

AASHTO Air Quality Peer Exchange

Quantitative MSAT Analyses and the Transition to EPA's MOVES Model

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Overview

**Quantitative mobile source air toxics (MSAT) analysis
framework under the Federal Highway Administration (FHWA)
Interim Guidance Update**

**FHWA experience in implementing the Interim Guidance
Update**

**Transition to the U.S. Environmental Protection Agency (EPA)
MOVES Model**

Quantitative MSAT Analysis Framework

Projects with higher potential MSAT effects

- Warrant a quantitative analysis to forecast local-specific emission trends of the priority MSAT for each alternative
- Address potential for cumulative impacts, where appropriate
- Discuss incomplete or unavailable information for project-specific MSAT Health Impacts Analysis following CEQ regulations (40 CFR 1502.22)
- Identify and consider mitigation, if meaningful differences in MSAT emissions among project alternatives are identified

Link to the Interim Guidance Update:

- http://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/aqintguidmem.cfm

Projects with Higher Potential MSAT Effects

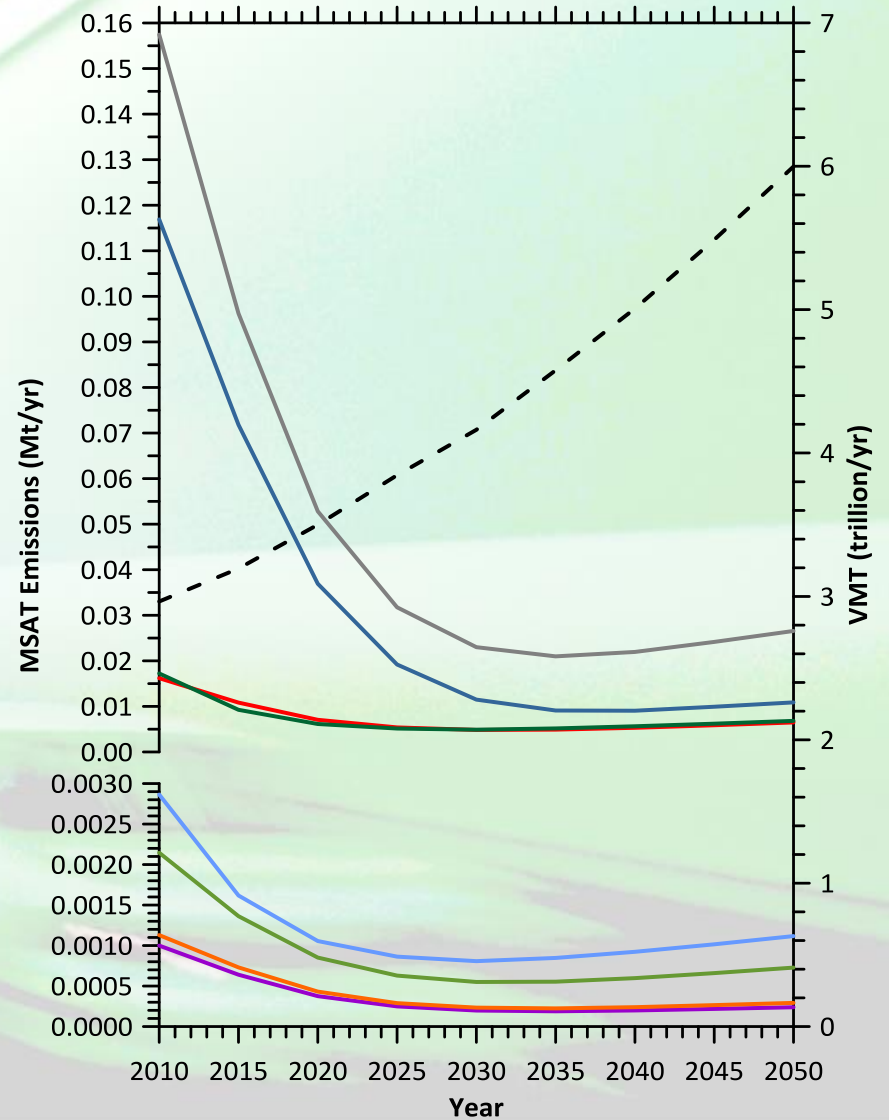
A limited number of highway projects expected to meet this two-prong test:

1. Create new capacity or add significant capacity to urban highways with traffic volumes where the AADT is projected to be in the range of 140,000 to 150,000 or greater by the design year; and also
2. Proposed to be located in proximity to populated areas

Includes highway projects that have the potential for meaningful differences in MSAT emissions among project alternatives

National MSAT Emission Trends Based on EPA's MOVES2010b Model for Vehicles Operating on Highways

