Generating 2D and 3D Models

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You can generate geo-referenced 2D and 3D models. This feature enables the generation of geo-referenced 2D and 3D models. SkyDeck utilizes high-powered cloud computing to process these tasks more efficiently than traditional methods. As a result, Skydeck offers faster turnaround times for your photogrammetry projects.

SkyDeck simplifies the complexity of photogrammetry processes, enabling you to effortlessly generate precise 2D and 3D data models with just a click of a button.

Generating models on SkyDeck

1. To begin, navigate to the desired site within SkyDeck. Once you're there, either open an existing snapshot or create a new one where you intend to generate the necessary models.
2. Head to the **Datasets** page of your snapshot. Here, locate and click on the **Generate Layer on SkyDeck** option.

Generate Layer on SkyDeck

The process to generate the required data models involves the following stages:

1. **Selecting the Inputs**
2. **Selecting the Outputs**
3. **Defining the Quality**

Step 1: Selecting Inputs

This step involves selecting or uploading the raw data to be used for generating the required models. There are two ways raw data can be imported into SkyDeck:

- **Through Your Missions**: When you execute a mission using SkyDeck, the collected raw data is automatically uploaded to the Site and Snapshot based on the mission's location and date.
- **Direct Upload**: If data capture is not done using SkyDeck, you have the option to directly upload the raw image data during the Select Input stage.

Data captured with SkyDeck

The missions module and SkyDeck Pilot App offer a comprehensive solution for planning and executing mapping missions across diverse 2D and 3D structures. After completing the flights, the collected data undergoes thorough quality checks and is automatically uploaded to the designated Site and Snapshot.

With this approach, you can directly access the automatically created Snapshot and locate the captured image data within the **Raw Image Gallery** on the **Datasets** page of the snapshot. During the **Select Input stage**, you'll find flight-wise data from the mission. You can select the combination of flights from which the raw data is to be extracted for processing. Choosing all the flights will generate a the desired models covering the entire surveyed site area

> Ensure that the path covered by these flights is adjacent to each other

Select Flight

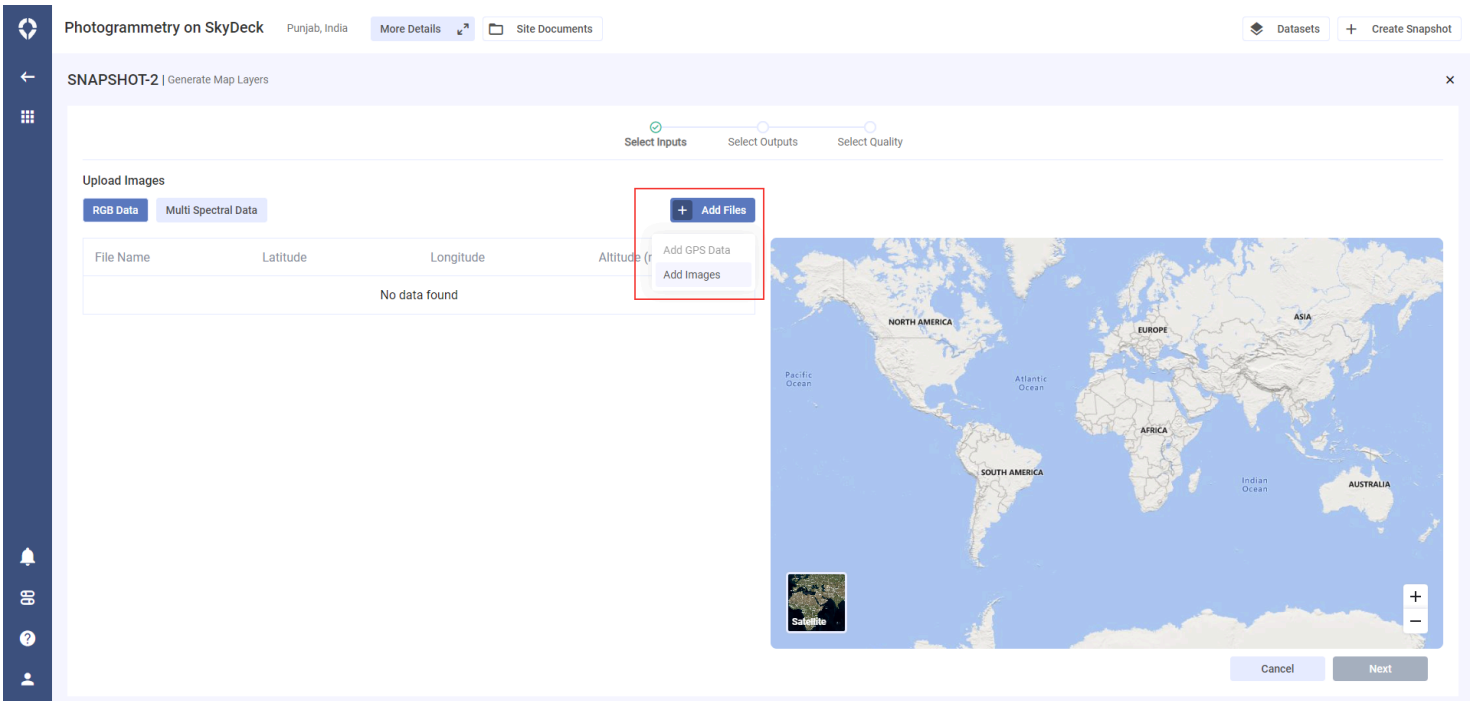
> When selecting multiple flights, ensure that the altitude and the camera parameters are consistent for across all flights.

