



Geosoft Technical Note Importing data into Target for ArcGIS

Introduction

Target™ for ArcGIS is a surface and drillhole mapping extension to ESRI's ArcGIS™ software designed for the compilation, mapping and analysis of geospatial data within your GIS environment.

The Target for ArcGIS system is organized around Geosoft's 3-dimensional-file format that enables the rapid processing and analysis of high volume surface and drillhole data. This note explains the process of importing industry standard file formats into the system and tips on how to simplify and manage this required task.

3-Dimensional Data Processing Architecture

A key to the Target for ArcGIS system is Geosoft's 3-dimensional-file format architecture. This object-oriented file structure stores data in a form that enables rapid access to data and efficient storage of 3-dimensional (drillhole) data.

Conventional file formats organize data as tables, records and fields. While this is effective for querying and searching type applications it has processing performance limitations because:

- Programs must read an entire record to access a single field
- It is computationally intensive to change record structures
- Data sampled at different intervals and starting points are difficult to store

A conventional file structure is shown below:

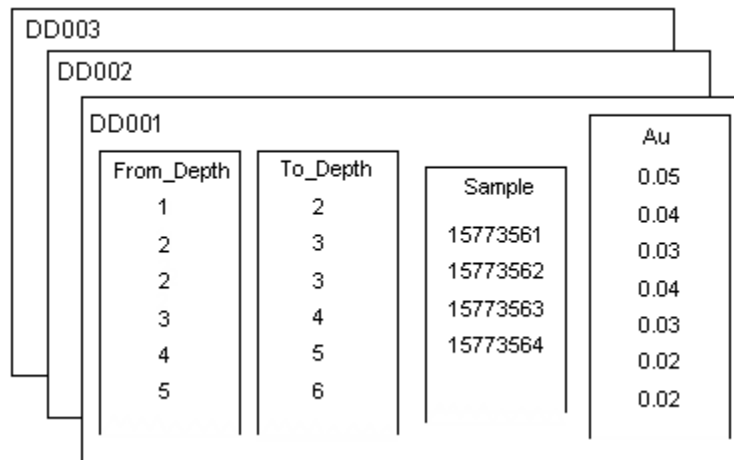
Hole_ID	From_Dep	To_Depth	Sample	Au ppm	As ppm
DD001	0	1	15773561	0.05	13
DD001	1	2	15773562	0.04	11
DD001	2	3	15773563	0.03	19
DD001	2	3	15773564	0.04	19
*	*	*	*	*	*
DD003	98	99	15767021	0.4	-0.5
DD003	99	100	15767022	0.22	-0.5
DD004	0	5	15766457	0.04	-0.5

The Target for ArcGIS system using the Geosoft 3D file structure overcomes these limitations. Organized in lines (or groups), columns and elements, the file stores all data values of a particular type in individual columns. This enables stand-alone processing of columns and eliminates the need to write results to interim storage areas and then re-write them after processing. The result is a significant increase in processing efficiency. This Geosoft file structure provides additional advantages including:

- Ability to process any number of lines/groups (i.e. drillholes)
- Ability to handle lines/groups with unlimited columns
- Ability to handle very large datasets

In addition, since columns are stored separately, this file format is capable of storing and manipulating data with different end point and sample intervals.

A Geosoft file structure is shown below:



Project Setup and Organization

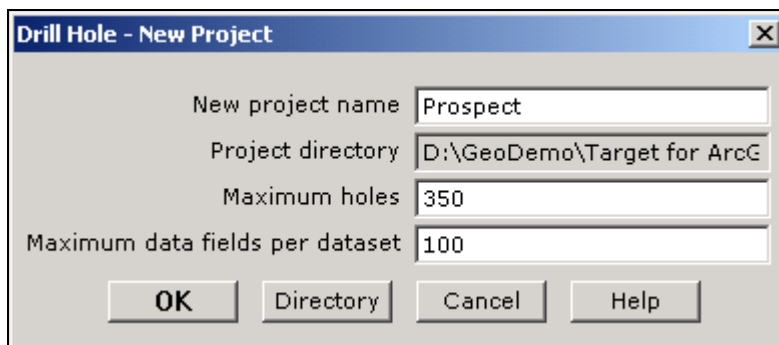
Project management and organization is essential for both field and project geoscientists, from the initial planning to the evaluation stage. Using Target for ArcGIS, exploration geoscientists working in ArcGIS can easily create, define and manage exploration projects.

The Target for ArcGIS drillhole system has been developed using Geosoft's unique three-dimensional file structure. These files are linked by a common project name that provides easier data management.

