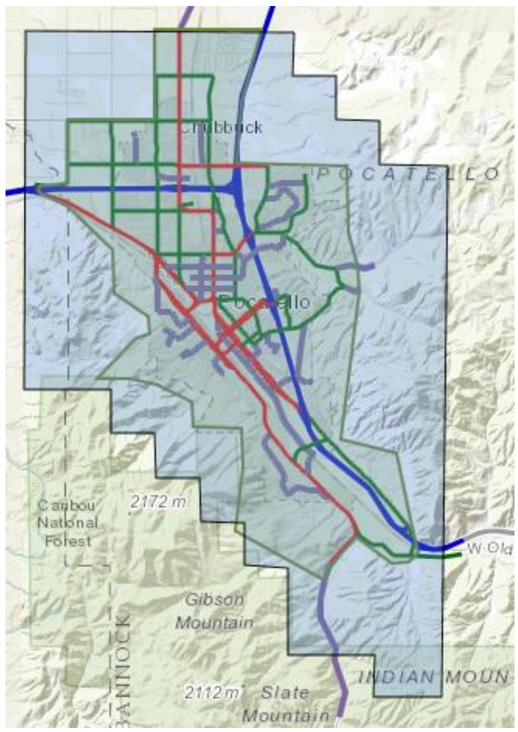
Portneuf Valley PM_{10} Maintenance Plan Amendment

Transition from MOBILE6 Model to MOVES Model
and to Revise Road Dust Methodology



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April 2014

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Acronyms, Abbreviations, and Symbols

ATR	automatic traffic recorder
AP-42	Compilation of Air Pollutant Emission Factors
BTPO	Bannock Transportation Planning Organization
EPA	United States Environmental Protection Agency
FR	Federal Register
DEQ	Idaho Department of Environmental Quality
ITD	Idaho Transportation Department
MOBILE6	Vehicle Emissions Modeling Software
MOVES	Motor Vehicle Emission Simulator
MVEB	motor vehicle emissions budget
NAAQS	National Ambient Air Quality Standards
NEI	National Emission Inventory
NH_4NO_3	ammonium nitrate
NO_x	nitrogen oxides
$PM_{2.5}$	particulate matter under 2.5 microns in size
PM_{10}	particulate matter under 10 microns in size
PVNAA	Portneuf Valley Nonattainment Area
SIP	State Implementation Plan
TDM	Travel Demand Model
TIP	Transportation Improvement Program
TPY	tons per year
VOC	volatile organic compounds

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Introduction

The purpose of this amendment is to revise the *Portneuf Valley PM_{10} Nonattainment Area State Implementation Plan, Maintenance Plan, and Redesignation Request* (DEQ 2004) motor vehicle emissions budget (MVEB) by incorporating emission estimates made with the Motor Vehicle Emission Simulator (MOVES), the latest United States Environmental Protection Agency (EPA)-required motor vehicle emissions factor model (EPA 2009, 2011a) and with an updated road dust estimation method (EPA 2011b). The revisions in this amendment only change emission related to the MVEB and no changes are made to the point or area source emissions.

Currently, the area's existing MVEB is based on the MOBILE5 model, the predecessor to the MOVES model and an old (1995) road dust estimation method (EPA 1995). This amendment updates the MVEB submitted with the original State Implementation Plan (SIP), approved by EPA in July 2006, using these latest EPA-approved methods, which are now required for conformity demonstrations. No change in activity or control measures is included; this is simply a change to the latest EPA-mandated road dust and on-road mobile emissions methods/model, and the most current planning assumptions. The updated MVEB is demonstrated to be equivalent to the MVEB in the 2004 SIP in terms of particulate matter under 10 microns in size (PM_{10}) contribution to the airshed.

Background

In areas that are not meeting the National Ambient Air Quality Standards (NAAQS), the Clean Air Act requires the state to develop a SIP containing emission control measures to reduce emissions enough to return the area to compliance with NAAQS. As part of developing control measures, a MVEB is developed that sets emission limits for all current and future transportation projects. Once the MVEB is established in the SIP, Metropolitan Planning Organizations estimate the regional vehicle emissions from all the local proposed road projects in the Transportation Improvement Program (TIP) and compare those emissions with the SIP's MVEB. This process is known as *transportation conformity*.

In March 2013, MOVES replaced MOBILE6 as EPA's official motor vehicle emissions factor model required for all regional emission analysis in support of transportation conformity. The Bannock Transportation Planning Organization (BTPO) addresses the MVEB for the Portneuf Valley attainment area.

In general, the MOVES model calculates higher nitrogen oxides (NO_x) and particulate matter under 2.5 microns in size ($PM_{2.5}$) emissions than the previous MOBILE6 model when the activity levels are held constant. Because of the higher emissions estimates resulting from MOVES, it is difficult to show conformity with SIPs that contain MVEB developed using MOBILE6, even when there has been no increase in actual emissions.

Emission Calculations

EPA approved the Portneuf Valley PM_{10} maintenance plan and designated the area in attainment on July 13, 2006 (71 FR 39574). This approved plan established MVEBs for on-road sources. DEQ has updated the existing MVEBs in the PM_{10} maintenance plan for the Portneuf Valley using the newer EPA-approved emissions model (MOVES2010b) and the latest paved road dust emission method as detailed in AP-42. This amendment to the SIP will revise the MVEBs to reflect both new methods now required by EPA.

In addition to the on-road mobile emissions estimated by the MOBILE6/MOVES models, paved road dust PM_{10} emissions are included in the MVEB. The 2004 SIP attainment demonstration used to establish the existing MVEB included paved road dust estimates made using EPA's 1996 AP-42 emission estimation guidance and incorporated locally determined road silt loading information developed in a 1996/1997 study by Light (1998).

In January 2011, EPA revised its AP-42 paved road dust estimation method (EPA 2011b), and DEQ used the new estimation guidance to update estimates of paved road dust emissions. A survey of the Pocatello and Chubbuck city road departments indicated that major changes in the use of wintertime antiskid treatments occurred between 1997 and 2012, including higher salt-to-sand ratios in the antiskid treatments, pre storm brine application to reduce the amount of antiskid materials required, and a greater number of sweepers to clean up the antiskid materials that are used (Appendix A). Based on this survey, silt loadings based on traffic volume were used as recommended by EPA (EPA 2011b) to account for wintertime antiskid treatment rather than the silt loading measured in the area 15 years earlier. As a result of the reduced sand usage and the updated emission estimation methods, a significant reduction in paved road dust is estimated for years 2011 and 2020. The paved road dust reductions are greater than the increase in direct exhaust PM_{10} and secondary PM_{10} due to precursor NO_x that occurred when MOVES replaced MOBILE6. The net effect is a reduced on-road mobile emissions inventory.

Description of Modeling Used

On March 2, 2010, EPA released a new mobile source emissions model called the Motor Vehicles Emissions Simulator 2010 (MOVES2010). The EPA provided a 2-year grace period to transportation planning organizations, ending March 2, 2012, during which the older MOBILE6 emissions could still be used to model emissions for transportation projects to meet the requirements of transportation conformity (75 FR 9411).

On October 13, 2011, EPA proposed a 1-year extension to the 2-year grace period because states and localities needed more time to transition to using MOVES2010a and to develop the technical capacity to use MOVES2010a (76 FR 63575). EPA finalized the extension on February 27, 2012 (77 FR 11394). The 1-year extension provides additional time that may be critical for nonattainment and maintenance areas to learn and apply MOVES2010a for regional conformity analyses. Any new transportation conformity analysis started after March 2, 2013, must use the MOVES model.

The EPA issued the MOVES2010b version of the model and its associated guidance in April 2012, and it is the version in effect throughout the period of this SIP revision analysis and is the version used by DEQ.

Planning Assumptions

To operate the MOVES model at the county-level as required by EPA for SIP-level emission inventories, DEQ developed an input database for each specific combination of inputs. This section discusses the assumptions, sources of input information, and calculation methodologies involved in developing SIP-level MOVES input databases.

In November 2012, DEQ completed statewide on-road emission estimates in support of the 2011 National Emission Inventory (NEI). This comprehensive project (DEQ 2012) gathered detailed information from the statewide motor vehicle registration database to describe the motor vehicle source population (ITD 2012a) and traffic counts by vehicle length from every permanent automatic traffic recorder (ATR) in the state (ITD 2012b). In addition, telephone and e-mail surveys filled in the bus and refuse truck source population data that may be unreliable in the registration database and in the national defaults. In view of this *SIP-level* detail in the NEI MOVES inputs, the Bannock County source population and temporal profiles developed for the NEI were used along with BTPO's Travel Demand Model (TDM) for the Portneuf Valley Nonattainment Area (PVNAA) (Parsons 2012) to develop local inputs for the Portneuf Valley. The use of the Bannock County inputs from the NEI statewide database, which was extensively quality assured and found to be consistent with other counties in Idaho of similar population ensures that the Portneuf Valley results are robust and internally consistent with the rest of Idaho.

Existing MVEB

The 2004 PVNAA SIP established MVEB for 2005, 2010, and 2020 (DEQ 2004). The existing MVEBs were developed consistent with the emissions inventory and attainment demonstration that showed future compliance with NAAQS for PM_{10}. The existing MVEBs established in the 2003 SIP are shown in Table 1.

Table 1. Existing MVEB established in 2004 PVNAA SIP.

Year	PM_{10} (TPY)	NO_x (TPY)	VOC (TPY)
2005	897	1,575	983
2010	1,120	1,085	716
2020	1,364	514	585

Notes: motor vehicle emission budget (MVEB); Portneuf Valley Nonattainment Area (PVNAA); State Implementation Plan (SIP); particulate matter with a diameter less than 10 microns (PM_{10}); tons per year (TPY); nitrogen oxides (NO_x); volatile organic compound (VOC)

The existing budgets include on-road mobile emissions computed using MOBILE6, paved road dust emissions computed using the 1995 version of the AP-42 paved road dust emission factor methodology that incorporated locally determined silt loading factors, and a small amount of unpaved road dust emissions from the few remaining unpaved roads in the area. No significant unpaved roads remain in the PVNAA in 2013.

Input Data

The on-road mobile emission inventory for the PVNAA was updated for 2011 and 2020 as described in Appendix A (DEQ 2013). Emissions estimates for 2010 were not made because (a) 2010 had passed and conformity for 2010 and prior years was already completed using MOBILE6, and (b) newer information was available for 2011 as a result of the 2011 NEI project. DEQ used SIP-quality, county-level MOVES inputs for the 2011 NEI so that it would be adequate for SIP documentation purposes. Early in 2013, DEQ updated the 2011 NEI inputs to reflect activity data from the Portneuf Valley TDM developed by BTPO. As a result, the more recent 2011 emissions will be used to replace the existing 2010 MVEBs since 2010 is no longer of interest and the recent model year is more relevant and timely. The SIP-level MOVES inputs developed for the 2011 NEI include source population data from the Idaho Department of Motor Vehicles, traffic temporal information from permanent ATRs, and bus and refuse truck local survey information (DEQ 2013).

Budgets and Safety Margins

The following demonstrates that the revised MVEB resulting from EPA-mandated changes in the on-road and paved road dust emission models results in lower net PM_{10} in the airshed.

It should be noted that actual on-road activity levels are not changing significantly beyond normal growth, and this demonstration reflects only changes in the estimated AP-42 road dust emissions and in the on-road mobile modeling emission estimates. This section and Appendix B describe how DEQ calculated the overall *net* effect of these emission calculation changes for total PM_{10}.

The net effective PM_{10} contribution is the combination of direct PM_{10} emissions plus the NO_x that has been converted to the secondary aerosol composed of ammonium nitrate (NH_4NO_3). Since the actual conversion rate of NO_x to NH_4NO_3 cannot be estimated without difficult and time-consuming photochemical modeling, DEQ followed the most conservative possible approach and estimated 100% conversion. Since VOCs only act similar to a *catalyst* in facilitating the NH_4NO_3 formation chemistry and do not directly form new PM_{10} separate from the nitrate formation, they are not included in calculating the *net* effective PM_{10} contribution to the airshed (Appendix B). Table 2 shows the comparison of total PM_{10} (direct PM_{10} + 100% conversion of NO_x to NH_4NO_3) using the existing MVEB in the 2004 SIP and a MVEB developed in 2013 with MOVES and the new AP-42 road dust calculations. The 2013 estimates show an increase in secondary particulate formation and a decrease in direct PM_{10}, but the total PM_{10} still remains below that in the existing 2010 and 2020 MVEBs from the SIP, which demonstrated compliance with the PM_{10} NAAQS.

Table 2. Comparison of 2013 on-road emissions with existing 2004 MVEBs in terms of net PM_{10}, including primary and secondary particulate, assuming 100% NO_x conversion.

