# Air Quality Conformity Analysis Report

## Harrisburg Area Transportation Study 2025-2028 TIP and 2045 RTP

**National Ambient Air Quality Standards (NAAQS) Addressed:**

**The Harrisburg Area Transportation Study (HATS) portion of the:**

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

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# Overview

This report provides an analysis of the air quality implications of the Harrisburg Area Transportation Study (HATS) 2025-2028 Transportation Improvement Program (TIP) and the 2045 Regional Transportation Plan (RTP). The analysis demonstrates transportation conformity under the 1997 8-hour ozone National Ambient Air Quality Standard (NAAQS) and the 2006 24-hour fine particulate ($PM_{2.5}$) NAAQS. The air quality conformity analysis reflects an assessment of the regionally significant, non-exempt transportation projects included in both the TIP and RTP. Note that conformity for the RTP is being reaffirmed as there are no changes to the RTP from 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 RTP 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 in the TIP and RTP. |
| **B** | Detailed Emission Results | Provides a detailed summary of emissions by roadway type, source type and emission process. |
| **C** | MOVES Sample Run Specification | Provides example of 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 HATS MPO area is 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. Only Cumberland and Dauphin counties are included in the 2006 24-hour $PM_{2.5}$ NAAQS maintenance area. All counties in the Harrisburg region are in attainment for the 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.

### 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 ($\mu g/m^3$). Cumberland and Dauphin counties were 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 $\mu g/m^3$. Cumberland and Dauphin counties were designated 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). As a result, both Dauphin and Cumberland counties are now classified as attainment for these NAAQS. However, both counties must continue to demonstrate conformity during the maintenance plan time period. The maintenance plan includes 2017 and 2025 $PM_{2.5}$ and NOx 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 µg/$m^3$. On December 18, 2014, EPA issued final designations for the standard that were revised on April 7, 2015 (80 FR 18535). The Harrisburg region was designated in attainment of the standard.

***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. The Harrisburg region 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 currently 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. The Harrisburg region 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 for many regions within the U.S. The Harrisburg region is 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 are conducted quarterly and included the review of all input planning assumptions, methodologies and analysis years. A meeting was conducted on February 7, 2024 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. MOVES3 has been used for this conformity determination and is (in addition to MOVES4) currently considered one of the latest approved model versions for transportation conformity purposes (86 FR 1106). After September 12, 2025, MOVES4 must be used for conformity determinations (88 FR 62567).

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 vehicle fleet turnover, PennDOT, in coordination with the Pennsylvania Air Quality Workgroup, has determined that the estimates of the vehicle fleet age for the most recent available data (2020-2022) may not be reflective of future conditions or longer term trends. Thus, the vehicle age assumption 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:

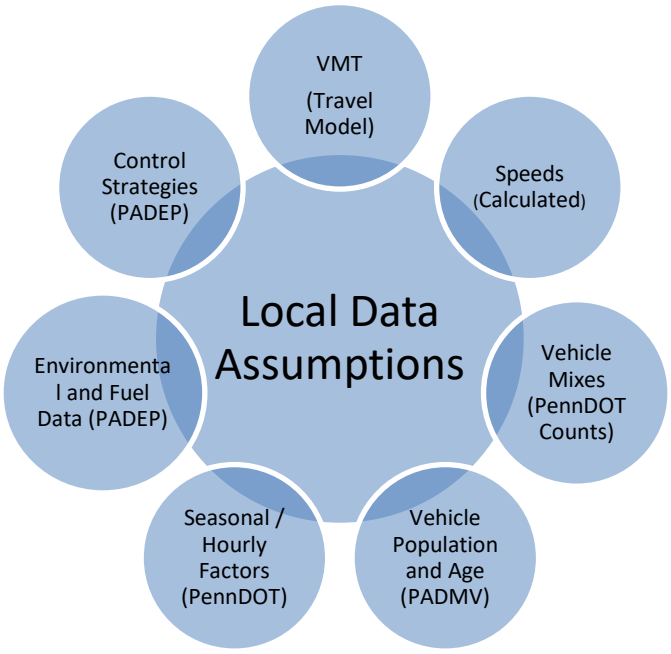
- *Policy Guidance on the Use of MOVES3 for State Implementation Plan Development, Transportation Conformity, General Conformity, and Other Purposes,* US EPA Office of Transportation and Air Quality, EPA-420-B-20-044, November 2020.
- *MOVES3 Technical Guidance: Using MOVES to Prepare Emission Inventories for State Implementation Plans and Transportation Conformity,* US EPA Office of Transportation and Air Quality, EPA-420-B-20-052, November 2020.

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.

