
Sputnik GIS
user manual
Release 1.4

Geoscan

Table of content:

1	System requirements	2
2	Installation	3
2.1	Windows	3
2.2	Linux	3
2.3	MacOS	4
3	Activation	5
3.1	Online activation	5
3.2	Offline activation	5
3.3	Activation in case of OS reinstalling	6
4	User Interface	7
4.1	GUI	7
4.2	Hotkeys	8
5	Navigation	9
6	Project	11
6.1	Projects management	11
6.2	Additional information	11
7	Data sources	12
7.1	Raster maps	12
7.2	Vector maps	12
7.3	3D models and point clouds	12
7.4	Drawings	12
7.5	WMS/WMTS/TLS services	13
7.6	Aerial survey	13
8	Measurement tools	14
8.1	Ruler	14
8.2	Corner ruler	14
8.3	Area	15
8.4	Volume	16
8.5	Volume difference	16
9	Survey	18

9.1	Contour lines	18
9.2	Cross section	19
9.3	Cross sections	19
9.4	Section comparing	20
9.5	Slope map	21
9.6	Kriging interpolation	22
9.7	Relief editor	23
9.8	TIN model	24
10	Modeling	26
10.1	Daylight	26
10.2	Visibility area	27
10.3	Observation point	27
11	Presentation	29
11.1	Screenshot	29
11.2	Video tour	30
11.3	Animated track	30
12	Special tool	32
12.1	Creating a Grid	32
12.2	Camera-antenna correction	33
12.3	Work with a GPS receiver	33
12.4	Align maps	34
13	Raster maps	36
13.1	Optimisation and re-projection	36
13.2	Visualisation	36
13.2.1	Single band mode	37
13.2.2	Multi-band mode	37
13.2.3	Palettes	37
13.3	Magic wand	40
14	KML tools	42
14.1	Geometry creation	42
14.2	Editing	42
14.3	Style	43
14.4	Geometry visualisation properties	44
14.5	Extended data and description	46
14.6	Geometry operation	46
14.7	Export	47
15	Shapefiles tools	48
15.1	Viewing attributes	48
15.2	Setting styles	49
16	3D models tools	50
17	Tiled models	51
17.1	Exporting part of *.tms model	51
17.2	Masking *.tms model	52
18	Point cloud tools	53
18.1	Lidar point clouds in *.las format	53
18.2	Agisfot point clouds in *.oc3 format	54

19 Drawings tools	55
20 WMS/WMTS/TLS services	56
20.1 WMS/WMTS services	56
20.2 TLS service	57
21 Working with UAV telemetry files	59
21.1 Aerial survey	59
21.2 Photo selection	59
21.3 Image projection	60
21.4 Agisoft Photoscan/Metashape project creation	61
22 Coordinate reference systems	62
23 Preferences	63
24 Troubleshooting	64
24.1 Installation errors	64
24.2 Startup errors	64
24.3 Runtime errors	64
25 Changelog	66
25.1 Sputnik GIS version 1.4	66
25.1.1 New features	66
25.1.2 Improvements	67
25.1.3 Bugfixes	67

About Sputnik GIS

Sputnik GIS - professional drone surveying software for engineers, surveyors and urban planners.

Sputnik GIS is an efficient software, designed for surveyors, engineers and urban planners to get the best from aerial surveys. System supports common data sources, like vector and raster maps, point clouds, 3D models, tiled 3D models, photos captured by drone, etc.

Software may be applied in such industries as construction management, monitoring and inspection, mining, urban planning, oil and gas, emergency management.

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System requirements

Minimum configuration:

- Windows 7, 8, 10 (64-bit), Linux (Mint, Ubuntu), Mac OS
- CPU: Intel Core i3
- 1 GB of disk space
- 4GB RAM
- Video card: Nvidia, AMD, Intel HD 4000 and newer, 1GB VRAM, OpenGL 2.1 support

Recommended configuration:

- Windows 7, 8, 10 (64-bit), Linux (Mint, Ubuntu), Mac OS
- CPU: Intel Core i5 / i7 and better
- 1 GB of disk space
- 8GB RAM
- Video card: Nvidia, AMD, 1GB VRAM, OpenGL 2.1 support

Sputnik GIS is distributed for Windows, MacOS and Linux operating systems. Follow the installation instructions for your operating system to complete the installation.

2.1 Windows

1. Run Sputnik GIS installation package (administrator privileges are required).
2. Follow the onscreen instructions to complete the setup .
3. After installation is finished, KML, KMZ, OC3 and TLS files will be associated with Sputnik GIS.
4. To start the application choose **Start > Sputnik**.
5. In case of issues during instalation process, read *Troubleshooting* chapter.

<p>Attention: You need to have administrator privileges to install Sputnik GIS and license driver. Software may work incorrectly if installed without administrator privileges.</p>
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2.2 Linux

1. Run Sputnik GIS installation package in Terminal from name Super user.
2. Follow the onscreen instructions to complete the setup.
3. After installation is finished, KML, KMZ, OC3 and TLS files will be associated with Sputnik GIS
4. To start the application choose Sputnik.
5. In case of issues during instalation process, read *Troubleshooting* chapter.

2.3 MacOS

1. Unpack the file format *.dmg containing the installation file of the Sputnik GIS.
2. Run Sputnik GIS installation package.
3. Follow the onscreen instructions to complete the setup.
4. After installation is finished, KML, KMZ, OC3 and TLS files will be associated with Sputnik GIS
5. To start the application choose Sputnik.
6. In case of issues during instalation process, read *Troubleshooting* chapter.

3.1 Online activation

To activate Sputnik GIS via Internet:

1. Make sure your Internet connection is functional.
2. Start Sputnik GIS, use **Activation...** command from **Help** menu.
3. Paste your license key to **Enter the product key** input field and click **Activate**.

Important: In case activation fails, check your key format. Proper format looks like: XXXXXXXX-XXXX-XXXX-XXXX-XXXXXXXXXXXX

3.2 Offline activation

Important: You need to use additional PC with Internet access to activate Sputnik GIS on PC without Internet access.

To activate Sputnik GIS on PC without Internet access:

1. Download [offline activation utility](#)
2. Start RUS utility on PC with Sputnik GIS installed. In the **Collect Status Information** tab check **Installation of new protection key** option and click **Collect information** button. In the **Collect information** dialog box, set the name and path to save *.c2v file.
3. Start web-browser on PC with Internet access and open the [Customer login link](#)
4. Log in to the Activation service using your license key a password
5. Select **Offline Activation** option.

6. Upload *.c2v file and click **Generate** button, *.v2c file will be generated.
7. Open RUC utility on PC with Sputnik GIS installed. In **Apply License File** tab select *.v2c file and click **Apply license** button.

3.3 Activation in case of OS reinstalling

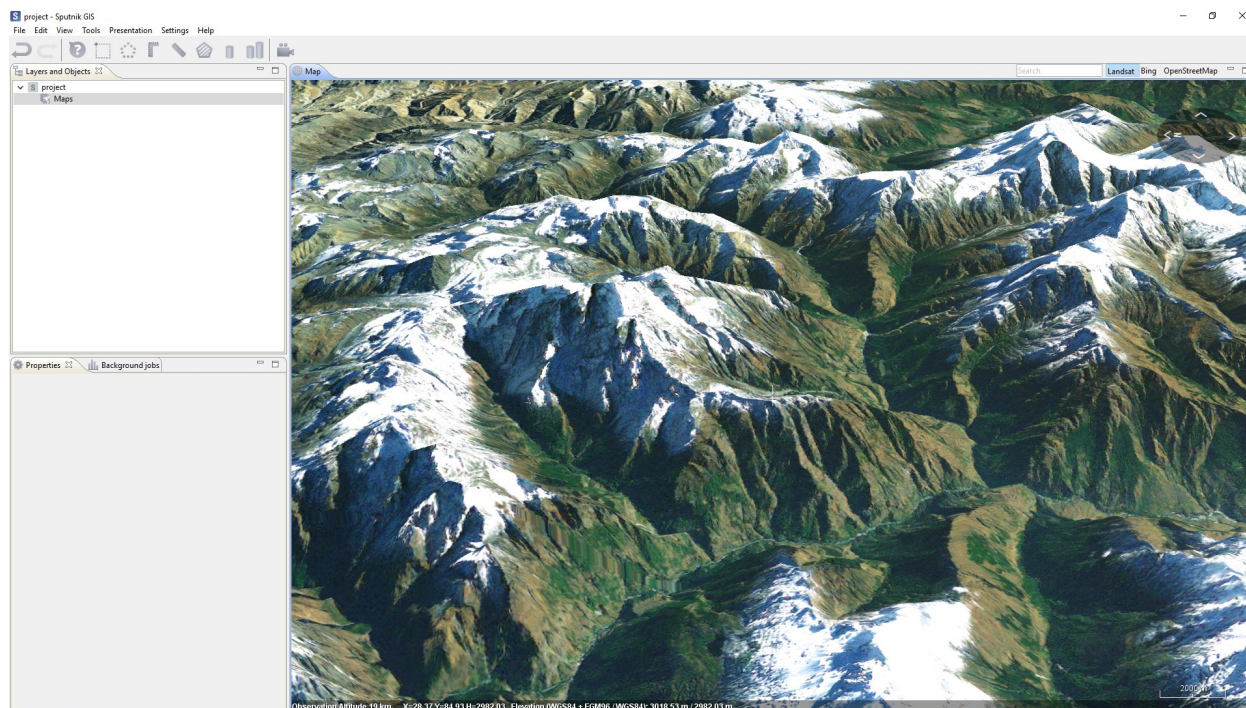
To activate Sputnik Agro after OS re-installation, follow these steps:

1. First you need to get *.v2c key. Open [License activation link](#) in your web browser and use your license key as login.
2. On the user registration page fill the information or click **Register later**
3. Click **View** button in the **Previous Activation** menu.
4. In the **generated keys** menu click **V2C File**. It will be downloaded.
5. Open [Check-in link](#) in your web-browser, select you *.v2c file and click **Apply** button.

4.1 GUI

Spuntik GIS GUI consists of:

- Main menu
- Toolbar
- **Layers and objects** window
- **Properties** window
- **Map** window
- **Background jobs** window



4.2 Hotkeys

Action	Hotkey
Open file	Ctrl + O
Undo	Ctrl + Z
Redo	Ctrl + Y
Delete	Delete
Select all	Ctrl + A
Clear selection	CTRL + D
Fullscreen	F11
Rectangular selection	Ctrl + R
Reset view to northup	N
Reset angle to top-down view and rotate map to north-up viewp	R

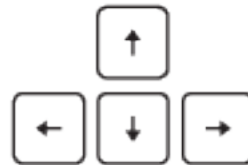
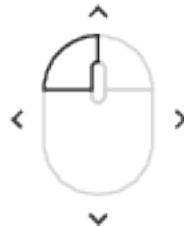
CHAPTER 5

Navigation

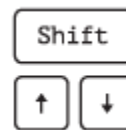
Scaling (zoom in/zoom out)



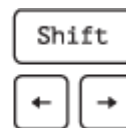
Moving (globe rotation around its center)



Clockwise / Counterclockwise rotation (globe rotation around the point on its surface)



Changing the vertical angle of the view (globe rotation around the point on its surface)



Inspecting high-altitude objects (Moving along high object)



Inspecting high-altitude objects (Moving along high object)



Work with different datasets can be simplified by switching between Sputnik GIS projects. Every project automatically stores a set of parameters:

- List of maps and drawings, loaded by user
- Last position of the 3D Map window camera
- Location, visibility and size of UI objects

6.1 Projects management

To create new project choose **Project** command from **New** submenu of **File** menu.

To open existing project choose **Project** command from **Open** submenu of **File** menu.

To open recent project choose one of available projects from **Recent projects** submenu of **File** menu.

To import any type of data into the project choose **File** command from **Open** submenu of the **File** menu.

6.2 Additional information

By default, imported raster maps are aligned with default SRTM elevation model. SRTM terrain data has 90 m spatial resolution and vertical accuracy about 1 m. Level of details can be increased by loading a local DEM.

Sputnik GIS navigation tools can rotate the viewpoint around the object.

Visualization priority is set from top to bottom in **Layers and Objects** window. Last opened objects are inserted in the lowest part of the list.

Use checkboxes in the **Layers and Objects** list to turn layers visibility on and off.

7.1 Raster maps

Sputnik GIS supports the following raster map extensions: *.tiff, *.ecw, *.jpg, *.kmz and elevation models extensions: *.tiff и *.kmz. Read more about working with raster map in chapter [Raster_tools](#)

7.2 Vector maps

Sputnik GIS supports the following raster map formats: *.shp и *.kml. Read more about working with *.kml in chapter [KML_tools](#), about working with *.shp in chapter [Shapefiles_tools](#).

7.3 3D models and point clouds

Sputnik GIS supports the following 3D models and point clouds formats: *.3ds, *.dae, *.obj, *.tls, *.las, *.oc3. Read more about working with 3D models in chapter [3D_models_tools](#), about working with *.tls in chapter [Tiled_models](#), about working with point clouds in chapter [Point_cloud_tools](#).

7.4 Drawings

Sputnik GIS supports drawings in *.dxf format. It is not available to import *.dxf file into project as a map layers and view it in the **Map** window. You can view *.dxf files in 2D **Drawings viewer** . Read more about working with *.dxf in chapter [Drawings_tools](#).

7.5 WMS/WMTS/TLS services

Sputnik GIS supports importing data from WMS and WMTS services with feature request option and *.tms models from Spunik Web service. Read more about working with WMS/WMTS/TLS services in chapter *WMS.WMTS.TLS_tools*.

7.6 Aerial survey


Sputnik GIS have number of tools for working with aerial imagery and UAV telemetry data:



- Visualisation of aerial survey telemetry in the **Map** window
- Viewing images in **Image viewer**
- Searching for images covering given point on the map
- Projecting aerial images on map

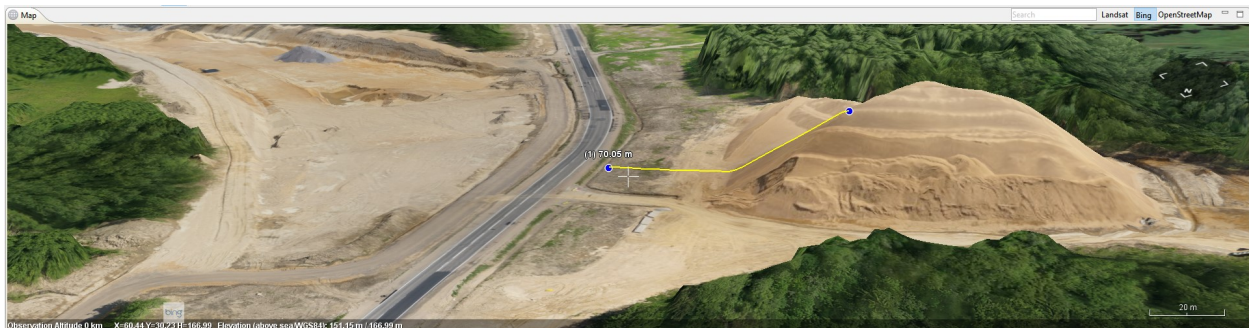
You need to have aerial survey telemetry file in *.txt format to be able to analyze it. Read more about working with survey data in chapter *Working with UAV telemetry files*.

Measurement tools

8.1 Ruler

 **Ruler** tool displays distance between two points on the surface.


To measure distance with **Ruler** click  icon in the toolbar, then select two points on the surface to measure the distance between them. Or select existing line and click on  icon in the toolbar to measure its length.




It is possible to change the position of selected point. Click once at a point, then drag it by the surface.

When length for polygon is measured, its value is saved to polygon extended data, you can use **Information tool** to display the volume value when you need.


8.2 Corner ruler



 **Corner ruler** tool displays slope, horizontal distance, actual distance and elevation between two points located on surface.

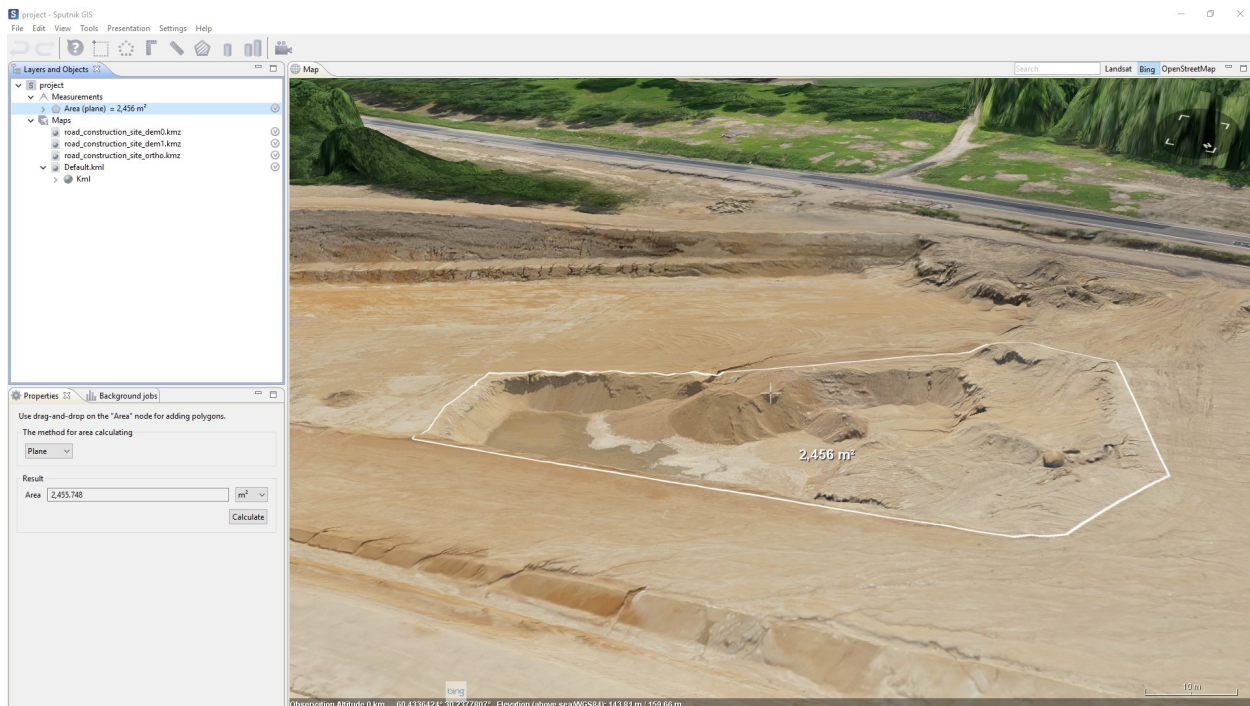
To perform measurements with **Corner ruler** click on  icon in the toolbar, then select two points on the surface to perform measurements.




8.3 Area

 **Area tool** displays area of a polygon on the modelled surface.

To measure area of polygon click on  icon in the toolbar and draw a polygon. Or select existing polygon and click on  icon in the toolbar.





