Quality Report

Generated with PIX4Dmapper version 4.8.1 Preview

Important: Click on the different icons for:

Help to analyze the results in the Quality Report

Additional information about the sections

Click here for additional tips to analyze the Quality Report

Summary

Project	zk1
Processed	2023-05-25 14:40:25
Camera Model Name(s)	FC6310R_8.8_5472x3648 (RGB)
Average Ground Sampling Distance (GSD)	1.46 cm / 0.57 in
Area Covered	0.021 km^2 / 2.0622 ha / 0.01 sq. mi. / 5.0985 acres
Time for Initial Processing (without report)	02m:05s

Quality Check

Images	median of 4832 keypoints per image	✓
Dataset	100 out of 101 images calibrated (99%), all images enabled, 2 blocks	⚠
Camera Optimization	1.43% relative difference between initial and optimized internal camera parameters	✓
Matching	median of 2526.24 matches per calibrated image	✓
Georeferencing	yes, no 3D GCP	⚠

Preview

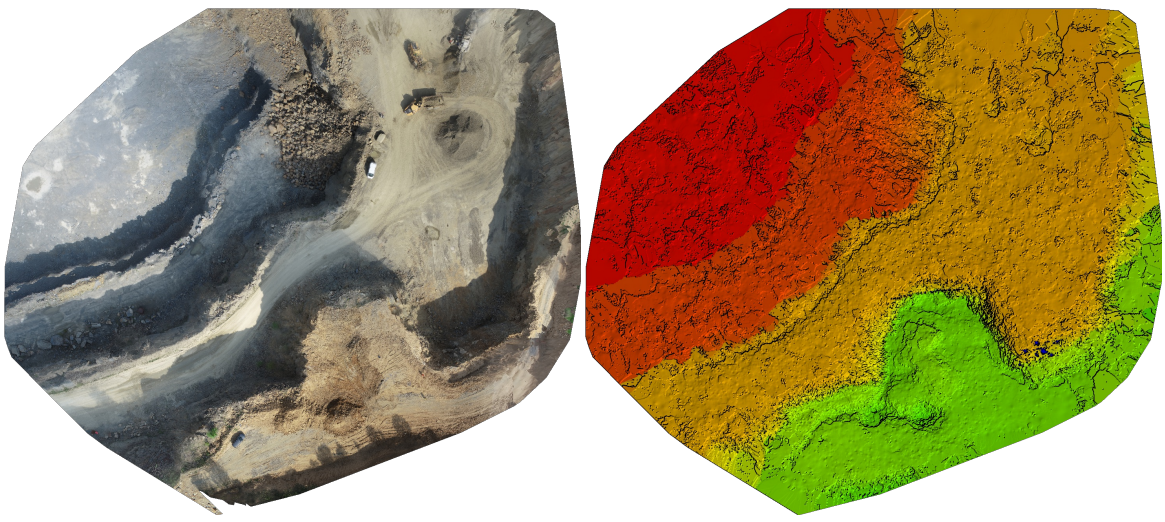