Direct Upload

With this option, you can bring data collected from different sources to SkyDeck for further processing. When working with a user-created snapshot, during the Select Inputs stage, you'll have the option to upload raw images and any additional GPS data files.

Here's how to upload the images:

1. Click on the **Add Files** option.
2. Select **Add Images** and attach the image files you wish to upload.



3. If your images contain geo-tag details in the metadata, SkyDeck will automatically extract the required information. However, if the image files are not geo-tagged, or if you prefer to use custom-defined geo-tagging, you can choose the **Add GPS Data** option to upload GPS mapping information in the form of a CSV file.

4. Once the necessary data is uploaded, you'll find the list of uploaded images on the left side, along with their GPS information. For a broader geographic context, the position of each image is displayed on the map located on the right side of the page. Simply select the images you wish to include in the processing from the list, and when you're ready, click on **Next** to proceed.

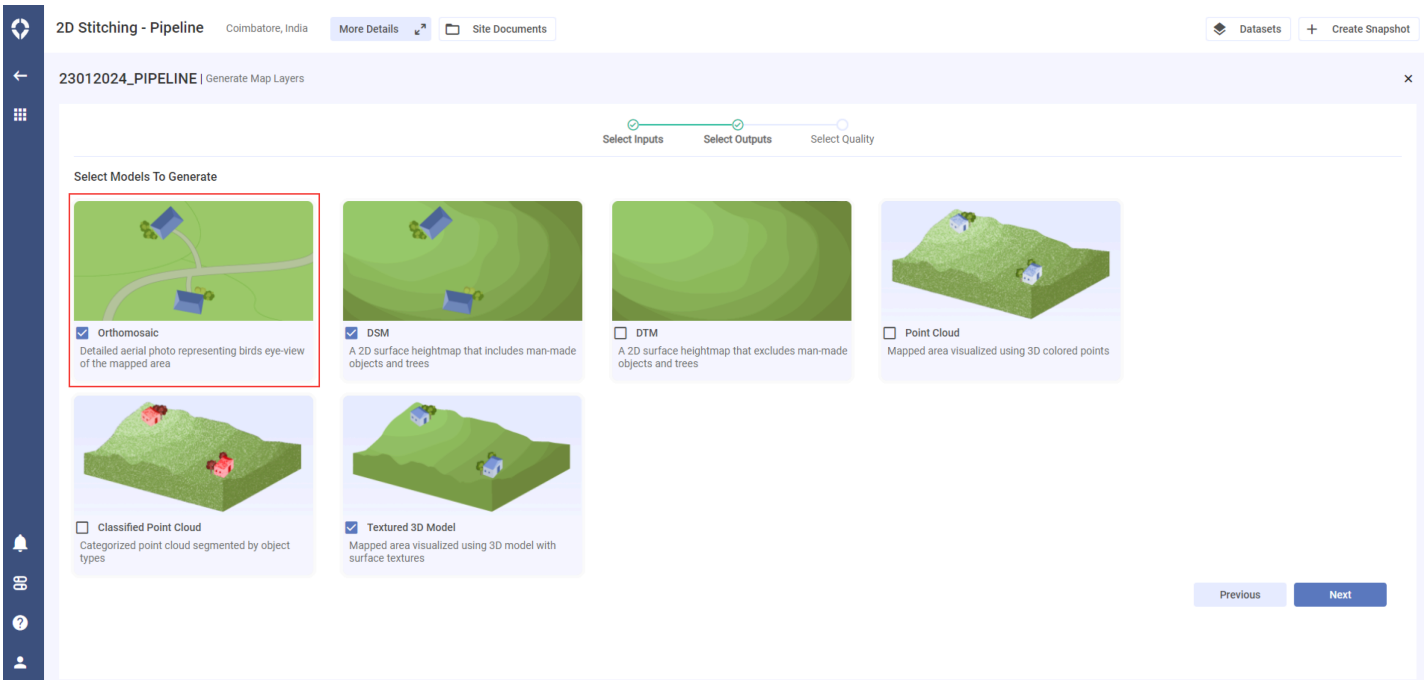
> Multispectral image data should be uploaded under the multispectral data tab. You cannot combine RGB and Multispectral data for generation of any model.

