

## Appendix A:

### Prior Fiscal Year Air Quality Accomplishments

## FY 2019 Accomplishments

Table A lists the Action Items from Fiscal Year (FY) 2019 CDOT *Air Quality Action Plan* and the status/accomplishments for each Action Item.

**Table A: Prior Fiscal Year Air Quality Accomplishments (Revision #3; July 2019)**

Action Items from FY 2018	Pollutant(s) Affected by Action <sup>1, 2</sup>	Status/Accomplishments FY 2019
<p>CDOT <i>Sustainability Program and Action Plan</i>: Report describing action items CDOT performs within CDOT; has action item table that is updated annually. Ongoing.</p>	<p>Criteria pollutants, MSAT, GHG</p>	<p>Action item table and accomplishments table are updated on an ongoing basis.</p>
<p>High-Performance Transportation Enterprise (HPTE): Continue to find innovative financing solutions for increasing roadway capacity through managed and express lanes in Colorado. Ongoing.</p>	<p>Criteria pollutants, MSAT, GHG</p>	<p>HTPE explored financing options for securing a \$50 million toll revenue backed loan for the I-25 North Johnstown to Fort Collins Project. HPTE expects to secure the funds in FY 2020. Through HPTE and the implementation of Express Lanes, CDOT was also the recipient of a \$65 million in INFRA grant funding for the I-25 South Gap project.</p>
<p>Alternative Fuel Corridor Designation: Collaborate with Colorado Energy Office (CEO) and equivalent agencies of eight states (AZ, ID, MT, NM, NV, UT, &amp; WY) (<i>Regional Electric Vehicle Plan for the West [REV West]</i>) to identify key interstate corridors and establish voluntary minimum standards for electric vehicle (EV) charging station development across the Intermountain West region. Ongoing.</p>	<p>Criteria pollutants, MSAT, GHG</p>	<p>Published REV West Baseline Report in October 2018 and developed Voluntary Minimum Standards for EV charging stations. Established new working group to focus on 8-state DOT coordination with state energy offices. Considering a “recommitment” by states with newly-elected Governors following 2018 election cycle. Will continue into FY 2020.</p>
<p>Congestion Mitigation and Air Quality (CMAQ) Advanced Fleets Technology (AFT) Project: Coordinate with CEO and Regional Air Quality Council (RAQC) on Charge Ahead Colorado Program to support purchase of electric and hybrid</p>	<p>Criteria pollutants, MSAT, GHG</p>	<p>Continued implementation of the Charge Ahead Colorado Program, in spite of ongoing impacts from the lack of Buy America waivers being approved by the FHWA. Currently preparing to add CMAQ funds to the contract in FY 2020. Will continue into FY 2022.</p>

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<p>EVs and charging infrastructure statewide. Program, under AFT I &amp; II contracts, was extended in FY 2018 and will end in FY 2022. Both programs are impacted by lack of Buy America waivers being approved by Federal Highway Administration (FHWA). Ongoing.</p>		
<p>CMAQ Alternative Fuels Colorado (AFC) Program: Collaborate with CEO and RAQC on program to support development of sustainable statewide alternative fuels market by incentivizing purchase of alternative fuel vehicles and fueling station equipment. Program was extended in FY 2018 and will end in FY 2020 to allow for spend-down of original \$15 million allocation. Vehicle purchase program impacted by lack of Buy America waivers being approved by the FHWA. Ongoing.</p>	<p>Criteria pollutants, MSAT, GHG</p>	<p>CEO awarded a 6 corridor, 33-site EV fast-charging grant to ChargePoint in November of 2018 and contracting was finalized in early 2019. Official project kick-off was held in May 2019. Original vehicle purchase program impacted by the lack of Buy America waivers being approved by the FHWA. Original compressed natural gas (CNG) fueling station program impacted by market forces (demand has dropped since gas prices are low). Program will continue into FY 2020.</p>
<p>CMAQ Local Agency Air Quality Projects: Collaborate with RAQC on awarding air quality improvement grants to local government entities located within federally-identified Denver/Front Range ozone non-attainment area. Ongoing.</p>	<p>Criteria pollutants, MSAT, GHG</p>	<p>Continued program implementation of 2018 round of projects. Awarded grants include Bicycle Colorado / Lakewood Mobility Education, Lone Tree Link, Boulder County Free Fare Promotion, and Boulder County Real-Time Information Marketing. Will continue into FY 2020.</p>
<p>Volkswagen (VW) Settlement Alternative Fuel Transit Vehicle Program: Coordinate with Colorado Department of Public Health and Environment (CDPHE), RAQC, CEO, and internal stakeholders to develop and implement \$18 million in VW Settlement funded alternative fuel vehicle grants for transit</p>	<p>Criteria pollutants, MSAT, GHG</p>	<p>Adopted Colorado's Beneficiary Mitigation Plan in April 2018, outlining the State's plan to use its Trust funding. In April 2019, awarded \$13.8 million to six transit agencies to replace 28 aging diesel buses with one CNG bus, three propane buses, and 24 electric buses and to add 20 EV charging systems. Will continue into FY 2020.</p>

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fleets across Colorado. Program anticipated to operate between 3 to 5 years or once state's \$68.7 million fund allocation is exhausted. Ongoing. (Appendix B of FY 2020 actions refers to this project as Alternative Fuel Transit Bus Replacement Program)		
Bicycle and Pedestrian Directives: Implement the updated 2016 Policy Directive 1602.0 <i>Elevating Bicycle and Pedestrian Opportunities in Colorado</i> and Procedural Directive 1602.1 by continuing to work on including bike and pedestrian considerations in planning, construction, and operations to facilitate a modal shift to active transportation.	Criteria pollutants, MSAT, GHG	Made advancements in implementing Policy 1602 by continuing to conduct facility design trainings and making presentations to Professional Engineer (PE) IIs and traffic engineers. However, overall compliance of the Policy is difficult. Projects are scoped without bike/pedestrian accommodation and CDOT planners do not always know about them.
RoadX: Continue to partner with private industry to pilot several transportation infrastructure technology projects to test technologies intended to enhance safety and mobility within transportation system that cost less and produce identifiable results. Ongoing, under Office of Innovative Mobility.	Criteria pollutants, MSAT, GHG	FY2019 pilots included Smart 25 (see separate row for more information); Wheelright Project (completed design; see Appendix B for more information); and a commercial motor vehicle truck parking information management system at four lots (sensors sent parking availability to a Truck Smart Parking Services [TSPS] website and Variable Message Sign (VMS) boards, which reduced trolling for spots). RoadX program was absorbed into new Office of Innovative Mobility in early 2019.
Transportation Systems Management & Operations (TSM&O): CDOT Connected Autonomous Vehicles (CAV) Modeling Project - Traffic analysis and modeling effort to establish traffic model to	Criteria pollutants, MSAT, GHG	Developed VISSIM script that models the estimated effects of CAVs on transportation system performance for varying adoption rate scenarios. Also developed anticipated crash modification factors based on evaluating historical crash data and

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<p>determine how CAV will impact roads. Phase I starts in June 2018 and continue into January 2019.</p>		<p>estimating the number of crashes that would be prevented by CAV safety technology. Specific facility type scripts based on the updated 2040 statewide model will be developed under Phase I by the end of FY 2019.</p>
<p>TSM&amp;O <i>Smart Mobility Plan</i>: TSM&amp;O will continue work on <i>Smart Mobility Plan</i> to ensure that CDOT has a healthy ecosystem for connected and autonomous vehicles and for regular vehicles. <i>Smart Mobility Plan</i> is first of a three-phase project. Phase 2 is <i>Intelligent Transportation System (ITS) Regional Implementation Plan</i>, and Phase 3 is <i>Statewide ITS Strategic Plan</i>. All three phases will be done by December 2018.</p>	<p>Criteria pollutants, MSATs, GHG</p>	<p>Phases 1, 2, and 3 of the Smart Mobility Plan are in draft form. It is expected that they will be concluded by the end of FY 2019.</p>
<p>TSM&amp;O Expanded Operations: TSM&amp;O will open a new Traffic Operations Center in Pueblo to service corridors within CDOT Region 2. TSM&amp;O also will co-locate Colorado State Patrol (CSP) staff with CDOT staff in the Golden Traffic Operations Center for better communication and coordination. TSM&amp;O also will plan another Traffic Operations Center, this one in Region 4 in northeastern Colorado. All of these efforts should smooth traffic flow.</p>	<p>Criteria pollutants, MSATs, GHG</p>	<p>All of the action items were completed in FY 2019.</p>
<p>TSM&amp;O Motorist Safety Patrol Program: Program to help motorists with traffic incidents and vehicle problems will continue to operate in Denver metro area, I-70 Mountain Corridor, I-25 Corridor in Region</p>	<p>Criteria pollutants, MSATs, GHG</p>	<p>This program operated in FY 2019 and will continue to operate in FY 2020.</p>

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<p>4, and I-25 Corridor in Region 2. This program seeks to reduce non-recurring traffic incidents that are a major cause of traffic congestion. Ongoing.</p>		
<p>TSM&amp;O Traffic Incident Management (TIM) Training Track: To support operations of TIM Training Track in Douglas County, TSM&amp;O will develop a comprehensive TIM website. Website will supplement information that participants in TIM training sessions acquire at training track, as well as provide refresher materials for those who have already taken TIM course. Ongoing.</p>	<p>Criteria pollutants, MSATs, GHG</p>	<p>All action items were completed in FY 2019. Website and refresher materials will continue to be available in FY 2020.</p>
<p>TSM&amp;O Technology Toolkit (T3): In concert with the <i>Smart Mobility Plan</i>, continue work on T3 that inventories technologies and ITS devices that are in use or undergoing testing. T3 assists engineers as their projects undergo TSM&amp;O assessments for safety, operations, and technology before projects begin.</p>	<p>Criteria pollutants, MSATs, GHG</p>	<p>T3 (now called Smart Mobility Toolkit) was created. Data provided from T3 helped inform decisions during Statewide Smart Mobility Plan process.</p>
<p>TSM&amp;O Transportation Demand (TDM) Plan, Phase 2: Phase 2 will address mobility as a service, among other aspects of managing transportation. In Phase 2, plan authors will develop a list of possible TDM projects and locations, using data gathered during Phase 1 and geo-spatial data developed in Phase 2. With Phase 1 data and Phase 2 geo-spatial data, CDOT will develop a list of possible TDM projects and locations for them.</p>	<p>Criteria pollutants, MSATs, GHG</p>	<p>Phase 2 draft study is under review and is expected to be completed in July 2019.</p>

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<p>Transportation Planning Regions (TPRs) and Metropolitan Planning Organizations (MPOs) will review information collected from both plan phases. <i>2045 Statewide Transportation Plan</i> (SWP) might reflect some of the Phase 2 recommendations.</p>		
<p>TSM&amp;O Data Analytics Intelligence System (DAISy) Development: This data analytics system will serve as the “brain” for CDOT communication between connected vehicles and CDOT infrastructure. CDOT will be able to push out information to drivers about work zones or weather-caused road conditions, and to collect information from vehicles on the roadway such as crashes, precipitation events, or even potholes. Ongoing.</p>	<p>Criteria pollutants, MSATs, GHG</p>	<p>Phases 0 and I of DAISy development were completed, including systems planning and development. 22 data sources were identified and will be used to enhance real-time operations and maintenance of Colorado roads. TSM&amp;O has been integrated with CDOT Division of Maintenance and Operations (DMO). For information about upcoming actions, see Appendix B.</p>
<p>ITS, Panasonic Project: Phase 1 started in April 2018 and will continue until March 2019; deploying hardware (radios) on the side of I-70. Phase 2 starts in October 2018 and will continue until March 2020; retrofitting 2,500 cars and will communicate between CDOT and the cars. Phase 3, 4, and 5 will be discussed in future updates. See Appendix A of July 2018 version for information on Phase 0. Ongoing.</p>	<p>Criteria pollutants, MSAT, GHG</p>	<p>ITS, Panasonic Project: Phase 1 will continue until August 2019; deploying hardware (radios) on the side of I-70. CDOT has deployed 100 road side units, and nearly 100 of their own fleet. Phase 2 will begin in Fall of 2019. For more information about Phase 2 through 5, see Appendix B.</p>
<p>Smart 25 Demonstration Project: Conduct pilot project to increase efficiency on I-25. Demonstration project will run for 6 month trial period, anticipated to have construction be from Summer 2018 to Summer/Fall 2019.</p>	<p>Criteria pollutants, MSAT, GHG</p>	<p>Construction items were separated into three projects. One was completed in January 2019. Second project was awarded in December 2018 (see Appendix B for more information on second and third projects). Demonstration was not</p>