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

Calibration Details

Number of Calibrated Images	100 out of 101

Number of Geolocated Images	101 out of 101

Initial Image Positions

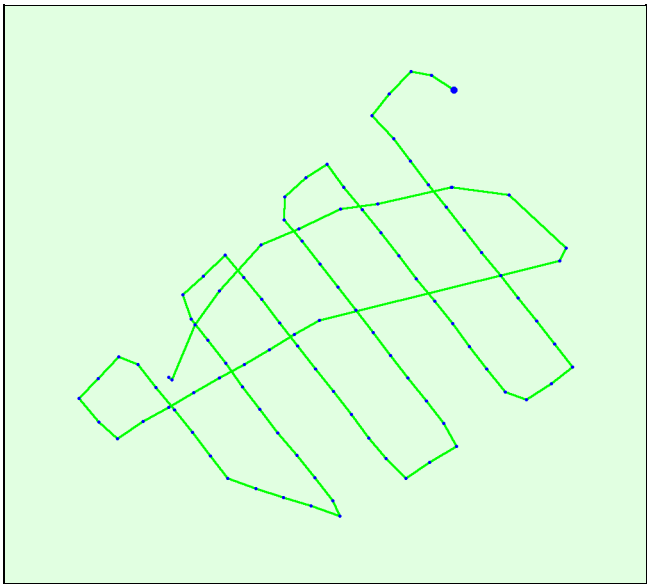
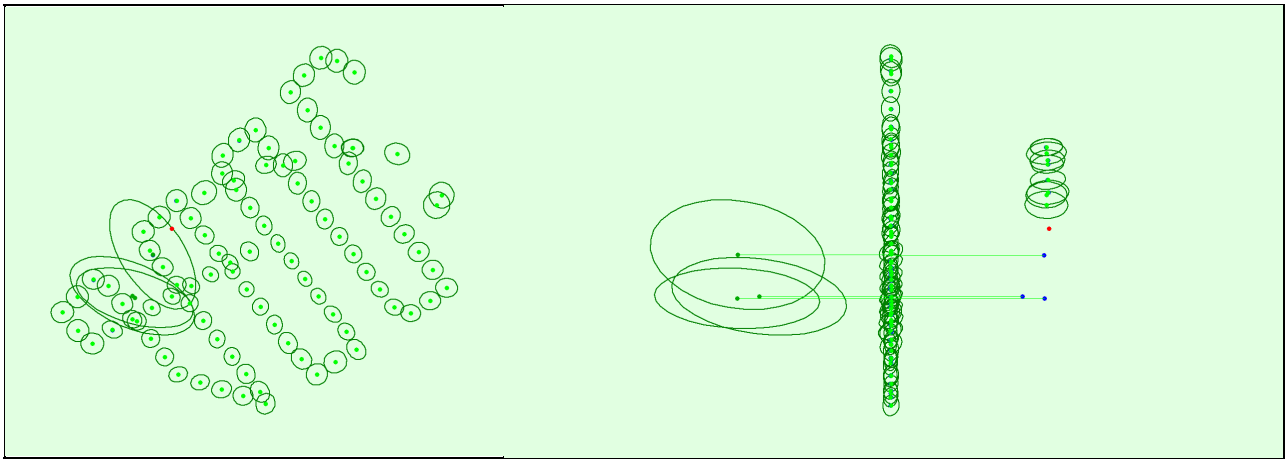
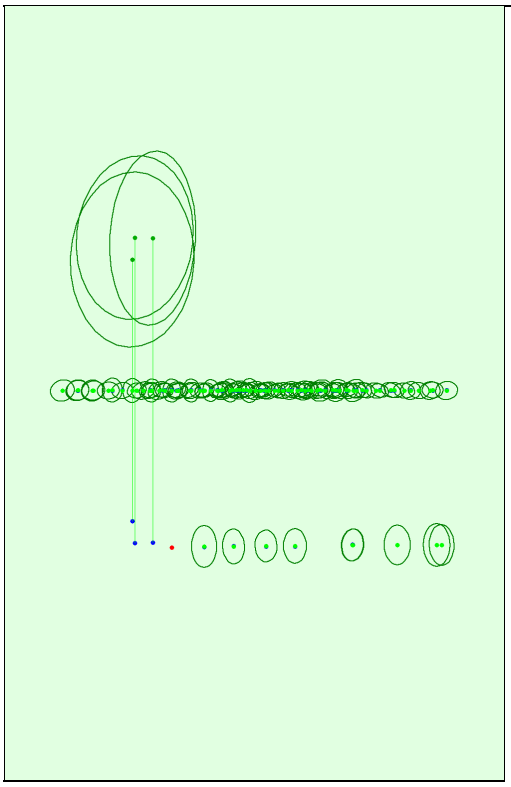


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

Computed Image/GCPs/Manual Tie Points Positions





Uncertainty ellipses 100x magnified

Figure 3: Offset between initial (blue dots) and computed (green dots) image positions as well as the offset between the GCPs initial positions (blue crosses) and their computed positions (green crosses) in the top-view (XY plane), front-view (XZ plane), and side-view (YZ plane). Red dots indicate disabled or uncalibrated images. Dark green ellipses indicate the absolute position uncertainty of the bundle block adjustment result.

