

# Completing Quantitative PM Hot-spot Analyses: 3-Day Course

*U.S. Environmental Protection Agency*

# Welcome

- Course Introduction
- Acknowledgements
- Breaks, lunch, and other logistics

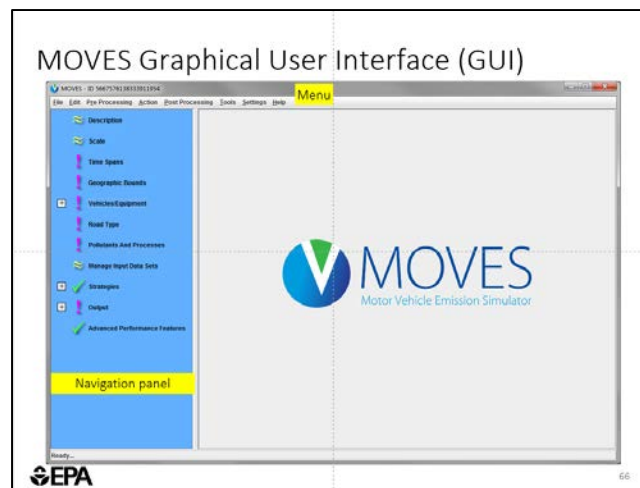
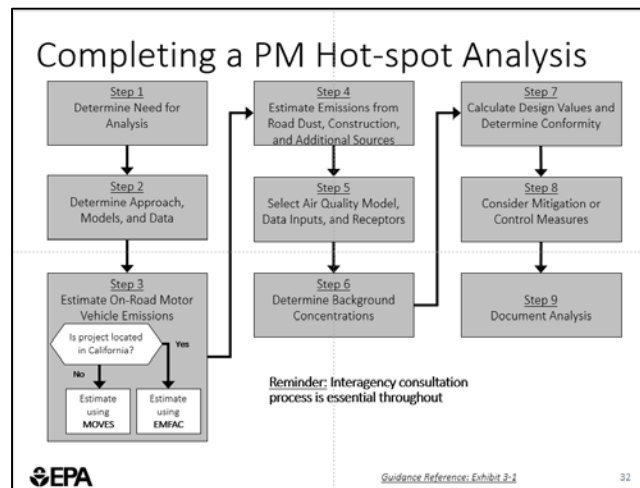
# Course Introduction

# About this Course

- This course describes how to complete a quantitative PM hot-spot analysis in accordance with EPA's current guidance
  - Relevant guidance sections noted on slides (see slide footers)
  - Includes references for appropriate model user guides and implementation guides
- Course includes both presentations and hands-on exercises
  - Slides cover hands-on material, for later reference
- The course uses a hypothetical "example analysis" for many hands-on portions
  - Same example continues through all analysis steps

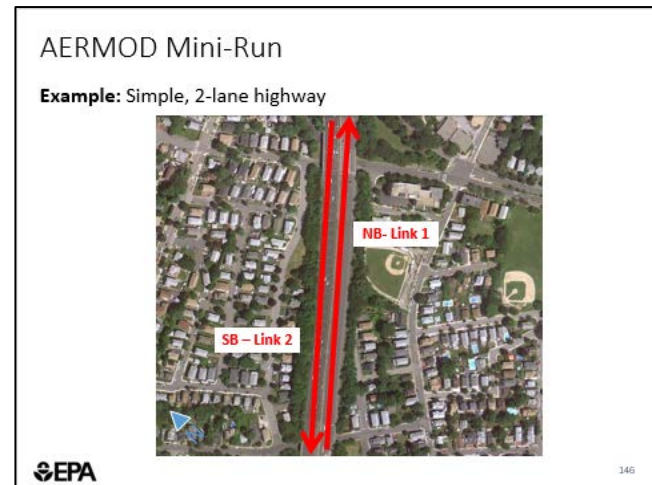
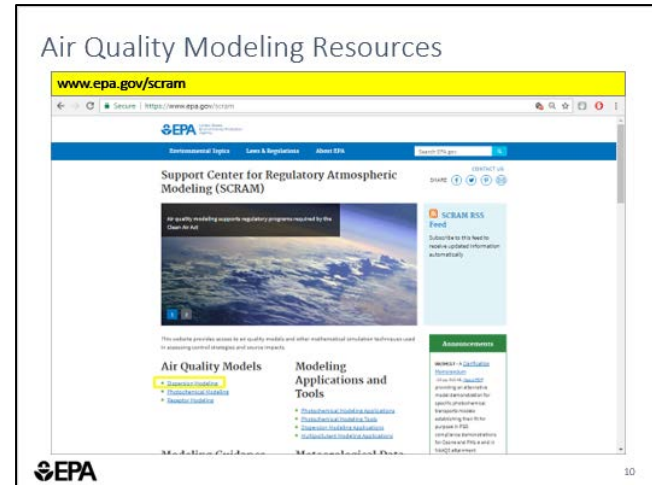
# Syllabus – Day 1

- Module 1: General PM Hot-spot Analysis Requirements and Overview
- Module 2: Using MOVES for PM Hot-spot Analyses
  - Complete a “mini-MOVES run”
  - Use MOVES to model the example analysis



# Syllabus – Day 2

- Module 3: Selecting an Air Quality Model, Data Inputs, and Receptors
- Module 4: Using AERMOD for PM Hot-spot Analyses
  - Complete a “mini-AERMOD run”
  - Use AERMOD to model the example analysis



# Syllabus – Day 3

- [Module 5: Using CAL3QHCR for PM Hot-spot Analyses]
  - **NOTE:** Reference material provided but topic is not covered in the in-person component of this training
- Module 6: Determining Background Concentrations
- Module 7: Calculating Design Values and Determining Conformity
  - Complete example analysis

Link Emission Rates

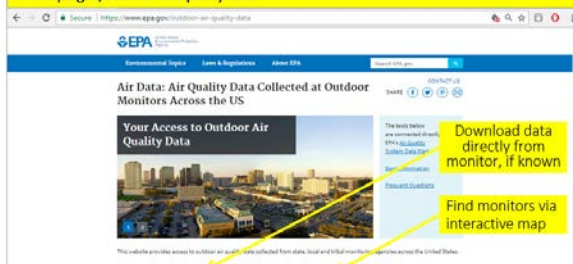
Uniform emission rate,  
Free-flowing vehicles

EF = Emission factor

TV = Traffic volume

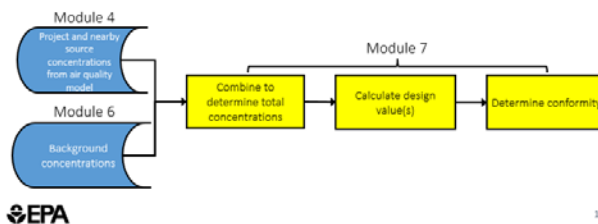
## Using EPA's AirData Website

[www.epa.gov/outdoor-air-quality-data](http://www.epa.gov/outdoor-air-quality-data)



## Determining DVs for the Example Analysis

- We have outputs from AERMOD from Module 4 and representative background data from Module 6
- We will combine these inputs to determine design values and conformity for the project



# Not covered in this course...

- Carbon monoxide (CO) hot-spot analyses or other types of project-level analyses
- Everything in the PM Hot-spot Guidance
  - You still need to read and reference it when completing analyses in the field
  - Example: Specific information on when interagency consultation is required or suggested
- A complete overview of MOVES or other models (air quality modeling, etc.)
  - Visit EPA's Project-Level Conformity and Hot-Spot Analysis website for more information and training opportunities
    - [www.epa.gov/state-and-local-transportation/project-level-conformity-and-hot-spot-analyses](http://www.epa.gov/state-and-local-transportation/project-level-conformity-and-hot-spot-analyses)



# Background on Quantitative PM Hot-spot Conformity Guidance

# Guidance and Models - History

- EPA initially released two technical guidance documents in the *Federal Register* on December 20, 2010:
  - *Transportation Conformity Guidance for Quantitative Hot-spot Analyses in  $PM_{2.5}$  and  $PM_{10}$  Nonattainment and Maintenance Areas*
    - Referred to as the “PM Hot-spot Guidance” in this course
  - *Using MOVES in Project-Level Carbon Monoxide Analyses*
    - Not covered in this course
- Also on December 20, 2010, EPA announced the availability of MOVES for use in PM and CO hot-spot analyses
  - Quantitative PM hot-spot analyses have been required since the end of the 2-year grace period, December 2012

# Guidance and Models - Latest

- Guidance updates:
  - The most recent version of the [PM Hot-spot Guidance](#) was released [November 2015](#)
  - The most recent version of “*Using MOVES in Project-Level Carbon Monoxide Analyses*” was released March 2015
    - Not covered in this course
- EPA announced the availability of MOVES2014 for use in PM and CO hot-spot analyses on October 7, 2014 (79 FR 60343)
  - 2-year conformity grace period ended October 7, 2016
  - Use MOVES2014/2014a for all new PM hot-spot analyses (outside California)
  - The most recent version of MOVES is [MOVES2014a](#)