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<p>System will then be shut down and data analyzed from Summer 2018 to Summer/Fall 2019. If concept deemed to be successful, a hot spot analysis will be conducted in Spring 2020 (before permanent implementation of project begins). Ongoing.</p>		<p>conducted and construction was not completed. Therefore, hot spot analysis was not conducted. Will continue in FY 2020.</p>
<p>I25 Gap Project: Seeking local sources of fill and backfill material that meets project specifications. This will lower haul truck vehicle miles traveled (VMT) over project life. Project is expected to begin in August 2018 and last through 2021. Ongoing.</p>	<p>Criteria pollutants, MSAT, GHG</p>	<p>Found two on-site sources and one major source that is 11 miles away. Project is now expected to last through 2022.</p>
<p>US 34 Big Thompson Canyon project: Rock is being cut and wasted nearby rather than hauling it further. This will lower haul truck VMT over the life of the project and keep hauling from affecting nearby communities. Cutting started in July 2016 and hauling is expected to occur through December 2018. Material is also being used on other flood repair projects.</p>	<p>Criteria pollutants, MSAT, GHG</p>	<p>All on-project generated materials were incorporated into project and/or stockpiled at future flood related project site (non-CDOT project; Idlewilde Reservoir Area Restoration project by City of Loveland &amp; FERC), by mid-February 2019. Multi-phase US 34 Big Thompson Canyon project was completed. No additional positive impacts will be realized.</p>
<p>Division of Transit and Rail (DTR), Bustang: Increase ridership on Bustang, a CDOT-contracted bus service intended to get more single-occupancy vehicles off congested routes, and provide improved bus service. Bustang is a CDOT-contracted bus service on I-25 from Colorado Springs to Fort Collins and on I-70 from Denver to Glenwood Springs. Ongoing.</p>	<p>Criteria pollutants, MSAT, GHG</p>	<p>Ridership grew 25.2 percent, increasing from 184,000 total passengers in FY2018 to 230,400 passengers in FY2019. Will continue in FY 2020.</p>



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<p>Bus Fleet Conversion to CNG or Electric: Many local transit agencies are considering converting their bus fleets to CNG or electric because of technology advancements. This conversion will occur over a decade or more as current fleets reach the end of their useful life and because of costs. CDOT estimates with approximately 2,000 transit vehicles in state, and related maintenance and fueling facilities, the total conversion cost will be more than \$2 billion. Ongoing.</p>	<p>Criteria pollutants, MSATs, and GHG</p>	<p>Alternative fueled fleet vehicles increased 26 percent over FY2018, adding 33 new CNG vehicles to Colorado's fleet of 2,778 buses operated statewide.</p>
<p>Improve Rural Bus Service: Outrider (a re-branding of rural routes into one cohesive system with ticket systems integrated with Bustang) is expected to improve rural bus service. Four Outrider routes: Lamar to Pueblo, Alamosa to Salida to Pueblo, Gunnison to Denver and Durango to Grand Junction. In calendar year 2018, CDOT is completing re-branding of the four rural routes to Outrider. CDOT believes Outrider will improve service in rural areas, and help air quality at urban ends of routes.</p>	<p>Criteria pollutants, MSATs, GHG</p>	<p>Successfully implemented Outrider regional bus service routes: Lamar to Pueblo, Alamosa to Salida to Pueblo, Gunnison to Denver and Durango to Grand Junction.</p>
<p>High Priority Bike Corridors: To assist overall effort of selecting bike corridors, staff and consultant expect to compile statewide inventory of bike facilities by mid-July 2018. By early August 2018, CDOT Bike and Pedestrian Unit should have geodatabase file and static maps as data for bicycle corridors. A September 2018 internal CDOT</p>	<p>Criteria pollutants, MSATs, GHG</p>	<p>Statewide inventory of bike facilities was compiled in the summer of 2018. Geodatabase file was obtained by September 2018 and was used to develop high demand bicycle corridor maps. The meetings described in the action took place between October 2018 and February 2019. CDOT selected High Demand Bicycle Corridors in June 2019, which completed the project except for</p>

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<p>meeting will take place to present an example map. From November 2018 through March 2019, staff and consultants will take bike corridor map to transportation planning region meetings for review. CDOT expects to select High Priority Bike Corridors by March 2019. Establishment of bike corridors may result in reduced air pollutants if corridors contribute to increased biking and decreased single-occupancy vehicle use.</p>		<p>final approval by management.</p>
<p>Develop Colorado Transportation Standard for Risk and Resilience Analysis: On heels of I-70 Risk and Resilience Pilot, staff recognized that risk assessment results depend on a variety of parameters and probabilities. Consequently, staff initiated a new project to develop statewide standards for risk assessments. Resulting standards will be Colorado-specific and will be available to any Colorado state agency. Depending on additional risk assessments and resilience measures implemented following this standard, this project may lead to a decrease in road closures, resulting in decreased VMT. Ongoing.</p>	<p>Criteria pollutants, MSATs, GHG</p>	<p>The Risk and Resilience Standard project kicked off in January 2019. It is a two-year effort. Six days of subject matter expert workshops were held to refine assumptions and methodologies used in the I-70 pilot. Will continue into FY 2020.</p>
<p>Greenhouse Gas (GHG) Considerations in Transportation Planning Series: An elective module developed for rural TPRs as part of the Transportation Planning Toolkit will be on the environment and will include discussion on effects of GHG.</p>	<p>Criteria pollutants, MSATs, GHG</p>	<p>Core modules of the Transportation Planning Toolkit were completed but work was halted in light of the Planning Reset instituted by CDOT's new leadership. As a result, a GHG-focused elective module for the Transportation Planning Toolkit was not developed and there are no</p>

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<p>Information provided by module should heighten awareness and reduce VMT. Will be completed by June 2019.</p>		<p>future plans to do so.</p>
<p>Federal Funding to Reduce GHG Emissions: National Highway Freight Program (NHFP) considers congestion mitigation an eligible category for use of these federal funds as well as general environmental impacts. Although GHG reduction is not a specific project selection criterion for NHFP because of difficulty in quantifying benefits, congestion mitigation projects are funded using NHFP funds for freight related projects. Ongoing.</p>	<p>Criteria pollutants, MSATs, GHG</p>	<p>CDOT expended \$53.25 million in federal funding in FY 2019 for projects that improved freight mobility and safety in urban areas: \$18.25M - NHFP (Truck parking, safety, and mobility improvements statewide); \$20M - Better Utilizing Investments to Leverage Investments (BUILD) (North I-25 interchange reconstruction and expansion; 12 bridges reconstructed and widened, seven of which are currently too low for many trucks; third lane used for an express lane); \$15M - Transportation Investment Generating Economic Recovery (TIGER). Improves reliability for 14 miles of North I-25 between Loveland and Fort Collins with features including ITS technology and replacement of two bridges.</p>
<p>2045 Statewide Plan (SWP): In first year of plan development, CDOT's Multimodal Planning Branch expects to kick off formal planning process in August 2018, followed by data collection and analysis August-December 2018; a determination of transportation issues, needs, and priorities December 2018-February 2019; a funding and gap analysis January 2019-March 2019; and identification of vision, goals, and strategies April-June 2019. This work should help inform a 2045 SWP that will discuss transportation and its effect on quality of life, which includes air</p>	<p>Criteria pollutants, MSATs, GHG</p>	<p>2018 election delayed start of planning process. Waited to determine if voters would approve more money for transportation in November 2018 (they didn't) and who would be elected the new governor. Data collection and analysis took place. Determination of transportation issues, needs, and priorities; funding and gap analysis; and identification of vision, goals, and strategies initiated in May of FY2019. Will continue into FY 2020.</p>

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quality improvement. Ongoing.		
Transportation Air Quality Research: Participate in multi-state Near-Road Air Quality Transportation Pooled Fund. Ongoing.	Criteria pollutants, MSAT, GHG	Submitted articles for peer-review publication (Task Order [TO] 1: Denver and Indianapolis case study; TO 2: modeled vs. measured near-road analysis work at Indianapolis and Providence; TO 3: background concentration assessment and near-road PM2.5 increments); TO 3 has been published. Held workshop for panel members in March. Presented findings from TO 2 and 3 at January 2019 Transportation Research Board (TRB) meeting. Report for TO 3 was finalized in June 2019. Funding commitments for 2019 came in late so project extended from June 30 to December 31, 2019.
Simple Steps/Better Air: Continue public outreach and education program to raise awareness of ground ozone pollution and create behavior change; focus on behavior change (program was previously called Ozone Aware). Ongoing.	Criteria pollutants, MSAT, GHG	Using key communication strategies for public outreach and education program. This includes paid, owned and earned media, community outreach and events, and stakeholder partnerships with Community Collaboration Group, Meteorologist Advisory Group and other partners. Program measures results by conducting qualitative and quantitative research with target audiences, with next round of research being conducted in August 2019. Will continue in FY 2020.

Notes for Tables A

1. Potential pollutants include:
  - 1.A. Transportation Criteria Pollutants: CO, PM<sub>10</sub>, PM<sub>2.5</sub>, NO<sub>x</sub> and VOC (not a criteria pollutant, but are a precursor to criteria pollutant ozone, which is not directly emitted by any source)
  - 1.B. Transportation Mobile Source Air Toxics (benzene, acetaldehyde, formaldehyde, acrolein, 1,3-butadiene, diesel particulate matter plus diesel exhaust organic gases, naphthalene, polycyclic organic matter, and ethylbenzene)
  - 1.C. Transportation Greenhouse Gases (CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O)
2. Determining which pollutants will be affected by each action:

- 2.A. Tailpipes of hydrocarbon fuel powered vehicles emit all three categories of pollutants: criteria pollutants, MSATs, and GHGs. Therefore, emissions of all three categories will be reduced if a strategy reduces VMT, increases system efficiency, increases the use of alternative fuel vehicles, or increases vehicle fuel efficiency. Most strategies will fall into this category.
- 2.B. Even if a strategy targets a specific pollutant, the strategy will most likely reduce tailpipe emissions. For example, Simple Steps/Better Air is a program that encourages VMT reduction specifically to help address the Denver Front Range ozone issue. However, strategies that reduce ozone precursors also generally reduce emissions of other pollutants.
- 2.C. Some strategies target specific pollutants. For example, concrete production creates CO<sub>2</sub>. Therefore, the strategy to add more fly ash to a concrete mixture reduces CO<sub>2</sub>, but no other pollutants.

**Appendix B:**  
**Fiscal Year 2020 Action Items**

## FY 2020 Action Items

The goal of CDOT's *Air Quality Action Plan* is to reduce air pollution from Colorado's transportation sector. Table B lists CDOT's FY 2020 Action Items. The following are included for each Action Item: strategy category(s), pollutant(s) affected by each action, and the champion (contact). Strategy categories include System Efficiency, Reducing vehicle miles traveled (VMT) Growth, Promoting Alternative (Alt) Fuel Vehicles, Increasing Vehicle Fuel Efficiency, and Collecting or Deflecting Emissions. The categories are described in more detail in Section 2.2 of this Plan.

**Table B: Current Fiscal Year Air Quality Action Items (Revision #3; July 2019)**

Action Item for FY 2020	Strategy Category					Pollutant(s) Affected by Action <sup>1, 2</sup>	Champion/Contact
	System Efficiency	Reduce VMT	Alt. Fuel	Fuel Efficiency	Absorption/Barrier		
CDOT <i>Sustainability Program and Action Plan</i> : Report describing action items CDOT will perform within CDOT and accomplishments (the status of past action items). Ongoing.		X	X	X		Criteria pollutants, MSAT, GHG	Sarah Mitchell EPB Sustainability Coordinator <a href="mailto:Sarah.Mitchell@state.co.us">Sarah.Mitchell@state.co.us</a> (303) 757-9764
Alternative Fuel Corridor Designation: Collaborate with Colorado Energy Office (CEO) and equivalent agencies of eight states (AZ, ID, MT, NM, NV, UT, & WY) ( <i>Regional Electric Vehicle Plan for the West [REV West]</i> ) to identify key interstate corridors and establish voluntary minimum standards for electric vehicle (EV) charging station development across the Intermountain West region. Ongoing.			X			Criteria pollutants, MSAT, GHG	Michael King DTD Transportation Planner <a href="mailto:Michael.King@state.co.us">Michael.King@state.co.us</a> (303) 757-9997
Alternative Fuel Transit Bus Replacement Program: Coordinate with Colorado			X			Criteria pollutants,	Michael King DTD Transportation Planner

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	System Efficiency	Reduce VMT	Alt. Fuel	Fuel Efficiency	Absorption/Barrier		
Department of Public Health and Environment (CDPHE), Regional Air Quality Council (RAQC), CEO, through Division of Transit & Rail's (DTR's) capital award processes to implement \$30 million in Volkswagen (VW) Settlement funds to replace aging transit fleets across Colorado with zero-emissions vehicles (ZEVs). Program anticipated to operate between 3 to 5 years or once State's \$68.7 million Trust fund allocation is exhausted.						MSAT, GHG	<a href="mailto:Michael.King@state.co.us">Michael.King@state.co.us</a> (303) 757-9997
Bicycle and Pedestrian Directives: Continue to Implement the updated 2016 Policy Directive 1602.0 <i>Elevating Bicycle and Pedestrian Opportunities in Colorado</i> and Procedural Directive 1602.1 by continuing to work on including bike and pedestrian considerations in planning, construction, and operations to facilitate a modal shift to active transportation. Ongoing.	X	X	X			Criteria pollutants, MSAT, GHG	Betsy Jacobsen Bicycle/ Pedestrian/ Byways Section Manager <a href="mailto:Betsy.jacobsen@state.co.us">Betsy.jacobsen@state.co.us</a> US 303-757-9982
CDOT Performance Plan: Under strategic policy initiative (SPI) Reducing Greenhouse Gas (GHG) Emissions, report the GHG produced per capita from the transportation sector as the lag measure for next year and provide quarterly updates for the lead measures and strategics support the SPI goal to the Governor's Office.	X	X	X			GHG	Darius Pakbaz DTD Performance Data Manager <a href="mailto:Darius.Pakbaz@state.co.us">Darius.Pakbaz@state.co.us</a> US 303-757-9133



