Air Quality Conformity Analysis Report

Lebanon County MPO 2027-2030 Transportation Improvement Program (TIP) and 2045 Long Range Transportation Plan (LRTP)

National Ambient Air Quality Standards (NAAQS) Addressed:

The Lebanon County MPO Portion of the:

- ***Harrisburg–Lebanon–Carlisle, PA 1997 8-Hour Ozone Maintenance Area***
- ***Harrisburg–Lebanon–Carlisle-York, PA 2006 24-Hour $PM_{2.5}$ Maintenance Area***
- ***Lebanon County, PA 2012 Annual $PM_{2.5}$ Maintenance Area***

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Overview

This report provides an analysis of the air quality implications of the current Lebanon County Metropolitan Planning Organization (LEBCO MPO) 2027-2030 Transportation Improvement Program (TIP) and 2045 Long Range Transportation Plan (LRTP). The analysis demonstrates transportation conformity under the 1997 8-hour ozone National Ambient Air Quality Standard (NAAQS), the 2006 24-hour fine particulate ($PM_{2.5}$) NAAQS and the 2012 annual $PM_{2.5}$ NAAQS. The air quality conformity determination reflects an assessment of the regionally significant, non-exempt transportation projects included in both the current TIP and the LRTP. All air quality significant projects for the LRTP remain the same as the previous conformity determination.

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 TIP and the LRTP 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, including the end year of the LRTP. 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 that have been updated or added to the TIP and LRTP.
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.

Lebanon County is currently included within the *Harrisburg-Lebanon-Carlisle, PA* maintenance area under the 1997 8-hour ozone NAAQS and the *Harrisburg-Lebanon-Carlisle-York, PA* maintenance area under the 2006 24-Hour $PM_{2.5}$ NAAQS. Lebanon County is designated as a single county maintenance area for the 2012 annual $PM_{2.5}$ NAAQS. The county is in attainment for all other 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.

Final 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 NOx 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 ($\mu g/m^3$). Lebanon County was designated as part of the Harrisburg-Lebanon-Carlisle 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 $\mu g/m^3$. Lebanon County was designated as a nonattainment area as part of the Harrisburg-Lebanon-Carlisle-York nonattainment area under the 2006 24-hour $PM_{2.5}$ NAAQS, effective December 14, 2009 (74 FR 58688).

A redesignation request and maintenance plan applicable to both the 1997 annual and 2006 24-hour $PM_{2.5}$ NAAQS was approved by EPA and effective December 8, 2014 (79 FR 72522). The maintenance plan includes 2017 and 2025 $PM_{2.5}$ and NOx mobile vehicle emission budgets (MVEBs) for transportation conformity purposes. On April 28, 2015, EPA provided an additional rulemaking to address document errors with the original approval and the listed MVEBs for Lebanon County (80 FR 23449).

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 are designated as attainment or 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). Lebanon County was designated as a nonattainment area under the standard.

On March 6, 2018, EPA made a final determination (FR 83 9435) that the Lebanon County nonattainment area has attained the 2012 annual $PM_{2.5}$ NAAQS. A redesignation request and maintenance plan applicable to the 2012 annual $PM_{2.5}$ NAAQS was approved by EPA and effective September 30, 2019 (84 FR 51420). The maintenance plan includes 2022 and 2030 $PM_{2.5}$ and NOx mobile vehicle emission budgets (MVEBs) for transportation conformity purposes.

2024 Annual $PM_{2.5}$ Standard

On February 7, 2024, EPA strengthened the annual $PM_{2.5}$ standard at 9.0 µg/m3 to provide increased public health protection, consistent with the available health science. The nonattainment areas have not been designated yet for this new 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).

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. Lebanon County was designated as an attainment area under the 2008 8-hour ozone NAAQS, effective July 20, 2012 (77 FR 30088). As a result, transportation conformity is not required for the standard.

On February 16, 2018, the United States Court of Appeals for the District of Columbia Circuit in *South Coast Air Quality Mgmt. District v. EPA* ("*South Coast II*," 882 F.3d 1138) held that transportation conformity determinations must be made in areas that were either nonattainment or maintenance for the 1997 ozone national ambient air quality standard (NAAQS) and attainment for the 2008 ozone NAAQS when the 1997 ozone NAAQS was revoked. These conformity determinations are required in these areas after February 16, 2019. Lebanon County was maintenance at the time of the 1997 ozone NAAQS revocation on April 6, 2015 and was also designated attainment for the 2008 ozone NAAQS on May 21,

2012. Therefore, per the *South Coast II* decision, this conformity determination is also being made for the 1997 ozone NAAQS.

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 Lebanon 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). A meeting was conducted on January 29, 2026, to review all planning assumptions and to discuss the template and content for transportation conformity analyses.

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. MOVES5 has been used for this conformity determination and is (in addition to MOVES4) currently considered one of the latest approved model versions for SIP and transportation conformity purposes (89 FR 99862). After December 11, 2026, MOVES5 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. For this conformity analysis, the data draws from the latest MPO regional travel demand model and PennDOT's latest 2023 triennial data update. The PennDOT triennial data update also is used to inform the planning assumptions for the future analysis years used for transportation conformity.