# PM Hot-spot Guidance

- Describes how to complete a quantitative hot-spot analysis in PM<sub>2.5</sub> and PM<sub>10</sub> nonattainment and maintenance areas for transportation conformity
- **Does not change the conformity requirements** (such as what projects require PM hot-spot analyses)
- Is consistent with existing regulations and guidance for conformity, the PM National Ambient Air Quality Standards (NAAQS), state implementation plans (SIPs), and other regulatory programs
- Was developed in coordination with the US Department of Transportation (DOT)

# Who should use the guidance?

- Agencies performing hot-spot analyses (“project sponsors”):
  - State DOTs, transit agencies
- Agencies providing data/technical support:
  - State and local AQ agencies, MPOs, EPA and DOT field offices
- Agencies reviewing and commenting on PM hot-spot analyses:
  - EPA and DOT field offices
  - Other state and local agencies
  - General public

# For More Information

- See EPA's conformity website for regulations, policy guidance, *Federal Register* notices, training, etc.
  - [www.epa.gov/otaq/stateresources/transconf/policy.htm#project](http://www.epa.gov/otaq/stateresources/transconf/policy.htm#project)
- See EPA's MOVES website for software downloads, technical documentation, and other helpful background materials
  - [www.epa.gov/otaq/models/moves/](http://www.epa.gov/otaq/models/moves/)
- For specific questions on a particular project analysis, contact the appropriate EPA Regional Office, FHWA Division Office, and/or FTA Regional Office

# Module 1

## General PM Hot-spot Analysis Requirements and Overview

# Module Overview

- Transportation conformity basics for PM hot-spot analyses
- Quantitative PM hot-spot analysis process
- Class Exercise: Selecting the Analysis Year(s)



# Key References

- [Clean Air Act section 176\(c\)](#)
- [Transportation conformity regulations \(40 CFR Part 93\)](#)
- [PM Hot-spot Guidance](#), Sections 1-3
- Common Acronyms in this Module
  - NAAQS – National Ambient Air Quality Standards
  - AQ – Air Quality
  - PM – Particulate Matter
  - DVs – Design Values

# Transportation Conformity: Hot-spot Analysis Basics

# Statutory and Regulatory Requirements

- CAA section 176(c) requires that federally supported transportation plans, transportation improvement programs (TIPs) and 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
- Conformity determinations for transportation plans and TIPs are separate and different actions from conformity determinations for individual projects

# Statutory and Regulatory Requirements

Conformity determinations for transportation plans and TIPs must:

- Be done before a new or amended transportation plan or TIP is approved by the MPO or accepted by DOT (40 CFR 93.104)
- Include emissions from the entire planned transportation network in the nonattainment or maintenance area (40 CFR 93.122)
- Be based on the latest planning assumptions (40 CFR 93.110) and latest emissions model (40 CFR 93.111)
- Be determined according to applicable consultation procedures (40 CFR 93.112)
- Meet other applicable conformity requirements

# Statutory and Regulatory Requirements

Conformity determinations for federal projects, i.e., projects that receive either FHWA or FTA funding or approval, must:

- Be found to conform before they are adopted, accepted, approved, or funded (40 CFR 93.104(d))
- Be from the currently (or most recently) conforming transportation plan and TIP (40 CFR 93.114, 93.115, 93.104(f))
- Be re-determined if one of the following occurs:
  - A significant change in project's design concept and scope
  - 3 years elapse since the most recent major step (major steps include NEPA process completion, start of final design, acquisition of a significant portion of the right of way; and construction (including federal approval of plans, specifications, and estimates)
  - Initiation of a supplemental environmental document for air quality purposes (40 CFR 93.104(d))
- Meet other applicable conformity requirements

# Statutory and Regulatory Requirements

- Most projects in PM<sub>2.5</sub> and PM<sub>10</sub> nonattainment and maintenance areas do not require a quantitative PM hot-spot analysis
- Conformity regulation section 93.123(b)(1) requires a PM hot-spot analysis as a part of a project-level conformity determination **only for projects of local air quality concern**
  - Example: new or expanded highway/transit projects with a significant number/significant increase in diesel vehicles (details later in this module)
  - PM hot-spot analyses are NOT required for other projects
- PM Hot-spot Guidance does not change existing PM hot-spot requirements

# Brief Comparison of Conformity Analysis Types

Transportation plan and TIP –

## *Regional Emissions Analysis:*

- ❑ Latest planning assumptions
- ❑ Latest emissions model
- ❑ Interagency consultation
- ❑ Covers the nonattainment or maintenance area
- ❑ Includes all projects in the area (entire network)
- ❑ Based on *emissions*: compared to emissions in SIP, base year emissions, or no-build emissions

Federal project –

## *PM Hot-spot Analysis*

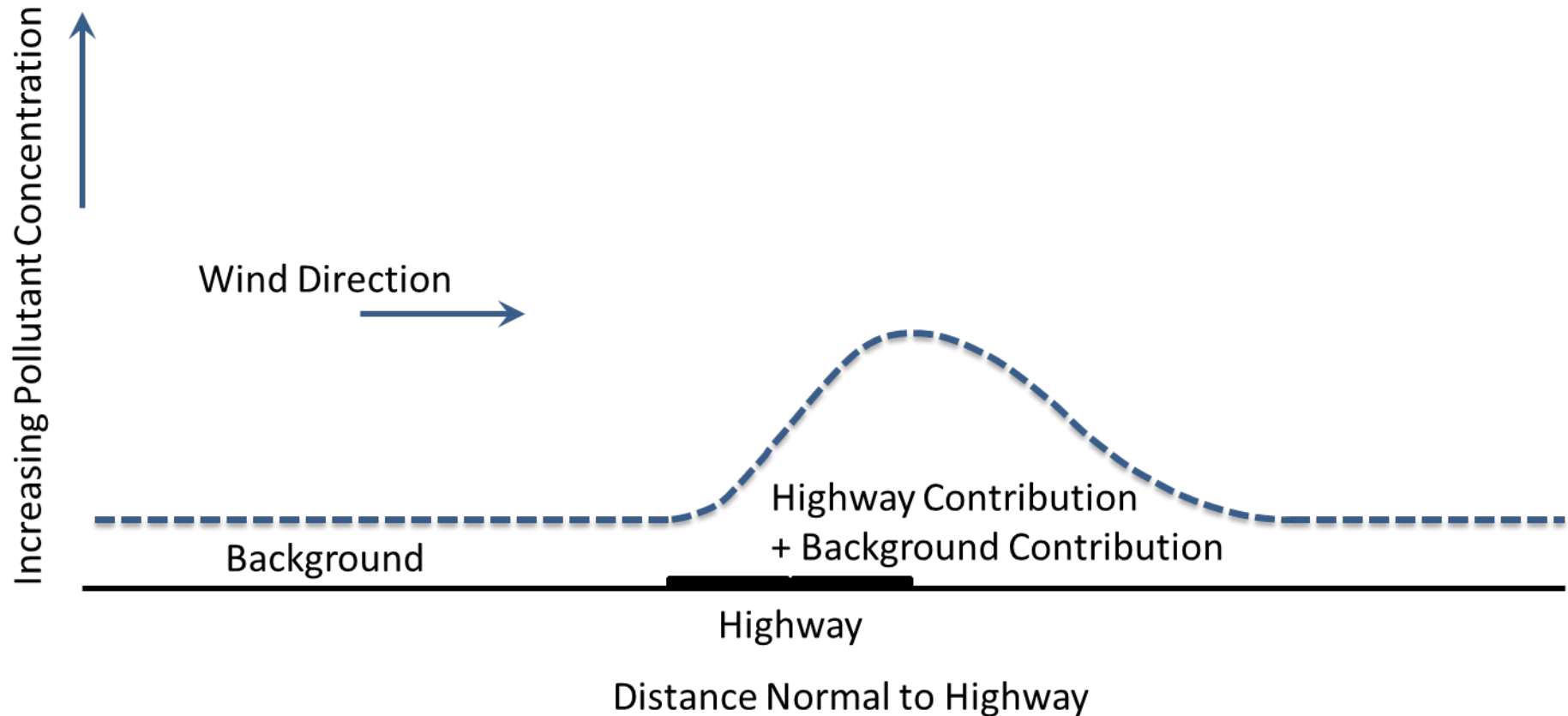
- ❑ Latest planning assumptions
- ❑ Latest emissions model
- ❑ Interagency consultation
- ❑ Covers only the area around the project
- ❑ Includes just the project and other sources affected by project
- ❑ Based on air quality *concentrations*: compared to NAAQS or no-build concentrations

# What is a hot-spot analysis?

- Conformity regulation 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
  - Assesses air quality impacts in the area substantially affected by the project
- When required, included within a project-level conformity determination



# Focus of PM Hot-spot Analysis



# When would a PM hot-spot analysis be done?

If one is needed\*, an analysis would be done for a project:

- After the transportation plan and TIP that include the project are adopted and determined to conform
- As part of the project-level conformity determination
- Usually within NEPA process, since NEPA analysis includes the air quality impacts of the project
  - Conformity requirements must be met prior to NEPA process completion
  - However, conformity is not a NEPA requirement – it's a Clean Air Act requirement

\* *We will cover what projects need a hot-spot analysis later in this module*

# Key Hot-spot Analysis Requirements

- Section 93.116(a) requires that project cannot cause new NAAQS violations, worsen existing violations, or delay timely attainment of the NAAQS or required interim milestone(s)
- Section 93.123(b)(1) requires that the hot-spot demonstration be based on quantitative analysis methods
  - Section 93.105(c)(1)(i) requires interagency consultation to “evaluate and choose models and associated methods and assumptions”
  - Section 93.110 requires hot-spot analyses to be based on latest planning assumptions
  - Section 93.111 requires hot-spot analyses to be based on the latest emissions model
- Section 93.123(c) includes general requirements for PM hot-spot analyses (more next slide)

# 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

# Interagency Consultation

- Consultation is an important tool for PM hot-spot analyses
- Interagency consultation procedures must be used to determine models and associated methods and assumptions for things like:
  - The geographic area covered by the analysis
  - The emissions models used in the analysis
  - Whether/how to estimate road and construction dust emissions
  - The nearby sources considered, background data used, and air quality model chosen, including the background monitors/ concentrations selected, and any interpolation methods used
  - The appropriateness of receptors to be compared to the annual PM<sub>2.5</sub> NAAQS
- See guidance for details

# Public Participation

- Section 93.105(e) requires agencies completing project-level conformity determinations to provide opportunity for public review and comment
- NEPA public involvement process typically used to satisfy this requirement
- If hot-spot analysis is performed after NEPA completed, public review requirement still needs to be met
  - Agencies have flexibility to decide on specific procedures
  - Consult with EPA/DOT for additional guidance

# Details on Hot-spot Analyses

- As noted earlier, a project cannot:
  - cause new NAAQS violations,
  - worsen existing violations, or
  - delay timely attainment of the NAAQS or required interim milestone(s)
- A hot-spot analysis is a build/no-build analysis comparing AQ concentrations of the project **build** scenario to either
  - the **NAAQS**, or
  - to AQ concentrations of the project **no-build** scenario
- **Build** and **no-build** scenarios are for the same future analysis year(s)
  - **Build** – conditions as if project was completed in the future analysis year(s)
  - **No-build** – conditions without project projected in the same future analysis year(s)

# How Is Conformity Met in a Hot-spot Analysis?

- Project meets conformity if at each appropriate receptor:
  - PM concentration of **build**  $\leq$  NAAQS, or
  - PM concentration of **build**  $\leq$  PM concentration of **no-build**
- For example:
  - Conformity is met at a receptor in a 2006 PM<sub>2.5</sub> NAAQS area in either of these cases:
    - **Build** 34  $\mu\text{g}/\text{m}^3$
    - NAAQS 35  $\mu\text{g}/\text{m}^3$  or, if:
      - **Build** 36  $\mu\text{g}/\text{m}^3$  (above the NAAQS)
      - **No-build** 37  $\mu\text{g}/\text{m}^3$



# Suggested Approach for Analyses

- Start with **build** scenario...follow steps to run models & calculate design values
  - If **build** DVs  $\leq$  NAAQS, conformity is met
- If **build** DVs  $>$  NAAQS, then:
  - Add mitigation/control measures and redo analysis, or
  - Calculate **no-build** scenario DVs
    - If **build** DVs  $\leq$  **no-build** DVs, conformity is met
- Measures can be added at any point in the process

# Refined PM Hot-spot Analyses

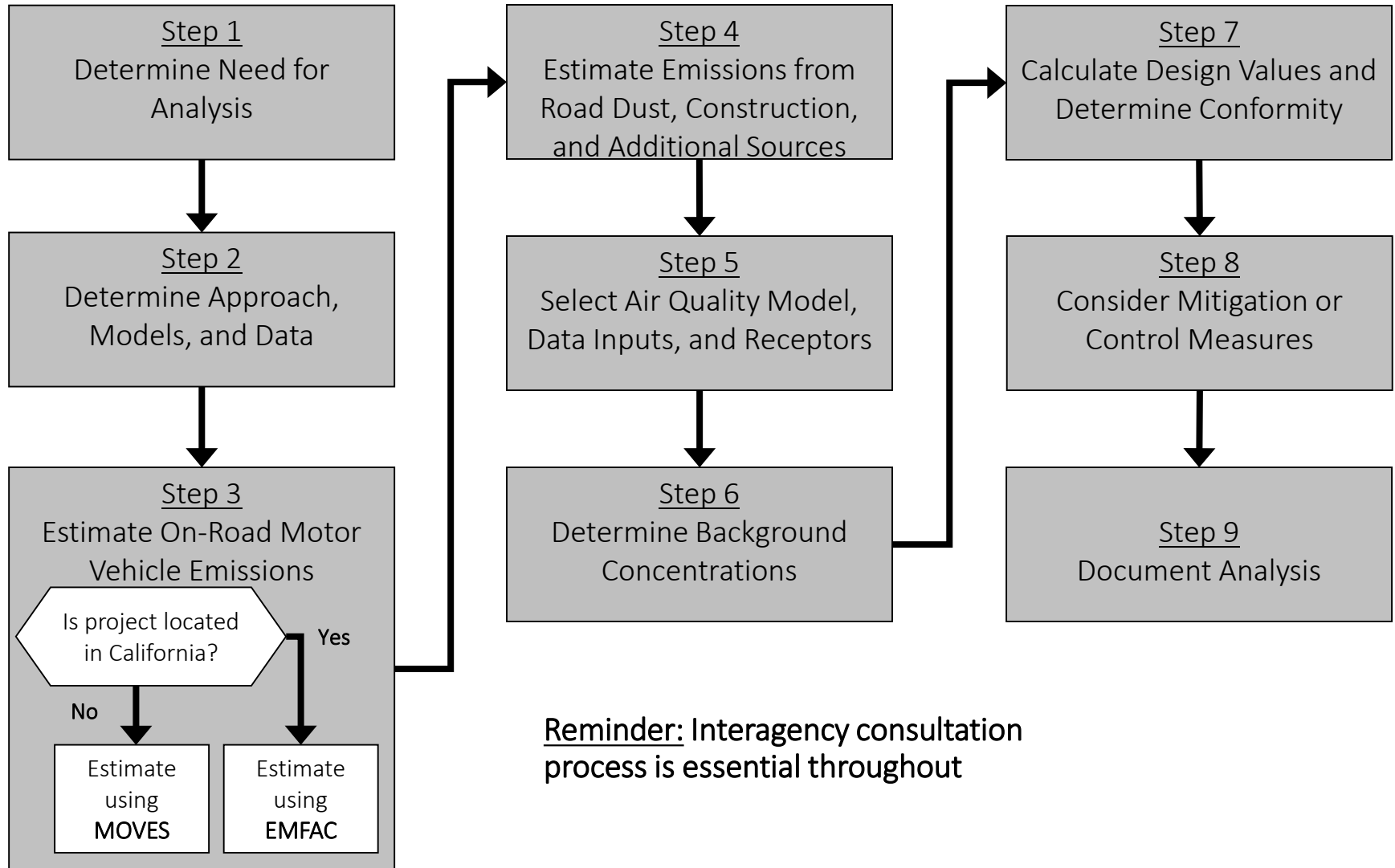
- PM Hot-spot Guidance focuses on refined PM hot-spot analyses, rather than screening analyses
  - Refined analyses rely on detailed local information for build and no-build scenarios
  - Screening analyses are based on worst case conditions for build scenario only
- Refined PM hot-spot analyses necessary due to complex nature of PM emissions, statistical form of each NAAQS, and temperature variability over a year
  - Much different than air quality modeling for CO NAAQS

