Trimble Business Center

Release Notes

Version 5.20

www.trimble.com

Welcome to Trimble Business Center 5.20

Trimble Business Center provides a complete office software solution for survey and construction professionals. Having the ability to work in a single software environment streamlines operational efficiency while minimizing the costs of data management, software maintenance, and training.

This version of Trimble Business Center includes numerous enhancements. See "New features" for more information.

Installing or updating

For installation or update instructions, see the appropriate bullet below.

Note:
Trimble Business Center (TBC) licensing information is contained in a Sentinel HASP hardware or software key connected to or installed on your computer. If no key has been connected or installed, TBC allows you to import and view data only (excluding data collected with Trimble-branded Mobile Mapping hardware, which requires an appropriate license). It does not allow you to use any licensed features. To view your license after installation is complete, select Support > License > License Manager. For a description of the features available in each licensed configuration, see "Licensed Features" in the online Help.

Warning!
When installing Trimble Business Center and various support applications (for example, Microsoft DirectX and Windows Mobile Device Center), you may be prompted to reboot your system multiple times to ensure the proper installation of these applications. To prevent the possibility of lost or corrupted data, it is highly recommended that you save all files and close all other applications prior to performing this installation.

- **New users installing TBC to use with a single-user license:**

  a. Before you insert the new Sentinel HASP hardware key you received in your installation package, install TBC from the TBC installation package downloaded from the Trimble website.

  b. Before running TBC for the first time, insert the new Sentinel HASP hardware key into an available USB port on your computer.

     All licensed features will be available when you run TBC. Your 1-year warranty begins the first time you open the software.

- **Existing users installing this version of TBC:**

  Install TBC from the installation package downloaded from the Trimble website.

Important Note! This version is available to users whose current warranty expiration date is **1 October 2019 or later**. If your warranty expires prior to this date and you proceed with the installation, licensed features will not be available. Contact your distributor to purchase a warranty extension. In the TBC ribbon, select Support > License Manager to verify your warranty expiration date.

New users installing TBC to use with a multi-user license installed on a network:

- Ensure your computer can connect to the network server where the HASP multi-user network license is installed. When you run the software after installation is complete, it will automatically search the network to locate the license.
- Ensure no HASP hardware key is connected to your computer during installation.
- See your administrator for more information.

Note to Administrators: For instructions on installing a HASP network key (multi-user license) and viewing and managing license information, in the TBC ribbon, select Support > License > License Manager. Then, in the License Manager dialog, select the Network Licensing Read Me link.

New features

Following are the new features included in this version of Trimble Business Center. To view context-sensitive help at any time while using TBC, press F1.

Field data

- **Support for new prism base in the Traverse Kit for SX and S Series Total Stations** - The new prism base includes two lever arms - SX notch and S notch - to accommodate the SX10 and S-series optical instruments. In support of this feature, TBC includes two new prism measurement methods:
  - “S notch” - This method is for the legacy "Bottom notch" and the new "S notch" lever arms (which are the same measurements) as well as the bottom notch on the S-series instruments.
  - "SX notch" - This method is for the new “SX notch” lever arm and bottom notch on the SX10.

  Other prism measurement methods have not been changed.

- **New selection set option in the View Filter Manager** - The View Filter Manager enables you to optionally select one or more selection sets whose member objects you want to show or hide and to which you want the filtering criteria to apply. This feature has been enhanced to allow you to also select the new automatically created "Unassigned objects" set, which includes as its members all of the objects that have not been assigned to any other selection set. Note that when you select multiple selection sets in the View Filter Manager, you can select to hide all member objects, show all member objects, or show just the member objects that are common to the selected sets, contingent on your additional selection of filtering options. (See "View Filter Manager Options" in the TBC Help.)
- **Selection Explorer enhancements** - The Selection Explorer has been enhanced to make the creation, management, and viewing of selection sets easier than ever. A second tool bar with commands to better manage and edit individual objects within a Selection Set or Selection Snapshot has been added. These commands, along with the rearrangement of Selection Set object controls along the top tool bar, provides a more intuitive environment when selecting and managing project data within the Selection Explorer. (See "Selection Explorer" in the TBC Help.)
- **Manage selection set membership in the Properties pane** - The Properties pane displayed for a scan, scan observation, scan setup, point, or media file object now includes a "Selection sets" drop-down checklist that allows you to select any existing selection set to which you want to add the object, create a new selection set for the object, or remove the object from a currently assigned selection set. By selecting multiple objects, you can manage the selection set membership for all of them at the same time. This replicates management tasks you can perform using the Selection Explorer, providing a convenient alternate selection set management workflow. Note that selection sets, which provide a re-usable means of selecting objects in your project, can also be used to filter viewable objects using the View Filter Manager. (See "Selection Explorer and Selection Sets" in the TBC Help.)
- **SiteVision support** - TBC provides full support for Trimble SiteVision and automatically installs the SiteVision AR exporter, which enables you to export points, CAD objects, lines, surfaces, and areas from your project to Trimble SiteVision. SiteVision uses the SiteVision integrated positioning system combined with a user-supplied phone with Google Play Services for AR to produce a hand-held high-accuracy outdoor augmented reality system. SiteVision enables users and clients to easily understand information such as new designs or existing underground services by seeing it in true-life scale on their hand-held device in the context of existing surroundings. Note that you can also export high-resolution cut/fill maps and LandXML utilities that can be visualized in SiteVision. (See "Export Trimble SiteVision AR Files" in the TBC Help.)

