San Joaquin Valley APCD

Procedure for Downloading & Processing NCDC Meteorological Data

Version: 3.1
Date: April 2013

Prepared by

Permit Services Division
Technical Services

DISCLAIMER

This document discusses the Lake's Environmental AERMOD VIEW software and its associated programs and EPA's AERMOD/AERMET modeling systems.

Any mention of trade names or commercial products is not intended to constitute endorsement or recommendation for use.

Table of Contents

Revision Notes

April 2013 Final V3.1

The District's Meteorological (met) Data Processing Procedures document is being updated to address the AERMET version12345 and new guidance provided by EPA. The document contains the following updates:

- Sections have been reorder
  - "Determining Meteorological Site Surface Conditions" section was move before "AREMET processing Using Lakes" section
  - Section 8 has been moved up to Section 7
- Updated the "AREMET processing Using Lakes" section to incorporate the AERMAT v12345 options (Wind Threshold)
  - Figure 8.17 and Table 8-3 have been updated to address Updates to AERMET version 12345.
- Minor correction to Pages : 10 (Caution Statement), 21 (Label Numbering), 49 (Update to table 8-1 #3), 62 (Label Correction), 69 (Clarification to bullet #6)
- Updated Figures: 3-8

September 2012 Final V3.0

The District's Meteorological (met) Data Processing Procedures document is being updated to address comments received from the draft document released in August and new guidance provided by EPA. The final document contains the following updates:

- The word **TIP!!** has been replace by the word **NOTE!!**
- Document reformatted to be consistent with other District documents
- District Logo's added to cover
- Updates to Section 2.1 wording to better describe the 1-Minute data process
- Added discussion of the wind speed threshold limit
- Corrected discussion of the 10% missing data requirement on page 61. It should have read "10% for each quarter of acquired data."
- Added Section 7.3.1 to discuss how to determine if a dataset complies with EPA's completeness requirement
- Updated the District's Met Reader database to perform data completeness checks

August 2012 Draft V3.0

The District's Meteorological (met) Data Processing Procedures document is being updated to include:

- Guidance on processing meteorological data using AERMET version 11059 and AERMINUTE
- Guidance for determining if a given site's condition is wet, dry, or average for a given year.
- General Guidance on determining which months are in a given season.
- Additionally, this document has been reformatted to be consistent with other documents being created by the District.
- Appendix A has been removed and replaced with web links within the document.
- 30 year Normals will be posted on the District's Modeling page. At the time of this updated 1981-2010 normals were available.

February 2010

This revision of the District's Meteorological (met) Data Processing Procedures introduces a new method for processing met data. This new method is primarily due to the changes that will be

implemented in the upcoming revision of the AERMET program (current version 06341) and the introduction of the new AERMINUTE pre-processor.

Introduction

The District's Meteorological (met) Data Processing Procedures were developed to provide District staff with guidance on processing meteorological datasets for use with EPA's AERMOD dispersion model. Additionally, this guidance document is intended to provide the regulated community and others with a transparent view of and the ability to comment on the District's procedures for generating AERMOD datasets.

This document is considered to be a living document that will be updated as corrections are identified, better information becomes available, or when updates and/or new procedures are implemented by EPA that would require changes to procedures contained within the document.

The regulated community and others can provide comments by sending an email to HRAModeler@valleyair.org. Based on the nature of the comment received, the District will update this guidance document and send out an email to the "Modeling Group" email list indicating the correction being made and any changes that may need to be implemented. Commenters will automatically be added to the "Modeling Group" email list to ensure that any future changes are also received. If the commenter chooses not to be included on the "Modeling Group" email list, please indicate so in the email sent.

1 ISH File Format

With the changes implemented by EPA to the AERMET program (version 11059), SAMSON formatted data is no longer allowed for years after1990. Therefore, once the new AERMET program is approved by EPA the District will begin processing data using NCDC's Integrated Surface Hourly Data (ISHD) TD-3505 where available. For those sites were ISH data is not available the District will use the Lakes' AERMET option of allowing the use of SAMSON formatted data to process NCDC data until 5 years of ISH data is available for a given site.

1.1 Introduction:

The following procedure is designed to provide staff a step by step approach for downloading and processing local meteorological data. It is hoped that this approach will provide other with the ability to generate their own AERMOD data without the cost of hiring a third party. Or if a third party is hired, we hope that this approach will provide enough information to understand the steps that may be taken to process the raw data collected at the met tower(s) into the final met data used in AERMOD.

1.2 Where to Start:

The NCDC currently provides TD-3505 (ISH) data, **For Free**, available for download from their ftp or HTML sites see Figure 1-1. TD-3505 (ISH) data is stored in directories by year. By double clicking a desired year the FTP site will display all the files, stations, available for download, see Figure 1-2. All files are in a "GZ" compressed file format. You will need a program to uncompress the file before using it.

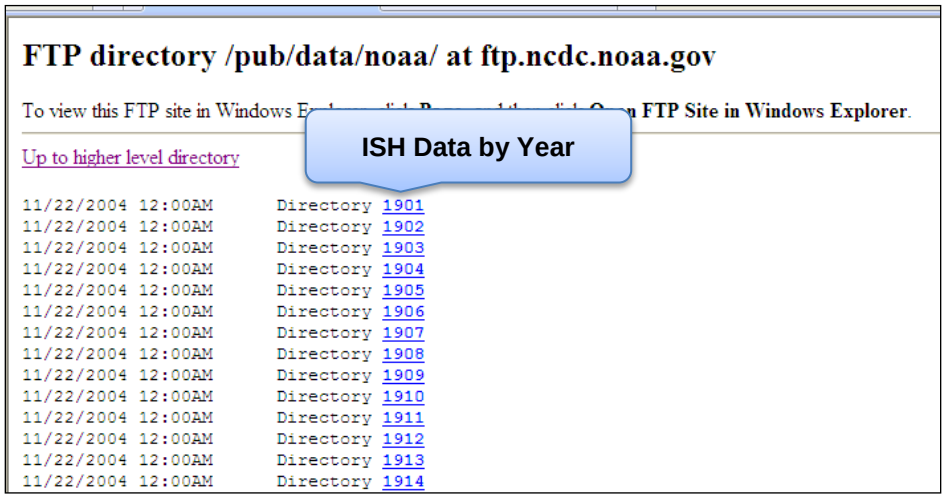


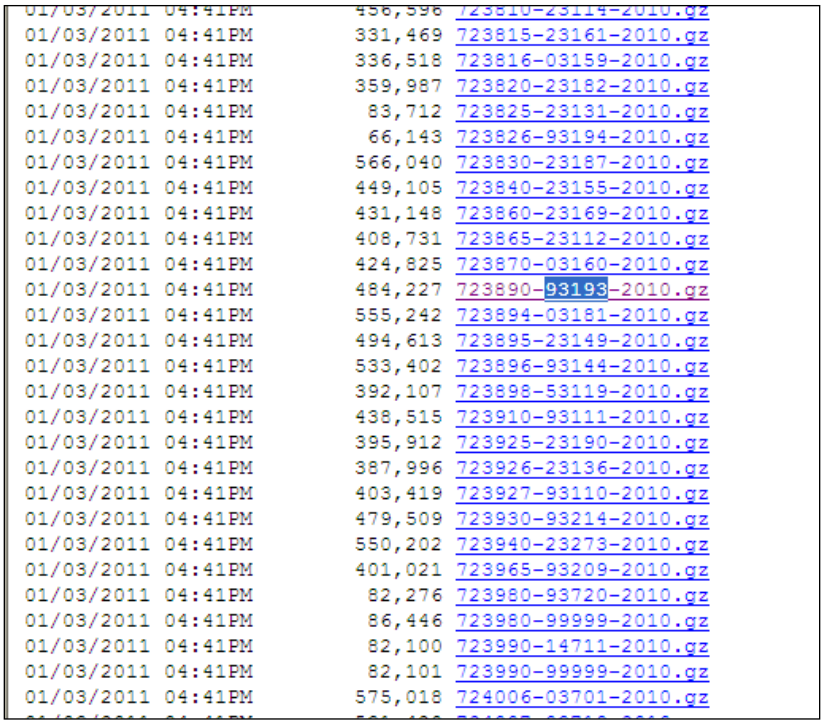
Figure 1-1 ISH FTP Site

WEB Link!!
Each file contains a complete years' worth of data.

TD-3505 (ISH) data
ftp://ftp.ncdc.noaa.gov/pub/data/noaa/
or
http://www1.ncdc.noaa.gov/pub/data/noaa/

1.3 File Naming Convention

A file's name corresponds to their United State Air Force (USAF) station numbers, WBAN station numbers and the year of the data e.g., 723890-93193-2010 corresponds with USAF number 723890 and WBAN number 93193. The links below provide an inventory of a station's data available and provide the USAF and WBAM numbers, Station Name, County Name, Station Information, and Station Call Sign. This information will assist in locating the desired file for downloading. Station data for sites in the San Joaquin Valley are included in Table 1-1 Station Listing (non-MM5 sites)Table 1-1 below.



```
01/03/2011  04:41PM           456,596 723810-23114-2010.gz
01/03/2011  04:41PM           331,469 723815-23161-2010.gz
01/03/2011  04:41PM           336,518 723816-03159-2010.gz
01/03/2011  04:41PM           359,987 723820-23182-2010.gz
01/03/2011  04:41PM            83,712 723825-23131-2010.gz
01/03/2011  04:41PM            66,143 723826-93194-2010.gz
01/03/2011  04:41PM           566,040 723830-23187-2010.gz
01/03/2011  04:41PM           449,105 723840-23155-2010.gz
01/03/2011  04:41PM           431,148 723860-23169-2010.gz
01/03/2011  04:41PM           408,731 723865-23112-2010.gz
01/03/2011  04:41PM           424,825 723870-03160-2010.gz
01/03/2011  04:41PM           484,227 723890-93193-2010.gz
01/03/2011  04:41PM           555,242 723894-03181-2010.gz
01/03/2011  04:41PM           494,613 723895-23149-2010.gz
01/03/2011  04:41PM           533,402 723896-93144-2010.gz
01/03/2011  04:41PM           392,107 723898-53119-2010.gz
01/03/2011  04:41PM           438,515 723910-93111-2010.gz
01/03/2011  04:41PM           395,912 723925-23190-2010.gz
01/03/2011  04:41PM           387,996 723926-23136-2010.gz
01/03/2011  04:41PM           403,419 723927-93110-2010.gz
01/03/2011  04:41PM           479,509 723930-93214-2010.gz
01/03/2011  04:41PM           550,202 723940-23273-2010.gz
01/03/2011  04:41PM           401,021 723965-93209-2010.gz
01/03/2011  04:41PM            82,276 723980-93720-2010.gz
01/03/2011  04:41PM            86,446 723980-99999-2010.gz
01/03/2011  04:41PM            82,100 723990-14711-2010.gz
01/03/2011  04:41PM            82,101 723990-99999-2010.gz
01/03/2011  04:41PM           575,018 724006-03701-2010.gz
```

Figure 1-2 File Naming Convention

WEB Link!!

Integrated Surface Hourly Station History file can be downloaded from ftp://ftp.ncdc.noaa.gov/pub/data/inventories/ISH-HISTORY.TXT (~1.1 Mbytes)

Integrated Surface Hourly Station Inventory
ftp://ftp.ncdc.noaa.gov/pub/data/inventories/ISH-INVENTORY.TXT (~48 Mbytes)

Table 1-1 Station Listing (non-MM5 sites)

USAF	WBAN	Station Name	Call Sign
723840	23155	BAKERSFIELD/MEADOWS	KBFL
723890	93193	FRESNO YOSEMITE INTL AP	KFAT
723898	53119	HANFORD MUNI	KHJO
747020	23110	LEMOORE NAS	KNLC
745046	93242	MADERA MUNI	KMAE
724815	23257	MERCED MUNI MACREADY	KMCE
724926	23258	MODESTO CITY CO HAR	KMOD
723895	23149	PORTERVILLE MUNI	KPTV
724920	23237	STOCKTON/METROPOLIT	KSCK
723896	93144	VISALIA MUNI	KVIS

1.4 Downloading a File

To download a desired file simply:

- Click on the file
- In the “File Download” window Click “Save”, see Figure 1-3

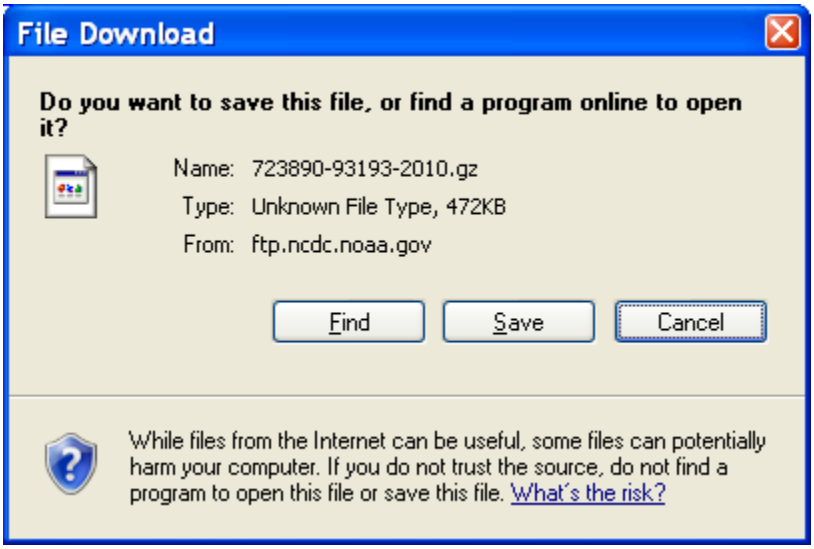


Figure 1-3 File Download

- From the “Save As” window navigate to the location were the file will be saved and click “Save”, see Figure 1-4

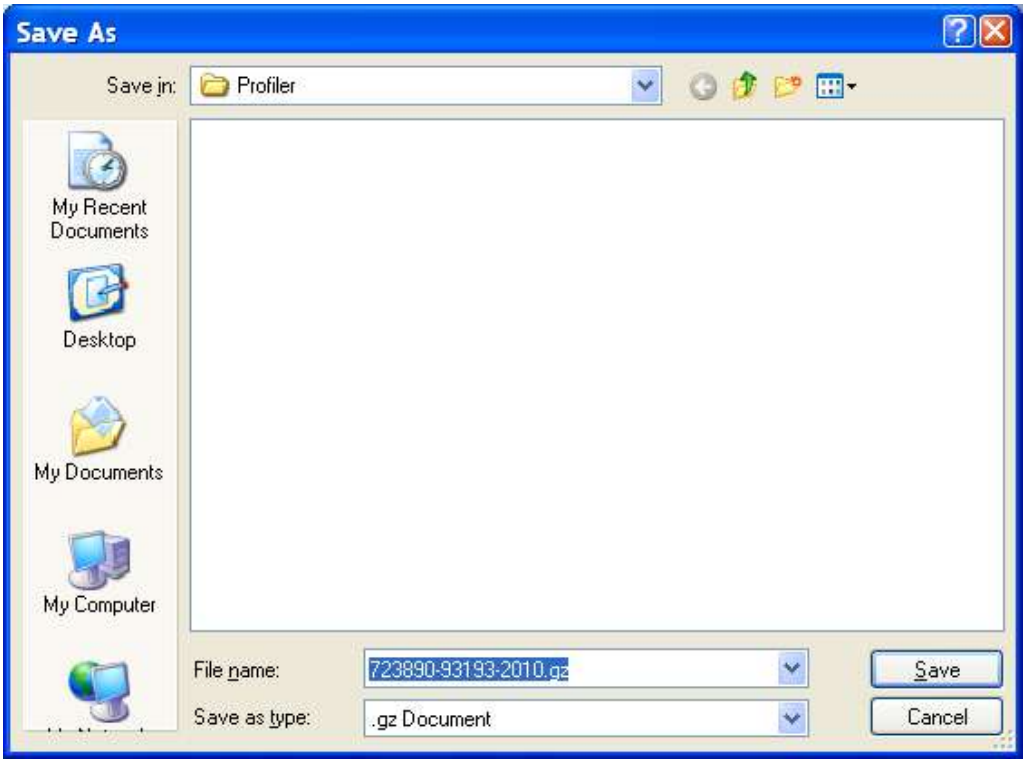


Figure 1-4 File Location

1.4.1 Final Step

Once the data has been downloaded

- Uncompress the file(s)
- And you're done. ISH data can be read by AERMET directly.
- Repeat the steps above to download additional years

NOTE!!
Depending on what web browser and/or version is being used the previous dialog boxes may be different than those displayed here.

2 1-Minute Meteorological Data

EPA has developed a pre-processor to read and process TD-6405 (1-Minute) formatted data to reduce the number of calm hours normally found when only TD-3505(ISH) or SAMSON data is used. The pre-processed data is then combined with the ISH or SAMSON data in AERMET's Stage 2 process.

NOTE!!
Section 8.2.2 Surface Screen – ASOS 1 Minute provides a discussion on how to download the 1 minute data automatically, if available.

NOTE!!
EPA is in the process of updating the AERMET program to allow for a wind speed threshold value to be implemented. Current indication is that a 0.5 m/sec wind speed threshold would be appropriate.

2.1 Introduction:

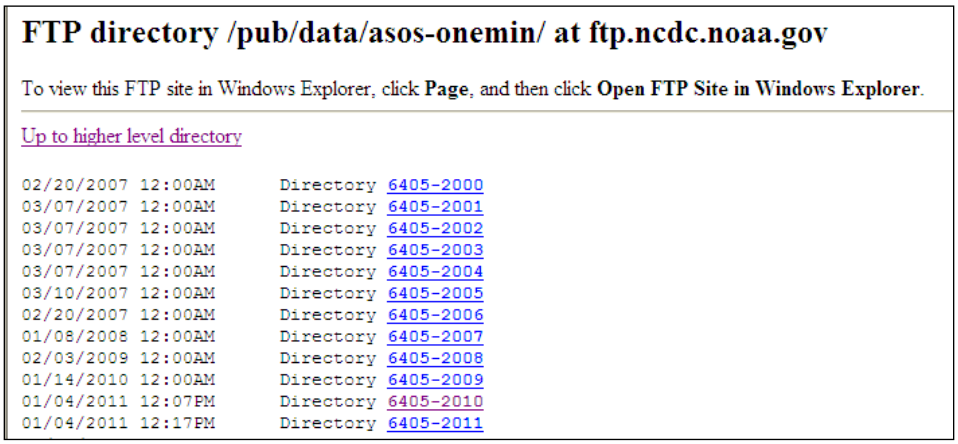
Surface meteorological data collected by the National Weather Service (NWS) and Federal Aviation Administration (FAA) are often used as the source of input meteorological data for AERMOD (EPA, 2010a). A potential concern related to the use of NWS meteorological data for dispersion modeling is the often high incidence of calms and variable wind conditions reported for the Automated Surface Observing Stations (ASOS) in use at most NWS stations since the mid-1990's. In the METAR coding used to report surface observations beginning July 1996, a calm wind is defined as a wind speed less than 3 knots and is assigned a value of 0 knots. The METAR code also introduced the variable wind observation that may include wind speeds up to 6 knots. However, the wind direction is reported as missing, if the wind direction varies more than 60 degrees during the 2-minute averaging period for the observation. The AERMOD model currently cannot simulate dispersion under calm or missing wind conditions. To reduce the number of calms and missing winds in the surface data, archived 1-minute winds for the ASOS stations can be used to calculate hourly average wind speed and directions, which are used to supplement the standard archive of hourly observed winds processed in AERMET (EPA, 2010b).

The following procedure is designed to provide staff a step by step approach for downloading TD-6405 (1-Minute) data. It is hoped that this approach will provide others with the ability to process their own AERMINUTE data.

2.2 Where to Start

Recently, the National Climatic Data Center (NCDC) began archiving the 2-minute average wind speeds for each minute of the hour for most ASOS stations for public access. These 2-minute values have not been subjected to the METAR coding for calm and variable winds. These 2-minute values have been subjected to only limited quality control measures. The 1-minute ASOS wind data consists of running 2-minute average winds, reported every minute, for commissioned ASOS stations. The 1-minute ASOS wind data can be obtained without cost through the National Climatic Data Center's (NCDC) website see Figure 2-1. The TD-6405 data is stored in directories by year. Double clicking on a directory will display all available data for a given year.

NOTE!!
NCDC 1-Minute data
ftp://ftp.ncdc.noaa.gov/pub/data/asos-onemin/



FTP directory /pub/data/asos-onemin/ at ftp.ncdc.noaa.gov

To view this FTP site in Windows Explorer, click **Page**, and then click **Open FTP Site in Windows Explorer**.

Up to higher level directory

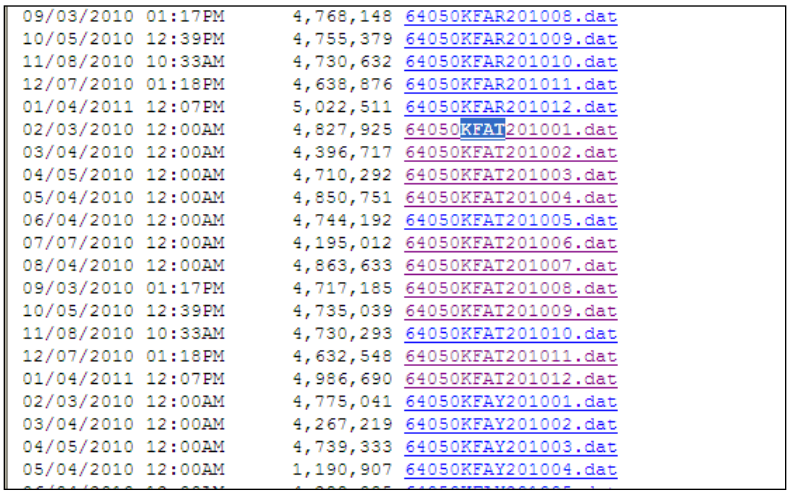
02/20/2007 12:00AM	Directory	6405-2000
03/07/2007 12:00AM	Directory	6405-2001
03/07/2007 12:00AM	Directory	6405-2002
03/07/2007 12:00AM	Directory	6405-2003
03/07/2007 12:00AM	Directory	6405-2004
03/10/2007 12:00AM	Directory	6405-2005
02/20/2007 12:00AM	Directory	6405-2006
01/08/2008 12:00AM	Directory	6405-2007
02/03/2009 12:00AM	Directory	6405-2008
01/14/2010 12:00AM	Directory	6405-2009
01/04/2011 12:07PM	Directory	6405-2010
01/04/2011 12:17PM	Directory	6405-2011

Figure 2-1 1-Minute NCDC Site

Web Link!!
The TD-6405 (1-minute) file format documentation can be downloaded from
http://www1.ncdc.noaa.gov/pub/data/documentlibrary/tddoc/td6405.pdf

2.3 File Naming Convention

For each station and year, files are available in monthly blocks, i.e. one file per month for a station. Files are generally named 64050XXXXYYYYMM.dat where XXXX is the four-character station call sign, and YYYY and MM are the 4-digit year and 2-digit month, see Figure 2-2. An example filename for Fresno Yosemite Intl AP, CA for January 2010 is '64050KFAT201001.dat'. First-order stations archives generally begin with data for 2000. Other stations archives generally started in March 2005. The file extensions are all files is ".dat". Station data for sites in the San Joaquin Valley are included in Section 1, Table 1-1 above.



09/03/2010 01:17PM	4,768,148	64050KFAR201008.dat
10/05/2010 12:39PM	4,755,379	64050KFAR201009.dat
11/08/2010 10:33AM	4,730,632	64050KFAR201010.dat
12/07/2010 01:18PM	4,638,876	64050KFAR201011.dat
01/04/2011 12:07PM	5,022,511	64050KFAR201012.dat
02/03/2010 12:00AM	4,827,925	64050KFAT201001.dat
03/04/2010 12:00AM	4,396,717	64050KFAT201002.dat
04/05/2010 12:00AM	4,710,292	64050KFAT201003.dat
05/04/2010 12:00AM	4,850,751	64050KFAT201004.dat
06/04/2010 12:00AM	4,744,192	64050KFAT201005.dat
07/07/2010 12:00AM	4,195,012	64050KFAT201006.dat
08/04/2010 12:00AM	4,863,633	64050KFAT201007.dat
09/03/2010 01:17PM	4,717,185	64050KFAT201008.dat
10/05/2010 12:39PM	4,735,039	64050KFAT201009.dat
11/08/2010 10:33AM	4,730,293	64050KFAT201010.dat
12/07/2010 01:18PM	4,632,548	64050KFAT201011.dat
01/04/2011 12:07PM	4,986,690	64050KFAT201012.dat
02/03/2010 12:00AM	4,775,041	64050KFAY201001.dat
03/04/2010 12:00AM	4,267,219	64050KFAY201002.dat
04/05/2010 12:00AM	4,739,333	64050KFAY201003.dat
05/04/2010 12:00AM	1,190,907	64050KFAY201004.dat

Figure 2-2 TD-6405 Download

2.4 Downloading a File

To download the desired file simply:

- Click on the file
- In the "File Download" window Click "Save", see Figure 2-3

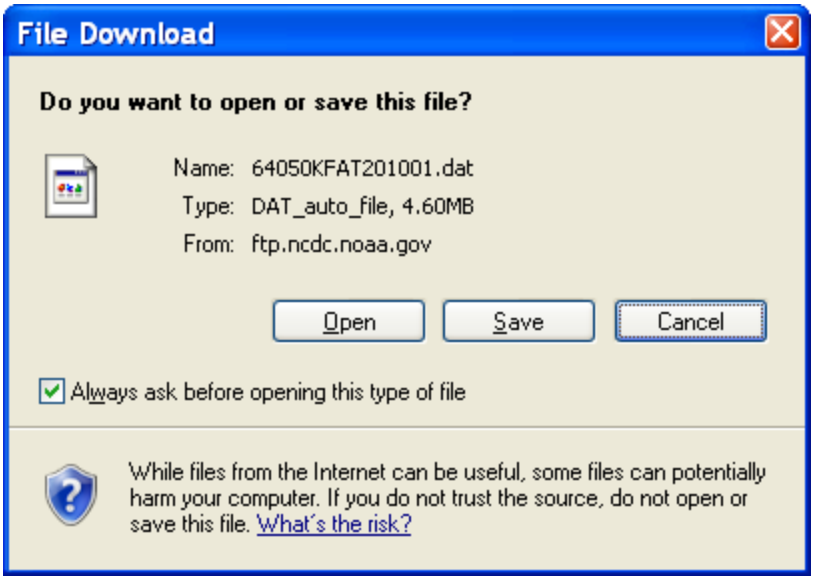


Figure 2-3 File Download

- From the "Save As" window, navigate to the location were the file will be saved and click "Save", see Figure 2-4.

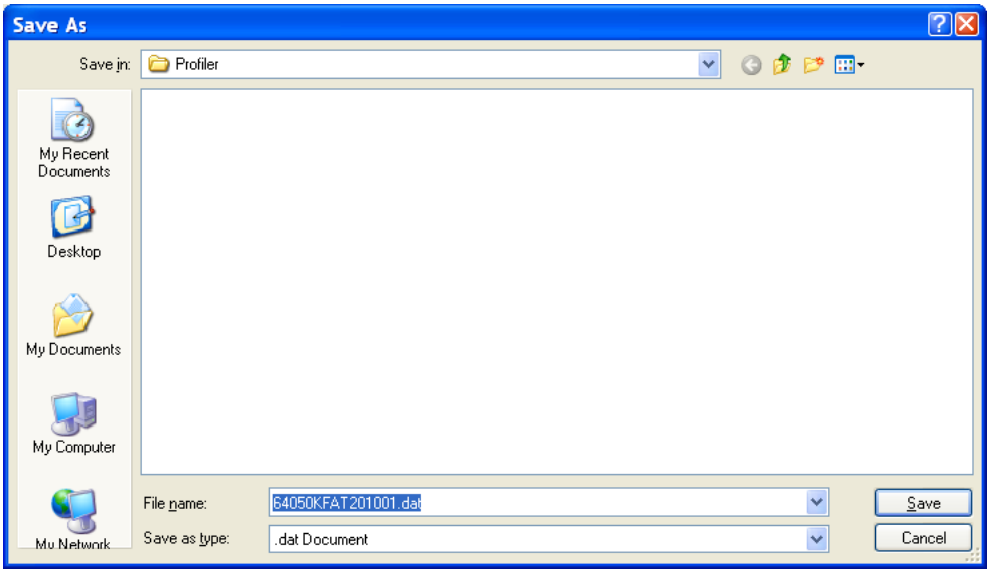


Figure 2-4 - File Location

2.4.1 Final Step

Once the data has been downloaded

- Repeat the steps above to download additional data
- And you're done. TD-6405 data will be read by AERMINUTE directly.

2.5 References

EPA, 2010a: Addendum - User's Guide for the AMS/EPA Regulatory Model – AERMOD. EPA-454/B-03-001. U.S. Environmental Protection Agency, Research Triangle Park, NC 27711.

EPA, 2010b: Addendum - User's Guide for the AERMOD Meteorological Preprocessor (AERMET). EPA-454/B-03-002. U.S. Environmental Protection Agency, Research Triangle Park, NC 27711.

3 SAMSON File Format

The following section describes the method that is used to generate Solar and Meteorological Surface Observation Network (SAMSON) formatted meteorological datasets. This process reformats the Quality Controlled Local Climatological hourly observation data currently available on NOAA National Climatic Data Center's (NCDC) website into a Samson format.

CAUTION!!
The current AERMET program does not allow SAMSON formatted data, dated after 1990, to generate valid surface files that will work correctly in AERMOD. Therefore, at this time, sites where ISH data is available the following method will be considered obsolete unless the ISH data does not meet the minimum regulatory requirements.

3.1 NCDC General Statement:

Due to various Federal Laws and Regulations, NOAA National Climatic Data Center (NCDC) is required to charge for some of its online data to recover the cost of data dissemination. This includes hardware and personnel costs incurred by each Data Center. Charges are required for most domains (e.g., .com, .org, .net). All online data are now free for all .gov, .edu, .k12, .mil, .us, and a few other specific domains.

NOTE!!
For more information on the free data policy please see NNDC's Free Data Distribution Statement (http://www.ncdc.noaa.gov/oa/nndc/freedata.pdf)

For information on how free access is granted via our web systems, please visit the Free Access (http://www.ncdc.noaa.gov/oa/about/ncdchelp.html#FREE) section of the NCDC help page (http://www.ncdc.noaa.gov/oa/about/ncdchelp.html)

Questions/Comments can be directed to: nndc.webmaster@noaa.gov

3.2 Where to Start:

The user needs to determine if their organization has FREE access rights to the online NCDC data. The user should go to the following website Listing of REMOTE Environment Variables (http://www.ncdc.noaa.gov/whoami/whoami) to determine if the user has one of the acceptable extensions (gov, edu, k12, mil, and us). The user should see his/her Host Name and the extension that has been determined.

Figure 3-1 What is My Host Name

If the *Host Name* does not have one of the acceptable extensions the user has two options 1) contact their IT department for assistance or 2) email nndc.webmaster@noaa.gov and explain in the email 1) that you work for an APCD or AQMD in California, 2) that your IP does not have one of the acceptable extensions, 3) what the data is going to be used for (Regulatory Dispersion Modeling with AERMOD), 4) Your contact information, and 5) Request an account or other means that can be used to download the data for free. If NCDC accepts your explanation they will issue a user name and password that can be used to access the online NCDC data.

3.2.1 I have Access, Now What?

Now that you have access to the NCDC's data you will need to follow the steps below to download the quality controlled data.

3.3 NCDC Access Type:

There are two types of access rights we will be dealing with in the following steps: 1) Free Access and 2) Free Account Access.

Free Access: Users that have one of the acceptable IP extension determined above:
Free Account Access: Users that have been given an account by NCDC to access the online data

3.3.1 Free Access:

Users with this type of access should use the following steps to access the online data provided by NCDC.

