Catchment Boundary Definition Fact Sheet

To produce an estimate within the LowFlows software, you need to import a catchment boundary. Defining a catchment boundary requires the following information:

- **scheme location:** as a grid reference;
- **catchment area:** total land and water area contributing to the discharge at a particular point (the catchment outlet) within the river network. Simply, this is the total extent of land where rainfall / precipitation drains downhill, into the river draining to the location of the scheme). In many catchments, the topographic watershed delimits this area. However, the underlying geology in some catchments may have a significant impact on the contributing area, especially in highly permeable regions like limestone and chalk catchments. In these cases, the impact of the groundwater divide should be considered during the definition of catchment boundaries;
- **artificial influences:** is the flow in your river influenced by the activities of man? Common artificial influences include direct abstractions from surface waters, abstractions from ground water, discharge of effluents, impounding reservoirs, canals and inter-basin transfers. There are a number of ways to find out what is influencing your catchment. The best source of information is the EA Catchment Abstraction Management Strategies (CAMS at www.environment-agency.gov.uk). You could also use local knowledge and OS maps to find, for example, impounding reservoirs, sewage treatment works, factories, etc...

Creating a Catchment Boundary

Catchment boundaries may be identified manually using topographic maps of appropriate scale (typically 1:25,000 or 1:50,000). A catchment boundary can be created either using the 'create polygon' feature in most GIS programmes (see Shapefiles format), or by drawing the boundary on an Ordnance Survey map and physically reading off the coordinates (see *.csv format). Both processes generally involve the following steps;

1. identify the grid reference of the catchment outlet, giving particular attention to the verification of the site in relation to upstream and downstream confluences;
2. identify the topographic catchment boundary using mapped information regarding:
    - river network location
    - contours
    - spot heights

A topographic catchment area can be drawn by starting at your proposed outlet (scheme location), moving up hill to the highest point (the watershed) and following the highest points around the rivers until you reach your outlet again. 6 figure grid references should be recorded for each new point (usually indicating a change of direction) of the catchment boundary. Figure 1 shows an example of a catchment boundary. Contours display the shape of the hills surrounding the rivers flowing down to an outlet.

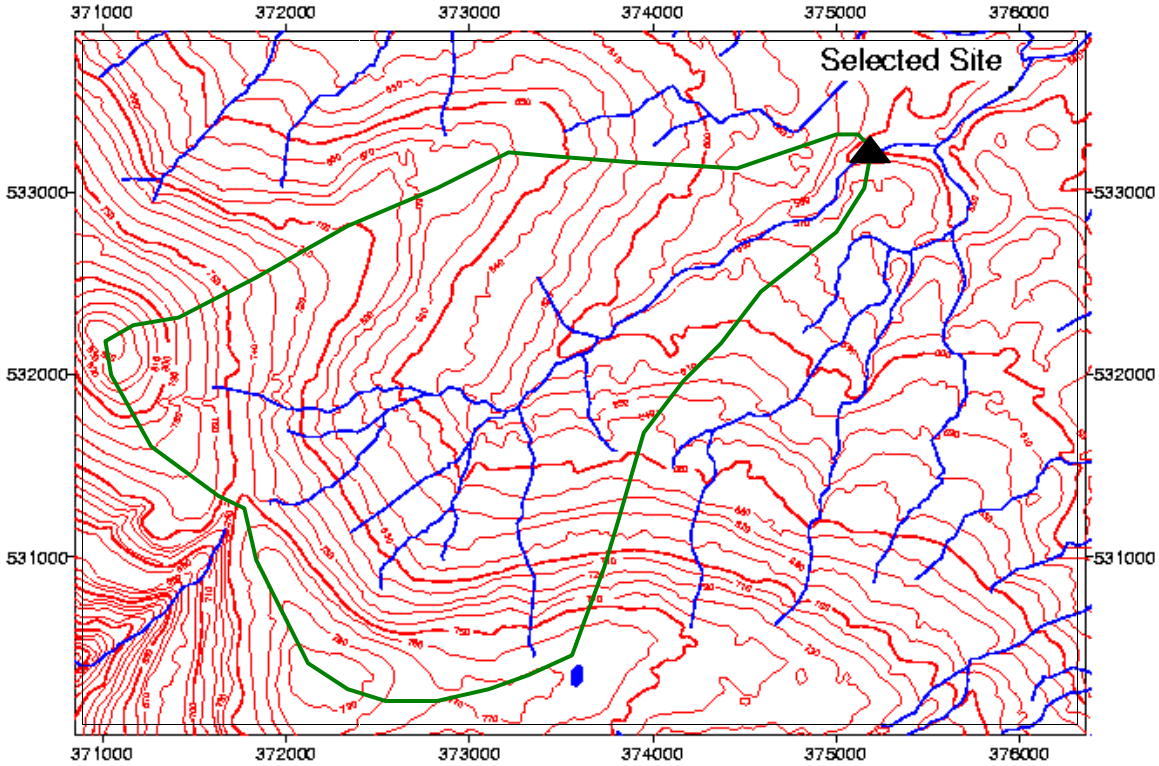

Figure 1: Example of catchment boundary definition (rivers, contour lines, catchment boundary)

Checks should be made to ensure the catchment boundary does not cross any rivers/streams except at the catchment outlet. Please note that accurate definition of the catchment area is an essential step. An inaccurately defined catchment will severely constrain the accuracy of any of the subsequent analysis. Site inspection may be necessary to fix the boundary of small or flat catchments.