- **Import/export feature definitions in custom CSV files** - Use the new "Convert CSV to FXL" command to import into your project's Feature Library feature definitions and control codes specified in records contained in a custom CSV (.csv) data file. Use the new "Write FXL to CSV" command to export feature definitions and control codes contained in your project's Feature Library to a custom CSV (.csv) data file that can be shared with others and imported into a different Feature Library. (See "Import (Convert) Feature Definitions from a Custom CSV (.csv) File" and "Export (Writer) Feature Definitions to a Custom CSV (.csv) File" in the TBC Help.)
- **Export panoramas to Google Earth Pro** - The Kml/Kmz exporter has been enhanced to allow you to easily export some or all of the photo station panoramas in your project to a KML or KMZ file that can be opened in Google Earth Pro. There you can click to view or exit any of the panoramas as necessary. The exporter also supports the export of points, stations, observations, labels, linework, media files, and feature data for display in Google Earth Pro. (See "Export Google Earth Pro Files (.kml/.kmz)" in the TBC Help.)
- **Export station panorama image files** - You can now export a panorama captured with a photo station to a JPG (.jpg) file that can be opened and viewed in any graphic viewer. (See "Export Station Panorama Image Files" in the TBC Help.)
- **Trimble R12 receiver support** - TBC fully supports the import and processing of GNSS data imported from the new Trimble R12 receiver.
- **Publish to Trimble Clarity enhancements** - The Publish to Clarity command enables you to publish point clouds, panoramas, and other 3D data in TBC Station View to a Trimble Clarity presentation that can be shared with clients and other team members. The web-based Clarity Viewer allows users to explore geospatial data using intuitive navigation techniques, make on-the-fly measurements, and add sticky-note annotations—all without the need to install or learn a new software application. For this release, the Publish to Clarity command has been enhanced as follows:
  - Login has been simplified for current and future services access by using the new Trimble Identity login profile.
  - Instead of creating and/or using a view filter defined in the View Filter Manager to specify the data to be published, you can now use a more standard method of selecting data with a variety of selection options.
  - You can now name your Clarity project right in the Publish to Clarity command pane.
  - Publishing status is now displayed on the status tab. And, once the transfer of data files to Clarity is complete, an appropriate status message is displayed indicating that you can continue your work in TBC as the publishing workflow continues exclusively in Clarity. This allows you to return to other work much more quickly than in the past.

  (See "Share 3D Data Using Trimble Clarity" in the TBC Help.)

- **Trimble Clarity website link** - TBC now includes a direct link to the Trimble Clarity website. Clarity is a secure, cloud-based system that enables surveyors to share views of their project's point clouds, photo images, and other 3D data with clients and colleagues via email. See also the new feature description "Publish to Trimble Clarity enhancements".
- **New TopoDOT export options** - The TopoDOT exporter has been enhanced to allow you to select (if applicable) the stations whose panoramic photos you want to export along with the other TopoDOT export files. TopDOT is an application for point cloud and image management, data assessment, and feature extraction. (See "Export TopoDOT Files" in the TBC Help.)
- **Streamlined panorama processing** - The Process Panorama command has been simplified by moving its KML/KMZ and JPEG export functionality to the Export command. The simpler interface enables you to more easily focus on balancing the exposure of all images for a more uniform look and blending the edges of adjoining images so they are less noticeable. After processing is complete, a single click will open the appropriate exporter if you want to export the panorama. (See "Process Panoramas" in the TBC Help.)
- **Support for *link* distance units** - TBC now supports *link* distance units as an alternate unit type. Type "li" or "link" following a value in any distance field and TBC will automatically convert the value from link units to the default distance units set in Project Settings (for example, US Survey Feet). There are 100 links in a chain. A chain is equivalent to 66 US survey feet. Configure TBC's alternate units in the Project Settings > Units > Distance menu and use alternative units for data entry, labels, and reports.
- **Coordinate System Database enhancements** - The following enhancements are included in the latest (version 87) default Coordinate System Database (current.csd):
  - Added NGS Geoid18 for Conterminous US and Puerto Rico
  - Updated description for UK Geoid Model OSGM15.ggf
  - Added 13 new geoid models to support 13 local vertical datums used in NZ
  - Added Hawaii Albers Equal Area Conic
  - Added new coordinate system for Luxembourg
  - Updated coordinate system for Main Road Australia
  - Updated Australian geoid ausgeoid2020.ggf
  - Updated area of use for French CC42
  - Added zone Albers Equal Area for Contiguous US 48 States
  - Added EGM2008 sub-grid for US
  - Added new geoid PL-EVRF2007-NH for Poland
  - Added new datum grid for Belgium
  - Added new geoid for Azores
  - Added new HS2 Datum Grid and Zone for UK

- Added new datum and zone Brunei RSO for Malaysia / Borneo
- Added two coordinate system zones for Haiti
- Renamed Russian datum "GSK-2011 (GOST 51794-2017)" to "GSK-2011 (GOST 32453-2017)"
- Updated geoid for Korea to KNGeoid18
- Updated datum shifts used for Slovakia S-JTSK (JTSK03). Obsolete wrong zone (JTSK) Krovak EN.
- Added new geoid models and zones for Spain
- Added EGM2008 extraction for Suriname
- Updated datum and geoid models for French Antilles

