TECHNICAL SUPPORT DOCUMENT FOR ON-ROAD MOBILE SOURCES: PM2.5 EMISSIONS INVENTORIES FOR PM2.5 SIP BASE YEARS

Winter PM2.5 Episode Days:
January 11-21 2007
February 13-19 2008
January 8-27 2009
December 7-31 2009
January 1-23 2010

September 20, 2012
Utah Division of Air Quality
Planning Branch/Mobile Sources

Abstract

This report discusses the on-road mobile source emissions inventories for the PM2.5 SIP base years in the seventeen counties in Utah that are part of the PM2.5 SIP domain.

The UDAQ Technical Analysis section identified four PM2.5 episodes. The episodes cover the following days:

Episode #1: Thursday, January 11, 2007 through Sunday, January 21, 2007 inclusive (11 days)
Episode #2: Wednesday, February 13 through Tuesday, February 19, 2008 inclusive (7 days)
Episode #3: Thursday, January 8 through Tuesday, January 27, 2009 inclusive (20 days);
Episode #4: Monday, December 7, 2009 through Tuesday, January 23, 2010 inclusive (48 days)

Each episode day and county was modeled separately for each of the base years. The reason for this is that daily vehicle miles traveled (VMT) and temperatures changed each day.

Results of emissions modeling showed that emissions were highest on Friday, January 12, 2007 as follows:

EMISSIONS INVENTORY (ALL 17 COUNTIES) FOR FRIDAY, JANUARY 19, 2007
TONS PER WINTER WEEKDAY

CO	NOx	PM10 Exh	PM2.5 Exh	Total HC*	NH3	SO2
1,534.76	231.86	11.92	11.24	121.32	3.43	2.16

PM10 Fugitive Dust	PM2.5 Fugitive Dust
19.54	4.89

*Total HC emissions include HC refueling emissions.

On-road inventories were computed using the EPA MOVES2010a (Motor Vehicle Emission Simulator) released August 2010. PM2.5 fugitive dust from paved roads was compiled utilizing AP-42 Chapter 13.2.1, "Introduction to Fugitive Dust Sources, section 13.2.1, "Paved Roads" (published in Federal Register on Feb. 4, 2011).

2e. ON-ROAD MOBILE SOURCES

iii. Abstract…….. 2

iv. Table of Contents…… 3

v. List of Tables……. 5

vi. Overview…… 6
(1) PM2.5 SIP Modeling Domain Responsibilities……. 6
(2) PM10 and PM2.5 Fugitive Dust from Paved Roads……. 7

vii. Procedure..... 7

(1) MOVES2010a Procedures..... 7
(a) MOVES Default Modifications……. 7
(b) Daily VMT..... 8
(c) Local Roads..... 9
(d) Source Classification Codes (SCC's) for Local Roads..... 12
(2) MOVES2010a Graphical User Interface (GUI) Selections..... 13
(a) Strategies: Alternative Vehicle Fuels & Technologies..... 14
(3) MOVES2010a County Data Manager Input Development..... 15
(a) County Data Manager Development Excel Workbooks..... 15
1. Source Type Population..... 16
2. Source Type Age Distribution..... 22
3. Vehicle Miles of Travel…….. 23
4. Rural Vehicle Type VMT..... 24
5. DAQ Urban Input File Template…… 27
6. Urban MPO Vehicle Activity Data..... 27
7. Travel Demand Models……. 28
8. TDMMOVES2 Program……. 28
9. Urban MPO VMT by Vehicle Type…… 28
10. No Rural VMT in WFRC and MAG Counties……. 29
11. HPMS Adjustment Factors……... 29
12. Local Road VMT and HPMS Factors……... 29
13. WFRC Post-model (MOVES) Adjustments……. 30
14. Rural Road Type Distribution..... 30
15. Urban MPO Road Type Distribution..... 31
16. Rural Average Speed Distribution..... 32
17. Urban MPO Average Speed Distribution..... 33
18. Rural Ramp Fractions..... 34
19. Urban MPO Ramp Fractions..... 34
20. DayVMTFraction…….. 35
21. Fuel Type ID..... 35
a. Fuel Supply…… 35
b. Fuel Formulation…….. 36
22. Hour VMT Fraction..... 37
23. I/M Coverage..... 37
24. Month VMT Fraction..... 37

25. Meteorological Data (Zone Month Hour)..... 37

viii. Model Outputs……... 38

ix. General Output……. 39

(1) Units……... 38
(2) Activity……... 39
(3) Output Emissions……..... 39
(4) SCC…… 39
(5) Road Types…… 39
(6) Components of Pollutants…….. 40
(7) Summary Reports…….. 40
(a) Urban MPO (WFRC, MAG, CMPO): Episode 1
1. Summary Sheets in SMOKE Format…….. 40
(b) Rural Counties: Episode 1
1. Summary Sheets in SMOKE Format……..… 40
(c) Urban MPO (WFRC, MAG, CMPO): Episode 2
1. Summary Sheets in SMOKE Format……..… 40
(d) Rural Counties: Episode 2
1. Summary Sheets in SMOKE Format……..…… 40
(e) Urban MPO (WFRC, MAG, CMPO): Episode 3
1. Summary Sheets in SMOKE Format……..…… 40
(f) Rural Counties: Episode 3
1. Summary Sheets in SMOKE Format…….…… 40
(g) Urban MPO (WFRC, MAG, CMPO): Episode 4
1. Summary Sheets in SMOKE Format…….…… 40
(h) Rural Counties: Episode 4
1. Summary Sheets in SMOKE Format…… 40

x. Fugitive Dust (Paved Roads PM10 and PM2.5)……..….. 41

(1) Constants k for PM10 and PM2.5……. 42
(2) Average Vehicle Weight…… 42
(3) Silt Loading Factors…….…. 42
(4) Precipitation……..… 43

xi. **APPENDIX ITEMS ON DVD**……. 2.e xi-1

xii. **REFERENCES**……..….. 2.e xii-1

v. **LIST OF TABLES**

1. Episode Summary Tables…….. 8
2. Daily Modifications Tables....…….. 9
3. Local Roads Modifications Tables…… 11
4. Source Classification Codes (SCC) and Road Types…… 14
5. Default AVFT for CNG Transit Buses……. 16
6. Source Type Populations…….……. 17
7. UT DMV Database of Vehicles…….…….. 21
8. MOBILE6 and MOVES Vehicle/Source Types…… 22
9. Final 2008 Source Type Population for Salt Lake County……. 23
10. Source Type Age Distribution (Salt Lake County, 2009)…… 24
11. Vehicle Type Calculation Example 2008 February (Tuesday) Wasatch County. 29
12. HPMS and MOBILE6 Road Types……. 35
13. Day VMT Fractions……. 37
14. Fuel Type Tables…….. 37
15. General Output Tables…….. 41
    a. Units……..…. 41
    b. Activity……..…… 41
    c. Output Emissions…….……. 41
    d. SCC Codes and Vehicle Types…….……... 42
16. Road Type Codes…….. 42
17. Pollutant Component Codes…….. 42
18. MOVES Summary Reports by MPO and Episode Year (EXCEL)…… 43

vi. **Overview**

The purpose of this document is to explain how EPA MOVES2010a (Motor Vehicle Emission Simulator) released in August 2010 was utilized to design a PM2.5 SIP on-road mobile source SIP inventory for air dispersion modeling. The inventory episodes covered 86 wintertime days in 2007, 2008 and 2009 - 2010 covering 17 counties. Counties that are members of a Metropolitan Planning Organization (MPO) were modeled by their respective MPO. The Utah Division of Air Quality (UDAQ) created inventories for the remaining rural counties.

The modeling goal for this project was to provide a mobile source inventory that approximates transportation conditions based upon best practices in transportation and air quality modeling. Model development relied primarily on interagency consultation procedures to ensure the best mix of local and default MOVES2010a inputs. Model development included discussions on the following topics: MOVES default database scale modifications, GUI selections, County Data Manager input development utilizing local and default data, and output selection for air dispersion modeling. The following agencies provided MOVES modeling development through the interagency consultation procedures.

Cache Metropolitan Planning Organization (CMPO)
EPA Office of Transportation and Air Quality: MOVES Team (OTAQ)
FHWA Resource Center: Air Quality Team (FHWA)
Utah Department of Transportation Systems Planning & Programming: Traffic Analysis
Utah Division of Air Quality (UDAQ)
Utah Division of Motor Vehicles (UDMV)
Mountainland Association of Governments (MAG)
Wasatch Front Regional Council (WFRC)

(1) PM2.5 SIP Modeling Domain Responsibilities

The modeling domain is divided into two groups: counties modeled by a Metropolitan Planning Organization (MPO); and counties modeled by UDAQ Planning Branch (Mobile Sources and Transportation Section):

Agency	Non-Attainment	County(-ies)	Coordinator
CMPO	Logan, UT	Cache	Jeff Gilbert
MAG	Provo, UT	Utah	Susan Hardy
WFRC	Salt Lake City, UT	Box Elder, Davis, Salt Lake, Tooele, Weber	Kip Billings
UDAQ	none	Carbon, Duchesne, Emery, Juab, Millard, Morgan, Rich, Sanpete, Summit, Wasatch	Rick McKeague

(2) PM10 and PM2.5 Fugitive Dust from Paved Roads

PM10 and PM2.5 fugitive dust from paved roads (re-entrained road dust) was modeled by UDAQ for each of the 17 counties and 86 episode days.
The latest EPA-approved version of AP-42, Chapter 13, "Miscellaneous Sources", Section 13.2.1, "Paved Roads" (January 2011), was used to compute the emission factors for PM10 and PM2.5 fugitive dust.

Key inputs to compute the emission factors are:

Average vehicle weight for each data pair (county, road type); units are tons
Silt loading factor for each road type; units are grams per square meter (gm/m2)
Particle size multiplier "k" for PM10 and PM2.5; (unitless)
Precipitation for each data pair (county, episode day); units are number of hours per episode day with precipitation greater than 0.01 inch.

Vehicle miles traveled (VMT) were identical to VMT used in the MOVES model.

(3) VOC Refueling Emissions Included under Total Hydrocarbons

VOC refueling emissions are included under "Total Hydrocarbon" emissions in the base year inventories created from MOVES201A.

In past inventory modeled using MOBILE6.2, VOC refueling emissions were equal to about 6% of VOC exhaust plus evaporative emissions during a typical winter day.

Separate runs using MOVES2010A will be performed to compute VOC refueling emissions. In a post-model adjustment, these emissions will be subtracted from the on-road inventory and will be moved to the Area Source (Non-point) inventory.

vii. **Procedure**

The interagency consultation process was utilized to develop modeling procedures for the new MOVES2010 (Motor Vehicle Emission Simulator) model that was initially released by the EPA in December 2009. The release of this new and updated vehicle emissions model has required close coordination between UDAQ, the EPA MOVES Team, the FHWA Air Quality Team, and local MPOs in order to develop data inputs for MOVES that were not required for MOBILE6. The agencies involved in the PM2.5 SIP project have had an opportunity to participate in drafting specific MOVES procedures either through e-mail or telephone conversations. The list below identifies the specific procedures involved in constructing an on-road mobile source inventory for the current EPA release of MOVES2010a (August 2010). A more detailed explanation of each procedure is found below.

