Air Quality Conformity Analysis Report

Kanawha-Putnam 2018-2021 TIP and 2045 Regional Transportation Plan

National Ambient Air Quality Standards (NAAQS) Addressed:

- 1997 8-Hour Ozone (Maintenance)

Prepared By:

Regional Intergovernmental Council (RIC)
and
West Virginia Department of Transportation

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MPO Approval: **September 13th, 2018**

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Overview

This report provides an analysis of the air quality implications of the Regional Intergovernmental Council (RIC) 2018-2021 Transportation Improvement Program (TIP) and 2045 Long Range Transportation Plan (LRTP). The analysis demonstrates transportation conformity under the 1997 8-hour ozone National Ambient Air Quality Standard (NAAQS). The air quality conformity analysis reflects an assessment of the regionally significant, non-exempt transportation projects included in the TIP and LRTP.

This document ensures that the findings meet all current criteria established by the U.S. Environmental Protection Agency (EPA) for the applicable NAAQS. A conformity determination has been completed to provide a regional forecast of emissions based on planned air quality significant projects and the latest available planning assumptions.

Background on Transportation Conformity

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

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

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

The transportation conformity determination includes an assessment of future highway emissions for defined analysis years. 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 EPA Region III and the West Virginia Department of Environmental Protection (WVDEP).

EXHIBIT 1: SUMMARY OF ATTACHMENTS

Attachment	Title	Description
A	Project List	Provides a list of regionally significant highway projects that have been updated or added to LRTP
B	Air Quality Interagency Consultation and Data Checklist	Provides consultation meeting minutes and an air quality data checklist
C	Detailed Emission Results	Provides a detailed summary of emissions by roadway type, source type and emission process.
D	MOVES Sample Run Specification	Provides example MOVES data importer (XML) and run specification (MRS) files.

National Ambient Air Quality Standard Designations

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

The RIC MPO region (Kanawha and Putnam counties) is currently designated as part of the *Charleston, WV* maintenance area under both the 1997 8-hour ozone and 2006 24-hour $PM_{2.5}$ NAAQS. The region is in attainment of the 2008 8-hour ozone, 2015 8-hour ozone, and 2012 annual $PM_{2.5}$ 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.

1997 and 2008 8-hour Ozone NAAQS

Ozone is formed by chemical reactions occurring under specific atmospheric conditions. Precursor pollutants that contribute to the formation of ozone include volatile organic compounds (VOC) and oxides of nitrogen (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. Both precursor pollutants are analyzed in the transportation conformity process.

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 Charleston, WV area was designated as an attainment area under the 2008 8-hour ozone NAAQS, effective July 20, 2012 (77 FR 30088).

On February 16, 2018 the D.C. Circuit reached a decision in *South Coast Air Quality Management District v. EPA*, Case No. 15-1115. In that decision, the court vacated major portions of the final rule that established procedures for transitioning from the 1997 ozone NAAQS to the stricter 2008 ozone NAAQS. While the implications of this ruling are being decided, this conformity determination addresses transportation conformity to the 1997 8-hour ozone NAAQS.

2006 24-Hour PM2.5 NAAQS

Fine particulate matter (PM2.5) 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.

On December 18, 2006, the EPA issued the 2006 PM2.5 standard that tightened the 24-hour fine particle standard from 65 µg/m3 to 35 µg/m3. As part of the 2012 $PM_{2.5}$ standard (issued January 15, 2013), the EPA affirmed the 24-hour $PM_{2.5}$ threshold set in 2006, maintaining a value of 35 µg/m3. The Charleston area (Kanawha and Putnam counties) was designated as a nonattainment area under the 2006 24-hour $PM_{2.5}$ standard. The area was redesignated to an attainment area on April 30, 2014.

In 2012, the West Virginia Department of Environmental Protection (WVDEP) initiated the process to redesignate the Charleston area to reflect a finding of insignificance for highway sources for the 2006 24-hour $PM_{2.5}$ standard. The redesignation request for a finding of mobile source insignificance was approved. The federal requirements—40 CFR 93.109(f)—stipulate that areas designated as attainment with SIP insignificant motor vehicle emissions findings are not required to satisfy a regional emissions analysis for §93.118 and/or §93.119 for a given pollutant/precursor and NAAQS. Instead, areas with SIP insignificance findings adopt a qualitative conformity determination for regional transportation plans and

TIPs. Although the area is designated as attainment and there is a finding of insignificance, this does not preclude RIC from complying with the other still-effective requirements of the transportation conformity rule, such as interagency consultations, hot spot analyses as necessary, latest planning assumptions, public participation, etc.

Interagency Consultation

As required by the federal transportation conformity rule, the conformity process includes a significant level of cooperative interaction among the federal, state, and local agencies. For this air quality conformity analysis, an interagency consultation conference call including EPA, FHWA, RIC, WVDEP and WVDOH was conducted on June 19, 2018 to review all input planning assumptions, methodologies and analysis years. **Exhibit 2** summarizes key decisions made by the interagency consultation group.

EXHIBIT 2: INTERAGENCY CONSULTATION DECISIONS

Item	Decision
Traffic Forecasts	Use of RIC TransCAD regional travel model as used for 2045 LRTP
EPA Emission Model	MOVES2014a
Ozone Conformity Test	Analysis for Kanawha and Putnam Counties Compare to 2018 Maintenance Plan budgets Analysis Years: 2018, 2025, 2035, 2045

Analysis Methodology and Data

This transportation conformity analysis was conducted using EPA's MOVES model. MOVES is an upgrade to EPA's modeling tools and replaces MOBILE6.2 as the official model for estimating emissions from highway vehicles for SIP emission inventories and transportation conformity (75 FR 9411), effective March 2, 2010. MOVES2014a has been used for this conformity determination and is the latest approved model version for SIP and transportation conformity purposes (79 FR 60343).

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 92.110. This analysis utilizes the latest available traffic, vehicle fleet and environmental data to estimate regional highway emissions. The analysis methodology and data inputs for this analysis were developed through interagency consultation and used available EPA guidance documents that included:

- *Policy Guidance on the Use of MOVES2014 for State Implementation Plan Development, Transportation Conformity, and Other Purposes*, US EPA Office of Air and Radiation, EPA-420-B-14-008, July 2014.
- *MOVES2014 and MOVES2014a Technical Guidance: Using MOVES to Prepare Emission Inventories in State Implementation Plans and Transportation Conformity.* US EPA Office of Air and Radiation, and Office of Transportation and Air Quality, EPA-420-B-15-093, November 2015.

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

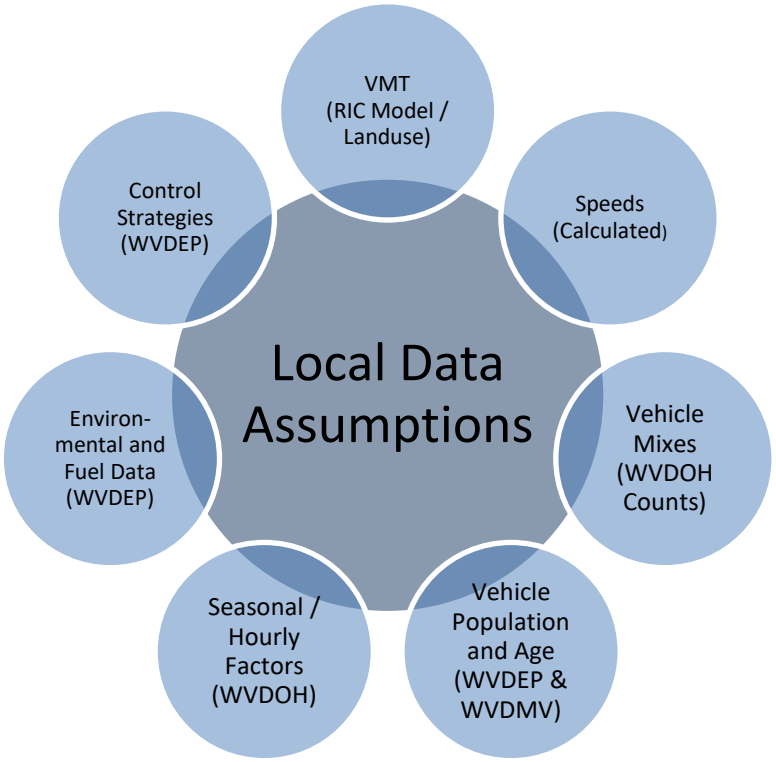
A mix of local and national default (internal to MOVES) data is used in the analysis. As illustrated in **Exhibit 3**, local data has been used for data items that have a significant impact on emissions, including: vehicle miles of travel (VMT), vehicle population, congested speeds, and vehicle type 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 the WVDOH, WVDEP, RIC and other local/national sources.

The methodology used for this analysis is consistent with resources used for past SIP inventories and other regional planning analyses. This includes the use of the regional travel demand model and custom post-processing software (PPSUITE) to calculate hourly speeds and prepare key traffic input files to the MOVES2014a 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.

