ORDNANCE SURVEY GB

OS Open Zoomstack - Getting Started Guide

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Ordnance Survey

Version History

Version	Date	Description
1.0	21/01/2019	Initial release
1.1	27/01/2019	Includes Cadcorp SIS Desktop 9

Purpose of this Document

This is the Getting Started Guide (hereinafter referred to as the 'Guide') for the OS Open Zoomstack product.

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Contents

1. Introduction

Overview

OS Open Zoomstack is designed to make OS map data more accessible, customisable and easier to use. It's a one file fits all product that has reduced the time to install detailed maps by an order of magnitude, saving valuable time and effort.

The instructions contained in this document shows you how to produce a feature-rich map that allows users to zoom in and out while being served high quality, fast-rendering results.

Zoomstack is supplied in GeoPackage and Vector Tiles formats. For demonstrative purposes, this document focuses on the implementation of Zoomstack, using each of the formats in various GIS (Geographic Information System) software applications. It is important to note that many other GIS software applications can be used with the Zoomstack product.

Using the GeoPackage or Vector Tiles format in any of the GIS software products will produce a similar result. You could either work through this guide from beginning to end or you could navigate directly to the Zoomstack format relevant to you:

- Zoomstack Vector Tiles Format
- Zoomstack GeoPackage Format

Once you've produced the map, it is advisable to apply styles to give it that extra visual appeal. The instructions for doing so is also contained in this document.

Purpose

The purpose of this document is to instruct users about how to produce quality maps using Ordnance Survey's (OS) Zoomstack product. It provides:

- An overview of the formats in which Zoomstack is supplied, specifically the Vector Tiles and GeoPackage formats.
- Instructions on how to implement Zoomstack Vector Tiles in GIS software applications.
- Instructions on how to implement Zoomstack GeoPackage in GIS software applications.

Resources

The following documents are associated with OS Open Zoomstack and which are accessible from our website:

1. OS Open Zoomstack Product Guide
2. OS Open Zoomstack Getting Started Guide
3. OS Open Zoomstack Technical Specification

Target Audience

This document is intended for:

- Users with no technical knowledge in GIS but are comfortable navigating the internet.
- Users with technical knowledge in GIS.

File Downloads

Throughout this document, we reference files that need to be downloaded as part of your 'getting started' instructions. For ease of reference, we've provided a list of all the files referenced in this document in the Appendix – List of File Downloads.

2. Zoomstack Vector Tiles Format

2.1 What are Vector Tiles?

A Vector Tile represents a specific area of the earth's surface and contains geographic information about the coverage area. Each tile can contain many layers of features such as buildings, roads, rivers, greenspaces, etc. They are packets of geographic data, packaged into tiles for transfer over the web. The information they contain can be used to deliver styled web maps to the end-user.

OS supplies data in the Mapbox Vector Tile Specification, packed in a single MBTiles file (which is based on the SQLite database).

2.2 What are the Benefits of Vector Tiles?

Vector Tiles offer users the following benefits:

- Styling - customise your map with full and dynamic design control.
- File size - lightweight tiles that are efficient and super-fast to render in the client.
- Pixel perfect - high resolution, beautiful mapping for all devices.
- Open standard - created under a Creative Commons Attribution 3.0 US License.
- Smooth - an improved, seamless user experience when zooming in and out of maps.

- Advanced features - Vector Tiles contain actual geographic data (not just images) which can be interrogated and analysed.
- Offline maps - store the tiles locally to take your maps offline.

With Zoomstack Vector Tiles you get one single MBTiles file that is around 3GB in size. It is light enough to be fast on the web and suitable for offline use. OS has pre-selected the right content for each zoom level and supply stylesheets to give you a great starting point. This can save a considerable amount of time and effort.

The instructions that follow are for installing Zoomstack Vector Tiles in Mapbox Studio and QGIS. Please refer to the relevant section based on the GIS software you're using:

- Installing Zoomstack Vector Tiles in Mapbox Studio
- Installing Zoomstack Vector Tiles in Cadcorp SIS Desktop 9
- Installing Zoomstack Vector Tiles in QGIS

Note that the GIS software packages above were used for demonstrative purposes in this guide and that many other GIS software applications can be used with the Zoomstack product.

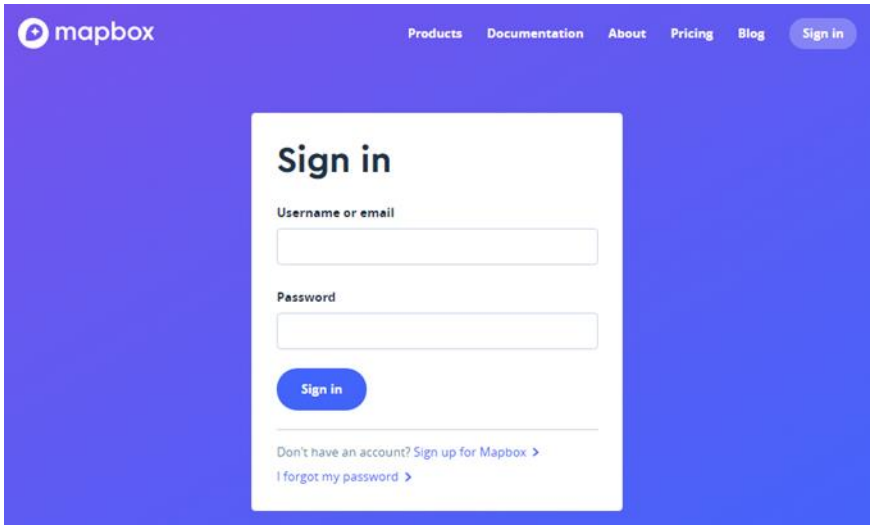
2.3 Installing Zoomstack Vector Tiles in Mapbox Studio

Mapbox Studio is a web application for creating custom maps. It allows you to manage and create datasets, tilesets, and map styles to produce maps with the features and the look and feel you want.

We recommend using Google Chrome for the best results.

The following instructions demonstrate how to install Zoomstack Vector Tiles using Mapbox Studio:

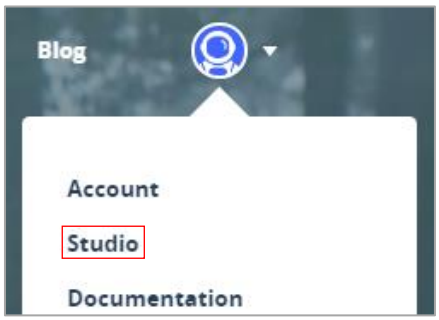
1. Download the Vector Tiles (MBTiles).
2. Go to Mapbox.com and sign in.



If you don't have a Mapbox Account, then create one by clicking on 'Sign up for Mapbox'.

A Pay-As-You-Go account will be fine for this purpose – it is free to get started and doesn't require any payment details.

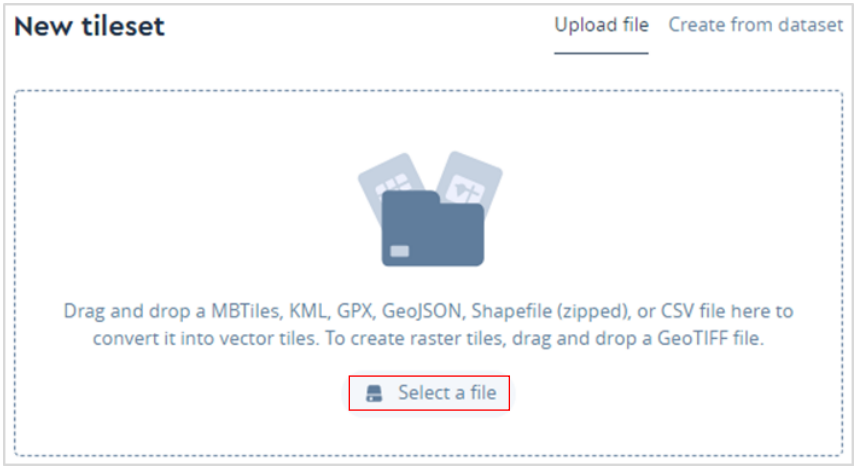
3. Once signed-in, click on *Studio* in the top right corner.



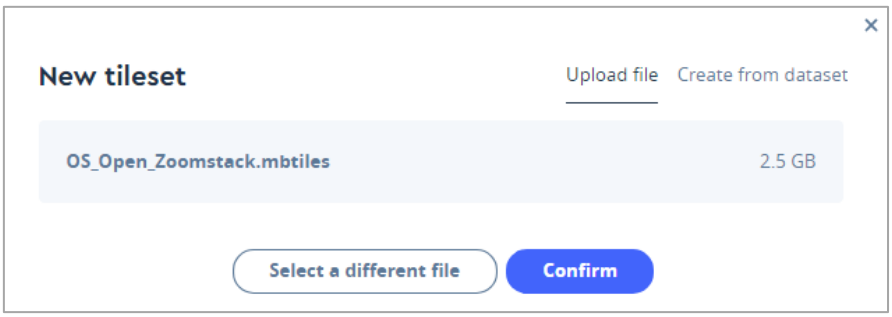
4. Click on the *Tilesets* tab in the top right corner.

Click on the *New Tileset* button.

5. Click on *Select a file*.



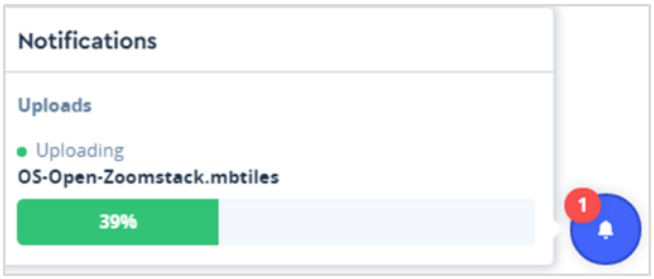
6. Navigate to the *OS_Open_Zoomstack.mbtiles* file and click *Open* and then click *Confirm*.



Mapbox Studio will then begin to upload and process your data and you will see a progress notification in the bottom right corner.

This will take a while, but you must stay on the page while it's processing.

You will see a notification in the bottom right. First it will say *Uploading* and then move on to *Processing*.



You may need to refresh the page eventually for it to complete the processing. We would recommend waiting 30 minutes before refreshing.

