



QUICK GUIDE – START USING WINDPRO

Purpose:

To get started using windPRO by creating a project from scratch.

Some basic features are presented to give an idea of the workflow and the interactions between maps, objects, tools and calculations.

Outline of Guide:

1. Installation and activation
2. Start – create project with background map and elevation data
3. Design wind farm and study it
4. Prepare for a calculation
5. Perform a calculation
6. The objects in windPRO

1. INSTALLATION AND ACTIVATION

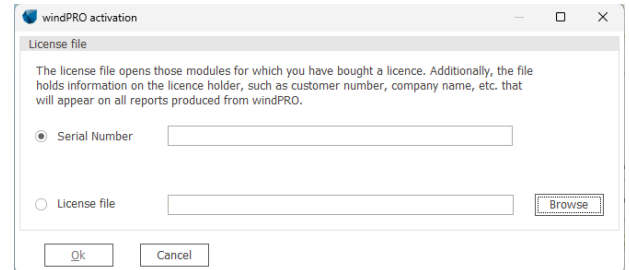
Download the latest windPRO installer here:

<http://www.emd.dk/windpro/downloads/>

Follow the on-screen installation instructions. Once installed, open Windows start menu and find windPRO 4.0. Select your desired language:



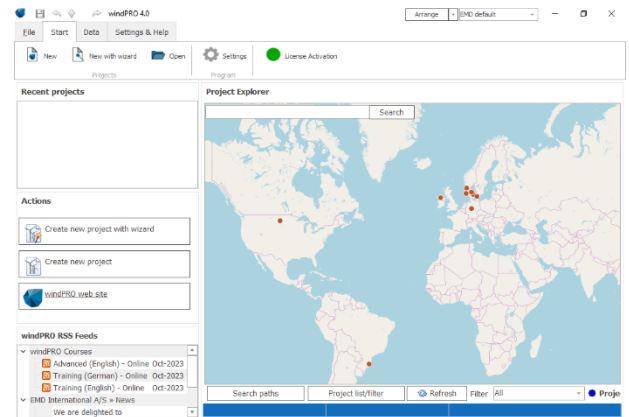
You will then be asked to activate your license:



Depending on your organizational setup you will either have received a file (.erf) from your license organizer or received a serial number from EMD (emd@emd.dk). Enter either the serial number or select the .erf file at the activation screen. Then follow the activation instructions on the screen. Internet connection is required.

2. STARTING YOUR PROJECT

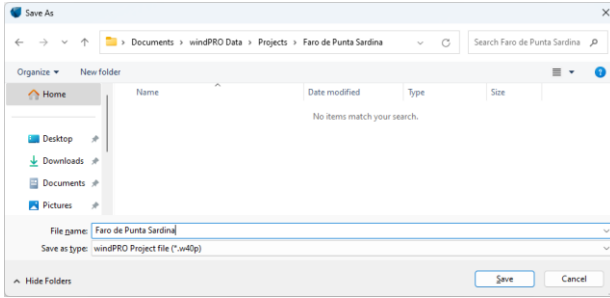
Opening windPRO will show you the start-up screen:



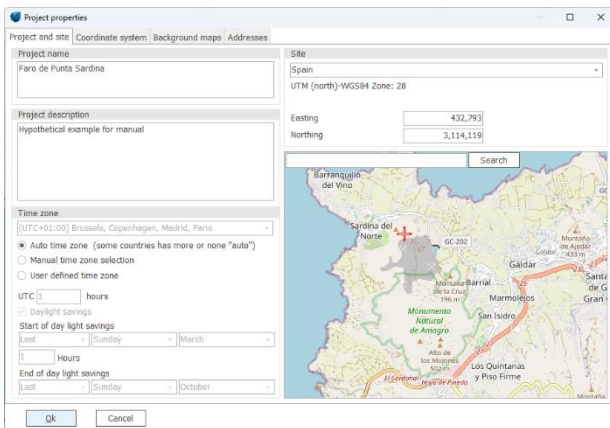
The map shows the projects located on your PC (or server) and each project can be opened by double clicking it.

