

## Data Import and Quality Control in Geochemistry for ArcGIS

This *Data Import and Quality Control in Geochemistry for ArcGIS* How-To Guide will demonstrate how to create a new geochemistry project, import geochemistry data including location, survey and assay data, merge location and assay data and level the assay data.

Geosoft provides sample data for you to use when working through these How-To Guides. These data files can be found in your "...\\Geosoft\\Oasis montaj\\resourcefiles\\data\\geochemistry" folder.

### Create a New Project

The first step when working in the Geochemistry for ArcGIS system is to create a *Geochemistry Project*. A Geochemistry Project is a File Geodatabase (fGDB) that contains all of your project information. The Project Attributes are stored in a table within the Geochemistry Project.

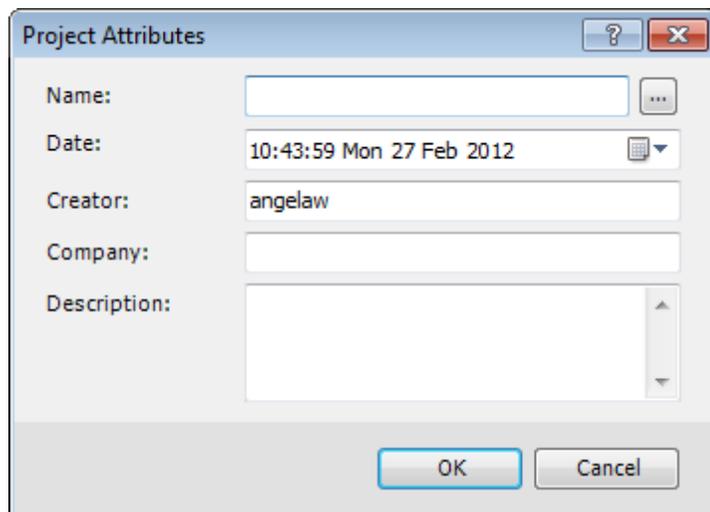
#### Creating a Project

The *Project Attributes* contains information about your project such as, Name, Date, Creator, Company, and Description. The Project Attributes information can be used as "Title" items in maps and reports, for example in the standards and duplicate reports or in the multi-graph reports. The Project Attributes are stored within your project and can be viewed and edited at any time.

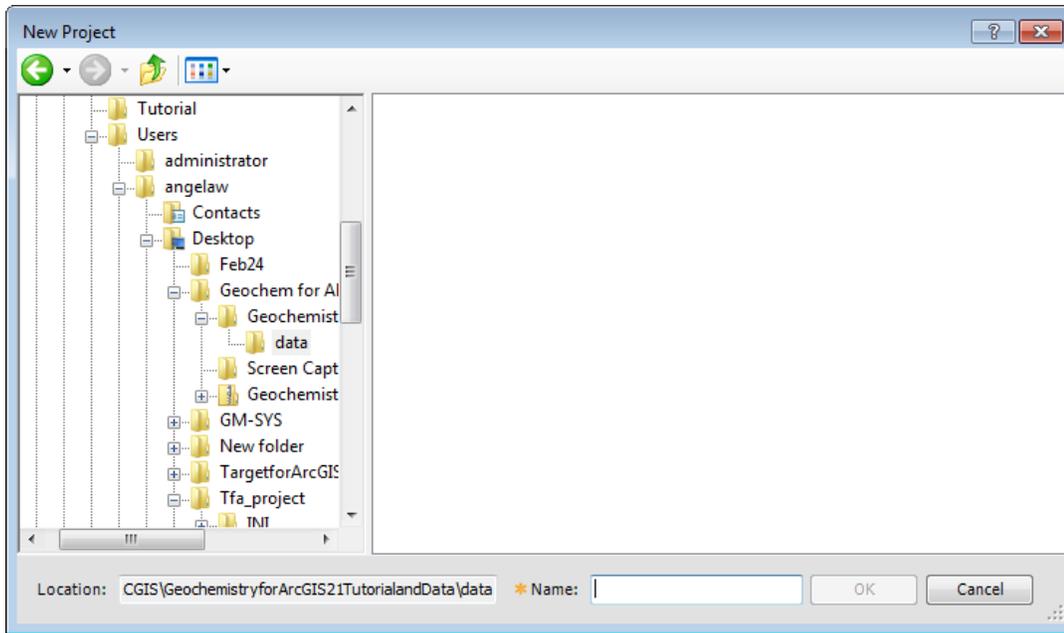
*Name* is a required field and will be used as the Geodatabase file name.

#### To Create a Project

1. On the *Geosoft Geochemistry* toolbar, from the *Geochemistry Project* menu, select **New**.  
The *Project Attributes* dialog appears.

A screenshot of the "Project Attributes" dialog box. It has a title bar with a question mark and a close button. The dialog contains five fields: "Name:" with an empty text box and a browse button (...); "Date:" with a date-time value "10:43:59 Mon 27 Feb 2012" and a calendar icon; "Creator:" with the text "angelaw"; "Company:" with an empty text box; and "Description:" with a large empty text area. At the bottom are "OK" and "Cancel" buttons.

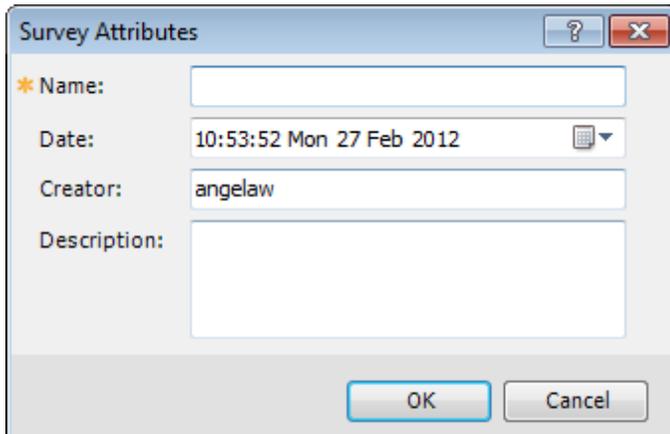
2. Click the **Browse** button to the right of the *Name* text box.  
The *New Project* dialog appears.



3. Use the directory tree to locate the folder where your MXD file and data files are saved.
4. In the *Name* text box specify the name of the new project.
5. Click **OK** to save the project file name and return to the *Project Attributes* dialog.

