

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

U.S. Environmental Protection Agency

Welcome

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

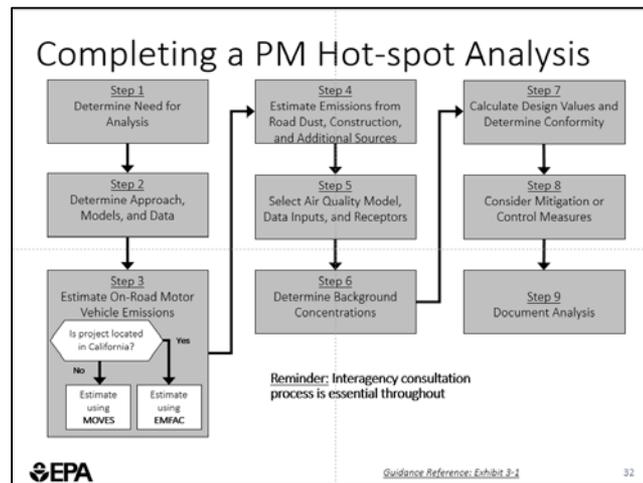
Course Introduction

About this Course

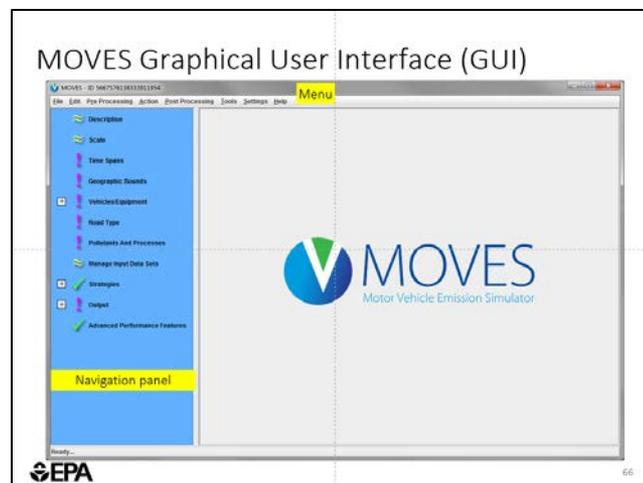
- This course describes how to complete a quantitative PM hot-spot analysis in accordance with EPA's current guidance
 - Relevant guidance sections noted on slides (see slide footers)
 - Includes references for appropriate model user guides and implementation guides
- Course includes both presentations 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

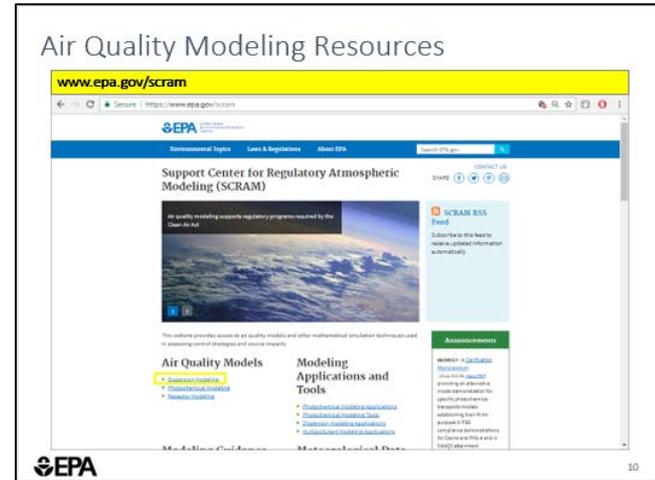


- Module 2: Using MOVES for PM Hot-spot Analyses
 - Complete a “mini-MOVES run”
 - Use MOVES to model the example analysis



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

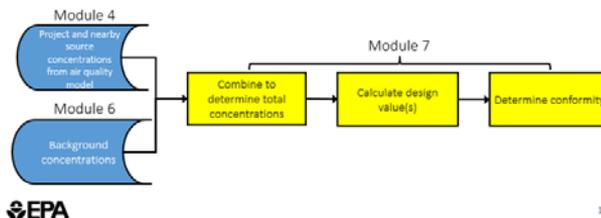
TV = Traffic volume

Using EPA's AirData Website

The screenshot shows the EPA AirData website interface. The URL is www.epa.gov/outdoor-air-quality-data. The page title is "Air Data: Air Quality Data Collected at Outdoor Monitors Across the US". There are two callout boxes: one pointing to the "Download data directly from monitor, if known" link and another pointing to the "Find monitors via interactive map" link. The EPA logo is visible in the bottom left corner of the screenshot.