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<p>Congestion Mitigation and Air Quality (CMAQ) Alternative Fuels Colorado (AFC) Program: Collaborate with CEO and RAQC on program to support development of sustainable statewide alternative fuels market by incentivizing purchase of alternative fuel vehicles and fueling station equipment. Program was extended in FY 2018 and will end in FY 2020 to allow for spend-down of original \$15 million allocation. Vehicle purchase program impacted by lack of Buy America waivers being approved by the Federal Highway Administration (FHWA). Current focus has shifted from compressed natural gas (CNG) to EV fast-charging corridors. Ongoing.</p>			X			<p>Criteria pollutants, MSAT, GHG</p>	<p>Michael King DTD Transportation Planner <a href="mailto:Michael.King@state.co.us">Michael.King@state.co.us</a> (303) 757-9997</p>
<p>CMAQ Advanced Fleets Technology (AFT) Project: Coordinate with CEO and RAQC on Charge Ahead Colorado Program to support purchase of electric and hybrid EVs and charging infrastructure statewide. Program, under AFT I &amp; II contracts, was extended in FY 2018 and will end in FY 2022. Both programs are impacted by lack of Buy America waivers being approved by FHWA. Ongoing.</p>			X			<p>Criteria pollutants, MSAT, GHG</p>	<p>Michael King DTD Transportation Planner <a href="mailto:Michael.King@state.co.us">Michael.King@state.co.us</a> (303) 757-9997</p>
<p>CMAQ Local Agency Air Quality Projects: Collaborate with RAQC on awarding air quality</p>		X	X			<p>Criteria pollutants,</p>	<p>Michael King DTD Transportation Planner</p>

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Action Item for FY 2020	Strategy Category					Pollutant(s) Affected by Action <sup>1, 2</sup>	Champion/Contact
	System Efficiency	Reduce VMT	Alt. Fuel	Fuel Efficiency	Absorption/Barrier		
improvement grants to local government entities located within federally-identified Denver/Front Range ozone non-attainment area. Ongoing.						MSAT, GHG	<a href="mailto:Michael.King@state.co.us">Michael.King@state.co.us</a> (303) 757-9997
Develop Colorado Transportation Standard for Risk and Resilience Analysis: Staff initiated a project to develop statewide standards for risk assessments in January 2019. Resulting standards will be Colorado-specific and will be available to any Colorado state agency. The project will result in a written standard document that CDOT staff will be able to use to complete future Risk and Resiliency analyses in a consistent manner. Results from risk and resiliency analysis will allow CDOT to pro-actively manage identified risks to increase system resiliency and minimize road closures and disruptions that usually lead to additional VMT.	X	X				Criteria pollutants, MSAT, GHG	Elizabeth Kemp CDOT Resiliency Program Manager <a href="mailto:elizabeth.kemp@state.co.us">elizabeth.kemp@state.co.us</a> .us 303.757.9629
Division of Maintenance and Operations (DMO) Data Analytics Intelligence System (DAISy) Development: Develop further applications to enhance real-time operations and maintenance of Colorado roadways through leveraging big data within the system. This will constitute Phases I and II and is dependent on executive review, approval and resources dedication.	X					Criteria pollutants, MSATs, GHG	Wes Maurer Manager, DMO <a href="mailto:Wes.Maurer@state.co.us">Wes.Maurer@state.co.us</a> 303-319-5121

Table B: Current Fiscal Year Air Quality Action Items (Revision #3; July 2019)

Action Item for FY 2020	Strategy Category					Pollutant(s) Affected by Action <sup>1, 2</sup>	Champion/Contact
	System Efficiency	Reduce VMT	Alt. Fuel	Fuel Efficiency	Absorption/Barrier		
DMO Motorist Safety Patrol Program: Program to help motorists with traffic incidents and vehicle problems will continue to operate in Denver metro area, I-70 Mountain Corridor, I-25 Corridor in Region 4, and I-25 Corridor in Region 2. This program seeks to reduce non-recurring traffic incidents that are a major cause of traffic congestion. Ongoing.	X			X		Criteria pollutants, MSATs, GHG	Ryan Tyler Division of Maintenance and Operations Branch Manager <a href="mailto:Ryan.Tyler@state.co.us">Ryan.Tyler@state.co.us</a> (303) 512-5814
DTR: In partnership with Division of Transportation Development and Rural Transit Assistance Program (RTAP) partners will provide Colorado transit agencies assistance in planning and implementing electric fleet vehicle conversions, including operational planning, power delivery planning, ZEV procurement and implementation support.			X			Criteria pollutants, MSAT, GHG	Michael King DTD Transportation Planner <a href="mailto:Michael.King@state.co.us">Michael.King@state.co.us</a> (303) 757-9997
DTR, Bustang and Outrider: Increase regional and interregional bus ridership and expand rural regional bus routes on Bustang and Bustang Outrider - CDOT's contracted bus services which are intended to get more single-occupancy vehicles off congested routes, and provide improved regional and interregional mobility options. Bustang is an interregional bus service on I-25 from Colorado Springs to Fort Collins and on I-70 from Denver to Grand Junction.	X	X	X	X		Criteria pollutants, MSAT, GHG	David Krutsinger DTR Director <a href="mailto:David.Krutsinger@state.co.us">David.Krutsinger@state.co.us</a> <a href="http://o.us">o.us</a> 303-757-9008

Table B: Current Fiscal Year Air Quality Action Items (Revision #3; July 2019)

Action Item for FY 2020	Strategy Category					Pollutant(s) Affected by Action <sup>1, 2</sup>	Champion/Contact
	System Efficiency	Reduce VMT	Alt. Fuel	Fuel Efficiency	Absorption/Barrier		
Outrider is a regional bus service that provides connections throughout rural regions of Colorado to their urban hubs, with connections to other local and interregional modes.							
Federal Funding to Reduce GHG Emissions: National Highway Freight Program (NHFP) considers congestion mitigation an eligible category for use of these federal funds as well as general environmental impacts. Although GHG reduction is not a specific project selection criterion for NHFP because of difficulty in quantifying benefits, congestion mitigation projects are funded using NHFP funds for freight related projects. Ongoing.	X						Gail Hoffman Transportation Planner <a href="mailto:Gail.Hoffman@state.co.us">Gail.Hoffman@state.co.us</a> 303-757-9700
High Priority Bike Corridors: Bike corridors established in FY 2019, pending FY 2020 management approval of High Demand Bicycle Corridors.		X		X		Criteria pollutants, MSATs, GHG	Lenore Bates Scenic Byways/Bike/Ped Section <a href="mailto:Lenore.Bates@state.co.us">Lenore.Bates@state.co.us</a> 303-757-9786
High-Performance Transportation Enterprise (HPTE): Continue to find innovative financing solutions for increasing roadway capacity through managed and express lanes in Colorado. Ongoing.	X			X		Criteria pollutants, MSAT, GHG	Piper Darlington HPTE Budget & Special Projects Manager <a href="mailto:Piper.darlington@state.co.us">Piper.darlington@state.co.us</a> 303-757-9032
HPTE Express Lanes Master Plan: Collaborate with CDOT and stakeholders to identify and prioritize which future corridors have the potential to benefit	X			X		Criteria pollutants, MSAT, GHG	Nicholas Farber Acting HPTE Director <a href="mailto:Nicholas.farber@state.co.us">Nicholas.farber@state.co.us</a> 303-757-9448

Table B: Current Fiscal Year Air Quality Action Items (Revision #3; July 2019)

Action Item for FY 2020	Strategy Category					Pollutant(s) Affected by Action <sup>1, 2</sup>	Champion/Contact
	System Efficiency	Reduce VMT	Alt. Fuel	Fuel Efficiency	Absorption/Barrier		
from Express Lanes including if high-occupancy vehicle (HOV) travel should be a component							
I25 Gap Project: Will seek additional local sources of fill and backfill material that meets project specifications. This will lower haul truck VMT over project life. Currently using two on-site sources. The other major source is 11 miles away. Project began in August 2018 and is expected to last through 2022.		X				Criteria pollutants, MSAT, GHG	<p>Chuck Attardo I-25 South Corridor Environmental Manager <a href="mailto:Chuck.Attardo@state.co.us">Chuck.Attardo@state.co.us</a> .us 303-859-9535</p>
Integrating Resiliency into CDOT Business Processes: Project will develop at least 5 case studies in order to provide proofs of concepts for how CDOT can integrate resiliency into core functions (e.g., long range planning, asset management, operations and maintenance, scoping and engineering, environmental planning documents). Each case study will be designed to drive ideas of resilience into day-to-day operations and find ways to use data, as seen in the information developed through the I-70 pilot. Throughout case study development, the project team will review CDOT's funding and criteria manuals to ensure the project outcome includes recommendations for incorporating resilience into these areas. Project is anticipated to lead to greater	X	X				Criteria pollutants, MSATs, GHG	<p>Elizabeth Kemp CDOT Resiliency Program Manager <a href="mailto:elizabeth.kemp@state.co.us">elizabeth.kemp@state.co.us</a> .us 303.757.9629</p>

Table B: Current Fiscal Year Air Quality Action Items (Revision #3; July 2019)

Action Item for FY 2020	Strategy Category					Pollutant(s) Affected by Action <sup>1, 2</sup>	Champion/Contact
	System Efficiency	Reduce VMT	Alt. Fuel	Fuel Efficiency	Absorption/Barrier		
consideration of resilience in day to day CDOT activities, which is hoped to lead to a decrease in road closures, resulting in decreased VMT.							
Intelligent Transportation System (ITS), Panasonic Project: Phase 2 will begin in Fall of 2019 and will focus on operational status of the infrastructure and data flows. Phase 3, 4, and 5 will be discussed in future updates. See Appendix A for information on Phase 1.	X			X		Criteria pollutants, MSAT, GHG	Lily Lizarraga Special Programs Coordinator <a href="mailto:lily.lizarraga@state.co.us">lily.lizarraga@state.co.us</a> 303-512-5821
National Performance Measures: Update pollutant/precursor benefit reduction targets for CMAQ funded projects as required under the FAST act for year 2022, the end of the first four year performance period.	X					CO, NO <sub>x</sub> , VOC, PM <sub>10</sub>	Darius Pakbaz DTD Performance Data Manager <a href="mailto:Darius.Pakbaz@state.co.us">Darius.Pakbaz@state.co.us</a> 303-757-9133
Office of Innovative Mobility: Continue to partner with private industry to pilot several transportation infrastructure technology projects to test technologies intended to enhance safety and mobility within transportation system that cost less and produce identifiable results.	X		X	X		Criteria pollutants, MSAT, GHG	Sophie Shulman Chief of Innovative Mobility <a href="mailto:Sophie.Shulman@state.co.us">Sophie.Shulman@state.co.us</a> 303-512-4011
Office of Innovative Mobility: Implement Governor's Executive Order "Supporting a Transition to Zero Emission Vehicles," including developing and implementing CDOT's Clean Transportation			X			Criteria pollutants, MSAT, GHG	Sophie Shulman Chief of Innovative Mobility <a href="mailto:Sophie.Shulman@state.co.us">Sophie.Shulman@state.co.us</a> 303-512-4011

Table B: Current Fiscal Year Air Quality Action Items (Revision #3; July 2019)

Action Item for FY 2020	Strategy Category					Pollutant(s) Affected by Action <sup>1, 2</sup>	Champion/Contact
	System Efficiency	Reduce VMT	Alt. Fuel	Fuel Efficiency	Absorption/Barrier		
Plan, increasing fleet electrification across the Department, and support for public charging infrastructure.							
Office of Innovative Mobility: Reduce per capita VMT through innovative programs to increase shared ridership, including implementation of Senate Bill (SB) 19-239, new mobility apps and technologies that encourage transit and shared usage - such as mobility hubs across the State. The SB 19-239 study is called 2019 Emerging Mobility Impact Study.	X	X	X	X			Sophie Shulman Chief of Innovative Mobility <a href="mailto:Sophie.Shulman@state.co.us">Sophie.Shulman@state.co.us</a> 303-512-4011
Research Study - Integrating Mobility Energy Productivity Metric into the CDOT Statewide Model: CDOT research branch will begin procurement process, finalize a scope of work, and select a vendor to perform research. Goal is to determine feasibility of integrating National Renewable Energy Laboratory (NREL) mobility metric to CDOT's statewide Travel Demand Model. Metric assesses impacts of transportation technologies. Research will begin in Fall 2019. Will continue into FY 2020.	X						David Reeves Contract Manager <a href="mailto:David.Reeves@state.co.us">David.Reeves@state.co.us</a> 303-757-9518
Simple Steps/Better Air: Continue public outreach and education program to raise awareness of ground ozone pollution and create behavior change. Will focus on behavior change.		X	X			Criteria pollutants, MSAT, GHG	Rose Waldman DTD Air Quality/Noise Program Manager <a href="mailto:Rose.Waldman@state.co.us">Rose.Waldman@state.co.us</a> <a href="tel:3037579016">US (303) 757-9016</a>

Table B: Current Fiscal Year Air Quality Action Items (Revision #3; July 2019)