Option 1:
To access data prior to Jan 2005 use this link
Unedited(http://cdo.ncdc.noaa.gov/ulcd/ULCD)

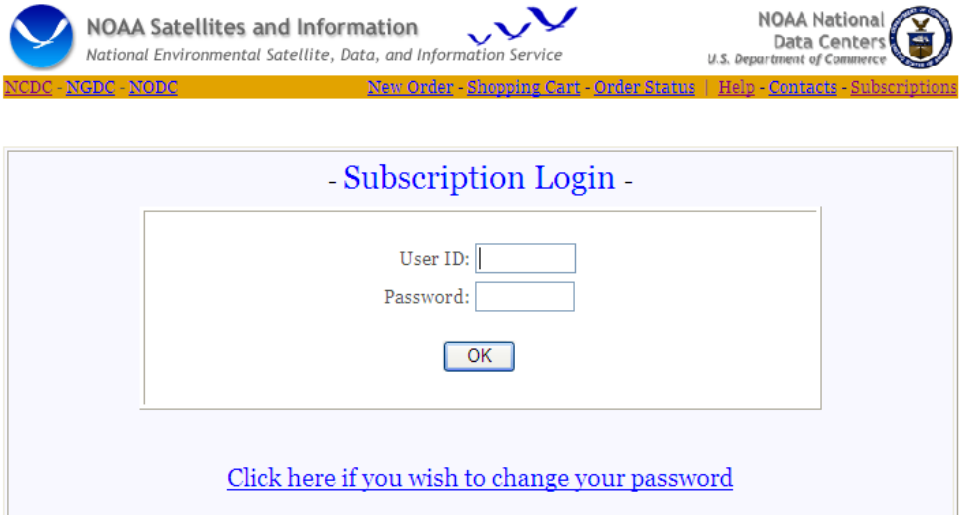
Option 2:
To access data after Jan 2005 use this link **Quality Controlled**
(http://cdo.ncdc.noaa.gov/qclcd/QCLCD?prior=N)

Now skip to Step 5 below (The screen shots below are based on Option 2)

3.3.2 Free Account Access:

Users with this type of access should use the following steps to access the online data provided by NCDC.

Step1 - Login into the NCDC https://ols.nndc.noaa.gov/sub-login.html



Enter your User ID and Password then click "OK"

Step 2 – Select data type "**Quality Controlled Local Climatological Data**"

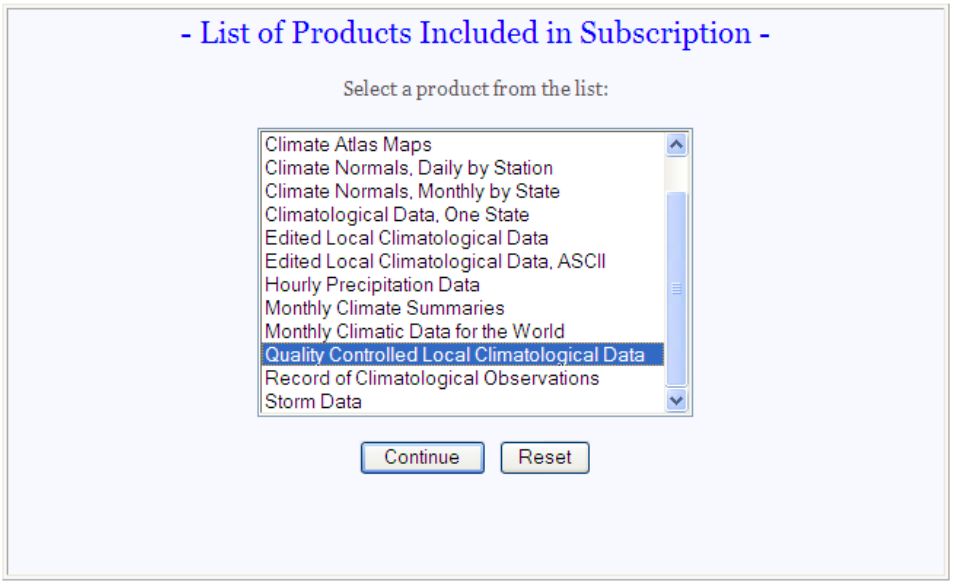


Figure 3-2 NCDC Product Listing

Select "Quality Controlled Local Climatological Data" then click "Continue"

Step 3 – Select "**All**" or a specific station if available

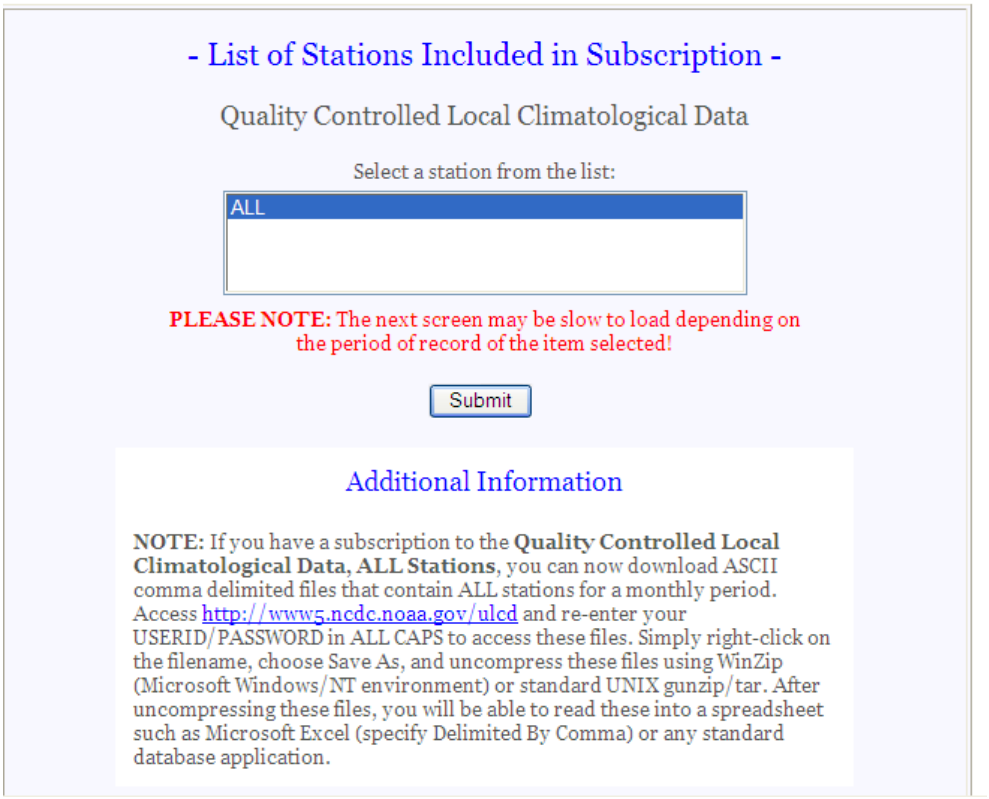


Figure 3-3 List of Stations Available

Select "ALL" then click "submit"

Step 4 – Select data period before January 2005 or After January 2005

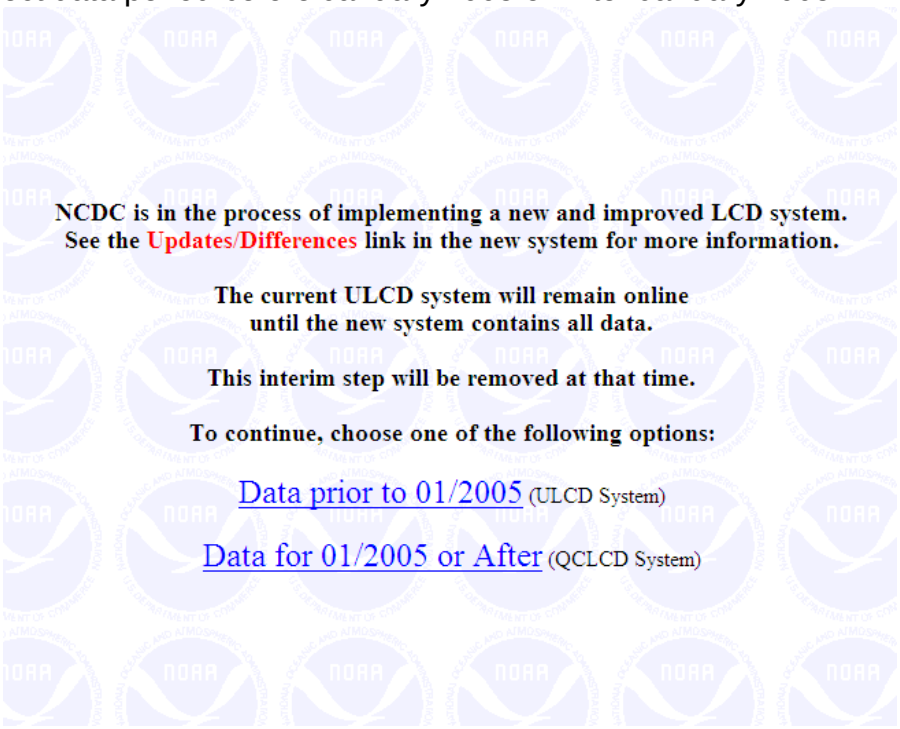


Figure 3-4 NDCD Data Type-Year

For this walk through click “Data for 01/2005 or After”

Step 5 – Select a state

Figure 3-5 Select State

Select “California” from the list then click “Continue”

Step 6 – Select the meteorological station of interest.

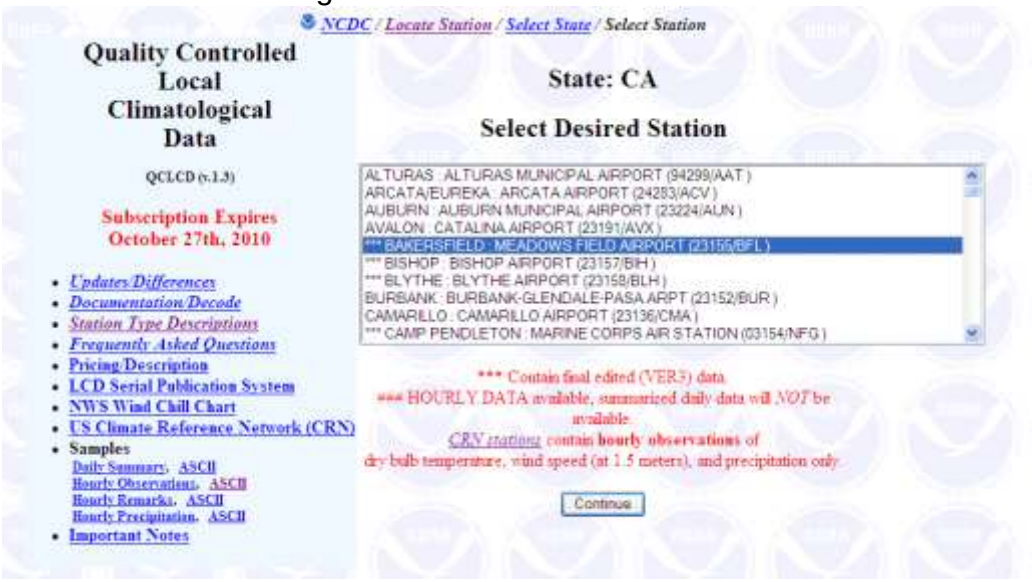


Figure 3-6 California Station Listing

Review the list of available meteorological stations and select the station of Interest, then click “Continue”.

Step 7 – Select the meteorological data to open (12 files for each year)

Figure 3-7 Select Month

From the list of available data select a file to open then click “Continue”

NOTE!!
1 year of meteorological data is broken into 12 files, one for each month.

Step 8 – Select E (Entire month) then click on the “Hourly (10A)” ASCII option button. Click the “submit” button to open a second browser window with the requested data.

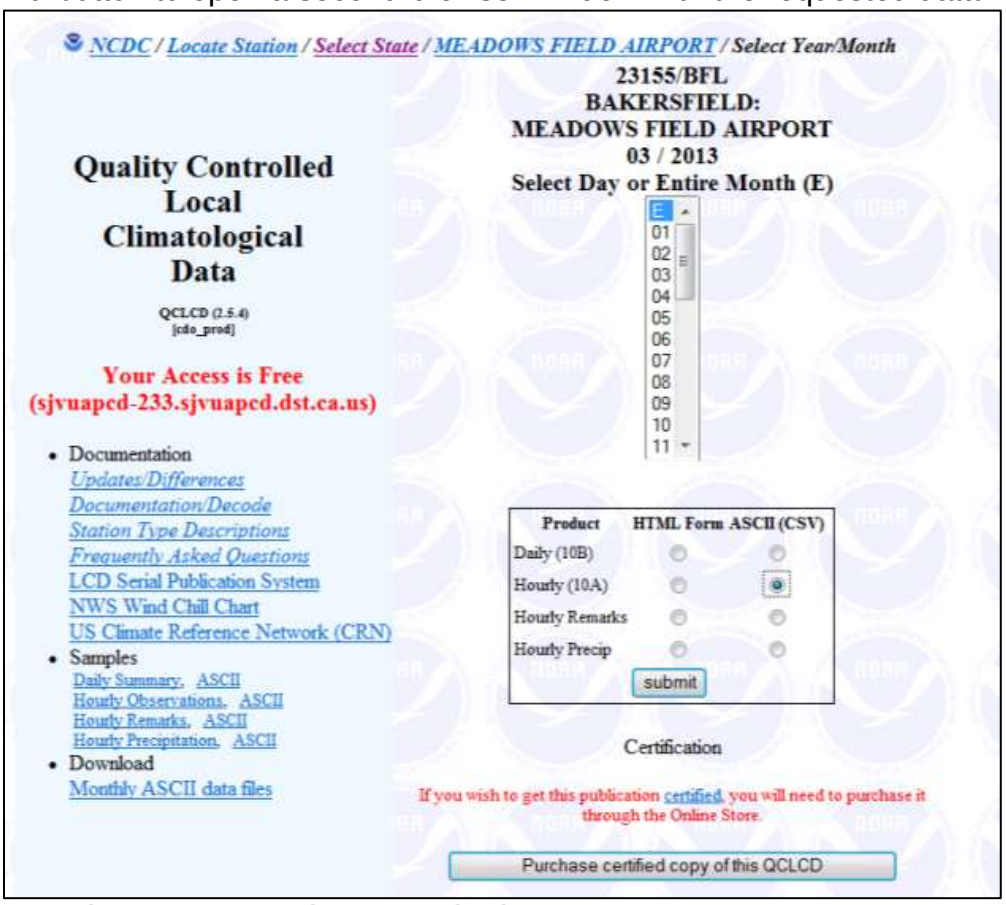


Figure 3-8 Met Station Data Selection

Step 9 – From the browser menu select EDIT --> Select All

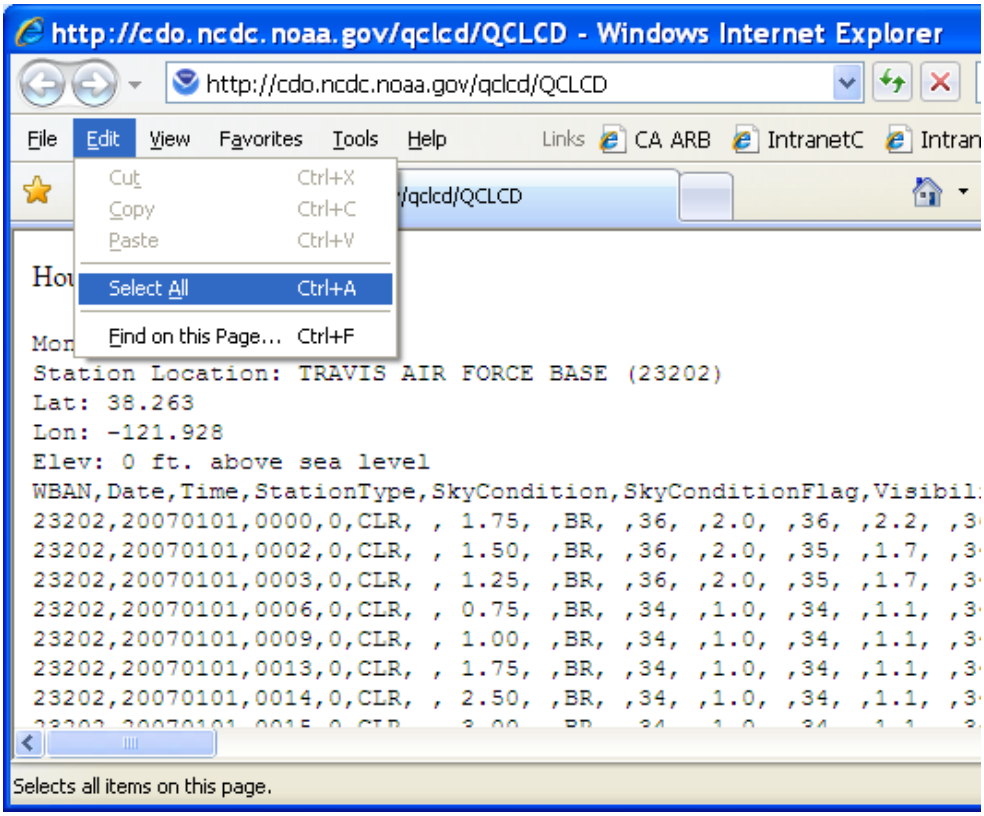
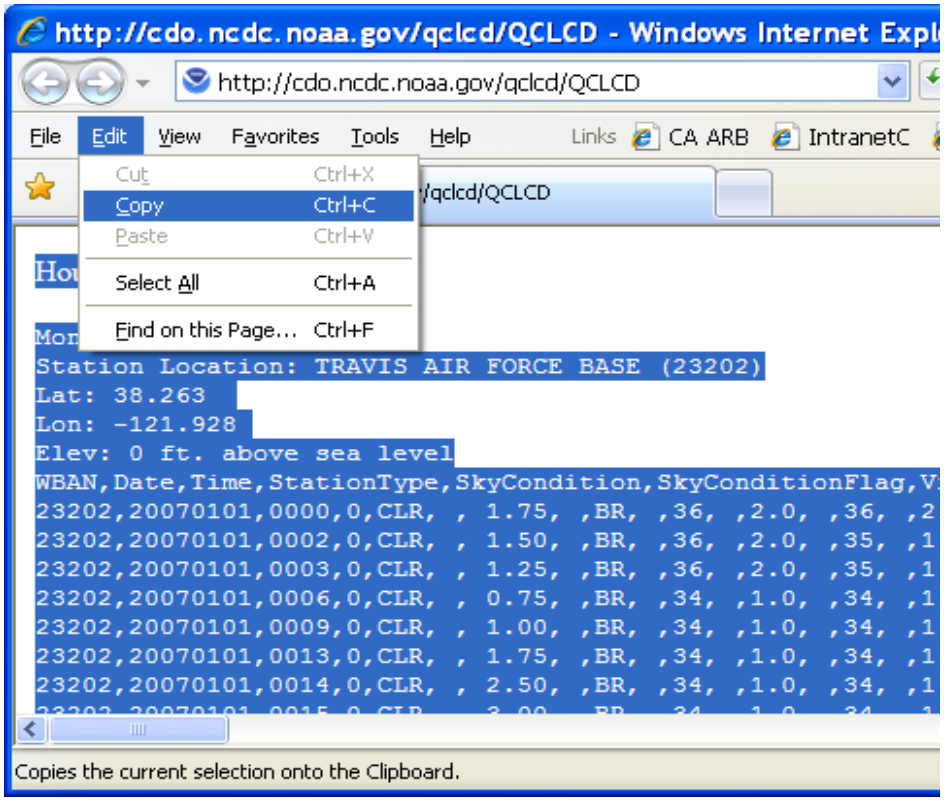


Figure 3-9 Monthly Data Format

Step 10 – From the browser select EDIT --> COPY



NOTE!!
Steps 9 and 10 can be performed using the following quick keys
CTL + A = Select ALL and CTL + C = Copy

Step 11- Open a text editor like WORD PAD and select EDIT --> PASTE. If you are going to process the data using the procedures found in Section 4"How to Process My SAMSON Data" it is recommended that you use the template files included on the CD or download from http://www.valleyair.org/busind/pto/Tox_Resources/Met%20Template.zip and copy the folder called "YEAR" and rename it to represent the year of the meteorological data being downloaded. Within this folder are 12 files numbered 1 thru 12, one for each month of the year. Open the corresponding file for the month being downloaded and paste the data.

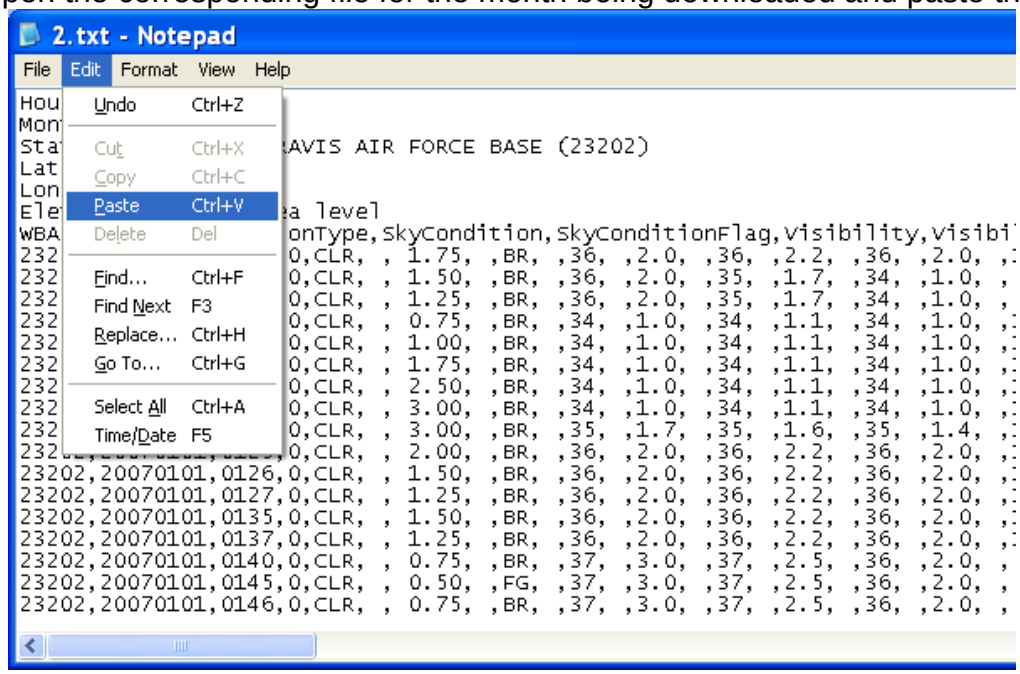


Figure 3-10 Paste Data to Local File

Step 12 – Delete the first line that was copied

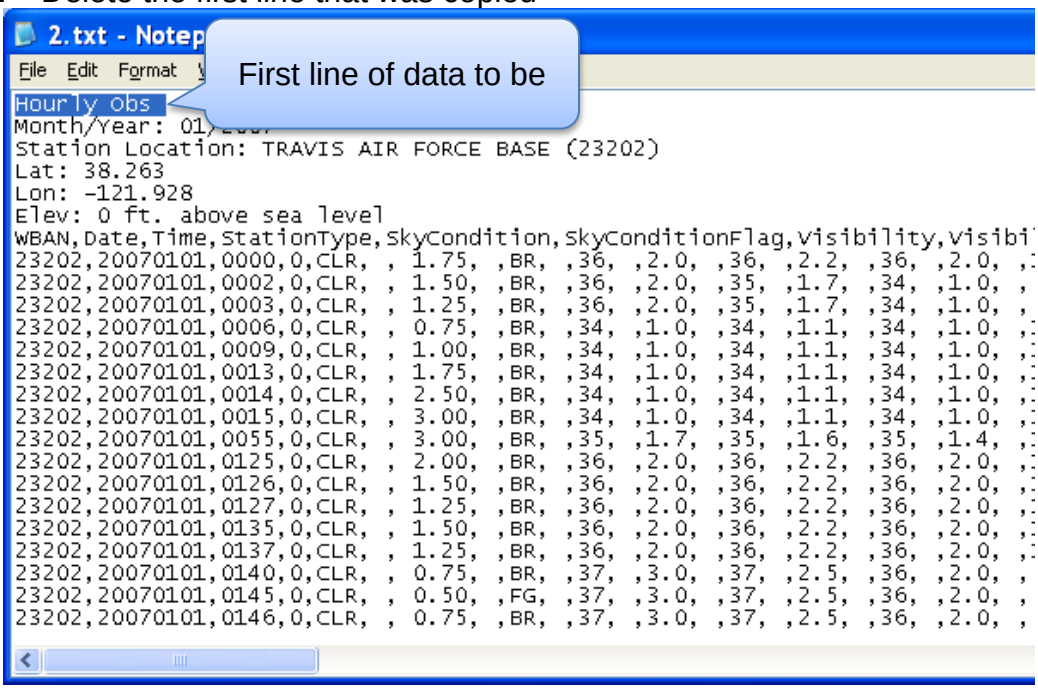


Figure 3-11 Removing First Line of Data

Highlight the first line as seen above and press the "Delete" key

Step 13 – The final file should look like below

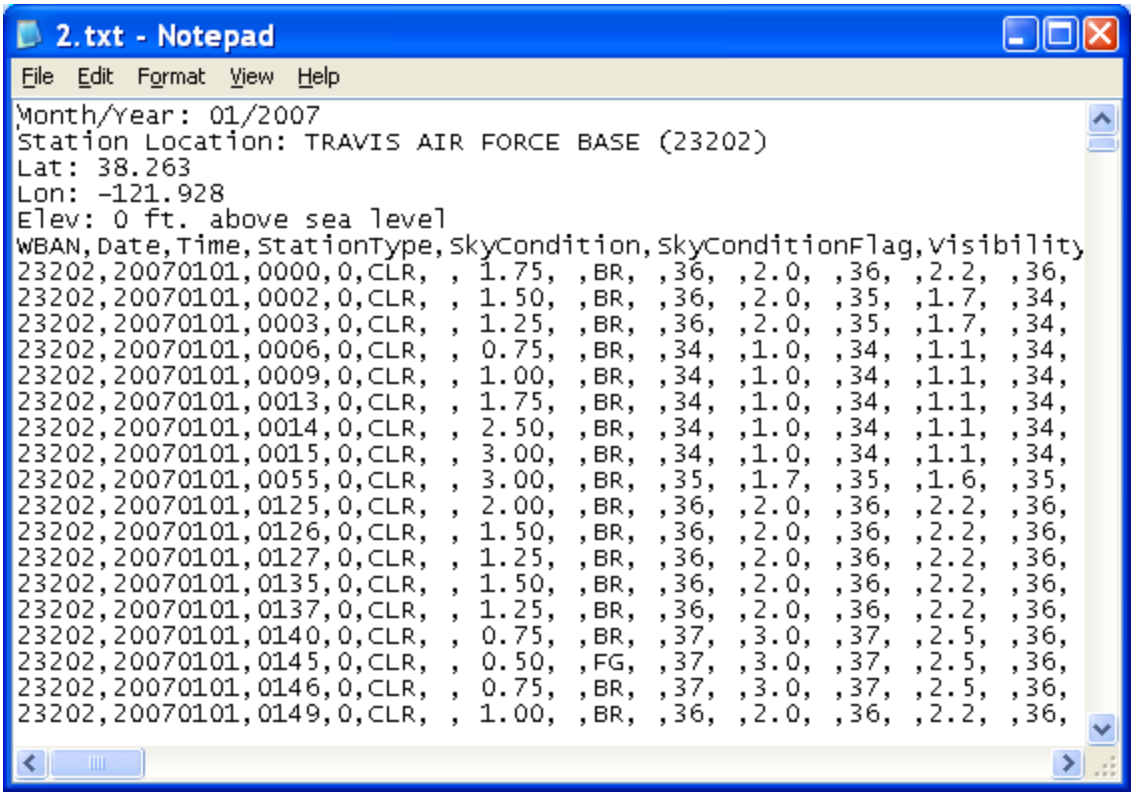


Figure 3-12 Final Data

Step 14 – Save and Close the file. Additionally close the second browser window open in Step 8.

Step 15 – Click the “BACK” button on the browser and Repeat Steps 8 through 14 for each month that is to be downloaded.

4 How to Process My SAMSON Data

Now that you have downloaded the local meteorological data, it's time to QA/QC the data and convert it into a Samson file format. This will allow AERMET to read and process the data into an AERMOD ready meteorological file.

4.1 QA / QC and Converting Local Met Data into Samson Format:

EPA has several requirements for QA/QC meteorological data which are described in "Procedures for Substituting Values for Missing NWS Meteorological Data for Use in Regulatory Air Quality Models" by Dennis Atkinson and Russell F. Lee, 1992. (http://www.rflee.com/RFL_Pages/missdata.pdf). This document describes the EPA-recommended procedures for filling missing data for use in such air quality models as ISCST3 and AERMOD. It is identical to the text file "missdata.txt" available from the EPA SCRAM website, except that formatting has been applied to the text.

Mr. Russell F Lee has also developed a DOS based program that implements the above procedures as well as converts the data into a Samson file format, which AERMET can read. The NCDC_CNV (http://www.rflee.com/RFL_Pages/NCDC_CNV.zip) is a program which can convert the abbreviated hourly surface meteorological data provided online by NCDC in comma-separated ASCII format, and the Integrated Surface Hourly Weather Observations (ISHWO, aka ISH, ISHD) to the SAMSON format. The file is a zipped file containing the program, instructions, and a sample input file. This is being made available "as is" without charge by the developer, and may be freely distributed as long as the instruction file is included intact. The NCDC_CNV zip file has been included with this document for convenience.

For this part of the walk through we will be using the files located in the "SAMPLE YEAR" directory on the included CD, see below.

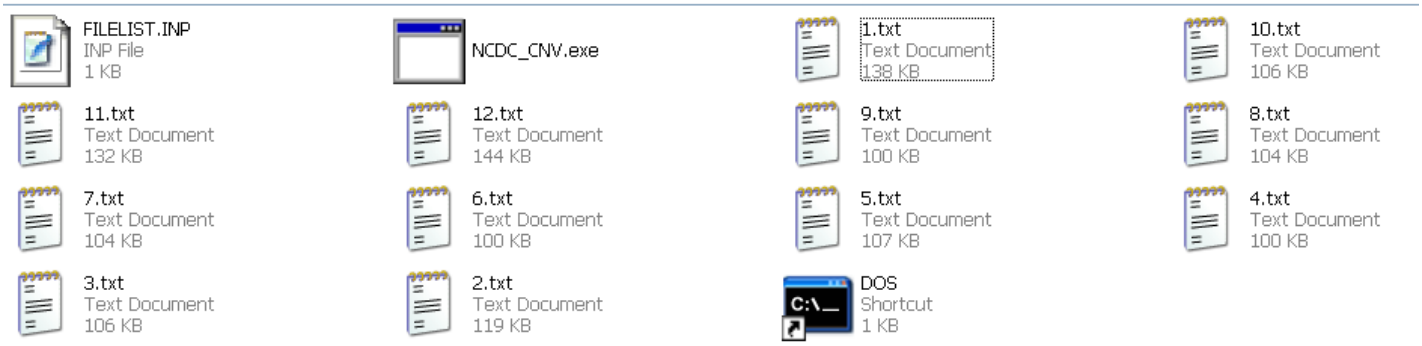


Figure 4-1 Data Files

NOTE!!
The FILELIST.INP and the NCDC_CNV.exe file will need to be located in the same directory as the files to be QA/QC in order to run properly.

