Ozone State Implementation Plan

# SERIOUS STATE IMPLEMENTATION PLAN FOR THE DENVER METRO AND NORTH FRONT RANGE OZONE NONATTAINMENT AREA

**State Implementation Plan for the**
**2008 8-Hour Ozone**
**National Ambient Air Quality Standard**

Adopted by:

**Colorado Air Quality Control Commission**

*December 18, 2020*

**Regional Air Quality Council**

*Proposed Serious Area SIP Revision*
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**SERIOUS STATE IMPLEMENTATION PLAN (SIP) FOR THE**
**DENVER METRO/NORTH FRONT RANGE OZONE NONATTAINMENT AREA**

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**ACRONYMS**

ACT - Alternative Control Techniques
AIM - Architectural and Industrial Maintenance
AIR - Automobile Inspection and Readjustment Program
APCD - Air Pollution Control Division
APEN - Air Pollutant Emission Notice
AQCC - Air Quality Control Commission
AQS - Air Quality System
AVO - Audio, Visual, Olfactory
BACT - Best Available Control Technology
BART - Best Available Retrofit Technology
BBL - Barrel
BC - Boundary Conditions
BEIS - Biogenic Emission Inventory System
BLM - Bureau of Land Management
BPA - Beaumont-Port Arthur
BRT - Bus Rapid Transit
BY - Base Year
CAA - Clean Air Act
CAMx - Comprehensive Air Quality Model with Extensions
CARB - California Air Resources Board
CASEO - Clean Air at Schools: Engines off!
CB6 - Carbon Bond 6
CBD - Central Business District
CBSA - Core-based statistical area
CDOT - Colorado Department of Transportation
CDPHE - Colorado Department of Public Health and Environment
CE - Capture Efficiency
CEMS - Continuous Emissions Monitoring System
CEO - Colorado Energy office
CFFP - Clean Fuel Fleets Program
CFV - Clean-Fuel Vehicles
CFR - Code of Federal Register
CHAT - Chatfield
CMAQ - Congestion Mitigation and Air Quality
CMAQ - Community Multi-scale Air Quality model
CMP - Congestion Management Process
CMV - Commercial Motor Vehicles
CNG - Compressed Natural Gas
CO - Carbon Monoxide
COGA - Colorado Oil & Gas Association
COGCC - Colorado Oil and Gas Conservation Commission
COLT - City of Loveland Transit
CSU - Colorado State University
CTG - Control Techniques Guidelines
DCFC - Direct Current Fast Charging
DENC - Drive Electric Northern Colorado
DERA - Diesel Emissions Reduction Act
DIA - Denver International Airport
DJ - Denver-Julesburg
DM/NFR - Denver Metro/North Front Range
DMA - Denver Metro Area
DOLA - Department of Local Affairs
DRCOG - Denver Regional Council of Governments
DRE - Destruction and Removal Efficiency
DSM - Demand Side Management
DV - Design Value
$DV_B$ - Base Design Value
$DV_F$ - Future Design Value
EAC - Early Action Compact
EF - Emission Factor
EG - Emission Guidelines
EGU - Electric Generating Units
EMP – Enhanced Monitoring Plan
EPA - U.S. Environmental Protection Agency
ERG - Eastern Research Group
EtOH - Ethanol
EV - Electric Vehicles
EVSE - Electric Vehicle Supply Equipment
FCW - Fort Collins West
FHWA - Federal Highway Administration
FR - Federal Register
FTP - Federal Test Procedure
FY - Fiscal Year
G/L - grams per liter
GAP - Generator Assistance Program
GC - Geos-Chem
GET - Greeley Evens Transit
GFS - Global Forecast System
GHG - Greenhouse Gas
GPS - Fleet Telematics
HAP - Hazardous Air Pollutants
HB - House Bill
HEV - Hybrid Electric Vehicle
HOV - High Occupancy Vehicle
HPMS - Highway Performance Monitoring System
ICG - Interagency Consultation Group

I/M - Inspection and Maintenance
ISR - Indirect Source Rule
ITS - Intelligent Transportation Systems
IWDW - Intermountain West Data Warehouse
KM - Kilometer
KW - Kilowatt
LAER - Lowest Achievable Emission Rate
LBS - Pounds
LB/GAL - Pound per Gallon
LCC - Lambert Conformal Conic
LDAR - Leak Detection and Repair Program
LDV - Light-Duty Vehicles
LDT - Light-Duty Trucks
LED - Light Emitting Diode
LED - Low Emission Diesel
LEV - Low Emission Vehicles
LNOx - Lightning NOx
MACT - Maximum Achievable Control Technology
MATS - Monitored Attainment Test Software
MDA8 - Maximum Daily Average Ozone Over an 8-Hour period
MDPV - Medium-Duty Passenger Vehicles
MEGAN - Model of Emissions of Gasses and Aerosols from Nature
$MI^2$ - Square mile
MOVES - Mobile Vehicle Emissions Simulator
MOVES2014 - MOVES (2014 Release)
MOVES2014a - MOVES (2015 Release)
MOVES2014b - MOVES (2018 Release)
MPACT - Metro Mayors Caucus, Progressive 15, Action 22, Club 20 and the 64 counties in the State of Colorado
MPE - Model Performance Evaluation
MOU - Memorandums of Understanding
MPO - Metropolitan Planning Organization
MSRP - Manufacturer's Suggested Retail Price
MVEB - Motor Vehicle Emissions Budgets
MY - Model Year
NAA - Nonattainment Area
NAAQS - National Ambient Air Quality Standard
NANSR - Nonattainment Area New Source Review
NCAR - National Center of Atmospheric Research
NCore – National Core
NEI - National Emissions Inventory
NESHAP - National Emission Standards for Hazardous Air Pollutants
NFR - North Front Range
NFRMPO - North Front Range Metropolitan Planning Organization
NLEV - National Low Emission Vehicle
NO - Nitrogen Oxide
NOx - Nitrogen Oxides
NMHC - Non-Methane Hydrocarbon
NPS - National Park Service
NREL - National Renewable Energy Laboratory
NSPS - New Source Performance Standards
NSR - New Source Review
O&G - Oil and Gas
OAP - Ozone Action Plan
OBD - On-Board Diagnostics
OEM - Original Equipment Manufacture
OTC - Ozone Transport Commission
PAMS - photochemical assessment monitoring station
PAYD - Pay–As–You–Drive
PC - Pneumatic Controller
PGM - Photochemical Grid Modeling
PHEV - Plug-In Hybrid Electric Vehicle
PHYD - Pay How You Drive
PM - Particulate Matter
PPB - Parts per Billion
PPM - Parts per Million
PSI - Pounds per Square Inch
PZEV - Partial Zero Emissions Vehicle
QAPP - Quality Assurance Project Plan
QMP - Quality Management Plan
RACM - Reasonably Available Control Measures
RACT - Reasonably Available Control Technology
RAQC - Regional Air Quality Council
RBLC - RACT/BACT/LAER Clearinghouse
RE - Rule Effectiveness
RES - Renewable Energy Sources
RFP - Reasonable Further Progress
RFNO - Rocky Flats North
RFS - Renewable Fuels Standard
RP - Rule Penetration
RRF - Relative Response Factor
RSD - Remote Sensing Device
RTD - Regional Transportation District
RTP - Regional Transportation Plans
RUCPP - Road Usage Charge Pilot Program
RVP - Reid Vapor Pressure
SB – Senate Bill
SBAP - Small Business Assistance Program

SCAQMD - South Coast Air Quality Management District
SCFH - Standard Cubic Feet per Hour
SEP - Supplemental Environmental Project
SHER - Statewide Hydrocarbon Emissions Reductions
SIP - State Implementation Plan
SLAMS - State/Local Air Monitoring Network
SMAT - Software for the Modeled Attainment Test
SMOKE - Sparse Matrix Operator Kernel Emissions
$SO_2$ - Sulfur Dioxide
SOV - Single Occupancy Vehicle
SSBA - Simple Steps Better Air
SULEV - Super Ultra-Low Emissions Vehicle
SUV – Sports Utility Vehicle
TAZ - Transportation Analysis Zone
TCEQ - Texas Commission of Environmental Quality
TCF - Texas Clean Fleet
TCFP - Texas Clean Fleet Program
TDM - Transportation Demand Management
TIP - Transportation Improvement Program
TLEV – Transitional Low Emission Vehicle
TMA - Transportation Management Associations
TMO - Transportation Management Organizations
TPD - Tons per Day
TPR - Transportation Planning Region
TPY - Ton per Year
TSD - Technical Support Document
TSSIP - Traffic Signal System Improvement Program
TTV - Travel Time Variation
TXLED - Texas Low Emission Diesel
UAA - Unmonitored Area analysis
ULEV - Ultra Low Emissions Vehicle
ULSD - Ultra-Low-Sulfur Diesel
USPS - United States Postal Service
VMT - Vehicle Miles Traveled
VOC - Volatile Organic Compounds
VW - Volkswagen
WBD - Windblown Dust
WRAP - Western Regional Air Partnership
WESTAR - Western State Air Resources Council
WRF - Weather Research and forecasting
ZEV - Zero Emission Vehicles

# EXECUTIVE SUMMARY

Executive Summary

## ES.1 PREAMBLE

This proposed State Implementation Plan for the Denver Metropolitan Area/North Front Range Region contains all necessary and required elements for Ozone Nonattainment Areas classified as "Serious" by the U.S. Environmental Protection Agency. The Plan was carefully developed in consultation with local, state and federal agencies to ensure that policy, regulatory, technical and administrative requirements were properly addressed and accounted for.

By accounting for all state and federally enforceable emission control measures and utilizing state-of-the-art analytical approaches, the Plan forecasts that the nonattainment area should achieve attainment with federal 8-hour ozone standard of 75 parts per billion by the required date of July 2021. However, the actual ozone monitoring data collected this past summer indicate that the region will fall short of attainment. Consequently, we are already preparing for the downgrade to severe non-attainment status and have intensified our planning to identify and implement the additional emission reduction measures that are necessary to achieve attainment of both the 2008 and 2015 ozone standards.

## ES.2 BACKGROUND

On May 21, 2012, the Denver Metro/North Front Range (DM/NFR) region was designated as Marginal nonattainment for the 2008 National Ambient Air Quality Standard (NAAQS) of 0.075 parts per million (ppm) effective July 20, 2012[1]. This included the seven counties of Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, and Jefferson in the Denver Metropolitan Area, and the southern portions of Larimer and Weld counties in the North Front Range area. The initial attainment deadline of December 31, 2015 was established in the final Implementation Rule for 2008 National Ambient Air Quality Standards for Ozone: Nonattainment Area Classifications Approach, Attainment Deadlines and Revocation of the 1997 Ozone Standards for Transportation Conformity Purposes Final Rule[2]. However, a subsequent decision by the D.C. Circuit Court in *NRDC v. EPA,* 777 F.3d 456 (D.C. Cir. 2014) in December 2014 revised the attainment deadline to July 20, 2015, which was three years after the effective date of designations. With July being the middle of the ozone season for the DM/NFR region, this ruling resulted in the DM/NFR region having to demonstrate attainment a year earlier than initially planned.

At the conclusion of the 2014 ozone season, four monitors violated the 2008 Ozone NAAQS based on the 3–year average of the 4th highest ozone concentration for the years 2012–2014. In addition, two monitors exceeded the standard based on the 4th maximum for 2014, thus the DM/NFR region did not qualify for a one–year attainment date extension based on “clean data” in 2014. On May 4, 2016, the U.S. Environmental Protection Agency (EPA) published a final rule[3] that determined Colorado’s Marginal ozone nonattainment area failed to attain the 2008 8–Hour Ozone NAAQS by the applicable Marginal attainment deadline and therefore reclassified the DM/NFR area to Moderate and required attainment of the NAAQS no later than July 20, 2018 based on 2015–2017 ozone season data.

At the conclusion of the 2017 ozone season three monitors in the DM/NFR had 3-year averages of the 4th highest ozone concentration that exceed the standard. However, the area did have a year of clean data

[1] EPA, Air Quality Designations for the 2008 Ozone National Ambient Air Quality Standards, Final Rule, *See* 77 Fed. Reg. 30088 (May 21, 2012).

[2] EPA, Implementation Rule for 2008 National Ambient Air Quality Standards for Ozone: Nonattainment Area Classifications Approach, Attainment Deadlines and Revocation of the 1997 Ozone Standards for Transportation Conformity Purposes Final Rule. *See* 77 Fed. Reg. 30160 (May 21, 2012)

[3] EPA, Determinations of Attainment by the Attainment Date, Extensions of the Attainment Date, And Reclassification of Several Areas for the 2008 Ozone National Ambient Air Quality Standards. *See* 81 Fed. Reg. 26697 (May 4, 2016).

and, as a result, Colorado requested a one-year extension in 2018. The State later withdrew the request in March 26th, 2019 and on August 18th, 2019 the EPA proposed to reclassify the DM/NFR nonattainment area to Serious under the 2008 ozone standard. The reclassification was finalized in December 26th, 2019[4] with an attainment date of July 20, 2021 based on 2018 – 2020 ozone season data.

Due to the reclassification to Serious, additional planning requirements were triggered, including the requirement to submit revisions to the State Implementation Plan (SIP) that address the Clean Air Act's (CAA) Serious nonattainment area requirements, as set forth in CAA Section 182(c) and the final SIP Requirements Rule[5] for the 2008 Ozone NAAQS. The proposed SIP revision includes the following mandatory planning elements which are discussed in detail in this proposed Serious Area SIP and will be presented to the Board of the Regional Air Quality Council (RAQC) in July 2020 and to the Air Quality Control Commission (AQCC) in September 2020 for Request for Public Hearing in December 2020:

- Air Quality Data (Chapter 2)
- Base (2017) and Future Year (2020) Emissions Inventories (Chapters 3 and 4)
- Reasonable Further Progress Demonstration (Chapter 4)
- Modeled Attainment Demonstration with Weight of Evidence Analysis (Chapter 5)
- Reasonably Available Control Technology Analysis (Chapter 6)
- Reasonably Available Control Measures Analysis (Chapter 7)
- Motor Vehicle Inspection and Maintenance Program (Chapter 8)
- Nonattainment New Source Review Program (Chapter 9)
- Contingency Measures Plan (Chapter 10)
- Motor Vehicle Emissions Budgets and Transportation Controls (Chapter 11)
- Clean Fuel Fleet Program (Chapter 12)

## ES.3 OZONE MONITORING DATA

The enhanced ozone ambient air monitoring network in the Denver Metro area and along the northern Front Range consists of 15 stations operated by the Colorado Air Pollution Control Division (APCD) and one location (2 stations) operated by the National Park Service (NPS) and the EPA in Rocky Mountain National Park. Table 1 presents the 3–year averages of the fourth maximum 8–hour concentrations monitoring data for 2015–2017 from APCD's Denver and North Front Range monitoring sites and Rocky Mountain National Park monitoring sites, which is the technical basis for the reclassification to a Serious nonattainment area for the 2008 Ozone NAAQS.

[4] EPA, Finding of Failure To Attain and Reclassification of Denver Area for the 2008 Ozone National Ambient Air Quality Standard, Final Rule, *See* 84 Fed. Reg. 70897 (Dec. 26, 2019).

[5] EPA, 2008 Ozone NAAQS SIP Requirements Rule. See 80 Fed. Reg. 12264 (March 6, 2015).

**Table 1 - 2015 – 2017 Ozone Values in the DMNFR Nonattainment Area**

| | 4th Max | | | |
|---|---|---|---|---|
| **Monitor** | **2015** | **2016** | **2017** | **3-Year Average (2015-2017)** |
| **NREL** | 81 | 83 | 74 | **79** |
| **Rocky Flats** | 77 | 79 | 75 | **77** |
| **Chatfield State Park** | 81 | 78 | 74 | **77** |
| **Fort Collins West** | 75 | 76 | 75 | **75** |
| **Welch** | 75 | 75 | 73 | **74** |
| **Greeley - Weld Tower** | 73 | 67 | 72 | **70** |
| **Welby** | 69 | 66 | 67 | **67** |
| **Fort Collins - CSU** | 69 | 70 | 66 | **68** |
| **Rocky Mtn. Nat'l Park** | 69 | 69 | 64 | **67** |
| **Aspen Park** | 70 | 73 | 66 | **69** |
| **La Casa** (NCore) | 71 | 69 | 66 | **68** |
| **Aurora East** | 68 | 66 | 67 | **67** |
| **CAMP** | 67 | 70 | 66 | **67** |
| **Highland** | NA | 72 | 73 | **--** |
| **Boulder Reservoir** | NA | NA | 73 | **--** |

## ES.4 EMISSIONS INVENTORIES

The base year (2017) and attainment year (2020) emissions inventories for nitrogen oxides ($NO_x$) and volatile organic compounds (VOC) were developed using EPA–approved emissions models and methodology. Table 2 provides a summary of the 2017 and 2020 emissions inventories included in this SIP as used in the Attainment Demonstration modeling. Projected future emissions in 2020 were based on anticipated growth, technological advancements, and expected emissions controls that will be implemented by the 2020 ozone season.

**Table 2 - 2017 and 2020 Nonattainment Area Emissions Inventory (tons per day)**

| Description | 2017 | | 2020 | |
|---|---|---|---|---|
| | VOC | NOx | VOC | NOx |
| **Area** | **65.3** | **--** | **54.6** | **-** |
| Architectural and Industrial Maintenance | 28.6 | -- | 25.1 | - |
| Consumer Products | 20.6 | -- | 15.7 | - |
| Other | 16.2 | -- | 13.9 | - |
| **Non-Road** | **44.0** | **42.6** | **44.3** | **39.1** |
| Agriculture | 0.3 | 2.3 | 0.2 | 1.8 |
| Aviation | 1.8 | 6.4 | 1.9 | 6.9 |
| Commercial Equipment | 6.7 | 17.2 | 6.5 | 14.1 |
| Lawn and Garden | 32.1 | 7.8 | 33.0 | 7.6 |
| Railroad | 0.5 | 8.4 | 0.4 | 8.2 |
| Recreation | 2.7 | 0.5 | 2.2 | 0.5 |
| **Oil and Gas** | **163.3** | **51.0** | **119.0** | **48.2** |
| Area | 43.6 | 38.1 | 54.5 | 34.4 |
| Condensate/Oil Tanks | 107.7 | 1.4 | 50.2 | 0.6 |
| Point | 12.0 | 11.5 | 14.3 | 13.1 |
| **On-Road** | **57.6** | **68.4** | **49.4** | **54.7** |
| Light-Duty Vehicles | 55.6 | 53.5 | 47.6 | 41.4 |
| Medium/Heavy-Duty Vehicles | 2.0 | 14.9 | 1.8 | 13.3 |
| **Point** | **22.9** | **25.1** | **25.0** | **21.7** |
| EGU | 0.3 | 9.4 | 0.4 | 4.6 |
| Non-EGU | 22.6 | 15.8 | 24.6 | 17.1 |
| **Grand Total** | **353.1** | **187.1** | **292.3** | **163.7** |

## ES.5 REASONABLE FURTHER PROGRESS

Under the CAA Section 182(b)(1), Moderate or higher ozone nonattainment areas are required to demonstrate progress towards attaining the ozone standard prior to their attainment year, which is done through a Reasonable Further Progress (RFP) demonstration. As a Serious Nonattainment area the DM/NFR area is required to reduce emissions of VOCs by 3% per year for the 3-year period beginning 6 years after redesignation (July 20, 2012), until the attainment date. For DM/NFR, this means VOC emission reductions must be achieved between January 1, 2018 and December 31, 2020 to be creditable towards RFP. Based on Table 3, Colorado demonstrates that the DM/NFR nonattainment area has met the 9% RFP requirement.

**Table 3 - VOC Emission Reductions from 2017 to 2020 compared to 2011**

| Description | VOC (2011) | VOC (2017) | VOC (2020) | VOC Reductions (2017-2020) |
|---|---|---|---|---|
| Area | 60.6 | 65.3 | 54.6 | 10.7 |
| Non-Road | 58.2 | 44.0 | 44.3 | -0.3 |
| Oil and Gas | 279.7 | 163.3 | 119.0 | 44.3 |
| On-Road | 93.7 | 57.6 | 49.4 | 8.2 |
| Point | 26.5 | 22.9 | 25.0 | -2.1 |
| Grand Total | 518.8 | 353.1 | 292.3 | 60.9 |
| | (A) | (B) | (C) | = (B)-(C) |
| | | | | 9% RFP Met |

| | | |
|---|---|---|
| 9% Reduction in VOC's from 2011 Base Year Needed | | |
| = 9%*(A) | 46.7 | tpd |

| | | |
|---|---|---|
| RFP Met and Exceeded by: | | |
| =[(B)-(C)] - [9%*(A)] | 14.2 | tpd |

## ES.6 MODELED ATTAINMENT DEMONSTRATION AND WEIGHT OF EVIDENCE ANALYSIS

Serious ozone nonattainment areas are required by 42 USC § 7511a(c)(2)(A) to submit an attainment demonstration that the plan, as revised, will provide for attainment of the ozone NAAQS by the applicable attainment date. This attainment demonstration must be based on photochemical grid modeling or any other analytical method determined by the Administrator, in the Administrator's discretion, to be at least as effective. For the DM/NFR Serious area SIP, photochemical grid modeling with supplemental analyses has been used to perform the attainment demonstration modeling. Table 4 summarizes the modeled attainment results employing the 3x3 modeling grid approach contained in EPA's 2018 Modeling Guidance[6]. The projected 2020 ozone future year design value ($DV_f$) at all of the monitoring sites in the DM/NFR nonattainment area are below the 75 ppb 2008 ozone NAAQS thereby demonstrating attainment. Since the monitored 2020 ozone DV will be based on the average of the 4th highest maximum 8-hour running mean (MDA8) ozone from three years (2018, 2019 and 2020) and 2018 was a high ozone year, some of the observed 2020 ozone DVs may be above the 2008 NAAQS. However, the 2020 future modeling suggests that the 2020 4th highest MDA8 ozone will be below the 2008 ozone NAAQS.

[6] U.S. Environmental Protection Agency (EPA), Modeling Guidance for Demonstrating Attainment of Air Quality Goals for Ozone, PM2.5 and Regional Haze", Nov. 2018.

**Table 4 - Design Value Results Based on Various Modeled Attainment Tests**

| Monitor | Site | County | DVb (ppb) | RRF 3x3 | DVf (ppb) |
|---|---|---|---|---|---|
| 80350004 | CHAT | Douglas | 77.3 | 0.9630 | 74.4 |
| 80590006 | RFNO | Jefferson | 77.3 | 0.9413 | 72.7 |
| 80590011 | NREL | Jefferson | 79.3 | 0.9577 | 75.9 |
| 80690011 | FTCW | Larimer | 75.7 | 0.9523 | 72.0 |
| 80310002 | CAMP | Denver | 67.7 | 0.9749 | 66.0 |
| 80310026 | CASA | Denver | 68.7 | 0.9679 | 66.4 |
| 80013001 | WELB | Adams | 67.0 | 0.9616 | 64.4 |
| 80050002 | HIGH | Arapahoe | 73.0 | 0.9681 | 70.6 |
| 80050006 | AURE | Arapahoe | 67.7 | 0.9650 | 65.3 |
| 80590005 | WELC | Jefferson | 73.0 | 0.9551 | 69.7 |
| 80590013 | ASNP | Jefferson | 70.0 | 0.9481 | 66.3 |
| 80690007 | RMNP | Larimer | 69.0 | 0.9531 | 65.7 |
| 80691004 | FTCO | Larimer | 69.0 | 0.9528 | 65.7 |
| 81230009 | WELD | Weld | 70.0 | 0.9577 | 67.0 |

DVb = base year design value, RRF = relative response factor

Supplemental analyses were also performed as part of the weight of evidence analysis that supports the SIP. These analyses include:

- Additional modeling analysis.
- Analyses of trends in ambient air quality and emissions.
- Additional emissions controls/reductions.

## ES.7 REASONABLY AVAILABLE CONTROL TECHNOLOGY ANALYSIS

As a Serious nonattainment area, under CAA section 182(c), Colorado must also submit a revised SIP that includes Reasonably Available Control Technology (RACT) analysis for major stationary sources, which for a Serious nonattainment area, major sources of VOCs and $NO_x$ in the nonattainment areas are those with the potential to emit 50 tons per year (tpy) or more. EPA defines RACT as the lowest emissions limitation that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility. Because a RACT analysis takes into account the technological and economic impacts of controls, the analysis and determination may differ from source to source and location to location. For RACT tied to attainment (i.e., measures for which credit is taken in the 2020 attainment demonstration), RACT must be implemented by August 3, 2020[5]. For RACT not tied to attainment, RACT must be implemented no later than July 20, 2021.

As part of the RACT analysis, Colorado reviewed the EPA's Control Techniques Guidelines (CTG) and compared them to Colorado's point source inventory and existing rules. Colorado also reviewed EPA's Alternative Control Techniques (ACT), EPA's RACT, Best Available Control Technology (BACT), Lowest Achievable Emission Rate Clearinghouse (RBLC), EPA's Menu of Control Measures (4/2/2010), federal New Source Performance Standards (NSPS), federal National Emission Standards for Hazardous Air Pollutants (NESHAP), and regulations applicable in other states' ozone nonattainment areas for potential emission control measures. Any identified potential control measures or strategies were further evaluated to determine whether the measures were reasonably available considering technological and economic feasibility, including whether the measures could be implemented by July 20, 2021. Colorado similarly

evaluated Colorado's major VOC or $NO_x$ sources in the nonattainment area against the CTGs, ACT, RBLC, Menu of Control Measures, NSPS, federal Emission Guidelines (EG), and NESHAP for potential additional control measures.

## ES.8 REASONABLY AVAILABLE CONTROL MEASURES ANALYSIS

As a result of reclassification to a Serious nonattainment area, under CAA section 172(c)(1) Colorado must also submit a Reasonably Available Control Measures (RACM) analysis, which must demonstrate that the state has adopted all reasonable measures to meet RFP and to demonstrate attainment. The Serious SIP revision includes enforceable control measures as well as discussion of other measures being implemented in the nonattainment area, but not included as part of this SIP. The control measures listed in Table 5 are included in the SIP as it relates to the 2020 emissions inventory and photochemical modeling in the attainment demonstration.

**Table 5 - Federally Enforceable Measures**

| Measures Included in the SIP |
|---|
| **Mobile Sources** |
| Federal On–Road and Non–Road Mobile Source Standards and Regulations |
| Vehicle Inspection and Maintenance Program – AQCC Regulation Number 11 |
| 7.8 Reid Vapor Pressure with 1 PSI Ethanol Waiver (8.8 RVP) |
| Stage I Vapor Recovery – AQCC Regulation No. 7 Part B, § VII |
| **Stationary Sources** |
| Oil and Gas Regulations – AQCC Regulation Number 7 |
| Regional Haze SIP Provisions and Minor Source RACT – AQCC Regulation Number 3 |
| Other Stationary Source Regulations – AQCC Regulation Nos. 3, 6, 7, and 8 |
| **Area Sources** |
| Control of Volatile Organic Compounds from Consumer Products and Architectural and Industrial Maintenance Coatings – AQCC Regulation Number 21 |

It has been determined through the RACM analysis that many control measures are currently being implemented including emission reduction measures that are not included as enforceable measures in the SIP, but are having a real world impact on ozone levels. Beyond this, there is a continuing effort by the RAQC's Control Strategy Committee to review additional strategies that may be feasible in the nonattainment area, but such strategies cannot be implemented in time to be incorporated into the Serious area SIP.

## ES.9 MOTOR VEHICLE INSPECTION AND MAINTENANCE PROGRAM

In 1995, the Denver metropolitan region implemented an "enhanced" vehicle inspection and maintenance (I/M) program as was required under the CAA. This program was regulated through AQCC Regulation Number 11. Additional program modifications were made throughout the 2000's and provided to EPA as SIP revisions. In 2009, the program was expanded to include portions of Larimer and Weld Counties as a "State–only" provision. With the previous Moderate area SIP, the plan was revised to incorporate the "State-only" counties as federally enforceable. As the area has been meeting the standards of the enhanced I/M program required for Serious nonattainment areas no major revisions are

required with this submittal. Recently, only minor revisions have been made which were approved by the EPA in February of 2019.

