Smart Construction

Smart Construction Quick3D
User Manual

March 5, 2025
Mobile Ver2.0.6 &Web Ver2.0.6-0002

Before you start

- This manual explains how to handle Smart Construction Quick3D, an online application service provided by EARTHBRAIN Ltd.
- This manual describes how to handle this application and the matters to be followed for safe use.
- Many of the accidents occur when work is done without following basic precautions.
  Before starting use of this application, read and follow all the information provided in this manual.
  Failure to follow warnings and cautions may result in serious injury or death.
- We cannot predict every situation in which customers will use our products.
  Therefore, the precautions described in this manual do not cover all safety-related matters.
  If you use this application in a situation not described in this manual, you are responsible for taking all necessary safety precautions.
  Never perform any of the actions prohibited in this manual.
- For indicating units, International System of Units (SI) is used.
  Explanation, numeral values, illustration, etc. are based on the information as of the time this manual was prepared.
- If you have any questions or concerns, please contact the EARTHBRAIN Support Center, described at the end of this manual.
- To use this application, you must agree to the “Terms of Service” that will be displayed when you start the application for the first time. Please read the Application Software Terms of Service carefully.
- Please use this application after understanding the Application Software Terms of Service regarding contract terms, warranties, and liability.
- The application may be updated without prior notice. So, actual specifications may differ from those in this manual.
- Screen and display of the application may change when updated. If there are any differences between what is written in this manual and the display on the application screen, operate according to the application display.
- Regarding the use of this application, the application developer is not responsible for any lack of measurement accuracy that may result from the user’s method of use.

Trademarks used in this manual

- Smart Construction, and Smart Construction Quick3D are registered trademarks of Komatsu Ltd.
- Wi-Fi is a registered trademark of Wi-Fi Alliance.
- iPhone and iPad are registered trademarks of Apple Inc.
- iOS is the OS name of Apple Inc. iOS, a registered trademark or trademark of Cisco Systems, Inc. or its affiliates in the United States and other countries, is used under license.

* In general, company names, product names, etc. written herein are business names, trademarks or registered trademarks of each company.

Precautions

⚠ Note

Unexpected accidents may occur.

- While shooting, be sure to pay close attention to your surroundings.
  Pay special attention to your footing to prevent falls and accidents.
- Refrain from shooting in areas where heavy machinery is in operation, as this may cause an accident.
- When other machinery is in operation, use this software with caution to avoid being caught in any moving parts.

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1. System Overview

Smart Construction Quick3D is software that provides a 3D point cloud of the measurement area by shooting that area using a mobile device.
It uses a camera and a LiDAR scanner for shooting, and can generate highly accurate 3D point cloud data from photos and LiDAR scanner data. To generate a more accurate 3D point cloud, it has a system that consists of a mobile application that imports photos and LiDAR scanner data and is available as a 3D point cloud viewer and a web-based application that is available as a viewer to check 3D point clouds on your PC.

System configuration overview

Bluetooth communication

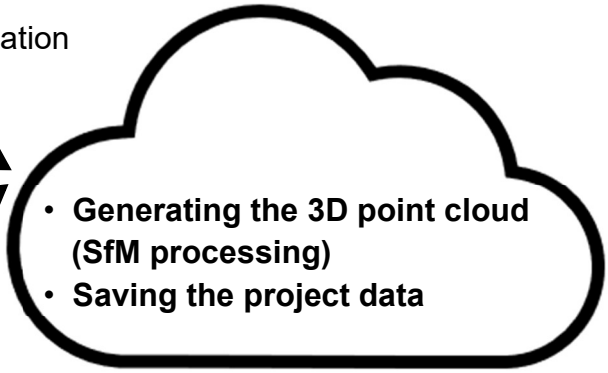
RTK device (viDoc RTK rover)

- Connection with iPhone/iPad via Bluetooth
- By combining it with Ntrip method correction data, highly accurate point clouds can be generated.

iOS application (Mobile device)

- Photo and LiDAR scanner data import function
- 3D point cloud viewer function
- Position correction calculation function
- Point cloud removal function

Internet communication



Cloud server

Internet communication

Web-based application (PC)

- 3D point cloud viewer function
- Position correction calculation function
- Point cloud removal function

2.1 What You Need

When using an RTK device	When an RTK device is not used
Mobile device (see “Recommended Operating Environment”) RTK device main unit* * Required when using a Plus AR license Subscription for correction data distribution service	Mobile device (see “Recommended Operating Environment”) Dedicated AR markers Position coordinate measurement terminal (e.g., Rover, total station)

2.2 Recommended Operational Environment

	OS	Recommended environment (as of January 27, 2025)	
Mobile application	iOS (most recent version)	iPhone 12 Pro	[SPC, SPC+]
		iPhone 12 Pro Max	[SPC, SPC+]
		iPhone 13 Pro	[SPC, SPC+]
		iPhone 13 Pro Max	[SPC, SPC+]
		iPhone 14 Pro	[SPC, SPC+]
		iPhone 14 Pro Max	[SPC, SPC+]
		iPhone 15 Pro	[SPC+]
		iPhone 15 Pro Max	[SPC+]
		iPhone 16 Pro	[SPC+]
		iPhone 16 Pro Max	[SPC+]
		iPad Pro 11 inches (2nd generation)	[SPC, *Casetify SPC+]
		iPad Pro 11 inches (3rd generation)	[SPC, *Casetify SPC+]
		iPad Pro 11 inches (4th generation)	[SPC, *Casetify SPC+]
		iPad Pro 11 inches (M4)	[Casetify SPC+]
		iPad Pro 12.9 inches (4th generation)	[-]
		iPad Pro 12.9 inches (5th generation)	[SPC, *Casetify SPC+]
		iPad Pro 12.9 inches (6th generation)	[SPC, *Casetify SPC+]
		iPad Pro 13 inches (M4)	[Casetify SPC+]
		[ ] indicates viDoc RTK rover connector-shape compatible type	
PC	Windows 10 or later	Browser: Google Chrome	
AR markers	-	Product specified by our company	
Position coordinates measurement terminal	-	Smart Construction Rover	

* Casetify SPC+ is displayed only when Pix4D catch is started up through Smart Construction Quick3D.

2.3 Measurement Performance

Measurement Accuracy	Refer to "**6.1 Smart Construction Quick3D Shooting Guidelines**".
Recommended maximum measurement area (when using an RTK device)	Flat area: ≤ 600 m^2 Slope: Slope length ≤ 12 m; extension ≤ 50 m (when using a telescopic rod) Method length ≤ 7 m; extension ≤ 50 m (when no telescopic rod is used)
Recommended maximum measurement area (when an RTK device is not used)	Flat area: ≤ 400 m^2 Slope: Slope length ≤ 4 m; extension ≤ 20 m

3 Initial Settings

3.1 Initial settings for mobile device and RTK device

<Mobile device settings>

1. Install “Smart Construction Quick3D” from the App Store on your mobile device.
2. Install “PIX4Dcatch:3D scanner” from the App Store on your mobile device.

1

2

3. Note 1
   When launching the application for the first time, allow it to access location information. Otherwise, you will be unable to shoot properly.

   Note 2
   “PIX4Dcatch:3D scanner” is an application provided by PIX4D.

<RTK device settings>

Using an RTK device enables more accurate location information to be obtained.
It is possible to acquire a point cloud according to the jobsite coordinates without placing a ground control point (GCP).
The following is an example of using “viDoc RTK rover(*)” as an RTK device.
(*) viDoc RTK rover is not waterproof or dustproof, so be careful when shooting.

The connection method and initial settings for using viDoc RTK rover are described below.

1. Attach the dedicated SP case to your iPhone or iPad.
(1-1: iPhone example, 1-2: iPad example)

1-1

1-2

2. Attach the antenna to the included viDoc RTK rover main unit, and attach the viDoc RTK rover main unit to the case attached to the iPhone or iPad in step 1 above.
When attaching, be careful to fit it firmly in the groove and rotate it, otherwise it will come off.
When attaching it, pay attention to ensuring that the gap width is even, as shown in Figure 2-2.
When connecting the main unit to an iPad, attach it with the antenna in the correct orientation with respect to the “viDoc” logo on the case as shown in Figure 2-3.
If connected as shown in Figure 2-4, the positional relationship between viDoc RTK rover and the camera will be incorrect, and location information will not be corrected appropriately.
The attachment of viDoc RTK rover to the iPhone or iPad is now complete.
To use the viDoc RTK rover, after attaching the case, press the power button in the position shown in Figure 2-2 to start.

2-1

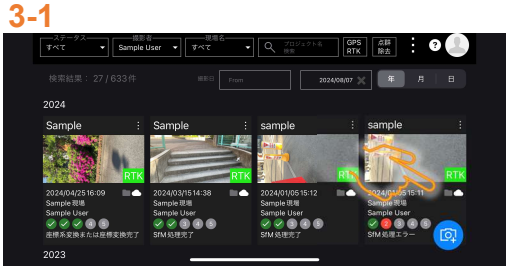
2-2

2-3

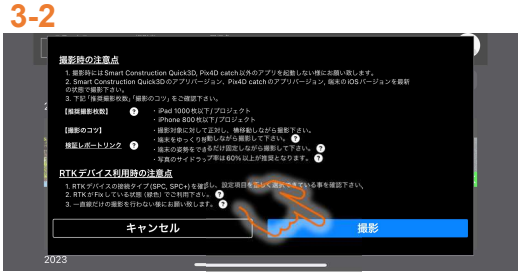
2-4

3. On your iPhone/iPad, open the Smart Construction Quick3D application, tap the Camera button.
The cautions for shooting will be displayed. Tap the [Shooting] button after reading.

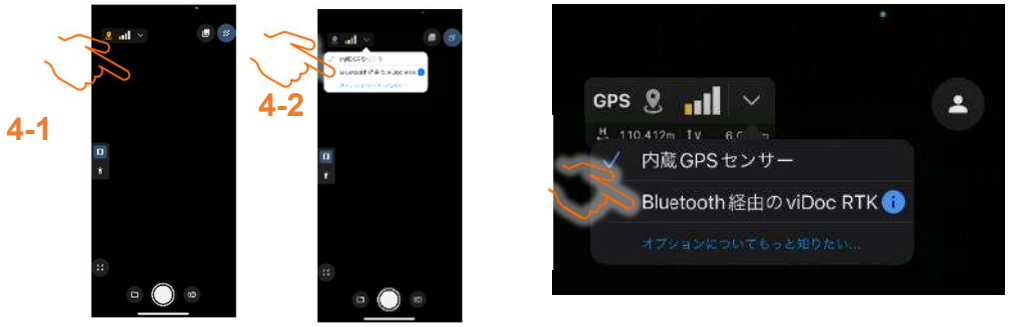
3-1



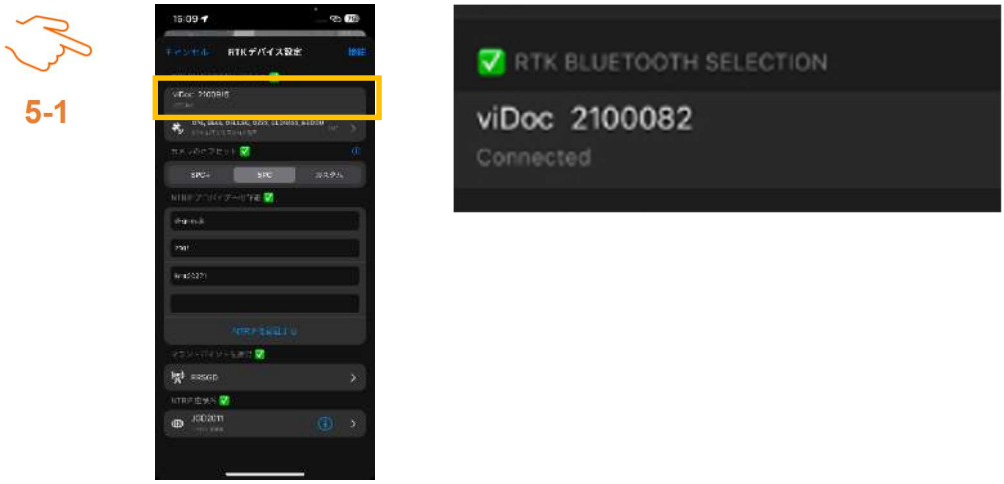
3-2



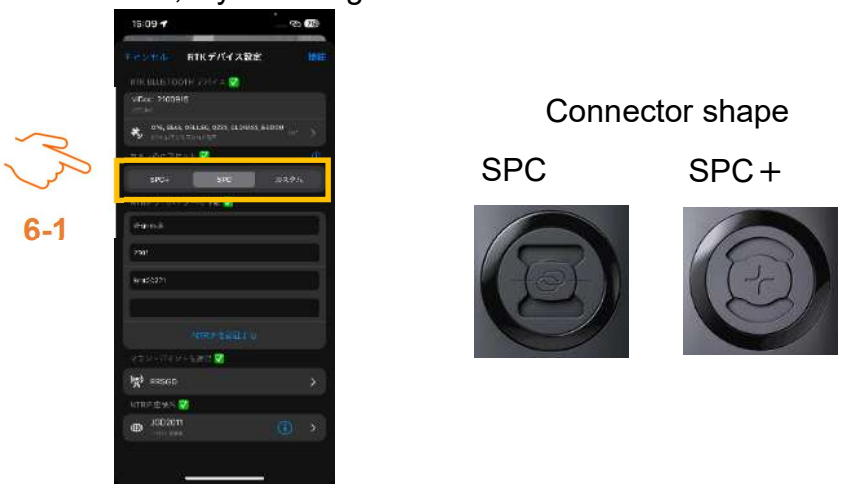
4. Select “viDoc RTK via Bluetooth” from the button to the right of the signal strength indicator in the upper left.



5. From “RTK BLUETOOTH SELECTION”, select the connected device(*).
When performing this procedure, make sure that the Bluetooth setting on your iPhone or iPad is set to “ON”.
(*) Select the terminal name of your viDoc RTK rover.



6. Select the appropriate item for your device from “Camera Offset”. Nothing is selected immediately after installation. Please check the photo of the connector shape below and select the one that fits your case.
[Note]
Even if you used with the case of SPC in the past, you must change the “Camera Offset” value to SPC+, if you changed the case to SPC+.



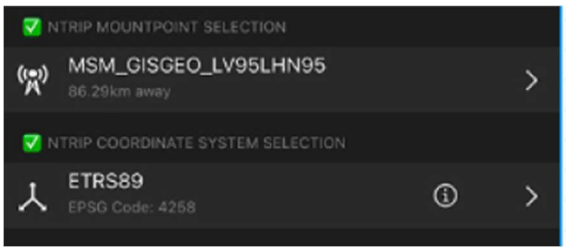
* When using an SPC+ type viDoc RTK rover with an iPad, **select “Casetify SPC+” for “Camera Offset” in the viDoc RTK rover settings screen in the application.**

If you directly launch PIX4Dcatch application and open the shooting screen, the leftmost indication of [Camera Offset] is [SPC+] and [Casetify SPC+] is not displayed.
To display [Casetify SPC+], you must enter the shooting screen from Smart Construction Quick3D application.

7. Check the “Ntrip provider details” checkbox. Enter each authentication information (host name/IP, port, user name, and password), and select authentication.

8. Select the mount point corresponding to the Ntrip provider* you use and the input coordinate reference system corresponding to it.
   * To use it, you will need to subscribe to a correction data distribution service.

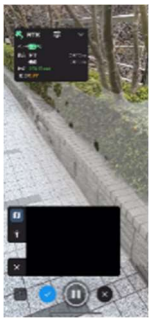
7-1



Ntrip provider	Host name/IP	Port	Mount point	Input coordinate reference system
Docomo	d-gnss.jp	2101	RRSGD	JGD2011
Softbank	Ntrip.ales-corp.co.jp	2101	32M5NHS	WGS84
Jenoba	Ntrip.jenoba.jp	2101	JVR32M	JGD2011
Fixed station (SC related)	Rtcmsv.smartconstruction.com	2101	MSM4_RAW	JGD2011

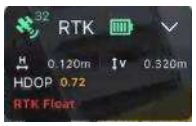
9. After completing the procedure up to step 8, select “Connect” in the upper right. Click [Connection] and switch to the shooting screen. When “RTK Fixed” is displayed in the upper left, you can shoot using correction data. If “DGNSS only” or “RTK Float” is displayed, accurate correction data cannot be obtained and the accuracy of the created point cloud will be affected.*

   * If satellite and internet conditions are not good, a connection will not be established.
   * An alarm sounds if RTK Fixed is lost during shooting. Note that the sound will not be heard when the sound is muted.



Correction data available

Correction data unavailable



10. When shooting with an iPhone, please be aware that depending on how you hold the viDoc RTK rover, your fingers may inadvertently appear in the photos. (This issue is unlikely to occur with an iPad.)
    We also recommend shooting while the extension rod is connected to the viDoc RTK rover (1/4-inch screw thread).

Recommended

Recommended

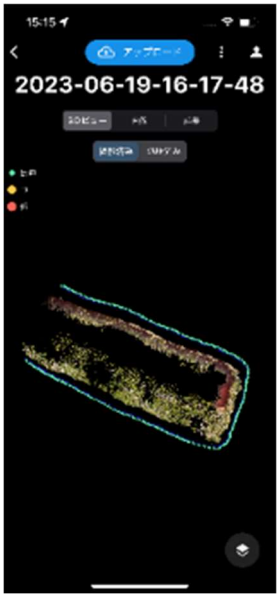
Not recommended
(Fingers may be included in the photo.)

11. The following are examples of 3D views after shooting. After shooting, if there are red points in the trajectory as shown in Figure 10-1, they represent places where shots were taken without the Fixed condition, thus degrading the accuracy. It is recommended to redo the shooting so that all the points remain green, indicating all shots are taken in the Fixed condition as shown in Figure 10-2.
    Note that if you bring the viDoc RTK rover to a position lower than your body, the viDoc RTK rover will be in your shadow, making it difficult to obtain correction Data.

10-1

There are red and yellow points in the trajectory indicating shots were taken while the Fix was lost.

10-2



There are no red or yellow points in the trajectory because all shots were taken in the Fixed condition.

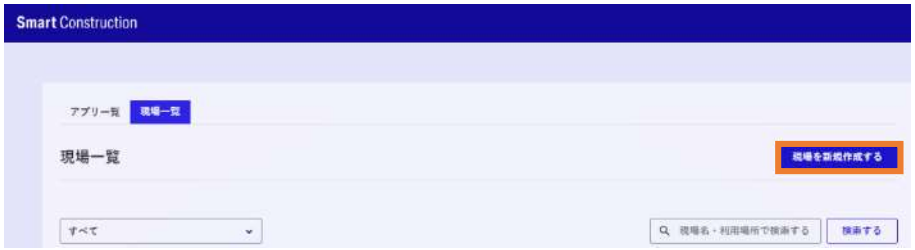
3.2 Jobsite Setting

Jobsite settings are required to use Smart Construction Quick3D.
If you have already created a jobsite, you can skip this step.