4.1.1 The Input File Review:

For a detailed explanation of the NCDC_CNV input file please refer to the file entitled "INSTRUCTIONS_VERS_2008-09-17.txt" located on the provided CD

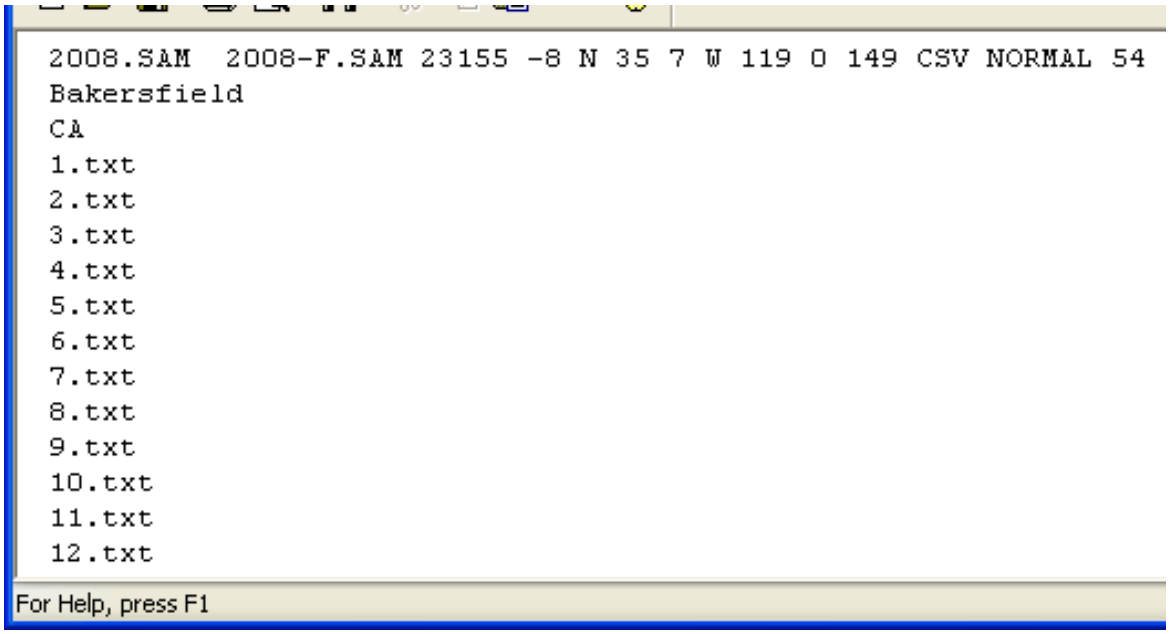
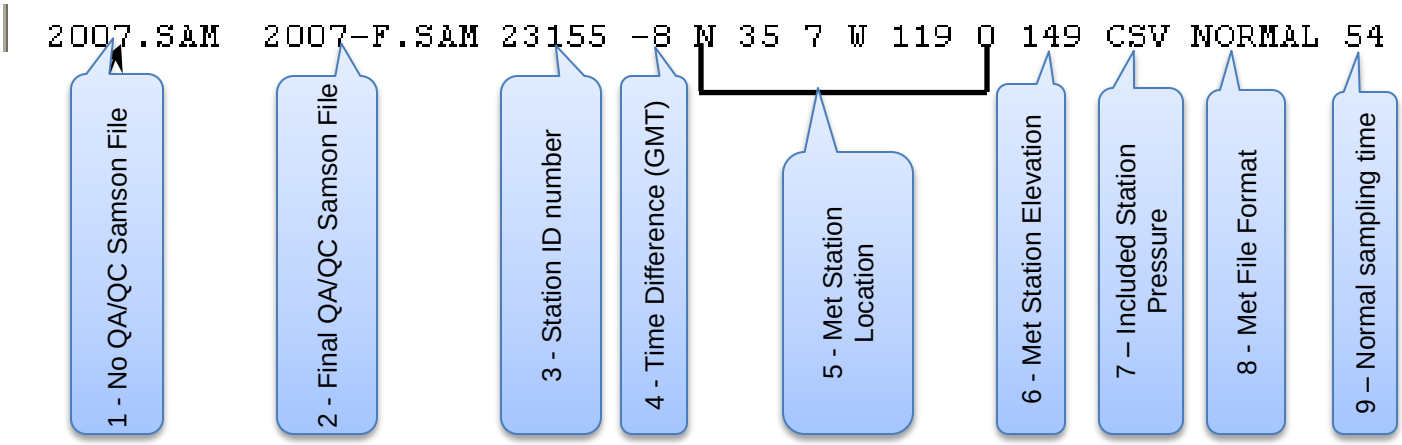


Figure 4-2 NCDC_CNV Input file

The Input file can be broken down into three basic parts; Program Control Line, Station Name and State, and the Meteorological File(s) to Read.

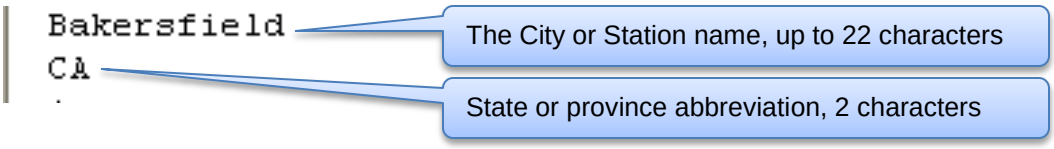
4.1.3 Program Control Line:



Detailed Item Description:

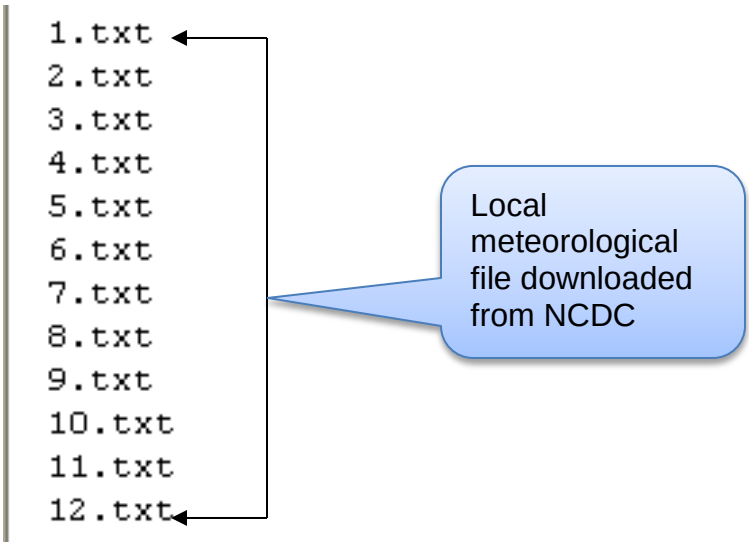
1) Filename of the output file converted to SAMSON format. Missing hours are not filled in this file.
2) Name of output file with missing data filled per Atkinson & Lee.
3) Station ID (5-digit number). This number will appear in the output SAMSON file.
4) Time zone (EST = -5, CST = -6, MST = -7, PST = -8, etc.)
5a) 'N' or 'S' to indicate North or South latitude.
5b) Latitude--whole degrees portion.
5c) Latitude--minutes portion.
5d) 'E' or 'W' to indicate East or West longitude.
5e) Longitude--whole degrees portion.
5f) Longitude--minutes portion.
6) Elevation of station above mean sea level, in meters.
7) Type of input data:
CSV, csv: Comma-separated values from NCDC online store. This accommodates all known variants of the format, and will likely accommodate future ones as well.
8) NORMAL or SUBSLP. NORMAL gives the SAMSON format the station pressure. SUBSLP substitutes sea level pressure for station pressure. CAUTION: Use SUBSLP only for stations fairly near sea level, when the station pressure is missing.
9) Code to identify minutes value(s) used for regular hourly (not special) data. This is only used for space-delimited data (ABBRDS), but must always be present.

4.1.4 Station Name and State:



4.1.5 Meteorological File(s) to Read:

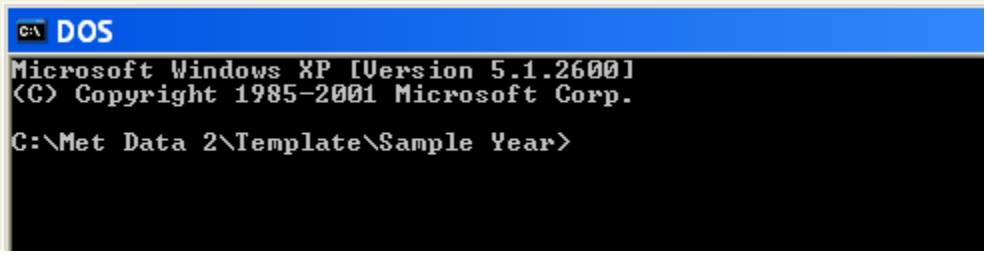
List of input files to be read and converted. These files will be concatenated in the order listed into the Samson output files noted in the Control Line.



Step 1 – Updating the Input File

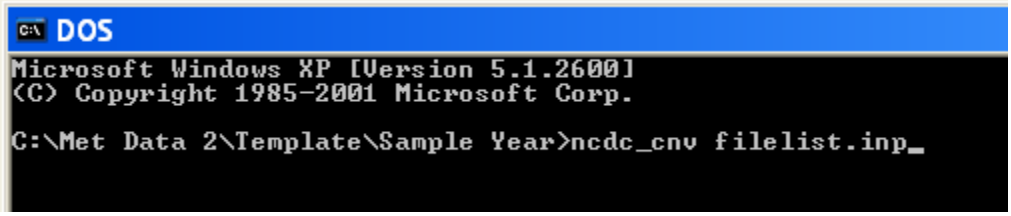
For each year of meteorological data to be processed the Control Line should be adjusted to reflect the parameters of the station to be processed.

Step 2 – Open a DOS Window and go to the directory that contains the files to be processed.

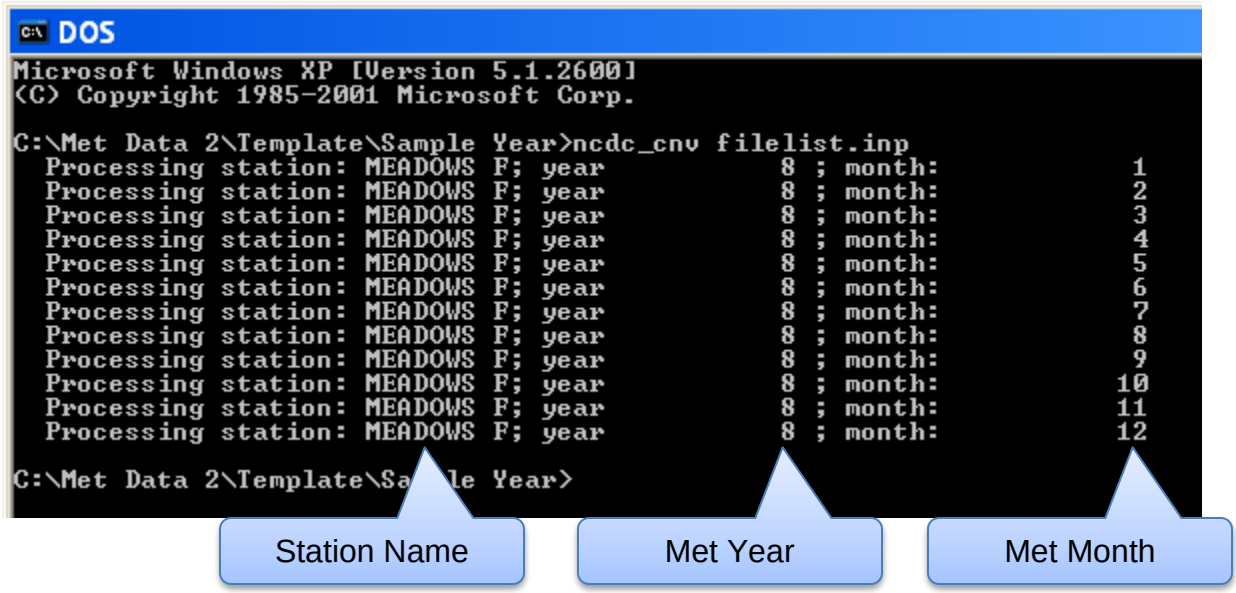


Step 3 – Run the NCDC_CNV.exe program.

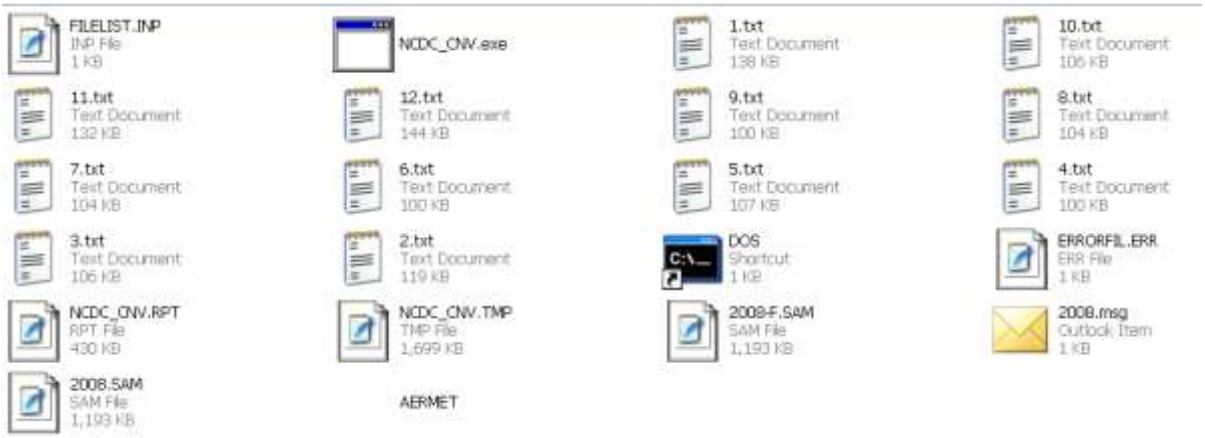
Type **NCDC_CNV filelist.inp** and then press the “Enter” key on the keyboard.



This will start the program. It should read each file listed in the INP file, one for each month of the year. Below is an example of the screen output after the program has run successfully.



4.1.6 Files Created by the NCDC_CNV Program:



4.1.6.1 List of Files Created:

- 2008.SAM – Downloaded meteorological data converted into Samson format
- 2008-F.SAM – The 2008.SAM file that has been QA/QC
- 2008.msg – Provides a list of the missing data that has been filled using EPA guidance
- Errorfil.err – Provides a list of program errors, if any.
- NCDC_CNV.RPT – Detailed list of each hour for each month that was read.
- NCDC_CNV.TMP – Temporary file used when reading data from the 12 individual files before converting it into the Samson Format.

Step 4 – Close the DOS window by typing “Exit”

5 Where's My Upper-Air Data?

Now that the surface data has been downloaded, the matching upper-air data will also need to be retrieved. This data is freely available without restriction.

5.1 Where To Start:

The upper-air data can be downloaded from http://esrl.noaa.gov/raobs/,

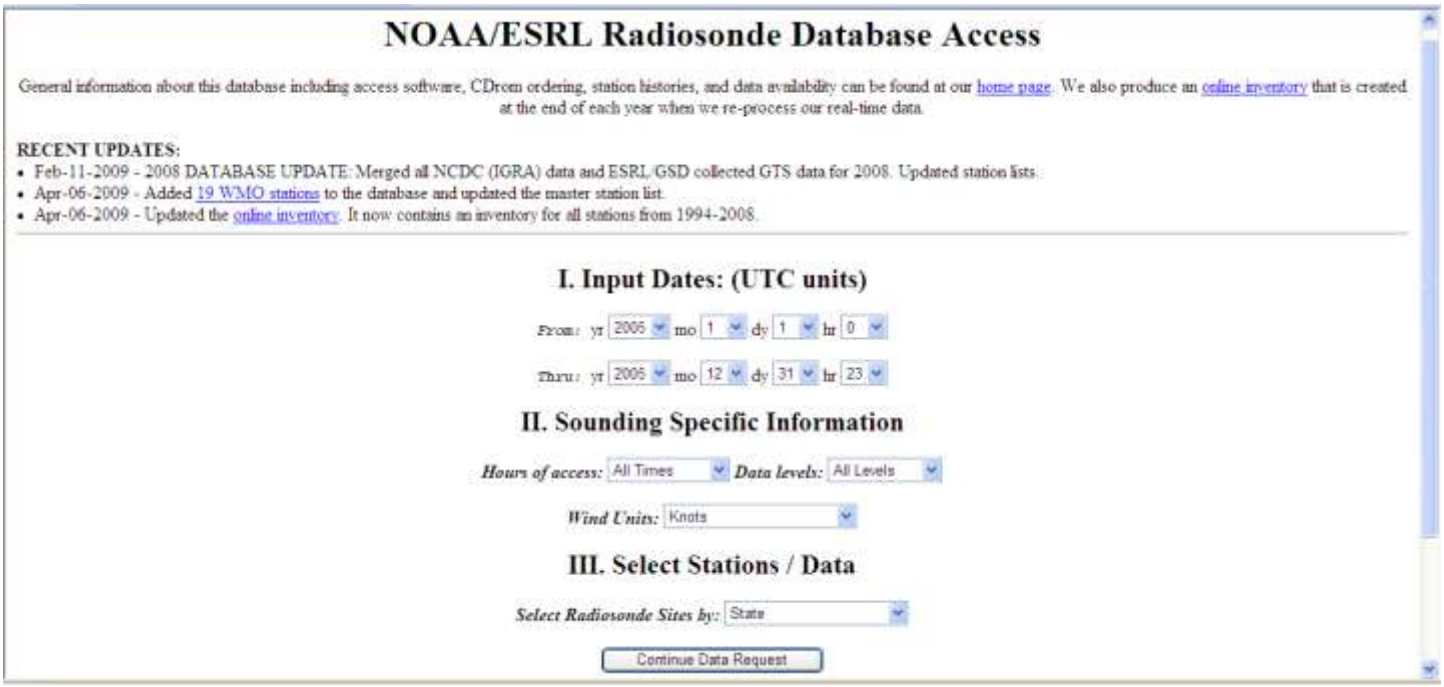


Figure 5-1 Radiosonde Database

Step 1 – Select the time period to download.

Set **From** inputs to: Year = (User define year), Month =1, Day = 1, and Hour=0 (midnight = morning). Set **Thru** inputs to: Year = (same as **From**), Month = 12, Day = 31, Hour = 23.

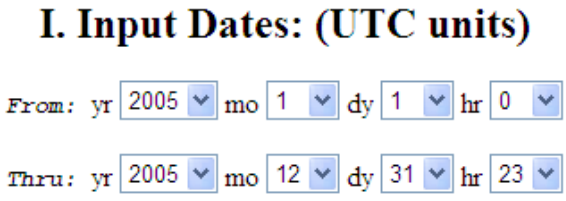


Figure 5-2 Time Period to Download

Step 2 – These options do not need to be altered.

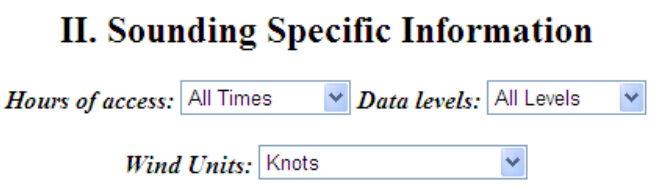


Figure 5-3 Sounding Input Information

Step 3 – Change Radiosonde Site to “State” then click “Continue Data Request”

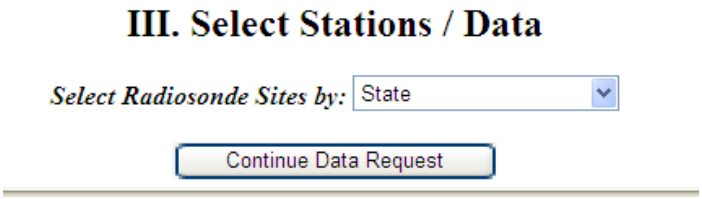


Figure 5-4 Sounding Selection

Step 4 – Select “CA-California” from the list and change the View option to “YES”

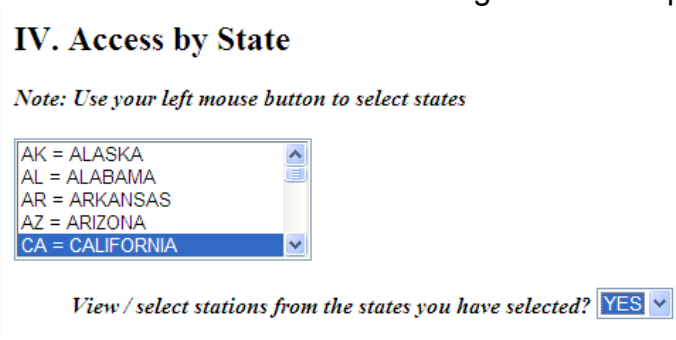


Figure 5-5 Select State

Step 5 – These options do not need to be changed. Click “Continue Data Request”

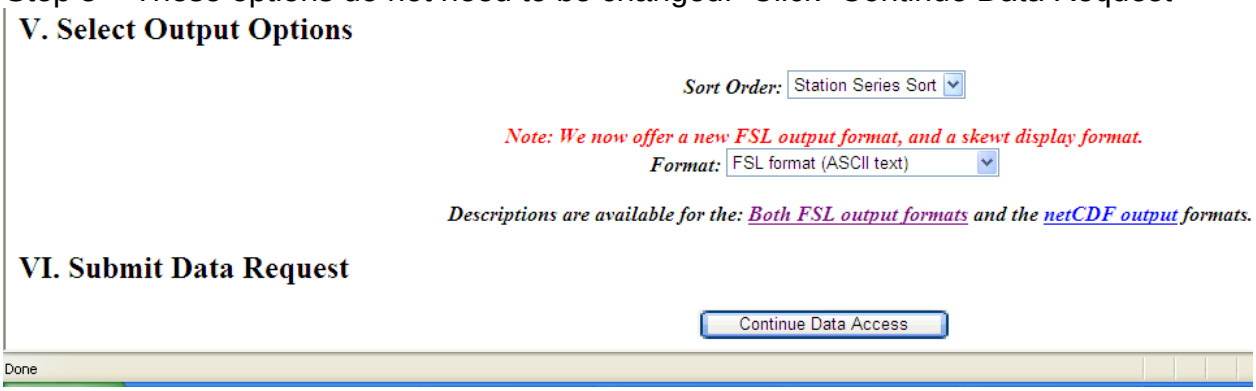


Figure 5-6 Sounding Output

Step 6 – Select the station to download.

The other options on this page do not need to be changed. Click “Get Radiosonde Data”

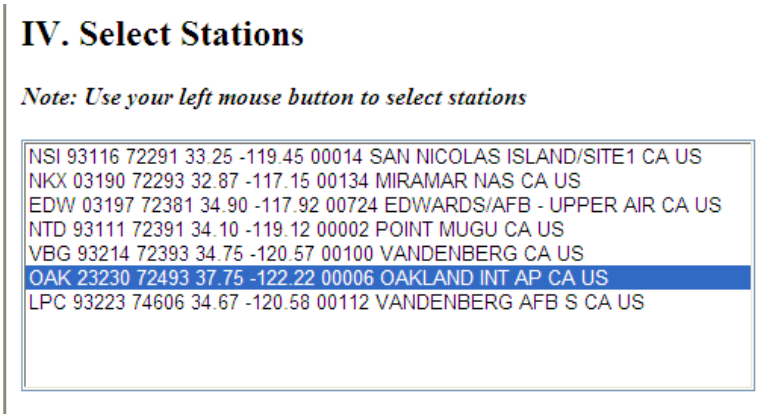


Figure 5-7 Station Selection

Step 7 – From the browser menu select EDIT → SELECT ALL then EDIT → COPY

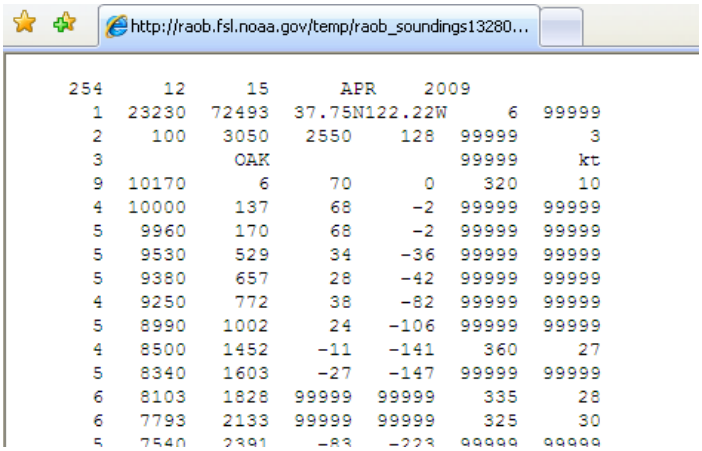


Figure 5-8 Web Output Page

Step 8 – Paste the contents into a text file with a naming of XXXX.FSL.
Where XXXX represents the year of the upper-air data. This will make it easier for AERMET to find the file.

NOTE!!
Repeat steps 1 thru 8 for each year upper-air data set needed.

6 AERMINUTE Pre-Processor (Manual Method)

The AERMINUTE pre-processor will read the TD-6405 data downloaded above and will generate a file that will be used in Stage 2 of the AERMET program. The file consists of one value for each hour of the day with the derived wind speed and direction that was processed from the TD-6405 (1-minute) data.

NOTE!!
Section 7 will describe how to use the Lakes' AERMET interface to process1-minute data and to use the Lakes' AERMIUNTE interface.

6.1 AERMINUTE Input File

The Input file consists of the following elements:

- STARTEND Start and Ending month and year of the data to be processed
- FWGROUP Ice Free Wind Installation information: Status(Y/N) and Month, day, and year, if the status = Y
- DATAFILE List of the data files to read
- SURFDATA The matching surface TD-3505 (ISH) file **(Optional)**
- OUTFILES List of output files. At a minimum the HOURFILE needs to be provided.

CAUTION!!
If the "SURFDATA" key field above is provided, the "COMPFILE" keyword and *name* fields must be included or the program will terminate.

STARTEND *start_month start_year end_month end_year*

IFWGROUP *Status comm_month comm_day comm_year*

DATAFILE STARTING
Datafile list
DATAFILE FINISHED

SURFDATA STARTING (Optional)
Surface files list
SURFDATA FINISHED

OUTFILES STARTING
HOURFILE *name*
SUMMFILE *name* *(Optional)*
COMPFILE *name* *(Optional)*
OUTFILES FINISHED

Figure 6-1 AERMINUTE Input File Structure

```
startend  01 2010 12 2010
ifwgroup  Y 04 03 2007

DATAFILE STARTING
64050KFAT201001.dat
64050KFAT201002.dat
64050KFAT201003.dat
64050KFAT201004.dat
64050KFAT201005.dat
64050KFAT201006.dat
64050KFAT201007.dat
64050KFAT201008.dat
64050KFAT201009.dat
64050KFAT201010.dat
64050KFAT201011.dat
64050KFAT201012.dat
DATAFILE FINISHED

SURFDATA STARTING
723890-93193-2010.ish
SURFDATA FINISHED


OUTFILES STARTING
hourfile FAT_1min_2010_B10300.dat
summfile FAT_1min_2010_summ_B10300.dat
SUMMFILE  minute_summary_richmond.csv
COMPFILE  checks_richmond.csv
OUTFILES FINISHED
```

Figure 6-2 Example of a AERMINUTE Input File

6.2 Ice Free Wind Inventory (IFW)

A list of stations with their IFW installation dates, as of October 27, 2009, can be found at: http://www.weather.gov/ops2/Surface/documents/IFW_stat.pdf.

6.3 Starting AERMINUTE

The first step in running AERMINUTE is to ensure that all the files required are located in the same directory. After confirming that all the files are in the appropriate directory, double click the AERMINUTE program. This can be done using “My Computer” or Explorer, see Figure 6-3.

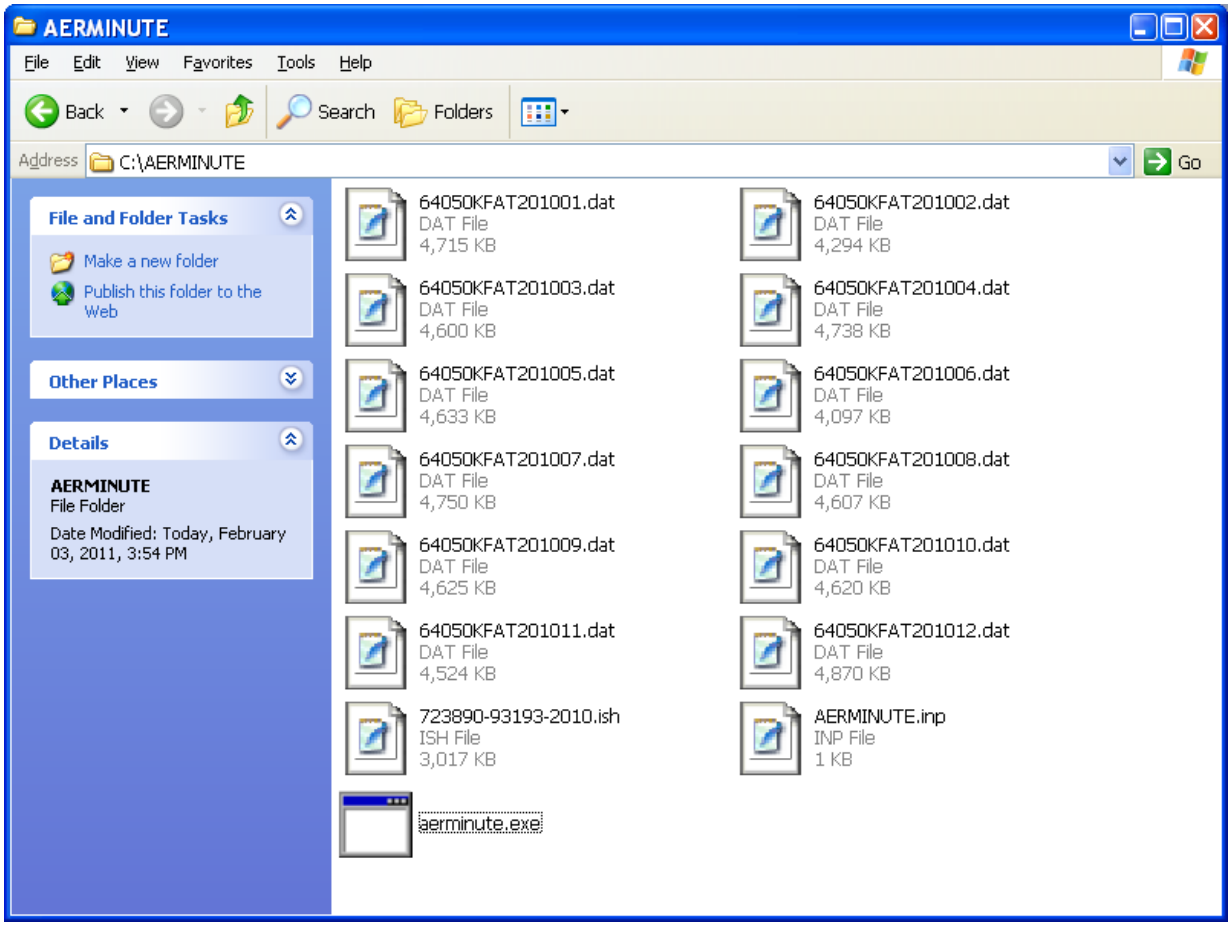


Figure 6-3 AERMINUTE Directory

After double clicking the AERMINUTE program, a DOS window will appear requesting the name of the AERMINUTE Input file, see Figure 6-4. Provide the AERMINUTE input file name and press “Enter” on the keyboard.

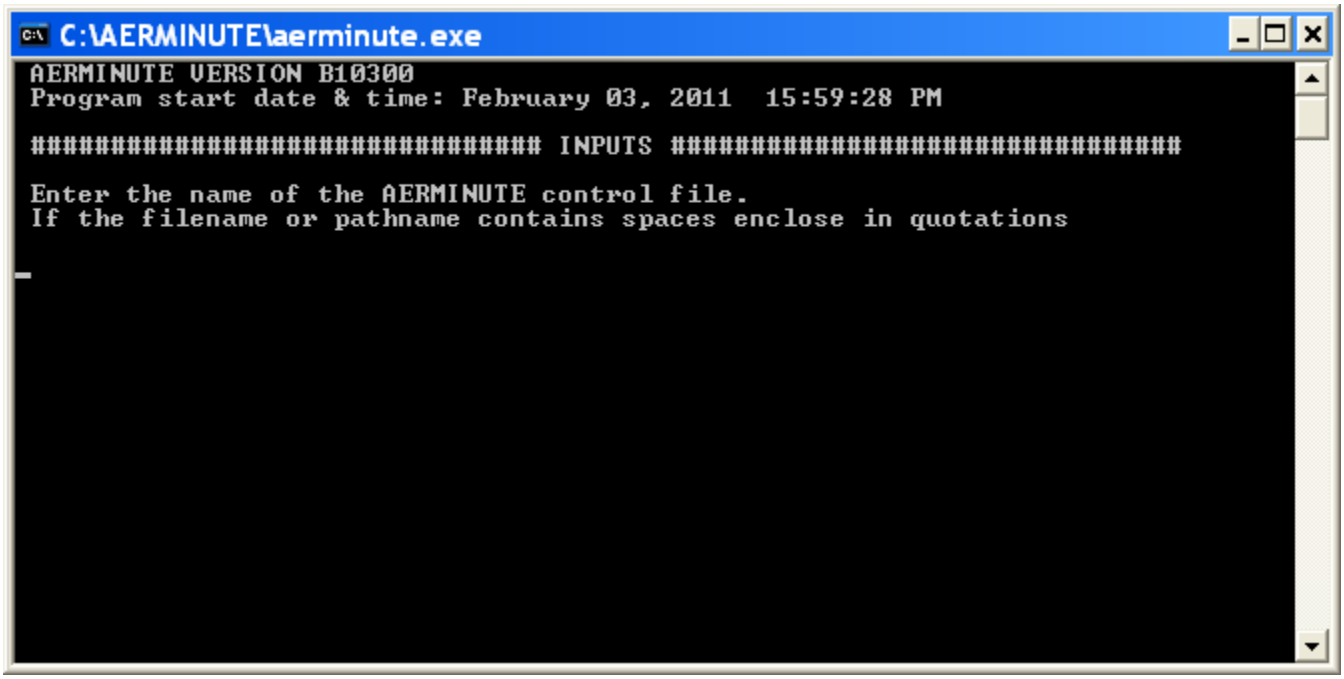


Figure 6-4 - AERMINUTE DOS Window

After entering the input file name and pressing enter, the AERMINUTE program will read the input file, initialize arrays and determine if all the files needed are present, see Figure 6-5.