Action Item for FY 2020	Strategy Category					Pollutant(s) Affected by Action <sup>1, 2</sup>	Champion/Contact
	System Efficiency	Reduce VMT	Alt. Fuel	Fuel Efficiency	Absorption/Barrier		
Smart 25 Demonstration Project: Construction items were separated into three projects. First was completed in January 2019. Second awarded in December 2018 and will be in construction from January 2019 until May 2020. Final construction project will be constructed in Fall 2019 (once cleared for construction). Project construction will continue to install devices and infrastructure until Spring 2020, at which time CDOT will conduct pilot project to increase efficiency on I-25. Demonstration will run for 6 month trial period, anticipated to run from May to October 2020. Then system will be shut down and data analyzed. Hot spot analysis will be conducted in Fall/Winter 2020 before any permanent implementation of the project could begin.	X						Zachary Miller Region 1 Central Engineering Section <a href="mailto:Zachary.Miller@state.co.us">Zachary.Miller@state.co.us</a> <a href="mailto:Zachary.Miller@state.co.us">US</a> 720-382-6381
Statewide Bicycle Plan: Develop revised Statewide Bicycle Plan as part of the 2045 Statewide Transportation Plan. Revision will use High Demand Corridor information and data from Strava, Inc. to make planning recommendations for improvements to enhance bicycle use for transportation and recreation.	X	X	X			Criteria pollutants, MSAT, GHG	Betsy Jacobsen Bicycle/ Pedestrian/ Byways Section Manager <a href="mailto:Betsy.jacobsen@state.co.us">Betsy.jacobsen@state.co.us</a> <a href="mailto:Betsy.jacobsen@state.co.us">US</a> 303-757-9982
2045 Statewide Plan (SWP): Process based on data-driven needs assessment and	X	X		X		Criteria pollutants, MSATs, GHG	Marissa Gaughan, Statewide and Regional Planning Manager



Table B: Current Fiscal Year Air Quality Action Items (Revision #3; July 2019)

Action Item for FY 2020	Strategy Category					Pollutant(s) Affected by Action <sup>1, 2</sup>	Champion/Contact
	System Efficiency	Reduce VMT	Alt. Fuel	Fuel Efficiency	Absorption/Barrier		
public/stakeholder outreach. Formal planning process started in May 2019 with county meetings, which will be followed by meetings with rural transportation planning regions (TPRs) and some of the five metropolitan planning organizations. Each TPR will meet three times to, among other things, update priority corridors, discuss how to integrate modes and various CDOT plans for the priority corridors, and develop a 10-year project pipeline. Pipeline includes four years of State Transportation Improvement Program (STIP), plus six years beyond that. By including all modes of travel, people may be moved more efficiently and effectively.							<a href="mailto:marissa.gaughan@state.co.us">marissa.gaughan@state.co.us</a> 303-512-4235
Traffic Incident Management (TIM) Training Track: TIM website supplements information that participants in TIM training sessions acquire at training track. Refresher materials provided for those who have already taken TIM course. Ongoing.	X			X		Criteria pollutants, MSATs, GHG	Ryan Tyler Division of Maintenance and Operations Branch Manager <a href="mailto:Ryan.Tyler@state.co.us">Ryan.Tyler@state.co.us</a> (303) 512-5814
Transportation Air Quality Research: Participate in multi-state Near-Road Air Quality Transportation Pooled Fund. Overall report for all task orders will be finalized. Publication on near-road ambient modeling vs. measurements will be submitted.				X	X	Criteria pollutants, MSAT, GHG	Rose Waldman DTD Air Quality/Noise Program Manager <a href="mailto:Rose.Waldman@state.co.us">Rose.Waldman@state.co.us</a> (303) 757-9016

**Table B: Current Fiscal Year Air Quality Action Items (Revision #3; July 2019)**

Action Item for FY 2020	Strategy Category					Pollutant(s) Affected by Action <sup>1, 2</sup>	Champion/Contact
	System Efficiency	Reduce VMT	Alt. Fuel	Fuel Efficiency	Absorption/Barrier		
WheelRight: In late summer 2019, CDOT will install sensors in the Woolly Mammoth Park and Ride, which will measure car tire tread depths and tire pressures and alert drivers if their tire pressure is low. This will lead to some drivers inflating their tires, which improves the miles per gallon achieved by the vehicle.				X		Criteria pollutants, MSATs, GHG	Sarah Mitchell EPB Sustainability Coordinator <a href="mailto:Sarah.Mitchell@state.co.us">Sarah.Mitchell@state.co.us</a> 303-757-9764

**Notes for Table B**

1. Potential pollutants include:
  - 1.A. Transportation Criteria Pollutants (CO, PM<sub>10</sub>, PM<sub>2.5</sub>, NO<sub>x</sub>, and VOCs [not a criteria pollutant, but are a precursor to criteria pollutant ozone, which is not directly emitted by any source])
  - 1.B. Transportation Mobile Source Air Toxics (benzene, acetaldehyde, formaldehyde, acrolein, 1,3-butadiene, diesel particulate matter plus diesel exhaust organic gases, naphthalene, polycyclic organic matter, and ethylbenzene)
  - 1.C. Transportation Greenhouse Gases (CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O)
  
2. Determining which pollutants will be affected by each action:
  - 2.A. Tailpipes of hydrocarbon fuel powered vehicles emit all three categories of pollutants: criteria pollutants, MSATs, and GHGs. Therefore, emissions of all three categories will be reduced if a strategy reduces VMT, increases system efficiency, increases the use of alternative fuel vehicles, or increases vehicle fuel efficiency. Most strategies will fall into this category.
  - 2.B. Even if a strategy targets a specific pollutant, the strategy will most likely reduce tailpipe emissions. For example, Simple Steps/Better Air is a program that encourages VMT reduction specifically to help address the Denver Front Range ozone issue. However, strategies that reduce ozone precursors also generally reduce emissions of other pollutants.
  - 2.C. Some strategies do target specific pollutants. For example, concrete production creates CO<sub>2</sub>. Therefore, the strategy to add more fly ash to a concrete mixture reduces CO<sub>2</sub>, but no other pollutants.

## Appendix C:

# Air Quality Performance Measure Results

# FY 2019 Air Quality Performance Measure Results

This appendix contains air quality performance measure results as calculated in Spring 2019. The measures and associated tables are:

- Statewide Motor Vehicle Emissions Performance Measure: Table C-1.
- Change in Statewide On-Road Gasoline Consumption per Capita: Table C-2.
- Greenhouse Gas (GHG) National Performance Measure: Table C-3.
- Summary table of all three performance measures: Table C-4.

All four tables are updated annually. In FY 2017, the first year these tables were published, the baseline year, calendar year (CY) 2011, was reported as well as the most current year for which the required data was available, which was either CY 2014 or CY 2015 (depending on the table). The baseline year was selected because 2011 was the base year of the 2017 Ozone SIP.

When analyzing air pollution trends, both total emissions and emissions per capita should be considered. The tables in this appendix show mixed results regarding Colorado criteria pollutant and GHG emissions. According to the calculation method used for Table C-1, criteria pollutant and GHG emissions decreased between CY 2016 and CY 2017 in both total mass and on a per capita basis. However, according to the method used for Table C-3, GHG emissions increased (criteria pollutant emissions are not calculated in this method), although emissions per capita showed a slight decrease. Although it would be preferable that both types of emissions decrease over time (mass and per capita) regardless of the calculation method, in a state with increasing population, it is not surprising that the total mass of emissions increased between CY 2016 and CY 2017 (based on the method used for Table C-3).

As shown in Table C-2, statewide gasoline consumption increased on both a mass and per capita basis between CY 2015 and CY 2016 and both decreased between CY 2016 and 2017. Gasoline consumption is directly linked to emissions; if consumption increases, generally emissions also increase. An increase of gasoline consumption on a per capita basis could be explained by people driving more (more vehicle miles travelled [VMT]) or driving less fuel efficient vehicles, or a combination. Between CY 2015 and CY 2016, VMT per capita increased from 9,243 miles to 9,417 miles. Therefore, an increase in gasoline per capita may be explained by both more miles being driven and the fleet of personal vehicles being less fuel efficient. Between CY 2016 and CY 2017, VMT per capita increased from 9,417 miles to 9,516 miles. Therefore, a decrease in gasoline per capita may be explained by a fleet of personal vehicles being more fuel efficient

**Table C-1: Statewide Motor Vehicle Performance Measure Emissions and Emissions per Capita (Revision #3; July 2019)**

Measure Parameters		Emissions <sup>1</sup>						
		CO	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	CO <sub>2e</sub>	VOC
Statewide (tons per day)	2011 <sup>2,3</sup>	724	197	11.4	6.3	70,885	71,127	34.4
	2015 <sup>3,5</sup>	555	135	9.9	4.6	72,550	72,713	21.2
	2016 <sup>3,7</sup>	529	116	9.2	4.1	71,947	72,099	18.6
	2017 <sup>3,8</sup>	497.1	84.3	8.6	3.5	70,655	70785	14.5
Statewide (tons per year)	2011	264,260	71,905	4,161	2,300	25,873,025	25,961,355	12,556
	2015	202,575	49,275	3,614	1,679	26,480,750	26,540,245	7,738
	2016	193,085	42,340	3,358	1,478	26,260,655	26,316,135	6,789
	2017	181,442	30,766	3,135	1,271	25,789,075	25,836,525	5,296
Statewide (pounds per capita) <sup>4</sup>	2011	103.2	28.1	1.6	0.9	10,105	10,140	4.9
	2015	74.2	18.1	1.3	0.6	9,706	9,728	2.8
	2016	69.7	15.3	1.2	0.5	9,483	9,504	2.5
	2017	64.7	11.0	1.1	0.5	9,195	9,212	1.9
Change in Emissions (tons per day) <sup>6</sup>	2011 to 2015	-169	-62	-1.5	-1.7	1,665	1,586	-13
	2015 to 2016	-26	-19	-0.7	-0.5	-603	-614	-2.6
	2016 to 2017	-32	-32	-0.6	-0.6	-1,292	-1,314	-4.1
Change in Emissions (tons per year) <sup>6</sup>	2011 to 2015	-61,685	-22,630	-548	-621	607,725	578,890	-4,818
	2015 to 2016	-9,490	-6,935	-256	-201	-220,095	-224,110	-949
	2016 to 2017	-11,644	-11,574	-223	-207	-471,580	-479,610	-1,493
Change in Emissions (pounds per capita) <sup>6</sup>	2011 to 2015	-29	-10	-0.3	-0.3	-399	-412	-2.1
	2015 to 2016	-4.5	-2.8	-0.1	-0.1	-222	-224	-0.4
	2016 to 2017	-5.0	-4.3	-0.1	-0.1	-289	-292	-0.6

**Notes for Table C-1**

1. Pollutants: carbon monoxide (CO), nitrogen oxides (NO<sub>x</sub>), particulate matter with diameter equal to or less than 10 microns (PM<sub>10</sub>) or 2.5 microns (PM<sub>2.5</sub>), carbon dioxide (CO<sub>2</sub>), carbon dioxide equivalent (CO<sub>2e</sub>), and volatile organic compounds (VOCs)
2. Tons per day values for CY 2011 were obtained from Table 4 of Colorado Air Pollution Control Division's (APCD's) report, which was in Appendix D of the 2017 *Air Quality Action Plan* (version 1).
3. APCD used Environmental Protection Agency (EPA) MOVES2014a model at the "National" scale for each

year and two Colorado counties to determine the yearly emission factors (gram/mile per highway performance monitoring system [HPMS] vehicle type and road type) for CO, NO<sub>x</sub>, VOC, PM<sub>10</sub>, PM<sub>2.5</sub>, CO<sub>2</sub>, and CO<sub>2e</sub>. After calculating fractions of HPMS vehicle type by road type from CDOT Automatic Traffic Recorder (ATR) data, these fractions were applied to CDOT-supplied VMT per functional class and area (urban/rural). The emission factors were then multiplied by vehicle miles traveled (VMT), summed over HPMS vehicle class, and converted to tons per day of pollutant per functional class, area type, and year. Calculating PM<sub>2.5</sub>, NO<sub>x</sub>, and VOC emissions was recommended by National Cooperative Highway Research Program (NCHRP) Report 809. CDOT determined emissions for additional pollutants should also be calculated. Emissions were calculated by Air Pollution Control Division (APCD) for on-road mobile sources traveling on the following functional classes of roads: 1 (Interstate); 2 (Principal Arterial - Other Freeways and Expressways); 3 (Principal Arterial - Other); 4 (Minor Arterial); 5 (Major Collector); 6 (Minor Collector); and 7 (Local). VMT data is from HPMS data for CYs 2011, 2015, 2016, and 2017, which are published in Federal Highway Administration's (FHWA's) VM-2 Report.

4. Emissions per capita were calculated by dividing the emissions by the number of people in Colorado. Population data represents July 1, the mid-year population; Colorado's population changes daily. Population data: 5,120,686 (2011); 5,456,584 (2015); 5,538,180 (2016); and 5,609,445 (2017). The data source is: <https://demography.dola.colorado.gov/population/population-totals-counties/#population-totals-for-colorado-counties>
5. Tons per day (tpd) values for 2015 were obtained from Table 5 of Colorado APCD's report, which was in Appendix D of the 2017 *Air Quality Action Plan* (Version 1).
6. If the change in emissions from an earlier year to a later year (e.g., CY 2015 to CY 2016) is a negative value, the later year emissions (e.g., CY 2016) are less than the earlier year emissions (e.g., CY 2015).
7. Tons per day (tpd) values for CY 2016 were obtained from Table 5 of Colorado APCD's report, which is in Appendix D of this 2018 *Air Quality Action Plan* (Version 2).
8. Tons per day (tpd) values for CY 2017 were obtained from Table 5 of Colorado APCD's report, which is in Appendix D of this 2019 *Air Quality Action Plan* update (Version 3).