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

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_{2.5} and PM₁₀ 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
- See EPA's MOVES website for software downloads, technical documentation, and other helpful background materials
 - 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_{2.5} and PM₁₀ 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 –

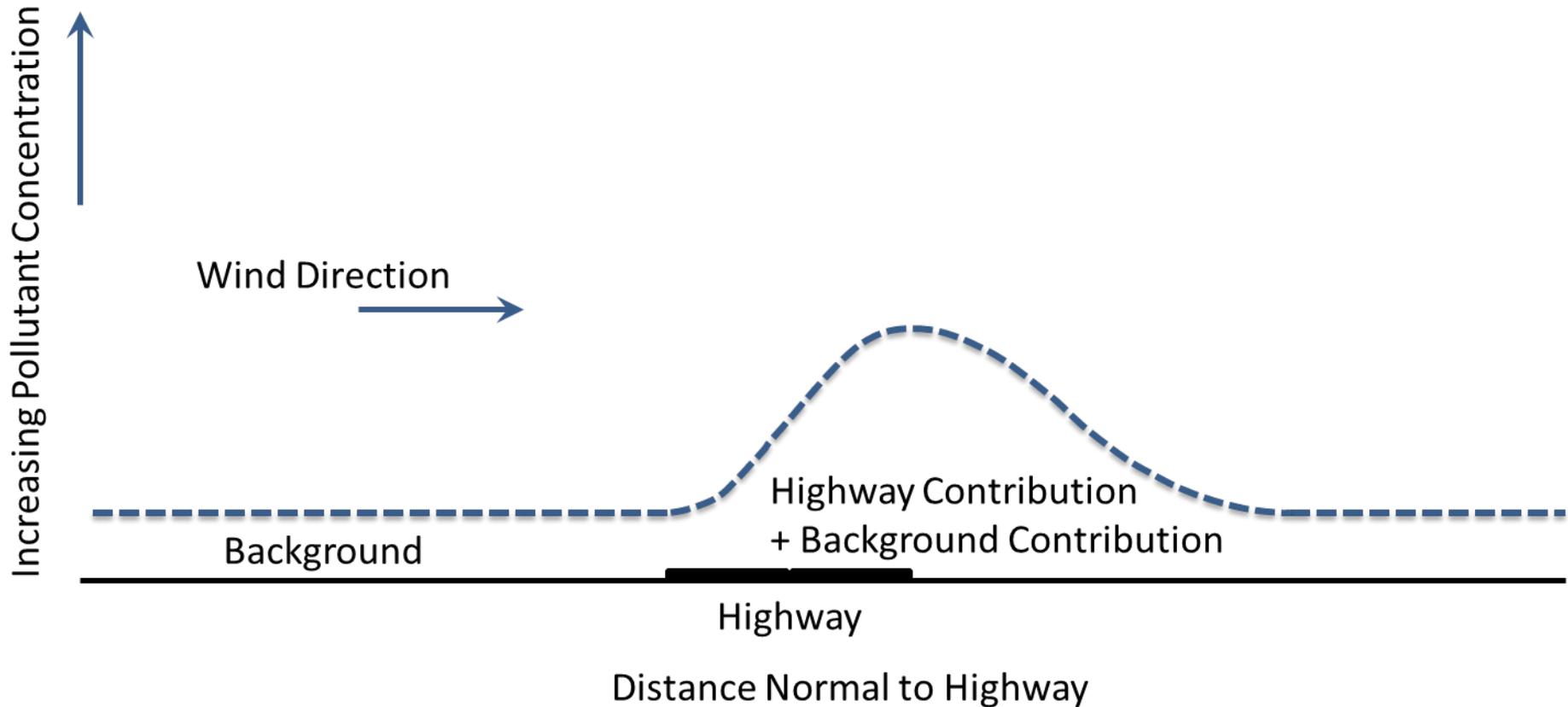
PM Hot-spot Analysis

- ❑ 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_{2.5} 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_{2.5} 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

