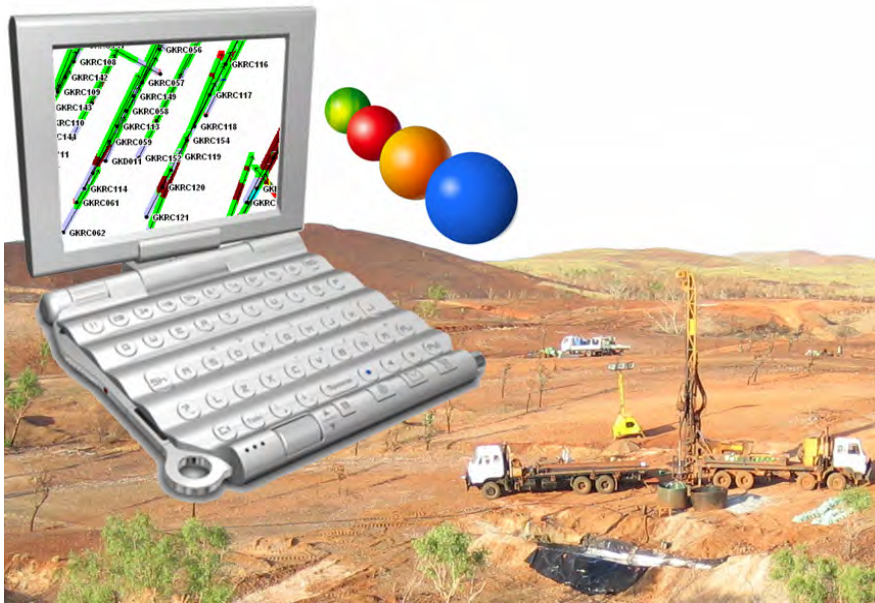


11. Drillhole Database Manager



The

Drillhole Database Manager is a separate add-on module designed to work seamlessly within MAADgis. The module is not available until it has been purchased and added to the company's license file. This is authenticated at application startup.

The Drillhole Database Manager is a database driven application that is accessible through the MapInfo interface to store and access geological Drillhole and sample location information.

This section outlines the setup and usage of the Drillhole DBMS module.

11.1 Drillhole DBMS Environment

The database has been built around MS Access, with an interface in MapInfo Professional. Currently the database structure is defined, and outlined in the next section.

Future direction of this Drillhole DBMS is to provide direct access ODBC compatible databases (i.e. SQL Server, Oracle).

This application can reside under a single directory, and the following files are required,

MAADdbms.MBX

Application to execute in MapInfo

MAADbCfg.txt

Configuration file

MAADdhole.mdb

MS Access database to store project parameter settings, and Drillhole information if required.

MAADdhole_blank.mdb

Blank database used as a template to store Drillhole data.

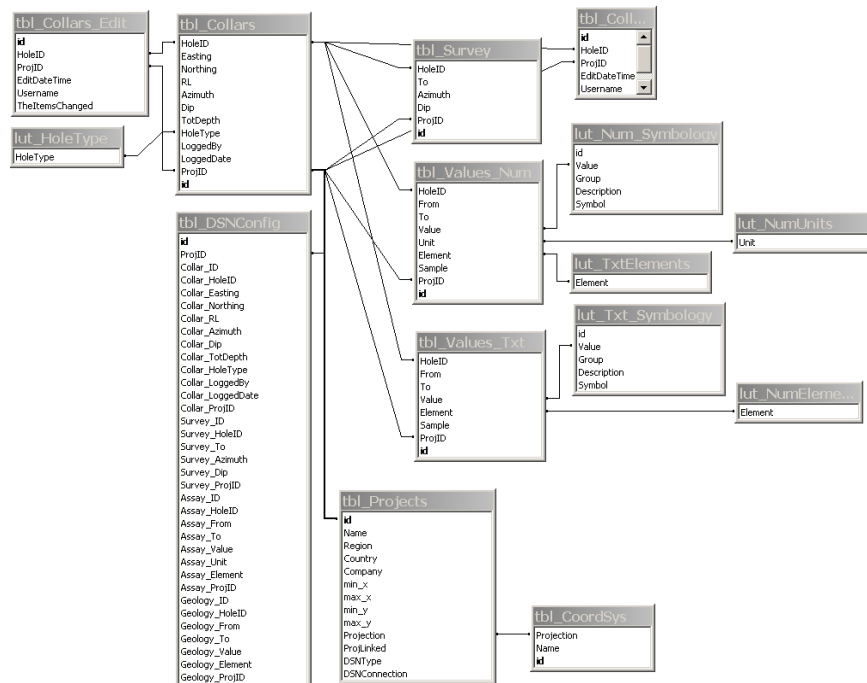
11.2 Database Relationships

To define a relationship between objects, the common join is the HoleID and ProjID. HoleID is the identifier of the hole, and ProjID is the project identifier.

There should never be 2 HoleID's and ProjID's the same within the same project.

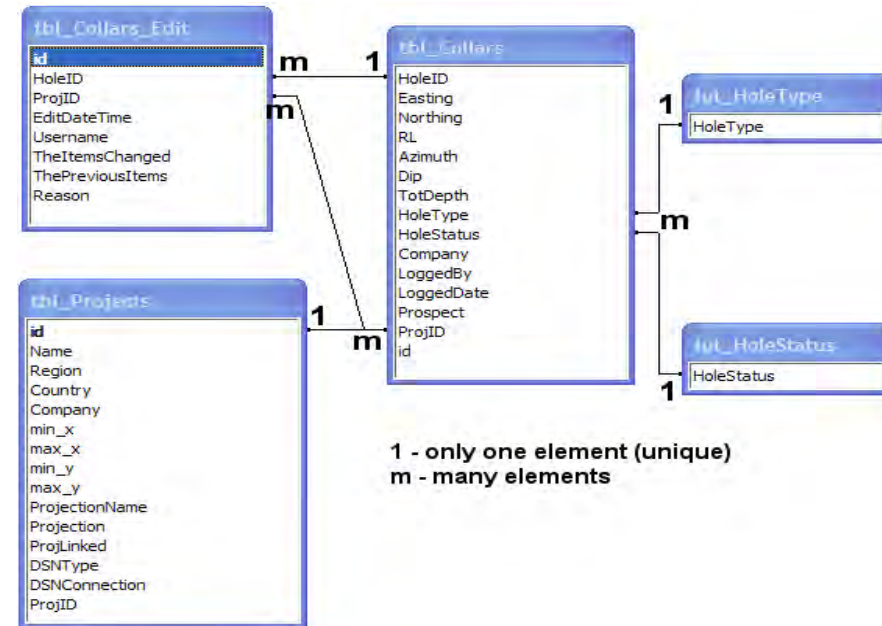
5 Core database tables exist, and contain all the required information about the project, collars, survey, assay and downhole geology data.

Look up tables exist that relate directly to the core tables to provide consistency in item and values.



It is not advisable to change any structures, relationships, table or column names or types as incorrect operation of MAADdhole cannot be guaranteed.

11.2.1 Project – Collar Table Relationships

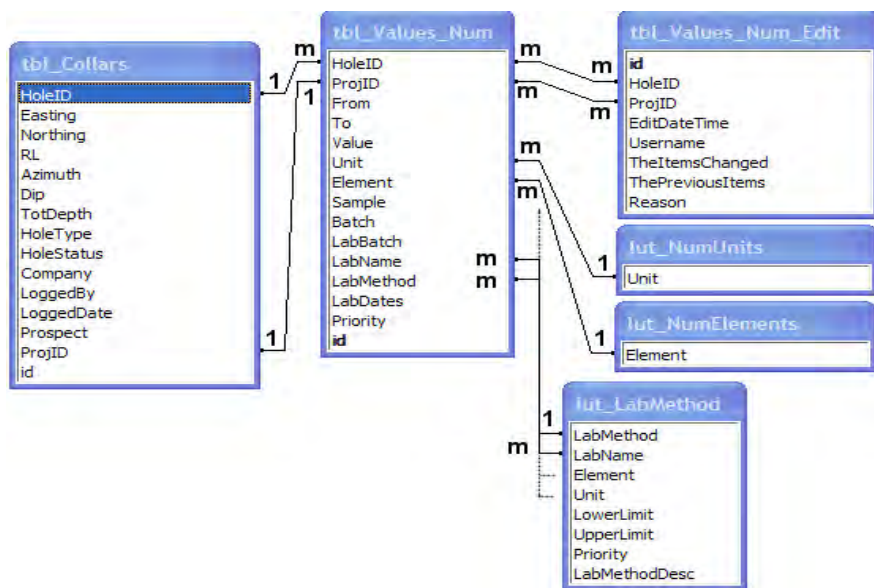


In defining a project, the project number is automatically assigned into the id field (autonumber), therefore there can only be 1 project identifier. This project identifier is used throughout the database structure to identify what project an item belongs to.

