WRPLOT View™
User Guide

Wind and Rain Rose Plots for Meteorological Data

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Lakes
Environmental

WRPLOT View™

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About WRPLOT View

WRPLOT View™ is a Windows program that generates wind rose statistics and plots for several meteorological data formats. A wind rose depicts the frequency of occurrence of winds in each of the specified wind direction sectors and wind speed classes for a given location and time period.
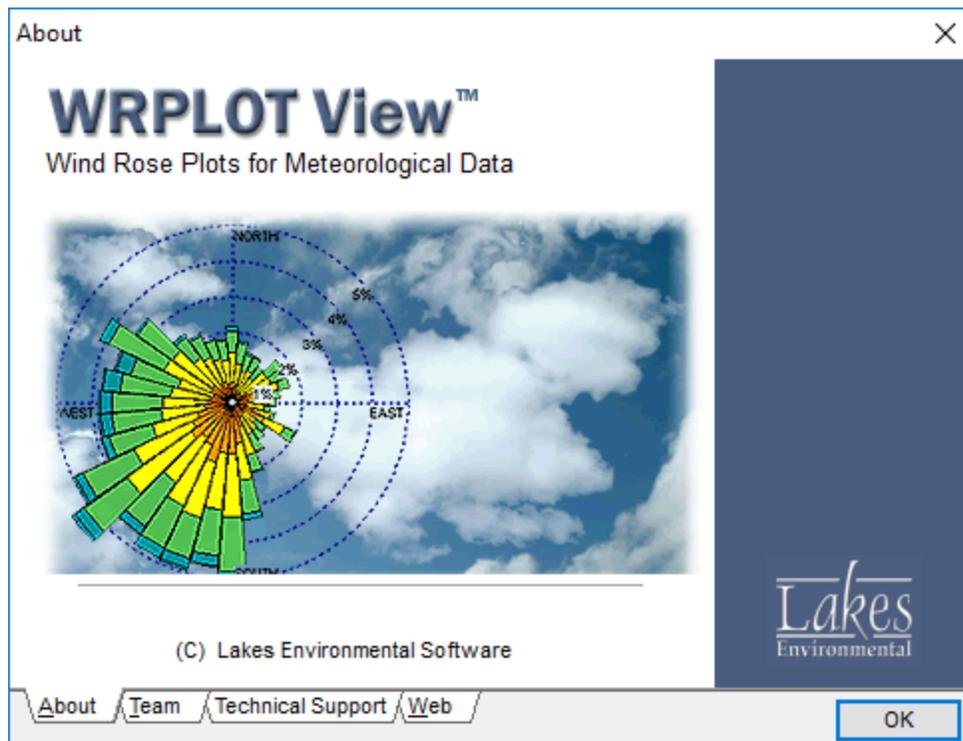
Wind roses can sometimes be used to depict graphically the dominant transport direction of the winds for an area. Due to the influences of local terrain, possible coastal effects, the exposure of the instruments, and the temporal variability of the wind, the wind rose statistics may not always be representative of true transport for an area. Other meteorological conditions may also be important for determining the formation and transport of certain atmospheric contaminants, particularly for reactive pollutants. The results of this program should therefore be used with caution.

Other Lakes Software Products and Services

Lakes Environmental offers a wide range of environmental software products, covering five major categories of air quality as well as worldwide pre-processed meteorological data.

To find out more about these products and services, see:

▶ Met Data Services

▶ Other Lakes Software Products

Interface Overview

WRPLOT View features a friendly, intuitive interface which provides easy access to all tools. The components of the WRPLOT View window are shown and briefly described below:
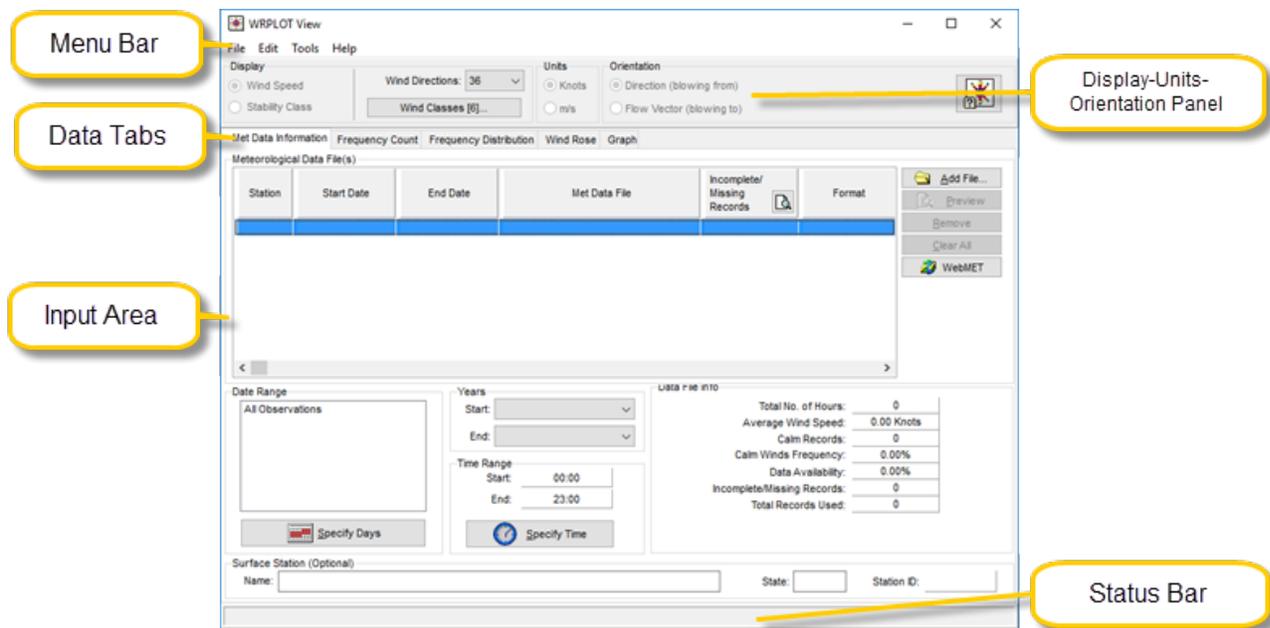
- **Menu bar:** Displays menu names. To open a menu, move the mouse over the menu name and then press the left mouse button. A drop-down menu appears displaying a list of related commands.

- **Display-Units-Orientation Panel:** The Display-Units-Orientation panel contains various options for your wind rose settings, such as units and orientation.

- **Tabs:** Used to navigate the data input; selecting a tab will display that tab's contents. The available tabs are:

    o **Met Data Information tab:** The Met Data Information tab contains options to set the meteorological data files the wind rose will use as well as their date, year and time range to display.

    o **Frequency Count tab:** The Frequency Count tab will display a chart containing a count of the number of occurrences of wind speeds and wind directions.

    o **Frequency Distribution tab:** The Frequency Distribution tab will display a chart containing statistical percentages of the occurrences of wind speeds and wind directions.

- o **Wind Rose tab:** The Wind Rose tab contains the Wind Rose graphical representation of the distribution of wind velocity and direction.

- o **Rain Rose tab:** The Rain Rose tab contains the Rain Rose graphical representation of the distribution of precipitation in SAMSON, HUSWO, Generic CSV, and Pre-Processed ISC format files.

- o **Graph tab:** The Graph tab contains a graph, which plots wind class or rain rate class frequency distributions.

- **Input Area:** This area displays the content of each input tab.

- **Status bar:** This area displays information that describes the actions of certain interface objects, as you hold the mouse pointer over them.

Menu Options

The following menu options are available in WRPLOT View:
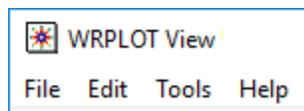
File Menu

File (Alt, F)
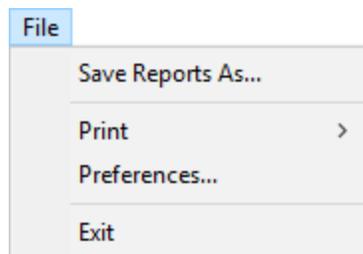
- **Save Reports As...:** Saves the current frequency count and distribution charts to a text file.

- **Print:** Displays the following submenu options:

- o **Frequency Report…:** This prints the current WRPLOT View frequency report file containing the frequency count and distribution charts.
    - ▪ **Date Range Report…:** This prints the date range report based on the current selection of days.
    - ▪ **Wind Rose…:** This displays the Print Preview dialog, where you can preview and print your wind rose plot.
    - ▪ **Graph…:** This prints the current WRPLOT View graph.
- **Preferences…:** Displays the Preferences dialog, where you can specify preferences, such as company name, modeler & model default settings.
- **Exit:** Closes the program.

Edit Menu

Edit (Alt, E)

Edit

| Copy to File | > |
| Copy to Clipboard | > |
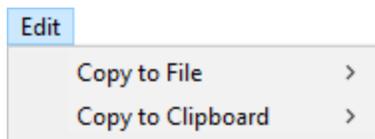
- **Copy to File:** Displays the following submenu options:
    - o **Bitmap:** Displays the **Export As Bitmap** dialog, allowing you to save the contents of the Wind Rose tab or Graph tab as a Windows bitmap.
    - o **Metafile:** Displays the **Save Enhanced Metafile** dialog, allowing you to save the contents of the Wind Rose tab or Graph tab as a Windows metafile.
- **Copy to Clipboard:** Displays the following submenu options:
    - o **Bitmap:** Copies the wind rose plot and graph to the clipboard, allowing you to paste these contents into another Windows application as a Windows bitmap.
    - o **Metafile:** Copies the wind rose plot and graph to the clipboard, allowing you to paste these contents into another Windows application as a Windows metafile.

Tools Menu

Tools (Alt, T)
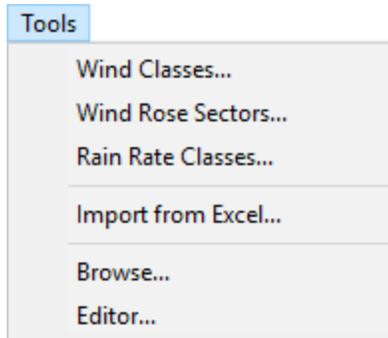
- **Wind Classes...:** Displays the Wind Classes dialog, which allows you to change the default wind speed classes.

- **Wind Rose Sectors...:** Displays the Wind Rose Sectors dialog, which allows you to customize the number and size of the wind rose sectors.

- **Rain Rate Classes...:** Displays the Rain Rate Classes dialog, which allows you to change the default precipitation classes.

- **Import from Excel...:** Opens the Import Surface Data from Excel utility, which allows you to create a SAMSON hourly surface data file from data in an Excel spreadsheet.

- **Precipitation Intensity:** This menu item is available only if you are using a met data file containing precipitation data. This option allows you to view precipitation information instead of wind information, for example a Rain Rose tab is displayed instead of a Wind Rose tab, and a graph of precipitation intensity is generated.

- **Wind Speed:** This menu item is available only if you are using a met data file containing precipitation data. This option allows you to view the wind information in the file and plots a wind rose.

- **Browse...:** Opens a Microsoft® Windows® Explorer dialog allowing you to browse through files.

- **Editor...:** Opens Microsoft WordPad for easy access to a text editor.

Help Menu

Help (Alt, H)

| Help |
| Contents |
| Team... |
| Technical Support... |
| Web Links... |
| Knowledgebase... |
| Order Met Data... |
| About... |
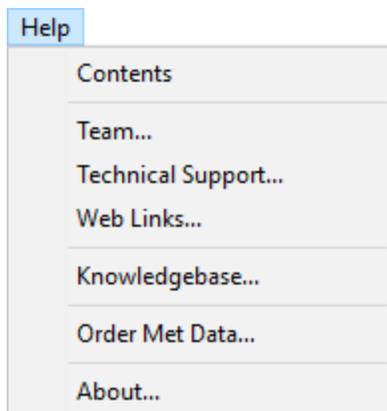
- **Contents:** Displays Help Contents, from which you can select topics.

- **Team...:** Displays information on the program development team.

- **Technical Support...:** Displays a dialog containing available Technical Support options for the program.

- **Web Links...:** Displays a dialog containing links to sites useful to the user.

- **Knowledgebase...:** Opens a web browser to the product Knowledgebase.

- **About...:** Displays the copyright notice and version number for the interface.

Input Data

The **Input Data** section provides a detailed overview of methods of data entry into **WRPLOT View**.

The following tools are described in this section:

▶ Display - Units - Orientation

▶ Met Data Information tab

▶ Frequency Count tab

▶ Frequency Distribution tab

▶ Wind Rose tab

▶ Rain Rose tab

▶ Graph tab

Display - Units - Orientation

In the **Display-Units-Orientation** panel you can select options for the display of the frequency reports and wind rose graph. The options available in this panel will depend on the type of meteorological data being used.

Display-Units-Orientation panel

Display

The Display panel allows you to select whether you would like the wind rose displayed in terms of wind speed or stability classes and the number of wind direction categories for your wind rose plot.

> The **Stability Class** option is available only for Pre-Processed ISC Met Data files and CALMET Time Series files that contain precipitation data. If any other met data file formats are used, this frame will be disabled and by default the wind speed option is used.

- **Wind Speed:** This option is available for all met data files and displays of the Frequency Count, Frequency Percentage, and Wind Rose Graph are in terms of wind speed.

- **Stability Class:** This option is only available for **Pre-Processed ISC Met Data** files and **CALMET Time Series** files that contain precipitation data. If this option is selected, then the display of the **Frequency Count**, **Frequency Percentage**, and **Wind Rose** are in terms of stability classes (A, B, C, D, E, F, and G).

- **Wind Directions:** You can adjust the number of pre-determined wind direction categories. This option facilitates determining the prevailing wind direction.

- **Wind Classes:** Click on the [Wind Classes [6]...] button to display the Wind Classes dialog where you can change the default wind speed classes.

- **Precipitation Classes:** Click the [Rain Rate Classes [6]...] button to display Rain Rate Classes dialog where you can change the default precipitation classes.

> The **Precipitation Classes** button replaces the **Wind Classes** button when the meteorological file loaded into the **Met Data Information** tab contains precipitation data and **Precipitation Intensity** option is selected in the **Tools** menu. **Precipitation Intensity** is only available for SAMSON, HUSWO, Generic CSV, and Pre-Processed ISC format files.

Unit of Measurement

This panel allows you to select the wind speed unit to be used for the display of the frequency reports and wind rose graph.

For wind data, two options are available:

- **Knots**

- **Meters/Second**

For precipitation data, one option is available:

- **mm/hr**

Orientation

Here you can specify the orientation of the wind display (blowing from or blowing to). Two options are available:

- **Direction (blowing from):** Indicates that the frequencies shown are related to winds blowing from an angle. For example, zero degree is actually wind blowing from north.

- **Flow Vector (blowing to):** Indicates that the frequencies shown are related to winds blowing to an angle. For example, zero degree is actually wind blowing to north.

Met Data Information tab

The **Met Data Information tab** is where you can add your met data files, view the information for each met file and specify date and time ranges for the met data.

Met Data Information tab

See the following sections for detailed information on each of the panels found in this tab:

▸ Meteorological Data Files

▸ Date, Year & Time Range

▸ Data File Info

‣ Surface Station

‣ List of Incomplete/Missing Hours

‣ Specify Days to Process

‣ Specify Time Range

Meteorological Data Files

The **Meteorological Data Files** panel allows you to specify the name and location of the met file you wish to use and displays information for the met files you have opened.
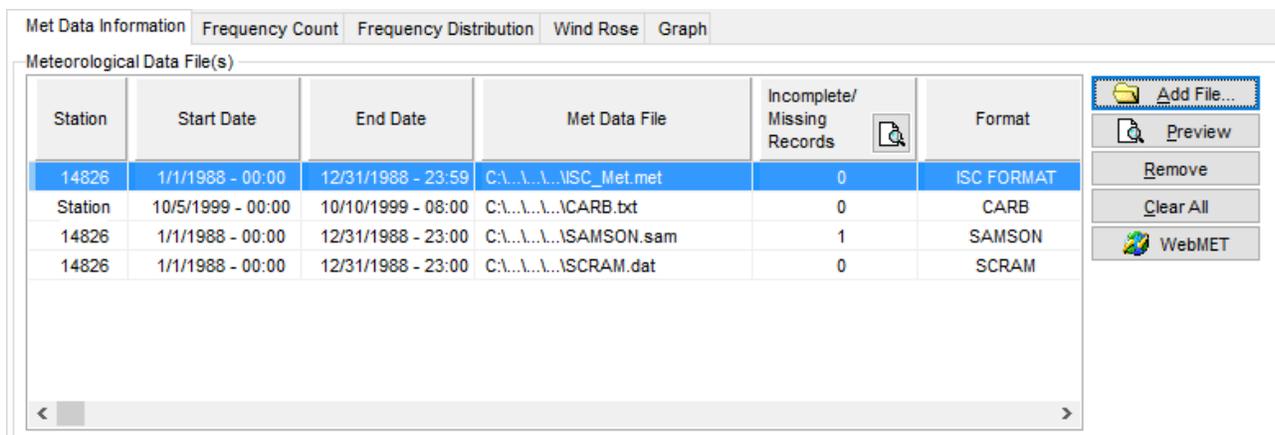
Meteorological Data Files panel

Met Data File Info

The following information is displayed for each met file that you add to your project:

- **Year:** Displays the year of the met data file.

- **Station:** Displays the station number of the met station where the met data was obtained.

- **Met Data File:** Displays the name and location of the met data file you have added.

- **Incomplete/Missing Hours:** This field indicates whether or not your met data file is complete. The number displayed here indicates the number of occurrences of incomplete or missing data. If 0 is displayed, your met file is complete. If any other number is displayed, this indicates there is data in the met file that is required by WRPLOT View that is either missing or incomplete. Click on the button to open the List of Incomplete/Missing Hours dialog.

- **Format:** Indicates the met file format of the met data you are using.

> See Supported Met Data File Formats.

The following buttons are found in this panel:

Add File... Click on this button to add a met data file for which wind rose statistics are to be produced.
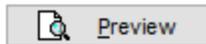
Preview Click on this button to view the met data file that is selected in the **Meteorological Data Files** window in Windows WordPad.
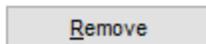
Remove Select this button to remove the met data file selected in the **Meteorological Data Files** window.
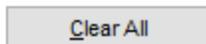
Clear All Press this button to delete all met data files.
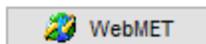
WebMET Clicking this button links with the WebMet site where you can locate met data files to be used for your wind rose plot.

Date, Year & Time Range

The **Date Range, Year** and **Time Range** panels allow you to specify the date, year and time for which the wind rose plot will be generated.

Date Range

The **Date Range** panel allows you to specify the date ranges for plotting. By default, all observations are selected for the creation of the wind rose.
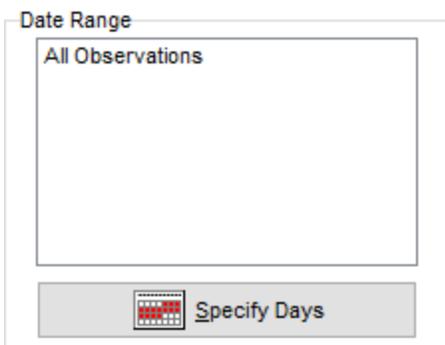
Date Range panel

If you wish to change the date range, for example create a wind rose plot only for the month of June, click on the [Specify Days] button to open the Specify Days to Process dialog where you can do so. Please note that every time you change the date range, your windrose plot will be regenerated. If the met data file you are using spans multiple years, the date range selected is used for each year.
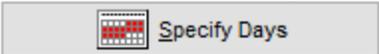
Years

If the meteorological data file you have specified is a multi-year data file, you have the option of selecting which year(s) to display.
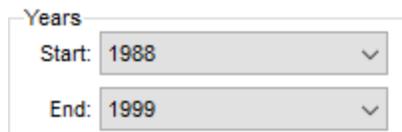
```
Years
  Start: 1988          v
  End:   1999          v
```

From the drop-down list, select the **Start** and **End** year to display.

Time Range

The **Time Range** panel allows you to select time ranges for plotting. By default, all hours of the day are selected for the creation of the wind rose.
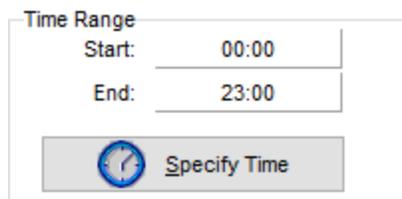
```
Time Range
  Start:        00:00
  End:          23:00

      [ Specify Time ]
```

Time Range panel

If you wish to change the time range, for example create a wind rose plot only for the hours from 6am to 11am, click on the [Specify Time] button to open the Specify Time Range dialog where you can do so. Please note that every time you change the time range, your windrose plot will be regenerated. If the met data file you are using spans multiple years, the time range selected is used for each year.
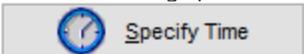
Data File Info

The Data File Info panel displays the combined information for all the met data files listed in the Meteorological Data Files panel. As you delete or add files, the values in the **Data File Info** panel will be updated to reflect the change.

Data File Info

Total No. of Hours:	8784
Average Wind Speed:	4.78 m/s
Calm Records:	109
Calm Winds Frequency:	1.24%
Data Availability:	100.00%
Incomplete/Missing Records:	0
Total Records Used:	8784

The following information is displayed:

- **Total No. of Hours:** Displays the total number of hours for all the met files added to the Meteorological Data Files list.

- **Average Wind Speed:** Displays the average wind speed for the selected met data files.

> You can have met files that are in different formats and have different units of wind speed measurement; WRPLOT View will convert all the wind speed data to either knots or meters per second as specified in the Display-Units-Orientation panel.

- **Calm Hours:** The number of hours which contain wind speed data that is below the first wind speed class. As you modify the wind speed classes in the Wind Classes dialog, this number may change.

- **Calm Winds Frequency:** Displays the percent frequency of calm winds. Calm winds are defined by a wind speed less than the threshold of the wind instrument, and coded as a zero wind speed and direction.

- **Data Availability:** This displays the percent of available data in the met files.

- **Incomplete/Missing Hours:** Displays the number of records that have incomplete or missing data fields for the specified format.

- **Total Hours Used:** The total number of hours used to generate the plot data.

Surface Station

The **Surface Station** panel will automatically display information about the surface station where the met data was collected, only if your data file is from one of the NWS stations available on the SCRAM BBS.

Surface Station (Optional)
Name: _____ State: _____ Station ID: 14826

Surface Station panel

The following information is displayed:

- **Name:** Displays the name of the surface station where the met data was collected.

- **State:** This is the state where the surface station is located.

- **Station ID:** This is the 5-digit station id for the surface station.

If your data file is not from a NWS station, then these fields will be blank. You can specify the Name and State for the surface station being used. The Station ID is read from your met data file.

> The information displayed in the **Surface Station** panel is used as the default title when you print your wind rose plot. This can be changed in the **Print Preview** dialog.

List of Incomplete/Missing Hours

The **List of Incomplete/Missing Hours** dialog allows you to view which lines in your met data file have missing or incomplete data. These lines are highlighted in red and the line number is indicated on the left.

You have access to this dialog by clicking on the [icon] button in the Meteorological Data Files panel.

List of Incomplete/Missing Hours dialog

At the top of the dialog the total number of lines in the met files is displayed, following by the total number of incomplete/missing hours. Using the [↓] and [↑] buttons, you can jump to all the incomplete/missing lines.