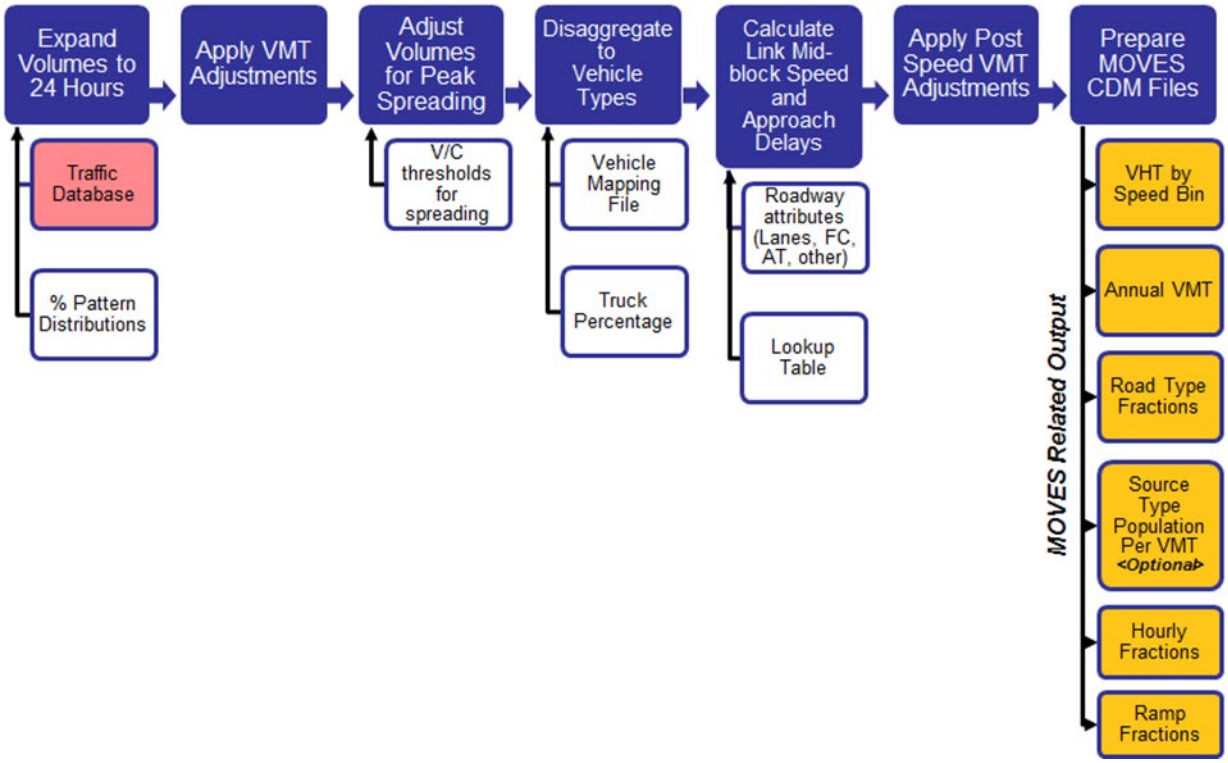
**EXHIBIT 2: LOCAL DATA INPUTS USED FOR CONFORMITY RUNS**




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 recently 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, capacity of the lane, and location of traffic signals. The model updates included a revalidation of the travel model to 2018-2019 traffic conditions. 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 HATS. 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 | Household | Total Employment |
|---|---|---|---|---|
| Cumberland | 2018 | 247,337 | 98,746 | 133,740 |
| | 2025 | 259,952 | 104,154 | 139,013 |
| | 2035 | 274,295 | 110,125 | 148,066 |
| | 2045 | 286,715 | 115,281 | 157,346 |
| | 2050 | 294,010 | 118,341 | 161,721 |
| Dauphin | 2018 | 273,335 | 112,785 | 181,875 |
| | 2025 | 284,339 | 117,247 | 195,947 |
| | 2035 | 292,982 | 120,865 | 208,693 |
| | 2045 | 300,638 | 124,041 | 221,824 |
| | 2050 | 305,697 | 126,124 | 229,193 |
| Perry | 2018 | 45,883 | 17,845 | 7,562 |
| | 2025 | 49,480 | 19,280 | 9,648 |
| | 2035 | 50,270 | 19,596 | 10,282 |
| | 2045 | 50,134 | 19,544 | 10,910 |
| | 2050 | 50,916 | 19,858 | 11,529 |

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 demand 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 were calculated as part of the model's validation process. 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 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 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 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 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 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), 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 buses and motor homes (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 age distribution 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 MOVES3 default data assumptions have been reviewed and determined adequate to be used as inputs to the MOVES emissions modeling. Key assumptions include:

- 10.0 RVP used for summer months.
- 100% market share of 10% ethanol throughout the year for analysis years 2025, 2035, 2045 and 2050 (based on MOVES3 defaults).

**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 assure 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]

The OBDII program is implemented in Philadelphia and Pittsburgh along with tailpipe (idle in Pittsburgh and idle and ASM in Philadelphia) and gas cap tests. Tests in other regions include:

- *Subject vehicles registered in the South Central and Lehigh Valley counties receive the visual, OBD and gas cap tests.*
- *Subject vehicles registered in the North region receive a gas cap test and visual inspection.*
- *Subject vehicles registered in the other 42 counties (67 total counties) receive a visual inspection as part of the annual safety inspection.*

**Vehicle Technology Programs**

Federal Programs

Current federal vehicle emissions control and fuel programs are incorporated into the MOVES3 software. The MOVES3 model includes the National Program standards covering light duty vehicles through model year 2026, heavy duty greenhouse gas standards for model year 2014-2018 vehicles, and the Tier 3 vehicle standards. 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.

MOVES3 also incorporates the following new federal emission standard rules:

- *Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles – Phase 2 (HD GHG2) Rule*: MOVES3 accounts for the HD GHG2 rule published in 2016. The rule set stricter fuel economy standards for HD vehicles which reduce CO2 emissions, but also impact other pollutants through changes in glider sales, hoteling activity, vehicle mass and road load coefficients.
- *Safe Affordable Fuel Efficient (SAFE) Vehicles Rule*: MOVES3 also accounts for the March 2020 SAFE standards for light-duty vehicles. These standards were less stringent than the preceding fuel economy standards, and thus increased fuel consumption and CO2 emissions.

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 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 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.
- *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 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 adjustments are provided as inputs to

PPSUITE and are applied to each of the roadway segment volumes. VMT adjustments are also applied to runs for future years.

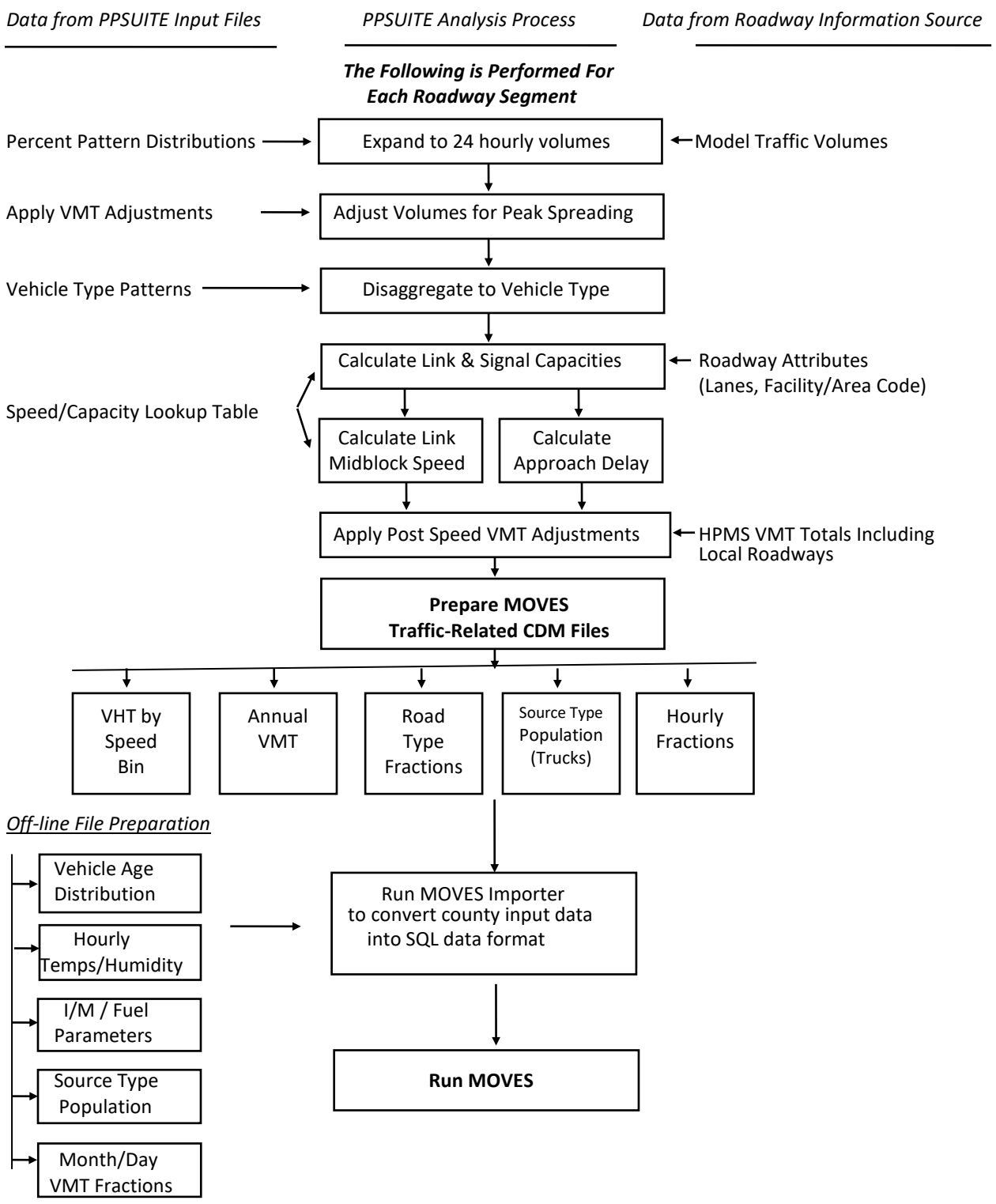
**Speed Estimation**

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) 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 or 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.