**Table C-2: Statewide On-Road Gasoline per Capita Performance Measure Data  
(Revision #3; July 2019)**

Measure Parameters		Measure Results
Statewide Gasoline Consumption (gallons)	2011 <sup>1</sup>	2,128,402,548
	2014 <sup>1,2</sup>	2,219,961,283
	2015 <sup>1</sup>	2,314,292,612
	2016 <sup>5</sup>	2,384,639,949
	2017 <sup>5</sup>	2,365,198,847
Statewide Gasoline Consumption per Capita (gallons per person) <sup>3</sup>	2011	415.6
	2014	414.4
	2015	424.8
	2016	430.6
	2017	421.6
Change in Gasoline Consumption (gallons) <sup>4</sup>	2011 to 2014	91,558,735
	2014 to 2015	94,331,329
	2015 to 2016	70,347,337
	2016 to 2017	-19,441,102
Change in Gasoline Consumption per Capita (gallons per person) <sup>4</sup>	2011 to 2014	-1.2
	2014 to 2015	10.4
	2015 to 2016	5.8
	2016 to 2017	-8.9

**Notes for Table C-2**

- Each State reports fuel consumption to FHWA on a monthly basis. Consumption is typically provided from State tax authority records. States' motor-fuel information systems, and, therefore, submitted data, are organized primarily for the purpose of administering State fuel-tax programs. Because of variations in individual State requirements, reported data are sometimes not comparable among the States. In order to treat States equitably in motor fuel attributions, and include information from all States in the national summary tables published in Highway Statistics on a comparable basis, the FHWA may adjust parts of the States' submissions. The adjustment process fits the data to uniform categories so that national characteristics and trends can be analyzed and projected. Consumption data sources: <https://www.fhwa.dot.gov/policyinformation/statistics/2011/33ga.cfm>  
<https://www.fhwa.dot.gov/policyinformation/statistics/2014/33ga.cfm>

<https://www.fhwa.dot.gov/policyinformation/statistics/2015/33ga.cfm>

2. When these calculations were first done in 2017, CY 2015 gasoline consumption data was not yet available by FHWA. The most recent year with complete data, as of March 2017, was CY 2014.
3. Population data is as of July 1 of each reported year. Population data: 5,120,686 (2011); 5,356,626 (2014); 5,448,055 (2015); 5,538,180 (2016); and 5,609,445 (2017). The data represents the mid-year population; Colorado's population changes daily. The data source is: <https://demography.dola.colorado.gov/population/population-totals-counties/#population-totals-for-colorado-counties>
4. If the change in emissions from an earlier year to a later year (e.g., CY 2015 to CY 2016) is a negative value, the later year emissions (e.g., CY 2016) are less than the earlier year emissions (e.g., CY 2015).
5. While doing the calculations in 2019 for 2016, sought new source for fuel consumption because FHWA only reported data with six significant figures instead of nine, which had been used in the past. Determined that the source of FHWA data was from the Department of Revenue (DOR). Although FHWA data lags by over two years, DOR data is more up to date. Therefore, in 2019, also calculated data for this table for 2017. Source of DOR data: <https://www.colorado.gov/pacific/revenue/colorado-motor-fuel-taxes>



Table C-3: Greenhouse Gas National Performance Measure Results (Revision #3; July 2019)

Measure Parameters	Year	Measure Results
Total million VMT (annual total vehicle-miles traveled on all public roads) <sup>1</sup>	2011	46,606
	2015	50,437
	2016	52,152
	2017	53,382
NHS million VMT (annual total vehicle-miles traveled on NHS) <sup>1</sup>	2011	23,808
	2015	31,938
	2016	33,047
	2017	33,811
Statewide Gasoline/Gasohol Consumption (thousand gallons) <sup>2</sup>	2011	2,079,287
	2015	2,107,254
	2016	2,217,141
	2017	2,196,347
Statewide Diesel Consumption (thousand gallons) <sup>2</sup>	2011	542,783
	2015	632,740
	2016	636,213
	2017	665,357
Tailpipe CO <sub>2</sub> emissions on NHS (total tailpipe CO <sub>2</sub> emissions on NHS in a calendar year) (tons) <sup>3</sup>	2011	24,460,065
	2015	25,714,813
	2016	26,725,112
	2017	26,867,706
Tailpipe CO <sub>2</sub> emissions on NHS per Capita (tons CO <sub>2</sub> per person) <sup>4</sup>	2011	4.78
	2015	4.71
	2016	4.83
	2017	4.79
Change in Tailpipe CO <sub>2</sub> Emissions on NHS (tons) <sup>5</sup>	2011 to 2015	1,254,748
	2015 to 2016	1,010,299

	2016 to 2017	142,594
Change in Tailpipe CO <sub>2</sub> Emissions per Capita (tons per person) <sup>5</sup>	2011 to 2015	-0.06
	2015 to 2016	0.11
	2016 to 2017	-0.04

**Notes for Table C-3**

1. VMT data is from FHWA's Highway Statistics report "Federal-Aid Highway Travel (VM-3)."
2. Fuel consumption data is from FHWA's Highway Statistics report "Motor Fuel Use (MF-21)."
3. Although fuel use data for Colorado is available from Colorado sources for fuel sources besides gas and diesel, emission factors for these fuels were not available when these calculations were done in April 2018. Therefore, only emissions from gas and diesel were included in this calculation. Emission factors used were 17.68 pounds CO<sub>2</sub> per gallon of gasoline/gasohol and 22.4 pounds CO<sub>2</sub> per gallon of diesel.
4. Population data is as of July 1 of 2011 and 2015. Population data: 5,120,686 (2011); 5,456,584 (2015); 5,538,180 (2016); and 5,609,445 (2017). The data represents the mid-year population; Colorado's population changes daily. The data source is: <https://demography.dola.colorado.gov/population/population-totals-counties/#population-totals-for-colorado-counties>
5. If the change in emissions from an earlier year to a later year (e.g., CY 2015 to CY 2016) is a negative value, the later year emissions (e.g., CY 2016) are less than the earlier year emissions (e.g., CY 2015).

Table C-4: Air Quality Performance Measure Summary (Revision #3; July 2019)

Year	Performance Measure			
	Motor Vehicle Emissions - Criteria Pollutants <sup>1,2</sup>	Motor Vehicle Emissions - CO <sub>2</sub> <sup>2,3</sup>	On-Road Gasoline Consumption <sup>4</sup>	GHG Tailpipe Emissions - CO <sub>2</sub> <sup>5</sup>
2011 <sup>6</sup>	355,182 tpy and 0.07 ton/capita/yr	25,873,025 tpy and 5.1 ton/capita/yr	2,128 million gal/yr and 416 gal/capita/yr	24,460,065 tpy and 4.78 tons/capita/yr
2014	Not Determined <sup>7</sup>	Not Determined <sup>7</sup>	2,220 million gal/yr and 414 gal/capita/yr	Not Determined <sup>7</sup>
2015	264,881 tpy and 0.05 ton/capita/yr	26,480,750 tpy and 4.9 ton/capita/yr	2,314 million gal/yr and 425 gal/capita/yr	25,714,813 tpy and 4.71 tons/capita/yr
2016	247,050 tpy and 0.04 ton/capita/yr	26,260,655 tpy and 4.7 ton/capita/yr	2,385 million gal/yr and 431 gal/capita/yr	26,725,112 tpy and 4.83 tons/capita/yr
2017	221,910 tpy and 0.04 ton/capita/yr	25,789,075 tpy and 4.6 ton/capita/yr	2,365 million gal/yr and 422 gal/capita/yr <sup>7</sup>	26,867,706 tpy and 4.79 tons/capita/yr

Notes for Table C-4

1. Criteria Pollutants represented in this table are: CO, NO<sub>x</sub>, VOC, PM<sub>10</sub>, PM<sub>2.5</sub>, and VOC. Emissions of each pollutant are reported in Table C-1.
2. The "Motor Vehicle" performance measure represents statewide on-road vehicle emissions from vehicles driven on seven functional classes of roads.
3. Although CO<sub>2e</sub> emissions were reported in Table C-1, only CO<sub>2</sub> emissions are reported in this table because the "GHG Tailpipe" performance measure reported only CO<sub>2</sub> emissions.
4. The "On-Road Gasoline Consumption" performance measure represents gasoline and diesel purchased statewide for on-road vehicles. Consumption of gasoline is directly linked to emissions, although for this performance measure, emissions are not calculated.
5. The "GHG Tailpipe Emissions" performance measure represents statewide on-road vehicle emissions from vehicles driven on the National Highway System, which covers five of seven functional classes of roads. It does not include minor collector or local roads.
6. The baseline year 2011 was selected because 2011 was the base year of the 2017 Ozone SIP.
7. Values in this table were first calculated in 2017. At that time, the most recent complete data set for calculations done for performance measures "Motor Vehicle Emissions" and "GHG Tailpipe Emissions" was for CY 2015. However, the most recent complete data set for the "On-Road Gasoline Consumption" performance measure was from CY 2014. Therefore, "On-Road Gasoline Consumption" data lagged the other data types by one year until Revision #3. During the development of the 2019 update, the source of the gasoline consumption data that had been used in the past was found. That source was more up to date, so the performance measure no longer lags.

**Appendix D:**

**2018 Statewide Motor Vehicle Performance**

**Measure Emissions Methodology: Colorado Air**

**Pollution Control Division Report**

# CDPHE Air Pollution Control Division

June 2019

## Colorado Running Motor Vehicle Emissions Inventory: 2016 and 2017

### Calculation Summary

This is an overview of the methods used to calculate the Colorado state emissions inventory for years 2016 and 2017. We ran the EPA MOVES2014b model at the “National” scale for each year and two CO counties to determine the yearly emission factors (gram/mile per HPMS vehicle type and road type) for CO, NO<sub>x</sub>, VOC, PM<sub>10</sub>, PM<sub>2.5</sub>, CO<sub>2</sub>, and CO<sub>2</sub> equivalent. After calculating the fractions of HPMS vehicle type by road type from the CDOT ATR data, we applied these fractions to the CDOT-supplied VMT per functional class and area (urban/rural). The emission factors were then multiplied by VMT, summed over HPMS vehicle class, and converted to tons of pollutant per functional class, area type, and year.

### CDOT ATR Data

CDOT supplied counts by FHWA vehicle class for permanent and temporary (48 hr) ATR stations. In conjunction with provided shape files for the locations of these stations, we calculated the weekday counts of vehicles by functional class (i.e., interstate, expressway, arterial, etc.) and area type (urban/rural). These counts were then converted from the 13 FHWA vehicles classes to the 6 HPMS vehicle types common to MOVES source types and FHWA classes. Finally, HPMS vehicle type fraction per functional class (FC) and area type (Rural?) were calculated (Table 1). Whether the link fell in the Metro Denver/North Front Range non-attainment area (NAA) was also retained as the MOVES emission factors differ slightly inside and outside of the NAA.

*Table 1. 2017 fractions of each of the 6 HPMS vehicle types (weighted by vehicle count) according to area type, functional class (FC), and NAA (nonattainment area) classification. Missing 2017 ATR data were filled in from 2016.*

NAA?	Rural?	FC	10f	20f	30f	40f	50f	60f
1	R	1	0.0005	0.46	0.43	0.0003	0.002	0.10
1	R	2	0.001	0.52	0.48	0.00003	0.002	0.003
1	R	3	0.001	0.50	0.46	0.001	0.002	0.04
1	R	4	0.01	0.50	0.46	0.01	0.01	0.01
1	R	5	0.01	0.50	0.47	0.01	0.01	0.01
1	R	6	0.01	0.50	0.47	0.01	0.01	0.01
1	R	7	0.01	0.45	0.44	0.02	0.03	0.04
1	U	1	0.001	0.49	0.46	0.0002	0.002	0.05
1	U	2	0.001	0.52	0.48	0.0002	0.001	0.002
1	U	3	0.001	0.52	0.48	0.001	0.001	0.002
1	U	4	0.01	0.49	0.46	0.02	0.01	0.01
1	U	5	0.01	0.50	0.46	0.01	0.01	0.01
1	U	6	0.01	0.50	0.46	0.01	0.01	0.01
1	U	7	0.01	0.50	0.47	0.005	0.01	0.01
0	R	1	0.001	0.47	0.43	0.001	0.003	0.10
0	R	2	0.001	0.46	0.43	0.002	0.01	0.11
0	R	3	0.001	0.46	0.43	0.002	0.01	0.11
0	R	4	0.005	0.49	0.46	0.002	0.01	0.04
0	R	5	0.01	0.48	0.45	0.01	0.02	0.04

0	R	6	0.01	0.48	0.46	0.01	0.02	0.03
0	R	7	0.01	0.43	0.41	0.02	0.02	0.12
0	U	1	0.001	0.47	0.43	0.001	0.003	0.10
0	U	2	0.01	0.51	0.47	0.002	0.002	0.01
0	U	3	0.001	0.51	0.47	0.001	0.003	0.01
0	U	4	0.002	0.52	0.48	0.001	0.003	0.003
0	U	5	0.01	0.50	0.47	0.004	0.01	0.01
0	U	6	0.01	0.50	0.47	0.005	0.01	0.002
0	U	7	0.01	0.50	0.47	0.005	0.01	0.002

## CDOT VMT

The HPMS vehicle fractions in Table 1 were applied to the CDOT VMT that was separated by area type and functional class. Table 2 is the result.

