



## TUTORIALS

using the ESdat Contaminated Site and Hydrogeology System

### Access Version

For use with ESDAT version 4

(version 4 software updates available from [www.esdat.com.au](http://www.esdat.com.au))

# ESdat

HELPING YOU DO, WHAT YOU WANT, WITH YOUR DATA

Produced by  **EScIS**  
EarthScience Information Systems

# Preface

ESDAT is a data management, analysis and reporting software system that is designed specifically for the management of spatial and time-series environmental datasets. ESDAT combines receipt of laboratory and field data with inbuilt data filtering, tabular reporting, graphing, GIS mapping, and outputs to commonly used data analysis and GIS software, without the need for users to manually reconfigure data file formats.

The internal functionality and range of interactivity with other environmental software packages enables users to manage data seamlessly from its source through analysis and reporting.

A number of systems can be used through ESDAT, the Contaminated Site and Hydrogeology System has been used for these tutorials. This system is available with either Access or SQL Server based systems. Access based systems offer greater ability for project specific customisation, while SQL Server based systems offer centralised multi-site/multi project data management. This tutorial refers to the Access based System.

For more detailed information on ESDAT see [www.esdat.com.au](http://www.esdat.com.au) or the ESDAT help files. If you require assistance with any problems, or have any questions you can contact support at EarthScience Information Systems.

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## Software Requirements

### Essential:

Microsoft Windows NT, 2000, XP, Vista

Microsoft Excel 2000, XP, 2003, Vista

### Possible links provided to software you may have on your machine:

Surfer 7,8

ArcMap 3.x, 8.x, 9.x

Mapinfo 6.x, 7.x

gINT 8

WinLog 4

Access 2000, XP, 2003, Vista

EVS add-in (available separately)

## Installing ESDAT

In order to install ESDAT and the sample files you should follow these steps:

1. Download the ESDATv4Install.msi file to your hard drive
2. Double Click to install (If you have restricted installation permissions you may need to obtain Admin status).

From time to time an update may be available from our web site, if you have a licenced version you will be automatically notified and can download and install the update.

## Tutorial 1

The purpose of this tutorial is to provide a quick overview of ESDAT's functionality. Further analysis and reporting is included in subsequent tutorials.

### Opening the Sample Database

Once you have installed ESDAT start the program by selecting ESDAT under the Windows Start – Programs Menu.

The Startup form will appear, where you can open existing databases, create new databases, or use factual reports functionality. A list of recent databases appears on the left of the form. The most recent database used (Sample Hydrogeology and Contam) will be highlighted.

1. Select 'Sample Hydrogeology and Contam' and click 'Open'.

### ESDAT Window Navigation

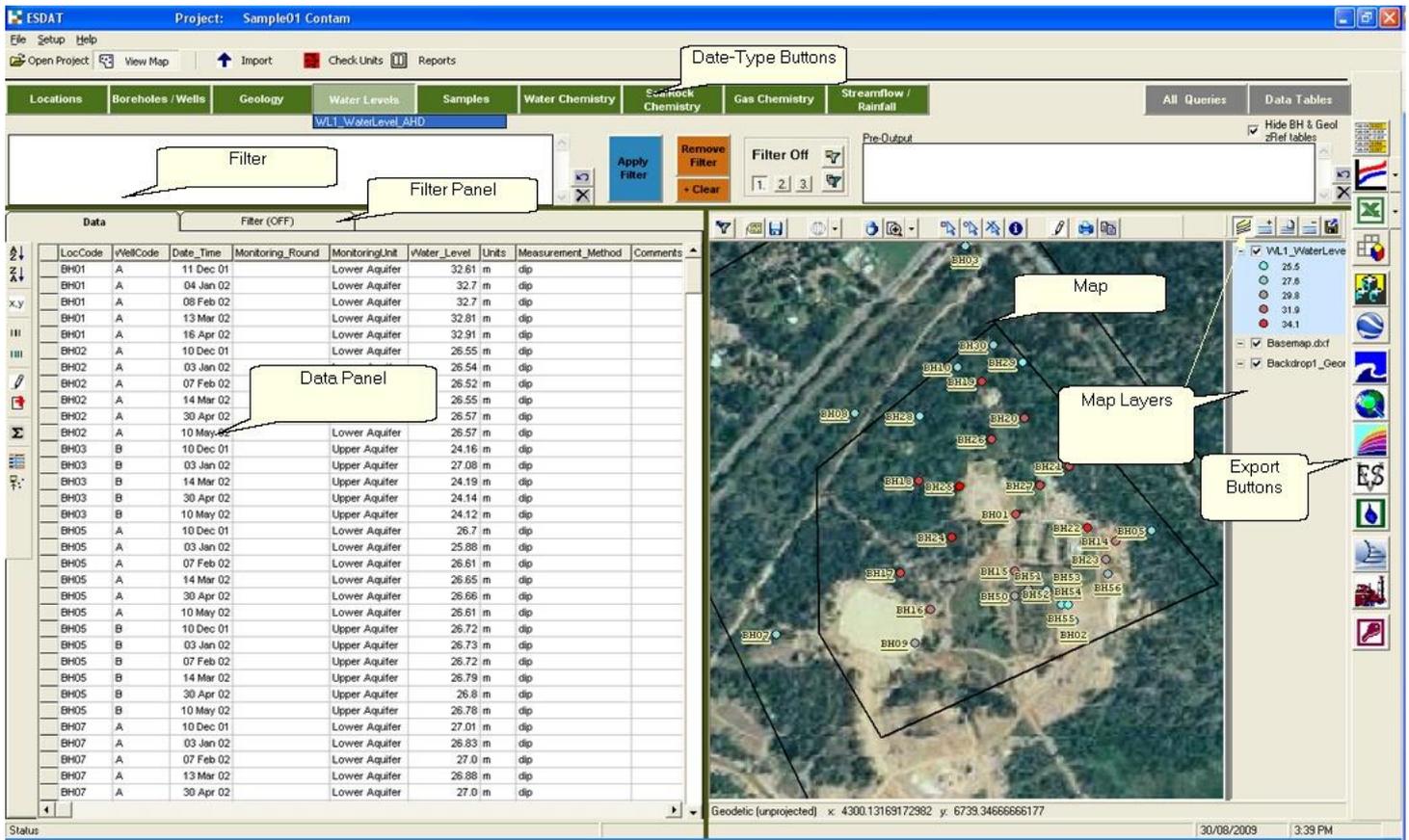
The buttons at the top of the screen are command buttons used to open different ESDAT functions such as the Map, Reports, Importing, and Unit Checks.

The line of green buttons below these are the Data-Type buttons. These represent different types of data such as Water Chemistry or Location information. These can be customised if required. When we open a database the Location information opens by default

Underneath the Data-Type buttons is the filter area. When you construct a filter it is displayed here.

Underneath the filter is the data. The data shown relates to the selected Data-Type, with the filter (if applied). The toolbar to the left of the data relates to actions affecting the data panel (such as editing, sorting or summarising).

The larger toolbar on the right shows the external links, which can be accessed through ESDAT. These are used to export or link data to other packages. Once we have selected and filtered our data we can click one of these buttons to export the data to the desired application.



Click on the  View Map button at the top of the screen to see the site locations with a background map.

## Tabulating Chemistry

1. In ESDAT click the "Water Chemistry" Data-Type button. in the "Reports" form click "Chemistry Result Tables"

A spreadsheet of the "Water Chemistry" data will be shown.