(1) **MOVES2010a Procedures**

1. MOVES Default Database Scale Modifications: daily VMT and local roads.
2. MOVES2010a GUI Selections: description, scale, time span, geographic bounds, road type, pollutants and processes, alternative vehicle fuels and technologies
3. MOVES2010a County Data Manager input development

(a) MOVES Default Modifications

Interagency consultation procedures were utilized to develop MOVES scale modifications for daily VMT and local roads. UDAQ consulted directly with the EPA OTAQ MOVES Team during the development and testing of the MOVES2010a database modifications. The first change developed by UDAQ is essentially a scale modification (daily rather than annual inputs and calculations) and does not change how the MOVES model actually calculates emissions. The second change developed by UDAQ adds rural and urban local roads along with their unique operational characteristics and inputs, particularly the difference in truck travel fractions on these roads compared to freeways and arterials. The modified database has been named UTAH MOD MOVESDB20100830 and has been adopted by UDAQ and the MPOs: CMPO, MAG and WFRC. Below are steps describing how the core MOVES database was modified to allow for daily VMT and local roads:

(b) Daily VMT

The scale modification developed by UDAQ and reviewed by the EPA MOVES Team allows the MOVES model to utilize daily VMT as an input. The MOVES default database requires the user to convert daily VMT into an annual VMT input before it is entered into the MOVES model. The MOVES default database model operates on annual VMT; then MOVES converts the VMT internally and the output is returned as daily VMT. The process of using MOVES to convert daily VMT to annual VMT and back to daily VMT is unlike the process used with legacy versions of MOBILE for SIP, transportation conformity or NEI purposes. The scale modification eliminates this process of converting to annual VMT by using daily VMT throughout the calculation.

For example, using the default database a user may begin with 3 million daily VMT and then scale it as annual VMT to 780,000,000 (3 million VMT * 260 weekdays). But the resulting output may be 2.5 million daily VMT. The default database creates ambiguous results for the user by incorporating weekend and seasonal variations in VMT that were not intended by the user when entering the daily VMT input values. The user cannot distinguish if the discrepancy is related to VMT or to some other problem. The daily VMT scale modification allows the user to understand MOVES2010a and quickly identify possible input errors. If the user inputs 3 million daily VMT into the UTAH MOD MOVESDB20100830 database, the output from the model will calculate 3 million daily VMT. The user finds it easy to identify specifically how MOVES is calculating since it is not converting annual VMT to daily VMT.

The scale modification allows the user multiple advantages: 1**)** Highway Performance Monitoring System (HPMS) VMT collected by UDOT for FHWA and Travel Demand Model VMT estimates are presented as daily values so no annual conversion is necessary. 2) Legacy versions of MOBILE have historically used daily VMT, so it eliminates some confusion when comparing results from the two models. 3) Utilizing a daily VMT value within MOVES allows the user to more intuitively follow the calculations within the model, helping them to understand MOVES calculation procedures and quickly identify possible errors.

The procedures used for creating the scale modifications for the UTAH MOD MOVESDB20100830 database are found below.

Daily Modifications

Table Name	Data Columns	Description of Changes
dayofanyweek	noOfRealDays	Weekday number of real days changed from 5 to 7; weekend day number of real days changed from 2 to 7.

dayID	dayName	noOfRealDays
5	Weekdays	7
2	Weekend	7

Table Name	Data Columns	Description of Changes
dayvmtfraction	dayVMTFraction	All dayVMTFractions set to 1.

sourceTypeID	monthID	roadTypeID	dayID	dayVMTFraction
11	1	1	2	1
11	2	1	2	1
11	3	1	2	1
Etc				

Table Name	Data Columns	Description of Changes
monthofanyyear	noOfDays	All noOfDays set to 1.

monthID	monthName	noOfDays	monthGroupID
1	January	1	1
2	February	1	2
3	March	1	3
4	April	1	4
5	May	1	5
6	June	1	6
Etc			

Table Name	Data Columns	Description of Changes
monthVMTfraction	monthVMTfraction	All number of days per month set to 1

sourceTypeID	isLeapYear	monthID	monthVMTFraction
11	N	1	1
11	N	2	1
11	N	3	1
11	N	4	1
11	N	5	1
11	N	6	1
Etc			

(c) Local Roads

The MOVES default database requires the user to utilize identical vehicle type profiles for arterial and local roads, but a local road modification allows MOVES to model local road types

separately. UDAQ and the MPOs believe that arterial and local roads have different traffic characteristics, such as VMT, speed distribution and VMT mix. Modeling these road types separately will create a more accurate inventory than combining arterial and local roads into one road type.

Local Road Modifications

Table Name	**Data Columns**	**Description of Changes**
avgspeeddistribution	roadTypeID avgSpeedBinID	Road types rural local(32)and urban local(52)added. Local average speeds were set to a constant speed of 12.9 mph.

sourceTypeID	roadTypeID	hourDayID	avgSpeedBinID	avgSpeedFraction
21	32	135	3	0.42
21	32	135	4	0.58
21	52	135	3	0.42
21	52	135	4	0.58
etc				

Table Name	**Data Columns**	**Description of Changes**
drivescheduleassoc	roadTypeID driveScheduleID	Road types rural local(32)and urban local(52) added. Road types 3 and 5 drive schedules copied to road types rural local(32)and urban local(52).

sourceTypeID	roadTypeID	isRamp	driveScheduleID
21	52	N	101
21	52	N	158
21	52	N	1009
21	52	N	1024
21	52	N	1025
21	52	N	1026
21	52	N	1029
21	52	N	1030
21	52	N	1041
21	52	Y	199
Etc.			

Table Name	**Data Columns**	**Description of Changes**
hourvmtfraction	roadtypeid hourVMTFraction	Road types rural local(32) and urban local(52) added. Road types 3 and 5 hourvmtfraction copied to road types rural local(32)and urban local(52).

sourceTypeID	roadTypeID	dayID	hourID	hourVMTFraction
21	52	2	1	0.0214739
21	52	2	2	0.0144428
21	52	2	3	0.0109684
21	52	2	4	0.00749451
21	52	2	5	0.00683855
21	52	2	6	0.0103588
etc.				

Table Name	**Data Columns**	**Description of Changes**
roadtype	roadTypeID roadDesc	Road types rural local(32) and urban local(52) added.

roadTypeID	roadDesc	rampFraction
1	Off-Network	0
2	Rural Freeway	0
3	Rural Arterial	0
4	Urban Freeway	0
5	Urban Arterial	0
32	Rural Local	0
52	Urban Local	0

Table Name	**Data Columns**	**Description of Changes**
roadtypedist	roadtypeID, roadTypeVMTFraction	Road types rural local(32) and urban local(52) added. RoadtypeVMTfractions for six road types normalized back to 1.000.

sourceTypeID	roadTypeID	roadTypeVMTFraction
21	1	0
21	2	0.352377
21	3	0.28582
21	4	0.105003
21	5	0.176076
21	32	0.0396498
21	52	0.0410736
etc		

Table Name	Data Columns	Description of Changes
zoneroadtype	roadTypeID SHOAllocFactor	Road types rural local(32) and urban local(52) added. SHOAllocFactors for road types 3 and 5 copied to road types 32 and 52.

zoneID	roadTypeID	SHOAllocFactor
490030	2	0.00207141
490030	3	0.000346871
490030	4	0
490030	5	0.0000792
490030	32	0.000346871
490030	52	0.0000792

(d) Source Classification Codes (SCC's) for Local Roads

To allow local roads to be modeled separately and to utilize the correct SCC road type fractions, the SCC road type codes and fractions were modified. This modification allowed the modelers to quickly identify if the MOVES model was performing calculations on inputs utilized for urban and rural freeways, arterials, and local roads.

MOVES SCC Road Types

SCCRoadTypeID	SCCRoadTypeDesc
1	Off-Network
11	Rural Interstate
13	Rural Principal Arterial
15	Rural Minor Arterial
17	Rural Major Collector
19	Rural Minor Collector
21	Rural Local
23	Urban Interstate
25	Urban Freeway/Expressway
27	Urban Principal Arterial
29	Urban Minor Arterial
31	Urban Collector
33	Urban Local

Table Name	Data Columns	Description of Changes
sccroadtypedistribution	roadtypeid sccroadtypeid sccroadtypefraction	Road types rural local (32)and urban local (52)added. SCCroadtype ID consolidated to 1, 11, 13, 23, 27, 21, and 33. SCCroadtypefractions set to 1.

roadTypeID	zoneID	SCCRoadTypeID	SCCRoadTypeFraction
1	490310	1	1
2	490310	11	1
3	490310	13	1
4	490310	23	1
5	490310	27	1
32	490310	21	1
52	490310	33	1

(2) **MOVES2010a Graphical User Interface (GUI) Selections**

The following MOVES2010a GUI selection inputs were entered for each of seventeen counties and 86 episode days, for a total of 1,462 separate run specs.

Description: Contains the name of the county being modeled, month, day, and year.

Scale: Domain/Scale: County
Calculation Type: Inventory

Time Span: Years Months Days (contains episode specific data)
Geographic Bounds: States: Utah
Counties: 17 counties in Utah

Vehicles/Equipment: On-road Vehicle Equipment Fuels: Gasoline and Diesel (all vehicle gasoline and diesel fuel combinations allowed)

Road Type: Off-Network (only road types that exist for that county are selected)
Rural Arterial
Rural Freeway
Rural Local
Urban Arterial
Urban Freeway
Urban Local

Pollutants and Processes:

Pollutants	Processes
Ammonia (NH3) Carbon Monoxide (CO) Nitrogen Oxide (NO) Oxides of Nitrogen (NOx) Primary Exhaust PM10 & 2.5 Primary PM10 & 2.5 Elemental Carbon Primary PM10 & 2.5 Organic Carbon Primary PM10 & 2.5 Sulfate Particulate Primary PM10 & 2.5 Sulfate Particulate Sulfur Dioxide (SO2)	Running Exhaust, Start Exhaust, Crankcase, Idle
Primary PM10 & 2.5	Brake wear, Tire wear
Non-methane Hydrocarbons	Crankcase, Refueling, Idle

Total Energy	Running Exhaust, Start Exhaust, Idle
Total Gaseous Hydrocarbons	Running Exhaust, Start Exhaust,
Volatile Organic Compounds	Evaporative, Crankcase, Refueling, Idle

(a) Strategies: Alternative Vehicle Fuels & Technologies (AVFT)

MOVES2010a includes a national default AVFT file that contains default fuel engine fractions for gasoline, diesel, and CNG vehicles by model year. The default AVFT file contains CNG fractions for transit buses at 6%, but the Utah Transit Authority is currently only operates five CNG buses out of 501 buses as of 2009.[1] The AVFT file was modified by setting all CNG fractions for transit buses (42) to zero, and re-normalizing the sum of fractions for diesel and gasoline transit buses to exactly 1.0000.

