Practical 1

Learning objectives:

- **To work with a raster base map within a GIS and overlay point data.**
- **To practise using Ordnance Survey mapping data.**
- **To learn how to manipulate ArcGIS to display maps.**
- **To understand maps as a visual display of underlying database information.**

Basic Mapping: Adding point data to a raster base map.

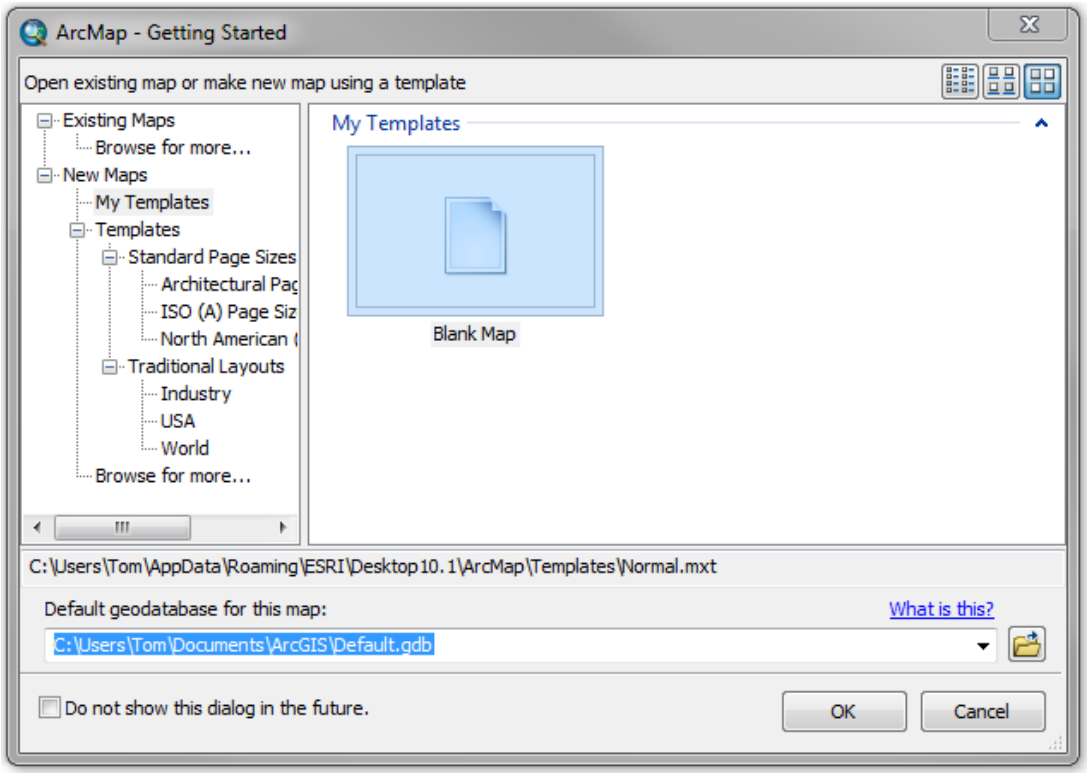
We will create a map showing the location of secondary schools in Edinburgh. To provide some context and locate these data in the real world, we will overlay this point data on to an Ordnance Survey raster base map.

Part 1: Bringing raster map data into ArcMap

1. If you don't already have ArcMap open, start the application.

   `Start → All Programs → ArcGIS → ArcMap 10.1`

2. The following dialog box will pop up in front of the application window.



3. Select "**Blank Map**" and click **OK**.

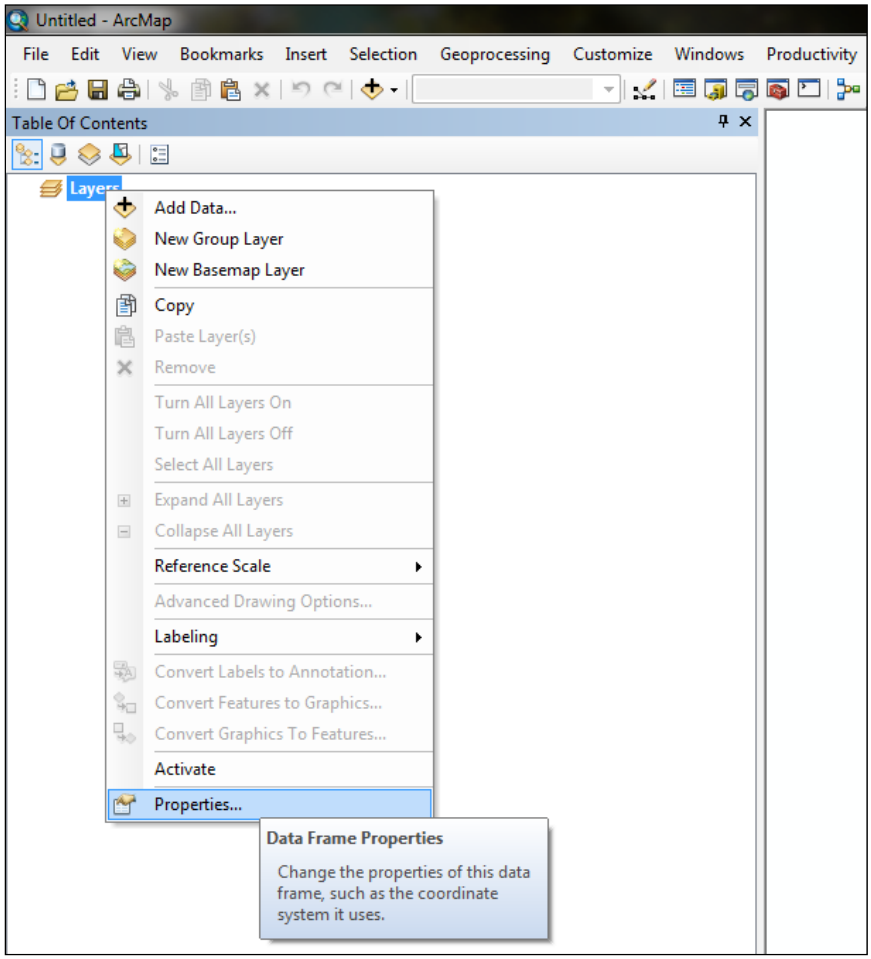
4. Click the **Maximize Window** icon in the top right corner to see more of the map display.

5. You can also move your **Tools Menu** which may be floating somewhere in the interface to a more convenient place by **dragging** it to the tool bar above the map display.

To ensure the data we are going to import and view in ArcMap is located and scaled correctly we will need to set a coordinate system for the data layer.

6. Right-click on the where it says **Layers** at the top of the panel (the **Table of Contents**) on the left-hand side of the screen.