Once uploaded, it will appear in your list of Tilesets.

2.3.1 Using OS styles to get started in Mapbox Studio

OS has supplied Mapbox GL Styles created by our cartographic designers for use in Mapbox Studio. These stylesheets allow you to add colours to features contained in the Vector Tiles to produce a far more vivid and visually appealing map.

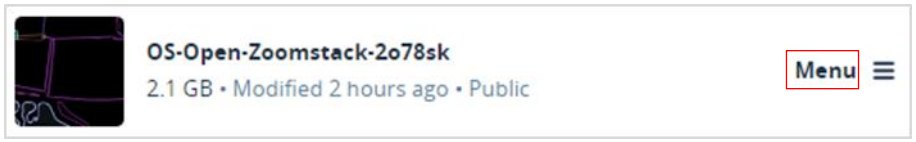
The steps that follow guide you through setting up Mapbox GL Styles in Mapbox Studio.

1. Download and unzip the OS Open Zoomstack Stylesheets folder. You can also view the stylesheets on GitHub.

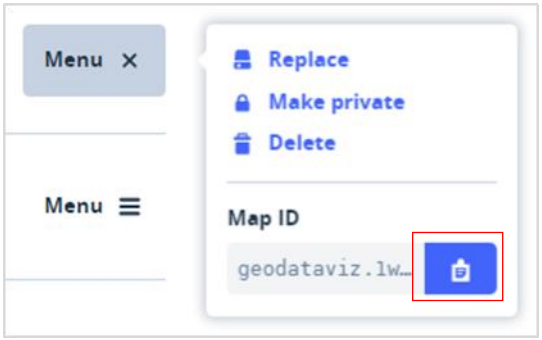
2. Copy the Map ID for your new Tileset by doing the following:

   a. In Mapbox Studio, click on the *Tilesets* tab in the top right corner.

   b. Scroll down until you see your new Tileset and click on the *Menu* button.



   c. Click on the clipboard icon to copy the Map ID.



3. Open the folder of stylesheets that you downloaded in step 1 and navigate to *Vector Tiles → Mapbox GL Styles* where you'll find four styles (Road, Outdoor, Light and Night).

4. Choose the style that you want to use and open the .json file (e.g. *Outdoor.json*) in a text editor.

5. Find this block of code near the top of the file (line 46) and paste your Map ID where it says ADD-SOURCE-URL-HERE:

```
"sources": {
    "composite": {
        "url": "mapbox://ADD-SOURCE-URL-HERE",
        "type": "vector"
    }
},
```

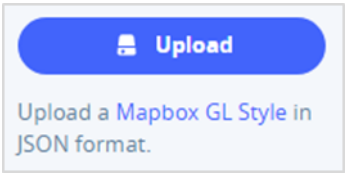
6. Save the .json file.

7. Go back to Mapbox Studio and on the *Styles* tab.

click

8. Click on the *New style* button.

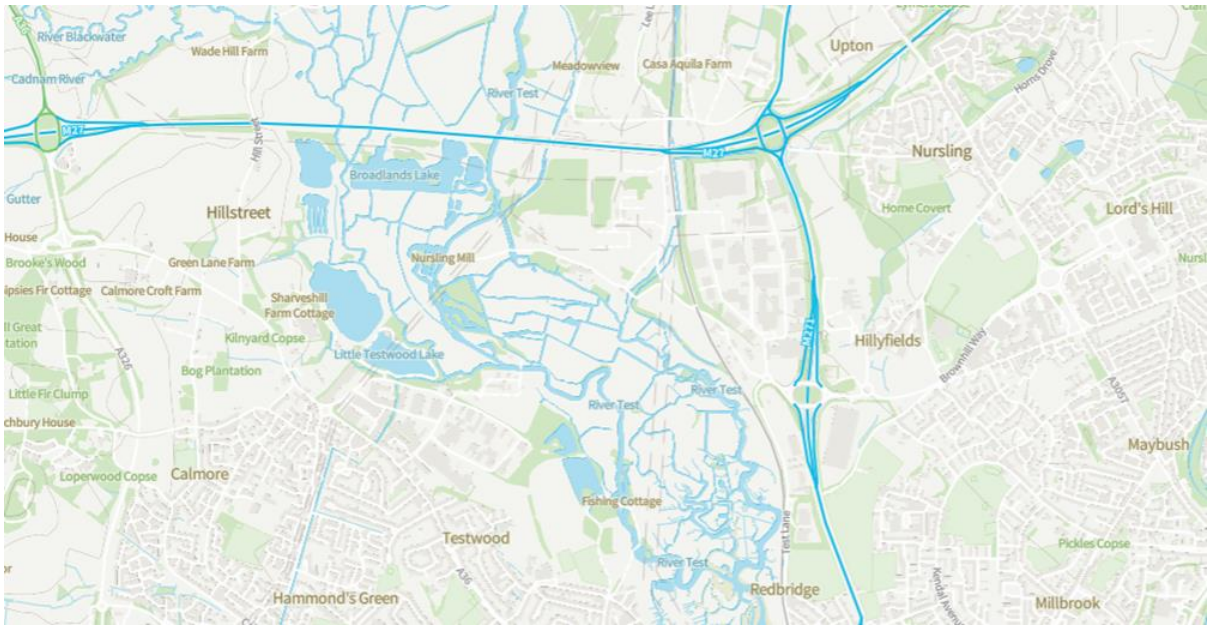
9. Click on the *Upload* button.



10. Navigate to your newly saved style.json file (e.g. OS Outdoor.json) and click *Open*.

    The style will then load up in the Mapbox Studio style editor.

    This is an example of what your map will look like if you chose the Outdoor style.

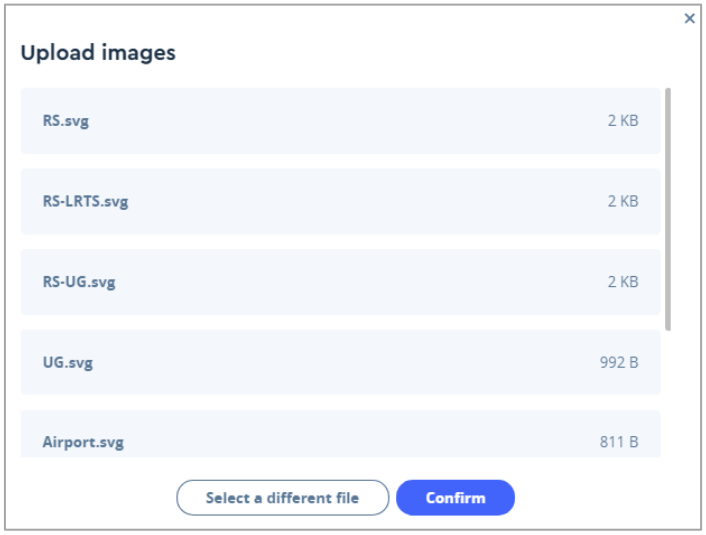


You may notice at this point that the symbols for Airports and Railway Stations aren't appearing, so now we need to add them to our new map.

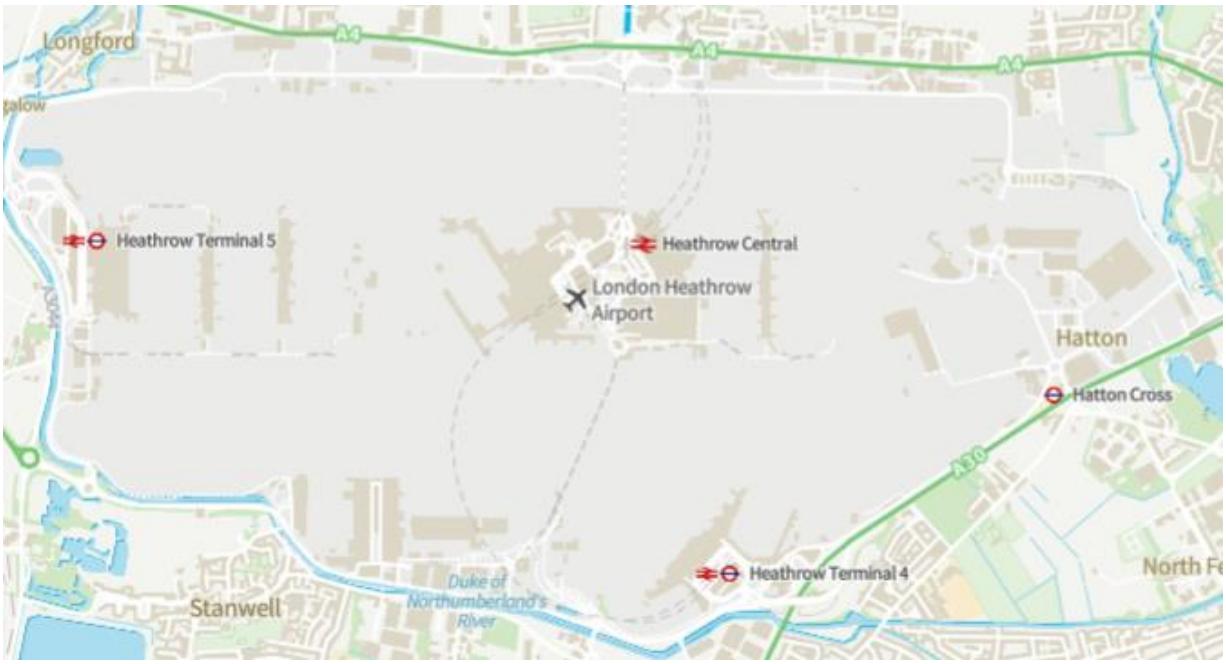
11. Open the folder of stylesheets that you downloaded in step 1 and navigate to *Vector Tiles → Mapbox GL Styles* where you'll find a folder called *os-open-zoomstack-symbols*.

12. Open this folder, then drag and drop the 7 SVG files into Mapbox Studio (directly into your browser window).

13. Click *Confirm* on the *Upload images* dialogue box.



14. Mapbox Studio will recognise the images and you should now see Airport and Railway Station symbols.



From this point on you can customise the content and style of your map (for example, you can turn layers on/off, delete them from your map, add new ones and change any of the style elements). You can learn more about how to use the Mapbox Studio style editor in this manual.

