Air Quality Conformity Analysis Report

Reading MPO 2023-2026 Transportation Improvement Program (TIP) and 2045 Long Range Transportation Plan (LRTP)

National Ambient Air Quality Standards (NAAQS) Addressed:

- 2008 8-Hour Ozone (Nonattainment)

Prepared By:

The Berks County Planning Commission and
Pennsylvania Department of Transportation
for the
Reading Area Transportation Study Coordinating Committee

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Overview

This report provides an analysis of the air quality implications of the current Reading Area Transportation Study (RATS) Coordinating Committee Metropolitan Planning Organization (MPO) 2023-2026 Transportation Improvement Program (TIP) and the 2045 Long Range Transportation Plan (LRTP). The analysis demonstrates transportation conformity under the 2008 8-hour ozone National Ambient Air Quality Standard (NAAQS). The air quality conformity analysis reflects an assessment of the regionally significant, non-exempt transportation projects included in the TIP and LRTP.

This document replaces the previously approved conformity demonstration and ensures that the findings meet all current criteria established by the U.S. Environmental Protection Agency (EPA) for the applicable NAAQS.

Background on Transportation Conformity

Transportation conformity is a way to ensure that federal funding and approval are awarded to transportation activities that are consistent with air quality goals. Under the Clean Air Act (CAA), transportation and air quality modeling procedures must be coordinated to ensure that the transportation programs are consistent with the area's applicable State Implementation Plan (SIP). The SIP is a federally approved and enforceable plan by which each area identifies how it will attain and/or maintain the health-related primary and welfare-related secondary NAAQS.

In order to receive transportation funding and approvals from the Federal Highway Administration (FHWA) or the Federal Transit Administration (FTA), state and local transportation agencies must demonstrate that the plans, programs, or projects meet the transportation conformity requirements of the CAA as set forth in the transportation conformity rule. Under the transportation conformity rule, transportation plans are expected to conform to the applicable SIP in nonattainment or maintenance areas. The integration of transportation and air quality planning is intended to ensure that transportation plans, programs, and projects will not:

- Cause or contribute to any new violation of any applicable NAAQS.
- Increase the frequency or severity of any existing violation of any applicable NAAQS.
- Delay timely attainment of any applicable NAAQS, any required interim emissions reductions, or other NAAQS milestones.

The transportation conformity determination includes an assessment of future highway emissions for defined analysis years. Emissions are estimated using the latest available planning assumptions and available analytical tools, including EPA's latest approved on-highway mobile sources emissions model, the Motor Vehicle Emission Simulator (MOVES). The conformity determination provides a tabulation of the analysis results for applicable precursor pollutants, showing that the required conformity test was met for each analysis year.

Report Contents

This document includes a summary of the methodology and data assumptions used for the conformity analysis. As shown in **Exhibit 1**, attachments containing additional detail have been provided with the document. In addition, modeling input and output files have been reviewed by the Environmental Protection Agency (EPA) Region III and the Pennsylvania Department of Environmental Protection (DEP).

EXHIBIT 1: SUMMARY OF ATTACHMENTS

Attachment	Title	Description
A	Project List	Provides a list of regionally significant highway projects.
B	Detailed Emission Results	Provides a detailed summary of emissions by roadway type.
C	MOVES Sample Run Specification	Provides example MOVES data importer (XML) and run specification (MRS) files.

National Ambient Air Quality Standard Designations

The CAA requires the EPA to set NAAQS for pollutants considered harmful to public health and the environment. A nonattainment area is any area that does not meet the primary or secondary NAAQS. Once a nonattainment area meets the standards and additional redesignation requirements in the CAA [Section 107(d)(3)(E)], EPA will designate the area as a maintenance area.

The RATS MPO area (Berks County) is currently designated as a nonattainment area under the 2008 8-hour ozone NAAQS. The county is attaining all other current NAAQS. Transportation conformity requires nonattainment and maintenance areas to demonstrate that all future transportation projects will not prevent an area from reaching its air quality attainment goals.

Fine Particulate Matter

Fine particulate matter ($PM_{2.5}$) can be emitted directly into the atmosphere (sources include exhaust and dust from brake and tire wear) or formed in the atmosphere by combinations of precursor pollutants (secondary formation). Sulfates and nitrates are two types of pollutants that contribute to secondary formation. Sulfate emissions are a result of power plant and industry emissions, while nitrate emissions result from automobiles, power plants, and other combustion sources. Scientific studies have shown a significant correlation between exposure to fine particulates and severe health issues such as heart disease, lung disease, and premature death.

The pollutants that could be analyzed in the conformity analysis are: [1] direct $PM_{2.5}$ emissions (tail pipe emissions, brake and tire wear), [2] re-entrained road dust, and [3] precursors nitrogen oxides (NO_X), volatile organic compounds (VOC), sulfur oxides (SO_X) and ammonia (NH_3). The EPA has ruled that until the EPA or DEP find that other precursor pollutants are significant contributors, and a SIP revision is

approved stating such findings, direct $PM_{2.5}$ emissions and NO_X are the only pollutants that must be analyzed for transportation conformity (40 CFR 93.119(f)(8)–(10)).

1997 Annual $PM_{2.5}$ and 2006 24-hour $PM_{2.5}$ Standards

The EPA published the 1997 annual $PM_{2.5}$ NAAQS on July 18, 1997, (62 FR 38652), with an effective date of September 16, 1997. An area is in nonattainment of this standard if the 3 year average of the annual mean $PM_{2.5}$ concentrations (for designated monitoring sites within an area) exceed 15.0 micrograms per cubic meter ($\mu g/m^3$). Berks County was designated as a nonattainment area under the 1997 annual $PM_{2.5}$ NAAQS, effective April 5, 2005 (70 FR 944).

The EPA published the 2006 24-hour $PM_{2.5}$ NAAQS on October 17, 2006, (71 FR 61144), with an effective date of December 18, 2006. The rulemaking strengthened the 1997 24-hour standard of 65 $\mu g/m^3$ (62 FR 38652) to 35 $\mu g/m^3$ and retained the 1997 annual $PM_{2.5}$ NAAQS of 15 $\mu g/m^3$. An area is in nonattainment of the 2006 24-hour $PM_{2.5}$ NAAQS if the 98^{th} percentile of the annual 24-hour concentrations, averaged over three years, is greater than 35 $\mu g/m^3$. Berks County was designated as attainment under the 2006 24-hour $PM_{2.5}$ NAAQS, effective December 14, 2009 (74 FR 58688).

A redesignation request and maintenance plan applicable to the 1997 annual $PM_{2.5}$ NAAQS was approved by EPA and effective December 22, 2014 (79 FR 76251). The maintenance plan includes 2017 and 2025 $PM_{2.5}$ and NO_X mobile vehicle emission budgets (MVEBs) for transportation conformity purposes.

EPA took final action on the "*Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements*" rule on August 24, 2016 (81 FR 58010 effective on October 24, 2016). In that rulemaking, EPA finalized the option that revokes the 1997 primary annual $PM_{2.5}$ NAAQS in areas that have always been designated as attainment and in maintenance of that NAAQS. After revocation, areas no longer have to expend resources on CAA air quality planning and conformity determination requirements associated with the 1997 annual $PM_{2.5}$ NAAQS.

2012 Annual $PM_{2.5}$ Standard

The EPA published the 2012 annual $PM_{2.5}$ NAAQS on January 15, 2013, (78 FR 3086), with an effective date of March 18, 2013. The EPA revised the annual $PM_{2.5}$ NAAQS by strengthening the standard from 15 $\mu g/m^3$ to 12 $\mu g/m^3$. An area is in nonattainment of this standard if the 3 year average of the annual mean $PM_{2.5}$ concentrations for designated monitoring sites in an area is greater than 12.0 $\mu g/m^3$. On December 18, 2014, EPA issued final designations for the standard that were revised on April 7, 2015 (80 FR 18535). Berks County is designated in attainment of the standard.

Ozone

Ozone is formed by chemical reactions occurring under specific atmospheric conditions. Precursor pollutants that contribute to the formation of ozone include VOC and NO_X, both of which are components of vehicle exhaust. VOCs may also be produced through the evaporation of vehicle fuel, as

well as by displacement of vapors in the gas tank during refueling. By controlling VOC and NO_X emissions, ozone formation can be mitigated.

1997 and 2008 8-hour Ozone NAAQS

The EPA published the 1997 8-hour ozone NAAQS on July 18, 1997, (62 FR 38856), with an effective date of September 16, 1997. An area was in nonattainment of the 1997 8-hour ozone NAAQS if the 3-year average of the individual fourth highest air quality monitor readings, averaged over 8 hours throughout the day, exceeded the NAAQS of 0.08 parts per million (ppm). On May 21, 2013, the EPA published a rule revoking the 1997 8-hour ozone NAAQS, for the purposes of transportation conformity, effective one year after the effective date of the 2008 8-hour ozone NAAQS area designations (77 FR 30160). As of July 20, 2013, Berks County no longer needs to demonstrate conformity to the 1997 8-hour ozone NAAQS. However, future SIP revisions must address EPA's anti-backsliding requirements.