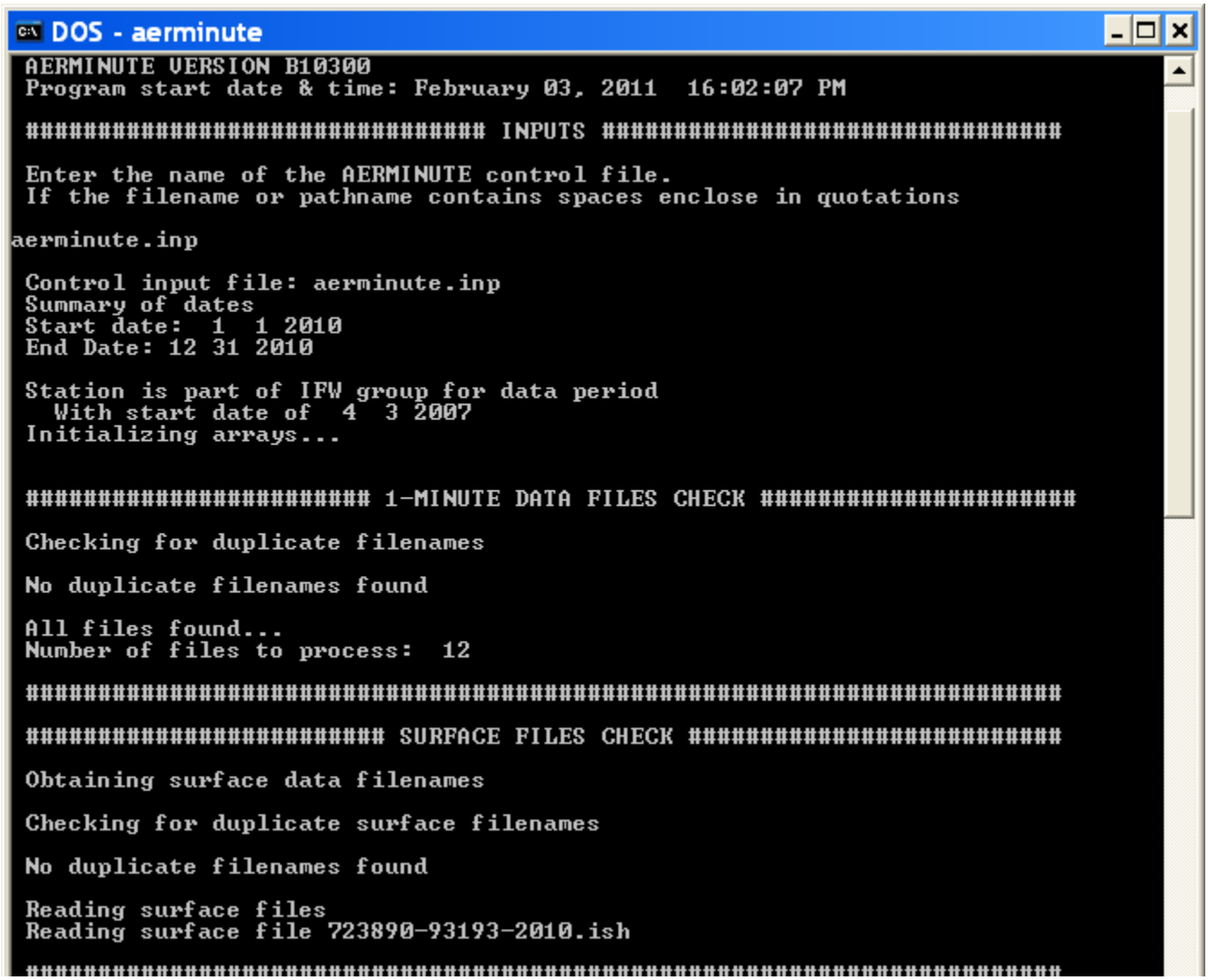


Figure 6-5 - AAERMINUTE initialization

Once AERMINUTE initializes, it will begin reading each of the 1-minute files listed in the input file, see Figure 6-6.

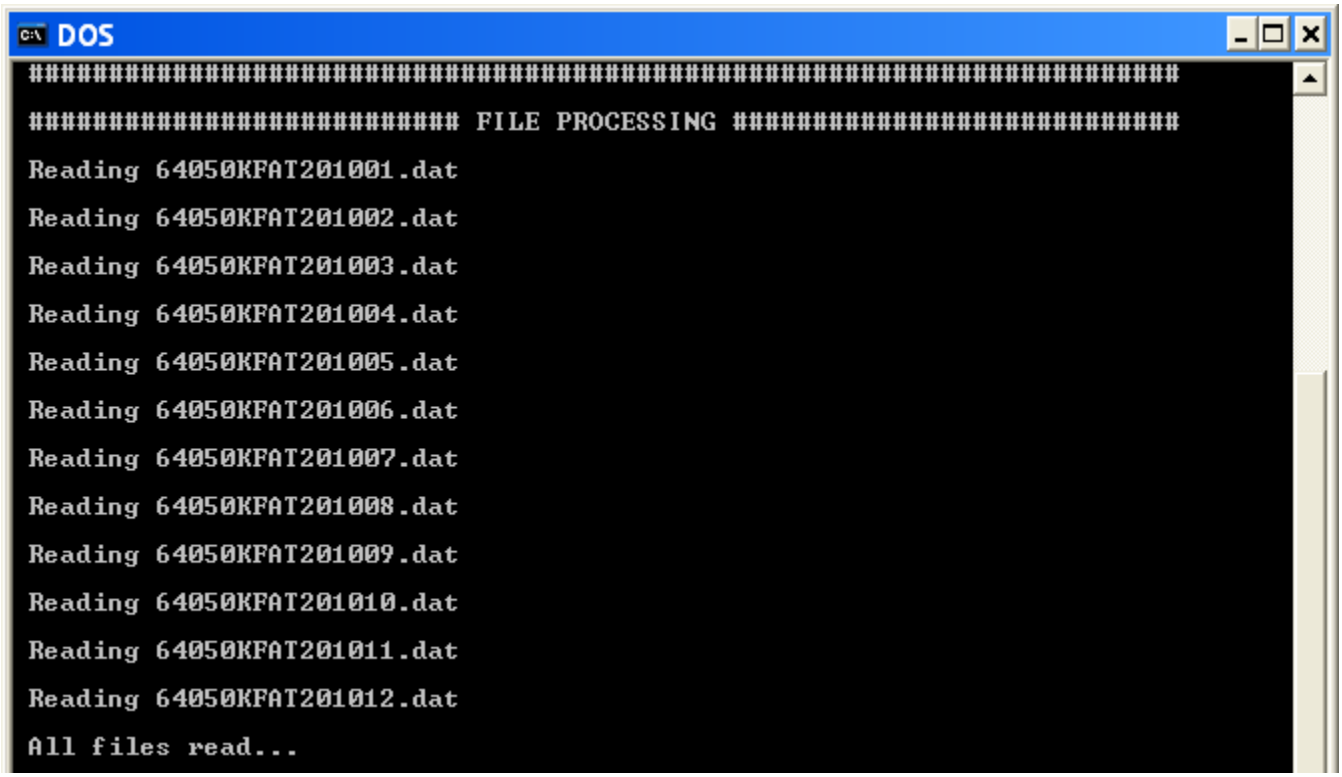


Figure 6-6 - Reading 1-Minute Files

After all the files are read, AERMINUTE will perform QC checks, start averaging the 1-minute data into hourly average data, and write data to a file for AERMET use, see Figure 6-7. The final step is to provide a summary of the data read and generated.

NOTE!!
If you double clicked the AERMINUTE program, versus running it from a DOS window, the screen will disappear immediately after the program terminates and you may not be able to see the final summary.

All the information presented in the DOS window is also written to a file called “AERMINUTE.log”. This file is located in the same directory as the run data and provides more details on the AERMINUTE run.

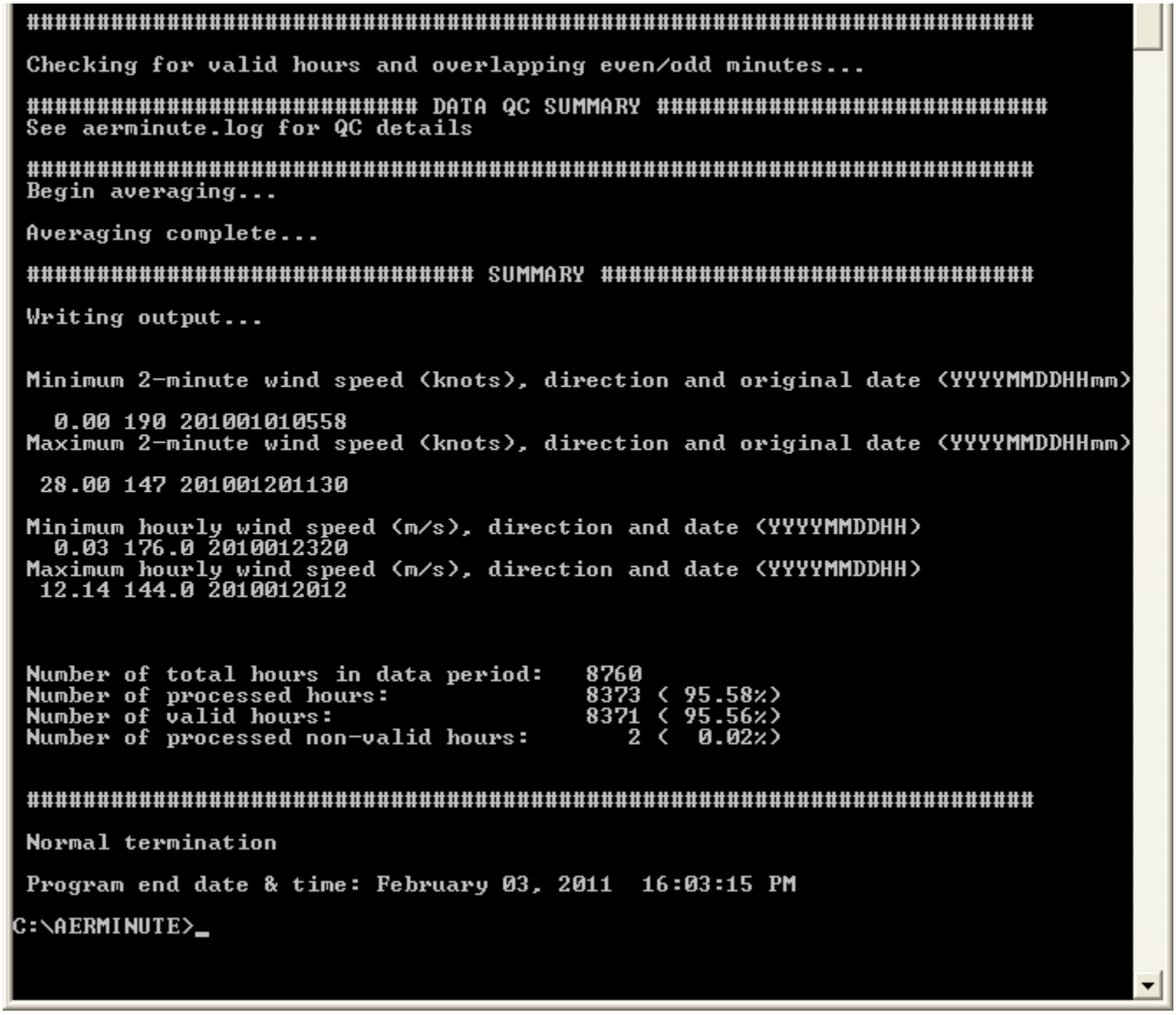


Figure 6-7 AERMINUTE Finalization

You’re Done

7 Determining Meteorological Site Surface Conditions

When generating an AERMOD ready meteorological dataset it is important to determine a meteorological site's surface condition. There are two parameters to be determined in this process. Currently there is no clear EPA procedure on how these parameters should be determined. Therefore, in order to provide transparency, the District has developed the following procedure for determining the site characteristics (Site Surface Moisture and the assignment of the Monthly/Seasonal combination).

7.1 Site Surface Moisture & Temperature

The guidance for determining a site's surface moisture provided by EPA, in the AERSURFACE User's Guide, states "The surface moisture condition can be determined by comparing precipitation for the period of data to be processed to the 30-year climatological record, selecting "wet" conditions if precipitation is in the upper 30th-percentile, "dry" conditions if precipitation is in the lower 30th-percentile, and "average" conditions if precipitation is in the middle 40th-percentile." In order to ensure that the appropriate parameters are used when processing meteorological data in AERMET and to provide District staff with a procedure for processing future data, this section will discuss how a site's surface moisture and monthly/seasonal assignments should be determined.

In order to determine a site's surface moisture condition (Wet, Dry, or Average) several items are required:

- NCDC 30-Year Normal Data
  - Percentile data
- A way to read the raw meteorological data
  - ISHD or;
  - SAMSON
- A way to compare the 30-year normal with the raw meteorological data

In order to determine a site's monthly/seasonal assignments, the temperature data will be used to assist in determining which months fall under which season for each meteorological station. EPA does provide default monthly/seasonal assignments. These assignments can be used if no better data is available, see Table 7-1.

Table 7-1 EPA Default Monthly/Seasonal Assignments

AERSURFACE User's Guide Table 2-2: Seasonal Category Descriptions		
Seasonal Category	Season Description	Default Month Assignments
1 (Summer)	Midsummer with lush vegetation	Jun, Jul, Aug
2 (Autumn)	Autumn with unharvested cropland	Sep, Oct, Nov
3 (Winter)	Late autumn after frost and harvest, or winter with no snow	Dec, Jan, Feb
4 (Winter)	Winter with continuous snow on ground	Dec, Jan, Feb
5 (Spring)	Transitional spring with partial green coverage or short annuals	Mar, Apr, May

Each of these items will be discussed in the subsequent sections.

7.1.1 30-Year Normal

As suggested by EPA each year, "period of data", should be compared to the 30-year climatological record. In order to do this, the 30-year normal data from the National Climatic Data Center (NCDC) must be downloaded.

WEB Link!!
Current NOAA's 1981-2010 Climate Normals web site
http://www.ncdc.noaa.gov/oa/climate/normals/usnormals.html#WHATARENORMALS

Current NCDC Precipitation FTP site
http://www1.ncdc.noaa.gov/pub/data/normals/1981-2010/products/precipitation/

The precipitation data provided on the NCDC FTP site are in multiple files. From the precipitation FTP site, see link above, download the following files 1) mly-prcp-25pctl.txt, 2) mly-prcp-50pctl.txt, 3) mly-prcp-75pctl.txt, and 4) mly-prcp-normal.txt (optional). As you will notice, these files are not based on the percentiles suggested by EPA in their AERSURFACE User's Guide.

NOTE!!
- It may be useful to download the station inventory file located at http://www1.ncdc.noaa.gov/pub/data/normals/1981-2010/station-inventories (allstations.txt). This file can assist in determining a station's identification (ID). This ID then can be used to identify the appropriate record in each of the precipitation files.
- It may also be useful to download the Readme.txt from http://www1.ncdc.noaa.gov/pub/data/normals/1981-2010/. This file provides the FLAGs and the Units for each file.

To streamline this process, the District has downloaded all the suggested files and has imported them into an Excel file which is located on the District's webpage called "30yr Normals 1981-2010.xlsx" (~25MB). In addition, the data in the Excel file has been converted, as per the NCDC readme file, into standard units for comparison with the raw meteorological data.

WEB Link!!
District Modelling Page
http://www.valleyair.org/busind/pto/Tox_Resources/AirQualityMonitoring.htm

7.1.1.1 Defining the 30-Year Normal Surface Conditions for a Given Site

To help with the comparison of the 30-year normal and the raw meteorological data, the District has developed a simple Excel spread sheet called "Met Conditions Template.xlsx". The "Met Conditions Template" spread sheet is used to compare the 30-year normal and the raw meteorological data to determine the site's surface moisture parameter. This is done in several steps

For this example we will be use Bakersfield, CA - Meadows Field Airport WBAN ID 23155.

NOTE!!
If no specific data is available, then the lead agency should be contacted to determine which nearby site would be the best surrogate.

Step 1:
- Open the 30yr Normals 1981-2010 Excel file.
- Locate the tab labelled "Wet (75%)", see Figure 7-1.
- Locate the record for Bakersfield Meadows Field Airport.

- This is done by holding down the CTL key while pressing the “F” key, see Figure 7-2.
- Type the WBAN ID in the “Find What” field and press the “Find Next” button.

NOTE!!
The Station ID can be broke down into two parts the Character and the Numerical parts. The Character part of the Station ID will typically start with US and followed by a C or W to identify the location of the station. The numerical part represents the WBAN ID number for the Station under evaluation.

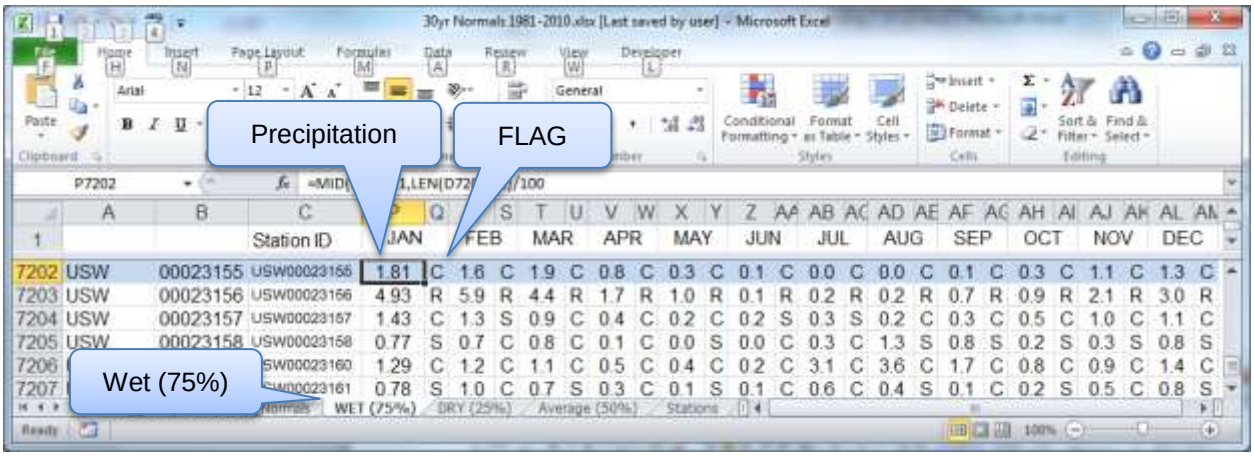


Figure 7-1 Wet (75%) 30yr Normal

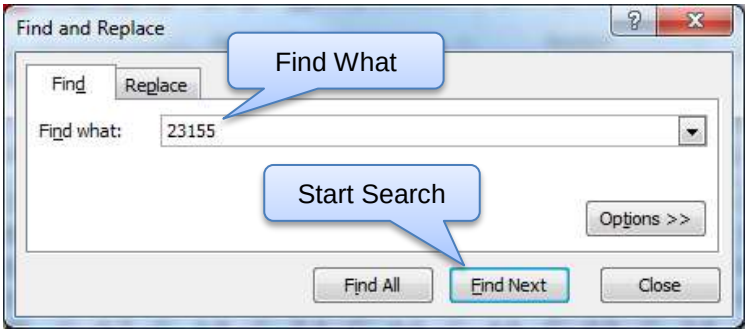


Figure 7-2 Excel Find Dialog Window

Step 2:

Once the Record has been located:

- Open the Met Conditions Template Excel file
- Copy the numerical value (Precipitation) for each month from the 30yr Normals 1981-2010 Excel file to the Met Conditions Template Excel file, see Figure 7-3.

NOTE!!
The data being copied starts in column “P”. Columns D thru O contain the raw uncovered NCDC data and are hidden for convenience only.

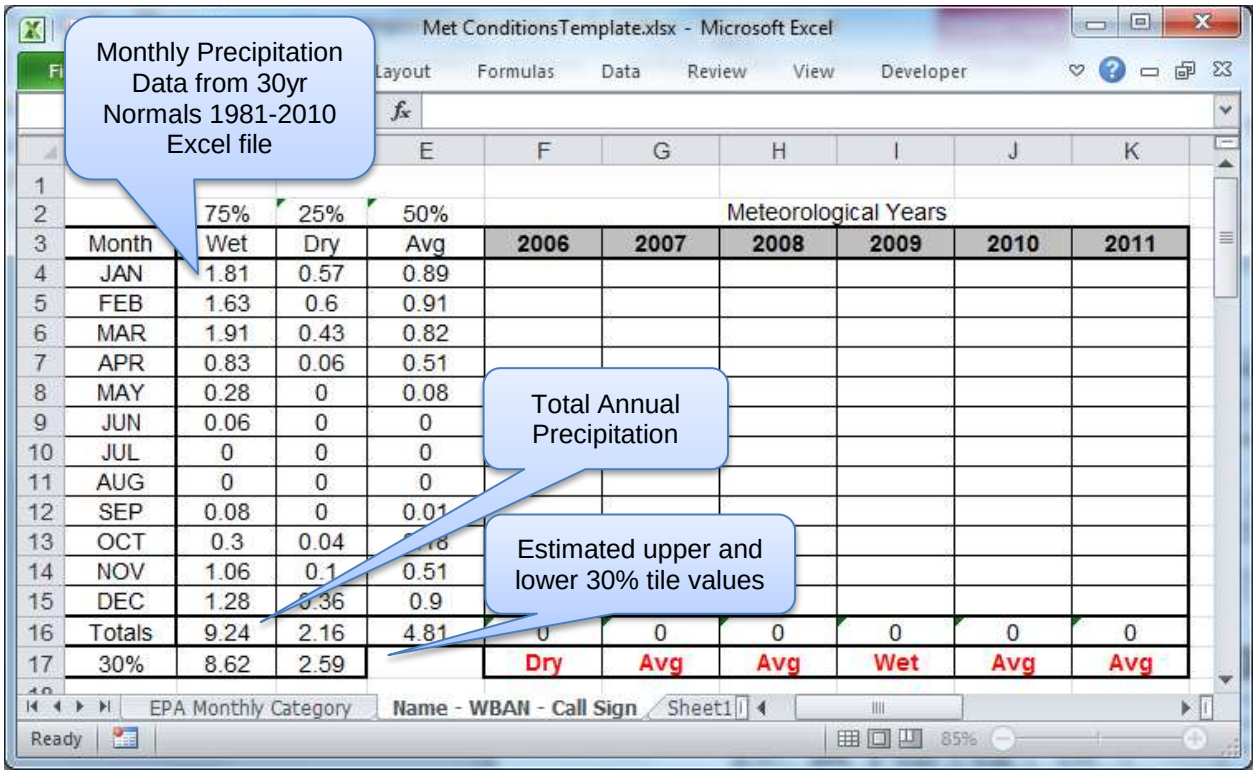


Figure 7-3 Met Conditions Template Excel File

Step 3:

- Repeat Steps 1 and 2 for the Dry (25%), Average (50%), Max_Temp, Min_Temp, and Avg_Temp data.

Step 4

- Rename the "Name – WBAN – Call Sign" tab label
  - For this example it would be "Bakersfield – 23155 - KBFL
- Save the Met Conditions Template Excel file

NOTE!!
As data is being entered into the Met Conditions Template Excel file, the Totals and the 30% rows will automatically update. These values will be used to determine if a year of meteorological data is Wet, Dry, or Average, see Figure 7-3.

7.1.2 Reading Precipitation & Temperature from Meteorological Data File

The next step in the process is to determine the monthly quantity of precipitation for each period of data (year) under review. Depending on what type of meteorological data is being used, there is a unique procedure for determining the monthly precipitation. Each of these procedures will be discussed separately below.

7.1.2.1 ISH Data Format

The full ISH data format is not a very easy format to read. Each hour of data is concatenated into one or multiple lines of data based on the information being reported by a station. In order to provide a readable format NCDC developed an abbreviated ISHD format program called ISHAPP2.exe. The ISHAPP2 program reads the full ISHD file and converts it into an abbreviated ISHD format which includes the most commonly requested data. In this case the "1-Hour Liquid Precip Report in Inches and Hundredths" data will be used to determine the monthly precipitation amounts for a given year.

Web Link!!
ISHAPP2.exe Program
ftp://ingest.ncdc.noaa.gov/pub/software
or
District Modelling Page
http://www.valleyair.org/busind/pto/Tox_Resources/AirQualityMonitoring.htm
File Name: ISH-abbreviated.zip – includes the Program, batch file and program description files.

CAUTION!!
The ISHAPP2 program is a DOS based program and may not work on all platforms.

7.1.2.1.1 Abbreviated ISH Format

The ISHAPP2 program will be used to extract the most common requested data from the full ISH data file. This done by:

- Copy the ISHAPP2 program to the directory where the ISH data was downloaded using the procedure in Section 1.
- From a DOS prompt type the program name, the input filename, and output filename. Then press the Enter key
- The ISHAPP2 program will generate the abbreviate ISH data file

NOTE!!
ISHAPP2 Command Prompt
ishapp2.exe c:/download/723150-03812-2004 c:/download/723150-03812-2004.out
program {pathname} *input filename* {pathname} *output filename*

To assist in this process, the District has created a batch file, see Figure 7-4, that will run the ISHAPP2 without having to start a DOS window and allow for multiple files to be processed. The batch file can be edited using Notepad or any other text editing program as needed for each project.

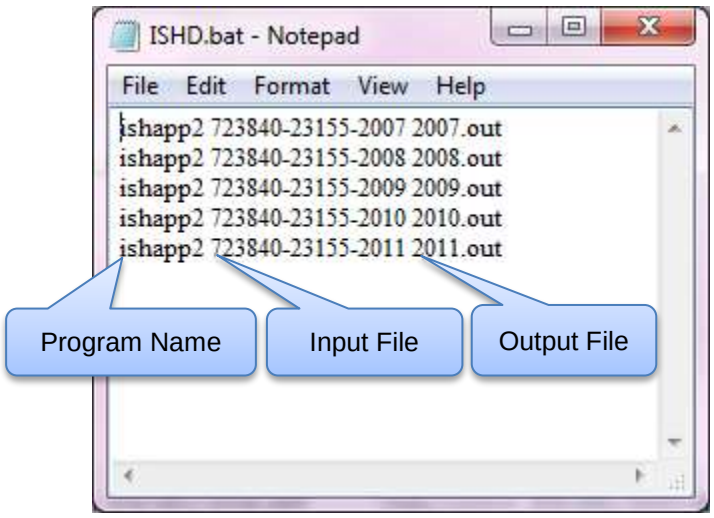


Figure 7-4 ISHD Batch File

To use the batch file, follow these steps:

- Update/Edit the ISHD.bat file as needed
- Save the batch file
- From the an Explorer Window, see Figure 7-5, Double click the batch file
- Once the DOS window disappears the process is complete

- The output files should now be visible in the directory, see Figure 8-7

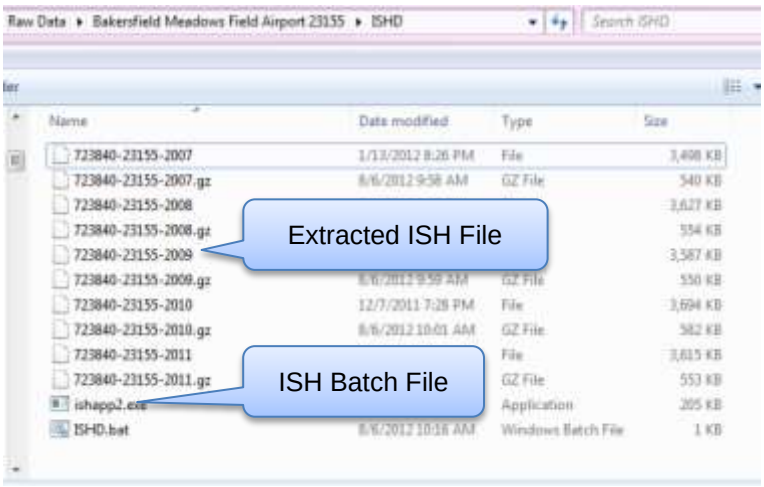


Figure 7-5 Explorer Window

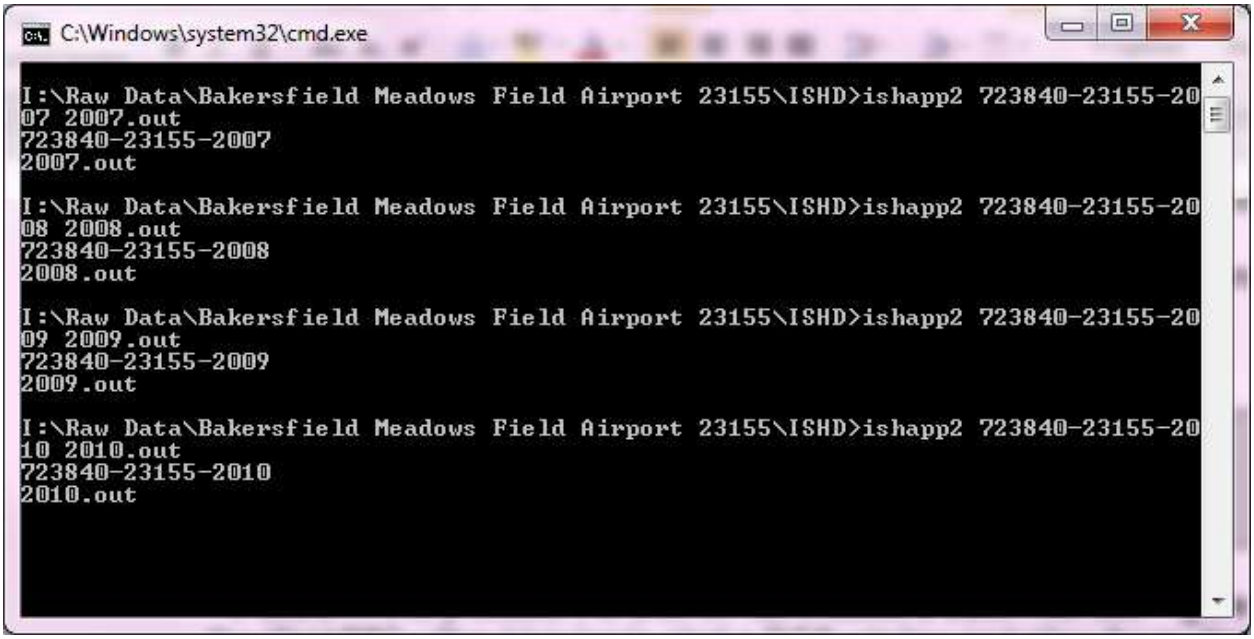


Figure 7-6 Batch File DOS Screen

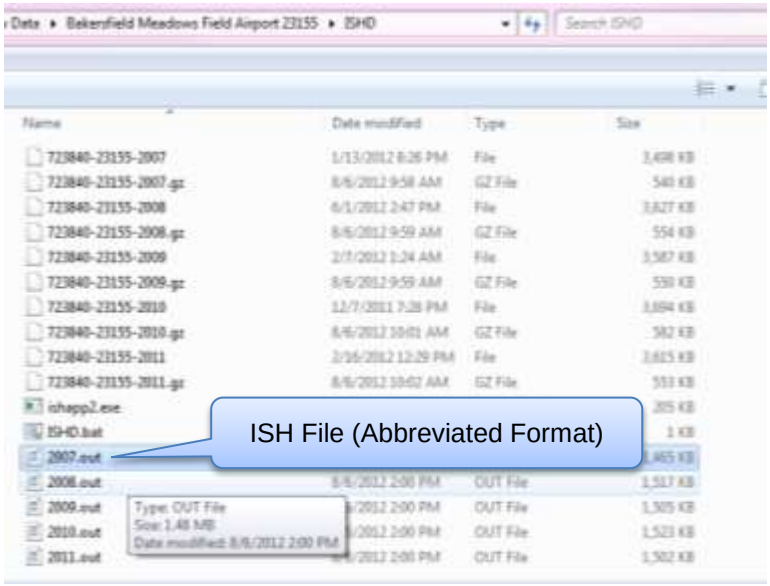


Figure 7-7 Batch Process Completed

7.1.2.2 Samson Format

The Samson file generated using the process described in Section 4 does not require any additional formatting before being read.

