Cache Valley $PM_{2.5}$ Nonattainment Area State Implementation Plan Amendment

Idaho Portion of the Logan UT-ID $PM_{2.5}$
Nonattainment Area

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1 Introduction

In this amendment, the *Cache Valley Idaho $PM_{2.5}$ Nonattainment Area State Implementation Plan* (SIP) (DEQ 2012) and *Cache Valley Idaho $PM_{2.5}$ Nonattainment Area State Implementation Plan Amendment* (DEQ 2014) are revised to address reasonable further progress (RFP), quantitative milestones (QMs), and the motor vehicle emission budget (MVEB) to demonstrate the Idaho-specific Logan Utah-Idaho (UT-ID) particulate matter 2.5 ($PM_{2.5}$) SIP satisfies federal $PM_{2.5}$ SIP requirements for RFP, QM, and MVEBs.

2 Background

As required by the Clean Air Act (CAA), the Idaho Department of Environmental Quality (DEQ) submitted the Cache Valley Idaho $PM_{2.5}$ SIP (DEQ 2012) to the United States Environmental Protection Agency (EPA) to address air quality in the Idaho portion of the Logan UT-ID $PM_{2.5}$ nonattainment area (NAA). The SIP was developed to meet the applicable requirements for the 2006 24-hour $PM_{2.5}$ National Ambient Air Quality Standard (NAAQS) in the area. The initial plan was submitted December 2012 to satisfy requirements in EPA's 2007 "Clean Air Fine Particle Implementation Rule" (72 FR 20586), which was based on the general NAA provisions in the CAA (Title I, Part D, Subpart 1). In December 2014, DEQ submitted the Cache Valley Idaho $PM_{2.5}$ SIP amendment (DEQ 2014) to amend the 2012 SIP and satisfy additional attainment plan requirements under the CAA (Title I, Part D, Subpart 4) according to the "Identification of Nonattainment Classification and Deadlines for Submission of State Implementation Plan (SIP) Provisions for the 1997 Fine Particle ($PM_{2.5}$) NAAQS and the 2006 $PM_{2.5}$ NAAQS" final rule (79 FR 31566).

On August 24, 2016, EPA issued the "Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements – Final Rule" (81 FR 58010), which was not available when DEQ submitted the 2012 SIP or 2014 SIP amendment. On October 27, 2016, EPA proposed to partially disapprove the moderate area plan for the Idaho portion of the Logan UT-ID $PM_{2.5}$ NAA (81 FR 74741), specifically, the RFP, QMs, and MVEB elements of the attainment plan. However, in that proposal, EPA stated, "if properly accounted for, reductions achieved by implemented control measures may be sufficient to demonstrate RFP in a QM report."

Based on newly available air quality monitoring data, on June 1, 2017, EPA proposed approving Idaho's attainment demonstration and 2014 MVEB as an early progress budget. Additionally, EPA proposed conditional approval of Idaho's RFP, QM, and revised MVEBs (82 FR 25208). On April 25, 2017, DEQ submitted a letter to EPA outlining our commitment to address those elements by August 1, 2018 (DEQ 2017). On August 8, 2017, EPA finalized conditional approval of Idaho's RFP, QM, and MVEB SIP elements, based on Idaho adopting and submitting updates to address those moderate area plan elements by August 1, 2018 (FR 82 37025). This submittal fulfills the obligation to address the RFP, QM, and MVEB SIP elements.

Although the attainment date for the Logan UT-ID $PM_{2.5}$ was December 31, 2015, EPA granted two 1-year extensions (CAA §188(d)), resulting in a new attainment date of December 31, 2017 (82 FR 42447).

3 Motor Vehicle Emission Budgets

A $PM_{2.5}$ SIP must identify not-to-be-exceeded limits on $PM_{2.5}$ and applicable precursors from on-road mobile sources. For this analysis, DEQ modeled the on-road vehicle emissions in Franklin County for calendar years 2015 and 2017 (Appendix A). The attainment year is 2015, and the year defined for RFP is 2017. Growth was estimated using automatic traffic recorder and census data. A MVEB is proposed that includes only the species contributing significantly to the formation of either primary or secondary $PM_{2.5}$ in the Idaho portion of the NAA. The budgets outlined in this section apply specifically to the Idaho side of the NAA. Additional budgets exist for the Utah side of the NAA.

The MVEB was determined for $PM_{2.5}$, nitrogen oxides (NO_x), and volatile organic compounds (VOC) emissions. As discussed in Appendix A, sulfur dioxide (SO_2) is an insignificant contributor to the secondary aerosol formation in the Logan UT-ID NAA and is not included. Although ammonia (NH_3) contributes to secondary aerosol formation, the region is NH_3 rich, so the very small mobile source NH_3 emissions are also not considered in MVEBs. Although originally thought a primary contributor to $PM_{2.5}$ concentrations, the analysis in Appendix A determined $PM_{2.5}$ emissions from paved road dust are not significant and will not be included in the MVEB.

The MVEB is comprised of on-road mobile sources and vehicle emissions (exhaust, tire, and brake wear). EPA's Motor Vehicle Emissions Simulator (MOVES) model was used to develop vehicle emissions estimates for the MVEB. The MVEB will apply when EPA determines the budget is adequate for transportation conformity. According to EPA's conformity rule, the emissions budget acts as a ceiling on emissions in the year for which it is defined or until a SIP revision modifies the budget.

Based on the on-road emissions estimated by MOVES, Table 1 shows the proposed Franklin County MVEB in tons per day.

Table 1. Motor vehicle emission budget for the Idaho side of the Cache Valley NAA.

Year	County	Pollutant (tons per day)		
		$PM_{2.5}$	NO_x	VOC
2015	Franklin	0.033	0.676	0.554
2017	Franklin	0.029	0.544	0.467

4 Reasonable Further Progress

4.1 Summary of Control Measures

As described in DEQ's commitment letter (DEQ 2017), Table 2 outlines the control measures included in the SIP (DEQ 2012) and SIP amendment (DEQ 2014).

Table 2. Summary of control measures.