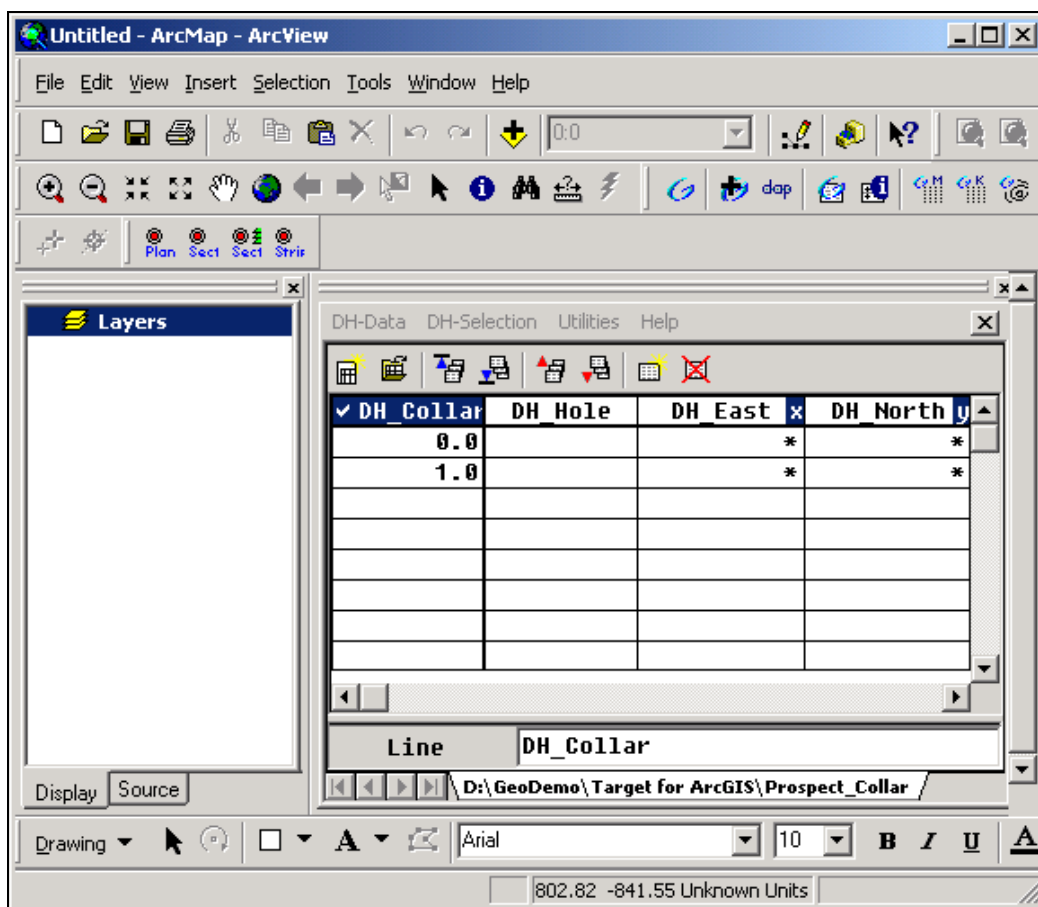
Starting a New Project

When you start a new drillhole project the "Collar" file is created and displayed in the *GDB Window*. Each individual 'data type' will have it's own file. The common project name will be added, as a prefix, to all the project files. For example, in a project named "Prospect" the following files could be created:

- Prospect_Collar.gdb Collar information
 - Prospect_Survey.gdb Hole dip-azimuth survey information
 - Prospect_XYSurvey.gdb Hole XYZ survey information.
 - Prospect_Assay Assay information ("Assay" label is user-specified)
 - Prospect_Geology Geology information ("Geology" label is user-specified)
1. On the *DH-Data* menu, select *New Project*. The *Drill Hole – New Project* dialog is displayed.



2. This dialog is used to create a new Drillhole project and its associated Collar Database. This is the first step in loading Drillhole data.
3. In the *New project name* box, specify a common project name. Note that, the project name can contain spaces, but cannot contain any underscore characters "_".
4. The *Project directory*, displayed as read only, is your current project directory (i.e. the directory in which to create the new drill project). To change this directory, click the **[Directory]** button and browse to the correct directory.
5. The *Maximum number of holes* (default 250) and the *Maximum data fields* (default 100) is a limit to reduce the size of the database index. These values should be modified to suit the dataset being imported for example, a project with 50 holes and 20 fields can simply use the default values however, a project of 2500 holes and 50 fields should have the number of holes increased to ~3000 (allowing for extra holes to be imported at a later date).
6. Click the **[OK]** button, an empty **Prospect_Collar.gdb** is opened and displayed in the *GDB Window*.



7. Once the "Collar" file has been created and displayed in the *GDB Window* you can begin entering data into the system. When entering data in Target for ArcGIS, you must start with collar data. A collar file must exist before survey or other data can be imported, and before plans and sections can be created.

Data Types and Import Formats

A drilling program will acquire many types of data ranging from hole location (i.e. collar details), surveys (e.g. dip and azimuth), geologic rock types and descriptions, drill hole geochemical assays and borehole geophysical logs. A description and example of the file types are provided below:

Drillhole locations

Collar information must contain (at a minimum) Hole ID, Easting, Northing and Relative Level (Elevation). Note that, in the data example below, the Azimuth, Dip, and Total Depth are also included in the collar file. If no survey file is specified (see below), then the total depth (length) of the hole becomes a required field in the collar table. If no azimuth/dip is specified in either the collar or survey file, then all holes are assumed to be vertical in orientation.

Hole_ID	East	North	RL	Azimuth	Dip	Final_Depth
DD001	12102.04	9988.76	60.81	357.83	-60.16	139
DD002	11697.3	9983.07	60.58	357.25	-59.77	145
DD003	12100	9904	60	0	-60	100
DD004	12000	10027	60	0	-55	177.5
RC001	11401.51	10072.08	61.37	354.9	-59.98	124
RC002	11498.45	10040.51	60.77	355.42	-60.14	166
RC003	11597.55	10048.23	60.46	355.46	-59.86	154
RC004	11696.53	10060.64	60.17	356.73	-60.34	112
RC005	11697.13	9992.43	60.53	356.59	-58.96	136

Surveys

(Optional) Hole orientation information in Hole ID, Depth, Azimuth, Dip format or Hole ID, Depth, Easting, Northing, Elevation format. Note that, a survey file is only required if a hole has actually been surveyed and the dip and azimuth change at depth.

