

Practical Dispersion Modeling

Everything You Need to Know Without Any Fluff

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Your Presenter

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 - ▶ 20 years at the Texas Commission on Environmental Quality (TCEQ)

Workshop Objectives

- ▶ Learning what you need to get started
- ▶ Learning where to find needed information to model
- ▶ Understanding why you did what you did

Acronyms

- ▶ AQA – Air quality analysis
- ▶ NAAQS – National ambient air quality standard
- ▶ PSD – Prevention of significant deterioration
- ▶ CFR – Code of federal regulations
- ▶ USC – United states code (The Law)
- ▶ GAQM – Guideline on Air Quality Models

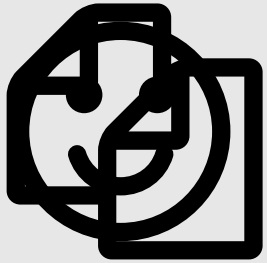
What is the Purpose of an AQA?

- ▶ Answer: Demonstrating compliance with:
 - ▶ NAAQS
 - ▶ PSD Increments
 - ▶ Any state requirements
- ▶ What's the difference between NAAQS and PSD Increments?

What is the Purpose of an AQA?

- ▶ NAAQS are air quality ceilings
 - ▶ Cannot exceed a NAAQS
 - ▶ Otherwise area can be designated nonattainment
- ▶ PSD Increments are permissible dirtying of the air quality

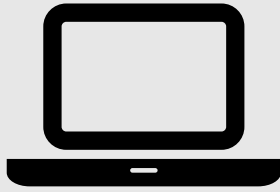
What is the Purpose of an AQA?



What Are The Values?

- ▶ NAAQS can be found in 40 CFR Part 50
- ▶ PSD Increments are found in:
 - ▶ 40 CFR 52.21(c)
 - ▶ In 42 USC 7473 for PM10 and SO₂

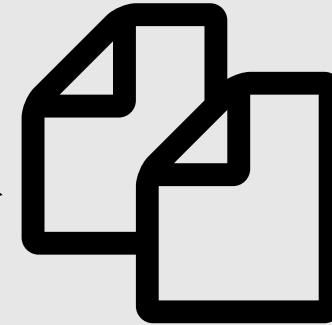
How To Make Demonstration?



Modeling



Monitoring



AQA

Why Modeling and Monitoring?

- ▶ Answer: The rules say so
- ▶ Requirements are in:
 - ▶ 40 CFR 52.21(k) Source impact analysis
 - ▶ 40 CFR 52.21(l) Air quality models
 - ▶ 40 CFR 52.21(m) Air quality analysis
 - ▶ Preapplication analysis

Where Do You Start?

▶ Step 1:

- ▶ Locate representative monitor near application site
 - ▶ Procedure described near end of course

If none available

- ▶ Set up monitor and start gathering data
 - ▶ Minimum 4 months of data
 - ▶ 1 year of data typical

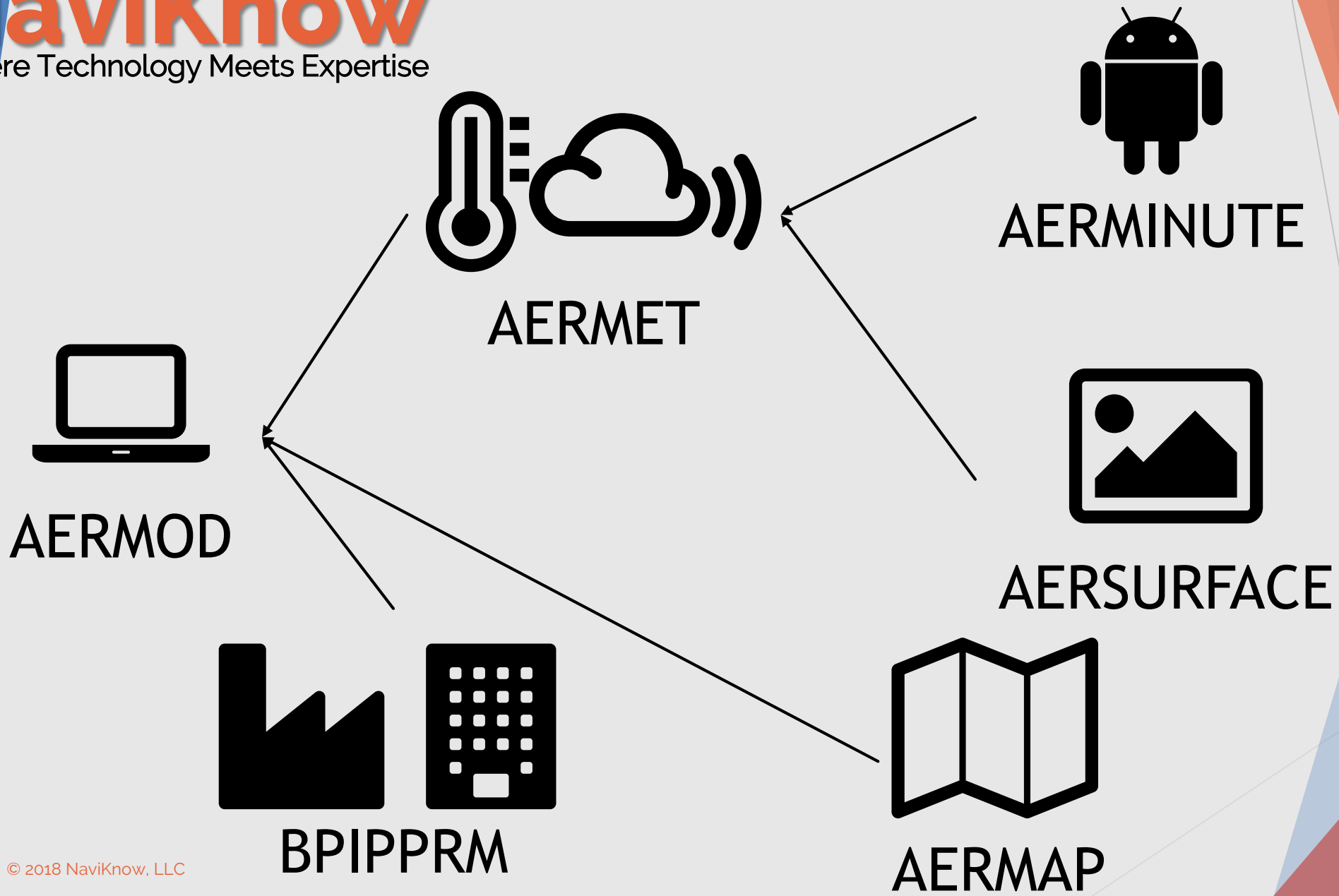
What's Next?