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

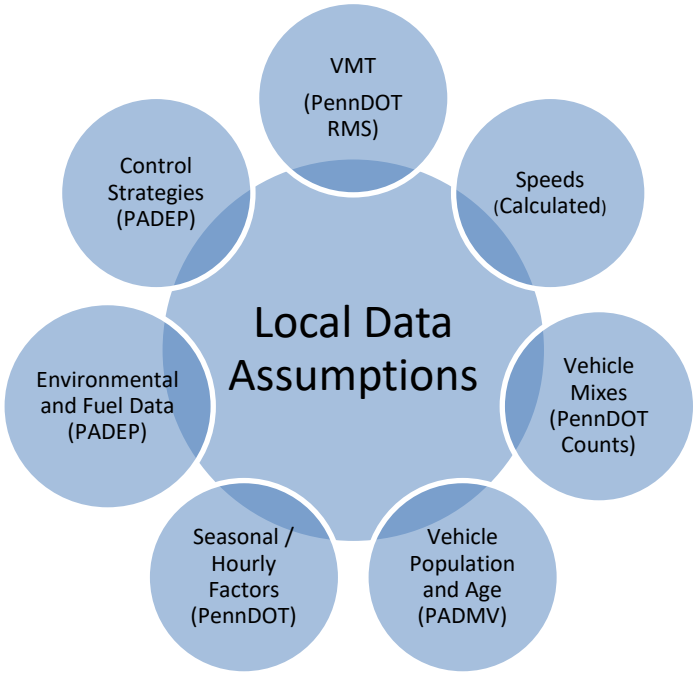
- *MOVES5 Policy Guidance: Use of MOVES for State Implementation Plan Development, Transportation Conformity, General Conformity, and Other Purposes,* US EPA Office of Transportation and Air Quality, EPA-420-B-24-038, November 2024.
- *MOVES5 Technical Guidance: Using MOVES to Prepare Emission Inventories for State Implementation Plans and Transportation Conformity,* US EPA Office of Transportation and Air Quality, EPA-420-B-24-043, November 2024.

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.

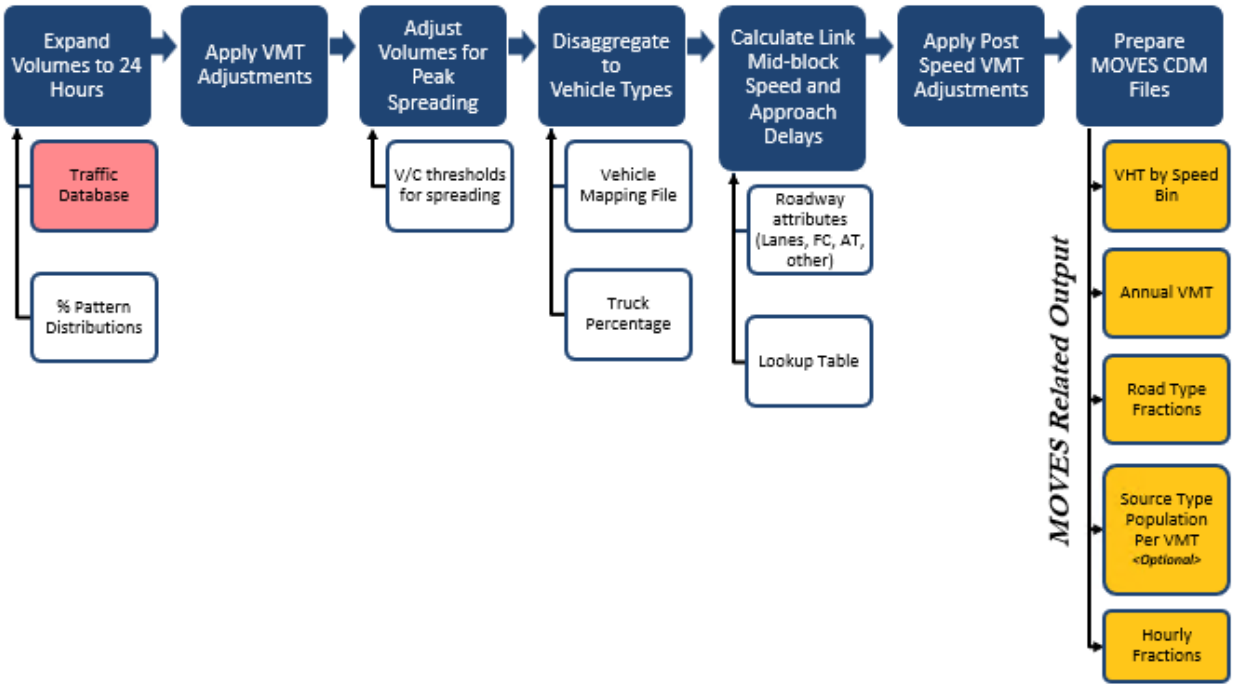
EXHIBIT 2: LOCAL DATA INPUTS USED FOR CONFORMITY RUNS



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 SQL 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 Voyager (TP+) software platform. The model was updated in 2020 to include the Lancaster, Harrisburg, York, Franklin, Adams and Lebanon MPO areas in the south-central region. The network contains attributes such as distance, number of lanes, area type, facility type, free flow speed, lane capacity, and location of traffic signals. The model updates included a revalidation of the travel model to 2018 traffic conditions. In 2023, additional updates were made to the regional model, which included a 2022 base year, new socioeconomic data, and revised external boundary traffic counts and through travel pattern movements based on available origin-destination and traffic count data. 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 and RTP 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. This data includes total population, household population, total employment, and school enrollment. **Exhibit 4** summarizes socioeconomic data for the base year and horizon years included in the conformity analysis.