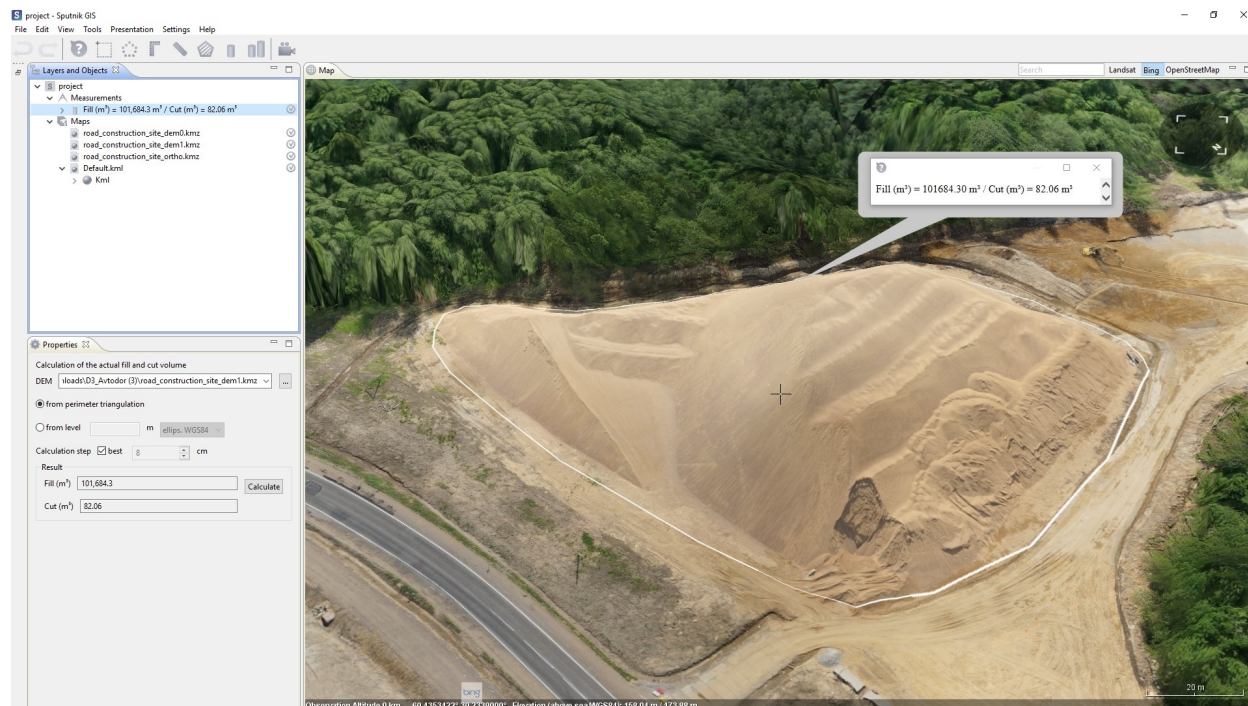
Important: Depending on the area measured, the result can be displayed in square meters, hectares or square kilometers. Area can be calculated on a plane or DEM surface.

When area of polygon is measured, its value is saved to polygon extended data. You can use  Information tool to display the area value when you need.

8.4 Volume


Volume tool calculates the volume of an area of DEM.

To calculate volume click on  icon in the toolbar and draw a polygon. Or select existing polygon and click on  icon in the toolbar.




Important: In case there is only one DEM in the Layers and Objects list,

Sputnik GIS uses that DEM for measurements. Otherwise, it is necessary to drag and drop selected DEM from Maps folder to **Measurements > Volume object**.

When volume for polygon is measured, its value is saved to polygon extended data. You can use  Information tool to display the volume value when you need.

8.5 Volume difference

Volume difference tool calculates the difference between two DEMs of the similar area, captured with a time interval. It is possible to calculate cut and fill volumes and highlight the areas that have changed.

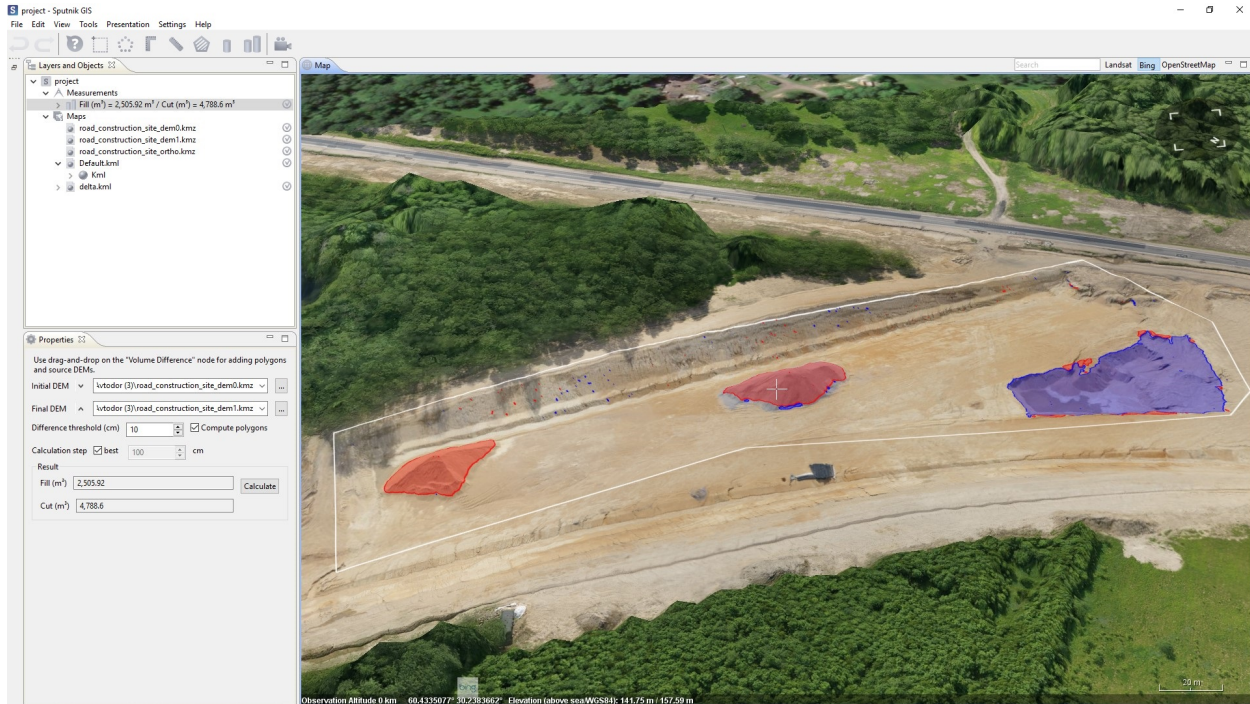
To calculate volume difference between two DEMs click on the  icon on the toolbar and then draw a polygon to measure the volume difference. Select Initial DEM and final DEM by moving it from Maps folder to **Measurements > Volume difference**.

Some parameters can be set before the calculation begins:

- Difference threshold (altitude difference between one point of two different DEMs to be included into calculation);


- Calculation step or turn «best» on.

The less the values of the calculation step and the difference threshold, the more time is required for calculation. Press **Calculate** button when setup is finished. After calculation is finished, you can see the result in the **Fill** and **Cut** fields in the **Properties** window.

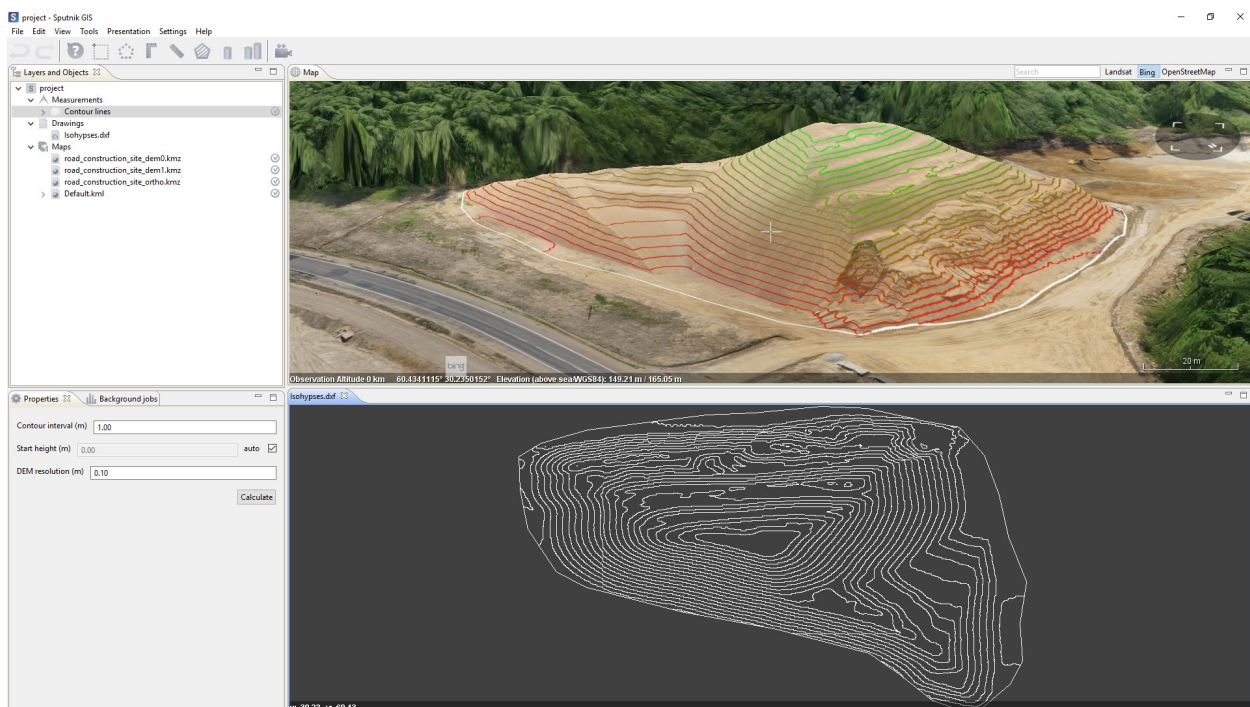


When volume difference for polygon is measured, its value is saved to polygon extended data. You can use **Information tool** to display the volume value when you need.


9.1 Contour lines


 **Contour lines** allows to calculate contour lines for given area on DEM.

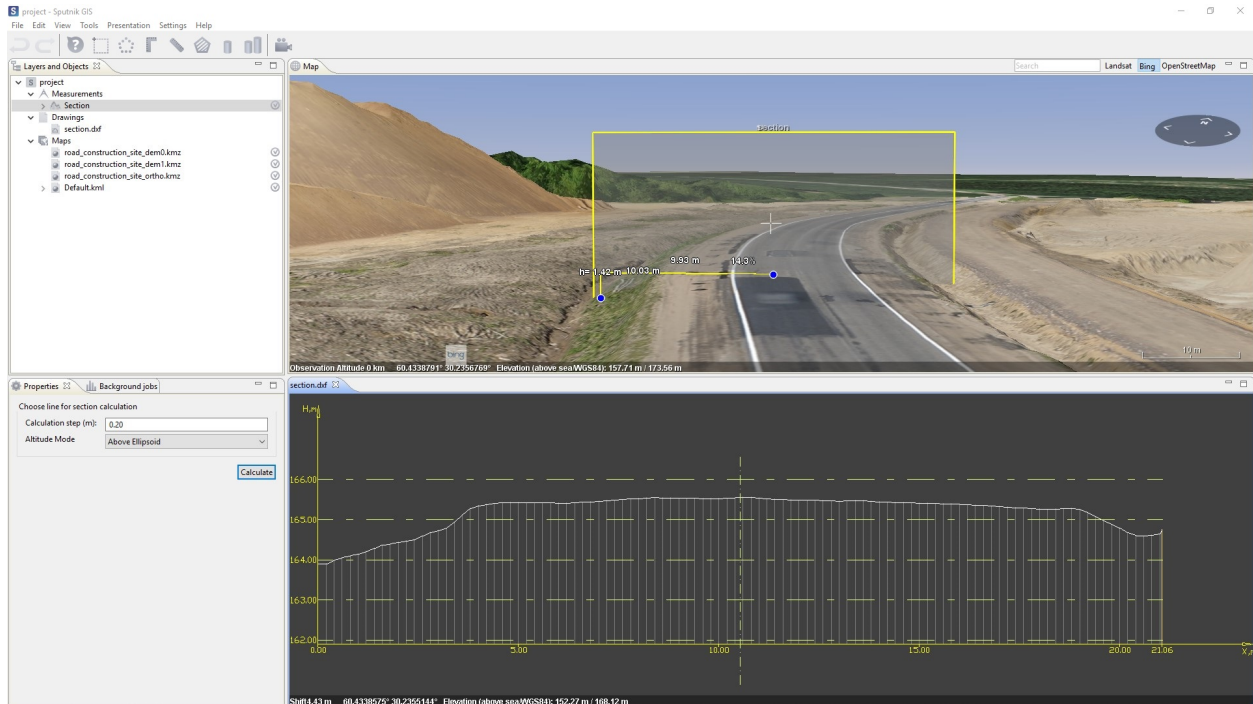
To start contour lines calculation choose  tool from **Tools** menu and delineate area to calculate contour lines within it. Set up *Contour interval* and *DEM resolution* in the **Properties** window and click **Calculate** button.



9.2 Cross section


 **Cross section** allows to generate cross section for given baseline in *.dxf format.


To start cross section generation choose  tool from **Sections** sub-menu of **Tools** menu and draw a baseline. Set up *Calculation step* and *Altitude mode* in the **Properties** window and click **Calculate** button. In the **Save** dialog box select the name and directory to save the output and format and click **Save** button. It is available to generate cross section in *.dxf, *.csv and *.txt formats.

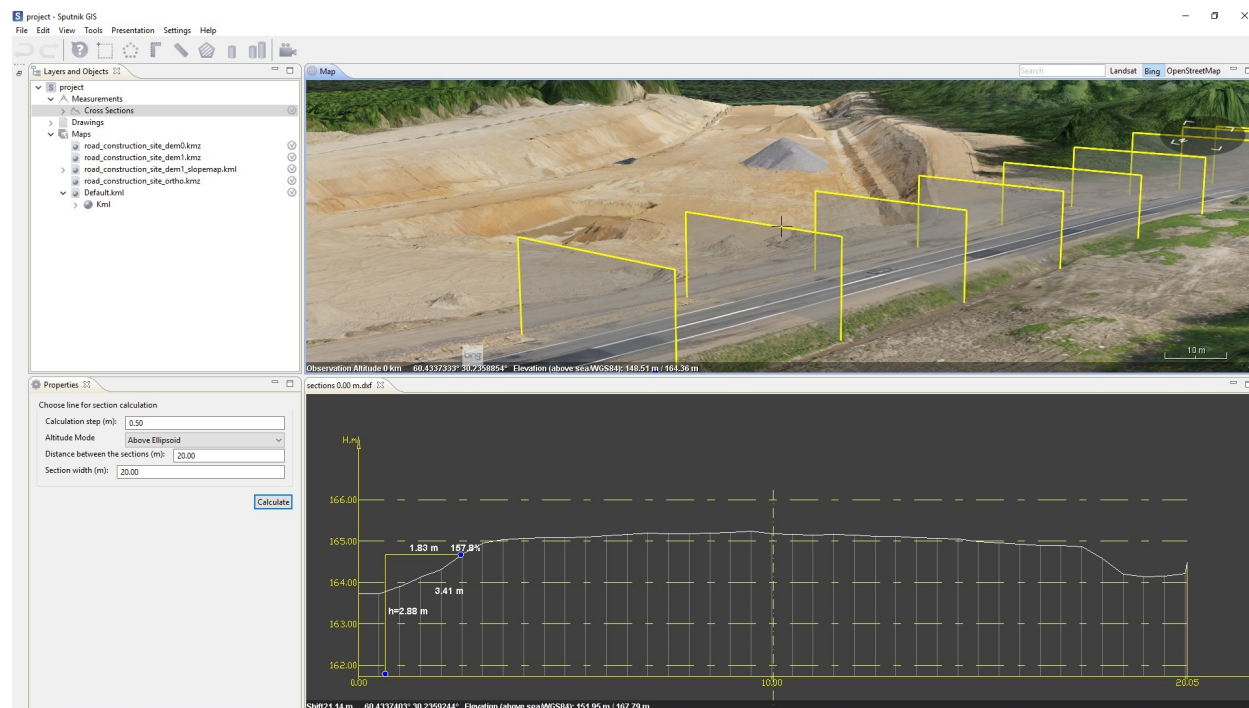


After section generation is finished, it will be displayed in the **Drawing viewer** window.

9.3 Cross sections

 **Cross sections** allows to generate custom set of cross sections perpendicular to given baseline and aligned to the left and to the right of the baseline by half of the section width value.

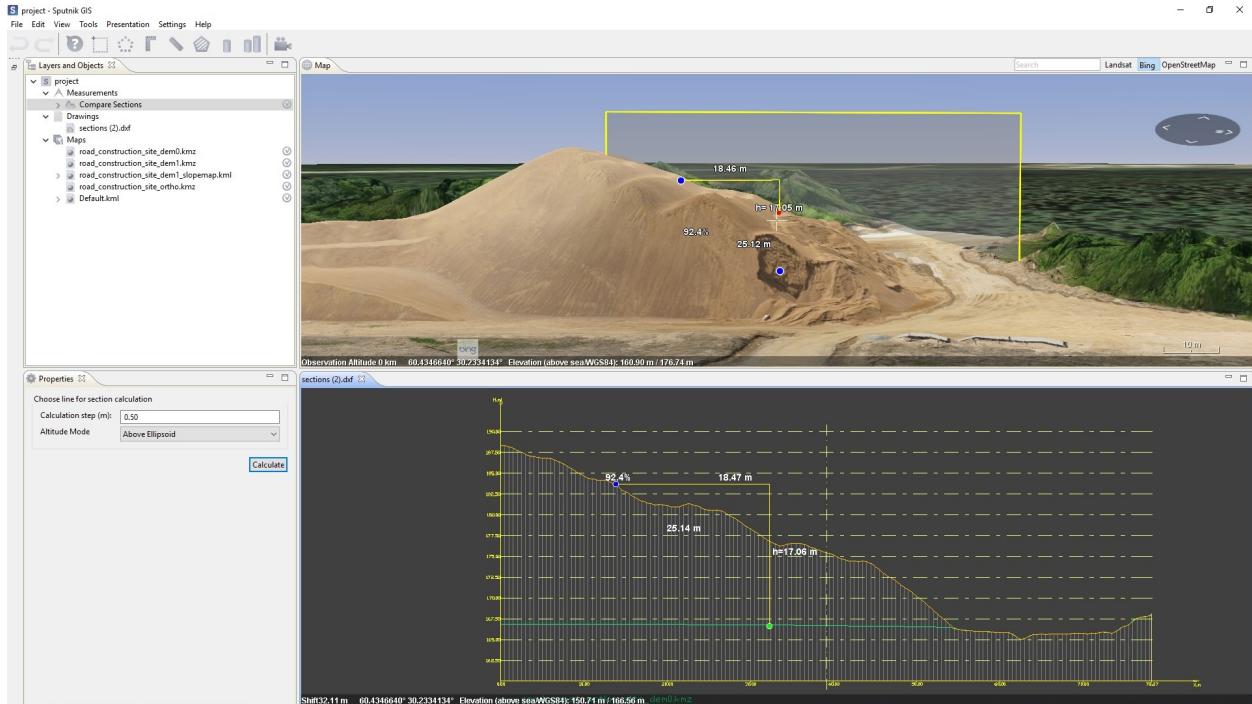
To start cross sections generation, choose  tool from **Section** submenu of **Tools** menu and draw a baseline. Set up *Calculation step*, *Distance between the sections*, *Section width* and *Altitude mode* in the **Properties** window and click **Calculate** button. In the **Save** dialog box set up the name, format and directory to save the output, and click **Save** button. It is available to generate cross sections in *.dxf, *.csv and *.txt formats.




