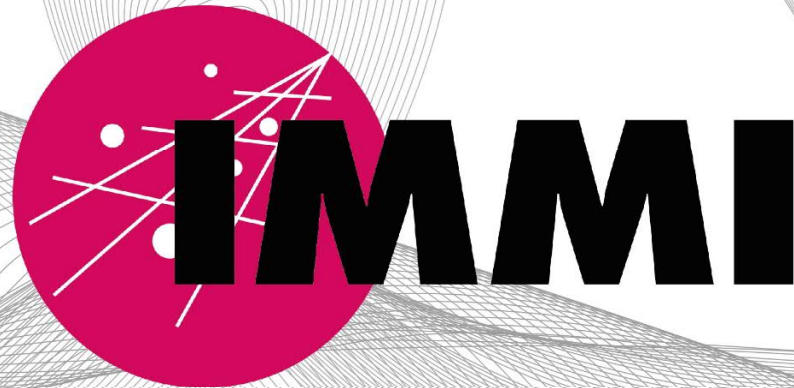
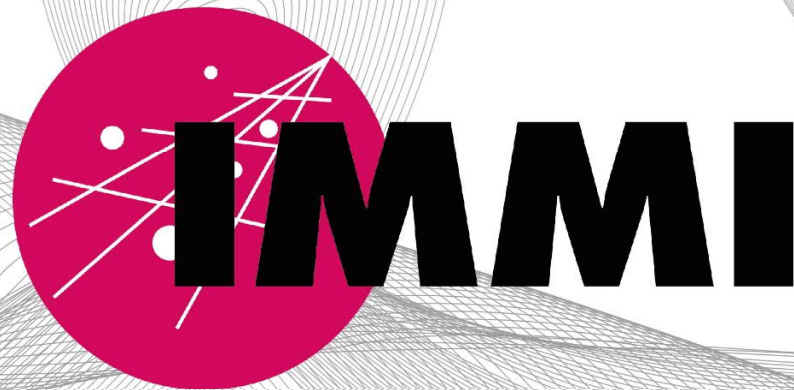


IMMI – Calculation of Aircraft Noise According
CNOSSOS-EU (Directive (EU) 2015/996)

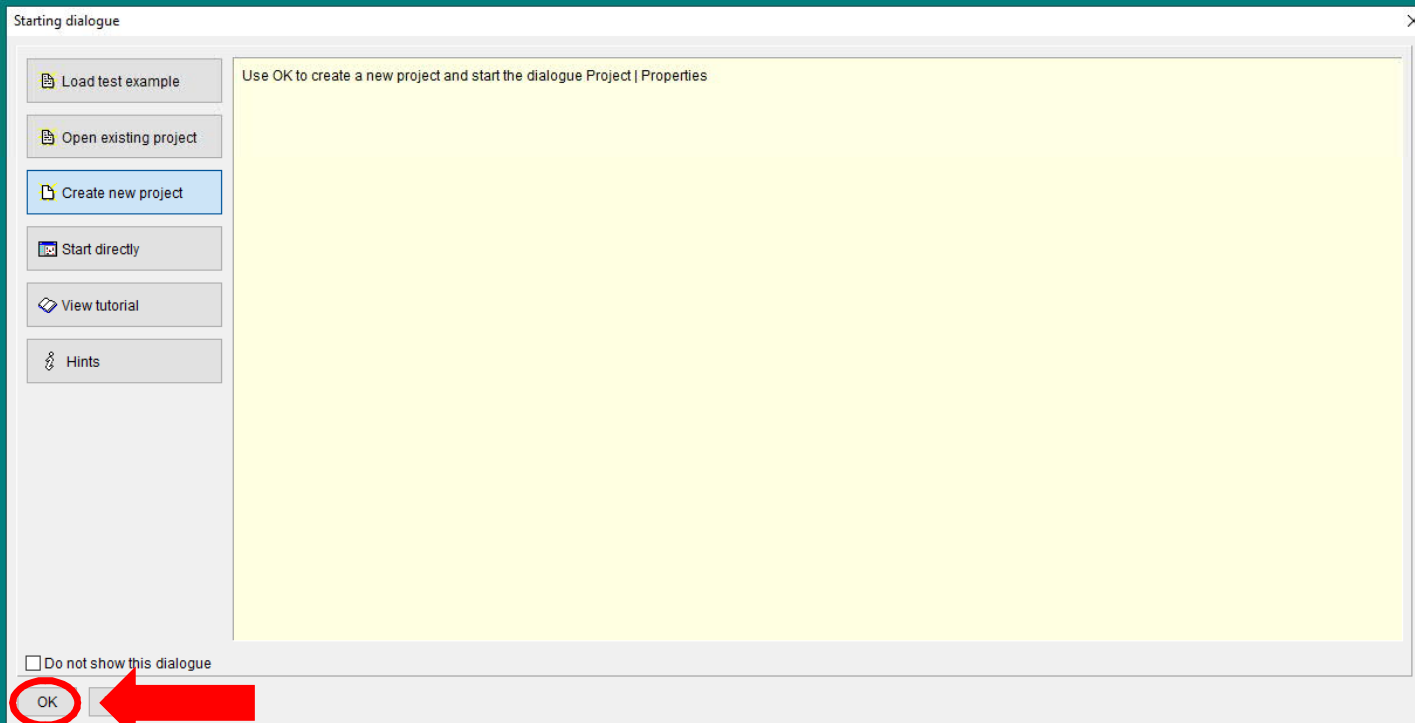
Wölf



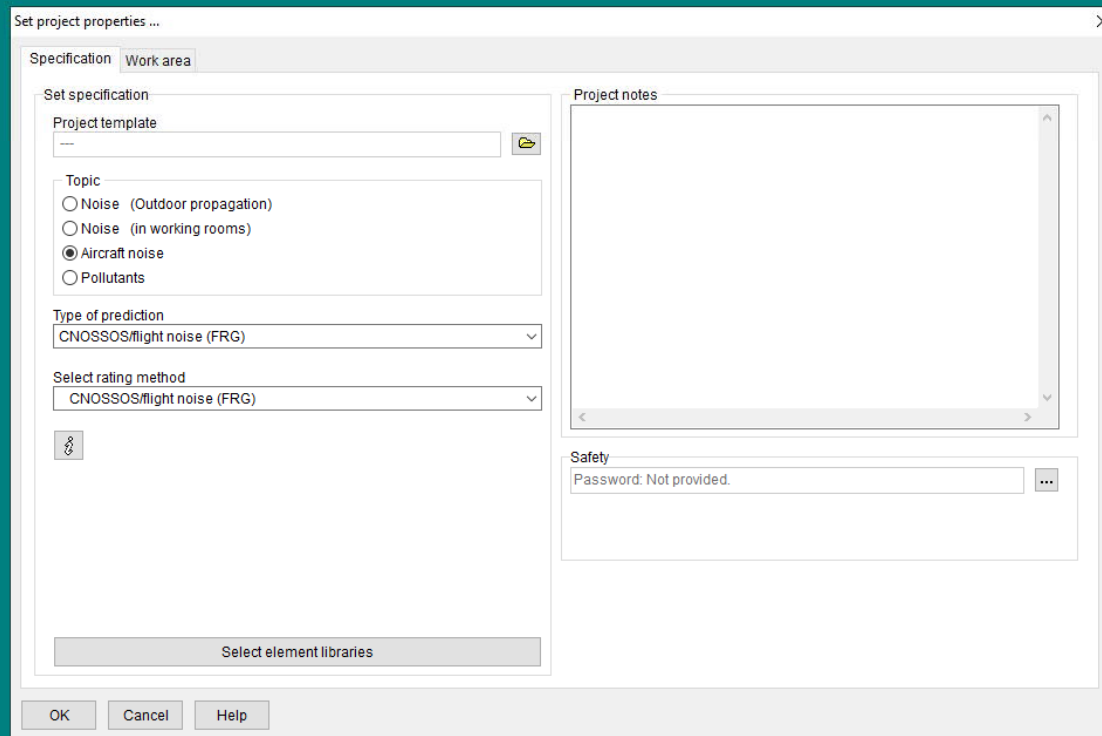
The aim of this tutorial is to provide you with an introduction to setting up a project according to the CNOSSOS-EU guideline for aircraft noise.



The basis for this project is using the data interface QSI according to DIN 45687. An example is stored in the IMMI installation folder, see Exampleprojects\Aircraft noise. This tutorial is based on the guideline CNOSSOS-EU.



Choose Create new project and confirm with Ok.



In the dialog box Set project properties ...: for the topic choose Aircraft noise and for type of prediction and for the rating method choose CNOSSOS/flight noise (FRG).

Set project properties ...

Specification Work area

Set specification


Project template
--

Topic

Noise (Outdoor propagation)
 Noise (in working rooms)
 Aircraft noise
 Pollutants

Type of prediction
CNOSSOS/flight noise (FRG)

Select rating method
CNOSSOS/flight noise (FRG)




Select element libraries

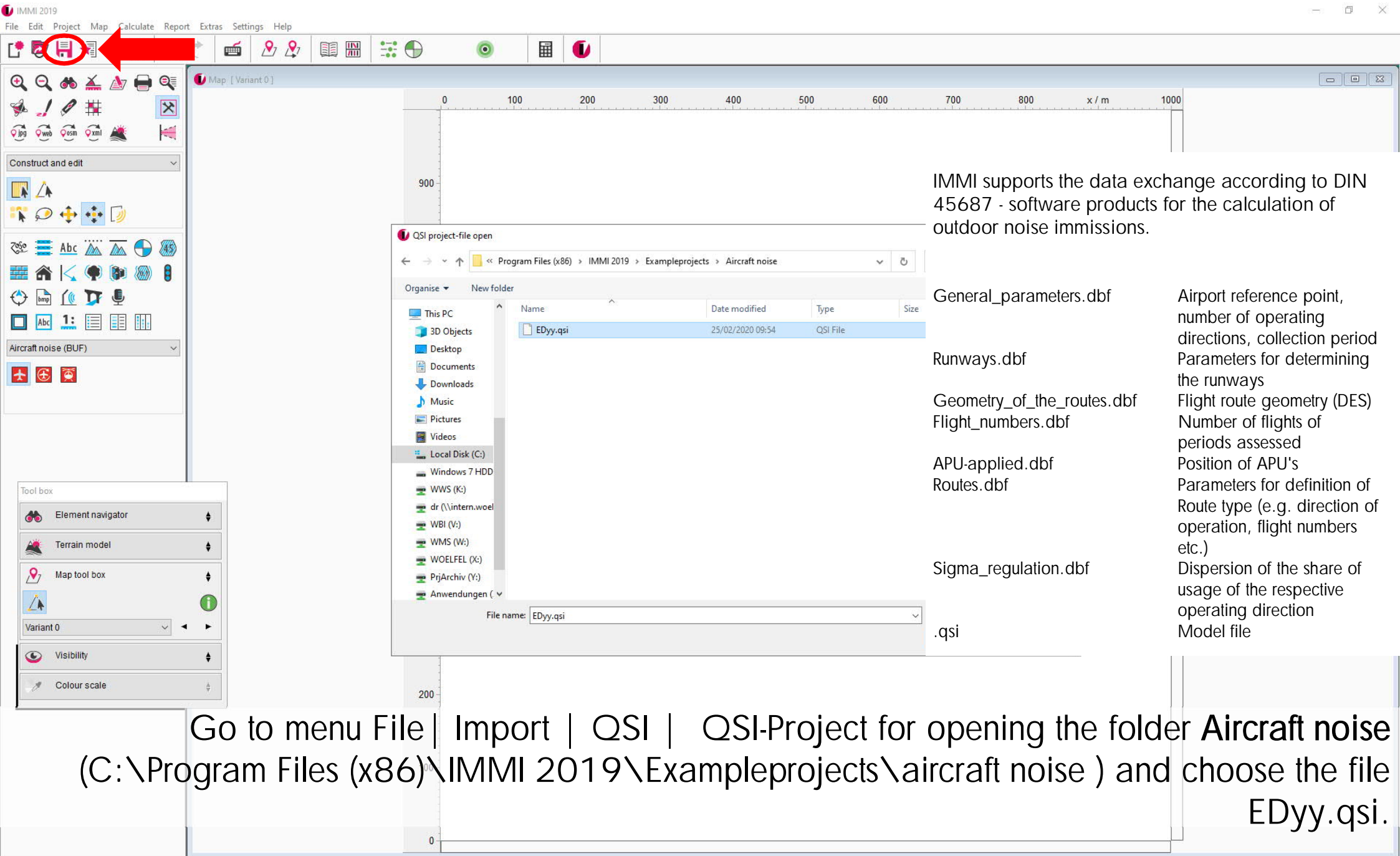
Project notes

Safety
Password: Not provided.

OK



Confirm with Ok.



IMMI supports the data exchange according to DIN 45687 - software products for the calculation of outdoor noise immissions.

- | | |
|----------------------------|--|
| General_parameters.dbf | Airport reference point, number of operating directions, collection period |
| Runways.dbf | Parameters for determining the runways |
| Geometry_of_the_routes.dbf | Flight route geometry (DES) |
| Flight_numbers.dbf | Number of flights of periods assessed |
| APU-applied.dbf | Position of APU's |
| Routes.dbf | Parameters for definition of Route type (e.g. direction of operation, flight numbers etc.) |
| Sigma_regulation.dbf | Dispersion of the share of usage of the respective operating direction |
| .qsi | Model file |

Go to menu File | Import | QSI | QSI-Project for opening the folder **Aircraft noise** (C:\Program Files (x86)\IMMI 2019\Exampleprojects\aircraft noise) and choose the file **EDyy.qsi**.