Default AVFT for CNG Transit Buses

sourceTypeID	modelYearID	fuelTypeID	engTechID	fuelEngFraction
42	2007	3	1	0.06
42	2008	3	1	0.06
42	2009	3	1	0.06
42	2010	3	1	0.06

Output/General Output: Units: Grams, Million BTU, Miles

Activity: Distance Traveled
Source Hours
Source Hours Idling
Source Hours Operating
Source Hours Parked
Population
Starts

Output/Output Emissions

Detail: Always: 24-hr and County
For All Vehicles: Emissions Process
On-road: SCC

[1]See UTA website, http://www.rideuta.com/. On the dark blue menu at the top of the page, choose "Media Room". Then choose the underscored wording "UTA Publications". Then choose the underscored wording "Annual Reports". Click on "2009 Comprehensive Annual Financial Report". Statistical data begins on p. 63 of 85. Go to page 78 to find the number of buses in operation each calendar year.

sourceTypeID	modelYearID	fuelTypeID	engTechID	fuelEngFraction
42	2007	3	1	0.06
42	2008	3	1	0.06
42	2009	3	1	0.06
42	2010	3	1	0.06

The MOVES input files are text files with a file name extension of ".mrs". All input files are found in the "Appendix Items on DVD".

UDAQ PM 2.5 MOVES Files.zip\Episodic\UDAQ\MRS\
CMPO PM 2.5 MOVES Files.zip\Episodic\CMPO\MRS\
MAG PM 2.5 MOVES Files.zip\Episodic\MAG\MRS\
WFRC PM 2.5 MOVES Files.zip\Episodic\WFRC\MRS\

(3) **MOVES2010a County Data Manager Input Development**

The following inputs were developed for the MOVES County Data Manager and can be found in the Appendix Items on DVD as indicated below:

(a) County Data Manager Excel Development Workbooks

County Data Manager Input — Data Sets

Source Type Population
PM 2.5 MOVES Files.zip\Episodic\File Development\Vehicle Population\

Age Distribution
PM 2.5 MOVES Files.zip\Episodic\File Development\Age Distribution\

Vehicle Type VMT
PM 2.5 MOVES Files.zip\Episodic\UDAQ\File Development\
PM 2.5 MOVES Files.zip\Episodic\CMPO\File Development\
PM 2.5 MOVES Files.zip\Episodic\MAG\File Development\
PM 2.5 MOVES Files.zip\Episodic\WFRC\File Development\

Average Speed Distribution
PM 2.5 MOVES Files.zip\Episodic\UDAQ (Rural)\File Development\Rural Areas Average Speeds\

Fuel
PM 2.5 MOVES Files.zip\Episodic\File Development\Fuel\

I/M Programs
PM 2.5 MOVES Files.zip\Episodic\MAG\CDM\
PM 2.5 MOVES Files.zip\Episodic\WFRC\CDM\

Met Data
PM 2.5 MOVES Files.zip\Episodic\File Development\Met Data\

County Database Manager Data

The CDMs that contain the above data sets can be found in the Appendix Items on DVD:

PM 2.5 MOVES Files.zip\Episodic\UDAQ\CDM\
PM 2.5 MOVES Files.zip\Episodic\CMPO\CDM\
PM 2.5 MOVES Files.zip\Episodic\MAG\CDM\
PM 2.5 MOVES Files.zip\Episodic\WFRC\CDM\

(1) Source Type Population

Source type population (vehicle population) is a new input for the MOVES model. Since this is a new calculation, extra emphasis will be placed on how it was calculated.

MOVES Source Types

sourceTypeID	HPMSVtypeID	sourceTypeName
11	10	Motorcycle
21	20	Passenger Car
31	30	Passenger Truck
32	30	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

Utah Division of Motor Vehicles (UDMV) January 1, 2009 data was used to calculate the vehicle populations for motorcycles (type 11), passenger cars (type 21), and light trucks (types 31 and & 32) with a gross vehicle weight rating $\leq$ 12,000 lbs with the assumption that these vehicles comprise the majority of travel within the PM2.5 SIP modeling domain. The table below contains vehicle counts from the UDMV for January 1, 2009.

	MC	PASS VEH	LT TRUCK
Box Elder	1605	27437	15922
Cache	3641	50987	24782
Carbon	760	11252	8932
Davis	8891	151157	55979
Duchesne	549	8180	9803

Emery	265	5451	4869
Juab	253	5306	3905
Millard	288	6676	5093
Morgan	292	5394	3425
Rich	46	1304	1119
Salt Lake	26897	524480	191640
Sanpete	463	12426	9301
Summit	1583	25508	12480
Tooele	1805	29601	15326
Utah	12827	210456	81570
Wasatch	828	12205	7417
Weber	6920	109608	51289

The source type populations for heavy-duty vehicles (types 41-62) were extracted from the MOVES default database. Specifically EPA's May 2010 version of MOVES was utilized to obtain data for heavy-duty vehicles (types 41 - 62). UDMV data for heavy-duty vehicles are limited to vehicles registered in the state. Since heavy-duty vehicles operating within the domain could be originating from anywhere within the U.S., a specific national MOVES run was generated to obtain source populations for heavy-duty and bus classes for vehicles types 40 and higher. The EPA MOVES Team provided the MOVES Population Run for this calculation.

To perform the MOVES Population Run the following GUI selection inputs were used:

Settings: Configure MOVES Default Database: movesdb20100830
Description: Contains the name of all the counties modeled.

Scale: Domain/Scale: National, Calculation Type: Inventory

Time Span: Time Aggregation Level: Month, Years: 1990, 1999-2050
Months: January, Days: Weekend & Weekday, Hours: 24

Geographic Bounds: States: Utah
Counties: All 17 counties in the Utah PM 2.5 SIP modeling domain

Vehicles/Equipment: On-road Vehicle Equipment
Fuels: Gasoline and Diesel, all allowed vehicle gasoline and diesel fuel combinations
Road Type: Off-Network
Rural Restricted Access
Rural Unrestricted Access
Urban Restricted Access
Urban Unrestricted Access

Pollutants: At least one pollutant needs to be selected, e.g.,
Carbon Monoxide: running, start, crankcase, idle

Output/General Output: Units: Grams, Joules, Miles
Activity: Distance Traveled
Output/Output Emissions Detail: Always: Month and County

For All Vehicles: Fuel Type & Emissions Process
On-road: Road Type & Source Use Type

Advanced Performance Features: Save Data for the following Masterloop Components

Total Activity Generator (TAG)
Operating Mode Distribution Generation (running OMDG)
Start Operating Mode Distribution Generator
Tirewear Operating Mode Distribution Generator
Copy Saved Generator Data
Database: populationrunTAG

Upon completing the national scale run, MOVES outputs a directory called "populationruntag". The output tables "starts" and "starts per vehicle" contain the data required to compute the source populations. Source population is computed by the following equation:

Source Population = Vehicle Starts/Starts per Vehicle

For example, in Salt Lake County for calendar year 2008, the source populations are:

Vehicle Code	Vehicle Name	Vehicle Starts	Starts per Vehicle	Vehicle Population
11	motorcycle	69,031	5.4	12,832
21	passenger car	12,576,834	39.3	320,295
31	passenger truck	8,692,851	38.0	228,560
32	lt. comm truck	3,057,392	40.0	76,358
41	intercity bus	4,580	15.7	291
42	transit bus	5,306	31.2	170
43	school bus	61,501	30.7	1,997
51	refuse truck	5,181	21.5	241
52	single-unit short-haul truck	446,443	35.3	12,620
53	single-unit long-haul truck	35,016	23.9	1,460
54	motor home	11,370	3.9	2,876
61	combination short-haul truck	103,913	32.0	3,243
62	combination long-haul truck	88,455	23.9	3,687
SUM	**SL Co**			**664,631**

The diagram below illustrates how DMV and UDAQ grouped the vehicles:

UTAH DMV DATABASE OF VEHICLES
Current to Jan 1, 2009

Light-duty Vehicles	Heavy-duty Vehicles
MC, LDV & LDT 1-4, HDV2b	HDV 3 – 8b, Buses
GVWR ≤ 12,000 lb	GVWR > 12,000 lb

M6 Types	MOVES Types	GVWR (lb)
MC	MC (11)	n/a
LDV	passenger car (21)	≤ 3,750
LDT 1-4	passenger truck (31)	≤ 8,500
HDV2b	light commercial truck (32)	8,500 < G ≤ 10,000

M6 Types	MOVES Types	GVWR (lb)
HDV 3-7	refuse truck, single-unit short- and long-haul truck (51 – 54)	10,000 < GVWR ≤ 33,000
HDBS, HDBT	buses (41 - 43)	n/a
HDV 8a, 8b	combination short- and long-haul truck (61, 62)	> 33,000

As shown in the diagram, the UDMV class "light-duty vehicles" includes those with GVWR up to 12,000 lb. UDAQ assigned these to MOVES classes 11, 21, 21 and 32.

This assignment is only an approximation based on the following assumptions: Some vehicles in the light-duty group have GVWR's from 10,000 to 12,000 lbs. These vehicles belong in MOVES vehicle type decile 50 (see "crosswalk" between MOBILE6 and MOVES vehicle types and the corresponding GVWR's below).

The more accurate way to assign light-duty vehicles with GVWR from 10,000 to 14,000 lbs is to distribute them among MOVES vehicle types 30 and 50. However, there is no way to determine the exact fractions of vehicles that belong in each class. For this reason, UDAQ believes the assignment of LDV's to MOVES classes 11, 21, 31 and 32 is sufficiently accurate. The UDMV class of heavy-duty vehicles is defined by a GVWR greater than 12,000 lbs. UDAQ assigned these to MOVES classes 41 through 62.