Quality Check for Uploaded Images

The Quality Check option during the uploaded process is designed to help you ensure that only sharp and high-quality images are used for the processing 2D and 3D models. This optional setting evaluates the attached images for appropriate quality before they are uploaded for further processing. To use this feature, click on the **Run Quality Check** option after attaching the images. Once the images are processed, select **Upload Quality Images** option to initiate upload of only validated image files, or select the **Upload All Images** option to initiate upload of all attached image files, including files with bad quality.

Step 2: Selecting Outputs

1. Select the models that you want to generate from the screen. If multispectral images are selected, you can also choose the multispectral models you want to generate.



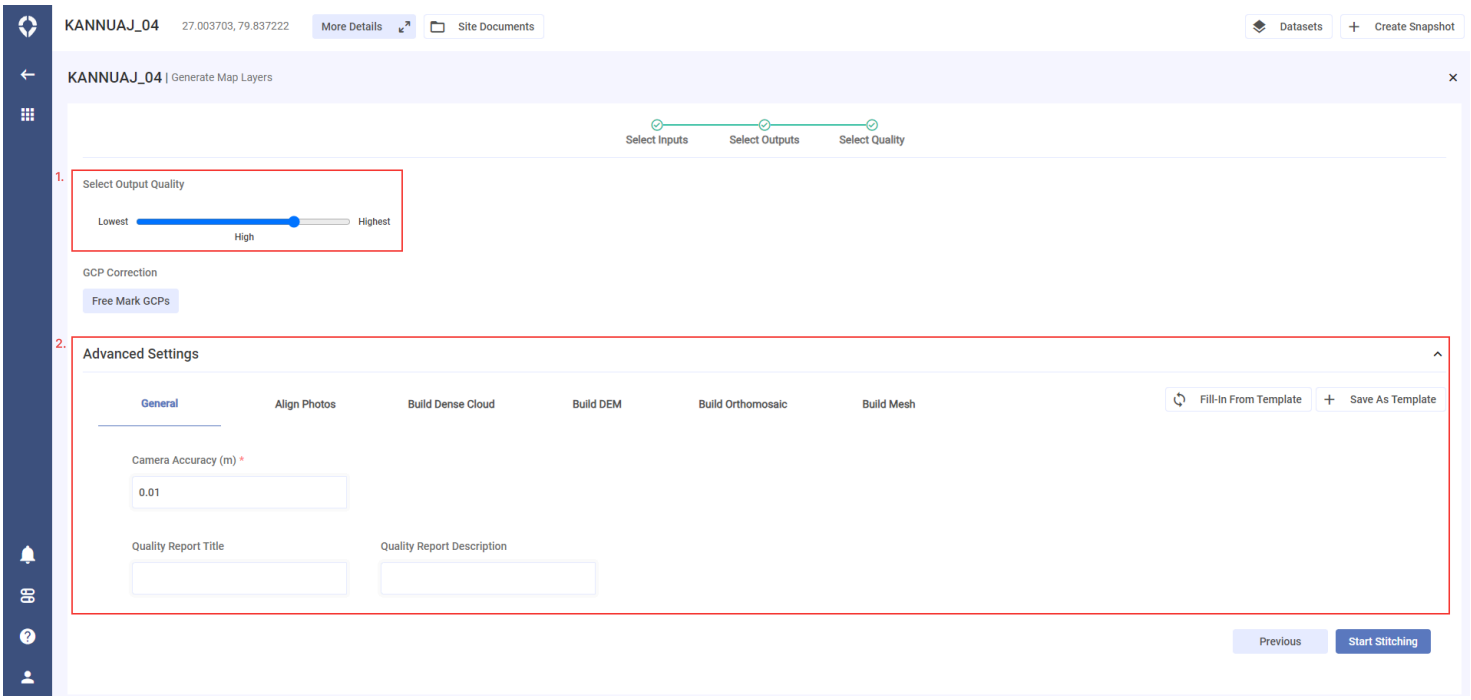
Step 3: Selecting Output Quality

In this section, you can define the quality of the output that will be generated.

> SkyDeck automatically selects the most optimal settings based on the number of images and the selected outputs. However, you can modify these parameters if needed.

To modify the quality settings:

1. You can use the **Quality slider** to let SkyDeck automatically set the stitching parameters based on your desired quality.
2. You can expand the **Advanced Settings** option and customize the parameters for each step of the process. Click **here** for details on the different settings under the Advance tab