Import QSI model file

QSI object	used to display
<input checked="" type="checkbox"/> glob_d	General parameters
<input checked="" type="checkbox"/> runw_d	Departure and landing lanes
<input checked="" type="checkbox"/> ageo_d	Geometry of the flight route
<input checked="" type="checkbox"/> anzf_d	Aircraft movements
<input checked="" type="checkbox"/> rout_d	Routes

QSI model-file: C:\Program Files (x86)\IMMI 2019\Exampleprojects\Aircraft noise\EDyy.qsi

QSI object: glob_d - General parameters

File: C:\Program Files (x86)\IMMI 2019\Exampleprojects\Aircraft noise\EDyy_Global.DBF

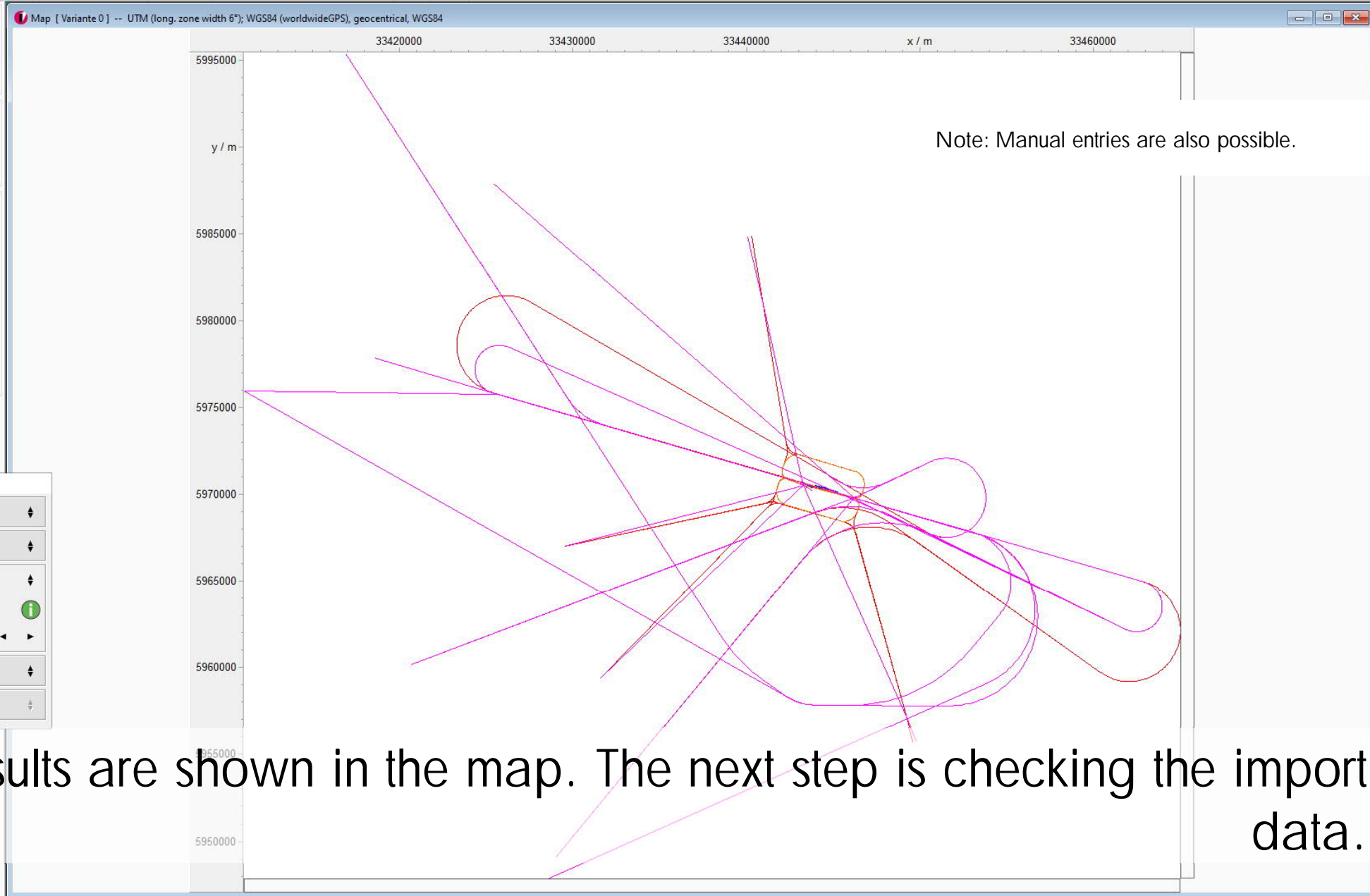
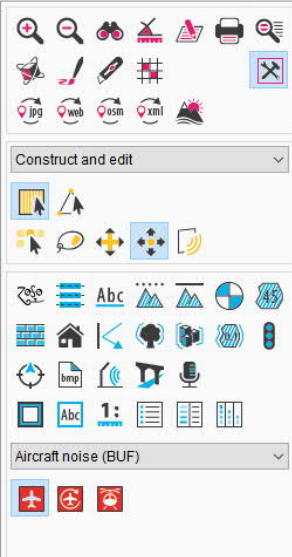
Shape: ---

IMMI elements: Internal assignment

NAME	ID	POS_AIRP_X	POS_AIRP_Y	POS_AIRP_Z	N_BETRIEB	N_JAHRE	MIL
▶ Heringsdorf	EDAH	33444275.97	5970359.49		16	10	Falsch

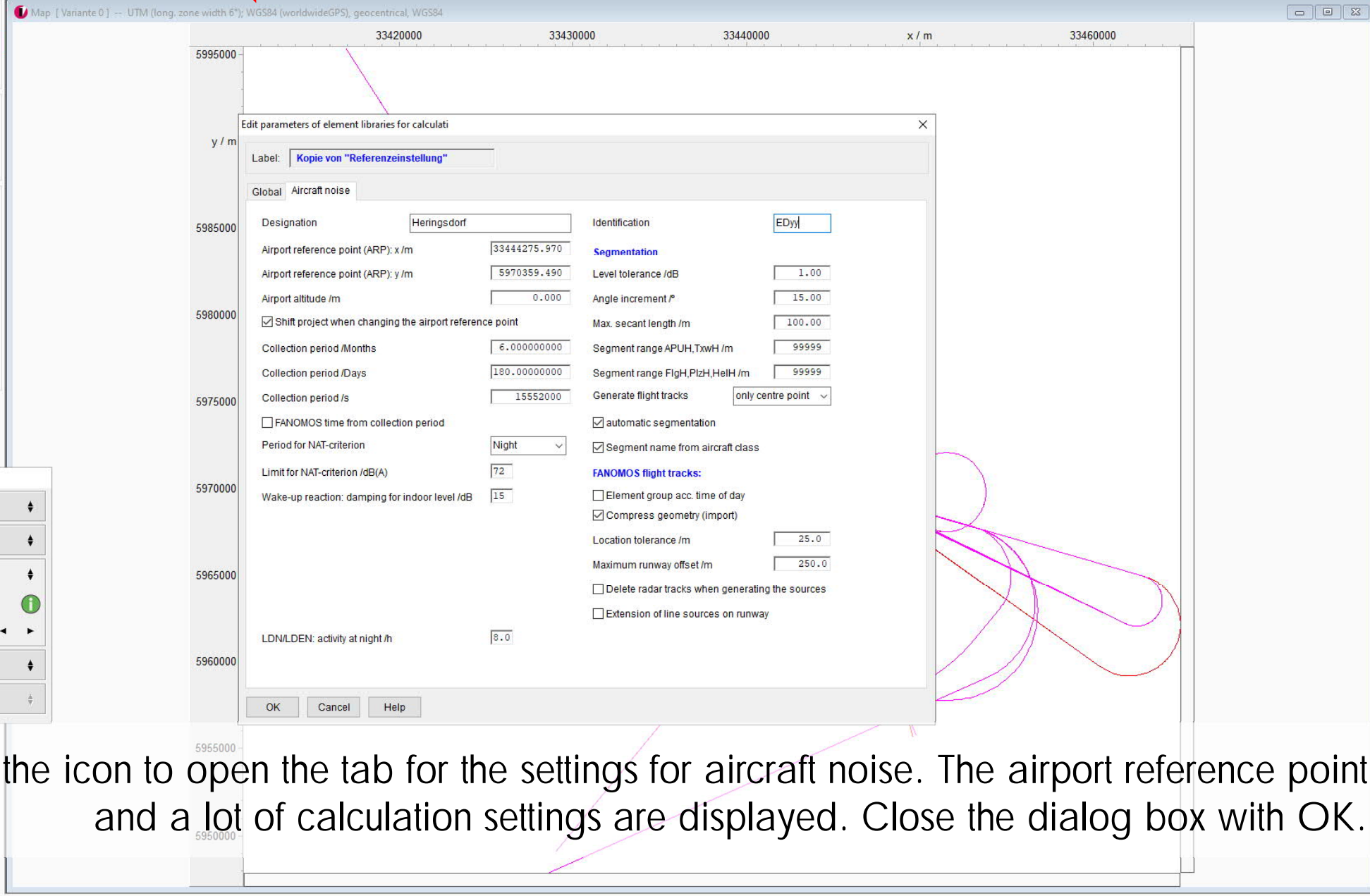
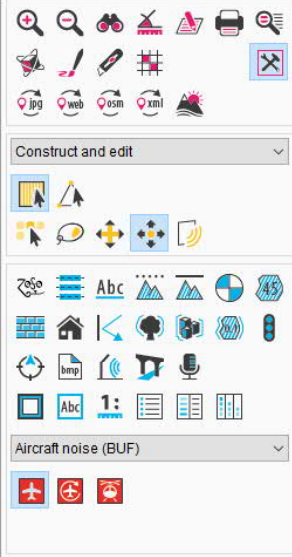
Import Cancel Help

The import dialog appears. Confirm the entries by clicking the Import button.

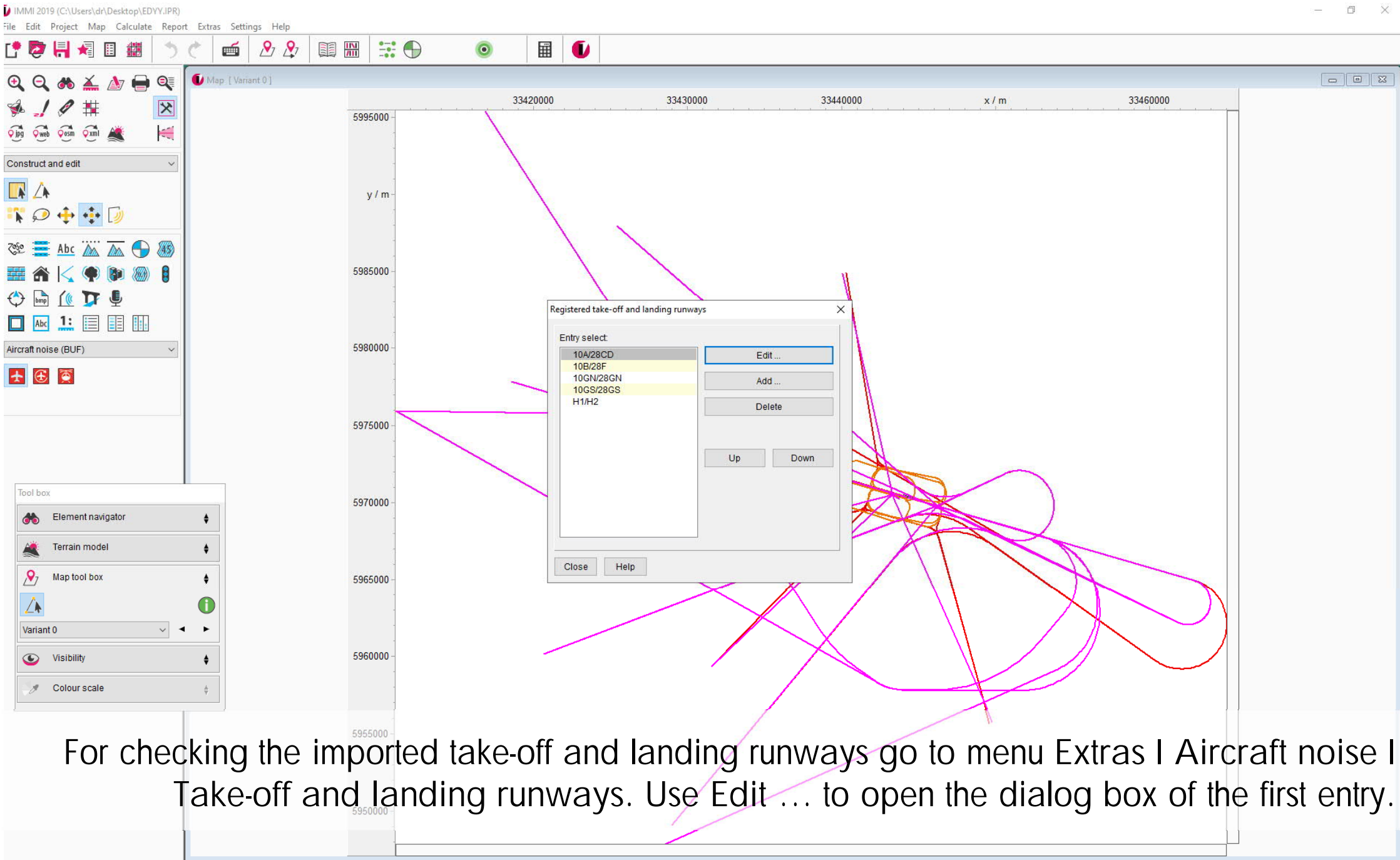


Note: Manual entries are also possible.

The results are shown in the map. The next step is checking the import data.



Click on the icon to open the tab for the settings for aircraft noise. The airport reference point and a lot of calculation settings are displayed. Close the dialog box with OK.