To start a new project, double click on the desired site position on the map. Next specify where you want to save your windPRO project and all relevant data files:

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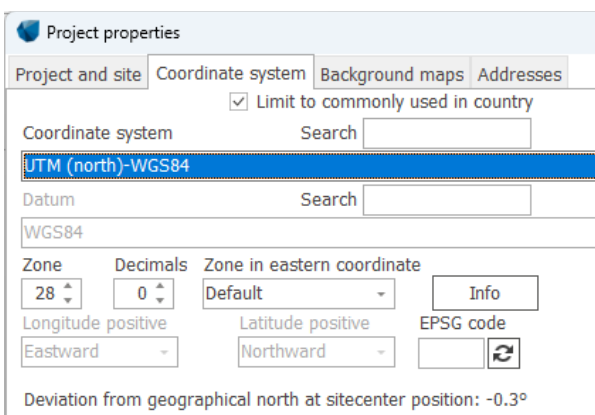


Click **Save** and next you will start selecting a more precise geographical location for the project:

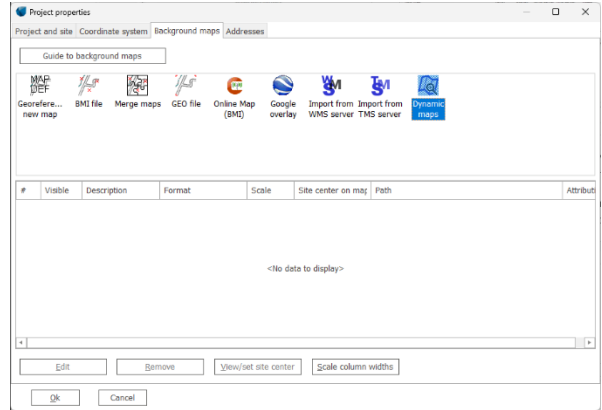


You can specify the location of your site by entering coordinates or click on the map to fine tune the position.

On the coordinate system tab, select the preferred system (the one you typical have coordinate info for):

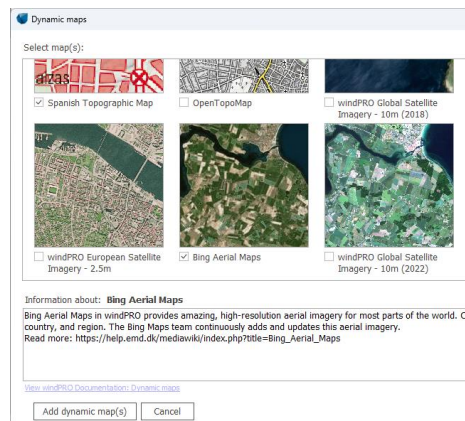


In the next tab, you can import background maps:



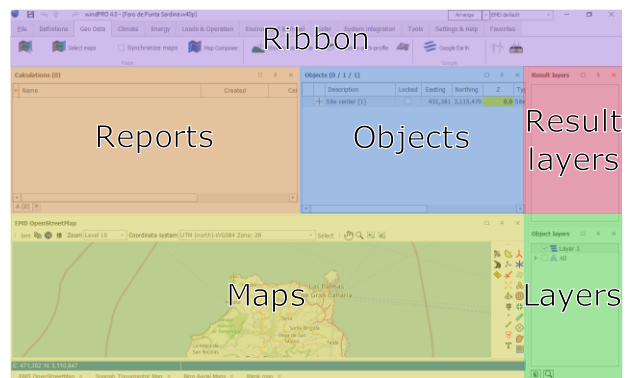
Here, you can import and georeference your own digital maps or simply use the available online maps.

In this example, we choose **Dynamic maps** and select **Bing Aerial Map** and **Spanish Topographic Map**:



Click **Add dynamic map(s)** and then **OK**.

This will take you to the windPRO main window which consists of multiple sections:

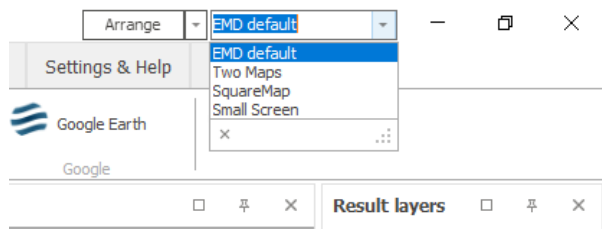


- The top **Ribbon** is where you start new calculations and assisting tools.
- The **Report** section is where the reports and results are stored once a calculation is done.

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- The **Maps** section shows a map of the site and location of any object like turbines, measurement data etc.
- The **Layers** section, allows you to group objects together so it is easy to show/hide groups of objects on the map.
- The **Objects** section is a list-representation of the objects on the map.
- The **Result layers** shows any geospatial results which can be layered on top of the map.