 *The Name of the Project will be the name of the file geodatabase (fGDB) that is created to store the project tables and feature classes. To assist in organising your data, the Project name often refers to location where the samples were collected.*

6. Specify the remaining parameters such as *Date*, *Creator*, *Company* and *Description* and click **OK**. The *Survey Attributes* dialog appears.



7. See the following *Create a New Survey* section for information on creating a new survey.

## Create a New Survey

The Geochemistry Project is an Esri File Geodatabase (fGDB) that stores all of the location and assay results that you import. A Project is designed to handle multiple datasets, or “Surveys” – as a Geochemistry sampling campaign might contain stream sediments, soil grids, and rock chip or drillhole samples. Before you import your first dataset, you will need to create a Survey within the Project that will keep each dataset separate from other survey datasets you might import. To assist in organising your data, the Survey name often indicates the “type” of survey or sampling program used for data collection.

### Creating a New Survey

Use the *Survey Attributes* dialog to add a new survey to your Geochemistry project.

#### To Create a New Survey

1. In the *Survey Attribute* dialog, in the *Name* text box specify the survey name.
2. Using the *Date* pop-up calendar you can select the data and time that the survey was completed or you can leave it as the default, resulting in the current date and time being added.
3. In the *Creator* text box type in (your name) or the name of the person that created the survey.
4. In the *Description* text area extra notes can be added to provide more information about a specific survey. The default is to leave this blank.
5. Click **OK** to save the survey information. This will also complete the creation of the project.



Once a Geochemistry project and survey has been created, you will be able to access your geochemistry data by clicking the **Geochemistry Data Source** icon on the Table of Contents tab. This tab will display your Geochemistry source project data; that is, any survey tables and feature classes associated with the project. This information is all contained in a file Geodatabase.

### Adding Additional Surveys

Additional surveys can be added from the *Geosoft Geochemistry* toolbar.

#### To Add Additional Surveys to the Geochemistry Project

1. On the *Geosoft Geochemistry* toolbar, select *Geochemistry Project*, and then select **New Survey**. The *Survey Attribute* dialog appears.

## Import Geochemistry Data

Once the Project and Survey are created, the geochemistry data can be imported. Geochemical data is often delivered as two separate files: one that contains the sample locations and other attributes about where the samples were collected, while the assay results are received from the lab as a separate file. In most cases, these two files will contain at least one common piece of information – the unique sample number that identifies each sample. The Geochemistry extension can import these two types of data (sample locations and assay results) and then merge them to create a single dataset. The procedure described below follows this workflow, but if your geochemistry data is already merged (i.e. in a single file), you can import this file by following the steps for the Assay Data import.

## Import Location Data

Typically the location data should be imported before the assay data. The location data generally includes the sample numbers and coordinates for the field samples. It also includes any duplicates and standards. Other relevant data such as lithology may also be included. The file formats that can be imported are, ASCII (\*.csv), Excel (\*.xls, \*.xlsx), Microsoft Access (\*.mdb), data from an ODBC connection, personal or file geodatabase, and feature classes and tables in the MXD files. acQuire and Geosoft Target drillhole data can also be imported into the survey.

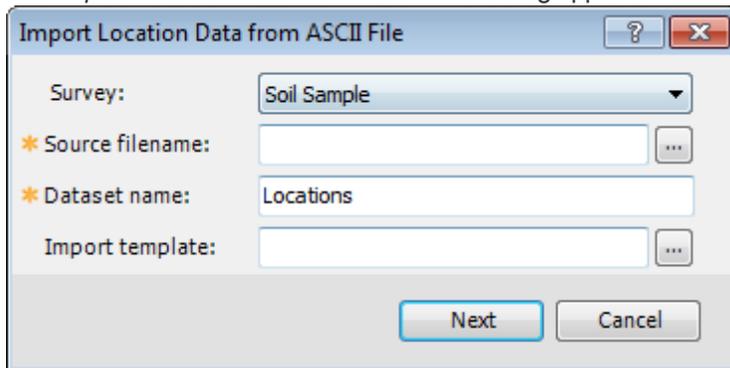
### Importing Location Data into the Survey

 The steps below describe importing ASCII data.

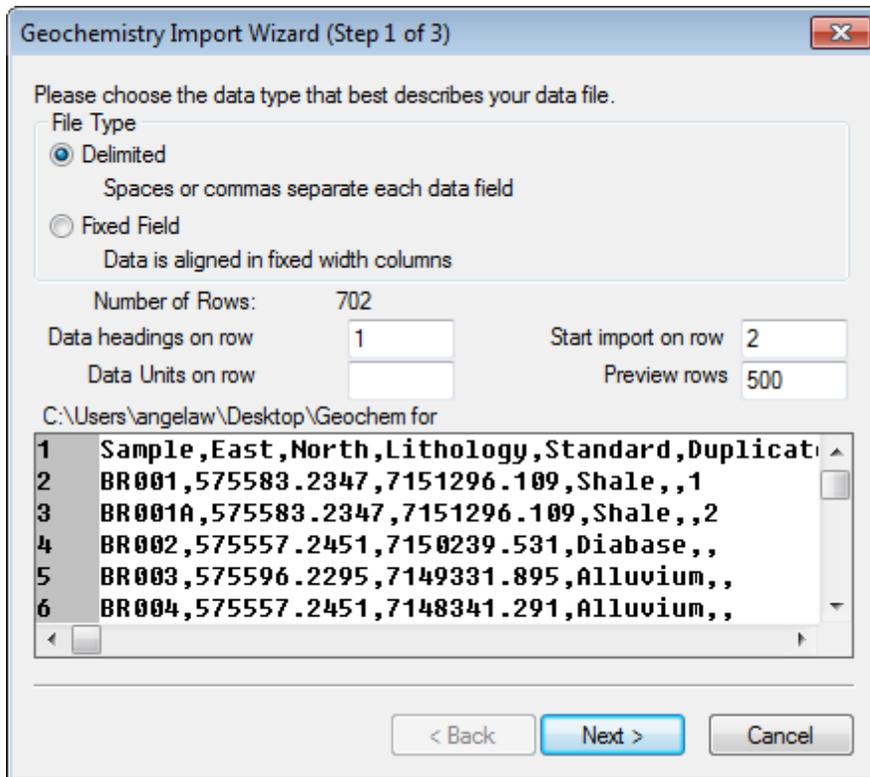
#### To Import ASCII Data into the Survey

1. On the *Geosoft Geochemistry* toolbar, from the *Data* menu, select **Import Location Data**.
2. Select **ASCII**.

The *Import Location Data from ASCII File* dialog appears.