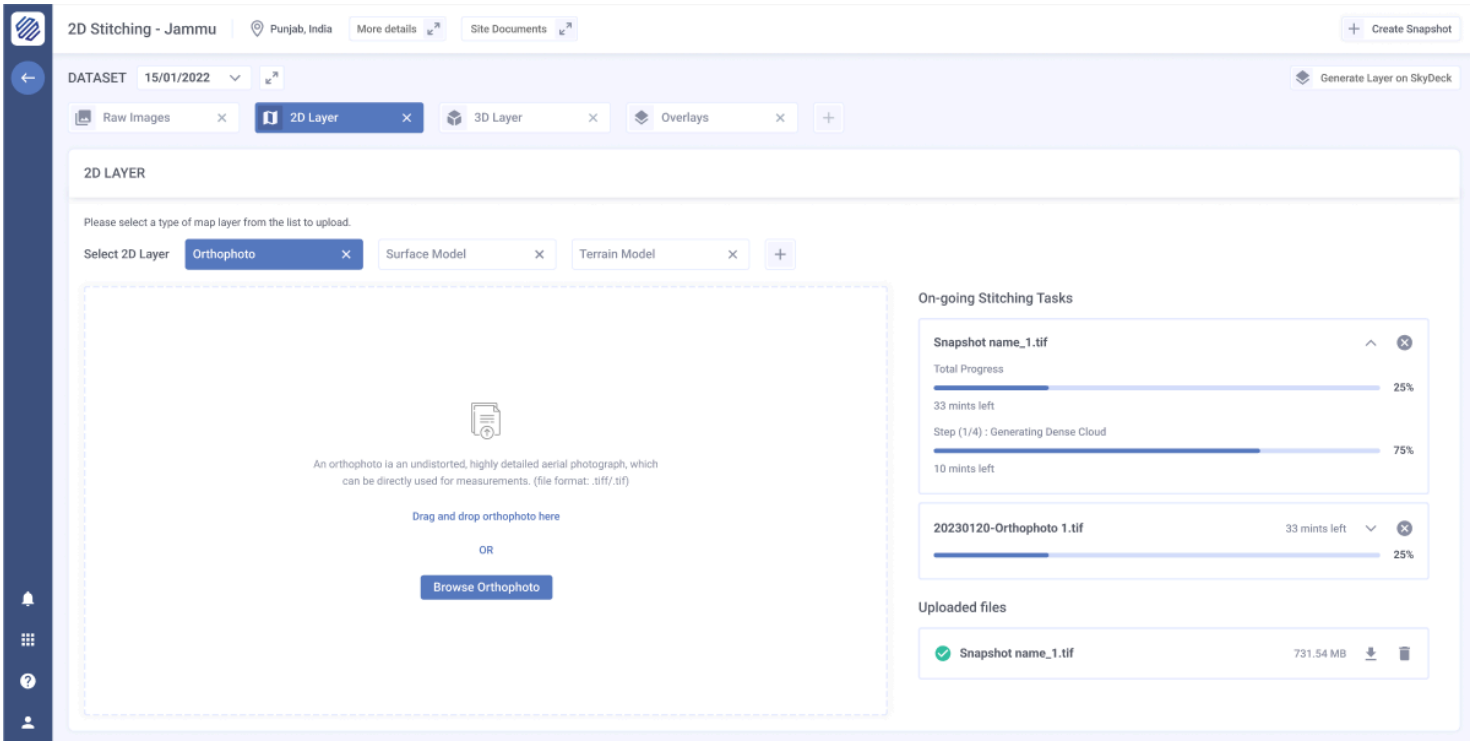


If you have GCP data for the survey, you can opt for GCP correction by selecting the **Free Mark GCPs** option. Click **here** for further instructions for performing GCP correction.
After you have defined the necessary settings and performed any required GCP correction, you can proceed by clicking on the **Start Stitching** button located at the bottom right corner to initiate the processing

> To start the process, accept the token cost for running the process. **Click Here** to learn more about how this cost is calculated.

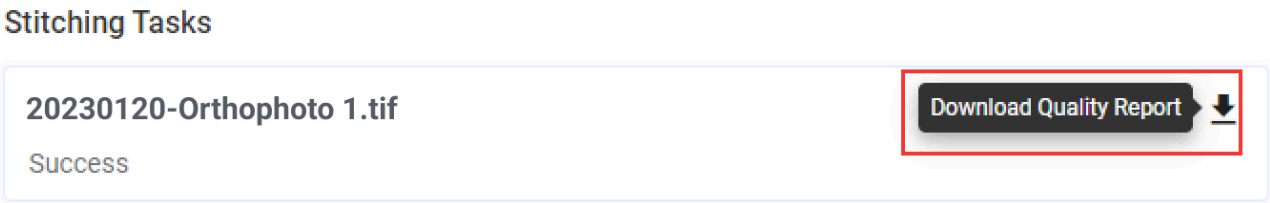
Tracking and Outputs

Once you initiate the process, of the task can be viewed from the datasets page. You can find individual tasks for each of the selected outputs under their respective tabs on the datasets page. From this panel you can monitor the progress of the activity.



After the processing is completed, the results are automatically uploaded to the datasets page and is visualized on the snapshot.

The stitching quality report for the generated data can be viewed through the **Stitching Tasks** panel on the **DATASET** page for the respective outputs.



Stitching Parameters

These advanced settings can be adjusted and optimized based on your need. However, if you are unsure about a setting, it is recommended to go with the default value for optimal results

> You can save these parameters as templates if you want to reuse these in future. To

know more, click **here**.