2. One of the columns will be titled "Monitoring Unit". Double Click on "Lower Aquifer". Click "Apply Filter"

We have now filtered for all Water Chemistry data in the "Lower Aquifer".

3. Click the  Chemistry Tables button at the top of the right toolbar.

4. Accept the "Use Current ESDat Filter" option, click "Next"

## ESDAT Environmental and Hydrogeology Tutorials

We can now specify the layout of the table, and specify the Sample Fields to be included.

5. For Orientation select “Chemical Names across the top”.
6. For Grouping select ‘Group By Chem Group
7. Accept the default Sample Fields to be output.
8. Ensure ‘Auto-Format Exceedances’ is selected.

Ensure ‘Summary Stats’ is selected.

Click “More Options” to browse additional options.

9. Click 

*The table is now produced in Excel. With the Auto-Format Exceedances option selected, any guideline exceedances are shown. Non-detects are in a grey font.*

16. Repeat the table production, but try varying the layout settings. Select an orientation of 'Chemical Names listed Vertically', and deselect “Auto-Format Exceedances”. Click Finish.

*The table is now produced in Excel, but the guideline exceedances are not formatted.*

10. Select the first Guideline on the table and, in the ‘Format Guideline Exceedances’ form in the upper left corner of the sheet, click the “Bold” button. Select any other guideline and click “Italic” in the ‘Format Guideline Exceedances’. The exceedances of these guidelines are shown in the specified format.

11. Repeat the above steps playing with different options.

Headers and footers can be set up with company logo’s and to automatically include project information, such as the site address and project number. Information on this is included in the Help files (Setup – Templates) available in the ESDAT Help menu.

## Reporting Chemistry QA errors

The most common (but not only) method of reporting Chemistry QA data in ESDAT is to use the Chemistry QA Checker.

1. Click the QA Checker (the left button).

The QA form will load. On the right are the different types of checks you can run and their settings. These are standard tests for Chemistry QA problems, such as violated holding times. All the settings are configurable. At the top left is a list of Sample Delivery Groups (SDG, a USEPA acronym), which are the batch numbers for a set of samples. Data for the report can be selected by SDG, or you can choose to use the Sampling Dates, or select all data.

2. Click the "Export All Data" checkbox at the bottom of the list of SDG's, and click the "QA Summary and QA Errors" button in the panel under the Output to Excel Tab.

*A report is produced in Excel. The initial screen shows the Table of Contents for the Report.*

3. From the Table of Contents, click on the 'Count of Samples' link. This gives a summary of the number of different sample types.
4. Go back to the contents (click on the link in Cell A2)
5. Click on the 'Field and Interlab Duplicates' link and review the table.

*This table shows all Field Duplicate results, with the RPD. Any non-conformances are shown in bold.*

6. Go back to the contents.
7. Click some of the other links to view any QA problems.
8. Close the Chemistry QA Report in Excel, and close the Chemistry QA Checker form and the Factual Reports form in ESDAT.

## Importing Laboratory Chemistry

Laboratory derived chemistry data can be automatically imported using a particular file format provided by the laboratories.

1. In ESDAT click the  Import button and select "Laboratory File" from the dropdown menu.
2. Select the file " Sample01.Labmark36.Chemistry22.csv" located in the sample directory (you may need to navigate to the path, this will typically be C:\Program\_Files\ESDAT\Sample\_Contam )

*The lab data will load in Excel, initially showing the Sample data.*

*There are a number of Field Duplicate Samples in the data (rows 22-24); we need to indicate which samples are the Field Duplicates, and which sample they are duplicates of. In this case the Field\_ID provides this information. Your field notes will normally be the source of this information.*

3. In cells I22-I24 (Sample Type column) select "Field\_D" from the drop-down. You will be prompted to click on the Sample for which this is a duplicate.

*In the case of row 22, the Sample is a duplicate of that taken from BH02 (in row 5).*

4. Select the Parent Sample (cell A5 for the first duplicate). Do the same for the other Field Duplicates.

*You will notice that the "Parent\_Sample" column is updated to show the SampleCode of the Parent Sample. The Location Code column is also updated with the location of the Parent Sample. The Field\_ID column remains unaltered.*

*There are two blanks in this batch. We need to specify what types of blank they are.*

5. In the Field\_ID column you will see the Trip Blank (labelled Trip Blank) and the Rinsate (Labelled Equip Blank)
6. In the row containing the Trip Blank data (Row 25), select the Sample\_Type (in column I') and from the dropdown menu, select Trip Blank.
7. In the row containing the Equipment Blank data (Row 26), select the Sample\_Type and from the dropdown menu, select Rinsate.

*Note the Field ID is left as it was specified in the field, but the LocCode, which was originally identical to the Field ID is now blank.*

8. In the Excel toolbar (under 'Add ins' in Vista) click on the  "Upload Data" icon, accept the defaults and click "Import".

*The data will upload*

9. Still in the same Excel workbook change to the Chemistry Sheet and import the Chemistry data.

*You will receive a small number errors related to an invalid ChemCode (ChemCodes are used to provide an unambiguous reference for a compound. CAS – Chemistry Abstract Service numbers are used where available). This error is caused by the ChemCode provided by the lab being different from valid values in the database.*

10. To fix the ChemCode click on the  "Get ChemCodes" icon in the Excel toolbar.

*The "Associate ChemCodes" form will be displayed.*

*The right panel shows all compounds in the database. The left panel shows the code we are having problems with (Potassium).*

*The correct ChemCode for Potassium has been found automatically.*

11. To update the codes in the spreadsheet click the "Update" button, and then click  "import" to import the corrected data.

*The laboratory data is now imported, there is no need to save changes in Excel.*

12.  Close Excel.

*Note: Excel is used as a tool to update the database files that ESDAT uses. The data are not stored in Excel.*

## ESDAT Map

1. To open the Map Click on the  View Map button at the top of the screen

Geology	Water Levels	Samples	Water Chemis
	WL1_WaterLevel_AHD		
	WL2_WaterDepths_bgl		
	WL3_NAPL		
	WL4_Water_Strikes		
	WL5_Pumping		

2. Move your mouse to the ' Water Level (AHD) ' data

*You now have all the water level data displayed in the data panel. The GIS Window shows the data locations read directly from the database and plotted against a basemap of the site.*

3. Click the Toggle Labels' button  on the map toolbar.

*The label will iterate between the Location Code, the Water Level range (with cold – hot colouring), both the location and the range, colouring with no label, and back to the Location Code.*

4. Select the Northernmost 5 or 6 points (position the mouse, depress the left mouse button, drag a square over the data points, release the button).

*The selected points will turn yellow.*

5. To add these locations to the filter click the  "Send selected Locations to Filter and deselect" button (left side of the map toolbar).

*You will see that a list of these locations have been added to the filter, and that the points return to their original colour.*

6. In the filter panel click the "Apply Filter" button

*We now have only the filtered data in the Data Panel, and the Map will display only the locations we have filtered for.*

## Graphing Water Levels

We are going to graph the data we have filtered for;

1. On the right toolbar click on the  "Produce Graph Plots in Excel" button.

*ESDAT will use default settings to plot the data using Excel (we will look at altering default settings in Tutorial 2).*

2. Click the  button at the bottom right of the screen. (This button appears under the 'Add ins' tab in Vista).
3. Select one series and click 'Replace'.
4. Click the button again and select another and click 'Add'. This way we can alter the composition of the graph.