The EPA published the 2008 8-hour ozone NAAQS on March 27, 2008, (73 FR 16436), with an effective date of May 27, 2008. EPA revised the ozone NAAQS by strengthening the standard to 0.075 ppm. Thus, an area is in nonattainment of the 2008 8-hour ozone NAAQS if the 3-year average of the individual fourth highest air quality monitor readings, averaged over 8 hours throughout the day, exceeds the NAAQS of 0.075 ppm. Berks County was designated as a nonattainment area under the 2008 8-hour ozone NAAQS, effective July 20, 2012 (77 FR 30088).

2015 8-hour Ozone NAAQS

In October 2015, based on its review of the air quality criteria for ozone and related photochemical oxidants, the EPA revised the primary and secondary NAAQS for ozone to provide requisite protection of public health and welfare, respectively (80 FR 65292). The EPA revised the levels of both standards to 0.070 ppm, and retained their indicators, forms (fourth-highest daily maximum, averaged across three consecutive years) and averaging times (eight hours). On April 30, 2018, EPA completed area designations, and Berks County was designated as an attainment area for the standard.

Interagency Consultation

As required by the federal transportation conformity rule, the conformity process includes a significant level of cooperative interaction among federal, state, and local agencies. For this air quality conformity analysis, interagency consultation was conducted as required by the Pennsylvania Conformity SIP. This included conference call(s) or meeting(s) of the Pennsylvania Transportation-Air Quality Work Group (including the Pennsylvania Department of Transportation (PennDOT), DEP, EPA, FHWA, FTA and representatives from larger MPOs within the state). Meeting and conference calls were conducted on October 28, 2021 and January 27, 2022 to review all input planning assumptions, methodologies and analysis years.

Analysis Methodology and Data

This transportation conformity analysis was conducted using EPA's MOVES model, which is the official model for estimating emissions from highway vehicles for SIP emission inventories and transportation conformity (75 FR 9411), effective March 2, 2010. MOVES2014a has been used for this conformity determination and is (in addition to MOVES2014b and MOVES3) currently considered one of the latest approved model versions for SIP and transportation conformity purposes (79 FR 60343). After January 9, 2023, MOVES3 must be used for conformity determinations.

Planning assumptions are updated following EPA and FHWA joint guidance (EPA420-B-08-901) that clarifies the implementation of the latest planning assumption requirements in 40 CFR 93.110. This analysis utilizes the best available latest traffic, vehicle fleet and environmental data to estimate regional highway emissions.

PennDOT updates many of the key planning assumptions on a triennial basis to support EPA's National Emissions Inventory (NEI) and FHWA's latest planning assumption requirements for transportation conformity. The PennDOT triennial data update is typically used to inform the planning assumptions for the future analysis years used for transportation conformity.

Due to the impacts that COVID has had on the latest 2020 triennial data update, PennDOT has determined that these estimates of vehicle miles of travel (VMT), vehicle mix percentages, travel time-of-day patterns, transit ridership, and vehicle fleet age may not be reflective of future conditions or longer term trends. The 2020 information indicates significant reductions in passenger vehicle travel and transit ridership. In addition, vehicle registration data shows very low vehicle sales and older vehicle scrappage. The 2020 information is not reflective of other historic data collected over the last 15-20 years, other than in 2010 during the recession. PennDOT, in coordination with the Pennsylvania Air Quality Workgroup, decided not to use the 2020 VMT, traffic and transit data to inform future VMT projections for conformity. The MPO's travel model continued to utilize the latest socio-economic forecasts to guide VMT growth rates though in most cases these had not been updated with data from the COVID period. In addition, PennDOT, in consultation with the Workgroup, decided not to use the 2020 vehicle age data to inform future age distributions and vehicle sales as this information is not reflective of historic trends. For both cases, the VMT growth and vehicle age assumptions relied on previous planning assumptions used for past conformity analyses.

All other data assumptions for the conformity analysis relied on the latest available planning assumptions or national/local defaults consistent with methods used for past conformity analyses and EPA's technical guidance. This includes information and characteristics related to fuels, inspection maintenance (I/M) program parameters, heavy-truck long duration idling, and environmental data (e.g. temperatures and humidity).

The analysis methodology and data inputs for this analysis were developed through interagency consultation and used available EPA guidance documents that included:

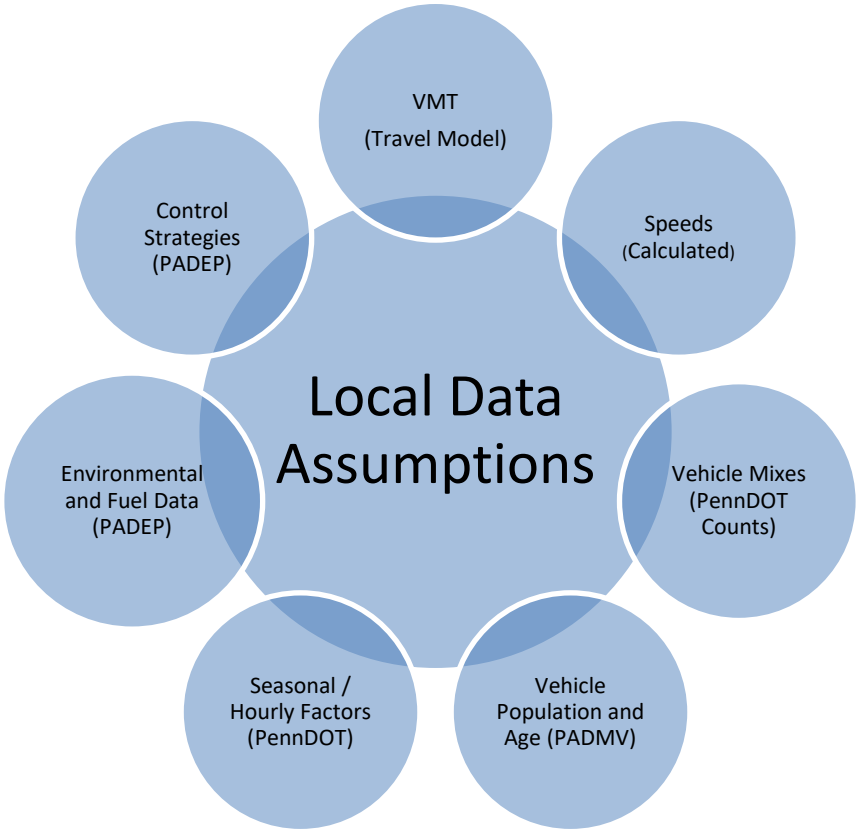
- *Policy Guidance on the Use of MOVES2014 for State Implementation Plan Development, Transportation Conformity, and Other Purposes*, US EPA Office of Air and Radiation, EPA-420-B-14-008, July 2014.
- *MOVES2014a User Guide*, US EPA Office of Transportation and Air Quality, EPA-420-B-15-095, November 2015.
- *MOVES2014 and MOVES2014a, and MOVES2014b Technical Guidance: Using MOVES to Prepare Emission Inventories for State Implementation Plans and Transportation Conformity.* US EPA Assessment and Standard Division, Office of Transportation and Air Quality, EPA-420-B-18-039, August 2018.

A mix of local and national default (internal to MOVES) data are used in the analysis. As illustrated in **Exhibit 2**, local data has been used for data items that have a significant impact on emissions, including: vehicle miles of travel (VMT), vehicle population, congested speeds, and vehicle type mix, as well as environmental and fuel assumptions. Local data inputs to the analysis process reflect the latest available planning assumptions using information obtained from PennDOT, DEP and other local/national sources.

The methodology used for this analysis is consistent with the methodology used to develop SIP inventories. This includes the use of custom post-processing software (PPSUITE) to calculate hourly speeds and prepare key traffic input files to the MOVES emission model. PPSUITE consists of a set of programs that perform the following functions:

- Analyzes highway operating conditions.
- Calculates highway speeds.
- Compiles VMT and vehicle type mix data.
- Prepares MOVES runs and processes MOVES outputs.