▶ Step 2:

- ▶ Select appropriate model
- ▶ Acceptable models listed in 40 CFR Part 51 Appendix W (a.k.a. Guideline to Air Quality Models, GAQM)
- ▶ This course is specific to the AERMOD model system

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Where Technology Meets Expertise



End of Lesson 1

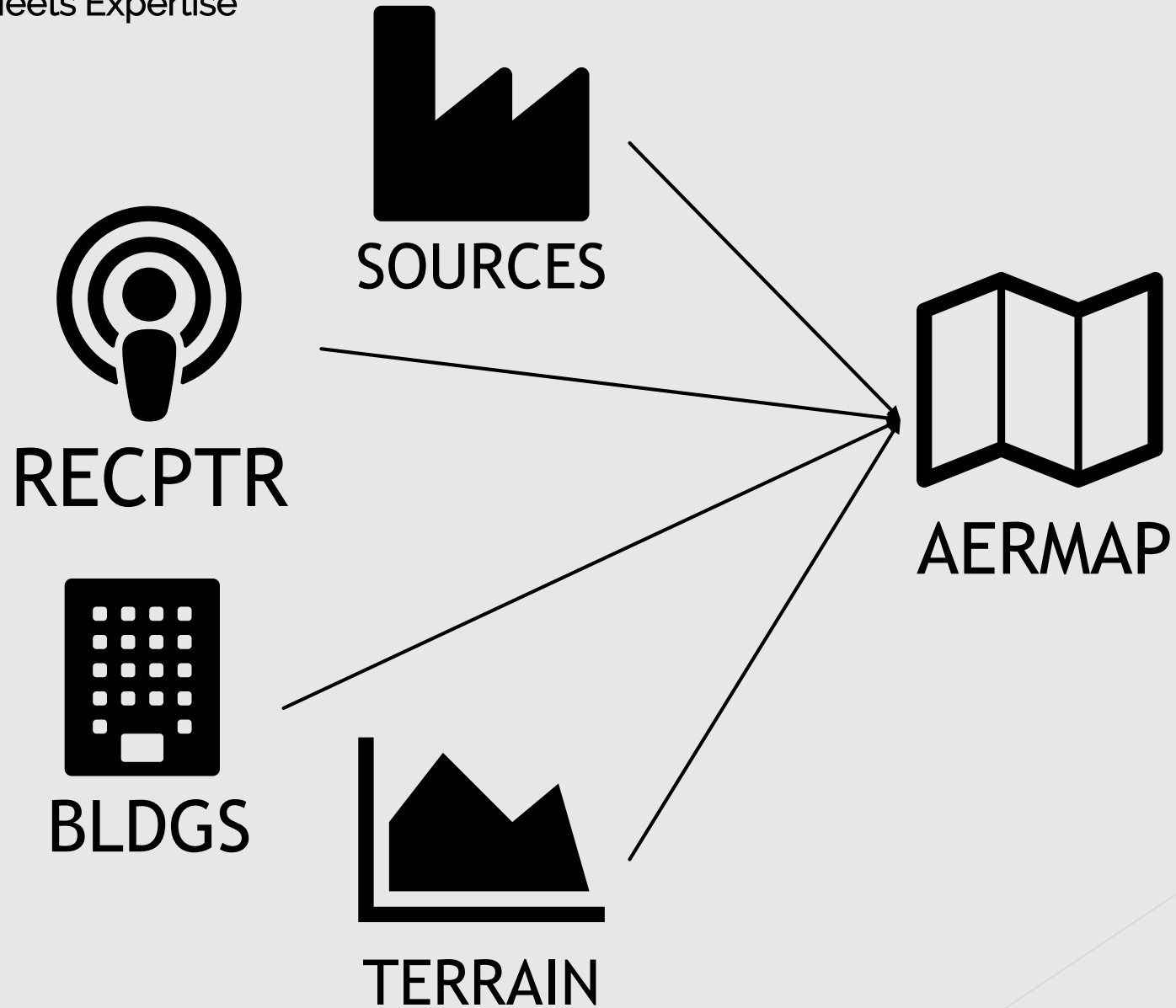
▶ In Lesson 2

- ▶ List and describe each AERMOD preprocessor program
- ▶ Describe the data requirements for each program
- ▶ Where to obtain data necessary to use the program

AERMOD Modeling System

▶ AERMAP

- ▶ Processes terrain elevation data and generates receptor and hill height information for input to AERMOD
- ▶ Used for elevations of receptors, sources, and buildings



How To Get Started With AERMAP

- ▶ Data requirements to get started:
 - ▶ Emission sources
 - ▶ Onsite and off-site sources
 - ▶ Application site property line
 - ▶ For building receptor grid
 - ▶ Buildings
 - ▶ Terrain data

How To Get Started With AERMAP

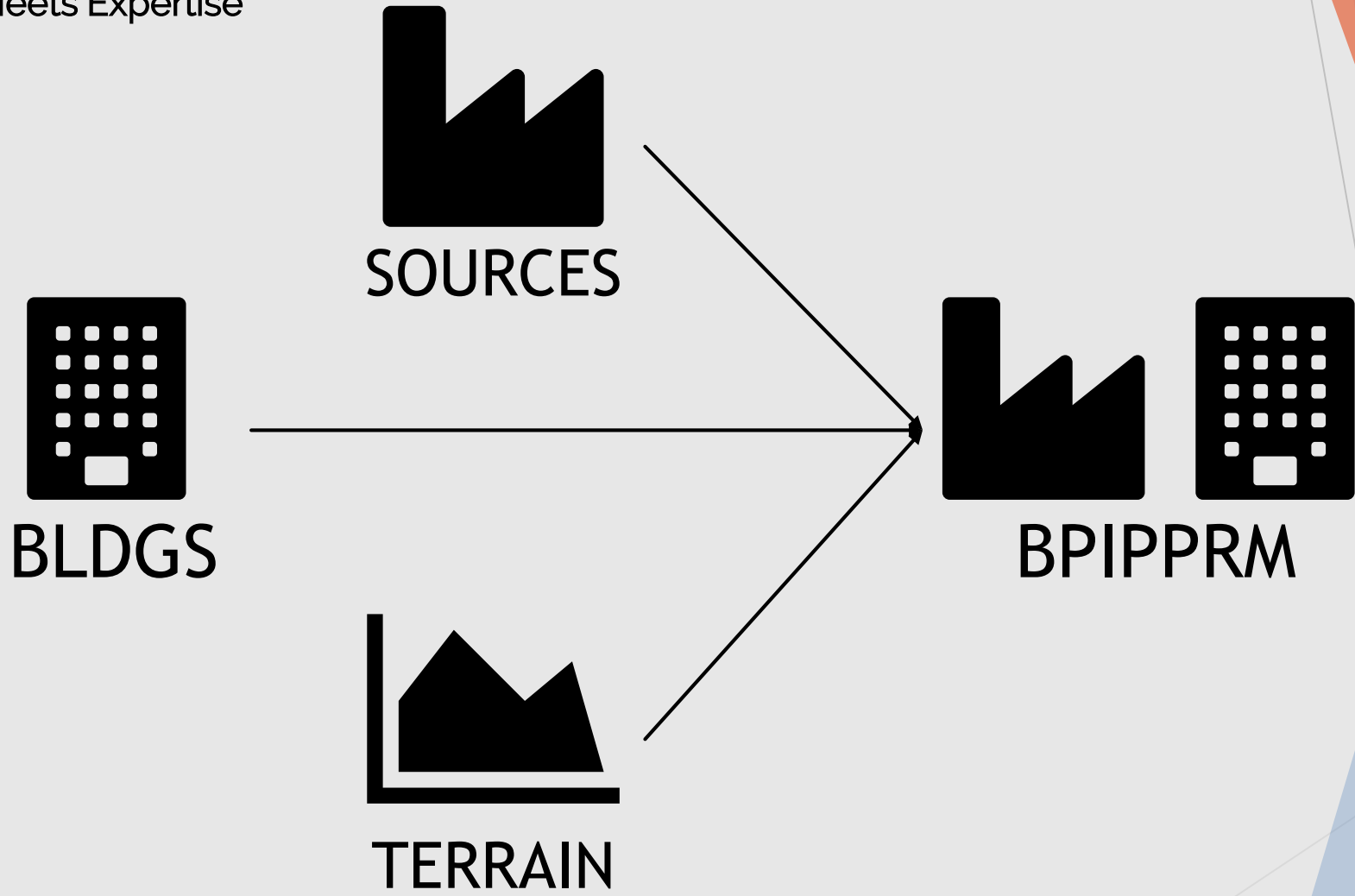
- ▶ Receptor grid specifications (typical)
 - ▶ 25 meter spacing along property (fence) line and out to 300 meters from property line
 - ▶ 100 meter spacing out to 1 km from property line
 - ▶ 500 meter spacing out to 5 km from property line
 - ▶ 1 km spacing out to 10-50 km as appropriate