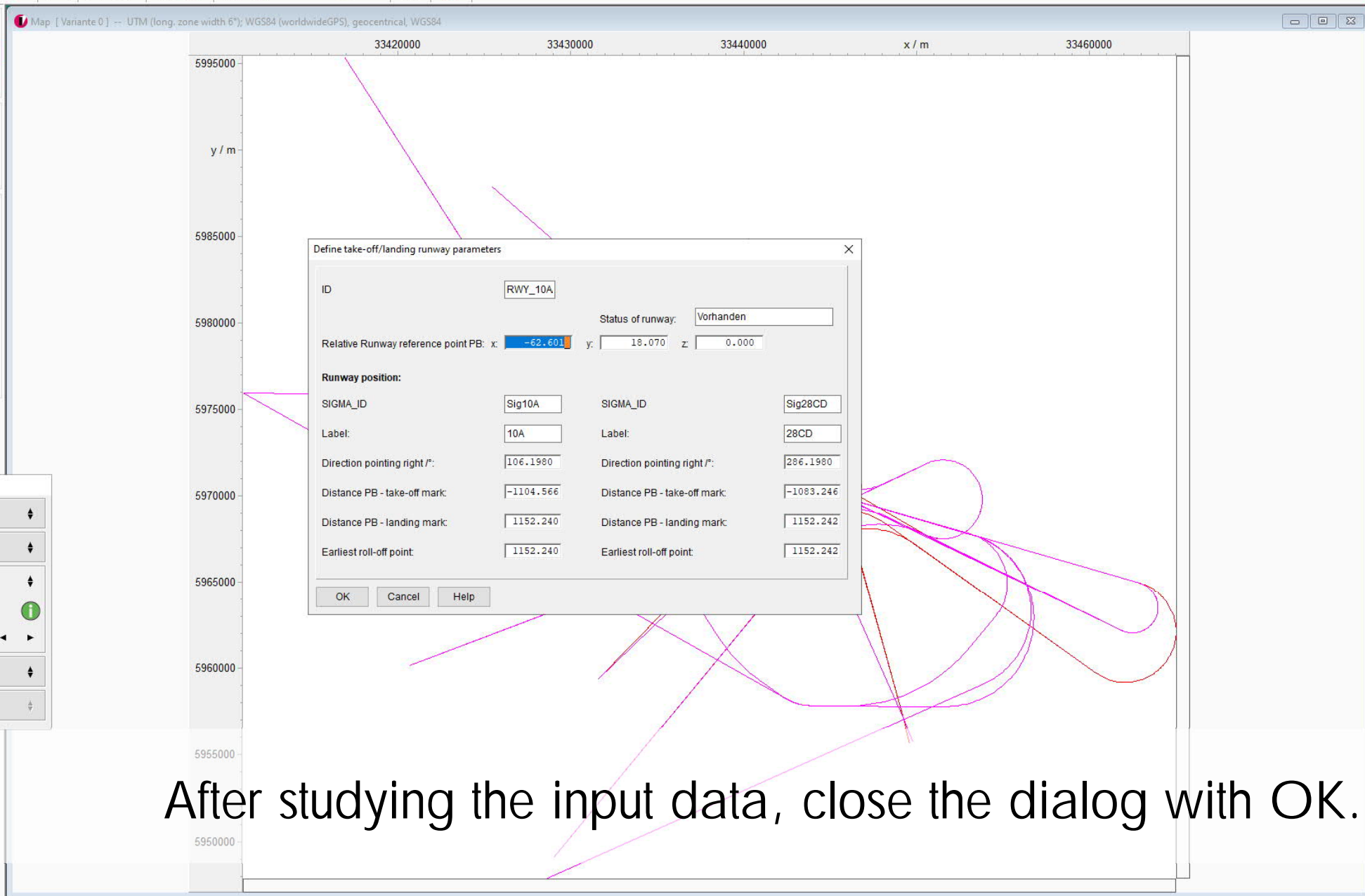


For checking the imported take-off and landing runways go to menu Extras | Aircraft noise | Take-off and landing runways. Use Edit ... to open the dialog box of the first entry.

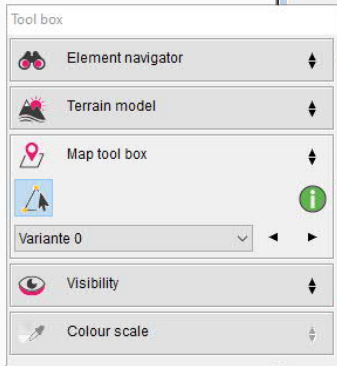
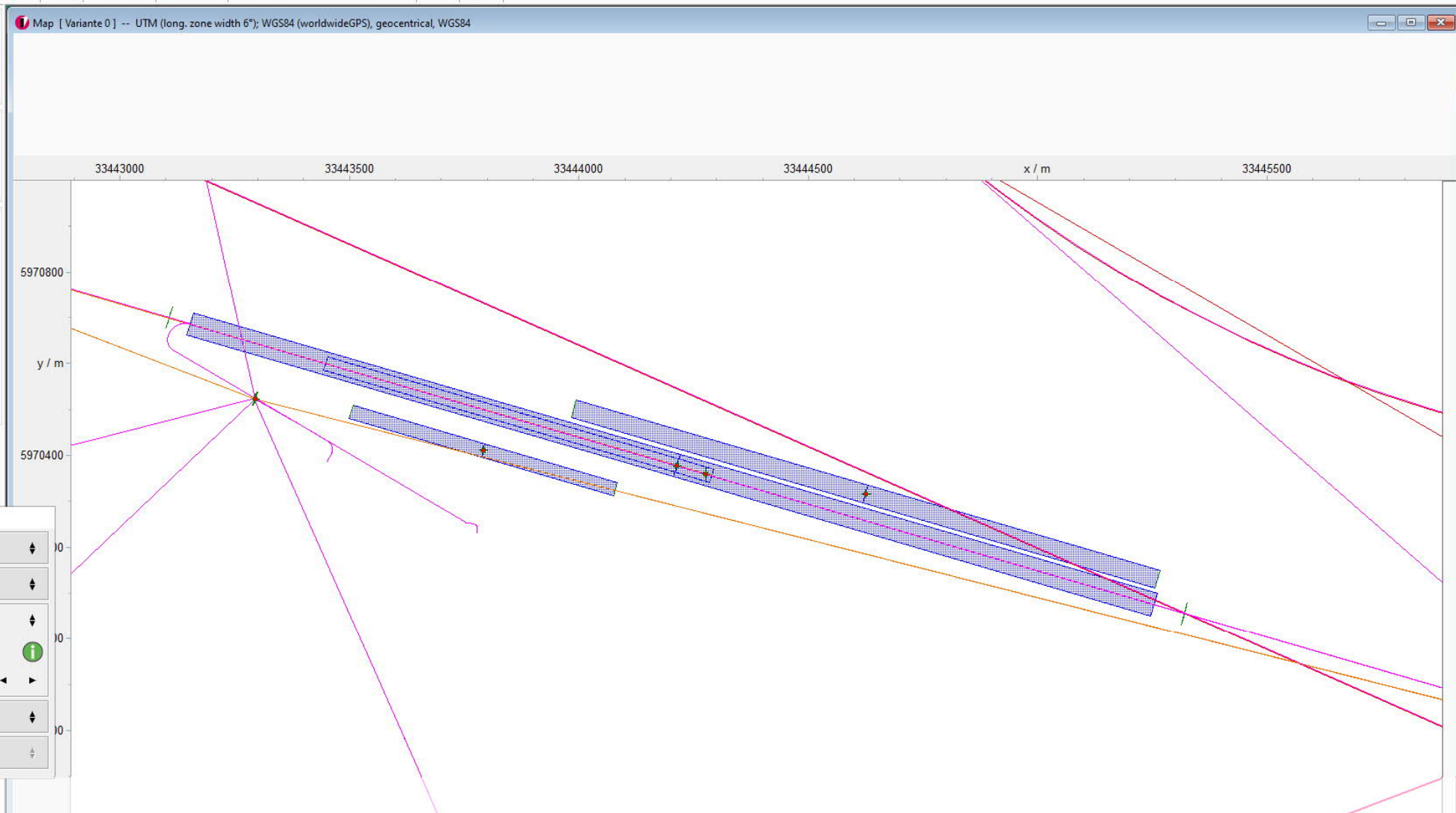
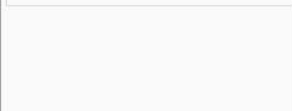
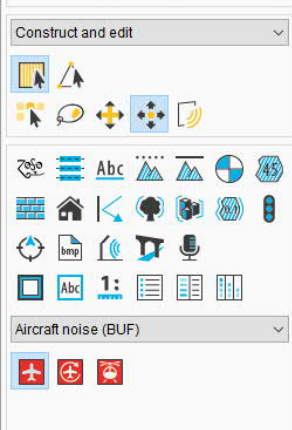


Construct and edit

Aircraft noise (BUF)



After studying the input data, close the dialog with OK.



Use the zoom in function to see the runways in detail in the map.



The 'Element input' dialog box is open, showing the 'Aircraft noise (BUF)' library. The 'flight route /CNOSSO' category is selected, showing 45 elements. The 'traffic pattern /CNOS' category has 10 elements, and 'helicopter /CNOSSOS' has 32 elements. A table of flight routes is displayed, with the first element selected.

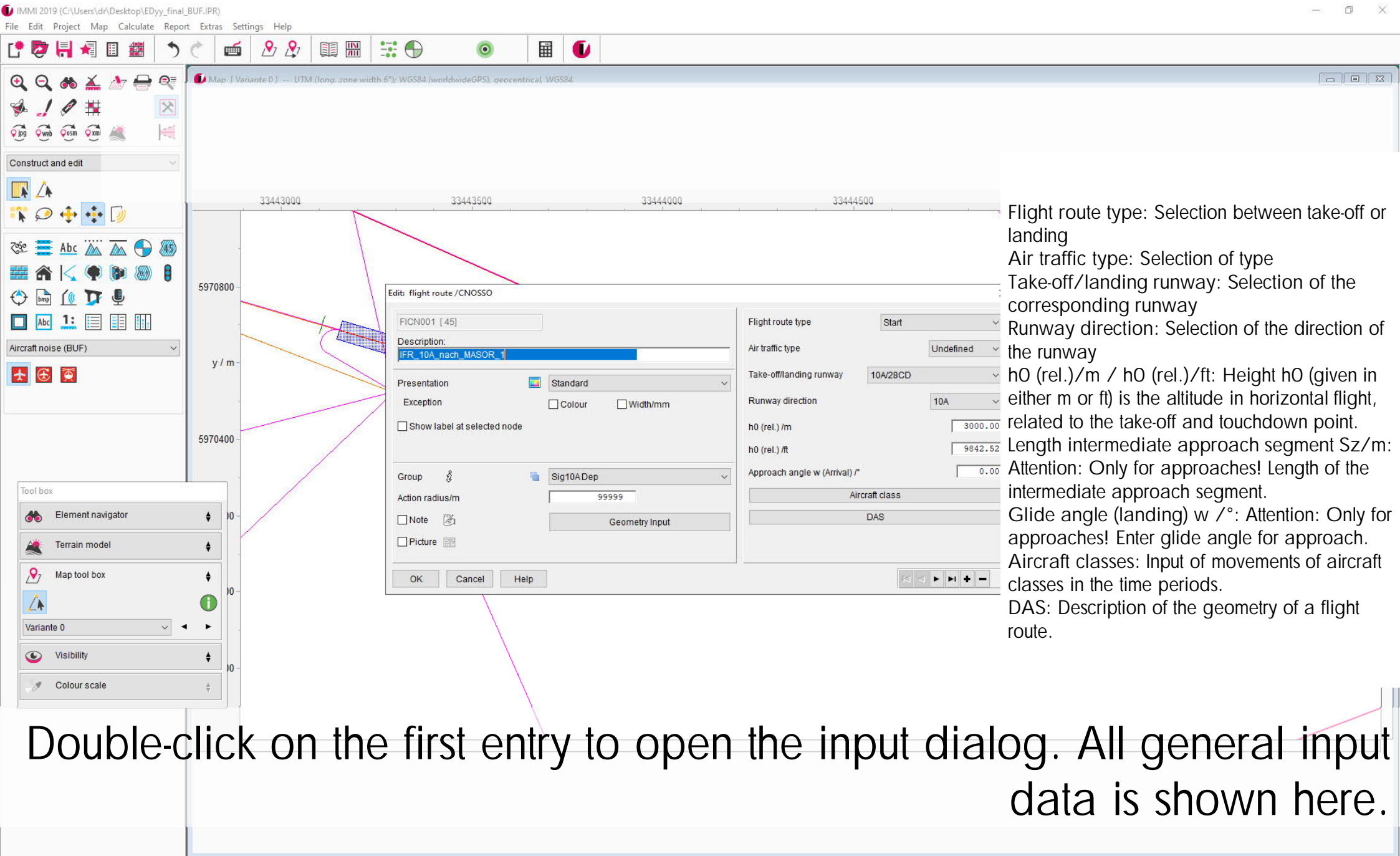
No.	Name	Label	Group
1	FICN0...	IFR_10A_nach_MASOR_1	Sig10A Dep
2	FICN0...	IFR_10A_nach_MASOR_2	Sig10A Dep
3	FICN0...	IFR_10A_nach_PENET	Sig10A Dep
4	FICN0...	IFR_10B_nach_MASOR_1	Sig10A Dep
5	FICN0...	IFR_10B_nach_MASOR_2	Sig10A Dep
6	FICN0...	IFR_10B_nach_PENET	Sig10A Dep
7	FICN0...	IFR_10_von_PENET_AB	Sig10A Arr
8	FICN0...	IFR_10_von_UDAXI_3	Sig10A Arr
9	FICN0...	IFR_10_von_UDAXI_AB_1	Sig10A Arr
10	FICN0...	IFR_10_von_UDAXI_AB_2	Sig10A Arr
11	FICN0...	IFR_10_von_UDAXI_CD_1	Sig10A Arr
12	FICN0...	IFR_10_von_UDAXI_CD_2	Sig10A Arr
13	FICN0...	IFR_28CD_nach_MASOR	Sig28CD Dep
14	FICN0...	IFR_28CD_nach_PENET	Sig28CD Dep
15	FICN0...	IFR_28F_nach_MASOR	Sig28CD Dep
16	FICN0...	IFR_28F_nach_PENET	Sig28CD Dep
17	FICN0...	IFR_28_von_PENET_AB	Sig28CD Arr
18	FICN0...	IFR_28_von_UDAXI_AB_1	Sig28CD Arr
19	FICN0...	IFR_28_von_UDAXI_AB_2	Sig28CD Arr
20	FICN0...	IFR_28_von_UDAXI_CD_1	Sig28CD Arr
21	FICN0...	IFR_28_von_UDAXI_CD_2	Sig28CD Arr
22	FICN0...	VFR_10A_nach_ECHO	Sig10A Dep
23	FICN0...	VFR_10A_nach_NOVEMBER	Sig10A Dep
24	FICN0...	VFR_10A_nach_SIERRA	Sig10A Dep
25	FICN0...	VFR_10A_nach_WHISKEY	Sig10A Dep
26	FICN0...	VFR_10B_nach_ECHO	Sig10A Dep
27	FICN0...	VFR_10B_nach_NOVEMBER	Sig10A Dep
28	FICN0...	VFR_10B_nach_SIERRA	Sig10A Dep
29	FICN0...	VFR_10B_nach_WHISKEY	Sig10A Dep

