Overview of the PM Hot-spot Requirements and Guidance for Transportation Conformity

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Outline of Presentation

- Background on conformity requirements
- Overview of PM hot-spot guidance
- EPA and DOT training efforts

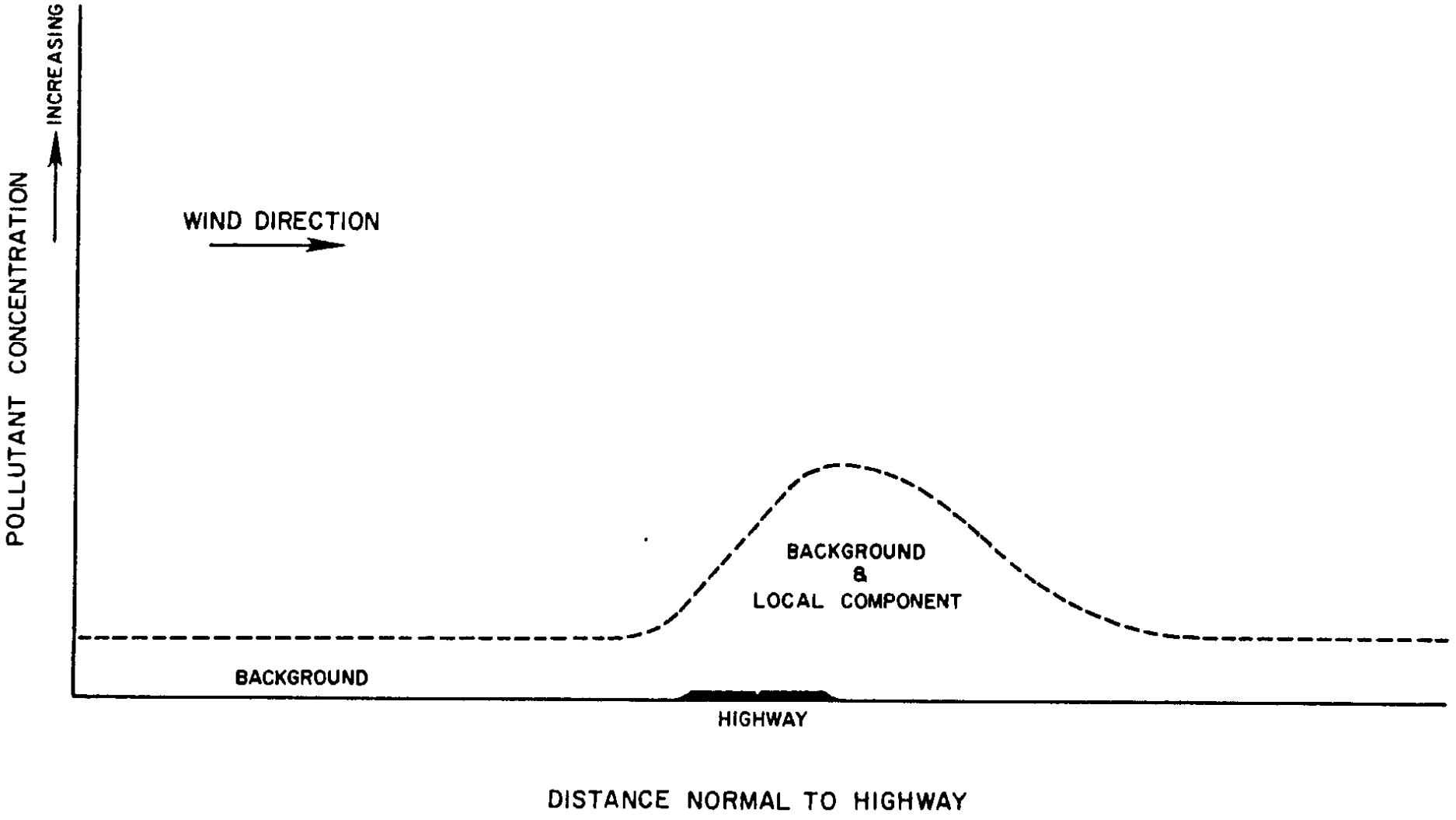
Statutory and Regulatory Requirements

- CAA section 176(c) requires that federally supported transportation projects in nonattainment and maintenance areas cannot:
  - Cause or contribute to new air quality violations,
  - Worsen existing violations, or
  - Delay timely attainment of the NAAQS or interim milestones