	Existing SIP MVEB with 100% NO_x Conversion Rate	2013 Estimates with 100% NO_x Conversion Rate	Difference, Existing SIP MVEB—2013 Estimates
Year	**2010**	**2011**	**2010/2011**
Secondary PM_{10} produced from NO_x and VOC	2,745	3,347	-602
Primary PM_{10}	1,120	382	738
Total PM_{10}	3,865	3,729	136
Year	**2020**	**2020**	**2020**
Secondary PM_{10} produced from NO_x and VOC	1,300	1,647	-347
Primary PM_{10}	1,364	379	986
Total PM_{10}	2,664	2,026	639

Notes: motor vehicle emission budget (MVEB); particulate matter with a diameter less than 10 microns (PM_{10}); nitrogen oxides (NO_x); State Implementation Plan (SIP); volatile organic compound (VOC)

If the updated emissions estimates are used directly as MVEBs, then minor model input differences in future conformity tests could potentially cause the TIP emissions estimates to exceed the updated budgets. To avoid this potential problem, *safety factors* are typically built into the MVEBs to the extent that can be tolerated while still demonstrating future year NAAQS compliance in the attainment demonstration, or in this case, while still showing equivalence with the existing MVEB.

It was determined a safety margin of 3.1% could be added to revised 2011 MVEBs and 31.5% could be added to the revised 2020 MVEBs without exceeding the total PM_{10} in the existing MVEBs. Since the existing SIP MVEB is consistent with an overall emission inventory and the approved attainment demonstration model showing future year compliance with the NAAQS (DEQ 2004), the revised *model change* MVEBs will remain consistent with the attainment demonstration as long as long as they are equivalent to the existing MVEBs in terms of the net PM_{10} quantity added to the airshed.

Revised MVEB for the Period 2011–2020

The analysis above demonstrates that model changes resulting from the use of the MOVEs2010b model and the 2011 AP-42 paved road dust method results in new MVEBs that are equivalent to the existing (2004 SIP) MVEBs in terms of PM_{10} contributions to the PVNAA airshed.

The resulting revised MVEB for this period is shown in Table 3. Conformity tests for any TIPs conducted from the approval of the MVEBs in this EIP revision through 2019 will be required to meet the budget shown for 2011. This is a conservative budget because, as noted in Appendix B, the 2011 MVEB includes the maximum (2011) MOVES direct PM_{10} emissions plus the maximum (2020) paved road dust emissions for the period. Any TIP conducted in 2020 and beyond will be required to meet the budget shown for 2020.

Table 3. Revised motor vehicle emission budgets for the PVNAA.

Year	PM_{10} (TPY)	NO_x (TPY)	VOC (TPY)
2005	N/A	N/A	N/A
2011	415	1,364	903
2020	498	856	651

Notes: Portneuf Valley Nonattainment Area (PVNAA); particulate matter with a diameter less than 10 microns (PM_{10}); tons per year (TPY); nitrogen oxides (NO_x); volatile organic compound (VOC); not applicable (N/A)

Emission Inventory Growth and Control Assumptions Unchanged

This report demonstrates that MVEBs updated using MOVES and the 2011 road dust methodology are equivalent to the existing MVEBs in the 2004 SIP. The other portions of the emissions inventory are unchanged by this modification, and the growth and control strategy assumptions used in the 2004 SIP are still valid. The emissions inventory developed for the 2004 SIP is reproduced in Appendix C, with the new MVEBs provided for comparison.

Control strategy assumptions for source categories other than on-road vehicle are not changed as part of this revision and are unchanged since the SIP was published in 2004. In addition, the growth assumptions used in the 2004 SIP to project emissions for the future years are still valid. The 2004 SIP analysis used the population growth from 1990 to 2000 (1.4% per year) to forecast population and household growth to the future year attainment dates, including 2010 and 2020, for generally all the anthropogenic area source categories. (Agriculture and stationary sources were assumed to remain level.) Subsequent census data indicate that combined population growth for Chubbuck and Pocatello, the population centers of the PVNAA, actually averaged 1.2% per year between 2000 and 2010, and is estimated to average only 0.6% for each city in 2011 and 2012 (US Census 2013). This is lower than the growth rates assumed in the SIP to occur for every year after 2000. The cities of Chubbuck and Pocatello represent nearly the entire populated portion of the PVNAA, so it is clear that growth assumptions used in the 2004 SIP are still valid.

Conclusion

The revised MVEB included in Table 3 will apply to future transportation conformity determinations. With these proposed changes to the MVEB, the SIP will continue to show maintenance of the 24-hour PM_{10} standard because it is equivalent to the MVEB used in the 2004 attainment demonstration. This SIP amendment will lead to an equitable and more relevant result when evaluating transportation impacts on the area’s air quality.

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Appendix A. Development of the Year 2011 and Year 2020 Mobile Source Emissions Inventories and Conformity Test for the Portneuf Valley Nonattainment Area, Idaho

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Development of the Year 2011 and Year 2020 Mobile Source Emissions Inventories and Conformity Test for the Portneuf Valley Nonattainment Area, Idaho

December 2013

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Abbreviations, Acronyms, and Symbols

ADT	average daily traffic
ATR	automatic traffic recorder
AVFT	alternative vehicle fuels and technology
BTPO	Bannock Transportation Planning Organization
CO	carbon monoxide
DEQ	Idaho Department of Environmental Quality
DMV	Idaho Department of Motor Vehicles
E10	fuel blend of 10% ethanol and 90% gasoline
EPA	United States Environmental Protection Agency
FHWA	Federal Highway Administration
HPMS	Highway Performance Monitoring System
I/M	inspection and maintenance
ITD	Idaho Transportation Department
MOVES	Motor Vehicle Emissions Simulator
mph	miles per hour
MVEB	motor vehicle emission budget
NEI	National Emission Inventory
NH_3	ammonia
NO_x	nitrogen oxides
PM_{10}	particulate matter with a diameter less than 10 microns
$PM_{2.5}$	particulate matter with a diameter less than 2.5 microns
PVNAA	Portneuf Valley Nonattainment Area
SIP	State Implementation Plan
SO_2	sulfur dioxide
TDM	Travel Demand Model
TVRDS	Treasure Valley Road Dust Study
VHT	vehicle hours traveled
VIN	vehicle identification number
VMT	vehicle miles traveled
VOC	volatile organic compound

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1 Introduction

On-road mobile emission inventories for the Portneuf Valley Nonattainment Area (PVNAA) are required for the State Implementation Plan (SIP) ten-year update documentation and for future conformity determinations to be made by the Bannock Transportation Planning Organization (BTPO), the metropolitan planning organization for Bannock County, Idaho. While current motor vehicle budgets established by the current SIP for particulate matter with a diameter less than 10 microns (PM_{10}) (DEQ 2004) were developed using the MOBILE motor vehicle emissions model, all future SIP documentation and conformity determinations after March 2, 2013, must be developed using the United States Environmental Protection Agency's (EPA's) new Motor Vehicle Emission Simulator (MOVES) model. The purpose of the PVNAA on-road emission inventory described in this report is to support the SIP maintenance plan ten-year update and conformity determinations to be made after March 2, 2013. Conformity determinations made prior to March 2, 2013, must be made using the same methodologies used to develop the motor vehicle emission budgets (MVEB) currently in effect as established in the 2004 *Portneuf Valley* PM_{10} *State Implementation Plan, Maintenance Plan, and Redesignation Request* (DEQ 2004).

The Motor Vehicle Emissions Simulator (MOVES2010b) (EPA 2011a) is the current EPA-designated model for on-road mobile emission inventory development for SIP maintenance plans and for Federal Highway Administration (FHWA) transportation conformity determinations. The on-road mobile source emissions inventory was developed using MOVES2010b according to EPA guidance *Using MOVES to Prepare Emission Inventories in State Implementation Plans and Transportation Conformity: Technical Guidance for MOVES2010, 2010a and 2010b* (EPA 2012).

The paved road dust emissions were developed using the latest EPA-recommended *AP-42, Compilation of Air Pollutant Emission Factors* method (EPA 2011b). There are no significant unpaved roads in the PVNAA, thus unpaved road emissions were not estimated.

This report details the methodologies and results for the MOVES on-road emissions modeling and paved road dust computations used to develop the 2011 and 2020 on-road emission inventories.

2 Methodology: MOVES Input Database Development

To operate the MOVES model at the county-level as required by EPA for SIP-level emission inventories, the Idaho Department of Environmental Quality (DEQ) developed an input database for each specific combination of inputs. This section discusses the assumptions, sources of input information, and calculation methodologies involved in developing SIP-level MOVES input databases.

In November 2012, DEQ completed statewide on-road emission estimates in support of the 2011 National Emission Inventory (NEI). This comprehensive project (DEQ 2012) gathered detailed information from the statewide motor vehicle registration database to describe the motor vehicle source population and traffic counts by length from every permanent automatic traffic recorder (ATR) in the state. In addition telephone and e-mail surveys filled in the bus and refuse truck source population data that may be unreliable in the registration database and in the national defaults. In view of this *SIP-level* detail in the NEI MOVES inputs, the Bannock County source population and temporal profiles developed for the NEI were used along with BTPO's Travel Demand Model (TDM) (Parsons 2012) to develop local inputs for the PVNAA. The use of the Bannock County inputs from the NEI statewide database, which was extensively quality assured and found to be consistent with other counties in Idaho of similar population ensures that the PVNAA results are robust and internally consistent with the rest of Idaho.

Based on similarity of geographic features, vehicle travel patterns, and data sources, DEQ grouped all 44 Idaho counties into three groups: Northern Idaho, Southern Idaho, and Treasure Valley to use the ATR data in developing the statewide 2011 NEI inputs (Table 1). A majority of PVNAA resides in Bannock County and belongs to the southern Idaho group. Because all of the urban southern Idaho group ATR sites except one reside in PVNAA and nearly all roads in PVNAA are urban roads, the southern Idaho group ATR data represent PVNAA very well.

Table 1. Idaho county groups for MOVES modeling purposes.

County Group	County ID	County Name	County Group	County ID	County Name
Northern Idaho	16009	Benewah	Southern Idaho (continued)	16031	Cassia
	16017	Bonner		16033	Clark
	16021	Boundary		16037	Custer
	16035	Clearwater		16039	Elmore
	16049	Idaho		16041	Franklin
	16055	Kootenai		16043	Fremont
	16057	Latah		16045	Gem
	16061	Lewis		16047	Gooding
	16069	Nez Perce		16051	Jefferson
	16079	Shoshone		16053	Jerome
Treasure Valley	16001	Ada		16059	Lemhi
	16027	Canyon		16063	Lincoln
Southern Idaho	16003	Adams		16065	Madison
	16005	Bannock		16067	Minidoka
	16007	Bear Lake		16071	Oneida
	16011	Bingham		16073	Owyhee
	16013	Blaine		16075	Payette
	16015	Boise		16077	Power
	16019	Bonneville		16081	Teton
	16023	Butte		16083	Twin Falls
	16025	Camas		16085	Valley
	16029	Caribou		16087	Washington
Note: Motor Vehicle Emission Simulator (MOVES)					

The required MOVES inputs, grouped by common data source, are shown in Figure 1. For example, *VMT Related* inputs such as road type distribution and monthly, daily, and hourly traffic profiles (top box) require detailed information from the Idaho Transportation Department (ITD) traffic counts and vehicle miles traveled (VMT) statistics to characterize the VMT within the modeling domain, while the *Source Related* inputs are derived primarily from the statewide vehicle registration database.