Selected: 1 Element
FICN001 IFR_10A_nach_MASOR_1

Use selection in the scheme

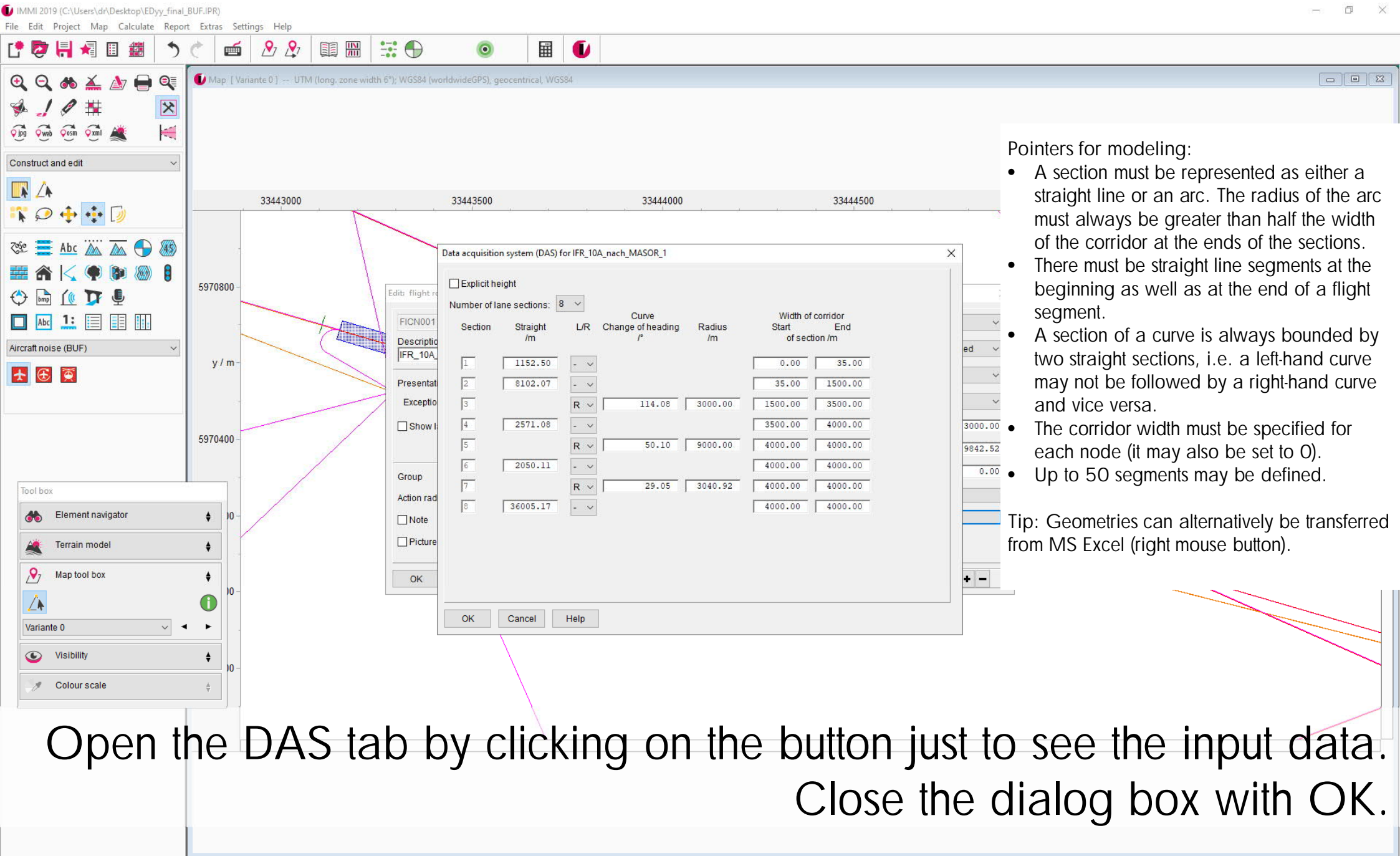
Buttons: Insert before, Geomet, Edit, Delete, Up, Down, Edit block

Open the database for elements via menu Project | Elements or use the corresponding icon. In the element library Aircraft noise (BUF) you see 3 element types: flight routes, traffic patterns and the helicopter flight routes.



Flight route type: Selection between take-off or landing
Air traffic type: Selection of type
Take-off/landing runway: Selection of the corresponding runway
Runway direction: Selection of the direction of the runway
h0 (rel.)/m / h0 (rel.)/ft: Height h0 (given in either m or ft) is the altitude in horizontal flight, related to the take-off and touchdown point.
Length intermediate approach segment Sz/m: Attention: Only for approaches! Length of the intermediate approach segment.
Glide angle (landing) w /°: Attention: Only for approaches! Enter glide angle for approach.
Aircraft classes: Input of movements of aircraft classes in the time periods.
DAS: Description of the geometry of a flight route.

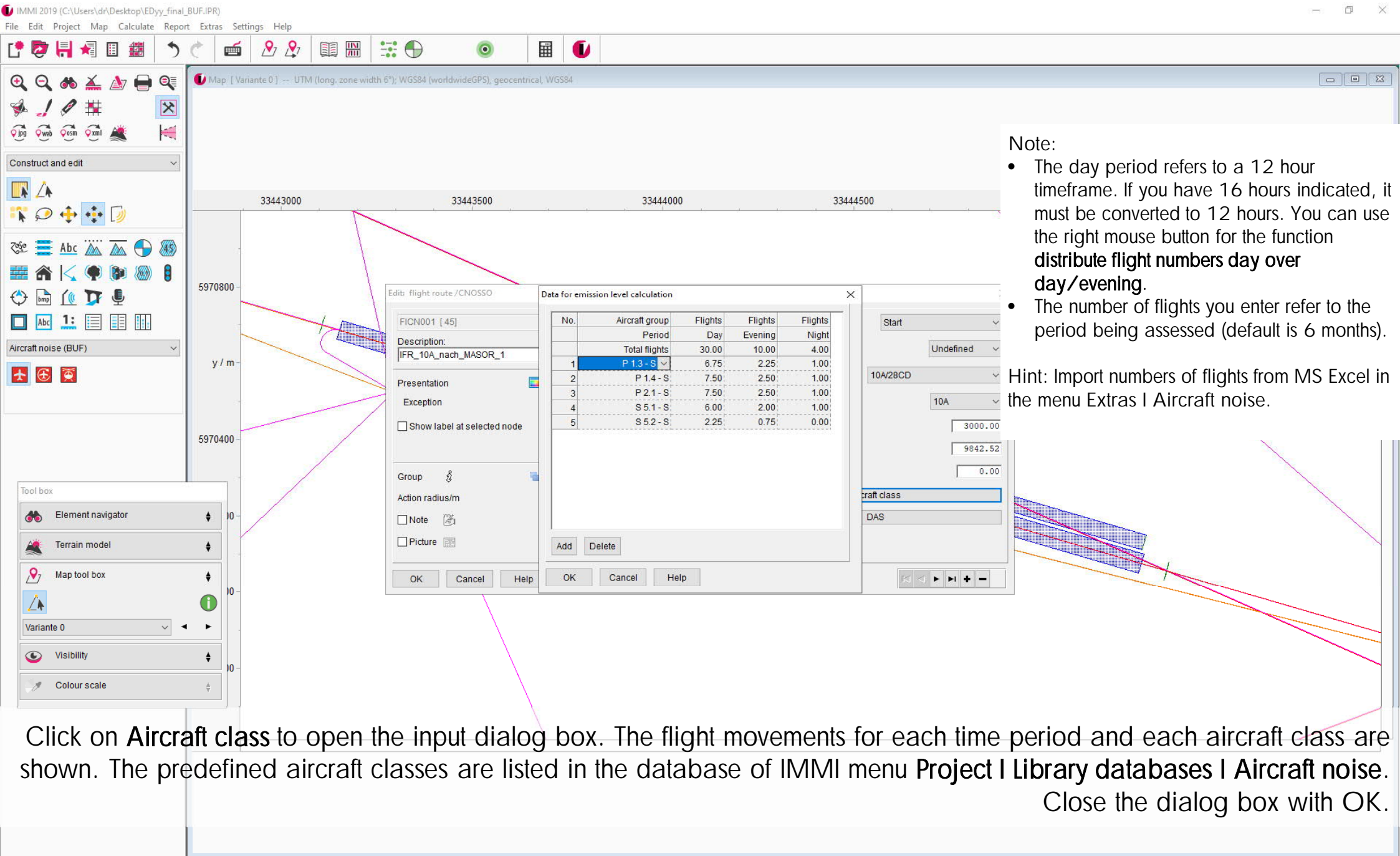
Double-click on the first entry to open the input dialog. All general input data is shown here.



Pointers for modeling:

- A section must be represented as either a straight line or an arc. The radius of the arc must always be greater than half the width of the corridor at the ends of the sections.
- There must be straight line segments at the beginning as well as at the end of a flight segment.
- A section of a curve is always bounded by two straight sections, i.e. a left-hand curve may not be followed by a right-hand curve and vice versa.
- The corridor width must be specified for each node (it may also be set to 0).
- Up to 50 segments may be defined.

Open the DAS tab by clicking on the button just to see the input data.
Close the dialog box with OK.



Note:

- The day period refers to a 12 hour timeframe. If you have 16 hours indicated, it must be converted to 12 hours. You can use the right mouse button for the function **distribute flight numbers day over day/evening**.
- The number of flights you enter refer to the period being assessed (default is 6 months).

Hint: Import numbers of flights from MS Excel in the menu Extras | Aircraft noise.

Click on **Aircraft class** to open the input dialog box. The flight movements for each time period and each aircraft class are shown. The predefined aircraft classes are listed in the database of IMMI menu **Project | Library databases | Aircraft noise**. Close the dialog box with OK.

IMMI 2019 (C:\Users\dr\Desktop\EDyy_final_BUF.IPR)

File Edit Project Map Calculate Report Extras Settings Help

Map [Variante 0] -- UTM (long. zone width 6°); WGS84 (worldwideGPS), geocentric, WGS84

Element input

[CNFL] Aircraft noise (BUF)

- All elemen
- Standard
- Drawing
- Aircraft noise (BUF)
- INTERN

[HeCN] helicopter /CNOSSOS

- flight route /CNOSSO 45
- traffic pattern/CNOS 10
- helicopter /CNOSSOS 32

Selected: 1 Element
HeCN001 IFR_H10_nach_MASOR_1

Use selection in the scheme

Direct Input

No.	Name	Label	Group
1	HeCN0...	IFR_H10_nach_MASOR_1 (von G1C)	Helii/APU
2	HeCN0...	IFR_H10_nach_MASOR_1 (von G2)	Helii/APU
3	HeCN0...	IFR_H10_nach_MASOR_2 (von G1C)	Helii/APU
4	HeCN0...	IFR_H10_nach_MASOR_2 (von G2)	Helii/APU
5	HeCN0...	IFR_H10_nach_PENET (von G1C)	Helii/APU
6	HeCN0...	IFR_H10_von_PENET_AB (zu G1C)	Helii/APU
7	HeCN0...	IFR_H10_von_UDAXI_3 (zu G1C)	Helii/APU
8	HeCN0...	IFR_H10_von_UDAXI_3 (zu G2)	Helii/APU
9	HeCN0...	IFR_H10_von_UDAXI_AB_1 (zu G1C)	Helii/APU
10	HeCN0...	IFR_H10_von_UDAXI_AB_1 (zu G2)	Helii/APU
11	HeCN0...	IFR_H10_von_UDAXI_AB_2 (zu G1C)	Helii/APU
12	HeCN0...	IFR_H10_von_UDAXI_AB_2 (zu G2)	Helii/APU
13	HeCN0...	IFR_H28_nach_MASOR (von G1C)	Helii/APU
14	HeCN0...	IFR_H28_nach_MASOR (von G2)	Helii/APU
15	HeCN0...	IFR_H28_nach_PENET (von G1C)	Helii/APU
16	HeCN0...	IFR_H28_nach_PENET (von G2)	Helii/APU
17	HeCN0...	IFR_H28_von_PENET_AB (zu G1C)	Helii/APU
18	HeCN0...	IFR_H28_von_PENET_AB (zu G2)	Helii/APU
19	HeCN0...	IFR_H28_von_UDAXI_AB_1 (zu G1C)	Helii/APU
20	HeCN0...	IFR_H28_von_UDAXI_AB_1 (zu G2)	Helii/APU
21	HeCN0...	IFR_H28_von_UDAXI_AB_2 (zu G1C)	Helii/APU
22	HeCN0...	IFR_H28_von_UDAXI_AB_2 (zu G2)	Helii/APU
23	HeCN0...	VFR_HVFR_nach_ECHO (von G2)	Helii/APU
24	HeCN0...	VFR_HVFR_nach_NOVEMBER (von G2)	Helii/APU
25	HeCN0...	VFR_HVFR_nach_SIERRA (von G1C)	Helii/APU
26	HeCN0...	VFR_HVFR_nach_SIERRA (von G2)	Helii/APU
27	HeCN0...	VFR_HVFR_nach_WHISKEY (von G2)	Helii/APU
28	HeCN0...	VFR_HVFR_von_ECHO (zu G2)	Helii/APU
29	HeCN0...	VFR_HVFR_von_NOVEMBER (zu G2)	Helii/APU

33445500

5970800
y / m
5970400

Tool box

- Element navigator
- Terrain model
- Map tool box
- Variante 0
- Visibility
- Colour scale

