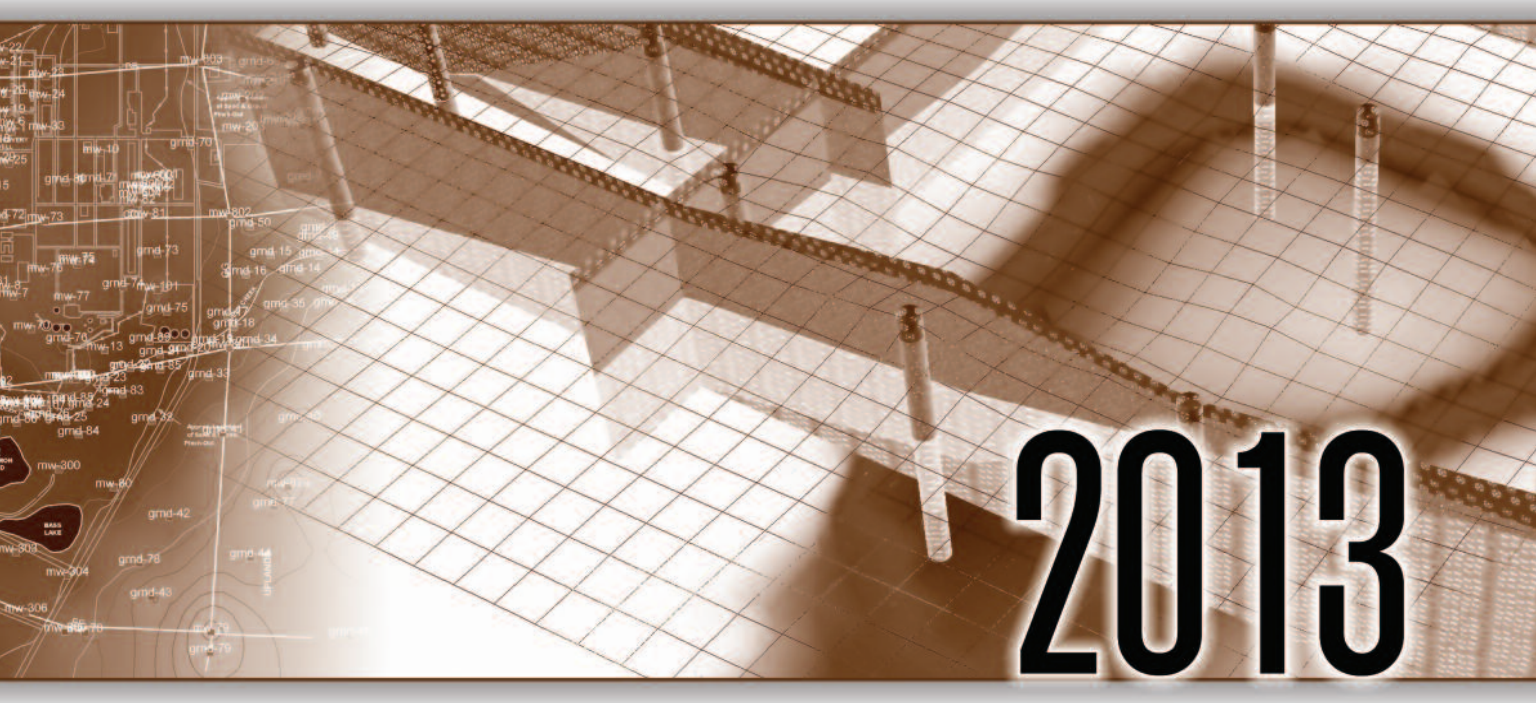
Demonstration Guide



Hydro GeoAnalyst

From Data Discovery to Delivery

Introduction to Hydro GeoAnalyst

Hydro GeoAnalyst (HGA) is the most comprehensive, and yet easy-to-use, environmental data management system, providing data validation, analysis, and visualization. The HGA package integrates a list of flexible and customizable database structures used around the world, complimented by state-of-the-art tools for data interpretation, statistical analysis, GIS mapping, data charting, and two- and three-dimensional visualizations.

For most environment-related projects, whether they are contaminated sites or municipal water supply projects, there is often an abundance of data that has been collected over the years. How many times have you had to sift through several paper reports for that one piece of information when compiling monthly summaries on a project? Can you be sure that you have not misplaced a report or failed to mention an important piece of data?

The HGA package addresses these and many other needs in the industry. The system enables you to create a project specific database, or enhance and build upon your existing database. It can collect all of your previous data and reports and consolidate them into a powerful relational database system that can be queried and referenced with ease.

HGA operates as a desktop application based on Microsoft SQL Server technology. The package supports multiple user levels, for controlled data management, with structured access privileges for setting up project data structures, checking out data to working sub-projects, and submitting new or modified data.

Typical applications for HGA include:

- Regional water well management
- Contaminant site inventory
- Regulatory compliance
- Geologic cross sections
- Public access to information
- Environmental site assessment
- Monitored natural attenuation
- Regional aquifer characterization and management
- Cross-boundary data sharing
- Aquifer vulnerability mapping

What's New in Hydro GeoAnalyst 2013

- **Event Planning -** this new module ensures that your field activities are always completed correctly and on time. Easily create multiple schedules for various stations and then create event plans that outline the details of your field activities including stations to be sampled, data to be collected, field checklists and more. Event plans are automatically converted into reports which can be printed and given to field personnel. Hydro GeoAnalyst keeps track of all your event plans and automatically reminds you in advance when scheduled field activities are due.

- **Print Borehole Log Plots to PowerPoint ™** - Need to print out your Borehole Log Plots (BHLPSs) fast? Use the Print BHLP to PowerPoint ™ feature available on the Well Profile tab. A borehole log for each station in the currently selected station group will be printed to a slide in a PowerPoint ™ presentation so you can simply print them out.If you would prefer to customize your own template – you can build it yourself by simply adding a query to a base printing template!

- **Print to Excel™** - Push your HGA queries and data tables to Excel ™ templates for quick and easy printing. You can also push HGA queries to Excel ™ templates for charting your time series data – all ready for printing. All Excel ™ templates are easily customized by you.

- **Start Page** - When first launching HGA 2013 we have added a Start Page to help you do common tasks such as creating a new project or opening an existing project – even installing the Demo Project. There is also a lot of valuable information such as; what's new in the latest version, links to online resources including "how to" videos to help you learn about the new features more quickly, and links to our Technical Support staff to make it easier to ask questions and report issues.

- **Updated Query Builder** - Our new Query Builder has been redesigned to make it easier for you to generate queries. You no longer need to manually trigger SQL statement generation - instead we do that automatically as you design your query. We also added "intellisense" to assist you to write out your own SQL statements.

- **Updated List Editor -** We have revised the List Editor which now includes a data model tree to make it easier to find the database field you want to make a list for. If you are making a list associated with images we have included a quick and easy import based on image files.

- **Updated Material Specification** - Now supports quick and easy import of material image files.

- **Support for SQL Server ™ 2012** - Hydro GeoAnanlyst supports Microsoft SQL Server™ 2012 and continues to support SQL Server™ 2008R2. We have also included the option to easily and automatically install a SQL Server™ 2012 Local DB as an alternative to a more lengthy full SQL Server installation. We recommend this as a quick and simple approach for trial evaluation of Hydro GeoAnalyst and for use as a sandbox using the Demo Project to test new program features.

- **SQL Server Authentication** - When connecting to your project database you can now choose the mode of authentication to be used, either Windows Authentication or now SQL Server Authentication.

- **User Interface Improvements** - We have made a number of notable interface improvements, including the ability to Show/Hide/Dock your Project Tree to maximize use of screen space and undock any tab-based modules out of the main Hydro GeoAnalyst window. This you are able to take full advantage of multiple displays and monitors! You can now create folders for grouping on additional branches of the Project tree (such as Station Groups, Maps, etc.) as well as an option to filter your project tree for easy searching.

About Hydro GeoAnalyst

HGA is implemented through a number of modules, each performing a specific task. This approach allows HGA to be memory efficient, flexible, and expandable.

The following modules are for the purposes of Data Management:

- Template Manager
- Data Transfer System
- Query Builder
- Lab QA/QC
- List Editor
- Material Specification

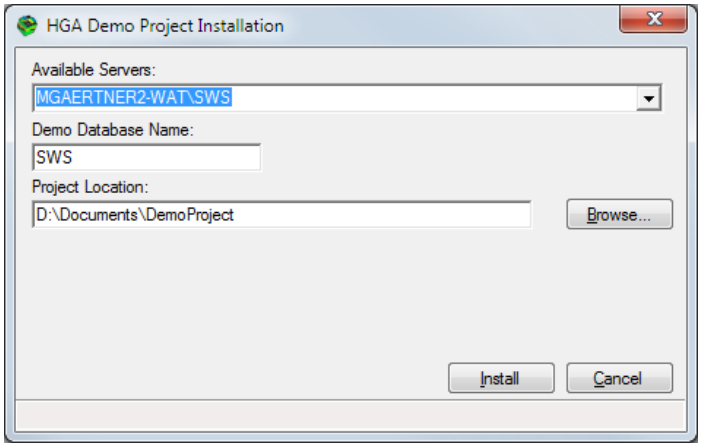
Interpretation of geologic and hydrogeologic data is made easy with the visualization modules that are provided in HGA. Using these tools, raw data can be transformed into meaningful spatial data sets. HGA offers a collection of standard and custom modules for interpreting vast amounts of spatial data. Some of these modules are briefly described in the following sections.The following modules are for the purposes of Analysis and Visualization:

- Cross Tab Query
- Time Series Plot
- Borehole Log Plotter
- Map Manager
- Cross Section Editor
- 3D Explorer

Additionally, HGA has a Report Designer module which allows you to push your data, analysis and visualizations to a Report template.

Installing Demo Project

A new feature implemented in HGA 2012.1 is the ability to install the Demo Project directly from the program. Simply launch HGA and select Project / Install Demo Project



You need to select the SQL Server you wish to use from the list of Available Servers (or type your SQL Server).

By default it will give the Demo Database Name: SWS however you can change this if you wish.

Then select the location for the project files. Lastly select the Install button.

Please Note: this process may take from 2 – 5 minutes, depending on your computer/network speed.

If you encounter difficulties installing the Demo Project as described above, you can follow these steps to manually download and install the Demo Project.

1. Open your internet browser, and navigate to the following website:

http://trials.swstechnology.com/archive/Software/Hydro_GeoAnalyst/Demo_Project/HGA_Demo_Project.ZIP

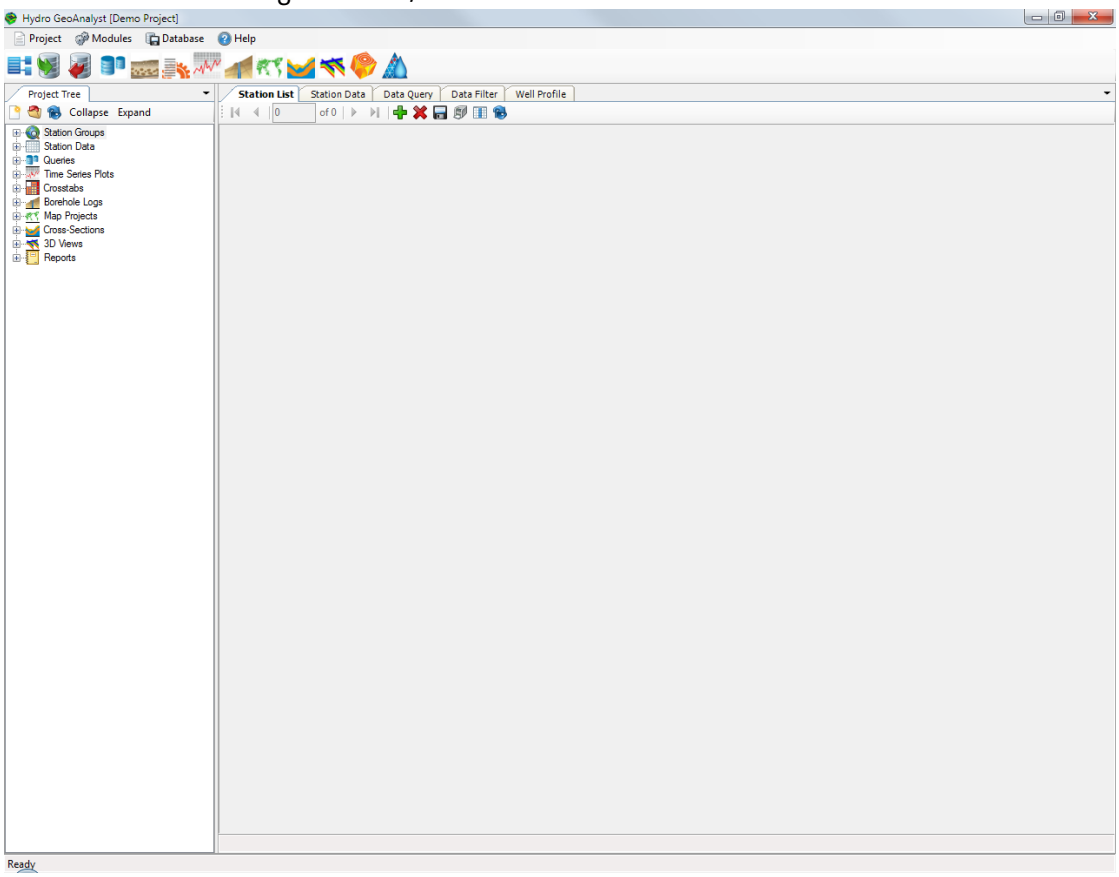
2. Select Save in the File Download dialog and in the Save As dialog, select a destination folder on your computer, and then click the Save button.
3. The demo project will begin to download to your computer. Depending on your internet connection speed, this may take several minutes. Once the HGA_Demo_Project.zip file has been downloaded to your computer, extract the contents of the HGA_Demo_Project.zip file to a location on your computer.
4. Ensure that your software is licensed and launch Hydro GeoAnalyst by double-clicking on the desktop short-cut icon.
5. Select Project / Open from backup from the HGA main menu.

6. In the Restore Database As dialog box, specify the SQL Server you wish to use.
7. Beside the Project field, select the Open button (folder with green arrow) and navigate to the folder where the demo project files were extracted to. Select the Project.vbh file.
8. Beside the Backup File field, select the Open button (folder with green arrow) and navigate to the folder where the demo project files were extracted to. Select the SWS_Demo_DB.bak file.
9. Finally, click the OK button to open the demo project.

Note: The above procedure is only required when opening the downloaded Demo Project for the first time. Next time you wish to open the Demo Project, you can select Project / Open, and then select the Project.vbh file for the Demo Project.

Viewing Demo Project

Once you have the demo project open either of the two ways described above you will see the following window;



All spatial data in the demo project is projected according to the NAD1983 coordinate system. This information is defined during project creation and can be viewed by selecting **Project / Properties**, from the HGA main menu.

> *Hydro GeoAnalyst now supports storing and displaying spatial data in localized coordinate systems. Now there is no need to adapt your spatial data to world coordinates, if you prefer to work in site coordinates.*

The Project Tree can be easily expanded to see all the nodes and entities of the Demo project. To expand the entire tree select the Expand button on the Project Tree tab. Take a moment to inspect the items under each node in the Project Tree.

Station Groups

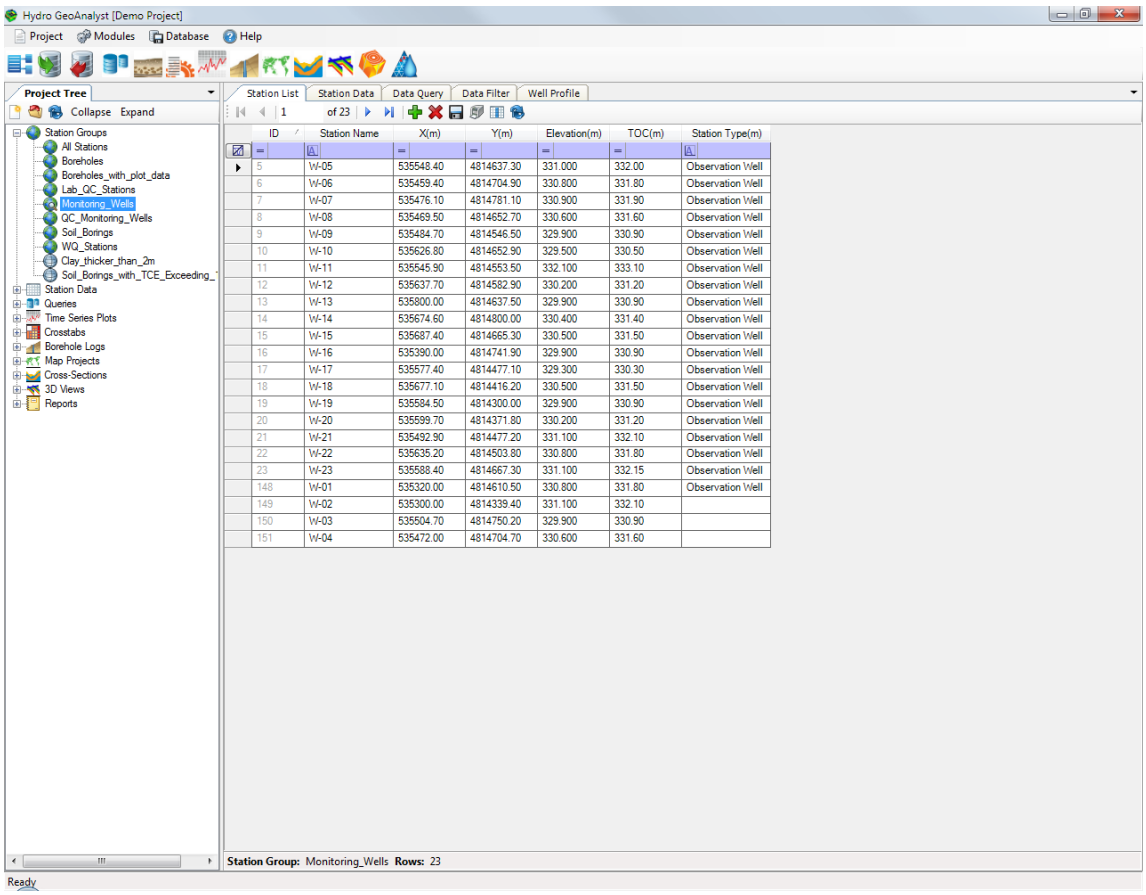
In HGA, stations can be sorted into groups allowing for efficient management and quick

retrieval of data stored in the database. All station groups created for a project are listed in the Project Browser under the Station Group node. Clicking on any of the sub-nodes corresponding to a station group will load the Station List tab, and display the appropriate stations belonging to that group. In the demo database, there are several station groups, including:

- All Stations
- Boreholes
- Monitoring Wells
- Soil Borings

To see the stations which belong to the Monitoring Wells station group, select this node from the project tree.

Monitoring Wells (under the Station Groups node in the project tree).



When a station group is selected, the stations belonging to that group will appear in the Station List tab. Once the stations in a group are displayed, a number of operations can be applied based on the selection.

Sorting Records

Using the sorting and filtering options, you can also select different views for the data. For example, it may be helpful to view just the stations at specific elevation.

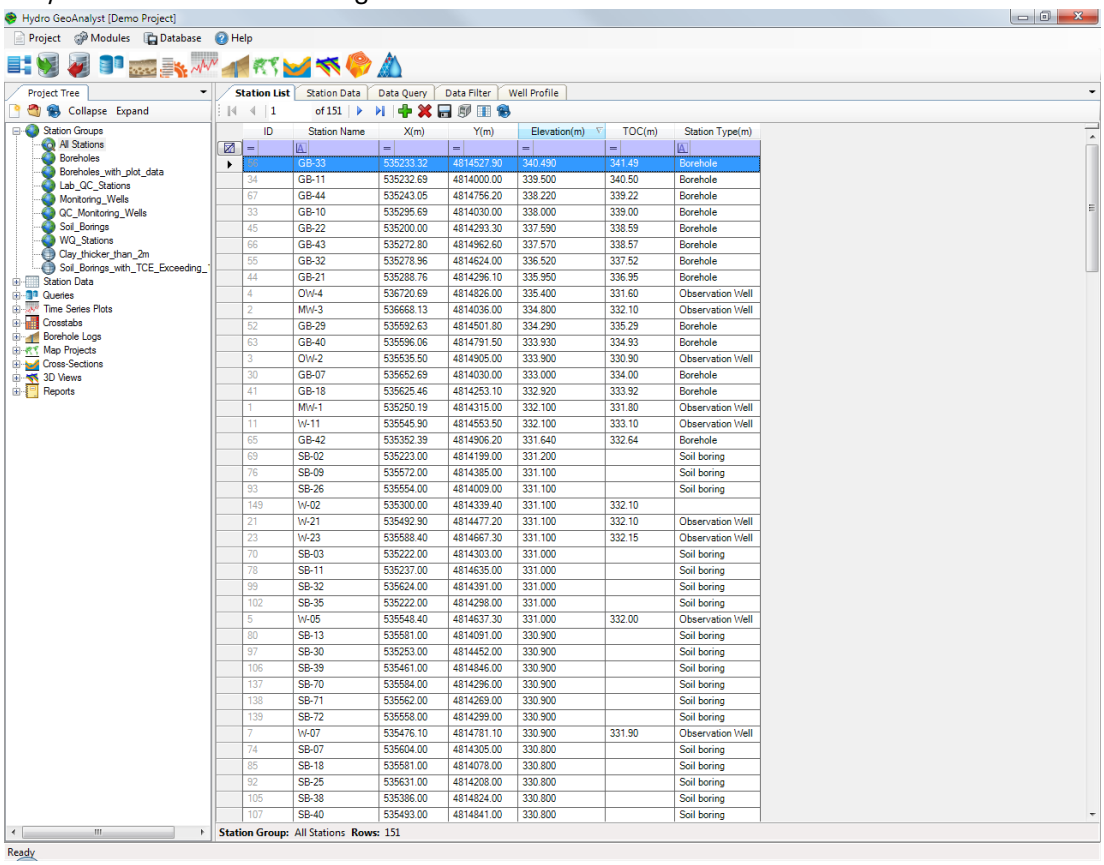
To do this select

- All Stations from the Station Groups node
- The Elevation column in the Station List

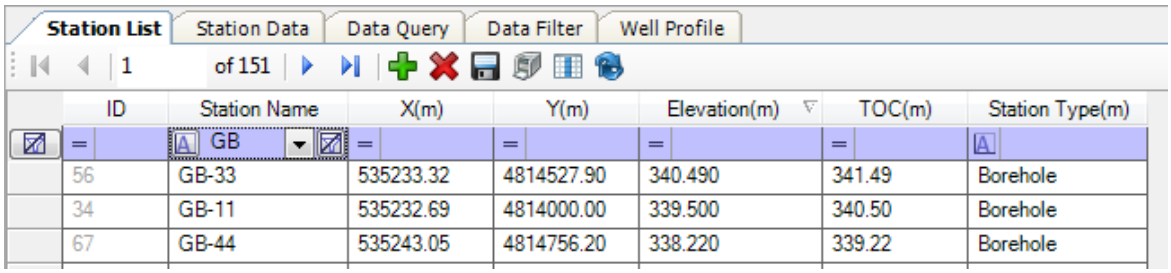
This will sort the values in this column from lowest to highest.
If you select the Elevation column again it will sort the values from highest to lowest..