7. This will bring up a drop down list; click on the **Properties** item at the bottom.



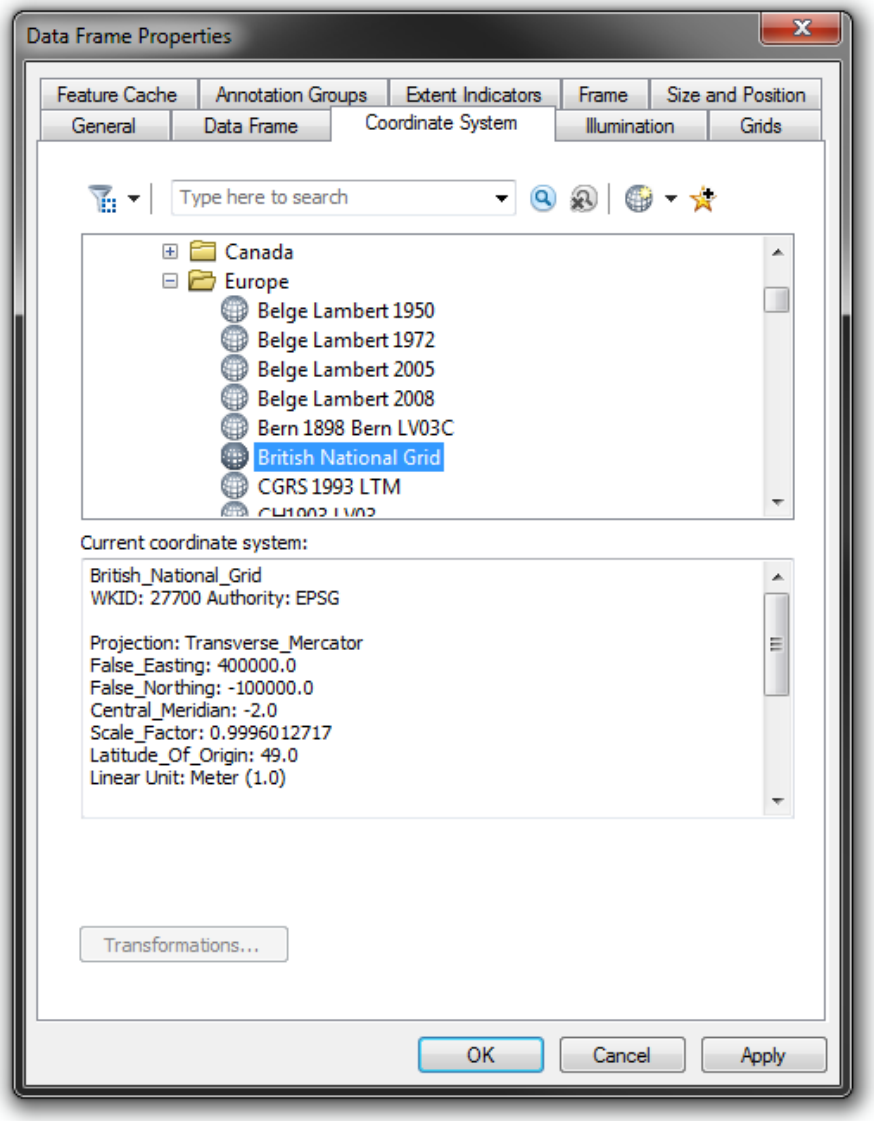
Layers is the default name of the **Data Frame** you are working in. You can have multiple Data Frames in a map Document but we will be keeping it simple in this training session and

sticking with one. After setting the projection for the Data Frame we will then change its name.

8. In the data frame properties dialogue box, click on the **Coordinate System** tab and in the **Select a Coordinate System** part navigate to the **British National Grid** by clicking on the following folders:

`Predefined → Projected Coordinate Systems → National Grids → Europe → British National Grid`

9. The details of the grid system should now be visible in the dialogue box as shown in the image below. Click **Apply** and **OK** to confirm the changes.



Now you can begin to bring in data to ArcMap.

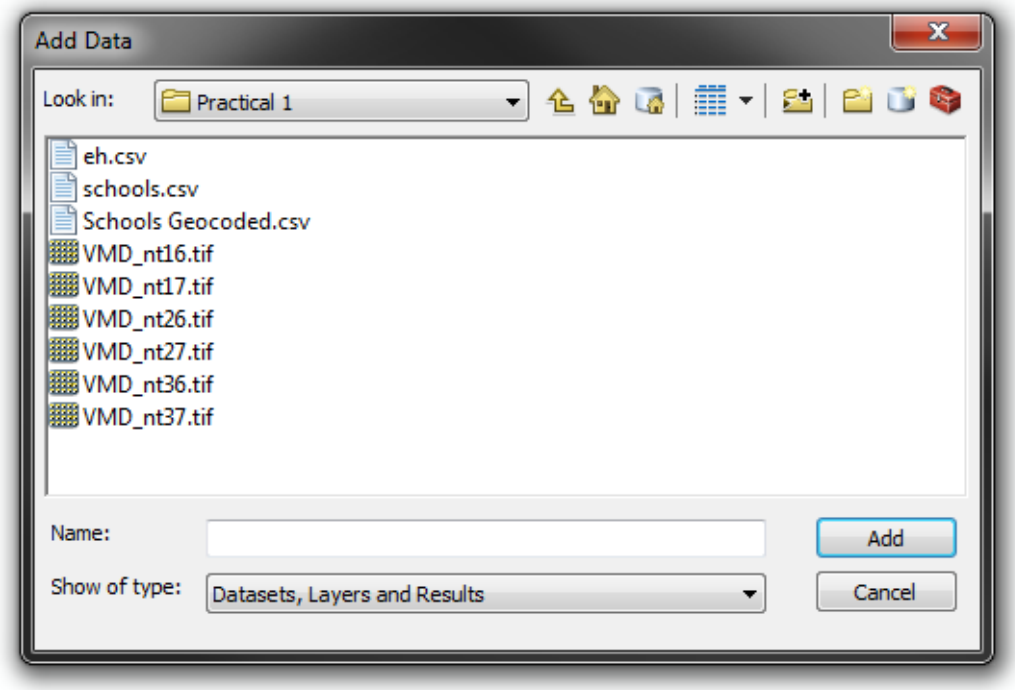
10. Click on the **Add Data** button on the tool bar: to open the dialogue box.

NOTE: When you first use ArcMap it will need you to tell it where the data you will be using is stored. Once you have told it the folder you are working on then it will remember it and keep it as a shortcut for future use.