7.1.2.3 Reading ISH/Samson Raw meteorological Data

To streamline the process of determining the monthly precipitation, the District has created a simple Access database that can read either the abbreviated ISH or Samson formatted raw meteorological data files, see Figure 7-8.

The database only contains one form which will allow the user to select, import, and summarize the monthly precipitation. For this example, we will be using the abbreviated ISH data file generated in Section 7.1.2.1.1. To use the database, follow these steps:

NOTE!!
Figure 8-8 also shows a select labeled “AERMOD Ready Format”. This section is only used to determine if a given AERMOD ready dataset is complete or not less than 10% missing acquired data and is not used for determining the amount of precipitation.

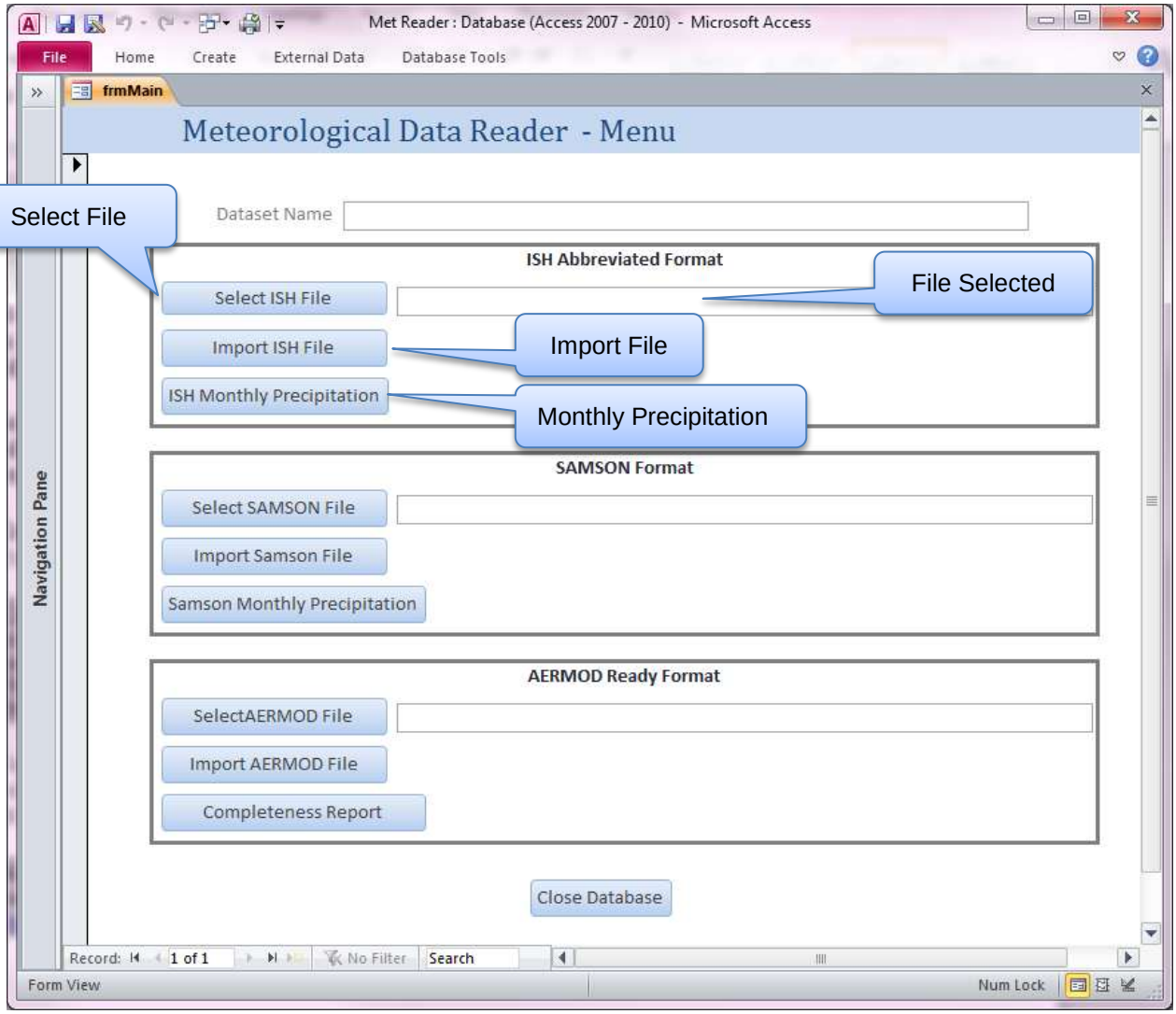


Figure 7-8 Meteorological Data Reader

- After opening the database, see Figure 7-8, Click the “Select ISH File” button
- Navigate to the directory where the abbreviated ISH data file is located, see Figure 7-9
- Select the file to be imported and Click the “Open” button
- The text box next to the “Select ISH File” button should now be filled in with the selected file’s directory location and name.
- Click the “Import ISH File” button. This will read the selected file into the database
    - A warning dialog box will appear indicating that data from the ISH import table will be deleted. The user should click “Yes” to clean all previous data from the ISH import table, see Figure 7-10
- After the import is complete, click the “ISH Monthly Precipitation” button. This will run a query that sums the precipitation for each month based on the data read, see Figure 7-11.

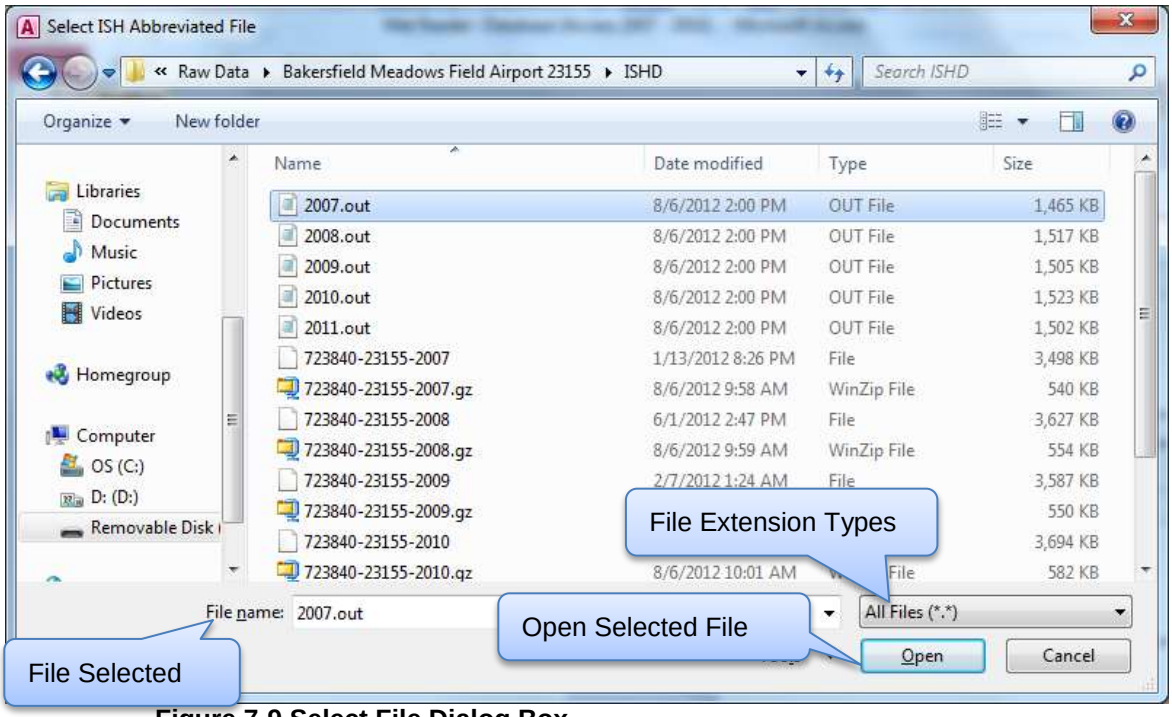


Figure 7-9 Select File Dialog Box

Figure 7-10 Preparing Import Table

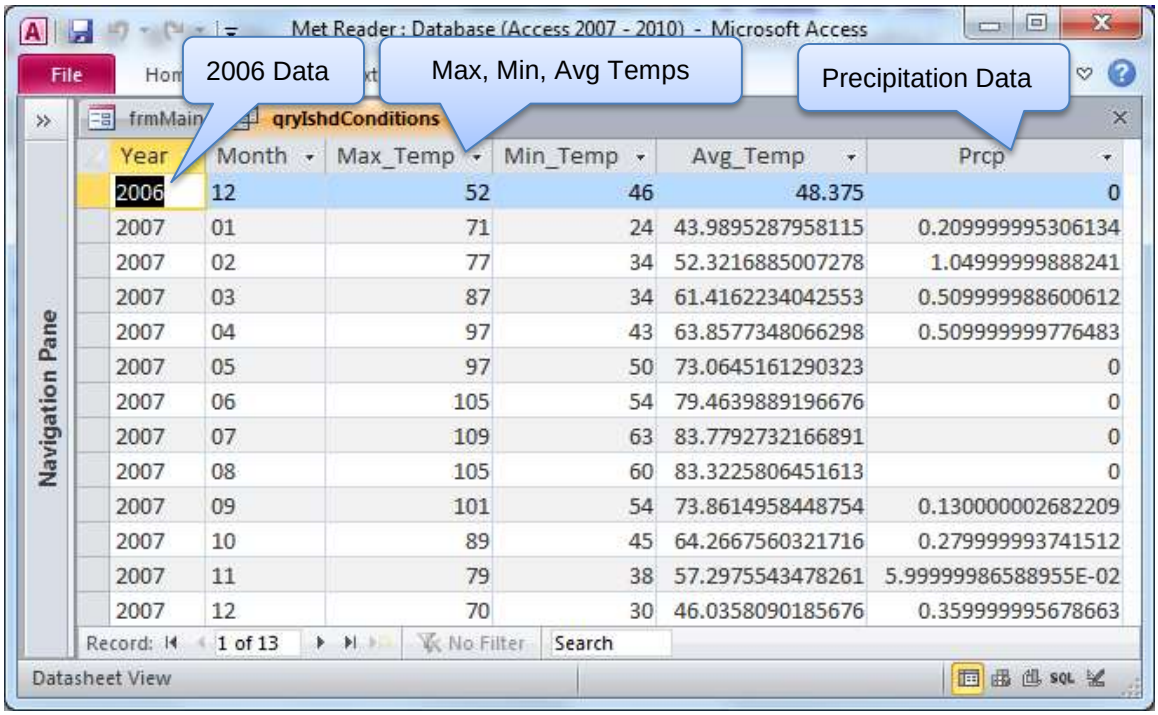


Figure 7-11 Monthly Precipitation

Caution!!
ISH data is reported in Greenwich Mean Time (GMT) and not local time (+8 hours for Pacific Time). Therefore, ISH data reported for Jan 1at 12:00 midnight GMT is actually 4PM on Dec 31 local time, as seen in Figure 8-11.

- Copy each month's precipitation and temperature data into the "Met Conditions Template" Excel file, see Figure 7-12 and Figure 7-13.
- Repeat this process for each ISH data file to be processed
- Once complete, the Excel file should look similar to Figure 7-12 and Figure 7-13

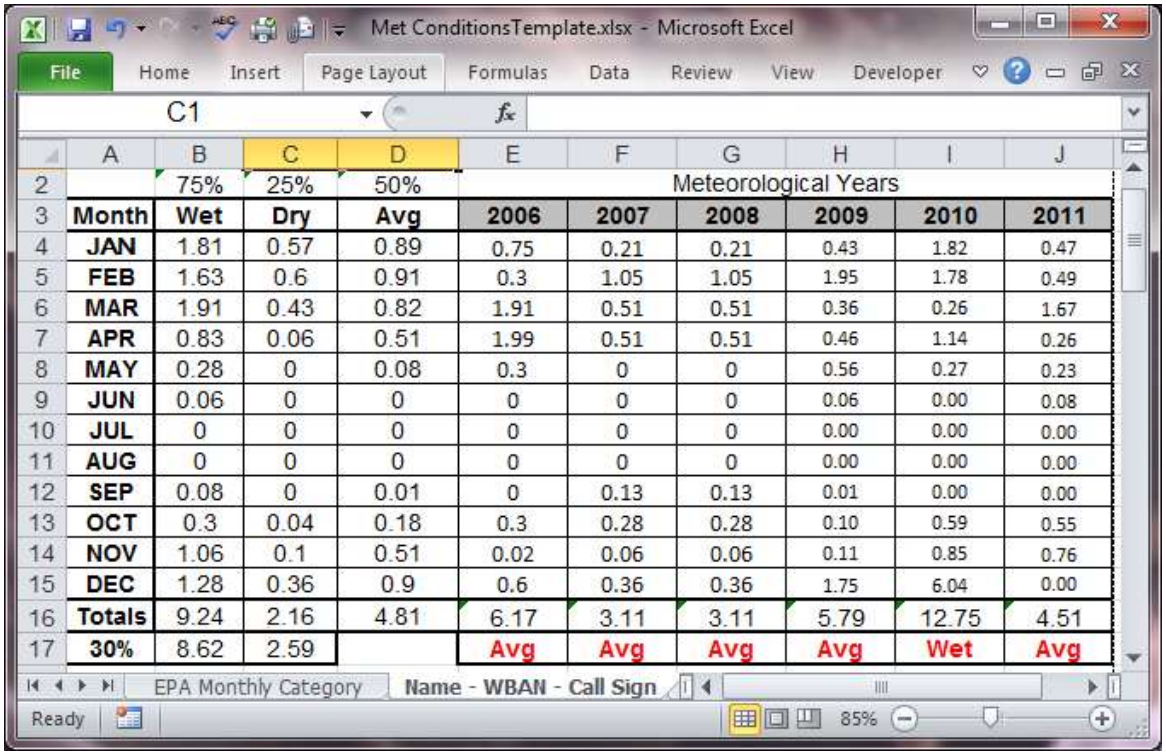
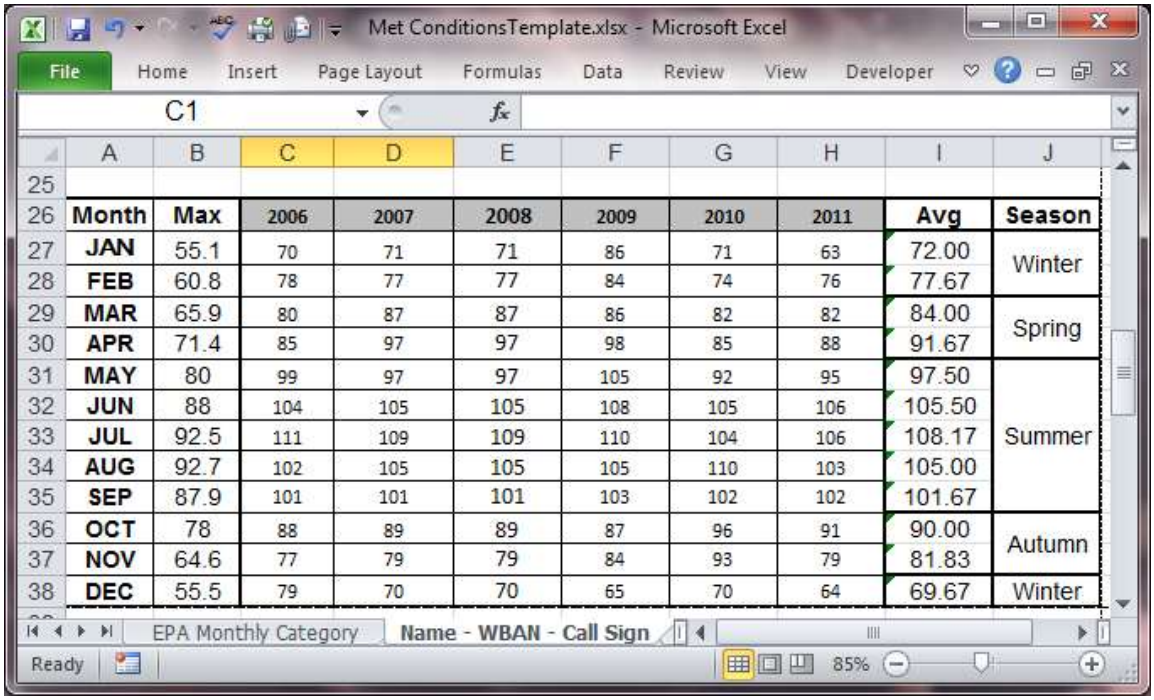


Figure 7-12 Precipitation Data Entered



Month	Max	2006	2007	2008	2009	2010	2011	Avg	Season
JAN	55.1	70	71	71	86	71	63	72.00	Winter
FEB	60.8	78	77	77	84	74	76	77.67	
MAR	65.9	80	87	87	86	82	82	84.00	Spring
APR	71.4	85	97	97	98	85	88	91.67	
MAY	80	99	97	97	105	92	95	97.50	Summer
JUN	88	104	105	105	108	105	106	105.50	
JUL	92.5	111	109	109	110	104	106	108.17	
AUG	92.7	102	105	105	105	110	103	105.00	
SEP	87.9	101	101	101	103	102	102	101.67	
OCT	78	88	89	89	87	96	91	90.00	Autumn
NOV	64.6	77	79	79	84	93	79	81.83	
DEC	55.5	79	70	70	65	70	64	69.67	Winter

Figure 7-13 Max Temperature data

- Save the the “Met Conditions Template” Excel file

7.1.3 Determine Site Surface Conditions

After all the meteorological data files have been read and the precipitation and temperature data has been entered into the Excel spreadsheet, the user must determine if a given year is Average, Dry, or Wet compared to the 30-year normal values. Additionally, the user must determine which months are associated with which season.

7.1.3.1 Surface Moisture Determination

The Surface Moisture condition for a given year is determined by summing the precipitation for a given year and comparing it to the Upper and Lower 30 percentile of the 30-year normals. The District’s “Met Conditions Template” Excel file estimates the Upper and Lower 30 percentile for comparison with the meteorological data for a given year. This process is repeated for each year under review.

For example: 2010 would be considered a Wet year as the annual precipitation is 12.75 inches compared to 8.62 (Upper 30 percentile) and 2007would be an Average year as the annual precipitation is 3.11 inches compared to 2.59 (Lower 30 percentile), see Figure 7-14

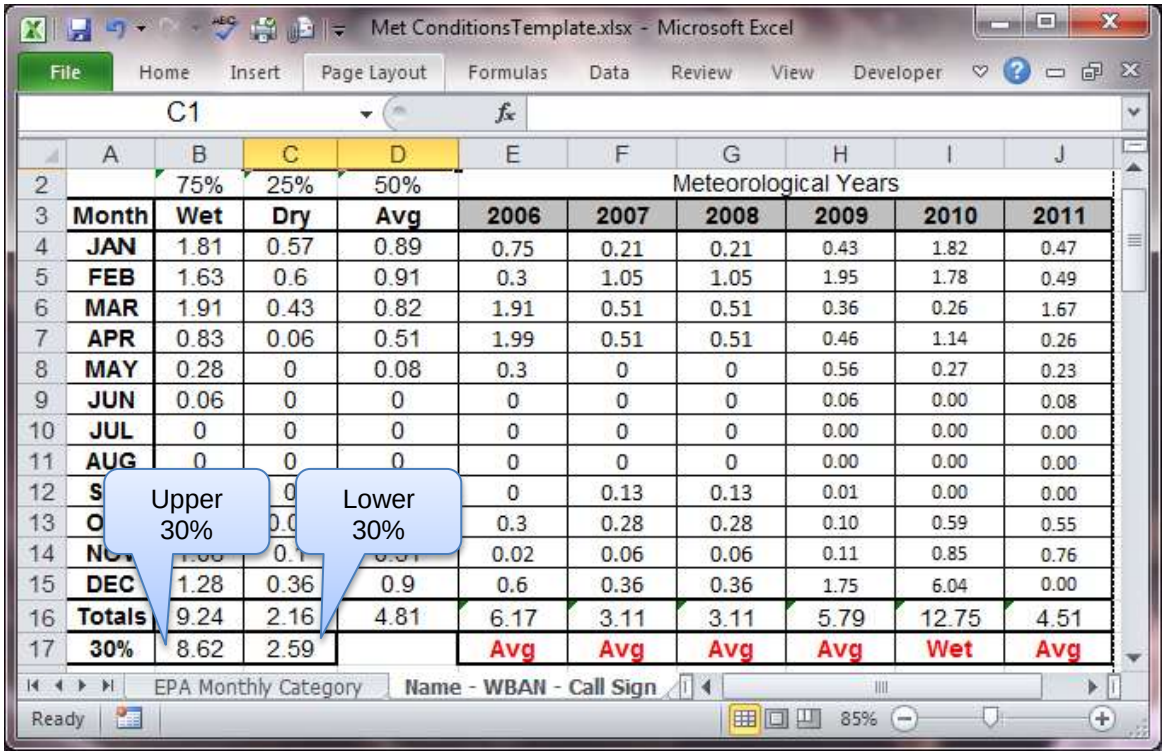
CAUTION!!

The NCDC 30-year Normal data are not in the same percentile values as recommended by EPA. Therefore, a simple adjustment has been made to estimate the Upper 30% and lower 30% of the 30-year Normal values.

For example

Upper 30% Value = (75% value /75)*70 = (9.24/75)*70 = 8.62

Lower 30% Value = (25% Value/25)*30 = (2.16/25)*30 = 2.59



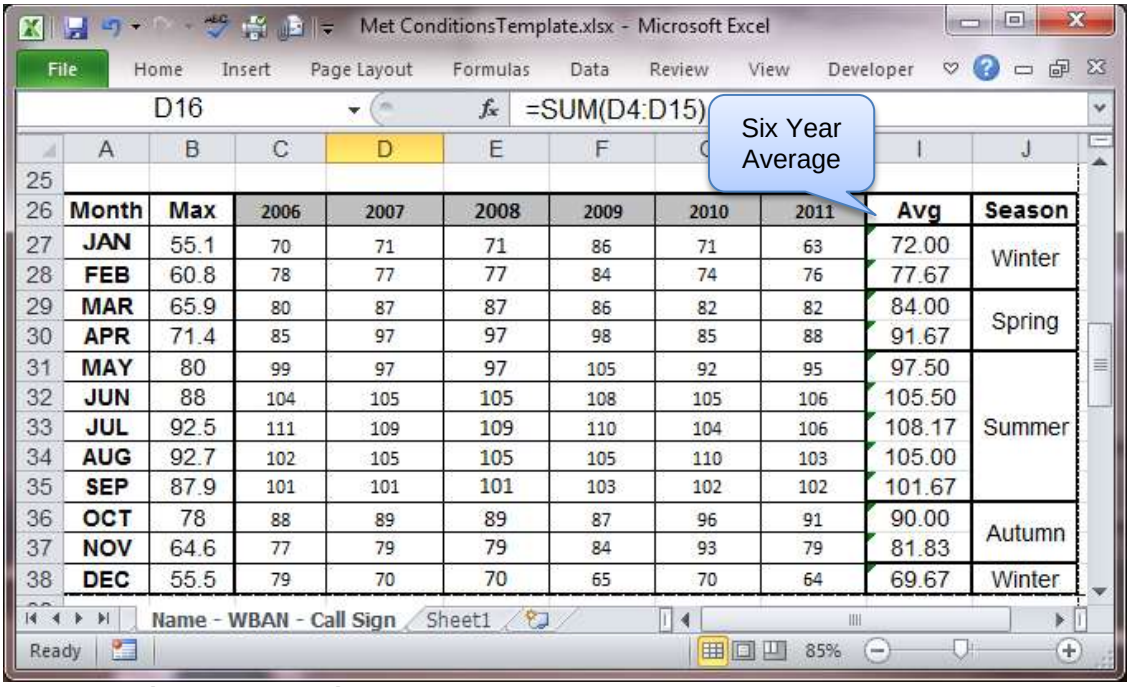
	A	B	C	D	E	F	G	H	I	J
2		75%	25%	50%	Meteorological Years					
3	Month	Wet	Dry	Avg	2006	2007	2008	2009	2010	2011
4	JAN	1.81	0.57	0.89	0.75	0.21	0.21	0.43	1.82	0.47
5	FEB	1.63	0.6	0.91	0.3	1.05	1.05	1.95	1.78	0.49
6	MAR	1.91	0.43	0.82	1.91	0.51	0.51	0.36	0.26	1.67
7	APR	0.83	0.06	0.51	1.99	0.51	0.51	0.46	1.14	0.26
8	MAY	0.28	0	0.08	0.3	0	0	0.56	0.27	0.23
9	JUN	0.06	0	0	0	0	0	0.06	0.00	0.08
10	JUL	0	0	0	0	0	0	0.00	0.00	0.00
11	AUG	0	0	0	0	0	0	0.00	0.00	0.00
12	S		0		0	0.13	0.13	0.01	0.00	0.00
13	O		0.0		0.3	0.28	0.28	0.10	0.59	0.55
14	NO		0.1		0.02	0.06	0.06	0.11	0.85	0.76
15	DEC	1.28	0.36	0.9	0.6	0.36	0.36	1.75	6.04	0.00
16	Totals	9.24	2.16	4.81	6.17	3.11	3.11	5.79	12.75	4.51
17	30%	8.62	2.59		Avg	Avg	Avg	Avg	Wet	Avg

Figure 7-14 Surface Moisture Determination

7.1.3.2 Monthly / Seasonal Assignment

To determine the Monthly/Seasonal assignments the following procedure will be performed using the five year average value to assign each month to a particular season, see Figure 7-15:

- A determination should be made of the monthly/seasonal assignments using the Max, Min, Average temperature values.
    - The 30-year normal values should be used only as a guide to block months by season and not for direct comparison.
- Knowledge of the local area should be used to further adjust each month as needed to ensure that monthly/season assignments are appropriate.



Month	Max	2006	2007	2008	2009	2010	2011	Avg	Season
JAN	55.1	70	71	71	86	71	63	72.00	Winter
FEB	60.8	78	77	77	84	74	76	77.67	
MAR	65.9	80	87	87	86	82	82	84.00	Spring
APR	71.4	85	97	97	98	85	88	91.67	
MAY	80	99	97	97	105	92	95	97.50	Summer
JUN	88	104	105	105	108	105	106	105.50	
JUL	92.5	111	109	109	110	104	106	108.17	
AUG	92.7	102	105	105	105	110	103	105.00	
SEP	87.9	101	101	101	103	102	102	101.67	
OCT	78	88	89	89	87	96	91	90.00	Autumn
NOV	64.6	77	79	79	84	93	79	81.83	
DEC	55.5	79	70	70	65	70	64	69.67	Winter

Figure 7-15 Maximum Temperature Data

8 AERMET Processing Using Lakes:

The final step in processing the meteorological data is to run AERMET with both the upper-air data and Samson file created in Section 4 or the ISH data from Section 1. For this part of the walk through we will be using the Lakes Environmental AERMET user interface.

8.1 Create a New Project

Create a new AERMET project file using Lakes Environmental AERMET View interface. On starting the AERMET View program the “ABOUT” screen will appear. Click the “OK” button to continue.

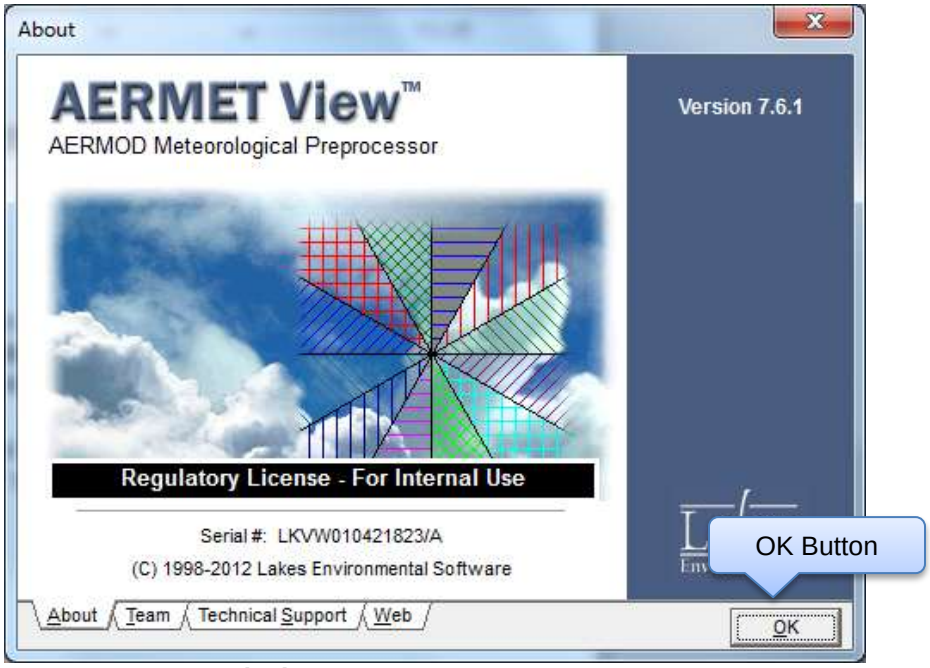


Figure 8-1 AERMET Splash Screen

The program will load an empty project screen

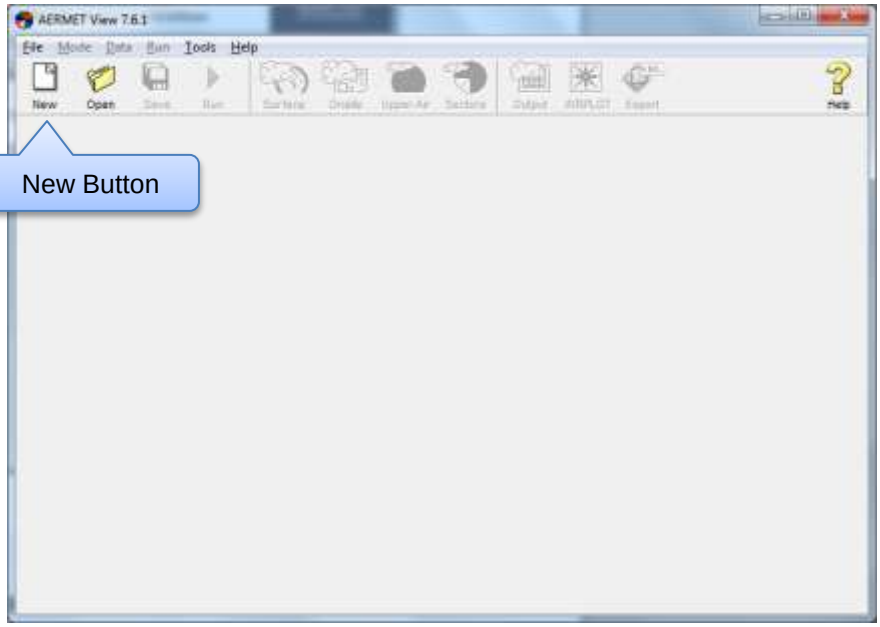


Figure 8-2 Empty Project Screen

NOTE!!
Samson data for years beyond 1990 will not work with EPA's compiled AERMET program. Lakes' has recompiled the AERMET program to allow for Samson data beyond 1990. In order to use this version of the AERMET program the user must change the AERMET EXE program being used by Lakes' AERMET View on the Preference Screen: This is done by clicking "FILE →Preferences.." from the main menu, see Figure 8-3. Then under the Application node select Models. Under the AERMET Executable options select the "Lakes AERMET (support any met file)" option. Then click the "OK" button.