Each section can be moved around and different window arrangements can be selected in the top:

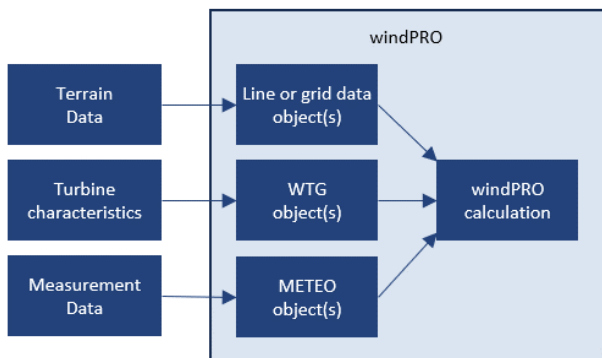



In this Quick Guide we stick to the *EMD default* layout.

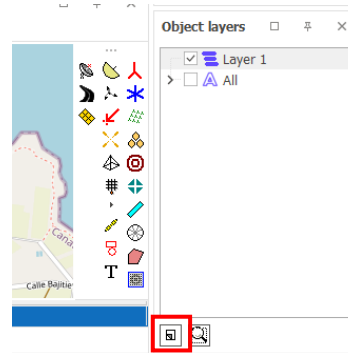
3. ADDING DATA

Now that you have created your project and loaded a few maps, it is time to import the most necessary data for your project.

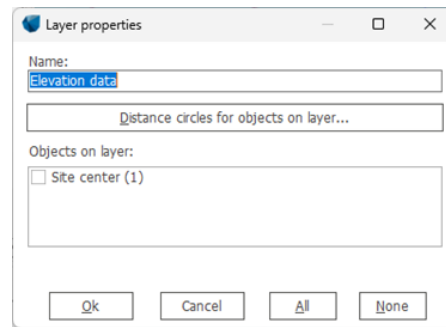
In windPRO, every calculation needs some kind of input data (elevation data, turbine type, measurements etc). These are stored in various windPRO objects.




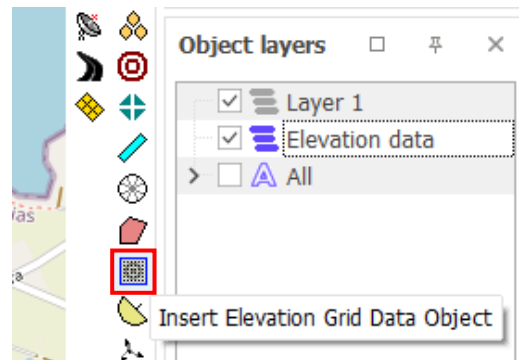
Since a project may contain hundreds of objects, it is nice to group the objects into different layers. Start by creating a new layer by clicking on the  icon in the **Object Layer** window (in the lower right corner):






Name the layer "*Elevation data*" and click **Ok**:



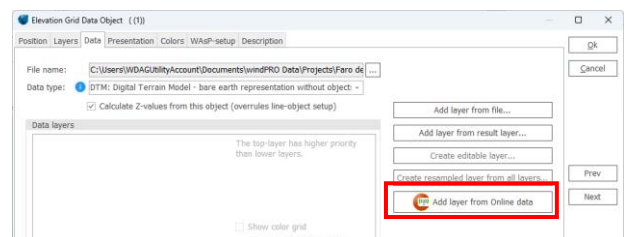
Now click on the symbol for **Elevation Grid Data** as :



(An alternative is to store elevation data as contours using the **Line Data object** ). Use this object when working with WASP.

With a left-click, place the  symbol on the map. The location is not necessarily important, so in this Quick Guide we place it close to the Site Center object .

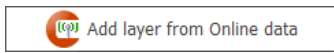
Once placed on the map, the properties window opens:



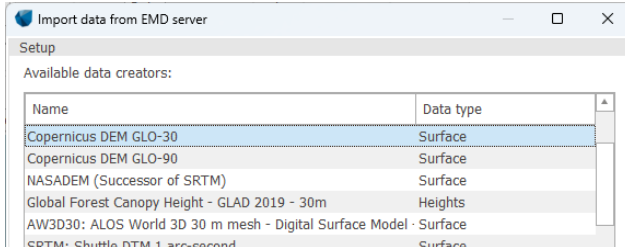
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From here you can add your own elevation data, or simply use the **Online data** provided with windPRO.