# More on Refined Analyses

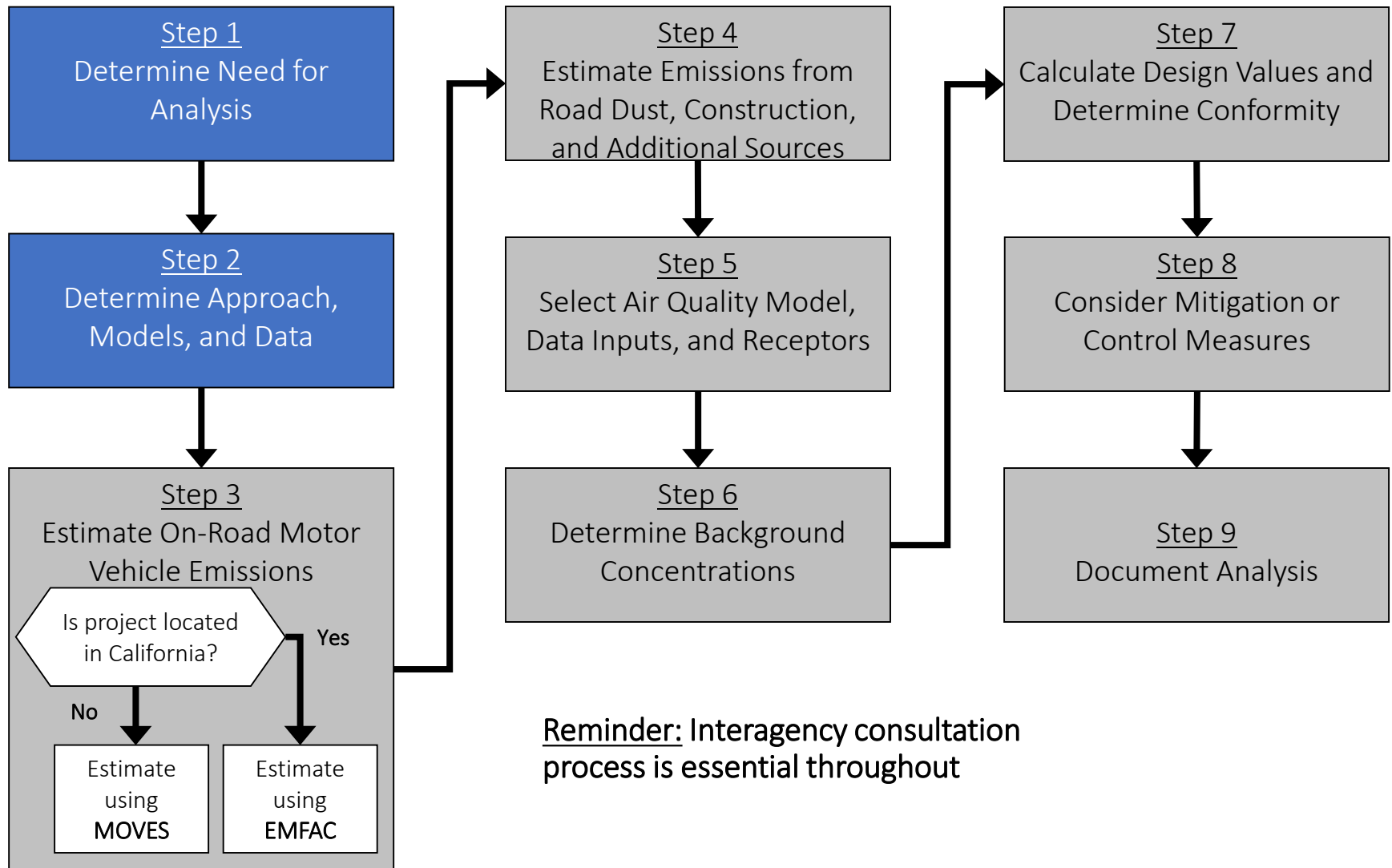
- Note that emissions modeling, air quality modeling, and representative background are all necessary
  - Cannot compare only build to no-build concentrations
- Some flexibilities and tools simplify the process, e.g.,
  - Calculating design values for the highest receptor (covered later)
- See guidance for examples of cases where a screening analysis or components may be appropriate
  - Consult with EPA Regional Offices, EPA Office of Transportation Air Quality (OTAQ), & EPA Office of Air Quality Planning & Standards (OAQPS) if screening analysis option considered

# Overview of the PM Hot-spot Analysis Process

# Completing a PM Hot-spot Analysis



# Completing a PM Hot-spot Analysis



**Reminder:** Interagency consultation process is essential throughout

# Step 1: Determining Need for Analysis

- PM hot-spot analyses required **only for projects of local air quality concern** (40 CFR 93.123(b)(1))
- Details on next slides
- Hot-spot analyses are NOT required for other projects
  - Note, if a project does not need a hot-spot analysis, that does **not** mean it is exempt from conformity altogether per 40 CFR 93.126
- PM Hot-spot Guidance does not affect existing consultation procedures for determining which projects require a PM hot-spot analysis
  - Use interagency consultation procedures to make decisions

# Projects of Local Air Quality Concern

(i) New highway projects that have a **significant number of diesel vehicles**, and expanded highway projects that have a **significant increase in the number of diesel vehicles**

(ii) Projects affecting intersections that are at Level-of-Service D, E, or F with a **significant number of diesel vehicles**, or those that will change to Level-of-Service D, E, or F because of increased traffic volumes from a **significant number of diesel vehicles** related to the project





# Projects of Local Air Quality Concern

(iii) New bus and rail terminals and transfer points that have a **significant number of diesel vehicles** congregating at a single location

(iv) Expanded bus and rail terminals and transfer points that **significantly increase the number of diesel vehicles** congregating at a single location

(v) Projects in or affecting locations, areas, or categories of sites which are **identified in the PM<sub>2.5</sub> or PM<sub>10</sub> SIP** (approved or adequate submitted SIP) as sites of violation or possible violation



# Examples: Highway Projects that Require a PM Hot-spot Analysis

From the March 2006 final rule (71 FR 12491) and PM Hot-spot Guidance Appendix B:

- 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 average annual daily traffic (AADT) and 8% or more of such AADT is diesel truck traffic
  - **Note:** *this is an example only, not a threshold*
- New exit ramps and other highway facility improvements to connect a highway or expressway to a major freight, bus, or intermodal terminal
- Expansion of an existing highway or other facility that affects a congested intersection (operated at Level-of-Service D, E, or F) that has a significant increase in the number of diesel trucks
- Similar highway projects that involve a significant increase in the number or diesel transit buses and/or diesel trucks

# Examples: Highway Projects that Require a PM Hot-spot Analysis

From the March 2006 final rule (71 FR 12491) and PM Hot-spot Guidance Appendix B:

- A major new bus or intermodal terminal that is considered to be a “regionally significant project” under 40 CFR 93.101;
- An existing bus or intermodal terminal that has a large vehicle fleet where the number of diesel buses increases 50% or more, as measured by bus arrivals
  - ***Note:*** *this is an example only, not a threshold*

# Examples: Projects that Would Not Require a PM Hot-spot Analysis

- From the March 2006 final rule (71 FR 12491) and PM Hot-spot Guidance Appendix B:
  - Any new or expanded [highway project that primarily services gasoline vehicle traffic](#), including such projects involving congested intersections operating at Level-of-Service D, E, or F
  - An [intersection channelization project](#) or [interchange configuration project](#) that involves either [turn lanes or slots](#), or lanes or movements that are [physically separated](#)
  - [Intersection channelization projects](#), [traffic circles](#) or [roundabouts](#), [intersection signalization projects at individual intersections](#), and interchange reconfiguration projects that are designed to improve traffic flow and vehicle speed
  - A new or expanded [bus terminal that is serviced by non-diesel vehicles](#);
  - A 50% increase in daily arrivals at a [small terminal](#) (e.g., a facility with 10 buses in the peak hour)

# Examples of Projects that Would Not Require a PM Hot-spot Analysis

- Projects that are exempt from conformity altogether under Table 2 of 40 CFR 93.126 would never need a PM hot-spot analysis for conformity, which include:
  - Highway Safety Improvement Program (HSIP) implementation:
    - Any project included in the state's HSIP
  - Projects that correct, improve, or eliminate a hazardous location or feature:
    - Recently, EPA and FHWA agreed that projects that fit this category include
      - Road diets
      - Auxiliary lanes less than 1 mile in length
      - Ramp metering
  - Etc.: all other project types listed on Table 2
- Note: a project on the list in Table 2 is not exempt if, through interagency consultation, it is determined that it has potentially adverse impacts (40 CFR 93.126)

## Step 2: Determining the Approach, Models, and Data Requirements

- Geographic area
- Analysis year(s)
- Relevant PM NAAQS
- Type of PM emissions
- Models and methods
- Project-specific data

# Determining the Geographic Area

- PM hot-spot analyses must examine “area substantially affected by the project”
  - Referred to in guidance as “the project area”
- Geographic area is 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
  - Need to also consider what other emission sources are located near the project
- Questions regarding the scope of the analysis can be determined through interagency consultation
- Class exercise at end of [Module 3](#)

# Selecting the Analysis Year(s)

- Project must conform over full duration of area's transportation plan (in isolated rural areas, 20 years)
- 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 the following factors:
  - Changes in vehicle fleets, traffic volumes, speeds, and VMT
  - Expected trends in background concentrations in project area and impacts of any nearby sources (e.g., those affected by project)
- Class exercise at end of [Module 1](#)



# Determining Relevant PM NAAQS

- PM hot-spot analyses are only done for the PM NAAQS for which the area is designated nonattainment or maintenance:
  - 2012 Annual PM<sub>2.5</sub> NAAQS – 12.0 µg/m<sup>3</sup>
  - 2006 24-hour PM<sub>2.5</sub> NAAQS – 35 µg/m<sup>3</sup>
  - 1997 PM<sub>2.5</sub> NAAQS
    - Annual NAAQS – 15.0 µg/m<sup>3</sup> (*revoked when areas attain; applies in only 7 areas*)
    - 24-hour PM<sub>2.5</sub> NAAQS – 65 µg/m<sup>3</sup> (*applies in only 2 areas*)
  - 1987 24-hour PM<sub>10</sub> NAAQS – 150 µg/m<sup>3</sup>
- Areas may be designated for more than one PM NAAQS
- EPA’s “Green Book” web page lists nonattainment and maintenance areas: [www.epa.gov/green-book](http://www.epa.gov/green-book)