EXHIBIT 4: SOCIOECONOMIC GROWTH ASSUMPTIONS TO THE TRAVEL MODEL

County	Year	Population	Households	Total Employment
Lebanon	2022	143,258	55,233	56,610
	2030	149,790	57,810	57,402
	2040	157,955	61,032	58,392
	2045	162,038	62,643	58,887
	2050	166,120	64,254	59,382

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 RMS highway segment volumes 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 for the 2017 analysis year. These factors are 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 RMS are adjusted to summer or average monthly conditions (as needed for annual processing), using seasonal adjustment factors prepared by PennDOT's 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 six HPMS vehicle groups (note that passenger cars and light trucks are grouped for input to MOVES). **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	Other Buses	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 six 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 RMS database.
- Hourly distributions for trucks and total traffic compiled by PennDOT's BPR.
- 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) up to 40 years old (for MOVES5 modeling). The vehicle age distributions were prepared from the most recently available 2023 registration download from PennDOT's Bureau of Motor Vehicles Registration Database. Due to data limitations, information for light duty vehicles and motor homes (including source types 11, 21, 31, 32 and 54) was used as local data for MOVES inputs, while heavy-duty vehicles (including source types 41, 42, 43, 51, 52, 53, 61, and 62) used the internal MOVES5 national default age distribution data.

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. 2023 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. The hourly temperature inputs needed for the MOVES model were prepared based on 10-year average data.

Fuel Parameters

The MOVES5 default data assumptions have been reviewed and determined adequate to be used as inputs to the MOVES emissions modeling. Key assumptions include:

- 9.617 RVP used for summer months (based on MOVES5 defaults).
- 100% market share of 10% ethanol throughout the year for analysis years 2030, 2040, 2045 and 2050 (based on MOVES5 defaults).

AVFT Input

The AVFT (Alternate Vehicle Fuel and Technologies) input table is used to specify the fraction of fuel types capable of being used by model year and source type. Pennsylvania 2023 vehicle registration data was used to develop the AVFT input for light duty vehicles (source types 21, 31 and 32), school bus, transit bus and motor homes. Forecasts for electric vehicles (EV) were based on PennDOT's EV Roadmap for light duty vehicles (source types 21, 31 and 32). For all other source types and heavy-duty vehicles, EV assumptions from MOVES5 default AVFT inputs and forecasts were utilized.

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 2021 I/M program performance.

In order to ensure that emission controls are working properly, vehicle inspection and maintenance (I/M) programs have been adopted in some nonattainment areas. These programs have the added benefit of improving the fuel efficiency of vehicles. The Pennsylvania inspection and maintenance (I/M) program was upgraded and expanded throughout the state with a phase-in period starting in September 2003 and fully implemented by June 2004.

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]

Vehicle Technology Programs

Federal Programs

Current federal vehicle emissions control and fuel programs are incorporated into the MOVES5 software. The MOVES5 model includes the following new federal emission standard rules that were not in previous versions of MOVES:

- *Multi-Pollutant Rule for Model Year 2027 and Later Light-Duty and Medium-Duty Vehicles (LMDV)*, March 2024 (Model Years 2027-2032): This rule incorporates higher projected electric vehicle (EV) fractions and more stringent standards for CO_2, particulate matter (PM), non-methane organic gases (NMOG), and NO_X.
- *Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles – Phase 3 (HDP3)*, March 2024 (Model Years 2027-2032): This rule includes higher projected EV fractions and updated energy consumption for heavy-duty EVs.

MOVES5 also includes the following recent on-road control programs that were already incorporated in MOVES4 or earlier versions:

- *Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards, January 2023 (Model Year 2027 and later).*
- *Revised 2023 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions Standards*, December 2021 (Model Years 2023-2026).
- *Safer Affordable Fuel Efficient (SAFE) Vehicles Rule*, March 2020 (Model Years 2021-2026).
- *Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium-and Heavy-Duty Engines and Vehicles—Phase 2*, October 2016 (Model Years 2019-2027).
- *Tier-3 Vehicle Emissions and Fuel Standards Program*, March 2014 (Model Years 2017-2025).
- *2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards*, October 2012 (Model Years 2017-2025).
- *Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium-and Heavy-Duty Engines and Vehicles*, September 2011 (Model Years 2014-2018).
- *Regulation of Fuels and Fuel Additives: Modifications to Renewable Fuel Standard Program (RFS2)*, December 2010.

Earlier foundational federal programs such as the Tier 2 Vehicle Emissions Standards and the 2007 Heavy-Duty Engine Rule are also inherently reflected in MOVES5 default emission rates. 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 NLEV input database was created for Pennsylvania per EPA's instructions and was used for this inventory.

State Programs

The Pennsylvania Clean Vehicles (PCV) Program, adopted in 1998, incorporated the California Low Emission Vehicle Regulations (CA LEV) 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 CAL 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 RMS database 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 using an average monthly day to support annual $PM_{2.5}$ analyses. 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.
- *Perform 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.
- *Disaggregate Vehicle Types* - EPA requires VMT estimates to be prepared by the five 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, in combination with MOVES defaults. The thirteen MOVES source types are then recombined into five 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.

- *Apply VMT Growth Adjustments* Volumes must also be adjusted to estimate future year VMT. VMT growth factors are provided as inputs to PPSUITE, and are applied to each of the roadway segment volumes. The VMT growth factors were developed from the PennDOT BPR Growth Rate forecasting system.

