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Introduction

Geology Download allows users to download British Geological Survey (BGS) map data for use in Geographical Information Software (GIS). Any registered user of Geology Digimap can download multiple map data products for their selected area.

In this exercise you will import and apply a style to small scale geological data in ArcGIS, then overlay geographic map data from Ordnance Survey.

These instructions have been prepared using ArcGIS version 10.1.

What is Geology Download?

Geology Download offers:

- Four categories of map data: Onshore Geology, Offshore Geology, Rock Information and Groundwater.
- DigMapGB – British Geological Survey onshore geological mapping in 5 scales – the most detailed is at a scale of 1:10000.
- All vector data supplied in Shape file format. MIF/MID format available for selected map data products.



What map data is available from Geology Download?

The map data products available through Geology Download are grouped into four categories: Onshore Geology, Offshore Geology, Rock Information and Groundwater.

The categories can be viewed in Step 2 of the Geology Download screen. A category can be expanded by clicking on the small plus symbol or on any category name.

Click **Info** next to any mapping product for details of scale, available format and a brief introduction to the dataset.

Product	Allowance
⊕ Onshore Geology (0 selected)	
⊕ Offshore Geology (0 selected)	
⊕ Rock Information (0 selected)	
⊕ Groundwater (0 selected)	

Onshore Geology

⊖ Onshore Geology (0 selected)			
<input type="checkbox"/>	1:10 000 Geology	Info	(0/50) tiles
<input type="checkbox"/>	1:25 000 Geology	Info	(0/30) tiles
<input type="checkbox"/>	1:50 000 Geology	Info	(0/30) tiles
<input type="checkbox"/>	Soil-Parent Material	Info	(0/30) tiles
<input type="checkbox"/>	Superficial Thickness Advanced	Info	No limit
<input type="checkbox"/>	Superficial Thickness Basic	Info	No limit
<input type="checkbox"/>	1:250 000 Geology	Info	No limit
<input type="checkbox"/>	1:625 000 Geology	Info	No limit

The Onshore Geology category contains:

1. British Geological Survey's **DiGMapGB** onshore geological mapping of Great Britain at 5 scales:
 - 1:10000 – note that this map product does not cover all of Great Britain.
 - 1:25000 – note that this map product does not cover all of Great Britain.
 - 1:50000 – covers all of GB.
 - 1:250000 – covers all of GB.
 - 1:625000 – covers all of GB.

Depending on the scale you select, **DiGMapGB** has a number of layers, including:

- Bedrock geology
- Superficial deposits
- Mass movement
- Artificial ground
- Linear features

2. **Soil Parent Material** - this map product details the distribution of physiochemical properties of the weathered and unweathered rock nearest the surface. The data is useful for:

- mapping of UK soil properties.
- identifying soils and landscapes sensitive to erosion.
- developing a better understanding of weathering properties and processes.

3. The **Superficial Deposits Thickness Model (SDTM)** is a raster-based dataset designed to demonstrate the variation in thickness of Quaternary-age superficial deposits across Great Britain, derived from borehole information and geological map data. The data comes as an Advanced or Basic Model, with a Distance Buffer layer to indicate the level of confidence in the model. The data is useful for:

- Civil Engineering
- Ground Water Modelling
- Predicting Landslides

Onshore Geology – Data Formats

Map data product	Shape file	MIF/MID	ArcInfo (raster)
1:10000 Geology	Y		
1:25000 Geology	Y		
1:50000 Geology	Y	Y	
1:250000 Geology	Y	Y	
1:625000 Geology	Y	Y	
Soil-Parent Material	Y		
Superficial Thickness Advanced			Y
Superficial Thickness Basic			Y

Offshore Geology

Offshore Geology (0 selected)		
<input type="checkbox"/>	1:250 000 Offshore Geology	Info No limit

Offshore Geology map data is available at a scale of 1:250000 and covers bedrock geology, fault lines and seabed sediments. Provided in Shapefile format.

Rock Information

Rock Information (0 selected)		
<input type="checkbox"/>	Lexicon of Named Rock Units	Info No limit
<input type="checkbox"/>	Onshore Borehole Index	Info No limit

- The **Lexicon of Named Rock Units** is provided in Excel format and has more than 13,000 entries. It contains information on rock units. Entries include:
 - Rock Unit Name and type.
 - Descriptions of the rock and its boundaries.
 - Details of the rock's age.
- The **Onshore Borehole Index** is provided as a Shape file. The Borehole Index contains:
 - Borehole locations.
 - Borehole names and depths.
 - Borehole ID codes.

Groundwater

Groundwater (0 selected)		
<input type="checkbox"/>	Geological Indicators Of Floo...	Info No limit
<input type="checkbox"/>	Permeability Indices	Info No limit

- Geological Indicators of Flooding** provide information on areas where Superficial Deposits show evidence of flooding. Areas are classified as being at high or low risk of flooding.

