

Trimble's Photogrammetry Portfolio

Options for different customer bases + user needs



Trimble Business Center

Desktop-based software to integrate all survey + construction sensor data in a single project environment. Includes a powerful yet simplified UAV photogrammetry processing engine + workflow.



Trimble UASMaster

Desktop-based software dedicated to UAV photogrammetry for advanced users to customize sensor settings, processing steps, + deliverable creation. Included with all TBC photogrammetry licenses + able to move data back + forth between UASMaster + TBC.



Trimble Inpho

Pioneering desktop-based software in aerial photogrammetry for advanced users dedicated to process medium to large format sensors, single and multi-head platforms and large area aerial photogrammetry projects, for regional and national mapping purposes.



Trimble Stratus

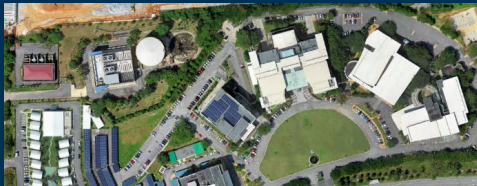
Cloud-based subscription service + interface featuring automated processing capabilities, online viewing, + analysis tools. Strengths include earthwork quantities + site monitoring applications for contractors.



The Datasets

Five data sets that incorporate different applications + processing techniques

Kuala Lumpur



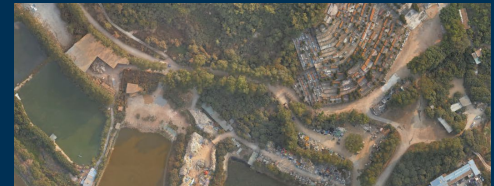
- DJI Phantom 4
- 157 images, 80 / 70 overlap
- No GCPs used
- 2.74cm GSD
- High-precision GNSS, no PP
- Urban area with buildings, cars, solar panels, + vegetation
- Processed at High to analyze the radiometry, geometry, + sharpness of true orthophotos

Qatar



- DJI Phantom 4 Pro
- 527 images, 80 / 64 overlap
- 5 GCPs used
- 2.18cm GSD
- No high-precision GNSS or PP
- Construction site with a field to the north, low ground contrast
- Processed at Default/Medium for a medium project + image size

DJI P1



- DJI Matrice 300 RTK
- 957 images, 80 / 80 overlap
- No GCPs used
- 1.44cm GSD
- High-precision GNSS, no PP
- Rural area with some buildings, vegetation, water features, landfill, + moving vehicles
- Processed at Low for a large project application as a site overview



The Datasets

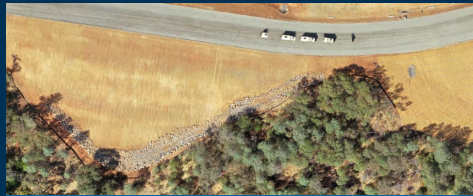
Five data sets that incorporate different applications + processing techniques

DJI Mission



- DJI Phantom 4
- 214 images, 85 / 85 overlap
- 5 GCPs used
- 2.34cm GSD
- No high-precision GNSS or PP
- Rural area with construction site + stockpiles
- Processed at Default/Medium for a typical construction stockpile quantity project

YUB20



- DJI Phantom 4
- 219 images, 80 / 75 overlap
- No GCPs used
- 2.77cm GSP
- High-precision GNSS with PP
- Rural area with vegetation, rocks, + vehicles on roadway
- Processed at Default/Medium for a typical surveying project + image size

Both DJI Mission and YUB20 raw field + processed datasets are available for free download on the Trimble Geospatial Sample Data site - click the screenshot to be redirected or go to <https://geospatial.trimble.com/resource-center/sample-datasets>



The Analysis

Five dimensions of comparison for aerial photogrammetric workflows



Quality

How well can the software adjust aerial imagery + create deliverables?



Performance

How long does the aerial imagery adjustment + deliverable creation take?



User Experience

Does the adjustment process balance robust options with intuitive interfaces?



Capabilities

What can the software do once the photogrammetric processing is complete?



Offering + Pricing

Does the software's offering + pricing meet market needs + provide a good customer value?

Ratings overview

Four evaluation levels to evaluate each software's capabilities



No capability

The software has no functionality or ability in the evaluation area.



Limited capability

The software has a few commands or immature features in the evaluation area. Additional software or enhancements are needed.



Partial capability

The software has numerous commands and abilities in the evaluation area, but additional software or enhancements are needed.



Strong capability

The software offers high-functioning, detailed, or complete commands and workflows in the evaluation area. No additional software is needed.

The Analysis





Quality



Quality Evaluation

Are the deliverables. i.e. **true-orthophotos** and **point clouds** representing the physical world in a high quality digital format?



Accuracy and Geometry



Are the position and the shape of the objects accurately represented?



Overall Color Balance



Are the colors radiometrically well balanced in the whole scene?



Brightness, Contrast and Color



Can objects be easily distinguished and well recognized?



Sharpness and Texture on the Objects

Are simple and complex textures represented correctly on surfaces?



Density and Resolution

How dense/high-resolution are the final point clouds and orthophotos?



Noise and Moving objects

Are the surfaces noise free and without any ghosting effects?



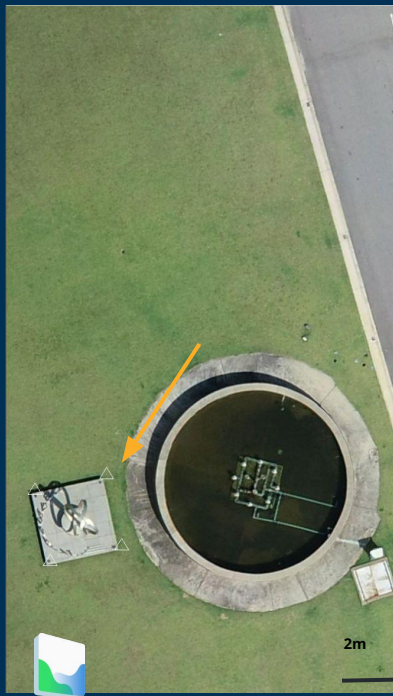
Accuracy and Precision

True Orthophoto (at **high** quality level)



Comparison of deliverables in
Georeferencing and Image
Matching at Pixel level
(1 x GSD), HQ GNSS, no GCPs,
no base-line processing

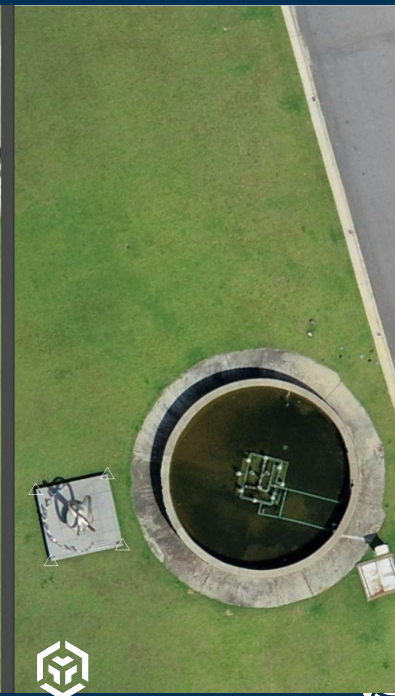
- TBC has the most stable and accurate engine in image matching and georeferencing
- Pix4D crashes at Pixel level, or is inaccurate in georeferencing and weak in image matching
- Metashape is relatively stable in image matching but has less accuracy in georeferencing



Metashape



Pix4Dmapper



TBC Photogrammetry

Accuracy and Precision

True Orthophoto (at **medium** quality level)



Comparison of deliverables in
Georeferencing and Image
Matching at Pixel level
(**2 x GSD**), HQ GNSS, no GCPs,
no base-line processing

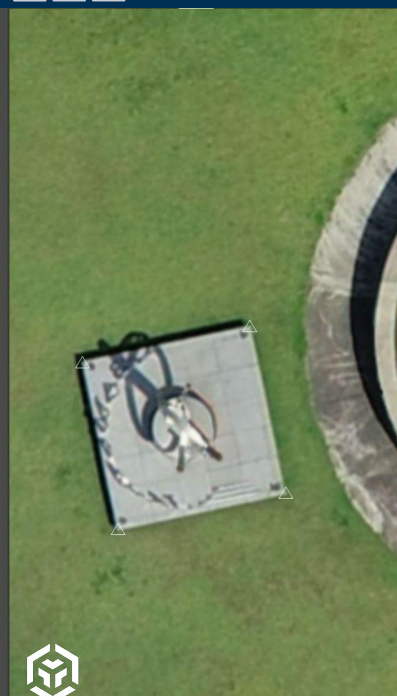
- TBC has the most stable and accurate engine in image matching and georeferencing
- Pix4D is stable and accurate in georeferencing, with reliable quality in image matching
- Metashape is relatively stable in image matching but has less accuracy in georeferencing



Metashape



Pix4Dmapper



TBC Photogrammetry



Shape and Geometry

True Orthophoto (at **medium** quality level)

For the comparison, choose an area with small objects in different illumination, depth and shape!



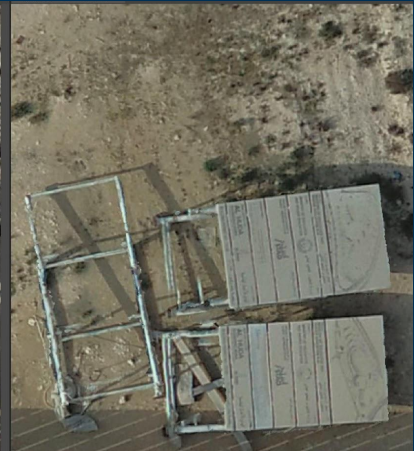
- High quality geometry of simple and complex objects in TBC with sharp edges



- No or less duplication of thin and small objects in TBC



- Consistent reconstruction of objects even in shadow areas in TBC



Metashape

Pix4Dmapper

TBC Photogrammetry





Shape and Geometry

True Orthophoto (at **high** quality level)

For the comparison, choose areas with mixed objects of buildings and trees, in different height and illumination!