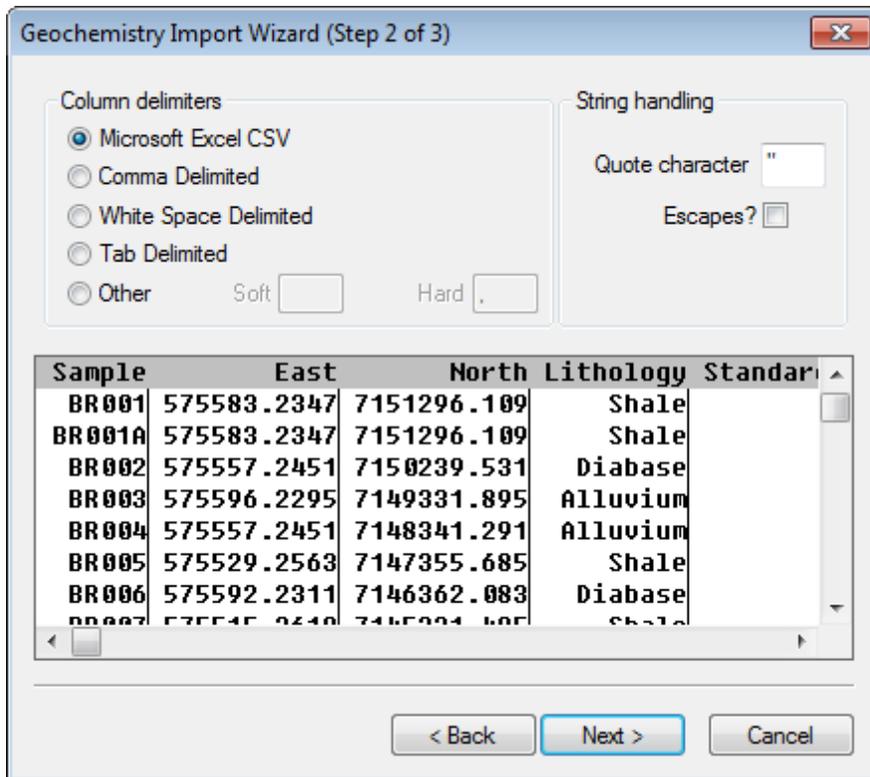
3. By default the current *Survey* name (in this case *Soil Sample*) should be displayed. If not, use the dropdown list to select the survey file.
4. **Browse** to the *Source filename*. The *Select file(s)* dialog will be displayed.
5. Select the file from your working folder and click **Open** to return to the *Import Location Data from ASCII File* dialog.
6. Specify the *Dataset name* for the new dataset. The default is *Locations*.
7. The *Import template* is used to save the import settings produced by the ASCII import wizard. By default this is blank and a default template file is created.
8. Click **Next**. The *Geochemistry Import Wizard (Step 1 of 3)* dialog appears.



9. This dialog is used to specify the format of the incoming data. The Import Wizard has scanned the incoming file and determined that the *File Type* is (Delimited).

 *Selections here will determine the options available in Step 2.*

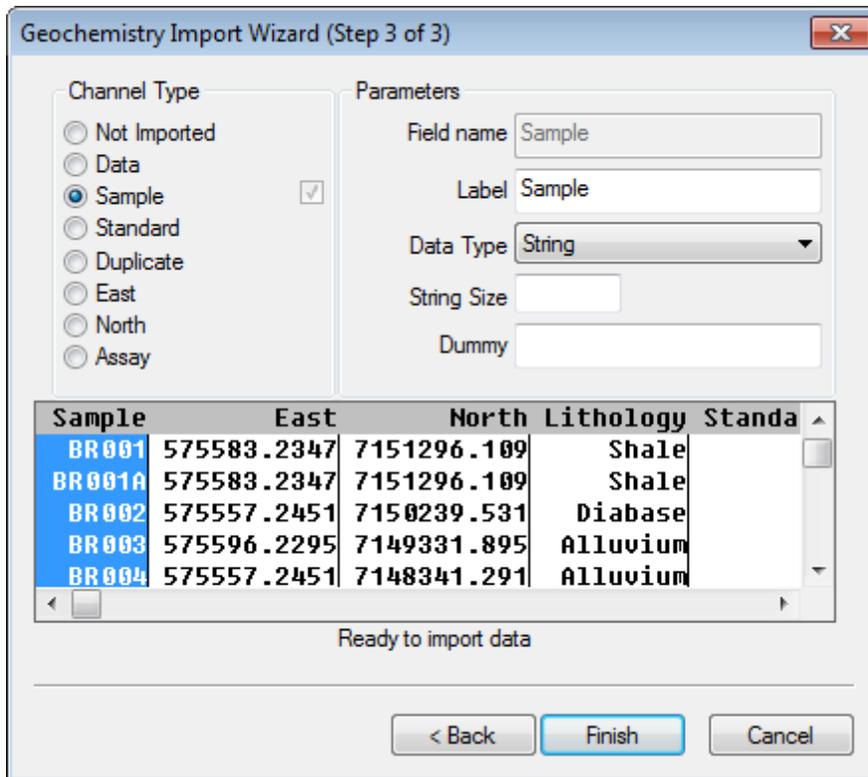
10. Use the four fields in the middle of the dialog to specify which row in the file contains the data headings (i.e. column names), data units (e.g. m, ft), which row to start importing data and the number of rows to display in the preview window.
11. Click **Next**. The Geochemistry Import Wizard (Step 2 of 3) dialog appears.



12. This dialog further defines the import columns and specify a string handling option, if required. Using the *Column delimiters* radio buttons, select the type of delimiter used to separate the column text.

 *The preview window displays lines indicating where the data will be separated into columns on import.*

13. Click **Next**. The *Geochemistry Import Wizard (Step 3 of 3)* dialog appears.



14. The Import Wizard scans your data to determine the type of data columns to be imported, (i.e. Channel Type). This is an important step to ensure that each Geochemistry project column is correctly identified. The *Channel Type* for each column is used to determine how the data is stored in the Geochemistry file Geodatabase.

 The “Sample” field, which includes a unique identifier for each data sample must be specified as a Channel Type to enable the Finish button and complete the import. It is always good practice to review your data to ensure that the Import Wizard has selected the correct columns.

15. In the preview window, select (highlight) a *Channel Type* column, as shown in the dialog above. The corresponding *Channel Type* (top-left) is selected, and in the *Parameters* area (top-right) the selected column’s name are displayed.  
16. Repeat step 15 for each of the columns in the preview window.