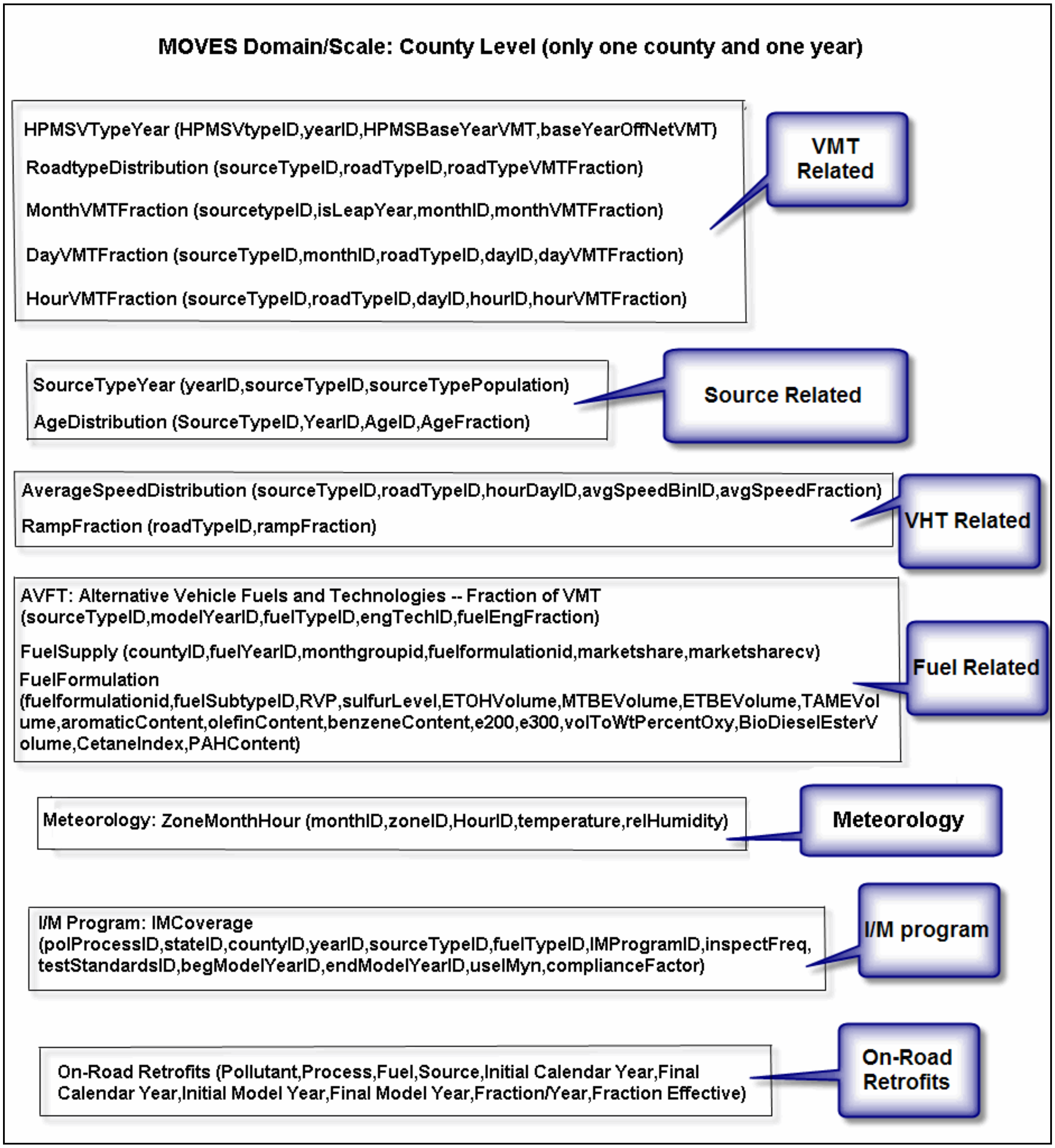

Figure 1. Motor Vehicle Emission Simulator input files and groups.

County-level input files were prepared for each category, using a combination of (primarily) local data and selected MOVES national defaults in those cases where local data are not available or are suspected to be less reliable. This section discusses the creation of each input in turn. The input files under discussion are listed after each section heading for clarification. For reference, MOVES road types and source types (vehicles) are defined in Table 2 and Table 3, respectively.

Table 2. MOVES road type descriptions.

Road Type	Description
1	Off-network
2	Rural restricted access
3	Rural unrestricted access
4	Urban restricted access
5	Urban unrestricted access

Note: Motor Vehicle Emission Simulator (MOVES)

Table 3. MOVES source type descriptions.

MOVES Source Type	Description
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

Note: Motor Vehicle Emission Simulator (MOVES)

2.1 VMT-Related Inputs

VMT inputs describe the distance traveled on different roadways by the various source types (vehicles). VMT-related inputs include road type distribution and VMT (annual, monthly, daily, and hourly estimates). The road type VMT distribution data set was developed from the BTPO TDM, and the monthly, weekday/weekend, and hourly VMT profiles were developed from permanent ATRs.

2.1.1 Annual VMT

HPMSVTypeYear(HPMSVtypeID, yearID, HPMSBaseYearVMT, baseYearOffNetVMT)

Annual VMT describes the total vehicle miles traveled for each Highway Performance Monitoring System (HPMS) vehicle type, for each county in the domain. To generate the annual VMT inputs, ITD ATR data were used to generate a weekday/weekend ratio and fleet mix for each road type, which were then applied to BTPO TDM annual average weekday VMT outputs to estimate annual VMT.

Comparing annual VMT attributed to local roads from the TDM output to ITD's annual local road VMT from fuels sales data indicated that the TDM does not underestimate VMT from local roads (as TDMs often do). Thus, a local road scale-up factor of 1.00 was used (i.e., no VMT adjustment for the local roads). The final TDM-based VMT are summarized in Table 4.

Table 4. Travel Demand Model-based annual vehicle miles traveled.

Year	Vehicle Miles Traveled
2011	409,399,732
2020	454,338,514

2.1.2 Road Type

RoadtypeDistribution(sourceTypeID, roadTypeID, roadTypeVMTFraction)

The road type distribution describes the fraction of fleet miles driven on each of the four applicable MOVES road types (rural restricted, rural unrestricted, urban restricted, and urban unrestricted) within the modeling domain for each source (vehicle) type. Road type distribution inputs were derived from TDM outputs provided by BTPO and ITD ATR data. A crosswalk table in Appendix A shows the relationships between BTPO TDM road types, the HPMS/FHWA road types, and the MOVES roadway types. The ATR-based traffic data and TDM outputs were used to allocate the annual VMT for each source type to road types. When the annual road distributions were complete for the FHWA road types, the distributions were aggregated into the four MOVES road types.

Year 2020 road type distribution was developed from the same ITD ATR data set along with year 2020 VMT from the TDM.

2.1.3 Monthly, Daily, and Hourly VMT

MonthVMTFraction(sourcetypeID, isLeapYear, monthID, monthVMTFraction)
DayVMTFraction(sourceTypeID, monthID, roadTypeID, dayID, dayVMTFraction)
HourVMTFraction(sourceTypeID, roadTypeID, dayID, hourID, hourVMTFraction)

Temporal distribution profiles further divided the source type annual VMT into finer time increments. Temporal profiles were derived from ATR data and annual VMT by FHWA road type based on BTPO's TDM.

ATR data contain hourly vehicle counts for each of five length categories or *bins*. Hourly counts for each length bin were converted to temporal distributions for each MOVES vehicle type and roadway type using a crosswalk scheme developed based on discussions with ITD and 2009–2011 Idaho statewide vehicle classification data (Scott Fugit, ITD, pers.comm. 2012). The final crosswalk table, which maps ATR length bins to MOVES vehicle types, is provided in Appendix B, and the 2009–2011 classification data are provided in Appendix C. Neither ATR data nor FHWA vehicle classification data distinguish between personal or commercial light-duty truck trips, and long- or short-haul heavy duty truck trips, so it was necessary to use national default fractions available in the MOVES model to make the final splits from FHWA classes to MOVES vehicle types in these categories. For each ATR site, a full year of ATR data were processed. Hourly, weekday/weekend, and monthly statistics were calculated for each vehicle type. Finally, ATR sites were grouped based on MOVES road types, and each site was weighted equally in constructing the final temporal profiles.

Year 2020 temporal profiles for each road type were developed from the same ITD ATR data set along with year 2020 VMT.

2.2 Source-Related Inputs

This group of inputs includes source type population and age distribution. Source-related inputs describe and group the vehicles in the modeling domain and are compiled using a variety of data sources (Table 5). The fleet mix distribution is a key component of on-road mobile source emissions. The majority of vehicles are well characterized by the Idaho Department of Motor Vehicle (DMV) registration database (Bob Thompson, ITD, pers.comm. 2012). The database is screened to ensure that only vehicles with current registrations are included, and vehicle types and ages are obtained from the vehicle identification number (VIN) to avoid data entry errors that may occur in manually entered fields.

Table 5. Crosswalk between MOVES source types and data sources for source-related MOVES input parameters.

MOVES Source Type	Source-Related Input Data Source
Motorcycle	ITD—DMV registration database
Passenger car	ITD—DMV registration database
Passenger truck	ITD—DMV registration database
Light commercial truck	ITD—DMV registration database
Intercity bus	Telephone and e-mail survey
Transit bus	Telephone and e-mail survey
School bus	Idaho Department of Education
Refuse truck	Telephone and e-mail survey, MOVES default database
Single unit short-haul truck	MOVES default database, annual local VMT
Single unit long-haul truck	MOVES default database, annual local VMT
Motor home	ITD—DMV registration database
Combination short-haul truck	MOVES default database, annual local VMT
Combination long-haul truck	MOVES default database, annual local VMT

Notes: Idaho Motor Vehicle Emissions Stimulator *(*MOVES); Idaho Transportation Department (ITD); Idaho Department of Motor Vehicles (DMV); vehicle miles traveled (VMT)

2.2.1 Source Type Population

SourceTypeYear(yearID, sourceTypeID, sourceTypePopulation)

The source type population input describes the types and numbers of vehicles that make up the fleet. Six sources of data were used to develop the source type population inputs as shown in Table 5.

Direct population and age data were obtained from service providers via telephone and e-mail surveys for transit and intercity buses and refuse trucks. School bus data were obtained from the Idaho Department of Education. For motorcycle, passenger car, passenger truck, light commercial truck, and motor home source types, VIN-decoded registration data were used to determine vehicle populations.

For all other heavy duty truck source types many of the vehicles are registered in other states so local registration data are not complete, and therefore, the heavy duty truck populations are derived from MOVES national defaults. Thus, for single and combination haul trucks, a factor was used to estimate the county level source type populations using local activity data, MOVES national default activity data, and MOVES national default source type populations as shown in Equation 1.

$$Population_{Local}^{SourceType} = VMT_{Local}^{SourceType}\left(\frac{Population_{NatlDefault}^{SourceType}}{VMT_{NatlDefault}^{SourceType}}\right)$$

Equation 1. Equation used to estimate vehicle population for source types without local data.

The 2010 census indicates that 89.3% of the PVNAA human population resides in Bannock County. Thus, the Bannock County source type population from the 2011 NEI was adjusted using this human population ratio as surrogate to produce the PVNAA source type population. A very small, sparsely populated sliver of the PVNAA is located in Power County; however, this is a negligible portion of the total PVNAA population and that portion of the source population is also assumed to have similar characteristics to Bannock County.

DEQ assumed the “VMT per vehicle population” is approximately constant from year to year, allowing 2020 source type populations to be estimated using Equation 2 shown below:

$$Population_{year\ 2020}^{SourceType} = VMT_{year\ 2020}^{SourceType}\left(\frac{Population_{year\ 2011}^{SourceType}}{VMT_{year\ 2011}^{SourceType}}\right)$$

Equation 2. Equation used to estimate vehicle population for 2020.

2.2.2 Age Distribution

AgeDistribution(SourceTypeID, YearID, AgeID, AgeFraction)

Age distributions characterize the age profile of each vehicle source type. Age distributions were developed for Bannock County using VIN-decoded vehicle registration data, refuse truck, transit and intercity bus fleet data from service providers, school bus fleet data from the Idaho Department of Education, and MOVES defaults for heavy duty haul truck source types. Because the majority of PVNAA is in Bannock County, age distributions developed for Bannock County were used for PVNAA directly.

The same age distribution developed for 2011 was used for 2020, based on the approximation that age distribution do not change significantly from year to year.

2.3 VHT-Related Inputs

Vehicle hours traveled (VHT) inputs characterize the time spent and average speeds of vehicles travelling on specific road types. This group of inputs includes ramp fractions and average speed distribution.

2.3.1 Ramp Fractions

RampFraction(roadTypeID, rampFraction)

Ramp fraction defines the portion of VHT on roadways that contain entrance and exit ramps for restricted access roadways. Ramps are treated separately from the remainder of the freeway VHT because the sudden acceleration and deceleration that occurs on ramps results in significantly higher emissions.

Both 2011 and 2020 ramp fractions for urban freeways were calculated by aggregating VHT on ramps and restricted access roadways from the TDM outputs then dividing ramp VHT by total restricted access roadway VHT to get the fraction of restricted access VHT attributed to ramps.

2.3.2 Average Speed Distribution

AverageSpeedDistribution(sourceTypeID, roadTypeID, hourDayID, avgSpeedBinID, avgSpeedFraction)

The average speed distribution allocates the different source types (vehicles) for each roadway type to 16 speed bins ranging from 0 to >72.5 miles per hour (mph) (Table 6). This input reflects levels of congestion on roadways. Average speed distributions were developed from TDM average daily traffic counts for each roadway segment and hourly traffic count statistics developed from detailed ATR traffic count data provided by ITD.