- The Elevation column in the Station List

Now you will see that the highest elevation is 340.49 and this occurs at station GB-33.



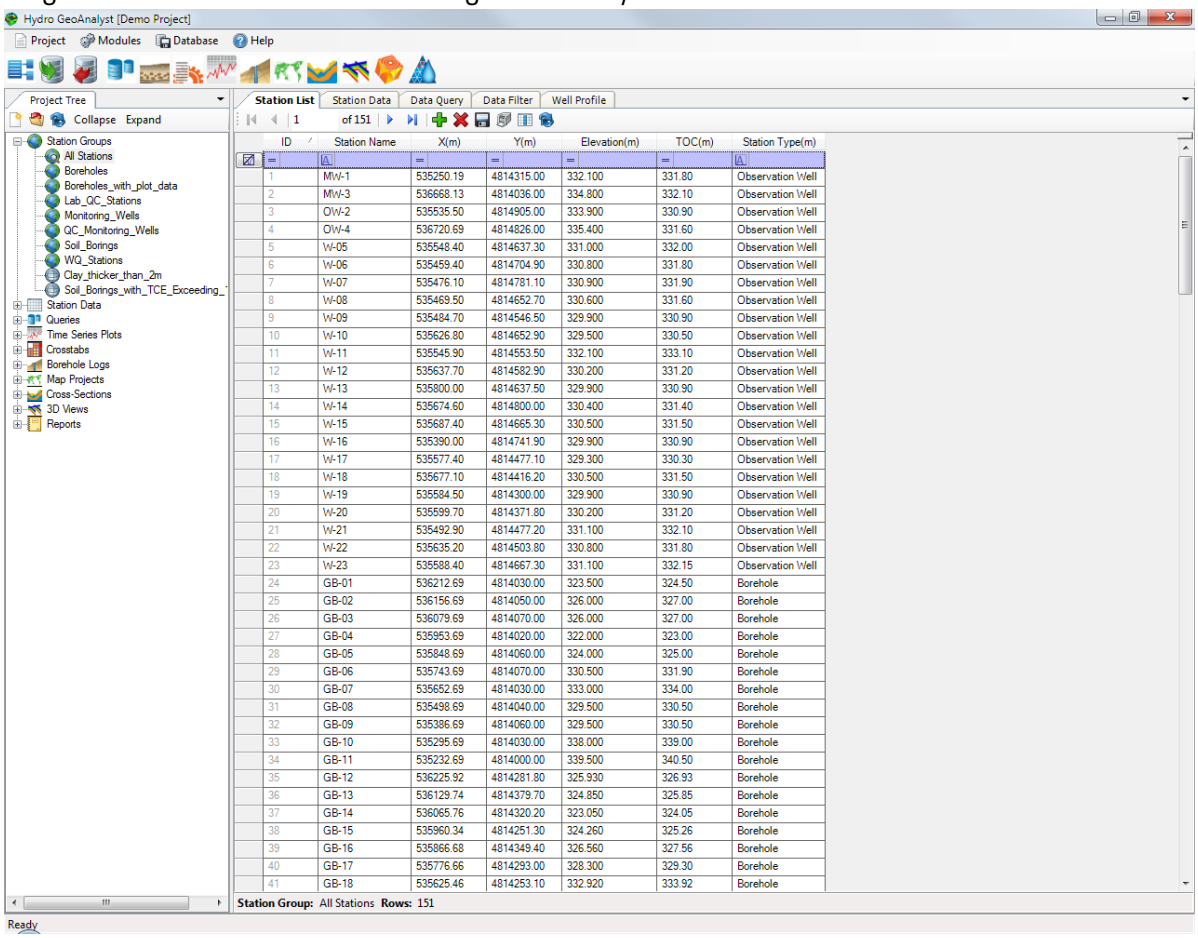
Additionally you will find the first row in the data grids is a filter row. You may want to find all the stations in your project that begin with GB. To do this enter GB in the filter row of the Station Name column.



ID	Station Name	X(m)	Y(m)	Elevation(m)	TOC(m)	Station Type(m)
=	GB	=	=	=	=	
56	GB-33	535233.32	4814527.90	340.490	341.49	Borehole
34	GB-11	535232.69	4814000.00	339.500	340.50	Borehole
67	GB-44	535243.05	4814756.20	338.220	339.22	Borehole

You will see that only the station which name begin with GB are in the station list.

To clear the filter, simple select the  button in the Station name column.
To get the station back into the original order you can sort on the ID field.



ID	Station Name	X(m)	Y(m)	Elevation(m)	TOC(m)	Station Type(m)
1	MW-1	535250.19	4814315.00	332.100	331.80	Observation Well
2	MW-3	536668.13	4814036.00	334.800	332.10	Observation Well
3	OW-2	535535.50	4814905.00	333.900	330.90	Observation Well
4	OW-4	536720.69	4814826.00	335.400	331.60	Observation Well
5	W-05	535548.40	4814637.30	331.000	332.00	Observation Well
6	W-06	535459.40	4814704.90	330.800	331.80	Observation Well
7	W-07	535476.10	4814781.10	330.900	331.90	Observation Well
8	W-08	535469.50	4814652.70	330.600	331.60	Observation Well
9	W-09	535484.70	4814546.50	329.900	330.90	Observation Well
10	W-10	535626.80	4814652.90	329.500	330.50	Observation Well
11	W-11	535545.90	4814553.50	332.100	333.10	Observation Well
12	W-12	535637.70	4814582.90	330.200	331.20	Observation Well
13	W-13	535800.00	4814637.50	329.900	330.90	Observation Well
14	W-14	535674.60	4814800.00	330.400	331.40	Observation Well
15	W-15	535687.40	4814665.30	330.500	331.50	Observation Well
16	W-16	535390.00	4814741.90	329.900	330.90	Observation Well
17	W-17	535577.40	4814477.10	329.300	330.30	Observation Well
18	W-18	535677.10	4814416.20	330.500	331.50	Observation Well
19	W-19	535584.50	4814300.00	329.900	330.90	Observation Well
20	W-20	535599.70	4814371.80	330.200	331.20	Observation Well
21	W-21	535492.90	4814477.20	331.100	332.10	Observation Well
22	W-22	535635.20	4814503.80	330.800	331.80	Observation Well
23	W-23	535588.40	4814667.30	331.100	332.15	Observation Well
24	GB-01	536212.69	4814030.00	323.500	324.50	Borehole
25	GB-02	536156.69	4814050.00	326.000	327.00	Borehole
26	GB-03	536079.69	4814070.00	326.000	327.00	Borehole
27	GB-04	535953.69	4814020.00	322.000	323.00	Borehole
28	GB-05	535848.69	4814060.00	324.000	325.00	Borehole
29	GB-06	535743.69	4814070.00	330.500	331.90	Borehole
30	GB-07	535652.69	4814030.00	333.000	334.00	Borehole
31	GB-08	535498.69	4814040.00	329.500	330.50	Borehole
32	GB-09	535386.69	4814060.00	329.500	330.50	Borehole
33	GB-10	535295.69	4814030.00	338.000	339.00	Borehole
34	GB-11	535232.69	4814000.00	339.500	340.50	Borehole
35	GB-12	536225.92	4814281.80	325.930	326.93	Borehole
36	GB-13	536129.74	4814379.70	324.850	325.85	Borehole
37	GB-14	536065.76	4814320.20	323.050	324.05	Borehole
38	GB-15	535960.34	4814251.30	324.260	325.26	Borehole
39	GB-16	535866.68	4814349.40	326.560	327.56	Borehole
40	GB-17	535776.66	4814293.00	328.300	329.30	Borehole
41	GB-18	535625.46	4814253.10	332.920	333.92	Borehole

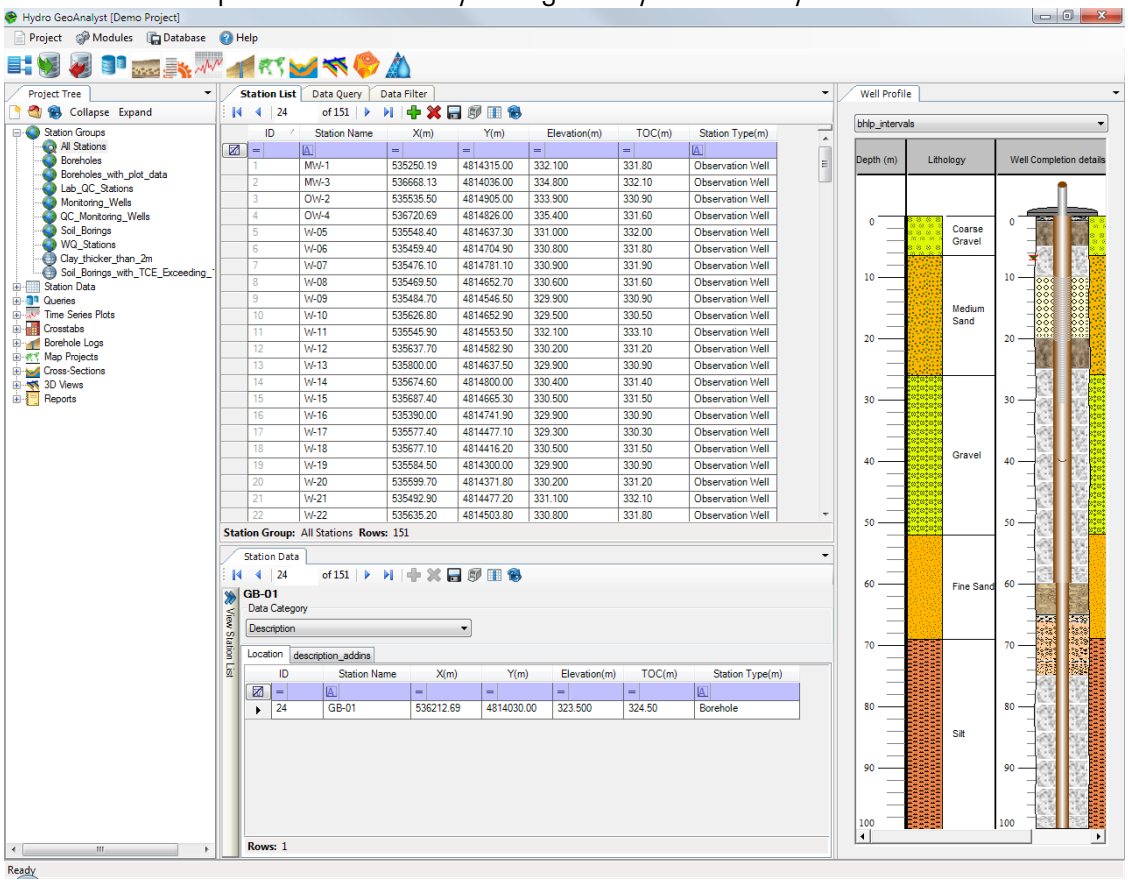
Adjusting Tab Layout

When opening HGA the default window displays will appear. There are two tab groups one with the Project Tree and one with the other 5 tabs (Station List, Station Data, Data Query, Data Filter, and Well Profile).

You have several options to adjust the view of these tab groups. You can add additional tab groups (right click on any existing tab) either vertical or horizontal.

You can rearrange the order of the tabs within a tab group by simply dragging and dropping a tab. You can even drag a tab from one tab group to another.

Here is an example of another way to organize your Tab Layout:



To get this arrangement right click on the Well Profile tab and select

New Vertical Tab Group

Then right click on the Station Data tab and select

New Horizontal Tab Group

Viewing Station Data

Manual Data Entry

HGA comes with standard, easy-to-use data entry grids equipped with drop-down combo boxes and many other features that facilitate data entry and validation for virtually any type of Station data.

Importing Data

The Data Transfer System (DTS) is designed to assist in the process of importing/ exporting data to/from the database. Using the DTS, station data can be imported from practically any source including delimited text files, MS Excel, MS Access Databases, SQL Server Databases and others.

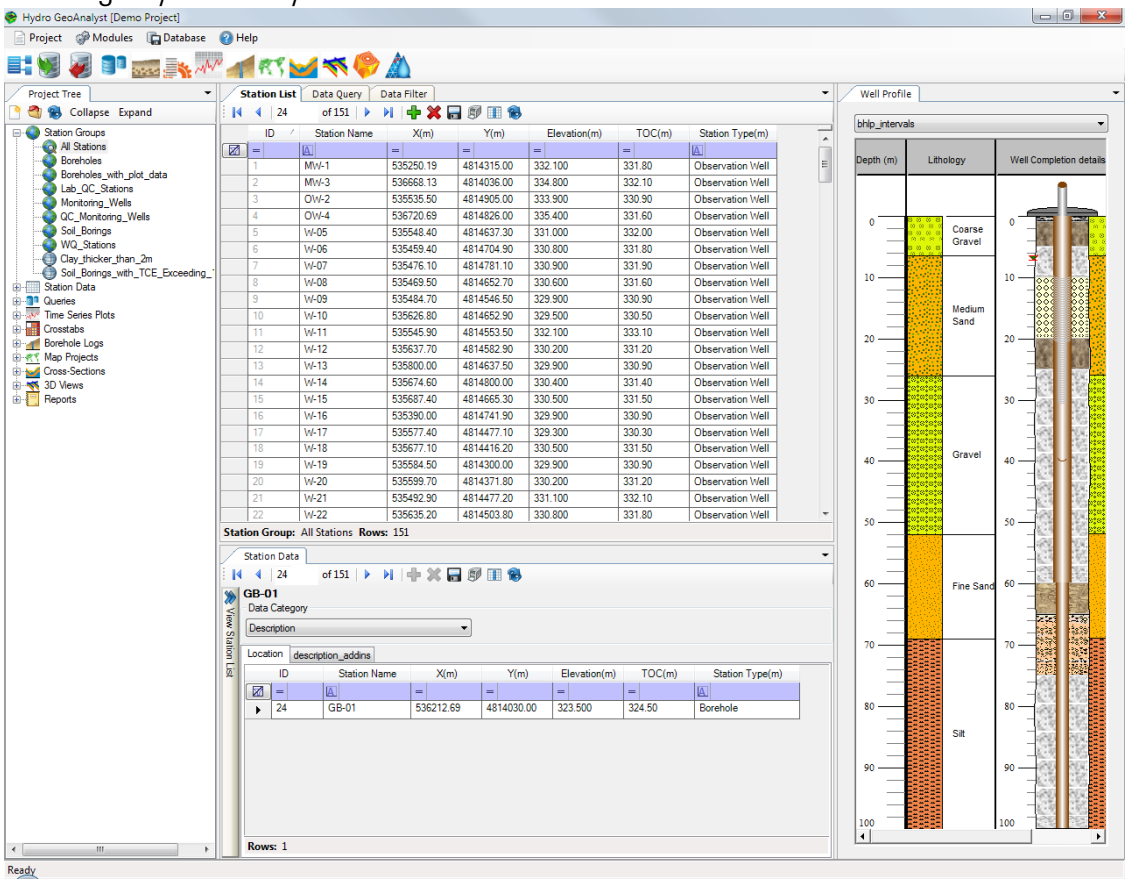
- Allows importing of data from virtually any source including:
    - Text files (.CSV)
    - Microsoft Excel spreadsheets (XLS)
    - Microsoft Access databases (MDB)
    - Any other ODBC or OLEDB data sources (DBF)
- DTS includes on-the-fly unit and coordinate system conversions during import and export
- Quickly choose from a complete list of coordinate systems (UTM, State Planar, Geographic, or other Global Coordinate Systems)
- Seamless data validation and error checking during data import, with the option to accept or reject selected records during import
- Importing new stations and group them as desired
- Each data transfer configuration is saved for future use

Hydro GeoAnalyst now supports different Windows regional and language settings, including the comma decimal delimiter numeric format, as well as various date formats, e.g., DD-MM-YYYY.

In this section, you will see how data is organized in the HGA database. First, load the Boreholes Station Group,

Boreholes (under the Station Groups node in the Project Tree).
GB-01 (highlight this row in the Station List)

The Station List tab provides only the data stored within the Station table. To see the additional data belonging to this station you must view the Station Data tab. If you have rearranged your tabs you can now view these 2 tabs at the same time!



The Station Data tab provides access to all data related to a single station. There are several Data Categories available, which are available in the Data Category combo box in the upper-left corner.

Geologic Description (from the Data Category combo box).

This will load the Lithology table and data for the selected station (GB-01). In this table, you will see soil intervals (from - to), soil types, soil descriptions, soil classification names, and soil patterns. Soil classifications may be selected from a picklist. The Demo Project is using the DIN 4023 classification. HGA is packaged with the following material specification lists:

- Unified Soil Classifications System (USCS)
- United States Department of Agriculture (USDA)
- Deutsches Institut für Normung e.V. (DIN 4023)
- International Association of Hydrogeologists (IAH)

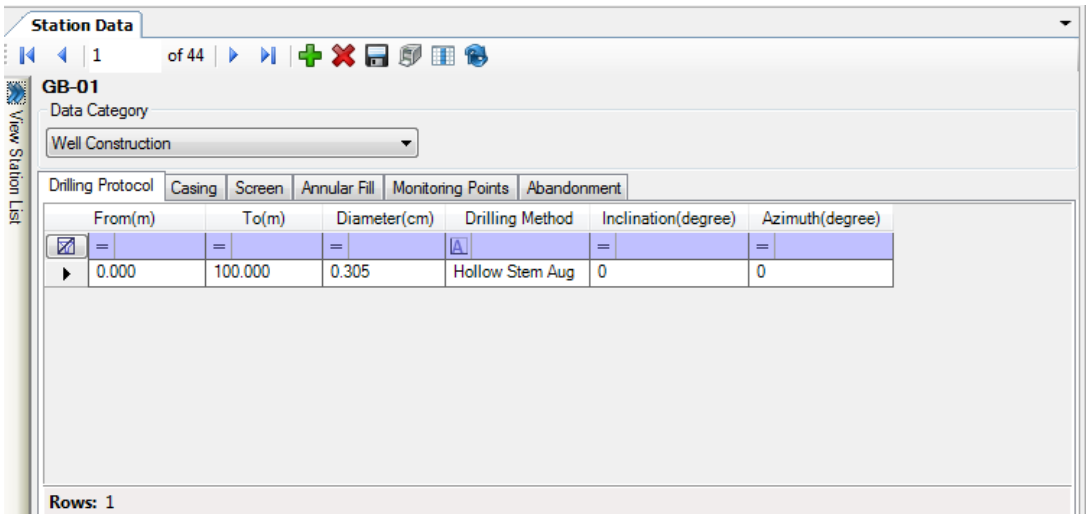
- Geological Survey of Canada (GSC)
- Dunham Carbonate Classification
- Shell Standard Classification

In addition, you can quickly develop or customize your own soils specifications palettes using a wide range of graphical file formats (JPG, BMP, GIF, ICO, WMF, EMF), and export any soil specifications to external files.

The geological data will be used to create Borehole Log Plots and geological Cross Sections. These features will be demonstrated later in this exercise.

Next, you will view the Well Construction data for the selected borehole.

Well Construction (from the Data Category combo box as shown below).



This will load the Well Construction data for the selected station (GB-01). In this table, you will see six tabs (tables):

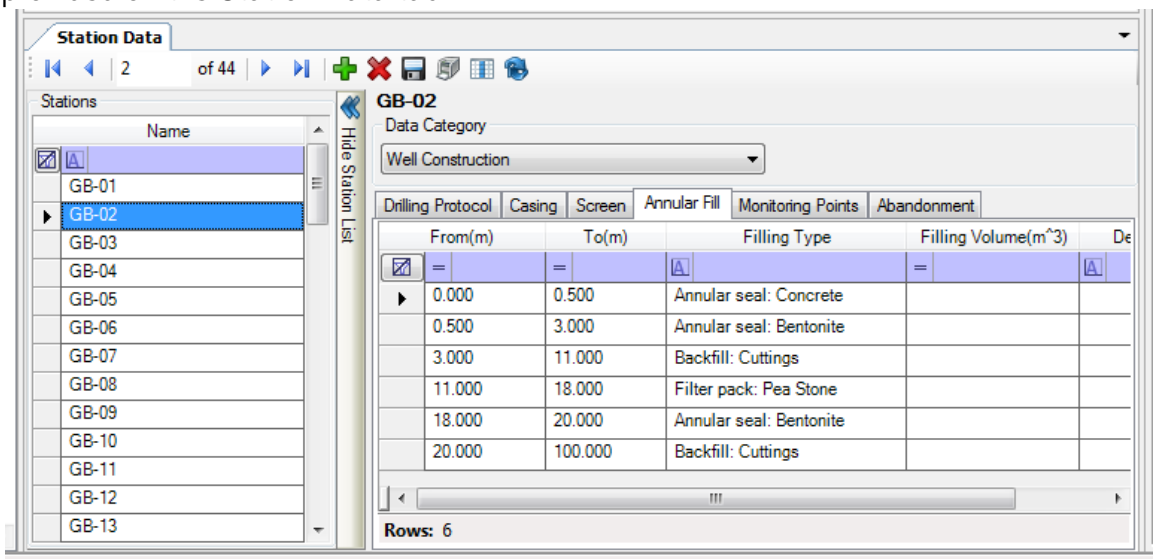
- Drilling Protocol (contains drilling information)
- Casing (contains info on well casing materials, diameter, etc.)
- Screen (contains screen interval details)
- Annular Fill (contains info on annular fill, gravel packs, sand packs, etc.)
- Monitoring Points (contains info on monitoring intervals and probes)
- Abandonment (contains info on when a station is abandoned)

Annular Fill tab, to see the records entered in this table.