 The Data Type for any data field that contains alphanumeric values (for example, sample numbers and rock codes) must be classified as (String).

17. Once you have reviewed the selected parameters for each of the columns in the preview window, click the **Finish** button to begin the import process, and the *Survey Coordinate System* dialog will be displayed.

## Survey Coordinates

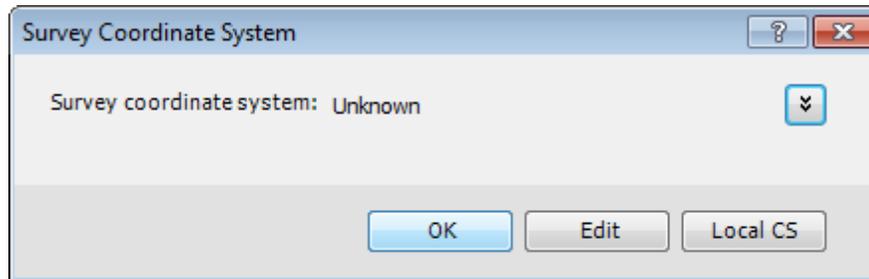
You can use the *Survey Coordinate System* option to define the Coordinate System of a survey’s location data.

### Setting Survey Coordinates

 You can also view the *Survey Coordinate System* dialog at any time by selecting the *Locations* table in *Geochemistry Data Source* mode, right-click and from the pop-up menu select **Coordinate System**.

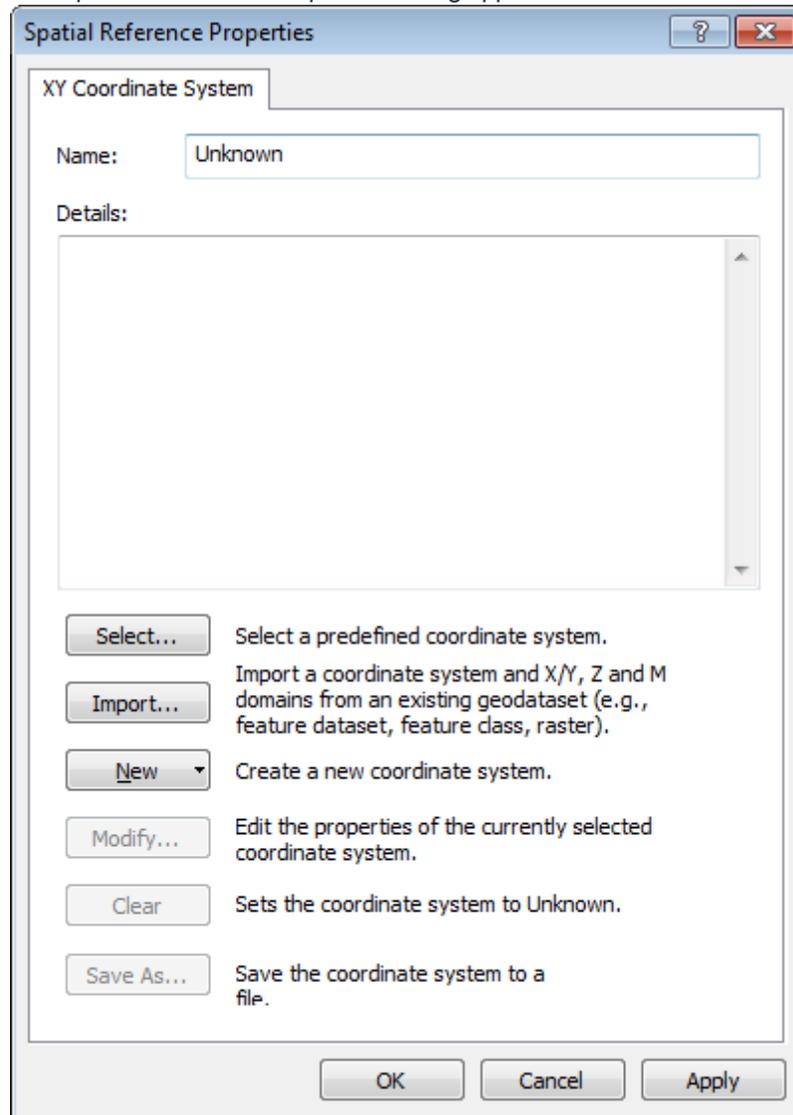
### To Set Survey Coordinates

The Survey Coordinate System dialog enables you to specify a Coordinate System for the incoming data.

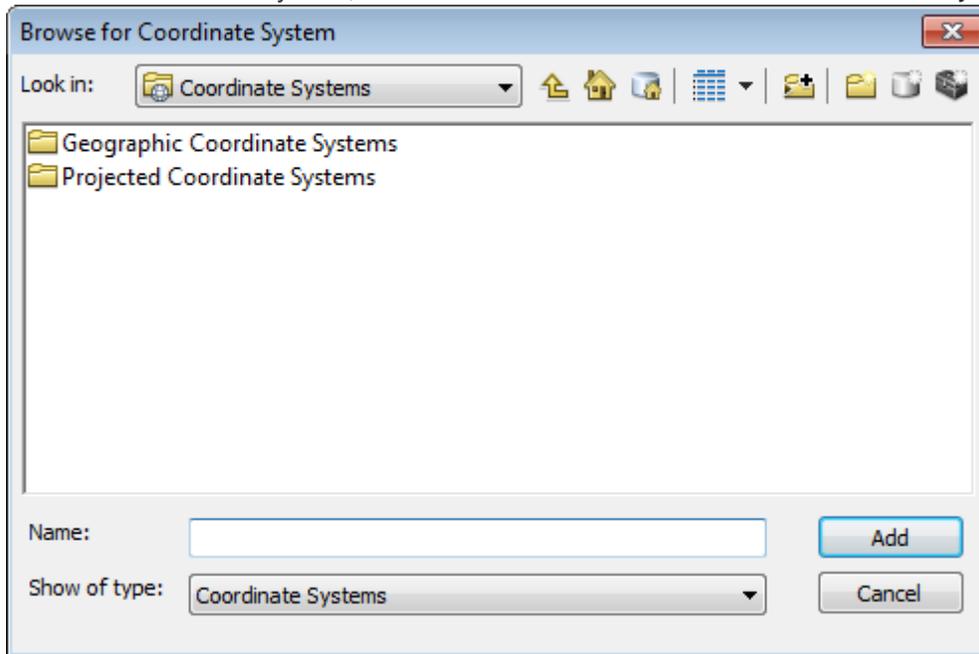


1. If the *Survey coordinate system* is set to “unknown”, you will need to specify the Coordinate System for the survey data.
2. Click **Edit**.

