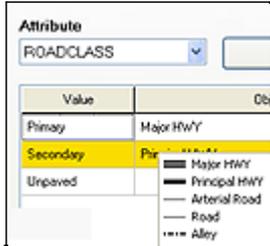




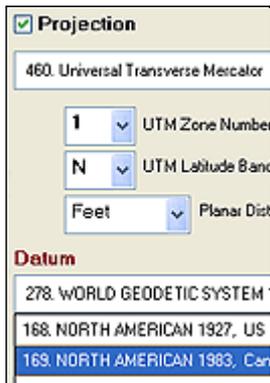
# About Mapwel

**Mapwel** is mapping software for creation of your own maps and their upload into the GPS unit. Unlike other software tools that work only with tracks and waypoints, Mapwel allows to create complete maps for GPS. [Click here to see supported GPS units.](#)



## Import of files, files merging

Mapwel supported GPS units require maps in vector format. Therefore, easiest way of how to create map for GPS is to import files in ESRI [\\*.shp](#), \*.gpx or other vector format into Mapwel, merge them together and assign proper type to all map objects. Mapwel also supports import of raster images and their automatic and manual vectorization.



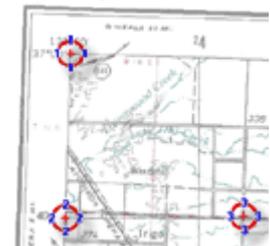
## Projections and datums

Imported files in both vector and raster format (especially \*.shp files) may use various projections and geographic systems. Mapwel supports hundreds of the commonly used systems, including UTM (Universal Transverse Mercator). Internal format of map data in Mapwel is WGS84, because this format is also internal format of the GPS units. Although user can select various coordinate systems in GPS, coordinates are always calculated from WGS84 format. Therefore, Mapwel converts all input data into WGS84.



## Autovectorization

If you need to get raster image into GPS with just a few mouse clicks, this is the right tool for you. Mapwel provides **Automatic "one-click" vectorization of raster images** (satellite imagery or scanned maps). Garmin units do not allow to load raster image directly into the GPS and use it as a map. Therefore, this function automatically vectorizes raster image and creates vector file compatible with GPS. [More >>](#)



## Map Georeferencing

Mapwel provides two approaches to establish relation between raster image and map coordinate system: 1. direct calibration, 2. separate image editing and map georeferencing. In both cases, result is a map with Lat/Lon grid parallel to the screen edges and coordinates assigned to left, right, top and bottom edge of the map. Click here to find out [more >>](#)



## User defined styles

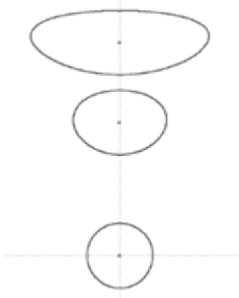
GPS units use basic (pre-defined) and user-defined sets of polygon patterns, line styles and symbol icons. Mapwel provides easy-to-use editor of user styles, which are supported by most of the new Garmin GPS. Click here to find out [more >>](#)

## Manual Map Drawing



Map can be drawn from the scanned paper chart, aerial photos, satellite images and/or with use of **tracks** and **waypoints** imported from your GPS. Tracks and waypoints are automatically converted into the map elements. Mapwel allows to draw map with use of **straight lines** and **curves**. When drawn with curves, map can be uploaded into the GPS with chosen precision/data-size ratio. User can apply **Contrast**, **Brightness** and **Gamma** filters to the scanned chart or satellite image to adjust the background for convenient drawing of vector objects on the top. To make drawing of complex objects easier, Mapwel provides **Opening in the Area** tool.

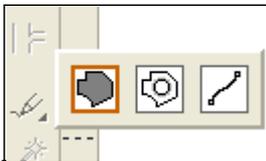
## Tools



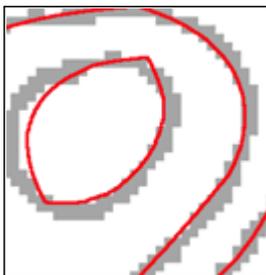
Mapwel tools help to manage maps in your GPS, which are normally not accessible, or hard to manipulate because they are all merged into a single file. '**Add maps to other maps in GPS**' function allows to add your map to those already present in the GPS memory. '**Delete specific maps in GPS**' allows to erase individual maps from your map set. '**Merge IMG files**' allows to combines several maps into a single file for use with Nüvi, Zümo, Colorado, Oregon or unit, which memory is directly accessible from Windows.

Other Mapwel tools help to create map faster. For example, '**Create Circle around Point**' function for aviation maps creates 'circles' of defined radius around all selected points. Very large 'circles' look deformed near poles, because of coordinate system projection. However, real-world distance from center to any point on the "circle" is the same.

## Freehand Tool



Unlike the other Mapwel drawing tools, which are based on the precise manual placement of the nodes, curves and lines, **Freehand tool** allows to draw many of the Mapwel objects very fast with a free hand. Strokes are automatically converted into the chosen style. After conversion, strokes can be edited as other vector objects (node by node).



## Trace Tool

This is another tool for faster vectorization of the raster image. It allows to vectorize one object (or set of similar objects) at once, but it cannot vectorize whole map with different types of objects at once. Tracing should be repeated for respective types of objects (filled areas, roads, rivers, etc.). **Trace tool** works on images with any common color depth (including True Color and bi-tone) that are sufficiently clean.

## Object Inspector



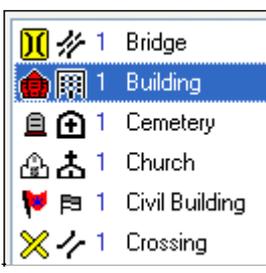
**Object Inspector** box at right side of the main Mawpel window displays information about respective map objects and simplifies the object manipulations. It also allows to select one or several objects in the work space.

## WYSIWYG

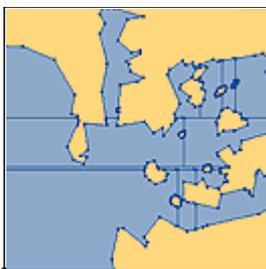


Mapwel allows to draw the map in any colors you choose and the '**What you see is what you get**' interface (WYSIWYG) shows how the map will look like on the color or monochrome GPS display. Mapwel also simulates the **Nighttime** and **Marine** color modes. When drawing the map, use display mode tabs in the left bottom corner of the Mapwel screen to review your map in the real GPS colors.

## Properties of Objects



Each object has adjustable **properties** like name, comment (text that is displayed in GPS when cursor stays on top of the object), type, max. zoom level, etc. POI (points of interest) may have address and phone number assigned. It is also possible to define properties of the whole map, like name, copyright text, address format, internal map ID, map draw priority and zoom levels of map layers.



## Automatic Object Splitting

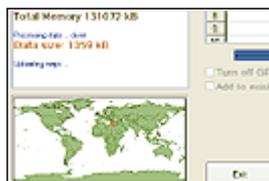
GPS rendering engine requires large areas and lines to be split into smaller objects because of the data structures limitations and speed of map rendering. Mapwel splits all objects automatically without loss of the map detail when it uploads map into the GPS. User does not have to bother about the object size or detail limitations. Splitting process runs internally without user even knowing about it.

## Accuracy

Map scope	Accuracy
< 45°	+/-2.4 m
90°	+/-4.8 m
180°	+/-9.6 m

Both technical and software limitation of GPS units restrict accuracy of maps (see the **Accuracy** table). This restriction is related to the map scope. It means that very large map is represented in GPS with lower accuracy than the small or normal size map. Mapwel automatically converts all map data into the best possible accuracy level.

## Map Uploading and Export



Finished map can be saved into Mapwel \*.mpw file format, [exported into \\*.img, \\*.kml or other supported format](#), or uploaded directly into the GPS. Export of map into other than \*.mpw file is supported by Mapwel Advanced version only. Mapwel includes separate **MapUpload** program for loading \*.img files into the GPS. **MapUpload** also allows to pack several img files into a single executable file to distribute to your friends or customers.

## All in One

Creation of map for GPS involves drawing or import of map, conversion of data into GPS native format and upload of data into GPS. Mapwel is the only available software that allows user to do above three steps with a single software tool.

- Use Mapwel WYSIWYG workspace to create complete GPS map with filled areas, all types of lines, map features, cities, exits and points of interest with addresses. Do not limit yourself to just tracks and waypoints. Use Mapwel import capabilities to open existing maps in various formats.
- When converting to GPS native format, Mapwel automatically splits large objects to meet GPS technical requirements and does lot of other automation to make creation of map as easy as possible.
- Upload your map directly into the GPS. Mapwel allows you to add your map to other maps already present in GPS memory. With Advanced version you can even export map into GPS native **IMG file**.
- Other most important features include: Free map loader (for IMG files from other sources), [Delete specific maps in GPS](#) function, UTM projected system and many geographic systems support.

## Demo

**Mapwel** is available for download and testing in **FREE** demo mode. Demo is fully functional except the limit on number of objects (map elements) that can be uploaded into the GPS. Therefore, maps uploaded into GPS with demo are incomplete.

## Levels

**Registered Mapwel** software is available in two levels:

1. **Basic**, for single GPS unit. Basic version allows user to upload map only into the GPS with ID that was used for registration. This version is intended for personal use.  
**Advanced**, for unlimited number of GPS units. Advanced version requires GPS (the one used for

2. **Advanced**, for unlimited number of GPS units. Advanced version requires GPS (the one used for registration) to check validity of password only once after installation of Mapwel. Then user may attach any other compatible GPS and upload maps into it. This version is intended for personnel or organizations that own number of GPS units. Advanced version allows to export maps into **IMG**, **KML** and **MP** format and supports batch conversion mode.

## Registration (Purchase)

To turn demo version into full version without limit user needs to purchase registration password and enter it into the Mapwel. No additional download is needed. Registration password is derived from the GPS unit ID number. This number is required for registration.

When uploading maps into GPS, Mapwel checks the ID of attached GPS. Therefore, GPS with ID used for registration is needed for uploading maps. Mapwel Advanced (see **Advanced** version), checks registered GPS only once, after installation.

## Requirements

- Windows 98/Me, Windows NT/2000/XP, Windows Vista compatible.
- Minimum hardware requirements: 256 mega bytes RAM, screen resolution 1024x960, True Color display mode



# Supported GPS Models

Model
Garmin™ Mobile® XT
Garmin™ Astro®
Garmin™ Oregon®(all models)
Garmin™ Colorado®(all models)
Garmin™ Nüvi® and Zümo®(all models)
Garmin™ Edge 605, 705®
Garmin™ iQue M3, M4, M5®
Garmin™ eTrex Summit HC®
Garmin™ eTrex Venture Cx, HC®
Garmin™ eTrex Legend, Legend C, Legend Cx, Legend HCx®
Garmin™ eTrex Vista, Vista C, Vista Cx, Vista HCx®
Garmin™ Rino 120, 130, 520, 530, 520HCx, 530HCx®
Garmin™ GPS V®
Garmin™ GPSMAP 60C, 60CS, 60Cx, 60CSx®
Garmin™ GPSMAP 76, 76S, 76C, 76CS, 76Cx, 76CSx®
Garmin™ GPSMAP 176, 176C, 276C, 376C, 378, 478C®
Garmin™ GPSMAP 96, 96C, 196, 296, 396, 496®
Garmin™ Quest, Quest 2®
Garmin™ Street Pilot i2, i3, i5®
Garmin™ Street Pilot c320, c330, c340®
Garmin™ Street Pilot c530, c550, 580®
Garmin™ Street Pilot 2610, 2620, 2650, 2660®

Both serial and USB data transfer is supported.

NOTE: Mapwel is not affiliated with any manufacturers mentioned here. All brand names and product names are trademarks of the respective manufacturers.



# Mapwel Registration

Mapwel is available in free **demo version for evaluation purposes**. Demo version truncates map uploaded into GPS (unless it is [Mapwel\\_Island.MPW](#) test file) and it has also the **multiple files upload** option disabled.

To turn demo into fully-functioning program, user needs to purchase registration password and insert it into demo **main menu / Help / Registration**.

Depending on the type of purchased password, Mapwel demo switches to **Basic** or **Advanced** registered mode. If Mapwel is in **Advanced** version, user can disconnect the registration GPS after the password checking and attach any compatible GPS for map upload. **Basic** Mapwel version allows user to upload map only to single GPS unit.



# Sample Map



To test the map into GPS upload and to see how the finished map looks in the Mapwel, use the **Mapwel\_Island.MPW** file in the **MAPWEL/FILES** folder. You can upload this map into GPS without truncation even if you have unregistered version of software.

**Note:** map elements like areas, lines and symbols appear gradually as you zoom-in the map in GPS. Use the **Setup/Map/Detail** menu in GPS to set detail level.



# Troubleshooting

## How to use Mapwel with Garmin Mobile XT ?

- Connect your phone to computer with USB cable. Select 'mass storage' mode. After a few seconds Mapwel should be able to work with the phone like with any other GPS. Try to read GPS ID with use of Mapwel main menu>GPS>Display GPS ID

## Map cannot be found in GPS after upload from Mapwel (MapUpload) program

- Most GPS (including Garmin Mobile XT) must be restarted after the map upload. Otherwise, map may be not visible.

## Map is not visible on the GPS screen, although it is listed in map list

- Some GPS models (like Garmin Mobile XT) require to turn on 'Outline Detailed Map' option in Tools/Settings/Map. Otherwise, border of custom map is not visible and this could make the searching for a custom map more difficult.
- Another possible cause of this problem is wrong use of the 'Background Area' polygons. These objects are intended to define irregular shape of the map. GPS displays only objects that are inside of the Background Area (if it is present in the map). Other objects are ignored. If Background Area polygon is wrongly used as a fill of some map object, the whole map is invisible.

## Some maps are not visible on the GPS screen

- GPS does not display maps with identical ID. If you use your own numbering of maps (Mapwel > File > Properties > ID), each must have a unique internal ID number. Unless you select 'User Defined' option, Mapwel assigns unique ID number to each map automatically.

## I use custom colors, symbols and fill patterns in my maps and some of them are displayed in weird colors in the GPS

- Although each map is saved with its own set of user defined colors and styles, GPS uses only one of those sets. Therefore, all maps that are present in the GPS memory must have the same set of user defined colors and styles. Otherwise, maps with different user defined sets are displayed with wrong styles.

## My custom map completely covers the underlying maps. Is it possible to make them show through my map?

- Yes, it is possible. Use Mapwel main menu > Edit > Preferences to turn on the 'Transparent map' option. Then load the map into the GPS.

## Map in GPS is displayed in other colors than those that are visible in Mapwel

- Map in GPS native format can contain two types of objects: 1. basic, 2. user defined. Objects of basic type have no color information stored with them. GPS displays them in its own pre-defined colors. User defined objects have their own color and style assigned by user (Mapwel main menu > Objects > User Defined Styles). Therefore, you have to use objects from the second category if you want GPS to display them in your own colors. Moreover, Mapwel allows to draw map objects in the work area in any color to make creation of map easier. These 'work' colors, however, are not transferred to GPS. To see how the map will look like in the GPS, please use 'Color' tab at bottom part of the main Mapwel screen.

## My auto-vectorized map is displayed as a large colored squares and details appear only when I zoom in to 120 m

- The most detailed layer of auto-vectorized maps is supposed to appear at higher zoom levels as well.

Check 'Map Detail' setting in your GPS. It should be set to 'Most'.

**Map looks good in Mapwel, but after loading to GPS the polylines and/or polygons become distorted and look like zig-zag line**

- The finest coordinate grid used in native map format has approximately 2.5 m spacing. If polylines and polygons in your map contain large number of very small elements, their coordinates are rounded (some up and some down) when exported to GPS map format, creating a zig-zag effect. The work around is to make elements of polylines and polygons longer.



# How to make your own map

Garmin GPS units accept only vector data. Therefore, creation of map in Mapwel involves several steps from calibration of raster scan or satellite image to upload of vectorized map to GPS.

Raster files used in below example are mw.jpg and mw2.jpg. They can be found in MAPWEL > FILES folder.

Click on any below step to see simple example:

1. [Direct image calibration](#) or [image editing+georeferencing](#)
2. [Background filters \(colors\)](#)
3. [Drawing/import of objects](#)
4. [Upload of map into GPS](#)

Some of these steps are not necessary if your input data are already vectorized and stored in file format supported by Mapwel (ESRI shapefiles, GPX, MP). Please see the following table for steps needed when working from a specific data format:

	Working from scan, aerial or satellite image (raster image)	Working from OziExplorer calibrated image (raster image)	Working from ESRI shapefiles (vector file)	Working from map in MP format (vector file)
<b>Image calibration</b>	✓			
<b>Map georeference</b>	✓		user prompted when importing shapefile	
<b>Background filters</b>	optional	optional		
<b>Drawing of objects</b>	✓	✓	optional	optional
<b>Upload of map into GPS</b>	✓	✓	✓	✓

Only the most frequently used methods are shown in above table. Each of them can be combined with use of your own tracks and waypoints imported from GPS, map files in GPX format downloaded from internet, etc.

## There are several ways how to create vector objects for the map

- Manual [drawing of objects](#)
- Automatic [vectorization of whole raster image](#)
- Automatic [tracing of objects from raster image](#)
- [Freehand drawing](#) with mouse or tablet
- Import of tracks and waypoints from GPS
- Use of [ESRI shapefiles](#)
- Merging of other Mapwel files or other compatible files (\*.MP, \*.GPX, etc.)

## Options for managing maps in your GPS

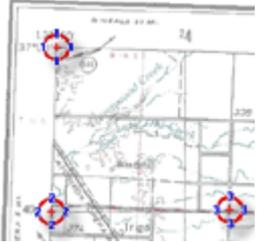
- [Erasing specific map](#) in GPS
- Adding map to maps already present in GPS

In case of problems with map uploading or displaying on GPS, please [click here](#).



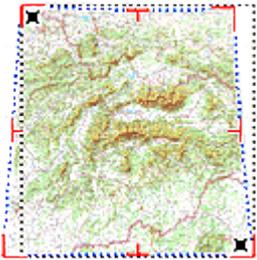
# Raster Image Calibration and Georeferencing

Mapwel provides two approaches to establish relation between raster image and map coordinate system. In both cases, result is a map with Lat/Lon grid parallel to the screen edges and coordinates assigned to left, right, top and bottom edge of the map. Selection of proper approach depends on the type of the raster image:



## Approach 1 (recommended)

is a [direct map calibration](#). This calibration transforms raster image and vector data drawn on top of the image to the Lat/Lon grid parallel to the screen edges. This method uses an affine linear transformation and will work with maps which are rotated or skewed. The Lat/Lon grid of the image must be linear (straight lines) to allow linear transformation to the grid parallel to screen edges. Even images with a non-linear Lat/Lon grid can be calibrated with this tool, if the grid non-linearity is caused by projection (like UTM, for example). In such a case, map usually contains linear Easting/Northing grid and non-linear Lat/Lon grid. Calibrate map with use of the Easting/Northing grid and Mapwel recalculates images so that the Lat/Lon grid becomes linear.



## Approach 2

involves separate transformation of raster image into rectangular grid, and consequent [map georeferencing](#). If image (typically distorted scan or map with unknown projection) is curved in a way that direct calibration cannot be used, it can be edited with tools for [rotation](#), [move](#), [cropping](#), non-linear [straightening](#) and [morphing](#). The goal is to achieve Lat/Lon grid parallel to the screen edges and optionally to make raster image match the tracks and waypoints imported from GPS. Once the image is calibrated, map can be [georeferenced with use of 2 points](#).

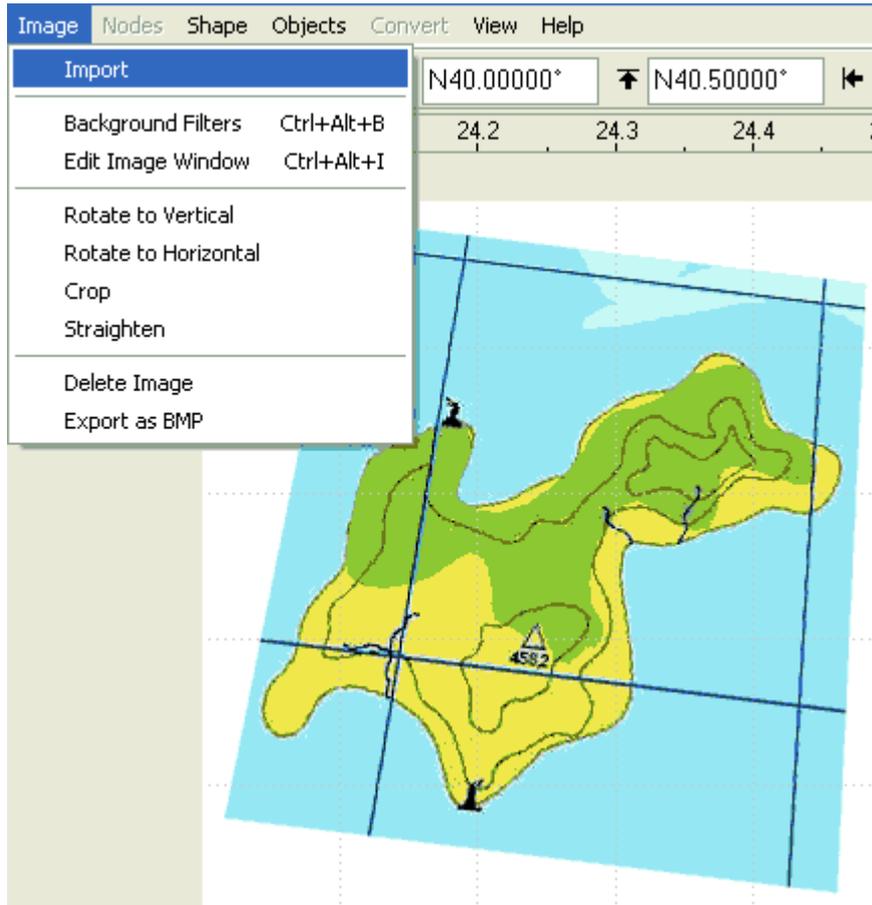


# Image Editing

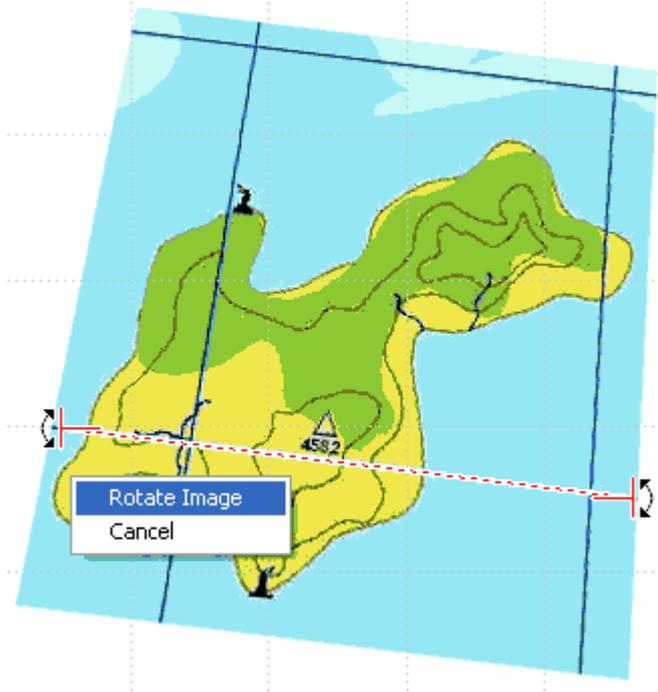
Mapwel provides several tools for image editing. This chapter deals with image **rotation**, **cropping** and **straightening**. Editing of raster image is an alternative approach to calibration. [Click here for more image editing and calibration tools](#).

## To rotate, straighten and crop image use following approach:

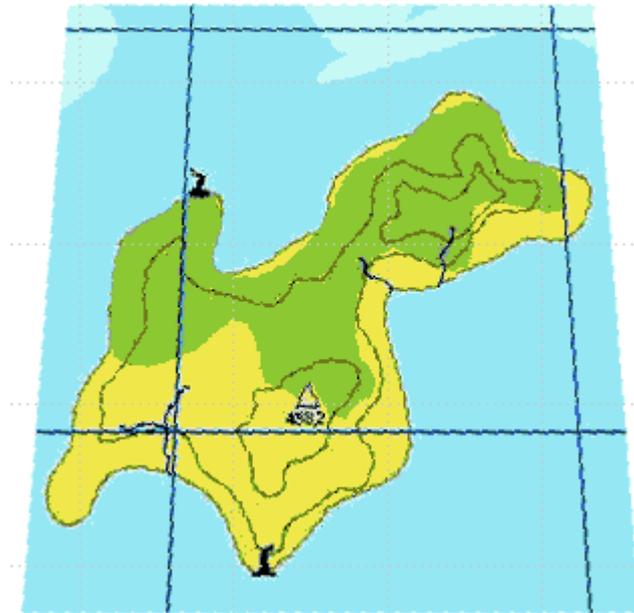
1. Use [main menu > Image > Import](#) function to place image into the work area background. Scanned photo is usually rotated and distorted.



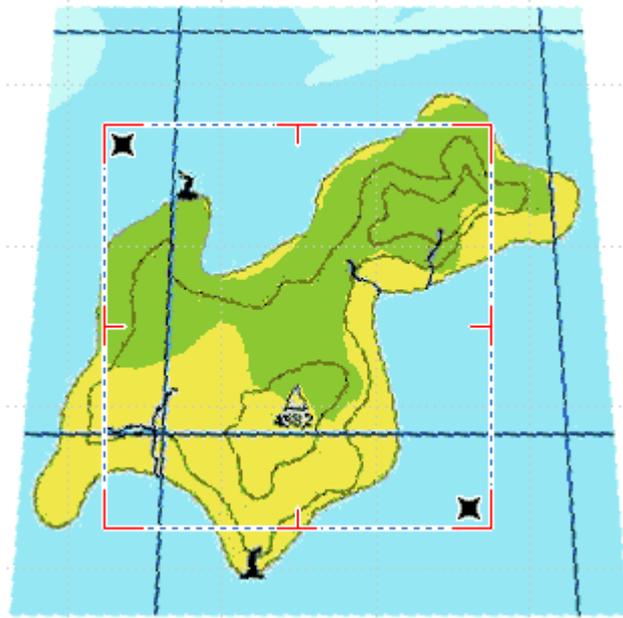
2. Use [main menu > Image > Rotate to Horizontal](#) function to rotate the image. Place the rotation marks on a line that is supposed to be horizontal. Then click right mouse button and choose Rotate Image command from the pop-up menu.



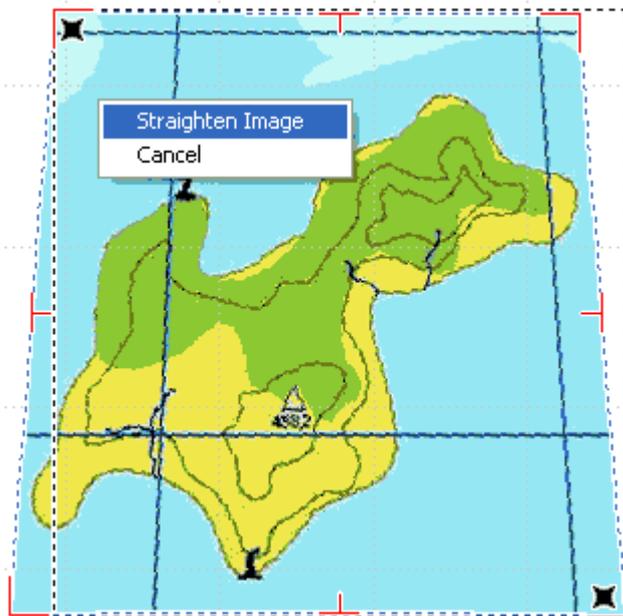
3. Image is rotated so that marked grid line is horizontal now.



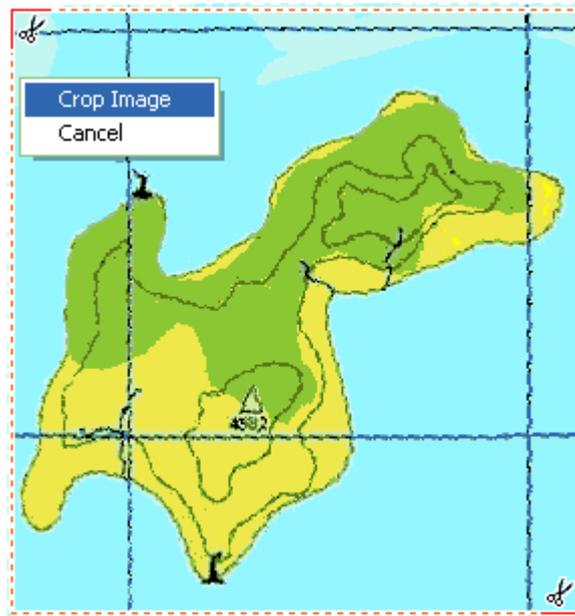
4. Use the [main menu > Image > Straighten](#) function to compensate the image deformity. The tool that appears in the work area has two main marks (left top and bottom right corner) and 6 additional marks.