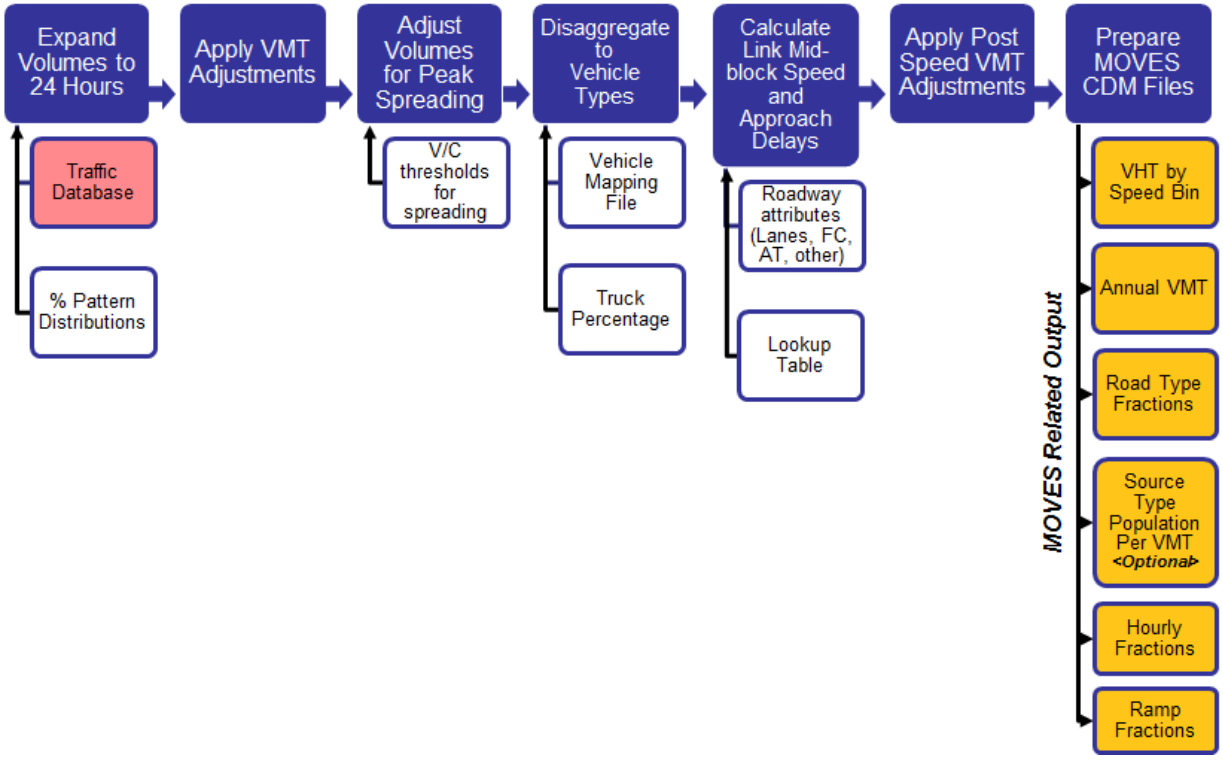
EXHIBIT 3: LOCAL DATA INPUTS USED FOR CONFORMITY RUNS



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 4** summarizes the key functions of PPSUITE within the emission calculation process. Other MOVES input files are prepared externally to the PPSUITE software, including vehicle population, vehicle age, environmental and fuel input files.

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

EXHIBIT 4: EMISSION CALCULATION PROCESS

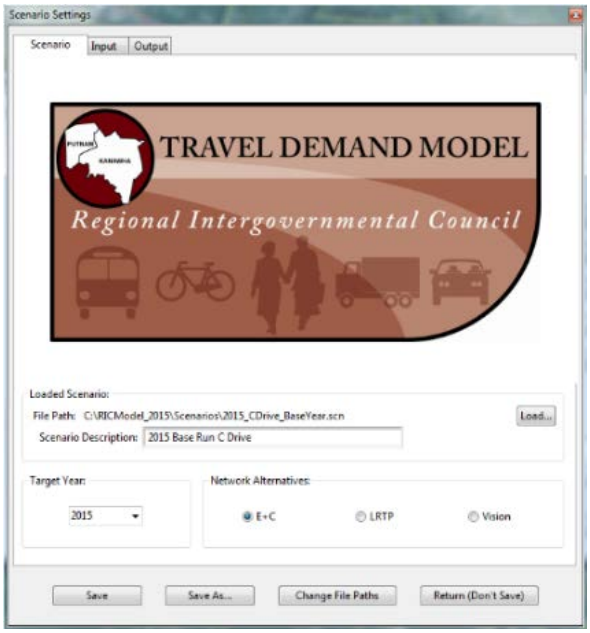


Description of Emission Modeling Input Data and Sources

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.

Roadway Data

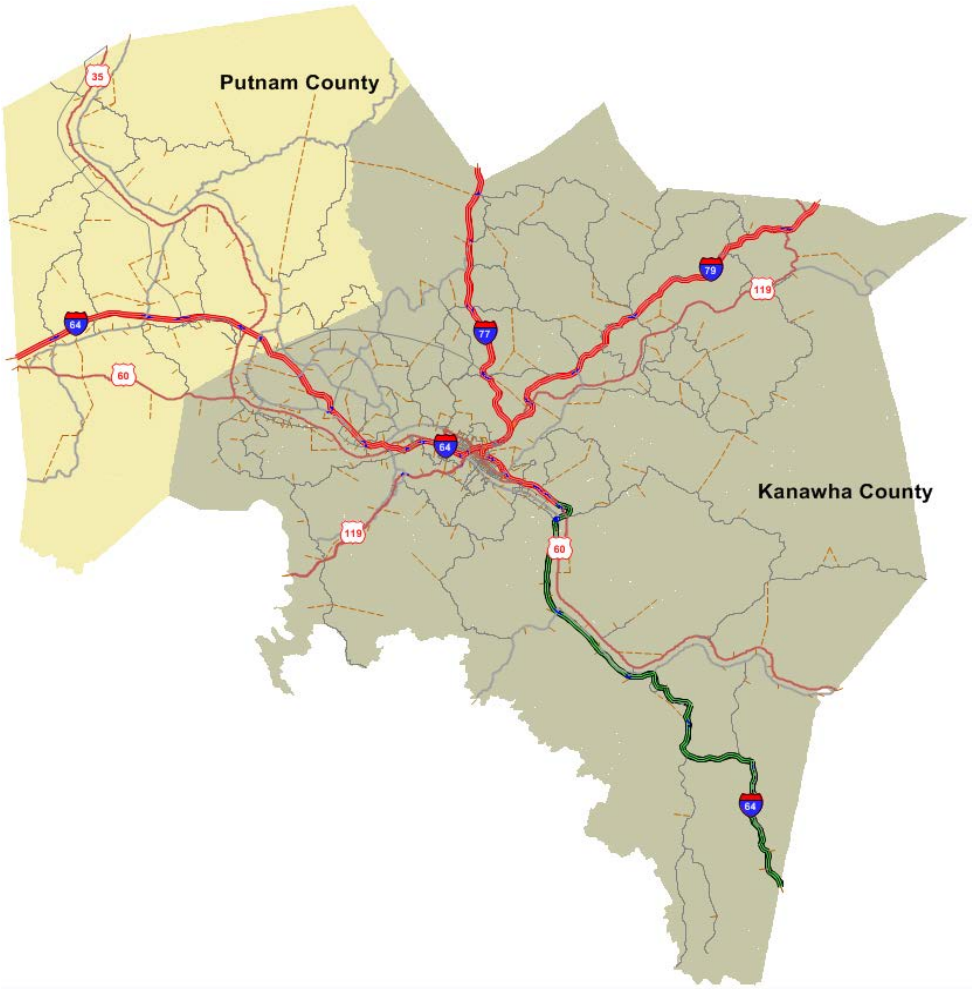
The roadway data input to emissions calculations for this conformity analysis is based on information from the RIC regional travel demand model. The travel model estimates roadway volumes based on input demographic forecasts and expected changes to the transportation roadway network. The RIC travel demand model follows the basic "four-step" travel demand forecasting process and utilizes the TransCAD (Version 7.0) software platform. Given the small portion of daily travel carried by the bus system in the Charleston region, a separate mode choice or transit model is not included. Auto-occupancy factors are used to convert person trips into vehicle trips.



The model is driven by socio-economic and transportation network data. These data include items such as zonal population, households, income, school enrollment, and employment by type for over 400 zones defined in the region.

Transportation network data, as illustrated in **Exhibit 5**, includes facility type, length, and speed limit for each of the highway links in the region. The highway network database contains attributes for each individual line in the line layer and includes all attributes needed to perform a traffic assignment.

EXHIBIT 5: RIC REGIONAL TRAVEL DEMAND MODEL



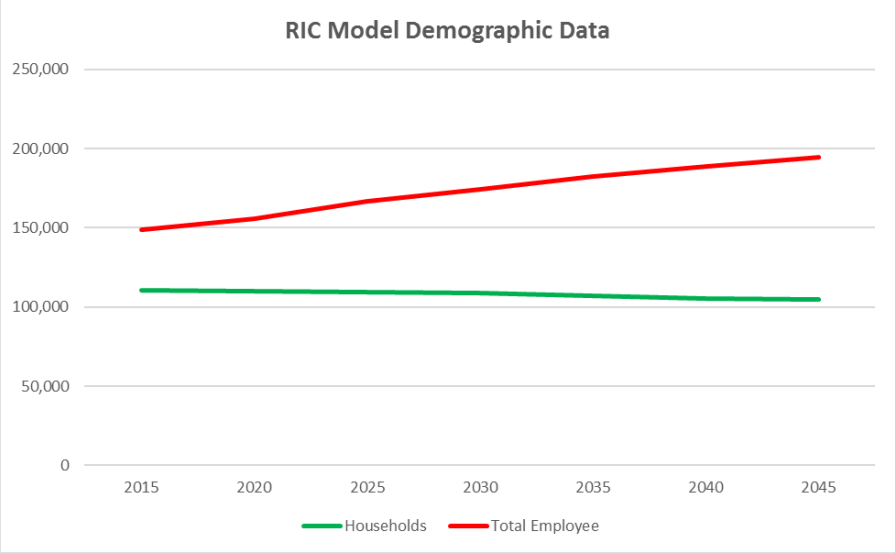
Demographic Forecasts

Forecast traffic volumes from the regional travel model are based on the demographics input to the model. Demographic data for the RIC model was obtained from several sources, including the U.S. Census, and InfoUSA (a commercial provider of employment data), RIC Staff, and the previous model socioeconomic data. The previous model utilized 2010 Census data to develop the 2010 household totals by TAZ. Information from the 2010 Census and the American Community Survey (ACS) helped in developing household totals by household size and number of workers. This information was used for the development of the 2015 socioeconomic data. **Exhibit 6** summarizes the demographics for the 2015 base year and 2045 horizon year of the LRTP. Demographics for other analysis years were forecasted using interpolation. **Exhibit 7** shows the demographic trends in the model region. The region is forecasted to have lower population but higher employment in future.