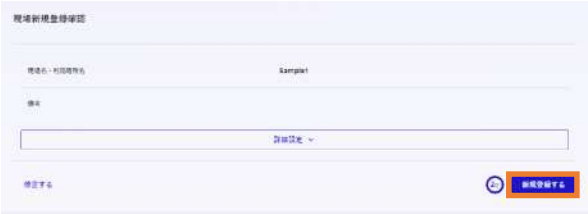
1. Get access to the Smart Construction Portal.
   (https://portal.smartconstruction.com/)

2. Click on the jobsite list.

3. Click the [Create New Jobsite] button in the upper right.



4. Fill in all the required fields and click [Register] at the bottom.

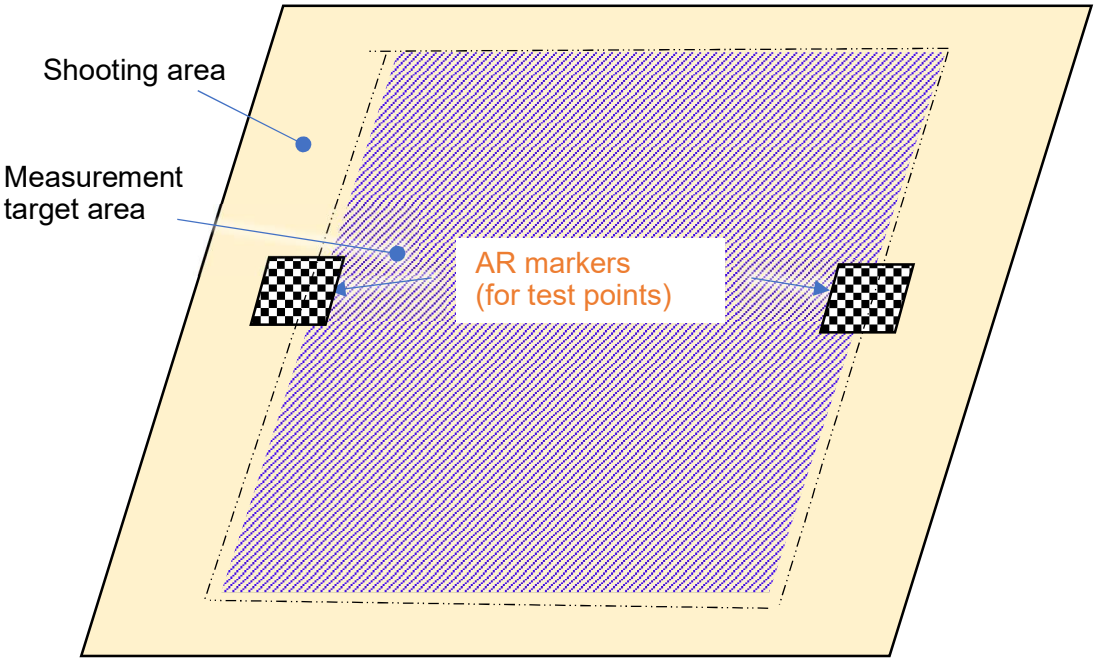


The new site is registered in the [Jobsite List].

4 Preparation for Measurement

4.1 Placing AR Markers and Measuring Position Coordinates (When Using an RTK Device)

1. Place AR markers (for test points)*1 as test points at any two locations within the measurement target area.
2. Measure the center coordinates of each AR marker with Smart Construction Rover*2.
   (For how to use Smart Construction Rover, refer to the instruction manual for that product.)



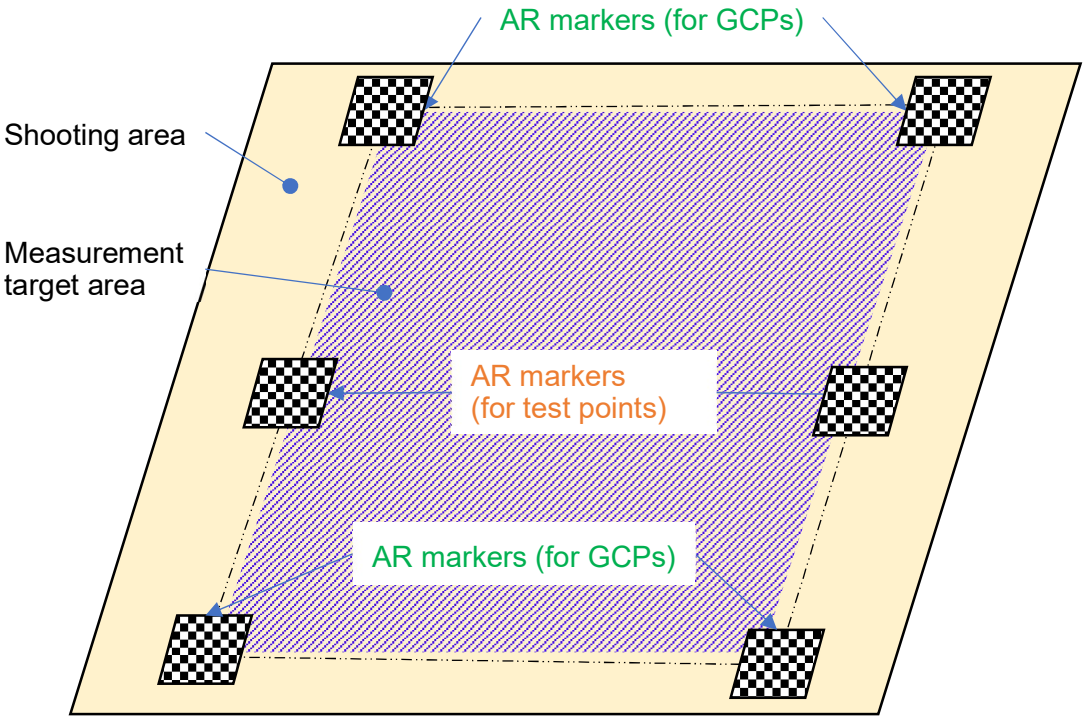
*1 When using an RTK device, shooting is performed using the following dedicated AR marker.

For test points (901 to 904)

*2 Rovers and total stations made by other companies can also be used.

4.2 Placing AR markers and measuring position coordinates (when an RTK device is not used)

1. Place AR markers (for calibration)[*1] at the four corners of the measurement area as ground control points (GCPs).
2. Place AR markers (for test points)[*1] as test points at any two locations within the measurement target area.
3. Measure the center coordinates of each AR marker with Smart Construction Rover[*2].
   (For how to use Smart Construction Rover, refer to the instruction manual for that product.)



*1 When an RTK device is not used, shooting is performed using the following two dedicated AR markers.

For GCPs (001 to 008)

For test points (901 to 904)

*2 Rovers and total stations made by other companies can also be used.

5 How to use the application

5.1 Login/Logout

<iOS application>

[Login]

1. Launch Smart Construction Quick3D on your mobile device.
2. Tap the Login button.
3. Log in with the Smart Construction account under which you purchased the Smart Construction Quick3D license.

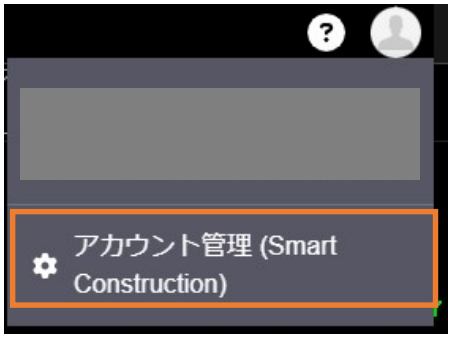
[Logout]

4. Tap Logout under the [Face] icon in the upper right.

<Web-based application>

[Login]

5. After logging into the Smart Construction Portal, launch Smart Construction Quick3D.
   Launch Smart Construction Quick3D.



[Logout]

6. Click [Account Management (Smart Construction)] under the [Face] icon in the upper right.

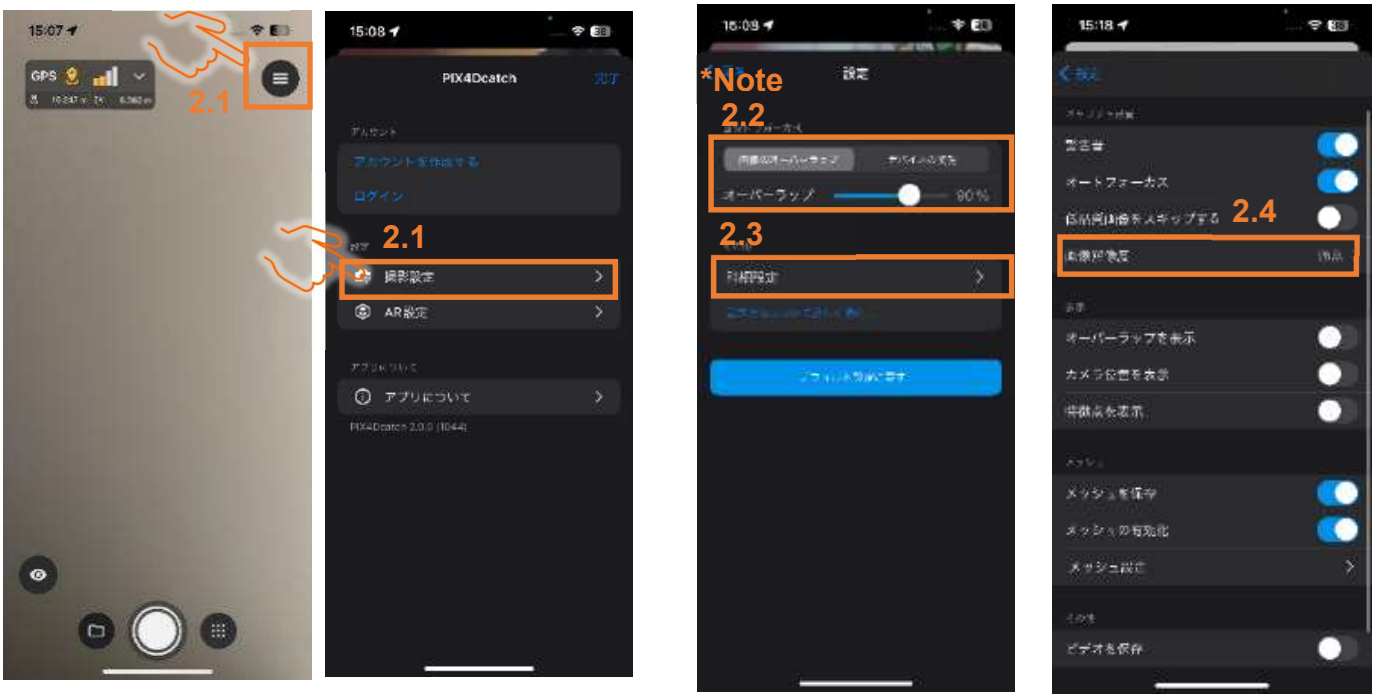
7. Click the [Logout] button under the [Face] icon in the upper right corner of Smart Construction Portal to log out.
   Click the [Logout] button under the [Face] icon in the upper right to log out.

5.2 Shooting (iOS Application only)

Use the camera and LiDAR scanner to take photos of the object to measure.
Generate a 3D point cloud using the photos taken here and LiDAR information.

1. Tap the [Camera] icon in the lower right of the project list. (This starts up the PIX4Dcatch:3D scanner.)
   Note: To start up the PIX4Dcatch:3D scanner, be sure to use this icon.
   If you launch PIX4Dcatch:3D scanner directly from the home screen, you cannot send the photographed data to Smart Construction Quick3D.

2. Please perform the following settings. (PIX4Dcatch:3D scanner operation)
   2.1 Tap the hamburger menu in the upper right of the screen, and then tap shooting settings.
   2.2 Setting the Overlap Ratio
   Set the overlap ratio to 90% or higher.
   (If you set the overlap ratio too high, increased number of photos will result in a larger data size, which may make it difficult to upload photos.)
   *Note: Even after setting, tap [Return] when the [Image Overlap] tab is active, as shown in the figure below, and click “Complete” in the dialog.
   If you tap [Return] when the [Device Attitude] tab active, you will be shooting using the [Device Attitude] information.
   2.3 Tap [Advanced Settings].
   2.4 Set the [Resolution] to match the object.
   For the recommended resolution for each shooting target, refer to “**6.1 Smart Construction Quick3D Shooting Guidelines**”.



3. Point the camera towards the edge of the measurement area and tap the [Shooting] button. (PIX4Dcatch:3D scanner operation)

4. Photos are taken automatically.
   A mesh will be displayed in the area where LiDAR is obtained. It is recommended to shoot photos using this as a guide.
   Take photos of the entire measurement area evenly and sequentially from its edge.
   (PIX4Dcatch:3D scanner operation)
   (For shooting tips, see "**6 Shooting Tips**".)
   * To improve the accuracy of the point cloud, it is necessary to extract feature points from multiple photos and generate a point cloud.
   Therefore, it is recommended to have more than 40 photos.
   (If there are less than 10 photos, an upload error will occur.)

5. After shooting, tap the "Shooting Completion" button. After completion of (PIX4Dcatch:3D scanner operation), refer to [**5.3.1 SfM Processing from iOS application**].

5.3 Generating the Point Cloud (SfM Processing)

Use the data captured in “**5.2 Shooting (iOS Application Only)**” to generate the point cloud (SfM processing).
This process requires an internet connection.
Due to the large amount of communication data, we recommend using it in a Wi-Fi environment.
Estimated communication volume (For how to set the image quality, refer to “**5.2 Shooting (iOS Application Only)**”.)

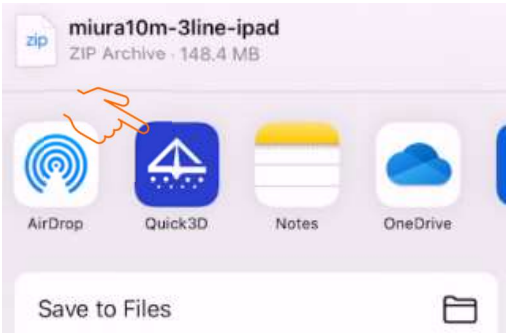
Normal image quality: Approximately 242 MB for 100 photos
4K quality: Approximately 660 MB for 100 photos

5.3.1 SfM Processing from iOS application

The screen shown below is displayed after completing [Save] in 5.2 5.

1. Tap the Share button at the top and tap [Export All Data].
   (PIX4Dcatch:3D scanner operation)

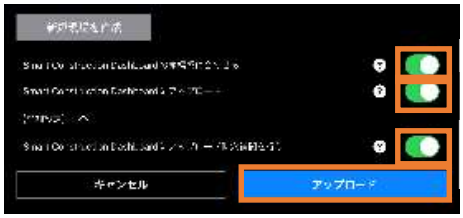
2. Tap [Smart Construction Quick3D] as the export destination.
   (PIX4Dcatch:3D scanner operation)
   * How to re-upload data that has been shot once is described in the online FAQ webpage.
   Click here for the link to the FAQ.

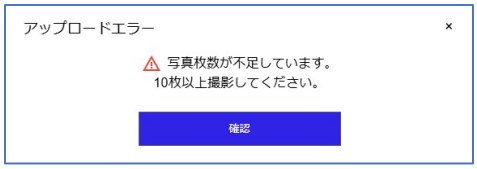


3. Choose the upload destination jobsite (created in “**3.2 Jobsite Setting**”).
   The upload destination jobsite can also be searched using text strings and matching sites will be displayed in a list from which you can select.
   When creating a site, tap [Create New Jobsite] and follow the procedures in “**3.2 Jobsite Setting**”. Then select the jobsite.

4. Set various options.
   4-1. If this option is set to ON, a point cloud is generated according to the coordinate system set in Smart Construction Dashboard.
   (You must set up the coordinate system in Smart Construction Dashboard in advance.)
   4-2. If this option is set to ON, the point cloud resulting from the coordinate system transformation in 2-1. above is automatically uploaded to Smart Construction Dashboard.
   4-3. If this option is set to ON, the ceiling of the point cloud will be interpolated when uploading in 2-2 above.

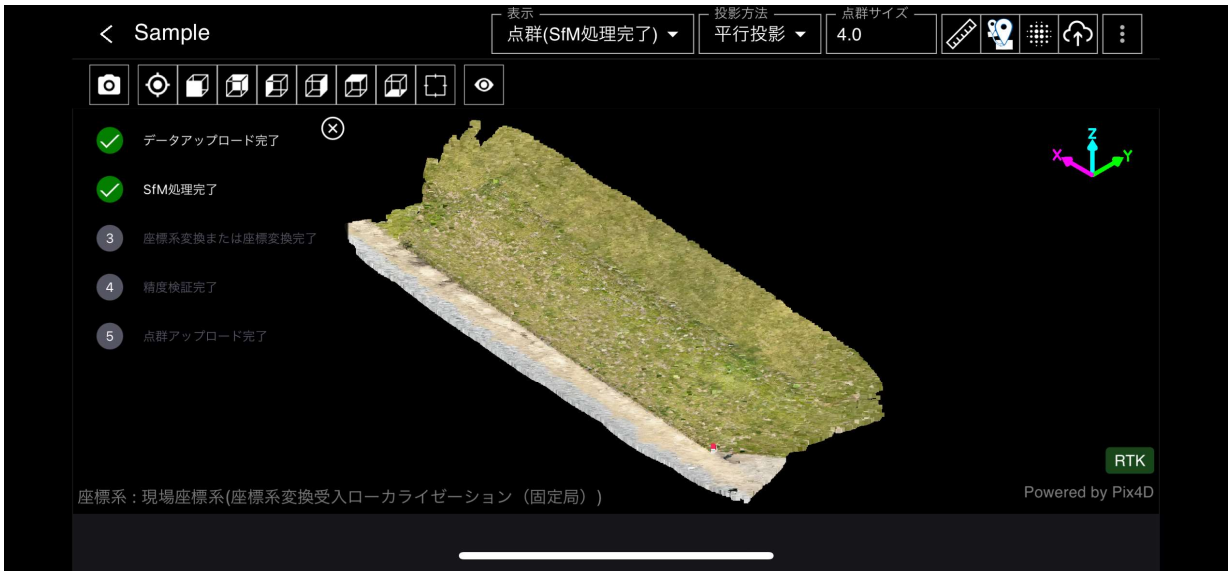
5. After completing of setting, tap [Upload].
   An upload error occurs if the number of photos is less than 10.
   This initiates uploading the photos to the server and generating the point cloud.
   You will also receive a notification at that email address once the SfM processing is complete.





6. Even if the application crashes during upload, the mobile power is turned off, etc., the system enters the upload standby state as shown below, and upload will start by tapping the target project again.
   * The project waiting to upload is displayed by setting the status filter to “All” or “Data Upload Wait”.

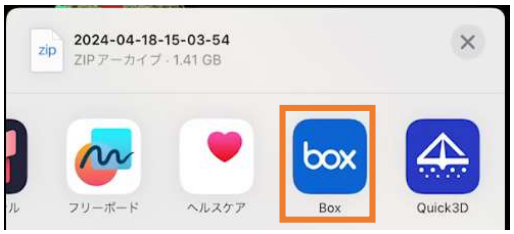
4．　After SfM processing is complete, you can view the point cloud (SfM-processed). By switching the display, you can also view the LiDAR point cloud.



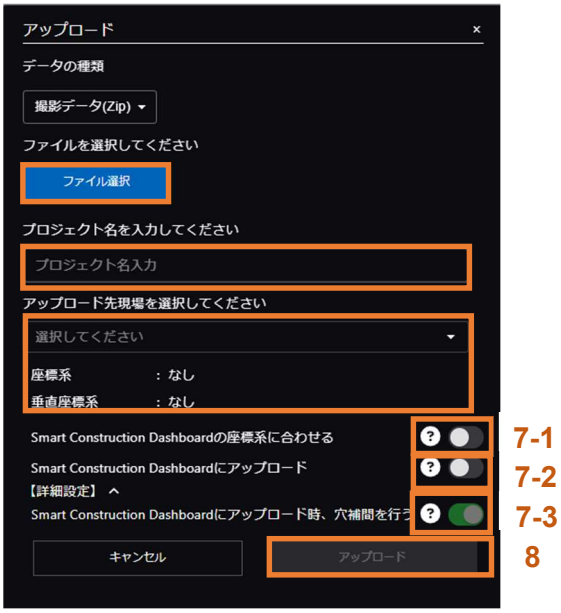
5.3.2 SfM processing from the web-based application

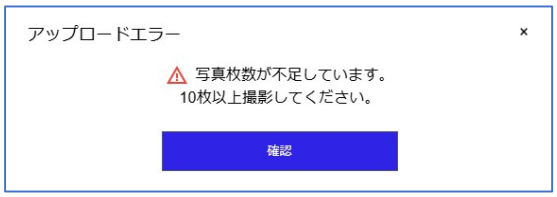
1. In 5.3-5, select an option, such as online storage or a local folder, to specify the upload destination and save the photographed data.
2. In the web-based application, click the “vertical ellipsis (kebab)” button in the upper right.
3. Click “Upload”.

Example of online storage



4. Click [Select File] and select the Zip file saved in 1. (Select a Zip file with more than 10 photos.)
5. Enter the project name you will create with SfM processing.
6. Select the jobsite to upload. The upload destination jobsite can also be searched using text strings and matching jobsites will be displayed in a list from which you can select. After jobsite selection, the coordinate system set for the site is displayed.
7. Set various options.
   - 7-1. If this option is set to ON, a point cloud is generated according to the coordinate system set in Smart Construction Dashboard. (You must set up the coordinate system in Smart Construction Dashboard in advance.)
   - 7-2. If this option is set to ON, the point cloud resulting from the coordinate system transformation in 7-1. above is automatically uploaded to Smart Construction Dashboard.
   - 7-3. If this option is set to ON, the ceiling of the point cloud will be interpolated when uploading in 7-2 above.
8. After the setting is complete, click [Upload] to upload and point cloud generation will start. If the number of photos in the Zip file is less than 10, an upload error will be displayed. You will also receive a notification at that email address once the processing is complete.