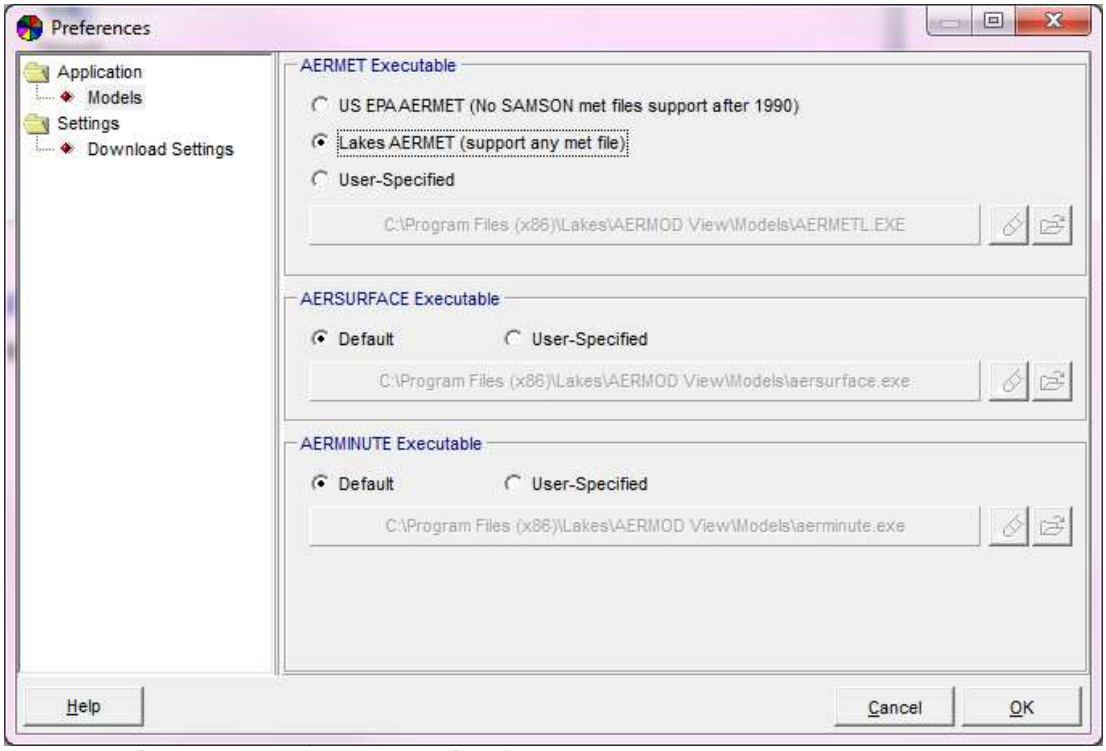


Figure 8-3 Preference Setting for Samson Data

Click the "NEW" button or from the main menu select File →New Project

On the "New AERMET View Project" screen, enter a file name that will be used to store your inputs, see Figure 8-4. It is recommended that you use the year for the meteorological data as the name for the project. It is also recommended that you create a separate directory for the other files downloaded and generated in the previous sections. Once the file name has been entered click "SAVE".

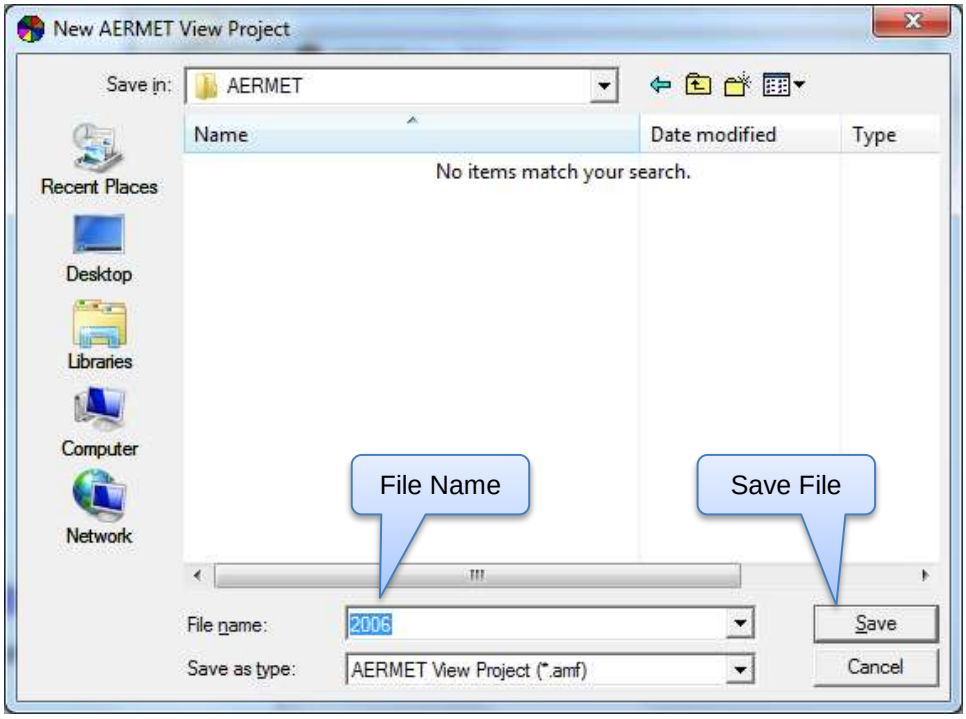


Figure 8-4 New AERMET Project Screen

8.2 AERMET Inputs

For this part of the walk through we will be dealing with three main screens: Surface, Upper Air, and Sectors, see Figure 8-5.

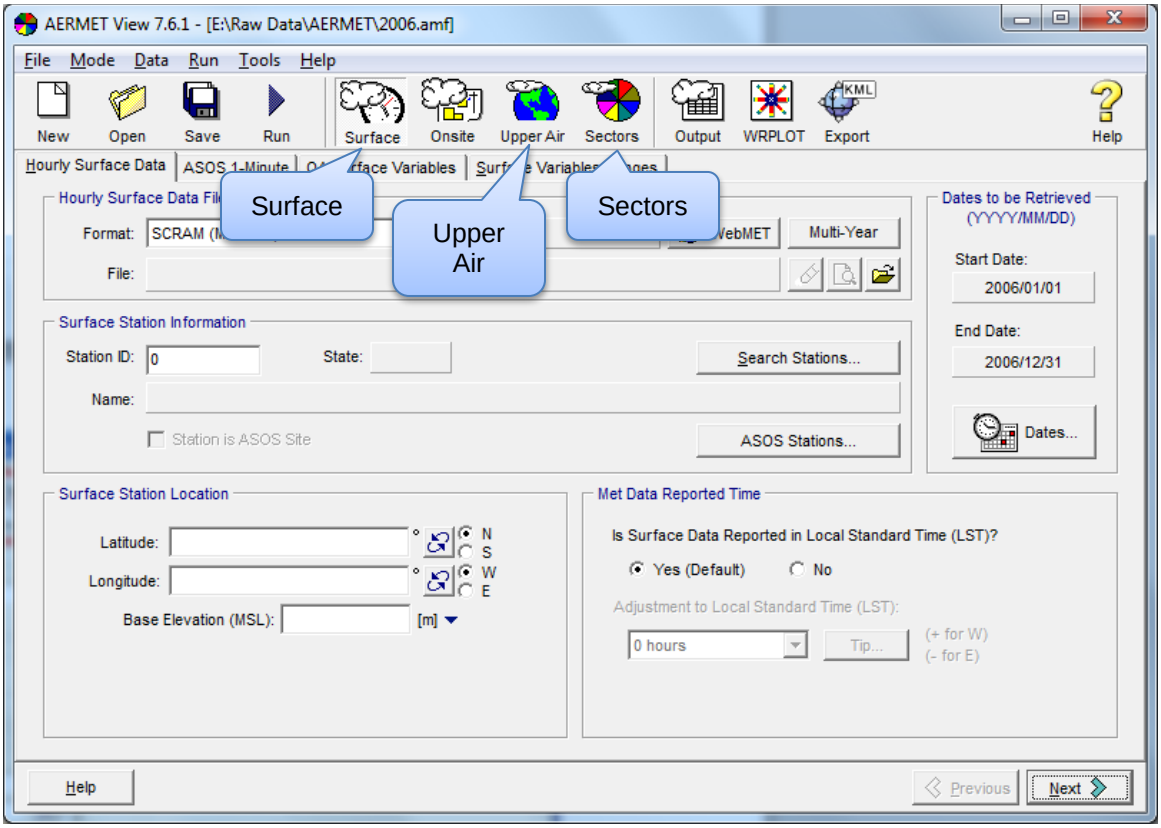


Figure 8-5 AERMET Input Screen

Each of these Inputs will be discussed in more detail in the following subsections.

8.2.1 Surface Screen – Hourly Surface Data

The Surface screen has three tabs that need to be reviewed. The first tab is the "Hourly Surface Data" which allows the user to select the surface meteorological file and format.

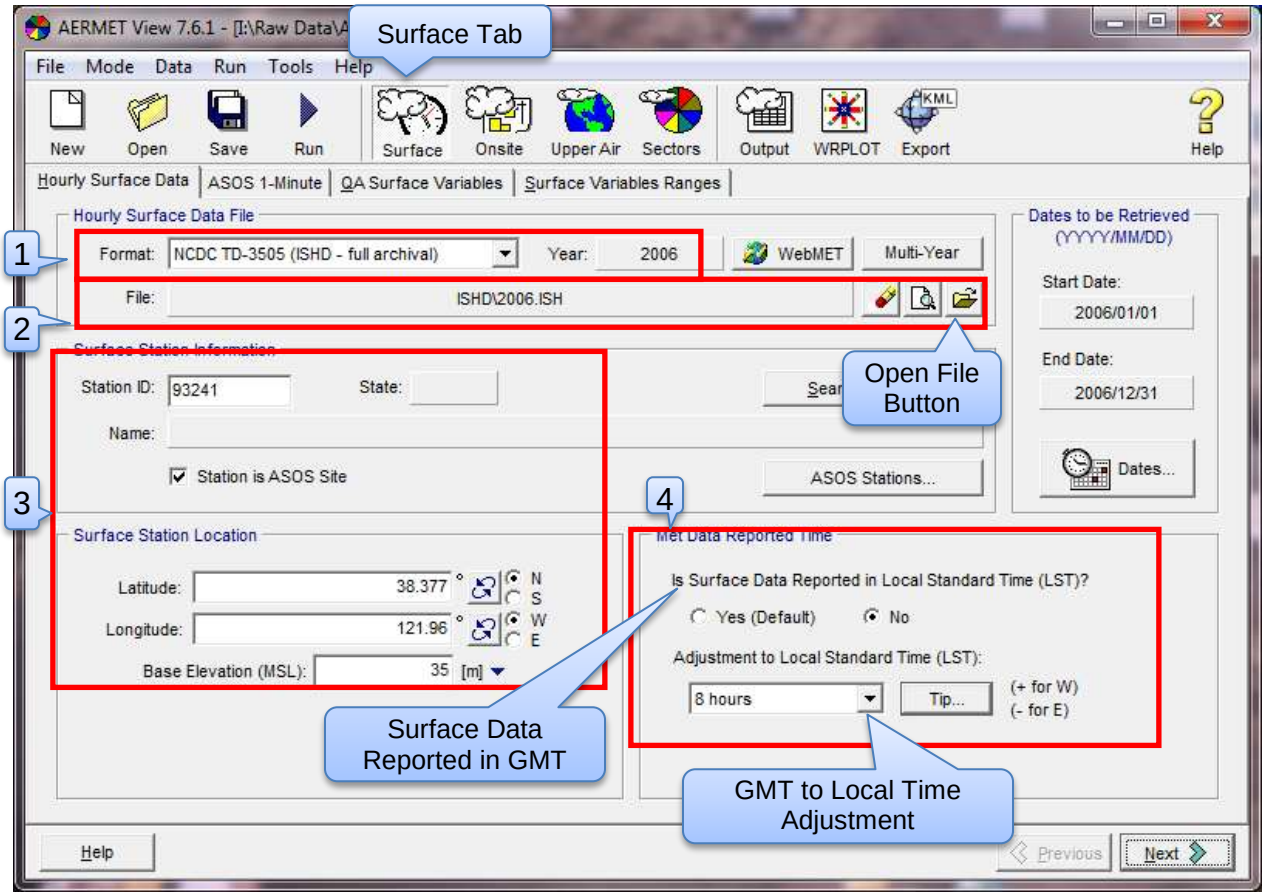


Figure 8-6 Hourly Surface Data

The following table describes the settings and parameters used to generate the AERMOD surface file, see Figure 8-6.

Table 8-1 Surface File Settings

Detail #	Description
1	From the pull down select the "SAMSON" or the NCDC TD-3505 (ISH) option.
2	Using the Open File button, navigate to the file location and select the Samson file created by the NCDC_CNV program or select the TD-3505 (ISH) file downloaded.
3	The data in this section will be entered automatically after the met file is selected. It is recommended that the "Station is ASOS site" option be confirmed
4A	Ensure that the "Yes (Default)" option is selected for SAMSON formatted data. TD-3505 (ISH) data is reported in UTC/GMT and therefore the user should select NO and enter the appropriate adjustment.
4B	The Adjustment to Local Time should read "0 Hours" if the data is reported in local time and "8 Hours" if reported in GMT (Greenwich Mean Time). California is 8 hours behind GMT. This will adjust the surface data to Local Standard Time (LST).

NOTE!!
The “Tip...” button can be used to determine the appropriate time adjustment needed depending on your data and locale.

8.2.2 Surface Screen – ASOS 1 Minute

The following section will walk you through the steps needed to generate the 1-minute data used by AERMET when generating the final surface and profile AERMOD ready meteorological files, see Figure 8-7.

NOTE!!
If 1-Minute data is not to be included proceed to Section 8.2.3

To include 1-minute data:

- Select the ASOS1-Minute tab.
- On the ASOS1-Minute screen click “Yes” under the “Include 1-Minute ASOS Wind Data File?”. The “AERMINUTE…” button will now be enabled.
- Click the AERMINUTE button to open the AERMINUTE processing screen, see Figure 8-8 below.

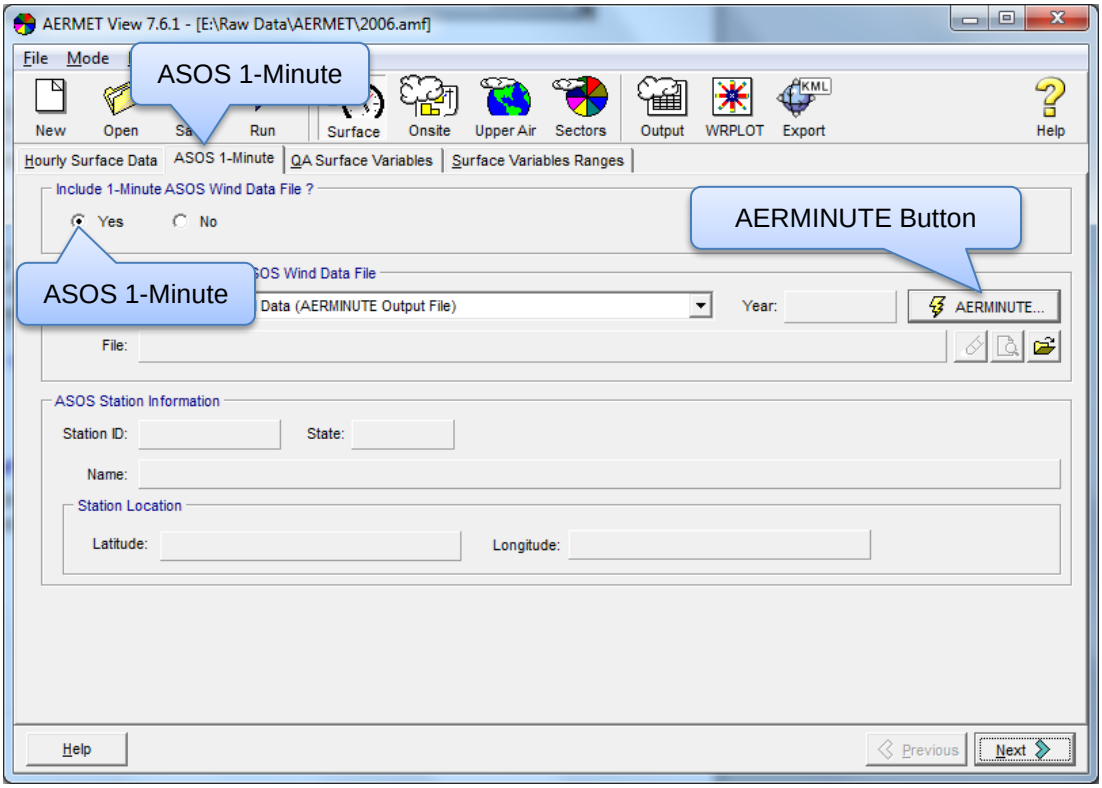


Figure 8-7 ASOS 1-Minute Screen

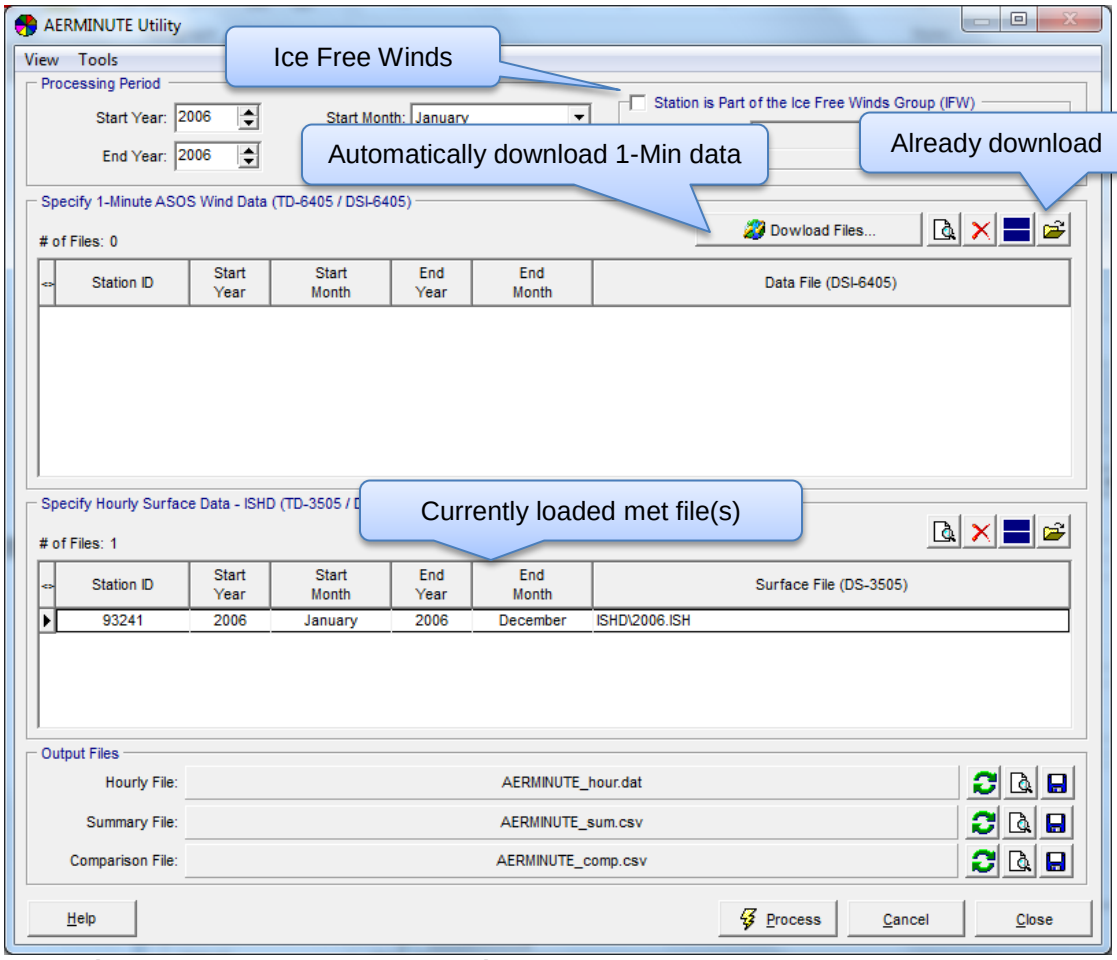


Figure 8-8 AERMINUTE Processing Screen

- Ice Free Winds (IFW)
  - If the Surface station is part of the IFW (Refer to Section 6.2):
    - Check the IFW check box
    - Enter the installation date in the IFW field.
- From the "AERMINUTE Utility" screen there are two options for loading the 1 minute data files:
  Option 1:
  - Allow Lakes' to automatically download the 1-minute data based on the Hourly Surface file currently loaded.
    - Click the "Download Files…" button
    - Select "Load 1-Minute ASOS Files"
    - Lakes' will search for the required files and download them if available

  Option 2:
  - Use data already downloaded using the procedure in Section 2.
    - Click the Folder Icon and navigate to the directory containing the 1minute data files.
    - Highlight all the files and click the "Open" button.
    - Lakes' will load all the files selected.

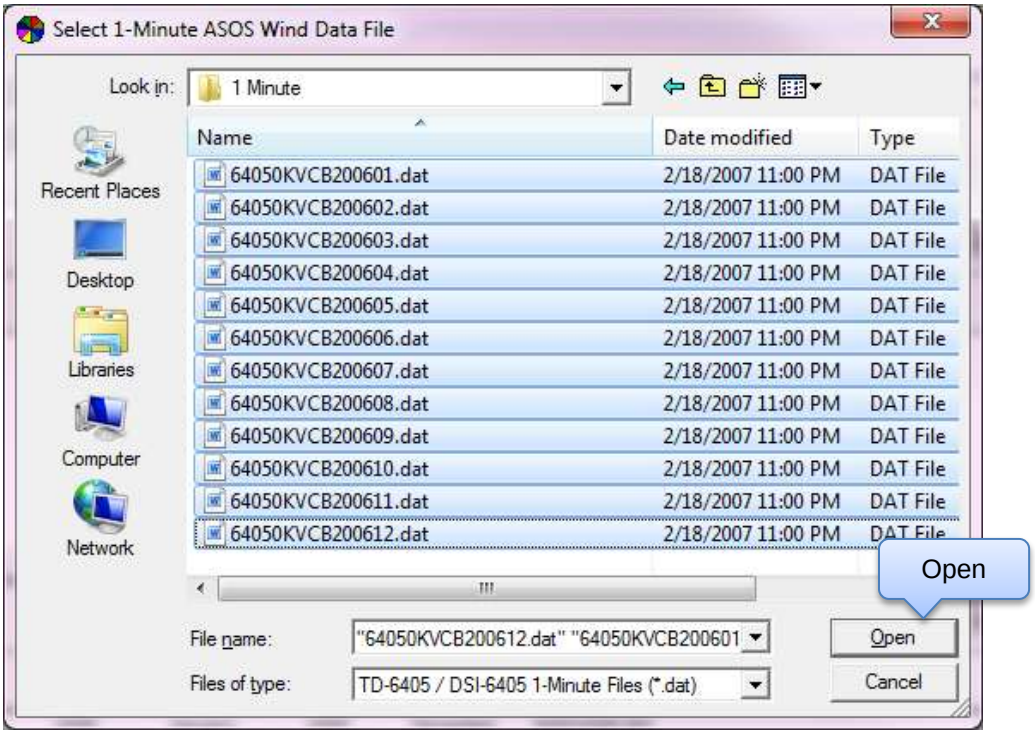


Figure 8-9 1-Minute Data Files

- The “AERMINUTE Utility” screen should now look like Figure 8-10 after the data files have been loaded.

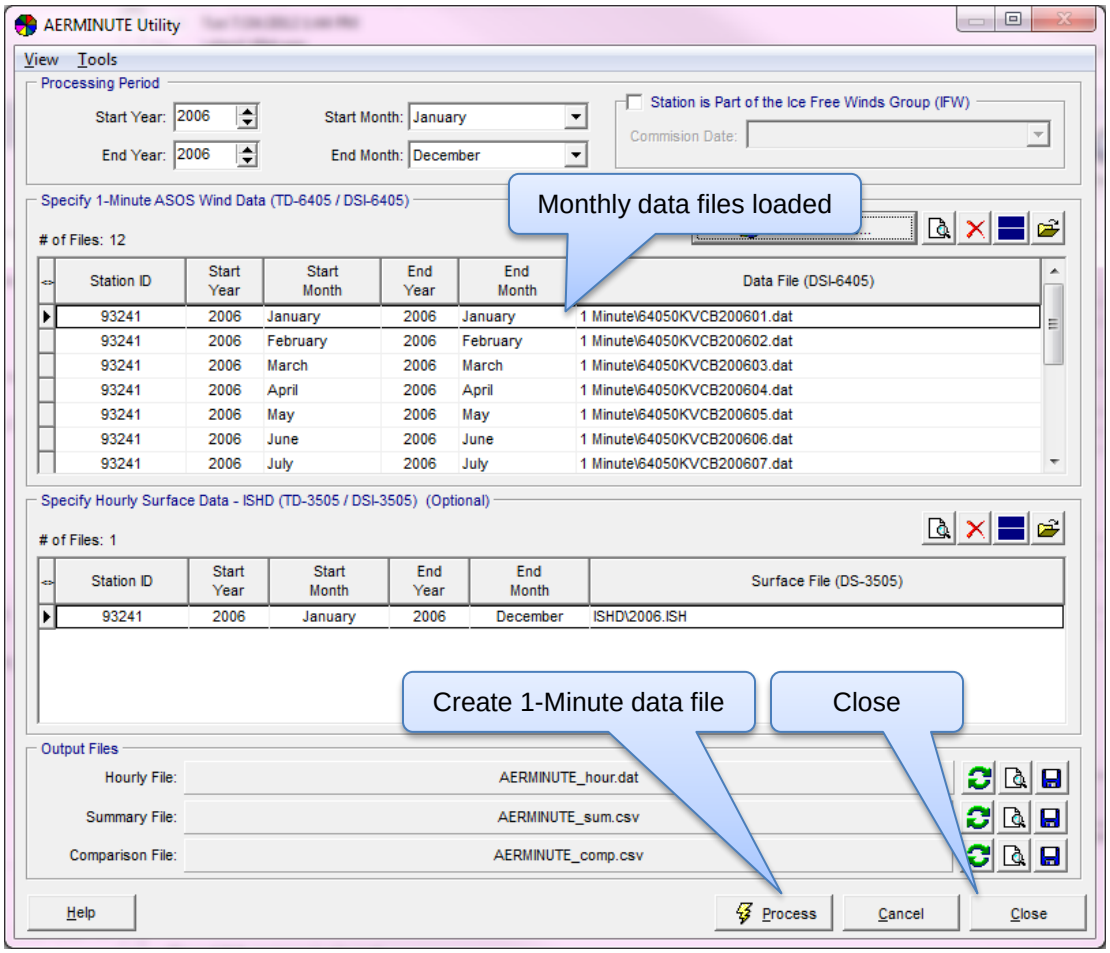


Figure 8-10 1-Minute Files Loaded

- To create the 1-minute data file click the “Process” button, see Figure 8-10.
- The status screen should appear, see Figure 8-11.

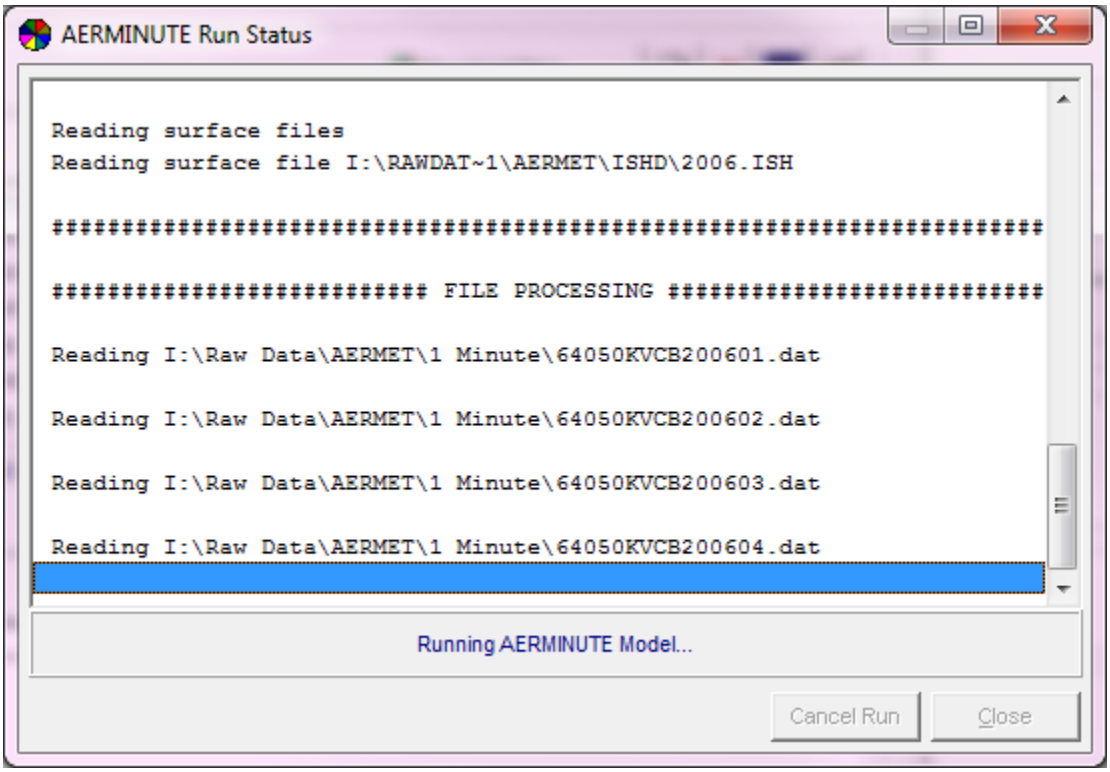


Figure 8-11 AERMINUTE Status Screen

- Once complete you should see Figure 8-12.

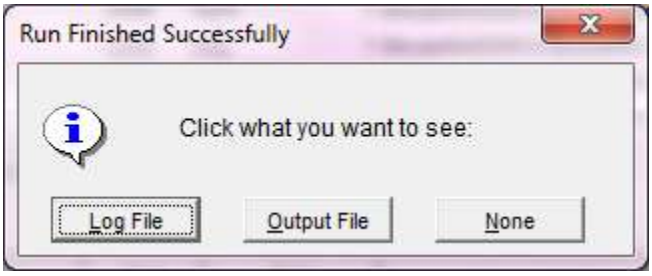


Figure 8-12 AERMINUTE Data Process Complete

- At this point you can review the AERMINUTE process log and/or the final 1-minute data file created.
- Once you’re done, click the “None” button, see Figure 8-12. You should return to the “AERMINUTE Utility” screen, see Figure 8-10.
- Click the “Close” Button to complete the process.

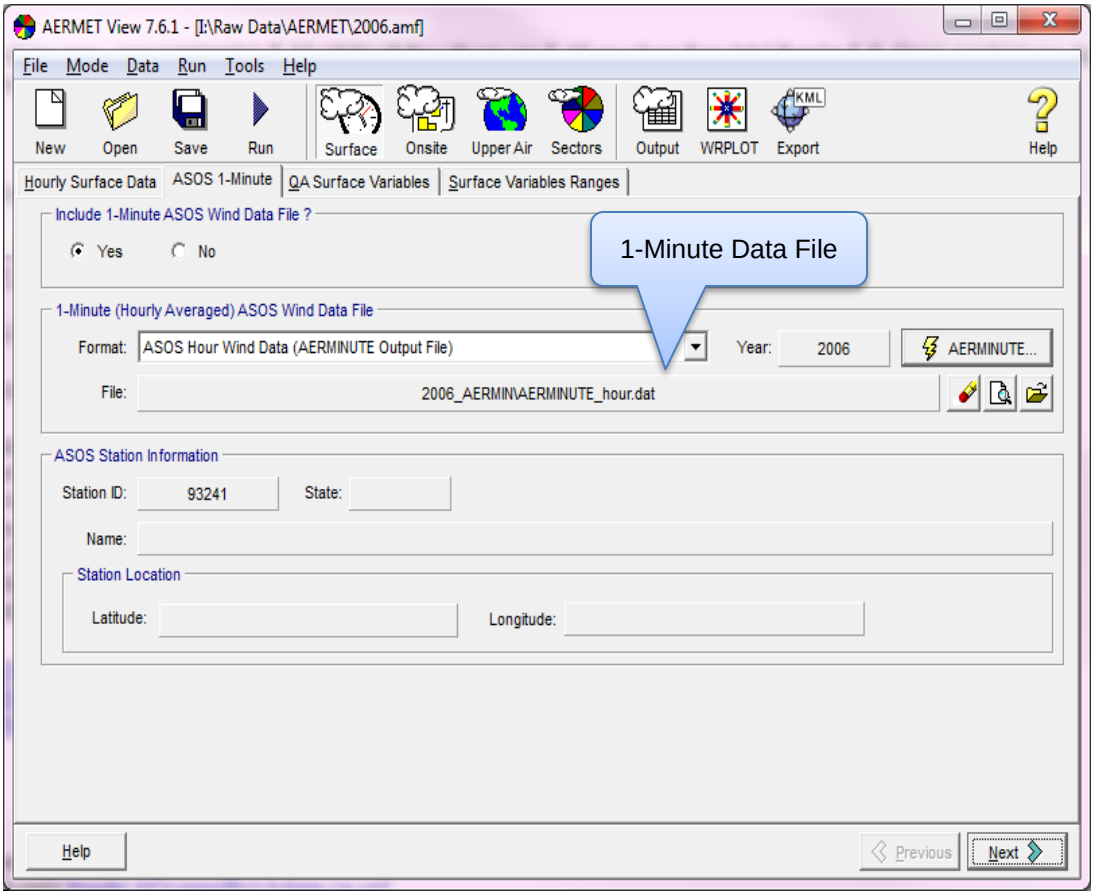


Figure 8-13 ASOS 1-Minute Tab

- As you will notice, the “Hourly File” file generated in the previous step has automatically be filled in under the “1-Minute (Hourly Average) ASOS Wind data File” section, see Figure 8-13.
- Click the “Next” button to proceed

8.2.3 Surface Screen – QA Surface Variables

The second tab on the Surface Screen is the “QA Surface Variables” tab. This tab allows the user to select variables to be used in the quality assessment of the surface data. The most common parameters have been selected and are presented in Figure 8-14.