## ES.10 NONATTAINMENT NEW SOURCE REVIEW

As a Serious nonattainment area, under CAA section 182(c)(5) Colorado must also submit a revised SIP that addresses $NO_x$ and VOC emission offsets under Colorado's Nonattainment New Source Review (NSR) permitting program. The CAA requires a permitting agency to determine that a source has obtained sufficient offsetting emissions reductions, when necessary to compensate for a proposed emissions increase, prior to commencing operation. Colorado's AQCC Regulation Number 3, Part D, Section V.A. requires that, among other things, a major stationary source in a Serious ozone nonattainment area obtain a ratio of total actual emission reductions of VOC compared to the emissions increase of VOC of at least 1.2:1 prior to commencement of operations and permitting by the Division. EPA approved these provisions into Colorado's SIP on January 25, 2016 (81 FR 3963). Therefore, Colorado's SIP adequately addresses the CAA's Serious nonattainment area requirements for $NO_x$ and VOC emission offsets. Major source threshold remains at a potential to emit 50 tons or more per year.

## ES.11 CONTINGENCY MEASURES PLAN

Section 172(c)(9) of the CAA requires that a nonattainment area SIP provide for the implementation of specific measures, termed contingency measures, if an area fails to attain the NAAQS or demonstrate RFP by the required deadline. For the DM/NFR Nonattainment Area, since the deadline to attain is July 20, 2021, contingency measures must result in additional emissions reductions after the attainment year.

For this contingency plan, the target emissions reductions were 2% $NO_x$ and 1% VOC from on-road mobile sources to meet the 3% requirement. As demonstrated in Table 6, anticipated future year reductions satisfy the contingency measure requirement with nearly a 3% reduction in NOx emissions and a 1% reduction of VOC emissions from on-road mobile sources based on the 2011 emissions inventory, totaling 5.4 tpd of VOCs and 9.3 tpd of NOx.

**Table 6 - VOC and NOX Emission Reductions from Contingency Measures**

| Line # | Description | VOC | NOx |
|---|---|---|---|
| **3% Contingency Requirement** | | | |
| 1 | NAA 2011 base year emissions inventory | 518.8 | 320.0 |
| 2 | 3% contingency reduction required (NOx and/or VOC) | 1.0% | 2.0% |
| 3 | **3% contingency reduction required (NOx and/or VOC)[A]** | **5.2** | **6.4** |
| 4 | NAA 2020 on-road mobile emissions inventory | 49.4 | 54.7 |
| 5 | NAA 2022 on-road mobile emissions inventory | 44.0 | 45.4 |
| 6 | **Total creditable mobile source reductions in 2022[B]** | **5.4** | **9.3** |
| 7 | % contingency reductions achieved[C] | 1.0% | 2.9% |
| 8 | Excess (+) / Shortfall (-)[D] | 0.2 | 2.9 |
| **Is 3% Contingency Requirement Met?** | | **Yes** | **Yes** |

[A] Line 1 * Line 2 [C] Line 6 / Line 1

[B] Line 4 - Line 5 [D] Line 6 - Line 3

## ES.12 MOTOR VEHICLE EMISSIONS BUDGETS

Transportation conformity is required under CAA section 176(c) to ensure that federally funded or approved highway and transit activities are consistent with ("conform to") the purpose of the SIP. Transportation conformity applies to designated nonattainment and maintenance areas for transportation–related criteria pollutants, including ozone, and requires that SIPs establish Motor Vehicle Emissions Budgets (MVEB). MVEBs are defined as the portion of the total allowable emissions defined in the submitted or approved SIP or maintenance plan for a certain date for the purpose of meeting RFP milestones or demonstrating attainment or maintenance of the NAAQS for any criteria pollutant or its precursors, allocated to highway and transit vehicle use and emissions.

The DM/NFR 8–hour ozone nonattainment area encompasses multiple Metropolitan Planning Organizations (MPO). The Denver Regional Council of Governments (DRCOG) is the MPO responsible for transportation planning in the 7–county Denver metropolitan area and a portion of southwest Weld County. Likewise, the North Front Range Metropolitan Planning Organization (NFRMPO) is the MPO responsible for transportation planning in the urbanized portions of Larimer and Weld counties.
For purposes of this SIP, MVEBs for VOC and $NO_x$ are established for the 2020 attainment year. Based on EPA guidance[7], this SIP maintains both an area–wide budget and subarea budgets allowing either to be used for transportation conformity purposes. The two subareas are defined as follows and shown in Table 7:

- **Northern Subarea**: Area denoted by the ozone nonattainment area north of the Boulder County northern boundary and extended through southern Weld County to the Morgan County line. This area includes the NFRMPO transportation planning area as well as the northern ozone nonattainment area portion of the Upper Front Range Transportation Planning Region (TPR) in Larimer and Weld counties.

- **Southern Subarea**: Area denoted by the ozone nonattainment area south of the Boulder County northern boundary and extended through southern Weld County to the Morgan County line. This area includes the nonattainment portion of DRCOG's' regional planning area and the southern Weld County portion of the Upper Front Range TPR.

Following the same approach as the previously approved ozone Moderate area SIP, this revision proposed to set new MVEBs for the northern and southern subareas, which upon EPA's finding of adequacy or approval will be the new budgets for upon which both MPOs will base future ozone conformity determinations until a subsequent budget is developed and approved.

**Table 7 - 8–Hour Subarea and Total Motor Vehicle Emissions Budgets**

| Motor Vehicle Emissions Budgets | 2020 | |
|---|---|---|
| | VOC (tpd) | $NO_x$ (tpd) |
| **Northern Subarea Budget** *(NFRMPO& UFR TPR Subarea)* | 8.2 | 9.7 |
| **Southern Subarea Budget** (*DRCOG & UFR TPR Subarea*) | 41.2 | 45.0 |
| **Total Nonattainment Area Budget** *(Entire Nonattainment Area)* | **49.4** | **54.7** |

[7] EPA, Guidance for Transportation Conformity Implementation in Multi-Jurisdictional Nonattainment and Maintenance Areas, July 2012

## ES.13 CLEAN FUEL FLEET PROGRAM

As a Serious nonattainment area, CAA section 182(c)(4) requires the implementation of the Clean Fuel Fleet Program (CFFP). Regulations for the Federal CFFP[8] were promulgated in March 1993 and have been codified at 40 CFR sections 88.301-93 - 88.313-93. Under section 246 of the CAA, certain states were required to adopt and submit to EPA a SIP revision containing a CFFP for ozone nonattainment areas with a 1980 population greater than 250,000 that were classified as serious, severe, or extreme. The CFFP requires fleet operators with 10 or more centrally-fueled vehicles or vehicles capable of being centrally-fueled to include a specified percentage of clean-fuel vehicles (CFV) in their purchases each year and to meet additional CAA requirements, including the requirement that covered fleet operators must operate the CFVs in covered nonattainment areas on a clean alternative fuel, defined as a fuel on which the vehicle meets EPA's CFV standards. EPA promulgated emission standards for CFVs[9] in September 1994.

Based on Tier 2 and Tier 3 vehicles making up over 80% of Colorado's fleet in 2020, Colorado has demonstrated that no additional State rulemaking or substitution measure is necessary to satisfy the CFFP requirement as the emission reductions that would be generated by Colorado adopting a CFFP have been eclipsed by EPA's Tier 2, Tier 3, and heavy-duty emissions standards. Additionally, in recognition of the many months required for the Colorado Air Pollution Control Division (APCD) to draft new rules and seek approval before the Colorado AQCC, it is likely that a new CFFP requirement for the DM/NFR area could not be implemented until 2022 (model year 2023) at the earliest. Thus, it would be both infeasible for Colorado to attempt to develop and implement a CFFP requirement in time for the 2020 ozone season nor would developing such a program have any air quality benefits to the region. Furthermore, the DM/NFR ozone nonattainment area is not relying upon any emissions reduction credits from a CFFP in its associated attainment demonstration or to meet RFP.

Lastly, Colorado has recently adopted California's Low Emission Vehicle (LEV) standards[10] as well as a Zero Emission Vehicles (ZEV) mandate[11], which are scheduled to be implemented no later than 2023. While the legal question of California establishing vehicle emissions standards is being adjudicated in the federal courts that will directly impact states such as Colorado who have adopted California vehicle standards, Colorado believes it has exceeded what can be reasonably expected to meet the CFFP requirements of the CAA.

[8] U.S EPA, Final Rule Clean Fuel Fleet Credit Program, Transportation Control Measures, and Related Provisions, (See 58 Fed. Reg. 11901, Mar. 1, 1993).

[9] U.S EPA, Final Rule Emission Standards for Clean-Fuel Vehicles and Engines, Requirements for Clean-Fuel Vehicle Conversions, and California Pilot Test Program, (See 59 Fed. Reg. 50042, Sept. 30, 1994).

[10] Colorado AQCC Regulation Number 20, Part B, adopted Nov. 15, 2018

[11] Colorado AQCC Regulation Number 20, Part C, adopted Aug. 19, 2019

# CHAPTER 1
# BACKGROUND AND OVERVIEW OF SERIOUS AREA SIP REQUIREMENTS

1 ONE
Chapter 1 – Background and Overview of Serious Area SIP Requirements

## 1.1 OVERVIEW

On May 21, 2012, the Denver Metro/North Front Range (DM/NFR) region was designated as Marginal nonattainment for the 2008 National Ambient Air Quality Standard (NAAQS) of 0.075 parts per million (ppm) effective July 20, 2012[12]. This included the seven counties of Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, and Jefferson in the Denver Metropolitan Area, and the southern portions of Larimer and Weld counties in the North Front Range area. The initial attainment deadline of December 31, 2015 was established in the final Implementation Rule for 2008 National Ambient Air Quality Standards for Ozone: Nonattainment Area Classifications Approach, Attainment Deadlines and Revocation of the 1997 Ozone Standards for Transportation Conformity Purposes Final Rule[13]. However, a subsequent decision by the D.C. Circuit Court in *NRDC v. EPA,* 777 F.3d 456 (D.C. Cir. 2014) in December 2014 revised the attainment deadline to July 20, 2015, which was three years after the effective date of designations. With July being the middle of the ozone season for the DM/NFR region, this ruling resulted in the DM/NFR region having to demonstrate attainment a year earlier than initially planned.

At the conclusion of the 2014 ozone season, four monitors violated the 2008 Ozone NAAQS based on the 3–year average of the 4$^{th}$ highest ozone concentration for the years 2012–2014. In addition, two monitors exceeded the standard based on the 4$^{th}$ maximum for 2014, thus the DM/NFR region did not qualify for a one–year attainment date extension based on "clean data" in 2014. On May 4, 2016, the U.S. Environmental Protection Agency (EPA) published a final rule[14] that determined Colorado's Marginal ozone nonattainment area failed to attain the 2008 8–Hour Ozone NAAQS by the applicable Marginal attainment deadline and therefore reclassified the DM/NFR area to Moderate and required attainment of the NAAQS no later than July 20, 2018 based on 2015–2017 ozone season data.

At the conclusion of the 2017 ozone season three monitors in the DM/NFR had 3-year averages of the 4$^{th}$ highest ozone concentration that exceeded the standard. However, the area did have a year of clean data and, as such, Colorado requested a one-year extension in 2018. The State later withdrew the request in March 26$^{th}$, 2019 and on August 18$^{th}$, 2019 the EPA proposed to reclassify the DM/NFR nonattainment area to Serious under the 2008 ozone standard. The reclassification was finalized December 26$^{th}$, 2019[15] with an attainment of the NAAQS no later than July 20, 2021 based on 2018 – 2020 ozone season data.

Due to the reclassification to Serious, additional planning requirements were triggered, including the requirement to submit revisions to the State Implementation Plan (SIP) that address the Clean Air Act's (CAA) Serious nonattainment area requirements, as set forth in CAA Section 182(c) and the final SIP Requirements Rule[16] for the 2008 Ozone NAAQS.

[12] EPA, Air Quality Designations for the 2008 Ozone National Ambient Air Quality Standards, Final Rule, *See* 77 Fed. Reg. 30088 (May 21, 2012).

[13] EPA, Implementation Rule for 2008 National Ambient Air Quality Standards for Ozone: Nonattainment Area Classifications Approach, Attainment Deadlines and Revocation of the 1997 Ozone Standards for Transportation Conformity Purposes Final Rule. *See* 77 Fed. Reg. 30160 (May 21, 2012)

[14] EPA, Determinations of Attainment by the Attainment Date, Extensions of the Attainment Date, And Reclassification of Several Areas for the 2008 Ozone National Ambient Air Quality Standards. *See* 81 Fed. Reg. 26697 (May 4, 2016).

[15] EPA, Finding of Failure To Attain and Reclassification of Denver Area for the 2008 Ozone National Ambient Air Quality Standard, Final Rule, *See* 84 Fed. Reg. 70897 (Dec. 26, 2019).

[16] EPA, 2008 Ozone NAAQS SIP Requirements Rule. See 80 Fed. Reg. 12264 (March 6, 2015).

## 1.2 HOW OZONE IS FORMED

Ground–level ozone is not emitted directly into the air, but is created by complex chemical reactions between nitrogen oxides ($NO_X$) and volatile organic compounds (VOC), and, to a lesser extent, carbon monoxide (CO), in the presence of sunlight. Emissions from industrial facilities and electric utilities, motor vehicle exhaust, gasoline vapors, and chemical solvents are some of the major sources of $NO_X$ and VOC.

In the DM/NFR, ozone is principally a summertime problem associated with high temperatures, intense sunlight, little cloud cover, light winds, and persistent high pressure systems. Colorado monitors ambient ozone concentrations at 15 sites in the DM/NFR. High ozone levels are more likely to be recorded at monitors along the foothills from Fort Collins in Larimer County south to Chatfield Reservoir in Douglas County. Typically, light, easterly winds transport VOC and $NO_X$ pollutants throughout the metro area and intense sunlight "bakes" the pollutants, resulting in higher concentrations along the foothills during prime ozone meteorological conditions.

## 1.3 OZONE HEALTH EFFECTS

Breathing ozone can trigger a variety of health problems including chest pain, coughing, throat irritation, and congestion. People with chronic lung and heart diseases, children, older adults, and even healthy people who are active outdoors can be affected when ozone levels are unhealthy. Ozone can worsen symptoms for those who have pre–existing conditions such as bronchitis, emphysema, asthma, chronic obstructive pulmonary disease, and heart disease. Ozone can also reduce lung function and inflame the linings of the lungs, and repeated exposure may permanently scar lung tissue. Ozone exposure can also increase the mortality risk for susceptible individuals, including the elderly and those with pre–existing conditions.

Numerous scientific studies have linked ground–level ozone exposure to a variety of problems, including:

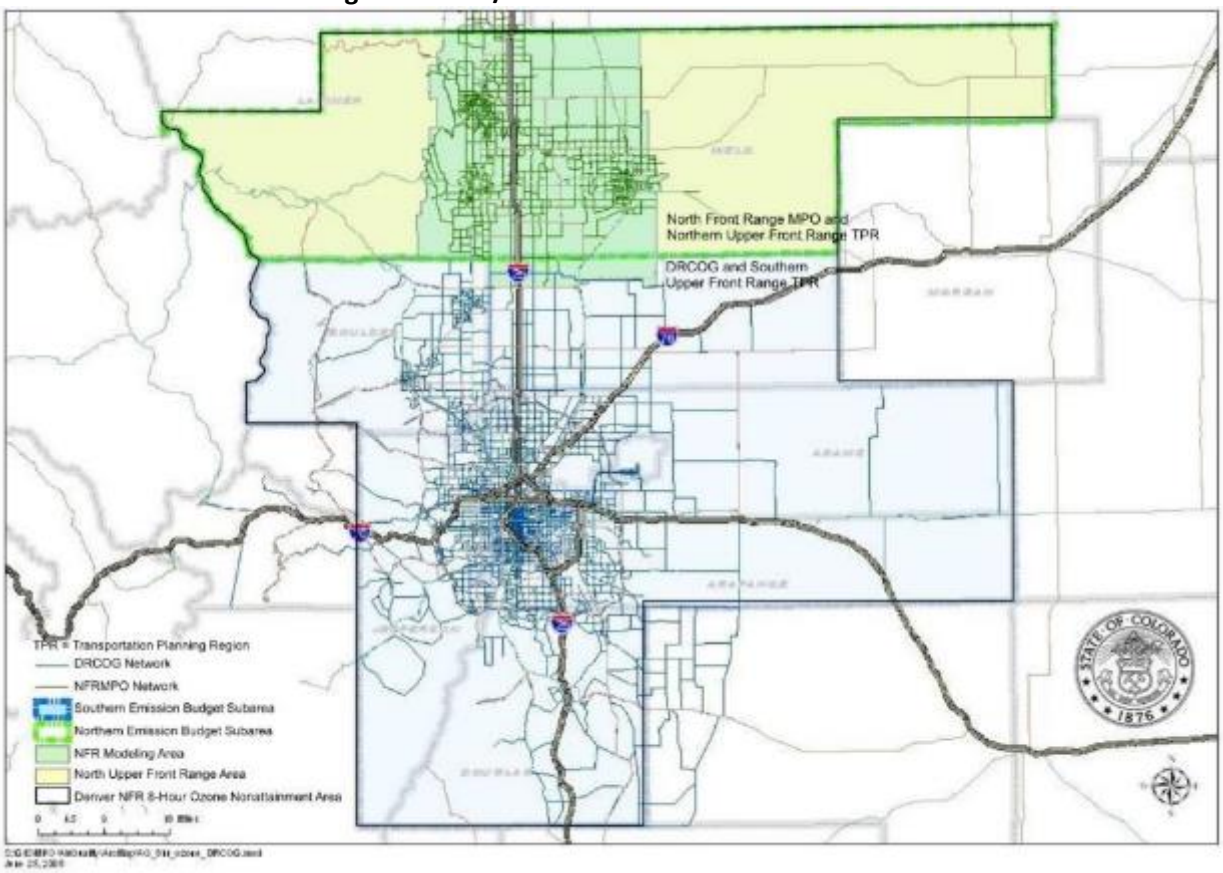
- airway irritation, coughing, and pain when taking a deep breath
- wheezing and breathing difficulties during exercise or outdoor activities
- inflammation of respiratory tract tissues
- aggravation of asthma and increased susceptibility to respiratory illnesses like pneumonia and bronchitis
- permanent lung damage with repeated exposures
- cardiac impacts

The CAA requires EPA to set air quality standards to protect both public health and the public welfare (e.g. crops and vegetation). States and local areas must develop plans to achieve these health–based standards as expeditiously as practical, but no later than the deadlines specified by the Clean Air Act (CAA).

## 1.4 DENVER METRO/NORTH FRONT RANGE OZONE NONATTAINMENT AREA

The nonattainment area boundary of the DM/NFR 8–hour ozone nonattainment area was established in 2004 through designations for the 1997 8–hour ozone NAAQS and was unchanged under EPA's April 2012 designations for the 2008 ozone standard and August 2018 designations under the 2015 ozone standard. This includes all of Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, and Jefferson counties, as well as portions of Larimer and Weld counties, as shown in Figure 1.

**Figure 1 – DM/NFR Ozone Nonattainment Area**




## 1.5 HISTORY OF THE OZONE NAAQS IN DENVER METRO/NORTH FRONT RANGE AREA

Over the past 40 years, there have been considerable efforts made in the DM/NFR to reduce precursor emissions that contribute to ozone, namely $NO_X$ and VOC, which has resulted in significant reductions in ozone. The region was initially designated as nonattainment for the 1–hour standard, the 1997 8–hour standard, the 2008 8–hour ozone standard, and the 2015 8-hour ozone standard. The region has not violated the 1–hour ozone standard since 1987 and has not violated the 1997 8–hour ozone standard since 2008.

### 1.5.1 1–Hour Ozone Standard

A revised ozone standard (0.12 parts per million (ppm) (120 parts per billion (ppb)) over a one– hour period) was promulgated by the EPA in 1978. A violation occurs when an area exceeds the ozone standard more than three times in three years at a given monitor. In March 1978, the EPA designated the DMA as nonattainment for the Ozone NAAQS. A SIP was developed and submitted to EPA in 1982 and approved by EPA in 1983[17]. The region attained this standard in 1988, however EPA reaffirmed the nonattainment designation in 1991, classifying the region as a "transitional" ozone nonattainment area, at which point the State began moving forward on developing a maintenance plan. In 2001, EPA approved the Ozone Maintenance Plan[18] and redesignated the region to attainment. In April 2009, EPA revoked the 1–hour standard[19], which was effective November 20, 2008 for the DM/NFR (one year after the region's deferred nonattainment status for the 8–hour ozone standard was not extended by the EPA).

### 1.5.2 1997 8–Hour Ozone Standard

In 1997, EPA established a new, more stringent standard for ozone. The new 8–hour standard was set at a level of 0.08 ppm (80 ppb) averaged over an 8–hour period. To take into account extreme and variable meteorological conditions that can influence ozone formation, the regional design value, which is the attainment benchmark, is based on the three–year average of the 4th maximum 8–hour average ozone value at any given monitor. Due to rounding, the EPA considers a violation of this standard to occur when the design value is equal to or greater than 85 ppb.

In December 2002, Colorado's state and regional agencies with responsibilities for air quality and transportation planning in the Denver Metro Area entered into an Early Action Compact (EAC) with EPA Region 8. This allowed for a deferral of nonattainment designation based on the development of an Ozone Action Plan (OAP) to achieve attainment prior to the end of 2007. However, in November 2007, due to a violation of the 1997 ozone standard, based on 2005–2007 monitor data the 7–county Denver Metro Area plus parts of Larimer and Weld Counties were designated nonattainment and given an attainment deadline of November 20, 2010. An Attainment Demonstration SIP was submitted in July 2009, which was partially approved by EPA in 2011[20]. Based on a three–year design value, the region has not violated this standard since 2009 and in 2015, the standard was revoked by EPA[21].

[17] EPA, Approval and Promulgation of State Implementation Plans; Colorado Carbon Monoxide/Ozone Attainment Plan, Final Rulemaking, *See* 48 Fed. Reg. 55284 (Dec. 12, 1983).

[18] EPA, Approval and Promulgation of Air Quality Implementation Plans; State of Colorado; Denver 1-Hour Ozone Redesignation to Attainment, Designation of Areas for Air Quality Planning Purposes, and Approval of Related Revisions, Final rule, *See* 66 Fed. Reg. 47086 (Sept. 11, 2001).

[19] EPA, Final 8-Hour Ozone National Ambient Air Quality Standards Designations for the Early Action Compact Areas, Final Rule, *See* 73 Fed. Reg. 17897 (Apr. 2, 2008).

[20] EPA, Approval and Promulgation of State Implementation Plans; State of Colorado; Attainment Demonstration for the 1997 8-Hour Ozone Standard, and Approval of Related Revisions, Final Rule, *See* 76 Fed. Reg. 47443 (Aug. 5, 2011).

[21] EPA, Implementation of the 2008 National Ambient Air Quality Standards for Ozone: State Implementation Plan Requirements, Final Rule, *See* 80 Fed. Reg. 12264 (Mar. 26, 2015).

### 1.5.3 2008 8–Hour Ozone Standard

In March 2008, the EPA revised the 1997 8–hour ozone NAAQS making it more stringent based on the most current health effects information available at the time. The revised ozone standard was set at a level of 0.075 ppm (75 ppb) averaged over an 8–hour period. The EPA maintained the same form of the standard where a violation of the standard occurs when the three–year average of the 4th maximum daily value at a monitor exceeds the federal standard. The region was originally classified as a Marginal nonattainment area, with an attainment date of July 20, 2015, based on the three-year average for 2012-2014. The region did not attain by the deadline, so was reclassified in 2016 to a Moderate nonattainment area with a new attainment date of July 20, 2018, based on the three-year average for 2015-2017. The three–year average 4th maximum values for 2015 to 2017, excluding exceptional events, are provided in Table 8 below. The region did not attain by the deadline, but did have "clean data" in 2017, which qualified Colorado to request a one-year extension. This request was submitted by the State to EPA, but then later revoked, resulting in the reclassification of the region to a Serious nonattainment area as of January 2020. The new attainment date is July 20, 2021 based on the three-year average for 2018-2020. A more detailed discussion of the air quality data is presented in Chapter 2.

**Table 8 – 2015 – 2017 Ozone Values in the DM/NFR Nonattainment Area**

| | Annual 4th Maximum Daily 8-Hour Ozone Average (ppb) | | | |
|---|---|---|---|---|
| **Monitor** | **2015** | **2016** | **2017** | **3-Year Average (2015-2017)** |
| **NREL** | 81 | 83 | 74 | **79** |
| **Rocky Flats** | 77 | 79 | 75 | **77** |
| **Chatfield State Park** | 81 | 78 | 74 | **77** |
| **Fort Collins West** | 75 | 76 | 75 | **75** |
| **Welch** | 75 | 75 | 73 | **74** |
| **Greeley - Weld Tower** | 73 | 67 | 72 | **70** |
| **Welby** | 69 | 66 | 67 | **67** |
| **Fort Collins - CSU** | 69 | 70 | 66 | **68** |
| **Rocky Mtn. Nat'l Park** | 69 | 69 | 64 | **67** |
| **Aspen Park** | 70 | 73 | 66 | **69** |
| **La Casa** | 71 | 69 | 66 | **68** |
| **Aurora East** | 68 | 66 | 67 | **67** |
| **CAMP** | 67 | 70 | 66 | **67** |
| **Highland** | NA | 72 | 73 | -- |
| **Boulder Reservoir** | NA | NA | 73 | -- |

### 1.5.4 2015 8–Hour Ozone Standard

In October 2015, the EPA further revised the 8–hour ozone NAAQS making it more stringent based on the most current health effects information available at the time. The revised ozone standard was set at a level of 0.070 ppm (70 ppb) averaged over an 8–hour period. The EPA maintained the same form of the standard where a violation of the standard occurs when the three–year average of the 4th maximum daily value at a monitor exceeds the federal standard and designated the region as a Marginal nonattainment area as of August 2018. Requirements for a Marginal area[22] under the 2015 standard are being submitted by the State of Colorado through a separate process. The Marginal SIP includes a 2017 base year inventory, certification letter, and table of required elements. The 2017 Marginal SIP inventory is the same as the 2017 inventory included in this Serious SIP revision.

[22] AQCC, Marginal SIP for the 2015 Ozone NAAQS, Approved June 18, 2020.

## 1.6 AIR QUALITY AGENCIES IN THE DM/NFR OZONE NONATTAINMENT AREA

Colorado Regulation Number 10 sets out the minimum requirements for interagency involvement consultation (Federal, State, regional and local) and resolution of conflict related to development of the SIP and transportation conformity. In responding to CAA requirements for SIP development, the local lead air quality planning agency, in close consultation and support from the Colorado Air Pollution Control Division (APCD), takes the lead in developing solutions for pollution problems that require special understanding of local industries, geography, housing, and travel patterns, as well as other factors. The roles and responsibilities of each of the agencies involved in the SIP development process are as follows:

### 1.6.1 Regional Air Quality Council

The Regional Air Quality Council (RAQC) is designated by the Colorado Governor as the lead air quality planning agency for the Denver metropolitan area and the lead air quality planning agency for ozone for Colorado's North Front Range. In this capacity, the mission of the RAQC is to develop effective and cost–efficient air quality initiatives with input from state and local government, the private sector, stakeholder groups, and private citizens. The RAQC's primary task is to prepare SIPs for compliance with federal air quality standards. The RAQC consists of a 29–member board appointed by the Governor.

### 1.6.2 Colorado Department of Public Health and Environment – Air Pollution Control Division

The APCD is housed under the Colorado Department of Public Health and Environment (CDPHE) and assists the RAQC in the SIP development process. This includes development of official emissions inventories, implementation of the region's Inspection and Maintenance (IM) program, permitting and analysis of Reasonably Available Control Technology (RACT), maintaining the air quality monitoring network, and assisting in the evaluation of potential emission reduction measures as part of the Reasonably Available Control Measures (RACM) analysis. In addition, the APCD is responsible for developing regulations necessary to implement the federally enforceable provisions of the SIP.