Where To Get The Data

- ▶ Source locations – From applicant
- ▶ Receptors – From applicant
 - ▶ Based on site property line
- ▶ Building footprints – From applicant
- ▶ Terrain elevations - ???
 - ▶ Needs to be in GeoTiff format

AERMOD Modeling System

- ▶ **BPIPPRM (a.k.a. BPIP-PRIME)**
 - ▶ Processes source and building locations and heights to calculate enhanced plume dispersion coefficients due to the turbulent wake, and reduced plume rise
 - ▶ Coefficients are source specific based on source/building spatial relationships



How To Get Started With BPIPPRM

- ▶ Data requirements to get started:
 - ▶ Emission sources
 - ▶ Onsite and off-site sources
 - ▶ Buildings
 - ▶ Tier footprints
 - ▶ Tier height (peak height)
 - ▶ Terrain data

Where To Get The Data

- ▶ Source locations – From applicant
- ▶ Building tier footprints – From applicant
- ▶ Building tier heights – From applicant
- ▶ Terrain elevations - ???
 - ▶ Needs to be in GeoTiff format

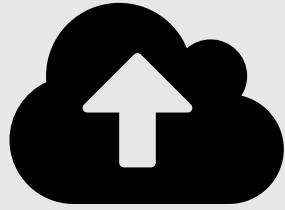
AERMOD Modeling System

▶ AERMET

- ▶ Processes surface and upper air meteorological observations for input to AERMOD
- ▶ Two files are produced by the AERMET. The surface file contains hourly observed and calculated surface variables. The profile file contains the observations at vertical level of the atmosphere

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Where Technology Meets Expertise



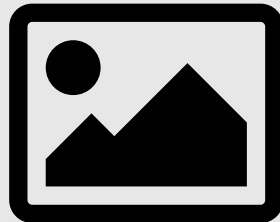
UPPER AIR



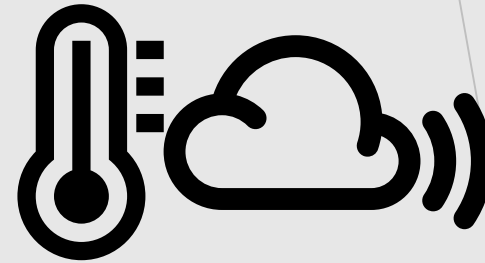
AERMINUTE



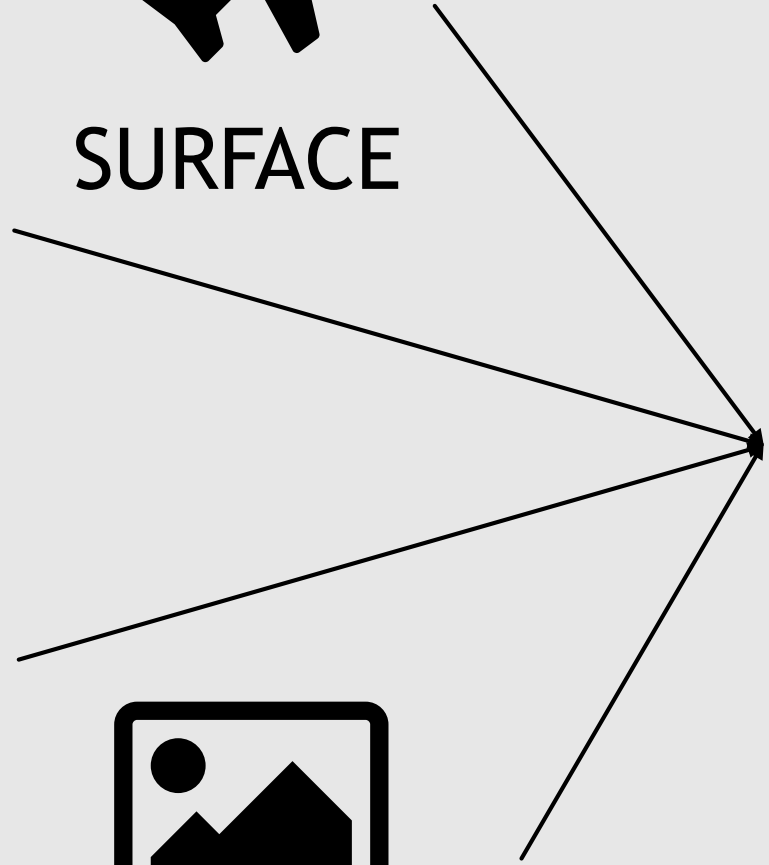
SURFACE



AERSURFACE



AERMET



How To Get Started With AERMET

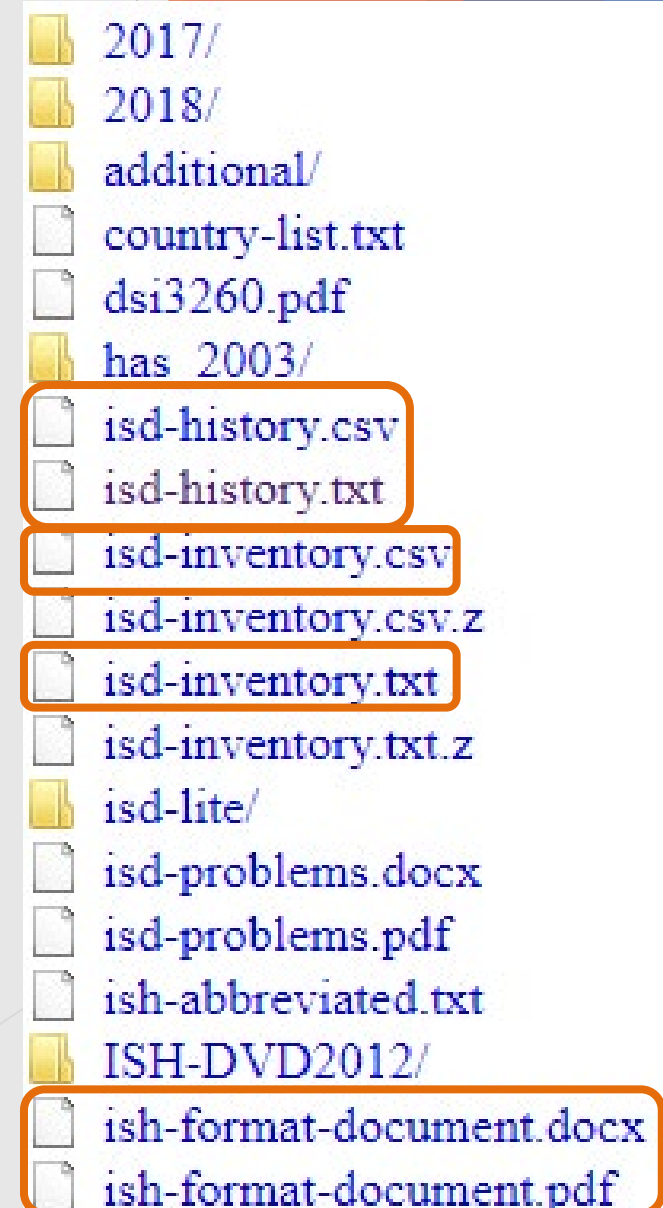
- ▶ Data requirements to get started:
 - ▶ Weather stations
 - ▶ Surface hourly observations
 - ▶ Upper air twice daily soundings
 - ▶ Station properties
 - ▶ Location (latitude and longitude)
 - ▶ Elevation
 - ▶ Time zone

Where to Find Surface Data?