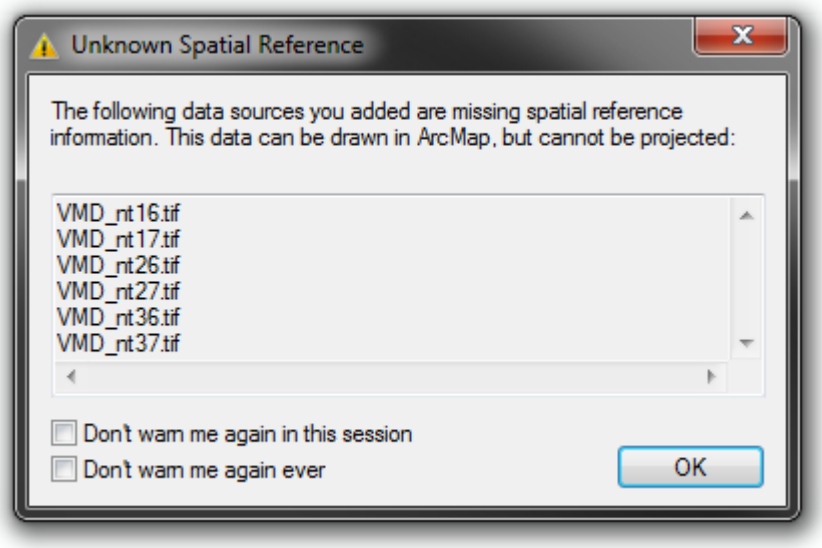
11. Look for the button icon **Connect to Folder** (hover the mouse over the buttons to read their labels if you aren't sure) and click on it.
12. Navigate to the folder you downloaded **Intro to Visualising data.**
13. With this folder name in the **Folder:** text box click **OK**.

You should now see three folders, **Practical1, 2 and 3**

14. Double click on **Practical 1** to open it.
15. Six raster files with the suffix .tif should appear in the dialog box. **Shift-click** or **control-click** to highlight them all then click the **Add** button.

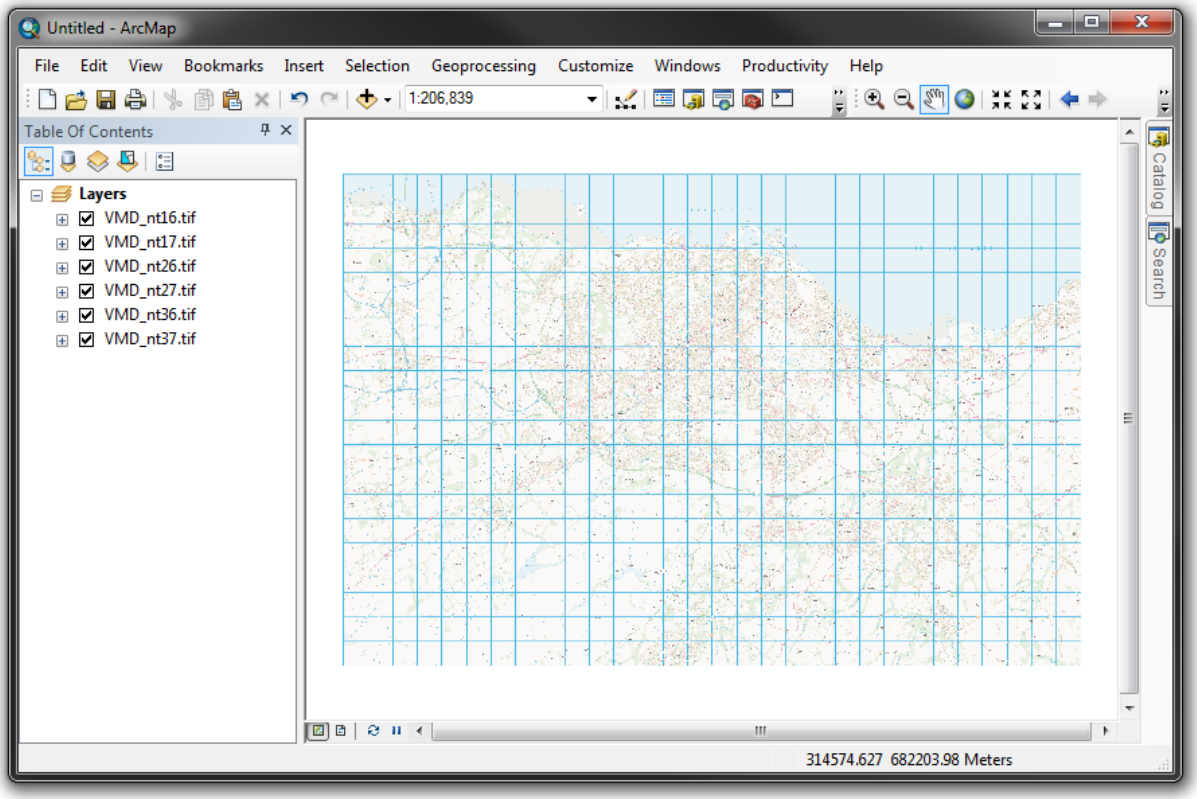


16. You may be warned that the data you are adding is missing spatial reference information. We have set the spatial reference already so the data will be projected once in ArcMap. Click **OK**.



17. You may be asked if you want to build pyramids. This speeds up the drawing of raster datasets as you zoom in and out. Click **OK** to do this.

NOTE: Pyramids allow the program to draw the maps faster at different scales as it pre-prepares raster images at different resolutions. If you are going to be zooming in and out a lot it is recommended you do this.



You should now see the six raster tiles in your map window, of Edinburgh and the surrounding area. The data we are using is **VectorMap® District Raster** (faded colour); this is an ideal backdrop map for overlaying your own data on. You can download it from Digimap's Ordnance Survey Collection Data Download service.

It is faded so your additions stand out more; there is a full colour version if you need to show the topographic features more prominently. VectorMap District Raster is best viewed at around 1:10,000 scale.

NOTE: The **Table of Contents** on the left shows the names of the files you have added. The datasets you have added are now referred to as layers within the data frame.

- The check box allows you to show or hide the data in the map window.
- Clicking on the plus sign will show you the "legend" to the file.

