

Appendix A:

Prior Fiscal Year Air Quality Accomplishments

FY 2018 Accomplishments

Table A lists the Action Items from Fiscal Year (FY) 2018 CDOT *Air Quality Action Plan* and the status/accomplishments for each Action Item.

Table A: Prior Fiscal Year Air Quality Accomplishments (Revision #2; July 2018)

Action Items from FY 2018	Pollutant(s) Affected by Action ^{1, 2}	Status/Accomplishments FY 2018
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.	Criteria pollutants, MSAT, GHG	Action item table is updated on an ongoing basis. Accomplishments table was updated in the Fall of FY 2018.
Transportation Air Quality Research: Participate in multi-state pooled fund ("Near-Road Air Quality Transportation Pooled Fund"). Ongoing.	Criteria pollutants, MSAT, GHG	National near-road data assessment report of 2016 near-road data finalized in FY 2018. Project continues through 6/30/19.
Vegetation: Phase III of Mobile Source Air Toxic (MSAT) vegetation research. Phase III will be completed during FY 2018.	Ozone, NO ₂ , PM ₁₀ , PM _{2.5} , SO ₂ , CO, diesel particulate matter	Draft report (<i>Recommendation for Study Design</i>) submitted in June 2018. Report will be finalized in FY 2019.
Smart 25 Demonstration Project: Conduct pilot project to increase efficiency on I-25. The demonstration project will run for a 6 month trial period in late spring/summer/fall 2018. The system will then be shut down and data analyzed. If the concept is deemed to be successful, before permanent implementation of the project begins, a hot spot analysis will be conducted. This would occur sometime in early 2019 once the demonstration data is analyzed.	Criteria pollutants, MSAT, GHG	Smart 25 Project has been delayed getting to construction. Project delayed by a Level 3 conduit dispute in CDOT ROW. Then, project was advertised twice and both times did not meet necessary requirements of 3 bidders and within 10 percent of engineer's estimate. For this reason, all work is delayed. It is anticipated construction will take place from Summer 2018 to Summer/Fall 2019. Demonstration will then follow from Summer 2019 into Winter 2020. Hot spot analysis would follow in spring 2020. Will continue into FY 2019 and FY 2020.
Simple Steps/Better Air: Continue public outreach and education program to raise	Criteria pollutants, MSAT, GHG	Ozone Action Alerts issued to Denver and the Front Range public as applicable during ozone season (June

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<p>awareness of ground ozone pollution and create behavior change; focus on behavior change (program previously called Ozone Aware).</p>		<p>through August). Public outreach conducted via radio, outdoor and digital advertising, social media outreach, community event sponsorships, stakeholder partnerships and outreach to media and local governments. Will continue into FY 2019.</p>
<p>Alternative Fuel Corridor Designation: Collaborate with Colorado Energy Office (CEO) and transportation and energy agencies of Utah and Nevada to develop a Tri-State Electric Vehicle (EV) Corridor framework and build-out plan connecting Denver, Salt Lake City, and Las Vegas along FHWA-designated Alternative Fuel Corridors by summer 2018.</p>	<p>Criteria pollutants, MSAT, GHG</p>	<p>Expanded original 3-state partnership to form 8-state <i>Regional Electric Vehicle Plan for the West</i> (REV West). Collaborated with CEO and equivalent agencies in AZ, ID, MT, NM, NV, UT, and WY to identify key interstate corridors and establish voluntary minimum standards for EV charging station development across Intermountain West region. Will continue into FY 2019.</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 EVs and charging infrastructure statewide. Four-year program will end in 2018.</p>	<p>Criteria pollutants, MSAT, GHG</p>	<p>Extended end date of existing AFT I contract to 6/30/19 and completed a new AFT II contract to continue program with additional CMAQ funds and an end date of 4/11/22. Both programs currently impacted by lack of Buy America waivers being approved by the FHWA. Will continue into FY 2019.</p>
<p>CMAQ Alternative Fuels Colorado (AFC) Program: Collaborate with CEO and RAQC on program to support development of a sustainable statewide alternative fuels market by incentivizing purchase of alt fuel vehicles and fueling station equipment. Four-year program will end in 2018.</p>	<p>Criteria pollutants, MSAT, GHG</p>	<p>Continued program implementation and extended RAQC contract end date to 6/30/20 to allow for spend-down of original \$15 million allocation. Vehicle purchase program currently impacted by the lack of Buy America waivers being approved by FHWA. Amended CEO contract to allow for updated focus on EV fast-charging corridor investments and released RFP in April 2018. Will continue into FY 2019.</p>

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<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 and awarded grants for 2018 round of applications. Federal fiscal year (FFY) 2016 (10/1/16 to 9/30/17) is the last year for which results are easily available. Colorado had \$17.164 million obligated for CMAQ projects in FFY 2016. Will continue into FY 2019.</p>
<p>GHG Considerations in Transportation Education: Include in Transportation Planning Toolkit education series for rural Transportation Planning Regions (TPRs) and Metropolitan Planning Organization (MPOs) impact of GHG build-up on weather patterns and consequently on transportation assets. These topics will be presented through 2018.</p>	<p>Criteria pollutants, MSAT, GHG</p>	<p>Fact sheet on air quality that includes GHG information was developed and was posted in June 2018.</p>
<p>Incorporate GHG Emission Reductions in Project Selection Criteria: Some environmental factors, such as GHG reduction, may be incorporated into project selection criteria for certain categories of highway projects where funding sources allow. Where possible, apply for and distribute federal funding in a way that promotes GHG reduction. Examples are funding from Nationally Significant Freight and Highway Program discretionary program and CMAQ for projects that reduce highway congestion reduction and bottlenecks and use alternate fuels for transit buses.</p>	<p>Criteria pollutants, MSAT, GHG</p>	<p>Systems Planning over FY 2018 attempted to use broad categories of eligible projects provided in the National Highway Freight Program (NHFP) to target federal funds more toward freight-specific projects. For example, congestion mitigation is one of several categories allowed in selecting projects for NHFP funding. Freight projects aimed at reducing congestion could improve air quality, such as building shoulders with minimum 8-foot widths so that freight trucks needing to get off the road can do so safely and not cause traffic to pile up behind. Also, CDOT in conjunction with MPOs and TPRs in air quality non-attainment and maintenance areas must demonstrate that CMAQ funds are</p>

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		being used to achieve set air quality targets. Will continue into FY 2019.
<p>I-70 Risk and Resiliency Assessment Pilot Project: Quantify and improve system resilience in advance of future threats (such as floods and rock falls) to reduce transportation system losses. Project should reduce highway closures, thereby reducing VMT because travelers won't have to take longer alternate routes. Pilot project is expected to be completed by calendar year 2017.</p>	<p>Criteria pollutants, MSAT, GHG</p>	<p>I-70 Pilot was completed and final report released 11/30/17. Pilot developed a methodology to quantify physical threats to our transportation system at the asset level and applied it to the I-70 corridor. Quantified risks can be included in benefit-cost analysis to select site-specific mitigation measures. This knowledge 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.</p>
<p>Use Federal Funding to Reduce GHG Emissions: Where possible, apply for and distribute federal funds in a way that promotes GHG emission reduction. Examples are Nationally Significant Freight and Highway Program discretionary funding for projects that reduce highway congestion and bottlenecks. Ongoing.</p>	<p>Criteria pollutants, MSAT, GHG</p>	<p>NHFP considers congestion mitigation an eligible category for use of federal funds as well as general environmental impacts. However, GHG reduction is not a specific project selection criteria for NHFP due to difficulty in quantifying benefits.</p> <p>For first two years of NHFP funding (FFY 2016 and FFY 2017), Transportation Commission (TC) approved 14 projects (\$35.75 million in funding), including widened paved shoulders, highway pullouts, interchange reconstruction, and safety improvements and auxiliary lanes on mountain passes.</p> <p>In summer 2018, CDOT began using Multi Objective Decision Analysis (MODA) structured decision tool in selecting projects for NHFP funding. Applicants submitted approximately 16 freight projects for FY 2018 NHFP funding. TC is expected to approve selected projects in July 2018.</p> <p>Will continue into FY 2019.</p>