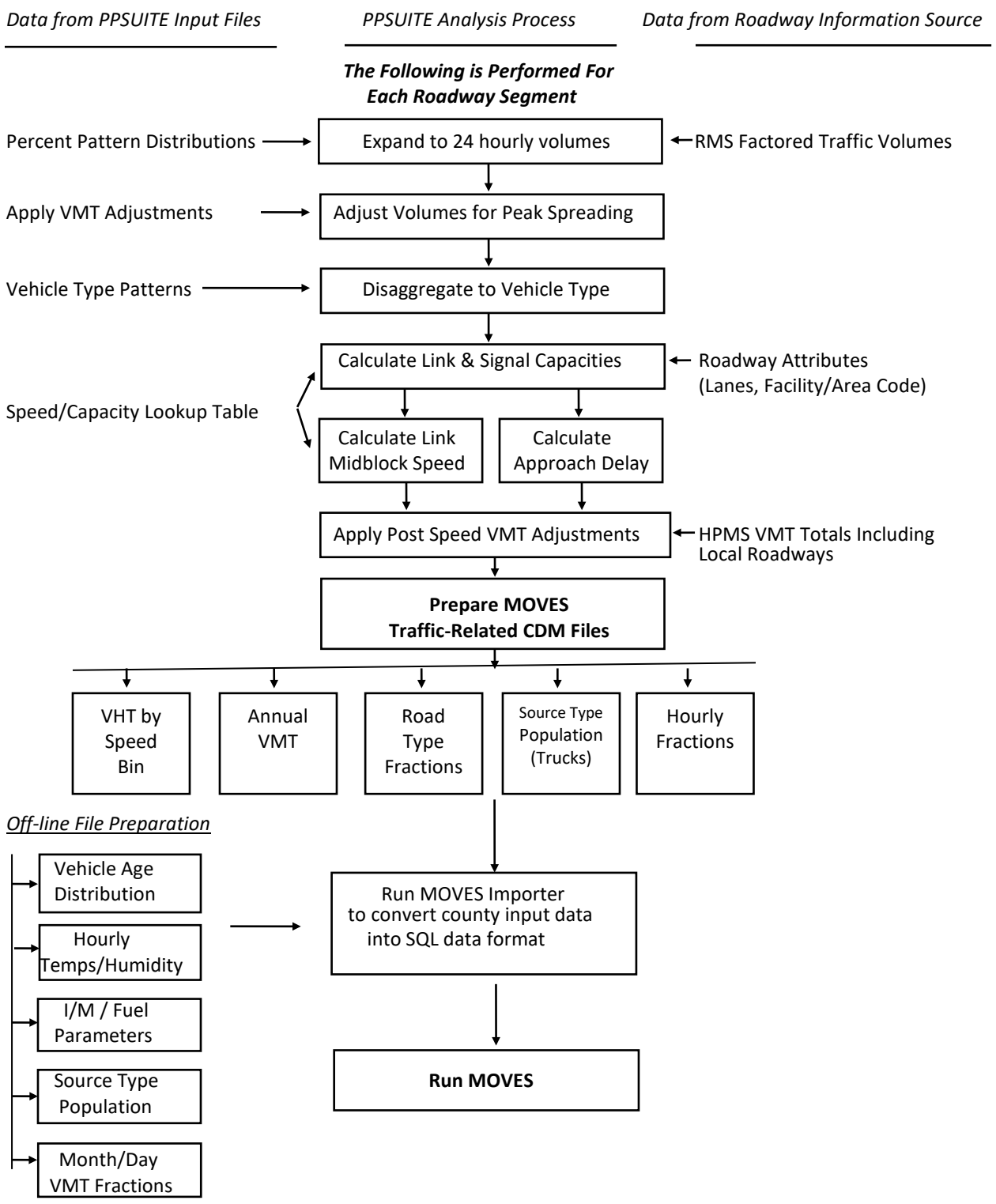
Speed Estimation

Emissions for many pollutants (including VOC and NOx) 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. 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) from 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



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.

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 RMS 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 MOVES 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.

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 SQL 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 7**. 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 7: MOVES RUN SPECIFICATION FILE PARAMETER SETTINGS

Parameter	Setting
MOVES Version	MOVES5
MOVES Default Database Version	MOVESDB20241112
Scale	COUNTY
Analysis Mode	Inventory
Time Span	**Annual Runs:** Single MOVES run with 12-month inputs including all days and hours
Input Time Aggregation	Hour
Geographic Selection	County [FIPS]
Vehicle Selection	All source types Gasoline, Diesel, CNG, E85, Electricity
Road Type	All road types including off-network
Pollutants and Processes	All $PM_{2.5}$ categories, NO_X, VOC
Database selection	Early NLEV database PA-Specific CA LEV program database
General Output	Units: Emission = grams; Distance = miles; Time = hours; Energy = Million BTU
Output Emissions	Time = Hour or Month, Emissions by Process ID, Source Type and Road Type

Conformity Analysis Results (Fine Particulate Matter)

Transportation conformity analyses of the current TIP and LRTP have been completed for Lebanon 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

On December 8, 2014, EPA approved the Commonwealth of Pennsylvania's request to redesignate the *Harrisburg-Lebanon-Carlisle, PA* and *Harrisburg-Lebanon-Carlisle-York, PA* nonattainment areas to attainment for the 1997 annual and 2006 24-hour $PM_{2.5}$ NAAQS. On April 28, 2015, EPA provided an additional rulemaking to address document errors with the original approval and the listed MVEBs for Lebanon County (80 FR 23449). On March 6, 2018, EPA made a final determination (FR 83 9435) that the Lebanon County nonattainment area has attained the 2012 annual $PM_{2.5}$ NAAQS. A redesignation request and maintenance plan applicable to the 2012 annual $PM_{2.5}$ NAAQS was approved by EPA and effective September 30, 2019 (84 FR 51420). The maintenance plan includes 2022 and 2030 $PM_{2.5}$ and NOx MVEBs for transportation conformity purposes. All MVEBs are summarized in **Exhibit 8**.