The *Spatial Reference Properties* dialog appears.

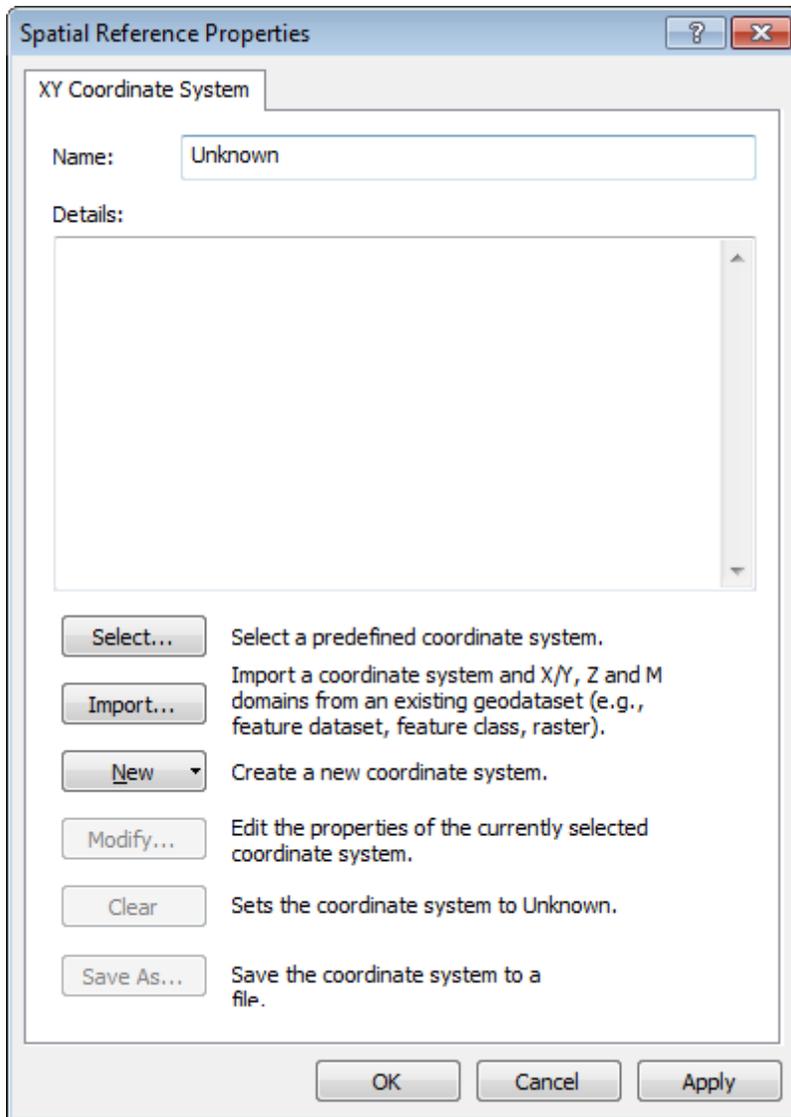


- To select a coordinate system, click the **Select** button. The *Browse for Coordinate System* dialog is displayed.

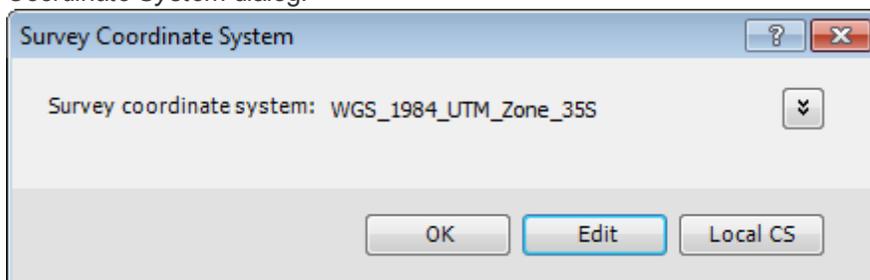


 *Coordinate Systems can also be imported from other geodatabases, shapefiles or other Esri native formats, by selecting the **Import** button. You can create a custom projection by selecting the **New** button. For more information on Coordinate Systems in ArcGIS, see the ArcGIS Desktop Help.*

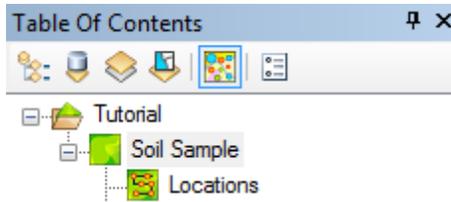
- Browse to the coordinate system file and click **Add**. The defined Coordinate System information will be displayed in the *Spatial Reference Properties* dialog. You can review this information to ensure you have selected the correct Coordinate System.



5. When you are satisfied with your defined coordinate system, click the **Apply** button.
6. Click **OK** to set the coordinate system and close the *Spatial Reference Properties* dialog and return to the *Survey Coordinate System* dialog.



7. Click **OK**. The location data with a set coordinate system will be imported into your project and a new table (in this case named 'Locations') will be added to the Table of Contents (TOC) window in Geochemistry Data Source mode, as shown below. The new table includes all of the sample locations for the data that was just imported – these are stored in a table in your Geochemistry Project (file Geodatabase) along with the Coordinate System information.



 The Table of Contents has several methods of listing layers: by drawing order, source, and whether layers are visible or selectable. Click the icon at the top of the tab to switch between these layer listing modes. You can tell which mode is active by looking at the button (the active one is highlighted) and the organisation of the items in the table of contents. The different ways of listing layers are simply methods of displaying information about the same data layers.

8. Select (highlight) the table in Geochemistry Data Source mode. Right-click and from the pop-up menu select **Open**. The location data will be displayed in a table as shown below.