Hole_ID	Depth	Dip	Azimuth			
DD001	0	-60.2	357.8			
DD001	10	-60.2	358.6			
DD001	20	-59.9	358.6			
DD001	30	-59.6	359.5			
DD001	40	-59.1	0.4			
DD001	50	-59.2	0.3			
DD001	60	-59.4	0.9			
DD001	70	-59	2.2			
DD001	80	-59.2	2.5			

From to Data

From-To data is data acquired over specified depth intervals down the hole for example, at a 1m interval with a measurement starting at 0m and extending to 139m. Geochemical assay data and geological rock code data are examples of From-To data.

Hole_ID	From_Dep	To_Depth	Sample	Au ppm	Ag ppm	As ppm	Standard	Duplicate
DD001	0	1	15773561	0.05	0	13		
DD001	1	2	15773562	0.04	0	11		
DD001	2	3	15773563	0.03	0	19		1
DD001	2	3	15773564	0.04	0	19		2
DD001	3	4	15773565	0.03	0	33		
DD001	4	5	15773566	0.02	0	36		
DD001	5	6	15773567	0.02	0	46		
DD001	6	7	15773568	0.03	0	45		

Point Data

Point data are data acquired in discrete measurements made at a specific depth, for instance 85.6m. The example below is a geophysical property log (borehole geophysics) in single point data format.

Hole_ID	Depth	Dip	Azimuth	Mag		
DD001	0	-60.2	357.8	48838.7		
DD001	2.5	-60.2	358.6	48843.8		
DD001	3	-59.9	358.6	48849.9		
DD001	4.5	-59.6	359.5	48856.5		
DD001	5	-59.1	0.4	48863.1		
DD001	6.5	-59.2	0.3	48870.1		
DD001	7	-59.4	0.9	48876.1		
DD001	7.5	-59	2.2	48881.1		
DD001	9	-59.2	2.5	48885.3		

Data Formats

The data, which is typically provided in a variety of formats including, ASCII (e.g. CSV, tab delimited), Database (Excel, Access), acQuire and LAS file format can be integrated into the Target for ArcGIS system.

Importing Drillhole Data

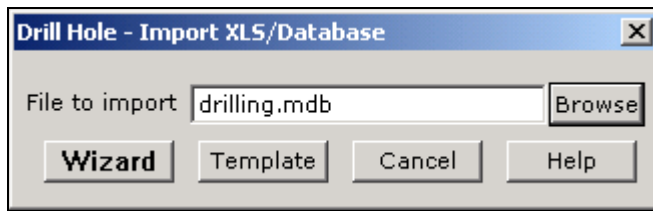
The Target for ArcGIS system enables the quick import of Collar, Survey, From-To and Point data, in both numeric and text formats, using a Drill Hole Import Wizard. Each data format (text, database, acQuire, and LAS) has its own Import Wizard. The Import Wizards' guide you through the process and automatically displays your data in the spreadsheet window. The spreadsheet window is similar to Excel in appearance but with specialized capabilities, including built-in data manipulation tools.

Importing Collar Data

When entering drillhole data in Target for ArcGIS, you must start with collar data. The system creates a unique collar GDB file that you can use to view all drillholes in the project at a glance. You can also plot an initial plan map showing all holes for review purposes. A collar file must exist before survey or assay data can be imported, and before plans and sections can be created.

Importing Collar data in Access (MDB) format:

1. On the *DH-Data* menu, select *Import* and then, *XLS/Database*. The *Drill Hole - Import XLS/Database* dialog is displayed.

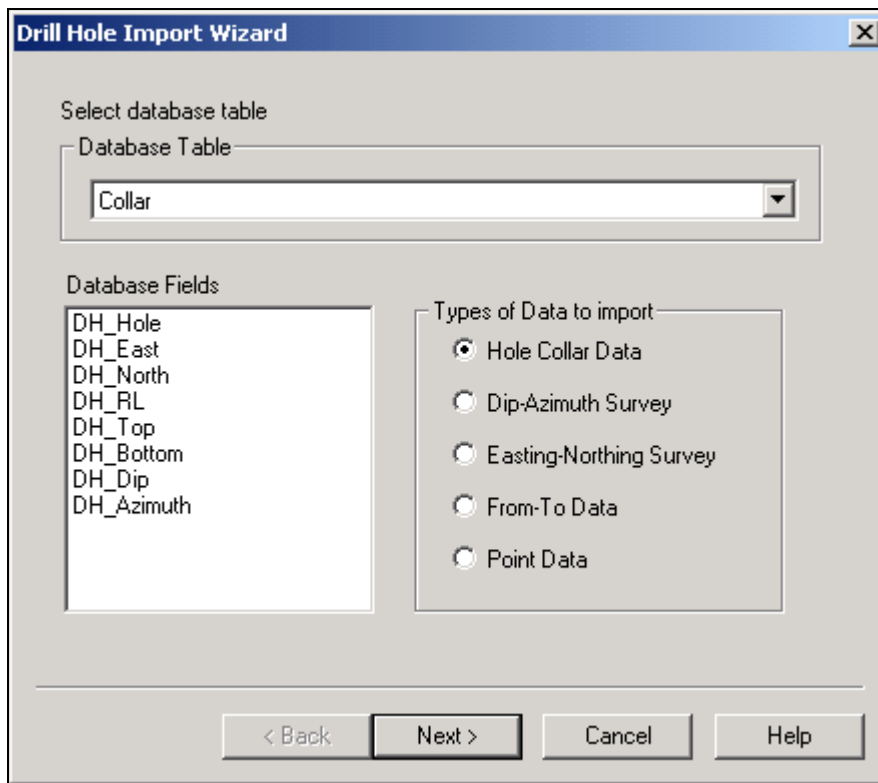


2. Using the **[Browse]** button, locate the file to import from your working directory and click the **[Open]** button. The system returns you to the *Drill Hole - Import XLS/Database* dialog, displaying the file name you wish to import.