Specify Days to Process

The Specify Days to Process dialog allows you to select the days and/or range of days you would like to process. This can be useful if you wish, for example, to do a seasonal analysis.

You have access to this dialog by clicking on the [Specify Days] button in the Date Range panel of the Met Data Information tab.

> If you are selecting days for a leap year, February 29th will be available.

Specify Days to Process dialog

The following buttons are found in the **Specify Days to Process** dialog:
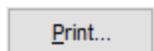
Print... Displays the Print dialog, where you can specify printing options such as printer, paper size etc.
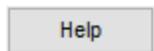
Help Displays the Help contents for the Specify Days to Process dialog.
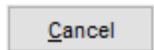
Cancel Closes the Specify Days to Process dialog, canceling any range of days selected.
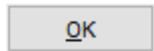
OK Closes the Specify Days to Process dialog, applying the range of days selected.

Unselects all the days.

Selects all the days.

Unselects the highlighted days.

Selects the highlighted days.

Switches the selection of highlighted days.

Specify Time Range

The **Specify Time Range** dialog allows you to select a specific time range for plotting your wind rose.
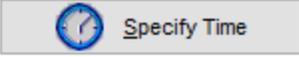
You have access to this dialog by clicking on the [Specify Time] button in the Data & Time Range panel.
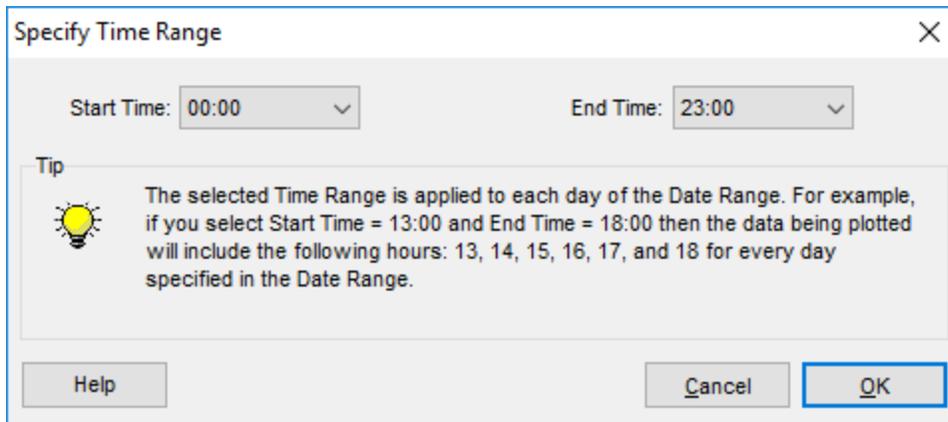
Specify Time Range dialog

From the **Specify Time Range** dialog, select the **Start Time** and the **End Time** from the drop-down lists and press the **OK** button. The selected time range will be applied to all met files and for each day you specified in the date range.

Frequency Count tab

The **Frequency Count** tab displays in tabular form the number of occurrences of winds in each of the wind direction sectors and wind speed classes. The sub-totals for each column and row (total occurrence of wind class and wind direction respectively) are displayed, as well as the number of calms, missing/incomplete and total wind data.

Frequency Count tab

You can choose to display your directions/wind classes in degrees or by compass points. To select the display option, left click with your mouse on the **Directions/Wind Classes** header to display the following floating menu option:
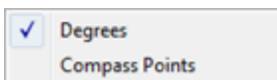
Select which option you would like to display. A check indicates which option is currently selected. You can also change this display option in the Graph/Reports tab of the Preferences dialog.

You can export, save and print the frequency reports by doing the following:

- **To Export the Report:** Click and specify a name and location for the exported .csv file.

- **To Save Report:** Select **File | Save Reports As...** from the menu. Specify the name and directory to save the frequency reports. The reports will be saved in text (*.txt) format which you can then read with any word processor.

- **To Print Frequency Report:** Select **File | Print | Frequency Report** from the menu.

Frequency Distribution tab

The **Frequency Distribution** tab displays the normalized frequency of occurrences of winds in each direction sector and each wind speed class. The sub-totals for each column and row (total occurrence of wind class and wind direction respectively) are displayed, as well as the number of calms, missing/ incomplete and total wind data.

	Directions / Wind Classes (m/s)	0.50 - 2.10	2.10 - 3.60	3.60 - 5.70	5.70 - 8.80	8.80 - 11.10	>= 11.10	Total
1	342 - 18	0.03654	0.02288	0.02892	0.01127	0.00034	0.00000	0.09995
2	18 - 54	0.02152	0.01799	0.03427	0.01833	0.00125	0.00011	0.09347
3	54 - 90	0.02357	0.02049	0.03119	0.01389	0.00137	0.00011	0.09062
4	90 - 126	0.03040	0.00968	0.01480	0.00046	0.00000	0.00000	0.05533
5	126 - 162	0.02926	0.01366	0.01469	0.00285	0.00000	0.00000	0.06045
6	162 - 198	0.03575	0.03279	0.04929	0.03097	0.00512	0.00000	0.15392
7	198 - 234	0.01935	0.02140	0.04269	0.02778	0.00569	0.00034	0.11726
8	234 - 270	0.02721	0.01969	0.04235	0.02470	0.00501	0.00068	0.11965
9	270 - 306	0.03199	0.01560	0.03347	0.02265	0.00592	0.00148	0.11111
10	306 - 342	0.03506	0.02095	0.02539	0.00592	0.00068	0.00000	0.08800
	Sub-Total	0.29064	0.19513	0.31705	0.15881	0.02539	0.00273	0.98975
	Calms							0.01013
	Missing/Incomplete							0.00011
	Total							1.00

Dates: 1/1/2004 - 00:00 ... 12/31/2004 - 23:00

% Off

Frequency Distribution tab

The frequency distribution can be displayed as either a normalized frequency or percent frequency. Selecting **%On** from the drop-down list at the top of the tab will display the distribution as a percent frequency while **%Off** will display it as a normalized frequency.

You can choose to display your directions/wind classes in degrees or by compass points. To select the display option, left click with your mouse on the **Directions/Wind Classes** header to display the following floating menu option:

✓ Degrees
   Compass Points

Select which option you would like to display. A check indicates which option is currently selected. You can also change this display option in the Graph/Reports tab of the Preferences dialog.

You can export, save and print the frequency reports by doing the following:

- **To Export the Report:** Click [icon] and specify a name and location for the exported .csv file.

- **To Save Report:** Select **File | Save Reports As...** from the menu. Specify the name and directory to save the frequency reports. The reports will be saved in text (*.txt) format which you can then read with any word processor.

- **To Print Frequency Report:** Select **File | Print | Frequency Report** from the menu.

Wind Rose tab

The **Wind Rose** tab graphically displays the frequency distribution of occurrences of winds in each of the defined direction sectors and wind speed classes for the specified date, year and time period.
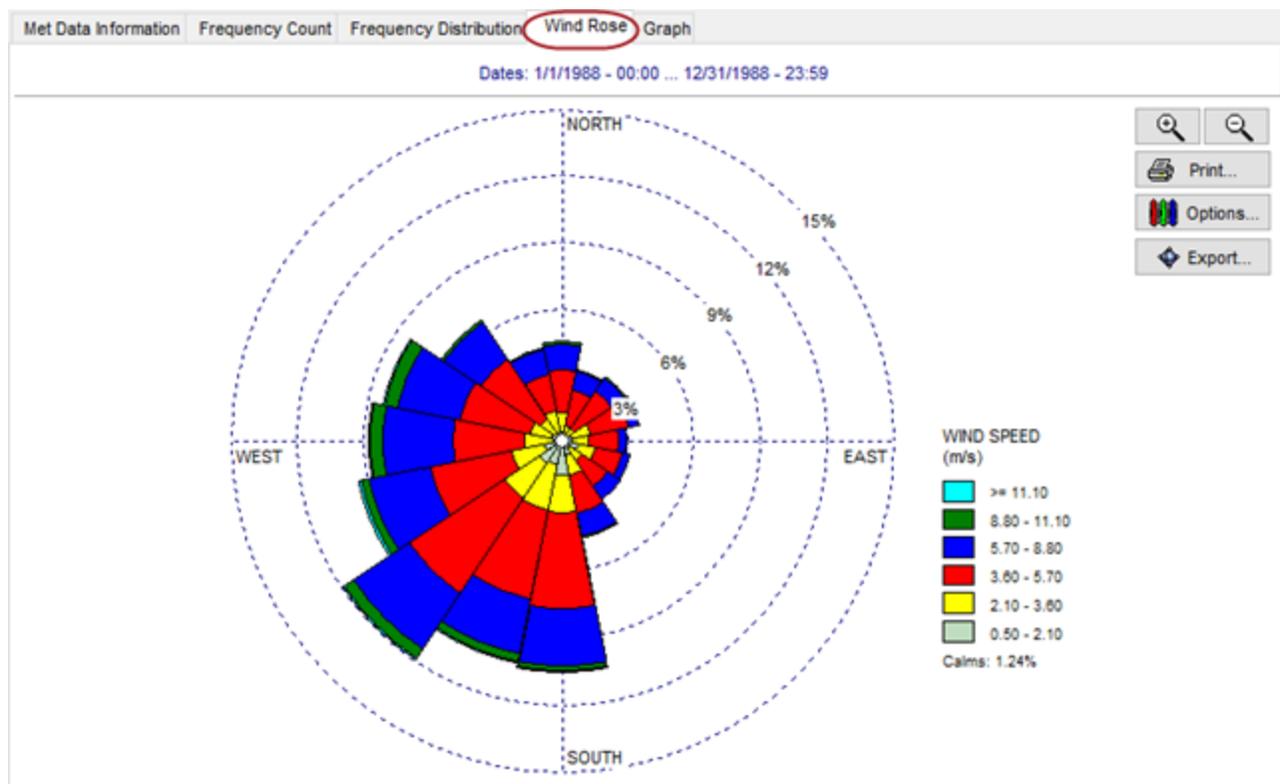
Wind Rose tab

The following buttons are available in this tab:

[icon] Select this button to zoom into an area of the wind rose plot.

🔍 Select this button to zoom out from the center of the wind rose plot.

🖨 Print... Select this button to display the Print Preview dialog.

🎨 Options... Select this button to display the Wind Rose Options dialog.

◆ Export... Select this button to export the plot to Google Earth.

Rain Rose tab

The **Rain Rose** tab graphically displays the frequency distribution of occurrences of rains in each of the defined direction sectors and rain rate classes classes for the specified date, year and time period. This tab is displayed instead of the Wind Rose tab, only if you have selected the **Precipitation Intensity** option from the Tools menu.
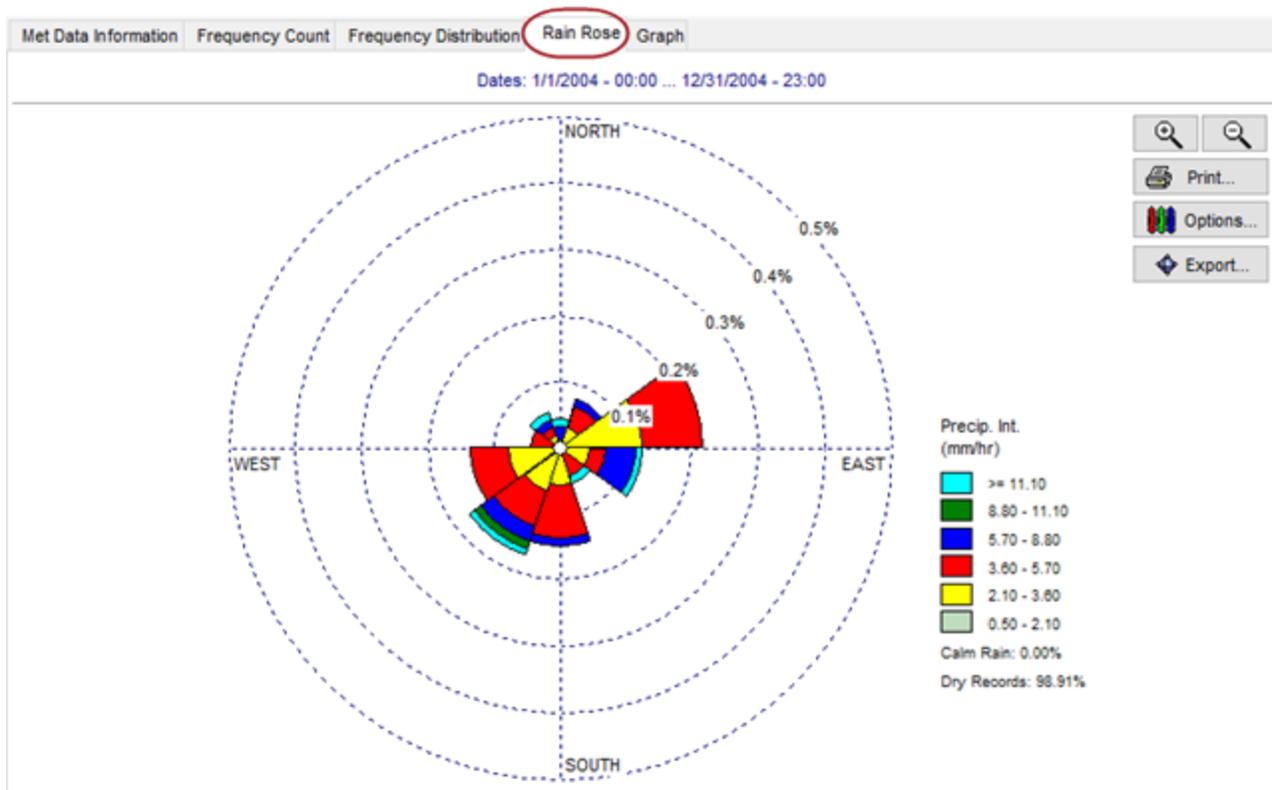
Rain Rose tab

The following buttons are available in this tab:

Select this button to zoom into an area of the rain rose plot.

Select this button to zoom out from the center of the rain rose plot.

Select this button to display the Print Preview dialog.

Select this button to display the Rain Rose Options dialog.

Select this button to export the plot to Google Earth.

Graph tab

The **Graph** tab displays a wind class frequency distribution plot for your met data files. If you have specified a pre-processed ISC met file (PCRAMMET processed data file) a stability class frequency distribution will be displayed. You can also view a graph of rain rate classes if you have met files containing hourly precipitation data and have selected the **Precipitation Intensity** option from the **Tools** menu.

You can print the graphs by selecting **File | Print | Graph** from the menu.
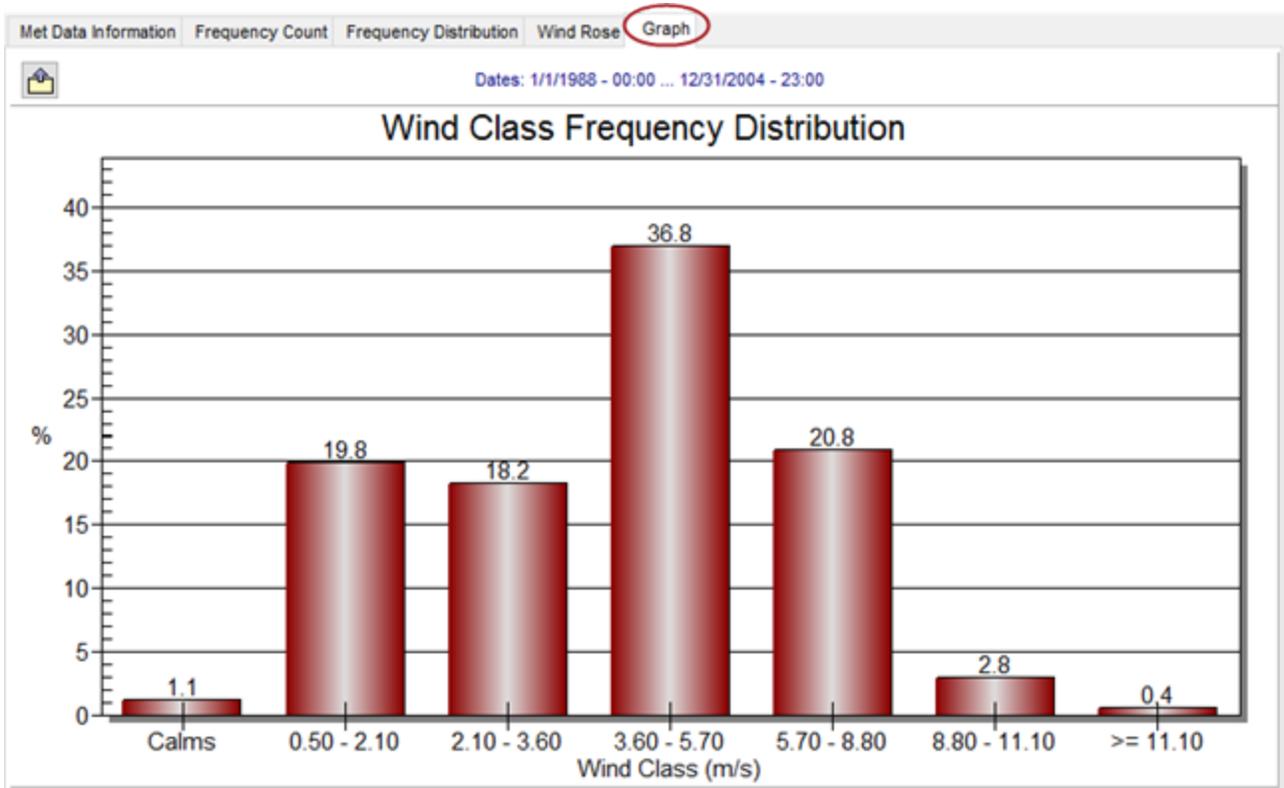
Graph tab

To customize the graphs, right click the graph, and select an option from the drop-down menu that appears:

Viewing Style	>	
Border Style	>	
Font Size	>	
✓ Show Legend		
Numeric Precision	>	
Plotting Method	>	
Data Shadows	>	
Grid Options	>	
Graph and/or Table	>	
Point Label Orientation	>	
Mark Data Points		
Undo Zoom		
Maximize...		
Customization Dialog...		
Export Dialog...		
Help		
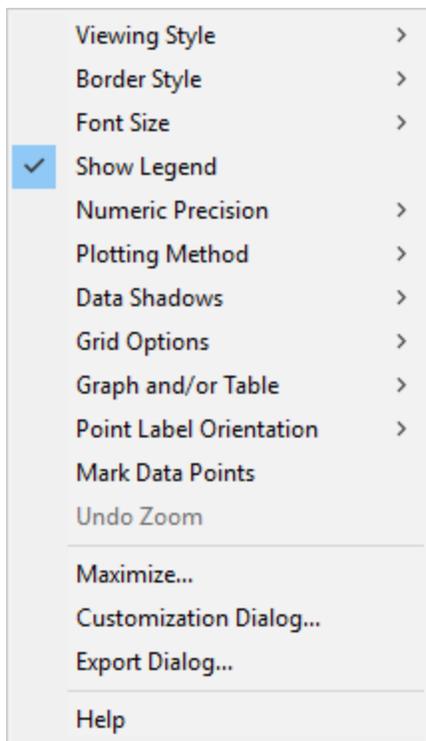
Double-clicking the graph opens the **Customization Dialog**.

Wind/Rain Rose Options

You have access to the **Wind/Rain Rose Options** dialog by clicking on the ⟦Options...⟧ button located in the Wind Rose or Rain Rose tab. This dialog contains several options to enhance the appearance of your rose plot.
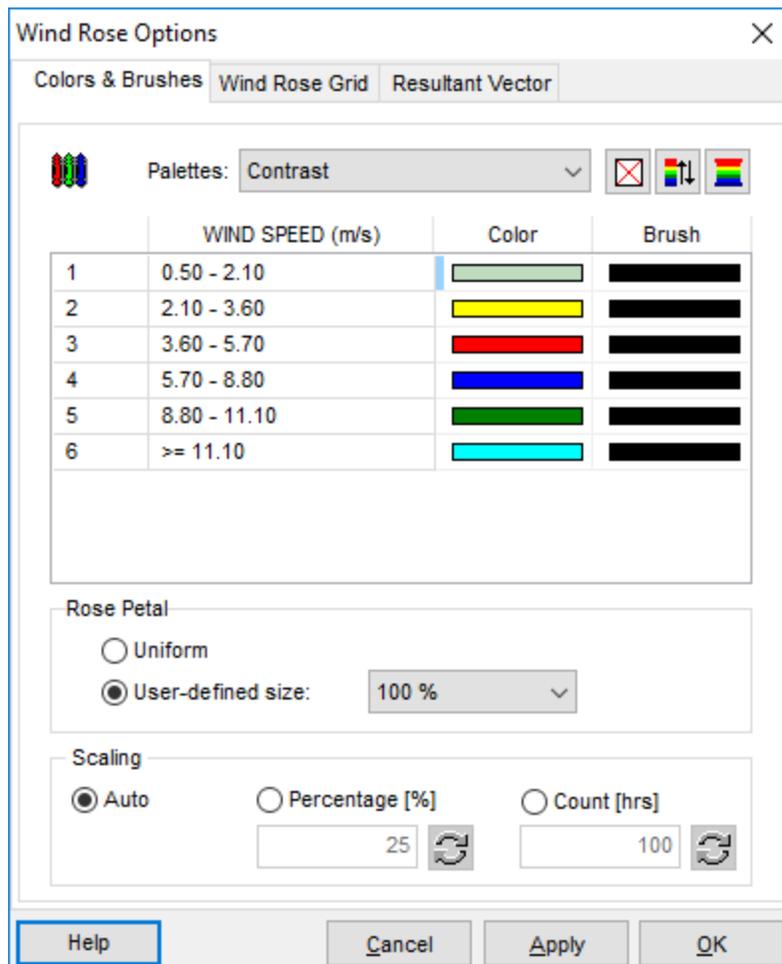
Rose Options dialog

There are three tabs available within the **Wind Rose Options** dialog, see the following sections for a description of the options found within each tab.