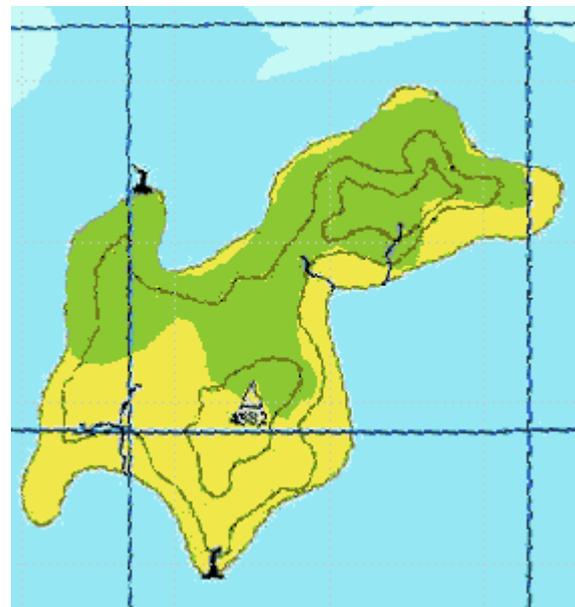
5. Place two main marks on map corners first. Then move the rest of marks to a corresponding spots on the map edge. The black dashed rectangle indicates how the map will be straighten. Click right mouse button and then choose Straighten Image command from the pop-up menu.



6. Use [main menu > Image > Crop](#) function to eliminate the empty space around the map. Place the crop marks and then click right mouse button to access the pop-up menu. Click on **Crop Image** item.



7. Adjustment of image is finished.





# Map Georeferencing

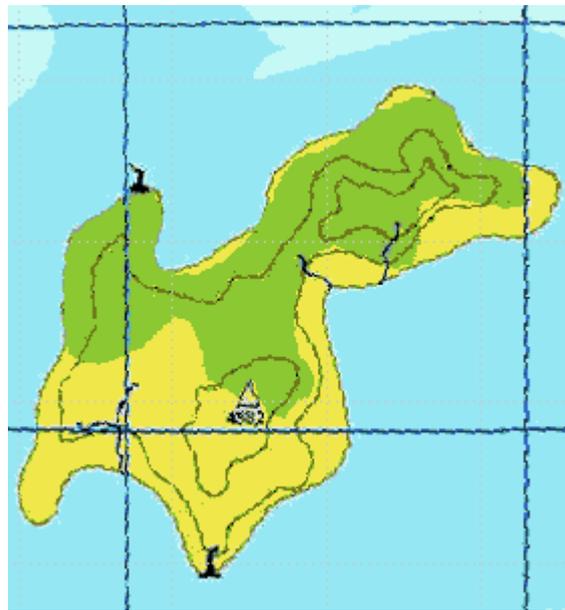
This tool is supposed to be used if raster image has linear Lat/Lon grid parallel to the screen edges. You do not need to use this tool if you have calibrated image with a direct [Image Calibration](#) tool. [Click here for more image editing and calibration tools.](#)

Mapwel uses coordinates of map edges (left=west, right=east, top=north, bottom=south) as a reference frame for all calculations.

If coordinates of edges are unknown (most common case), user can define coordinates of any two known spots and Mapwel derives the edge coordinates from them. These two points must be not located on the same horizontal or vertical line and they should be as far one from the other as possible.

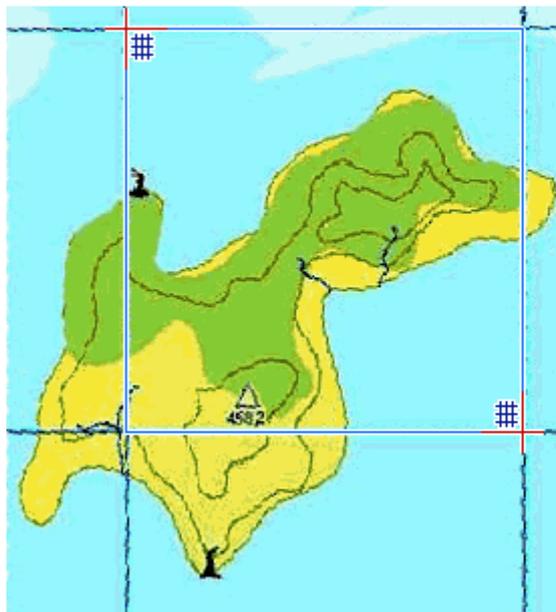
## Georeferencing map with 2 points:

Imagine the map with unknown edge coordinates:



1. Use [main menu > File > Georeference Map](#) function to define coordinates of two known spots (grid intersections, in this case). Place the red marks onto the two known spots. Click right mouse button on the work area to access a pop-up menu and then assign coordinates to each of the two spots.

**Note:** When using lat/lon coordinates, west and south coordinates are regarded as if they were negative, i.e. W80 is -80, for example.



**North and West**

**Projection**

460. Universal Transverse Mercator

32 UTM Zone Number

T UTM Latitude Band Letter

Meters Planar Distance Units

**Datum**

278. WORLD GEODETIC SYSTEM 1984, World, WGE

↑ N00.13911°

← W000.08701°

Position Format: hddd.ddddd°

OK

2. Use **Apply to Map Coordinates** command from the pop-up menu. Note that map edge coordinates are adjusted automatically according to the two defined spots. Map edge coordinates recalculated to WGS84.

↓ S00.04550°   ↑ N00.10600°   ← W000.02980°   → E000.11212°

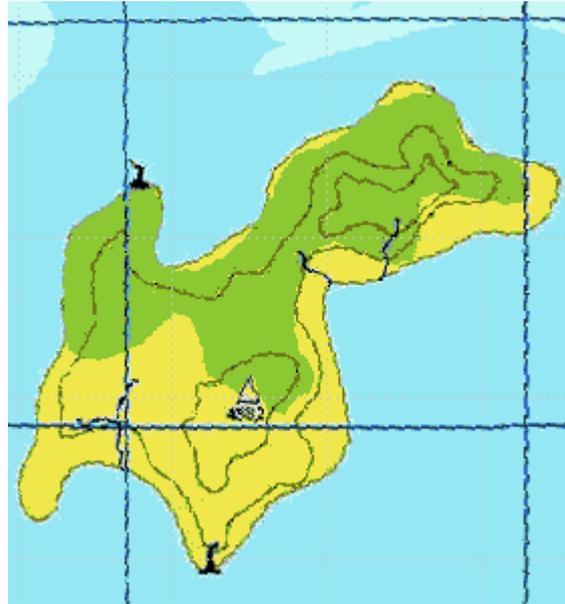
## Notes

To change coordinates format, elevation units, distance units, map transparency, transfer speed and curves precision, use the main menu **Edit > Preferences**.

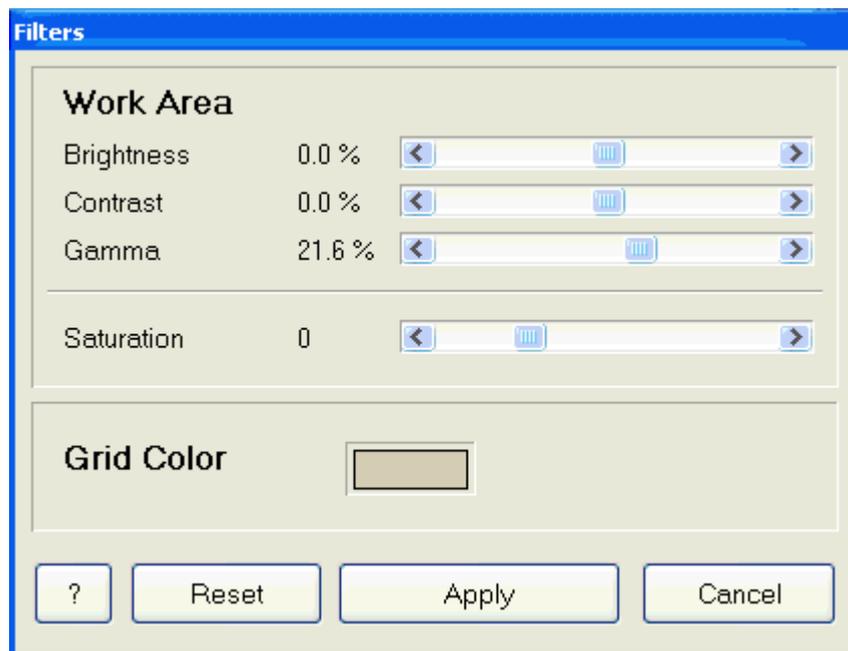


# Background Filters (Colors)

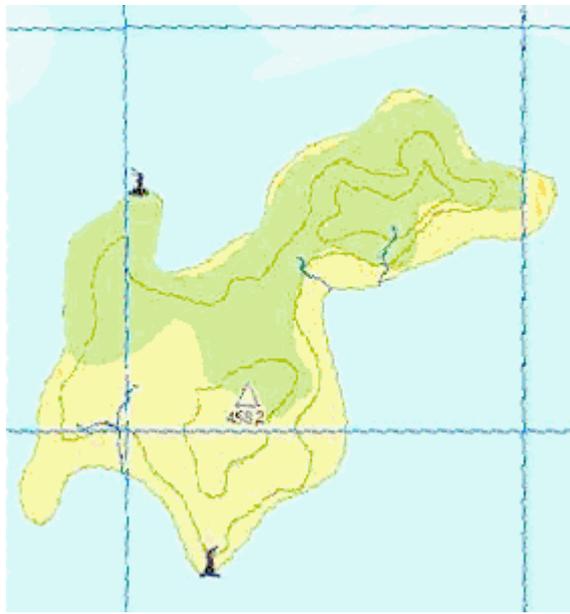
When using imported image as a template for map drawing, it can be useful to make it brighter, darker or less saturated to allow objects drawn on the top to be more visible and thus make the work more comfortable.



Use the [main menu > Image > Background Filters](#) window to adjust brightness or colors saturation. In this case the **Gamma** parameter was adjusted to make image brighter.



Background image is much brighter, while all detail is still visible.





# Drawing of Objects

When drawing this island map, we will follow these steps:

1. Drawing of Areas (ocean, forest, land)
2. Drawing of Lines (land contours)
3. Drawing of Symbols

Some area types (Park) are always displayed beneath others, regardless on their creation order. Therefore, it is necessary to ensure that no other area covers them. This is the reason why we will make an opening in the ocean object.

Areas should overlap each other a bit to avoid of displaying a small gap between the areas in GPS.

## 1. Areas

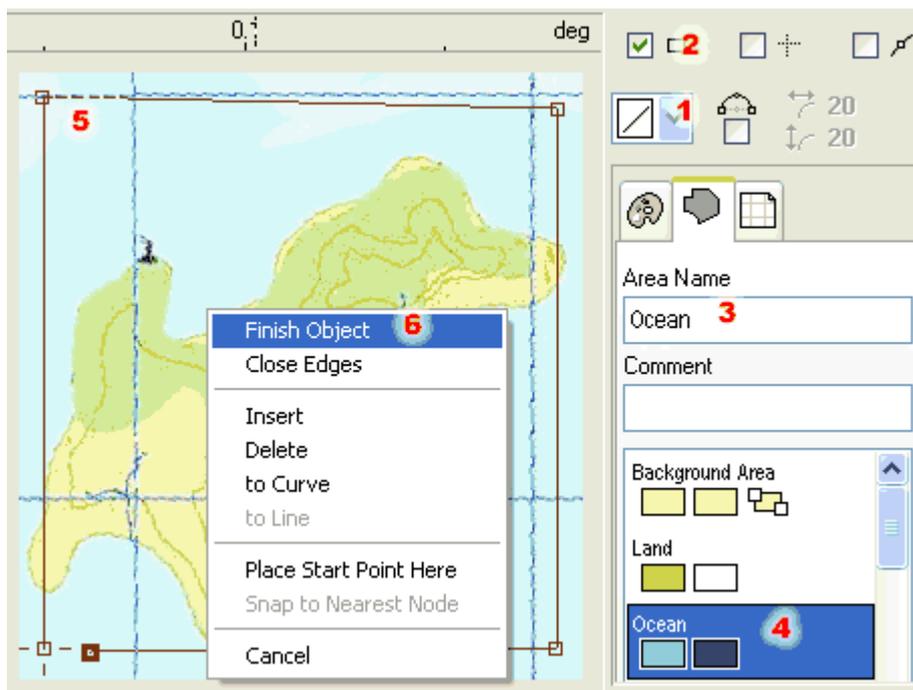
Let's draw the **ocean area** first. As the map is supposed to be rectangular in this case, the edges of ocean area should lie exactly on the Work Area edges.

 Select the **Area** tool and place the first node somewhere near the bottom left corner of the Work Area. Set the **edge type** to straight lines (control 1). Check the '**Snap to Work Area Edges**' option (2).

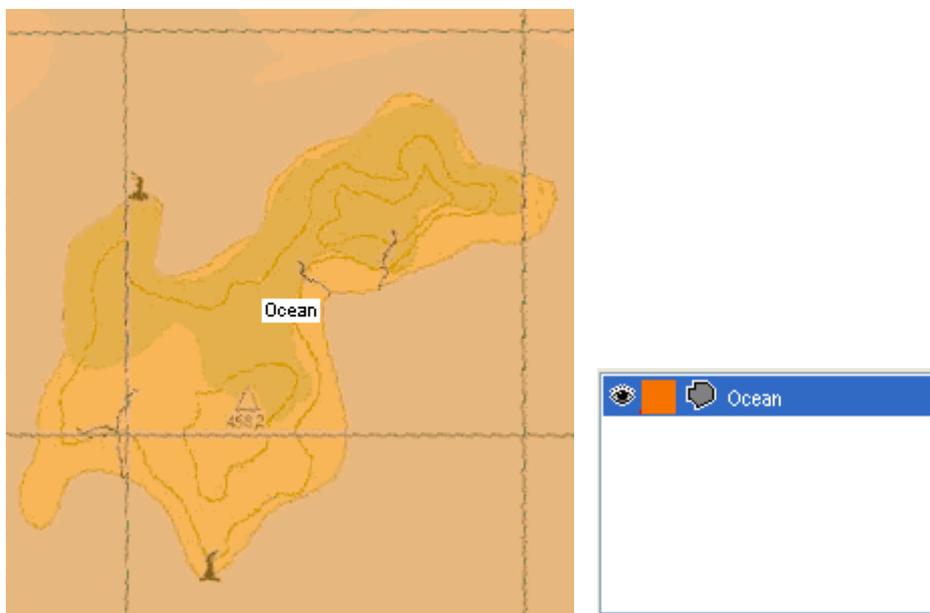
Set the object parameters **name** (3) and **type** (4).

Draw the ocean object by clicking left mouse button on the Work Area. Select each of the nodes (5) and move it towards the Work Area corner. As the 'Snap' option is ON, the nodes will be snapped to the corners automatically.

Then click the right mouse button and choose the **Finish Object** command from the pop-up menu.



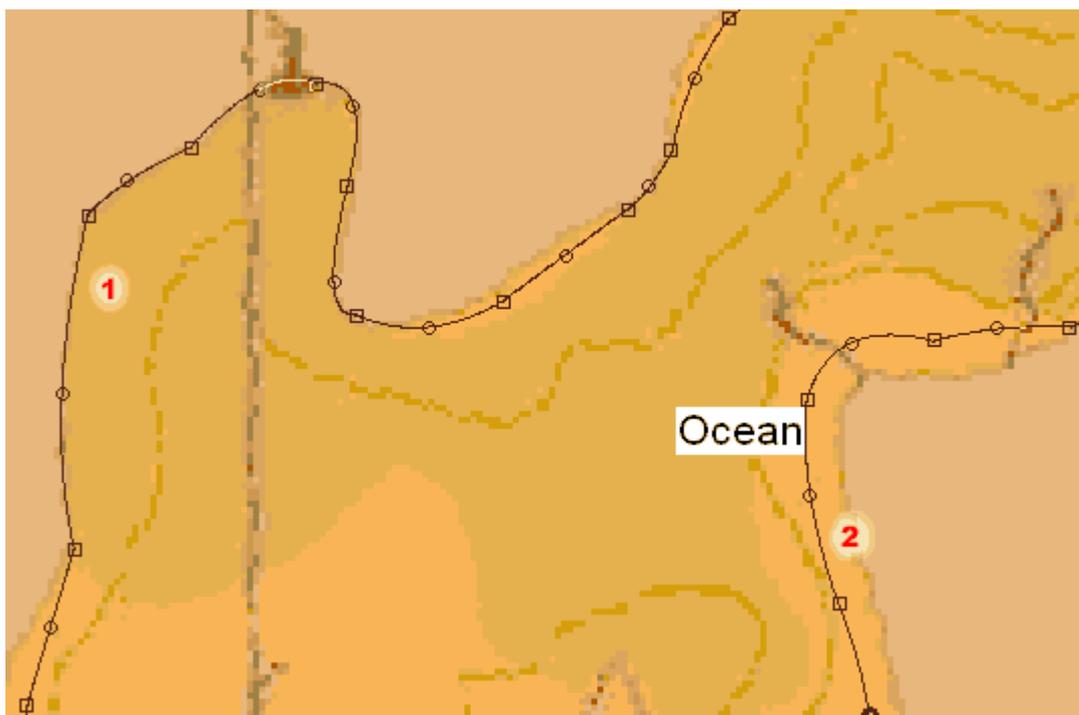
The ocean area now covers whole map. It is of an orange color, because this color was set in the **Palette**. Note that new object is displayed in the **Object Inspector window** as a small icon.



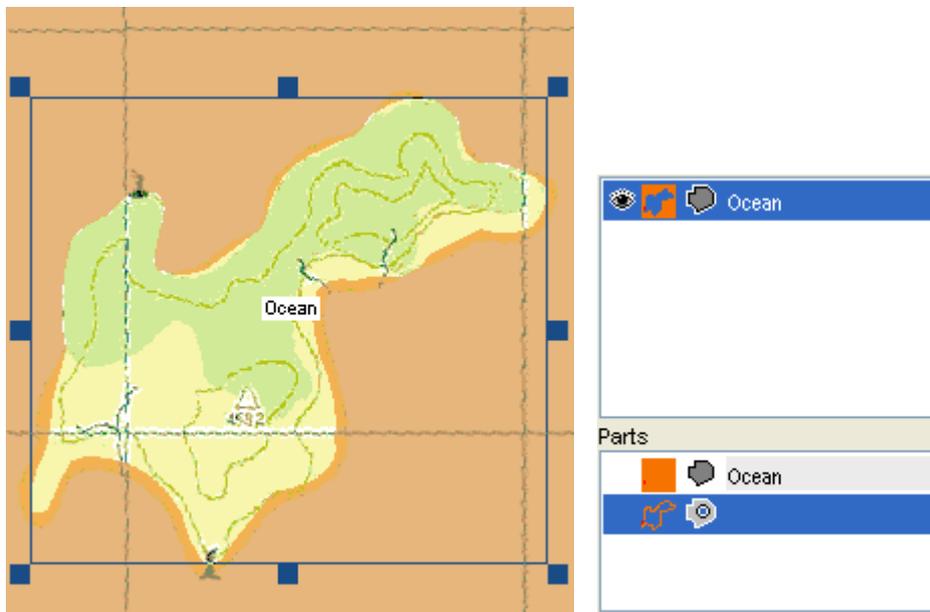
Now we will draw an opening for the ocean area to create a hole for the forest object to show through.

 Select the **Opening** tool and draw the hole. After placing the first node, change the **edge type** to curves. The future forest object should overlap the ocean and land objects (because forest is displayed beneath all other objects), while the ocean object should overlap the land (because land will be on top of other areas). This is the reason why the opening is draw on the edge of the forest (1) and why it overlaps the land (2).

See below animated example on how to draw area or opening with curves.

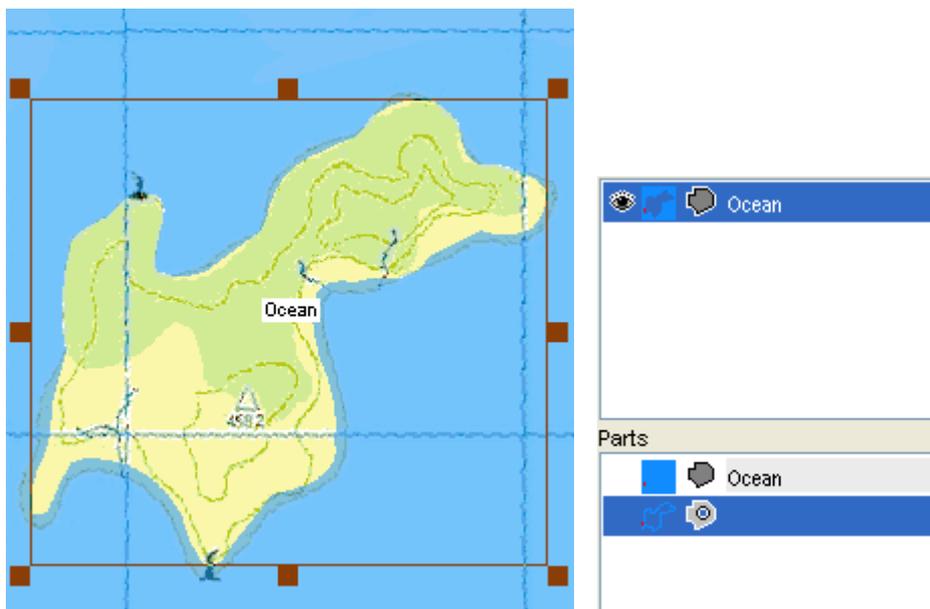


Now there is the opening in the ocean object. Note that combined ocean+opening object is displayed in the object inspector window. Separate parts are displayed in the **Parts** window to allow user to select and manipulate them.

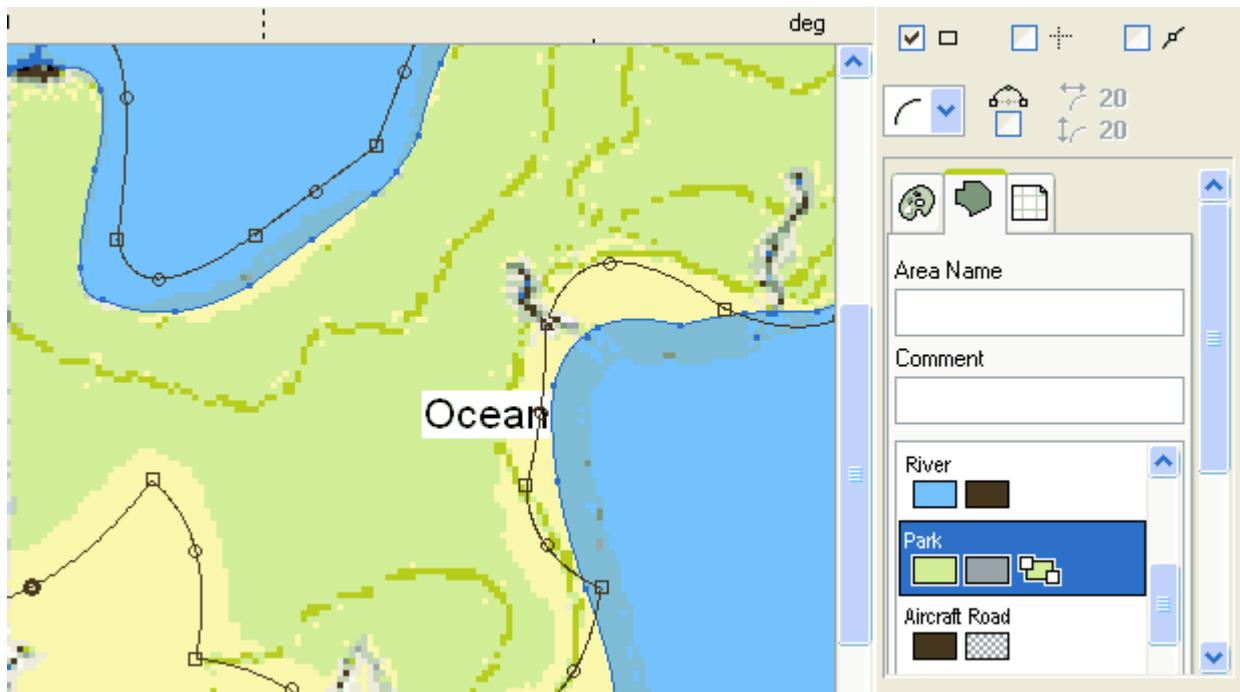


To change color of the ocean object, press left mouse button on the color in the Palette and draw color to object icon in the Object Inspector or to the selected object in the Work Area. Then release the button.

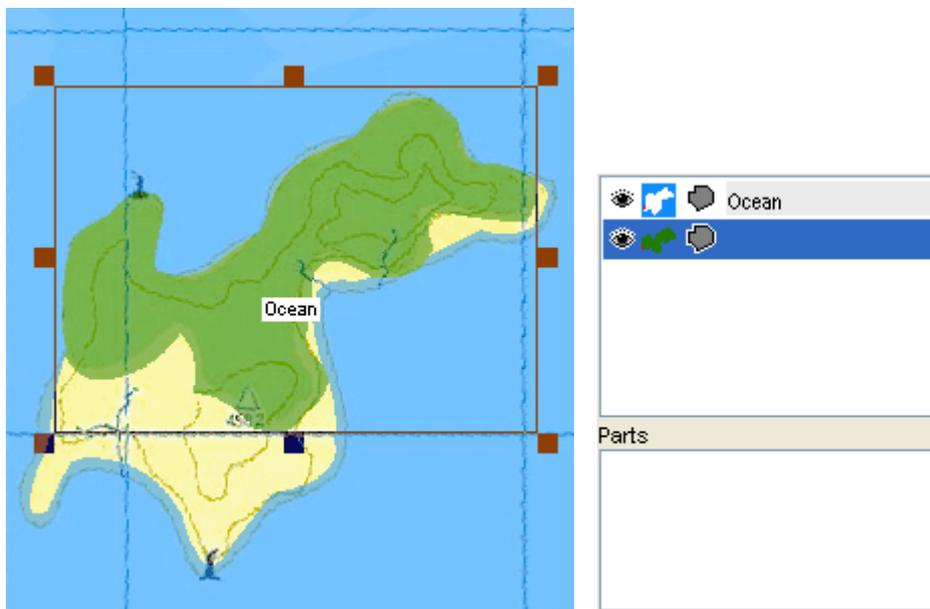
Another way is to click right mouse button on selected object and choose **Color** command from the pop-up menu to access the color dialog window.



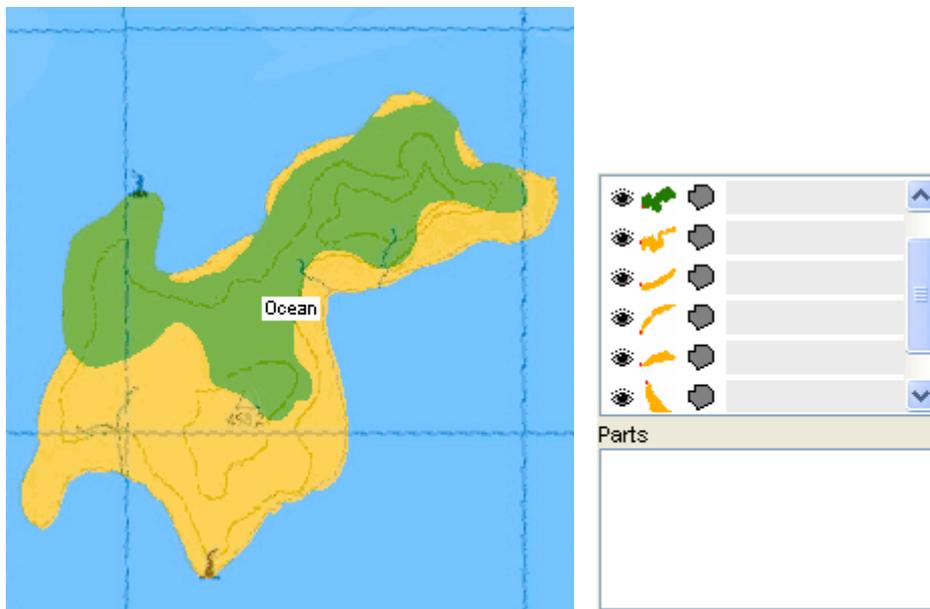
Now we will draw the second area - **forest**. Select the Area tool and draw the forest object with use of curves. Note that forest should overlap all other areas (ocean and land), because it is displayed beneath them. While drawing the forest, set the area type to **Park**. Note the 3rd icon in the Park item which indicates that this object is displayed beneath others.



The forest area is finished. Now there are two objects in the Object Inspector window.



We will draw the 3rd type of area - **land**. Use the same approach as with the forest with a single difference - the land area is on top of others and therefore you do not have to make overlays. There are 5 land areas in this example.



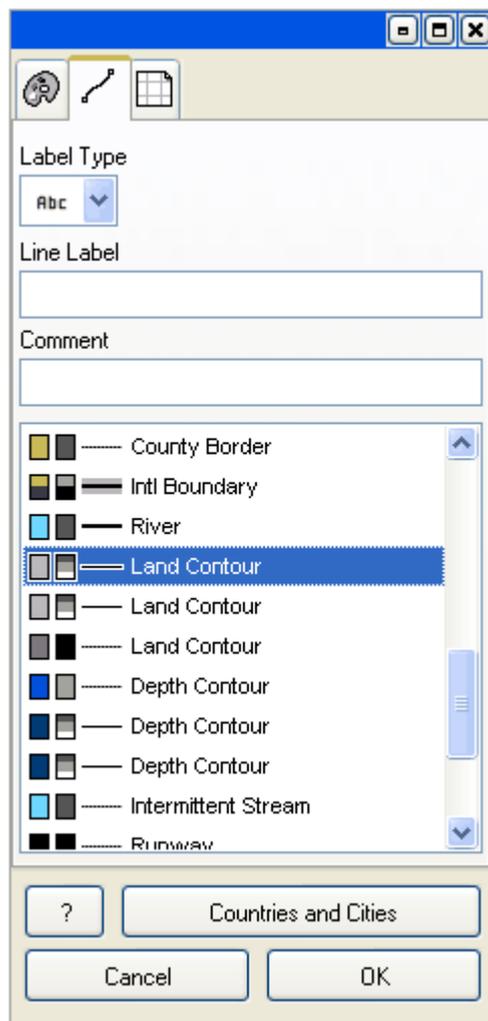
## 2. Lines

Now we will draw the lines (land contours).