Choose **Add layer from Online data**:

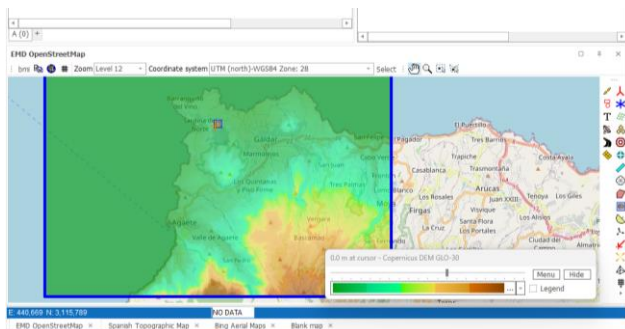


A list of available data sources appears:



Pick the data source you find most suitable, for instance the *NASADEM* dataset. windPRO gives access to multiple high-quality regional and global datasets depending on the site location. For more information about online data see the [windPRO Knowledgebase](#).

Clicking **Next** and **Ok** you return to the main window with the elevation data loaded and displayed on the map:



Here elevation data have been downloaded for 20 x 20 km.

Now your basic working environment is established and the project development can start.

4. DESIGNING A WIND FARM

windPRO offers two kinds of turbine objects:

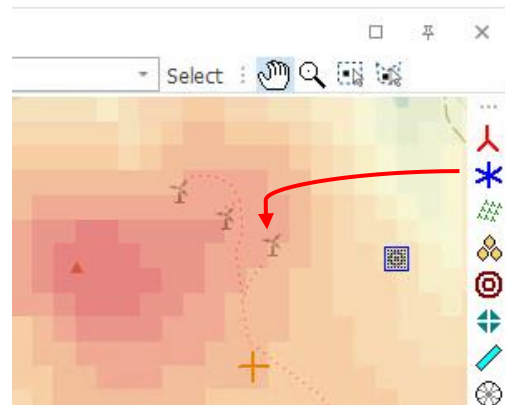
- New wind turbine (New WTG)
- Existing wind turbine (Existing WTG)

This distinction is convenient when for example, an existing wind farm is to be expanded. Then the new

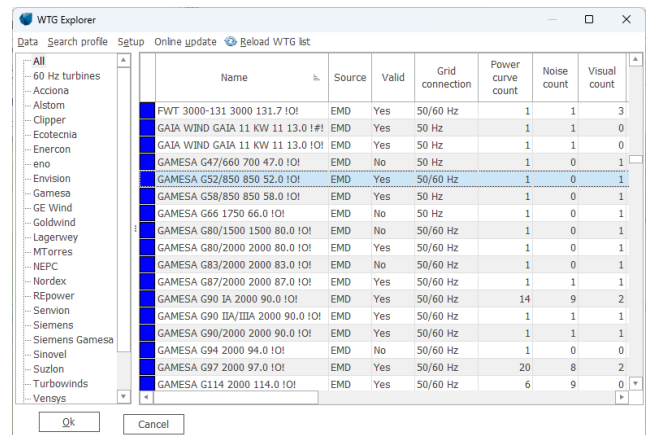
turbines are separately reported, while including the influence from the existing turbines on the new ones.

We will now place Existing WTGs on the map. It's a good idea to create a new layer for these turbines called "Old WTGs" (like we did with the "Elevation data" layer).

Click on the "Existing WTG object" button from the object menu bar and place it on the map (if shown, existing turbines may be visible on the OSM map at zoom level 15 or on the Bing Maps):

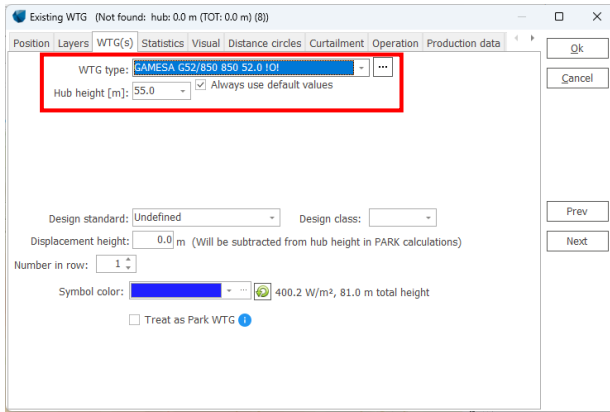


When adding the first WTG object on the map, the Wind Turbine Catalogue appears:

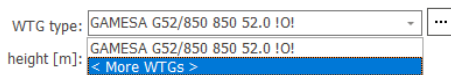


In this example we are looking to insert an existing Gamesa turbine. Scroll down and double click on the *GAMESA G52/850* turbine. This turbine model has now been selected for the inserted "Existing WTG" object:

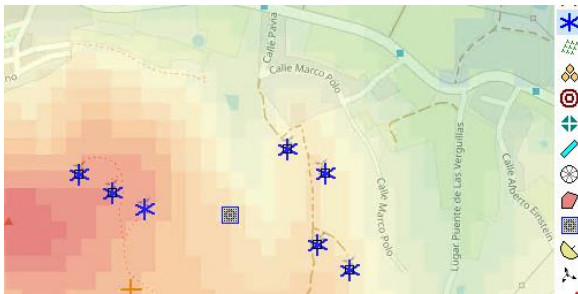
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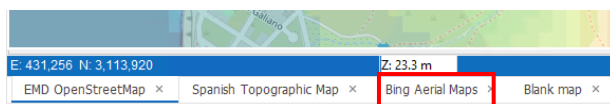
You can always change the selected turbine model from the drop down list:



Click **Ok** and repeat for every “Existing WTG” you wish to add:



You can change which map to view in the bottom of the map e.g., Bing Aerial map:




Here we can see that the WTG objects not positioned exactly where the real turbines were erected:



This is due to a discrepancy between the OpenStreetMap data and Bing Maps data. In this case, we place more

trust in the satellite image and want to adjust the location of the WTG object.

To move the WTGs in to the right position, simply click on the  WTG object on the map for selection, then drag with the mouse or use the arrow keys on your keyboard.

If you need to change the hub height or other properties for multiple turbines, simply hold down **<SHIFT>** and mouse-drag a selection box around the turbines you want to select.

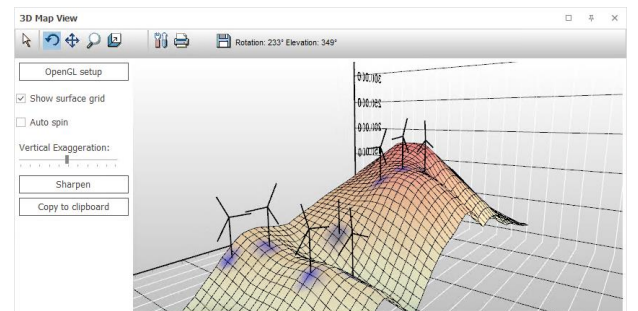
5. 3D VIEW OF SITE

There are multiple ways of visualizing how the turbines are placed in the landscape (Google Earth, terrain profile, 3D profile, quick profile)

To view the terrain in 3D click the **Show/update 3D Map View Window**:




Here the site can be viewed exaggerated and it is possible to study how the terrain elevation differs at the different turbine positions:



6. PREPARE FOR A NOISE CALCULATION

Most calculation types require extra data, most often entered as objects. This section will illustrate how to prepare for a noise calculation (DECIBEL module).

 The **Noise Sensitive Area (NSA)** object, holds the information on coordinates and noise demands for neighboring properties or dwellings.

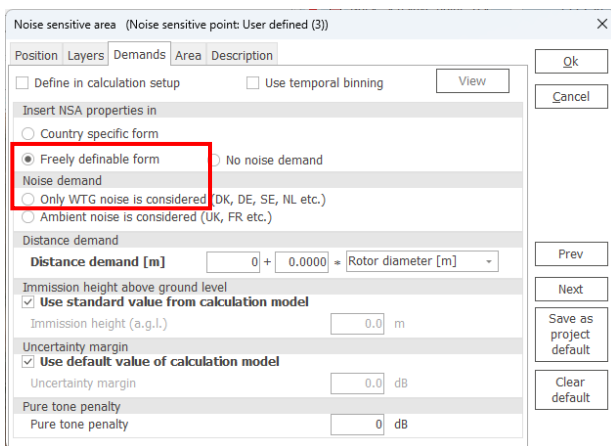
The NSA object can either be a point or an area. Click on the NSA object, then double-click on the map where the neighbor is located to insert a NSA point:

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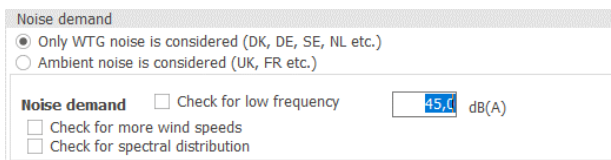
(Alternatively, if you want to define an area, click only once to start drawing a polygon).