*Only those data selected will be displayed. Play around with the options here.*

5.  Close Excel without saving

## Graphing Time-Series Chemistry

Water Chemistry	Soil/Rock Chemistry
LChem1_Chemistry	
LChem2_Environmental_Standards	
LChem3_milliequivalents	

1. In ESDAT, Select ' Water Chemistry' data

2. Click the graph icon  on the right toolbar to "Produce graph plots in Excel".

*A series of graphs showing available time-series chemistry is generated. Environmental guideline levels are indicated by dotted black lines.*

*By default the graphs are plotted two to a page; all graphs show the same date range; non-detects plotted as zero; and environmental standards are included.*

3. Click the drop-down arrow next to the graph icon . You will see that all these settings can be altered if desired.

## Contouring

1. Using the Groundwater Water Level data, remove and clear the filter in ESDAT by clicking on the red  "+ Clear" button beneath the  "Remove Filter" button.

In the Data Panel one of the columns is the "Date\_Time". We can filter for a value by double clicking on the value in the data panel.

2. Double-click on the date '11 Dec 01'

*This repopulates the filter with this date.*

3. To apply the filter double click the same data again or click the green "Apply Filter" button.

*Double clicking the same value twice applies the filter. When the filter is applied the filter tab should read "Filter (ON)"*

4. Click on the  "Contour in Surfer" button.

5. Accept defaults and Click “Contour”.

*Surfer will now open and you will see the contoured water levels, with data points.*

6. Close Surfer without saving and go back to ESDAT.

We have had a brief demonstration of some of the basic functionality of ESDAT. To cover these topics in greater depth you should work through the next tutorial in sequence.

## Key Concepts in Tutorial 1

In Tutorial 1 we established the following key concepts.

- Production of Chemistry Output Tables using basic filters and different layout settings
- Use of the QA Checker.
- Import of Laboratory Data and assigning unique codes to each compound.
- Use of the inbuilt map, and labelling and colouring by values.
- Introduction to Filtering
- Introduction to Graphing
- Use of filtered data to export to external packages

## Tutorial 2

This tutorial assumes previous completion of Tutorial 1, and builds on the concepts in greater depth as well as introducing new features.

### Filtering



We have seen a brief example of the use of the filter in the Tutorial 1 overview. The filter uses the following concepts:

- A double click on a value in the data panel adds the selected data to the filter. Double Clicking on the same value/point again applies the filter
- A click on a point on the map and clicking  "Send selected Locations to Filter and deselect" adds the selected data to the filter.
- Multiple points can be selected from the map by dragging a square around them
- More sophisticated filters can be constructed using the "Filter" tab,
- Advanced users can manually edit the filters and use the pre-output filter.

While working through the tutorial it may be necessary to refer back to these core concepts until you are comfortable with the correct procedure for use of the filter.

We would like to see what Lead Water Chemistry results are available in the 'Upper Aquifer'.

Samples	Water Chemistry	Soil/Rock Chemistry	Gas Chemistry
	LChem1_Chemistry		
	LChem2_Environmental_Standards		
	LChem3_milliequivalents		

1. Select 'Water Chemistry'

data .

2. If the map is open, close it so we can see more of the data (ie  at the top of the screen)

- In the data panel, double click on a ChemName cell containing the value "Lead";

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
30 Jan 04		F

- In the Column "Monitoring Unit" (scroll to the right) double click on a cell containing "Upper Aquifer". To apply the filter double click on this cell (or another with the same value) again, or click "Apply Filter" in the filter panel.

We can also construct the filter from the "Filter" panel. To do this:

- Clear the Filter using the "+Clear" button directly beneath the "Remove Filter" button at the top of the screen.
- Click on the "Filter" tab



- To populate the filter do the following:
  - Click on the Field "ChemName" - The window on the right will populate with the list of ChemNames.
  - Double click on the Value "Lead"

Now, in the left window:

- Click on the Field "Monitoring Unit" – The list to the right will once again populate.
- Double click on the Value "Lower Aquifer"

*The filter string should read:*

*ChemName = 'Lead' And*

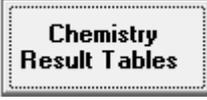
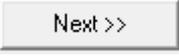
*MonitoringUnit = 'Lower Aquifer'*

4. Click Apply Filter to obtain just this data. (If you have made a mistake in constructing the filter you will get a message box telling you so, you should clear the filter and try again)
  - *You can see the locations of these points in the map panel, when it is open.*
  - *The data associated with this filter is shown in the Data panel, which can be viewed by clicking the “Data” tab on the left side of the screen.*

*You can also construct the filter by editing the filter text directly. There are comprehensive guidelines on more sophisticated use of the Filter in the Help files.*

## Filtering for Chemistry Tables

We saw in Tutorial 1 how to produce a Chemistry Table when filtering by Matrix and Sample Batch or Date. Here we are going to look at using a more complex filter.

- Select the ‘Soil Chemistry’ data.
- in the ‘Filter’ tab, select the Field ‘Sample\_Depth (Avg)’
- Click once on  ‘less than or equal to’ from the operator buttons.
- When the list of average depths populates, double click on a depth that closely approximates the value you are seeking (in this case ‘3.5’).
- Mouse-click in the filter panel and delete the ‘.5’ on the end. This will leave the filter reading '[Sample\_Depth(Avg)] <= 3'.
- Apply the filter, and look at the “Data” tab to check some data conforms with the filter applied.
- Now, to produce the report, click on the  Reports button and select .
- Check the  Use Current ESDAT Filter checkbox in the Chemistry Output Tables form to process the report from filter you have just arranged, then click .
- Accept the defaults in the next Chemistry Output Tables form, and click ‘Finish’.

*ESDAT will now construct your report in Excel.*

## Graphing and Trend Analysis



### Non-Chemistry

1. Select the Water Level (AHD) data, and if necessary, remove the filter.

2. To see the default graph settings, click the drop-down arrow next to the graph icon



**Graph data in Excel**

**Generic**

Plot (Y-axis):   Check for Duplicate Chart Values

Invert

Against (X-axis):   Produce a new Chart for changes in:

Series By: (lines):

Use consistent X-axis ranges

Use consistent Y-axis

Chart Updatable  Include Linear Regression Trend: p

Chart Template:

*Note that the form indicates the Water Level will be plotted on the Y-axis, the Date-Time on the X-axis, and that a new series (ie line on the graph) will be generated for each combination of LocCode and WellCode.*

3. Click the check box which reads “Produce a new Chart for changes in” and select “Monitoring Unit”

4. Change the Chart Format to “MultiChart Template”

5. Click “Plot”

*Excel will open and the data will be plotted. Confirm that the data is plotted as specified in the chart settings you used. As there is a lot of data you may find it hard to distinguish any trends (we will look at this shortly).*

*The data used to create this graph is in the worksheets "Data\_xxxx " in the same Excel book.*

6. Click on one of the Data sheets and as an exercise delete part of the data. Switch back to the graph and some data will be missing.
7. Click the  custom button, and click "Update". The data table will be repopulated with data from the database, and the graph will once again be complete.

*We can use the same approach to update graphs to reflect new data imported into the database. We will do this later using this graph.*

8. Save this excel workbook in a location you will remember.
9. Repeat steps 1-5 above, but also select the checkbox "Linear Regression Trend"

*You will initially be shown a Trend Summary Table*

10. Change to the "Chart" sheet
11. Select the lower graph and click on the  button at the bottom right. (This button appears in the 'Add Ins tab in Excel Vista)
12. Select only those series which are labelled as having a trend (LH stands for Last Value is Highest, TUp stands for Trending Up) and click 'Replace'.