CAD and drafting

- **Smart Text supports Lat/Long/Height -** The Smart Text tool in the Create Text and Edit Text commands enables you to insert dynamically updated text and/or values for properties associated with an object or location to which you are assigning a label or annotation. The Smart Text tool has been enhanced to include the insertion of the Latitude, Longitude, and/or Height property. This is in addition to support for the insertion of many other object properties, including Easting, Northing, Elevation, Station/Distance along, Offset, Length, Area, Line elevation, Surface elevation, Layer, and more. (See "Create and Edit Text" and "Use Smart Text Codes within Text" in the TBC Help.)
- **Auto-increment point name when copying points** - When using the Copy Objects command to copy points, the newly created points will auto-increment their point ID to the next available point number. (See "Copy an Object" in the TBC Help.)
- **Slope length added to linestring properties** - The slope length of a linestring is now displayed in the linestring's Properties pane. (See "Create a Linestring" in the TBC Help.
- **Fillet/Chamfer using arcs** - The Fillet/Chamfer command has been enhanced to support using combinations of arcs and lines. If the specified radius is too large, you are presented with an option to use the largest valid radius.
- **Include crossing lines in a By Polygon selection** - The Select by Polygon command now has an option to allow the selection of lines that cross the polygon, as well as those that are inside or outside of it. The command has also been added to the Home ribbon.
- **Drape only at vertices enhancement in the Change Elevation command** - A "Drape only at vertices" check box is now available within the Surface elevation option with the Change Elevation command. When checked, only the vertices of the selected objects will be elevated to the selected surface elevation. When unchecked, vertices will be elevated to the selected surface elevation and new vertices will be added at every point that crosses the surface's triangulation lines. (See "Change the Elevation of Objects" in the TBC Help.)

- **Explode hatches** - You can now use the Explode command on hatch patterns.
- **Run a Geometry Report** - Use the Geometry Report command to see a simple listing of the geometry of linear objects (lines and alignments) in your project. For alignments, you can choose to report on key horizontal alignment (HAL) and/or vertical alignment (VAL) points, as well as HAL/VAL control points, such as VPIs. You can also opt to report on alignment geometry at a specified station interval (delta station). (See "Run a Geometry Report" in the TBC help.)

Data prep

Vertical Design

- Use new 'vertical design' tools to rapidly create 3D models for roads, intersections, parking lots, site improvements, landscaping, and more from 2D linework. Vertical design functionality gives you a rule-based way to build such models using parametric instructions for elevations, cross-elevations, cross-slopes, long slopes, grades, breaklines, etc. to specify the geometric relationships between lines. This parametric approach means that you can easily adjust one rule or line's geometry and have it modify the entire resulting surface. The rules have an order, so their dependencies build on each other.

  Vertical designs are defined by:

  - Linear objects (CAD lines, linestrings, and alignments) which can be either 2D or 3D
  - Rules that parametrically define how selected lines geometrically relate to each other. To build the required model, use the various rule functions to instruct the process of converting lines into 3D structures.

  The new TBC commands allow you to:

  - **Create a vertical design** - Use the Create Vertical Design command to build models from linework using a variety of rules (parametric instructions) for elevations, slopes, cross slopes, grades, and other types of connections and transitions. This functionality provides a rule-based way to create 3D models for roads, intersections, parking lots, landscaping, and other site features. (See "Create a Vertical Design" in the TBC help.)
  - **Edit a vertical design** - After you have created a vertical design, use the Edit Vertical Design command to enter or modify parameters for a design. You can also use the Remove Line From a Vertical Design command to edit the design. When you are done making changes, use the Rebuild Vertical Design command to bring your model up-to-date with the updated design. (See "Edit a Vertical Design" in the TBC help.)
  - **Add/remove lines from a vertical design** - After you have created a vertical design, use the Remove Line from Vertical Design command to edit the design by taking a source or target line out of the computations. You can add new lines to a vertical design using the Lines tab in the Edit Vertical Design command. (See "Remove Lines from a Vertical Design" in the TBC help.)

- **Rebuild a vertical design** - When you are done making changes, use the Rebuild Vertical Design command to bring your model up-to-date with the updated design.

This set of tools builds on the parametric intersection functions for modeling roundabouts, cul-de-sacs, ramps, and interchanges, and enables you to prepare data from 2D linework that defines the geometry of a target model. You can use vertical control rules to elevate lines that are then automatically added to a 3D vertical design model. You can also use vertical design tools to elevate lines to be added to an existing surface model built without the vertical design rules.

Imported Cross-Section Conversion and Prep

- TBC brings major improvements to corridor takeoff workflows! The changes come in the form of new capabilities for converting and cleaning up imported PDF and CAD cross-section drawings. The enhancements can reduce days/weeks of painstaking work on large projects down to hours/days of work, and make the process more interesting, engaging, and satisfying. In addition, you will finish with significantly better, more accurate, and comprehensive models and takeoff computations.

  In TBC, you can now import PDF sheets directly into a Sheet View. When you import cross-section sheets into a Sheet View, the imported sheets are added to a Plan Set that you can name. Any vector lines in the PDFs are automatically extracted from the cross-section sheets and layered (if the source PDF data is not already layered) based on their line types, line weights, and other properties. Once the PDF sheet vectors have been extracted, you can use your cleanup and relayering processes (much like the site data prep process) to configure the data as you need it before converting all of the relevant data into 3D linework. As before, you can still import CAD cross-section lines into the Plan View, but you can now convert PDF and CAD cross-section data into either stored cross-sections or 3D lines.

  Once your linework is 3D, use the new tools described below to find the edges of selected lines (longitudinal features), as well as the boundaries of those same lines, rapidly facilitating the creation of 3D surface models that can then be used for volume, area, and length computations. These 3D surface models can also be added to a corridor as Surface type instructions so the Corridor Earthwork Report can calculate end area volumes.