3. Click the **[Wizard]** button to start the *Import Wizard*.

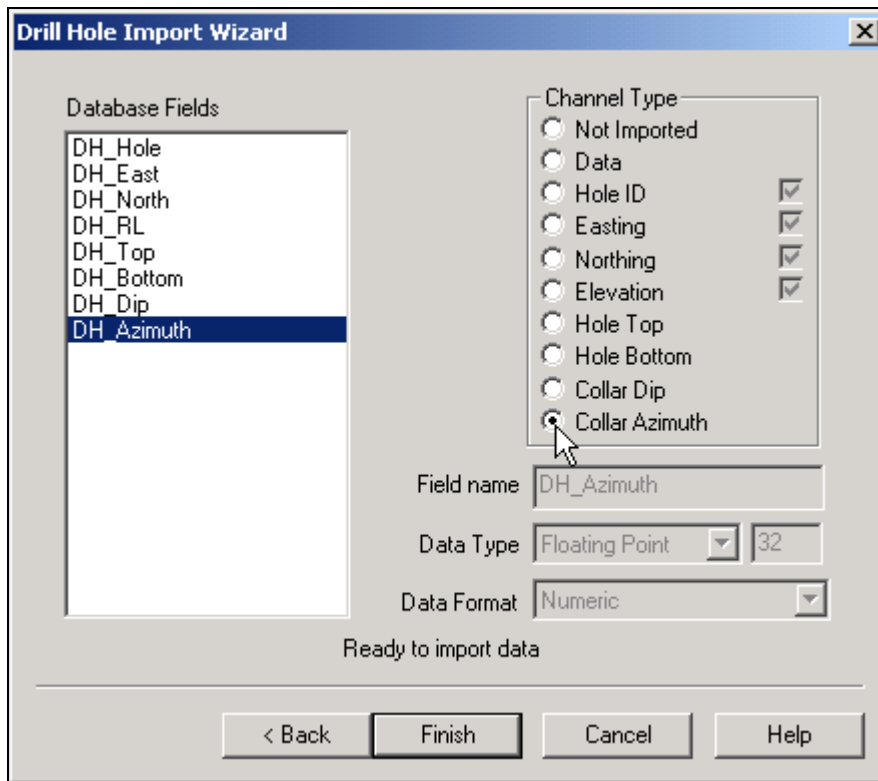
Note: The *Import Wizard* creates an import template that is used to import the data. The template gets its name from the import file name, with the extension "i4" for database import (or "i3" for ASCII import), for example, for "drilling.mdb" the template "drilling.i4" is created.

4. The first *Drill Hole Import Wizard* dialog is displayed. This dialog is used to select the database table and type of data to be imported. The *Database Fields* box, displays the fields for the currently selected table.



5. Using the *Database Table* dropdown list, select the table that includes your **Collar** data. In the *Types of Data to import* select (**Hole Collar Data**). For more information about the *Drill Hole Import Wizard* settings, click the **[Help]** button on the individual *Wizard* dialogs.

6. Click the **[Next>]** button and the second *Drill Hole Import Wizard* dialog is displayed. This dialog is used to specify the import parameters for the database file that is being imported. Select (highlight) each field to specify the *Channel Type* and *Parameters*.



7. Click the **[Finish]** button to create the template file and to import the collar database (collar.mdb) file into the **Prospect_Collar.gdb** displayed in the *GDB Window*.

Template files

The template is used by the file import to set up columns, data types, etc., in the Target database. The template file is useful for re-importing data, or importing new data with the same formatting. If a template corresponding to the input file name is located in your working directory, then it is used as the default template, with the particular template file extension "i4" for database import or "i3" for ASCII import.

Template File "Drilling.i4":

```

/ Generated Template for FILENAME=D:\GeoDemo\drilling.mdb
[IMPORT ADO]
CONNECT Provider=Microsoft.Jet.OLEDB.4.0;Password="";User ID=Admin
TABLE Collar
IMPORT DH_Hole,DH_Hole,USER32,NORMAL
IMPORT DH_East,DH_East,DOUBLE,NORMAL
IMPORT DH_North,DH_North,DOUBLE,NORMAL
IMPORT DH_RL,DH_RL,DOUBLE,NORMAL
IMPORT DH_Top,DH_Top,DOUBLE,NORMAL
IMPORT DH_Bottom,DH_Bottom,DOUBLE,NORMAL
IMPORT DH_Dip,DH_Dip,DOUBLE,NORMAL
IMPORT DH_Azimuth,DH_Azimuth,DOUBLE,NORMAL

```

Importing Survey Data

Various types of surveys (acid, gyroscope, magnetic orientation, etc.) can be used to record hole depth (depth measured from the drillhole collar). For Target for ArcGIS, you can use survey data in one of two forms:

Hole	Depth	Azimuth	Dip	
Hole	Depth	Easting	Northing	Elevation

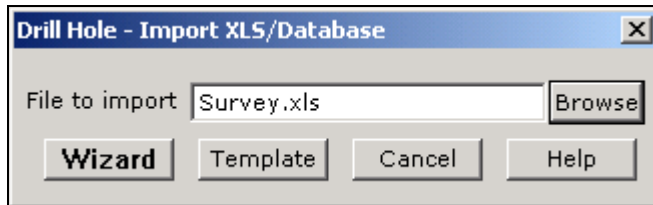
Before importing data, you must make sure that you have all fields as shown in one of these configurations (i.e. these fields are required on import).