9.4 Section comparing


Compare sections and **Compare cross sections** tools allows to generate cross section or set of cross sections for multiple DEMs on one *.dxf drawing.

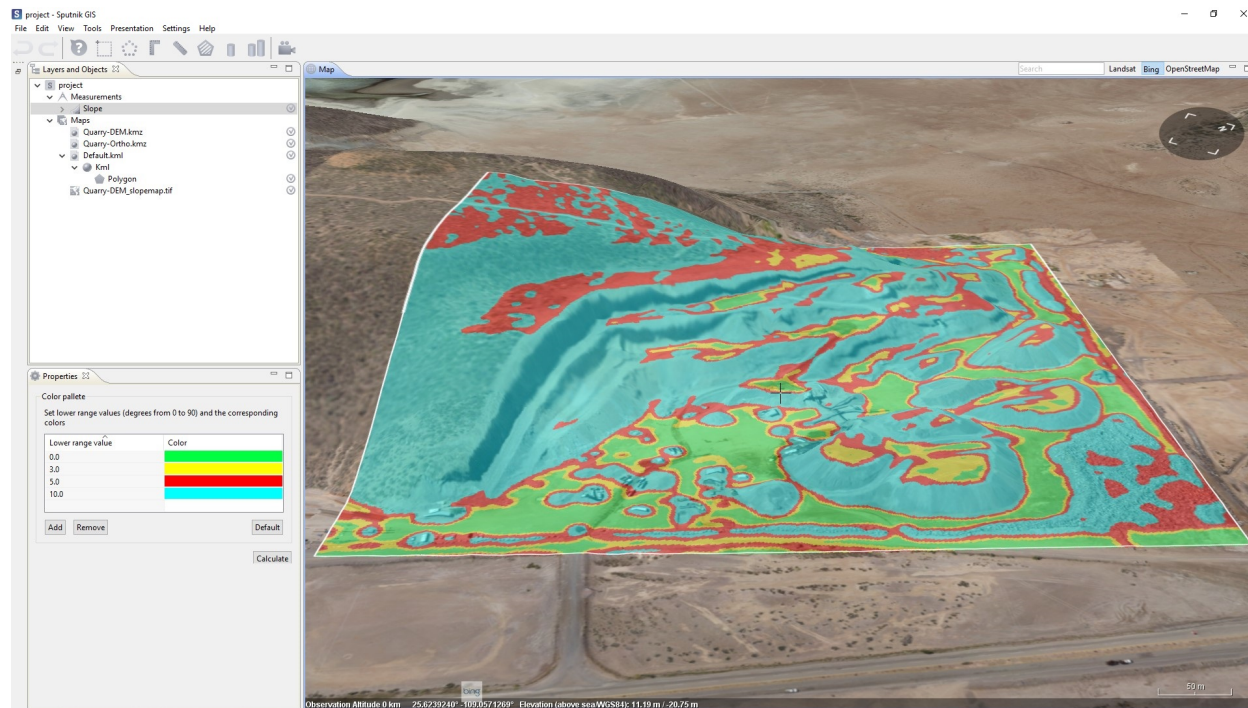
To start sections comparing choose one available section comparing tools from **Sections** submenu of tools menu and draw a baseline. Set up parameters in the **Properties** window and click **Calculate** button. In the **Calculate sections for elevation models** window select elevation model to calculate sections for, set up the name and directory to save the output and format.



9.5 Slope map

 **Slope map** tool allows to calculate slope map for given area on DEM.


To start slope map calculation choose  tool from **Tools** menu and draw the polygon to calculate the slope map within it. In the **Properties** window set up color palette for the slope map and click **Calculate** button. In the **Calculate slope maps** window select elevation model to calculate slope maps for, names and formats for the output and click **OK**



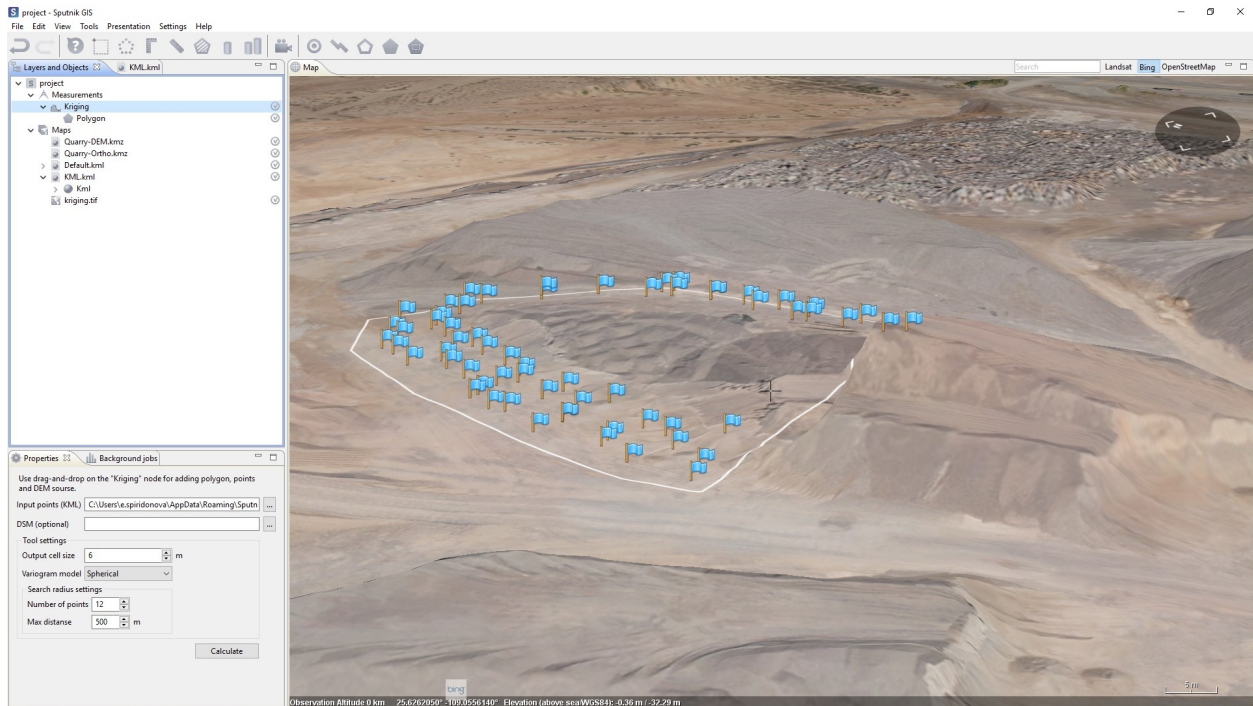
Note: It is possible to change default slope map color palette. To do that, choose **Preferences** command from **Settings** menu, in the **Preferences** window switch to **Slope map** tab and set the default color palette parameters.

9.6 Kriging interpolation

 **Kriging interpolation** allows to build elevation model from given set of points.


To start building elevation model choose  command from **Edit relief** submenu of **Tools** menu and draw a polygon to build elevation model within it. Import *.kml file with points into Sputnik GIS and drag it from **Maps** folder into **Kriging interpolation** node. In the **Properties** window set up the *Variogram model* and other parameters if needed, click **Calculate** button.



In case you have points coordinates in *.txt file, create empty polyline, right-click on and choose **Edit coordinates..** command. In the **Edit coordinates** window select coordinates reference system and paste coordinates from *.txt file. To create points from polyline, right-click on it and choose **Create points..** command.



Important: Keep in mind that vertical datum, used for altitude measurements in *.kml files is the WGS84 EGM96 Geoid.

9.7 Relief editor

 **Relief editor** tool allows to edit elevation models. **Relief editor** tool may be used to build DEM from DSM by deleting buildings and other objects, the other usage scenario is to model new surface features.

To start relief editing choose  command from from **Edit relief** submenu of **Tools** menu. Now you can draw polygons to delineate relief feature you want to modify. Double click to finish polygon drawing and start to draw the next one. To finish polygon drawing click  button on the toolbar or press **Enter** button.


In case you need to delete features from surface - just delineate them with polygons, the part of elevation model within given polygons will be interpolated with respect to polygons node.

In case you need to model new surface feature - draw it as polygon and set the needed elevation for each polygon node using **Coordinates editor**.

Before starting calculation choose if you want to edit current file or create a copy of it and click **Calculate** button.

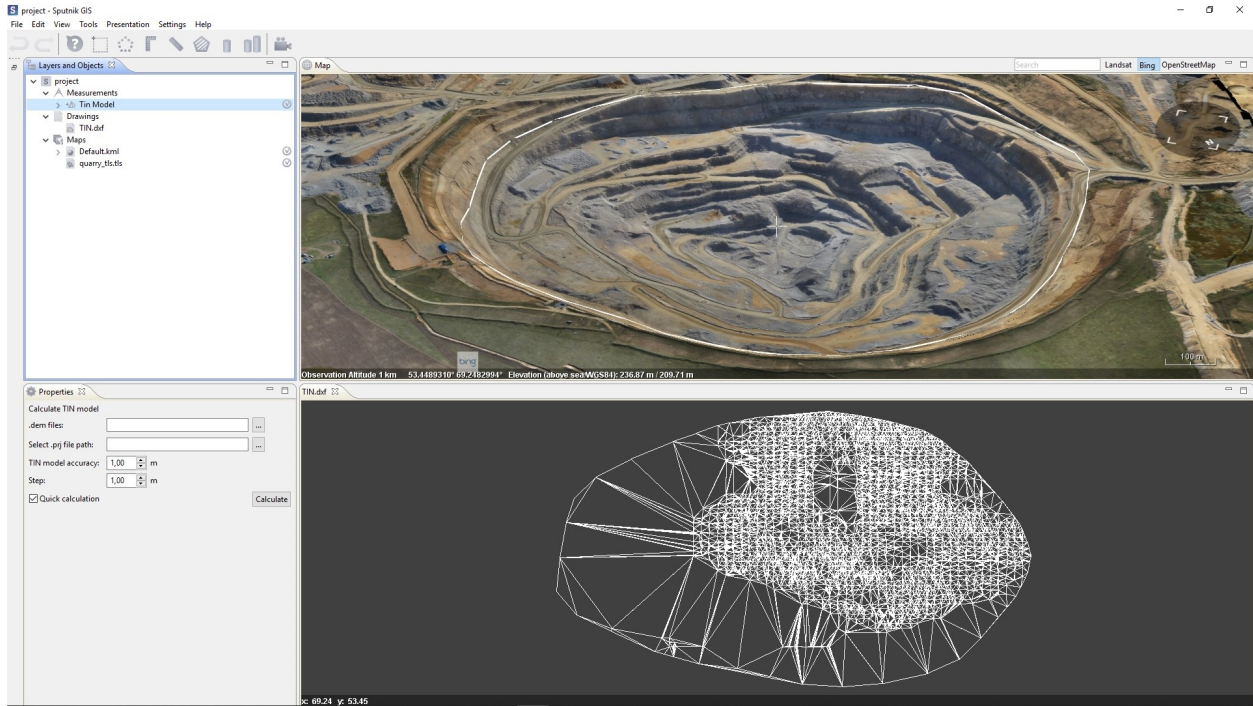


9.8 TIN model

 **Calculate TIN model** allows to convert surface model from *.tiff or *.kmz formats into *.dxf format. TIN model is a surface model in the form of a network of adjacent non-intersecting triangular faces, defined by the nodes and edges that cover the surface.


To generate TIN model of surface choose **Calculate TIN model** tool from **Tools** menu and draw a polygon to generate TIN model within it.

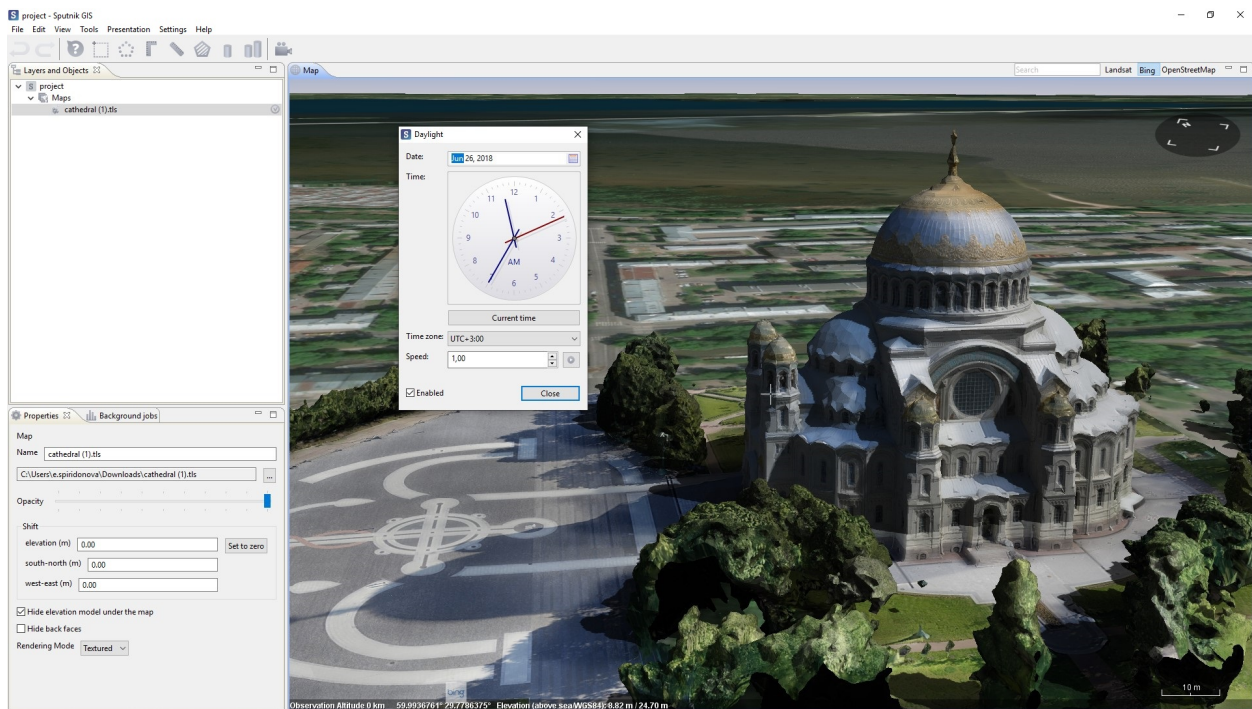
In the **Properties** window set up *.dem files* to generate TIN model for, *.prj file* to reproject TIN model, *TIN model accuracy* and *Step* parameters and click **Calculate** button. The Quick calculation option reduces processing time, but makes the model rough. To get the exact model, uncheck this option.



10.1 Daylight

 **Daylight** tool allows to visualise daylight for given area, at given date and time.

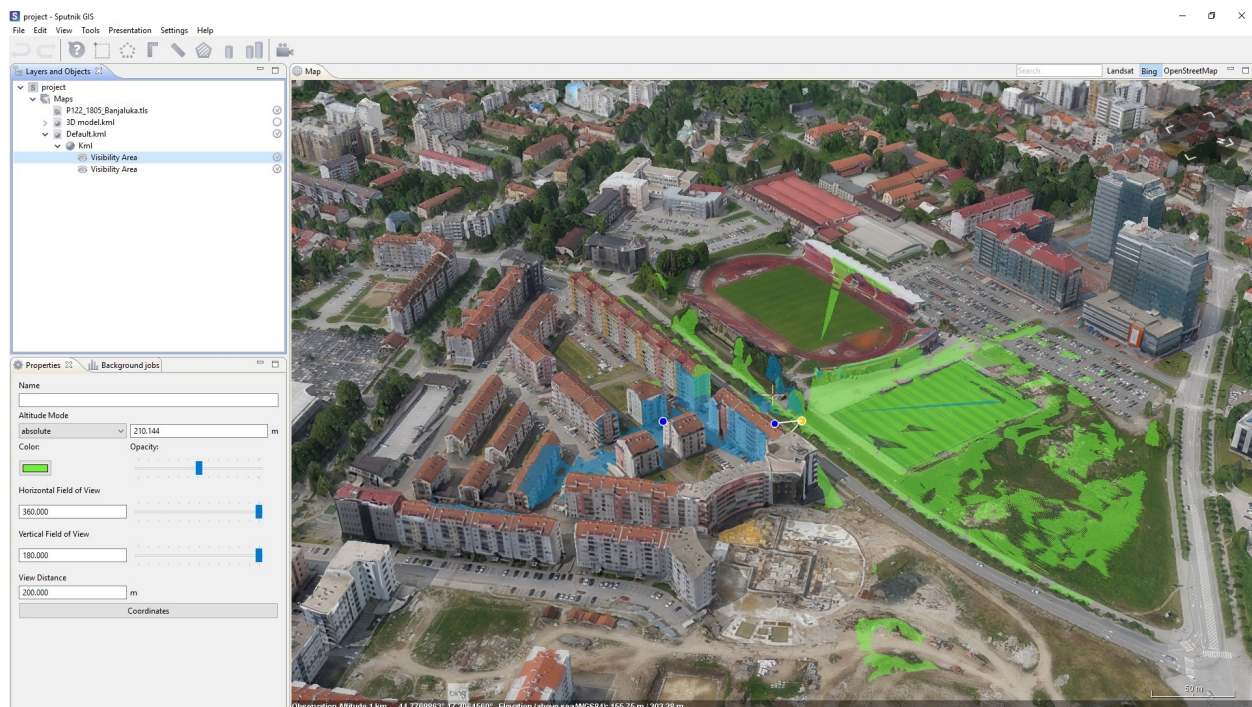
To start daylight modeling, select **Daylight** command from **View** menu. In the **Daylight** window and check **Enabled** box. You can set date and time for daylight modeling using **Time** widget, date using **Date** widget and time zone using **Time zone** widget. To set the current date and time, click **Current time** button. To start time animation set the *Speed* parameter and click  button.



10.2 Visibility area


 **Visibility area** tool allows to model and export visibility area from given point on model.


To start visibility area modeling, choose  from **Tools** menu and set the start point in the **Map** window. To change visibility area position, click it in the **Map** window and drag. To change visibility area altitude, press **Shift** button and drag it.