### 1.6.3 Colorado Air Quality Control Commission

The Colorado Air Quality Control Commission (AQCC) is the regulatory body with responsibility for adopting air quality regulations consistent with state statute including the responsibility and the authority to adopt SIPs and implementing regulations. The AQCC takes action on SIPs and regulations through a public hearing process. The AQCC has nine members who are appointed by the Governor and confirmed by the State Senate.

### 1.6.4 Interagency Consultation Group

In the DM/NFR nonattainment area, an Interagency Consultation Group (ICG) is made up of representatives from the regional Metropolitan Planning Organizations, local transit agencies, the RAQC, the APCD, the Colorado Department of Transportation (CDOT), EPA, and the Federal Highway Administration (FHWA). The role of this group is to undertake an interagency consultation process, in accordance with Colorado Regulation Number 10, as it relates to the development of the SIP, applicable control measures related to transportation included in the SIP, transportation plans, the Transportation Improvement Program (TIP), and Transportation Conformity determinations. The Denver Regional Council of Governments (DRCOG) is the metropolitan planning organization (MPO) responsible for transportation planning in the 7–county Denver metropolitan area and a portion of southwest Weld County. Likewise, the North Front Range Metropolitan Planning Organization (NFRMPO) is the MPO responsible for transportation planning in the urbanized portions of Larimer and Weld counties.

## 1.7 SERIOUS AREA SIP ELEMENTS

The DM/NFR region was given a new attainment deadline of July 20, 2021 and is required to develop and submit a SIP on an expedited schedule. For a Serious nonattainment area, a SIP revision is required to include the following mandatory planning elements as required in CAA section 182(c) and as outlined in the final SIP Requirements Rule[23]:

- Air Quality Data (Chapter 2)
- Base (2017) and Future Year (2020) Emissions Inventories (Chapters 3 and 4)
- Reasonable Further Progress Demonstration (Chapter 4)
- Modeled Attainment Demonstration and Weight of Evidence Analysis (Chapter 5)
- Reasonably Available Control Technology Analysis (Chapter 6)
- Reasonably Available Control Measures Analysis (Chapter 7)
- Motor Vehicle Inspection and Maintenance Program (Chapter 8)
- Nonattainment New Source Review Program (Chapter 9)
- Contingency Measures Plan (Chapter 10)
- Motor Vehicle Emissions Budgets and Transportation Control (Chapter 11)
- Clean Fuel Fleet Program (Chapter 12)

## 1.8 SERIOUS AREA SIP DEVELOPMENT PROCESS

The development of the SIP for the 2008 Ozone NAAQS was led by the RAQC, with close coordination and assistance from the APCD. The RAQC is responsible for coordinating with the APCD and EPA on the development of the various elements of the SIP and crafting the SIP for adoption by the AQCC. Work began in March 2019 in anticipation of the reclassification to a Serious nonattainment area by the EPA following the revocation of the one-year extension request. This timeline required SIP development and submittal on an expedited schedule.

A subset of the SIP development process was the RAQC's Control Strategy Committee process. Initially the RAQC operated three committees, made up of RAQC Board members and members of the public, each with the task of evaluating potential strategies for incorporation into this or a future SIP. In 2019, the three committees were collapsed into one, overarching committee to better streamline the process and assess the co-benefits of different strategies. The SIP includes federally–enforceable measures as well as discussion on state–only measures and voluntary emission reduction measures, which are not included as part of the SIP, which were evaluated by the Committee. Also included are elements that need further evaluation for a possible incorporation into a future SIP, which were reviewed as part of the committee process. With months of analyses, modeling, and review of these various SIP elements and numerous Board and public meetings, the RAQC and APCD have jointly developed this Serious Area SIP for the 2008 Ozone NAAQS that includes all mandatory elements, which are discussed in detail in subsequent chapters of this document.

[23] EPA, Implementation of the 2008 National Ambient Air Quality Standards for Ozone: Nonattainment Area Classifications Approach, Attainment Deadlines and Revocation of the 1997 Ozone Standards for Transportation Conformity Purposes, Final Rule, *See* 77 Fed. Reg. 30160 (May 21, 2012).

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# CHAPTER 2
# OZONE MONITORING DATA

2
Chapter 2 – Ozone Monitoring Data

## 2.1 OVERVIEW

Section 182(c)(1) of the Clean Air Act requires that all ozone nonattainment areas (NAA) classified as Serious or above implement measures to enhance and improve monitoring for ambient concentrations of ozone, nitrogen oxides (NOx), and volatile organic compounds (VOC), and to improve monitoring of emissions of NOx and VOC. An enhanced monitoring network for ozone is referred to as the photochemical assessment monitoring station (PAMS) network. Section 40 of the Code of Federal Regulations, Part 58.10(a)(10), Part 58(a)(11) and Appendix D(5) address PAMS sites and requirements. Appendix D(5)(a) describes the requirements for a PAMS site in any core-based statistical area (CBSA) with a population of 1,000,000 or more. Appendix D(5)(h) requires an Enhanced Monitoring Plan (EMP) for additional monitoring in areas classified as Moderate or above. Per Part 58(a)(10), a monitoring plan for a PAMS site must be submitted to EPA no later than July 1, 2018. Per Part 58(a)(11), an EMP must be submitted to U.S. Environmental Protection Agency (EPA) no later than October 1, 2019. Colorado sent it's EMP[24] to EPA (on October 2, 2019) after a 30-day comment period and it is included as a Technical Support Document (TSD) to this State Implementation Plan. Unfortunately, the Colorado Air Pollution Control Division (APCD) has yet to begin full PAMS monitoring due to limited funding and staffing resources. Because of support limitations, EPA extended the start date for PAMS monitoring by two-years[25], with the new start date being June 1, 2021. The Colorado Department of Public Health and Environment (CDPHE) will implement full PAMS monitoring once EPA provides the resources necessary to procure supplies and operate the station.

The 2019 ozone ambient air monitoring network in the Denver Metro/North Front Range NAA consists of 14 stations operated by the Colorado APCD and one location (2 stations) operated by the National Park Service (NPS) and the EPA in Rocky Mountain National Park. There have been other stations that have operated in the past 13 years as well. Table 9 provides a listing of the sites that were operating in 2019, or have been in operation since 2006 for the APCD's North Front Range NAA monitoring sites, as well as for the Rocky Mountain National Park monitoring sites operated by the NPS and EPA. Also shown are sites outside of the NAA, but are within the Core-Based Statistical Area for Denver. The geographical distribution of the current and historic Front Range monitors is presented in Figure 2.

**Table 9 - Monitoring Site List**

| AQS# | Name | Latitude | Longitude | Notes |
|---|---|---|---|---|
| 08-001-3001 | Welby | 39.838200 | -104.949845 | Operational |
| 08-005-0002 | Highland | 39.567905 | -104.957085 | Operational |
| 08-005-0006 | Aurora East | 39.638540 | -104.569130 | Operational |
| 08-013-0011 | South Boulder Creek | 39.957205 | -105.238460 | Discontinued 12/2015 |
| 08-013-0014 | Boulder Reservoir | 40.070010 | -105.220230 | Operational |
| 08-019-0006 | Mines Peak * | 39.794390 | -105.763985 | Operational (non-reg.) |
| 08-031-0002 | CAMP | 39.751160 | -104.987635 | Operational |
| 08-031-0014 | Carriage | 39.751760 | -105.030680 | Discontinued 02/2013 |
| 08-031-0025 | DMAS (NCore) | 39.704005 | -104.998105 | Discontinued 08/2012 |

[24] See "State of Colorado Enhanced Monitoring Plan for Ozone", Colorado Department of Public Health and Environment, Air Pollution Control Division, October 1, 2019, https://www.colorado.gov/airquality/tech_doc_repository.aspx#network_plan.

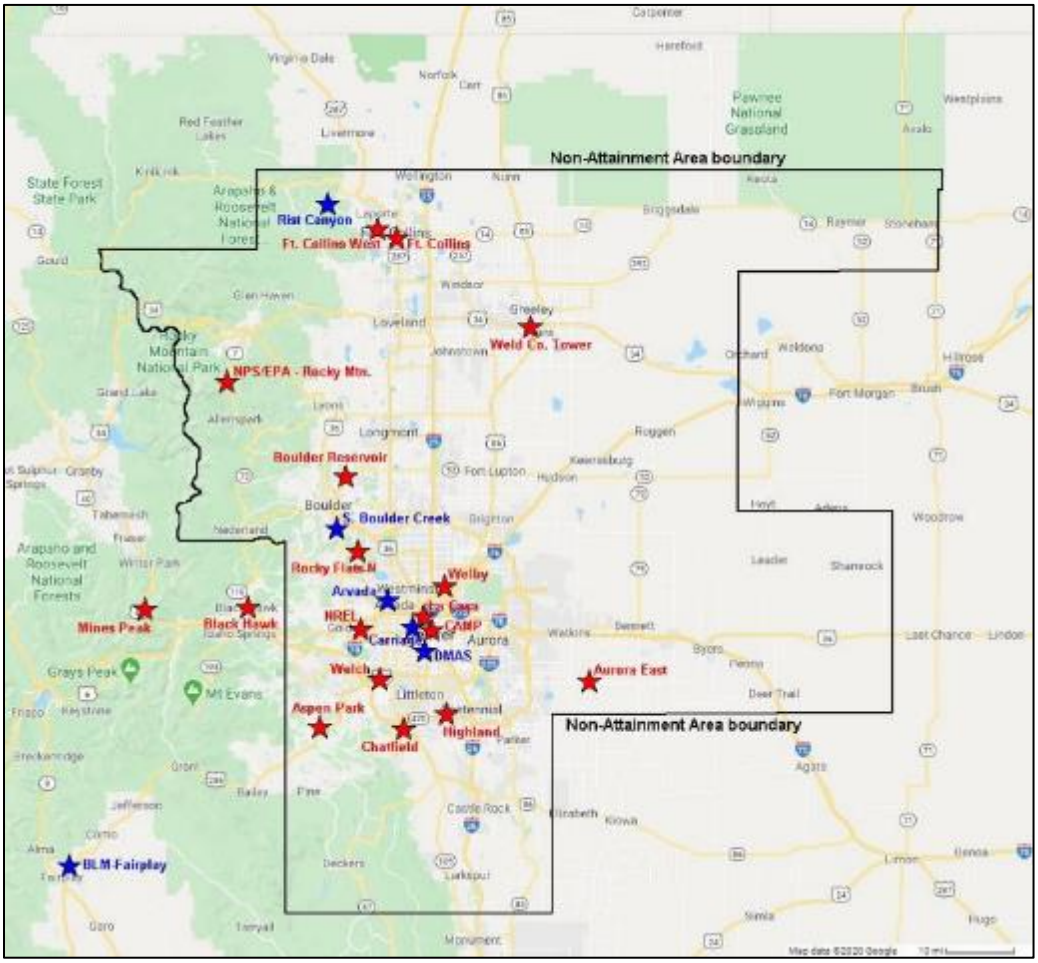
[25] *See* "Extension of Start Date for Revised Photochemical Assessment Monitoring Stations", 85 Fed. Reg. 834 (Jan. 8, 2020).

| | | | | |
|---|---|---|---|---|
| 08-031-0026 | La Casa (NCore) | 39.779490 | -105.005180 | Operational |
| 08-035-0004 | Chatfield Park | 39.534500 | -105.070365 | Operational |
| 08-047-0003 | Black Hawk * | 39.792515 | -105.491305 | Commenced 07/2019 |
| 08-059-0002 | Arvada | 39.800335 | -105.099970 | Discontinued 01/2011 |
| 08-059-0005 | Welch | 39.638780 | -105.139510 | Operational |
| 08-059-0006 | Rocky Flats - N | 39.912795 | -105.188575 | Operational |
| 08-059-0011 | NREL | 39.743725 | -105.177990 | Operational |
| 08-059-0013 | Aspen Park | 39.541515 | -105.298410 | Discontinued 09/2019 |
| 08-069-0007 (POC 1) | NPS - Rocky Mtn. NP | 40.278145 | -105.545660 | Operational |
| 08-069-0007 ** | EPA - Rocky Mtn. NP | 40.277800 | -105.545300 | Operational |
| 08-069-0011 | Fort Collins - West | 40.592795 | -105.141410 | Operational |
| 08-069-0012 | Rist Canyon | 40.642135 | -105.275105 | Discontinued 06/2013 |
| 08-069-1004 | Fort Collins - Mason | 40.577470 | -105.078920 | Operational |
| 08-093-0002 | BLM – Fairplay * | 39.240125 | -105.983145 | Discontinued 02/2018 |
| 08-123-0009 | Weld Co. Tower | 40.386360 | -104.737445 | Operational |

* Not within the NAA

** POC 8 for 2006-2010, POC 3 for 2011 to present (also formerly designated as 08-069-9991)

**Figure 2 - Map of Sites**




*Red = Current sites in operation in 2019*

*Blue = Sites since 2006 that are no longer in operation*

This section shall not be construed to establish a monitoring network in the federally-enforceable State Implementation Plan (SIP). The EPA has already approved a monitoring SIP for the State of Colorado and this description of the ozone monitoring network shall not be construed to amend such monitoring SIP. All APCD sites listed have been approved in the APCD's 2019 Annual Network Plan. EPA does not approve the NPS/EPA or Bureau of Land Management (BLM) monitors or sites as part of the APCD's Annual Network Plan approvals.

## MONITORING DATA

Valid 8-hour averages are calculated based on the form of the 2008 ozone standard (40 Code of Federal Regulations, Part 50, Appendix P). An ozone monitoring day shall be counted as a valid day if valid 8-hour averages are available for at least 75% of possible hours in the day. Also, for Colorado, through 2015, the "ozone monitoring season" was designated by EPA to be March 01 through September 30. As of December 28, 2015, EPA changed Colorado's ozone season to year-round (effective 2017).

Table 10 presents the fourth maximum 8-hour ozone concentrations for each site, by year, and Table 11 presents the 3-year averages of the fourth maximum 8-hour concentrations. A trend graph of data from 2006 – 2019 for key sites in the Denver and North Front Range area is presented in Figure 3.

**Table 10 - 4th Maximum 8-Hour Ozone Values**

| Year | Welby 08-001-3001 | Highland 08-005-0002 | Aurora East 08-005-0006 | S. Bldr. Ck. 08-013-0011 | Boulder Res. 08-013-0014 | Mines Pk. ** 08-019-0006 |
|---|---|---|---|---|---|---|
| | 8-hr. 4th max (ppm) | 8-hr. 4th max (ppm) | 8-hr. 4th max (ppm) | 8-hr. 4th max (ppm) | 8-hr. 4th max (ppm) | 8-hr. 4th max (ppm) |
| **2006** | 0.069 | 0.081 | - | 0.082 | - | - |
| **2007** | 0.070 | 0.075 | - | 0.085 | - | - |
| **2008** | 0.076 | * | - | 0.076 | - | - |
| **2009** | 0.072 | 0.069 | * | 0.073 | - | - |
| **2010** | 0.063 | 0.075 | 0.070 | 0.072 | - | - |
| **2011** | 0.075 | 0.078 | 0.077 | 0.076 | - | - |
| **2012** | 0.077 | 0.080 | 0.074 | 0.076 | - | - |
| **2013** | 0.077 | 0.079 | 0.073 | 0.079 | - | - |
| **2014** | 0.067 | * | 0.067 | 0.070 | - | * |
| **2015** | 0.069 | * | 0.068 | 0.074 | - | 0.069 |
| **2016** | 0.066 | 0.072 | 0.066 | - | * | * |
| **2017** | 0.068 | 0.072 | 0.069 | - | 0.073 | 0.070 |
| **2018** | 0.069 | 0.077 | 0.072 | - | 0.077 | 0.078 |
| **2019** | 0.060 | 0.073 | 0.066 | - | 0.069 | 0.067 |

** Incomplete data year.*

*** Site not in the NAA. Not a regulatory level site.*

| Year | CAMP 08-031-0002 | Carriage 08-031-0014 | DMAS NCore 08-031-0025 | LaCasa NCore 08-031-0026 | Chatfield Pk. 08-035-0004 | Black Hwk.** 08-047-0003 |
|---|---|---|---|---|---|---|
| | 8-hr. 4th max (ppm) | 8-hr. 4th max (ppm) | 8-hr. 4th max (ppm) | 8-hr. 4th max (ppm) | 8-hr. 4th max (ppm) | 8-hr. 4th max (ppm) |
| **2006** | 0.062 | 0.072 | - | - | 0.086 | - |
| **2007** | 0.057 | 0.076 | - | - | 0.082 | - |
| **2008** | - | 0.072 | 0.070 | - | 0.080 | - |
| **2009** | - | 0.063 | 0.062 | - | 0.071 | - |
| **2010** | - | 0.069 | 0.064 | - | 0.079 | - |
| **2011** | - | 0.075 | 0.070 | - | 0.082 | - |
| **2012** | 0.068 | 0.077 | 0.073 | - | 0.086 | - |
| **2013** | 0.067 | - | - | 0.071 | 0.083 | - |
| **2014** | 0.061 | - | - | 0.066 | 0.074 | - |
| **2015** | 0.067 | - | - | 0.071 | 0.081 | - |
| **2016** | 0.070 | - | - | 0.069 | 0.078 | - |
| **2017** | 0.067 | - | - | 0.068 | 0.074 | - |
| **2018** | 0.071 | - | - | 0.072 | 0.083 | - |
| **2019** | 0.067 | - | - | 0.065 | 0.078 | ** |

** Incomplete data year.*

*** Black Hawk commenced operation 7/9/2019. Site is not in the NAA.*

| Year | Arvada 08-59-0002 | Welch 08-059-0005 | Rocky Flats N 08-059-0006 | NREL 08-059-0011 | Aspen Park 08-059-0013 | NPS-RMNP 08-069-0007 |
|---|---|---|---|---|---|---|
| | 8-hr. 4th max (ppm) | 8-hr. 4th max (ppm) | 8-hr. 4th max (ppm) | 8-hr. 4th max (ppm) | 8-hr. 4th max (ppm) | 8-hr. 4th max (ppm) |
| **2006** | 0.082 | 0.081 | 0.090 | 0.083 | - | 0.076 |
| **2007** | 0.079 | 0.080 | 0.090 | 0.085 | - | 0.078 |
| **2008** | 0.074 | 0.073 | 0.079 | 0.076 | - | 0.076 |
| **2009** | 0.070 | 0.070 | 0.079 | 0.068 | - | 0.068 |
| **2010** | 0.075 | 0.072 | 0.076 | 0.074 | 0.073 | 0.077 |
| **2011** | 0.079 | 0.077 | 0.081 | 0.083 | 0.072 | 0.077 |
| **2012** | - | 0.079 | 0.084 | 0.081 | 0.077 | 0.079 |
| **2013** | - | 0.080 | 0.085 | 0.084 | 0.077 | 0.074 |
| **2014** | - | 0.066 | 0.077 | 0.076 | 0.065 | 0.069 |
| **2015** | - | 0.075 | 0.077 | 0.081 | 0.070 | 0.069 |
| **2016** | - | 0.075 | 0.079 | 0.083 | 0.073 | 0.069 |
| **2017** | - | 0.075 | 0.075 | 0.074 ** | 0.068 | 0.067 |
| **2018** | - | 0.066 | 0.081 | 0.080 | 0.071 | 0.074 |
| **2019** | - | 0.072 | 0.072 | 0.075 | *** | 0.065 |

** Incomplete data year.*

*** The NREL 4th maximum value for 2017 was 0.076, but EPA concurred on 9/2 and 9/4 as exceptional events.*

**** Aspen Park was removed on 9/16/2019.*

| Year | EPA-RMNP 08-069-0007 | Ft. Collins W 08-069-0011 | Rist Cyn. 08-069-0012 | Ft. Collins 08-069-1004 | BLM-Fairplay ** 08-093-0002 | Weld Co. Twr. 08-123-0009 |
|---|---|---|---|---|---|---|
| | 8-hr. 4th max (ppm) | 8-hr. 4th max (ppm) | 8-hr. 4th max (ppm) | 8-hr. 4th max (ppm) | 8-hr. 4th max (ppm) | 8-hr. 4th max (ppm) |
| **2006** | 0.075 | * | - | 0.078 | - | 0.082 |
| **2007** | 0.073 | 0.085 | - | 0.069 | - | 0.074 |
| **2008** | 0.076 | 0.076 | - | 0.066 | - | 0.073 |
| **2009** | 0.066 | 0.073 | * | 0.063 | - | 0.067 |
| **2010** | 0.073 | 0.075 | 0.071 | 0.066 | - | 0.073 |
| **2011** | 0.070 | 0.080 | 0.073 | 0.068 | - | 0.077 |
| **2012** | 0.077 | 0.080 | 0.071 | 0.074 | - | 0.080 |
| **2013** | 0.075 | 0.082 | * | 0.074 | - | 0.073 |
| **2014** | 0.073 | 0.074 | - | 0.072 | - | 0.070 |
| **2015** | 0.070 | 0.075 | - | 0.069 | 0.067 | 0.073 |
| **2016** | 0.067 | 0.076 | - | 0.070 | 0.066 | 0.067 |
| **2017** | 0.069 | 0.075 | - | 0.066 | 0.065 | 0.072 |
| **2018** | 0.073 | 0.081 | - | 0.072 | * | 0.073 |
| **2019** | 0.064 | 0.071 | - | 0.064 | - | 0.063 |

** Incomplete data year.*

*** Site is not in the NAA.*

**Table 11 - 8-Hour Ozone Three-Year Average 4th Maximum Ozone Values**

| Year | 2008 Std. (ppm) | Welby 08-001-3001 | Highland 08-005-0002 | Aurora East 08-005-0006 | S. Boulder Ck. 08-013-0011 | Boulder Res. 08-013-0014 |
|---|---|---|---|---|---|---|
| | | 3-yr. avg. 4th max. (ppm) | 3-yr. avg. 4th max. (ppm) | 3-yr. avg. 4th max. (ppm) | 3-yr. avg. 4th max. (ppm) | 3-yr. avg. 4th max. (ppm) |
| **2006-2008** | 0.075 | 0.071 | - | - | **0.081** | - |
| **2007-2009** | 0.075 | 0.072 | - | - | **0.078** | - |
| **2008-2010** | 0.075 | 0.070 | - | - | 0.073 | - |
| **2009-2011** | 0.075 | 0.070 | 0.074 | - | 0.073 | - |
| **2010-2012** | 0.075 | 0.071 | **0.077** | 0.073 | 0.074 | - |
| **2011-2013** | 0.075 | **0.076** | **0.079** | 0.074 | **0.077** | - |
| **2012-2014** | 0.075 | 0.073 | - | 0.071 | 0.075 | - |
| **2013-2015** | 0.075 | 0.071 | - | 0.069 | 0.074 | - |
| **2014-2016** | 0.075 | 0.067 | - | 0.067 | - | - |
| **2015-2017** | 0.075 | 0.067 | - | 0.067 | - | - |
| **2016-2018** | 0.075 | 0.067 | 0.073 | 0.069 | - | - |
| **2017-2019** | 0.075 | 0.065 | 0.074 | 0.069 | - | 0.073 |

*Note: **Bolded** data are levels above the NAAQS.*

| Year | 2008 Std. (ppm) | Mines Peak * 08-019-0006 | CAMP 08-031-0002 | Carriage 08-031-0014 | DMAS NCore 08-031-0026 | LaCasa NCore 08-031-0027 |
|---|---|---|---|---|---|---|
| | | 3-yr. avg. 4th max. (ppm) | 3-yr. avg. 4th max. (ppm) | 3-yr. avg. 4th max. (ppm) | 3-yr. avg. 4th max. (ppm) | 3-yr. avg. 4th max. (ppm) |
| **2006-2008** | 0.075 | - | - | 0.073 | - | - |
| **2007-2009** | 0.075 | - | - | 0.070 | - | - |
| **2008-2010** | 0.075 | - | - | 0.068 | 0.065 | - |
| **2009-2011** | 0.075 | - | - | 0.069 | 0.065 | - |
| **2010-2012** | 0.075 | - | - | 0.073 | 0.069 | - |
| **2011-2013** | 0.075 | - | - | - | - | - |
| **2012-2014** | 0.075 | - | 0.065 | - | - | - |
| **2013-2015** | 0.075 | - | 0.065 | - | - | 0.069 |
| **2014-2016** | 0.075 | - | 0.066 | - | - | 0.068 |
| **2015-2017** | 0.075 | - | 0.068 | - | - | 0.069 |
| **2016-2018** | 0.075 | - | 0.069 | - | - | 0.069 |
| **2017-2019** | 0.075 | 0.071 | 0.068 | - | - | 0.068 |

*Note: **Bolded** data are levels above the NAAQS.*
** Site is not in the NAA.*

| Year | 2008 Std. (ppm) | Chatfield Pk. 08-035-0004 | Black Hawk * 08-047-0003 | Arvada 08-59-0002 | Welch 08-059-0005 | Rocky Flats N 08-059-0006 |
|---|---|---|---|---|---|---|
| | | 3-yr. avg. 4th max. (ppm) | 3-yr. avg. 4th max. (ppm) | 3-yr. avg. 4th max. (ppm) | 3-yr. avg. 4th max. (ppm) | 3-yr. avg. 4th max. (ppm) |
| **2006-2008** | 0.075 | **0.082** | - | **0.078** | **0.078** | **0.086** |
| **2007-2009** | 0.075 | **0.077** | - | 0.074 | 0.074 | **0.082** |
| **2008-2010** | 0.075 | **0.076** | - | 0.073 | 0.071 | **0.078** |
| **2009-2011** | 0.075 | **0.077** | - | 0.074 | 0.073 | **0.078** |
| **2010-2012** | 0.075 | **0.082** | - | - | **0.076** | **0.080** |
| **2011-2013** | 0.075 | **0.083** | - | - | **0.078** | **0.083** |
| **2012-2014** | 0.075 | **0.081** | - | - | 0.075 | **0.082** |
| **2013-2015** | 0.075 | **0.079** | - | - | 0.073 | **0.079** |
| **2014-2016** | 0.075 | **0.077** | - | - | 0.072 | **0.077** |
| **2015-2017** | 0.075 | **0.077** | - | - | 0.075 | **0.077** |
| **2016-2018** | 0.075 | **0.078** | - | - | 0.072 | **0.078** |
| **2017-2019** | 0.075 | **0.078** | * | - | 0.071 | **0.076** |

*Note: **Bolded** data are levels above the NAAQS.*
** Black Hawk commenced operation 7/9/2019. Site is not in the NAA.*

| Year | 2008 Std. (ppm) | NREL 08-059-0011 | Aspen Park 08-059-0013 | NPS-RMNP 08-069-0007 | EPA-RMNP 08-069-0007 | Ft. Collins W 08-069-0011 |
|---|---|---|---|---|---|---|
| | | 3-yr. avg. 4th max. (ppm) | 3-yr. avg. 4th max. (ppm) | 3-yr. avg. 4th max. (ppm) | 3-yr. avg. 4th max. (ppm) | 3-yr. avg. 4th max. (ppm) |
| **2006-2008** | 0.075 | **0.081** | - | **0.076** | 0.074 | **0.082** |
| **2007-2009** | 0.075 | **0.076** | - | 0.074 | 0.071 | **0.078** |
| **2008-2010** | 0.075 | 0.072 | - | 0.073 | 0.071 | 0.074 |
| **2009-2011** | 0.075 | 0.075 | - | 0.074 | 0.069 | **0.076** |
| **2010-2012** | 0.075 | **0.079** | 0.074 | **0.077** | 0.073 | **0.078** |
| **2011-2013** | 0.075 | **0.082** | 0.075 | **0.076** | 0.074 | **0.080** |
| **2012-2014** | 0.075 | **0.080** | 0.073 | 0.074 | 0.075 | **0.078** |
| **2013-2015** | 0.075 | **0.080** | 0.070 | 0.070 | 0.072 | **0.077** |
| **2014-2016** | 0.075 | **0.080** | 0.069 | 0.069 | 0.070 | 0.075 |
| **2015-2017** | 0.075 | **0.079 *** | 0.070 | 0.068 | 0.068 | 0.075 |
| **2016-2018** | 0.075 | **0.079 *** | 0.070 | 0.070 | 0.069 | **0.077** |
| **2017-2019** | 0.075 | **0.076 *** | ** | 0.068 | 0.068 | 0.075 |