**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** | MOVES3 |
| **MOVES Default Database Version** | MOVESDB20221007 |
| **Scale** | COUNTY |
| **Analysis Mode** | Inventory |
| **Time Span** | **Annual Runs:**<br>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<br>Gasoline, Diesel, CNG, E85, Electricity |
| **Road Type** | All road types including off-network |
| **Pollutants and Processes** | All $PM_{2.5}$ categories, $NO_X$ |
| **Database selection** | Early NLEV database<br>PA-Specific CAL LEV program database |
| **General Output** | Units:<br>Emission = grams; Distance = miles;<br>Time = hours; Energy = Million BTU |
| **Output Emissions** | Time = Month, Emissions by Process ID, Source Type and Road Type |

## Conformity Analysis Results (Fine Particulate Matter)

Transportation conformity analyses of the current TIP and RTP have been completed for the Harrisburg area. 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. As a result, both Dauphin and Cumberland counties are now classified as attainment for these NAAQS. However, both counties must continue to demonstrate conformity during the maintenance plan time period. The MVEBs provided in the maintenance plans for the HATS MPO region (Cumberland and Dauphin counties) are summarized in **Exhibit 8**.

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

| County / Pollutant | 2017 Budget (tons/year) | 2025 Budget (tons/year) |
|---|---|---|
| **$PM_{2.5}$** | 365 | 275 |
| **NOx** | 10,287 | 7,024 |

**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 MPO's long range plan forecast period.
- All established MVEB years.
- Attainment year of the standard if within timeframe of TIP and RTP.
- 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 |
|---|---|
| 2025 | Budget Year |
| 2035 | Interim Year |
| 2045 | RTP Horizon Year |
| 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 TIP and RTP 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 common bridge replacements and roadway restoration projects, which constitute the majority of the TIP and RTP list, have been excluded from consideration since they are considered exempt under 40 CFR 93.126-127. A list of significant highway projects is shown in **Attachment A**.

**Analysis Results**

An emissions analysis has been completed for the 1997 8-hour ozone NAAQS and the 2006 24-hour $PM_{2.5}$ NAAQS. Forecast years have been estimated using the procedures and assumptions provide 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 Harrisburg region annual $PM_{2.5}$ and $NO_X$ emissions. Emissions are compared against the available 2017 and 2025 SIP MVEBs listed in **Exhibit 8**. The results illustrate that projected emissions are below the applicable MVEBs.

**Exhibit 10: ANNUAL $PM_{2.5}$ EMISSION ANALYSIS RESULTS AND CONFORMITY TEST**
(Annual)

| Pollutant | *2025 (tons/year)* | *2035 (tons/year)* | *2045 (tons/year)* | *2050 (tons/year)* |
|---|---|---|---|---|
| *$PM_{2.5}$* | *124* | *79* | *73* | *74* |
| *$NO_X$* | *3,701* | *2,303* | *2,305* | *2,394* |
| *MVEB - $PM_{2.5}$* | ***275*** | ***275*** | ***275*** | ***275*** |
| *MVEB - $NO_X$* | ***7,024*** | ***7,024*** | ***7,024*** | ***7,024*** |
| 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 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 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, 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:

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

- 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 Harrisburg region's SIP maintenance plan does 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), requires 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. HATS, 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 the Harrisburg area and have compared the cost with the estimated revenues and maintenance needs of the new roads over the same period. The TIP and RTP have been determined to be financially constrained.

**Public Participation**

The TIP and RTP 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 HATS Public Participation Plan, and Pennsylvania's Conformity SIP. The draft document was made available for a 30-day public review and comment period starting May 1st, which included a public meeting.

**Conformity Statement**

The conformity rule requires that the TIP and RTP 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 RTP for the Harrisburg area 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 HATS 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 MOVES3 for State Implementation Plan Development, Transportation Conformity, General Conformity, and Other Purposes,* US EPA Office of Transportation and Air Quality, EPA-420-B-20-044, November 2020.

*MOVES3 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-20-052, November 2020.

**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, 2020 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.

**RTP:** Regional 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

## 2025-2028 TIP Air Quality Significant Projects

| County | MPMS | Name | Description |
|---|---|---|---|
| **Interstate Highway-Bridge Projects** | | | |
| Dauphin | 92931 | Eisenhower Interchange | This project consists of roadway and structure improvements on 40th St, Paxton St, Derry St, Pen-Har Dr, new Paxton Street Connector, Chambers Hill Road, and the new Paxton St Interchange in Swatara Township, Dauphin County. |
| Dauphin | 113357 | I-83 East Shore Section 3B | Reconstruct and widen for additional lanes on I-83 from SR 0230 (Cameron Street) to about 1500 feet west of SR 3013 (29th Street) overpass and along the SR 3010 (Paxton Street) and 17th Street corridors; and structure replacements in Harrisburg City and Swatara Township, Dauphin County. |
| Dauphin | 113376 | I-83 East Shore Section 3C | Replace and widen I-83 Viaduct Structure from the Susquehanna River to SR 0230 (Cameron Street) in Harrisburg City, Dauphin County. *Construction of this project will initiate beyond TIP years.* |
| Dauphin | 113378 | Eisenhower Interchange B | Reconstruction and widening for lane additions from the Eisenhower Interchange: I-83 to the north to Union Deposit Interchange, I-283 to the south to PA 441 Interchange, and US-322 to the east to Pen-Har Interchange in Swatara and Lower Paxton Townships, Dauphin County. *Construction of this project will initiate beyond TIP years.* |
| Dauphin | 113380 | Eisenhower Interchange C | Reconstruction and widening for lane additions from the Eisenhower Interchange: I-83 to the south to the 29th Street overpass in Swatara Township, Dauphin County. *Construction of this project will initiate beyond TIP years.* |
| Dauphin | 113381 | Eisenhower Interchange D | This project consists of the I-83 Eisenhower Interchange reconstruction and widening, Derry Street Interchange and bridge replacements in Swatara Township, Dauphin County. *Construction of this project will initiate beyond TIP years.* |
| Dauphin | 113754 | I-83 South Bridge Replacement | Bridge Replacement, Widening and Interchange Improvements of I-83 South Bridge over the Susquehanna River in Harrisburg City. |
| **Non-Interstate Highway-Bridge Projects** | | | |
| Cumberland | 114202 | Lemoyne Bottleneck Improvements | This project may consist of bicycle, pedestrian and safety improvements from the intersection of Market St (SR 1010) with S. Third St (SR 2035) to Front St (SR 1027) in Lemoyne Borough, Cumberland County with the installation of a bike lane, sidewalk upgrades and roadway lane reconfiguration in Lemoyne and Wormleysburg Boroughs. May also include Front Street traffic signal upgrade and signal coordination. |