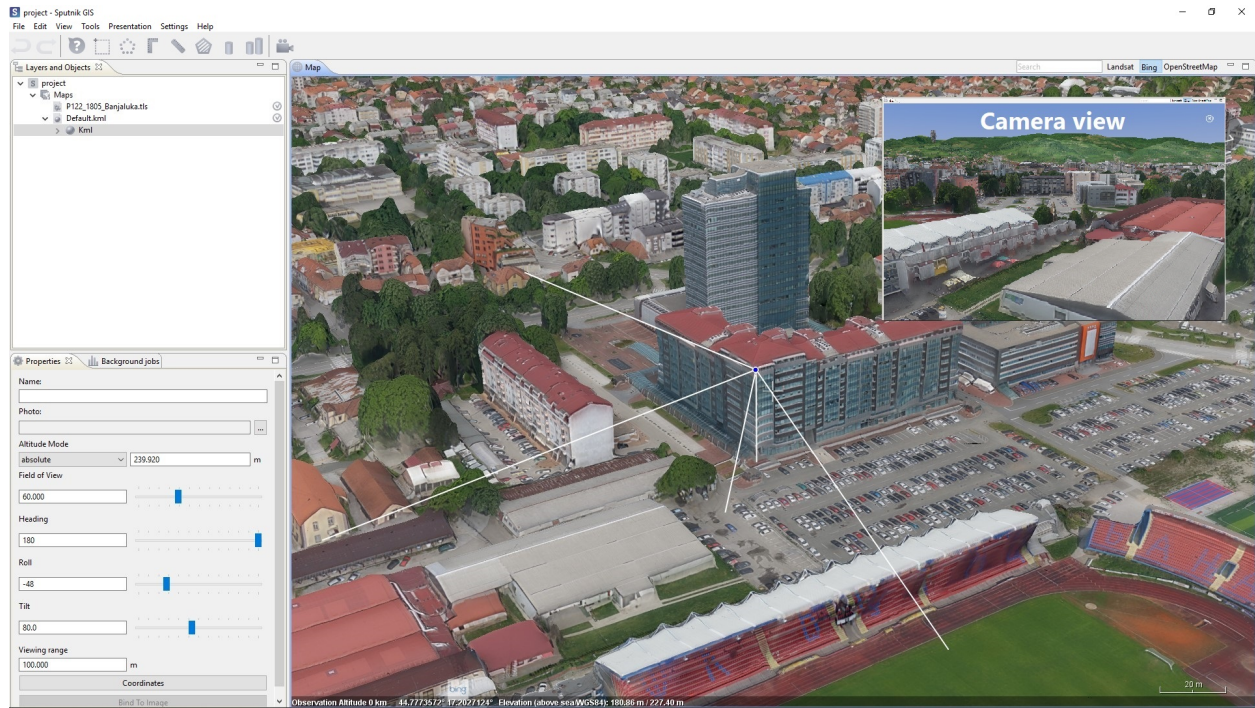


You can set the parameters for **Visibility area** tool in the **Properties** window. To export visibility area in *.tiff format, right-click it in the **Layers and objects** window and choose **Save as...** command. In the **Save visibility area** dialog box set the output resolution and click **Save** button. In case **Import into project** box is checked, the output *.tiff file will be imported into project.

10.3 Observation point


 **Observation point** tool allows to model view from given point on the model and binding image to it.

To start observation modeling, choose  from **Tools** menu and set the observation point in the **Map** window. To change observation point position click it in the **Map** window and drag it. To change observation point altitude, press **Shift** button and drag it. To switch to first person view from observation point, right-click it and choose **CCTV view**.

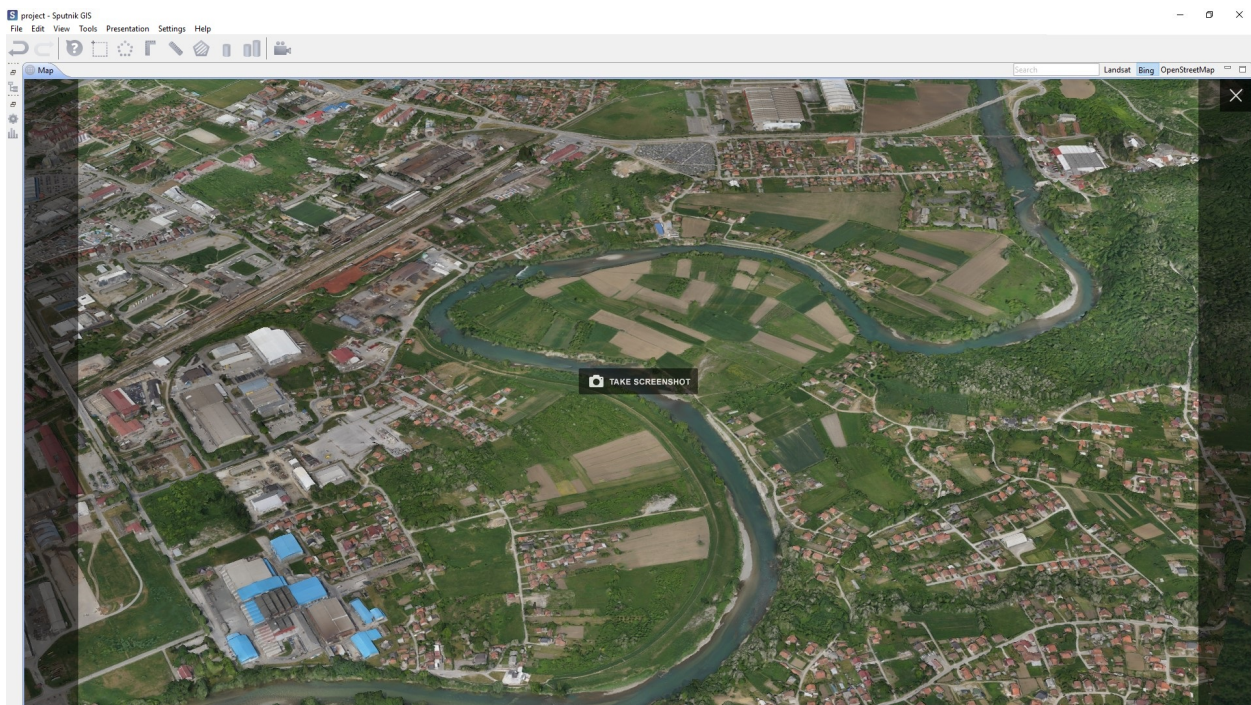


You can set the parameters for **Observation point** tool in the **Properties** window. To attach an image to observation point select an image in the **Properties** window. To project attached image to the model, right click on the observation point and choose **Bind to image**.



11.1 Screenshot



 **Screenshot** tool allows to create high resolution screenshots of 3D models and other data imported into the project.

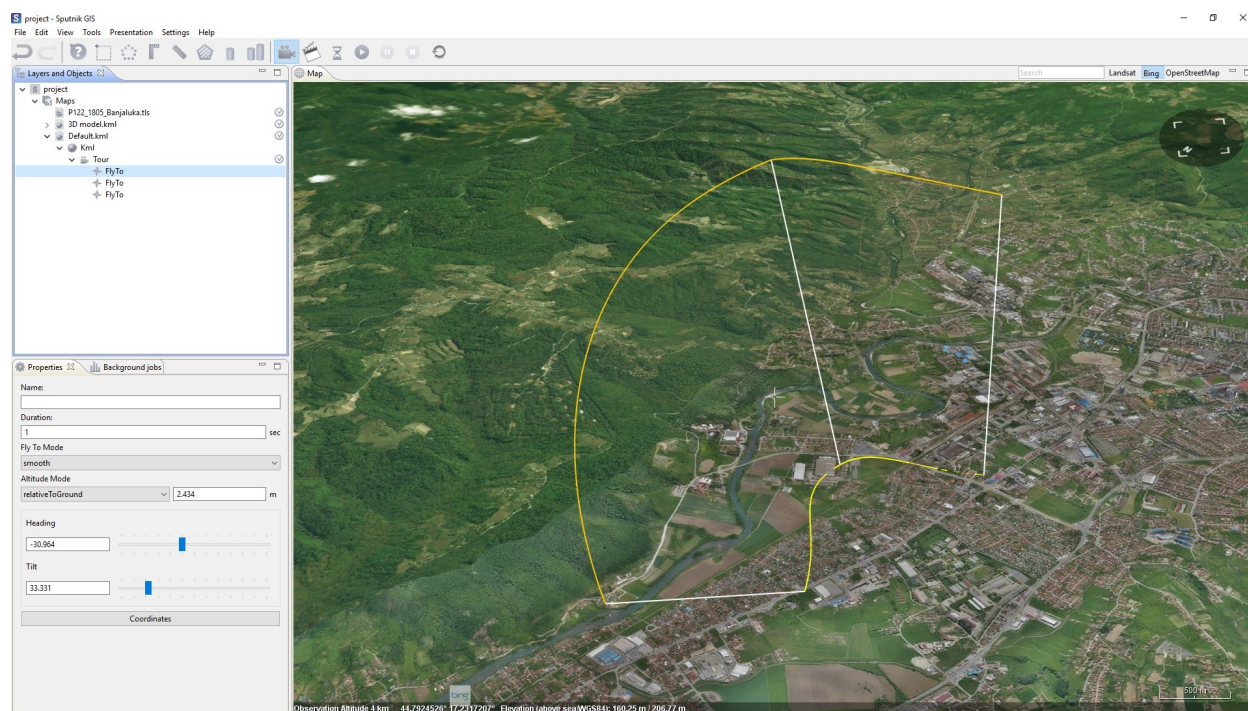
To create screenshot choose one of available resolutions or **Custom size** command from **Screenshot** sub-menu of the **Presentation** menu. To take screenshot click **Take screenshot** button in the **Map** window.





11.2 Video tour


 **Tour** tool allows to create video tour around the 3D model, or other data imported into the project, and render it in high resolution. To start video tour creation click  icon on the toolbar. To save current

view as key position click  icon on the toolbar, to create delay click  icon on the toolbar. You can change key position parameters and delay parameters in the **Properties** window. Location of key position can be changed in the **Map** window, to do that drag key position node in the **Map** window. To change key position altitude, press **Shift** button and drag it.



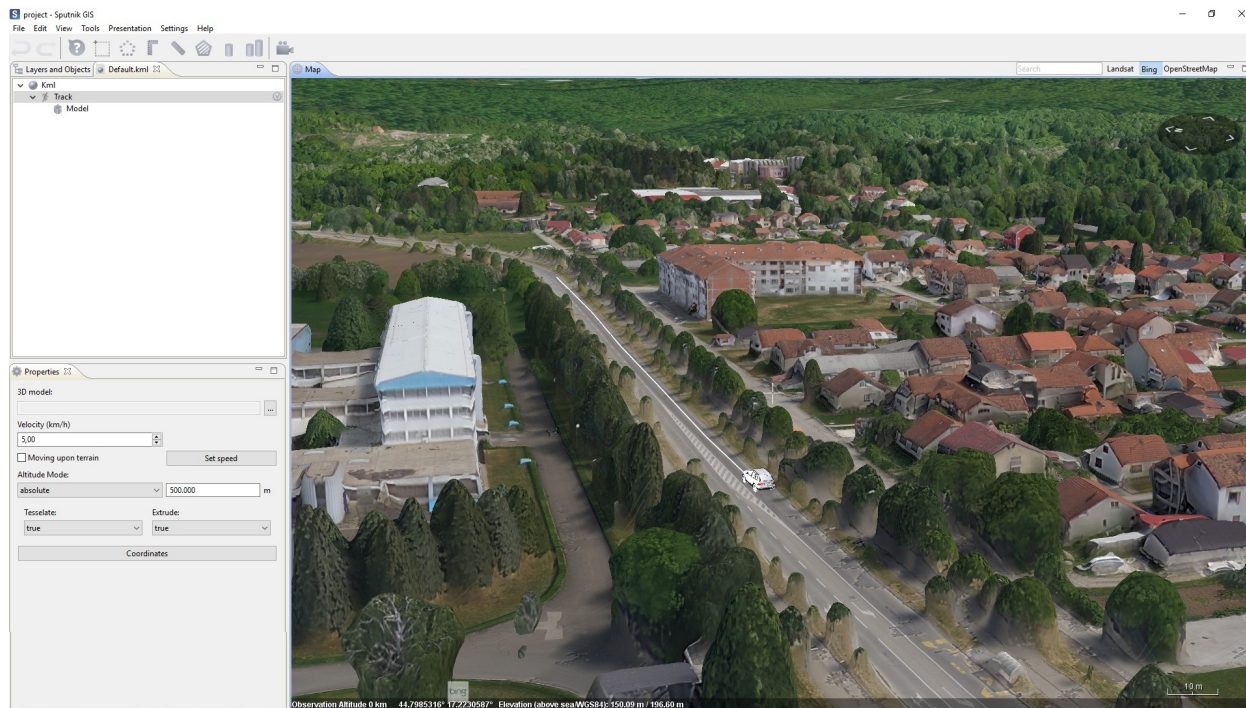
To play video tour use  and  buttons on the toolbar. To render a video from video tour right-click the tour in the **Layers and objects** window and choose **Video recording...** command. In the **Video settings** window set rendering parameters and click **Record...** button.

11.3 Animated track

 **Track** tool allows to create animated track for 3D model.


To start animated track creation choose **Record a track** command from **Presentation** menu and draw a trajectory of track. To attach 3D model to track, set it in the **Properties** window, other parameters of track are available in the **Properties** window as well.

To play animated track use  and  buttons on the toolbar.



Note: Video tour may be combined with animated track. To render an animated video from video tour and track, create new folder and drag and drop tour and track objects into it. Then right-click the folder in the **Layers and objects** window and choose **Video recording...** command.

12.1 Creating a Grid

The  **Grid** tool is used to create a regular grid with indexed cells.

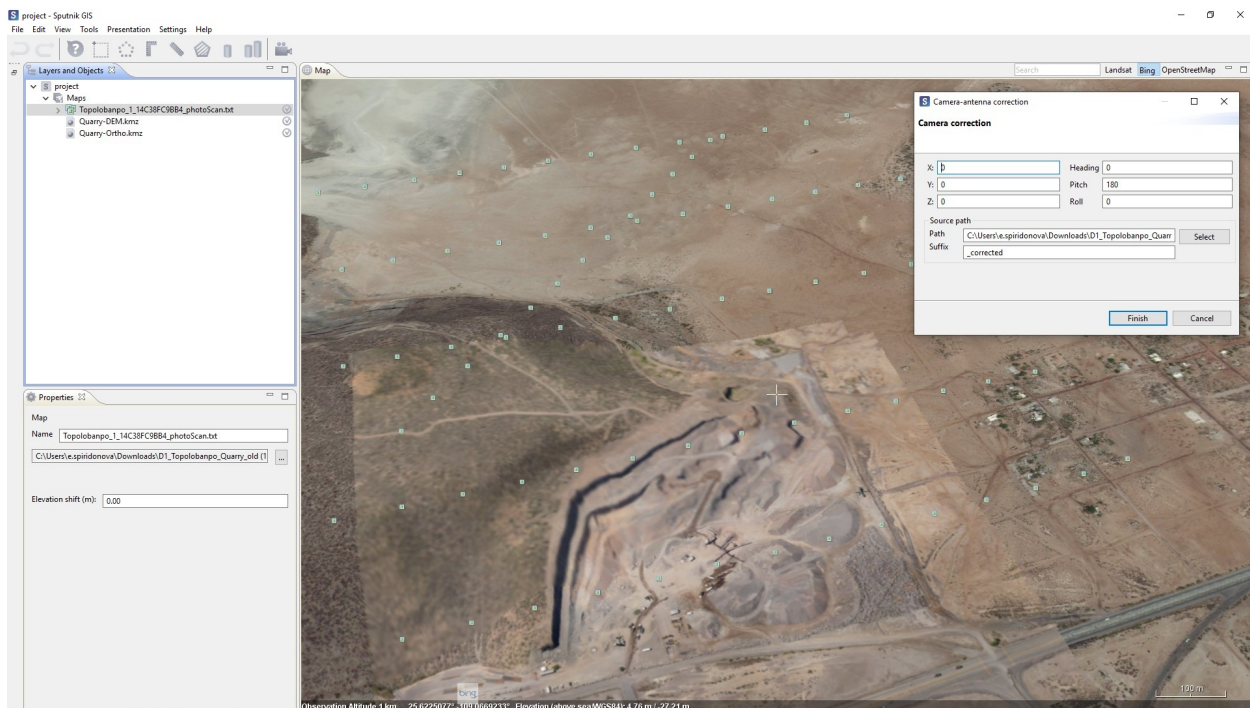
To create a grid in **Layers and objects** window, select *.kml file containing a polygon bounding region for the grid. Select **Create grid** from **Tools** menu. In the dialog box, set the grid size in kilometers. Specify the path to save the result and press **OK**.



Note: To select several squares from the grid, hold down the **Ctrl** key and then click the square in the grid one by one.

12.2 Camera-antenna correction

The program GIS Sputnik the ability to correct the distance between the antenna and the onboard GPS receiver UAV. For correction, add a text document with the coordinates of the photo centers. In **Tools** section, select **Camera-antenna correction**. Camera-antenna correction is also available in the context menu of the file. In the **Map** window that appears, specify the necessary correction parameters.



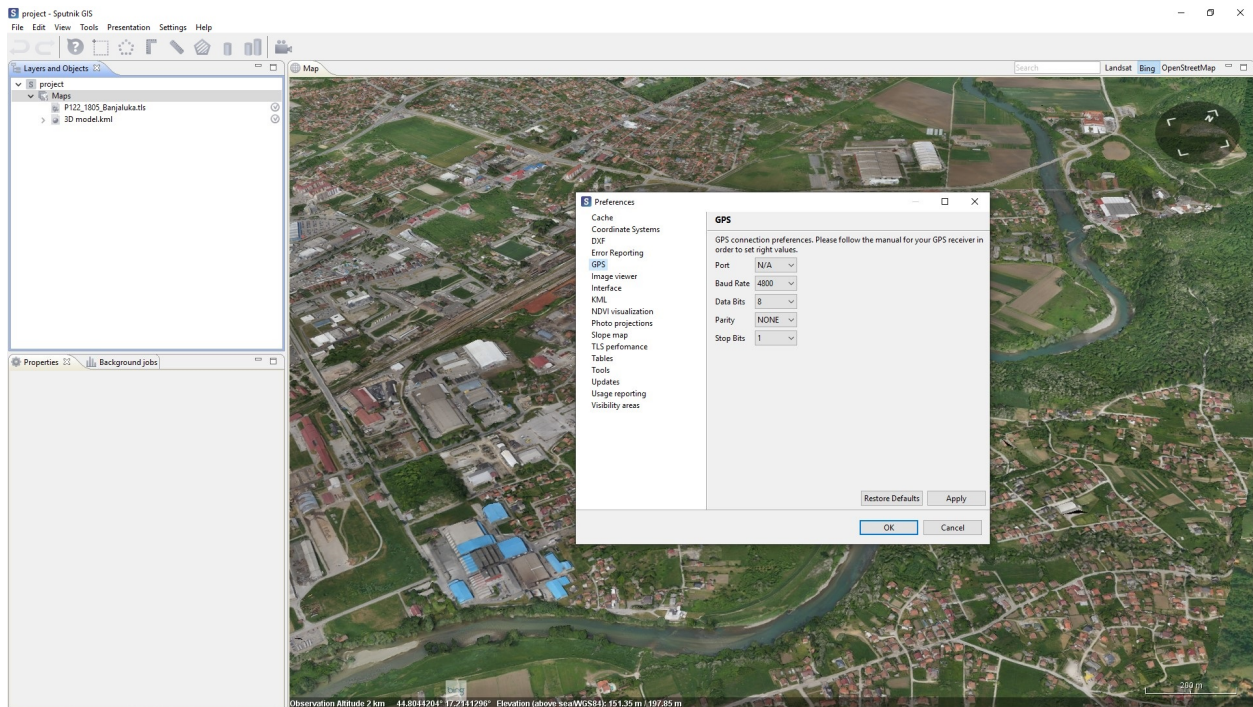
Important: the **Suffix** is added automatically by the program, if it does not appear, use **_corrected**.

12.3 Work with a GPS receiver

GPS connection preferences are set to GPS receiver functions. Select **Preferences** from **Settings** menu. GPS receiver settings are usually specified in the manual of the receiver model. If the parameters are known, they are entered in the program window **Parameters** in the section **GPS**. The GIS Sputnik takes into account the following parameters:

- Port,
- Baud rate,
- Data Bits,
- Parity,

- Stop Bits.