When a NSA is established, this window appears:



Some country specific noise regulations (demands) are available in windPRO. These appear automatically based on the country of the site, if available.

In this example, we will use the “Freely definable form” and select the “Only WTG noise is considered” option. Then set a fixed noise demand at 45 dB(A):

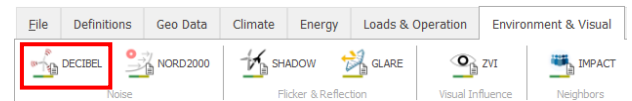


Click **Ok** to close the object.

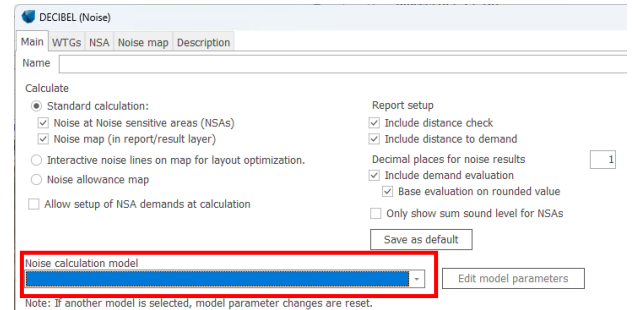
It is possible to enter many kinds of noise demands, including ambient noise, multiple wind speed ranges, distance demands etc. See the [Environmental manual](#) for in-depth information.

7. PERFORM A CALCULATION

In the **Environment & Visual** tab, a **DECIBEL** calculation can be started:

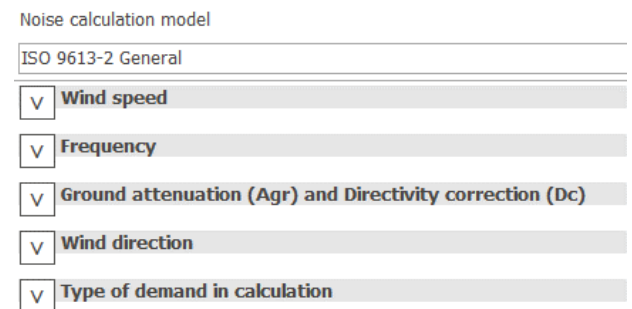


Clicking the **DECIBEL** button opens the calculation setup:



Select a noise calculation model from the list. In this case we use the *ISO 9613-2 General*.

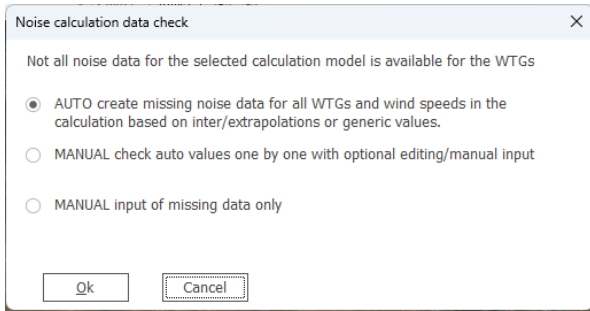
Once selected, the Model Parameters window opens. Here it is possible to edit the assumptions going in to the noise model. In this case, we stick to the default settings.



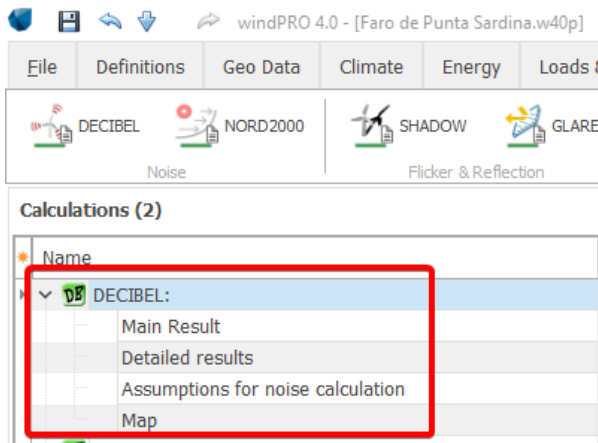
Click **Ok** and then **Ok** to start the calculation.