Permeability Indices. Data based on the DigMapGB 1:50000 scale. The Permeability Index consists of a three-part code representing: Predominant Flow Mechanism, Maximum Permeability and Minimum Permeability.

What will I learn from this exercise?

On completion of this guide you will be able to:

- Identify individual map data files
- Import and view geological vector data to ArcGIS
- Apply a cartographic style to Shapefiles in ArcGIS
- Optional: overlay geographical raster map data from Digimap's Ordnance Survey Collection

What data do I have?

We have provided you with two types of data for use with this guide, in 2 folders:

Geology data – BGS 1:625000

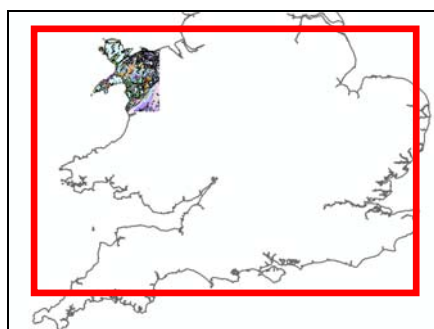
This dataset covers all of Great Britain and is freely available from the British Geological Survey (BGS) website:

<http://www.bgs.ac.uk/opengeoscience/downloads.html>

You can download this data, and more detailed British Geological Survey data, from Geology Download:



Your data is for the area of Anglesey, as outlined in red on the image below:



You have four Shapefiles; geology lines, bedrock polygons, dykes polygons and superficial polygons:

1. gb_625k_v5_fault_geology_lines_CLIP
2. gb_625k_v5_bedrock_geology_polygons_CLIP
3. gb_625k_v5_dykes_geology_polygons_CLIP
4. gb_625k_superficial_geology_polygons_CLIP

Shapefile is a data format that consists of at least 3 types of file of the same name. All of the constituent files must be kept in the same location in order for the Shapefiles to work correctly. **Do not split the files up!**

1. **SHP**—shapefile format; the feature geometry (line, point, polygon, etc)
 2. **DBF**—attribute format; attribute data stored in dBASE IV format
 3. **SHX**—shape index format
 4. **PRJ** – often a PRJ file is included, which stores information about the projection and spatial coordinate system of its associated Shapefile.
-
2. One AVL file and three LYR files have been provided by the BGS. These are the files used in ArcGIS to apply the BGS cartographic style to the geology layers.

Ordnance Survey OpenData raster dataset

We have also provided some Ordnance Survey geographic data:

- Ordnance Survey data, 1:250000 raster, tile SH, which covers North Wales.
- The image shows the contents of the folder **250000 OS Raster data**.
- The TIF file is your raster map image.
- The TFW file contains the geographic coordinates of your map image. **DO NOT DELETE THIS FILE.**

Name	Date modified	Type	Size
sh	02/11/2012 11:36	TIFF image	3,617 KB
sh.tfw	02/11/2012 11:36	TFW File	1 KB
os_open_conditions	02/11/2012 11:36	Text Document	1 KB
250k_raster_gaz_2012	02/11/2012 11:36	Text Document	1,024 KB

This map data is freely available via the Ordnance Survey OpenData website:

<http://www.ordnancesurvey.co.uk/oswebsite/products/os-opendata.html>

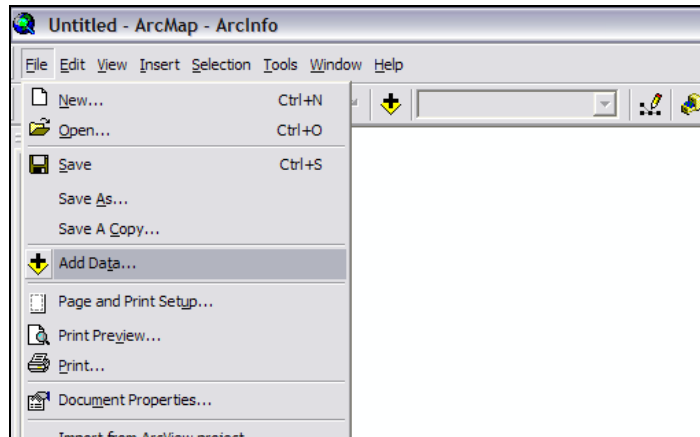
You can also download the data from Digimap’s Ordnance Survey Collection, in the Data Download service:



Add geological data in ArcMap

Shapefiles are compatible with ArcGIS. Let's add and view our geological data.