- ▶ **1-Hour Observations available from NOAA**
 - ▶ <ftp://ftp.ncdc.noaa.gov/pub/data/noaa>
 - ▶ Integrated Surface Hourly Database (ISHD)
 - ▶ Data from 1901-Present

Where to Find Surface Data?

- ▶ More information on files
 - ▶ isd-history.csv
 - ▶ isd-inventory.csv
 - ▶ ish-format-document.pdf
- ▶ Review these files before downloading data files



Where to Find Surface Data?

► Look up datasets available:

- <ftp://ftp.ncdc.noaa.gov/pub/data/noaa/isd-history.csv>

```
"USAF", "WBAN", "STATION NAME", "CTRY", "STATE", "ICAO", "LAT", "LON", "ELEV (M) ", "BEGIN", "END"  
"007026", "99999", "WXPOD 7026", "AF", "", "", "+00.000", "+000.000", "+7026.0", "20140711", "20170822"  
"007070", "99999", "WXPOD 7070", "AF", "", "", "+00.000", "+000.000", "+7070.0", "20140923", "20150926"  
"008260", "99999", "WXPOD8270", "", "", "", "+00.000", "+000.000", "+0000.0", "19420101", "19561231"  
"008411", "99999", "XM20", "", "", "", "", "", "20160217", "20160217"  
"008414", "99999", "XM18", "", "", "", "", "", "20160216", "20160217"  
"008415", "99999", "XM21", "", "", "", "", "", "20160217", "20160217"  
"008418", "99999", "XM24", "", "", "", "", "", "20160217", "20160217"  
"010000", "99999", "BOGUS NORWAY", "NO", "", "ENRS", "", "", "", "20010927", "20051231"  
"010010", "99999", "JAN MAYEN (NOR-NAVY) ", "NO", "", "ENJA", "+70.933", "-008.667", "+0009.0", "19310101", "20180820"  
"010013", "99999", "ROST", "NO", "", "", "", "", "", "19861120", "19880105"  
"010014", "99999", "SORSTOKKEN", "NO", "", "ENSO", "+59.792", "+005.341", "+0048.8", "19861120", "20180820"  
"010015", "99999", "BRINGELAND", "NO", "", "", "+61.383", "+005.867", "+0327.0", "19870117", "20111020"
```

Where to Find Surface Data?

- ▶ Look up dataset completeness:
 - ▶ <ftp://ftp.ncdc.noaa.gov/pub/data/noaa/isd-inventory.csv>


```
"USAF", "WBAN", "YEAR", "JAN", "FEB", "MAR", "APR", "MAY", "JUN", "JUL", "AUG", "SEP", "OCT", "NOV", "DEC"  
"007026", "99999", "2014", "0", "0", "0", "0", "0", "0", "180", "0", "4", "0", "552", "0"  
"007026", "99999", "2016", "0", "0", "0", "0", "0", "794", "0", "0", "0", "0", "0", "0"  
"007070", "99999", "2014", "0", "0", "0", "0", "0", "0", "0", "0", "1", "0", "0", "0"  
"007070", "99999", "2015", "0", "0", "0", "0", "0", "0", "0", "0", "198", "0", "0", "0"  
"008403", "99999", "2014", "733", "1131", "1462", "536", "0", "0", "0", "0", "0", "0", "0", "0"  
"008411", "99999", "2014", "712", "655", "740", "713", "736", "704", "708", "713", "712", "735", "706", "737"  
"008411", "99999", "2015", "729", "643", "741", "713", "738", "718", "741", "736", "1281", "3791", "3652", "3689"  
"008411", "99999", "2016", "3744", "1939", "0", "0", "0", "0", "0", "0", "0", "0", "0", "0"  
"008414", "99999", "2014", "731", "645", "742", "712", "732", "709", "703", "718", "711", "731", "711", "738"  
"008414", "99999", "2015", "735", "672", "742", "713", "740", "719", "741", "735", "718", "744", "716", "728"  
"008414", "99999", "2016", "743", "385", "0", "0", "0", "0", "0", "0", "0", "0", "0", "0"  
"008415", "99999", "2014", "297", "688", "736", "706", "738", "485", "98", "569", "0", "2", "0", "0"
```











Where to Find Surface Data?

- ▶ Surface file naming convention:
<USAF ID>-<WBAN ID>-<4-digit year>.gz

← → ↻ ⓘ ftp://ftp.ncdc.noaa.gov/pub/data/noaa/2016/

Index of /pub/data/noaa/2016/

 [\[parent directory\]](#)

Name	Size	Date Modified
 007026-99999-2016.gz	13.3 kB	3/30/17, 7:00:00 PM
 008411-99999-2016.gz	132 kB	3/30/17, 7:00:00 PM
 008414-99999-2016.gz	38.2 kB	3/30/17, 7:00:00 PM
 008415-99999-2016.gz	30.8 kB	3/30/17, 7:00:00 PM
 008418-99999-2016.gz	29.3 kB	3/30/17, 7:00:00 PM
 010010-99999-2016.gz	318 kB	3/30/17, 7:00:00 PM
 010014-99999-2016.gz	194 kB	3/30/17, 7:00:00 PM
 010020-99999-2016.gz	191 kB	3/30/17, 7:00:00 PM
 010030-99999-2016.gz	299 kB	3/30/17, 7:00:00 PM
 010060-99999-2016.gz	235 kB	3/30/17, 7:00:00 PM
010070-99999-2016.gz	279 kB	3/30/17, 7:00:00 PM

Where to Find Upper Air Data?

▶ Available from NOAA

▶ <https://www.esrl.noaa.gov/raobs/>

▶ Need to complete HTML form to generate data

▶ Data generated in web browser

▶ Select all data on page then copy to text file

7 Items to Input to Form

- ▶ Start time – YYYY MM DD HH
- ▶ End time – YYYY MM DD HH
- ▶ Sounding times – 0z, 12z, both, or all times
- ▶ Data levels – All, mandatory, mand and sigs
- ▶ Wind units – Knots or tenths m/sec
- ▶ Station ID – WMO, WBAN, state, country, lat/long
- ▶ Format – FSL, FAA604, NetCDF

NOAA/ESRL Radiosonde Database

software for our CDrom and DVD archive products, and other details is available on the

ESRL/GSD data for 2015 and 2016 thru March 24th.

I. Input Dates: (UTC units)

From: yr mo dy hr

Thru: yr mo dy hr

II. Sounding Specific Information

Hours of access: Data levels:

Wind Units:

III. Select Stations / Data

Select Radiosonde Sites by:

Radiosonde Database Access

*** Select Either Option ***

arrriage controls) below:

Sort Order:

Note: We no longer are able to offer the SkewT format.