- Transportation conformity rule is at 40 CFR parts 51 and 93
  - Applies only in nonattainment and maintenance areas for transportation-related NAAQS

- Section 93.101 defines a **hot-spot analysis** as an estimation of likely future localized pollutant concentrations and a comparison to the relevant NAAQS
  - This is smaller than an entire nonattainment or maintenance area

Focus of PM Hot-spot Analysis



Relevant PM NAAQS

- PM hot-spot analyses are done only for the PM NAAQS for which the area is designated nonattainment or maintenance:
  - 1997 Annual $PM_{2.5}$ NAAQS – 15.0 µg/m^3
  - 1997 24-hour $PM_{2.5}$ NAAQS – 65 µg/m^3
  - 2006 24-hour $PM_{2.5}$ NAAQS – 35 µg/m^3
  - 1987 24-hour PM_{10} NAAQS – 150 µg/m^3

- Areas may be designated nonattainment for more than one PM NAAQS

Projects of Local Air Quality Concern

- Section 93.123(b)(1) requires a PM hot-spot analysis only for **projects of local air quality concern**
  - PM hot-spot analyses are ***not*** required for other projects

- Examples of projects that require a PM hot-spot analysis:
  - A project on a new highway or expressway that serves a significant volume of diesel truck traffic, such as facilities with greater than 125,000 AADT and 8% or more of such AADT is diesel truck traffic
  - New exit ramps and other highway facility improvements to connect a highway or expressway to a major freight, bus, or intermodal terminal
  - A major new bus or intermodal terminal that is considered to be a "regionally significant project" under section 93.101 that involves a significant number of diesel buses or trucks

How is Conformity Met in a Hot-spot Analysis?

Project meets conformity requirements, if at each appropriate receptor:

PM concentration of build ≤ NAAQS, *or*

PM concentration of build ≤ PM concentration of no-build

Example:

Conformity is met at a receptor in a 2006 $PM_{2.5}$ NAAQS area in either of these cases:

Build (with project)	34 µg/m^3
NAAQS:	35 µg/m^3

or, if:

Build (with project)	36 µg/m^3 (above the NAAQS)
No-build (without project)	37 µg/m^3