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<p>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.</p>	<p>Criteria pollutants, MSAT, GHG</p>	<p>CDOT continues to implement ongoing activities such as specialized education to engineers and planners regarding facility design; attending some scoping meetings for construction projects; providing technical support to CDOT and local agencies regarding bike and pedestrian accommodation; and providing outreach information and materials to local agencies and the general public. Will continue into FY 2019.</p>
<p>High Priority Bike Corridors: Determine which corridors should be designated as high priority bike corridors using criteria agreed upon by a multidisciplinary CDOT group. Designations should help target improvements to make biking along these routes safer and more enjoyable. If these corridors facilitate a mode shift, then more people using bicycles for transportation will result in fewer air pollutants. The bike corridors are expected to be identified by the end of 2017.</p>	<p>Criteria pollutants, MSAT, GHG</p>	<p>Bike and Pedestrian Section is in first phase of identifying High Priority Bike Corridors. Staff will prioritize bike routes based on short-term maintenance and operations on existing bike facilities (e.g., plowing, sweeping, limited pavement markings, and shoulder widening) and by level of demand and use. Lead consultant is researching 2040 rural and urban Regional Transportation Plans (RTPs) to determine which regional priority corridors have potential to become high priority bike corridors because plans identified them as having biking or multimodal importance. A CDOT multi-disciplinary team selected these criteria for High Priority Bike Corridors: safety, type and level of use, connectivity, and if they are regional priority corridors. It has not been determined if criteria will be weighted. Will continue into FY 2019.</p>
<p>Division of Transit and Rail (DTR): Transit Provider Grant to finance local transit agency vehicles, infrastructure, and operations, and development of transit/rail plans/studies with key plans</p>	<p>Criteria pollutants, MSAT, GHG</p>	<p>DTR distributed a total of \$30.6 million in grants to local transit agencies (Administration/Operating - 38.8 percent, Capital - 54.9 percent, Operating - 1.7 percent, Mobility Management - 4.3 percent, and</p>

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<p>being completed approximately every four years for statewide transit, rural regional transit, and state freight and passenger rail. Grants for vehicles operated by local transit agencies are expected to increase ridership, which may reduce vehicle miles traveled (VMT). Ongoing. (Note that information for Bustang has been moved to its own row)</p>		<p>Planning/Other - 0.3 percent). Administration/operating grants pay 80 percent of administrative costs and 50 percent of operating costs. Operating grants pay only costs associated with directly providing the service. Mobility management projects include travel training and call centers. Will continue into FY 2019.</p>
<p>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.</p>	<p>Criteria pollutants, MSAT, GHG</p>	<p>Bustang is on pace to complete FY 2018 (July 2017 to June 2018) another 25 percent ridership increase over the previous year. Will continue into FY 2019.</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>Closed on public-private partnership financing and agreement for the Central 70 project. This action item will continue into future years for other projects.</p>
<p>RoadX: Continue to partner with private industry to pilot several transportation infrastructure technology projects to test technologies intended to enhance safety and mobility within the transportation system that cost less and produce identifiable results. Ongoing.</p>	<p>Criteria pollutants, MSAT, GHG</p>	<p>Panasonic project is a connected vehicle project. Phase 0 conducted from February 2017 to March 2018. Was primarily planning phase to determine when and how vehicle-to-everything (V2X) technology will be deployed. Test environment deployed and fully operational at 61st/Pena campus at four public intersections; proves technical functionality and will serve as deployment laboratory prior to I-70 corridor. Phase 1 started in April 2018 and will continue until March 2019. This project was transferred from</p>

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		RoadX to ITS. RoadX transferred CDOT Connected Autonomous Vehicles (CAV) Modeling Project to TSM&O. See Appendix B for more information on both projects.
<p>Transportation Systems Management & Operations (TSM&O): Continue to use Intelligent Transportation System (ITS) and other technologies, courtesy patrols, ramp metering, and transportation demand management (TDM) to improve the flow of traffic. Also continue to support RoadX. Ongoing.</p>	<p>Criteria pollutant, MSAT, GHG</p>	<p>In April 2018, CDOT installed a Traffic Incident Management (TIM) Training Track at the Douglas County Emergency Vehicle Operations Center. The nearly three-acre property will allow safe training of first responders using real vehicles and re-creating mock scenarios. With more training of first responders, incident clearance times for crashes and chances of secondary crashes will decrease. TIM Training Track indirectly should result in less congestion.</p>
<p>TSM&O Toolkit: To assist engineers with undergoing safety, operations, and technology assessments, a TSM&O Technology Toolkit (T3) is being prepared. T3 will be a primer on new and emerging technologies for improved safety, mobility, and operations of state's transportation infrastructure. Manual will describe technologies and ITS devices that are in use or undergoing testing, as well as those that are up and coming. T3 will be updated as technologies and approaches change.</p>	<p>Criteria pollutants, MSAT, GHG</p>	<p>TSM&O Toolkit became part of <i>Smart Mobility Plan</i>. See two rows below for an update.</p> <p>Will continue into FY 2019. See Appendix B for more information.</p>
<p>TSM&O TDM: Many successful methods used around Colorado for managing transportation demand are discussed in report TSM&O expects to publish in 2017, <i>Colorado Transportation Options: Statewide TDM Plan</i>.</p>	<p>Criteria pollutants, MSAT, GHG</p>	<p>CDOT completed Phase 1 of <i>TDM Plan</i> in FY 2018. Plan inventoried TDM strategies within state, costs to implement TDM strategies, and developed an estimate of number of people participating in TDM strategies. Using this information,</p>

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<p>Those methods include regional, local, and intercity transit; carpools and vanpools; walking and bicycling; variable work hours and telecommuting; and park and ride lots from which drivers can board buses, trains, or vans.</p>		<p>TDM Plan calculated return on investment. Phase 2 of TDM Plan began in FY 2018 and will continue into FY 2019. See Appendix B for more information.</p>
<p>TSM&O Initiatives on Congestion Management and Ramp Metering: TSM&O has several initiatives aimed at reducing the two types of highway congestion: recurring and non-recurring. Ongoing.</p>	<p>Criteria pollutants, MSAT, GHG</p>	<p><i>Smart Mobility Plan</i>: TSM&O began work on <i>Smart Mobility Plan</i> in 2018 to map out needs for fiber optic lines and for ITS devices for improved communication and connection with CDOT Operations Centers and the Regions. Will continue into FY 2019; See Appendix B.</p>
<p>2045 <i>Statewide Transportation Plan</i> (SWP): New elements of this plan are anticipated to include Scenario Planning, Statewide Travel Model analysis, health impact elements, and integration of Multimodal Freight Plan and other CDOT plans in the SWP. Strategies will be included to address GHG emissions within CDOT and statewide and to mitigate effects of extreme weather (e.g., fires, avalanches, floods, landslides, and mud slides). A few rural RTPs may include discussions about impact of major weather events on regional transportation system and ways to prepare for those impacts. 2045 SWP and rural RTPs all will be completed by 2020.</p>	<p>Criteria pollutants, MSAT, GHG</p>	<p>Anticipated to begin in summer 2018 and finish in March 2020, SWP currently has a completed scope of work that incorporates scenario planning, Statewide Travel Model analysis, health impacts, and integration of the <i>Colorado Freight Plan</i> and other CDOT plans. In preparation for SWP development, staff accomplished this pre-work:</p> <ul style="list-style-type: none"> • Formation of three work groups on regional transportation plan development, connected and autonomous vehicle (CAV) scenario planning, and technology policy. Work groups made recommendations on what CDOT could do in all three areas. • Development of <i>Colorado State Freight and Passenger Rail Plan</i> in parallel with <i>Colorado Freight Plan</i> to coordinate improvements and policies across modes. • Close coordination with Information Management Branch (IMB) to ensure statewide travel model has capability of modeling connected and autonomous

