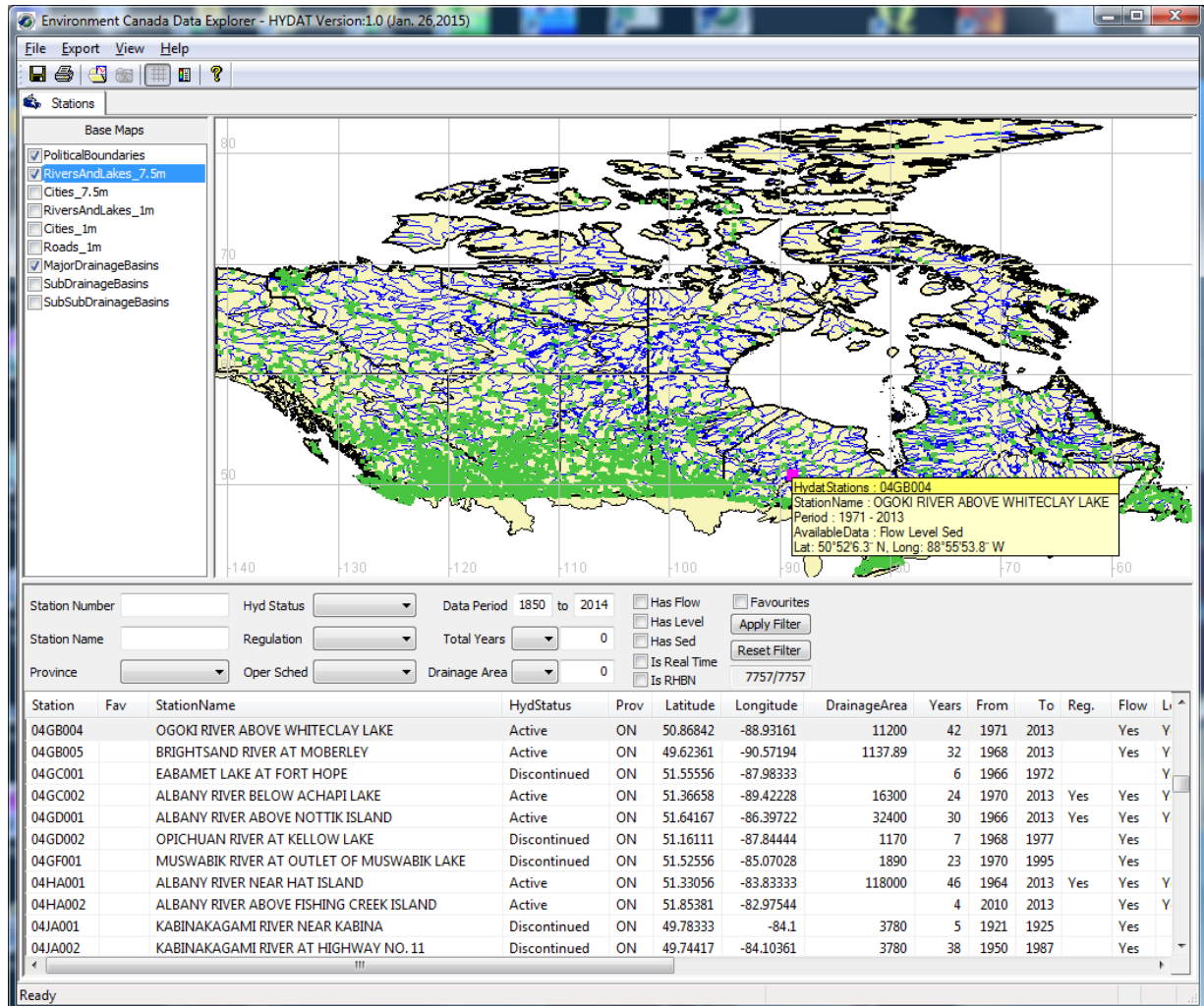




# EC DataExplorer



Version 2.1

Mar 2016



Environment  
Canada

Environnement  
Canada

<b>Environment Canada Data Explorer</b>	<b>- 4 -</b>
<b>1.1 – Introduction to EC DataExplorer</b>	<b>- 4 -</b>
<b>1.2 - Installation</b>	<b>- 4 -</b>
1.2.1 - System requirements	- 4 -
1.2.2 - Installing the Program	- 4 -
<b>2.1 – The EC DataExplorer View</b>	<b>- 6 -</b>
<b>2.2 – Displaying Base Maps and GIS Data</b>	<b>- 7 -</b>
<b>2.3 – Navigating Within the Map View</b>	<b>- 8 -</b>
2.3.1 – Zooming with the Map View	- 8 -
2.3.2 – Panning the Map View	- 8 -
2.3.3 – Returning to the Default View	- 8 -
<b>2.4 – Customizing the Map View</b>	<b>- 9 -</b>
2.4.1 – Showing or Hiding the Grid	- 9 -
2.4.2 – Showing or Hiding the Legend	- 9 -
<b>3.1 - Selecting a Station</b>	<b>- 9 -</b>
3.1.1 - Applying a Filter	- 10 -
3.1.2 - Sorting the Station Set	- 12 -
3.1.3 - Viewing Station Details	- 13 -
3.1.4 – Designating Favourite Stations	- 13 -
<b>4.1 – The Station View Interface</b>	<b>- 15 -</b>
4.1.1 – Closing the Station View	- 16 -
<b>4.2 –The Time Series View</b>	<b>- 17 -</b>
4.2.1 – Navigating Within the Time Series View	- 17 -
4.2.2 – Manipulating the Legends	- 18 -
<b>4.3 – The Data Table Control</b>	<b>- 19 -</b>
4.3.1 – Opening Data Tables	- 19 -
4.3.2 – Closing Data Tables	- 19 -
4.3.3 – Displaying Empty Records	- 19 -
4.3.4 – Interpreting Data Tables	- 20 -
<b>5.1 – Exporting Data</b>	<b>- 22 -</b>
5.1.1 - Green Kenue Viewer	- 22 -
5.1.2 – Saving a Station Set	- 22 -
5.1.3 – Saving a Time Series	- 22 -
5.1.4 – Saving a Data Table	- 23 -
5.1.5 – Exporting Multiple Data Objects	- 23 -
<b>6.1 – Historical Time Series Analysis (HTSA)</b>	<b>- 26 -</b>
6.1.1 - Launching the HTSA	- 26 -
6.1.2 - The HTSA Graphics Tab	- 28 -
6.1.3 – The HTSA Table Tab	- 31 -
<b>Appendix 1 – Advanced Configuration</b>	<b>- 33 -</b>
A1.1 – Changing the location of the HYDAT Database	- 33 -
A1.2 – Customizing the Map Layers	- 33 -

<b>Appendix 2 – Database Structure</b>	<b>- 35 -</b>
<b>Appendix 3 – File Formats</b>	<b>- 47 -</b>
A3.1 - File Headers	- 47 -
A3.2 – Line Sets (i2s)	- 48 -
A3.3 – Point Sets (pt2)	- 49 -
A3.4 – Time Series (ts3)	- 49 -
A3.5 – Tables (tb0)	- 50 -

# Environment Canada Data Explorer

## 1.1 – Introduction to EC DataExplorer

**EC DataExplorer** is a self-contained application that acts as a browser and search engine for Environment Canada's **HYDAT** database. It allows you to search for a hydrometric gauging station by location, name, data period, or other criteria, and to view data graphically or in tabular form. As of version 2.0.9 an analysis tool has been made available that allows the user to interactively compare daily time-series data over a specified period with statistically summarized historical data.

## 1.2 - Installation

### 1.2.1 - System requirements

For best results, EC DataExplorer should be used on a computer that meets the following standards:

- Microsoft Windows XP SP3, Vista SP1, or Windows 7, with all critical patches installed
- Intel Core2Duo or equivalent processor, 2 GHz or faster
- OpenGL-capable video card with up-to-date drivers. Nvidia preferred
- 1 GBytes RAM (2 GBytes recommended)
- 1 GByte HDD space free
- MS Access or MS Access Runtime Library must be installed (included);

### 1.2.2 - Installing the Program

Once you have downloaded the program, you must install it before it can be used.

#### To install EC DataExplorer:

1 - Locate the **ECDataExplorer\_#.#.#\_32bit.msi** file on your computer, where **#.#.#** indicates the version number of the program.

2 - Double-click on the file or right-click and select **Install**.

**Note:** You must have Administrative privileges to install the program.

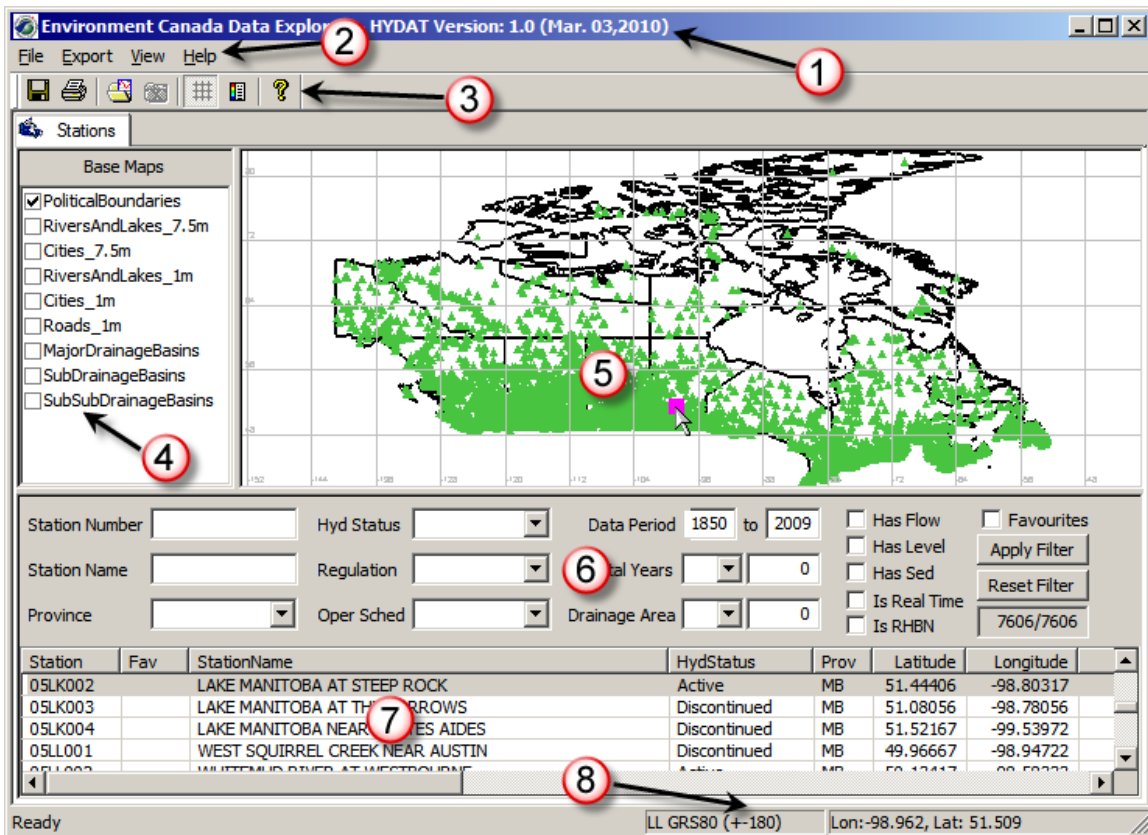
3 - Follow the prompts within the installation program.

If you do not have Microsoft Access or the Microsoft Access Runtime Library installed, then complete steps 4-6.

- 4 - Once the installation has completed, locate the folder into which EC DataExplorer was installed. The default location is:  
**C:\Program Files\EC\ECDataExplorer.**
- 5 - In the **Support** folder, double-click on **AccessRuntime.exe** or right-click on it and select **Open**. Under Windows 7, right-click and select **Run As Administrator**.
- 6 - Follow the prompts to install the Microsoft Access Runtime Library. When this installation is complete, EC DataExplorer is ready to use.