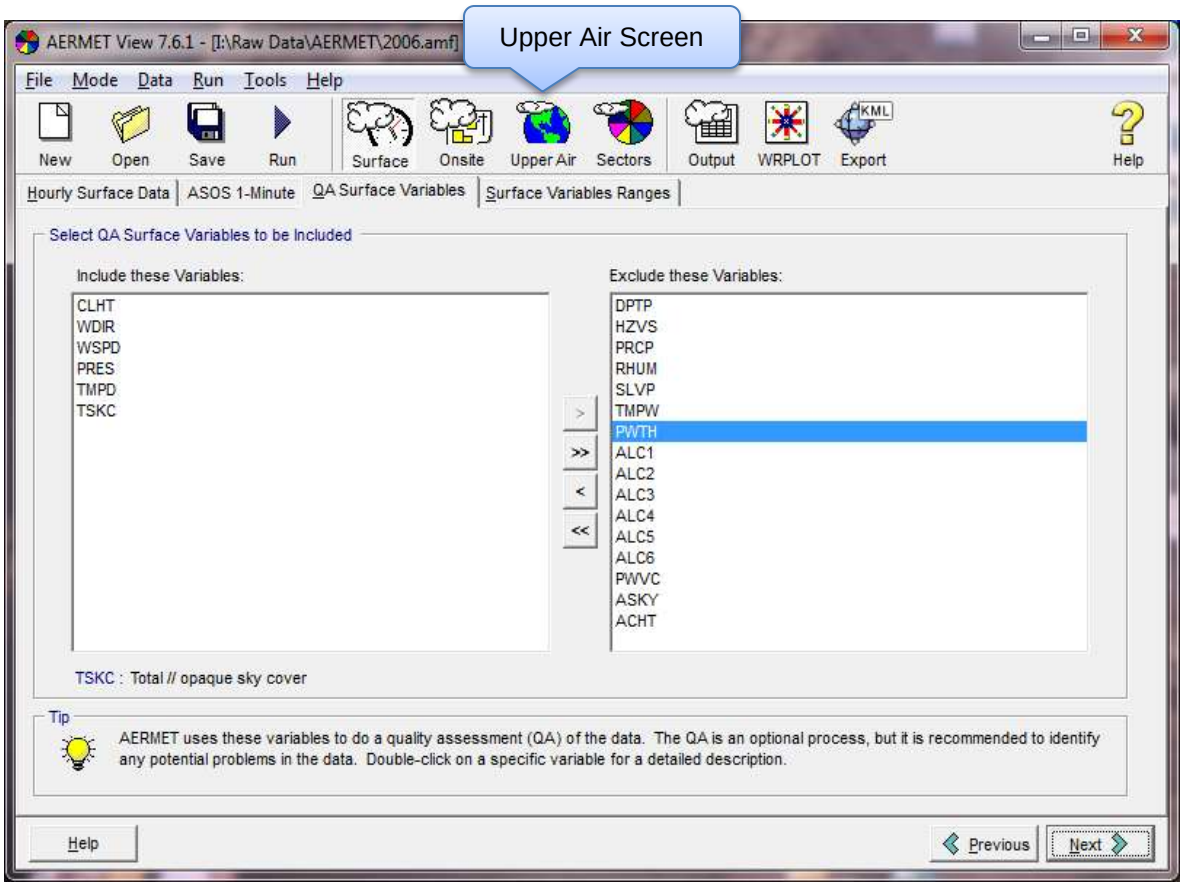


Figure 8-14 QA Common Parameters

To view information about each variable:

- Double click any variable
- A new dialog screen will appear that will provide a description of the available variables and the default parameters to be used as part of the QA process.

Once you have determined which variable(s) will be included, if any, click the “Upper Air” button, see Figure 8-14.

NOTE!!
The “Surface Variable Ranges” tab is not being discussed as it is recommended that these variables not be adjusted. If the user has used non-standard variables when creating the surface data then adjustment may be needed.

8.2.4 Upper AIR Screen – Upper Air Data

The Upper Air screen has two tabs that need to be reviewed. The first tab is the “Upper Air Data” tab which allows the user to select the Upper Air file and parameters to be used when generating the upper air profile data for AERMOD, see Figure 8-15.

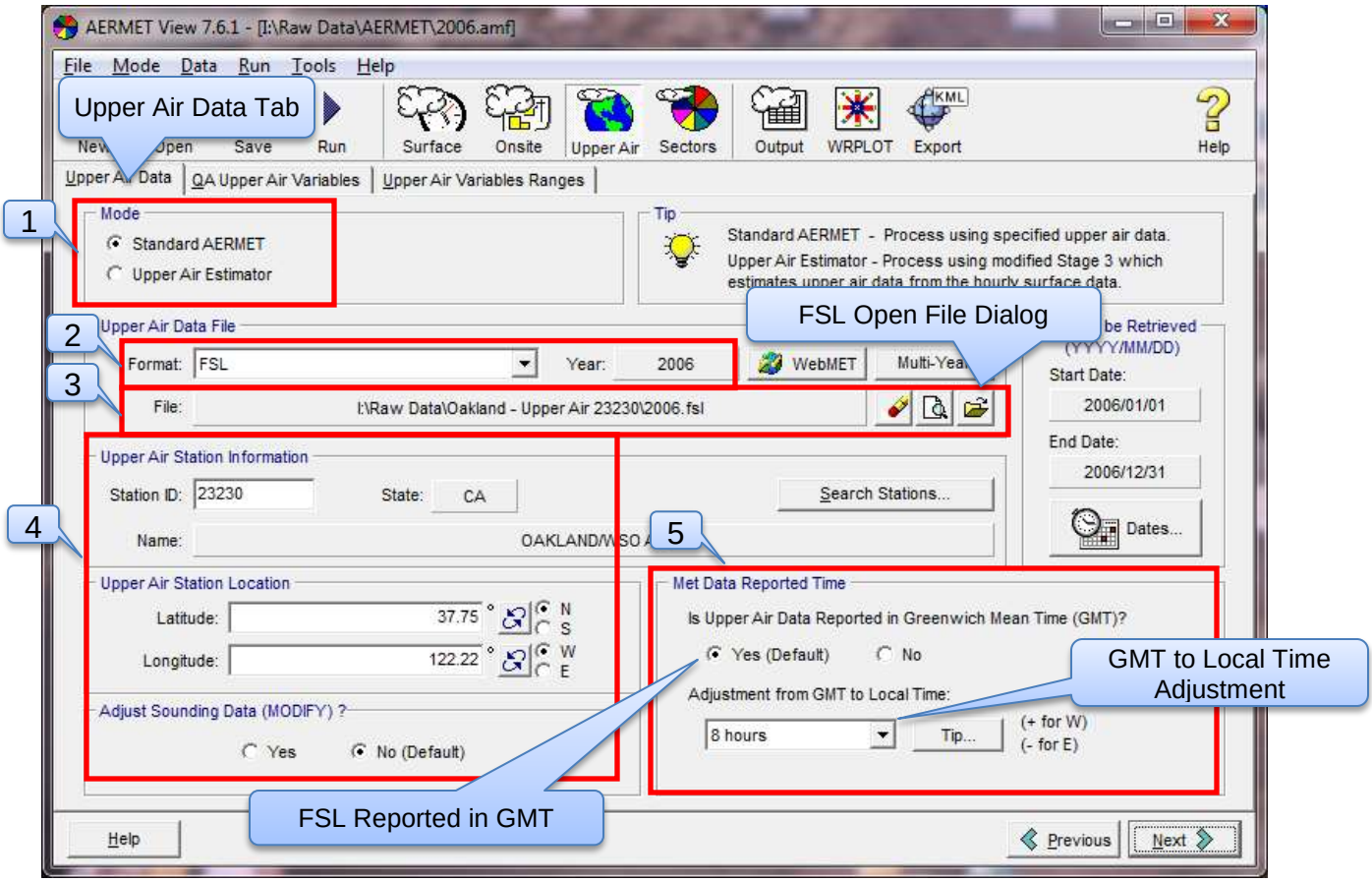


Figure 8-15 Upper Air Screen

The following table describes the settings and parameters used to generate the AERMOD upper air profile file.

Table 8-2 Upper Air Setting

Detail #	Description
1	Select “Standard AERMET”.
2	From the pull down select the “FSL” option.
3	Using the Open File button navigate to, and select the FSL file (upper air data) that was previously downloaded.
4	The data in this section will be entered automatically after the FSL file is selected.
5A	Insure that the “Yes (Default)” option is selected. Upper air data is reported in GMT (Greenwich Mean Time) and need to be adjusted to local time.
5B	The Adjustment to Local Time should read “8 Hours” if the data is reported in GMT and “0 Hours” if reported in LST. This will adjust the upper air data to match the surface data being processed.

8.2.5 Upper AIR Screen – QA Upper Air Variables

The Second tab on the Upper Air Screen is the “QA Upper Air Variables” tab. This tab allows the user to select variables to be used in the quality assessment of the upper air data.

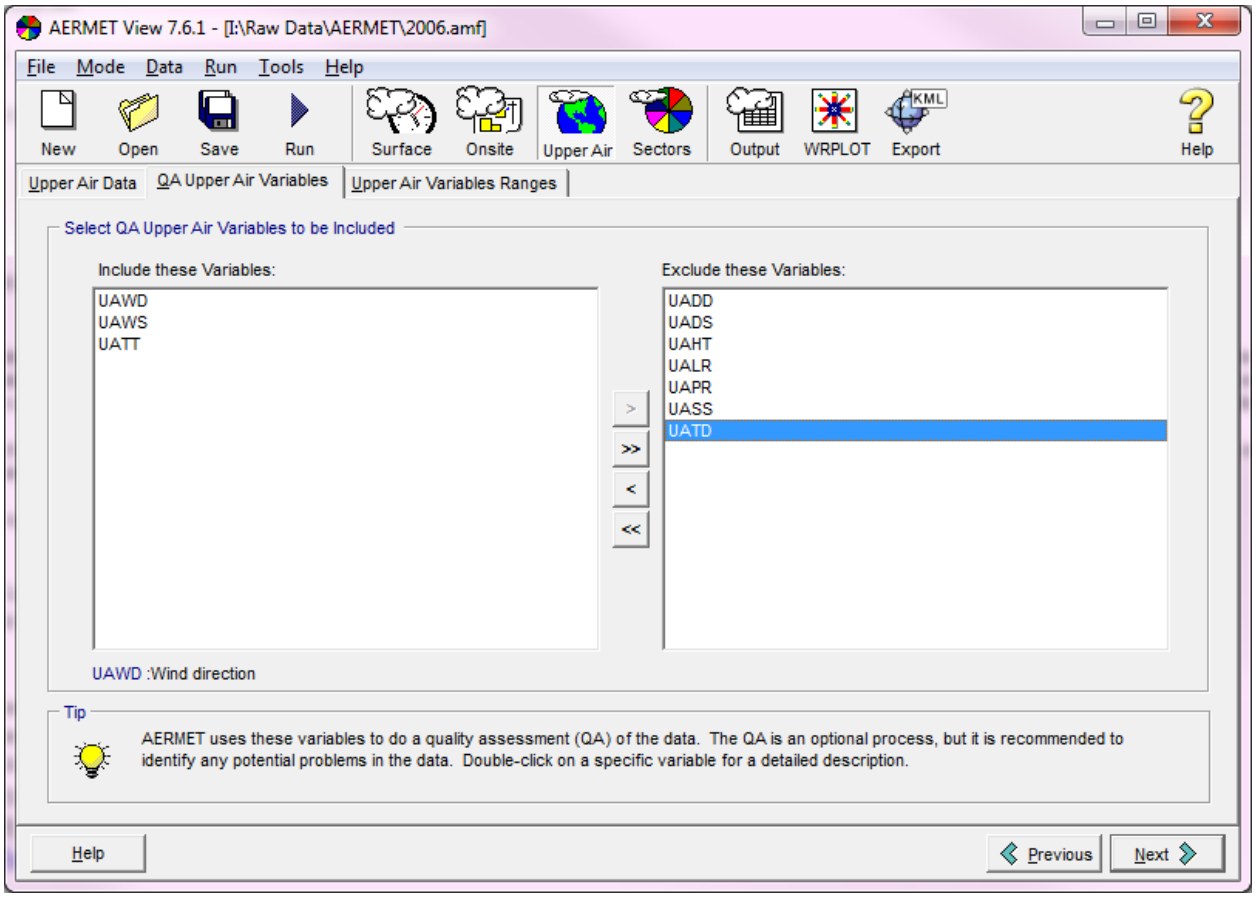


Figure 8-16 Upper Air QA Screen

To view information about each variable:

- Double click any variable
- A new dialog screen will appear that will provide a description of the available variables and the default parameters to be used as part of the QA process.

Once you have determined which variable(s) will be included, if any, click the “Sectors” button, see Figure 8-16.

NOTE!!
The “Upper Air Variable Ranges” tab is not being discussed as it is recommended that these variables not be adjusted. If the user has used non-standard variables when creating the upper air data then adjustment may be needed.

8.2.6 Sectors Screen – Processing Options

The Sectors screen has two tabs that need to be reviewed. The first tab is the “Processing Options” which allows the user to set the basic setting for the AERMOD met files to be created, see Figure 8-17.

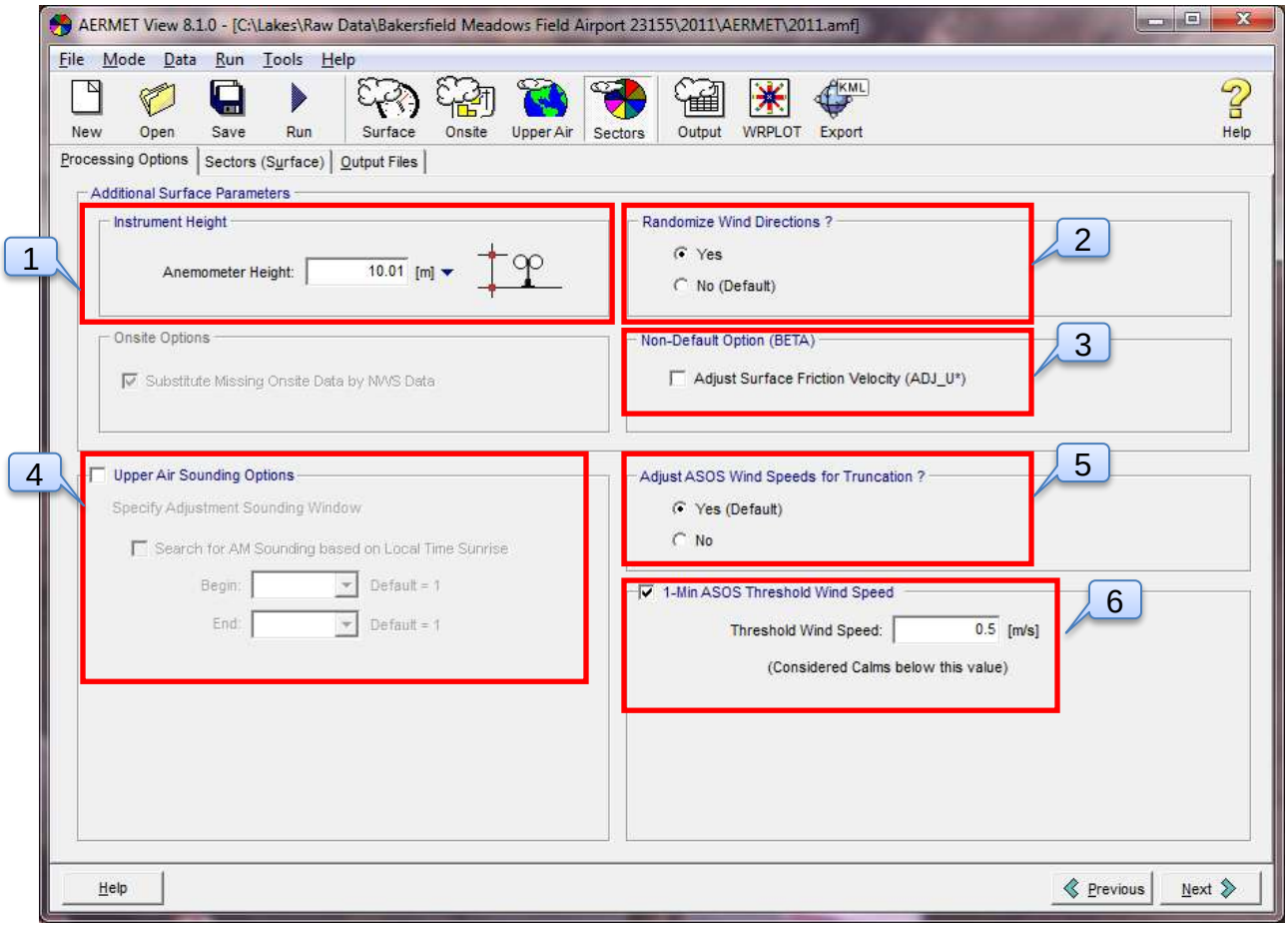


Figure 8-17 AERMET Processing Options

The following table describes the settings and parameters used to for processing each sector being evaluated.

Table 8-3 Sector Options

Detail #	Description
1	The height of the anemometer at the station under evaluation. ASOS stations are typically set at 10 meters.
2	It is recommended that "Yes" be selected under the "Randomize NWS Wind Directions" option Select this option to randomize the NWS wind directions in order to avoid a bias toward the cardinal compass points (N, S, E, and W). The wind directions are randomized for each 10 degree sector to one degree increments. A bias would occur for the un-randomized wind directions because three 10-degree sectors would contribute to the N, S, E, and W sector statistics (e.g., 350, 360 and 10 degrees for the north sector), while only two 10-degree sectors would contribute to the other 22.5 degree sectors. If the user selects "No" and leaves the NWS Wind Directions the program sets the direction to the nearest 10th of a degree: For example, a direction of 164 degree would be reported as 160.
3	**BETA Option-** Adjust Surface Friction Velocity (u*)**:** Check the box to adjust for low wind speed conditions. If you use this option, a flag will be written to the output file. If this flag is present, you must include the BETA option on the CO

Detail #	Description
	MODELOPT keyword in the AERMOD input file. If you are using AERMOD View, this will be done automatically when you specify the met data files in Met Pathway.
4	This option is not intended for met data generated in the US and should not be selected
5	This option is only available if ASOS data (1-Minute data) is being used to complement NWS Surface data. This Option adds 1/2 knot (0.26 m/s) to all ASOS-based wind speeds (1-minitue) to compensate for the bias introduced due to the wind speed being truncated, rather than rounded, to whole knots.
6	Check the box if you wish to enable setting of **Threshold Wind Speed** and then enter the threshold value (between 0 and 1 m/s inclusive). Conditions with wind speeds below this value are considered "calm". If you use this option, the value you specified will be noted in the resultant .SFC file. At this time EPA recommends a value of 0.5 m/sec. It is recommended that the reviewing agency approve the value before processing of the data.

8.2.7 Sectors Screen – Sector & Surface Parameters

The Second tab on the Sectors Screen is the “Sectors (Surface)” tab. This tab allows the user to enter surface parameters for sectors surrounding the meteorological station. EPA recommends that a 1 km radius be used to develop surface roughness parameters per sector and a 10 km radius be used to develop the Albedo and Bowen Ratio for each sector.

NOTE!!
The Lakes AERMET interface automatically uses EPA recommended distance for the surface Roughness, Albedo, and Bowen Ratio as noted above.

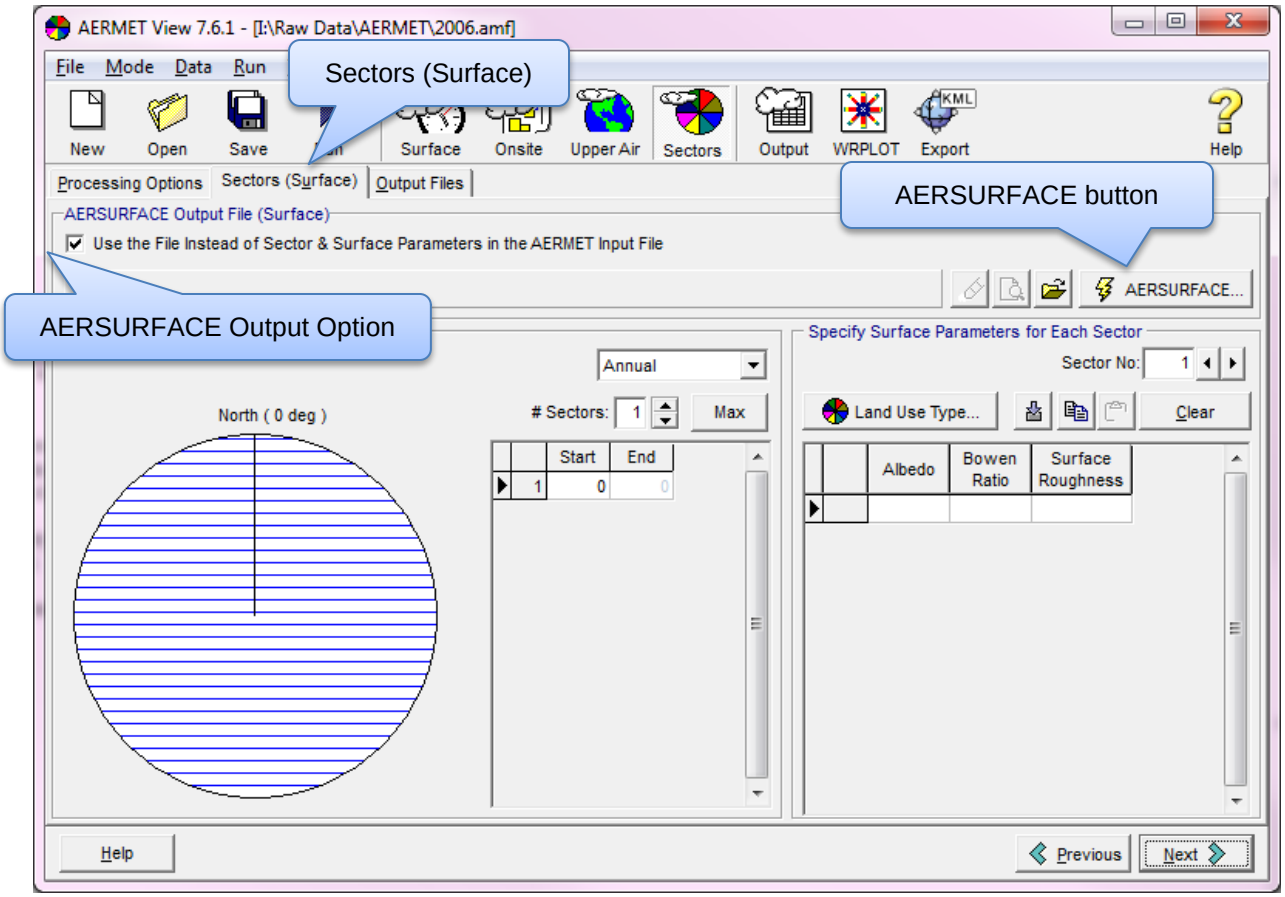


Figure 8-18 Sector Options

It is recommended that the user use the “AERSURFACE Output File (Surface)” option to streamline the process of generating the surface roughness, Albedo and Bowen Ratio parameters.

Therefore, after selecting the “AERSURFACE Output File” Option click the “AERSUFACE” button and proceed to the next section.

8.2.8 AERSURFACE Utility Screen:

The AERSURFACE Utility Screen is used to read land cover data contained in the Tiff or Bin file using EPA guidance discussed above. This screen also allows the user to determine how those parameters will be generated (Annually, Seasonally, or Monthly).

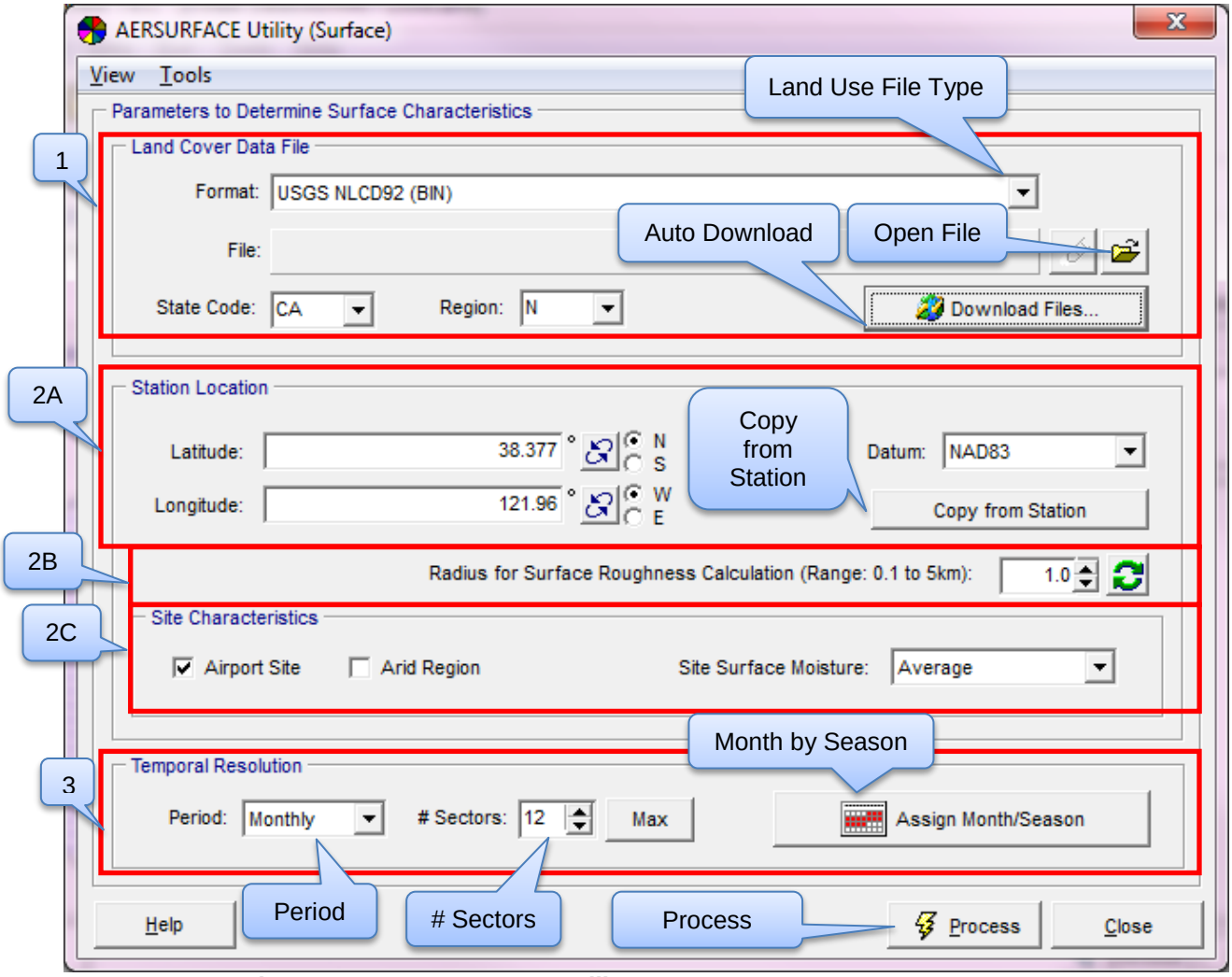


Figure 8-19 AERSURFACE Utility

Table 8-4 Sector Details

Detail #	Description
1	Land Cover Data File • From the pull down select "USGS NLCD92 (BIN) or (GeoTIF)" • Either load the file from your local drive or allow Lakes' to Autodownload the data based on the Surface data file. **NOTE!!** • It is recommended that the "Land Use" Data be downloaded to the local hard drive from http://edcftp.cr.usgs.gov/pub/data/landcover/states/ FTP site (File size can range from 200 MB to >500MB each) • If the Bin type file was selected two additional fields will be enabled (State and Region). Fill in the fields as appropriate.
2A	Station Location It is recommended that the user click the "Copy from Station" button. This will fill in the latitude, longitude, and Datum based on the surface station currently loaded. **NOTE!!** EPA guidance is to use the location of the monitoring site to determine surface parameters.

Detail #	Description
2B	Surface Roughness EPA guidance as of Jan 9, 2008 is to us a 1km radius around the surface station to determine surface roughness.
2C	Site Characteristics • Select the type of location that best describes the meteorological site. **NOTE!!** • Airport Site - AERSURFACE will use surface characteristics that reflect an area more dominated by transportation land cover. • Arid Region - AERSURFACE will use the seasonal surface characteristics for these categories that are more representative of a desert area • Site Surface Moisture – See Section 8 for more information on how to determine a site's surface moisture. **NOTE!!** To determine the surface moisture conditions, a given year should be compared to a 30 year normal. ○ **Wet** if precipitation is in the upper 30th-percentile ○ **Dry** if precipitation is in the lower 30th-percentile ○ **Average** if precipitation is in the middle 40th-percentile.
3	Temporal Resolution • Period – For the purpose of generating meteorological data for use when performing New Source Review (NSR) modeling, the Period option should be set to **Monthly.** • # Sectors – The sector option should be set to between 8 and 12. The District will set the # of sectors to 12. • Assign Monthly/Season – See Section 8 for more information on how to determine a site's Monthly/Season assignments
4	To start AERSURFACE click the "Process" button. AERSURFACE will access the Tiff or Bin file for the location selected and derive the necessary parameters based on the month/season allocation determined by the user.

8.2.8.1 Running AERSURFACE

After pressing the "Process" button the AERSURFACE should display the AERSURFACE status screen as seen in Figure 8-20. Once the AERSURFACE has completed, the user should see Figure 8-21.

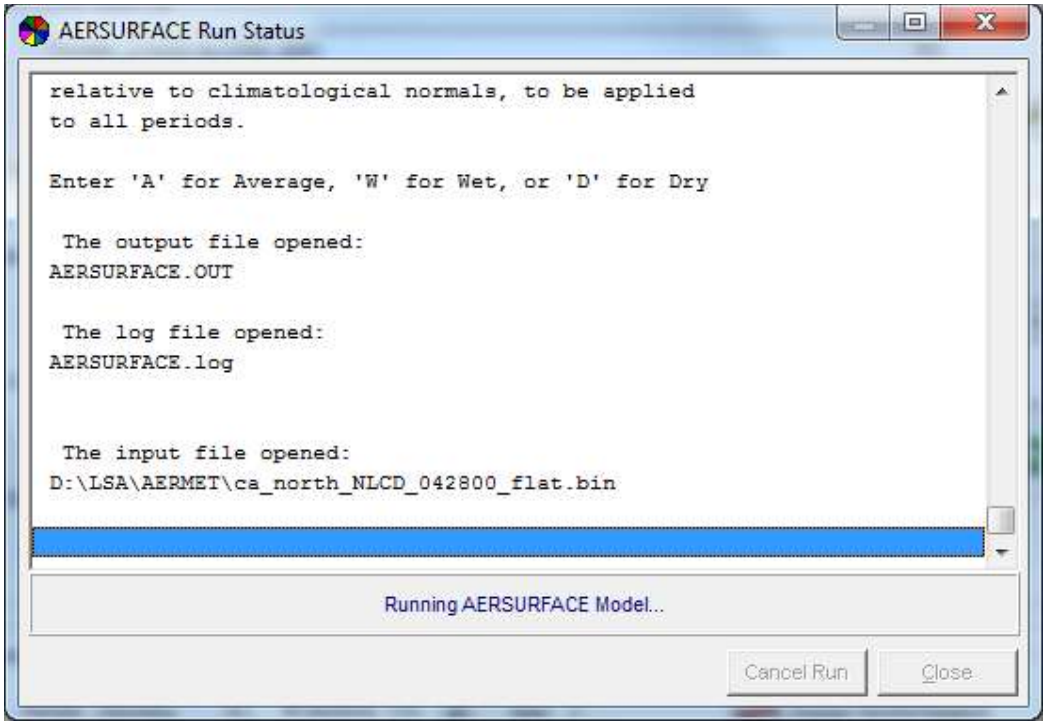


Figure 8-20 AERSURFACE Status Screen

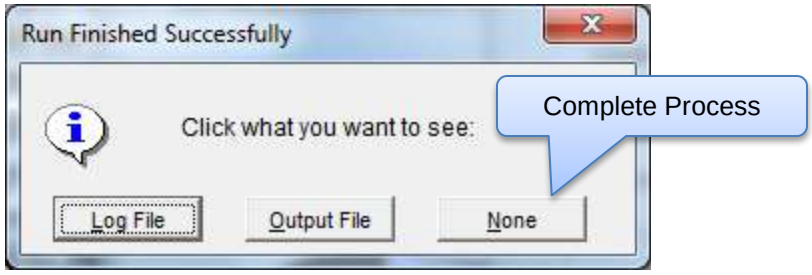


Figure 8-21 AERSURFACE Complete Status

At this point the user can review the AERSURFACE process log and/or the final AERSURFACE data file created. Once the user is done, click the “None” button, see Figure 8-21. You should return to the “Sector (Surface)” tab, see Figure 8-22.