ObjectID *	Sample	X	Y	Z	Lithology	Stanc
1	BR001	575583.2347	7151296.109	<Null>	Shale	
2	BR001A	575583.2347	7151296.109	<Null>	Shale	
3	BR002	575557.2451	7150239.531	<Null>	Diabase	
4	BR003	575596.2295	7149331.895	<Null>	Alluvium	
5	BR004	575557.2451	7148341.291	<Null>	Alluvium	
6	BR005	575529.2563	7147355.685	<Null>	Shale	
7	BR006	575592.2311	7146362.083	<Null>	Diabase	
8	BR007	575515.2619	7145331.495	<Null>	Shale	
9	BR008	575691.1915	7144540.812	<Null>	Alluvium	
10	BR009	575455.2859	7143513.223	<Null>	Alluvium	
11	BR010	575395.3099	7142097.789	<Null>	Shale	
12	BR010A	575395.3099	7142097.789	<Null>	Shale	
13	BR011	575751.1675	7141293.111	<Null>	Shale	
14	BR012	575372.3191	7140313.503	<Null>	Shale	
15	BR013	575729.1763	7138989.033	<Null>	Shale	

9. To close the table, click the **Close** button.

## Import Assay Data

The Assay data typically includes the sample numbers and related analytical measurements from the lab. The file formats that can be imported are, ASCII (\*.csv), Excel (\*.xls, \*.xlsx), Microsoft Access (\*.mdb), data from an ODBC connection, personal or file geodatabase, and feature classes and tables in the MXD files. acQure and Geosoft Target drillhole data can also be imported into the survey.

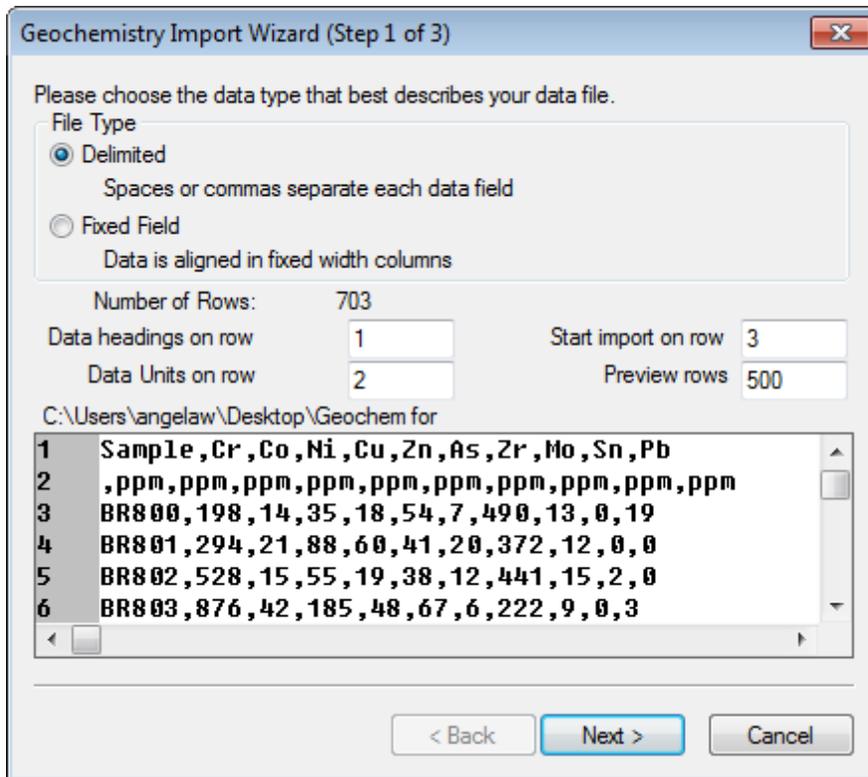
## Importing Assay Data into the Survey

 The steps below describe importing ASCII data.

## To Import Assay Data into the Survey

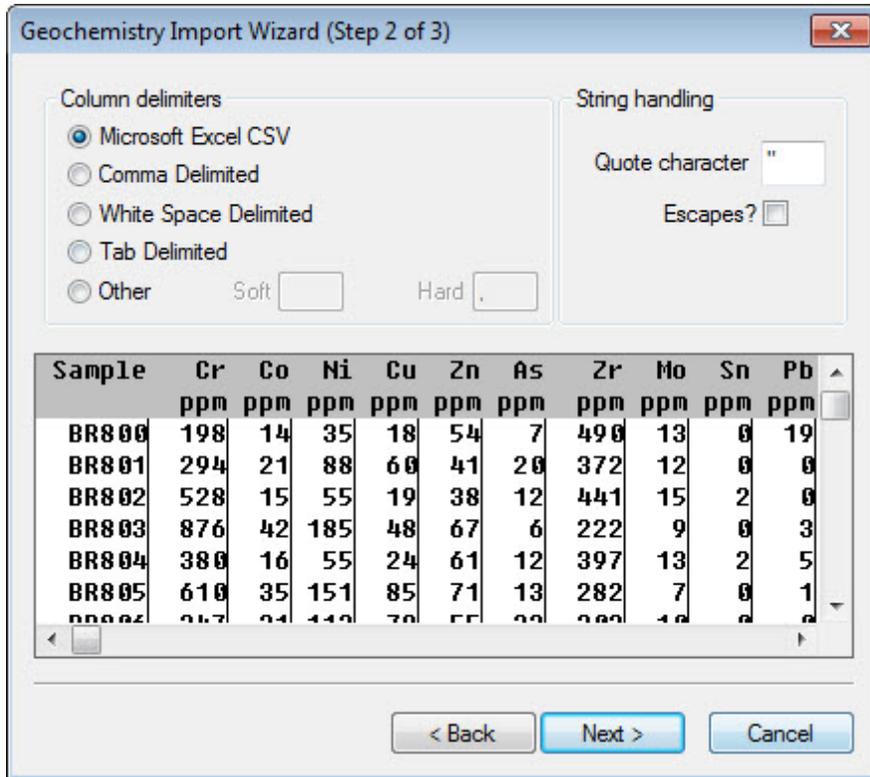
1. On the *Geosoft Geochemistry* toolbar, from the *Data* menu, select **Import Assay Data**.
2. Select **ASCII**. The *Import Assay Data from ASCII File* dialog appears.