**EC DataExplorer** can be launched by double-clicking the icon, which is located on the desktop, or by selecting the program from the Start menu.

## 2.1 – The EC DataExplorer View

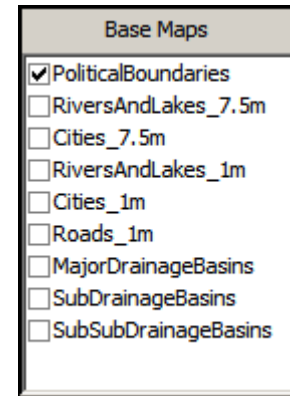


- 1 - **The Title Bar** – The Title Bar indicates the name of the program and the version and date of the HYDAT database installed.
- 2 - **The Menu Bar** – The Menu Bar allows access to all of the command options available in EC DataExplorer.
- 3 - **The Toolbar** – The Toolbar gives quick access to the most commonly used commands.
- 4 - **The Base Maps Control** – This area allows you to select which maps are displayed in the Map View control.
- 5 - **The Map View** – This area displays the maps selected in the Base Maps window, along with the markers for each of the gauging stations.
- 6 - **The Filter Panel** – The Filter Panel lets you restrict which gauging stations are shown in the Map View control and the Station Set.
- 7 - **The Station Set Table** – This area shows the information associated with each of the gauging stations shown in the Map View.
- 8 - **The Status Bar** – This area shows the projection system used in the Map View control, as well as the coordinates of the cursor.

## 2.2 – Displaying Base Maps and GIS Data

The Base Maps Control allows you to choose which maps are displayed in the Map View control. By default, only the Canada outline map is displayed, along with the locations of each of the gauging stations. Other maps can be shown or hidden by checking or clearing the checkbox next to the map name. Nine maps are included:

- PoliticalBoundaries
- RiversAndLakes\_7.5m
- Cities\_7.5m
- RiversAndLakes\_1m
- Cities\_1m
- Roads\_1m
- MajorDrainageBasins
- SubDrainageBasins
- SubSubDrainageBasins



The maps with names ending in 1m contain data at a scale of 1:1,000,000, while those ending in 7.5m contain data at a scale of 1:7,500,000. The higher resolution maps contain finer data, but will require more system resources to display. Other maps can be shown in the Base Maps control and Map View control as well. See [Appendix 1: Advanced Configuration](#) for details on adding other GIS data.

You can also customize the appearance of the base maps. See [Appendix 1: Advanced Configuration](#) for details on customizing the base maps.

All included maps are derived from GeoGratis Data. More information on GeoGratis can be found at this website: <http://www.geogratis.ca/>

## 2.3 – Navigating Within the Map View

The Map View shows the Base Maps and the geographical locations of each of the gauging stations. You can zoom and pan the displayed map. When panning the Map View, the mouse cursor will change to a hand icon.

### 2.3.1 – Zooming with the Map View

- **To zoom in**, click within the Map View to activate it, and then scroll up with the mouse wheel. Alternatively, you can hold down the **Ctrl** key and the left mouse button and move the mouse cursor upwards.
- **To zoom out**, select the Map view (by clicking inside), and then scroll down with the mouse wheel. Or, hold down the **Ctrl** key and the left mouse button and move the mouse cursor downwards.

### 2.3.2 – Panning the Map View

- **To pan the Map View**, click the left mouse button within the window and drag the mouse cursor in the direction you would like to move.

### 2.3.3 – Returning to the Default View

- **To return the Map View to its original perspective**, right-click within the window and select **Default View**. Note that this will not unselect any gauging station that is highlighted.



## 2.4 – Customizing the Map View

Within the EC DataExplorer View, you can customize the appearance of the Map View by showing or hiding the Grid and the Legend object. By default, the Grid is visible and the Legend is turned off.

### 2.4.1 – Showing or Hiding the Grid

- **To show or hide the Grid**, select **View→Show Grid** from the Menu Bar. If the grid is shown, the menu option will become checked.

### 2.4.2 – Showing or Hiding the Legend

- **To show or hide the Legend**, select **View→Show Legend** from the Menu Bar. If the Legend is shown, the menu option will become checked.

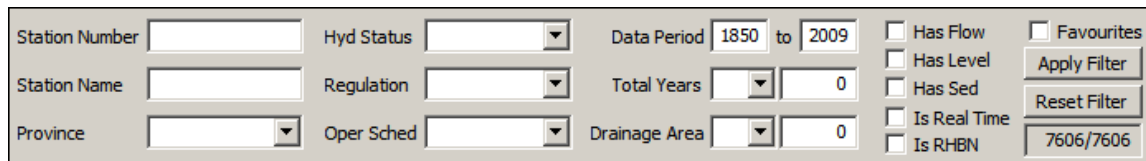
▲	HydatStations
—	PoliticalBoundaries
—	RiversAndLakes_7.5m
◆	Cities_7.5m
—	RiversAndLakes_1m
◆	Cities_1m
—	Roads_1m
	MajorDrainageBasins
	SubDrainageBasins
	SubSubDrainageBasins

## 3.1 - Selecting a Station

To view detailed data for a gauging station, including graphs and tables of data recorded over time, you will need to select the station and load its data.

### 3.1.1 - Applying a Filter

When you are trying to locate a specific station, or a type of station, the filter panel can be very useful in narrowing down your options and letting you locate the data you want. In each case (except Data Period), a field that is left blank is ignored when applying a filter.



The screenshot shows a filter panel with the following fields and options:

- Station Number: [text input]
- Hyd Status: [dropdown menu]
- Data Period: [1850] to [2009]
- Station Name: [text input]
- Regulation: [dropdown menu]
- Total Years: [dropdown menu] [0]
- Province: [dropdown menu]
- Oper Sched: [dropdown menu]
- Drainage Area: [dropdown menu] [0]
- Has Flow: ☐
- Has Level: ☐
- Has Sed: ☐
- Is Real Time: ☐
- Is RHBN: ☐
- Favourites: ☐
- Buttons: Apply Filter, Reset Filter
- Text: 7606/7606

There are 15 filter criteria:

- **Station Number** – This field searches for a string of characters that appear at the beginning of the seven-character Station Number field. The first two digits on the Station Number indicate the major drainage basin in which the station is located. The next two characters indicate the sub-basin and sub-sub-basin. The last three digits indicate the specific station within the sub-sub-basin. For example if you enter “02J” and apply the filter, you will see all the stations located in sub-basin 02J (the Upper Ottawa).
- **Station Name** – This field searches for a string of characters that can be found anywhere within the Station Name field. This is the official name of the gauging station, including the body of water on which the station is located and the approximate location. This field can be up to 70 characters in length.
- **Province** – This field restricts the displayed stations to those located in a particular province, territory or state. Note that in the case of areas that have changed designations, the value is based on where the station is currently located. This field may also be left blank to avoid filtering by province.
  - **AB** – Alberta
  - **BC** – British Columbia
  - **MB** – Manitoba
  - **NB** – New Brunswick
  - **NL** – Newfoundland and Labrador
  - **NS** – Nova Scotia
  - **NT** – Northwest Territories
  - **NU** – Nunavut

- **ON** – Ontario
  - **PE** – Prince Edward Island
  - **QC** – Quebec
  - **SK** – Saskatchewan
  - **YT** – Yukon Territory
  - **ME** – Maine
  - **MN** – Minnesota
  - **MT** – Montana
  - **ND** – North Dakota
  - **AK** – Alaska
  - **WA** – Washington
  - **ID** – Idaho
- **Hyd Status** – This field may be changed to Active or Discontinued or left blank. Selecting Active will show stations where data collection is still being carried out. Selecting Discontinued will show stations where data is not longer collected.
  - **Regulation** – This field may be set to Regulated or Natural or left blank. Regulated gauging stations are those that feature a regulating structure upstream, such as a dam or weir.
  - **Oper Sched** – This field, short for Operating Schedule, may be set to Continuous, Miscellaneous, or Seasonal, or left blank. This refers to the frequency of data recording—year-round, only during certain seasons, or some other pattern.
  - **Data Period** – This field sets the lower and upper limits, respectively, for the time period displayed in the station set. The default values are for a range of 1850 to 2009, the latest year for which data is currently available. When you apply the filter, the results will include all gauging stations that have at least one data record falling within the indicated range.
  - **Total Years** – This field allows you to search for stations that have recorded data spanning a minimum or maximum number of years. To search for stations with a maximum span, select **<=** from the list. To search for stations with a minimum span, select **>=**. In either case, enter the limit in the second box.
  - **Drainage Area** – This field allows you to search for stations that have a maximum or minimum drainage area. To search for stations with a maximum area, select **<=** from the list. To search for stations with a minimum area, select **>=**. In either case, enter the limit in the second box.

- **Has Flow** – This field indicates whether a station has had Flow rate data included in its history. To search for only stations including Flow data, click on the checkbox.
- **Has Level** – This field indicates whether a station has had Water Level recorded. To search for only stations including Level data, click on the checkbox.
- **Has Sed** – This field indicates whether a station has had sediment data recorded. To search for only stations that include Sediment data, click on the checkbox.
- **Is Real Time** – This field indicates whether the method of data collection at the gauging station includes real-time data. If a station contains both real-time and sampled data, this field will be active. To search for only stations that have real-time data recorded, click on the checkbox.
- **Is RHBN** – This field indicates whether the gauging station is part of the Reference Hydrometric Basin Network. To search for only stations that are part of the RHBN, click on the checkbox.
- **Favourites** – This field indicates whether the filter will return results limited to stations designated as Favourites according to the currently loaded Favourite Stations list. See [3.1.4 – Designating Favourite Stations](#) for more information on Favourite Stations lists.

Once you have selected all of your Filter criteria, click the **Apply Filter** button or hit **Enter** to restrict the Station Set. The count display under the button will show how many stations fall within your search.

To remove your Filter and show all stations again, click the **Reset Filter** button. This will also clear all of your entered Filter criteria and return the Station Set to the default sort order.

### 3.1.2 - Sorting the Station Set

Even with a Filter applied, there may still be as many as several thousand gauging stations included in your Station Set. To make the list easier to navigate, you can sort the list by any category.

Station	Fav	StationName	HydStatus	Prov	Latitude	Longitude	DrainageArea	Years			
From	To	Reg.	Flow	Level	Sed	OperSched	RealTime	RHBN	Region	Datum	Agency

- **To sort the Station Set**, click on the header bar for the column by which you would like to sort. This will sort the displayed station in ascending order. To reverse the sort order (to descending order), click on the header bar again. To return to the default sort order, you can also click the **Reset Filter** button.

### 3.1.3 - Viewing Station Details

Once you have located the gauging station that you would like to examine, the next steps are to select the station and view it.

1 - **To select a station**, either:

- Double-click on the station within the Map View window. This will highlight and jump to the station in the Station Set.
- Click on the station within the Station Set table. This will highlight the station in the Map View window.

**Note:** You may also Ctrl-Click to select multiple stations, or Shift-Click to select a range of stations. Each station selected will be highlighted in the Map View window.

2 - **To view the selected station**, either:

- Right-click on the highlighted station within the Map View or the Station Set and select **View Selected Station** from the menu.
- Double left-click on the highlighted station within the Station Set.
- Click on the **View Selected Station** button on the Tool Bar.
- Select **View→Selected Station** from the Menu Bar.

**Note:** If more than one station is selected, all will be opened when any is opened. If you have selected more than 20 stations, you'll be prompted to confirm before the stations are opened.

**Note:** If the selected station is already open, re-opening it will switch the active window to the Station View for the station.

### 3.1.4 – Designating Favourite Stations

If you frequently work with a particular set of stations, you can designate those stations as Favourites. You can then search for those stations easily by checking the Favourites box on the Filter Panel. You can also save and load multiple lists.