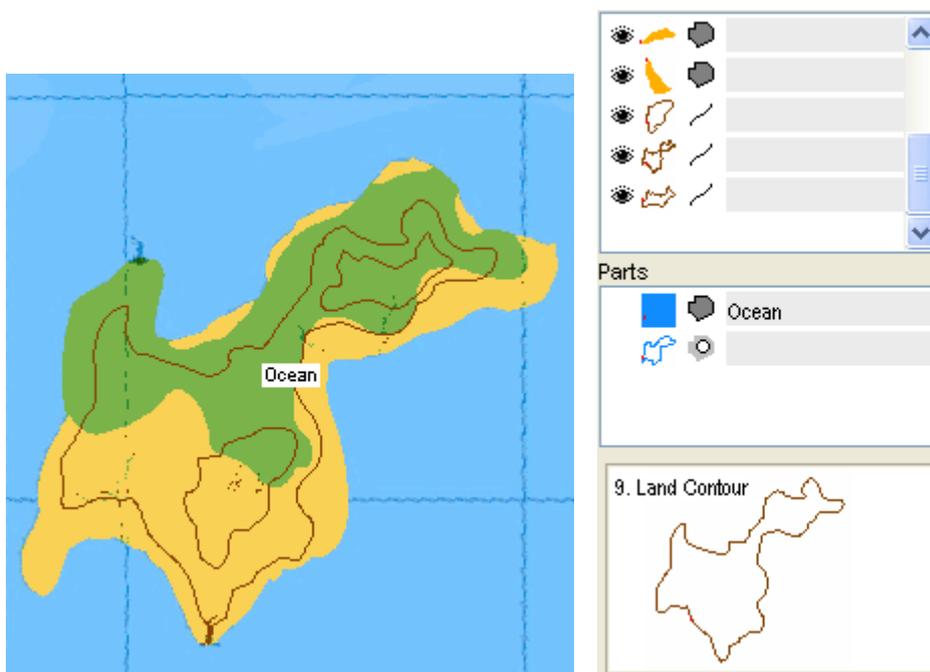
 Select the **Line** tool and draw all contours one-by-one with use of the curves. See below animated example on how to draw line objects.



When lines are finished, select them all and click right mouse button on selection to access the pop-up menu. Choose **Properties** to open **Properties window** and set **Land Contour** line type.



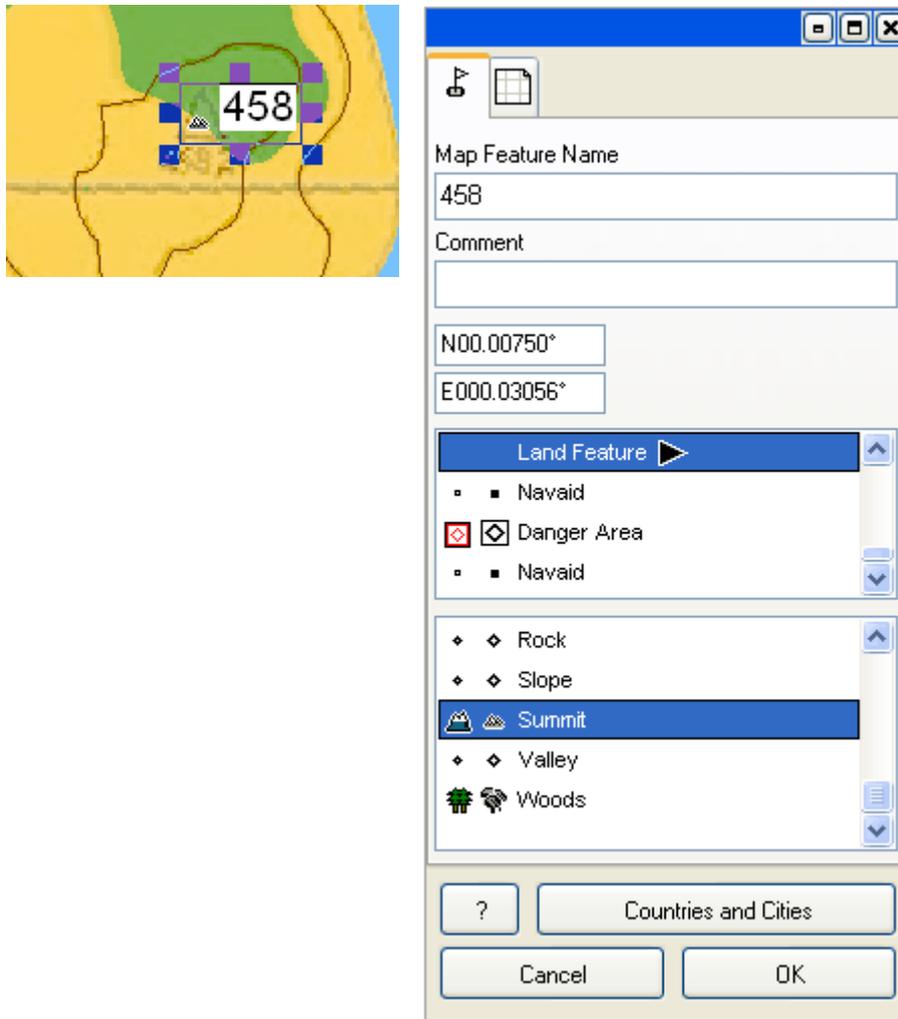
The map looks like this now. Note that when you move cursor over the object icon in the Object Inspector window, enlarged object icon and its description is displayed in the zoom window.



### 3. Symbols

 Select the **Map Feature** tool and click on the respective spot on the map to place the symbol. Default type of map feature is **Summit**, therefore only the object name should be changed, in the case. Select the object and click right mouse button to access the pop-up menu. Choose **Properties** and set the object's name in the

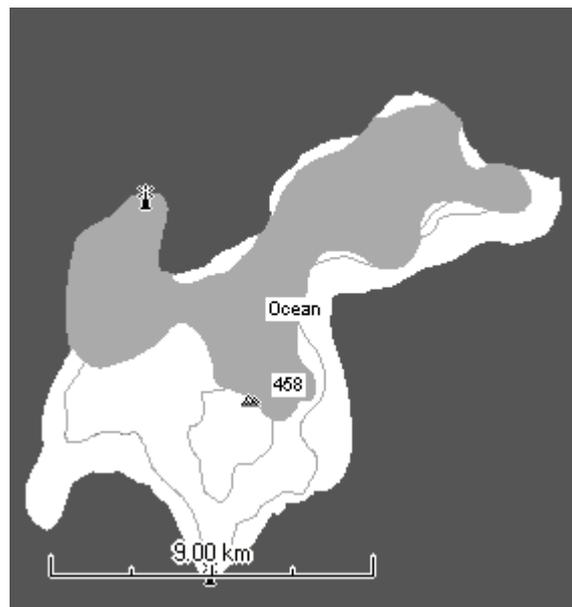
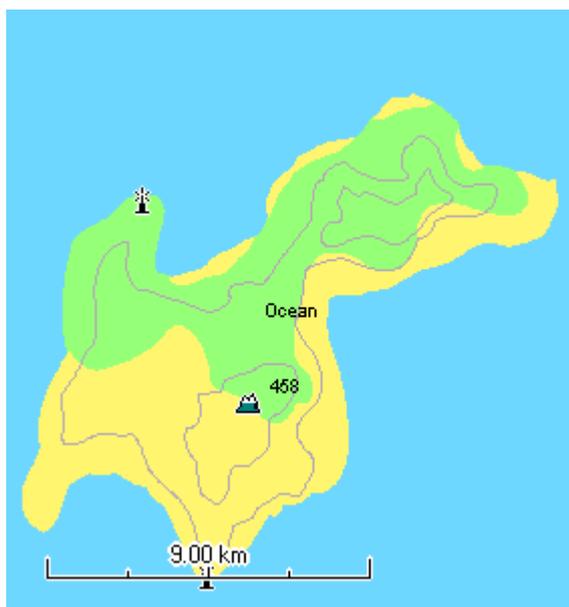
## Properties window.



Now make the rest of symbols in the map. They are Map Features objects too. Select the **Navaid>Racon** type in the [Properties window](#) after object is finished.



Duplicate the Racon symbol and place it on the proper spot on the map. This simple example map is finished now. To check how it will look like in the color or monochrome display GPS click on **'Color'** or **'Grey Scale'** tabs in the bottom left corner of the Mapwel. You can switch between the tabs anytime during the map creation.







# Upload of Map into GPS

Use the [main menu > File > Upload Map to GPS](#) command.

In case of problems with map uploading or displaying on GPS, please [click here](#).



# How to load raster image into GPS

Use the [main menu > Image > Automatic Vectorization](#) command.



# How to acquire GPS ID number

Use the [main menu > GPS > Display GPS ID](#) command.



# Import of ESRI Shape Files

**ESRI Shape Files** are vector files that contain geographical data and optional attributes. Shape files can support point, line and area features. Each layer is stored separately. An ESRI shape file consists of main file (.SHP), an index file (.SHX) and attributes dBASE table (.DBF).

Use the **main menu / File / Open or Merge** function to import an ESRI shape file and convert it into the Mapwel map. Then you can upload it into the GPS unit.

As the shape files are primarily not designed to use with GPS units and attributes of objects are specified by user, Mapwel cannot assign the shape file attributes (data) to the map object properties like Name, Comment, Type, etc. automatically. User is prompted to assign available shape file data to the map objects.



Because layers are stored in a separate shape files, it is necessary to **Merge** (with use of main menu>File>Merge command) all shape files to create complete map in Mapwel. Mapwel stores whole map in a single MPW file.

## Loading of each SHP file involves three steps:

1. Selection of projection and datum used for representation of geographical data in SHP file.
2. Assignment of SHP attributes to types used by Mapwel.
3. Assignment of other SHP attributes representing name, comment, street name, phone number and other data to Mapwel data structures.

## Step 1 - Selection of projection and datum

Use the first tab in the SHP open file dialog to select **coordinate system** of the SHP file. You have to know coordinate system of the SHP file. If chosen coordinate system is not the right one, map will be imported improperly.

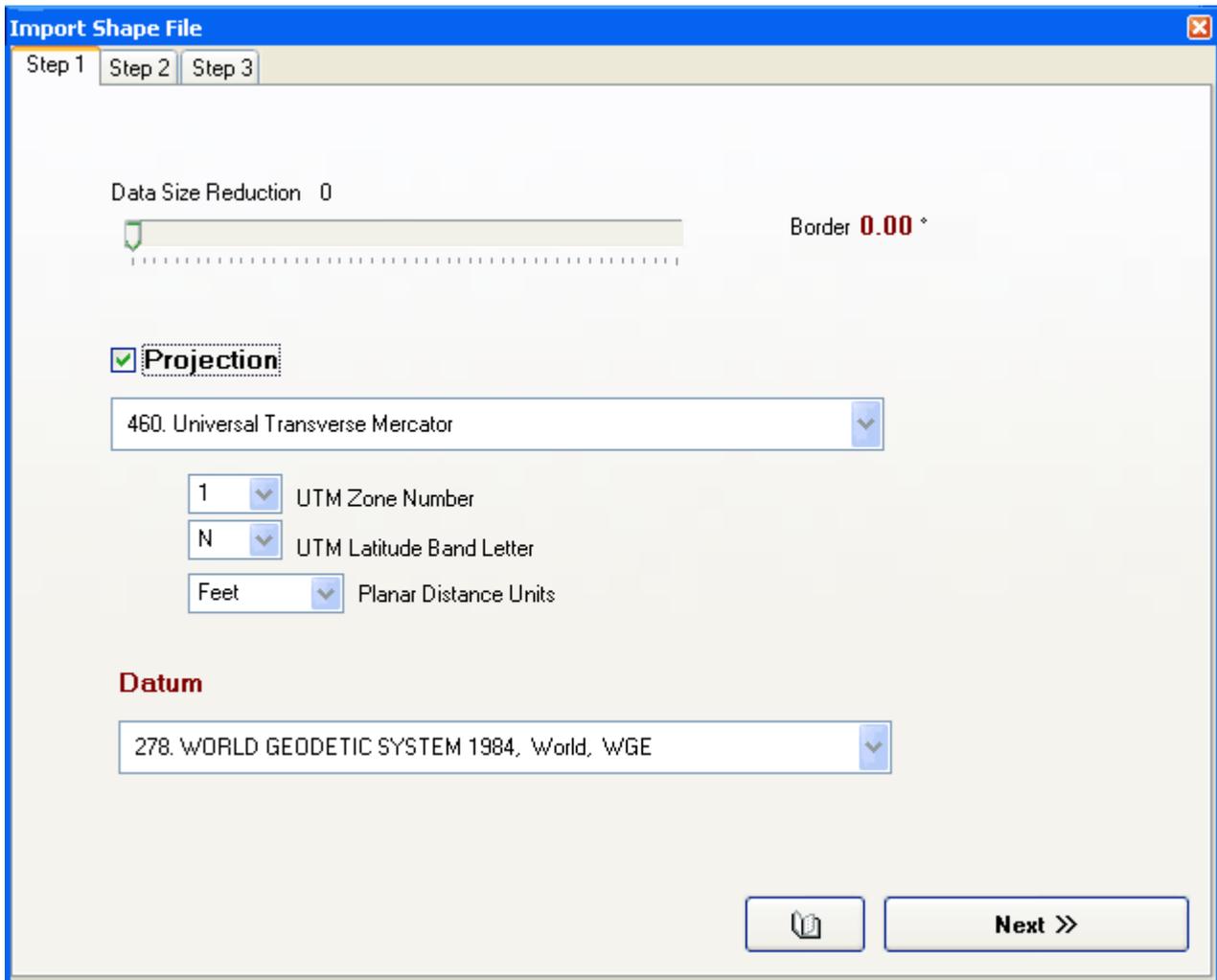
**UTM Zone Number**, **UTM Latitude Band Letter** and **Planar Distance Units** are controls for definition of additional information for UTM system. UTM Latitude band letter affects only selection of the hemisphere (northern or southern) when converting coordinates from UTM to Lat/Lon. Therefore, you can obtain the same Lat/Lon coordinates for various band letters.

Use **Data Size Reduction** control to decrease the number of imported vertices (in case of area and line objects). If imported data contain too many vertices, displaying of map on the GPS can be very slow. In such a case, reduce the size of imported data to speed-up the map displaying. Reduction of vertices decreases also precision of the map elements definition. The highest available accuracy of the map elements uploaded into the Garmin GPS is approximately  $\pm 1.2$  m. Accuracy of imported data should be lower or equal to this value to optimize the speed of map displaying and data size.

**Border** is an empty space added around the map. Imported map may be clipped to bounding rectangle of all

objects. Set Border to non-zero value if you need to add empty space around the map. Click left or right mouse button on the value to increase/decrease it, or click on 'Border' label to set value by keyboard.

Click the **Next>>** button when you are finished with selection of coordinate system and data size reduction.



To learn about custom (user-defined) projections, [click here](#) please.

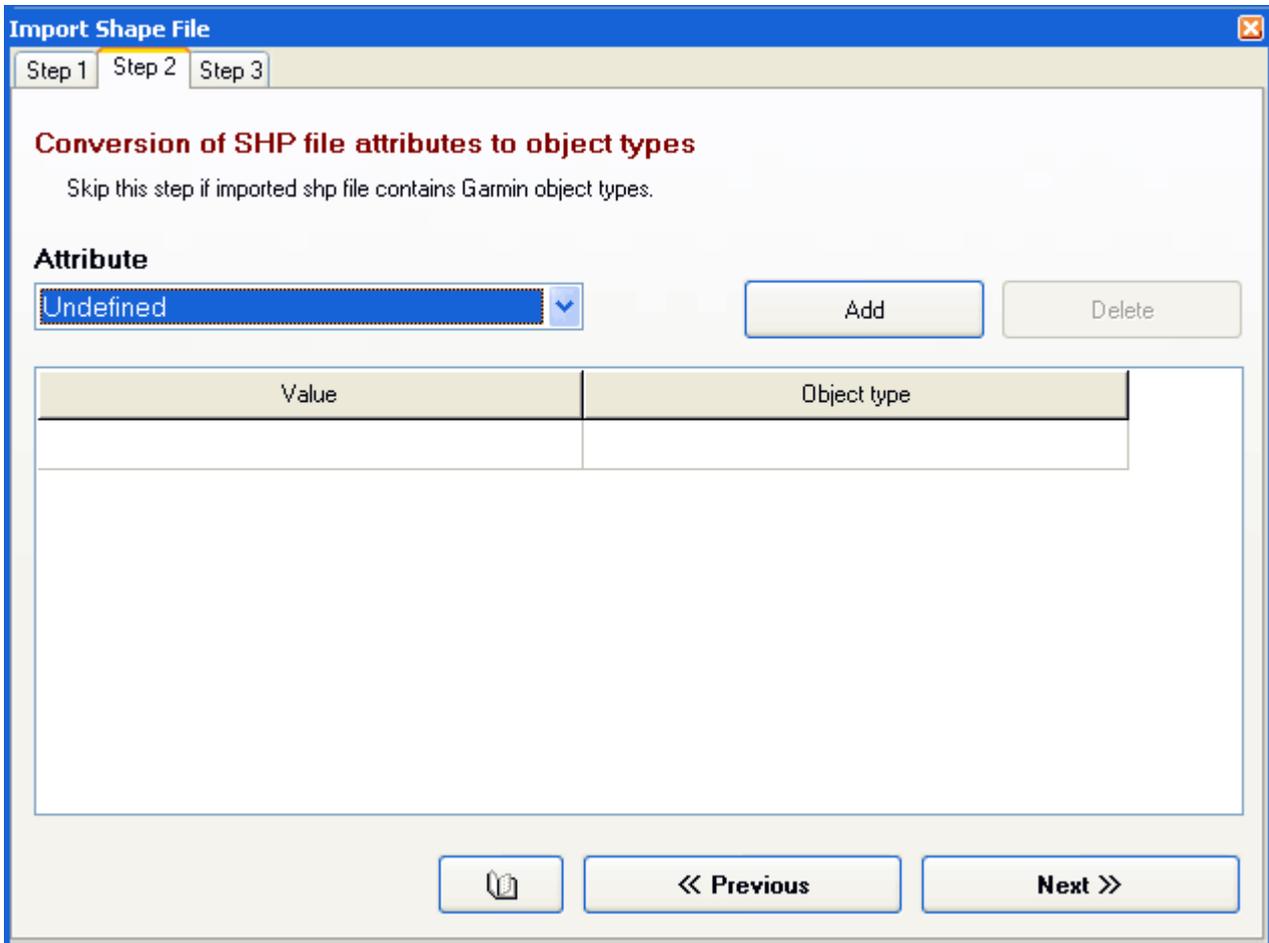
## Step 2 - Assignment of attributes to Mapwel types

If any of the SHP file attributes defines the type of objects, you can use this tab to create attribute-to-Mapwel type conversion table.

Mapwel cannot recognize meaning of SHP attributes automatically, as they may contain any type of information. Definition of conversion table allows user to assign proper type to imported objects.

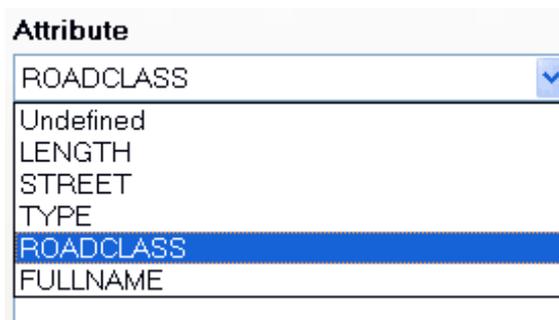
You can skip this step if:

- there is no attribute that defines type of objects
- some attribute already contains Garmin object types
- you do not wish to assign type to objects.

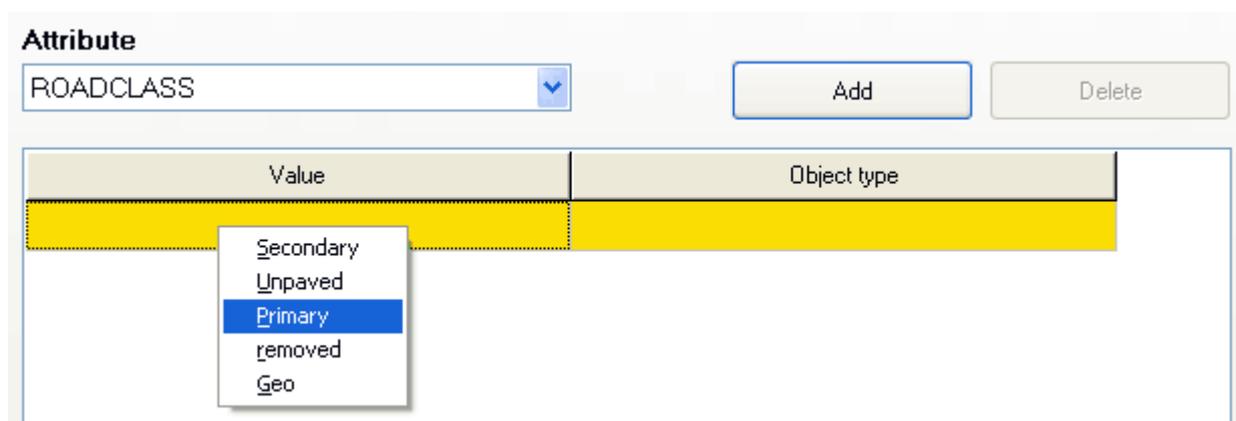


**Follow these steps to create conversion table:**

A) Select attribute that defines the object types.



B) Click on the first line of the first column in conversion table. Select attribute value from the pop-up menu that appears.



C) Click on the second column in the same line. Select type of object from the pop-up menu. This type will be assigned to all imported objects that have attribute **ROADCLASS** set to value **Primary**.

Object type	
==== Major HWY	----- Depth Contour
==== Principal HWY	----- Depth Contour
----- Arterial Road	----- Depth Contour
----- Road	----- Intermittent Stream
----- Alley	----- Runway
----- Ramp	----- Pipeline
----- Unpaved Road	----- Powerline
==== Major HWY Connector	----- Marine Boundary
----- Roundabout	----- Marine Hazard

D) Use **Add** button to create as many items in the table as necessary. Define all attribute **value - object type** pairs.

**Attribute**

ROADCLASS

Value	Object type
Primary	Principal HWY
Secondary	Road
Unpaved	Unpaved Road

==== Major HWY	----- Depth Co
==== Principal HWY	----- Depth Co
----- Arterial Road	----- Depth Co
----- Road	----- Intermitt
----- Alley	----- Runway
----- Ramp	----- Pipeline
----- Unpaved Road	----- Powerline
==== Major HWY Connector	----- Marine Bc

When finished, click on the **Next>>** button.

### Step 3 - Assignment of other SHP attributes to Mapwel data structures

**Import Shape File**

Step 1 Step 2 Step 3

**Assign shape file data to map objects**

**Area**

Name: Undefined

Comment: Undefined

Type\*: Undefined

**Point**

Name: Undefined

Comment: Undefined

Type\*: Undefined

House\*\*: Undefined

Street\*\*: Undefined

Phone\*\*: Undefined

**Line**

Name: Undefined

Comment: Undefined

Type\*: ROADCLASS

Any field can be left "Undefined".  
 \* Use "Type" when imported file contains Garmin object types.  
 \*\* Valid only for Point of Interest objects (POI).

If there are attributes, which define the name, comment or other Mapwel-compatible data like street name or phone number, use this tab to assign them to the respective Mapwel variables.

If imported file has an attribute that conforms the Garmin area, line and point indexing system, assign this attribute to the **Type** variable. This condition is usually satisfied by shape files originally created for GPSmapper software.

If type conversion table was defined in **Step 2**, **Type** is automatically set to the respective attribute.

**Line**

Name: Undefined

Comment: Undefined

Type\*: FULLNAME

Click the **Finish** button when the last step is finished.

In this case, imported map has four types of lines: 3 types as defined in the **Step 2** and the 4th (default) type for rest of the lines, which were left with the undefined type.







# Custom (User Defined) Projection

Mapwel supports hundreds of projections and datums. If you need to use custom projection, please use following approach:

1. Open **Userprj.INI** file from your **Mapwel>Settings** folder in any text editor.
2. Edit parameters in either **[USER\_DEFINED\_Transverse\_Mercator]** or **[USER\_DEFINED\_Lambert\_Conformal\_Conic]** section, according to the projection method. Then save the edited file. **Please note:** change only fields at right side of '=', i.e. the key values. Do not change section and key names.
3. When using below window for entering coordinates, check the **Projection** check box and select **X\_User\_Defined\_Transverse\_Mercator** or **X\_User\_Defined\_Lambert\_Conformal\_Conic** projection.

Current version of Mapwel supports **transverse Mercator** and **Lambert conformal conic** projections. Support for other projections will be added in the future.

The screenshot shows a dialog box titled "Assign North and West" with a close button in the top right corner. It contains the following elements:

- A checked checkbox labeled "Projection".
- A dropdown menu showing "743. Universal Transverse Mercator".
- Three dropdown menus for parameters:
  - "1" for "UTM Zone Number"
  - "N" for "UTM Latitude Band Letter"
  - "Feet" for "Planar Distance Units"
- A section header "Datum" in red text.
- A dropdown menu showing "166. NORTH AMERICAN 1927, US - CONUS, NAS C".
- Two input fields for coordinates:
  - X: "17000" (with a left arrow icon)
  - Y: "23000" (with an up arrow icon)
- A "Position Format" dropdown menu showing "hddd.dddd\*".
- An "OK" button.

Custom projections are listed among pre-defined projections in this window, which pops-up whenever coordinates are converted to WGS84.



# Map Coordinates

Following procedure is typically used to georeference imported raster image with Lat/Lon grid parallel to the screen edges, which corner coordinates are known.

[Click here for more image editing and calibration tools.](#)

Map coordinates are displayed in a bar at the top part of the main Mapwel window. To enter a non-WGS84 coordinate, click left mouse button on **arrow icon** at left side of the box, instead of typing the coordinate into the box.

↓	S00.04550°	↑	N00.10600°	←	W000.02980°	→	E000.11212°
---	------------	---	------------	---	-------------	---	-------------

Boxes for entering map coordinates.

A [window for entering and conversion of coordinates](#) in various coordinate systems will appear.



# Morphing of Image

This tool is intended for use with maps with unknown projection and datum, or with distorted maps. In other cases, please try [direct calibration](#) first.

When drawing vector map with use of scanned paper map and tracks acquired with GPS, you can often encounter the problem of paper map not matching the tracks, even if it was declared as a 'GPS map'. In such case another problem pops-out and this is how to draw the rest of objects as it is not clear how to position them with respect to the measured tracks. If whole image is just shifted, you can use [main menu / Image / Move](#) function to position the image under vector tracks properly. If deviation between image and vector parts is not constant, correction requires more labour.

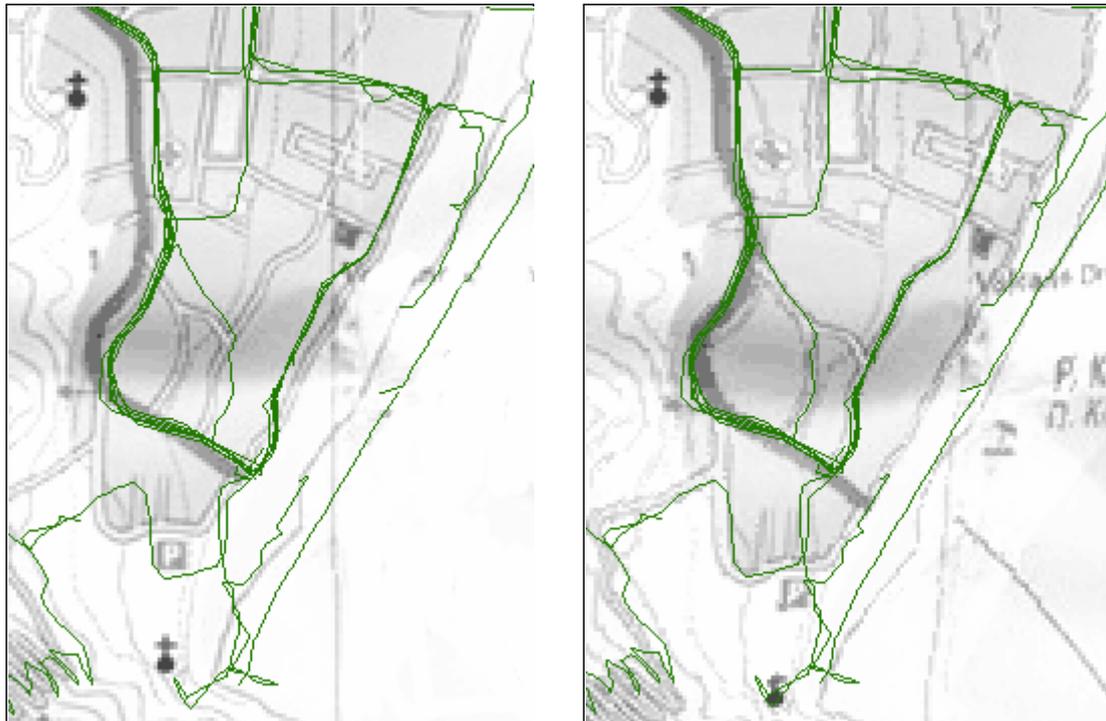


Fig. 1. Measured tracks do not match scanned paper map very well (left).  
Image after non-linear calibration with three pairs of points (right).