EXHIBIT 6: DEMOGRAPHIC GROWTH ASSUMPTIONS TO THE TRAVEL MODEL

County	Year	Population	Employment
Kanawha County	2015	194,750	128,834
	2045	176,855	161,106
Putnam County	2015	60,860	20,252
	2045	69,260	33,684
Total	**2015**	**255,610**	**149,086**
	2045	**246,115**	**194,790**

EXHIBIT 7: DEMOGRAPHIC TRENDS



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

- lanes
- roadway capacity
- distance
- weekday traffic volume
- area type code
- facility class code

The lane values, capacities, area type, and facility class are important inputs for determining the congestion and speeds for individual highway segments. The PPSUITE processing software allows for many additional variables other than those available in the regional travel model. Using these variables

improves the calculation of congested speeds. Such variables include information regarding free-flow speeds, traffic signal and control parameters, and volume-delay functions. This data is determined from lookup tables based on the model link's area type and facility class. Much of the lookup table data was developed from information contained in the Highway Capacity Manual.

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 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 for 2017 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 for accounting for missing local roadway VMT that is not represented within the regional travel model.
- *Seasonal Factors*: The traffic volumes estimated from the regional travel demand model are adjusted to summer condition, using seasonal adjustment factors. July weekday seasonal factors were applied to the AADT for ozone analyses. Seasonal adjustment factors were obtained from the WVDOH. The factors are based on data processing of West Virginia's permanent traffic count stations. The seasonal factors are also used to develop the 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. Therefore, it is important to estimate the pattern by which roadway volume varies by hour of the day. 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. This data was not directly available from WVDOH but was determined through an assessment of available data in other states. The same factors are also used to develop the MOVES hourly fraction file.

Vehicle Class Data

Emission rates within MOVES also vary significantly by vehicle type. MOVES produces emission rates for thirteen MOVES vehicle source input types. VMT, however, is input to MOVES by five HPMS vehicle groups (note that passenger cars and light trucks are grouped for input to MOVES2014a). **Exhibit 8** summarizes the distinction between each classification scheme.

EXHIBIT 8: MOVES SOURCE TYPES AND HPMS VEHICLE GROUPS

SOURCE TYPES	
11	Motorcycle
21	Passenger Car
31	Passenger Truck
32	Light Commercial Truck
41	Intercity Bus
42	Transit Bus
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

HPMS Class Groups	
10	Motorcycle
25	Passenger Car
25	Passenger/Light Truck
40	Buses
50	Single Unit Trucks
60	Combination Trucks

For this regional inventory, vehicle type pattern data was developed for each county and facility class combination based on WVDOH classification counts and internal MOVES defaults. As the first step, WVDOH truck count data was used to develop percentage splits of the total volume to the following vehicle groups: (1) autos and (2) heavy trucks and buses. MOVES default VMT by HPMS vehicle type (for Kanawha and Putnam counties) were then used to split the vehicle groups (autos and trucks) into the HPMS vehicle classes needed by MOVES.

The vehicle type percentages are also provided to the capacity analysis section of PPSUITE to adjust the speeds in response to trucks. That is, a given number of larger trucks take up more roadway space than a given number of cars, and this is accounted for in the speed estimation process by adjusting capacity using information from the Highway Capacity Manual.

Vehicle Ages

Vehicle age distributions are input to MOVES for each county by the thirteen source types. The distributions reflect the percentage of vehicles in the fleet up to 31 years old. The vehicle age distributions were prepared by WVDEP based on information obtained from West Virginia Division of Motor Vehicle (WVDMV) 2016 registration data. MOVES default values were used for source types 41, 42, 43, 51, 52, 53, 61, and 62, which includes all heavy trucks and buses.

Vehicle Population

The information on the vehicle fleet including the number and age of vehicles impacts forecasted start and evaporative emissions within MOVES. Similar to vehicle ages, MOVES requires the population of vehicles by the thirteen source type categories. The vehicle population data were prepared by WVDEP for year 2016. Since regional population and households are not forecast to increase, the base year vehicle population data was also used for all future analysis years.

Environmental and Fuel Characteristics

Information on environmental, fuel, vehicle technology and other control strategy assumptions were determined based on a review of MOVES2014a default information and other available local data. MOVES2014a default temperature and humidity values as well as MOVES2014a default fuel assumptions were used for the region. Key fuel assumptions include:

- RVP=9.7 for E10 fuel; RVP=8.7 for E15 fuel.
- A 95.7% market share of E10 and a 4.3% market share of E15 in 2018.
- A 90.2% market share of E10 and a 9.8% market share of E15 in 2025.
- A 74.7% market share of E10 and a 25.3% market share of E15 in 2035.
- A 61.9% market share of E10 and a 38.1% market share of E15 in 2045.

Other Vehicle Technology and Control Strategies

West Virginia does not have a vehicle inspection maintenance program and there are no state vehicle technology strategies included in the highway emissions inventory. Current federal vehicle emissions control and fuel programs are incorporated into the MOVES2014a software. These include the National Program standards covering model year vehicles through 2025. Modifications of default emission rates are required to reflect the early implementation of the National Low Emission Vehicle Program (NLEV) program in West Virginia. To reflect these impacts, EPA has released instructions and input files that can be used to model these impacts. This inventory utilized the October 2014 version of the files (https://www.epa.gov/moves/tools-develop-or-convert-moves-inputs).

Analysis Process Details

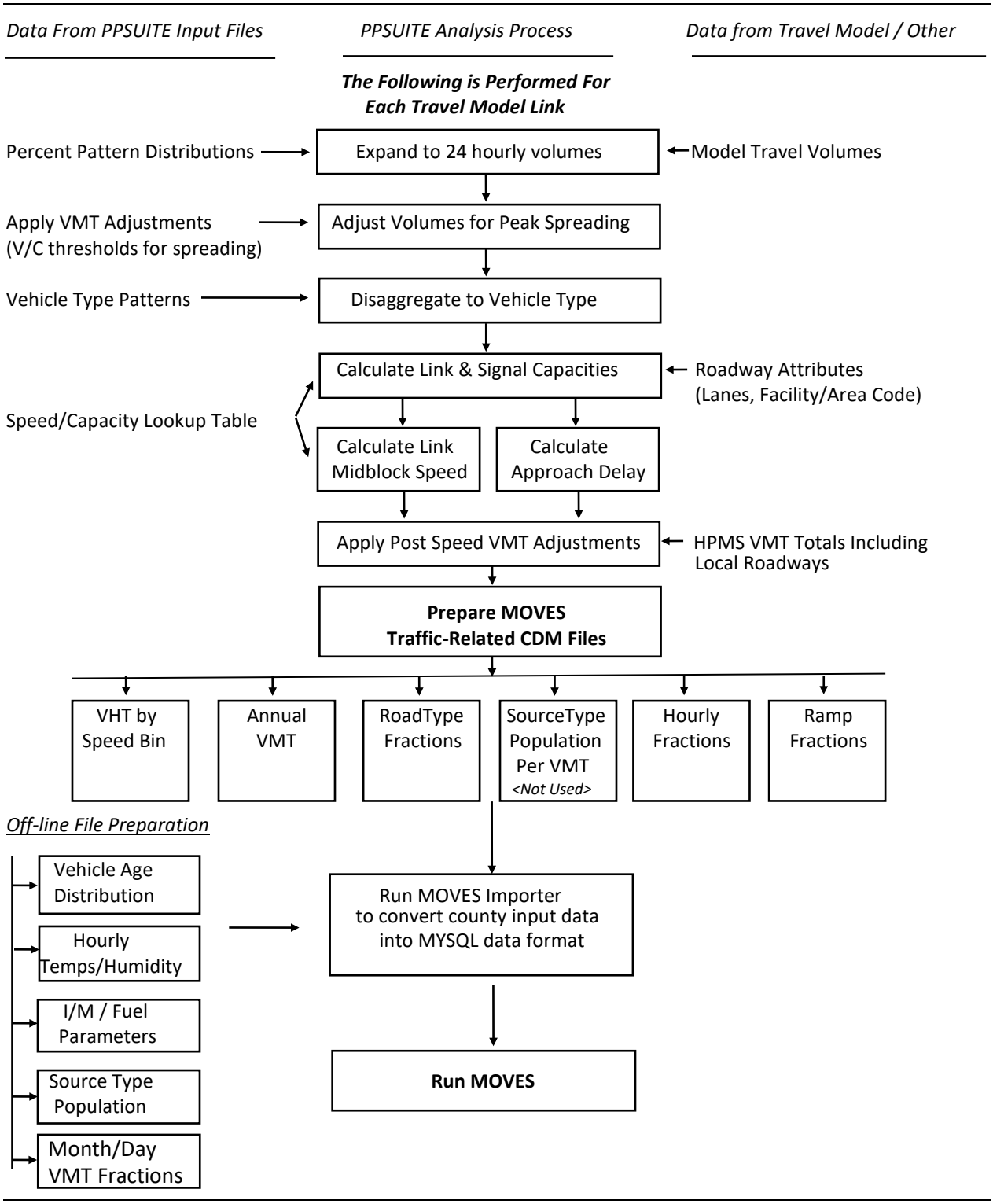
The previous sections have summarized the input data used for computing speeds and emission rates for this conformity analysis. This section explains how PPSUITE and MOVES use that input data to produce emission estimates. **Exhibit 9** provides a more detailed overview of the PPSUITE analysis procedure using the available traffic data information described in the previous section.