2 look up tables exist, one for the hole status, the other for the hole type. If an item is not within these 2 tables, it is automatically added at runtime through the interface.

During the program run time, a number of fields are joined to provide exporting or uploading functionality. On exporting, MapInfo uses the columns of Easting and Northing from the tbl_Collars table, and creates them spatially using the projection defined at the project's creation (tbl_projects.projection).

11.2.2 Collar – Assay Table Relationships



Any numerical values (i.e. assays) are uploaded or added to the tbl_Values_Num table.

The primary unique identifiers are the **HoleID** and the **ProjID** fields, however the following fields are used as the secondary unique fields to define a single item,

- From**
- To**
- Unit**
- Element**

Priority

Test are undertaken at various stages of the programs operation to ensure the combination of these entries ensure a unique value within the database at all times.

3 look up tables interact with tbl_Values_Num table,

- Lut_NumUnits (i.e. ppm, ppb,%, etc)
- Lut_NumElements (i.e. Au, As, Pb, etc)
- Lut_LabMethod (i.e. XRF, FA_ICP, etc)

When altering values in these look up tables, the values entered in the primary join fields must be of continuous characters only (no illegal characters).

Values used in these fields are automatically assigned as column names within MapInfo, and program errors will occur if illegal MapInfo column characters are identified.

A similar relationship structure is used for textual items (tbl_Values_txt), except the units look up table is omitted.

The lab method options can be substituted for sampling method, geophysical observed or measured methods, etc. for textual data added within tbl_Values_txt.tbl

11.2.3 Collar – Survey table Relationships

The Survey table is fairly much stand alone, and does not have any look up tables that interact with it.

The common link fields are the HoleID and ProjID fields, with the field of 'To' providing the unique field for validation.

11.3 Core Database Structure

11.3.1 Project Table

[tbl_projects]

id	unique identifier. Autonumber field. Main link field.
Name	Name of the project
Region	Region or additional info field
Country	Country of the project
Company	Company that owns the project, or who collected the info
min_x	Minimum X Coordinate of the project
min_y	Minimum Y Coordinate of the project
max_x	Maximum X Coordinate of the project
max_y	Maximum Y Coordinate of the project
projection	Projection of the drillholes. Must be MapInfo projection syntax.
ProjLinked	If the project is linked to others
DSNType	Type of Database. 1 = MS Access, 2 = ODBC DSN
DSNConnection	Connection string to database.
ProjID	Holds the id defined for the project if disconnected from the main database.

Field Name	Data Type	
id	AutoNumber	Main link or identifier of project
Name	Text	Name of the project area - selection interface option
Region	Text	Sub region of the country
Country	Text	Country - selection interface option
Company	Text	Company - selection interface option
min_x	Number	Min Longitude
max_x	Number	Max Longitude
min_y	Number	Min Latitude
max_y	Number	Max latitude
ProjectionName	Text	Name of the projection
Projection	Text	Will be in MapInfo format - initially used to
ProjLinked	Number	if the area is a sub area of another, the number will be linked here
DSNType	Number	Type of connection 1= Access .mdb, 2 = DSN
DSNConnection	Text	Connection string
ProjID	Number	duplicate of id

11.3.2 Collar Table

Field Name	Data Type	
HoleID	Text	Primary key - identifier of the hole - must be unique
Easting	Number	X coordinate - must all be in the same projection
Northing	Number	Y coordinate - must all be in the same projection
RL	Number	Height
Azimuth	Number	azimuth 0 - 360
Dip	Number	dip 0 - 90
TotDepth	Number	depth of the hole
HoleType	Text	what sort of hole it is - DD, RAB, RC, etc
HoleStatus	Text	status of the hole - complete, in progress, proposed, etc
Company	Text	Name of Company who (not driller), but company who commissioned the drilling
LoggedBy	Text	name of person who logged/drilled/sampled
LoggedDate	Text	the date - dd/mm/yyyy
Prospect	Text	can be prospect name, tenement number, etc
ProjID	Number	Primary key - linked to project table
id	AutoNumber	used internally for record identification

[tbl_collars]

HoleID	The hole identifier. Main link field and must be unique
Easting	X coordinate, must be in projection describe in tbl_projects
Northing	Y coordinate, must be in projection describe in tbl_projects
RL	RL elevation of the hole
Azimuth	Direction the hole was drilled. Orientation from true north.
Dip	Angle the hole was drilled. Downhole dip should be negative.
TotDepth	Depth of the hole (in metres)
HoleType	The type of hole (RAB, RC, DD, etc)
HoleStatus	Status of the hole (i.e. drilled, proposed, etc)
Company	The company who commissioned the hole
LoggedBy	Who drilled the hole
LoggedDate	Date the hole was drilled
Prospect	Name of the prospect
ProjID	Project link. Main link field.
Id	Unique record identifier, autonumber field.

Drillhole surface trace uses the columns of Azimuth, Dip and TotDepth from the collar table.

Updating the values of Azimuth, Dip and TotDepth can be generated automatically through the interface for a particular collar from the associated tables of Assay, Geology or Survey.

11.3.3 Assay Table

tbl_Values_Num : Table			
	Field Name	Data Type	
▶	HoleID	Text	Primary Key - has to be unique for collars
	ProjID	Number	Number to link to the Project Name, used with HoleID to select.
	From	Number	Primary key - start m
	To	Number	end m
	Value	Number	The value of the column - 123.23, -37.23 etc
	Unit	Text	Unit of the value if applicable - ppb, ppm,etc
	Element	Text	Will be the associated column title - Au, Rock, etc
	Sample	Text	Sample ID
	Batch	Text	Company batch ID
	LabBatch	Text	Lab Batch ID
	LabName	Text	Name of Lab - No spaces Will be the associated column title
	LabMethod	Text	Method lab used
	LabDates	Text	Dates in and out of the lab
	Priority	Text	should be a number ranking - 1,2,3 etc
🔍	id	AutoNumber	internal id - automatically generated

[tbl_Values_Num]

HoleID	The hole identifier. Main link field and will be duplicated.
From	The starting downhole interval value
To	The ending downhole interval value
Value	The value (must be a number)
Unit	The value unit of measurement (i.e. ppm, ppb, etc)
Element	The element type (ie Au, As, Pb, Zn, etc)
ProjID	Project link. Main link field.
Id	Unique record identifier, autonumber field.
Sample	The sample number (Yours)
Batch	The batch number (Yours)
LabBatch	Lab batch number
LabName	Name of the laboratory
LabMethod	Method used for analysis
LabDates	Dates in / out of the lab
Priority	Quality of values 1 (H), 2, 3, etc

This table stores all numerical assay values in a normalised structure for a Drillhole interval. When data is exported to MapInfo, a flat file

structure is created, where the values column name comes from combining the Element value and the Unit value for a record. These 2 values are separated by an underdash (i.e. Au_ppm).

11.3.4 Downhole Geology Table

tbl_Values_Txt : Table			
	Field Name	Data Type	
▶	HoleID	Text	
	From	Number	
	To	Number	
	Value	Text	The value of the column Pk, Cs, etc
	Element	Text	Will be the associated column title Lithology, Rock, etc [no spaces allowed]
	ProjID	Number	Number to link to the Project Name, used with HoleID to select.
🔍	id	AutoNumber	
	Sample	Text	Sample ID
	Batch	Text	
	LabBatch	Text	
	LabName	Text	
	LabMethod	Text	
	LabDates	Text	
	Priority	Text	

[tbl_Values_Txt]

HoleID	The hole identifier. Main link field and will be duplicated.
From	The starting downhole interval value
To	The ending downhole interval value
Value	The value (must be text)
Element	The element type (i.e. Lithology, Rock, etc)
ProjID	Project link. Main link field.
Id	Unique record identifier, autonumber field.
Sample	The sample number (Yours)
Batch	The batch number (Yours)
LabBatch	Lab batch number
LabName	Name of the laboratory
LabMethod	Method used for analysis
LabDates	Dates in / out of the lab
Priority	Quality of values 1 (H), 2, 3, etc

This table stores all text values and comments in a normalised structure for a Drillhole interval. When data is exported to MapInfo, a flat file structure is created, where the values column name comes from the Element value of a record.