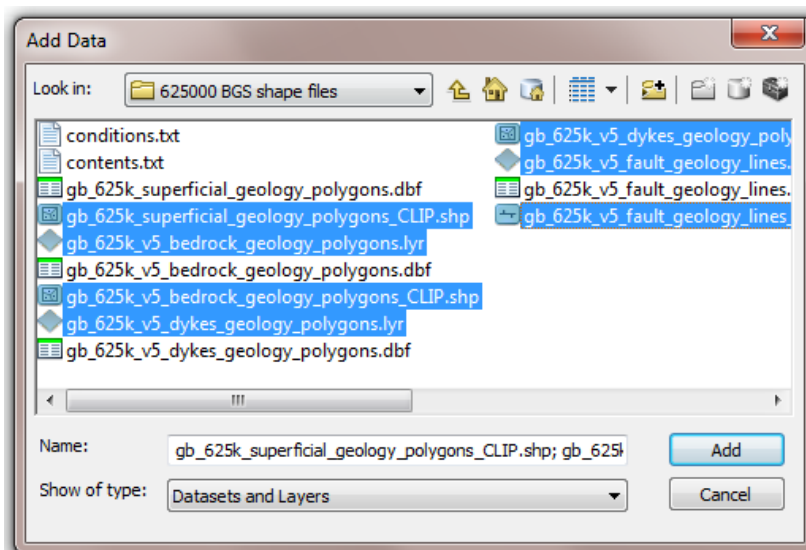
1. Start ArcMap¹:
2. Click on the **File** menu and select **Add Data**.



3. Navigate to the folder containing your data files. You may have to click the **Connect to Folder** button, a yellow folder with a plus sign to see your folder.

4. Select all **four geology Shapefiles** and the **three layer files (.lyr)** visible in the dialog box using **CTRL + click**.

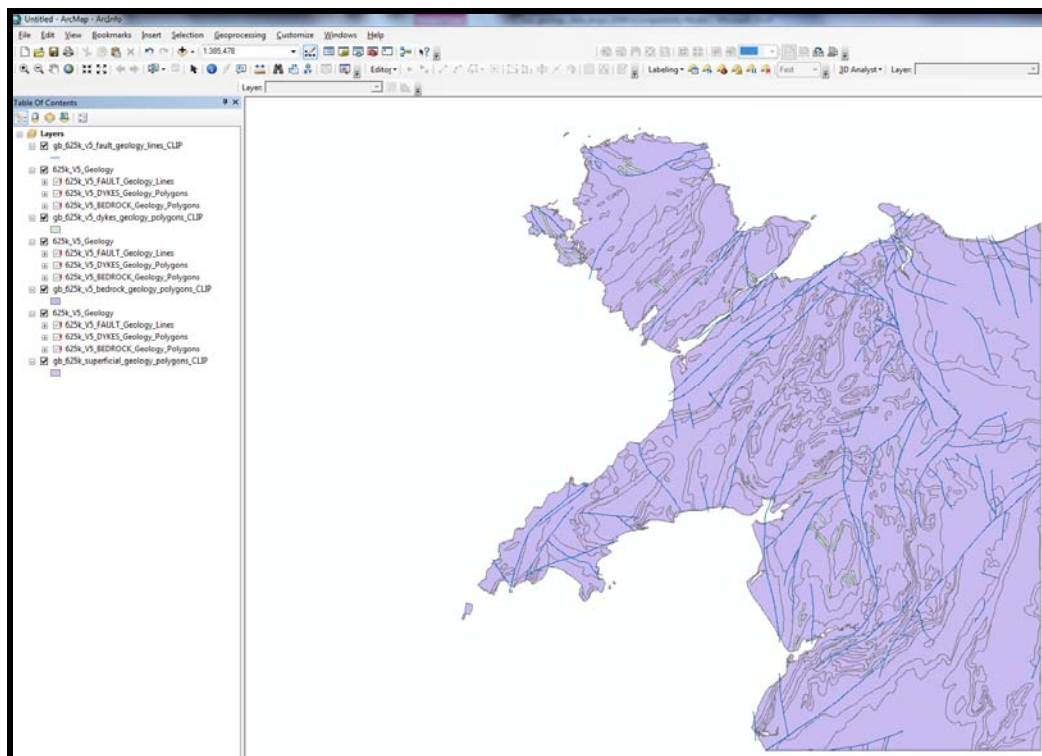
5. Click **Add**.



¹ ArcMap is the ArcGIS program that allows you to view and analyse map data.

The name of each file you import to ArcMap will now be visible in the Layers panel on the left. All the layers should open up in a map similar to the one shown below, although your colours may be different.

We will look at the colours next.



