

NoiseMap five

Guide to Digital Mapping

The features described in this User Guide may not be available on all installations.

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E&OE

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GUIDE TO DIGITAL MAPPING

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2. AN OVERVIEW OF DIGITAL MAPPING AND IMAGING

THE CONCEPT OF DIGITAL MAPPING

Noise models are a specialist form of digital mapping used by noise mapping software for doing noise calculations. The most time-consuming part of noise mapping is the creation of this noise model. Whilst noise models can be created by on-screen drawing, these days this is only used for the simplest schemes, or to make minor adjustments to an existing model.

This guide introduces the concept of digital maps, drawings and images and how these are used in NoiseMap. This will help you to make the best use of the available information resources.

NoiseMap makes it possible to create noise models directly from digital mapping, using automated conversion features in the software. The conversion process strips out unnecessary features and detail from the digital map, such as individual trees and low walls, or information that cannot be readily used such as various ground detail.

At the same time, the conversion process can add other essential information that may not be present in the map. For example, a digital map is often only two-dimensional. *NoiseMap* can separately import ground contour details and use these to add a height dimension to other objects such as roads or noise barriers.

Ordinary digital maps do not contain important non-geographical information such as traffic flows, rail roughness or plant sound power levels, but *NoiseMap* helps you to add this information to the noise model.

Geographical Information Systems (GIS) can contain some of this additional information and if so, *NoiseMap* can add it directly to the Noise Model.

It will depend on the project whether detail should be processed and added to base mapping in an external GIS or drawing system, or whether it should be done in *NoiseMap*. *NoiseMap* is a type of specialised GIS and has many features of a drawing system, but it does not replace general-purpose packages.

DIGITAL MAPPING FORMATS

There are several formats for digital mapping, principally:

- Bitmaps

- Raster maps
- Vector maps

Bitmaps are essentially computer images in which each pixel on the screen is assigned a colour value. The pixels can be stored in files, and are not usually compressed, so each pixel on the screen has an individual colour value assigned to it: this makes for large files. Bitmaps can be compressed using many available techniques, becoming JPEGs, PNGs and the like. Depending on the compression method, some loss of definition (blurring) can occur.

A **Raster map** is essentially a grid of points at a fixed spacing. The value assigned to each point may represent a colour value, as in a bitmap, but it could also be any other value, such as a ground height or noise level. Just as in a bitmap, the map has a finite resolution dependent on the spacing of the grid of points. The value of the ground height (or whatever the raster represents) is not known within the spaces between the grid points, but is inferred from the adjacent points.

A **Vector drawing** is made up of a series of lines joining defined points. The lines usually represent the edges of features, such as a building, or the position of a value such as the location of a ground height contour. One benefit of a vector drawing is that each object can be independently represented in the drawing and therefore each object can have its own 'properties' and can be displayed separately from the other objects. A further benefit of a vector drawing is that features can be represented with fewer data points than needed in a raster image, so it is relatively compact, and it can be scaled up or down without loss of resolution. However, it is limited to the resolution that was chosen when the drawing was created. Thus, if ground contours are drawn at 10 m height intervals, say at 10 and 20 m above sea level, the position of the 15 m contour is not defined and must be inferred from the adjacent contours.

NOISEMAP PREFERENCES

NoiseMap is based primarily on **Vector objects**, although raster and bitmap objects are also used for some situations. You can import and undertake automatic conversion in both Shapefile and DXF Vector formats described below.

Shapefiles

Shapefiles are the most flexible form of Vector Mapping. Originally designed for use by ESRI ArcView Geographical Information Systems (GIS), they are now widely used for similar applications. In addition to the geographical location of each object, a shapefile can contain almost any other information about the object, such as the road surface, traffic flows, building heights, or rail roughness. A Shapefile contains at least two distinct parts. One of these contains the geographical information, i.e. the co-ordinates of the object, which can be two or three dimensional. The other part is a database that contains the additional information or 'attributes' of the objects.

DXF

Drawing Exchange format (DXF) is a very common format for digital drawings, originating from AutoCAD. It originally only allowed 2-D or 3-D lines to be imported, and although its capabilities have been extended, it does not include the 'attributes' available in a Shapefile and its popularity in mapping applications has declined.

Bitmaps and on-screen drawing

Bitmaps are usually obtained from aerial photographs by screen-capture or by scanning in paper drawings or photographs. NoiseMap can use a bitmap of any scale – it is only necessary to be able to determine the real-world separation distance of two points on the map or photograph. However, these cannot be automatically converted into NoiseMap objects. Instead, you have to trace over the objects of interest using the mouse on-screen. This is a good way of adding detail if digital maps are not available but can be time-consuming and inefficient for large areas.

XML

This is a general-purpose method of storing and sending information. Some maps are available in this format but **cannot** be used in NoiseMap.

FEATURE CODES, LAYERS AND AUTOMATED CONVERSION

A vector drawing may contain a large number of entities representing objects of many different types. It is useful to be able to distinguish between the different types of objects.

Feature codes

In Shapefiles, this can be done by giving each object a **feature code** that represents the type of object. Ordnance Survey maps have standard feature codes that identify common objects such as roads, rail tracks, water bodies, buildings, etc. Every object in the map has a feature code, although many objects fall into the category of 'general feature'.

Layers

DXF-type drawings do not allow objects to have additional attributes, so they cannot be given feature codes, but they do allow a drawing to have many separate 'layers'. These layers can be visualised as separate 'transparent' sheets that can be overlaid on each other to form the complete drawing. There is in fact no necessity for each layer to contain only one type of object – for example one layer could contain a map of an area and another layer could contain all the details of a new housing development, with buildings, roads and every other detail.

Automated conversion

However, to allow automatic conversion of a digital drawing into a noise model, it is highly desirable that each layer should only contain one type of object. For example, road centre lines

should be in one layer, kerb lines in another layer and buildings in another. Labels should also in separate layers. If each layer of the drawing contains only one type of object, *NoiseMap* can automatically convert all the objects in the layer into the appropriate object type.

Mixed layers

Note that some CAD technicians are primarily concerned with creating a drawing that looks nice on screen and on paper. They are not going to make a technical analysis of a drawing and they may find it easier to handle if they merge the original separate layers into one layer of mixed object types. Where digital drawings contain a mix of different types of object in a layer, *NoiseMap* is still able to semi-automatically convert some types of entity into noise model objects, but it is much less efficient. In order for entities to be converted, they must be represented as 'polylines', ie short sections of straight line joined into a continuous chain.

Geometrical objects

Where DXF drawings use other ways of representing objects, such as arcs and elliptical shapes, instead of polylines, these cannot be automatically converted by *NoiseMap*, but can be entered manually by tracing over them with the mouse.

USING FEATURE CODES AS LAYERS

As stated above, *NoiseMap* can automatically convert all the objects in the selected *layer* of a map into the desired type of *NoiseMap* object. Shapefiles do not have layers – they have feature codes. But when importing a shapefile into *NoiseMap*, you can select a particular attribute, such as the feature code, to assign the object to a given layer. *NoiseMap* will then create one layer for each different feature code, thus allowing automatic conversion to be used.

TOPOGRAPHIC DATA

THE HEIGHT DIMENSION

The height dimension is particularly important when modelling the spread of noise, but is often missing from maps and drawings, whether in paper or digital format.

Nevertheless, digital height data is now available at reasonable cost through the use of large-area 'remote surveying' techniques, which has greatly simplified this aspect of noise modelling.

NoiseMap contains a number of tools for adding separately-obtained height information to two-dimensional maps, either by 'draping' the two-dimensional map over a grid (or array) of height values (ground levels), or draping over ground contour lines.

OBTAINING HEIGHT INFORMATION

You should obtain the topographic (i.e. height) data and enter it first. Topographic surveying is a complex matter and a brief explanation is needed. Modern topographic data is obtained by aerial radar or lidar survey. Whilst this avoids the cumulative errors that can arise from old-fashioned manual surveying, the ground surface is not always visible, being obscured by vegetation, buildings and structures. Various techniques are employed to discover the 'bare earth' levels free from vegetation, buildings and structures.

DEMS AND DTMS

The 'bare earth' levels are called a Digital Elevation Model (DEM) and are usually supplied as a grid of points. A Digital Surface model (DSM) is the level of the surface including the height of structures and vegetation – it is useful for knowing the line of sight between objects, but is not useful for noise modelling. A digital terrain model (DTM) can mean either the same as a DEM, or it can include a vector dataset denoting the edges of features, i.e. contour lines. A vector DTM is best for noise modelling and is widely available.

GROUND CONTOURS OR PROFILES ARE ESSENTIAL

NoiseMap **must have ground contour data** for the correct modelling of the attenuation effect of acoustically-soft ground and for the calculation of the barrier screening effect of the topography.

For this reason, you must obtain topographical data in the form of ground contours and save these contours as part of the noise model.

Contour interval

Unfortunately, there has been a recent tendency for engineers using gridded height data to convert this into contours with a very small contour interval – often as close as 10 cm. Whilst this level of accuracy may be important in civil engineering, it is an arbitrary and misleading degree of precision for noise modelling: – for example, affected by wheel ruts or a stray brick on the ground. For noise modelling, a contour interval of 1 m is sufficient. Indeed it is more important to locate the edges of features with accuracy. NoiseMap allows for this: ground 'contours' do not have to be level – it is quite permissible to mark the 'profiles' of the edges of features such as the top and bottom of embankments and cuttings, with each point being a different height. This uses much less data and is much more efficient for model size, calculation speed and accuracy.

OBTAINING HEIGHT DATA

Ordnance Survey 'Landline' and 'Mastermap' drawings are only two-dimensional: all objects are effectively at zero height. Ground contours are not provided: usually the only height information is in the form of spot heights. These are in the form of crosses in one layer of the drawing to mark the location, and an associated height label in another layer of the drawing.

OS 'Landform' drawings contain three-dimensional ground height information, and are available in two types: one with spot heights and contour lines, and the other as a rectangular matrix of heights. NoiseMap can use either type for the extraction of height data, but only contour lines can be permanently stored within the noise model.

Independent providers such as **NextMap** are now able to supply various types of remotely-surveyed height datasets, which are usually used in conjunction with 2D maps such as OS Landline, MasterMap or specific scheme drawings, which provide the *location* of built features. These are sometimes called Digital Terrain Models (DTM) or Digital Elevation Models (DEM).

Some engineering design packages, such as MX (MOSS) and AutoCAD can produce a full 3D **line** output and these can be used by *NoiseMap* to produce the 3D model directly. However, some drawing packages can now provide 3D '**polygon**' drawings which represent the surfaces of an area. For example, a wall could be represented by a series of vertical rectangles. These may be good for visualisation of an area, but are **not suitable** for use with NoiseMap.

AUTOMATIC HEIGHT GENERATION

NoiseMap can generate heights automatically if 3D data is present in the map being processed, or it can extract heights from a separate dataset and add them to the objects being processed.

There are six options for obtaining heights, but you will only be offered those options available from the data present:

- ❑ from the DXF line itself (if it is three-dimensional): this is the easiest and most accurate, when the model is in 3D (for example output from a highway design package);
- ❑ from OS 'Landform' (or other types) of ground height grid: this is a straightforward and automatic way of adding height data. They can sometimes be provided as contour lines, but more usually they are a grid of points each with a given height. The edges of features can be blurred by the grid spacing and a plan map will be needed in order to see the location of features. New digital datasets are available with a close grid spacing that can give good resolution of small features. However, beware that heights provided in a grid format cannot be stored in NoiseMap. You must use them to abstract the height of features such as roads and buildings,

and the edges of slopes, embankments and cuttings which can then be stored in NoiseMap.