windPRO offers a large library of turbine data such as power curves, visualizations and noise data. However, not all turbines include all data. In this example, we don't have any noise data available, so windPRO asks us what to do. In this case, we select “AUTO” to just use generic noise data and click **Ok**:

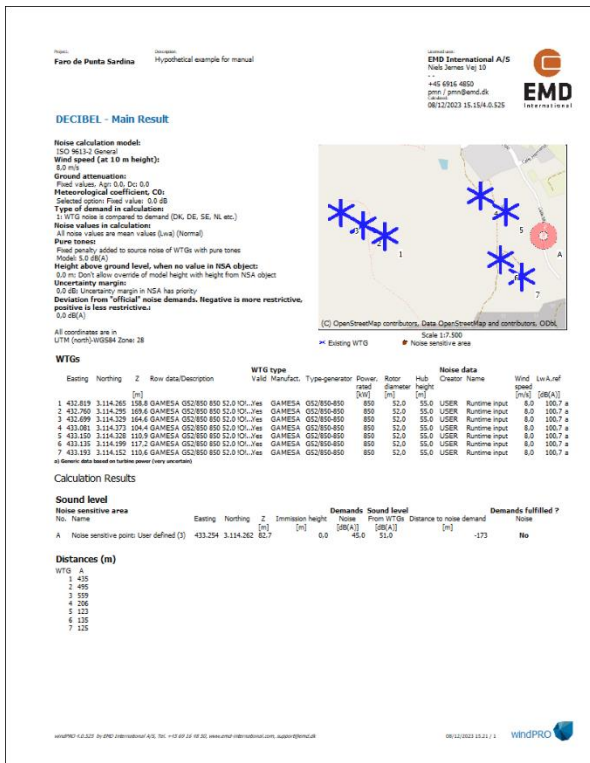
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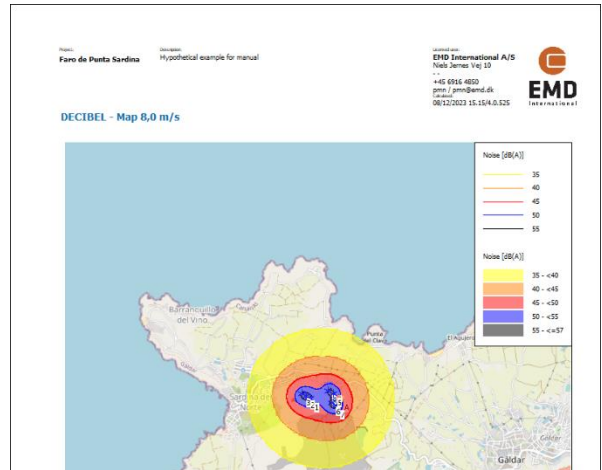
After calculation has ended, a calculation report appears in the **Calculations** window:



Double-clicking on e.g. **Main Results** opens the report:



Report: Part of the Main result page, with all the most important assumptions and results.



Report: Finally an example of a noise map at a specific wind speed.












The reports from windPRO are generally accepted as documentation of environmental impact by the authorities, like the energy calculation reports are accepted by the investors.

windPRO is regularly updated with new capabilities to match the requirements of the wind community. This development is highly influenced by active users world wide and by experts at EMD who have been in the wind business for several decades.












With windPRO you will have the most comprehensive wind farm project development framework to handle any type of wind farm project. To deepen your skills, we encourage you to visit the [windPRO knowledgebase](#) and participate in our [training courses](#).

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8. THE OBJECTS IN WINDPRO (DATA CONTAINERS)