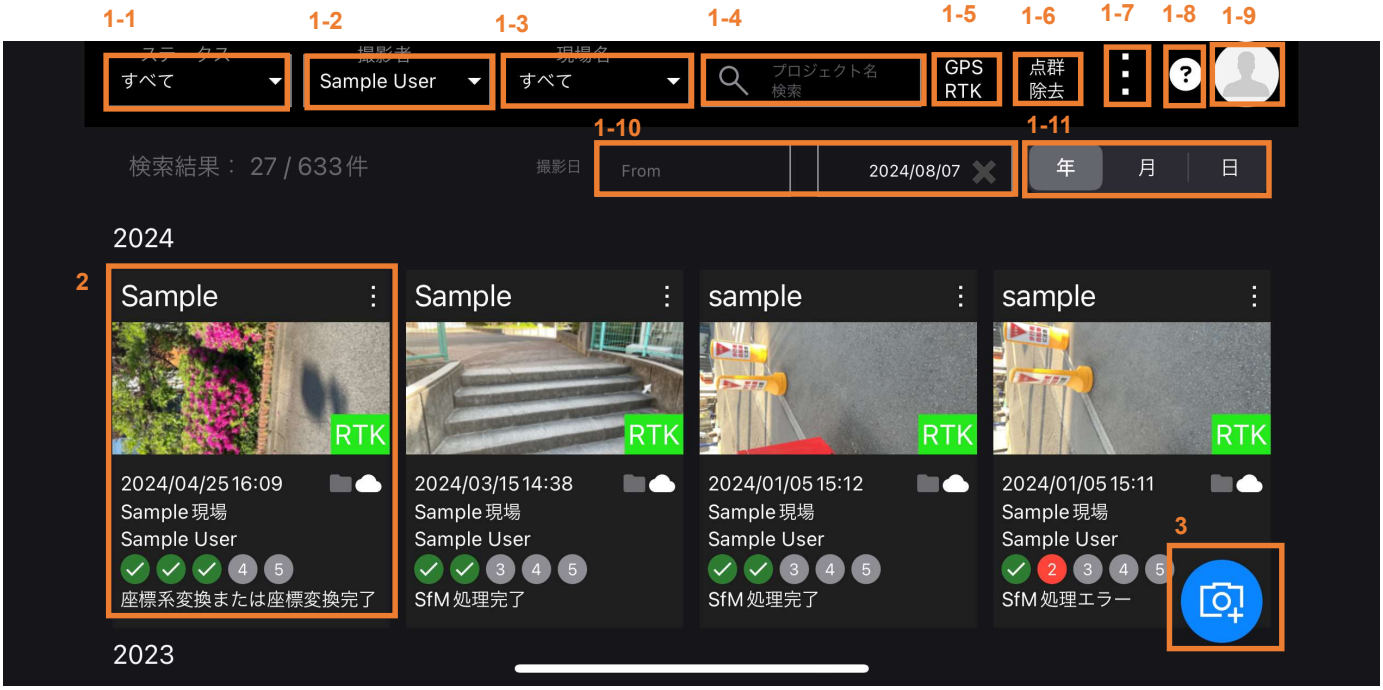




5.4 Explanation of Project List/Project Details

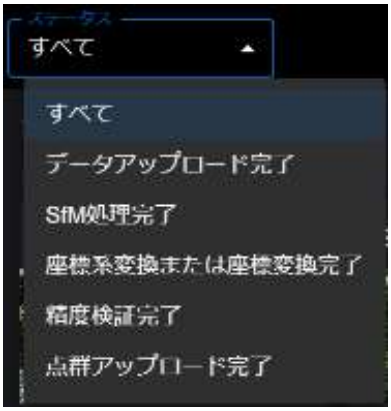
5.4.1 Project list

1. Project List screen



1-1. Filtering function by status
You can search for projects by filtering them by status below.

Web version



iOS version

1-2. Surveyor filtering: You can filter by selecting a surveyor from the surveyor list.

1-3. Jobsite name filtering: You can filter by selecting a site from the jobsite name list.

1-4. Project name search function: You can search for projects with any keyword.

1-5. GPS RTK filter: You can filter by “RTK device used (RTK)” and “RTK device unused (GPS)”.

1-6. Point cloud removal filter: You can filter by “point cloud removal done” and “not done”.

1-7. This button provides access to project deletion, SfM processing from a local file (**5.3.2 SfM processing from the web-based application**), and settings (projection method and automatic coordinate system alignment).

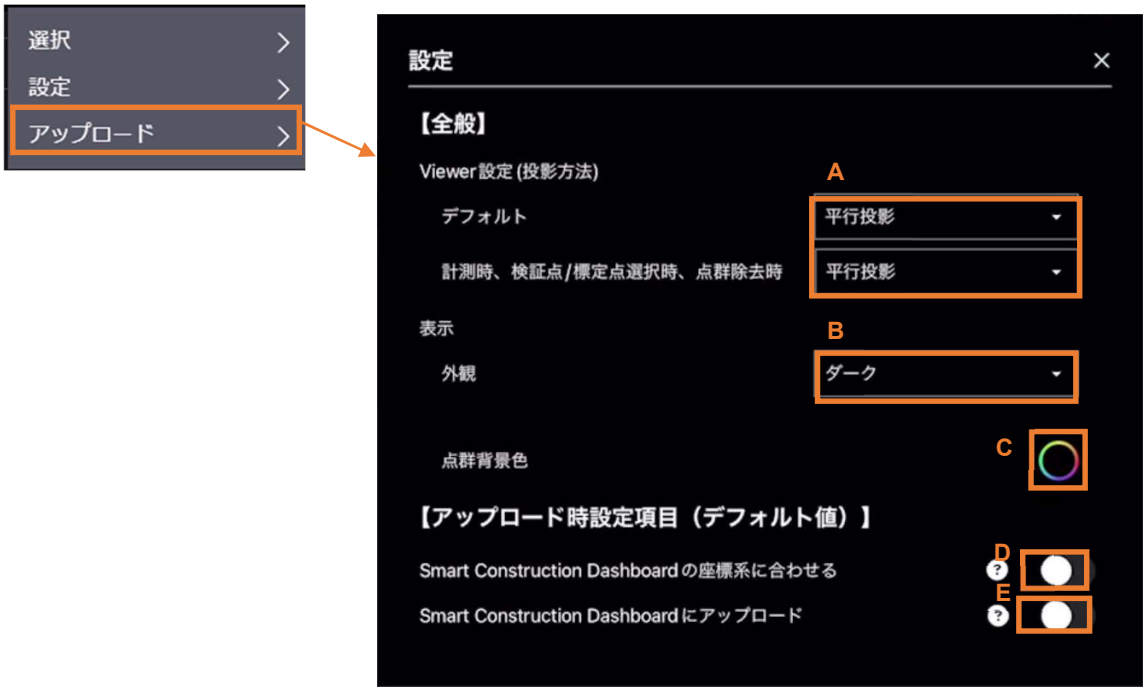
A. These set the projection method when you select points for measurement and transformation when the viewer has been defaulted.
You can select each of these from perspective or parallel projection.

B. Set the appearance. You can select the dark mode with a black background and the light mode with a white background.

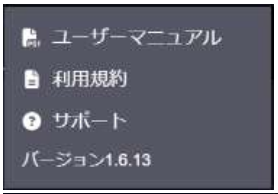
C. Set the point cloud background color.
You can select the background color from the color palette when using the point cloud viewer.

D. This is the default value of the “SfM-processed coordinate system” settings (**5.3.1 SfM Processing from iOS application**, **5.3.2 SfM processing from the web-based application**) when uploading.
If you change the settings, the default values of the dialog when uploading will be changed.

E. This is the default value of the "Upload to Smart Construction Dashboard" settings (see **5.3.1 SfM Processing from iOS application** and **5.3.2 SfM processing from the web-based application**) when uploading.
If you change the settings, the default values of the dialog when uploading will be changed.

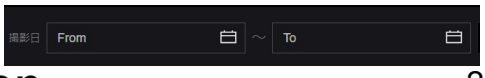


1-8. Switches to the User Manual, Terms of Service, and Support Page.



1-9. Switches to account management (Smart Construction Portal).

1-10. You can specify the shooting date by From to To.



1-11. Switches the display between year, month, and day units.

2. This is a photographed project.
Click here to switch to the Project Details screen.

Primary status list

: Uploading of photographed data completed (SfM processing in progress)

: SfM-processed

: Coordinate system transformation or coordinate transformation (Helmert transformation) completed

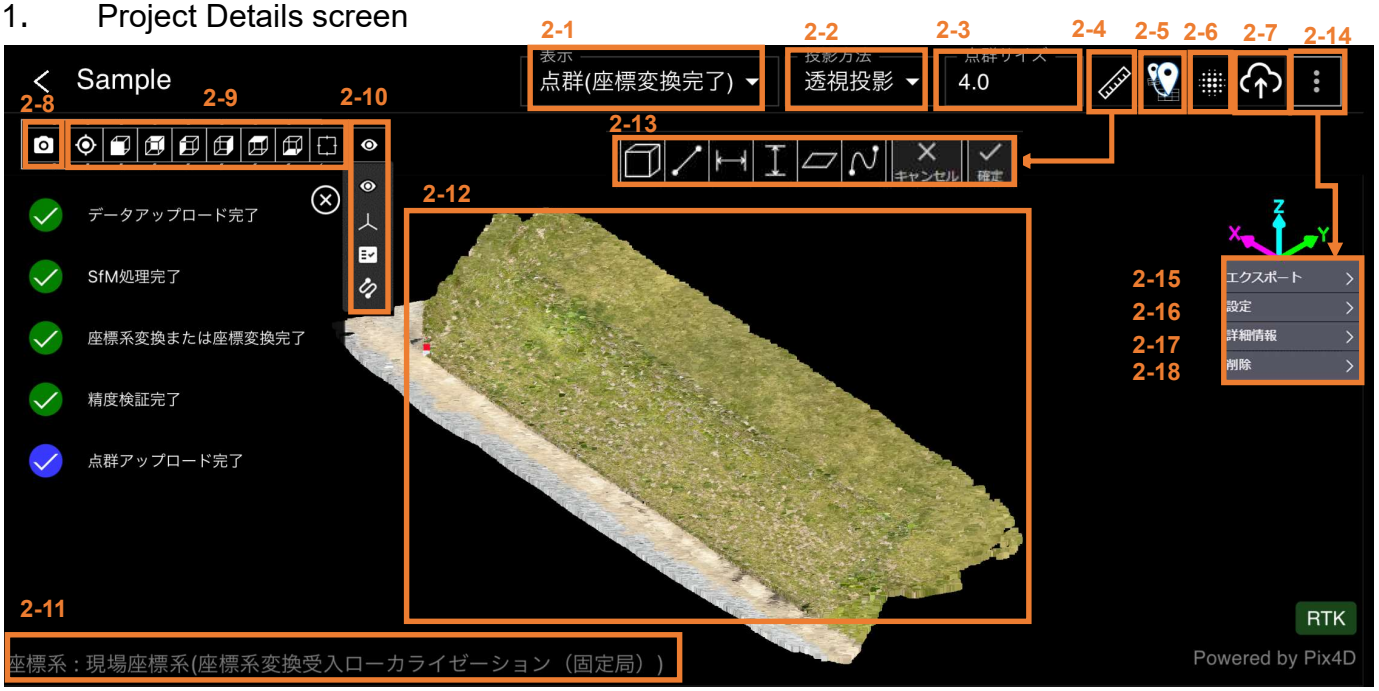
: Accuracy verification completed

: Smart Construction Dashboard
or upload to LANDLOG Viewer completed

3. Click this icon to start shooting.

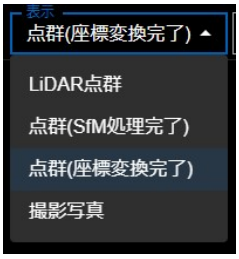
5.4.2 Project details

1. Project Details screen



2. Tool button

2-1. Point cloud display switching
Switches the display to each point cloud.
* The point cloud (coordinate transformation completed) is displayed only when coordinate transformation is executed.



2-2. Switches between [Perspective Projection] and [Parallel Projection] for Display Point Cloud.
(For [Perspective Projection], zooming in on a closed point cloud moves the viewpoint inside, allowing you to view its interior.)

2-3. Point cloud size adjustment
Enter the point size or click the arrow buttons to increase or decrease the point cloud size.

2-4. Clicking here opens the measurement menu.
For more details, see “**5.7 Measuring the Generated Point Cloud**”.

2-5. Clicking here opens the [Coordinate Transformation Menu].
For more details, see “**5.8 Performing Coordinate Transformation and Accuracy Verification of the Generated Point Cloud**”.

2-6. Clicking here opens [point cloud removal menu].
For more details, see “**5.9 Removing a Point Cloud from a Generated Point Cloud**”.

2-7. Uploads to Smart Construction Dashboard or LANDLOG Viewer. For more details, see “**5.10 Uploading the Point Cloud to the Smart Construction Application**”.

2-8. Screenshot function
Click the camera icon to take a screenshot.
The screenshot is copied to the clipboard.

2-9. Clicking here changes the viewpoint of the point cloud.

2-10. These buttons switch to show/hide the point cloud, axes, status, and camera trajectory.

2-11. The coordinate system of the displayed point cloud is displayed.

2-12. The point cloud is displayed. The point cloud is displayed in the [Survey Coordinate System].
The operations for the point cloud are as follows.

<Mouse operation>

Left click and drag:	The point cloud moves.
Right click and drag:	The point cloud zooms in/out.
Center click (or press and hold down Ctrl key) and drag:	The point cloud rotates around the point you clicked.

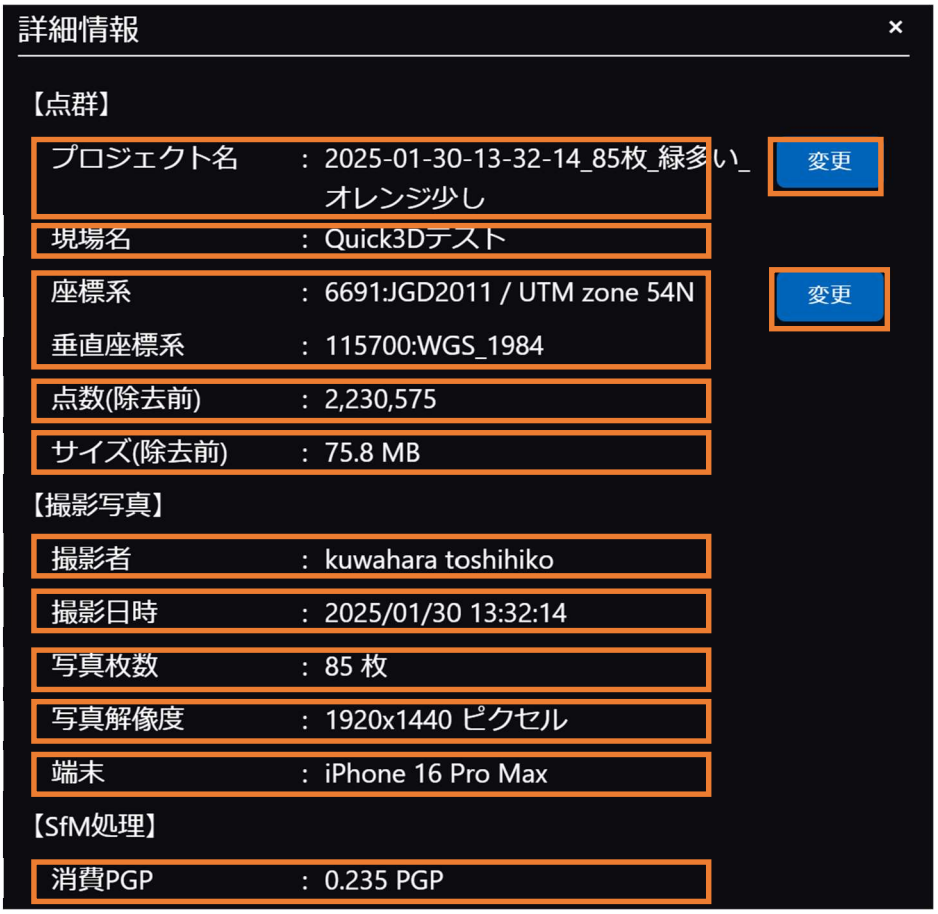
2-13. Execute each measurement.
For more details, see “**5.7 Measuring the Generated Point Cloud**”.

2-14. Detailed Menu

2-15. Export point clouds and various data.
For more details, see “**5.11 Exporting Data**”.

2-16. The personal settings is displayed. You can change various settings.
This is the same as the setting shown by the [vertical ellipsis (kebab)] button at the upper right of the project list.

2-17. Displays detailed information about the project.

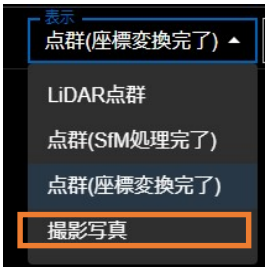


(1)	Project name	Project name set when uploading. You can change the project name with the [Change] button on the right.
(2)	Jobsite name	Jobsite name registered when uploading
(3)	Coordinate System Vertical coordinate system	The coordinate system set when uploading. You can change the coordinate system with the right button.
(4)	Number of points (before removal)	Number of points before point cloud removal
(5)	Size (before removal)	Point cloud size before point cloud removal
(6)	Surveyor (photographer)	Uploaded user name
(7)	Shooting date/time	Shooting date and time
(8)	Number of shots	Number of photos
(9)	Photo resolution	Photo resolution set when shooting
(10)	Terminal	Terminal name used when shooting
(11)	Consumed PGP	A value indicating the processing volume for SfM processing Consumed PGP is calculated as [photo resolution [megapixels] x number of photos [shots]/1000]. The higher the photo resolution and the number of photos, the larger the value of consumed PGP.

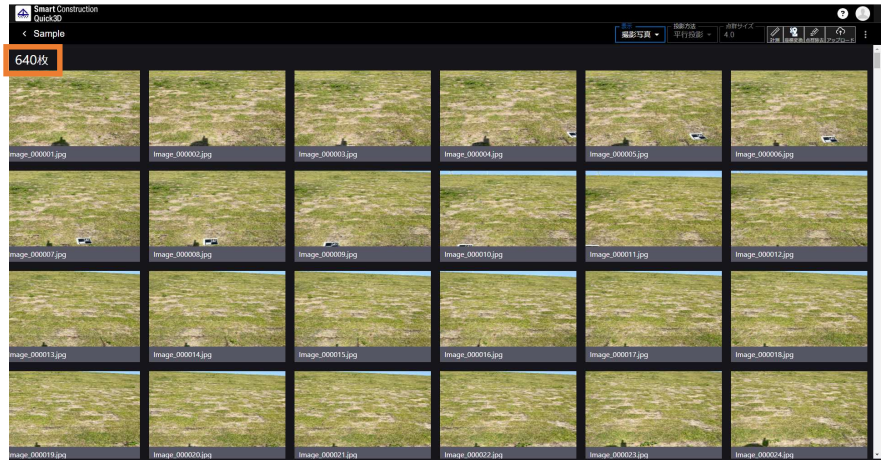
2-18. Delete the project. *Note that after deletion, you cannot restore it.