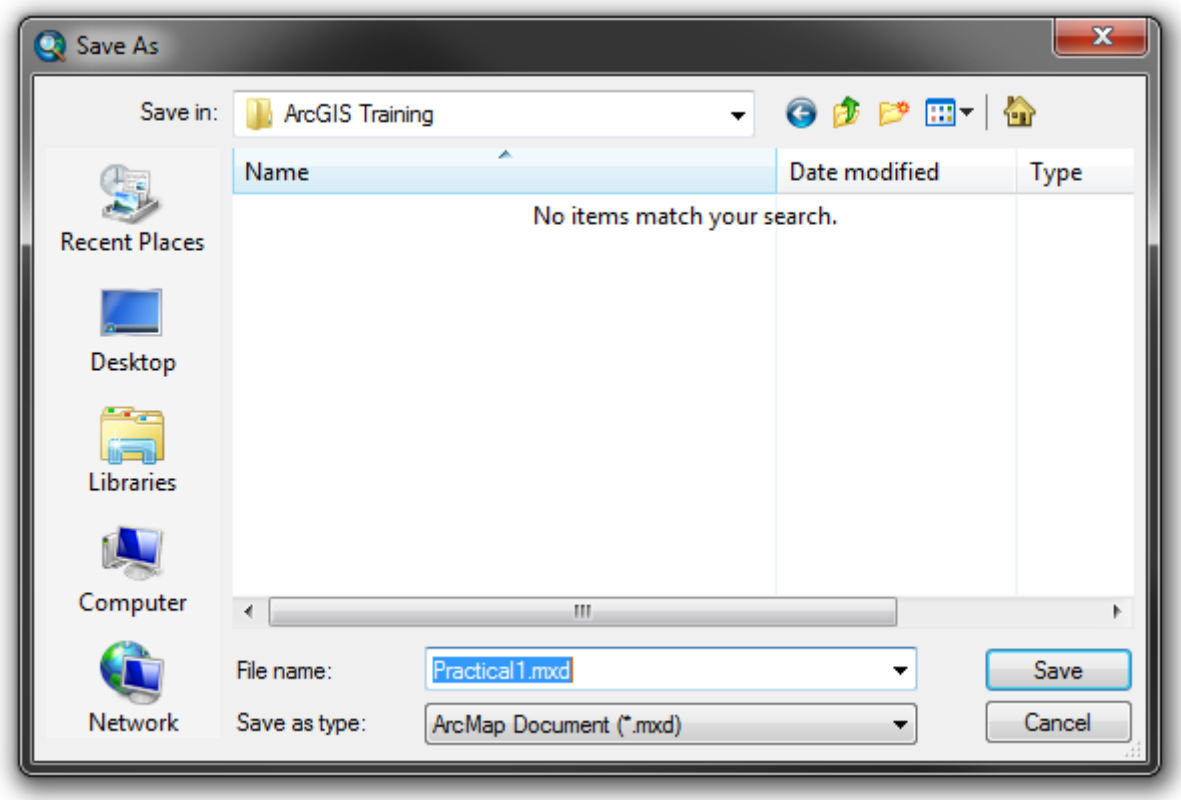
Now is a good time to get used to some of the controls for panning and zooming the data. The main ones you will need are found in the tool bar we moved to the top at the start of the exercise:

There is also the Scale drop down menu where you can pick from a list or manually type in the scale at which you want to view the data.

18. Click on the arrow next to the scale and select **1:10,000.**
19. You can use the buttons to zoom in and out on your current location or the **Scroll Wheel** on your mouse.
20. The button allow you to drag a box round features you are interested in to zoom in on them.
21. The button to change your mouse pointer to a hand. This allows you to grab and pan the map.
22. The buttons allow you go back and forward between map views you have already seen. They are blue when active:
23. Finally the button allows you to return to view where you can see all the data you have added to your map document.

At this point it is also a good idea to **save** our map; you do this in the usual way for a Windows program.

24. Click **File** then **Save as…**
25. Save the file in the same folder as the data: **My Documents/ArcGIS Training**
26. Replace **Untitled** with a suitable name such as **Practical1**



IMPORTANT: You are saving your ArcMap document as an **.mxd** file. This is a list of instructions or behaviours for the data and any customisations to the interface. It will remember any symbology changes and selections you make to data and which tool bars are shown. It will **NOT** save any changes to the data files themselves and does **NOT** contain any data. The .mxd file won't work without the data files, so these need to be kept with it.

Part 2: Add point data from spreadsheet

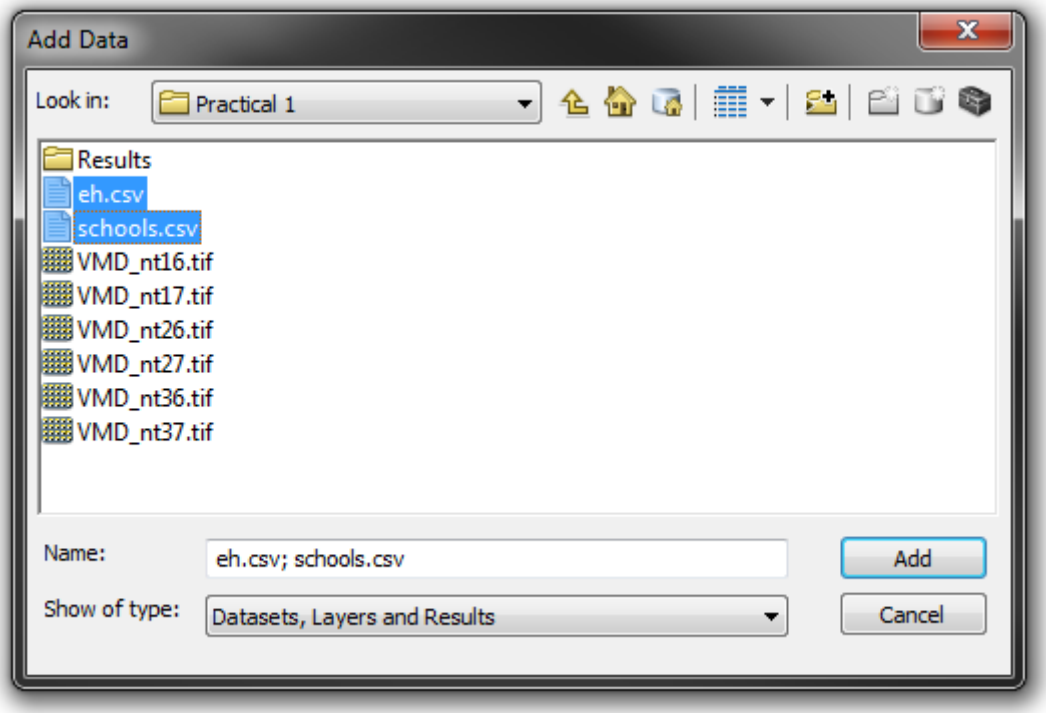
Now we have added our base map raster data we can now go through the steps needed to add your own point data.

We will be using two spreadsheet files;

1. **Schools.xls.** The first contains the names of secondary schools in Edinburgh, with their address and postcode (obtained from www.upmystreet.com). The schools.xls file has been saved as a .csv file (schools.csv) to make it importable by ArcGIS.
2. **Eh.csv.** The second is a .csv file of postcodes for Edinburgh that has been downloaded from Digimap. This file contains the geographical co-ordinates for each postcode which can be added to the base map created above. The Postcode file is eh.csv and is unchanged from the file downloaded from Boundary Download.