Guidance Reference: Section 2.4

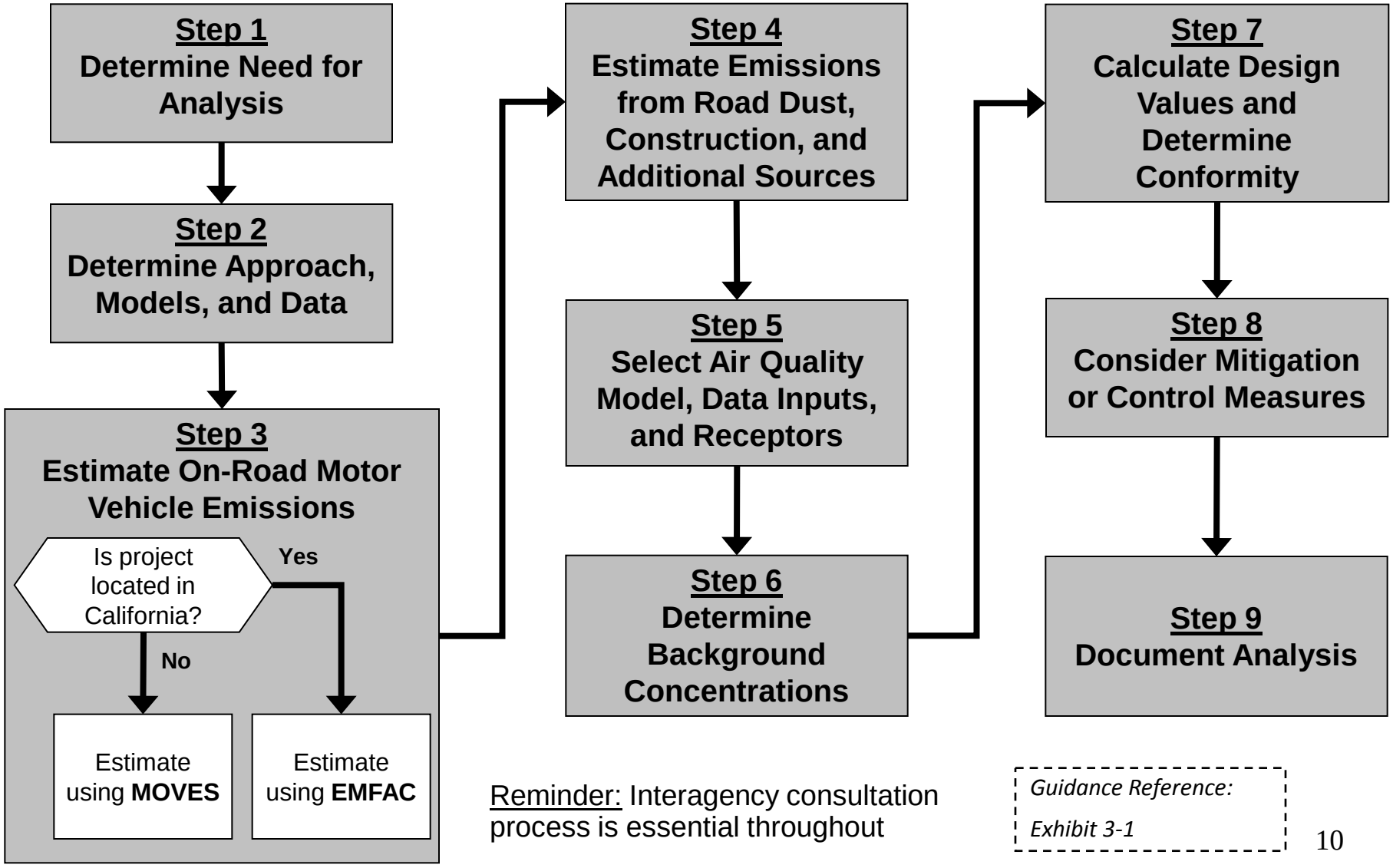
New Guidance and Models

- On December 20, 2010, EPA released PM Hot-spot Guidance
  - » *Transportation Conformity Guidance for Quantitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas*
- Guidance is consistent with existing regulations and guidance for conformity, the PM NAAQS, SIPs, and other regulatory programs
  - » Does not change the conformity requirements (such as what projects require PM hot-spot analyses)
- EPA also approved MOVES2010a for use in PM and CO hot-spot analyses and EMFAC2007 for PM hot-spot analyses in California
  - » 2-year conformity grace period ends December 20, 2012

When Are Quantitative PM Hot-spot Analyses Required?

- Beginning December 20, 2012, **quantitative** PM hot-spot analyses are required
  - » Exception: a **qualitative** PM hot-spot analysis begun before December 20, 2012 can be completed
- Until December 20, 2012:
  - » Any PM hot-spot analyses required can continue to be done qualitatively
  - » Quantitative analyses can be completed, if desired
- Hot-spot analysis grace period is separate from MOVES2010 grace period for regional conformity analyses

Completing a PM Hot-spot Analysis



Reminder: Interagency consultation process is essential throughout

Guidance Reference:

Exhibit 3-1

PM Hot-spot Analysis Requirements

- Section 93.116(a) requires that project cannot cause new NAAQS violations, worsen existing violations, or delay timely attainment over timeframe of transportation plan or regional conformity analysis

- Sections 93.110 and 93.111 requires hot-spot analyses to be based on latest planning assumptions and latest emissions models

- Section 93.105(c)(1)(i) requires interagency consultation procedures to be used to “evaluate and choose models and associated methods and assumptions”

- Section 93.123(c) includes general requirements for PM hot-spot analyses

General Regulatory Requirements

Section 93.123(c) requires that PM hot-spot analyses must:

- Estimate the **total emissions** burden of direct PM emissions: project and background
- Include the **entire transportation project**, after identifying the major design features that will significantly impact local concentrations
- Use **assumptions consistent with** those used in regional emissions analyses for inputs required in both analyses (e.g., temperature, humidity)
- Assume mitigation or control measures only where **written commitments** have been obtained
- Consider emissions increases from **construction-related activities only** if they occur during the construction phase and last more than five years at any individual site
  - » PM hot-spot analyses are not required to consider **temporary** increases

Determining the Geographic Area

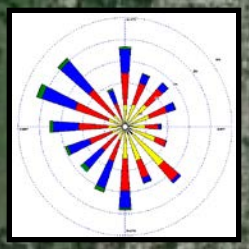
- PM hot-spot analyses must examine “area substantially affected by the project”
  - » Referred to in guidance as “the project area”
- Determined on a case-by-case basis
- Must include entire project
  - » For large projects, may be appropriate to focus on locations of highest AQ concentrations
- Also need to consider what other emission sources are located near the project, including “nearby sources”
- Questions regarding the scope of the analysis can be determined through interagency consultation

Guidance Reference:

Section 3.3.2

Example of Project Area

Hypothetical situation



1/2 mile

500 m

Roads affected by project

Emissions modeling

Project area

Air quality modeling

Analysis Year(s) and Quarters Evaluated

- Need to choose an analysis year(s) during when:
  - » Peak emissions **from project** are expected, and
  - » New or worsened violation would most likely occur due to cumulative impacts **of project and background concentrations**

- Need to consider changes in vehicle fleets, traffic volumes, speeds, VMT, and expected trends in background concentrations in project area and impacts of any nearby sources (e.g., those affected by project)

- A hot-spot analysis for the **annual PM NAAQS** would cover all 4 quarters of the analysis year

- Hot-spot analyses for the **24-hour PM_{10} or $PM_{2.5}$ NAAQS** would typically cover all 4 quarters of the analysis year, unless future violations and peak emissions are expected for one quarter

Guidance Reference:

Section 2.8. 3.3.3, & 3.3.4

Data, Models, and Methods

- Latest planning assumptions at time of analysis required
  - » Project-specific data for both emissions and AQ modeling is critical
- Latest emissions models required (pending grace period)
  - » MOVES2010a
  - » EMFAC2007 in California
  - » For future model releases, EPA will explain how and when new models and revisions apply for PM hot-spot analyses
- When applicable, complete emissions modeling for dust (e.g., AP-42) or nearby sources affected by the project (e.g., locomotives at an expanded freight terminal)
- Important to select AQ model early in process (needed to prepare emissions modeling)
  - » AERMOD
  - » CAL3QHCR

Guidance Reference:

Sections 3.3.6 &3.3.7

General MOVES Guidance

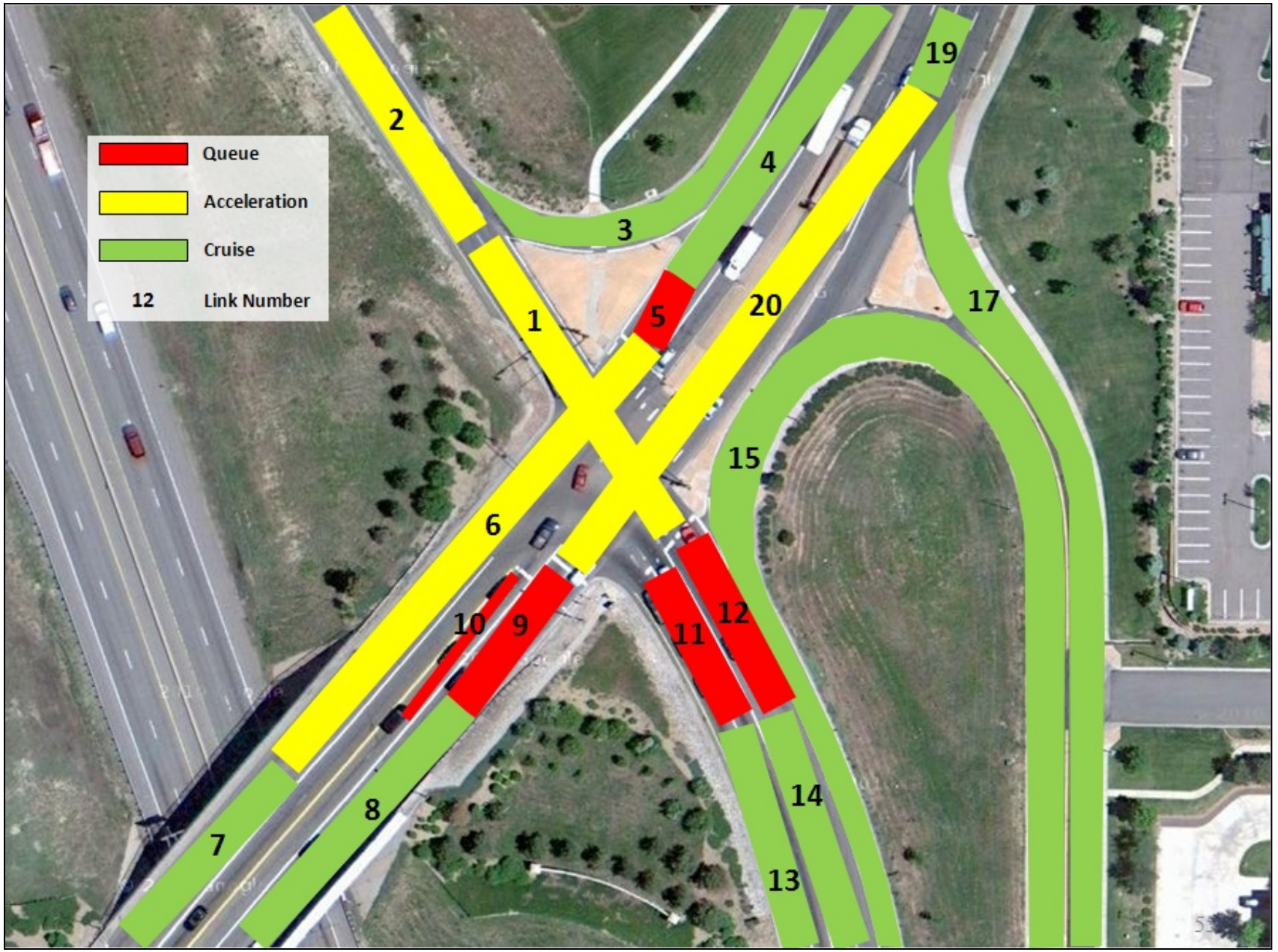
- Define a project's links in MOVES to accurately capture emissions where they occur
- Include segments with similar traffic/activity conditions and characteristics
- In general, the definition of a link will depend on how much the vehicle activity (accel, decel, cruise, or idle) changes over the length of roadway, data availability, and the modeling approach used

Guidance Reference:

Section 4.2

Defining MOVES Links (with Average Speed)

Defining MOVES Links (with Average Speed)



General Overview of Air Quality Modeling

- Includes:
  - Selecting the air quality model
  - Characterizing emissions sources
  - Obtaining meteorological (met) data
  - Specifying receptors in project area
  - Running the AQ model

- PM Hot-spot Guidance is consistent with the recommendations for AQ modeling in 40 CFR 51, App. W

- Project sponsors will need to refer to the latest user guides and available guidance for complete instructions

Selecting an Appropriate Air Quality Model

Type of Project	Recommended Model
Highway and intersection projects	AERMOD, CAL3QHCR
Transit, freight, and other terminal projects	AERMOD
Projects that involve both highway/intersections and terminals, and/or nearby sources	AERMOD

- Recommendations are consistent with EPA's current recommended models in 40 CFR Part 51, App. W, approved models on SCRAM
- CAL3QHC is not appropriate for modeling refined PM hot-spot analyses

Guidance Reference:
Exhibit 7-2 & Sec. 7.3.1

Types of Emission Sources

	Line Source	Point Source	Area Source	Volume Source
Different source types can be used in a hot-spot analysis to represent…	• Highways and intersections	• Bus garage or transit terminal exhaust stacks	• Transit or freight terminals • Parking lots • Highways and intersections	
Model	AERMOD* CAL3QHCR	AERMOD	AERMOD	

*AERMOD can simulate line sources using a series of adjacent area or volume sources.