By convention:

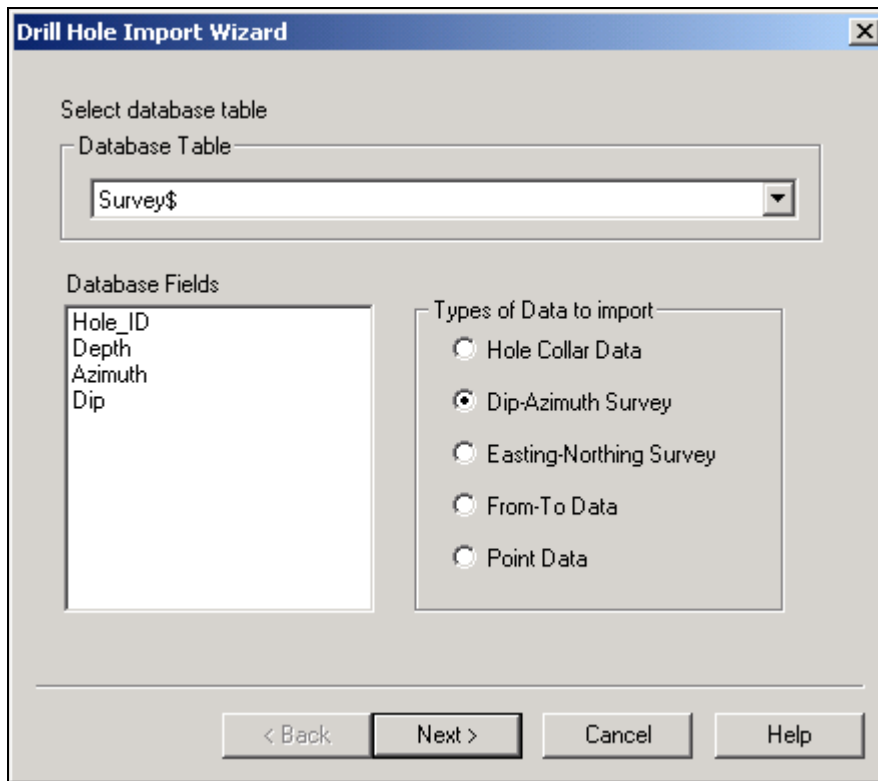
- Depth is the distance measured into the hole from the collar, increasing from zero.
- Azimuth is in degrees, increasing positively in a clockwise sense from North (i.e. N is 0 degrees, E is 90 degrees).
- Dip is in degrees, positive or negative, where 0 is horizontal and -90 (or 90) is vertical down, depending on the preferred dip sign convention (option available under the *DH-Data/Preferences* menu item).
- Depth, Easting, Northing and Elevation are in the same units as default units set in *DH-Data\Set Projection* dialog, to change the units, click the [Modify] button.

Importing Survey data in Excel (XLS) format:

1. On the *DH-Data* menu, select *Import* and then, *XLS/Database*. The *Drill Hole – Import XLS/Database* dialog is displayed.



2. Using the [**Browse**] button, locate the file to import from your working directory and click the [**Open**] button. The system returns you to the *Drill Hole – Import XLS/Database* dialog, displaying the file name you wish to import.
3. Click the [**Wizard**] button to start the *Import Wizard*. The first *Drill Hole Import Wizard* dialog is displayed.



4. Using the *Database Table* dropdown list, select the table to import and then in *Types of Data to import*, select the survey type that matches your data (e.g. **Dip-Azimuth Survey**).
5. Click the [**Next>**] button and the second *Drill Hole Import Wizard* dialog is displayed. Use this dialog to specify the import parameters for the database file that is being imported. Select (highlight) each field to specify the *Channel Type* and *Parameters*.
6. Click the [**Finish**] button to create the template file and to import the survey database (survey.xls) file into the **Prospect_Survey.gdb** and display it in the *GDB Window*.

Template File “Survey.i4”:

```

/ Generated Template for FILENAME=D:\GeoDemo\Survey.xls
[IMPORT ADO]
CONNECT Provider=Microsoft.Jet.OLEDB.4.0;Password="";User ID=Admin
TABLE Survey$
IMPORT Hole_ID,DH_Hole,USER20,NORMAL
IMPORT Depth,DH_Depth,DOUBLE,NORMAL
IMPORT Azimuth,DH_Azimuth,DOUBLE,NORMAL
IMPORT Dip,DH_Dip,DOUBLE,NORMAL