EPA-Approved Control Measures for the Idaho Portion of the Logan UT-ID $PM_{2.5}$ NAA	Implementation Schedule	Estimated Reductions (uncontrolled-to-controlled emissions)	Quantitative Milestone Reporting Metric
Residential Woodstove Curtailment Program	Fully implemented summer and fall 2012	0.06 tons per day (tpd) direct $PM_{2.5}$, 0.009 tpd (NO_x, and 0.078 tpd (VOC) (DEQ 2012,Table 6)	Control measure implementation schedule—confirm measures were implemented. Date and Air Quality Index for all air quality advisories issued since program establishment.
Residential Woodstove Changeout Program	2006–2007, 2011–2012, and 2013–2014	0.05 tpd direct $PM_{2.5}$, 0.003 tpd NO_x, 0.13 tpd VOC. (DEQ 2014, Table 3)	Control measure implementation schedule—confirm measures were implemented. Number of woodstove replacements since 2006.
Road Sanding Agreements	July 16, 2012, and October 25, 2012	0.10 tpd direct $PM_{2.5}$ (DEQ 2012, Table 7)	Control measure implementation schedule—confirm measures were implemented. Annual wintertime sand and salt volumes (yards) and ratios since program inception in 2012.

In the following sections, each control measure is described, and evidence is presented to document how DEQ successfully implemented each control measure.

4.2 Woodstove Curtailment

Residential wood combustion (RWC) ordinances were adopted within Franklin County and six Idaho cities that lie within the Idaho side of the Cache Valley (Franklin, Preston, Weston, Dayton, Clifton, and Oxford). Key elements in the current RWC ordinances include issuing a mandatory burn ban when $PM_{2.5}$ is at, or is forecasted to reach, 75 on the Air Quality Index (AQI). This AQI value corresponds to a $PM_{2.5}$ concentration of 23.5 micrograms per cubic meter ($\mu g/m^3$) and aligns with the RWC ordinances applicable within Cache County, UT. All of the cities and the unincorporated Franklin County have existing ordinances prohibiting both open burning and using RWC devices when an air quality alert is issued, as noted above. The ordinances also prohibit installing non-EPA-certified devices.

The estimated maximum reductions for the RWC measure are 0.06 tons per day (tpd) direct $PM_{2.5}$, 0.009 tpd NO_x, and 0.078 tpd VOC (DEQ 2012, Table 6)

A summary of the woodstove curtailment days issued from 2012 to 2017 is included below:

- 2012 (partial year)—1
- 2012—47
- 2014—13
- 2015—5
- 2016—18
- 2017—29

A detailed spreadsheet of the specific woodstove curtailment days identified and the corresponding AQI for the previous 24 hours are included in Appendix B.

4.3 Woodstove Changeout

As described in the SIP amendment (DEQ 2014), DEQ implemented three woodstove changeout programs on the Idaho side of the NAA (2006–2007, 2011–2012, and 2013–2014), changing out a total of 209 uncertified RWC devices. Stoves were removed and recycled through Idaho's Alternative Energy Device tax deduction program. In 2016, funding from a supplemental environmental project settlement became available, and DEQ helped fund the change out of four additional stoves. In total, 256 woodstoves have been changed out in the Idaho portion of the NAA since 2006. As described in the SIP amendment (applying the appropriate temporal profile to convert to tons per day), these changeouts have led to reductions of 0.05 tpd direct $PM_{2.5}$, 0.003 tpd NO_x, and 0.13 tpd VOC (DEQ 2014, Table 3). In addition to PM reductions, the woodstove changeout programs have reduced air toxics, such as formaldehyde, acrolein, and benzo(a)pyrene, which are generated as combustion by-products.

4.4 Road Sanding

When the SIP (DEQ 2012) was developed, it was estimated that one of the largest components of directly emitted $PM_{2.5}$ on the Idaho side was due to mobile dust, which is primarily from reentrained dust on paved roads. Franklin County Road and Bridge, the City of Preston, and the Idaho Transportation Department (ITD) entered into road sanding agreements as part of the SIP. The Franklin Road and Bridge agreement reduces the amount of sand used on paved roads by applying brine when conditions are appropriate and using a salt and sand mixture where antiskid treatment is required. ITD moved to applying a straight sodium chloride solution, only using antiskid material when it is required for safety. According to records submitted to DEQ, ITD used salt in 2014 (409 tons), 2015 (340 tons), and 2016 (109 tons) and did not use sand. Franklin County Road and Bridge used a 10:1 ratio of sand and salt in past years; however, for the 2012 SIP they agreed to use a 4:1 ratio of sand and salt when antiskid treatment is required (Table 3). Franklin County also agreed to apply brine when temperatures are above 22^{o}F, which further reduces the amount of sand required by approximately 50%. Preston now uses a 2:1 ratio of sand

and salt at an average of 700 tons total per year. As described in the SIP, these road sanding commitments were estimated to lead to 0.10 tpd direct $PM_{2.5}$ reduction per year (DEQ 2012, Table 7). Based on the MVEB analysis (Appendix A), the $PM_{2.5}$ road dust estimation in 2012 was too high. The RFP analysis in section 4.5 provides additional discussion.

Table 3. Franklin County Road and Bridge sand and salt ratios.

Year	Salt (yards)	Sand (yards)	Ratio (sand and salt)
2011	824	4,118	5:1
2012	368	1,474	4:1
2013	937	3,749	4:1
2014	379	1,516	4:1
2015	1093	4,372	4:1
2016	483	1,932	4:1
2017	1481	6,664	4.5:1[a]

[a] Conditions were considered more extreme than normal due to the amount of snow and ice.

4.5 RFP Analysis

A required element of a moderate area SIP is to demonstrate RFP towards the attainment date (December 31, 2015, for this NAA). Implemented control measures must continue to demonstrate RFP towards a QM date (December 31, 2017, for this NAA).