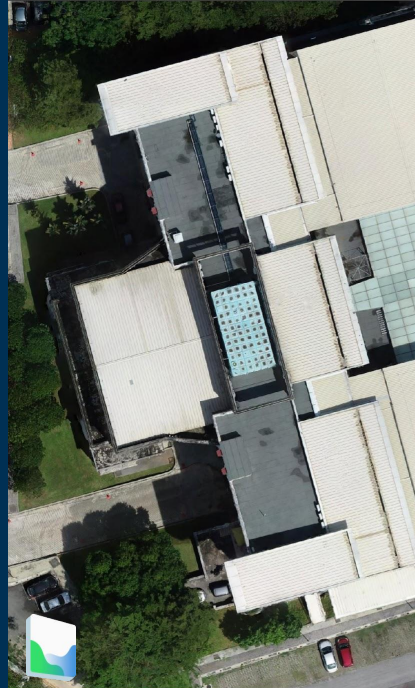
- High quality geometry of simple (roofs) and complex surfaces (trees) in TBC and Metashape



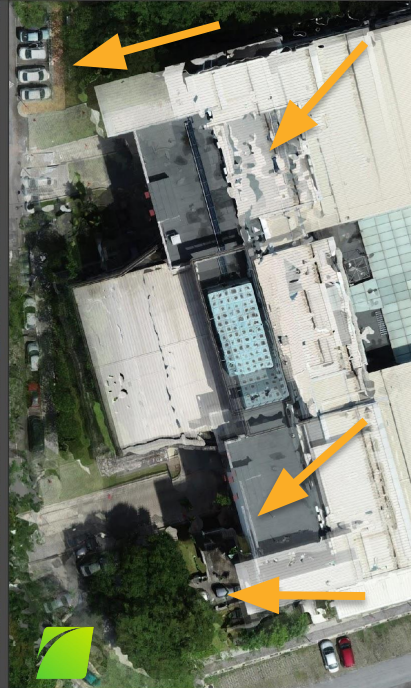
- Weak reconstruction engine in Pix4D, delivering wrong position and shape of objects



- Consistent geometry of objects both in highly illuminated and also shadow areas in TBC



Metashape



Pix4Dmapper



TBC Photogrammetry

Position and Geometry

True Orthophoto (at **high** quality level)

For the comparison, choose areas with mixture of poor/strong (round/angular) geometry and poor/rich texture



- High quality reconstruction of objects with round/angular geometry in TBC and Metashape



- Weak reconstruction engine in Pix4D, delivering inaccurate position and shape of objects



- Homogeneous reconstruction of objects with poor and rich texture in TBC and Metashape



Metashape



Pix4Dmapper



TBC Photogrammetry

Geometry and Sharpness

True Orthophoto (at **high** quality level)

For the comparison, choose areas with sharp edges and sudden changes in height and illumination



- High quality reconstruction of objects with sharp and crispy edges in TBC



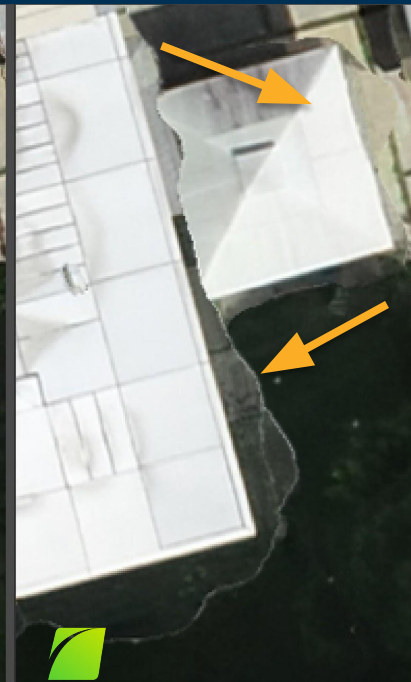
- Weak reconstruction of geometry in Pix4D leads in artifacts at the edges and corners



- Mouse-bite effects and low quality radiometry adjustment on sudden changes on surfaces in Metashape



Metashape



Pix4Dmapper



TBC Photogrammetry





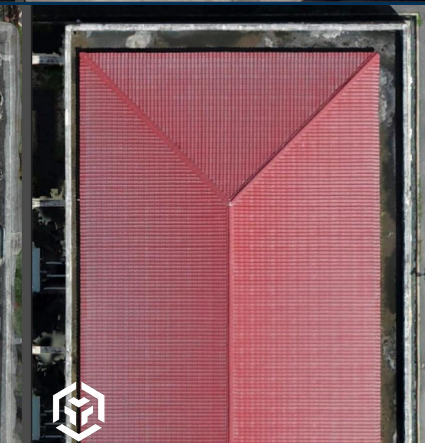
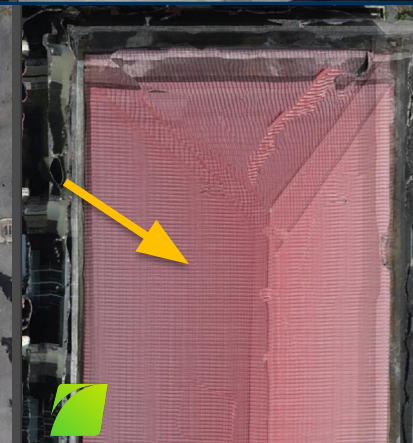
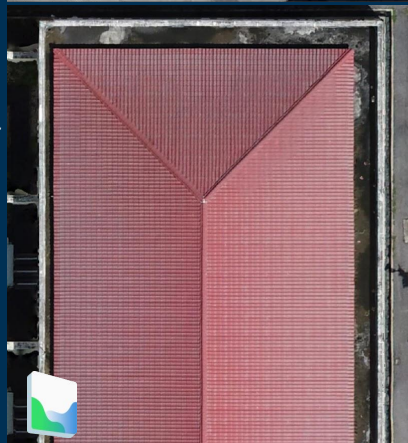
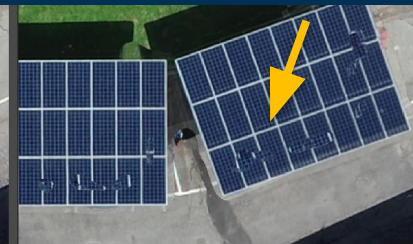
Sharpness and Texture

True Orthophoto (at **high** quality level)

For the comparison, choose objects with single color and repeated texture



- High quality reconstruction of objects with single color and repeated textures in TBC
- Weak reconstruction of single color and repeated textures and shadow in Pix4D
- Better contrast of simple surfaces with repeated textures in Metashape



Metashape

Pix4Dmapper

TBC Photogrammetry



Overall Color Balance

True Orthophoto (at **medium** quality level)

For the comparison, choose an area with less color changes and poor texture like desert or grassland



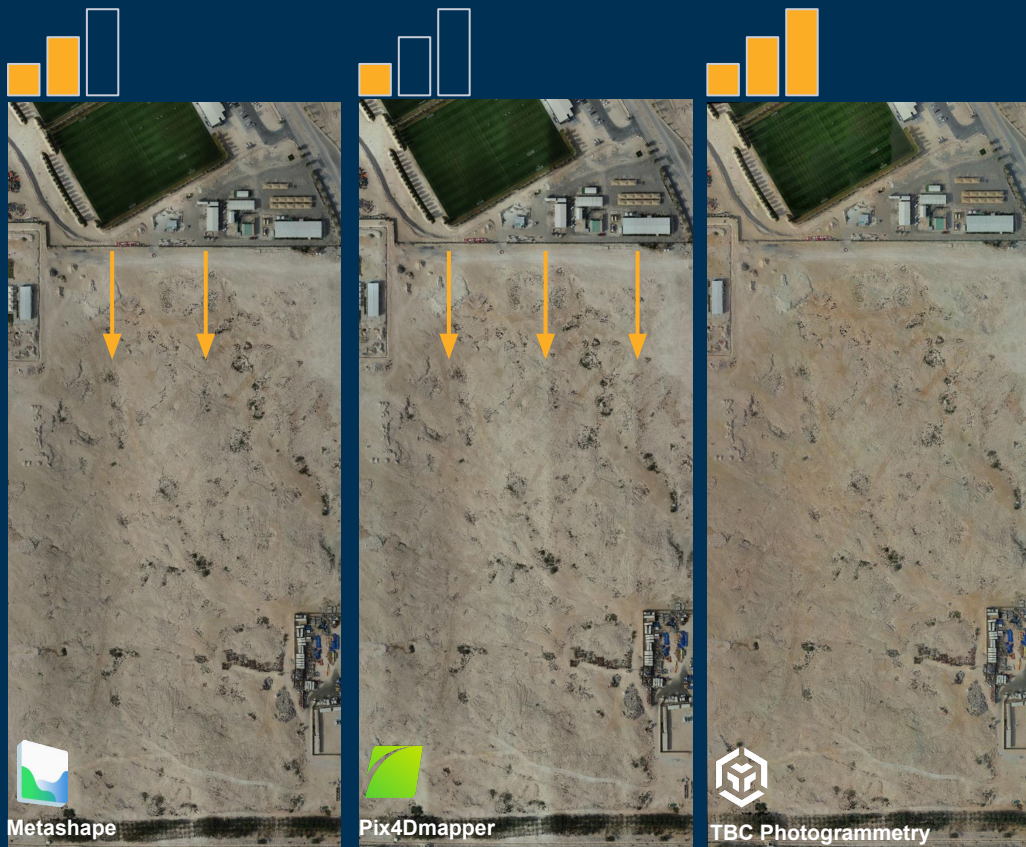
- Well brightness in all three software



- Best radiometry and color balance in TBC, suitable for reliable feature extraction



- Weak radiometry adjustment and color balance of whole orthomosaic in Pix4D



Overall Color Balance

True Orthophoto (at **high** quality level)

For the comparison, choose an area with many changes in color, illumination, texture and content!



- Well brightness, no overexposure or under illumination in all three software,



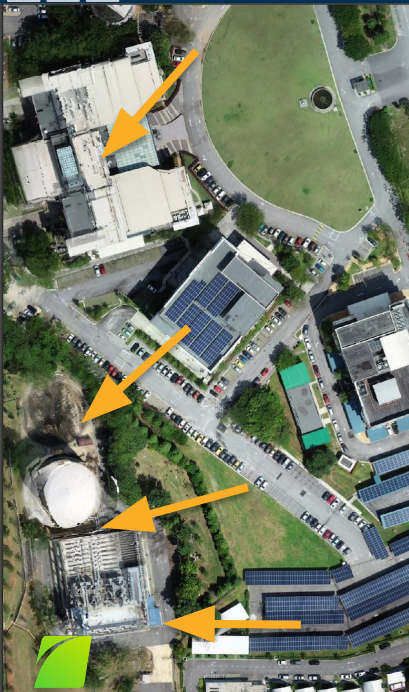
- Better color balance and crispy orthophoto in TBC



- Best representation of shadowed and under illuminated areas in TBC



Metashape



Pix4Dmapper



TBC Photogrammetry



Brightness, Contrast and Color

True Orthophoto (at **high** quality level)

For the comparison, choose an area, full of colorful objects with sharp edges and different illumination.



- Well brightness, no overexposure or under illumination in all three software



- Better contrast in TBC and Metashape, colors are more enhanced



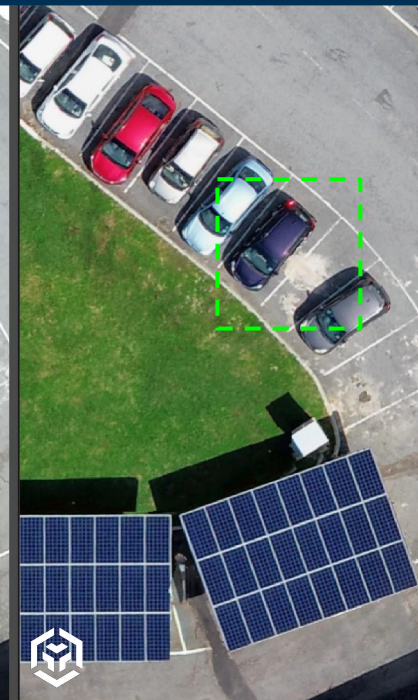
- Balanced colors in TBC and Metashape on repeated textures with more liveliness in TBC



Metashape



Pix4Dmapper



TBC Photogrammetry



Contrast and Brightness in Shadow

True Orthophoto (at **high** quality level)

For the comparison, choose an area, with high difference in illumination and brightness.