*Table 2. 2017 CDOT VMT/day by HPMS vehicle class (10 through 60), area type (Rural?), and FHWA functional class (FC). Missing functional classes from 2017 were filled with data from 2016.*

NAA?	Rural?	FC	10	20	30	40	50	60
1	R	1	4,031	3,799,269	3,505,000	2,285	14,770	853,028
1	R	2	233	239,745	220,617	13	961	1,573
1	R	3	4,967	3,765,381	3,476,341	4,698	17,303	271,893
1	R	4	41,854	1,791,110	1,673,892	20,313	30,921	46,857
1	R	5	33,900	1,586,756	1,486,914	21,163	30,437	33,994
1	R	6	14,352	671,759	629,491	8,960	12,885	14,391
1	R	7	29,191	1,159,724	1,138,881	47,327	82,586	104,180
1	U	1	10,364	8,164,239	7,522,352	2,876	35,854	772,065
1	U	2	5,256	4,951,383	4,536,858	2,255	8,549	18,737
1	U	3	14,883	8,411,639	7,721,230	12,825	21,204	33,982
1	U	4	136,994	5,463,382	5,090,021	236,254	85,153	113,451
1	U	5	68,387	2,405,874	2,238,072	40,002	34,284	39,515
1	U	6	890	39,907	37,408	861	719	814
1	U	7	92,050	3,237,529	3,014,545	32,099	42,477	57,254
0	R	1	3,304	2,269,177	2,099,224	4,315	15,410	461,505
0	R	2	370	125,474	117,008	642	1,487	29,841
0	R	3	6,018	2,042,893	1,905,048	10,450	24,216	485,850
0	R	4	9,925	1,046,884	974,540	3,714	13,480	90,581
0	R	5	18,327	902,194	858,676	11,995	31,240	72,346
0	R	6	6,382	381,830	366,644	10,203	16,080	21,023
0	R	7	13,692	646,858	622,010	25,991	27,125	184,514
0	U	1	6,668	4,580,247	4,237,203	8,710	31,105	931,531
0	U	2	29,482	2,867,636	2,646,046	12,724	12,611	82,337
0	U	3	4,904	4,934,161	4,563,630	5,282	24,836	89,391
0	U	4	11,806	3,410,862	3,141,766	3,344	16,872	16,918
0	U	5	33,054	1,436,268	1,343,251	11,744	24,067	15,375
0	U	6	481	24,094	22,528	227	387	110
0	U	7	38,661	1,935,851	1,810,100	18,215	31,076	8,837

## MOVES2014b Emission Factors

We ran the EPA MOVES2014b model in inventory mode at the “National” scale, which relies on the national default database (i.e., for VMT, Inspection & Maintenance (I/M) Programs, Regional Fuel Supply, Age Distribution, Meteorology, etc.) and thus is not appropriate for regulatory purposes. Because the I/M programs differ in the NAA, Adams County represents the Denver Metro/North Front Range (DMNFR) NAA while El Paso County represents the rest of the state. We restricted this inventory to on-network running emissions, so we excluded MOVES road type 1 (off-network). We selected MOVES output by year, county, road type, pollutant, and activity (distance traveled) with the standard units of grams, miles, and Joules. The main inputs are summarized in Table 3 below. The full text of the run specification file is reproduced in Attachment 1 to this Appendix.

Table 3. Primary MOVES inputs used to calculate CDOT running emissions inventories.

<b>MOVES2014b Inputs</b>	<b>Details</b>
<b>Scale</b>	National Inventory
<b>Time Spans</b>	Time Aggregation: Hour Years: 2016 and 2017 Months: January & July Days: Weekdays only Hours: All hours
<b>Geographic Bounds</b>	State: Colorado Counties: Adams (8001) and El Paso (8041)
<b>On Road Vehicles</b>	All Fuel & Source Use Type combinations
<b>Road Type</b>	On Network: 2-5
<b>Pollutants and Processes</b>	CO = 2; NO <sub>x</sub> = 3; VOC = 87 PM <sub>10</sub> = 100+106+107 PM <sub>2.5</sub> = 110+116+117 CO <sub>2</sub> = 90; CO <sub>2</sub> equivalent = 98 >> select additional prerequisites when prompted For ProcessIDs = 1, 9, 10, 11, 12, 13, 15
<b>General Output</b>	Units: Grams, Joules, Miles Activity: Distance Traveled
<b>Output Emissions Detail</b>	Time: Year Location: County On and Off Road: Road Type & Source Use Type

Only January and July are selected to emphasize the high-pollution seasons for CO and ozone precursors, respectively. In addition, only weekdays are selected.

We used the national default VMT per county and determined the weekday year-average emission factors for each pollutant in post-processing (MOVES emissions/MOVES VMT). We also performed the following conversions: 1) MOVES source type to HPMS vehicle type, 2) MOVES road type to FHWA functional class, and 3) County to area type (Urban or Rural and NAA or Non-NAA).

These emission factors per HPMS vehicle class, functional class, and area type (Attachment 2) were multiplied by the VMT in Table 2 to yield the total annual emissions below (Tables 4 and 5, for 2016 and 2017, respectively).

A process flowchart to compute final emissions is shown in Attachment 3.

Table 4. 2016 weekday running emissions inventory.

Rural?	FC	Total VMT	CO (tons)	NO <sub>x</sub> (tons)	PM <sub>10</sub> (tons)	PM <sub>2.5</sub> (tons)	CO <sub>2</sub> (tons)	CO <sub>2eq</sub> (tons)	VOC (tons)
R	1	12,175,913	55.1	16.6	0.75	0.51	7,304	7,313	1.45
R	2	382,790	3.2	0.6	0.03	0.02	349	349	0.07
R	3	11,181,826	36.1	11.3	0.73	0.37	6,054	6,064	1.31
R	4	5,458,008	18.2	3.9	0.27	0.12	2,580	2,585	0.63
R	5	4,786,901	16.3	3.5	0.24	0.11	2,286	2,290	0.57
R	6	2,015,000	6.9	1.46	0.10	0.04	959	961	0.24
R	7	4,029,000	13.0	4.8	0.31	0.17	2,223	2,227	0.56
U	1	24,739,356	105.3	25.8	1.48	0.87	13,292	13,311	2.82
U	2	14,298,331	63.2	8.5	0.51	0.24	6,327	6,338	1.44
U	3	24,894,682	90.5	12.9	1.76	0.48	12,732	12,766	3.42
U	4	16,870,252	64.1	11.4	1.41	0.47	9,066	9,092	2.80
U	5	7,174,668	28.2	4.6	0.58	0.18	3,897	3,908	1.23
U	6	122,657	0.5	0.1	0.01	0.003	65	66	0.02
U	7	9,791,000	37.8	5.9	0.76	0.23	5,197	5,211	1.62
Totals:		<b>137,920,384</b>	<b>538</b>	<b>111</b>	<b>8.9</b>	<b>3.8</b>	<b>72,330</b>	<b>72,481</b>	<b>18.2</b>

Table 5. 2017 weekday running emissions inventory.

Rural?	FC	Total VMT	CO (tons)	NO <sub>x</sub> (tons)	PM <sub>10</sub> (tons)	PM <sub>2.5</sub> (tons)	CO <sub>2</sub> (tons)	CO <sub>2eq</sub> (tons)	VOC (tons)
R	1	13,031,319	51.4	13.3	0.69	0.46	7,157	7,165	1.14
R	2	737,964	3.0	0.5	0.03	0.02	341	341	0.06
R	3	12,015,057	33.2	8.9	0.70	0.34	5,922	5,931	1.04
R	4	5,744,070	16.8	2.9	0.26	0.11	2,519	2,524	0.51
R	5	5,087,943	15.0	2.6	0.23	0.10	2,233	2,236	0.46
R	6	2,154,000	6.3	1.09	0.10	0.04	937	938	0.20
R	7	4,082,078	11.9	3.9	0.29	0.15	2,178	2,182	0.46
U	1	26,303,214	98.1	20.2	1.39	0.78	13,004	13,021	2.22
U	2	15,173,873	58.9	5.8	0.48	0.22	6,169	6,178	1.11
U	3	25,837,967	82.8	8.9	1.73	0.45	12,410	12,439	2.69
U	4	17,726,823	58.7	8.5	1.37	0.43	8,848	8,870	2.28
U	5	7,689,891	25.9	3.3	0.57	0.17	3,803	3,812	1.00
U	6	128,426	0.4	0.1	0.01	0.003	64	64	0.02
U	7	10,318,695	34.7	4.3	0.74	0.21	5,070	5,082	1.32
Totals:		<b>146,031,320</b>	<b>497</b>	<b>84</b>	<b>8.6</b>	<b>3.5</b>	<b>70,654</b>	<b>70,785</b>	<b>14.5</b>



## Attachment 1. MOVES Run Specification (RunSpec) File for Running Emissions

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RunSpec file continued...

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RunSpec file continued...

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  <fuelsubtype selected="false"/>
  <emissionprocess selected="false"/>
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  <sourceusetype selected="true"/>
  <movesvehicletype selected="false"/>
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RunSpec file continued...

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</donotexecute>

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## Attachment 2. MOVES Emission Factors (EFs)

2016

Rural?	FC	NAA?	HPMS ID	CO (g/mile)	NO <sub>x</sub> (g/mile)	PM <sub>10</sub> (g/mile)	PM <sub>2.5</sub> (g/mile)	CO <sub>2</sub> (g/mile)	CO <sub>2eq</sub> (g/mile)	VOC (g/mile)
R	1	1	10	13.42	0.83	0.04	0.03	399	400	0.78
R	1	1	20	3.00	0.29	0.02	0.01	314	314	0.06
R	1	1	30	4.77	0.62	0.02	0.01	428	429	0.09
R	1	1	40	3.78	8.12	0.34	0.28	1,310	1,314	0.54
R	1	1	50	4.44	3.00	0.17	0.12	990	991	0.27
R	1	1	60	1.47	6.94	0.32	0.24	1,750	1,751	0.26
R	1	0	10	13.54	0.85	0.04	0.03	399	400	0.77
R	1	0	20	3.46	0.37	0.02	0.01	311	312	0.07
R	1	0	30	5.62	0.75	0.02	0.01	425	426	0.12
R	1	0	40	3.80	8.23	0.35	0.28	1,298	1,303	0.54
R	1	0	50	4.47	3.05	0.17	0.12	980	981	0.27
R	1	0	60	1.47	7.04	0.32	0.24	1,735	1,736	0.26
R	2	1	10	13.42	0.83	0.04	0.03	399	400	0.78
R	2	1	20	3.00	0.29	0.02	0.01	314	314	0.06
R	2	1	30	4.77	0.62	0.02	0.01	428	429	0.09
R	2	1	40	3.78	8.12	0.34	0.28	1,310	1,314	0.54
R	2	1	50	4.44	3.00	0.17	0.12	990	991	0.27
R	2	1	60	1.47	6.94	0.32	0.24	1,750	1,751	0.26
R	2	0	10	13.54	0.85	0.04	0.03	399	400	0.77
R	2	0	20	3.46	0.37	0.02	0.01	311	312	0.07
R	2	0	30	5.62	0.75	0.02	0.01	425	426	0.12
R	2	0	40	3.80	8.23	0.35	0.28	1,298	1,303	0.54
R	2	0	50	4.47	3.05	0.17	0.12	980	981	0.27
R	2	0	60	1.47	7.04	0.32	0.24	1,735	1,736	0.26

2016 EFs continued...

Rural?	FC	NAA?	HPMS ID	CO (g/mile)	NO <sub>x</sub> (g/mile)	PM <sub>10</sub> (g/mile)	PM <sub>2.5</sub> (g/mile)	CO <sub>2</sub> (g/mile)	CO <sub>2eq</sub> (g/mile)	VOC (g/mile)
R	3	1	10	13.55	0.82	0.04	0.02	382	384	0.97
R	3	1	20	2.03	0.25	0.03	0.01	315	316	0.06
R	3	1	30	3.25	0.52	0.03	0.01	424	425	0.09
R	3	1	40	3.26	6.70	0.41	0.30	1,084	1,089	0.63
R	3	1	50	4.28	2.83	0.21	0.13	922	924	0.35
R	3	1	60	1.68	7.12	0.41	0.29	1,766	1,767	0.32
R	3	0	10	13.67	0.84	0.04	0.02	382	384	0.96
R	3	0	20	2.37	0.32	0.03	0.01	312	313	0.07
R	3	0	30	3.84	0.63	0.03	0.01	421	422	0.12
R	3	0	40	3.27	6.79	0.41	0.30	1,073	1,079	0.63
R	3	0	50	4.31	2.88	0.21	0.13	912	914	0.34
R	3	0	60	1.68	7.22	0.41	0.29	1,750	1,751	0.32
R	4	1	10	13.55	0.82	0.04	0.02	382	384	0.97
R	4	1	20	2.03	0.25	0.03	0.01	315	316	0.06
R	4	1	30	3.25	0.52	0.03	0.01	424	425	0.09
R	4	1	40	3.26	6.70	0.41	0.30	1,084	1,089	0.63
R	4	1	50	4.28	2.83	0.21	0.13	922	924	0.35
R	4	1	60	1.68	7.12	0.41	0.29	1,766	1,767	0.32
R	4	0	10	13.67	0.84	0.04	0.02	382	384	0.96
R	4	0	20	2.37	0.32	0.03	0.01	312	313	0.07
R	4	0	30	3.84	0.63	0.03	0.01	421	422	0.12
R	4	0	40	3.27	6.79	0.41	0.30	1,073	1,079	0.63
R	4	0	50	4.31	2.88	0.21	0.13	912	914	0.34
R	4	0	60	1.68	7.22	0.41	0.29	1,750	1,751	0.32
R	5	1	10	13.55	0.82	0.04	0.02	382	384	0.97
R	5	1	20	2.03	0.25	0.03	0.01	315	316	0.06
R	5	1	30	3.25	0.52	0.03	0.01	424	425	0.09
R	5	1	40	3.26	6.70	0.41	0.30	1,084	1,089	0.63
R	5	1	50	4.28	2.83	0.21	0.13	922	924	0.35
R	5	1	60	1.68	7.12	0.41	0.29	1,766	1,767	0.32
R	5	0	10	13.67	0.84	0.04	0.02	382	384	0.96
R	5	0	20	2.37	0.32	0.03	0.01	312	313	0.07
R	5	0	30	3.84	0.63	0.03	0.01	421	422	0.12
R	5	0	40	3.27	6.79	0.41	0.30	1,073	1,079	0.63
R	5	0	50	4.31	2.88	0.21	0.13	912	914	0.34
R	5	0	60	1.68	7.22	0.41	0.29	1,750	1,751	0.32
R	6	1	10	13.55	0.82	0.04	0.02	382	384	0.97
R	6	1	20	2.03	0.25	0.03	0.01	315	316	0.06
R	6	1	30	3.25	0.52	0.03	0.01	424	425	0.09
R	6	1	40	3.26	6.70	0.41	0.30	1,084	1,089	0.63