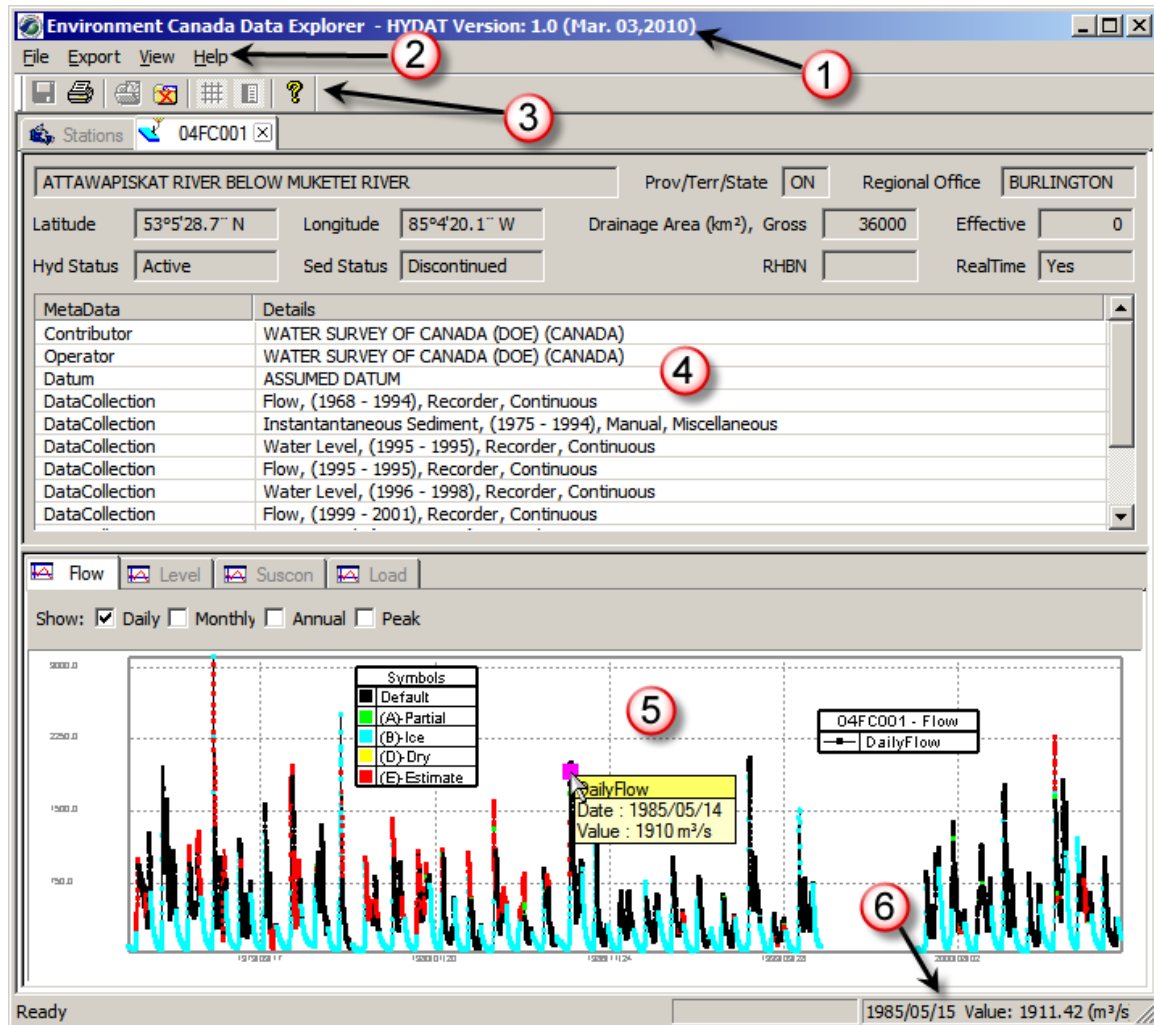
- **To add a station to your Favourite Stations list**, select the station within the Station Set and right-click on it. From the shortcut menu, select **Add to Favourite Stations List**. You'll see the word **Yes** appear in the **Fav** column of the Station Set for the selected station.
- **To remove a station from your Favourite Stations list**, select the station within the Station Set and right-click on it. From the shortcut menu, select **Remove from Favourite Stations List**. You'll see the word **Yes** disappear from the **Fav** column of the Station Set for the selected station.
- **To save your Favourite Stations List**, from the Menu Bar, select **File→Save Favourite Stations List**. Give the list a name and click **Save**. You can have as many Favourite Stations Lists as you like.

- **To load a Favourite Stations List**, from the menu bar, select **File→Load Favourite Stations List**. Select the Favourite Stations List that you'd like to load and click **Open**.

**Note:** You can have only one Favourite Stations List loaded at a time. When you load a new Favourite Stations List, any stations designated as Favourites that are not part of the new Favourite Stations List will no longer be designated as Favourites.

## 4.1 – The Station View Interface

When you choose to view a gauging station, it is displayed in the Station View window, which opens immediately.



- 1 - **The Title Bar** – The Title Bar shows the program name, as well as the version and date of the HYDAT Database.
- 2 - **The Menu Bar** – The Menu Bar allows access to all of the command options available in EC DataExplorer. It is largely the same as in the Map View, with the addition of the Close Current Station option.
- 3 - **The Tool Bar** – The Toolbar gives quick access to the most commonly used commands.
- 4 - **The Station Details Panel** – This area shows all of the Station Details associated with the gauging station. This includes the data available in the

Station Set, as well as the Metadata and details on how the data was collected.

**Note:** The Metadata presented in this panel is a detailed summary of station's data collection history. Some information may not be consistent with that in the station set table, which presents the data available in the current version of Hydat database. For further information, please inquire via email to: [wsc@ec.gc.ca](mailto:wsc@ec.gc.ca).

- 5 - **The Data Panel** – This area shows the time series associated with the gauging station and the data tables from which they are derived.
- 6 - **The Status Bar** – Within the Station View window, the Status bar shows the time and value (X- and Y-coordinates, respectively) of the point located beneath the mouse cursor.

#### 4.1.1 – Closing the Station View

- **To Close the Station View**, click on the red 'X' button that appears in the header bar of the Station Details Panel or select **View→Close Current Station** from the Menu Bar.



- **To Close All Open Stations**, select **View→Close All Stations** from the Menu Bar.



## 4.2 –The Time Series View

The Time Series View is used to display Time Series data from gauging stations in graphical format. Depending on the data involved, they may be shown as a line or a series of points.

There are four panels that may be available in this section; not all stations will display all four tabs.

- **Flow** – The rate of flow for a waterway is shown in m<sup>3</sup>/s.
- **Level** – Water level is shown in m of elevation relative to the station Datum.
- **Suscon** – The concentration of suspended material is given in mg/l.
- **Load** – Sediment load is displayed in tonnes.

By checking or clearing the checkboxes above the Time Series display, you can show or hide the Daily, Monthly, Annual, or Peak data for a particular tab. Each tab remembers which datasets are displayed separately. If a particular dataset was not recorded for the station, that checkbox will be inaccessible.

### 4.2.1 – Navigating Within the Time Series View

Much like the Map View control, you can zoom and pan within the Time Series display. See [section 2.3 – Navigating Within the Map View](#) for specifics.

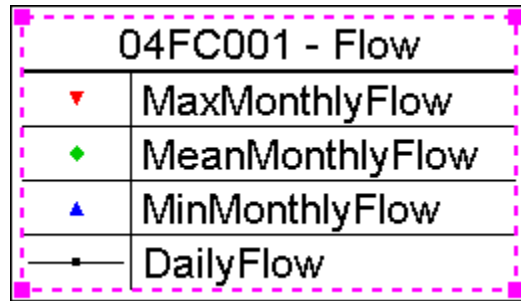
By holding down the **Ctrl** key and the left mouse button, you can zoom in or out on the vertical and horizontal axes independently.

**To compress the View horizontally**, hold down **Ctrl** and the left mouse button and move the mouse to the left; **to stretch the View horizontally**, move the mouse to the right.

**To compress the View vertically**, hold down **Ctrl** and the left mouse button and move the mouse downwards; **to stretch the View vertically**, move the mouse upwards.

#### 4.2.2 – Manipulating the Legends

The Legend objects, which are shown within the Time Series display, automatically update to indicate which values are being shown, and the symbols being used to display them.



04FC001 - Flow	
▼	MaxMonthlyFlow
◆	MeanMonthlyFlow
▲	MinMonthlyFlow
—■—	DailyFlow

**To move or resize the Legend**, double-click on it so that it is shown with a broken magenta border. You can then click and drag it to relocate it, or drag the edges to resize it.

Note that unlike the Map View, the Legend and Grid cannot be turned off within the Station View.

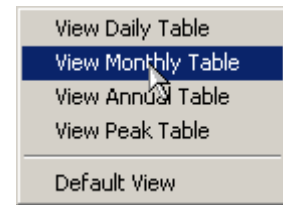
## 4.3 – The Data Table Control

In addition to viewing recorded data in the Time Series View, you can take a closer look by examining the tabular data that underlie the graphs.

### 4.3.1 – Opening Data Tables

To view tabular data for a Time Series, you can:

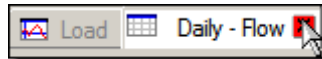
- Right-click on the Time Series Data Panel and select the Table that you'd like to view from the menu.
- From the Menu Bar, select **View→Daily Table**, **Monthly Table**, **Annual Table**, or **Peak Table**.



**Note:** If the selected table is already open, re-opening it will switch to the open table panel.

### 4.3.2 – Closing Data Tables

- **To Close a Data Table**, click on the red 'X' button that appears in the header bar of the Data Table.



### 4.3.3 – Displaying Empty Records

Data Tables may be viewed with empty records hidden or displayed. In the former case, only time periods that contain recorded data are shown on the table. In the latter, all time periods between the first and last time periods with data are shown, some of which may contain no information. By default, empty records are not displayed.

- **To Display Empty Records**, select **View→Include Missing Records** from the Menu Bar. If the Include Missing Records option is currently active, the menu entry will have a checkmark next to it.

**Note:** This option will only be applied to tables that are opened after the option has been activated. If a Data Table is already open, selecting or unselecting the Include Missing Records option will not affect which records are displayed in the table.

#### 4.3.4 – Interpreting Data Tables

Each Data Table for a particular time series has a different set of headers, reflecting the data that it contains.

- **Daily Tables** – Each row in a Daily Table represents one month of daily measurements.
  - **Year** – This column indicates the year of the data contained in the row.
  - **Month** – This column indicates which month is contained in the row. This is an integer from 1 to 12.
  - **1 to 31** – This column header, a digit from 1 to 31, indicates which day's value is contained in the cell.
- **Monthly Tables** – Each row in a Monthly Table is derived from one month of daily measurements.
  - **Year** – This column indicates the year of the data contained in the row.
  - **Month** – The column indicates which month is summarized in the row. This is an integer from 1 to 12
  - **Mean** – This column contains the mean of all measurements for the indicated month, not including days where a dry observation was recorded.
  - **Min. Day** – This column indicates on which day of the month the first occurrence of the minimum measurement was recorded.
  - **Min** – This column contains the minimum measurement recorded during the month.
  - **Max. Day** – This column indicates on which day of the month the first occurrence of the maximum measurement was recorded.
  - **Max** – This column contains the maximum measurement recorded during the month.
- **Annual Tables** – Each row in an Annual Table is derived from one year's worth of measurements.
  - **Year** – This column indicates the year of the data contained in the row.
  - **Mean** – This column contains the mean of all measurements for the indicated year, not including days where a dry observation was recorded.
  - **Min. Month** – This column indicates during which month of the year the first occurrence of the minimum measurement was recorded. This is an integer from 1 to 12.
  - **Min. Day** – This column indicates on which day of the Min. Month the first occurrence of the minimum measurement was recorded.
  - **Min** – This column contains the minimum measurement recorded during the year.