*Note: **Bolded** data are levels above the NAAQS.*

** Exceptional events for 9/2/2017 and 9/4/2017 at NREL were concurred by EPA. 3-year average values with the exceptional events included would have been 0.080 for 2015-2017, 0.079 for 2016-2018 and 0.077 for 2017-2019.*

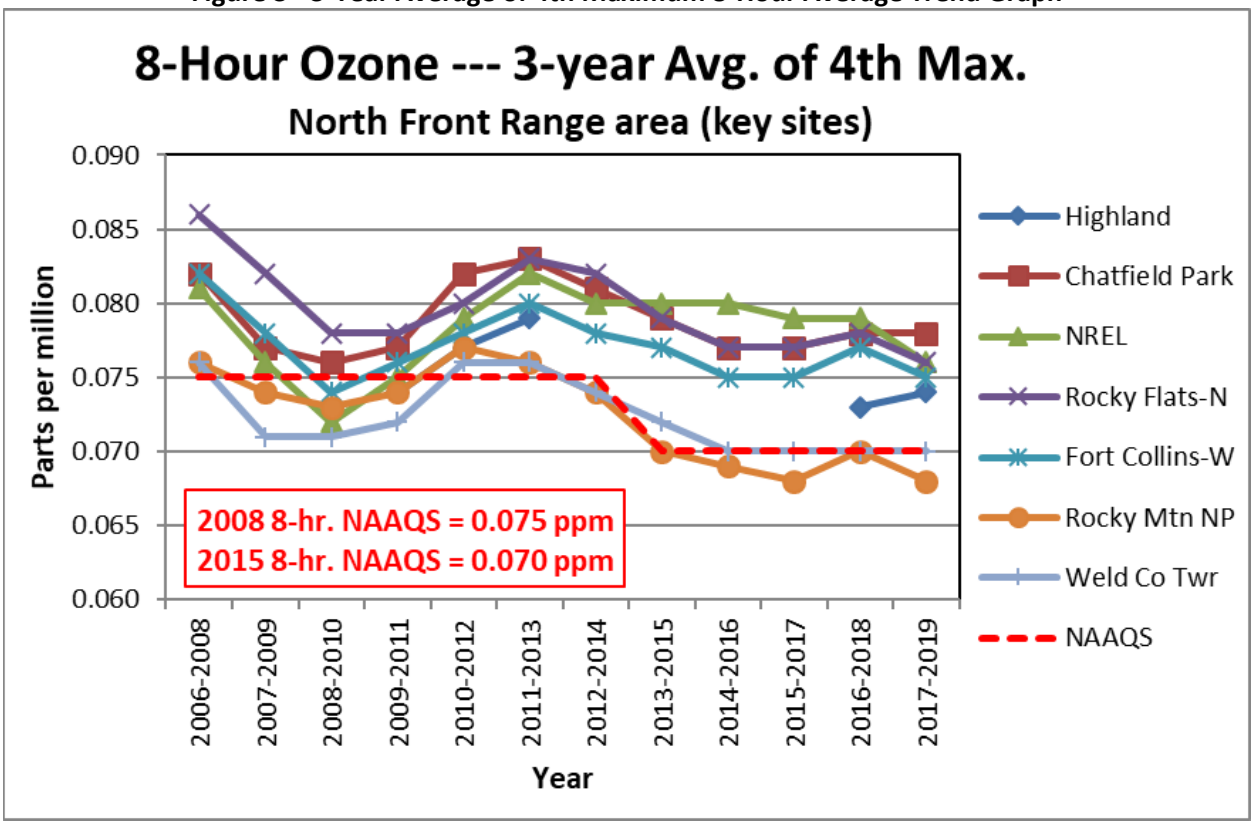
*** Aspen Park was removed on 9/16/2019.*

| Year | 2008 Std. (ppm) | Rist Cyn. 08-069-0012 | Ft. Collins 08-069-1004 | BLM-Fairplay * 08-093-0002 | Weld Co. Twr. 08-123-0009 |
|---|---|---|---|---|---|
| | | 3-yr. avg. 4th max. (ppm) | 3-yr. avg. 4th max. (ppm) | 3-yr. avg. 4th max. (ppm) | 3-yr. avg. 4th max. (ppm) |
| **2006-2008** | 0.075 | - | 0.071 | - | **0.076** |
| **2007-2009** | 0.075 | - | 0.066 | - | 0.071 |
| **2008-2010** | 0.075 | - | 0.065 | - | 0.071 |
| **2009-2011** | 0.075 | - | 0.065 | - | 0.072 |
| **2010-2012** | 0.075 | 0.071 | 0.069 | - | **0.076** |
| **2011-2013** | 0.075 | - | 0.072 | - | **0.076** |
| **2012-2014** | 0.075 | - | 0.073 | - | 0.074 |
| **2013-2015** | 0.075 | - | 0.071 | - | 0.072 |
| **2014-2016** | 0.075 | - | 0.070 | - | 0.070 |
| **2015-2017** | 0.075 | - | 0.068 | 0.066 | 0.070 |
| **2016-2018** | 0.075 | - | 0.069 | - | 0.070 |
| **2017-2019** | 0.075 | - | 0.067 | - | 0.069 |

*Note: **Bolded** data are levels above the NAAQS.*

** Site is not in the NAA.*

**Figure 3 - 3-Year Average of 4th Maximum 8-Hour Average Trend Graph**




## MONITORING NETWORK VERIFICATION

The APCD has and will continue to operate an appropriate air quality monitoring network of State/Local Air Monitoring System monitors (SLAMS) in accordance with 40 CFR Part 58 to verify the attainment status of the 8-hour ozone National Ambient Air Quality Standard (NAAQS). If measured mobile source parameters (e.g., vehicle miles traveled, congestion, fleet mix, etc.) change significantly over time, or if the stationary source profile in the area changes significantly, the APCD will perform the appropriate studies to determine whether additional and/or re-sited monitors are necessary. Annual review of the SLAMS air quality surveillance system will be conducted in accordance with 40 CFR Part 58.10 to determine whether the system continues to meet the monitoring objectives presented in Appendix D of 40 CFR Part 58 and the siting criteria presented in Appendix E of 40 CFR Part 58. All APCD sites listed have been approved in the APCD's 2019 Annual Network Plan. EPA does not approve the NPS/EPA or BLM monitors or sites as part of the APCD's Annual Network Plan approvals.

## QUALITY ASSURANCE PROGRAM

Ozone monitoring data for the Denver and North Front Range area have been collected and tested for quality assurance in accordance with 40 CFR Part 58 Appendix A, EPA's "Quality Assurance Handbook for Air Pollution Measurement Systems: Vol. II - Ambient Air Quality Monitoring Program" (EPA-454/B-17-001, January 2017), the APCD's Quality Management Plan (QMP) and the APCD's Quality Assurance Project Plan (QAPP) documents. The data have been uploaded to EPA's Air Quality System (AQS) and are available for public review at the APCD and through EPA's AQS database.

Table 12 presents the data recovery rates for each monitoring site in the Denver and North Front Range area. Percent data recovery is the number of valid sampling hours for the year divided by the total number of hours in the year. For some years, the percent data recovery is high versus the actual number of hours in the year due to when the monitor was officially designated in operation.

**Table 12 - Ozone Data Recovery Rates for Each Monitoring Site**

| | Welby 08-001-3001 | | Highland 08-005-0002 | | Aurora East 08-005-0006 | | S. Boulder Ck. 08-013-0011 | | Boulder Res. 08-013-0014 | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Year** | % | # hours | % | # hours | % | # hours | % | # hours | % | # hours |
| **2006** | 96% | 8436 | 97% | 8459 | - | - | 98% | 8561 | - | - |
| **2007** | 98% | 8596 | 99% | 8648 | - | - | 96% | 8369 | - | - |
| **2008** | 95% | 8329 | 99% * | 2643 * | - | - | 96% | 8396 | - | - |
| **2009** | 94% | 8235 | 89% | 7812 | 89% * | 4394 * | 99% | 8678 | - | - |
| **2010** | 75% | 6587 | 96% | 8367 | 99% | 8712 | 99% | 8711 | - | - |
| **2011** | 99% | 8693 | 94% | 8245 | 95% | 8289 | 99% | 8660 | - | - |
| **2012** | 94% | 8258 | 95% | 8326 | 99% | 8732 | 98% | 8587 | - | - |
| **2013** | 96% | 8407 | 98% * | 6432 * | 99% | 8684 | 98% | 8561 | - | - |
| **2014** | 93% | 8128 | - | - | 100% | 8718 | 98% | 8568 | - | - |
| **2015** | 96% | 8444 | 99% * | 2905 * | 98% | 8610 | 99% | 8698 | - | - |
| **2016** | 94% | 8296 | 98% | 8601 | 99% | 8704 | - | - | 99% * | 2906 * |
| **2017** | 96% | 8374 | 99% | 8680 | 100% | 8719 | - | - | 97% | 8473 |
| **2018** | 95% | 8298 | 96% | 8453 | 97% | 8490 | - | - | 93% | 8127 |
| **2019** | 93% | 8164 | 97% | 8537 | 96% | 8416 | - | - | 99% | 8630 |

** Partial year.*

| Year | Mines Peak ** 08-019-0006 | | CAMP 08-031-0002 | | Carriage 08-031-0014 | | DMAS NCore 08-031-0025 | | LaCasa NCore 08-031-0026 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | % | # hours | % | # hours | % | # hours | % | # hours | % | # hours |
| **2006** | - | - | 99% | 8666 | 98% | 8557 | - | - | - | - |
| **2007** | - | - | 98% | 8593 | 97% | 9494 | - | - | - | - |
| **2008** | - | - | 90% * | 628 * | 97% | 8532 | 98% * | 5992 * | - | - |
| **2009** | - | - | - | - | 99% | 8712 | 97% | 8496 | - | - |
| **2010** | - | - | - | - | 98% | 8626 | 93% | 8149 | - | - |
| **2011** | - | - | - | - | 96% | 8416 | 87% | 7636 | - | - |
| **2012** | - | - | 89% | 7800 | 99% | 8705 | 91% * | 5399 * | - | - |
| **2013** | - | - | 98% | 8552 | 99%* | 1397 * | - | - | 95% | 8305 |
| **2014** | 92% * | 4064 * | 98% | 8583 | - | - | - | - | 99% | 8674 |
| **2015** | 80% | 7031 | 99% | 8702 | - | - | - | - | 97% | 8514 |
| **2016** | 66% | 5766 | 96% | 8446 | - | - | - | - | 98% | 8640 |
| **2017** | 84% | 7343 | 98% | 8603 | - | - | - | - | 98% | 8593 |
| **2018** | 75% | 6596 | 99% | 8633 | - | - | - | - | 95% | 8285 |
| **2019** | 73% | 6943 | 99% | 8639 | - | - | - | - | 93% | 8135 |

** Partial year.*
*** Not in NAA.*

| Year | Chatfield Pk. 08-035-0004 | | Black Hawk ** 08-047-0003 | | Arvada 08-059-0002 | | Welch 08-059-0005 | | Rocky Flats-N 08-059-0006 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | % | # hours | % | # hours | % | # hours | % | # hours | % | # hours |
| **2006** | 98% | 8599 | - | - | 98% | 8579 | 97% | 8505 | 97% | 8461 |
| **2007** | 98% | 8543 | - | - | 98% | 8616 | 99% | 8700 | 97% | 8513 |
| **2008** | 93% | 8727 | - | - | 97% | 8561 | 99% | 8703 | 95% | 8350 |
| **2009** | 99% | 8710 | - | - | 97% | 8527 | 96% | 8426 | 96% | 8433 |
| **2010** | 99% | 8638 | - | - | 100% | 8718 | 100% | 8725 | 94% | 8244 |
| **2011** | 99% | 8638 | - | - | 99% | 8699 | 99% | 8638 | 97% | 8480 |
| **2012** | 93% | 8142 | - | - | - | - | 99% | 8700 | 97% | 8563 |
| **2013** | 99% | 8670 | - | - | - | - | 99% | 8688 | 96% | 8434 |
| **2014** | 99% | 8673 | - | - | - | - | 99% | 8638 | 99% | 8668 |
| **2015** | 99% | 8657 | - | - | - | - | 98% | 8620 | 98% | 8600 |
| **2016** | 99% | 8665 | - | - | - | - | 96% | 8425 | 99% | 8658 |
| **2017** | 99% | 8648 | - | - | - | - | 92% | 8051 | 98% | 8627 |
| **2018** | 96% | 8421 | - | - | - | - | 71% | 6198 | 96% | 8436 |
| **2019** | 95% | 8364 | 77% * | 3402 * | - | - | 97% | 8536 | 98% | 8555 |

** Partial year.*
*** Not in NAA.*

| Year | NREL 08-059-0011 | | Aspen Park 08-059-0013 | | NPS-Rocky Mtn. 08-069-0007/1 | | EPA-Rocky Mtn. 08-069-0007/3 | | Ft. Collins West 08-069-0011 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | % | # hours | % | # hours | % | # hours | % | # hours | % | # hours |
| **2006** | 99% | 8700 | - | - | 93% | 8180 | 89% | 7821 | 99% * | 5560 * |
| **2007** | 99% | 8707 | - | - | 96% | 8434 | 94% | 8218 | 99% | 8684 |
| **2008** | 93% | 8188 | - | - | 98% | 8627 | 97% | 8537 | 96% | 8469 |
| **2009** | 98% | 8586 | 94% * | 5529 * | 96% | 8449 | 99% | 8661 | 97% | 8534 |
| **2010** | 92% | 8033 | 97% | 8454 | 98% | 8588 | 90% | 7873 | 97% | 8497 |
| **2011** | 99% | 8639 | 96% | 8393 | 99% | 8666 | 85% | 7429 | 99% | 8678 |
| **2012** | 99% | 8739 | 98% | 8614 | 99% | 8677 | 93% | 8212 | 99% | 8703 |
| **2013** | 98% | 8609 | 98% | 8606 | 99% | 8650 | 94% | 8242 | 98% | 8554 |
| **2014** | 99% | 8690 | 99% | 8655 | 94% | 8209 | 91% | 7957 | 98% | 8603 |
| **2015** | 98% | 8617 | 98% | 8593 | 94% | 8224 | 92% | 8041 | 97% | 8466 |
| **2016** | 97% | 8539 | 97% | 8531 | 98% | 8644 | 94% | 8259 | 99% | 8674 |
| **2017** | 91% | 7988 | 99% | 8648 | 95% | 8343 | 94% | 8272 | 98% | 8572 |
| **2018** | 98% | 8578 | 97% | 8460 | 99% | 8698 | 93% | 8184 | 99% | 8684 |
| **2019** | 96% | 8388 | 97% * | 6042 * | 98% | 8622 | 92% | 8080 | 99% | 8702 |

** Partial year.*

| Year | Rist Canyon 08-069-0012 | | Ft. Collins 08-069-1004 | | BLM-Fairplay ** 08-093-0002 | | Weld Co. Tower 08-123-0009 | |
|---|---|---|---|---|---|---|---|---|
| | % | # hours | % | # hours | % | # hours | % | # hours |
| **2006** | - | - | 98% | 8607 | - | - | 99% | 8633 |
| **2007** | - | - | 90% | 7905 | - | - | 99% | 8672 |
| **2008** | - | - | 98% | 8614 | - | - | 96% | 8445 |
| **2009** | 99% * | 5489 * | 99% | 8683 | - | - | 98% | 8588 |
| **2010** | 100% | 8719 | 98% | 8608 | - | - | 98% | 8592 |
| **2011** | 98% | 8554 | 98% | 8564 | - | - | 95% | 8342 |
| **2012** | 99% | 8685 | 96% | 8472 | - | - | 99% | 8709 |
| **2013** | 98% * | 4248 * | 99% | 8689 | - | - | 95% | 8300 |
| **2014** | - | - | 99% | 8652 | - | - | 98% | 8627 |
| **2015** | - | - | 98% | 8587 | 96% * | 6230 * | 97% | 8489 |
| **2016** | - | - | 99% | 8663 | 96% | 8432 | 98% | 8574 |
| **2017** | - | - | 100% | 8718 | 96% | 8419 | 95% | 8361 |
| **2018** | - | - | 99% | 8663 | 75% * | 1044 * | 96% | 8407 |
| **2019** | - | - | 94% | 8212 | - | - | 97% | 8504 |

** Partial year.*

*** Not in NAA.*

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# CHAPTER 3
# 2017 MILESTONE YEAR EMISSIONS INVENTORY

3 THREE
Chapter 3 – Updated 2017 Milestone Year Emissions Inventory

## 3.1 OVERVIEW

Per Clean Air Act (CAA), 42 U.S.C. §7511a(a)(1) ("§182(a)(1)"), on July 17, 2014, the Colorado Department of Public Health and Environment (CDPHE) submitted a 2011 Periodic Emissions Inventory for Ozone Precursors for the 9–county Denver Metro/North Front Range (DM/NFR) nonattainment area under the 2008 Ozone National Ambient Air Quality Standard (NAAQS). The 2011 base year inventory was included as part of the Moderate area State Implementation Plan (SIP)[26] submittal and establishes the baseline from which Reasonable Further Progress (RFP) must be calculated for nonattainment areas classified as Moderate and higher (CAA §182(b)(1)(A)). Additionally, as part of the Moderate area SIP, a projected 2017 attainment year emissions inventory was developed and submitted to EPA (and was approved by EPA in 2018). Due to EPA's reclassification of the DM/NFR to Serious nonattainment for the 2008 NAAQS, effective January 2020, the CDPHE has prepared an updated 2017 emissions inventory (now referred to as a "milestone" year for purposes of RFP[27]) based on currently available data, in accordance with EPA's revised guidance on emissions inventory development[28], and is being resubmitted as part of this Serious area SIP (CAA §182(c)(2)(B)).

## 3.2 2011 BASE YEAR EMISSIONS INVENTORY

A 2011 emissions inventory was developed for a typical July day for the year 2011 for the ozone precursors of oxides of nitrogen ($NO_X$) and volatile organic compounds (VOC) emitted in the DM/NFR area. An inventory of emissions was developed for all major source categories including oil and gas, point, area, non–road, and on–road sources (see Table 13). Residential fuel combustion is excluded because emissions from this category are negligible in the summer. Fire emissions and other "naturally occurring" emissions are not included in the anthropogenic portion of the inventory, but are included as "biogenic" sources which are held constant and are addressed in section 3.3.7. The full 2011 emissions inventory with detailed information on methodology is available in the Moderate area SIP. This 2011 emissions inventory is the baseline year inventory for both RFP (Chapter 4) and the Contingency Measures Plan (Chapter 10) of this SIP.

[26] See "Approval and Promulgation of State Implementation Plan Revisions; Colorado; Attainment Demonstration for the 2008 8-Hour Ozone Standard for the Denver Metro/North Front Range Nonattainment Area, and Approval of Related Revisions", 83 Fed. Reg. 31,068 (July 3, 2018).

[27] *See* "Milestones", CAA §182(g)

[28] *See* "'Emission Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations,'' EPA-454/B-17-002. Revised May 2017.

**Table 13 – 2011 Nonattainment Area Emissions Inventory (tons per day (tpd))**

| Description | VOC | $NO_X$ |
|---|---|---|
| **Oil and Gas Sources** | | |
| Point Sources Subtotal | 14.8 | 18.1 |
| Condensate/Oil Tanks Subtotal | 216.0 | 1.1 |
| Area Sources Subtotal | 48.9 | 22.2 |
| **TOTAL** | **279.7** | **41.4** |
| **Point Sources (EGU and Non–Oil and Gas)** | | |
| Electric Generating Units (EGU) | 0.7 | 39.7 |
| Point (Non–Oil and Gas) | 25.9 | 21.0 |
| **TOTAL** | **26.5** | **60.7** |
| **Area Sources (Non–Oil and Gas)** | | |
| **TOTAL** | **60.6** | **-** |
| **Non–Road Mobile Sources** | | |
| **TOTAL** | **58.2** | **75.9** |
| **On–Road Mobile Sources** | | |
| Light–Duty Vehicles | 90.0 | 102.5 |
| Medium/Heavy–Duty Vehicles | 3.7 | 39.6 |
| **TOTAL** | 93.7 | 142.0 |
| **Total Anthropogenic Emissions** | **518.8** | **320.0** |

## 3.3 2017 MILESTONE YEAR EMISSIONS INVENTORY

The Regional Air Quality Council (RAQC), in conjunction with the Colorado Air Pollution Control Division (APCD), developed an updated 2017 "milestone year" emissions inventory for a Serious nonattainment area. When initially developed for the Moderate area SIP the 2017 inventory was calculated based on projected values. The 2017 inventory approved as part of the Moderate area SIP has been updated for the purposes of the Serious area SIP using actual data collected in 2017 and methodologies as presented in the following sections. This inventory is also being used to meet requirements of being a Marginal nonattainment area under the 2015 8-hour Ozone NAAQS[29,30]. This inventory is in tons per summer day (tpd) and represents the most current available data for emissions estimates for an average episode day during the peak summer ozone season of June through September. This includes actual data for the oil and gas sector and stationary sources in addition to newer data from updated regional transportation demand models used by the two Metropolitan Planning Organizations in the DM/NFR.

### 3.3.1 Background

The 2017 inventory was developed using EPA–approved emissions models and methodology. Anthropogenic VOC emissions total 353.7 tpd and $NO_X$ emissions total 187.1 tpd (see Table 14). The full 2017 emissions inventory is provided in Appendix 3-A. The following sections discuss the development of the 2017 emission inventory broken out by source category, with more detailed descriptions provided in the accompanying Technical Support Documents (TSD).

[29] The EPA classified the DM/NFR as a Marginal nonattainment area for the 2015 8-hr Ozone NAAQS, effective August 3, 2018. *See* "Additional Air Quality Designations for the 2015 Ozone National Ambient Air Quality Standards." 83 Fed. Reg. 25,776 (June 4, 2018).

[30] Approved by Colorado Air Quality Control Commission (AQCC) June 2020.

**Table 14 – Updated 2017 Nonattainment Area Emissions Inventory (tpd)**

| Description | VOC | NOx |
|---|---|---|
| **Area** | **65.3** | **--** |
| Architectural and Industrial Maintenance | 28.6 | -- |
| Consumer Products | 20.6 | -- |
| Other | 16.2 | -- |
| **Non-Road** | **44.0** | **42.6** |
| Agriculture | 0.3 | 2.3 |
| Aviation | 1.8 | 6.4 |
| Commercial Equipment | 6.7 | 17.2 |
| Lawn and Garden | 32.1 | 7.8 |
| Railroad | 0.5 | 8.4 |
| Recreation | 2.7 | 0.5 |
| **Oil and Gas** | **163.3** | **51.0** |
| Area | 43.6 | 38.1 |
| Condensate/Oil Tanks | 107.7 | 1.4 |
| Point | 12.0 | 11.5 |
| **On-Road** | **57.6** | **68.4** |
| Light-Duty Vehicles | 55.6 | 53.5 |
| Medium/Heavy-Duty Vehicles | 2.0 | 14.9 |
| **Point** | **22.9** | **25.1** |
| EGU | 0.3 | 9.4 |
| Non-EGU | 22.6 | 15.8 |
| **Grand Total** | **353.1** | **187.1** |

### 3.3.2 Oil and Gas Sources

The emissions inventory for the oil and gas sector includes three segments: point sources, condensate/oil tanks, and area sources and provided in Table 15. In consideration of the technological advancements and emission controls taking place in the oil and gas sector, the RAQC and the Colorado APCD engaged industry to develop the 2017 and 2020 future year emissions inventory. In May 2015, the APCD and RAQC held several meetings with representatives from the top six oil and gas producers in the Denver–Julesburg (DJ) basin, representing around 80% of production in the DM/NFR area, which resulted in detailed information which was used to develop the Moderate area SIP. As part of the Serious area SIP, this group was reconvened to update emissions for 2017 based on actual emissions data wherein 11 producers submitted facility and equipment-specific data for 2017, with 8 of them having facilities that operate within the DM/NFR area.

#### 3.3.2.1 Oil and Gas Point Sources

Oil and gas point sources include external combustion boilers, industrial processes, internal combustion sources, petroleum/solvent evaporation, and waste disposal. This portion of the inventory is based upon reporting in the Colorado Air Pollutant Emission Notice (APEN) database.

### 3.3.2.2 Oil and Gas Condensate/Oil Tanks

Oil and gas condensate/oil tanks are the largest single source of VOC emissions in the emissions inventory and are rivaled only by mobile emissions in quantity. Prior to 2012, nearly every well drilled in the DJ basin was vertical. Starting around 2012, the number of vertical wells being drilled began to decline with nearly all new wells drilled being directional or horizontal. Non-vertical wells are able to reach more area in the formation and are thus able to extract more energy with fewer wells, making it a more efficient technology for production from today's oil and gas sector. In addition, implementation of multiple stages of separation and tankless production facilities allow for more gas capture, which reduces flash emissions and enables more product to be retained for the sales.

While a 13.7 pounds per barrel (lb/bbl) emission factor (EF) is still used for many older facilities with vertical wells, newer facilities with horizontal wells use multiple stages of separation to get rid of flash gas before the oil goes into storage, thus lowering the uncontrolled emission factor to closer to 1 lb/bbl and minimizing the potential for leaks. Because of this, it necessitated the need for an updated methodology in determining appropriate emission factors for 2017 and beyond. As a continuation of the collaboration with industry, discussed previously, it was determined that the projected 2017 inventory developed for the Moderate area SIP could be further refined based on actual data that is now available.

For the 2017 oil and gas inventory, emissions were based on 2017 data from the Colorado APEN database, data collected by the Colorado Oil and Gas Conservation Commission (COGCC), and data reported directly by industry. A survey from several of the largest oil and gas producers in the State provided information on actual production and emissions from 2017 on a per facility basis. From this data, a facility-level tank EF was calculated in lbs/bbl based on provided uncontrolled emissions rates from condensate/oil tanks. Each facility was then categorized into bins and assigned a corresponding control factor, which is the applicable capture efficiency (CE) multiplied by the applicable rule effectiveness (RE) (see Equation 1). According to EPA's 1992 Guidance[31], CE is the actual operating conditions and process and/or device upsets and RE reflects the ability of a regulatory program to achieve all the emission reductions that could have been achieved by full compliance with the applicable regulations at all sources at all times. In addition, the RE and CE control discount factors take into account some degree of typical non–compliance and control measure effectiveness with regulatory requirements.

**Equation 1: Adjusted Emissions**

$$\text{Adjusted Emissions (tpd)} = \text{Facility Production (bbl/yr)} \times EF_{PR\text{-}wtd,Unc}\ \text{(lb/bbl)} \div 2000\ \text{lb/ton} \times 1\ \text{yr}/365\ \text{days} \times (1 - DRE \times (CE \times RE))$$

- $EF_{PR\text{-}Wtd,Unc}$ is the production-weighted uncontrolled VOC emissions factor for primary- and secondary-controlled production (determined through analysis of 2017 producer-reported data (see Point Source and Oil and Gas Emissions Inventory Development TSD).

[31] *See* "U.S. EPA., Guidelines for Estimating and Applying Rule Effectiveness for Ozone/CO State Implementation Plan Base Year Inventories". Nov. 1992, EPA-4S2/R-92.QlO.

- Destruction and removal efficiency (DRE) is the efficacy of the control device (i.e., the percentage of molecules removed in an exhaust stream relative to the amount that entered).

For the various bins, the control factor was determined as follows:

- $VOC\_EF_{uncontrolled} \geq 9.0$ lbs/bbl = (0.75*0.80) = 60.0%
- $VOC\_EF_{uncontrolled} \geq 1.0$ lbs/bbl = (0.80*0.83) = 66.4%
- $VOC\_EF_{uncontrolled} < 1.0$ lbs/bbl = (0.99*0.86) = 85.1%

The values for CE and RE were selected to account for changes observed in the 6 am to 9 am precursor levels at the CDPHE VOC monitoring site in Platteville, Colorado from 2012 to 2018. This timeframe is optimal in order to capture raw emissions prior to the time of the day when emissions begin being involved in photochemical reactions. In order to ground truth CE and RE, Colorado separately evaluated ambient monitoring results from the Platteville monitoring site, early in the day when VOC levels were expected to be low. Colorado then adjusted the emissions estimates to account for the higher VOC levels, including ethane which is attributed largely only to oil and gas exploration and production. Based on this, it was determined that RE is lowest (80%) for high $VOC\_EF_{uncontrolled}$ site-specific values and is highest (86%) for the lowest site-specific uncontrolled VOC emission factor bin.