VMT Preparation

Producing an emissions inventory with PPSUITE requires a process of disaggregation and aggregation. Data is available and used on a very small scale – individual travel model 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 Travel Model Link VMT* - The RIC regional travel model contains the roadway links, distances and travel volumes needed to estimate VMT. The PPSUITE software processes each link by simply multiplying the assigned travel volume by the distance to obtain VMT.
- *Disaggregate to Hours* - 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 dividing 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 that may impact emission calculations.
- *Disaggregation to Vehicle Types* - EPA requires VMT estimates to be prepared by source type, reflecting specific local characteristics. The hourly volumes are disaggregated to the HPMS MOVES vehicle groupings based on WVDOH vehicle classification count data in combination with MOVES defaults as described in the previous section.
- *Apply HPMS VMT Adjustments* - Volumes must also be adjusted to account for differences with the HPMS VMT totals, as described previously. VMT adjustments are provided as input to PPSUITE and are applied to each of the roadway segment volumes. These adjustments were developed from reported HPMS VMT totals for 2017. The VMT adjustments are applied to all analysis year runs. The VMT added or subtracted to the travel model links assume the speeds calculated using the original volumes for each roadway segment for each hour of the day.
- *Apply Seasonal Adjustments* – PPSUITE adjusts the traffic volumes to the appropriate analysis season. These traffic volumes are assembled by PPSUITE and extrapolated over the course of a year to produce the annual VMT file input to MOVES.

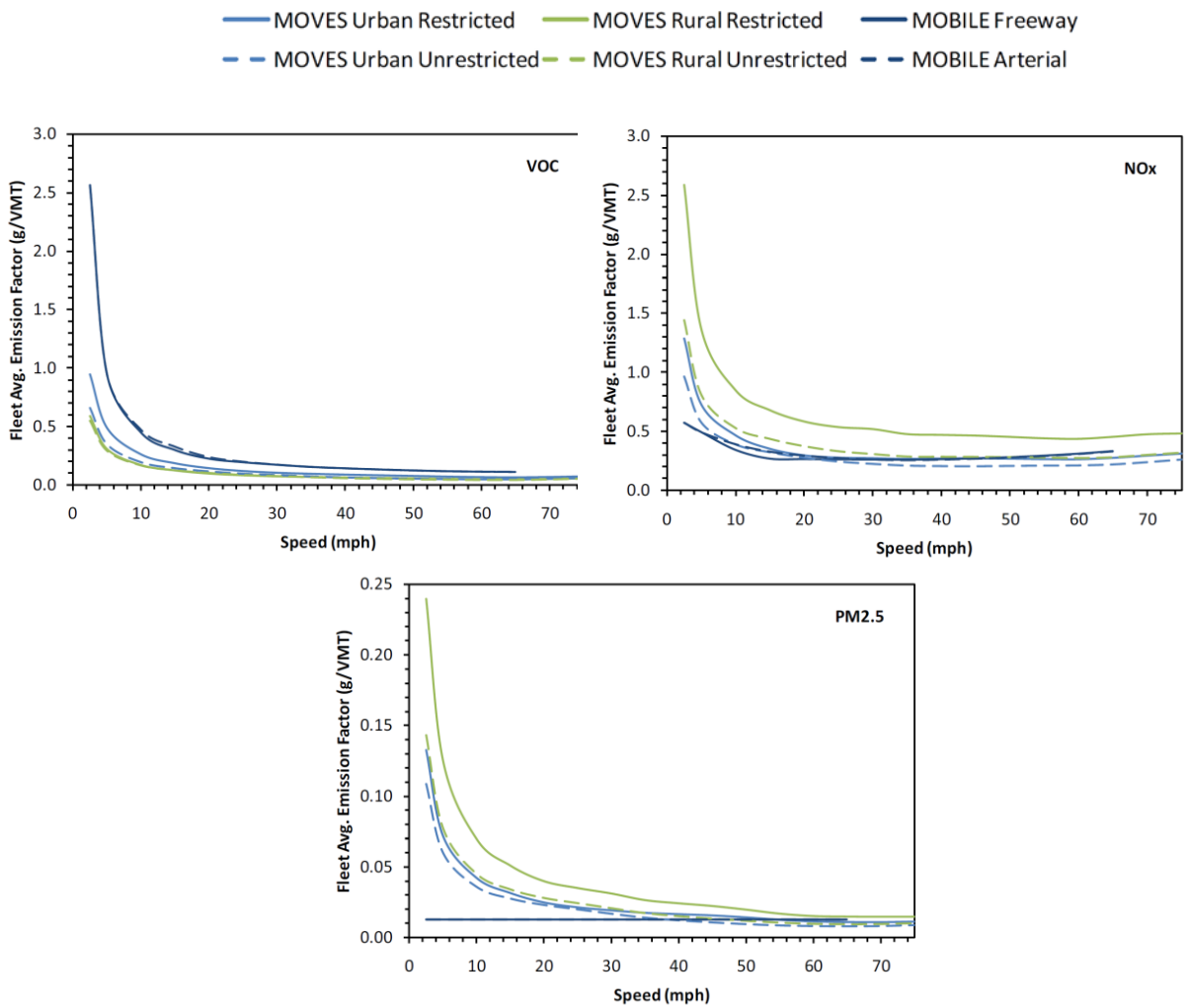
EXHIBIT 9: PPSUITE SPEED/EMISSION ESTIMATION PROCEDURE



Speed Estimation

Emissions for many pollutants (including VOC and NO_X) vary significantly with travel speed. VOC emissions generally decrease as speed increases, while NO_X emissions decrease at low speeds and increases at higher speeds, as illustrated in **Exhibit 10**. 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.

EXHIBIT 10: EMISSION FACTOR VS. SPEED VARIANCES (VOC, NOX, AND $PM_{2.5}$)



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

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

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

Developing the MOVES Traffic Input Files

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

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

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

- *VMT Input File*: VMT is the primary traffic input affecting emission results. The roadway segment distances and traffic volumes are used to prepare estimates of VMT. PPSUITE performs these calculations and outputs the MOVES annual VMT input file to the County Data Manager (CDM). The annual VMT is computed by multiplying the travel model 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 MOVES2014a model (http://www.epa.gov/otaq/models/moves/) and ensures that MOVES emission rates are used to the fullest extent.

- *Road Type Distributions*: Within MOVES, typical drive cycles and associated operating conditions vary by roadway type. MOVES defines five different roadway types as follows:

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

  For this analysis, the MOVES road type distribution file is automatically generated by PPSUITE using defined equivalencies. The off-network road type includes emissions from vehicle starts, extended idling, and evaporative emissions. Off-network activity in MOVES is primarily determined by the Source Type Population input.

- *Ramp Fractions*: The RIC regional travel model has separate facility classes (urban and rural) for ramps. As a result, PPSUITE assembles ramp VMT for these links and prepares the Ramp Fraction file for input to MOVES.

MOVES Runs

After computing speeds and aggregating VMT and VHT, PPSUITE prepares traffic-related inputs needed to run EPA's MOVES software. Additional required MOVES inputs are prepared externally from the processing software and include temperatures, I/M program parameters, fuel characteristics, vehicle fleet age distributions, and source type population. The MOVES county importer is run in batch mode. This program converts all data files into the MySQL format used by the MOVES model. At that point, a MOVES run specification file (*.mrs) is created which specifies options and key data locations for the run. The MOVES run is then executed in batch mode. A summary of key MOVES run specification settings is shown in **Exhibit 11**. 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 11: MOVES RUN SPECIFICATION FILE PARAMETER SETTINGS

Parameter	Setting
MOVES Default Database Version	11/17/2017
Scale	COUNTY
Analysis Mode	Inventory
Time Span	**July Weekday Runs:** July month, Weekday, 24 hours
Time Aggregation	Hour
Geographic Selection	54039 – Kanawha County 54079 – Putnam County
Vehicle Selection	All source types Gasoline, Diesel, CNG, E85
Road Type	All road types including off-network
Pollutants and Processes	VOC, NOx
Database selection	Early NLEV database
General Output	Units: Emission = grams Distance = miles Time = hours Energy = Million BTU
Output Emissions	Time = Hour, Emissions by Process ID, Source Type and Road Type

Conformity Analysis

A transportation conformity analysis of the current TIP and LRTP has been completed for the Charleston 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

A SIP redesignation plan for the *Charleston, WV* nonattainment area (Kanawha and Putnam counties) was approved on August 10, 2006 under the 1997 8-hour ozone NAAQS (reclassifying the area to "Maintenance"). The SIP established 2009 and 2018 motor vehicle emission budgets (MVEBs) for the area. The MVEBs were subsequently revised using EPA's MOVES2010a emission model effective November 14, 2011 (76 FR 56975) and were corrected on July 11, 2018 (83 FR 32062). The ozone transportation conformity analysis has been conducted to evaluate emissions in comparison to the applicable ozone MVEBs as summarized in **Exhibit 12**.

EXHIBIT 12: 1997 8-HOUR OZONE MOTOR VEHICLE EMISSION BUDGETS

County / Pollutant	2009 Budget (tons/day)	2018 Budget (tons/day)
VOC	16.7	13.7
NOx	38.9	17.1

Analysis Years

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

- The last year of the LRTP's forecast period.
- The attainment year of the standard if within timeframe of TIP and LRTP.
- An intermediate year or years such that if there are two years in which analysis is performed, the two analysis years are no more than ten years apart.