- VMT
- Total MSAT
- Diesel PM
- Benzene
- Formaldehyde
- Butadiene
- Naphthalene
- Acrolein
- Polycyclics



FHWA Experience in Implementing the Interim Guidance Update

Technical assistance

- Offered through FHWA Division Offices
- Quick-start Guide for Using MOVES for NEPA MSAT Analysis

Project-level applications

- Offered on a case-by-case basis (e.g., NH, MD, WA, GA)

Training

- Individual session offered on using EPA's MOVES model for quantitative MSAT analyses, or as part of
- A 4-session workshop on project-level air quality analysis in NEPA

FHWA Experience in Implementing the Interim Guidance Update

Recurring issues

- List of priority MSAT and in particular, diesel particulate matter (PM) components and polycyclic organic compounds
- Methodology for determining the affected transportation network
- Using the EPA's MOVES model to perform a quantitative MSAT analysis

FHWA's Priority Mobile Source Air Toxics

- 1. Diesel PM**
- 2. Benzene**
- 3. Formaldehyde**
- 4. 1,3-Butadiene**
- 5. Naphthalene**
- 6. Acrolein**
- 7. Polycyclic organic matter (POM)**

Affected Transportation Network

Purpose

- Capture the anticipated changes in MSAT emissions as a direct result of a proposed project
- Provide a framework for an objective quantitative assessment, minimizing uncertainty and bias
- Keep the analysis manageable by analyzing all segments associated with the project plus those segments expecting meaningful changes in emissions (e.g., $\pm 10\%$ or more)

Affected Transportation Network

Define the network based on available project-specific information such as a supporting technical traffic analysis

Recommended Metrics

- Changes of $\pm 5\%$ or more in AADT on congested highway links of LOS D or worse
- Changes of $\pm 10\%$ or more in AADT on uncongested highway links of LOS C or better
- Changes of $\pm 10\%$ or more in travel time
- Changes of $\pm 10\%$ or more in intersection delay

Distinguish modeling artifacts from real effects

Transition to EPA's MOVES Model

Scale

- Domain/Scale: County
- Calculation Type: Inventory

Time Spans

- Time Aggregation Level: Hour
- Years: Base Year, First Year of Operation, Design Year
- Months: Jan / Apr / Jul / Oct for average day; otherwise, Select All
- Days: Weekdays for average day; otherwise, Select All
- Hours: Select All

Geographic Bounds

- Region: County or Custom Domain of Project Location

Transition to EPA's MOVES Model

On Road Vehicle Equipment

- All relevant fuels/source use types combinations
- For diesel PM, all relevant source use types operating on diesel fuel

Road Type (as relevant)

- Rural restricted access
- Rural unrestricted access
- Urban restricted access
- Urban unrestricted access

Transition to EPA's MOVES Model

Pollutants and Processes – Diesel-fueled Vehicles

- Pollutants
 - Primary Exhaust PM10 – Total
 - Pollutant Chains
 - Primary PM10 – Organic Carbon
 - Primary PM10 – Elemental Carbon
 - Primary PM10 – Sulfate Particulate
 - Total Energy Consumption
- Processes
 - Running Exhaust and Crankcase Running Exhaust

Transition to EPA's MOVES Model

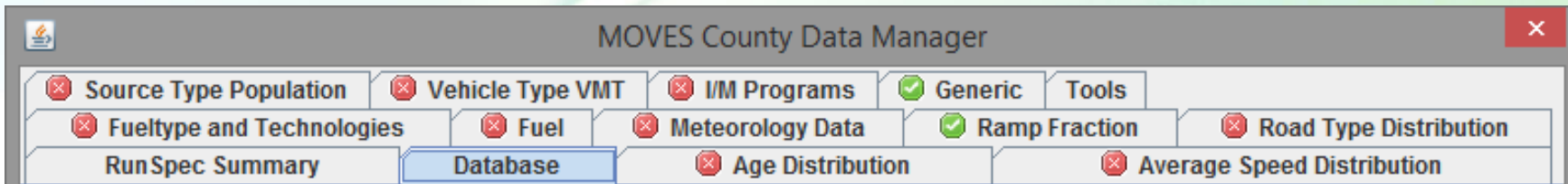
Pollutants and Processes – All Selected Fuel/Type Combinations

- Pollutants
 - Benzene
 - 1,3-Butadiene
 - Formaldehyde
 - Acrolein
 - Additional Air Toxics (Naphthalene and POM)
 - Pollutant Chains
 - Volatile Organic Compounds
 - Non-Methane Hydrocarbons
 - Total Gaseous Hydrocarbons
- Processes: Running Exhaust and Crankcase Running Exhaust