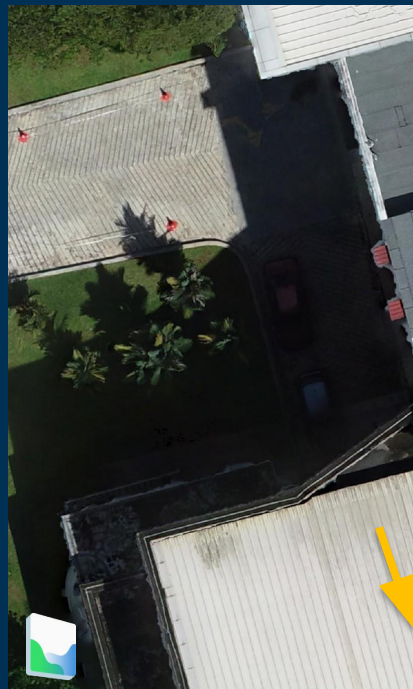
- Significantly better representation of objects under shadows in TBC



- Better contrast in TBC and color balance in TBC and Metashape



- Colors on the objects are kept crispy and liveliness



Metashape



Pix4Dmapper



TBC Photogrammetry



Point Density

(at **medium** quality level)

- Each pixel one point
- Up to **12x** higher point density
- Same matching level (GSD)
- Up to **25%** higher performance

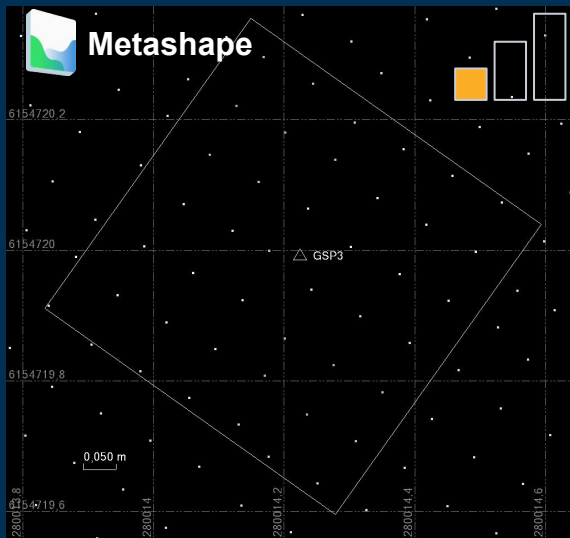


TBC

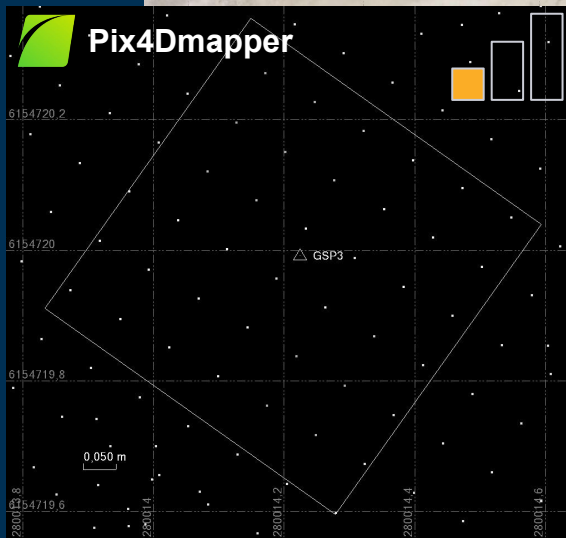
True orthophoto with 2cm GSD



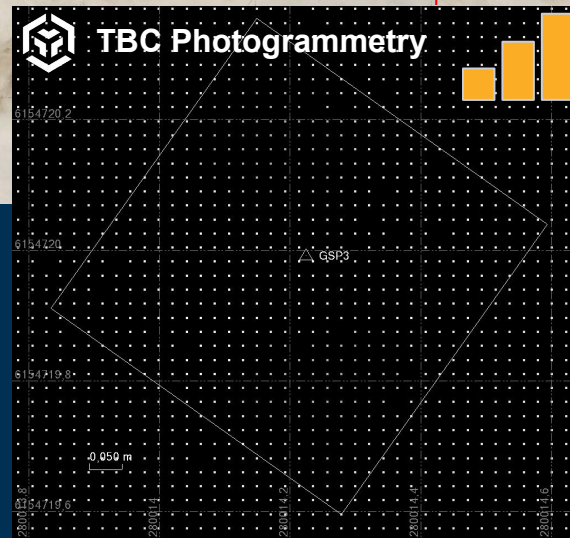
Metashape



Pix4Dmapper



TBC Photogrammetry





Point Cloud Quality (at medium quality level)

Point Cloud (raw)

 TBC Photogrammetry





Point Cloud Quality (at medium quality level)

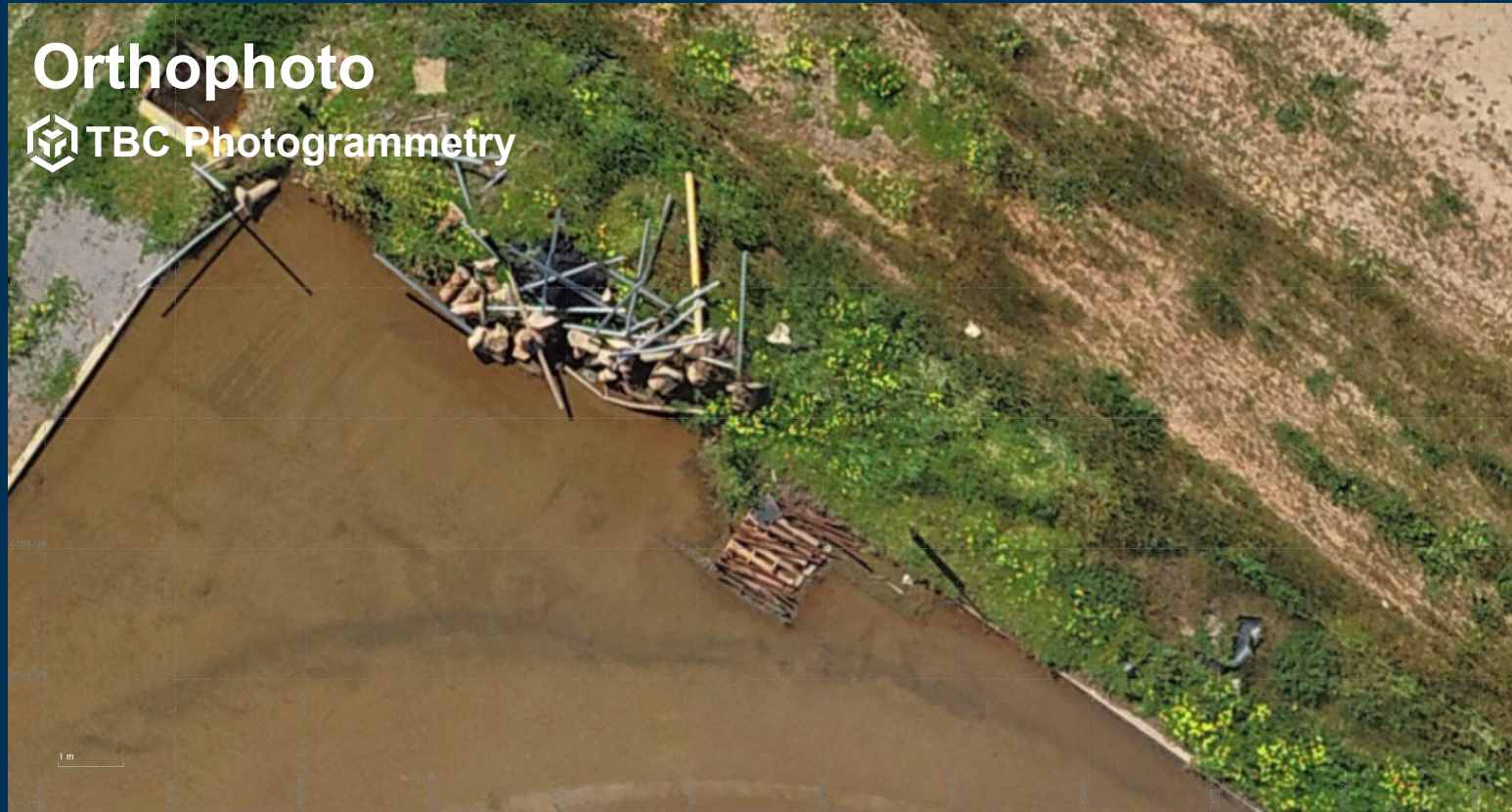
Point Cloud (refined)