All analysis years were determined through the interagency consultation process. **Exhibit 13** provides the analysis years used for this conformity analysis.

EXHIBIT 13: TRANSPORTATION CONFORMITY ANALYSIS YEARS

Analysis Year	Description
2018	Budget Year
2025	Interim Year
2035	Interim Year
2045	Last Year of LRTP

Regionally Significant Highway Projects

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

Conformity Analysis Results

An emissions analysis has been completed for the 1997 8-hour ozone NAAQS. **Exhibit 14** summarizes the Charleston area ozone emission results for a summer weekday in each analysis year. All years are lower than the applicable conformity budgets established in the regional maintenance plan for the 1997 ozone NAAQS. A summary of MOVES input parameters is provided in **Attachment B**. A detailed emission summary is also provided in **Attachment C**. Example MOVES importer (XML) and run specification (MRS) files are provided in **Attachment D**.

EXHIBIT 14: OZONE EMISSION ANALYSIS RESULTS AND CONFORMITY TEST
(SUMMER WEEKDAY)

Pollutant	*2018 BUDGET (tons/day)*	*2018 (tons/day)*	*2025 (tons/day)*	*2035 (tons/day)*	*2045 (tons/day)*
VOC	***13.7***	*4.10*	*2.71*	*1.55*	*1.41*
NOX	***17.1***	*11.34*	*6.50*	*4.31*	*4.56*
Conformity Result		**Pass**	**Pass**	**Pass**	**Pass**

Conformity Determination

Financial Constraint

The planning regulations, Sections 450.322(b)(11) and 450.324(e), require the transportation plan 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. RIC, in conjunction with WVDOH, FHWA and FTA, has developed an estimate of the cost to maintain and operate existing roads, bridges and transit systems in the MPO region and have compared the cost with the estimated revenues and maintenance needs of the new roads over the same period. The TIP and LRTP have been determined to be financially constrained.

Public Participation

The TIP and LRTP have undergone the public participation requirements as well as the comment and response requirements according to the procedures established in compliance with 23 CFR part 450, the region's Public Participation Plan, and the Conformity SIP. The draft document was made available for a public review and comment period.

Conformity Statement

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

The TIP and LRTP for the RIC MPO area is 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 MPO and its partners in meeting the regional air quality goals, while maintaining and building an effective transportation system.

Resources

MOVES model

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

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

MOVES2014 and MOVES2014a Technical Guidance: Using MOVES to Prepare Emission Inventories in State Implementation Plans and Transportation Conformity. US EPA Office of Air and Radiation, and Office of Transportation and Air Quality, EPA-420-B-15-093, November 2015.

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

Traffic Engineering

Highway Capacity Manual, Transportation Research Board, presents current knowledge and techniques for analyzing the transportation system.

Highway Vehicle Inventory Glossary

AADT: Average Annual Daily Traffic, average of ALL days.

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

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

FC: Functional code, applied in data management to road segments to identify their type (freeway, local, etc.).

Growth factor: Factor used to convert volumes to future years.

HPMS: Highway Performance Monitoring System

I/M: Vehicle emissions inspection/maintenance 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.

MOVES: The latest model EPA has developed to estimate emissions from highway vehicles.

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 processes MOBILE emission rates.

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

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

VHT: Vehicle hours traveled.

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

ATTACHMENT A

Project List

County	District	Project	Improvement	Planning Year	Analysis Year	Bond Project
Kanawha	1 (CL-8)	WV 622, I-64 to N of WV 62	Widen existing roadway from 3 to 5-lanes, I-64/Cross Lanes I/C to WV 62, Kanawha County - 0.8 mi	2036-2045	2025	YES
Kanawha	1	Oakwood Road Improvements (US 119 improvements from MacCorkle Ave to Jefferson Rd)	Construct new I/C on US 119 at Lucado Road; construct frontage roads (Add lanes, flyovers, I/C's, frontage roads, etc. along US 119)	Phases: 1-2025 2-2035 3-2045	2025	YES
Putnam	1	US 35 Paving and Interchange	Pave 14 miles of US 35 currently under a Grade and Drain projeict including a new I/C near Buffalo Bridge		2025	YES
Putnam	1 (PC-3)	I-64 Widening	Widen I-64 from US 35 to Nitro including new bridge across Kanawha River	2026-2035	2035	YES
	PC-6A	Teays Valley Rd (CR 33)	Widening	2036-2045	2045	
	KC-8A	Dupont Avenue (US 60)	Widening	2026-2035	2035	YES
	PC-8A	Charleston Road (WV 62)	Widening	2026-2035	2035	
	KC-9	Greenbrier St (WV 114)	Widening	2026-2035	2035	
	KC-U1	Institute Connector	New Location	2026-2035	2035	
	KC-7	Lens Creek Rd (WV 94)	Widening	2026-2035	2035	

ATTACHMENT B

Interagency Consultation / Air Quality Data Checklist Summary

RIC Metro Mobility Plan
Air Quality Conformity Analysis: Interagency Consultation Conference Call
Meeting Minutes
June 19, 2018 10:00 AM

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1. Attending

WVDOH and Michael Baker International (MBI) hosted the Interagency Consultation Group (ICG) conference call / webinar to kick-off the transportation conformity analysis on June 19, 2018 at 10AM. The purpose and goals for the meeting are to:

- Review ICG roles and responsibilities
- Review data collection efforts
- Review and approve latest planning assumptions
- Protocol for identifying Exempt, Non-exempt and Regionally Significant Projects
- Understanding of the conformity process and future review and public comment period requirements
- Discuss future Maintenance Plan Requirements

The participants on the call included:

Participant	Agency	Participant	Agency
Perry Keller	WVDOH	Kara Greathouse	RIC
Chris Kinsey		Randy Durst	WWW
David Fewell	WVDEP	Tracy Brown	
Laura Crowder		Saleem Salameh	KYOVA
Alanna Keller		Terri Sicking	
Chandra Inglis-Smith	FHWA-WV	Dave Moore	ODOT
Laura Toole	FHWA-OH	Mike Maleski	OEPA
Leigh Oesterling		Thomas Witt	KYDOT
Bernadette Dupont	FHWA-KY	Jim Frazier	MBI
Gregory Becoat	EPA Region 3	Dan Szekeres	
Michele DeAngelis	FTA-Region 3	Ying-Tzu Chung	
		Avinash Sinha	

2. Conformity Areas:

Five areas were identified in the FHWA guidance that are subject to transportation conformity for the 1997 Ozone NAAQS. All five areas have approved Maintenance Plans. MBI will perform the conformity analysis for:

- Charleston, WV
- Huntington-Ashland, WV-KY
- Parkersburg-Marietta, WV-OH

ODOT will perform the conformity analysis for:

- Steubenville-Weirton, OH-WV
- Wheeling, WV-OH

3. Conformity Areas and MVEBs

The ICG reviewed the motor vehicle emissions budgets (MVEB) as listed in the table below. For the multi-state areas, it was agreed that MBI will perform the analysis for the Ohio portion of WWW. The approved budget for Washington County, OH was added to the table below. For KYOVA, the Kentucky portion of the conformity analysis will be performed by KYOVA. MBI will assist as needed.

Area	MPO	Counties	Budget Year	VOC (tpd)	NOx (tpd)
Charleston	RIC	Kanawha	2009	16.7	38.9
		Putnam	2018	13.5	17.1
Huntington	KYOVA	Cabell	2009	7.4	14.0
		Wayne	2018	6.6	13.5
Parkersburg	W-W-W	Wood	2009	5.5	7.3
			2018	4.7	7.3
		Washington	2018	1.93	3.25
Weirton	BHJ	Brooke	2009	3.4	4.2
		Hancock	2018	1.9	3.9
Wheeling	Bel-O-Mar	Marshall	2009	10.4	9.1
		Ohio	2018	7.7	3.1

4. Conformity Tools and Models

The ICG reviewed the proposed analysis years required to meet the conformity guidance of the last year of the plan, intermediate years not more than 10 years apart, the attainment year and budget years in the timeframe of the TIP/plan. EPA Region 3 stated that 2018 is a required analysis year for all three MPOs as it is a budget year in the timeframe of the TIP. The following was approved by the ICG:

a. Analysis Years

RIC: 2018, 2025, 2035, 2045
KYOVA/WWW: 2018, 2020, 2030, 2040

b. EPA Emissions Model – MOVES2014a
c. MPO TRANSCAD models and roles
    a. RIC: MPO will provide the modeling setups for MBI to run the model.
    b. KYOVA/WWW: MPO model final assigned networks for each analysis year
    c. MBI's PPSUITE Pre/Post-Processing

5. Project Lists

The project lists include all TIP / Plan and State Road Bond projects that identify exempt and nonexempt projects with draft regionally significant project identified. The MPOs will review the lists and provide any adjustments/comments to WVDOH and MBI. The group discuss that KY and OH projects should be included in the list. Below are the draft regionally significant projects for each MPO.