  In addition, you can now ‘draw’ more information into cross-section lines to help determine overexcavation or wall footing excavation quantities, and convert those lines into 3D linework for the same processes. Editing within the 3D View has also been improved, allowing you to remain in the view while building 3D models. This will help you better visualize the end result while working.

  Benefits of converting PDF and CAD cross-section data into 3D lines instead of stored cross-sections include:

  - You can retain the source layers of all imported linework, along with the line’s colors, names, and weights, etc.

- Once converted, working with 3D lines in the 3D View is a more satisfying experience than digitizing cross-sections manually. The process of creating 3D linework is far quicker (depending on how organized the source data is), so that within minutes of starting work, you can have existing terrain and parts of a finished grade surface completed.
- With 3D lines, you can generate surface models for most feature types, including walls, bridges, ramps, suspended highways, and barriers, as well as pavement, earthworks, and subgrades.

New training materials specific to these workflows are being created and they will be placed in the Trimble Business Center for Construction forum when completed. (See also “Work with Corridor Cross-section Data", "Create Cross-sections from CAD Drawings”, "Create Cross-sections from PDF Data" and “Track Cross-sections in CAD Drawings” in the TBC help.)

PDF Cross-section Conversion Enhancements

These are the main areas of improvement:

- **Import PDFs into a Sheet View** - PDF sheets can now be imported directly into a Sheet View as sheets in a sheet set. The Import command includes a new option to automatically join dashed lines into solid lines in the imported vectors. On import, sheets are sized and all vectors and text are extracted.
- **Work in multiple sheets at once** - Once the PDF sheets are imported, when you open the Sheet View from Project Explorer, press SHIFT, and select the sheet set (not a single sheet), the Sheet View will open and display all of the sheets in the set in one view (overlaying on top of each other). This allows you to select objects from all sheets at one time. When selecting, e.g., title boxes and borders for deletion, this means you can delete them for all sheets from one view. When selecting data like grids, grid labels, or station labels to relayer the objects onto your preferred layers, this again allows you to select quickly from all sheets at the same time. For example, selecting cross-section data for Existing Terrain, Finished Grade, or Subgrade levels can all be done from one view.

  Combining the Multi-sheet View with the Isolate Layer mode or other View Filter options allows you to rapidly select and organize your data as you need it. You can also create a Multi-sheet View from the Sheet selection list in the Sheet View: if you press SHIFT while selecting the Sheet Set from the list, you will generate the Multi-sheet View. You can easily return to a Single Sheet View to review one sheet at a time when needed (e.g., when data is cluttered). In the Sheet View’s sheet selection list, you can now also click the list and use the Up and Down arrows to scroll through the available sheets. To pull up the list, use the arrow at the right edge of the sheet selector.
- **Clean up data in the Sheet View** - Project Cleanup works better in Sheet View now for Joining Lines or for Removing Vertices etc.

- **Track edges and boundaries** - Track Line Edge is a TML Macro command that must first be downloaded from the Macro Community. Use the new Track Line Edge command to rapidly track longitudinal feature lines and boundary lines from 3D cross-section linework to establish both length and area quantities, as well as to form better surface models. The resulting boundaries can be applied to surfaces created from the cross-section and longitudinal feature lines to constrain areas of a surface; this enables you to add a single surface to the corridor models used to compute earthwork volumes.
- **Separate upper and lower cross-sections** - Explode Lines is a TML Macro command that must first be downloaded from the Macro Community. Use the new Explode Lines command to separate top and bottom surface elements (where provided) into closed rectangles or polygons (e.g., in CAD cross-sections from Bentley). This command also separates the data onto Top, Bottom and Side layers, making it easy to isolate and select them while working in 3D Views.

CAD Cross-section Conversion Enhancements

- **Convert cross-section data into 3D lines** - The Create Stored Cross-sections from CAD Drawings command now enables you to convert imported cross-section linework into either stored cross-sections or 3D lines. 3D lines will generate better, more comprehensive results faster. This conversion of CAD data can now be done from either the Sheet View or the Plan View, using the same workflows. These changes will save you a huge amount of time converting linework into 3D models.
- **Use various selection methods** - You can now select various types of data, e.g., station labels, grids, and grid labels by layer, or linework from any layer by selecting objects when converting CAD data into cross-sections. You can also select the same data in the Section Data selection; the grids and labels (when selected by layer) will be removed from the selection to be converted; which saves time when selecting the data.
- **Track cross-sections lines better** - The Track Cross-section command now works better in more scenarios, especially in the Sheet view where the units may be in either inches or mm and distances are very small compared to Plan View where the units are in feet or meters and the distances much larger. Note: When entering distances into controls when working with Sheet View data, you should enter the values as, e.g., 0.04” so that it converts into correct distances.
- **Set the elevation of a grid line** - You can now also change the elevation of an elevation grid baseline to the elevation of the grid line in case there are no elevation labels that can be used (same polyline text issue as above). The CAD cross-section conversion process now looks at the elevation of the grid lines to see if there is one that can be used to define the base elevation. In this case, you should also use the No Grid option (one Elevation Grid Line and one Offset Grid Line) along with a horizontal and vertical scale to convert the data.

- **Set an elevation of zero** - You can change the elevation of the 0 offset grid line to 0 elevation. The CAD cross-section conversion process now looks for an offset grid Line with elevation 0 to determine where the cross-section goes in relation to the selected centerline.