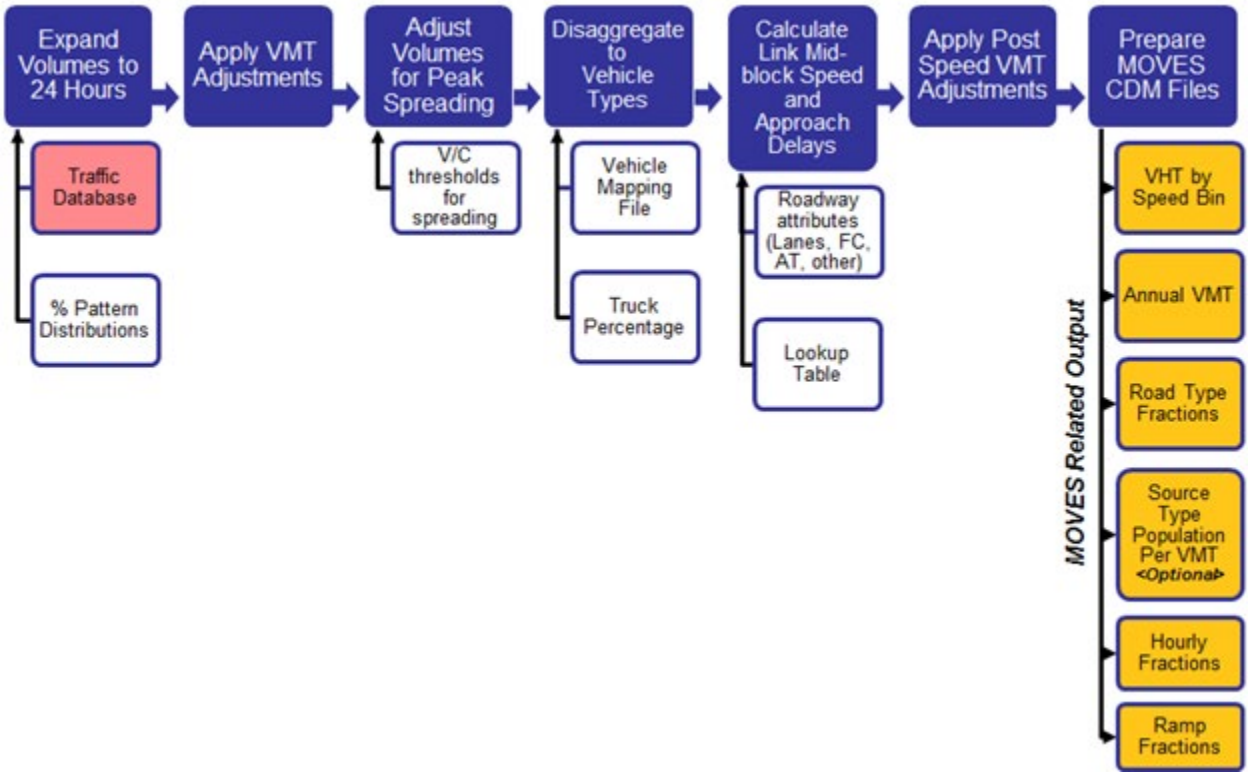
EXHIBIT 2: LOCAL DATA INPUTS USED FOR CONFORMITY RUNS



PPSUITE is a widely used and accepted tool for estimating speeds and processing emissions rates. The PPSUITE tool has been used for developing on-highway mobile source inventories in SIP revisions, control strategy analyses, and conformity analyses in other states. The software was developed to utilize accepted transportation engineering methodologies. The PPSUITE process is integral to producing traffic-related input files to the MOVES emission model. **Exhibit 3** summarizes the key functions of PPSUITE within the emission calculation process. Other MOVES input files are prepared externally to the PPSUITE software, including vehicle population, vehicle age, environmental and fuel input files.

The CENTRAL software is also used in this analysis. CENTRAL is a menu-driven software platform that executes the PPSUITE and MOVES processes in batch mode. The CENTRAL software allows users to execute runs for a variety of input options and integrates custom MYSQL steps into the process. CENTRAL provides important quality control and assurance steps, including file naming and storage automation.

EXHIBIT 3: EMISSION CALCULATION PROCESS



Key MOVES Input Data

A large number of inputs to MOVES are needed to fully account for the numerous vehicle and environmental parameters that affect emissions. These inputs include traffic flow characteristics, vehicle descriptions, fuel parameters, I/M program parameters and environmental variables. MOVES includes a default national database of meteorology, vehicle fleet, vehicle activity, fuel and emission control program data for every county; EPA, however, cannot certify that the default data is the most current or best available information for any specific area. As a result, local data, where available, is recommended for use when conducting a regional conformity analysis. A mix of local and default data is used for this analysis. These data items are discussed in the following sections.

Travel Demand Model

The roadway data input to emissions calculations for this conformity analysis is based on information from the region's travel demand forecasting model. The travel demand model estimates roadway volumes based on input demographic forecasts and expected changes to the transportation roadway network.

The travel demand model follows the basic "four-step" travel demand forecasting process and utilizes the Cube BASE (TP+) software platform. The model consists of 673 Traffic Analysis Zones (TAZ's), approximately 16,000 links, and approximately 9,000 nodes. The network contains attributes such as distance, number of lanes, area type, facility type, free flow speed, capacity of the lane, and location of traffic signals.

The regional travel model was updated in 2015. The updates included enhancing the network and zone structure, and validating the model to a 2015 base year. Using the projected traffic volume data from the model, conditions were evaluated for all applicable future analysis years. All significant air quality projects from the TIP were coded into the travel demand model.

Transit data was also generated as part of the travel demand model. Existing fixed transit routes and their associated attributes (i.e., stops, headways, fares, and speeds) are included within a transit subroutine. Ridership estimates generated by this subroutine are fed back into the model stream as part of the overall network processing.

Traffic forecasts were projected based on the socioeconomic and land use data projections developed by Berks County Planning Commission. This data includes total population, households, and employment. **Exhibit 4** summarizes the socioeconomic data for the conformity analysis years.

EXHIBIT 4: SOCIOECONOMIC GROWTH ASSUMPTIONS TO THE TRAVEL MODEL

County	Year	Population	Household	Total Employment
Berks	2025	436,837	164,493	176,797
	2035	457,485	172,268	180,686
	2045	477,789	179,914	184,575

The travel model network and assigned traffic volumes are processed by PPSUITE to prepare the traffic inputs needed to run the MOVES emission model. The following information is extracted from the model for emission calculations:

- Lanes
- Roadway capacity
- Distance
- Daily traffic volume
- Type of area abutting the roadway (e.g. urban, suburban, rural, etc.)
- Type of roadway facility (e.g. interstate, arterial, collector, local, etc.)

Other Supporting Traffic Data

Other traffic data is used to adjust and disaggregate traffic volumes. Key sources used in these processes include the following:

- *Highway Performance Monitoring System (HPMS VMT)*: According to EPA guidance, baseline inventory VMT computed from the regional travel model must be adjusted to be consistent with HPMS VMT totals. The VMT contained in the HPMS reports are considered to represent average annual daily traffic (AADT), an average of all days in the year, including weekends and holidays. Adjustment factors are calculated and used to adjust locally modeled roadway data VMT to be consistent with the reported HPMS totals, and are applied to all county and facility group combinations within the region. These adjustments are important to account for local roadway VMT not represented within the regional travel demand model.
- *Seasonal Factors*: The traffic volumes estimated from the regional travel demand model are adjusted to summer or average monthly conditions (as needed for annual processing), using seasonal adjustment factors prepared by PennDOT's Bureau of Planning and Research (BPR) in their annual traffic data report published on the BPR website (http://www.dot.state.pa.us/ Search: Research and Planning). The seasonal factors are also used to develop MOVES daily and monthly VMT fraction files, allowing MOVES to determine the portion of annual VMT that occurs in each month of the year.
- *Hourly Patterns*: Speeds and emissions vary considerably depending on the time of day. In order to produce accurate emission estimates, it is important to estimate the pattern by which roadway volume varies by breaking the data down into hourly increments. Pattern data is in the form of a percentage of the daily volumes for each hour. Distributions are provided for all the counties within the region and by each facility type grouping. The hourly pattern data has been developed from 24-hour vehicle count data compiled by PennDOT's BPR, using the process identified in PennDOT's annual traffic data report. The same factors are also used to develop the MOVES hourly fraction file.

Vehicle Class

Emission rates within MOVES also vary significantly by vehicle type. MOVES produces emission rates for thirteen MOVES vehicle source input types. VMT, however, is input to MOVES by five HPMS vehicle groups (note that passenger cars and light trucks are grouped for input to MOVES2014a. **Exhibit 5** summarizes the distinction between each classification scheme.

EXHIBIT 5: MOVES SOURCE TYPES AND HPMS VEHICLE GROUPS

SOURCE TYPES		HPMS Class Groups	
11	Motorcycle	10	Motorcycle
21	Passenger Car	25	Passenger Car
31	Passenger Truck	25	Passenger/Light Truck
32	Light Commercial Truck	40	Buses
41	Intercity Bus	50	Single Unit Trucks
42	Transit Bus	60	Combination Trucks
43	School bus		
51	Refuse Truck		
52	Single Unit Short-haul Truck		
53	Single Unit Long-haul Truck		
54	Motor Home		
61	Combination Short-haul Truck		
62	Combination Long-haul Truck		

The emissions estimation process includes a method to disaggregate the traffic volumes to the thirteen source types and then to recombine the estimates to the five HPMS vehicle classes. Vehicle type pattern data is used by PPSUITE to distribute the hourly roadway segment volumes among the thirteen MOVES source types. Similar to the 24-hour pattern data, this data contains percentage splits to each source type for every hour of the day. The vehicle type pattern data is developed from several sources of information:

- PennDOT truck percentages from the Roadway Management System (RMS) database.
- Hourly distributions for trucks and total traffic compiled by PennDOT's BPR.
- Transit data from PennDOT and the National Transit Database (NTD) Transit Profiles (https://www.ntdprogram.gov).
- School bus registration data from PennDOT's Bureau of Motor Vehicles Registration Database.