Insert before Geomet Edit Delete Edit block

Up Down

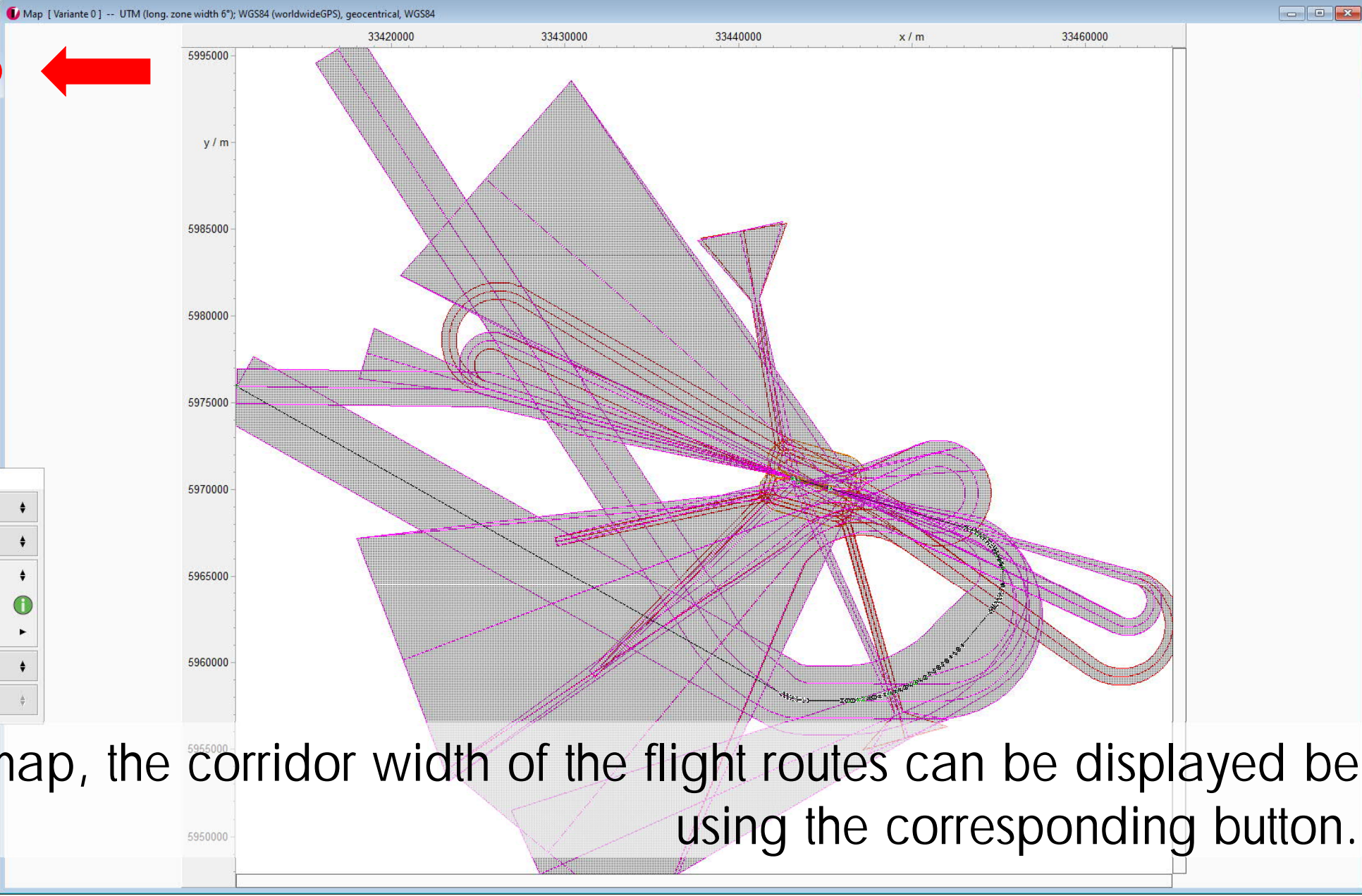
No notes available

Back to the database take a look at the other elements – Traffic circuit or helicopter. Use the Close button to exit the database.



Construct and edit

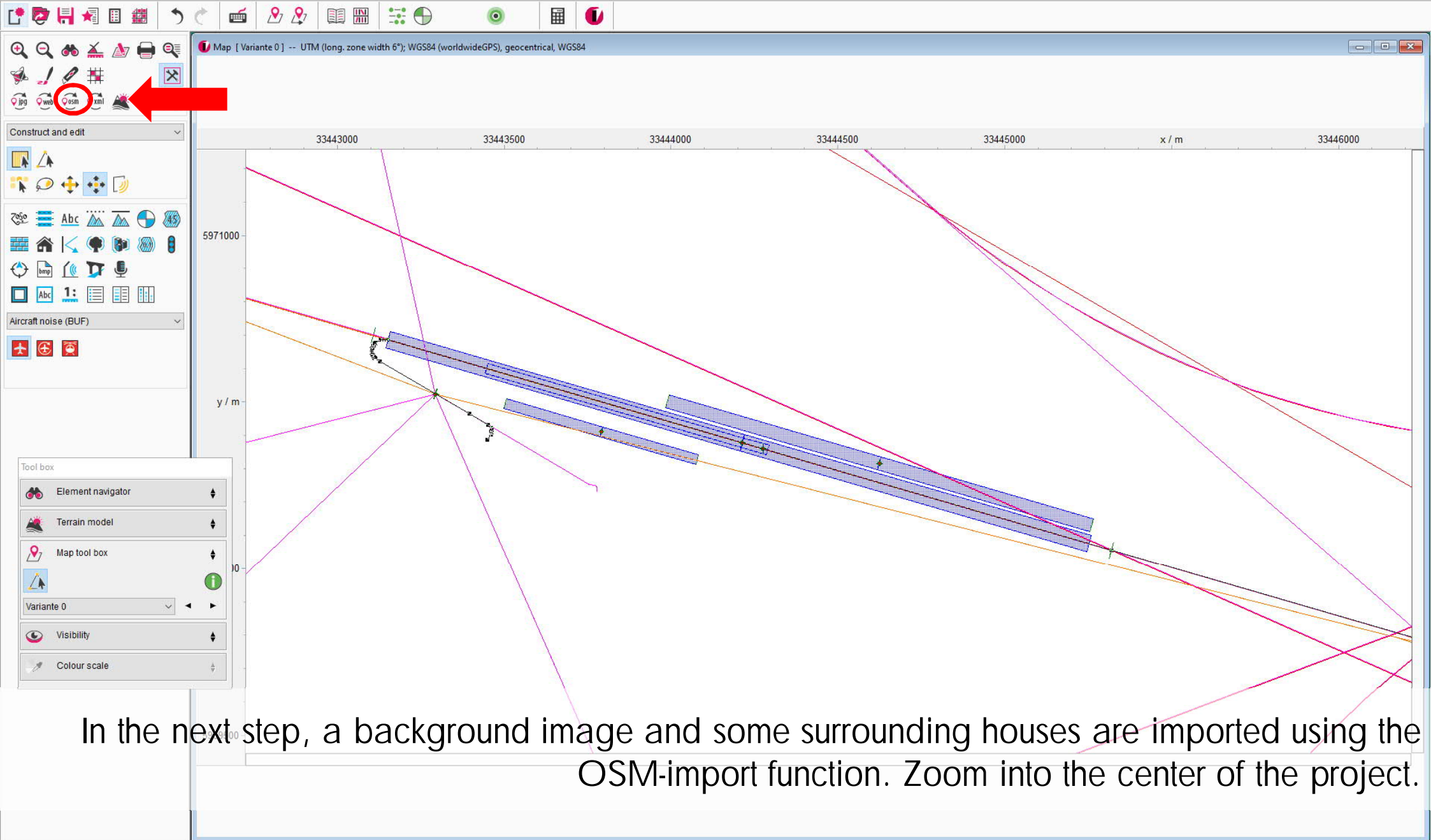
Aircraft noise (BUF)



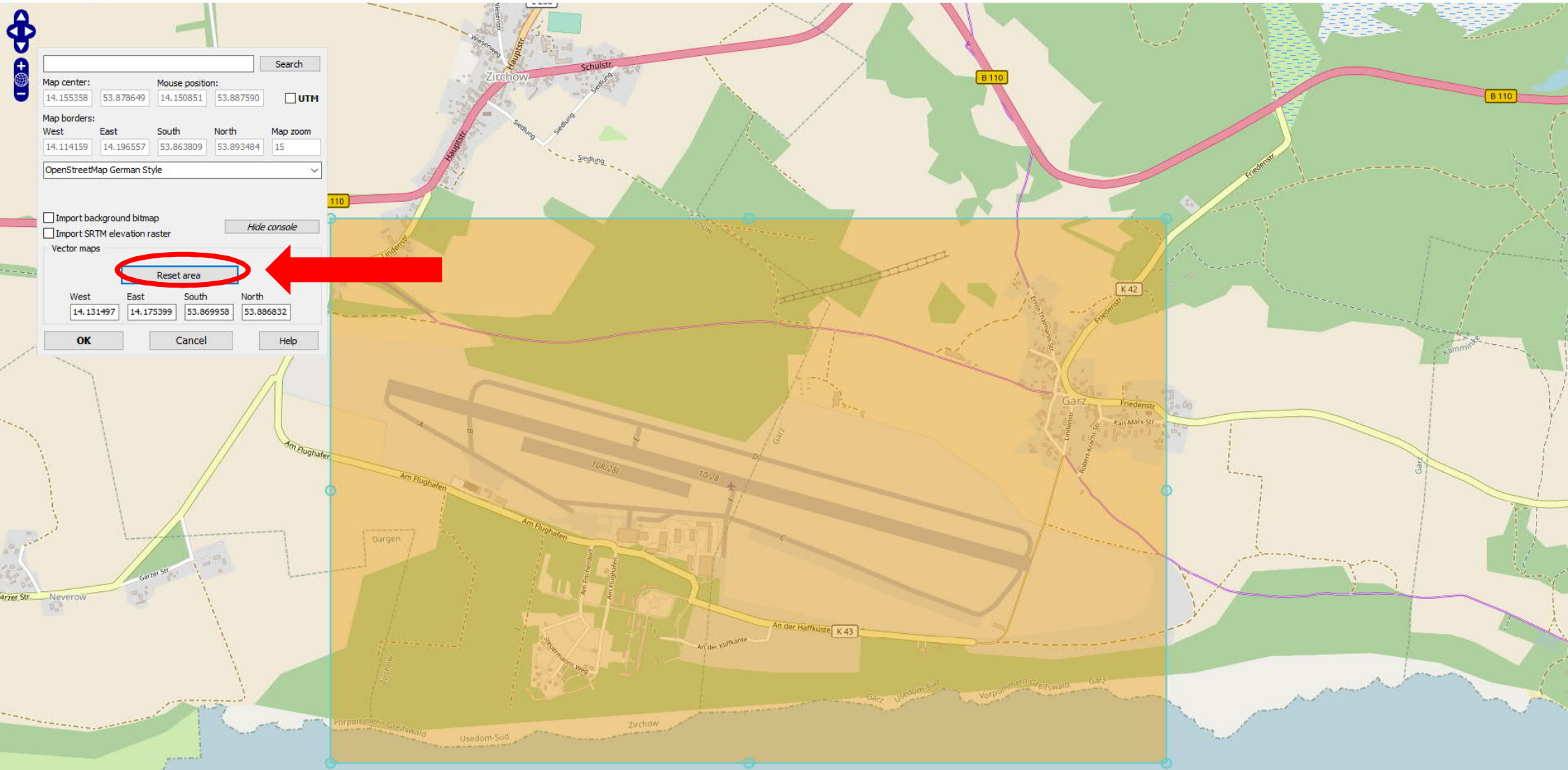
Tool box

- Element navigator
- Terrain model
- Map tool box
- Variante 0
- Visibility
- Colour scale

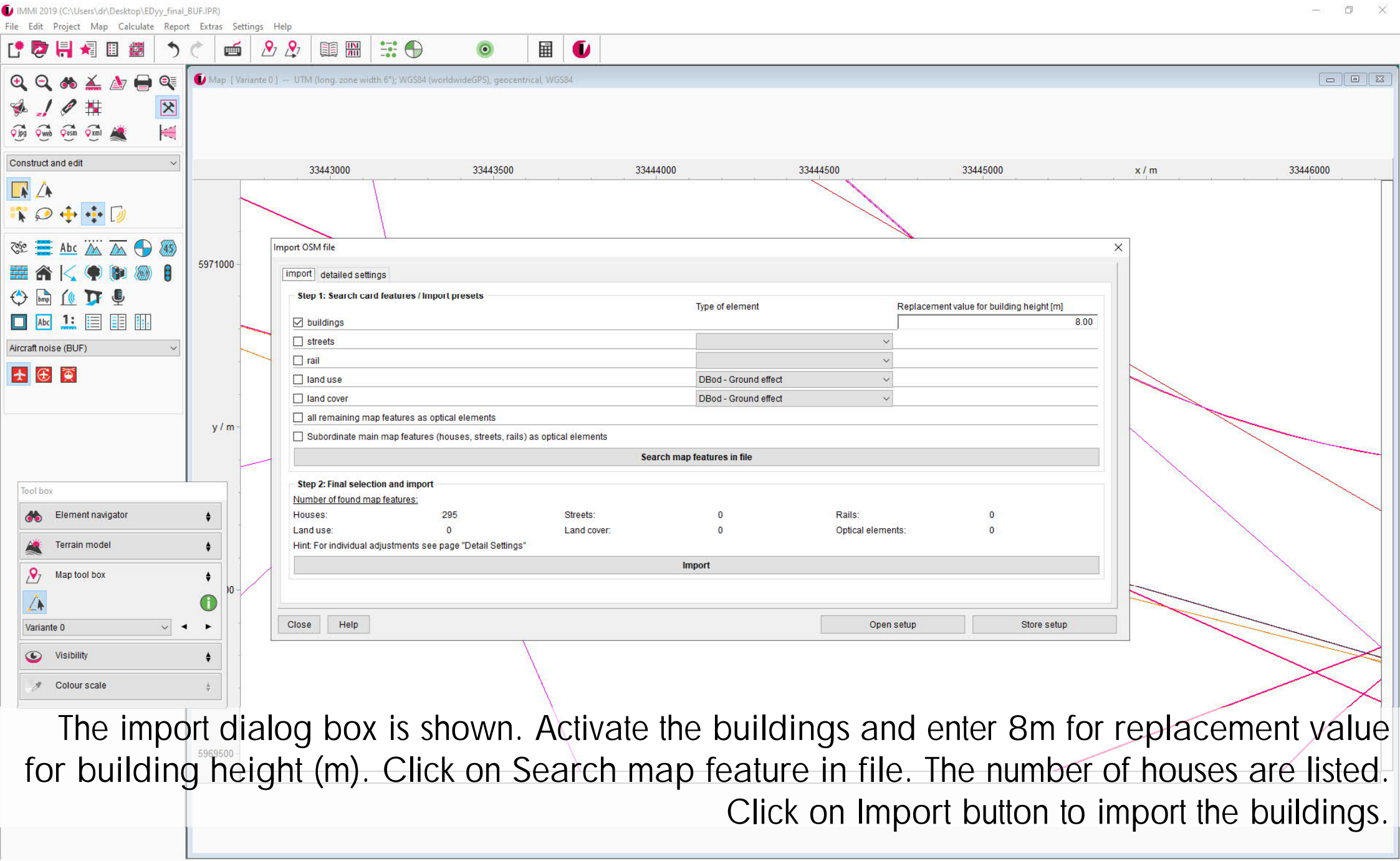
In the map, the corridor width of the flight routes can be displayed by using the corresponding button.



In the next step, a background image and some surrounding houses are imported using the OSM-import function. Zoom into the center of the project.



Choose OpenStreetMap as the background image. Use the Select area button to choose a small area around the airport. Click OK to start the import.