# Determining Quarters to Be Evaluated

- A hot-spot analysis for the **annual PM<sub>2.5</sub> NAAQS** would cover all 4 quarters of the analysis year
  - Q1 (January-March)
  - Q2 (April-June)
  - Q3 (July-September)
  - Q4 (October-December)
- Hot-spot analyses for a **24-hour PM NAAQS** would typically cover all 4 quarters of the analysis year
  - Except when future NAAQS violations and peak emissions in project area expected in only one quarter (use interagency consultation process to determine when appropriate)

# Determining Type of PM Emissions to Include

| Emissions Type*                | Included in PM Hot-spot Analysis?  |
|--------------------------------|--|
| Exhaust, Brake Wear, Tire Wear | Always included  |
| Re-entrained Road Dust         | <p>PM<sub>2.5</sub> areas without SIP budgets – Included <u>only</u> if EPA or state determines it's a significant contributor</p> <p>PM<sub>2.5</sub> areas with SIP budgets – Included <u>only</u> if in budgets</p> <p>PM<sub>10</sub> areas – <u>Always</u> included</p> |
| Construction-related Emissions | Included <u>only</u> if they occur during the construction phase and last more than 5 years at any individual site   |

\* Only directly emitted PM emissions are included in analyses, not precursors

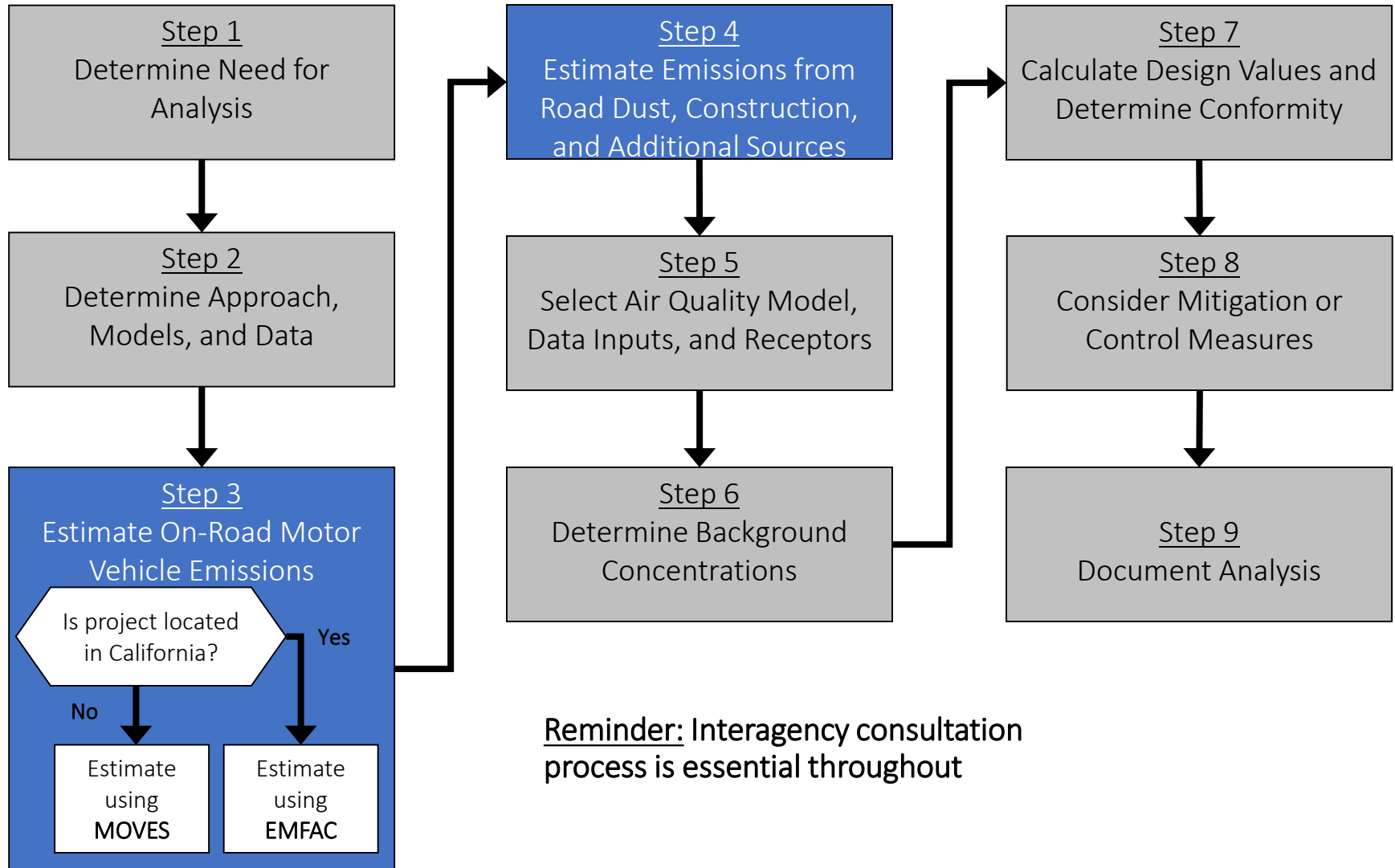
# Determining Models and Methods

- Section 93.111 requires latest emissions models to be used (with a conformity grace period)
  - MOVES2014a
  - EMFAC2014 in California
- Important to select AQ model early in process (needed to prepare emissions modeling)
  - AERMOD
  - CAL3QHCR (until the end of the transition period: January 17, 2020)
- Other models and methods (e.g., AP-42)

# Obtaining Project-Specific Data

- Section 93.110(a) requires the latest planning assumptions available at time analysis begins
- Use project-specific data for emissions and AQ modeling, whenever possible
  - See guidance for examples
  - Defaults may be appropriate in some cases
- Areas will also need representative data on background concentrations in the project area
  - We will cover in [Module 6](#)

# Completing a PM Hot-spot Analysis



Reminder: Interagency consultation process is essential throughout

# Estimating Emissions

- Step 3: Estimating the project's PM emissions from exhaust, brake wear, and tire wear (direct PM only)
  - We will cover how to use the MOVES2014a model for a PM hot-spot analysis in detail in [Module 2](#)
  - Result from this step: emissions factors for each “link” of the project for the analysis year(s)
- Step 4: Estimating emissions from road dust, construction, and additional sources
  - Course does not cover this step in detail
  - Some basic information on following slides

# Estimating Emissions from Dust Using AP-42

- AP-42 is EPA's compilation of data and methods for estimating emissions from a variety of activities and sources
- AP-42, Chapter 13 includes:
  - Section 13.2: Introduction to Fugitive Dust Sources
  - Section 13.2.1: Paved Roads
  - Section 13.2.2: Unpaved Roads
  - Section 13.2.3: Heavy Construction Operations (includes road construction)
- Use latest approved version of AP-42 from EPA's website:  
[www.epa.gov/air-emissions-factors-and-quantification/ap-42-Compilation-air-emission-factors](http://www.epa.gov/air-emissions-factors-and-quantification/ap-42-Compilation-air-emission-factors)



# Estimating Re-entrained Road Dust

- Use AP-42 or alternative local approach
  - Areas may already have a locally-developed method or may develop one specific to local conditions
- Dust from paved roads
  - AP-42 can be used where silt loading, mean vehicle weight, and mean vehicle speeds fall within ranges in AP-42
    - Site-specific silt load data must be consistent with regional emissions analysis (per 93.123(c)(3))
    - If factors not in ranges, then use locally-developed method
- Dust from unpaved roads
  - If using AP-42, use appropriate equation (AP-42 dust equations differ for industrial sites vs. publicly accessible roads)
    - Surface material moisture content moisture percentage, if used, must be consistent with regional emissions analysis (per 93.123(c)(3))

# Estimating Construction-Related Dust

- Required only if not temporary
- Use AP-42, Section 13.2.3 or alternative local approach
- If using AP-42, note potential for material to be tracked out from the site; may need also to include dust from paved roads (see AP-42, Section 13.2.1)
- In some cases, an alternative approach may be more appropriate than AP-42 (e.g., if project conditions are not within the ranges used to develop AP-42 equations)