Polycyclic Organic Matter

Compound	Form	pollutantID	Form	pollutantID
Dibenzo(a,h)anthracene	particle	68	gas	168
Fluoranthene	particle	69	gas	169
Acenaphthene	particle	70	gas	170
Acenaphthylene	particle	71	gas	171
Anthracene	particle	72	gas	172
Benz(a)anthracene	particle	73	gas	173
Benzo(a)pyrene	particle	74	gas	174
Benzo(b)fluoranthene	particle	75	gas	175
Benzo(g,h,i)perylene	particle	76	gas	176
Benzo(k)fluoranthene	particle	77	gas	177
Chrysene	particle	78	gas	178
Fluorene	particle	81	gas	181
Indeno(1,2,3,c,d)pyrene	particle	82	gas	182
Phenanthrene	particle	83	gas	183
Pyrene	particle	84	gas	184

MOVES County Data Manager



Data ^a	Run Detail			Sources				
	Same for All Runs	Vary by Year	Vary by Alternative	Local MPO	State Air Agency	State DOT	MOVES Default	Project-Specific
Age Distribution	•			•	•	•		
Average Speed Distribution		•	•					•
Fueltype and Technologies	•			•	•		•	
Fuel Supply ^b		•		•	•		•	
Fuel Formulation ^b		•		•	•		•	
Meteorology Data	•			•	•		•	
Ramp Fraction		•	•	•	•			•
Road Type Distribution		•	•					•
Source Type Population		•		•	•	•	•	
HPMS Vehicle Type Year ^c		•	•					•
Month VMT Fraction ^c	•			•		•	•	
Hour VMT Fraction ^c	•			•		•	•	
I/M Programs		•		•	•		•	

^aUse data reflecting annual average conditions representing long-term MSAT exposure; e.g., data from annual PM2.5 regional conformity analyses

^aFuel tab

^bVehicle Type VMT tab

Project-specific Data

Link ID / Name

County

Road Type

Speed by Time Period

- Peak / Off-Peak
- AM / MD / PM / ON
- Hourly

VMT by Time Period by Vehicle Type

- Heavy truck fraction
- MOVES source types 11 through 62

Vehicle Type VMT

HPMSVTypeYear

	A	B	C
1	HPMSVtypeID	yearID	HPMSBaseYearVMT
2	10		
3	20		
4	30		
5	40		
6	50		
7	60		

yearID:

Analysis years – base year,
first year of operation, and
design year

Road Type Distribution

	A	B	C
1	sourceTypeID	roadTypeID	roadTypeVMTFraction
2	11	1	
3	11	2	
4	11	3	
5	11	4	
6	11	5	
7	21	1	
8	21	2	
9	21	3	
10	21	4	
11	21	5	
12	31	1	
13	31	2	
14	31	3	
15	31	4	
16	31	5	
17	32	1	
18	32	2	
19	32	3	
20	32	4	

sourceTypeID:

11, 21, 31, 32, 41, 42, 43,
51, 52, 53, 54, 61, 62

roadTypeID:

1, 2, 3, 4, 5

Average Speed Distribution – Vehicle Hours Travel (VHT) by Average Speed

	A	B	C	D	E
1	sourceTypeID	roadTypeID	hourDayID	avgSpeedBinID	avgSpeedFraction
2	11	2	12	1	
3	11	2	12	2	
4	11	2	12	3	
5	11	2	12	4	
6	11	2	12	5	
7	11	2	12	6	
8	11	2	12	7	
9	11	2	12	8	
10	11	2	12	9	
11	11	2	12	10	
12	11	2	12	11	
13	11	2	12	12	
14	11	2	12	13	
15	11	2	12	14	
16	11	2	12	15	
17	11	2	12	16	
18	11	2	15	1	
19	11	2	15	2	
20	11	2	15	3	

sourceTypeID:

11, 21, 31, 32, 41, 42, 43,
51, 52, 53, 54, 61, 62

roadTypeID:

2, 3, 4, 5

hourDayID:

12, 22, 32, . . . 242 weekend
15, 25, 35, . . . 245 weekday

avgSpeedBinID:

1, 2, 3, 4, 5, 6, 7, 8, 9, 10,
11, 12, 13, 14, 15, 16

Documentation

A quantitative MSAT analysis using MOVES can generate *lots* of files

The administrative record should include (electronically) every file needed to trace the process from beginning to end

- MOVES runspecs
- Input data spreadsheets
- Input databases
- Output databases
- Post-processing spreadsheets used to generate result tables for the NEPA document

Documentation

Additional suggestions

- Include a brief “readme” document describing each file
- Use naming conventions so that it’s easy to tell which files are grouped together (runspecs, input and output databases, input data spreadsheets, and output post-processing spreadsheets)
- Use the Description box in the MOVES runspec to describe each run
- Explain any anomalies (e.g., an output database that contains more than one run when others don’t, etc.)

Contact



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