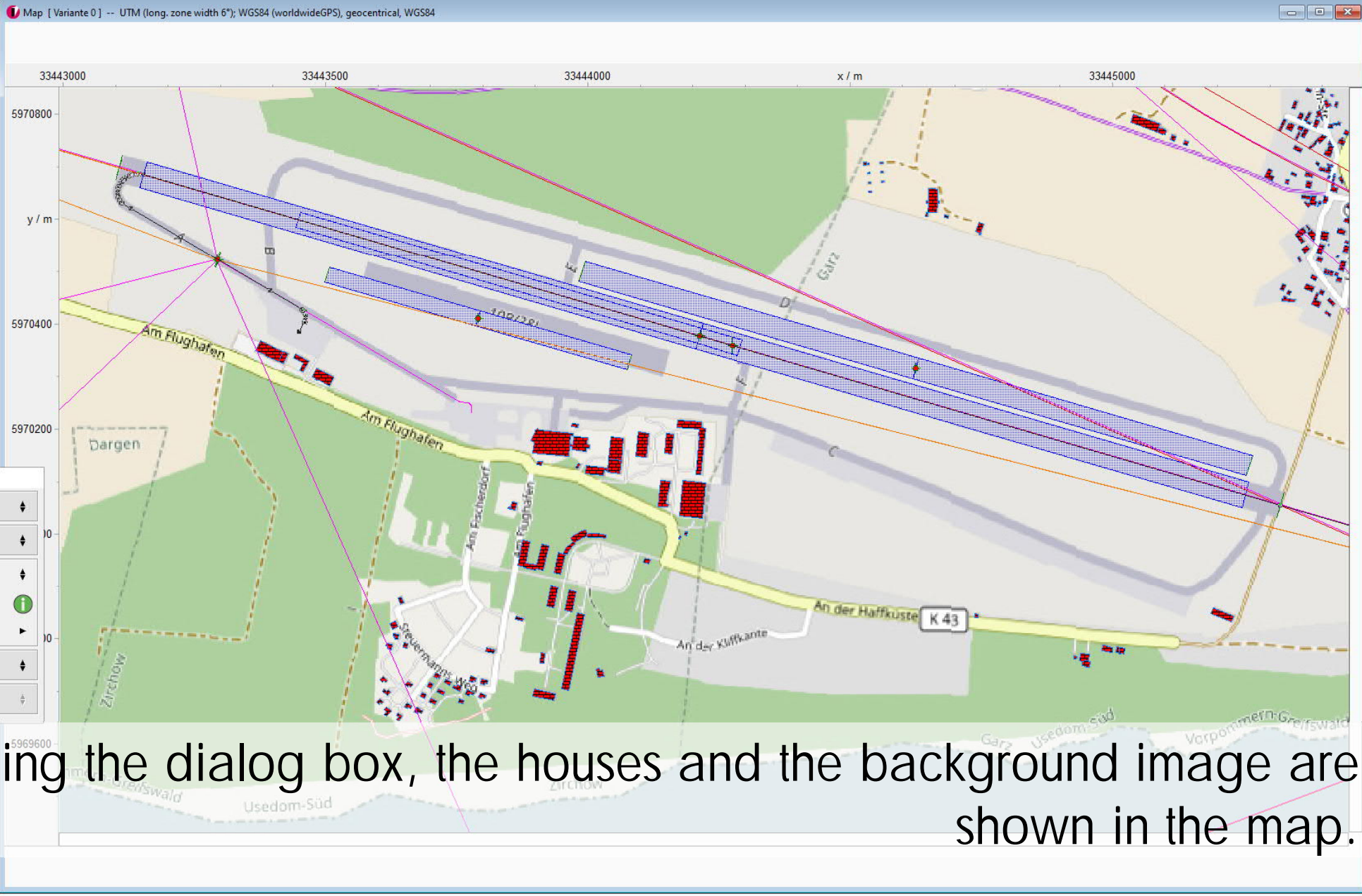


The import dialog box is shown. Activate the buildings and enter 8m for replacement value for building height (m). Click on Search map feature in file. The number of houses are listed. Click on Import button to import the buildings.



Construct and edit

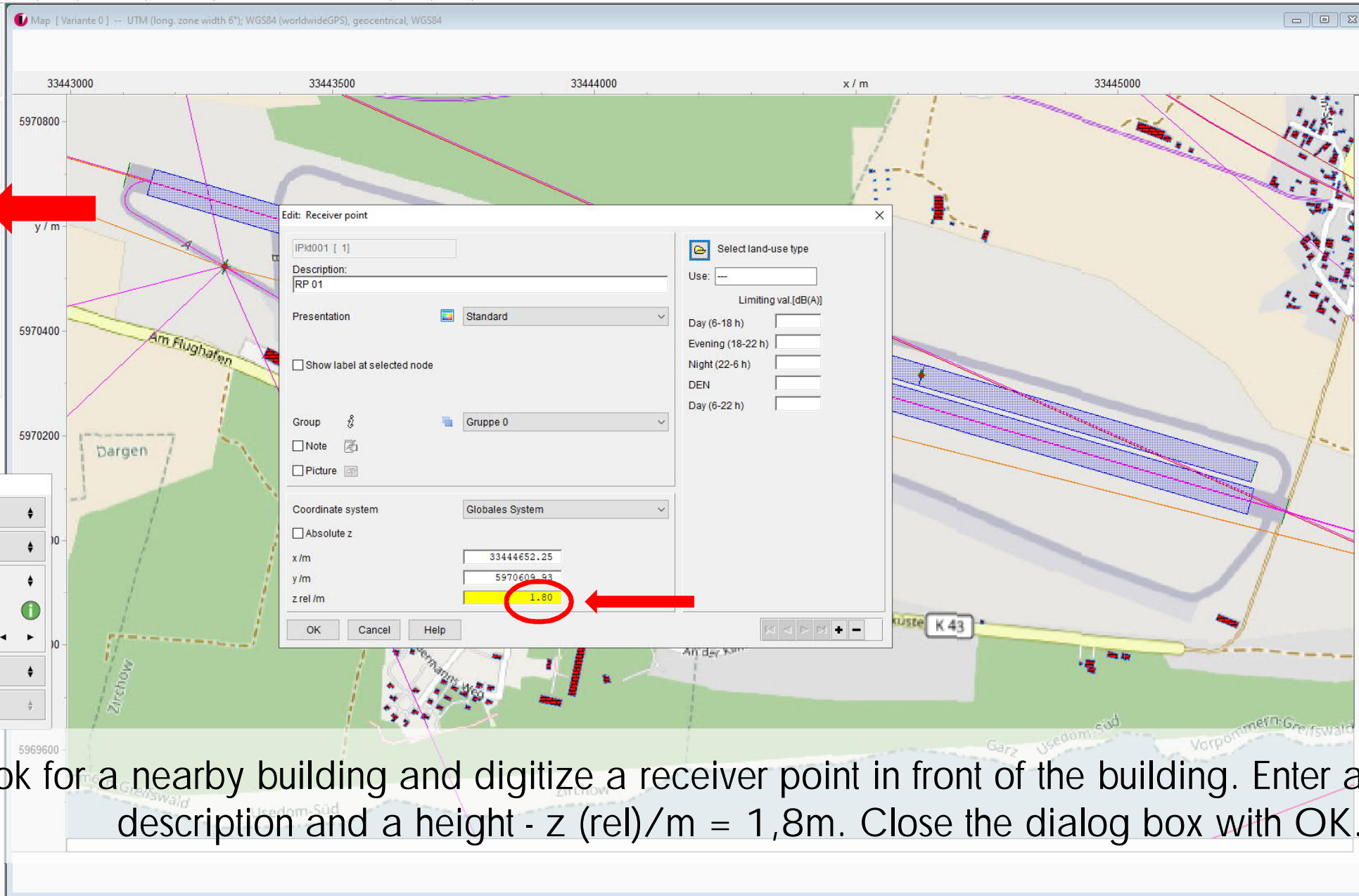
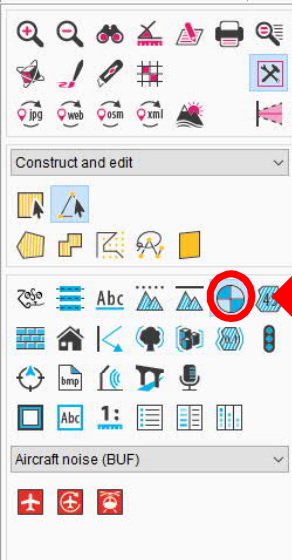
- Navigation and editing tools (arrow, pan, zoom, etc.)
- Layers and visibility controls (ABC, eye icon)
- Aircraft noise (BUF) settings (airplane icon)



Tool box

- Element navigator
- Terrain model
- Map tool box
- Variante 0
- Visibility
- Colour scale

After closing the dialog box, the houses and the background image are shown in the map.



Edit: Receiver point

IPk001 [1]

Description: RP 01

Presentation: Standard

Show label at selected node

Group: Gruppe 0

Note

Picture

Coordinate system: Globales System

Absolute z

x / m: 33444652.25

y / m: 5970609.93

z rel / m: 1.80

Use: ---

Limiting val. [dB(A)]

Day (6-18 h):

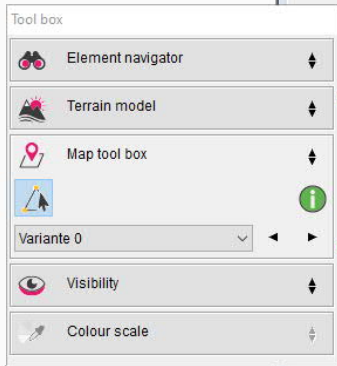
Evening (18-22 h):

Night (22-6 h):

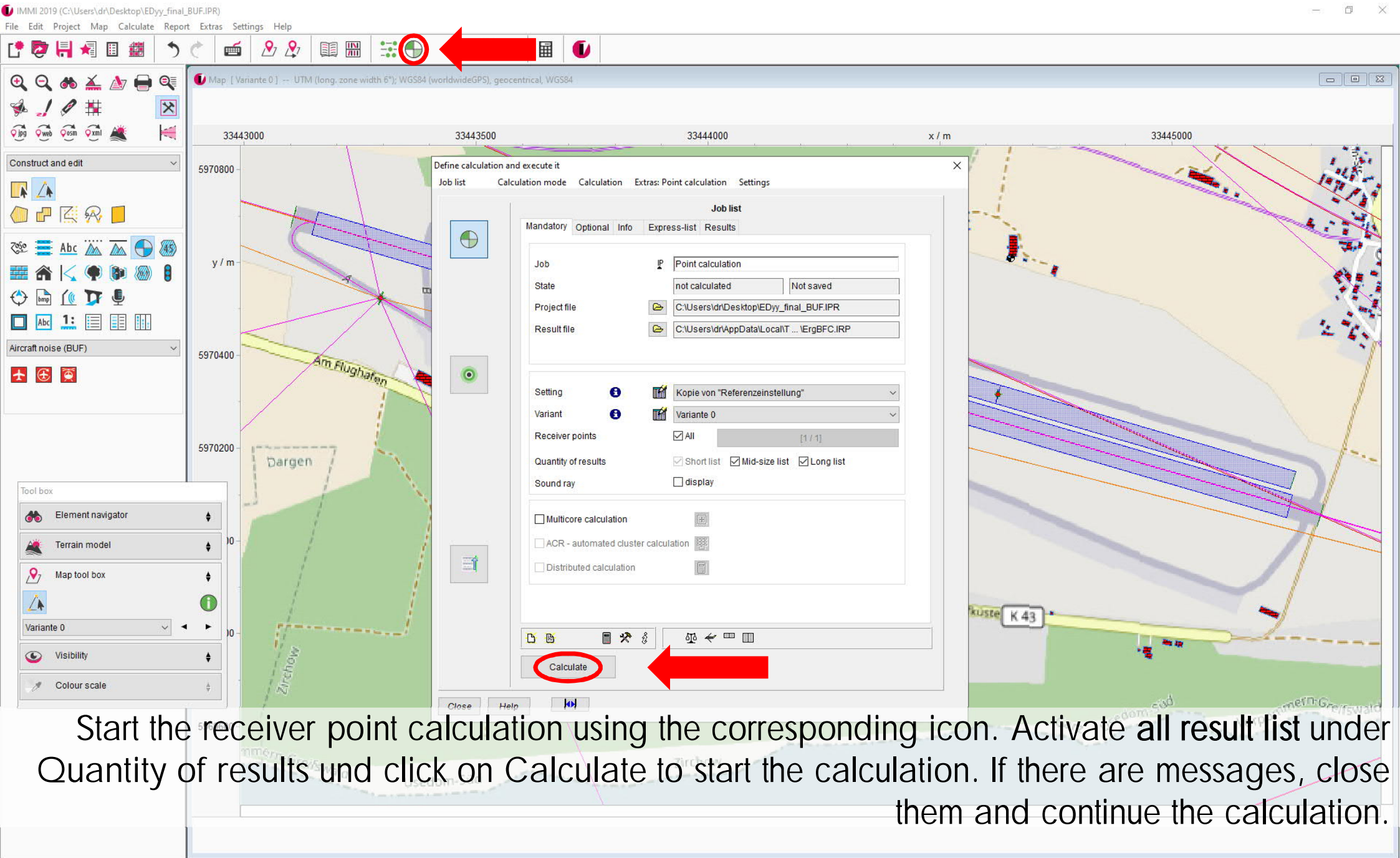
DEN:

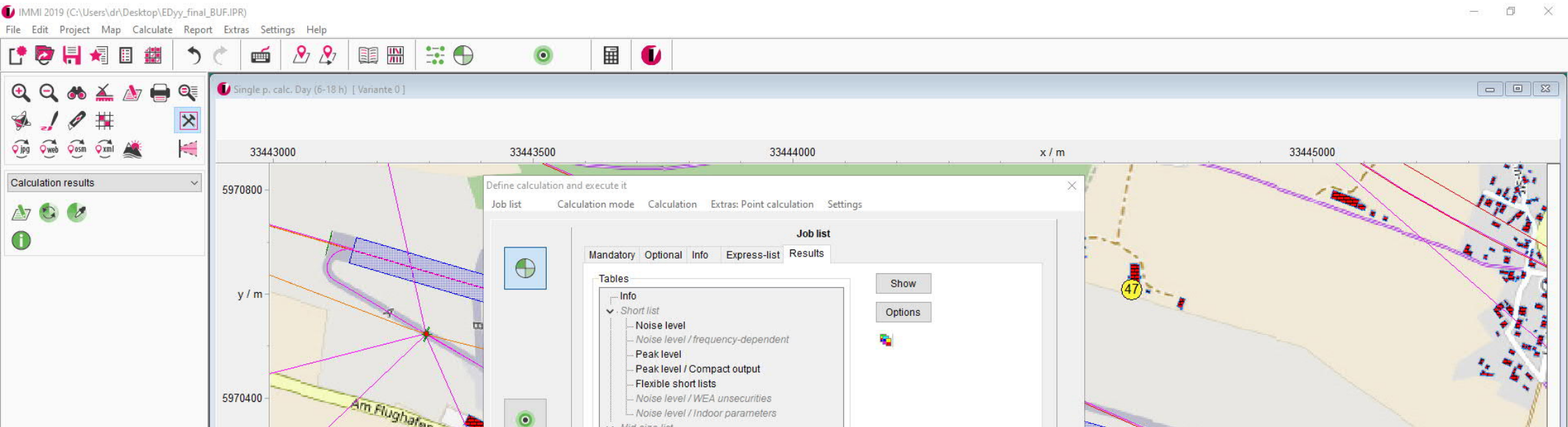
Day (6-22 h):

OK Cancel Help



Look for a nearby building and digitize a receiver point in front of the building. Enter a description and a height - z (rel)/m = 1,8m. Close the dialog box with OK.