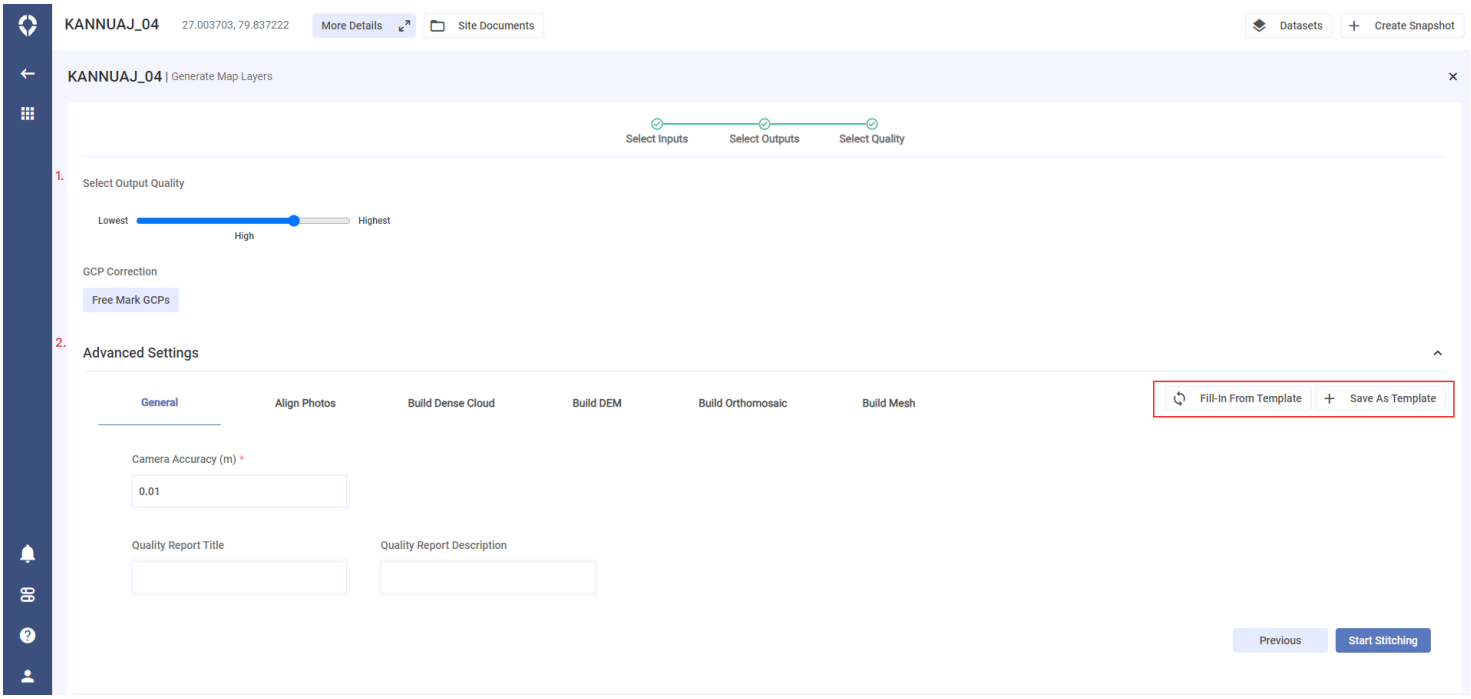
Parameter	Description
Align Photos	This process analyzes the images and identifies the common reference points in each image to determine how they fit together.
Accuracy	This option specifies the accuracy of detection of camera position for every image. Higher accuracy settings help to obtain more accurate camera position estimates but can take longer.
Keypoint Limit*	This option defines the upper limit of feature points considered for processing for every image.
Tiepoint Limit*	This option defines the upper limit of matching points considered for processing for every image.
Generic Preselection	If enabled, a generic preselection step is applied to reduce the number of potential matches in the detected common features. This can be used to speed up the alignment process.
Reference Preselection	If enabled, coordinate information is used to find overlapping points between images based on camera positions. This can yield better results if camera orientation information is available.
Guided Image Matching	If enabled, this option allows to boost the number of key points per image without signification increase in processing time.
Adaptive Camera Model Fitting	If enabled, this option allows automatic selection of camera parameters to be included into the alignment process.
Exclude Stationery Points	If enabled, this option will exclude tie points that remain stationary across multiple different images. This can help eliminate false positives related to camera or lens artefacts.
Build Dense Cloud	This process generates a 3D representation of the data by placing the points from the images in space, capturing shapes and structures from the images to determine the detailed geometry of the scene.
Quality	This option specifies the desired quality of the depth maps generation. Higher quality settings can be used to obtain more detailed and accurate geometry, but they require longer time for processing.
Depth Filtering Mode*	This option specifies the filtering mode is used to identify and remove the noise from the calculated points. Stronger filter presets remove more noise, but also may remove useful information in case there are small and thin structures in the scene.
Reuse Depth Maps	If enabled, this option allows already calculated Depth maps to be reused in incremental processes.