Mapwel provides '[Image Morphing](#)' tool for non-linear calibration of bitmap image to allow user to adjust image before actually drawing vector objects on top of it. Morphing function uses pairs of points defined by user. Image is calibrated so that area around the first point of each pair is transformed into area around the second point of each pair.

Click on [main menu / Image / Image Morphing](#) to start image adjustment. The first pair of calibration points will appear on the screen. They are one of top of the other. Click on the cross indicating position of the point and move it aside. Now you can see both points in the pair and an arrow between them, which indicates direction of image transformation in this place.

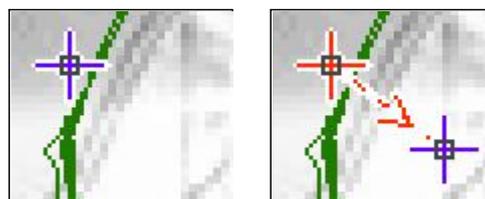


Fig. 2. Pair of calibration points.

If you click right mouse button on any of the calibration points, a pop-up menu appears, which contains following command: **Preview**, **Original**, **Add Pair**, **Delete Pair**, **Morph Image**, **Cancel**.

Place calibration pair on some corresponding places (fig. 3. left) and use the **Preview** command from pop-up menu to see effect of calibration (fig. 3. right). First point of the pair is placed on street on the raster image. Second point is placed on the corresponding place of the measured track. In **Preview**, area near first point is transformed into area near second point and raster image matches the measured tracks much better.

We use **Preview** for now, because there will be more calibration pairs added. As adjustment is performed on a raster image, each change could add distortion to the image. Therefore, use Preview to see effect of calibration until all pairs are added. We will use **Morph Image** to perform all changes at once at the end of calibration.



Fig. 3. Image with single pair of calibration points before calibration (left) and after calibration (right).

Now we will add second pair of calibration points to calibrate upper part of the image. Use **Add Pair** command from the pop-up menu. Notice that image returns to original form to allow user to place all points under the same conditions. Use **Preview** command to see calibration with two pairs. You can switch between **Original** and **Preview** mode to examine points placement and calibration effect.

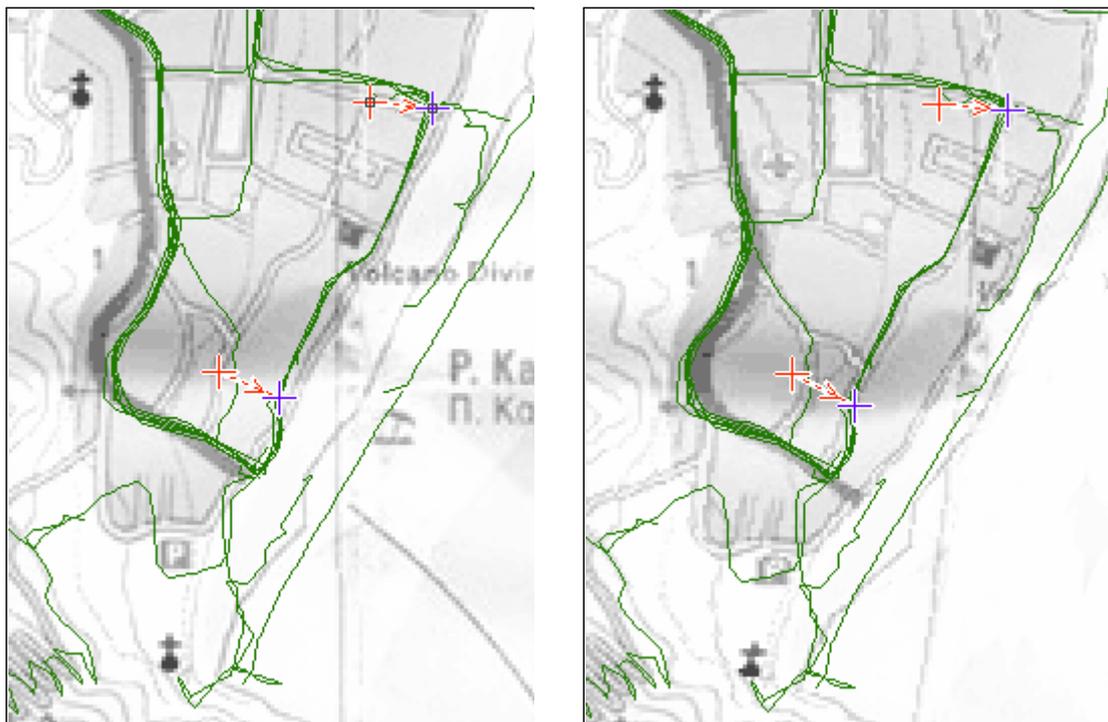


Fig. 4. Image with two pairs of calibration points before calibration (left) and after calibration (right).

Measured tracks fit adjusted image quite good now, except the bottom part of the image. There has to be one

more calibration pair added.

Usually, there should be not many calibration pairs used, and they should be not placed one near to the other, because influence of each pair reaches only to the nearest pair. If pairs are too near one to the other, image gets distorted because of adjustments being too local.

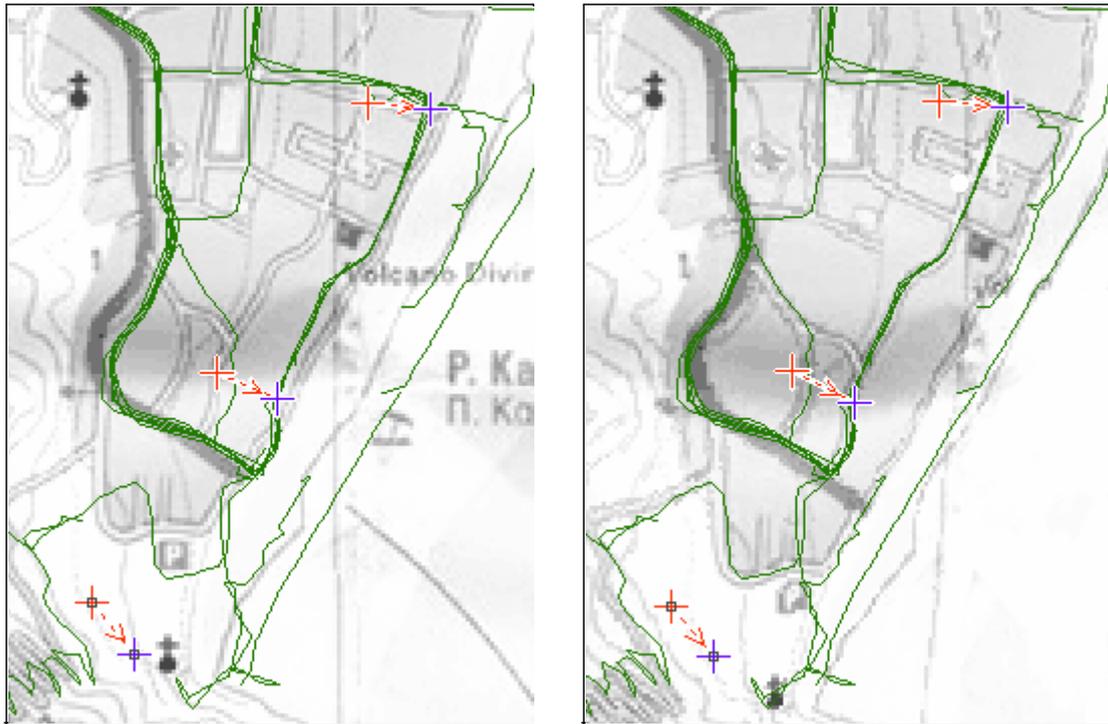


Fig. 5. Image with two pairs of calibration points before calibration (left) and after calibration (right).

Notice that roads near 3rd pair are calibrated even when the pair is not placed on any particular object on the image (left).  
Use such approach to prevent pairs being too near one to the other.

The image seems to be calibrated quite well with three pairs of points. So far we were using the **Preview** mode. Now click on **Morph Image** function to perform all adjustments to raster image at once.

When doing a large map, calibrate it part-by-part, each part with use of several pairs (like shown in above example). Do not calibrate the whole map at once as each pair slows down the calibration process. As the influence of pairs is more or less local, there is no reason to calibrate large map at once.



# Move Image

When drawing vector map with use of scanned paper map and tracks acquired with GPS, you can often encounter the problem of paper map not matching the tracks, even if it was declared as a 'GPS map'. If the whole image is just shifted, the **main menu / Image / Move** function can be used to position the image under the vector tracks properly. In other cases, please [click here for more image editing and calibration tools](#).

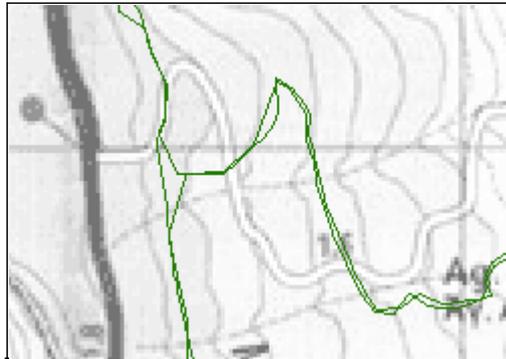


Fig. 1. Image under the vector objects needs to be shifted.

Let's suppose that deviation is constant in this case. Click on **main menu / Image / Move** command to start image adjustment. Place pair of points to mark the current and desired position of any spot on the raster image.

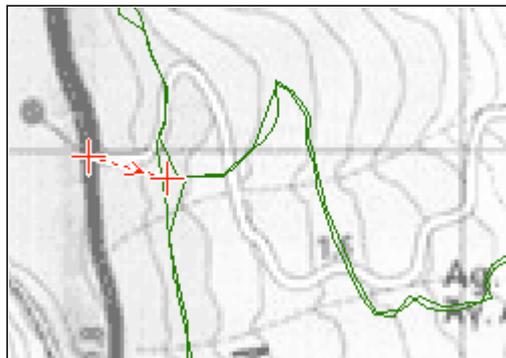


Fig. 2. Current and desired position of spot on raster image. The shift direction is marked by an arrow.

Click right mouse button to access a pop-up menu. Select **Move** to shift the raster image.



Fig. 3. Image shifted to fit under the vector objects.



# Exporting Maps

This function can be accessed via **main menu > File > Export Map**. Use this command to save map in format other than Mapwel's native MPW format if you need to process data in other software. Mapwel currently supports data export into Garmin **IMG**, Google Earth **KML** and cGPSmapper **MP** formats.

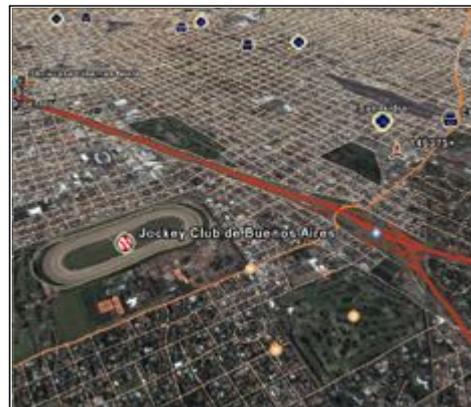
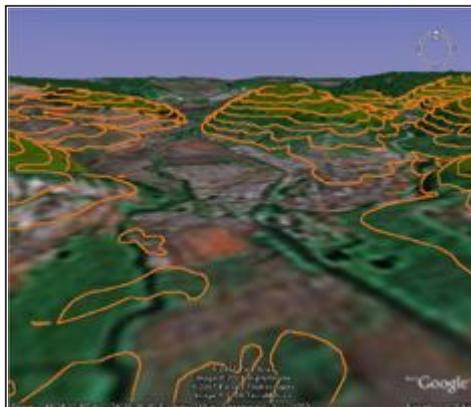
**Mapwel Advanced** licence is need to use export function. It is not available in Mapwel Basic.

## Google Earth KML (Keyhole Markup Language) format

Maps exported into this format can be open in Google Earth and displayed on top of the earth surface. When you create your own map, it is very useful to use this function to check accuracy of the map. If the 'terrain' option in Google Earth is set, map is displayed so that it follows the terrain and it looks like 3D map.



Map exported from Mapwel in KML format and loaded into Google Earth.  
Map contains polygons, polylines and symbols.  
POIs are exported with address info (if supplied).



Left: contour lines from Mapwel displayed 3D with 'Terrain' option in Google Earth.  
Right: map from Mapwel displayed on top of the satellite image in Google Earth.

## Garmin IMG format

IMG is native binary format of Garmin GPS units. These files can be loaded into GPS with our freeware **MapUpload** (included with Mapwel installation files) or with 3rd party upload software.

Mapwel (both Basic and Advanced) allows to load maps directly into the GPS. If you prefer to use other uploading method, please note that Garmin GPS units with files 'visible' from PC require all maps to be merged into single IMG files with name GMAPSUPP.IMG. Find out more [here](#).

To define irregular shape of map, use the 'Background Area' polygon object in Mapwel. Please note that map can contain only 1 object of this type and all other object must lie within its boundaries. If 'Background Area' is used, GPS does not display objects outside of this polygon.

IMG File Feature	Availability
Irregular map shape	✓
POI addresses, Country and State info support	✓
User defined zoom levels	✓
User defined polygons, polylines and symbols	✓
User defined copyright text	✓
Locking maps with unlock code	✗
Auto-routing	✗
Marine maps	✗



# How to erase all maps in GPS

Use the [main menu > GPS > Erase Maps is GPS](#) command.



# How to compile multiple maps into IMG format at once

Use the [main menu > Files > Batch](#) command.



# How to erase specific maps

Use the [main menu > GPS > Erase Specific Maps](#) command to open window with list of maps to be erased. The list is empty when window opens.

Click on **Get Map List from GPS** button to download list of maps from the GPS.

Click on **Get Map List from IMG file** button to load list of maps stored in the IMG file on PC. IMG file can contain single map or map set with many maps. Users can build and edit their map set on PC and then load it to multiple GPS units. Use this option to erase specific maps from your map set file on PC, without need to work with GPS.

Mark maps to be erased by clicking on the respective line of the **Erase** column.

When finished, click on  button to perform erasure. All maps marked by X sign will be erased. This operation may last even several minutes.

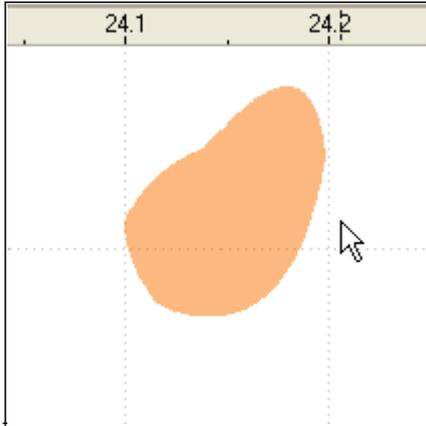


## How to change serial data transfer speed

Use the [main menu > Edit > Preferences](#) command or change the speed in the [Map Transfer](#) window.



# Guide Lines



**Guide Lines** are horizontal, vertical, or slanted lines that can be placed anywhere in the work area window to aid in object placement and nodes alignment.

To create a new guide line, position cursor on either vertical or horizontal ruler, depress the left mouse button and drag cursor to the work area.

Guide lines can be used for **areas and lines splitting**. Place the guide line on the object. Select object and then select the guide line. Click right mouse button on the guide line to access pop-up menu. Choose **Slice Selected Objects** command.

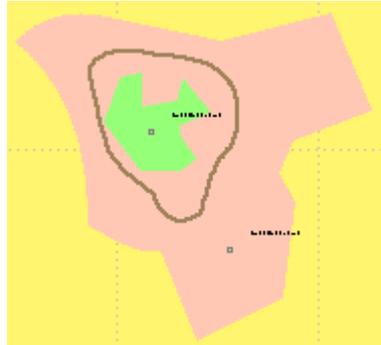
Use **main menu > Edit** to lock or erase guide lines or to switch on/off snapping of objects to the guide lines. Use **main menu > Nodes** to switch on/off snapping of nodes to the guide lines.



## How to Create Map of Irregular Shape

If you want to draw your map so that it is not rectangular, in order to not cover surrounding countries, you have to assign it an irregular shape.

To achieve irregular shape of the map when displayed in GPS, place a special area of **Background Area** type as a first object in the map. This area is displayed in pink color in both '**Color**' and '**Grey Scale**' display modes.





# How to Measure Track Length

The total length of all selected line objects is displayed in Properties window on the [Line Tab](#).

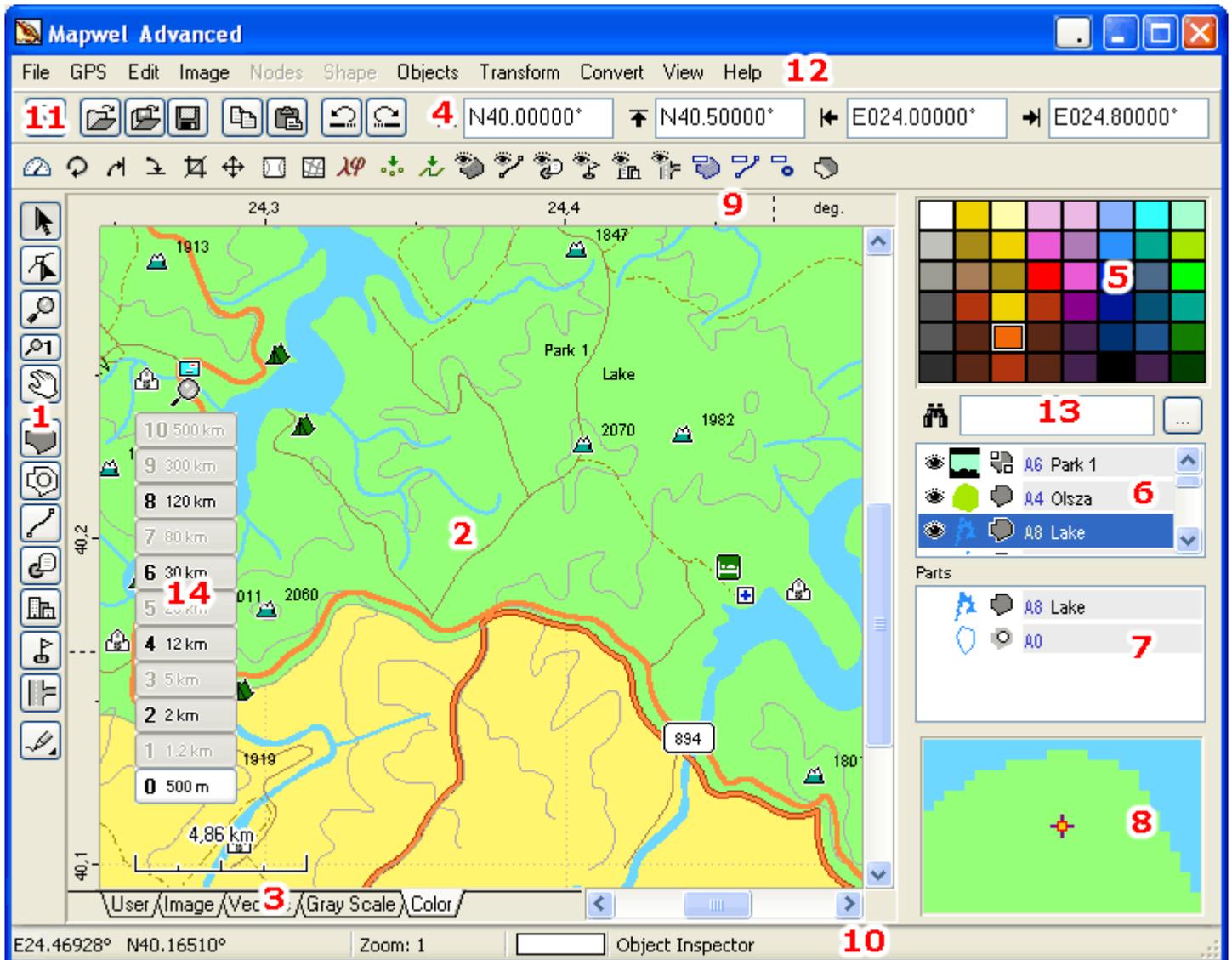


# How to define your own area, line and symbol styles

Use the [main menu > Objects > User Defined Styles](#) command to launch the editor of above mentioned styles.



# Main Window



- 1** The **Tool Bar** contains tools for creation, editing and transformation of objects. Click [here](#) to learn more.
- 2** **Work Area**. When starting a new map, the work area is blank. User can import scanned image or photo into the background of work area. Default colors of work area and grid lines are specified and can be changed in [Edit / Preferences](#).
- 3** **Display Mode Tabs**. In **User** mode, all objects (background image and map objects) are displayed in user colors. In **Image** mode only the background image is displayed. In **Vector** mode only the map objects are displayed (in user colors). **Grey Scale** mode simulates the monochrome display of GPS units and **Color** mode simulates the color display of GPS units. Use the last two modes to see how the map will look in GPS.
- 4** **Button bar**. The most used functions from main menu and pop-up menus are accessible through these buttons.
- 5** **Palette** of Colors. Click right mouse button on any color to adjust this color. To change color of an existing object, press left mouse button on color and drag and drop it on the object icon in [Objects Inspector window](#) or on the selected object in the work area. To set color that will be used for newly created objects click left mouse button on any color. Color that will be used for new objects is outlined in black and white.

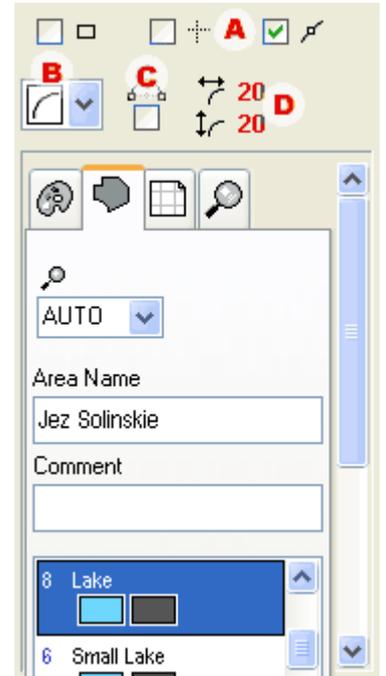
**6 Object Inspector window.** All objects created on working area are displayed here in order of creation. It shows order of objects, their type, visibility, name and comment.

When composing complex map with many objects, it is sometimes difficult to isolate desired object in the work area. Use Object Inspector in this case. To change order of objects, select them with right mouse button, drag them to their new position, and release mouse button. To Hide/Show object click the eye icon to the left of each object.

To access menu to duplicate, delete, or change properties, click right mouse button on selected objects in Object Inspector window.

To change color of object in Object Inspector, press left mouse button on any color in Palette and drag it to this object. Then release the button. Another way is to double click the object icon to access the color dialog box, or use the Color command from the pop-up menu.

Color can be also dragged and dropped from object in the list onto the palette.



To select non-contiguous subset of objects, depress the Ctrl key and left click on each object.

In the editing mode the Object Inspector and Part Inspector windows are replaced with basic parameters of the object.

Read more about Object Inspector [here](#).

**7 Part Inspector window.** Openings (holes) of area objects are displayed here as well as parts of grouped objects. This window serves to select holes and parts for further manipulation, because they cannot be selected in work area and in Objects Inspector.

**8 Magnifying window.** This window displays enlarged area around mouse cursor. It aids precise placement of nodes, allowing user to maintain view of design in the Work Area. To hide this window, use View/Zoom Window; this will enlarge the Parts Inspector window. When cursor moves over Object Inspector, this window displays enlarged object icon and description.

**9 Rulers.** Press left button on vertical or horizontal ruler and drag mouse to Work Area to create a Guide Line.

**10 Status Bar.** The mouse cursor coordinates, zoom and tool hint or other information are displayed here.

**11** Button for sending the map into the GPS unit. Same command is available in [main menu / File](#).

**12 Main Menu.**

**13 Find Object control.** Type several characters of searched object name or comment into this box. If object with name or comment that begins with these characters exists, Object Inspector scrolls the list to make found object visible and selects it.

**14 Zoom Levels Preview.** Use this control to preview how map layers will be displayed in GPS at various zoom levels.

**A Snap Nodes options.** Use these check boxes to define snapping of nodes to work area edges, guide lines or other nodes. Snapping helps precise placement of nodes. Same options can be found in [main menu / Nodes](#).

**B**  **Edge Mode** combo box - choose line or curve edge as default when creating new objects.

**C**  **Middle Point First** check box - if checked, new curve element is created so that on first click, line is created. On a second click line turns to a curve using the previous point (end of line) as middle point of curve. If it is not checked, the curve is created on a first click, but the middle point must be dragged to proper position.

**D** **Curvature of the rectangle** with rounded corners.

**E** Basic **parameters** of the newly created object. More parameters can be accessed with use of Objects / Properties menu after finishing the object.



# File

The first 6 commands are **New, Open, Open Recent, Save, Save As** and **Merge**.

**Open** and **Merge** commands allow user to open map files in Mapwel MPW and other formats. Use **Merge** command to combine two or more maps. Note that background bitmap is discarded when merging maps. Only the vector map objects are preserved. Current version of Mapwel supports these formats:

File Format	Extension	Read	Write	Comment
Mapwel	.MPW	✓	✓	
ESRI Shape File	.SHP	✓	✗	
Google Earth Keyhole Markup Language	.KML	✓	✓	Files exported in this format can be used with Google Earth
GPS eXchange	.GPX	✓	✗	
cGPSmapper GPSMapEdit	.MP	✓	✓	Current version of Mapwel does not support auto routing, streets numbering & marine charts
MapDekode	.DBX	✓	✗	
OziExplorer Waypoint File	.WPT	✓	✗	
OziExplorer Track File	.PLT	✓	✗	
Garmin GPS Database	.GDB	✓	✗	
Garmin	.IMG	✗	✓	Mapwel Advanced version can export maps into IMG format and/or upload IMG files into GPS.

Click [here](#) to find out more about the ESRI shape files import. Mapwel also supports export into **IMG** map files and their upload into GPS (see below), but it does not support editing of these files.

**Upload Map to GPS** converts the map data into proper GPS format and allows user to [upload](#) one or several MPW and/or IMG map files into the GPS unit.

**Upload IMG File to GPS** launches the **MapUpload.exe** program, which allows user to upload one or several IMG map files into the GPS unit. MapUpload does not perform any checking if IMG file is correct. This function is intended to allow user to upload map files that he/she has created in other software. MapUpload also allows user to wrap multiple IMG files into **selfextracting .exe** file. It is also possible to embed author's logo and map set image, and optionally **lock maps to a specific GPS ID** number. However, protection method currently used in MapUpload is not secure. Note: **MapUpload.exe** is a separate program that can be found in the Mapwel folder. Unlike Mapwel itself, MapUpload is **FREWARE** and it can be distributed separately. It cannot be sold.

**Countries and Cities.** This command is used to define [table of countries, states, cities, zip codes](#) and their mutual links. This table is necessary for creation of [Cities](#) and [POI](#) (points of interest) objects. For detail information click here please.

**Georeference Map.** Use this function to establish relationship between the image coordinates (x,y) with known real-world coordinates (longitude/latitude). Define location of two spots with known coordinates and program will derive coordinates of the map edges. Mapwel uses coordinates of the map edges for all calculations. Click [here](#) to learn more.

**Export Map.** Use this command to [export map](#) into Garmin **IMG**, Google Earth **KML** or cGPSmapper **MP** map

file. This function works only in Advanced version of Mapwel. The GPS unit to which the registration is bound must be connected and switched on.

**Google > Launch Google Maps.** Use this command to compare your map created in Mapwel with satellite image or Google map. It is useful when it is not clear what kind of object the data you are working from represent. This command opens separate web browser window and launches Google Maps web site with map, satellite or hybrid image of the area of your map created in Mapwel.

**Batch.** Use this command to access window for batch conversion of multiple **MPW**, **MP** or **DBX** map files into the Garmin **IMG** format. First, select files to convert into the Map Files Table. Then choose the destination folder for the IMG files and hit **Compile** button. List of source files can be stored on disc with use of **menu > List > Save** command for later re-use.

This function works only in Advanced version of Mapwel. The GPS unit to which the registration is bound must be connected and switched on.

**Merge IMG files.** Use this command to merge several IMG maps into a single file. This command is useful if you want to [prepare maps for iQue, Nüvi, Zümo, or Colorado manually](#). Otherwise, Mapwel makes all map operations (transfer, add map, erase, erase specific map) and user does not need to use this command.

The last command is **Exit**, which follows the usual Windows convention prompting user to name the map and choose a location.



**Import Waypoints from GPS.** Waypoints acquired by user can be used for map drawing. Import waypoints from GPS and they become part of the map automatically. Please note that map (the "work area" in Mapwel) is defined by North, West, South and East boundary (coordinate). User can either import only those waypoints, which coordinates fit into the map boundaries, or map boundaries can be adjusted automatically so that all waypoints fit on the map. Use the first option when you add waypoints to an existing map and you want to ignore the waypoints that are outside of map. Use the second option when you work on a blank background and you want to import all waypoints from the GPS.

**Import Tracks from GPS.** Tracks acquired by user can be used for map drawing as well as the waypoints.

**Erase Maps in GPS.** Use this function to delete all maps in the GPS. Base Map uploaded by manufacturer is not erased.

**Erase Specific Maps.** Use this function to delete specific maps in the GPS or in the IMG file that contains a map set (such file is usually named GMAPSUPP.IMG). Base Map uploaded by manufacturer to GPS is not erased with this operation. Learn more about this function [here](#).