	New WTG – creates a single WTG or row with equal spacing. Link to the comprehensive WTG catalogue, where all data for energy, noise, flicker, visualization and economic is/can be given.
	Existing WTG – actual energy production can be added and used to compare with calculated in e.g., Performance Check module. Existing WTGs has another status in calculation than new WTGs and is grouped separately in the PARK print out.
	Park Design – Only available with OPTIMIZE license. Create large wind farm layouts with multiple rows in strictly geometric patterns (for example offshore). Together with the WTG area object, the Park design object can "auto-realize" WTGs limited to non-restricted areas.
	WTG Area – Creates boundaries for WTG projects. For each section design options can be set such as number of WTGs, installed power and minimum distance requirements. Used by OPTIMIZE and as multi-purpose object for defining sites.
	Line Object – makes it possible to digitize/edit contour lines on-screen for use as digital height contour lines, roughness lines etc. The Line Object can import lines from different databases/file formats.
	Elevation Grid Object – allows for importing irregular grid data (elevation) and comprehensive graphical representation of elevation data.
	Area Object – For digitizing areas (polygons), e.g., forests, water, cities, farmland. The data can be used for multiple purposes; export of roughness lines, for ZVI, forest model etc.
	Meteo Object – to import or enter measured wind data for generating wind statistics or directly for energy calculation based on the measured wind data. Plenty of data import and analysis features.
	WASP Obstacle– to be used in energy calculations using WASP as calculation engine.
	Site Data – input of local terrain (roughness etc.) and regional wind statistics. When WASP is connected, it is possible to link digital height contour maps and roughness lines. Used for ATLAS, WASP interface, RESOURCE and PARK).
	Noise Sensitive Area – for calculation of noise (DECIBEL or NORD2000) at specific positions (neighbors).

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	Shadow Receptor – for calculation of flickering (SHADOW) at specific positions (neighbors).
	Camera Object – contains all data for a PHOTOMONTAGE, position and photo direction, the background photo, the camera parameters (focal length, film format), weather conditions etc.
	Control Point – to be used when calibrating camera models for PHOTOMONTAGE but also as multi-purpose object for reference points.
	3D-visualization Object – makes it possible to render figures drawn in SketchUp (*.DAE files) into a photomontage or 3D-animation. Can also be used for Glare calculations.
	VR object (3D animation) – contains all data for a 3D-Animation, like size of area, sky background, surface texture etc.
	Radar object – for defining radar positions and restrictions by ZVI calculations
	e-Grid objects – Create electrical lines, bus bars, transformers and loads for electrical calculations.
	Ruler object – Create a measuring tool for distance measurements. Basis for terrain profile.
	Shape tool – draw a rectangle or circle on the map as support for layout or measuring. The tools can be used for other features like the terrain profile.
T	Text object – Create a text on the background map.
	Road object – Create roads and calculate dig/fill and cost of roads. Optimization functions for minimizing costs included. Can also be used as an advanced measuring object and terrain profile viewer for fully flexible tracks.
	Solar PV object – Design solar photovoltaic farms and calculate the energy yield in the time domain, visualize the solar panels on photos and assess the environmental glare at neighbors.

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9. CALCULATIONS IN WINDPRO

BASIS	WTG Catalogue, Map Handling, Project Administration, Globe etc.
METEO	Import, screen, clean and repair wind data. Calculation of energy yield of single WTG
MCP	Measure-Correlate-Predict long-term reference data with measured wind data
MODEL	Interface to flow models for calculation of wind statistics, energy yield and wind resource maps
PARK	Array loss/wind farm calculation based on METEO or MODEL
LOSS & UNCERTAINTY	Loss and uncertainty analysis with calculated net energy yield at different exceedance levels (P50 to P99)
OPTIMIZE	Automatic optimization of Turbine Layout and Noise Curtailment Strategy
SOLAR PV	Design and AEP calculation for PV projects
HYBRID	Techno-economic analysis of hybrid projects with wind, solar and storage
PERFORMANCE CHECK	Analysis of the actual production of existing turbines and wind farms based on SCADA data
TR10	Calculation of quality factor for operating WTGs based on German TR10
SITE COMPLIANCE	WTG suitability for site and layout according to IEC 61400-1 standards
LOAD RESPONSE	WTG load estimation with generic or specific load models.
SHADOW	Flicker calculation for WTG or Wind Park of any neighbor (+ isoline map).
DECIBEL	Noise calculation for WTG(s) or Wind Farm at any neighbor (+ isoline map).
ZVI	Calculation of Zones of Visual Influence (area calculation + ZVI-map)

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IMPACT	Complete print of the environmental impact of each neighbour
NORD2000	Advanced noise calculations
GLARE	Calculation of the sun's reflections on objects onto neighbors.
PHOTOMONTAGE	Visualization of WTG(s) based on a landscape photo or artificial landscape
ANIMATION	Animated presentation of WTG(s) based on a landscape photo
SketchUp INTEGRATION	3D model exchange between windPRO and third-party 3D application, SketchUp.
eGRID	Design, calculation and optimization of electrical grid systems for WTG projects
WINDBANK	Economic calculation of single owners/companies/corporations