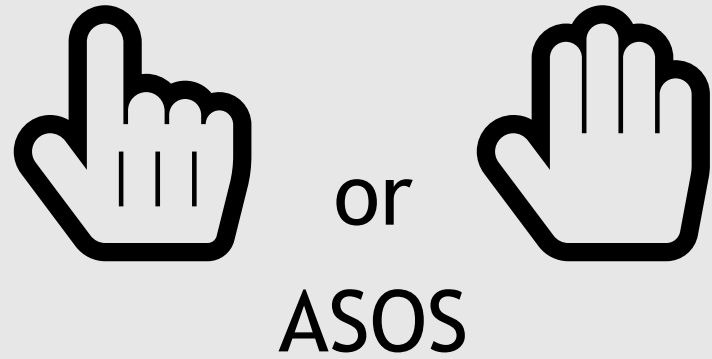
Format:

Descriptions are available for the: [Both FSL output formats.](#)

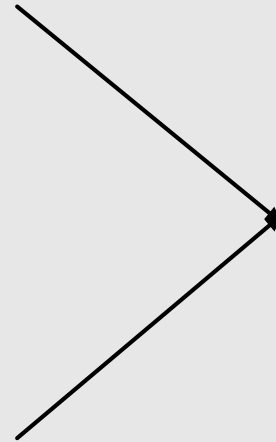
AERMOD Modeling System

▶ AERMINUTE

- ▶ Processes NWS 1-minute or 5-minute ASOS wind data for input to AERMET.
- ▶ Was developed to reduce number of calm and missing hours by substituting standard hourly observations with full hourly average winds calculated from 1 or 5-minute ASOS wind data



Ice Free Wind



AERMINUTE

Getting Started With AERMINUTE

- ▶ Data requirements to get started:
 - ▶ Weather stations
 - ▶ 1- or 5-minute ASOS data (monthly data files)
 - ▶ Ice free wind instrumentation date

Where to Find ASOS Data?

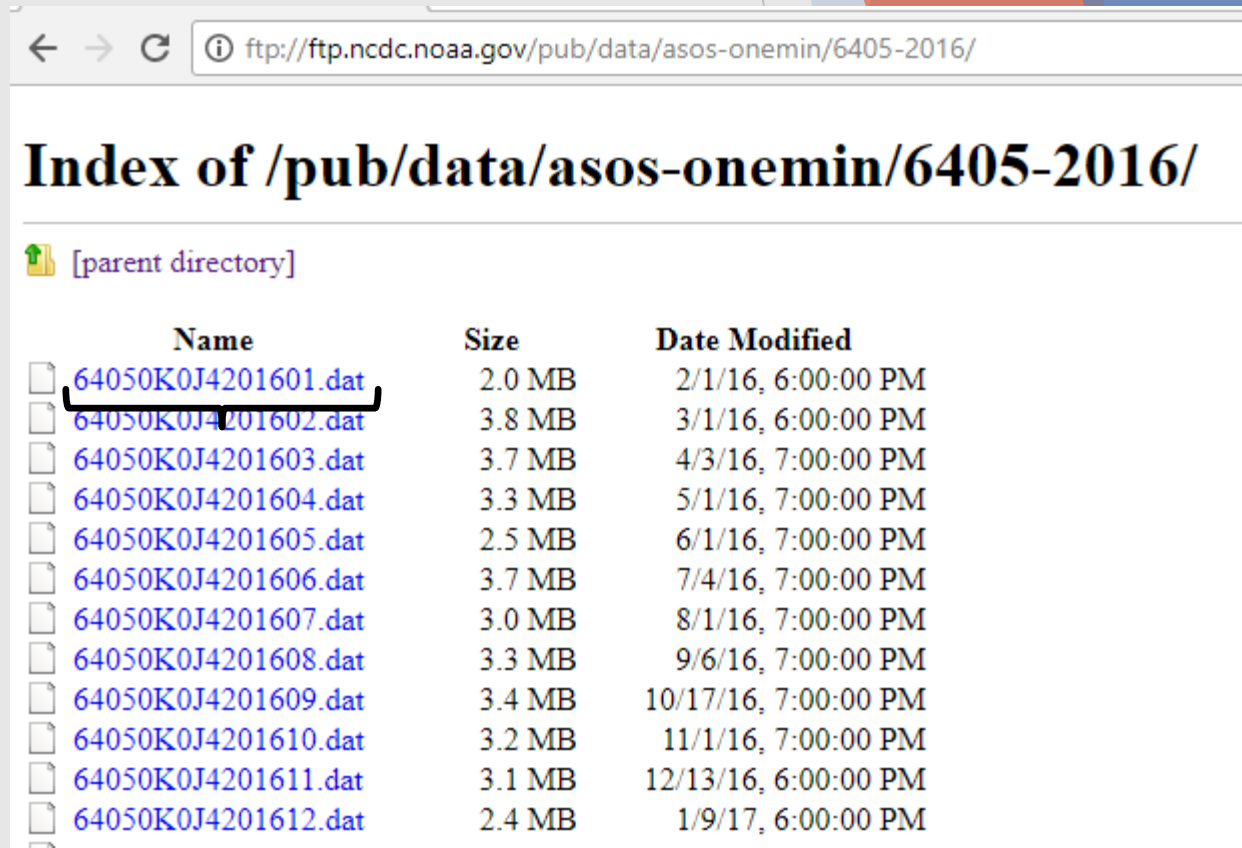
- ▶ Data for AERMINUTE can be found at:
 - ▶ <ftp://ftp.ncdc.noaa.gov/pub/data/asos-onemin/>
 - ▶ <ftp://ftp.ncdc.noaa.gov/pub/data/asos-fivemin/>

Where to Find ASOS Data?













- ▶ ASOS data file naming convention:

64050<call ltrs>YYYYMM.dat

- ▶ Typically 12 per year



The screenshot shows a web browser window displaying an FTP directory listing. The address bar shows the URL: ftp://ftp.ncdc.noaa.gov/pub/data/asos-onemin/6405-2016/. The page title is "Index of /pub/data/asos-onemin/6405-2016/". Below the title, there is a link for "[parent directory]". The main content is a table with three columns: "Name", "Size", and "Date Modified". The table lists 12 data files, each with a file icon, a name, a size, and a date modified. The first file, 64050K0J4201601.dat, is highlighted with a black box.