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		<p>vehicle scenarios that will be included in SWP. IMB involved in development of CAV scenarios (low, medium, and high market penetration) to provide a common understanding of assumptions.</p> <p>These efforts could lead to a SWP that suggests approaches that will accommodate for CAVs and make recommendations to ensure CAVs reduce congestion. Will continue into FY 2019.</p>
<p>EV Fast Charging Stations: National Renewable Energy Laboratory (NREL) staff is working with CDOT and other project partners to analyze Front Range traffic counts and survey data. Results will be used to identify the most effective locations for new EV fast charging infrastructure to reduce drivers' range anxiety and support development of a sustainable statewide charging network. Ongoing.</p>	<p>Criteria pollutants, MSAT, GHG</p>	<p>Completed study in collaboration with NREL and RAQC, with outputs used to target EV fast-charging investments using VW Settlement and CMAQ funds.</p>

Notes for Tables A

1. Potential pollutants include:
 - 1.A. Transportation Criteria Pollutants: CO, PM₁₀, PM_{2.5}, NO_x 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 (CO₂, CH₄, and N₂O)
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 (formerly called Ozone Aware)

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 CO₂. Therefore, the strategy to add more fly ash to a concrete mixture reduces CO₂, but no other pollutants.

Appendix B:
Fiscal Year 2019 Action Items

FY 2019 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 2019 Action Items that will help achieve the goal by reducing emissions from the transportation sector. 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 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 #2; July 2018)

Action Item for FY 2018	Strategy Category					Pollutant(s) Affected by Action ^{1, 2}	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 performs within CDOT; has action item table that is updated annually. Ongoing.		X	X	X		Criteria pollutants, MSAT, GHG	Sarah Mitchell EPB Sustainability Coordinator Sarah.Mitchell@state.co.us (303) 757-9764
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	Kari Grant HPTE Specialist Kari.Grant@state.co.us 303-757-9380
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			X			Criteria pollutants, MSAT, GHG	Michael King DTD Transportation Planner Michael.King@state.co.us (303) 757-9997

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	System Efficiency	Reduce VMT	Alt. Fuel	Fuel Efficiency	Absorption/Barrier		
(EV) charging station development across the Intermountain West region. Ongoing.							
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 EVs and charging infrastructure statewide. Program, under AFT I & 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.			X			Criteria pollutants, MSAT, GHG	Michael King DTD Transportation Planner Michael.King@state.co.us (303) 757-9997
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.			X			Criteria pollutants, MSAT, GHG	Michael King DTD Transportation Planner Michael.King@state.co.us (303) 757-9997
CMAQ Local Agency Air Quality Projects: Collaborate with RAQC on awarding air quality		X	X		X	Criteria pollutants, MSAT, GHG	Michael King DTD Transportation Planner

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	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.							Michael.King@state.co.us (303) 757-9997
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 fleets across Colorado. Program anticipated to operate between 3 to 5 years or once state's \$68.7 million fund allocation is exhausted.			X			Criteria pollutants, MSAT, GHG	Michael King DTD Transportation Planner Michael.King@state.co.us (303) 757-9997
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.	X	X		X		Criteria pollutants, MSAT, GHG	Betsy Jacobsen DTD Manager, Bicycle / Pedestrian / Scenic Byways Program Betsy.Jacobsen@state.co.us 303-757-9982
RoadX: Continue to partner with private industry to pilot several transportation infrastructure technology projects to test technologies intended to enhance safety and mobility within	X		X	X		Criteria pollutants, MSAT, GHG	Peter Kozinski Director, Road X Peter.Kozinski@state.co.us 303-757-9066

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	System Efficiency	Reduce VMT	Alt. Fuel	Fuel Efficiency	Absorption/Barrier		
transportation system that cost less and produce identifiable results. Ongoing.							
Transportation Systems Management & Operations (TSM&O): CDOT Connected Autonomous Vehicles (CAV) Modeling Project - Traffic analysis and modeling effort to establish traffic model to determine how CAV will impact roads. Phase I starts in June 2018 and continue into January 2019.	X					Criteria pollutants, MSAT, GHG	Alexandra Axley CDOT CAV Modeling Project Manager Allie.Axley@state.co.us 303-757-9463
TSM&O <i>Smart Mobility Plan</i> : TSM&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.	X					Criteria pollutants, MSATs, GHG	Bob Fifer Business Development and Planning Manager/ITS Branch Bob.Fifer@state.co.us 303-512-5808
TSM&O Expanded Operations: TSM&O will open a new Traffic Operations Center in Pueblo to service corridors within CDOT Region 2. TSM&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&O also will	X	X		X		Criteria pollutants, MSATs, GHG	Ryan Tyler Mobility Operations Command Manager Ryan.Tyler@state.co.us 303-512-5814

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	System Efficiency	Reduce VMT	Alt. Fuel	Fuel Efficiency	Absorption/Barrier		
plan another Traffic Operations Center, this one in Region 4 in northeastern Colorado. All of these efforts should smooth traffic flow.							
TSM&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 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.	X			X		Criteria pollutants, MSATs, GHG	Kevin Devine Traffic Incident Program Manager Kevin.Devine@state.co.us 303-512-5875
TSM&O Traffic Incident Management (TIM) Training Track: To support operations of TIM Training Track in Douglas County (see Appendix A), TSM&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.	X			X		Criteria pollutants, MSATs, GHG	Kevin Devine Traffic Incident Program Manager Kevin.Devine@state.co.us 303-512-5875
TSM&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&O assessments for safety, operations, and	X			X		Criteria pollutants, MSATs, GHG	Bob Fifer Business Development and Planning Manager/ITS Branch Bob.Fifer@state.co.us 303-512-5808

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	System Efficiency	Reduce VMT	Alt. Fuel	Fuel Efficiency	Absorption/Barrier		
technology before projects begin.							
<p>TSM&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 (See Appendix A) and Phase 2 geo-spatial data, CDOT will develop a list of possible TDM projects and locations for them.</p> <p>Transportation Planning Regions (TPRs) and Metropolitan Planning Organizations (MPOs) will review information collected from both plan phases. <i>2045 Statewide Transportation Plan (SWP)</i> might reflect some of the Phase 2 recommendations.</p>		X				<p>Criteria pollutants, MSATs, GHG</p> <p>Lisa Streisfeld Planning, Performance and TDM Manager Lisa.Streisfeld@state.co.us US 303-757-9876</p>	
<p>TSM&O Data Analysis 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.</p>	X			X		<p>Criteria pollutants, MSATs, GHG</p> <p>Wes Maurer Traffic Operation Center Branch Manager Wes.Maurer@state.co.us 303-512-5820</p>	

Table B: Current Fiscal Year Air Quality Action Items (Revision #2; July 2018)