Table 6. MOVES speed bins.

avgSpeedBinID	avgBinSpeed	avgSpeedBinDesc
1	2.5	Speed <2.5 miles per hour (mph)
2	5	2.5 mph ≤ speed <7.5 mph
3	10	7.5 mph ≤ speed <12.5 mph
4	15	12.5 mph ≤ speed <17.5 mph
5	20	17.5 mph ≤ speed <22.5 mph
6	25	22.5 mph ≤ speed <27.5 mph
7	30	27.5 mph ≤ speed <32.5 mph
8	35	32.5 mph ≤ speed <37.5 mph
9	40	37.5 mph ≤ speed <42.5 mph
10	45	42.5 mph ≤ speed <47.5 mph
11	50	47.5 mph ≤ speed <52.5 mph
12	55	52.5 mph ≤ speed <57.5 mph
13	60	57.5 mph ≤ speed <62.5 mph
14	65	62.5 mph ≤ speed <67.5 mph
15	70	67.5 mph ≤ speed <72.5 mph
16	75	72.5 mph ≤ speed

The hourly ATR-based traffic count profiles for each roadway type were used to estimate hourly volume on each segment. The Akcelik volume delay function (Equation 3) was then used to develop the average speed distribution database for each hour. This is the same volume delay function used in the BTPO’s TDM (Parsons 2012) so the emissions model is internally consistent with the TDM.

$$R = R_0 + D_0 + 0.25T\left[(x-1) + \sqrt{\left((x-1)^2 + \frac{16J \cdot X \cdot L^2}{T^2}\right)}\right]$$

Where:

R	= Link traversal time
R_0	= Free flow link traversal time
D_0	= zero flow control delay
T	= expected duration of demand
X	= flow to capacity ratio
J	= calibration parameter
L	= Link length

Equation 3. Akcelik volume delay function.

Both 2011 and 2020 average speed distributions were developed for all four MOVES road types using TDM outputs developed by BTPO and hourly temporal profiles based on the detailed ATR data provided by ITD.

2.4 Fuel-Related Inputs

This group of inputs includes data regarding fuel supply, fuel formulation, and alternative vehicle fuels and technology (AVFT).

2.4.1 Fuel Supply

FuelSupply(countyID, fuelYearID, monthgroupid, fuelformulationid, marketshare, marketsharecv)

Fuel supply inputs designate the fuel formulations used by the model for each model year for each source type.

National default fuel supply inputs were used for all source types except the E10 market share. By the end of 2011, the E10 market share in Idaho is known to have been virtually 100%, but to account for a small number of suppliers who were still selling gasoline with no ethanol in 2011, a nominal market share of 99% was used for E10 with 1% assigned for ethanol-free gasoline for 2011.

For 2020, national default fuel supply was used (i.e., 100% E10 market share).

2.4.2 Fuel Formulation

FuelFormulation(fuelFormulationID,fuelSubtypeID,RVP,sulfurLevel,ETOHVolume,MTBEVolume,ETBEVolume,TAMEVolume,aromaticContent,olefinContent,benzeneContent,e200,e300,BioDieselEsterVolume,CetaneIndex,PAHContent,T50,T90)

MOVES national default fuel formulations were judged to be reasonable and alternative local data are not readily available. Therefore, national default fuel formulations were used for all source types for both 2011 and 2020.

2.4.3 Alternative Vehicle Fuels and Technology

AVFT(sourceTypeID, modelYearID, fuelTypeID, engTechID, fuelEngFraction)

AVFT input files in MOVES allow the user to assign source type activity by model year to vehicles with different fuel and/or engine technologies. PVNAA vehicles were modeled using a custom AVFT input file derived from VIN-decoded registration data for Bannock County. For vehicle types not included in the registration data, AVFT files were developed from local data available from the telephone and e-mail surveys shown in Table 5. National default AVFT was used as a supplement when no local data was available.

In 2020, the same vehicle age distribution was assumed to occur as that found in 2011 so vehicle age *zero* was changed from model year 2011 to model year 2020. To match the shift in the age distribution, AVFT for 2020 was similarly shifted.

2.5 Meteorology

ZoneMonthHour(monthID, zoneID, HourID, temperature, relHumidity)

The meteorology inputs include the average hourly temperature and relative humidity data for PVNAA. The meteorological observation data for 2011 at the Pocatello Regional Airport National Weather Service station, KPIH, obtained from MESOWEST (2012) an on-line data source described by Horel et. al (2002) were used to generate the meteorology input. For any time periods in which KPIH data are missing, data sets from nearby ITD stations, ITD25, and ITD46 (MESOWEST 2012), were used to gap-fill the original data set.

For the future year 2020 projections, the same meteorology input from 2011 was used.

2.6 Inspection and Maintenance Programs

IMCoverage(polProcessID, stateID, countyID, yearID, sourceTypeID, fuelTypeID, IMProgramID, inspectFreq, testStandardsID, begModelYearID, endModelYearID, useIMyn, complianceFactor)

There are no inspection and maintenance (I/M) programs in place in PVNAA during 2011, and no need for an I/M program is anticipated in the foreseeable future. Thus, no I/M program is designated in the model for both 2011 and 2020.

2.7 On-Road Retrofits

On-roadRetrofits(Pollutant, Process, Fuel, Source, InitialCalendarYear, FinalCalendarYear, InitialModelYear, FinalModelYear, Fraction/Year, FractionEffective)

Because adequate local data were not available to prepare local on-road retrofit inputs, the PVNAA was modeled without local on-road retrofits.

3 Methodology: Paved Road Dust

Fugitive dust from paved and unpaved roads can be a significant source of PM_{10} emissions. Because there are no unpaved roads in PVNAA, unpaved road dust is assumed to be negligible. This section will focus on paved road dust.

In general, the factors that affect paved road dust emissions include the weight of the vehicles that drive on the roadway surface, vehicle speed, fine particle (silt) loading on the roadway surface available for entrainment, and precipitation on the roadway that decreases road dust emissions. A new emission factor equation for paved roads was published in January 2011 by EPA as the agency's recommended method in *AP-42 Compilation of Air Pollutant Emission Factors* (EPA 2011b, section 13.2.1). This section of the report discusses data collection and calculation using the new AP-42 method.

Paved road dust emissions were computed on a daily basis following the most recent AP-42 guidance (EPA 2011b) for emission factor calculation. The emissions for each day type (weekend/weekday), each month and each roadway type are the product of the emission factor and the VMT in each day type, each month, and on each roadway type. Therefore, for each day type, each month, and each roadway type in PVNAA, VMT, road surface silt loading, average weight of the vehicles traveling the road, and the number of hours with at least (0.01 inches) of precipitation must be determined. The following sections discuss these inputs in detail. For the purposes of paved road dust calculations, winter season is defined as November 1–February 29, and the summer or *nonwinter* season is defined as April 1–October 31. The annual emission estimates include all 12 months. Note, road dust categories are computed only for local roads, arterials and freeways; however, VMT are available for the HPMS roadway types. Table 7 shows the roadway type definitions and the crosswalk relationship between the road dust roadways and HPMS roadway types.

Table 7. Roadway type definitions in road dust calculation.

Road Type for Road Dust	Road Type for Road Dust	HPMS Road Type ID	HPMS Road Type
11	Rural interstate	11	Rural interstate
13	Rural arterial	13	Rural principal arterial
		15	Rural minor arterial
		17	Rural major collector
		19	Rural minor collector
21	Rural local	21	Rural local
23	Urban interstate	23	Urban interstate
		25	Urban freeway/ expressway
27	Urban arterial	27	Urban principal arterial
		29	Urban minor arterial
		31	Urban collector
33	Urban local	33	Urban local

Note: Highway Performance Monitoring System (HPMS)

3.1 Vehicle Miles Traveled

The VMT was generated using TDM outputs in conjunction with ITD ATR data to produce VMT for each day type, each month, and each roadway type. The annual VMT totals used in the road dust calculations are the same as those used in the MOVES modeling, summarized in Table 4, section 2.1.1.

3.2 Road Dust Emission Factor

Paved road dust emissions were computed on a daily basis using the January 2011 *AP-42 Compilation of Air Pollutant Emission Factors* (EPA 2011b, section 13.2.1, Equation 2), as shown in Equation 4 below. This new version of EPA's road dust methodology is now required for use in SIP and conformity demonstrations. The form of the emission factor equation (Equation 4) accounts for the dust suppression effect of precipitation that occurs during each averaging period.

$$E_{ext} = [\ \mathrm{k}\ (\mathrm{sL})^{0.91}\ \times\ (\mathrm{W})^{1.02}\ ] \times \left(1 - \frac{\mathrm{P}}{4\mathrm{N}}\right)$$

Equation 4. Paved road dust emission factor.

where

E_{ext} = PM_{10} or $PM_{2.5}$ emission factor in the same units as k

k = particle size multiplier (1.0 for PM_{10}) (grams/VMT)

sL = road surface silt loading (grams per square meter)

W = average weight of the vehicles traveling the road (tons)

P = number of *wet* days with at least 0.01 inches of precipitation during the averaging period (daily)

N = number of days in the averaging period (e.g., 28, 29, 30, or 31 for monthly)

3.2.1 Particle Size Multipliers

The particle size multiplier variable, “k” in Equation 4 is used to define the fraction of total PM_{10} emissions that will be classified as $PM_{2.5}$ emissions; however, it does not influence the total PM_{10} emission quantities. The Treasure Valley Road Dust Study (TVRDS) conducted in 2002 (Etemezian et al. 2002) concluded that 5.7% of the total PM_{10} emissions were in the $PM_{2.5}$ size category. The TVRDS was conducted in Ada and Canyon counties but since the data were collected in Idaho, it is assumed to better reflect reality for Idaho-specific soils and urban areas than the default value (25%) recommended in the guidance (EPA 2011b) and is therefore applied to PVNAA. This is a minor issue for a PM_{10} motor vehicle budget because the $PM_{2.5}$ is less important than the total PM_{10} emission rate upon which the budget is based.

3.2.2 Silt Loading

General default silt loadings are available by the average daily traffic (ADT) category in the January 2011 emission factor methodology for paved roads (EPA 2011b). The VMT-weighted silt loading factors are necessary for each roadway type using Equation 5.

$$sL = \sum_{i=1}^{4} a_i U_i$$

Equation 5. VMT-weighted silt loading.

where

sL = VMT-weighted silt loading factor

i = index from 1 to 4, which represent average daily traffic volume (ADT) categories <500, 500–5,000, 5,000–10,000, and >10,000, respectively

a = Fraction of VMT on roadway in ADT category “i”

U = Ubiquitous baseline silt loading for the summer season or ubiquitous winter baseline silt loading for the winter season, for ADT category “i”

The resulting VMT-weighted silt loadings for both summer and winter season by roadway type are shown in Table 8. These silt loadings were used for both 2011 and 2020 road dust computations.

It should be noted that silt loadings were measured in the Pocatello and Chubbuck area in 1996/1997 (Light 1998) and were used in the 2004 SIP and subsequent conformity determinations since then. However, significant changes in the antiskid treatment have occurred in the PVNAA since 1996 resulting from reduced sand usage and improved road dust sweeping capacity. The differences are generally summarized in Table 9, based on information obtained from the Pocatello and Chubbuck road departments (Randy Ghezzi pers. comm. 2013 and Bryan Hall pers. comm. 2013, respectively). The changes reduced the amount of silt on roadways by using brine pretreatment, estimated to reduce the amount of sand consumption by 50% when used, by replacing some of the sand with road salt, which does not produce silt, and by doubling the street sweeping capacity in both cities. Significant changes resulted in the 15 years between 1996 and 2011 from the SIP-related road sanding agreements and additional ongoing efforts. DEQ believes the local road silt levels in the PVNAA are lower than they were in 1996/1997 and are better represented by the more explicit new EPA method (EPA 2011b), which used *ubiquitous winter* silt loadings with initial peak antiskid silt loading contributions following storms. Thus, DEQ now uses the new EPA method, which scales up to the number of winter storms and to the traffic level on each roadway to make the current paved road dust emission estimates.

Table 8. Silt loadings used for paved road emission factor calculation.

Road Type	Season	Silt Loading Factor
Rural interstate	Winter	0.0740
Rural interstate	Summer	0.0359
Rural arterial	Winter	0.6550
Rural arterial	Summer	0.2030
Rural local	Winter	2.4
Rural local	Summer	0.6
Urban interstate	Winter	0.0554
Urban interstate	Summer	0.0282
Urban arterial	Winter	0.1669
Urban arterial	Summer	0.0713
Urban local	Winter	2.4
Urban local	Summer	0.6

Table 9. Antiskid improvements to lower silt loadings in Pocatello and Chubbuck.

	1996	2013
Pocatello (Ghezzi pers.comm. 2013)		
Sand:salt ratio	15:1	4:1
Number of street sweepers	2	4
Salt brine pretreatment	0	33,000 gallons
Chubbuck (Hall pers. comm. 2013)		
Sand:salt ratio	5:1	3:1
Number of street sweepers	1	2
Salt brine pretreatment	0	30 gallons/lane mile

3.2.3 Average Vehicle Weight by Roadway Type

Average vehicle weight for each roadway type is derived from the vehicle type fraction on each roadway type and average vehicle weight by vehicle type. ITD ATR data were used to determine the vehicle type fractions traveling on each roadway type. The ATR data identify motorcycles, passenger vehicles, and three classes of heavy-duty vehicles by length measurement; however, the FHWA vehicle classification statistics for Idaho by roadway type (Appendix C) are needed to provide greater detail in vehicle classification. The average vehicle weight for each vehicle type was obtained from the MOVES default database (EPA 2011a) as shown in Table 10. Source type descriptions are provided in Table 3.