Once you are happy with your map, click *Publish* in the top right corner and your map is ready to use.

For more detailed information, take a look at Mapbox Studio tutorials.

2.4 Installing Zoomstack Vector Tiles in Cadcorp SIS Desktop 9

These instructions are based on Cadcorp SIS Desktop 9, released in November 2018.

1. Download the Vector Tiles (MBTiles), and the accompanying Mapbox GL Styles. You will need the style files from the Mapbox GL Styles folder and the sprites.json and sprites.png files, from the *sprites* sub-folder.

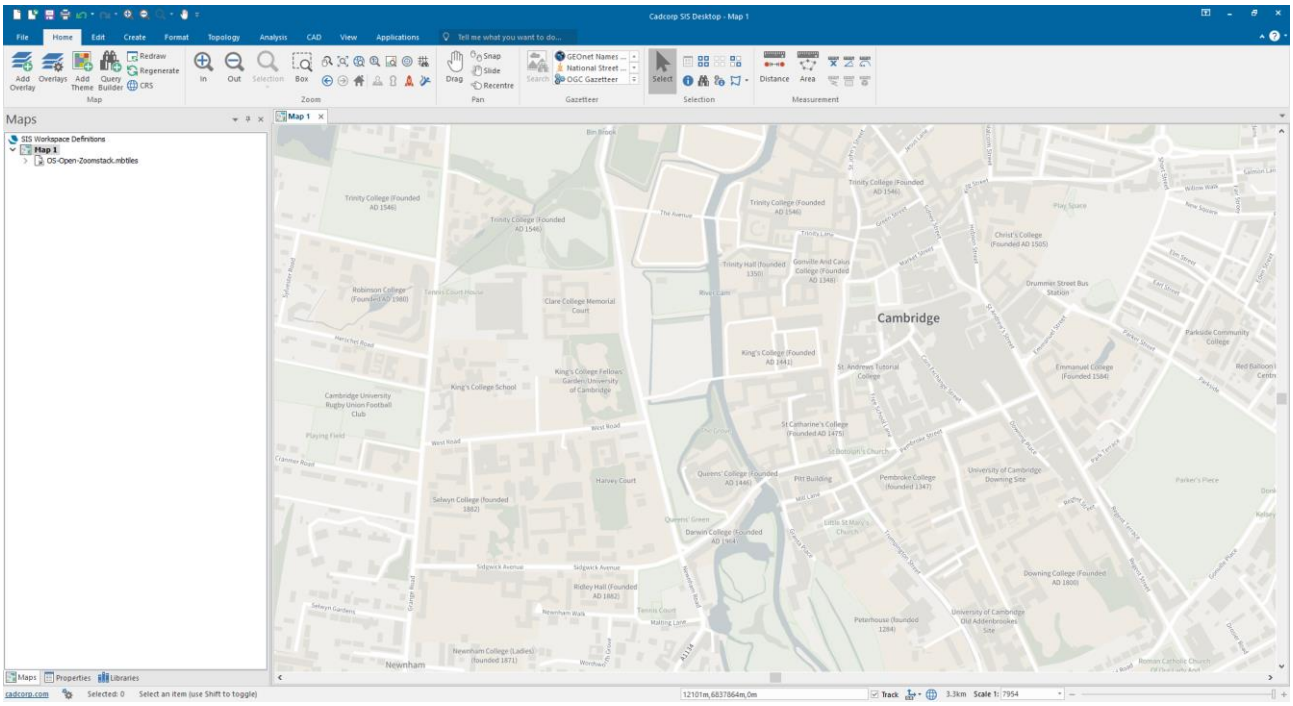
2. Rename one of the downloaded Mapbox GL Style files to *style.json* and place it, and the sprites.json and sprites.png files, alongside the downloaded MBTiles file (OS_Open_Zoomstack.mbtiles).

3. Open Cadcorp SIS Desktop.

4. The easiest way to load the data is to simply drag-and-drop the MBTiles file into Cadcorp SIS Desktop.

5. Because the tiles use the *WGS 84 Pseudo-Mercator* coordinate reference system the default extents are much bigger than GB, so you'll have to zoom in.

   Example view of Cambridge, using the Light style:



2.5 Installing Zoomstack Vector Tiles in QGIS

These instructions are based on QGIS 3.4 – a Long Term Release version.

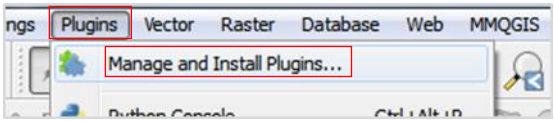
1. Download the Vector Tiles (MBTiles).

2. In QGIS, install the Vector Tile Reader Plugin.

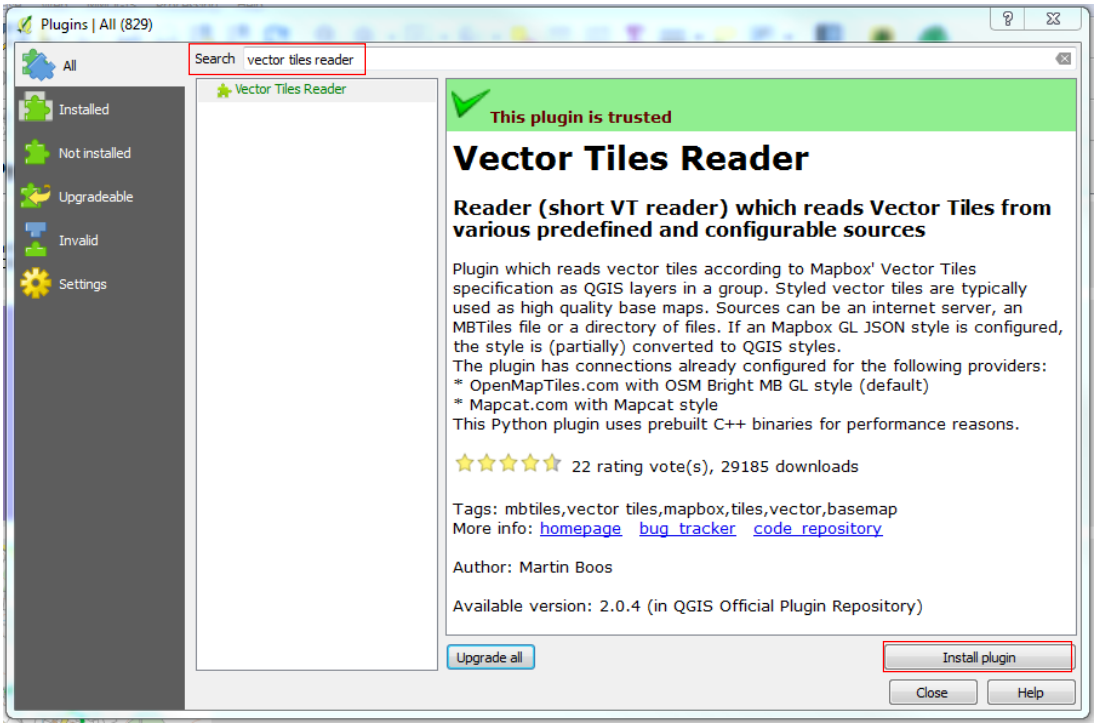
   Some versions of QGIS has a *Vector Tiles Reader* plugin that allows you to read Vector Tiles from a server, directory or local MBTiles file. Install the plugin as follows:

   a. Load QGIS desktop.

   b. From the top menu, click *Plugins* and then *Manage and Install Plugins…*

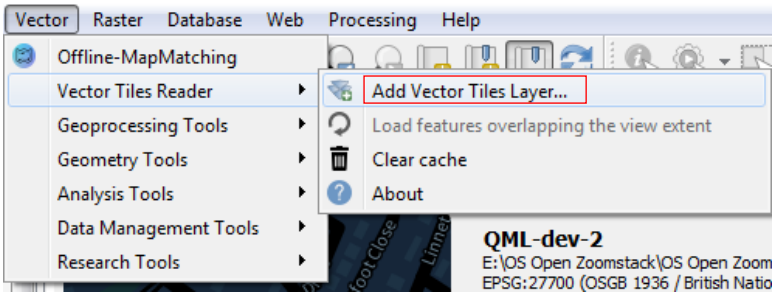


   c. In the dialogue box, search for *Vector Tiles Reader*, select it and click *Install plugin*.

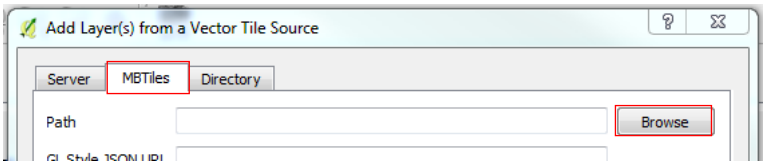


3. This section shows you how to load Vector Tiles in QGIS.

   a. After you've installed the Vector Tiles Reader plugin, go to the top menu, click *Vector → Vector Tiles Reader → Add Vector Tiles Layer…*