- from selected DXF layers: if you have combined an OS 'Landform' ground contour map with the OS 'Landline' map (using another CAD package), you only want to use the 3D ground contours when getting heights: you indicate the available layers in the DXF View Options screen;
- from *NoiseMap* ground contours, perhaps previously obtained by converting OS 'Landform' contour data;
- from *NoiseMap* spot height chain (a chain of points you create temporarily for obtaining heights), see p. **Error! Bookmark not defined.**;
- entered manually in the object properties editing screen.

When you are putting in a new object, it may not be at ground level. If you are getting the height from ground contours, then you would need to add some height to the local ground level to obtain the height of the object. For example, if you are entering a barrier which is 3 m above ground level, enter 3 in the **Add Height** box.

Further information on using DTM/DEM data

If DTM data is provided as a series of polylines (points connected to form lines) then it can be stored for future use in NoiseMap as a ground height profile. However, if the DTM is provided as a grid of points, it cannot be permanently stored in NoiseMap. It can be temporarily imported but must then be used to abstract the heights of other features (such as the edges of roads, building outlines, the top and bottom of slopes, etc) which can, of course, be saved into the noise model.

When using the **View>Load Landform Grid** feature, you can import a grid of points either in DXF point format or in CSV format by selecting from the drop-down. The grid has a maximum size of 5000 by 5000 points. In CSV format, each line has an x, y and z value. No column headers are expected. Any line beginning with ; is regarded as a comment and is ignored.

3. USING VECTOR DIGITAL MAPPING

The previous chapter introduced the concepts of digital mapping, the formats in which they are commonly available, and aspects of what is required in a NoiseMap model.

It should help you in deciding what digital mapping you should acquire. This present chapter is intended to guide you in using Vector digital mapping (Shapefiles and DXF files) to create a noise model.

GEOGRAPHICAL OBJECTS IN NOISE MODEL

The following geographical objects comprise the noise model:

- ☐ Road Segments
- ☐ Track Segments
- ☐ Route Segments
- ☐ Fixed Workings
- ☐ Receivers
- ☐ Barriers
- ☐ Outlines (Buildings, Water, Areas, Marker lines, Annotation)
- ☐ Ground contours
- ☐ Ground type outlines

ATTRIBUTES OF GEOGRAPHICAL OBJECTS

Each of these objects has a range of attributes which differs according to the type of object. These are shown in the attributes table in the appendix to this guide, which should be consulted to assist with understanding the following description.

The first column of the attributes table shows all the rows of the relevant **object properties dialog box**. The object properties box is different for each type of object and is shown by selecting an object and either double-clicking on it or opening the Edit Object button in the toolbar.

Which values can be imported from digital mapping?

Most of the property values of an object can be imported from a shapefile, except those that are used internally by NoiseMap for

managing the model. The management values are shown for user information but are not user-editable. Such values are indicated by an asterisk (*) in the table. Some of the rows of the properties box are action buttons, generally to do with calculating the object height. These do not represent any object value and cannot be imported from a shapefile.

Some objects in a noise model are not specifically geographical although they can be associated with geographical locations. These include such objects as traffic flows, construction activities and train services, where the same object can exist in many locations, and where the same location can have several different instances of the object. Shapefiles do not readily lend themselves to this type of object and so NoiseMap imports these from separate tables. These objects are indicated with a + symbol in the appendix.

It is preferable to assign a traffic flow *reference number* to a road segment, rather than the traffic flow itself. To allow for situations where the traffic flow parameters have been assigned in a shapefile, it is possible to import these from the shapefile. However, the actual traffic flow parameters are not saved as part of the road segment properties: instead NoiseMap puts them into a separate traffic flow table. These objects are indicated with a ++ symbol in the appendix.

Information required in a noise model

The full and complete information ideally needed for a noise model is set out in the appendix to this guide, which also defines the contents of the Shapefiles used by *NoiseMap* to export its noise models. Shapefiles are a method of data transfer used by ESRI GIS systems.

Shapefiles in this format can be immediately imported into *NoiseMap* and automatically converted into a noise model.

Shapefiles in other formats can also be imported and automatically converted, although they may not contain all the information needed for a complete noise model. The additional information must then be imported from other sources, generated with the use of tools within *NoiseMap*, or added manually.

Other digital maps such as those in DXF (AutoCAD data exchange format) can be used, but these are more limited than Shapefiles and some post-processing within *NoiseMap* is likely to be needed.

CO-ORDINATE RANGE

UK ORDNANCE SURVEY NATIONAL GRID

A NoiseMap model is limited to 2048x2048 tiles. By default, tiles are 500 m square, so this is an area of 1024x1024 km (over 1 million square kilometres). The area of the UK is about

244,000 square kilometres, but the distance from Land's End to John O'Groats is about 1000 km, so it should be possible to have the whole of Great Britain in a single model. We are not aware that anyone has done this yet, so cannot say that it would work.

The maximum 'easting' of the Ordnance Survey national grid is 700 km, but the maximum 'northing' of the OS national grid is 1300 km, and lies north of Shetland. Thus the whole of the United Kingdom cannot be included in a single model using the default tile size.

However, it is possible to make tiles larger – for example 1000m square – so then the model could cover this larger area. We do not support or recommend this.

OTHER GRID SYSTEMS

The issue of mapping the curved surface of the earth to a flat sheet of paper is complex. Various systems of 'projection' are used depending on the part of the globe being mapped.

In one example in the Middle East, typical model co-ordinates are (800 000, 2 600 000). In other words, the model is 800 km east of the origin and 2,600 km north of the origin. NoiseMap will only allow you to have 7FF by 7FF (expressed in hexadecimal) tiles in a model, ie 2048 by 2048 tiles, expressed in decimal. Since the tiles are 500 m square by default, the furthest point can only be 1024 by 1024 km from the origin.

In this case study, the scheme, whilst large, only covers about 50 km by 50 km, so can easily be accommodated in NoiseMap as long as the co-ordinates of the model origin are moved closer to the co-ordinates of the area being modelled.

This must be done when creating the model database, because afterwards models can only be shifted within the area covered by valid tiles. In this example, when model database is first created, set the origin to, say, (700 000, 2 500 000). This means that the model will occupy tiles typically (100 000, 100,000) m from the origin, i.e. about 200 tiles to the east and north of the origin. This is well within the allowable range, as in the example, the maximum co-ordinates of the 50 km square area will now be about (150 000,150 000).

Note that you cannot have negative co-ordinates (you cannot go west or south of the origin) so don't put the origin in the middle of your scheme, but well to the south and west of the scheme.

MODELLING LARGER AREAS

If you do need a larger model, you could set the tile size to something larger, say 1000 m square. This is only possible in the 'remote server' version only. This can have other downsides, so only do it if you must.

You cannot map objects with negative co-ordinates (ie less than (0,0)). Such areas are coloured pink in the graphical display.

SHAPEFILES

Shapefiles are the most efficient way of importing a noise model, although DXF files offer a similar but less efficient alternative. A Shapefile contains at least two distinct parts. One of these contains the geographical information, i.e. the co-ordinates of the object, which can be two or three dimensional. The other part is a database that contains additional information about the objects. For example, if it is the Shapefile of a road, the Shapefile might contain information on road width and traffic flows. There may also be identifiers, such as a road name and a unique Topographical ID (TOID). These are contained in the database part of the Shapefile. The database (.dbf) part of a Shapefile can be opened in Excel (but you cannot save any changes without buying an add-in as Microsoft have dropped this functionality in the latest versions.)

THE DATABASE (ATTRIBUTE)

PART

The database part of the Shapefile can be thought of as a table with a number of columns, each column representing one type of information, such as the width of the road, the traffic flow on the road, or texture depth of the road surface. The information contained in a Shapefile is not standardised, but depends entirely on the choices made by the person who created it. This means you will need to select the pertinent information from the Shapefile and assign it to the correct *NoiseMap* objects. You will need to find out from your GIS specialist what each column name signifies, or you may be able to work this out by opening the file in Excel and studying it. Some of the columns may not be required in the noise model, and so these can be ignored. If you are converting many Shapefiles, this 'profiling' exercise can take some care and time. To avoid having to do it each time you load a Shapefile, you can store a set of 'profiles' for future use, see 3:5. *NoiseMap* also contains a standard set of profiles which corresponds to the format used when you export Shapefile data from *NoiseMap*, as set out in **Error! Reference source not found.**, Chapter **Error! Bookmark not defined.** of this manual. This gives a complete list of the parameters that can be imported for each object type. See **Error! Reference source not found.**, p **Error! Bookmark not defined.** for guidance on exporting Shapefiles that can be used as examples of the format used.

Some model values, particularly those not permanently fixed to a geographical location, cannot be imported from a Shapefile, but *NoiseMap* provides alternative ways of importing them, usually from a csv (spreadsheet) file. These include traffic flows, train vehicle definitions, train service definitions, plant definitions and activity definitions.

Some values in a Shapefile are used only in processing the shapefile and are not permanently stored in the noise model.

LOADING A SHAPEFILE

SELECT THE SCENARIO

For reasons connected with the database operation, before you can load a Shapefile, you must first load part of the scenario to which the new objects will belong, or which will be the parent scenario if you are creating a new scenario. (If you are creating a completely new database, which currently contains no information, then this requirement obviously does not apply.)

When you have opened the start scenario, to commence the loading process select **View> Load Shapefile**. A Select Shape File dialogue box will open and you can navigate to the file containing the Shapefile you wish to load. Highlight the file name and click Open.

Loading a Shapefile does not turn it into NoiseMap objects. It simply allows it to appear as a picture on the screen. The conversion process is done later.

SHAPEFILE PROFILE (COLUMN MAPPINGS)

A **Define Shapefile Mapping** dialogue box opens. This allows you to choose which non-geographical parameters (attributes) in the Shapefile will be linked to which *NoiseMap* objects, and which will be ignored.

Object types

Preferably, your shapefile should only contain one type of object, such as road alignments, as this makes conversion easier. However, digital maps often contain many different types of object, such as buildings, roads, railway tracks, etc. This is not a problem as long as the shapefile also contains a 'feature code' that identifies each type of object.

Layers

You can then use the feature code to separate the digital map into 'layers' such that each layer only contains one type of object. This will allow you to convert the whole layer into the appropriate NoiseMap object in one go. If you have a map with mixed feature types but without any way of separating them, you will need to use a more manual approach.

Default Shapefile Profiles (mappings)

NoiseMap has a default set of column names which it uses when a Shapefile is exported from the system. If your Shapefiles use the same mappings, you can automatically assign these and import the Shapefile without assigning each column separately. Select or load a profile to apply a stored set of column mappings from the drop-down at the bottom of the window, or click Save to store the current set of mappings for future use.

Column name

To provide your own column mappings, proceed as follows. To the left of the window is a list of Column Names contained in the selected shape file. You will need to find out from the GIS specialists which parameter each column name defines. Quite probably many of them will not be relevant to the noise model.

For each Column Name containing data that you want to transfer to the noise model, proceed as follows.

- ☐ Highlight the Column Name you wish to transfer to the noise model
- ☐ Select the Object Type that the parameter applies to
- ☐ Select the Parameter of that object type that the selected Shapefile column contains.