Table 10. Average vehicle weight by vehicle type.

SourceType ID	HPMS Vtype ID	SourceType Name	Source Mass (Metric Tons)
11	10	Motorcycle	0.285
21	20	Passenger car	1.479
31	30	Passenger truck	1.867
32	30	Light commercial truck	2.060
41	40	Intercity bus	19.594
42	40	Transit bus	16.556
43	40	School bus	9.070
51	50	Refuse truck	20.684
52	50	Single unit short-haul truck	7.642
53	50	Single unit long-haul truck	6.250
54	50	Motor home	6.735
61	60	Combination short-haul truck	29.328
62	60	Combination long-haul truck	31.404

Note: Highway Performance Monitoring System (HPMS)

3.2.4 Precipitation Data

The number of days with more than a *trace* of precipitation (≥0.01 inches) is required in the road dust calculation. The precipitation data were gathered from two sources, MESOWEST (MESOWEST 2012) described by Horel et al. (2002) and the Western Regional Climate Center (WRCC 2012). The detailed process used to derived the precipitation data were documented in the 2012 DEQ report, *Development of the 2011 Paved Road Dust Inventory for the National Emission Inventory* (DEQ 2012). Because the majority of the PVNAA resides in Bannock County, the data for Bannock County, based primarily on the Pocatello Airport National Weather Service station were used to represent the PVNAA. The days per month with more than a trace amount of precipitation during 2011 are shown in Table 11. For the future year 2020, the same meteorology inputs were used.

Table 11. Number of days with greater than 0.01 inches of precipitation for each month in 2011.

County	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bannock	8	6	16	18	14	9	3	3	2	8	7	4

4 Results

On-road mobile source and paved road dust emissions estimate results are presented in this section.

4.1 On-Road Mobile Source Emission Estimates

On-road mobile source annual emission totals are shown in Table 12. The emission results include estimates for nitrogen oxides (NO_x), sulfur dioxide (SO_2), volatile organic compounds (VOC), carbon monoxide (CO), particular matter and ammonia (NH_3). The PM_{10} and $PM_{2.5}$

emission estimates in Table 11 include particulate matter from direct exhaust, brake wear, and tire wear and does not include paved road dust.

Table 12. Annual on-road emissions in PVNAA.

Year	NO_x	SO_2	VOC	CO	PM_{10}	$PM_{2.5}$	NH_3
	(tons per year)						
2011	1,323	4.4	876	9,529	64.8	51.4	17.9
2020	651	4.0	495	6,643	41.0	27.6	12.7

Notes: Portneuf Valley Nonattainment Area (PVNAA); nitrogen oxides (NO_x); sulfur dioxide (SO_2); volatile organic compound (VOC); carbon monoxide (CO); particulate matter with a diameter less than 10 microns (PM_{10}); particulate matter with a diameter less than 2.5 microns ($PM_{2.5}$); ammonia (NH_3)

4.2 Paved Road Dust Emission Estimates

Paved road dust annual emissions for the PVNAA are shown in Table 13.

Table 13. Annual paved road dust emissions in PVNAA.

Year	PM_{10}	$PM_{2.5}$
	(tons per year)	
2011	316.9	18.1
2020	337.5	19.2

Notes: particulate matter with a diameter less than 10 microns (PM_{10}); particulate matter with a diameter less than 2.5 microns ($PM_{2.5}$)

5 Quality Control and Quality Assurance

Quality control was achieved by a quality assurance check of each set of inputs and the final result for both on-road MOVES modeling and paved road dust calculation. In general, each input was checked for internal consistency, compared with Bannock County, where majority of PVNAA resides, and assessed for reasonableness. Input and output data were graphed and analyzed to ensure that the expected vehicle population, roadway activity, and seasonal patterns were obtained and that differences between PVNAA and Bannock County for 2011 and 2020 on inputs and output data sets were understood and justified.

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Appendix A. Crosswalk between BTPO TDM Road Types, FHWA Roadway Types, and MOVES Roadway Types

<table>
<tr><th>BTPO Road Type ID</th><th>BTPO Road Type Descriptions</th><th>Area Type</th><th>FHWA Road Type Code</th><th>FHWA Road Type Description</th><th>MOVES Road Type</th><th>MOVES Road Type Description</th></tr>
<tr><td colspan="5">Parked vehicles and extended idle are not included in BTPO or FHWA road types</td><td>1</td><td>Off Network</td></tr>
<tr><td>6</td><td>Interstate</td><td>Rural</td><td rowspan="2">01</td><td rowspan="2">Rural Principal Arterial—Interstate</td><td rowspan="2">2</td><td rowspan="2">Rural Restricted Access</td></tr>
<tr><td>5</td><td>Ramp</td><td>Rural</td></tr>
<tr><td>4</td><td>Principal arterial</td><td>Rural</td><td>02</td><td>Rural Principal Arterial—Other</td><td rowspan="6">3</td><td rowspan="6">Rural Unrestricted Access</td></tr>
<tr><td>3</td><td>Minor arterial</td><td>Rural</td><td>06</td><td>Rural Minor Arterial</td></tr>
<tr><td>2</td><td>Collector</td><td>Rural</td><td>07</td><td>Rural Major Collector</td></tr>
<tr><td></td><td></td><td>Rural</td><td>08</td><td>Rural Minor Collector</td></tr>
<tr><td>1</td><td>Local</td><td>Rural</td><td rowspan="2">09</td><td rowspan="2">Rural Local</td></tr>
<tr><td>0</td><td>Centroid connector</td><td>Rural</td></tr>
<tr><td>6</td><td>Interstate</td><td>Urban</td><td rowspan="2">11</td><td rowspan="2">Urban Principal Arterial—Interstate</td><td rowspan="3">4</td><td rowspan="3">Urban Restricted Access</td></tr>
<tr><td>5</td><td>Ramp</td><td>Urban</td></tr>
<tr><td></td><td></td><td>Urban</td><td>12</td><td>Urban Principal Arterial—Other Freeways or Expressways</td></tr>
<tr><td>4</td><td>Principal arterial</td><td>Urban</td><td>14</td><td>Urban Principal Arterial—Other</td><td rowspan="5">5</td><td rowspan="5">Urban Unrestricted Access</td></tr>
<tr><td>3</td><td>Minor arterial</td><td>Urban</td><td>16</td><td>Urban Minor Arterial</td></tr>
<tr><td>2</td><td>Collector</td><td>Urban</td><td>17</td><td>Urban Collector</td></tr>
<tr><td>1</td><td>Local</td><td>Urban</td><td rowspan="2">19</td><td rowspan="2">Urban Local</td></tr>
<tr><td>0</td><td>Centroid connector</td><td>Urban</td></tr>
</table>

Appendix B. Crosswalk between ATR Length Bins, FHWA Vehicle Classes, and MOVES Source Types

ATR Length Bin	ATR Length Bin Range	FHWA Vehicle Class	FHWA Vehicle Class Description	MOVES Source Type ID	MOVES Source Types
1	0–5.9 ft	1	Motorcycles	11	Motorcycle
2	6–22.9 ft	2	Passenger Cars	21	Passenger Car
		3	Other Two-Axle, Four-Tire, Single-Unit Vehicles	31	Passenger Truck
				32	Light Commercial Truck
3	23–39.9 ft	4	Buses	41	Intercity Bus
				42	Transit Bus
				43	School Bus
		5	Two-Axle, Six-Tire, Single-Unit Trucks	51	Refuse Truck
				52	Single Unit Short-haul Truck
				53	Single Unit Long-haul Truck
				54	Motor Home
		6	Three-Axle, Single-Unit Trucks	51	Refuse Truck
				52	Single Unit Short-haul Truck
				53	Single Unit Long-haul Truck
				54	Motor Home
		7	Four-or-More Axle, Single-Unit Trucks	51	Refuse Truck
				52	Single Unit Short-haul Truck
				53	Single Unit Long-haul Truck
				54	Motor Home
4	40–69.9 ft	8	Four-or-Less Axle, Single-Trailer Trucks	61	Combination Short-haul Truck
				62	Combination Long-haul Truck
		9	Five-Axle, Single-Trailer Trucks	61	Combination Short-haul Truck
				62	Combination Long-haul Truck
		10	Six-or-More Axle, Single-Trailer Trucks	61	Combination Short-haul Truck
				62	Combination Long-haul Truck
5	>70 ft	11	Five-or-Less Axle, Multi-Trailer Trucks	61	Combination Short-haul Truck
				62	Combination Long-haul Truck
		12	Six-Axle, Multi-Trailer Trucks	61	Combination Short-haul Truck
				62	Combination Long-haul Truck
		13	Seven-or-More Axle, Multi-Trailer Trucks	61	Combination Short-haul Truck
				62	Combination Long-haul Truck

Appendix C. ITD Statewide Vehicle Classification Data

CLASSIFICATION DATA 2009 THROUGH 2011
MANUAL AND DIAMOND SCALE
ALL LOCATIONS

15:49 MONDAY, APRIL 16, 2012 1

PERCENTAGES	SCHEME F CATEGORIES												
FNCT_CD	MTRCYC	CAR	PU/VAN	BUS	2 AX TRK	3 AX TRK	4 OR + AX 1 UNIT	4 OR - AX TRK/TR-LR	5 AX TRK/TR-LR	6 OR + AX TRK/TR-LR	5 OR - AX MULTI TRLR	6 AX MULTI TRLR	7 OR + AX MULTI TRLR
RURAL INTERSTATE	0.52	33.14	31.58	0.32	4.82	0.66	0.05	3.86	17.48	3.37	0.40	0.43	3.38
RURAL PRINCIPAL ARTERIAL	1.88	44.08	37.27	0.48	5.99	0.84	0.07	1.80	4.74	1.87	0.08	0.08	0.83
RURAL MINOR ARTERIAL	1.44	44.01	41.17	0.22	6.36	1.41	0.07	1.26	2.05	1.29	0.09	0.04	0.59
RURAL MAJOR COLLECTOR	1.24	44.78	42.08	0.81	5.94	2.00	0.04	0.64	1.52	0.76	0.02	0.01	0.15
RURAL MINOR COLLECTOR	1.81	26.87	48.30	2.49	4.20	3.85	0.00	0.91	4.08	5.10	0.00	0.11	2.27
LOCAL ROAD	0.86	32.80	42.87	0.18	9.46	6.08	0.00	0.68	2.27	2.27	0.18	0.06	2.27
URBAN P.A. INTERSTATE	0.01	31.24	26.03	0.39	4.34	0.61	0.01	1.97	26.87	3.75	1.35	0.28	3.16
URBAN PRINCIPAL ARTERIAL	2.77	52.41	36.20	0.23	4.33	1.01	0.23	1.02	0.78	0.51	0.11	0.17	0.24
URBAN MINOR ARTERIAL	0.57	56.93	36.15	0.44	3.52	0.36	0.17	0.68	0.39	0.22	0.11	0.26	0.21
URBAN COLLECTOR	0.90	53.06	38.47	0.49	4.77	0.50	0.05	0.59	0.67	0.26	0.10	0.04	0.11
LOCAL SYSTEM	1.11	52.61	39.70	0.00	5.94	0.00	0.00	0.40	0.24	0.00	0.00	0.00	0.00
ALL	1.42	47.41	37.40	0.43	5.15	0.90	0.10	1.37	3.65	1.20	0.12	0.14	0.71

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Appendix B. Procedure for Revising MVEBs for PVNAA to Reflect MOVES and Paved Road Dust Model Changes

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Procedure for Revising MVEBs for PVNAA to Reflect MOVES and Paved Road Dust Model Changes

Introduction

The 2004 State Implementation Plan (SIP) for the Portneuf Valley Nonattainment Area (PVNAA) established motor vehicle emission budgets (MVEB) for 2005, 2010, and 2020 (DEQ 2004). The existing MVEBs were developed consistent with the emission inventory and attainment demonstration that showed future compliance with the National Ambient Air Quality Standards (NAAQS) for particulate matter with a diameter less than 10 microns (PM_{10}). The existing MVEBs established in the 2003 PVNAA SIP are shown in Table 1.

Table 1. Existing MVEB established in 2004 PVNAA SIP.