Absolute camera position and orientation uncertainties

	X [m]	Y [m]	Z [m]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.029	0.028	0.029	0.124	0.061	0.066
Sigma	0.020	0.015	0.034	0.255	0.046	0.149

Overlap

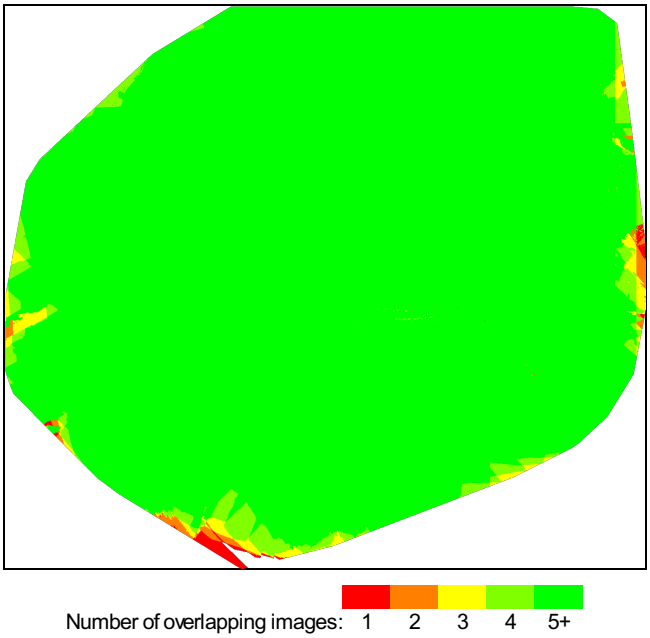


**Figure 4: Number of overlapping images computed for each pixel of the orthomosaic.
Red and yellow areas indicate low overlap for which poor results may be generated. Green areas indicate an overlap of over 5 images for every pixel. Good quality results will be generated as long as the number of keypoint matches is also sufficient for these areas (see Figure 5 for keypoint matches).**

Bundle Block Adjustment Details

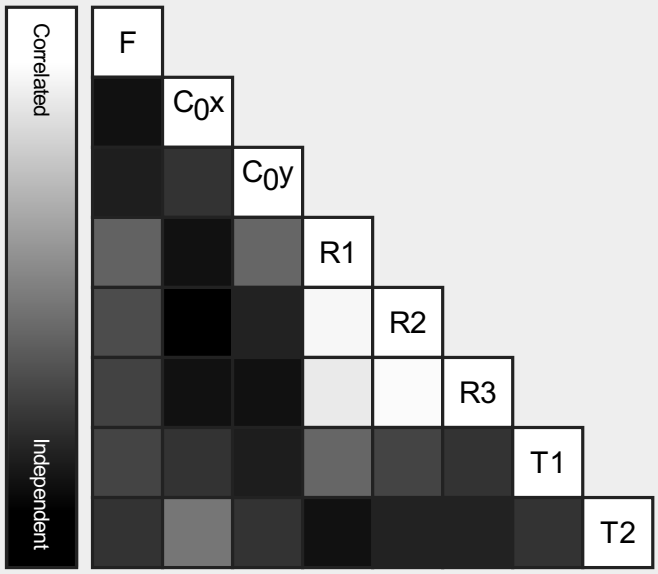
Number of 2D Keypoint Observations for Bundle Block Adjustment	239058
Number of 3D Points for Bundle Block Adjustment	75105
Mean Reprojection Error [pixels]	0.108