Calculate Point Colors	If enabled, points colors will be calculated. This can be disabled if color is not required and can save processing time.
Calculate Point Confidence	If enabled, the confidence score will be given to a point in the dense cloud based on how many depth maps have been used to generate it.
Build DEM	This process creates a 3D map of the terrain in the scene to calculate the elevations of various points on the ground.
Source Data	This option determines what base data is used to generate the elevation models. > It is recommender to use Dense Cloud if you are generating DSM and DTM.
Interpolation	This option determines where interpolation is used to calculate the elevation of all areas of the scene. > It is recommended to keep this enabled.
Build Orthomosaic	This process stitches together all the images to create a highly detailed orthomosaic.
Surface	This option determines what base data is used to generate the orthomosaic. > It is recommended to use DEM data for aerial surveys.
Blending Mode	This option determines how overlapping images are combined to create the orthomosaic. > It is recommended to use Mosaic mode for seamless textures in the output.
Refine Seamlines	This option is used make the seamlines bypass complex objects in order to avoid visual artefacts on the final output.
Enable Hole Filling	This option can help avoid holes and artefacts in case of complex surfaces. > It is recommended to always keep this enabled.

Fill-in from Template

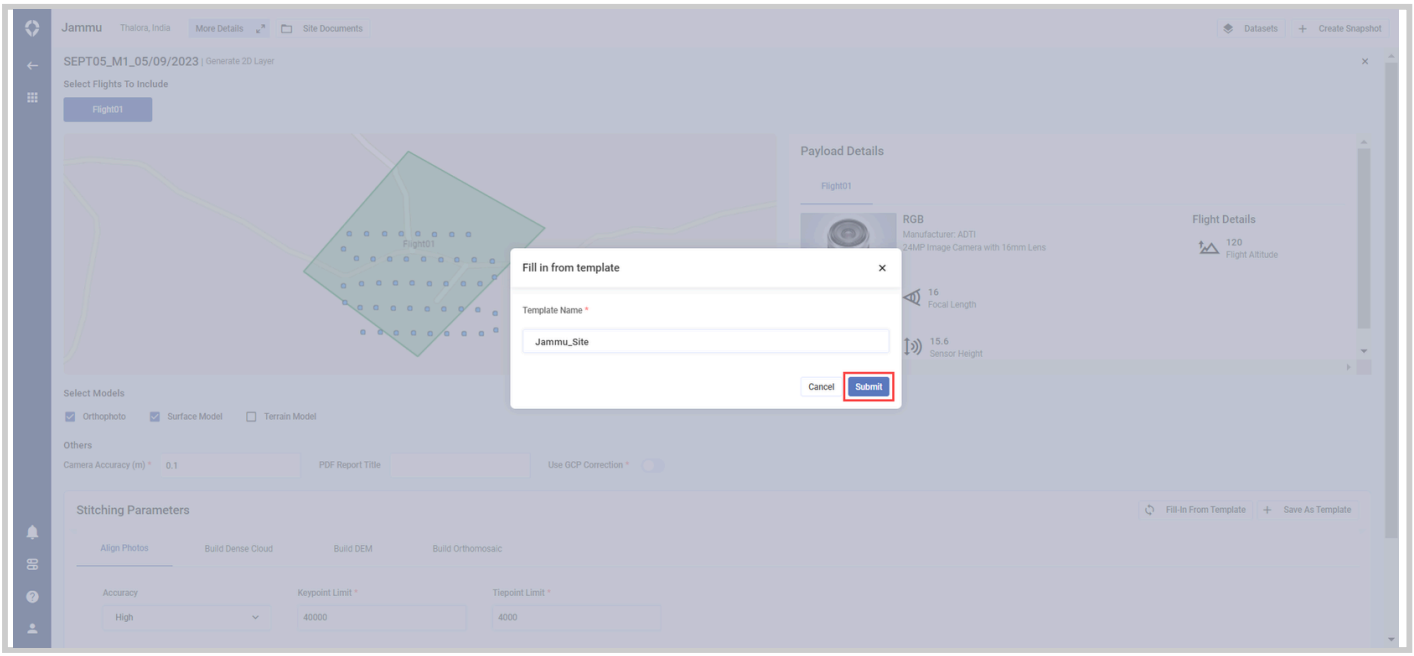
The **Fill-in from Template** option allows you to save the selected settings in a template and apply the same settings to other projects and datasets.

1. Once you have adjusted the stitching parameters, to save and reuse these for other datasets, click **Save As Template**.