Vehicle type percentages are also input into the capacity analysis section of PPSUITE to adjust the speeds in response to truck volume. Larger trucks take up more roadway space compared to an equal number of cars and light trucks, which is accounted for in the speed estimation process by adjusting capacity using information from the Transportation Research Board's fifth edition of the *Highway Capacity Manual*. (http://hcm.trb.org/).

Vehicle Ages

Vehicle age distributions are input to MOVES for each of the thirteen source types. These distributions reflect the percentage of the vehicle fleet falling under each vehicle model year (MY), to a maximum age of 31 years. The vehicle age distributions were prepared from the most recently available registration download from PennDOT's Bureau of Motor Vehicles Registration Database. Due to data limitations,

information for light duty vehicles, intercity bus and motor home (including source types 11, 21, 31, 32, 41 and 54) was used as local data for MOVES inputs, while heavy-duty vehicles (including source types 42, 43, 51, 52, 53, 61, and 62) used the MOVES national default data. The registration data download is based on MOBILE6.2 vehicle categories. The data was converted to source types using the EPA convertor spreadsheets provided with the MOVES emission model.

Vehicle Population

The vehicle population information, including the number and age of vehicles, impacts forecasted start and evaporative emissions within MOVES. Similar to vehicle ages, MOVES requires vehicle populations for each of the thirteen source type categories. County vehicle registration data was used to estimate vehicle population for light-duty vehicles, transit buses, and school buses. Other heavy-duty vehicle population values were based on VMT for each source type using the vehicle mix and pattern data discussed previously. PPSUITE automatically applies MOVES default ratios of VMT and source type population (e.g. the number of miles per vehicle by source type) to the local VMT estimates to produce vehicle population.

For the preparation of source type population for other required conformity analysis years, base values were adjusted using forecast population and household data for the area. Growth rates were limited so as to not exceed the VMT growth assumptions.

Meteorology Data

Average monthly minimum temperatures, maximum temperatures, and humidity values are consistent with the regional State Implementation Plan (SIP) modeling conducted by DEP. The data was obtained from WeatherBank, Inc. EPA's MOBILE6.2-MOVES meteorological data convertor spreadsheet (http://www.epa.gov/oms/models/moves/tools.htm) was used to prepare the hourly temperature inputs needed for the MOVES model, based on the available data.

Fuel Parameters

The MOVES default fuel formulation and fuel supply data were reviewed and updated based on available local volumetric fuel property information. The gasohol market penetration and Reid Vapor Pressure (RVP) values were updated, but MOVES default data was used for the remaining parameters. Key assumptions include:

- 10.0 RVP used for summer months [Local data].
- 10% and 15% ethanol used throughout the year with [MOVES default market shares [vary by year].

I/M Program Parameters

The inspection maintenance (I/M) program inputs to the MOVES model are based on previous and current programs within each county (all PA I/M programs are based on county boundaries). All analysis

years include Pennsylvania's statewide I/M program. The default I/M program parameters included in MOVES were examined for each county and necessary changes were made to the default parameters to match the actual local program.

The I/M program requirements vary by region (five regions) and include on-board diagnostics (OBD) technology that uses the vehicle's computer for model years 1996 and newer to identify potential engine and exhaust system problems that could affect emissions. The program, named PAOBDII, is implemented by region as follows:

- *Philadelphia Region* - Bucks, Chester, Delaware, Montgomery and Philadelphia Counties
  [Includes tailpipe exhaust testing using ASM2015 or equipment for pre-1996 vehicles up to 25 years old]
- *Pittsburgh Region* - Allegheny, Beaver, Washington and Westmoreland Counties.
  [Includes tailpipe exhaust testing using PA 97 equipment for pre-1996 vehicles up to 25 years old]
- *South Central and Lehigh Valley Region* - Berks, Cumberland, Dauphin, Lancaster, Lebanon, Lehigh, Northampton and York Counties.
  [Includes gas cap and visual inspection only for 1975 through 1995 model years]
- *North Region* - Blair, Cambria, Centre, Erie, Lackawanna, Luzerne, Lycoming, and Mercer Counties.
  [Gas cap and visual inspection only – No OBD]
- *Other 42 Counties* – Includes the remaining 42 counties not included above.
  [Visual inspection only – No OBD]

Other Vehicle Technology and Control Strategy Data

Current federal vehicle emissions control and fuel programs are incorporated into the MOVES software. These include the National Program standards covering vehicles MY2012-MY2025. Modifications of default emission rates are required to reflect the early implementation of the National Low Emission Vehicle (NLEV) Program in Pennsylvania. To reflect these impacts, EPA has released instructions and input files that can be used to model these impacts.

The Pennsylvania Clean Vehicles (PCV) Program, adopted in 1998, incorporates the California Low Emission Vehicle Regulations (CA LEV, as amended) by reference. The PCV Program allowed automakers to comply with the NLEV program as an alternative to this Pennsylvania program until MY2006. Beginning with MY2008, all "new" passenger cars and light-duty trucks with a gross vehicle weight rating (GVWR) of 8,500 pounds or less sold/leased and titled in Pennsylvania must be certified by the California Air Resources Board (CARB) or be certified for sale in all 50 states. For this program, a "new" vehicle is a qualified vehicle with an odometer reading less than 7,500 miles. DEP and PennDOT both work with the public, including manufacturers, vehicle dealers and consumers, to ensure that vehicles sold and purchased in Pennsylvania or vehicles purchased from other states by Pennsylvania residents comply with the requirements of the PCV Program, in order to be titled in Pennsylvania. Additionally, PennDOT ensures that paperwork for title and registration includes proof of CARB- or 50-state emission certification or that the vehicle owner qualifies for an exemption to the requirements, as listed on PennDOT's MV-9 form and in the PCV Program regulation. When necessary, information from

PennDOT's title and registration process may be used to audit vehicle title transactions to determine program compliance.

The impacts of this program are modeled for all analysis years beyond 2008 using the same instructions and tools downloaded for the early NLEV analysis. EPA provided input files to reflect state programs similar to the CA LEV program. Modifications to those files were made to reflect a 2008 program start date for Pennsylvania.

Analysis Process Details

The previous sections have summarized the input data used for computing speeds and emission rates for this conformity analysis. This section explains how PPSUITE and MOVES use that input data to produce emission estimates. **Exhibit 6** provides a more detailed overview of the PPSUITE analysis procedure using the available traffic data information described in the previous sections.

VMT Preparation

Producing an emissions inventory with PPSUITE requires a process of disaggregation and aggregation. Data is available and used on a very detailed scale – individual roadway segments for each of the 24 hours of the day. This data needs to be processed individually to determine the distribution of vehicle hours of travel (VHT) by speed and then aggregated by vehicle class to determine the input VMT to the MOVES emission model. Key steps in the preparation of VMT include:

- *Assemble VMT* - The regional travel demand model contains the roadway segments, distances and travel volumes needed to estimate VMT. PPSUITE processes each segment by simply multiplying the assigned travel volume by the distance to obtain VMT.
- *Apply Seasonal Adjustments* – PPSUITE adjusts the traffic volumes to the appropriate analysis season. These traffic volumes are assembled by PPSUITE and extrapolated over the course of a year to produce the annual VMT file input to MOVES.
- *Disaggregate to Hours* - After seasonal adjustments are applied, the traffic volumes are distributed to each hour of the day. This allows for more accurate speed calculations (effects of congested hours) and allows PPSUITE to prepare the hourly VMT and speeds for input to MOVES.
- *Peak Spreading* - After distributing the daily volumes to each hour of the day, PPSUITE identifies hours that are unreasonably congested. For those hours, PPSUITE then spreads a portion of the volume to other hours within the same peak period, thereby approximating the "peak spreading" that normally occurs in such over-capacity conditions. This process also helps prevent hours with unreasonably congested speeds from disproportionately impacting emission calculations.
- *Disaggregation to Vehicle Types* - EPA requires VMT estimates to be prepared by the six HPMS vehicle groups, reflecting specific local characteristics. As described in the previous section, the hourly volumes are disaggregated into thirteen MOVES source types based on data from PennDOT and NTD, in combination with MOVES defaults. The thirteen MOVES source types are then recombined into six HPMS vehicle classes.

- *Apply HPMS VMT Adjustments* - Volumes must also be adjusted to account for differences with the HPMS VMT totals, as described in previous sections. VMT adjustment factors are provided as inputs to PPSUITE and are applied to each of the roadway segment volumes. VMT adjustment factors are also applied to runs for future years.

Speed Estimation

Emissions for many pollutants (including VOC and NO_X) vary significantly with travel speed. VOC emissions generally decrease as speed increases, while NO_X emissions decrease at low speeds and increases at higher speeds, as illustrated in **Exhibit 7**. Because emissions are so sensitive to speed changes, EPA recommends special attention be given to developing reasonable and consistent speed estimates. EPA also recommends that VMT be disaggregated into subsets that have roughly equal speeds, with separate emission factors for each subset. At a minimum, speeds should be estimated separately by road type.