11.3.5 Survey Table

tbl_Survey : Table			
	Field Name	Data Type	
	HoleID	Text	hole identifier
	To	Number	distance down hole 15, 35, etc
	Azimuth	Number	< 360 degrees
	Dip	Number	<= 90 degrees
	ProjID	Number	
	id	AutoNumber	

[tbl_Survey]

HoleID The hole identifier. [Main link field and will be duplicated.](#)

To The ending downhole interval value. Is to cumulative.

Azimuth Direction the interval was drilled. Orientation from true north.

Dip Angle the interval was drilled. Downhole dip should be negative

ProjID Project link. [Main link field.](#)

Id Unique record identifier, autonumber field.

11.4 Database Look-Up Tables

A number of look up tables exist within the database that are joined automatically at runtime within the MAADdhole interface.

No administration interface is available within the MAADdhole interface, and additions or alterations to these look up tables must be completed by accessing the database tables themselves.

These look up tables are to be set with company standards before drilling data is added. Changes to the MAADdhole_blank.mdb will ensure all future created project databases will contain the required standards.

The following look up tables are defined;

- Hole Status
- Hole Type
- Lab Method with detection limits for elements
- Elements
- Units of measure

Important: When altering values in these look up tables, the values entered in the primary join fields must be of continuous characters only (no illegal characters).

Values used in these fields are automatically assigned as column names within MapInfo, and program errors will occur if illegal MapInfo column characters are identified.

Illegal characters to MapInfo column definitions include \,/,|,-,#,@, spaces, etc), and column names can include numbers as long as they are not the first character. You can use an _ as a space separator if required.

11.5 Preparing data for import into the Drillhole DBMS.

To prepare mass data for easy importation to the Drillhole DBMS structure, organise your data into 4 Mapinfo tables, a collar, assay, downhole geology and survey tables. Separate data into these individual files based on unique project areas.

Ensure assay and downhole geology tables are normalised (i.e. 1 value after another as apposed to a flat file structure).

Project ID values will be assigned at time of project creation, and must be appended to the column of ProjID before uploading to the appropriate database. **Do not create a column called ProjID in any of the tables to be uploaded, as this will affect the Bulk Upload functionality.**

The following table structures with appropriate data should be defined in MapInfo for easy importation;

11.5.1 Collar Table

[??_collars.tab]

HoleID	Character (30)
Easting	Float
Northing	Float
RL	Float
Azimuth	Float
Dip	Float
TotDepth	Float
HoleType	Character (12)
HoleStatus	Character (12)
Company	Character (30)
LoggedBy	Character (30)
LoggedDate	Character (30)

Prospect	Character (40)
ProjID *	Integer

Minimum fields required to upload a file,

HoleID	Character (30)
Easting	Float
Northing	Float

11.5.2 Assay Table

[??_Assays.tab]

HoleID	Character (30)
From	Float
To	Float
Value	Float
Unit	Character (12)
Element	Character (12)
ProjID*	Integer
Id*	Integer – leave as 0
Sample	Character (30)
Batch	Character (30)
LabBatch	Character (30)
LabName	Character (30)
LabMethod	Character (30)
LabDates	Character (50)
Priority	Integer

Minimum fields required to upload a file,

HoleID	Character (30)
From	Float
To	Float
Value	Float
Unit	Character (12) – you assign on testing/upload
Element	Character (12) – you assign on testing/upload

Priority Integer

This version of MAADdhole requires assay data to be a flat file format to be uploaded, where repetition of uploading values of similar elements and units are required.

Structuring files this way and uploading them in this manner is required for proper validation of the data, such as duplicates records.

When you receive data from external sources, data quality and completeness of the data can come in many formats. At worst case scenario, the following is usually supplied,

Assay Browser			
HoleID	From	To	Au_ppm
<input type="checkbox"/> BER001	0	3	0.037
<input type="checkbox"/> BER001	3	6	0.391
<input type="checkbox"/> BER001	6	9	0.014
<input type="checkbox"/> BER001	9	12	0.01
<input type="checkbox"/> BER001	12	15	0.025
<input type="checkbox"/> BER001	15	18	0.012
<input type="checkbox"/> BER001	18	21	0.008
<input type="checkbox"/> BER001	21	24	0.008
<input type="checkbox"/> BER002	0	3	0.053
<input type="checkbox"/> BER002	3	6	0.016
<input type="checkbox"/> BER002	6	9	0.014
<input type="checkbox"/> BER002	9	12	0.01
<input type="checkbox"/> BER002	12	15	0.0935

To help with validation, and to ensure you give some priority value to the quality of the data, create a new column called 'priority', of type integer. At a minimum, use the following scale of values for data quality or ranking

0 – unknown, **1** – Highest >> **5** Lowest.

In future versions the process of uploading normalised files will be included.

11.5.3 Downhole Geology Table

[??_Lithology.tab]

HoleID Character (30)
 From Float
 To Float

Value Character (50)
 Element Character (12)
 ProjID* Integer
 Id* Integer – leave as 0
 Sample Character (30)
 Batch Character (30)
 LabBatch Character (30)
 LabName Character (30)
 LabMethod Character (30)
 LabDates Character (50)
 Priority Integer

For downhole geology tables, Labmethods, Labnames, etc can be substituted for sampling method, or person who undertook the sampling.

Minimum fields required to upload a file,

HoleID Character (30)
From Float
To Float
Value Float
 Element Character (12) – you assign on testing/upload
Priority Integer

11.5.4 Survey Table

[??_Survey.tab]

HoleID Character (30)
 To Float
 Azimuth Float – from 0 to 360 degrees
 Dip Float and value should be negative. Values from 0 to -90 degrees
 ProjID* Integer

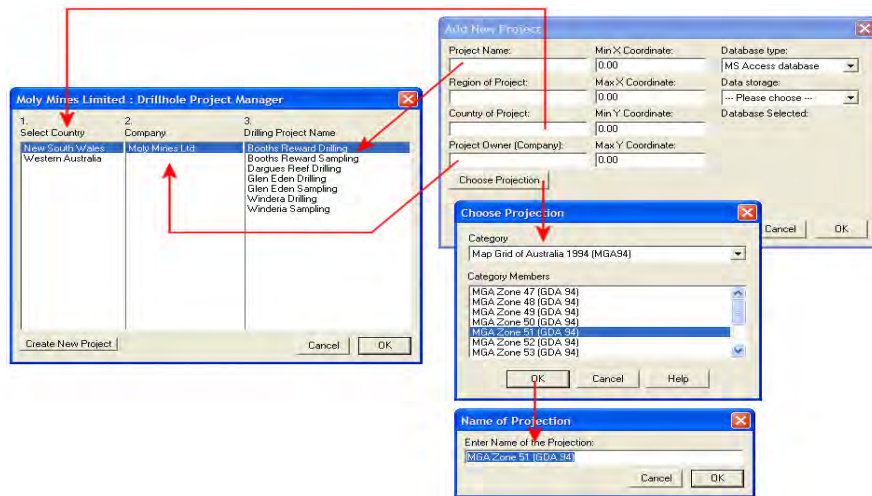
* A unique identifier value (id) is assigned to each of the above tables, which is not to be specified in MapInfo.

11.6 Creating Drillhole Projects

To get started, first a project must be defined.

It is within this project creation phase that the project name, spatial projection and unique project identifier is defined.

If no projects are defined, the project definition interface is automatically displayed, otherwise a project can be defined from within the Drillhole Project Manager or the Drillhole Manager interface by selecting the 'Create New Project' button.



Important fields to complete are;

- Project Name
- Country of project
- Project Owner
- Projection (all locations must be of type selected – no multiple projections allowed)
- Data storage (choose database method to store)

A project ID cannot be changed once it is created (generated automatically using an autonumber field)

11.7 Tests Required For Uploading Data to the Database

To bulk upload data, a number of tests must be performed on the data to be uploaded to ensure data quality within the database is maintained.

Primarily, the tests perform the function of duplicate checking, both within the file to upload, and within the database.

Files will not be able to be uploaded unless the tests are successfully performed, and performed within the same 24 hour testing period.

