Blending mode	Mosaic
Surface	DEM
Enable hole filling	Yes
Enable ghosting filter	No
Processing time	41 minutes 35 seconds
Memory usage	15.20 GB
Date created	2021:11:18 20:33:35
Software version	1.7.5.13229
File size	78.65 GB

System

Software name	Agisoft Metashape Professional
Software version	1.7.5 build 13229
OS	Windows 64 bit
RAM	63.82 GB
CPU	Intel(R) Core(TM) i9-9900K CPU @ 3.60GHz
GPU(s)	GeForce RTX 2080
	GeForce RTX 2080