Idaho did not perform airshed modeling for the moderate SIP submittal but relied on the modeling conducted by the Utah Division of Air Quality. Utah's attainment analysis in their moderate area SIP submittal only focused on Utah emissions (Idaho emissions were removed). This omission indicates that the Logan UT-ID NAA was expected to attain the standard based solely on Utah's emission reductions. In the Idaho SIP, Idaho's emissions are a fraction of the Utah $PM_{2.5}$ and precursor emissions for this NAA (DEQ 2012, Tables 4 and 5). Idaho's achieved emission reductions go beyond that necessary to attain the standard.

Because the attainment modeling focused primarily on Utah emission reductions and the newer 2014 NEI data were not available when the Idaho SIP was submitted in 2012, an estimate for Idaho's RFP was determined from the NEI data. The NEI data cover all of Franklin County. Because the Idaho portion of the NAA is entirely contained within Franklin County and holds 99% of the county's population, the NEI emissions for Franklin County provide the most reasonable approximation of Idaho NAA emissions. NEI emissions for 2008 and 2014 were compared to calculate progress in reductions. All control measures were implemented before the end of 2014, so the difference between the 2008 and 2014 NEI emissions were annualized to calculate an estimated RFP for the Idaho portion of the NAA (Table 4). One year's RFP was calculated as 0.008 tpd $PM_{2.5}$, 0.003 tpd NOx, 0.008 tpd SO_2, and 0.07 tpd VOC.

Table 4. Summary of RFP based on NEI for the Idaho portion of the Logan UT-ID NAA. The 2008 and 2014 NEI emissions were compared to estimate the RFP value.

Year	Pollutant (tons per winter day)a			
	$PM_{2.5}$	NO_x	SO_2	VOC
2008 NEI	0.38[b]	1.73	0.08	3.38
2014 NEI	0.33[b]	1.71	0.03	3.38
RFP[c]	0.008	0.003	0.008	0.07

[a] A December monthly temporal value was applied to the annual tons per year emissions to get a single winter's pound per day emissions. Some of the source categories were adjusted based on local knowledge because some sources do not contribute to airshed emissions during the winter months.
[b] The road dust emissions were removed because the calculation method was updated. The emissions were overestimated by a factor of 5 in the 2008 NEI but corrected in the 2014 NEI.
[c] The difference between the 2008–2014 NEI was annualized to obtain the RFP estimate.

This RFP value was used to estimate emissions for 2010 (base year), 2015 (attainment year), and 2017 (QM/RFP year) as shown in Table 5.

Table 5. Estimated emissions for the Idaho portion of the Logan, UT-ID NAA.

Year	Pollutant (tons per day)			
	$PM_{2.5}$	NO_x	SO_2	VOC
2010	0.364	1.73	0.064	3.24
2015	0.322	1.71	0.02	2.88
2017	0.31	1.7	0.01	2.74

The MVEB analysis from Appendix A illustrates RFP towards the QM date. A summary of modeled $PM_{2.5}$ and precursor emissions for 2015 to 2017 is shown in Table 6. For $PM_{2.5}$ (the combination of on-road and paved road dust emissions) and $PM_{2.5}$ precursors, the modeling indicates a decrease in emissions from 2015 to 2017.

Table 6. On-road daily average wintertime emissions from the 2015 and 2017 Franklin County MOVES runs.

Year	Pollutant (tons per day)			
	$PM_{2.5}$[a]	NO_x	SO_2	VOC
2015	0.080	0.676	0.002	0.554
2017	0.079	0.544	0.001	0.467

[a] $PM_{2.5}$ emissions include both on-road and paved road dust emissions.

The reductions currently realized from implementing the control measures in the Idaho portion of the NAA (Table 7) were compared to the RFP values shown in Table 4. While uncertainty exists when estimating emission reductions from Idaho's control measures, the estimated reductions from Table 7 are all higher than the RFP values in Table 4 for NO_x, $PM_{2.5}$, and VOC.

Idaho's control measures do not address SO_2. Since these control measures were implemented before the end of 2014, the reductions continue going forward.

Table 7. Summary of estimated control measure emission reductions for the Idaho portion of the Logan UT-ID NAA.

Control Measure	Emission Reduction (tons per day)			Time Period
	$PM_{2.5}$	NO_x	VOC	
Residential woodstove curtailment	0.06	0.009	0.078	2013–2017
Residential woodstove changeouts	0.05	0.003	0.13	2014–2017
Road sanding agreements	a	—	—	2013–2017
Total	0.11	0.012	0.208	—

[a] Due to differences in how road dust was calculated in the SIP (DEQ 2012) and the method currently used, this analysis excludes road sanding to prevent overestimating RFP. The most recent MVEB analysis estimates a 0.02 tpd reduction in $PM_{2.5}$ due to the 2016 road sanding agreements.

5 Quantitative Milestone Analysis

For plan revisions showing attainment, the CAA requires QMs showing RFP achieved every 3 years. In this amendment, DEQ analyzed the emission reductions needed for quantifying RFP towards demonstrating attainment. The key control strategies identified in the 2012 SIP and 2014 SIP amendment and outlined in Table 2 were implemented and helped reduce emissions during the nonattainment period. These measures collectively contributed to attaining the 2006 $PM_{2.5}$ standard by December 31, 2017.

The adopted measures listed in Table 7 are successfully implemented and should provide continued incremental reductions in emissions. DEQ believes the accounting of control measure implementation and the resulting emissions reductions satisfy the QM requirement for the Logan UT-ID $PM_{2.5}$ NAA.

For this NAA, the quantitative milestone date was December 31, 2017, and from this date, the state had 90 days to submit a QM report. Idaho submitted the QM report on March 6, 2018, which fulfilled the obligation.

6 Conclusion

On August 8, 2017, EPA finalized conditional approval of the RFP, QM, and MVEB elements. The approval was based on Idaho adopting and submitting a SIP update to address those moderate area plan elements by August 1, 2018 (FR 82 37025). This submittal fulfills the obligation to address the RFP, QM, and MVEB elements. The certificate of hearing and proof of publication are provided in Appendix C.

The original attainment for this NAA was December 31, 2015. However, in 2017, EPA approved two 1-year extensions of the attainment date in accordance with CAA §188(d) (82 FR 107, 25992). The attainment date for the Logan UT-ID $PM_{2.5}$ NAA is now December 31, 2017. Based on the most recent certified monitoring data, the area is attaining the 24-hour standard.