- For AQ modeling, physical characteristics and locations are assigned to the links developed for emissions modeling in MOVES
- Timing of emissions – use approach for MOVES runs in AQ modeling

Guidance Reference:

Sect 7.3.2, 7.4, App J.3.3-3.5

Selecting Meteorological Data For Air Quality Modeling

- **Using meteorological (met) data representative of project area is critical for PM hot-spot analyses**
  - Key factor in producing credible results
- Following met data is typically required…
  - Upper air data
  - Surface data
  - Surface characteristics
  - Population data to account for urban heat island effect
- State and local air agencies have experience finding representative met data
  - May have preprocessed met data available (typically for use with AERMOD)

Guidance Reference:

Section 7.5

What Do Background Concentrations Include?

- Background concentrations are those emissions not from the project that also affect the project area
  - From **nearby sources** and **other sources**

- **Nearby sources:** Individual sources other than the project that contribute to ambient PM concentrations in the project area; in general only included in AQ modeling when affected by the project
  - Example: a port, rail yard, or intermodal terminal where emissions will increase as result of a highway project

- **Other sources:** Emissions not from project or any nearby source that is modeled

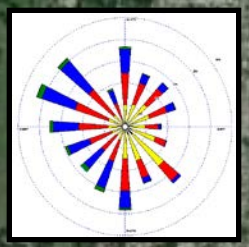
- State and local AQ agencies and EPA Regions are key resources

Guidance Reference:

Section 8.1

Example of Project Area with Nearby Source Modeled

Hypothetical situation



1/2 mile

500 m

Roads affected by project

Emissions modeling

Project area

Air quality modeling

Background for Other Sources

- Options include:
  1. Using data from one or more air quality monitors
  2. Using a chemical transport model (CTM)
  3. Using an on-road mobile source adjustment factor
  4. Other options as considered by EPA

- Use same background concentrations for build and no-build scenarios at all receptors

Guidance Reference:

Section 8.3

Example:

Selecting a representative monitor

Hypothetical situation

Downwind and further away, dissimilar source mix

3

Close and upwind w/similar mix of sources

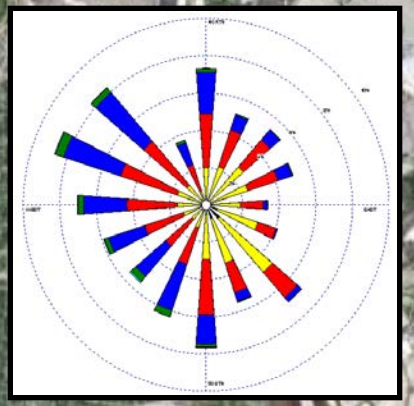
2

Project area

May be best choice

Close and upwind, but dissimilar source mix

1



1 Mile

Calculating Design Values and Determining Conformity

- For conformity purposes, a "design value" is a statistic that describes future air quality concentrations in the project area that can be compared to a particular NAAQS
- Calculated by combining:
  - Results of AQ model (project and nearby source concentrations) ***with***
  - Representative background concentrations
- Each NAAQS calculates design values differently
- Result of this step: design values for the project that are then used to determine if project conforms
- EPA has developed tips for calculating design values, including a MySQL script for the 24-hour $PM_{2.5}$ NAAQS

Guidance Reference:

Section 3.8 & 9

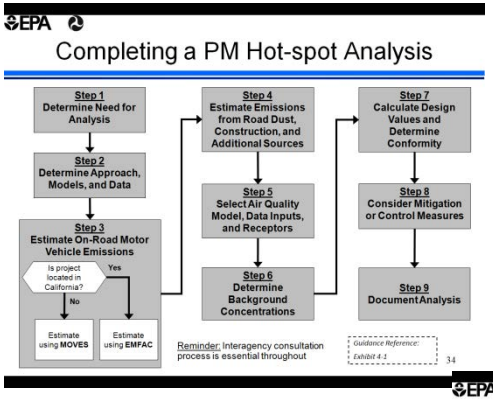
PM Hot-spot Training: 3-Day Course

- EPA and FHWA have developed a 3-day technical course that focuses on applying models for conformity PM hot-spot analyses:
  - MOVES at the project scale (EMFAC in CA)
  - AERMOD, and
  - CAL3QHCR