5.5 Checking the Photos Taken

1. Select [Photos] from [Display] in the project details.



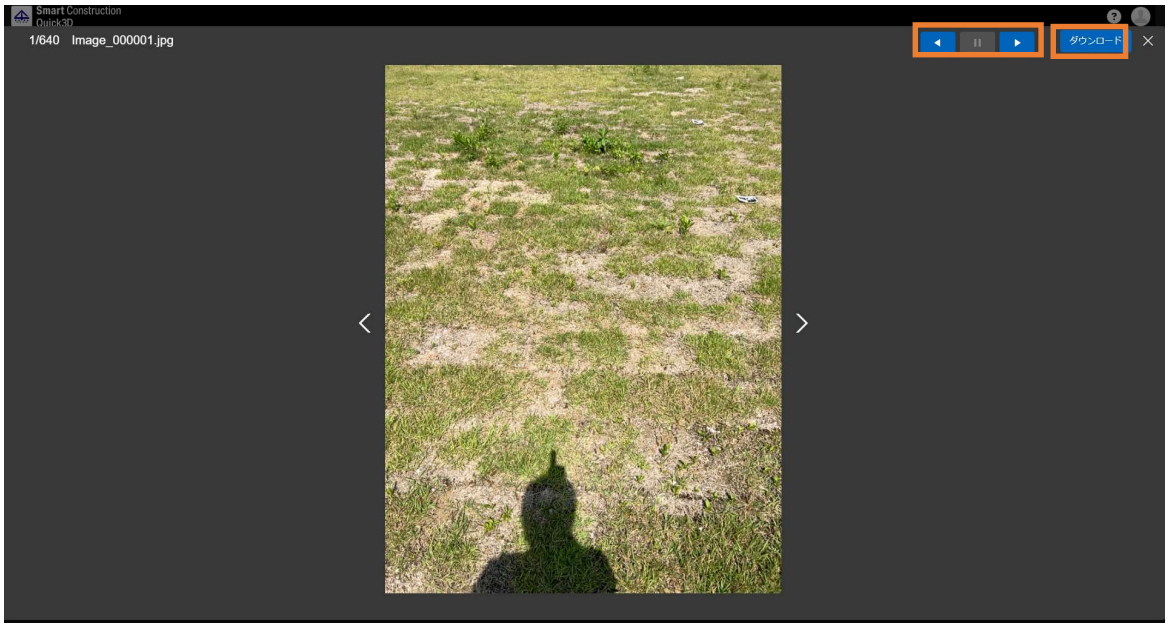
2. The photo list is displayed. The number of photos is shown in the upper left.



3. Select the photo to enlarge it. You can also download the displayed photo with the [Download] button in the upper right.

Clicking the [▶] mark automatically advances the displayed photo forward. The STOP button will stop the automatic advance.

Clicking the [◀] mark automatically advances the displayed photo backward. The STOP button will stop the automatic advance.



5.6 Transformation of the Coordinate System of the Generated Point Cloud

The absolute position of the created point cloud is typically expressed in the coordinate system of the [UTM plus the ellipsoidal height (or altitude)].
This function allows you to convert this coordinate system to the values of another arbitrary coordinate system.
This function can run for the SfM-processed point cloud.
If the SfM-processed coordinate system transformation is ON in 5.1-4, the coordinate system transformation adapting to the coordinate system set in the Smart Construction Dashboard will be automatically executed after SfM processing.
This process requires an internet connection.

*1 The vertical datum is automatically defined based on the camera model of the imported imagery.
For details, refer to the specifications defined by PIX4D (Link).

	X		Y		垂直基準	
点群生成直後	値	座標系	値	座標系	値	座標系
	x1	UTM	y1	UTM	z1	楕円体高 or 標高

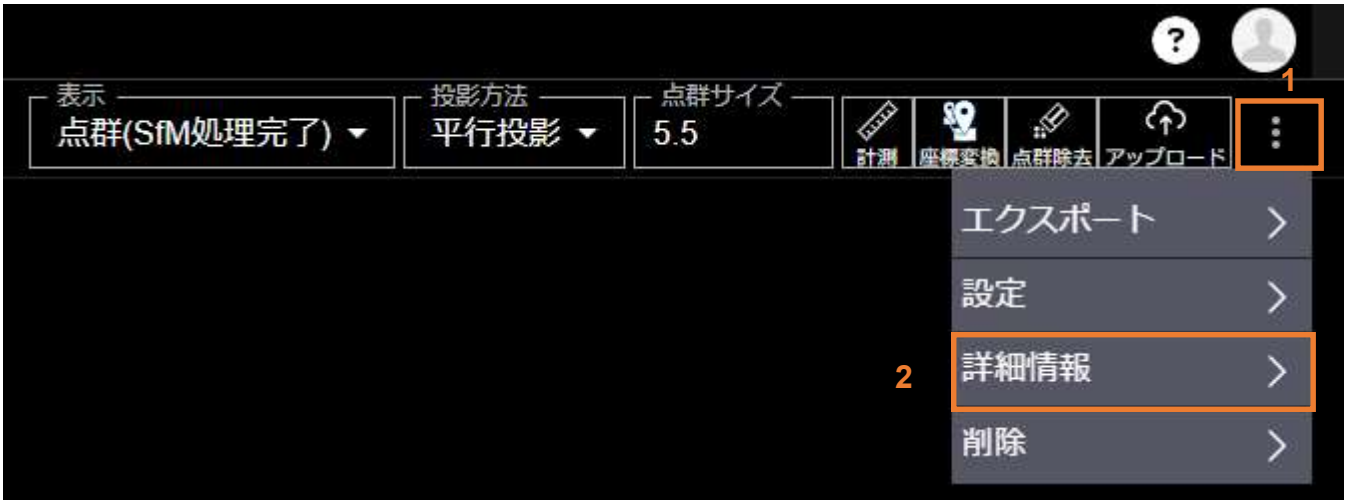
座標系変換機能を使用
任意の座標系を選択

	X		Y		垂直基準	
座標系変換機能使用後	値	座標系	値	座標系	値	座標系
	x1'	**選択した座標系 ※2**	**y1'**	**選択した座標系 ※2**	**z1'**	**選択した座標系 ※2**

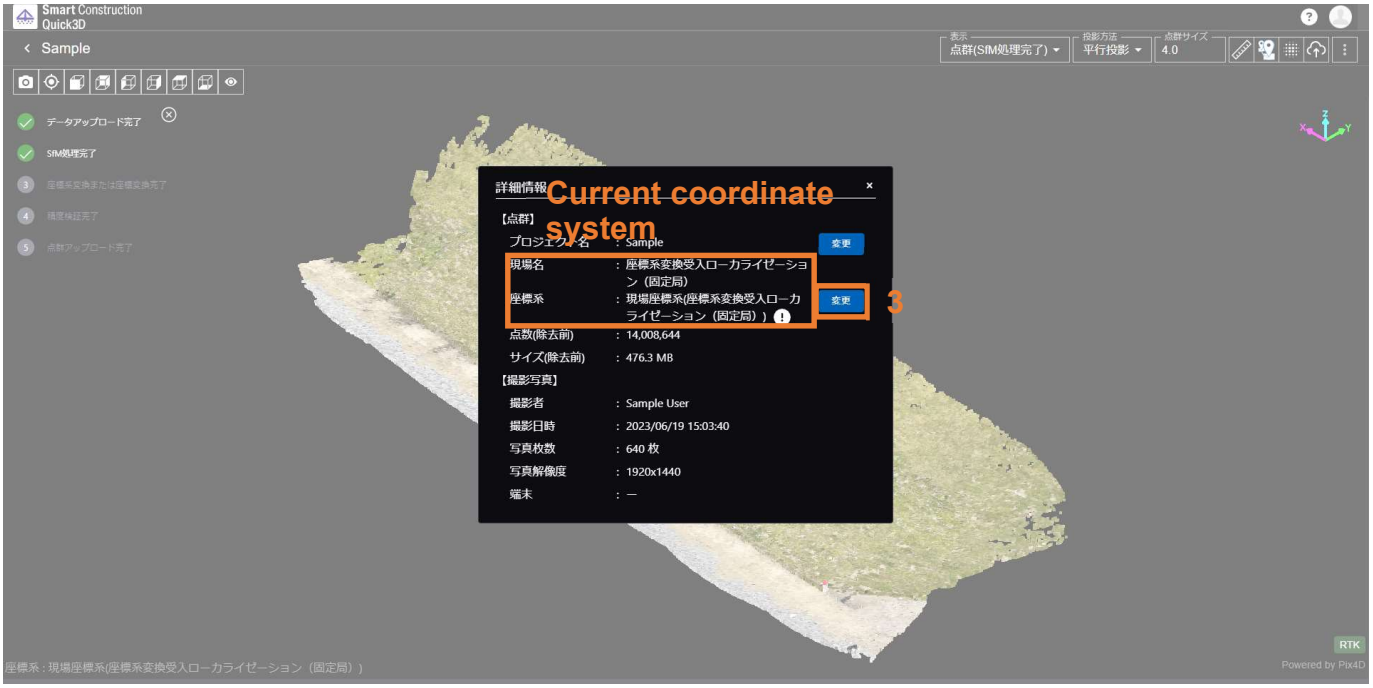
*2 The values for (x1, y1, z1) and (x1', y1', z1') in the above table represent the same position, but take different values due to the change in the coordinate system.
*3 If you export the point cloud in LAS format, the information defining this coordinate system will not be included in the LAS file.
(The coordinate values exported in the LAS file will be (x1', y1', z1'), but the LAS file will not include the information defining that it is in the selected coordinate system.)

5.6.1 Coordinate system change

1. Click the [vertical ellipsis (kebab)] button in the upper right.
2. Click [Coordinate System] in the dropdown menu.



3. The current coordinate system of the SfM-processed point cloud will be displayed. Click the Change button.



4. Select [Link Coordinate System of Smart Construction Dashboard] or [Select Coordinate System].

   4-1. [Link Coordinate System of Smart Construction Dashboard]
   The coordinate system of the point cloud to be coordinate-transformed is transformed to the coordinate system set in Smart Construction Dashboard for the jobsite to which the point cloud (project) belongs.
   In the Smart Construction Dashboard, you can use the public or localization coordinate system. Select this option if you want to change it to the localization coordinate system. (In Smart Construction Dashboard, you will need to set up the coordinate system. For details, refer to the Smart Construction Dashboard User Guide.)

   4-2. [Select Coordinate System]
   The coordinate system of the point cloud to be transformed is transformed to an arbitrary public coordinate system.
   Select an arbitrary coordinate system and vertical datum from the drop-down menu. (You can also enter the name of the coordinate system name and search for it.)

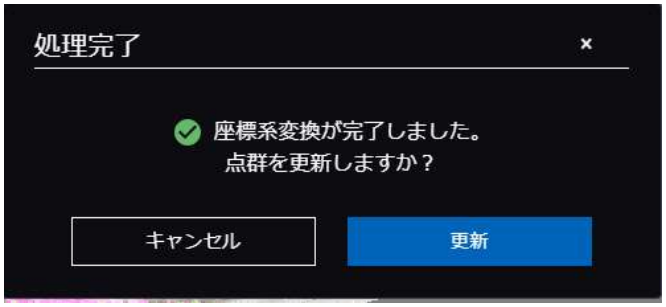
5. Click [Next].

6. The screen displays the untransformed and transformed coordinate systems.
   If there are no problems with the contents, click [Next].

7. The [Coordinate System Transformation in Progress] mark is displayed on the Select Point Cloud tab at the top of the screen.
   When the coordinate system conversion process is complete, the mark disappears.
   (After coordinate system transformation, you can check the currently set coordinate system by proceeding to process 3.)

[Coordinate System Transformation in Progress] mark

8. When the coordinate system transformation is complete, a popup will appear, and the processing will be complete.

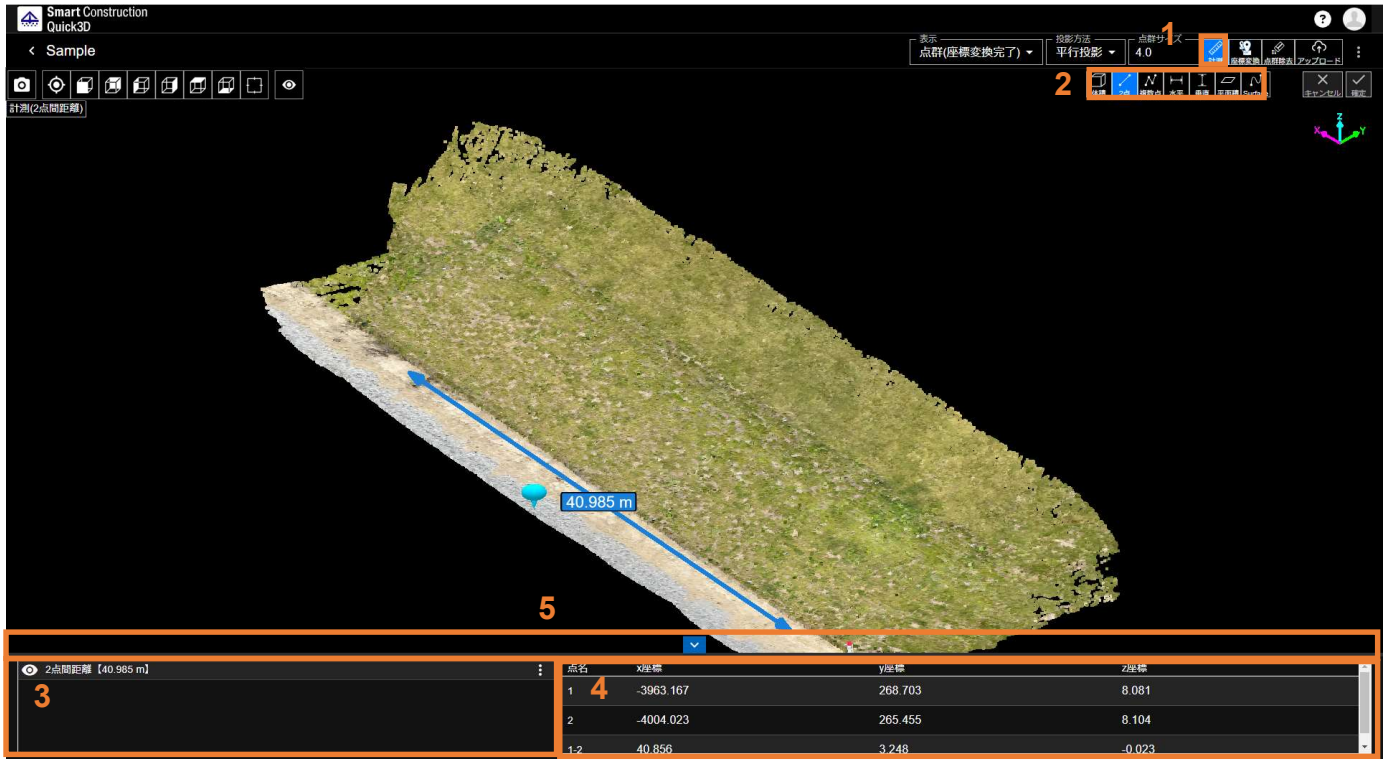


5.7 Measuring the Generated Point Cloud

You can measure the distance between any points.
This measurement applies to all points in the LiDAR point cloud and the SfM-processed point cloud. The measurement results are saved.

The measurement menu is displayed with the following procedure.

1. Click the [Measurement] icon in the upper right of the screen.
2. Click [Measurement to Use] in the expanded menu and start measurement.



3. The measurement results are displayed here.
   The measurement results are saved, and you can check them even the next time you open them.

4. If you select the measurement results in step 3 above, you can check the numeral values of the measured points.

5. You can change the table size by dragging the [bar] between the measurement results and the point cloud table, or the [v] mark.
   In addition, you can temporarily hide the table by clicking the [v] mark.

5.7.1 Volume measurement

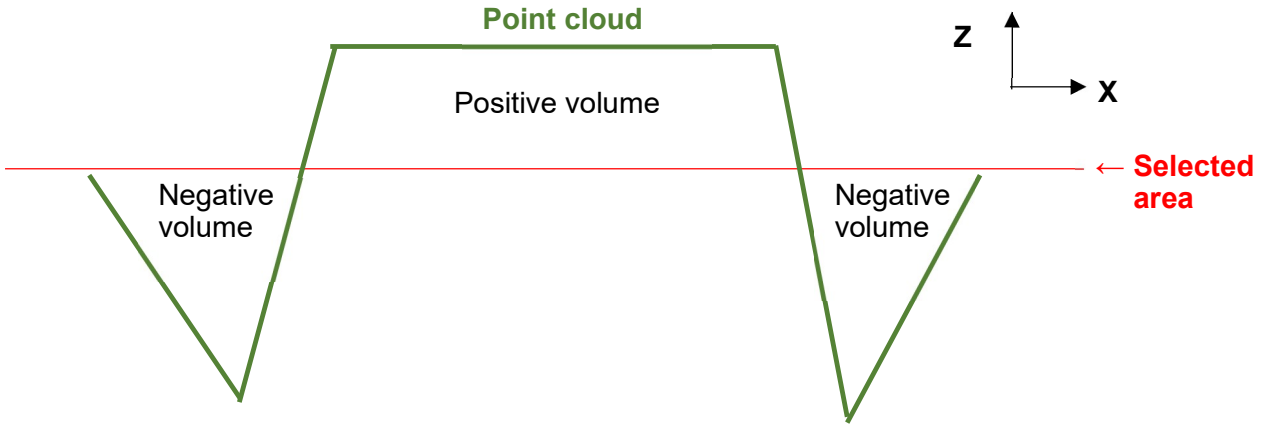
Functional description

1. This measures the volume of the space formed by an arbitrarily created plane (a plane defined by connecting the selected points with straight lines) and the point cloud.

Excavation:	Calculate the volume required to form the shape of the selected surface (i.e., soil volume). Note: The volume is calculated as a positive value (see the figure below). (Refer to the figure below.)
Fill:	Calculate the volume required to form the shape of the selected surface (i.e., soil volume). Note: The volume is calculated as a negative value (see the figure below). (Refer to the figure below.)
Soil volume difference:	This is calculated as [Excavation] - [Fill].

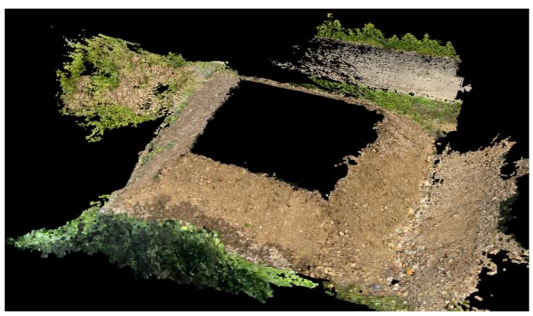
2. As an example, the following is a point cloud obtained from shooting a temporary fill (11 m per side and 1.7 m high) from the outside around the circumference.
If there is no ceiling, as shown in the left image below, the volume cannot be correctly measured in Smart Construction Quick3D, but you can calculate the volume using Smart Construction Dashboard.
If there is a ceiling, as shown in the right image below, you can measure the volume with Smart Construction Quick3D.

1



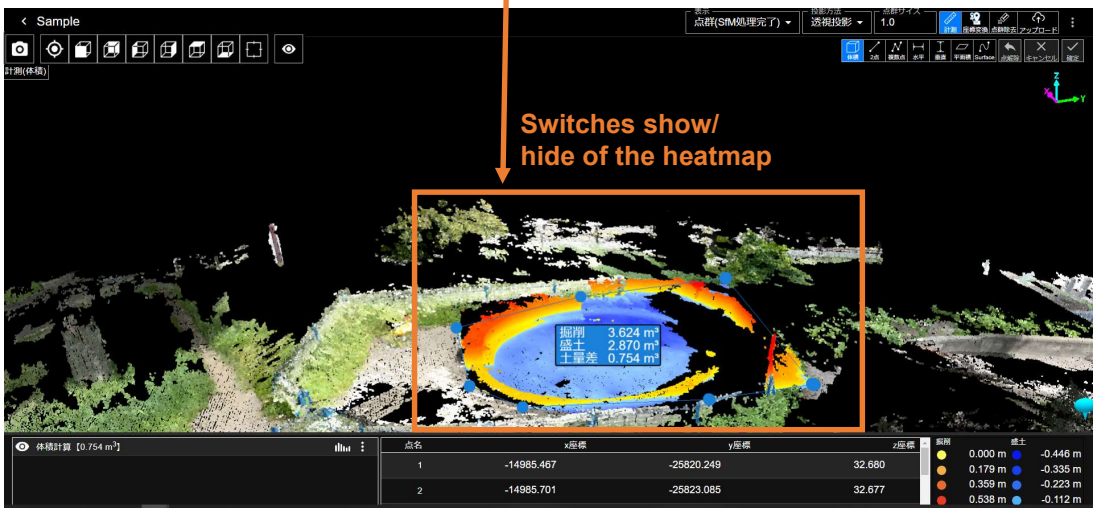
2

Volume cannot be measured with Smart Construction Quick3D



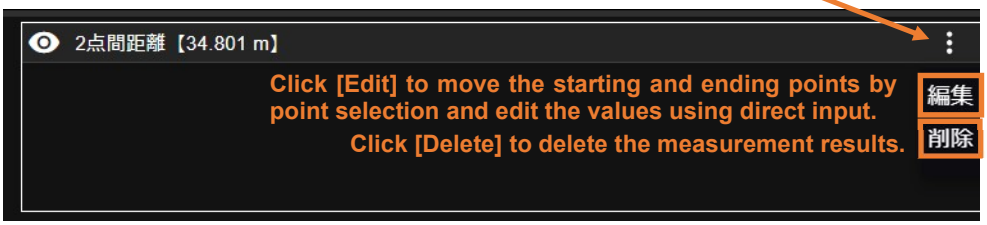
Volume can be measured with Smart Construction Quick3D

1. Click the [Measurement] icon in the upper right.
2. Click the [Volume Measurement] icon.
3. Click to enclose the desired measurement area.
4. Click the checkmark button.
5. The soil volume within the enclosed area is displayed.