| County | MPMS | Name | Description |
|---|---|---|---|
| Cumberland | 114315 | Sporting Hill Turn Lane | project consists of resurfacing, adding turn lanes, coordinated signal replacements at 4 intersections and updating bicycle and pedestrian accommodations on South Sporting Hill Road (SR 1013) from Trindle Road (PA 641) to Carlisle Pike (SR 1010), in Hampden Township Cumberland County. |
| Cumberland | 117594 | SR 641 and Locust Point Rd Intersection HSM | The project consists of safety improvements at the intersection of SR 0641 (Trindle Road) and SR 1007 (Locust Point Road), in Silver Spring and Monroe Townships, Cumberland County. |
| Cumberland | 117596 | SR 641 and Middlesex Rd Intersection HSM | This project may consist of installing a roundabout, installing a traffic signal, increasing triangular sight distance, improving intersection skew angle, and installing systemic signing and marking improvements for stop controlled intersections at the intersection of PA 641 and T 560, T 684 (Middlesex Road) in Middlesex Township, Cumberland County. |
| Cumberland | 117675 | West St, Willow St, Walnut Bottom Rd | This project may consist of a mini-roundabout at the intersection of SR 3023 (Walnut Bottom Road) West Street and Willow Street in Carlisle Borough, Cumberland County. |
| Dauphin | 106554 | Riverlands Safety Implementation | This project consists of the implementation of safety improvements identified in the study, which consist of low-cost safety improvements, reconfiguration of interchanges, auxiliary lanes on US 22. The westbound US 22 went from 2 lanes to 3 lanes in certain locations, with the addition of the frontage road. The westbound acceleration lane on the Clarks Ferry Bridge is being extended 1,300 feet until the frontage road begins. The frontage road is approximately 4,555 feet. This will include a potential closure of the median on US 22/322 from 11/15 and US 22/322 interchange to the Susquehanna River in Reed Township, Dauphin County. |
| Dauphin | 114316 | Cameron/Maclay Intersection | This project consists of intersection, traffic signal coordination, and pedestrian facilities improvements on Cameron Street (SR 230) from Paxton Street (SR 3009) to Elmerton Avenue (SR 3026). These improvements will also help to reduce congestion and improve pedestrian safety in the City of Harrisburg, Dauphin County. |

| County | MPMS | Name | Description |
|---|---|---|---|
| Dauphin | 116786 | Middletown Rd Safety and Congestion Improvements | This project consists of widening Middletown Road (SR 2003) from SR 283 to SR 322 in Derry and Londonderry Townships, Dauphin County. Potential improvements from the corridor transportation evaluation include improved access management, geometric improvements at the intersection of Middletown Road and the Route 322 eastbound exit ramp, addition of a turn lane or median, and widening the roadway altogether (long term). |
| Dauphin | 117612 | PA 743 and PA 341 Intersection HSM | This project may consist of a change of intersection skew angle, installation of a roundabout and change of intersection sight distance at the intersection of PA 743 (Elizabethtown Road) and PA 341 (Colebrook Road) in Conewago Township, Dauphin County. |
| **Transit Projects** | | | |
| Dauphin | 112974 (Hwy-Bridge) & 112975 (Transit) | SRTA Employment Access | Funding will be used in coordination with MPMS# 113077 from the YAMPO TIP for a demonstration project to provide access to employment centers along the I-83corridor between York and Harrisburg beyond the current SRTA (York County) or SRTA (Harrisburg Area) fixed route service areas. |

## 2045 RTP Air Quality Significant Projects

***(no new air quality significant projects since last conformity determination)***

| County | Location | RTP Timeframe | Long Project Description |
|---|---|---|---|
| Cumberland | Trindle Road (Sporting Hill Road to Camp Hill Borough) | Mid-Range | Traffic volumes are heavy on this roadway with significant commercial, residential, and office development along the corridor. The Township is requesting the corridor be widened to four lanes. |
| Cumberland | Intersection of Orrs Bridge Road, Carlisle Pike & Central Blvd | Mid-Range | Realignment of Central Boulevard to address offset intersection alignment and improve traffic movements as well as safety |
| Cumberland | Intersection of Carlisle Pike and St. Johns Church Rd | Mid-Range | Re-delineate the center two-way left turn lane on the westbound approach to provide 290' of storage and investigate extending the eastbound right turn lane to provide 295' of storage |
| Cumberland | Hogestown - Carlisle Pike from Commerce Drive to SR 114 | Mid-Range | This high-volume roadway is disruptive to the community and presents safety and character concerns. This creates a situation that is directly adverse to the goals of the Township's Comprehensive Plan, which strives to safely and efficiently accommodate regional pass-through traffic. Per the Comprehensive Plan from 2019 for Silver Spring Township, an objective outlines requires all improvement to consider preservation of rural and suburban character of the Township by directing future development and redevelopment towards areas of existing development. Preserving the historical portions of the village and ensuring this residential land use location maintains integrity. Traffic concerns will be further compromised with upcoming planned development of the Hempt Farms property. |
| Cumberland | Wertzville Road (Orrs Bridge Road to North Enola Drive) | Mid-Range | Wertzville Road is currently a two lane roadway traversing the Township in an east/west direction and serves as a major east/west corridor providing access to businesses located in the Township. During peak traffic periods, left turns into private residences and other businesses/commercial areas reduce capacity of the through movements. By providing a continuous two way center turn lane, capacity will be significantly improved along the corridor. |

| County | Location | RTP Timeframe | Long Project Description |
|---|---|---|---|
| Dauphin | US 422, 322, and Hershey Park Drive Interchange | Mid-Range | The Route 322/422/Hersheypark Drive Interchange has been identified as a problem interchange for several years within Derry Township. The interchange has several loops and does not efficiently merge traffic at the ramp terminals. Additionally, Derry Township Police has temporarily closed a lane along westbound Route 322 in order to provide safe merging areas for event traffic from Hersheypark Drive. The interchange also divides this area of the Township and precludes bike/pedestrian movements between Walton Avenue/Hummelstown area and Route 322/Hershey Medical Center area. The shoulders are too narrow to support bicycle traffic and there are no sidewalks. Considering the volume and speed of traffic within the interchange, there are safety concerns with non-motorized uses traversing this area. |
| Cumberland | Intersection of Simpson Ferry Road & Wesley Dr/Sheely Ln | Mid-Range | Separation of the current shared right/through lane to an individual right turn lane and an individual through lane to alleviate congestion. |
| Dauphin | Route 147, Route 225, 4th Street, Armstrong Street | Mid-Range | Preferred Alternative in Freight Study - Modification of 4th Street and Armstrong Street to one-way traffic patterns to create a partial one-way loop |
| Cumberland | Wertzville Road (Valley Road to East Pennsboro Twp) | Mid-Range | Due to the arterial nature of Route 944 in the Township and its related high traffic volumes, Hampden Township is requesting the road be widened to four lanes. |
| Dauphin | Route 422 (W Chocolate Ave) and Old West Chocolate Ave | Mid-Range | North-south mobility for vehicles and bikes/pedestrians is lacking in several portions of Derry Township. In this specific area, access to and from Old West Chocolate Ave from Route 422 is restricted for motorists, cyclists, and pedestrians. A railroad traverses this area, limiting the potential connection points. Motorists, bicyclists and pedestrians typically use the cut through residential roadways of 2nd Avenue to travel north on N Hockersville Road. Based on 2019 traffic counts, over 100 vehicles traverse this residential neighborhood during a typical peak hour. Additionally, there are frequent long queues and delays at the nearby intersection of Route 422 and N Hockersville Road. |
| Cumberland | Intersection of Hummel Avenue and 18th Street | Mid-Range | Traffic volumes have been increasing for many years. Congestion, delays, and safety concerns have increased along with the volumes. Roadways approach from six directions, through three traffic signals, converging on a single bridge. A busy at-grade railroad crossing within the project limits affects traffic operations. The |
| Cumberland | Intersection of Hummel Avenue and 17th Street | Mid-Range | |