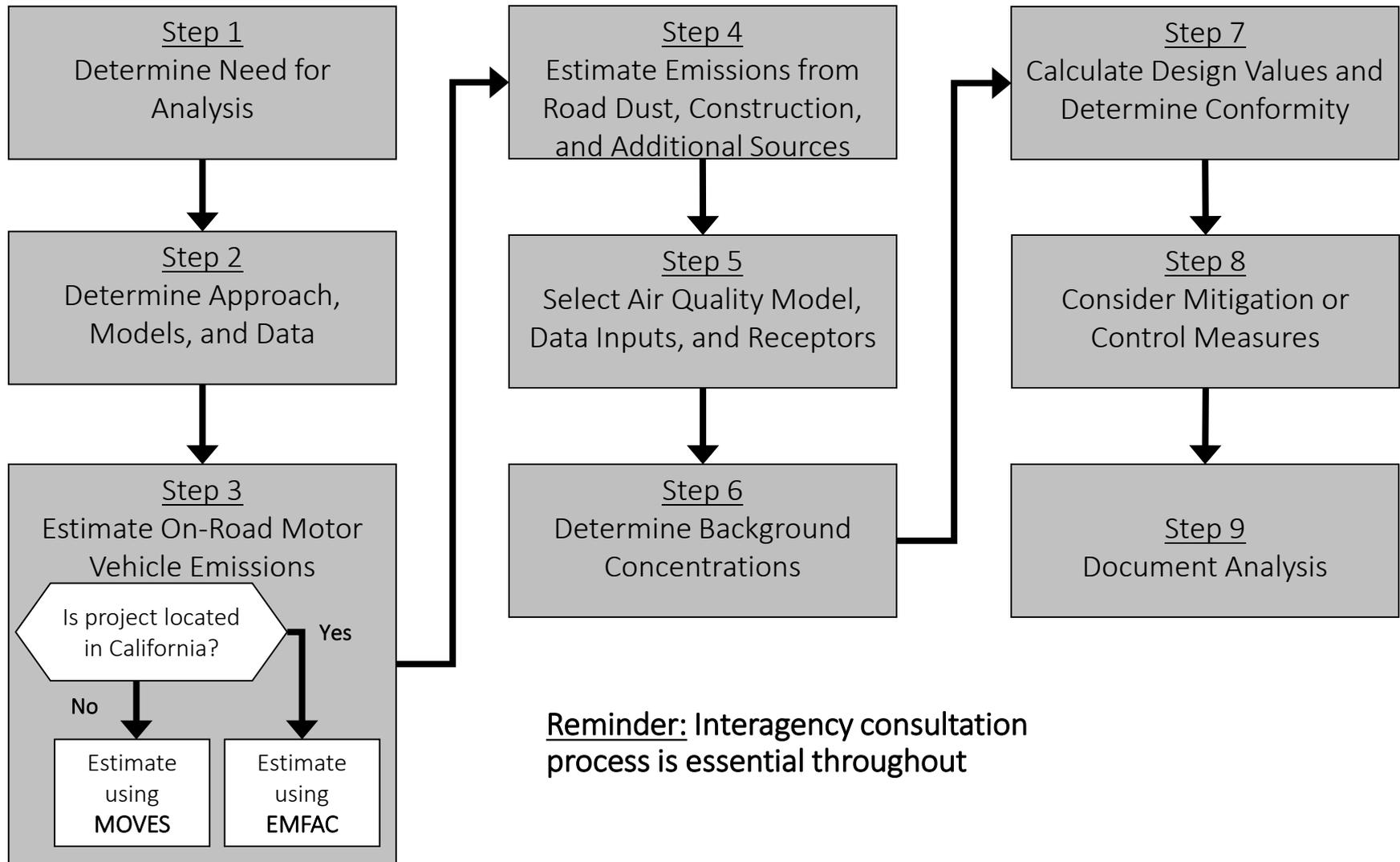
- PM Hot-spot Guidance focuses on refined PM hot-spot analyses, rather than screening analyses
 - Refined analyses rely on detailed local information for build and no-build scenarios
 - Screening analyses are based on worst case conditions for build scenario only
- Refined PM hot-spot analyses necessary 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

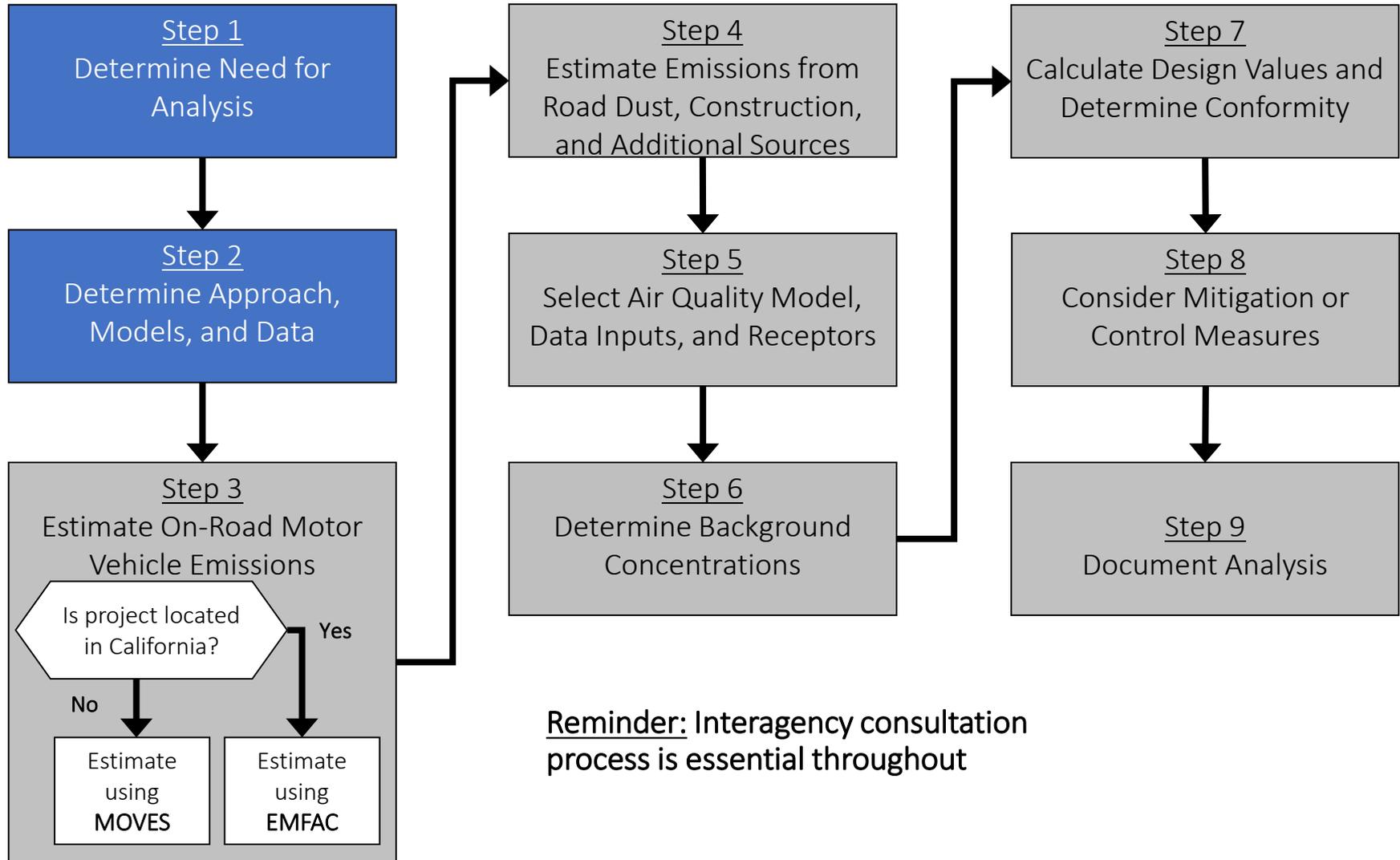
- Note that emissions modeling, air quality modeling, and representative background are all necessary
 - Cannot compare only build to no-build concentrations
- Some flexibilities and tools simplify the process, e.g.,
 - Calculating design values for the highest receptor (covered later)
- See guidance 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_{2.5} or PM₁₀ 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_{2.5} NAAQS – 12.0 µg/m³
 - 2006 24-hour PM_{2.5} NAAQS – 35 µg/m³
 - 1997 PM_{2.5} NAAQS
 - Annual NAAQS – 15.0 µg/m³ (*revoked when areas attain; applies in only 7 areas*)
 - 24-hour PM_{2.5} NAAQS – 65 µg/m³ (*applies in only 2 areas*)
 - 1987 24-hour PM₁₀ NAAQS – 150 µg/m³
- 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