Since the first base year in 2011, the capture of emissions has increased due to state and federal regulatory requirements, greater state and federal compliance and enforcement efforts, and advances in industry engineering practices and process technology. Through the continuation of these combined efforts, it is expected that the emission of VOCs from tanks will be minimized to the maximum extent practicable as required by Regulation Number 7, 5 C.C.R. §1001-9, and higher capture and routing of emissions to the control device will be achieved for flashing emissions.

#### 3.3.2.3 Oil and Gas Area Sources

Oil and gas area sources include a wide variety of categories such as engines, truck loading, pneumatic devices, fugitives, hydraulic fracturing completions, and blowdowns. For 2017, emissions were provided by industry and scaled up based on production and well count to account for the full sector. Any additional categories not captured by producer-submitted information were supplemented through scaling-up data from the 2014 National Emissions Inventory (NEI) based on source classification code.

**Table 15 –Updated 2017 Oil and Gas Point and Area Source Emissions Inventory (tpd)**

| Description | VOC | NOx |
|---|---|---|
| **Area** | **43.6** | **38.1** |
| Drilling (incl. some pre-production) | 0.9 | 9.4 |
| Hydraulic fracturing (incl. some pre-production) | 2.6 | 11.8 |
| Fugitives | 7.9 | 0.0 |
| Heaters | 0.1 | 1.7 |
| Internal Combustion Engines | 6.6 | 15.0 |
| Pneumatic devices | 12.9 | 0.0 |
| Pneumatic pumps | 0.1 | 0.0 |
| Separator control | 1.7 | 0.0 |
| Truck loading of condensate liquid | 3.3 | 0.0 |
| Venting - blowdowns | 2.7 | 0.0 |
| Venting - initial completions and recompletions | 3.1 | 0.1 |
| Water tank losses | 1.7 | 0.0 |
| **Condensate/Oil Tanks** | **107.7** | **1.4** |
| **Point** | **12.0** | **11.5** |
| External Combustion Boilers | 0.0 | 0.2 |
| Industrial Processes | 3.0 | 0.7 |
| Internal Combustion Engines | 4.7 | 10.5 |
| Petroleum and Solvent Evaporation | 4.3 | 0.046 |
| **Oil and Gas Subtotal** | **163.3** | **51.0** |

### 3.3.3 Point Sources

The 2017 emissions inventory for power plants, also referred to as electric generating units (EGUs), was developed based upon Colorado APEN reported data for each year and is specified in Table 16.

**Table 16 – Updated 2017 EGU NOX Emissions (tpd)**

| Description | NOx |
|---|---|
| Arapahoe Combustion Turbine Facility | 0.1 |
| Blue Spruce Energy Center | 0.2 |
| Cherokee | 6.5 |
| Fort St. Vrain | 1.0 |
| Frank Knutson Station | 0.02 |
| J M Shafer | 0.5 |
| Rocky Mountain Energy Center | 0.6 |
| Spindle Hill Energy Center | 0.1 |
| Valmont | 0.3 |
| Zuni | 0.04 |
| **EGU Subtotal** | **9.4** |

The Colorado Clean Air Clean Jobs Act of 2010 was instrumental in spurring $NO_X$ emission reductions from the EGU sector. From 2011 to 2017, $NO_X$ emissions were cut nearly in half because of the mandates in this bill, which called for the closure of multiple units and the switching to natural gas for others. Other point sources (shown in Table 17) includes external combustion boilers, industrial processes, internal combustion sources, and petroleum/solvent evaporation that are not associated with the oil and gas industry and was also developed based upon Colorado APEN reported data. The inventory for internal combustion engines factors in federal non–road engine standards and includes NOx emission reductions from a broad array of small boilers due to EPA's area source Maximum Achievable Control Technology (MACT) (Subpart JJJJJJ), taking effect in 3/21/12.

**Table 17 –Updated 2017 Point Source (Non–EGU) Sources Emissions Inventory (tpd)**

| Description | VOC | NOx |
|---|---|---|
| External Combustion Boilers | 0.5 | 5.5 |
| Industrial Processes | 7.1 | 4.9 |
| Internal Combustion Engines | 0.4 | 4.8 |
| MACT Source Categories | 0.2 | 0.0 |
| Petroleum and Solvent Evaporation | 11.1 | 0.3 |
| Waste Disposal | 3.2 | 0.2 |
| **Non-EGU Point Sources Subtotal** | **22.9** | **25.1** |

### 3.3.4 Area Sources

Area sources (non–oil and gas) are primarily VOC sources and include a wide range of diverse categories such as coatings, household and personal care products, pesticides, automotive aftermarket products, and sealants. The 2017 emissions inventory (provided in Table 18) was based on EPA's 2014 NEI and the 2017 inventory was grown from the 2014 NEI based upon county population projections from the State Demography Office. There are few national regulations that impact these sources.

**Table 18 –Updated 2017 Area Sources Emissions Inventory (tpd)**

| Description | VOC |
|---|---|
| **Agriculture** | **1.8** |
| Beef cattle production composite | 0.7 |
| Dairy cattle composite | 0.2 |
| Pesticide Application | 0.7 |
| Poultry production - layers with dry manure management systems | 0.1 |
| Swine production composite | 0.1 |
| **Architectural and Industrial Maintenance** | **28.6** |
| All Adhesives and Sealants | 9.5 |
| All Coatings and Related Products | 4.9 |
| Architectural Coatings | 12.3 |
| Industrial Maintenance Coatings | 1.9 |
| **Consumer Products** | **20.6** |
| All Household Products | 10.4 |
| All Personal Care Products | 10.2 |
| **Cooking and Grilling** | **0.7** |
| Commercial Cooking - Charbroiling | 0.5 |
| Commercial Cooking - Frying | 0.1 |
| Residential Grilling | 0.1 |
| **Other** | **11.3** |
| All Automotive Aftermarket Products | 1.0 |
| All FIFRA Related Products | 9.3 |
| Emulsified Asphalt | 0.2 |
| Miscellaneous Products (Not Otherwise Covered) | 0.7 |
| Other Special Purpose Coatings | 0.1 |
| Tank Trucks in Transit | 0.1 |
| Traffic Markings | 0.01 |
| **Portable Gas Cans** | **2.4** |
| Commercial | 1.1 |
| Residential | 1.3 |
| **Area Sources Subtotal** | **65.3** |

### 3.3.5 Non–Road Sources

Non–road mobile sources include large and small engines such as lawn and garden equipment, commercial and industrial equipment, construction and mining equipment, aircraft, and locomotives. The inventory for these sources is shown in Table 19. This inventory was developed using several methods, with a majority of categories being based on the EPA's Non–Road Model, which is now incorporated into EPA's Mobile Vehicle Emissions Simulator (MOVES2014) model. EPA's Non-Road Model accounts for federal regulations, including engine standards. Categories that are not based on the non–road model are aircraft and locomotives.

For aircraft, Denver International Airport (DIA) provided data on fleet composition and activity level to estimate emissions. Other aircraft is grown based on DIA 2014 Terminal data forecast to 2017 and aggregated for the nonattainment area. For railroad locomotives and switchers (i.e. rail yard), the activity levels are grown from 2011 to 2017 based on population. Line Haul locomotive (i.e. railroad equipment diesel) activity levels are apportioned based on track mileage in the DM/NFR area. An emission factor is then applied based upon EPA's guidance on Emission Factors for Locomotives to calculate emissions.

**Table 19 –Updated 2017 Non–Road Emissions Inventory (tpd)**

| Description | VOC | NOx |
|---|---|---|
| **Agriculture** | **0.3** | **2.3** |
| Agricultural Equipment | 0.3 | 2.3 |
| **Aviation** | **1.8** | **6.4** |
| Aircraft | 1.7 | 6.1 |
| Airport Ground Support Equipment | 0.1 | 0.3 |
| **Commercial** | **6.7** | **17.2** |
| Commercial Equipment | 4.3 | 3.5 |
| Construction and Mining Equipment | 1.9 | 10.7 |
| Industrial Equipment | 0.5 | 3.0 |
| Logging Equipment | 0.0 | 0.0 |
| **Lawn and Garden** | **32.1** | **7.8** |
| Commercial | 26.6 | 7.0 |
| Residential | 5.5 | 0.7 |
| **Railroad** | **0.5** | **8.4** |
| Line Haul | 0.3 | 5.6 |
| Rail Yard - Switcher Locomotives | 0.2 | 2.8 |
| Railroad Support Equipment | 0.0 | 0.0 |
| **Recreation** | **2.7** | **0.5** |
| Pleasure Craft | 1.4 | 0.4 |
| Recreational Equipment | 1.3 | 0.1 |
| **Non-Road Mobile Sources Subtotal** | **44.0** | **42.6** |

### 3.3.6 On–Road Sources

The 2017 on–road emission inventory (shown in Table 20) was developed as part of the Moderate area SIP for the 2008 NAAQS, and was the basis for the Motor Vehicle Emissions Budgets (MVEB) that are currently in place[32]. The 2017 on–road emission inventory is provided in Table 20 and was estimated using the EPA's emission modeling tool MOVES2014, which was officially released in October 2014 and updated in May 2015 with carbon bond 6 (CB6) chemical mechanisms (version movesdb2014cb6v2). On November 4, 2015, EPA released an updated version of their mobile model, MOVES2014a, which was considered a minor revision to MOVES2014. However, due to SIP inventory and modeling work already being underway using MOVES2014 and the relatively minor updates associated with the newer version, EPA indicated that it was suitable for Colorado to continue to use the inventories developed using MOVES2014 for the Moderate area SIP, and approved that portion of the Moderate area SIP.

The mobile model has multiple inputs including vehicle miles traveled (VMT), vehicle population, roadway activity data (speed and time of day), roadway classifications (urban, rural, restricted, unrestricted), fuel properties, inspection and maintenance (I/M) program, and temperature and humidity profiles. VMT is based on model output data from the Denver Regional Council of Governments (DRCOG) and the North Front Range Metropolitan Planning Organization (NFRMPO). The default fuel formulation was used for 2017.

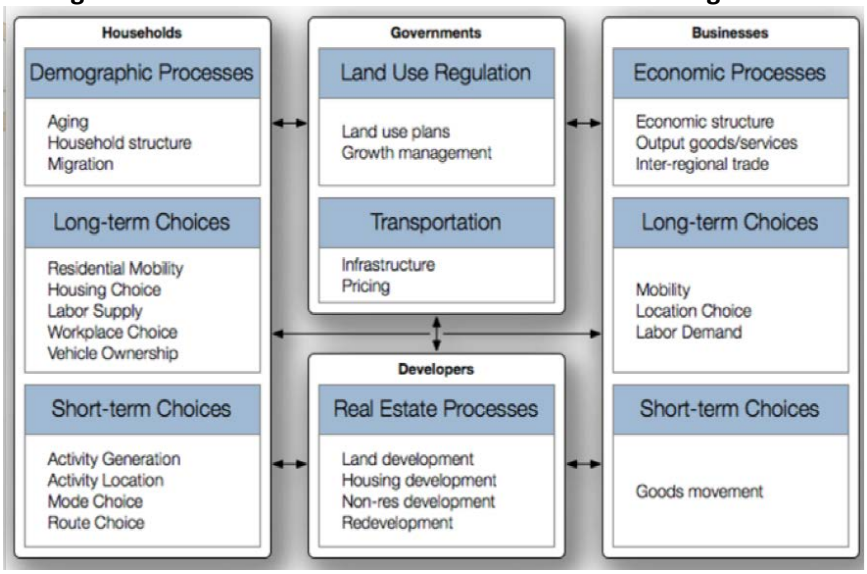
**Table 20 - 2017 On–Road Mobile Source Emission Inventory (tons per day)**

| Description | | VOC | NOx |
|---|---|---|---|
| **Class 10 – Motorcycles** | On-Network | 0.3 | 0.1 |
| | Off-Network | 1.8 | 0.0 |
| **Class 20 – Passenger Cars** | On-Network | 6.2 | 12.1 |
| | Off-Network | 16.3 | 7.1 |
| **Class 30 – Light Trucks** | On-Network | 7.7 | 18.9 |
| | Off-Network | 23.4 | 15.4 |
| **Class 40 – Buses** | On-Network | 0.1 | 1.0 |
| | Off-Network | 0.003 | 0.003 |
| **Class 50 – Refuse / Single–Unit Trucks** | On-Network | 0.2 | 0.8 |
| | Off-Network | 0.3 | 0.2 |
| **Class 60 – Short / Long–Haul Trucks** | On-Network | 0.4 | 7.4 |
| | Off-Network | 1.0 | 5.5 |
| **On-Road Mobile Sources Subtotal** | | **57.6** | **68.4** |
| **Subtotals (All Classes)** | **On-Network** | 14.8 | 40.1 |
| | **Off-Network** | 42.8 | 28.2 |

VMT outputs are the product of sophisticated transportation and land use models used to predict the state of transportation in the future. For the northern subarea, the NFRMPO uses a four–step model process consisting of the following four models: Economic Forecast Model; Land Use Allocation Model; Travel Demand Model; and Emissions Model. For the southern subarea, DRCOG uses UrbanSim (Figure 4) to forecast socioeconomic changes and the Focus 30+ step activity–based travel model to synthesize individual regional household and population data to forecast travel throughout a typical weekday based on personal and travel–related characteristics.

[32] Moderate Area SIP budgets went into effect on January 30, 2018 upon EPA's finding of adequacy. (*See* "U.S EPA. Morales, Monica S. (2018, Jan. 30). "State Implementation Plan (SIP) Attainment Plan for the Metro-Denver/North Front Range Ozone Nonattainment Area; Transportation Conformity Adequacy".)

**Figure 4 - DRCOG UrbanSim Socioeconomic Forecasting Process**




The outputs of these models include population, employment, and households in each transportation analysis zone (TAZ), roadway use data (traffic volumes, speed and delay), and transit use data.
Based on this data, forecasts can be made related to:

1. Generated trips land uses
2. Distributed trips on an identified transportation network
3. Distributed trips among mode choice (drive, carpool, transit, bike, walk)
4. Assigned traffic onto the identified transportation network
5. Impacts on the transportation network

Table 21 shows the VMT and vehicle population in 2017. Vehicle population and fleet age distribution are based on the 2014 report by Eastern Research Group (ERG), with 2017 vehicle population being grown from 2014 by the ratio of the VMT increase from 2014 to 2017. The inventory is broken out by six Highway Performance Monitoring System (HPMS) vehicle classes and by on–network and off–network. For HPMS class 60 populations, the MOVES default ratio of class 60 populations to VMT is used to calculate the population because class 60 vehicles are not always registered where they are used.

**Table 21 –2017 VMT in Nonattainment Area**

| Vehicle Class by Subregion | 2017 VMT (daily miles) |
|---|---|
| **DRCOG – Southern Subregion** | **80,509,957** |
| Light–Duty Vehicles (Classes 10–30) | 78,937,128 |
| Medium and Heavy–Duty Vehicles (Classes 40–60) | 1,572,829 |
| **NFRMPO – Northern Subregion** | **12,949,520** |
| Light–Duty Vehicles (Classes 10–30) | 12,672,221 |
| Medium and Heavy–Duty Vehicles (Classes 40–60) | 277,299 |
| **TOTAL** | **93,459,477** |

TAZ data from DRCOG and NFRMPO are used to apportion off–network start and evaporative emissions to the grid cells for photochemical modeling. Both on–network and off–network data are processed by the APCD through MOVES2014b[33]. These emission outputs are then split out by county and processed through EPA's Sparse Matrix Operator Kernel Emissions (SMOKE) MOVES processor for use in photochemical modeling.

### 3.3.7 Biogenic Sources

Emissions of VOC and $NO_X$ from biogenic sources have been generated by the Model of Emissions of Gases and Aerosols from Nature (MEGAN) Biogenic Emissions Model using land cover data base of biomass type and density and hourly meteorology data. The National Center of Atmospheric Research (NCAR) has produced a global data base of land use data for use with MEGAN. Surface temperatures are provided by the Weather Research and Forecasting (WRF) Model. Biogenic sources, shown in Table 22, are held constant between 2017 and 2020.

**Table 22 – 2017 Biogenic Emissions (tons per day)**

| Description | VOC | $NO_X$ |
|---|---|---|
| Total Biogenic Sources | 178.7 | 50.9 |

[33] On November 4, 2015, EPA released an updated version of their mobile model, MOVES2014a, which was considered a minor revision to MOVES2014. In July 2018, EPA released an additional update (MOVES2014b) that was intended to improve estimates of emissions from nonroad mobile sources. MOVES2014b did not significantly change the on-road criteria pollutant emissions results of MOVES2014 and is not considered a new model for State Implementation Plan (SIP) and transportation conformity purposes.

## APPENDIX 3–A: UPDATED 2017 EMISSIONS INVENTORY

| Description | VOC | NOx |
|---|---|---|
| **Point** | **22.9** | **25.1** |
| EGU | 0.3 | 9.4 |
| External Combustion Boilers | 0.5 | 5.5 |
| Industrial Processes | 7.1 | 4.9 |
| Internal Combustion Engines | 0.4 | 4.8 |
| MACT Source Categories | 0.2 | 0.0 |
| Petroleum and Solvent Evaporation | 11.1 | 0.3 |
| Waste Disposal | 3.2 | 0.2 |
| **Area** | **65.3** | **--** |
| **Agriculture** | **1.8** | -- |
| Beef cattle production composite | 0.7 | -- |
| Dairy cattle composite | 0.2 | -- |
| Pesticide Application | 0.7 | -- |
| Poultry production - layers with dry manure management systems | 0.1 | -- |
| Swine production composite | 0.1 | -- |
| **Architectural and Industrial Maintenance** | **28.6** | -- |
| All Adhesives and Sealants | 9.5 | -- |
| All Coatings and Related Products | 4.9 | -- |
| Architectural Coatings | 12.3 | -- |
| Industrial Maintenance Coatings | 1.9 | -- |
| **Consumer Products** | **20.6** | -- |
| All Household Products | 10.4 | -- |
| All Personal Care Products | 10.2 | -- |
| **Cooking and Grilling** | **0.7** | -- |
| Commercial Cooking - Charbroiling | 0.5 | -- |
| Commercial Cooking - Frying | 0.1 | -- |
| Residential Grilling | 0.1 | -- |
| **Other** | **11.3** | -- |
| All Automotive Aftermarket Products | 1.0 | -- |
| All FIFRA Related Products | 9.3 | -- |
| Emulsified Asphalt | 0.2 | -- |
| Miscellaneous Products (Not Otherwise Covered) | 0.7 | -- |
| Other Special Purpose Coatings | 0.1 | -- |
| Tank Trucks in Transit | 0.1 | -- |
| Traffic Markings | 0.0 | -- |
| **Portable Gas Cans** | **2.4** | -- |
| Commercial | 1.1 | -- |
| Residential | 1.3 | -- |
| **On-Road** | **57.6** | **68.4** |
| **Light-Duty Vehicles** | **55.6** | **53.5** |
| Off-Net | 41.5 | 22.5 |
| On-Net | 14.1 | 31.0 |
| **Medium/Heavy-Duty Vehicles** | **2.0** | **14.9** |
| Off-Net | 1.3 | 5.8 |
| On-Net | 0.6 | 9.1 |

**APPENDIX 3–A: UPDATED 2017 EMISSIONS INVENTORY (CONTINUED)**

| Description | VOC | NOx |
|---|---|---|
| **Non-Road** | **44.0** | **42.6** |
| **Agriculture** | **0.3** | **2.3** |
| Agricultural Equipment | 0.3 | 2.3 |
| **Aviation** | **1.8** | **6.4** |
| Aircraft | 1.7 | 6.1 |
| Airport Ground Support Equipment | 0.1 | 0.3 |
| **Commercial** | **6.7** | **17.2** |
| Commercial Equipment | 4.3 | 3.5 |
| Construction and Mining Equipment | 1.9 | 10.7 |
| Industrial Equipment | 0.5 | 3.0 |
| Logging Equipment | 0.0 | 0.0 |
| **Lawn and Garden** | **32.1** | **7.8** |
| Commercial | 26.6 | 7.0 |
| Residential | 5.5 | 0.7 |
| **Railroad** | **0.5** | **8.4** |
| Line Haul | 0.3 | 5.6 |
| Rail Yard - Switcher Locomotives | 0.2 | 2.8 |
| Railroad Support Equipment | 0.0 | 0.0 |
| **Recreation** | **2.7** | **0.5** |
| Pleasure Craft | 1.4 | 0.4 |
| Recreational Equipment | 1.3 | 0.1 |
| **Oil and Gas** | **163.3** | **51.0** |
| **Area** | **43.6** | **38.1** |
| Drilling (incl. some pre-production) | 0.9 | 9.4 |
| Hydraulic fracturing (incl. some pre-production) | 2.6 | 11.8 |
| Fugitives | 7.9 | 0.0 |
| Heaters | 0.1 | 1.7 |
| Internal Combustion Engines | 6.6 | 15.0 |
| Pneumatic devices | 12.9 | 0.0 |
| Pneumatic pumps | 0.1 | 0.0 |
| Separator control | 1.7 | 0.0 |
| Truck loading of condensate liquid | 3.3 | 0.0 |
| Venting - blowdowns | 2.7 | 0.0 |
| Venting - initial completions and recompletions | 3.1 | 0.1 |
| Water tank losses | 1.7 | 0.0 |
| **Condensate/Oil Tanks** | **107.7** | **1.4** |
| **Point** | **12.0** | **11.5** |
| External Combustion Boilers | 0.0 | 0.2 |
| Industrial Processes | 3.0 | 0.7 |
| Internal Combustion Engines | 4.7 | 10.5 |
| Petroleum and Solvent Evaporation | 4.3 | 0.0 |
| **Grand Total** | **353.1** | **187.1** |

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# CHAPTER 4
# 2020 ATTAINMENT YEAR EMISSIONS INVENTORY AND REASONABLE FURTHER PROGRESS (RFP) DEMONSTRATION



## 4.1 OVERVIEW

There are two primary parts of the Clean Air Act (CAA) that provide for the requirements applicable to areas designated nonattainment for the ozone National Ambient Air Quality Standard (NAAQS): Sections 171 – 179B, 42 U.S.C. §§ 7501 – 7509a, referred to as "Subpart 1", and Sections 181 – 185B, 42 U.S.C. §§ 7511 – 7511f, referred to as "Subpart 2." Subpart 1 applies to areas designated nonattainment for any of the NAAQS, while Subpart 2 provides more detailed requirements for areas designated nonattainment specifically for the ozone NAAQS.

All nonattainment areas classified Moderate or above must adopt revisions to their State Implementation Plans (SIP) that demonstrate attainment by the applicable attainment date and make "reasonable further progress" towards attainment. This Reasonable Further Progress (RFP) requirement is first found in Subpart 1, Section 172(c)(2). "Reasonable further progress" is defined as "such annual incremental reductions in emissions of the relevant air pollutant as are required by this part or may reasonably be required by the Administrator for the purpose of ensuring attainment of the applicable national ambient air quality standard by the applicable date." CAA §171(a), 42 U.S.C. § 7501(a).

CAA Subpart 2, §182(c)(2)(A)) provides that an area classified as Serious must submit a revised plan demonstrating that the SIP will provide for attainment of the ozone NAAQS by the applicable attainment date. This attainment demonstration must be based on photochemical grid modeling or any other analytical method determined by the Administrator, in the Administrator's discretion, to be at least as effective. The 2020 emission inventories for nitrogen oxides ($NO_X$) and volatile organic compound (VOC), discussed in sections 4.2 through 4.4 of this chapter, support the photochemical grid modeling and attainment demonstration addressed in Chapter 5. CAA Subpart 2, §182(c)(2)(B) provides that an area classified as Serious for ozone must submit a revision to its SIP showing a 9% reduction in VOC over each consecutive 3-year period beginning 6 years after designation as nonattainment (July 20, 2012), until the attainment date, which is demonstrated in section 4.5.

## 4.2 SUMMARY OF 2020 OZONE SEASON DAY EMISSIONS INVENTORY

This section presents the 2020 emissions inventory used in the modeling scenarios for the Serious area SIP for the Denver Metro/North Front Range (DM/NFR), which includes the counties of Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, Jefferson, and portions of Larimer and Weld. This inventory is in tons per summer day and represents emissions estimates for an average episode day during the peak summer ozone season (June through September). The 2020 inventory for VOC and NOx accounts for emissions growth associated with changes in population, fuel use, and economic activity as well as emissions reductions associated with on–the–books controls. The U.S. Environmental Protection Agency (EPA) has provided guidance on developing emission projections to be used with models and other analyses for demonstrating attainment of air quality goals for ozone (EPA 2017[34]).

[34] U.S. Environmental Protection Agency (EPA), Emissions Inventory Guidance for Implementation of Ozone [and Particulate Matter] National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations, May 2017, https://www.epa.gov/sites/production/files/2017-07/documents/ei_guidance_may_2017_final_rev.pdf.

This guidance and other information[35] available from EPA was followed and used in developing the future year emission projections. Inventories for the 8–hour ozone 2020 control case modeling are included in the Attainment Demonstration, which is covered in Chapter 5.

## 4.3 CONTROL MEASURES ACCOUNTED FOR IN THE INVENTORY

The 2020 inventory, summarized in Table 23, reflects control measures that were in place as SIP control measures by the beginning of the 2020 summer ozone season (May 1, 2020) and are detailed below.

**Table 23 – Federally Enforceable Measures**

| Measures Included in the SIP |
|---|
| **Mobile Sources** |
| Federal On–Road and Non–Road Mobile Source Standards and Regulations |
| Vehicle Inspection and Maintenance (I/M) Program |
| 7.8 Reid Vapor Pressure with 1 PSI Ethanol Waiver (8.8 RVP) |
| Stage I Vapor Recovery |
| **Stationary Sources** |
| Oil and Gas Regulations – Regulation Number 7 |
| Regional Haze SIP Provisions – Regulation Number 3 |
| Other Stationary Source Regulations – Regulation Number 3, 6, 7, and 8 |
| Low-VOC Architectural and Industrial Maintenance (AIM) and Consumer Products - Regulation Number 21 |

### 4.3.1 Federal On–Road and Non–Road Mobile Source Standards and Regulations

Federal engine and vehicle emissions standards are incorporated into EPA's mobile source model (MOVES2014b). This includes standards for on–road vehicles as well as small engines, non–road mobile sources, and fuels[36]. Specific regulations accounted for in the mobile mode include:

**a. Non–Road Engines, Vehicles, Equipment**

i. Large Non–Road Diesel Engine Rule – Tier 4 (Phased–In Model Years (MY) 2008–2015)
ii. Locomotive Engine Rule (MY 2015+)
iii. Federal Non–Road Spark–Ignition Engines and Equipment (Phased–In MY 2008–2016)
iv. Recreational Spark–Ignition (SI) Engine Standards (Phased–In MY 2008+)

**b. On–Road Engines and Vehicles**

i. Tier 2 Standards for Light–Duty and some Medium–Duty Vehicles (Phased–In MY 2004–2009)
ii. Tier 3 Standards for Light–Duty and some Medium–Duty Vehicles (Phased–In MY 2017–2025)
iii. Heavy–Duty Engine and Vehicle Standards (Phased–In MY 2007+)
iv. Light–Duty Vehicle Greenhouse Gas Rule (Phase 1 (Phased–In MY 2012–2016); Phase 2 – (Phased–In MY 2017–2025))
v. Medium and Heavy–Duty Vehicle Greenhouse Gas Rules (Phase 1 (Phased–In MY 2014–2018))

[35] U.S. Environmental Protection Agency's (EPA) final *2008 National Ambient Air Quality Standards for Ozone: State Implementation Plan Requirements,* 80 Fed. Reg. 12,264 (Mar. 6, 2015).

[36] U.S. EPA, Emission Standards Reference Guide, All EPA Emission Standards, www.epa.gov/emission-standards-reference-guide/all-epa-emission-standards], accessed 03/16/20.