Action Item for FY 2018	Strategy Category					Pollutant(s) Affected by Action ^{1, 2}	Champion/Contact
	System Efficiency	Reduce VMT	Alt. Fuel	Fuel Efficiency	Absorption/Barrier		
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 for information on Phase 0.	X			X		Criteria pollutants, MSAT, GHG	Tyler Svitak Connected and Autonomous Technology Program Manager Tyler.Svitak@state.co.us 303.512.5824
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. 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).	X					Criteria pollutants, MSAT, GHG	Zachary Miller Region 1 Central Engineering Section Zachary.Miller@state.co.us 720-382-6381
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.		X				Criteria pollutants, MSAT, GHG	Chuck Attardo I-25 South Corridor Environmental Manager Chuck.Attardo@state.co.us 303-859-9535
US34 Big Thompson Canyon project: Rock is being cut and		X					Monte Malik Construction Manager

Table B: Current Fiscal Year Air Quality Action Items (Revision #2; July 2018)

Action Item for FY 2018	Strategy Category					Pollutant(s) Affected by Action ^{1, 2}	Champion/Contact
	System Efficiency	Reduce VMT	Alt. Fuel	Fuel Efficiency	Absorption/Barrier		
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.							Monte.Malik@state.co.us 303-916-1563
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.	X	X	X	X		Criteria pollutants, MSAT, GHG	David Krutsinger DTR Deputy Director David.Krutsinger@state.co.us 303-757-9008
Bus Fleet Conversion to compressed Natural Gas (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.			X	X		Criteria pollutants, MSATs, and GHG	David Krutsinger Director, Division of Transit and Rail David.Krutsinger@state.co.us 303-757-9008

Table B: Current Fiscal Year Air Quality Action Items (Revision #2; July 2018)

Action Item for FY 2018	Strategy Category					Pollutant(s) Affected by Action ^{1, 2}	Champion/Contact
	System Efficiency	Reduce VMT	Alt. Fuel	Fuel Efficiency	Absorption/Barrier		
<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>	X	X				<p>Criteria pollutants, MSATs, GHG</p>	<p>David Krutsinger Director, Division of Transit and Rail David.Krutsinger@state.co.us o.us 303-757-9008</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 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</p>		X		X		<p>Criteria pollutants, MSATs, GHG</p>	<p>Lenore Bates Scenic Byways/Bike/Ped Section Lenore.Bates@state.co.us s 303-757-9786</p>

Table B: Current Fiscal Year Air Quality Action Items (Revision #2; July 2018)

Action Item for FY 2018	Strategy Category					Pollutant(s) Affected by Action ^{1, 2}	Champion/Contact
	System Efficiency	Reduce VMT	Alt. Fuel	Fuel Efficiency	Absorption/Barrier		
decreased single-occupancy vehicle use. Ongoing.							
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.	X	X				Criteria pollutants, MSATs, GHG	Oana Deselnicu Systems Planning Section Oana.Deselnicu@state.co.us 303-512-4179
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. Information provided by module should heighten awareness and reduce VMT. Will be completed by June 2019.	X	X				Criteria pollutants, MSATs, GHG	Michael King Transportation Planner Michael.King@state.co.us 303-757-9997
Federal Funding to Reduce GHG Emissions: National Highway Freight Program (NHFP) considers congestion mitigation an eligible	X					Criteria pollutants, MSATs, GHG	Jason Wallis Freight Senior Authority Jason.Wallis@state.co.us 303-757-9425

Table B: Current Fiscal Year Air Quality Action Items (Revision #2; July 2018)

Action Item for FY 2018	Strategy Category					Pollutant(s) Affected by Action ^{1, 2}	Champion/Contact
	System Efficiency	Reduce VMT	Alt. Fuel	Fuel Efficiency	Absorption/Barrier		
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.							
2045 SWP: In first year of plan development, CDOT's Multimodal Planning Branch (MPB) 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 quality improvement.	X	X	X	X		Criteria pollutants, MSATs, GHG	Michelle Scheuerman Manager, Statewide Planning Michelle.Scheuerman@state.co.us 303-757-9770
Transportation Air Quality Research: Participate in multi-state Near-Road Air Quality Transportation Pooled Fund. Ongoing.				X	X	Criteria pollutants, MSAT, GHG	Rose Waldman DTD Air Quality/Noise Program Manager Rose.Waldman@state.co.us (303) 757-9016
Simple Steps/Better Air: Continue public outreach and education program to raise awareness of ground ozone pollution and create behavior change; focus on		X	X			Criteria pollutants, MSAT, GHG	Rose Waldman DTD Air Quality/Noise Program Manager Rose.Waldman@state.co.us

Table B: Current Fiscal Year Air Quality Action Items (Revision #2; July 2018)

Action Item for FY 2018	Strategy Category					Pollutant(s) Affected by Action ^{1, 2}	Champion/Contact
	System Efficiency	Reduce VMT	Alt. Fuel	Fuel Efficiency	Absorption/Barrier		
behavior change (program was previously called Ozone Aware).							(303) 757-9016

Notes for Table B

1. Potential pollutants include:
 - 1.A. Transportation Criteria Pollutants (CO, PM₁₀, PM_{2.5} NOx , 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 (CO₂, CH₄, and N₂O)
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, Ozone Aware (also called 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 CO₂. Therefore, the strategy to add more fly ash to a concrete mixture reduces CO₂, but no other pollutants.

Appendix C:

Air Quality Performance Measure Results

FY 2018 Air Quality Performance Measure Results

This appendix contains air quality performance measure results as calculated in Spring 2018. 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 2015 and CY 2016 in both total mass and on a per capita basis. However, according to the method used for Table C-3, they increased. 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 2015 and CY 2016 (based on the method used for Table C-3).

Statewide gasoline consumption increased on both a mass and per capita basis between CY 2014 and CY 2015. 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.

Table C-1: Statewide Motor Vehicle Performance Measure Emissions and Emissions per Capita (Revision #2; July 2018)

Measure Parameters	Emissions ¹						
	CO	NO _x	PM ₁₀	PM _{2.5}	CO ₂	CO _{2e}	VOC
Statewide, 2011 (tons per day) ^{2,3}	724	197	11.4	6.3	70,885	71,127	34.4
Statewide, 2011 (tons per year)	264,260	71,905	4,161	2,300	25,873,025	25,961,355	12,556
Statewide, 2011 (pounds per capita) ⁴	103.2	28.1	1.6	0.9	10,105	10,140	4.9
Statewide, 2015 (tons per day) ^{3,5}	555	135	9.9	4.6	72,550	72,713	21.2
Statewide, 2015 (tons per year)	202,575	49,275	3,614	1,679	26,480,750	26,540,245	7,738
Statewide, 2015 (pounds per capita) ⁴	74.2	18.1	1.3	0.6	9,706	9,728	2.8
Change from 2011 to 2015 (tons per day) ⁶	-169	-62	-2	-2	1,665	1,586	-13
Change from 2011 to 2015 (tons per year) ⁶	-61,685	-22,630	-548	-621	607,725	578,890	-4,818
Change from 2011 to 2015 (pounds per capita) ⁶	-29	-10	-0.3	-0.3	-399	-412	-2.1
Statewide, 2016 (tons per day) ^{3,7}	529	116	9.2	4.05	71947	72099	18.6
Statewide, 2016 (tons per year)	193,085	42,340	3,358	1,478	26,260,655	26,316,135	6,789
Statewide, 2016 (pounds per capita) ⁴	69.7	15.3	1.2	0.5	9,483	9,504	2.5
Change from 2015 to 2016 (tons per day) ⁶	-26	-19	-1	-1	-603	-614	-3
Change from 2015 to 2016 (tons per year) ⁶	-9,490	-6,935	-256	-201	-220,095	-224,110	-949
Change from 2015 to 2016 (pounds per capita) ⁶	-5	-3	-0.1	-0.1	-222	-224	-0.4

Notes for Table C-1

1. Pollutants: carbon monoxide (CO), nitrogen oxides (NO_x), particulate matter with diameter equal to or less than 10 microns (PM₁₀) or 2.5 microns (PM_{2.5}), carbon dioxide (CO₂), carbon dioxide equivalent (CO_{2e}), 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_x, VOC, PM₁₀, PM_{2.5}, CO₂, and CO_{2e}. 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_{2.5}, NO_x, 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, and 2016, 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. The 2011 population was 5,120,686. The 2015 population was 5,456,584. The 2016 population was 5,538,180. 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).