The current 3 year design value, 2015-2017, is 30 $\mu g/m^3$ for the Idaho portion of the Logan UT-ID $PM_{2.5}$ NAA.

7 References

DEQ (Idaho Department of Environmental Quality). 2012. *Cache Valley Idaho $PM_{2.5}$ Nonattainment Area State Implementation Plan*. Boise, ID: DEQ.

DEQ (Idaho Department of Environmental Quality). 2014. *Cache Valley Idaho $PM_{2.5}$ Nonattainment Area State Implementation Plan Amendment*. Boise, ID: DEQ.

DEQ (Idaho Department of Environmental Quality). 2017. *Commitment Letter to Support Conditional Approval for Certain SIP Requirements for the Idaho Portion of the Logan UT/ID NAA for the 2006 24-hour $PM_{2.5}$ NAAQS.* Boise, ID: DEQ.

Appendix A. Motor Vehicle Emissions Budget for Franklin County, Idaho: Technical Memorandum

1 Introduction

The Idaho Department of Environmental Quality (DEQ) manages the Idaho side of the Logan Utah-Idaho (UT-ID) nonattainment area (NAA). The NAA encompasses Franklin County in southeastern Idaho, where approximately 99% of the county's population resides in the Idaho portion of the NAA. Analyzing the transportation emissions for Franklin County provides the most reasonable approximation of Idaho NAA transportation emissions.

This analysis defines an updated motor vehicle emissions budget (MVEB) for the Idaho portion of the NAA. An MVEB is required to determine the allowable emissions of on-road particulate matter 2.5 ($PM_{2.5}$) and its precursors in Franklin County to attain current air quality standards.

For this analysis, DEQ modeled the on-road vehicle emissions in Franklin County for calendar years 2015 and 2017. The attainment year is 2015, and 2017 is the year defined for reasonable further progress. Growth was estimated using automatic traffic recorder (ATR) and census data. DEQ also determined paved road dust emissions in the winter when $PM_{2.5}$ concentrations are highest. A corresponding MVEB is proposed that includes only the species contributing significantly to the formation of either primary or secondary $PM_{2.5}$ in the Cache Valley.

2 Data and Methods

2.1 Model Inputs

The Motor Vehicle Emissions Simulator (MOVES) was developed by the United States Environmental Protection Agency (EPA) for use by state and local regulatory agencies, in developing state implementation plans (SIPs) for NAAs. EPA requires states to use the most updated models and methods for MVEB analysis, and the most recent version of MOVES (2014a) was used to model on-road emissions in this analysis (EPA 2015).

Table A-1 lists 15 required MOVES input files, their corresponding input group, and the sources for the input data. A majority of the inputs either were the same inputs developed for the National Emission Inventory (NEI) 2014 (DEQ 2015) or were derived from the NEI 2014 inputs by applying growth rates. The meteorology input is derived from a January 2007 episode, the worst case scenario identified in the *Utah State Implementation Plan Control Measures for Area and Point Sources, Fine Particulate Matter, $PM_{2.5}$ SIP for the Logan, UT-ID Nonattainment Area*. (Utah DEQ 2014). Default values were used for the remaining inputs.

Because exact source type and vehicle miles traveled (VMT) information was not available for 2015 and 2017, the source- and VMT-related inputs were modified by applying a growth rate to the NEI 2014 inputs. For this analysis and because of the primarily rural nature of the county and its proximity along a major highway, two different growth rates per year were used depending on whether the traffic and vehicles were assumed to be local or passing through (Table A-2).

Table A-1. Sources and groups of MOVES inputs.

Input Group	MOVES Input	Source for Input Data
Source-related	SourceTypeAgeDistribution (Vehicle population by age)	Assume the same fleet turnover rate as NEI 2014
	SourceTypeYear (Vehicle population)	Adjust NEI 2014 inputs to count growth for 2015 and 2017
VMT-related	HPMSVTypeYear (Annual VMT) MonthVMTFraction DayVMTFraction HourVMTFraction RoadTypeDistribution (VMT distribution by road type)	Apply a growth rate to the NEI 2014 VMT based on Franklin County automatic traffic recorder (ATR) data and human population (census) data depending on road type (Idaho 2013 and 2014 ATR data set used in NEI 2014 development)
VHT-related	RoadType (Fraction of vehicle hours traveled [VHT]) on ramps) AvgSpeedDistribution (VHT distribution by hourly average speed)	Assume same data as in NEI 2014: Idaho 2013 and 2014 (ATR) data set used in NEI 2014 development
Inspection/maintenance (I/M)-related	IMCoverage (I/M program parameters)	None; no I/M program in Franklin County
Fuel-related	FuelUsageFraction (Applies to vehicles that can use different fuel types) FuelFormulation FuelSupply	MOVES default fuels inputs
	AVFT (Alternative Vehicle Fuels and Technologies)	Uses source data as surrogate; assumes same turnover rate as NEI 2014
Meteorology-related	ZoneMonthHour (Hourly temperature and relative humidity)	Same as used in 2014 SIP (Utah DEQ 2014): an episode in January 2007, the worst-case scenario

Table A-2. Growth rates for VMT and source type data.[a]

Year	FHWA Road Type ID[b]	MOVES Source Type ID[b]	Traffic/Vehicle Type	Growth Rate (%)	Data Source
2015	06, 07, 08	52, 53, 61, 62	Passing through	**8.4**	ATR
	09, 19	11, 21, 31, 32, 41, 42, 43, 51, 54	Local	**0.6**	Census
2017	06, 07, 08	52, 53, 61, 62	Passing through	**3.5**	ATR
	09, 19	11, 21, 31, 32, 41, 42, 43, 51, 54	Local	**0.9**	Census

a. The growth rates for 2017 are averages of 2012–2016. b. The FHWA (Federal Highway Administration) Road Type IDs and MOVES Source Type IDs are defined in Attachment 2.