LowFlows Catchment Boundary Import Formats

LowFlows requires the user to generate a digital catchment boundary outside of the software. There are two ways of achieving this;

1. **shapefiles:** GIS programmes like ESRI ArcGIS and Pitney Bowes MapInfo have the ability to digitise boundaries from electronic maps. Other GIS programmes may have this functionality;

2. **comma separated values (*.csv) file:** coordinate pairs of the catchment boundary are manually obtained from paper maps or other copies, for example streetmap EU Ltd (2009), and entered into a spreadsheet saved as a *.csv file.

Once defined, catchment boundary shapefiles or *.csv files are easily imported into the LowFlows software as boundary polygons representing catchments.

Shapefiles

Using a GIS interface, the appropriate Ordnance Survey map should be imported and a polygon created of the catchment boundary. The boundary polygon should be saved as a shapefile.

CSV

A *.csv file can be used to store the grid references of your catchment boundary. Each 6 figure grid reference should be entered into a spreadsheet as X,Y coordinates (simply Easting and Northing locations). Figure 2 displays a spreadsheet with X (Easting) coordinates in column A and Y (Northing) coordinates in column B. Notice the columns are not headed.

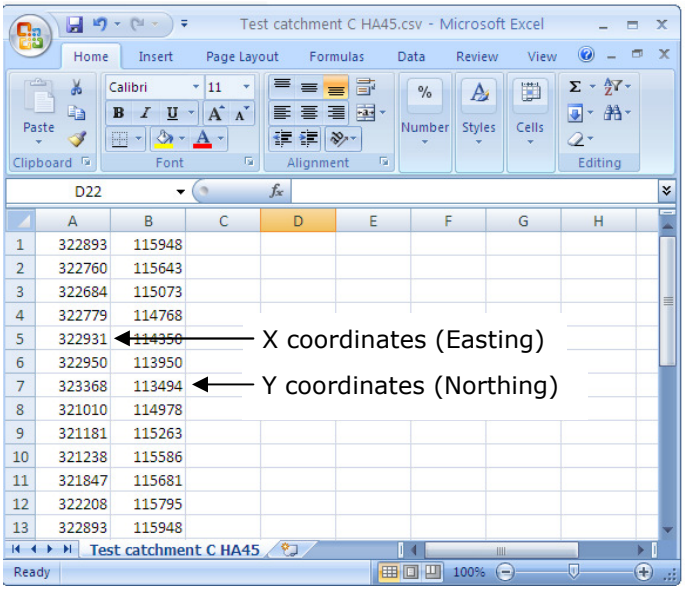

Figure 2: catchment boundary coordinates' format

It is imperative the X,Y coordinates should be listed in order (clockwise or anticlockwise) to show the sense of the polygon. The last point in the file should be a repeat of the first point, to ensure polygon closure (figure 2, row 1 and row 13). Once all X,Y coordinate data is entered, the spreadsheet should be saved as a comma separated values (*.csv) file (figure 3). Spreadsheet programs such as Microsoft Excel and similar programs can be used to save the data as a *.csv file.

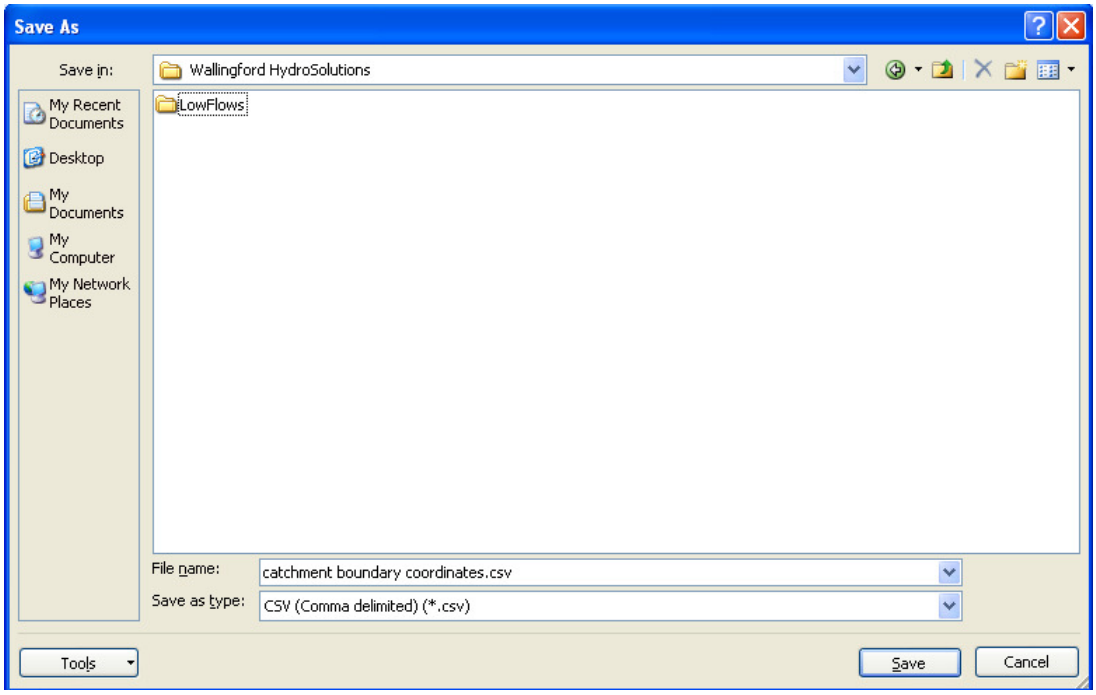

Figure 3: saving a spreadsheet as a *.csv file