Many of these enhancements make it possible to process and use imported PDF data quickly if the provided text comes in the form of unusable polylines. Fortunately, many PDF cross-section sets have text, so this is not an issue in those cases; all CAD cross-section files have text, so the enhancements do not apply in those cases.

3D Cross-section Editing Enhancements

- **Edit cross-sections more effectively** - The Stored Cross-section Editor has been improved in these ways:
  - The Stored Cross-Section Editor now includes a check box that allows you to specify whether or not to update the data displayed in the editor's graphic view and table fields based on the stored cross-section you select in the Plan View or 3D View.
  - The Delete [DEL] key now allows you to delete a selected node.
  - You can now view selected cross-sections in the Stored Cross-section Editor.
  - Line marking can now being applied to stored cross-sections. Node markers have been added so you can see the node locations.
  - You can now move nodes using math operations (add, subtract, multiply, and divide).
  - When navigating between cross-sections in the Stored Cross-section Editor, if you press SHIFT when you click Next or Previous button, the view will retain the current zoom level (instead of zooming to the view extents each time).
  - Snap indicators are shown when editing stored cross-section nodes in the Plan View. This works better now where there are vertical elements in cross-sections; in the past your drawing cursor always snapped to the lower node.
  - There is a new Lock icon in the cross-section editor to prevent the UI from updating when you pick another cross-section.

  (See "Edit a Stored Cross-Section" in the TBC Help.)

Cross-section Related Macro Commands (TMLs)

Visit the TBC Macros and Extensions Community https://community.trimble.com/groups/trimble-business-center-hce to download any of these TMLs.

- **Auto-create station labels with a macro command** - You can now use the Increment Text macro command to rapidly create station labels if imported PDF data has no station text that can be used. Often PDF files have text drawn as polylines, rendering the text useless for station labels and grid labels (for offsets and elevations). This command automates the labeling process, potentially reducing the time down, e.g., from 20 minutes to 2 minutes for a large number of cross-sections.

  Use this new macro command for many things, including labeling cross-sections imported from PDF where the text in the PDF is absent (replaced with polylines that look like text, but are not text). The TML allows you to specify the text style, layer, text height, etc. and then specify a start value and an increment (like station 0 with an increment of 100), and then rapidly click all of the section zero-offset line end points to place station text on the cross-sections which can then be used to convert them into stored cross-sections or 3D lines. This workflow saves a lot of time, e.g., on 72 sections on 12 sheets (6 per sheet), this saved ~20 minutes and made the process easier.

- **Explode lines using a macro command** – Use the Explode Lines macro to explode any lines into either all segments or into top, bottom, and side segments on separate layers (using a Break Angle control). This is ideal for breaking up CAD and PDF cross-section data in preparation for conversion into 3D lines, which saves hours of painstaking work and makes selecting data easier and faster in the 3D View. This command can also be used on Subgrades Adjusted surfaces in combination with the improved Explode Surfaces command to remove vertical walls between adjusted subgrade areas.

- **Track line edges with a macro command** - Once you have converted CAD or PDF cross-sections into 3D lines, the next challenge is to create the longitudinal linework that is required to act as 3D breaklines in the models created from the 3D lines. You can now use the Track Line Edge macro to pick an alignment and a set of lines to create either the edge lines (in the direction of increasing station) along the min/max offset edges of selected lines or a boundary around the selected lines.

These workflows can save you hours of manually creating edge and boundary lines. Where additional lines are required, tools such as the Offset Line command can be used to finish linework on complex shapes, such as curbs and bridge decks, saving literally hours of painstaking work building 3D models.

The boundary lines you create can be selected in the Area/Length/Count Report to determine areas of, e.g., pavement, milling, or seeding, etc. You can also use one or more boundaries to constrain a surface model, which is useful on divided highways where the left and right pavement and subgrade surfaces are separated by a median; this enables you to create a single surface with multiple boundaries. You can then add that surface to a corridor model as a Surface type instruction for the purpose of computing corridor earthwork volumes.

Specialty solutions

GIS

- **Option to use feature class names from a geodatabase provider** - When connecting to a GIS file geodatabase provider or ArcGIS Enterprise geodatabase provider, you can now select to use either GIS feature class names or feature class aliases for the creation of corresponding feature codes in a Feature Definition file. Aliases tend to be more descriptive than names, but they can be very long, or identical for different feature classes. Names are always unique.

Mobile Mapping

- **Plane picker for run registration** - The registration command for the MX9 system now supports two additional target picking modes: the Intersected Plane picker and the Road-mark picker. Both modes enable picking a precise target center and lead to better registration accuracy. The snap to scan point picking mode remains available and is called Default.
- **Generate a cleaner MX9 point cloud** - The Generate Scan command provides three different presets of noise filtering: Default, Rail, and Power-line. Each preset can be customized with adjusted values of deviation, reflectance, amplitude, and range to help achieve clean details for each run.
- **New MX9 Mobile Mapping exporter to Solv3d** - A new exporter for the MX9 system has been added. It enables you to export scans and images to the Solv3d web application.
- **Improved change of Mobile Mapping mission trajectory** - It is possible again to change mission trajectory file at any point in the workflow, enabling comparisons between different trajectory versions or a collaborative job.
- **Register Run to Run command** - You can use the new Register Run to Run command to register two runs together. One is defined as a Reference Run, meaning that its trajectory will not change, and the other as an Adjusted Run, meaning that its trajectory will be optimized with regards to the Reference Run's trajectory. As a result, the corresponding scan data will match correctly.
- **Register a Run command enhancements** - The Register a Run command has been enhanced as follows:
  - You can change the coordinate quality of a Ground Control Point (GCP) used for adjusting the trajectory of a run directly within the Register a Run command.
  - You can define a GCP as a Validation Point (VP) whose purpose is to let users measure the quality of a registration as residual values between the GCP and the picked target.
- **Split Mobile Mapping Run command** - Because processing a long run can be time consuming, you can use the new Split Mobile Mapping Run command to split a long run into smaller pieces and select each individually for processing.