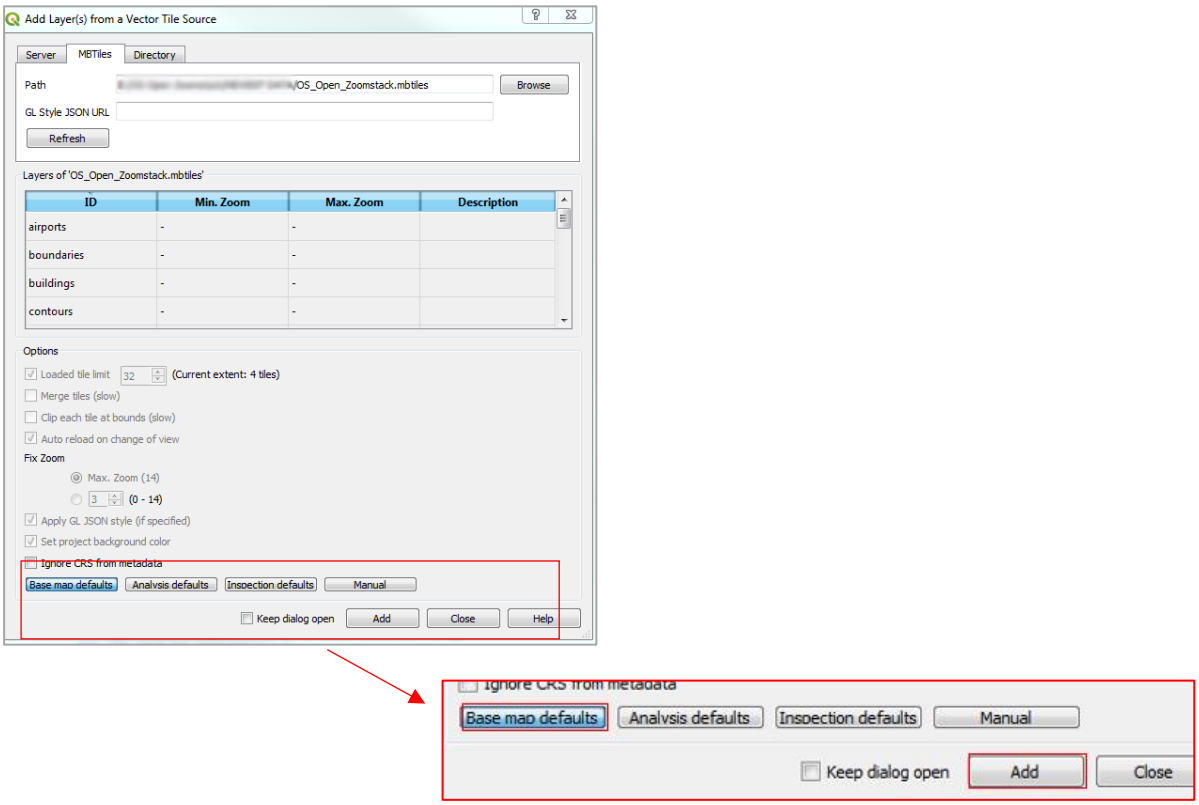


   b. In the dialogue box, select the *MBTiles* tab and then click *Browse*.



   c. Navigate to your data, *OS_Open_Zoomstack.mbtiles*, and click *Open*.

   d. Then hold the CTRL key and select all the layers, select *Base map defaults* and click *Add*.



The data will then appear in your Layers Panel and render in your map window. This plugin is new, and you may find it a little slow - it helps the performance if you zoom in to street level as this will limit the number of features in your map window.

4. In the Layers Panel, drag and drop the layers into the following order as this is the order in which QGIS will draw them:

You'll find more information and help with the plugin, on GitHub.

2.6 Host your own Vector Tiles

There are many choices for hosting and serving your own Vector Tiles. Here is a list of the available options for Vector Tiles and some more here relating specifically to MBTiles.

If you want to export the MBTiles file to a directory of files, then you can use Tippecanoe or MBUtil. This post is a nice example of the former using OS Open Zoomstack.

2.7 Using OS Styles on Vector Tiles You Created

It is possible to use OS styles on Vector Tiles you've created. Follow the steps below to do this.

1. You will need to download the folder of stylesheets. You can also view the stylesheets on GitHub.

2. Once you've downloaded and unzipped the folder of stylesheets, navigate to *Vector Tiles → Mapbox GL Styles* where you will find four styles.

Choose the style that you want to use and open the .json file (e.g. *OS Outdoor.json*) in a text editor.

3. Find this chunk of code near the top of the file and paste your data source where it says ADD-SOURCE-URL-HERE:

```
"sources": {
    "composite": {
        "url": "mapbox://ADD-SOURCE-URL-HERE",
        "type": "vector"
    }
},
```

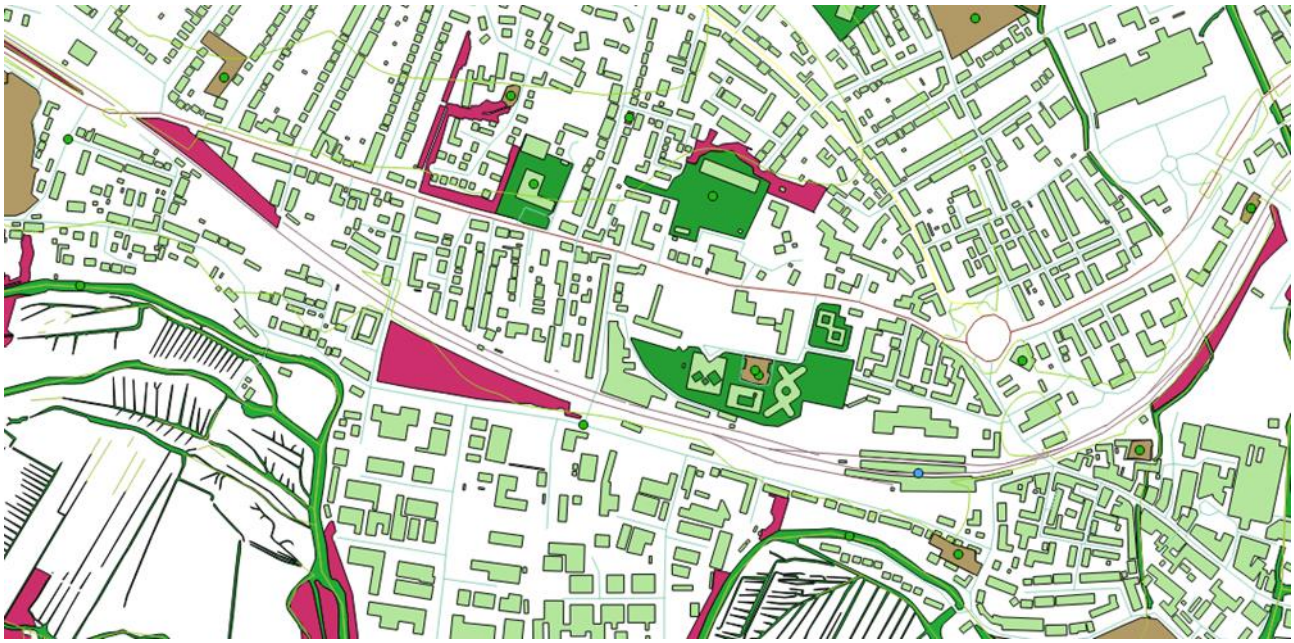
   You can find more information on the different source types here.

4. Save the .json file.

   This style is now ready to use. If you want to customise the style, then Maputnik is a good open source map editor for this job.

3. Zoomstack GeoPackage Format

3.1 What is a GeoPackage?



GeoPackage is an open, standards-based, portable, platform-independent, compact format for transferring geospatial information. This allows Zoomstack to store geospatial data in a single file that is easy to distribute. It can hold large amounts of data and can support the different geometry types and indexes which make the data much easier to use. Quite simply it is a great Plug n Play format which works with a wide range of software implementations.

3.2 What are the Benefits of GeoPackage?

GeoPackage offer users the following benefits:

- The single file is easy to transfer and offers the end-user a rich experience.
- Attribute names are not limited in length making it user friendly.
- No file size limit so lots of data can be easily accommodated.
- Supports both raster and vector making it versatile for any type of data.
- OGC Standard.

The instructions that follow are for installing Zoomstack GeoPackage in various GIS software applications. Please refer to the relevant section based on the GIS software you're using:

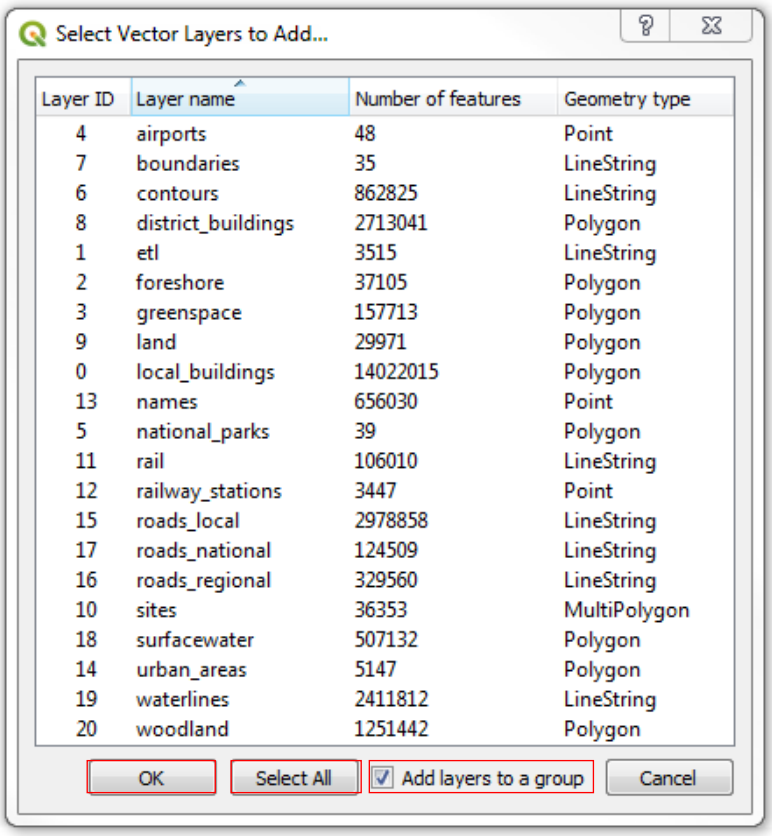
- Installing Zoomstack GeoPackage in QGIS
- Installing Zoomstack GeoPackage in ESRI ArcMap
- Installing Zoomstack GeoPackage in Cadcorp SIS Desktop 9
- Installing Zoomstack GeoPackage in MapInfo

Note that the GIS software packages above were used for demonstrative purposes in this guide and that many other GIS software applications can be used with the Zoomstack product.