5.7.2 Measurement between two points

1. Click the [Measurement] icon in the upper right.
2. Click the [Measure between 2 points] icon.
3. Click the starting and ending points of the measurement.
4. The measurement results are displayed.



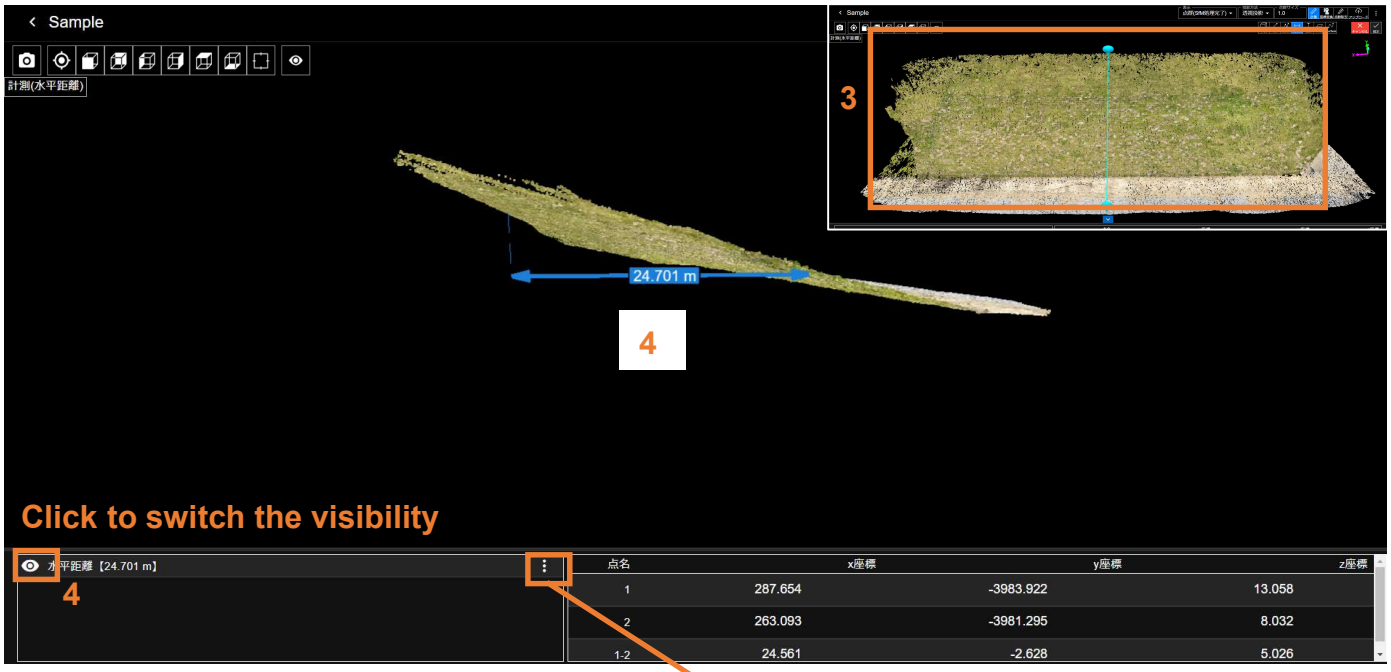
5.7.3 Measurement between multiple points

1. Click the [Measurement] icon in the upper right.
2. Click the [Distance between multiple points] icon.
3. Select two or more points necessary for measurement.
4. Click (or right-click) the checkmark button.
5. The measurement results are displayed.

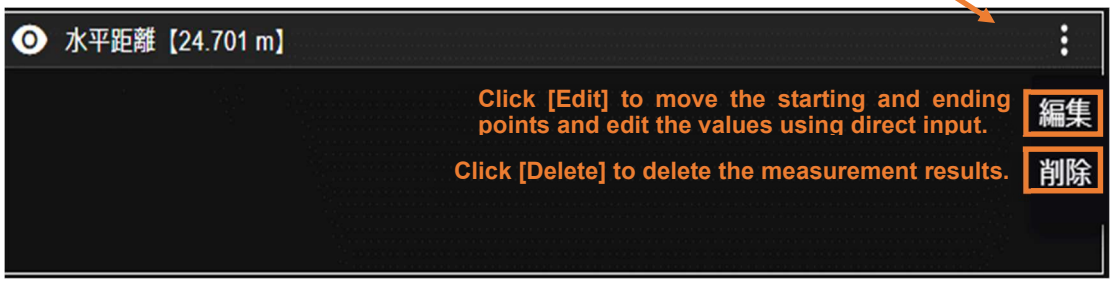
5.7.4 Horizontal distance measurement

1. Click the [Measurement] icon in the upper right.
2. Click the [Horizontal distance] icon.
3. Click the starting and ending points of the measurement.
4. The measurement results are displayed.

Click to show/hide

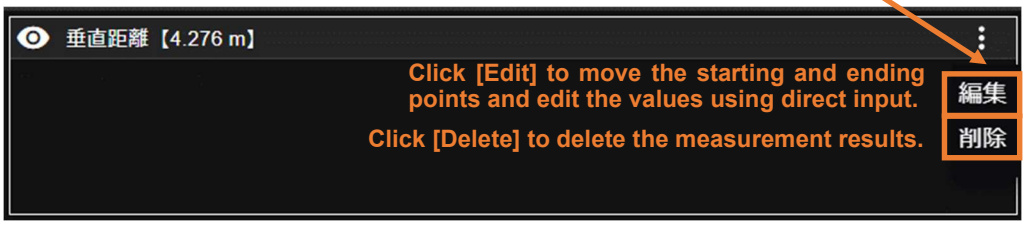


Click to switch the visibility



5.7.5 Vertical distance measurement

1. Click the [Measurement] icon in the upper right.
2. Click the [Vertical distance] icon.
3. Click the starting and ending points of the measurement.
4. The measurement results are displayed.

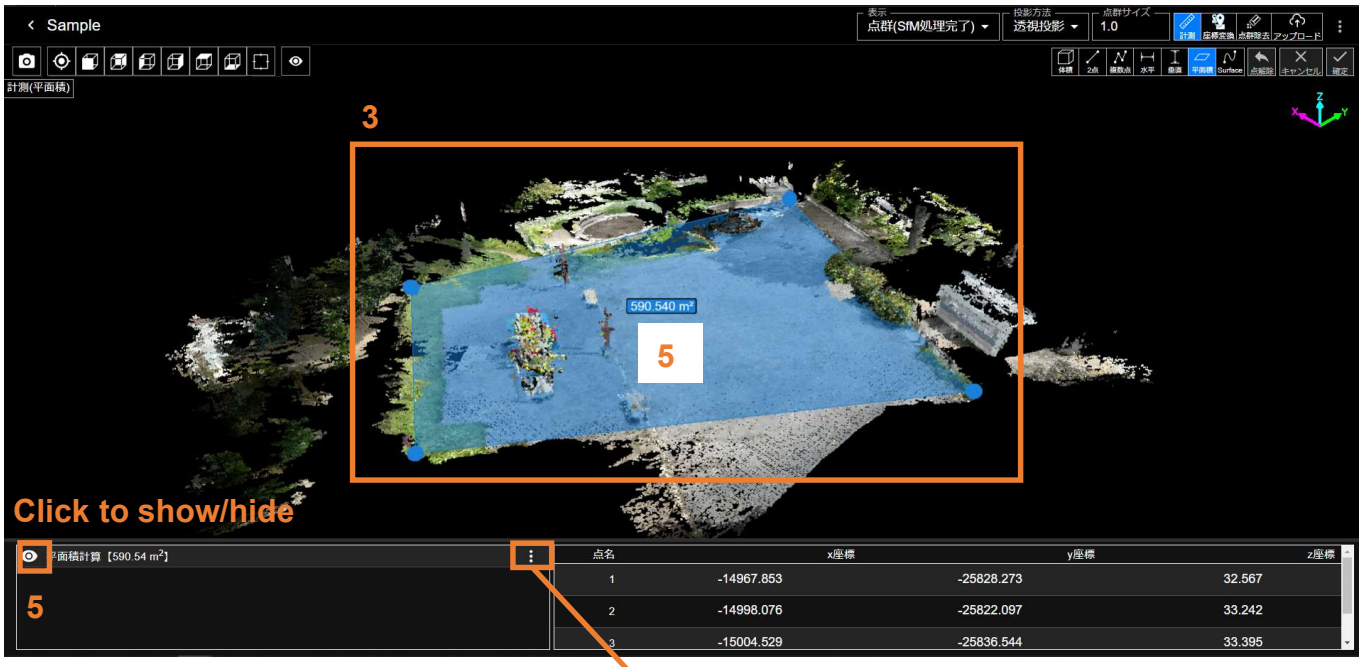


5.7.6 Measurement of horizontal area

Functional description

This measures the area of an arbitrarily selected area (a plane defined by connecting the selected points with straight lines).

1. Click the [Measurement] icon in the upper right.
2. Click the [Measure horizontal area] icon.
3. Click to enclose the desired measurement area.
4. Click (or right-click) the checkmark button.
5. The measurement results are displayed.
   *Note that the undulations of the actual ground surface are not considered to measure the area.

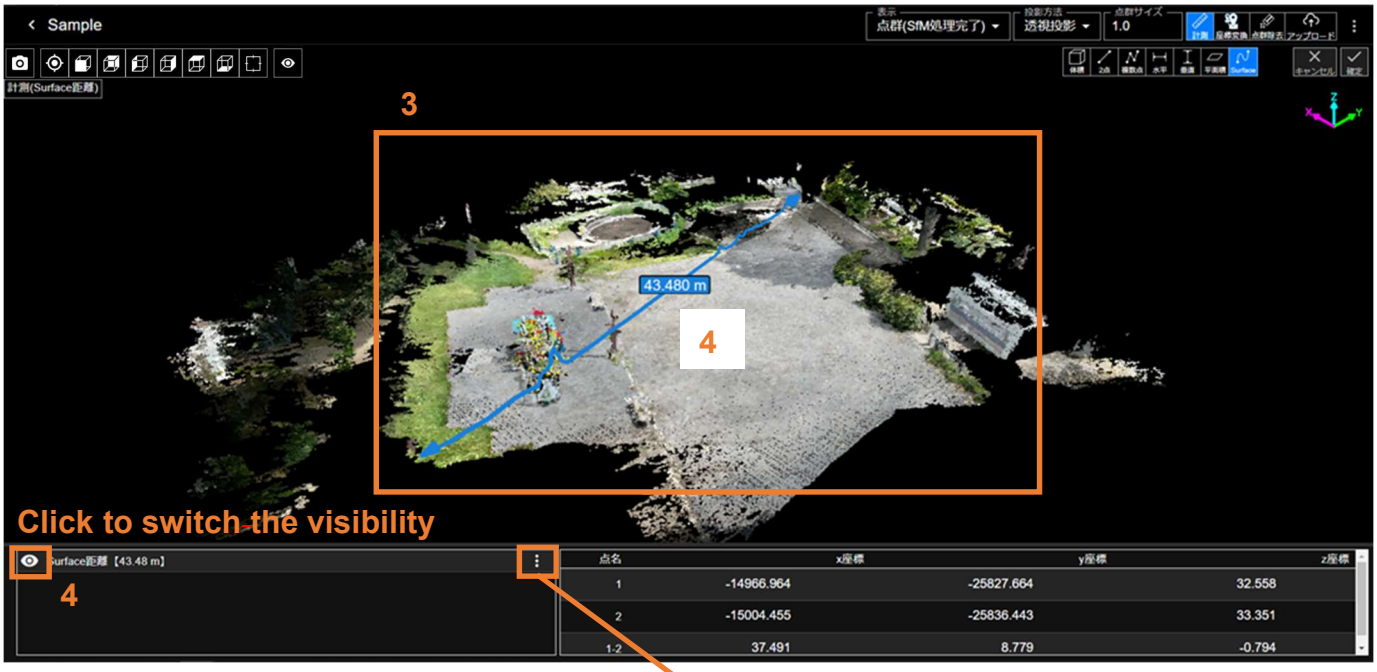


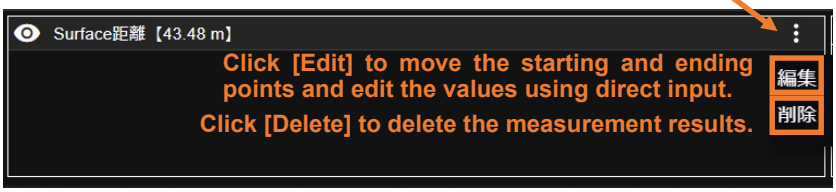
5.7.7 Measurement of surface distance

Functional description

This measures the length of a line that connects arbitrarily selected points along the point cloud surface.

1. Click the [Measurement] icon in the upper right.
2. Click the [Surface distance] icon.
3. Click the starting and ending points of the measurement.
4. The measurement results are displayed.





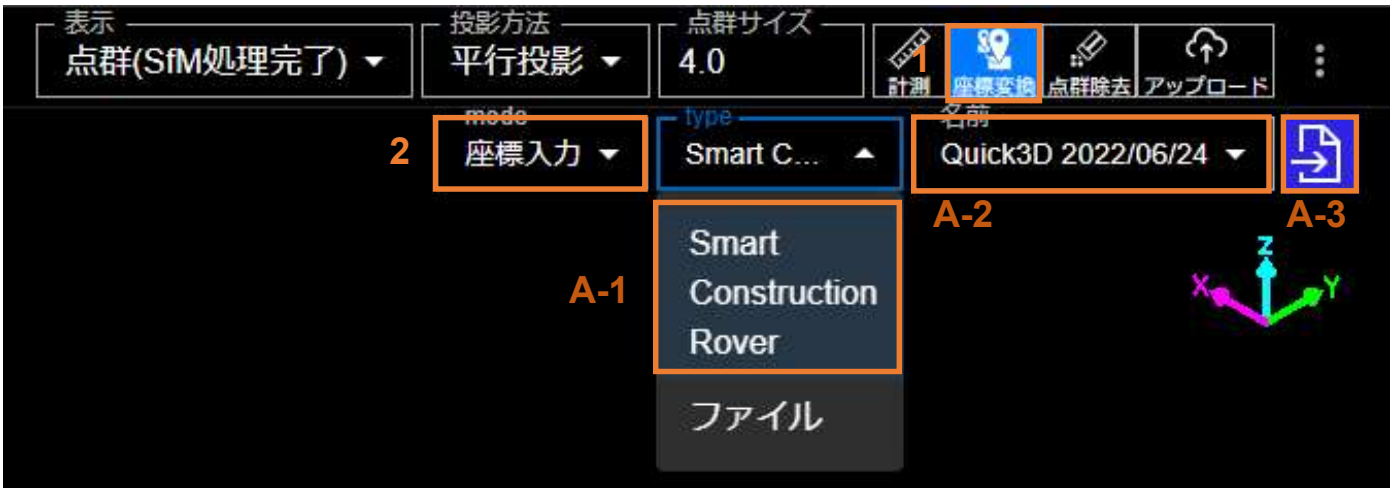
5.8 Performing Coordinate Transformation and Accuracy Verification of the Generated Point Cloud

5.8.1 Entering coordinates (importing GCP and test point coordinates)

The point cloud generated up to "**5.3 Generating the Point Cloud (SfM Processing)**" does not have a definite position with respect to the jobsite coordinate system.
Therefore, you perform a coordinate transformation (Helmert transformation) to align it with the jobsite coordinate system.
In this section, you import the location coordinates of GCPs and test points measured in "**4.2 Placing AR markers and measuring position coordinates (when an RTK device is not used)**" into the application.
This process requires an internet connection.

1. Click the [Coordinate transformation] icon in the upper right.
2. Select [Enter Coordinate] from [mode].

A) If you used Smart Construction Rover (process in "**4.2 Placing AR markers and measuring position coordinates (when an RTK device is not used)**"):
   A-1. Select Smart Construction Rover from [type].
   A-2. Check that the [name] matches the one measured with Smart Construction Rover.
   A-3. Click the [Import] icon.
   A-4. The coordinates measured with Smart Construction Rover are imported.



B) If you have saved the GCP and test point coordinate data files separately (targets: .txt/.csv/.sim):

B-1. From [type], select [File].

B-2. Select [Coordinate System of Retained File] from [Coordinate System].

* The mathematical coordinate system is (Y, X, Z), and the survey coordinate system is (X, Y, Z).

B-3. Click the [Import] icon.

B-4. The coordinates written in the file are imported.

4. The formats for the files to be used are shown below

[txt, csv files (survey coordinate system)]

[SIMA file]

5.8.2 Coordinate transformation

This procedure is for when an RTK device is not used.
When using an RTK device, the point cloud is generated from position information using GNSS. This procedure is basically unnecessary because it can be used with sufficient accuracy without coordinate transformation.

1. Click the [Coordinate transformation] icon in the upper right.
2. Select [Coordinate Transformation] from [Mode].

3. Link the coordinates imported in "**4.2 Placing AR markers and measuring position coordinates (when an RTK device is not used)**" to the positions of the GCPs within the point cloud.

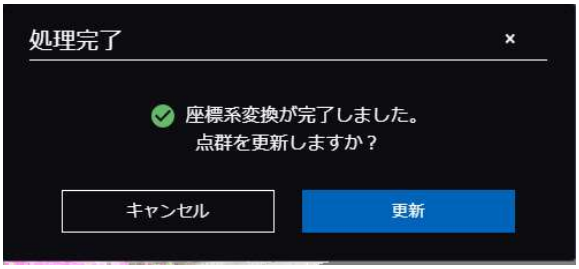
   3-1. Click the + icon on the coordinate entering tab at the bottom.
   3-2. Click and select the center of the GCP position within the point cloud.
   3-3. Click after the + icon in 3-1 changes to the Save icon.
   3-4. In the dropdown menu, select the coordinate name to be linked to the GCP center.
   3-5. To check the positional relationship of the imported point on the coordinate entering tab, click the icon.
   In a separate viewer, you can check the position of the coordinates corresponding to the point cloud.
   (The positional relationship of the coordinates imported in "**4.2 Placing AR markers and measuring position coordinates (when an RTK device is not used)**" is displayed, so you can select [3-3] above while referring to it.)