Year	PM_{10} (TPY)	NO_x (TPY)	VOC (TPY)
2005	897	1,575	983
2010	1,120	1,085	716
2020	1,364	514	585

Notes: motor vehicle emission budget (MVEB); Portneuf Valley Nonattainment Area (PVNAA); State Implementation Plan (SIP); particulate matter with a diameter less than 10 microns (PM_{10}); tons per year (TPY); nitrogen oxides (NO_x); volatile organic compound (VOC)

The existing budgets include on-road mobile emissions computed using MOBILE5, paved road dust emissions computed using the 1995 version of the AP-42 paved road dust emission factor methodology (EPA 1995), and a small amount of unpaved road dust emissions from the few remaining unpaved roads in the area. The United States Environmental Protection Agency (EPA) required the use of Motor Vehicle Emission Simulator (MOVES) (EPA 2009, 2011a) by March 2013 and a revised AP-42 paved road dust methodology (EPA 2011b) by February 2013 for all SIP documents and conformity tests. As a result, the Bannock Transportation Planning Organization (BTPO) is required to conduct their conformity tests using the new methods. To ensure that a model-only change does not cause BTPO to fail the conformity test, the Idaho Department of Environmental Quality (DEQ) is revising the existing SIP MVEBs (DEQ 2004) to reflect changes in the future year emission estimates that result strictly from the changes caused by the model/method used. The revised on-road motor vehicle emissions were developed by DEQ in 2013 using BTPO's latest Travel Demand Model (TDM) and planning assumptions for 2011 and 2020 (DEQ 2013). The purpose of this analysis is to compute revised MVEBs for the period from 2010 to 2020, and for 2020 and beyond to replace the 2004 MVEBs shown in Table 1 and to demonstrate that the revised MVEBs are equivalent to the existing MVEBs in terms of the net PM_{10} projected to be contributed to the airshed, including PM_{10} formed by the reaction of precursor gases, which produce secondary inorganic aerosol and contribute to the total PM_{10} in the airshed. As long as the new MVEBs do not result in greater total PM_{10} contribution to the PVNAA airshed than the existing MVEBs, and the growth factors and control strategy assumptions used in the original SIP future year projections remain valid, such that the overall conclusions of the SIP attainment demonstration still hold, the other (nonmobile) categories of the emission inventory and demonstration do not need to be revisited (EPA 2012a).

Development of Revised MOVES and Paved Road Dust Emission Inventory

The on-road mobile emission inventory for the PVNAA was updated for 2011 and 2020 as described by DEQ (2013). Emissions estimates for 2010 were not made, however, because newer information was available for 2011 as a result of the 2011 National Emission Inventory (NEI) project. DEQ used SIP-quality, county-level MOVES inputs (EPA 2012b) for the 2011 NEI so that it would be adequate for SIP documentation purposes. Then in early 2013, DEQ updated the 2011 NEI inputs to reflect activity data from the PVNAA TDM developed by BTPO. As a result, the more recent 2011 emissions will be used to replace the existing 2010 MVEBs because 2010 is no longer of interest, and the more recent model year is more relevant and timely. Nevertheless, the combined growth rate for the two cities in the PVNAA, Chubbuck and Pocatello, from 2010 to 2011 is estimated to be 0.6% (US Census 2013) so the 2010 and 2011 estimates are virtually equivalent in time and population and may be considered interchangeable. The SIP-level MOVES inputs developed for the 2011 NEI include source population data from the Idaho Department of Motor Vehicles, traffic temporal information from permanent automatic traffic recorders and bus and refuse truck local survey information (DEQ 2013). The MOVES modeling results are shown in Table 2 for the milestone years 2011 and 2020. In addition, road dust emissions are shown in Table 3 for the same two years, estimated using the 2011 AP-42 paved road dust emission factor method (EPA 2011b). The 2011 AP-42 method replaced the 1995 AP-42 paved road dust method in January 2011, and EPA required its use for any work after February 2013, so DEQ revised the paved road dust emissions to be consistent with any future conformity test that BTPO conducts. The few remaining unpaved roads that were modeled in the 2004 emission inventory have been paved since 2004 and no unpaved road emissions remain in the PVNAA, so unpaved road emissions are set to zero. MOVES and AP-42 paved road dust PM_{10} emissions are shown in Table 3 along with the total direct PM_{10} emissions from both sources.

Table 2. On-road mobile source (MOVES) emissions for 2011 and 2020 (DEQ 2013).

Year	NO_x	SO_2	VOC	CO	PM_{10}	$PM_{2.5}$	NH_3
	(tons per year)						
2011	1,323	4.4	876	9,529	64.8	51.4	17.9
2020	651	4	495	6,643	41	27.6	12.7

Notes: Motor Vehicle Emission Simulator (MOVES); nitrogen oxides (NO_x); sulfur dioxide (SO_2); volatile organic compound (VOC); carbon monoxide (CO); particulate matter with a diameter less than 10 microns (PM_{10}); particulate matter with a diameter less than 2.5 microns ($PM_{2.5}$); ammonia (NH_3)

Table 3. Paved road dust PM_{10} emissions, MOVES emissions, and total direct PM_{10} emissions for model years 2011 and 2020 (DEQ 2013).

Year	Paved Road Dust PM_{10} (TPY)	MOVES PM_{10} (TPY)	Total Direct PM_{10} Emissions
	(tons per year)	(tons per year)	(tons per year)
2011	316.9	64.8	382
2020	337.5	41	378

A direct comparison of the updated MOVES and paved road emissions (DEQ, 2013) with the existing MVEB established in the 2004 SIP is shown in Table 4. The 2011 PM_{10} emission estimates in Table 4 include the direct PM_{10} emissions from MOVES (consisting of exhaust particulate, brake wear and tire wear) combined with PM_{10} from revised paved road dust computations (DEQ, 2013). Only those pollutants that can significantly contribute directly to particulate matter levels in the atmosphere, or indirectly, through photochemical reactions are included in the motor vehicle budgets: Direct PM_{10}, nitrogen oxides (NO_x) and Volatile Organic Carbon compounds (VOCs). The NO_x and VOCs form ammonium nitrate (NH_4NO_3) "*secondary aerosol*" by photochemical reaction in the atmosphere. Ammonia (NH_3), another precursor to ammonium nitrate is not included in the motor vehicle emission budget because vehicles exhaust extremely small amounts, and it is so plentiful in the western U.S. atmosphere that it is generally considered always available for reaction and relatively invariant in the atmosphere. In addition, sulfur dioxide (SO_2) may contribute to formation of the secondary aerosol ammonium sulfate ($(NH_4)_2SO_4$), however motor vehicles produced very little SO_2 in 2004 (<1% of the total sulfur dioxide inventory) so it was not included in the 2004 MVEBs. Lower fuel sulfur standards have resulted in even less motor vehicle SO_2 since 2004. Carbon monoxide is a gas and plays no significant role in the photochemical production of secondary PM_{10} so it too is not considered further.

In the Table 4 summary, the second column shows the emission estimates revised in 2013 in comparison to the existing MVEB in the third column. The final column shows the difference for each pollutant. Both NO_x and VOC emissions are higher in the 2011 results than the existing MVEBs due to the change in model, while in 2020, only the NO_x emissions are higher; the VOC emissions are slightly lower. In both cases, the total PM_{10} emissions are well below the existing SIP MVEB levels. This large difference results primarily from using the more recent paved road dust estimation method and the newer silt loadings recommended by EPA in the new AP-42 method (EPA, 2011), rather than the 1995 AP-42 method and locally measured silt loadings (Light, 1998) based on measurements made in 1996/1997. Significant changes in road sanding operations occurred beginning in 1995 when road sanding agreements with the local city and county road departments established a much higher level of road dust controls including salt addition to replace portions of the sand, and street sweeping trucks to remove residual road dust after winter storms. DEQ believes those changes in road sanding practices from 1996 to 2011 made the Pocatello area silt loadings comparable to other cities across the nation, a significant benefit of the SIP process. As a result, DEQ believes the recommended nationwide silt loadings in the 2011 AP-42 paved road dust methodology are more representative of the PVNAA roadways than the 1996/1997 silt loading measured by Light (1998) prior to any significant road sanding control measures. These revised silt loadings are more realistic because they account for the typically higher nationwide road silt associated with normal wintertime road sanding conditions but with silt levels that vary with the amount of traffic (e.g., restricted access interstates have much less silt and local roads have more).

The 2013 revised emissions show some reductions in direct PM_{10} emissions and secondary aerosol precursors (including VOC in 2020) and some increases in secondary aerosol precursors (VOC in 2010 and NO_x in 2010 and 2020). As a result, it was not immediately obvious what the net effect will be on the final airshed concentrations of PM_{10}. The following section discusses a conservative approach for reconciling the new emission estimates with the net effect the emissions will have on the airshed, thereby putting the new estimates on a common basis with the existing MVEBs from the 2004 SIP.

Table 4. Direct comparison of 2013 on-road emission totals with existing SIP MVEB in tons per year (DEQ 2004).

	Existing SIP MVEB	2013 Estimates Based on BTPOs 2011 TDM	Difference, Existing SIP MVEB—2013 Estimates
Year	**2010**	**2011[a]**	**2010/2011**
NO_x	1,085	1,323	-238
VOC	716	876	-160
PM_{10}	1,120	382	738
Total	2,921	2,581	—
Year	**2020**	**2020**	**2020**
NO_x	514	651	-137
VOC	585	495	90
PM_{10}	1364	379	986
Total	2,463	1,525	—

a. The 2011 year estimates are more up-to-date and therefore are used to replace 2010.
Notes: State Implementation Plan (SIP); motor vehicle emission budget (MVEB); Bannock Transportation Planning Organization (BTPO); Travel Demand Model (TDM); nitrogen oxides (NO_x); volatile organic compound (VOC); particulate matter with a diameter less than 10 microns (PM_{10});

Calculation of Net PM_{10}

To determine the effect of emission reductions on the PM_{10} concentrations in the PVNAA airshed, the method used to demonstrate attainment in the 2004 SIP must be considered. CALPUFF dispersion modeling with chemical reaction and Speciated Linear Rollback Modeling were used to demonstrate attainment in the 2004 SIP, both based on the assumption that any change in emissions for any single species, either a primary or secondary pollutant, has a directly linear effect on the concentrations of PM_{10} in the airshed. For direct PM_{10} emissions, the effect on PM_{10} concentrations above the regional background level is directly proportional to the relative change in emissions. For the NO_x emissions, the actual effect is uncertain because it depends on the rate of photochemical transformation of NO_x into NH_4NO_3, a solid particle less than 10 micrometers in size at wintertime temperatures. However, we can say unequivocally that the *maximum* amount of PM_{10} that can be formed in the atmosphere from each ton of NO_x emissions can be determined based on stoichiometric calculations reflecting the overall transformation process. A simplified representation of the photochemical process is shown in Equation 1. In this process, it should be noted that (a) only one NH_4NO_3 molecule can be formed for each NO_x molecule, (b) ammonia plays a role in forming NH_4NO_3 but is not considered further since the atmosphere is rich in NH_3 and thus has little effect on the extent or rate of NH_4NO_3 formation; and (c) VOCs participate in the chemistry and are essential in determining the overall rate and extent of this transformation; however, carbon does not appear on the right-hand side of the reaction as a part of the NH_4NO_3 particulate formed in the atmosphere, and motor vehicle VOCs produce no significant PM_{10} in the atmosphere on their own accord.

$$NO_x + VOCs + NH_3 + \text{solar UV light} \rightarrow NH_4NO_3$$

Equation 1. Ammonium nitrate formation.

Since one molecule of NO_x (NO or NO_2) forms one molecule of NH_4NO_3, the maximum amount of PM_{10} as NH_4NO_3 that can be formed from 1 ton of NO_x, under any circumstances is therefore determined stoichiometrically by Equation 2:

$$\text{Tons of } PM_{10} \text{ as } NH_4NO_3 = \text{tons } NO_x \times (80/31.6) = \text{tons } NO_x \times 2.53$$

Equation 2. 100% NO_x to PM_{10} formula.

Where the ratio (80/31.6) reflects the ratio of molecular weights of NH_4NO_3 (80) and NO_x (31.6), assuming the NO_x consists of 90% nitric oxide (NO) and 10% nitrogen dioxide (NO_2), the composition of NO_x emissions in the MOVES model, reflecting tail-pipe measurements used by EPA in the formulation of the MOVES model (EPA 2010). Thus, although 100% NO_x conversion to NH_4NO_3 does not occur in practice, we can say with absolute certainty that it is not possible for greater than 100% conversion and therefore, adopting it is a conservative assumption. It should be noted that there is also a night-time mechanism for forming nitrate aerosol from NO_x emissions; however, the same rule applies: one NO_x molecule can only produce one NH_4NO_3 molecule, and the conversion described in Equation 2 describes the maximum amount of PM_{10} formed as NH_4NO_3 regardless of the chemical mechanism involved.