The 2014 and 2015 ATR data for a site on US 91 north of Franklin was used to estimate 2015 VMT for rural minor arterial, rural major collector, and rural minor collector roadways. This estimate assumes the traffic on those roadways is primarily passing through the county. The estimated human population in Franklin County in 2014 and 2015 was based on the 2010 census and was used to determine a growth rate that was applied to the rural local and urban local roadways. These roadways are assumed to be primarily used by local traffic and not traffic passing through the county. The 2017 VMT estimates followed the same methods but used a 5-year average of the growth rates from 2012 to 2016 for the 2017 growth rate because the 2017 ATR data from the Idaho Transportation Department (ITD) and 2017 population estimate from census data were not available.

The same assumptions were made regarding vehicle population in 2015 and 2017. The ATR data was used to estimate the increase in population for the short- and long-haul truck source types, assuming those vehicle types primarily pass through Franklin County. The growth rate based on human population data was applied to the remaining source types. The 2017 source type populations were estimated with the same methods but used a 5-year average of the growth rates from 2012 to 2016 for the 2017 growth rate.

2.2 Paved Road Dust Calculations

In addition to modeling on-road emissions with MOVES, particulate emissions from traffic on paved roads were calculated following "Section 13.2.1: Paved Roads" of the EPA document, *AP-42: Compilation of Air Emission Factors* (EPA 2011). The emission factor is used to determine the quantity of particulate emissions that become airborne following vehicle traffic on a paved road. For this analysis, the emission factor for a particular road of interest was calculated using hourly precipitation data in the following equation:

$$E_{ext} = [k(sL)^{0.91} * W^{1.02}](1 - \frac{1.2P}{N})$$

where

E_{ext} is the daily average emission factor with same units as k.
k is the particle size multiplier for particle size range and units of interest.
sL is the road surface silt loading in grams per square meter (g/m^2).
W is the average weight in tons of the vehicles traveling the road.
$1.2P/N$ is the precipitation reduction factor.
P is the number of hours in an average day with at least 0.254 millimeter (0.01 inch) of precipitation.
N is the total number of hours in a day.

The precipitation-related variables are based on the January 2007 episodic precipitation data and are the same data used in the 2014 SIP (Utah DEQ 2014).

The *Treasure Valley Road Dust Study: Final Report* (DRI 2002) found that approximately 5.7% of PM_{10} is $PM_{2.5}$. This percentage is different than the national-level emissions factor AP-42 (EPA 2011), which assumes that 25% of PM_{10} is $PM_{2.5}$. Because local data should be used when possible, for this analysis, the particle size multiplier k was selected to be 1 for PM_{10} and 0.057 for $PM_{2.5}$.

Franklin County agreed to use chemical deicing agents on main roads and a 4:1 sand/salt ratio to treat the other roads in the wintertime while ITD elected to use an entirely saline solution on the roads it maintains (major highways). For silt loading, DEQ assumed that chemical deicing agents are used on all roads with daily traffic counts of at least 500, including US 91. For other roads, a 4:1 sand/salt ratio treatment is used. The ubiquitous baseline values for silt loading (assumes no sand use) are applied to all roads that receive only chemical deicing agents. The ubiquitous winter baseline values for silt loading are higher than the ubiquitous baseline values due to sanding in the winter. The ubiquitous winter baseline values were modified for all roads using the 4:1 sand/salt ratio:

$$FWB = UB + (UWB - UB) * (4/5)$$

where

FWB is the Franklin winter baseline.
UB is the ubiquitous baseline.
UWB is the ubiquitous winter baseline (each with units grams per square meter).

Table A-3 lists each road type, corresponding traffic category, and the baseline values for silt loading. The Franklin County winter baseline values were used in the emission factor calculations. Interstates are not shown because there are none in Franklin County.

Table A-3. Silt loading values for roads in Franklin County.

Road Type	ADT Category	Ubiquitous Baseline (g/m^2)	Ubiquitous Winter Baseline (g/m^2)	Franklin Winter Baseline (g/m^2)	Notes
Rural arterial	<500	0.6	2.4	2.04	4:1 sand/salt ratio
	500-5,000	0.2	0.6	0.2	All salt and liquid brine or chemical deicing agents
	5,000-10,000	0.06	0.12	0.06	All salt and liquid brine or chemical deicing agents
	>10,000	0.03	0.03	0.03	All salt and liquid brine or chemical deicing agents
Urban arterial	<500	0.6	2.4	2.04	4:1 sand/salt ratio
	500-5,000	0.2	0.6	0.2	All salt and liquid brine or chemical deicing agents
	5,000-10,000	0.06	0.12	0.06	All salt and liquid brine or chemical deicing agents
	>10,000	0.03	0.03	0.03	All salt and liquid brine or chemical deicing agents
Rural local	<500	0.6	2.4	2.04	4:1 sand/salt ratio
Urban local	<500	0.6	2.4	2.04	4:1 sand/salt ratio

The modified Franklin County winter baseline values were computed and then weighted based on the fraction of VMT on each roadway type/traffic category. The final variable, average vehicle weights, was extrapolated from the vehicle length analysis of the ATR data. The resulting emission factors are in grams per VMT. To obtain PM_{10} and $PM_{2.5}$ emissions, the emission factor was multiplied by VMT on each roadway type and for each day of the week (week day or weekend day) and converted from grams to US tons.

3 Results

Table A-4 shows the January daily average VMT comparison between the two Franklin County runs completed for this analysis. Franklin County's VMT increased nearly 6% between 2015 and 2017.

Table A-4. January daily average VMT for the two Franklin County runs completed for this analysis.

Year	January Daily VMT
2015	236,538
2017	250,692

The on-road daily average wintertime emissions determined from the 2015 and 2017 MOVES runs (see Attachment 1) are shown in Table A-5. The slight decrease in carbon monoxide (CO), nitrogen oxides (NO_x), sulfur dioxide (SO_2), and volatile organic compound (VOC) emissions from 2015 to 2017 are due to a slight increase in cleaner vehicles entering the fleet and older vehicles exiting the fleet. The increase in PM_{10} is attributable to increased VMT (and road dust) in 2017. $PM_{2.5}$ also sees a slight decrease in 2017 although PM_{10} increases. Increased VMT is likely to also increase brake- and tire-wear $PM_{2.5}$ emissions, but increases in newer, cleaner vehicles (and the subsequent decrease in older vehicles) result in lower $PM_{2.5}$ emissions from exhaust.