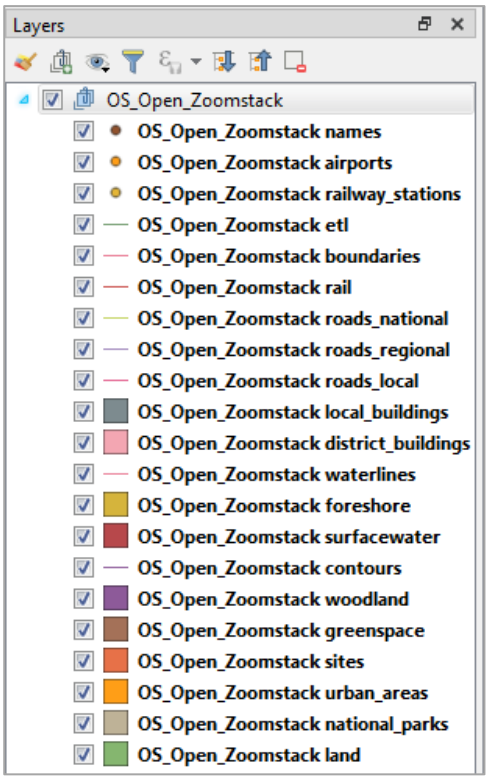
3.3 Installing Zoomstack GeoPackage in QGIS

These instructions are based on QGIS 3.4 – a Long Term Release.

1. Download and unzip the GeoPackage.
2. Open QGIS and start a new project.
3. The easiest way to load the data is to simply drag and drop the unzipped GeoPackage (*OS_Open_Zoomstack.gpkg*) into QGIS, click *Select All* and *Add layers to a group*, then click *OK*.



4. In the Layers Panel, drag and drop the layers into the following order as this is the order in which QGIS will draw them:



It may take a little while for the data to render as this is a large file. You may find it quicker if you zoom in to street level as this will limit the number of features in your map window.

We would highly recommend using the stylesheets OS provides as this adds feature filters and styling. The following instructions show you how to use our QML stylesheets.

3.3.1 Using OS stylesheets to get started in QGIS

OS has supplied QML stylesheets for use in QGIS. The QML stylesheets allow you to add colours to features contained in the Vector Tiles to produce a far more vivid and visually appealing map.

The steps that follow will guide you through setting up QML stylesheets in QGIS.

1. Before continuing, you will need to download the folder of stylesheets. You can also view the stylesheets on GitHub.

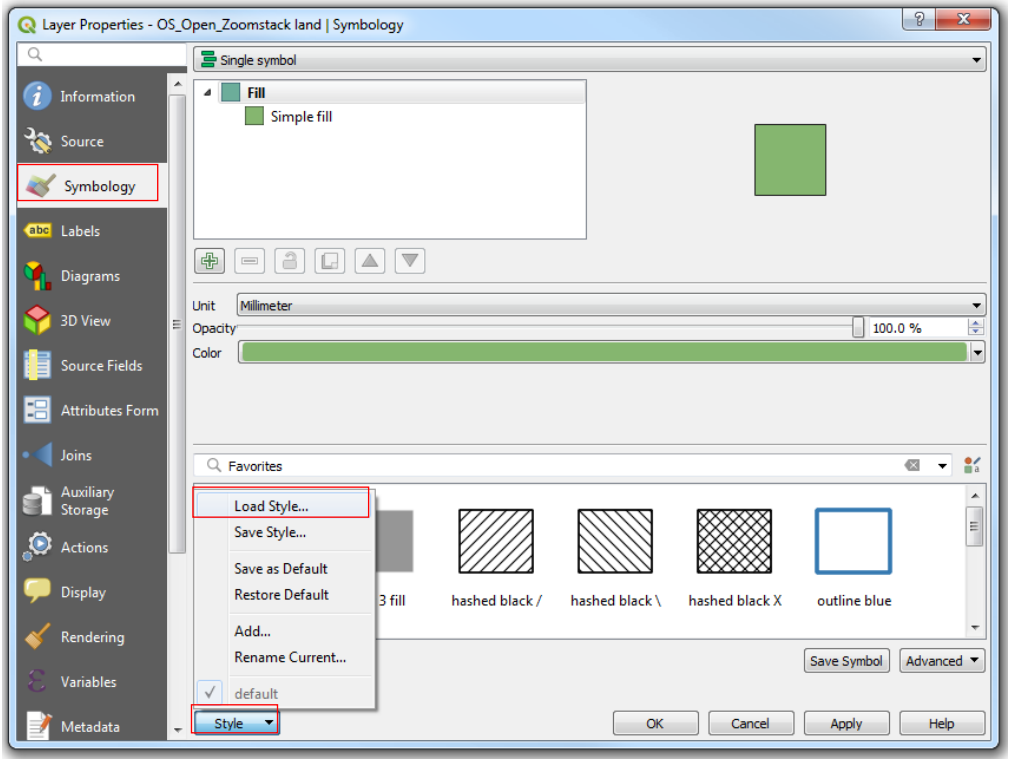
2. Once downloaded and unzipped, navigate in the folder to *GeoPackage → QGIS Stylesheets (QML)*.

3. Next, copy the folder of SVGs called *os-open-zoomstack-symbols* into your QGIS SVG directory (a typical Windows file path is *C:\Program Files\QGIS xxxx\apps\qgis\svg*, where xxxx represents the version of QGIS you are running). QGIS may require a restart in order to pick these up.

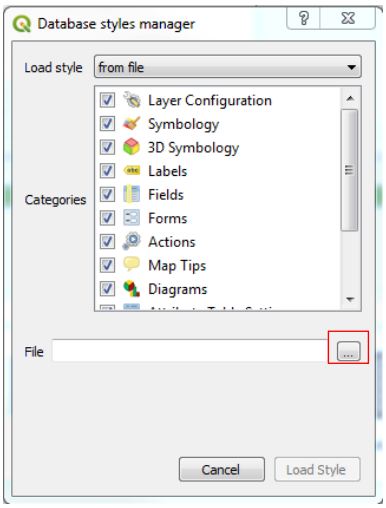
4. To add a sea tint to your map, go to the top menu and select *Project* → *Properties...* → *General* and change the background colour depending on your chosen style:

    - Outdoor: R169 G221 B239
    - Road: R213 G239 B248
    - Light: R197 G205 B208
    - Night: R4 G19 B38

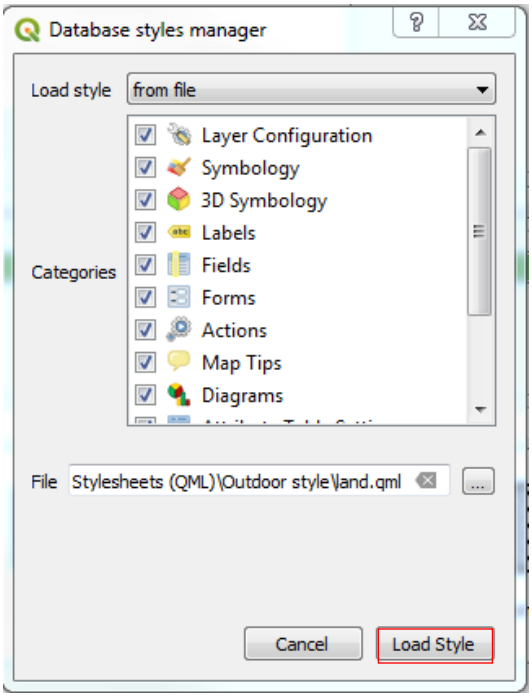
5. To apply the QML, double-click on a layer to open up the Layer Properties window. Then, from the left-hand panel, select the *Symbology* tab, click *Style* → *Load Style*…



6. Next, click the 3 dots along from *File*.



7. Then browse to your folder of stylesheets, navigate to *GeoPackage → QGIS Stylesheets (QML)* and select the corresponding QML file (e.g. *land.qml* for the land layer), then click *OK* and *Load Style*.



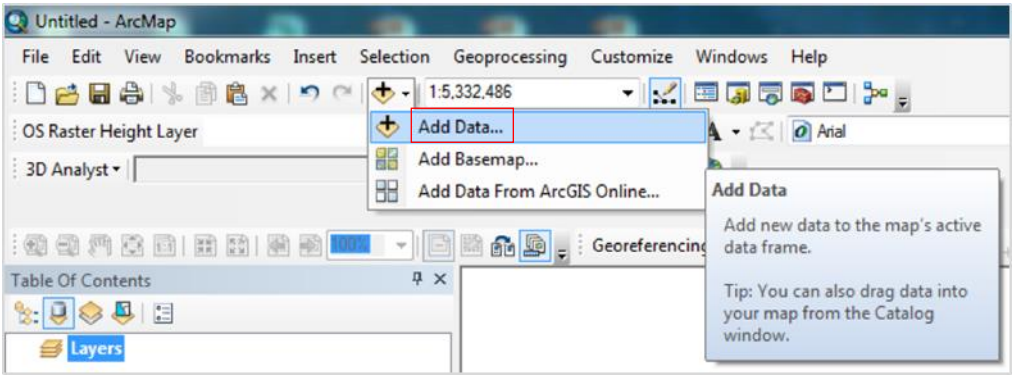
8. You will need to repeat this process for every layer until they are all styled, and you have a gorgeous map.

3.4 Installing Zoomstack GeoPackage in ESRI ArcMap

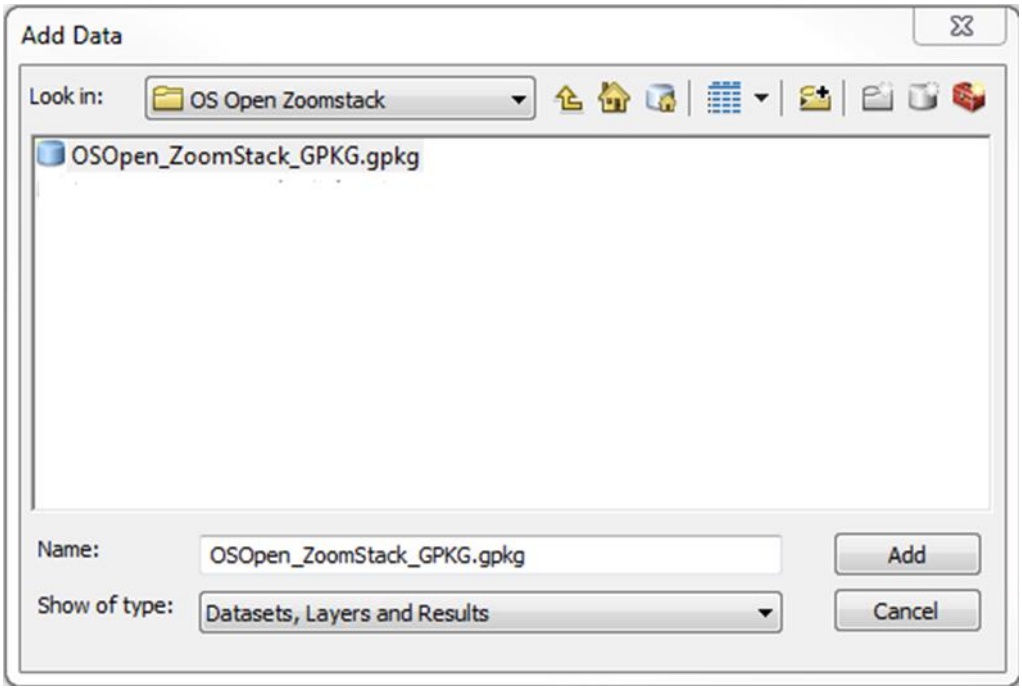
These instructions are based on ESRI ArcMap 10.6.1. ArcMap versions 10.2 and above will support GeoPackage and versions 10.3 and above also support the editing of GeoPackage.