Save Stitching Parameters Template

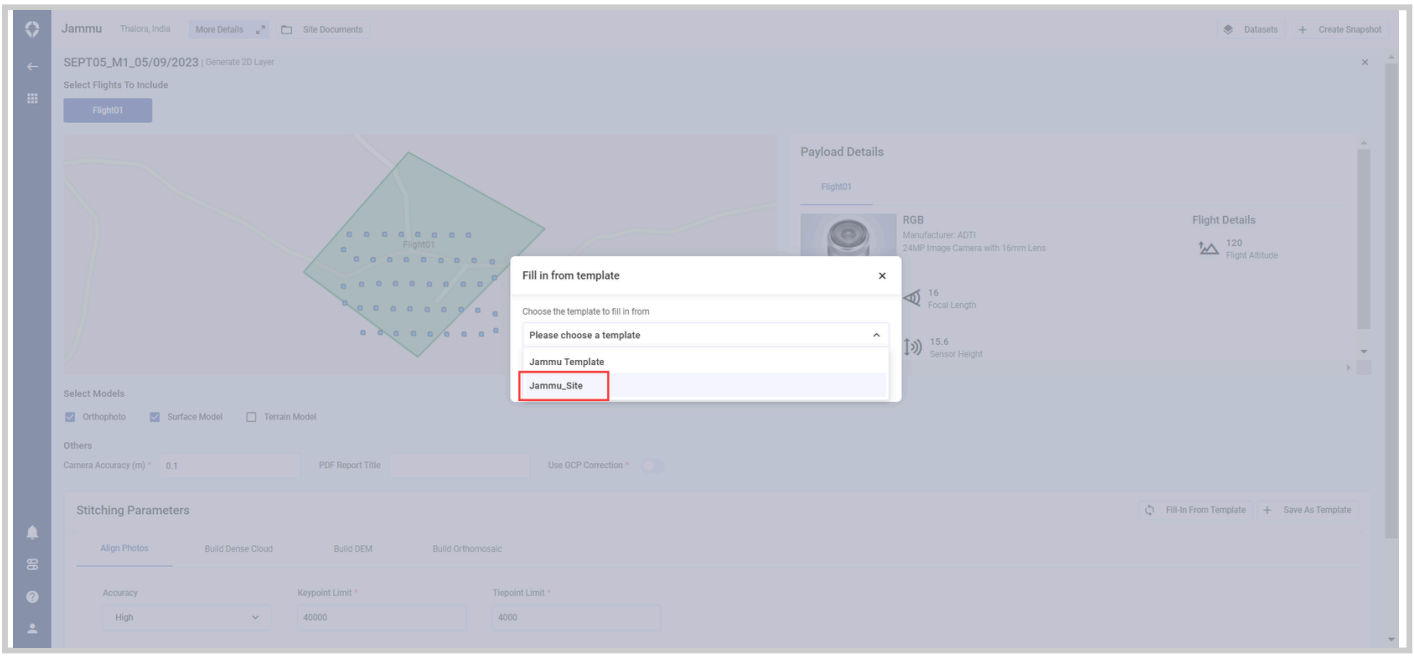
2. In the **Fill in from template**, enter the **Template Name*** and click **Submit**.



Enter Template Name

3. To reuse a saved template, click **Fill-In From Template**.

4. In the **Fill in from template** pop-up, select the template from the dropdown and click **Select**. The values for the stitching parameters are automatically filled from the template.