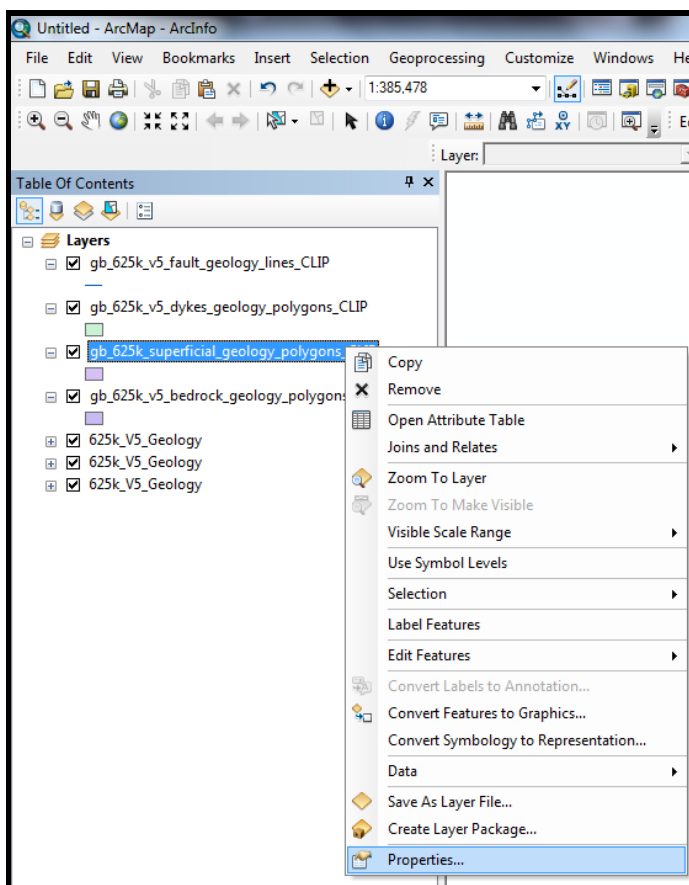
Apply the BGS Cartographic style

When the data is first loaded into ArcMap, it will not have the standard BGS colours, i.e. it will look different than it does when viewed in Geology Digimap’s Roam service.

We need to tell ArcMap which colours to apply to the dataset based on the BGS cartographic style. We can do this by applying symbology (cartographic) information.

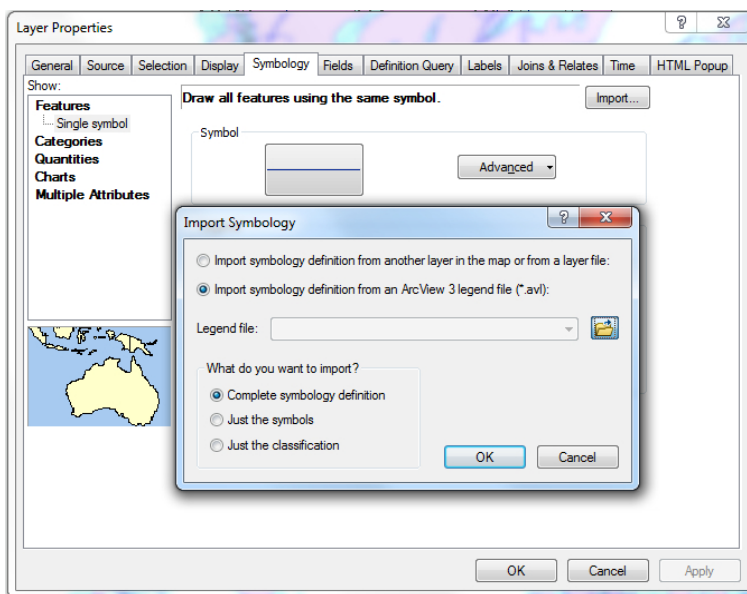
One symbology file (.avl) and three layer files (.lyr) are bundled with your geology data. We will apply the symbology they contain using these steps:

1. **Right click** on the **superficial geology** layer in the **Table of Contents** panel.