Define Shapefile Mapping

Select a column from the shapefile, and specify an object parameter to be read from the column during layer conversion.

Column Name:

- SE_ID
- ROADNAME
- TOID
- WIDTH
- LOCALHT
- GROUNDTYPE
- CATEGORY
- MOTORWAY
- CWAYTYPE
- HORIZSEP
- VERTSEP
- RETCUT
- ABSORB
- BCL
- TCL
- DEL
- AGL
- BCR
- TCR
- DER
- AGR
- ROADSURF
- TEXDEPTH

Object Type:

- General Data
- All Object Types
- Contours
- Roads
- Tracks
- Workings
- Barriers

Parameter:

- Ignore
- Use as Layers

☐ Assume each row is unique

Unit: Metres

Data type: Number

Columns mapped: 0 of 31

Select or load a profile to apply a stored set of column mappings, or save the current mapping as a new profile.

No Mapping

Save... Remove

No columns mapped - all data will be ignored

OK Cancel

Shapefile column mappings (profile)

The following table shows the parameters that can be mapped for each object type in the current version of the software. By default, all columns are set to *Ignore*, which means they will not be used during the import process.

Object Type	Parameter
General Data	Ignore (doesn't load the parameter) Use as Layer (sorts data into layers according to value of this parameter)
All object types	Height Width Editable object ID (User supplied ID) Non-editable object ID (eg TOID) Description. <i>[note: NoiseMap will combine several columns to make a longer description, with each column separated by a comma. Useful for addresses.]</i> Area Perimeter
Segments	Editable <i>Traffic flow</i> ID (user supplied ID) Non-editable <i>Traffic flow</i> ID (eg TOID) Flow description Flow Rate Percent Heavy Speed Gradient corrected flow Flow multiplier Category Motorway flag Surface type Texture Depth/Correction Average local height 1 st Effective Barrier Ground type Carriageway type Horizontal separation Vertical separation Retained cut type BCL,TCL, DEL,AGL,BCR, TCR, DER, AGR retained cut parameters Cadna road width

	Cadna Road type Cadna Road surface
Contours	Ground type (currently N/A)
Tracks	Average local height Ground Type 1 st Effective Barrier Maximum vehicle speed (km/h) Track Correction (dB) Retained cut depth Ballast
Workings	Average local height Ground Type 1 st Effective Barrier
Barriers	Fractional Open Area Absorbency Cadna height attribute
Outlines	Height method
Receivers	Receiver type Local height Left angle of view Right angle of view Number of floors Floor height increment

Shapefile mapping

Assume each row is unique

You should tick this box whenever the parameter you are importing is different for each item of the input data. This will usually apply to the unique (non-editable) IDs, such as the TOIDS and traffic flow IDs. When you tick this box, the data will not be searched for duplicate values, thus speeding up the loading process.

Example Shapefile set-up

The following table shows how a typical Shapefile might be converted

Column name	Column description	Object type	Parameter
-------------	--------------------	-------------	-----------

OD	Oscar ID	All objects	Non-editable ID (Unique)
LAE-ID	London Atmospheric Emissions Inventory ID	Segments	Non-editable flow ID (Unique)
Flow factor	Factor to convert from LAEI to actual flow	General	Ignore (not needed in noise model)
Category	Road category	Segments	Category
Speeds	Traffic speed	Segments	Speed
Heavy Percent	Percentage of heavy vehicles in flow	Segments	Percent Heavy
Total Flow	18-hour flow	Segments	Flow Rate
Width	Carriageway width	All objects	Width

Example of Shapefile mapping

Editable and non-editable IDs

ID values can be important in data management to identify items of information and to act as a link when information is used in different contexts. *NoiseMap* allows data items to have user-editable IDs, which the user can assign, and non-editable IDs which have usually been generated by some external source. Non-editable IDs cannot be changed by the *NoiseMap* user, since this would destroy the original external linkages. You should import externally-generated ID numbers as non-editable values so that the user cannot inadvertently alter them.

Usually, externally-generated ID numbers of objects will be unique (eg a building or road segment TOID, or a flow ID). In such cases, you should tick the check-box so that the import process does not spend unnecessary time trying to classify them.

Once loaded, the Shapefile will appear as red outlines on the screen. At this stage it is still a picture. The next step is to convert it into *NoiseMap* objects. This step is very similar for Shapefile and DXF drawings and is discussed in a separate section

PREPARING VECTOR MAPS FOR CONVERSION TO NOISEMAP OBJECTS

For brevity, in this section we will refer to both Shapefiles and DXF drawings as 'Vector Maps', and where *NoiseMap* uses the term 'DXF', this usually applies equally to Shapefiles. These contain a large number of 'entities' which are usually grouped into layers. It is preferable that each layer should only contain one type of entity, for example, road centre lines should be in one layer, kerb lines are in another layer and buildings are in another. Labels are also in separate layers. If each layer of the Vector Map drawing contains only one type of object, this will make it much easier to use the automatic layer conversion system built into *NoiseMap*.

Where vector maps contain a mix of different types of object, *NoiseMap* is still able to semi-automatically convert some types of entity into noise model objects. In order for entities to be converted, they must be represented as 'polylines', ie short sections of straight line joined into a continuous chain.

Where vector maps use other ways of representing objects, such as arcs and elliptical shapes, instead of polylines, these cannot be automatically converted by *NoiseMap*, but can be entered manually by tracing over them with the mouse.

Layer name	Description	Colour
G8010001	Building outline	Red
G8010004	Building outline (overhead)	Red
G8010014	Railway (narrow gauge)	Blue
G8010015	Railway (standard gauge)	Blue
G8010021	Road (public) edge of metalling	Blue
G8010025	Triangulation point	Blue
G8010026	Bench mark	Blue
G8010027	Spot height	Blue
G8010030	General detail, hedges, fences, walls	White
G8010032	General ground level or minor overhead detail	White
G8010033	Underground alignments, course of antiquities	Blue
G8010059	Water detail	Cyan
G8010098	Centreline public road	Yellow
G8010374	Top of slope	Red
G8010375	Top of cliff	Red
G8010376	Bottom of cliff or slope	Brown
G8010572	Grid lines	White
G8010575	Grid values	White
G8011000	Road names and numbers	Blue
G8011005	Administrative boundary text	Magenta
G8010006	Building names and numbers	Red
G8010009	Miscellaneous text	White
G8011010	Water feature text	Cyan

OS Landline – Layer numbers (Selected)

CONTROLLING THE DETAIL IN THE VECTOR MAP VIEW

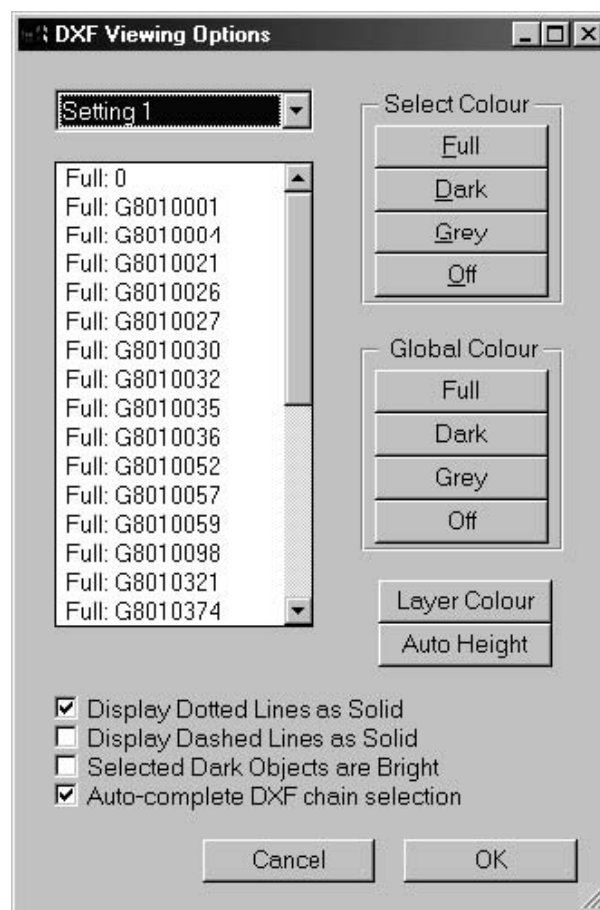
To control the Vector Map view, select **View> DXF Viewing Options**. This works for DXF and Shapefiles and lets you control:

- ☐ which layers of the drawing are displayed
- ☐ their colour and display appearance.

The list at the left-hand side of the box shows all the layers in the drawing. OS maps use a series of codes for this, see table inset. Other drawings may use different layer names. The box is resizable to let you see longer names.

Each layer can be set to show objects in different colours:

- ☐ Full colour – objects are shown in the specified colour
- ☐ Dark – dull version of full colour
- ☐ Grey - the objects are shown in a shade of grey. Greyed objects cannot be selected with the mouse.
- ☐ Off - the objects are not shown



Vector Map Viewing Options

Turning a layer to **Dark** can make a drawing easier to read by fading out unimportant detail. Turning an object to **off** can greatly increase the re-draw speed of large drawings.

You can change the setting by selecting the layer and clicking the **select colour** button. You can save up to three settings for future use by clicking on the down arrow and choosing a setting number. However, these settings are not remembered when you exit *NoiseMap*.

Changing layer colours

By default, layers will be shown in the colour defined by the Vector Map file – by default this will be red. You can change the colour of any layer by selecting it and clicking Layer colour. This will show 16 pre-set Windows colours. Choose one of the colours by pointing at it with the mouse and clicking, and close the window by clicking **OK**. In addition to the pre-set colours, it is possible to select any other colour available on your graphics card. To do this, click on the pre-set colour you wish to change, then click Edit. A selection of a further 48 pre-set colours is shown. You can select one of these or click on Define Custom Colours. A further screen opens, showing the full palette available. Click at the point which has the desired hue, and then move the slider on the right hand side up until the requisite luminance is achieved. Then click Add to Custom Colours. You may then select the colour and click **OK**. It will now be added to the colour choice in the layer colour picker display. Select it and click **OK** to change the colour of the layer.



Part of a shapefile with user-chosen layer colours

Auto height

If you have a 3D ground contour that you wish to be used in generating the height of *NoiseMap* objects, indicate which layers contain the height data by selecting the layer name and clicking **Auto Height**. This will put an asterisk alongside the layer name to show that entities in that layer can be used in auto height calculations. Ensure that you do not select 2-D entities, such as grid lines, as they will not have a valid height dimension. *Note that selecting a layer for auto-height calculation does not cause heights to be calculated: you still have to choose to do a height calculation during the Vector Map conversion process.*

MODEL DISPLAY

***Display dotted lines as
solid***

***Display dashed lines as
solid***

Some lines in a Vector Map model may be dotted or dashed. This can make them more difficult to see, especially if they are short, and may make it more difficult to tell when they have been selected in *NoiseMap*. Check these boxes to display them as solid lines. *Note that this only affects lines which have been entered as a continuous line with a dotted/dashed display characteristic. It will not join up lines which have been digitised with a break in them.*

***Selected Dark Objects are
bright***

This can make it easier to see when a dark object has been selected.

***Auto-complete Vector Map
chain selection***

Most entities are made up from several short lines joined in a chain (a polyline in CAD parlance). This option causes the whole chain to be selected when you click on any part of it. This is usually the preferred option.