The "crosswalk" between MOBILE6 and MOVES source types is found in the EPA Age Distribution Importers, "Vehicle Type Mapping" tab:

Composite Vehicle Classes for Vehicle Registration Data from MOBILE6			
M6Vtype16ID	**Abbreviation**	**Description**	**HPMSVtypeID**
	LDV	Light-Duty Vehicles (Passenger Cars)	20
2	LDT1	Light-Duty Trucks 1 (0-6,000 lbs. GVWR, 0-3,750 lbs. LVW)	30
3	LDT2	Light-Duty Trucks 2 (0-6,000 lbs. GVWR, 3,751-5,750 lbs. LVW)	30
4	LDT3	Light-Duty Trucks 3 (6,001-8,500 lbs. GVWR, 0-5,750 lbs. ALVW)	30
5	LDT4	Light-Duty Trucks 4 (6,001-8,500 lbs. GVWR, 5,751 lbs. and greater ALVW)	30
6	HDV2B	Class 2b Heavy-Duty Vehicles (8,501-10,000 lbs. GVWR)	30
7	HDV3	Class 3 Heavy-Duty Vehicles (10,001-14,000 lbs. GVWR)	50
8	HDV4	Class 4 Heavy-Duty Vehicles (14,001-16,000 lbs. GVWR)	50
9	HDV5	Class 5 Heavy-Duty Vehicles (16,001-19,500 lbs. GVWR)	50
10	HDV6	Class 6 Heavy-Duty Vehicles (19,501-26,000 lbs. GVWR)	50
11	HDV7	Class 7 Heavy-Duty Vehicles (26,001-33,000 lbs. GVWR)	50
12	HDV8A	Class 8a Heavy-Duty Vehicles (33,001-60,000 lbs. GVWR)	60
13	HDV8B	Class 8b Heavy-Duty Vehicles (>60,000 lbs. GVWR)	60
14	HDBS	School Buses	40
15	HDBT	Transit and Urban Buses	40
16	MC	Motorcycles (All)	10

MOVES SourceUseType Vehicle Categories		
SourceTypeID	**SourceTypeName**	**HMPSVtypeID**
11	Motorcycle	10
21	Passenger Car	20
31	Passenger Truck	30
32	Light Commercial Truck	30
41	Intercity Bus	40
42	Transit Bus	40
43	School Bus	40
51	Refuse Truck	50
52	Single Unit Short-Haul Truck	50
53	Single Unit Long-Haul Truck	50
54	Motor home	50
61	Combination Short-Haul Truck	60
62	Combination Long-Haul Truck	60

Conversion of Source Type Populations by Local UDMV data and MOVES Defaults

Passenger Cars/Light Trucks & Motorcycles

Counts from UDMV

11 motorcycle
21 passenger car
31 passenger truck
32 light commercial truck

Heavy Trucks and Buses

Counts from MOVES

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 long-haul truck
62 combination long-haul truck

Final Source Type Population Adjustment

The UDMV historically has mixed data between passenger cars and light trucks so a composite VMT fraction obtained from UDOT for these particular vehicle types is utilized on the full count from the UDMV to determine the correct number of passenger cars (type 21) and light trucks (types 31 and 32). Source type population growth rates from the MOVES default are utilized to determine future and past source type populations. The input files for vehicle population are found in the "Appendix Items on DVD":

PM 2.5 MOVES Files.zip\Episodic\File Development\Vehicle Population\

Final 2008 Source Type Population for Salt Lake County

yearID	sourceTypeID	sourceTypePopulation
2008	11	26897
2008	21	342026
2008	31	280411
2008	32	93683
2008	41	291
2008	42	170
2008	43	1997
2008	51	241
2008	52	12620
2008	53	1460
2008	54	2876
2008	61	3243
2008	62	3687

(2) Source Type Age Distribution

UDMV age distribution data current to January 1, 2009 was used to calculate the vehicle populations for motorcycle (type 11), passenger cars (type 21), and light trucks (types 31 and 32) with a gross vehicle weight rating up to 12,000 lbs with the assumption that these vehicles comprise a majority of travel within the PM2.5 SIP modeling domain.

UDMV Age Distribution for Passenger Cars and Light Trucks

MODEL YEAR	MC	PASS/LT TRUCK
1978	0.0283	0.0146
1979	0.007	0.0014
1980	0.0112	0.0008
1981	0.0119	0.0009
1982	0.0149	0.001
1983	0.0106	0.0015
1984	0.0086	0.0026
1985	0.0099	0.0035
1986	0.009	0.0047
1987	0.005	0.0054
1988	0.0045	0.0073
1989	0.0045	0.0101
1990	0.0041	0.0128
1991	0.0046	0.0158
1992	0.007	0.019
1993	0.009	0.0249
1994	0.0101	0.0303
1995	0.014	0.0374
1996	0.0159	0.0373
1997	0.0173	0.0479
1998	0.0212	0.0502
1999	0.026	0.059
2000	0.0294	0.0644
2001	0.0403	0.0651
2002	0.0512	0.0649
2003	0.0702	0.0673
2004	0.0615	0.0675
2005	0.0861	0.0711
2006	0.1005	0.0698
2007	0.1605	0.0724
2008	0.1457	0.0691

UDMV data for heavy-duty vehicles is limited to vehicles registered in the state. The EPA MOBILE6 registration distribution converter (http://www.epa.gov/otaq/models/moves/tools.htm) was utilized to create age distribution files by county. UDMV data for passenger cars (type 21) and light trucks (types 31 and 32) were placed within the converter and MOVES defaults were used from the convertor for vehicle types 41 - 62.

Multiple phone conversations took place between UDAQ, the EPA MOVES Team and the FHWA Air Quality Team during the development of these files. All agencies involved found that the default MOVES data for heavy-duty vehicles for source type population and age distribution are probably more suitable than the limited local UDMV data. The input files for Age Distribution are found in the "Appendix Items on DVD"

PM 2.5 MOVES Files.zip\Episodic\File Development\Age Distribution\

(3) Vehicle Miles of Travel

The "Utah modified MOVES database" includes the following road types. A single county may have up to six different road types, as follows:

Road Type Code	Road Type
11	Rural Interstate
13	Rural Arterial
21	Rural Local
23	Urban Interstate
27	Urban Arterial
33	Urban Local

Counties and road types used are summarized below and grouped according to the agency responsible for the emission inventory for that county. Note that road types under MAG and WFRC do not include rural roads:

Agency	Count(-ies)	Road Type Code	Road Type
Cache MPO	Cache	13	Rural Arterial
		21	Rural Local
		27	Urban Arterial
		33	Urban Local
MAG WFRC	Utah Box Elder, Davis, Salt Lake, Tooele, Weber	23 27 33	Urban Interstate Urban Arterial Urban Local
UDAQ	Carbon, Wasatch	13	Rural Arterial
		23	Urban Interstate
		27	Urban Arterial
		33	Urban Local
UDAQ	Duchesne,	13	Rural Arterial

	Rich, Sanpete	21	Rural Local
UDAQ	Emery, Juab, Millard, Morgan	11	Rural Interstate
		13	Rural Arterial
		21	Rural Local
UDAQ	Summit	11	Rural Interstate
		13	Rural Arterial
		21	Rural Local
		23	Urban Interstate
		27	Urban Arterial
		33	Urban Local

For each road type, there are day-of-week adjustment factors for VMT. Using Box Elder County as an example, the VMT reported in the HPMS data system is converted from average annual daily traffic (AADT) to specific day-of-week VMT as shown below:

There are unique daily factors for each day of the week and each month of the year. Specifically, UDOT developed yearly, monthly and daily VMT factors for all base years 2007 – 2009.

Example: Converting Box Elder AADT VMT to a Monday in January 2007

Year	Month	Day of Week	Road Type	Monthly Conver-sion Factor	Daily Conver-sion Factor	HPMS AADT	win AWKDT or win AWKNDT
2007	Jan	Mon	Rural Freeway	0.8177	0.9872	1,142,949	922,552
2007	"	"	Rural Arterial	0.8104	1.0672	601,132	519,894
2007	"	"	Urban Freeway	0.9337	1.1134	254,701	268,966
2007	"	"	SUM			1,998,782	1,711,412

(4) Rural Vehicle Type VMT

"Vehicle Type VMT" is often referred to as "travel fraction" or "VMT fraction", indicating how VMT is distributed among the vehicle types.

For interstate and arterial facilities, UDAQ obtained raw VMT travel fractions for ten FHWA vehicle classes grouped by Gross Vehicle Weight Rating (GVWR) ranges from the UDOT Division of Systems Planning and Programming. The travel fractions were obtained by county from automated pneumatic counters that detect axle spacing and "weigh-in motion" (WIM) counters placed on arterials and interstates.

Since there are no counters on local roads, the UDAQ used travel fractions for LDV's and HDV's from the MPOs' local road surveys for urban counties.

The data was converted to MOBILE6 vehicle types and then to MOVES vehicle (source) types. The base year for these data was 2008.

VMT on each road type was divided among ten vehicle classes by Gross Vehicle Weight Rating (GVWR). The ten vehicle classes used by UDOT are as follows:

Vehicle	GVWR Range(lb)
LDV	≤ 6,000
LDV	6,000 < GVWR ≤ 8,500
HDV	8,500 < GVWR ≤ 10,000
HDV	10,000 < GVWR ≤ 14,000
HDV	14,000 < GVWR ≤ 16,000
HDV	16,000 < GVWR ≤ 19,500
HDV	19,500 < GVWR ≤ 26,000
HDV	26,000 < GVWR ≤ 33,000
HDV	33,000 < GVWR ≤ 60,000
HDV	GVWR > 60,000

Individual VMT values for the above ten vehicle types on each road type were converted to fractions. The EPA default VMT fractions for calendar year 2008 were then used to expand the fractions for ten vehicles to the sixteen vehicle types in MOBILE6 (see "Appendix Items on DVD":

PM 2.5 MOVES Files.zip\Episodic\UDAQ\File Development\
PM 2.5 MOVES Files.zip\Episodic\CMPO\File Development\
PM 2.5 MOVES Files.zip\Episodic\MAG\File Development\
PM 2.5 MOVES Files.zip\Episodic\WFRC\File Development\

MOBILE6 vehicle types were grouped into the six MOVES gross vehicle types by decile (i.e., 10 = motorcycle, 20 = passenger car, 30 = passenger truck and light commercial truck, 40 = buses, 50 = single-unit haul truck, and 60 = combination truck.).

The final step was to break up the VMT under each decile into fractions for all the MOVES vehicle types under that decile. For example, decile "30" is comprised of passenger truck and light commercial truck. The VMT fractions for these vehicle types were obtained from their respective MOVES default fractions. In the same way, MOVES default fractions for vehicle types in each respective "decile" were used to obtain the final VMT fractions for the thirteen vehicle types in MOVES.

To obtain VMT fractions for other calendar years (2007 and 2009), the annual percent change in the MOVES default VMT fractions by calendar year was utilized to grow the mix. The resulting VMT fractions were normalized to a sum of exactly 1.0000.

To perform the MOVES VMT fraction run, the following GUI selection inputs were used:

Settings: Configure MOVES Default Database: movesdb20100830

Description: Contains the name of all the counties modeled.