| County | Location | RTP Timeframe | Long Project Description |
|---|---|---|---|
| Cumberland | Intersection of State Street and 17th Street | Mid-Range | Township is requesting that three signalized intersections be upgraded: Hummel at 18th, Hummel at 17th, and State at 17th (cost includes all of these intersections). |
| Cumberland | US 15/Rossmoyne Rd/Wesley Dr Interchange | Long-Range | Traffic accessing interchange ramps currently functions at poor levels of service. Turn lane stacking frequently exceeds capacity of the lanes. Congestion occurs daily. Lower Allen is requesting upgrades to existing signalized intersections or existing alignments. |
| Cumberland | Intersection of Gettysburg Road and St. Johns Road | Long-Range | Traffic volumes on Gettysburg Road have been increasing for many years. Congestion, delays, and safety concerns have increased along with the volumes. The Township is requesting two intersections on Gettysburg Road be upgraded - upgrade existing signalized intersection at Slate Hill Road/Locust Street and install a new traffic signal at St. Johns Road (cost includes both intersections). |
| Cumberland | Route 944/Miller's Gap and Old Willow Mill | Long-Range | Per HRG's 2014 Wertzville Road Corridor Study, safe stopping distance is not provided for 45 mph posted speed limit Northbound - looking left, and Southbound looking right. Houses limit intersection sight distance. In addition to the sight distance concerns, turn lane warrants indicate multiple turn lanes should be provided to provide safe egress from Wertzville Road - an eastbound left turn lane and westbound left and right turn lanes. The 2017 SR 0944 Safety Study, performed by WBCM also notes the limited intersection sight distance and reports a significant number of angle crashes at this intersection - more than at any other study intersection within Silver Spring Township. Intersection safety concerns are compounded by the heavy side-street traffic along Old Willow Mill Road and Millers Gap Road and tight intersection radii on all legs of the intersection. |
| Cumberland | York Rd, Petersburg Rd, and Carlton Avenue | Long-Range | Installation of traffic signal to mitigate congestion and improve safety |
| Perry | Bloomfield Rd (SR 274) and Locust Street | Long-Range | Intersection improvements to address sight distance concerns due to retaining walls |
| Cumberland | Intersection of Lisburn Rd and Creek Rd | Long-Range | Intersection improvements to address increasing traffic volumes, congestion and delays, and safety concerns (cost includes intersections of Lisburn Road at Creek Road, Carlisle Road, and Spanglers Mill Road) |

| County | Location | RTP Timeframe | Long Project Description |
|---|---|---|---|
| Cumberland | Intersection of Lisburn Rd and Carlisle Rd | Long-Range | Intersection improvements to address increasing traffic volumes, congestion and delays, and safety concerns (cost includes intersections of Lisburn Road at Creek Road, Carlisle Road, and Spanglers Mill Road) |
| Cumberland | Intersection of Lisburn Rd and Spanglers Mill Rd | Long-Range | Intersection improvements to address increasing traffic volumes, congestion and delays, and safety concerns (cost includes intersections of Lisburn Road at Creek Road, Carlisle Road, and Spanglers Mill Road) |
| Cumberland | Spring Rd (RT34) and Longs Gap Road | Long-Range | Intersection realignment to a "T" intersection, installation of a 3-way traffic signal, construction of a left turn lane on Spring Road (Rt34) for those who want to turn left onto Longs Gap Road |
| Cumberland | Intersection of Holly Pike (Rt 34) and Pine Road | Long-Range | The intersection is a "T" intersection with a heavily traveled state highway. Previous studies conducted by a developer in the area indicate that a turn lane is warranted. The project in question never materialized. The wait for opportunities to make left turns has caused people to risk pulling out onto Pine Road in unsafe conditions. The issues at this intersection were also independently reported by Dickinson Township. |

# ATTACHMENT B

## Detailed Emission Results

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

## 2025 Annual $PM_{2.5}$ by Road Type

| County | Road Type | Annual VMT | Speed (mph) | Emissoins (Tons/Year) | |
|---|---|---|---|---|---|
| | | | | NOx | $PM_{2.5}$ |
| Cumberland | Off-Network | N/A | N/A | 339.95 | 10.70 |
| | Rural Restricted | 567,429,746 | 63.7 | 488.59 | 12.14 |
| | Rural UnRestricted | 363,141,329 | 39.9 | 148.60 | 5.82 |
| | Urban Restricted | 1,166,586,330 | 58.1 | 701.60 | 19.24 |
| | Urban UnRestricted | 1,004,512,278 | 27.2 | 346.10 | 17.50 |
| | *Subtotal* | *3,101,669,683* | | *2,024.84* | *65.40* |
| Dauphin | Off-Network | N/A | N/A | 302.83 | 10.67 |
| | Rural Restricted | 92,792,129 | 63.5 | 51.66 | 1.37 |
| | Rural UnRestricted | 324,760,725 | 40.1 | 109.17 | 4.60 |
| | Urban Restricted | 1,416,995,090 | 57.3 | 830.82 | 22.99 |
| | Urban UnRestricted | 1,221,555,806 | 29.2 | 382.06 | 19.46 |
| | *Subtotal* | *3,056,103,750* | | *1,676.54* | *59.08* |
| Off-Model Project Emission Benefits | | | | 0.00 | 0.00 |
| **Region Total** | | **6,157,773,433** | | **3,701.38** | **124.49** |
| | | | **(Kg/Year)** | **3,357,835** | **112,931** |

## 2035 Annual $PM_{2.5}$ by Road Type

| County | Road Type | Annual VMT | Speed (mph) | Emissoins (Tons/Year) | |
|---|---|---|---|---|---|
| | | | | NOx | $PM_{2.5}$ |
| Cumberland | Off-Network | N/A | N/A | 272.50 | 8.50 |
| | Rural Restricted | 542,424,474 | 64.7 | 239.85 | 4.59 |
| | Rural UnRestricted | 347,778,059 | 39.4 | 82.01 | 3.30 |
| | Urban Restricted | 1,461,231,076 | 57.6 | 462.85 | 11.09 |
| | Urban UnRestricted | 1,139,361,377 | 26.2 | 222.52 | 13.50 |
| | *Subtotal* | *3,490,794,985* | | *1,279.73* | *40.99* |
| Dauphin | Off-Network | N/A | N/A | 230.16 | 8.85 |
| | Rural Restricted | 141,993,194 | 63.7 | 38.62 | 0.92 |
| | Rural UnRestricted | 349,557,325 | 39.4 | 61.91 | 3.03 |
| | Urban Restricted | 1,590,186,830 | 56.7 | 479.48 | 11.82 |
| | Urban UnRestricted | 1,283,562,754 | 28.8 | 213.59 | 13.76 |
| | *Subtotal* | *3,365,300,103* | | *1,023.76* | *38.38* |
| Off-Model Project Emission Benefits | | | | 0.00 | 0.00 |
| **Region Total** | | **6,856,095,088** | | **2,303.49** | **79.37** |
| | | | **(Kg/Year)** | **2,089,693** | **72,000** |

**2045 Annual $PM_{2.5}$ by Road Type**

| County | Road Type | Annual VMT | Speed (mph) | Emissoins (Tons/Year) | |
|---|---|---|---|---|---|
| | | | | NOx | $PM_{2.5}$ |
| Cumberland | Off-Network | N/A | N/A | 283.94 | 6.39 |
| | Rural Restricted | 670,581,594 | 64.6 | 262.44 | 4.69 |
| | Rural UnRestricted | 387,723,041 | 39.1 | 83.79 | 3.29 |
| | Urban Restricted | 1,586,901,819 | 57.6 | 449.08 | 10.25 |
| | Urban UnRestricted | 1,201,489,488 | 25.4 | 218.97 | 13.39 |
| | *Subtotal* | *3,846,695,942* | | *1,298.20* | *38.00* |
| Dauphin | Off-Network | N/A | N/A | 229.19 | 6.44 |
| | Rural Restricted | 204,689,075 | 63.6 | 48.06 | 1.06 |
| | Rural UnRestricted | 380,411,716 | 38.2 | 61.88 | 3.00 |
| | Urban Restricted | 1,691,442,095 | 56.7 | 455.11 | 10.70 |
| | Urban UnRestricted | 1,383,628,450 | 28.0 | 212.56 | 13.92 |
| | *Subtotal* | *3,660,171,336* | | *1,006.80* | *35.12* |
| Off-Model Project Emission Benefits | | | | 0.00 | 0.00 |
| **Region Total** | | **7,506,867,278** | | **2,305.00** | **73.11** |
| | | | **(Kg/Year)** | **2,091,062** | **66,328** |