Name	Size	Date Modified
 64050K0J4201601.dat	2.0 MB	2/1/16, 6:00:00 PM
 64050K0J4201602.dat	3.8 MB	3/1/16, 6:00:00 PM
 64050K0J4201603.dat	3.7 MB	4/3/16, 7:00:00 PM
 64050K0J4201604.dat	3.3 MB	5/1/16, 7:00:00 PM
 64050K0J4201605.dat	2.5 MB	6/1/16, 7:00:00 PM
 64050K0J4201606.dat	3.7 MB	7/4/16, 7:00:00 PM
 64050K0J4201607.dat	3.0 MB	8/1/16, 7:00:00 PM
 64050K0J4201608.dat	3.3 MB	9/6/16, 7:00:00 PM
 64050K0J4201609.dat	3.4 MB	10/17/16, 7:00:00 PM
 64050K0J4201610.dat	3.2 MB	11/1/16, 7:00:00 PM
 64050K0J4201611.dat	3.1 MB	12/13/16, 6:00:00 PM
 64050K0J4201612.dat	2.4 MB	1/9/17, 6:00:00 PM

Where to Find ASOS Data

► Ice Free Wind Installation Dates

http://www.weather.gov/ops2/Surface/documents/IFW_stat.pdf

Ice Free Wind Installation Dates for NWS and FAA owned ASOS sites

IDENTIFIER	CITY	STATE	INSTALL DATE
ADO	KODIAK	AK	4/10/2007
AKN	KING SALMON	AK	3/21/2007
AKW	KLAWOCK	AK	6/7/2006
ANC	ANCHORAGE	AK	9/18/2006
ANN	ANNETTE	AK	5/26/2006
AQT	NUIQSUT	AK	8/22/2006
AWI	WAINWRIGHT	AK	8/16/2006
BET	BETHEL	AK	9/13/2006
BIG	DELTA JUNCTION	AK	10/7/2005

End of Lesson 2

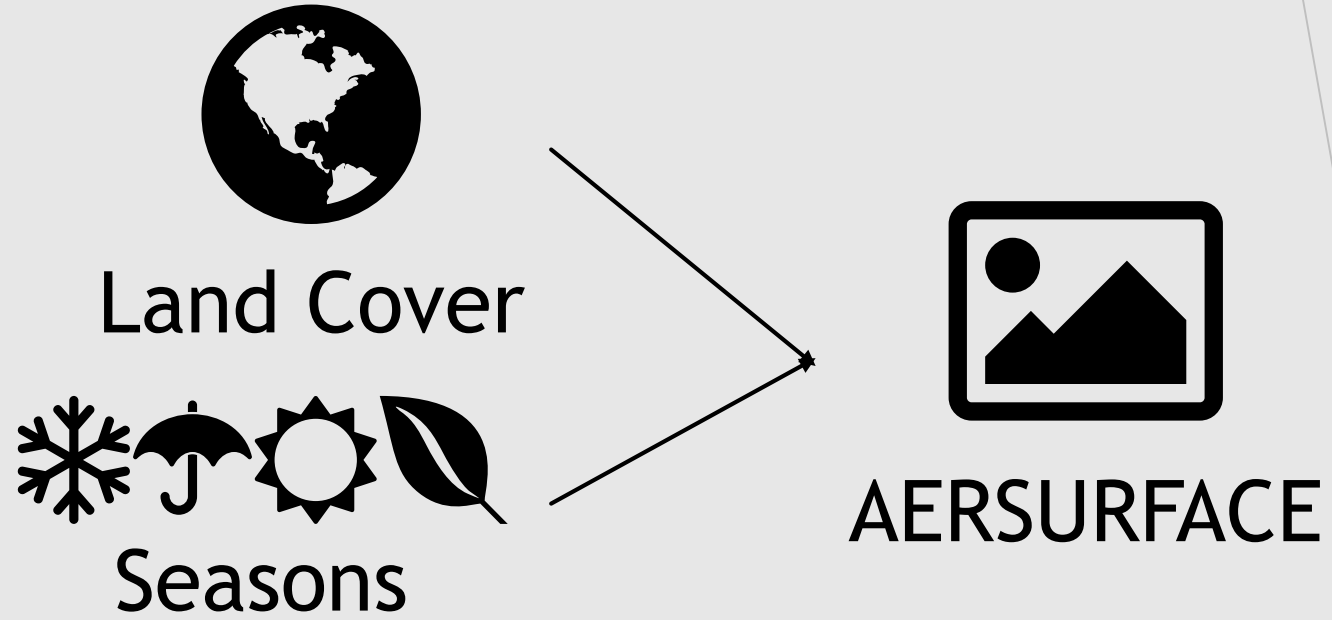
▶ In Lesson 3

- ▶ Describe AERSURFACE preprocessor program for AERMET
- ▶ Describe the data requirements and issues
- ▶ List and describe AERMOD input sections
- ▶ Data requirements for AERMOD input

AERMOD Modeling System

▶ AERSURFACE

- ▶ Processes land cover data to calculate appropriate values for three surface characteristics: surface roughness length $\{z_0\}$, albedo $\{r\}$, and Bowen ratio $\{Bo\}$
- ▶ Tool has been developed to aid users in obtaining realistic and reproducible surface characteristic values



Getting Started With AERSURFACE

- ▶ Data requirements to get started:
 - ▶ Land cover data
 - ▶ Available for lower 48 states
 - ▶ Surface characteristic values associated with standardized land cover categories
 - ▶ Months assigned to seasons
 - ▶ No guidance on this from EPA

Where to Find Land Cover Data?

- ▶ Land cover can be found at:
 - ▶ <https://www.mrlc.gov/data>
 - ▶ Data sets from 2001-2016, in 5-year increments
 - ▶ Now includes Alaska, Hawaii, Puerto Rico
 - ▶ However, AERSURFACE requires 1992 NLCD!

Where to Apply Land Cover Data?

- ▶ EPA guidance is “location of the meteorological tower”
- ▶ The adequacy of input data should be judged independently for each variable. The values for surface roughness, Bowen ratio, and albedo should reflect the surface characteristics in the vicinity of the meteorological tower or representative grid cell when using prognostic data, and should be adequately representative of the modeling domain. Finally, the primary atmospheric input variables, including wind speed and direction, ambient temperature, cloud cover, and a morning upper air sounding, should also be adequately representative of the source area when using observed data.

Where to Apply Land Cover Data?

- ▶ Issues with EPA guidance:
 - ▶ Inconsistent with fundamental EPA guidance
 - ▶ No procedures or criteria
 - ▶ Impossible to implement
 - ▶ Can be indefensible in court

Where to Apply Land Cover Data?

- ▶ Use application site
 - ▶ Consistent with fundamental EPA guidance
 - ▶ Can be implemented
 - ▶ Is defensible in court
 - ▶ Just common sense
 - ▶ It's an estimate, anyway

Which Land Cover Data?

- ▶ The meteorological data used as input to a dispersion model should be selected on the basis of spatial and climatological (**temporal**) representativeness as well as the ability of the individual parameters selected to characterize the transport and dispersion conditions in the area of concern...Temporal representativeness is a function of the year-to-year variations in weather conditions. Where appropriate, data representativeness should be viewed in terms of the appropriateness of the data for constructing realistic boundary layer profiles and, where applicable, three-dimensional meteorological fields, as described in paragraphs (c) and (d) of this subsection.

Other Issues on Land Cover Data?

- ▶ **Temporal representativeness**
 - ▶ 1992? Really?
 - ▶ Data sets for 2001 to 2016 available
- ▶ **Roughness length questions**
 - ▶ Higher urbanization with lower values
 - ▶ Inconsistent with met observation protocols

Other Issues on Land Cover Data?

- ▶ Realignment of land cover categories

- ▶ Consistent for data sets for 2001 to 2016

- ▶ See article

- <http://www.naviknow.com/2018/09/19/mapping-land-use-land-cover-codes-from-nlcd1992-to-nlcd2011/>

Other Issues on Land Cover Data?

- ▶ Proposal for roughness in highly urban areas

- ▶ Consistent with WMO observation protocols

- ▶ See article

- <http://www.naviknow.com/2018/09/19/mapping-land-use-land-cover-codes-from-nlcd1992-to-nlcd2011/>

How To Assign Months to Seasons?

- ▶ EPA guidance
 - ▶ None
 - ▶ Default is calendar seasons
 - ▶ Inconsistent with fundamental EPA guidance

How To Assign Months to Seasons?