*The series of interest are now much easier to study.*

13. You can now  close Excel

## Chemistry

1. In ESDAT, Select ' Water Chemistry' data



2. Click the drop-down arrow next to the graph icon . You will see the settings that can be altered, ie to include environmental standards; what to do with non detects; to use a uniform date range or fit each chart individually; to do a trend analysis; and the Chart Template to use.

3. Change the settings so that you are not including environmental standards; include a trend analysis; and change the chart template to “MultiChart”. Click “Plot”.

*You will see the charts as they are generated. You will finally be presented with some trend statistics. The trend for each series is also indicated on each chart.*

4. In ESDAT, again click the drop-down arrow next to the graph icon. Change the template to “Tiled”. Click “Plot”. This layout is suitable when assessing large numbers of compounds.

## Excel Export



1. In ESDAT use any data and click on the Excel icon .

You will see that you have a number of options, to only export selected rows, to maintain the link to the database, or to produce a Pivot Table or Pivot Chart.

Pivot Tables and Charts are tools available through Excel, and Excel has comprehensive documentation on their use. ESDAT links to a superior Pivot-Table to that available in Excel (discussed later), so Excel Pivot Tables are not recommended unless you are already familiar with their use.

ESDAT provides some tools for use within Excel.

2. In the ESDAT Excel Export click the “open ESDAT Excel controls” button at bottom right of the form.

*This will activate the ESDAT functionality buttons within Excel, which we will come back to.*

3. Click in the ‘Maintain Link to Database’ checkbox and Click Export.

*Selecting "Maintain Link to Database" also formats cells with no visible boundaries, (this is an Excel convention to indicate that the cells are linked to an external database), and the data can be updated as new data is loaded into the database.*

*In Excel you will notice that the ESDAT icon should now appear in your toolbar. This is your access point for ESDAT: Charting; Importing; Utilities. These will be investigated in more detail later.*

## ArcView and ArcMap Export



This section assumes a basic ability to use ArcGIS. ArcGIS must be installed. ESDAT also exports shape files to Arcview 3 (an earlier version of ArcMap), however this tutorial only deals with ArcMap9. The shapefile export works in the same manner.

## Stacked (Tabular) Labels

In ESDAT

1. Select Water Chemistry and filter for Chromium, Copper and Calcium data, with a Total\_or\_Filtered value of 'T'.

2. Apply filter

3. Click on the ArcMap icon ()

4. Select the "Stack Labels" check box (if using ArcGIS 9.x), and click "Plot".

*A blank ArcMap project will open with the data points shown. (If ArcMap is not installed where expected you will have to navigate to the executable)*

## Stacked (Tabular) Labels with Environmental Exceedances

1. Use SChem2\_Environmental Standards (under 'Soil Chemistry' or Soil Leachate) and filter for ChemName In( 'TPH C6 - C9 Fraction' , 'TPH C10 - C14 Fraction' , 'TPH C15-C28 Fraction' , 'TPH C29-C36 Fraction' )

2. Click on the ArcMap icon ()

3. Select the 'Stack Labels (Bold Exceedances)' check box, and click 'Plot'.

*The data will be shown in ArcMap, and the one exceedance will be shown in bold.*

## Data with full attributes / Live database linkages

Stacked labels reconfigure the data so that where there are multiple records for each location the data is consolidated for a single record at each location. This 'summary' of data can mean that certain attributes you require are not exported.

1. To export data without alteration repeat the above steps, but don't select the "Stack Labels" options.

Data in ArcMap can be linked back to the database so that as changes are made the map is automatically updated. Stacked labels do not support live linking. To create a live link:

2. Export as before, but select "Live link to data" prior to clicking "Plot".

This export is most useful for ongoing monitoring, where data can be filtered for a particular compound, and the point size or colour made to represent a concentration gradient. The ArcMap Document will always be up to date.

### ArcMap Notes

- You can add basemaps to these exports, and move the labels to facilitate better viewing. If you have Maplex for ArcGIS you can use this to facilitate better automatic label placement.. To have full ability to move and edit the labels in ArcGIS, ArcGIS requires that the labels be transformed into Annotation.
- The data exported and saved in the file "ESDAT-Shapefile" (shown in the left panel of ArcGIS/ArcView) is only temporary. To save a permanent copy in ArcGIS/ArcView the file must be renamed. To do this.
  - a) In ArcGIS right click the file
  - b) Select Data – Export Data
  - c) Change the file name.Otherwise ESDAT can export to a nominated shapefile without opening ArcMap (during the export select "Don't open ArcMap – Just produce a shapefile" instead of "New Instance" in the data destination.

## MapInfo Exports



MapInfo exports include the ability to export data as is, or summarised by each point. The ability to summarise by each point is useful where you may have multiple time series results at each point and want to show the maximum result.

1. Select ' Water levels ' data
2. Export using both the MIF (summarised) and Text (with attributes) options (with the attributes option you will need to run the x,y create points command in MapInfo)
3. Browse the tables to look at the differences.

## gINT Link



\*Complete this only if your organisation uses gINT 8 or higher for geological logging.

1. Click on the gINT icon on the right side of the screen. You will see the gINT screen flash.
2. Click the “Logs” button. The ESDAT borehole data will now be shown in gINT.

*This export uses standard gINT reports, which can be customised.*

## WinLog4 Link



\*Complete this only if your organisation uses WinLog4 for geological logging.

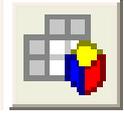
Click on the WinLog4 icon on the right side of the screen (  ).

1. Click “Send Data to WinLog”.  
*A new WinLog database will be created (if it didn't already exist) and it will be populated with borehole information from ESDAT.*
2. Click “Launch WinLog”.  
*WinLog will launch and you will see the WinLog borehole map.*
3. Within WinLog you can open a borehole log by double clicking on the borehole on the map, or clicking the “Open a borehole log” button.

*You may need to edit some of the output in WinLog to tweak label locations. If you find that data in WinLog is incorrect or incomplete you should enter or edit the data in ESDAT and re-export the data to WinLog. Note: if the data is in both ESDAT and WinLog, but is slightly different the data needs to be deleted from WinLog before it can be re-populated from ESDAT.*

WinFence can also be used on this data in the same way WinFence is traditionally used with WinLog data.

## PivotTable List Export



Although factual reports are provided for chemistry data, sometimes users need to restructure other chemistry or other data in a specific manner. ESDAT provides two tools for this. The easiest to use is the PivotTable List export.

The PivotTable List is a tool hidden within Microsoft Office (you will need to have Office). Linked with ESDAT it can be a useful tool to restructure filtered ESDAT data.

1. In ESDAT Select some Water Level data and click the  PivotTable List button.

2. Click the  Field List button (second from the right in the top toolbar)

3. Select the Location Code and drag it to the Column Fields on the Table.

Drag the Date/Time to the Row Fields

Drag the Water Level to the Detail Fields

*Using this you can add extra fields to the table. You will see that for some locations there are two measurements for each date.*

Drag the Well and the Monitoring Unit before the Date/Time

4. Try dragging the fields to different positions to generate different layouts.

*The data will be restructured to suit this new layout.*

5. From the Menus select Edit – Copy All, and click OK on the messagebox.

6. Paste the data into Excel

*This tool is quite handy, and easy to use, but copying from it to Excel can be quite slow when used with large output tables. Data should be filtered to that desired prior to copying the data to the clipboard. ESDAT's Cross-Tab summary (described later) is better able to handle restructuring of large tables, but is sometimes not as intuitive to use.*

## Data Importing



Click on the  “Import” icon, select ‘Templates’ and click on the “Wells / Water Levels” button. ESDAT will produce a template in Excel for you, into which you can paste or type data then import it.