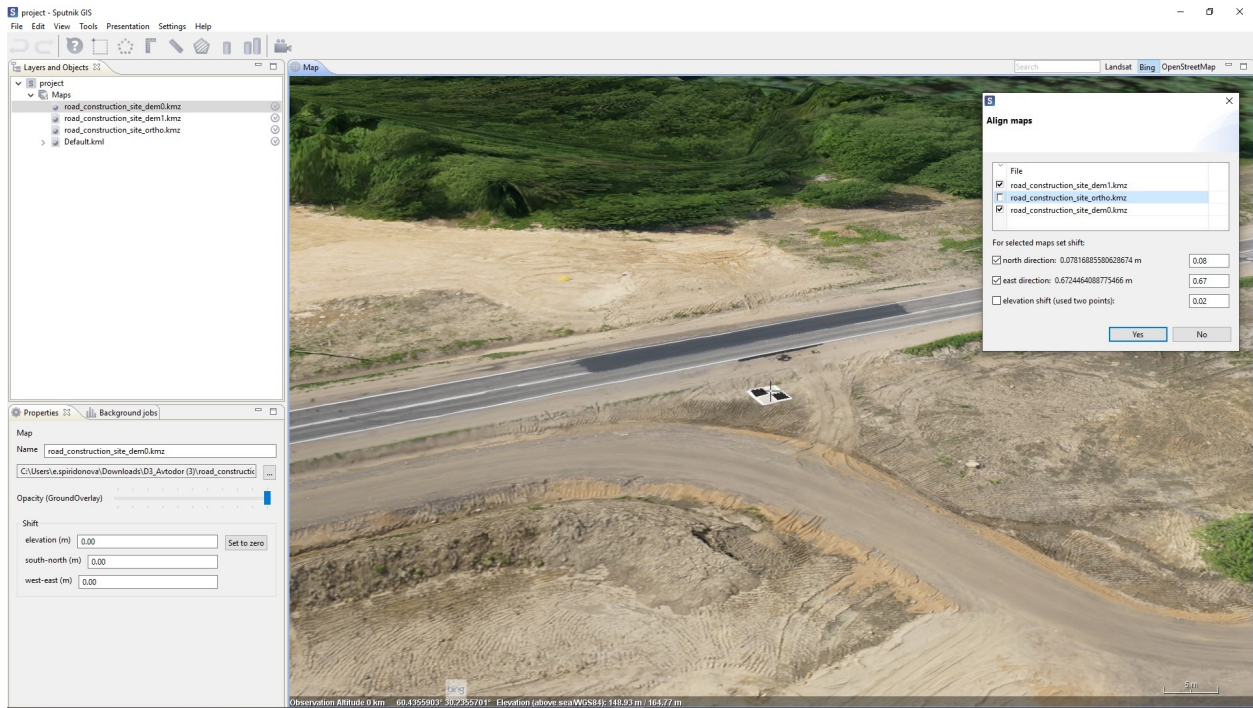


Important: The program allows you to visualize the moving GPS receiver on the **Map**. Select **Follow GPS** command from **View** menu. **Map** window will display the movement of the device.

12.4 Align maps

In the GIS Sputnik program, a tool for **Align maps** relative to each other is implemented. You need to load orthophotos into **Map** window. In **Tools** menu, select **Align maps**.

In **Layers and objects** window, click one of the orthophotos, then select a point on **Map** and click the left mouse button. Red point-shaped marker will appear. Select the corresponding point on the second orthophoto. After that, the shift of the second card will be calculated and it will be shifted to the required distance.



Note: You can shift the orthophoto in the **Properties** window of the selected orthophoto. Shift parameters can be set:

- by height,
- by direction (South-North and West-East).

13.1 Optimisation and re-projection

To speed up the rendering of raster maps in *.tiff format needs to optimize them. In some cases you may need also to reproject raster map into other coordinate reference system.

To optimise or reproject raster map chose **Raster map** command from **Import** submenu of **File** menu. In **Import raster map** window select the raster or several rasters and click **Next** button. Check the *Optimize* box for optimisation. To reproject raster map into other coordinate system double click on it, in the **Coordinate systems** window select one of available coordinate systems and click **OK** button. To finish import procedure, click **OK** button.

13.2 Visualisation

Sputnik GIS allows several visualisation modes for raster maps:

- Single band
- Multi-band mode
- Color palette

Sputnik GIS supports working with such types of raster maps as:

Map type	Number of channels	Stored value type	The default display
Multispectral images	> 3	int	the image in the natural or pseudo color
RGB raster maps	3	int	the image in the natural color
Height map (DEM/DSM)	1	float	relief
Other single-band rasters	1	float	relief
Other single-band rasters	1	int	monochrome image

To change raster map visualisation med click **Additional properties** in the **Properties** window. In the **Additional properties** window switch to **Visualisation** tab and set up visualisation mode.

13.2.1 Single band mode

Single band mode is a default mode for 1 or 2 bands raster maps. You may set up which band will be visualised in the **Map** window.

This mode is the **default** mode for displaying single-band rasters when file loaded into the program.

To switch to this mode, in the drop-down list **Visualization mode** select **Single-Channel**. In this mode, You can set the Max and Min thresholds of values to display.

Important: This mode can also be used to display a single channel of a multiband raster.

13.2.2 Multi-band mode

Multi-band mode is a **default** mode for 3 or > 3 bands raster maps. You may set up which bands will be interpreted as Red, Green, Blue bands and visualise raster map in pseudo color mode.

To switch to this mode, in the drop-down list **Visualization mode** select **Multi-Bands**.

13.2.3 Palettes

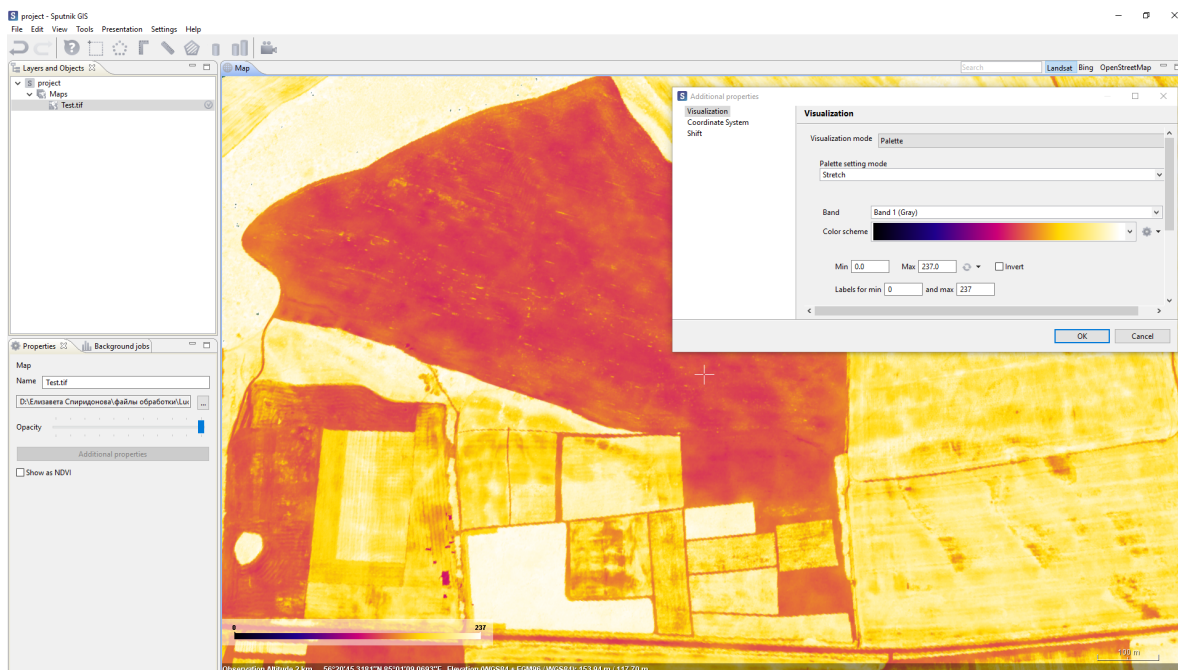
Palettes is a default visualisation mode for any type of raster map. You may use it with any type of raster map to style one of its bands.

To switch to this mode, in the drop-down list **Visualization mode** select **Palettes**.

There are three palette-setting mode in Sputnik GIS:

- **Stretch**

Set band, color scheme and additional parameters and click **OK** button to finish. To set off the palette right-click raster map in the **Layers and objects** window and chose **Default** command from **Show as** menu.

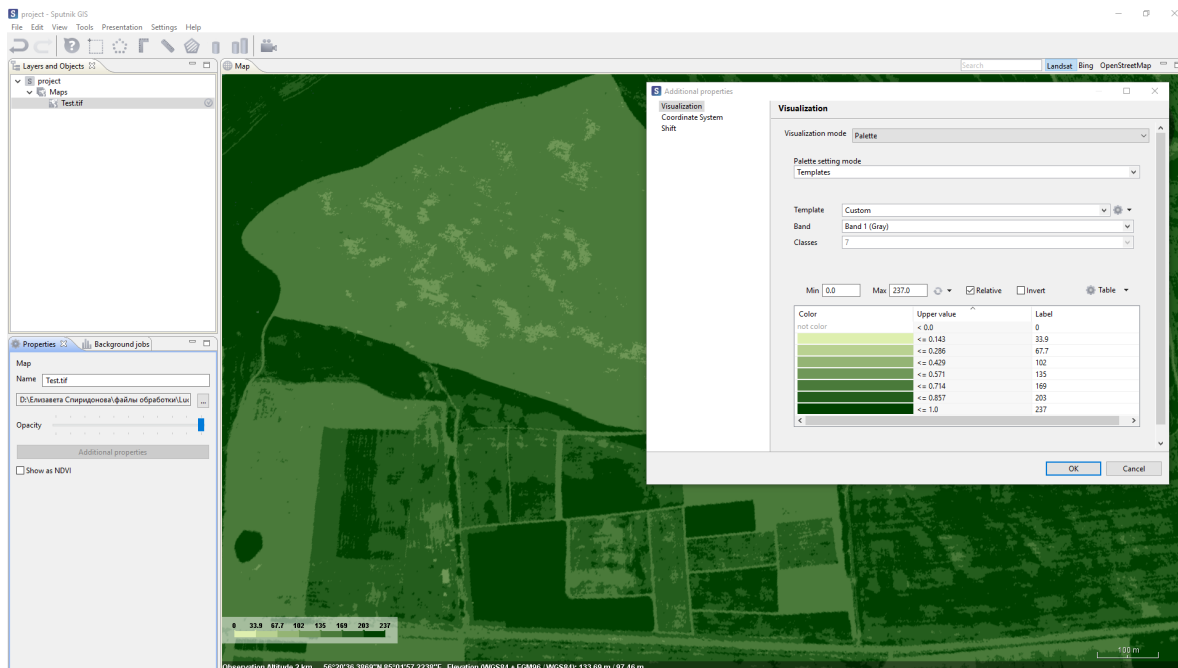


You can save your palette for this section **Color scheme** select **Save as...** The palette will be saved in *.xml format.

- **Classify**

Select band, number of classes and color scheme. Set additional parameters and click **OK** button to finish.

Important: Check *Relative* box to translate the raster values to relative mode (from 0 to 1). If raster has a float type values, it will be interpreted as elevation model. Check *Hide elevation* box to interpret raster map as image.

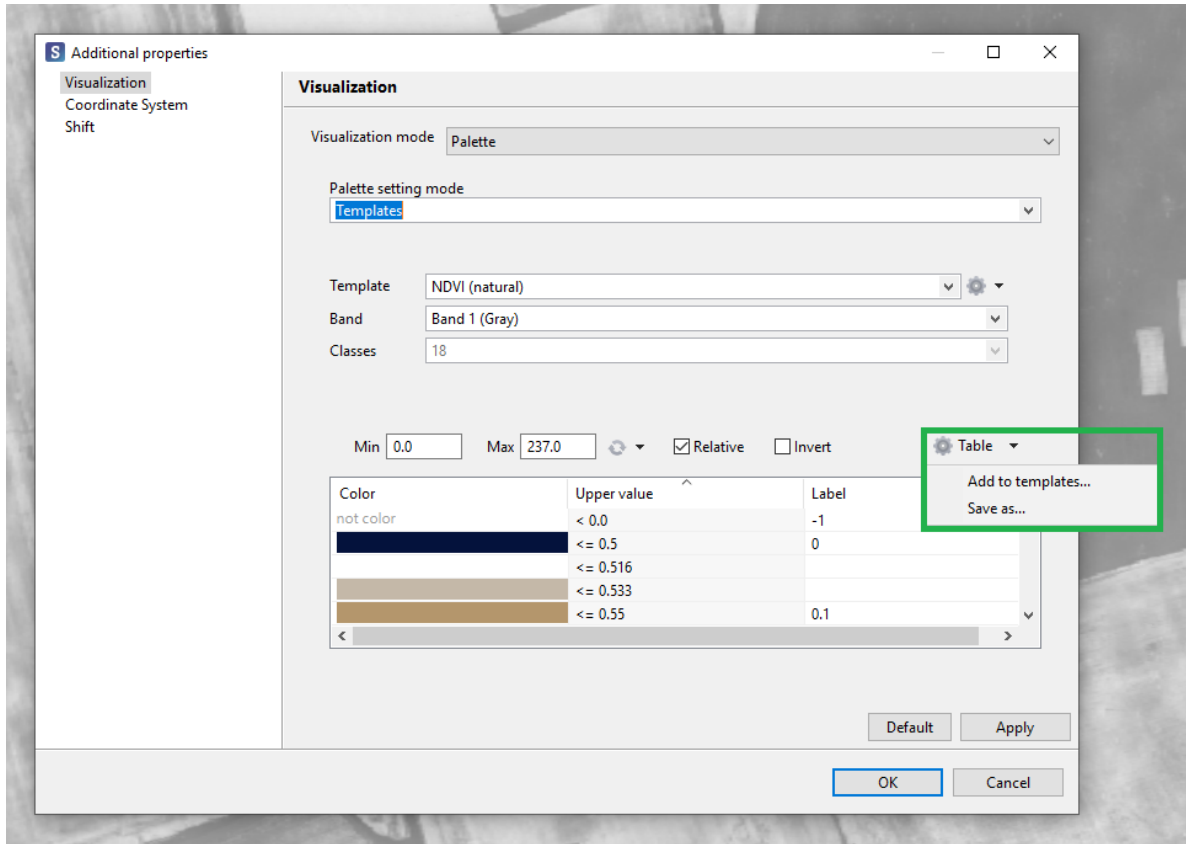


You can save your palette for this section **Color scheme** select **Save as...** The palette will be saved in *.xml format.


- **Templates**


You can create or load templates. To create templates, click **Table** and select **Add to templates...** The file will be added to the list of existing templates.

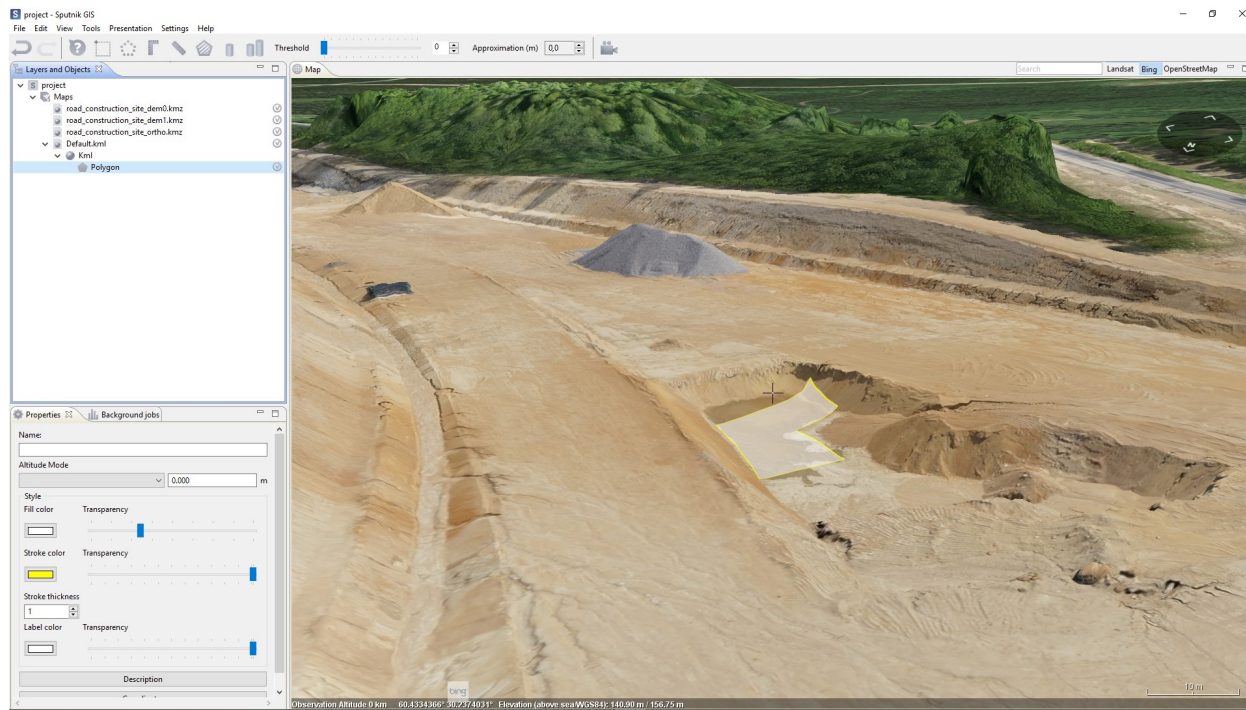
To load palette in the **Template** section, select **Load...** from the context menu. The added palette can be edited and saved to a new file. Select the **Save as...** in the context menu of the section **Table**.



13.3 Magic wand

 **Magic wand** allows to vectorise objects and on raster map in semi-automatical mode.

To start vectorisation choose  icon from **Tools** menu and click on the object of your interest in the **Map** window. When **Magic wand** tool is active you may set its parameters in the toolbar. Change Threshold value - to increase or decrease the vectorization zone. The Approximation parameter is responsible for the number of nodes in the polygon.







Note: Keep **Ctrl** button pressed when using magic wand to automatically merge new polygons with old.

14.1 Geometry creation

Sputnik GIS allows to perform basic edit operations for *.kml files. To create new *.kml file choose **KML** command from **New** submenu of **File** menu.