▶ Proposal

- ▶ Use realistic and reproducible procedure
- ▶ Based on monthly mean temperature
- ▶ See article

<http://www.naviknow.com/2018/01/24/aersurface-season-values/>

Other Options in AERSURFACE?

- ▶ **Averaging Period**
 - ▶ Annual, seasonal, monthly
 - ▶ Extra effort, impact uncertain
 - ▶ Will need to justify
 - ▶ Is it any better?

Other Options in AERSURFACE?

- ▶ **Wind direction sectors**
 - ▶ From 1 to 12
 - ▶ Separate analysis for each sector
 - ▶ Extra effort, impact uncertain
 - ▶ Will need to justify
 - ▶ Is it any better?

AERMOD Modeling System

▶ AERMOD

- ▶ Steady-state plume dispersion model for assessment of pollutant concentrations from a variety of sources
- ▶ Simulates transport and dispersion from multiple point, area, or volume sources based on an up-to-date characterization of the atmospheric boundary layer

AERMOD Input File Structure

- ▶ Pathway, Keyword structure
- ▶ Pathways are:
 - ▶ CO – Control options
 - ▶ SO – Source properties
 - ▶ RE – Receptors
 - ▶ ME – Meteorological inputs and options
 - ▶ OU – Output options

AERMOD CO Pathway

▶ MODELOPT Keyword

▶ Which values to calculate

▶ CONC, DEPOS, DDEP, WDEP, etc.

▶ Which algorithms to use

▶ FLAT or ELEV; just use ELEV

▶ ARM2, PVMRM, OLM

▶ Selection may require more options (Keywords)

AERMOD CO Pathway

▶ AVERTIME Keyword

- ▶ Make sure is consistent with standard

▶ POLLUTID Keyword

- ▶ Can be anything, except when it can't
- ▶ Can depend on MODELOPT value
- ▶ PM25, PM2.5, PM-2.5 or PM-25 for PM2.5 NAAQS
- ▶ NO2 and SO2 for NAAQS

AERMOD SO Pathway

▶ LOCATION

- ▶ Defines each source: ID, type X, Y, Z
- ▶ Source **MUST** occur here first

▶ SRCPARAM

- ▶ Lists source properties:
 - ▶ ID, rate, height, others depending on source type

AERMOD SO Pathway

▶ SRCPARAM

▶ For POINT, POINTHOR, POINTCAP

▶ ID, Rate (g/sec), H, T, V, D

▶ For VOLUME

▶ ID, Rate (g/sec), H, σ_y , σ_z

▶ For AREA, AREACIRC, AREAPOLY, LINE

▶ ID, Rate (g/m²-sec), H, other type specific parameters

AERMOD SO Pathway

▶ SRCGROUP

- ▶ Default is the ALL group
- ▶ Can have user defined groups
 - ▶ Source should be defined
 - ▶ Group_ID Source_ID1 Source_ID2...SourceIDn
- ▶ Output is by source group

AERMOD SO Pathway

- ▶ **Other common keywords**
 - ▶ AREAVERT – vertices for AREAPOLY
 - ▶ EMISFACT – variable emission rates
 - ▶ HROFDY – hour of day for 24-hr schedule
 - ▶ WSPEED – by windspeed; used with WINDCATS
 - ▶ HOUREMIS – hourly emission rates
 - ▶ Data file needed

AERMOD RE Pathway

- ▶ ELEVUNIT – Default is meters
- ▶ Can use grids, but DON'T
- ▶ Use DISCCART – discrete receptors

AERMOD ME Pathway

▶ Required keywords

- ▶ SURFFILE, PROFFILE, SURFDATA, UAIRDATA, PROFBASE

▶ To limit simulation

- ▶ STARTEND, DAYRANGE

▶ Other options

- ▶ WINDCATS, WDROTATE (why would you use?)

AERMOD OU Pathway

- ▶ RECTABLE – required for all averaging times except ANNUAL
- ▶ PLOTFILE – max at each receptor
- ▶ MAXIFILE – each value above threshold value
- ▶ MAXDAILY – max daily at each receptor
- ▶ All results by source group

End of Lesson 3

- ▶ In Lesson 4, special topics
 - ▶ Procedure to determine background concentrations
 - ▶ Time saving/modeling minimizing techniques
 - ▶ NK Tools

Representative Monitor Data

▶ What rules require:

40 CFR 52.21(m)(1)(iii) - With respect to any such pollutant (other than nonmethane hydrocarbons) for which such a standard does exist, the analysis shall contain continuous air quality monitoring data gathered for purposes of determining whether emissions of that pollutant would cause or contribute to a violation of the standard or any maximum allowable increase.

Representative Monitor Data

► What rules require:

40 CFR 51 Appx. W 8.3.2.b- If several monitors are available, preference should be given to the monitor with characteristics that are most similar to the project area. If there are no monitors located in the vicinity of the new or modifying source, a “regional site” may be used to determine background concentrations. A regional site is one that is located away from the area of interest but is impacted by similar or adequately representative sources.

Representative Monitor Data

- ▶ **Methodology should be:**
 - ▶ realistic, reproducible, systematic, and objective
- ▶ **What criteria to use?**
 - ▶ Similar regional emissions
 - ▶ Similar nearby emissions
 - ▶ Similar land use characteristics

Representative Monitor Data

- ▶ What data to use?
 - ▶ National emissions inventory (NEI)
 - ▶ County-wide emissions (regional)
 - ▶ Major source (site) emissions
 - ▶ Land cover datasets
 - ▶ All is readily available and current

Representative Monitor Data

▶ Procedure

- ▶ Compare County-wide emissions (monitor to site)
- ▶ Compare Nearby emissions (monitor to site)
- ▶ Compare Land cover (monitor to site)
- ▶ Use discretion and judgement to make selection

Representative Monitor Data

COUNTY	Bowie	Harris
TOTAL	2,508	20,666
TOTAL INDUSTRIAL	2,363	17,743
TOTAL MOBILE	145	2,923
TIER1NAME		
CHEMICAL & ALLIED PRODUCT MFG	0	312
FUEL COMB. ELEC. UTIL.	0	474
FUEL COMB. INDUSTRIAL	33	2,134
FUEL COMB. OTHER	32	553
HIGHWAY VEHICLES	89	1,400
METALS PROCESSING	0	66
MISCELLANEOUS	2,116	8,313
NATURAL RESOURCES	0	0
OFF-HIGHWAY	56	1,523
OTHER INDUSTRIAL PROCESSES	81	2,625
PETROLEUM & RELATED INDUSTRIES	0	156
SOLVENT UTILIZATION	1	35
STORAGE & TRANSPORT	0	87
WASTE DISPOSAL & RECYCLING	100	2,990

Representative Monitor Data

AQ5 ID484530021			TOTAL
Site Name Austin Webberville Rd			63
Site_ID	Site_Name	Distance (m)	TPY
11479711	BRACKENRIDGE HOSPITAL	2363.539	0.00536339
9071811	AUSTIN AMERICAN STATESMAN	3072.405	0.0243
10949111	CAPITOL NATIONAL BANK BUILDING	3181.17	0.00536339
6478111	AUSTIN HOT MIX HAL C WEAVER	3226.08	0.6544613
4181711	POWER PLANT	3418.045	21.52216
12033911	DELL CHILDRENS MEDICAL CENTER	4623.618	0.00536339
5678711	ED BLUESTEIN SITE	4805.649	20.6539
6478211	SPANSION AUSTIN FACILITY	5282.635	3.0168
12092011	HEART HOSPITAL OF AUSTIN	5480.063	0.0054789
11867211	SETON MEDICAL CENTER H-4	5557.153	0.00536339
11948511	SOUTH AUSTIN MEDICAL CENTER	7202.18	0.00536339
12270211	MABRY AHP /NG/	7907.821	0.0054789
12225011	STARFLIGHT FACILITY	8415.988	0.00536339
12268311	DRYDEN	8433.628	0.010126
9066011	Austin-Bergstrom Intl	8614.397	16.94052883

