



TUTORIAL - Filtering

Using the ESdat Environmental Database System

For use with ESDAT version 5

(version 5 software updates available from www.esdat.com.au)

ESdat

HELPING **YOU** DO, WHAT **YOU** WANT, WITH **YOUR** DATA

Produced by



Function Tutorial - Filtering

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Summary

This tutorial:

- examines the preparation and application of data filters in ESdat
- explores the ESdat Filter Panel and Filter Area
- applies to both Access and SQL Server versions of ESdat
- requires approximately 60 minutes to complete
- uses the *Sample Hydrogeology and Contam* (and therefore can be completed with the demonstration version of ESdat)

Pre-requisites

It is assumed the user has previously completed:

- *Tutorial 2 – Introducing ESdat*

This tutorial builds on Filtering concepts in greater depth.

For a full list of the Tutorials available for use with ESdat, please see the [Tutorial List](#).

Key Learning

Following completion of this tutorial, the user will have developed skills in the following:

- building filters using the Data, Filter and Map Panels
- building filters using the concept of Spatial groups
- saving filters temporarily or permanently

Introduction

ESdat filtering functionality was introduced in Tutorial 1.

Filtering data allows the user to manipulate a large data set in order to focus on information of interest. Filtering can be multi-layered, allowing screening of data based upon multiple parameters.

For example, the user may choose to focus in on:

- metals results obtained from a single groundwater well;
- over a certain period of time; and
- obtained by a particular method.

The combination of multiple filters is near-limitless and allows flexibility in querying a dataset.

Some filters have been established in ESdat. These permanently available filters appear in the form of queries that form the *Data Types*.

Data Types available in ESdat include the following:

- Location data
- Borehole and groundwater well data
- Geological data
- Water levels
- Water, soil and gas chemistry data
- Logger data

Note that these Data Types are consistent with the range of buttons visible when *Data Views* is selected. ESdat automatically organises data within a project database (i.e. filters the data) into these different categories.

The filter function within ESdat allows further refinement of data to suit the specific requirement of users.

The Filter Area

The ESdat *Filter Area* is used to create and apply filters, and is presented in the figure below:





The white area (highlighted with the yellow boundary) in the figure above is referred to as the *Filter Text Box*.

Filters are shown as formulae in the *Filter Text Box*. Filters can be generated by various methods, including writing directly into the *Filter Text Box*.

A filter is constructed in a form of pseudo-English in the form of Structured Query Language (SQL) which is used to extract desired information; advanced users can manually edit this SQL statement if needed.

The key *Filter Area* buttons in ESdat appear to the right of the *Filter Text Box*.



The undo button  allows the user to undo one action (the last) only, while the delete button  clears text from within the *Filter Text Box*.



The three grey tabs below the Filter Text Box allow access to the Data Panel, Map Panel and Filter Panel (highlighted in yellow in the figure above).

Creating Filters

Filters can be created in ESdat using each of these panels, as follows:




Data Panel:

- Filters can be constructed directly from the data displayed within the *Data Panel* for a specific Data Type by double clicking on specific cells. The parameters or values in the cells can be used to create a filter (e.g. double clicking on a certain Location Code will filter data to include only data from that location)

Filter Panel:

- Allows construction of more sophisticated filters from any possible values for any available fields that can be accessed for the chosen Data Type.

Map Panel

- Is typically used to select Locations from a map using the:
 - Select Rectangle  tool, or the Select Circle  tool; and the
 - To Filter button 

The following sections explore constructing filters using these different options available in ESdat.

Data Panel Filtering

As shown in Tutorial 1, by double clicking on a value in the Data Panel adds the selected value to the Filter Area.

Double clicking on the same value/point again applies the filter to the dataset.

Exercise 1: Filtering using the Data Panel for Water Chemistry results

The objective of this exercise is to filter water chemistry results for lead in the *Upper Aquifer*.

- Open ESdat
- Open the *Sample Hydrogeology and Contam* database
- Navigate to the *Data Views* view type (selected from the top toolbar within ESdat)
- Click on the *Water Chemistry* data type button
- Selecte the *Data Panel* (grey tab) to view the tabulated water chemistry data
- Find the *ChemName* column and double click on a cell containing the value *Lead* (as shown in the figure below)

Sampled_Date-Time	ChemName	Total_or_Filtered
30 Jan 04	Nickel	F
30 Jan 04	Arsenic	F
30 Jan 04	Chromium (total)	F
30 Jan 04	Copper	F
30 Jan 04	Zinc	F
30 Jan 04	Lead	F

Note the text `ChemName = 'Lead'` in the Filter Text Box.