- **Min. Symbol** – This cell may contain a letter indicating how the minimum measurement was obtained.
  - **A** – Partial
  - **B** – Ice
  - **D** – Dry
  - **E** – Estimated
  - **S** – Sample Obtained
- **Max. Month** – This column indicates during which month of the year the first occurrence of the maximum measurement was recorded. This is an integer from 1 to 12.
- **Max. Day** – This column indicates on which day of the Max. Month the first occurrence of the maximum measurement was recorded.
- **Max** – This column contains the maximum measurement recorded during the year.
- **Max Symbol** – This cell may contain a letter indicating how the maximum measurement was obtained. These codes are the same as the ones used for the Min. Symbol column (see above).
- **Peak Tables** – Each row in a Peak Table contains information on a single peak measurement.
  - **Date** – This cell contains the date and time of day when the measurement was taken.
  - **Min** – This cell contains the measurement, if it represented a minimum.
  - **Max** – This cell contains the measurement, if it represented a maximum.
  - **Symbol** – This cell may contain a letter indicating how the measurement was taken. These codes are the same as those used for the Min. Symbol column on the Annual Table tab (see above).

## 5.1 – Exporting Data

### 5.1.1 - Green Kenue Viewer

This section discusses exporting HYDAT data to a number of EnSim file formats. Green Kenue is a freely available software that can be used to visualize and manipulate the EnSim files.

To download a copy of Green Kenue please visit:

[http://www.nrc-cnrc.gc.ca/eng/solutions/advisory/green\\_kenue\\_index.html](http://www.nrc-cnrc.gc.ca/eng/solutions/advisory/green_kenue_index.html)

### 5.1.2 – Saving a Station Set

A Station Set can be saved as either an EnSim Table Data file or a Comma Delimited text file. For details on EnSim Table Data files, see [Appendix 3](#).

#### To Save a Station Set

- 1 - With the EC Data Explorer View active, click the **Save** button on the Tool Bar, or select **File→Save Table** from the Menu Bar.
- 2 - Select a file format. (**.tb0** or **.csv**). The **.tb0** format is as described in [Appendix 3 – File Formats](#). The **.csv** format is a simple listing of data as it appears in the table, suitable for import into a spreadsheet.
- 3 - Select a location and provide a name for the file. By default, the data will be saved in EnSim Table Data format, and named **HydatStations.tb0**.
- 4 - Click **Save**.

### 5.1.3 – Saving a Time Series

Time Series data can be exported into a Type 3 Time Series file, which is a text-based EnSim data file format. For details on Type 3 Time Series files, see [Appendix 3](#).

#### To Save a Time Series:

- 1 - Load the gauging station into the Station View control.
- 2 - On the Menu Bar, click **File→Save Time Series→Daily, Monthly, Annual, or Peak**.
  - If you are exporting a Monthly or Annual Time Series, you will also have to select **Min, Mean, or Max**.
  - If you are exporting a Peak Time Series, you will have to select **Min or Max**.

In any case, if a particular Station does not have a particular Time Series recorded, that option will be unavailable.

- 3 - Select a location and provide a name for the file. By default, the Time Series will be named StationCode\_TimeSeriesName.ts3. For example, the minimum monthly flow time series for the Rideau River above Smiths Falls, station 2LA005, will be **2LA005\_MinMonthlyFlow.ts3**.
- 4 - Click **Save**.

#### 5.1.4 – Saving a Data Table

Data Tables can be saved as either an EnSim Table Data file or a Comma Delimited text file. For details on EnSim Table Data files, see [Appendix 3](#).

##### To Save a Data Table:

- 1 - Load the gauging station into the Station View control
- 2 - View the Data Table.
- 3 - On the Menu Bar, select **File→Save Table** or click the **Save** button on the Tool Bar.
- 4 - Select a file format. (**.tb0** or **.csv**). The .tb0 format is as described in [Appendix 3 – File Formats](#). The .csv format is a simple listing of data as it appears in the table, suitable for import into a spreadsheet.
- 5 - Select a location and provide a name for the file. By default, the data will be saved in EnSim Table Data format, and named StationCode\_DataTableName.tb0. For example, the Monthly Flow Data Table for the Rideau River above Smiths Falls will be saved as **2LA005\_Monthly – Flow.tb0**.
- 6 - Click **Save**.

#### 5.1.5 – Exporting Multiple Data Objects

EC Data Explorer allows you to export multiple datasets from multiple gauging stations at the same time, or to export multiple datasets from a single gauging station.

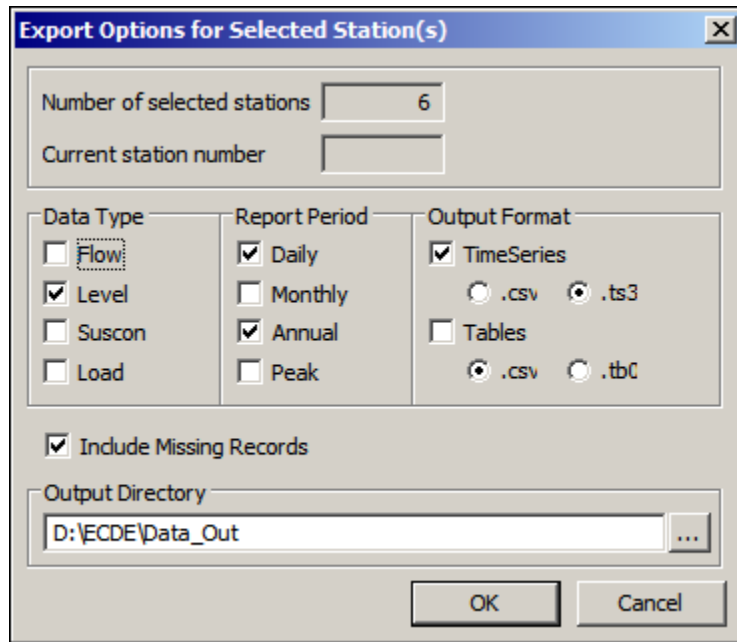
##### To Export Multiple Datasets:

- 1 - To export data from multiple gauging stations, select the gauging stations within the Station Set Table of the EC Data Explorer View by Ctrl-clicking or Shift-clicking.  
  
To export data from the currently active gauging station, go to the station's Station View panel.
- 2 - From the Menu Bar, select **Export→Export Selected Stations** if you're currently in the EC Data Explorer View, or select **Export→Export Current Station** if you're in the Station View.

- 3 - Within the **Export Options for Selected Station(s)** dialog, select the **Data Type**, **Report Period**, and **Output Format** that you'd like to export.

If you're exporting data from multiple stations, the number of stations will be listed in the **Number of selected stations** box.

If you're exporting data from a single station, that station's number will be displayed in the **Current station number** box.



- Within the **Data Type** area, select any or all of **Flow**, **Level**, **Suscon**, or **Load**. You must select at least one **Data Type**.
- Within the **Report Period** area, select any or all of **Daily**, **Monthly**, **Annual**, or **Peak**. You must select at least one **Report Period**.
- Within the **Output Format** area, select either or both of **TimeSeries** or **Tables**. You must select at least one **Output Format**.
  - If you're exporting **TimeSeries**, you may select either **.csv** or **.ts3** format, but not both. The default format is **.csv**.
  - If you're exporting **Tables**, you may select either **.csv** or **.tb0** format, but not both. The default format is **.csv**.

**Note:** The **.csv** file format produced by the export function is designed to be compatible with that produced by the Water Survey of Canada Archived Hydrometric Data website, located at <http://wateroffice.ec.gc.ca/>

- 4 - Choose whether to include or exclude missing records. See Section [4.3.3 – Displaying Empty Records](#) for more information on this option.

**Note:** Activating or de-activating this option is identical to selecting or de-selecting **View→Include Missing Records** from the Menu Bar, and may alter that setting, even outside the **Export** menu.



**Note:** Regardless of the **Include Missing Records** setting, datasets for which no data exists for a particular gauging station will not be exported.

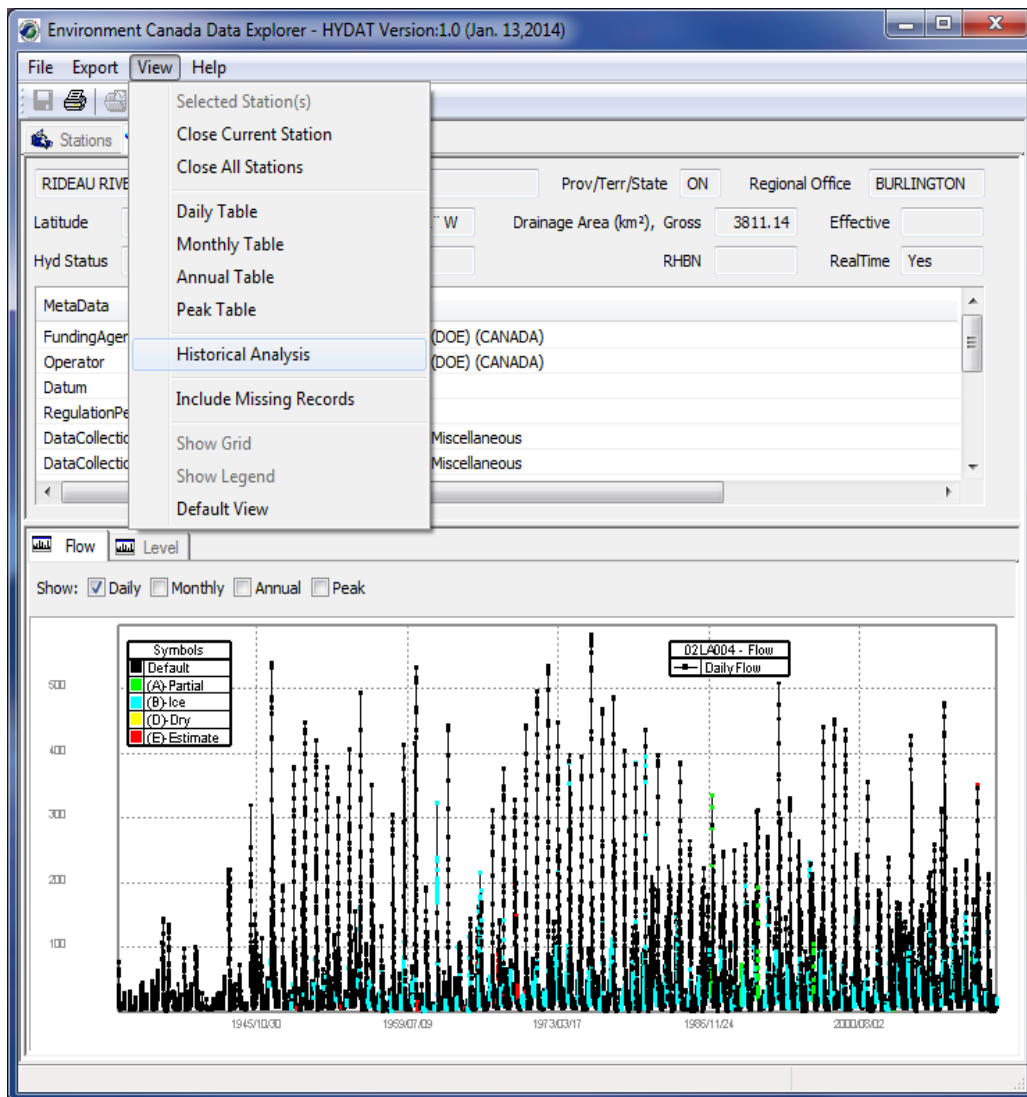
- 5 - Provide an **Output Directory** for the exported records. Click the ... button to browse to the destination directory.
- 6 - Click **OK** to export the datasets, or **Cancel** to return to the program.

## 6.1 – Historical Time Series Analysis (HTSA)

The historical time series analysis (HTSA) provides a graphical and tabular display of time series statistical data summarized over a specified time period.