Internal Camera Parameters

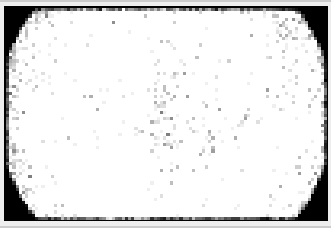
FC6310R_8.8_5472x3648 (RGB). Sensor Dimensions: 12.833 [mm] x 8.556 [mm]

EXIF ID: FC6310R_8.8_5472x3648

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	3658.300 [pixel] 8.580 [mm]	2722.500 [pixel] 6.385 [mm]	1835.100 [pixel] 4.304 [mm]	-0.269	0.112	-0.033	0.000	-0.001
Optimized Values	3710.754 [pixel] 8.703 [mm]	2727.665 [pixel] 6.397 [mm]	1802.605 [pixel] 4.228 [mm]	-0.285	0.128	-0.038	-0.000	-0.000
Uncertainties (Sigma)	3.095 [pixel] 0.007 [mm]	1.619 [pixel] 0.004 [mm]	1.178 [pixel] 0.003 [mm]	0.002	0.004	0.003	0.000	0.000



The correlation between camera internal parameters determined by the bundle adjustment. White indicates a full correlation between the parameters, ie. any change in one can be fully compensated by the other. Black indicates that the parameter is completely independent, and is not affected by other parameters.



The number of Automatic Tie Points (ATPs) per pixel, averaged over all images of the camera model, is color coded between black and white. White indicates that, on average, more than 16 ATPs have been extracted at the pixel location. Black indicates that, on average, 0 ATPs have been extracted at the pixel location. Click on the image to the see the average direction and magnitude of the re-projection error for each pixel. Note that the vectors are scaled for better visualization. The scale bar indicates the magnitude of 1 pixel error.

2D Keypoints Table

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	4832	2526
Min	4251	366
Max	5653	3240
Mean	4800	2391

3D Points from 2D Keypoint Matches

	Number of 3D Points Observed
In 2 Images	46769

In 3 Images	12157
In 4 Images	5640
In 5 Images	3185
In 6 Images	2007
In 7 Images	1440
In 8 Images	962
In 9 Images	646
In 10 Images	471
In 11 Images	333
In 12 Images	267
In 13 Images	194
In 14 Images	151
In 15 Images	179
In 16 Images	88
In 17 Images	95
In 18 Images	86
In 19 Images	56
In 20 Images	45
In 21 Images	31
In 22 Images	33
In 23 Images	30
In 24 Images	21
In 25 Images	28
In 26 Images	18
In 27 Images	19
In 28 Images	16
In 29 Images	14
In 30 Images	12
In 31 Images	19
In 32 Images	11
In 33 Images	6
In 34 Images	12
In 35 Images	13
In 36 Images	9
In 37 Images	9
In 38 Images	5
In 39 Images	6
In 40 Images	5
In 41 Images	3
In 42 Images	6
In 43 Images	1
In 45 Images	1
In 46 Images	3
In 48 Images	2
In 53 Images	1