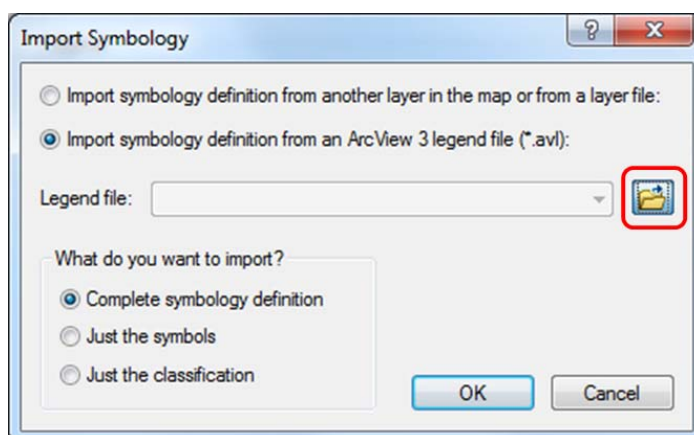


2. Select **Properties**:

3. Click the **Symbology** tab. Click the **Import** button in the top right corner.



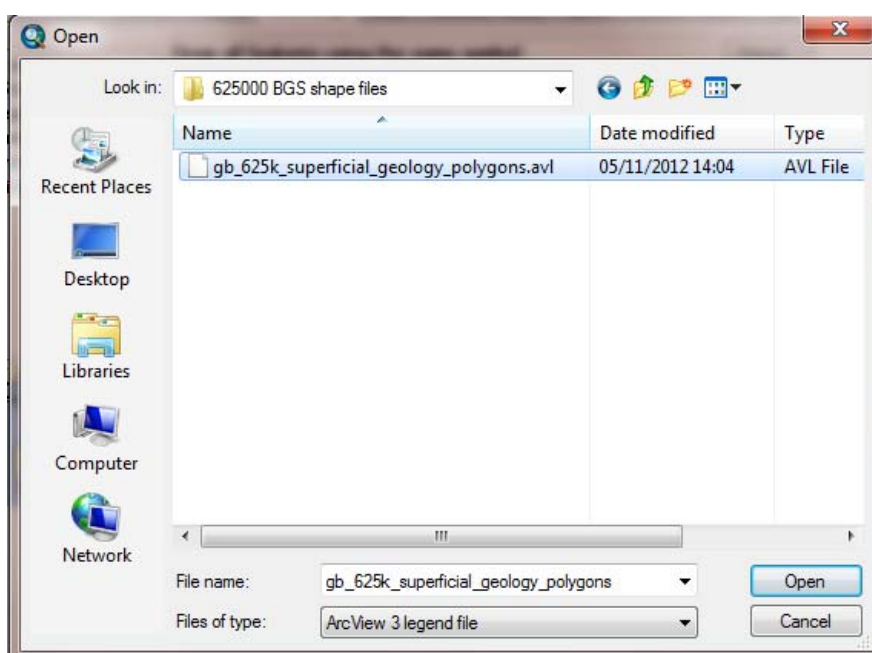
4. Select to **Import Symbology definition from an Arc View 3 legend file (*.avl)**.



5. Click on the **Browse** button.

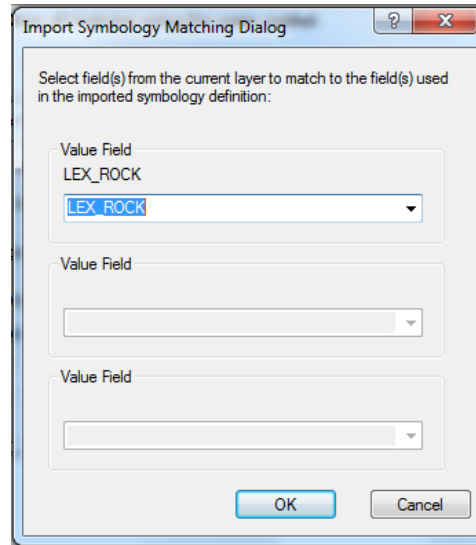
The **.avl** file will be in the same folder the geological data², the folder **625000 BGS Shapefiles**.

6. Select the **.avl** file corresponding to the **superficial geology** layer you selected in the **Table of Contents** panel. Then click **Open**.

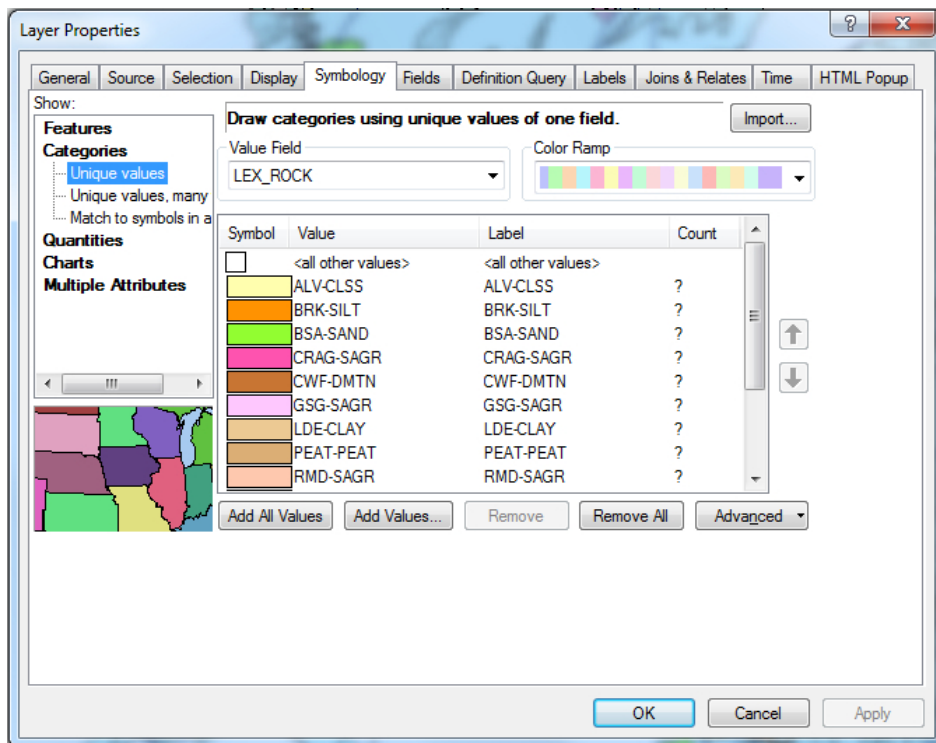


² NOTE: when you download data from Geology Digimap, or the BGS Open Geo Science website, your download includes the required AVL and layer files for applying cartographic styling.