New *.kml file will be opened in edit mode. When edit mode for *.kml file activated a set of specific tools appears in the toolbar:

Icon	Tool
	Create Point
	Create line
	Create ring
	Create polygon

14.2 Editing

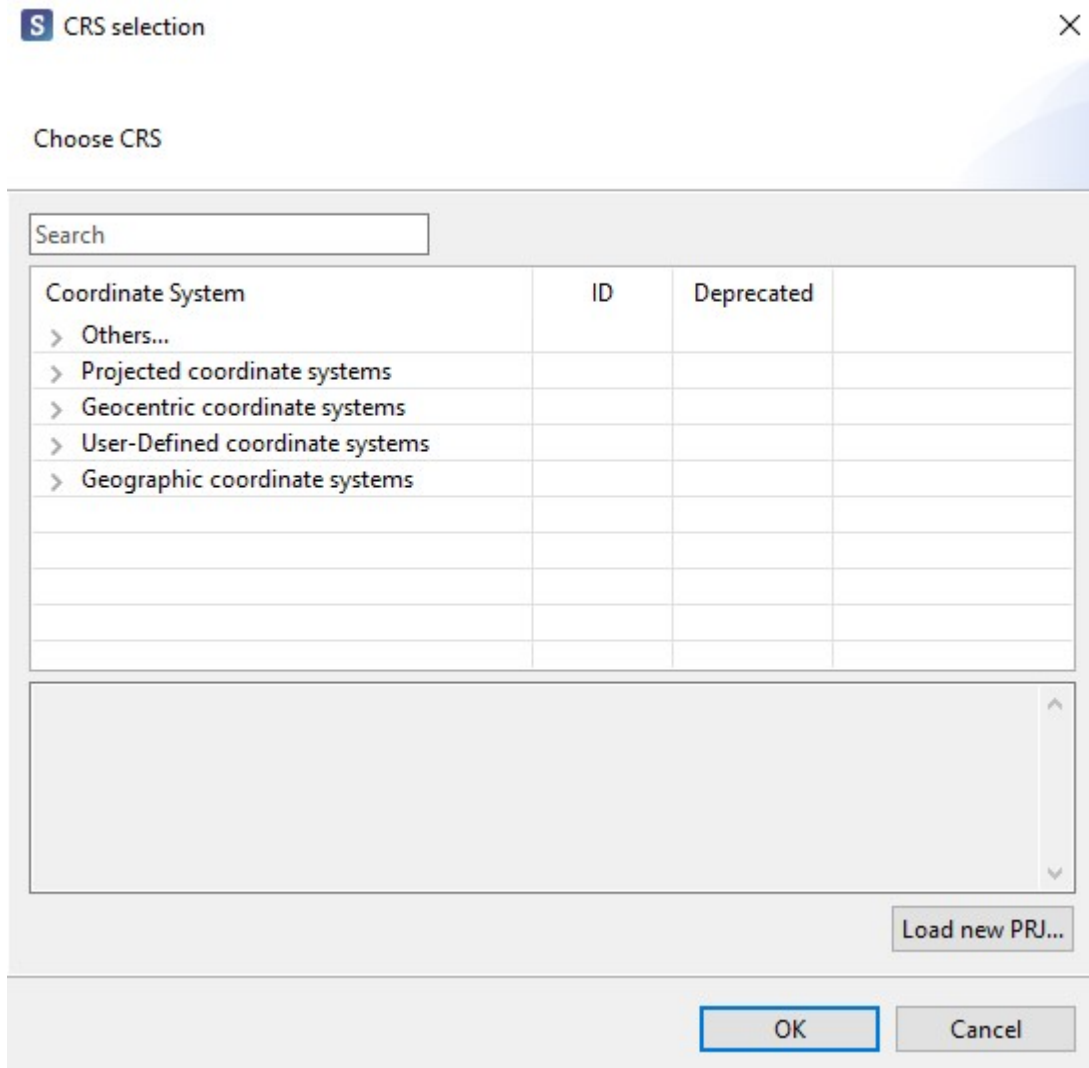
To open *.kml in edit mode select it in the **Layers and objects** window and choose **Open editor** command from context menu.

To edit geometry node, click left mouse button on it in the **Map** window and drag.

To edit coordinates of geometry manually, select it and choose **Edit coordinates..** command from context menu.

In **Edit coordinate** dialog box it is available to:

- change separated node coordinates
- set the elevation for all geometry nodes
- set the coordinate representation mode



14.3 Style

To configure geometry style, select it in the **Layers and objects** window and configure style properties in the **Properties** window.

When several geometries are selected, you can configure common style for all selected geometries.

When folder or multigeometry is selected, you can configure common style for all geometries inside folder or multigeometry.

14.4 Geometry visualisation properties

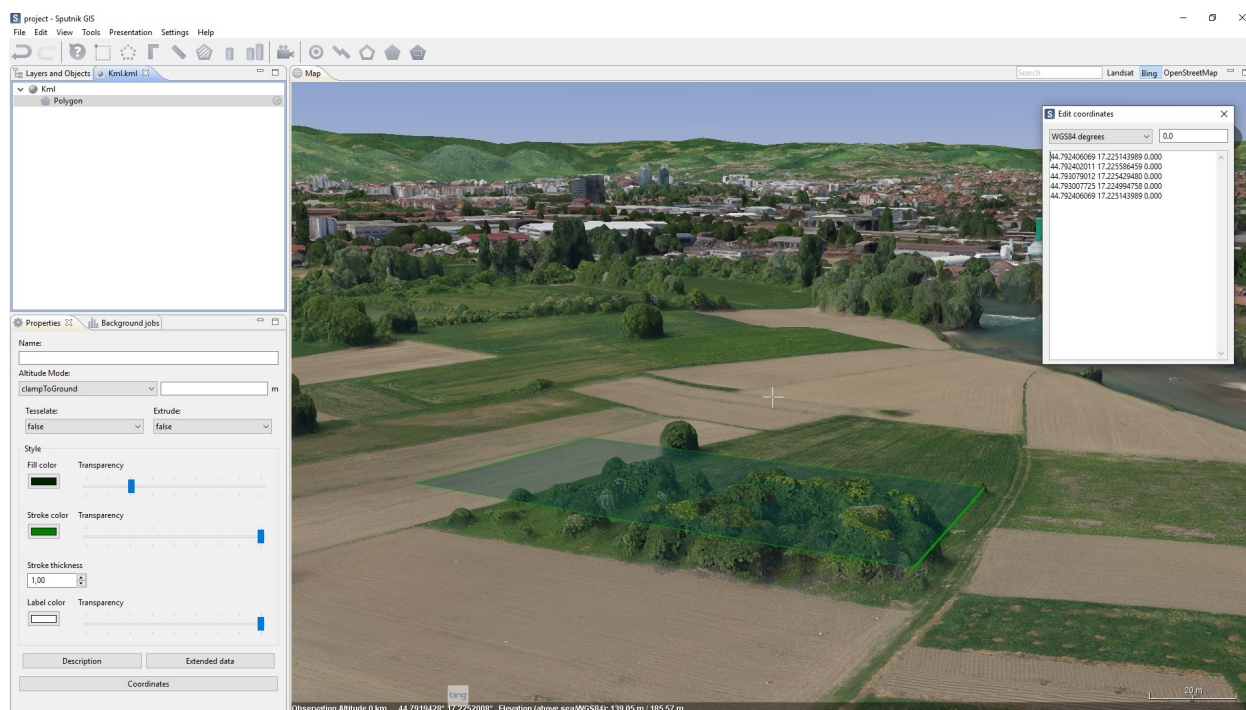
Sputnik GIS tools allow to draw 2D and 3D geometry objects.

Three altitude modes for geometries are available:

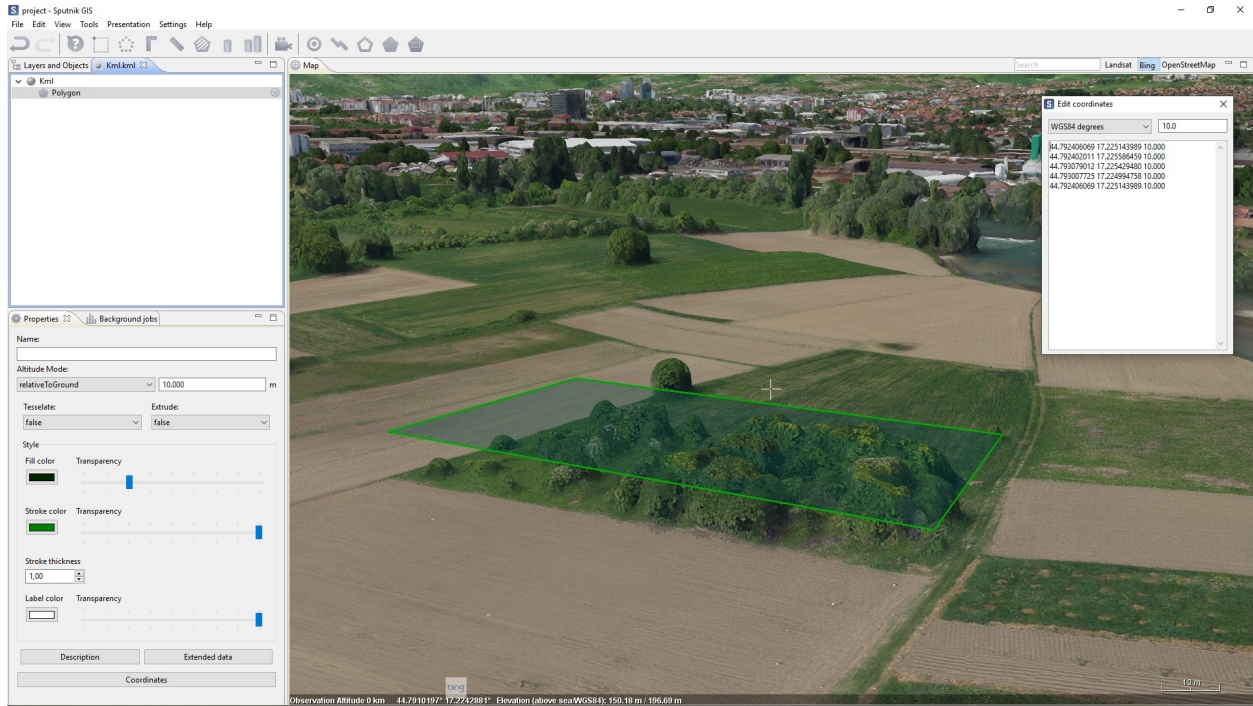
- clampToGround / clampToSeaFloor;
- relativeToGround / relativeToSeaFloor ;
- absolute.

Default mode for geometry objects is clampToGround.

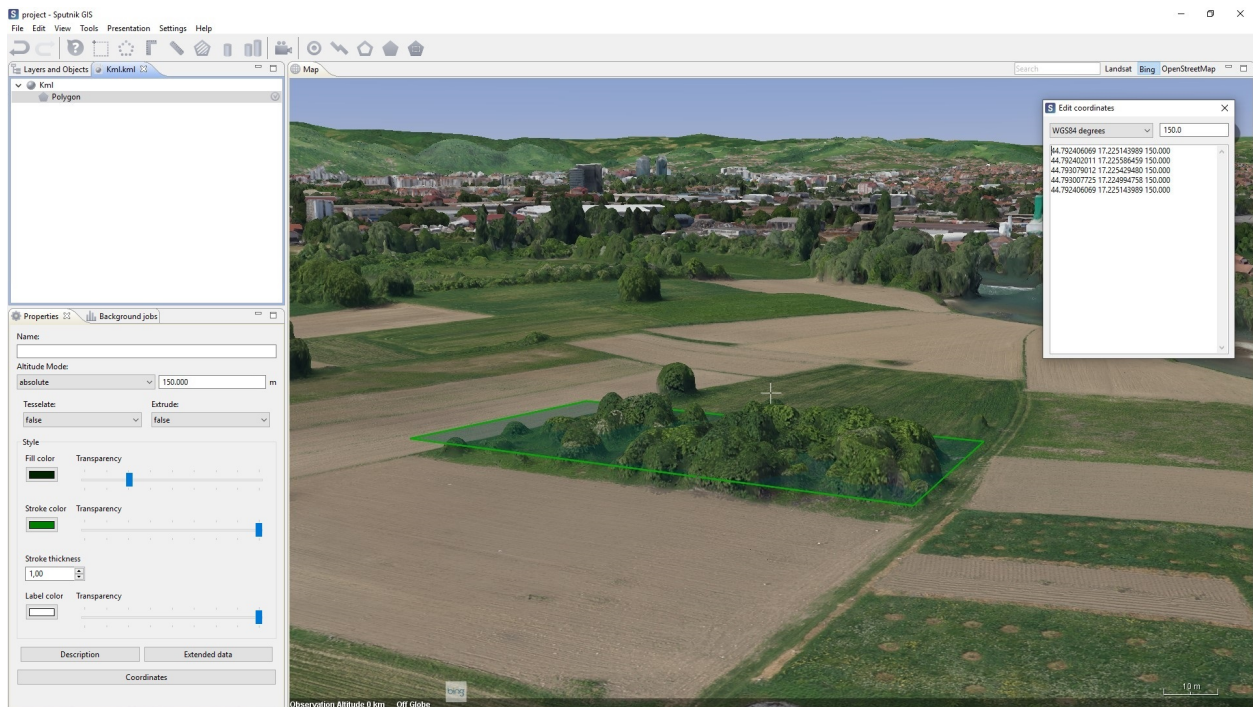
Example: clampToGround mode



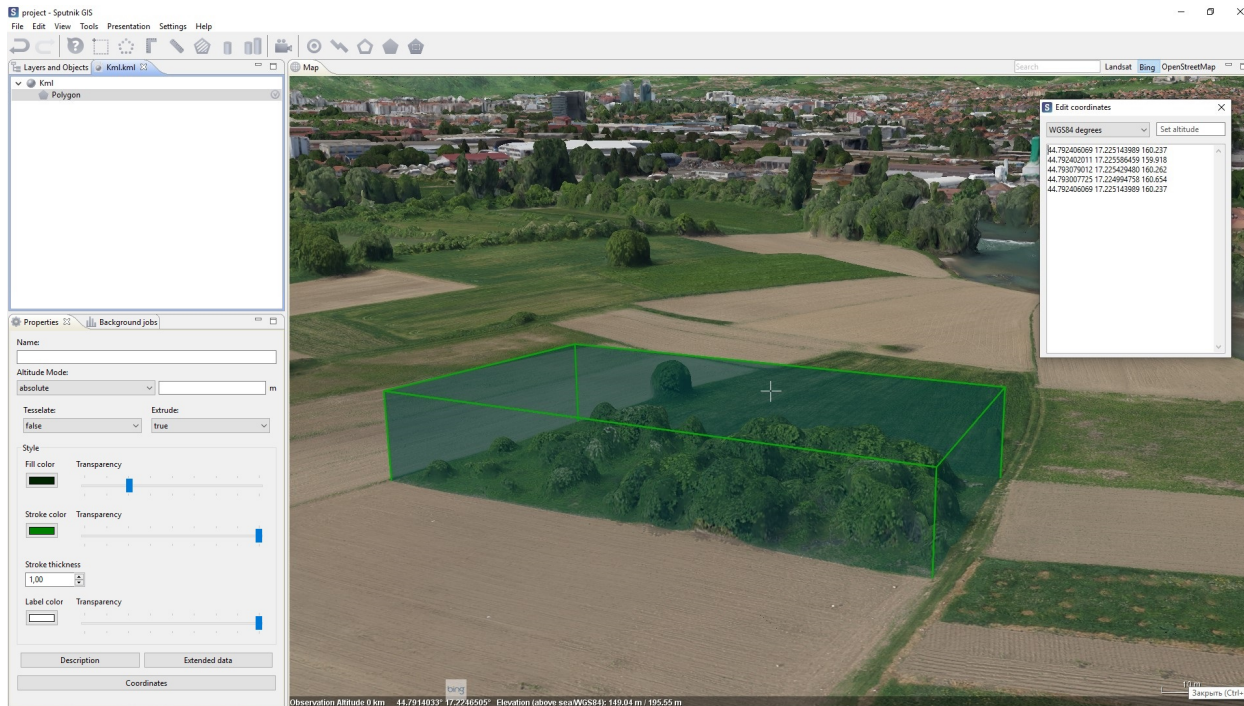
Example: relativeToGround mode



Example: absolute mode



To create 3D geometry objects (only available in absolute or relativeToGround mode) switch extrude mode. To switch extrude mode of geometry object, choose **Change extrude property** in its context menu.



Tessellation is a property of polygons and polylines that is responsible for the geometry drawing method in three-dimensional space, the parameter value can be changed in the **Properties** window. If the value of the parameter **Tessellate** is set to *false*, the geometry will be drawn as a single object and may fall under the relief. If the value of the parameter **Tessellate** is set to *true*, the geometry will be divided into a set of linear primitives and will lie on the relief.

14.5 Extended data and description

Each geometric object can contain attribute information, the *.kml format allows you to add a description and extended data in the format “Name - Value” to the geometric primitive.

To add a description to the geometric object, select it in the window **Layers and objects** and click the **Description** button in the **Properties** window. In the window that appears, you can add a text description of the geometric object, the description supports HTML markup.

To add extended data to the geometric object, select it in the **Layers and Objects** window and click the **Extended Data** button in the **Properties** window. In the window that appears, you can create new attributes and set names and values.

To view a description of an object or its attributes, select the tool | inf | on the toolbar and click it on the geometric object in the window **Map**.

14.6 Geometry operation

Sputnik GIS has a wide range of tools to convert between different types of geometry and perform boolean operations on two or more polygons

Select two or more polygons in the Layers and Objects window or in the 3D map window, then call the context menu by clicking right mouse button. You can perform the following operations:

- Union – polygons dissolve into one polygon, or become a multigeometry feature if there are no common points.
- Intersect - only the common points are copied to the resulting polygon(s).
- Difference – the common points of the polygon(s) are subtracted from the first selected polygon.
- Symmetrical difference – only the non-common points are copied to the resulting polygon(s).

It is possible to transform geometry objects from one type to another:

	from point	from lines	from ring	from polygon
Create points		+	+	+
Create line	+		-	-
Create ring	+	+		-
Create polygon	+	+	+	

To transform geometry objects from one type to another, select two or more objects in the **Layers and Objects** window and choose one of available transformations in its context menu.

To create buffer, select geometry and choose **Create buffer** command from its context menu.

14.7 Export

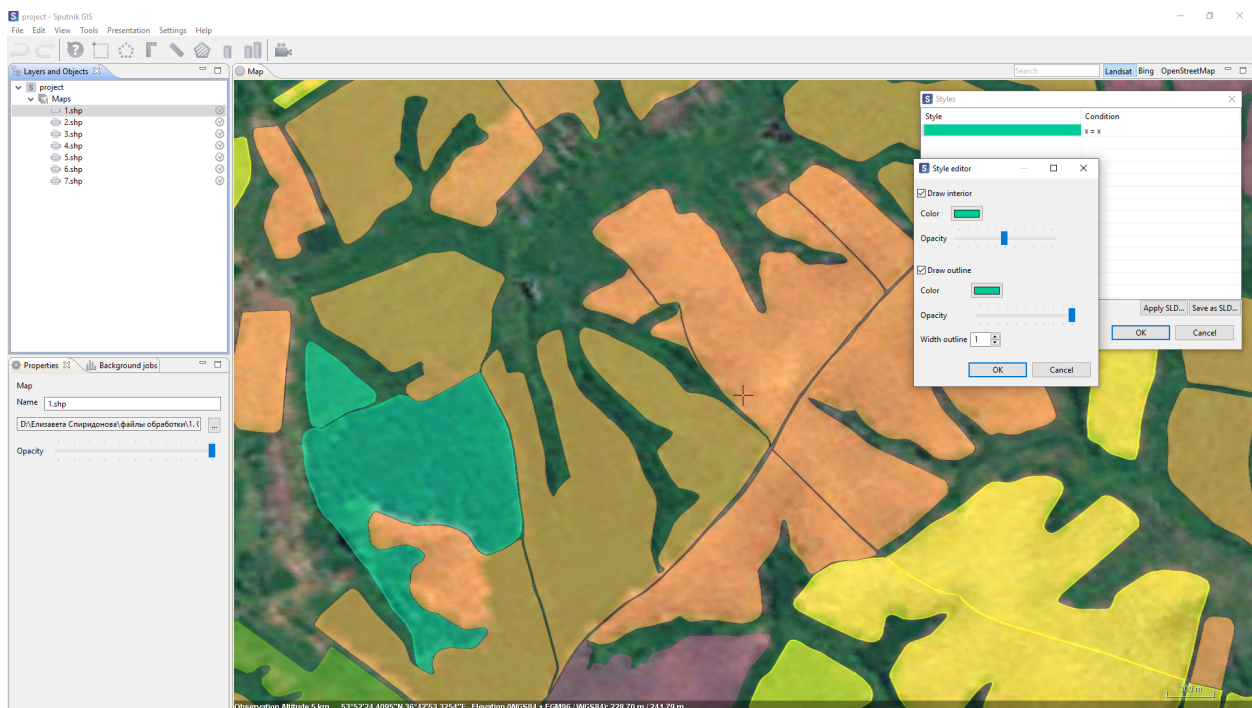
It is available to export *.kml file into *.dxf and *.shp formats for further usage in GIS and CAD applications. To export *.kml file to *.dxf or *.shp choose **Save as** command from its context menu. In the **Save** dialog box select name, format, and directory for output file. You can use *.prj file to set custom CRS for the output *.dxf or *.shp file file.