Scale: Domain/Scale: National
Calculation Type: Inventory

Time Span: Time Aggregation Level: Month
Years: 1990, 1999-2050
Months: January
Days: Weekday
Hours: 24

Geographic Bounds: States: Utah
Counties: All 17 counties in the Utah PM 2.5 SIP modeling domain

Vehicles/Equipment: On-road Vehicle Equipment

Fuels: Gasoline and Diesel
All vehicle gasoline and diesel fuel combinations

Road Type: Off-Network
Rural Restricted Access
Rural Unrestricted Access
Urban Restricted Access

Urban Unrestricted Access

Pollutants: Total Energy Consumption

Output/General Output: Units: Grams, Joules, Miles
Activity: Distance Traveled

Output/Output Emissions Detail: Always: Hour and County
On-road: Road Type and Source Use Type
Advanced Performance Features: Save Data for the following Masterloop Components:

Total Activity Generator (TAG)
Copy Saved Generator Data
Database: vmtgenTAG

The VMT fractions were utilized to calculate VMT by vehicle type and road type distribution using VMT values from UDOT HPMS 2007-2009 data. UDOT Division of Systems Planning and Programming provided seasonal, weekday-weekend adjustment factors. The input files for VMT and vehicle type fractions ("VMT fractions") are found in the "Appendix Items on DVD":

PM 2.5 MOVES Files.zip\Episodic\UDAQ\File Development\
PM 2.5 MOVES Files.zip\Episodic\CMPO\File Development\
PM 2.5 MOVES Files.zip\Episodic\MAG\File Development\
PM 2.5 MOVES Files.zip\Episodic\WFRC\File Development\

Vehicle Type Calculation Example 2008 February (Tuesday) Wasatch County

movesrunid	monthid	sourcetypeid	sum(activity)	yearid	percent
5	1	11	4,162	2008	0.006
5	1	21	288,092	2008	0.392
5	1	31	239,067	2008	0.326
5	1	32	79,865	2008	0.109
5	1	41	793	2008	0.001
5	1	42	235	2008	0.000
5	1	43	903	2008	0.001
5	1	51	1,395	2008	0.002
5	1	52	44,495	2008	0.061
5	1	53	5,770	2008	0.008
5	1	54	2,650	2008	0.004
	1	61	28,190	2008	0.038
5	1	62	38,490	2008	0.052
			734,109		1.000

(5) DAQ Urban Input File Template

The MPOs used the MOVES input files prepared by DAQ as the template for modeling vehicle emissions in Box Elder, Cache, Davis, Salt Lake, Tooele, Utah and Weber Counties. These input files, or County Database Manager (CDM) files, contain data for fuels, vehicle age, meteorology, vehicle population, and vehicle Inspection and Maintenance (I/M) programs, all of which were kept intact as prepared by DAQ and described in this document.

The DAQ input file templates also contain vehicle activity data as described above. For these vehicle activity data inputs, the MPOs relied on data from their respective Travel Demand Models to replace the values provided in the DAQ input file template.

The methodology used by each respective MPO to model vehicle activity in the urban areas will be presented, particularly where the MPO method is different from the DAQ method.

(6) Urban MPO Vehicle Activity Data

The MOVES model requires four input files to describe vehicle activity. These vehicle activity input files are: 1) VMT by vehicle type, 2) ramp fraction, 3) roadway type distribution and 4) speed distribution. As stated in the overview to the TSD, urbanized counties that are members of a Metropolitan Planning Organization (MPO) were modeled by their respective MPO. Hence WFRC, MAG and Cache MPO submitted the mobile source emission inventories for the urban counties under their jurisdiction with slight variations in methodology according to the resources or other unique conditions for each MPO. (DAQ prepared the mobile source emission inventories for the remaining rural counties.)

(7) Travel Demand Models

Owing to the fact that WFRC and MAG operate jointly a Regional Travel Demand Model (TDM), and that Cache operates its own TDM, the vehicle activity data necessary for preparing the emission inventories were derived from the respective travel models. The Travel Demand Model quantifies vehicle activity. The model consists of a highway and transit network and socio-economic data (population, employment, vehicle ownership, and household size, for example). This is particularly useful for estimating future vehicle activity and therefore future vehicle emissions.

(8) TDM2MOVES Program

WFRC developed a program to use with the Travel Demand Model that extracts vehicle activity data from the travel model and produces the input files required for the MOVES emissions model. The Travel Demand Model program is referred to as TDM2MOVES because it converts travel demand model (TDM) data to MOVES input files. The TDM2MOVES program prepares the four vehicle activity input files for use with MOVES mentioned above, along with other files useful for data summary and analysis. The vehicle activity files are prepared for each county and year identified in the Travel Demand Model.

The TDM2MOVES program was also employed by MAG, and the respective files for the Utah County area were used in the MOVES County Data Manager in the same manner.

The Cache MPO Travel Demand Model is not currently set up for automatic generation of MOVES input files, so CMPO manually prepared the necessary vehicle activity files for MOVES using data from Cache County TDM.

(9) Urban MPO VMT by Vehicle Type

In general, the Regional Travel Demand Model estimates vehicle miles traveled (VMT) for each link in the travel model network. The VMT is tallied by county and highway functional class. This data is then multiplied by vehicle type fractions, or VMT mix, for the respective county and highway functional class. Finally, the data is totaled by vehicle type across all roadway types and formatted as required for MOVES input data. These calculations are accomplished by the TDM2MOVES program.

WFRC used VMT by vehicle type data from the Regional Travel Demand Model for Davis, Salt Lake and Weber Counties (or other travel models in the case of Tooele and Box Elder Counties) and then adjusted the resulting MOVES emission totals and VMT totals to HPMS levels.

MAG elected to not change the VMT by vehicle type data provided in the DAQ input file template since it was already based on reported HPMS values for VMT.

CMPO likewise used HPMS data for the VMT by vehicle type data in the DAQ input file template; however, CMPO adjusted the HPMS VMT inputs. These adjustments changed urban

local VMT for 2007 and 2008 to correct a coding error discovered in the UDOT HPMS data. Also, Cache used a different heavy- duty/light-duty split for local roads based on a number of field data counts.

(10) No Rural VMT in WFRC and MAG Counties

The MOVES model groups VMT into two classes: urban and rural. This corresponds to the HPMS data reporting system, which likewise groups VMT data by urban and rural as well as roadway type. The Regional Travel Demand Model, however, makes no such distinction of VMT within the boundaries of the model; therefore, all the VMT within the Regional Travel Model domain is considered urban VMT.

(11) HPMS Adjustment Factors

The Regional Travel Demand Model estimates vehicle miles traveled (VMT) for each link in the travel model network. The VMT is tallied by county and highway functional class. These data are then compared with VMT reported in the Highway Performance Monitoring System (HPMS). The VMT from the HPMS data is based on actual vehicle count data collected annually by the Utah Department of Transportation and is considered the control total for VMT.

An adjustment factor for HPMS is defined as the HPMS value for VMT divided by the Travel Demand Model value for VMT. This HPMS adjustment factor is calculated for each road type and each county for the year 2007, which is the most recent year shared by both HPMS data and Travel Demand Model results. The 2007 HPMS adjustment factor is then applied to Travel Demand Model forecasts of VMT to "correct" the model results to HPMS values.

(12) Local Road VMT and HPMS Factors

The Regional Travel Demand Model is composed of links representing freeways, ramps and arterials (including many but not all minor arterials and collector roads). Local roads with a primary function of traffic access, such as residential streets, are not expressly included in the highway network. The highway network does include a different kind of link called a centroid connector that is used as an access point for trips generated in residential or employment zones. These special centroid connectors have a hypothetical (but constant) length, and a traffic volume in proportion to the population or employment in the zone it connects. From the length and volume data, a hypothetical VMT value can be estimated for the centroid link.
By dividing the known local road VMT reported in the HPMS data system by this hypothetical VMT, an HPMS adjustment factor for local roads is obtained. While the length of the centroid connector may be hypothetical, the traffic volume on the centroid link is a realistic estimate of traffic demand for that zone. Therefore, this is a meaningful tool to forecast VMT on local roads using the Travel Demand Model even though local roads are not expressly defined in the travel model network.

(13) WFRC Post-model (MOVES) Adjustments

As discussed earlier, the TDM2MOVES program includes HPMS adjustment factors for the

base year 2007. While this is useful for correcting future VMT estimates to the HPMS standard, the PM2.5 episodes being modeled (2007, 2008, 2009 and 2010) all have actual HPMS data already recorded. MAG and Cache MPO utilized the actual HPMS reported VMT's for the respective years distributed among the appropriate road types as prescribed from the TDM results.

WFRC, on the other hand, ran the MOVES model using the 2007 VMT by Vehicle input files from the TDM2MOVES program. This made it necessary to factor the distance (or VMT) reported in the MOVES summary file to match the VMT reported in HPMS for 2008, 2009, and 2010. Since emissions are a function of distance, the emissions reported in the MOVES summary file were likewise adjusted.

In the case of Box Elder and Tooele Counties (not included in the WFRC/MAG Travel Demand Model), there is a distinction between vehicle data in the non-attainment area portion of the county and the entire county as reported in the HPMS data system and as defined in the air shed domain. WFRC executed the MOVES model using the travel characteristics for the non-attainment portions of Box Elder and Tooele Counties, so these results had to be factored to include the entire county. The ratio of weekday-adjusted HPMS VMT to WFRC model VMT was calculated for Box Elder and Tooele Counties and for each road type. These ratios were used to factor the MOVES results for these two counties.

A second adjustment to VMT and emissions was also made to reflect VMT variations by day of the week. Weekend traffic (Sunday in particular) tends to be much lower than weekday traffic, and variations by different weekdays are also observed. This day-of-week adjustment is made in the same manner used by DAQ for rural areas except that WFRC applied this adjustment after running the MOVES model rather than applying the adjustment to the VMT by Vehicle input file.

(14) Rural Road Type Distribution

FHWA HPMS VMT data reported as average annual day traffic (AADT) was supplied by the Utah Department of Transportation (UDOT) for calendar years 2007, 2008 and 2009. At the time of this draft, 2010 VMT was not available, so 2010 VMT was set to 2009 VMT. The justification for this is that the 2009 – 2010 episode dates run from December 2009 through January 2010.

In addition, UDOT provided average annual day adjustment factors for each combination of winter month and year (i.e., for January 2007, February 2008, January 2009 and December 2009 – January 2010). Level of detail was to provide separate factors for six road types (the four default road types in MOVES plus rural local roads and urban local roads).

Finally, separate VMT adjustment factors were supplied by UDOT for each day of the week. It is seen that VMT is lowest on Sundays, which is expected.

See Appendix Items on DVD:

PM 2.5 MOVES Files.zip\Episodic\UDAQ (Rural)\CDM\.