7. Ensure the **Value Fields** match, as shown. Then click **OK**.



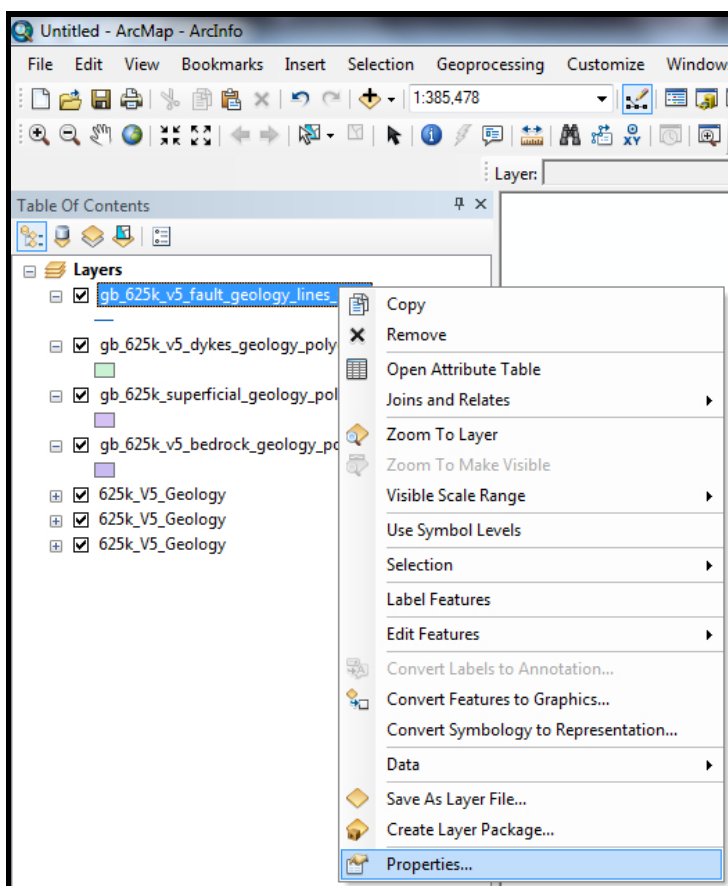
8. Click Apply then **OK** at the **Layer Properties** box to update the map.



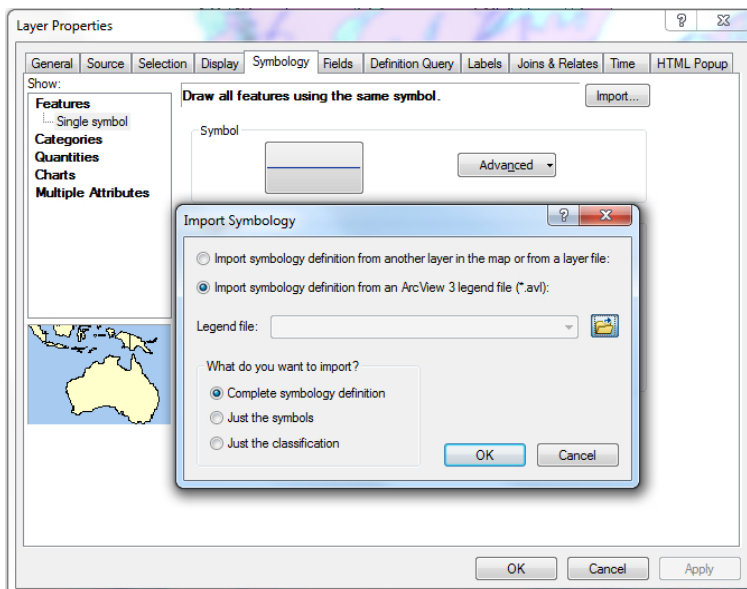
We will style the remaining three layers following the steps above.

9. **Right click** on the **fault geology lines** layer in the **Table of Contents** panel on the left.