Hint: Joining Vector Map chains

*A single entity in a Vector Map model may have been drawn with a number of separate chains (polylines in CAD parlance). These chains often break across adjacent map 'tiles', or for other reasons. You can join two adjacent chains into a continuous chain by selecting them and clicking **Edit> Join DXF chains**. This lets you auto-convert longer lengths of objects.*

CONVERTING VECTOR MAPS TO NOISEMAP

There are two different options for converting a Vector Map into NoiseMap objects.

CONVERTING A WHOLE LAYER

If each layer of your Vector Map file contains only one type of object (e.g. one layer may contain roads only, another may contain buildings only, and so on) then you may be able to convert all the objects in the layer into *NoiseMap* objects in one operation, using the **View>Convert layer** function. See *Automated Model Creation*, page **Error! Bookmark not defined.**

CONVERTING SELECTED OBJECTS

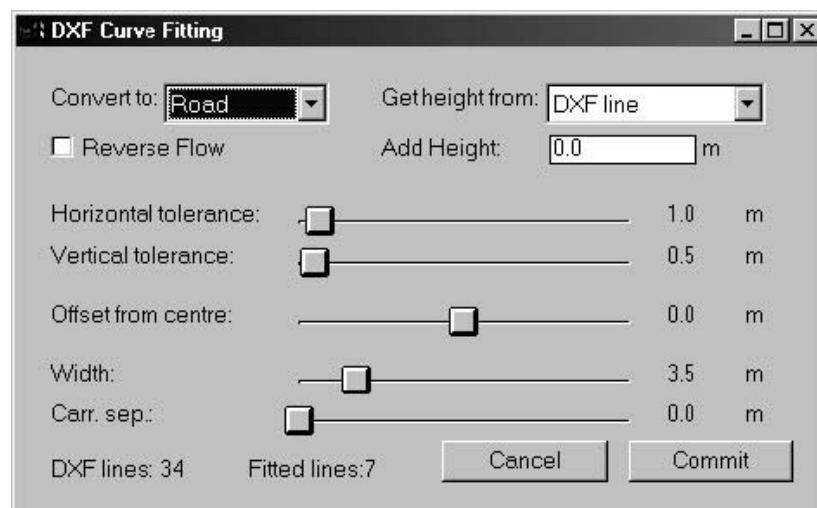
If the Vector Map layers contain a mix of objects, or you do not wish to convert all the objects in the layer, you can convert selected Vector Map objects into NoiseMap objects using **View>Convert DXF /Shapefile Selection** (shortcut

Ctrl+D). Objects can be converted into Contour lines, Roads, Tracks, Workings, Barriers or Receivers.

The height of the object can be obtained from the Vector Map line itself (if it is three-dimensional); from *NoiseMap* ground contours; or it can be entered manually. The object may not be at ground level and if you are getting the height from the Vector Map line or ground contours, then you would need to add some height to the local ground level to obtain the height of the object. For example, if you are entering a barrier which is 3 m above ground level, enter 3 in the **Add Height** box.

NoiseMap will fit a series of straight lines to the selected Vector Map entity, within tolerances set on the slider controls in the box. The smaller the tolerance, the greater the number of lines needed to fit the Vector Map entity. The number of Vector Map segments in the chain, and the number of *NoiseMap* lines needed to fit them to the set tolerance, is shown at the bottom of the screen.

The vertical tolerance will have no effect on 2-dimensional Vector Map lines.



DXF/Vector Map Curve Fitting Dialogue

Offset from centre

This allows the *NoiseMap* line to be displaced or offset from the line on which it is based. This is useful where there is no road centre-line in the Vector Map model, and you have to base your segments on the kerb line. It is also useful where you want to enter a roadside barrier, but you are basing its alignment on the road centre-line. Move the slider until the barrier or segment appears in the correct position.

Width

This allows the width of the object to be adjusted to fit the map, and saves you having to measure the width from the map. It applies to segments and barriers.

Note that width applies to the whole width of a barrier. However, it applies to one half of a dual carriageway, and also

one half of a single carriageway, so a carriageway width of 5 m will appear 10 m wide on the plan. If the edges of the object line up with the outline of the object in the Vector Map file, then the correct width has been set.

Carriageway separation

This applies to all carriageways and is added to the width. It does not apply to barriers.

Reverse flow

Road segments are entered in the same direction as the Vector Map line on which they are based. During the fitting process, the direction is shown by a series of arrows alongside the segment. For two-way flows, the direction of the segments is immaterial, but for one-way flows, the direction of flow affects the gradient correction, so this must be entered correctly. Click this box to change the direction of the segment and traffic flow. **Note:** *NoiseMap* assumes that for two-way flows, traffic drives on the left.

Commit

This button converts the selected objects into *NoiseMap* objects. The relevant dialogue box will now pop up, to show the objects you have just added. You can now add the extra details to the objects, such as a descriptive name, category, traffic flows and carriageway type. If you chose to get the height from the Vector Map line or ground contours, this will have been done for you. If not, you can now enter the heights manually or click on the **Get height** button, to get the height from any of the methods listed in the dialogue box.

IMPORTING FROM DXF DIGITAL DRAWING FILES

INTRODUCTION

NoiseMap can import digital drawing files in DXF version 12 format. The drawing units must be in metres.

DXF is a drawing exchange format used by many drawing packages, such as AutoCAD. Many digital maps, including UK Ordnance Survey Landline and Landform maps, can be obtained in this format. DXF files contain the 2-D or 3-D co-ordinates of each object in the drawing, so when loaded the drawing will automatically appear at the correct co-ordinates.

Hint: Specifying DXF files for automatic conversion

*For easiest automatic conversion of DXF files, you should request the following specification: * DXF version 12 format; *Drawing units in metres; * Map uses Ordnance Survey National Grid co-ordinates (i.e. objects are at their real world position); * Each layer should only contain one type of object; * Ideally, objects should be 3-dimensional (i.e. with height co-ordinates) though this is not essential; * Objects should be 'exploded' and external references should be resolved.*

*If the units of a drawing are millimetres (as commonly used in architectural drawings) you can force *NoiseMap* to rescale to metres by entering the*

following command in the Command Pane at the bottom of the Log/Results window:

set dxfrealscale 0.001

You can substitute any other scale factor in place of the 0.001. For example, if the drawing units are feet, you can convert to metres with the scale factor 0.305. Note that this applies to height as well as plan distance.

Because DXF is a general-purpose format, digital drawings can be constructed in an infinite variety of ways. It is not possible to guarantee that all digital maps can be read correctly by *NoiseMap*. *NoiseMap* does not attempt to provide all the features to be expected in a CAD package. You cannot edit or re-export a DXF drawing, although you can export a *NoiseMap* model as a DXF file.

Quite often, the digital map of a large scheme is subdivided to produce a 'layout' which fits onto conventional paper sizes, often within labelled drawing frames. *NoiseMap* will ignore such layouts. They are not usually very helpful for noise modelling, as the scheme is discontinuous and the separate strips are not in the correct geographical relationship. Instead, the drawing will be displayed as a map with the various elements in correct geographical relationship.

LOADING A DXF FILE

Before you can load a DXF file, you must have a scheme open, or you must create a new scheme, as described elsewhere in this manual.

To load a digital map, select **View> Load DXF File**.

This will open the **Select DXF File** window. Navigate to the file containing the DXF model (NB it must have the file type DXF) and double-click or select **Open**.

NoiseMap will read the file and show the message:

Performing DXF pre-scan

During this process, it will look for entities in the drawing, and decide which are likely to be features that you would wish to convert into a *NoiseMap* model. It will make these features selectable with the mouse. Sometimes, there may be several separate large blocks in the drawing. If so, their names will be displayed, and you will be asked which ones are to be imported. The drawing will then be imported and it will appear centred on the screen. The usual navigation controls can be used to pan and zoom around the drawing. If you 'lose' the DXF model, you can re-centre it on the screen by selecting **View> Centre View Around DXF**.

At this point, the drawing is only an image on the screen. It must now be converted into *NoiseMap* objects. Please see the preceding section for guidance.

4. BRIEF INTRODUCTION TO USING OS MAPPING

There are many types of digital mapping now available. Some of it is highly sophisticated. This introduction explains how to use basic OS digital mapping in NoiseMap without the need for specialist digital mapping, drawing or GIS software. Basic digital mapping is relatively inexpensive and readily available, although lacking some features provided in more sophisticated and expensive mapping. *[You can use scanned or digital images as a cheap alternative. Whilst this may be convenient for a small area, it is more labour-intensive, so cost-savings will diminish for large or more sophisticated projects. See Guidance on using Bitmaps for further information.]*

The best OS mapping for this application in NoiseMap is OS MasterMap.

This is a digital form of the original 1:1250 scale paper maps and it is highly-detailed. However, it is a 'flat' map, just like the paper original, so objects do not have any heights attached to them. Whilst not ideal, this is not too much of a problem as you can obtain the topography separately and 'drape' the flat map over it.

THE TOPOGRAPHIC DATA

You should obtain the topographic (i.e. height) data and enter it first. Topographic surveying is a complex matter and a brief explanation is needed. Modern topographic data is obtained by aerial radar or lidar survey. Whilst this avoids the cumulative errors that can arise from old-fashioned manual surveying, the ground surface is not always visible, being obscured by vegetation, buildings and structures. Various techniques are employed to discover the 'bare earth' levels free from vegetation, buildings and structures. A Digital Elevation Model (DEM) is the level of the bare earth free from obstructions, referenced to a datum level, usually supplied as a grid of points. A Digital Surface model (DSM) is the level of the surface including the height of structures and vegetation – it's useful for knowing the line of sight between objects. It is usually supplied as a grid of points. A digital terrain model (DTM) can mean either the same as a DEM, or it can include a vector dataset denoting the edges of features, i.e. contour lines.

Vector datasets (i.e.DTM contour lines) are preferred for NoiseMap.

SOURCES OF TOPOGRAPHIC DATA

The simplest topographic data is traditional ground contour data. This is usually available at a relatively coarse vertical interval of about 2 m. Nevertheless, this is adequate for most noise mapping, as the critical factor is the relative heights of objects close together, such as the heights of buildings and barriers relative to the noise source. The precise elevation is not critical.

One source of this is NextMap, which is available at a 2m contour interval. This is what we are using here. You should purchase it as a shapefile: one example is available here:

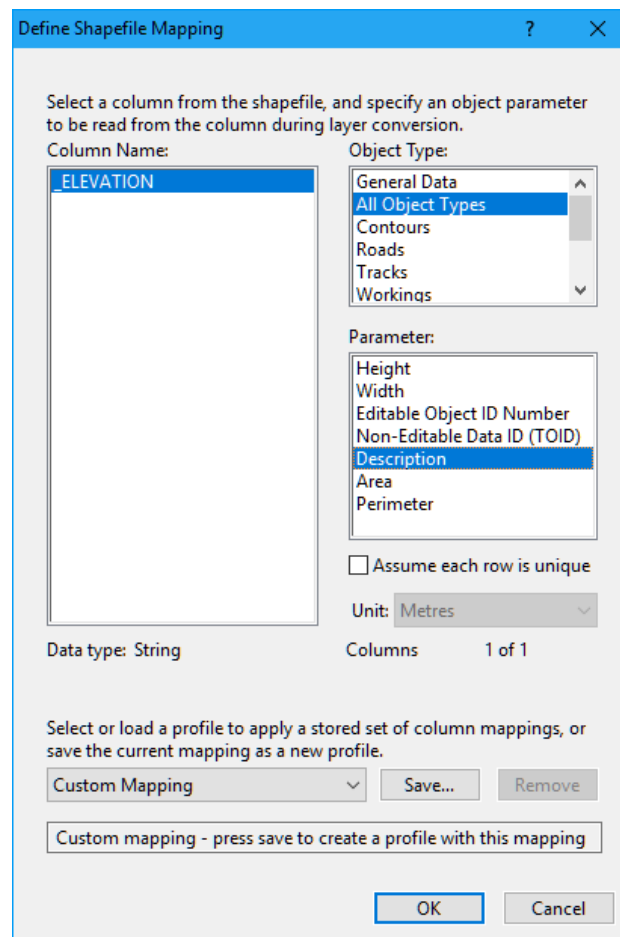
<https://www.emapsite.com/mapshop/sample.aspx?map=1835>

We will be using this in this introduction, but there are many other suppliers.