```

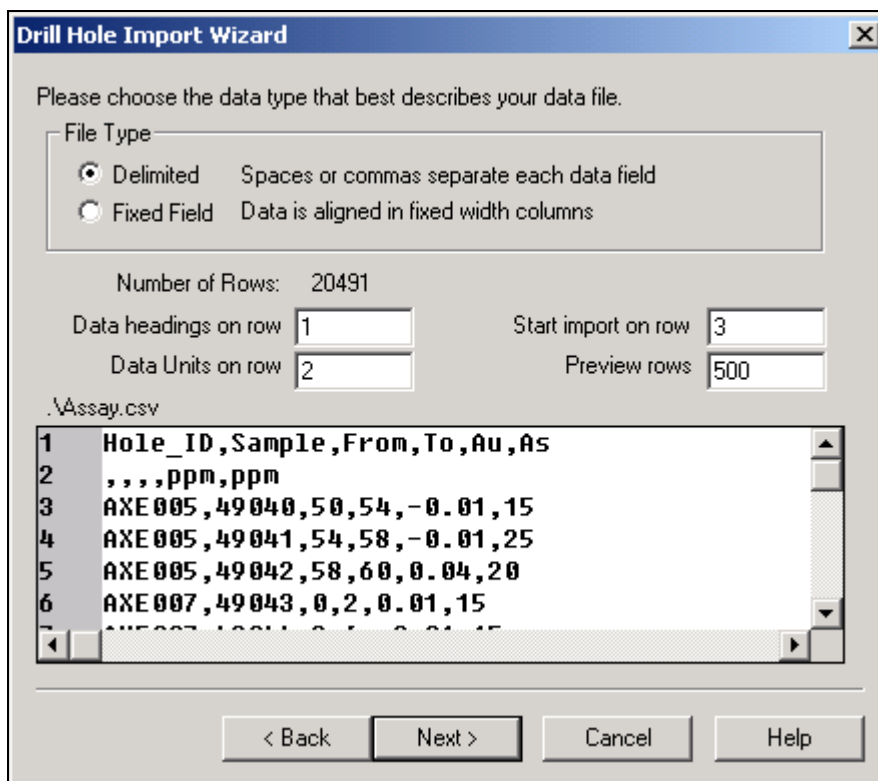
Importing Assay Data

Geochemical assay data are typically acquired by obtaining core or rotary drill samples over specific depth ranges (From-To ranges) and sending samples to an assay laboratory. Numerical results are typically returned from the laboratory in electronic format and can be imported quickly into the system.

Before import, you must make sure that your data files contain the following information – **HOLE ID, FROM, TO** and a series of **ASSAY** results. The following example demonstrates importing a text file (CSV) into the drillhole project.

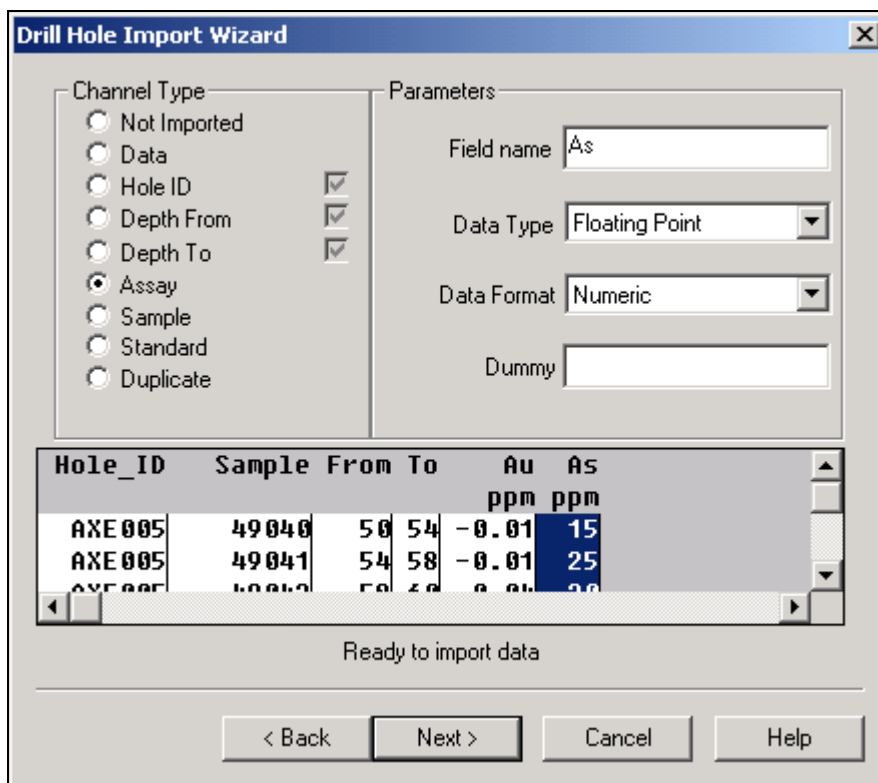
Importing Assay data in ASCII (CSV) format:

1. On the *DH-Data* menu click *Import*, and then click the *Text file*. The *Drill Hole – Ascii Import* dialog is displayed.
2. Using the **[Browse]** button, select the text file (**Assays.csv**) file from your working directory and click the **[Open]** button. The system returns you to the *Drill Hole – ASCII Import* dialog and displays the file name you wish to import.
3. Click the **[Wizard]** button. The system scans the file and displays the first dialog of the *Drill Hole Import Wizard*.
4. Specify the *Data Input Format* as (**ASCII Data**) and the *Types of Data to import* as (**From-To Data**). The window at the bottom of the dialog displays the file that is being imported.
5. Click the **[Next>]** button to display the second dialog in the *Drill Hole Import Wizard*. Select (**Delimited**) in the *File Type* box (i.e. separated by commas).



6. The four fields in the middle of the dialog box specify which line in the file contains the data headings (i.e. column names), data units (“ppm” or “%” etc.), which line to begin importing data from and the number of lines to display in the preview window.
7. Click the **[Next>]** button to display the third dialog in the *Drill Hole Import Wizard*. Specify the *Column delimiters* as **Microsoft Excel CSV** (i.e. the type of character used to separate the column text). The system displays the data in columns by drawing lines in the preview window indicating the way in which it is preparing to import your data.