 TBC Photogrammetry



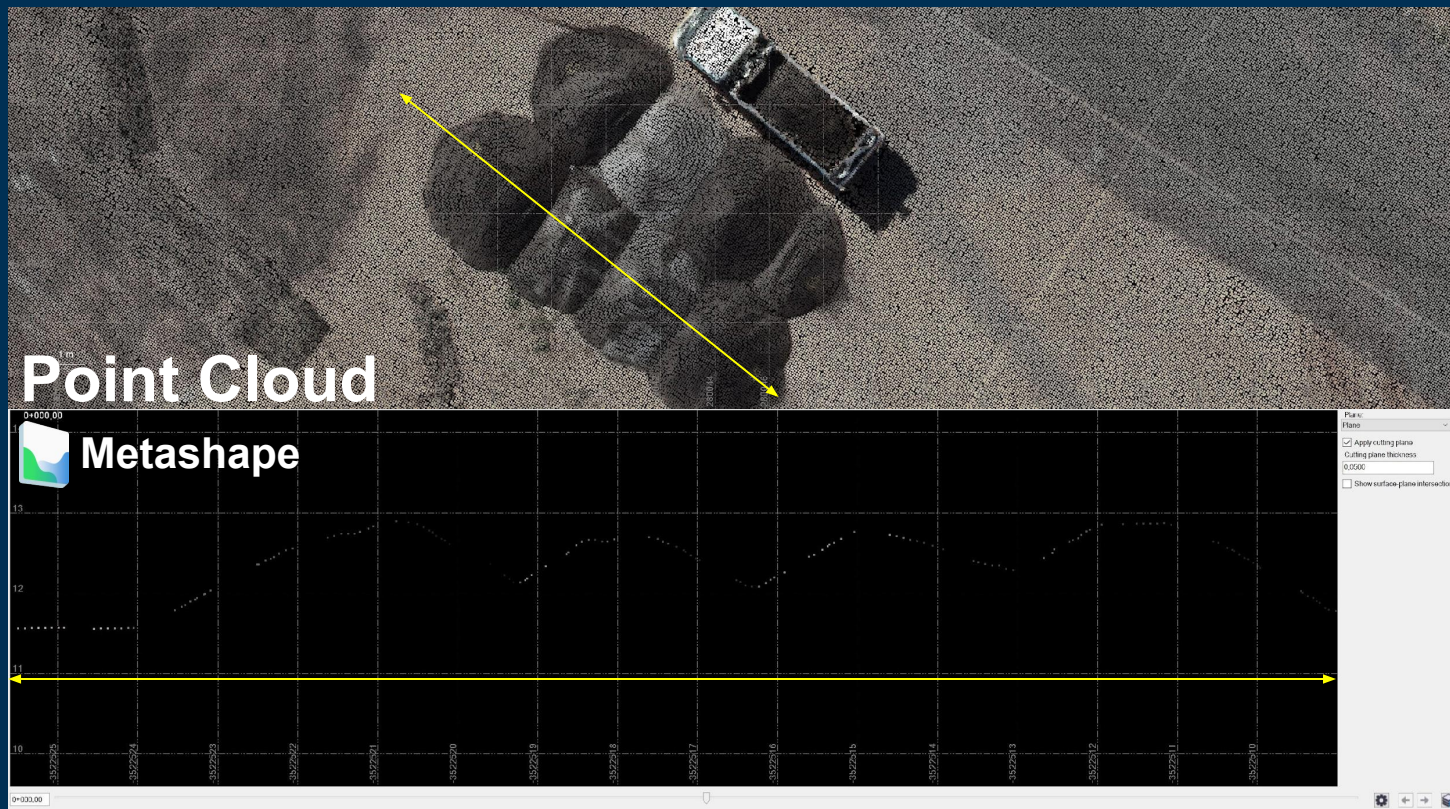


Orthophoto Quality (at medium quality level)





Point Cloud Density (at medium quality level)





Point Cloud Density (at medium quality level)



Quality

Conclusions



Image matching and georeferencing in TBC is most stable and accurate both at high and medium level quality. Better color balancing and contrast in the deliverables makes recognition of objects easier for feature extraction purposes.



Pix4Dmapper is stable in image matching and georeferencing at medium level but insatiable and weak georeferencing in high quality level. It crashes at the pixel level or takes longer, with low quality deliverables.



Image matching and georeferencing in Metashape is stable and accurate both at high level quality, and less accuracy in georeferencing at medium level. The quality of surfaces are satisfactory but the quality of the edges are low due to the mouse-bite effect at the edges.





Performance



Performance Evaluation

How fast is the image matching and processing of the deliverables?



Processing Steps

- 1) Adjust PhotoStations
- 2) Deliverables

Deliverables

Digital Surface Model (Highest Quality) for True-Orthophoto+Point Cloud

Operator

TBC expert but a beginner in photogrammetry

PC and Configuration

Are the colors balanced radiometrically in the whole scene?

- Intel(R) Core(TM) i7-6700 CPU @ 3.40GHz
- 32 GB RAM
- NVIDIA GeForce GTX 745
- Samsung SSD 980 1TB



Performance

Kuala Lumpur - Processed at High level (Level 0 = 1 x GSD)
DJI Phantom 4 (DJI FC6310R), GSD= 2.70 cm, 157 images,
no GCPs, high quality GNSS, no base-line processing



Software	Image Matching / Orientation / Alignment	Dense Point Cloud + DEM Generation	Orthophoto Mosaic Generation	Total
Trimble Business Center	00:21:48	01:00:46	00:20:59	01:43:33
Pix4Dmapper	00:22:10	05:25:04	07:40:52	13:28:05
Agisoft Metashape	01:03:06	02:09:07	00:30:03	03:42:15



Performance

DJI Mission - Processed at Medium level (**Level 1 = 2 x GSD**)
DJI Phantom 4 (DJI FC6310R), GSD= 2.15 cm, 214 images,
with GCPs, low quality GNSS, no base-line processing

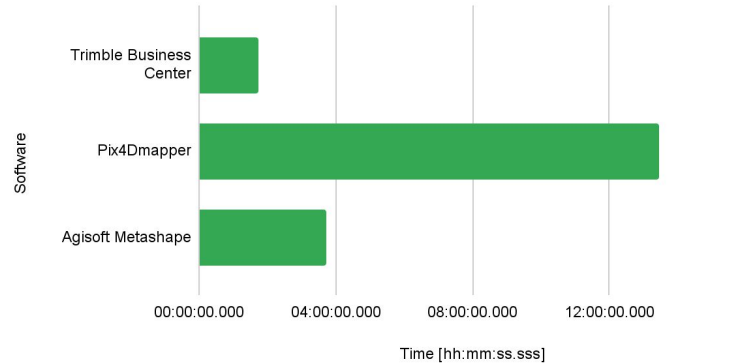


Software	Image Matching / Orientation / Alignment	Dense Point Cloud Generation	Orthophoto Mosaic Generation	Total
Trimble Business Center	00:14:52	00:44:42	00:15:56	01:12:23
Pix4Dmapper	00:12:04	00:23:40	00:48:21	01:24:04
Agisoft Metashape	00:35:57	00:44:04	00:39:31	01:59:32

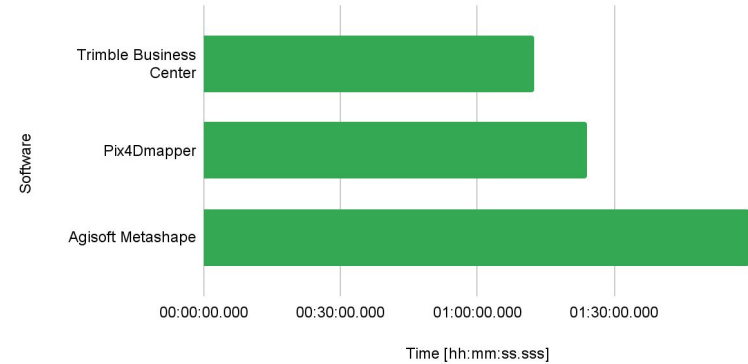


Performance

Completion Time of Each Software on High Level using GNSS Quality (Kuala Lumpur)



Completion Time of Each Software on Medium Level with GCPs (DJI Mission)



Performance

Conclusions



TBC takes a little longer to import photos + does a comparable job to Pix4Dmapper during the image matching step. TBC is incredibly fast at processing datasets at the High Quality level.



Pix4Dmapper takes an extremely long time to process datasets at the High Quality level. However, it is fairly fast at processing datasets at the Medium quality level.



Agisoft imports photos extremely quickly but takes a while to finish image matching/photo alignment. Metashape does not process the point cloud + orthomosaic as fast as TBC.





User Experience



User Experience /Interface (UX/UI)

Is the user able to Start, Process and Finish the job in an easy and convenient guided workflow?



Number of Steps

How many steps are there from import to deliverables?

Learning Curve and Repeatability

How much knowledge is needed from START to FINISH?

Number of Windows

Does user open and work with different windows?

Guided User Interface

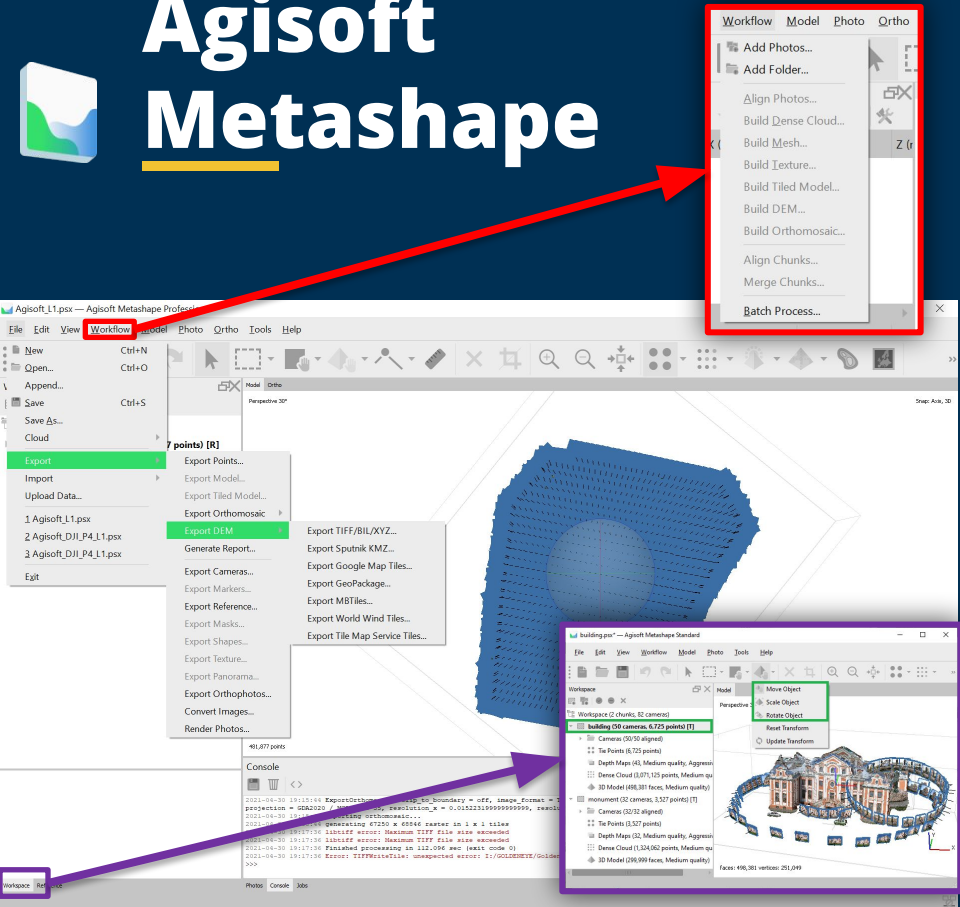
Is the software menu-based, window-based or wizard-based?

Working and Visualization Tools

Can the functionalities be found easily and are the tools well visualized?



