

# **Introduction to ArcExplorer<sup>®</sup> Geographical Information Systems (GIS) – The Mt. Buller Database**

An exercise developed by the  
Centre for GIS and Modelling  
Department of Geomatics  
The University of Melbourne



## 1. Introduction

This exercise has been designed as an introductory resource for the Geography Teachers Association of Victoria. It introduces the use of free Geographical Information System (GIS) called ArcExplorer, combined with some geospatial datasets provided by the Department of Geomatics, The University of Melbourne. ArcExplorer is a spatial data viewer and explorer designed specifically for ESRI Shapefiles which are only one of many GIS data formats. This format is used widely around the world. ArcExplorer is free software. Its analysis and data modelling capabilities are very limited since it is primarily designed to view data. For more complex analysis and data modelling the software ArcView should be used. The following sections provide instructions for viewing the GIS database using ArcExplorer. Sample questions and marking schemes are also provided. More complex GIS analysis can be performed with commercially available software such as ESRI's ArcView and this exercise should be seen as a simple introduction to spatial data and its uses.

## 2. To download ArcExplorer and data

1. ArcExplorer can be downloaded from the ESRI web site at  
<http://www.esri.com/software/arcexplorer/index.html>
2. Download and install ArcExplorer to your computer
3. Data has been provided by The Department of Geomatics and includes the following themes for Mt. Buller Alpine Resort, Victoria :
  - Contours25 – 25 metre contours showing elevation
  - Spothights – Spothights showing selected high-points at Mt. Buller
  - Rivers – Rivers and creeks at Mt. Buller
  - Lifts – The Mt. Buller ski lift network ( a little old)
  - BullerAerial – An aerial photograph showing Mt. Buller from the air
  - BullerDEM – A digital elevation model of Mt. Buller showing elevations
  - BullerSlope – A map showing high and low slopes at Mt. Buller
4. Download zipped file (BullerGTAV.zip) from:  
<http://www.geom.unimelb.edu.au/zenger/research/gtav/>
5. Using WinZip (or similar software) unzip this files into your working directory on the hard drive of your computer.
6. Additional spatial data for use with ArcExplorer can be obtained from the following:
  - Environmental Systems Research Institute (ESRI) has a range of free databases available for the entire world at:  
<http://www.esri.com/company/free.html>
  - Australian Surveying and Land Information Group maintains a range of databases for Australia: <http://www.auslig.gov.au/>

## 3. What you can do with ArcExplorer

- View and query ESRI shapefiles
- Display a wide variety of image formats

- Address match (locate street addresses or intersections on a map)
- Measure distances on your map
- Find features
- Identify and query geographic and attribute data
- Display data using classifications, symbols, and labeling
- Pan and zoom through multiple map layers
- ArcExplorer also features legends, overview maps, saving and retrieving projects, and map printing.

#### 4. The Map View

A Map View is the section of the interface where you display, explore, query and analyse geographic data in ArcExplorer. Map Views are saved in the ArcExplorer session you're currently working with. A Map View is a collection of themes, a theme being a distinct set of geographic features in a particular geographic data source. For example, a Map View showing a country might have one theme representing cities, one theme representing roads, one representing rivers, and so forth.

Standard



Map Tools




Theme Tools

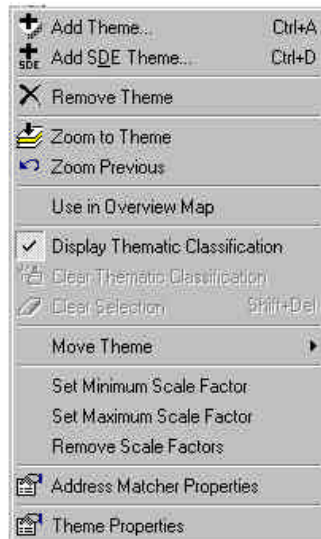


#### 5. Adding Stored Spatial Data to ArcExplorer

ArcExplorer's key functionality is the adding and viewing of spatial data. Spatial formats you can view with ArcExplorer include Shapefiles, ARC/INFO coverages, images. In this exercise we will add data for the Mt. Buller site. You must first unzip your files you downloaded from the web to allow ArcExplorer to read them in.