When you have downloaded and unzipped your DTM (digital terrain model shapefile), start NoiseMap and create the database for the new noise model.

Then got to View>Load Shapefile and navigate to the folder containing the unzipped DTM. Double click to open it.

You will get a window as follows:

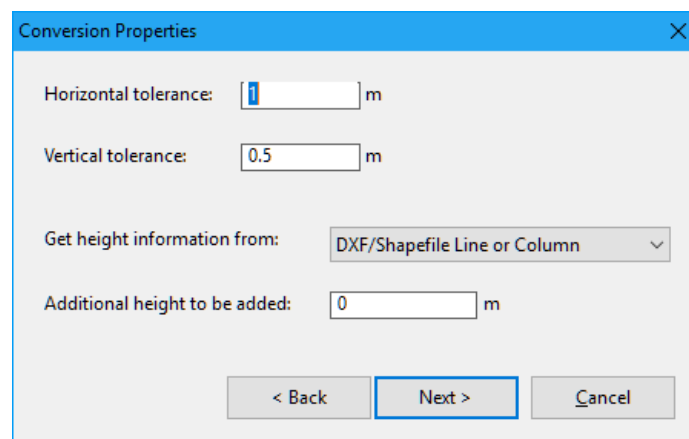


Highlight **_ELEVATION**, select **All object types** in the top-right-hand window and **Description** in the lower right-hand window. Click **OK**

The contours will appear on the screen. You will get a message 'Do you want to load database data covering the DSF/Shapefile area?'. You don't need to do this, so click **No**.

At this point, the shapefile is just a picture on the screen. We need to convert it to NoiseMap objects, specifically contours. Go to the menu and select View > Convert Layer.

A dialog asks what object you wish to convert into. Choose Contour Lines and click Next. Set the horizontal and vertical tolerances to 1m and 0.5 m respectively. Ensure that you set Get Height Information from to DXF/Shapefile Line or Column. Ensure the Additional height to be added is 0. The window should now look like:

A screenshot of the 'Conversion Properties' dialog box. It has a blue title bar with the text 'Conversion Properties' and a close button (X). The dialog contains four input fields: 'Horizontal tolerance:' with a value of '1' and unit 'm'; 'Vertical tolerance:' with a value of '0.5' and unit 'm'; 'Get height information from:' with a dropdown menu showing 'DXF/Shapefile Line or Column'; and 'Additional height to be added:' with a value of '0' and unit 'm'. At the bottom, there are three buttons: '< Back', 'Next >', and 'Cancel'. The 'Next >' button is highlighted with a blue border.

Click **Next**.

You will get a window asking you to select the layer to convert. Leave this at **default** and click **Next**.

The layer will now be converted into Ground contours. Check the conversion by going to View > View As Colour. Tick View as Colour to On and click Update View. You should now see the contours coloured according to height. If not, clear NoiseMap and try again, being very careful to ensure that you set Get Height Information from to DXF/Shapefile Line or Column.

You can now commit the changes to the Base Scenario. You now have a NoiseMap Ground Model.

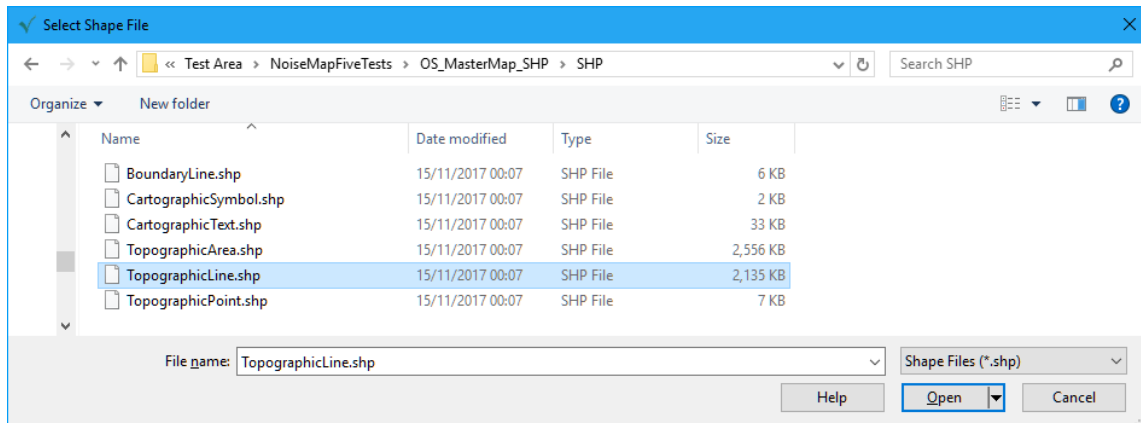
THE MAPPING DATA

We are going to use OS MasterMap which is available as a shapefile, such as this example:

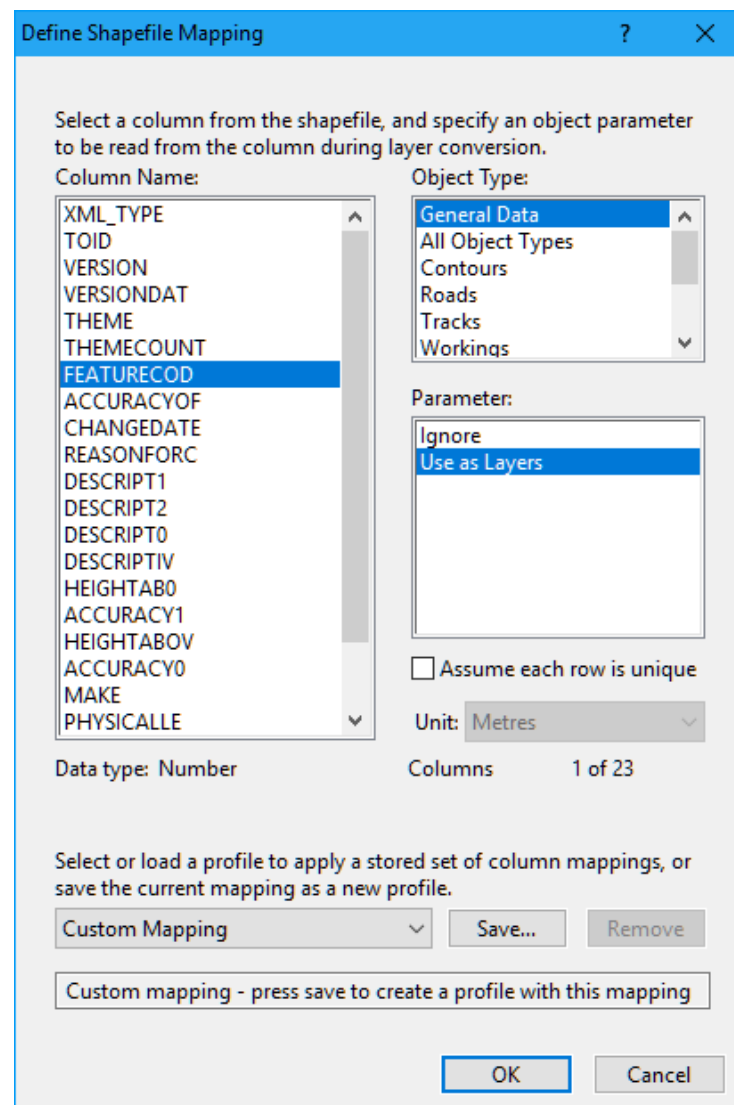
<https://www.emapsite.com/mapshop/sample.aspx?map=1839>

Download and unzip your MasterMap.

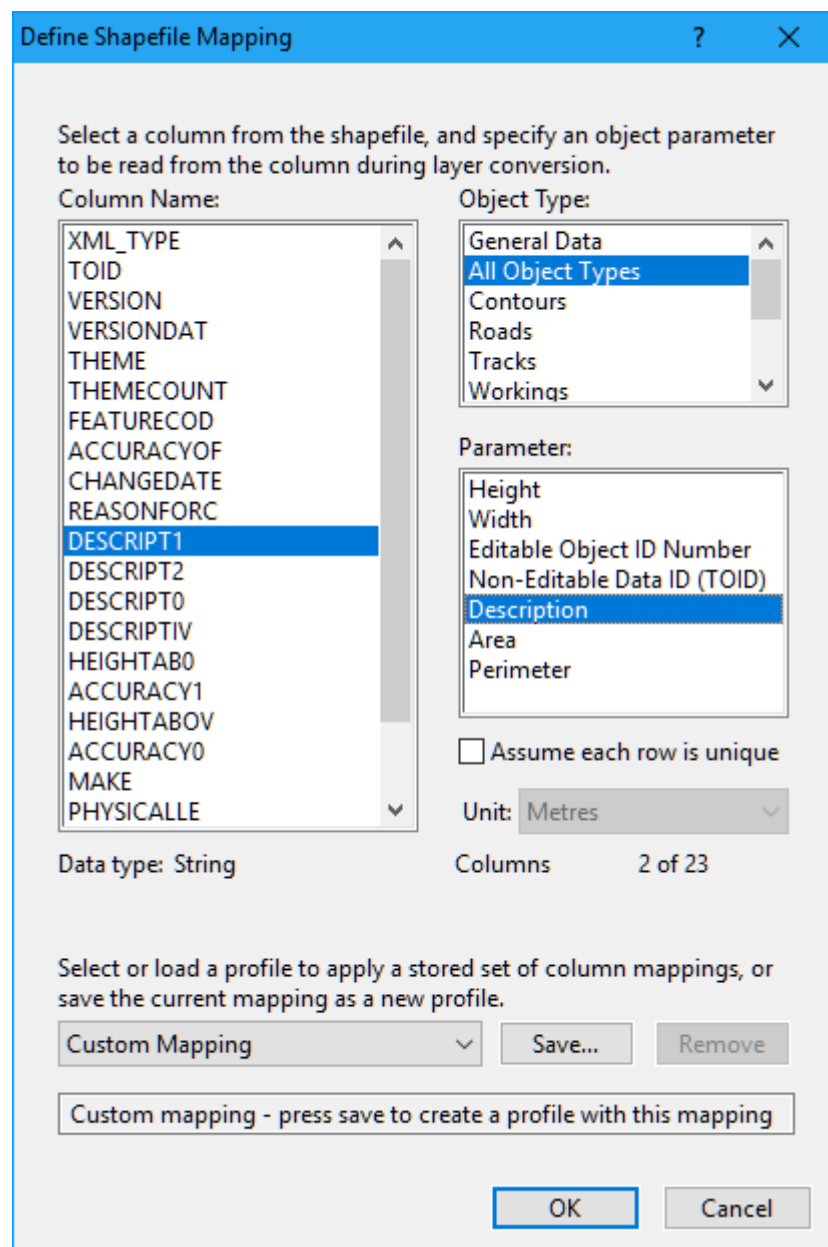
Start NoiseMap and load your terrain model. Go to View > Load Shapefile and navigate to the MasterMap folder. You will find several shapefiles in it as follows. Select TopographicLine.shp as shown below:



You will get the Shapefile mapping window. Set FeatureCod (Feature Code) to Use as layers, as shown below. Don't click OK yet.