- Find the *Monitoring Unit* column and double click on a cell containing the value *Upper Aquifer*

Sample_Depth	MonitoringUnit	Sampled_Date-Time	Monitoring
7	11.0 Lower Aquifer	25 Feb 2010	
7	11.0 Lower Aquifer	25 Feb 2010	
7	11.0 Lower Aquifer	25 Feb 2010	
3	7.0 Upper Aquifer	25 Feb 2010	
3	7.0 Upper Aquifer	25 Feb 2010	
3	7.0 Upper Aquifer	25 Feb 2010	

The filter string in the Filter Text Box should appear as:

```
ChemName = 'Lead' AND
```

```
MonitoringUnit = 'Upper Aquifer'
```

- Click *Apply Filter*
- While viewing the *Data Panel*, click the *Remove Filter* button

This will turn the filter off, however the text within the Filter Text Box will be retained.

- Turn the filter on and off using this process to see the results of applying the constructed filter.

Note the Filter On/Filter Off text to the right of the *Remove Filter* button.

View the results of the above filter on the Map:

- Switch to the *Map Panel*
- Click the *Labels* button (top centre of the map)
- Select *Show Result Table* (this will create a table of analytical results against each location on the map)
- Toggle between *Apply Filter* and *Remove Filter* to observe the changes in data displayed on the map

View the results of the filter on a Chemistry Output Table:

- Click on the *Chem Table* button (located at the right side of screen)



- Accept the *Use current ESDAT Filter* option
- Click *Next*
- Uncheck *Include Summary Statistics* (unless P_{Ro}UCL is installed and mapped through ESDat. Macros may also need to be enabled in Excel)
- Accept the remaining default settings and click *Finish*


A Chemistry Output Table table will now be generated in Excel.

Note that only Lead analytical results for the Upper Aquifer are presented in the table, as the filter has been applied.

Filtering using the Filter Panel

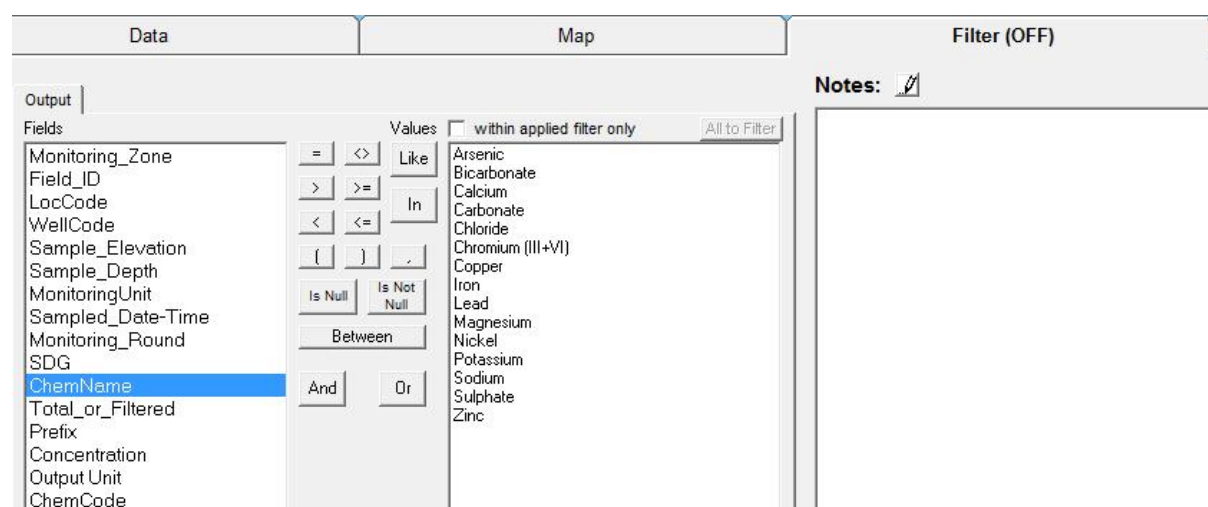
Exercise 2: Filtering using the Filter Panel for Water Chemistry results

The following exercise will construct the same filter as that constructed in Exercise 1 using the Filter Panel.