Determining Quarters to Be Evaluated

- A hot-spot analysis for the **annual PM_{2.5} 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_{2.5} areas without SIP budgets – Included <u>only</u> if EPA or state determines it's a significant contributor</p> <p>PM_{2.5} areas with SIP budgets – Included <u>only</u> if in budgets</p> <p>PM₁₀ 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

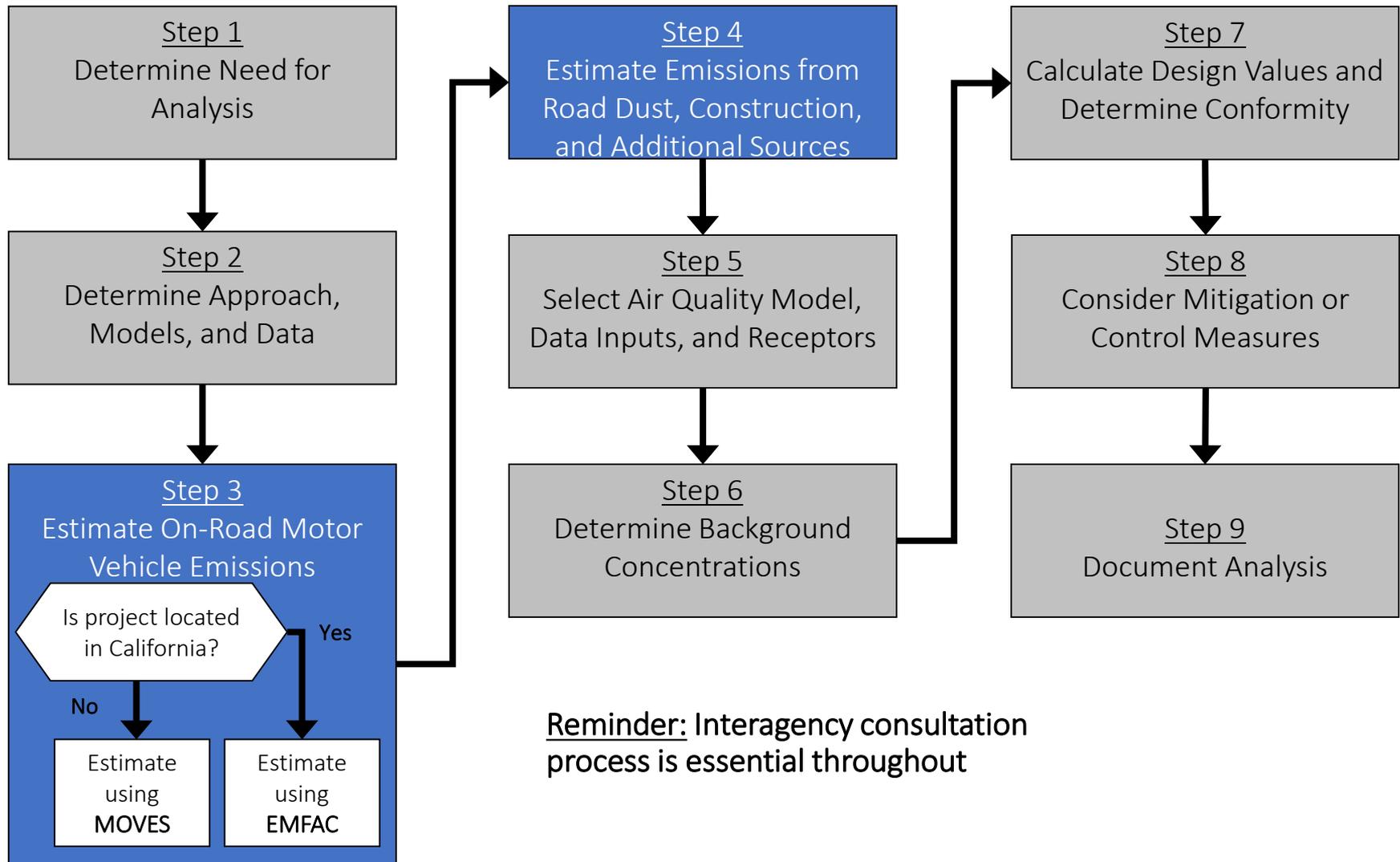
Determining Models and Methods

- 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

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:

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

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

...etc....

Estimating Other Emissions

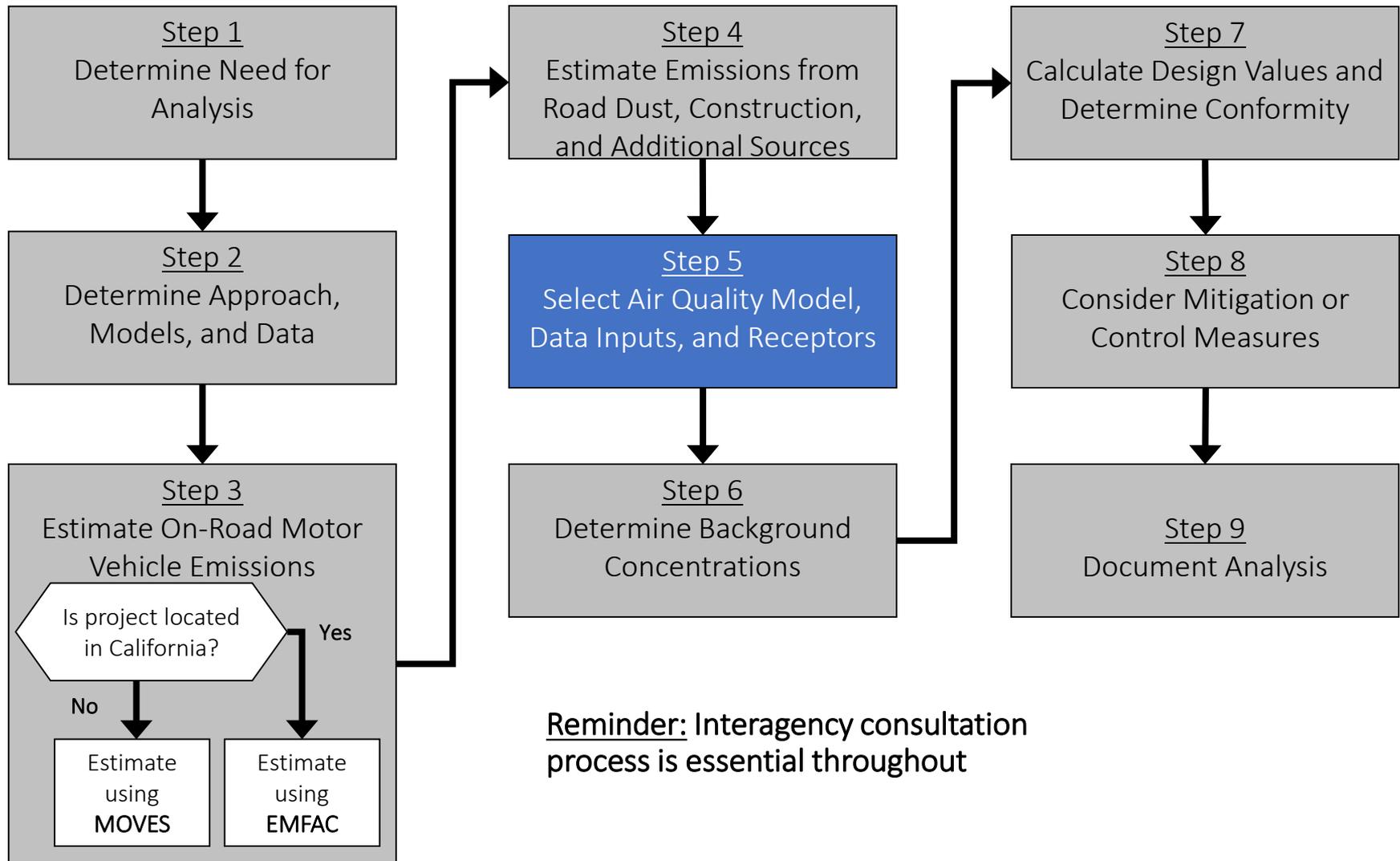
- Construction vehicles and equipment
 - Required only if not temporary
 - May have been quantified for SIP non-road inventory
 - Choose model/method using interagency consultation process
 - Example: MOVES2014a - Nonroad
 - Hourly emission factors would be multiplied by activity in the hour
- Locomotive 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