### 6.1.1 - Launching the HTSA

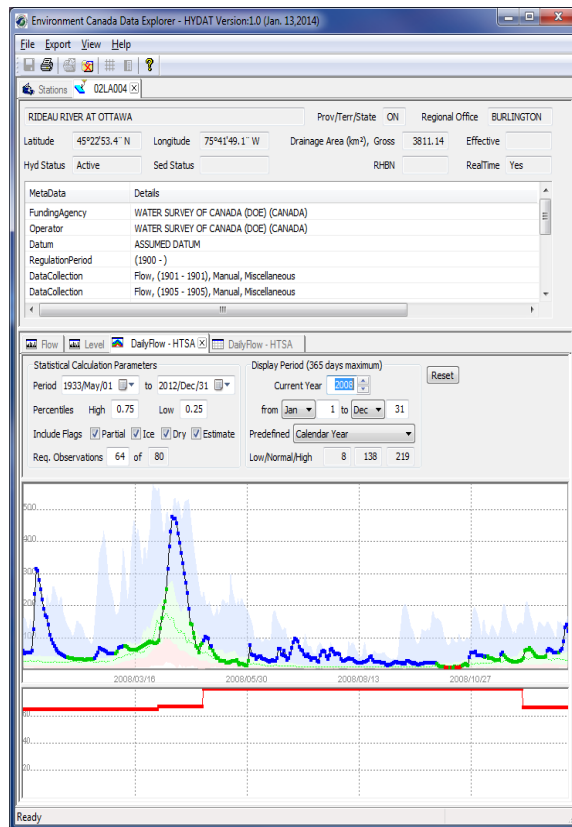
The HTSA must be performed against an open daily time series. After a time series is selected and viewed (see Section 4.1 for details), the HTSA interface can be launched by selecting **View→Historical Analysis** as seen below. A HTSA interface will be launched for the time series that is currently being viewed.



Two separate tabs will be created each labeled with the suffix “- HTSA”.

- The first is the HTSA Graphics tab, identified by the chart icon, contains the HSTA control interface and graphical representation.
- The second is the HTSA Table tab, identified by the table icon, shows the equivalent tabular results shown in the HTSA Graphics tab.

**Figure 1 - HTSA Graphics Tab**



**Figure 2 - HTSA Table Tab**

Environment Canada Data Explorer - HYDAT Version 1.0 (Jan. 13.2014)

File Export View Help

Stations 02LA004 X

RIDEAU RIVER AT OTTAWA Prov/Terr/State ON Regional Office BURLINGTON

Latitude 45°22'53.4" N Longitude 75°41'49.1" W Drainage Area (km²), Gross 3811.14 Effective

Hyd Status Active Sed Status RHN RealTime Yes

MetaData Details

FundingAgency WATER SURVEY OF CANADA (DOE) (CANADA)

Operator WATER SURVEY OF CANADA (DOE) (CANADA)

Datum ASSUMED DATUM

RegulationPeriod (1900 - )

DataCollection Flow, (1901 - 1901), Manual, Miscellaneous

DataCollection Flow, (1905 - 1905), Manual, Miscellaneous

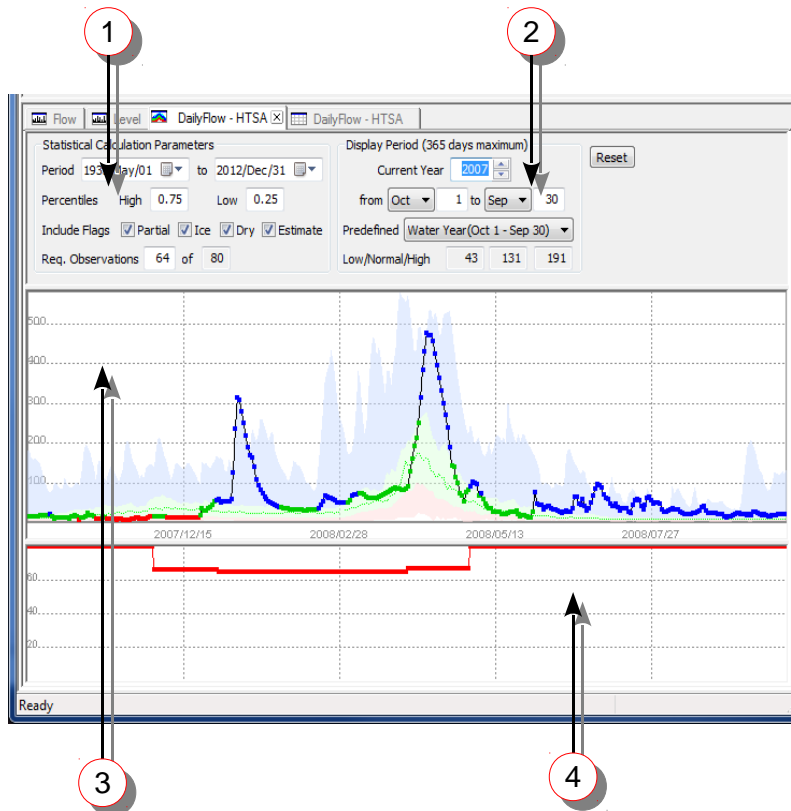
Date	DailyFlow	Symbol	Indicator	WeibullPosition	Max	Median	Min	HighPercentile
2007/10/01	15.6	-	Normal	0.728395	182	10.3	5.15	15.9
2007/10/02	15.5	-	Normal	0.679012	180	10.3	4.5	17.1
2007/10/03	16.1	-	Normal	0.703704	161	11.9	4.9	17.3
2007/10/04	15.6	-	Normal	0.679012	159	11.1	4.76	17.3
2007/10/05	15.1	-	Normal	0.691358	162	11.1	4.67	17.3
2007/10/06	16.9	-	Normal	0.703704	156	11.3	4.62	18
2007/10/07	17.6	-	Normal	0.716049	148	11.3	4.67	17.9
2007/10/08	18.6	-	Normal	0.691358	132	11.8	4.59	19.7
2007/10/09	18.4	-	Normal	0.691358	106	12.3	4.67	21.3
2007/10/10	18.2	-	Normal	0.666867	93.8	12.3	4.59	20.3
2007/10/11	19.8	-	Normal	0.716049	79.2	11.3	4.42	20.6
2007/10/12	21.1	-	High	0.753086	75.3	11.3	4.59	20.7
2007/10/13	14.5	-	Normal	0.62963	80.8	11	4.53	20.2
2007/10/14	11.3	-	Normal	0.432099	100	12.3	4.25	17.8
2007/10/15	13.1	-	Normal	0.518519	101	12.3	4.59	21.3
2007/10/16	13.4	-	Normal	0.54321	88.9	12.3	4.25	23.8
2007/10/17	13.3	-	Normal	0.469136	84.3	13.5	4.25	25.5
2007/10/18	13.1	-	Normal	0.432099	84.9	14.7	4.25	23.7
2007/10/19	14.2	-	Normal	0.444444	116	15.4	4.67	24
2007/10/20	12.8	-	Normal	0.382716	97.1	14.8	4.53	25.7
2007/10/21	8.9	-	Normal	0.259259	90.1	14.1	4.3	28.1
2007/10/22	15.3	-	Normal	0.493827	87.7	15.3	4.9	31.2
2007/10/23	15	-	Normal	0.481481	91.7	15.7	5.24	30

Ready

### 6.1.2 - The HTSA Graphics Tab

The HTSA Graphics Tab has four areas:

1. the Statistical Calculation Parameters Control,
2. the Display Period Control,
3. the Time Series Statistics Display,
4. and the Data Observations Display.



#### 1. Statistical Calculation Parameters Control

The statistical calculation parameters control allows the user to control how the time series parameters are calculated. The following fields may be adjusted:

**Period** – these two controls specify the start and end dates of the period for which statistics will be calculated. The default values are the start and end dates of the time series being analyzed.

**Percentiles** – these two fields specify the quantiles that indicate high or low observations (from 0 to 1). The default values are the upper and lower quartiles or 0.75 and 0.25. The High value must be greater than or equal to the Low value.

**Include Flags** – this control allows for the inclusion or exclusion of HYDAT observations that have been flagged with a marker.

These include

- (A) Partial – the calculation for the daily data is made with an incomplete daily record
- (B) Ice – ice cover is observed at the time of measurement
- (D) Dry – the conditions of the river are dry at the time of measurement
- (E) Estimate – the observation is an estimate only.

**Req. Observations** – the minimum number of observations required on a day to calculate and present the statistics for that day. The default value is calculated as 80% of the observed years in the time series.

## 2. Display Period Control

The display period control allows for the modification of how the historical analysis graphics and table are displayed.

**Current Year** – this control updates the annual time series to be featured in the Time Series Statistical Display. The “current year” defaults to the most recent year in the time series. The tabular data tab will display information for the selected current year.

**From** – this control specifies the start and end date for displaying data in the Time Series Statistical Display. Default values are January 1 and December 31.

**Predefined** – this control allows for the quick selection of a predefined display range, including calendar year (default), water year (October to September) and other seasonal date ranges. The selection of a predefined display range overwrites the “From” selection.

**Low/Normal/High** – this display shows a summary of the number of observations for the selected year that fall within the defined High, Normal (between High and Low) or Low ranges for the observed data time series. These summary data are updated automatically and cannot be edited.

**Reset** – this button resets the Display Period Control and Statistical Calculation Parameters Control to default values.

### **3. Time Series Statistics Display**

The time series statistics display shows graphically the results of the statistical analysis as defined by the statistical parameters and display period controls. The results are in the form of a ribbon plot with the blue colour band representing the high observation range, the green band representing normal observation range (between high and low) and the red band representing the low observation range. A thin solid green line represents the median observations. Superimposed over the ribbon plot are the data of the currently selected time period. The observations of the time series are colour-coded to match the band in which they fall (i.e. high observations are blue, etc.). If insufficient data are available to perform the calculations for a particular day, as specified by the required observations limit, that day will appear as a blank section of the ribbon plot.

### **4. Data Observations Display**

The data observations display presents a time-series graph indicating the number of observations available for producing statistics for each day of the year. The maximum value is the number of years in the time series calculation period. Values of less than the maximum number are due to missing data, or data that do not meet the criteria as specified in the Statistical Calculation Parameters Control options.

### 6.1.3 – The HTSA Table Tab

The HTSA table contains the results of the analysis subject to the values supplied by the user in the “Statistic Calculation Parameters” controls on the HTSA- Graphics tab. The table has one record for every “Day Number” specified in the “Display Period” controls.

The contents of the HSTA Table can be exported for further processing. Once the HTSA Table Tab is being displayed, the **File→Save Table** options may be selected as shown below. The tabular data may then be saved to any of the supported tabular file types including TB0, CSV and DBF.