UDOT HPMS VMT was organized according to the following MOVES road type ID's:

Modified MOVES Road TypeID's	UDOT HMPS Categories
Rural Arterial	Rural Major Collector (07) Rural Minor Collector (08) Rural Minor Arterial (06) Rural Other Principal Arterial (02)
Rural Freeway	Rural Interstate (01)
Rural Local	Rural Local (09)
Urban Arterial	Urban Collector (17) Urban Minor Arterial (16) Urban Other Principal Arterial (14)
Urban Freeway	Urban Interstate (11) Urban Freeway and Expressway (12)
Urban Local	Urban Local (19)

Road Type Distribution Example 2008 February (Tuesday) Wasatch County

sourceTypeID	roadTypeID	roadTypeVMT Fraction
11	1	0.000
11	2	0.000
11	3	0.698
11	4	0.000
11	5	0.172
11	32	0.084
11	52	0.046
21	1	0.000
21	2	0.000
21	3	0.698
21	4	0.000
21	5	0.172
21	32	0.084
21	52	0.046
etc		

(15) Urban MPO Road Type Distribution

WFRC and MAG used the road type distribution data from the TDM2MOVES program. The TDM2MOVES program also makes a tally of vehicle miles traveled (VMT) by county for all roadway types: freeways, ramps, arterials and local roads. For MOVES input, this data also needs to be disaggregated by vehicle type. The TDM2MOVES program performs these calculations based on-road type designations in the TDM and the urban area VMT mix or vehicle type fraction data provided. The data are reported as a percentage of vehicle activity on each road type, with the sum for each vehicle type equal to 100%.

For Cache County, the CMPO used the same methods as DAQ used in the rural areas to determine road type distribution. The CMPO adjusted the HPMS VMT inputs in 2007 and 2008 to correct a coding error discovered in the UDOT HPMS data.

The road type distribution files can be found in the Appendix Items on DVD:

PM 2.5 MOVES Files.zip\Episodic\UDAQ (Rural)\File Development\
PM 2.5 MOVES Files.zip\Episodic\CMPO\File Development\
PM 2.5 MOVES Files.zip\Episodic\MAG\File Development\
PM 2.5 MOVES Files.zip\Episodic\WFRC\File Development\

(16) Rural Average Speed Distribution

The "Easy Mobile Inventory Tool" (EMIT) created by FHWA was used to compute MOBILE6 average speeds for restricted and unrestricted road types. EMIT creates a MOBILE6 speed input file utilizing the Highway Capacity Method to determine rural speeds based on HPMS data and a 1% ramp fraction. This tool is important for estimating speeds in rural areas that do not have a travel demand model. UDOT Division of Systems Planning and Programming provided HPMS Rural County lane miles for 2008. The rural HPMS data is sorted by the following MOBILE6 road types for input into the FHWA Easy Mobile Inventory Tool (EMIT):

HPMS	MOBILE6 Road Types
Rural Interstate (01)	Interstate
Rural Other Principal Arterial (02)	Other Principal Arterial
Rural Minor Arterial (06)	Minor Arterial
Rural Major Collector (07)	Major Collector
Rural Minor Collector (08)	Minor Collector
Rural Local (09)	Local
Urban Interstate (11)	Interstate
Urban Freeway and Expressway (12)	Other Freeway
Urban Other Principal Arterial (14)	Other Principal Arterial
Urban Minor Arterial (16)	Minor Arterial
Urban Collector (17)	Major Collector
Urban Local (19)	Local

UDAQ created a modified database which added rural and urban local roads. Speeds for all local roads were set to 12.9 mph as in MOBILE6. MOBILE6 SPEEDVMT distributions were converted to MOVES average speed distributions using the EPA Average Speed Converter MOBILE6.xls tool. The input files for the 2008 lane miles in the rural counties are found in the "Appendix Items on DVD":

PM 2.5 MOVES Files.zip\Episodic\UDAQ (Rural)\File Development\Rural Areas Average Speeds\

(17) Urban MPO Average Speed Distribution

WFRC and MAG used the speed distribution data from the TDM2MOVES program. For the rural areas in the air shed domain, there is only limited speed data available – usually a single average daily speed. But for the urban areas within the domain of the Regional Travel Demand Model, a full spectrum of estimated speeds that vary by time of day and by level of congestion is available.

The TDM models traffic for four different time periods and traffic conditions: AM, midday, PM, and evening. The "AM" period represents 3 hours of the morning commute to work, "midday" represents the next 6 hours of traffic activity, "PM" represents 3 hours of the afternoon commute back home, and "evening" represents the remaining 12 hours of traffic.

A weekend speed profile was created by simply reassigning some of the weekday time period assignments to other hours of the day in the weekend speed profile. Observations of actual traffic activity shows that traffic at 6-8 AM on a weekend day has a similar speed profile as the evening weekday time period. Likewise the 3-5 PM weekend day has a similar speed profile as the weekday midday time period. Therefore, these hour assignment adjustments were made in the spreadsheet TDM data to produce a weekend speed profile.

The TDM2MOVES program determines the speed on each link in the TDM for each of the four time periods. The Vehicle Hours Traveled (VHT) on each link are then tallied into a speed profile by "speed bin" (in 5 mph increments) and by each hour of the day. Once all the VHT is thus tallied, the speed profile is converted to a percentage distribution of speed by dividing the VHT for each speed bin in a given hour by the total VHT for that hour. The speed profile is disaggregated further by vehicle type and roadway type. For road types classified as "local", the MOBILE6 default speed of 12.9 mph is used.

For Cache County, the CMPO Regional Travel Demand Model (TDM) was used to assign average speeds to the coded roadway network on a link-by-link basis. Like the WFRC TDM, the CMPO model is also able to provide a speed profile for four different time periods (the Cache TDM has the same time period categories as the WFRC TDM). Unlike the WFRC TDM, the Cache model does not have the capability to automatically process or convert data into MOVES input files. Therefore, the CMPO post-processed the 2008 Cache TDM weekday speed data into a speed profile import format for MOVES. This was accomplished by exporting the Cache TDM data as a GIS "shapefile". Since the Cache TDM network's functional classification scheme was

somewhat different than the functional classification scheme that was used by UDOT for the HPMS VMT data, the links in the Cache model were manually coded with UDOT's functional classification. Based on this revised functional classification, the TDM output data (in GIS shapefile format) was processed in a spreadsheet to produce the MOVES speed distribution. VHT and modeled speed for each link in the network was tallied by the MOVES speed bins. This data was converted to the speed bin fraction of modeled VHT by time period and MOVES road type.

A weekend speed profile was created by simply reassigning some of the weekday time period assignments to other hours of the day in the weekend speed profile. Observations of actual traffic activity in Cache County showed that 6-8 AM on a weekend day has a similar speed profile as the evening weekday time period. Likewise the 3-5 PM weekend day has a similar speed profile as the weekday Midday time period. Therefore, these hour assignment adjustments were made in the spreadsheet TDM data to produce a weekend speed profile.

CMPO used the same weekend speed profile technique as WFRC and MAG. The CMPO used the 2008 weekday and weekend speed profile for all the 2007, 2008, 2009 and 2010 base year modeled episode days.

The input files for average speed distribution are found in the "Appendix Items on DVD":

CMPO PM 2.5 MOVES Files.zip\Episodic\CMPO\CDM\
MAG PM 2.5 MOVES Files.zip\Episodic\MAG\CDM\
WFRC PM 2.5 MOVES Files.zip\Episodic\WFRC\CDM\

18. Rural Ramp Fractions

UDAQ utilized the MOVES default ramp fraction of 8% for rural counties that have urban and rural freeways. The default was utilized because no ramps exist in the HPMS system.
The input files for the rural ramp fractions are found in the "Appendix Items on DVD":

UDAQ PM 2.5 MOVES Files.zip\Episodic\UDAQ\CDM\

(19) Urban MPO Ramp Fractions

WFRC and MAG used the ramp fraction data from the TDM2MOVES program. The TDM2MOVES program makes a tally of vehicle hours traveled (VHT) by county for all roadway types: freeways, ramps, arterials and local roads. The ramp fraction input file for the MOVES model defines "ramp fraction" as ramp VHT divided by the total of ramp and freeway VHT. The ramp fraction input files are created by the TDM2MOVES program for each county.

Cache County does not have any freeways or freeway ramps.

The input files for the urban ramp fractions are found in the "Appendix Items on DVD":

CMPO PM 2.5 MOVES Files.zip\Episodic\CMPO\CDM\
MAG PM 2.5 MOVES Files.zip\Episodic\MAG\CDM\
WFRC PM 2.5 MOVES Files.zip\Episodic\WFRC\CDM\

(20) DayVMTFraction

UDAQ exported the default fractions and replaced each value with a "1". The purpose of this is to allow MOVES to model a single day instead of a month, season or year. In the County Data Manager, this file must have day VMT fractions set to "1" for the corresponding month and day being modeled.

sourceTypeID	monthID	roadTypeID	dayID	dayVMTFraction
21	1	1	5	1
21	1	2	5	1
21	1	3	5	1
21	1	4	5	1
21	1	5	5	1
21	1	32	5	1
21	1	52	5	1
etc.				

(21) Fuel Type ID

The MOVES default database (MOVESDB20100830) includes a table called "fuel type". This is the starting point to determine the correct fuel for a given data triplet (county, year and month).

The table "fuel type" contains only the following basic fuel types:

fuelTypeID	defaultFormulationID	fuelTypeDesc
1	10	Gasoline
2	20	Diesel Fuel

fuelSubtypeID	fuelTypeID	fuelSubtypeDesc
10	1	Conventional Gasoline
20	2	Conventional Diesel Fuel

(a) Fuel Supply

The table "fuel supply" (in the MOVES default database) is organized by county, calendar year and month.

For example, for Salt Lake County in February 2008, the table shows the following:

county ID	fuelYear ID	monthGroup ID	fuelFormula-tion ID	marketShare	marketShareCV
49035	2008	2	2525	0.436743	0.5
49035	2008	2	7932	0.564357	0.5
49035	2008	2	20043	1.000000	0.5

(b) Fuel Formulation

To find the fuel properties for each of the above fuel formulations, refer to the table "Fuel Formulation" in the MOVES default database.

For the fuel formulation in the example above, the table "Fuel Formulation" shows the fuel properties:

FuelFormula-tionID	FuelSub-typeID	RVP (psi)	SulfurLevel (ppmw)	Aromatic Content (vol%)
2525	12	11.7643	54.6375	22.358
7932	10	11.7643	54.6375	22.358
20043	20	0	43	0.

However, upon closer inspection, the following was found:

Fuel formulation 2525 has a fuel subtypeID of 12. When one looks up "12" in the fuelsubtypeID table above, one finds E-10. From discussions with the Utah Petroleum Association, it was found that E-10 was not introduced to Salt Lake County until Spring 2010. Thus UDAQ removed fuel formulation 2525 from fuels used in Salt Lake County in 2008.

Fuel formulation 2525 has a fuelsubtypeID of 10, which corresponds to conventional gasoline in the table "fuelsubtype". Fuel formulation 20043 has a fuelsubtypeID of 20, which corresponds to conventional diesel fuel in the table.

Thus the actual fuel formulations used in Salt Lake County in February 2008 are 2525 (conventional gasoline) and 7932 (conventional diesel fuel).