First, we need to add the csv tables to ArcGIS:

1. Click on the Add Data **icon** on the tool bar: You should be in the Practical 1 folder.
2. **Control-click** to highlight both, then click the **Add** button

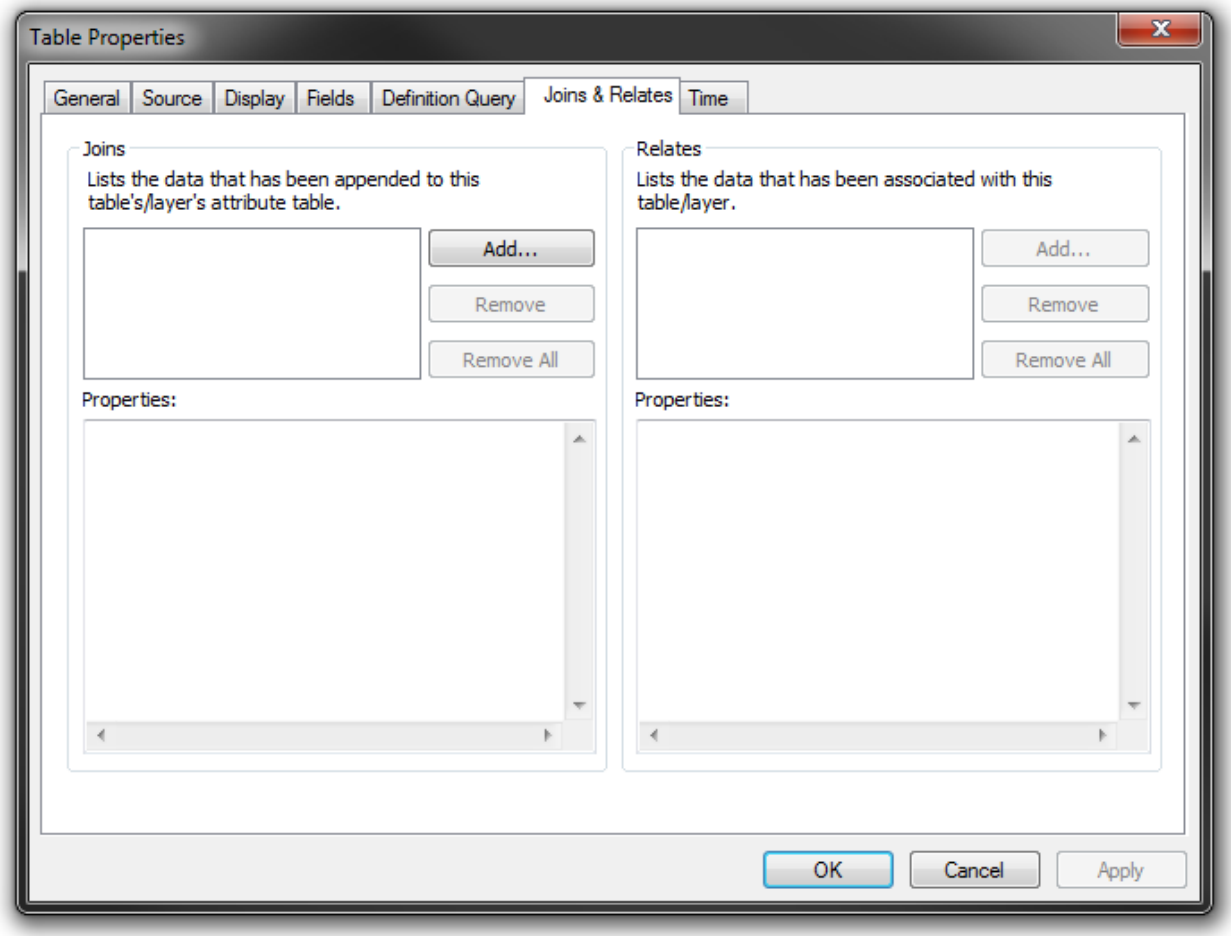


You can view the information in these tables:

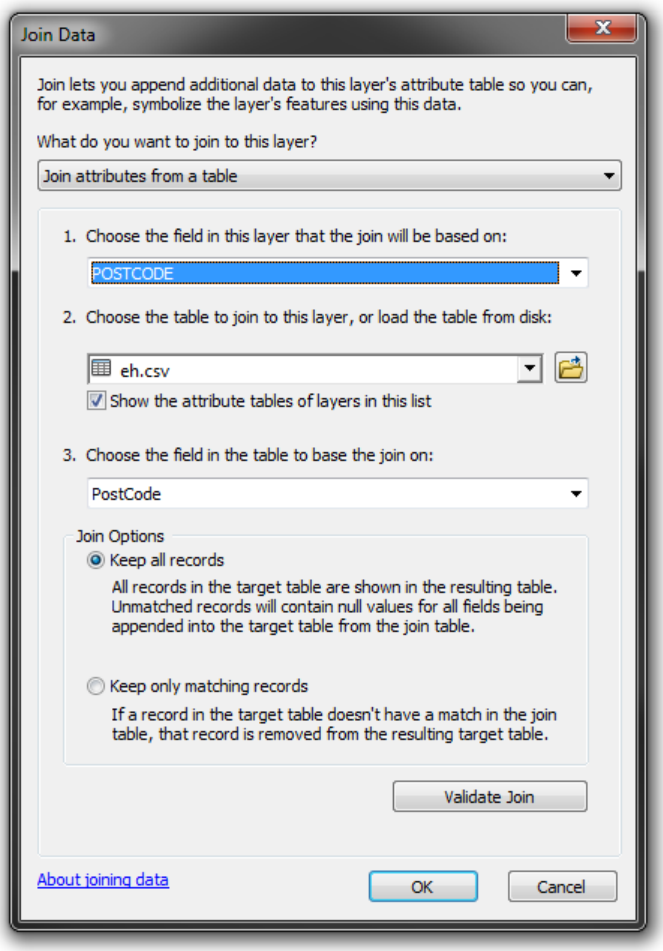
3. **Right-click** on the schools.csv in the table of contents and select **Open.**
4. The table will open in a new window; you can see the attributes in each column.
5. Repeat this for the **eh.csv** file. Notice that this table has **Easting** and **Northing** columns.

These tables contain all the information we need to display the schools locations on the map but the information is split between them. To get the co-ordinates for each school we need to add the information from the postcodes table to the Schools table. To do this we need to create a join between the two tables and this can be done based upon a common attribute (a column in each table that contains the same information) to get all the information we need in one place.

6. **Right-click** on the schools.csv in the table of contents and select **Properties…** This opens the **Table Properties** dialogue box.
7. Select the final tab, **Joins and Relates** from the properties box.
8. Click on **Add** under **Joins** (left side).