- **MX9 Mission Report** - You can run the new MX9 Mission Report to view the properties of a mission, including capture devices, runs, trajectories and generated scans. (This feature is available for MX9 missions only.)
- **Export color information** - You can now include color information when exporting to TMX, Orbit and Solv3D.

Tunneling

- **Custom Tunnel As-built Report enhancements** - The Custom Tunnel As-built Report has been enhanced as follows:
  - When creating the Custom Tunnel As-built Report, you now have the following options:
    - Use the same scale for all cross-section views or apply a "best fit" scale for each view.
    - Display grid lines in the cross-section views, or hide the grid lines and display a scale bar instead.
  - The scale denominator used in the report now increases by 10 after 1/10 (for example: 1/5, 1/10, 1/20, 1/30 , and so on).
  - A Summary table has been added to the end of the report that includes as-built, designed, overbreak, and underbreak area sums and total volumes. (Total volumes are calculated using the average end area method based on the total length of the tunnel and the cross-sections in the report.) This new table is intended to provide more comprehensive summary information about the tunnel without the need for manual computations or additional report customization.

  (See "Run Tunnel As-Built Reports" in the TBC Help.)
- **Specify a search distance using the Assign Tunnel As-Built Points command** - When using the Assign Tunnel As-Built Points command, you can now specify a search distance for collecting scan points instead of using a sampling distance, giving you greater control over which points are collected as as-built points. (See "Assign Tunnel As-Built Points" in the TBC Help.)

Scanning

- **Support for Trimble X7 Laser Scanner and Perspective field software** - TBC fully supports the import and post-processing of scan data captured with the Trimble X7 Laser Scanner and Trimble Perspective field software. This includes support for the following new features:
  - The "annotation" feature in Perspective enables field users to assign a name to a scan point on a feature of interest, add a description, and, optionally, attach one or more photographs of the feature. After the data is imported into TBC, you can easily see the annotated point in a graphic view and the Project Explorer, view its description in the point's Properties pane, and view attached photos in the point's Media Folder. If necessary, you can make changes to the annotation or its associated point properties.

- The "labeling" feature in Perspective enables users in the field to apply one or more labels to a scan station, providing additional information about the station, such as its location on a site. When the data is imported into TBC, each of the labels is converted into a selection set that is assigned to the scan station and each of the objects associated with the station, such as the captured scan, the point, scan observations, and media files as applicable. The selection set is displayed as an editable property in the object's **Properties** pane.

  You can use a selection set singly or in combination with other selection sets to select scan stations and their associated member objects (using the Selection Explorer) or show/hide scan stations and their associated member objects (using the View Filter Manager). For example, an imported scan station might have been assigned three separate labels in the field: *bldg 1*, *floor 1*, and *west*. By selecting the corresponding *bldg 1*, *floor 1*, and *west* selection sets in the View Filter Manager in TBC, you can display exclusively the scan station and its associated objects captured on the first floor of the west wing of building 1.

- When you import a TZF file from the Trimble X7 Laser Scanner, an options dialog displays that allows you to select whether to colorize the scan points and whether to create a panorama media file and/or a 3D station view panorama—on import.

- **Point cloud scan registration enhancements** - The Register Scans command enables you to register overlapping scans imported from multiple scan stations to ensure they are correctly aligned with each other and, if a survey station setup is included, to survey control, resulting in a single, rigid point cloud. The Register Scans command has been enhanced for this release as follows:

  - You can pick a scan point in a graphic view to select its associated scan station as a reference (unmovable) station to which movable stations will be aligned during registration.

  - With a single click, you can easily remove a station from a group of reference stations to be used for registration.

  - For plane-based registrations, an indicator displays with any scan station that was leveled in the field software. Optionally, you can specify not to use this leveling data in the registration process in TBC.

- **Unique suffix applied to duplicate scan names** - When you import point cloud scans that have the same name (as you might receive from the Trimble Perspective software, Trimble SX10, or Trimble TX8), TBC automatically appends the name with a parenthetical suffix that includes the object type ("Y" for scans) and a number, resulting in a unique, easy to find scan name in TBC. (See "Import Point Cloud Files" in the TBC Help.)