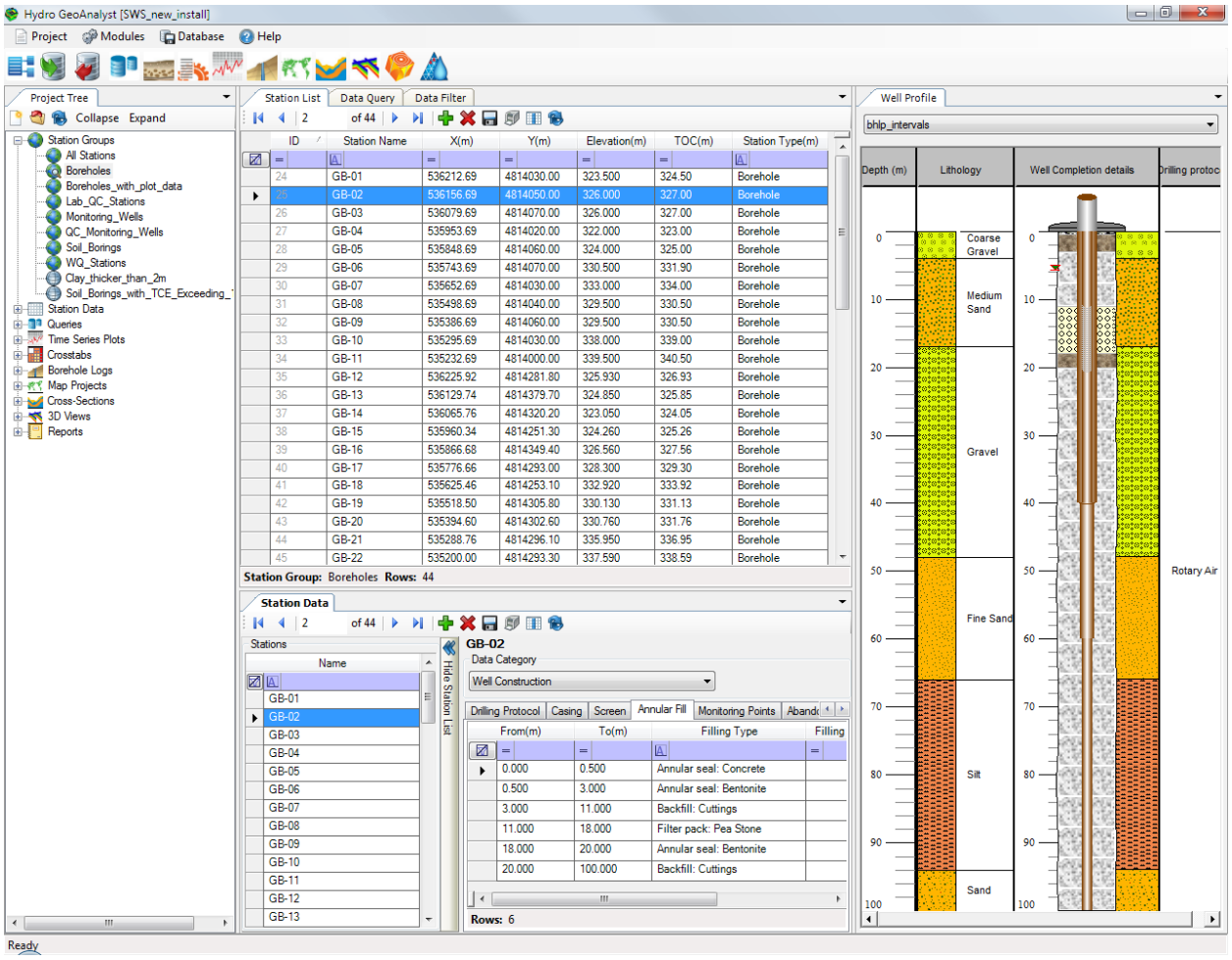
You will see the interval and filling materials entered for this borehole.
HGA comes with a List Editor tool that affords users the ability to create and customize lists for any field - allowing for rapid data entry. Common examples of lists include:

- Well drilling methods, construction, and casing materials
- List of common chemical names with their CAS Registry numbers
- Lab analysis test methods
- County and State Codes
- Applicable standards for various purposes, regions, and agencies

You can review the data for additional stations by selecting a station on the station list provided on the Station Data tab.



This will load the Well Construction data for the newly selected station. You can also see the Well Construction in the Well Profile tab.



Next, you will view the Monitoring Event data (groundwater chemistry and water table elevations). First, you must select an appropriate station group.

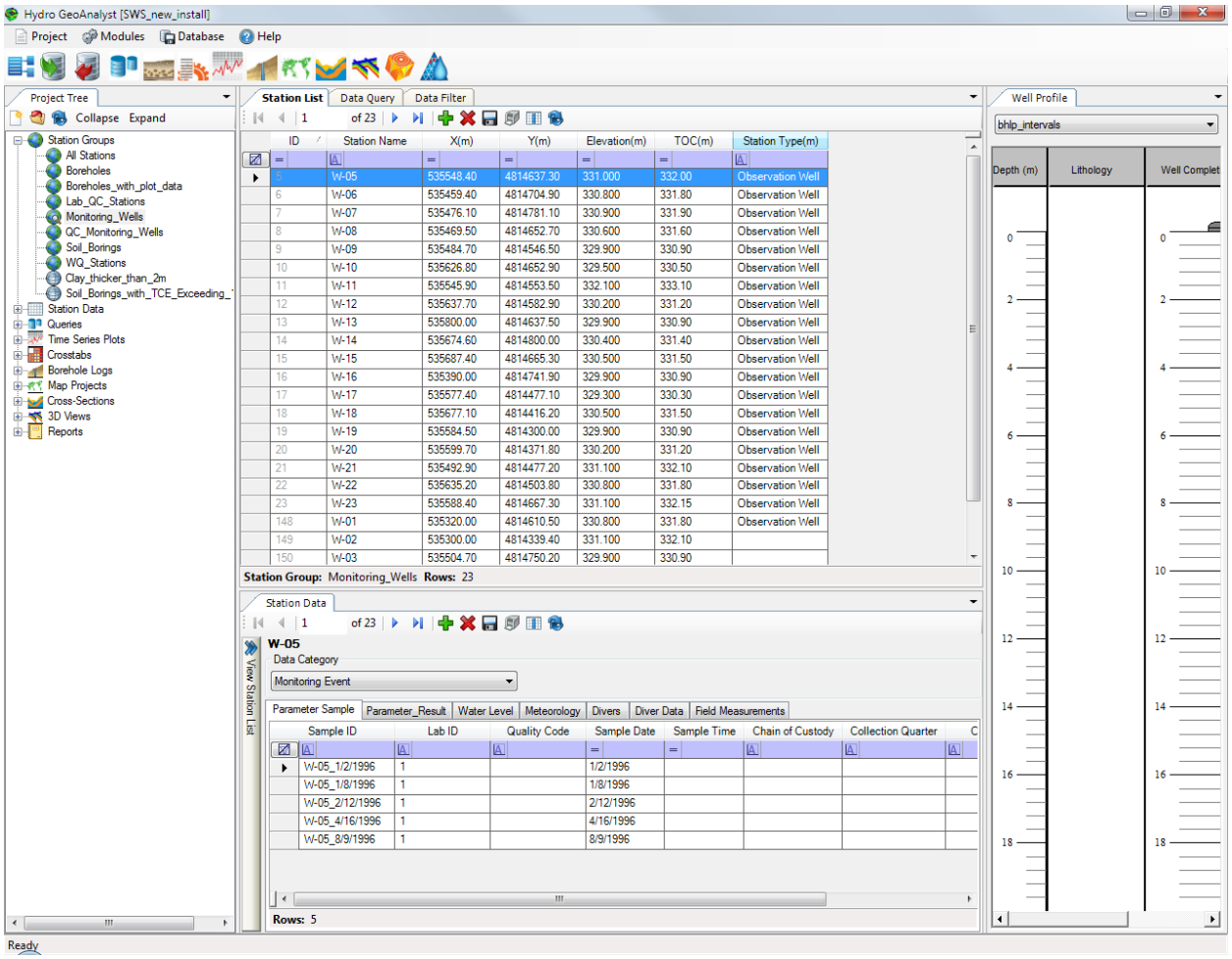
Monitoring Wells (from the Station Group node in the Project Tree).

W-05 (in the station list)

On the Station Data tab ,

Monitoring Event (from the Data Category combo box).

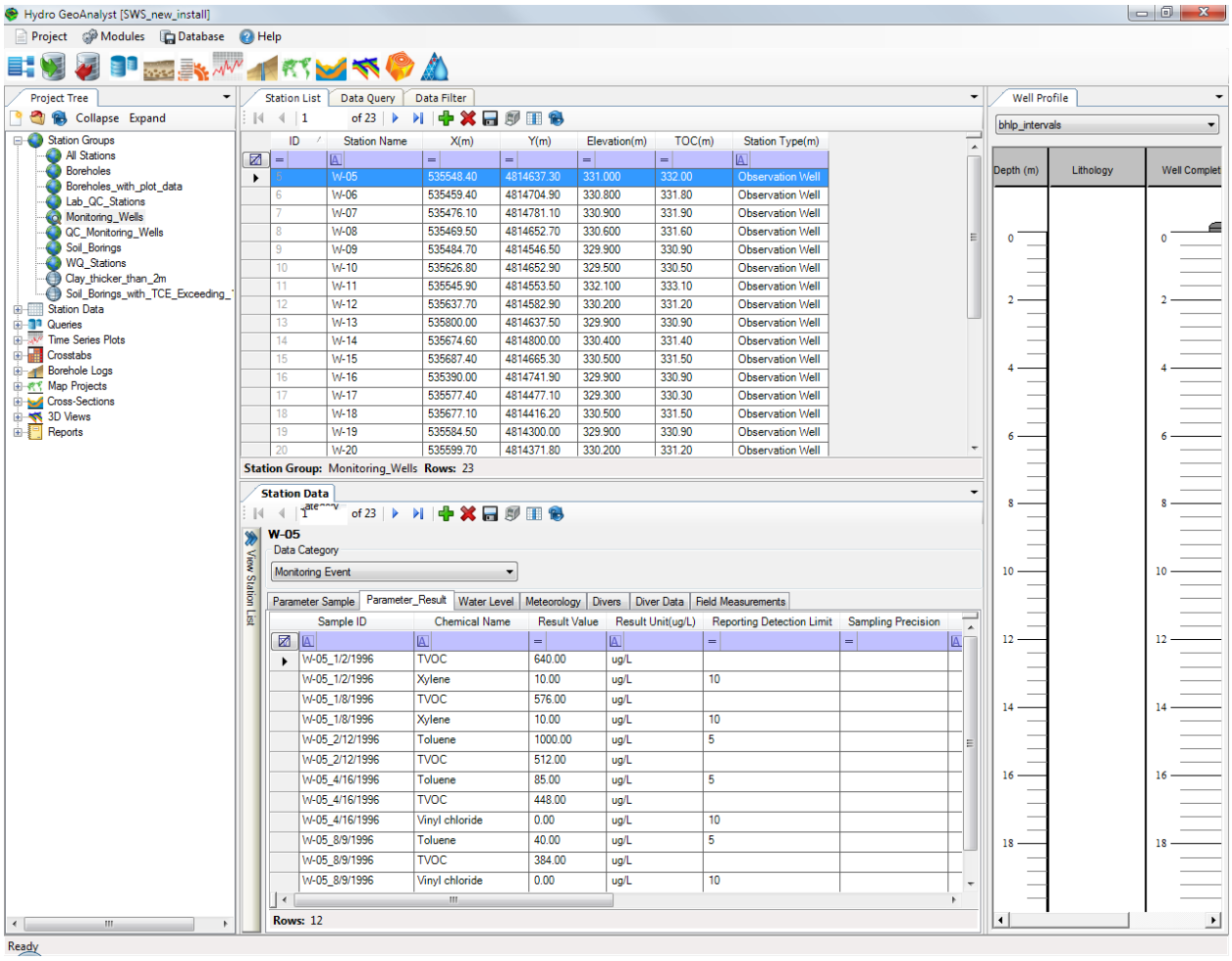
The data for this will appear as shown in the figure below.



This data category contains seven tables:

- Parameter_Sample (sample id, date, etc.)
- Parameter_Results (sampling results for various chemicals)
- Water Level (results from water table elevations measurements for several dates)
- Meteorology (data from for example weather stations)
- Divers (data related to divers installed at the station)
- Diver Data (Data logger results for this station)
- Field Measurements (measurements that may be taken in the field)

As shown below, the Parameter_Results table provides a list of samples collected for this well, the date and time of the observation, and the concentrations provided by laboratory analyses.


Hydro GeoAnalyst [SWS_new_install]
Project
Modules
Database
Help
Project Tree
Collapse
Expand
Station Groups
All Stations
Boreholes
Boreholes_with_plot_data
Lab_QC_Stations
Monitoring_Wells
QC_Monitoring_Wells
Soil_Borings
WQ_Stations
Clay_thicker_than_2m
Soil_Borings_with_TCE_Exceeding_
Station Data
Queries
Time Series Plots
Crosstabs
Borehole Logs
Map Projects
Cross-Sections
3D Views
Reports
Station List
Data Query
Data Filter
of 23
ID
Station Name
X(m)
Y(m)
Elevation(m)
TOC(m)
Station Type(m)
5 W-05 535548.40 4814637.30 331.000 332.00 Observation Well
6 W-06 535459.40 4814704.90 330.800 331.80 Observation Well
7 W-07 535476.10 4814781.10 330.900 331.90 Observation Well
8 W-08 535469.50 4814652.70 330.600 331.60 Observation Well
9 W-09 535484.70 4814546.50 329.900 330.90 Observation Well
10 W-10 535626.80 4814652.90 329.500 330.50 Observation Well
11 W-11 535545.90 4814553.50 332.100 333.10 Observation Well
12 W-12 535637.70 4814582.90 330.200 331.20 Observation Well
13 W-13 535800.00 4814637.50 329.900 330.90 Observation Well
14 W-14 535674.60 4814800.00 330.400 331.40 Observation Well
15 W-15 535687.40 4814665.30 330.500 331.50 Observation Well
16 W-16 535390.00 4814741.90 329.900 330.90 Observation Well
17 W-17 535577.40 4814477.10 329.300 330.30 Observation Well
18 W-18 535677.10 4814416.20 330.500 331.50 Observation Well
19 W-19 535584.50 4814300.00 329.900 330.90 Observation Well
20 W-20 535599.70 4814371.80 330.200 331.20 Observation Well
Station Group: Monitoring_Wells Rows: 23
Station Data
of 23
W-05
Data Category
Monitoring Event
View Station List
Parameter Sample
Parameter_Result
Water Level
Meteorology
Divers
Diver Data
Field Measurements
Sample ID
Chemical Name
Result Value
Result Unit(ug/L)
Reporting Detection Limit
Sampling Precision
W-05_1/2/1996 TVOC 640.00 ug/L
W-05_1/2/1996 Xylene 10.00 ug/L 10
W-05_1/8/1996 TVOC 576.00 ug/L
W-05_1/8/1996 Xylene 10.00 ug/L 10
W-05_2/12/1996 Toluene 1000.00 ug/L 5
W-05_2/12/1996 TVOC 512.00 ug/L
W-05_4/16/1996 Toluene 85.00 ug/L 5
W-05_4/16/1996 TVOC 448.00 ug/L
W-05_4/16/1996 Vinyl chloride 0.00 ug/L 10
W-05_8/9/1996 Toluene 40.00 ug/L 5
W-05_8/9/1996 TVOC 384.00 ug/L
W-05_8/9/1996 Vinyl chloride 0.00 ug/L 10
Rows: 12
Well Profile
bhlp_intervals
Depth (m)
Lithology
Well Complet
0
2
4
6
8
10
12
14
16
18
Ready

Querying the Database

HGA goes beyond simply storing your data. HGA also provides practical search/query tools to help you access and interact with your data, using the industry-standard 'Structured Query Language' (SQL). Retrieving your data has never been easier!

Some of the features of the Query Builder include:

- Quickly generate simple or advanced SQL Statements within the Design Preview panel
- Automatic validation of SQL Statement provides warning for incorrect statements
- Logical use of expressions and operations make data querying easy (e.g. >, >=,
- <=, <, =, < >, !=, !<, !>, LIKE, IS, IS NOT, BETWEEN, &, !)
- Improved query efficiency using group-centric or data centric approaches
- Efficiently map query results directly to the Map Manager
- Generate quick statistics from your queries (e.g. AVG, COUNT, MAX, MIN,
- STDEV, STDEVP, SUM, VAR, VARP)
- Sort query results in ascending or descending order

Using the Query Builder, you can design and execute data queries such as:

- Select and map all water wells drilled later than a specified date
- Select and map all boreholes deeper than a specified depth
- Report groundwater/soil concentrations that exceed a given concentration
- Highlight stations with vapor concentrations at a given concentration
- Map pumping wells with pumping rates greater than a specified value

Creating a Data Query

In this example, you will create and execute a Data Query to find exceedences of TCE (Trichloroethylene) in the Soil Samples.

To load the Query Builder,

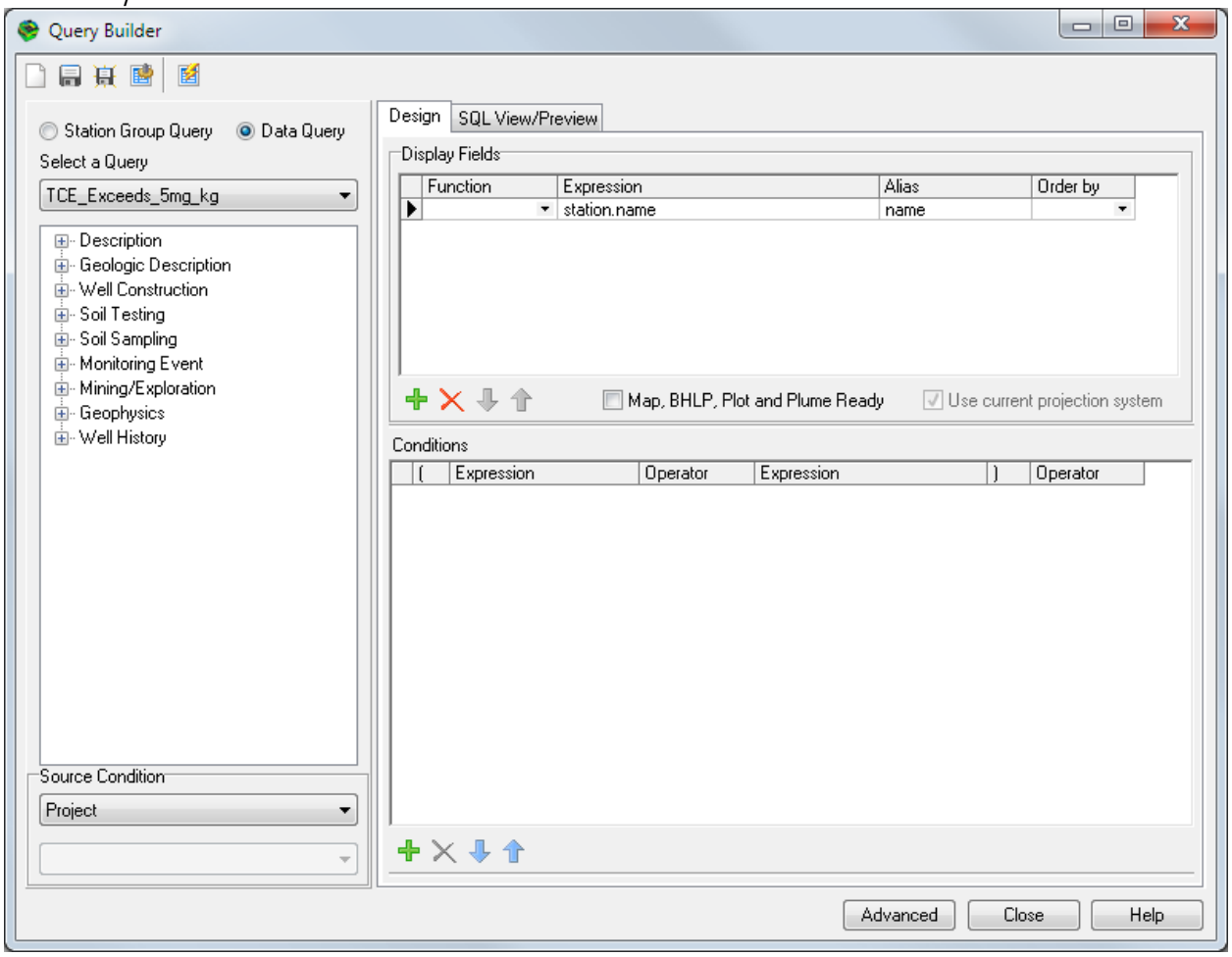
Modules / Query Builder (from the main menu)

Or

 (from the main toolbar).

You will be prompted to either create a new query or open an existing query.
We are creating a new query so enter the name: TCE_Exceeds_5mg_kg and select OK.
NOTE: Slashes are not supported in the SQL string, therefore the underscore is used to denote "per".

The Query Builder window will load as shown below.

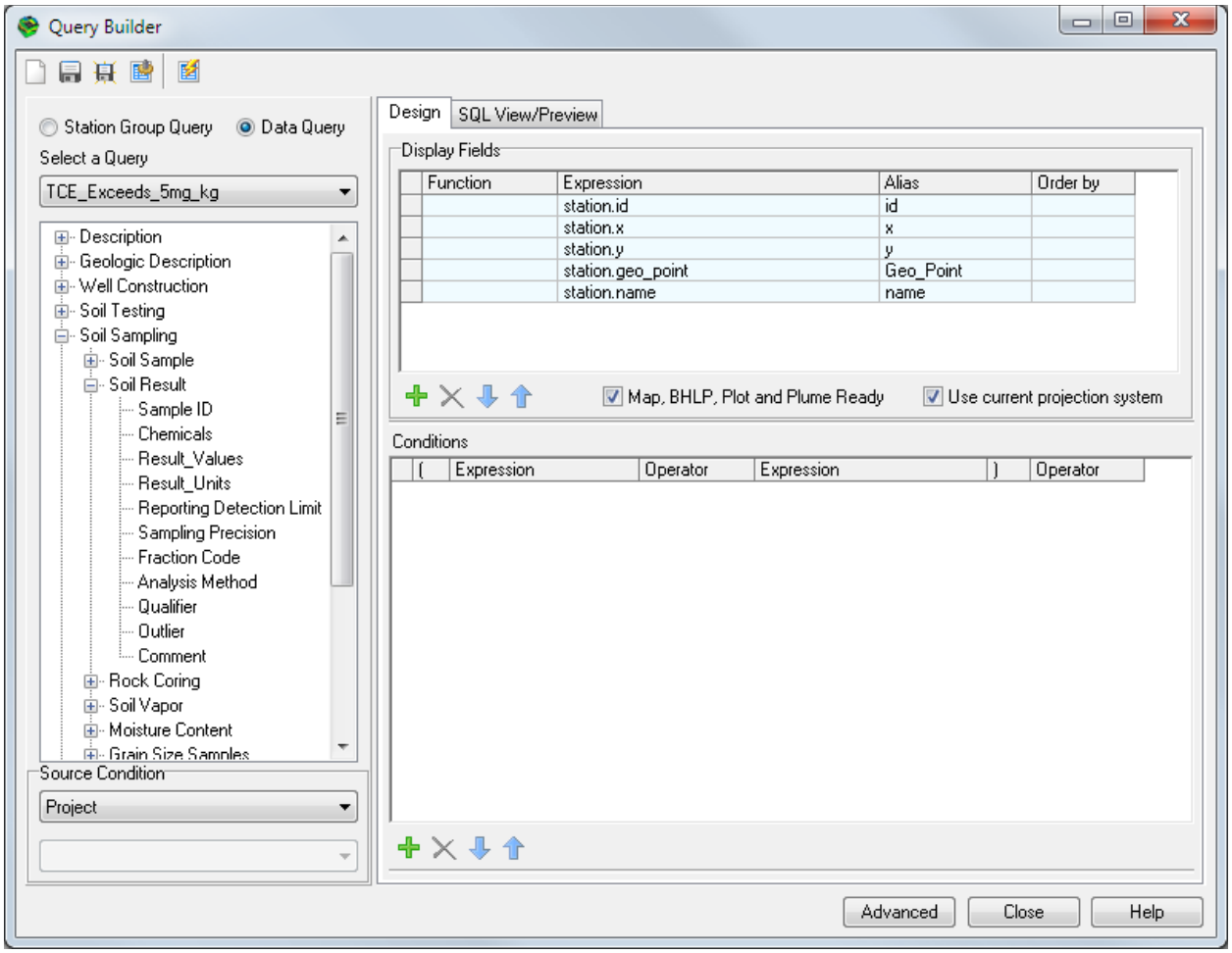


We want to be able to display this query on Map later so ensure the Map Ready option is selected.

Map, BHLP, Plot, and Plume Ready (checkbox on)

You will notice the Query will automatically add several fields to the Display Fields section of the query that are required for using the query on a map.

In the tree on the left side of the window, expand the Soil Sampling node, and then expand the Soil Result node.