RIC Projects

County	District	Project	Improvement	Planning Year	Analysis Year	Bond Project
Kanawha	1 (CL-8)	WV 622, I-64 to N of WV 62	Widen existing roadway from 3 to 5-lanes, I-64/Cross Lanes I/C to WV 62, Kanawha County - 0.8 mi	2036-2045	2025	YES
Kanawha	1	Oakwood Road Improvements (US 119 improvements from MacCorkle Ave to Jefferson Rd)	Construct new I/C on US 119 at Lucado Road; construct frontage roads (Add lanes, flyovers, I/C's, frontage roads, etc. along US 119)	Phases: 1-2025 2-2035 3-2045	2025	YES
Putnam	1	US 35 Paving and Interchange	Pave 14 miles of US 35 currently under a Grade and Drain projejct including a new I/C near Buffalo Bridge		2025	YES
Putnam	1 (PC-3)	I-64 Widening	Widen I-64 from US 35 to Nitro including new bridge across Kanawha River	2026-2035	2035	YES
	PC-6A	Teays Valley Rd (CR 33)	Widening	2036-2045	2045	
	KC-8A	Dupont Avenue (US 60)	Widening	2026-2035	2035	YES
	PC-8A	Charleston Road (WV 62)	Widening	2026-2035	2035	
	KC-9	Greenbrier St (WV 114)	Widening	2026-2035	2035	
	KC-U1	Institute Connector	New Location	2026-2035	2035	
	KC-7	Lens Creek Rd (WV 94)	Widening	2026-2035	2035	

6. Latest Planning Assumptions

MBI led the discussions to review each planning assumption for the ICG to approve. The planning assumptions included MOVES inputs, traffic data and identified local data inputs and national defaults. ODOT has protocol for inter-zonal VMT adjustments; MBI will incorporate the protocol when preparing HPMS VMT adjustments for Washington County, OH. The tables below show the latest planning assumptions approved for this conformity analysis.

Latest Planning Assumptions - MOVES

Data Item	Inputs Assumptions		
	Charleston, WV (RIC)	Huntington, WV (KYOVA)	Parkersburg, WV (WWW)
MOVES RunSpec			
MOVES Version	MOVES2014a		
MOVES Default Database	MOVESDB20161117		
Scale/Calulation Type	County Scale Inventory Run		
Analysis Counties	Kanawha (FIPS: 54039), Putnam (FIPS: 54079)	Cabell (FIPS:54011), Wayne (FIPS:54099)	Wood (FIPS:54107)
Analysis Years	2018, 2025, 2035, 2045	2018, 2020, 2030, 2040	2018, 2020, 2030, 2040
Analysis Days/Months	July Weekday		
Pollutants	VOC, NOx		
Stage II Refueling Emissions	Not Included		
Fuel Types	Gasoline, Diesel, CNG, E85		

Latest Planning Assumptions - Traffic

Data Item	Inputs Assumptions		
	Charleston, WV (RIC)	Huntington, WV (KYOVA)	Parkersburg, WV (WWW)
Traffic Data			
Highway Network	2018, 2025, 2035 and 2045 networks and setups to run model, socio-economic inputs/summary data	2018, 2020, 2030 and 2040 assigned networks and socio-economic inputs/summary data	2018, 2020, 2030 and 2040 assigned networks and socio-economic inputs/summary data
County HPMS VMT Adjustments	**Data request:** Latest available HPMS VMT Calculate AADT HPMS adjustments for 2018 (Ensure VMT is consistent with reported HPMS)		
Seasonal Adjustments	**Data request:** Monthly and daily seasonal adjustment factors Use July weekday seasonal factors to convert AADT to average July weekday traffic		
Vehicle Mixes	**Data request:** Truck count/vehicle mix data by functional class, by county MOVES VMT required by 5 HPMS vehicle classes. Use DOT truck count data to split model traffic volumes into auto and trucks, and use MOVES2014a default VMT distributions for the region to divide the two vehicle groups (auto and trucks) into MOVES 13 source types, which are recombined to the 5 HPMS vehicle classes.		

Latest Planning Assumptions – MOVES Inputs

Data Item	Inputs Assumptions		
	Charleston, WV (RIC)	Huntington, WV (KYOVA)	Parkersburg, WV (WWW)
MOVES Inputs			
Annual VMT	Calculated by PPSUITE from model / seasonal factors / vehicle mapping		
Avg. Hourly Speed Distribution	Calculated by PPSUITE (Minimum Speed = 2.5 mph)		
Road Type Distribution	Calculated by PPSUITE; a RoadType field must be added to the travel model network based on FC.		
Ramp Fraction	Calculated by PPSUITE (use ramp classes coded in model network) or use MOVES2014a defaults		
Month VMT Fractions	Factors to convert AADT to an average day in each month (Local data or MOVES default). Calculated based on seasonal adjustment factors.		
Day VMT Fractions	Calculated based on seasonal adjustment factors		
Hour VMT Fractions	Factors to disaggregate daily traffic volumes by hour for different roadway functional classes. Borrow hourly distributions from other region.		
Source Type Population	Data request: socio-economic data. 2016 Inputs provided by WVDEP --> Grow to future years by applying growth factors developed from socio-economic data (same growth factors for all source types)		Data request: socio-economic data. 2016 Inputs provided by WVDEP. Use 2016 data for all analysis years.
Vehicle Age Distribution	Source Types 11, 21, 31, 32 & 54: based on 2016 WV DMV Registration Data for the region; Source Types 41, 42, 43, 51, 52, 53, 61 & 62: use MOVES National Defaults.		
Fuel Parameters (Gasoline/Diesel/CNG/E85)	Use MOVES2014a defaults		
I/M Parameters	No I/M programs		
Temperatures/Humidity	Use MOVES2014a defaults		
Control Programs			
Early NLEV / ~~CALLEV~~	Include EPA provided MOVES override database for early NLEV implementation		
Stage II Refueling Parameters	Not Included		

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7. Data Collection Efforts

The data collection efforts are in process as MBI sent request to the MPOs, WVDOH and WVDEP. The group reviewed the status and pending data needed for the conformity analysis. With the addition of Washington County OH, MBI will send data requests to ODOT and OEPA for a list of data needs. MBI will continue to process the existing data to the formats needed for their PPSUITE process.

Still pending data items include:

- KYOVA will prepare and provide 2018 network files to MBI.
- RIC will provide the TRANSCAD modeling setups for MBI this week.
- WVDOH HPMS data

8. Schedule

MBI will perform and finish technical analysis within 30 days after the completion of data collection efforts, and then prepare documentation within 15 days after finishing technical analysis.

RIC, KYOVA and WWW stated that their public comment period is 15 days and will be responsible for completing the public comment requirements. RIC's next board meeting is September 13, KYOVA's is September 23, and WWW's is September 19.

WVDOH requested that once the public comment and conformity reports are complete to pursue special MPO Board meeting to approve the conformity before the next scheduled meeting to ensure timely delivery to FHWA/EPA.

9. Next Steps

To support future WVDEP Maintenance Plans (SIP) efforts, WWW will need to prepare 2025 network and RIC will need to prepare 2030 network files for MBI. MBI will perform the highway emissions summaries for 2025 and 2030 for WVDEP to use for future MVEB that will be included in the new Maintenance Plans.

MBI will finish modeling setups, conduct conformity analysis, and then distribute draft conformity report for ICG review in early/mid August.

Air Quality Data Checklist Summary

Data Item	Inputs Assumptions
Long Range Plan	2045 Regional Transportation Plan
Transportation Improvement Program	FY 2018-2021 TIP
MOVES RunSpec	
MOVES Version	MOVES2014a
MOVES Default Database	MOVESDB20161117
Scale/Calulation Type	County Scale Inventory Run
Analysis Counties	Kanawha (FIPS: 54039), Putnam (FIPS: 54079)
Analysis Years	2018, 2025, 2035, 2045
Analysis Days/Months	July Weekday
Pollutants	VOC, NOx
Stage II Refueling Emissions	Not Included
Fuel Types	Gasoline, Diesel, CNG, E85
Traffic Data	
Highway Network	Use socio-economic forecast and latest network inputs updated for 2045 LRTP
County HPMS VMT Adjustments	Calculate AADT HPMS adjustments for 2017 (Ensure VMT is consistent with reported HPMS)
Seasonal Adjustments	Use July weekday seasonal factors provided by DOT to convert AADT to average July weekday traffic
Vehicle Mixes	MOVES VMT required by 5 HPMS vehicle classes. Use DOT truck count data to split model traffic volumes into auto and trucks, and use MOVES2014a default VMT distributions for the region to divide the two vehicle groups (auto and trucks) into MOVES 13 source types, which are recombined to the 5 HPMS vehicle classes.
MOVES Inputs	
Annual VMT	Calculated by PPSUITE from model / seasonal factors / vehicle mapping
Avg. Hourly Speed Distribution	Calculated by PPSUITE (Minimum Speed = 2.5 mph)
Road Type Distribution	Calculated by PPSUITE; a RoadType field must be added to the travel model network based on FC.
Ramp Fraction	Calculated by PPSUITE (use ramp classes coded in model network) or use MOVES2014a defaults
Month VMT Fractions	Factors to convert AADT to an average day in each month (Local data or MOVES default). Calculated based on seasonal adjustment factors.
Day VMT Fractions	Calculated based on seasonal adjustment factors
Hour VMT Fractions	Factors to disaggregate daily traffic volumes by hour for different roadway functional classes. Borrow hourly distributions from other region.
Source Type Population	Use 2016 Inputs provided by WVDEP for all analysis year
Vehicle Age Distribution	Source Types 11, 21, 31, 32 & 54: based on 2016 WV DMV Registration Data for the region; Source Types 41, 42, 43, 51, 52, 53, 61 & 62: use MOVES National Defaults.
Fuel Parameters (Gasoline/Diesel/CNG/E85)	Use MOVES2014a defaults
I/M Parameters	No I/M programs
Temperatures/Humidity	Use MOVES2014a defaults
Control Programs	
Early NLEV	Include EPA provided MOVES override database for early NLEV implementation
AVFT	Not included
Stage II Refueling Parameters	Not Included