Environment Canada Data Explorer - HYDAT Version:1.0 (Jan. 13, 2014)

File Export View Help

Save Time Series

Save Table

Generate Report

Save Favourite Stations List

Load Favourite Stations List

Print

Exit

Prov/Terr/State ON Regional Office BURLINGTON

75°41'49.1" W Drainage Area (km²), Gross 3811.14 Effective Yes

RHBN RealTime Yes

OF CANADA (DOE) (CANADA)

OF CANADA (DOE) (CANADA)

Datum ASSUMED DATUM

RegulationPeriod (1900 - )

DataCollection Flow, (1901 - 1901), Manual, Miscellaneous

DataCollection Flow, (1905 - 1905), Manual, Miscellaneous

Flow Level DailyFlow - HTSA DailyFlow - HTSA

Date	DailyFlow	Symbol	Indicator	WeibullPosition	Max	Median	Min	HighPercentile
2007/10/01	15.6	-	Normal	0.728395	182	10.3	5.15	15.9
2007/10/02	15.5	-	Normal	0.679012	180	10.3	4.5	17.1
2007/10/03	16.1	-	Normal	0.703704	161	11.9	4.9	17.3
2007/10/04	15.6	-	Normal	0.679012	159	11.1	4.76	17.3
2007/10/05	15.1	-	Normal	0.691358	162	11.1	4.67	17.3
2007/10/06	16.9	-	Normal	0.703704	156	11.3	4.62	18
2007/10/07	17.6	-	Normal	0.716049	148	11.3	4.67	17.9
2007/10/08	18.6	-	Normal	0.691358	132	11.8	4.59	19.7
2007/10/09	18.4	-	Normal	0.691358	106	12.3	4.67	21.3
2007/10/10	18.2	-	Normal	0.666667	93.8	12.3	4.59	20.3
2007/10/11	19.8	-	Normal	0.716049	79.2	11.3	4.42	20.6
2007/10/12	21.1	-	High	0.753086	75.3	11.3	4.59	20.7
2007/10/13	14.5	-	Normal	0.62963	80.8	11	4.53	20.2
2007/10/14	11.3	-	Normal	0.432099	100	12.3	4.25	17.8
2007/10/15	13.1	-	Normal	0.518519	101	12.3	4.59	21.3
2007/10/16	13.4	-	Normal	0.54321	88.9	12.3	4.25	23.8
2007/10/17	13.3	-	Normal	0.469136	84.3	13.5	4.25	25.5
2007/10/18	13.1	-	Normal	0.432099	84.9	14.7	4.25	23.7
2007/10/19	14.2	-	Normal	0.444444	116	15.4	4.67	24
2007/10/20	12.8	-	Normal	0.382716	97.1	14.8	4.53	25.7
2007/10/21	8.9	-	Normal	0.259259	90.1	14.1	4.3	28.1
2007/10/22	15.3	-	Normal	0.493827	87.7	15.3	4.9	31.2
2007/10/23	15	-	Normal	0.481481	91.7	15.7	5.24	30

Save current table to a file.

The fields present in the table exported table include:

- Date – Date within current display period. Also “Day Number” for statistical values.
- DailyFlow – Current value of the analysed quantity on Date.
- Symbol – Symbol associated with current value on Date.
- Indicator – classification of current value on Date. (High, Normal, Low).
  - High indicates the value is above the “High Percentile” threshold.
  - Low indicates the value is below the “Low Percentile” threshold.
  - Normal indicates the value is between the High and Low Percentile thresholds.
  - NoData indicates that there was no value recorded on Date.
- WeibulPosition – (rank of Current Value)/(total number of observations)
- Max – maximum of analysed quantity on “DayNumber”
- Median – median of analysed quantity on “DayNumber”
- Min – minimum of analysed quantity on “DayNumber”
- High Percentile – high percentile threshold of analysed quantity on “DayNumber”
- Low Percentile – low percentile threshold of analysed quantity on “DayNumber”
- Mean - mean of analysed quantity on “DayNumber”
- Sigma – standard deviation of analysed quantity on “DayNumber”
- ObservationsUsed – number of observations used in calculating statistics on “DayNumber”
- TotalObservations – total number of observations found in source time series on “DayNumber”



## Appendix 1 – Advanced Configuration

The EC DataExplorer configuration file is located in your ECDataExplorer program directory. By default, the file is located at **C:\Program Files\EC\ECDataExplorer\ECDataExplorer.cfg**. The file can be edited in Notepad or any other text editor.

The configuration file allows you to change the location of the HYDAT database file and to add, remove, or customize the maps that are displayed in the Map View.

### A1.1 – Changing the location of the HYDAT Database

By changing the location stored in the configuration file, you can access a HYDAT database stored somewhere other than the default location.

#### To change the location of the HYDAT Database

- 1 - Open **ECDataExplorer.cfg** in a text editor.
- 2 - Enter the new location of the Database file after the `:Database` keyword. Note that this path is relative to the EC DataExplorer program folder. The default value is **DatabaseHydat.mdb**.

### A1.2 – Customizing the Map Layers

By changing the parameters of a map layer within the configuration file, you can display additional maps, or customize the display characteristics of the included maps. You can display **Line Set (.i2s)** or **Point Set (.pt2)** files in the Map View. See [Appendix 3: File Formats](#) for more information on these file formats.

#### To customize a Map Layer

- 1 - Open **ECDataExplorer.cfg** in a text editor.
- 2 - Enter the characteristics after the `:MapLayer` keyword. Each line must contain five values, separated by spaces, in addition to the keyword:
  - **Path** – This value must be the location of the data file, relative to the EC Data Explorer program folder.
  - **Colour** – This value determines the colour in which the data is displayed on the map and in the legend. The data is in the format of a six-byte hexadecimal number, with the three couplets corresponding to the intensity of the blue, green, and red values, respectively. The colours used in the default settings correspond to the following numbers:
    - 0x000000 – Black
    - 0xFF0000 – Blue
    - 0xAAAAAA – Light Grey

- 0x0080FF - Orange
- **DrawingStyle** – This value indicates the type of line or shape that is used to indicate the data on the map. Line Sets may be displayed as `solid`, `dotted`, `dash`, `longdash` or `polygon` lines. Point Sets may be displayed as `square`, `triangle`, `diamond`, or `star` points.
- **LineWidth/PointSize** – This parameter determines the size of the data as displayed on the map. The value is given in pixels and does not change when the map is zoomed in or out. Point Sets are displayed with a value of 7 pixels, by default, while Line Sets vary from 1 to 3 pixels.
- **Selectable** – This parameter determines whether or not the data can be selected and highlighted (by double-clicking) within the Map View.

**Note:** The ECDataExplorer.cfg file contains several alternate configurations that can be activated by uncommenting the relevant section and commenting out (by inserting an `#` at the start of the line) the previous configuration.

- **Lines** – shows the drainage basins as lines instead of polygons, to improve performance on slower machines.
- **Light colours** – uses lighter coloured polygons to display the drainage basins.
- **Medium colours (default)** – uses medium coloured polygons to display the drainage basins.
- **Darker colours** – uses darker coloured polygons to display the drainage basins.

## Appendix 2 – Database Structure

### **STATIONS** – Stores information about a station, including identification, location and operation etc.

Field Name	Key	Type	Size	Description (units)	Comments
STATION_NUMBER	y	text	7	Unique 7-character station identification	
STATION_NAME		text	80	Official name for station identification	
PROV_TERR_STATE_LOC		text	2	The province, territory or state in which the station is located	
REGIONAL_OFFICE_ID		text	1	The identifier of the regional office responsible for the station	Links to look-up table REGIONAL_OFFICE_LIST
HYD_STATUS		text	1	The status (either Active or Discontinued) of a hydrometric data collection program at a station	Links to look-up table STN_STATUS_CODES
SED_STATUS		text	1	The status (either Active or Discontinued) of a sediment data collection program at a station	Links to look-up table STN_STATUS_CODES
LATITUDE		single	4	North-South Coordinates of the gauging station in decimal degrees	
LONGITUDE		single	4	East-West Coordinates of the gauging station in decimal degrees	
DRAINAGE_AREA_GROSS		single	4	The total surface area that drains to the gauge site (km^2)	
DRAINAGE_AREA_EFFECT		single	4	The portion of the drainage basin that contributes runoff to the gauge site, calculated by subtracting any non-contributing portion from the gross drainage area (km^2)	
RHBN		yes/no	1	Reference Hydrometric Basin Network station	
REAL_TIME		yes/no	1	Indicates if a station has the capacity to deliver data in real-time or near real-time	
CONTRIBUTOR_ID		integer	2	Unique ID of an agency that contributes data to the HYDAT database. The agency is non-WSC and non WSC funded	Links to look-up table AGENCY_LIST
OPERATOR_ID		integer	2	Unique ID of an agency that operates a hydrometric station	Links to look-up table AGENCY_LIST
DATUM_ID		integer	2	Unique ID for a datum	Links to look-up table DATUM_LIST

**STN\_REMARKS – Provides descriptive remarks about particular occurrences at a station and is documented under standard headings**

Field Name	Key	Type	Size	Description (units)	Comments
STATION_NUMBER	y	text	7	Unique 7-character station identification	
REMARK_TYPE_CODE	y	byte	1	An internal ID which categorizes a remark	Links to look-up table STN_REMARK_CODES
YEAR	y	integer	2	Year to which a remark applies	For historical comments: Year = dummy value
REMARK_EN		Memo	*	Textual information, in English, for a given remark type	
REMARK_FR		Memo	*	Textual information, in French, for a given remark type	

**STN\_DATA\_RANGE – Provides a historical summary of data**

Field Name	Key	Type	Size	Description (units)	Comments
STATION_NUMBER	y	text	7	Unique 7-character station identification	
DATA_TYPE	y	text	1	Code for the type of data	Links to look-up table DATA_TYPES
SED_DATA_TYPE	y	text	2	Code for the type of instantaneous sediment data	Links to look-up table SED_DATA_TYPES
YEAR_FROM		integer	2	The first year of the DATA_TYPE collection	
YEAR_TO		integer	2	The last year of the DATA_TYPE collection	
RECORD_LENGTH		byte	1	Number of years of data available in the HYDAT database	Could be less than YEAR_TO minus YEAR_FROM

**STN\_REGULATION – Contains information to identify whether modifications to a flow regime of a drainage system affect data produced at a hydrometric station and the duration of such affects**

Field Name	Key	Type	Size	Description (units)	Comments
STATION_NUMBER	y	text	7	Unique 7-character station identification	
YEAR_FROM	y	integer	2	Year the flow regulation started	
YEAR_TO		integer	2	Year the flow regulation ended	
REGULATED		yes/no	1	A flag indicating whether the flow is regulated or not (‘no’ for Natural and ‘yes’ for regulated)	

**STN\_DATA\_COLLECTION – Contains current and historical information about the hydrometric or sediment data collection programs**

Field Name	Key	Type	Size	Description (units)	Comments
STATION_NUMBER	y	text	7	Unique 7-character station identification	
DATA_TYPE	y	text	1	Code for the type of data	Links to look-up table DATA_TYPES
YEAR_FROM	y	integer	2	The beginning year of a period when data is collected for a station's hydrometric program or for a station's sediment program	
YEAR_TO		integer	2	The ending year of a period when data is collected for a station's hydrometric program. This information is not applicable for sediment stations	
MEASUREMENT_CODE		text	1	Either 1) the sampling method used in the collection of sediment data or 2) the type of the gauge used in the collection of the hydrometric data	Links to look-up table MEASUREMENT_CODES
OPERATION_CODE		text	1	A code representing the schedule of station operation for the collection of sediment or hydrometric data	Links to look-up table OPERATION_CODES

**ANNUAL\_INSTANT\_PEAKS – Annual maximum/minimum instantaneous flows and water levels (Measured in Field)**

Field Name	Key	Type	Size	Description (units)	Comments
STATION_NUMBER	y	text	7	Unique 7-character station identification	
DATA_TYPE	y	text	1	Code for the type of data	Links to look-up table DATA_TYPES
YEAR	y	integer	2	Year of occurrence	
PEAK_CODE	y	text	1	Type of peak value	Links to look-up table PEAK_CODES
PRECISION_CODE		byte	1	Precision of water level measurement	Links to look-up table PRECISION_CODES
MONTH		byte	1	The month of occurrence	
DAY		byte	1	The day of occurrence	
HOUR		byte	1	The hour of occurrence	
MINUTE		byte	1	The minute of occurrence	
TIME_ZONE		text	4	Time zone of the station location	
PEAK		single	4	Flow or water level value (Units are dependent on DATA_TYPE)	
SYMBOL		text	1	Indicates a condition where the daily mean has a larger than expected error	Links to look-up table DATA_SYMBOLS