Use Saved Template

GCP Correction

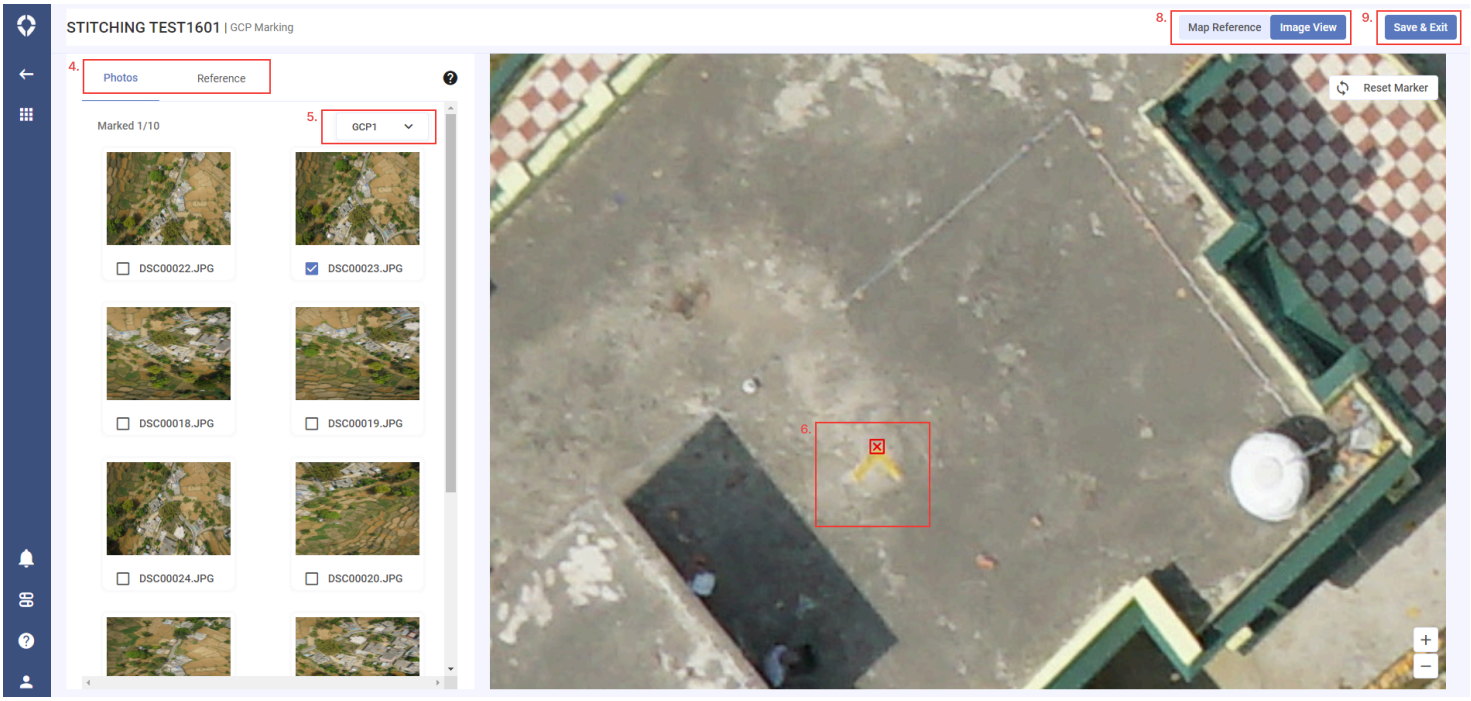
Ground Control Points (GCPs) are strategically placed markers or targets on the ground before a survey. These markers play a pivotal role in surveying, by referencing the known coordinates of GCPs, they assist in accurately aligning and positioning maps to their surroundings during the reconstruction process. Incorporating GCPs enables the photogrammetry process to precisely calculate the positional coordinates for all the points in the dataset, enhancing the overall accuracy of the survey.

To perform GCP correction:

1. Click on the **Free Mark GCPs** option on the **Select Quality** page.
2. **Drag and drop your GCP data file here** or click **Browse Files.** Once the file is uploaded, a preview of the information will be shown. Click on the **Mark GCPs** button to proceed.

> To use GCP information from the survey, use a Comma-Separated Values (CSV) file with the following format: Marker, Latitude, Longitude, Altitude. Ensure that the coordinates are in the WGS84 EPSG 4326 format. Please note that if the file format or coordinate reference system is incorrect, you won't be able to proceed

4. The **GCP Marking** page is displayed with the left pane showing the list of images filtered for each GCP marker. There are 2 tabs here - the **Photos** tab, with a list of images and the **Reference** tab which gives information about the correction performed. The right pane displays the selected image to mark the GCPs. For each GCP marker, the ten images, that are most likely to contain the selected marker, are automatically filtered and presented for GCP correction.



GCP Marking

5. Select the first GCP marker from the dropdown to create corrections and open the first image.
6. Place the red marker precisely at the center point of the GCP marker in the image. Make sure the marker is placed accurately at the center for best result.

> The GCP correction process needs to be done for a minimum of 3 images per GCP marker. It is recommended to be done for 6-7 images for each marker for the best results.

7. Repeat this step for all other GCP markers.
8. You can use the **Map Reference mode** to identify the position of GCP marker in the selected image by observing the estimated position on the satellite map.
9. Once you have done the GCP marking for all the markers, click **Save & Exit** option.

Automatic GCP Correction

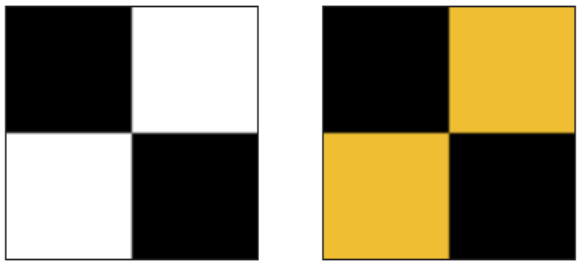
You can select the **Auto-detect GCP** option to automatically perform GCP correction using computer vision.

> To use GCP information from the survey, use a Comma-Separated Values (CSV) file with the following format: Marker, Latitude, Longitude, Altitude. Ensure that the

coordinates are in the WGS84 EPSG 4326 format. Please note that if the file format or coordinate reference system is incorrect, you won't be able to proceed

Note that auto-marking for GCP works only for standard chess style GCP markers only.

SkyDeck uses Machine Learning to automatically mark GCP points with pixel-level accuracy in your images. Please note that this feature works when the GCP markers are clearly identifiable and supports only the following marker types:



If your GCPs do not fall into these categories, the automatic identification cannot be used.

Proceeding with this option without the appropriate markers may result in inaccurate or incomplete GCP correction.

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