EXHIBIT 8: ANNUAL $PM_{2.5}$ MOTOR VEHICLE EMISSION BUDGETS

Pollutant	For 2006 $PM_{2.5}$ NAAQS		For 2012 $PM_{2.5}$ NAAQS	
	2017 Budget (tons/year)	2025 Budget (tons/year)	2022 Budget (tons/year)	2030 Budget (tons/year)
$PM_{2.5}$	76	52	50	31
NOx	2,252	1,446	1,867	1,374

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 last year of the LRTP's forecast period.
- All established MVEB years.
- Attainment year of the standard if within timeframe of TIP and LRTP.
- 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 9** provides the analysis years used for this conformity analysis.

EXHIBIT 9: TRANSPORTATION CONFORMITY ANALYSIS YEARS

Analysis Year	Description
2030	Near Term Year – Last Year of LRTP
2040	Interim Year
2045	Horizon Year of LRTP
2050	Additional Horizon Year

Components of the $PM_{2.5}$ Regional Emissions Analysis

$PM_{2.5}$ can be the result of either direct or indirect emissions. Direct transportation emissions can be the result of brake or tire-wear, particulates in exhaust emissions, or dust raised by on-road vehicles or construction equipment. Possible indirect transportation related emissions of $PM_{2.5}$ include: NH_3, NO_X, SO_X, and VOC. The EPA has ruled that regional analysis of direct $PM_{2.5}$ emissions must include both exhaust and brake/tire-wear emissions. EPA's current regulations specify that road dust should be included in the regional analysis of direct $PM_{2.5}$ emissions only if the EPA or the state air agency have found it to be a significant contributor to the region's nonattainment. Neither the EPA nor the state air agency has determined road dust to be a significant contributor in the nonattainment area for this conformity determination.

Until a SIP revision is approved proving that NO_X is insignificant, EPA's current regulations state that indirect $PM_{2.5}$ emissions must be analyzed for NO_X. Conversely, VOC, SO_X and NH_3 must be analyzed only if the state(s) or the EPA determines one or more of these pollutants significant. Therefore, NO_X is the only indirect $PM_{2.5}$ component analyzed for the nonattainment area in this conformity determination.

Regionally Significant Highway Projects

For the purposes of conformity analysis, model highway networks are created for each analysis year. For the horizon years, regionally significant projects from the LRTP 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 and LRTP list, 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 2006 24-hour and 2012 annual $PM_{2.5}$ NAAQS. Forecast years have been estimated using the procedures and assumptions provided in this conformity report. 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 10 summarizes the annual $PM_{2.5}$ and NO_X emissions. Emissions are compared against the available 2022, 2025 and 2030 SIP MVEBs listed in **Exhibit 8**. The results illustrate that projected emissions are below the applicable MVEBs.

EXHIBIT 10: ANNUAL PM2.5 EMISSION ANALYSIS RESULTS AND CONFORMITY TEST
(Annual)

Pollutant		*2030 (tons/year)*	*2040 (tons/year)*	*2045 (tons/year)*	*2050 (tons/year)*
$PM_{2.5}$		*20*	*17*	*17*	*17*
NO_X		*453*	*297*	*297*	*315*
MVEBs 2006 $PM_{2.5}$ NAAQS	*$PM_{2.5}$*	***52***	***52***	***52***	***52***
	NO_X	***1,446***	***1,446***	***1,446***	***1,446***
MVEBs 2012 $PM_{2.5}$ NAAQS	*$PM_{2.5}$*	***50***	***31***	***31***	***31***
	NO_X	***1,867***	***1,374***	***1,374***	***1,374***
Conformity Result		**Pass**	**Pass**	**Pass**	**Pass**

Conformity Analysis Results (Ozone)

On November 29, 2018, EPA issued *Transportation Conformity Guidance for the South Coast II Court Decision*[1](EPA-420-B-18-050, November 2018) that addresses how transportation conformity determinations can be made in areas that were nonattainment or maintenance for the 1997 ozone NAAQS when the 1997 ozone NAAQS was revoked, but were designated attainment for the 2008 ozone NAAQS in EPA's original designations for this NAAQS (May 21, 2012).

The transportation conformity regulation at 40 CFR 93.109 sets forth the criteria and procedures for determining conformity. The conformity criteria for TIPs and LRTPs include: latest planning assumptions (93.110), latest emissions model (93.111), consultation (93.112), transportation control measures (93.113(b) and (c), and emissions budget and/or interim emissions (93.118 and/or 93.119).