The computational framework used for this analysis meets and exceeds the recommendation above relating to speed estimates. Speeds are individually calculated for each roadway segment and hour. Rather than accumulating the roadway segments into a particular road type and calculating an average speed, each individual link hourly speed is represented in the MOVES vehicle hours of travel (VHT) by a speed bin file. This MOVES input file allows the specification of a distribution of hourly speeds. For example, if 5% of a county's arterial VHT operates at 5 mph during the AM peak hour and the remaining 95% operates at 65 mph, this can be represented in the MOVES speed input file. For the roadway vehicle emissions calculations, speed distributions are input to MOVES by road type and source type for each hour of the day.

To calculate speeds, PPSUITE first obtains initial capacities (i.e., how much volume the roadway can serve before heavy congestion) and free-flow speeds (speeds assuming no congestion) to create a speed/capacity lookup table. As described previously, this data contains default roadway information indexed by the area and facility type codes. For areas with known characteristics, values can be directly coded to the database and the speed/capacity default values can be overridden. For most areas where known information is unavailable, the speed/capacity lookup tables provide valuable default information regarding speeds, capacities, signal characteristics, and other capacity adjustment information used for calculating congested delays and speeds. The result of this process is an estimated average travel time for each hour of the day for each highway segment. The average travel time multiplied by traffic volume produces vehicle hours of travel (VHT).

EXHIBIT 6: PPSUITE SPEED/EMISSION ESTIMATION PROCEDURE

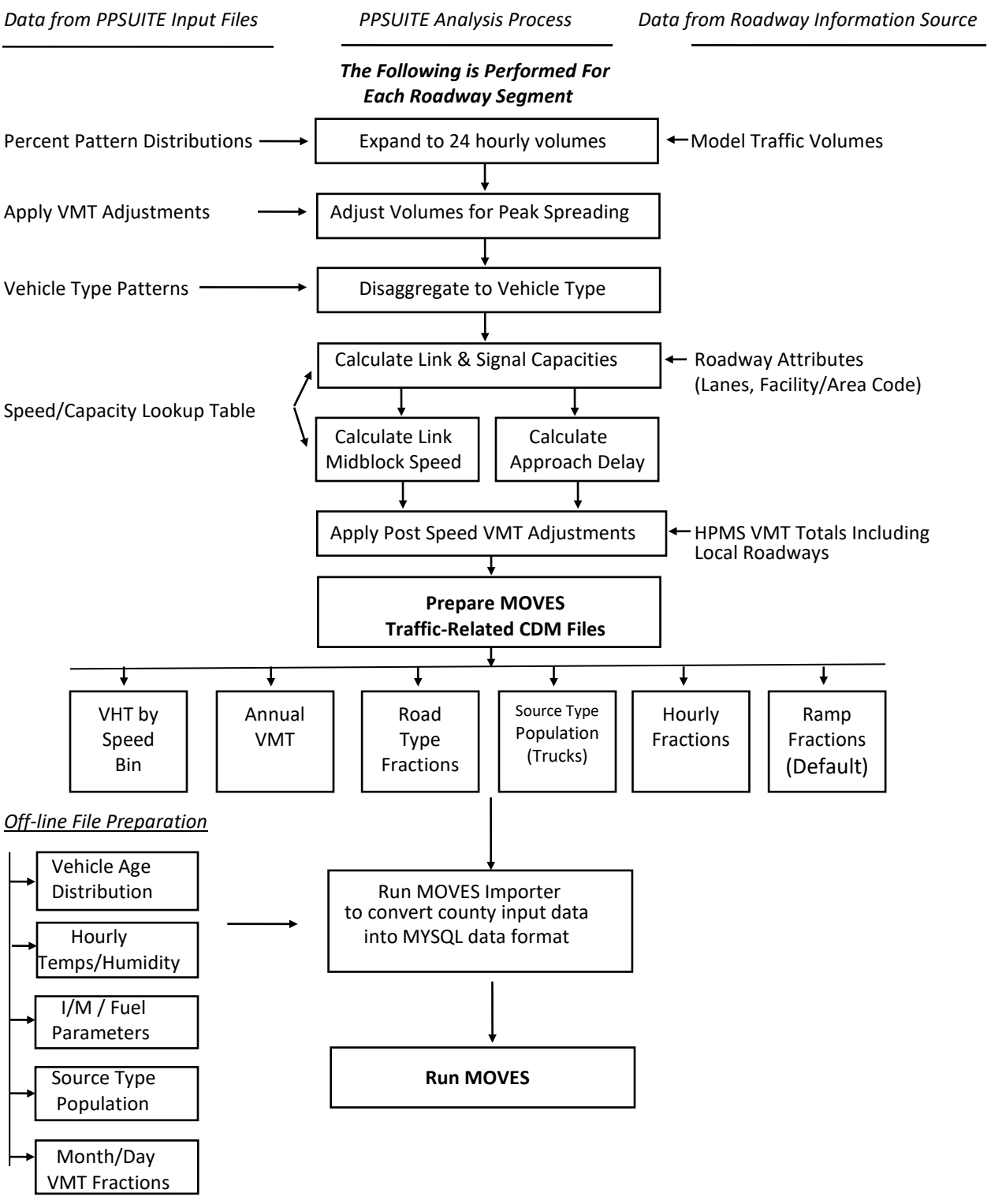
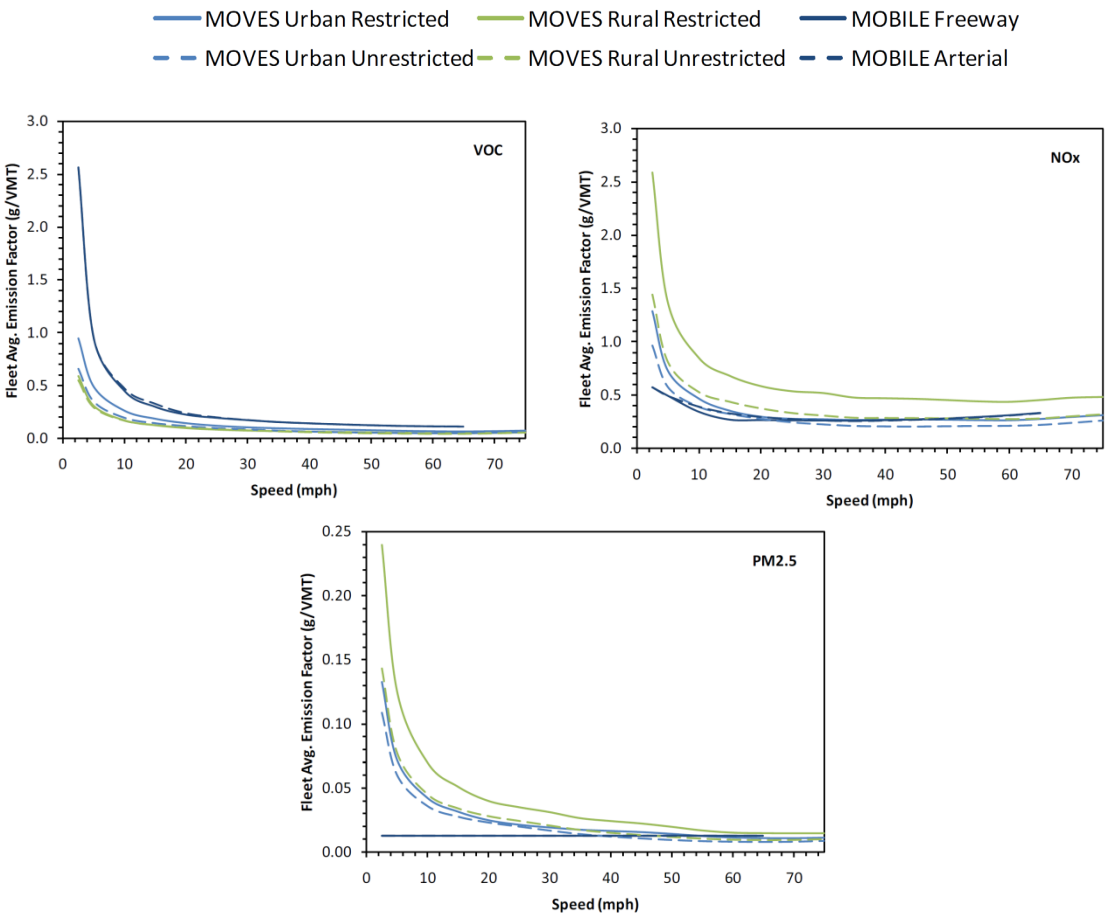


EXHIBIT 7: EMISSION FACTOR VS. SPEED VARIANCES (VOC, NO_X, AND $PM_{2.5}$)



Source: Figure 3 from Implications of the MOVES2010 Model on Mobile Source Emission Estimates, Air & Waste Management Association, July 2010.

Developing the MOVES Traffic Input Files

The PPSUITE software is responsible for producing the following MOVES input files during any analysis run:

- VMT by HPMS vehicle class.
- VHT by speed bin.
- Road type distributions.
- Hourly VMT fractions.
- Ramp fractions.