ATTACHMENT C

Detailed Emission Results

Detailed Emission Results for Daily Ozone Analysis

2018 Daily Ozone by County

County	Summer Daily VMT	Emissoins (Tons/Day)	
		VOC	NOx
Kanawha	6,828,359	3.22	9.00
Putnam	1,825,848	0.88	2.34
Off-Model Project Emission Benefits		0.00	0.00
Region Total	**8,654,207**	**4.09** **3,714**	**11.35** **10,292**

2025 Daily Ozone by County

County	Summer Daily VMT	Emissoins (Tons/Day)	
		VOC	NOx
Kanawha	7,484,591	2.14	5.31
Putnam	2,110,200	0.57	1.19
Off-Model Project Emission Benefits		0.00	0.00
Region Total	**9,594,791**	**2.70** **2,453**	**6.50** **5,895**

2035 Daily Ozone by County

County	Summer Daily VMT	Emissoins (Tons/Day)	
		VOC	NOx
Kanawha	8,331,316	1.25	3.68
Putnam	2,348,371	0.30	0.63
Off-Model Project Emission Benefits		0.00	0.00
Region Total	**10,679,686**	**1.55** **1,402**	**4.31** **3,911**

2045 Daily Ozone by County

County	Summer Daily VMT	Emissoins (Tons/Day)	
		VOC	NOx
Kanawha	9,186,424	1.15	3.94
Putnam	2,588,751	0.26	0.62
Off-Model Project Emission Benefits		0.00	0.00
Region Total	**11,775,175**	**1.41** **1,279**	**4.56** **4,133**

2018 Daily Ozone by Road Type

County	Road Type	Summer Daily VMT	Speed (mph)	Emissoins (Tons/Day) VOC	NOx
Kanawha	Off-Network	N/A	N/A	2.17	2.39
	Rural Restricted	1,764,438	60.0	0.20	1.76
	Rural UnRestricted	825,171	17.9	0.24	1.51
	Urban Restricted	1,853,368	56.8	0.22	1.92
	Urban UnRestricted	2,385,382	28.4	0.37	1.42
	Subtotal	*6,828,359*		*3.22*	*9.00*
Putnam	Off-Network	N/A	N/A	0.53	0.26
	Rural Restricted	0	N/A	0.00	0.00
	Rural UnRestricted	558,464	22.9	0.13	0.89
	Urban Restricted	703,846	55.3	0.08	0.58
	Urban UnRestricted	563,539	17.1	0.14	0.62
	Subtotal	*1,825,848*		*0.88*	*2.34*
Off-Model Project Emission Benefits				0.00	0.00
Region Total		**8,654,207**		**4.09**	**11.35**
			(Kg/Day)	**3,714**	**10,292**

2025 Daily Ozone by Road Type

County	Road Type	Summer Daily VMT	Speed (mph)	Emissoins (Tons/Day) VOC	NOx
Kanawha	Off-Network	N/A	N/A	1.56	1.97
	Rural Restricted	2,160,704	59.9	0.12	0.99
	Rural UnRestricted	831,579	17.0	0.12	0.72
	Urban Restricted	1,993,190	56.7	0.12	0.94
	Urban UnRestricted	2,499,118	27.3	0.22	0.69
	Subtotal	*7,484,591*		*2.14*	*5.31*
Putnam	Off-Network	N/A	N/A	0.36	0.14
	Rural Restricted	0	N/A	0.00	0.00
	Rural UnRestricted	506,783	22.1	0.06	0.37
	Urban Restricted	972,418	55.2	0.06	0.36
	Urban UnRestricted	631,000	16.4	0.09	0.32
	Subtotal	*2,110,200*		*0.57*	*1.19*
Off-Model Project Emission Benefits				0.00	0.00
Region Total		**9,594,791**		**2.70**	**6.50**
			(Kg/Day)	**2,453**	**5,895**

2035 Daily Ozone by Road Type

County	Road Type	Summer Daily VMT	Speed (mph)	Emissoins (Tons/Day) VOC	NOx
Kanawha	Off-Network	N/A	N/A	0.92	1.90
	Rural Restricted	2,666,952	59.8	0.07	0.59
	Rural UnRestricted	877,849	16.2	0.07	0.40
	Urban Restricted	2,144,709	56.5	0.06	0.49
	Urban UnRestricted	2,641,807	26.9	0.12	0.31
	Subtotal	*8,331,316*		*1.25*	*3.68*
Putnam	Off-Network	N/A	N/A	0.18	0.06
	Rural Restricted	0	N/A	0.00	0.00
	Rural UnRestricted	544,404	22.1	0.03	0.21
	Urban Restricted	1,139,149	55.1	0.03	0.20
	Urban UnRestricted	664,817	15.5	0.05	0.17
	Subtotal	*2,348,371*		*0.30*	*0.63*
Off-Model Project Emission Benefits				0.00	0.00
Region Total		**10,679,686**		**1.55**	**4.31**
			(Kg/Day)	**1,402**	**3,911**

2045 Daily Ozone by Road Type

County	Road Type	Summer Daily VMT	Speed (mph)	Emissoins (Tons/Day) VOC	NOx
Kanawha	Off-Network	N/A	N/A	0.83	2.16
	Rural Restricted	3,160,833	59.5	0.08	0.63
	Rural UnRestricted	935,283	15.5	0.07	0.40
	Urban Restricted	2,279,928	56.4	0.06	0.47
	Urban UnRestricted	2,810,381	26.1	0.12	0.28
	Subtotal	*9,186,424*		*1.15*	*3.94*
Putnam	Off-Network	N/A	N/A	0.14	0.04
	Rural Restricted	0	N/A	0.00	0.00
	Rural UnRestricted	583,009	22.0	0.03	0.21
	Urban Restricted	1,298,999	55.0	0.03	0.20
	Urban UnRestricted	706,743	14.5	0.05	0.17
	Subtotal	*2,588,751*		*0.26*	*0.62*
Off-Model Project Emission Benefits				0.00	0.00
Region Total		**11,775,175**		**1.41**	**4.56**
			(Kg/Day)	**1,279**	**4,133**

2018 Daily Ozone by Source Type

County	Source Type	Summer Daily VMT	Emissoins (Tons/Day) VOC	NOx
Kanawha	Motorcycle	38,173	0.10	0.03
	Passenger Car	2,159,027	0.85	0.69
	Passenger Truck	3,368,989	1.47	1.82
	Light Commercial Truck	134,706	0.12	0.15
	Intercity Bus	3,069	0.00	0.03
	Transit Bus	49,588	0.03	0.31
	School Bus	132	0.00	0.00
	Refuse Truck	4,391	0.00	0.02
	Single Unit Short-haul Truck	136,951	0.05	0.26
	Single Unit Long-haul Truck	274,031	0.09	0.55
	Motor Home	7,163	0.01	0.03
	Combination Short-haul Truck	206,131	0.05	0.98
	Combination Long-haul Truck	446,008	0.45	4.14
	Subtotal	*6,828,359*	*3.22*	*9.00*
Putnam	Motorcycle	10,206	0.03	0.01
	Passenger Car	539,904	0.23	0.18
	Passenger Truck	949,192	0.46	0.53
	Light Commercial Truck	24,836	0.02	0.03
	Intercity Bus	893	0.00	0.01
	Transit Bus	13,086	0.01	0.08
	School Bus	148	0.00	0.00
	Refuse Truck	36,976	0.01	0.20
	Single Unit Short-haul Truck	24,168	0.01	0.06
	Single Unit Long-haul Truck	48,000	0.02	0.12
	Motor Home	3,927	0.01	0.02
	Combination Short-haul Truck	64,476	0.02	0.35
	Combination Long-haul Truck	110,038	0.05	0.76
	Subtotal	*1,825,848*	*0.88*	*2.34*
Region Total		**8,654,207 (Kg/Day)**	**4.09 3,714**	**11.35 10,292**

2025 Daily Ozone by Source Type

County	Source Type	Summer Daily VMT	Emissoins (Tons/Day) VOC	NOx
Kanawha	Motorcycle	41,778	0.09	0.03
	Passenger Car	2,362,891	0.60	0.38
	Passenger Truck	3,687,104	0.94	0.91
	Light Commercial Truck	147,426	0.07	0.08
	Intercity Bus	3,565	0.00	0.02
	Transit Bus	54,603	0.01	0.16
	School Bus	143	0.00	0.00
	Refuse Truck	4,603	0.00	0.01
	Single Unit Short-haul Truck	145,805	0.02	0.12
	Single Unit Long-haul Truck	309,308	0.04	0.29
	Motor Home	7,014	0.01	0.02
	Combination Short-haul Truck	261,809	0.03	0.52
	Combination Long-haul Truck	458,541	0.33	2.79
	Subtotal	*7,484,591*	*2.14*	*5.31*
Putnam	Motorcycle	11,910	0.03	0.01
	Passenger Car	630,073	0.17	0.10
	Passenger Truck	1,107,716	0.29	0.27
	Light Commercial Truck	28,984	0.02	0.02
	Intercity Bus	1,093	0.00	0.01
	Transit Bus	14,271	0.00	0.04
	School Bus	159	0.00	0.00
	Refuse Truck	42,010	0.01	0.09
	Single Unit Short-haul Truck	25,262	0.00	0.03
	Single Unit Long-haul Truck	53,193	0.01	0.06
	Motor Home	3,776	0.00	0.01
	Combination Short-haul Truck	80,519	0.01	0.18
	Combination Long-haul Truck	111,234	0.02	0.37
	Subtotal	*2,110,200*	*0.57*	*1.19*
Region Total		**9,594,791 (Kg/Day)**	**2.70 2,453**	**6.50 5,895**