**Display GPS ID.** Use this function to find out the unique identification number of the GPS unit defined by manufacturer.



# Edit

Use the **Preferences** command to change the map and data transfer settings. The work area, nodes, edges, grid and guide lines colors can also be changed under Preferences. Click [here](#) for more information.

**Snap to Guide Lines** snaps selected objects to nearest guide line when user moves objects in the Transformation mode. Objects are snapped only if they are near to the guide line. This function allows user to align objects with use of the guide lines. It works with whole objects (not just edited nodes as snap options under then [main menu > Nodes](#)).

**Lock Guide Lines** disables editing of guide lines and adding of new guide lines. Locking of guide lines prevents unwanted seizure of guide lines when working with digitized objects in the work area.

**Erase Guide Lines** deletes all guide lines in the work area.

**Copy** and **Paste** are clipboard operations.

# Image

**Import** command is used to bring an image into the background as a template for drawing; Mapwel can import an image in JPG, GIF, BMP, PNG and TIFF formats.

Mapwel can import images up to 7700 x 7700 pixels if run on Windows XP or later, and 3000 x 3000 pixels on previous versions of Windows. Larger images are scaled down to above size.

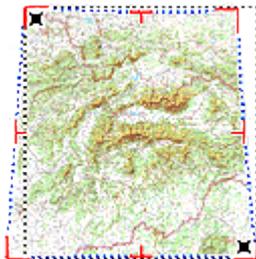
**Import OziExplorer Calibrated Image** command imports OziExplorer \*.MAP with raster image and georeferencing information. Current version of Mapwel supports only \*.MAP files in WGS84 with 2 calibration points. If 7 or more calibration points are used, Mapwel uses only 2 of them for georeference. \*.MAP files with 3-6 calibration points (affine calibration methods) are not supported.

[Background Filters](#) and [Edit Image Window](#) are described separately.

**Rotate to Vertical** and **Rotate to Horizontal** are tools for rotation of image. They are intended for precise rotation of images that contain either vertical or horizontal lines (grid). Place rotation marks on the object (line) in the image and then click right mouse button on the work area. Select 'Rotate Image' from the pop-up menu. Image will be rotated so that marked line is vertical or horizontal, respectively. **Please note:** use [Edit Image Window](#) for rotation of image with angle parameter.

**Crop** is tool for precise placement of crop marks and cropping of the image. Place crop marks on the image and then click right mouse button on the 'scissors' symbol near the crop mark. **Please note:** [Edit Image Window](#) can be used for cropping of image too.

**Straighten.** Use this tool to compensate distortion of scanned images or photos. If deformed image has edges or grid that are supposed to be orthogonal, set the red marks on these deformed lines. Then click the right mouse button on the work area and select 'Straighten Image' command from the pop-up menu. Image will be transformed so that selected shape becomes a rectangle (see below image: blue shape transforms into a black rectangle)



**Image Morphing.** Use this tool for non-linear calibration of raster image according to measured tracks and waypoints. Image is calibrated with pairs of points that define source and destination areas of projection.

**Move.** Use this tool to move image under the vector map.

**Calibration.** Use his tool to calibrate image and the vector data drawn on top of the image.

**Delete Image** if you want to reduce the size of the MPW file (for publishing map on the Internet, for example) and you do no longer need the background image.

**Export as BMP** saves your cropped and adjusted image as a separate bitmap file. Use this function if you need to use the image in other application. Mapwel stores map, image and all other data in a single MPW file.

**Automatical Vectorization.** Use this tool for quick creation of GPS map from raster image.

**Acquire (Scan) ...** command launches the image scanning software. This command work with scanners that support TWAIN. Scanned image is transferred into background of the work area as if it was loaded with **Import** command.





# Nodes

The Nodes Menu is accessible only in creation/editing mode.

**Align Beginning to Previous Object** moves the beginning of an edited object to the end of previous object.

The next command, **Align End to Next Object**, causes the end of the object being edited to the beginning of the next object.

**Align Line Beginning to beginning of Previous**. When doing a complex line, some line parts start not on end of previous part, but on its beginning, instead. Use this function to place beginning of the new part exactly on beginning of previous part.

**Reverse Nodes Order** changes the order of nodes.

Use **Delete Whole Edge** command to erase whole edge and start its creation anew.

**Snap nodes to Work Area Edges, Snap to Guide Lines, Snap to Nodes, Snap to Object Edges** are options for alignment of nodes during editing or creation of object. Nodes are snapped only if they are moved near to the work area edges, [guide lines](#), other nodes or edges of other objects, respectively.

**Please note:** these options affect snapping of the edited nodes. Snap options under the [main menu > Edit](#) affect snapping of the whole objects.



# Shape

The **Shape** Menu is accessible only in the creation/editing mode. To use any of the 10 commands, place at least one node in the work area, then select one of the shapes and draw it in the work area. Right mouse click and select **To Elements** from the small pop-up menu. Mapwel will move the last node to the nearest point on the shape just created and the shape will be started from that point. This means the shape can be started from any point.



# Objects

**Edit** switches selected object to editing mode.

**Group** is function for combining several objects into one for easier manipulations. This lets you apply the same transformations, properties and other changes to all the objects within the group at the same time.

Use **Ungroup** function to divide grouped objects.

**Sort Colors** function changes order of selected objects so that objects of the same color are in the successive order.

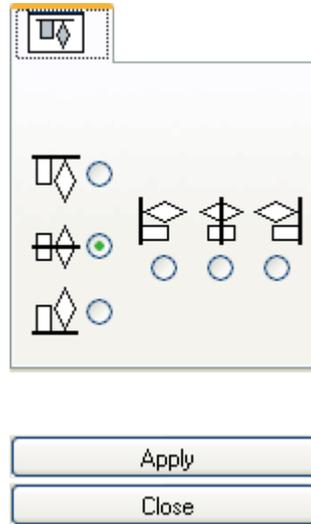
**Sort Types** changes order of selected objects so that **Areas** are listed first, **Lines** are next and then **Points of Interest, Exits, Cities** and **Map Features**. This function helps you to organize objects in your map.

**Sort Names** function sorts selected objects alphabetically.

**User Defined Styles** command launches [editor of filled areas, lines and symbols](#).

# Transform

**Transformation Window** command opens window for alignment of 2 or more selected objects. This command may be useful when drawing reference frames (circles) around some object



**Please note:** use [main menu > Convert > Create Circle around Point](#) command for easier and more precise drawing of reference circles.

**Combine Outlines** makes single line object from series of lines.

**Expand Objects** enlarges selected objects by offsetting the object contours. It is intended for creation of overlay of constant width between adjacent objects. Expand Objects command does not provide the same result as normal enlargement.



**Shrink Objects** reduces size of selected objects by offsetting the object contours. Shrink Objects command does not provide the same result as normal size reduction.

**Shaping** submenu contains commands for so called boolean operations on the filled areas. These operations include **union**, **intersection** and **difference**. Click [here](#) for more information.



# Convert

The **Convert** commands work on objects selected with the Transform Tool (arrow) or in Objects Inspector.

**Create Line from Area** creates line object from selected area object. If area object has openings, program will create also lines from openings as a separate objects.

**Create Area from Opening** creates a new area object from selected opening in an existing area. Opening must be selected in the Parts Inspector window. This command is intended for situation when user needs to create object of other color for a hole (opening) in the area. User should adjust the newly created area or the opening to make them overlay each other, to avoid gaps when displayed in the GPS.

**Create Area from Line** creates a new area object from selected line object. If area is not closed, program automatically closes it.

It is important to note that above commands will duplicate an object and then convert the new object as selected. Below commands just convert selected objects without duplication.

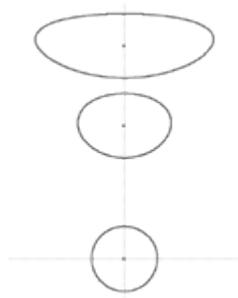
**Area to Opening** command can be used to convert areas like land or islands to openings in the underlying area like ocean, for example. Map may display faster in GPS if island is made as an opening in the ocean area, letting the background (yellow) area showing through, as opposite to island being a land area put on top of the solid ocean area. In the first case, GPS has lower number of layers to display. When converting selected areas to openings, some area object must precede selected objects in the list, as newly created openings cannot be a stand alone objects and they must follow after the area object.

**Map Feature to POI** and **POI to Map feature** convert respective type of points into the other type.

**Area to POI** can be used to convert small areas like buildings into the points of interest.

**Swap Object Name and Comment** command helps to manipulate objects in the list when using the **Sort objects on Name function**.

**Create Circle around Point** creates "circles" of defined radius around all selected points. Near poles very large "circles" look deformed (see below image), because of coordinate system projection. However, real-world distance from center to any point on the "circle" is the same.





# Select

Commands in this menu allow to select vector objects with use of various criteria, or modify existing selection.

The first command is **Zoom to Selected Objects**. This command scrolls selected object(s) to center of the screen and zooms in or out to fit selection to the screen. It helps to localize object(s) selected in the [Inspector window](#) in the work area.

Next command **Zoom and Edit Selected Objects** works in the same way as above command, but it also starts nodes editing mode.

**New Selection, Add to Selection** and **Select Subset** options allow to define the way of how vector objects are selected.

Rest of the commands in this menu allows to select multiple objects of the same type (like **Roads, POIs with address**) at once. They work with either whole map or just selection, according to selection mode defined by above options.

# View

Unlike the Eye icon in the Object Inspector window which hides/shows only particular objects, commands in the View Menu hide/show all objects that fit user-specified criteria.

**Areas, Lines, Points of Interest, Map Features, Cities, Exits** settings show or hide respective type of objects.

**Area Captions, Line Captions, Symbol Captions** show or hide names (captions) of respective type of objects in the work area. Symbols are all point objects (Points of Interest, Map Features, Cities, Exits).

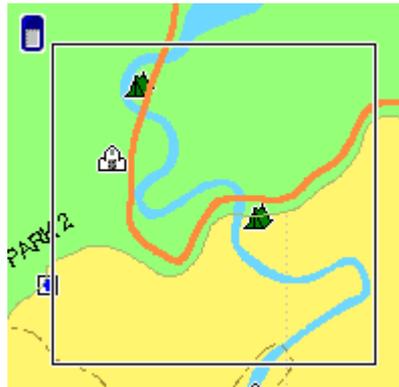
**Fill of Areas.** Uncheck this setting to turn into the "wire frame" display mode. This is useful for example when you need to make overlay of the Areas.

**Show/Hide Objects.** Use this sub-menu to show and hide set of selected or unselected objects.

**Guide Lines, Button Bar, Grid, Rulers** settings show or hide respective controls of the work area.

**Zoom Window** shows/hides zoom window in the bottom right corner of the screen. Hiding this window is useful in case of low screen resolution (800x600, for example) to enlarge Object Inspector window.

**GPS Display Frame.** Check this setting to show frame of the GPS unit display in the 'gray scale' and 'color' modes. This function allows you to see if map does not have too much detail and if it will be legible on the GPS display. To change size of the display frame, click on the GPS icon in the upper-left corner with right mouse button.



**Nighttime, Marine Colors.** Use these settings to change the map colors in 'gray scale' and 'color' display mode. Marine colors works in both 'gray scale' and 'color' display mode. Nighttime has effect only in the 'color' mode.



**Start-up Window with Videos List.** Uncheck this option if you do not want the list of tutorial videos to pop-up when starting the Mapwel.



# Object Inspector

The main features of Object Inspector are described in [Main Window chapter](#).

Right click on selected object or objects in Object Inspector to access a pop-up menu for operations with selected objects.

For meaning of **Group** and **Ungroup** commands please see [Main Menu / Objects chapter](#).

To select and manipulate openings or grouped objects, use the Part Inspector window beneath the Object Inspector window. It is not possible to select these parts directly on the Work Area.

To change order of objects in Object Inspector, select an object with a left click, depress the right mouse button and drag it to its new position in the list. Then release the right button and, from the menu that appears, choose whether the selection should be placed **Before** or **After the item**. You can choose also the **Set Identical Parameters** command to copy properties from one object to another of the same type.

Double click on the object name to open the [Properties](#) window.



1	2	3	4	5	List item in the Inspector window
			Zoom Level	Name & Comment	1. Eye icon for showing/hiding object, 2. Small picture of object, 3. Type of object, 4. Name and comment of object.
					Object is visible. Left click on the icon to hide the object.
					Object is invisible. Left click on the icon to show the object.
					Object Icon.
					Object is Area.



Object is Area of type that is always displayed behind other objects.



Object is Line.



Object is land or depth contour (Line).



Object is railroad (Line).



Object is river (Line).



Object is trail (Line).



Object is Line of road type.



Object is Line of road type, with a road sign.



Object is Point of Interest (POI) with empty address fields.



Object is Point of Interest (POI) with address.



Object is City.



Object is Map Feature.



Object is Exit.



Object is Opening in the Area. Openings are displayed in the **Parts** window.



Object is composed of several other objects that are grouped.

Name  
& Comment

Name and comment of object. Click on it to change object properties.

A6

Automatic zoom level of object.

4

Individually set zoom level of object.



# Tools



From top to bottom:



- Select and Transform Tool



- Edit Edges Tool



- Zoom Tool



- Zoom 1 Tool



- Pan Tool



- Create Area Tool



- Create Opening Tool



- Create Line Tool



- Create Point of Interest (POI) Tool



- Create City Tool



- Create Map Feature Tool



- Create Exit Tool



- Create Autorouting Highway \*



- Create Autorouting Street \*



- Create Autorouting Road \*



- Create Marine Area \*\*



- Create Marine Line \*\*



- Create Marine Point \*\*



- Create object with [Freehand](#)



- [Trace tool](#) (tool for vectorization of raster images)

\* Tools available only in the Mapwel versions that support autorouting.

\*\* Tools available only in the Mapwel versions that support marine charts.

Use zoom tool to zoom in (left mouse button click) or zoom out (right mouse button click). If you want to zoom in a specific area, depress the left mouse button and drag mouse to make selection. Then release the mouse button and selected area will be enlarged so that it fits on the screen.



Opening can be used only after Area or previous Opening object. It does not appear in Object Inspector window as a separate object and cannot be selected directly on the Work Area. To select the Opening object for transformation, use the Part Inspector window.

To add Opening to Area, the Area must be either selected or it must be the last object in the Object Inspector list.



# Freehand Tool

**Freehand tool** works like a painting tool. Unlike the other Mapwel tools, which are based on the precise manual placement of the nodes, curves and lines, Freehand tool allows to draw many of the Mapwel objects with a free hand. Strokes are automatically converted to a chosen style. After conversion, strokes can be edited as other vector objects (node by node). The Freehand tool can be combined with any other tools in the Mapwel.

Like other creation tools in Mapwel, Freehand tool can be used with various display modes (User, Grayscale, Color).

Freehand tool can work with any Microsoft Windows compatible mouse or digitizing tablet. Its use is not restricted to any specific brand of tablet.

Before you start actual drawing with the Freehand tool, you should choose the style you want to use. Click with right mouse button or corresponding tablet pen button depressed on the Freehand icon (in the **Tool Bar**). Panel with freehand styles will appear (picture below). This panel can be invoked also by holding the left mouse button or tablet pen tip depressed about 1 second on the Freehand icon.

Each style is represented by its icon. Hover the cursor over the icon to display the style name. Select desired freehand style to activate the tool. Mapwel will switch to creation/editing mode.



Freehand Styles	
1	Area
2	Opening of Area or Marine Area
3	Line/Road
4	Autorouting Highway *
5	Autorouting Street *
6	Autorouting Road *
7	Marine Area **
8	Marine Line **

\* Styles available only in the Mapwel versions that support autorouting.

\*\* Styles available only in the Mapwel versions that support marine charts.

Click left mouse button or tablet pen on the Freehand tool to start drawing. When the Freehand tool is active, parameters of respective style are displayed on panel at the right side of the Mapwel window. **After Stroke** options allow to configure the Freehand tool. For example, it is possible to define whether to finish freehand mode after a single stroke or reactivate the tool.

## Freehand Options

Meaning of the **After Stroke** options is as follows:

### After Stroke

- Finish Object
- Edit
- Another stroke
- Reactivate tool

- **Finish Object** - converts stroke into nodes and finishes creation/editing immediately
  - **Edit** - converts stroke into nodes and switches to normal nodes editing mode
  - **Another stroke** - converts stroke into nodes and allows to add another strokes.
- When finished, single vector object contains several strokes.

Only one of above options can be active at once.

If **Reactivate tool** is checked, Mapwel automatically reactivates Freehand tool after each stroke. This feature works only with **Finish object** option. To end strokes creation, hit **ESC** or **ENTER (RETURN)** key on the keyboard, or click the **STOP** button above the freehand options.



# Trace Tool

**Trace Tool** lets you create vector objects from raster images. This process is almost (though not entirely) automatic. Trace tool allows to vectorize one object (or set of similar objects) at once, but it cannot vectorize whole map with different types of objects at once. Tracing should be repeated for respective types of objects (filled areas, roads, rivers, etc.). Trace tools works on images with any common color depth (including True Color and bi-tone) that are sufficiently clean.

Raster image should be imported into work area with use of [main menu>Image>Import](#) command. Vectorization involves several steps (please see animated Fig.1):

1. Activation of the trace tool, choosing of the proper trace style (see Fig.2).
2. Setting of magic wand tolerance, selection options and vector object properties.
3. Selection of respective object or multiple objects on raster image with magic wand.
4. Setting of vector objects parameters (type of line, zoom level, etc.)
5. Conversion of selected raster objects into vector objects.

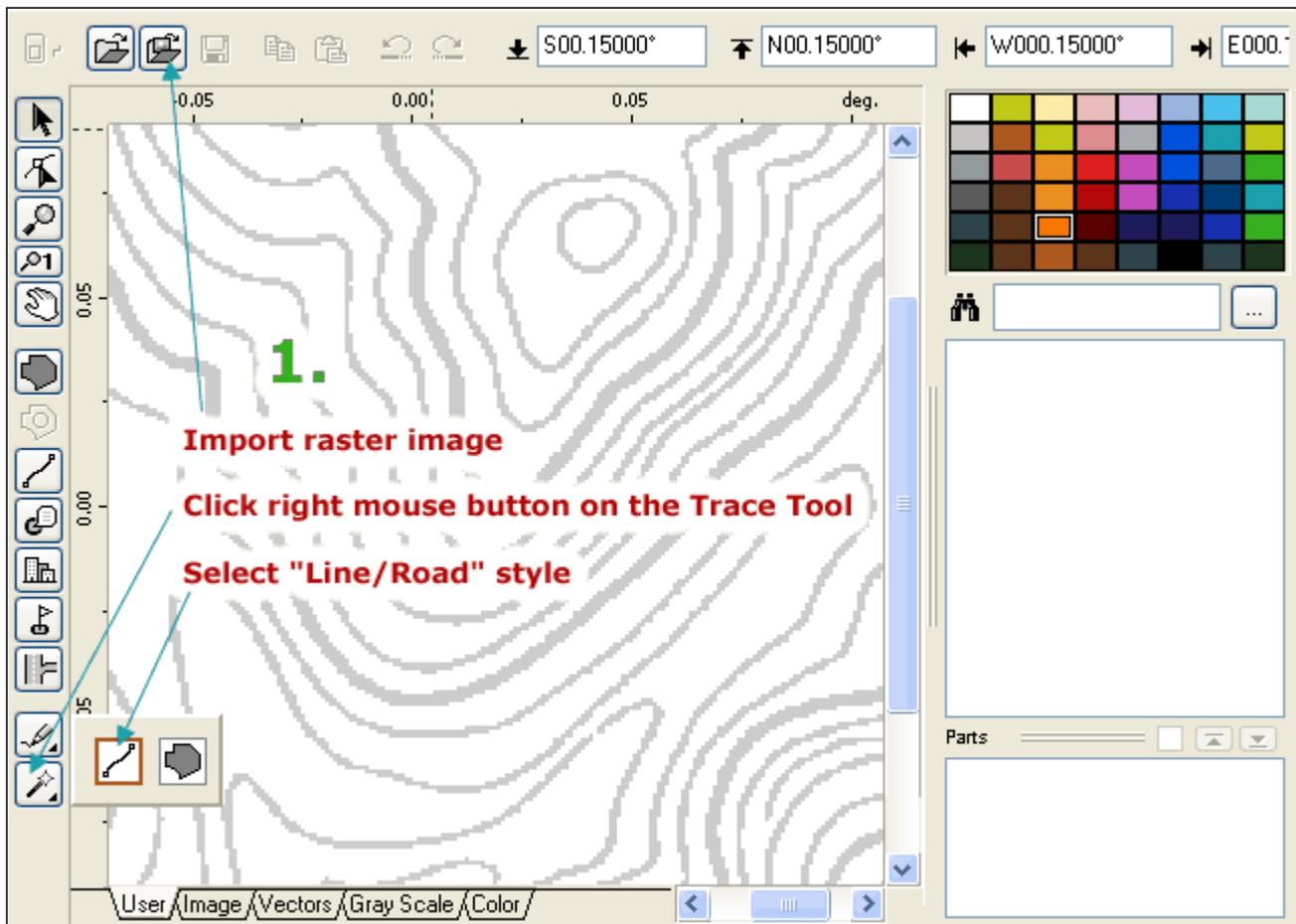


Fig. 1. Animation - Use of the Trace Tool

Before you start using the Trace tool, you should choose the style you want to use. Click with right mouse button on the Trace tool icon (in the [Tool Bar](#)). Panel with trace styles will appear (picture below). This panel can be invoked also by holding the left mouse button depressed about 1 second on the Trace tool icon.

Each style is represented by its icon. Hover the cursor over the icon to display the style name. Select desired style to activate the tool. Mapwel will switch to creation/editing mode.



Fig. 2. Trace Tool styles (styles 3-7 are not available in the current version of Mapwel).

Tab. 1. Trace Styles	
1	Area
3	Line/Road
4	Autorouting Highway *
5	Autorouting Street *
6	Autorouting Road *
7	Marine Area **
8	Marine Line **

\* Styles available only in the Mapwel versions that support autorouting.

\*\* Styles available only in the Mapwel versions that support marine charts.

## Trace Controls

Use these controls to adjust:

- Parameters of vector objects
- Magic wand sensitivity (tolerance)
- Selection operations for selecting multiple objects



**Color box** - define color of vector objects. "**Auto Color**" must be unchecked.

Tolerance **25**

**Auto Color** - color of vector objects will be taken from raster image.

Simplicity 7



**Simplicity** - varies in range 0..10.

0 means precise vector objects with high number of elements. 10 means low precision and low number of elements.

Ignore Openings

**Edge Type combol box** - select curve (polycurve) or straight lines (polyline) type of vector objects

Selection

- New
- Add
- Add Similar
- Subtract
- Intersect

**Ignore Openings** - valid only for filled areas. Holes in vectorized areas are ignored, only the outer shape is vectorized.

**Selection** - various operations for selection of multiple or complex objects. Use "**Add Similar**" if you want to select non-contiguous objects of similar color at once.



# User Defined Styles

Some Garmin GPS units support user defined styles\* for filled areas, lines and points. Mapwel software includes editor of these styles and library of predefined styles. Editor allows user to create her/his own fill patterns, colors, line styles and point icons (cities, map features, points of interest and exits). New styles are saved with map in Mapwel \*.MPW format.

\* Support of user defined styles may require upgrade of the GPS firmware. User defined styles were successfully tested on GPSmap 60C, 60CSx, Nuvi and Vista C. If map with user defined styles is loaded to Garmin GPS that does not support them, objects are displayed with use of the GPS built-in styles, i.e. user defined styles are not used.

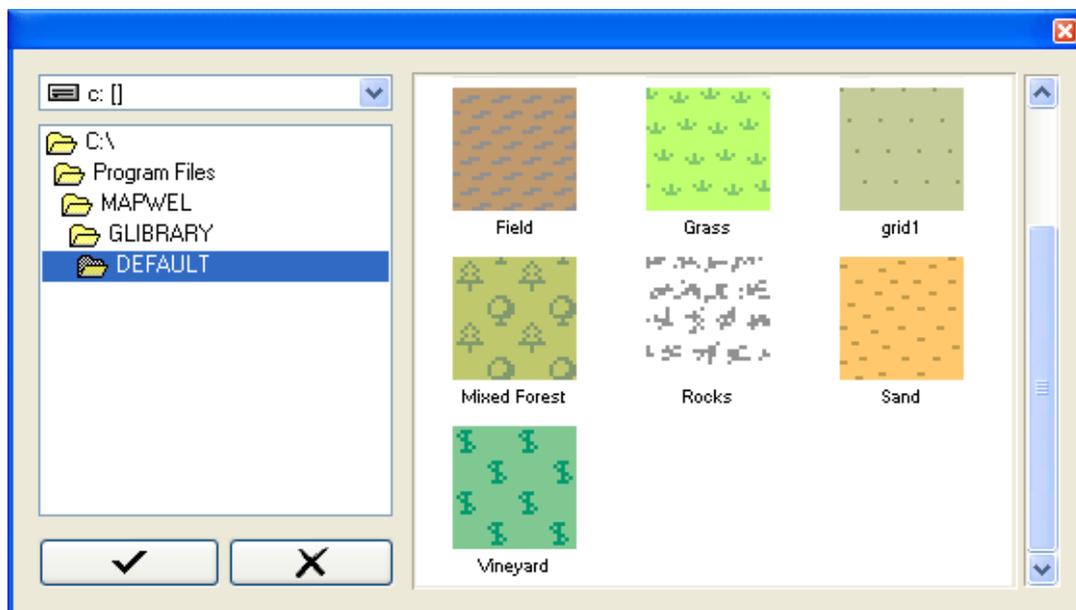
**Warning:** if you create map for loading into several types of GPS units, make sure that all of them support user defined styles, before actual creation of the map!

GPS units support single set of user defined styles for all maps in the memory. If maps with different sets of styles are loaded into GPS together, only one set of styles is active, i.e. some maps will be displayed with wrong styles. Use **menu>File>Save Whole Set** and **menu>File>Open Whole Set** commands to copy all styles from one map to another, to ensure that they use the same set of styles.



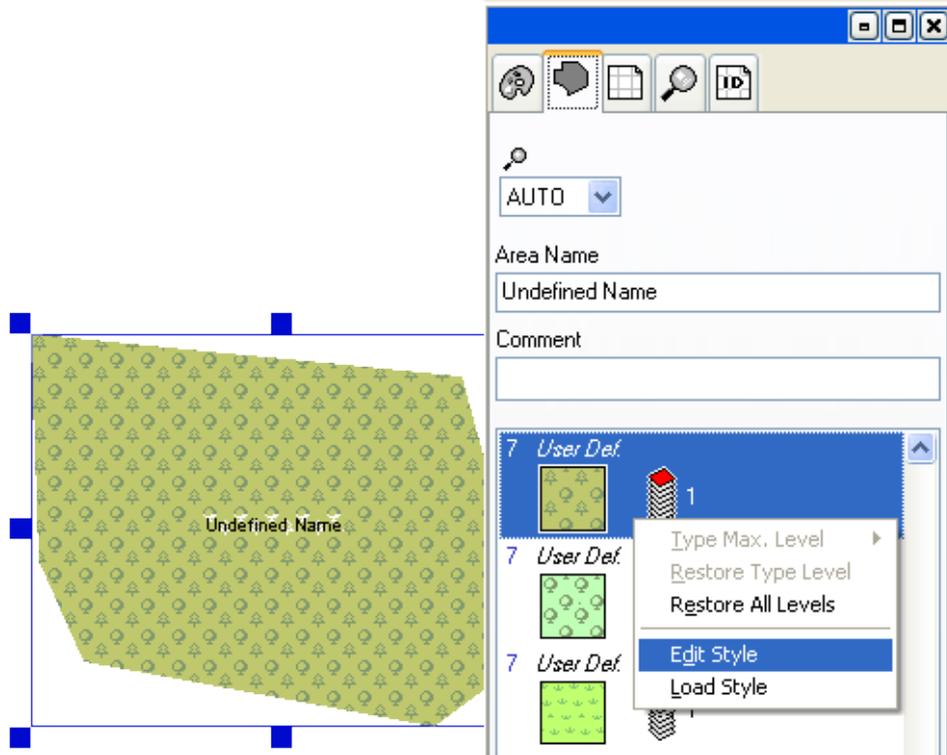
User defined styles for filled area, line and point of interest.

It is also possible to save respective new styles as a separate files to disk, for future use in other maps, or to export styles in \*.txt format to use with other mapping software.



Library of predefined styles.