Agisoft Metashape



User Experience (UX)

- Unclear where to start
- Photogrammetry workflow is found from the menu
- Guided through the workflow based on the activation of steps
- Ability to apply settings + batch process to expedite repeatable projects
- Navigation and editing tools are easily accessible in the window
- Tree-based project structure

User Interface (UI)

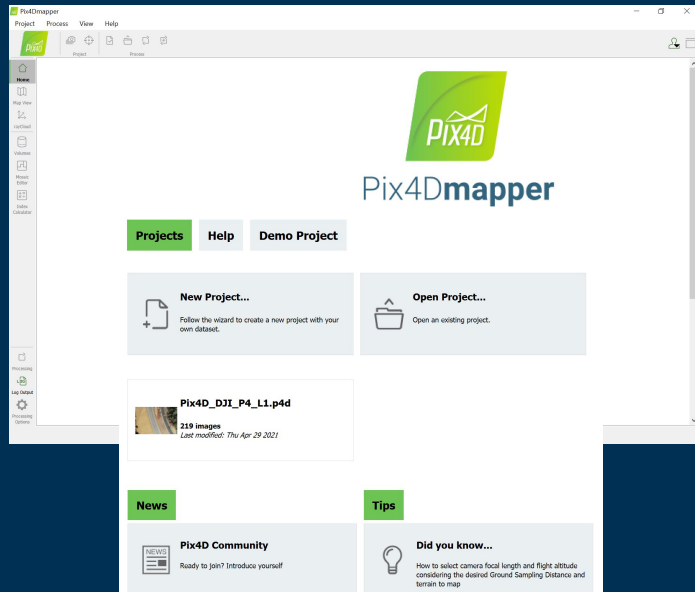
- Based on menus and sub-menus
- Simple and self-explanatory icons
- Difficult to find and distinguish activated vs. non-activated icons because of minimal contrast and gray icons
- Gray environment, with white workspace

Conclusion

- Steps of the workflow are hidden in the menus
- Need prior photogrammetry knowledge and/or experience
- Training, help and dependency on instruction



Pix4Dmapper



UX

- Easily know where to start
- Guided workflow through communicative steps with the user on the GUI
- Define the project based on the needed deliverables (batch processing of all steps is easy)
- Template definition and setup is possible

UI

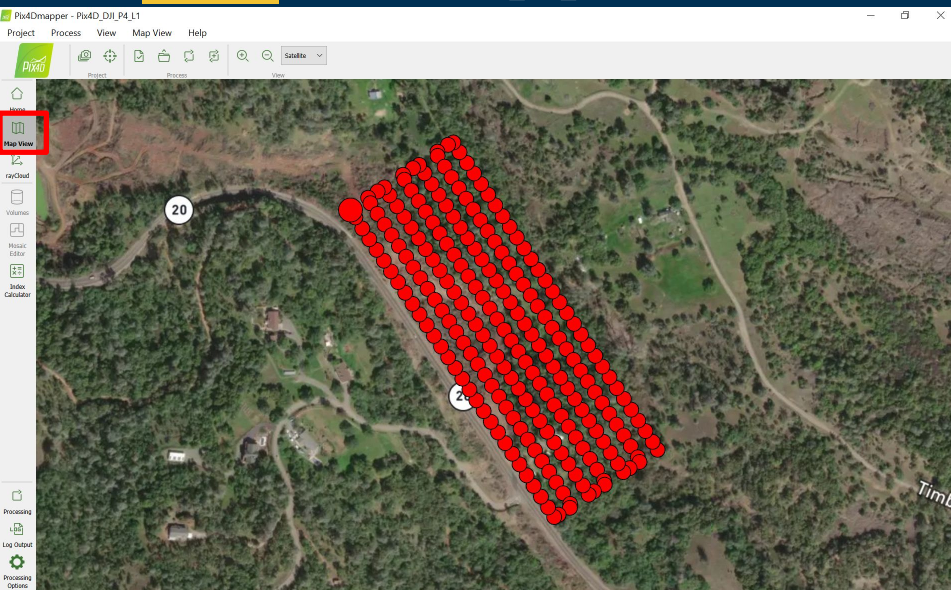
- Icon-based and smaller, communicative menu
- Simple and self-explanatory icons
- Gray environment, with black workspace

Conclusion

- Workflow steps are shown down in the Processing Options window and Processing pane
- Need prior photogrammetry knowledge and/or experience
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Pix4Dmapper



The feeling of “I am doing this the right way?”

UX

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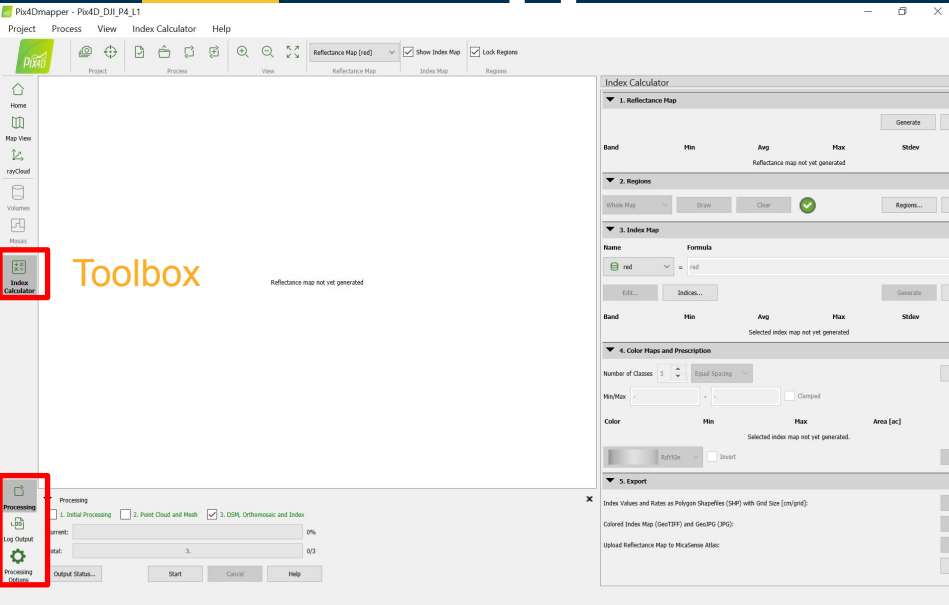


Tools are available based on priorities

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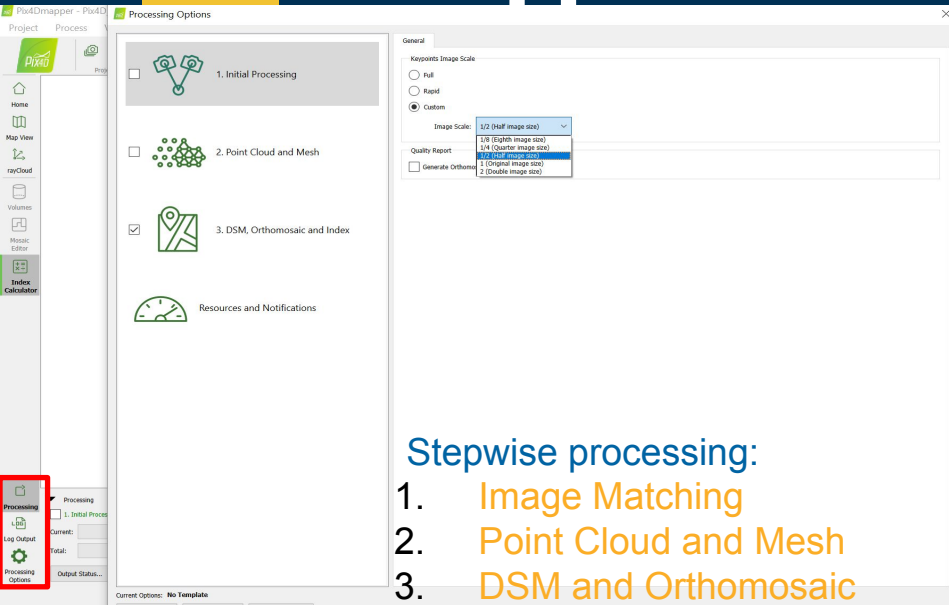
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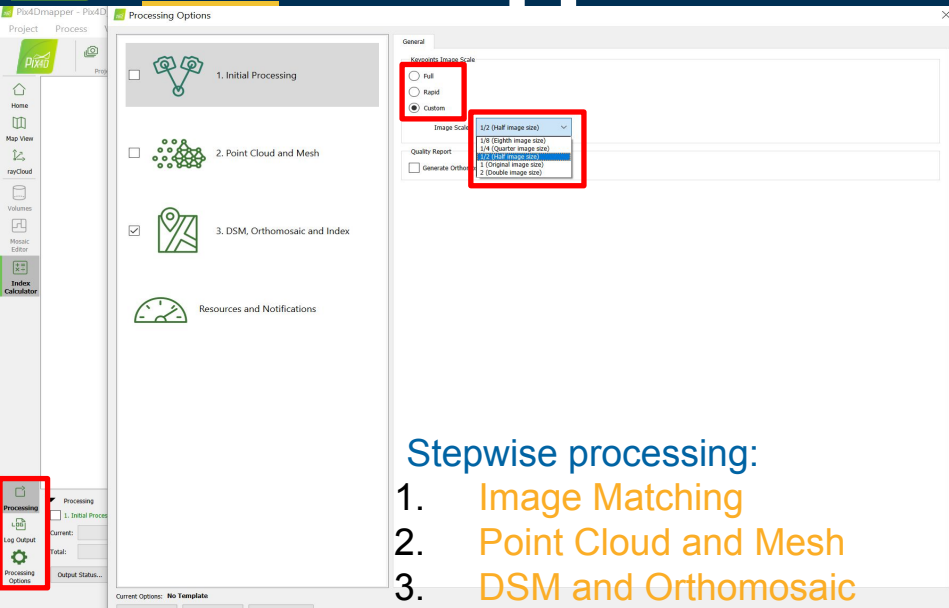
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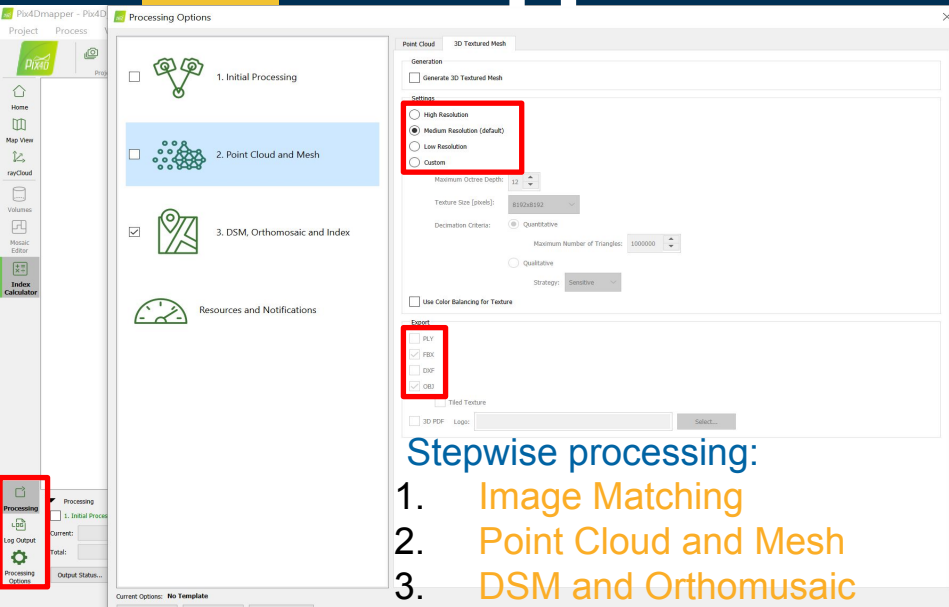
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- Simple and self-explanatory icons
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Conclusion

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Pix4Dmapper



Stepwise processing:

1. Image Matching
2. Point Cloud and Mesh
3. DSM and Orthomosaic

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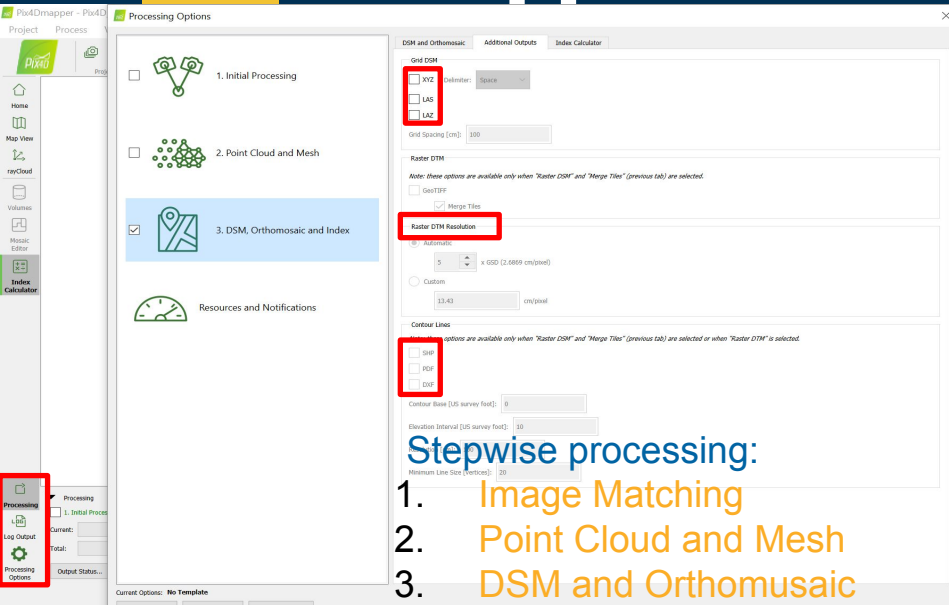
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Pix4Dmapper



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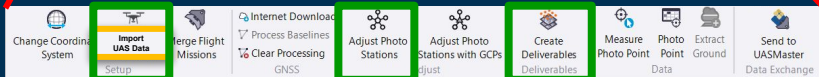
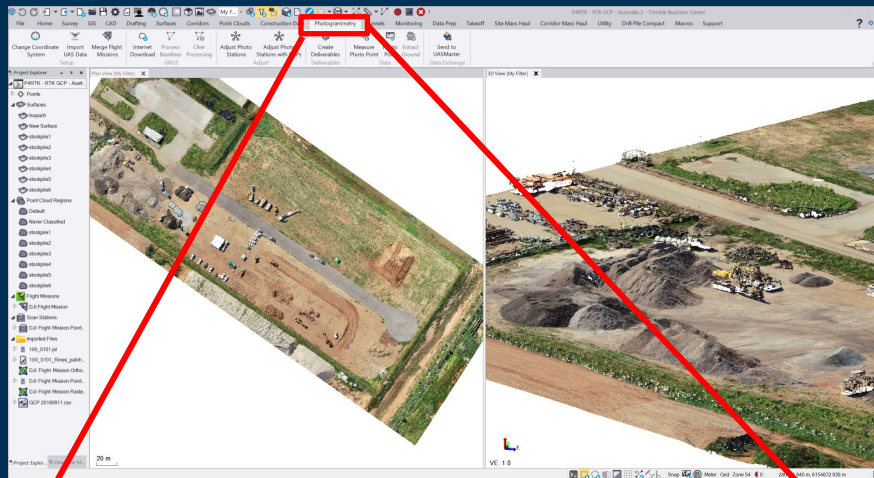
Conclusion

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Trimble Business Center



STEP 1
IMPORT

STEP 2
ADJUST

STEP 3
DELIVERABLES

UX

- Application and workflow define the UX
- Communicative with the user
- Clean, left-to-right approach simplifies the workflow, showing only the applicable adjustment steps

UI

- Dense icon-based menu along with icon names
- Gray environment, with white or black background workspace (customized to user's liking)
- Quick Access Toolbar includes duplicative or frequently used commands

Conclusion

- Workflow steps are shown in menu with following steps grayed out
- Help dependency



More Automation, More UAVs

DJI Series

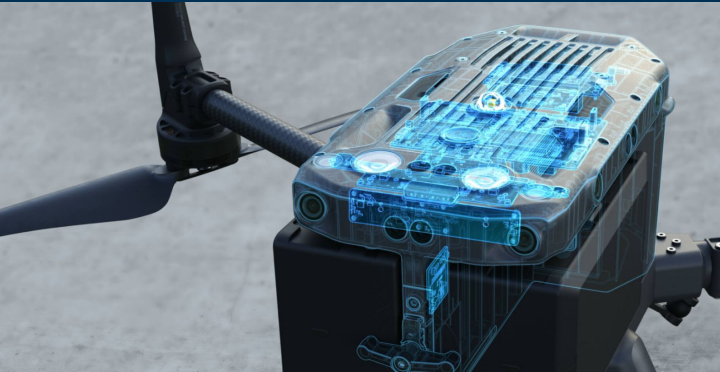
- DJI Phantom 4 ✓
- DJI Phantom 4 RTK ✓
- DJI M300 (P1, L1) ✓
- DJI M300 P1 Base-line processing ✓
- DJI Mavic 3 Enterprise (v5.90)

MicroDrones

- mdMapper1000DG ✓
- mdLiDAR1000LR ✓
- mdLiDAR3000 ✓
- mdLiDAR3000DL ✓

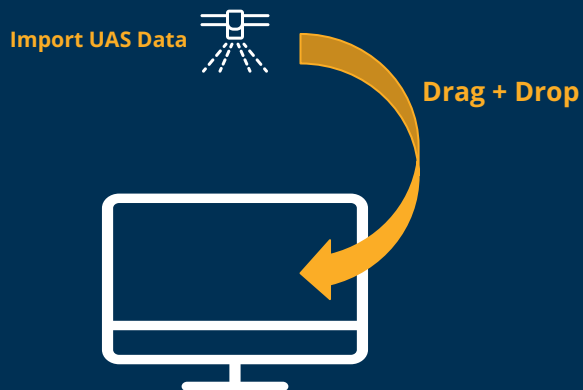
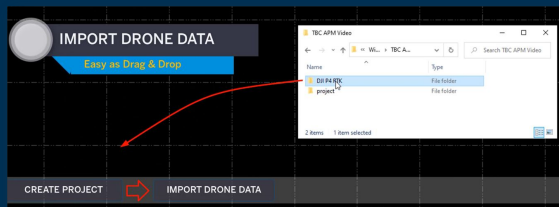
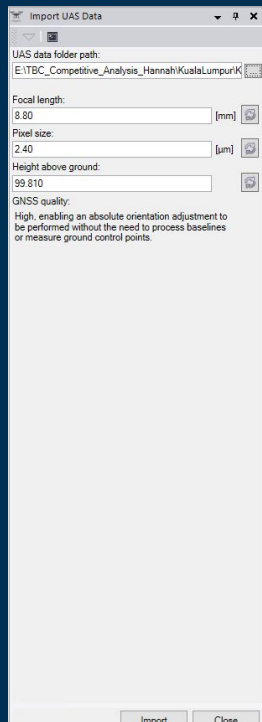
And More ...

- WingtraOne GEN II ✓
- Sensefly (v5.90)
- Quantum Systems (v5.90)



Trimble Business Center

STEP 1



UX

- Application and workflow define the UX
- Communicative with the user
- Clean, left-to-right approach simplifies the workflow, showing only the applicable adjustment steps

UI

- Dense icon-based menu along with icon names
- Gray environment, with white or black background workspace (customized to user's liking)
- Quick Access Toolbar includes duplicative or frequently used commands

Conclusion

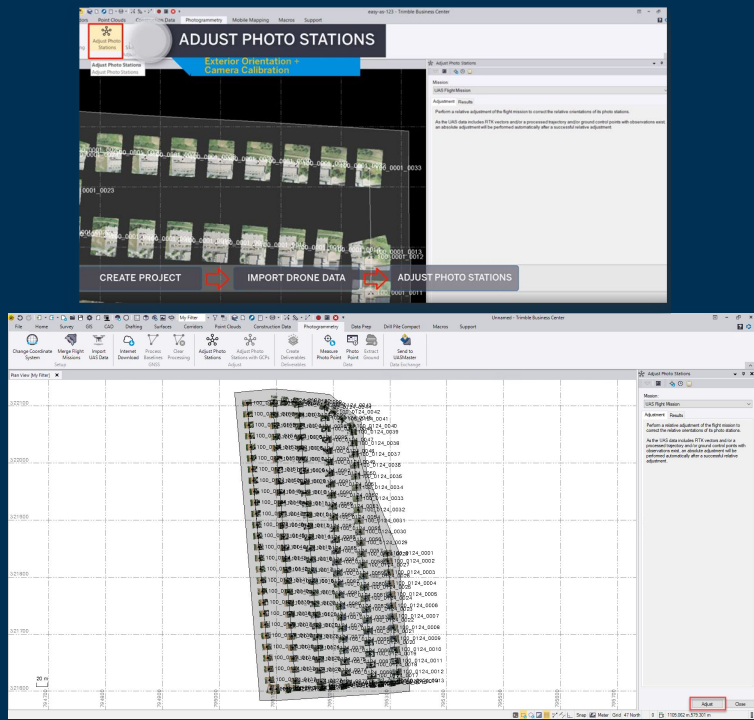
- Workflow steps are shown in menu with following steps grayed out
- Help dependency





Trimble Business Center

STEP 2



UX

- Application and workflow define the UX
- Communicative with the user
- Clean, left-to-right approach simplifies the workflow, showing only the applicable adjustment steps

UI

- Dense icon-based menu along with icon names
- Gray environment, with white or black background workspace (customized to user's liking)
- Quick Access Toolbar includes duplicative or frequently used commands

Conclusion

- Workflow steps are shown in menu with following steps grayed out
- Help dependency



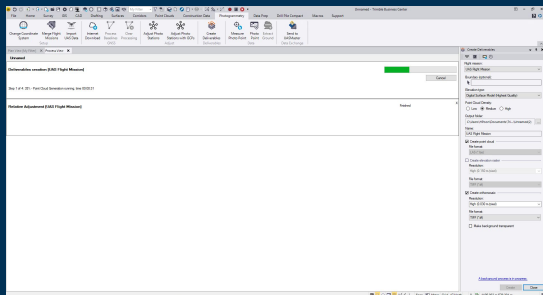


STEP 3



Orthophoto

True-Orthophoto



- Application and workflow define the UX
- Communicative with the user
- Clean, left-to-right approach simplifies the workflow, showing only the applicable adjustment steps

- Dense icon-based menu along with icon names
- Gray environment, with white or black background workspace (customized to user's liking)
- Quick Access Toolbar includes duplicative or frequently used commands

- Workflow steps are shown in menu with following steps grayed out
- Help dependency



User Experience

Conclusions



The aerial photogrammetry tab follows a simplified left-to-right workflow-based approach in three steps, that is easy to understand and follow. However, upon first opening TBC, users can be quite overwhelmed by the number of tabs and icons and the many features and modules.

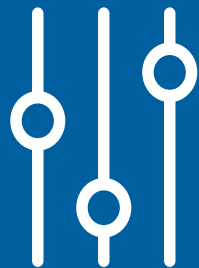


Pix4Dmapper is a mixture of menu and wizard-based workflow has a intuitive user interface with guiding prompts to click and an array of online help available at user's fingertips. The number of windows and clicks are still high through the workflow.