**c. Fuels**

i. Tier 3 Fuel Standards (Effective 2017 for large refineries, 2020 for small refineries)
ii. Renewable Fuel Standard Program (RFS2) (Effective 2015)
iii. Control of Hazardous Air Pollutants from Mobile Sources (Effective 2007)
iv. Ultra–Low–Sulfur Diesel (ULSD) (Effective 2006)

### 4.3.2 Inspection and Maintenance (I/M) Program – AQCC Regulation Number 11

Under the CAA, nonattainment areas classified as Serious or higher are required to implement an "enhanced" motor vehicle inspection and maintenance (I/M) program as part of the SIP. Under the carbon monoxide NAAQS, the Denver metropolitan area was required to implement an "enhanced" I/M Program. The state began implementing an enhanced program in 1995 and continues to implement it in the Denver metropolitan seven–county area, including Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, and Jefferson counties. The I/M program area is presented in Figure 5. In 2010, parts of Larimer and Weld Counties in the North Front Range area were added to the program area as a state–only requirement and was subsequently incorporated into the Moderate area SIP, making it federally enforceable upon EPA's approval in 2018.[37].

In Colorado, Air Quality Control Commission (AQCC) Regulation Number 11, 5 C.C.R. §1001-13, addresses the requirements for the I/M Program, which consists of the following elements:

- Non–Diesel Fueled Motor Vehicles
- Bi–annual inspection of 1982 and newer vehicles; annual inspection for 1981 and older vehicles
- Seven model year and newer vehicle exemption
- Four model year on–board diagnostics (OBD II) inspection
- I/M 240 transient inspection for 1982 and newer light–duty gas vehicles with the remaining vehicles receiving a two-speed idle inspection
- On–road Remote Sensing Device (RSD) Clean Screen Program – allows vehicles seen two or more times within 12 months of required emissions inspection to pass clean screen inspection in lieu of a standard inspection at a station
- Enforced via registration renewal

[37] *See* "Approval and Promulgation of State Implementation Plan Revisions; Colorado; Attainment Demonstration for the 2008 8-Hour Ozone Standard for the Denver Metro/North Front Range Nonattainment Area, and Approval of Related Revisions", 83 Fed. Reg. 31,068 (July 3, 2018).

**Figure 5 - Denver Metro/North Front Range I/M Program Area**


On December 12, 2012, the AQCC adopted modifications to Regulation Number 11 that increased the model year exemptions from four to seven model years and implemented an on–board diagnostics testing program for model years' eight through eleven. On October 16, 2014, the AQCC adopted additional revisions that clarified certain provisions contained in the regulation to improve convenience, including allowing for more of the driving public to take advantage of the convenient roadside emissions testing program and allowing self–inspecting vehicle fleets to utilize the more convenient on–board diagnostics testing procedure. These regulation revisions were submitted to EPA on March 15, 2013 and February 20, 2015, respectively and took effect January 1, 2015.

Additionally, to meet the requirements for a Moderate area, Regulation Number 11, Sections II and V.A. were revised in November 2016 to incorporate the urbanized portions of Larimer and Weld Counties into the SIP and became federally enforceable upon EPA approval of the SIP and Regulation Number 11 revisions. Minor changes to the I/M program have been made since the Moderate SIP, which are discussed in more detail in Chapter 8.

### 4.3.3 7.8 Reid Vapor Pressure (RVP) with 1 PSI Ethanol Waiver (8.8 RVP)

Since 2004, gasoline sold in the Denver Metro 1–hour ozone nonattainment area during the summer ozone season (June 1 to September 15) has been subject to a national Reid Vapor Pressure (RVP) limit of 7.8 pounds per square inch (psi) to reduce fuel volatility. For ethanol–blended fuels, the RVP limit is 8.8 psi due to the federal 1.0 psi RVP waiver for ethanol.

Prior to 2010, gasoline sold in the Larimer and Weld area during the summer ozone season (June 1 to September 15) was subject to a national RVP limit of 9.0 psi; 10.0 psi for ethanol–blended fuels. On March 1, 2010, EPA approved extending this regulation to the full 8–hour ozone nonattainment area as part of the Federal Volatility Control Program in the DM/NFR 1997 8–Hour Ozone Nonattainment Area[38]. This included expanding the low RVP fuel requirement to portions of Larimer and Weld counties and into the remaining portions of Arapahoe, Adams, Boulder, and Broomfield counties.

[38] *See* " Regulation of Fuels and Fuel Additives: Federal Volatility Control Program in the Denver-Boulder Greeley-Ft. Collins-Loveland, CO, 1997 8-Hour Ozone Nonattainment Area", 75 Fed. Reg. 9107 (Mar. 1, 2010).

### 4.3.4 Stage I Vapor Recovery – Control of Vapors from Gasoline Transfer to Storage Tanks – AQCC Regulation Number 7

Stage I Vapor Recovery refers to the process of reclaiming vapor that, in the past, was released into the air when loading fuel into transport vehicles (tankers) at terminals during the unloading of the fuel at the service station. The provisions in Part B, Section VII of Colorado Regulation Number 7, 5 C.C.R. §1001-9 ("Regulation 7") are part of the federally approved SIP and provide for the control of VOC emissions associated with the transfer of gasoline to storage tanks[39]. Regulation 7, Part B, §VII requires Stage I vapor controls on terminals, bulk stations and gasoline dispensing facilities (service stations) that exceed the permit threshold of two tons per year of uncontrolled actual VOC emissions in the DM/NFR. Permitted sources must have a vapor collection/recovery system that utilizes approved fittings on all gasoline storage tanks. The operator must ensure that the tanks are only filled with fuel from a certified delivery truck equipped with an approved vapor recovery system and that the system is properly connected during the entire filling operation. The air permit defines the type of air pollution control measures that will be used, the kinds and amounts of materials used by the facility and any other operating limits that may apply. Fuel dispensing facilities are required to maintain records of gasoline dispensed from each tank and maintain vapor recovery equipment/fittings to minimize air emissions.

Failure to properly operate the equipment can result in violations being issued to both the transporter and the owner of the service station or gasoline terminal. The responsibility for complying with Stage I requirements falls on both the transporter and the recipient of the gasoline. Transporters of gasoline must have their equipment pressure and vacuum tested annually (Regulation 7, Part B, §IV.D) to ensure that there are no leaks in the lines or other parts of the tank. This includes hoses, piping, and connections. In addition, the deliverer must ensure that the equipment is properly connected when transferring gasoline from the transport tank to the storage tank. The recipient of the gasoline (usually a service station) must also ensure that the proper equipment has been installed and is in working order.

Stage I controls are normally not required in attainment areas in Colorado outside of the DM/NFR area; however, terminals, bulk stations, and service stations equipped to use Stage I controls are encouraged to use them state–wide to control emissions of VOCs and hazardous air pollutants (HAP). In areas where vapor recovery equipment is required, the equipment must be utilized at all times.

### 4.3.5 Oil and Gas Regulations – AQCC Regulation Number 7

#### 4.3.5.1 Control Program Overview

Provisions in Regulation 7, Part D, Section I, provide the basis for the control program for oil and gas sources in the SIP. Many of these provisions have already been approved into the SIP by EPA, and therefore were not adopted specifically for this Serious area SIP. Other elements have been adopted by the AQCC into the SIP but have not yet been approved by the EPA; those measures, particularly those adopted in 2019, are not measures for which the State is "taking credit" as part of this Serious area SIP. Key elements of the SIP control program include:

- All air pollution control equipment used to demonstrate compliance shall be operated and maintained consistent with manufacturer specifications and good engineering and maintenance practices (Regulation 7, Part D, §I.C.1.a.).

[39] Unless otherwise noted, the regulatory citations are to the version of Regulation Number 7 as most recently updated by the AQCC on December 19, 2019, and as available on the Colorado Secretary of State's website. These citations may differ from the citations in the version of Regulation Number 7 most recently approved by the EPA. A Regulation Number 7 Reorganization Crosswalk is available to assist in reviewing the reorganization of Regulation Number 7. These renumbering revisions have not yet been approved by EPA.

- All condensate collection storage, processing and handling operations must be designed, operated and maintained so as to minimize emission of VOCs to the maximum extent practicable (Regulation 7, Part D, §I.C.1.b.). This provision has been included in previous EPA–approved versions of Regulation 7 and has been the basis for recent EPA and state enforcement actions initiated against companies. This provision was expanded in 2019 to apply to all hydrocarbon liquid and produced water operations, as opposed to just condensate, but that expansion has not yet been approved into the SIP by EPA.

- All air pollution control equipment used to demonstrate compliance with Sections I.D, I.J and I.K must meet a control efficiency of at least 95% (Regulation 7, Part D, §I .C.1.c.). This provision as it applied to air pollution control equipment used to demonstrate compliance with Section I.D. has been included in previous EPA-approved versions of Regulation 7. This provision was expanded in 2017 to apply to Sections I.J. and I.K., but that expansion has not yet been approved into the SIP by EPA.

- A combustion device used to control VOCs must be enclosed and shall have no visible emissions (Regulation 7, Part D, §I .C.1.d.). This provision as it applied to air pollution control equipment used to demonstrate compliance with Section I.D. has been included in previous EPA-approved versions of Regulation 7. This provision was expanded in 2017 to apply to Sections I.J. and I.K., but that expansion has not yet been approved into the SIP by EPA.

- All combustion devices used to control emissions of VOCs from certain oil and gas facilities shall be equipped with and operate an auto–igniter (Regulation 7, Part D, §I .C.1.e). This provision as it applied to air pollution control equipment used to demonstrate compliance with Section I.D. has been included in previous EPA-approved versions of Regulation 7. This provision was expanded in 2017 to apply to Sections I.J. and I.K., but that expansion has not yet been approved into the SIP by EPA.

- Owners and operators of condensate storage tanks that emit greater than two tons per year of actual uncontrolled VOCs shall reduce such emissions by 90% from uncontrolled actual emissions throughout their entire system. This is known as the system–wide control requirement (Regulation 7, Part D, §§I .D.1 and D.2).

- Fugitive VOC emissions from leaking equipment at natural gas processing plants are subject to the leak detection and repair (LDAR) program provided in 40 C.F.R. Part 60, Subpart OOOO unless subject to 40 C.F.R. Part 60, Subpart OOOOa. This provision previously required compliance with the LDAR program in Subpart KKK at a minimum and has been included in previous EPA-approved versions of Regulation 7. This provision was expanded in 2017 to require compliance with the LDAR program in Subpart OOOO at a minimum, but that expansion has not yet been approved into the SIP by EPA.

- Still vents and vents from any flash separator or flash tank on a glycol natural gas dehydrator shall reduce uncontrolled actual emissions of VOCs by at least 90% through the use of a condenser or air pollution control equipment (Regulation 7, Part D, §I.H.1.).

- Monitoring, recordkeeping and reporting requirements are also specified (5 C.C.R. 1001-9, Part D, §§I.E. and I.F.). These provisions were expanded or revised in 2019 to apply to the new storage tank control program, described further below, and have not yet been approved into the SIP by EPA.

- Audio, visual, olfactory (AVO) inspections of storage tanks and associated equipment, and approved instrument monitoring method (AIMM) inspections of facility components, are required (Regulation 7, Part D, §§I.E.2.b., I.E.2.c.(viii), and I.L). These provisions were adopted in 2017 and 2019 and have not yet been approved into the SIP by EPA.

#### 4.3.5.2 Regulation Number 7 Rulemaking History

**a. 2008 Revisions**

On December 12, 2008, the AQCC approved revisions to Regulation 7 regarding emissions from oil and gas operations as part of the overall ozone reduction strategy in the SIP revisions for the 1997 8–Hour Ozone NAAQS. Among other things, the revisions strengthened Reasonably Available Control Technology (RACT) requirements for inclusion in the SIP specific to condensate storage tanks, gas processing plant leaks, and glycol dehydration units. During this same rulemaking, the AQCC adopted state–only enforceable RACT requirements that apply to newly designated ozone nonattainment areas, engines, and pneumatic devices.

Some of these revisions were submitted to EPA in June 2009 as part of Colorado's SIP submittal for the 1997 8–Hour Ozone NAAQS. On August 5, 2011, EPA issued a final action on Colorado's SIP submittal, both approving Colorado's attainment demonstration for the 1997 NAAQS and disapproving specific revisions to Regulation Number 7, including the inadvertent repeal of Regulation 7, §II.D. and all revisions to Part D, §I (formerly §XII) adopted by the AQCC in December 2008.

**b. 2012 Revisions**

In response to EPA's disapproval of the 2008 revisions to Regulation 7 that were submitted as a SIP amendment, the AQCC adopted revisions to the regulation and Ozone SIP on December 20, 2012.

In particular, the AQCC's revisions addressed and corrected the following sections (by reference to the regulatory citation in effect as of this submittal):

- Part A, §II.D – Alternative Control Plans and Test Methods
- Part D, §I.C.2 – Emission Factor Calculation Methodology for Condensate Tanks
- Part D, §I.D.2.a – System–wide Control Requirements for Condensate Tanks
- Part D, §I.E.3 – Monitoring Combustion Devices as Control for Condensate Tanks
- Part D, §I.F.3 – Recordkeeping for Condensate Tanks
- Part D, §I.F.5 – Recordkeeping and Reporting Exemption for Compressor Stations and Drip Stations
- Part D, §I.G.2 – Control Equipment Requirement for Natural Gas Processing Plants
- Part D, §I.G.5 – Recordkeeping and Reporting for Alternative Compliance Option
- Part D, §I.H. – Control Requirements for Glycol Dehydrators

The revisions to the sections of Regulation Number 7 outlined above were submitted to EPA on May 13, 2013, as revisions to the Ozone SIP. EPA approved these revisions on July 3, 2018 (83 Fed. Reg. 31068).

### c. 2014 Revisions (State-Only)

On February 23, 2014, the AQCC adopted further State–Only revisions to Regulation Number 7 to augment the State's control of VOCs and other hydrocarbons (including methane) from oil and gas sources and apply the controls on a state–wide basis. These revisions overall strengthen good air pollution practices at these operations and support, but do not replace the SIP control requirements in Part D, Section I of the regulation. The provisions in Part D, Sections II and III were adopted in this rulemaking as State–Only requirements that were not intended as additions or revisions to Colorado's Ozone SIP, thus were not submitted to EPA as such and are not included in the emissions inventory estimates.

**Leak Detection and Repair (LDAR) Program**

The 2014 revisions to Regulation 7 established a leak detection and repair (LDAR) program for well production facilities and natural gas compressor stations as a State–Only requirement. The rule requires owners or operators of well production facilities and natural gas compressor stations to inspect components for leaks using an approved instrument monitoring method. The rule establishes monitoring frequencies according to emission thresholds. Identified leaks must then be repaired within a specified period.

**Pneumatic Controllers**

Pneumatic controllers are instruments at oil and gas facilities that are generally actuated using pressurized gas and are used to control or monitor process parameters such as liquid level, gas level, pressure, valve position, liquid flow, gas flow and temperature. Pneumatic controllers can also be actuated by non–gas sources of power, such as solar, electric or air. In many situations, across all segments of the oil and gas industry, pneumatic controllers make use of the available high–pressure natural gas to operate control of a valve. Continuous bleed controllers continuously vent supply gas to the atmosphere. Intermittent controllers vent gas periodically when actuating an end device (but do not have a continuous bleed rate). Continuous bleed controllers can either be high bleed (greater than 6 standard cubic feet per hour (scfh) of natural gas to the atmosphere) or low bleed (less than or equal to 6 scfh). For intermittent controllers, the amount of emissions is dependent on the amount of natural gas vented per actuation and how often it is actuated. There is not currently sufficient data to indicate that regulation of intermittent controllers would have a significant impact on reducing VOC emissions.

Part D, Section III of Regulation 7 regulates pneumatic controllers statewide as a State–Only requirement. Since 2009, high bleed controllers have been prohibited in the DM/NFR, unless there are safety or process reasons for maintaining high–bleed devices. As a result, there are few high bleed controllers remaining and most controllers are now intermittent devices. Currently, it is estimated that nearly all of the controllers in the DM/NFR are intermittent or low-bleed devices.

### d. 2017 Revisions (Oil and Gas CTG)

On September 18, 2015, EPA issued Emission Standards for New and Modified Oil and Gas Sources (OOOOa) as well as Control Techniques Guidelines (CTG) for existing sources in the oil and natural gas industry. Pursuant to CAA §182(b)(2)(A), Colorado was then

obligated to adopt into its Ozone SIP RACT for the oil and gas sources covered by the Oil and Gas CTG.

In November 2017, the AQCC adopted revisions to Regulation 7 consistent with EPA's Oil and Gas CTG's and timely submitted the corresponding SIP revision for approval to EPA in May 2018. However, in 2018, EPA proposed a withdrawal of the Oil and Gas CTG and has not finalized that action. In 2020, EPA was sued to compel action on Colorado's RACT SIP as it pertains to the Oil and Gas CTG. That suit is still pending.

**e. 2019 Revisions (SIP Revisions and State-Only)**

The AQCC held a rulemaking hearing December 2019 to approve revisions to Regulation 7 including a full reorganization of the regulation into Parts A-E, and changes to the SIP and state-only requirements. The revisions have yet to be approved by EPA into the SIP.

Revisions to the SIP included:

1) establishing a storage tank control threshold at 4 tons per year (tpy) VOC in lieu of the current system-wide control strategy;
2) requiring control technology to limit emissions from separation equipment from newly constructed, re-fracked, or restimulated wells;
3) strengthening storage tank monitoring requirements, both as to frequency and inspection requirements;
4) aligning related recordkeeping and reporting;
5) updating RACT requirements for major sources of VOC and/or NOx in the 8-hour Ozone Control Area; and
6) other SIP cleanup and strengthening measures.

Changes to state-only requirements included:

1) lowering the threshold for storage tank controls (from 6 tpy to 2 tpy VOC);
2) establishing storage tank measurement system and tank loadout control requirements;
3) strengthening monitoring requirements and increasing the frequency of Approved Instrument Monitoring Method (AIMM) inspections;
4) expanding the requirement to employ Best Management Practices (BMPs) to well plugging activities;
5) aligning and updating recordkeeping and reporting requirements;
6) expanding the "find and fix" pneumatic controller program state-wide; and
7) establishing an annual inventory for equipment used in oil and gas activities.

Additionally, there were revisions to Regulation Number 3, 5 C.C.R. §1001-5 ("Regulation 3"), Parts A, B, and C to revise the Air Pollutant Emission Notice (APEN) reporting and construction permitting requirements specific to oil and gas well production facilities, narrowing or eliminating APEN exemptions, aligning Part B permit requirements with statutory language, updating transfer of ownership requirements, and clarifying APEN and permitting exemptions.

### 4.3.6 Regional Haze SIP Provisions – AQCC Regulation Number 3

As part of the Colorado Clean Air Clean Jobs Act, a number of power plants were identified for shut–down, conversion to natural gas, or additional emissions controls. Between 2011 and 2020, projects aimed at

reducing emissions of this included the closure of Public Service Company's Cherokee Units 1–3, which were retired in 2012, 2011, and 2015, respectively, and Arapahoe Units 3–4, which shut down in 2013. These unit closures resulted in a 21 ton per day reduction in $NO_X$ emissions. In addition, the retirement of Valmont Unit 5 and the conversion of Cherokee Unit 4 from coal to natural gas occurred at the end of 2017, and Zuni closed in 2018. These specific closures, as well as the emission controls being employed on the existing Electric Generating Units (EGU), are outlined in Regulation 3, Part F – Regional Haze Limits – Best Available Retrofit Technology (BART) and Reasonable Progress (RP), subsection VI – Regional Haze Determinations as part of the BART Alternative Program Determinations. This regulation was submitted to the EPA on May 25, 2011, as part of the Colorado Regional Haze SIP, and approved by EPA[40].

Under Regulation Number 3, Part A, §III.D.2, minor sources in designated nonattainment or attainment/maintenance areas that are otherwise not exempt, shall apply RACT for the pollutants for which the area is nonattainment or attainment/maintenance, which includes NOX and VOC. This case–by–case RACT is determined through the permitting process and incorporated into the permit.

### 4.3.7 Other Stationary Source Regulations – AQCC Regulation Number 3, No. 6, No. 7, and No. 8

Regulation 3, Regulation Number 6, 5 C.C.R. §1001-8, Regulation 7, and Regulation Number 8, 5 C.C.R. §1001-10, contain control requirements for a wide range of sources including boilers, incinerators, graphic arts, pharmaceutical synthesis, and more. In addition, federal New Source Performance Standards (NSPS) and National Emission Standards for Hazardous Air Pollutants (NESHAP) are incorporated in the regulations by reference. These control measures are included in the emissions inventory estimates.

### 4.3.8 Low-VOC Architectural and Industrial Maintenance and Consumer Products – AQCC Regulation Number 21

In a continued effort to reduce ozone precursor emissions and achieve the ozone NAAQS, in May 2019 APCD proposed a new Regulation Number 21, 5 C.C.R. §1001-25 (Regulation Number 21), Control of Volatile Organic Compounds from Consumer Products and Architectural and Industrial Maintenance (AIM) Coatings, to establish VOC content limits for consumer products and AIM coatings manufactured and/or sold in Colorado. On July 19, 2019, the AQCC approved adopting VOC standards in the Ozone Transport Commission (OTC) model rules for consumer products and AIM coatings manufactured, distributed, or sold in Colorado (specifically the OTC AIM coatings model rule phase 2 (2014) and VOC standards in the OTC consumer products model rule phase 4 (2013)). The OTC model rules, which are the basis for the APCD proposal, achieve additional VOC reductions over EPA's national rules in 40 CFR Part 59, Subparts C and D (1998)[41]. No later than May 2020, this rule will reduce VOC emissions from consumer products and AIM coatings and contribute to attaining and maintaining the ozone NAAQS in Colorado. The standards are being included in this ozone SIP for a Serious area, with the exception of the implementation of the standards outside of the DM/NFR, which will remain a state-only requirement. The SIP revisions have not yet been approved by EPA into the SIP.

## 4.4 2020 PROJECTION METHODOLOGIES FOR ALL SOURCES

The 2020 inventory was developed using EPA–approved emissions models and methodology. Anthropogenic VOC emissions are projected to be 292.3 tons per day (tpd) and $NO_X$ emissions are

[40] *See* "Approval and Promulgation of Implementation Plans; State of Colorado; Regional Haze State Implementation Plan", 77 Fed. Reg. 76,871 (Dec. 31, 2012).

[41] Colorado intends to submit these SIP revisions for approval to EPA upon Leg approval in Summer 2020.

projected to be 163.7 tpd. Table 24 provides a summary of the 2020 emissions inventory. Projected future emissions in 2020 were based on anticipated growth as well as expected emissions controls that will be implemented by the 2020 ozone season. The full 2020 emissions inventory is provided in Appendix 4–A. The following sections discuss the development of the 2020 emission inventory broken out by source category.

**Table 24 –2020 Nonattainment Area Emissions Inventory (tpd)**

| Description | VOC | NOx |
|---|---|---|
| **Area** | **54.6** | **-** |
| Architectural and Industrial Maintenance | 25.1 | - |
| Consumer Products | 15.7 | - |
| Other | 13.9 | - |
| **Non-Road** | **44.3** | **39.1** |
| Agriculture | 0.2 | 1.8 |
| Aviation | 1.9 | 6.9 |
| Commercial Equipment | 6.5 | 14.1 |
| Lawn and Garden | 33.0 | 7.6 |
| Railroad | 0.4 | 8.2 |
| Recreation | 2.2 | 0.5 |
| **Oil and Gas** | **119.0** | **48.2** |
| Area | 54.5 | 34.4 |
| Condensate/Oil Tanks | 50.2 | 0.6 |
| Point | 14.3 | 13.1 |
| **On-Road** | **49.4** | **54.7** |
| Light-Duty Vehicles | 47.6 | 41.4 |
| Medium/Heavy-Duty Vehicles | 1.8 | 13.3 |
| **Point** | **25.0** | **21.7** |
| Electric Generating Units (EGU) | 0.4 | 4.6 |
| Non-EGU | 24.6 | 17.1 |
| **Grand Total** | **292.3** | **163.7** |

### 4.4.1 Oil and Gas Sources

The emissions inventory for the oil and gas sector includes three segments: point sources, condensate/oil tanks, and area sources. In consideration of the technological advancements and emission controls taking place in the oil and gas sector, and building upon efforts beginning during the Moderate area SIP development process, the Regional Air Quality Council (RAQC) and APCD sought assistance from industry in developing the future year emissions inventory. Beginning in late 2018, the APCD held a series of meetings with representatives from the major oil and gas producers in the Denver–Julesburg (DJ) basin, which resulted in detailed information and future projections being provided to the APCD for 2020 inventory development. A map of the DJ Basin is provided in Figure 6.

These meetings were focused on discussion of actual site–specific emissions data from 2017, including technology and production and projected 2020 emissions and production. Discussions also took place with the Colorado Oil & Gas Association (COGA) to estimate future production and technology use among the rest of the producers in the DJ basin. Estimates for this segment assumed that production would increase approximately 27% per year from 2017 to 2020, consistent with historic production increases from 2014 to 2018 based on Colorado Oil and Gas Conservation Commission (COGCC) data. It is also assumed that there would be a decline in vertical well production and increase in horizontal well production, with new production utilizing multiple stages of separation.

**Figure 6 – Denver–Julesburg Basin**


#### 4.4.1.1 Oil and Gas Point Sources

Oil and gas point sources include external combustion boilers, industrial processes, internal combustion sources, and petroleum/solvent evaporation. This portion of the inventory is based upon the Colorado APEN database and is provided in Table 25. For the 2020 emissions inventory, APEN-reported data was grown by the projected change in oil production in the DM/NFR from 2017 to 2020 (including projected decrease in production from existing facilities as well as the much larger projected increase in production from new facilities) based on the most recently available data at the time (i.e., the 2018 APEN database) APEN reported data was grown to by the projected increase in oil production from 2014 to 2018 (see Figure 7). The inventories for internal combustion engines also factored in federal non–road engine standards.

**Table 25 – 2020 Oil and Gas Point Source Emissions Inventory (tpd)**

| Description | VOC | NOx |
|---|---|---|
| **Point** | | |
| External Combustion Boilers | 0.1 | 0.3 |
| Industrial Processes | 4.3 | 0.9 |
| Internal Combustion Engines | 5.6 | 11.8 |
| Petroleum and Solvent Evaporation | 4.3 | 0.1 |
| **Oil and Gas Subtotal** | **14.3** | **13.1** |

#### 4.4.1.2 Oil and Gas Condensate/Oil Tanks

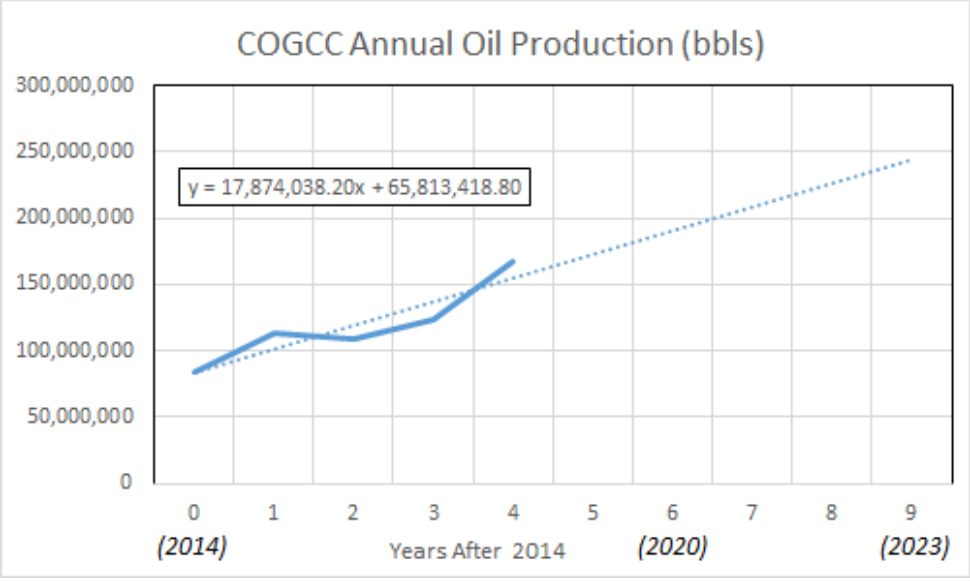
In 2020, VOCs from condensate/oil tanks only slightly outpace those of on-road mobile sources in the emissions inventory. As described in section 3.3.2 (2017 oil & gas emissions inventory), Colorado experienced a large production uptick around 2012 owing to advancements in technology that caused the majority of new wells to be drilled directionally or horizontally versus the prior method of vertical extraction. Such new drilling techniques caused profitable increases

in production for industry, but brought with it a large increase in the amount of condensate storage tanks, pipeline development, venting episodes, and truck traffic and tank loadout, to name a few. Over the past several years, efforts have been made as a result of 2014 regulations on storage tanks and 2014 regulations initiating LDAR inspections to implement more stages of separation or (even in some instances) tankless production, alongside the LDAR program established by the EPA to reduce fugitive VOC emissions from components. Strategies such as these allow for more capture of sales gas, while simultaneously reducing the flashing or leaking of such gases to the atmosphere.