Table C-2: Statewide On-Road Gasoline per Capita Performance Measure Data (Revision #2; July 2018)

Measure Parameters	Measure Results
Statewide Gasoline Consumption, 2011 (gallons) ¹	2,128,402,548
Statewide Gasoline Consumption, 2014 (gallons) ^{1,2}	2,219,961,283
Statewide Gasoline Consumption, 2015 (gallons) ¹	2,314,292,612
Statewide Gasoline Consumption per Capita, 2011 (gallons per person) ³	415.6
Statewide Gasoline Consumption per Capita, 2014 (gallons per person) ³	414.4
Statewide Gasoline Consumption per Capita, 2015 (gallons per person) ³	424.8
Change from 2011 to 2014, Gasoline Consumption (gallons) ⁴	91,558,735
Change from 2011 to 2014, Gasoline Consumption per Capita (gallons per person) ⁴	-1.2
Change from 2014 to 2015, Gasoline Consumption (gallons) ⁴	94,331,329
Change from 2014 to 2015, Gasoline Consumption per Capita (gallons per person) ⁴	10.4

Notes for Table C-2

1. 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. The 2011 population was 5,120,686. The 2014 population was 5,356,626. The 2015 population was 5,538,180. 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).

Table C-3: Greenhouse Gas National Performance Measure Results (Revision #2; July 2018)

Measure Parameters	Measure Results
Total million VMT (annual total vehicle-miles traveled on all public roads), 2011 ¹	46,606
Total million VMT (annual total vehicle-miles traveled on all public roads), 2015 ¹	50,437
Total million VMT (annual total vehicle-miles traveled on all public roads), 2016 ¹	52,152
NHS million VMT (annual total vehicle-miles traveled on NHS), 2011 ¹	23,808
NHS million VMT (annual total vehicle-miles traveled on NHS), 2015 ¹	31,938
NHS million VMT (annual total vehicle-miles traveled on NHS), 2016 ¹	33,047
Statewide Gasoline/Gasohol Consumption, 2011 (thousand gallons) ²	2,079,287
Statewide Diesel Consumption, 2011 (thousand gallons) ²	542,783
Statewide Gasoline/Gasohol Consumption, 2015 (thousand gallons) ²	2,107,254
Statewide Diesel Consumption, 2015 (thousand gallons) ²	632,740
Statewide Gasoline/Gasohol Consumption, 2016 (thousand gallons) ²	2,217,141
Statewide Diesel Consumption, 2016 (thousand gallons) ²	636,213
Tailpipe CO ₂ emissions on NHS (total tailpipe CO ₂ emissions on NHS in a calendar year), 2011 (tons) ³	24,460,065
Tailpipe CO ₂ emissions on NHS (total tailpipe CO ₂ emissions on NHS in a calendar year), 2015 (tons) ³	25,714,813
Tailpipe CO ₂ emissions on NHS (total tailpipe CO ₂ emissions on NHS in a calendar year), 2016 (tons) ³	26,725,112
Tailpipe CO ₂ emissions on NHS per Capita, 2011 (tons CO ₂ per person) ⁴	4.78
Tailpipe CO ₂ emissions on NHS per Capita, 2015 (tons CO ₂ per person) ⁴	4.71
Tailpipe CO ₂ emissions on NHS per Capita, 2016 (tons CO ₂ per person) ⁴	4.83

Change from 2011 to 2015, Tailpipe CO ₂ Emissions on NHS (tons) ⁵	1,254,748
Change from 2015 to 2016, Tailpipe CO ₂ Emissions on NHS (tons) ⁵	1,010,299
Change from 2011 to 2015, Tailpipe CO ₂ Emissions per Capita (tons per person) ⁵	-0.1
Change from 2015 to 2016, Tailpipe CO ₂ Emissions per Capita (tons per person) ⁵	0.1

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 CO₂ per gallon of gasoline/gasohol and 22.4 pounds CO₂ per gallon of diesel.
4. Population data is as of July 1 of 2011 and 2015. The 2011 population was 5,120,686. The 2015 population was 5,456,584. The 2016 population was 5,538,180. 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 #2; July 2018)

Year	Performance Measure			
	Motor Vehicle Emissions - Criteria Pollutants ^{1,2}	Motor Vehicle Emissions - CO ₂ ^{2,3}	On-Road Gasoline Consumption ⁴	GHG Tailpipe Emissions - CO ₂ ⁵
2011 ⁶	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 4.8 tons/capita/yr
2014	Not Determined ⁷	Not Determined ⁷	2,220 million gal/yr and 414 gal/capita/yr	Not Determined ⁷
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 4.7 tons/capita/yr
2016	247,050 tpy and 0.04 ton/capita/yr	26,260,655 tpy and 4.7 ton/capita/yr	Not Determined ⁷	26,725,112 tpy and 4.8 tons/capita/yr

Notes for Table C-4

1. Criteria Pollutants represented in this table are: CO, NO_x, VOC, PM₁₀, PM_{2.5}, 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_{2e} emissions were reported in Table C-1, only CO₂ emissions are reported in this table because the "GHG Tailpipe" performance measure reported only CO₂ 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 will lag the other data types by one year.

Appendix D:

2018 Statewide Motor Vehicle Performance

Measure Emissions Methodology: Colorado Air

Pollution Control Division Report

June 2018

Colorado Running Motor Vehicle Emissions Inventory: 2015 and 2016

Calculation Summary

This is an overview of the methods used to calculate the Colorado state emissions inventory for years 2015 and 2016. We ran the EPA MOVES2014a 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, NOx, VOC, PM10, PM2.5, CO2, and CO2 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 (48hr) 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 vehicle 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. 2016 fractions of each of the 6 HPMS vehicle types according to area type, functional class (FC), and NAA (non-attainment area) classification.

Rural?	FC	NAA?	f10	f20	f30	f40	f50	f60
R	1	1	0.002	0.47	0.44	0.01	0.01	0.08
R	2	1	0.003	0.51	0.47	0.00	0.01	0.01
R	3	1	0.004	0.50	0.46	0.002	0.01	0.03
R	4	1	0.01	0.50	0.46	0.01	0.01	0.01
R	5	1	0.01	0.49	0.46	0.01	0.01	0.01
R	6	1	0.01	0.49	0.46	0.01	0.01	0.01
R	7	1	0.01	0.46	0.45	0.01	0.03	0.03
U	1	1	0.001	0.48	0.45	0.003	0.01	0.06
U	2	1	0.003	0.51	0.47	0.001	0.01	0.01
U	3	1	0.002	0.51	0.47	0.002	0.01	0.01
U	4	1	0.01	0.49	0.46	0.02	0.01	0.01
U	5	1	0.02	0.50	0.47	0.01	0.01	0.01
U	6	1	0.01	0.50	0.47	0.01	0.01	0.01
U	7	1	0.02	0.50	0.46	0.01	0.01	0.01
R	1	0	0.002	0.45	0.42	0.003	0.01	0.11
R	3	0	0.01	0.47	0.44	0.003	0.01	0.08
R	4	0	0.01	0.47	0.45	0.01	0.01	0.05
R	5	0	0.01	0.48	0.46	0.01	0.02	0.02

R	6	0	0.01	0.48	0.46	0.01	0.02	0.02
R	7	0	0.01	0.48	0.46	0.01	0.02	0.03
U	1	0	0.002	0.44	0.42	0.003	0.01	0.13
U	2	0	0.01	0.51	0.47	0.003	0.003	0.01
U	3	0	0.01	0.49	0.46	0.01	0.01	0.02
U	4	0	0.01	0.50	0.47	0.003	0.01	0.01
U	5	0	0.01	0.50	0.47	0.003	0.01	0.01
U	6	0	0.01	0.50	0.47	0.003	0.01	0.004
U	7	0	0.01	0.50	0.47	0.003	0.01	0.004

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. 2016 CDOT VMT/day by HPMS vehicle class (10 through 60), area type, and functional class.