Agisoft Metashape can be confusing to navigate in at first with gray icons and no contrast or color to easily identify what icons are for. However, their simple workflow menu makes it easy to get right to processing once users know where to go + the batch processing is a major time saver.





Capabilities

Key functionality beyond the aerial adjustments + deliverables that allow you to stay in a single software to complete the project + client's deliverables

- **Survey data integration + processing**
- **Geodetics**
- **Point cloud tools**
- Image tools
- **Surfaces + meshes**
- Volume + CAD tools
- Imports + exports
- Other highlight features



Survey data integration + processing

Survey Sensor Support

- TBC supports raw data from GNSS, total stations, digital levels, terrestrial scanners, + mobile mapping sensors from Trimble and third-parties, allowing users to **stay in one survey CAD package for multi-sensor survey projects**.
- Pix4Dmapper + Agisoft Metashape do not support non-photogrammetric survey sensors.



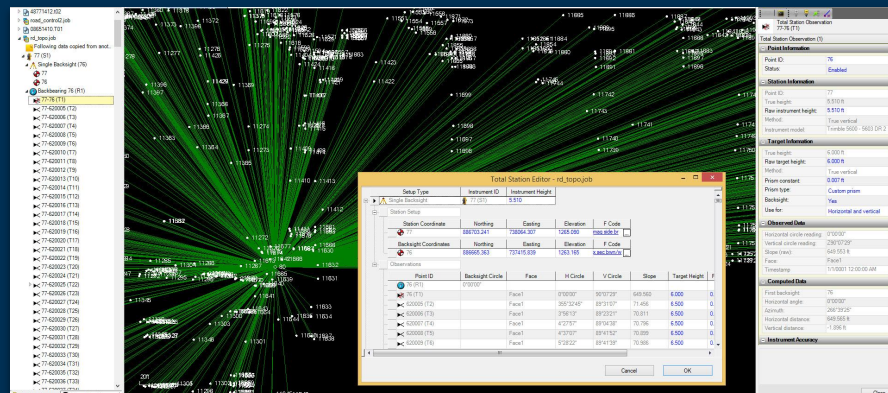
TRIMBLE + THIRD-PARTY SENSORS SUPPORTED IN TBC



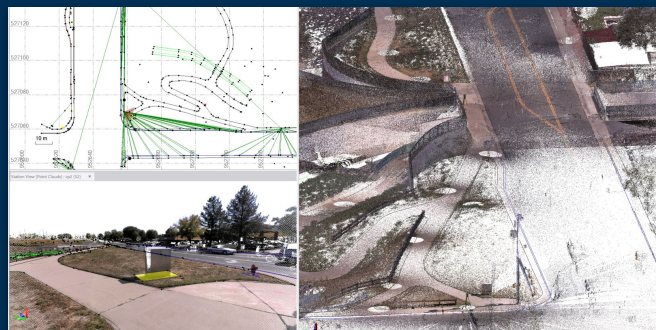
Survey data integration + processing

Field Data QA/QC

- TBC displays measurements + properties, allowing the user to edit parameters such as rod heights + prism constants to **eliminate re-work due to field blunders**. TBC also offers numerous field data reports, via *.html, MSWord, + style sheets, providing **confidence for surveyors + clients**.
- Pix4Dmapper + Agisoft Metashape do not support non-photogrammetric field data QA/QC.



VIEW FIELD MEASUREMENTS, SUCH AS ROD HEIGHTS + TURNED ANGLES IN TBC



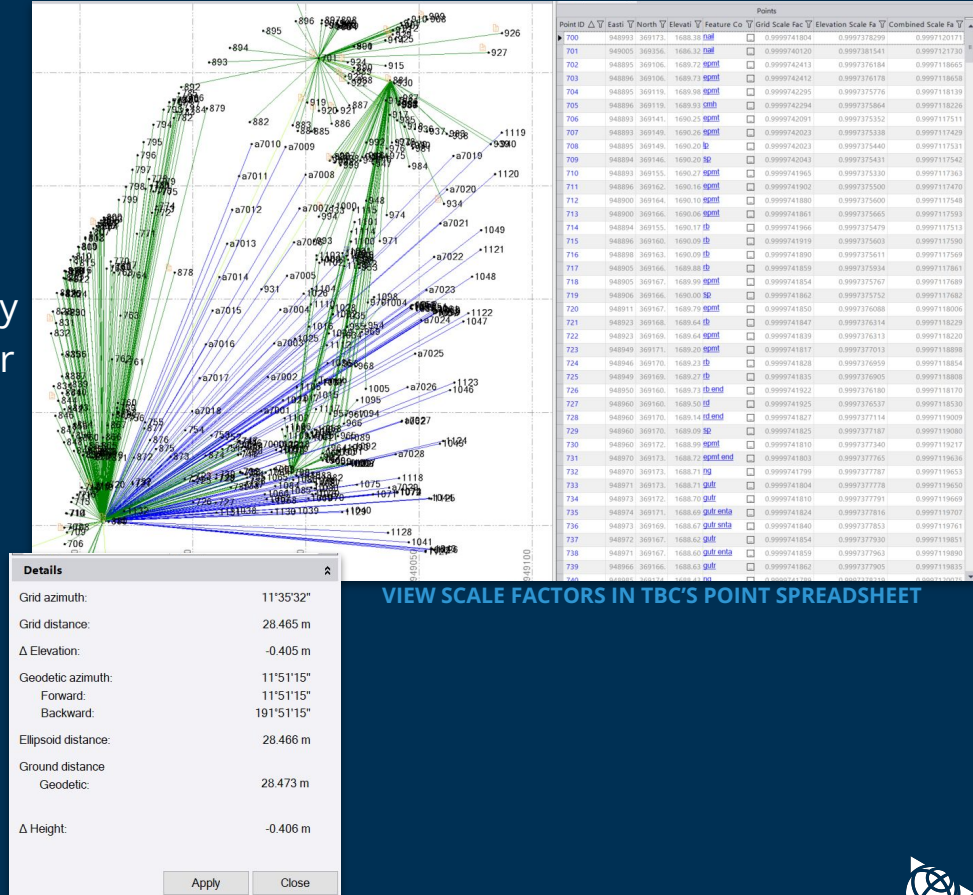
GNSS, OPTICAL, + TERRESTRIAL SCAN DATA IN TBC



Geodetics

Grid + Ground Distances

- TBC projects grid coordinates onto locally surveyed ground coordinates to allow for **integration of optical + scan data alongside GNSS data in one project environment.**
- Pix4Dmapper + Metashape are pure cartesian grid-based packages. It is possible to convert grid-ground + vice versa in Pix4Dmapper but additional, tedious steps are required.

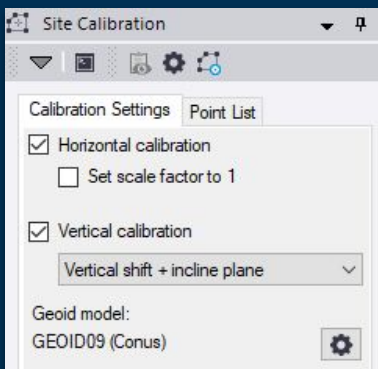
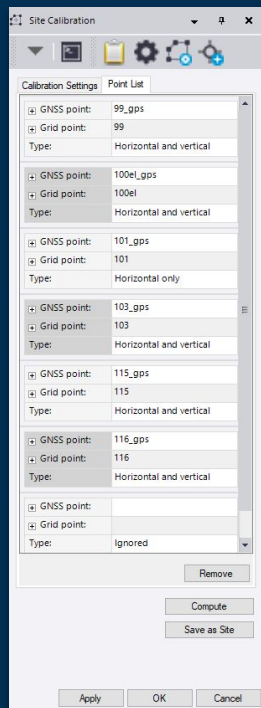


VIEW SCALE FACTORS IN TBC'S POINT SPREADSHEET

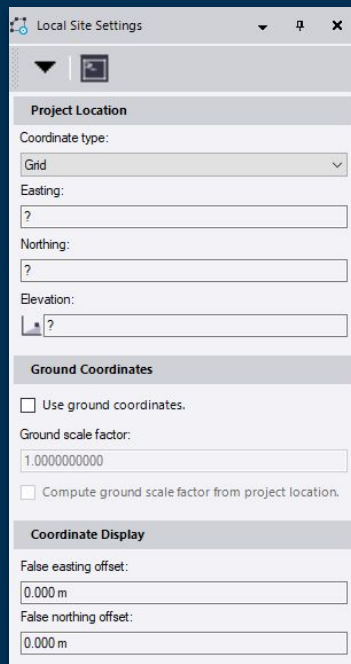
LEVERAGE GRID OR GROUND IN TBC



Geodetics



**CALIBRATE A SITE TO ESTABLISH
RELATIONSHIP BETWEEN WGS84
+ LOCAL CONTROL POSITIONS
IN TBC**



Local Sites + Calibrations

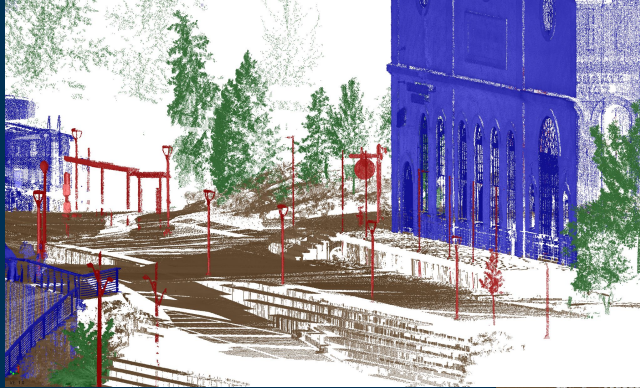
- TBC offers the capability of entering local site settings to create a ground coordinate system to **accommodate proper elevation differences between your site + the ellipsoid**.
- Pix4Dmapper supports arbitrary grid coordinate systems as local site calibrations but is not tied to underlying geodetics, risking reduced accuracy across a set of GNSS coordinates.
- Agisoft Metashape does not support local site calibrations. Agisoft is unable to link between local + geodetic systems.



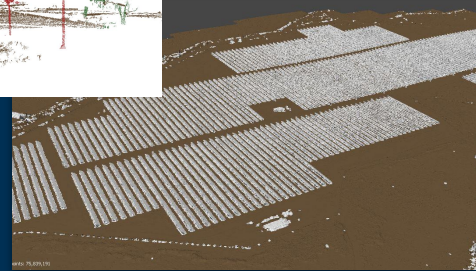
Point cloud tools

Clean-up Tools

- TBC offers segmentation + auto classification tools to **visualize + extract information quicker** or remove extraneous or noisy point cloud points.
- Pix4Dmapper supports the manual editing of point clouds by reducing noise to improve the visual rendering.
- Metashape does a very good job in automatic ground classification for point clouds to divide all the points into two classes: ground points + other.