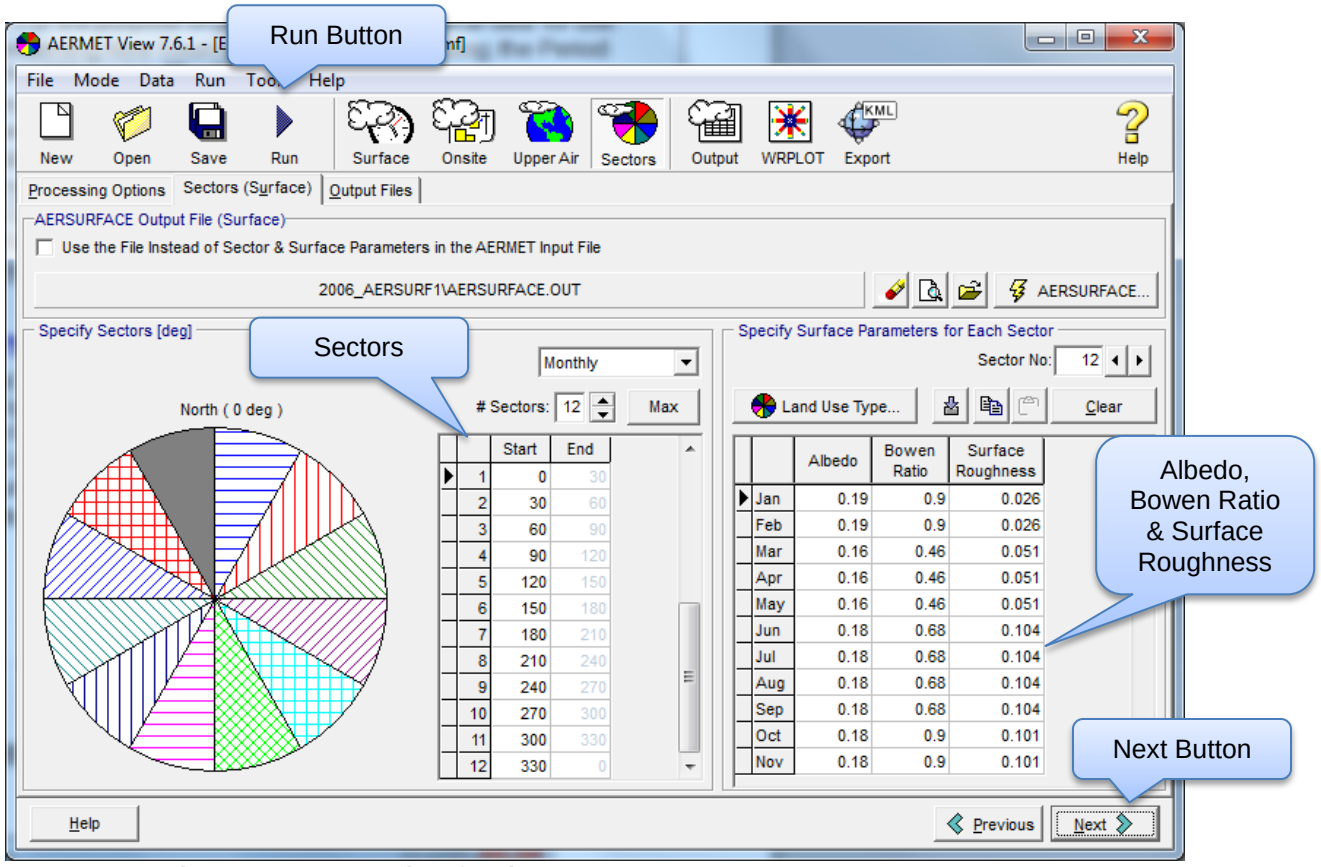


Figure 8-22 Sector (Surface)

After returning to the "Sector (Surface)" tab the user will notice that the Sectors, Albedo, Bowen Ratio & Surface Roughness data have been filled in using data from the AERSURFACE data previously generated.

8.2.9 Are We There Yet?

There are two final steps to completing the AERMOD Meteorological data generation process. The first is to run AERMET and generate the Surface and Profile data files for AERMOD.

8.2.9.1 Running AERMET

Click the "Next" button or from the Menu bar select "RUN", see Figure 8-22. If the user clicked the "Next" button the "Output Files" tab will be displayed, see Figure 8-23. If the user clicked the "RUN" button the "Project Status" screen will be displayed, see Figure 8-24.

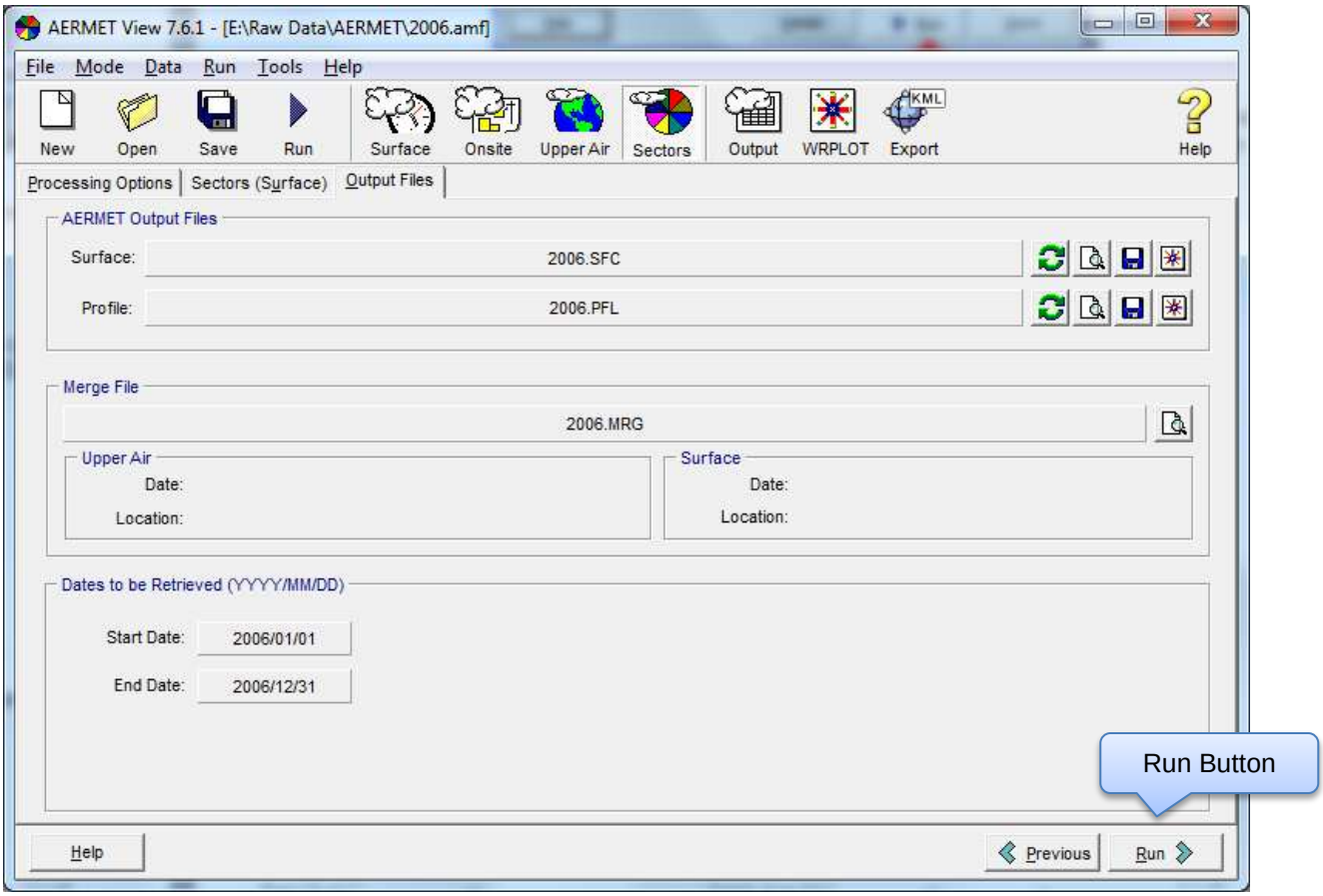


Figure 8-23 Output Files Tab

To start generating the meteorological data from the “Output Files” tab the user clicks the “RUN” button, see Figure 8-22. The “Project Status” should appear, see Figure 8-24. This screen will indicate if the current project if complete and if the user would like to delete the temporary files create when generating the AERMOD meteorological data. If the project status is not complete the user can click on the “Detail” button to determine what data is needed or missing.

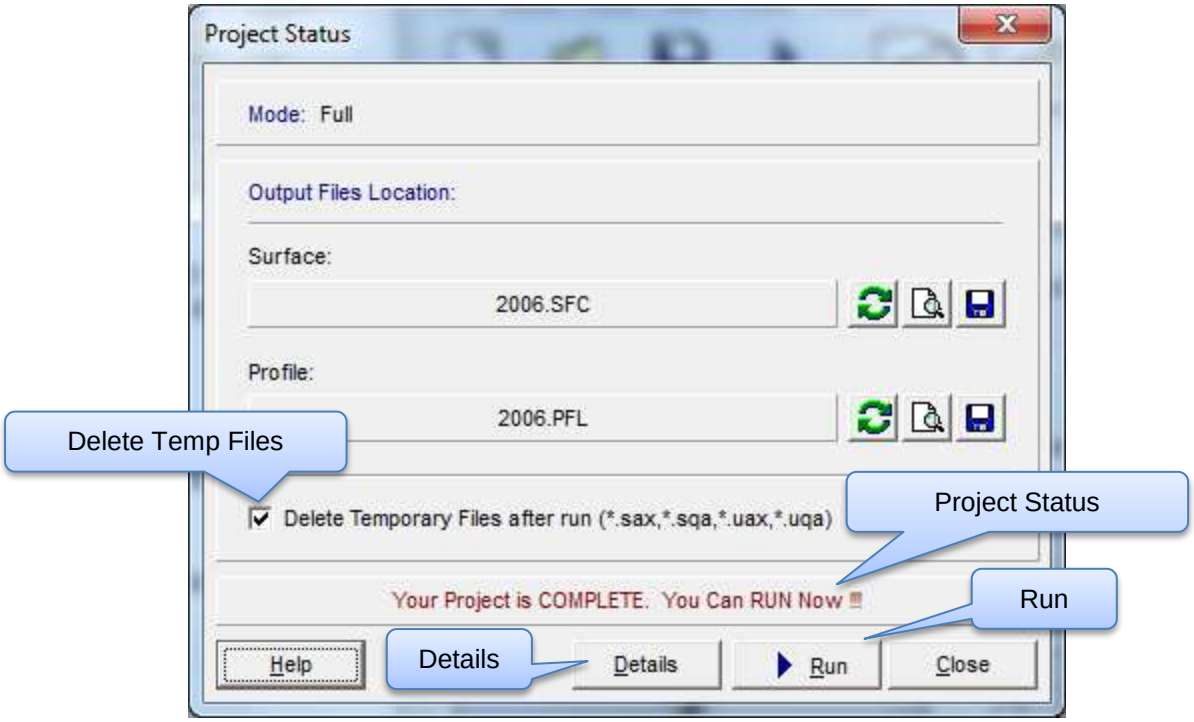


Figure 8-24 Project Status Screen

Once the project has been determined to be complete, click the “RUN” button. A series of DOS windows will appear. The DOS windows represent the three stages of the AERMET process.

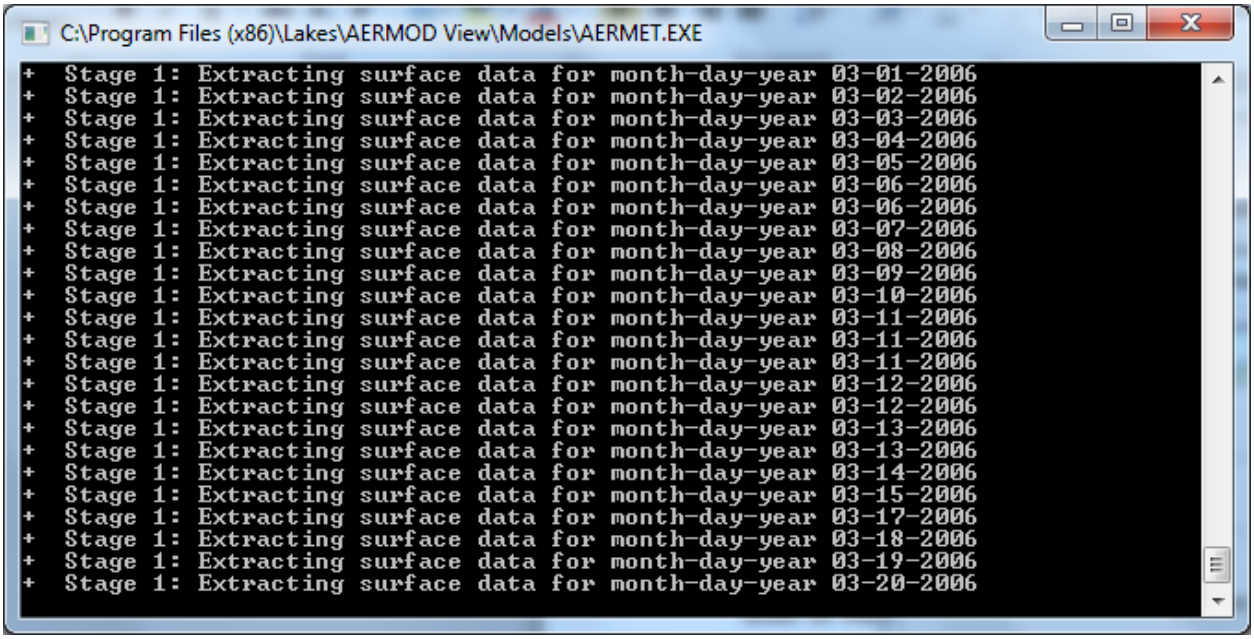


Figure 8-25 AEMET Processing Screen

Once all three stages have completed, the screen shown in Figure 8-26 will appear allowing the user to view the new surface and profile files generated. To complete the process click the “None” button.

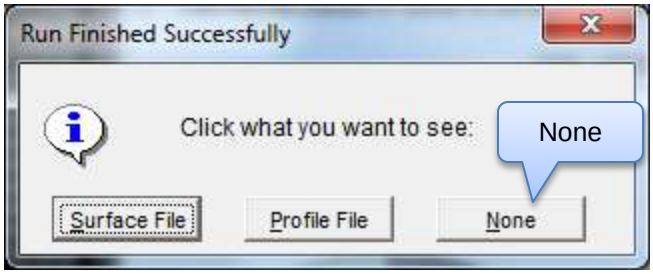


Figure 8-26 AERMET Run Screen

After clicking the "None" button the user should return to the "Output Files" tab, see Figure 8-27. You have just generated AERMOD ready meteorological files. At this point the user can close the AERMET program.

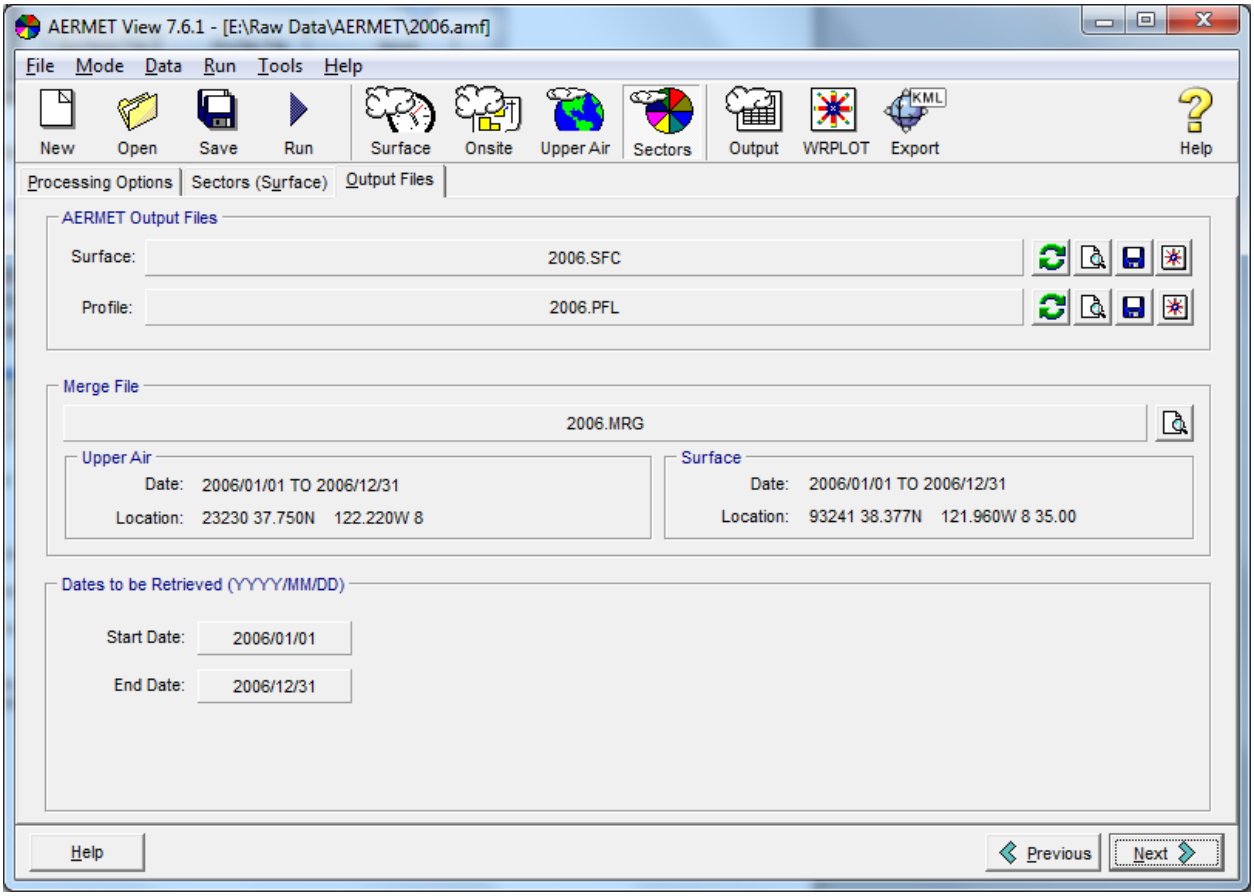


Figure 8-27 AERMET Output Files

8.3 Testing the Meteorological Data

To ensure that the files generated in Section 8.2 are acceptable for regulatory purposes, it is recommended that the user run an AERMOD test run to determine the number of Hours Processed, Calm Hours, Missing Hours and Percent of Missing Hours.

CAUTION!!

At the present time, EPA only requires that meteorological datasets not have more than 10 percent of missing hours per quarter in order for the meteorological dataset to be considered acceptable for regulatory purposes. This only applies to the Wind Speed, Wind Direction, Temperature, and Stability as per EPA's "Meteorological Monitoring Guidance for Regulatory Modeling Application" document. Additionally, the 90% completeness applies to each individual variable.

To facilitate the process of determining completeness, the District has create a MS Access database, see Figure 7-28, that will read the AERMET processed surface files and report the number of missing data for Wind Speed, Wind Direction, and Temperature.

Web Link!!
Meteorological Monitoring Guidance for Regulatory Modeling Application
http://www.epa.gov/scram001/guidance/met/mmgrma.pdf

NOTE!!
A meteorological dataset with more than 10 percent missing hours may be used if approved by the reviewing agency.

8.3.1 Met Data Completeness Determination

Using the District's Met Reader database, see Figure 7-28, the user will be able to read the AERMOD ready dataset and determine the number of hours in each quarter that are missing for each of the required parameters (wind speed, wind direction, and temperature).

CAUTION!!
This process should only be done on non-filled data to determine if a datasets meets EPA's completeness requirement.

NOTE!!
The database imports only one file at a time. The file may contain as many years of data as the user chooses. The program will generate a single report with each year and quarter listed.

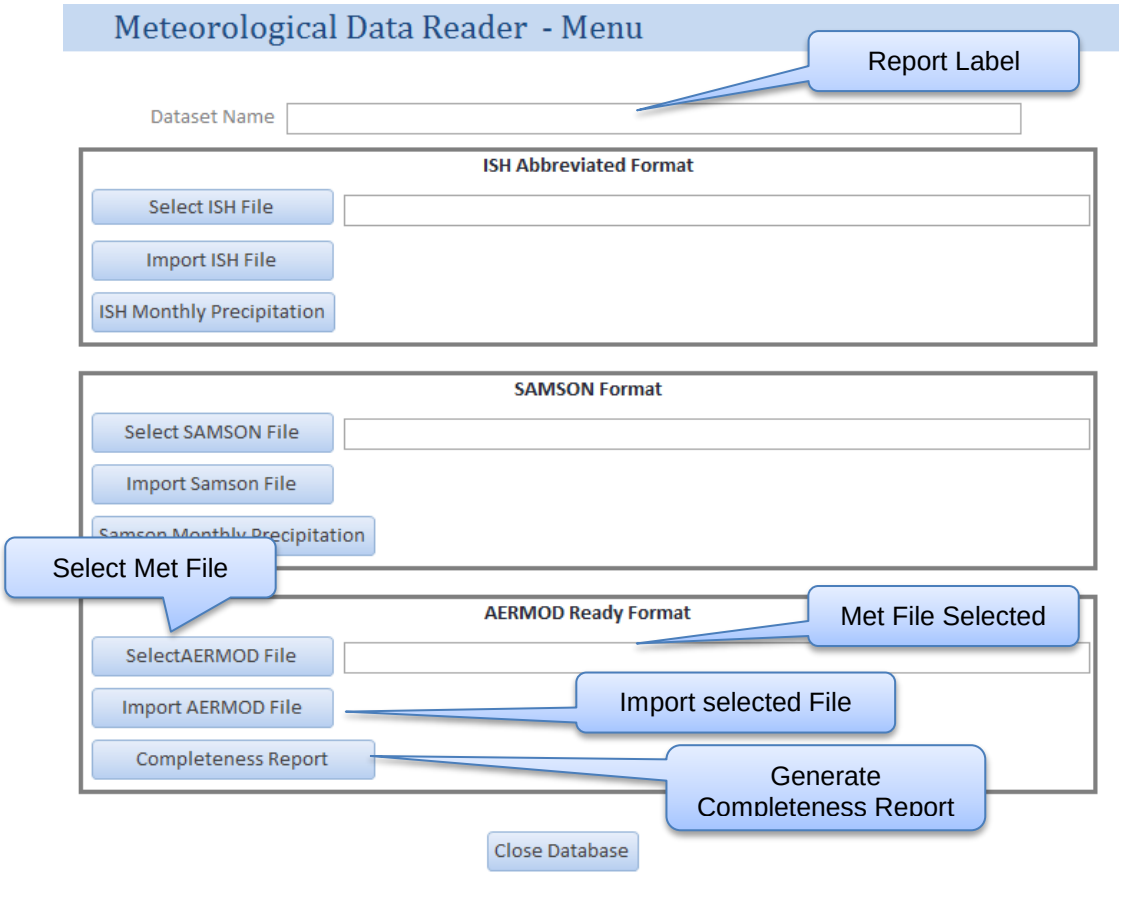


Figure 8-28 District Met Reader Database

To determine if a dataset is complete follow these steps:

- After opening the database, see Figure 8-28, click the "Select AERMOD File" button

- Navigate to the directory where the AERMOD ready data file is located, see Figure 8-29.
- Select the file to be imported and Click the “Open” button
- The text box next to the “Select AERMOD File” button should now be filled in with the selected file’s directory location and name.
- Click the “Import AERMOD File” button. This will read the selected file into the database
    - A warning dialog box will appear indicating that data from the AERMET import table will be deleted. The user should click “Yes” to clear all previous data from the AERMET import table, see Figure 8-30.
- After the import is complete, click the “Completeness Report” button. This will run code that counts each quarter’s, by year, missing data and then generate a report displaying the maximum number of missing hours that are allowed for each quarter versus the actual number of missing hours, by parameter, see Figure 8-31.

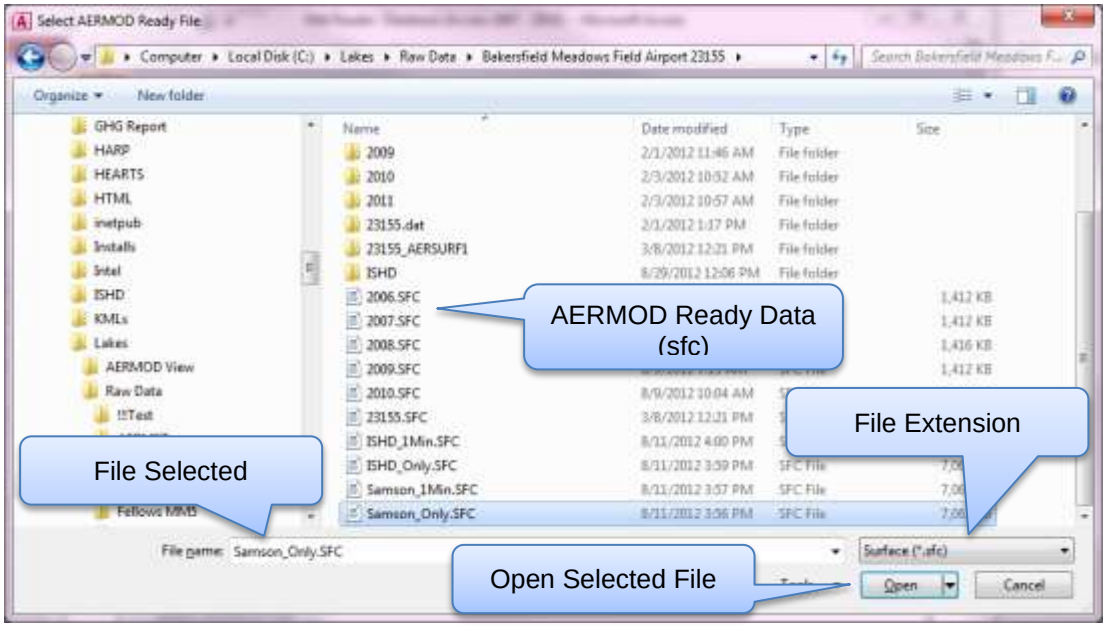
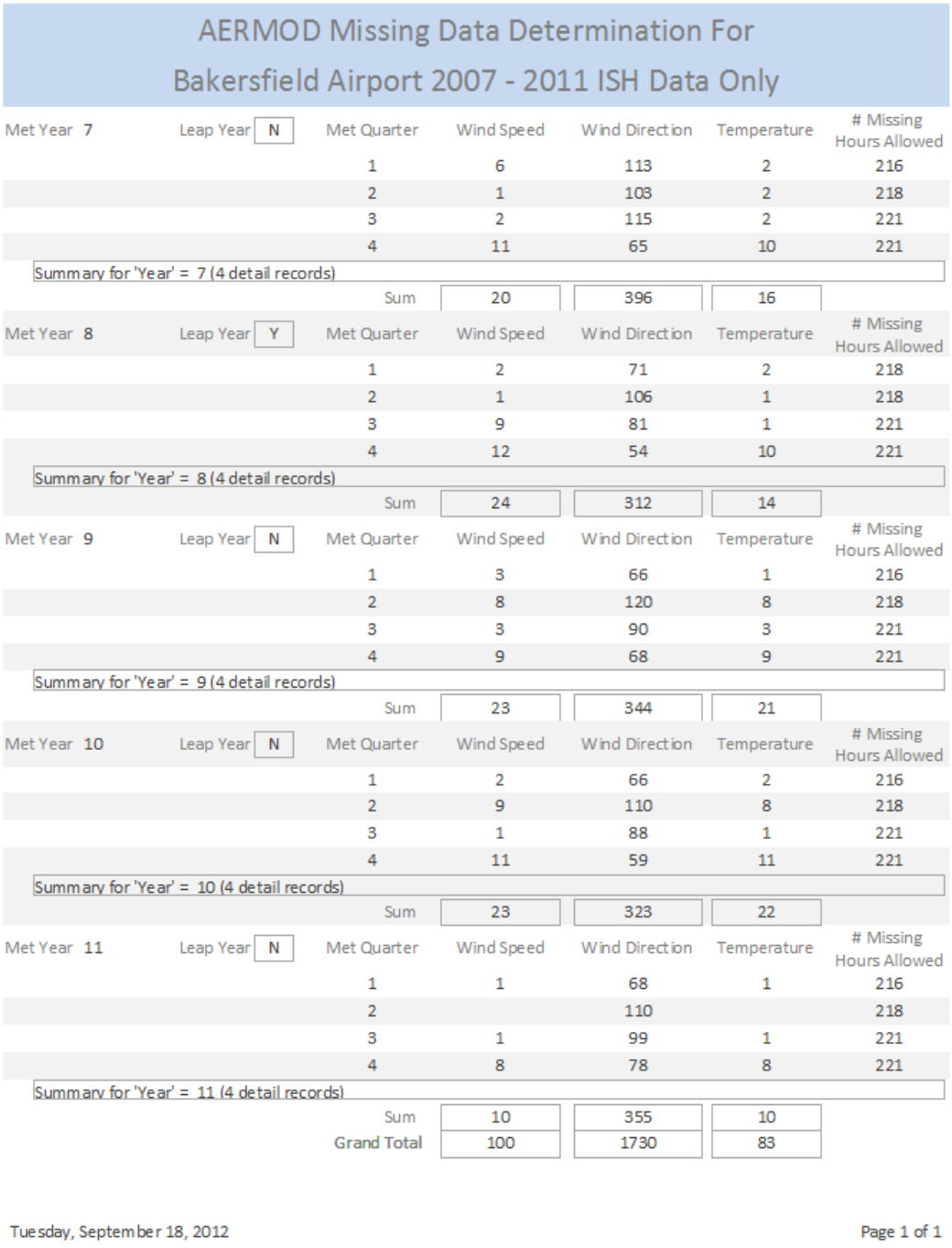


Figure 8-29 Select AERMOD Dataset

Figure 8-30 Preparing AERMET Table



AERMOD Missing Data Determination For
Bakersfield Airport 2007 - 2011 ISH Data Only

Met Year	Leap Year	Met Quarter	Wind Speed	Wind Direction	Temperature	# Missing Hours Allowed
7	N	1	6	113	2	216
		2	1	103	2	218
		3	2	115	2	221
		4	11	65	10	221
Summary for 'Year' = 7 (4 detail records)						
		Sum	20	396	16	
8	Y	1	2	71	2	218
		2	1	106	1	218
		3	9	81	1	221
		4	12	54	10	221
Summary for 'Year' = 8 (4 detail records)						
		Sum	24	312	14	
9	N	1	3	66	1	216
		2	8	120	8	218
		3	3	90	3	221
		4	9	68	9	221
Summary for 'Year' = 9 (4 detail records)						
		Sum	23	344	21	
10	N	1	2	66	2	216
		2	9	110	8	218
		3	1	88	1	221
		4	11	59	11	221
Summary for 'Year' = 10 (4 detail records)						
		Sum	23	323	22	
11	N	1	1	68	1	216
		2		110		218
		3	1	99	1	221
		4	8	78	8	221
Summary for 'Year' = 11 (4 detail records)						
		Sum	10	355	10	
		Grand Total	100	1730	83	

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Figure 8-31 Completeness Determination Report

NOTE!!
Blanks in the above report would indicate that no hours were found to be missing for a given quarter based on the standard missing data codes (999 or 99.9). Each parameter should be compare individually by quarter to the "**#** Missing Hours Allowed" field to determine completeness. Any parameter having a value greater than the allowed number is considered not complying with EPA's completeness requirement.