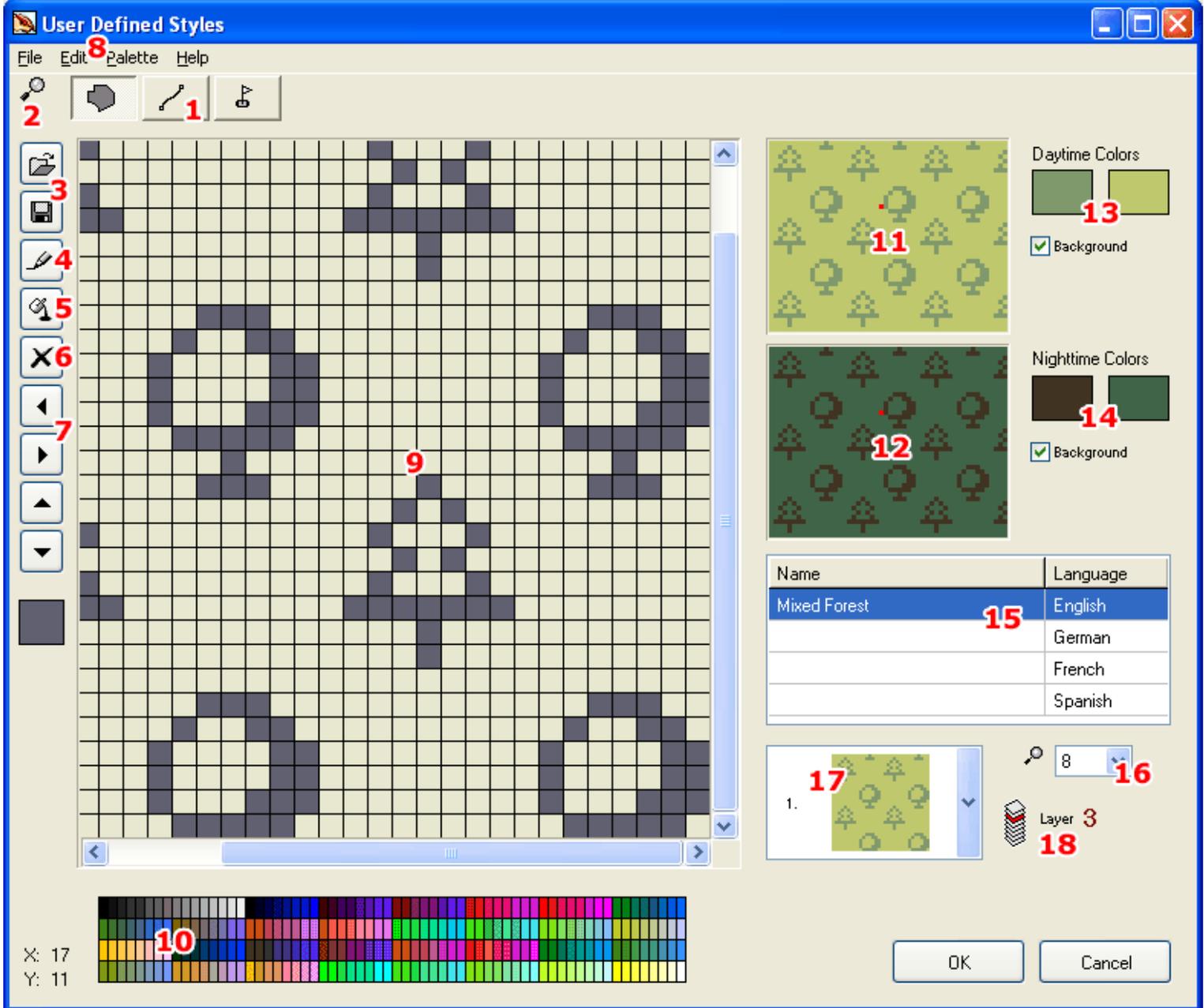
Editor of user styles can be accessed with Mapwel **main menu > Objects > User Defined Styles**, or with pop-up menu in the [Properties window](#).



## Filled Areas

Editor of user styles contains separate tabs (1) for editing of areas, lines and points. User defined areas are bitmaps of 32x32 pixels size. Only 2 colors (foreground and background) per pixel are allowed. User can define one pair of colors for GPS **daytime mode** (13) and another pair for the **nighttime mode** (14). Use of the background colors is optional. If they are not used, the area will be transparent.

It is possible to define **name of the style** (displayed by some GPS units) in up to 4 languages. Use table (15) to type-in the name of the style. use right mouse button click on the **Language** column to choose from available languages.



**Zoom level** (16) control allows to define maximum zoom level at which the object using this style will be visible in the GPS.

**Layer** specifies order in which object will drawn by the GPS. By assignment of proper layers user can define which object will be drawn on top of the other objects.

Please see below table for description of the rest of the controls.

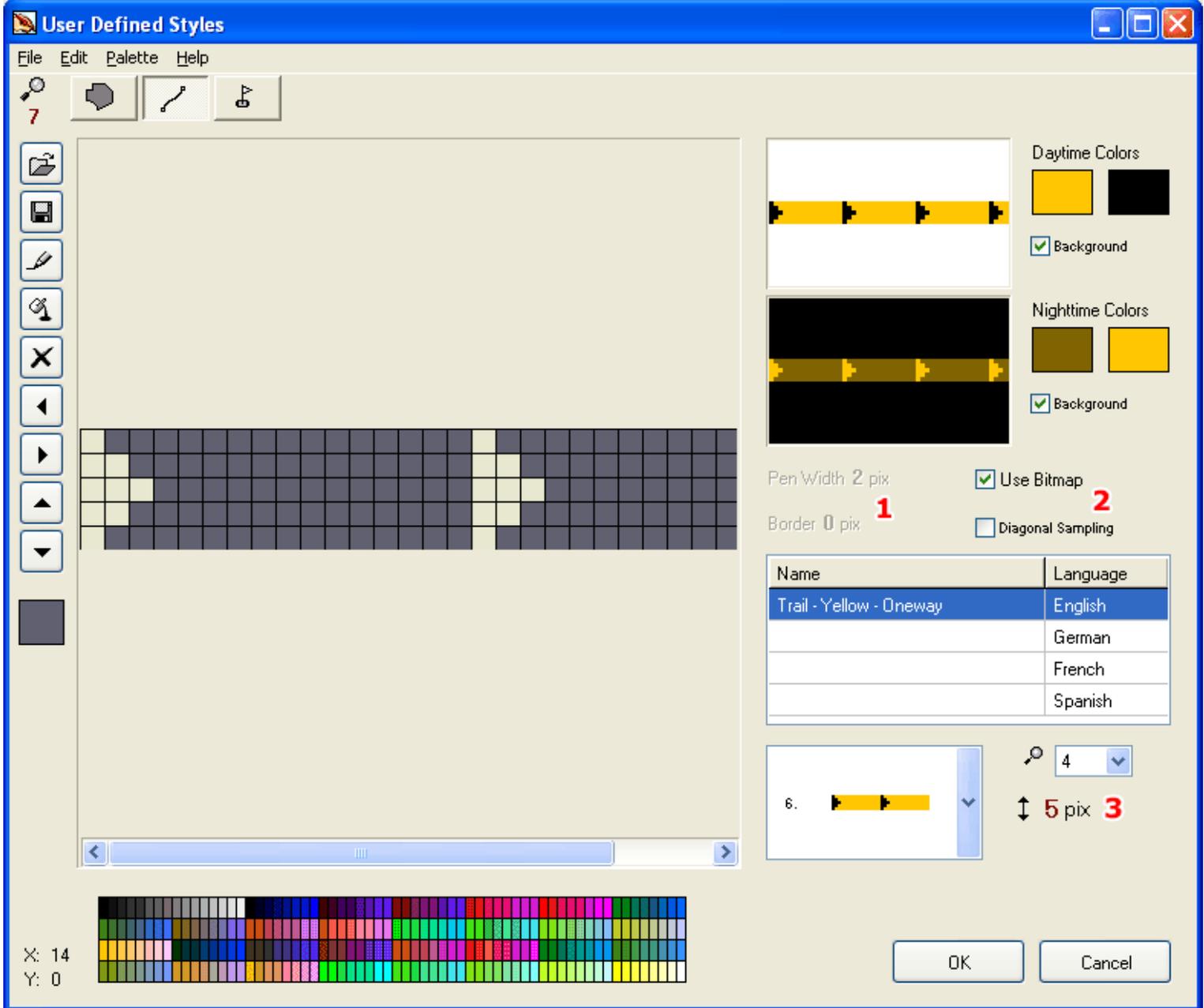
- 1 Tabs with editors for areas, lines and points.
- 2 Editor zoom control. It is also possible to use mouse wheel to zoom the work area in and out.
- 3 Open and Save buttons. Use these buttons (or menu>File) to open or save styles from/to library.
- 4 **Pencil** tool.
- 5 **Paint Bucket** tool.
- 6 **Clear style** button.
- 7 **Scroll** buttons.
- 8 Menu.
- 9 Work area.

**Color palette.** Some GPS units (GPSmap 60CSx, for example) use fixed 256-colors palette. Use default colors from this palette to ensure that your styles will look the

- 10** same on the PC and GPS. Use left and right mouse button click to copy color from palette to Day colors controls. Use SHIFT, CTRL or ALT + left and right mouse button click to copy color from palette to Night colors controls.
- 11** Style preview in daytime colors.
- 12** Style preview in nighttime colors.
- 13** **Daytime foreground and background colors.** If **Background check box** is unchecked, the area will be transparent.
- 14** **Nighttime foreground and background colors.** If **Background check box** is unchecked, the area will be transparent.
- 15** Table with optional style names in various languages.
- 16** **Maximum zoom level** for the style.
- 17** Combo box with available user defined styles.
- 18** **Layer** (see above). Use left and right mouse button click on the number to increase/decrease the value. Click on the caption to use other ways of inserting the value.

## Lines

Lines editor is available on the second tab. Line styles are defined as either the bitmap of 32 pixels width and variable height, or line with set pen and border width. In both cases, line uses only two colors, which can be defined separately for the daytime and nighttime modes.



Please see below table for description of the rest of the controls.

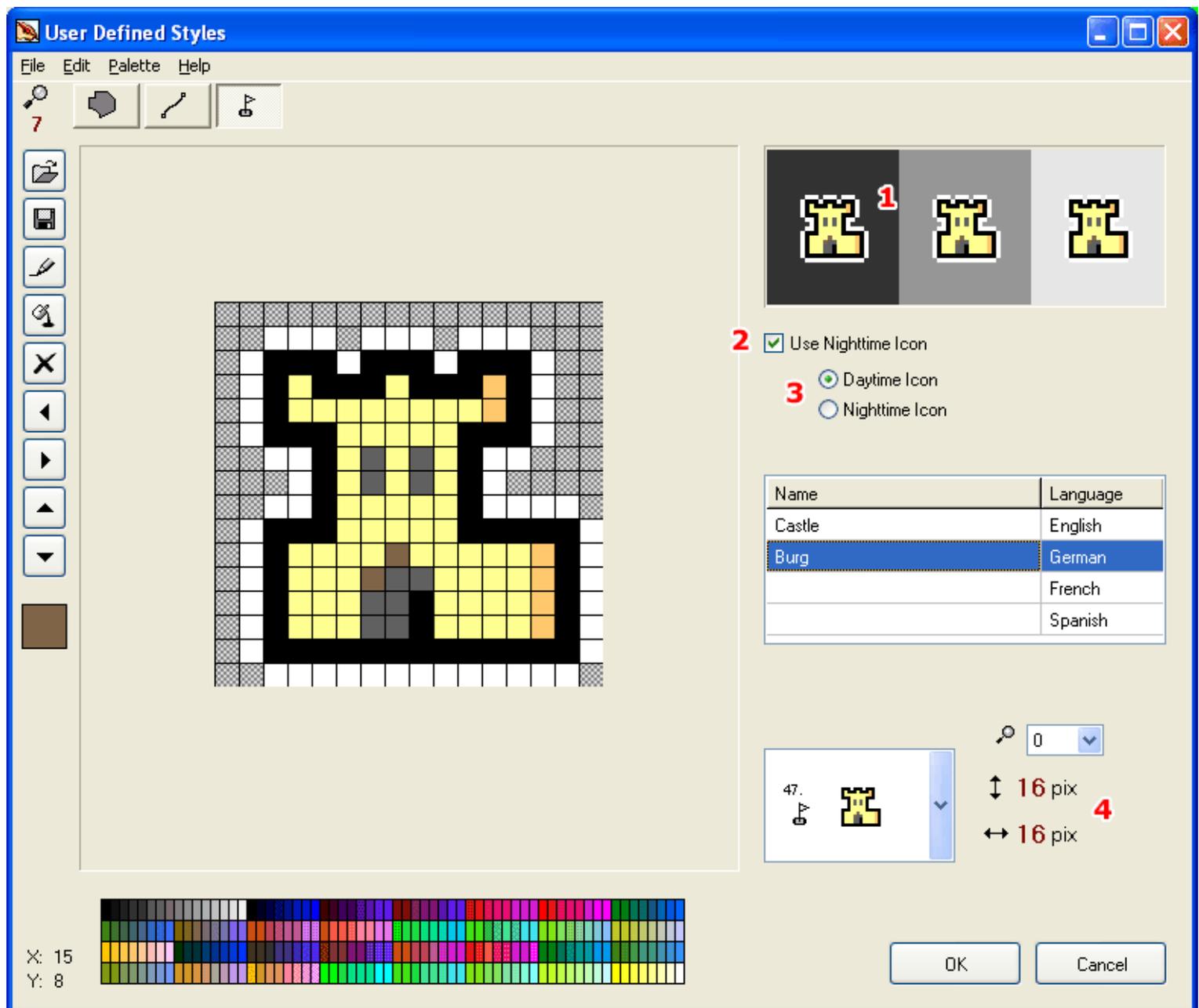
- 1 Pen and Border width** for lines that are not defined by bitmap.
- 2 Use Bitmap** control for switching on/off the bitmap mode. When displayed on the GPS, bitmap is rendered with either horizontal or vertical sampling (according to angle of the line), unless the **Diagonal Sampling** is enabled. In such case, rendering uses also the diagonal sampling, but it does not look good for all bitmaps.
- 3 Height** of the bitmap. Use left and right mouse button click on the number to increase/decrease the value. Click on the icon to use other ways of inserting the value.

## Points

Unlike areas and lines that use only 2 color bitmaps, point styles use multicolored icons with optional transparent background. Point icons are of variable size (up to 16x16 pixels), with up to 255 colors. Use left mouse button when drawing the icon to fill pixels with color chosen from the palette. Use right mouse button to erase pixels (transparent background). See next chapter (Menu) for useful command that help with drawing of the icons.

Please note: Left mouse click on the palette selects the drawing color. Right click opens the color mixer that allows to define a new color. However, some GPS units (GPSmap 60CSx, for example) use fixed 256-colors palette and they

are not capable of displaying more colors. In such case, all colors are mapped to the default palette.



Please see below table for description of the rest of the controls.

- 1** **Preview** of icon on various backgrounds.
- 2** Control to **enable/disable nighttime icon**.
- 3** Controls to switch between editing of daytime and nighttime icon.
- 4** **Width** and **Height** of the bitmap. Use left and right mouse button click on the number to increase/decrease the value. Click on the icon to use other ways of inserting the value.

## Menu

**Menu > Edit** contains some useful commands that make creation of the styles easier:

**Derive Night Colors from the Day Colors** command generates automaticall night colors for edited area or line style.

**Replace Colors with Closest Matching Colors in the Palette** command replaces all colors in edited style with the most similar colors from the palette.

**Add Border** command creates thin border of selected color around the point icon (see above castle icon example).

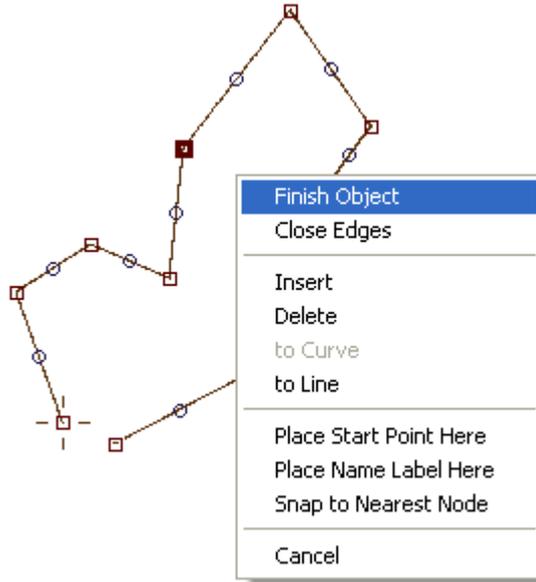
**Copy Daytime Icon to Nighthtime Icon** and **Copy Nighthtime Icon to Daytime Icon** commands create copy of the respective icon.

**Create Nighthtime Icon from Daytime Icon** command generates the nighthtime icon, which is a darker copy of the daytime icon.



# Edit Mode Pop-Up Menu

Click right mouse button in creation/edit mode on the work area to access this pop-up menu.



**Finish Object** ends the creation/edit mode. If object is Area, program automatically closes the object.

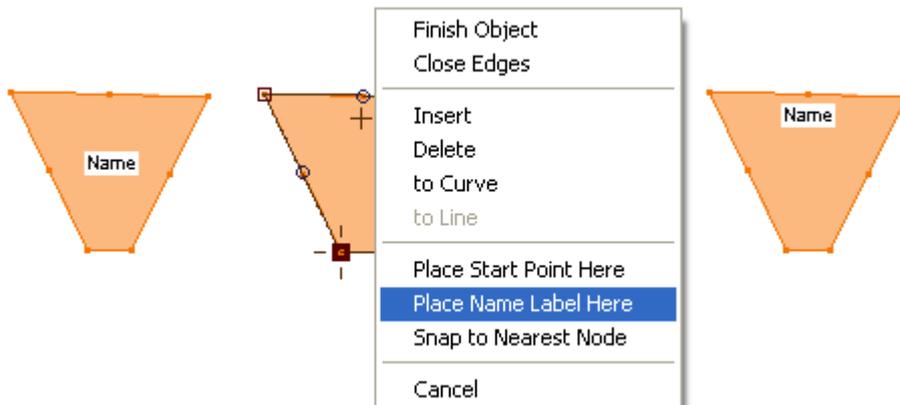
**Close Edges** closes the object. Use it for land and depth contour lines to ensure that line is closed.

**Split Object.** This command is available only for Line objects. Select square node (end of curve or straight line element) and use this command to split the object.

**Insert, Delete, to Curve** and **to Line** commands are available only if rectangular node is selected (end of curve or straight line element). Insert creates a new element before the selected element. Delete erases selected element. To Curve converts selected straight line element into curve. To Line converts selected curve element to straight line.

Use **Place Start Point Here** command to change beginning of the object. Object (**Area or Line**) is automatically closed and then the start point is re-positioned. This command is available only if rectangular node is selected (end of curve or straight line element).

Mapwel automatically places the name label of Area object. If you want to assign position of label manually, use the **Place Name Label Here** command. The label center is positioned on a place where the mouse cursor was before you invoke this pop-up menu (small cross on the below picture). **Note:** Label position is valid only in the Mapwel. It is not transferred into the GPS. GPS decides where to display name labels by itself.



**Snap to Nearest Node** moves selected node to nearest node which belongs to other object (not to currently edited object).



# Shortcut Keys

<b>3</b>	Place beginning of object to end of previous object
<b>e</b>	Add new line part to edge
<b>d</b>	Add new curve part to edge
<b>space</b>	Finish object creation/editing, if possible
<b>esc</b>	Cancel object creation/editing
<b>arrow keys</b>	Scrolls Work Area
<b>arrow keys +ALT</b>	Moves selected objects in transform mode and selected node in edit/create mode.
<b>-</b>	Zoom out
<b>+</b>	Zoom in
<b>Page Up</b>	Zoom out
<b>Page Down</b>	Zoom in
<b>SHIFT+ Page Up</b>	To Front (order of objects)
<b>SHIFT+ Page Down</b>	To Back (order of objects)
<b>CTRL</b>	When depressed, forces new lines and curves to precise horizontal, vertical or diagonal direction in edit/create mode. If used with Shapes, creates precise circle instead of ellipse and square instead of rectangle.
<b>CTRL+1</b>	Zoom to selected object(s)
<b>CTRL+2</b>	Zoom to selected object(s) and start nodes editing mode.
<b>CTRL+A</b>	Select all objects (in transformations mode)
<b>CTRL+C</b>	Copy selected objects into clipboard
<b>CTRL+D</b>	Duplicates selected objects
<b>CTRL+E</b>	Edit selected object. If more objects are selected, the first of them is edited.
<b>CTRL+I</b>	Import image
<b>CTRL+N</b>	Deselect (in transformations mode)
<b>CTRL+S</b>	Save file
<b>CTRL+V</b>	Paste objects from clipboard
<b>CTRL+Y</b>	Redo
<b>CTRL+Z</b>	Undo
<b>Delete</b>	Deletes selected objects (in transformations mode). Deletes an element that ends with selected square (in edit/create mode).
<b>INSERT</b>	Inserts a new element before selected square node in edit/create mode.
<b>CTRL+ALT+B</b>	Background Filters (Image brightness and colors)

<b>CTRL+ALT+I</b>	Display Edit Image window
<b>ALT + mouse cursor move</b>	Pan work area without having to switch tools
<b>ALT+A</b>	Hide / Show Map Features objects
<b>ALT+D</b>	Hide / Show grid
<b>ALT+E</b>	Hide / Show Exit objects
<b>ALT+F</b>	Hide / Show Area objects
<b>ALT+G</b>	Hide / Show guide lines
<b>ALT+I</b>	Hide / Show City objects
<b>ALT+O</b>	Hide / Show Line objects
<b>ALT+P</b>	Hide / Show Points of Interest
<b>ALT+R</b>	Hide / Show rulers
<b>ALT+T</b>	Hide / Show button bar
<b>ALT+Z</b>	Hide / Show zoom window
<b>Double click on Work Area</b>	The new object is started immediately without need to select any tool. The new object is of the same type as the last object.
<b>CTRL+F1</b>	Align beginning of object to end of previous object (in editing mode)
<b>CTRL+F2</b>	Align end of object to beginning of next object (in editing mode)
<b>CTRL+F3</b>	Align beginning of Line object to beginning of previous Line object (in editing mode)
<b>CTRL+F5</b>	* Set selected node(s) attribute "Intesection"
<b>CTRL+F6</b>	* Set selected node(s) attribute "Border node"
<b>CTRL+F7</b>	* Set selected node(s) attribute "No left turn"
<b>CTRL+F8</b>	* Set selected node(s) attribute "No right turn"
<b>CTRL+F9</b>	* Set selected node(s) attribute "No U turn"
<b>CTRL+SHIFT+F5</b>	* Clear selected node(s) attribute "Intesection"
<b>CTRL+SHIFT+F6</b>	* Clear selected node(s) attribute "Border node"
<b>CTRL+SHIFT+F7</b>	* Clear selected node(s) attribute "No left turn"
<b>CTRL+SHIFT+F8</b>	* Clear selected node(s) attribute "No right turn"
<b>CTRL+SHIFT+F8</b>	* Clear selected node(s) attribute "No U turn"
<b>CTRL+SHIFT+F10</b>	* Clear all restrictions of selected node(s)
<b>CTRL+ALT+O</b>	Create Line from Area
<b>TAB</b>	<p>When creating new object, TAB key can be used to quick adjustment of the curve elements. Create new curve element with TAB key instead of left mouse button. Then move the mouse with TAB key depressed to adjust the curve. Then release the TAB key.</p> <p><b>Please note:</b> to use the TAB key for curves adjustment, the edge mode must be set to 'curve'.</p> 

x Works like right mouse button. It is intended for use with tablet.

\* applies to autorouting lines only.



# Built-in Tutorial Videos

To make the learning of map creation faster and easier, Mapwel includes technology for playback of built-in tutorial videos. Mapwel installation file includes several tutorial videos with written comments made by developers.

Videos are available from the list displayed in the start-up window. If you do not see this window at Mapwel start-up, use the main [menu / View](#) to enable displaying of the start-up window.

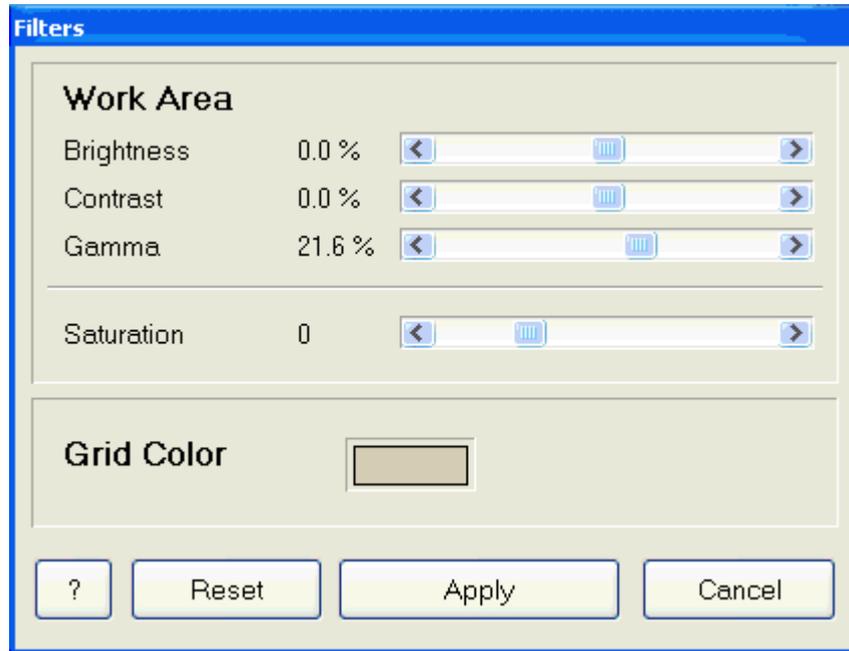
## **Troubleshooting**

Video playback may be affected or interrupted if you have tablet connected to your computer. Please disconnect the tablet and try to play videos again.



# Background Image Filters

Background filters affect the way the background (imported image) is displayed behind the drawn vector objects. Characteristics such as **Brightness**, **Contrast**, **Gamma** and colors **Saturation** can be adjusted, as well as the grid color.



In contrast to graphics programs where the main meaning of filters is to enhance the look of an image, filters in Mapwel are intended for dimming, darkening, brightening or other adjustment of image so that its colors do not interfere with objects drawn on top of the background image. All these parameters are saved with map into a single MPW file.

The grid color in this window does not affect the default grid color in [Preferences](#) that is used when starting a new map.

**Gamma** parameter changes brightness mostly of dark colors and it does not affect absolute black and white.

All above settings do not affect the map appearance in the GPS. They serve to make map drawing more comfortable.



# Preferences

The Preferences window is accessible through main menu under **Edit / Preferences**. The map and data transfer settings as well as the work area and grid settings can be changed in this window. Choosing **Save and Apply** means these parameters will be loaded automatically for each new map.

**Edit Mode Colors** allow user to define colors of edges and nodes used in edit mode.

If **Max. Contrast** is checked, edge and node colors are darkened or brightened according to the edited object background. Max. Contrast can make edited objects more visible.

Note: the **Grid Color** can be set also in Image/Adjust individually for current design. It is saved with file and it overrides the default grid color from Preferences.

**Map Export** parameters:

If map is **Transparent**, it is uploaded into the GPS without the background area and it overlays the GPS base map or other maps located on the same position, letting the underneath maps show through. Use this setting if you want to add details to an existing map in the GPS.

**Please note:** many line objects are displayed in a different way if the map is transparent. Use the **display mode Tabs** to check the look of your map after setting it to transparent mode. Mapwel does not show underneath maps, because they are in GPS, not in Mapwel.

**Precision / Data Size.** If map is drawn with use of curves, this control allows user to set to how many lines the curves are converted when map is uploaded into GPS (as the GPS accepts only the lines). Mapwel provides curves for easier drawing of map and for precision control. Once the map is drawn in curves, user can adjust the size of data according to available memory in GPS.



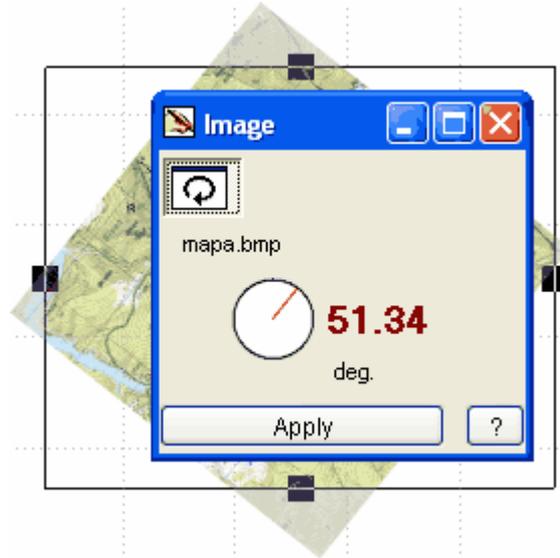
**Transfer Speed.** Use this control to set speed of the map upload. If you encounter problems with loading maps into GPS, decrease the transfer speed. This parameter affects only the serial data transfer. Speed of USB data transfer is set automatically.



# Edit Image Window

[Click here for more image editing and calibration tools.](#)

The **Edit Image Window** is accessible through main menu under Image / Edit Image Window. While Edit Image window is visible, four small rectangles appear in the work area to allow user to crop the image.



Rotate image first. Usually, the scanned image is not perfectly horizontal or vertical. Press left or right mouse button on the red angle parameter or click the rotate icon to adjust the angle.

Second step is setting of crop lines. Press left mouse button on any of four small rectangles and drag them to a new position. Area outside of selection will be cropped.

Please note: to rotate or crop image precisely, use main menu / **Image** / [Rotate to Vertical](#), [Rotate to Horizontal](#) and [Crop](#) tools.

After above steps, click **Apply** to perform changes.



# Countries and Cities Table

Access this table either via [main menu > File](#) or click **Countries and Cities** button in the [Properties window](#).

Countries		Code
1.	C	

Cities		Country or State
1.		

States	Code	Country
1.		

ZIP Codes	City
1.	

?  
Cancel  
OK

**Countries and Cities Table** is used for City and POI (point of interest) objects. If you want to use [City objects](#) in your map, you should fill this table first. City objects with undefined name are not transferred into the GPS.

If you use [POI objects](#) in your map, you need to fill this table only if you want to use country, state, city or zip code fields in the POI address. Any field in the POI address can be left empty.