Table A-5. On-road daily average wintertime emissions from the 2015 and 2017 Franklin County MOVES runs.

Year	Pollutant (tons per day)						
	NH_3	CO	NO_x	SO_2	VOC	PM_{10}	$PM_{2.5}$
2015	0.009	5.302	0.676	0.002	0.554	0.043	0.033
2017	0.009	4.109	0.544	0.001	0.467	0.039	0.029

Note: ammonia (NH_3)

Table A-6 highlights the difference between the PM_{10} and $PM_{2.5}$ on-road emissions (MOVES output) and the emissions from paved road dust. For both PM_{10} and $PM_{2.5}$, on-road emissions decrease from 2015 to 2017, corresponding with an increase in cleaner vehicles. In contrast, PM_{10} and $PM_{2.5}$ paved road dust emissions increase slightly from 2015 to 2017 due to an increase in VMT. Overall, the direct $PM_{2.5}$ emissions decrease is greater than the road dust $PM_{2.5}$ increase.

Table A-6. Daily average wintertime PM_{10} and $PM_{2.5}$ emissions from MOVES and the paved road dust calculations.

Year	Pollutant (tons per day)			
	PM_{10} from MOVES	$PM_{2.5}$ from MOVES	PM_{10} from Road Dust	$PM_{2.5}$ from Road Dust
2015	0.043	0.033	0.828	0.047
2017	0.039	0.029	0.872	0.050

4. Franklin County Motor Vehicle Emissions Budget

Based on the 2015 on-road emissions estimated by MOVES output (Table A-5), the proposed Franklin County MVEB is as follows:

- NO_x—0.676 tpd
- VOC—0.554 tpd
- $PM_{2.5}$—0.033 tpd

The *Draft $PM_{2.5}$ Precursor Demonstration Guidance* (EPA 2016) recommends that a significant $PM_{2.5}$ impact is 1.3 micrograms per cubic meter ($\mu g/m^3$) for the 24-hour National Ambient Air Quality Standards (NAAQS). To determine which pollutants should be included in the MVEB, the $PM_{2.5}$ speciation at local monitoring sites and local emission inventory composition for each pollutant must be understood. Figures A-1 and A-2 show $PM_{2.5}$ speciation at Franklin and Logan, UT, respectively. Table A-7 provides the emission inventory from Utah's SIP (Utah DEQ 2014).

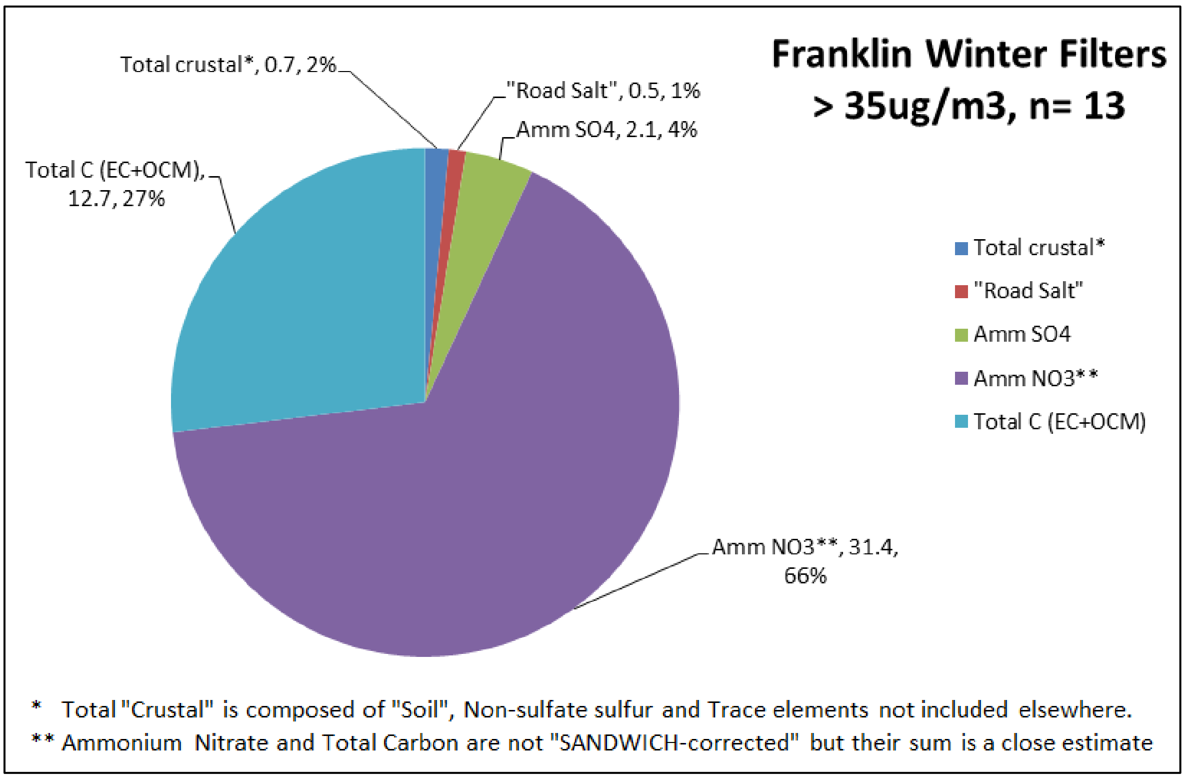

Figure A-1. Winter $PM_{2.5}$ speciation at Franklin.