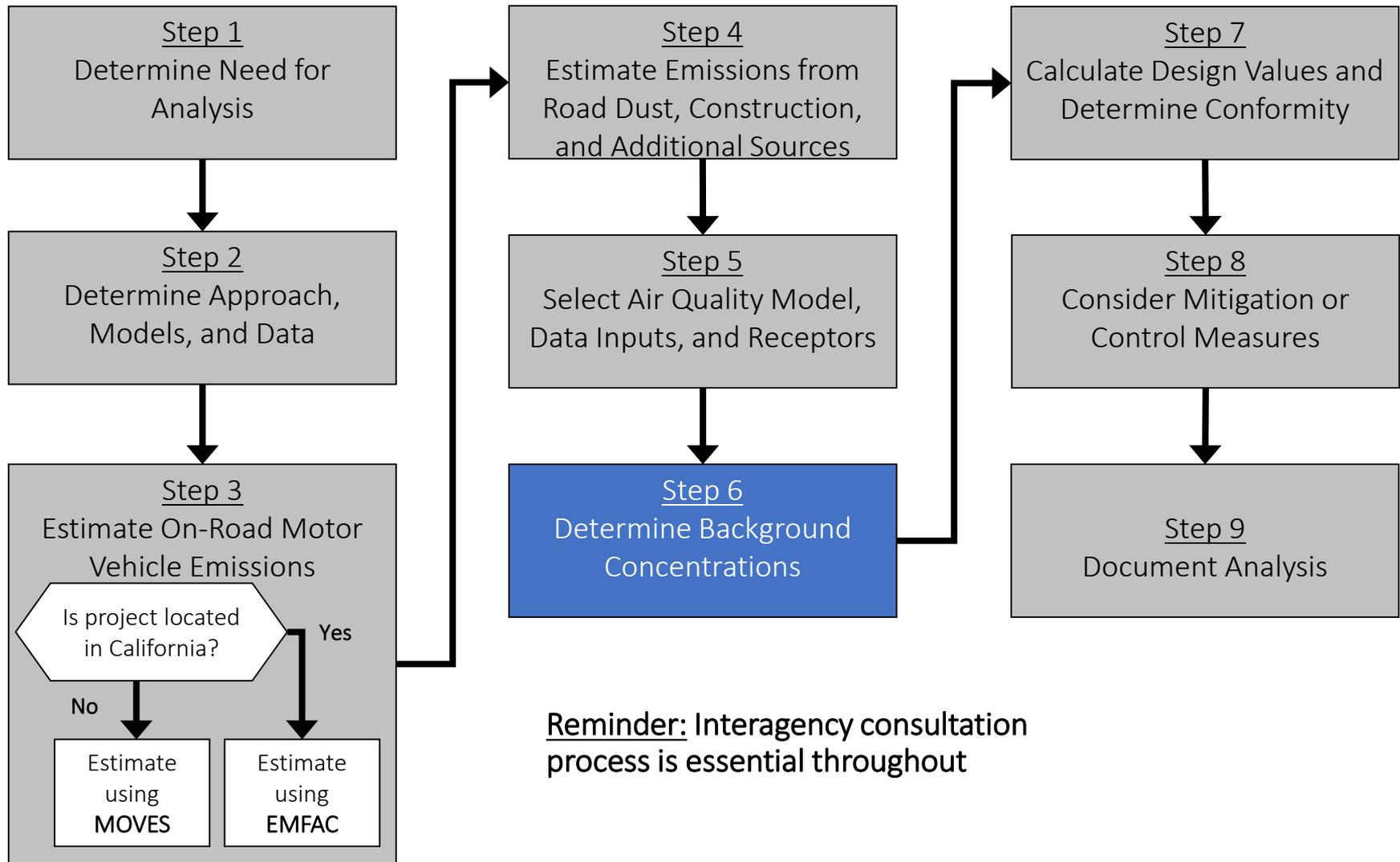
Completing a PM Hot-spot Analysis



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



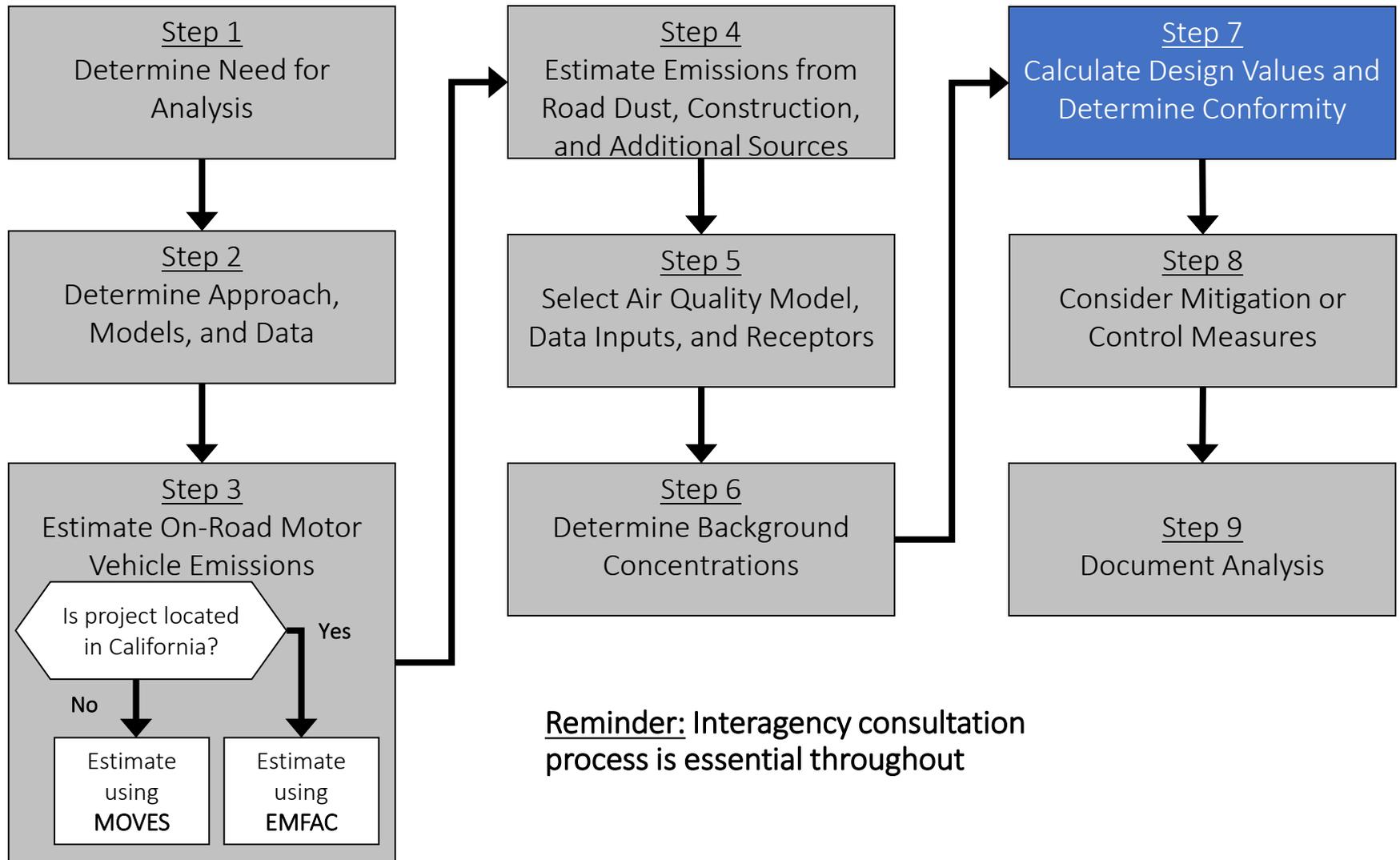
Step 6: Determining Future Background Concentrations

- 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