**2050 Annual PM2.5 by Road Type**

| County | Road Type | Annual VMT | Speed (mph) | Emissoins (Tons/Year) | |
|---|---|---|---|---|---|
| | | | | NOx | $PM_{2.5}$ |
| Cumberland | Off-Network | N/A | N/A | 296.46 | 5.84 |
| | Rural Restricted | 691,930,679 | 64.6 | 265.31 | 4.67 |
| | Rural UnRestricted | 396,924,664 | 38.8 | 85.25 | 3.32 |
| | Urban Restricted | 1,709,582,137 | 57.5 | 480.34 | 10.79 |
| | Urban UnRestricted | 1,243,709,349 | 24.9 | 226.31 | 13.85 |
| | *Subtotal* | *4,042,146,829* | | *1,353.67* | *38.47* |
| Dauphin | Off-Network | N/A | N/A | 235.51 | 5.78 |
| | Rural Restricted | 237,859,293 | 63.5 | 54.65 | 1.19 |
| | Rural UnRestricted | 383,853,768 | 38.1 | 61.90 | 2.98 |
| | Urban Restricted | 1,755,187,167 | 56.6 | 465.65 | 10.82 |
| | Urban UnRestricted | 1,451,574,321 | 27.5 | 222.67 | 14.61 |
| | *Subtotal* | *3,828,474,549* | | *1,040.38* | *35.39* |
| Off-Model Project Emission Benefits | | | | 0.00 | 0.00 |
| **Region Total** | | **7,870,621,378** | | **2,394.05** | **73.86** |
| | | | **(Kg/Year)** | **2,171,848** | **67,001** |

**2025 Annual $PM_{2.5}$ by Source Type**

| County | Source Type | Annual VMT | Emissoins (Tons/Year) | |
|---|---|---|---|---|
| | | | NOx | $PM_{2.5}$ |
| Cumberland | Motorcycle | 18,061,658 | 14.19 | 0.43 |
| | Passenger Car | 1,182,493,900 | 73.73 | 8.71 |
| | Passenger Truck | 1,247,744,900 | 318.48 | 16.51 |
| | Light Commercial Truck | 147,886,860 | 63.10 | 2.74 |
| | Intercity Bus | 10,684,850 | 42.77 | 1.00 |
| | Transit Bus | 5,391,703 | 20.37 | 0.36 |
| | School Bus | 1,903,168 | 4.81 | 0.19 |
| | Refuse Truck | 1,626,605 | 4.77 | 0.09 |
| | Single Unit Short-haul Truck | 165,076,816 | 183.90 | 4.67 |
| | Single Unit Long-haul Truck | 11,099,814 | 10.26 | 0.27 |
| | Motor Home | 5,183,935 | 13.91 | 0.49 |
| | Combination Short-haul Truck | 60,180,104 | 202.80 | 4.02 |
| | Combination Long-haul Truck | 244,335,370 | 1,071.74 | 25.94 |
| | *Subtotal* | *3,101,669,683* | *2,024.84* | *65.40* |
| Dauphin | Motorcycle | 18,683,914 | 14.42 | 0.45 |
| | Passenger Car | 1,223,234,230 | 78.88 | 9.42 |
| | Passenger Truck | 1,290,733,380 | 336.62 | 17.72 |
| | Light Commercial Truck | 152,978,486 | 66.68 | 2.92 |
| | Intercity Bus | 4,602,738 | 19.18 | 0.46 |
| | Transit Bus | 9,336,143 | 36.94 | 0.66 |
| | School Bus | 1,338,600 | 3.62 | 0.14 |
| | Refuse Truck | 1,186,526 | 3.64 | 0.07 |
| | Single Unit Short-haul Truck | 120,276,444 | 141.29 | 3.60 |
| | Single Unit Long-haul Truck | 8,084,199 | 7.97 | 0.21 |
| | Motor Home | 3,778,028 | 11.40 | 0.41 |
| | Combination Short-haul Truck | 43,849,666 | 153.68 | 3.12 |
| | Combination Long-haul Truck | 178,021,396 | 802.23 | 19.91 |
| | *Subtotal* | *3,056,103,750* | *1,676.54* | *59.08* |
| Off-Model Project Emission Benefits | | | 0.00 | 0.00 |
| **Region Total** | | **6,157,773,433 (Kg/Year)** | **3,701.38 3,357,835** | **124.49 112,931** |

**2035 Annual $PM_{2.5}$ by Source Type**

| County | Source Type | Annual VMT | Emissoins (Tons/Year) | |
|---|---|---|---|---|
| | | | NOx | $PM_{2.5}$ |
| Cumberland | Motorcycle | 20,263,364 | 15.64 | 0.49 |
| | Passenger Car | 1,326,639,700 | 34.81 | 8.91 |
| | Passenger Truck | 1,399,835,800 | 88.33 | 13.03 |
| | Light Commercial Truck | 165,921,220 | 13.98 | 1.66 |
| | Intercity Bus | 12,273,443 | 27.00 | 0.39 |
| | Transit Bus | 6,112,176 | 11.28 | 0.10 |
| | School Bus | 2,166,758 | 2.70 | 0.05 |
| | Refuse Truck | 1,720,832 | 3.63 | 0.03 |
| | Single Unit Short-haul Truck | 189,577,297 | 150.60 | 2.64 |
| | Single Unit Long-haul Truck | 12,634,140 | 8.27 | 0.15 |
| | Motor Home | 5,359,907 | 7.33 | 0.30 |
| | Combination Short-haul Truck | 67,014,929 | 169.67 | 2.45 |
| | Combination Long-haul Truck | 281,275,420 | 746.50 | 10.79 |
| | *Subtotal* | *3,490,794,985* | *1,279.73* | *40.99* |
| Dauphin | Motorcycle | 20,486,338 | 15.59 | 0.49 |
| | Passenger Car | 1,341,244,440 | 37.27 | 9.30 |
| | Passenger Truck | 1,415,251,600 | 93.44 | 13.66 |
| | Light Commercial Truck | 167,729,164 | 14.75 | 1.74 |
| | Intercity Bus | 5,323,024 | 12.63 | 0.19 |
| | Transit Bus | 10,508,981 | 21.09 | 0.20 |
| | School Bus | 1,506,730 | 2.11 | 0.03 |
| | Refuse Truck | 1,249,709 | 2.79 | 0.02 |
| | Single Unit Short-haul Truck | 137,109,706 | 115.80 | 2.05 |
| | Single Unit Long-haul Truck | 9,126,266 | 6.43 | 0.12 |
| | Motor Home | 3,876,730 | 6.25 | 0.27 |
| | Combination Short-haul Truck | 48,449,319 | 128.81 | 1.90 |
| | Combination Long-haul Truck | 203,438,096 | 566.79 | 8.39 |
| | *Subtotal* | *3,365,300,103* | *1,023.76* | *38.38* |
| Off-Model Project Emission Benefits | | | 0.00 | 0.00 |
| **Region Total** | | **6,856,095,088 (Kg/Year)** | **2,303.49 2,089,693** | **79.37 72,000** |