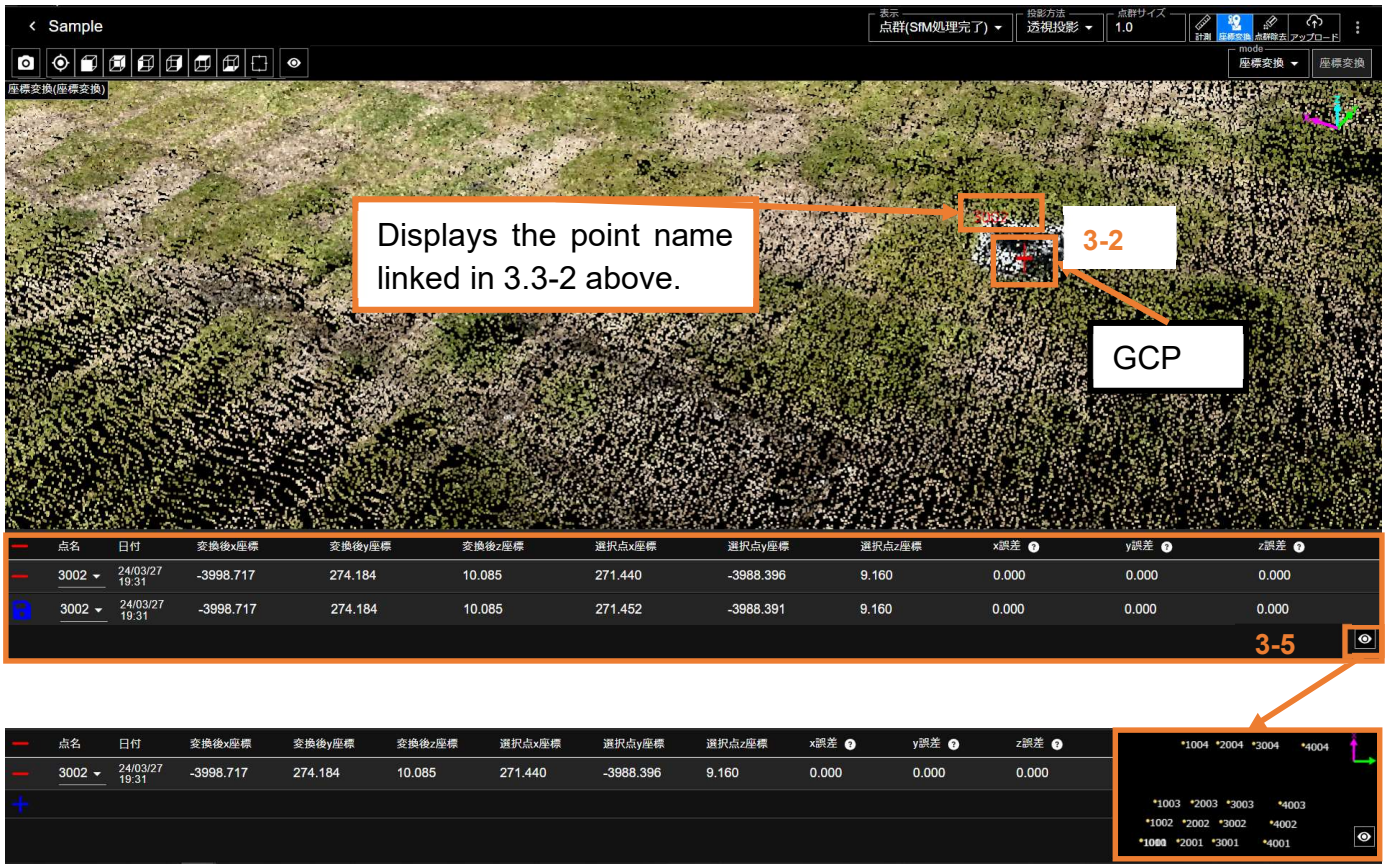
4. Repeat the above process 3. for each GCP.
5. Clicking the [Coordinate Transformation] button executes a coordinate transformation (Helmert transformation).
   Note: All points linked in process 3. above are used for the coordinate transformation.
   If there are any points you do not want to use for the transformation, click the - (minus) icon to remove them.

The [Coordinate Transformation in Progress] mark is displayed on the Select Point Cloud tab at the top of the screen.
When the coordinate transformation process is complete, the mark disappears.

[Helmert Transformation in Progress] mark

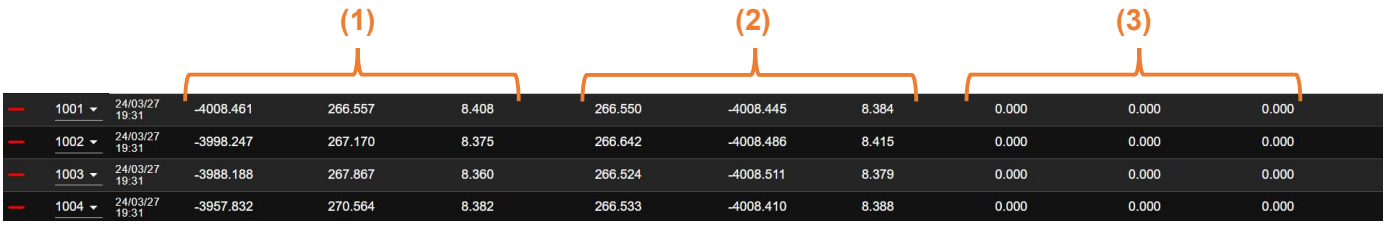
6. When the coordinate transformation is complete, a popup will appear, and the processing will be complete.





* Explanation of the table columns

(1) Post-transformation coordinates (coordinates used for transformation)
Those coordinates obtained from Rover, etc., that are positive for the respective points
(2) Selected point coordinates (coordinates of the untransformed point)
Coordinates obtained from GNSS information of the mobile device (or coordinates of the point cloud after coordinate system transformation)
(3) Error (= (1) minus (2))



—	1001	24/03/27 19:31	-4008.461	266.557	8.408	266.550	-4008.445	8.384	0.000	0.000	0.000
—	1002	24/03/27 19:31	-3998.247	267.170	8.375	266.642	-4008.486	8.415	0.000	0.000	0.000
—	1003	24/03/27 19:31	-3988.188	267.867	8.360	266.524	-4008.511	8.379	0.000	0.000	0.000
—	1004	24/03/27 19:31	-3957.832	270.564	8.382	266.533	-4008.410	8.388	0.000	0.000	0.000

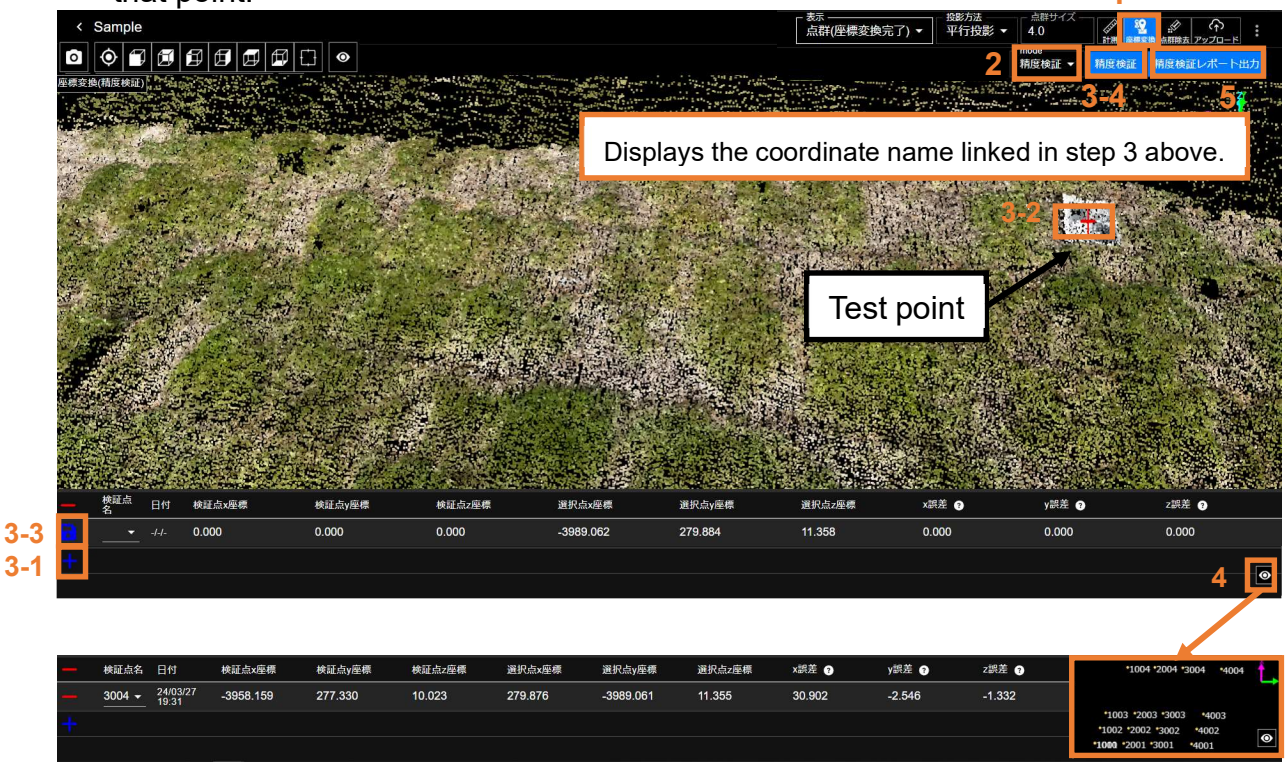
5.8.3 Accuracy verification

You use imported test point coordinates to verify the accuracy of the point cloud.
You can export the accuracy verification results obtained here as a report.

1. Click the [Coordinate transformation] icon in the upper right.
2. Select [Accuracy Verification] from [mode].

3. Link the coordinates imported in "**4.2 Placing AR markers and measuring position coordinates (when an RTK device is not used)**" to the positions of the test points within the point cloud.
   3-1. Click the + icon on the coordinate entering tab at the bottom.
   3-2. Click the center of the test point position within the point cloud. (After clicking, the + mark is displayed.)
   3-3. Click the Save icon (changed from the + icon in 3-1).
   3-4. Click the [Accuracy verification] icon in the upper right. (You can also manually select it from the dropdown menu.)

4. To check the positional relationship of the imported points on the coordinate entering tab, click the Eye icon in the lower right.
   In a separate viewer, you can check the position of the coordinates corresponding to the point cloud.
5. Click [Output of accuracy verification report] to output a report containing the screen shot at that point.



5.9 Removing a Point Cloud from a Generated Point Cloud

From the generated point cloud, you can remove unnecessary construction machines, outlier points, etc.
This applies to the following point clouds.

- Untransformed coordinates point cloud (SfM-processed point cloud, untransformed and transformed coordinate system point clouds)
- Coordinate-transformed point cloud (Helmert-transformed point cloud)

1. From the project list, open the project for which to perform this function and display the point cloud to remove.

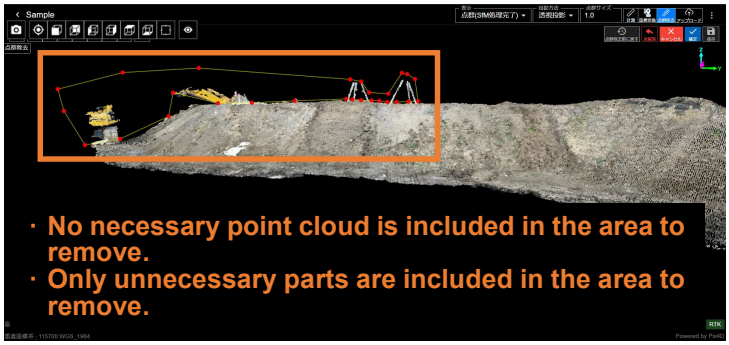
2. Click the [Remove point cloud] icon in the upper right.

3. Move, enlarge, or reduce the point cloud and display the removed area.
   * In this example to explain this function, following operations will be performed to remove the yellow construction machines and the surveying equipment in the center.

4. Click and place multiple points on the viewer so that they will surround the area to remove.
   * The area that you can specify for removal is only a 2D area viewed from the front; therefore, we recommend the following: (1) When enlarging or moving the image in step 3, adjust it so that only “unnecessary parts” fit within the area seen from the front, and (2) Adjust the position so that the “necessary part” is not included in the area seen from the front.
   * There is a limit to the number of selectable points. The number of selectable points is not specifically defined as it depends on the performance of terminal device. When the upper limit is reached, an error message is displayed as below.

   In that case, deselect the points and select the points within the upper limit.

Good example



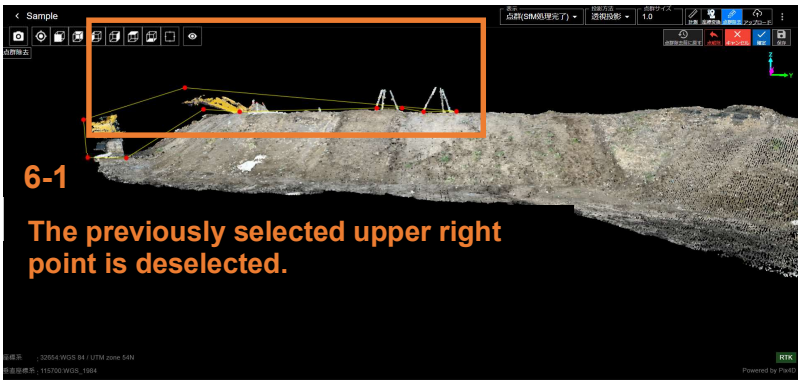
An error caused when the number of selected points reach the upper limit

5. Or, after clicking the checkmark button in step 4, you can use the “Invert Selected Area” function to remove a point cloud other than the selected area. In other words, when you select the area, if there is a large proportion of the area other than the part you want to keep, you can efficiently remove the point cloud by selecting only the parts you want to keep in advance and then checking “Invert Selected Area”.

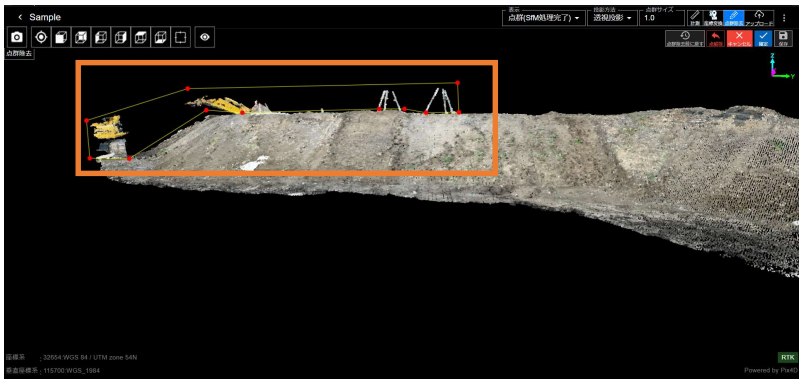
6. If you make a mistake in point selection, you can deselect the point you clicked just before (Deselect Point (6-1)) or cancel the entire area specification (Cancel Measurement (6-2)).

Before point deselection

After point deselection

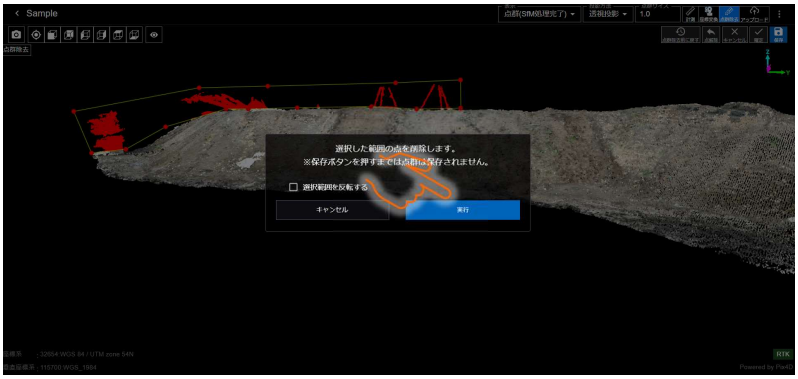


Before measurement cancel



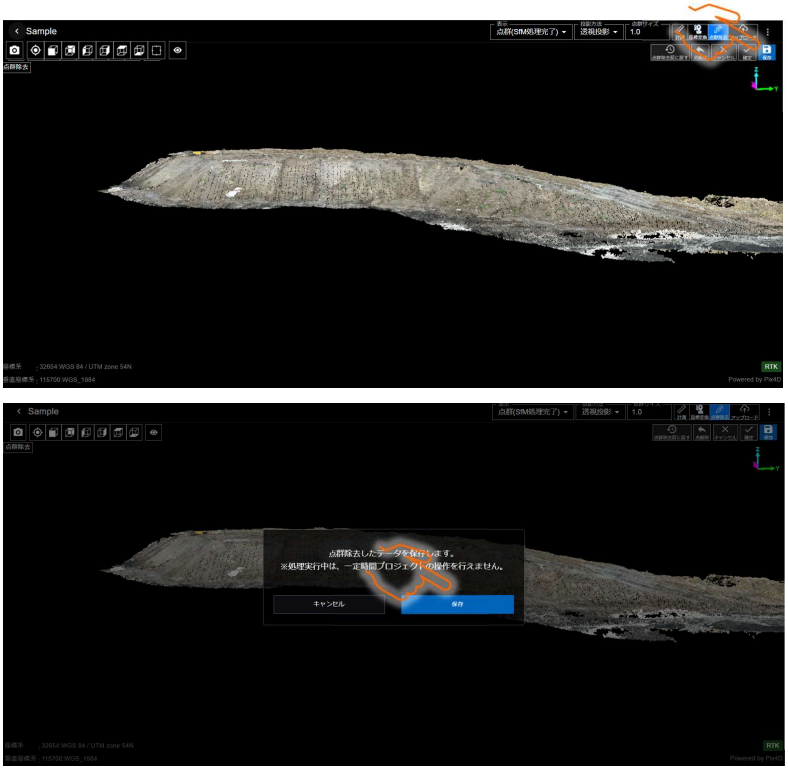
After measurement cancel

7. Once the area selection is complete, click the “OK” button and then the “Run” button to actually remove the point cloud.



8. Completion of step 7 is followed by the display of the point cloud resulting from the removal.
   * At this point, the point cloud has not yet been saved. Therefore, if you want to remove other parts, you can return to step 4 and select the area again before performing point cloud removal.

9. If there are no problems with the point cloud displayed in step 8, click Save in the upper right.

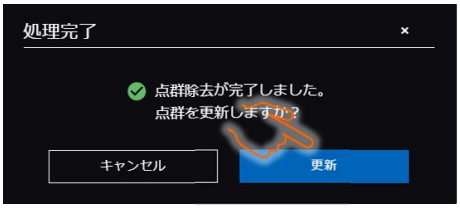


10. The [Coordinate Transformation in Progress] mark is displayed on the Select Point Cloud tab at the top of the screen.
When the coordinate transformation process is complete, the mark disappears.

[Point cloud removal in progress] mark

* For this status, the point cloud before removal is displayed, not the one after removal.
After processing is complete, a dialog will be displayed, and it will be updated to the point cloud after removal by clicking the Update button.

11. When the coordinate transformation is complete, a popup will appear, and the processing will be complete.



12. You can export and use the point cloud that has been removed.

13. After point cloud removal, if you check the project list, an icon is given to the project for which point cloud removal has been executed.

14. To return the point cloud to the state immediately after shooting, click “Return to Immediately after Shooting”.

15. You can return the point cloud to the state immediately after shooting as shown below.

16. If you return the point cloud to the state immediately after shooting, the icon on the project list will disappear.

5.10 Uploading the Point Cloud to the Smart Construction Application

You can upload the generated point cloud to each Smart Construction application.
You can upload the point cloud to the following application.

- Smart Construction Dashboard
- Landlog Viewer

Uploading it facilitates point cloud management, measurement, volume calculation, and other processing.
This process requires an internet connection.

1. Click the [Upload] icon in the upper right of the screen.

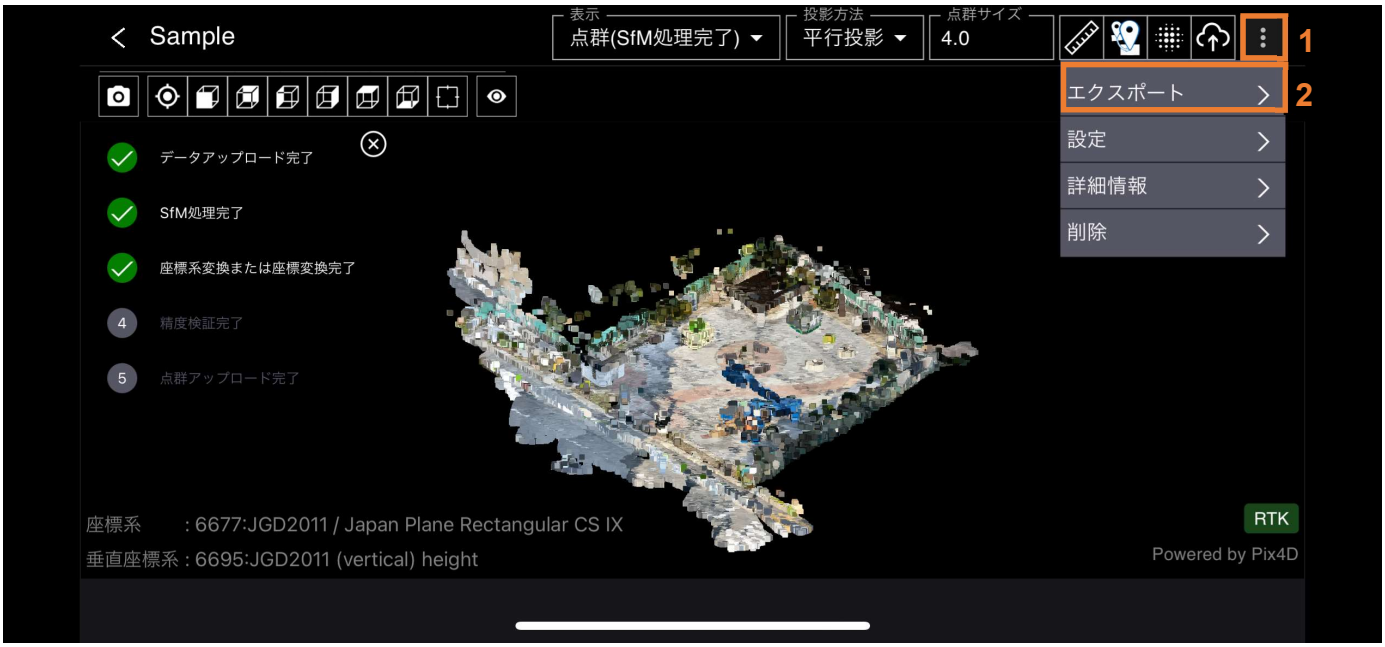
2. Select the upload destination application.