1. Download and unzip the GeoPackage.

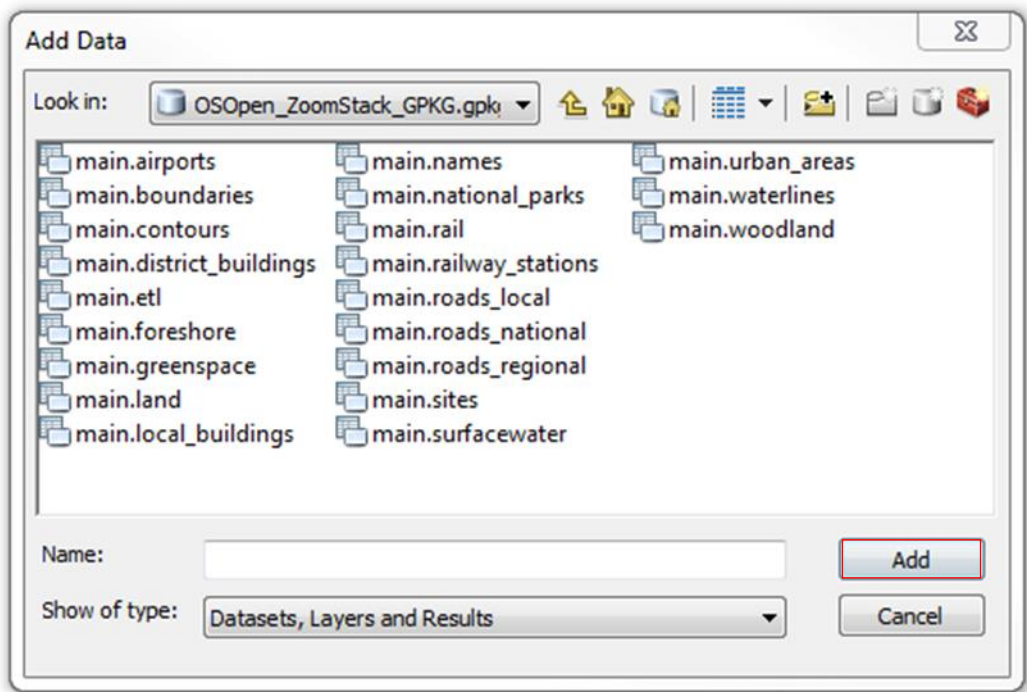
2. Open ArcMap and click on the *Add Data* button.



3. Browse to the location of your unzipped GeoPackage.



4. Double click on the .gpkg file then either select one layer, or hold CTRL and select all layers and then click *Add*.



The data will now load into ArcMap. This may take a while as this is a large file, but once it is loaded you will see the data rendered with default styles.

Render speeds can be quite slow when all the layers are visible. If you are only interested in a few layers, then you can turn the others off – OS Open Zoomstack is fully customisable in that sense.

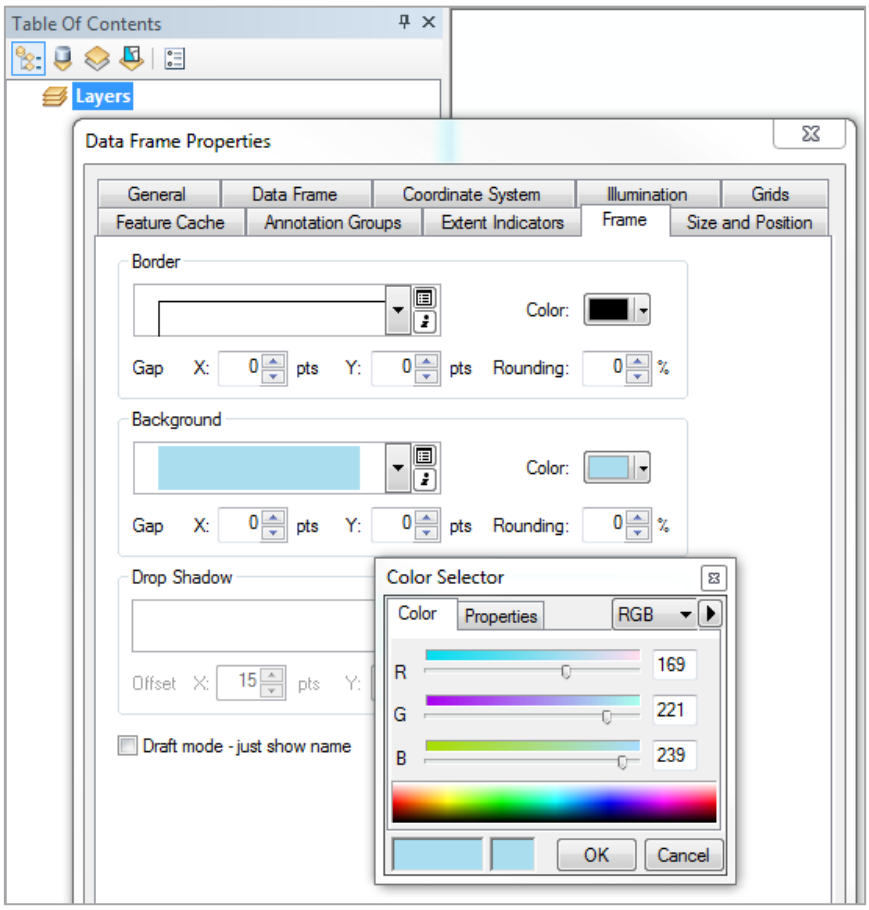
It is highly recommended you use the OS stylesheet provided as this adds the relevant layer ordering and feature filters. The following instructions show you how to use the LYR File.

3.4.1 Using OS stylesheets to get started in ESRI ArcMap

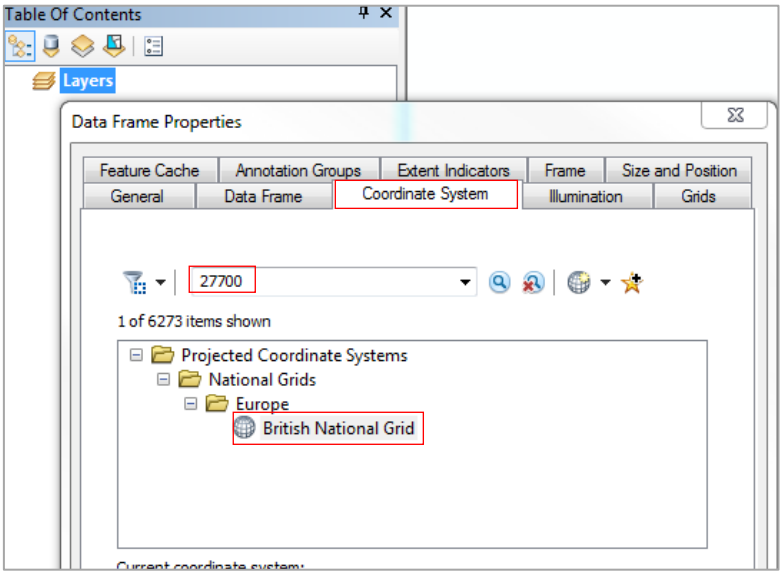
1. Before continuing, you will need to download the folder of stylesheets. You can also view the stylesheets on GitHub.

2. Firstly, we'll add a sea tint to your map. To do this, right click on *Layers* and then *Properties*…. In the *Data Frame Properties*, select *Frame* and change the Background colour depending on your chosen style:

   - Outdoor: R169 G221 B239
   - Road: R213 G239 B248
   - Light: R197 G205 B208
   - Night: R4 G19 B38

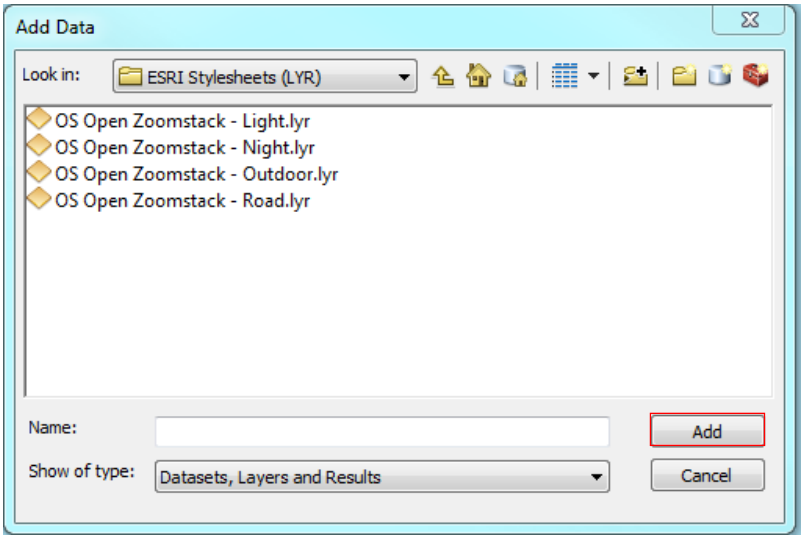


3. Next, set the Coordinate System to British National Grid. Select the *Coordinate System* tab and search for *27700*, select *British National Grid* and click *OK*.