Short list [9 Rows]

List Edit View

Short list		Point calculation									
Noise prediction		Rating following: CNOSSOS/flight noise (FRG)									
Variante 0		Setting: Kopie von "Referenzeinstellung"									
		Day (6-18 h)		Evening (18-22 h)		Night (22-6 h)		DEN		Day (6-22 h)	
		LV	L r,A	LV	L r,A	LV	L r,A	LV	L r,A	LV	L r,A
		/dB	/dB	/dB	/dB	/dB	/dB	/dB	/dB	/dB	/dB
IPkt001	RP 01		47.129		47.129		41.080		49.812		39.217

Press F1 to obtain information relative to further features

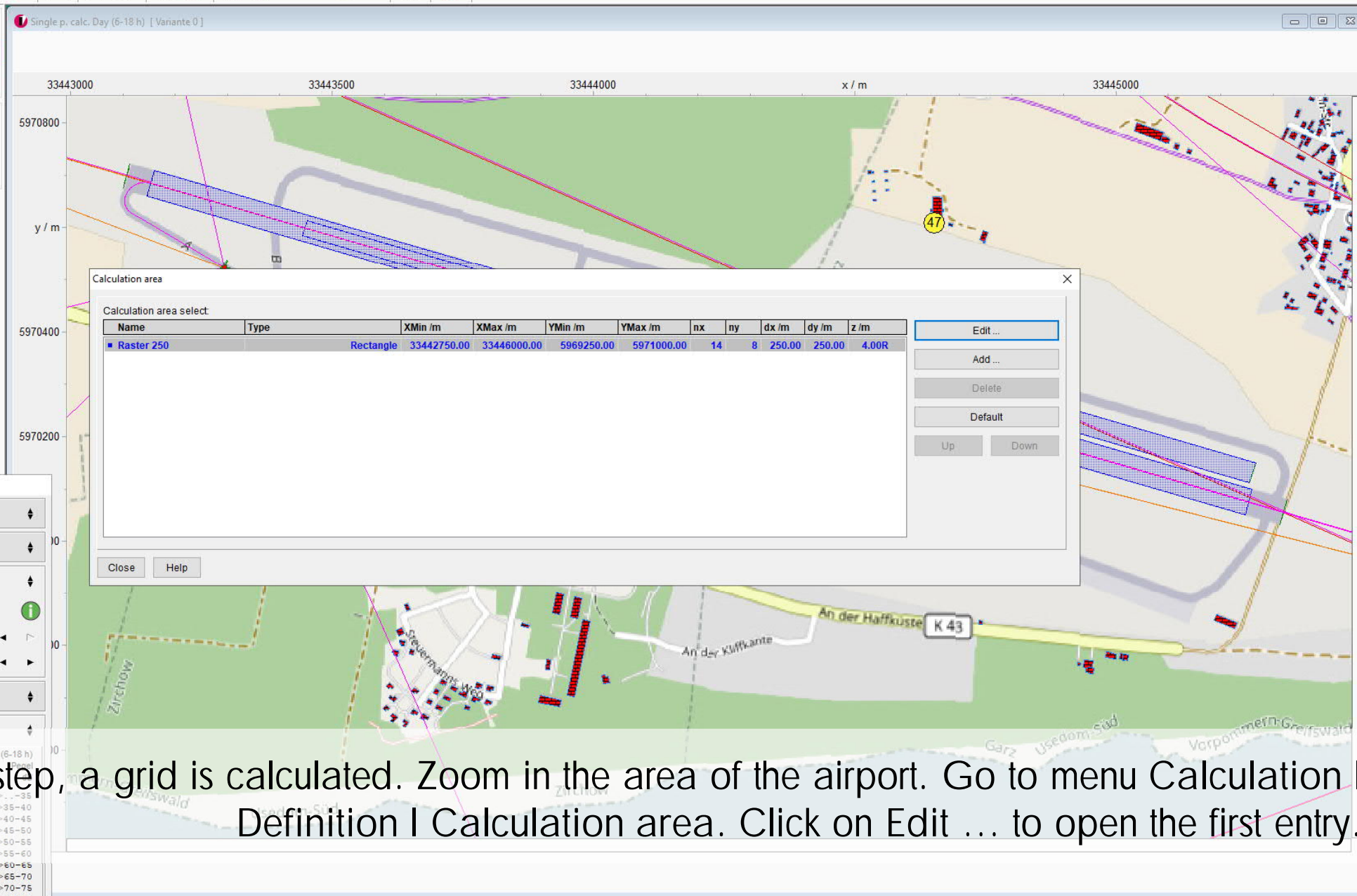
The Express-list is shown. Switch to Results tab and choose Short list / Noise level. Close all dialog boxes.





Calculation results

- Icons for calculation results and information.



Calculation area

Calculation area select:

Name	Type	XMin /m	XMax /m	YMin /m	YMax /m	nx	ny	dx /m	dy /m	z /m
Raster 250	Rectangle	33442750.00	33446000.00	5969250.00	5971000.00	14	8	250.00	250.00	4.00R

Buttons: Edit..., Add..., Delete, Default, Up, Down, Close, Help

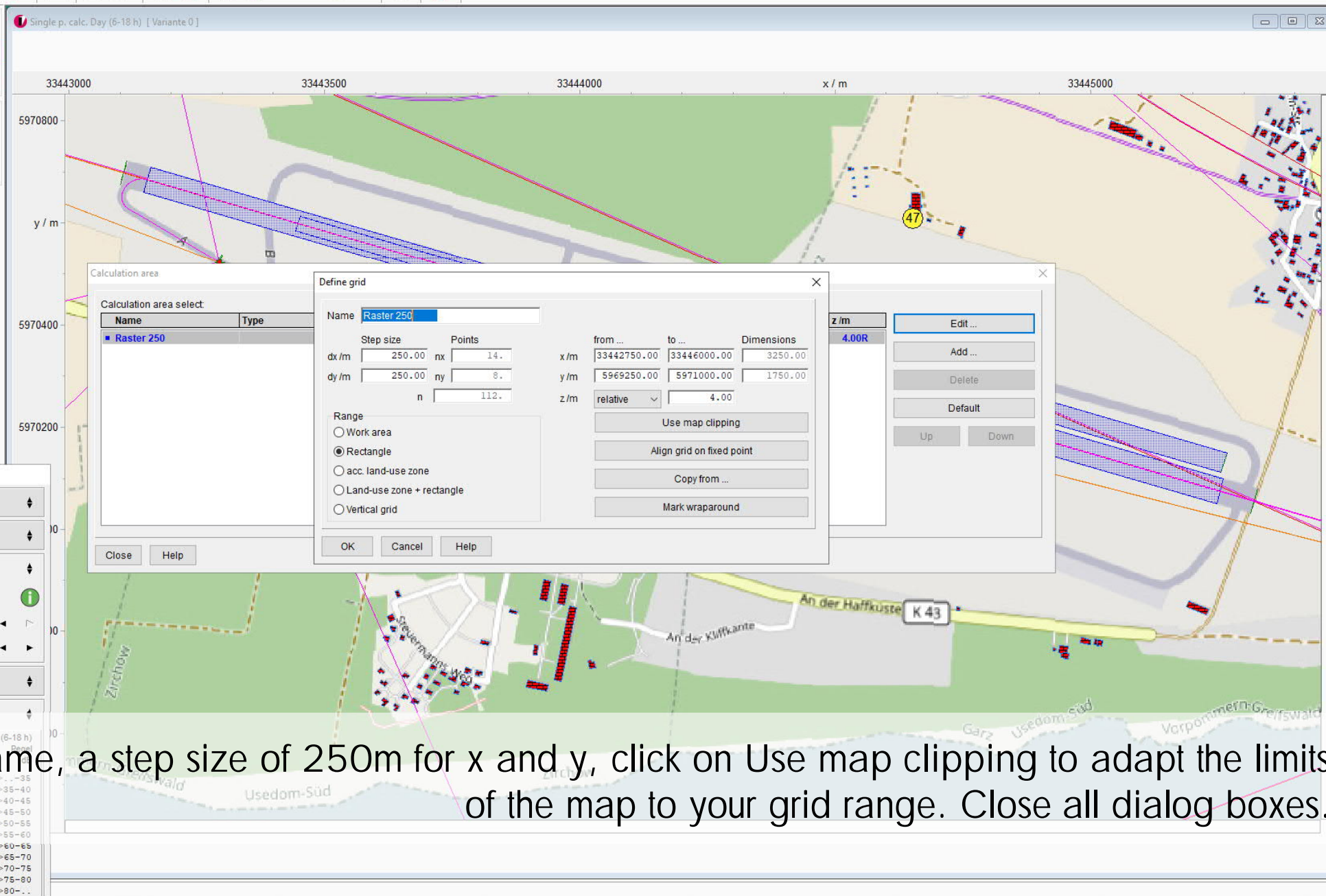
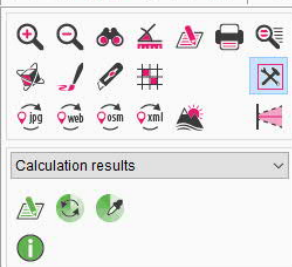
Tool box

- Element navigator
- Terrain model
- Map tool box
- Variante 0
- Day (6-18 h)
- Visibility
- Colour scale

Day (6-18 h) Colour scale legend:

- >35-40
- >40-45
- >45-50
- >50-55
- >55-60
- >60-65
- >65-70
- >70-75
- >75-80
- >80...

In the next step, a grid is calculated. Zoom in the area of the airport. Go to menu Calculation I Definition I Calculation area. Click on Edit ... to open the first entry.



Calculation area

Calculation area select:

Name	Type
Raster 250	

Close Help

Define grid

Name: Raster 250

Step size: dx/m 250.00, dy/m 250.00

Points: nx 14, ny 8, n 112

Range:
 Work area
 Rectangle
 acc. land-use zone
 Land-use zone + rectangle
 Vertical grid

Dimensions:
x/m from 33442750.00 to 33446000.00
y/m from 5969250.00 to 5971000.00
z/m relative 4.00

Buttons: Use map clipping, Align grid on fixed point, Copy from ..., Mark wraparound

OK Cancel Help

z/m 4.00R

Edit ...

Add ...

Delete

Default

Up Down

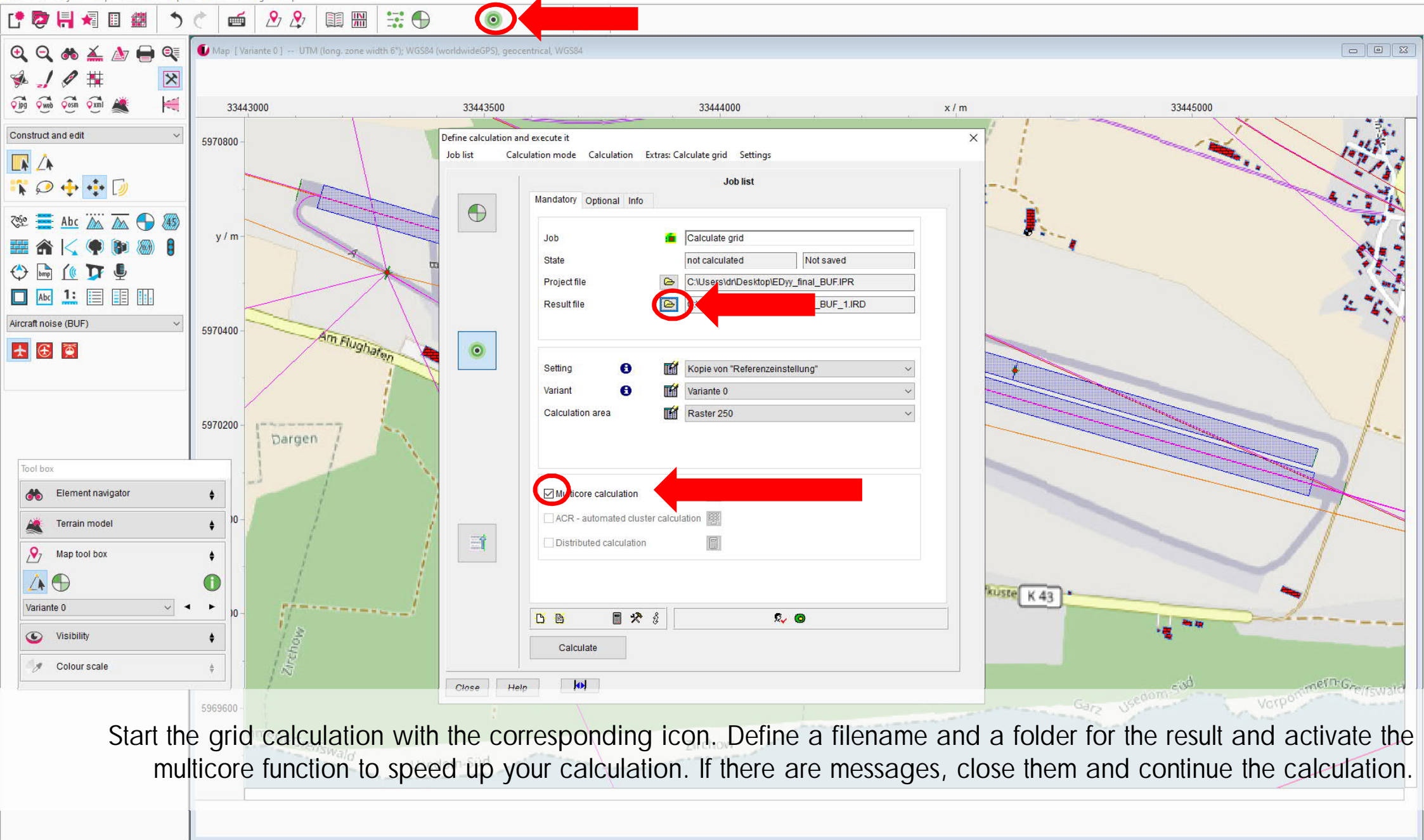
Tool box

- Element navigator
- Terrain model
- Map tool box
- Variante 0
- Day (6-18 h)
- Visibility
- Colour scale