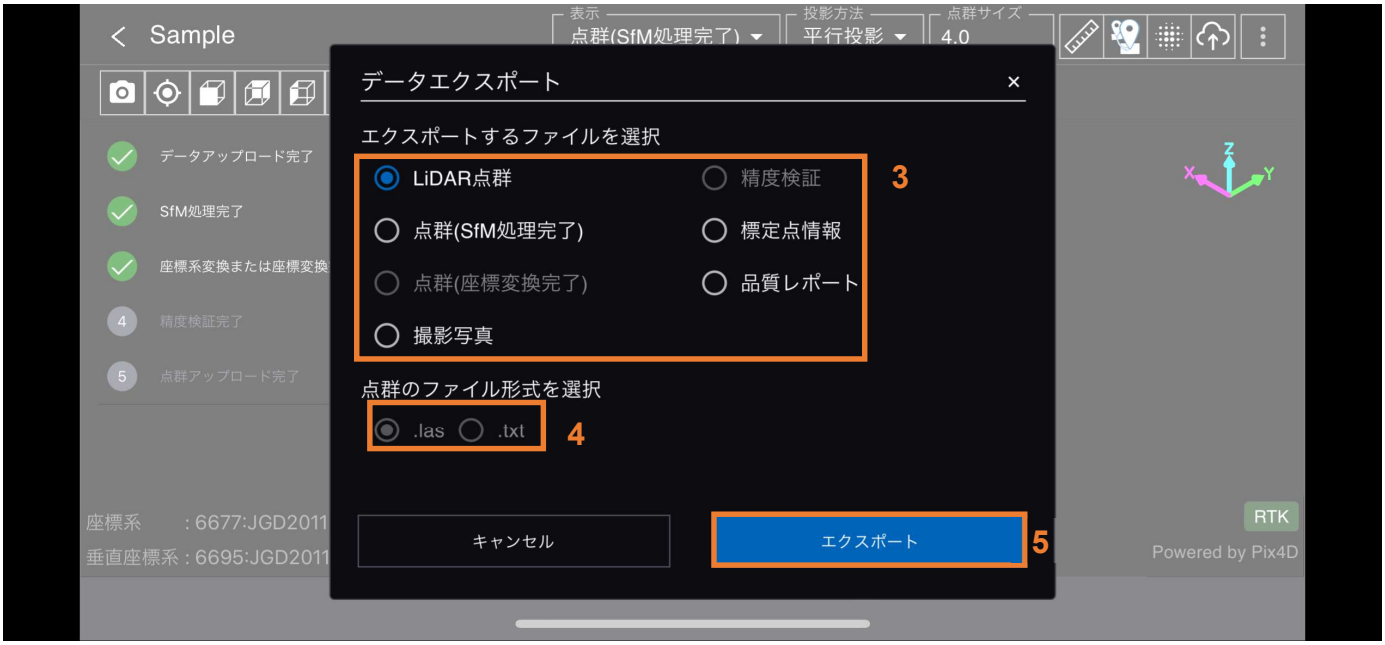
3. To upload it to Smart Construction Dashboard, select the point cloud to upload (3-1), the file format (3-2), and whether to perform hole interpolation when uploading (3-3). To upload it to Landlog Viewer, select the coordinate system (3-4).
4. After configuring the settings, click the [Upload] button. The point cloud will be uploaded to Smart Construction Dashboard or Landlog Viewer.
   The target point cloud must belong to the upload destination jobsite in Smart Construction Quick3D.

5.11 Exporting Data

You can export generated point clouds, GCP coordinates, photos, etc., in files to a local folder.
This process requires an internet connection.
Due to the large amount of communication data, we recommend using it in a Wi-Fi environment.
(You may experience communication of 1 GB or more.)

1. Click the menu in the upper right of the screen.
2. Click [Export].
3. Turn on the target data to export.
4. Select the file format for the point cloud to export.
5. Click [Export].
6. You can check the export file in the specified folder for the Web application and from [File] for the iOS application.
   * The LAS and txt files are exported in [mathematical coordinate system].

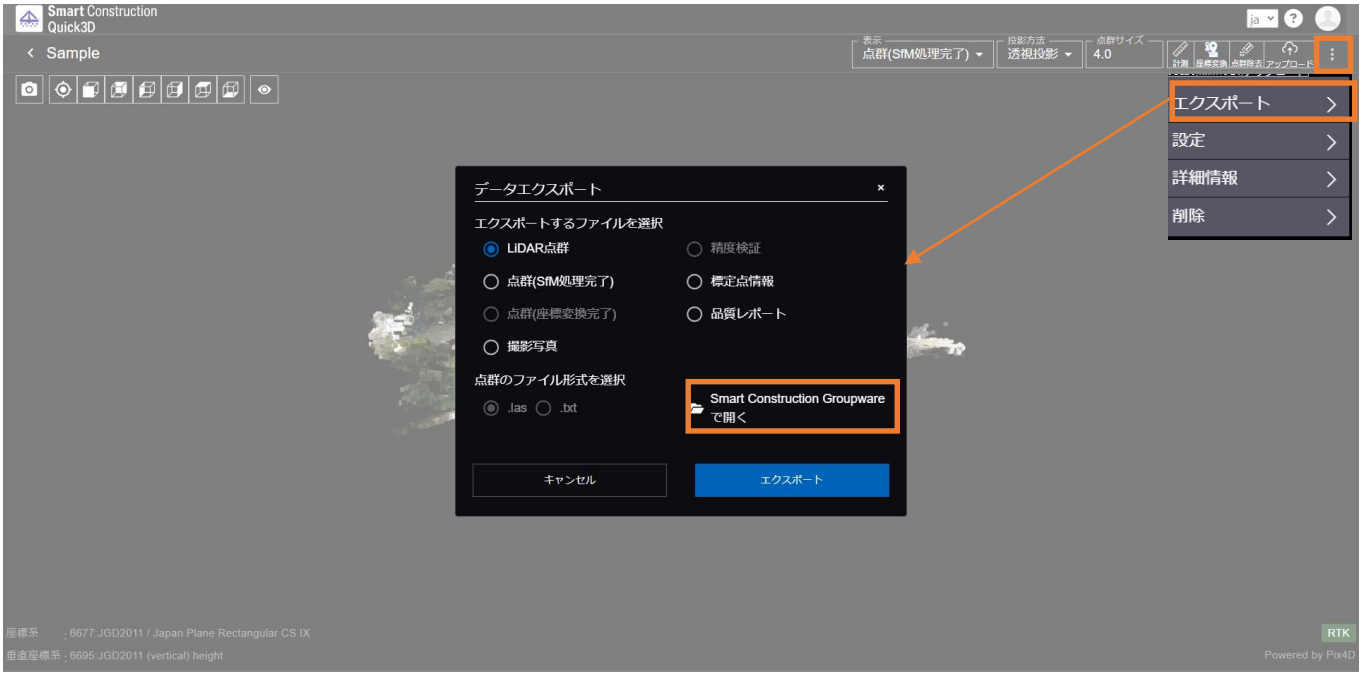




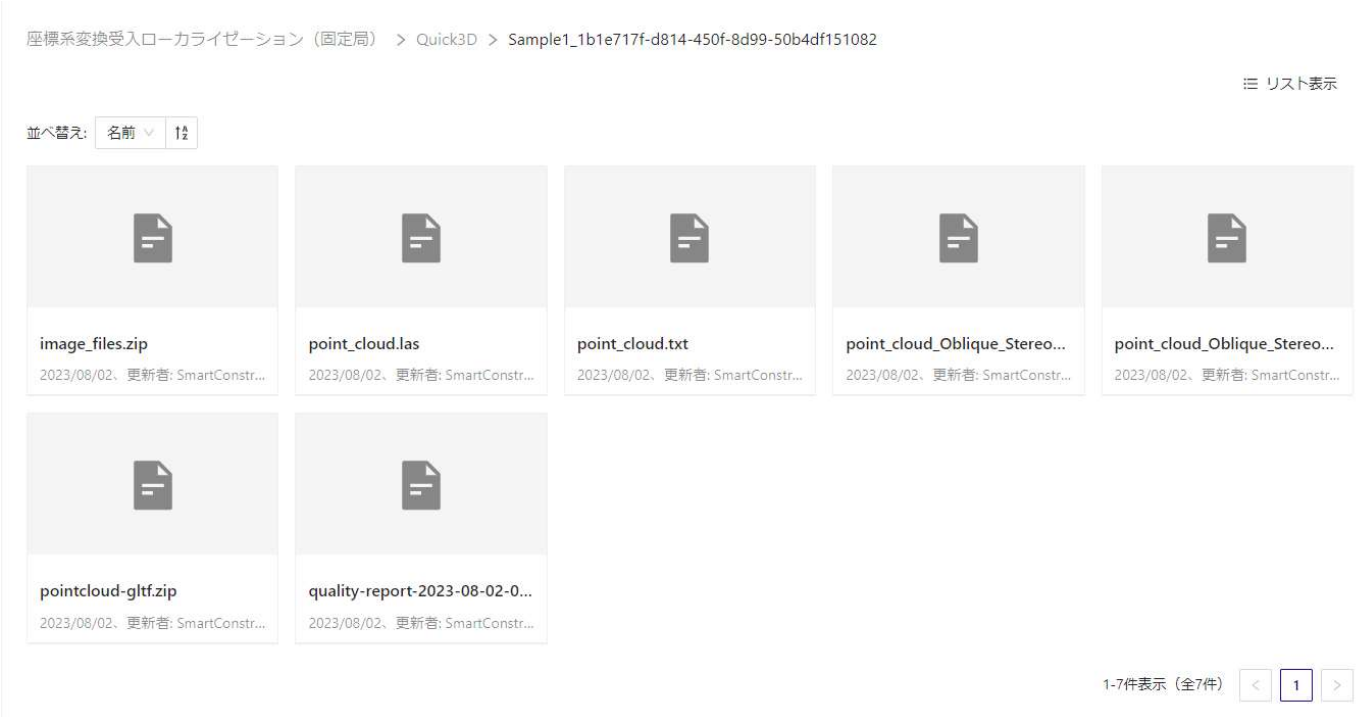
5.12 Using Smart Construction Groupware (Web-based application only)

Besides data export in 5.11, the web-based application allows you to download, from Smart Construction Groupware, generated point clouds, GCP coordinates, photos, etc., in files to a local folder.
This process requires an internet connection.

1. From the project details, click “Export” shown by the vertical ellipsis (kebab) button in the upper right and click “Open in Smart Construction Groupware” in the data export dialog.



As shown below, point clouds generated by Quick3D, photos, quality reports, etc. are stored there and you can download and use them.



6 Shooting tips

6.1 Smart Construction Quick3D

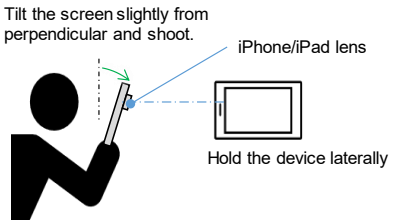
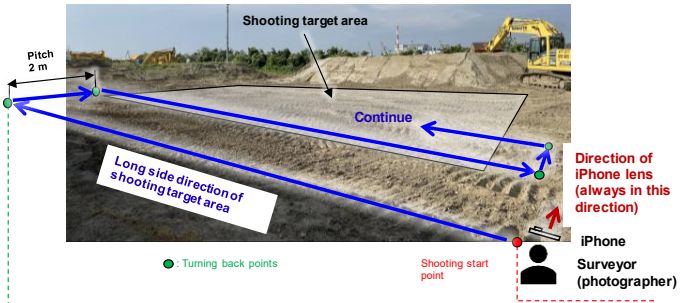
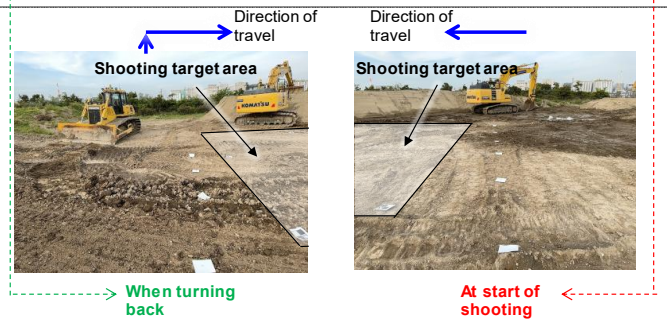
6.1.1 Shooting a flat area

When shooting a flat area, it is recommended to shoot under the conditions and shooting methods shown in the table below.
By implementing this shooting method, it is expected that a point cloud with accuracy within ±5 cm can be generated.
Refer to this link*2 for the test report on the accuracy verification test using this shooting method.

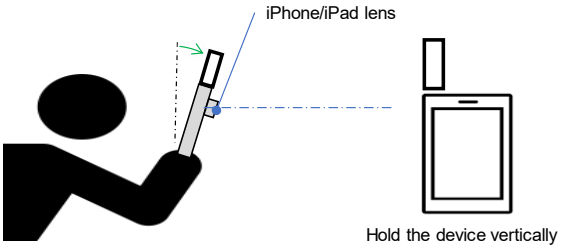
*1 Accuracy may not be achieved when measuring in special terrain or depending on how the product is used.
If such a case is encountered, please contact us at the contact information given in “8. Contact”.

*2 This link is only accessible by distributors. If you are not a distributor and wish to obtain a test report, please contact your local distributor.

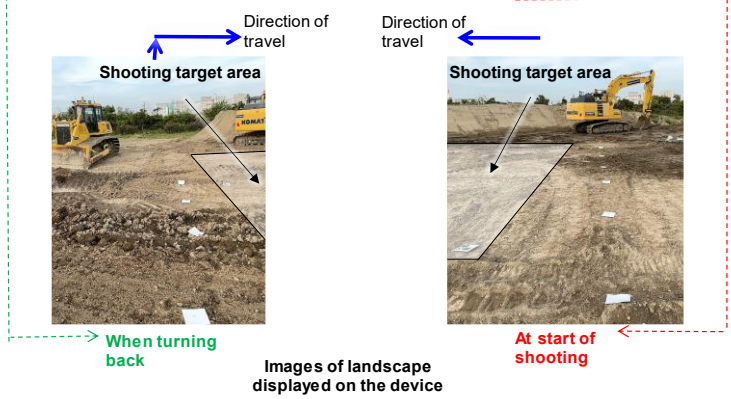
[When shooting with an iPhone/iPad only]

PIX4Dcatch settings	**Overlap ratio**	Set to 90% (setting in the “PIX4Dcatch” app)	
	Image quality	Set to “Normal” (A setting in the “PIX4Dcatch” app. Refer to “5.3 Measuring (shooting)” for the setting method.)	
Usage area	**Target object**	Flat area (soil)	
	Area of target object	up to 400 m^2	
	Aspect ratio	1:1 to 1:4 (20 m × 20 m to 10 m × 40 m * In the case of 400 m^2)	
How to hold the device	**Device angle**	Tilt the screen slightly from perpendicular as shown in the right figure and shoot.	
	Device orientation	Hold laterally as shown in the right figure.	
	Device height	Hold the device at the approximate position of your face when standing upright and shoot.	
Shooting method	**Direction of travel**	1. Shoot while moving sideways to the tar get object being captured. 2. If the shooting target area is not square, shoot by moving in the long side direction as shown in the right figure.	
	Side lap rate	Walk at pitches of 2 m or less. If you walk at pitches of 2 m or less under the above conditions, the side lap rate will be around 60%.	
	At start of shooting and when turning back	**At start of shooting** Start from the position where the nearest corner of the measurement target area is near the bottom corner of the device screen in the direction of travel. **When turning back** Turn back after passing the measurement target area sufficiently. Reason: This is to ensure a sufficient lap rate (number of images taken) for the entire measurement target area.	 **Images of landscape displayed on the device**

[When using viDoc RTK rover]

<table>
<tr><td rowspan="2">PIX4Dcatch settings</td><td>Overlap ratio</td><td colspan="2">Set to 90% (setting in the “PIX4Dcatch” app)</td></tr>
<tr><td>Image quality</td><td colspan="2">Set to “Normal” (A setting in the “PIX4Dcatch” app. Refer to “5.3 Measuring (shooting)” for the setting method.)</td></tr>
<tr><td rowspan="3">Usage area</td><td>Target object</td><td colspan="2">Flat area (soil)</td></tr>
<tr><td>Area of target object</td><td colspan="2">up to 600 m^2</td></tr>
<tr><td>Aspect ratio</td><td colspan="2">1:1 to 1:4 (24.5 m × 24.5 m to 12 m × 48m * In the case of 600 m^2)</td></tr>
<tr><td rowspan="3">How to hold the device</td><td>Device angle</td><td>Tilt the screen slightly from perpendicular as shown in the right figure and shoot.</td><td rowspan="3">Tilt the screen slightly from perpendicular and shoot.
 
</td></tr>
<tr><td>Device orientation</td><td>Hold vertically as shown in the right figure.</td></tr>
<tr><td>Device height</td><td>Hold the device at the approximate position of your face when standing upright and shoot.</td></tr>
<tr><td rowspan="3">Shooting method</td><td>Direction of travel</td><td>Shoot while moving sideways to the target object being captured.</td><td rowspan="2">
</td></tr>
<tr><td>Side lap rate</td><td>Walk at pitches of 2 m or less.
If you walk at pitches of 2 m or less under the above conditions, the side lap rate will be around 60%.</td></tr>
<tr><td>At start of shooting and when turning back</td><td>At start of shooting
Start from the position where the nearest corner of the measurement target area is near the bottom corner of the device screen in the direction of travel.

When turning back
Turn back after passing the measurement target area sufficiently.

Reason: This is to ensure a sufficient lap rate (number of images taken) for the entire measurement target area.</td><td> 
</td></tr>
<tr><td>Points to note</td><td colspan="3">Shoot with the viDoc RTK Rover’s antenna pointing up.
Hold the device so that the antenna is not obscured by your body as much as possible. (To prevent multipath)
Shoot with GNSS Fixed. (An alarm sounds if the Fix is lost.)
Shooting with higher accuracy is possible by using fixed stations for correction data.
Use iOS devices in an ambient temperature range of 0° to 35°C. At lower or higher temperatures, their operation may change to make adjustments for the temperature.
If the sky or water surfaces are included in the image, the generated point cloud may contain a lot of noise resulting in an unintended point cloud.</td></tr>
</table>

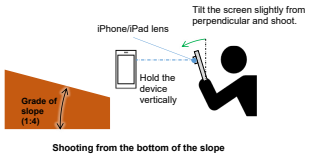
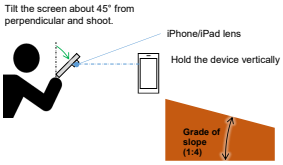
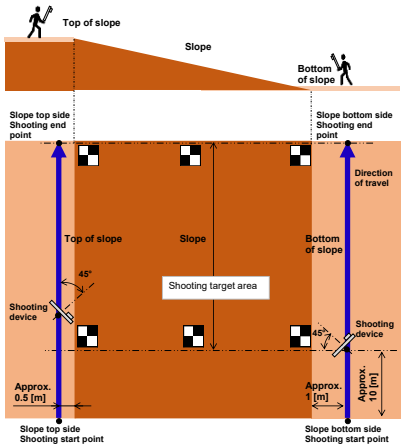
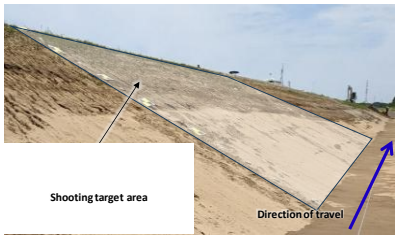
6.1.2 Shooting a slope

When shooting a slope, it is recommended to shoot under the conditions and shooting methods shown in the table below.
By implementing this shooting method, it is expected that a point cloud with accuracy within ±5 cm can be generated.
Refer to this link*2 for the test report on the accuracy verification test using this shooting method.