2035 Daily Ozone by Source Type

County	Source Type	Summer Daily VMT	Emissoins (Tons/Day) VOC	NOx
Kanawha	Motorcycle	46,424	0.09	0.03
	Passenger Car	2,625,661	0.33	0.14
	Passenger Truck	4,097,135	0.44	0.31
	Light Commercial Truck	163,821	0.03	0.02
	Intercity Bus	4,384	0.00	0.01
	Transit Bus	60,931	0.00	0.08
	School Bus	154	0.00	0.00
	Refuse Truck	5,234	0.00	0.01
	Single Unit Short-haul Truck	165,082	0.01	0.09
	Single Unit Long-haul Truck	346,127	0.02	0.22
	Motor Home	7,585	0.00	0.01
	Combination Short-haul Truck	294,566	0.01	0.37
	Combination Long-haul Truck	514,214	0.30	2.40
	Subtotal	*8,331,316*	*1.25*	*3.68*
Putnam	Motorcycle	13,273	0.03	0.01
	Passenger Car	702,188	0.09	0.04
	Passenger Truck	1,234,500	0.14	0.09
	Light Commercial Truck	32,302	0.01	0.00
	Intercity Bus	1,307	0.00	0.00
	Transit Bus	15,666	0.00	0.02
	School Bus	169	0.00	0.00
	Refuse Truck	49,968	0.00	0.07
	Single Unit Short-haul Truck	27,059	0.00	0.02
	Single Unit Long-haul Truck	56,314	0.00	0.05
	Motor Home	3,863	0.00	0.00
	Combination Short-haul Truck	89,090	0.01	0.13
	Combination Long-haul Truck	122,670	0.01	0.20
	Subtotal	*2,348,371*	*0.30*	*0.63*
Region Total		**10,679,686 (Kg/Day)**	**1.55 1,402**	**4.31 3,911**

2045 Daily Ozone by Source Type

County	Source Type	Summer Daily VMT	Emissoins (Tons/Day) VOC	NOx
Kanawha	Motorcycle	51,150	0.10	0.04
	Passenger Car	2,892,986	0.27	0.11
	Passenger Truck	4,514,272	0.36	0.21
	Light Commercial Truck	180,500	0.02	0.01
	Intercity Bus	5,354	0.00	0.01
	Transit Bus	66,934	0.00	0.08
	School Bus	168	0.00	0.00
	Refuse Truck	5,804	0.00	0.01
	Single Unit Short-haul Truck	182,966	0.01	0.10
	Single Unit Long-haul Truck	382,849	0.02	0.24
	Motor Home	8,338	0.00	0.00
	Combination Short-haul Truck	322,283	0.02	0.40
	Combination Long-haul Truck	572,820	0.35	2.74
	Subtotal	*9,186,424*	*1.15*	*3.94*
Putnam	Motorcycle	14,651	0.03	0.01
	Passenger Car	775,073	0.08	0.03
	Passenger Truck	1,362,637	0.11	0.06
	Light Commercial Truck	35,654	0.00	0.00
	Intercity Bus	1,419	0.00	0.00
	Transit Bus	17,160	0.00	0.02
	School Bus	183	0.00	0.00
	Refuse Truck	57,646	0.00	0.08
	Single Unit Short-haul Truck	28,751	0.00	0.02
	Single Unit Long-haul Truck	59,715	0.00	0.05
	Motor Home	4,071	0.00	0.00
	Combination Short-haul Truck	96,502	0.01	0.14
	Combination Long-haul Truck	135,289	0.01	0.20
	Subtotal	*2,588,751*	*0.26*	*0.62*
Region Total		**11,775,175 (Kg/Day)**	**1.41 1,279**	**4.56 4,133**

2018 Daily Ozone by Emission Process

County	Emission Process	Emissoins (Tons/Day) VOC	NOx
Kanawha	Running Exhaust	0.80	6.61
	Start Exhaust	1.03	0.93
	Brakewear	0.00	0.00
	Tirewear	0.00	0.00
	Evap Permeation	0.25	0.00
	Evap Fuel Vapor Venting	0.49	0.00
	Evap Fuel Leaks	0.31	0.00
	Crankcase Running Exhaust	0.02	0.00
	Crankcase Start Exhaust	0.01	0.00
	Crankcase Extended Idle Exhaust	0.01	0.00
	Extended Idle Exhaust	0.29	1.43
	Auxiliary Power Exhaust	0.01	0.04
	Subtotal	*3.22*	*9.00*
Putnam	Running Exhaust	0.26	2.08
	Start Exhaust	0.29	0.26
	Brakewear	0.00	0.00
	Tirewear	0.00	0.00
	Evap Permeation	0.07	0.00
	Evap Fuel Vapor Venting	0.15	0.00
	Evap Fuel Leaks	0.09	0.00
	Crankcase Running Exhaust	0.01	0.00
	Crankcase Start Exhaust	0.00	0.00
	Crankcase Extended Idle Exhaust	0.00	0.00
	Extended Idle Exhaust	0.00	0.00
	Auxiliary Power Exhaust	0.00	0.00
	Subtotal	*0.88*	*2.34*
Region Total		**4.09**	**11.35**
	(Kg/Day)	**3,714**	**10,292**

2025 Daily Ozone by Emission Process

County	Emission Process	Emissoins (Tons/Day) VOC	NOx
Kanawha	Running Exhaust	0.38	3.34
	Start Exhaust	0.67	0.50
	Brakewear	0.00	0.00
	Tirewear	0.00	0.00
	Evap Permeation	0.14	0.00
	Evap Fuel Vapor Venting	0.36	0.00
	Evap Fuel Leaks	0.31	0.00
	Crankcase Running Exhaust	0.01	0.00
	Crankcase Start Exhaust	0.01	0.00
	Crankcase Extended Idle Exhaust	0.00	0.00
	Extended Idle Exhaust	0.24	1.41
	Auxiliary Power Exhaust	0.02	0.06
	Subtotal	*2.14*	*5.31*
Putnam	Running Exhaust	0.13	1.05
	Start Exhaust	0.19	0.14
	Brakewear	0.00	0.00
	Tirewear	0.00	0.00
	Evap Permeation	0.04	0.00
	Evap Fuel Vapor Venting	0.11	0.00
	Evap Fuel Leaks	0.10	0.00
	Crankcase Running Exhaust	0.00	0.00
	Crankcase Start Exhaust	0.00	0.00
	Crankcase Extended Idle Exhaust	0.00	0.00
	Extended Idle Exhaust	0.00	0.00
	Auxiliary Power Exhaust	0.00	0.00
	Subtotal	*0.57*	*1.19*
Region Total		**2.70**	**6.50**
	(Kg/Day)	**2,453**	**5,895**

2035 Daily Ozone by Emission Process

County	Emission Process	Emissoins (Tons/Day) VOC	NOx
Kanawha	Running Exhaust	0.16	1.79
	Start Exhaust	0.24	0.20
	Brakewear	0.00	0.00
	Tirewear	0.00	0.00
	Evap Permeation	0.05	0.00
	Evap Fuel Vapor Venting	0.23	0.00
	Evap Fuel Leaks	0.30	0.00
	Crankcase Running Exhaust	0.00	0.00
	Crankcase Start Exhaust	0.00	0.00
	Crankcase Extended Idle Exhaust	0.00	0.00
	Extended Idle Exhaust	0.25	1.60
	Auxiliary Power Exhaust	0.03	0.09
	Subtotal	*1.25*	*3.68*
Putnam	Running Exhaust	0.05	0.57
	Start Exhaust	0.07	0.06
	Brakewear	0.00	0.00
	Tirewear	0.00	0.00
	Evap Permeation	0.01	0.00
	Evap Fuel Vapor Venting	0.07	0.00
	Evap Fuel Leaks	0.10	0.00
	Crankcase Running Exhaust	0.00	0.00
	Crankcase Start Exhaust	0.00	0.00
	Crankcase Extended Idle Exhaust	0.00	0.00
	Extended Idle Exhaust	0.00	0.00
	Auxiliary Power Exhaust	0.00	0.00
	Subtotal	*0.30*	*0.63*
Region Total		**1.55**	**4.31**
	(Kg/Day)	**1,402**	**3,911**

2458 Daily Ozone by Emission Process

County	Emission Process	Emissoins (Tons/Day) VOC	NOx
Kanawha	Running Exhaust	0.15	1.78
	Start Exhaust	0.16	0.15
	Brakewear	0.00	0.00
	Tirewear	0.00	0.00
	Evap Permeation	0.03	0.00
	Evap Fuel Vapor Venting	0.20	0.00
	Evap Fuel Leaks	0.28	0.00
	Crankcase Running Exhaust	0.00	0.00
	Crankcase Start Exhaust	0.00	0.00
	Crankcase Extended Idle Exhaust	0.00	0.00
	Extended Idle Exhaust	0.29	1.90
	Auxiliary Power Exhaust	0.03	0.11
	Subtotal	*1.15*	*3.94*
Putnam	Running Exhaust	0.05	0.58
	Start Exhaust	0.04	0.04
	Brakewear	0.00	0.00
	Tirewear	0.00	0.00
	Evap Permeation	0.01	0.00
	Evap Fuel Vapor Venting	0.06	0.00
	Evap Fuel Leaks	0.09	0.00
	Crankcase Running Exhaust	0.00	0.00
	Crankcase Start Exhaust	0.00	0.00
	Crankcase Extended Idle Exhaust	0.00	0.00
	Extended Idle Exhaust	0.00	0.00
	Auxiliary Power Exhaust	0.00	0.00
	Subtotal	*0.26*	*0.62*
Region Total		**1.41**	**4.56**
	(Kg/Day)	**1,279**	**4,133**

ATTACHMENT D

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

(Sample For 2018 July Weekday Runs: Kanawha County)

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


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

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