10. Select **Properties:**

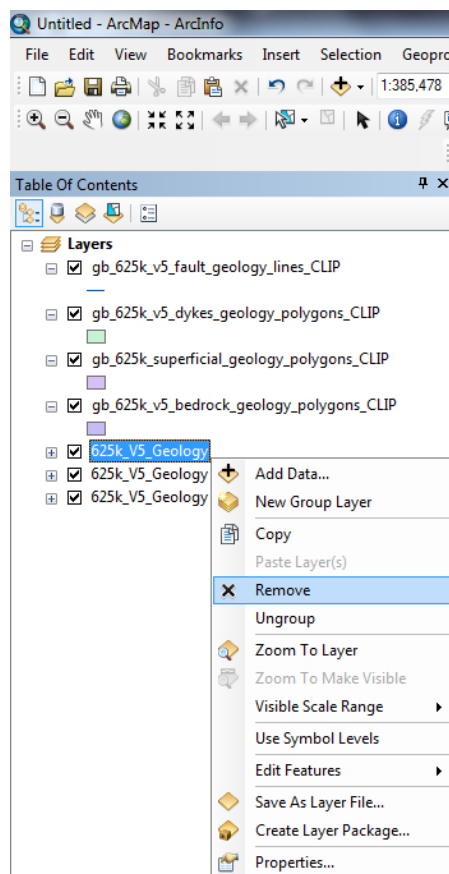


11. Select the **Symbology** tab, then click the **Import** button in the top right corner.

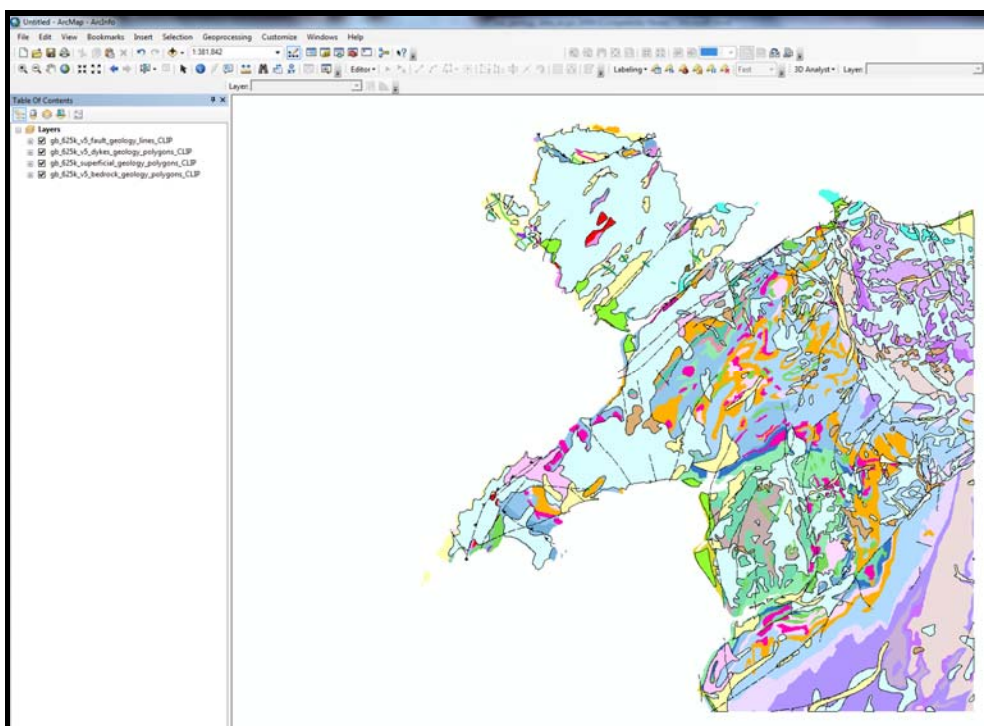


Remove the **.lyr** layers in the **Table of Contents** panel as follows.

1. **Right click** one of the **.lyr** files showing in the **Table of Contents** panel.
2. Click **Remove**.
3. **Repeat steps 24-25** to **remove the remaining two .lyr files** showing in the **Table of Contents** panel.



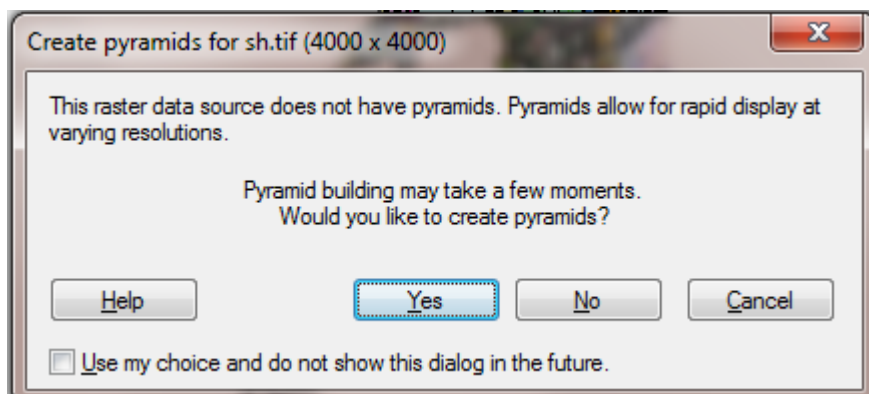
You now have a map that has a similar colour scheme as a printed geological map, which should look similar to the one shown below:



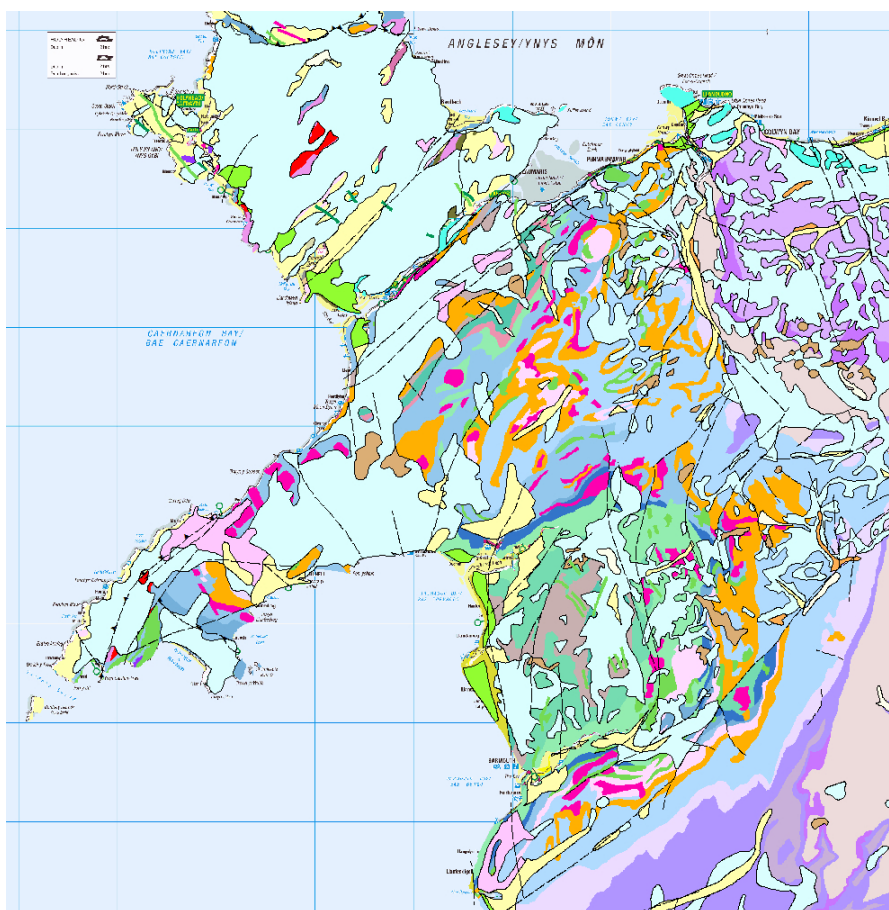
Overlaying Geographical Map Data - optional

In order to view the data with a geographical background we will add the Ordnance Survey 1:250 000 Raster data for the same area as our Anglesey data.

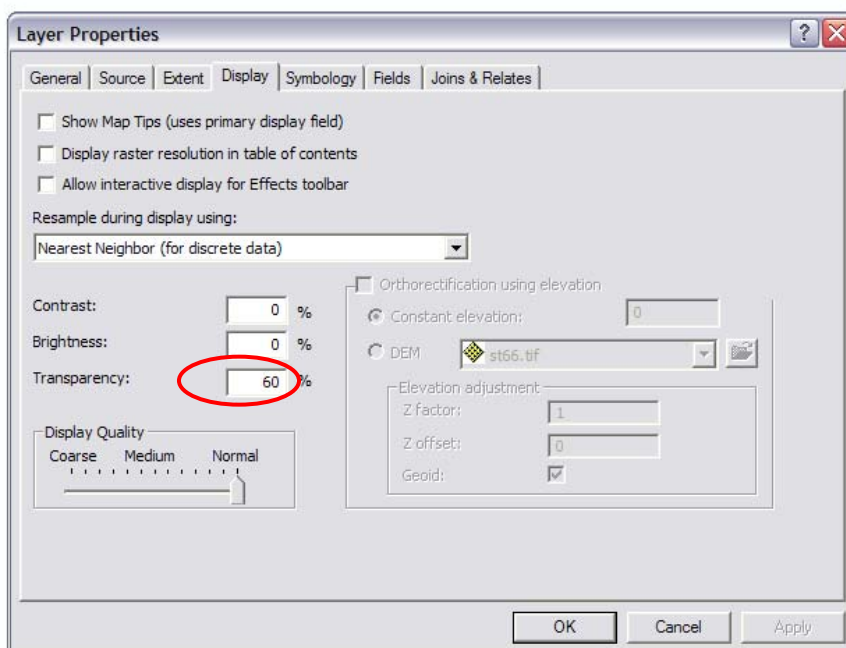
1. Click on the File menu in ArcMap and select Add Data.
2. Select the folder 250000 OS Raster data
3. Double click the sub-folder raster-250k_65252
4. Select the sh.tif tile.
5. Click Add.
6. You may receive this message. Click Yes.



You should now have a map that looks something similar to the one below. You will notice that the geology totally obscures the view of the geography below it. We need to alter the appearance of the geographical map tile to make it visible below the geology data.



7. **Click and drag** the **sh.tif** layer above the geology layers in the **Table of Contents** panel.
NOTE: you may have to ‘collapse’ your layers by clicking on the minus signs in order to see your **sh.tif** layer.
8. **Right click** on the **sh.tif** layer in the **Table of Contents** panel and select **Properties**.
9. Click on the **Display** tab.



- 10.
11. Change the **Transparency** to **60%**.
12. Click **OK**.

Once you have updated the display of the geographical data you should see the geology through it.

13. **Zoom in** for a closer look. Notice how some of the geology follows the contours. You can experiment with the Transparency level in step 7 to adjust the views for clear analysis.