Representative Monitor Data

Land Use Code	Land Code Name	Category	Site Percent	Clinton Percent
11	Open Water	Rural	0.83%	1.70%
21	Developed, Open Space	Urban	5.18%	10.70%
22	Developed, Low Intensity	Urban	6.07%	21.45%
23	Developed, Medium Intensity	Urban	1.02%	33.01%
24	Developed, High Intensity	Urban	0.56%	23.87%
31	Barren Land (Rock/Sand/Clay)	Urban	0.46%	0.59%
41	Deciduous Forest	Rural	16.86%	1.00%
42	Evergreen Forest	Rural	20.69%	1.13%
43	Mixed Forest	Rural	4.13%	0.78%
52	Shrub/Scrub	Rural	10.21%	0.59%
71	Grassland/Herbaceous	Rural	2.96%	1.50%
81	Pasture/Hay	Rural	25.77%	0.64%
82	Cultivated Crops	Rural	0.34%	0.02%
90	Woody Wetlands	Rural	4.54%	2.17%
95	Emergent Herbaceous Wetlands	Rural	0.38%	0.87%
		TOTAL Rural	86.71%	10.40%
		Urban	13.29%	89.62%

Representative Monitor Data

- ▶ Detailed SOP
- ▶ <http://www.naviknow.com/2018/02/14/determine-background-concentrations-minutes/>
- ▶ Free online course
- ▶ <https://learn.naviknow.com/p/free-mini-course-selecting-representative-monitoring-data>

Unitized Emission Rate Modeling

- ▶ **A.K.A. Generic Modeling**
 - ▶ Model all sources at unit rate; 1 lb/hr or 1 g/sec
 - ▶ Create source groups with one source per group
 - ▶ Generate result set per source (source group)
 - ▶ Apply emission rates to results

Unitized Emission Rate Modeling

- ▶ Most appropriate when
 - ▶ Multiple sources AND
 - ▶ Multiple air contaminants to evaluate
 - ▶ Also, for multiple operating scenarios

Unitized Emission Rate Modeling

- ▶ **Benefits of this method**
 - ▶ One model run rather than dozens
 - ▶ Saves time and effort
 - ▶ Can use for source culpability analysis

Unitized Emission Rate Modeling

- ▶ Different levels of refinement
 - ▶ 1-D with SCREEN3 or AERSCREEN (why?)
 - ▶ 2-D with AERMOD PLOTFILE
 - ▶ 3-D with AERMOD MAXIFILE
 - ▶ Use threshold value of at most 1 E-06
 - ▶ Identical to fully refined

Unitized Emission Rate Modeling

▶ How to implement?

- ▶ Use 2-D or 3-D approach

- ▶ Don't use a spreadsheet

- ▶ Use a database to process output and results

▶ **For more details go to:** <http://www.naviknow.com/2018/04/18/unitized-dispersion-modeling/>

Using NK Tools

▶ What are NK Tools?

- ▶ File processing utilities from NaviKnow
- ▶ For quick thorough post-processing of results
- ▶ For QA/QC of model input
- ▶ For visualization of model input

Using NK Tools – AERMOD Input

- ▶ **Process AERMOD input files**
 - ▶ Combines ALL AERMOD input files into ONE file
 - ▶ Allows for standardized database queries
 - ▶ Checks for inconsistent input values
 - ▶ Checks for potentially out of range parameter values

Using NK Tools – BPIPPRM Input

- ▶ **Process BPIPPRM input files**
 - ▶ Creates CSV file for easy import to a database
 - ▶ Allows for standardized database queries
 - ▶ Checks for inconsistent input values between AERMOD and BPIPPRM
 - ▶ Create KML for data visualization

Using NK Tools – AERMOD Output

- ▶ **Process AERMOD PLOTFILES and MAXIFILES**
 - ▶ Creates ONE CSV file for easy import to a database
 - ▶ Allows for standardized database queries
 - ▶ Summaries of model result for entire project
 - ▶ Allows for source culpability analysis
 - ▶ Formats data for GIS or graphics applications

Thank You For Attending

- ▶ On Behalf of NaviKnow, Thank You!
 - ▶ Presenter: Robert Opiela, P.E.
- ▶ NaviKnow appreciates your time!

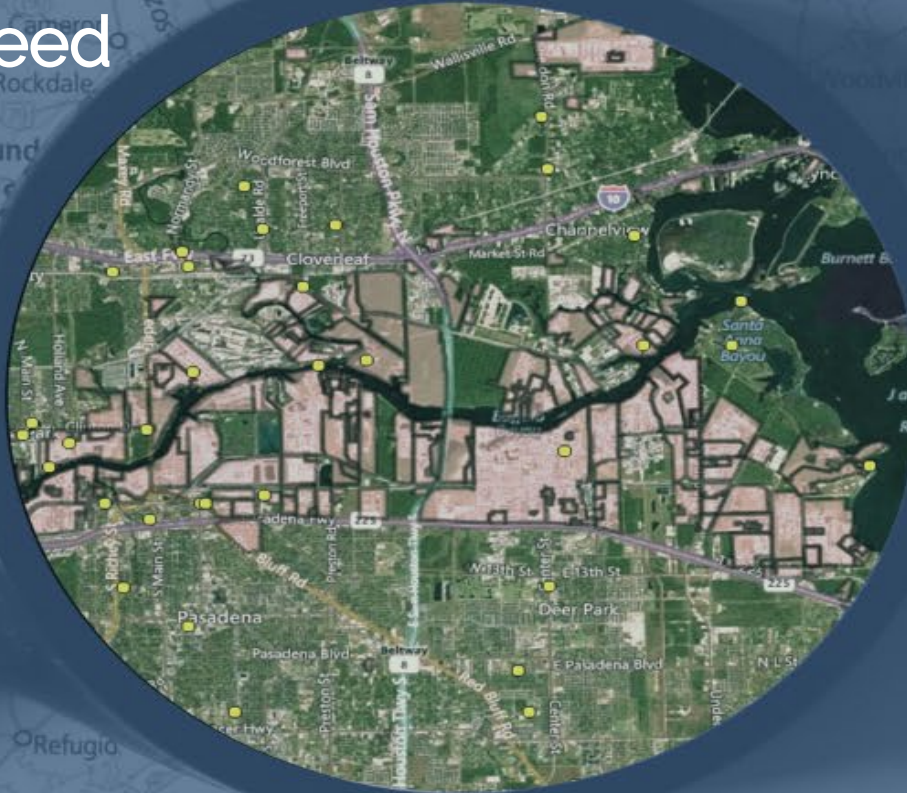
Thank You For Attending

- ▶ For any questions, comments, suggestions
 - ▶ Email: CEO@NaviKnow.com
 - ▶ Phone: (320) 500-1247
 - ▶ Website: <http://NaviKnow.com>
- ▶ See on Webinar Wednesday!

NaviKnow

Providing the information you need
and the tools to put it
into action

Questions and Answers



Email Questions to:
Support@NaviKnow.com