2016 EFs continued...

Rural?	FC	NAA?	HPMS ID	CO (g/mile)	NO <sub>x</sub> (g/mile)	PM <sub>10</sub> (g/mile)	PM <sub>2.5</sub> (g/mile)	CO <sub>2</sub> (g/mile)	CO <sub>2eq</sub> (g/mile)	VOC (g/mile)
R	6	1	50	4.28	2.83	0.21	0.13	922	924	0.35
R	6	1	60	1.68	7.12	0.41	0.29	1,766	1,767	0.32
R	6	0	10	13.67	0.84	0.04	0.02	382	384	0.96
R	6	0	20	2.37	0.32	0.03	0.01	312	313	0.07
R	6	0	30	3.84	0.63	0.03	0.01	421	422	0.12
R	6	0	40	3.27	6.79	0.41	0.30	1,073	1,079	0.63
R	6	0	50	4.31	2.88	0.21	0.13	912	914	0.34
R	6	0	60	1.68	7.22	0.41	0.29	1,750	1,751	0.32
R	7	1	10	13.55	0.82	0.04	0.02	382	384	0.97
R	7	1	20	2.03	0.25	0.03	0.01	315	316	0.06
R	7	1	30	3.25	0.52	0.03	0.01	424	425	0.09
R	7	1	40	3.26	6.70	0.41	0.30	1,084	1,089	0.63
R	7	1	50	4.28	2.83	0.21	0.13	922	924	0.35
R	7	1	60	1.68	7.12	0.41	0.29	1,766	1,767	0.32
R	7	0	10	13.67	0.84	0.04	0.02	382	384	0.96
R	7	0	20	2.37	0.32	0.03	0.01	312	313	0.07
R	7	0	30	3.84	0.63	0.03	0.01	421	422	0.12
R	7	0	40	3.27	6.79	0.41	0.30	1,073	1,079	0.63
R	7	0	50	4.31	2.88	0.21	0.13	912	914	0.34
R	7	0	60	1.68	7.22	0.41	0.29	1,750	1,751	0.32
U	1	1	10	13.49	0.82	0.04	0.03	392	394	0.87
U	1	1	20	2.79	0.27	0.03	0.01	316	316	0.06
U	1	1	30	4.37	0.57	0.03	0.01	426	427	0.09
U	1	1	40	3.84	7.84	0.40	0.31	1,282	1,287	0.62
U	1	1	50	4.79	3.04	0.20	0.14	1,010	1,011	0.32
U	1	1	60	1.60	6.98	0.38	0.28	1,749	1,750	0.30
U	1	0	10	13.61	0.85	0.04	0.03	392	394	0.86
U	1	0	20	3.22	0.35	0.03	0.01	313	313	0.07
U	1	0	30	5.14	0.70	0.03	0.01	422	423	0.12
U	1	0	40	3.86	7.94	0.40	0.31	1,270	1,275	0.62
U	1	0	50	4.82	3.09	0.20	0.14	1,000	1,001	0.31
U	1	0	60	1.60	7.07	0.38	0.28	1,733	1,735	0.30
U	2	1	10	13.49	0.82	0.04	0.03	392	394	0.87
U	2	1	20	2.79	0.27	0.03	0.01	316	316	0.06
U	2	1	30	4.37	0.57	0.03	0.01	426	427	0.09
U	2	1	40	3.84	7.84	0.40	0.31	1,282	1,287	0.62
U	2	1	50	4.79	3.04	0.20	0.14	1,010	1,011	0.32
U	2	1	60	1.60	6.98	0.38	0.28	1,749	1,750	0.30
U	2	0	10	13.61	0.85	0.04	0.03	392	394	0.86
U	2	0	20	3.22	0.35	0.03	0.01	313	313	0.07



2016 EFs continued...

Rural?	FC	NAA?	HPMS ID	CO (g/mile)	NO <sub>x</sub> (g/mile)	PM <sub>10</sub> (g/mile)	PM <sub>2.5</sub> (g/mile)	CO <sub>2</sub> (g/mile)	CO <sub>2eq</sub> (g/mile)	VOC (g/mile)
U	2	0	30	5.14	0.70	0.03	0.01	422	423	0.12
U	2	0	40	3.86	7.94	0.40	0.31	1,270	1,275	0.62
U	2	0	50	4.82	3.09	0.20	0.14	1,000	1,001	0.31
U	2	0	60	1.60	7.07	0.38	0.28	1,733	1,735	0.30
U	3	1	10	13.50	0.69	0.05	0.03	381	383	1.44
U	3	1	20	2.39	0.25	0.05	0.01	382	383	0.09
U	3	1	30	3.60	0.50	0.06	0.02	501	502	0.12
U	3	1	40	3.71	7.56	0.62	0.42	1,193	1,202	0.89
U	3	1	50	5.87	3.78	0.38	0.20	1,247	1,251	0.58
U	3	1	60	2.27	8.49	0.76	0.45	2,081	2,083	0.48
U	3	0	10	13.62	0.71	0.05	0.03	381	383	1.44
U	3	0	20	2.80	0.32	0.05	0.01	378	379	0.11
U	3	0	30	4.28	0.61	0.06	0.02	495	497	0.17
U	3	0	40	3.72	7.66	0.62	0.42	1,179	1,188	0.89
U	3	0	50	5.91	3.83	0.38	0.20	1,232	1,235	0.58
U	3	0	60	2.27	8.61	0.76	0.45	2,059	2,061	0.48
U	4	1	10	13.50	0.69	0.05	0.03	381	383	1.44
U	4	1	20	2.39	0.25	0.05	0.01	382	383	0.09
U	4	1	30	3.60	0.50	0.06	0.02	501	502	0.12
U	4	1	40	3.71	7.56	0.62	0.42	1,193	1,202	0.89
U	4	1	50	5.87	3.78	0.38	0.20	1,247	1,251	0.58
U	4	1	60	2.27	8.49	0.76	0.45	2,081	2,083	0.48
U	4	0	10	13.62	0.71	0.05	0.03	381	383	1.44
U	4	0	20	2.80	0.32	0.05	0.01	378	379	0.11
U	4	0	30	4.28	0.61	0.06	0.02	495	497	0.17
U	4	0	40	3.72	7.66	0.62	0.42	1,179	1,188	0.89
U	4	0	50	5.91	3.83	0.38	0.20	1,232	1,235	0.58
U	4	0	60	2.27	8.61	0.76	0.45	2,059	2,061	0.48
U	5	1	10	13.50	0.69	0.05	0.03	381	383	1.44
U	5	1	20	2.39	0.25	0.05	0.01	382	383	0.09
U	5	1	30	3.60	0.50	0.06	0.02	501	502	0.12
U	5	1	40	3.71	7.56	0.62	0.42	1,193	1,202	0.89
U	5	1	50	5.87	3.78	0.38	0.20	1,247	1,251	0.58
U	5	1	60	2.27	8.49	0.76	0.45	2,081	2,083	0.48
U	5	0	10	13.62	0.71	0.05	0.03	381	383	1.44
U	5	0	20	2.80	0.32	0.05	0.01	378	379	0.11
U	5	0	30	4.28	0.61	0.06	0.02	495	497	0.17
U	5	0	40	3.72	7.66	0.62	0.42	1,179	1,188	0.89
U	5	0	50	5.91	3.83	0.38	0.20	1,232	1,235	0.58
U	5	0	60	2.27	8.61	0.76	0.45	2,059	2,061	0.48

2016 EFs continued...

Rural?	FC	NAA?	HPMS ID	CO (g/mile)	NO <sub>x</sub> (g/mile)	PM <sub>10</sub> (g/mile)	PM <sub>2.5</sub> (g/mile)	CO <sub>2</sub> (g/mile)	CO <sub>2eq</sub> (g/mile)	VOC (g/mile)
U	6	1	10	13.50	0.69	0.05	0.03	381	383	1.44
U	6	1	20	2.39	0.25	0.05	0.01	382	383	0.09
U	6	1	30	3.60	0.50	0.06	0.02	501	502	0.12
U	6	1	40	3.71	7.56	0.62	0.42	1,193	1,202	0.89
U	6	1	50	5.87	3.78	0.38	0.20	1,247	1,251	0.58
U	6	1	60	2.27	8.49	0.76	0.45	2,081	2,083	0.48
U	6	0	10	13.62	0.71	0.05	0.03	381	383	1.44
U	6	0	20	2.80	0.32	0.05	0.01	378	379	0.11
U	6	0	30	4.28	0.61	0.06	0.02	495	497	0.17
U	6	0	40	3.72	7.66	0.62	0.42	1,179	1,188	0.89
U	6	0	50	5.91	3.83	0.38	0.20	1,232	1,235	0.58
U	6	0	60	2.27	8.61	0.76	0.45	2,059	2,061	0.48
U	7	1	10	13.50	0.69	0.05	0.03	381	383	1.44
U	7	1	20	2.39	0.25	0.05	0.01	382	383	0.09
U	7	1	30	3.60	0.50	0.06	0.02	501	502	0.12
U	7	1	40	3.71	7.56	0.62	0.42	1,193	1,202	0.89
U	7	1	50	5.87	3.78	0.38	0.20	1,247	1,251	0.58
U	7	1	60	2.27	8.49	0.76	0.45	2,081	2,083	0.48
U	7	0	10	13.62	0.71	0.05	0.03	381	383	1.44
U	7	0	20	2.80	0.32	0.05	0.01	378	379	0.11
U	7	0	30	4.28	0.61	0.06	0.02	495	497	0.17
U	7	0	40	3.72	7.66	0.62	0.42	1,179	1,188	0.89
U	7	0	50	5.91	3.83	0.38	0.20	1,232	1,235	0.58
U	7	0	60	2.27	8.61	0.76	0.45	2,059	2,061	0.48

2017

Rural?	FC	NAA?	HPMS ID	CO (g/mile)	NO <sub>x</sub> (g/mile)	PM <sub>10</sub> (g/mile)	PM <sub>2.5</sub> (g/mile)	CO <sub>2</sub> (g/mile)	CO <sub>2eq</sub> (g/mile)	VOC (g/mile)
R	1	1	10	13.26	0.82	0.04	0.03	399	400	0.77
R	1	1	20	2.82	0.19	0.02	0.01	307	307	0.04
R	1	1	30	4.48	0.40	0.02	0.01	416	417	0.07
R	1	1	40	3.26	7.43	0.32	0.26	1,303	1,308	0.49
R	1	1	50	3.48	2.39	0.15	0.10	981	982	0.22
R	1	1	60	1.32	6.23	0.29	0.22	1,732	1,734	0.23
R	1	0	10	13.37	0.85	0.04	0.03	399	400	0.77
R	1	0	20	3.24	0.25	0.02	0.01	304	305	0.05
R	1	0	30	5.18	0.49	0.02	0.01	413	414	0.09
R	1	0	40	3.27	7.53	0.32	0.26	1,292	1,296	0.49
R	1	0	50	3.50	2.43	0.15	0.10	972	973	0.22