Aerial Photogrammetry

- **UAS processing enhancement** - UAS processing in TBC has been enhanced as follows:

  - Improved processing speeds throughout camera calibration and surface generation

- More robust georeferencing algorithm for more successful processing, better tie point matching, and better camera modeling
- Support of image size to 103 MP
- Improved adjustment report supports high-DPI monitors and includes a polynomial camera distortion table and graphics
- Enhanced tie point matching strategies for a better distribution and connectivity of tie points. Fine-tuned tie point matching strategies result in a higher number of tie points and more precise image measurements even in low textured areas, avoiding points along shadow edges.
- Improved distortion modeling for higher quality point clouds and ortho images

General enhancements

- **Isolate layers by selecting objects** - You can now select one or more objects when using the Isolate Layer (in the View Filter Manager), making it easier and faster to isolate the required layer.
- **Join lines more efficiently** - The Join Lines command has been enhanced with better and faster line-to-line connections with the addition of an Auto-advance feature for the Base line selection box. With Auto-advance enabled, the base line you selected is retained and this box is skipped when joining additional lines. Tip: You can toggle the Auto-advance mode on/off by pressing [Control] + [.] (period or decimal point).
- **Keep a shape closed when deleting a segment** - The Delete Line Segment command now joins the remaining segments into a single line when used on a closed shape.
- **Snap to 3D objects** - The Quick Line macro command (TML) has been enhanced so that it can snap to 3D objects in a 3D View. It now extracts the elevation value automatically, making it usable in 3D cross-section conversion workflows.
- **Remove vertical walls** - The Explode Surface macro command (TML) has been improved so that it can now auto-locate triangle edges that were used to form breaklines in a model. This is useful if you want to eliminate the vertical walls in Subgrade Adjusted models.
- **Select objects by length and elevation** - The Advanced Select command has been enhanced so that you can now use the length of a polyline, CAD line, or linestring in your selection criteria. The SelectByLayer and SelectByElevation options have also been added to the command. Each of these options helps when sorting through PDF cross-section data.
- **White out more space around text** - The space around text with the Whiteout setting has been increased slightly.
- **Add Smart Text for a cut/fill map** - You can now label the initial and final surfaces used to create a cut/fill map using these Smart Text codes:

  Initial surface: @<OD,O,nsi>@

Final surface: @<OD,O,nsf>@

- **Add Smart Text for a surface volume grid** - You can now label the initial and final surfaces used to create a surface volume grid using these Smart Text codes:

  Name: @<NM,O>@

  Initial surface: @<OD,O,nsi>@

  Final surface: @<OD,O,nsf>@

- **Run an improved Batter Conformance Report** - These two settings were added to the batter conformance report and pavement conformance report commands.
  - **Remove diagonal** - This specifies whether a single diagonal triangle edge between two roadway feature breaklines is ignored when a surface is sliced to create a cross-section. By not slicing these diagonal edges, the warping effects of transitions, such as superelevations, can be properly reflected in the displayed cross-section, rather than simply reflecting the geometry of the TIN approximation.
  - **Adjust for arc/chord** - This specifies whether a cross-section is adjusted laterally to follow the related horizontal alignment when the surface is sliced to create a cross-section. Again, this better represents the intended cross-sectional shape of the roadway, as opposed to its TIN approximation which can differ significantly.

Resolved issues

The following issues **have been fixed** in this version of TBC:

- When importing a .12DA file containing alignments, the alignments did not line up correctly in TBC in some situations.
- The Dynaview was not honoring the image file viewing priorities set in the Plan View.
- The Feature Definition Manager was not allowing the import of DDF-formatted files.
- A GIS enterprise connection could not be established.
- The print preview was not within the plot box bounds.
- Printing sheets to PDF was taking too long to complete.
- When editing stored cross-sections, you could not graphically select the next x-sect to view/edit.
- Cross-sections could not be extracted from a sheet view when offset labels have been rotated or have different vertical offsets.
- The Auto-flip text feature was not working with table tag labels.

- When using the Copy Objects command, the newly copied objects were not being created in the sequence of the source objects, resulting in the unexpected naming of objects copied from objects with sequential numeric names. (For example, if points 1, 2, 3, and 4 were copied, the resulting source/copy point pairs would not be 1:5, 2:6, 3:7, and 4:8 as expected.)
- Mobile Mapping:
  - Undoing Mobile Mapping Update scans and Run registration was not possible.
  - Creating cutting planes perpendicular to Mobile Mapping runs was not possible.
  - TBC kept links to Mobile Mapping SBET files of the original project after the Run Registration command and Save As.
  - Mobile Mapping trajectories' colors are now consistent with the color of their corresponding run.
  - Mobile Mapping MTA usage indicator in scan property was not consistent with user choice.
  - Mobile Mapping colorization Backward and Forward options were not active.

Known issues

See "Known Issues" in the TBC Help for a complete list of known issues associated with the software and related utilities, along with possible workarounds.

Miscellaneous notes

- **Ignore unknown satellites in baseline processing** - If an "unknown" satellite (that is, a satellite that is not listed in Project Settings > Baseline Processing > Satellites) is imported into a project from raw data files, TBC automatically sets the satellite's baseline processing status to "ignore" so it is not included in the processing (just as if you had unchecked it in Project Settings had it appeared there).
- **New prism height measurement method for Trimble SX10** - Prior to TBC v5.20, typical measurement methods for Trimble prisms designed for traversing with S-series total stations included “True vertical”, “Bottom notch”, “Bottom of V10”, “Lever of V10 extension”, etc. For TBC v5.20, the prism measurement method "Bottom notch" has been renamed “S notch” (same as the prior "Bottom notch"), and a new “SX notch” measurement method has been added that provides the same horizontal and vertical offsets as the bottom notch on the SX10. Other prism measurement methods have not been changed.
- **Mobile Mapping Windows display** - When processing Mobile Mapping data, it is recommended that your Window's display scale and layout not exceed 100%.