▶ Colors & Brushes tab

▶ Wind Rose Grid tab

▶ Resultant Vector tab

Colors & Brushes tab

The **Colors & Brushes** tab of the Wind/Rain Rose Options dialog is where you control the color options of the wind rose plot.
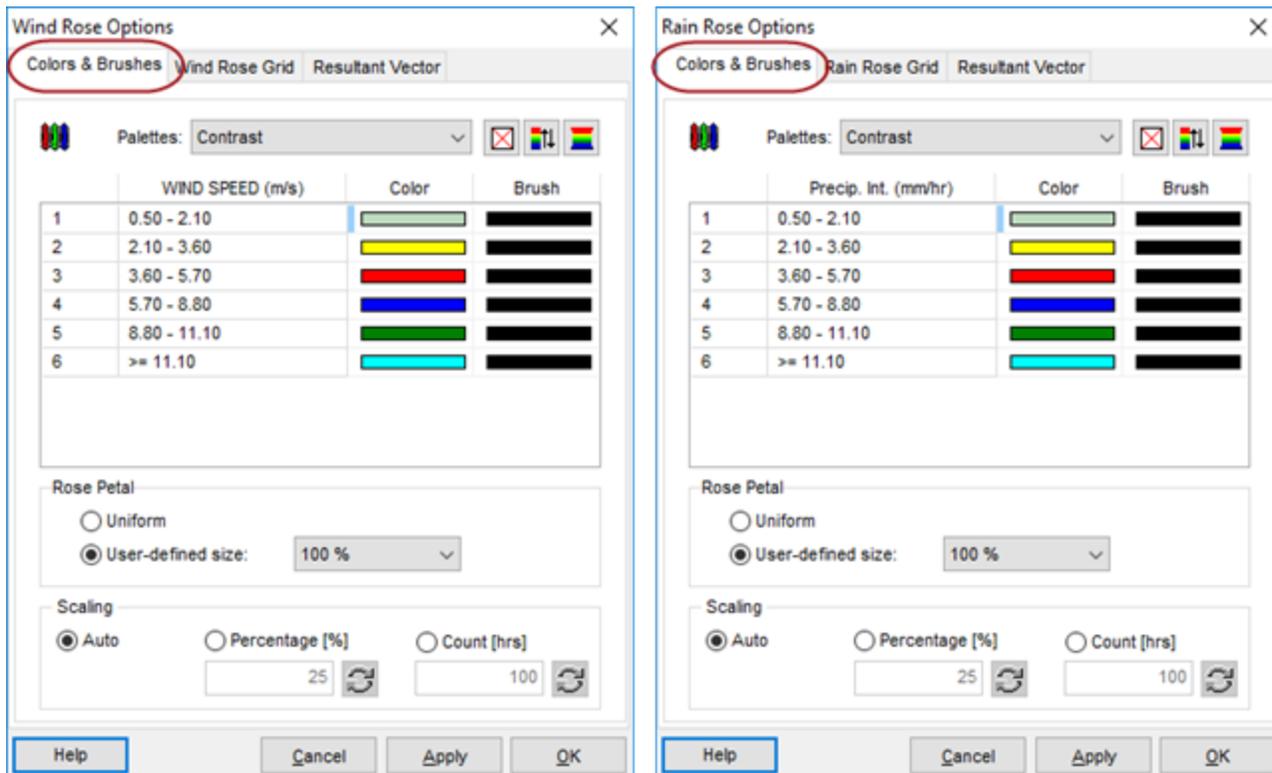
Rose Options dialog - Colors & Brushes tab

Wind Rose

In this tab you can select a color palette to be applied to your wind speed classes. Each wind speed class you selected in the Wind Classes dialog is listed here with it's range, and the color and brush style displayed.

Rain Rose

In this tab you can select a color palette to be applied to your precipitation classes. Each wind precipitation class you selected in the Rain Rate Classes dialog is listed here with it's range, and the color and brush style displayed.

Options

The following options allow you to customize the display of your rose plot:

- **Palettes:** Select a color scheme for your rose plot from one of the pre-defined palettes from the drop-down list. You can also use the following buttons when defining you colors:

  ⊠ **Clear Color In Selected Row:** Select this button to remove the color from the selected row.

  ⬆⬇ **Invert Colors:** Select this button to invert the order of the colors.

  ▤ **Interpolate Colors:** Select this button to interpolate the colors. See Interpolating Colors.

- **Color:** Double-click on the color bar to open the Color dialog where you can select the color you would like to use for that particular wind speed or precipitation class.

- **Brush:** Double-click on the brush bar to display a drop-down list from where you can select a brush style.

- **Rose Petal**

  o **Uniform:** Select this option to apply the uniform width for the rose petals displayed in the plot interface as well as the Google Earth interface when the plot is exported.

  o **User-defined Size:** From the drop-down list you can select the percentage width of the rose petals representing the wind directions or precipitation intensity in the rose plot. The range of values is from 50% to 100% as seen in image below.
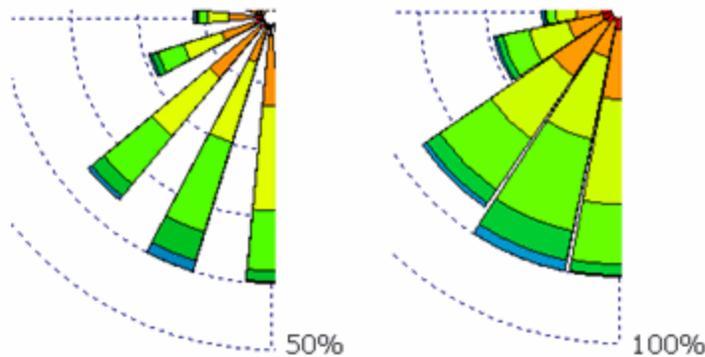
- **Scaling:** The Scaling option refers to the scaling display for the rose rings. Five rings are displayed for the rose with an equal increment value. The user can control the frequency

percentage value [%] or frequency count value [hrs] for the outer ring. The following options are available:

- o **Auto:** This option is the default and the scaling of the rose rings are automatically calculated based on the meteorological data being displayed.

- o **Percentage [%]:** The user can specify a fixed percentage value for the outer ring. This option can be used when comparing roses for different datasets using the same scale.

  Press the [icon] button to get the default value for the current meteorological data.

- o **Count [hrs]:** The user can specify the number of hours instead of the percentage for the outer ring. In this case, the display of the rose ring labels will be in terms of count [hours] as seen in the Frequency Count tab. Press the [icon] button to get the default value for the current meteorological data.
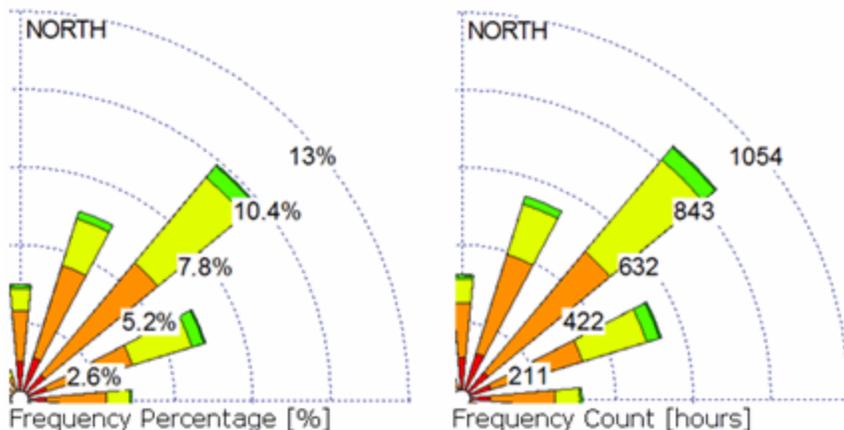
Interpolating Colors

This option easily allows you to create an attractive color gradient for your contour plot.

How to Interpolate Colors:

1. Select the color that you would like to interpolate.

1	0.50 - 2.10		
2	2.10 - 3.60		
3	3.60 - 5.70		
4	5.70 - 8.80		
5	8.80 - 11.10		
6	>= 11.10		
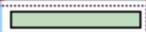
2.   Click the button. You need at least one blank (no color) level to be able to interpolate colors.

1	0.50 – 2.10		
2	2.10 – 3.60		
3	3.60 – 5.70		
4	5.70 – 8.80		
5	8.80 – 11.10		
6	>= 11.10		

3.   Click the button to interpolate between two colors and create a custom color scheme.

1	0.50 – 2.10		
2	2.10 – 3.60		
3	3.60 – 5.70		
4	5.70 – 8.80		
5	8.80 – 11.10		
6	>= 11.10		

In the example above, after the top row color was removed, all colors were recalculated and adjusted.

Wind Rose Grid tab

The **Wind Rose Grid** tab of the Wind Rose Options dialog enables you to customize the appearance of the wind rose grid and the font displayed in the plot.
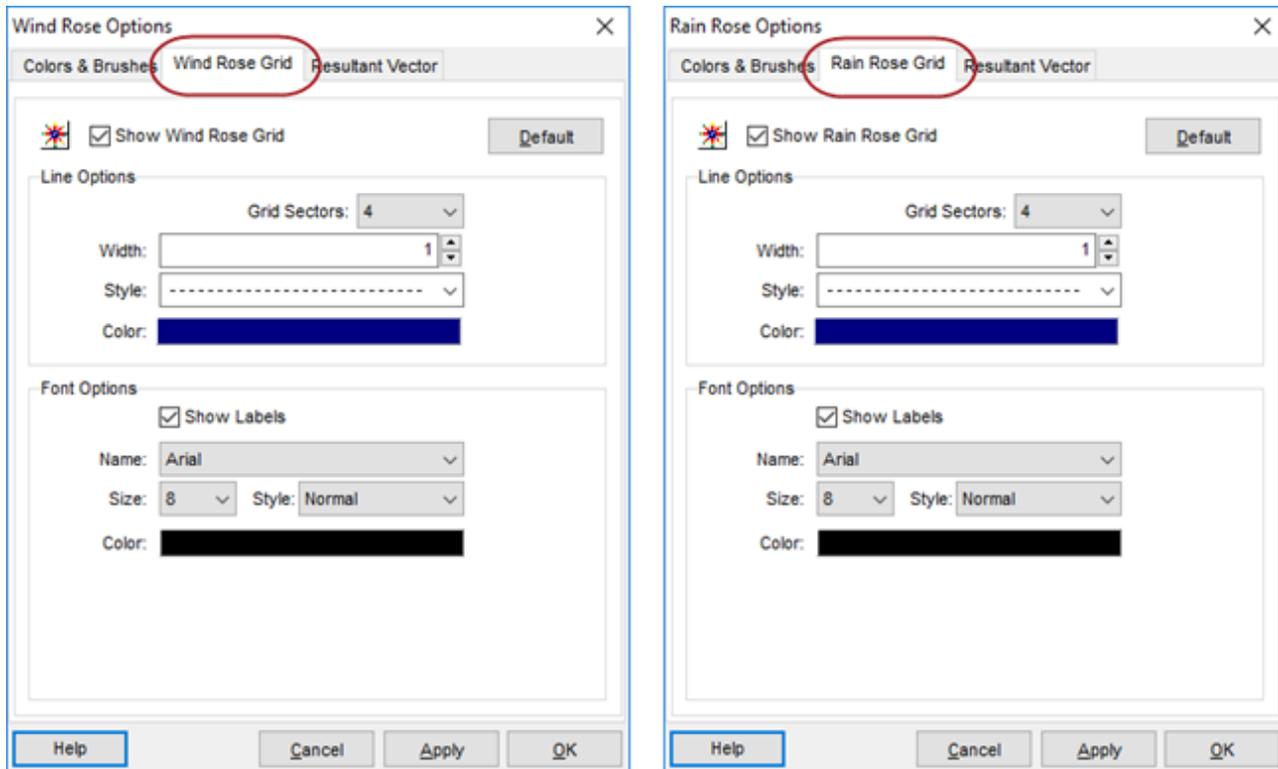
Rose Options dialog - Wind/Rain Rose Grid tab

You can choose to display or hide the rose grid by checking and unchecking the **Show Wind Rose Grid** box. At any time, you can click on the [Default] button to return to the default settings for your wind rose grid. Several options are available to enhance the appearance of your plot:

Line Options

- **Grid Sectors:** Here you can select the number of grid sectors for your rose grid from the drop-down list.

- **Width:** Specify here the width of the grid lines.

- **Style:** Select the style for your grid lines from the drop-down list.

If you have selected a dashed line style, only a width of 1 is available. You can increase the width for the lines only if you select the solid line style.

- **Color:** Click on the color bar to display the Color dialog from where you can select a color for the grid lines.

Font Options

- **Show Labels:** Check this box if you would like the labels displayed on the rose plot.

- **Name:** Select a font type from the drop-down list.

- **Size:** Select a font size from the drop-down list.

- **Style:** Select a font style from the drop-down list.

- **Color:** Click on the color bar to display the Color dialog from where you can select a color for the grid labels.

Resultant Vector tab

The **Resultant Vector** tab of the Wind/Rain Rose Options dialog allows you to specify display options for the resultant vector. The resultant vector is the dominant direction or mean direction of the vectors. This is calculated by computing the vector resultant or vector sum of the unit vectors that represent the various directions in the data. The magnitude of the resultant vector represents the mean resultant vector length.
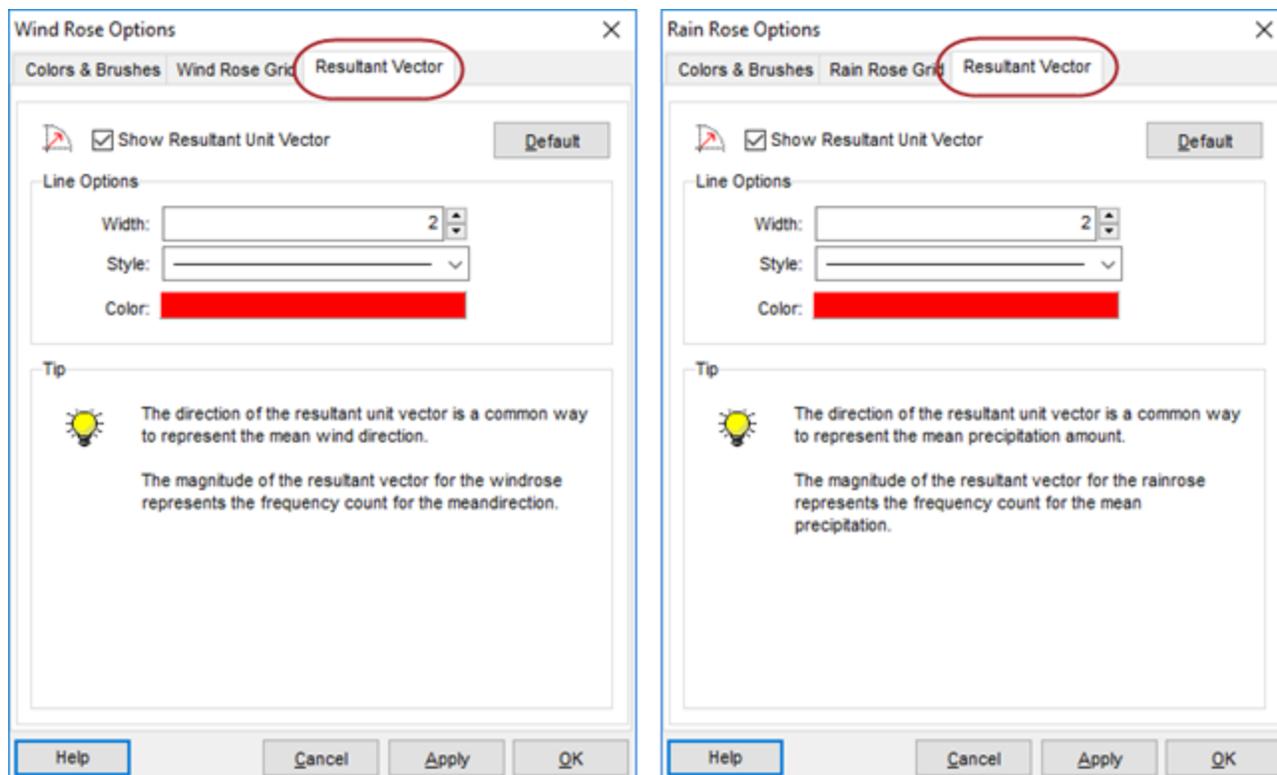
Rose Options dialog - Resultant Vector tab

The following options are available:

- **Show Resultant Vector:** Check this box if you would like the resultant vector displayed on the rose plot.

- **Default:** Clicking this button restores the default settings.

- **Width:** Select a line width from the drop-down list for the resultant vector.

- **Style:** Select a line style from the drop-down list for the resultant vector.

- **Color:** Click on the color bar to display the Color dialog from where you can select a color for the displayed resultant vector.

Color Dialog

The **Color** dialog allows you to modify colors of objects or layers.
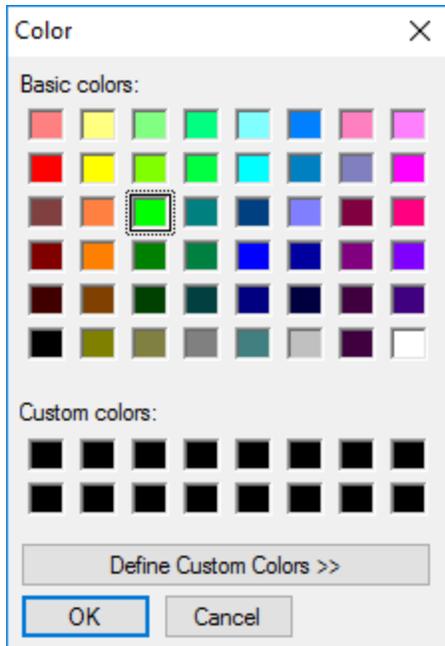
Color dialog

Select a color from the table of **Basic colors** or from **Custom colors**, and click on the **OK** button to apply that color.

Tools & Utilities

The **Tools & Utilities** sections provides a detailed overview of the functionality in the **Tools** menu.

The following tools are described in this section:

- ▶ Wind Classes

- ▶ Wind Rose Sectors

- ▶ Rain Rate Classes

- ▶ Save Class Configuration

- ▶ Load Class Configuration

- ▶ Import Surface Data from Excel

- ▶ Export to Google Earth

Wind Classes

The **Wind Classes** dialog allows you to change the default wind speed classes. You have access to this dialog by selecting **Tools | Wind Classes...** from the menu or by clicking on the

| Wind Classes [6]... |

button in the Display-Units-Orientation panel.
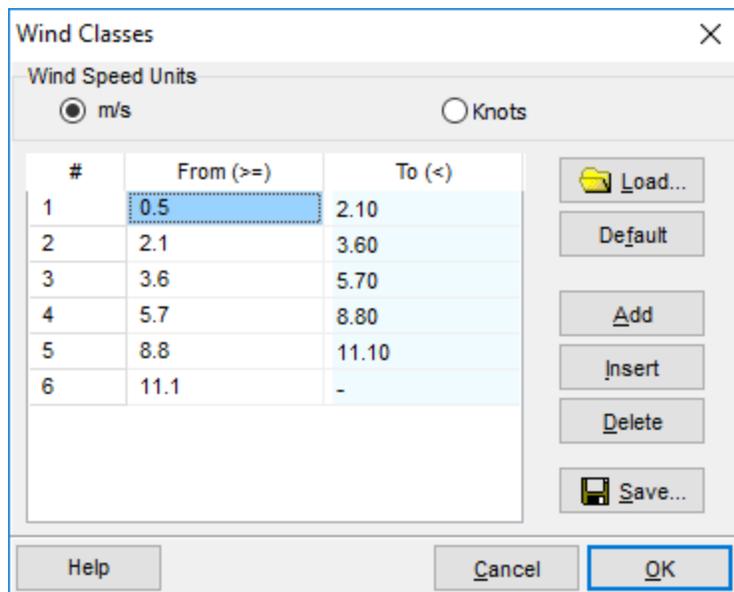
Wind Classes dialog

At the top of the **Wind Classes** dialog you have the option of selecting the units of measurement for wind speed, either meters per second or knots.

By default, six wind classes are set with the **From** and **To** ranges already specified for each class. To change the range for any class, simply double-click within a cell and change the value directly. You can also add up to three more wind classes (maximum of nine wind classes) and set the range of each class.

The following buttons are found in the **Wind Classes** dialog:
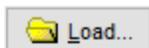
[Load...] Allows you to load a previously saved wind class configuration through the Select Class Configuration dialog.
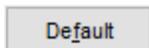
[Default] Resets the wind speed classes to the WRPLOT View default.
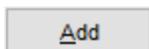
[Add] Adds a wind speed class to the end of the list.
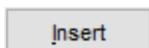
[Insert] Inserts a class above the selected class in the list.

[Delete] Deletes the selected wind speed class.
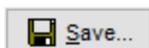
[Save...] Allows you to Specify Name for Class Configuration to save it for future use.

Specify Name for Class Configuration
Specify Name: My Class Configuration
Help   Cancel   OK
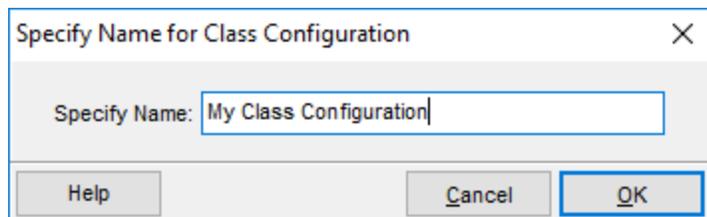
Once a configuration has been saved, it can be accessed using the [Load...] button and Select Class Configuration dialog.
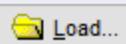
Wind Rose Sectors

This dialog allows you to define custom wind rose sectors. This tool can be loaded by selecting **Tools | Wind Rose Sectors** from the main menu.
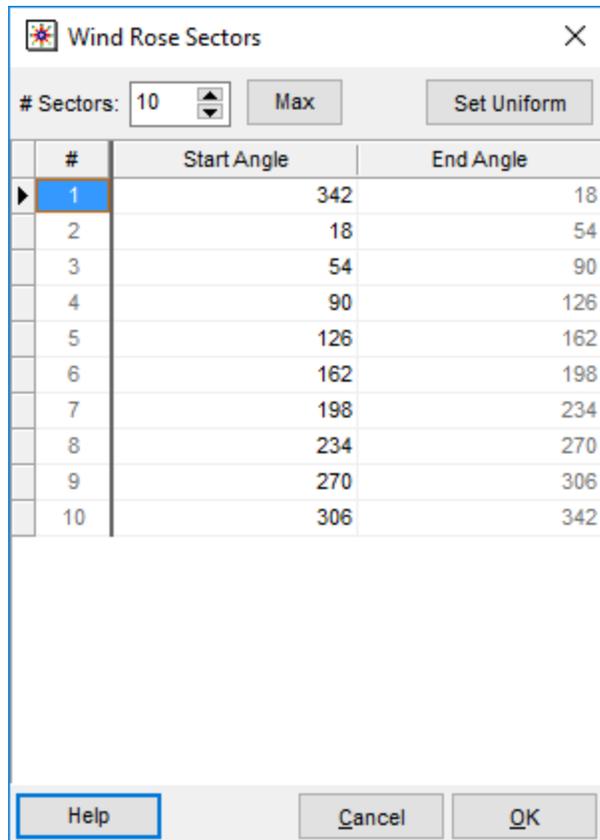
Use the following options to define the wind rose sectors:

 # Sectors: Use the ▲▼ buttons to define the number of sectors you wish to have.

Max Sets the **# Sectors** to maximum (36).

Set Uniform Sets the angle interval for the sectors to uniform range centered on a default angle.

Rain Rate Classes

The **Rain Rate Classes** dialog allows you to change the default rain rate classes. You have access to this dialog by selecting **Tools | Rain Rate Classes...** from the menu or by clicking on the
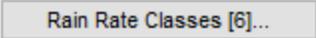
Rain Rate Classes [6]...   button in the Display-Units-Orientation panel.
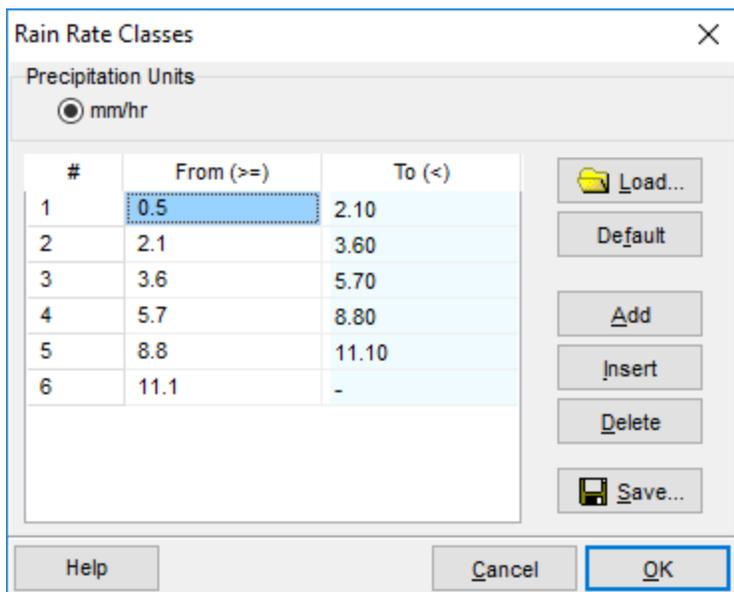
Rain Rate Intensity dialog

At the top of the **Rain Rate Classes** dialog the units of measurement for precipitation rate is displayed.