### ANNUAL\_STATISTICS – Annual statistics (minimum/maximum/mean) derived from daily values

Field Name	Key	Type	Size	Description (units)	Comments
STATION_NUMBER	y	text	7	Unique 7-character station identification	
DATA_TYPE	y	text	1	Code for the type of data	Links to look-up table DATA_TYPES
YEAR	y	integer	2	Year of daily value	
MEAN		single	4	Annual mean value, derived from daily values	
MIN_MONTH		byte	1	Month in which minimum occurred	
MIN_DAY		byte	1	Day on which minimum occurred	
MIN		single	4	Annual minimum daily mean	
MIN_SYMBOL		text	1	Indicates a condition when minimum occurred	Links to look-up table DATA_SYMBOLS
MAX_MONTH		byte	1	Month in which maximum occurred, e.g., 10 for October	
MAX_DAY		byte	1	Day on which maximum occurred	
MAX		single	4	Annual maximum daily mean	
MAX_SYMBOL		text	1	Indicates a condition when maximum occurred	Links to look-up table DATA_SYMBOLS

### DLY\_FLOWS – Daily flow values

Field Name	Key	Type	Size	Description (units)	Comments
STATION_NUMBER	y	text	7	Unique 7-character station identification	
YEAR	y	integer	2	Year for the daily flow values	
MONTH	y	byte	1	Month for daily flow values	
FULL_MONTH		yes/no	1	Flags whether the data exist for every day of the month	
NO_DAYS		byte	1	Number of days in this month	
MONTHLY_MEAN		single	4	Average of the daily flow data for a month that has complete data	
MONTHLY_TOTAL		single	4	Total of the daily flow values for each month that has complete data	
FIRST_DAY_MIN		byte	1	Day on which the minimum daily flow first occurred	
MIN		single	4	Minimum daily flow during month ( $m^3/sec$ )	
FIRST_DAY_MAX		byte	1	Day on which the maximum daily flow first occurred	
MAX		single	4	Maximum daily flow during month ( $m^3/sec$ )	
FLOW1		single	4	Daily flow value ( $m^3/s$ )	
FLOW_SYMBOL1		text	1	Indicates a condition where the daily mean has a larger than expected error	Links to look-up table DATA_SYMBOLS
...				Flow, Symbol (for 31 days)	

### DLY\_LEVELS – Daily water level values

Field Name	Key	Type	Size	Description (units)	Comments
STATION_NUMBER	y	Text	7	Unique 7-character station identification	
YEAR	y	Integer	2	Year for daily water level values	
MONTH	y	Byte	1	Month for daily water level values	
PRECISION_CODE		Byte	1	Precision of water level measurement	Links to look-up table PRECISION_CODES
FULL_MONTH		yes/no	1	Flags whether the data exist for every day of the month	
NO_DAYS		Byte	1	Number of days in this month	
MONTHLY_MEAN		Single	4	Average of the daily water level data for a month that has complete data	
MONTHLY_TOTAL		Single	4	Total of the daily water level values for each month that has complete data	
FIRST_DAY_MIN		Byte	1	Day on which the minimum daily level first occurred	
MIN		Single	4	Minimum daily water level during month (m)	
FIRST_DAY_MAX		Byte	1	Day on which the maximum daily level first occurred	
MAX		Single	4	Maximum daily water level during month (m)	
LEVEL1		Single	4	Daily water level value (m)	
LEVEL_SYMBOL1		Text	1	Indicates a condition where the daily mean has a larger than expected error	Links to look-up table DATA_SYMBOLS
...				Level, Symbol (for 31 days)	

### SED\_DLY\_SUSCON – Daily suspended sediment concentration values

Field Name	Key	Type	Size	Description (units)	Comments
STATION_NUMBER	y	text	7	Unique 7-character station identification	
YEAR	y	integer	2	Year of daily value	
MONTH	y	byte	1	Month of daily value	
FULL_MONTH		yes/no	1	Flags whether the data exist for every day of the month	
NO_DAYS		byte	1	Number of days in this month	
MONTHLY_TOTAL		single	4	Total of the daily suspended sediment concentration values for each month that has complete data	
FIRST_DAY_MIN		byte	1	Day on which the minimum daily concentration first occurred	
MIN		single	4	Minimum daily concentration during month (mg/l)	
FIRST_DAY_MAX		byte	1	Day on which the maximum daily concentration first occurred	
MAX		single	4	Maximum daily concentration during month (mg/l)	
SUSCON1		single	4	Daily suspended sediment concentration value (mg/l)	
SUSCON_SYMBOL1		text	1	Describes whether the SUSCON value is based on an estimate or a sample	Links to look-up table DATA_SYMBOLS
...				Concentration, Symbol (for 31 days)	

**SED\_DLY\_LOADS – Daily suspended sediment loads in tonnes calculated by SED\_DLY\_SUSCON \* DLY\_FLOWS \* Constant**

Field Name	Key	Type	Size	Description (units)	Comments
STATION_NUMBER	y	text	7	Unique 7-character station identification	
YEAR	y	integer	2	Year of daily load value	
MONTH	y	byte	1	Month of daily load value	
FULL_MONTH		yes/no	1	Flags whether the data exist for every day of the month	
NO_DAYS		byte	1	Number of days in this month	
MONTHLY_MEAN		single	4	The average of the daily sediment loads for a month (tonnes)	
MONTHLY_TOTAL		single	4	Total of the daily sediment load values during this month (tonnes)	
FIRST_DAY_MIN		byte	1	Day on which the minimum daily load first occurred	
MIN		single	4	Minimum daily sediment load value during the month (tonnes)	
FIRST_DAY_MAX		byte	1	Day on which the maximum daily load first occurred	
MAX		single	4	Maximum daily sediment load value during the month (tonnes)	
LOAD1		single	4	Daily amount of sediment transported (tonnes)	
...				Load (for 31 days)	

**SED\_SAMPLES – Instantaneous sediment samples data**

Field Name	Key	Type	Size	Description (units)	Comments
STATION_NUMBER	y	text	7	Unique 7-character station identification	
SED_DATA_TYPE	y	text	2	Contains the type of sampling method used in collecting sediment for a station	Links to look-up table SED_DATA_TYPES
DATE	y	date	8	Contains the time to the nearest minute of when the sample was taken	
SAMPLE_REMARK_CODE		text	1	Remark code that indicates the condition or nature of the sample taken	Links to look-up table SAMPLE_REMARK_CODES
TIME_SYMBOL		text	1	An "E" symbol means the time is an estimate only	
FLOW		single	4	Contains the instantaneous discharge in cubic metres per second at the time the sample was taken	
FLOW_SYMBOL		text	1	Indicates a condition where the daily mean has a larger than expected error	Links to look-up table DATA_SYMBOLS
SAMPLER_TYPE		text	5	Contains the type of measurement device used to take the sample	
SAMPLING_VERTICAL_LOCATION		text	4	The location on the cross-section of the river at which the single sediment samples are collected. If one of the standard locations is not used the distance in meters will be shown	Links to look-up table SED_VERTICAL_LOCATION



Field Name	Key	Type	Size	Description (units)	Comments
SAMPLING_VERTICAL_SYMBOL		text	1	Indicates sample location relative to the regular measurement cross-section or the regular sampling site	Links to look-up table SED_VERTICAL_SYMBOLS
TEMPERATURE		single	4	Contains the instantaneous water temperature in Celsius at the time the sample was taken	
CONCENTRATION		single	4	Contains the instantaneous concentration sampled in milligrams per litre	
CONCENTRATION_SYMBOL		text	1	General comment codes about the sample or the sampling process	Links to look-up table CONCENTRATION_SYMBOLS
DISSOLVED_SOLIDS		single	4	Contains the instantaneous dissolved solids sampled (mg/L)	
SAMPLE_DEPTH		single	4	Contains the water depth in metres where the sample was taken	
STREAMBED		text	2	"SB" indicates streambed record	
SV_DEPTH1		single	4	Depth 1 for split vertical depth integrating (m)	
SV_DEPTH2		single	4	Depth 2 for split vertical depth integrating (m)	

**SED\_SAMPLES\_PSD – Particle size distribution analysis of samples in SED\_SAMPLES table**

Field Name	Key	Type	Size	Description (units)	Comments
STATION_NUMBER	y	text	7	Unique 7-character station identification	
SED_DATA_TYPE	y	text	2	Contains the type of sediment data that is collected for a station	Links to look-up table SED_DATA_TYPES
DATE	y	date	8	Contains the date and time to the nearest minute of when the sample was taken	
PARTICLE_SIZE	y	single	4	Particle size (mm)	
PERCENT		byte	1	Contains the percentage values for indicated particle sizes for samples collected	

**STN\_DATUM\_CONVERSION – Contains factors used to convert the water levels referred to one datum to another datum**

Field Name	Key	Type	Size	Description (units)	Comments
STATION_NUMBER	y	text	7	Unique 7-character station identification	
DATUM_ID_FROM	y	integer	2	The code identifying a datum from which water level is being converted	Links to look-up table DATUM_LIST
DATUM_ID_TO	y	integer	2	The code identifying a datum to which water level is being converted	Links to look-up table DATUM_LIST
CONVERSION_FACTOR		single	4	The conversion factor applied to water levels referred to one datum to obtain water levels referred to another datum	

**STN\_DATUM\_UNRELATED – Contains the history of the information on the gauge datum**

Field Name	Key	Type	Size	Description (units)	Comments
STATION_NUMBER	y	text	7	Unique 7-character station identification	
DATUM_ID	y	integer	2	Unique code identifying a datum	Links to look-up table DATUM_LIST
YEAR_FROM		date	8	The first year of use	
YEAR_TO		date	8	The last year of use	

**STN\_OPERATION\_SCHEDULE – Historical station operation schedule**

Field Name	Key	Type	Size	Description (units)	Comments
STATION_NUMBER	y	text	7	Unique 7-character station identification	
DATA_TYPE	y	text	1	Code for type of data	Links to look-up table DATA_TYPES
YEAR	y	integer	2	Year of operation schedule	
MONTH_FROM		text	3	Station operation start month	
MONTH_TO		text	3	Station operation end month	

**DATUM\_LIST – DATUM look-up Table**

Field Name	Key	Type	Size	Description (units)	Comments
DATUM_ID	y	integer	2	DATUM identifier	
DATUM_EN		text	80	Descriptive Datum Name (English)	
DATUM_FR		text	80	Descriptive Datum Name (French)	

**AGENCY\_LIST – AGENCY look-up Table**

Field Name	Key	Type	Size	Description (units)	Comments
AGENCY_ID	y	Integer	2	Agencies identifier	
AGENCY_EN		text	80	Name of the Agency (English)	
AGENCY_FR		text	80	Name of the Agency (French)	

**REGIONAL\_OFFICE\_LIST – REGIONAL\_OFFICE look-up Table**

Field Name	Key	Type	Size	Description (units)	Comments
REGIONAL_OFFICE_ID	y	byte	1	Region ID	
REGIONAL_OFFICE_NAME_EN		text	20	Region Name (English)	
REGIONAL_OFFICE_NAME_FR		text	20	Region Name (French)	

**STN\_REMARK\_CODES – REMARK\_TYPE look-up Table (Linked with STN\_REMARKS)**

Field Name	Key	Type	Size	Description (units)	Comments
REMARK_TYPE_CODE	y	byte	1	REMARK_TYPE identifier	
REMARK_TYPE_EN		text	50	Descriptive REMARK_TYPE (English)	
REMARK_TYPE_FR		text	50	Descriptive REMARK_TYPE (French)	

**SAMPLE\_REMARK\_CODES – SEDIMENT\_SAMPLE\_REMARK look-up Table (Linked with SED\_SAMPLES)**

Field Name	Key	Type	Size	Description (units)	Comments
SAMPLE_REMARK_CODE	y	byte	1	Sediment Sample Remark identifier	
SAMPLE_REMARK_EN		text	90	Descriptive Sediment Sample Remark (English)	
SAMPLE_REMARK_FR		text	90	Descriptive Sediment Sample Remark (French)	

**DATA\_TYPES – DATA\_TYPE look-up Table**

Field Name	Key	Type	Size	Description (units)	Comments
DATA_TYPE	y	text	1	Data type code	
DATA_TYPE_EN		text	50	Descriptive Data Type (English)	
DATA_TYPE_FR		text	50	Descriptive Data Type (French)	