Some sample data for import has been provided to illustrate certain features.

In Excel:

1. Open the file “New Data.xls” in the Sample directory (this will typically be C:\Program Files\ESDAT\Sample Contam).

*The Excel Book “New Data” contains some water level data (in the water level sheet), but it’s not in the format we’re looking for.*

To enter it into the Water Level table:

2. Copy and Paste the water level data from this file to the relevant sheets in the workbook you just created (make sure you your data matches the template type you are using).
3. Arrange the data in the correct columns.
4. Click on the  icon in Excel, accept the defaults on the “Upload Data” form, and click Import.

*The second data row will be imported (shaded a pale shade of green) to the database, but the first **will generate an error telling you that the record already exists.***

To compare the data you are trying to import with the data already in the database:

5. Click on the  icon in Excel, select the option checkbox “Compare Import Records with Existing Duplicate Records”, and click “Import”.

*A new (separate) worksheet will be created and shown. The new data will be shown next to the existing data (some of the data will be off the screen; scroll to the right). Differences will be highlighted in purple (some differences are fields which have been filled in with a default).*

To overwrite the existing information

1. Change back to the sheet from which we are importing; Click on the  icon in Excel, change the “Action” option from “Add new Records” to “Overwrite Existing Records”, and click Import.
2.  Close Excel without saving.

*This means of importing can be used for any data table in the database, including any tables you may add or modify yourself.*

## Laboratory Chemistry

1. In ESDAT import the laboratory data “Tute2.LaboratoryAA.Sample22.csv”
2. You will see that your Location and Depth data are concatenated in the Field ID. Click the  (Spilt Field ID) button. You will see that the location and the depth range are specifically defined. This works for a specific variety of formats, and extras can be added upon request.
3. Nominate your QA data. QA1 is a Field Duplicate of the shallow sample at BH05. QA2 is a Field Blank.
4. Import the data, correcting any errors.
5. Change to the Chemistry Sheet and import this data. You will notice that the first few ChemCodes are missing.
6. Assign the missing ChemCodes using the lookup list in ESDAT, or if you cannot find the compound (due to different naming conventions) use the links to NIST (US National Institute of Standards), or IPCS INCHEM (International Program on Chemical Safety).
7. Import the data that was rejected previously.

## Field Chemistry

1. In ESDAT click on the  "Import" icon, Select "Templates", and click on "Field Chemistry".

You will be presented with an excel worksheet for importing field chemistry data. Some predefined field parameters have been loaded, and the CAS Code is given above (or a surrogate code if no CAS code is available).

2. Type in some sample data as shown below: (A formula for creating the sample code is automatically generated. )

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
3										E.CONDUCTIVITY	PH	Redox	Temp	TOTALALKALINITY	UNK00172
4	SampleCode	Field_ID	LocCode	Sampled_Date-Time	WellCode	Sample_Depth_From	Sample_Depth_To	Matrix_Type	SampleComments	Electrical	pH	Redox	Temp	Alkalinity	Diss_Ox
5										uS/cm	pH_Units	mV	oC	mg/l	mg/l
6	BH1_01Jan04_3	BH1		1/01/2004		3	8	soil		500	8.1			21	
7		BH10		1/01/2004		5	10	soil		700	7.7			20	

3. Import the data (click the  button on the toolbar).

There may be a missing parent sample that is required related to the Location. Check that the nomenclature for Location Code BH1 is consistent with that already used in the database.

The Fields available for import can be customised by selecting from the drop-down which appears which clicking on a Field Name. Different or additional Sample Fields can also be specified as defaults. This is covered in the help files.

## Historical Chemistry

Historical chemistry can be imported into ESDAT in one of two formats: 1) a tabular (Cross-Tab) format which is the same layout as the field import above and is similar to the presentation of data in reports; and 2) a columnar format, where the chemicals are listed in a single column and the sample information is repeated for each chemical result. The Columnar format is convenient if transferring data obtained from other databases. The Cross-Tab format is convenient if importing data from report tables. To import in the Cross-Tab format do the following.

1. In ESDAT click on the  "Import" icon, Select "Templates", and double-click on "Historical Chemistry".
2. Copy the chemistry data from the Historical Chemistry Sheet in the "New Data.xls" file (this will typically be in C:\Program Files\ESDAT\Sample Contam) and paste in the Historical Chemistry Import Template. Arrange the data so that the chemical names are along the top (where Analyte1, etc.. are originally), the units are filled in, and the sample information is in the correct column. Your screen should look like the image below.

SampleCode	LocCode	Sampled_Date-Time	WellCode	Sample_Depth_From	Matrix_Type	Arsenic	Chromium	Cu
						mg/L	mg/L	mg/L
	BH1	08-Jan-04			water	0.17		
	BH1	30-Jan-04			water	0.004	0.21	1.05
	BH2	08-Jan-04			water	0.002		
	BH2	30-Jan-04			water	0.17	0.064	0.005

3. Click the  "Get ChemCodes" icon, which will attempt to automatically assign CAS Codes or allow you to assign them manually. Arsenic and Chromium will be found automatically, select Cu and type in "Cop". The code for Copper will be found in the right panel. Double click this and click "Update".
4. In Excel click the  "Upload Data" icon and import the data.
5.  Close Excel.

## Borehole Data

Importing borehole data provides the data for WinLog and gINT outputs, as well as for use in other data reporting and analysis. For example, indicating that a particular screened interval monitors a particular aquifer can be useful when filtering for data in that aquifer. Lithology information can be useful if included in the Chemistry Output Tables.

1. To import Borehole data click on the  "import" icon, Select "Templates", and click on "Borehole / Geological Logging".
2. This will load the relevant borehole and related Excel Import templates. These appear as sheets (Geology, Water Strike, etc..)
3. Obtain a borehole log from a recent project and work through the Excel Import Templates adding the data that you typically acquire. Use the drop-down arrows where available, for example; LocCode.
4. Once imported this data will be available in the WinLog/gINT exports, or you will be able to see it under the relevant Data-Type button in ESDAT (such as Borehole / Wells).
5. You can now  close Excel again.

## Chemistry Lookup Table and Output Units

Results in ESDAT are converted to a consistent unit for each compound, allowing results imported in various units (eg ug/L and mg/L) to be output in the one unit. This makes tables, graphs, and maps easier to produce and read. The calculation raises the possibility however that a conversion between the measurement unit and the output unit does not exist in the database. ESDAT runs checks on this in both the Chemistry QA Error Checker, and under the menu Data – Check Chemistry Unit Conversions. The latter menu also allows the user to add a conversion, or to change the output units.

In ESDAT

1. Click the button “Check Units” in the top toolbar

There is one conversion problem from PPB\_W to mg/g. We can either change the output units (for example to mg/kg) or add a conversion. In this case we will add a conversion.

2. Click in the box which reads “Conversion”

3. select “Add Conversion”

The “Conversion” Form will appear

4. Type in the conversion (0.0000001).

5. Click ‘OK”

Checks are also run to check that the most appropriate unit is used for a compound. For example if mg/L is the output unit, but the concentrations are low ESDAT will recommend that the output units be changed to ug/L.

6. To look at the recommended output unit changes select the Recommended Output Unit Changes tab, and click (which will mark with an ‘x’) in the “Change?” column for those you wish to change.

As a practice run here, you could change Units of measurement for Mercury and Cadmium.

7. Click "Update checked compounds"

8. You can now close this form

All the settings for each compound are stored in the reference table "zRef\_Chemistry\_Lookup". Select this table under the "Data Tables" button.