2017 EFs continued...

Rural?	FC	NAA?	HPMS ID	CO (g/mile)	NO <sub>x</sub> (g/mile)	PM <sub>10</sub> (g/mile)	PM <sub>2.5</sub> (g/mile)	CO <sub>2</sub> (g/mile)	CO <sub>2eq</sub> (g/mile)	VOC (g/mile)
R	1	0	60	1.32	6.32	0.29	0.22	1,718	1,719	0.23
R	2	1	10	13.26	0.82	0.04	0.03	399	400	0.77
R	2	1	20	2.82	0.19	0.02	0.01	307	307	0.04
R	2	1	30	4.48	0.40	0.02	0.01	416	417	0.07
R	2	1	40	3.26	7.43	0.32	0.26	1,303	1,308	0.49
R	2	1	50	3.48	2.39	0.15	0.10	981	982	0.22
R	2	1	60	1.32	6.23	0.29	0.22	1,732	1,734	0.23
R	2	0	10	13.37	0.85	0.04	0.03	399	400	0.77
R	2	0	20	3.24	0.25	0.02	0.01	304	305	0.05
R	2	0	30	5.18	0.49	0.02	0.01	413	414	0.09
R	2	0	40	3.27	7.53	0.32	0.26	1,292	1,296	0.49
R	2	0	50	3.50	2.43	0.15	0.10	972	973	0.22
R	2	0	60	1.32	6.32	0.29	0.22	1,718	1,719	0.23
R	3	1	10	13.38	0.81	0.04	0.02	382	384	0.96
R	3	1	20	1.89	0.16	0.03	0.01	308	309	0.05
R	3	1	30	3.00	0.34	0.03	0.01	413	413	0.07
R	3	1	40	2.87	6.14	0.38	0.28	1,079	1,084	0.58
R	3	1	50	3.38	2.26	0.19	0.11	914	916	0.28
R	3	1	60	1.51	6.39	0.38	0.26	1,749	1,750	0.28
R	3	0	10	13.49	0.83	0.04	0.02	382	384	0.95
R	3	0	20	2.19	0.21	0.03	0.01	305	306	0.06
R	3	0	30	3.49	0.42	0.03	0.01	409	410	0.09
R	3	0	40	2.88	6.23	0.38	0.28	1,068	1,073	0.58
R	3	0	50	3.40	2.29	0.19	0.11	904	906	0.28
R	3	0	60	1.51	6.48	0.38	0.26	1,732	1,734	0.28
R	4	1	10	13.38	0.81	0.04	0.02	382	384	0.96
R	4	1	20	1.89	0.16	0.03	0.01	308	309	0.05
R	4	1	30	3.00	0.34	0.03	0.01	413	413	0.07
R	4	1	40	2.87	6.14	0.38	0.28	1,079	1,084	0.58
R	4	1	50	3.38	2.26	0.19	0.11	914	916	0.28
R	4	1	60	1.51	6.39	0.38	0.26	1,749	1,750	0.28
R	4	0	10	13.49	0.83	0.04	0.02	382	384	0.95
R	4	0	20	2.19	0.21	0.03	0.01	305	306	0.06
R	4	0	30	3.49	0.42	0.03	0.01	409	410	0.09
R	4	0	40	2.88	6.23	0.38	0.28	1,068	1,073	0.58
R	4	0	50	3.40	2.29	0.19	0.11	904	906	0.28
R	4	0	60	1.51	6.48	0.38	0.26	1,732	1,734	0.28
R	5	1	10	13.38	0.81	0.04	0.02	382	384	0.96
R	5	1	20	1.89	0.16	0.03	0.01	308	309	0.05
R	5	1	30	3.00	0.34	0.03	0.01	413	413	0.07

2017 EFs continued...

Rural?	FC	NAA?	HPMS ID	CO (g/mile)	NO <sub>x</sub> (g/mile)	PM <sub>10</sub> (g/mile)	PM <sub>2.5</sub> (g/mile)	CO <sub>2</sub> (g/mile)	CO <sub>2eq</sub> (g/mile)	VOC (g/mile)
R	5	1	40	2.87	6.14	0.38	0.28	1,079	1,084	0.58
R	5	1	50	3.38	2.26	0.19	0.11	914	916	0.28
R	5	1	60	1.51	6.39	0.38	0.26	1,749	1,750	0.28
R	5	0	10	13.49	0.83	0.04	0.02	382	384	0.95
R	5	0	20	2.19	0.21	0.03	0.01	305	306	0.06
R	5	0	30	3.49	0.42	0.03	0.01	409	410	0.09
R	5	0	40	2.88	6.23	0.38	0.28	1,068	1,073	0.58
R	5	0	50	3.40	2.29	0.19	0.11	904	906	0.28
R	5	0	60	1.51	6.48	0.38	0.26	1,732	1,734	0.28
R	6	1	10	13.38	0.81	0.04	0.02	382	384	0.96
R	6	1	20	1.89	0.16	0.03	0.01	308	309	0.05
R	6	1	30	3.00	0.34	0.03	0.01	413	413	0.07
R	6	1	40	2.87	6.14	0.38	0.28	1,079	1,084	0.58
R	6	1	50	3.38	2.26	0.19	0.11	914	916	0.28
R	6	1	60	1.51	6.39	0.38	0.26	1,749	1,750	0.28
R	6	0	10	13.49	0.83	0.04	0.02	382	384	0.95
R	6	0	20	2.19	0.21	0.03	0.01	305	306	0.06
R	6	0	30	3.49	0.42	0.03	0.01	409	410	0.09
R	6	0	40	2.88	6.23	0.38	0.28	1,068	1,073	0.58
R	6	0	50	3.40	2.29	0.19	0.11	904	906	0.28
R	6	0	60	1.51	6.48	0.38	0.26	1,732	1,734	0.28
R	7	1	10	13.38	0.81	0.04	0.02	382	384	0.96
R	7	1	20	1.89	0.16	0.03	0.01	308	309	0.05
R	7	1	30	3.00	0.34	0.03	0.01	413	413	0.07
R	7	1	40	2.87	6.14	0.38	0.28	1,079	1,084	0.58
R	7	1	50	3.38	2.26	0.19	0.11	914	916	0.28
R	7	1	60	1.51	6.39	0.38	0.26	1,749	1,750	0.28
R	7	0	10	13.49	0.83	0.04	0.02	382	384	0.95
R	7	0	20	2.19	0.21	0.03	0.01	305	306	0.06
R	7	0	30	3.49	0.42	0.03	0.01	409	410	0.09
R	7	0	40	2.88	6.23	0.38	0.28	1,068	1,073	0.58
R	7	0	50	3.40	2.29	0.19	0.11	904	906	0.28
R	7	0	60	1.51	6.48	0.38	0.26	1,732	1,734	0.28
U	1	1	10	13.32	0.82	0.04	0.03	393	394	0.86
U	1	1	20	2.63	0.18	0.02	0.01	309	309	0.04
U	1	1	30	4.09	0.37	0.03	0.01	414	415	0.07
U	1	1	40	3.33	7.18	0.37	0.28	1,275	1,281	0.56
U	1	1	50	3.76	2.41	0.18	0.12	1,001	1,003	0.25
U	1	1	60	1.43	6.26	0.35	0.25	1,732	1,733	0.27
U	1	0	10	13.44	0.84	0.04	0.03	393	394	0.85

2017 EFs continued...

Rural?	FC	NAA?	HPMS ID	CO (g/mile)	NO <sub>x</sub> (g/mile)	PM <sub>10</sub> (g/mile)	PM <sub>2.5</sub> (g/mile)	CO <sub>2</sub> (g/mile)	CO <sub>2eq</sub> (g/mile)	VOC (g/mile)
U	1	0	20	3.01	0.23	0.02	0.01	306	306	0.06
U	1	0	30	4.73	0.46	0.03	0.01	410	411	0.09
U	1	0	40	3.34	7.27	0.37	0.28	1,264	1,269	0.56
U	1	0	50	3.78	2.45	0.18	0.12	991	993	0.25
U	1	0	60	1.43	6.35	0.35	0.25	1,717	1,718	0.27
U	2	1	10	13.32	0.82	0.04	0.03	393	394	0.86
U	2	1	20	2.63	0.18	0.02	0.01	309	309	0.04
U	2	1	30	4.09	0.37	0.03	0.01	414	415	0.07
U	2	1	40	3.33	7.18	0.37	0.28	1,275	1,281	0.56
U	2	1	50	3.76	2.41	0.18	0.12	1,001	1,003	0.25
U	2	1	60	1.43	6.26	0.35	0.25	1,732	1,733	0.27
U	2	0	10	13.44	0.84	0.04	0.03	393	394	0.85
U	2	0	20	3.01	0.23	0.02	0.01	306	306	0.06
U	2	0	30	4.73	0.46	0.03	0.01	410	411	0.09
U	2	0	40	3.34	7.27	0.37	0.28	1,264	1,269	0.56
U	2	0	50	3.78	2.45	0.18	0.12	991	993	0.25
U	2	0	60	1.43	6.35	0.35	0.25	1,717	1,718	0.27
U	3	1	10	13.33	0.69	0.05	0.03	381	383	1.43
U	3	1	20	2.21	0.17	0.05	0.01	374	374	0.07
U	3	1	30	3.30	0.33	0.06	0.01	487	488	0.09
U	3	1	40	3.28	6.94	0.58	0.38	1,188	1,196	0.81
U	3	1	50	4.63	3.05	0.35	0.17	1,237	1,240	0.47
U	3	1	60	2.04	7.64	0.71	0.40	2,063	2,066	0.43
U	3	0	10	13.45	0.71	0.05	0.03	381	383	1.43
U	3	0	20	2.57	0.22	0.05	0.01	369	370	0.08
U	3	0	30	3.86	0.41	0.06	0.01	481	483	0.13
U	3	0	40	3.29	7.03	0.58	0.38	1,174	1,182	0.81
U	3	0	50	4.66	3.10	0.35	0.17	1,222	1,225	0.47
U	3	0	60	2.04	7.74	0.71	0.40	2,042	2,044	0.43
U	4	1	10	13.33	0.69	0.05	0.03	381	383	1.43
U	4	1	20	2.21	0.17	0.05	0.01	374	374	0.07
U	4	1	30	3.30	0.33	0.06	0.01	487	488	0.09
U	4	1	40	3.28	6.94	0.58	0.38	1,188	1,196	0.81
U	4	1	50	4.63	3.05	0.35	0.17	1,237	1,240	0.47
U	4	1	60	2.04	7.64	0.71	0.40	2,063	2,066	0.43
U	4	0	10	13.45	0.71	0.05	0.03	381	383	1.43
U	4	0	20	2.57	0.22	0.05	0.01	369	370	0.08
U	4	0	30	3.86	0.41	0.06	0.01	481	483	0.13
U	4	0	40	3.29	7.03	0.58	0.38	1,174	1,182	0.81
U	4	0	50	4.66	3.10	0.35	0.17	1,222	1,225	0.47
U	4	0	60	2.04	7.74	0.71	0.40	2,042	2,044	0.43

2017 EFs continued...

Rural?	FC	NAA?	HPMS ID	CO (g/mile)	NO <sub>x</sub> (g/mile)	PM <sub>10</sub> (g/mile)	PM <sub>2.5</sub> (g/mile)	CO <sub>2</sub> (g/mile)	CO <sub>2eq</sub> (g/mile)	VOC (g/mile)
U	5	1	10	13.33	0.69	0.05	0.03	381	383	1.43
U	5	1	20	2.21	0.17	0.05	0.01	374	374	0.07
U	5	1	30	3.30	0.33	0.06	0.01	487	488	0.09
U	5	1	40	3.28	6.94	0.58	0.38	1,188	1,196	0.81
U	5	1	50	4.63	3.05	0.35	0.17	1,237	1,240	0.47
U	5	1	60	2.04	7.64	0.71	0.40	2,063	2,066	0.43
U	5	0	10	13.45	0.71	0.05	0.03	381	383	1.43
U	5	0	20	2.57	0.22	0.05	0.01	369	370	0.08
U	5	0	30	3.86	0.41	0.06	0.01	481	483	0.13
U	5	0	40	3.29	7.03	0.58	0.38	1,174	1,182	0.81
U	5	0	50	4.66	3.10	0.35	0.17	1,222	1,225	0.47
U	5	0	60	2.04	7.74	0.71	0.40	2,042	2,044	0.43
U	6	1	10	13.33	0.69	0.05	0.03	381	383	1.43
U	6	1	20	2.21	0.17	0.05	0.01	374	374	0.07
U	6	1	30	3.30	0.33	0.06	0.01	487	488	0.09
U	6	1	40	3.28	6.94	0.58	0.38	1,188	1,196	0.81
U	6	1	50	4.63	3.05	0.35	0.17	1,237	1,240	0.47
U	6	1	60	2.04	7.64	0.71	0.40	2,063	2,066	0.43
U	6	0	10	13.45	0.71	0.05	0.03	381	383	1.43
U	6	0	20	2.57	0.22	0.05	0.01	369	370	0.08
U	6	0	30	3.86	0.41	0.06	0.01	481	483	0.13
U	6	0	40	3.29	7.03	0.58	0.38	1,174	1,182	0.81
U	6	0	50	4.66	3.10	0.35	0.17	1,222	1,225	0.47
U	6	0	60	2.04	7.74	0.71	0.40	2,042	2,044	0.43
U	7	1	10	13.33	0.69	0.05	0.03	381	383	1.43
U	7	1	20	2.21	0.17	0.05	0.01	374	374	0.07
U	7	1	30	3.30	0.33	0.06	0.01	487	488	0.09
U	7	1	40	3.28	6.94	0.58	0.38	1,188	1,196	0.81
U	7	1	50	4.63	3.05	0.35	0.17	1,237	1,240	0.47
U	7	1	60	2.04	7.64	0.71	0.40	2,063	2,066	0.43
U	7	0	10	13.45	0.71	0.05	0.03	381	383	1.43
U	7	0	20	2.57	0.22	0.05	0.01	369	370	0.08
U	7	0	30	3.86	0.41	0.06	0.01	481	483	0.13
U	7	0	40	3.29	7.03	0.58	0.38	1,174	1,182	0.81
U	7	0	50	4.66	3.10	0.35	0.17	1,222	1,225	0.47
U	7	0	60	2.04	7.74	0.71	0.40	2,042	2,044	0.43

### Attachment 3. Emissions Calculation Process