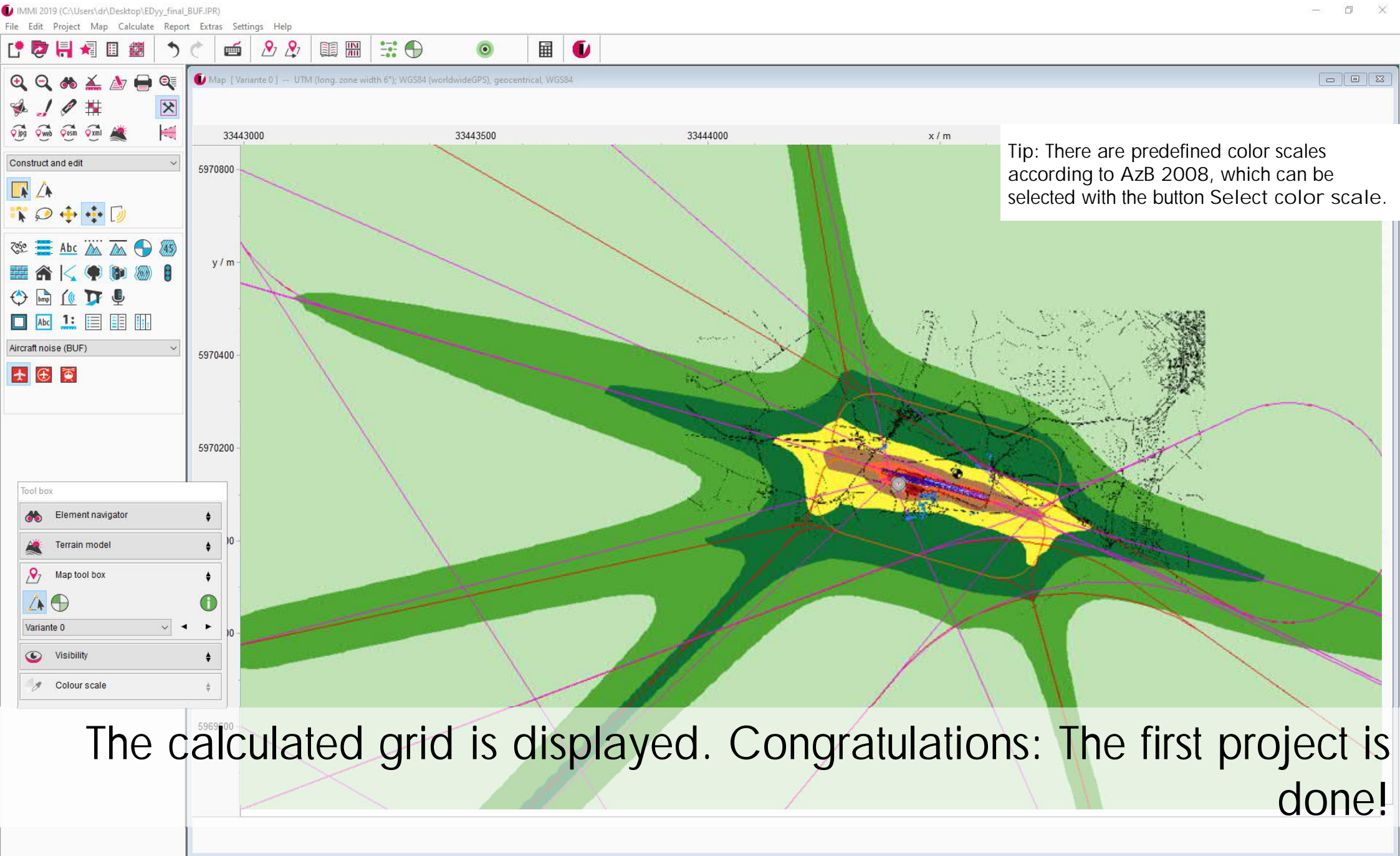
Day (6-18 h) Colour scale legend:

>35-40
>40-45
>45-50
>50-55
>55-60
>60-65
>65-70
>70-75
>75-80
>80-...

Enter a name, a step size of 250m for x and y, click on Use map clipping to adapt the limits of the map to your grid range. Close all dialog boxes.

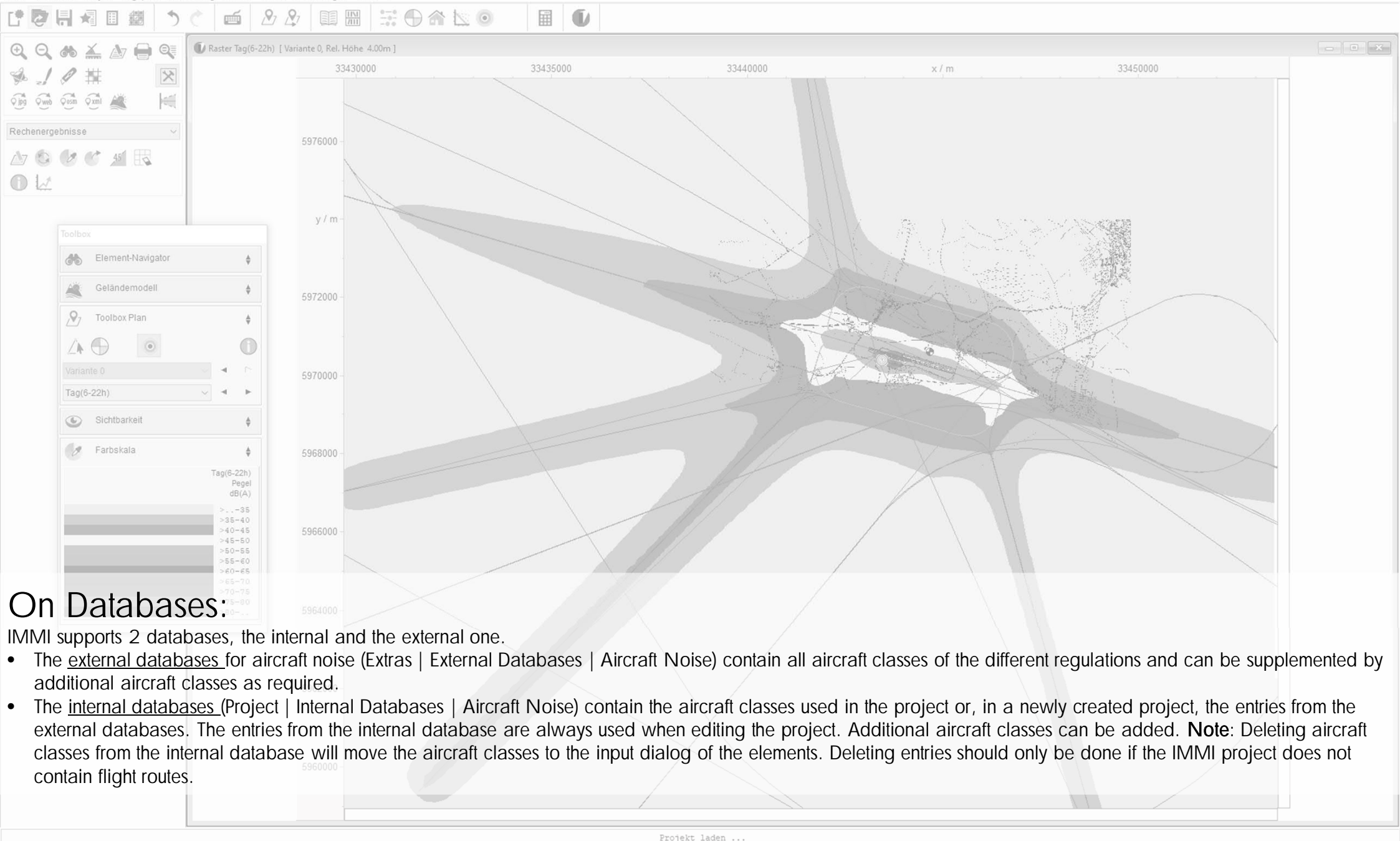


Start the grid calculation with the corresponding icon. Define a filename and a folder for the result and activate the multicore function to speed up your calculation. If there are messages, close them and continue the calculation.



Tip: There are predefined color scales according to AzB 2008, which can be selected with the button Select color scale.

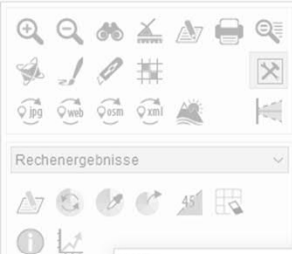
The calculated grid is displayed. Congratulations: The first project is done!



On Databases:

IMMI supports 2 databases, the internal and the external one.

- The external databases for aircraft noise (Extras | External Databases | Aircraft Noise) contain all aircraft classes of the different regulations and can be supplemented by additional aircraft classes as required.
- The internal databases (Project | Internal Databases | Aircraft Noise) contain the aircraft classes used in the project or, in a newly created project, the entries from the external databases. The entries from the internal database are always used when editing the project. Additional aircraft classes can be added. **Note:** Deleting aircraft classes from the internal database will move the aircraft classes to the input dialog of the elements. Deleting entries should only be done if the IMMI project does not contain flight routes.

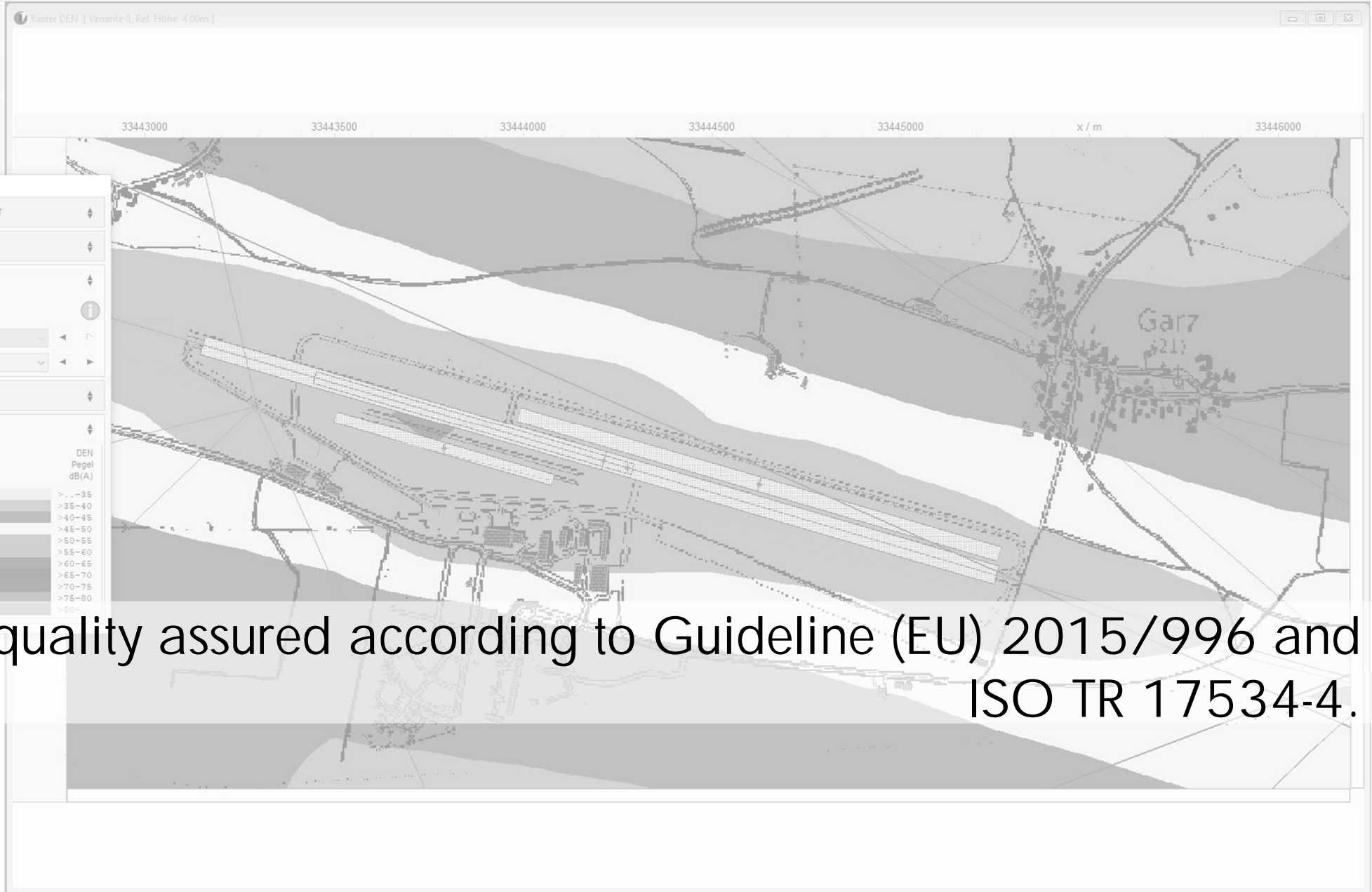


Rechenergebnisse

Toolbox

- Element-Navigator
- Geländemodell
- Toolbox Plan
- Variante 0
- DEN
- Sichtbarkeit
- Farbskala

DEN	Pegel	dB(A)
>..	-35	
>35	-40	
>40	-45	
>45	-50	
>50	-55	
>55	-60	
>60	-65	
>65	-70	
>70	-75	
>75	-80	
>80		



IMMI is quality assured according to Guideline (EU) 2015/996 and ISO TR 17534-4.



Rechenergebnisse



Toolbox

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DEN	Pegel	dB(A)
>...	>35	>35
>35	>40	>40
>40	>45	>45
>45	>50	>50
>50	>55	>55
>55	>60	>60
>60	>65	>65
>65	>70	>70
>70	>75	>75
>75	>80	>80
>80	>...	>...

Additional features for the calculation of aircraft noise:
FANOMOS: Import, evaluation and calculation of radar tracks.