- Click the **[Next>]** button to display the fourth dialog in the *Drill Hole Import Wizard*. The *Import Wizard* scans your data and determines the type of data with which you are working (i.e. **Column Type**). It is always good practice to review your data to ensure that the wizard has selected the correct columns.



- The **Parameters** section of the dialog box shows the name and type of data of the column highlighted in the preview window.

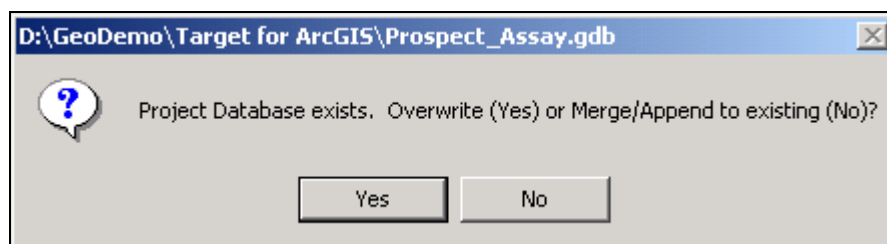
Note: The *Data Type* for columns that contain alphanumeric data (for example, sample numbers, rock codes etc.) must be classified as **String**.

- Click the **[Next>]** button to display the fifth and last dialog in the *Drill Hole Import Wizard*. The purpose of this dialog is to enable you to specify a unique name or description for your data. The name chosen will be appended to the corresponding holes in the database for easier access and recognition of your data.
- Specify a *Data Name* for this data (e.g. **Assay**) and click the **[Finish]** button to create the template file and to import the assay CSV data (assays.csv) into the **Prospect_Assay.gdb** and display it in the *GDB Window*.

Importing Additional 'From-To' or 'Point' Data

When importing additional 'From-To' or 'Point' type data the database naming convention is the same as the original data import. For example, if as in the procedure above, the initial assay data is imported to 'Prospect_Assay.gdb' and later additional assay results (e.g. NewAssay.csv) are acquired. The new data can be imported into a new separate database (i.e. 'Prospect_NewAssay.gdb') by specifying a new unique *Data Name* on the last dialog in the *Drill Hole Import Wizard* (e.g. **NewAssay**).

However, you can also Overwrite or Merge/Append the new data with the original import data by specifying the same unique name (i.e. **Assay**) on the last dialog in the *Drill Hole Import Wizard*. You will then be prompted with a dialog informing you that the project database exists, and to Overwrite the project data select **[Yes]** or to Merge/Append select **[No]**.



Template File "Assay.i3":

```
/ Wizard Generated Template for .\Assay.csv
[IMPORT ARCHIVE]
FILEHEADER 2
UNITHEADER 1
RECORDFORM DELIM,"",",","",",","\\"
SKIPSTRING "/"
DATA 0,8,NORMAL,,,,
CHAN DH_Hole,ASCII,NORMAL,8,0,LABEL="Hole_ID"
DATA 1,12,NORMAL,,,,
CHAN Sample,ASCII,NORMAL,12,0,LABEL="Sample";CLASS=Sample
DATA 2,5,NORMAL,,,,
CHAN DH_From,DOUBLE,NORMAL,8,0,LABEL="From"
DATA 3,3,NORMAL,,,,
CHAN DH_To,DOUBLE,NORMAL,8,0,LABEL="To"
DATA 4,6,NORMAL,,,,
CHAN Au,DOUBLE,NORMAL,8,2,LABEL="Au";CLASS=Assay
DATA 5,4,NORMAL,,,,
CHAN As,DOUBLE,NORMAL,8,1,LABEL="As";CLASS=Assay
```

Accessing Geosoft 3D Data in ArcGIS

The Geosoft *GDB Window* is a special window within ArcMap that is used to create and view Geosoft's unique three-dimensional file structure. The GDB Window is specifically designed to enable users to access drillhole data using the organized and self-contained spreadsheet tab windows. These windows offer a direct interface to your data and enable you to perform a variety of tasks, including:

- Display a view of the data in numerical or profile format
- Dynamically link data in spreadsheet and profile windows
- Display database statistics
- Apply mathematical expressions to data
- Process and display resulting data
- Analyze data using built-in Geosoft eExecutable functionality

Spreadsheet Window

The data visible in the "Spreadsheet window" represents only some of the data in the Geosoft 3D file. This differs from a conventional spreadsheet program, in that what you see on the screen is the data. The Spreadsheet window only displays those parts of the data that you choose to display.

In general, you may have as many drillholes and columns in your Geosoft 3D file as you require (i.e. there is no limit). However, you are free to display the columns in any order or remove them from the window whenever you like.

Profile Window

The data profile view is your "graphical window" to the Geosoft 3D file. You can display profiles of one or more numeric variables in your file simply by selecting the column, right clicking and from the popup menu select *Show Profile*. The profile appears directly below its corresponding spreadsheet in a profile window. You can have up to three "panes" with 32 variables in each window.

Profile windows are linked dynamically to their corresponding spreadsheet. When you select a value or range of values in either the spreadsheet or profile window respectively, they are also highlighted in the other window. Right click inside the profile window to view the *Profile* menu.