A new dialogue box appears called **Join Data,** fill this in as follows:



9. Select Join attributes from a table from the first drop-down menu.

10. Select **POSTCODE**, which is a field from the boundary data.

11. Select **eh.csv**, which is the table that has the coordinates for each postcode.

12. Select **PostCode**, which is the matching field in the eh.csv. ArcMap does this automatically as it will find the best match.

13. **Keep all records**, there are no invalid postcodes in the schools list but if there were they would still show.

14. Click **OK:** Your tables are now joined.

NOTE: The "About joining data" link takes you into the help pages for further information.

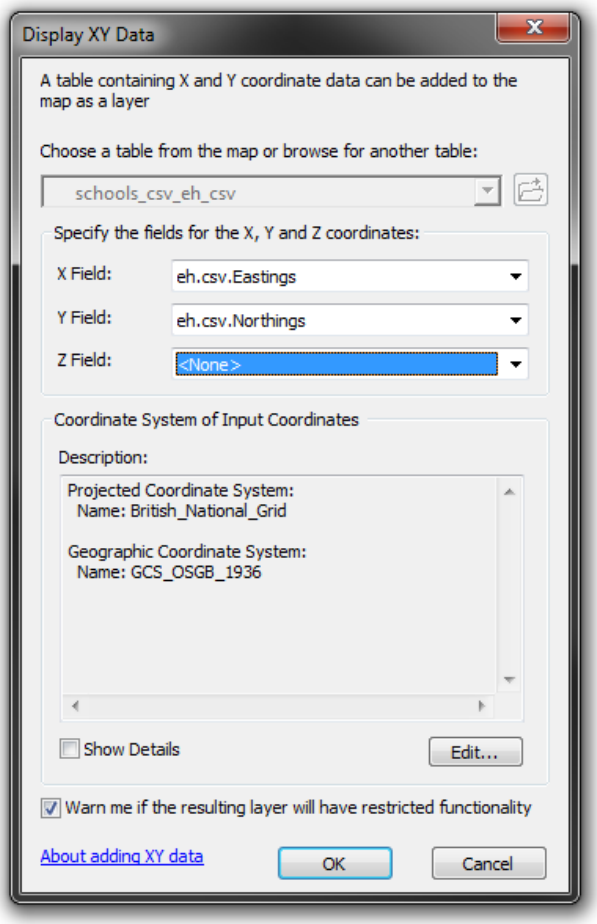
15. Click **OK** on the Table Properties dialogue box to finish the process.

16. Right-click on the schools.csv table and select **Open.**

17. Notice that the columns from the **eh.csv** table are now added on the end.

18. Notice each school entry now has an **Easting** and a **Northing.**

You have just **geo-coded** the schools dataset. We can now add the schools as points to the map.



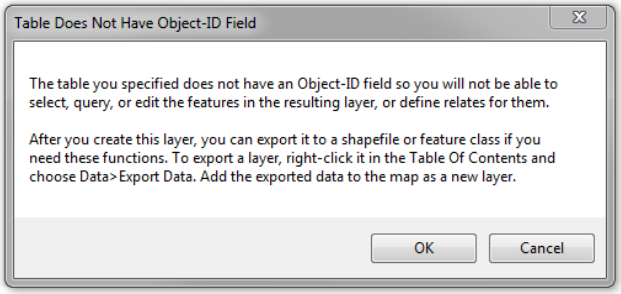
19. **Right-click** on the schools.csv in the table of contents and select **Display XY Data…**

20. Set the X field to **eh.csv.Eastings** and the Y field to **eh.csv.Northings**.

NOTE: You can change the Coordinate System at this point. In older versions of ArcGIS you have to do this at this point as it doesn't automatically select the one you are using.

21. Click **OK**.

You will receive a warning message saying basically the points are for display only:



We don't need to do this for at the moment, however we will **Export Data** to a file in practical three when we need to do some of the operations that require it.

22. Click **OK**.

A new layer should be added to the Data Frame called **'schools_csv_eh_csv Events'**.

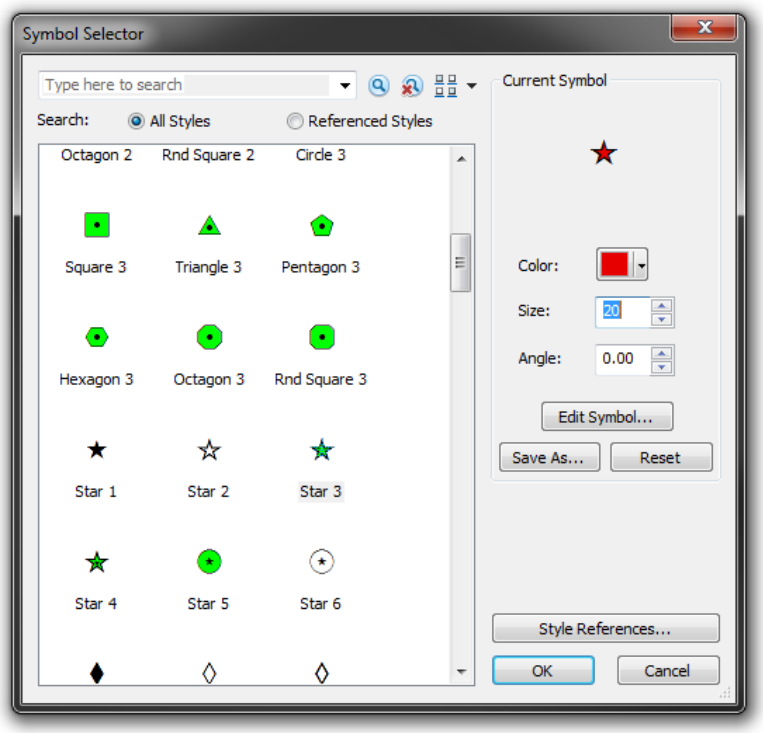
NOTE: The term "Event" is used as ArcMap assumes that the points represent some kind of event you want to plot, such as instances of an illness.