2D Keypoint Matches

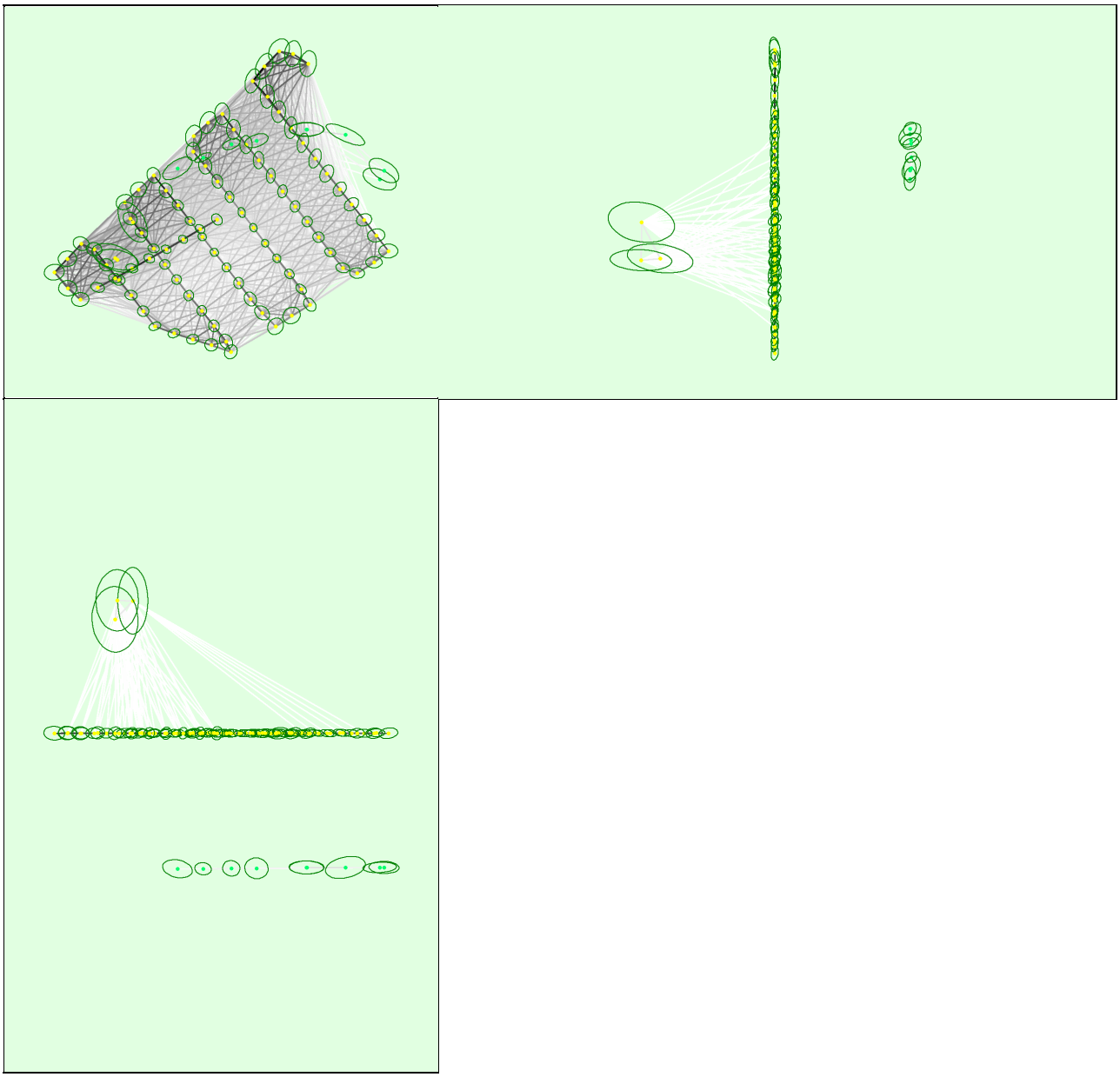


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images. Dark green ellipses indicate the relative camera position uncertainty of the bundle block adjustment result.

Relative camera position and orientation uncertainties

	X [m]	Y [m]	Z [m]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.004	0.004	0.003	0.013	0.008	0.007
Sigma	0.002	0.002	0.003	0.024	0.006	0.014

Geolocation Details

Absolute Geolocation Variance

Min Error [m]	Max Error [m]	Geolocation Error X [%]	Geolocation Error Y [%]	Geolocation Error Z [%]

-	-0.07	0.00	0.00	11.34
-0.07	-0.06	0.00	0.00	4.12
-0.06	-0.04	0.00	0.00	6.19
-0.04	-0.03	0.00	0.00	10.31
-0.03	-0.01	0.00	0.00	8.25
-0.01	0.00	49.48	51.55	14.43
0.00	0.01	50.52	48.45	6.19
0.01	0.03	0.00	0.00	9.28
0.03	0.04	0.00	0.00	9.28
0.04	0.06	0.00	0.00	6.19
0.06	0.07	0.00	0.00	2.06
0.07	-	0.00	0.00	12.37
Mean [m]		-0.000003	0.000012	-0.000063
Sigma [m]		0.003832	0.004796	0.058767
RMS Error [m]		0.003832	0.004796	0.058767