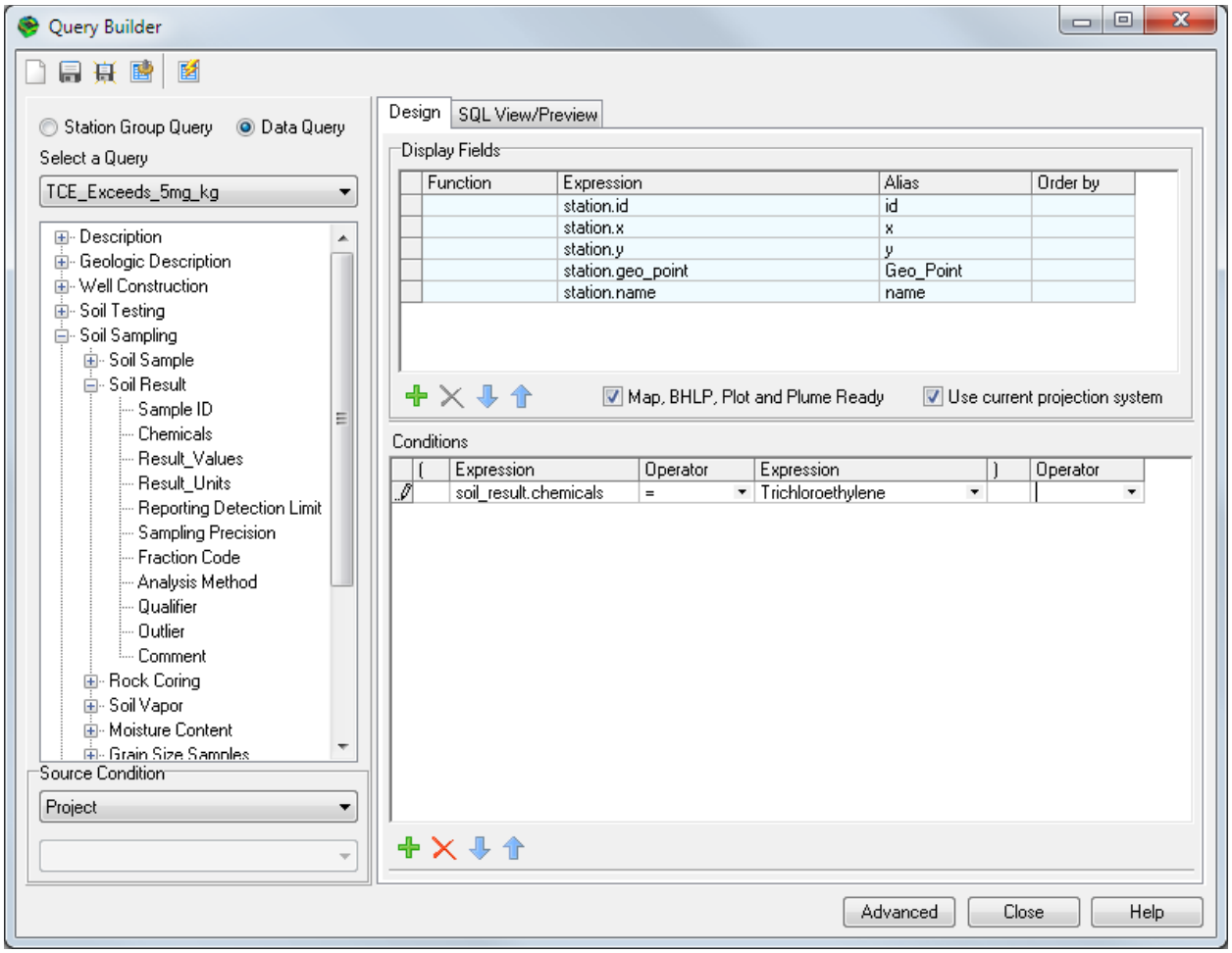
Locate and click on the Chemicals field. Drag this field into the blank Conditions frame, under the Expression column. The selected field will be added automatically to the Query Conditions.

Under the Conditions, select an Operator for this field.

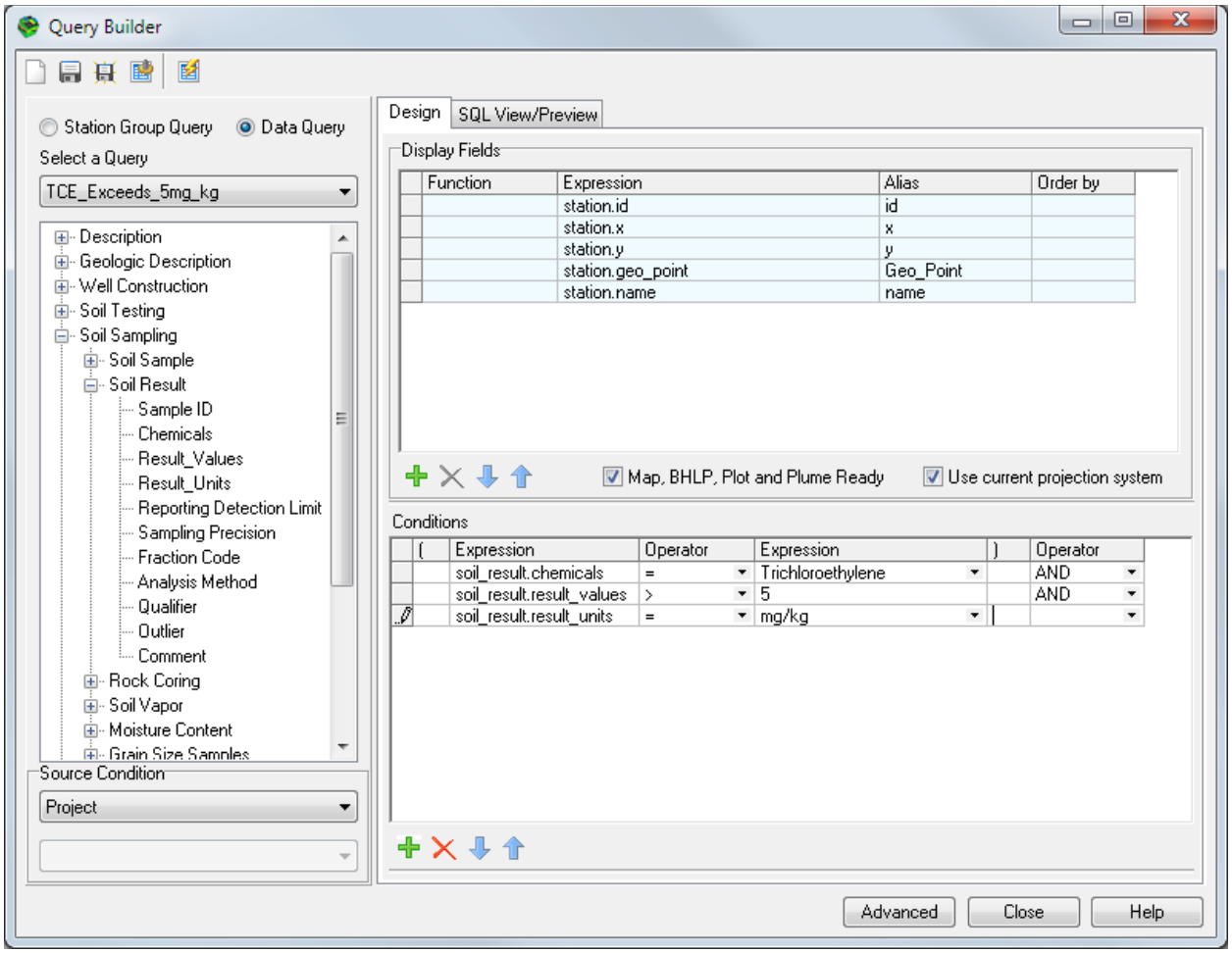
= (from the combo box)

Select an Expression for the field. For this example, locate TCE (Trichloroethylene) from the list:

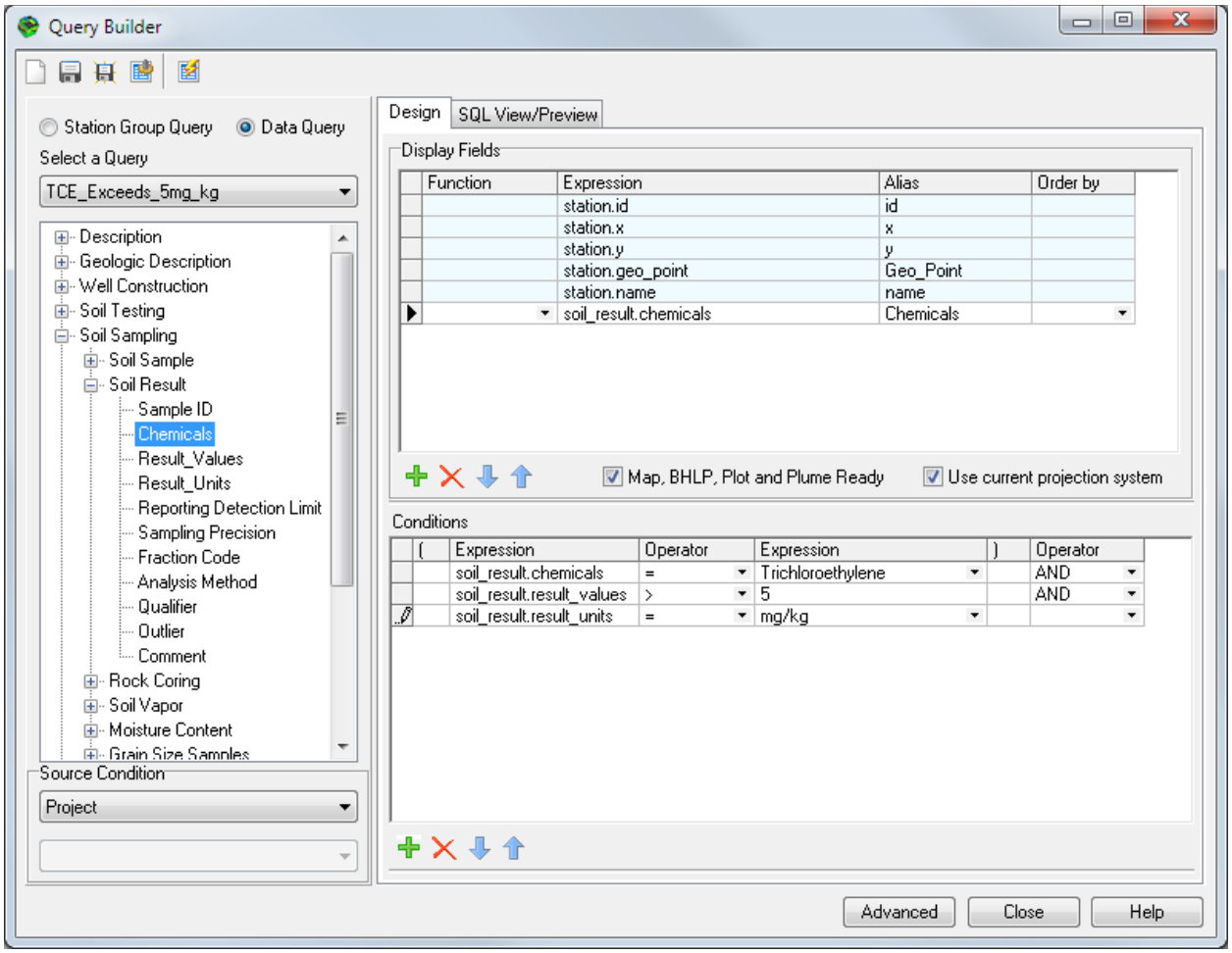
Trichloroethylene



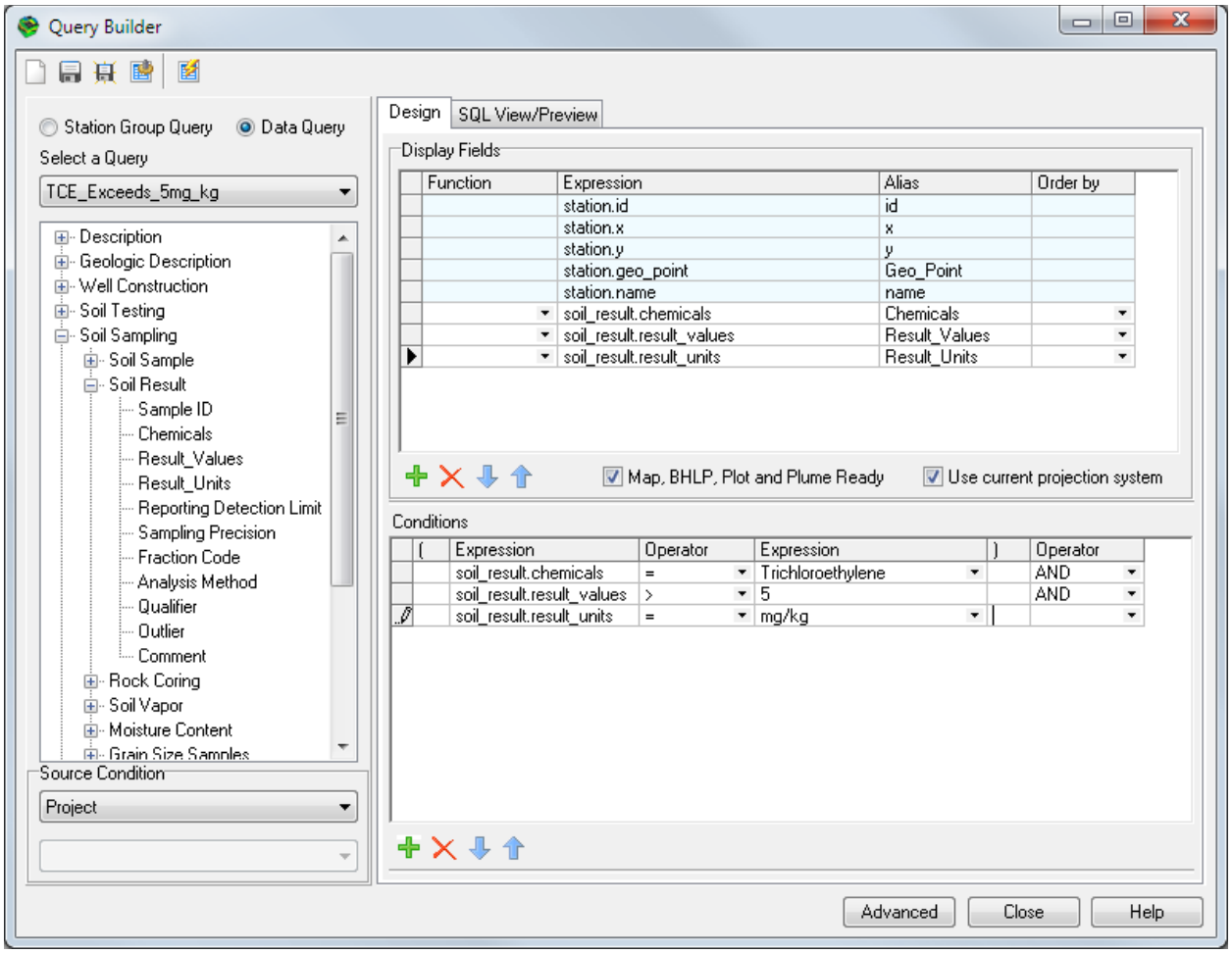
Next, add two additional fields to the Query Conditions:
Locate and click on the **Result_values** field. Drag this field into the blank conditions field, under the first Expression column. The selected field will be added automatically to the Query Conditions. For the Operator, select the **>** from the combo box. And then for the second expression type: **5**
Finally, repeat these steps for the Result_units field. Locate and click on the **Result_units** field. Drag this field into the blank conditions field, under the first Expression column. The selected field will be added automatically to the Query Conditions. For the Operator, select **=** from the combo box. Select an Expression for the field. For this example, select the appropriate soil chemistry units: **mg/kg**, from the combo box.
The query Builder should like the image below.



Now some fields must be also be added to the Display Fields. The Name field has been added automatically, however you can also add any relevant fields to display in the query results. To do so, locate and click on the **Chemicals** field in the tree on the left side of the window. Drag this field into the blank Display Fields grid (in the upper part of the window).



Repeat this for the **Result_values** and **Result_units** fields.
Once the fields have been added, the Query Builder display should be similar to the one shown in the figure below.

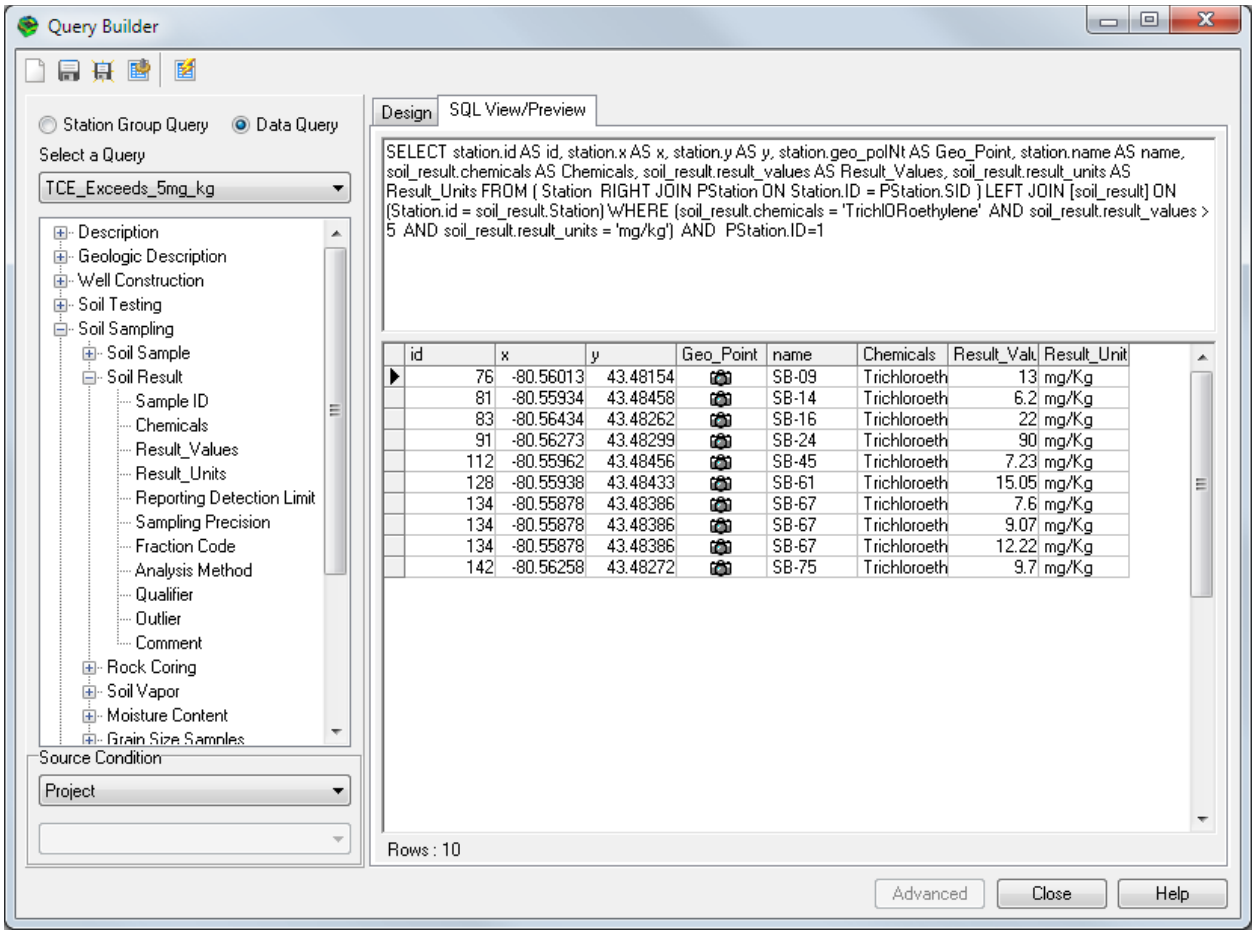


To see the results of your query you must generate the SQL statement (based on your design) and then execute the SQL Statement.

 (generate button on the toolbar)

 (execute button on the toolbar)

The results of the query should appear, as shown in the figure below.



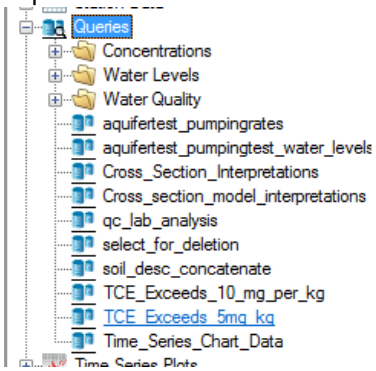
This query should return 10 records that satisfy the specified conditions.

Close (to return to the main HGA window.)

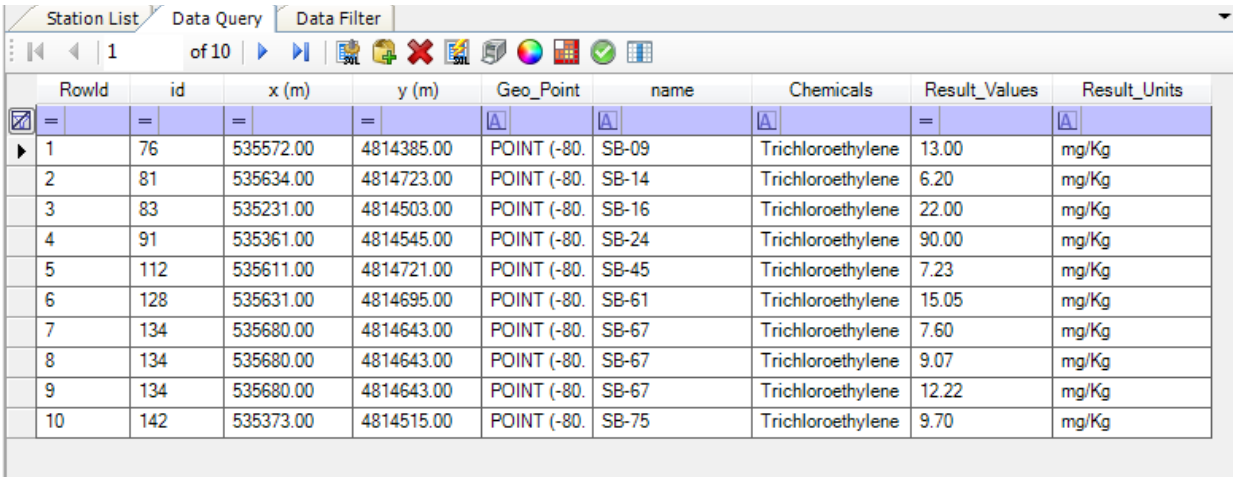
Yes (to save the query)

Upon returning to the HGA window, you will see the Data Query will appear as a new node under the Queries node in the project browser.

Expand the Queries node in the project browser, and select this query.



This will execute the Query, and display the Query results in the Data Query tab.