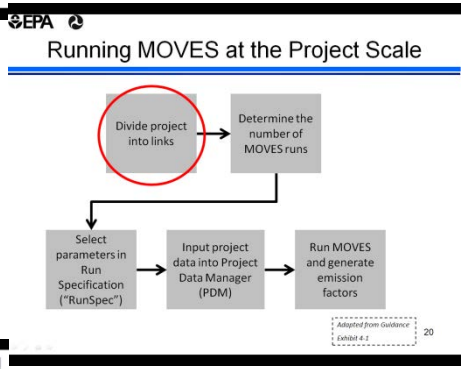
- Course includes:
  - Additional tools & tips
  - Simple hands-on exercises to apply models
  - “Example analysis” to demonstrate how models used in practice

Course Outline: Day 1

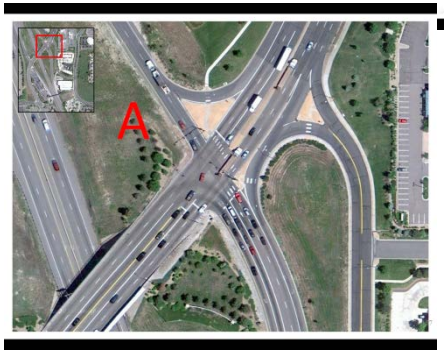
Module 1: Overview of PM Hot-Spot Analysis Requirements and Process



Module 2: Using MOVES at the Project Level



Begin the *example analysis* using MOVES

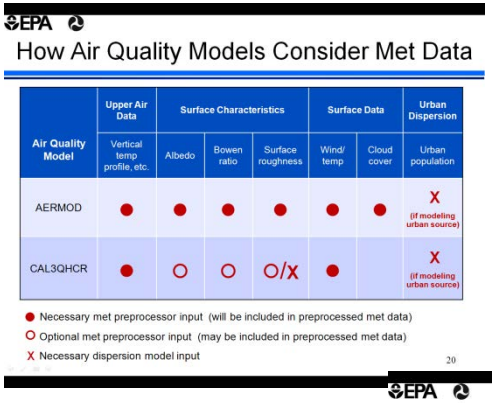


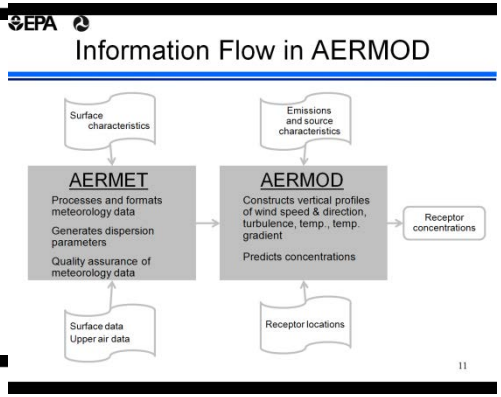
Course Outline: Day 2

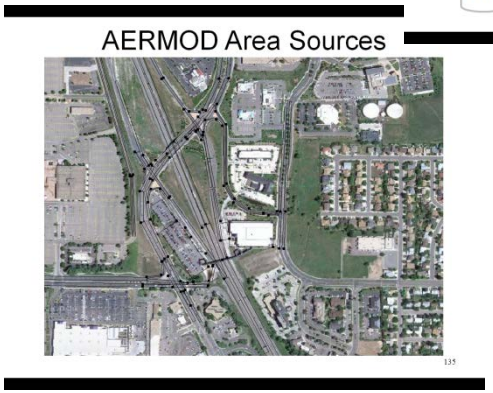
Module 3: Selecting an Air Quality Model, Data Inputs, and Receptors