These files are text formatted files with a *.csv extension. The files are provided as inputs within the MOVES County Data Manager (CDM) and are described below:

- *VMT Input File*: VMT is the primary traffic input affecting emission results. The roadway segment distances and traffic volumes are used to prepare estimates of VMT. PPSUITE performs these calculations and outputs the MOVES annual VMT input file to the County Data Manager (CDM). The annual VMT is computed by multiplying the travel model roadway adjusted VMT by 365 days (366 days in a leap year).
- *VHT by Speed Bin File*: As described in the previous section, the PPSUITE software prepares the MOVES VHT by speed bin file, which summarizes the distribution of speeds across all links into each of the 16 MOVES speed bins for each hour of the day by road type. This robust process is consistent with the methods and recommendations provided in EPA's technical guidance for the MOVES2014 model (http://www.epa.gov/otaq/models/moves/) and ensures that MOVES emission rates are used to the fullest extent.
- *Road Type Distributions*: Within MOVES, typical drive cycles and associated operating conditions vary by roadway type. MOVES defines five different roadway types as follows:

  1 Off-Network.
  2 Rural Restricted Access.
  3 Rural Unrestricted Access.
  4 Urban Restricted Access.
  5 Urban Unrestricted Access.

  For this analysis, the MOVES road type distribution file is automatically generated by PPSUITE using defined equivalencies. The off-network road type includes emissions from vehicle starts, extended idling, and evaporative emissions. Off-network activity in MOVES is primarily determined by the Source Type Population input.
- *Ramp Fractions*: Since ramps are not directly represented within the regional travel demand model, the assumption is that 8% of total Freeway VHT is Ramp VHT, consistent with EPA's technical guidance.

MOVES Runs

After computing speeds and aggregating VMT and VHT, PPSUITE prepares traffic-related inputs needed to run EPA's MOVES software. Additional required MOVES inputs are prepared externally from the processing software and include temperatures, I/M program parameters, fuel characteristics, vehicle fleet age distributions, and source type population. The MOVES county importer is run in batch mode. This program converts all data files into the MYSQL format used by the MOVES model. At that point, a MOVES run specification file (*.mrs) is created which specifies options and key data locations for the run. The MOVES run is then executed in batch mode. A summary of key MOVES run specification settings is shown in **Exhibit 8**. MOVES can be executed using either an inventory or rate-based approach. For this analysis, MOVES is applied using the *inventory-based* approach. Using this approach, actual VMT and population are provided as inputs to the model; MOVES is responsible for producing the total emissions for the region.

EXHIBIT 8: MOVES RUN SPECIFICATION FILE PARAMETER SETTINGS

Parameter	Setting
MOVES Version	MOVES2014a
MOVES Default Database Version	MOVESDB20161117
Scale	COUNTY
Analysis Mode	Inventory
Time Span	**July Weekday Runs:** July month, Weekday, 24 hours
Time Aggregation	Hour
Geographic Selection	County [FIPS]
Vehicle Selection	County [FIPS]
Road Type	All source types Gasoline, Diesel, CNG, E85
Pollutants and Processes	All road types including off-network
Database selection	All $PM_{2.5}$ categories, NO_X
General Output	Early NLEV database PA-Specific CA LEV program database
Output Emissions	Units: Emission = grams; Distance = miles; Time = hours; Energy = Million BTU

Conformity Analysis Results

Transportation conformity analyses of the TIP and LRTP has been completed for Berks County. The analyses were performed according to the requirements of the Federal transportation conformity rule at 40 CFR Part 93, Subpart A. The analyses utilized the methodologies, assumptions and data as presented in previous sections. Interagency consultation has been used to determine applicable emission models, analysis years and emission tests.

Emission Tests

There are currently no approved SIP MVEBs for Berks County under 2008 8-hour ozone NAAQS. However, the County has an approved SIP revision establishing MVEBs under the 1997 8-hour ozone NAAQS. The MVEBs were originally approved on January 14, 2008 (73 FR 2162) and subsequently revised on March 31, 2014 (79 FR 17875). As required, the latest revised budgets are used for the ozone conformity test. The ozone conformity analysis has been conducted to evaluate emissions in comparison to the applicable ozone MVEBs summarized in **Exhibit 9**.

EXHIBIT 9: 8-HOUR OZONE MOTOR VEHICLE EMISSION BUDGETS

County / Pollutant	2009 Budget (tons/day)	2018 Budget (tons/day)
VOC	13.1	7.5
NO_X	29.0	14.9

Analysis Years

Section 93.119(g) of the Federal Transportation Conformity Regulations requires that emissions analyses be conducted for specific analysis years as follows:

- A near-term year, one to five years in the future.
- The MPO's horizon year for long range planning.
- All established MVEB years.
- Attainment year of the standard if within timeframe of the conformity analysis.
- An intermediate year or years such that if there are two years in which analysis is performed, the two analysis years are no more than ten years apart.

All analysis years were determined through the interagency consultation process. **Exhibit 10** provides the analysis years used for this conformity analysis.

EXHIBIT 10: TRANSPORTATION CONFORMITY ANALYSIS YEARS

Analysis Year	Description
2025	Interim Year
2035	Interim Year
2045	LRTP Horizon Year

Regionally Significant Highway Projects

For the purposes of conformity analysis, model highway networks are created for each analysis year. Regionally significant projects from the TIP were coded onto the networks. Detailed assessments were only performed for those new projects which may have a significant effect on emissions in accordance with 40 CFR Parts 51 and 93. Only those projects which would increase capacity or significantly impact vehicular speeds were considered. Projects such as bridge replacements and roadway restoration projects, which constitute the majority of the TIP, have been excluded from consideration since they are considered exempt under 40 CFR 93.126-127. A list of highway projects is shown in **Attachment A**.

Analysis Results

An emissions analysis has been completed for the 2008 8-hour ozone NAAQS. **Exhibit 11** summarizes the Berks County ozone emission results for a summer weekday in each analysis year. All years are lower than the applicable conformity budgets established in the regional maintenance plan for the 1997 ozone NAAQS. A detailed emission summary is also provided in **Attachment B**. Example MOVES importer (XML) and run specification (MRS) files are provided in **Attachment C**.

EXHIBIT 11: OZONE EMISSION ANALYSIS RESULTS AND CONFORMITY TEST
(Summer Weekday)

Pollutant	*2018 BUDGET (tons/day)*	*2025 (tons/day)*	*2035 (tons/day)*	*2045 (tons/day)*
VOC	**7.5**	*3.9*	*2.6*	*2.4*
NO_X	**14.9**	*8.1*	*5.9*	*6.7*
Conformity Result		**Pass**	**Pass**	**Pass**

Conformity Determination

Financial Constraint

The planning regulations, Sections 450.324(f)(11) and 450.326(j), require the TIP and LRTP to be financially constrained while the existing transportation system is being adequately operated and maintained. Only projects for which construction and operating funds are reasonably expected to be available are included. The RATS MPO, in conjunction with PennDOT, FHWA and FTA, has developed an estimate of the cost to maintain and operate existing roads, bridges and transit systems in Berks County and has compared the cost with the estimated revenues and maintenance needs of the new roads over the same period. The TIP and LRTP has been determined to be financially constrained.

Public Participation

The TIP and LRTP has addressed the public participation requirements as well as the comment and response requirements according to the procedures established in compliance with 23 CFR Part 450, RATS Public Participation Plan, and Pennsylvania's Conformity SIP. The draft documents were made available for a 30-day public review and comment period.

Conformity Statement

The conformity rule requires that the TIP and LRTP conform to the applicable SIP(s) and be adopted by the MPO/RPO before any federal agency may approve, accept, or fund projects. Conformity is determined by applying criteria outlined in the transportation conformity regulations to the analysis.

The RATS MPO TIP and LRTP are found to conform to the applicable air quality SIP(s) or EPA conformity requirements. This finding of conformity positively reflects on the efforts of the RATS MPO and its partners in meeting the regional air quality goals, while maintaining and building an effective transportation system.

Resources

MOVES Model

Modeling Page within EPA's Office of Mobile Sources Website contains a downloadable model, MOVES users guide and other information. See (http://www.epa.gov/omswww/models.htm)

Policy Guidance on the Use of MOVES2014 for State Implementation Plan Development, Transportation Conformity, and Other Purposes, US EPA Office of Air and Radiation, EPA-420-B-14-008, July 2014.

MOVES2014a User Guide, US EPA Office of Transportation and Air Quality, EPA-420-B-15-095, November 2015.

MOVES2014 and MOVES2014a, and MOVES2014b Technical Guidance: Using MOVES to Prepare Emission Inventories for State Implementation Plans and Transportation Conformity. US EPA Assessment and Standard Division, Office of Transportation and Air Quality, EPA-420-B-18-039, August 2018.

Traffic Engineering

Highway Capacity Manual, fifth edition (HCM2010), Transportation Research Board, presents current knowledge and techniques for analyzing the transportation system.

Traffic Data Collection and Factor Development Report, 2014 Data, Pennsylvania Department of Transportation, Bureau of Planning and Research.

Highway Vehicle Emissions Analysis Glossary

AADT: Average Annual Daily Traffic, average of ALL days

CAA: Clean Air Act as amended

CARB: California Air Resources Board

CFR: Code of Federal Regulations

County Data Manager (CDM): User interface developed to simplify importing specific local data for a single county or a user-defined custom domain without requiring direct interaction with the underlying MySQL database in the MOVES emission model

DEP: Department of Environmental Protection.