Quality Control and Quality Assurance Validation Tests

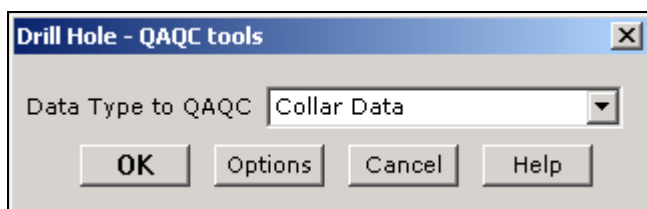
The Target for ArcGIS system provides the tools to enable you to perform Quality Control and Quality Assurance validation tests on each of the five different data types (Collar Data, Dip/Azimuth Survey, Easting-Northing Survey, From-To Data, and Point Data). The validation of drillhole data is automatically run while importing from ASCII, database or LAS file formats. However, the validation routines can be run at any time after import, which is especially useful if errors have been manually corrected and need to be rechecked.

The *Drill hole - QAQC tools* dialog asks you to select the type of data to perform the QA/QC tests on. For each data type there are different sets of options you can enable/disable using the **[Options]** button. The system saves these settings to the geosoft.ini file in your "\\arcgis\arcexe83\Geosoft\User\ini" directory.

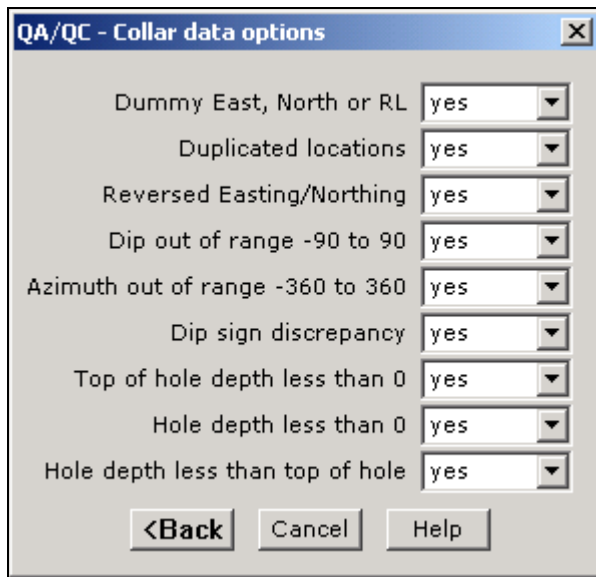
The individual QA/QC tests are run automatically during data import. Each test produces its own log file; e.g. Collars (Collars.log), From-To (FromToData.Log), All data (QAQC.log). If no problems are found you receive a message such as: "No problems were detected with the Dip-Azimuth Survey data."

For more detailed information on the options available for each data type, click the **[Help]** button on the *Drill hole - QAQC tools* dialog.

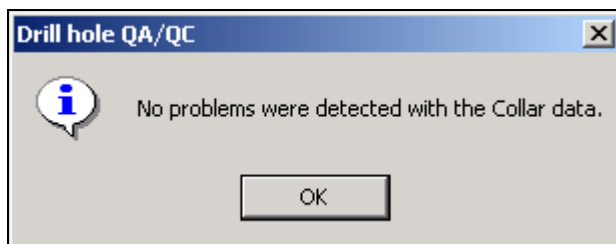
1. On the *DH-Data* menu click *QAQC*. The *Drill hole - QAQC tools* dialog is displayed.



2. From the *Data Type to QAQC* dropdown list, select the data type you want to perform the QA/QC test on. To see the list of options that the selected data type will use for testing, click the **[Options]** button. In this case, the *QA/QC - Collar data options* dialog is displayed.



3. Once you have modified your test options, click the [**<Back**] button to return to the *Drill hole - QA/QC tools* dialog.
4. Click the [**OK**] button to run the test. If no errors are found the *Target for ArcGIS QA/QC* dialog will be displayed telling you that no errors were detected.



5. Click the [**OK**] button to close the *Drill Hole - QA/QC tools* dialog.
6. If errors are detected, for example when running the test on the From – To Data, a data log file will be displayed listing the problem samples, see the FromToData.log displayed below:

Database: D:\GeoDemo\Target for ArcGIS\Prospect_Assay.gdb

```

AXRC027 [line 17551] : Missing From/To interval [36.00 : 40.00].
AXRC036 [line 19053] : Missing From/To interval [153.00 : 154.00].
SKC255 [line 4871] : Missing From/To interval [39.00 : 42.00].
SKC380 [line 8415] : Missing From/To interval [87.00 : 90.00].
SKC392 [line 8964] : Missing From/To interval [54.00 : 55.00].
SKD388 [line 13228] : To [112.50] is greater than Hole Bottom [112.00].
SKD411 [line 13374] : To [141.50] is greater than Hole Bottom [141.00].
SKD433 [line 13526] : Missing From/To interval [150.00 : 172.50].
SKD433 [line 13527] : Missing From/To interval [172.71 : 177.45].
SKD433 [line 13528] : Missing From/To interval [177.90 : 234.63].
SKD433 [line 13529] : Missing From/To interval [234.91 : 236.30].
SKD433 [line 13530] : Missing From/To interval [236.50 : 282.00].
SKD434 [line 13659] : Missing From/To interval [150.00 : 264.00].
SKD514 [line 13894] : To [327.33] is greater than Hole Bottom [327.00].

```

Note: If you run this test on a data type that you do not have in your current project, for example in this case "Easting-Northing survey" you will be prompted with the Drill Hole - QAQC dialog telling you "No East-North survey data exists in this Target for ArcGIS project".

For more information, contact the Geosoft office nearest you:

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