Station List | Data Query | Data Filter

1 of 10

RowId	id	x (m)	y (m)	Geo_Point	name	Chemicals	Result_Values	Result_Units
1	76	535572.00	4814385.00	POINT (-80.	SB-09	Trichloroethylene	13.00	mg/Kg
2	81	535634.00	4814723.00	POINT (-80.	SB-14	Trichloroethylene	6.20	mg/Kg
3	83	535231.00	4814503.00	POINT (-80.	SB-16	Trichloroethylene	22.00	mg/Kg
4	91	535361.00	4814545.00	POINT (-80.	SB-24	Trichloroethylene	90.00	mg/Kg
5	112	535611.00	4814721.00	POINT (-80.	SB-45	Trichloroethylene	7.23	mg/Kg
6	128	535631.00	4814695.00	POINT (-80.	SB-61	Trichloroethylene	15.05	mg/Kg
7	134	535680.00	4814643.00	POINT (-80.	SB-67	Trichloroethylene	7.60	mg/Kg
8	134	535680.00	4814643.00	POINT (-80.	SB-67	Trichloroethylene	9.07	mg/Kg
9	134	535680.00	4814643.00	POINT (-80.	SB-67	Trichloroethylene	12.22	mg/Kg
10	142	535373.00	4814515.00	POINT (-80.	SB-75	Trichloroethylene	9.70	mg/Kg

Several queries have been created for you in the Demo Project. Feel free to peruse them and see how they were constructed. To view how a query was designed, right-click on the desired query and select Edit. The names and organization of the queries should give you an idea of their purpose. You will notice that you can group your queries into folders to make it easier to find the query you are looking for.

Time Series Plots

The plotting component offers the following tools:

- Create Time Series X-Y plots based on data queries
- Display time series plots as line charts or bar charts.
- Add legends and data marker labels to plots
- Add best fit, trend, formula, or statistical lines to the plot
- Interact with plots, and display multiple plot windows in the viewer window simultaneously
- Define data series ranges, and modify display properties for different data ranges (
- Select fields for plot grouping or data series grouping
- Modify display properties, including axis, labels, symbols, legends, and intervals
- Print plots in a report, single or multiple pages
- Save plot settings as templates for re-use
- Export plots to graphics format
- Copy plots to Windows clipboard

In HGA, the plots are saved under the Plots node in the Project tree; the demo project contains several examples. Feel free to take a moment and open these examples, and discover the numerous options that are available. Below is a brief description of each plot:

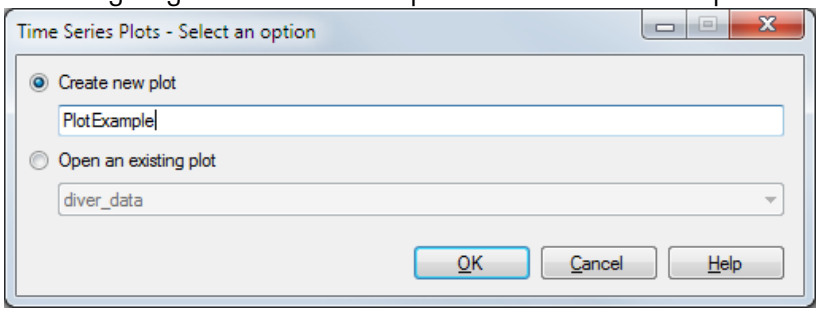
diver_data	Displays average depth to water level data for station W-23 over the month of November.
water_levels	Displays water level data for multiple stations, over the a period of eight months.
water_quailty_plots	Displays water chemistry data, for multiple stations, over a period of several years.

Creating a New Plot Page Design

To create a plot, follow the steps below:

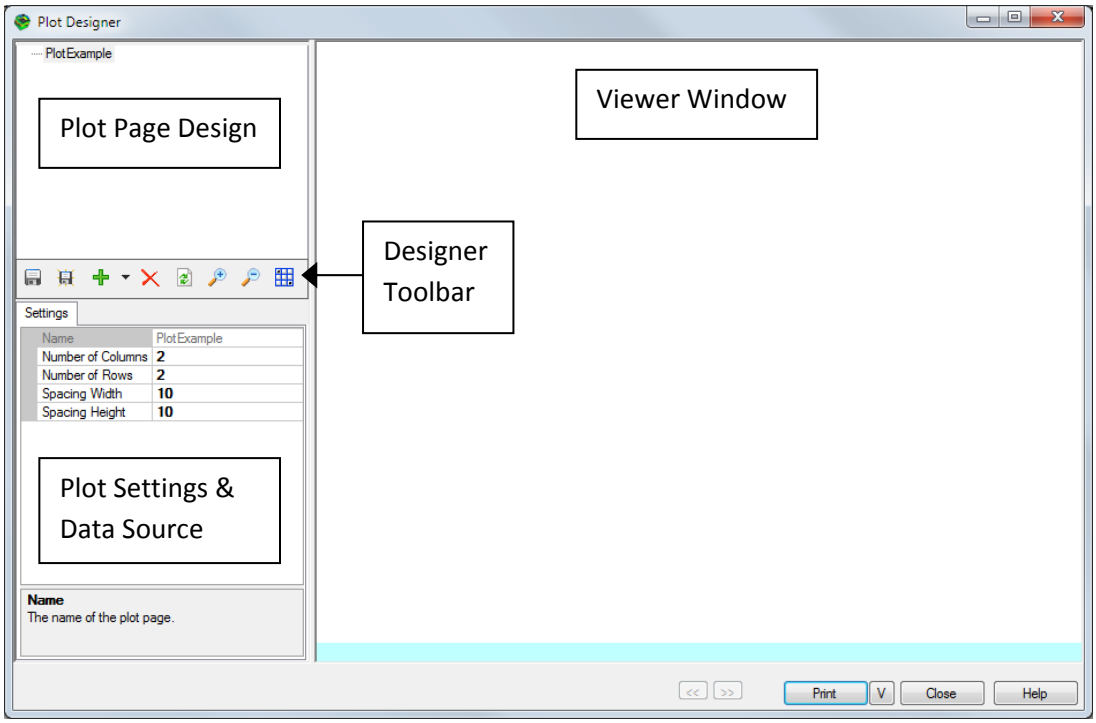
 (from the mian toolbar)

We are going to create a new plot so enter PlotExample in the dialog box that appears.



OK

The Plot designer window will appear as shown below:



The plot window contains the following items:

- **Plot Page Design Tree**: A list of all available plot page designs, plots, and series such as Lines and Standards
- **Designer Toolbar**: Toolbar buttons used for modifying the plot design
- **Plot Settings and Data Source**: Contains the settings for the selected entity, and data mappings
- : Contains a real time view of the plot page design

Adding a Plot

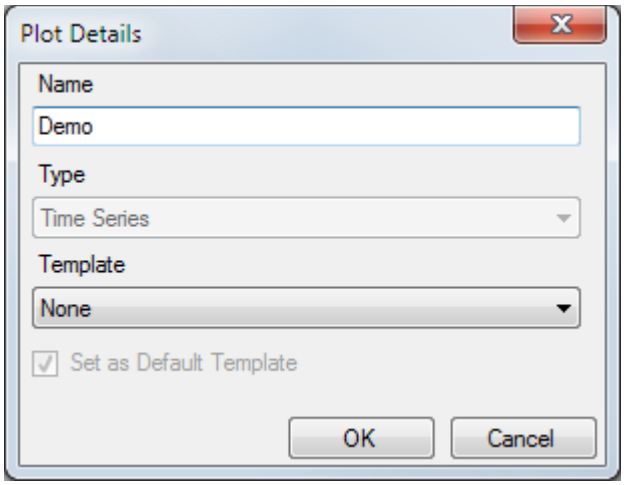
To add a new plot,

 (Add) button

In the Name field enter the name of the plot:

Demo (type)

None (from the Template dropdown list box)



Select OK to create the plot.

OK

Mapping Fields

The next step is to map the fields in your query, to the fields required by the plot component. This is done under the Data Source tab.

Data Source (tab in the lower-left corner of the window)

Map the following fields:

For the Query,

Time_Series_Chart_Data (from the drop down list)

For the Plot Grouping, click on the right side of the field to load the available fields.

name (from the list)

OK

For the Series Grouping, click on the right side of the field to load the available fields

chemical_name (from the list)

OK

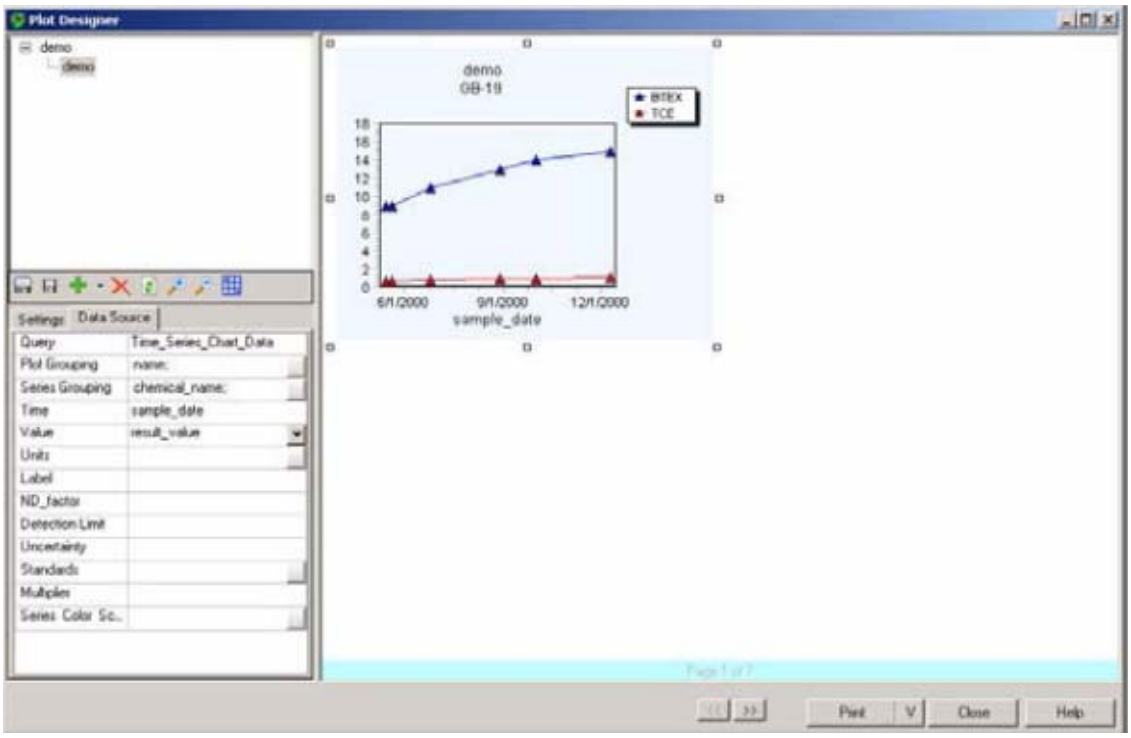
For the Time,

date (from the dropdown list)

For the Value,

result_value (from the dropdown list)

The plot should now be displayed as shown in the screen shot below:



At the bottom of the Plot window, there are scroll buttons to pan to the next and previous pages. In this example, the query and grouping options has resulted in a plot page design spanning 7 pages.

>> (to see plot data for remaining stations in the query)

There are numerous plot and data series settings that can be modified, under the Settings tab. Feel free to experiment with these features now.
For more details, please consult the HGA User's Manual.

Saving Plot Template

Once you have designed the current plot to your style and data needs, you can save the design as a template for re-use in future plots. To do so:
Right-mouse click on **Demo** (the plot name in the tree), and select **Save as a plot template** from the menu.
Enter a name for the plot template, and then select OK.

The template will be available next time you create a new plot, in the Add Plot dialog under the Templates combo box.

Close (to close the Time Series module)

Crosstab Queries

Crosstab queries are special type of queries that let you store your data in a normalized manner in your database, but let you produce pivoted, denormalized outputs from that data. In other words, crosstab queries let you rotate rows to columns to see different summaries of the source data.

Suppose you occasionally want to get a pivoted view of your chemistry results, whereby each row represents a different sample at each station, and each column represents results for each analyte. Another common example within the environmental industry is to show analyte names, reporting units, and regulatory limits along the left column, while sample names, date and/or depth ranges are shown along the top row, and result values and qualifiers shown in the intersecting cells. By using crosstab queries, you can create summary views of your data for easier analysis and reporting.

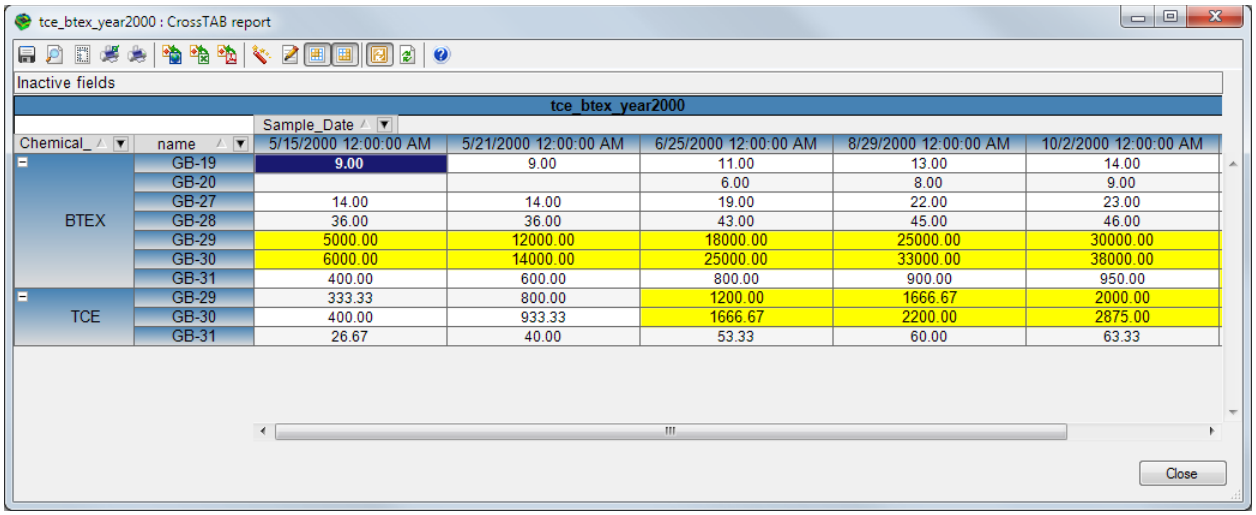
With the crosstab query tools, you can:

- Generate advanced crosstab queries from existing data queries
- Format columns, rows, sorting options, display (color, font) settings, or choose from over 30 predefined style templates
- Construct complex reports using the powerful built-in Expression Editor.
- Highlight cells that violate user-defined data bounds
- Export a crosstab query HTML, MS Excel and PDF format
- Print crosstab query results

In the demo project, there are two examples of crosstab queries. From the HGA tree view, expand the Crosstab node, and then double click on the tce_btex_year 2000 example.

tce_btex_year 2000 (double click)

The Crosstab window will then open, as shown in the following screenshot:



From the toolbar in the upper-left corner, there are several printing and exporting options available:

- Use the  button to set the printing options.
- Use the  button to print the crosstab report.
- Use the  button to export the report to an HTML file. A dialog will appear where you can specify a directory and filename for the .HTML file.
- Use the  button to export the report to an MS Excel file. A dialog will appear where you can specify a directory and filename for the .XLS file.
- Use the  button to export the report to a PDF file. A dialog will appear where you can define the page and export settings, and the filename for the .PDF file.
- Use the  button to hide the sub totals in the crosstab report.
- Use the  button to hide the global totals in the crosstab report.

The crosstab query component contains numerous features that are outside the scope of this demo tutorial. For more details, please refer to the HGA User's Manual.

Close (in the lower right corner, to return to the HGA main window)

Borehole Log Plotter

The Borehole Log Plotter (BHLP) is a built-in borehole log component developed with a full range of features that support the design and plotting of professional borehole logs and well construction details. Once the borehole template is defined, logs can be generated quickly and efficiently for all boreholes in the project. Automated data links reduce the need for user intervention!

- You can design borehole log plots containing:
- Lithology information for each formation (patterns and descriptions)
- Description of the geologic formation
- The depth and/or elevation of each layer
- Well construction details (casing, screens, annular fill)
- Charts that display one or more data types collected at various depths in the well including those resulting from geophysical investigations
- Symbols showing sample locations, groundwater levels, etc.
- Unlimited number of chemical result plots
- Database templates include several pre-designed borehole log templates
- Borehole log plots provide real-time data entry assistance
- Launch logs by clicking on a well in the GIS Map Manager or 2D Cross-Section Editor
- Add or remove data columns to the log for virtually any field in the database
- Generate professional log reports including logos and other box fields
- Logs format and layout is fully customizable
- Scan borehole logs using drop-down menus
- Import/export final borehole log designs when exchanging with other HGA users
- Export final borehole log reports to various formats (HTML, RTF, PDF, XLS, TIF, and TXT)
- Print multiple borehole logs as a group, or individually
- Report Previews allows for scanning the complete list of logs prior to printing
- Print to any Windows printer or standard plotter

Viewing BHLP Templates

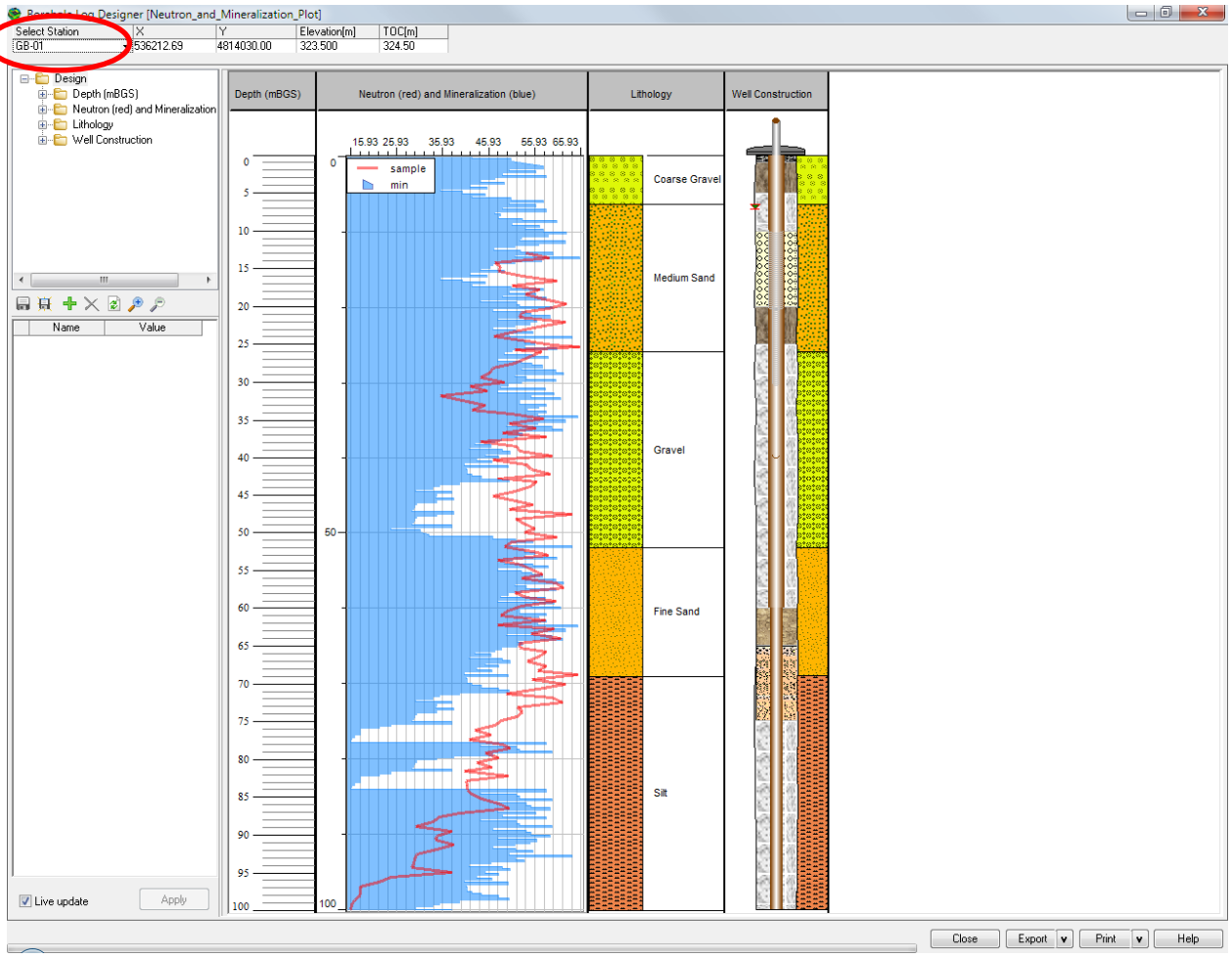
Several borehole log plot templates are provided in the Demo project.

Boreholes (from the Station Groups node in the project tree)

From the project tree, expand the Borehole Logs node, then

neutron_and_mineralization_plot (double click)

The Borehole Log Plot Designer window will appear as shown below:



From the Select Stations drop down menu (circled above),

GB-02 (select from the dropdown list)

The display is updated to reflect the Lithology, Well Construction, and Scale of the selected station. The Borehole Log Plotter provides the ability to zoom in to any section of the plot; a critical tool when analyzing and interpreting detailed data, on a fine scale. These options are available as zoom in / zoom out buttons on the toolbar.

The Borehole Log Plotter also allows you to select Data Queries as data sources for plot, depth, or interval columns. Using a Data Query instead of a Data Table provides more flexibility in the type of information that can be added to a BHLP; for more details, please consult the HGA User's Manual.

The BHLP templates created in the Demo Project each contain a different number and/or order of data columns. Feel free to peruse the other BHLP templates.

Saving and Printing

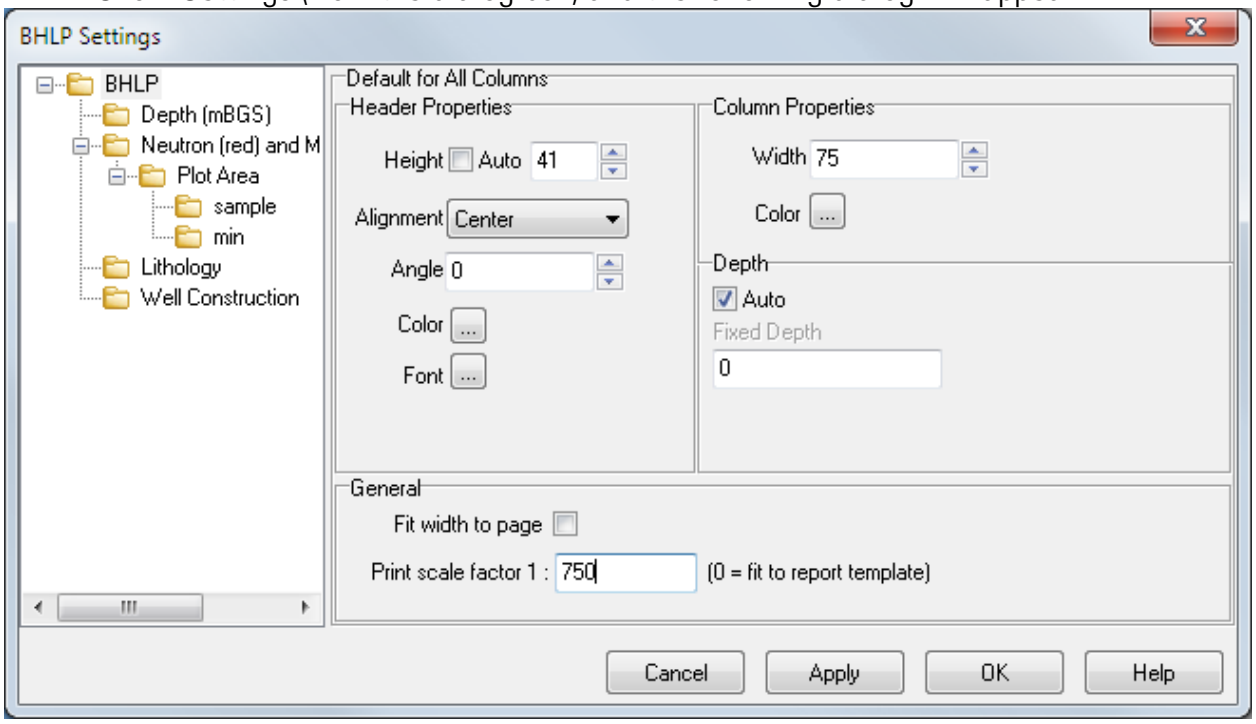
Once the desired view has been loaded, the BHLP may be loaded into the Report Editor for printing. It is possible to create one report for each station in the group, or only one report for the selected station.