Emission rate or factor: Expresses the amount of pollution emitted per unit of activity. For highway vehicles, this is usually expressed in grams of pollutant emitted per mile driven

EPA: Environmental Protection Agency.

FC: Functional code. Applied to road segments to identify their type (freeway, local, etc.)

FHWA: Federal Highway Administration

FR: Federal Register

FTA: Federal Transit Administration

Growth factor: Factor used to convert volumes to future years

HPMS: Highway Performance Monitoring System

I/M: Vehicle emissions inspection/maintenance programs are required in certain areas of the country. The programs ensure that vehicle emission controls are in good working order throughout the life of the vehicle. The programs require vehicles to be tested for emissions. Most vehicles that do not pass must be repaired.

LRTP: Long Range Transportation Plan

MOVES: Motor Vehicle Emission Simulator. The latest model EPA has developed to estimate emissions from highway vehicles

MVEB: motor vehicle emissions budget

NAAQS: National Ambient Air Quality Standard

NTD: National Transit Database

Pattern data: Extrapolations of traffic patterns (such as how traffic volume on road segment types varies by time of day, or what kinds of vehicles tend to use a road segment type) from segments with observed data to similar segments

PPSUITE: Post-Processor for Air Quality. A set of programs that estimate speeds and prepares MOVES inputs and processes MOVES outputs

Road Type: Functional code, applied in data management to road segments to identify their type (rural/urban highways, rural/urban arterials, etc.)

RMS: Roadway Management System

SIP: State Implementation Plan

Source Type: One of thirteen vehicle types used in MOVES modeling

TAZ: Traffic Analysis Zone System

TIP: Transportation Improvement Program

VHT: Vehicle hours traveled

VMT: Vehicle miles traveled. In modeling terms, it is the simulated traffic volumes multiplied by link length

VOC: volatile organic compound emissions

ATTACHMENT A

Project List

2023-2026 TIP and PennDOT Twelve Year Program (TYP)
Air Quality Significant Projects

(Note The RATS MPO LRTP includes projects identified in PennDOT's TYP)

TIP/TYP	MPMS	Name	Description
TIP	61972	US 222 Widening	This project involves the widening of US Route 222 from Schaeffer Road to the Kutztown Bypass in Richmond, Maidencreek and Maxatawny Townships, Berks County. The highway will be widened to four lanes, a median barrier will be installed, as well as roundabouts at Pleasant Hills Road and Richmond Road.
TIP	70274	River Road Extension	The proposed project consists of constructing a new roadway on the vacant parcel located between W. Windsor Street and Spring Street that is currently owned by the City of Reading School District. The new roadway will intersect W. Spring Street approximately 400 feet west of Weiser Street and connect to the existing intersection of W. Windsor Street and Lincoln Street. The new roadway will provide two-way traffic access between W. Windsor Street and W. Spring Street, along with sidewalk on both sides of the road to accommodate pedestrians and 7-foot wide shoulders for bicyclists.
TIP	79467	SR 12 Elizabeth Avenue	This project involves safety improvements along the State Route 12 corridor from Hill View Road/Elizabeth Avenue to Skyline Drive (SR 2027) in Alsace Township, Berks County. The proposed corridor improvements include shoulder widening, utility relocation, embankment removal to improve curve sight distance, and super elevate curves. Additional proposed improvements include a hybrid roundabout at SR 12 and Hill View Road / Elizabeth Avenue, a traffic signal with realignment at Skyline Drive, and addition of a left turn lane for Route 12 west at Skyline Drive.
TIP	90569	SR 222 & Long Lane	This project involves the construction of a roundabout on US Route 222 and Long Lane (State Route 1024) to improve safety and reduce congestion in Maxatawny Township.
TIP	92414	SR 222_73 & Genesis Drive	This project involves intersection improvements at the intersection of US Route 222 and State Route 73, including additional turn lanes and signal improvements to reduce overall delay through the corridor and provide pedestrian accessibility. The intersections of US Route 222 and Tamarack / Genesis Drive and US Route 222 and Schaeffer Road will each receive a multilane roundabout. Ten (10') foot shoulders are to be provided for the accommodation of non-motorized traffic including horse and buggies and bicycles. At the southern end of the project, the existing structure over Willow Creek will be replaced.
TIP	102161	Lancaster (US 222 Bus) Corridor Imp	This project includes safety corridor improvements along State Route 3222 (Business 222) from Kenhorst Boulevard to Route 10 (Schuylkill River Trail Bridge) in the City of Reading.

TIP/TYP	MPMS	Name	Description
TIP	102162	SR 2014 (Spring St) Corridor Improvements	This project involves corridor improvements to the entire length of State Route 2014 (Spring Street) from Centre Avenue (State Route 61) to 13th Street in the City of Reading, Berks County. This project will upgrade traffic signals to provide higher visibility by adding larger signal heads, brighter illumination with LED modules, and additional signal heads over travel lanes with protected phasing where needed. Signal Coordination using new controller equipment will reduce congestion and improve safety through radio interconnection. Ten existing signals either have small heads, are dim or are poorly positioned on old supporting equipment.
TIP	105954	State Hill Rd from Colony Dr. to SR 222 SB Ramps	Corridor safety improvements along State Route 3023 (State Hill Road) between the State Route 222 southbound on-ramp and Colony Drive in Wyomissing Borough. Improvements to be considered include widening, access management, roundabout(s), traffic signal updates and coordination.
TIP	105963	Route 662 and Oley Turnpike Intersection	Construct a roundabout at the intersection of State Route 622 (Memorial Highway) and State Route 2020 (Oley Turnpike Road).
TIP	110008	222 SB Auxiliary Lane-Wyomissing	This project involves the addition of an auxiliary lane along US Route 222 Southbound between Paper Mill Road and the US Routes 222 and 422 Interchanges in Wyomissing Borough, Berks County. The project begins where Berkshire Boulevard passes over US Route 222 and continues up and around the hard curve to the Paper Mill Road exit. Due to increasing capacity, noise study mitigation results to be determined. Project also includes preventative maintenance measures to the bridge spanning Crossing Drive and concrete patching and resurfacing on adjacent section of roadway.
TIP	110075	SR 422 Ben Franklin Congested Corridor	Upgrade of 13 signalized intersections along Route 422, the Ben Franklin Highway, to be more traffic responsive between Pineland Road and River Bridge Road (SR 2077) in Amity and Exeter Townships.
TIP	114439	West Shore Bypass - Phase 1	This project involves highway reconstruction/widening of US Route 422 (the West Shore Bypass) including complete reconstruction to six lanes beginning at Buttonwood Street overpass in West Reading through the Lancaster Avenue interchange in the City of Reading. This reconstruction includes reconfiguration of the Penn Street/Penn Avenue interchange and the Lancaster Avenue interchange, reconstruction of the Bingaman Street Bridge and associated bicycle and pedestrian connections. The project also includes replacement of the Schuylkill River Bridge and 422 over Norfolk Southern Railroad bridges west of the Interstate 176 interchange, including reconstruction of the I176 N to US 422 W on-ramp in Cumru Township, Berks County. Also included are preventative maintenance activities on US 422 Bridges over Brentwood Drive, Schuylkill River east of Lancaster Avenue and the bridge over Schuylkill River east of Interstate 176.

TIP/TYP	MPMS	Name	Description
TIP	117620	State Hill Road - Norfolk Southern RR to Penn Ave	This project involves the conversion of State Hill Road (State Route 3023) intersection with Penn Avenue (Business 422) into a roundabout to improve safety and reduce congestion in Wyomissing Borough.
TYP	72814	West Shore (US 422) Reconstruction Phase 2	This project involves highway reconstruction/widening of US Route 422 (the West Shore Bypass) from PA 12 to the Schuylkill River Bridge east of Interstate 176 in Wyomissing and West Reading Boroughs, the City of Reading, Cumru and Exeter Townships, Berks County. The project will include widening of the roadway for a length of 5.5 miles to accommodate three travel lanes in each direction between the Warren Street Bypass and the Interstate 176 interchange. There will also be reconstruction of four travel lanes between the Interstate 176 interchange and the Schuylkill River Bridge east of the Interstate 176 interchange. The Penn Street and Lancaster Avenue interchanges will be realigned and reconstructed, while the Wyomissing and Interstate 176 interchanges will be reconstructed. This project will also include reconstruction of the Bingaman Street Bridge. This project includes completion of preliminary engineering for the entire corridor. Details for Phase 1 can be found under MPMS 114439.
TYP	97234	222 Kutztown Bypass to Lehigh County Line	This project involves the preliminary engineering phase for widening to two lanes in both directions of US Route 222 for 3.81 miles from the US Route 222 Kutztown Bypass north to Kutztown Road at the Berks/Lehigh County Line in Maxatawny Township.
TYP	117603	State Hill Road - SR 222 SB to Norfolk Southern RR	This project involves improvements to State Hill Road (SR 3023) intersections with State Route 222 southbound ramps, State Route 222 northbound ramps and Spring Street/Granite Point Drive with addition of a roundabout at State Route 222 southbound and addition of a roundabout combining the State Route 222 northbound and Spring Street intersections, in Wyomissing Borough.
TYP	117721	SR 183 (Bernville Road) Lane Drop Hourglass Fix	This project involves the widening of SR 183 (Bernville Road) to eliminate the narrow section between the US 222 and West Leesport Road in Bern Township.