For the 1997 ozone NAAQS areas, transportation conformity for TIPs and LRTPs for the 1997 ozone NAAQS can be demonstrated without a regional emissions analysis, per 40 CFR 93.109(c). This provision states that the regional emissions analysis requirement applies one year after the effective date of EPA's nonattainment designation for a NAAQS and until the effective date of revocation of such NAAQS for an area. The 1997 ozone NAAQS revocation was effective on April 6, 2015, and the *South Coast II* court upheld the revocation. As no regional emission analysis is required for this conformity determination, there is no requirement to use the latest emissions model, or budget or interim emissions tests. Therefore,

[1] Available from https://www.epa.gov/state-and-local-transportation/policy-and-technical-guidance-state-and-local-transportation

transportation conformity for the 1997 ozone NAAQS can be demonstrated by showing the remaining requirements in Table 1 in 40 CFR 93.109 have been met. These requirements, which are laid out in Section 2.4 of EPA's guidance and addressed below, include:

- Latest planning assumptions (93.110)
- Consultation (93.112)
- Transportation Control Measures (93.113)
- Fiscal constraint (93.108)

The use of latest planning assumptions in 40 CFR 93.110 of the conformity rule generally applies to a regional emissions analysis. In the 1997 ozone NAAQS areas, the use of latest planning assumptions requirement applies to assumptions about transportation control measures (TCMs) in an approved SIP. However, the Lebanon County SIP maintenance plans do not include any TCMs. All remaining requirements are addressed in the conformity determination section of this document.

Conformity Determination

Financial Constraint

The planning regulations, Sections 450.324(f)(11) and 450.326(j), require the transportation plan and TIP 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. LEBCO, 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 Lebanon County and have compared the cost with the estimated revenues and maintenance needs of the new roads over the same period. The TIP and LRTP have been determined to be financially constrained.

Public Participation

The TIP and LRTP have undergone the public participation requirements as well as the comment and response requirements according to the procedures established in compliance with 23 CFR Part 450, the LEBCO Public Participation Plan, and Pennsylvania's Conformity SIP. The draft document was made available for a 30-day public review and comment period starting on April 17, 2026, which included a public meeting.

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 TIP and LRTP for Lebanon County 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 LEBCO 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)

MOVES5 Policy Guidance: Use of MOVES for State Implementation Plan Development, Transportation Conformity, General Conformity, and Other Purposes, US EPA Office of Transportation and Air Quality, EPA-420-B-24-038, November 2024.

MOVES5 Technical Guidance: Using MOVES to Prepare Emission Inventories for State Implementation Plans and Transportation Conformity, US EPA Office of Transportation and Air Quality, EPA-420-B-24-043, November 2024.

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, 2023 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 SQL 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

The following Lebanon County air quality significant highway projects are included in the conformity analysis:

MPMS #	Project Name	Description
Air Quality Significant Projects on 2027-2038 PennDOT 12-Year Program (TYP)		
116163	PA 343 Seventh Street Improvements	This project consists of safety improvements with a potential roundabout at the intersection of North 7th St (SR 343) and Kochenderfer Road/Kimmerlings Road, also resurfacing on SR 343 from the Lebanon City Line to south of Heffelfinger Road in North Lebanon Township, Lebanon County.
116164	US 422 Cumberland St and Prescott Rd Int	This project consists of safety improvements with a potential roundabout at the intersection of Cumberland Street (SR 422) and Prescott Drive/Prescott Road (SR 1013/SR 2005) in North Lebanon Township and South Lebanon Township, Lebanon County.
121782	SR 72 Summit Street and York Street Intersection Improvements	This project may consist of Intersection Improvements on SR 72 at the Intersections of Summit Street and York Street in North Cornwall Township, Lebanon County. Improvements include pedestrian mobility, signage, line striping improvements and traffic signal and coordination improvements.
123271	SR 117/Airport Rd Int Imp - MTF	This project may consist of a roundabout installation at the intersection of State Route 117 (Forge Road) and Airport Road in South Londonderry Township, Lebanon County.
123272	SR 419/Cornwall Rd Intersection Improvement	This project may consist of a roundabout installation at the intersection of State Route 419 (Freeman Drive/Boyd Street) and State Route 2001 (Cornwall Road) in Cornwall borough, Lebanon County.
Air Quality Significant Projects on LRTP (Beyond TYP Timeframe)		
No Additional Air Quality Significant Projects		

ATTACHMENT B

Detailed Emission Results*

Annual $PM_{2.5}$ Analysis

**All table values and totals have been estimated from the MOVES detailed output and rounded to 1-2 decimal points. Due to rounding, individual table entries may not add exactly to the total*

Detailed Emission Results for Annual $PM_{2.5}$ Analysis

2030 Annual $PM_{2.5}$ by Road Type

County	Road Type	Annual VMT	Speed (mph)	Emissions (Tons/Year)	
				NOx	$PM_{2.5}$
Lebanon	Off-Network	N/A	N/A	99.59	3.34
	Rural Restricted	425,278,495	63.9	198.58	6.18
	Rural UnRestricted	435,917,384	39.6	82.41	5.08
	Urban Restricted	235,920	65.2	0.11	0.00
	Urban UnRestricted	434,243,046	31.9	72.15	5.43
	Subtotal	*1,295,674,844*		*452.84*	*20.02*
Off-Model Project Emission Benefits				0.00	0.00
Region Total		**1,295,674,844**		**453**	**20**
			(Kg/Year)	**410,813**	**18,166**