This Table contains the following information.

- ChemCode,
- ChemName (which is used for output in preference to the name given with other data, such as from the lab, or with the environmental standards. The ChemCode is used to match the ChemName with the correct data)
- ChemName\_Abbrev (Used where short names are required – eg in GIS labelling)
- Output Units
- Chem Groups (Custom groups can be specified to enable grouping of compounds in output tables, or filtering in ESDAT)
- Alternative Names (Used for finding CAS numbers during import)
- Volatility (Used for identifying violations of holding times)
- Equivalent Weight (Used for GeoChemical outputs in milliequivalents)

Other reference and lookup tables (those starting with zRef) can be browsed. Their contents can be edited as needed.

Editing these values has a direct effect on the outputs. This enables you to easily change the name that is used for a compound, the units in which it will be reported, and the compound grouping in which it will be arranged.

## Deleting Data

To delete the data we previously imported into ESDAT select the "Samples" data type button. You can filter by the Sample Delivery Group (SDG), which is typically unique for each lab file (16716 for this batch); or the "Data Added" Field where the date is today, or you can filter by any other field.

1. In the Filter dialogue (ESDAT→Filter tab) double click on "Date Added".  
Dates upon which data were added will appear in the Right side panel.
2. click the "=" button, and double click on today's date in the right panel.

3. Click “Apply filter”.

To edit or delete the data you need to enter Edit Mode,

4. Click the Data tab and click the  “Allow Editing” icon (on the toolbar along the left edge of the screen). The button should turn red.
5. Select the top left corner of the data grid (to select all the data), right click, and click on Delete Row(s).

You will be prompted to ensure you want to delete the data, select yes. The samples we imported today, and the associated chemistry results have now been deleted.

## Updateable Charts

We previously created and saved a chart of some water levels, and subsequently imported some water level data. To see how the chart is updated.

In ESDAT:

1. Switch to, or open the Excel file we saved earlier containing the water levels graph.

Either

A)

2. Click the ESDAT icon in the Excel toolbars.

The ESDAT Excel controls form will appear

3. Select the “ESDAT Charting” checkbox, and click “OK”
4. Select the graph
5. With the graph selected, click on the  button and click “Update”

Or B)

1. Switch to the data tab
2. Right click on the data and click “Refresh Data”

*Notice that the new data for BH8-A or BH8-B is now represented on the graph.*

## Mapping



### Adding / editing locations through the map

Select the Location data (under the 'Location' Data-type button).

To alter the position of existing locations on the map

1. Click the  "edit button" on the map toolbar.

The editing toolbar will appear in the default mode, with the  "Edit Vertices" button selected.

2. Select a point and drag it to a new location (mouse-click once on the point to select, then click and hold onto the point whilst dragging it to the new position before releasing the mouse-button).

To add a new point on the map

1. Click the  "add point" button on the maps edit toolbar.
2. Click on the map
3. When prompted enter a location code (eg BH New)
4. Add any other desired information to the Location Table and click OK

To interrogate a point

1. Ensure the  "Information button" is toggled on.
2. Click on a point

## Labelling

Select the datatype 'Soil Chemistry' and click on the GIS Window button (  View Map) at the top of the screen

1. Filter for ChemName In( 'TPH C6 - C9 Fraction' , 'TPH C10 - C14 Fraction' , 'TPH C15-C28 Fraction' , 'TPH C29-C36 Fraction' )
2. Click Apply Filter
3. Click the  "Toggle Labels" button 3 times, you will see the label change from the LocCode to a stacked label to no label.
4. Click the  print button on the map toolbar, accept the default map title.
5. Close the print preview
6. Clear the filter and filter for the ChemName = 'TPH C6 - C9 Fraction'
7. Click the  "Toggle Labels" button 3 times, you will see the label iterate between: the LocCode; the concentration range for 'TPH C6 - C9 Fraction', with points coloured by the maximum concentration; to no label with colouring.

## Aggregate Summary



The Aggregate Summary can be used to obtain statistics and summaries of your data. For example, for water chemistry concentrations covering the whole site, and portions of the site.

2. Select ' Water Chemistry ' data.

3. click on the  "Summarise Data" button (to the left of the data panel)

*You will now have a dialogue box in front of you with the tabs "Aggregate Summary" and "Cross Tab Summary".*

3. Using the "Aggregate Summary" double click on "LocCode", "WellCode", "ChemName", and four times double click on "Concentration".

*These fields with the instruction "Group By" will appear on the summary construction table.*

4. Underneath the four Concentration labels click on the "Group By" text and change them to Min, Avg, Max, and Count respectively.
5. Click "View Summary" and "Close".

*You can now see a summary of the minimum, average, maximum, and the count for concentrations of each chemical at each well and location.*

6. Click the  "Summarise Data" button again. Select the text LocCode and WellCode in the bottom panel, right click and select delete . Click "View Summary" and "Close".

*You can now see the aggregate summary of the minimum, average, maximum and the count for concentrations of each chemical over the entire site.*

## Tutorial 3 – Further Concepts

This tutorial assumes previous completion of Tutorial 1 and 2. Tutorial 3 builds on this knowledge, but is not necessary for general use of ESDAT.

### Post Import Chemistry Calculations

Often you will need to report chemistry results that do not correspond with the data that has been imported. Examples of this are:

Units will need converting to match those of environmental standards, or other data

Concentrations will need to be summed (eg Total PAH's, TPH C10-36)

Calculations will need to be applied (eg concentration ratios)

Unit conversion is discussed in Tutorial 2. The sections below deal with summing and calculating compounds.

### Combined Compounds

ESDAT can automatically sum compounds to create an output for the sum. ESDAT comes with a summation of Aldrin + Dieldrin, and TCE + DCE + VCE..

To add another compound to ESDAT (eg Total N) select  Import – Templates - Data Tables. Double Click “zRef\_Combine\_Compounds”. Type the following data

Nitrate (as N)	Total N
Nitrite (as N)	Total N
Ammonia as N	Total N

1. Click the  “Get ChemCodes” icon. Match the names you have used with those used by ESDAT. Click Update, the new names will replace those initially typed.
2. Import the data

The combined compound will be calculated whenever chemistry data is imported, or when instructed from the ESDAT menu Setup – Chemistry – Combined Compounds, where some options for the calculation can be specified.

## Calculated Compounds

In some cases you will need to manipulate results prior to output. Examples of this include:

- Chemistry Results imported for SO<sub>4</sub> in mg/L, but outputs required for SO<sub>4</sub> (as S) in mg/L
  - Useful for comparing with Interlab Duplicates or Environmental Standards where results are reported in different oxidation states.
- Cr (III) and Cr(III + VI) data imported by an output of CR(III) (% of Total)
  - required (for NEPM)

ESDAT Calc files are available, which, when loaded into the database, will perform these calculations on data when imported. These files are in text xml format and contain calculation instructions in the form of SQL. Custom files can be produced by any users, however in general, because knowledge of SQL is required, any additional requirements are best sent to ESDAT support staff for assistance.

1. Produce a Chemistry Result Table for Soil using all data.
2. Add and run a ESDAT Post – Import Custom Calculation for converting Cr (III) to Cr (III %).  
(under the menu Setup – Chemistry)

*This will be automatically run after importing future lab data.*

3. Produce the same Chemistry Result Table as above.

*Note that Cr (III %) is now included in the results.*

## Adding extra Matricies

By default the Hydrogeology and Environmental system comes with matricies of 'Soil', 'Water' and 'Gas'. Extra matricies can be added if desired.