Additional tests can be performed on the files, however they have no bearing on the upload process.

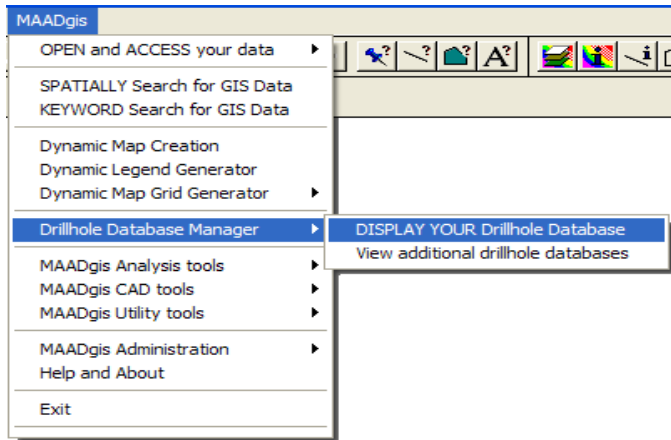
You must systematically work through every test that is required for each data item (collars, assays, etc), and re-running the required tests must be made after alterations are performed.

Alterations must be performed on a file of the same name, and within the same 24 hour period to then successfully use the Data Loader or Bulk Upload function.

11.8 Using the Drillhole Database Manager

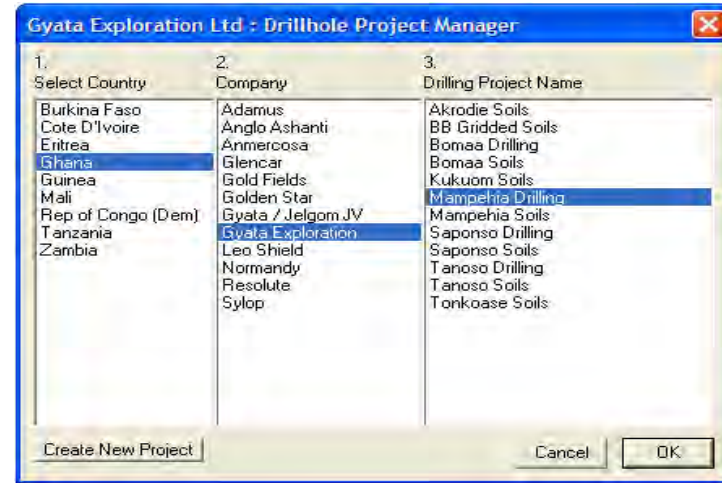
11.8.1 Viewing Data from the Drillhole DBMS

Select from the option of **Drillhole Database Manager >> Display YOUR Drillhole Database ...**

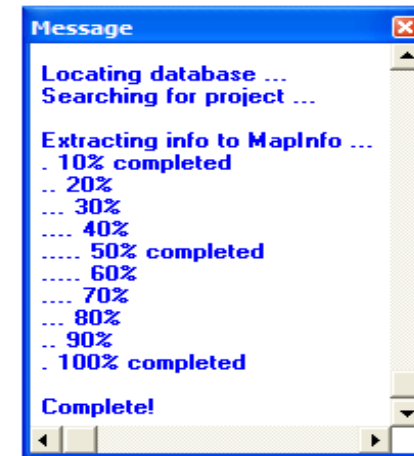


The option of 'View additional Drillhole databases' looks for additional MAADdhole programs that may be stored within sub-directories beneath the main program directory.

Select from the **country**, then **company** and finally the **drilling / sampling program or project** you wish to view

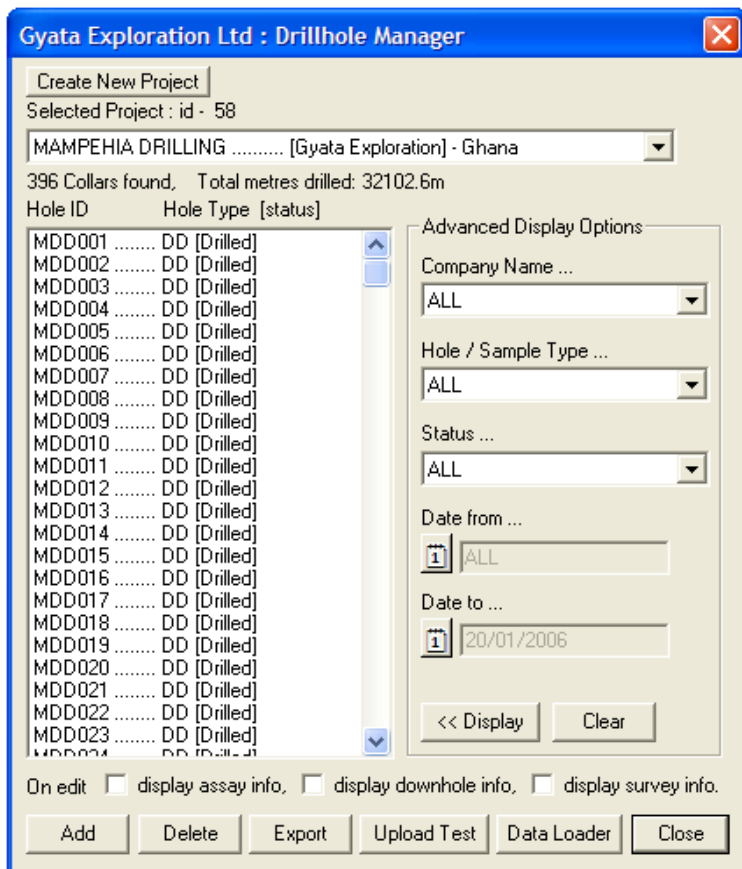


The database is searched by the project selected and collar information (Hole id, Easting, Northing and Hole type) is returned. If the number of collars is large, only Hole id is returned. If databases are large in size, it may take a while to display information. As a result, progress can be tracked in the message window.

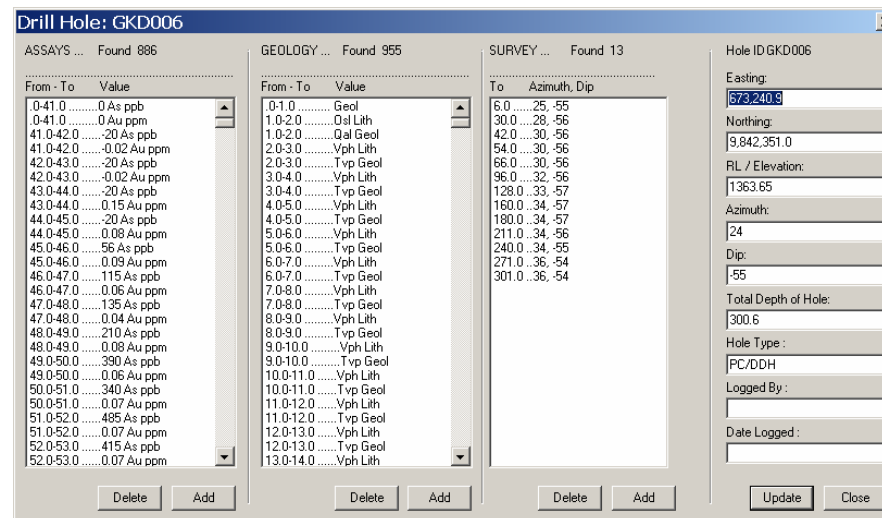


The interface returned allows the user to either swap projects, double click on a Drillhole to edit it and/or display it's assay / downhole geology / survey information. Other options are available to **add a new project**,

add or delete a Drillhole, export the database to MapInfo or csv format, or upload new data to the database using the **Data Loader** or **Upload Test** functions.



Double-clicking a Drillhole will return all information associated with the Drillhole. To display the Drillhole information with associated assay information, select the appropriate checkbox. Reduced performance to display assay, geology and survey data simultaneously is noticeable when either 2 or 3 options are selected.



Further selecting of an assay, downhole geology or survey value will display a dialogue box that allows the item to be edited.