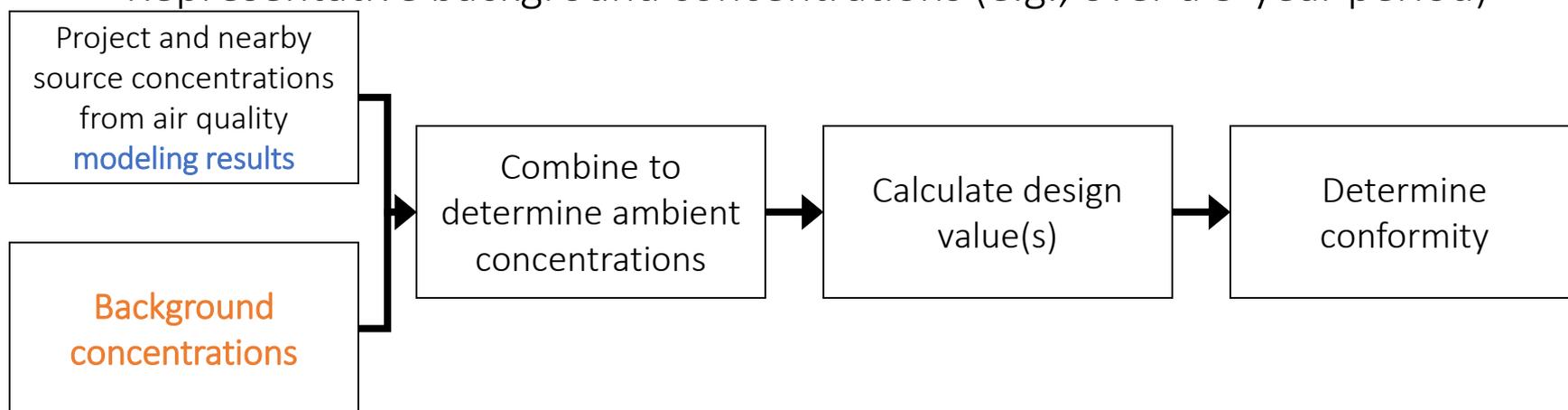
- Background concentrations are determined primarily through [monitoring data](#)
- Result of this step: file of representative background data (e.g., from an AQ monitor over a 3-year period)
- We will cover in more of this in [Module 6](#)