The Borehole Log Plotter allows printing to a user-defined scale.

To specify the print scale setting,

Design (Right-click on the folder on the BHLP tree)

Show Settings (from the dialog box) and the following dialog will appear:



Beside the Print scale factor, type:

750

A Print scale factor of 1:750 would mean that 750 "units" on the BHLP would correspond to 1 "unit" on the printout.

OK (to close dialog box)

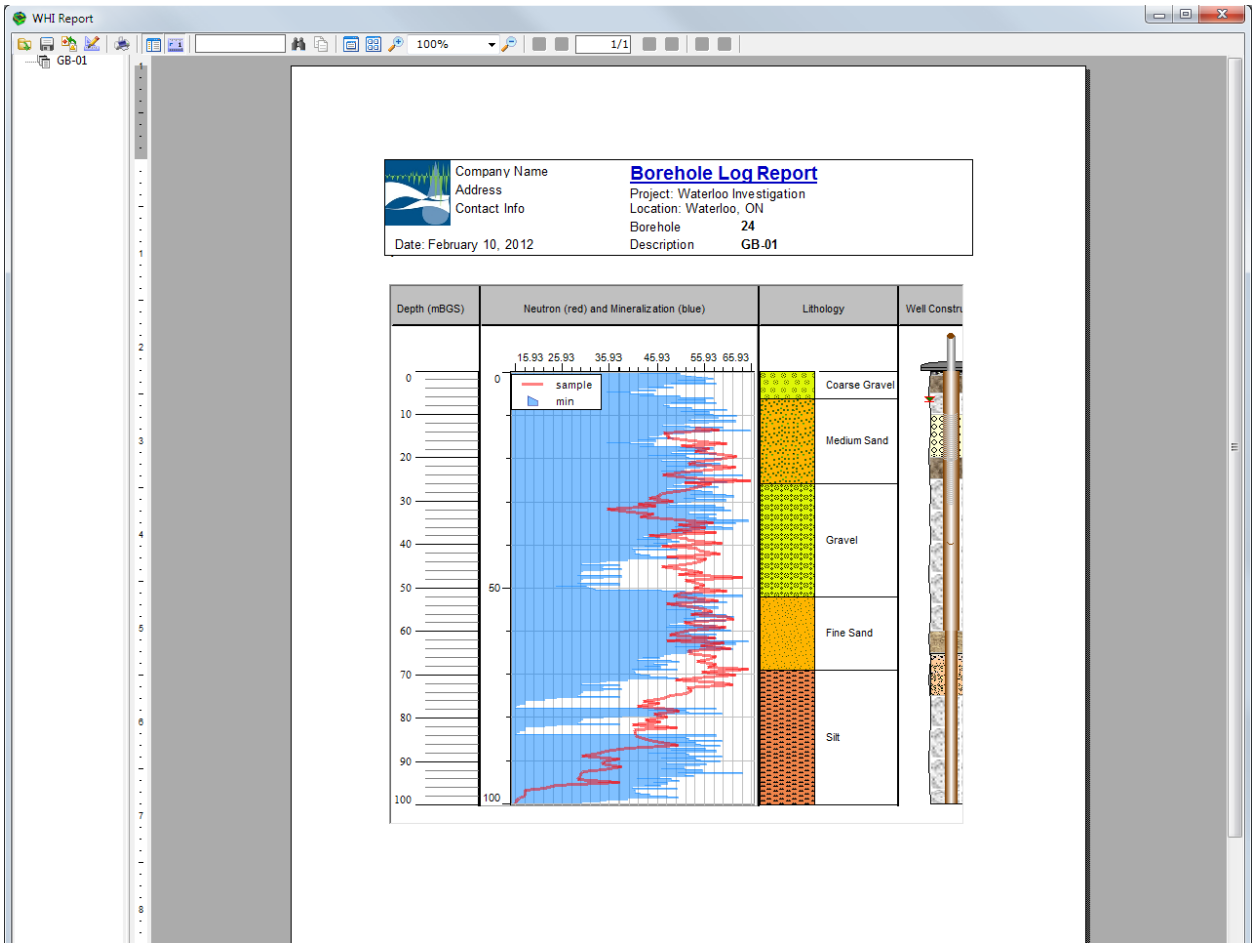
To print a report for the selected BHLP only,

Print (button in the lower-right corner)

bhlp_portrait (from the Select Template dialog box dropdown list)

OK

You will get a preview of the report to be printed as shown below:



X (top right button to close the print preview and return to the BHLP window)
Close (bottom right button to close the BHLP Designer and return to the main HGA window)

Map Manager

The Map Manager is built on ESRI™ technology and is packed with an abundance of mapping features that seamlessly connect your project maps with the HGA database. However, the Map Manager goes far beyond simple mapping, it also acts as a fundamental source for producing cross-sections, accessing borehole logs and well construction details, and developing contour maps (elevations, concentrations, water table, etc.). The Map Manager is an integral part of HGA and is ideally suited for analyzing and presenting the spatial orientation of your groundwater or borehole project data.

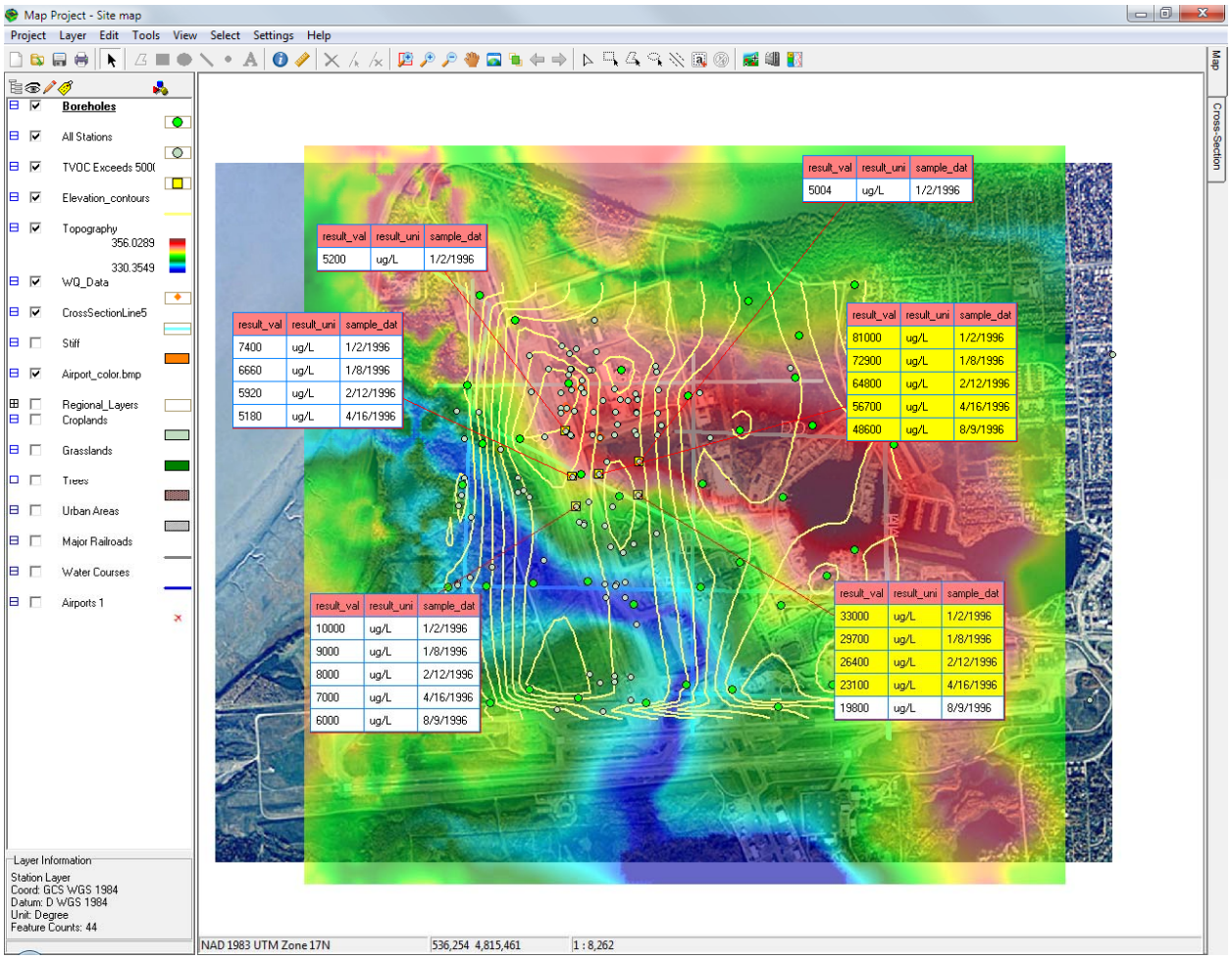
Some of the key features of the Map Manager are listed below:

- Effortlessly load query or station group data from the project
- Import/open a vast array of basemaps for your projects including:
    - Bitmap (BMP, DIB)
    - JPEG (JPG)
    - Tiff (TIF, TFF, TIFF)
    - MrSID (SID)
    - AutoCAD Files (DXF, DWG)
    - Shapefiles (SHP)
- Import/Open surface files (DEM, Surfer Grid, and ESRI ASCII)
- Quickly georeference raster image maps to match your project\data coordinates
- Create various map layers from station data and query results
- View maps at different scales
- Edit map layers (label and symbol properties, order, style, color)
- Draw polygons, circles, lines, points
- Create a legend and scale for the Map Project
- Add descriptive text using Windows true-type fonts and symbols
- View statistics for selected data or a group of stations
- Measure distances on the map
- Export Map view as Raster images
- Define single or multiple cross-section lines on the map
- Label and symbol renderer allows for creating color ramps, gradients, shading, etc.
- Interpolate any data layers, and save the interpolated (gridded) data to file
- Create contour lines and color shading layers.
- Display grid lines (graticule) on the map.
- Display time series plots linked to stations on the map.
- Send maps to the Report Editor for inclusion with the report template

In this example, you will open an existing map project, and then load several data queries that were described in the previous section.
First, before proceeding, ensure that you are viewing the main window of HGA. Then to load the Map Manager expand the Map Projects node of the Project tree

Site Map (double click)

Once the Map Manager window is loaded, the display should be similar to the one shown below.



The Map Manager window contains the following elements:

- **Menu Bar**: Contains program menu commands
- **Toolbar**: Contains short cut buttons to some of the functions in the Map manager
- **Layer Manager**: Modify layer order, set layers visible, active, and modify layer properties
- **Map Window**: Contains the layers for the map project
- **Layer Information**: Displays the projection system for the selected layer

- **Coordinates**: Displays the X,Y co-ordinate for the current mouse cursor location
- **Scale**: Displays scale for the map window
- **Active Window**: Select between the Map window or the Cross Section window

The Demo Map Project contains several layers, as indicated in the Layer Manager on the left side of the window. There is an air photo of the site, which is a helpful visual aid to relate station locations to land features. Some Station Groups and queries have been loaded as a new map layer, each represented by a unique symbol. There are several Cross Section lines digitized on the map (this feature will be discussed in further detail in the next section).
There is also a color shading layer representing the topography of the area as well as contour lines of the elevations.

Creating a New Map Layer with a Data Query

You will now load the TCE data query as a new map layer. To do so,

Layer / Load HGA Data
Data Query (select the radio button, in the dialog that appears)
TCE_Exceeds_5mg_kg (from the list of data queries)
OK
OK (on the Set Field Precision dialog box)

Hydro GeoAnalyst allows you to set the precision of numeric attributes when importing shapefiles or creating map layers from HGA data. This feature is useful when displaying numeric data on a map using the label renderer, and only a certain number of decimal places is desired in the displayed data.

This will display the query results on the map project, as a new map layer. Next, you will create a contour map of the chemistry data.

Creating a Contour Map

Environmental professionals are often required to produce contour maps. Contouring of project data such as water levels or contaminant concentrations is an effective method of relating spatial distribution of data over a map. Since HGA stores station data and various quantitative datum within its core, HGA was designed with contouring tools that pull data directly from the source.

Some of the key contouring features in the GIS Map Manager include:

- Quickly load and contour data from any station data, or from pre-defined HGA queries
- Display color contours over the map with labels
- Modify contour line thickness and intervals
- Use color gradients to show distribution of the parameter over the Site
- Select from industry-standard interpolation methods, including:
    - Kriging,
    - Inverse Distance, and
    - Natural Neighbor

Some common examples of environmental data contouring include:

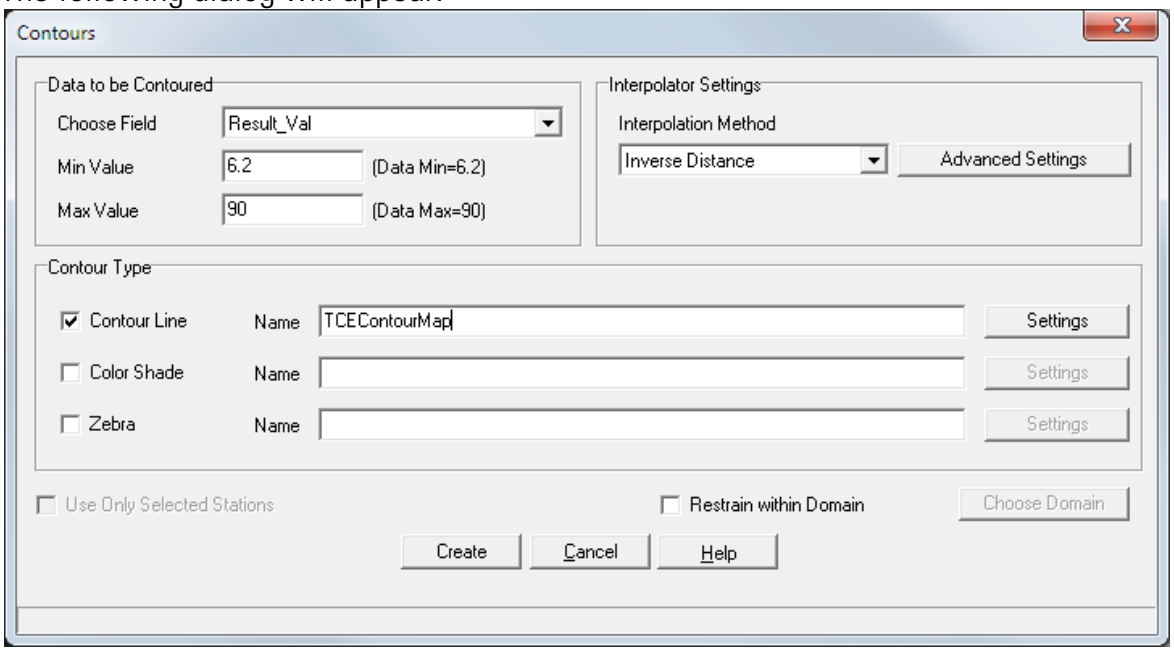
- Groundwater surface elevations
- Bedrock surface elevations
- Lithological surface elevations
- Water table elevations
- Concentration data (contaminated, water quality, volumetric, etc.)

In this example, you will contour the TCE data that was loaded in the previous section.

TCE_Exceeds_5mg_kg (select layer in the layer control, to make this the active layer (if not already selected)

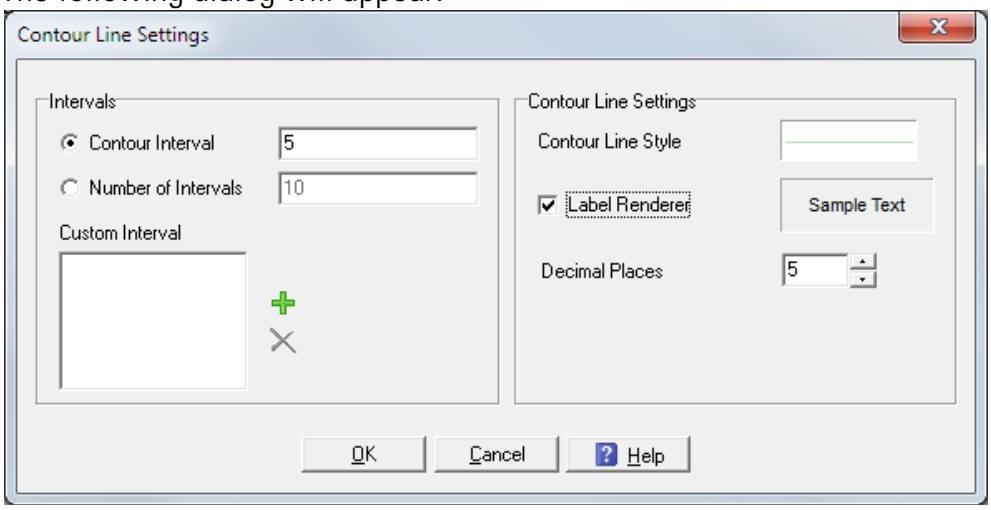
Layer / Create Contours / with HGA (from the main menu of Map Manager)

The following dialog will appear:



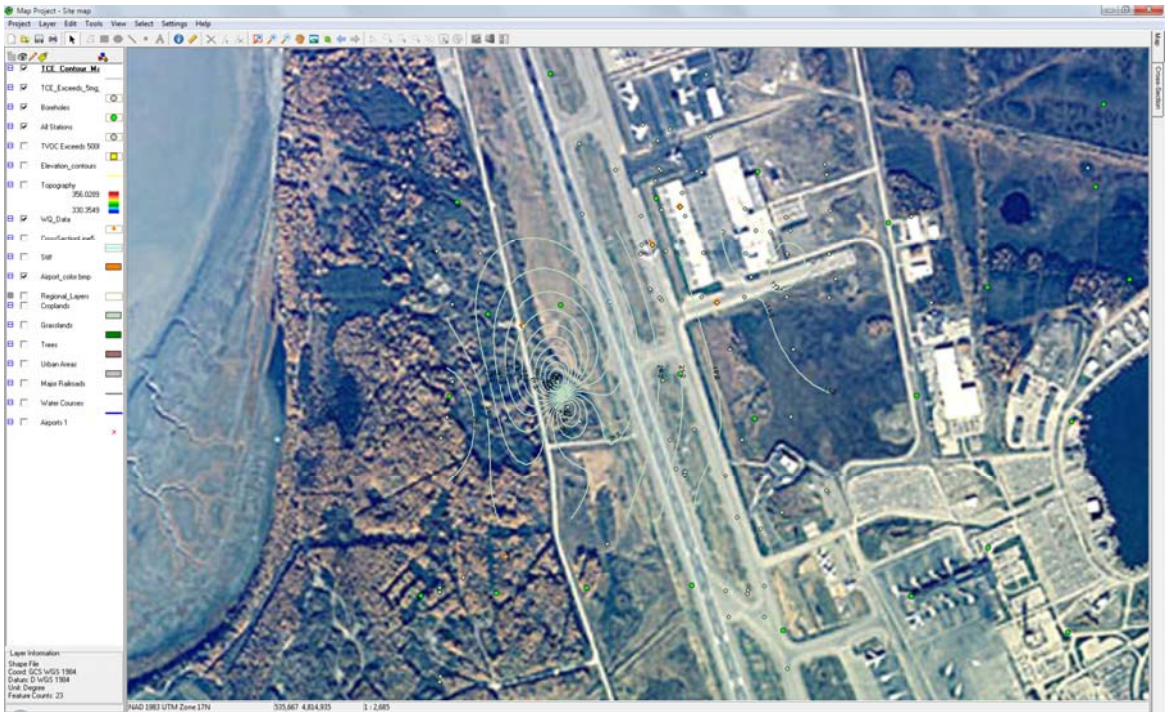
Result_val (from the combo box beside Choose Field)
Inverse Distance (for the Interpolation Method)
TCEContourMap (typein the Name text box)
Settings (beside the name text box)

The following dialog will appear:



Contour Interval (select radio button)
5 (type for the Contour Interval)
Label Renderer checkbox (select to turn on labels)
OK (to accept the contour line settings)
Create (button at the bottom of the window)
OK (to the message that the contours were created successfully)

The contours will then be displayed on the Map project, and the Map layer will be added to the Layer Control (on the left side of the window). A sample is displayed below.



Next, you will create a Thematic map, in order to visually represent the greatest concentrations of TCE at these stations. Before proceeding, turn off the ContourMap layer (remove the Visible) status.

Creating a Thematic Map

HGA offers thematic mapping functionality to help graphically display the distribution of a single attribute/characteristic or the relationship between several attributes. Some of the key features include:

- Create thematic maps to define a theme from virtually any field in the database
- Create a map layer with thematic symbols for selected station queries
- Select from pie graphs, bar charts, or graduated polygon distributions
- Modify point style appearance (pattern, font, symbol, fill, border, size)
- Assign a graduated color scheme for a range of values at point
- Manually edit minimum or maximum range values
- Select and define color ramps using standard or custom RGB colors
- Assign various symbol styles to specific point values
- Add labels for various thematic selections
- Adjust thematic map layers in any preferred order

For environmental professionals, thematic maps are extremely useful in covering a wide variety of characteristics such as displaying the relationships between:

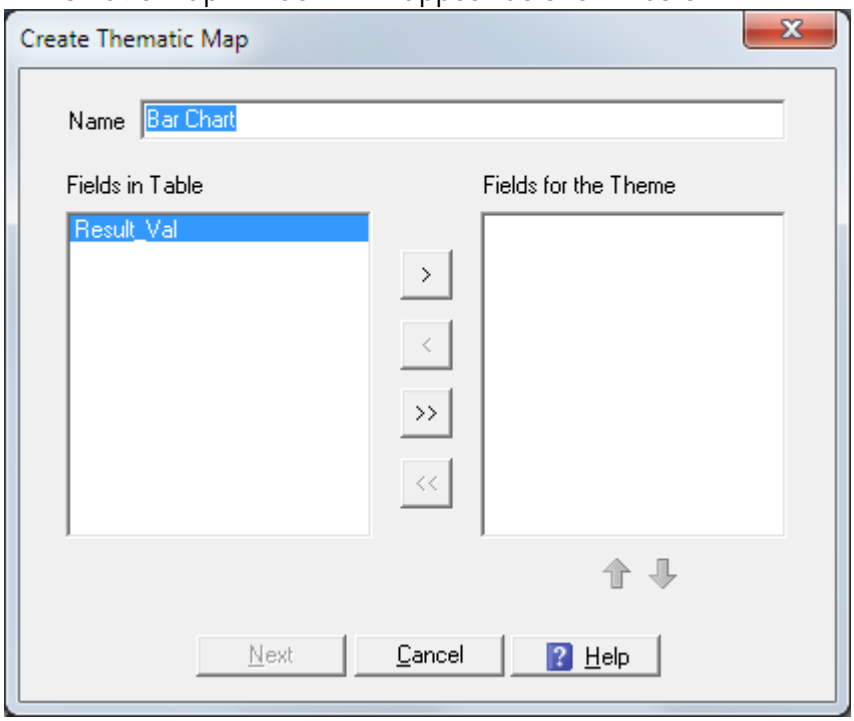
- Wells with head elevations above or below ground surface (Artesian conditions)
- Groundwater pumping volumes and precipitation (Recharge potential)
- Layer thickness from ground surface to subsequent layers (Aggregate exploration)
- Soil types (sand versus clay) and aquifer vulnerability to contamination
- Graduated value polygons for land use or contaminant source inventories
- Population density versus aquifer thickness

To create a Thematic Bar Chart, follow the instructions below.