ATTACHMENT B

Detailed Emission Results

Detailed Emission Results for Ozone Analysis

2025 Ozone by Road Type

County	Road Type	Summer Daily VMT	Speed (mph)	Emissions (Tons/Day)	
				VOC	NOx
Berks	Off-Network	N/A	N/A	3.031	3.795
	Rural Restricted	2,476,324	62.3	0.158	1.530
	Rural UnRestricted	3,641,803	37.6	0.254	1.037
	Urban Restricted	1,638,205	55.0	0.099	0.597
	Urban UnRestricted	4,556,504	29.1	0.373	1.119
	Subtotal	*12,312,836*		*3.916*	*8.079*
Off-Model Project Emission Benefits				0.000	0.000
Region Total		**12,312,836**		**3.916**	**8.079**
			(Kg/Day)	**3,552**	**7,329**

2025 Ozone by Source Type

County	Source Type	Summer Daily VMT	Emissions (Tons/Day)	
			VOC	NOx
Berks	Motorcycle	75,238	0.203	0.049
	Passenger Car	5,969,964	1.088	0.609
	Passenger Truck	3,811,497	1.498	1.441
	Light Commercial Truck	981,430	0.386	0.426
	Intercity Bus	2,435	0.001	0.011
	Transit Bus	29,409	0.006	0.083
	School Bus	16,997	0.006	0.040
	Refuse Truck	24,007	0.002	0.045
	Single Unit Short-haul Truck	503,087	0.110	0.469
	Single Unit Long-haul Truck	28,255	0.004	0.027
	Motor Home	18,473	0.027	0.044
	Combination Short-haul Truck	206,288	0.018	0.392
	Combination Long-haul Truck	645,756	0.567	4.444
	Subtotal	*12,312,836*	*3.916*	*8.079*
Off-Model Project Emission Benefits			0.000	0.000
Region Total		**12,312,836**	**3.916**	**8.079**
		(Kg/Day)	**3,552**	**7,329**

2025 Ozone by Emission Process

County	Emission Process	Emissions (Tons/Day)	
		VOC	NOx
Berks	Running Exhaust	0.503	4.283
	Start Exhaust	1.199	1.122
	Brakewear	0.000	0.000
	Tirewear	0.000	0.000
	Evap Permeation	0.253	0.000
	Evap Fuel Vapor Venting	0.618	0.000
	Evap Fuel Leaks	0.835	0.000
	Crankcase Running Exhaust	0.007	0.001
	Crankcase Start Exhaust	0.016	0.000
	Crankcase Extended Idle Exhaust	0.004	0.000
	Extended Idle Exhaust	0.448	2.558
	Auxiliary Power Exhaust	0.033	0.114
	Subtotal	*3.916*	*8.079*
Off-Model Project Emission Benefits		0.000	0.000
Region Total		**3.916**	**8.079**
	(Kg/Day)	**3,552**	**7,329**

2035 Ozone by Road Type

County	Road Type	Summer Daily VMT	Speed (mph)	Emissions (Tons/Day)	
				VOC	NOx
Berks	Off-Network	N/A	N/A	2.046	3.609
	Rural Restricted	3,118,644	62.2	0.107	0.954
	Rural UnRestricted	4,126,453	37.5	0.175	0.534
	Urban Restricted	1,826,575	54.6	0.064	0.319
	Urban UnRestricted	4,776,704	28.7	0.248	0.501
	Subtotal	*13,848,376*		*2.640*	*5.918*
Off-Model Project Emission Benefits				0.000	0.000
Region Total		**13,848,376**		**2.640**	**5.918**
			(Kg/Day)	**2,395**	**5,368**

2035 Ozone by Source Type

County	Source Type	Summer Daily VMT	Emissions (Tons/Day)	
			VOC	NOx
Berks	Motorcycle	84,069	0.202	0.054
	Passenger Car	6,670,642	0.662	0.307
	Passenger Truck	4,258,834	0.904	0.496
	Light Commercial Truck	1,096,624	0.226	0.145
	Intercity Bus	3,098	0.000	0.005
	Transit Bus	34,406	0.002	0.042
	School Bus	19,263	0.001	0.017
	Refuse Truck	28,306	0.001	0.034
	Single Unit Short-haul Truck	593,258	0.068	0.354
	Single Unit Long-haul Truck	33,325	0.002	0.021
	Motor Home	21,785	0.013	0.023
	Combination Short-haul Truck	243,242	0.011	0.294
	Combination Long-haul Truck	761,523	0.546	4.125
	Subtotal	*13,848,376*	*2.640*	*5.918*
Off-Model Project Emission Benefits			0.000	0.000
Region Total		**13,848,376**	**2.640**	**5.918**
		(Kg/Day)	**2,395**	**5,368**

2035 Ozone by Emission Process

County	Emission Process	Emissions (Tons/Day)	
		VOC	NOx
Berks	Running Exhaust	0.244	2.309
	Start Exhaust	0.516	0.470
	Brakewear	0.000	0.000
	Tirewear	0.000	0.000
	Evap Permeation	0.122	0.000
	Evap Fuel Vapor Venting	0.389	0.000
	Evap Fuel Leaks	0.849	0.000
	Crankcase Running Exhaust	0.002	0.000
	Crankcase Start Exhaust	0.007	0.000
	Crankcase Extended Idle Exhaust	0.000	0.000
	Extended Idle Exhaust	0.462	2.967
	Auxiliary Power Exhaust	0.050	0.171
	Subtotal	*2.640*	*5.918*
Off-Model Project Emission Benefits		0.000	0.000
Region Total		**2.640**	**5.918**
	(Kg/Day)	**2,395**	**5,368**

2045 Ozone by Road Type

County	Road Type	Summer Daily VMT	Speed (mph)	Emissions (Tons/Day)	
				VOC	NOx
Berks	Off-Network	N/A	N/A	1.790	4.319
	Rural Restricted	3,948,503	60.6	0.113	1.094
	Rural UnRestricted	4,951,100	35.9	0.182	0.547
	Urban Restricted	2,104,707	53.7	0.061	0.318
	Urban UnRestricted	4,976,785	28.5	0.218	0.426
	Subtotal	*15,981,096*		*2.363*	*6.705*
Off-Model Project Emission Benefits				0.000	0.000
Region Total		**15,981,096**		**2.363**	**6.705**
			(Kg/Day)	**2,144**	**6,083**

2045 Ozone by Source Type

County	Source Type	Summer Daily VMT	Emissions (Tons/Day)	
			VOC	NOx
Berks	Motorcycle	96,409	0.217	0.062
	Passenger Car	7,649,798	0.549	0.260
	Passenger Truck	4,883,971	0.642	0.299
	Light Commercial Truck	1,257,579	0.164	0.093
	Intercity Bus	4,198	0.000	0.005
	Transit Bus	40,659	0.002	0.046
	School Bus	22,565	0.001	0.017
	Refuse Truck	34,114	0.001	0.041
	Single Unit Short-haul Truck	714,779	0.078	0.415
	Single Unit Long-haul Truck	40,166	0.002	0.025
	Motor Home	26,246	0.013	0.017
	Combination Short-haul Truck	293,085	0.013	0.347
	Combination Long-haul Truck	917,527	0.681	5.078
	Subtotal	*15,981,096*	*2.363*	*6.705*
Off-Model Project Emission Benefits			0.000	0.000
Region Total		**15,981,096**	**2.363**	**6.705**
		(Kg/Day)	**2,144**	**6,083**

2045 Ozone by Emission Process

County	Emission Process	Emissions (Tons/Day)	
		VOC	NOx
Berks	Running Exhaust	0.227	2.386
	Start Exhaust	0.334	0.359
	Brakewear	0.000	0.000
	Tirewear	0.000	0.000
	Evap Permeation	0.083	0.000
	Evap Fuel Vapor Venting	0.281	0.000
	Evap Fuel Leaks	0.790	0.000
	Crankcase Running Exhaust	0.001	0.000
	Crankcase Start Exhaust	0.004	0.000
	Crankcase Extended Idle Exhaust	0.000	0.000
	Extended Idle Exhaust	0.579	3.740
	Auxiliary Power Exhaust	0.064	0.220
	Subtotal	*2.363*	*6.705*
Off-Model Project Emission Benefits		0.000	0.000
Region Total		**2.363**	**6.705**
	(Kg/Day)	**2,144**	**6,083**

ATTACHMENT C

Sample MOVES Data Importer (XML) Input File
and
Run Specification (MRS) Input File

(Sample for 2025 July Weekday)

MOVES County Data Manager Importer File – July Weekday Run (MOVESIMPORTER.XML)

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MOVES Run Specification File – July Weekday Run (MOVESRUN.MRS)

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