By default, six rain rate classes are set with the **From** and **To** ranges already specified for each class. To change the range for any class, simply double-click within a cell and change the value directly. You can also add up to three more rain rate classes (maximum of nine) and set the range of each class.

The following buttons are found in the **Rain Rate Classes** dialog:
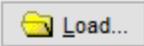
Load...   Allows you to load a previously saved rain rate class configuration through the Select Class Configuration dialog.
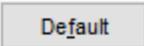
Default   Resets the rain rate classes to the WRPLOT View default.

Add   Adds a rain rate class to the end of the list.
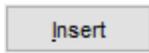
Insert   Inserts a class above the selected class in the list.
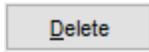
Delete   Deletes the selected rain rate class.

Save...   Allows you to Specify Name for Class Configuration to save it for future use.

Specify Name for Class Configuration   ×

Specify Name: My Class Configuration

Help   Cancel   OK
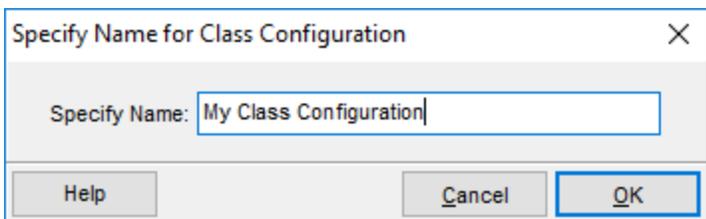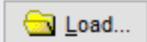
Once a configuration has been saved, it can be accessed using the **Load...** button and Select Class Configuration dialog.

Save Class Configuration

The **Specify Name for Class Configuration** dialog allows you to provide a name for the current wind or rain rate class configuration, so it can be easily loaded at a later time. This dialog can be accessed by clicking the **Save...** button in Wind Classes or Rain Rate Classes dialog.

Specify Name for Class Configuration   ×

Specify Name: My Class Configuration

Help   Cancel   OK
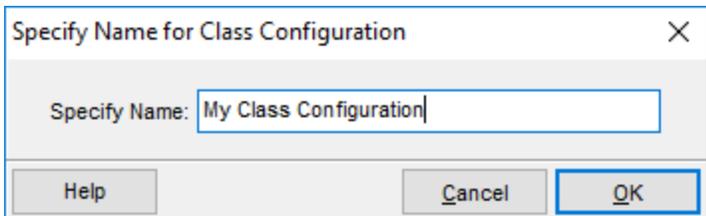
Specify Name for Class Configuration

The following options are available in the dialog:

Specify Name: Type in the name for the current class configuration.
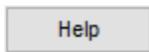
Help: Call context sensitive help page.

Cancel : Close the dialog without saving the configuration.

OK : Save the current configuration under the specified name.

Once you specify a name for your current configuration and click **OK**, it will become available in the Select Class Configuration dialog.

Load Class Configuration

The **Select Class Configuration** dialog allows you to select a class configuration that has been previously saved. This dialog can be accessed by clicking the [Load...] button in Wind Classes or Rain Rate Classes dialog.
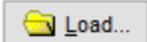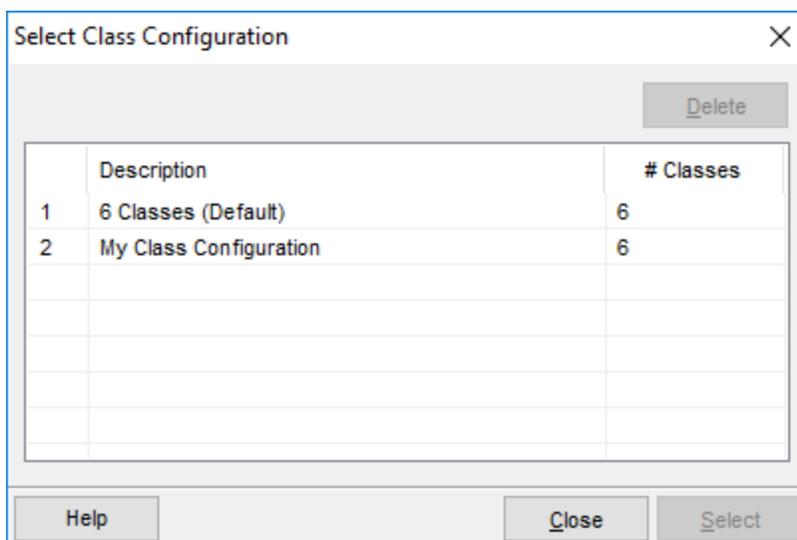
Select Class Configuration

The following options are available in this dialog:

Delete : Delete currently selected configuration.

Help : Call context specific help page.

Close : Close the dialog without loading a configuration.

Select: Load currently selected configuration.

Wind class and rain rate class configurations are both displayed in this dialog.

Import Surface Data From Excel Utility

The **Import Surface Data from Excel** utility is used to convert hourly surface data that is contained in a Microsoft® Excel® spreadsheet file to the proper SAMSON file format, which can be used to generate your own hourly surface data files in the SAMSON format. Also, within this process, you can convert Excel spreadsheet units to the proper SAMSON units, if your data are not already formatted in the proper units.
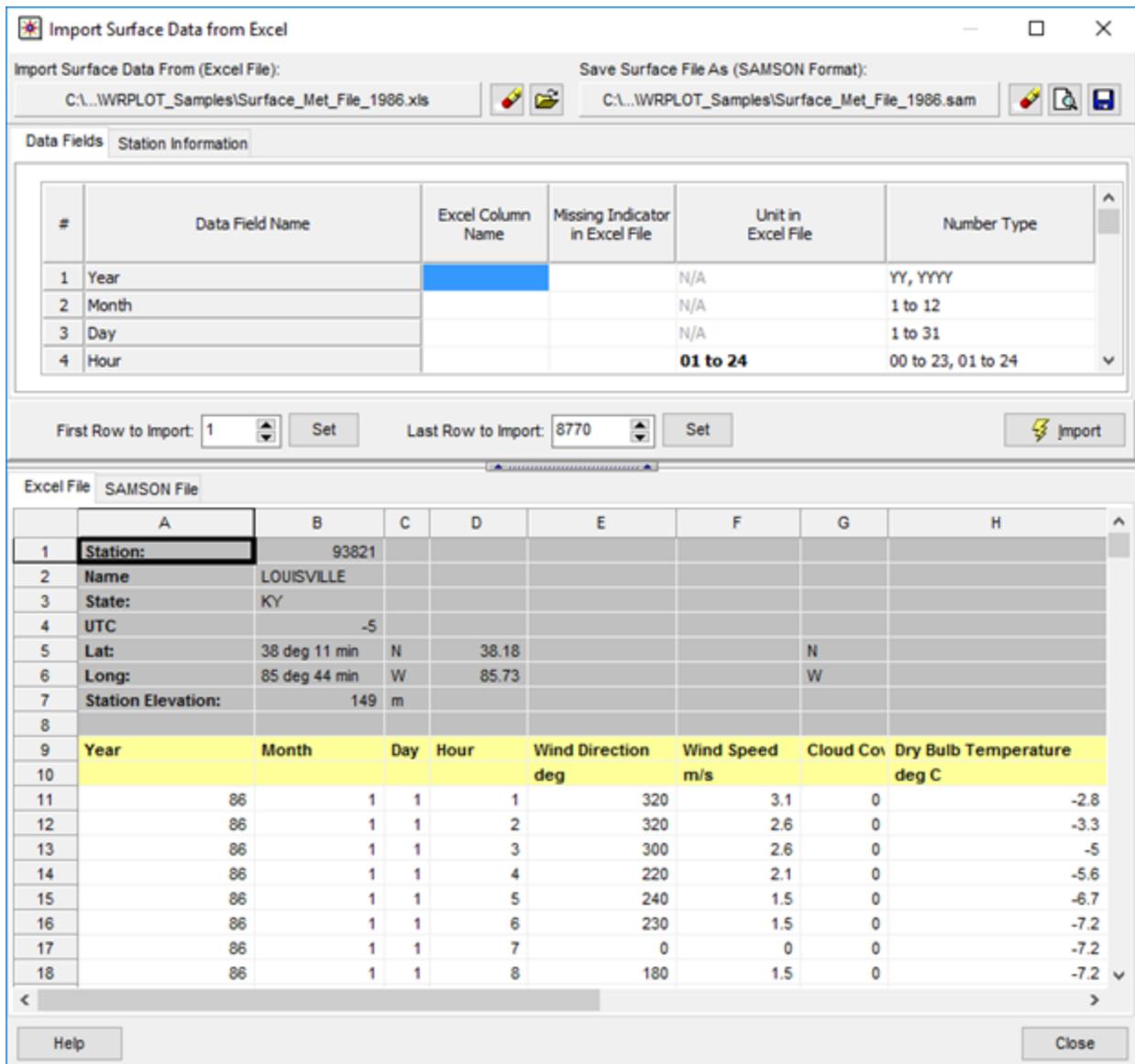
Import Surface Data from Excel utility

How to Import Hourly Surface Data from Excel:

1. Select **Tools | Import From Excel...** to display **Import Surface Data from Excel** dialog.

2. Click the [folder] button and select the Excel file (*.xls, *.xlsx) you wish to import data from. The specified file name will also automatically be inserted into the **Save Surface Data As (SAMSON Format) panel** appended by extension .sam.

3. If you wish to change the name of the surface SAMSON file to be generated, click the [save] button and specify the file name and location where you wish to save the SAMSON file.

4.   Under the **Excel File** tab located on the bottom of the **Import Surface Data from Excel** dialog, you will see a preview of the contents of the Excel file you have specified.

5.   In the **Data Fields** tab, go through your Excel spreadsheet file column by column. Specify in the **Excel Column Name** (ie: A, B, C,...) portion of the table the column number for the appropriate descriptive **Data Field Name** (e.g, Year, Month, Day, Hour, Wind Direction, ... etc.). You can do this by typing in the appropriate letter in the column, or by selecting the Excel spreadsheet file column header and right-clicking with your mouse. From the pop-up menu, you can check the appropriate field.

Data Fields tab

Excel File tab

> If you have any missing data, it is important to fill in the **Missing Indicator In Excel File** column. For example, in the case your Excel file has some hours with missing wind direction data, it is important to indicate what is the missing data flag that is being used in the Excel file, If missing data is left empty, then leave the **Missing Indicator In Excel File** column also blank. The generated SAMSON file will be filled with the appropriate missing data indicator. A data set which is less than 90% complete should not be used for air quality modeling purposes. For data fields that contain no missing data, leave this column blank.

> **See Also:** Procedures for Substituting Values for Missing Indicators for information on providing substitute values for missing data.

6. Go to the **Station Information** tab and specify the Surface Station ID, City, State, Latitude, Longitude, Time Zone, and Station Elevation.
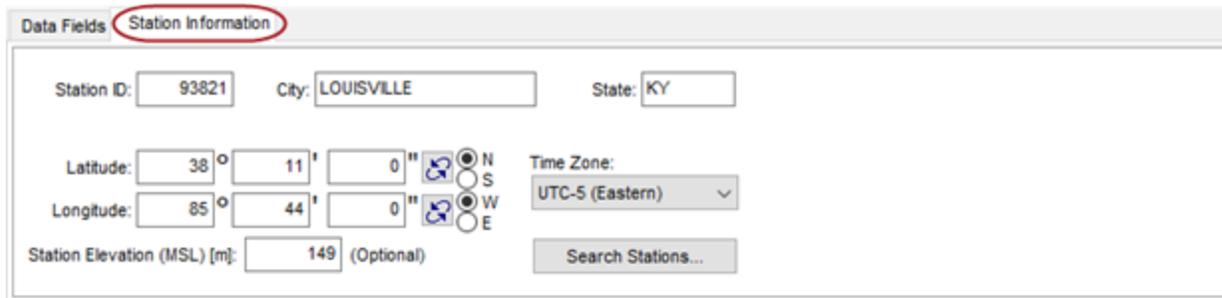
Station Information tab

7. Determine the rows where you meteorological data starts and ends. Then select the appropriate rows from the **First Row to Import** and **Last Row to Import** fields and click Set for each. Use these options to limit the import to only those rows containing actual data.
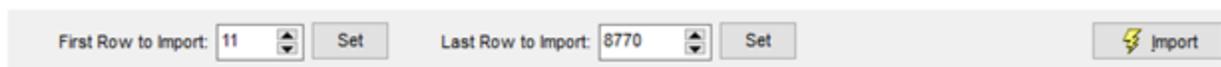
8. Click the [⚡ Import] button, and your SAMSON file will be generated.

> The generated SAMSON file is based on the 24-hour clock and is recorded as 01 through 24. Times are in Local Standard Time (LST) and are adjusted in WRPLOT View to the 01-24 clock in which hour 24 is the same as hour 00 of the next day.

Interface Reference

See below additional descriptions of the fields available under the **Data Fields** and **Station Information** tabs:

Data Fields

This tab contains the following options:

- **Data Field Name:** Contains all the variables that can be used to create your file. See the Minimum Requirements of Data which informs you which fields are required to create your SAMSON file, depending on what you are going to use this SAMSON file for.

- **Excel Column Name:** Input the letter (ie: A, B, C,...) in the Excel spreadsheet file that corresponds to the Data Field Name.

- **Missing Indicator in Excel File:** Type an entry in the cell only if you have missing indicators for a variable. For instance, if you are missing data for certain hours for a variable, leave the field blank in the Missing Indicator in Excel File column for that variable, and your SAMSON file will contain the appropriate missing data indicators.

- **Unit in Excel File:** Contains the units of measurement for your data in the Excel spreadsheet file.

- **Number Type:** Specifies the type of number (e.g. date, day of month, hour of day, integer, etc) that the data field represents.

> In the **Unit in Excel File** column, some cells are in bold font. If a bold cell is clicked, a drop down menu appears, allowing you to select your desired units. The appropriate conversion factor is applied, and your SAMSON file will be created in the appropriate units.

Station Information

In this tab you must define the surface station information in order to create your SAMSON File. The following information must be specified:

- **Station ID:** Specify here the 5 digit ID number that identifies the surface station where the data was obtained. If your station does not have an ID number, you can specify ID 99999 instead.

- **City:** Enter the closest city to the surface station.

- **State:** Enter the state where the surface station is located (2 letter abbreviation)

- **Latitude:** Specify the latitude of the surface station. For stations North of the equator, select the N option. For stations South of the equator, select the S option.

- **Longitude:** Specify the longitude of the surface station. For stations West of Greenwich, select the W option. For stations East of the Greenwich, select the E option.

The latitude and longitude of the surface station location can be entered in either decimal degrees or in sexagesimal format. You can click on the ⟲ button to choose between formats. This button will also convert between formats, so that if you enter your coordinates in decimal degrees, you can click on this button to convert to the sexagesimal format.

- **Time Zone:** Select the time zone of the surface station from the drop down list. This is the number of hours by which the local standard time lags or leads Universal Time. WRPLOT View supplies a list of all the time zones (UTC-12 to UTC+12).

- **Station Elevation (Optional):** If desired, you can specify the elevation of the surface station above mean sea level, in meters.

[Search Stations...]**:** Displays the Meteorological Stations Database where you can select a surface met station to be used. This will automatically update all the fields in the **Station Information** tab.

Meteorological Stations Database

The **Meteorological Stations Database** allows you to select an NWS station to be used as the met station from where your surface data was obtained and automatically sets up the surface station information for you. This database is displayed by clicking on the [Search Stations...] button in the **Station Information** tab of the Import Surface Data from Excel utility and contains both US and Canadian met stations.
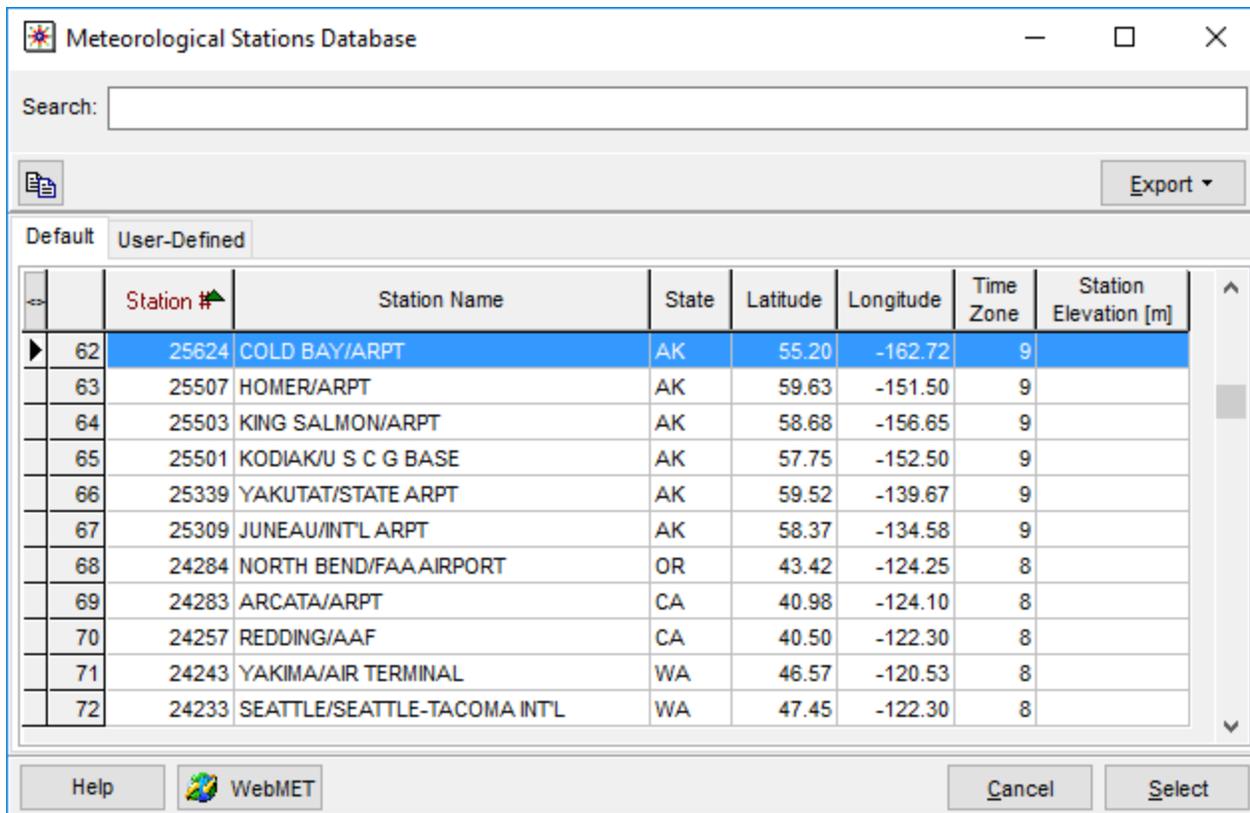
Meteorological Stations Database

The **Meteorological Stations Database** allows you to perform a search to either narrow down the search stations to choose from or to locate a specific met station. Click on the header of the column for which you want to base your search (e.g., Station #). Note that the selected header caption changes color and a green arrow appears. In the **Search** text box, enter your search text (e.g., station #, name, time zone). Rammet View will then search for a match or the closest match and will mark the row for the record with a black arrow. Select the station you wish to use and click on the

Select button to close the database and add the surface station information.

The **Meteorological Stations Database** is composed of two tabs described in the following sections:

▶ Default tab

▶ User-Defined tab

Default tab

The **Default** tab of the Meteorological Stations Database allows you to view the default met station database and select a station to be used for your project.
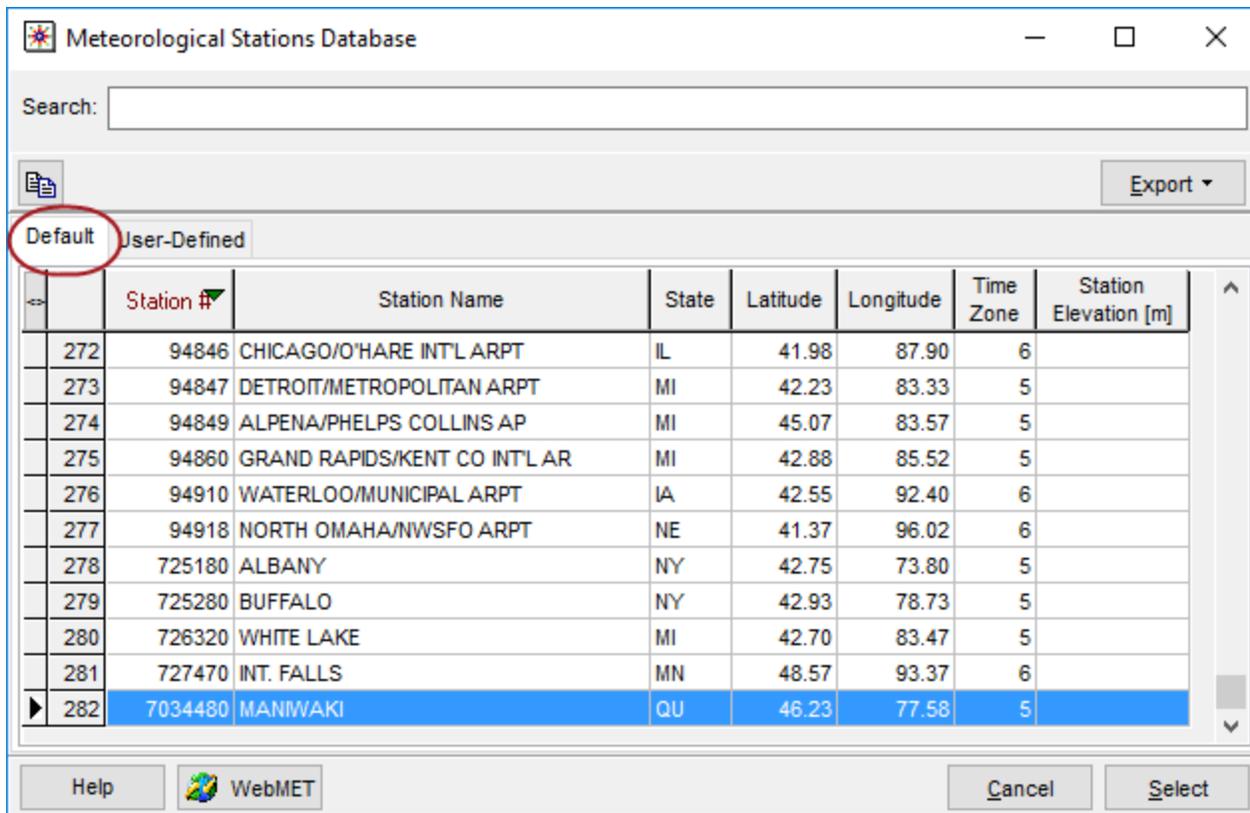
Meteorological Stations Database - Default tab

The **Default** tab provides you with a list of NWS stations and their information such as name, ID, location, etc. From this database you can select a station to be used as the surface station where the hourly surface data was obtained. This database cannot be modified. You can, however, copy a selected row and paste in into the User-Defined tab of the **Meteorological Stations Database**, where you can modify the station information. Simply select the row you wish to copy, click on the **Copy**

button ( ) and paste it into the **User-Defined** tab.