11.8.2 Updating Data

3 methods can be used to alter data in the database,

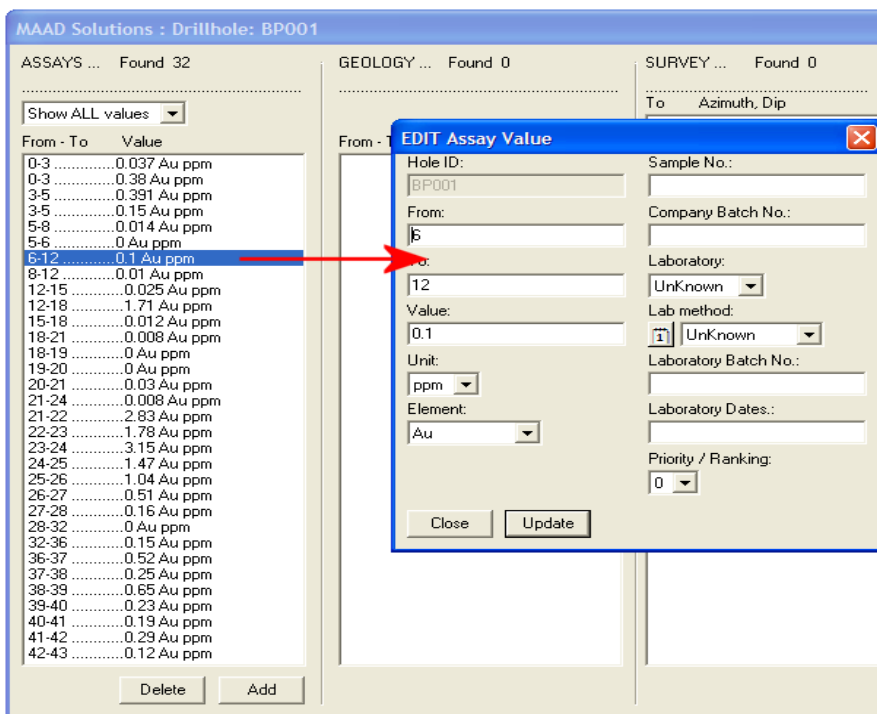
- Select an entry from the interface and manual alter the entry (alterations are tracked in the database automatically – i.e. the changed record, what the record was previously, who changed it, and date)
- Use a routine inbuilt to an entry
- Alter the data in MapInfo, run it through the required testing procedures and use the bulk uploader functionality (great for large amounts of data).

11.8.2.1 Manual Selection

All items in the database can be changed, either by double-clicking an entry in a display window, or selecting from a dropdown menu.

All changes (when the update buttons are selected) are logged in the database, and these can be analysed at a later date for quality checking and reporting.

If a single change is required, this is the preferred method to use to change.



On selecting update, not only is the change written to the database, but also a few checks are undertaken to ensure data quality and uniqueness.

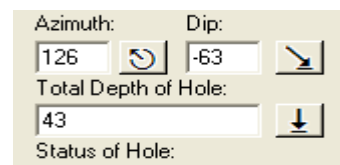
11.8.2.2 In-built Routines

Once new data is uploaded, cross table checks can be undertaken to ensure completeness of that data.

An example may be that when a drillhole was planned, its estimated depth was to be 50m, at a dip of 60 and azimuth of 235. In reality, when the drillhole was drilled, results back from and stored assay and survey files was indicate something different.

This data can be analysed per hole, and if required can be updated in the collar file to reflect the true value.

Options to undertake these functions are initiated with an associated button next to the measurement options of either Azimuth, Dip of Total depth.



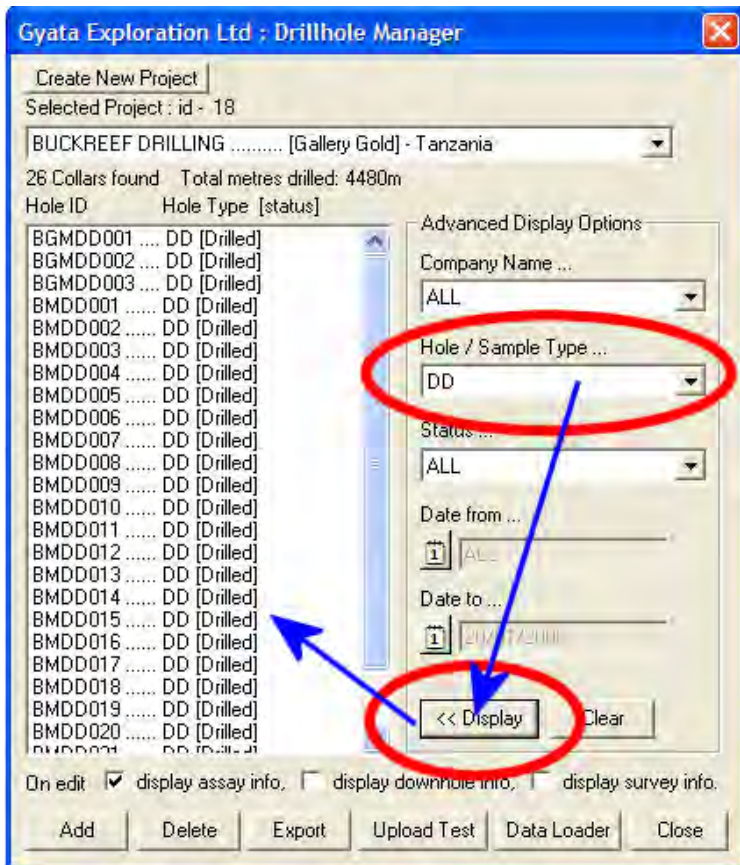
11.8.2.3 Bulk Uploads

To use the bulk upload function, ensure that the upload tests have been performed on the files to upload, and are successful in outcome.

It is best to structure or organise the data to upload (can only be done in MapInfo, therefore files that are supplied must first be imported into MapInfo), see the section on 'Preparing data to upload'.

11.8.3 Creating a Subset of Project Data

Data can be subsetted using the criteria of ‘company name’, ‘the sampling type’ and/or the ‘status of the sample location’. This enables drilling data of different types, by different companies that are part of the same project area, a facility to centrally store the data and at the same time can be easily separated and exported.

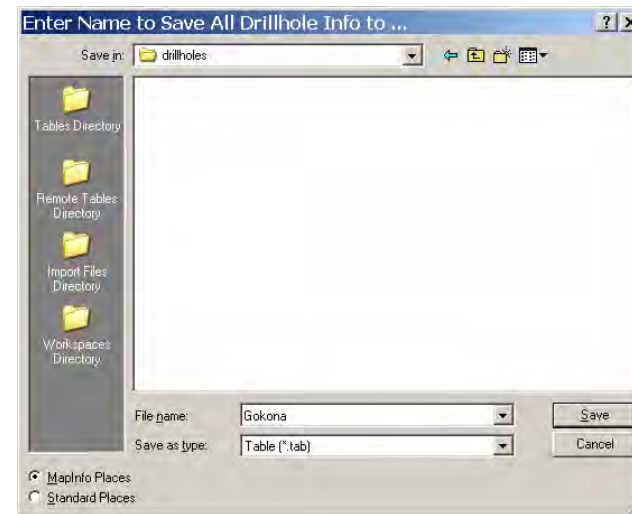


11.8.4 Exporting Data to MapInfo

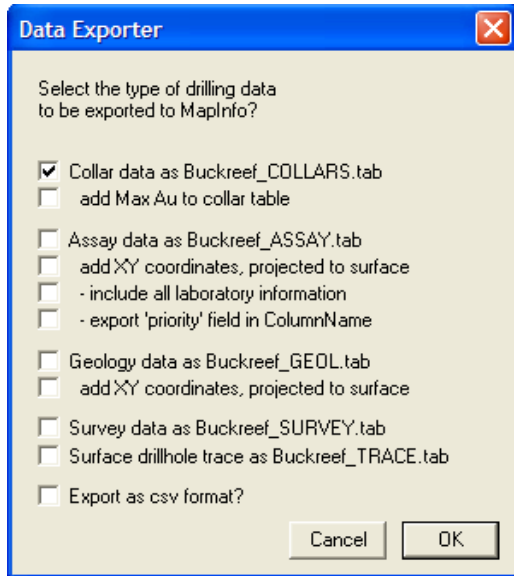
To export the data to display in MapInfo, select the **Export button**.

Data that is currently displayed in the ‘?? Collars found’ window will only be exported.

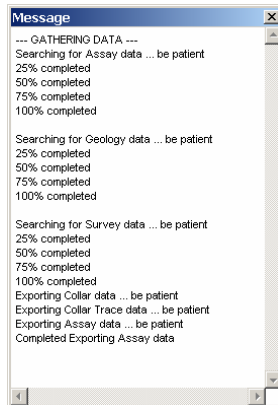
Choose a directory to export the data to. The first **6** letters of the project are displayed in the filename prompt (this can be changed to a more meaningful name or left as is).