2030 Annual $PM_{2.5}$ by Source Type

County	Source Type	Annual VMT	Emissions (Tons/Year)	
			NOx	$PM_{2.5}$
Lebanon	Motorcycle	7,611,702	5.85	0.17
	Passenger Car	877,637,207	43.22	6.33
	Passenger Truck	177,597,596	33.13	2.13
	Light Commercial Truck	16,827,709	4.41	0.25
	Intercity Bus	3,987,534	13.25	0.44
	Transit Bus	2,816,056	3.66	0.06
	School Bus	2,555,340	3.43	0.12
	Refuse Truck	749,777	1.76	0.04
	Single Unit Short-haul Truck	71,990,735	47.51	1.68
	Single Unit Long-haul Truck	4,817,505	2.94	0.13
	Motor Home	4,043,377	3.08	0.13
	Combination Short-haul Truck	46,764,068	97.86	2.68
	Combination Long-haul Truck	78,276,239	192.75	5.84
	Subtotal	*1,295,674,844*	*452.84*	*20.02*
Off-Model Project Emission Benefits			0.00	0.00
Region Total		**1,295,674,844**	**452.84**	**20.02**
		(Kg/Year)	**410,813**	**18,166**

2030 Annual $PM_{2.5}$ by Emission Process

County	Emission Process	Emissions (Tons/Year)	
		NOx	$PM_{2.5}$
Lebanon	Running Exhaust	387.50	5.94
	Start Exhaust	50.03	2.81
	Brakewear	0.00	8.17
	Tirewear	0.00	2.32
	Evap Permeation	0.00	0.00
	Evap Fuel Vapor Venting	0.00	0.00
	Evap Fuel Leaks	0.00	0.00
	Crankcase Running Exhaust	3.58	0.71
	Crankcase Start Exhaust	0.00	0.02
	Crankcase Extended Idle Exhaust	0.08	0.01
	Extended Idle Exhaust	9.92	0.03
	Auxiliary Power Exhaust	1.73	0.01
	Subtotal	*452.84*	*20.02*
Off-Model Project Emission Benefits		0.00	0.00
Region Total		**452.84**	**20.02**
	(Kg/Year)	**410,813**	**18,166**

2040 Annual $PM_{2.5}$ by Road Type

County	Road Type	Annual VMT	Speed (mph)	Emissions (Tons/Year)	
				NOx	$PM_{2.5}$
Lebanon	Off-Network	N/A	N/A	88.39	1.80
	Rural Restricted	554,891,078	63.7	128.12	5.09
	Rural UnRestricted	459,663,458	37.4	41.40	4.38
	Urban Restricted	969,151	61.3	0.22	0.01
	Urban UnRestricted	510,817,167	31.2	38.89	5.26
	Subtotal	*1,526,340,853*		*297.02*	*16.55*
Off-Model Project Emission Benefits				0.00	0.00
Region Total		**1,526,340,853**		**297**	**17**
			(Kg/Year)	**269,453**	**15,010**

2040 Annual $PM_{2.5}$ by Source Type

County	Source Type	Annual VMT	Emissions (Tons/Year)	
			NOx	$PM_{2.5}$
Lebanon	Motorcycle	8,858,123	6.77	0.20
	Passenger Car	1,021,354,964	25.01	5.30
	Passenger Truck	206,684,306	13.50	1.59
	Light Commercial Truck	19,574,208	2.06	0.17
	Intercity Bus	5,703,959	8.49	0.29
	Transit Bus	3,076,291	2.37	0.06
	School Bus	2,890,189	1.97	0.08
	Refuse Truck	938,048	1.33	0.04
	Single Unit Short-haul Truck	90,036,008	36.17	1.15
	Single Unit Long-haul Truck	6,029,261	1.92	0.08
	Motor Home	4,957,597	1.21	0.09
	Combination Short-haul Truck	58,446,382	69.97	2.66
	Combination Long-haul Truck	97,791,517	126.25	4.84
	Subtotal	*1,526,340,853*	*297.02*	*16.55*
Off-Model Project Emission Benefits			0.00	0.00
Region Total		**1,526,340,853**	**297.02**	**16.55**
		(Kg/Year)	**269,453**	**15,010**

2040 Annual $PM_{2.5}$ by Emission Process

County	Emission Process	Emissions (Tons/Year)	
		NOx	$PM_{2.5}$
Lebanon	Running Exhaust	245.20	2.28
	Start Exhaust	43.44	1.63
	Brakewear	0.00	9.75
	Tirewear	0.00	2.74
	Evap Permeation	0.00	0.00
	Evap Fuel Vapor Venting	0.00	0.00
	Evap Fuel Leaks	0.00	0.00
	Crankcase Running Exhaust	0.97	0.11
	Crankcase Start Exhaust	0.00	0.01
	Crankcase Extended Idle Exhaust	0.02	0.00
	Extended Idle Exhaust	4.53	0.01
	Auxiliary Power Exhaust	2.86	0.01
	Subtotal	*297.02*	*16.55*
Off-Model Project Emission Benefits		0.00	0.00
Region Total		**297.02**	**16.55**
	(Kg/Year)	**269,453**	**15,010**

2045 Annual $PM_{2.5}$ by Road Type

County	Road Type	Annual VMT	Speed (mph)	Emissions (Tons/Year)	
				NOx	$PM_{2.5}$
Lebanon	Off-Network	N/A	N/A	91.18	1.14
	Rural Restricted	626,090,596	63.3	129.97	5.43
	Rural UnRestricted	473,876,801	36.1	37.91	4.43
	Urban Restricted	1,427,670	61.3	0.29	0.01
	Urban UnRestricted	563,243,844	30.2	37.38	5.66
	Subtotal	*1,664,638,911*		*296.73*	*16.68*
Off-Model Project Emission Benefits				0.00	0.00
Region Total		**1,664,638,911**	**(Kg/Year)**	**297** **269,193**	**17** **15,130**