You may also export the meteorological stations database. Click on the Export ▼ button to display a floating menu from where you can choose to export the data as either a text file or an XML file. Once you have selected a file format, the **Export As** dialog is displayed where you can specify the name and location of the file you wish to export.

User-Defined tab

The **User-Defined** tab of the Meteorological Stations Database allows you to modify information for existing NWS stations found in the database or add new met stations to the database.
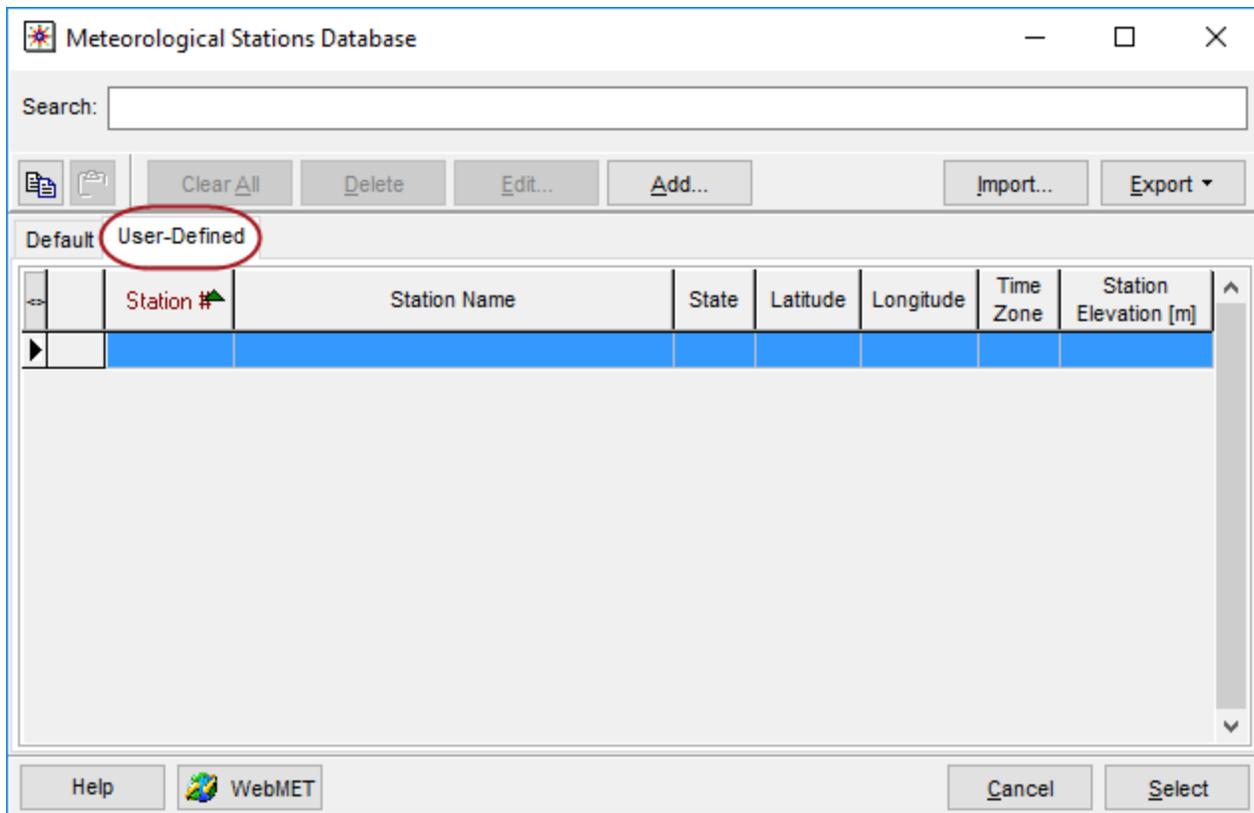
Meteorological Stations Database - User-Defined tab

The following buttons are found in the **User-Defined** tab of the **Meteorological Stations Database**. The function of each one of these buttons is explained below:

Allows you to copy the selected record to the local clipboard.

Allows you to paste the contents of the local clipboard to the **User-Defined** tab. If, for example, you have copied a station from the Default tab, it will be pasted into the **User-Defined** database when you click on this button.

Use this button to remove all the stations from the **User-Defined** database.

Use this button to remove the selected station from the **User-Defined** database.
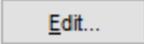
Edit...   Clicking on this button opens the Edit Station dialog for the selected station in the **User-Defined** tab.

Add...   Clicking on this button will open the Add Station allowing you to add a stations to the **User-Defined** tab.

Import...Allows you to import a data file into the **User-Defined** database. Click on the **Import** button to open the **Import** dialog. The default file type in the **Files of type** drop-down list is XML Files (*.xml) but you can select Text format (semi-colon delimited) from the drop-down list.

Export ▾   Allows you to export the **User-Defined** meteorological stations database as either a Text file or an XML file.

Add Station

The **Add Station** dialog is displayed by clicking on the **Add** button in the User-Defined tab of the Meteorological Stations Database.
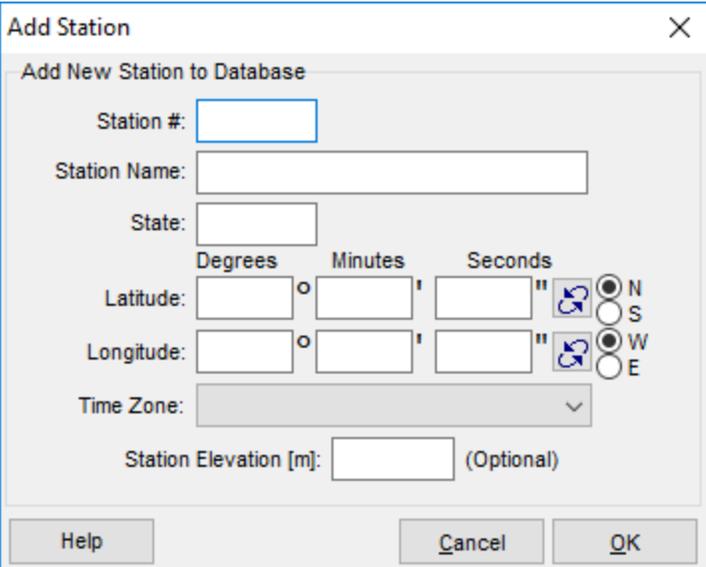
Add Station dialog

The **Add Station** dialog allows you to add a station to the **User-Defined** database. The following station information must be entered:

- **Station #:** Specify here the 5 digit ID number that identifies the surface station.

- **Station Name:** Enter the name of the surface station.

- **State:** Enter the state where the surface station is located.

- **Latitude:** Specify the latitude of the surface station in decimal degrees. For stations NORTH of the equator, select the N option. For stations SOUTH of the equator, select the S option.

- **Longitude:** Specify the longitude of the surface station in decimal degrees. For stations WEST of Greenwich, select the W option. For stations EAST of the Greenwich, select the E option.

- **Time Zone:** Select the time zone of the surface station from the drop down list. This is the number of hours by which the local standard time lags or leads Universal Time. WRPLOT View supplies a list of all the time zones (UTC-12 to UTC+12). Time zones are positive for stations WEST of Greenwich.

- **Station Elevation (Optional):** If desired, you can specify the elevation of the surface station above mean sea level, in meters.

Edit Station

The **Edit Station** dialog is displayed by clicking on the **Edit** button in the User-Defined tab of the **Meteorological Stations Database**.

Edit Station dialog

The properties of the station selected in the **User-Defined** tab are displayed, allowing you to make the necessary changes. Once you have finished editing, click the **OK** button to return to the Meteorological Stations Database.

Minimum Requirements for Hourly Surface Data

The Hourly Surface Data file must have the following data fields in order to run WRPLOT View:

- Date

- Time

- Wind Direction

- Wind Speed

Optional:

- Precipitation

Procedures for Substituting Values for Missing Data

Procedures for Substituting Values for Missing NWS Meteorological Data for Use in Regulatory Air Quality Models

Dennis Atkinson and Russell F. Lee

7/07/92

Introduction

The Meteorological data required for short-term air quality dispersion modeling consist of hourly surface observations, and morning and afternoon mixing heights. The RAMMET meteorological pre-processor program requires surface data in the CD144 format, and mixing height data in the TD9689 format. In order for the RAMMET program to function properly, these data must be 100% complete. Data acquired from the National Climatic Data Center (NCDC) occasionally have periods of missing data. If the lengths of these periods are not excessive, reasonable values may be substituted without seriously degrading the modeling results.

As with on-site data, a data set which is less than 90% complete should not be used for air quality modeling purposes. Substitutions for missing data should only be made to complete the data set for modeling applications, and should not be used to achieve the 90% criterion. Note that, for purposes of achieving the 90% criterion, cloud cover is valid for a given hour if a value for EITHER opaque cloud cover or total cloud cover is available.

The procedure for providing substitute values for missing data has two parts. The first part is an objective procedure, which applies to single isolated hours with missing surface data and single isolated days of missing mixing height data. Substitutions for those data are accomplished using procedures described below.

The second part is a subjective procedure which applies to longer sequences of missing data. Substitutions for those data require judgment, and should be accomplished by an air quality meteorologist based on scientific knowledge and professional experience. The procedures, described in detail below, are generally consistent with procedures used historically by EPA.

The Objective Procedure

Surface Data

Hourly surface weather observations of opaque cloud cover, ceiling height, temperature, wind direction, and wind speed are required.

Substitutions for missing surface data are made as follows:

- If opaque cloud cover is missing, then total cloud cover is used. If total cloud cover is also missing, then a "0" is used for opaque cloud cover if the ceiling is greater than 7000 feet (high level clouds are generally not opaque), and a "7" if the ceiling is less than or equal to 7000 feet. If the opaque cloud cover, total cloud cover, and ceiling are all missing, values of ceiling and opaque (or total) cloud cover from the preceding hour are used, provided that values from both the preceding and the succeeding hours are present (i.e., only a single hour is missing). If two or more consecutive hours of cloud cover (both opaque and total) are missing, then the subjective procedure outlined below should be used.

- If ceiling height is missing, and either the opaque cloud cover or the total cloud cover is less than or equal to 5, then "---" (the code for unlimited ceiling) is used. Otherwise, if the ceiling height is missing, but values for both the preceding and succeeding hours are present, then the value from the preceding hour is used. If two or more consecutive hours of ceiling height are missing, then the subjective procedure outlined below is used.

- If temperature is missing, then a value interpolated between the preceding hour and the succeeding valid hour is substituted. If two or more consecutive hours of temperatures are missing, then the subjective procedure outlined below is followed.

- If a single hour of wind direction and speed is missing then the average direction and average speed from the four hours surrounding that hour is substituted. Except for the first two and last two hours of the year, this average is derived from the two hours before and two hours after the hour of the missing value. In the interest of simplicity, the average wind direction is obtained from the mean unit vector wind. If two or more consecutive hours of either wind direction or wind speed are missing, then the subjective procedure outlined below should be used.

Mixing Height Data

Both a morning mixing height and an afternoon mixing height are required for each day of the year. Objective substitutions for missing mixing heights are made as follows:

- If a single afternoon mixing height is missing, the value interpolated between the preceding and successive afternoon mixing heights are used. Similarly, if a single morning mixing height

is missing, the value interpolated between the preceding and succeeding morning mixing heights is used.

- If two or more consecutive afternoon mixing heights or two or more consecutive morning mixing heights are missing, then the subjective procedure outlined below is used.

The Subjective Procedure

When the objective procedure does not provide a substitute value for some parameter, the data are reviewed by an air quality meteorologist. If technically appropriate, a substitute value is identified, based on the following procedure, using sound scientific knowledge and professional experience.

Surface Data

The following procedures are recommended for substituting values for missing surface data when the objective procedure described above is not appropriate. Sound meteorological judgment and professional experience is required to developing appropriate substitute data values.

- If a ceiling height value is missing, then the five ceiling height values before and after that hour are reviewed to obtain appropriate values to substitute. For an opaque cloud cover of 5 or less, the value for ceiling height must be "---" to indicate unlimited ceiling (by definition, the ceiling is unlimited when the cloud cover is 5/10 or less). If the opaque value is 6 or greater, the values before and after that hour are reviewed to derive appropriate ceiling values.

- If temperature is missing, then the temperature values on either side of the data void are reviewed. Often an interpolation can be made for up to a few hours. However, these values may need to be adjusted to be consistent with the other meteorological factors. Near times of daily maxima or minima, one can adequately simulate daily maxima or minima for other days of similar meteorological conditions.

- If a wind direction value is missing, the data values a few hours (perhaps five or so) on either side of the data void are reviewed. It is important to maintain not only consistency of wind direction, but also some consistency of wind variability. Otherwise, a few hours with the wind from the same direction will result, which can produce unreasonably high estimates of 8-hour and 24-hour average concentrations.

- If wind speed is missing, the five values both before and after the data void are reviewed. Any obvious patterns of wind speed should be continued and adjusted, if needed, to make the substitute data realistic from an air quality modeling viewpoint.

Mixing Height Data

The following procedure is recommended for substituting values for missing morning or afternoon mixing height values, when the objective procedure described above is not appropriate. The procedure with mixing height data, as with surface data, requires careful meteorological judgment and professional experience in order to derive appropriate substitute values.

As a general rule, a sequence of missing mixing heights of five days or more are not filled in. Also, any missing sequence of four days which does not have adequate continuity (at least five full days on either side of the data void) is also not filled in. Such files cannot be used as input to the RAMMET (or PCRAMMET) preprocessor, since doing so produces values of zero for the mixing height, resulting in unrealistic modeling results.

Export to Google Earth

The **Export to Google Earth** utility allows you to export your wind rose plot to a KML (Keyhole Markup Language) file that in Google Earth. This allows you to clearly envision your wind rose and its impact using the high quality images provided by Google Earth. must be present in a project to be exported to Google Earth.
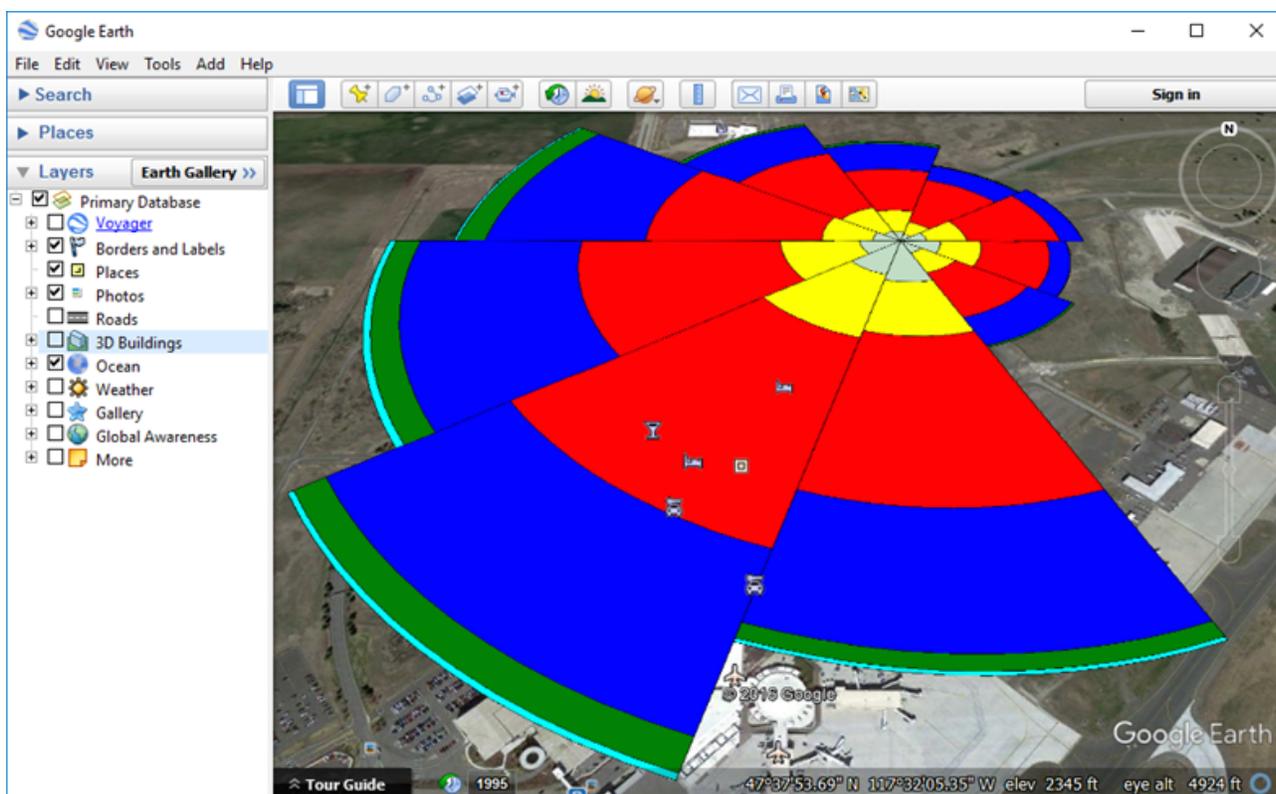
For information about using Google Earth, please see the Google Earth webpage.

> Refer to Google Earth Licensing for important information about using Google Earth.
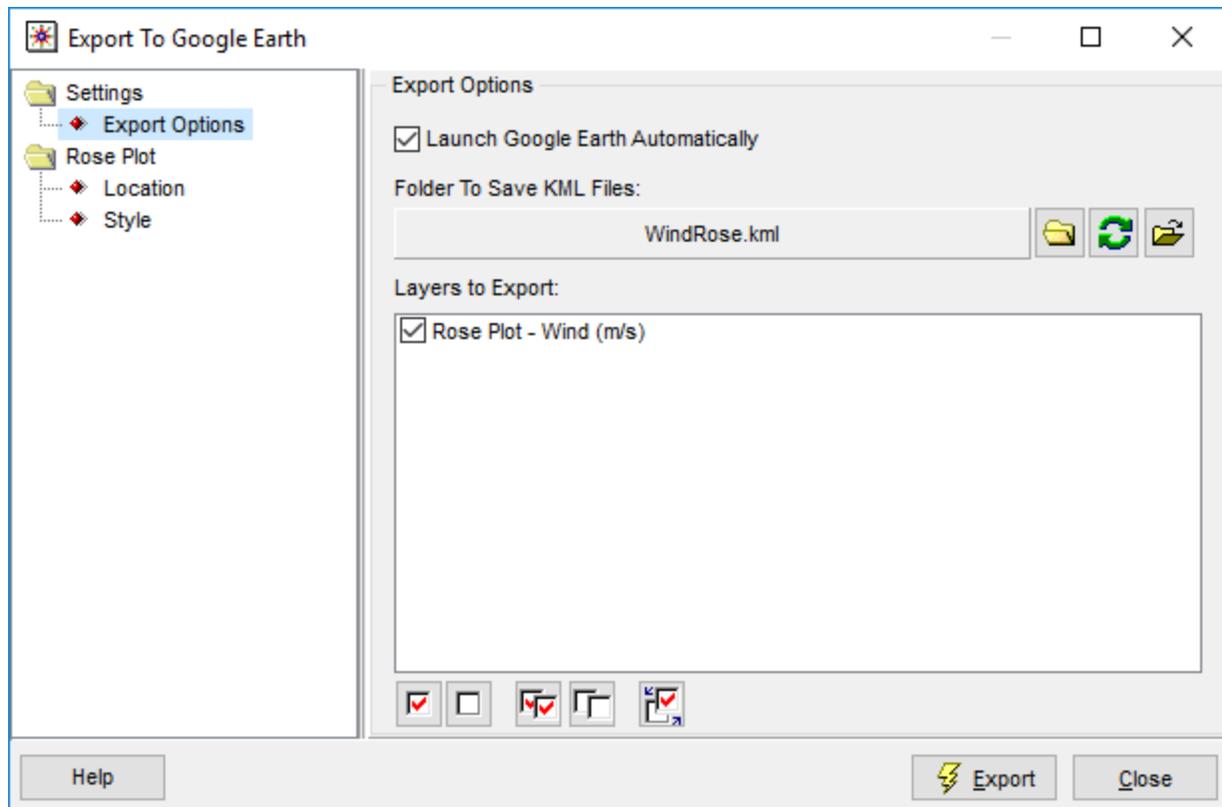
Export to Google Earth

The **Export to Google Earth** utility contains several options. These options are explained in the following sections:

▶ Export Options

▶ Location

▶ Style

Export Options

The **Export Options** page of the <u>Export to Google Earth</u> utility allows you to specify your export options.
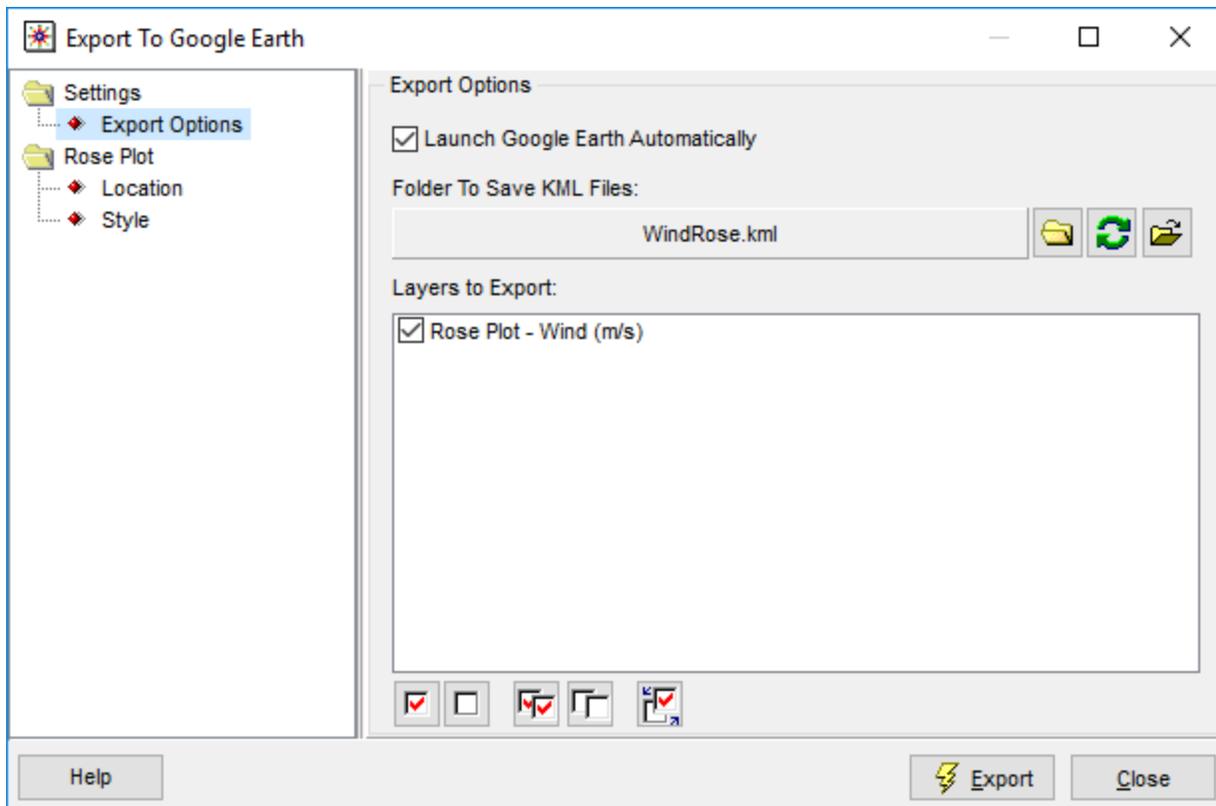
Export to Google Earth - Export Options

By default, Google Earth will be launched after the project is exported to a KML file. If you do not wish to launch Google Earth right away, uncheck the **Launch Google Earth Automatically** box; WRPLOT View will only generate the KML files for future use.