Select the **type of data to export**. (Only collar data is initially checked, tick additional checkboxes as required).



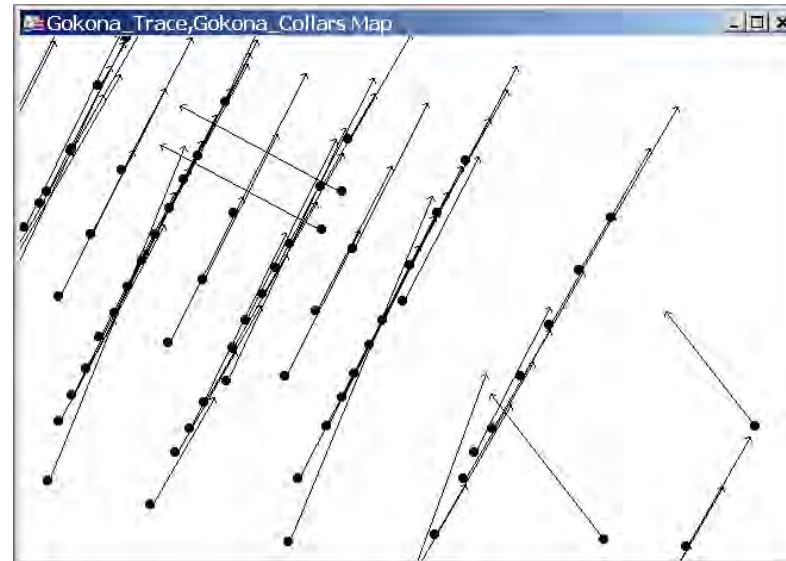
Large databases to export may take time. Progress is displayed in the message window.



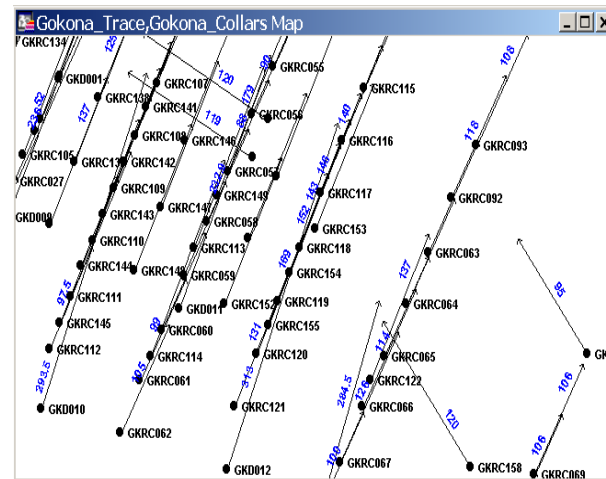
Collar data is created and displayed spatially within a map window at the **projection specified for the project.**

If the Drillhole surface trace option is **selected, azimuth, dip and total depth of the hole** is used to calculate this layer. The trace line is

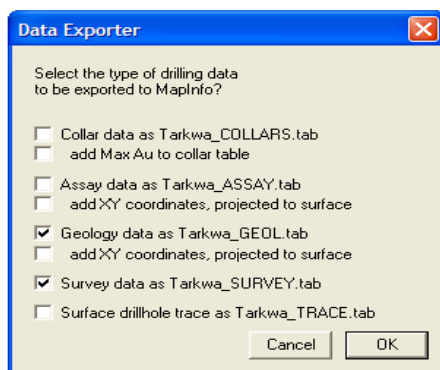
projected onto the surface. This layer is automatically displayed within the same window as the collar table. The line style of the trace layer is symbolised as an arrow showing the direction of the hole.



These layers can be easily labelled, using the column of **HoleID for collars**, and **TotDepth for the trace layer.**



Additional Drillhole data can be extracted to MapInfo by reselecting the Export button. Be careful using this option when selecting filenames that may contain duplicates.



Assay and geology files are created into a flat file format, where a values unit type (i.e. ppm) and element are automatically created as column titles for easy identification. This function allows for many unique elements and values to be maintained within the database.

Gokona_Assay Browser						
	HoleID	From	To	Sample	Au_ppm	As_ppb
<input type="checkbox"/>	GKD001		0	1 N/S		0
<input type="checkbox"/>	GKD001		1	2 536715	0.04	-20
<input type="checkbox"/>	GKD001		2	3 536716	0.03	-20
<input type="checkbox"/>	GKD001		3	4 536717	0.03	-20
<input type="checkbox"/>	GKD001		4	5 536718	0.03	-20
<input type="checkbox"/>	GKD001		5	5.5 536719	0.03	-20
<input type="checkbox"/>	GKD001		5.5	6 537359	0.03	-20
<input type="checkbox"/>	GKD001		6	6.5 537360	0.02	-20
<input type="checkbox"/>	GKD001		6.5	7 537361	0.02	-20

Once the collar, assay, downhole geology and survey files are created, it is easy to integrate these files into Discover's Drillhole Cross Section generator.

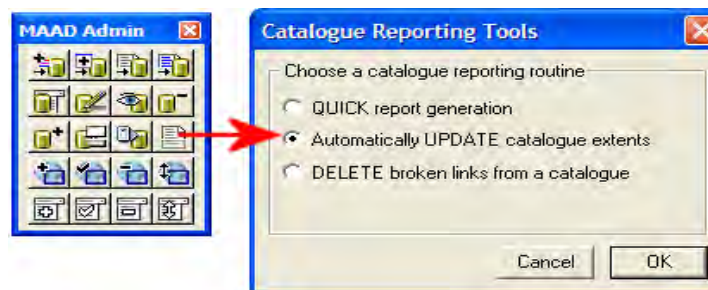
11.8.5 Catalogue Drillhole Data using MAADgis

MAADgis can be used to catalogue exported Drillhole data, (the collar, projected assay/geology and survey trace data).

The process would be to export data to a directory, and then use MAADgis to catalogue.

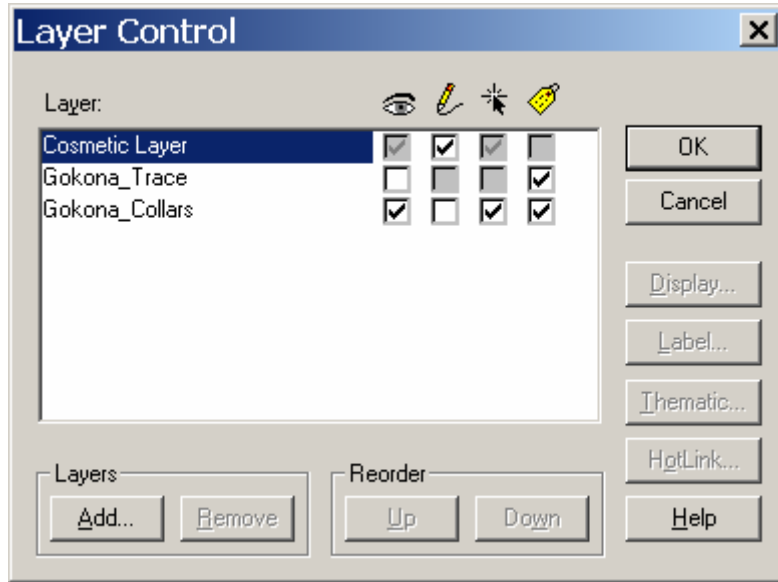
When the database is updated, simply export the data again and overwrite the existing files (MAADgis is still pointing to the original filename selected).