- Remove and clear the filter created in Exercise 1 by clicking the *+Clear*  button

This will restore the full, unfiltered data set.

- Select the Filter Panel (note the tab should currently show *Filter (OFF)*)



- In the *Output Fields* list (left column, see above), click once on the field *ChemName*. This will populate the window on the right with the list of *ChemName* Values.

- Double click on the value *Lead*

A filter will be created in the *Filter Text Box* as follows:

```
ChemName = 'Lead'
```

- Click on the Output Field *Monitoring Unit*

A list of *Monitoring Unit* values will appear in the window to the right.

- Double click on the value *Upper Aquifer*

The filter is now the same as that created in Exercise 1. Confirm this by viewing the *Data* Panel and the *Map* Panel.

- Clear the filter and remove it, ready for the next exercise.

Hint:

If a mistake is made while constructing a filter, a dialogue box will be displayed with an error message. If an error message appears:

- click the *OK* button to close the error message
- click the *+Clear* button beside the Filter
- repeat Exercise 2 from the beginning

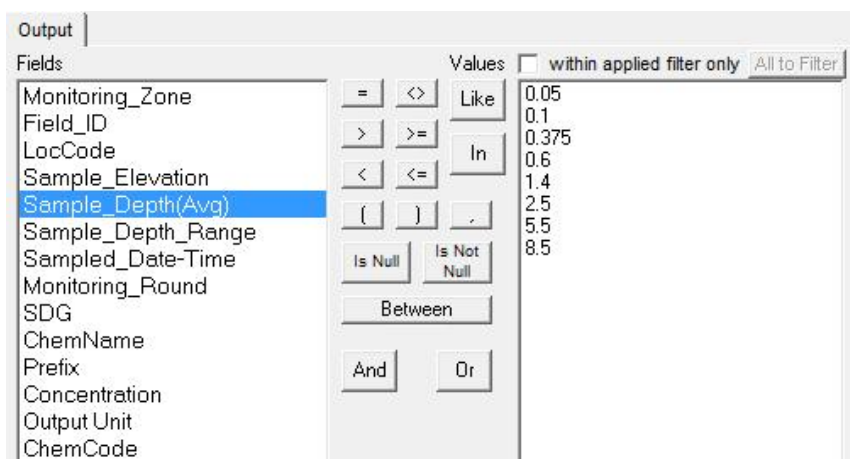
Exercise 3: Filtering using the Filter Panel for Soil Chemistry depths

In this exercise a filter will be created to show all soil chemistry data within the upper 0.4 depth units (typically meters or feet).

- Select the *Soil Chemistry Data Type* button

The *SChem1_Chemistry* table will be selected by default. (Hover over the *Soil Chemistry Data Type* button to display all table options).

- Click on the *Map Panel* and note the number of data points showing
- In the *Filter Panel*, select the Output Field: *Sample_Depth (Avg)*



- Click once on \leq (less than or equal to) from the operator buttons
- From the Values list (right column), double click on *0.6* (the depth that closest to 0.4)
- Edit the text in the Filter Text Box and change *0.6* to *0.4*. The text appearing in the Filter Text Box will read

[Sample_Depth(Avg)] \leq 0.4

- Click the blue *Apply Filter* button
- Navigate to the Map Panel and compare the number of points now visible

Map Panel Filtering

By clicking and holding the left mouse button on a point on the map, then dragging the mouse in any direction will create a rectangle. Any locations within that rectangle will be selected.



Multiple points can be selected on a map by dragging a square or circle around them (see the *Select Rectangle* and the *Select Circle* buttons to the upper left of the *Map Panel* – *Select Rectangle* is the default option).

Clicking the *To Filter* button in the map toolbar (immediately above the map) adds the selected point to the filter.