Click on the [folder] button and specify location. Select the folder in which to save the KML files.

Click the [reset] button to reset the **Folder To Save KML Files** to default.

Click the [open] button to open the currently selected folder in the browser.

In the **Layers to Export** list, leave checked all of the layers that you wish to include in the exported KML file. Click the checkbox to uncheck any layers that you do not wish to include. Currently, only the **Rose Plot** (**Wind** or **Rain**) layer is exported.
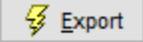
Click the [Export] button to export the project layers to the KML file. The Google Earth interface opens, and the points specified in the KML file displayed.

Location

The **Location** page of the Export to Google Earth utility allows you to specify the location where the wind rose plot occurs.
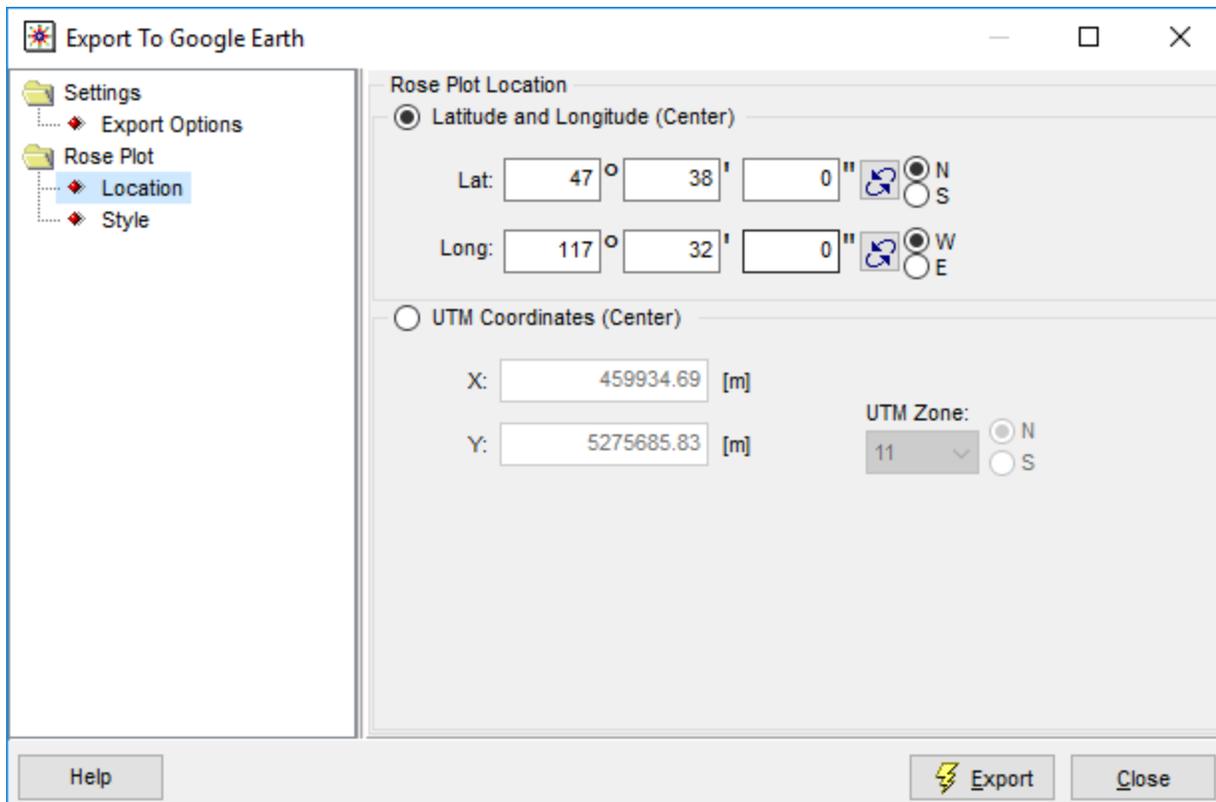
Export to Google Earth - Location

The location can be specified in either **Latitude & Longitude** or in **UTM Coordinates**. The coordinates should be specified for the center of the wind rose.

> It is extremely important that before you export to Google Earth, you check the location coordinates for the wind rose. This ensures that WRPLOT View will output your wind rose to the correct position on Earth.

There are only two met file formats accepted by WRPLOT View that contain location information. When either of these two formats are specified, the location information is automatically displayed in the Rose Plot Location panel:

- Pre-Processed AERMET Surface Met Data File (*.sfc)

- Hourly Surface Data File Format - SAMSON (*.sam)

The following met file format contain met station information (the met station ID) and from this information WRPLOT is able to ascertain the location of the wind rose plot and display it in the Rose Plot Location panel:

- Hourly Surface Data File Format - SCRAM

- Hourly Surface Data File Format - CD-144

- Hourly Surface Data File Format - HUSWO

- Hourly Surface Data File Format - TD-3505

- Lakes Hourly Surface Data File Format

- Pre-Processed ISC Met Data File

Style

The **Style** page of the Export to Google Earth utility allows you to customize the appearance of the wind rose plot when exported to Google Earth.
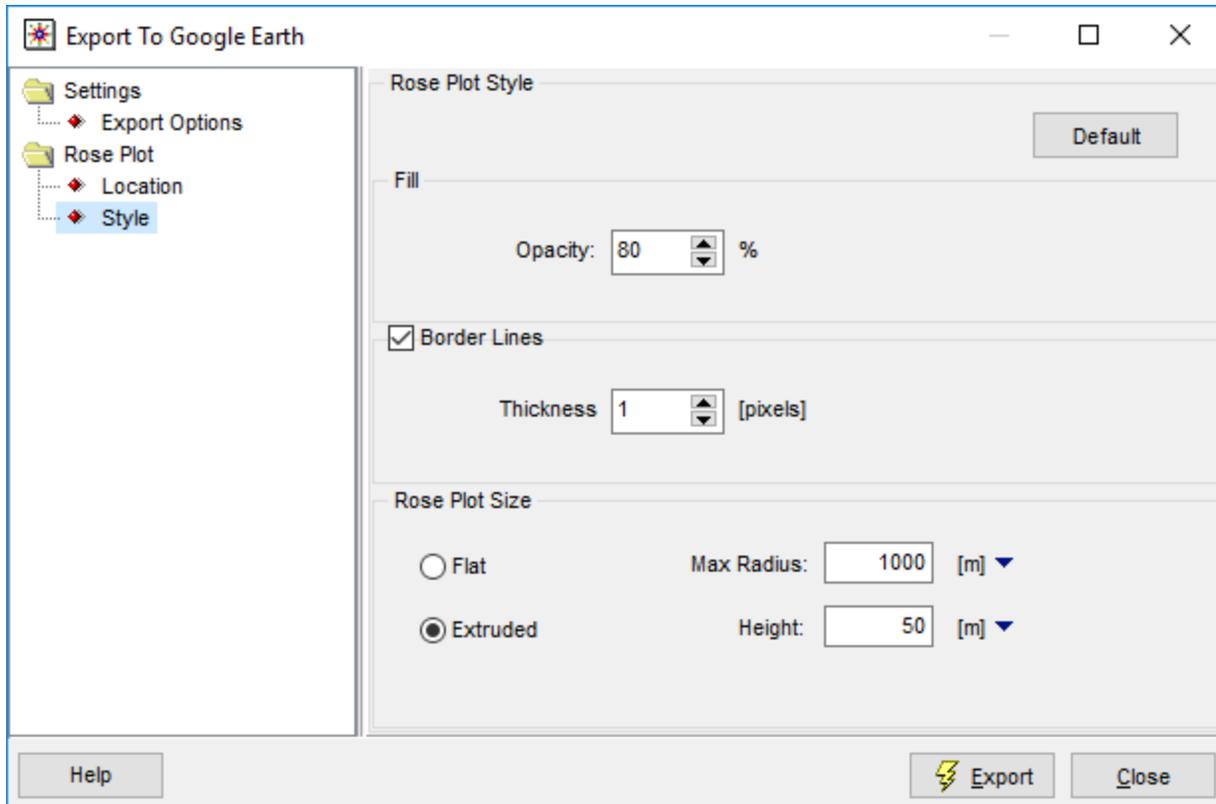
Export to Google Earth - Style

At any time, you can click on the [Default] button to return to the default settings. Several options are available to enhance the appearance of your plot:

Fill

In this section you can specify the opacity of the wind rose. Simply enter a value or click on the up/down arrow keys to change the opacity.
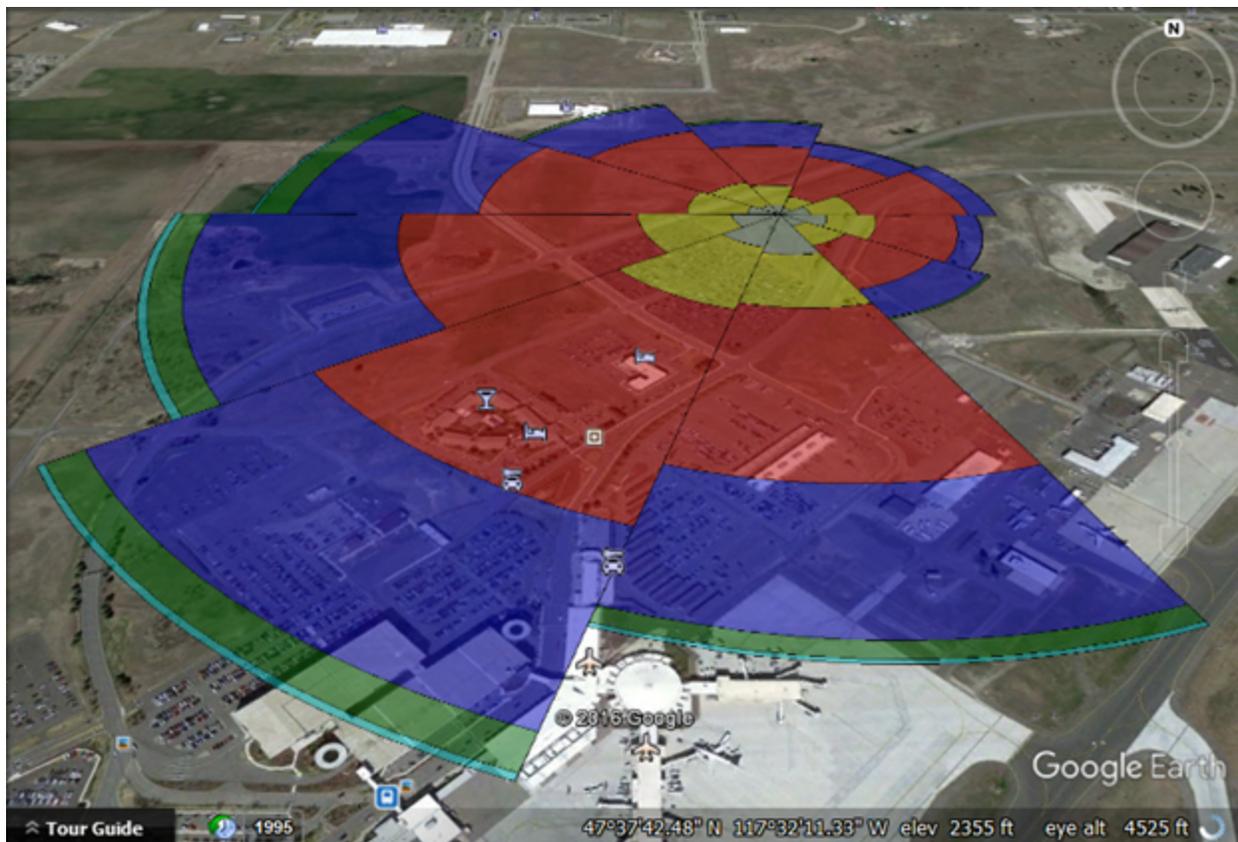
Opacity of 50%

Border Lines

Here you can change the thickness of the lines for the wind rose. Simply enter a value or click on the up/down arrow keys to change the line thickness.

Rose Plot Style

You can export your wind rose as either **Flat** or **Extruded**. If you have selected Extruded, you can also specify a corresponding **Height**. The **Max Radius** allows you to enter a radius value for the size of the wind rose plot.
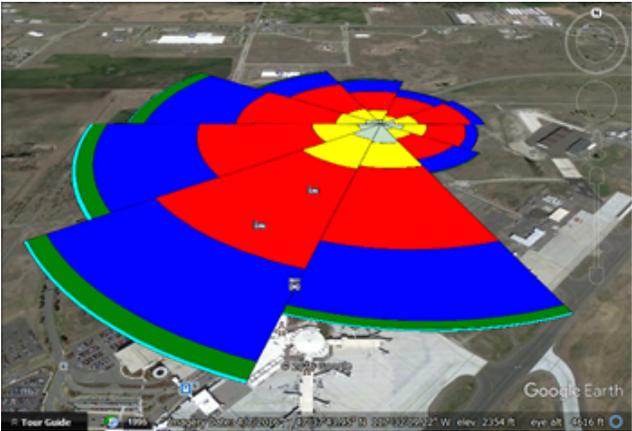
Flat option
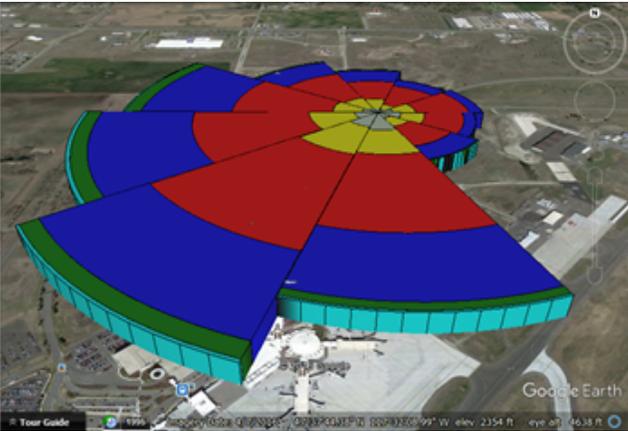
Extruded option

Supported Met Data File Formats

WRPLOT View supports a number of different file formats. You can specify more than one met data file in the following file formats:

> For a sample of any one of these files, refer to the WRPLOT_Samples directory that is part of the installation.

Hourly Surface Data Files

- SCRAM (MET144) Format

- SAMSON Format

- CD-144 Format

- HUSWO Format

- TD-3505 Format

PCRAMMET Output Files

This is the meteorological hourly surface data file preprocessed by PCRAMMET for input into the U.S. EPA ISCST3 or ISC-PRIME model in ASCII format.

- Pre-processed ISC Met Data Format (*.met)

AERMET Output Files

These are meteorological hourly surface and profile data files preprocessed by AERMET for input into the AMS/EPA AERMOD model.

- Pre-processed Surface Met Data File (*.sfc)

- Pre-processed Profile Met Data File (*.pfl)

AERMINUTE Output Files

This is the output from the AERMINUTE pre-processor for calculating hourly averages of wind speed and direction from ASOS 1-minute and 5-minute data sets. This file is incorporated in AERMET.

- Pre-processed AERMINUTE Met Data File (*.dat)

CALPUFF File Formats

These are meteorological hourly surface data files used by the CALPUFF model.

- CALPUFF Generic CSV File (*.csv)

- CALPUFF Time Series File (*.dat)

Lakes Data Files

These data files can be created from observed weather data obtained from your own weather station, or from data obtained on-line and are stored in ASCII character format.

- Lakes Format (*.txt)

How to Obtain Met Data

Lakes Met Data Services

Lakes Environmental provides **worldwide meteorological data** for use in the AERMOD and CALPUFF air dispersion models. Choose from the Weather Research and Forecasting model (WRF) or the NCAR 5th-Generation Mesoscale Model (MM5). These models are used to compute accurate windfields anywhere in the world.

To **request a quote** for these services, please use the **online quotation request form** at https:// www.webLakes.com/services/met_order.html).

> For more information see Met Data Services.

Hourly Surface Data (MET-144 format, also known as SCRAM format)

The MET-144 data format is a limited subset of the CD-144 data. SCRAM meteorological data files for NWS stations can be downloaded from the SCRAM (Support Center for Regulatory Air Models) section of the EPA's web site.

Press the [WebMET] button to download FREE Surface data (SCRAM format).

Hourly Surface Data (SAMSON format)

An alternative to the CD-144 Surface Data and the TD-3240 Precipitation Data is the data set available on the Solar and Meteorological Surface Observation Network (SAMSON) CD-ROMs. The SAMSON data are on a three CD-ROM set and contain radiation measurements, weather observations and precipitation data from 239 airports across the U.S. for the period of 1961 through 1990. The SAMSON data can be used for Surface Data or Precipitation Data and contain all of the required meteorological variables for concentration, dry and wet particle deposition, and wet vapor deposition. You can purchase the SAMSON CD-ROM for the western, central, or eastern United States from the NCDC in Asheville, North Carolina.

Press the [WebMET] button to download FREE Surface data (SAMSON format).

Hourly Surface Data (CD-144, HUSWO format)

CD-144 refers to the "Card Deck 144 format" obtained by request from the National Climatic Data Center (NCDC) in Asheville, North Carolina. Observations in CD-144 format on diskette for a specific year and station should be requested. The file is composed of one record per hour, with all weather elements reported in an 80-column card image. The HUSWO compact disc contains the first order stations in the United States for the period 1990-1995, overlapping the SAMSON CD for 1990.

Hourly Surface Data (TD-3505 format)

Hourly surface data can be obtained by requesting data in TD-3505 format from the National Climatic Data Center (NCDC) in Asheville, North Carolina. The integrated surface hourly database are from observational data and are stored in an ASCII character format.

Hourly Surface Data File Format - SCRAM

The surface data files downloaded from the U.S. EPA SCRAM web site are in a compressed format. The weather variables not required in the computations are omitted from the NCDC CD-144 format (80-character record) and the blank fields removed to create a 28-character record also known as the SCRAM format. The SCRAM format can be processed directly by WRPLOT View.

Columns	Element
1-5	Surface Station Number
6-7	Year*
8-9	Month*
10-11	Day*
12-13	Hour*
14-16	Ceiling Height (Hundreds of feet)
17-18	Wind Direction (Tens of Degrees)*
19-21	Wind Speed (Knots)*
22-24	Dry Bulb Temperature (Degrees Fahrenheit)
25-26	Total Cloud Cover
27-28	Opaque Cloud Cover

* Only these variables are used by WRPLOT View to generate the wind rose statistics

The variables used by WRPLOT View from the SCRAM record include the following:

- **Surface Station Number:** The WBAN number identifying the NWS surface observation station.

- **Year, Month and Day of Record:** Identifies the year, month and day during which the meteorological data were observed. Only the last two digits of the year are reported.

- **Hour:** Identifies the hour of the meteorological data observation. Hour is based on the 24-hour clock and is recorded as 00 through 23.

- **Ceiling Height:** The height of the cloud base above local terrain which is coded in hundreds of feet.

- **Wind Direction:** The direction from which the wind is blowing, based on the 36 point compass, e.g. 09=East, 18=South, 27=West, 36=North, 00=Calm.

- **Wind Speed:** The wind speed measured in knots (00=Calm).

- **Dry Bulb Temperature:** The ambient temperature measured in whole degrees Fahrenheit.

- **Cloud Cover:** There are two cloud cover parameters, opaque cloud cover and total cloud cover in the CD-144 and SCRAM meteorological data files. Both parameters identify the amount of cloud cover measured in tens of percent, e.g., 0 = clear or less than 10%, 4 = 40-49%, '-' = overcast or 100%.

Hourly Surface Data File Format - SAMSON

The first record in the SAMSON file contains station data. The format of this record is:

Column	Element	Definition
001	Indicator	To indicate a header record
002-006	WBAN Number	Station number identifier
008-029	City	City where station is located
031-032	State	State where station is located
033-036	Time Zone	The number of hours by which the local standard time lags or leads Universal Time.
039-044	Latitude	Station latitude N = northern hemisphere, S = southern hemisphere Degrees Minutes
047-053	Longitude	Station longitude W = west, E = east Degrees Minutes
056-059	Elevation	Elevation of the station in meters above sea level.

The FORTRAN format of this record is:

(1X,A5,1X,A22,1X,A2,1X,I3,2X,A1,I2,1X,I2,2X,A1,I3,1X,I2,2X,I4)

Each variable is represented by a position number. This position number always corresponds to that variable, no matter how many or how few variables are retrieved. The second record contains the list of variables (by a position number) that appear in the data file. There is no particular format; the variable number appears above the column of data it represents with at least one space (and usually many more) between the position numbers.

The third and subsequent records contain the weather elements. The data are free format, i.e., there is at least one space between each element in the record. The year, month, day, hour and observation indicator always appear on each record. These are followed by the variables retrieved by the user. If all the variables were retrieved, they would appear in the following order:

Field (Position)	Description	Value	Units	Missing Indicator
Header (002-003) (005-006) (008-009) (011-012)	Year* Month* Day* Hour (LST)* Observation indicator	1-12 1-31 1-24		
1 (014-017)	Extraterrestrial horizontal radiation	0-1415	Wh/m2	
2 (019-022)	Extraterrestrial direct normal radiation	0-1415	Wh/m2	
3 (024-027) (029-029) (030-030)	Global horizontal radiation** Data value Flag for data source Flag for data uncertainty	0-1415 A-H, ? 0-9	Wh/m2	9999
4 (032-035) (037-037) (038-038)	Direct normal radiation** Data value Flag for data source Flag for data uncertainty	0-1415 A-H, ? 0-9	Wh/m2	9999
5 (040-043) (045-045) (046-046)	Diffuse horizontal radiation** Data value	0-1415 A-H, ? 0-9	Wh/m2	9999

Field (Position)	Description	Value	Units	Missing Indicator
	Flag for data source Flag for uncertainty			
6 (048-049)	Total cloud cover	0-10	Tenths	99
7 (051-052)	Opaque cloud cover	0-10	Tenths	99
8 (054-058)	Dry bulb temperature	-70.0 to 60.0	Degrees Celsius	9999.
9 (060-064)	Dew point temperature	-70.0 to 60.0	Degrees Celsius	9999.
10 (066-068)	Relative humidity	0-100	%	999
11 (070-073)	Station pressure	700-1100	Millibars	9999
12 (075-077)	Wind direction* (N = 0 or 360, E = 90, S =180, W =270)	0-360	Degrees	999
13 (078-082)	Wind speed*	0.0-99.0	Meters/second	9999. or 99.0
14 (083-088)	Visibility (777.7 = unlimited visibility)	0.0-160.9	Kilometers	99999.
15 (089-094)	Ceiling height (77777 = unlimited ceiling height, 88888 = cirroform)	0-30450	Meters	999999
16 (097-105)	Present weather**	0-9	Numerical digits	

Field (Position)	Description	Value	Units	Missing Indicator
17 (106-109)	Precipitable water	0-100	Millimeters	9999
18 (110-115)	Broadband aerosol optical depth	0.0-0.900		99999.
19 (116-119)	Snow depth	0-100	Centimeters	9999
20 (120-122)	Number of days since last snowfall (88 = 88 or greater days)	0-88	No. of days	999
21 (124-129) (130-130)	Hourly precipitation amount (124-129) Hourly precipitation flag (130-130)	0-99999	Inches and Hundredths	

* Only these variables are used by WRPLOT View to generate the wind rose statistics

** For more information on these parameters, please contact Lakes Environmental for documentation containing a complete description of the SAMSON file format.