When you export *.kml file containing more than one geometry type into *.shp format, select geometry types you would like to export. Each geometry type will be exported in separated *.shp file. You can create dictionary for attributes names. Click settings in the **Export Kml to ShapeFile** dialog box, set up names for output attributes in the Conformity column and click **Save** dictionary. To use the dictionary created earlier, click **Apply** dictionary.

CHAPTER 15

Shapefiles tools

Sputnik GIS support importing and visualisation of *.shp file and exporting *.kml files into *.shp format. Know more about exporting *.kml file into *.shp in *KML tools* chapter. To open *.shp select **File > Open > File....** In the dialog box, specify the file type - *.shp. The file appears in the **Map** window.



15.1 Viewing attributes

To view *.shp file table of attributes right-click it and choose **Show attributes**. To switch between pages of attributes table use **Previous** and **Next** buttons.

15.2 Setting styles

To set up styles for *.shp file, right-click it and choose **Shapes style...** command. In the **Shapes style...** window you may apply *.sld file to *.shp file. To apply *.sld file right-click on *.shp file in the **Layers and objects** window and choose **Shapes style...**, in the **Styles** window click **Apply SLD...** button and select proper *.sld.

To change style for condition, double-click on it in the **Styles** window and set up new style in the **Style editor** window. To save new *.sld file, use **Save as SLD** button in the **Styles** window.

Note that the format specification is *.shp implies strict typing of the file by geometry type, different styles are applied to different types of layers:

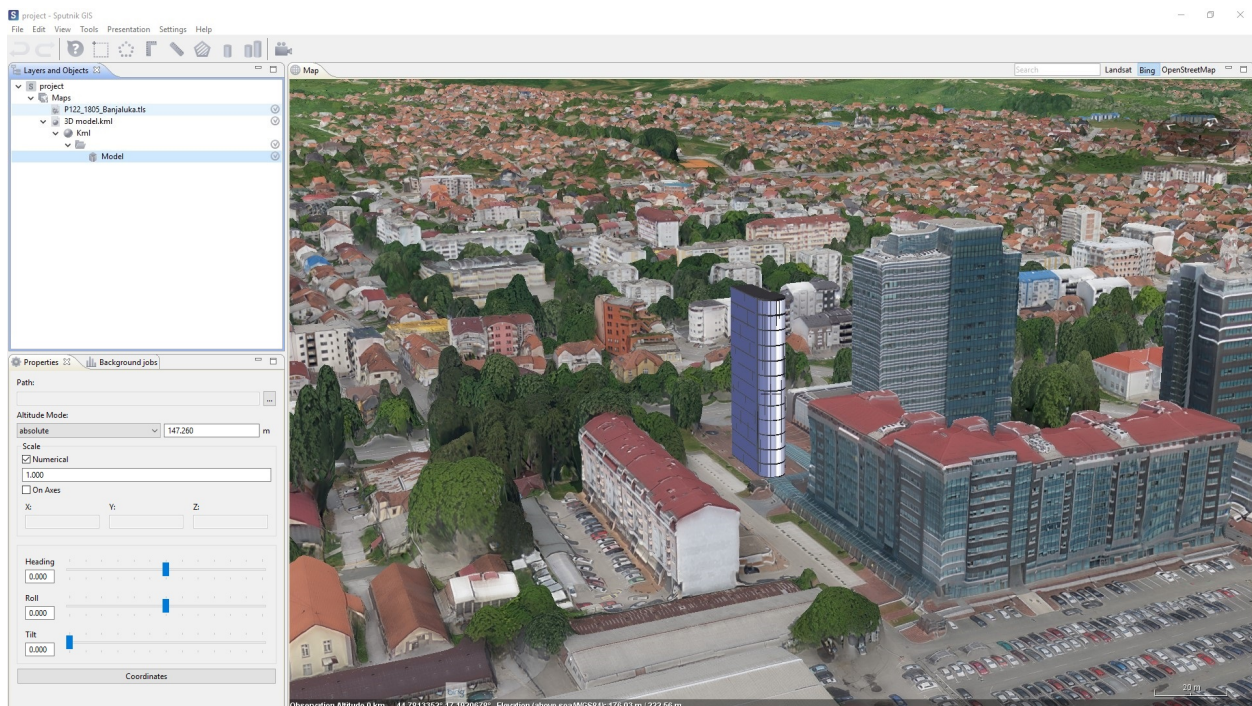
Layers	Available style	Available style	Available style
Points	Marker thickness	Marker color	•
Lines	Line thickness	Line color	•
Lines	Stroke thinckness	Stroke color	Fill color

CHAPTER 16

3D models tools

Sputnik GIS support 3D models in *.obj, *.3ds, *.dae extensions. It is available to view model in **Map** window, scale and change it's orientation. To open 3D model in Sputnik GIS use **File** command from **Open** submenu of the **File** menu. To change 3D model properties, select it in the **Layers and objects** window and change properties in the **Properties** window.

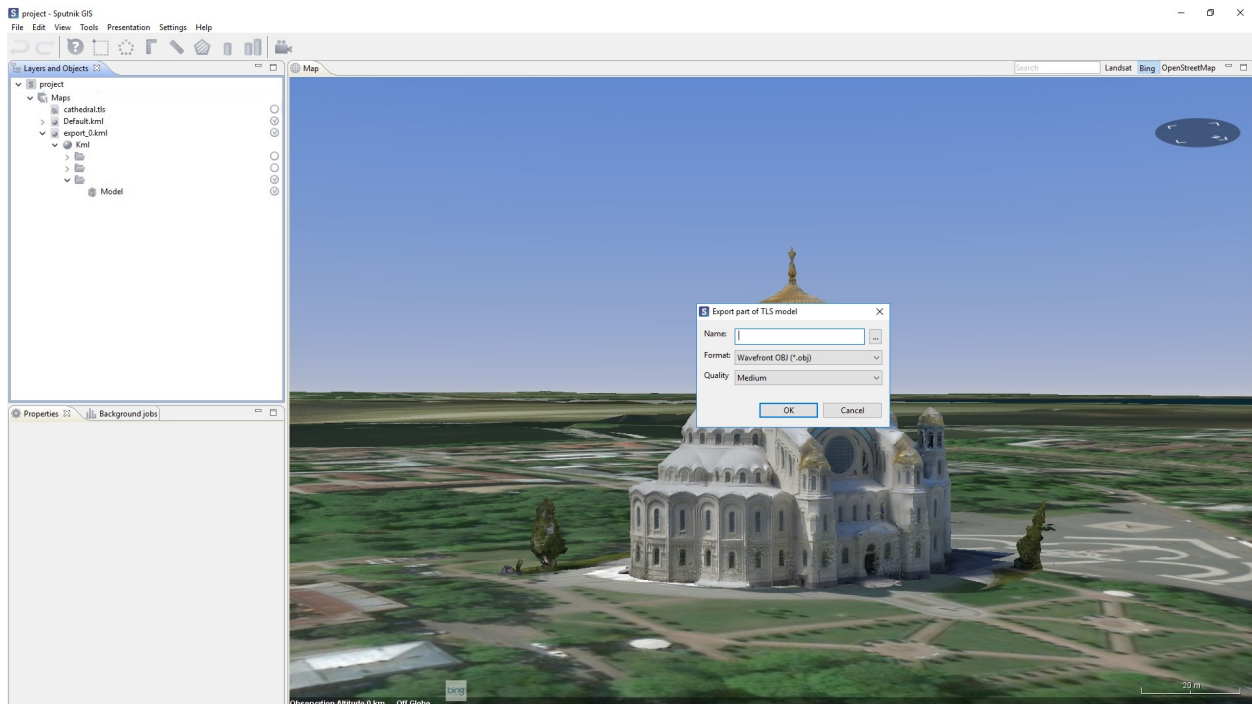
Important: Imported model will be placed to the point marked by crosshair. Along with model, *.kml file with spatial reference, scale and orientation data will be created.



17.1 Exporting part of *.tls model


 **Export part of *.tls model** tool allows to export part of 3D tiled model in *.tls form into *.3ds, *.obj, *.dae format.

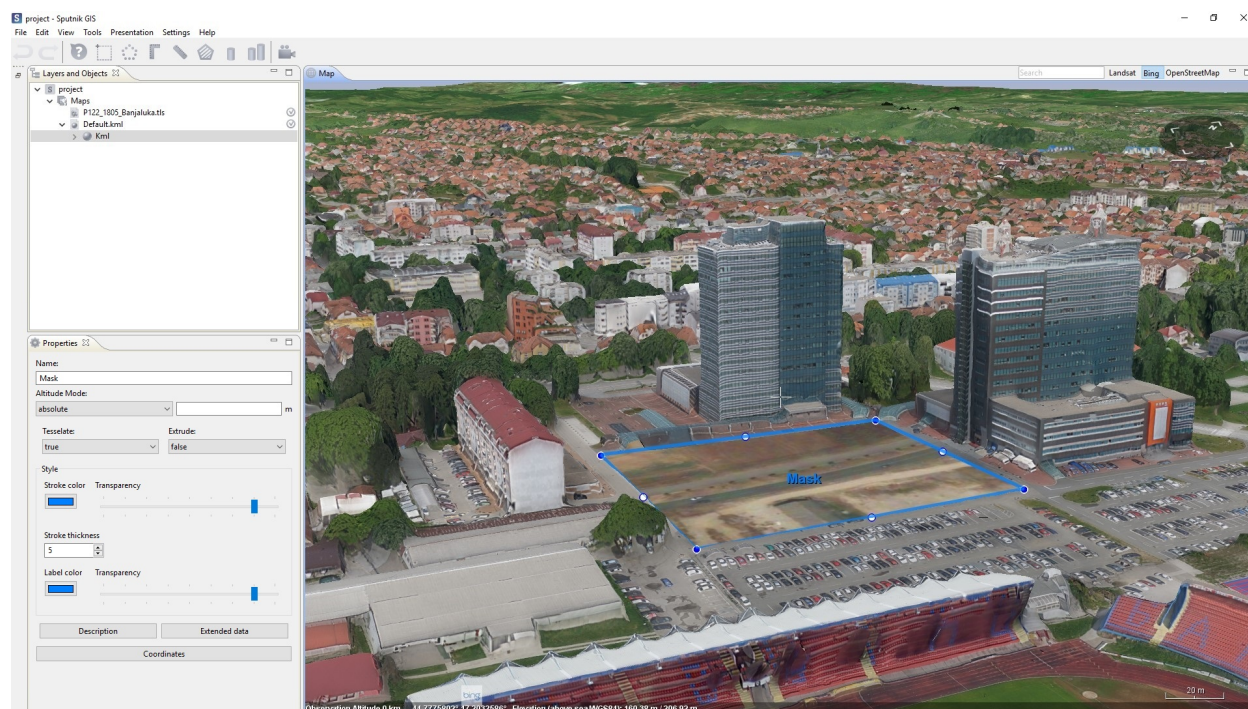
To export part of *.tls model choose  command from **TLS tools** submenu of **Tools** menu and draw a polygon to export part of model within it. In the **Export part of TLS model** window set up path for the output, *Quality*, *Format* and click **OK** button.



17.2 Masking *.tls model

 **Create TLS mask** tool allows to mask part of *.tls model within given polygon.

To mask part of *.tls model choose  command from **TLS tools** submenu of **Tools** menu and draw a polygon to mask part of *.tl model within it. To reset mask right-click on it and choose **Reset TLS Mask** command. To set mask properties right-click it and choose **Properties of TLS mask**.



Sputnik GIS supports point clouds in *.las and *.oc3 formats.

The tools listed bellow may be used with point cloud:

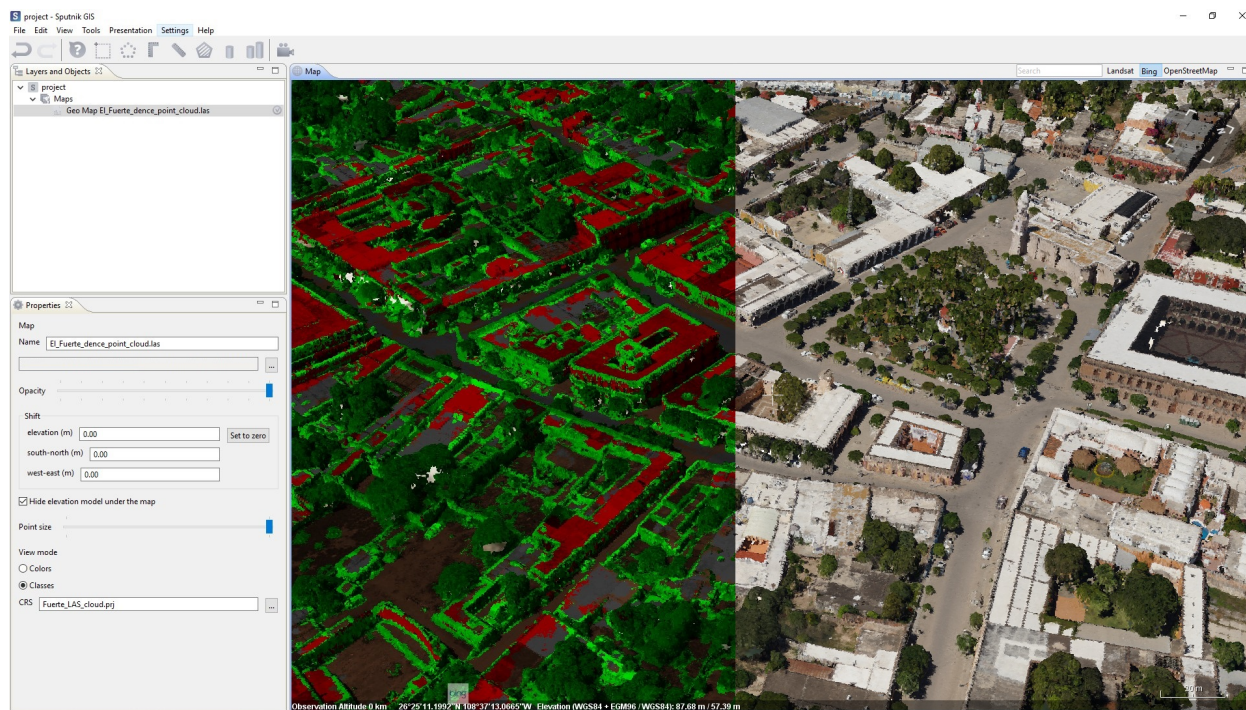
- Ruller,
- Corner ruller,
- Area,
- Drawing *.kml geometries.

18.1 Lidar point clouds in *.las format

To import *.las file into Sputnik GIS choose **File** command from **Open** submenu of **File** menu. In some cases *.las file have no proper information about coordinate reference system in it's metadata. In this case you can set it manually in the **Properties** window.

Two modes are available for point cloud visualisation: *colors* and *classes*. To change point cloud visualisation mode, right-click it and choose one of available mode from **View mode** submenu.

The point cloud is in the *.las format can not contain information about coordinate system, set the coordinate system of the file manually. In the **Properties** window, select **Advanced properties** and set the coordinate system in the dialog box. You can set the offset of the point cloud.



18.2 Agisfot point clouds in *.oc3 format

To import *.oc3 file into Sputnik GIS choose **File** command from **Open** submenu of **File** menu.

Two modes are available for point cloud visualisation: *colors* and *classes*. To change point cloud visualisation mode, right-click it and choose one of available mode from **View mode** submenu.

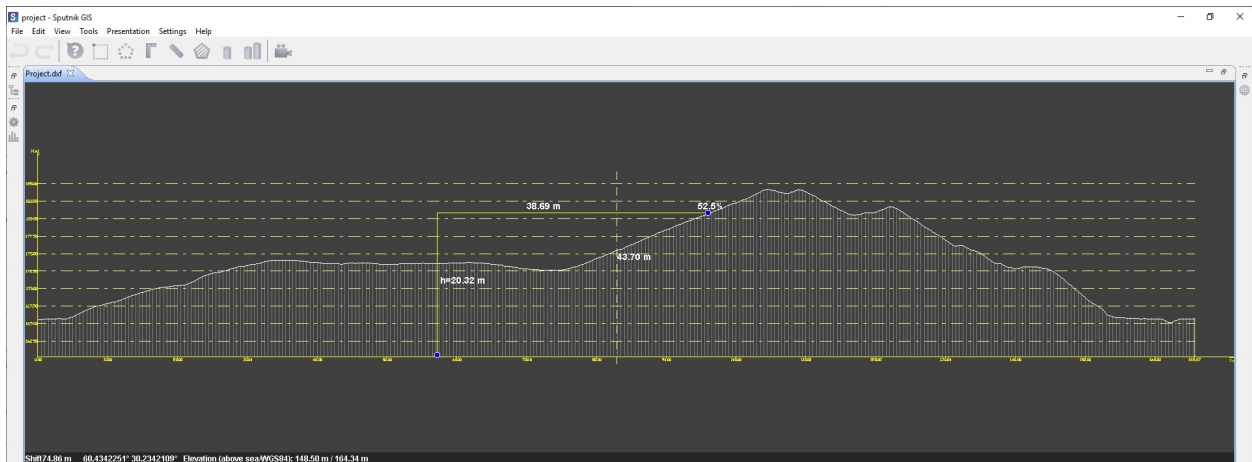
CHAPTER 19

Drawings tools

Sputnik GIS support generation of *.dxf files and it's visualisation in 2D **Drawing viewer**

You can export to *.dxf format any *.kml file, also such tools as: sections, cross sections, compare sections, TIN model create output in *.dxf format. To import *.dxf into Sputnik GIS choose **File** command from **Open** submenu of **File** menu. To open drawing in **Drawing viewer** double left-click on it in the **Layers and objects** window.


You can perform measurements in **Drawing viewer** using corner ruler  .