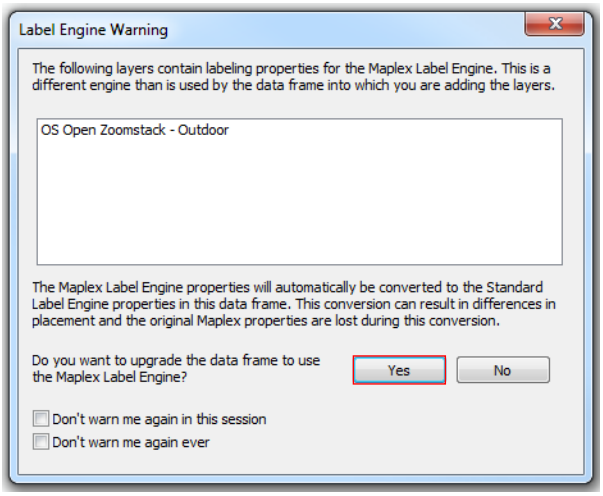


4. Click the *Add Data* button 

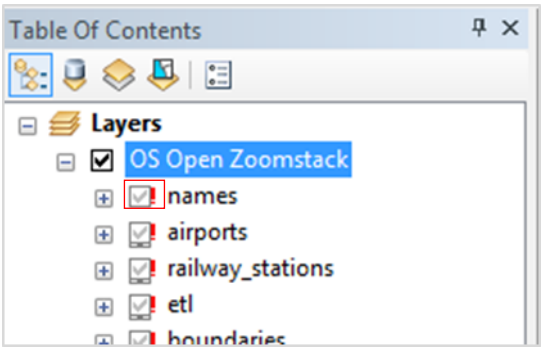
5. Then browse to your folder of stylesheets, navigate to *GeoPackage → ESRI Stylesheets (LYR)* and select the style of your choice, then click *Add.*



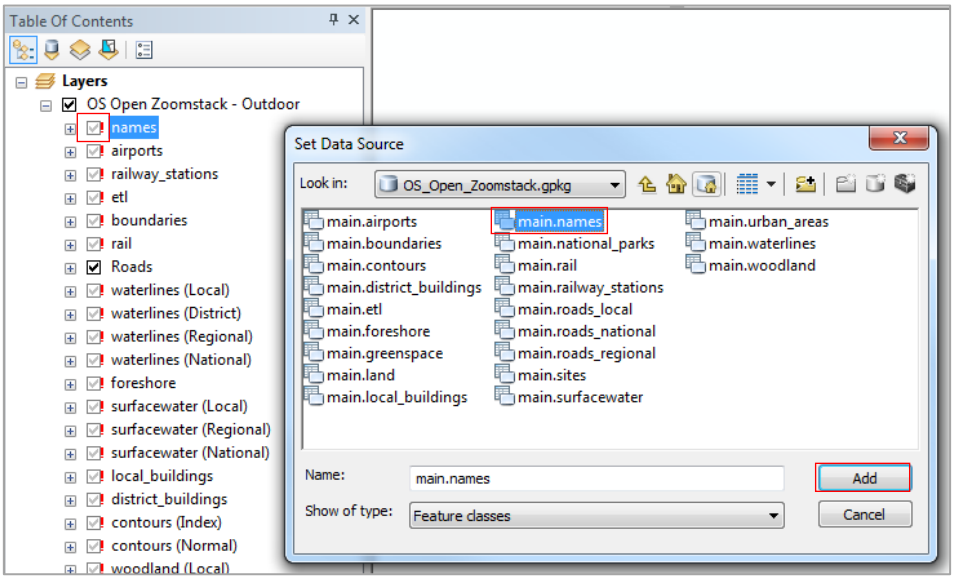
6. If you see the following *Label Engine Warning*, click *Yes*.



The LYR File will then load into your Table of Contents but there will be a red exclamation mark against each layer and initially no data will render.



7. Click on one of the red exclamation marks to open the *Set Data Source* dialogue box then navigate to your *OS_Open_ZoomStack.gpkg*, select the corresponding layer and click *Add*.



8. You will need to repeat this process for every layer until they are all styled.

Note that Roads are in a group which you will need to expand before setting the data sources.

Although designed in ArcMap, the LYR Files will also work in ArcGIS Pro in the same way as described above. Due to a difference in rendering engine, your map may appear slightly different.

3.5 Installing Zoomstack GeoPackage in Cadcorp SIS Desktop 9

These instructions are based on Cadcorp SIS Desktop 9, released in November 2018.

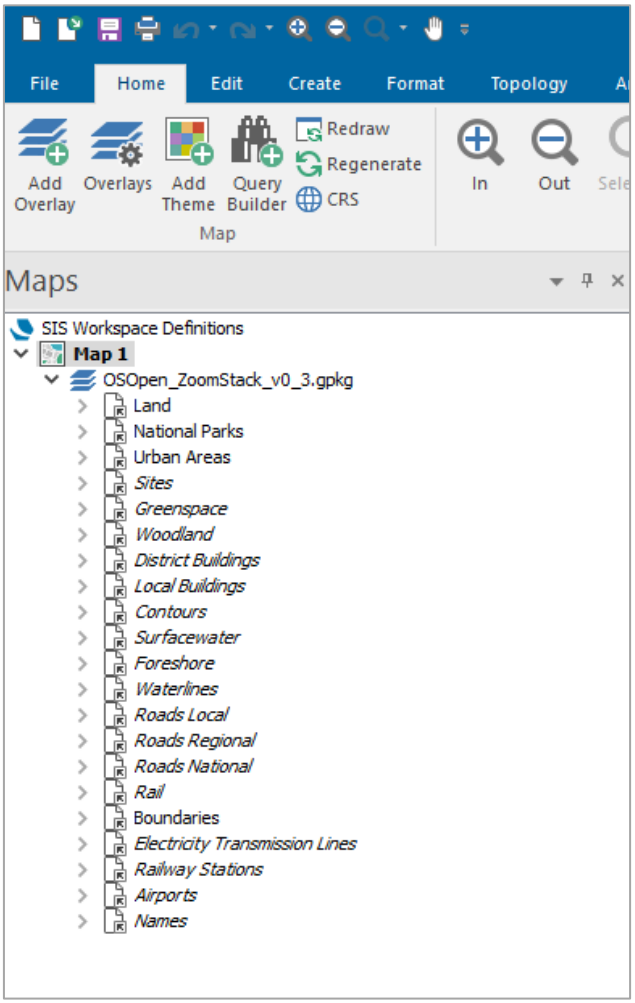
1. Download and unzip the GeoPackage.

2. Open Cadcorp SIS Desktop.

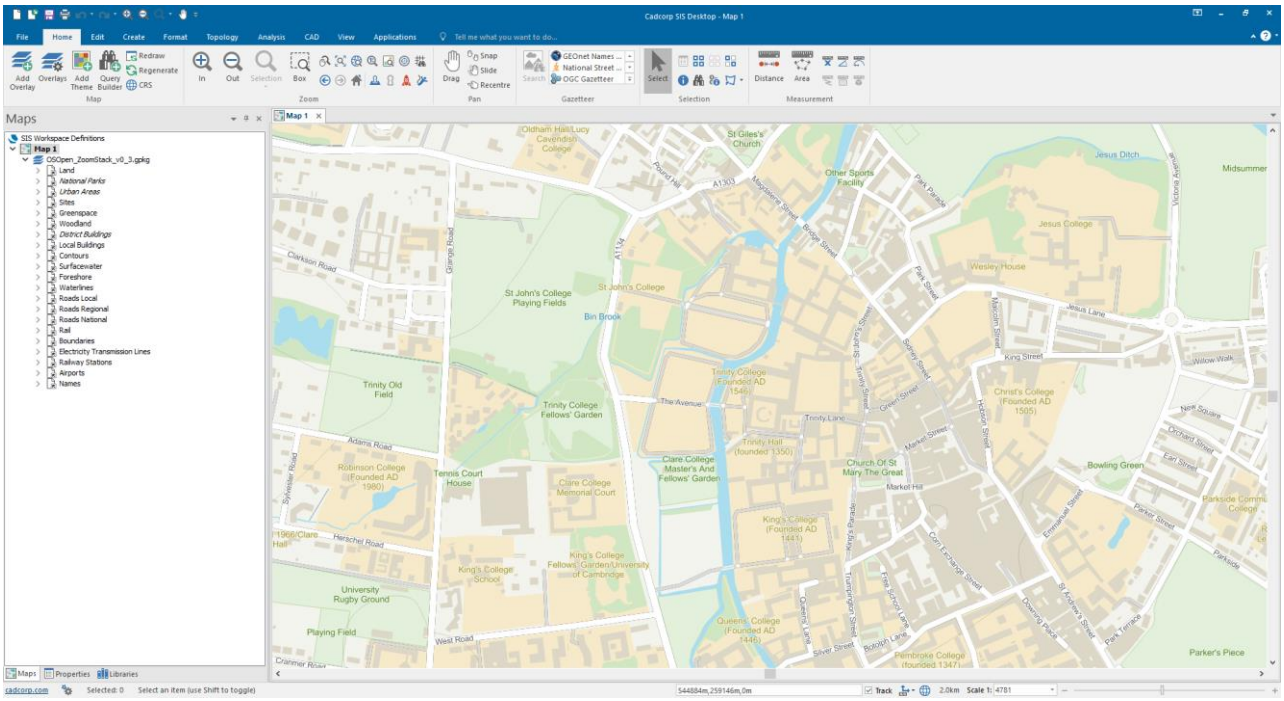
3. The easiest way to load the data is to simply drag-and-drop the unzipped GeoPackage (OS_Open_Zoomstack.gpkg) into Cadcorp SIS Desktop.

4. Cadcorp SIS Desktop will automatically recognise the GeoPackage as OS Open Zoomstack, will load the Zoomstack layers (known as *Overlays* in Cadcorp SIS Desktop) in the correct order for drawing, will apply suitable scale thresholds to those Overlays, and will also apply default styling to the Overlays, using the Outdoor style.