Rural?	FC	NAA?	HPMS10	HPMS20	HPMS30	HPMS40	HPMS50	HPMS60
R	1	0	20207	3853446	3626454	27975	93232	965709
R	3	0	47328	4036543	3799442	24700	99864	663454
R	4	0	52402	2042742	1940077	24015	62403	211973
R	5	0	39221	1599046	1525030	22571	59280	74102
R	6	0	13286	684184	653057	10188	25198	26062
R	7	0	27409	1361078	1295517	21167	46693	72084
U	1	0	13014	2596491	2455472	15358	75738	736794
U	2	0	14742	1348711	1245805	7996	7668	17928
U	3	0	84504	3561124	3353683	39266	83241	174979
U	4	0	37855	2183905	2045601	13140	39223	31401
U	5	0	21324	939493	879768	6502	16419	10198
U	6	0	984	52222	48858	336	855	450
U	7	0	24078	1278016	1195706	8227	20934	11002
R	1	1	8760	1992859	1859698	29610	34586	328688
R	2	1	1715	344850	319167	132	3409	4168
R	3	1	12186	1401009	1308528	4925	24069	75018
R	4	1	16604	641869	600480	6960	11849	15756
R	5	1	19506	786236	738872	11580	17548	17445
R	6	1	8298	334456	314308	4926	7465	7421
R	7	1	16366	618689	609302	19958	45457	43978
U	1	1	29228	9466989	8814329	57743	151149	1202888
U	2	1	35854	6191999	5725923	15462	62654	95107
U	3	1	35396	9309038	8610096	33906	92036	106877
U	4	1	164553	6351608	5916394	301093	97205	117845
U	5	1	83919	2787715	2593752	34563	39636	32017
U	6	1	195	10011	9394	201	184	161
U	7	1	126470	3753866	3503800	51218	61818	49665

MOVES2014a Emission Factors

We ran the EPA MOVES2014a model in inventory mode at the “National” scale, which relies on the national default databases (i.e. for VMT, Inspection & Maintenance (I/M) Programs, 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 Metro Denver/North Front Range 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 run specification file is reproduced in Appendix A.

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

MOVES2014a Inputs	Details
Scale	National Inventory
Time Spans	Time Aggregation: Hour Years: 2016 Months: January & July Days: Weekdays only Hours: All hours
Geographic Bounds	State: Colorado Counties: Adams and El Paso
On Road Vehicles	All Fuel & Source Use Type combinations
Road Type	On Network: 2-5
Pollutants and Processes	CO = 2; NO _x = 3; VOC = 87 PM ₁₀ = 100+106+107 PM _{2.5} = 110+116+117 CO ₂ = 90; CO ₂ equivalent = 98 (select additional prerequisites when prompted)
General Output	Units: Grams, Joules, Miles Activity: Distance Traveled
Output Emissions Detail	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 use type to HPMS vehicle type, 2) MOVES road type to Functional class, and 3) County to area type (urban/rural and NAA).

These emission factors per HPMS vehicle class, functional class, and area type (Appendix B) were multiplied by the VMT in Table 2 to yield the total annual emissions below (for both years).

Table 4. 2015 weekday running emissions inventory (tons/day).

Rural?	FC	VMT	CO tons	NOx Tons	PM10 tons	PM2.5 tons	CO2 tons	CO2e Tons	VOC tons
-1	1	12,175,913	56	17	0.74	0.52	6,876	6,885	1.6
-1	2	382,790	2	0	0.01	0.01	180	180	0.0
-1	3	11,181,826	38	11	0.66	0.34	5,526	5,537	1.5
-1	4	5,458,008	19	8	0.49	0.29	3,196	3,202	0.9
-1	5	4,786,901	17	5	0.31	0.16	2,416	2,421	0.7
-1	6	2,015,000	7	1	0.09	0.04	882	884	0.3
-1	7	4,029,000	14	3	0.17	0.07	1,763	1,767	0.5
0	1	24,739,356	107	32	1.73	1.09	13,575	13,597	3.4
0	2	14,298,331	64	12	0.63	0.35	6,553	6,565	1.7
0	3	24,894,682	97	19	2.11	0.73	13,377	13,416	4.3
0	4	16,870,252	67	14	1.49	0.55	9,101	9,128	3.2
0	5	7,174,668	29	5	0.56	0.19	3,738	3,750	1.3
0	6	122,657	0	0	0.01	0.00	66	67	0.0
0	7	9,791,000	39	8	0.86	0.31	5,300	5,316	1.8
137,920,383			555	135	9.9	4.6	72,550	72,713	21.2

Table 5. 2016 weekday running emission inventory (tons/day).

Rural ?	FC	VMT	CO tons	NOx tons	PM10 tons	PM2.5 tons	CO2 tons	CO2e tons	VOC tons
-1	1	12,841,225	57	17.5	0.77	0.53	7,302	7,312	1.6
-1	2	673,441	3	0.4	0.02	0.01	283	283	0.1
-1	3	11,497,066	37	12	0.73	0.38	5,862	5,872	1.4
-1	4	5,627,132	19	5	0.31	0.15	2,687	2,692	0.7
-1	5	4,910,437	17	3.5	0.23	0.1	2,197	2,201	0.6
-1	6	2,088,849	7	1.5	0.1	0.04	926	928	0.3
-1	7	4,177,697	14	3.5	0.22	0.11	1,955	1,959	0.5
0	1	25,615,193	100	28	1.61	0.97	13,571	13,591	2.8
0	2	14,769,850	60	8	0.51	0.25	6,239	6,250	1.4
0	3	25,484,145	89	15	1.94	0.6	13,020	13,055	3.6
0	4	17,299,824	62	12	1.45	0.51	8,997	9,023	2.8
0	5	7,445,306	27	4	0.55	0.17	3,750	3,761	1.2
0	6	123,851	0	0.1	0.01	0.00	62	62	0.0
0	7	10,084,802	37	6	0.75	0.23	5,096	5,110	1.6
142,638,818			529	116	9.2	4.05	71,947	72,099	18.6

Appendix A. MOVES run specification file

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Appendix B. MOVES Emission Factors

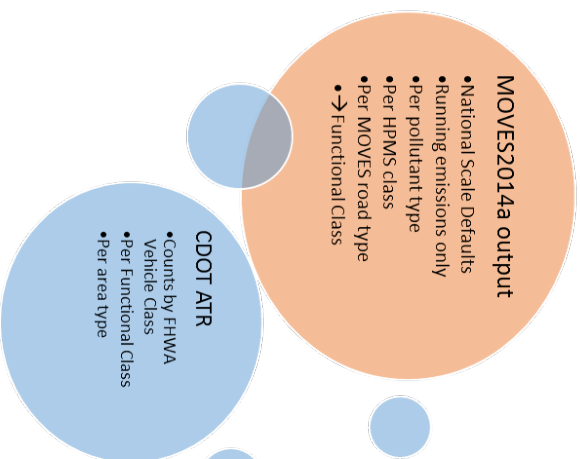
2016 (gpm = gram per mile)