3. By default, the current **Survey** should be displayed. If it is not, use the dropdown list to select the current survey file.
  4. Use the **Browse** button to locate the *Source filename*.  
The *Select file(s)* dialog appears.
  5. Select the file from your working director and click **Open** to return to the *Import Assay Data from ASCII File* dialog.
  6. Specify the *Dataset name* for the new dataset. The default is Assay.
- ⚠** *Selecting the Convert negatives checkbox will convert all negative values in your data to one-half the detection limit, e.g. "-1.0" would indicate that the detection limit for this assay element was 1 ppm, and the measured value was below detection limit. On import, the "-1.0" value would be replaced with a positive "0.5", thus avoiding any negative values in the statistics and plots.*
7. The *Import template* is used to save the import settings produced by the ASCII import wizard. It is useful when importing multiple files with the exact same format, such as assay results from the same laboratory. By default this is blank and a default template file is created.
  8. By default the *Import assay field attributes from source* checkbox is selected. This parameter will enable the Assay field units to be set from the input file (if defined there). If this checkbox is left unchecked, then the Assay field attributes file should be specified, or the assay field attributes will have to be set manually after import.
- ⚠** *The Assay field attribute file parameter is enabled only when the Import assay field attributes from source checkbox is cleared. The Assay field attribute file (\*.CSV) should contain assay attributes for example, standard minima and maxima, detection limits and outlier limits.*
9. The *Batch Attributes* fields (optional) enable you to enter any batch attribute, for example the batch name (or number), the name of the lab, the analytical method or sample preparations used.
  10. Click **Next** and the *Geochemistry Import Wizard (Step 1 of 3)* dialog appears.



 This Import Wizard is the same as the Wizard used to import the location data.

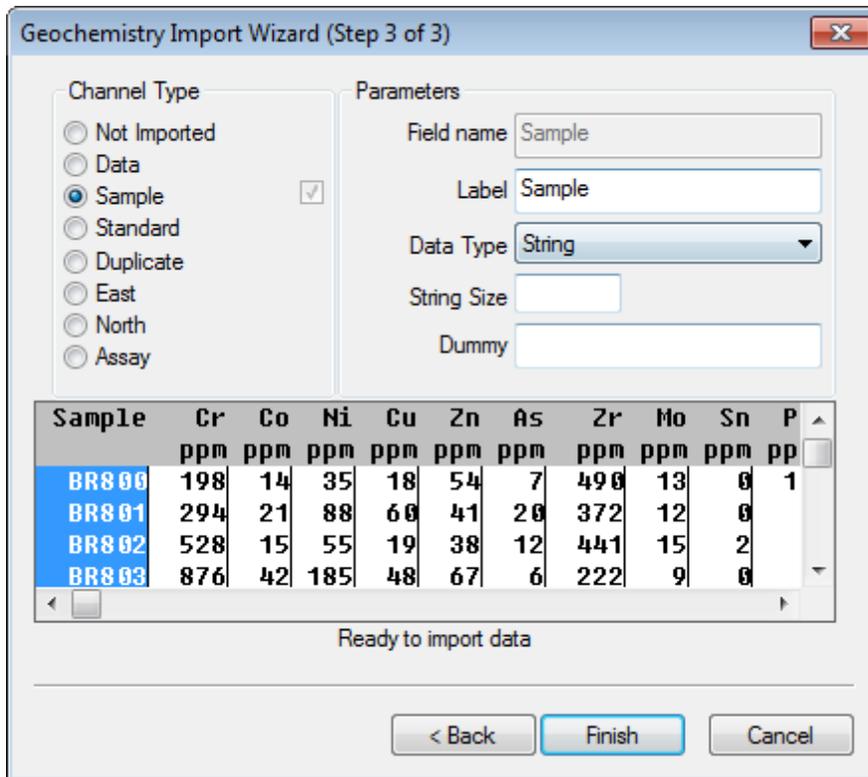
11. This dialog is used to specify the format of the incoming data. The Import Wizard has scanned the incoming file and determined that the *File Type* is (Delimited).
-  Selections here will determine the options available in Step 2.
12. Use the four fields in the middle of the dialog to specify which row in the file contains the data headings (i.e. column names), data units (e.g. ppm, ppb), which row to start importing data and the number of rows to display in the preview window.
13. Click **Next**. The *Geochemistry Import Wizard (Step 2 of 3)* dialog appears.



- This dialog further defines the import columns and specify a string handling option, if required. Using the *Column delimiters* radio buttons, select the type of delimiter used to separate the column text.

 *The preview window displays lines indicating where the data will be separated into columns on import.*

- Click **Next**. The *Geochemistry Import Wizard (Step 3 of 3)* dialog appears.



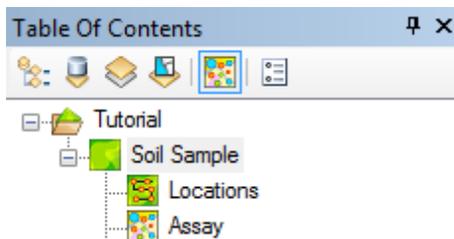
16. The Import Wizard scans your data to determine the type of data columns to be imported, (i.e. Channel Type). This is an important step to ensure that each Geochemistry project column is correctly identified. The *Channel Type* for each column is used to determine how the data is stored in the Geochemistry file Geodatabase.

 The “Sample” field, which includes a unique identifier for each data sample must be specified as a Channel Type to enable the Finish button and complete the import. It is always good practice to review your data to ensure that the Import Wizard has selected the correct columns.

17. In the preview window, select (highlight) a *Channel Type* column, as shown in the dialog above. The corresponding *Channel Type* (top-left) is selected, and in the *Parameters* area (top-right) the selected column’s name are displayed.  
18. Repeat step 17 for each of the columns in the preview window.

 The *Data Type* for any data field that contains alphanumeric values (for example, sample numbers and rock codes) must be classified as (String).

19. Once you have reviewed the selected parameters for each of the columns in the preview window, click the **Finish** button to begin the import process. A new table will be added to the Table of Contents (TOC) tab in the Geochemistry Data Source mode.



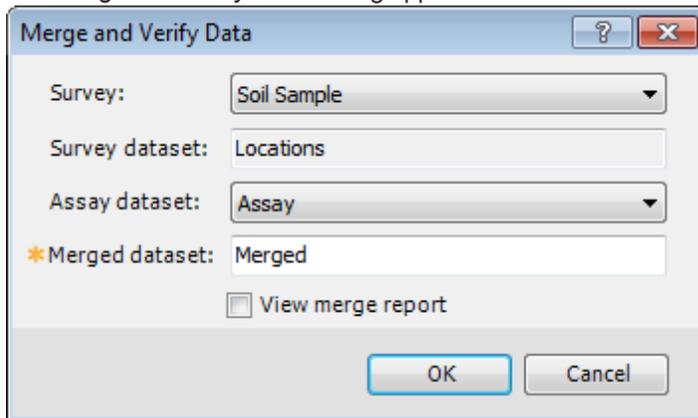
20. Select (highlight) the table in Geochemistry Data Source mode. Right-click and from the pop-up menu select **Open**. The assay data will be displayed.