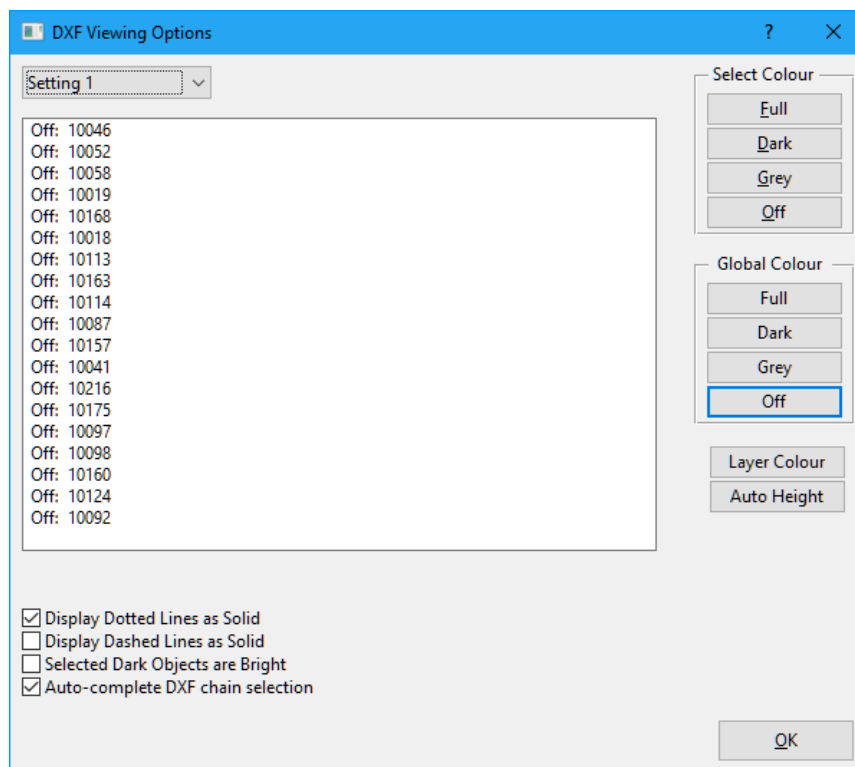
Now select Descript1 and in All Object Types, select description, as shown below:



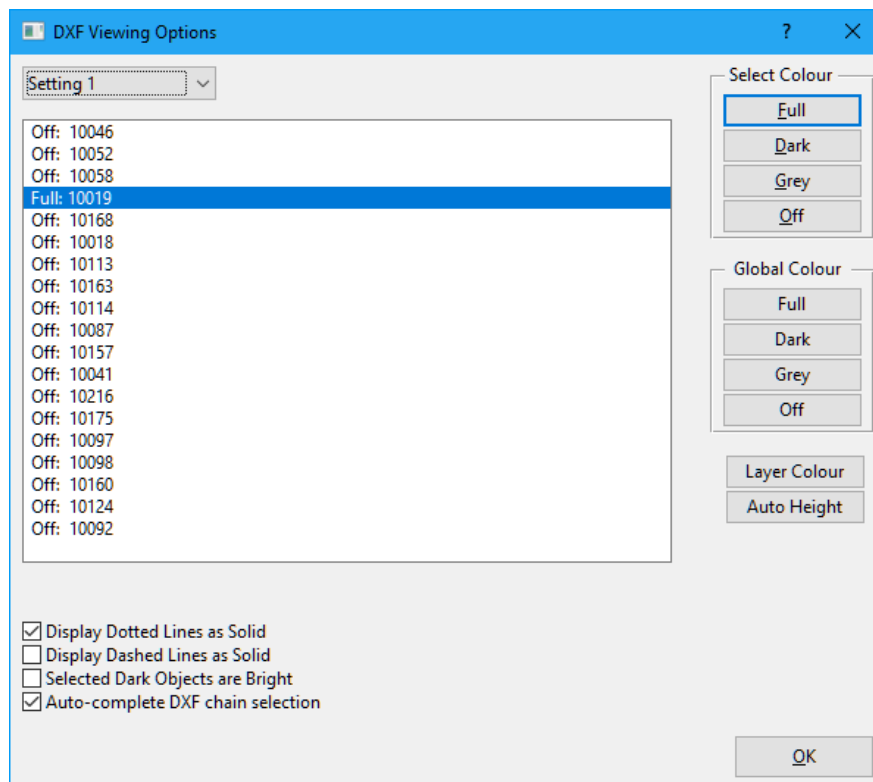
Now you can click OK. The MasterMap will appear on the screen. It is a picture and not a NoiseMap object yet. We still need to convert the required layers into NoiseMap objects.

Load the database data covering the DXF/Shapefile area, if not already present.

Although the map looks like a complete drawing, it is actually hundreds of separate objects all shown at once. If you go to View>DXF view options, you will see the codes used to describe the various layers of the map, each one being a different type of object. Go to Global colour and click Off as shown below. The map disappears.



Now go to the left-hand column and highlight layer 10019 – which contains the buildings. Under select colour, choose Full. The building outlines appear.

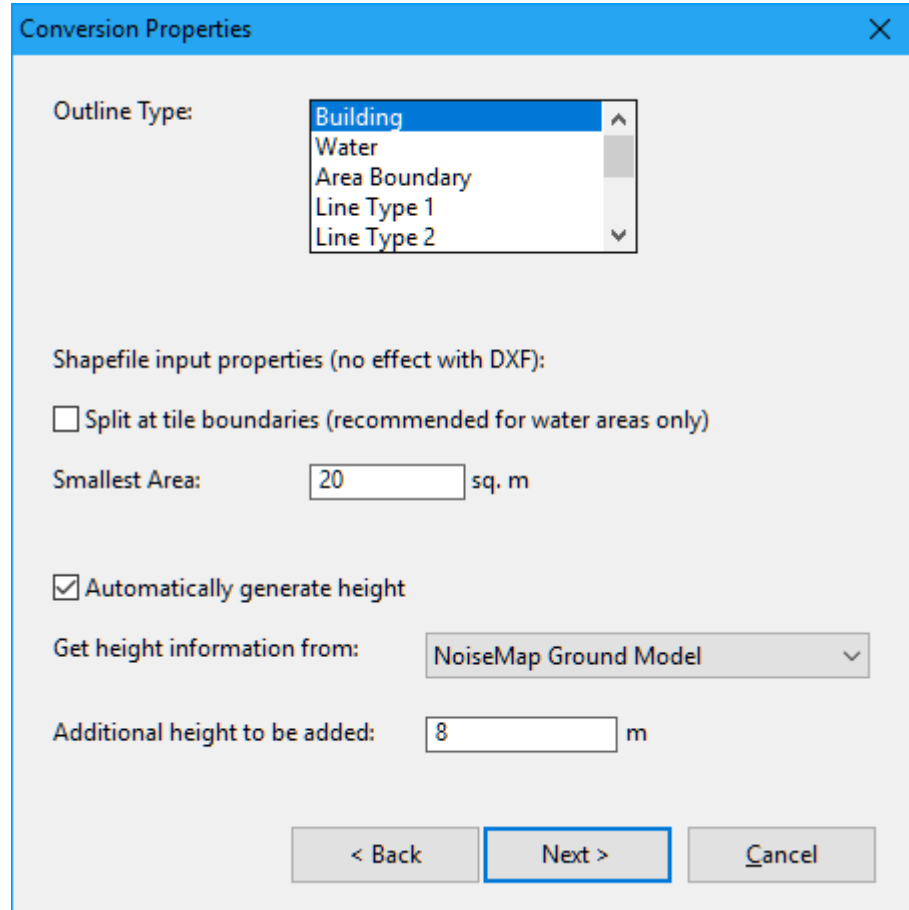


We will firstly convert these into NoiseMap building objects. Click OK to close the Viewing Options window and select from the menu View > Convert Layer

In Object to Convert into, select Outlines(Building,Water/etc) and click **Next**.

In Outline Type, select Building. Also Click **Automatically generate height** and select **Get height information from: to NoiseMap Ground Model**. In **Additional height** to be added, put **8 m**. All buildings will be set to 8m above the ground. This is a default height in the absence of better information.

The dialogue will look like shown below. Click **Next**



Conversion Properties

Outline Type: Building

Shapefile input properties (no effect with DXF):

☐ Split at tile boundaries (recommended for water areas only)

Smallest Area: 20 sq. m

☒ Automatically generate height

Get height information from: NoiseMap Ground Model

Additional height to be added: 8 m

< Back Next > Cancel

You will be asked to select the layer to convert. Choose 10019.

Be sure that no other layers are highlighted or the conversion will not give the result you expect. The buildings will appear as grey blocks. Commit the changes.

ROADS

MasterMap only has the road kerb lines, not the centreline. The simplest option is to convert all the kerb lines into lines in the NoiseMap model. They help you to interpret the map but they do not affect any calculations.

You can buy a dataset of road centre lines, but we aren't covering that here.

The kerb lines are feature 10168 .To convert the kerb lines to line annotation in Noisemap, go to View > Convert Layer and in Object to convert into, select Outlines (Building/Water/Area etc). Click **Next**

In outline type, choose Line Type 1 and click Next (you don't need to bother with height information, as lines don't have any).

Click Next. In Layer to Convert, choose 10168. Ensure that no other layers are selected (although you can convert any other feature into lines if this is helpful).

Commit the changes.

So how do we put roads in? Probably you only have traffic flows for a few roads anyway (or you may not be doing a road noise model).

The simplest thing is to go to ADD OBJECT (the green Plus in the tool bar) and select Road segments, then just trace along the centrelines of the roads of interest. There are ways of converting the MasterMap objects, but this is fiddly and best explained another time.

5. USING DIGITAL IMAGES

OBTAINING AND CREATING SUITABLE IMAGES

Sometimes you wish to create a noise model of a small area. This is simple to do from aerial photography. You can also use any map or drawing of the area of interest that you have scanned in or captured on-screen, but take care over copyright issues.

To use a digital image, you must know the real-world distance between two points in the image so that its scale can be correctly established. In NoiseMap, these two points will be taken to represent the west-east axis of the drawing.

Google, for example, prints a scale-line on the image that will represent a certain real-world distance, for detailed maps this is often 50 or 100 m, depending on the zoom size of the image.