Completing a PM Hot-spot Analysis



Step 7: Calculating Design Values and Determining Conformity

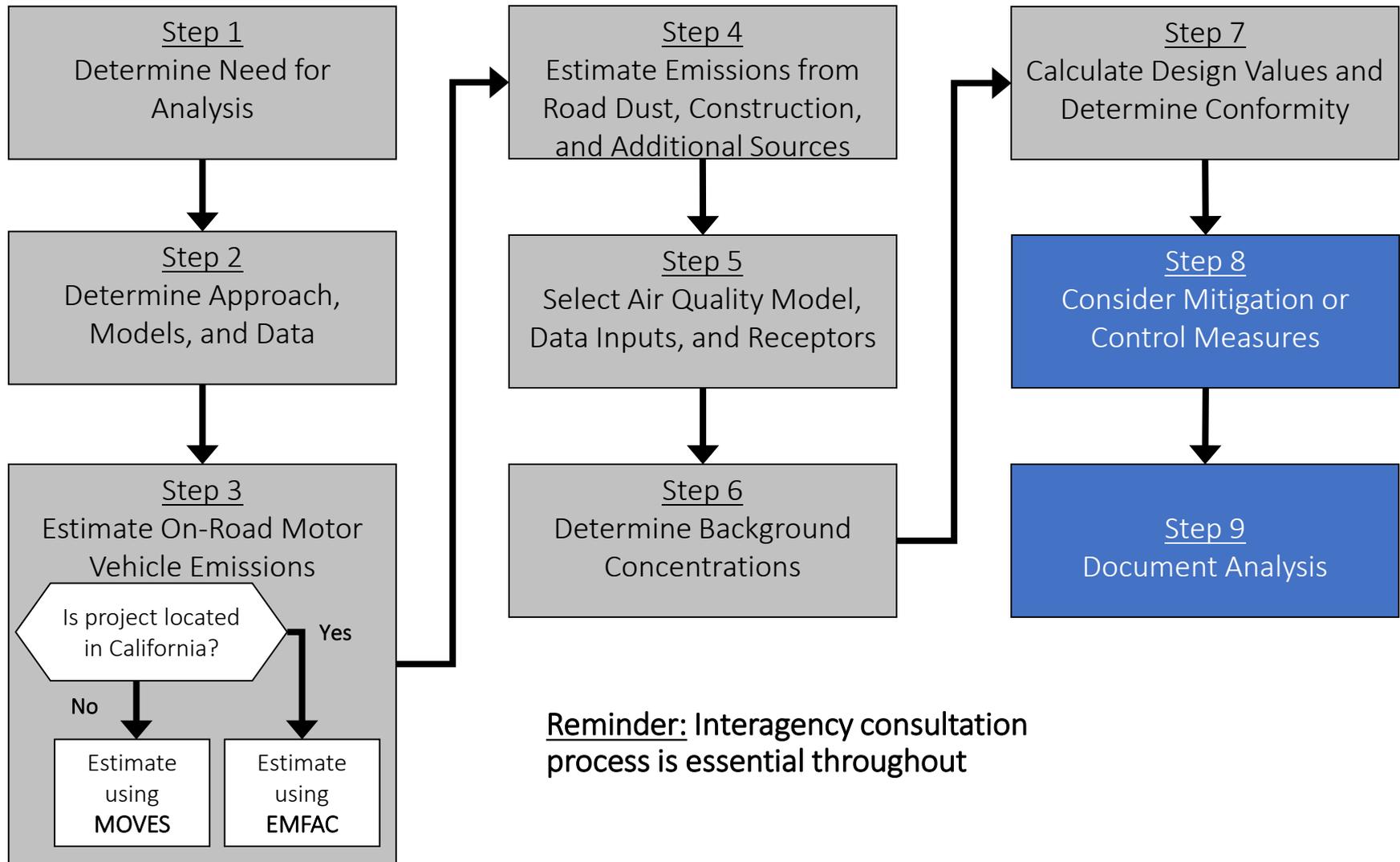
- For conformity purposes, a “design value” is a statistic that describes future air quality concentrations in the project area that can be compared to a particular NAAQS
- Calculated by combining:
 - Air quality modeling results (concentrations from the project and any nearby sources, e.g., over a 5-year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