   Expanding the tree in the Maps control bar will show the loaded Overlays (those marked in *italics* are not visible in the current map view due to their scale-threshold):



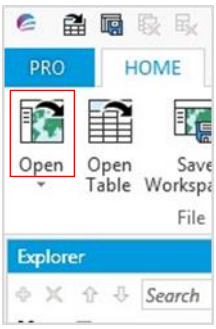
Example view of Cambridge, using the Outdoor style:



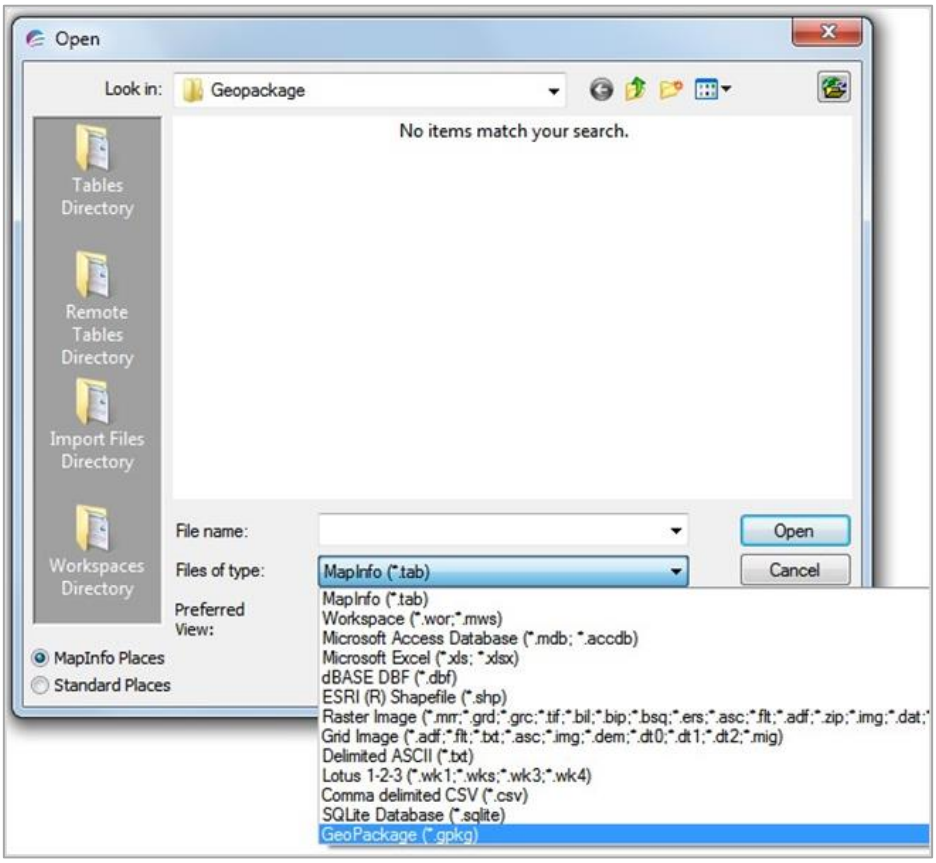
3.6 Installing Zoomstack GeoPackage in MapInfo

MapInfo Pro version 15.2.2 and above supports reading, editing and creating GeoPackage Feature Tables.

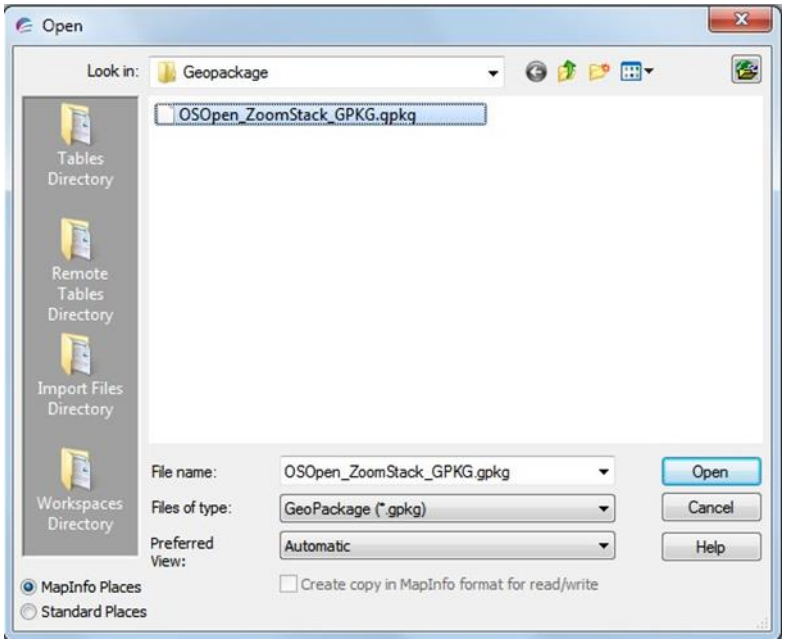
1. Download and unzip the GeoPackage.
2. Open MapInfo.
3. Click on the Open button.



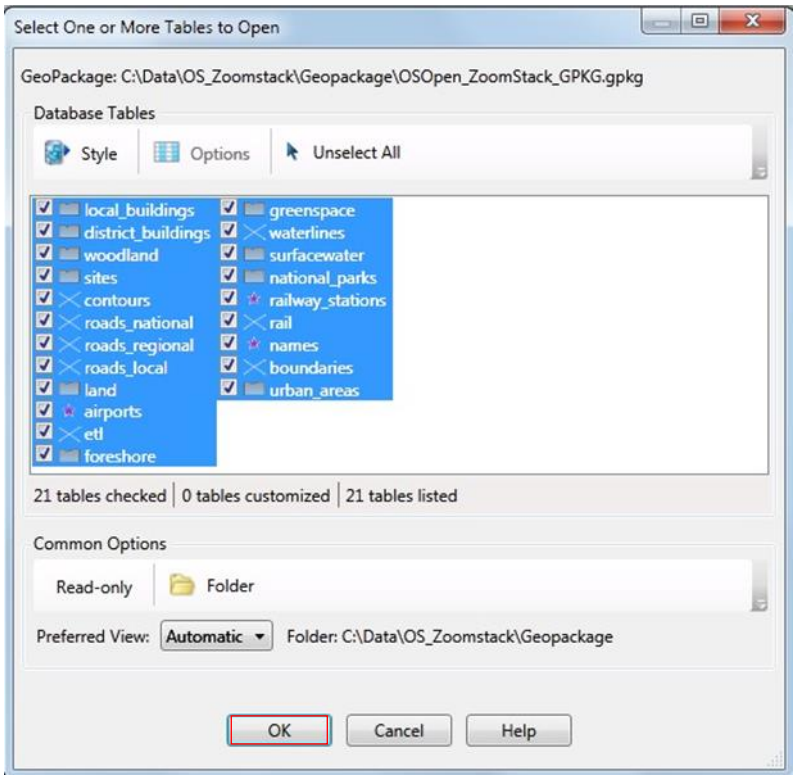
4. In the following window, browse to the location of your GeoPackage and, using the dropdown, select *GeoPackage* as the file type.



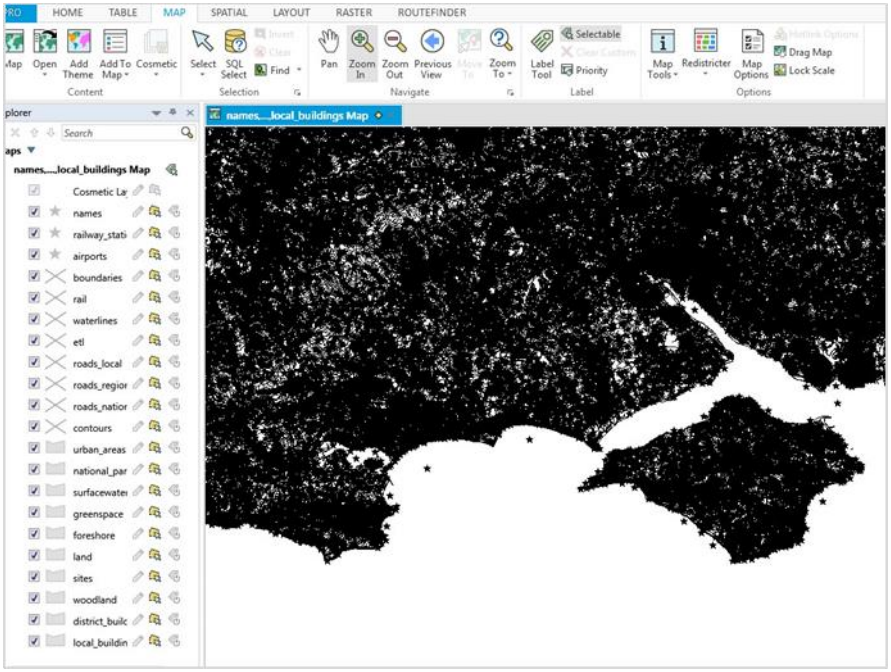
5. Select *OS_Open_ZoomStack.gpkg* and click Open.



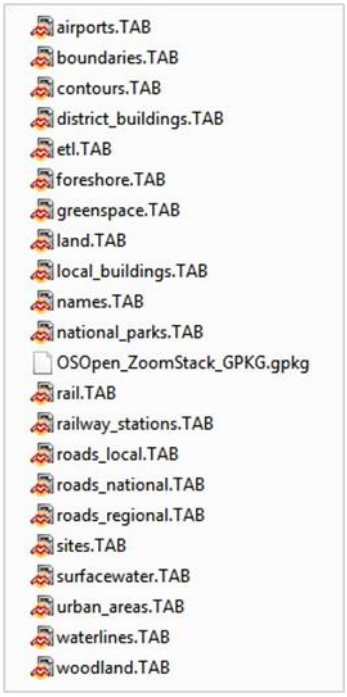
6. Select all the tables and click *OK*.



Your data will then render in your map view with default styles.



In your data folder, you will notice that TAB files have been created for each table.



4 Manually Applying Styles

Not all GIS software allows for a stylesheet to be applied directly to your data, so you may be required to manually input the cartographic styles. For this purpose, we have supplied the colour values for each of our four house styles; Outdoor, Road, Light and Night.

You can view them on GitHub in the Colour Values folder. You can also download the folder of stylesheets.

If you create your own cartographic styles, please share them with us as we're very interested to see what you've done. You can do so by saving a screenshot and tweeting it, tagging in @OrdnanceSurvey.

7. Appendix 3 – List of file Downloads

Filename
Mapbox Vector Tile Specification
GeoPackage Download
Vector Tiles (MBTiles)
Zoomstack Stylesheets

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