## Merge Location and Assay Data

Once the sample locations and assay data have been imported they can then be merged into a single dataset using the unique sample number associated with each record. Analysis tools (such as Histogram and Scatter Analysis) may be used on the assay table if the sample location data is not available. However, in order to create a feature class (or symbolized map layer) and display the spatial distribution of the geochemical results on a map, you need to merge the assay results with the location data.

### To Merge the Location and Assay Data

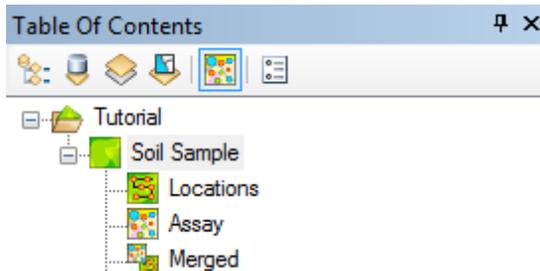
1. On the *Geosoft Geochemistry* toolbar, from the *Data* menu, select **Merge Location and Assay Data**. The *Merge and Verify Data* dialog appears.



2. By default, the current *Survey* (in this case *Soil Sample*) should be displayed. If it is not, use the dropdown list to select the current survey file. The *Survey dataset* is provided as read-only.
3. By default, the current *Assay dataset* should be displayed. If it is not, use the drop-down list to select the current assay table.
4. Specify the *Merged dataset* name. The default is *Merged*.
5. Select the *View merge report* checkbox to display a merge error report (*chmerge.txt*) at the end of the merge process. This report will provide details of any errors encountered

 For more information, see the *Example Merge Error Report* section below.

6. Click **OK**. The survey and assay tables will be merged into one *Merged* table file. If you selected the *View merge report* check box, the merged error report will be displayed .
7. A new table will be added to the Table of Contents tab in *Geochemistry Data Source* mode.



8. Select (highlight) the table in *Geochemistry Data Source* mode. *Right-click* and from the pop-up menu select **Open**. The merged data will be displayed.

## Merge Error Report

The following example error report was generated by the data not including X Y locations for the duplicate samples. As this report indicates, there are no merging errors with this data.

### Merge Error Report

13/03/2012 10:21:59 AM

There are no errors.

## Level Assay Data

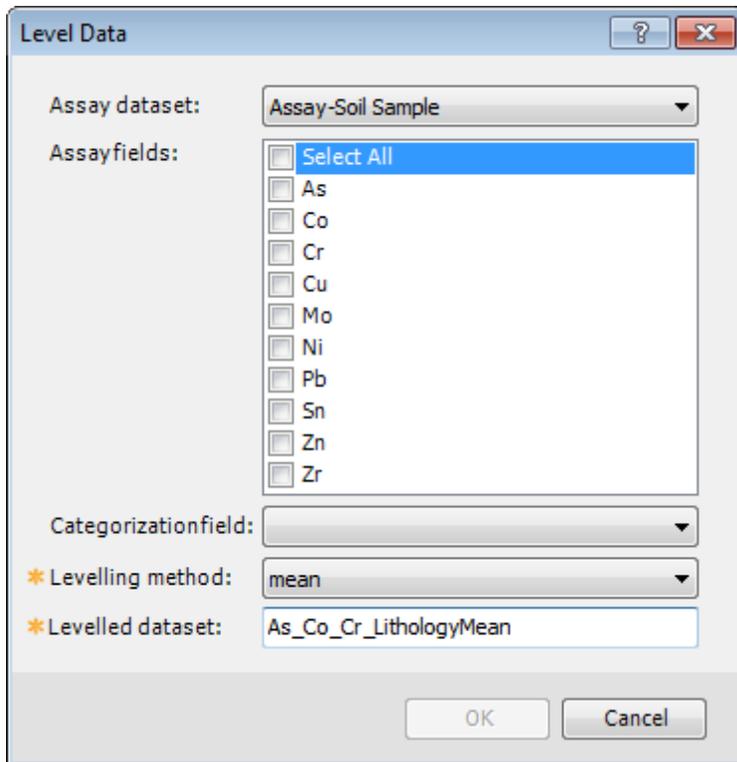
Geochemical datasets collected at different times can often have variable background values due to changes in sampling medium and method, or variations in the analytical methods used. Variations can also be due to physical factors such as bedrock lithology, but even though the differences are real, they can still obscure anomalies of interest. To remove these variations in the data, you can use the Levelling options to create a new data table in which the values have been statistically modified.

A categorization field is used to divide the assay data into classes; a selected statistical parameter is then calculated for each of the categorized groups. The categorization field can be anything categorical, such as sampling method or analytical method, sample date or lithology from which the samples were collected. Different levelling methods include mean, median, mode, geometric mean, Z-scores (mean, median, or robust) and peak to noise (response ratio).

To assist you in understanding the relationships in your data you can level your data based on a categorization field, for example, year, sample type or lithology.

### To Level Assay Data

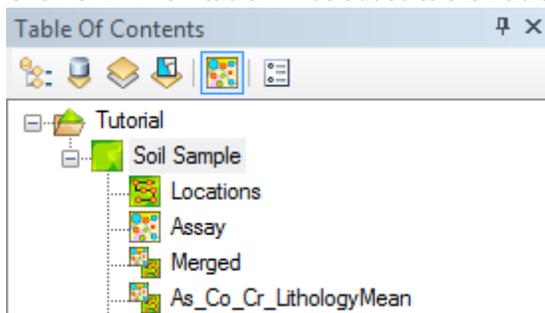
1. On the *Geosoft Geochemistry* toolbar, from the *Data* menu, select **Level Assay Data**.  
The *Level Data* dialog appears.



2. Use the *Assay dataset* dropdown list to select the assay data to level.
3. You can then use the *Assay fields* check boxes to select the fields you want to level.
4. Select the *Categorization field* from the dropdown list. The levelling process groups the data by category then applies the levelling process to each group individually.
5. Use the *Levelling method* dropdown list to select the levelling statistic.

 For more information on the levelling methods or any other parameter, click the **Help** button

6. In the *Levelled dataset* text box, specify the name of the new output levelled dataset
7. Click **OK**. A new table will be added to the Table of Contents (TOC) tab in Geochemistry Data Source mode.



8. Select (highlight) the table in Geochemistry Data Source mode. Right-click and from the pop-up menu select **Open**. The data will be displayed.

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