To fill Countries and Cities Table follow these steps:

1. Enter countries and their codes (codes are optional) into the first table. To add new a line, press the F2 key on your keyboard. To delete last line in the table, hit F3 key on your keyboard.
2. If Country has states, enter states and their codes (codes are optional).
3. Assign respective country to each state. Click right mouse button on the 3rd column in the States table to access pop-up menu with countries list.
4. Enter cities.
5. Assign respective country or state to cities. Click right mouse button on the 2nd column in the Cities table to access pop-up menu with countries and states list. Countries are marked with a blue square and States are marked with a red square.
6. Enter ZIP codes
7. Assign respective city to ZIP codes. Click right mouse button on the 2nd column in the ZIP Codes table to access pop-up menu with cities list.

Main menu in this window contains following commands:

**Table.** Use it to **save** and **open** Countries and Cities Table. If several maps use the same table, you can save the table and open it in another map. **Import** command allows to load countries, states, cities or zip codes from separate text (\*.TXT) files. TXT file must have following format:

```
Item1/Code1  
Item2/Code2  
Item3/Code3
```

...

"/Code" section optional and it is valid only for countries and states (for example: Great Britain/GB). TXT files with cities and zip codes should not have "/Code" section.

**Edit.** Use it to add or delete last line in the table.

**Erase.** Use it to erase tables in this window.

**Sort.** Use it to sort tables in this window alphabetically. If there are objects in the map which are already using Countries and Cities table, they are automatically adjusted.

## Valid characters

**Country, State, City** - letters and - & ' /

**Country and State Code** - letters

Zip Code - letters and digits



# Objects

## Area Object

Use **Area Tool**  to create an area object. The edge of the **area** object is composed of straight lines and curves. Small rectangles are end points of lines and curves. Small circles are middle points of curves. The cross at the left side is beginning of the edge.

**Area** object can contain openings. **Opening** objects must be created with Opening Tool  and they must follow after the main Area object.

User can adjust properties of area object, like name, comment, zoom level and type.

Click with right mouse button on the object type to set individual zoom level for object and/or [edit user defined object style](#).

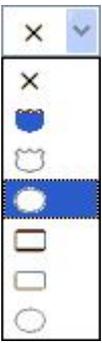
Areas are drawn in order determined by 'layer'. For example, 'Park' type objects are drawn in layer 6, which means that they are draw behind areas in layers 1..5 and on top of areas in layers 7 and 8. Therefore, some area types are displayed in the background, even if they were created on top of other areas. To make such areas visible, you have to create openings in objects that are displayed in front of them. 'Layer' is adjustable for [user defined styles](#).



The green object is the area that is displayed behind others (park, in this example). We need to make an opening in the surrounding land to make park visible (it shows through the opening). Notice that the two areas overlap. This is very important, because GPS could display tiny gap between the two areas, otherwise.

## Line Object

Use **Line Tool**  to create a line object. The edge of the line object is composed of straight lines and curves. Small rectangles are end points of straight lines and curves. Small circles are middle points of curves. The cross at the left side is beginning of the edge.



Depending on the type, Line object can have:

- Normal name label with optional comment.
- Altitude or depth label.
- Road label and any of the 6 road signs. Select the proper road sign in the **Sign** combo box in [Properties](#) window.

Use the [Line Tab](#) in Properties window to measure length of line objects.



## Symbols

These objects display on the map mostly as an icon with name. If cursor is placed on top of the icon (in GPS or in 'Grey scale' and 'Color' tabs in Mapwel), the optional comment is displayed as a hint.



**Point of Interest.** This object can be assigned with address (house number, street, phone number, city, zip code, state and country). If city, zip code, state and country are used, they must be chosen from the already filled-in [Countries and Cities](#) table. Address is displayed in the GPS when you click on the POI icon.



**City.** The city name must be chosen from the already filled-in **Countries and Cities** tabel. City cannot have comment.



**Map Feature.**



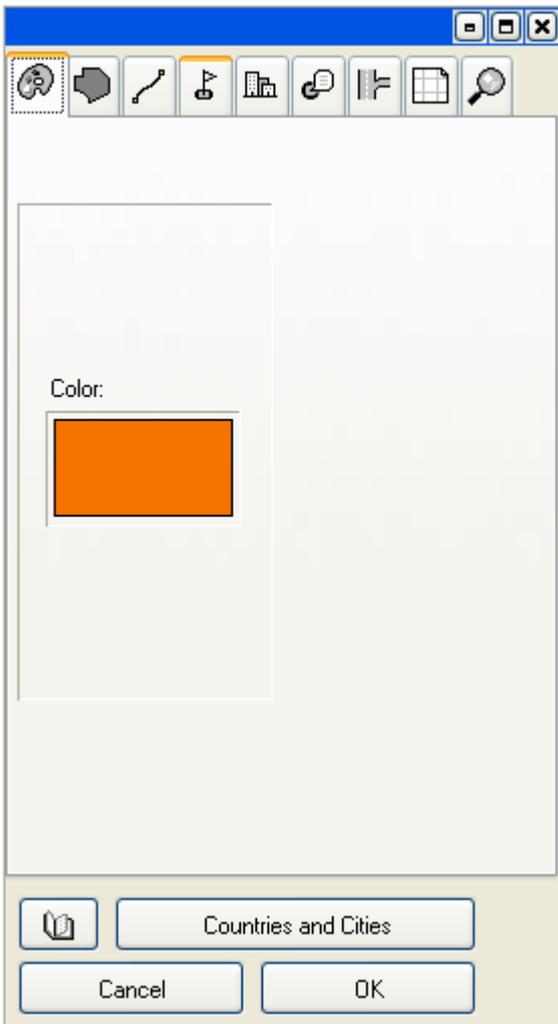
**Exit.**



# Properties of Objects

To change parameters of several objects at once, select objects, click right mouse button and select 'Properties' command from the pop-up menu. Properties are organized in several tabs, according to type of objects.

-  [Color Tab](#)
-  [Area Tab](#)
-  [Line Tab](#)
-  [Map Feature Tab](#)
-  [City Tab](#)
-  [Point of Interest \(POI\) Tab](#)
-  [Exit Tab](#)
-  [Map Tab](#)
-  [Map Zoom Levels Tab](#)
-  [Map ID Tab](#)

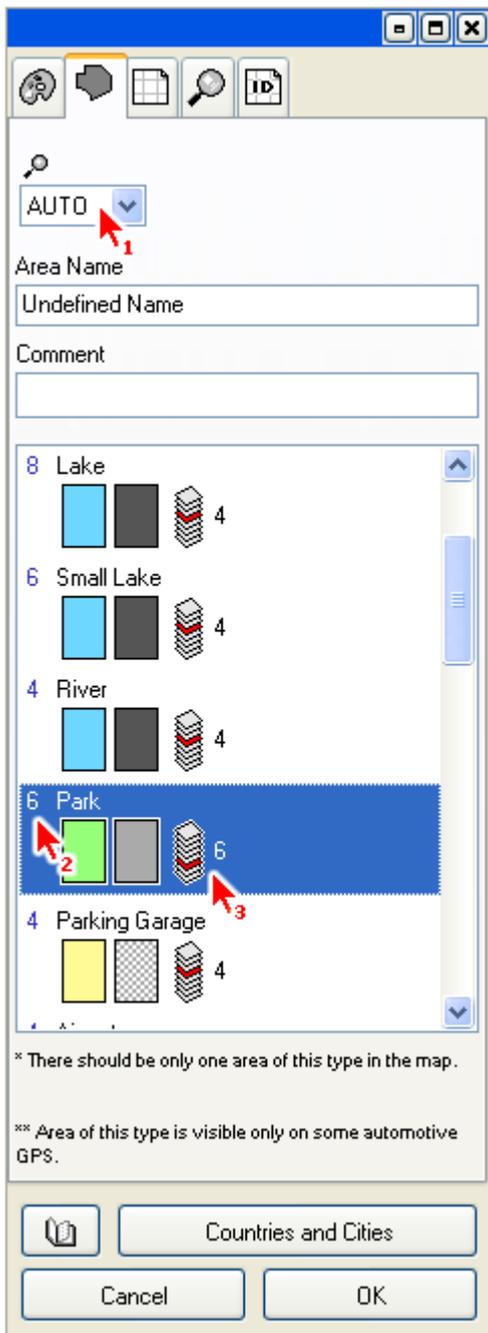


## Color Tab

This tab is common for Areas and Lines. Symbols (Map Features, Cities, POIs and Exits) do not have color property.

Use the color control to assign user color to the object. User colors are used only in the Normal and Vector display mode. When transferred to the GPS, the color information is discarded. GPS uses its own colors according to type of object (see **Area** and **Line** tabs).

User color can help you when you draw large and complicated map. For example, you can assign different colors to land contours according to their altitude.



## Area Tab

These parameters are applicable only to Area objects. All these settings are uploaded with map into the GPS.

Control marked with arrow 1 is **Individual Zoom Level** of selected object(s). If set to AUTO, the global zoom level of respective area type is used (in this case, zoom level of 'Park' type). Zoom Level defines maximum zoom in which the object is displayed in GPS.

**Name** is the text that is displayed on the area in the GPS. **Comment** is text that is displayed when you place cursor on top of the area.

The list at the bottom contains available area **types**. Always assign the proper type to the area object, because the area type defines how the object is displayed in the GPS. Each row in the list contains type name, color sample and gray scale sample of the area.

Color sample shows the area color and pattern if loaded into GPS with color display. Grey scale sample shows the area color and pattern if loaded into GPS with monochrome display.

Arrow 2 marks **Global Zoom Level** of areas of 'Park' type. The global zoom level is used for each object of the same type, unless the object has set an individual zoom level. To set global zoom level for any area type, click right mouse button on the area type and use the pop-up menu that appears.

The icon marked with arrow 3 indicates layer in which the object of respective type is displayed. By proper assignment of layers to the types you can achieve one type of area objects to be displayed on top of (or under) the other types.

Objects in layers with higher index are displayed behind areas with lower layer index, regardless of their creation order (the 'Park', for example). To make such area visible, you have to make openings to all areas that cover this area.



In this example, an opening was made to the yellow area to allow the green area show through.

Line Tab with road Line object

## Line Tab

These parameters are applicable only to Line objects. All these settings are uploaded with map into the GPS.

When accessed through pop-up menu / Properties (i.e. not through editing mode), the total **length of all selected line objects** is displayed in this tab. You can use it to measure imported tracks, for example. To change distance units use the [Edit > Preferences](#) window.

Control marked with arrow 1 is **Individual Zoom Level** of selected object(s). If set to AUTO, the global zoom level of respective line type is used (in this case, zoom level of 'Road' type). Zoom Level defines maximum zoom in which the object is displayed in GPS.



Setting of this check box defines whether to display the direction indicator after the line name or not.

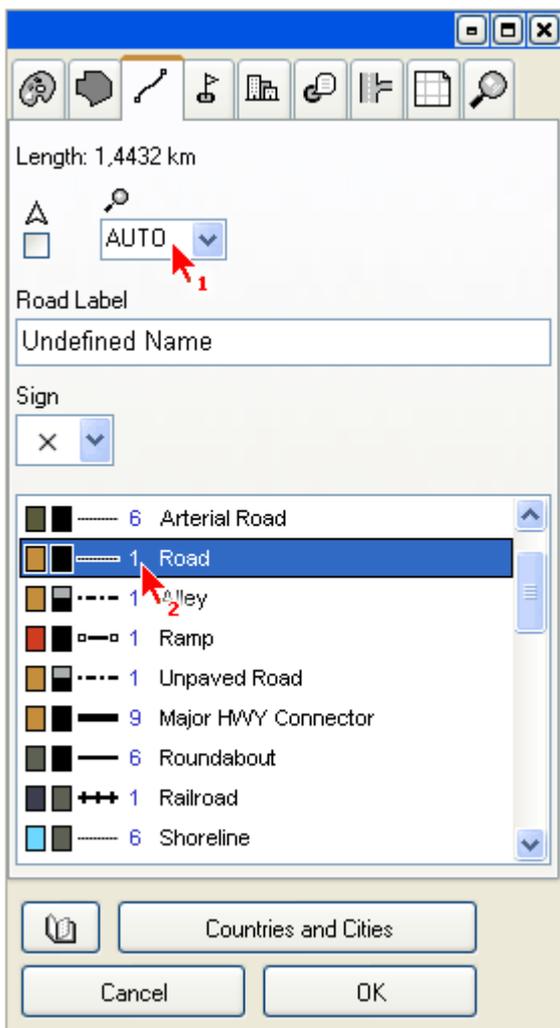
Depending on the type, Line object can have:

- **Road label** and any of the available 6 **road signs** (roads).
- Normal **name** label with optional **comment**.
- **Altitude or depth** label (land and depth contours).

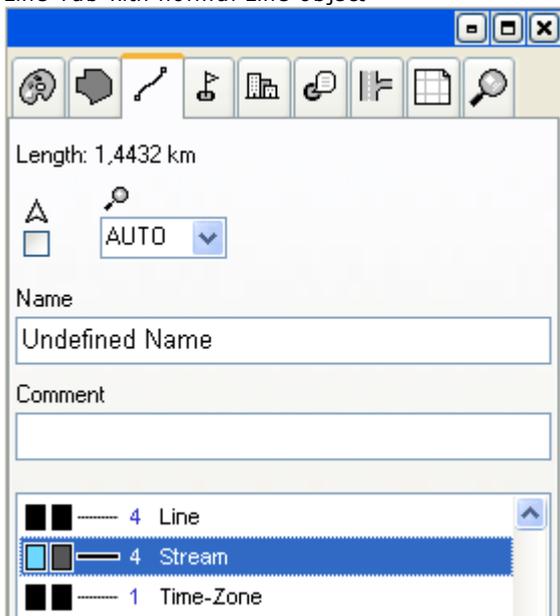
**Name** is the text that is displayed next to the line or over the line in the GPS. **Comment** is text that is displayed when you place cursor on top of the line.

**Altitude or Depth** label can contain only digits. You can choose the elevation and depth units in the [Edit > Preferences](#) window.

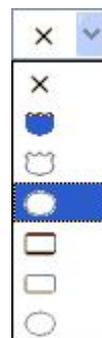
**Road label** can contain both letters and digits.

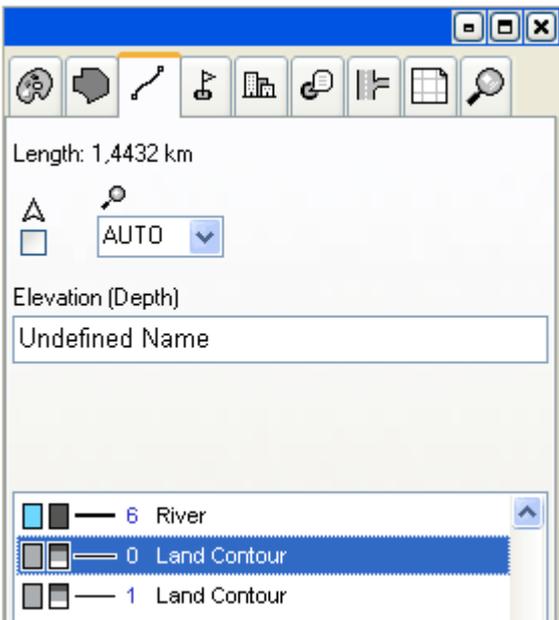


Line Tab with normal Line object



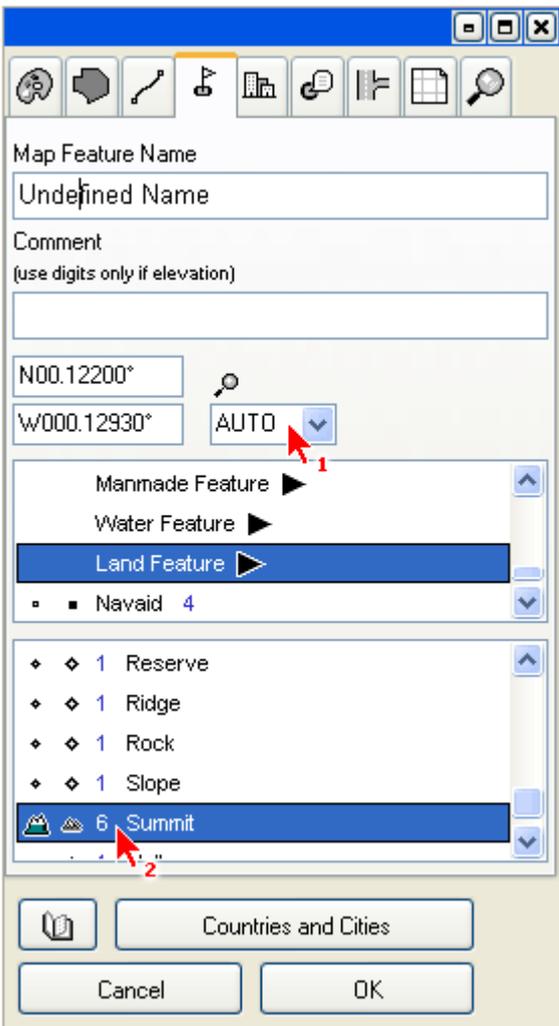
Line Tab with elevation (depth) Line object





The list at the bottom contains available line **types**. Always assign the proper type to the line object, because the line type defines how the object is displayed in the GPS. Each row in the list contains color icon and gray scale icon, line style and the type name. Icons show the color (or several colors) used for displaying of this line type in the color and monochrome GPS.

Arrow 2 marks **Global Zoom Level** of lines of 'Road' type. The global zoom level is used for each object of the same type, unless the object has set an individual zoom level. To set global zoom level for any line type, click right mouse button on the line type and use the pop-up menu that appears.



## Map Feature Tab

These parameters are applicable only to Map Feature objects. All these settings are uploaded with map into the GPS.

Meaning of controls marked by arrow 1 and 2 is the same as on the area or line tab.

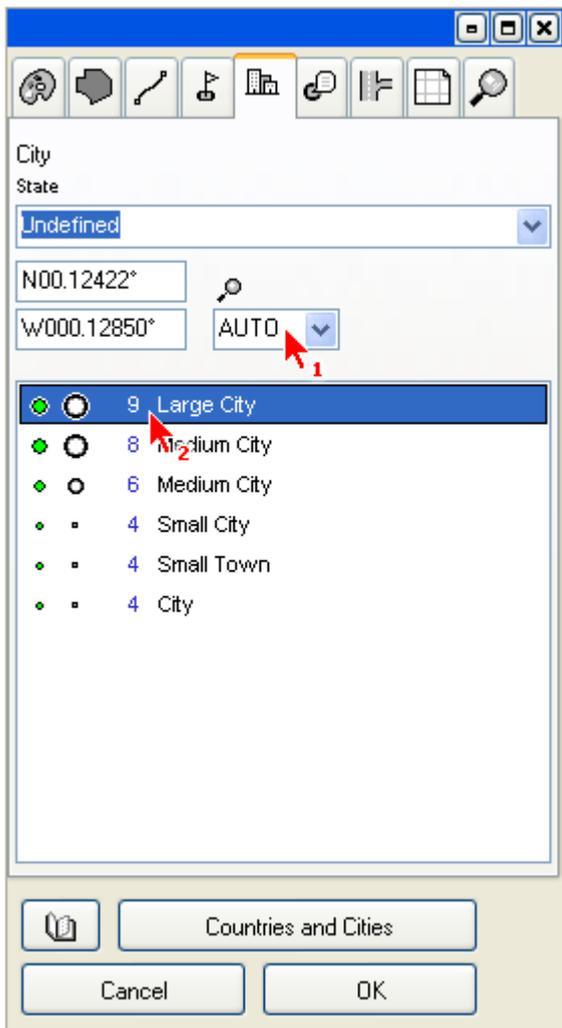
**Map Feature Name** is the text that is displayed next to the object icon in the GPS.

**Comment** is text that is displayed when you place cursor on top of the icon.

**Coordinate** controls allow you to change the object position. To change position format, use the main menu [Edit > Preferences](#).

The list in the middle is the Map Feature **Class**. Some classes have several **subclasses** that are displayed in the bottom list. Choose the proper Map Feature type using the class and subclass lists.

Icons in the class and subclass lists show how the Map Feature will look like in the color GPS (left icon) and monochrome GPS (right icon).



## City Tab

These parameters are applicable only to City objects. All these settings are uploaded with map into the GPS.

**City** is the text that is displayed next to the object icon in the GPS. User is not allowed to type the city name directly into this box. It is necessary to fill the [Countries and Cities](#) table first (click on the button at the bottom). Then it is possible to choose city from drop-down list in this combo box.

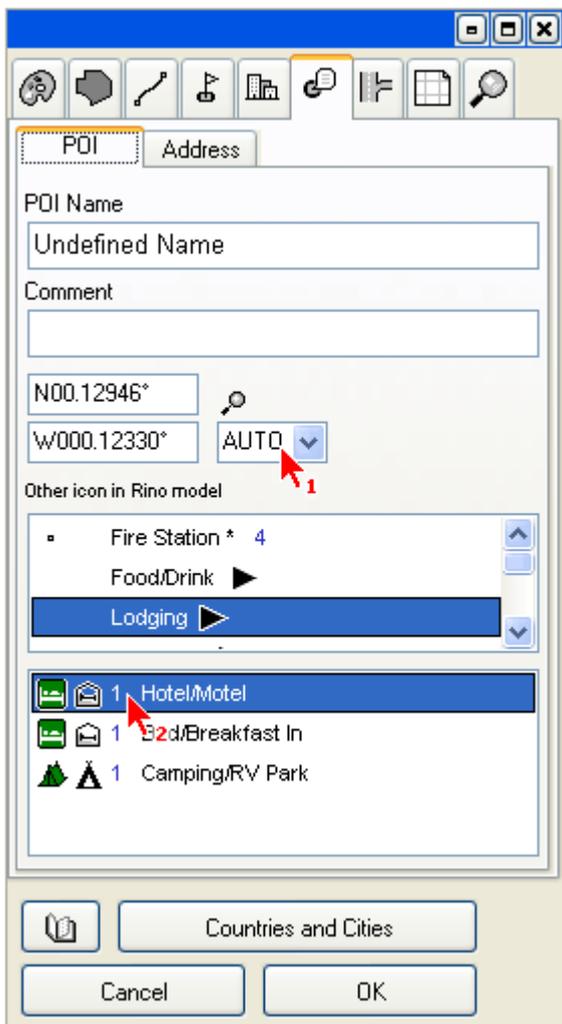
**Please note:** City objects with undefined name are not uploaded into the GPS.

**Coordinate** controls allow you to change the object position. To change position format, use the main menu [Edit > Preferences](#).

Meaning of controls marked by arrow 1 and 2 is the same as on the area or line tab.

The list in the middle is the City **Type**.

Icons in the type list show how the City will look like in the color GPS (left icon) and monochrome GPS (right icon).



## Point of Interest (POI) Tab

These parameters are applicable only to POI objects. All these settings are uploaded with map into the GPS.

**POI Name** is the text that is displayed next to the object icon in the GPS.

**Comment** is text that is displayed when you place cursor on top of the icon.

**Coordinate** controls allow you to change the object position. To change position format, use the main menu [Edit > Preferences](#).

Meaning of controls marked by arrow 1 and 2 is the same as on the area or line tab.

The list in the middle is the POI **Class**. Some classes have several **subclasses** that are displayed in the bottom list. Choose the proper POI type using the class and subclass lists.

Icons in the class and subclass lists show how the POI will look like in the color GPS (left icon) and monochrome GPS (right icon). A few monochrome icons looks different in the Garmin® Rino™ GPS. These icons are marked with \*.

POI can have addresses assigned. User can fill any of the address boxes or left them empty.

**House, Street and Phone** data can be typed directly.

**Country, State, City and ZIP Code** are available from the [Countries and Cities Table](#), which must be filled first (click on the button at the bottom).

Address is displayed in the GPS when you click on the POI icon. The address format can be defined in the Map Tab (see below).

### Valid characters

**House** - letters and digits.

**Street** - only letters.

**Phone** - digits and - sign.

### Exit Tab

These parameters are applicable only to Exit objects. All these settings are uploaded with map into the GPS.

**Exit Name** is the text that is displayed next to the object icon in the GPS.

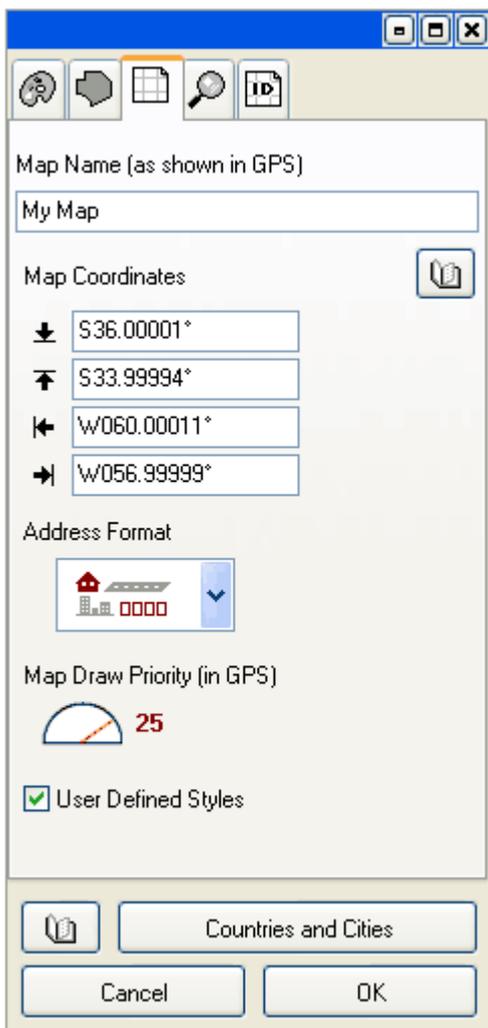
**Comment** is text that is displayed when you place cursor on top of the icon.

**Coordinate** controls allow you to change the object position. To change position format, use the main menu [Edit > Preferences](#).

Meaning of controls marked by arrow 1 and 2 is the same as on the area or line tab.

The list in the middle is the Exit **Class**. Some classes have several **subclasses** that are displayed in the bottom list. Choose the proper Exit type using the class and subclass lists.

Icons in the class and subclass lists show how the Exit will look like in the color GPS (left icon) and monochrome GPS (right icon).



## Map Tab

These parameters apply for the whole map.

**Map Name** is the text displayed in GPS as a name of the map

**Map Coordinates** define the coordinates of bottom (south), top (north), left (west) and right (east) edge of the map.

If you do not know the map edges coordinates, you can define coordinates of two spots on the map and then let program to calculate edged coordinates from them. See [main menu > File > Adjust Map Coordinates](#) for more detail.

To change coordinates format, use the main menu [Edit > Preferences](#).

**Address Format** defines mutual position of house, street, city and zip code data fields in the Points of Interest address (see the POI Tab above) as it is displayed in the GPS.

**Map Draw Priority** affects order in which overlapping maps are displayed on the GPS. Map with higher Draw Priority is drawn on top of the overlapping map with lower Draw Priority, unless the second map is **transparent**. Transparent maps are always drawn on top of the non-transparent maps, even if they have lower Draw Priority.

**User Defined Styles** check box allows to switch on/off saving of the user defined styles into the map file when exporting map into IMG file or uploading map to GPS. It does not affect the storage of user styles in source \*.MPW file.



## Map Zoom Levels Tab

These settings apply for the whole map.

Map uploaded into GPS has several layers (zoom levels). Each zoom level contains different amount of data to speed-up map displaying and to prevent too many objects being displayed in higher zoom.

Controls on this tab allow user to define number of zoom levels and approximate zoom by which map layers appear on the GPS display.

The number of objects visible in respective zoom level is displayed at the right side of the check box.

In zoom level 0 all objects are visible. The higher is the zoom level, the lower is the number of visible objects. Use controls in above parameter tabs if you want to make some individual object or all objects of the same type more visible or less visible.



## MapID Tab

These settings apply for the whole map.

Each map contains ID number, which should be unique among maps that are present in the single GPS unit at the same time.

Mapwel generates internal map ID automatically from map coordinates and creation time.

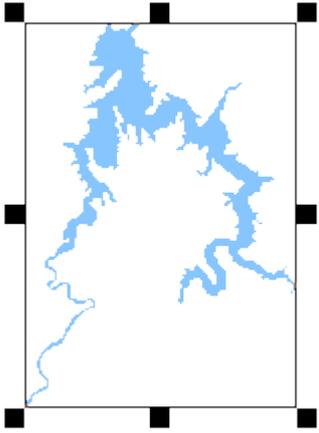
This tab allows to define map ID manually and/or set the map ID as a filename for export of map into the IMG and MP format, which can be useful if you want to use map in other software programs.

These settings are supposed to be used only by an expert user. If you upload your maps directly into GPS with Mapwel or MapUpload, you do not need to change default values.

**Best Possible Accuracy** informs you about accuracy available for the current map scope (map coordinates range) when uploaded map to the GPS.



# Transformation of Objects



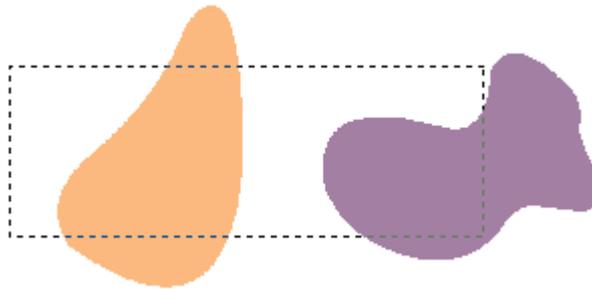
Select object with use of Transform Tool  and:

To change size proportionally, left click any corner square and drag to desired size.

To change size non-proportionally, left click a middle square and drag to desired size.