EPA (2008) and others (Boylan and Kim 2012) have estimated the likely atmospheric conversion rates of NO_x to NH_4NO_3, since it is of regulatory interest when considering interpollutant trading in nonattainment areas. EPA's initial $PM_{2.5}$ implementation guidance early in the program (EPA 2008) suggested that a 100:1 interpollutant trading ratio (IPTR) (100 tons NO_x to 1 ton $PM_{2.5}$) was appropriate for the western United States; however, EPA withdrew their 2008 suggested IPTRs in 2011 and required that IPTRs must be locally determined using photochemical models (McCarthy 2011). A recent Federal Register notice (FR 41349, July 13, 2011) indicates that EPA proposes to approve a western United States location-specific NO_x to $PM_{2.5}$ IPTR of 9:1 for the San Joaquin Valley of California. This is less than one-third of the PM_{10} formation rate that corresponds to DEQ's 100% conversion assumption (which is effectively equivalent to a 2.53:1 IPTR, in tons NO_x:ton $PM_{2.5}$, PM_{10} being equivalent to $PM_{2.5}$ for the purposes of this discussion.) In view of the more realistic conversion rate such as 9:1, DEQ's *100% conversion* bounding assumption is very conservative. Should it become necessary, DEQ would pursue development of a local IPTR for the PVNAA; however, since MVEB equivalency is confirmed assuming 100% conversion, such a significant effort does not currently appear necessary.

The quantity of VOC emissions can affect the actual conversion rate of NO_x to NH_4NO_3, as discussed above, however, once we assume that 100% of the NO_x converts instantaneously in the atmosphere to NH_4NO_3, then no amount of VOC can have any additional effect in increasing the conversion rate or extent of conversion of NO_x into NH_4NO_3 or PM_{10}. As a result, the quantity of VOC emissions drops out of the computation for determining the net PM_{10} production. Thus the VOC emission budget will be the MOVES VOC estimate for the appropriate year with the same safety factors applied to the NO_x and PM_{10} budgets.

Based on the above discussion of net PM_{10}, the Table 4 comparison of the 2013 emission estimates with the existing MVEB from the 2004 SIP can be rearranged to show the net effects on PM_{10}. The rearranged table reflecting net PM_{10} emissions due to both direct PM_{10} emissions and NO_x precursor emissions is shown in Table 5. In Table 5, VOC is not shown and the NO_x emissions have been translated (using Equation 2) into *secondary PM_{10}*. Now it is clear, from the *total PM_{10}* values, that for both 2011 and 2020 model years, the 2013 PM_{10} estimates are lower than the total PM_{10} associated with the MVEB established by the 2004 PVNAA SIP. Therefore, the model changes implemented in 2013 resulted in lower net PM_{10} in the airshed and are thus approvable as a SIP revision without consideration of the overall emission inventory and without revisiting the attainment demonstration.

Table 5. Comparison of 2013 on-road emissions with 2004 MVEBs in terms of net PM_{10}, including primary and secondary particulate, assuming 100% NO_x conversion.

	2013 Estimates with 100% NO_x Conversion Rate	**Existing SIP MVEB with 100% NO_x Conversion Rate**	**Difference, Existing SIP MVEB—2013 Estimates**
Year	**2011**	**2010**	**2010/2011**
Secondary PM_{10} produced from NO_x and VOC	3,347	2,745	-602
Primary PM_{10}	382	1,120	738
Total PM_{10}	3,729	3,865	136
Year	**2020**	**2020**	**2020**
Secondary PM_{10} produced from NO_x and VOC	1,647	1,300	-347
Primary PM_{10}	379	1,364	986
Total PM_{10}	2,026	2,664	639

Notes: motor vehicle emission budget (MVEB); particulate matter with a diameter less than 10 microns (PM_{10}); nitrogen oxides (NO_x); volatile organic compound (VOC)

Safety Factor

The preceding section demonstrates that the revised MVEBs resulting from EPA-mandated changes in the on-road and paved road dust emission models results in lower net PM_{10} in the airshed. However, if the updated emissions estimates were used directly as MVEBs, then any minor model input differences in future conformity tests could potentially cause the Transportation Improvement Program (TIP) emissions estimates to exceed the updated budgets without any actual increase in activity or emissions. To avoid this potential problem, *safety factors* are typically built into the MVEBs to the extent that can be tolerated while still demonstrating future year NAAQS compliance in the attainment demonstration, or in this case, without exceeding the existing MVEB. Since the existing SIP MVEB is consistent with an overall emission inventory and approved attainment demonstration model showing future year compliance with the NAAQS (DEQ 2004), the revised *model change* MVEBs will remain consistent with the attainment demonstration as long as it does not exceed the effective PM_{10} contributed to the airshed attributed to the existing MVEB. Thus, the small differences shown in Table 5 between the *Existing SIP MVEB* total PM_{10} and the *2013 Estimates* total PM_{10} (136 TPY in 2010 and 639 TPY in 2020) represent *extra* PM_{10} reductions and, therefore, may be used to provide some minimal safety factor in the new MVEBs. The procedure for determining an allowable safety factor that does not cause the new MVEB to exceed the existing MVEB in terms of its net contribution to PM_{10} in the airshed is represented in Table 6 through Table 8. Again it is important to note that the *extra* reductions *converted* to safety factor come only from the lower motor vehicle emission estimates, not from other emission categories, so a reassessment of the nonmotor vehicle emission inventory and the attainment demonstration is not required.

To ensure that the MVEB is protective for any TIP that must be evaluated during the period from 2010 to 2019, it is critical to conservatively select the highest component for each pollutant that occurs in the period (i.e., from either 2010 or 2020). For VOC and NO_x, that means that the emissions for 2011 must be used because these two pollutants are highest in 2011 and lowest in 2020. For PM_{10}, the selection is not as clear because the MOVES PM_{10} emissions are higher in 2011 (65 TPY) than they are in 2020 (41 TPY), while the road dust emissions are higher in 2020 (338 TPY) than they are in 2011 (317 TPY), as shown in Table 2 and Table 3, respectively. Thus to ensure that the highest projected direct PM_{10} emissions are used in the MVEBs to conservatively represent any year in between the two milestone years, the 2011 MOVES PM_{10} (65 TPY) is added to the 2020 paved road dust PM_{10} (338 TPY) resulting in a hypothetical maximum total direct PM_{10} emission estimate of 403 TPY as shown highlighted in Table 6.

To reexamine the net effect on airshed PM_{10} contributions after identifying the maximum emission levels for the period 2011–2020 (shaded grey in Table 6), we must again assume that 100% of the NO_x may convert to PM_{10} in the form of NH_4NO_3 as shown in Table 7. The 2011 *Maximum 2013 Estimates* shown in Table 7, representing the total net PM_{10} emission estimates are again lower than the existing MVEBs, now by 115 tpy, or 3.1% in 2011 and by 639 tpy or 31.5% in 2020. These differences in net PM_{10} emissions may then be translated into "*safety factor*" additions to the estimated emissions without causing the 2013 total PM_{10} estimates to exceed the existing (2004 SIP) MVEB total PM_{10}. Thus, the motor vehicle emission projections may be increased by 3.1% in 2011 and 31.5% in 2020. The 2011 safety factor of 3.1% is not normally adequate, but since the first TIP submittal that must demonstrate conformity will be the 2015 TIP, the effective safety factor for that modeling year, by interpolation between 3% and 31.5%, would be approximately 13%, a somewhat more reasonable, yet still narrow margin of safety. Nevertheless, due to other conservative features of this analysis, DEQ is confident that these safety factors will be adequate.

Table 6. Maximum emissions for the 2011–2020 period.

	Maximum 2013 Estimates	Existing SIP MVEB	Difference
Year	**2011**	**2010**	**2010/2011**
NO_x	1,323	1,085	-238
VOC	876	716	-160
PM_{10}	403	1,120	717
Year	**2020**	**2020**	**2020**
NO_x	651	514	-137
VOC	495	585	90
PM_{10}	379	1364	986

Table 7. Maximum Net PM_{10} emissions for the 2011–2020 period assuming 100% NO_x conversion.

	Maximum 2013 Estimates with 100% Conversion Rate (TPY)	Existing SIP MVEB with 100% Conversion Rate (TPY)	Difference (TPY)
Year	**2011**	**2010**	**2010**
Secondary PM_{10} produced from NO_x and VOC	3,347	2,745	-602
Primary PM_{10}	403	1,120	717
Total PM_{10}	3,750	3,865	115
% Available as Safety Factor	= 115 TPY/3,750 TPY		= 3.1%
Year	**2020**	**2020**	**2020**
Secondary PM_{10} produced from NO_x and VOC	1,647	1,300	-347
Primary PM_{10}	379	1,364	986
Total PM_{10}	2,026	2,664	639
% Available as Safety Factor	= 639 TPY/2,026 TPY		= 31.5%

Notes: particulate matter with a diameter less than 10 microns (PM_{10}); nitrogen oxides (NO_x); tons per year (TPY); State Implementation Plan (SIP); motor vehicle emission budget (MVEB); volatile organic compound (VOC)

Finally, the explicit safety factors of 3.1% in 2011 and 31.5% in 2020 are applied to the 2013 emission estimates of Table 6 to provide a *New SIP MVEB* highlighted in Table 8. In this table, the *Maximum 2013 Estimates* in Table 6 were increased, by 3% for 2011 and by 31.5% in 2020, then entered in Table 8 as the *New SIP MVEB*.

Table 8. New SIP MVEBs including safety factor compared to existing MVEBs.

	Existing SIP MVEB	New SIP MVEB	Difference, New MVEB—Existing MVEB
Year	**2010**	**2011**	**2010/2011**
NO_x	1,085	1,364	279
VOC	716	903	187
PM_{10}	1,120	415	-705
Year	**2020**	**2020**	**2020**
NO_x	514	856	342
VOC	585	651	66
PM_{10}	1,364	498	-866

Notes: State Implementation Plan (SIP); motor vehicle emission budget (MVEB); nitrogen oxides (NO_x); volatile organic compound (VOC); particulate matter with a diameter less than 10 microns (PM_{10})

As a final step in the process of setting new MVEBs, the new values are tested to demonstrate that the net effect on the PVNAA airshed PM_{10} levels, after applying the safety factors, will be equivalent to the existing MVEB established in the 2004 SIP. The net PM_{10} is once more computed, assuming 100% conversion of NO_x to PM_{10} as shown in Table 9. Table 9 demonstrates that the total PM_{10} in the *New SIP MVEB* budget for PVNAA is equivalent to the *Existing SIP MVEB* established in the 2004 SIP, as the difference between the two is zero in both 2010/2011 and 2020.

Table 9. New versus existing SIP MVEBs equivalence check in terms of net PM_{10} contribution to PVNAA.

	Existing SIP MVEB	New SIP MVEB	Difference, New MVEB—Existing MVEB
Year	**2010**	**2011**	**2010/2011**
Secondary PM_{10} produced from NO_x	2,745	3,450	705
Primary PM_{10}	1,120	415	-705
Total PM_{10}	3,865	3,865	0
Year	**2020**	**2020**	**2020**
Secondary PM_{10} produced from NO_x	1,300	2,167	866
Primary PM_{10}	1,364	498	-866
Total PM_{10}	2,664	2,664	0

Notes: State Implementation Plan (SIP); motor vehicle emission budget (MVEB); particulate matter with a diameter less than 10 microns (PM_{10}); Portneuf Valley Nonattainment Area (PVNAA); nitrogen oxides (NO_x)

New Motor Vehicle Emission Budget for the Period 2011–2020 and Beyond 2020

The analysis above demonstrates that model changes resulting from the use of the MOVES2010b model and the 2011 paved road dust method results in new MVEBs that are equivalent to the existing MVEBs in terms of PM_{10} contributions to the PVNAA airshed. The resulting MVEB for this period is shown in Table 10. Conformity tests for any TIPs conducted from 2015 through 2019 will be required to meet the budget shown for 2011 (Recall that the 2011 PM_{10} includes the maximum [2011] MOVES emissions plus the maximum (2020) paved road dust emissions). Any TIP conducted in 2020 and beyond will be required to meet the budget shown for 2020.

Table 10. New motor vehicle emission budgets for the PVNAA.

Year	PM_{10} (TPY)	NO_x (TPY)	VOC (TPY)
2005	N/A	N/A	N/A
2011	415	1,364	903
2020	498	856	651

Notes: Portneuf Valley Nonattainment Area (PVNAA); particulate matter with a diameter less than 10 microns (PM_{10}); tons per year (TPY); nitrogen oxides (NO_x); volatile organic compound (VOC); not applicable (N/A)

References

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Appendix C. 2004 SIP Emission Inventory with Updated On-road Mobile Emissions

Table 1. SIP 2004 emission Inventory with updated on-road mobile emissions (shaded).