- **Disabling a laptop integrated graphics card** - If you are using a laptop computer with both an integrated (on-board) graphics card (for example, Intel®) and a discrete graphics card (for example, NVIDIA®) enabled, TBC may freeze when you are working with point clouds. To avoid this problem, you must select to disable the integrated graphics card and use only the discrete graphics card when working with scan registration. Follow these steps:

  a. Open your Windows Control Panel, select BitLocker Drive Encryption, and select to suspend protection - if it is turned on. This is required to make the BIOS change required to disable the integrated graphics card.

  b. Restart your laptop computer and select to enter the BIOS setup utility as soon as the first image displays (prior to Windows launching) by pressing the appropriate shortcut key (for example, F1, F2, F10, ESC, or DEL). The BIOS shortcut is typically displayed briefly on the screen during startup.

  c. Once in the BIOS setup utility, navigate to the location of the graphics card control and use the appropriate method to disable the integrated graphics card. The method for doing this will vary depending on the BIOS setup utility. You can search the Internet for specific instructions.

     For example, for a Dell® laptop implementing NVidia Optimus™ technology, you would select Settings > Video > Switchable Graphics in the BIOS setup utility, and then uncheck the Enable Switchable Graphics check box.

  d. Save changes and exit the BIOS setup utility to continue computer startup.

  e. If BitLocker Drive Encryption was suspended, turn it back on.

  Additional notes:

  - Your laptop computer consumes more power when using the discrete graphics card exclusively. If it is running in battery mode, you should re-enable the integrated graphic card when you are done working with scan registration.
  - Do not use Device Manager to disable the integrated graphics card. Device Manager disables the card just for Windows, not for the entire motherboard, causing the integrated graphics card to still load first.
  - Some laptops do not allow you to disable the integrated graphics card.

- **ArcGIS versions and Windows operating systems** - When using TBC to connect or write data to an ArcGIS Enterprise Geodatabase provider, see your ArcGIS user documentation to determine which versions of the ArcGIS products are supported on the various versions of the Windows operating system.
- **OpenCL Runtime driver** - OpenCL Runtime is a graphics accelerator driver required when TBC is performing automatic tie point matching or dense point cloud creation. If the driver is not installed, an error message is displayed indicating OpenCL Runtime cannot be found. In this case, you must download OpenCL Runtime from https://software.intel.com/en-us/articles/opencl-drivers#phiwin and install it on your computer using the instructions provided.
- **VCE compatibility** - As a general rule, you cannot open a VCE project file created in a newer version of TBC in an older version of TBC.

- **Windows 8 users** – Some components in TBC require Microsoft .NET Framework 3.5 to operate. If the .NET Framework 3.5 is not installed, you are prompted to install it when you install TBC. If your computer is connected to a domain that does not allow you to directly connect to Windows Updates on the Internet to enable and install .NET 3.5, you may need to change your group policy settings. See your system administrator for assistance.

  For more information, see http://technet.microsoft.com/en-us/library/dn482065.aspx
- **TabletSync transfers -** If you use TabletSync to transfer large files (for example, panoramas) into TBC, it can take a long time for the upload to complete. As an alternative, you can shorten the transfer time by copying the files from the tablet onto a USB memory stick and copying the files from the stick into TBC.
- **Proxy server settings** - If you receive an error when trying to access an external server to process data, you may need to specify a proxy server for your LAN using Internet Properties > Connections > LAN settings > Proxy Server.

System requirements

Operating system:	Microsoft Windows® 10 (64-bit version) Microsoft Windows 8 (64-bit version) Microsoft Windows 7 (64-bit version with Service Pack 1)
Processor:	Dual-core 1.80 GHz or better recommended Quad-core 2.80 GHz or better (additional cores with hyper-threading support highly recommended for Aerial Photogrammetry, Mobile Mapping, and Scanning modules) **Note:** Because components of TBC make use of Intel-only multi-thread processing, AMD Ryzen processors are not supported.
Random access memory (RAM):	4 GB or more recommended 32 GB or more recommended for Aerial Photogrammetry, Mobile Mapping, and Scanning modules

Hard disk space available:	10 GB or more recommended 100 GB or more on solid-state drive required for Aerial Photogrammetry, Mobile Mapping, and Scanning modules The recommended SSD overall hard drive capacity is 500GB or more for Aerial Photogrammetry, Mobile Mapping, and Scanning modules
Monitor:	1280 x 1024 or higher resolution with 256 or more colors (at 96 DPI)
I/O Ports:	USB 2.0 port required if HASP hardware key is used
Graphics:	DirectX 11 compatible graphics card with 512 MB memory or more OpenGL version 3.2 or later required when working with point cloud data (latest version recommended) 8 GB graphics card or higher (for example, NVIDIA Quadro P4000) required when working with Aerial Photogrammetry, Mobile Mapping, and Scanning modules **Note:** If you are using a laptop computer with both an integrated (on-board) graphics card and a discrete NVIDIA graphics card enabled via Optimus technology, your computer must allow you to select to disable the integrated graphics card and use only the discreet graphics card when working with point cloud data. See "Disabling a laptop integrated graphics card" in the "Miscellaneous notes" section earlier in this document.

Important!

It is critical that you keep your graphics driver(s) updated if you are working with point cloud data.

Whether your computer has one or multiple graphics cards installed, you must ensure each has been updated with the latest driver provided by the card's manufacturer. The best way to determine if your driver needs to be updated and, if so, perform the update is to visit the card manufacturer's website. For more information, see "Update and Configure Your Graphics/Video Driver" in the online Help.

(If, instead, you decide to update your driver using the Windows Device Manager and the "Search automatically" option, the program may suggest using a Microsoft-approved WHQL version of the driver. However, to ensure you have the latest bug fixes and new features for your graphics card, it is recommended that you use the latest manufacturer version instead.)