## There are 2 ways of how to make selection of objects with marquee box:

1. Drag marquee box from left to right to select objects without completely enclosing them with a marquee box



2. Draw marquee box from right to left to select only those objects that lie completely within the marquee box.





# Shaping

These commands work on objects selected with the Transform Tool (arrow) or in [Objects Inspector](#).

The [main menu > Transform > Shaping commands](#) allow to modify and combine selected objects with use of the boolean operations.



Two selected objects. Green object has an opening.

**Union** - this command creates an object or objects that contain all selected objects merged together. Vertices inside of the filled areas are erased. If selected objects do not overlap one another, result of the union are copies of the original objects.



Union of two objects.

**Intersection** - this command creates an object or several objects that are intersections of the selected objects. If selected objects do not overlap one another, this function does not produce any new object (as intersection does not exist).



Intersection of two objects.

**Difference** - this command subtracts selected objects from the object that is first in order of creation among the selected objects. It is necessary to arrange order of respective objects in the [object inspector list](#) before use of this function, to assure proper order of objects. Newly created object or objects contain only those areas of the first object that are not covered by the next objects.



Difference of two objects.



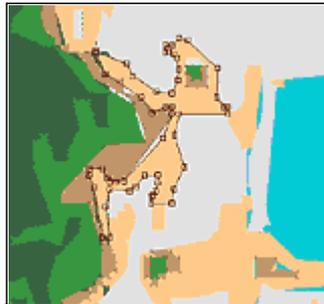
# Loading Raster Image into GPS

## Automatic Vectorization

(Sample file in \*.IMG format is stored in MAPWEL>FILES folder.)

This function can be accessed via **main menu > Image > Automatic Vectorization**. It allows to create map for GPS from satellite images or scans automatically, within a few minutes. It is intended for use in situation when there are no vector maps available of the area of interest, and drawing of precise vector map is not efficient either because of lack of time or limited use of the map.

In fact, Garmin units do not allow to load raster image into GPS and use it as a map. This function automatically vectorizes raster image and creates vector file compatible with GPS. Autovectorized maps contain thousands of small color spots and are large in size and slow to render on GPS, therefore.



Objects automatically vectorized from raster image.  
Map consists of large number of polygons.  
Colors are derived from raster and included into "User defined styles"  
for optional manual tuning and/or transfer to other map file.

Examples of autovectorized maps in GPS





**Pros:** almost "one-click" process to create ready-to-use GPS map. You can create map like above examples in a few minutes. Auto-vectorized map can be combined with waypoints, tracks, manually drawn objects or other map data (like merged shapefiles, etc.)

**Cons:** GPS must support user defined styles (most of new units support them). Auto-vectorized map file is larger than normal map file and its rendering in GPS is slower. Auto-vectorized map does not allow to search objects. Objects do not have names, hints and other attributes. In other words, this kind of map is for viewing only.

## Technical notes

Auto-vectorized maps were successfully tested on Colorado, Nuvi, GPSMAP 60CSx, Street Pilot c550.

Number of auto-vectorized maps can be loaded into GPS at once. Auto-vectorized maps can be exported into IMG format and combined with any other GPS maps. However, they must use the same set of user defined colors. To achieve this goal, use paletted images with same color palette. Current version of Mapwel supports max. 86 colors for autovectorization.

**Warning:** you have to set **map detail** in GPS to '**Most**' (default value is 'Normal') to see autovectorized map in full detail. Otherwise, only a large colored squares are visible. Autovectorized map is supposed to be rendered in full detail at zoom 800 m and closer.



Map setup menu with Detail option.  
This is screenshot from Colorado 300, but each Garmin GPS has some menu for setting this option.  
Make sure to set it to 'Most'.

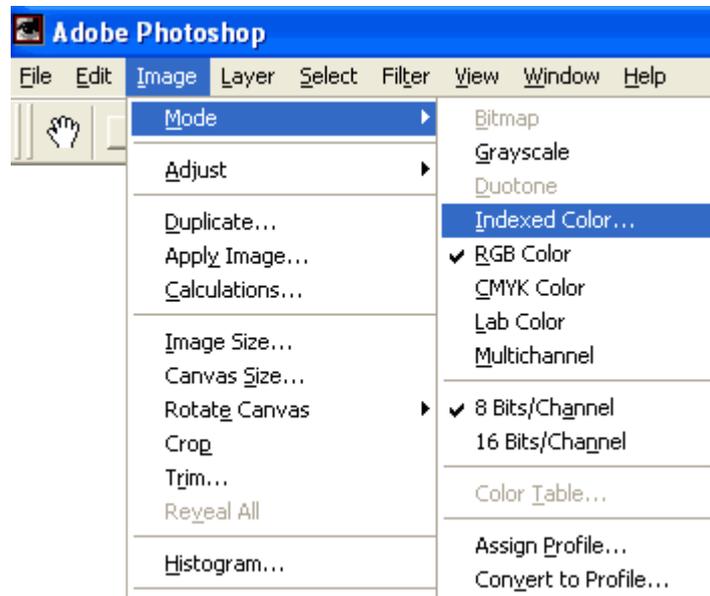
1. Use any image editing software to resample and crop raster image. Reduce number of colors to fit into range supported by Mapwel (up to 86). Save image into GIF, PNG or BMP format.
2. Import image into Mapwel. If number of colors exceeds max. allowed number, Mapwel automatically reduces number of colors during autovectorization.
3. Georeference the map. You can skip this step if you import OziExplorer callibrated image.
4. Use main menu>Image>Automatic Vectorization function to create map.
5. Send map from Mapwel to GPS.

## How to reduce number of colors in an image

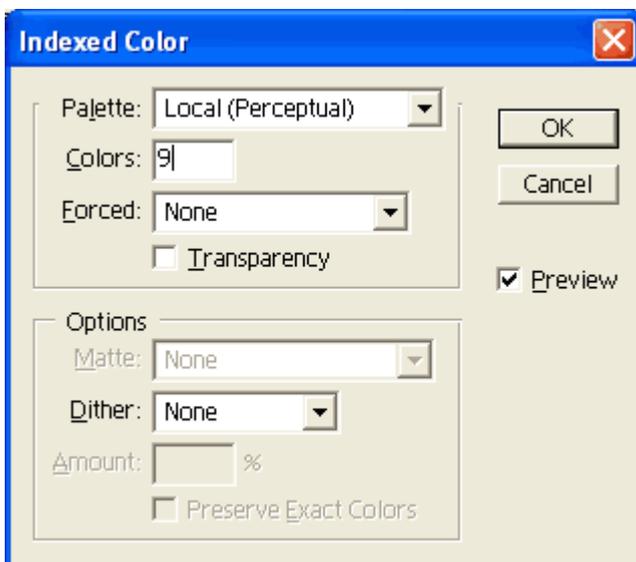
To use image for automatic conversion into vectors, you may need to reduce number of colors. Mapwel reduces number of colors automatically, but you may need to use the same color palette for several images. In such a case, reduce colors manually, save the color palette and use it for other images too.

If you have Adobe Photoshop, you can use following approach:

1. Use Photoshop > **main menu** > **Image** > **Mode** > **Indexed Color** to open window for color reduction.

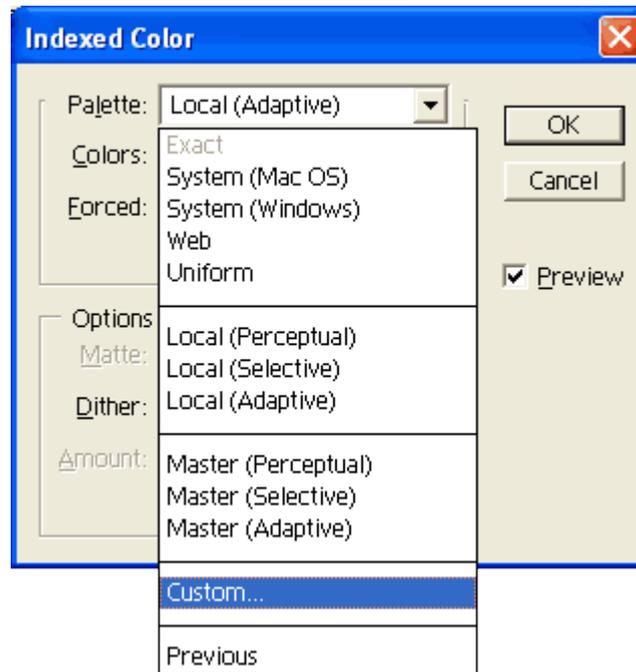


2. Select no dither, no transparency and set required number of colors Select any type of palette that works best for your image.

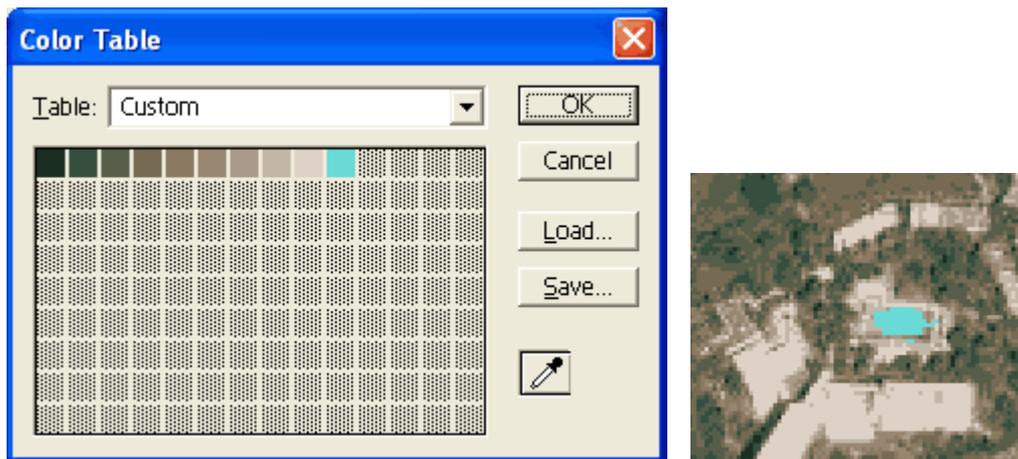


3. Image with reduced number of colors lacks blue color for pool. We will add it manually. Undo the color

reduction and repeat step 1. However, select 'Custom' palette in this case. Please note: in this simple example number of colors is reduced to 9, but Mapwel supports much more colors.



4. Custom palette contains 9 color automatically selected in previous color reduction. Add light blue color as 10th color into palette and click OK. Image now contains 10 colors and light blue is among them. Save image into BMP, GIF or PNG format to avoid colors distortion (do not use JPG format for the same reason).



**Sample file in \*.IMG format is stored in MAPWEL>FILES folder.**



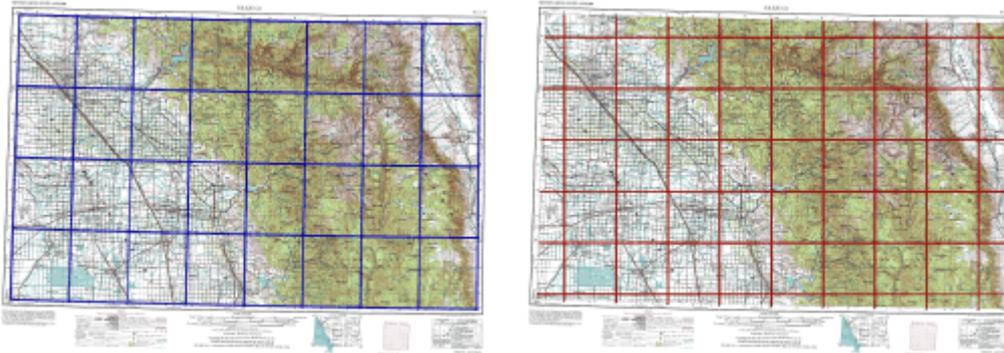
# Direct Map Calibration

[Click here for more image editing and calibration tools.](#)

This tool is available via [main menu > Image > Calibration](#). It allows to transform raster image and vector data drawn on top of the image to the Lat/Lon grid parallel to the screen edges. This method uses an affine linear transformation and will work with maps which are rotated or skewed. The Lat/Lon grid of the image must be linear (straight lines) to allow linear transformation to the grid parallel to screen edges. Even images with a non-linear Lat/Lon grid can be calibrated with this tool, if the grid non-linearity is caused by projection (like UTM, for example). In such a case, map usually contains linear Easting/Northing grid and non-linear Lat/Lon grid. Map should be calibrated with use of the Easting/Northing grid and Mapwel recalculates images so that the Lat/Lon grid becomes linear.

## Image with projection and grid lines

Below map is in UTM coordinates and has 2 grids: Lat/Lon grid (highlighted with blue color), which is curved because of the projection, and Easting/Northing grid (highlighted with red color), which is linear. Calibration and conversion from UTM to Lat/Lon will make the Lat/Lon grid linear and parallel with the screen edges.



Left: non-linear Lat/Lon grid. Right: linear UTM grid.

Use [main menu > Image > Calibration](#) to start the calibration tool. We will use 3 points with UTM coordinates to calibrate the image. As the grid lines are drawn on the map, the easiest way is to position calibration points on intersections of the grid lines

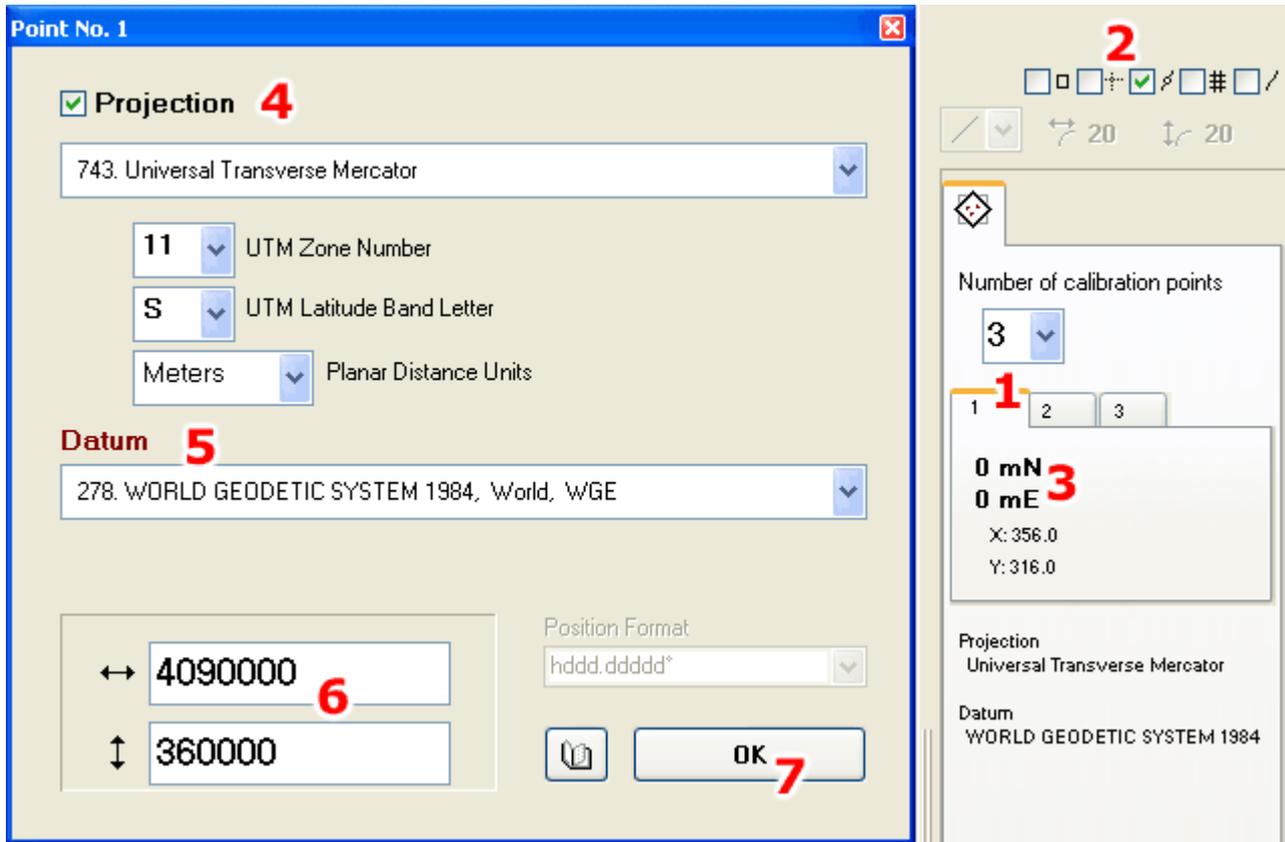


Left: image with calibration points positioned on intersections of grid lines. Right: detail.

Panel at the right side of the Mapwel screen contains calibration controls. They should be used in the following way:

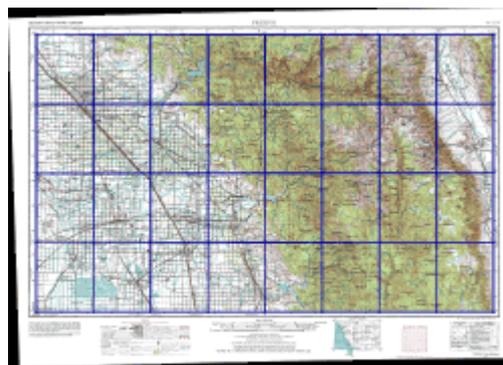
1. Select any calibration point by clicking on the respective tab **(1)**. Selected point is highlighted in the work area and automatically scrolled into center of the screen (if there is enough space to scroll). Number of calibration points is defined in combo box above the tabs.
2. It is possible to use any of the snap node options to snap calibration points to nodes, objects, etc. It is often convenient to snap calibration points to waypoints or guide lines placed on the map.
3. Define geographical position of each calibration point by clicking on the coordinates **(3)** and typing exact coordinate values into boxes **(6)** in window that appears. Select projection **(4)**, if any, and Datum **(5)**. In

this case, coordinates are defined as easting and northing, in meters. Click **OK** button (7) to close the coordinates window.



Left: Window for entering point coordinates in various systems. Right: panel with calibration controls.

When geographical position of all calibration points is defined, click **Apply** button at top of the Mapwel screen, or use right mouse button click to invoke pop-up menu in the work area. Then select **Apply** command from the pop-up menu. Image is calibrated so that Lat/Lon grid becomes linear (see blue grid on the below image) and coordinates of the map are derived from the geographical position of the calibration points. Below map coordinates are in WGS84.



Calibrated image.

↓ N35.790914°    ↑ N37.091995°    ← W120.118679°    → W117.915515°

Overall map coordinates in WGS84, derived from the calibration points.

**Notes:**

When using 2 points calibration, the points can be placed anywhere on the map, but the best precision is achieved when 2 points are as far one from the other as possible. Points cannot be placed on the vertical or horizontal line, i.e. they cannot have any coordinate identical.

When using 3 points calibration, the points can be placed anywhere on the map, but the best precision is achieved when 3 points are as far one from the other as possible. Points cannot be placed on the same straight

line in any direction.

All calibration points must be specified the same coordinate system, i.e. do not change projection and/or datum when entering next point.

If image does not contain grid lines, it is recommended to use some distinctive points like crossroads. Their coordinates can be easily found with Google Earth, for example. Another way is to measure coordinates of these points with GPS.

Map without projection is calibrated in the same way as above map, but "**Projection**" option should be disabled. Coordinates are entered in Lat/Lon form.

When converting UTM coordinates to Lat/Lon, **Latitude Band Letter** affects only selection of the hemisphere (north and south). Therefore, you may get the same Lat/Lon coordinates with different UTM Latitude Band Letters.



# Setting Map Parameters

1. To define map position, either enter coordinates of the map edges into boxes in the button bar, or if you do not know edge coordinates, use the [main menu > File > Georeference Map](#) to define map coordinates according to two known spots on the map. Map must be already straightened and rotated so that north is up.

**North and West**

**Projection**

460. Universal Transverse Mercator

32 UTM Zone Number

T UTM Latitude Band Letter

Meters Planar Distance Units

**Datum**

278. WORLD GEODETIC SYSTEM 1984, World, WGE

↑ N00.13911°

← W000.08701°

Position Format: hddd.ddddd°

OK

2. Place the two marks on the known spots on the map (grid intersections, for example) and define coordinates of these spots. Then click the right mouse button to access the pop-up menu and choose **Apply to Map Coordinates**. Mapwel recalculates the map edge coordinates according to defined two spots.

↓ S00.04550°   ↑ N00.10600°   ← W000.02980°   → E000.11212°

3. To change map name, address format or to see available map accuracy, select any object and click right mouse button to access **Properties** window.

4. To change coordinates format, elevation units, distance units, map transparency, transfer speed and curves precision, use the main menu [Edit > Preferences](#).



# Conversion of Coordinates

Click [here](#) to learn about image calibration and map georeferencing methods.

Mapwel uses WGS84 for internal storage of all data, because internal format of GPS maps is based on the WGS84 too. Setup menu in GPS allows to select from number of grids and datums, but displayed coordinates are always calculated from data that are stored in default WGS84.

You can create map in Mapwel from resources in various coordinate systems. Mapwel allows to convert these coordinates to GPS map native coordinate system WGS84.

When below window appears, select proper projection (if any) and datum and then type coordinates into the boxes. Format of Lat/Lon coordinates can be set in the **Position Format** combo box. Click **OK** button to use coordinates.

When using UTM projection, make sure to select proper planar distance units. Latitude band letter affects only selection of the hemisphere (northern or southern) when converting coordinates from UTM to Lat/Lon. Therefore, you can obtain the same Lat/Lon coordinates for various band letters.

**Assign North and West**

**Projection**

743. Universal Transverse Mercator

1 UTM Zone Number

N UTM Latitude Band Letter

Feet Planar Distance Units

**Datum**

166. NORTH AMERICAN 1927, US - CONUS, NAS C

← 17000

↑ 23000

Position Format: hddd.dddd°

Print OK

To learn about custom (user-defined) projections, [click here](#) please.



# Manual map preparation for iQue, Nüvi, Zümo and Colorado

All above units store detail maps on a memory card or in the internal memory. All detail maps, normally stored as a separate img files, must be merged into a single file with GMAPSUPP.IMG name. Otherwise, GPS will not recognize and display the maps.

Mapwel Advanced allows to generate separate img files and then merge them into a single GMAPSUPP.IMG file for use with iQue, Nüvi, Zümo and Colorado .

**Please follow these steps to create GMAPSUPP.IMG file:**

**Step 1.** Generate separate img files with Mapwel Advanced. Use [main menu > File > Export Map](#) to save each map with img extension.

**Step 2.** Use Mapwel [main menu > File > Merge IMG Files](#) to merge your img files into a single file and store it with GMAPSUPP.IMG name. If you want to upload maps to iQue, proceed to step 3. If you want to upload maps to other GPS, proceed to step 4.

**Step 3 (iQue only).** Use synchronization software included with your iQue (ActiveSync®, HotSync® or other) to load finished GMAPSUPP.IMG file into GARMIN folder\* of iQue memory card. Restart iQue to enable uploaded maps.

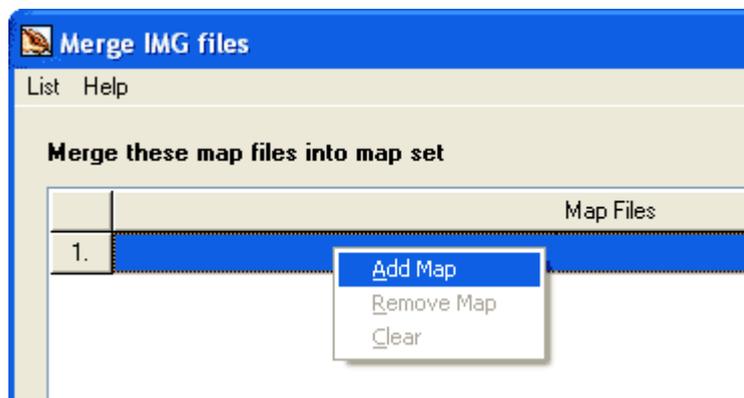
**Step 4 (Nüvi, Zümo, Colorado).** Connect GPS to your PC and switch it on. Use Windows Explorer or any file manager software to copy your GMAPSUPP.IMG file to GARMIN folder\* in the GPS. Then disconnect the USB cable and wait until GPS reads the maps.

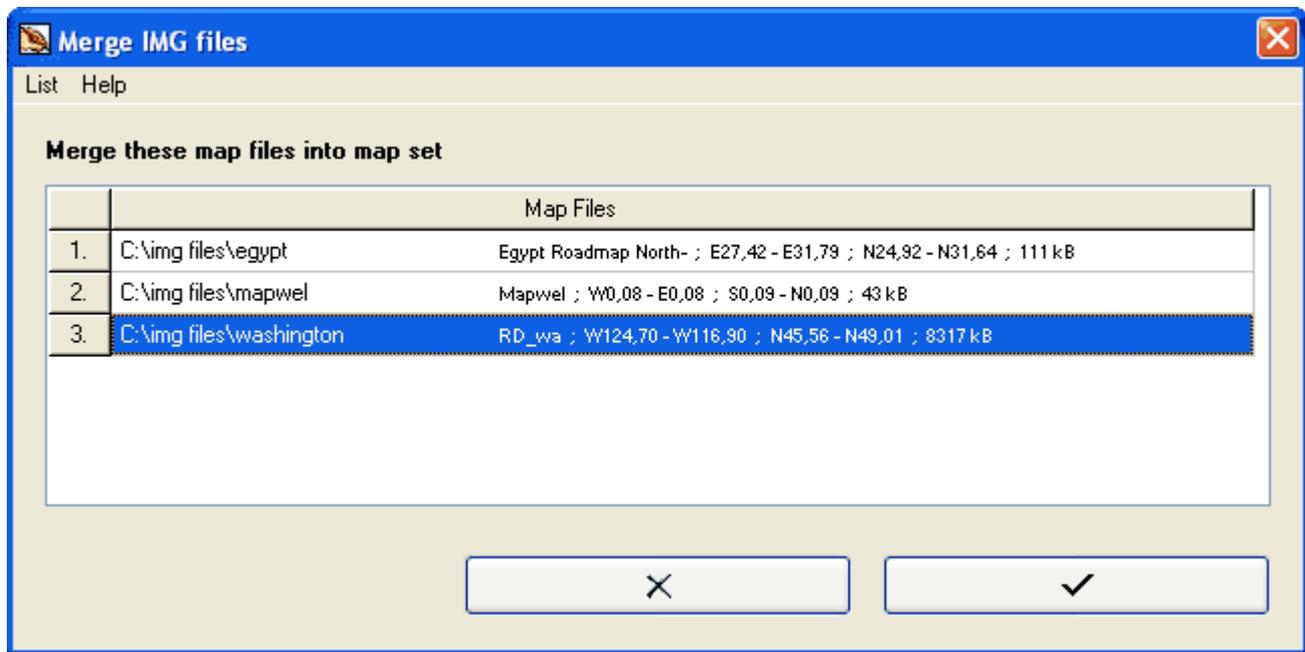
\*Check where your GPS stores detail maps (GMAPSUPP.IMG file) and load your file into this directory. The previous GMAPSUPP.IMG file will be overwritten. If you want to preserve maps in this file, merge it to your maps like any other img file (see step 2), prior to loading your maps to the card.

Step 2 is discussed in more detail below:

## Step 2 - Creation of GMAPSUPP.IMG File

Use Mapwel Advanced [main menu > File > Merge IMG File](#) function to open window for merging separate img files into a single file. Click right mouse button on the tab and use **Add Map** command from the pop-up menu to add respective img files to the list.





You can save list of img files on disc, for a future use. Use **List > Save List** command to store list into Mapwel \*.mml file.

When finished, click ✓ button to generate single GMAPSUPP.IMG file from the list. Then upload this file to the GPS as described in steps 3 and 4 above.



# Map Upload

User can upload one or several maps into the GPS unit. Mapwel uses unique GPS ID set by GPS manufacturer to check the registration before the map upload. Therefore, user is prompted to attach the GPS that was used for purchase of registration password.

If Mapwel is in **Advanced** version, user can disconnect the registration GPS and attach any compatible GPS for map upload. **Basic** Mapwel version allows user to upload only to single GPS unit. **Unregistered** Mapwel allows user to upload map to any compatible GPS, but map is truncated.

**Map Transfer**

List Help

**Advanced version. You can attach any compatible GPS now and upload maps.**

Map Files	
1.	C:\DOCUME~1\DUSANB~1..Current Map.mpw Mapwel : W0.53 - E0.53 ; S0.57 - N0.58

Context Menu:  
Add Map  
Remove Map  
Clear

**Status**

Preparing data ... 0%  
Mapwel  
W0.54 - E0.54 ; S0.58 - N0.60

Data size: 124 kB  
Compilation time: 1 s  
...  
Transfer complete.

Turn off GPS after transfer  
 Add to existing maps

**Transfer Speed (Serial Port only)**

Maximum

Warning

Detect GPS

Exit

Upload to GPS

If you want to transfer several maps into the GPS at once, add maps to the map list. Use the main menu or pop-up menu (accessible with right mouse button click on the list) to manage the list items.

Geographic location of files transferred to GPS is plotted on the world map, for reference.

**Current Map** denotes map currently open in the Mapwel. **Add to existing maps** option allows to add your map to maps already loaded in the GPS.

**Important:** if your GPS is connected to PC via serial port, please make certain that **Serial Data Format in Setup / Interfaces** in the GPS is set to "GARMIN".

The map should only be uploaded to the unit for which it is intended. If this map is uploaded to a GPS unit other than it is designed for, it will render the unit inoperative. Do not operate the GPS unit during the transfer! Click [here](#) to see list of supported GPS models.

In case of problems with map uploading or displaying on GPS, please [click here](#).