Min Error and Max Error represent geolocation error intervals between -1.5 and 1.5 times the maximum accuracy of all the images. Columns X, Y, Z show the percentage of images with geolocation errors within the predefined error intervals. The geolocation error is the difference between the initial and computed image positions. Note that the image geolocation errors do not correspond to the accuracy of the observed 3D points.

Relative Geolocation Variance

Relative Geolocation Error	Images X [%]	Images Y [%]	Images Z [%]
[-1.00, 1.00]	100.00	100.00	58.76
[-2.00, 2.00]	100.00	100.00	85.57
[-3.00, 3.00]	100.00	100.00	98.97
Mean of Geolocation Accuracy [m]	0.026181	0.026181	0.044229
Sigma of Geolocation Accuracy [m]	0.000684	0.000684	0.001369

Images X, Y, Z represent the percentage of images with a relative geolocation error in X, Y, Z.

Geolocation Orientational Variance	RMS [degree]
Omega	178.884
Phi	2.786
Kappa	9.199

Geolocation RMS error of the orientation angles given by the difference between the initial and computed image orientation angles.

Initial Processing Details

System Information

Hardware	CPU: AMD Ryzen 7 5800H with Radeon Graphics RAM: 31GB GPU: AMD Radeon(TM) Graphics (Driver: 31.0.12024.0), NVIDIA GeForce RTX 3060 Laptop GPU (Driver: 30.0.15.1272)
Operating System	Windows 10 Pro, 64-bit

Coordinate Systems

Image Coordinate System	WGS 84
Output Coordinate System	S-JTSK / Krovak

Processing Options

Detected Template	3D Maps - Rapid/Low Res
Keypoints Image Scale	Rapid, Image Scale: 0.25

Advanced: Matching Image Pairs	Aerial Grid or Corridor
Advanced: Matching Strategy	Use Geometrically Verified Matching: no
Advanced: Keypoint Extraction	Targeted Number of Keypoints: Automatic
Advanced: Calibration	Calibration Method: Standard Internal Parameters Optimization: All External Parameters Optimization: All Rematch: Auto, yes

Point Cloud Densification details

Processing Options

Image Scale	multiscale, 1/4 (Quarter image size, Fast)
Point Density	Low (Fast)
Minimum Number of Matches	3
3D Textured Mesh Generation	yes
3D Textured Mesh Settings:	Resolution: Medium Resolution (default) Color Balancing: no
LOD	Generated: no
Advanced: 3D Textured Mesh Settings	Sample Density Divider: 1
Advanced: Image Groups	group1
Advanced: Use Processing Area	yes
Advanced: Use Annotations	yes
Time for Point Cloud Densification	01m:13s
Time for Point Cloud Classification	NA
Time for 3D Textured Mesh Generation	01m:48s

Results

Number of Generated Tiles	1
Number of 3D Densified Points	647173
Average Density (per m^3)	138.33

DSM, Orthomosaic and Index Details

Processing Options

DSM and Orthomosaic Resolution	4 x GSD (1.46 [cm/pixel])
DSM Filters	Noise Filtering: yes Surface Smoothing: yes, Type: Sharp
Raster DSM	Generated: yes Method: Inverse Distance Weighting Merge Tiles: yes
Orthomosaic	Generated: yes Merge Tiles: yes GeoTIFF Without Transparency: no Google Maps Tiles and KML: no
Time for DSM Generation	06s
Time for Orthomosaic Generation	03m:11s
Time for DTM Generation	00s
Time for Contour Lines Generation	00s
Time for Reflectance Map Generation	00s
Time for Index Map Generation	00s