Note that the fuel formulations listed for a given (county, year, month) in the fuel supply table may not be in adjacent rows. The fuel formulations for Salt Lake County in February 2008 are in rows 7755, 7756 and 7981 in the table "Fuel Supply".

The following counties contained E-10 fuel according to MOVES 2010a, but according to the Utah Petroleum Industry, E-10 was not introduced to Utah until Spring 2010. In order to replicate the fuel actually utilized during the PM2.5 episodes, the fuel parameters were modified by removing E-10 and replacing it with conventional gasoline. The EPA MOVES Team provided technical guidance on the procedure to modify MOVES 2010a for this purpose.

The following default MOVES 2010a counties contained E-10 and were modified with conventional gasoline:

2007-2010
Davis
Juab
Morgan
Salt Lake
Summit
Tooele
Utah
Weber

(22) Hour VMT Fraction

MOVES2010a default data for hour VMT fraction was utilized for all counties. To find the MOVES default values of hourVMTfraction or "VMT by Hour" for a given road type, refer to the table "hourVMTfraction" in the MOVES default database (20100830).

(23) I/M Coverage (Davis, Salt Lake, Utah and Weber Counties)

UDAQ obtained written details of I/M test procedures from the four I/M programs in Utah, which are administered at the county level. Currently only Davis, Salt Lake, Utah and Weber Counties have implemented I/M programs. UDAQ staff modified the default I/M input file to reflect each specific county program. The input files for I/M are found in the "Appendix Items on DVD":

MAG PM 2.5 MOVES Files.zip\Episodic\CMPO\CDM\
WFRC PM 2.5 MOVES Files.zip\Episodic\CMPO\CDM\

(24) MonthVMTFraction

The default database contains different fractions for each month, to be used when an annual inventory is created. UDAQ set all fractions for the episode months (January, February and December) to "1". This is required in order to model single days with MOVES.

(25) Meteorological Data (Zone Month Hour)

Meteorological data is identified in the database as Zone Month Hour data. This data consists of hourly temperature (ºF) and relative humidity values (%) for each separate county and episode day. Data were collected by the UDAQ Planning Branch, Technical Analysis Section.[2]

[2]From the home page at, http://mesowest.utah.edu/index.html . On the map, click on the outline of Utah. On the upper menu (red bar), under "Product", choose "Current Weather Summary (instead of "Surface Weather Maps") and click on "GO". Then choose a station name, e.g., "Salt Lake City I" (Salt Lake City International Airport). To find a different station, go to the menu on the left-hand side of the page. Under "MORE INFO", choose "Nearby Stations" and select a different city or station.

viii. **Model Outputs**

The UDAQ Technical identified four episodes when PM2.5 levels were highest:

Thu, Jan 11 – Sun, Jan 21, 2007 inclusive
Wed, Feb 13 – Tue, Feb 19, 2008 inclusive
Thu, Jan 8 – Tue, Jan 27, 2009 inclusive
Mon, Dec 7, 2009 – Sat, Jan 23, 2010 inclusive

UDAQ initially executed MOVES runs for each separate episode day above. Seventeen counties were modeled for each episode day.

For emission inventory purposes, the seventeen counties were assigned to the MPOs and UDAQ as follows:

MPO	Counties
Cache MPO	Cache
Mountainland Association of Governments	Utah
Wasatch Front Regional Council	Box Elder, Davis, Salt Lake, Tooele, Weber
UDAQ	Carbon, Duchesne, Emery, Juab, Millard, Morgan, Rich, Sanpete, Summit, Wasatch

Using the MOVES input files created by DAQ as a template, the Metropolitan Planning Organizations (MPOs) supplied the necessary input data sets based on travel model results and compiled the episode day emission inventories for the counties in their jurisdictions.

MOVES model outputs are found in "Appendix Items on DVD":

PM 2.5 MOVES Files.zip\Episodic\UDAQ\Output\
PM 2.5 MOVES Files.zip\Episodic\CMPO\Output\
PM 2.5 MOVES Files.zip\Episodic\MAG\Output\
PM 2.5 MOVES Files.zip\Episodic\WFRC\Output\

ix. **General Output**

Working through the MOVES input screen under the menu item "Output" (on the left-hand side of the screen), the sub-menu item "General Output" allows the user to choose the desired units and other output data parameters. Units used by UDAQ appear in bold font below:

(1) Units (Output)

Mass Units	**grams**, kilograms, pounds, U.S. Tons
Energy Units	joules, kilojoules, **million BTU**
Distance Units	kilometers, **miles**

(2) Activity (Output)

The following data sets may be output:

Distance Traveled
Source Hours
Source Hours Idling
Source Hours Operating
Source Hours Parked
Population
Starts

(3) Output Emissions

Under the menu item "Always", UDAQ chose units that appear in bold font below:

Time	**24-hour day**, Hour, Portion of Week, Month, Year
Location	**County**, Nation, State, Zone
Pollutant	**Y** or N

The menu items "Estimate Uncertainty" and "Number of Iterations" do not function during an actual run.

Output from MOVES can be organized several ways, depending on the users desired selections on the "Output Emissions" screen. UDAQ selected output by vehicle type (source classification code or SCC), and emission process. SCC identification and vehicle type is defined as follows:

(4) Source Classification Codes		Vehicle Type
220	1001	LDGV
220	1020	LDGT I
220	1040	LDGT II
220	1070	HDGV
220	1080	MC
223	0001	LDDV
223	0060	LDDT
223	0071	HDDV2b
223	0072	HDDV3, 4, 5
223	0073	HDDV6, 7
223	0074	HDDV8a, 8b
223	0075	HDDB (school and transit bus)

(5) Road Types

UDAQ modified the MOVES database (20100830) by adding local roads to the road types. Codes assigned to the road types were defined as follows:

Code	Road Type
11	Rural Interstate
13	Rural Arterial
21	Rural Local
23	Urban Interstate
27	Urban Arterial
33	Urban Local

(6) Components of Pollutants

One or more of the following components were used for the various pollutants:

Code	Component
B	brake wear
T	tire wear
X	exhaust
V	evaporative

(7) Summary Reports

MOVES produces summary reports after program execution. The user chooses the top menu item "Post-Processing" and then chooses "Produce Summary Report". The output can immediately be converted to EXCEL or some other format.

EXCEL workbooks were created for each county by corresponding agency (Cache MPO, MAG, UDAQ and WFRC). Within each county output dataset, there is a separate workbook for each episode year, which contains the daily inventories for each episode day in the episode. In addition, there is a summary worksheet that shows daily totals for each episode day. The summary workbooks are found in the "Appendix Items on DVD" (9) PM2.5 Base Year Summary.

The workbooks are organized as follows:

MPO	Year		Workbook
Urban MPO: Episode 1			
Cache MPO	2007	2007	CMPO.xlsx
MAG	2007	2007	MAG.xlsx
WFRC	2007	2007	WFRC.xlsx
Rural Counties: Episode 1			
UDAQ	2007	2007	UDAQ.xlsx
Urban MPO: Episode 2			
Cache MPO	2008	2008	CMPO.xlsx
MAG	2008	2008	MAG.xlsx
WFRC	2008	2008	WFRC.xlsx

MPO	Year	Workbook
Rural Counties: Episode 2		
UDAQ	2008	2008 UDAQ.xlsx
Urban MPO: Episode 3		
Cache MPO	2009	2009 CMPO Jan.xlsx
MAG	2009	2009 MAG Jan.xlsx
WFRC	2009	2009 WFRC Dec.xlsx
Rural Counties: Episode 3		
UDAQ	2009	2009 UDAQ Jan.xlsx
Urban MPO: Episode 4		
Cache MPO	2010	2010 CMPO Jan.xlsx
MAG	2010	2010 MAG Jan.xlsx
WFRC	2010	2010 WFRC Jan.xlsx
Rural Counties: Episode 4		
UDAQ	2010	2010 UDAQ Jan.xlsx

x. **Fugitive Dust (PM10 and PM2.5) from Paved Roads (Re-entrained Road Dust)**

AP-42, Chapter 13.2, "Introduction to Fugitive Dust Sources", Section 13.2.1, "Paved Roads", has been revised since the November 2006 version. The new final version dated January 2011 was announced in the Federal Register on February 4, 2011.

UDAQ modeled fugitive dust from paved roads using the final January 2011 version.

Inputs are somewhat different between the models. Inputs common to both methods include the following:

Name of Input	Description	Detail	New Values	
(1) Constants k for PM10 and PM2.5 multiplier			1.0, 0.25 for PM10 and PM2.5 respectively	
(2) Average Vehicle Weight	tons	Interstate	var.	var.
		Arterial	var.	var.
		Local	var.	var. *

*In general, average vehicle weight is highest on interstates and lowest on local roads. In rural counties, average vehicle weight is often a factor of three or four times higher than in large urban counties due to the relatively higher percentage of large trucks in rural areas compared to urban areas with large volumes of commuter traffic.

(3) Silt Loading Factors (SLF)

UDAQ, after discussions with the Interagency Consultation Team, used the recently approved methodology in the latest version of AP-42, Ch 13.2.1 published in the FR January 2011. EPA default silt loading factors (SLF's) were used. The Team determined that the SLF's from an old

local study on silt loading conducted in Salt Lake County were of questionable accuracy (see Reference #1).

The EPA default SLF's are shown below, copied from Table 13.2.1-2 of the January 2011 guidance in AP-42:

ADT Category	< 500	500-5,000	5,000-10,000	> 10,000
Ubiquitous Baseline (g/m2)	0.6	0.2	0.06	0.03 0.015 limited access

The workbooks for fugitive dust are found in the "Appendix Items on DVD", Episodes/ Fugitive Dust/ (EXCEL workbooks). Note that the inventories of fugitive dust from paved roads are in units of **tons per year** as requested by UDAQ Technical Analysis Section.

(4) Precipitation

Precipitation inputs were obtained from the UDAQ Technical Analysis Section. Units are "number of hours per day with precipitation greater than 0.01 inch". As precipitation increases, fugitive dust decreases. The precipitation factor (1 - 1.2P/N) is greater than or equal to 1 whenever the value of P is 20 or more (hours out of 24). In this case, the EF for dust equals zero. For P = 0, the EF is maximum.

Precipitation data for all episodes, counties and days are found in the "Appendix Items on DVD", Episodes/Fugitive Dust/ (EXCEL workbooks).