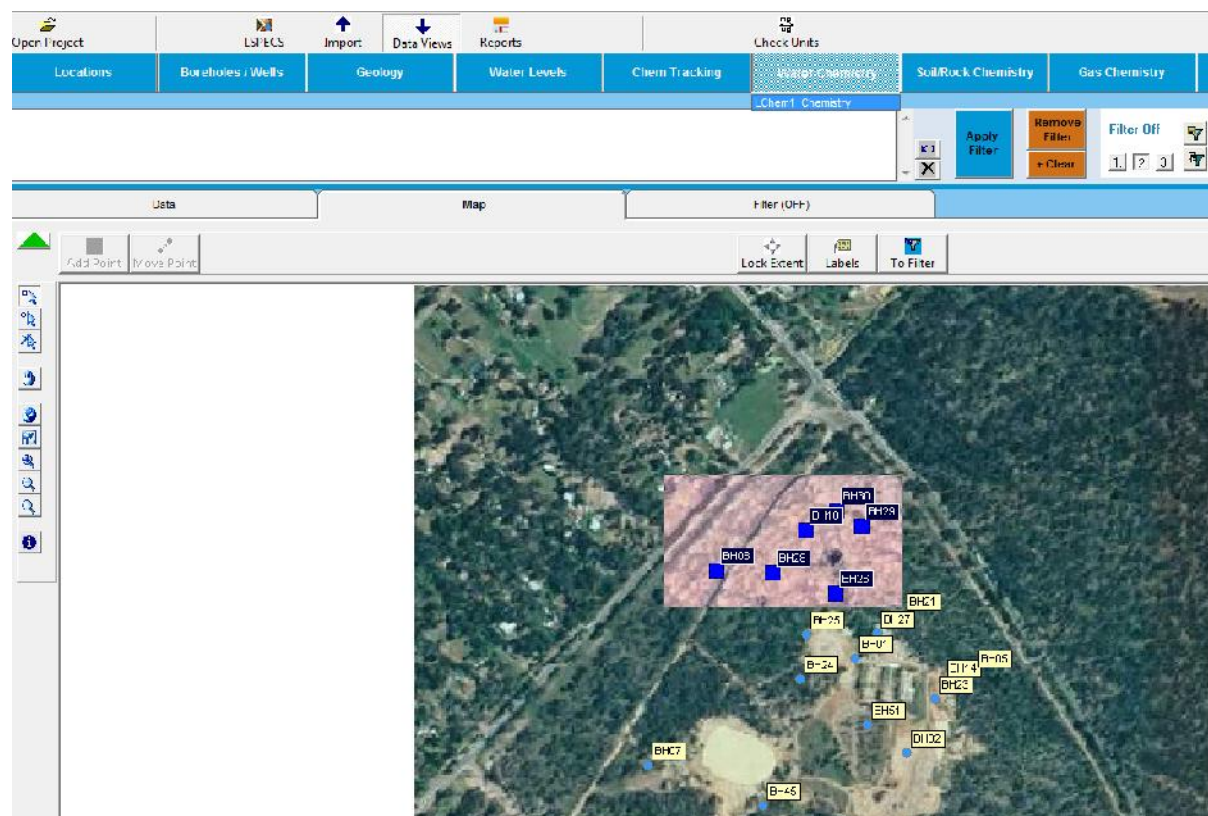
By clicking on a point again, it is deselected.

Exercise 4: Filtering by Location from the Map Panel

This exercise will filter the Water Chemistry results available within a specific area on a map.

- Click the *Water Chemistry* data type button (*LChem1_Chemistry* is selected by default)
- View the map from the Map Panel and note the points that are visible
- Use either the *Select by Rectangle*  or *Select by Circle*  tool to select a group of data points on the map

The figure below illustrates selection of a group of locations (data points) using the *Select by Rectangle* option.



- Click *To Filter*

Note that the location codes for the selected points appear in the Filter Text box.

- Click *Apply Filter*

Only the selected points will appear on the Map and the data panel to see the filtered data set.

- Clear the filter, in preparation for the next exercise.

Spatial Groups

ESdat has the ability to assign *Spatial Groups* for the purpose of filtering.

A group of Locations can be selected and a name assigned to that group, creating the *Spatial Group*.

For example, a location (e.g. soil bore) in Ballina could belong to two spatial groups – Ballina Shire and NSW (two very large *Spatial Groups* in this case).

A single location can belong to multiple *Spatial Groups*, as this example shows.

Users can create Spatial Groups as required, as shown in the next exercise.