# Adding Dust to an Analysis

- Add emission factor(s) for road and construction dust to MOVES emission factors for each project link
- Example:

$$MOVES\ EF_{Link\ 1} + Road\ Dust\ EF = Total\ EF_{Link\ 1}$$

$$MOVES\ EF_{Link\ 2} + Road\ Dust\ EF = Total\ EF_{Link\ 2}$$

*...etc....*

# Estimating Other Emissions

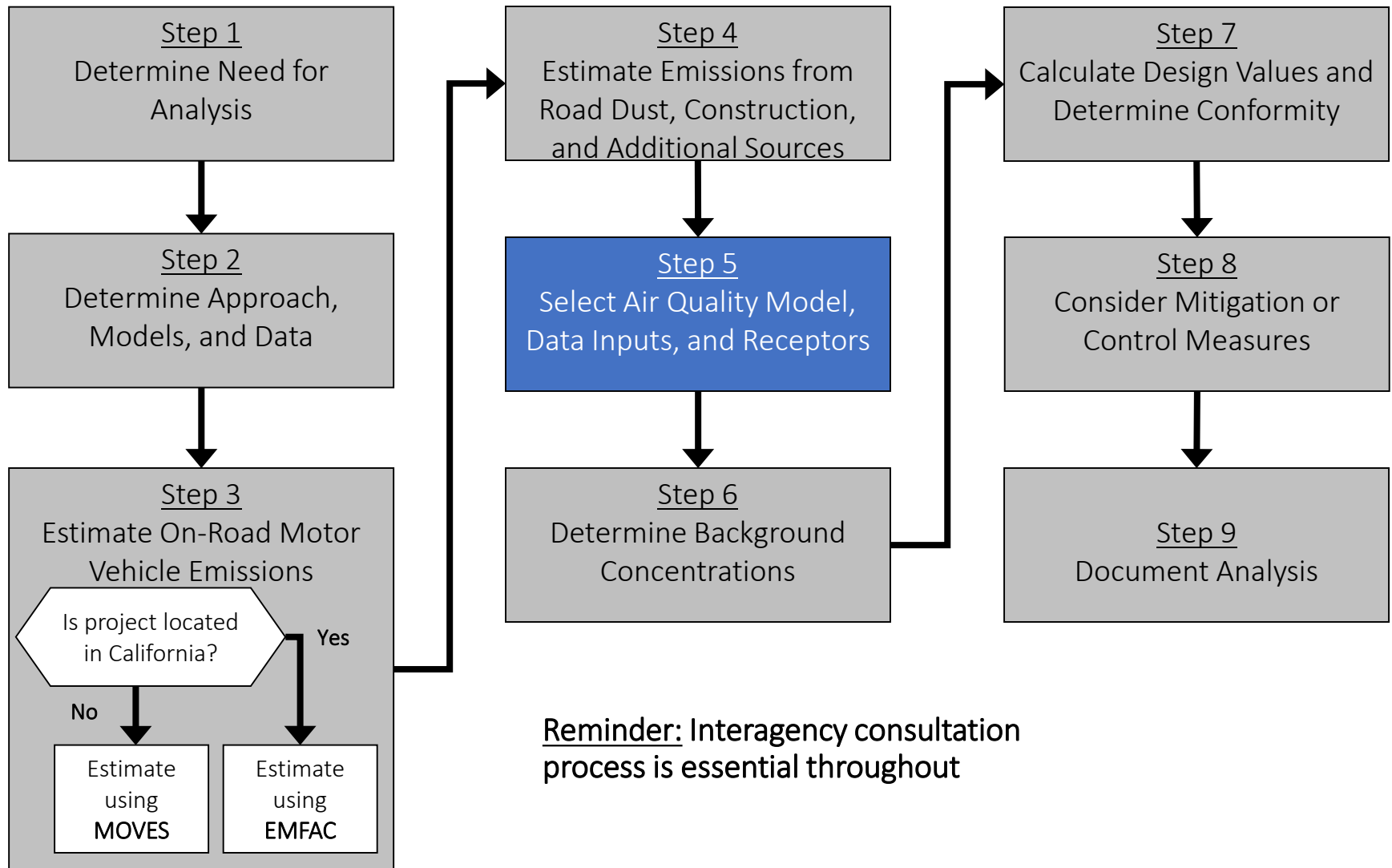
- Construction vehicles and equipment
  - Required only if not temporary
  - May have been quantified for SIP non-road inventory
  - Choose model/method using interagency consultation process
    - Example: MOVES2014a - Nonroad
    - Hourly emission factors would be multiplied by activity in the hour
- Locomotive emissions
  - See PM Hot-spot Guidance Appendix I for step-by-step guidance
- Additional sources, such as nearby sources affected by the project (e.g., marine ports, rail yards, intermodal facilities)



# Adding Other Emissions to an Analysis

- These other sources of emissions, if present, would be included in AERMOD air quality modeling as one or more distinct sources
  - Including construction emissions, locomotives, and nearby sources
  - [Module 4](#) covers how to characterize sources of emissions

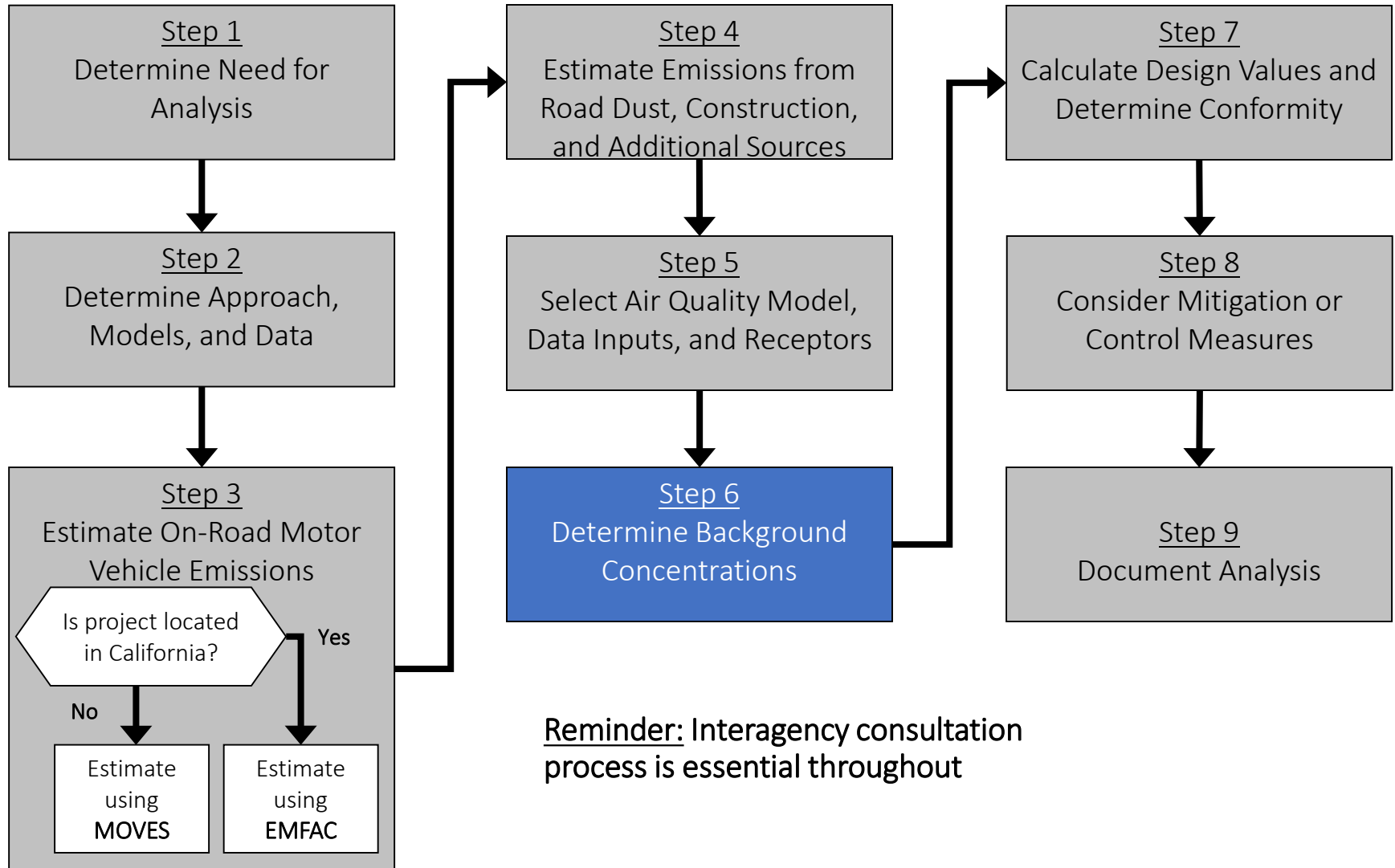
# Completing a PM Hot-spot Analysis



# Step 5: Selecting Air Quality Model, Data Inputs, and Receptors

- This includes...
  - Selecting the air quality model
  - Characterizing emissions sources
  - Obtaining meteorological data
  - Specifying receptors in project area
  - Running the model
- Result of this step: estimated future AQ concentrations...
  - ...for the project and any nearby sources that are modeled
  - ...at specific receptor locations
  - ...over a 5-year period (or 1-year period, if using site-specific met data)
- We provide an air quality modeling overview in [Module 3](#)
- [Module 4](#) covers using AERMOD; [Module 5](#) covers using CAL3QHR but is not covered in the in-person training