2045 Annual $PM_{2.5}$ by Source Type

County	Source Type	Annual VMT	Emissions (Tons/Year)	
			NOx	$PM_{2.5}$
Lebanon	Motorcycle	9,618,896	7.34	0.21
	Passenger Car	1,109,072,399	22.41	4.97
	Passenger Truck	224,431,164	10.85	1.46
	Light Commercial Truck	21,260,293	1.79	0.16
	Intercity Bus	6,704,343	8.18	0.28
	Transit Bus	3,226,397	2.12	0.06
	School Bus	3,046,750	1.74	0.07
	Refuse Truck	1,028,728	1.36	0.04
	Single Unit Short-haul Truck	100,209,733	37.66	1.12
	Single Unit Long-haul Truck	6,706,126	1.79	0.08
	Motor Home	5,499,762	0.87	0.09
	Combination Short-haul Truck	65,033,370	72.63	2.89
	Combination Long-haul Truck	108,800,952	127.99	5.25
	Subtotal	*1,664,638,911*	*296.73*	*16.68*
Off-Model Project Emission Benefits			0.00	0.00
Region Total		**1,664,638,911** **(Kg/Year)**	**296.73** **269,193**	**16.68** **15,130**

2045 Annual $PM_{2.5}$ by Emission Process

County	Emission Process	Emissions (Tons/Year)	
		NOx	$PM_{2.5}$
Lebanon	Running Exhaust	245.67	1.77
	Start Exhaust	43.41	1.04
	Brakewear	0.00	10.81
	Tirewear	0.00	3.00
	Evap Permeation	0.00	0.00
	Evap Fuel Vapor Venting	0.00	0.00
	Evap Fuel Leaks	0.00	0.00
	Crankcase Running Exhaust	0.48	0.04
	Crankcase Start Exhaust	0.00	0.01
	Crankcase Extended Idle Exhaust	0.01	0.00
	Extended Idle Exhaust	3.84	0.01
	Auxiliary Power Exhaust	3.33	0.01
	Subtotal	*296.73*	*16.68*
Off-Model Project Emission Benefits		0.00	0.00
Region Total	**(Kg/Year)**	**296.73** **269,193**	**16.68** **15,130**

2050 Annual $PM_{2.5}$ by Road Type

County	Road Type	Annual VMT	Speed (mph)	Emissions (Tons/Year)	
				NOx	$PM_{2.5}$
Lebanon	Off-Network	N/A	N/A	96.95	0.64
	Rural Restricted	700,847,996	62.8	139.58	5.95
	Rural UnRestricted	525,414,830	34.9	40.59	4.91
	Urban Restricted	1,777,818	61.5	0.35	0.02
	Urban UnRestricted	586,959,898	29.4	37.13	5.87
	Subtotal	*1,815,000,542*		*314.60*	*17.39*
Off-Model Project Emission Benefits				0.00	0.00
Region Total		**1,815,000,542**	**(Kg/Year)**	**315** **285,402**	**17** **15,775**

2050 Annual $PM_{2.5}$ by Source Type

County	Source Type	Annual VMT	Emissions (Tons/Year)	
			NOx	$PM_{2.5}$
Lebanon	Motorcycle	10,445,911	7.97	0.23
	Passenger Car	1,204,431,357	22.06	4.88
	Passenger Truck	243,730,101	10.12	1.37
	Light Commercial Truck	23,082,657	1.74	0.15
	Intercity Bus	7,762,507	8.67	0.30
	Transit Bus	3,407,877	1.99	0.06
	School Bus	3,229,822	1.68	0.08
	Refuse Truck	1,149,831	1.47	0.04
	Single Unit Short-haul Truck	111,197,343	40.01	1.11
	Single Unit Long-haul Truck	7,441,832	1.76	0.07
	Motor Home	6,146,486	0.65	0.09
	Combination Short-haul Truck	72,161,573	79.00	3.18
	Combination Long-haul Truck	120,813,245	137.47	5.83
	Subtotal	*1,815,000,542*	*314.60*	*17.39*
Off-Model Project Emission Benefits			0.00	0.00
Region Total		**1,815,000,542** **(Kg/Year)**	**314.60** **285,402**	**17.39** **15,775**

2050 Annual $PM_{2.5}$ by Emission Process

County	Emission Process	Emissions (Tons/Year)	
		NOx	$PM_{2.5}$
Lebanon	Running Exhaust	262.35	1.51
	Start Exhaust	44.63	0.58
	Brakewear	0.00	12.00
	Tirewear	0.00	3.28
	Evap Permeation	0.00	0.00
	Evap Fuel Vapor Venting	0.00	0.00
	Evap Fuel Leaks	0.00	0.00
	Crankcase Running Exhaust	0.22	0.01
	Crankcase Start Exhaust	0.00	0.00
	Crankcase Extended Idle Exhaust	0.00	0.00
	Extended Idle Exhaust	3.63	0.01
	Auxiliary Power Exhaust	3.77	0.00
	Subtotal	*314.60*	*17.39*
Off-Model Project Emission Benefits		0.00	0.00
Region Total	**(Kg/Year)**	**314.60** **285,402**	**17.39** **15,775**

ATTACHMENT C

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

(Sample for 2030 Annual Runs)

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

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MOVES Run Specification File – Annual Run (MOVESRUN.MRS)

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