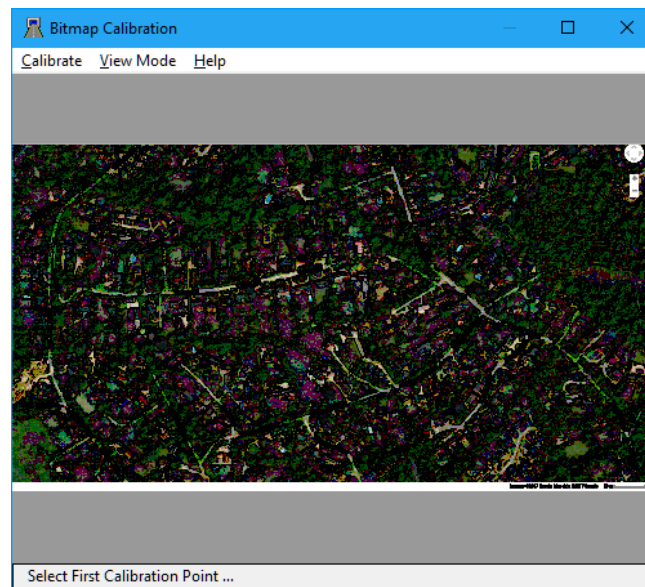
Once you have selected the image on screen, you can capture it using the Windows *Alt+PrintScreen* command. This will be a bit-map image of your screen, so it is best to use a large HD screen for this.

Now you need to save the image. You can use Windows Paint, PhotoShop or other image-processing software. Paste the image into the image-processing software, crop it, enhance the brightness and contrast as needed, and save it as a Windows Bitmap (24-bit is the default).

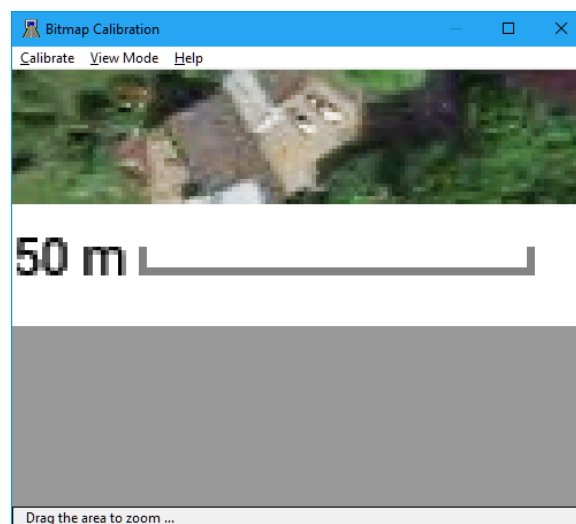
Now you are ready to import it into NoiseMap.

IMPORTING DIGITAL IMAGES INTO NOISEMAP

Start NoiseMap, load up your (probably blank) database and go to View > Load Bitmap. Navigate to the Bitmap file and open it. A window will open saying **Bitmap calibration**, as shown below:



It is zoomed out, so click on View Mode>Zoom and use the zoom cursor to outline the bottom of the map containing the scale bar:



Now select **View Mode>Pick** . The cursor changes to simple cross-hairs. Move carefully to the first Calibration point (the left-hand end of the scale bar) and click. Enter the co-ordinates for this point. If you don't know these, it doesn't matter. Enter an arbitrary value, eg 10000 x and 10000 y (note: choose largish values so that none of the map strays into negative co-ordinates.)

Now go carefully to the second calibration point (the right-hand end of the scale bar) and click. Enter the co-ordinates of this end, which in this example will be 10050 x, 10000 y as the bar is 50 m long; the line must be horizontal (on the same y co-ordinate). You will be asked to confirm the calibration. The main thing to check is that the angle should be as near zero as possible, though it is often 0.1 or 0.2 degrees, which is OK. Then go to **Calibrate>Exit** in the menu. You will be asked if you wish to create an RNB file. This is simply a file to remember the calibration for next time. Click **Yes** and give a name (usually

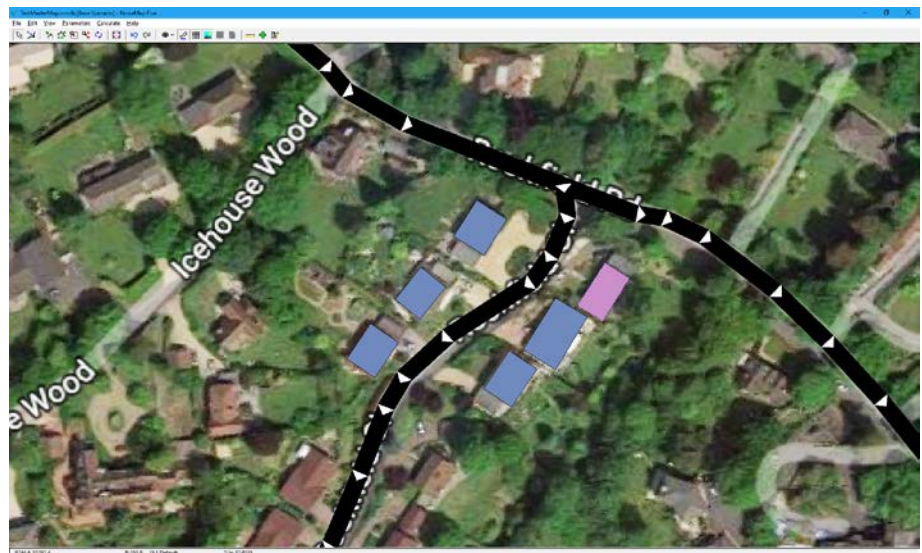
select the one that's offered). The map will appear at the right place and at the right scale. You can check this by moving the cursor to various positions and checking the co-ordinates shown at the bottom of the screen. If you made a mistake, you can easily re-do the calibration. Now you can zoom in to see the detail and start digitising objects.

DIGITISING OBJECTS

Click the green + sign in the toolbar and choose the object type that you wish to add. Click on the ? help button for guidance on how to add objects with the mouse.

The screenshot below shows an area of the digital image where buildings and roads have been added as NoiseMap objects by digitising over the photograph.

There is no height information in an aerial photo, but you may be able to find a contour map which you can use to create a Ground Elevation Model. If so, generate the ground contours first and then you can add the elevation of objects relative to the ground at the same time as you digitise them.



GETTING SQUARE CORNERS ON BUILDINGS

Sometimes, you may wish to get precise angles between lines: for example square corners on a building object. If you hold down the Control key as you move the mouse, the connecting line to the previous point will move in steps of 15 degrees, which allows you to get a right-angle or other fixed angle. If you hold down Control + Alt, then the connecting line moves in steps of 5 degrees, which gives you finer control.

If you wish to connect the last point back to a precise angle with the first point, then hold down the Space Bar. To get the final corners square with the first and previous point, then hold down Control and Space Bar. Shift-Click generates a line back to the first point on non-building objects.

If you make a mistake, pressing Escape deletes the last point, and successive Escapes delete backwards to the beginning of the chain.

ROAD WIDTHS

Road widths can be adjusted in the Road Segment Properties dialogue: for further assistance, see the context-sensitive help.

TRAFFIC FLOWS

Traffic flow datasets are available from county and other highway authorities, but these will normally only cover the major traffic routes. For minor roads, you will probably have to do some traffic counts, but this is beyond the scope of this short guide.

6. HINTS AND TIPS

ENSURING THAT A SHAPEFILE HAS ALL THE COLUMNS REQUIRED

Suppose you are creating a shape file to import workings on a very large site. You want import your own workings number for each working location, so that you can relate it to your activity spread sheet. How is this done?

Shapefiles can contain very many columns of information, some of which may be relevant to NoiseMap, and some may not be relevant. NoiseMap allows you to 'map' the columns in your shapefile to the parameters needed by NoiseMap. The user manual explains this, but if you would like to see an example of a shapefile, in this case for workings, you could create a very simple test model and then export it as a shapefile [View > Export Shapefile]

You can then open the shapefile in a GIS or you can open the database part [.dbf] in Excel, where you can inspect the columns. There are two different shapefile formats, one for Fixed Workings and one for Mobile Workings.

The column for the Workings ID is imported as **'All objects'> 'Editable Object ID'**

HOW DO YOU CONVERT JUST ONE PART OF A SHAPEFILE?

Shapefiles often contain many different types of object. How do you select and convert just one type of object, buildings, for example?

If you just apply 'convert layer' to a shapefile containing many different types of objects into buildings, for example, NoiseMap will try to convert everything into buildings. Of course, you don't want to convert roads or garden walls into buildings, so how do you separate the various elements of the digital map?

A Shapefile can contain any number of different sorts of objects, but if it has been properly assembled, then each object will have a 'Feature Code' that identifies the sort of object that it is. Standard feature codes may or may not be used, but this doesn't really matter.

First, you need to inspect the database element of the Shapefile. This is essentially a large table with many columns and one row for each object in the file. In NoiseMap, open the Shapefile. The '**Define Shapefile Mapping**' dialog will open and you will see the list of column names in the Shapefile. Many of these will not be meaningful, but look for one called something like 'FeatureCode' and in the Parameter box, select '**Use As Layers**'. This will cause the features to be split into separate layers according to their Feature Code. But it won't tell you which code is used for what type of feature. Look for another column that is called Description or similar and select it. Under Object Type select All Object types and under Parameter, select Description. You can have more than one object selected as a description, so if several columns look hopeful, select each of them as a description.

Once the Shapefile has loaded, you will see the map on the screen. To work out which feature code is used for a Building, click on a building outline and open the **Selected Object Properties** box. Open the **mapped object data** at the bottom of the window and you will see that the values of the mapped columns are displayed. This will let you make a list of the feature codes of interest.

Armed with this information you are ready to convert layers. Go to **View>Convert Layer** and choose the type of object you want to convert a layer into. For Buildings, you select **Outlines**. Click **Next** and under **Outline Type**, select **Building**. Choose how you want to get the heights. Then under **Layer to Convert**, select the layer of interest. You can select more than one layer, but be very careful only to select those of interest, as trying to convert an inappropriate layer into Buildings will cause problems, as NoiseMap has to go through many contortions to ensure that building outlines are properly connected into a 'closed polygon'. If they are not really building outlines, then the process could take hours and would come out with nonsense.

If you really want to play with the contents of a Shapefile, you can open the database element (file type .dbf) in Excel and look at the whole thing. You could even add or combine columns, such as adding traffic flows to roads. Unfortunately, Microsoft decided to remove the ability for Excel to save in dbf format from recent versions of Excel. So if you want to do this, you will need to get a dbf add-in. Some good ones are available, but be very careful to get this from a reliable source as many freebie

add-ins come with a malware payload, as I have learned to my cost!

HOW DO YOU PUT BUILDINGS NUMBERS ONTO A NOISE MAP?

There are several ways that you could do this. If you have an OS digital map, then if you search the various layers you will find that several layers contain text labels. This should include house numbers and house names.

Although the OS standardises the feature codes used in its maps, you may find that if they have been supplied by, say, a local authority, you will have to do a bit of searching to find out the feature codes that are most useful to you. You may be able to do this by opening the dbf part of the shapefile in Excel and looking through the columns to find the most useful one. Make a note of the feature code that identifies the house numbers and also the column that contains the house numbers (or other labels that you want to use). You should ensure that the house numbers are defined as text rather than numeric values, as NoiseMap needs you to import these as a text descriptor. [If they are numeric values, you will need to use the Excel TEXT function to convert them to text values. A slight issue is that although Excel will read in dbf files, it will no longer export in that format and you will need a third-party add-in to restore that function.]

Then import the shapefile, choosing the column containing the feature codes for 'use as layers'. This will ensure that each different type of feature will be put into a separate layer. This is essential so that you can use the 'convert layer' function. Choose to import as a 'descriptor' the column containing the house numbers. You will now have a layer holding the house numbers.