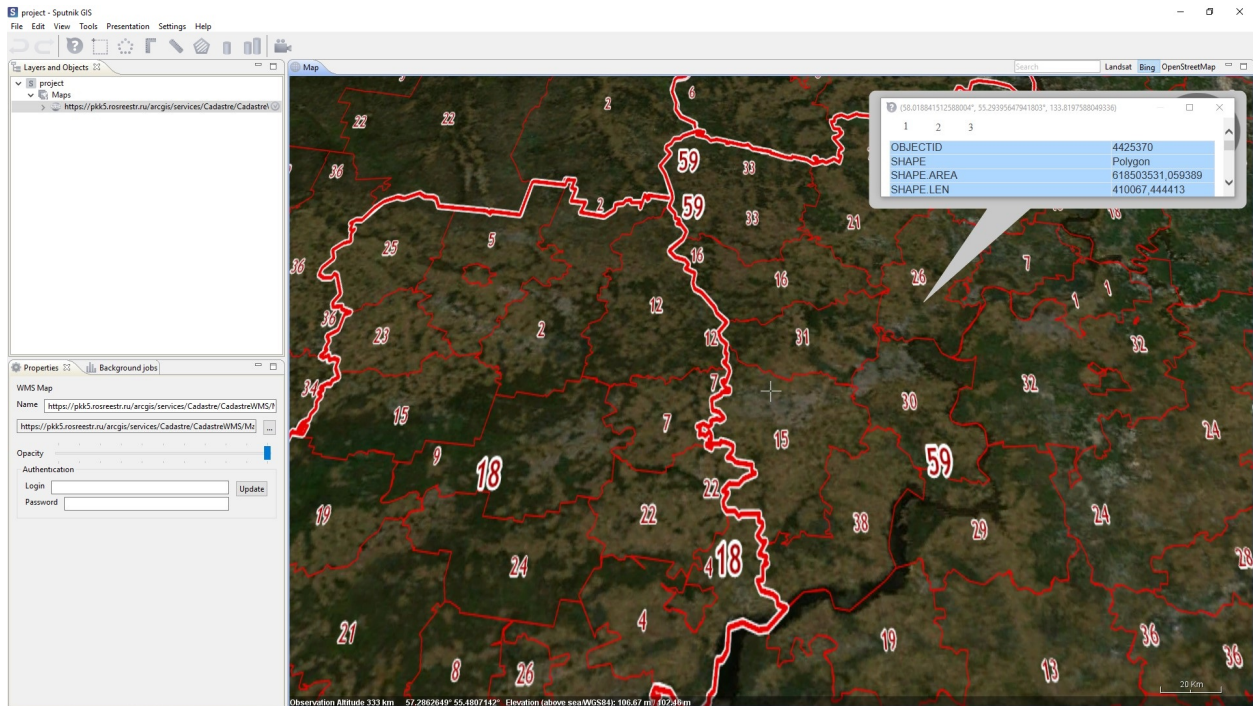


20.1 WMS/WMTS services

WMS - Web Map Service WMTS - Web Map Tile Service

To import WMS or WMTS map choose **WMS/WMTS..** command from **Import** submenu of **File** menu. In the **Import Web Map** dialog box set up the *url* and *Authentication* parameters if needed and click **Next** button. Than select needed layers and click **Finish** button.

It is available to get feature info from WMS/WMTS maps imported. To do that use  tool on interested feature.



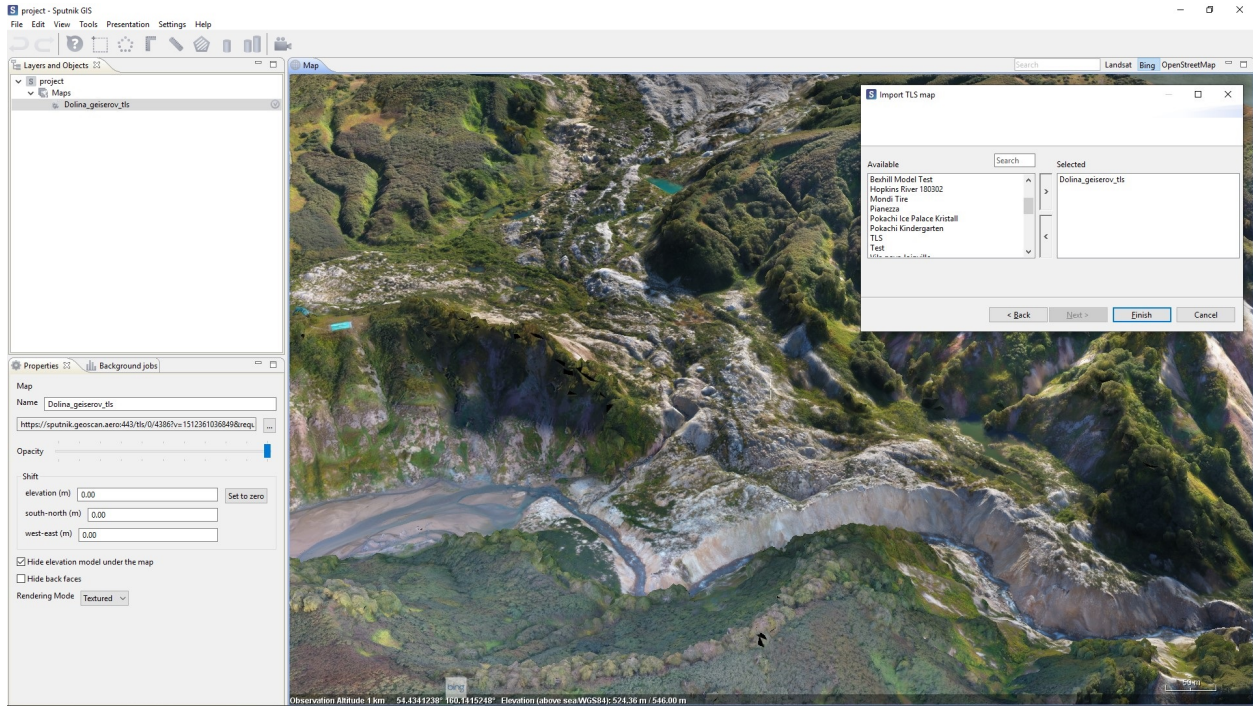
Due to WMTS support, you can use your own tile surfaces, created with Mapbox service. To use your Mapbox tile surface, copy its link and paste it to URL-string in **Web map import** window.

20.2 TLS service

TLS service - Sputnik Web TLS service: <https://sputnik.geoscan.aero/>

To import *.tls model from Sputnik Web service choose **TLS..** command from **Import** submenu of **File** menu. In the **Import TLS Map** dialog box set up *Authentication* parameters for your Sputnik Web account and click **Next** button. Then select needed *.tls models and click **Finish** button.

Selected TLS model will be displayed in **map** workspace.



21.1 Aerial survey

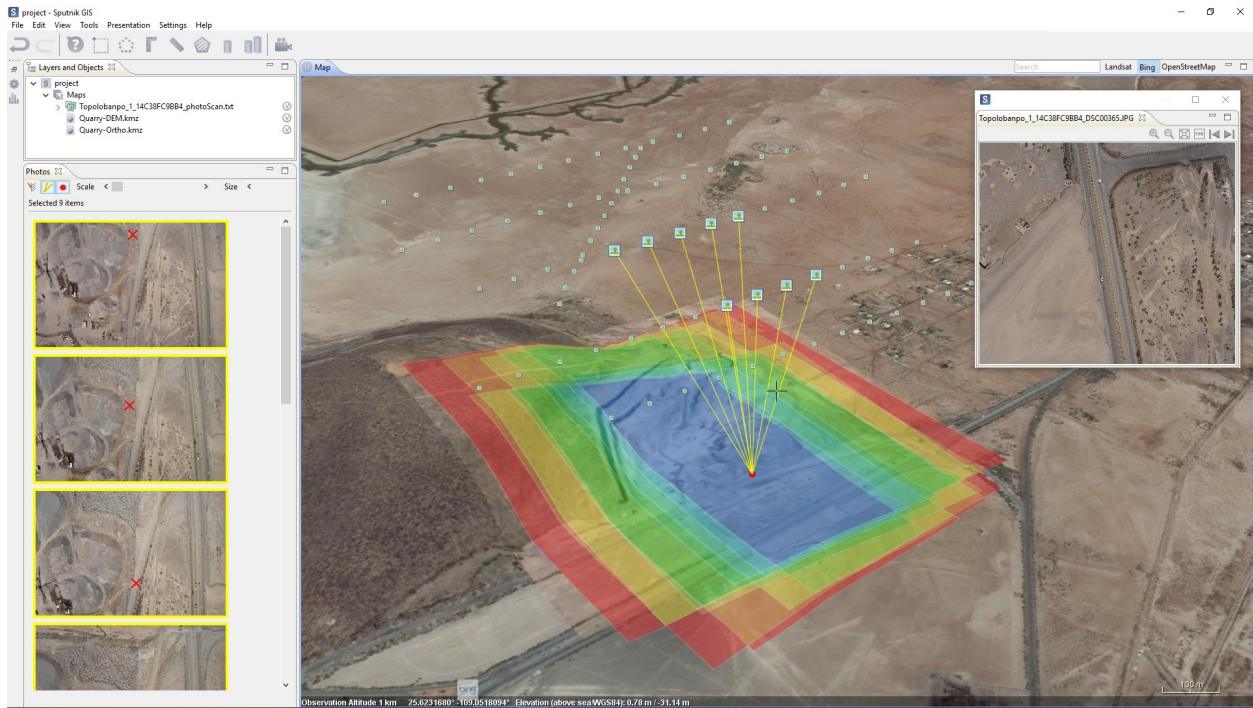
Sputnik GIS provides number of tools for aerial survey raw data analysis. To work with raw aerial survey data you need to have images and *.txt file containing UAV telemetry in one folder. Image coordinates should be in WGS 84 CRS.

To start working with aerial survey choose **File** command from **Open** submenu of **File** menu and select telemetry file in *.txt, *.tel.

21.2 Photo selection

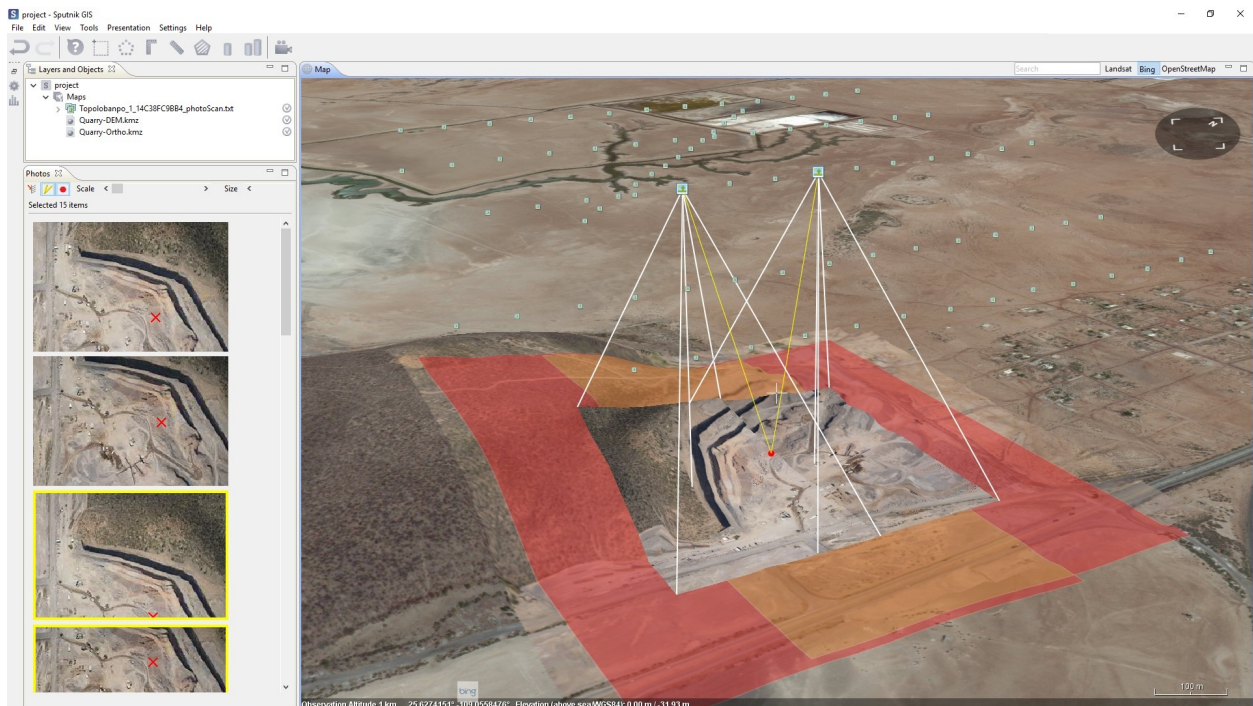
To select aerial images covering given point on a map right-click on the map and choose **Select photos** command. Selected photos will be displayed in the **Photos** window.

To open photo in the **Photo viewer** double-click it. If needed you may copy photos from **Photos** window and paste them into other software.



21.3 Image projection

To project image on surface right-click on it in the **Map** window choose **Project photo** command. To get accurate photo projection you can bind it manually, to do that, right-click on photo in the **Map** window and choose **Bind to image** command.



21.4 Agisoft Photoscan/Metashape project creation

To create Agisoft Metashape project from aerial survey raw data right-click telemetry file in the **Layers and objects** window and choose **Create Photoscan/Metashape project**.

Coordinate reference systems

In Sputnik GIS it is available to set up coordinate reference system for current project. All data in the project transforms to project coordinate reference system on the fly.

To set up project coordinate reference system choose one from **Coordinate system** submenu of the **Settings** menu. To set up custom CRS, choose **Custom CRS** command from **Coordinate system** submenu of the **Settings** menu. In **Choose CRS** dialog box, choose one of available CRS and click **OK**. To add custom CRS to the list of available CRS, click **Load new PRG** button, in the **Load new PRJ file** dialog box select file and set CRS name, click **OK**.

Note: If you import raster map without CRS information in its metadata, or in case CRS information in metadata is wrong you can set CRS for raster map manually in its properties window. In **Properties** window click **CRS** button, in dialog box set up CRS for raster map.

CHAPTER 23

Preferences

Select **Settings > Preferences** in main menu. In this window, you can configure a number of user parameters to improve the interaction with the program.

Parameters	Descriptions
DXF	this page is for configuring DXF vector images (*.dxf), created when using the tools: Sections, TIN model
GPS	GPS connection preferences
KML	setting up creation, viewing and working with *.kml files
Language	choose language
NDVI visualization	set the default palette for viewing NDVI maps
TLS performance	adjust the balance between performance and display quality *.tls models
Tools	this page is for configuring tools
Interface	general interface settings. Setup single object dragging and location format
Slope map	set the default palette for the draft Map tool
Cache	is a folder for temporary data in the file system
Updates	enable/disable update installation
Usage reporting	enable/disable the usage reporting of the Software
Error Reporting	setting up error reporting
Image viewer	selecting an image viewer
Photo projections	setting the display of photo
Coordinate Systems	work with the database of coordinate systems
Tables	tables settings

24.1 Installation errors

The most probable cause of errors that appear during Sputnik GIS installation is a lack of administrator privileges.

In case the error appears:

1. Abort the installation
2. Check whether you have sufficient level of administrator privileges
3. Run installation again

24.2 Startup errors

Startup errors occur because of licencing issues.

Follow these steps:

1. Check whether hardware key (USB dongle) is installed properly on the local PC or on the Licence Server
2. In case software key is used, check if the HASP driver is installed properly

Read more about license driver issues in chapter Administration.

24.3 Runtime errors

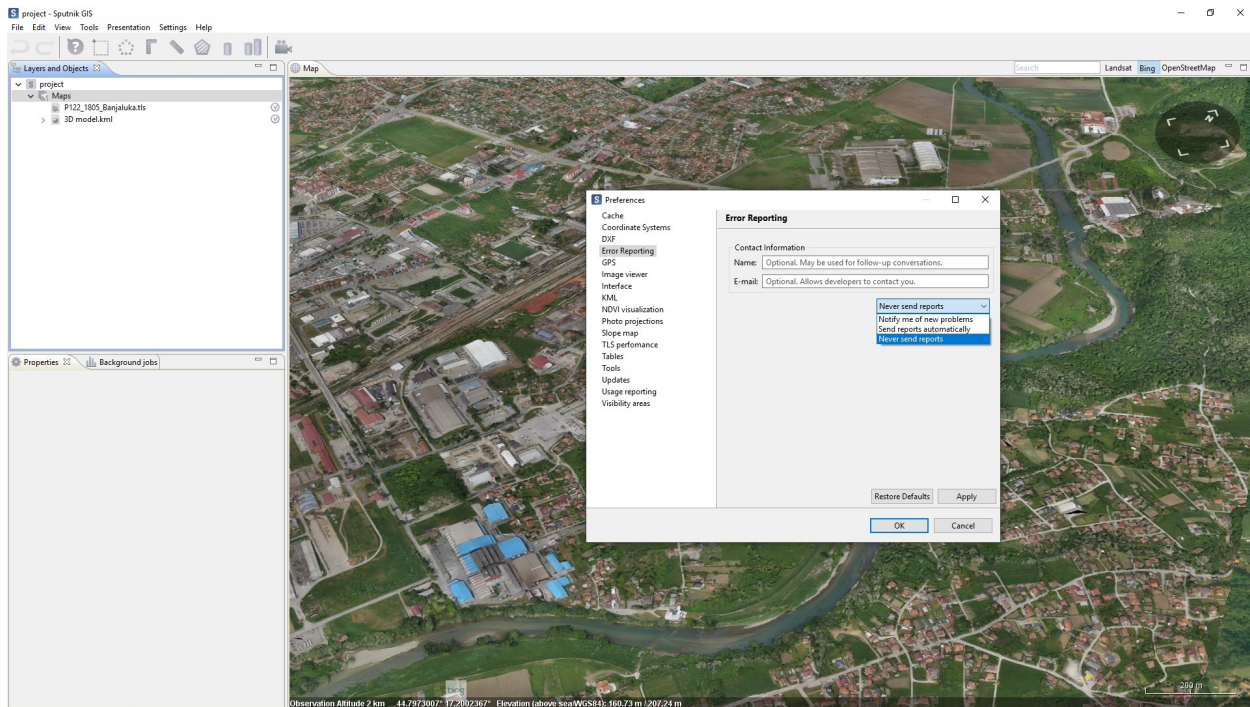
Two types of errors can occur during runtime:

1. Handled exceptions appear in the bottom right part of 3D Map window;
2. Unhandled exceptions appear in a separate window.

In case of handled exception occur, the message box with instructions will appear in the bottom right part of **Map** window.

In this kind of unhandled exceptions, please click on Send report button and write a short message to describe a sequence of actions performed before the error has appeared. It will take some time to analyze your report and to update Sputnik GIS.

Important: You can also setup automated report sending or disable it. Go to **Settings > Preferences...** enter contact information and select one of available options for error reporting.



We appreciate your help. Together, we make Sputnik GIS better!

25.1 Sputnik GIS version 1.4

25.1.1 New features

- EPSG CRS base
- User defined CRS support
- Relief editor
- Daylight modeling
- Observation points
- Visibility zones
- Photo projection
- Track animation
- Simultaneously tracks and tours animation
- Video rendering of animated tours, tours + tracks
- Sputnik Web connection - loading *.tls models
- *.shp files support
- *.las 1.4 support
- Solid mode for *.tls
- Dollhouse mode for *.tls
- Color mode for *.las

25.1.2 Improvements

- Improved *.tls rendering performance
- Ability to add intermediate edges to polygons/polylines
- GUI for animated tours
- New GUI for *.kml
- Improved “Mask” tool performance
- Improved raster maps import master

25.1.3 Bugfixes

- No reloading while moving layers between folders
- Solid *.obj, *.3ds, *.dae 3d models are displayed correctly
- Coordinate system parameters are read from file metadata
- The key combination CTRL + A (selection of all objects), works in all text boxes
- Fixed errors arising from the construction of isohyps
- All generated *.dxf files are read in AutoCAD and other CAD systems.
- The sky is correctly displayed on the screenshots and rendered videos
- Export part of *.tms works without any errors
- Files with an uppercase extension supported
- There is no error in the absence of access to the project layers
- The trajectory of the animated tour smoothes correctly