Hourly Surface Data File Format - CD-144

The CD-144 format refers to the "Card Deck 144 format" available from the NCDC. The file is composed of one record per hour, with all weather elements reported in an 80-column card image. The format of these records is described in the Card Deck 144 WBAN Hourly Surface Observations Reference Manual (NOAA, 1970), also available from the NCDC.

Data in the CD-144 format file that is checked or used by WRPLOT View includes:

Position	Element
1- 5	Surface Station Number
6- 7	Year*
8- 9	Month*
10-11	Day*
12-13	Hour*
14-16	Ceiling Height (Hundreds of Feet)
39-40	Wind Direction (Tens of Degrees)*
41-42	Wind Speed (Knots)*
47-49	Dry Bulb Temperature (° Fahrenheit)
79	Opaque Cloud Cover

* Only these variables are used by WRPLOT View to generate the wind rose statistics.

The following list describes variables found in the CD-144 file:

- **Surface Station Number:** The WBAN number identifying the NWS surface observation station.

- **Year, Month and Day of Record:** Identifies the year, month and day during which the meteorological data were observed. Only the last two digits of the year are reported.

- **Hour:** Identifies the hour of the meteorological data observation. Hour is based on the 24-hour clock and is recorded as 00 through 23. Times are Local Standard Time (LST) and are adjusted in AERMET to the 01 - 24 clock in which hour 00 is hour 24 of the previous day. Thus, when data are retrieved from an archive file for a specific time period, the first hour is discarded since it is prior to the beginning time. Likewise, since the data for a day ends with hour 23, the last day in the extracted data file will only have 23 hours.

- **Ceiling Height (Hundreds of Feet):** The height of the cloud base above local terrain and is coded in hundreds of feet.

- **Wind Direction (Tens of Degrees):** The direction from which the wind is blowing, based on the 36 point compass, e.g. 09=East, 18=South, 27=West, 36=North, 00=Calm.

- **Wind Speed (Knots):** The wind speed measured in knots (00=Calm).

- **Dry Bulb Temperature (Degrees Fahrenheit):** The ambient temperature measured in whole degrees Fahrenheit.

- **Cloud Cover:** There are two cloud cover parameters, opaque cloud cover and total cloud cover in the CD-144 and SCRAM meteorological data files. Both parameters identify the amount of cloud cover measured in tens of percent, e.g., 0 = clear or less than 10%, 4 = 40-49%, '-' = overcast or 100%.

Hourly Surface Data File Format - HUSWO

The first record in the file retrieved from the HUSWO CD contains the list of variables, represented by a position number, that appear in the data file. There is no particular format; the variable number appears above the column of data it represents with at least one space between the position numbers. The second and subsequent records contain the weather elements retrieved from the HUSWO CD.

When you specify an hourly surface data file in the HUSWO format, you will be prompted to choose between English and metric units; choose the units that match the data you retrieved from the HUSWO CD.

If all the variables were retrieved from the HUSWO CD, they would appear in the following order:

- for English Units

- for Metric Units

HUSWO Format (English Units)				
Field #	**Field Length**	**Element**	**Values**	**Notes**
1	5	Station ID	00000-99999	
	1	ASOS flag	blank or A	"A" indicates ASOS observations
2	4	Year (4-digit)	1990-1995	
	2	Month	01-12	
	2	Day	01-31	
	2	Hour (LST)	01-24	Unit = LST
3	4	Global horizontal radiation	0000-1415	Unit = W/m^2 (nearest tenth) Missing = 9999

HUSWO Format (English Units)				
Field #	**Field Length**	**Element**	**Values**	**Notes**
4	4	Direct normal radiation	0000-1415	Unit = W/m^2 (nearest tenth) Missing = 9999
5	2	Total cloud cover	00-10	Unit = tenths Missing = 99
6	2	Opaque cloud cover	00-10	Unit = tenths Missing = 99
7	5	Dry bulb temperature	-94.0-140.0	Unit = degrees Fahrenheit Missing = 999.9
	1	Dry bulb interpolation flag	blank or I	"I" means value was linearly interpolated
8	5	Dew point temperature	-94.0-140.0	Unit = degrees Fahrenheit Missing = 999.9
9	3	Relative humidity	000-100	Unit = % Missing = 999
10	4	Station pressure	2067-3248	Unit = hundredths of inches Missing = 9999
	1	Station pressure interpolation flag	blank or I	"I" means value was linearly interpolated
11	3	Wind direction	000-360	Unit = degrees Missing = 9999 N=360, E=90, S=180, W=270
12	4	Wind speed	0.0-99.9	Unit = mi/hr Missing = 99.9
13	6	Visibility	0.0-777.7	Unit = mi Missing = 9999.9

Lakes
Environmental

HUSWO Format (English Units)				
Field #	Field Length	Element	Values	Notes
				777.7 = unlimited
14	5	Ceiling height	00000-99900	Unit = feet Missing = 99999 Unlimited = 77777 Cirroform = 88888
15	8	Present weather		See Present Weather table from documentation available from your met supplier.
16	5	ASOS cloud layer 1		See Sky Condition table from documentation available from your met supplier. Missing = 99999
17	5	ASOS cloud layer 2		
18	5	ASOS cloud layer 3		
19	3	Hourly precipitation amount	0-999	Unit = hundredths of inches (for the past hour)
	1	Precipitation flag	Blank, A, D, or M	See Hourly Precipitation section from documentation available from your met supplier.

HUSWO Format (English Units)				
Field #	**Field Length**	**Element**	**Values**	**Notes**
20	3	Snow depth	000-100	Unit = in Missing = 999

HUSWO Format (Metric Units)				
Field #	**Field Length**	**Element**	**Values**	**Notes**
1	5	Station ID	00000-99999	
2	4	Year (4-digit)	1990-1995	
	2	Month	01-12	
	2	Day	01-31	
	2	Hour (LST)	01-24	Unit = LST
3	4	Global horizontal radiation	0000-1415	Unit = W/m^2 (nearest tenth) Missing = 9999
4	4	Direct normal radiation	0000-1415	Unit = W/m^2 (nearest tenth) Missing = 9999
5	2	Total cloud cover	00-10	Unit = tenths Missing = 99
6	2	Opaque cloud cover	00-10	Unit = tenths Missing = 99
7	5	Dry bulb temperature	-70.0-60.0	Unit = degrees Celsius Missing = 999.9
	1	Dry bulb interpolation flag	blank or I	
8	5	Dew point temperature	-70.0-60.0	Unit = degrees Celsius Missing = 999.9
9	3	Relative humidity	000-100	Unit = % Missing = 999
10	4	Station pressure	0700-1100	Unit = millibars

HUSWO Format (Metric Units)				
Field #	**Field Length**	**Element**	**Values**	**Notes**
				Missing = 9999
	1	Station pressure interpolation flag	blank or I	"I" means value was linearly interpolated
11	3	Wind direction	000-360	Unit = degrees Missing = 9999 N=360, E=90, S=180, W=270
12	4	Wind speed	0.0-99.9	Unit = m/s Missing = 99.9
13	6	Visibility	0.0-777.7	Unit = km Missing = 9999.9 777.7 = unlimited
14	5	Ceiling height	00000-88888	Unit = meters Missing = 99999 77777 = unlimited 88888 = cirroform
15	8	Present weather		See Present Weather table from documentation available from your met supplier.
16	5	ASOS cloud layer 1		See Sky Condition table from documentation available from your met supplier.

HUSWO Format (Metric Units)				
Field #	Field Length	Element	Values	Notes
17	5	ASOS cloud layer 2		Missing = 99999
18	5	ASOS cloud layer 3		
19	3	Hourly precipitation amount	0-999	Unit = mm (for the past hour)
	1	Precipitation flag	Blank, A, D, or M	See Hourly Precipitation section from documentation available from your met supplier.
20	3	Snow depth	000-254	Unit = cm Missing = 999

The online help that accompanies the HUSWO CDs contains a complete discussion of these variables, including the sky condition, present weather, and hourly precipitation tables.

Hourly Surface Data File Format - TD-3505

The National Climatic Data Center (NCDC) TD3505 format is also called the Integrated Surface Hourly Data (ISHD).

> WRPLOT View reads data in the same manner as US EPA AERMET - between 30 minutes of the previous hour and 1 minute of the current hour.

See below a brief description of the TD-3505 format:

Column	Description
1-4	Total Variable Characters
5-10	Fixed Weather Station (USAF Master Station Catalog)
11-15	Fixed Weather Station (NCDC WBAN)
16-23	Date (YYYY/MM/DD)*
24-27	Time (HH/MM)*
28	Data Source Flag
29-34	Latitude Coordinate
35-41	Longitude Coordinate
42-46	Report Type Code
47-51	Elevation Relative to Mean Sea Level (m)
52-57	Call Letter Identifier
58-60	Quality Control Process Name
61-63	Wind Direction Angle (degrees)*
64	Wind Direction Quality Code
65	Wind Type Code
66-69	Wind Speed Data (m/s)*
70	Wind Speed Quality Code
71-75	Ceiling Height (m)
76	Ceiling Height Quality Code
77	Ceiling Height Determination Code

Column	Description
78	CAVOK (Ceiling and Visibility Okay) Code
79-84	Visibility Distance (m)
85	Visibility Distance Quality Code
86	Visibility Distance Variability Code
87	Visibility Distance Variability Quality Code
88-92	Air Temperature (degrees Celsius)
93	Air Temperature Quality Code
94-98	Dew Point Temperature (degrees Celsius)
99	Dew Point Temperature Quality Code
100-104	Sea Level Pressure Rate (Heptopascals)
105	Sea Level Pressure Quality Code

* Only these variables are used by WRPLOT View to generate the wind rose statistics.

There are additional data which may be included in TD-3505 data files. For a description of this data, and a more comprehensive description of the required data, please see our Support Resources page.

Pre-Processed ISC Met Data File

WRPLOT View can read met data preprocessed by PCRAMMET for input into ISCST3 and ISC-PRIME. Please note that the *.met file must be generated using the **ASCII** format option in PCRAMMET.

HEADER RECORD

The first record of the ASCII output file consists of the following four variables:

Field	Description
001	Surface Station Number
002	Surface Station Year
003	Mixing Height Station Number
004	Mixing Height Station Year

These variables are written with the format:

(4(I6, 1X))

DATA RECORDS (ONE PER HOUR)

The ASCII preprocessed meteorological file, for concentration estimates, consists of the following variables, one record for each hour of the period.

Field	Description
001	Year (2 digits)*
002	Month*
003	Day*
004	Hour*
005	Random flow vector*
006	Wind speed (m/s)*
007	Ambient temperature (K)
008	Stability category
009	Rural mixing height (m)

Field	Description
010	Urban mixing height (m)

* Only these variables are used by WRPLOT View to generate the wind rose statistics.

These variables are written with the format:

(4I2, 2F9.4, F6.1, I2, 2F7.1)

See also Sample ISC Met File

Sample ISC Met File

A standard ISC met file created by PCRAMMET in the ASCII format will have the format displayed below. Variables labeled in red are the standard columns you will find in an ISC met file created for concentration estimates. Variables labeled in blue are added to the standard file if deposition estimates are required.
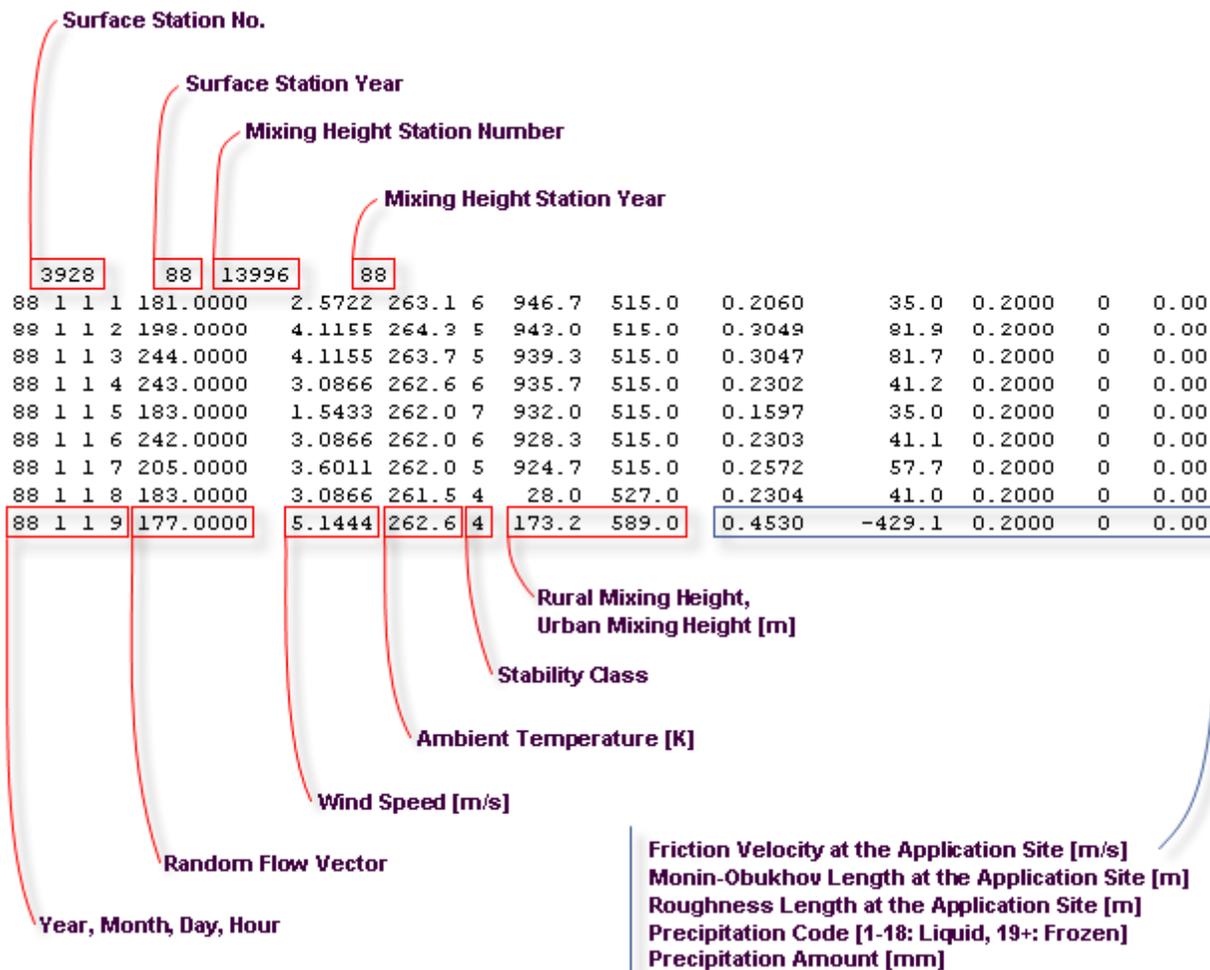
ISC Met file in ASCII Format for Wet Deposition

Pre-Processed AERMET Profile Met Data File

WRPLOT View can read met data preprocessed by AERMET for input into AERMOD. The following is the file format for the Profile met data file (*.pfl):

Position	Description
1	Year (2 digits)*
2	Month*
3	Day*

Position	Description
4	Hour*
5	Measurement Height (m)
6	1, if this is the last (highest) level for this hour, or 0 otherwise
7	Direction the wind is blowing from for the current level (degrees)*
8	Wind speed for the current level (m/s)*
9	Temperature at the current level (degrees Celsius)
10	Standard deviation of the wind direction fluctuations (degrees)
11	Standard deviation of the vertical wind speed fluctuations (m/s)

* Only these variables are used by WRPLOT View to generate the wind rose statistics.

Pre-Processed AERMET Surface Met Data File

WRPLOT View can read met data preprocessed by AERMET for input into AERMOD.

The following is the file format for the Surface met data file (*.sfc):

HEADER RECORD

The first record of the ASCII output file consists of the following six variables:

Field	Description
001	Latitude
002	Longitude
003	Station identifier for upper air data; usually the WBAN number used to extract the data from an archive data set
004	Station identifier for hourly surface observations; usually the WBAN number used in extracting the data
005	On-site identifier
006	AERMET version date

DATA RECORDS (ONE PER HOUR)

The ASCII preprocessed meteorological file, consists of the following variables:

Field	Description
001	Year (2 digits)*
002	Month*
003	Day*
004	Julian Day
005	Hour*
006	Sensible heat flux (W/m)2
007	Surface friction velocity (m/s)
008	Convective velocity scale (m/s)
009	Vertical potential temperature gradient above PBL

Field	Description
010	Height of convectively-generated boundary layer (m)
011	Height of mechanically-generated boundary layer (m)
012	Monin-Obukhov length (m)
013	Surface roughness length (m)
014	Bowen ratio
015	Albedo
016	Wind speed (m/s)*
017	Wind direction (degrees)*
018	Reference height for wind speed and wind direction
019	Temperature (K)
020	Reference height for temperature (m)

* Only these variables are used by WRPLOT View to generate the wind rose statistics.

Pre-processed AERMINUTE Met Data File

WRPLOT View can read hourly met data files preprocessed by AERMINUTE for input into AERMET. The following is the file format for the AERMINUTE hourly met data file (*.dat):

```
AERMINUTE Version 14337  WBAN: 14732    Call sign: KLGA    IFW: Y    IFW date: 07/06/2009
10  1  1  1 999.00 999.0
10  1  1  2 999.00 999.0
10  1  1  3 999.00 999.0
10  1  1  4   1.53  74.0
10  1  1  5   1.31  97.0
10  1  1  6   0.44 341.0
```

The following parameters are used in this file:

- 2-digit year

- 2 digit month

- 2 digit day

- 2 digit hour

- Wind speed (m/s)

- Wind direction (degrees)

CALPUFF Generic CSV File

The TRC Generic CSV format of surface met files is supported by WRPLOT View.

The Generic CSV file format can be created from observational data. The file must be in *.csv format and the data must be comma delimited. No blanks are allowed in between commas, the missing data needs to be input as 9999. This format requires that the first line of text in the file be GENERIC. Hours are multiplied by 100 (100, 200,....2300). The header file must be the same as in the sample below:

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	GENERIC												
2	Station	ID	='	14826	Temp	Precip	Pressure	RH	Wdir10m	Wspeed10	Ccover	Cheight	
3	month	day	year	hour	degC	mm	mb	%	deg	ms-1	tenths	hundreds_of_feet	
4	1	1	1988	0	33.2	0	997.1	16.6	262	2.7	10	9999	
5	1	1	1988	100	32.6	0	996.8	16.6	265	3.3	9	9999	
6	1	1	1988	200	31.8	0	996.6	16.5	267	3.4	8	9999	
7	1	1	1988	300	30.9	0	997	16.9	276	3.8	7	9999	
8	1	1	1988	400	30.5	0	997.6	16.8	279	4.1	4	9999	
9	1	1	1988	500	30.9	0	998.3	16.8	280	4	10	9999	
10	1	1	1988	600	33	0	998.7	15	294	3.9	5	9999	
11	1	1	1988	700	34.8	0	998.9	15.6	303	4.6	5	9999	
12	1	1	1988	800	36.6	0	999.3	26.4	328	5.5	10	9999	
13	1	1	1988	900	38.2	0	999.3	29.6	332	6.2	10	9999	

CALPUFF Generic CSV File Format

CALPUFF Time Series File

The CALPUFF Time Series file is output from the **Wind Rose Tool** found in Lakes Environmental's **CALPUFF View** software application. This tool extracts meteorological variables for an individual cell in a CALMET.DAT meteorological data file. WRPLOT View supports both **Wind Speed** and **Stability Class** display options when using this file format. Note that the **Stability Class** option only appears if that variable is included in the file. The following is the file format for the CALPUFF Time Series file (*.dat):

```
Timeseries at gridpoint ( 69 , 2)( X: 730.740 km,  Y: 4060.370 km)
YEAR MONTH DAY HOUR  SEC YEAR MONTH DAY HOUR  SEC     WS       WD        T  PG Class    U*   Mix.Hgt     Lmo      W* Prec.Rate
                                                    (m/s)    (deg)      (K)   (m/s)    (m/s)    (m)       (m)    (m/s)  (mm/hr)
                                                   Layer 1  Layer 1  Layer 1 Layer 1  Layer 1 Layer 1  Layer 1 Layer 1 Layer 1
1990   8  30   0    0 1990   8   30    0    0 3600   1.78   219.63   293.22    6.00    0.13    73.42    17.79    0.00    0.00
1990   8  30   1    0 1990   8   30    1    0 3600   1.52   348.49   292.62    6.00    0.12    59.61    17.79    0.00    0.00
1990   8  30   2    0 1990   8   30    2    0 3600   0.84   293.32   292.00    6.00    0.06    50.00    17.79    0.00    0.00
1990   8  30   3    0 1990   8   30    3    0 3600   1.41   344.96   291.87    6.00    0.11    57.27    17.79    0.00    0.00
1990   8  30   4    0 1990   8   30    4    0 3600   0.84   312.88   291.56    6.00    0.06    50.00    17.79    0.00    0.00
1990   8  30   5    0 1990   8   30    5    0 3600   1.50   300.94   291.36    4.00    0.16   112.69    41.40    0.00    0.00
```

The following parameters are used in this file:

- Starting YEAR/MONTH/DAY/HOUR/SEC

- Ending YEAR/MONTH/DAY/HOUR/SEC

- WS (Wind Speed)

- WD (Wind Direction)

- T (Temperature)

- PG Class (PG Stability Class)

- U* (Surface Friction Velocity)

- Mix.Hgt (Mixing Height)

- Lmo (Monin-Obuchov Length)

- W* (Convective Velocity Scale)

- Prec.Rate (Precipitation Rate)

For the purposes of use with WRPLOT View only **WS**, **WD**, and **PG Class** parameters are required. The others are optional.

Lakes Hourly Surface Data File Format

The Lakes format for hourly surface data files was created to allow you to easily arrange your observational data into a format that will be read by WRPLOT View. This is useful in situations where you have met data in a format not accepted by the program, or have raw observational data from a met station.

> Please note that you should only enter one observation per hour in the met file.