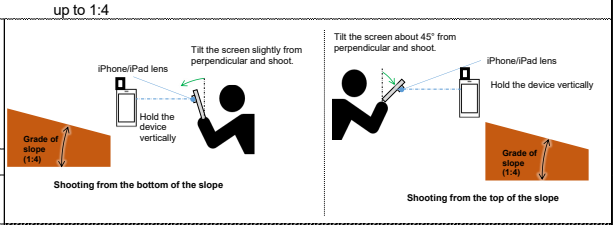
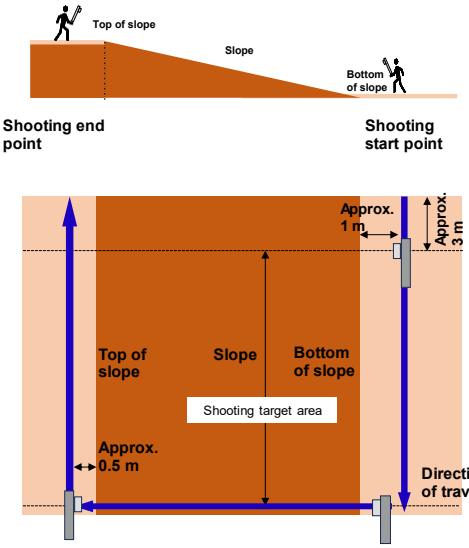
*1 Accuracy may not be achieved when measuring in special terrain or depending on how the product is used.
If such a case is encountered, please contact us at the contact information given in “8. Contact”.

*2 This link is only accessible by distributors. If you are not a distributor and wish to obtain a test report, please contact your local distributor.

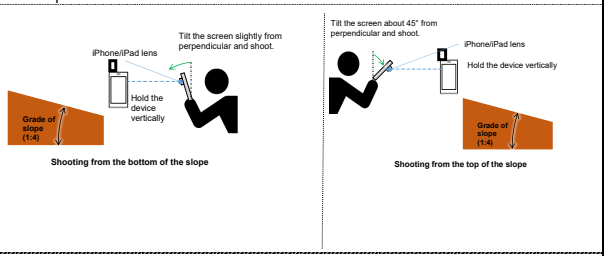
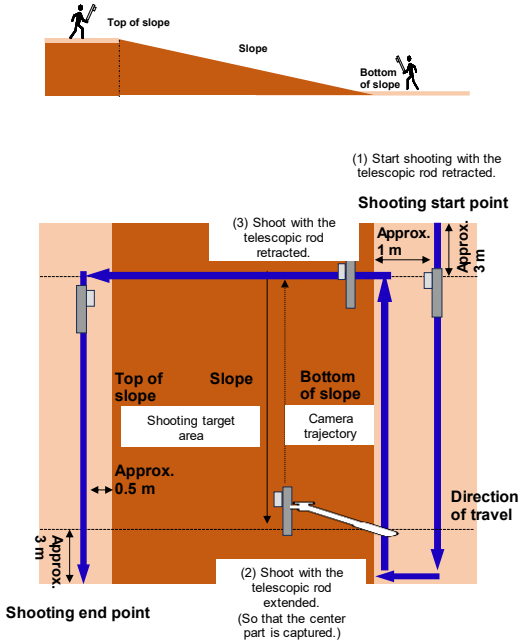
[When shooting with an iPhone/iPad only]

Target object		Slope (soil)	
PIX4Dcatch settings	Overlap ratio	Set to 90% (setting in the “PIX4Dcatch” app)	
	Image quality	Set to “4K”. (A setting in the “PIX4Dcatch” app. Refer to “5.3 Measuring (shooting)” for the setting method.) *When set to 4K, a shutter sound will be heard each time a shot is taken.	
Usage area	Slope length	It is recommended to shoot up to 4m in slope length at one time. When shooting an 8 m long slope, it is recommended to divide shots in the slope length direction from the bottom of the slope and the top of the slope, respectively.	
	Extension	Extension that can be shot at once: up to 20 m	
	Grade of slope	up to 1:4	
How to hold the device	When shooting from the bottom of the slope	Tilt the screen slightly from perpendicular as shown in the right figure and shoot.	 Shooting from the bottom of the slope
	When shooting from the top of slope	Tilt the screen about 45° from perpendicular as shown in the right figure and shoot.	 Shooting from the top of the slope
	Device orientation	Hold vertically as shown in the right figure.	
	Device height	Hold the device at the approximate position of your face when standing upright and shoot.	
	Direction to point the device	Hold the device at an angle of about 45° to the target object to be captured in the direction of travel.	
Shooting position	When shooting from the bottom of the slope	1. It is recommended to start shooting from approximately 10 m behind in the direction of travel. 2. It is recommended to shoot from a distance of about 1 m from the bottom of the slope.	
	When shooting from the top of slope	1. It is recommended to start shooting from approximately 10 m behind in the direction of travel. 2. It is recommended to shoot from a distance of about 0.5 m from the bottom of the slope.	
Shooting method		1. Shoot while moving sideways to the target object being captured. 2. Shoot by moving in one way and do not go back the way you came or change the direction in the middle of shooting the same target object. 3. Make sure that the shooting target area (GCP) is captured in the image.	

[When using viDoc RTK rover/hand-held shooting]

<table>
<tr><td colspan="2">Target object</td><td colspan="2">Slope (hand-held shooting)</td></tr>
<tr><td rowspan="2">PIX4Dcatch settings</td><td>Overlap ratio</td><td colspan="2">Set to 90% (setting in the “PIX4Dcatch” app)</td></tr>
<tr><td>Image quality</td><td colspan="2">Set to “Normal” (A setting in the “PIX4Dcatch” app. Refer to “5.3 Measuring (shooting)” for the setting method.)</td></tr>
<tr><td rowspan="3">Usage area</td><td>Slope length</td><td colspan="2">It is recommended to shoot only up to 7 m in slope length at one time.</td></tr>
<tr><td>Extension</td><td colspan="2">Extension that can be shot at once: up to 50 m</td></tr>
<tr><td>Grade of slope</td><td colspan="2">up to 1:4</td></tr>
<tr><td rowspan="4">How to hold the device</td><td>Device angle</td><td>Tilt the screen slightly from perpendicular as shown in the right figure and shoot. (Shooting from the bottom of the slope)
Tilt the screen about 45° from perpendicular as shown in the right figure and shoot. (Shooting from the top of the slope)</td><td rowspan="4"> 
</td></tr>
<tr><td>Device orientation</td><td>Hold vertically as shown in the right figure.</td></tr>
<tr><td>Device height</td><td>Hold the device at the approximate position of your face when standing upright and shoot.</td></tr>
<tr><td>Direction to point the device</td><td>Hold the device directly facing the target object being captured.</td></tr>
<tr><td>Shooting position</td><td>-</td><td>1. It is recommended to start shooting from approximately 3 m behind in the direction of travel.
2. It is recommended to shoot from a distance of about 1 m from the bottom of the slope.
3. It is recommended to shoot from a distance of about 0.5 m from the top of the slope.
4. It is recommended to shoot up to 3 m behind the direction of travel and end the shooting.</td><td rowspan="2"> 
</td></tr>
<tr><td colspan="2">Shooting method</td><td>1. Shoot continuously from the bottom to the top of the slope and shoot at once from both of the top and bottom of the slope as shown in the right figure.
(If the slope length is 4 m or less, it is acceptable to shoot only from the bottom of the slope.)
2. Shoot while moving sideways to the target object being captured.
3. Shoot by moving in one way and do not go back the way you came or change the direction in the middle of shooting the same target object.
4. Make sure that the shooting target area is captured in the image.</td></tr>
<tr><td>Points to note</td><td colspan="3">Shoot with the viDoc RTK Rover’s antenna pointing up.
Hold the device so that the antenna is not obscured by your body as much as possible. (To prevent multipath)
Shoot with GNSS Fixed. (An alarm sounds if the Fix is lost.)
Shooting with higher accuracy is possible by using fixed stations for correction data.
Use iOS devices in an ambient temperature range of 0° to 35°C. At lower or higher temperatures, their operation may change to make adjustments for the temperature.
If the sky or water surfaces are included in the image, the generated point cloud may contain a lot of noise resulting in an unintended point cloud.</td></tr>
</table>

[When using viDoc RTK rover/with a telescopic rod]

<table>
<tr><td colspan="2">Target object</td><td colspan="2">Slope (shooting with telescopic rod)</td></tr>
<tr><td rowspan="2">PIX4Dcatch settings</td><td>Overlap ratio</td><td colspan="2">Set to 90% (setting in the “PIX4Dcatch” app)</td></tr>
<tr><td>Image quality</td><td colspan="2">Set to “Normal” (A setting in the “PIX4Dcatch” app. Refer to “5.3 Measuring (shooting)” for the setting method.)</td></tr>
<tr><td rowspan="3">Usage area</td><td>Slope length</td><td colspan="2">It is recommended to shoot only up to 12 m in slope length at one time.</td></tr>
<tr><td>Extension</td><td colspan="2">Extension that can be shot at once: up to 50 m</td></tr>
<tr><td>Grade of slope</td><td colspan="2">up to 1:4</td></tr>
<tr><td rowspan="4">How to hold the device</td><td>Device angle</td><td>Tilt the screen slightly from perpendicular as shown in the right figure and shoot. (Shooting from the bottom of the slope)
Tilt the screen about 45° from perpendicular as shown in the right figure and shoot. (Shooting from the top of the slope)</td><td rowspan="3"> 
</td></tr>
<tr><td>Device orientation</td><td>Hold vertically as shown in the right figure.</td></tr>
<tr><td>Device height</td><td>1st direction and 3rd direction: Hold the device at the approximate position of your face when standing upright.
2nd direction: Hold the device with the telescopic rod extended enough to shoot the center of the slope.</td></tr>
<tr><td>Direction to point the device</td><td>Hold the device directly facing the target object being captured.</td></tr>
<tr><td>Shooting position</td><td>-</td><td>1. It is recommended to start shooting from approximately 3 m behind in the direction of travel.
2. It is recommended to shoot from a distance of about 1 m from the bottom of the slope.
3. When the telescopic rod is extended, it is recommended to stand near the bottom of the slope and shoot.
4. It is recommended to shoot from a distance of about 0.5 m from the top of the slope.
5. It is recommended to shoot up to 3 m behind the direction of travel and end the shooting.</td><td rowspan="2"> 
</td></tr>
<tr><td colspan="2">Shooting method</td><td>1. Shoot continuously from the bottom to the top of the slope and shoot at once from both of the top and bottom of the slope as shown in the right figure.
2. Shoot while moving sideways to the target object being captured.
3. Shoot by moving in one way and do not go back the way you came or change the direction in the middle of shooting the same target object.
4. Make sure that the shooting target area is captured in the image.</td></tr>
<tr><td>Points to note</td><td colspan="3">Shoot with the viDoc RTK Rover’s antenna pointing up.
Hold the device so that the antenna is not obscured by your body as much as possible. (To prevent multipath)
Shoot with GNSS Fixed. (An alarm sounds if the Fix is lost.)
Shooting with higher accuracy is possible by using fixed stations for correction data.
Use iOS devices in an ambient temperature range of 0° to 35°C. At lower or higher temperatures, their operation may change to make adjustments for the temperature.
If the sky or water surfaces are included in the image, the generated point cloud may contain a lot of noise resulting in an unintended point cloud.</td></tr>
</table>

6.2 Other Precautions for Shooting

- It is difficult to generate an accurate point cloud when shooting vegetation because the objects may move in the wind at each photo shooting time.

- Avoid shooting at night or during snowfall, as it will be difficult to generate accurate point clouds.
  It will be difficult to generate an accurate point cloud.

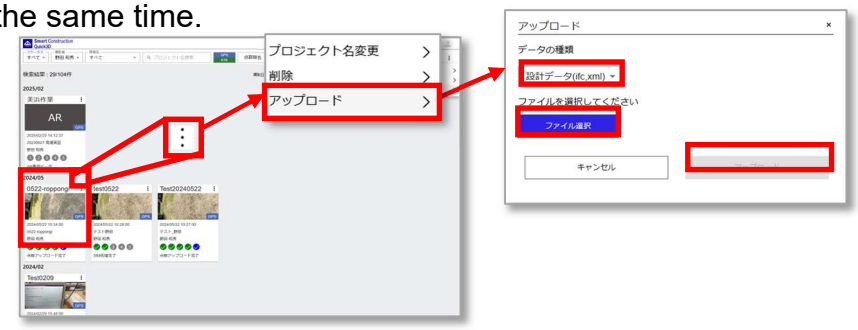
7 AR Display Function [only for Plus AR Licensees]

[Smart Construction Quick3D Plus AR] licensees will be able to use the [AR display function] in addition to the conventional Smart Construction Quick3D functions.
The AR display function can be used in the two steps below.

[STEP 1: Preparation of AR display data]
The data that can be displayed with the AR display function are as follows.

1. Point cloud (SfM-processed)
2. LAS file (must be uploaded as AR-specific data)
3. IFC file and LandXML file (must be uploaded as AR-specific data)

[1. Point cloud (SfM-processed)] displays in AR the point cloud generated by uploading photos taken with a regular mobile application or web-based application and performing SfM processing. You can also add design data later and display the point cloud (SfM-processed) and design data at the same time.



For [2. LAS file] and [3. IFC file and LandXML file], upload the file in advance on the web-based application. The method of uploading files is the same as in [5.3.2 SfM processing from the web-based application].

Select the file, project name, upload destination jobsite, and coordinate system of the file. Click the Upload button. This completes the data upload.

If you upload a file in LandXML format, you can also select the data color for AR.
After data upload is complete, an AR-specific project will be created as shown below.
Tap the AR-specific project to display the specified coordinate system or the file name uploaded as AR-specific data.
You can also delete the uploaded data by clicking the [Delete] button on the screen.

< Precautions >
· Up to one point cloud data and one design data can be displayed.
· The jobsite coordinate system is not currently supported.
· It is not possible to display and check the contents of AR-specific files on the web-based application at this time, so please distinguish them from the coordinate system and file name.

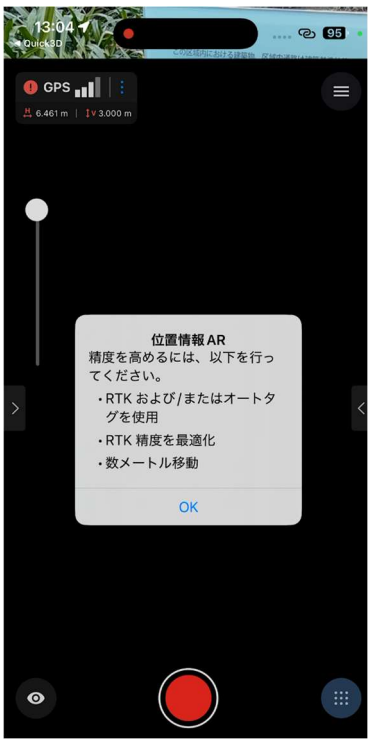
AR-specific data can be filtered by selecting [AR-specific data] from the filters in the project list.

[STEP 2: Execute AR display] (mobile application only)

AR display can be executed by selecting [Display in AR] from the vertical ellipsis (kebab) button at the upper right for each project.

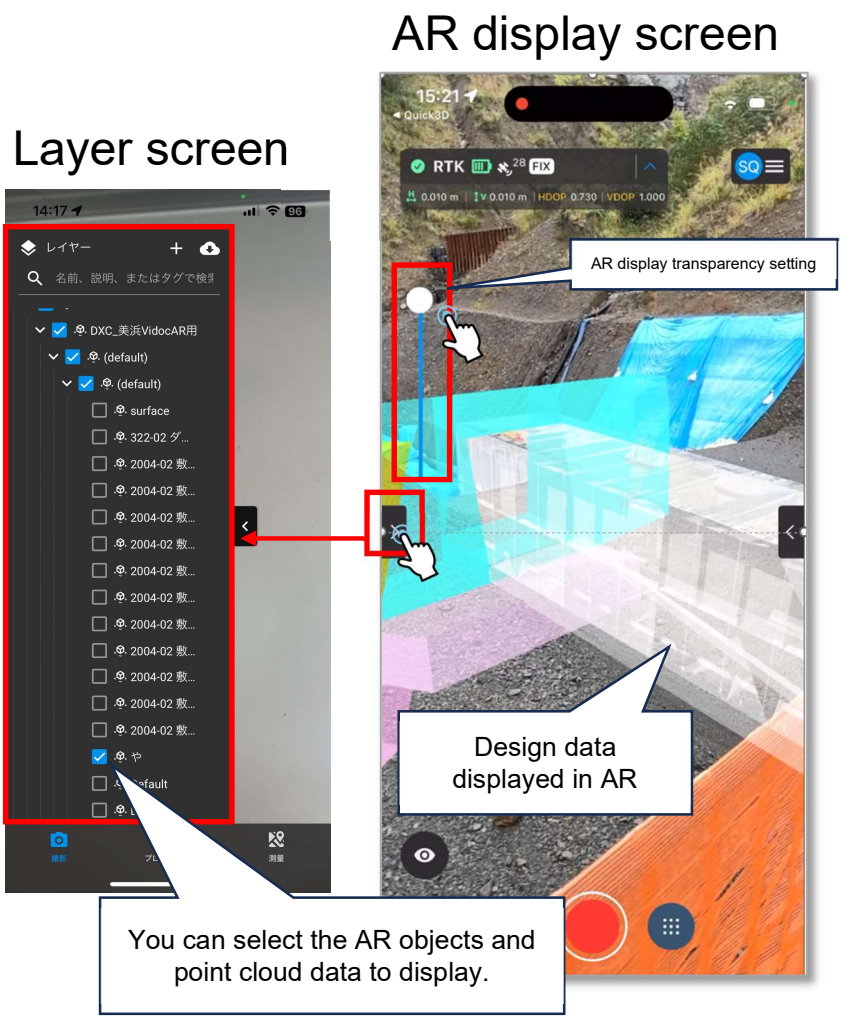
First, a [Location information AR] announcement is displayed. Tap the [OK] button.
At this point, the loaded data (point cloud data and/or design data) is displayed in front of the smartphone camera.

Then, select [RTK via Bluetooth] to connect to an RTK device.
For how to connect to an RTK device, refer to [3.1 Initial settings for mobile device and RTK device].



The loaded data (point cloud data and/or design data) is still displayed before your eyes immediately after connection to the RTK device, but if you move around a little while the status is [FIX], the loaded data will be displayed at positions along the coordinate system.

You can adjust from “show/hide the data display” above the actual jobsite by moving the left bar knob up and down.
Tap the [>] icon on the left to bring up the layer screen and open the screen to switch the AR display target on or off. You can switch ON/OFF here.



In addition, tapping the AR display target changes the color, and you can change the AR display target status by tapping [<] on the right.

< Precautions >

・During AR display, even if you press the shooting button for point cloud shooting, the SfM processing cannot be completed successfully, resulting in an error. Do not press this button.

・If you want to redisplay another AR after executing an AR display, or if you want to do point cloud shooting again, close the camera application and Smart Construction Quick3D once and restart each one before using them.

9 Revision history

Created/revised date	Description
August 17, 2022	Initial version
September 10, 2024	Ver. 2.0.0 released
November 12, 2024	Ver. 2.0.3 released Added information to [5.2 Shooting (iOS Application Only)] that 10 or more photos are required. Added information to [5.3.1 SfM processing from iOS application] and [5.3.2 SfM processing from web-based application] that an upload error will occur if the number of photos is less than 10. The display of [5.3.2 SfM processing from the web-based application] has been corrected. Added an explanation of the point cloud operation method to [5.4.2 Project details]. Added an explanation of the automatic photo advance function to [5.5 Checking the photos taken]. Added an explanation of [Output of accuracy verification report] to [5.8.3 Accuracy verification].
January 27, 2025	Added viDoc RTK Rover applicable models. (iPhone 16 Pro, ProMax, iPad Pro 11 inches (M4), 13 inches (M4))
February 25, 2025	Ver. 2.0.6 released “5.3.2 SfM processing from the web-based application” When a jobsite is selected, the coordinate system set for the site is now displayed. Added an explanation of the consumed PGP display to [5.4.2 Project details]. In addition, added a function to display from directly above.
March 5, 2025	Added the AR display function [only with Plus AR option].

Smart Construction Quick3D User Guide

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