(xi) **APPENDIX ITEMS ON DVD--EPISODE DAYS FOR PM2.5 SIP**

Thu, Jan 11 - Sun, Jan 21, 2007 Inclusive
Wed, Feb 13 - Tue, Feb 19, 2008 Inclusive
Thu, Jan 8 - Tue, Jan 27, 2009 Inclusive
Mon, Dec 7 - Thu, Dec 31, 2009 Inclusive
Fri, Jan 1 - Sat, Jan 23, 2010 Inclusive

Appendix Number	Directory Names	Subdirectory Names	File Names
	PM2.5 MOVES Files\Episodic\		
	CMPO\ (**Cache County**)	CDM\	cache_11107_cdm thru cache_12107_cdm inclusive
			cache_21308_cdm thru cache_21908_cdm inclusive
			cache_010809_cdm thru cache_012709_cdm inclusive
			cache_120709_cdm thru cache_123109_cdm inclusive
			cache_010110_cdm thru cache_012310_cdm inclusive
		File Development\	MOVES MIX072210 Local Cache_ Adjust.xlsx
			TDM_GIS_2008_withUDOTFC_5_ weekend.xlsx
		MRS\	Cache_11107.mrs thru Cache_12107.mrs inclusive
			Cache_21308.mrs thru Cache_21908.mrs inclusive
			Cache_10809.mrs thru Cache_12709.mrs inclusive
			Cache_120709.mrs thru Cache_123109.mrs inclusive
			Cache_10110.mrs thru Cache_12310.mrs inclusive
		Output\	CMPO01112007Body.tab thru CMPO01212007Body.tab
			CMPO02132008Body.tab thru CMPO02132008Body.tab

Appendix Number	Directory Names	Subdirectory Names	File Names

(continued) PM2.5 MOVES Files\Episodic\

	CMPO\ (**Cache County**)	Output\ (continued)	CMPO01082009Body.tab thru CMPO01272009Body.tab
			CMPO12072009Body.tab thru CMPO12312009Body.tab
			CMPO01012010Body.tab thru CMPO01232010Body.tab
	File Development\ (**General for all 17 counties in PM2.5 SIP domain**)	Age Distri-**bution**	PM25 Population Run.mrs
			UTAH MOVES Age dist.xlsx
			Working Copy of Tax Comm Registered On-road Vehicles.xlsx
		AVFT\	MOVES_default_AVFT082010a_without_natgas.csv

NOTE: The file "MOVES_default_AVFT082010a_without_natgas.csv" contains the MOVES2010a default diesel fractions, which were applied to all 17 counties in the episode inventories.

		Fuel\	E-10.txt
			MOVES UTAH FUEL Update.xlsx
		Fuel Formu-lation MOVES 2010a\	fuelformulation.frm fuelformulation.MYD fuelformulation.MYI
		Met Data\ **2007**\	Box Elder County 2007 Temp Data.xlsx
			Cache County 2007 Temp Data.xlsx
			Carbon County 2007 Temp Data.xlsx
			Davis County 2007 Temp Data.xlsx
			Duchesne County 2007 Temp Data.xlsx
			Emery County 2007 Temp Data.xlsx

Appendix Number	Directory Names	Subdirectory Names	File Names
	File Development\	**Met Data**\ **2007**\	Juab County 2007 Temp Data.xlsx

	(**General for all 17 counties in PM2.5 SIP domain**)		Millard County 2007 Temp Data.xlsx
			Morgan County 2007 Temp Data.xlsx
			Rich County 2007 Temp Data.xlsx
			Salt Lake County 2007 Temp Data.xlsx
			Sanpete County 2007 Temp Data.xlsx
			Summit County 2007 Temp Data.xlsx
			Tooele County 2007 Temp Data.xlsx
			Utah County 2007 Temp Data.xlsx
			Wasatch County 2007 Temp Data.xlsx
			Weber County 2007 Temp Data.xlsx
		Met Data\ 2008\	Similar to above for Feb 2008
		Met Data\ 2009\	Similar to above for Jan 2009
			2009MOVES-MET-DATA-README.xls
		Met Data\ 2009	Similar to above for Dec 2009
		Met Data\ 2010\	Similar to above for Jan 2010
			2010MOVES-MET-DATA-README.xls

NOTE: The above met data files include both temperature and relative humidity for all counties and episode days.

Appendix Number	Directory Names	Subdirectory Names	File Names
	PM2.5 MOVES Files\	Episodic\	
	File Development\ (General for all 17 counties		

	in PM2.5 SIP) -continued-		
		Relative Humidity\	MOVES-RELATIVEHUMIDITY - 2007.xls MOVES-RELATIVEHUMIDITY - 2008.xls
		Temperature\	MOVES-TEMPERATURE -2007.xls MOVES-TEMPERATURE -2008.xls
		Vehicle Population\	MOVES MAY 2010 starts.csv PM25 Population Run.mrs Source Type Population Instructions.doc starts.pdf UTAH MOVES Monthly 1990 -2050 Vehicle Population based on May 2010 MOVESMIX.xlsx Working Copy of Tax Comm Davis County Registered On-road Vehicles.xls
	MAG\ (**Utah County**)	CDM\	CDMs (separate) for each episode day for Utah County Thu, Jan 11 - Sun, Jan 21, 2007 inclusive Wed, Feb 13 - Tue, Feb 19, 2008 inclusive Thu, Jan 8 - Tue, Jan 27, 2009 inclusive Mon, Dec 7 - Thu, Dec 31, 2009 inclusive Fri, Jan 1 - Sat, Jan 23, 2010 inclusive
		File Development\	MOVES MIX072210 Local MAG NO Rural.xlsx
Appendix Number	Directory Names	Subdirectory Names	File Names
	PM2.5 MOVES Files\	Episodic\	
	MAG\ (**Utah County**) -continued-		
		MRS\	Input files for each episode day for Utah County
		Output\	Output files for

			each episode day for Utah County
	UDAQ (Rural Counties)\	CDM\	CDMs for mostly rural counties in PM2.5 SIP domain\
		49007	Carbon County
		49013	Duchesne County
		49015	Emery County
		49023	Juab County
		49027	Millard County
		49029	Morgan County
		49033	Rich County
		49039	Sanpete County
		49043	Summit County
		49051	Wasatch County
	File Development\		Utah MOVES VMT & Fractions.xls
		Rural Areas Average Speeds\	
		EMIT to M6 Speeds\	2008 Lane Miles.xlsx Local Speed Calc.xlsx Carbonsvmt1.d Duchesnesvmt1.d Emerysvmt1.d Juabsvmt1.d Millardsvmt1.d Morgansvmt1.d Richsvmt1.d Sanpetesvmt1.d Summitsvmt1.d Wasatchsvmt1.d
		Mobile6 to MOVES Speeds\	Carbon_averagespeedconverter_mobile6.xls Duchesne_averagespeed converter_mobile6.xls

Appendix Number	Directory Names	Subdirectory Names	File Names
	PM2.5 MOVES Files\	Episodic\	
	UDAQ (Rural Counties)\	Mobile6 to MOVES Speeds\ (continued)	Emery_averagespeed converter_mobile6.xls Juab_averagespeed converter.xls Millard_averagespeed converter.xls Morgan_averagespeed

			converter.xls
			Rich_averagespeed converter.xls
			Sanpete_averagespeed converter.xls
			Summit_averagespeed converter.xls
			Wasatch_averagespeed converter.xls
			Utah MOVES VMT & Fractions.xlsx
		MRS\	Input files for mostly rural counties (each episode day)
		Output\	Output files "
	WFRC\		
		FIPs	Counties
		49003	Box Elder County
		49011	Davis County
		49035	Salt Lake County
		49045	Tooele County
		49057	Weber County
		CDM\	CDMs for each county above (and each episode day)
		File Development\	MOVES MIX072210 Local WFRC MAG NO Rural.xlsx
		MRS\	Input files for each county and episode day
Appendix Number	Directory Names	Subdirectory Names	File Names
	PM2.5 MOVES Files\ **WFRC**\ (continued)	Episodic\	
		Output\	Output files for the above counties
	Re-entrained Road Dust\		**Car Crust.XLS**
			conformity budgets not 4 Road dust.DOC
			PM2.5 Re-entrained Dust Email July 20 2011.txt
	Dust\	**Episode 2007-2010**	

		Fug Dust 021611\	Idaho Dust\
			Feb 2008\ideq_dust021308.csv
			thru ideq_dust021908.csv
			Jan 2007\ideq_dust011107.csv
			thru ideq_dust012107.csv
			Jan 2010\ideq_dust010110.csv
			thru ideq_dust012310.csv
			Jan and
			Dec 2009\December\
			ideq_dust120709.csv
			thru ideq_dust123109.csv
			\January\
			ideq_dust010809.csv
			thru ideq_dust012709.csv
		Fug Dust 021611\	SMOKE UDAQ\
			Dec 2009\dust files .csv
			(UDAQ)
			Feb 2008\"
			Jan 2007\"
			Jan 2009\"
			Jan 2010\"
		Fug Dust 021611\	**Workbooks**
			UDAQ\ **Dec 2009**\
			02-16-2011 for Mon
			Dec 7 - Mon Dec 14
			2009 NEW with EPA
			Default SL.xls

Appendix Number	Directory Names	Subdirectory Names	File Names
	PM2.5 MOVES Files\	Episodic\	
	Dust\ (continued)	**Episode 2007-2010**	
		Fug dust 021611\	**Workbooks**
			UDAQ\ **Dec 2009**\
			02-16-2011 for Tue
			Dec 15 - Mon Dec 21
			2009 NEW with EPA
			Default SL.xls
			02-16-2011 for Tue
			Dec 22 - Mon Dec 28
			2009 NEW with EPA
			Default SL.xls
			02-16-2011 for Tue
			Dec 29 - Thu Dec 31
			2009 NEW with EPA
			Default SL.xls

				Jan 2009\
				02-15-2011 Thu - Wed Jan 8 - 14 2009 NEW with EPA Default SL.xlsx
				02-15-2011 Thu - Wed Jan 15 - 21 2009 NEW with EPA Default SL.xlsx
				02-15-2011 Thu - Tue Jan 22 - 27 2009 NEW with EPA Default SL.xlsx
				Jan 2010\
				02-16-2011 for Fri Jan 1 - Mon Jan 4 2010 NEW with EPA Default SL.xls
				02-16-2011 for Tue Jan 5 - Mon Jan 11 2010 NEW with EPA Default SL.xls
				02-16-2011 for Tue Jan 12 - Mon Jan 18 2010 NEW with EPA Default SL.xls

Appendix Number	Directory Names	Subdirectory Names	File Names	
	PM2.5 MOVES Files\ **Dust**\ (continued)	Episodic\ **Episode 2007-2010 Fug dust 021611**\	**Workbooks UDAQ**\	**Jan 2010**\(continued)
				02-16-2011 for Tue Jan 19 - Tue Jan 26 2010 NEW with EPA Default SL.xls
		"	"	02-15-2011 Feb Wed - Tue 13 - 19 2008 NEW with EPA Default SL.xlsx
		"	"	02-15-2011 Jan 2007 NEW with EPA Default SL.xlsx
		Episode 2007-2010 Fug Dust 021611\		02-16-2011 Note.doc
				02-16-2011 Summary

of Fug Dust All
Episodes.xls

(See separate Word doc for base year (2008) and projection year (2014, 2017 and 2019) DVD index.)

END

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