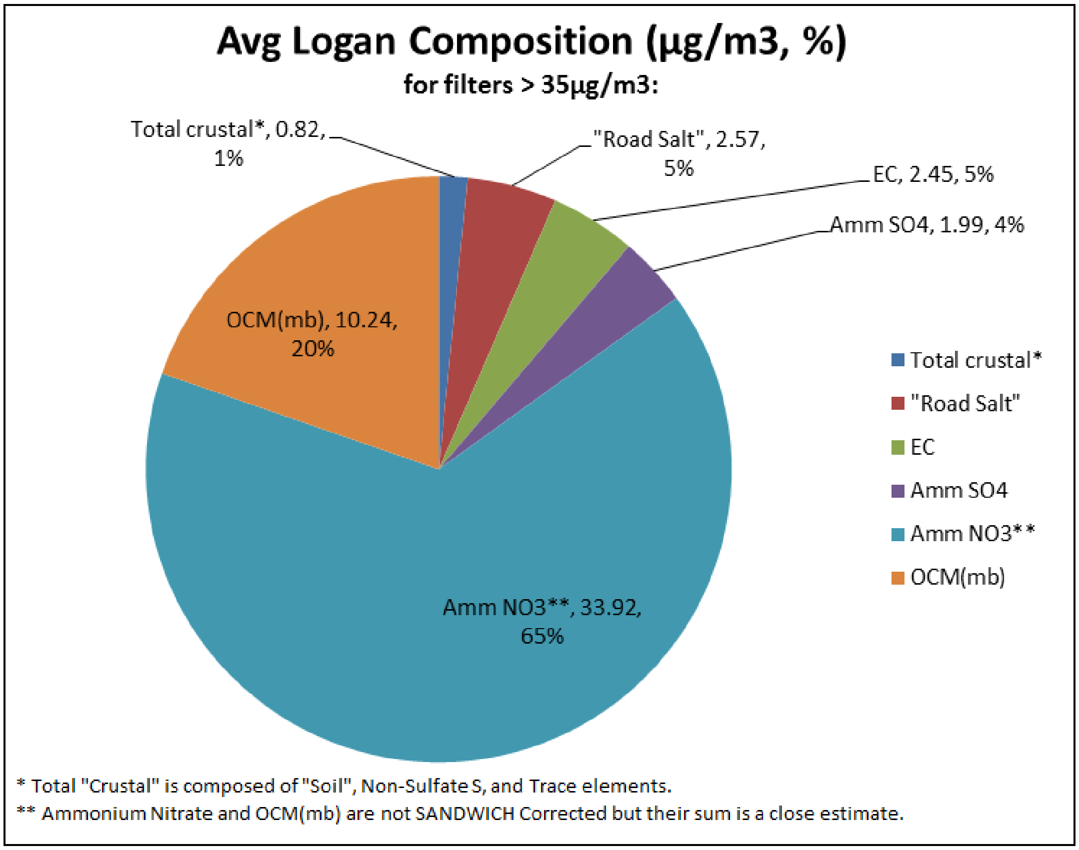

Figure A-2. Average $PM_{2.5}$ speciation at Logan, UT.

Table A-7. Baseline (2010) and attainment year (2015) emissions summaries for the Logan, UT–ID NAA from Utah DEQ (2014).

	NA-Area	Source Category	PM2.5	NOX	VOC	NH3	SO2
2010	Logan, UT-ID						
Sum of Emissions (tpd)		Area Sources	0.54	1.63	4.16	4.31	0.26
		Mobile Sources	0.67	6.48	4.99	0.12	0.04
		NonRoad	0.13	1.15	2.28	0.00	0.02
		Point Sources	0.00	0.02	0.63	0.00	0.00
		Total	1.35	9.28	12.06	4.43	0.32
2015	Logan, UT-ID						
Sum of Emissions (tpd)		Area Sources	0.40	1.59	3.75	4.08	0.27
		Mobile Sources	0.32	4.49	3.36	0.10	0.03
		NonRoad	0.10	0.81	1.77	0.00	0.01
		Point Sources	0.00	0.00	0.00	0.00	0.00
		Total	0.82	6.89	8.88	4.19	0.31

Notes: Emissions units are in tons per average winter day. The mobiles source emissions are from the MOVES model output and AP-42 (road dust) (EPA 2011). Road dust is included in the $PM_{2.5}$ mobile source emissions.

Based on precursor demonstration guidance, $PM_{2.5}$ speciation data, and the local emission inventory composition for each pollutant, three species were selected, consistent with the MVEB proposed in Utah's SIP (Utah DEQ 2014). Franklin County contains about 10% of the Logan UT-ID NAA population, and the proposed MVEB contains emissions of about 10% of the values in the Utah MVEB. Precursors that produce less than 1.3 µg/m^3 are not included in the MVEB or in other emission control planning. The species selection is described below.

4.1 Included Species

NO_x and VOCs are included because they are important precursors to secondary $PM_{2.5}$. NO_x first reacts to form nitric acid, which then undergoes another reaction with ammonia (NH_3) to form ammonium nitrate. Ammonium nitrate is a main component of $PM_{2.5}$ in the NAA. VOCs also react with species in the atmosphere to form secondary $PM_{2.5}$; both anthropogenic and biogenic VOCs in the atmosphere can react with NO_x, indicating that NO_x has increased opportunity to contribute to secondary $PM_{2.5}$ emissions if both NO_x and VOC emissions are elevated. If the microenvironment is NO_x- or VOC-limited, increasing NO_x (in NO_x-limited conditions) or VOCs (in VOC-limited conditions) increases secondary $PM_{2.5}$ significantly.

Primary $PM_{2.5}$ emissions due to vehicle exhaust and brake and tire wear, as modeled by MOVES, are included because they include carbon, which is present at an amount greater than the precursor significance threshold of 1.3 $\mu g/m^3$ in the Logan filter speciation.

4.2 Excluded Species

$PM_{2.5}$ emission from paved road dust is excluded. PM loosened from the roadways and re-emitted into the air is mostly larger than 2.5 micrometers and composed of geologic or crustal elements that, in total, make up only 1% of the total winter contributions in Franklin, ID (Figure A-1) and 2% of the average contributions in Logan, UT (Figure A-2). Speciation data for both Franklin and Logan indicate a crustal contribution less than the precursor significance threshold of 1.3 $\mu g/m^3$.