Exercise 5: Using Spatial Groups for filtering

To create a Spatial Group:

- Select a number of the locations on the map by:
 - clicking on a point;
 - using the Select by Rectangle tool; or
 - using the *Select by Circle* tool
- Add these locations to the filter by clicking the *To Filter* button
- Click the *Apply Filter* button
- Switch to the *Data Panel*
- Click the *Assign Filtered Locations to a Spatial Group* button (shown in the figure below) located at the bottom the toolbar at the left of the *Data Panel*



- When prompted enter a suitable group name (e.g. *Northern Group*)
- Click *OK*
- Clear the filters
- Switch back to the *Filter Panel*
- Select *Group* from the list of *Output Fields*

Once selected, a list of names should appear on the right panel, including the new Spatial Group name.

- Double click the new Spatial Group name (note the Filter Text Box)
- Click *Apply Filter*
- Return to the *Map Panel*.

Note the locations included in the new *Spatial Group* are displayed.

Try applying and removing the filter, and note the changes.

Manual filter creation

ESdat allows direct, manual editing of filter text within the *Filter Text Box* that is generated from the Filter, Data and Map Panels.

There are comprehensive guidelines on the correct syntax in the [ESdat Help files](#).

Saving Filters

Exercise 6: Saving Filters Temporarily

Up to three filters can be stored temporarily at one time.

This can be useful when querying specific sub-sets of a data base, such as lead concentrations in the Upper and Lower Aquifers in the *Sample Hydrogeology and Contam* example database. Creating and saving these two distinct filters in ESdat allows toggling between the two.


A set of buttons that allow temporary storage of filters are located in the *Filter Area* to the right of the *Remove Filter* and *Clear Filter* buttons.

The *1, 2 & 3 Buttons* (shown in the figure below), each temporarily store a filter, while an alternative filter is applied.



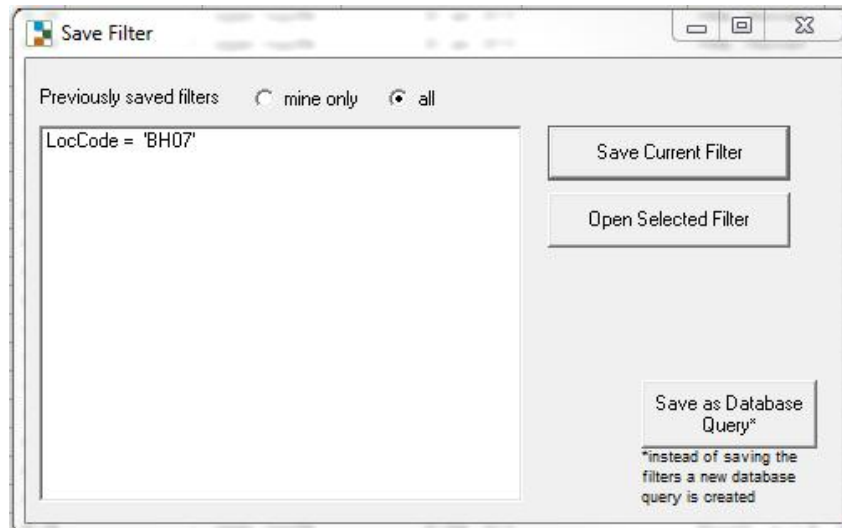
- Before commencing to construct a filter, ensure previous filters are removed and cleared
- Select *Button 1*
- Construct a filter
- Select *Button 2*
- Construct a second, different filter
- Select *Button 1* again
- Apply Filter
- Select *Button 2* (note the changed text above Buttons 1, 2 & 3)
- Apply Filter (again, note the changed text above Buttons 1, 2 & 3)

Exercise 7: Saving Filters Permanently for Reuse

The Save Filter ( also see the figure above) button allows a constructed and applied filter to be permanently saved.

When saving, a description for the filter being saved is required (by default, text from the Filter Text Box is used as the filter description, however this can be altered).

- Create a filter
- Click the *Save Filter* button
- A dialogue box will open (as shown in the figure overleaf). Click *Save Current Filter*



Previously saved filters are also accessed through the *Save Filter* button. The dialogue box will open listing previously saved filters.

- Click the *Save Filter* button, opening the dialogue box
- Click on the *Open Selected Filter* button
- Re-open and apply the filter saved in the earlier steps

Copying Filter Information

The Copy QA Information to Clipboard button  copies information about the current filter, such as:

- Data source
- Filter information
- Creation date
- Creator details

This information can then be pasted into any application (such as a report or spreadsheet, or copying quality assurance information into clipboard).

Further Tutorials

For a list of other tutorials available with ESdat see

<http://www.esdat.net/esdathelp/index.html?tutorials.htm>