The arrangement of the variables in the Lakes file is as follows:

Column	Element
1	Station ID
2	Year
3	Month
4	Day
5	Hour
6	Wind Direction (degrees)
7	Wind Speed (Knots)

> See also Sample Lakes File Format

Sample Lakes File Format

The Lakes file format can be created from observational data. The file must be in ASCII format and the data must be space or tab delimited. This format requires that the first line of text in the file be LAKES FORMAT. You may enter any comments into this file, any rows that begins with an asterisk (*) are recognized as comments, and will be ignored by WRPLOT View. Wind speed must be entered in whole numbers and wind direction must be entered in whole degrees. See the sample file below:

```
LAKES FORMAT
* -------------------------------------------------
* Rows with * at the begining of the line are recognized
* as comments and are ignored by WRPLOT View
*
* STNID (5)
* YEAR (4)
* MONTH (2)
* DAY (2)
* HOUR (2) 0-23
* WDIR (3) deg
* WSPD (3) knots
* -------------------------------------------------
14826    1988    1    1      2      260     14
14826    1988    1    1      3      250     16
14826    1988    1    1      4      250     15
14826    1988    1    1      5      240     15
14826    1988    1    1      6      240     14
14826    1988    1    1      7      260     16
14826    1988    1    1      8      260     18
14826    1988    1    1      9      250     16
14826    1988    1    1     10      260     16
14826    1988    1    1     11      270     17
14826    1988    1    1     12      270     18
14826    1988    1    1     13      270     20
14826    1988    1    1     14      260     17
14826    1988    1    1     15      250     20
14826    1988    1    1     16      250     19
14826    1988    1    1     17      250     18
14826    1988    1    1     18      250     16
14826    1988    1    1     19      260     14
14826    1988    1    1     20      250     16
14826    1988    1    1     21      240     11
14826    1988    1    1     22      250     14
14826    1988    1    1     23      260     13
14826    1988    1    2      0      250     13
14826    1988    1    2      1      240     11
```

Printing and Preferences

Print Preview

The **Print Preview** dialog is displayed when you select **File | Print... | Wind Rose** from the menu.

Before you can print the contents of the drawing area, **WRPLOT View** displays the **Print Preview** dialog. Here you can select printing options and preview how your printouts will look. **WRPLOT View** prints the contents of the drawing area into templates. These templates were designed so you can have important information about your project automatically added to your printouts.
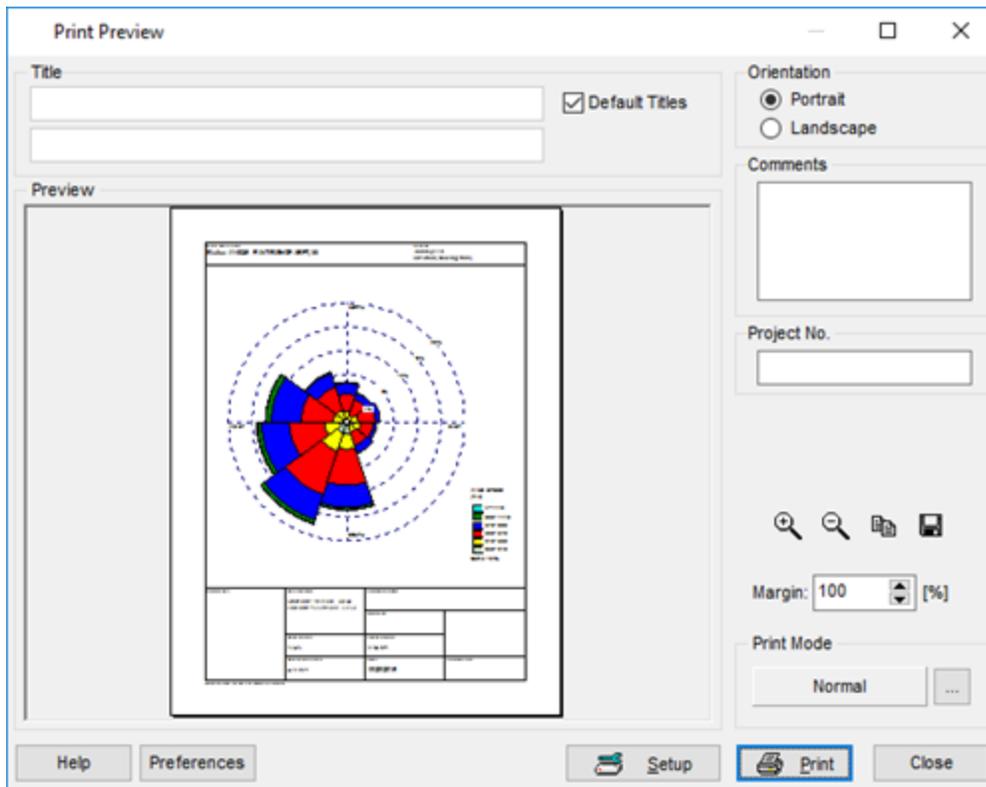
Print Preview dialog

The **Print Preview** dialog contains the following options:

- **Title: WRPLOT View** places the name of your project as the default title. However, you have the option of specifying different titles. To specify different titles, uncheck the **Default Titles** box and type in the titles.

- **Orientation:** This is the orientation for your printout. Note that the preview area shows a preview of your results in both orientations - portrait and landscape.

- **Comments:** In this field you can type any comments or notes you want to be printed along with your printouts.

- **Project No.:** In this field you can specify your project number.

- **Margin:** Enter a percentage for the margin. The default is 100%. Specifying a percentage <100% will produce a narrower margin than the default. Specifying a percentage >100% will produce a wider margin than the default.

- **Print Mode:** Displays which Print Mode option you are using. Click on to open the **Print Mode** dialog where you can select whether to print in Normal or Bitmap Mode.

Button Guide

At the lower right corner of the dialog a series of buttons are available. See the function of these buttons below:

Zoom In: If you select this tool, your mouse pointer changes to a magnifying glass. On the Preview area, click on the location you want to zoom in. Click as many times as necessary, until you have the right magnification.

Zoom Out: Select this tool to go back to the original image size.

Copy to Metafile: Select this tool if you want to copy the image to the clipboard as a Microsoft® Windows® Metafile. You can then paste into any Windows application that supports pasting of a Windows Metafile from the clipboard.

Save to File: Select this option if you want to save the print preview image to a file. You can save the printout as an Enhanced Windows Metafile (*.emf) or a bitmap (*.bmp).
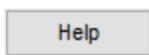
Help   Displays the **Help** contents for the options contained in the **Print Preview** dialog.
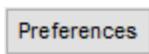
Preferences   Displays the Preferences dialog where you can specify printing and labeling options for your printouts.

Setup   Displays the **Print Setup** dialog where you can specify printing options such as paper size and orientation.
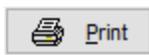
Print   Displays the **Print** dialog where you can specify printing options such as printer and number of copies.

Close   **Closes** the **Print** Preview dialog.

Preferences

In the **Preferences** dialog you can define default options for your printouts and various other preferences for your project.

> In the **Preferences** dialog you define your global preferences. This means that the options you have selected in this dialog will be used as the default for every printout, for your current project or any other project you open.

You have access to the **Preferences** dialog by selecting **File | Preferences** from the menu or clicking on the **Preferences** button located in the Print Preview dialog.
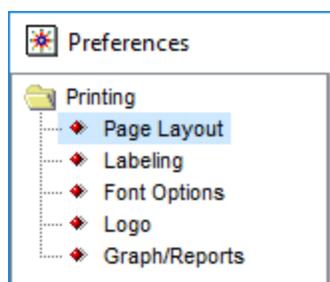
You have the following options in the **Preferences** dialog:

- Page Layout

- Labeling

- Font Options

- Logo

- Graph/Reports

Page Layout

The **Page Layout** page, of the [Preferences](#) dialog, allows you to specify the information that will appear on your printouts.
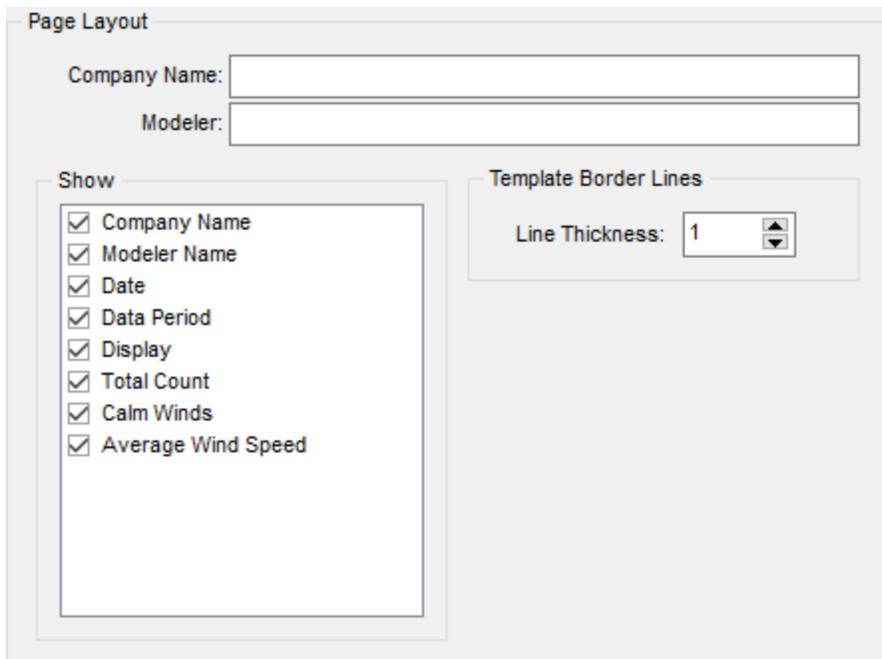
Preferences dialog - Page Layout

Page Layout

- **Company Name:** Specify the name of your company to be printed on the printout template.

- **Modeler:** Type the name of the modeler to be printed on the printout template.

Show

From the list box you can select what information you would like displayed on your printout. Check the appropriate box to display the desired information on the printout.

Template Border Lines

- **Line Thickness:** This is the thickness of all the boarder lines for the printout templates.

Labeling

In **Labeling** page, of the [Preferences](#) dialog, you can specify the labeling options for the printout templates.
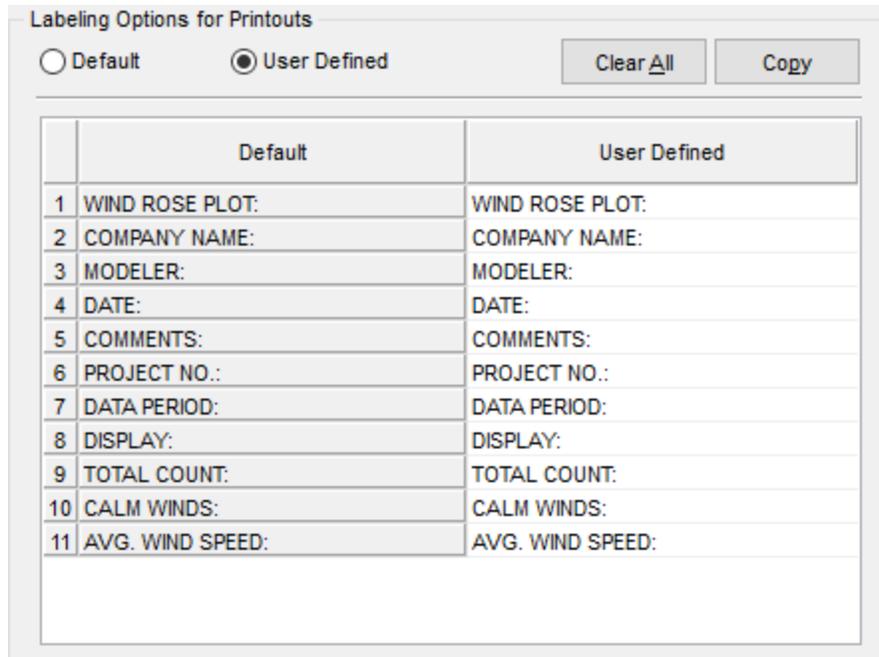

Preferences dialog - Labeling

- **Labeling Options for Printouts:** Allows you to select the **Default** or **User Defined** options. If you select **User Defined**, you can change the default label titles for the various sections of the printout layout.
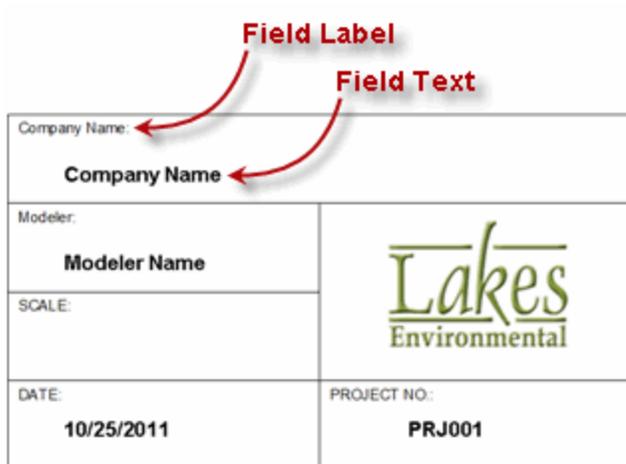
 Deletes the labels in the fields of the **User Defined** column

 Copies the default labels into the fields of the **User Defined** column

Font Options

The **Font Options** page, of the Preferences dialog, allows you to specify the font, size, style, color and position of the field labels and field text for your printout.
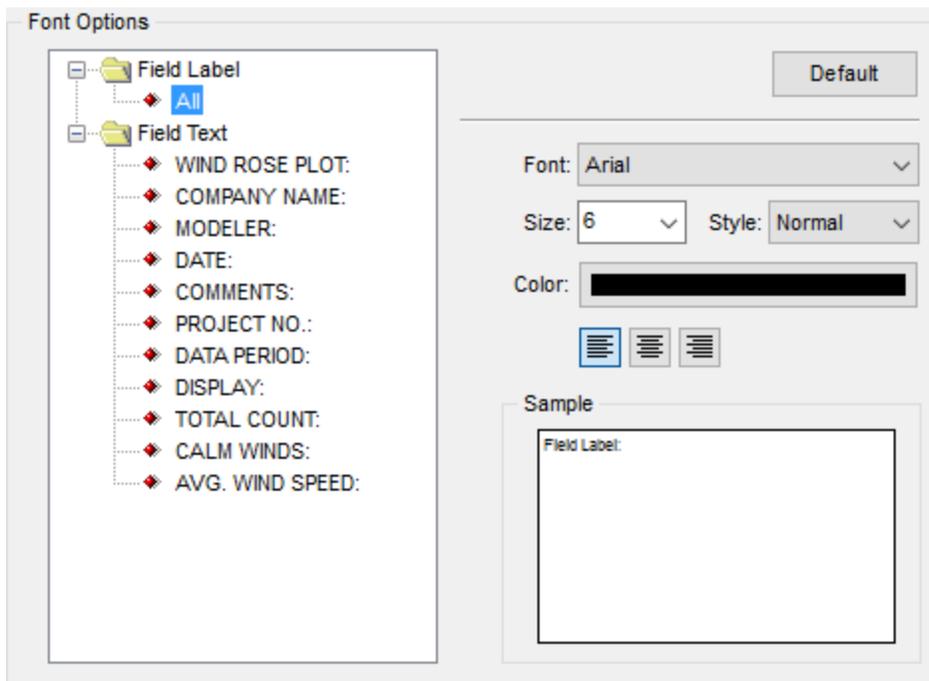

Preferences dialog - Font Options

The following options are available:

- **Font Options – Tree View:** The tree view displays the following options -

  o **Field Label:** These are the labels that describe the field content in the printout template boxes. Font Options will be applied to all field labels.

  o **Field Text:** These are the labels used for the content of the printout template box. Under the Field Text tree item you can select the field text for which you would like to change font options.

- **Default:** The **Default** button returns all your font settings to the default. Click on this button to display a floating menu from where you can select **All** or **Selected**. If you choose **All**, then default settings will be applied to the Field Labels and all the Field Text. If you choose **Selected**, only the fields you have selected from the tree list will be returned to the default. You can select items from the tree list by pressing down the Shift key while you select multiple items in sequence or the Ctrl key to make disjoint selections.

- **Font:** Select a font from the drop-down list.

- **Size:** Select a font size from the drop-down list.

- **Style:** Select a font style from the drop-down list.

- **Color:** Click on the color bar to open the Color dialog from where you can select a color for your text.

- **Position:** Click on one of the three buttons to select the alignment of your text. The text can be either left, center or right aligned.

- **Sample:** As you make selections for color, font, size, and style for your text, the sample is updated to reflect the changes.

Logo

The **Logo** page, of the Preferences dialog, allows you to import an graphic to be used as your logo. This logo will be displayed on the bottom right side of your printout.
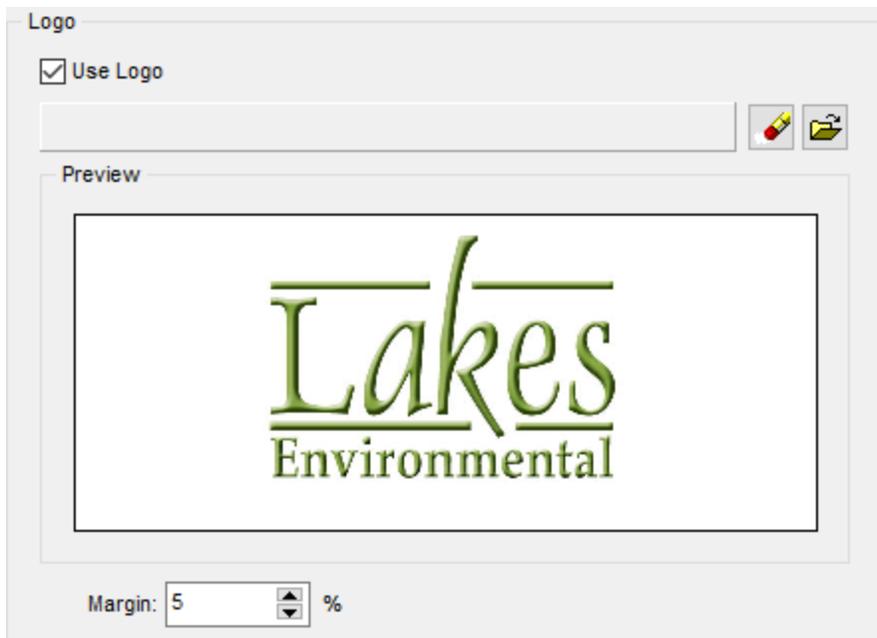
Preferences dialog - Logo

Check the **Use Logo** box to make the **Specify File** panel active. Click on the **Specify File** ( ) button and specify the name and location of the graphic file you will be using.

> The path displayed above the **Preview** panel indicates the folder where the image will be stored for WRPLOT View.

The imported graphic will be displayed in the **Preview** panel. Several file formats are supported: gif, jpg, jpeg, bmp, emf, and wmf.

The **Margin** option lets you specify how much white space you would like surrounding your logo. The default margin is 5%, you can increase or decrease this at any time.

Graph/Reports

The **Graph/Reports** option of the Preferences dialog allows you to select display options for your graphs and reports.
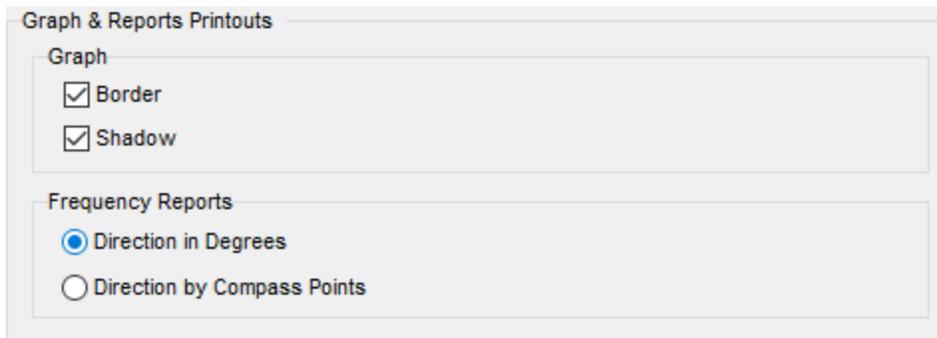
Graph & Reports Printouts dialog

The following options are available:

Graph & Reports Printouts

- **Border:** Check this option if you would like a border surrounding your graph printout.

- **Shadow:** Check this option if you would like a shadow displayed for your graph.

Frequency Reports

- **Direction in Degrees:** Select this option if you would like the direction displayed in degrees.

- **Direction by Compass Points:** Select this option if you would like the direction displayed by compass points.

This display option for your frequency reports can also be changed within the Frequency Count and Frequency Distribution tabs.

Technical Support

System Requirements

WRPLOT View is a Microsoft® Windows®-based program that can be installed in the following Windows operating systems (32-bit and 64-bit):

- Microsoft Windows 10

- Microsoft Windows 8 & 8.1

- Microsoft Windows 7 (Home Premium, Professional and Ultimate versions)

Technical Support

Freeware products provide the following technical support options:

- Knowledgebase: http://www.webLakes.com/kb/FreewareKB/

- If you would like to report an issue with the software or provide suggestions for new product features, please direct your comments via email: support@webLakes.com.

- We recommend that you visit our web site periodically to check for future updates.

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- Michael Hammer

- Alexandra Torrens

WRPLOT View source code, executables, help, and user's guides are the intellectual property of Lakes Environmental Software.

Disclaimer

The calculations performed by WRPLOT View and the contents of this document have been checked to the best of our abilities. The user is responsible for checking the input data and the results for consistency.

Met Data Services

Lakes Environmental provides **worldwide meteorological data** for use in the AERMOD and CALPUFF air dispersion models. Choose from the Weather Research and Forecasting model (WRF) or the NCAR 5th-Generation Mesoscale Model (MM5). These models are used to compute accurate windfields anywhere in the world.

To **request a quote** for these services, please use the **online quotation request form** at https://www.webLakes.com/services/met_order.html.

Lakes employs a wide variety of output formats and processing options. Types of data available through our service include:

- CALMET-Ready from WRF or MM5

- CALPUFF-Ready from WRF

- AERMET-Ready from WRF or MM5

- AERMOD-Ready Station Data (USA only)

- And other products available

Standard WRF data orders are available in 1-km, 4-km, and 12-km resolutions, and MM5 data orders in 4-km and 12-km. Our in-house certified consulting meteorologists can process WRF data based on any custom parameters you require such as:

- Domain size

- Grid resolution

- Physics options

- Output formats

Other Lakes Software Products

Lakes Environmental offers a wide range of environmental software products, covering five major categories of air quality.
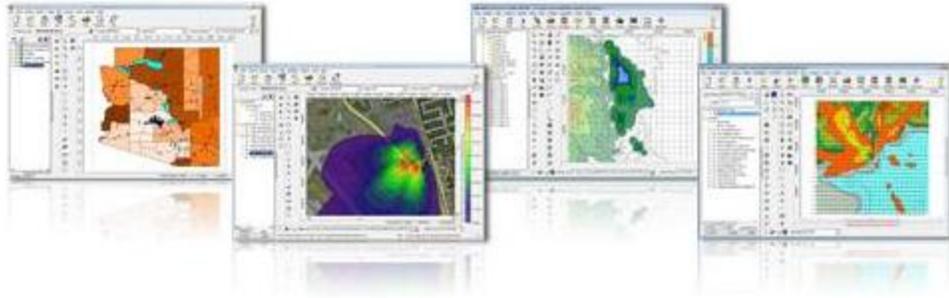
Click on one of the five categories listed below to see more about how to select the right software for you.

▶ Air Dispersion Modeling

▶ Compliance Assurance

▶ Emergency Release

▶ Emissions Management

▶ Risk Assessment