SO_2 is also excluded from the MVEB. Although SO_2 reacts in the atmosphere to form ammonium sulfate, ammonium sulfate was only 2.1 $\mu g/m^3$ in the speciated Franklin filters (about 2 $\mu g/m^3$ at Logan). On-road vehicles contribute less than 10% of the total SO_2 emissions (Table A-7), and by stoichiometry, SO_2 and ammonium sulfate have a 1:1 relationship; therefore, on-road vehicles contribute only about 0.2 $\mu g/m^3$ or about 10% of the 2.1 $\mu g/m^3$ sulfate $PM_{2.5}$, which is well below the precursor significance threshold of 1.3 $\mu g/m^3$. SO_2 emissions are largely affected by federal fuel regulations as well as fleet turnover.

NH_3 is excluded because vehicles produce very little ammonia (less than 0.01 tpd; 2% of the total ID-UT NH_3 inventory). The NAA, and most of the western United States, is rich in NH_3, so secondary $PM_{2.5}$ production is not sensitive to any reductions in NH_3 unless it is drastic (Utah DEQ 2014).

CO is also excluded because it does not contribute significantly in the formation of secondary $PM_{2.5}$.

References

DEQ (Idaho Department of Environmental Quality). 2015. *Development of the 2014 Idaho On-Road (MOVES) Mobile Source Inventory*. Boise, ID: DEQ.

DRI (Desert Research Institute). 2002. *Treasure Valley Road Dust Study: Final Report*. Reno, NV: DRI.

EPA (United States Environmental Protection Agency). 2011."Section 13.2.1: Paved Roads." *AP-42: Compilation of Air Emission Factors*. Washington, DC: EPA.

EPA (United State Environmental Protection Agency). 2015. *MOVES2014 and MOVES2014a Technical Guidance: Using MOVES to Prepare Emission Inventories for State Implementation Plans and Transportation Conformity*. Washington, DC: EPA.

EPA (United States Environmental Protection Agency). 2016. *Draft $PM_{2.5}$ Precursor Demonstration Guidance*. Washington, DC: EPA.

Utah DEQ (Utah Department of Environmental Quality) 2014. *Utah State Implementation Plan Control Measures for Area and Point Sources, Fine Particulate Matter, $PM_{2.5}$ SIP for the Logan, UT-ID Nonattainment Area*. Salt Lake City, UT: Utah DEQ.

Attachment 1

List of MOVES runs performed for this analysis.

County	MOVES Run Description	Year Modeled	Input Database	Output Database
Franklin	Run with local inputs	2015	c16041y2015_in	c16041y2015_out
Franklin	Run with local inputs	2017	c16041y2017_in	c16041y2017_out
Franklin	MOVES 2014a Default Run	2015	None	c16041y2015_default_out
Franklin	MOVES 2014a Default Run	2017	None	c16041y2017_default_out

Attachment 2

FHWA Road Type Definitions used by MOVES.

FHWARoadTypeCode	FHWARoadDescription
01	Rural Principal Arterial - Interstate
02	Rural Principal Arterial - Other
06	Rural Minor Arterial
07	Rural Major Collector
08	Rural Minor Collector
09	Rural Local
11	Urban Principal Arterial - Interstate
12	Urban Principal Arterial - Other Freeways or Expressways
14	Urban Principal Arterial - Other
16	Urban Minor Arterial
17	Urban Collector
19	Urban Local

MOVES Source Type Definitions

SourceTypeID	HPMSVtypeID	SourceTypeName
11	10	Motorcycle
21	25	Passenger Car
31	25	Passenger Truck
32	25	Light Commercial Truck
41	40	Intercity Bus
42	40	Transit Bus
43	40	School Bus
51	50	Refuse Truck
52	50	Single Unit Short-haul Truck
53	50	Single Unit Long-haul Truck
54	50	Motor Home
61	60	Combination Short-haul Truck
62	60	Combination Long-haul Truck

Appendix B. Woodstove Curtailment Days Identified from 2012–2017 and Corresponding AQI Value

2012		2013		2014		2015		2016		2017	
Date	AQI	Date	AQI	Date	AQI	Date	AQI	Date	AQI	Date	AQI
12/30	82	1/1	96	1/1	85	12/3	79	1/1	62	1/1	113
		1/2	98	1/2	83	12/4	74	1/2	56	1/7	84
		1/3	85	1/17	85	12/5	77	1/3	70	1/8	112
		1/4	84	1/18	85	12/30	82	1/4	75	1/15	98
		1/7	141	1/19	85	12/31	95	1/5	85	1/16	91
		1/8	152	1/20	86			1/6	139	1/17	83
		1/9	145	1/21	89			1/7	86	1/18	98
		1/10	151	1/22	83			1/14	102	1/19	137
		1/16	113	1/23	100			1/24	102	1/20	157
		1/17	117	1/24	82			1/28	75	1/21	78
		1/18	114	1/25	60			1/29	99	1/27	89
		1/19	140	1/26	71			2/6	80	1/28	83
		1/20	159	1/27	95			2/7	85	1/29	71
		1/21	158					2/8	96	1/30	92
		1/22	169					2/9	113	1/31	140
		1/23	165					2/10	111	2/1	153
		1/24	179					2/11	103	2/2	163
		1/25	168					12/31	109	2/3	168
		1/26	138							12/6	64
		1/27	98							12/7	38
		2/3	84							12/8	74
		2/4	63							12/9	95
		2/5	148							12/10	58
		2/6	153							12/11	35
		2/7	153							12/12	40
		2/8	115							12/13	59
		2/9	108							12/14	67
		2/13	95							12/15	54
		2/14	97							12/16	76
		2/15	129								
		2/16	108								
		2/17	84								
		2/18	90								
		2/19	54								
		2/20	72								
		12/12	72								
		12/13	89								
		12/14	143								

2012		2013		2014		2015		2016		2017	
Date	**AQI**	**Date**	**AQI**	**Date**	**AQI**	**Date**	**AQI**	**Date**	**AQI**	**Date**	**AQI**
		12/15	115								
		12/16	95								
		12/17	117								
		12/18	122								
		12/19	127								
		12/28	85								
		12/29	111								
		12/30	87								
		12/31	105								

Appendix C. Certificate of Hearing and Proof of Publication