NAA	FC	Rural?	HPMS	CO gpm	NOx gpm	PM10 gpm	PM25 gpm	VOC gpm	CO2 gpm	CO2e gpm
0	1	R	10	13.54	0.85	0.04	0.03	0.77	399	400
0	1	R	20	3.46	0.37	0.02	0.01	0.07	311	312
0	1	R	30	5.62	0.75	0.02	0.01	0.12	425	426
0	1	R	40	3.80	8.23	0.35	0.28	0.54	1298	1303
0	1	R	50	4.47	3.05	0.17	0.12	0.27	980	981
0	1	R	60	1.47	7.04	0.32	0.24	0.26	1735	1736
0	1	U	10	13.61	0.85	0.04	0.03	0.86	392	394
0	1	U	20	3.22	0.35	0.03	0.01	0.07	313	313
0	1	U	30	5.14	0.70	0.03	0.01	0.12	422	423
0	1	U	40	3.86	7.94	0.40	0.31	0.62	1270	1275
0	1	U	50	4.82	3.09	0.20	0.14	0.31	1000	1001
0	1	U	60	1.60	7.07	0.38	0.28	0.30	1733	1735
0	2	R	10	13.54	0.85	0.04	0.03	0.77	399	400
0	2	R	20	3.46	0.37	0.02	0.01	0.07	311	312
0	2	R	30	5.62	0.75	0.02	0.01	0.12	425	426
0	2	R	40	3.80	8.23	0.35	0.28	0.54	1298	1303
0	2	R	50	4.47	3.05	0.17	0.12	0.27	980	981
0	2	R	60	1.47	7.04	0.32	0.24	0.26	1735	1736
0	2	U	10	13.61	0.85	0.04	0.03	0.86	392	394
0	2	U	20	3.22	0.35	0.03	0.01	0.07	313	313
0	2	U	30	5.14	0.70	0.03	0.01	0.12	422	423
0	2	U	40	3.86	7.94	0.40	0.31	0.62	1270	1275
0	2	U	50	4.82	3.09	0.20	0.14	0.31	1000	1001
0	2	U	60	1.60	7.07	0.38	0.28	0.30	1733	1735
0	3	R	10	13.67	0.84	0.04	0.02	0.96	382	384
0	3	R	20	2.37	0.32	0.03	0.01	0.07	312	313
0	3	R	30	3.84	0.63	0.03	0.01	0.12	421	422
0	3	R	40	3.27	6.79	0.41	0.30	0.63	1073	1079
0	3	R	50	4.31	2.88	0.21	0.13	0.34	912	914
0	3	R	60	1.68	7.22	0.41	0.29	0.32	1750	1751
0	3	U	10	13.62	0.71	0.05	0.03	1.44	381	383
0	3	U	20	2.80	0.32	0.05	0.01	0.11	378	379
0	3	U	30	4.28	0.61	0.06	0.02	0.17	495	497
0	3	U	40	3.72	7.66	0.62	0.42	0.89	1179	1188
0	3	U	50	5.91	3.83	0.38	0.20	0.58	1232	1235
0	3	U	60	2.27	8.61	0.76	0.45	0.48	2059	2061
0	4	R	10	13.67	0.84	0.04	0.02	0.96	382	384
0	4	R	20	2.37	0.32	0.03	0.01	0.07	312	313
0	4	R	30	3.84	0.63	0.03	0.01	0.12	421	422
0	4	R	40	3.27	6.79	0.41	0.30	0.63	1073	1079
0	4	R	50	4.31	2.88	0.21	0.13	0.34	912	914
0	4	R	60	1.68	7.22	0.41	0.29	0.32	1750	1751

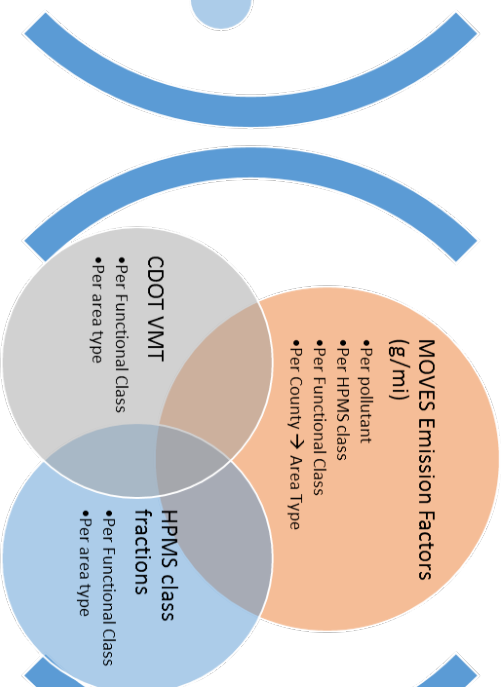
0	4	U	10	13.62	0.71	0.05	0.03	1.44	381	383
0	4	U	20	2.80	0.32	0.05	0.01	0.11	378	379
0	4	U	30	4.28	0.61	0.06	0.02	0.17	495	497
0	4	U	40	3.72	7.66	0.62	0.42	0.89	1179	1188
0	4	U	50	5.91	3.83	0.38	0.20	0.58	1232	1235
0	4	U	60	2.27	8.61	0.76	0.45	0.48	2059	2061
0	5	R	10	13.67	0.84	0.04	0.02	0.96	382	384
0	5	R	20	2.37	0.32	0.03	0.01	0.07	312	313
0	5	R	30	3.84	0.63	0.03	0.01	0.12	421	422
0	5	R	40	3.27	6.79	0.41	0.30	0.63	1073	1079
0	5	R	50	4.31	2.88	0.21	0.13	0.34	912	914
0	5	R	60	1.68	7.22	0.41	0.29	0.32	1750	1751
0	5	U	10	13.62	0.71	0.05	0.03	1.44	381	383
0	5	U	20	2.80	0.32	0.05	0.01	0.11	378	379
0	5	U	30	4.28	0.61	0.06	0.02	0.17	495	497
0	5	U	40	3.72	7.66	0.62	0.42	0.89	1179	1188
0	5	U	50	5.91	3.83	0.38	0.20	0.58	1232	1235
0	5	U	60	2.27	8.61	0.76	0.45	0.48	2059	2061
0	6	R	10	13.67	0.84	0.04	0.02	0.96	382	384
0	6	R	20	2.37	0.32	0.03	0.01	0.07	312	313
0	6	R	30	3.84	0.63	0.03	0.01	0.12	421	422
0	6	R	40	3.27	6.79	0.41	0.30	0.63	1073	1079
0	6	R	50	4.31	2.88	0.21	0.13	0.34	912	914
0	6	R	60	1.68	7.22	0.41	0.29	0.32	1750	1751
0	6	U	10	13.62	0.71	0.05	0.03	1.44	381	383
0	6	U	20	2.80	0.32	0.05	0.01	0.11	378	379
0	6	U	30	4.28	0.61	0.06	0.02	0.17	495	497
0	6	U	40	3.72	7.66	0.62	0.42	0.89	1179	1188
0	6	U	50	5.91	3.83	0.38	0.20	0.58	1232	1235
0	6	U	60	2.27	8.61	0.76	0.45	0.48	2059	2061
0	7	R	10	13.67	0.84	0.04	0.02	0.96	382	384
0	7	R	20	2.37	0.32	0.03	0.01	0.07	312	313
0	7	R	30	3.84	0.63	0.03	0.01	0.12	421	422
0	7	R	40	3.27	6.79	0.41	0.30	0.63	1073	1079
0	7	R	50	4.31	2.88	0.21	0.13	0.34	912	914
0	7	R	60	1.68	7.22	0.41	0.29	0.32	1750	1751
0	7	U	10	13.62	0.71	0.05	0.03	1.44	381	383
0	7	U	20	2.80	0.32	0.05	0.01	0.11	378	379
0	7	U	30	4.28	0.61	0.06	0.02	0.17	495	497
0	7	U	40	3.72	7.66	0.62	0.42	0.89	1179	1188
0	7	U	50	5.91	3.83	0.38	0.20	0.58	1232	1235
0	7	U	60	2.27	8.61	0.76	0.45	0.48	2059	2061
1	1	R	10	13.42	0.83	0.04	0.03	0.78	399	400
1	1	R	20	3.00	0.29	0.02	0.01	0.06	314	314
1	1	R	30	4.77	0.62	0.02	0.01	0.09	428	429
1	1	R	40	3.78	8.12	0.34	0.28	0.54	1310	1314