TCE exceeds 5mg per_kg (select layer from the Layer Control to ensure that it is active)

Layer / Create Thematic Map / Bar Chart (from the Map Manager main menu)

A Thematic map window will appear as shown below:



type: BarChart in the Name field.
(This name will appear in the thematic map list should you choose to edit it later on.)

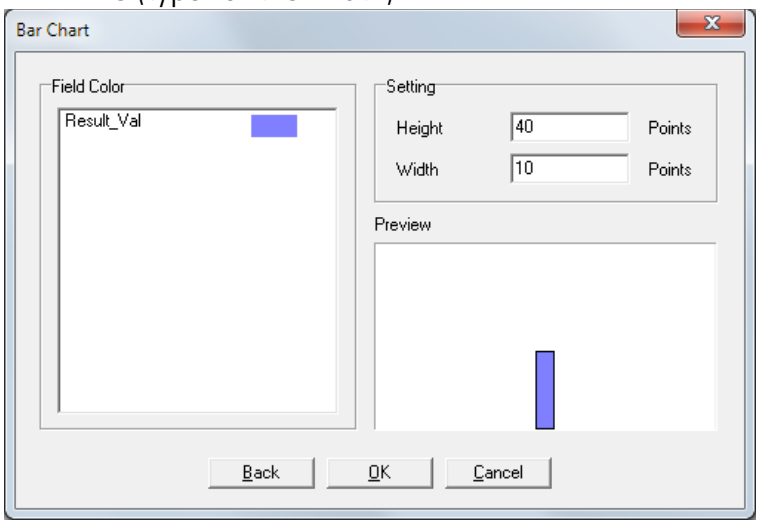
Result_Val (highlight field from the left panel)

(select button to move this field to the right panel)

Next (button to proceed to the next window)

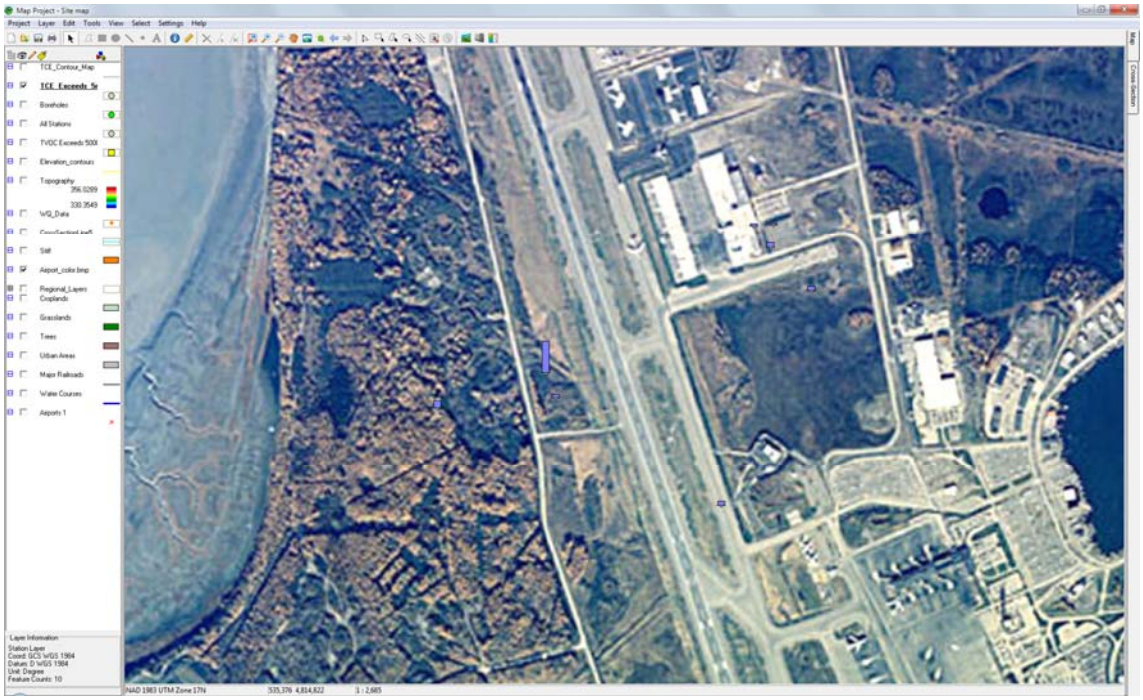
In this dialogue, specify the bar chart color, and the column dimensions. A preview window in the lower right corner displays a preview of the true size and color of the thematic map, as it will appear in the Map Manager.

40 (type for the height)
10 (type for the width)



OK (select button to create the map).

The thematic map is an entity of the selected layer; when this layer is hidden, so too will the corresponding thematic map. To visualize only this bar chart, it may be helpful to hide the non-essential layers by selecting View / Turn off all layers. Having done so, turn on just the air photo (to provide a map background) and the "TCE exceeds 5 mg_kg" layer by clicking on the check-boxes beside them. An example of a Map Project with a Bar Chart is shown below:



Saving and Printing

Once you are satisfied with the map view, there are several options for exporting the display:

- Save the image as a graphics file
- Print the image directly as is
- Insert the image into a report

If you wish, you may print this map view now. To do so,

Project / Print (from the main menu)
Select any print template from the list
OK

The map window will load into the Report Editor, where the image may be inserted into a report, and printed or saved to .PDF, .HTML, .RTF, and other file formats. In addition, the Report Editor allows for customizing the header, footer and logo.

Print Report (button from the toolbar)
X (Close button to return to the Map Manager window)

Features in Map Manager

The HGA demo project provides an additional map project that can be accessed by double-clicking SiteMap2 from the Maps node. This project contains examples of the other features available in HGA's Map Manager.
Take a minute and view some of the new features before proceeding to the next section.
The figure shown below indicates the new features that appear in SiteMap2 .

To read more about the graticule, color shade layers and intersecting map layers, please refer to the HGA User's Manual.
In the next section, you will view a pre-defined cross section using the Cross Section Editor.

Cross-Section Editor

Groundwater and environmental site investigations typically entail detailed analysis of lithologic data acquired from boreholes. Interpreting and visualizing the borehole data is a crucial step in understanding the subsurface regime. HGA comes complete with a fully-integrated cross-section tool that is designed with all the features you need to create report-ready geologic/hydrogeologic cross-section interpretations.

Simply digitize your cross-section line in the Map Manager, then automatically render the cross-section line to display your boreholes directly within the Cross-Section Editor and begin your interpretation. It's really that simple!

The Cross-Section Editor is designed with easy-to-use tools for interpreting geological and hydrogeological data, as well as interpreting data for groundwater flow models. Generating model layers for use as modeling layer elevations in groundwater modeling packages such as Visual MODFLOW Pro has never been easier!

In addition, the Cross-Section Editor is seamlessly integrated with the HGA 3DExplorer, a tool that combines and displays one or more cross-sections in a 3D fence diagram view!

The Cross-Section Editor allows for three types of data interpretations:

- Geologic (containing lithology structure data)
- Hydrogeologic (containing locations of aquifers, aquitards, etc.)
- Model (containing locations of model layer lines, which may be used in numerical groundwater modeling)

The Cross-Section Editor provides users with the following key features:

- Digitize geologic and hydrogeologic layers using the polygon draw tool
- Load surface layers (e.g. DEM) from Map Manager to generate detailed topography model lines
- Select standard cross-section fill patterns from the Geology
- Copy zones from geology layers in order to define hydrogeology zones
- Display the locations of intersecting layers and other cross sections (using symbols and labels)
- Display water table location in cross section view
- Dynamically view the spatial orientation of the boreholes in the Map Preview Window - simply move the mouse over the 2D borehole to highlight its location on the map

- View the orientation of cross-sections as they relate to the Map Preview Window
- Define properties of intersecting features (other layers or cross sections)
- Display screened interval in cross section view
- Modify labels for lines and polygons
- Zoom in/out and pan features
- Launch cross-section for viewing in the HGA 3D Explorer
- Export cross-section view to image format
- Export model layer points for use in groundwater models, including Visual MODFLOW
- Send cross-sections to the Report Editor to be included in a report template
- Copy window to clipboard

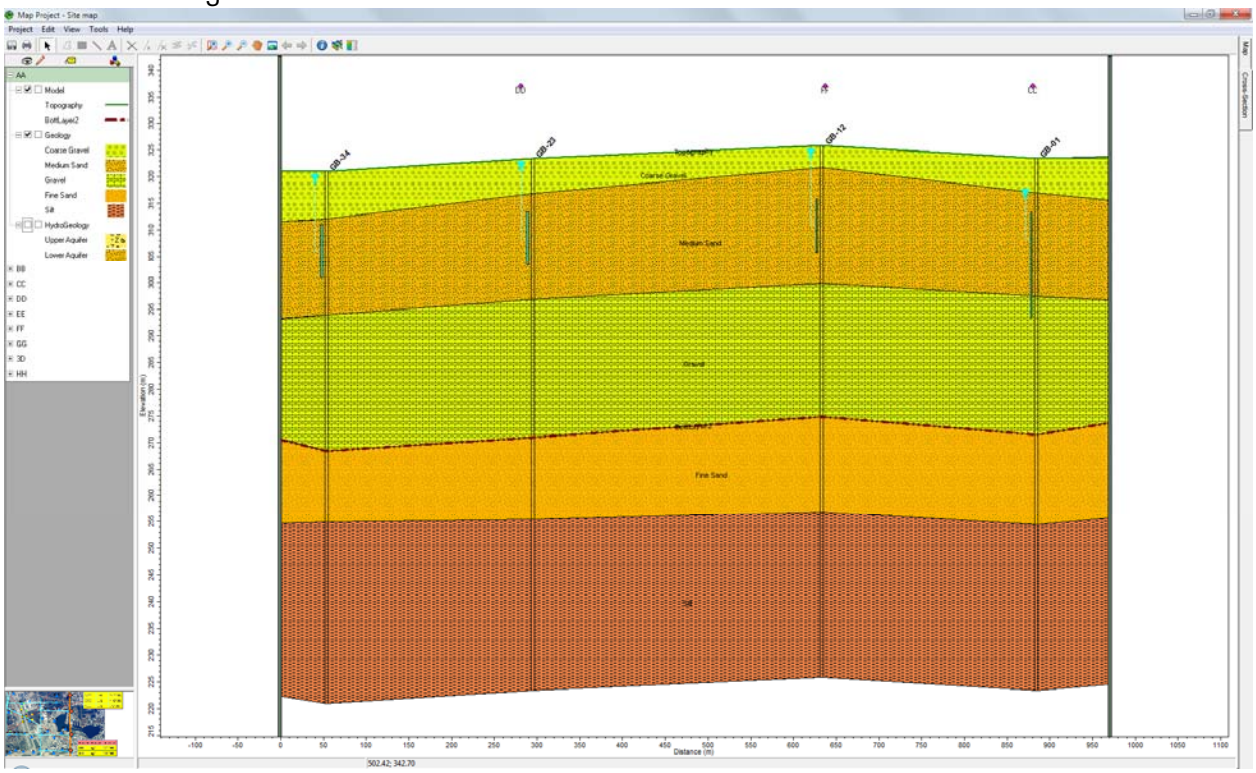
To load the cross section editor from the Map Manager,

Cross Section (select tab in the upper right corner of the Map Manager window)

Next, select a cross section from the tree on the left side.

+ (beside AA)

Once a cross section has been loaded into the Cross Section Editor, the window will appear similar to the figure shown below.



The Cross Section Editor window contains the following items:

- Menu Bar: Contains program menu commands
- Toolbar: Contains buttons to some of the functions in the Cross Section editor
- Layer Control: Modify layer order, make layers visible, active, and modify layer properties.
- Cross-Section Window: Contains the cross-section view for the selected cross-section line.
- Map Preview: Displays the selected cross-section line, as it appears in the map project. The selected stations for the cross-section are highlighted in this Map preview window.
- Coordinates: Displays the X, Z co-ordinate for the current mouse cursor location.
- Active Window: Select between the Map Manager window and the Cross Section Editor window.

In the Site Map project, the cross sections have already been defined for you. However, it is a simple task to define new cross section interpretations using the polygon and line drawing tools that are included with the Cross Section Editor.
In the layer control, you can see the aforementioned interpretation types (Model, Geologic, and Hydrogeologic). From here, you can show/hide each interpretation type.
Also, note some of the other convenient features of the Cross Section editor:
The Map Preview window shows the location of the cross section line, and the stations involved in the cross section. The Map Preview window is linked directly to the displayed cross section.
Place your mouse cursor over the Map Preview window, and place it on top of one of the stations selected for this cross section. This causes the selected station to temporarily flash in the cross section window. This helps you to relate the stations in a planar view, to what you are seeing in the cross section (2D) view.
Conversely, you may relate stations in the cross section view to what is displayed in the map preview window. Place your mouse cursor over a single station in the cross section window, then look at the Map Preview window. You will see the selected station will flash temporarily in the map preview window. This helps you to relate the stations in the cross section view, to their physical XY location on the map view.

To confirm the lithology for an individual station, use the information button in the toolbar:

View / Information (from the main menu, or select the  button from the toolbar)

Move the mouse cursor over a station, and move through the depth of the borehole.

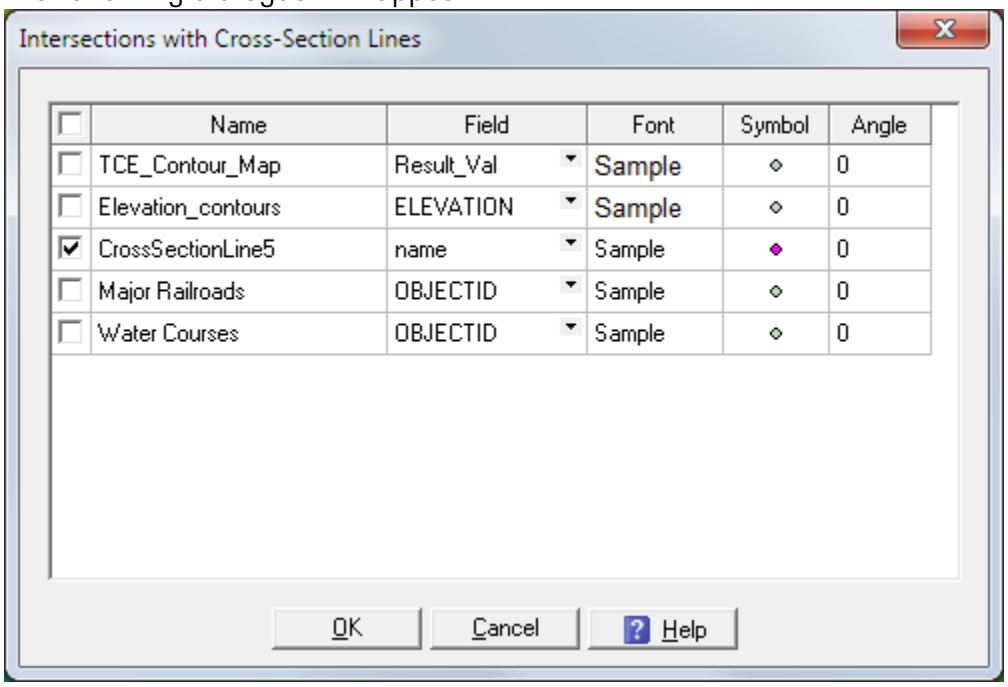
This will display a text box containing the soil description and interval information for the station.

Intersecting Layers

When viewing an individual cross section, you can also see the intersection locations of other cross sections or other layers such as contour lines and highways as defined in the map project. To do so, **BEFORE** you create a new cross section line, in the Map Manager

Settings / Cross Section

The following dialogue will appear:



Click on the symbol in each layer to customize the display

OK (to close the dialog)

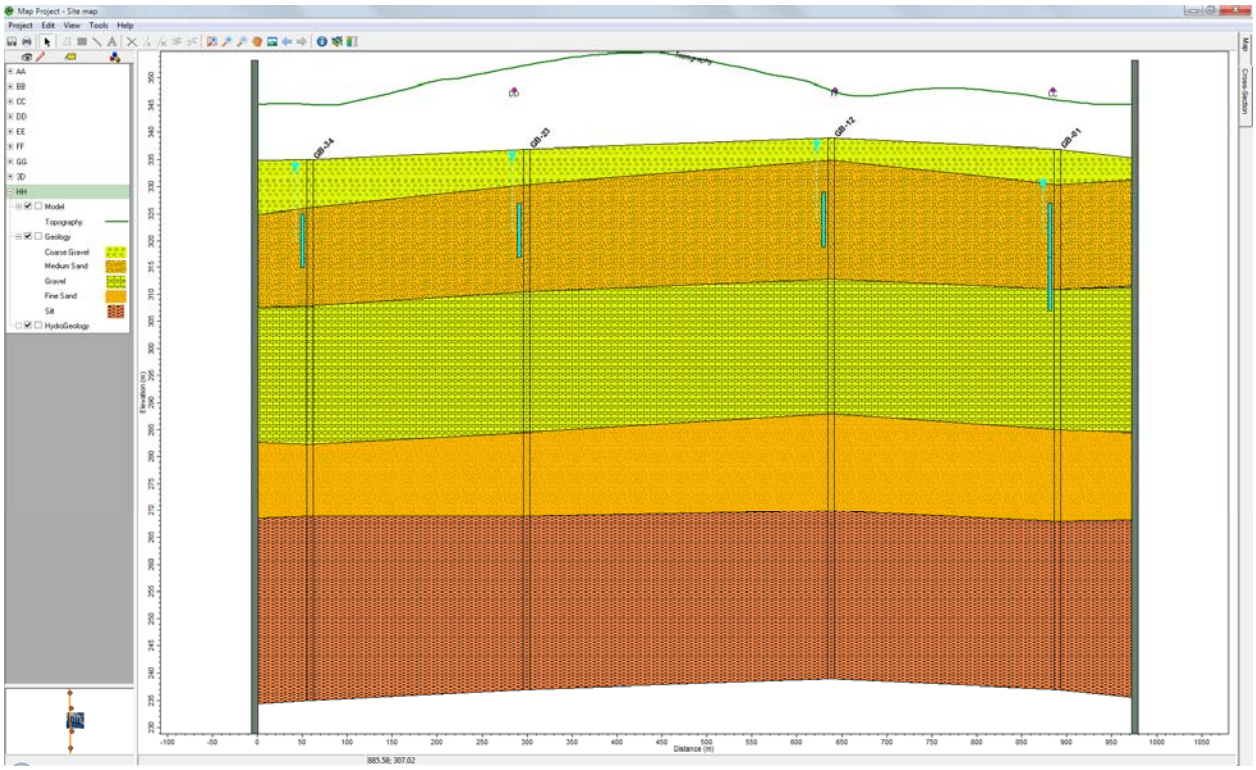
Cross-Section (tab in the Map window to return to the Cross Section editor)

Create Topography Lines from Surface Layers

To view an example of this feature,

+ (beside HH)

The cross-section will now appear as shown in the screenshot below.



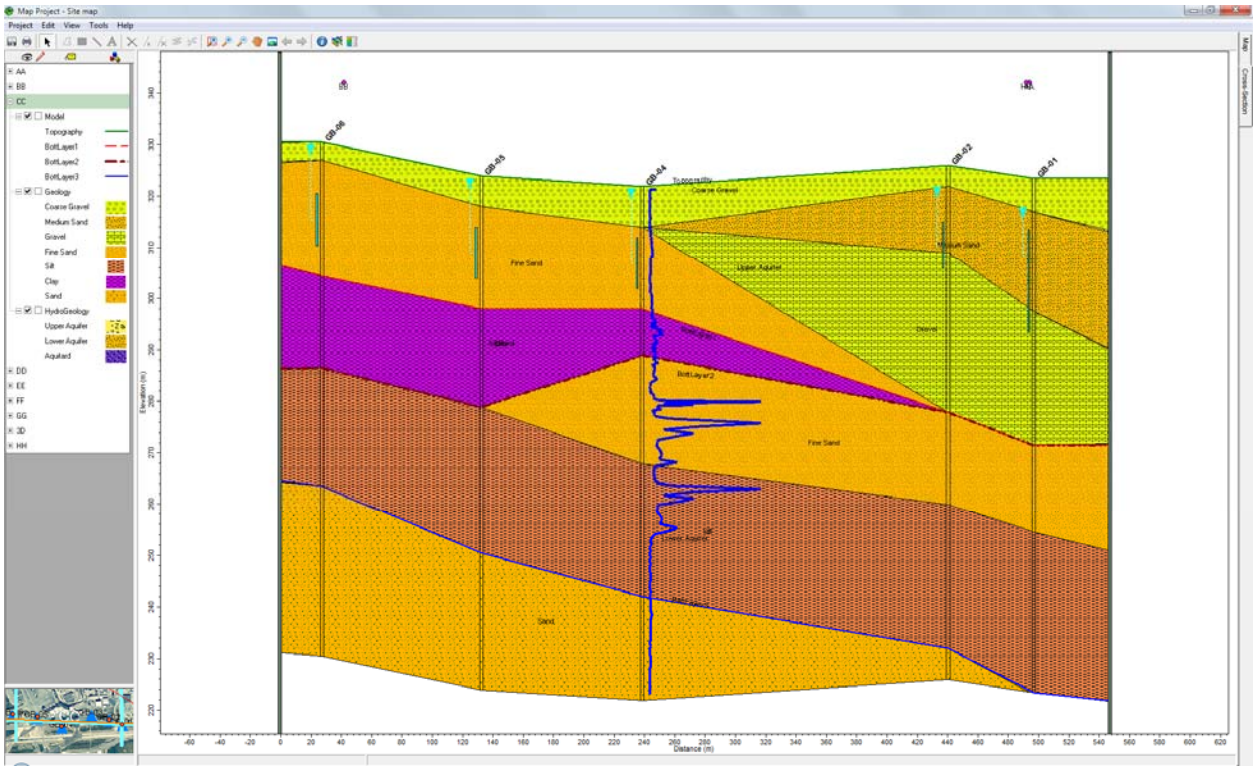
This shows a discrepancy between the topography layer and the data entered in the database for the station (i.e. the elevation field in the station table) and could be used to validate your data – in this case it may mean the elevations for the station may need to be re-surveyed.

Display Borehole Log Plot

The Cross-Section Editor allows you to display borehole log plots directly on the selected cross-section. Using this feature, you can display plot columns containing data such as geophysical, resistivity, or gamma measurement, or interval columns such as well screen intervals; this data can be a valuable asset when creating the cross-section interpretations.

- **-** (beside HH, to close this cross-section)
- **+** (beside CC, to open this cross-section)

This cross-section will now appear as shown in the screenshot below.



You may modify which BHLP template and stations should be selected on the Cross-Section, using the Tools / Display BHLP option from the main menu. For more details, please consult the HGA User's Manual.