How to Add Data to ArcExplorer

7. Click the Add Theme button to open the Add Themes dialog .
8. For Data Types, you can choose the type of data you want to load from All ArcExplorer Types, Shapefiles, ARC/INFO Coverages, Supported Images or ZIP Archives. Choose All Other Formats to see all files stored in a directory.
9. Navigate to the directory where your data is stored.
10. Click the file you wish to add and click Add Theme.
11. Navigate to another directory to add additional themes, or click Close to close the Add Themes dialog. The themes you chose appear in the legend.
12. Add all the other datasets in the directory and you should see the data appear in the map view.



## 6. The legend

All themes in a map view are listed to the left of the map in the Legend. The legend shows the theme name and the symbol used to draw each theme. The check box next to each theme indicates whether it is currently turned on or off in the map view, that is, whether it is currently drawn on the map or not. The order in which the themes are listed in the legend is also important. The themes at the top of the legend are drawn on top of those below it. Themes that form the background of your map are listed at the bottom of the legend. Change the drawing order by using the left mouse button to drag themes up and down within the Legend. Use the black and gray arrows to scroll the legend up and down if there are more themes loaded than can be shown.

## 7. Getting and viewing attribute features in your data

### **Identify Tool**

When you use the Identify tool, ArcExplorer looks for features in the active theme at the location you click. On the Identify Results panel, ArcExplorer reports the number of features found where you clicked. If more than one feature was identified, you can see all the features that were found by using the drop down functionality on the Feature list.

13. Ensure that you have added the theme Contours25 to your view



14. Select the Identify tool
15. Click anywhere on a contour line to obtain the description for that contour which in this cases shows its height in meters.
16. You will see a window that shows the Contour25 and its attribute descriptions.

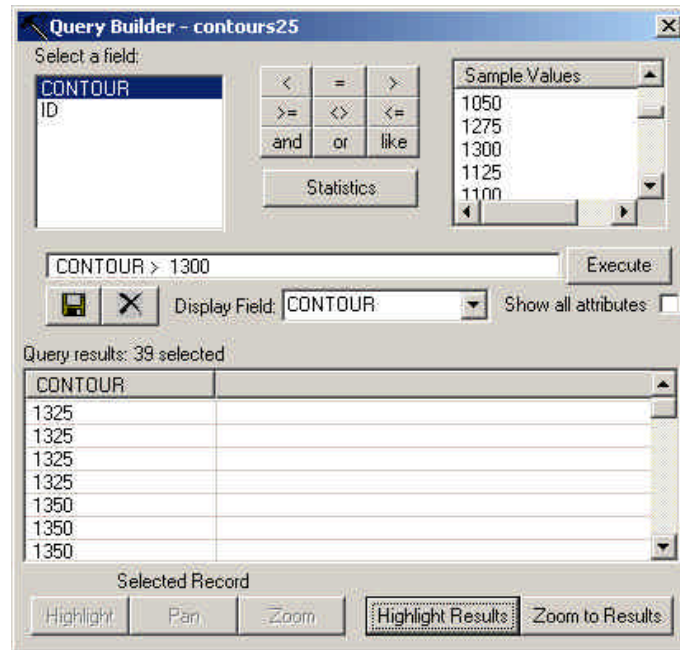
### **Query Builder (finding heights above 1300 metres)**

A query expression is a precise definition of what you want to select. Building a query expression is a powerful way to select features because an expression can include multiple attributes, operators, and calculations.

17. We will create a query that finds all the contours with a height more than 1300 metres
18. Click the name of the theme you wish to query to make it active – in this case the Contour25.shp file that has already been added to the view.

19. Click the Query Builder tool 

20. Issue the query as shown below and select Execute.



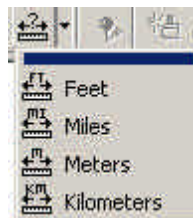
21. After this query has been issued, select **Highlight Results** and you should see the results of this query shown in the map view.

22. Many other queries can be attempted that allow you to select combinations of questions.

### ***The measure tool***

You can use the measure tool to specify a measurement unit and then measure distances on your map in feet (ft), miles (mi), meters (m), or kilometers (km).