**2045 Annual $PM_{2.5}$ by Source Type**

| County | Source Type | Annual VMT | Emissoins (Tons/Year) | |
|---|---|---|---|---|
| | | | NOx | $PM_{2.5}$ |
| Cumberland | Motorcycle | 22,194,817 | 17.14 | 0.53 |
| | Passenger Car | 1,453,096,500 | 27.68 | 8.40 |
| | Passenger Truck | 1,533,265,700 | 62.92 | 11.31 |
| | Light Commercial Truck | 181,731,250 | 9.09 | 1.45 |
| | Intercity Bus | 14,374,519 | 27.83 | 0.25 |
| | Transit Bus | 6,616,209 | 11.35 | 0.09 |
| | School Bus | 2,342,588 | 2.63 | 0.04 |
| | Refuse Truck | 1,978,018 | 4.07 | 0.03 |
| | Single Unit Short-haul Truck | 215,276,376 | 165.99 | 2.91 |
| | Single Unit Long-haul Truck | 14,274,528 | 9.08 | 0.16 |
| | Motor Home | 6,099,593 | 4.76 | 0.13 |
| | Combination Short-haul Truck | 75,589,463 | 181.63 | 2.45 |
| | Combination Long-haul Truck | 319,856,380 | 774.06 | 10.24 |
| | *Subtotal* | *3,846,695,942* | *1,298.20* | *38.00* |
| Dauphin | Motorcycle | 22,260,553 | 16.87 | 0.53 |
| | Passenger Car | 1,457,395,010 | 29.48 | 8.75 |
| | Passenger Truck | 1,537,825,640 | 66.46 | 11.82 |
| | Light Commercial Truck | 182,255,637 | 9.60 | 1.51 |
| | Intercity Bus | 6,075,916 | 12.93 | 0.12 |
| | Transit Bus | 11,283,133 | 21.33 | 0.18 |
| | School Bus | 1,621,639 | 2.08 | 0.03 |
| | Refuse Truck | 1,382,450 | 3.04 | 0.02 |
| | Single Unit Short-haul Truck | 150,104,462 | 124.35 | 2.20 |
| | Single Unit Long-haul Truck | 9,962,869 | 6.90 | 0.13 |
| | Motor Home | 4,252,736 | 3.70 | 0.10 |
| | Combination Short-haul Truck | 52,709,230 | 134.57 | 1.87 |
| | Combination Long-haul Truck | 223,042,060 | 575.49 | 7.84 |
| | *Subtotal* | *3,660,171,336* | *1,006.80* | *35.12* |
| Off-Model Project Emission Benefits | | | 0.00 | 0.00 |
| **Region Total** | | **7,506,867,278 (Kg/Year)** | **2,305.00 2,091,062** | **73.11 66,328** |

**2050 Annual $PM_{2.5}$ by Source Type**

| County | Source Type | Annual VMT | Emissoins (Tons/Year) | |
|---|---|---|---|---|
| | | | NOx | $PM_{2.5}$ |
| Cumberland | Motorcycle | 23,267,813 | 17.98 | 0.56 |
| | Passenger Car | 1,523,338,800 | 27.95 | 8.61 |
| | Passenger Truck | 1,607,391,900 | 59.78 | 11.03 |
| | Light Commercial Truck | 190,522,850 | 8.78 | 1.43 |
| | Intercity Bus | 15,513,233 | 29.84 | 0.27 |
| | Transit Bus | 6,852,974 | 11.74 | 0.09 |
| | School Bus | 2,425,049 | 2.72 | 0.04 |
| | Refuse Truck | 2,107,900 | 4.32 | 0.03 |
| | Single Unit Short-haul Truck | 228,758,671 | 175.93 | 3.08 |
| | Single Unit Long-haul Truck | 15,203,718 | 9.65 | 0.17 |
| | Motor Home | 6,482,312 | 4.97 | 0.14 |
| | Combination Short-haul Truck | 80,762,938 | 191.42 | 2.53 |
| | Combination Long-haul Truck | 339,518,670 | 808.58 | 10.48 |
| | *Subtotal* | *4,042,146,829* | *1,353.67* | *38.47* |
| Dauphin | Motorcycle | 23,270,691 | 17.61 | 0.56 |
| | Passenger Car | 1,523,533,090 | 29.54 | 8.99 |
| | Passenger Truck | 1,607,606,020 | 62.92 | 11.52 |
| | Light Commercial Truck | 190,525,560 | 9.24 | 1.49 |
| | Intercity Bus | 6,557,838 | 13.91 | 0.13 |
| | Transit Bus | 11,694,105 | 22.14 | 0.19 |
| | School Bus | 1,676,809 | 2.15 | 0.03 |
| | Refuse Truck | 1,462,673 | 3.22 | 0.03 |
| | Single Unit Short-haul Truck | 157,629,682 | 130.64 | 2.32 |
| | Single Unit Long-haul Truck | 10,459,959 | 7.26 | 0.13 |
| | Motor Home | 4,466,839 | 3.82 | 0.11 |
| | Combination Short-haul Truck | 55,658,587 | 140.85 | 1.92 |
| | Combination Long-haul Truck | 233,932,696 | 597.08 | 7.98 |
| | *Subtotal* | *3,828,474,549* | *1,040.38* | *35.39* |
| Off-Model Project Emission Benefits | | | 0.00 | 0.00 |
| **Region Total** | | **7,870,621,378 (Kg/Year)** | **2,394.05 2,171,848** | **73.86 67,001** |

**2025 Annual $PM_{2.5}$ by Emission Process**

| County | Emission Process | ProcessID | Emissoins (Tons/Year) | |
|---|---|---|---|---|
| | | | NOx | $PM_{2.5}$ |
| Cumberland | Running Exhaust | 1 | 1,789.50 | 36.14 |
| | Start Exhaust | 2 | 151.94 | 6.89 |
| | Brakewear | 9 | 0.00 | 10.11 |
| | Tirewear | 10 | 0.00 | 5.52 |
| | Evap Permeation | 11 | 0.00 | 0.00 |
| | Evap Fuel Vapor Venting | 12 | 0.00 | 0.00 |
| | Evap Fuel Leaks | 13 | 0.00 | 0.00 |
| | Crankcase Running Exhaust | 15 | 14.21 | 5.41 |
| | Crankcase Start Exhaust | 16 | 0.01 | 0.06 |
| | Crankcase Extended Idle Exhaust | 17 | 0.50 | 0.38 |
| | Extended Idle Exhaust | 90 | 64.35 | 0.81 |
| | Auxiliary Power Exhaust | 91 | 4.33 | 0.08 |
| | *Subtotal* | | *2,024.84* | *65.40* |
| Dauphin | Running Exhaust | 1 | 1,458.43 | 30.53 |
| | Start Exhaust | 2 | 159.21 | 7.58 |
| | Brakewear | 9 | 0.00 | 10.55 |
| | Tirewear | 10 | 0.00 | 5.28 |
| | Evap Permeation | 11 | 0.00 | 0.00 |
| | Evap Fuel Vapor Venting | 12 | 0.00 | 0.00 |
| | Evap Fuel Leaks | 13 | 0.00 | 0.00 |
| | Crankcase Running Exhaust | 15 | 10.94 | 4.20 |
| | Crankcase Start Exhaust | 16 | 0.01 | 0.06 |
| | Crankcase Extended Idle Exhaust | 17 | 0.35 | 0.26 |
| | Extended Idle Exhaust | 90 | 44.60 | 0.56 |
| | Auxiliary Power Exhaust | 91 | 3.00 | 0.05 |
| | *Subtotal* | | *1,676.54* | *59.08* |
| Off-Model Project Emission Benefits | | | 0.00 | 0.00 |
| **Region Total** | **(Kg/Year)** | | **3,701.38**<br>**3,357,835** | **124.49**<br>**112,931** |