Source Category	Original Emissions (DEQ 2004)[a]			Updated Emissions (DEQ 2013)[b]		
	MOBILE5 & 1995 Paved Road Dust			MOVES & 2011 Paved Road Dust		
2000 EI	**PM_{10}**	**VOC**	**NO_x**	**PM_{10}**	**VOC**	**NO_x**
Point	640.8	230.3	924.9	Not updated		
Area	980.3	1,610.1	181.9			
Non-road	41.4	255.4	823.0			
On-Road Mobile	768.6	1,186.7	1,677.8			
Total	**2,431.0**	**3,282.4**	**3,607.4**			
2005 EI	**MOBILE5 & 1995 Paved Road Dust**					
Point	622.2	106.4	538.3	Not updated		
Area	1,006.2	1,683.2	191.8			
Non-road	41.1	217.5	680.7			
On-Road Mobile	904.4	890.0	1,380.2			
Total	**2,573.8**	**2,897.0**	**2,791.0**			
2010 EI	**MOBILE5 & 1995 Paved Road Dust**			**MOVES & 2011 Paved Road Dust**		
Point	622.3	106.4	538.3	622.3	106.4	538.3
Area	1032.0	1756.3	201.7	1,032.0	1,756.3	201.7
Non-road	40.4	183.0	596.4	40.4	183.0	596.4
On-Road Mobile	1019.0	629.9	964.5	381.7	876.0	1,323.0
Total	**2713.7**	**2675.5**	**2300.8**	**2,076.4**	**2,921.6**	**2,659.4**
2015 EI	**MOBILE5 & 1995 Paved Road Dust**					
Point	622.2	106.4	538.3	Not updated		
Area	1,057.9	1,829.4	211.6			
Non-road	42.2	184.5	578.5			
On-Road Mobile	1,138.5	480.8	618.6			
Total	**2,860.8**	**2,601.1**	**1,947.0**			
2020 EI	**MOBILE5 & 1995 Paved Road Dust**			**MOVES & 2011 Paved Road Dust**		
Point	622.2	106.4	538.3	622.2	106.4	538.3
Area	1,089.8	1,902.5	221.5	1,089.8	1,902.5	221.5
Non-road	44.5	195.7	579.4	44.5	195.7	579.4
On-Road Mobile	1,258.8	415.3	452.7	378.5	495.0	651.0
Total	**3,015.4**	**2,619.9**	**1,792.0**	**2,135.0**	**2,699.6**	**1,990.2**

Notes:
State Implementation Plan (SIP); Motor Vehicle Emission Simulator (MOVES); emission inventory (EI); particulate matter with a diameter less than 10 microns (PM_{10}); volatile organic compound (VOC); nitrogen oxides (NO_x)

a. DEQ (Idaho Department of Environmental Quality). 2004. *Portneuf Valley PM_{10} Nonattainment Area State Implementation Plan, Maintenance Plan and Redesignation Request.* Pocatello, ID: DEQ.

b. DEQ (Idaho Department of Environmental Quality). 2013. *Development of the Year 2011 and Year 2020 Mobile Source Emissions Inventories for the Portneuf Valley Non-Attainment Area, Idaho*. Boise, ID: DEQ.

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Appendix D. Public Involvement

Public Notice

NOTICE OF 30-DAY PUBLIC COMMENT PERIOD AND PUBLIC HEARING REGARDING THE PROPOSED REVISION TO THE STATE IMPLEMENTATION PLAN FOR PM_{10} (coarse particulate matter) IN PORTNEUF VALLEY, IDAHO (CITIES OF POCATELLO AND CHUBBUCK)

Notice is hereby given that the State of Idaho Department of Environmental Quality (DEQ) has scheduled a public comment period from now through March 17, 2014. DEQ will conduct a public hearing on Tuesday, March 11, 2014, at 6:30 p.m. in the City of Pocatello City Council Chambers located at 911 N. 7th Ave., Pocatello, Idaho.

PROPOSED ACTION: DEQ is proposing to submit to the U.S. Environmental Protection Agency (EPA) an amendment to the State Implementation Plan (SIP) for PM_{10} (coarse particulate matter) in the Portneuf Valley Area. The intent of the amendment is to revise the Portneuf Valley PM_{10} SIP motor vehicle emissions budget (MVEB) by incorporating emission estimates made with the Motor Vehicle Emission Simulator (MOVES), the latest EPA-required motor vehicle emissions factor model and with an updatedAP-42 road dust estimation method. The revisions in this amendment only change emissions related to the MVEB and no changes are made to stationary or area source emissions.

AVAILABILITY OF MATERIALS AND PUBLIC HEARING: The draft SIP amendment is available for public review on the DEQ website at *www.deq.idaho.gov/public-comment-opportunities.*

Printed materials will be made available at the Marshall Public Library located at 113 S, Garfield Ave., Pocatello, Idaho, and the DEQ Regional Office in Pocatello located at 444 Hospital Way #300.

An informational meeting will be held at the City of Pocatello City Council Chambers on March 11, 2014, at 6:00 p.m. mountain time.

A public hearing will be held at the City of Pocatello City Council Chambers on March 11, 2014, at 6:30 p.m. mountain time. Oral and written testimony will be accepted at that time.

SUBMISSION OF WRITTEN COMMENTS–ASSISTANCE ON TECHNICAL QUESTIONS: Anyone may submit written comments regarding this proposal. To be most effective, comments should address air quality considerations and include supporting materials where available. Comments, requests, and questions regarding the public comment process, or technical assistance should be directed to Melissa Gibbs, Department of Environmental Quality, 444 Hospital Way #300, Pocatello, Idaho 83201, melissa.gibbs@deq.idaho.gov, or (208) 236-6160. Please reference "Portneuf Valley PM_{10} MOVES SIP amendment" when sending comments or requesting information.

All written comments concerning this proposal must be directed to and received by the undersigned on or before 5:00, p.m. mountain time, March 17, 2014.

DATED this 14th day of February, 2014.
Melissa Gibbs
Airshed Coordinator

Public Hearing

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PROOF OF PUBLICATION

STATE OF IDAHO
County of Bannock

LN21348 **KAREN MASON**

NOTICE OF 30-DAY PUBLIC COMMENT PERIOD AND PUBLIC HEARING REGARDING THE PROPOSED REVISION TO THE STATE IMPLEMENTATION PLAN FOR PM10 (coarse particulate matter) IN PORTNEUF VALLEY, IDAHO (CITIES OF POCATELLO AND CHUBBUCK)

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SUBMISSION OF WRITTEN COMMENTSASSISTANCE ON TECHNICAL QUESTIONS: Anyone may submit written comments regarding this proposal. To be most effective, comments should address air quality considerations and include supporting materials where

being first duly sworn on oath deposes and says: that SHE was at all times herein mention a citizen of the United States of America more than 21 years of age, and the Principal Clerk of the Idaho State Journal, a daily newspaper, printed and published at Pocatello, Bannock County Idaho and having a general circulation therein.
That the document or notice, a true copy of which is attached, was published in the said IDAHO STATE JOURNAL, on the following dates, to-wit:

_Feb._14__2014________2014
__________2014________2014
__________2014________2014
__________2014________2014

That said paper has been continuously and uninterruptedly published in said County for a period of seventy-eight weeks prior to the publication of said notice of advertisement and is a newspaper within the meaning of the laws of Idaho.

K. Mason

STATE OF IDAHO
COUNTY OF BANNOCK
On this 14th. of Feb. in the year of 2014, before me, a Notary Public, personally appeared KAREN MASON Known or identified to me to be the person whose name subscribed to the within instrument, and being by me first duly sworn declared that the statements therein are true, and acknowledge to me that he executed the same.

Notary of Public
Lore A. Sekot
Residing at Arimo exp. 3/3/2015

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21| Current Net Amount Due	22| 30 Days	60 Days	Over 90 Days
N/A	N/A	N/A	N/A

4| Page Number	5| Billing Date		6| Billed Account Number	7| Advertiser/Client Number
1	02/14/14	800868	113710 .	113710

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Due date: 03/01/14

21| Current Net Amount Due	22| 30 Days	60 Days	Over 90 Days	*Unapplied Amount	23| Total Amount Due
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24| Invoice Number	25| Advertiser Information 1| Billing Period	6| Billed Account Number	7| Advertiser/Client Number	2| Advertiser/Client Name
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CERTIFICATE OF HEARING

SUBJECT: Portneuf Valley PM10 State Implementation Plan

LOCATION: City of Pocatello City Council Chambers, Pocatello, Idaho

HEARING DATE: March 11, 2014

The undersigned designated hearing officer hereby certifies that on the 11th day of March, 2014, a public hearing on the proposed revisions to the Portneuf Valley PM10 State Implementation Plan was held at the City of Pocatello City Council Chambers in Pocatello, Idaho. The hearing commenced at 6:30 p.m. and was adjourned at 7:30 p.m. Members of the public attended the hearing but did not wish to present oral testimony.

Notice of this hearing appeared in the Idaho State Journal on February 14, 2014.

DATED this 11th day of March, 2014.

Mark Petersen
Hearing Officer

SIGN-IN ROSTER FOR PUBLIC HEARING

Public Hearing on Portneuf Valley PM10 State Implementation Plan

LOCATION: City of Pocatello City Council Chambers, Pocatello, Idaho

DATE: March 11, 2014

NAME (PLEASE PRINT)	EMAIL ADDRESS AND/OR MAILING ADDRESS	ORGANIZATION REPRESENTED (IF ANY)	DO YOU WISH TO TESTIFY? (YES/NO)
MORI Byington	MORI@bannockplanning.org	BTPO	NO
Hannah Sanger	hsanger@pocatello.us	City Poc.	No
JEN COLE	jennifer.cole@deq.idaho.gov	IDEQ	NO
RALPH PAUL	RALPH.PAUL@deq.idaho.gov	IDEQ	NO

Public Comment and DEQ Response

DEQ received two comments during the public comment period held from February 14, 2014, through March 17, 2014. No public comments were submitted during the public hearing that was held on March 11, 2014. None of the comments received raised substantive issues requiring modification to the proposed SIP.

Comment 1: Mike (submitted via email) I'm not against clean air, Or controling pollution but lets not raise taxes or give penalties for family's or individual's that have a older car that may not meet the governments standards! A lot of people won't be able to afford more tax or a penaltie. I have never figured that equation out, your car pollutes so much so we are going to tax you or fine you!! Not sure how that fixes the problem!! It's always the same thing with government and enviromental agency's!! A new tax will fix the issue! I guess what I'm trying to say is stay out of the publics pocket!! We are all sick of the government taking our money to suppoy there little programs!! It was your Idea to add more restriction so figure out a way to do it without raising taxes!! Just stay out of my pocket!!!

Response to Comment 1: The amendment as proposed does nothing to raise taxes nor does it give penalties or require additional restrictions. The purpose of this amendment is to revise the Portneuf Valley PM10 Nonattainment Area State Implementation Plan, Maintenance Plan, and Redesignation Request (DEQ 2004) motor vehicle emissions budget (MVEB) by incorporating emission estimates made with the Motor Vehicle Emission Simulator (MOVES), the latest United States Environmental Protection Agency (EPA)-required motor vehicle emissions factor model (EPA 2009, 2011a) and with an updated road dust estimation method (EPA 2011b). The revisions in this amendment only change emission related to the MVEB and no changes are made to the point or area source emissions.

Comment 2: This comment was received from the Bannock Transportation Planning Organization. This letter is in support of the proposed revision and requests DEQ to submit to EPA as soon as possible.

BANNOCK
Transportation Planning
ORGANIZATION

210 East Center Street
P.O. Box 6129
Pocatello, Idaho 83205

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www.bannockplanning.org

March 5, 2014

Melissa Gibbs, Airshed Coordinator
DEQ Pocatello Regional Office
444 Hospital Way, #300
Pocatello, Idaho 83201

RE: Draft Portneuf Valley PM10 Maintenance Plan Amendment

Dear Ms. Gibbs;

The Bannock Transportation Planning Organization's (BTPO) Policy Board at their March 3, 2014 meeting voted to support the approval of the Portneuf Valley PM10 Maintenance Plan Amendment. The amendment has been reviewed by the BTPO Interagency Consultation Committee and the recommended changes to Motor Vehicle Emissions Budget and modeling procedures are consistent with the procedures used in the travel demand model and reflect best data collection practices. The use of AP-42 for road dust emission factors reflects the changes in road sanding procedures which have occurred in the region.

The proposed amendment is needed to allow BTPO to convert to the required Motor Vehicle Emissions Simulator (MOVES) for air quality conformity determination. BTPO would strongly urge the approval of the amendment by the Idaho Department of Environmental Quality as soon as possible for submission to the Environmental Protection Agency.

BTPO Policy Board would like to thank IDEQ for their efforts in developing the MOVES model for the Portneuf region and preparing this Maintenance Plan Amendment.

Thank you for your time and consideration in this matter.

Sincerely,

Mori R Byington.

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