Module 4: Using AERMOD for PM Hot-Spot Analyses

Continue the *example analysis* using AERMOD







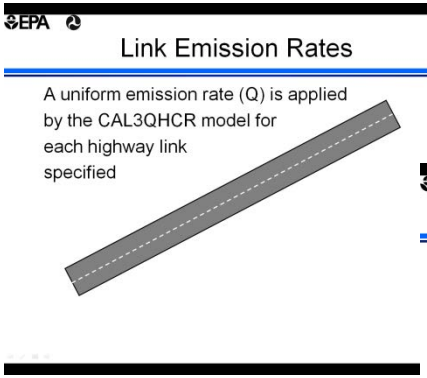
Course Outline: Day 3

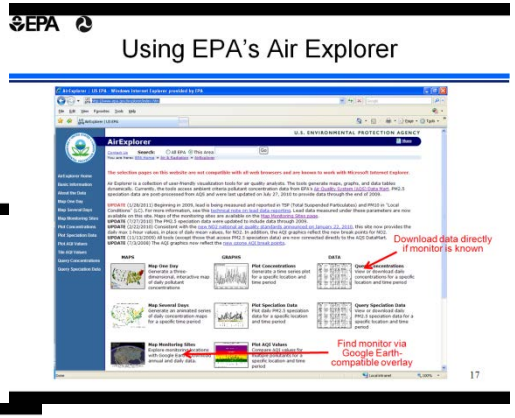
Module 5: Using CAL3QHCR for PM hot-spot analyses (continue the *example analysis*)

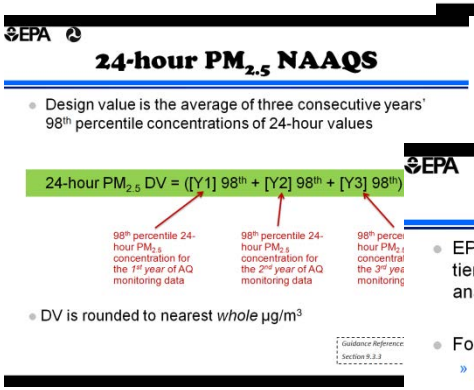
Module 6: Determining Background Concentrations

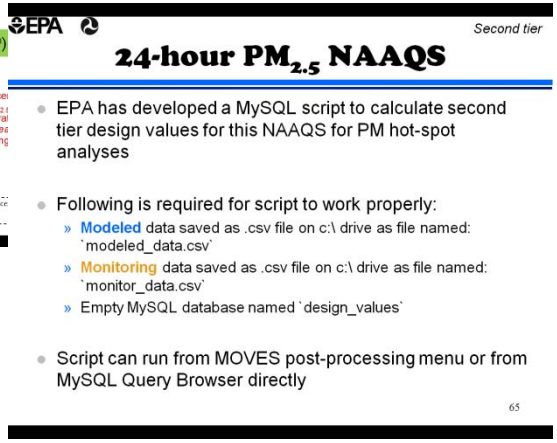
Module 7: Calculating Design Values and Determining Conformity

Calculate design values for the *example analysis*









PM Hot-spot Training: 3-Day Course

- Seven trainings have been done so far:
  - Columbus, Seattle, Newark, Sacramento, Atlanta, Phoenix, Baltimore
- Currently determining other dates & locations
  - Email us at conformity-hotspot@epa.gov with potential training locations
  - Contact Meg Patulski at (734) 214-4842 or patulski.meg@epa.gov
- Website will be updated as dates/locations are determined
  - See www.epa.gov/otaq/stateresources/transconf/training.htm
  - Emails also to be sent to stakeholder groups, TRB, and via EPA's mobile listserver

For More Information

- See EPA's conformity website for:
  - Regulations, policy guidance, FR notices, training
  - www.epa.gov/otaq/stateresources/transconf/policy.htm#project
- See EPA's MOVES website for:
  - Software, MOVES MySQL scripts, technical documentation, and other helpful background materials
  - www.epa.gov/otaq/models/moves/
- Questions?
  - Specific questions on a particular project analysis
    - Contact appropriate EPA Region or DOT field office
  - General questions on PM hot-spot guidance
    - patulski.meg@epa.gov
  - Technical questions about guidance document
    - conformity-hotspot@epa.gov