1	1	R	50	4.44	3.00	0.17	0.12	0.27	990	991
1	1	R	60	1.47	6.94	0.32	0.24	0.26	1750	1751
1	1	U	10	13.49	0.82	0.04	0.03	0.87	392	394
1	1	U	20	2.79	0.27	0.03	0.01	0.06	316	316
1	1	U	30	4.37	0.57	0.03	0.01	0.09	426	427
1	1	U	40	3.84	7.84	0.40	0.31	0.62	1282	1287
1	1	U	50	4.79	3.04	0.20	0.14	0.32	1010	1011
1	1	U	60	1.60	6.98	0.38	0.28	0.30	1749	1750
1	2	R	10	13.42	0.83	0.04	0.03	0.78	399	400
1	2	R	20	3.00	0.29	0.02	0.01	0.06	314	314
1	2	R	30	4.77	0.62	0.02	0.01	0.09	428	429
1	2	R	40	3.78	8.12	0.34	0.28	0.54	1310	1314
1	2	R	50	4.44	3.00	0.17	0.12	0.27	990	991
1	2	R	60	1.47	6.94	0.32	0.24	0.26	1750	1751
1	2	U	10	13.49	0.82	0.04	0.03	0.87	392	394
1	2	U	20	2.79	0.27	0.03	0.01	0.06	316	316
1	2	U	30	4.37	0.57	0.03	0.01	0.09	426	427
1	2	U	40	3.84	7.84	0.40	0.31	0.62	1282	1287
1	2	U	50	4.79	3.04	0.20	0.14	0.32	1010	1011
1	2	U	60	1.60	6.98	0.38	0.28	0.30	1749	1750
1	3	R	10	13.55	0.82	0.04	0.02	0.97	382	384
1	3	R	20	2.03	0.25	0.03	0.01	0.06	315	316
1	3	R	30	3.25	0.52	0.03	0.01	0.09	424	425
1	3	R	40	3.26	6.70	0.41	0.30	0.63	1084	1089
1	3	R	50	4.28	2.83	0.21	0.13	0.35	922	924
1	3	R	60	1.68	7.12	0.41	0.29	0.32	1766	1767
1	3	U	10	13.50	0.69	0.05	0.03	1.44	381	383
1	3	U	20	2.39	0.25	0.05	0.01	0.09	382	383
1	3	U	30	3.60	0.50	0.06	0.02	0.12	501	502
1	3	U	40	3.71	7.56	0.62	0.42	0.89	1193	1202
1	3	U	50	5.87	3.78	0.38	0.20	0.58	1247	1251
1	3	U	60	2.27	8.49	0.76	0.45	0.48	2081	2083
1	4	R	10	13.55	0.82	0.04	0.02	0.97	382	384
1	4	R	20	2.03	0.25	0.03	0.01	0.06	315	316
1	4	R	30	3.25	0.52	0.03	0.01	0.09	424	425
1	4	R	40	3.26	6.70	0.41	0.30	0.63	1084	1089
1	4	R	50	4.28	2.83	0.21	0.13	0.35	922	924
1	4	R	60	1.68	7.12	0.41	0.29	0.32	1766	1767
1	4	U	10	13.50	0.69	0.05	0.03	1.44	381	383
1	4	U	20	2.39	0.25	0.05	0.01	0.09	382	383
1	4	U	30	3.60	0.50	0.06	0.02	0.12	501	502
1	4	U	40	3.71	7.56	0.62	0.42	0.89	1193	1202
1	4	U	50	5.87	3.78	0.38	0.20	0.58	1247	1251
1	4	U	60	2.27	8.49	0.76	0.45	0.48	2081	2083
1	5	R	10	13.55	0.82	0.04	0.02	0.97	382	384
1	5	R	20	2.03	0.25	0.03	0.01	0.06	315	316

1	5	R	30	3.25	0.52	0.03	0.01	0.09	424	425
1	5	R	40	3.26	6.70	0.41	0.30	0.63	1084	1089
1	5	R	50	4.28	2.83	0.21	0.13	0.35	922	924
1	5	R	60	1.68	7.12	0.41	0.29	0.32	1766	1767
1	5	U	10	13.50	0.69	0.05	0.03	1.44	381	383
1	5	U	20	2.39	0.25	0.05	0.01	0.09	382	383
1	5	U	30	3.60	0.50	0.06	0.02	0.12	501	502
1	5	U	40	3.71	7.56	0.62	0.42	0.89	1193	1202
1	5	U	50	5.87	3.78	0.38	0.20	0.58	1247	1251
1	5	U	60	2.27	8.49	0.76	0.45	0.48	2081	2083
1	6	R	10	13.55	0.82	0.04	0.02	0.97	382	384
1	6	R	20	2.03	0.25	0.03	0.01	0.06	315	316
1	6	R	30	3.25	0.52	0.03	0.01	0.09	424	425
1	6	R	40	3.26	6.70	0.41	0.30	0.63	1084	1089
1	6	R	50	4.28	2.83	0.21	0.13	0.35	922	924
1	6	R	60	1.68	7.12	0.41	0.29	0.32	1766	1767
1	6	U	10	13.50	0.69	0.05	0.03	1.44	381	383
1	6	U	20	2.39	0.25	0.05	0.01	0.09	382	383
1	6	U	30	3.60	0.50	0.06	0.02	0.12	501	502
1	6	U	40	3.71	7.56	0.62	0.42	0.89	1193	1202
1	6	U	50	5.87	3.78	0.38	0.20	0.58	1247	1251
1	6	U	60	2.27	8.49	0.76	0.45	0.48	2081	2083
1	7	R	10	13.55	0.82	0.04	0.02	0.97	382	384
1	7	R	20	2.03	0.25	0.03	0.01	0.06	315	316
1	7	R	30	3.25	0.52	0.03	0.01	0.09	424	425
1	7	R	40	3.26	6.70	0.41	0.30	0.63	1084	1089
1	7	R	50	4.28	2.83	0.21	0.13	0.35	922	924
1	7	R	60	1.68	7.12	0.41	0.29	0.32	1766	1767
1	7	U	10	13.50	0.69	0.05	0.03	1.44	381	383
1	7	U	20	2.39	0.25	0.05	0.01	0.09	382	383
1	7	U	30	3.60	0.50	0.06	0.02	0.12	501	502
1	7	U	40	3.71	7.56	0.62	0.42	0.89	1193	1202
1	7	U	50	5.87	3.78	0.38	0.20	0.58	1247	1251
1	7	U	60	2.27	8.49	0.76	0.45	0.48	2081	2083



1: Calculate



2: Combine/multiply



3: Total Emissions