1. In ESDAT select Setup – Chemistry – Add Sampling Matrix

2. Select the matrix state which best describes the new matrix. Double click on “Solid”
3. Type in a new matrix 'Sediment ', and click Submit.

Sediment and other solid matrix Matrix Types will be output with soil results in the main screen, and users can filter for the matrix type to be used. When importing chemistry data from now on users will be able to select from water, soil, gas, and sediment. Create an import template for field chemistry and verify this.

## Location Groups

ESDAT has the ability to assign locations to a number of zones (called Location or Spatial Groups) for the purpose of filtering.

To create your own group

1. Select a number of the locations on the map (or filter by any other criteria in the data panel) and populate and apply the filter Filter.
2. Click the  “Assign Filtered Locations to a Spatial Group” button located on the datagrid toolbar, to the left of the Data Panel. When prompted enter a meaningful name for the group.
3. Clear the filters.
4. In the "Filter" dialogue scroll down to the bottom of the field names (on the left) and click on the name “Group”. A list of names should appear on the right panel. Double click the name you entered.

Apply the filter. If you have the GIS Window open you will note that all the locations are those you selected in creating the Location Group. Try Applying and Removing the filter and note the change.

## Managing Map layers

To further customize the labels and colours beyond the predefined labels:

1. Select Soil Chemistry and filter for the ChemName = 'TPH C6 - C9 Fraction'.
2. Choose the output labelling type most closely matching what you want (as shown in Tutorial 2)

Click the  "View and Manage Map Layers" button to show the layers.

3. Double click on the layer called 'Soil Chemistry ' (may also say "Max Concentration" depending on the label toggle you have selected) to bring up the layer dialogue.
4. Select the 'Renderer' tab.
5. Select some appropriate colours.
6. Click the 'Wizard' button, which will be at the bottom right of the form
7. For the 'Formula' option, select 'Max-Concentration' from the dropdown, then click next
8. Select 'Continuous values', then click 'Next'
9. Check that under 'Features', 'Marker' is selected, and under 'Render by', 'Colour' is selected.
10. Apply the settings, then close the wizard

To remove a layer

1. Ensure you can see the list of layers (Click the  "View and Manage Map Layers" button if necessary)
2. Select the Backdrop Layer

3. Click the Delete Layer button ()

To add a layer

1. Click the Add Layer button ()
2. Navigate to the file “Backdrop1.JPG” in the sample folder (typically c:\program files\esdat\ sample contam )

*As this file does not have extents associated with it (ie a jpw world file) the user will have to position it.*

3. Select the corners of the image and drag to get the best location. You can use the zoom buttons ( ) if required.
4. When you have completed editing, turn off the edit button ()

## Data Reprojection

On the fly reprojection of data is available, although is currently limited. Any base layers represented in WGS84 (Latitude/Longitude, ie most regional and national datasets) are automatically reprojected to UTM (ie Australias MGA, and most other national grids) so the data overlays properly. If your data is not in MGA/UTM this will not work properly and you will have to use consistent projections for all layers. On-the-fly reprojection will be improved in future versions.

## ESDAT Database Interaction

Complete this section if you have even a passing interest in using Access databases and in making your own modifications and customisations of ESDAT outputs.

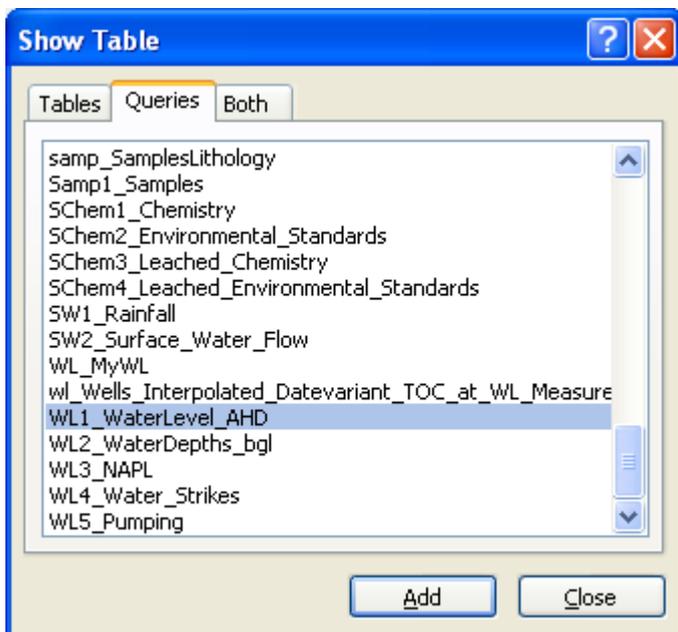


1. In ESDAT Click on the  Access icon on the right. ESDAT will open the current database in Access.
2. Now in Access, in the Objects form on the Left, click the 'Queries' button

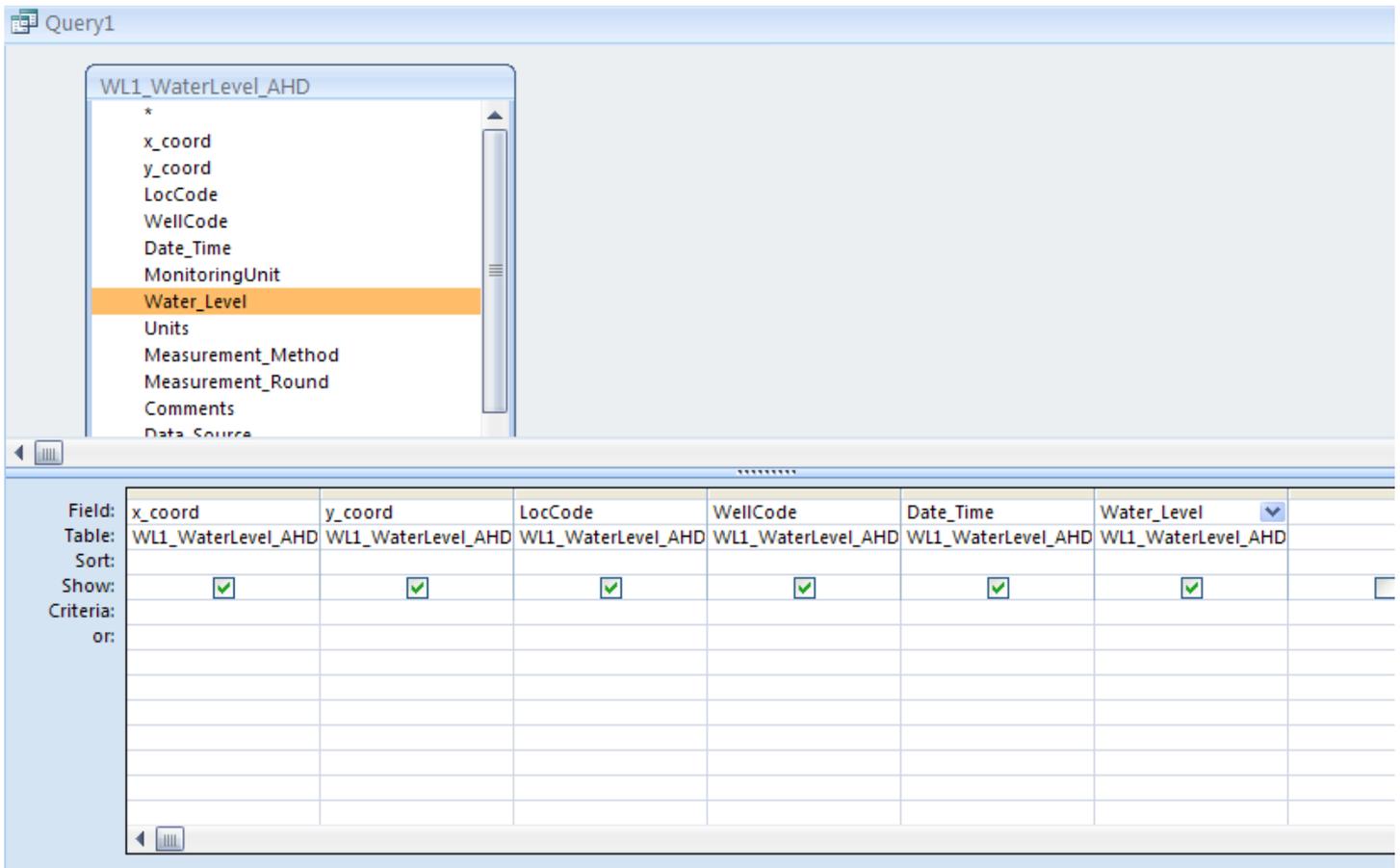
Examine the list of Queries (click the Queries button on the left) and you will notice that the queries match those appearing under the Data-Type buttons in ESDAT. If you open them in Access you will see exactly the same data. If you alter and save them in Access you will see the changes when looking at them through ESDAT.