23. Save your work and then move on to the next section.

Part 3: Changing the point display with Symbol Selector

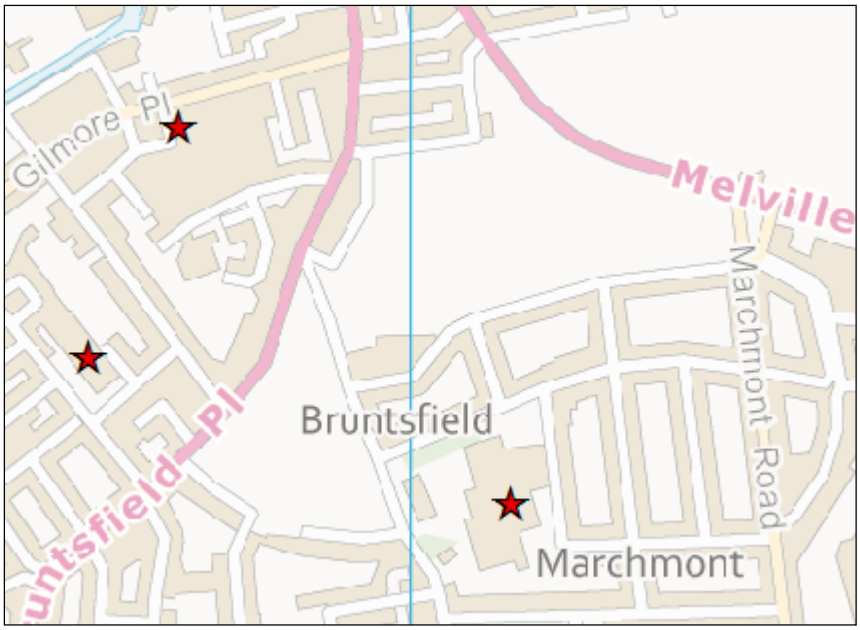
The schools are easily visible in this faded map, but they can be harder to see on busier background mapping. ArcMap chooses its legend colours at random so the chance that you will need to intervene to make the map more aesthetically pleasing is high.

1. **Click** on the point symbol immediately below the **schools Events** layer.
2. The Symbol Selector appears.



3. Choose a symbol that you like and that will stand out such as **Star 3**.
4. Change the **Color:** to something strong like **Red.**
5. Increase the **Size:** to **20**.

The symbols will show up much against most data sets now. Generally, it is always best to pick a colour that doesn't feature too heavily on the base map if you want your points to stand out. Having a different shape and a larger size can help too, but you may want to consider how closely spaced your points are before making the symbols very large.



6. Save your work and then move on to the next section

This is the end of the basic exercises,

there is one further part if you have time.

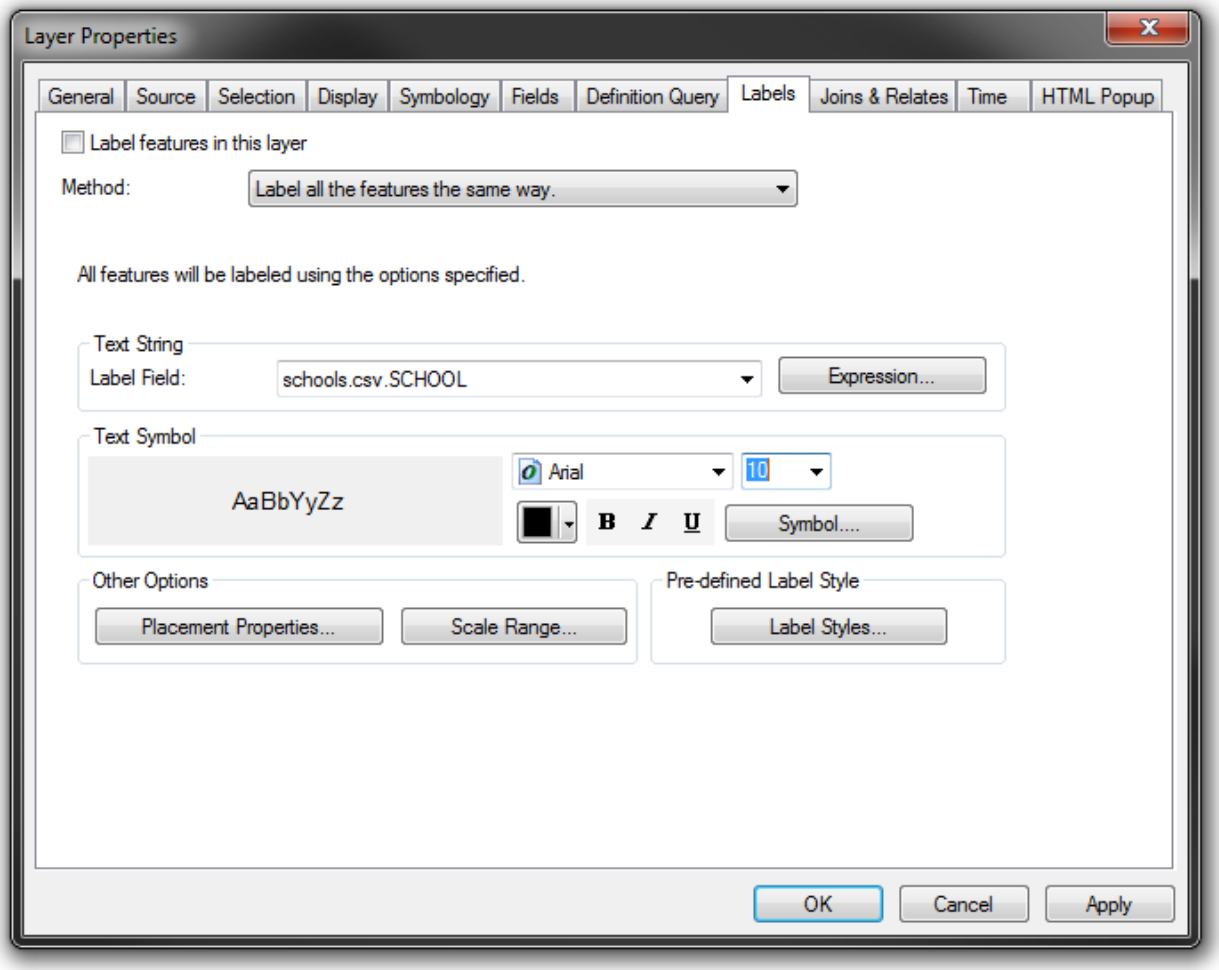
The following exercise can be done if you have time:

Part 4: Labelling features

You can use ArcMap to label the Schools with the names given in the attribute table:

1. **Right-click** on **schools_csv_eh_csv Events** and select **Properties…**

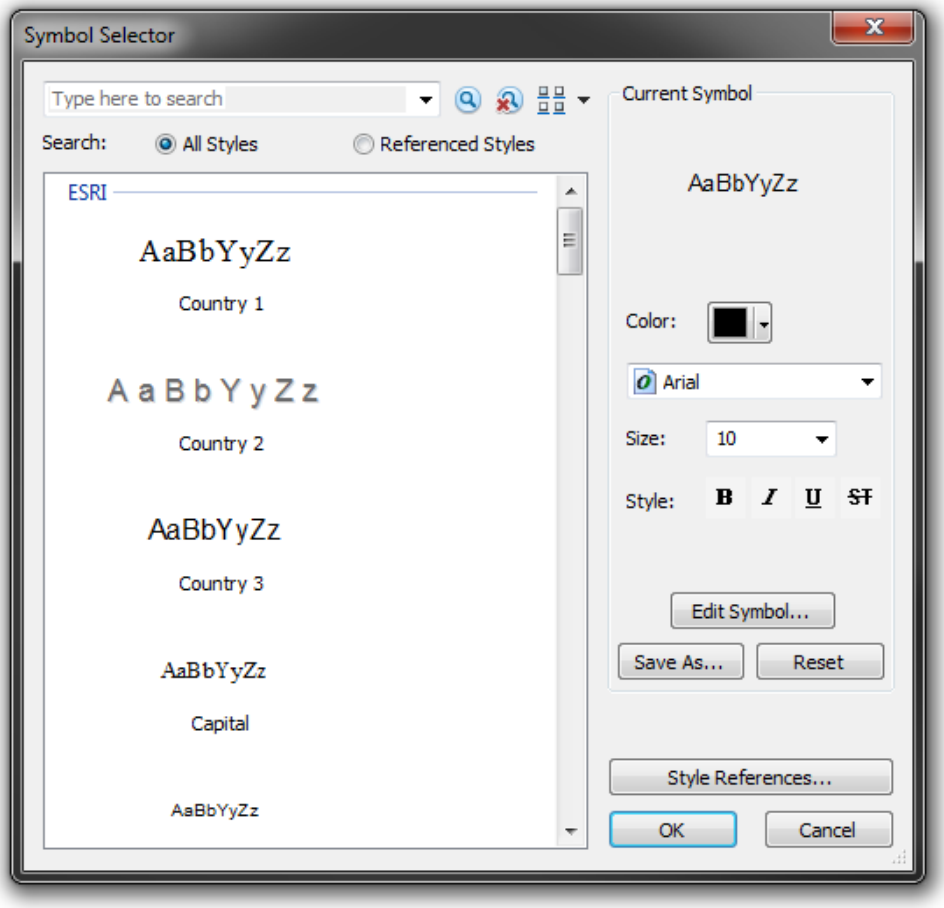
2. Select the **Labels** tab.



3. Tick the **Label features in this layer** box.

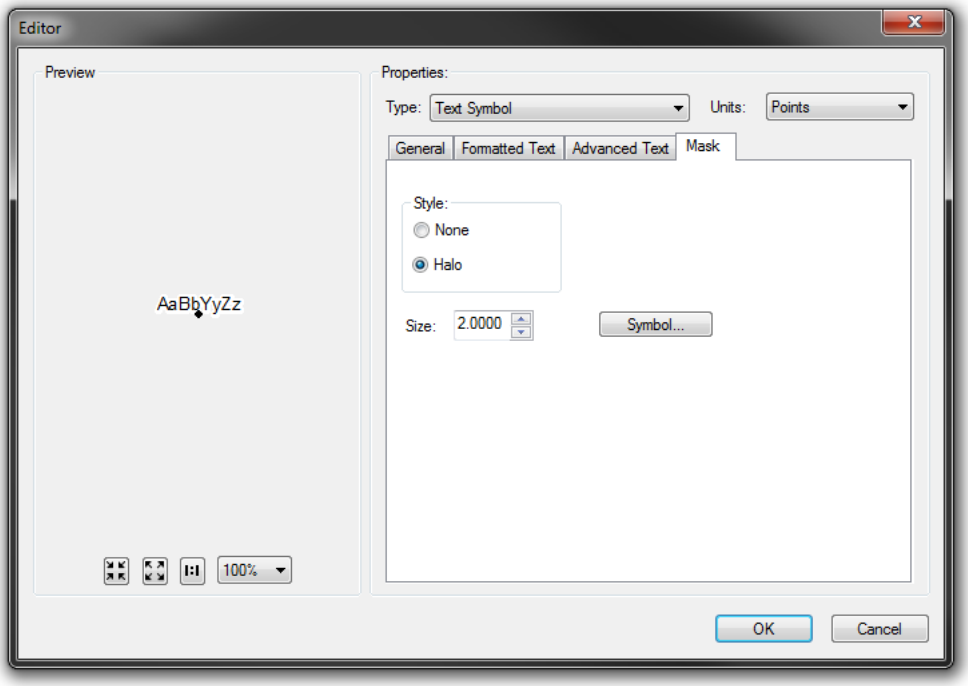
4. Make sure the **schools.csv.SCHOOL** column is set as the **Label Field** in the **Text String** box.

5. Click **Symbol…** in the **Text Symbol** box to get more options.



6. Change the **Size** to **10** and the font if you prefer something different

7. Click **Edit Symbol…** to get even more options!



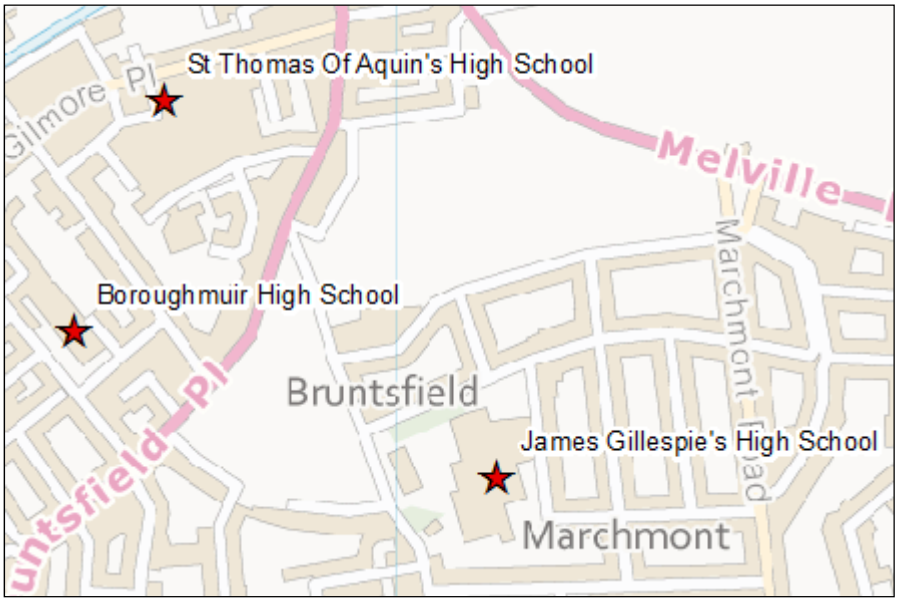
8. In the **Editor** window switch to the **Mask** tab and select the **Halo** option. This gives a white halo around the text so it can be read over the background map.

9. Click **OK** to close the **Editor** window

10. Click **OK** to close the Symbol Selector

11. Click **Apply** and **OK** to close the Properties window.

You should now have labels on your schools that clearly stand out from the map:



You have now completed the first practical!

Save your work and we can then move on to Practical 2