All future growth in oil and gas development is assumed to involve horizontal wells in combination with either tankless facilities or 2 and 3 stages of separation. Vertical well production is declining, as are single stage separation facilities. Tankless facilities have zero tank emissions at the well pad since there is no storage on site with all liquid production being piped to Midstream centralized processing facilities such as Occidental Petroleum's centralized oil stabilization facility. Such centralized facilities use pressurized vessels to stabilize liquids and thereby eliminate upstream flashing of gases from atmospheric storage tanks. The pressure vessels have no thief hatches or pressure relief valves, resulting in very low emissions. Such technology allows Occidental Petroleum's centralized facility to be classified a true minor source.

Projections to 2020 for Colorado were based on reported oil production for the 5-year timeframe 2014 to 2018 (the approach taken by the Inventory Collaborative workgroup through the Western Regional Air Partnership (WRAP) and the Western State Air Resources Council (WESTAR)). This method involved a simple linear approximation of change in production (Figure 7), but for the purposes of this SIP, production was projected using total oil production from DM/NFR counties only (note that production projections include the portions of Weld and Larimer that lie outside the DM/NFR). It is worth noting that regardless of year, over 95% of all oil production in the DM/NFR occurs in Weld county alone (coincident with the Wattenberg Field from Figure 6).

**Figure 7 - Projection of Oil Production from Nonattainment Area Counties**




To estimate future production, the 2017 data reported by industry (used for the 2017 emissions inventory in chapter 3) was analyzed for several specific metrics. Assuming activities reported by industry in 2017 were representative of future modeling years (i.e., 2020), the following parameters were able to be determined:

- ratio of production from new versus existing facilities in 2017
- ratio of new facilities with and without tankless production
- emissions from new production
- emissions from existing production

Furthermore, Colorado production and well completion data (found online through the COGCC database) were used to determine the decline factor for existing production. The decline in existing production between 2012 and 2015 (as a negative percentage) was the most recent data available to be used as a proxy for the existing production decrease over the 3-year period from 2017 to 2020. Total emissions in 2020 were determined by summing the emissions associated with new production and the emissions associated with existing production. Emissions of $NO_X$ and VOC associated with condensate/oil tanks in the 2020 emissions inventory are provided in Table 26.

**Table 26 - 2020 Oil and Gas Condensate/Oil Tank Emissions Inventory (tpd)**

| Description | VOC | NOx |
|---|---|---|
| **Condensate/Oil Tanks** | **50.2** | **0.6** |

#### 4.4.1.3 Oil and Gas Area Sources

Oil and gas area sources include a wide variety of categories such as engines, truck loading, pneumatic devices, fugitives, hydraulic fracturing completions, and blowdowns. The 2020 emission projections provided by nine of the highest producing operators in the DM/NFR, which were based on 2017 data and took into account well count, and technology advancements as a result of state and federal rules. Although annual production has continued to increase year after year, the number of active wells is expected to stay about constant due to a higher production capacity of horizontal wells and a decline of older low production vertical wells. In addition, several companies have commented that it is their practice to tie in vertical wells that are within close proximity to new horizontal facilities, which enables production from those wells to go through the same stages of separation and emission control as that of newer wells.

To account for the rest of the producers, each source was scaled–up by production or well count depending on the category. A breakout of emissions by categories is provided in Table 27. Miscellaneous sources were held constant from 2017 to 2020.

**Table 27 – 2020 Oil and Gas Area Source Emissions Inventory (tpd)**

| Description | VOC | NOx |
|---|---|---|
| **Area** | | |
| Drilling (incl. some pre-production) | 0.7 | 7.4 |
| Hydraulic fracturing (incl. some pre-production) | 2.0 | 9.2 |
| Fugitives | 9.5 | 0.0 |
| Heaters | 0.2 | 3.3 |
| Internal Combustion Engines | 6.8 | 14.3 |
| Pneumatic devices | 19.4 | 0.0 |
| Pneumatic pumps | 0.1 | 0.0 |
| Separator control | 3.4 | 0.0 |
| Truck loading of condensate liquid | 3.9 | 0.0 |
| Venting - blowdowns | 4.2 | 0.0 |
| Venting - initial completions and recompletions | 2.5 | 0.1 |
| Water tank losses | 2.0 | 0.1 |
| **Oil and Gas Area Subtotal** | **54.5** | **34.4** |

### 4.4.2 Point Sources

The 2020 emissions inventory for power plants, also referred to as EGUs, was developed based upon Colorado APEN reported data for 2018 and is specified in Table 28. The Colorado Clean Air Clean Jobs Act of 2010 was instrumental in spurring $NO_X$ emission reductions from the EGU sector. From 2011 to 2020, $NO_X$ emissions are estimated to be cut by nearly three-quarters because of the mandates in this bill, which called for the closure of multiple units and the switching to natural gas for others. In the DM/NFR, the following plant conversion and shutdown are factored into the 2020 inventory:

- Cherokee Unit 4 – switch from coal to natural gas
- Valmont Unit 5 – shutdown
- Zuni – shutdown

**Table 28 –2020 EGU $NO_X$ Emissions (tpd)**

| Description | 2020 Summertime Avg. NOx Emission Projections |
|---|---|
| Arapahoe Combustion Turbine Facility | 0.1 |
| Blue Spruce Energy Center | 0.2 |
| Cherokee | 2.1 |
| Fort St. Vrain | 1.0 |
| Frank Knutson Station | 0.0 |
| J M Shafer | 0.8 |
| Rocky Mountain Energy Center | 0.3 |
| Spindle Hill Energy Center | 0.1 |
| **EGU Subtotal** | **4.6** |

Other point sources beyond EGUs include external combustion boilers, industrial processes, internal combustion sources, and petroleum/solvent evaporation that are not associated with the oil and gas industry. The future year inventory is based upon 2018 APEN data, which includes mandatory regulatory reductions. The inventory for internal combustion engines also factors in federal non–road engine standards and is provided below in Table 29.

Previous requirements for the Moderate area major sources (≥ 100 tpy NOx) (boilers, duct burners, process heaters, stationary combustion turbines, stationary reciprocating internal combustion engines > 5 tpy NOx) were to conduct an initial adjustment by April 1, 2017. For sources that have recently become "major" (i.e. ≥ 50 tpy NOx for a Serious nonattainment area) (boilers, duct burners, process heaters, stationary combustion turbines, stationary reciprocating internal combustion engines, dryers, furnaces, ceramic kilns > 5 tpy NOx), source must conduct an initial adjustment by May 1, 2020. After the initial adjustment, an adjustment is required every 12 months or following an applicable schedule in an NSPS/Maximum Achievable Control Technology (MACT). Some of these sources are also subject to NOx limits in Part E, Section II for their combustion equipment. The SIP revisions have not yet been approved by EPA into the SIP.

**Table 29 – 2020 Point Source (Non–Oil and Gas) Sources Emissions Inventory (tpd)**

| Description | VOC | NOx |
|---|---|---|
| External Combustion Boilers | 0.5 | 5.7 |
| Industrial Processes | 7.7 | 4.9 |
| Internal Combustion Engines | 1.1 | 5.8 |
| MACT Source Categories | 0.0 | 0.0 |
| Petroleum and Solvent Evaporation | 11.9 | 0.4 |
| Waste Disposal | 3.4 | 0.2 |
| **Non-EGU Point Sources Subtotal** | **25.0** | **21.8** |

### 4.4.3 Area Sources

Area sources (non–oil and gas) are primarily VOC sources and include a wide range of diverse categories such as coatings, household and personal care products, pesticides, automotive aftermarket products, and sealants. The 2020 inventory is provided in Table 30 and is grown from EPA's 2014 National Emission Inventory (NEI) based upon county population projections from the State Demography Office and then reductions from implementation of Colorado AQCC Regulation Number 21 were applied as follows, following the same methodology as developed by the OTC[42]:

- 26.9% reduction for all household products and personal care products
- 30% reduction in industrial maintenance and other special purpose coatings
- 32.2% reduction in architectural coatings

[42] Ozone Transport Commission (OTC) Technical Support Document (TSD), Consumer Products Amendments Phase 3 and 4, 06/28//2016, https://otcair.org/upload/Documents/Reports/TSD%20Apppendix%20A%20VOC%20Worksheets%20160824.xls, accessed 3/16/20.

**Table 30 – 2020 Area Source Emissions Inventory (tpd)**

| Description | VOC |
|---|---|
| **Agriculture** | **1.8** |
| Agricultural Field Burning - whole field set on fire | 0.0 |
| Beef cattle production composite | 0.7 |
| Dairy cattle composite | 0.2 |
| Pesticide Application | 0.7 |
| Poultry production – broilers | 0.0 |
| Poultry production - layers with dry manure management systems | 0.1 |
| Swine production composite | 0.1 |
| **Architectural and Industrial Maintenance** | **25.1** |
| All Adhesives and Sealants | 9.9 |
| All Coatings and Related Products | 5.2 |
| Architectural Coatings | 8.7 |
| Industrial Maintenance Coatings | 1.4 |
| **Consumer Products** | **15.7** |
| All Household Products | 7.9 |
| All Personal Care Products | 7.8 |
| **Cooking and Grilling** | **0.7** |
| Commercial Cooking – Charbroiling | 0.5 |
| Commercial Cooking – Frying | 0.1 |
| Residential Grilling | 0.1 |
| **Other** | **8.9** |
| All Automotive Aftermarket Products | 0.8 |
| All FIFRA Related Products | 7.1 |
| Emulsified/Cutback Asphalt | 0.2 |
| Miscellaneous Products (Not Otherwise Covered) | 0.8 |
| Other Special Purpose Coatings | 0.0 |
| Tank Trucks in Transit | 0.1 |
| Traffic Markings | 0.0 |
| **Portable Gas Cans** | **2.5** |
| Commercial | 1.1 |
| Residential | 1.3 |
| **Area Sources Subtotal** | **54.6** |

### 4.4.4 Non–Road Sources

Non–road mobile sources include large and small engines such as lawn and garden, commercial and industrial equipment, construction and mining, aircraft, and locomotives and are shown in Table 31. This inventory was developed using several methods with a majority of categories being based on the EPA's Non–Road Model, which accounts for federal regulations, including engine standards. Categories that are not based on the non–road model are aircraft and locomotives.

For aircraft, Denver International Airport (DIA) provided updated data on fleet composition and activity level to estimate emissions[43]. Other aircraft is grown based on DIA 2014 Terminal data forecast to 2020 and aggregated for the nonattainment area. For railroad locomotives and switchers (i.e. rail yard), the activity levels are interpolated to 2020 (from a linear interpolation between 2016 and 2023) based on datasets from the Eastern Regional Technical Advisory Committee, Amtrak, and the Denver Terminal. Line

[43] Denver International Airport, State Implementation Plan (SIP) Air Quality Inventory, Nov. 2019.

Haul locomotive (i.e. railroad equipment diesel) activity levels are apportioned based on track mileage in the nonattainment area. An emission factor is then applied based upon EPA's guidance on Emission Factors for Locomotives to calculate emissions. Commercial lawn and garden is the largest source of VOC emissions in the non–road category, and is the fourth largest source of $NO_X$ emissions, behind construction equipment, locomotives, and aircraft.

**Table 31 – 2020 Non–Road Emissions Inventory (tpd)**

| Description | VOC | NOx |
|---|---|---|
| **Agriculture** | **0.2** | **1.8** |
| Agricultural Equipment | 0.2 | 1.8 |
| **Aviation** | **1.9** | **6.9** |
| Aircraft | 1.8 | 6.6 |
| Airport Ground Support Equipment | 0.1 | 0.3 |
| **Commercial** | **6.5** | **14.1** |
| Commercial Equipment | 4.4 | 3.2 |
| Construction and Mining Equipment | 1.7 | 8.2 |
| Industrial Equipment | 0.4 | 2.7 |
| Logging Equipment | 0.0 | 0.0 |
| **Lawn and Garden** | **33.0** | **7.6** |
| Commercial | 27.6 | 6.9 |
| Residential | 5.4 | 0.7 |
| **Railroad** | **0.4** | **8.2** |
| Line Haul | 0.2 | 5.3 |
| Rail Yard - Switcher Locomotives | 0.2 | 2.9 |
| Railroad Support Equipment | 0.0 | 0.0 |
| **Recreation** | **2.2** | **0.5** |
| Pleasure Craft | 1.0 | 0.4 |
| Recreational Equipment | 1.2 | 0.1 |
| **Non-Road Mobile Sources Subtotal** | **44.3** | **39.1** |

### 4.4.5 On–Road Sources

The 2020 on–road emission inventory is provided in Table 32 and was estimated using the most recent version of EPA's emission modeling tool Motor Vehicle Emission Simulator MOVES2014b. On November 4, 2015, EPA released an updated version of their mobile model, MOVES2014a, which was considered a minor revision to MOVES2014. In July 2018, EPA released an additional update (MOVES2014b) that was intended to improve estimates of emissions from non-road mobile sources. MOVES2014b did not significantly change the on-road criteria pollutant emissions results of MOVES2014 and is not considered a new model for SIP and transportation conformity purposes.

The mobile model has multiple inputs including vehicle miles traveled (VMT), vehicle population, roadway activity data (speed and time of day), roadway classifications (urban, rural, restricted, unrestricted), fuel properties, I/M program, and temperature and humidity profiles. VMT is based on model output data from the Denver Regional Council of Governments (DRCOG) and the North Front Range Metropolitan Planning Organization (NFRMPO). The default fuel formulation was used for 2020.

**Table 32 – 2020 On–Road Mobile Source Emission Inventory (tpd)**

| Description | | VOC | NOx |
|---|---|---|---|
| **Class 10 – Motorcycles** | On-Network | 0.3 | 0.1 |
| | Off-Network | 1.8 | 0.007 |
| **Class 20 – Passenger Cars** | On-Network | 4.9 | 8.8 |
| | Off-Network | 14.9 | 6.0 |
| **Class 30 – Light Trucks** | On-Network | 5.8 | 14.2 |
| | Off-Network | 19.9 | 12.3 |
| **Class 40 – Buses** | On-Network | 0.1 | 0.7 |
| | Off-Network | 0.003 | 0.002 |
| **Class 50 – Refuse / Single–Unit Trucks** | On-Network | 0.1 | 0.6 |
| | Off-Network | 0.3 | 0.2 |
| **Class 60 – Short / Long–Haul Trucks** | On-Network | 0.3 | 5.8 |
| | Off-Network | 1.0 | 5.9 |
| **On-Road Mobile Sources Subtotal** | | **49.4** | **54.7** |
| **Subtotals (All Classes)** | **On-Network** | 11.5 | 30.3 |
| | **Off-Network** | 37.9 | 24.4 |

VMT outputs are the product of sophisticated transportation and land use models used to predict the state of transportation in the future. For the northern subarea, the NFRMPO uses a four–step model process consisting of the following four models: Colorado Department of Local Affairs (DOLA) population and employment projections; Land Use Allocation Model; Travel Demand Model; and Emissions Model. For the southern subarea, DRCOG uses UrbanSim (Figure 4) to forecast socioeconomic changes and the Focus 30+ step activity–based travel model to synthesize individual regional household and population data to forecast travel throughout a typical weekday based on personal and travel–related characteristics.

The outputs of these models include population, employment, and households in each transportation analysis zone (TAZ), roadway use data (traffic volumes, speed and delay), and transit use data.
Based on this data, forecasts can be made related to:

1. Generated trips land uses
2. Distributed trips on an identified transportation network
3. Distributed trips among mode choice (drive, carpool, transit, bike, walk)
4. Assigned traffic onto the identified transportation network
5. Impacts on the transportation network

Table 33 shows the change in VMT and vehicle population for 2020. Vehicle population and fleet age distribution are based on a 2017 report by Eastern Research Group (ERG)[44], with 2020 vehicle population being grown from 2017 by the ratio of the VMT increase from 2017 to 2020. The inventory is broken out by six Highway Performance Monitoring System (HPMS) vehicle type classes and by on–network and off–network emissions, with a vehicle mix based on a 5-year average of Automatic Traffic Recorder (ATR) station data provided by DRCOG. For HPMS class 60 populations, the MOVES2014b default ratio of class 60 populations to VMT is used to calculate the population because class 60 vehicles are not always registered where they are used.

[44] Eastern Research Group (ERG), Development of MOVES Registration Fraction and Population Files Using 2017 Colorado Registration Data, FINAL REPORT, Feb. 28, 2018.

**Table 33 – 2020 VMT and Vehicle Population in Nonattainment Area**

| Vehicle Class by Subregion | 2020 VMT (daily miles) | 2020 Vehicle Population |
|---|---|---|
| **DRCOG – Southern Subregion** | **84,812,961** | **3,421,628** |
| Light–Duty Vehicles (Classes 10–30) | 83,148,061 | 2,777,304 |
| Medium and Heavy–Duty Vehicles (Classes 40–60) | 1,664,900 | 644,324 |
| **NFRMPO – Northern Subregion** | **14,266,896** | **56,243** |
| Light–Duty Vehicles (Classes 10–30) | 13,961,805 | 40,220 |
| Medium and Heavy–Duty Vehicles (Classes 40–60) | 305,091 | 16,024 |
| **TOTAL** | **99,079,857** | **3,477,871** |

TAZ data from DRCOG and NFRMPO are used to apportion off–network start and evaporative emissions to the grid cells for photochemical modeling. Both on–network and off–network data are processed by the APCD through MOVES2014b. These emission outputs are then split out by county and processed through EPA's Sparse Matrix Operator Kernel Emissions (SMOKE) MOVES processor for use in photochemical modeling. In addition to developing an inventory for modeling, this future year emissions inventory for on-road mobile sources is used for setting new emissions budgets for Transportation Conformity, which is discussed in Chapter 11.

### 4.4.6 Biogenic Sources

Emissions of VOC, $NO_X$, and CO from biogenic sources have been generated by the Model of Emissions of Gases and Aerosols from Nature (MEGAN) Biogenic Emissions Model using land cover data base of biomass type and density and hourly meteorology data. The National Center of Atmospheric Research (NCAR) has produced a global data base of land use data for use with MEGAN. Surface temperatures are provided by the Weather Research and Forecasting (WRF) Model. Biogenic sources, shown in Table 34 are held constant between 2017 and 2020 and are not included in the RFP analysis, but are included as part of the overall 2020 emissions inventory for the DM/NFR nonattainment area.

**Table 34 – 2020 Biogenic Emissions (tons per day)**

| Description | VOC | $NO_X$ |
|---|---|---|
| **Total Biogenic Sources** | 178.7 | 50.9 |

## 4.5 REASONABLE FURTHER PROGRESS (RFP)

As discussed in section 4.1, the CAA requires all nonattainment areas classified Moderate or above adopt revisions to their SIP that demonstrate attainment by the applicable attainment date and make "reasonable further progress" towards attainment. Subpart 2, §182(c)(2)(B) provides that an area classified as a Serious nonattainment area for ozone must submit a revision to its SIP showing a 9% reduction in VOC over each consecutive 3-year period beginning 6 years after redesignation (July 20, 2012), until the attainment date. For DM/NFR, this means VOC emission reductions must be achieved between January 1, 2018 and December 31, 2020 to be creditable towards RFP. Because the region initially met the RFP requirement in the Moderate area SIP using only VOC reductions, this RFP demonstration may contain reductions of emissions of VOCs and NOx. Due to the large emissions reductions to be realized by 2020, the DM/NFR region is able to demonstrate RFP with VOC reductions alone. This analysis is provided in Table 35.

### 4.5.1 Methodology

The procedures and methodology for demonstrating compliance with RFP requirements are as follows:

1. Develop a 2011 base year inventory for a nonattainment area that takes into account certain adjustments for RFP purposes (excludes biogenic sources);
2. Update 2017 VOC nonattainment area inventory (Moderate area attainment year);
3. Develop a projected inventory of VOC emissions for 2020 (Serious Area attainment year); and
4. Demonstrate that projected 2020 emissions of VOC will be at least 9% below the emissions in 2017 based on percent reductions from the 2011 base year inventory.

**Table 35 – VOC Emission Reductions from 2017 to 2020 VOC based on 2011 Base Year Inventory (tpd)**

| Description | VOC (2011) | VOC (2017) | VOC (2020) | VOC Reductions (2017-2020) |
|---|---|---|---|---|
| Area | 60.6 | 65.3 | 54.6 | 10.7 |
| Non-Road | 58.2 | 44.0 | 44.3 | -0.3 |
| Oil and Gas | 279.7 | 163.3 | 119.0 | 44.3 |
| On-Road | 93.7 | 57.6 | 49.4 | 8.2 |
| Point | 26.5 | 22.9 | 25.0 | -2.1 |
| Grand Total | 518.8 | 353.1 | 292.3 | 60.9 |
| | (A) | (B) | (C) | = (B)-(C) |
| | | | | 9% RFP Met |

| | | |
|---|---|---|
| 9% Reduction in VOC's from 2011 Base Year Needed = 9%*(A) | 46.7 | tpd |
| RFP Met and Exceeded by: =[(B)-(C)] - [9%*(A)] | 14.2 | tpd |

Based on the demonstration in Table 35, Colorado has shown that the DM/NFR meets, and exceeds, the 9% RFP requirement through a reduction of 61 tpd of VOC between 2017 and 2020.

## APPENDIX 4–A: 2020 EMISSIONS INVENTORY

| Description | VOC | NOx |
|---|---|---|
| **Point** | **25.0** | **21.8** |
| Electric Generating Units (EGU) | 0.4 | 4.7 |
| External Combustion Boilers | 0.5 | 5.7 |
| Industrial Processes | 7.7 | 4.9 |
| Internal Combustion Engines | 1.1 | 5.8 |
| MACT Source Categories | 0.0 | 0.0 |
| Petroleum and Solvent Evaporation | 11.9 | 0.4 |
| Waste Disposal | 3.4 | 0.2 |
| **Area** | **54.6** | **-** |
| **Agriculture** | **1.8** | **-** |
| Beef cattle production composite | 0.7 | - |
| Dairy cattle composite | 0.2 | - |
| Pesticide Application | 0.7 | - |
| Poultry production - layers with dry manure management systems | 0.1 | - |
| Swine production composite | 0.1 | - |
| **Architectural and Industrial Maintenance** | **25.1** | **-** |
| All Adhesives and Sealants | 9.9 | - |
| All Coatings and Related Products | 5.2 | - |
| Architectural Coatings | 8.7 | - |
| Industrial Maintenance Coatings | 1.4 | - |
| **Consumer Products** | **15.7** | **-** |
| All Household Products | 7.9 | - |
| All Personal Care Products | 7.8 | - |
| **Cooking and Grilling** | **0.7** | **-** |
| Commercial Cooking - Charbroiling | 0.5 | - |
| Commercial Cooking - Frying | 0.1 | - |
| Residential Grilling | 0.1 | - |
| **Other** | **8.9** | **-** |
| All Automotive Aftermarket Products | 0.8 | - |
| All FIFRA Related Products | 7.1 | - |
| Emulsified Asphalt | 0.2 | - |
| Miscellaneous Products (Not Otherwise Covered) | 0.8 | - |
| Other Special Purpose Coatings | 0.0 | - |
| Tank Trucks in Transit | 0.1 | - |
| Traffic Markings | 0.01 | - |
| **Portable Gas Cans** | **2.5** | **-** |
| Commercial | 1.1 | - |
| Residential | 1.3 | - |
| **On-Road** | **49.4** | **54.7** |
| **Light-Duty Vehicles** | **47.6** | **41.4** |
| Off-Net | 36.6 | 18.3 |
| On-Net | 11.0 | 23.1 |
| **Medium/Heavy-Duty Vehicles** | **1.8** | **13.3** |
| Off-Net | 1.3 | 6.1 |
| On-Net | 0.5 | 7.2 |

**APPENDIX 4–A: 2020 EMISSIONS INVENTORY (CONTINUED)**

| Description | VOC | NOx |
|---|---|---|
| **Non-Road** | **44.3** | **39.1** |
| **Agriculture** | **0.2** | **1.8** |
| Agricultural Equipment | 0.2 | 1.8 |
| **Aviation** | **1.9** | **6.9** |
| Aircraft | 1.8 | 6.6 |
| Airport Ground Support Equipment | 0.1 | 0.3 |
| **Commercial** | **6.5** | **14.1** |
| Commercial Equipment | 4.4 | 3.2 |
| Construction and Mining Equipment | 1.7 | 8.2 |
| Industrial Equipment | 0.4 | 2.7 |
| Logging Equipment | 0.002 | 0.001 |
| **Lawn and Garden** | **33.0** | **7.6** |
| Commercial | 27.6 | 6.9 |
| Residential | 5.4 | 0.7 |
| **Railroad** | **0.4** | **8.2** |
| Line Haul | 0.2 | 5.3 |
| Rail Yard - Switcher Locomotives | 0.2 | 2.9 |
| Railroad Support Equipment | 0.01 | 0.03 |
| **Recreation** | **2.2** | **0.5** |
| Pleasure Craft | 1.0 | 0.4 |
| Recreational Equipment | 1.2 | 0.1 |
| **Oil and Gas** | **119.0** | **48.2** |
| **Area** | **54.5** | **34.4** |
| Drilling (incl. some pre-production) | 0.7 | 7.4 |
| Fracking (incl. some pre-production) | 2.0 | 9.2 |
| Fugitives | 9.5 | 0.0 |
| Heaters | 0.2 | 3.3 |
| Internal Combustion Engines | 6.8 | 14.3 |
| Pneumatic devices | 19.4 | 0.0 |
| Pneumatic pumps | 0.1 | 0.0 |
| Separator control | 3.4 | 0.0 |
| Truck loading of condensate liquid | 3.9 | 0.02 |
| Venting - blowdowns | 4.2 | 0.00 |
| Venting - initial completions and recompletions | 2.5 | 0.1 |
| Water tank losses | 2.0 | 0.1 |
| **Condensate/Oil Tanks** | **50.2** | **0.6** |
| Condensate/Oil Tanks | 50.2 | 0.6 |
| **Point** | **14.3** | **13.1** |
| External Combustion Boilers | 0.1 | 0.3 |
| Industrial Processes | 4.3 | 0.9 |
| Internal Combustion Engines | 5.6 | 11.8 |
| Petroleum and Solvent Evaporation | 4.3 | 0.1 |
| Waste Disposal | 0.005 | 0.0 |
| **Grand Total** | **292.3** | **163.7** |

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# CHAPTER 5
# MODELED ATTAINMENT DEMONSTRATION AND WEIGHT OF EVIDENCE ANALYSIS



## 5.1 OVERVIEW

As a Serious ozone nonattainment area, the region is required by 42 U.S.C. § 7511a(c)(2)(A) to submit a demonstration that the area will attain the ozone national ambient air quality standard (NAAQS) by the applicable attainment date. This attainment demonstration must be based on photochemical grid modeling (PGM) or any other analytical method determined by the U.S. Environmental Protection Agency (EPA) Administrator, in the Administrator's discretion, to be at least as effective. For the Denver Metro/North Front Range (DM/NFR) Serious ozone nonattainment area state implementation plan (SIP), photochemical grid modeling with supplemental analyses was used to perform the attainment demonstration modeling prior to the summer of 2020.