The example below shows a modification of the query WaterLevel\_AHD query so that only one result (the average) is returned per day per Well. This may be useful if using a data logger.

1. Create a new Query (In Access 200/2003 click the 'New' button next to the 'Design' button, In Access 2007 - Select the Create menu, then Query Design)
2. Add the WL1\_WaterLevel\_AHD query as shown.



3. From the list of fields in WL1\_WaterLevel\_AHD double click on the Field names we want to see as shown below (x\_coord, y\_coord, LocCode, WellCode, Date\_Time, Water\_Level). This will populate the columns in the lower half of the screen.



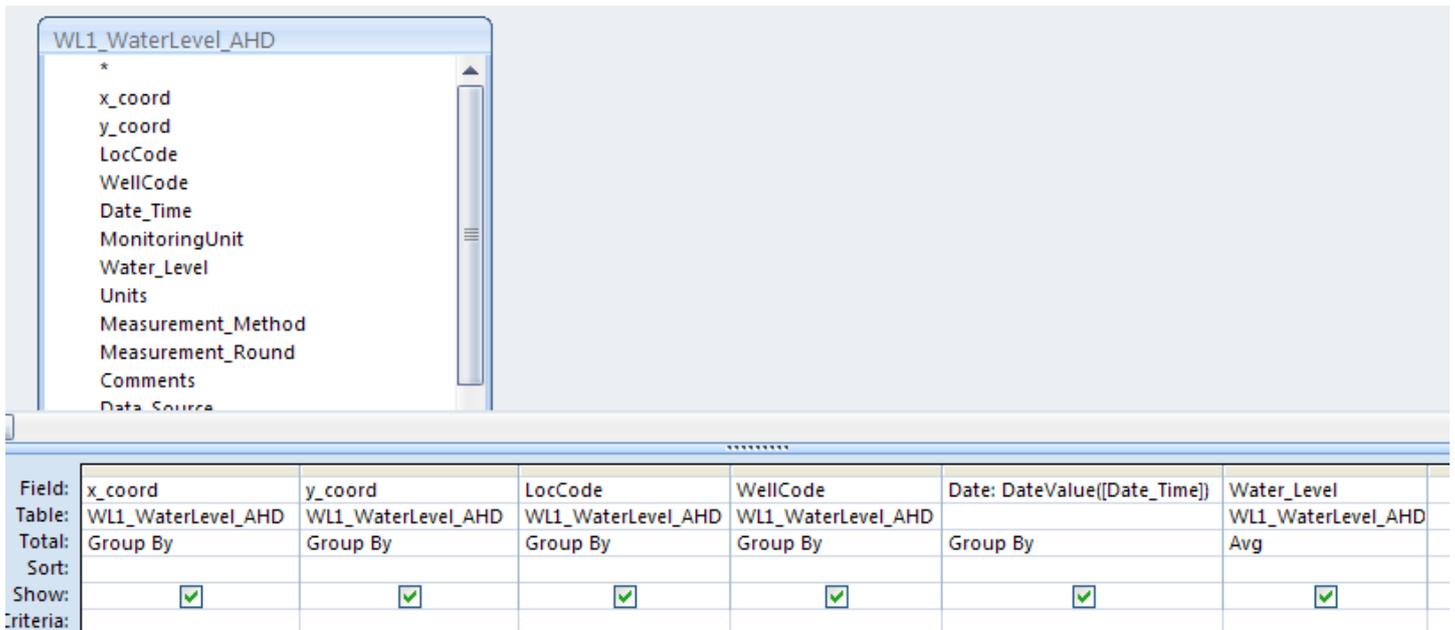
4. Click the 'View' button on the top left of the screen to see the data. We have not yet made any changes to it, we just have a sub-selection of the columns originally in WL1\_Waterlevel\_AHD. Click 'Design' view.

5. Click the  Totals Button

6. Modify the design as follows:

Use the DateValue formula to remove the time portion of the Date\_Time and rename as Date as shown below ie Date: DateValue([Date\_Time]). The Group By instruction will now group the results by each date rather than each date\_time record.

In the Water\_Level Column change the Group By to Avg.



7. Preview the results and save the new query.

To immediately view the new query in ESDAT you may have to refresh the connection to the database. Select (in ESDAT) Setup->Refresh Connection.

Using this approach you can customise the interface for any data types or database, or to create new queries. Try opening one of the other queries which you can see through ESDAT to see how the data is manipulated. If you wish to make these modifications yourself you should research Access functions and Queries.

You may now close Access.

## General instructions for starting a new project:

General instructions for starting a new project:

### 1. Starting Project

Start ESDAT. Click on the 'New' icon, then

Type the project name in the Identification Code;

Select 'Hydrology and Environmental',

Specify the location for the new database (click the  box). Click OK.

The primary Project form will appear.

The Project Number will already be entered. Add a Project Name, Manager, Office and other appropriate Project attributes.

### 2. Loading Location data (optional)

From the ESDAT menus select Import – Templates - Data Tables,

In the white Listbox double click on the 'Location' table

A template will open in Excel. Enter the data.

Select the Import button () on the Excel toolbar, click Import.

Fix any problems and reimport.

### 3. Loading Lab Data

From the ESDAT menus select Import, Laboratory File.

Navigate to the laboratory file. (The laboratory file must be in the ESDAT format)

Select the 'Sample' file. The file should then open up in Excel.

Specify the field duplicates and blanks and import as described in the tutorials

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\*When a field duplicate is imported, it is important that the sample type is changed from *Normal* to *Field\_D* under the Sample Type column, similarly Interlab Duplicates must be changed to Interlab\_D. The parent sample will need to be assigned in the Parent Sample column. Details on this can be obtained from the field person/sampler.

## 4. Loading Environmental Standards

From the ESDAT menus select Import, Environmental Standards.

Navigate to the Environmental Standards file. (The file must be in the ESDAT format,

Select the file that relates to the standards you want. The file should then open up in Excel.

The file may contain multiple sheets which need to be imported if the standard requires evaluation of a summation of compounds.

The file is ready to import; click  import.

## 5. Checking and Outputs

Use the 'Reports' functions to check and report data

Check the data using the Chemistry QA Error Checker, and

Tabulate the data using the Chemistry Result Table Export.