# Completing a PM Hot-spot Analysis



Reminder: Interagency consultation process is essential throughout



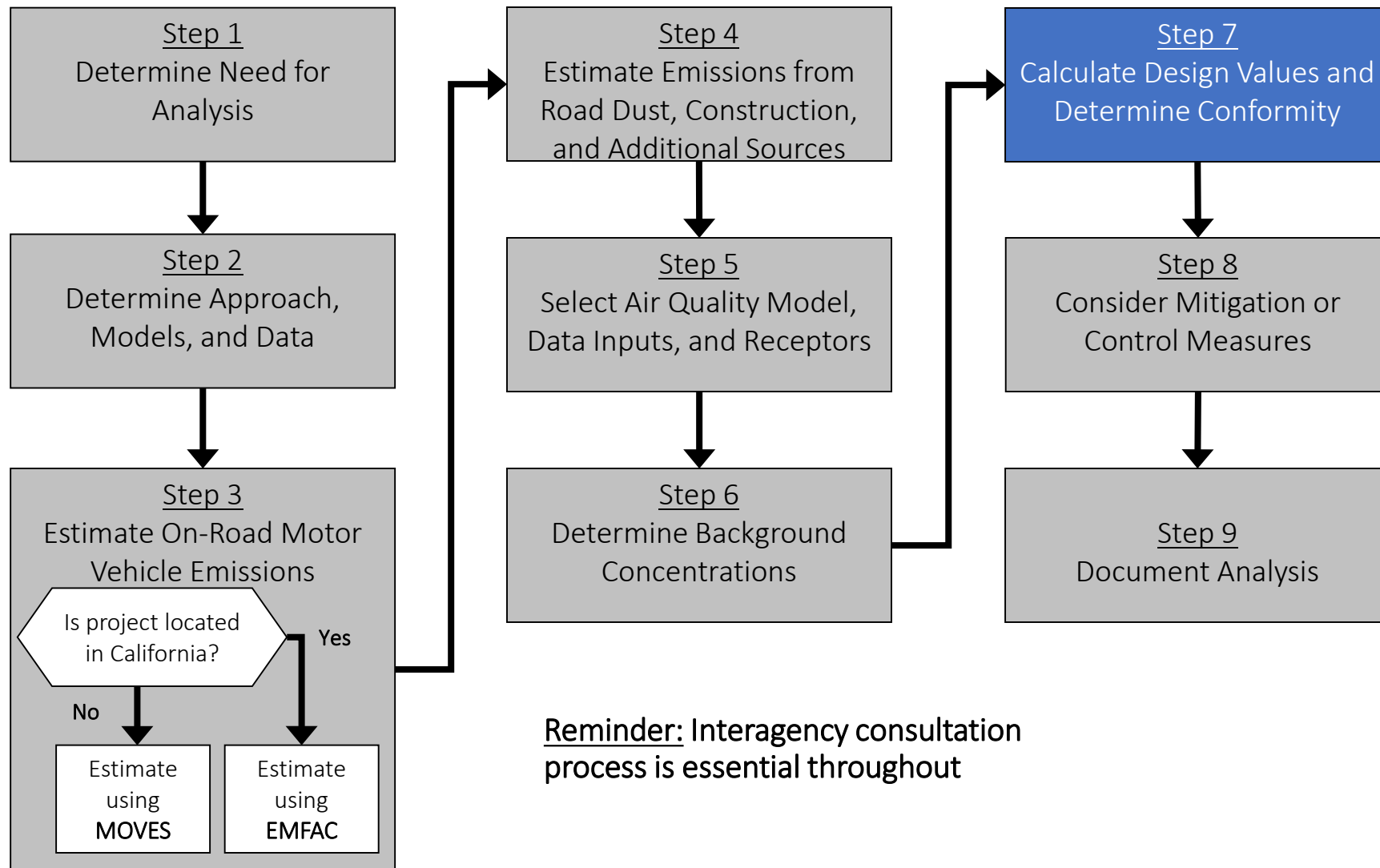
# Step 6: Determining Future Background Concentrations

- Section 93.123(c)(1) states that “estimated pollutant concentrations must be based on the total emission burden which may result from the implementation of the project, summed together with future background concentrations...”
  - Note, options for future background concentrations described in Module 6; often latest background concentrations from monitors used
- “Background” concentration means ambient levels of pollutants not associated with any of the sources explicitly included in the modeling analysis
  - In general, nearby sources would be modeled only when affected by the project
  - Impacts of other sources are captured by background concentrations
  - Background concentrations come from, e.g., other roads in the area, stationary sources, industrial sources, etc.

# Step 6: Determining Future Background Concentrations

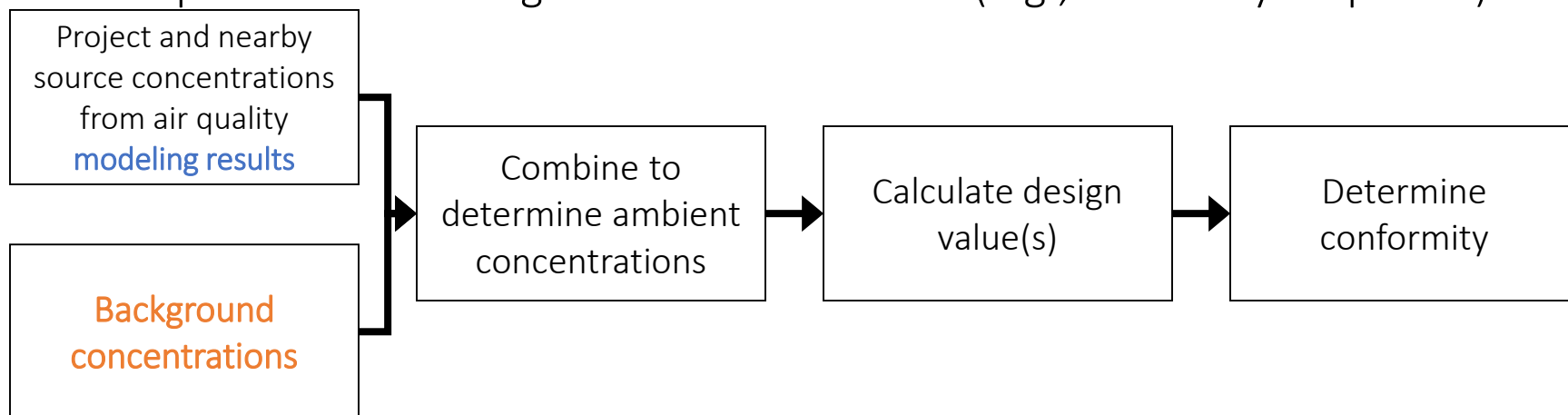
- Background concentrations are determined primarily through **monitoring data**
- Result of this step: file of representative background data (e.g., from an AQ monitor over a 3-year period)
- We will cover in more of this in **Module 6**