23. Practice using the measure tool to calculate the distance from one ski lift to another.



## **8. Scale and map display**

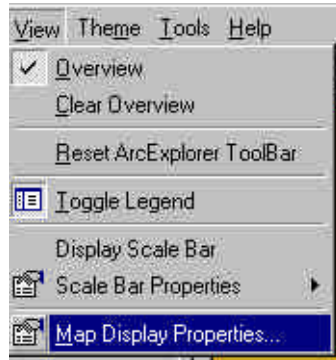
### ***Scale Bar***

The scale bar consists of a representative fraction (1:24,000), a rule with distance markers, and an equation (One inch = 40 miles). The fraction (RF scale) is a common way to present scale in cartography and can be read as "one inch on the screen is equal to 24,000 inches on the ground." The equation (sometimes referred to as a "verbal scale") presents the same information but translates the single unit (an inch in this example) into a unit you'd use when getting around in the real world (e.g., miles).

### ***Setting the Map Display Properties***

You can control the background color, map outline, scroll bars, and other characteristics of your map view.

24. Experiment with the Map Display Properties of your view area.



## 9. Symbolising your data (changing how the ski lifts look).

How to open the Theme Properties dialog:

25. Double-click the theme's name in the legend (in this instance Lifts.shp) or
26. or click the Theme Properties button. The Theme Properties dialog is displayed
27. In the Theme Properties dialog, the Theme name field shows you the theme you are working with.
28. Change the properties to Dashed Line, with a width of 2 and some other colour.
29. Your lifts should now appear significantly different than earlier
30. Experiment with other options and with other data themes

### **Single Symbol Maps**

The Single Symbol classification displays all the features in the theme with the same color and style. When you add a theme to ArcExplorer, it is displayed as Single Symbol maps.

### **Unique Values Maps**

The Unique Values classification displays features by applying a different color to each unique value for a specified field.

### **Class Breaks Maps**

The Class Breaks option uses quantile classification to create graduated color maps. In the quantile classification method, each class contains the same number of features. A different color is applied to each category of values from whichever field in the database you specify.

### **Label Maps**

The Labels option draws maps that are labeled with a specified text field in the database. You have two options to create label maps: Standard or No Overlapping Labels. Each option has its advantages depending on the type of data you are labeling and the cartography you require.

For Standard label maps, labels are placed according to the preferences you choose on the Theme Properties dialog. Standard label maps are generally suitable for large area features that do not require resolution for label placement problems such as crowding or overlapping.

For No Overlapping Labels maps, ArcExplorer assesses the features being labeled and attempts to resolve cases where labels are crowded or overlapping. The No Overlapping Labels option is helpful for labeling compacted features such as street networks. Also, masking labels is only available on the No Overlapping Labels maps.

31. Make the layer Spotheights the active layer in your view.
32. Double click the theme to obtain its properties
33. Select Standard Labels and make the Text Field 'Elevations'
34. This should label each spot height in the map with its elevation.

## 10. Saving, copying and printing your work in ArcExplorer

ArcExplorer saves projects in files with an .aep extension. The Map Display properties, whether themes are turned on or off, the map extent, view properties, any classification or labels applied to themes, and any scale factors you may have set are saved. When you create an .aep file, you're not changing or altering the base data in any way. On some printers the maps will not printout correctly. Please follow the instructions below which show you how to turn your map into a graphic image that you can place in Word or other software and print from that application.

To copy the image of a map view for use in another Windows application (like a word processor or a drawing program). ArcExplorer makes it easy to create a graphic image of your view by selection **Copy to File** from under the **Edit** menu. ArcExplorer provides a simple map layout in landscape (horizontal) format. The layout includes a north arrow, legend, title text, date, map view, and an optional scale bar (the scale bar must be present in the view in order for it to appear on the final layout). If the themes or classification categories cannot fit on one page, the legend prints onto a second or more pages. The print function works with any Windows supported printer.

## 11. Answers to be submitted

(these are simple example questions that could be developed to be more extensive)

1. How many contours have an elevation greater than 1300 metres?
2. What is the heighest spotheight elevation at Mt.Buller?
3. What is the length of the longest ski lift at Mt Buller and what is its name?
4. Describe whether each of the data sources you are using are raster, vector or image formats?
5. How many spot heights are in areas greater than 1400 metres?
6. Create the following maps (your maps should contain a title, scale bar, legend)
  - a. A map that shows elevations greater than 1400 metres
  - b. A map that shows all ski-lifts draped over the aerial photography of the mountain
  - c. A map that shows the digital elevation model and all the rivers at Mt. Buller (is there any obvious relationship between elevation and these rivers?)

## 12. Credits

This exercise and database has been developed by Dr. Andre Zerger from original material and material provided within the ArcExplorer (ESRI 2000) software.

### Contact Details

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