If the extents of the drilling has changed, use the following MAADgis administration function,

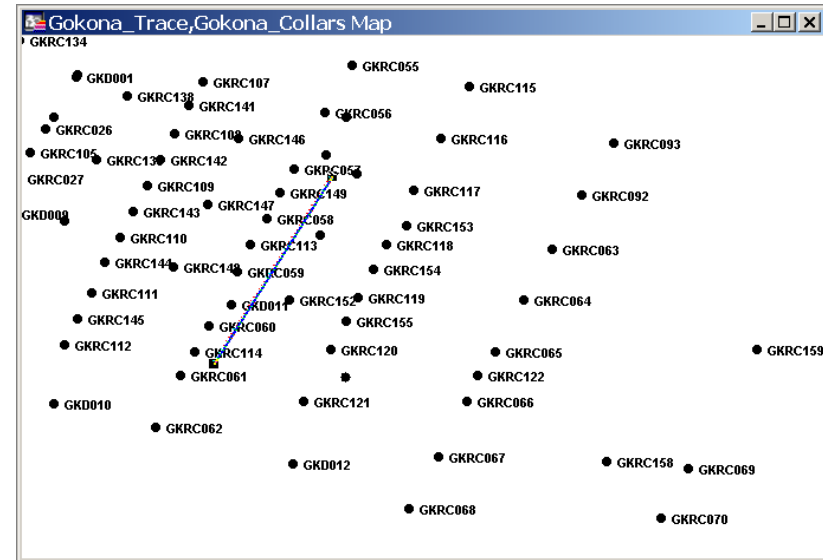


11.8.6 Create Drillhole Cross Section using Discover

To create a cross section, first make the Cosmetic Layer editable ([Map >> Layer Control](#)).



On the map window, draw a line that represents the length of the cross section to generate. **Then select the line using the graphical select tool.**

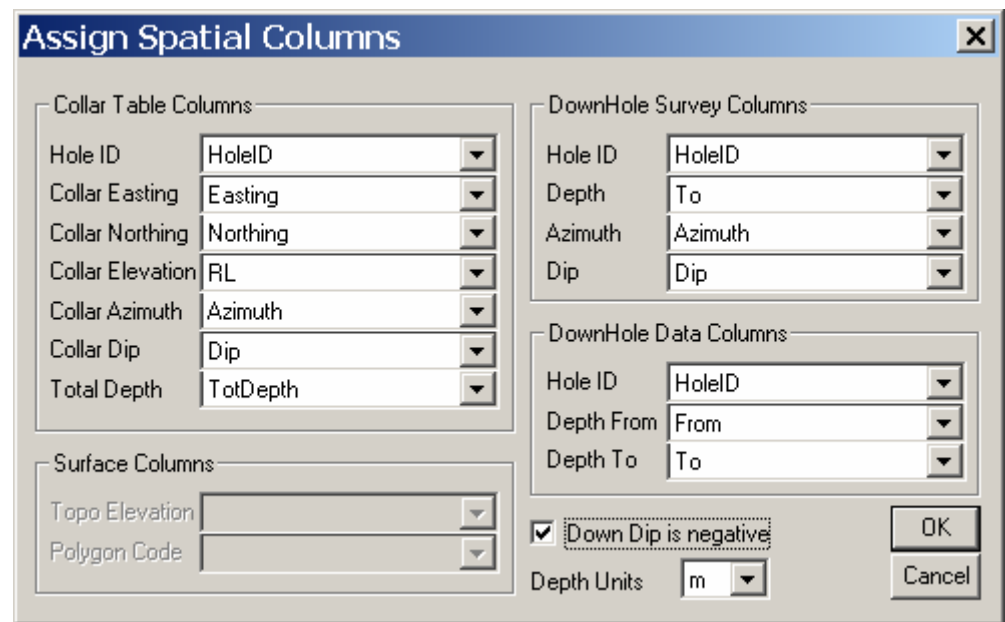
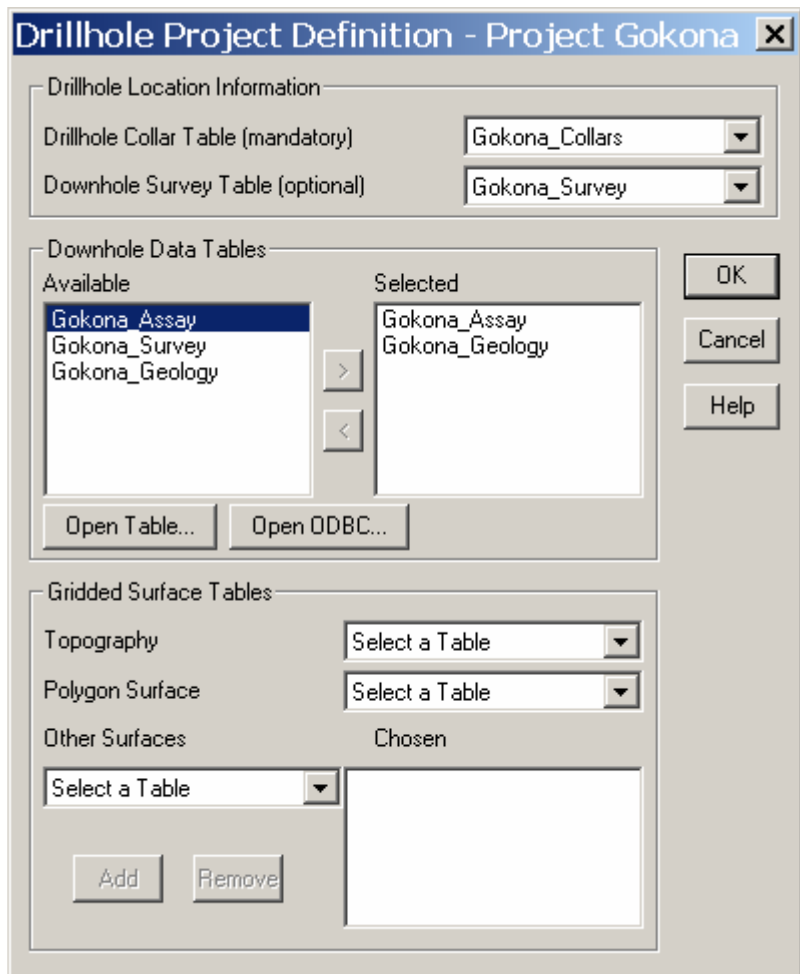


If [Discover's >> Drillhole Display](#) menu is not active, then select it from the Discover dropdown menu. From the Drillhole menu, select [Setup](#).



Select the [New](#) option (if a Drillhole project hasn't been selected before), and define the [Drillhole project name and the same directory](#) that the collar, assay, etc files have been created in.

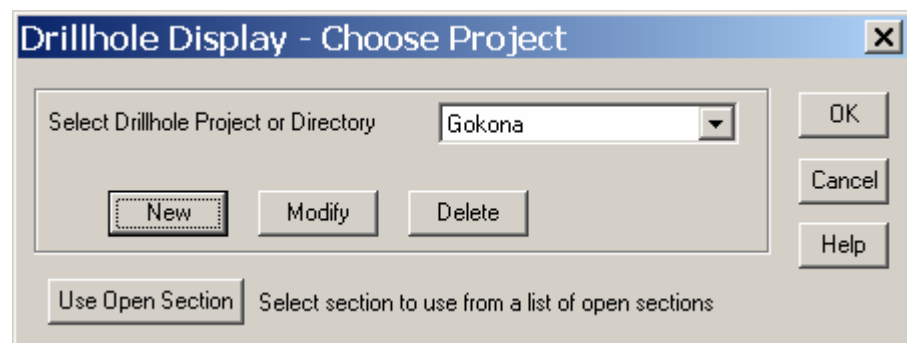
Next, an interface is displayed to define the [collar, assay, downhole geology and surface file parameters](#) (if they apply).



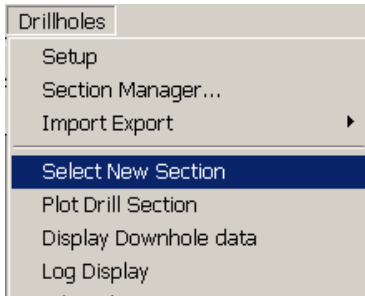
Once the Drillhole display project parameters are set, close this window. Once a project is set, the above option only has to be completed once (unless the directory that contains the resulting collar, assay, geology files has been deleted.)

Assign column values for tables. **The files exported from Drillhole DBMS will contain the correct fields that align with HoleID, Azimuth, from, to etc**

Ensure down dip is negative is selected.