# Completing a PM Hot-spot Analysis



# Step 7: Calculating Design Values and Determining Conformity

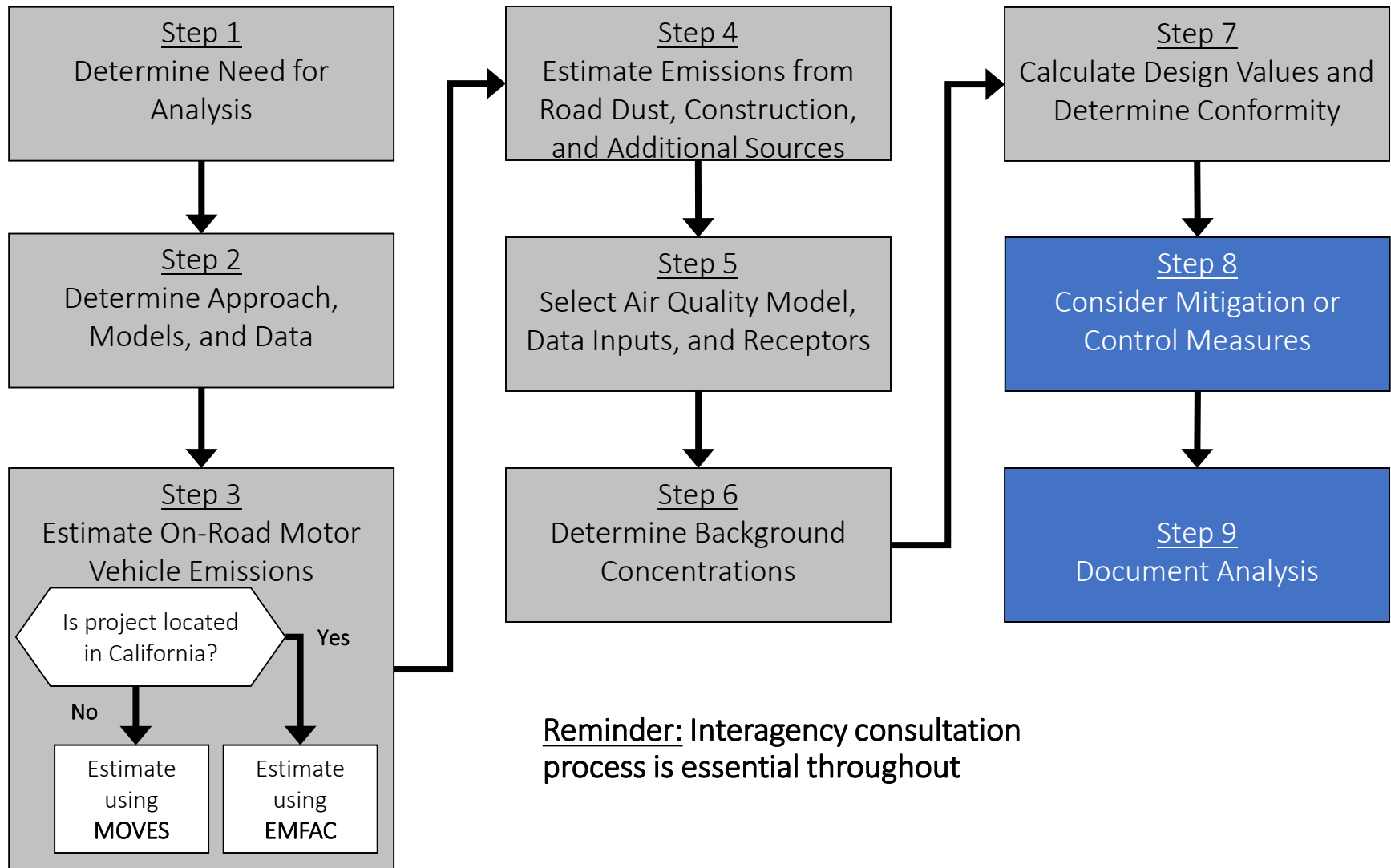
- For conformity purposes, a “design value” is a statistic that describes future air quality concentrations in the project area that can be compared to a particular NAAQS
- Calculated by combining:
  - Air quality modeling results (concentrations from the project and any nearby sources, e.g., over a 5-year period) with
  - Representative background concentrations (e.g., over a 3-year period)



# Step 7: Calculating Design Values and Determining Conformity

- Each NAAQS calculates design values differently
- Result of this step: design values for the project that are then used to determine if project conforms
- Will we cover this step in [Module 7](#)

# Completing a PM Hot-spot Analysis



**Reminder:** Interagency consultation process is essential throughout

# Step 8: Considering Mitigation and Control Measures in an Analysis

- Mitigation and control measures – applied within the project area – can be considered at any stage of a PM hot-spot analysis
- Can be applied to project itself or other PM sources in project area
- If measures are selected, additional emissions/AQ modeling will need to be completed and new design values calculated
- Sections 93.123(c)(4) and 93.125(a) require written commitments to be obtained from the project sponsor or operator prior to making the project-level conformity determination

# Categories of Potential Measures

- Retrofitting, replacing vehicles or engines and using cleaner fuels
  - Retrofit diesel engines
  - Update fleet to cleaner engines
  - Replacement of older diesel vehicles
- Reduced idling programs
  - Implement anti-idling program for trucks/buses
- Transportation project design revisions
  - Reduce diesel vehicles at one location
  - Reduce idling within facility
  - Route traffic away from populated areas
  - Consider alternative travel/goods movement transportation modes





# Categories of Potential Measures

- Reduce background concentrations by addressing other source emissions
  - Reduce school bus emissions
  - Reduce emissions from ships, cargo handling equipment, and other vehicles at ports
  - Adopt locomotive anti-idling measures
  - Remanufacture locomotives
  - Reduce stationary source emissions
- Fugitive dust control programs
  - Cover open trucks during project construction
  - Street cleaning program
  - Site watering program
  - Street and shoulder paving and erosion control
  - Reduce use of salt and sand in project area



## Step 9: Documenting the PM Hot-spot Analysis

- Documentation should be sufficient to support the conclusion that the proposed project meets conformity rule requirements
- Included in project-level conformity determination
- Appropriate sections of NEPA analysis (e.g., project description, etc.) could be referenced

# Documenting the PM Hot-spot Analysis

Should include, at a minimum (see guidance for details):

- Description of proposed project, when it is expected to open, and projected travel activity data
- Analysis year(s) examined and factors considered in determining year(s) of peak emissions
- Emissions modeling data, including model used, inputs and results, and how project was characterized in terms of links
- Model inputs and results for road dust, construction emissions, and emissions from other sources (as applicable)

# Documenting the PM Hot-spot Analysis

- Air quality modeling data, including model used, inputs and results, and receptors employed
- How background concentrations were determined
- Any mitigation and control measures implemented
- How interagency and public participation requirements were met
- Conclusion that the proposed project meets conformity requirements for PM NAAQS
- Sources of data for modeling; any critical assumptions made

Class Exercise: For each case, what year(s) might be analyzed in a PM hot-spot analysis?

# Assumptions for Exercises

- Cases should be assumed to involve projects of local air quality concern
- Cases are illustrative only
- Cases do not include additional information about project or interagency consultation that would be used in an actual PM hot-spot analysis

# Guidance Recap

- Need to choose an analysis year or years within the transportation plan during when:
  - Peak emissions from the project are expected
  - A new or worsened NAAQS violation would most likely occur due to cumulative impacts of project and background concentrations
- Need to consider the following factors:
  - Changes in vehicle fleets
  - Changes in traffic volumes, speeds, and VMT
  - Expected trends in background concentrations in the project area and the impacts of any nearby sources (e.g., those affected by the project)

# Case 1: New Interchange

- A new interchange connecting a 4-lane principal arterial with a 6-lane freeway through entrance/exit ramps to provide truck access to local warehouses and other businesses
- Project will be completed October 2022
  - Distribution centers and warehouses are expected to be locating on the arterial and in place in 2023
- Air quality in the area has been improving
- No nearby sources need to be included in air quality modeling



# Case 1: Questions

- What are the factors that influence the analysis year(s)?
- What are potential analysis year(s)?

# Case 1: Questions

- What are the factors that influence the analysis year(s)?
  - Changes in vehicle fleets
    - Significant new increase in trucks in project area
  - Changes in traffic volumes, speeds, and VMT
    - More traffic at the interchange by 2023
  - Expected trends in background concentrations, including nearby sources that are affected
    - Air quality concentrations are trending downward
    - No nearby sources affecting the project area to consider
- What are potential analysis year(s)?
  - 2022: could be year of peak emissions, if truck emission rates have greater influence on overall emissions
  - 2023: could be year of peak emissions, if the number of trucks has greater influence on overall emissions

# Case 2: Highway Expansion

- An existing 4-lane arterial (2 lanes in each direction) is to be expanded to 8 lanes (4 lanes in each direction) from its end point at a shipping port to an interstate a few miles away
  - Purpose is to accommodate a significant increase in truck round trips to the port projected to result from increased future activity at the port
- Project will be completed October 2020
- Port authority's financial forecasts show the port's volume will continue to rise through 2025
  - Truck traffic anticipated to rise to keep pace with increasing port activity

# Case 2: Questions

- For this case, what are the factors that influence the analysis year(s)?
- What are potential analysis years?

# Case 2: Questions

- For this case, what are the factors that influence the analysis year(s)?
  - Changes in vehicle fleets
    - Increase in percentage of trucks that make up AADT
  - Changes in traffic volumes, speeds, and VMT
    - Increased truck traffic, effect on speed, increased VMT
  - Expected trends in background concentrations, including nearby sources that are affected
    - Project intended to accommodate additional port volume; increase in port emissions have to be considered in choice of analysis year(s)
- What are potential analysis years?
  - 2021: year after project opens, and/or
  - 2025: year for which port growth projected

# Case 3: New Bus Terminal

- A new bus terminal is planned that will be approved now and built in two phases:
  - Phase I will be completed Sept 2020 and will comprise the terminal building and be able to accommodate 50 buses at one time
  - Phase II will be completed in June 2022 and include another 50 bus bays
  - Terminal will operate from 6 am to 10 pm and will generate 2 bus trips per hour per bay
- Transit operator will initially operate terminal with existing diesel buses
  - Has committed to replace diesels with CNG buses beginning 2021 – Will replace 10 buses per year
- Area's attainment date is 2021

# Case 3: Questions

- For this case, what are the factors that influence the analysis year(s)?
- What are potential analysis years?

# Case 3: Questions

- For this case, what are the factors that influence the analysis year(s)?
  - Changes in vehicle fleets
    - Bus fleet will become cleaner as it changes from diesel to CNG beginning in 2021
  - Changes in traffic volumes, speeds, and VMT
    - Project will result in differences in these factors
  - Expected trends in background concentrations, including nearby sources that are affected by the project
  - Other factor: Terminal will be developed in two stages, so two analysis years should be modeled
- What are potential analysis years?
  - 2020: after phase I completed and
  - 2022: after phase II completed
  - *Note: attainment year is not relevant for choosing an analysis year(s)*



Questions?