**SED\_DATA\_TYPES – INSTANT SEDIMENT DATA TYPE look-up table (Linked with SED\_SAMPLES and SED\_SAMPLES\_PSD)**

Field Name	Key	Type	Size	Description (units)	Comments
SED_DATA_TYPE	y	text	2	Instant Sediment Data Type identifier	
SED_DATA_TYPE_EN		text	60	Descriptive Instant Sediment Data Type (English)	
SED_DATA_TYPE_FR		text	60	Descriptive Instant Sediment Data Type (French)	

**OPERATION\_CODES – STATION'S OPERATION SCHEDULE look-up table**

Field Name	Key	Type	Size	Description (units)	Comments
OPERATION_CODE	y	text	1	Station's Operation Schedule identifier	
OPERATION_EN		text	20	Descriptive Station's Operation Schedule (English)	
OPERATION_FR		text	20	Descriptive Station's Operation Schedule (French)	

**MEASUREMENT\_CODES – MEASUREMENT METHOD look-up table (linked with STN\_DATA\_COLLECTION)**

Field Name	Key	Type	Size	Description (units)	Comments
MEASUREMENT_CODE	y	text	1	Measurement Method identifier	
MEASUREMENT_EN		text	50	Descriptive Measurement Method (English)	
MEASUREMENT_FR		text	50	Descriptive Measurement Method (French)	

**PRECISION\_CODES – LEVEL'S PRECISION CODE look-up table**

Field Name	Key	Type	Size	Description (units)	Comments
PRECISION_CODE	y	byte	1	Precision identifier	
PRECISION_EN		text	40	Descriptive Precision (English)	
PRECISION_FR		text	40	Descriptive Precision (French)	

**STN\_STATUS\_CODES – STATION STATUS CODE look-up table**

Field Name	Key	Type	Size	Description (units)	Comments
STATUS_CODE	y	text	1	Station Status Symbol	
STATUS_EN		text	20	Descriptive Station Status (English)	
STATUS_FR		text	20	Descriptive Station Status(French)	

**PEAK\_CODES – INSTANT PEAK CODE look-up table**

Field Name	Key	Type	Size	Description (units)	Comments
PEAK_CODE	y	text	1	Peak Code identifier	
PEAK_EN		text	20	Descriptive Peak Code (English)	
PEAK_FR		text	20	Descriptive Peak Code (French)	

**DATA\_SYMBOLS – DATA SYMBOLS look-up table**

Field Name	Key	Type	Size	Description (units)	Comments
SYMBOL_ID	y	text	1	Symbol code	
SYMBOL_EN		text	50	Description of Symbol (English)	
SYMBOL_FR		text	50	Description of Symbol (French)	

**SED\_VERTICAL\_SYMBOLS – INSTANT SEDIMENT SAMPLING VERTICAL SYMBOL look-up table**

Field Name	Key	Type	Size	Description (units)	Comments
SAMPLING_VERTICAL_SYMBOL	y	text	1	Instant Sediment Sampling Vertical Symbol for the location of vertical profile sampled	
SAMPLING_VERTICAL_EN		text	125	Descriptive Sampling Vertical Symbol (English)	
SAMPLING_VERTICAL_FR		text	125	Descriptive Sampling Vertical Symbol (French)	

**SED\_VERTICAL\_LOCATION – INSTANT SEDIMENT SAMPLING VERTICAL LOCATION look-up table**

Field Name	Key	Type	Size	Description (units)	Comments
SAMPLING_VERTICAL_LOCATION_ID	y	text	4	Instant Sediment Sampling Vertical Location identifier	
SAMPLING_VERTICAL_LOCATION_EN		text	60	Descriptive Sampling Vertical Location (English)	
SAMPLING_VERTICAL_LOCATION_FR		text	60	Descriptive Sampling Vertical Location (French)	

**CONCENTRATION\_SYMBOLS – CONCENTRATION SYMBOL look-up table**

Field Name	Key	Type	Size	Description (units)	Comments
CONCENTRATION_SYMBOL	y	text	1	General comment symbol about the sediment sample or the sampling process	
CONCENTRATION_EN		text	60	Description of Concentration Sample (English)	
CONCENTRATION_FR		text	60	Description of Concentration Sample (French)	

**Version – Version information of HYDAT database**

Field Name	Key	Type	Size	Description - valid values/units	Comments
VERSION		text	15	Version of database	
DATE		Date/time	8	Date of database generation	

## Appendix 3 – File Formats

The files exported by EC DataExplorer, and the files used to store Base Map data, are EnSim native file formats. These files are text-based and contain a record of all information associated with a data set.

### A3.1 - File Headers

All EnSim native file formats have similar headers. The first portion of the header is identical for all of these files. An example (from a xyz file) is shown below.

```
#####
:FileType xyz ASCII EnSim 1.0
# Copyright (c) Canadian Hydraulics Centre/National Research Council 1998-2005
# DataType XYZ Point Set
#
:Application ECDataExplorer
:Version 1.0.41
:WrittenBy Username
:CreationDate Fri, Mar 27, 2009 11:20 AM
#
#-----
```

Keywords begin with the colon character ( : ). Keywords may have specific meanings within the context of the application file type, such as the origin, count, and delta of a rectangular grid. When EC DataExplorer recognizes one of the keywords, it will look for the proper information immediately following.

**Note:** The :EndHeader keyword must be the last line of the header. Other keywords can appear in any order, but if a given keyword appears more than once in a header, the last listed appearance will replace any earlier occurrences.

Standard keywords appearing in the top section of the header (like those shown above) are as follows:

- :FileType - Required - Shows the file type in the form of the file extension, such as r2s, i3s, t3s, and so on; whether the file is ASCII or binary; and the version number of the EnSim file type.
- :Application - Optional - States the Application with which the file was created.
- :Version - Optional - This gives the version of the application with which the file was created.
- :WrittenBy - Optional - This is the username assigned to the computer workstation or account with which the file was created.
- :CreationDate - Optional - This is the date and time at which the file was last altered.

In addition, each file contains an :EndHeader keyword, which marks the end of the header section and the start of the data section.

### A3.2 – Line Sets (.i2s)

Line set data files are used to store the majority of Base Map data that is provided with EC DataExplorer. In addition to the header common to all EnSim data files, an .i2s file contains several keywords, followed by the body of the data.

- `:SourceFile` – Some of the Base Maps contain this keyword, which contains the filename of the original data from which the Line Set was extracted.
- `:Projection` – This keyword indicates in which coordinate system the points are given. All files provided with EC DataExplorer have the value `LatLong` here, indicating that the coordinates represented by the data consist of points in Latitude and Longitude. This keyword is always followed by the `Ellipsoid` keyword.
- `:Ellipsoid` – All Base Maps provided with EC DataExplorer have the value `GRS80` here, indicating that the ellipsoid used to generate the coordinates was GRS80.
- `:AttributeName` – Together with `:AttributeType`, this keyword identifies data attributes associated with the data in the file.

The data following this keyword is in two parts. The first part is an integer number. It refers to the order of the attribute with respect to the other attributes in the file. If each line has one attribute, the number is 1. If there are three attributes, the first to be read is 1, the second is 2, and so on. The second part of the keyword is a name used to identify the data attribute. For example, `:AttributeName 1 F_CODE`.

- `:AttributeType` – This keyword identifies the type of data associated with each attribute. The numbering is the same as that used in the `:AttributeName` field. The second part of the keyword gives the type of data. The Base Maps provided use `integer` and `text` data.

Once the format of the data has been described, the remainder of the file consists of the data. The following format is repeated for each line in the set.

The first line of data contains at least one value. The first of these is an integer representing the total number of vertices in the line. The other values are the attributes associated with the line. The number, name, and type of attributes are specified by the `:AttributeName` and `:AttributeType` keywords in the file header.

The following lines of data contain the x- and y-coordinates of each vertex in the order in which they are connected. If the data represents a closed polyline, or polygon, the coordinates on the first and last lines must be identical. The first number in each line is the x-coordinate, and the second number is the y-coordinate.



### A3.3 – Point Sets (pt2)

EnSim Point Sets are used to indicate city locations on the Base Maps. The keywords used in Point Sets are the same as those used in Line Sets, but the body of the data is organized differently.

For details on the :SourceFile, :Projection, :Ellipsoid, :AttributeName, and :AttributeType keywords, see section [A3.2 – Line Sets \(i2s\)](#).

The body of the data consists of a list of coordinates, each of which is followed by the data described in the header attributes. In the case of the included Base Maps, the data consists of the names of the cities located at each of the points.

### A3.4 – Time Series (ts3)

There are several types of EnSim Time Series files. Ts3 files are used to store scalar data with explicit time. Time series files exported by EC DataExplorer feature several additional keywords, but not all files will contain all of the possibilities.

- :Name – This field contains the default filename that was provided for the file. It consists of the station code, followed by the field name. For example, for the minimum monthly flow time series for the Rideau River above Smiths Falls, station 2LA005, this field will be 2LA005\_MinMonthlyFlow.
- :AttributeUnits – This field records the units in which the data was measured. For example, for files recording flow, the value will be 1 (indicating that the units apply to the first variable in the time series)  $\text{m}^3/\text{s}$ .
- :LocationX – This field contains the location of the gauging station, in decimal degrees of longitude.
- :LocationY – This field contains the location of the gauging station, in decimal degrees of latitude.

The other keywords found in the header of an exported ts3 file are treated as Meta Data, and are directly filled with the values displayed in the Station Details Panel.

- :Station – This field records the ID code of the gauging station.
- :Name – This field contains the text name of the station.
- :Prov – This field contains the two-letter abbreviation for the province in which the station is located.
- :Region – This field stores the managing region for the station.
- :Latitude – This field records the latitude of the station, in Degrees, Minutes, and Seconds.

- `:Longitude` – This field stores the longitude of the station, in Degrees, Minutes, and Seconds.
- `:HydStatus` – This field contains the Hydrometric status of the station, either `Active` or `Discontinued`.
- `:SedStatus` – This field stores the Sediment recording status of the station, either `Active` or `Discontinued`.
- `:Drainage` – This field records the gross drainage area of the station, in  $\text{km}^2$ .
- `:DrainageAreaEff` – This field records the effective drainage area of the station, in  $\text{km}^2$ .
- `:RHBN` – This field stores a `Yes` or `No`, indicating whether the station is part of the RHBN.
- `:RealTime` – This field contains a `Yes` or `No`, indicating whether the station's records include real-time data.
- `:Contributor` – This field stores the contents of the Contributor `MetaData` field.
- `:Operator` – This field stores the contents of the Operator `MetaData` field.
- `:Datum` – This field records the contents of the Datum `MetaData` field.
- `:DataCollection` – This field, which can appear multiple times, records the contents of the `DataCollection MetaData` fields.

The time series data appears after the `:EndHeader` keyword. Each line records a single point, and consists of the date (as `YYYY/MM/DD`), the time of day (as `HH:MM`), and the value recorded. If there is no time recorded for a given value, the time appears as `00:00`.

### **A3.5 – Tables (tb0)**

EnSim Tables are used to record data that applies to an entire time scale—that is, all daily, monthly, annual, or peak data for a given gauging station. There are several keywords particular to Tables.

- `:ColumnMetaData` - This keyword initiates the block of keywords and values that describe the table attributes (columns). The keywords found within the block are:
  - `:ColumnName` - The column (or attribute) names. This field specifies the name for each column from 1 to n.
  - `:ColumnUnits` - The column (or attribute) units. This field specifies units as a string for each column from 1 to n.

- `:ColumnType` - The column (or attribute) data type. This field specifies the data type for each column from 1 to n. Data types may be float, integer, boolean, text, or date.
- `:EndColumnMetaData` - This keyword ends the block of keywords and values that describe the table attributes (columns).

In addition to the `ColumnMetaData` keywords, Tables may contain the same `MetaData` keywords as are found in Time Series files. See [A3.4 – Time Series \(ts3\)](#) for more information on these keywords.

Following the `:EndHeader` keyword, the data contained in the table are listed, with one table row per line.