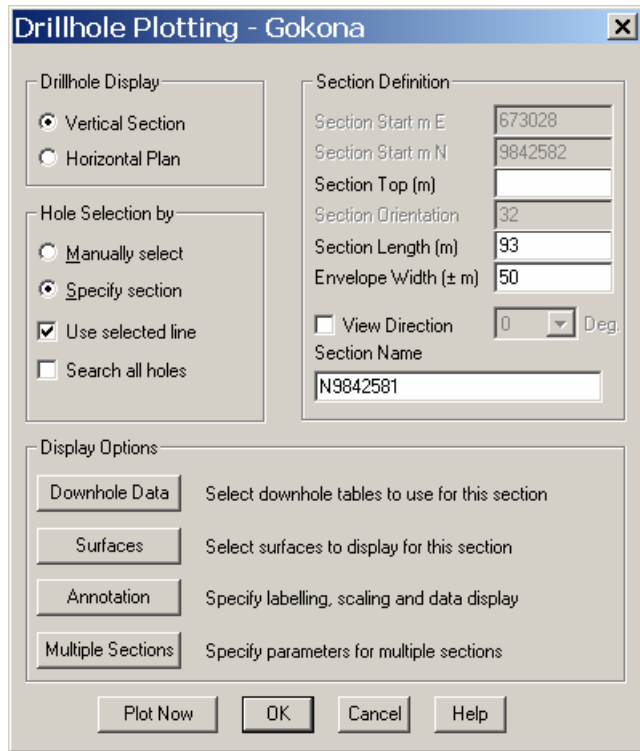


To display a cross section, from the Drillholes menu, select the option to **Select New Section.**

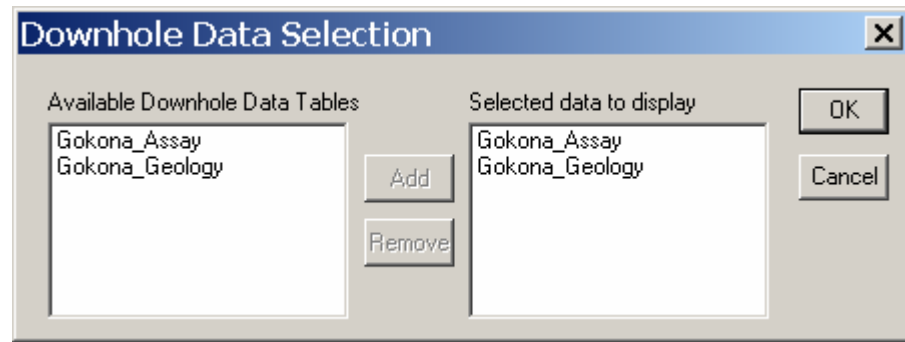


From the next interface that is display, select

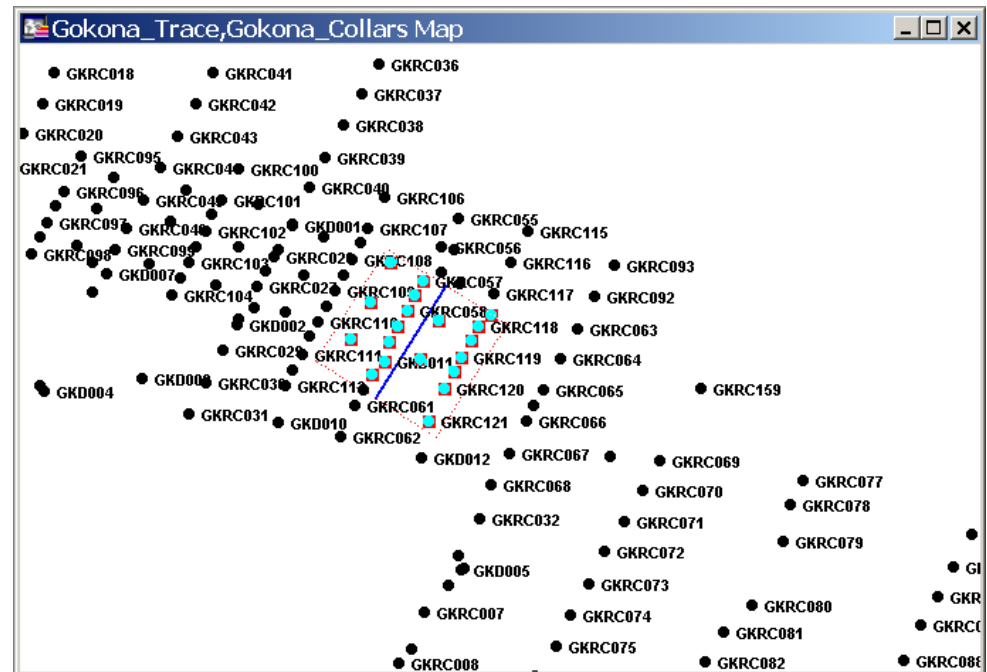
- **The checkbox for Use selected line**
- **Add section name (or leave if OK)**
- **Define the envelop width**



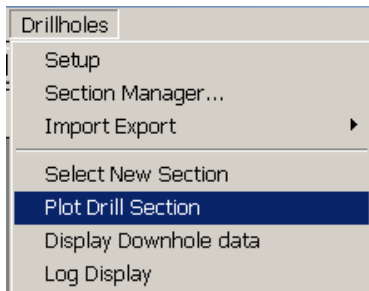
Before the **Plot Now** button is selected, select the **Downhole Data** button to define assays and/or geology to display.



Selecting OK, will dismiss the interface and the drillholes that fall within the envelope distance (defined on the Drilling Plotting dialogue box) will be selected.

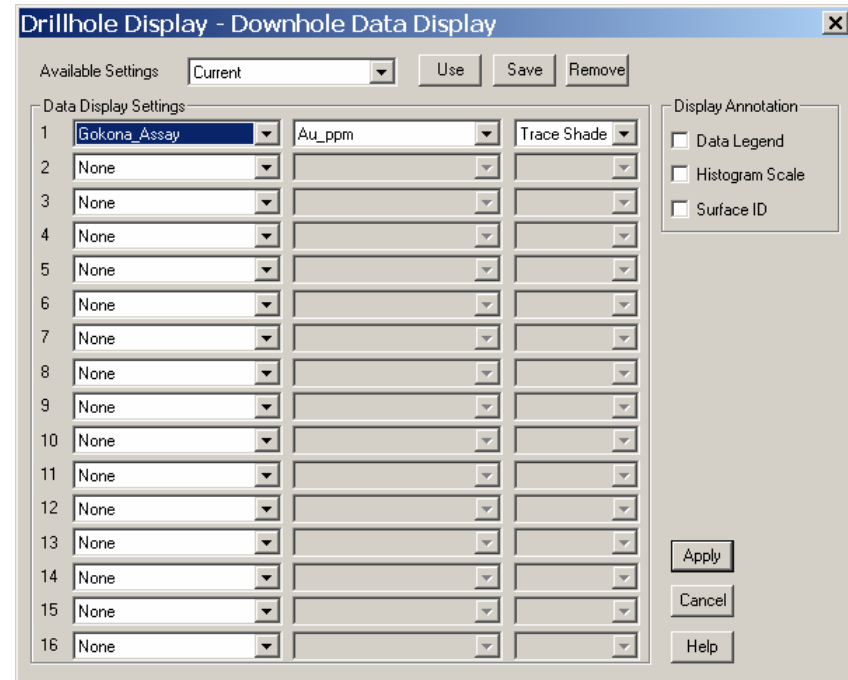


To display the cross section, select the **Plot Drill Section** option of from the Drillholes dropdown menu.

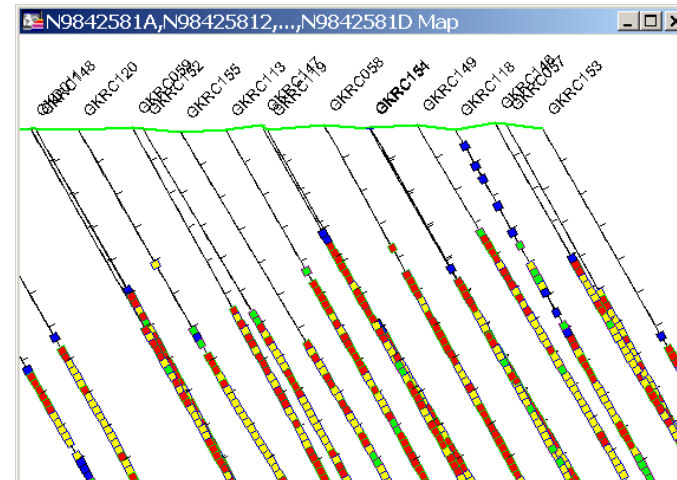


At this point, only the drill hole traces are created. To add assay and/or geology data, select the option to **display downhole data**.

Choose required data to display, plus the method of display..



The results are drawn into the cross section window.



To save the settings, save a workspace (**File >> Save Workspace**).