**2035 Annual $PM_{2.5}$ by Emission Process**

| County | Emission Process | ProcessID | Emissoins (Tons/Year) | |
|---|---|---|---|---|
| | | | NOx | $PM_{2.5}$ |
| Cumberland | Running Exhaust | 1 | 1,106.82 | 13.40 |
| | Start Exhaust | 2 | 109.18 | 7.39 |
| | Brakewear | 9 | 0.00 | 11.75 |
| | Tirewear | 10 | 0.00 | 6.24 |
| | Evap Permeation | 11 | 0.00 | 0.00 |
| | Evap Fuel Vapor Venting | 12 | 0.00 | 0.00 |
| | Evap Fuel Leaks | 13 | 0.00 | 0.00 |
| | Crankcase Running Exhaust | 15 | 15.35 | 1.76 |
| | Crankcase Start Exhaust | 16 | 0.00 | 0.06 |
| | Crankcase Extended Idle Exhaust | 17 | 0.42 | 0.19 |
| | Extended Idle Exhaust | 90 | 38.79 | 0.18 |
| | Auxiliary Power Exhaust | 91 | 9.17 | 0.03 |
| | *Subtotal* | | *1,279.73* | *40.99* |
| Dauphin | Running Exhaust | 1 | 869.51 | 11.32 |
| | Start Exhaust | 2 | 108.95 | 7.96 |
| | Brakewear | 9 | 0.00 | 11.62 |
| | Tirewear | 10 | 0.00 | 5.81 |
| | Evap Permeation | 11 | 0.00 | 0.00 |
| | Evap Fuel Vapor Venting | 12 | 0.00 | 0.00 |
| | Evap Fuel Leaks | 13 | 0.00 | 0.00 |
| | Crankcase Running Exhaust | 15 | 11.81 | 1.33 |
| | Crankcase Start Exhaust | 16 | 0.00 | 0.06 |
| | Crankcase Extended Idle Exhaust | 17 | 0.29 | 0.13 |
| | Extended Idle Exhaust | 90 | 26.85 | 0.12 |
| | Auxiliary Power Exhaust | 91 | 6.35 | 0.02 |
| | *Subtotal* | | *1,023.76* | *38.38* |
| Off-Model Project Emission Benefits | | | 0.00 | 0.00 |
| **Region Total** | **(Kg/Year)** | | **2,303.49**<br>**2,089,693** | **79.37**<br>**72,000** |

**2045 Annual $PM_{2.5}$ by Emission Process**

| County | Emission Process | ProcessID | Emissoins (Tons/Year) | |
|---|---|---|---|---|
| | | | NOx | $PM_{2.5}$ |
| Cumberland | Running Exhaust | 1 | 1,125.67 | 10.70 |
| | Start Exhaust | 2 | 106.21 | 5.54 |
| | Brakewear | 9 | 0.00 | 12.97 |
| | Tirewear | 10 | 0.00 | 6.90 |
| | Evap Permeation | 11 | 0.00 | 0.00 |
| | Evap Fuel Vapor Venting | 12 | 0.00 | 0.00 |
| | Evap Fuel Leaks | 13 | 0.00 | 0.00 |
| | Crankcase Running Exhaust | 15 | 16.65 | 1.53 |
| | Crankcase Start Exhaust | 16 | 0.00 | 0.04 |
| | Crankcase Extended Idle Exhaust | 17 | 0.42 | 0.16 |
| | Extended Idle Exhaust | 90 | 37.82 | 0.13 |
| | Auxiliary Power Exhaust | 91 | 11.43 | 0.02 |
| | *Subtotal* | | *1,298.20* | *38.00* |
| Dauphin | Running Exhaust | 1 | 859.15 | 8.66 |
| | Start Exhaust | 2 | 102.20 | 5.80 |
| | Brakewear | 9 | 0.00 | 12.94 |
| | Tirewear | 10 | 0.00 | 6.34 |
| | Evap Permeation | 11 | 0.00 | 0.00 |
| | Evap Fuel Vapor Venting | 12 | 0.00 | 0.00 |
| | Evap Fuel Leaks | 13 | 0.00 | 0.00 |
| | Crankcase Running Exhaust | 15 | 12.53 | 1.13 |
| | Crankcase Start Exhaust | 16 | 0.00 | 0.05 |
| | Crankcase Extended Idle Exhaust | 17 | 0.28 | 0.11 |
| | Extended Idle Exhaust | 90 | 25.06 | 0.09 |
| | Auxiliary Power Exhaust | 91 | 7.57 | 0.01 |
| | *Subtotal* | | *1,006.80* | *35.12* |
| Off-Model Project Emission Benefits | | | 0.00 | 0.00 |
| **Region Total** | **(Kg/Year)** | | **2,305.00**<br>**2,091,062** | **73.11**<br>**66,328** |

**2050 Annual $PM_{2.5}$ by Emission Process**

| County | Emission Process | ProcessID | Emissoins (Tons/Year) | |
|---|---|---|---|---|
| | | | NOx | $PM_{2.5}$ |
| Cumberland | Running Exhaust | 1 | 1,175.30 | 10.61 |
| | Start Exhaust | 2 | 108.49 | 5.01 |
| | Brakewear | 9 | 0.00 | 13.70 |
| | Tirewear | 10 | 0.00 | 7.27 |
| | Evap Permeation | 11 | 0.00 | 0.00 |
| | Evap Fuel Vapor Venting | 12 | 0.00 | 0.00 |
| | Evap Fuel Leaks | 13 | 0.00 | 0.00 |
| | Crankcase Running Exhaust | 15 | 17.45 | 1.54 |
| | Crankcase Start Exhaust | 16 | 0.00 | 0.04 |
| | Crankcase Extended Idle Exhaust | 17 | 0.44 | 0.16 |
| | Extended Idle Exhaust | 90 | 39.71 | 0.13 |
| | Auxiliary Power Exhaust | 91 | 12.27 | 0.01 |
| | *Subtotal* | | *1,353.67* | *38.47* |
| Dauphin | Running Exhaust | 1 | 890.13 | 8.48 |
| | Start Exhaust | 2 | 102.96 | 5.16 |
| | Brakewear | 9 | 0.00 | 13.73 |
| | Tirewear | 10 | 0.00 | 6.65 |
| | Evap Permeation | 11 | 0.00 | 0.00 |
| | Evap Fuel Vapor Venting | 12 | 0.00 | 0.00 |
| | Evap Fuel Leaks | 13 | 0.00 | 0.00 |
| | Crankcase Running Exhaust | 15 | 13.04 | 1.13 |
| | Crankcase Start Exhaust | 16 | 0.00 | 0.04 |
| | Crankcase Extended Idle Exhaust | 17 | 0.29 | 0.10 |
| | Extended Idle Exhaust | 90 | 25.94 | 0.08 |
| | Auxiliary Power Exhaust | 91 | 8.01 | 0.01 |
| | *Subtotal* | | *1,040.38* | *35.39* |
| Off-Model Project Emission Benefits | | | 0.00 | 0.00 |
| **Region Total** | **(Kg/Year)** | | **2,394.05**<br>**2,171,848** | **73.86**<br>**67,001** |

# ATTACHMENT C

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

**(Sample for 2025 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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