Now go to Convert Layer and select the layer that contains the house numbers. Choose to import this as an outline and choose outline type 'Annotation 1'. [This has the smallest font.] The houses will now be numbered/named! Commit the changes. [Remember to do this in a base scenario so that the house numbers will be available in all child scenarios.] If you can't see the house numbers, make sure that labelling for outlines and also for the 'Annotation 1' outline type is on in Display options.

If you don't have the OS house numbers, you might have an AddressPoint file. This also has house numbers and you can convert these using a similar procedure. One difference is that OS usually label house numbers selectively, whereas AddressPoint has every house

numbered - often several numbers per house - so it is not as neat.

You can use a similar approach to labelling street names.

7. NOISEMAP MODEL OBJECTS

ROAD OBJECT TYPE

Attribute description in Object Properties Box	Name in default Shapefile mapper	Description
SE_ID *	SE_ID	NoiseMap internal object identifier
Number	ROADNUM	User defined road segment number (should be unique)
Identifier	ROADNAME	Road name/ identification string
Category	CATEGORY	Category to which this road contributes noise
TOID	TOID	Unique object identification string
Modified *	-	Date/time that object was last modified
Root Scenario *	-	Scenario from which object inherits its main parameters
Start X	-	East-west position of object start point
Start Y	-	North-South position of object start point
Start H	-	Absolute height of object start point
End X	-	East-west position of object send point
End Y	-	North-South position of object end point
End H	-	Absolute height of object end point
Local Height	LOCALHT	Average height of object above local ground
Tile *	-	Reference number of tile containg the object
Flow ID	FLOWNUM	Reference number of the traffic flow using this road Non-editable (external reference number) of traffic flow using road
LAEI_ID ++	LAEI_ID	
FLOWNAME ++	FLOWNAME	User-assigned name for traffic flow
Flow rate ++	FLOW	Vehicle flow rate
Percent heavy vehs ++	PHV	Percentage of heavy vehicles
Speed ++	SPEED	Average flow speed Speed is not corrected for effect of gradient =0, or corrected =1
Basis ++	BASIS	Amount by which flow rate is to be factored to obtain the period flow
Multiplier ++	MULTIPLIER	Type of road for Lden calculations (1=MOTORWAY, 0=NON-MOTORWAY)
Road Type	MOTORWAY	Road surface type 0=bitumen, 1=concrete, 2=pervious, 3>manual correction
Surface Type	ROADSURF	
Texture Depth	TEXDEPTH	Road texture depth (mm) OR manual correction (dB)
Ground Type	GROUNDTYPE	Default type of ground between road and a receiver, 0=hard, 1=soft
First Effective Barrier	FIRSTBAR	Number of first effective barrier for elevated roads
Carriageway type	CWAYTYPE	Type of carriageway, eg one-way, dual, normal

Attribute description in Object Properties Box	Name in default Shapefile mapper	Description
Carriageway width	WIDTH	Width of each road carriageway
Horizontal Separation	HORIZSEP	Horizontal distance between dual carriageways
Vertical separation	VERTSEP	Vertical distance between dual carriageways
Retained cut flag	RETCUT	0= no retained cut, 1= retained cut
Retained cut absorbency	ABSORB	0= non-absorbent walls, 1=absorbent walls,
BCL	BCL	Distance to bottom of left-hand cutting (m)
TCL	TCL	Distance to top of left-hand cutting (m)
DEL	DEL	Depth of left hand cutting (m)
AGL	AGL	Angle of left-hand cutting (deg)
BCR	BCR	Distance to bottom of right-hand cutting (m)
TCR	TCR	Distance to top of right-hand cutting (m)
DER	DER	Depth of right-hand cutting (m)
AGR	AGR	Angle of right-hand cutting (deg)
*		These are assigned automatically by NoiseMap
+		Cannot be imported via shapefile
++		Only used during import from shapefile - not stored in object

RAIL TRACKS OBJECT TYPE

Attribute description in Object Properties Box	Name in default Shapefile mapper	Description
SE_ID *	SE_ID	NoiseMap internal object identifier
Number	TRACKNUM	User defined track segment number (should be unique)
Identifier	TRACKNAME	Track name/ identification string
TOID	TOID	Unique object identification string
Modified *	-	Date/time that object was last modified
Root Scenario *	-	Scenario from which object inherits its main parameters
Start X	-	East-west position of object start point
Start Y	-	North-South position of object start point
Start H	-	Absolute height of object start point
End X	-	East-west position of object end point
End Y	-	North-South position of object end point
End H	-	Absolute height of object end point
Local Height	LOCALHT	Average height of object above local ground
Tile *	-	Reference number of tile containing the object
Maximum vehicle speed	MAXSPEED	Maximum vehicle speed permitted on track
Correction	TRACKCORR	Track correction value (dB)
Retained cut depth	RETCUT	Depth of retained cut that track is in
Ground type	GROUNDTYPE	Default type of ground between track and a receiver
Ballast	BALLAST	Track ballast location
First effective barrier	FIRSTBAR	Number of first effective barrier for elevated tracks
Track services +	-	Train services running on this track segment (list of)
+		Cannot be imported via shapefile
*		These are assigned automatically by NoiseMap

ROUTE SEGMENTS

Attribute description in Object Properties Box	Name in default Shapefile mapper	Description
SE_ID *	SE_ID	NoiseMap internal object identifier
Number	WORKINGNUM	User defined route segment number (should be unique)
Identifier	WORKINGNAME	Route name/ identification string
Category	-	Category to which this route contributes noise
TOID	TOID	Unique object identification string
Modified *	-	Date/time that object was last modified
Root Scenario *	-	Scenario from which object inherits its main parameters
Start X	-	East-west position of object start point
Start Y	-	North-South position of object start point
Start H	-	Absolute height of object start point
End X	-	East-west position of object send point
End Y	-	North-South position of object end point
End H	-	Absolute height of object end point
Local Height	LOCALHT	Average height of object above local ground
Tile *	-	Reference number of tile containg the object
Ground type	GROUNDTYPE	Default type of ground between route and a receiver
First effective barrier	FIRSTBAR	Number of first effective barrier for elevated routes
Working Activities +	-	Activities using this route segment (list of)
+		Cannot be imported via shapefile
*		These are assigned automatically by NoiseMap

FIXED WORKINGS OBJECT TYPE

Attribute description in Object Properties Box	Name in default Shapefile mapper	Description
SE_ID *	SE_ID	NoiseMap internal object identifier
Number	WORKINGNUM	User defined fixed working number (should be unique)
Identifier	WORKINGNAME	Fixed working name/ identification string
Category	-	Category to which this fixed working contributes noise
TOID	TOID	Unique object identification string
Modified *	-	Date/time that object was last modified
Root Scenario *	-	Scenario from which object inherits its main parameters
Start X	-	East-west position of object start point
Start Y	-	North-South position of object start point
Start H	-	Absolute height of object start point
Local Height	LOCALHT	Average height of object above local ground
Tile *	-	Reference number of tile containing the object
Ground type	GROUNDTYPE	Default type of ground between working location and a receiver
First effective barrier	FIRSTBAR	Number of first effective barrier for elevated workings
Working Activities +	-	Activities using this working location (list of)
+		Cannot be imported via shapefile
*		These are assigned automatically by NoiseMap

RECEIVERS

Attribute description in Object Properties Box	Name in default Shapefile mapper	Description
SE_ID *	SE_ID	NoiseMap internal object identifier
Number	RECNUM	User defined route segment number (should be unique)
Identifier	RECNAME	Route name/ identification string
TOID	TOID	Unique object identification string
Modified *	-	Date/time that object was last modified
Root Scenario *	-	Scenario from which object inherits its main parameters
Start X	-	East-west position of object start point
Start Y	-	North-South position of object start point
Start H	-	Absolute height of object start point
Height above ground	LOCALHT	Average height of object above local ground
Tile *	-	Reference number of tile containing the object
Receiver type	RECVTTYPE	Type of reflections at receiver
Left angle of view	LEFTANGLE	Receiver left-hand side angle of view
Right angle of view	RIGHTANGLE	Receiver right-hand side angle of view
Repeats/Floors	FLOORS	Number of repeated receivers above base receiver height
Repeat/Floor height	FLOORHEIG	Height between each repeated receiver
+		Cannot be imported via shapefile
*		These are assigned automatically by NoiseMap

BARRIERS

Attribute description in Object Properties Box	Name in default Shapefile mapper	Description
SE_ID *	SE_ID	NoiseMap internal object identifier
Number	BARRNUM	User defined barrier number (should be unique)
Identifier	BARRNAME	Barrier name/ identification string
TOID	TOID	Unique object identification string
Modified *	-	Date/time that object was last modified
Root Scenario *	-	Scenario from which object inherits its main parameters
Start X	-	East-west position of object start point
Start Y	-	North-South position of object start point
Start H	-	Absolute height of object start point
End X	-	East-west position of object end point
End Y	-	North-South position of object end point
End H	-	Absolute height of object end point
Local Height	LOCALHT	Average height of object above local ground
Top of barrier	-	Level or parallel with ground (used only in height calculation)
Tile *	-	Reference number of tile containing the object
Barrier absorbency	ABSORBENCY	Barrier is absorbent/non-absorbent with respect to sound
Barrier width	WIDTH	Width of non-thin barrier
Fractional open area	FOA	Fraction of open space in barrier
Height adjustment +		List of height adjustment layers for run-time barrier height adjustment
+		Cannot be imported via shapefile
*		These are assigned automatically by NoiseMap

OUTLINES

Attribute description in Object Properties Box	Name in default Shapefile mapper	Description
SE_ID *	SE_ID	(Outlines are multi-purpose objects, used for buildings, annotations, etc) NoiseMap internal object identifier
Outline ID	-	User defined outline number (may be assigned automatically)
Identifier	-	Outline name/ identification string
TOID	TOID	Unique object identification string
Modified *	-	Date/time that object was last modified
Root Scenario *	-	Scenario from which object inherits its main parameters
X Position	-	Centroid of object
Y Position	-	Centroid of object
Tile *	-	Reference number of tile containing the object
Outline type	TYPE	Type of outline **
Height Method	HTMETHOD	Description = Either absolute or height above ground
Height	HEIGHT	Value = absolute height or height above ground
+		Cannot be imported via shapefile
*		These are assigned automatically by NoiseMap
**		Can be one of: Building, Water, Area boundary, Address Point, Line type 1,2,3, Annotation type 1,2,3 Outlines can be polylines or polygons containing many vertices, or a single point, depending on type.

GROUND CONTOURS

Attribute description in Object Properties Box	Name in default Shapefile mapper	Description
SE_ID *	SE_ID	NoiseMap internal object identifier
ID		User defined contour number (should be unique)
Identifier		Outline name/ identification string
TOID	TOID	Unique object identification string
Modified *	-	Date/time that object was last modified
Root Scenario *	-	Scenario from which object inherits its main parameters
Move X +	-	amount to shift x-coordinate of selected point(s)
Move Y +	-	amount to shift y-coordinate of selected point(s)
Move Height +	-	amount to shift height-coordinate of selected point(s)
Contour Type	CONNAME	One of: Ground contour, hard ground outline, soft ground outline
Contour common height +		Height to be given to all selected contour points
Get point heights +		Select method for calculating contour height
X, Y, H		list of ground contour point co-ordinates
+		Cannot be imported via shapefile
*		These are assigned automatically by NoiseMap

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