Saving and Printing

Once you are satisfied with the cross section view, there are several avenues you can follow:

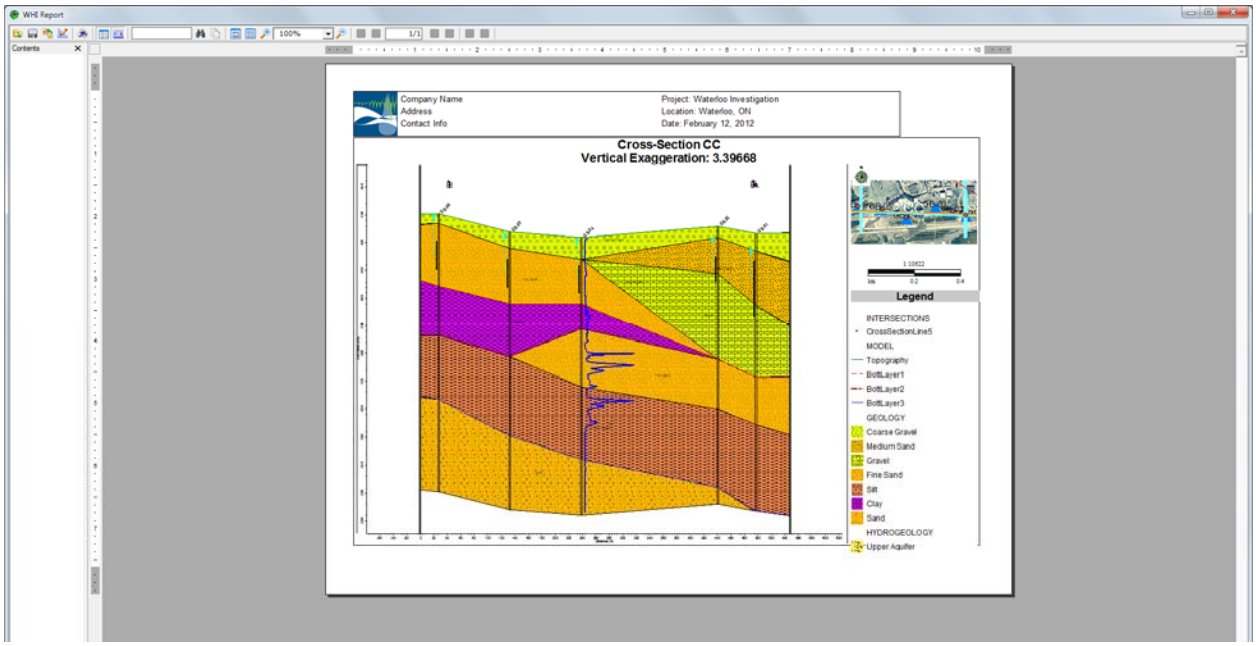
- Save the image as a graphics file
- Print the image directly as is
- Insert the image into a report
- View the cross section (and other cross sections) in 3D

If you wish, you may print this cross section now. To do so,

File / Print (from the main menu of the Cross-Section Editor)
Select any print template from the list
OK (and the Cross-section will be pushed to the Report Editor)

The cross section will load into the Report Editor, where the image may be inserted into a report, and printed or saved to .PDF, .HTML, .RTF, and other file formats. In addition, the

Report Editor allows for customizing the header, footer and logo. The image will appear similar to the one shown below.



Print Report (button from the toolbar)

X (Close button to return to the Cross Section Editor window)

In the next section, you will see how multiple cross sections can be viewed in the 3D Explorer.

3D Visualization with HGA 3D-Explorer

HGA 3D-Explorer is a powerful 3D visualization and animation package that is seamlessly integrated within HGA. HGA 3D-Explorer was designed as a tool for displaying multiple cross-sections/fence diagrams, well locations with lithology, maps, contours, etc., all within the same 3D graphical environment. HGA 3D-Explorer brings your data and data queries to life and takes the guessing out of data interpretation. With just one click of a button, you can explore your data!

The HGA 3D-Explorer offers a truly unique perspective of the entire site, through its ability to display multiple cross-sections simultaneously; this perspective is not possible when viewing individual 2D cross sections. In addition, basemaps may be displayed for relating the fence diagrams to surface features. The various graphical tools and presentation formats available are specifically designed for viewing geology and hydrogeology data. In addition to displaying fence diagrams, the HGA 3D-Explorer can also be used to display surfaces for each layer involved in the interpretation. Use the HGA 3DExplorer to import basemaps to relate this to the cross-section interpretations. For example, a contour map or DXF site map may be overlaid on top of multiple fence diagrams. Finally, use the AVI recording tools to record the auto-rotation of the 3D fence diagrams for presentation purposes.

Some of the key features of the HGA 3D Explorer are highlighted below:

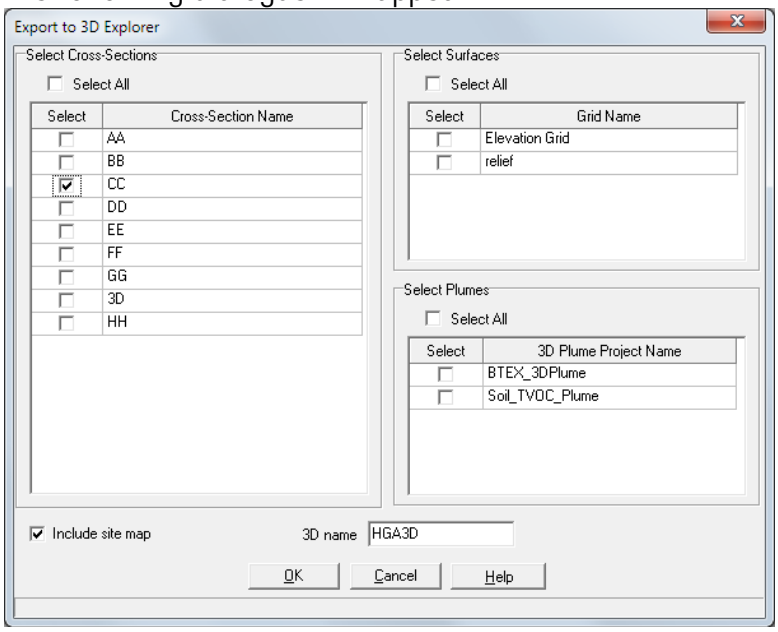
- Render colorful, high-impact, 2D/3D views of any number of cross-sections
- Views cross-sections as geologic, hydrogeology, or model layers
- Display contaminant plumes in the form of color maps or isosurfaces
- Simultaneously view boreholes with lithology, and cross-sections in full 3D
- Auto-rotate the model image around the X, Y, Z axis
- Record and save animations during auto-rotation
- Import grid files containing water table elevation, geologic surfaces, or topography
- Import and overlay basemap (DXF, BMP)
- Drape maps over any selected surface (e.g. drape .bmp file over ground surface)
- Set any vertical exaggeration factor
- Display legend relating soil names and patterns
- Assign various objects as transparent
- Save configuration settings (e.g white background, black axis, etc.)
- Export 3D view to image format (JPG, GIF, BMP)
- Send 3D views to the Report Editor to be included in reports
- Copy 3D window to clipboard

In this demonstration, you will select a few cross sections from the Site_Map map project, and load these into 3D Explorer.

From the Cross Section Editor,

View / View 3D (from the main menu, or select the  button from the toolbar)

The following dialogue will appear:



Select the cross sections to display from the dialogue, by placing a check mark beside each cross section name. Or, to select all cross sections, place a check mark beside Select All at the top of the dialog.

Select AA, CC, EE, GG (place checkmark beside these cross sections)

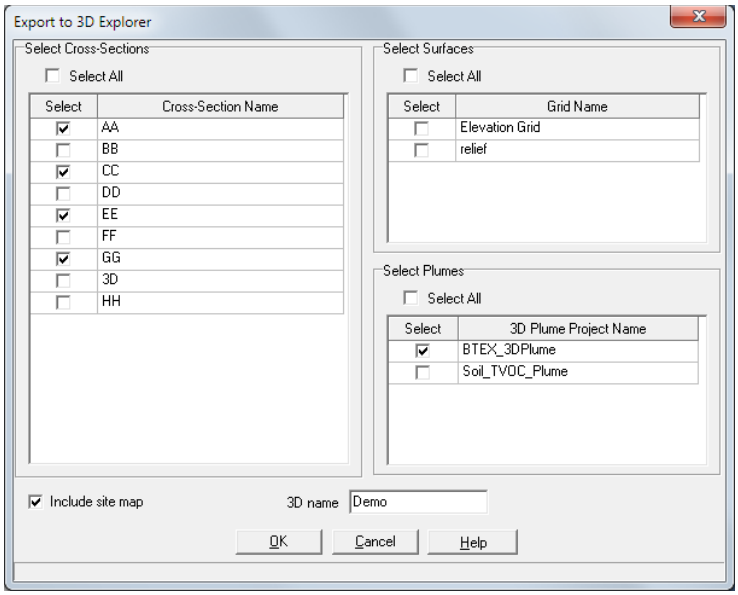
Under the Plumes frame,

BTEX_3DPlume (place checkmark beside this plume)

In the demo project, the plume file has been created for you.

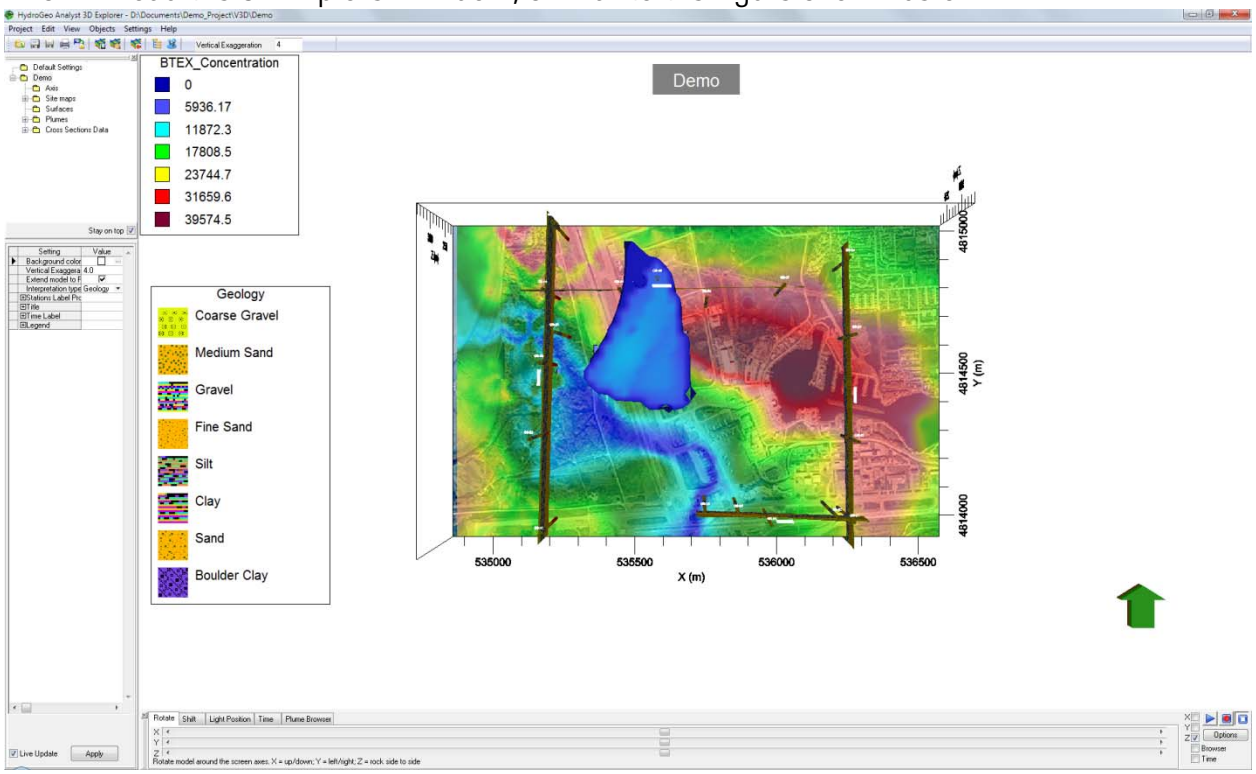
Enter a name for the 3D project in the field in the lower-right corner:

Demo (type in 3D Name Field)



OK

This will load the 3D Explorer window, similar to the figure shown below:



You will see that the fence diagrams produce a new perspective on the site geology. The site map from the demo map project is also displayed, by default, to help relate the cross section data to surficial features.

Navigation Tools

Locate the field containing the Vertical Exaggeration (at the top of the window), and enter a new value:

4 (type in field)
Enter (on your keyboard)

At the bottom of the 3D window, there is a Navigation tools panel which is used to orient the 3D grid. To rotate the 3D grid,

Rotate (tab on the Navigation Toolbars)
X (slider bar)

Drag the X slider bar slowly to the left, to see the resulting affect on the 3D grid.

Alternately, you may use the AutoRotate feature. The AutoRotate tools located on the right-hand side of the Rotate tab may be used to continuously rotate the model image around the X, Y and/or Z axis.

Z (place a checkmark beside this option on the right-side of the controls)

Play (select the  button to start the rotation)

Observe the rotation for a few seconds, then,

Stop (select the  button to stop the rotation)
Z (select to de-select this option)

You can shift or zoom in/out of the 3D grid using the shift options.

Shift (tab on the Navigation Toolbars)
Z (slider bar)

Drag the slider bar to the left to zoom out, or to the right to zoom in.

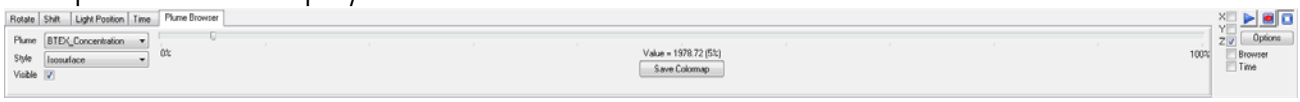
The 3D Explorer window contains several controls, which are not discussed in this exercise. Individual cross sections and interpretation types may be shown or hidden from the 3D display, using the project tree on the left side of the 3D Explorer window. However, these capabilities are not explored in this demo exercise. For more details, refer to HGA's User's Manual.

3D Plume Visualization

HGA provides the ability to display and animate 3D volumes of contaminants, in the format of color maps, isolines, or isosurfaces; a powerful visualization feature that is demonstrated below.

Plume Browser (tab on the Navigation Toolbars)

The options will be displayed as shown below.



When the 3D project was created, the 3D-Explorer displays the plume in the form of an isosurface by default. The default isosurface value will be 5% of the maximum concentration value.

The options in the Plume Browser tab provide you with a preliminary assessment of the plume. As such, there are basic options for color maps and isosurfaces. Once you have a better understanding of where the contaminants lie, and at what time steps, you can use the more advanced options in the Plumes node in the tree; this includes:

- advanced isoline maps with color fill and line settings
- color maps with clip at cut-off options
- isosurface options, including color from palette, show borders, and display volume estimation

In the Style combo box, select the desired display style. Select from Colormap on XY, XZ, or YZ planes, or Isosurface.

The Visible checkbox shows/hides the current plume browser display element.

Time (place a checkmark, on the right-side of the controls)

Play (select  button to start the animation)

Observe the animation of the plume for a few seconds. Note the time label at the top of the 3D window, that shows the corresponding time interval.

Stop (select the  button to stop the animation)

When you are satisfied with an isosurface, you can save it to the Plumes tree, for further manipulation. By doing so, you will enable more advanced options for the isosurface, and this will allow for displaying multiple colormaps and/or isosurfaces.

Save Isosurface button

The new isosurface value will be added to the tree, under Plumes / Plume / Region / BTEX / Isosurface_1. From here, you may modify the isosurface value, display settings, and also view the Volume Estimation. To modify the Isosurface value, you must load the Isosurface Properties; to do so, click on the [...] button beside Isosurface Properties.

Now, return to the Plume Browser tab in the Navigation tools
Change the display type from Isosurface to ColorMap:

Colormap (on XY Plane from the Style combo box)

Use the Slider bar, and set the Position to ~50%, as shown below:

Play (select the  button to start the animation)

Observe the animation of the plume for a few seconds. Note the time label at the top of the 3D window, that shows the corresponding time interval.

Stop (select the  button to stop the animation)

Change the colormap display type:

Colormap (on XZ Plane from the Style combo box)

Now you will animate the position of a colormap, but at a fixed time interval

Time (tab on the Navigation Toolbars)

Use the Slider bar, set the time to near the end of the animation (~ 12/1/2000)

Plume Browser (tab on the Navigation Toolbars)
Time check-box, (to disable this option)
Browser check-box, (to enable this option)

Play (select the  button to start the animation)

Observe the animation of the colormap for a few seconds. In this scenario, the color map position will be animated through the entire site domain, in a loop, for a fixed time.

Stop (select the  button to stop the animation)

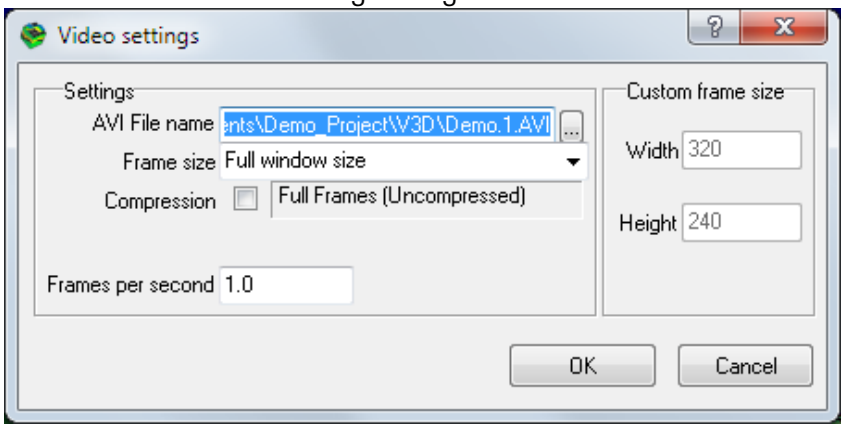
When you are satisfied with a view, click on the [Save Colormap] button to add this display element to the 3D Project, under the Plumes node in the tree.
There are numerous features available for the Plumes that are not illustrated in this exercise. For more details, please consult the HGA's Users Manual.

Record AVI File

You can record 3D animation (rotation, plume animation, isosurface or color map spanning) to an .AVI file. To do so

Record (select the  button located on the Navigation toolbar)

This will load the following dialog:



By default, the .AVI file will be saved to the folder in which the project is located. You can change the file destination by browsing to the desired location. You can also set the speed of the video by changing the value in the "Frames per second" field. The larger the value, the faster the video will play. This has no effect on the recording time. Feel free to record a video file now by pressing [OK].

OK (button)

When you are finished, after about 30 seconds

Stop (select the  button to stop the recording)

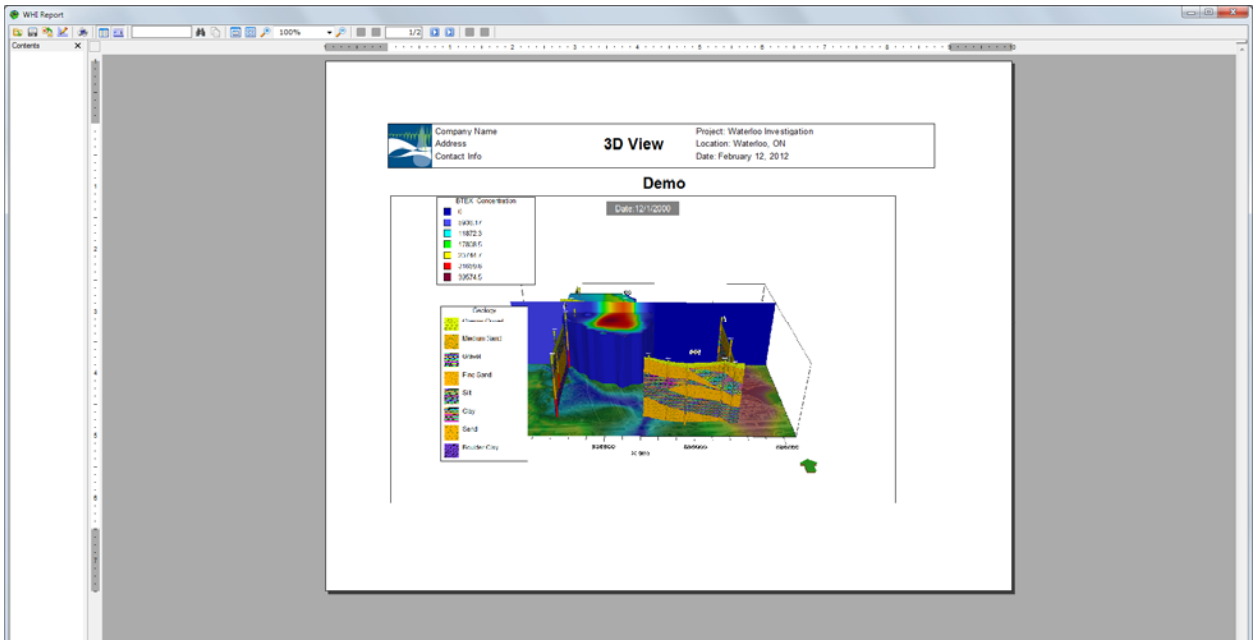
NOTE: The recorded .AVI files may get very large depending on the length of the video. To play back the file, browse to the folder on your hard drive, locate the .AVI file and load it into a supported media player.

Saving and Printing

Once the desired view has been loaded, the 3D image may be loaded into the Report Editor for printing. To do so,

Project / Print (from the 3D Explorer main menu)
Select any print template from the list
OK

The 3D window will load into the Report Editor, where the image may be inserted into a report, and printed or saved to .PDF, .HTML, .RTF, and other file formats. In addition, the Report Editor allows for customizing the header, footer and logo. The image will appear similar to the one shown below.



Print Report (button from the toolbar)
X (Close button to return to the 3D Explorer window)

Then, close the 3D Explorer window by selecting

Project / Exit (from the 3D Explorer main menu)

Report Editor

Generating professional reports from groundwater and environmental projects can be a time-consuming effort. It becomes particularly challenging when a project includes rounds of information for various dates spanning over months or even years.
Furthermore, many regulatory agencies require adherence to specific reporting formats.
To overcome these challenges, HGA was designed with the Report Editor. The Report Editor is a time-saving component used for creating professional reports that contain any number of datasets plus, include 2D and 3D views for your projects.

HGA's Report Editor includes the following features:

- SWS Report Wizard offers step-by-step guidance for creating report templates
- Dynamic linking of reports to HGA data and components make creating reports easy
- Customize reports to meet regulatory report format requirements
- Easy-to-use Report Designer environment makes creating report templates a snap

Explorer and Property Tool Boxes offer complete flexibility for:

- Formatting objects (alignment and distribution)
- Inserting standard footer and headers including logos
- Adjusting text color, font, style, size, location
- Defining column, row, and field heights
- Create an unlimited number of report layouts and save for future use
- Incorporate data values, time-series graphs, log, cross-sections, 3D views, etc.
- Define page and printer setup
- Preview the complete report prior to printing
- Provides Barcode control
- Allows report bookmarks and Internet hyperlinks

Export final reports to:

- Portable Document Format (PDF)
- Rich Text Format (RTF)
- Web-ready Hypertext Markup Language (HTML)
- Microsoft Excel TM (XLS)
- Tagged Image File Format (TIF)
- Plain Text File (TXT)

This concludes the Demo Project Guide.