AUTOMATED CLASSIFICATION OF
POINT CLOUD REGIONS IN TBC

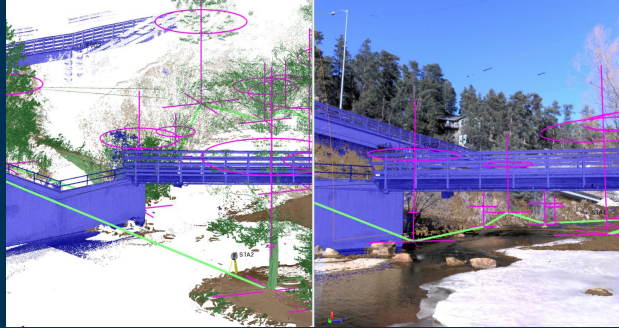


STRONG AUTOMATIC GROUND
CLASSIFICATION IN METASHAPE



REMOVE EXTRANEOUS POINTS FROM THE POINT CLOUD IN PIX4Dmapper

Point cloud tools



POINT CLOUD DATA CLASSIFIED + FEATURES
EXTRACTED IN TBC



TREES EXTRACTED AS
BLOCKS IN TBC



AUTOMATIC FEATURE EXTRACTION IN
PIX4Dsurvey (SEPARATE SOFTWARE)

Feature Extraction

- TBC extracts a variety of geometry + features such as trees, poles, signs, manholes, overhead lines, curb and gutter, lane line markings, + cross-sections to **turn data into actionable information + deliverables**.
- Pix4Dmapper does not offer feature extraction capabilities. Pix4Dsurvey as a separate software package has introduced some automatic feature extraction tools like manholes, drains + stockpile detection as a separate software package.
- Metashape does not offer feature extraction capabilities.



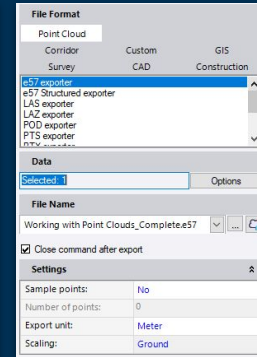
Point cloud tools

Survey + Construction Deliverables

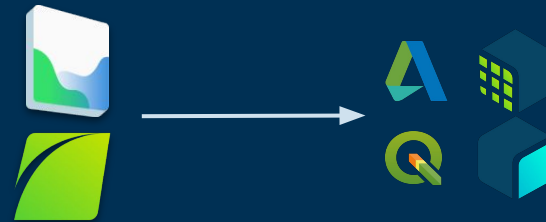
- TBC offers a **variety of additional point cloud deliverables**, industry-standard export formats, orthophotos from scan points, + **scan inspections** between 3D design objects such as IFCs.
- Pix4Dmapper produces orthophotos from point clouds. It requires an export to other software to create further survey + construction deliverables.
- Agisoft Metashape requires third-party software to output survey + construction deliverables.



PERFORM SCAN INSPECTIONS BETWEEN
OBJECTS IN TBC



EXPORT POINT
CLOUDS IN GRID OR
GROUND SCALING
WITH TBC



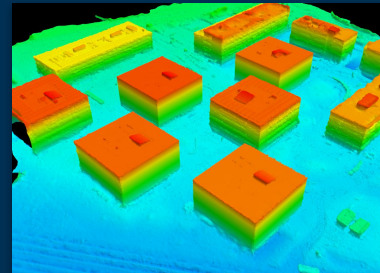
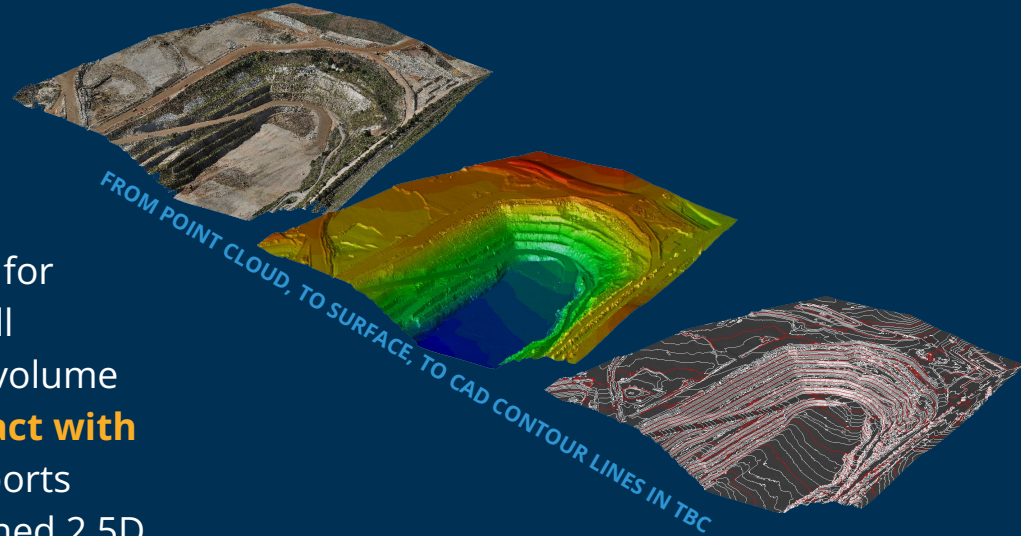
POINT CLOUDS MUST BE EXPORTED TO
ADDITIONAL THIRD PARTY SOFTWARE FOR
MANIPULATION + DELIVERABLE TOOLS



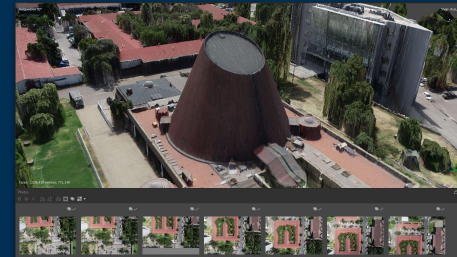
Surfaces + meshes

Creating + Editing

- TBC creates + edits dynamic 2.5D surfaces for ground modeling, tie-ins, subgrades, cut-fill comparisons, machine control systems, + volume computations for you to **visualize + interact with geospatial data with ease**. TBC also supports projection planes to create vertical or inclined 2.5D surfaces along retaining walls or dam faces to **run surface-based monitoring or change detection**.
- Pix4Dmapper supports the generation of full 3D textured meshes from point clouds for a myriad of applications.
- Agisoft Metashape supports generation of a polygonal mesh model based on dense cloud data.



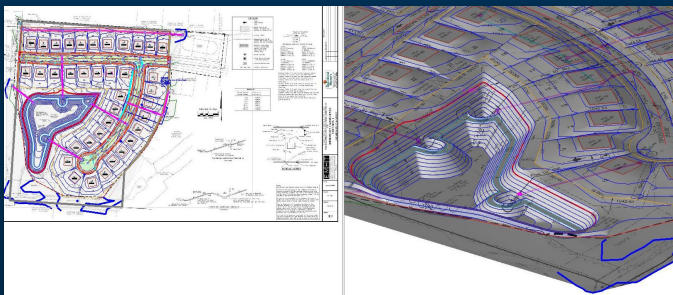
IMPROVED 3D TEXTURED MESH
AFTER ADDING SURFACES WITH
PIX4Dmapper



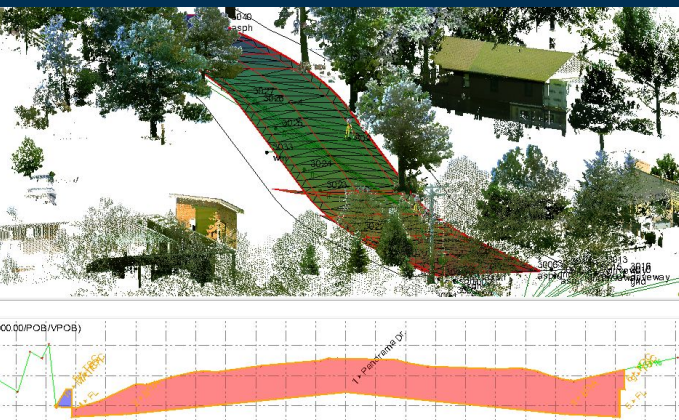
POLYGONAL MESH MODEL BASED ON
DENSE CLOUD DATA IN METASHAPE



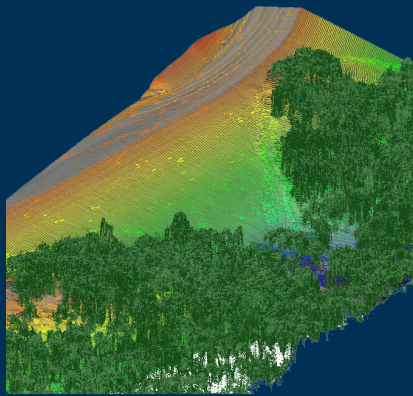
Surfaces + meshes



DYNAMIC CONTOUR LINES FROM A VECTOR PDF WITH LABELS FOR DATA PREP IN TBC



CREATE SURFACE MODELS FROM POINT CLOUD DATA IN TBC



SEAMLESSLY WORK WITH POINT CLOUD + SURFACES IN TBC

Surface Tools

- Apply dynamic contour lines and labels, cut + view cross-sections, use elevation commands to prepare linework, or drape georeferenced images onto surfaces in TBC to **deliver complex surface models for field devices, machine control systems, + third-party export.**
- Pix4Dmapper can generate smooth contour lines but you must export to a third-party to add labels + perform further editing.
- Agisoft can generate contour lines with labels with limited editing tools.



Capabilities

Conclusions



With industry-leading survey adjustment routines, powerful CAD creation tools, growing point cloud functionality, + more, you can leverage TBC's competitive aerial processing functionality with the rest of TBC's capabilities to keep you inside one survey CAD package for complete end-to-end workflows + deliverables.



Pix4Dmapper focuses on aerial photogrammetry processing + deliverable creation. With imports + exports to help you complete your AP projects, Pix4Dmapper has limited reach beyond.



Same as Pix4Dmapper, Agisoft Metashape focuses on aerial photogrammetry processing + deliverable creation. With imports + exports to help you complete your AP projects, Pix4Dmapper has limited reach beyond.



What makes TBC Unique?

Five dimensions of comparison for aerial photogrammetric workflows



Quality

Significantly higher quality in delivering point clouds + orthophotos



Performance

Higher performance in productivity across any level of quality



User Experience

A 3-button guided workflow from drag + drop to production



Capabilities

Stay in one software for your aerial photogrammetry + multi-sensor survey + construction workflows



Offering + Pricing

Attractively priced + heavily featured subscription options as well as the flexibility for on-prem perpetual license

TBC's aerial photogrammetry workflows for surveyors are more competitive now in the marketplace than ever before. Critical advancements have addressed long-requested enhancements such as **performance, user experience, + value**.

These much improved aerial photogrammetry capabilities, such as increased drag-and-drop UAV support, quicker adjustment + processing, + improved quality for orthomosaic and point cloud deliverables, along with TBC's broad support for different field sensors, industry-leading survey adjustment routines, + robust client deliverable options, offer a compelling argument for surveyors to **start + stay in TBC** for their aerial surveying projects.