Photochemical modeling is a useful tool for projecting future ozone concentrations, determining source regions that contribute to local ozone levels, and estimating the impacts of emission source categories. Though the predictive capacity of models is scientifically sound, models have inherent limitations since they are simplistic approximations of complex phenomena. Therefore, results should not be the sole source of information relied upon in determining if a region will attain the ozone NAAQS. Note, the actual determination of whether or not an area has attained the standard is based on monitoring, and is made in a separate process from the SIP submittal. Further note that the attainment determination will be based on the three-year average for 2018 - 2020, whereas the modeled attainment test focuses on air quality projections with 2020 emissions levels (combined in this case with 2016 meteorology).

EPA's 8–hour ozone draft modeling guidance,[45] published in 2018, ("2018 Modeling Guidance") recommends a set of supplemental analyses, termed "weight of evidence", to support the attainment determination if the maximum–modeled 8–hour ozone design value (DV), at more than one monitor, is "close" to the 75 parts per billion (ppb) standard. Weight of the evidence analysis is "a totality of the circumstances approach, one that considers all available data to evaluate the reasonableness of the modeled results and which supplements those results."[46] EPA's 2018 Modeling Guidance outlines the basic criteria required for an attainment demonstration based on weight of evidence, which are as follows:

- A fully–evaluated, high–quality modeling analysis that projects future values that are close to the NAAQS;
- A description of each of the individual supplemental analyses, preferably from multiple categories. These supplemental analyses include additional modeling analyses, analysis of trends in ambient air quality and emissions, and analysis of additional emission controls and reductions that are not contained in the SIP attainment inventory and modeling; and
- A written description as to why the full set of evidence leads to a conclusive determination regarding the future attainment status of the area that differs from the results of the modeled attainment test alone.

[45]U.S. Environmental Protection Agency (EPA), Modeling Guidance for Demonstrating Attainment of Air Quality Goals for Ozone, PM2.5 and Regional Haze", Nov. 2018.

[46]Environmental Defense Fund v. United States EPA, 369 F.3d 193, 198 (2d Cir. 2004).

The outcome of photochemical modeling and weight of evidence analyses are presented in subsequent sections. The procedures used to develop the 2016 photochemical grid modelling platform and conduct the 2020 attainment demonstration modeling were outlined in a formal Modeling Protocol[47]. An overview of these procedures is provided in the remainder of this chapter. Details on the development of the 2016 PGM modeling platform and model performance evaluation are contained in a draft report dated May 2020 (Ramboll, 2020a). This chapter contains the following analyses performed for the SIP attainment demonstration, which is based on modeling presented in the 2020 Ramboll report titled, "2020 Attainment Demonstration Modeling for the Denver Metro/North Front Range Serious Ozone State Implementation Plan"[48]:

- Overview of the modeling approach (Section **Error! Reference source not found.**)
- Development of the 2020 emissions and a comparison with the 2016 emission (Section 0)
- Ozone design value projections for 2020 base case modeling and 2020 modeled ozone attainment demonstration (Section 0)
- Weight of evidence containing supplemental information supporting the 2020 attainment demonstration (Section 0).
- Summary and conclusions (Section 0)

## DM/NFR NONATTAINMENT AREA 2016 MODELING APPROACH

The 2020 ozone attainment demonstration modeling for the DM/NFR nonattainment area using the 2016 PGM platform includes emissions, meteorological and ozone model simulations using a nested 36/12/4-kilometer (km) grid with the 4-km grid domain focused on the state of Colorado. The development of the DM/NFR area 2016 36/12/4-km PGM modeling platform leveraged data from the EPA 2016 36/12-km PGM modeling platforms. The EPA 2016 36/12-km PGM platforms are described next, followed by an overview of the development of the DM/NFR nonattainment area 2016 36/12/4-km PGM modeling platform used for the 2020 attainment demonstration modeling.

### 5.1.1 EPA 2016 36/12-km PGM Modeling Platforms

The EPA and Multi-Jurisdictional Organizations (MJOs) conducted a 2016 inventory collaborative study[49] to develop 2016 emissions inventory of comparable quality to the National Emissions Inventory (NEI[50]). EPA developed a 2016 PGM modeling platform that used the same 12-km grid resolution continental U.S. domain (12US2) used in previous EPA PGM platforms (i.e., 2011 and 2014), but added an expanded 36-km grid resolution 36US3 domain as shown in Figure 8. EPA has released several versions of their 2016 36/12-km PGM modelling platform as follows:

- 2016v7.1 Alpha[51] PGM platform was available in June 2019 and was based mainly on 2014 National Emissions Inventory version 7.1 (NEIv7.1) emissions (2016fd emissions).

[47] Ramboll, 2020 and 2023 Attainment Demonstration Modeling for the Denver Metro/North Front Range Ozone Nonattainment Area, April 2019.

[48] Ramboll. 2020 Attainment Demonstration Modeling For the Denver Metro/North Front Range Serious Ozone State Implementation Plan.. Ramboll US Corporation, Novato CA and Alpine Geophysics, Arvada, CO. June 2020.

[49] http://views.cira.colostate.edu/wiki/wiki/10197

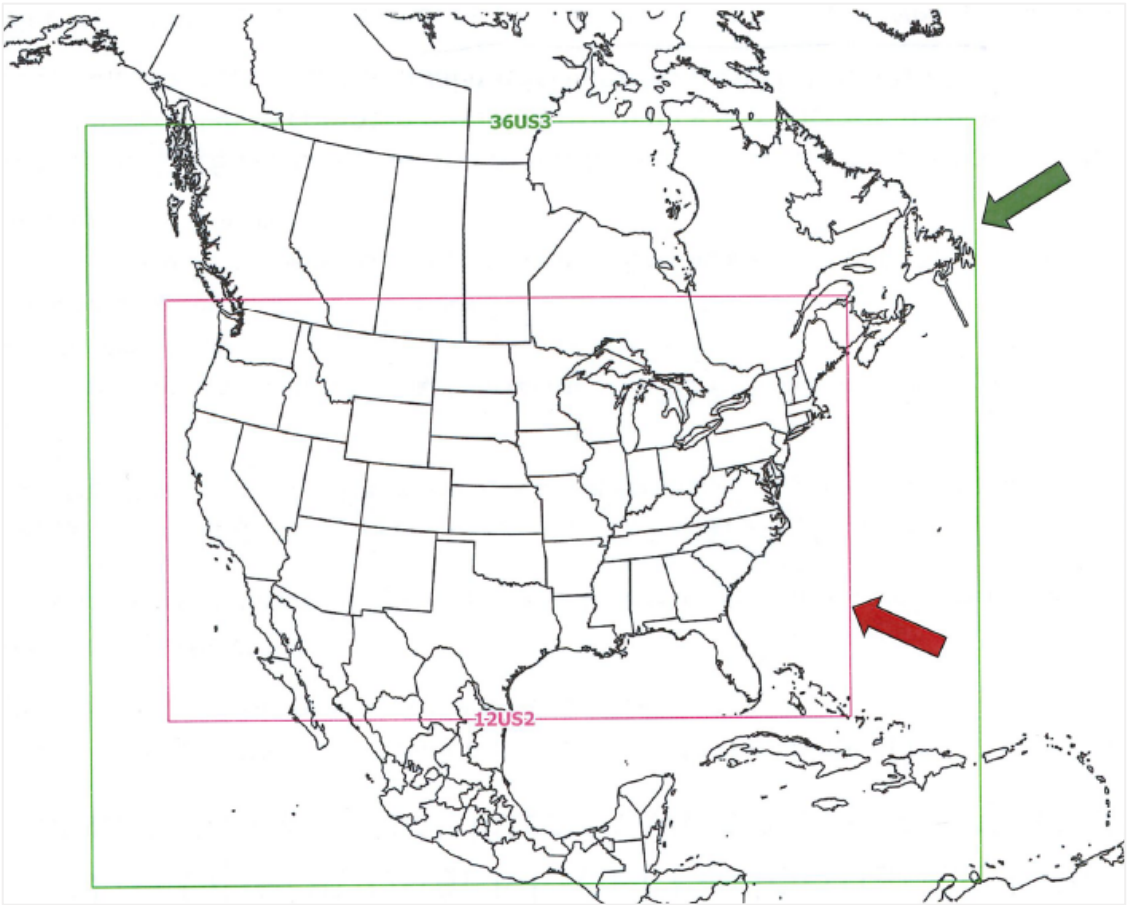
[50] EPA develops an NEI inventory every 3-years, including 2011 and 2014. The 2017 NEI is in development.

[51] https://www.epa.gov/air-emissions-modeling/2016-alpha-platform

- The 2016v7.2 Beta (2016ff) PGM platform used 2016 emissions from the joint EPA/MJO emissions collaborative study. The original 2016v7.2 Beta PGM platform was released in March 2019 through the Intermountain West Data Warehouse (IWDW[52]).
- EPA made some updates to the 2016v7.2 PGM platform and used the new 2016v7.2 "Beta Prime" (2016fg) modeling platform for their preliminary 2028 regional haze modelling (EPA, 2019b). Details on EPA's 2016v7.2 modeling platform are contained in a Technical Support Document (TSD[53]).
- The final EPA 2016v1[54] (2016fh) PGM modeling platform was released in November 2019, with updates to Commercial Marine Vessels occurring in February 2020, which is also available on the IWDW. The 2016v1 inventory included emission projections for 2023 and 2028.

The DM/NFR area 2016 36/12/4-km PGM modeling platform uses the same 36US3 (green) and 12US2B (red) PGM modeling domains as used in the EPA 2016 modeling platform.

**Figure 8 - EPA's 2016 platform 36-km and 12-km grid resolution domains**[55]




[52] http://views.cira.colostate.edu/iwdw/
[53] https://www.epa.gov/sites/production/files/2019-09/documents/2016v7.2_regionalhaze_emismod_tsd_508.pdf
[54] https://www.epa.gov/air-emissions-modeling/2016v1-platform
[55] 36-km grid resolution 36US3 domain (green) and 12-km grid resolution 12US2 domain (red) used in EPA's 2016 modeling platforms

### 5.1.2 Episode Selection

Episode selection is an important component of an 8-hour ozone attainment demonstration. EPA guidance recommends that 10-days be used to project 8-hour ozone design values at each critical monitor (EPA, 2018d). The Regional Air Quality Council (RAQC) and the Air Pollution Control Division of the Colorado Department of Public Health and Environment (Division) specified that the baseline modeling period should be either the summer of 2016 or 2017. The summer of 2016 episode was selected for the 2020 attainment demonstration modeling for the following reasons (see Chapter 3 of the Modeling Protocol for details, Ramboll, 2019):

- 2016 has higher ozone concentrations than 2017 and the annual 4th high maximum daily 8-hour average (MDA8) ozone for key monitors in 2016 are generally closer to the 2014-2016, 2015-2017 and 2016-2018 ozone design values than 4th highest MDA8 ozone concentration that occurred in 2017;
- 2016 is not an unusually low ozone year;
- Ozone concentrations in 2016 are less influenced by emissions from wildfires than in 2017;
- 2016 emissions were developed by a joint EPA/MJO study and EPA developed a 2016 36/12-km PGM modeling platform that can be leveraged to reduce the amount of resources and time needed to develop a completely new modeling platform, as would be needed for 2017.
- Emissions from the 2017 NEI were not available at the time the study was initiated.

The DM/NFR nonattainment area PGM modelling was conducted for May through August 2016. However, since the first ozone exceedance days was in mid-June, May 2016 was used as an initialization period using just the 36-km modelling domain for computational efficiency, with the full 36/12/4-km domain configuration started on June 1st.

### 5.1.3 Model Selection

Details on the rationale for model selection are provided in Chapter 2 of the Modeling Protocol (Ramboll, 2019). The Weather Research Forecast (WRF) prognostic meteorological model was selected using a 36/12/4-km resolution grid, with the 4-km grid covering Colorado. Emissions modeling was conducted using the Sparse Matrix Operator Kernel Emissions (SMOKE) model for most source categories. The Model of Emissions of Gases and Aerosols from Nature (MEGAN v3.1) was used for biogenic emissions. There are Comprehensive Air-quality Model (CAMx) emission pre-processors that were used for windblown dust (WBD), lightning NOx (LNOx), sea salt (NaCl) and Dimethyl Sulfide (DMS) emissions. The 2014 version of the Motor Vehicle Emissions Simulator (MOVES2014b) on-road mobile source emissions model was used with SMOKE-MOVES and 2016 WRF meteorological data to generate on-road mobile source emissions. The use of link-based vehicle activity data within the DM/NFR nonattainment area was evaluated and ultimately used at the county-level to be consistent with the conformity calculations. The CAMx PGM was used to simulate ozone and other concentrations across the 36/12/4-km modelling domains.

The modeling protocol (Ramboll, 2019) also recommended carrying the Community Multiscale Air Quality (CMAQ) PGM as a supporting model in the weight of evidence portion of the 2020 attainment demonstration. However, EPA did not have a corresponding CMAQ 2016v1 modeling platform to use, updated the model (CMAQ v5.3) during the middle of the 2016 platform development with changes to the inputs and ultimately it was determined more important to carry a second meteorological input configuration for CAMx as part of the weight of evidence analysis than use CMAQ.

### 5.1.4 Domain Selection

The DM/NFR nonattainment area 2016 PGM modeling platform used the same 36-km 36US3 and 12-km 12US2B domains as used in the EPA 2016 modeling platform (see Figure 8). A 4-km Colorado domain was added to the 36/12-km domain structure using the same 4-km Colorado domain as used in the previous DM/NFR nonattainment area 2017 ozone SIP and using two-way interactive grid nesting. Figure 9 displays the 36/12/4-km domain structure with Figure 10 displaying the 4-km Colorado domain with locations of ozone monitoring sites. The domains use a Lambert Conformal Conic (LCC) projection defined using the parameters in Table 36 with the extent of the 36/12/4-km grid domains given in Table 37. New WRF 2016 36/12/4-km meteorological modeling was conducted to generate finer scale 4-km meteorological conditions for the Colorado domain and consistent meteorology among the 36/12/4-km domains.

**Figure 9 - DM/NFR Nonattainment Area 2016 36/12/4-km CAMx and Emissions Modeling Domains**

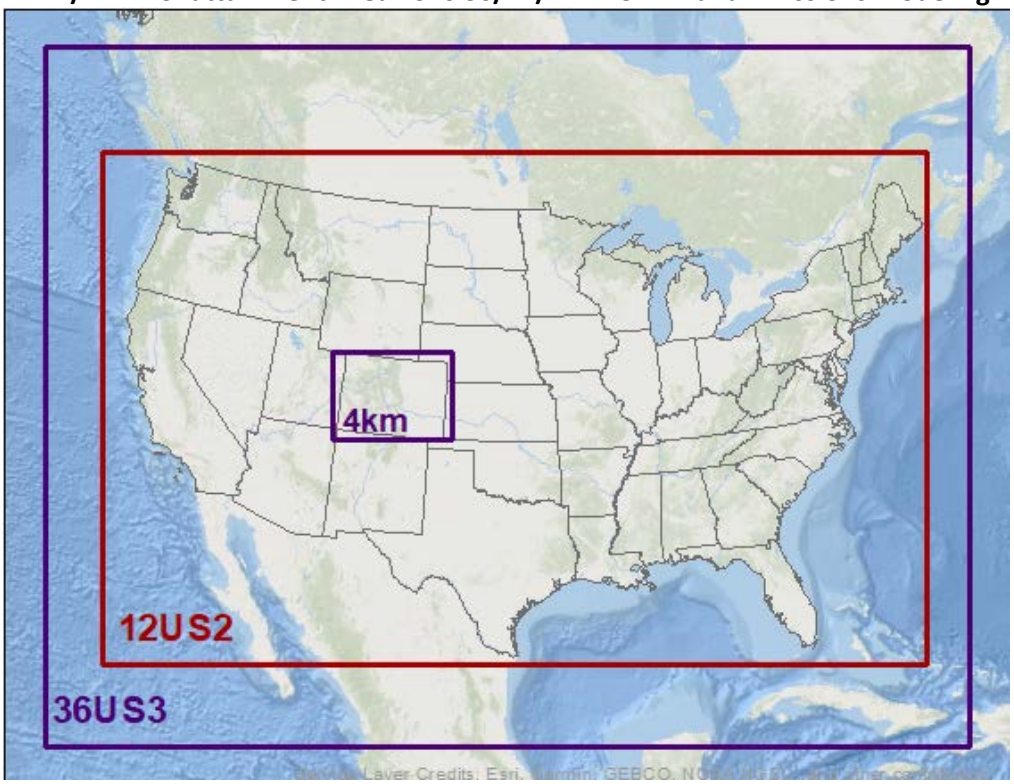


**Figure 10 - DM/NFR Nonattainment Area 2020/2023 4-km Colorado Domain for CAMx[56]**

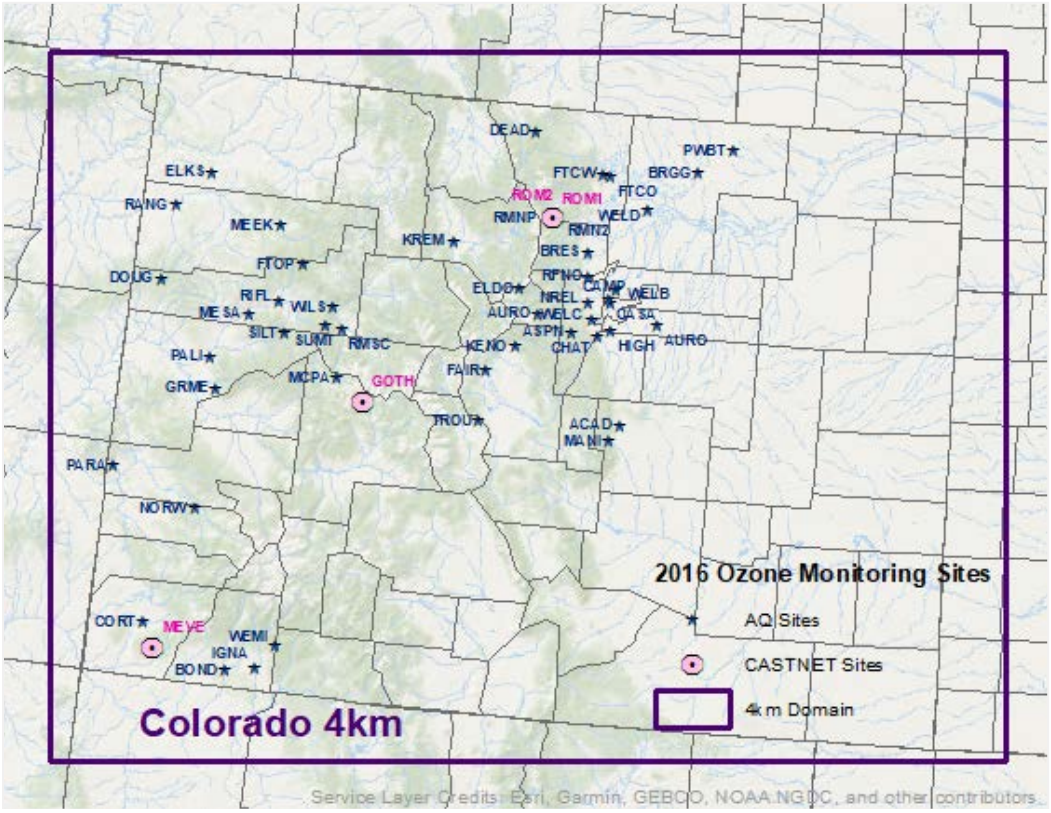



**Table 36 - Lambert Conformal Conic Projection Parameters[57]**

| Parameter | Value |
|---|---|
| Projection | Lambert-Conformal |
| 1st True Latitude | 33 degrees N |
| 2nd True Latitude | 45 degrees N |
| Central Longitude | -97 degrees W |
| Central Latitude | 40 degrees N |

**Table 37 - Grid definitions for CAMx[58]**

| Grid | Origin (SW) (km) | Extent (NE) (km) | NX | NY |
|---|---|---|---|---|
| 36 km | (-2952, -2772) | (3240, 2556) | 172 | 148 |
| 12 km* | (-2424, -1632) | (2352, 1344) | 398 | 248 |
| 4 km* | (-1084, -328) | (-392, 184) | 173 | 128 |

[56] DM/NFR Nonattainment Area 2020/2023 attainment demonstrations modeling 4-km Colorado domain for CAMx and emissions modeling, with locations of ozone monitors that were operating during some portion of 2016.
[57] Lambert Conformal Conic projection parameters for the DM/NFR Nonattainment Area 36/12/4-km modeling domains.
[58] Grid definitions for CAMx DM/NFR Nonattainment Area 2016 36/12/4-km modeling domains.

### 5.1.5 Base and Future Year Emissions Data

The 2016 base year emissions data for the 36/12-km domains were initially based on the EPA/MJO 2016 Beta emissions (2016ff) and then updated to the 2016v1 emission estimates (2016fh). For the 4-km Colorado domain, the EPA 2016fh emissions with Division updates for Colorado oil and gas and on-road mobile sources were used. New emissions were generated for natural emission sources, including biogenic and LNOx for all three domains. The EPA 2016 platform does not include LNOx emissions and used the Biogenic Emission Inventory System (BEIS) biogenic emission model whose emissions were replaced by MEGAN biogenic emissions in all three domains. 2020 future year emissions were based on an interpolation between EPA's 2023 and 2016 emissions with some updates to Colorado provided by the Division. Section 0 of this report compares the 2016 and 2020 emissions within the DM/NFR nonattainment area.

### 5.1.6 Meteorology Input Preparation and QA/QC

The CAMx 2016 36/12/4-km meteorological inputs were based on output from 2016 WRF meteorological model simulation for the 36/12/4-km domains conducted by the Ramboll/Alpine team for the DM/NFR nonattainment area 2020 attainment demonstration study. The 2016 36/12/4-km WRF output was processed by WRFCAMx processor to generate meteorological inputs for CAMx. Chapter 2 of the 2016 base case report[59] describes the DM/NFR nonattainment area 2016 36/12/4-km WRF modeling with more details provided in a separate WRF 2016 application/evaluation report[60].

CAMx was also run using EPA's 2016 36/12-km meteorological inputs that were based on EPA's 2016 36-km and 12-km domain WRF modeling (EPA, 2019a). Because EPA's 2016 database did not use a 4-km modeling domain, the meteorological inputs for the 4-km Colorado domain were based on interpolation of the 12-km domain meteorological inputs using the CAMx flexi-nest feature, although high-resolution 4-km emissions were used.

### 5.1.7 Initial and Boundary Conditions Development

Boundary Conditions (BCs) for the 36-km 36US3 domain were based on a 2016 simulation of the GEOS-Chem (GC) global chemistry model. The GC2CAMx processor was used to generate day-specific diurnally varying BCs extracted from the global chemistry model to define the lateral boundaries around the 36-km 36US3 modeling domain (i.e., GC-BC). Given uncertainties in global emission inventories, the 2016 BCs were held constant for the 2020 modeling.

### 5.1.8 Diagnostic Sensitivity Analyses

Starting with EPA's 2016 36/12-km Beta CAMx modeling platform, a series of diagnostic sensitivity tests were conducted arriving at the final CAMx 2016 36/12/4-km base case model configuration that used EPA 2016v1 emissions for the 36/12-km domains. The results of these diagnostic sensitivity tests are given in Chapter 5 of the 2016 base case modelling report and included investigations into the following:

- BCs using 2016 GEOS-Chem versus 2016 Hemispheric CMAQ.
- Biogenic emissions using BEIS versus MEGAN biogenic emissions models.

[59] Ramboll, 2020a. 2016 Base Case Modeling and Model Performance Evaluation for the Denver Metro/North Front Range 2020 Attainment Demonstration. Ramboll US Corporation, Novato, CA. Alpine Geophysics, Arvada, CO. May 2020.

[60] Ramboll, 2019b. WRF Meteorological Modeling to Support Denver 2020 and 2023 Ozone Attainment Demonstration Modeling. Ramboll US Corporation, Novato, CA. August 2019.

- Meteorology using CAMx meteorological inputs based on processing of the DM/NFR NAA 36/12/4-km WRF versus EPA's 2016 36/12-km WRF simulations.
- Use of 4-km Colorado domain emissions and meteorological inputs.
- Treatment of on-road mobile source emissions in the DM/NFR nonattainment area.

### 5.1.9 Final 2020 Base Case Modeling and Model Performance Evaluation

Two final CAMx 2016 36/12/4-km base case simulations were performed that are referred to as "S9" and "S10":

- S9 CAMx 36/12/4-km base case simulation used meteorological inputs based on the 2016 36/12/4-km WRF simulation (Ramboll, 2019b) conducted for the DM/NFR nonattainment area 2020 attainment demonstration modeling study.

- S10 CAMx 36/12/4-km base case simulation used meteorological inputs based on EPA's 2016 36/12-km WRF simulation (EPA, 2019a) with the 4-km Colorado domain meteorology interpolated from the 12-km resolution data using the CAMx flexi-nest feature.

The Model Performance Evaluation (MPE) followed EPA's recommendations in their ozone modeling guidance (EPA, 2007; 2014d; 2018a) and other sources (e.g., Simon, Baker and Phillips, 2012; Emery et al., 2016). The focus of the MPE was on MDA8 ozone performance at sites within the DM/NFR nonattainment area, especially for the four highest ozone sites and for days that are used to project future year 2020 ozone design values for the attainment demonstration. The CAMx 2016 36/12/4-km base case MPE for the two WRF meteorological input datasets were presented in Chapter 7 of the 2016 base case modeling report (Ramboll, 2020a).

### 5.1.10 2020 Attainment Demonstration Modeling

EPA's Software for the Modeled Attainment Test (Software for the Modeled Attainment Test (SMAT-CE)) version 1.6 was used to make 2020 ozone design value projections using the CAMx 2016 and 2020 modeling results for both the S9 and S10 configurations. 2020 ozone projections were made several different ways as described in Section 0 and 0 of this document.

### 5.1.11 Weight of Evidence

Section 0 provides the 2020 attainment demonstration weight of evidence supplemental analysis. This analysis looks at the various 2020 ozone projections, ambient air quality data including ozone trends, and other data to support that by 2020 the 4th highest MDA8 ozone concentrations in the DM/NFR nonattainment area are expected to be below the 75 parts per billion (ppb) 2008 ozone NAAQS.

## SUMMARY OF 2016 AND 2020 EMISSIONS

This Chapter provides an overview on the development of the 2016 and 2020 36/12/4-km domain emission inputs for CAMx modeling and a summary of the 2016 and 2020 $NO_X$ and VOC emissions within the DM/NFR nonattainment area. Details on the 2016 emissions modeling procedures are provided in Chapter 4 of the 2016 base case modeling report (Ramboll, 2020a).

### 5.1.12 Overview of 2016 and 2020 Emissions Development

The EPA/MJO 2016v1 modeling platform 2016fh and 2023fh emissions were the primary source of the CAMx 36/12/4-km 2016 and 2020 emission inputs.

#### 5.1.12.1 2016 Base Case Emissions

The 2016 base case emissions were based on the EPA 2016v1 emission inventories version 2016fh with some updates for Colorado. The EPA 2016v1 modeling platform 36/12-km anthropogenic emissions were provided in CMAQ model format so were converted to CAMx format using the CMAQ2CAMx converter[61]. The EPA 2016v1 BEIS biogenic emissions were replaced by MEGAN biogenic emissions and processors were run to generate LNOx, sea salt and DMS emissions.

For the 4-km Colorado domain, on-road mobile source emission inputs for the 2016 base case were developed using the SMOKE-MOVES processor with: (1) EPA's 2016 MOVES emissions factor (EF) look-up table; (2) county-level vehicle activity data based on DRCOG and NFRMPO link-based activity data from their travel demand model (TDM) modeling for counties in the DM/NFR nonattainment area or using EPA's default county-level activity data outside of the DM/NFR nonattainment area; and (3) 4-km gridded hourly WRF meteorological data. 2016 oil and gas emissions developed by WRAP were processed for the 2016 base case. For other anthropogenic emission source categories, the SMOKE emissions processor was used to process the 2016fh emissions for the 4-km Colorado domain. 2016fh point source electric generating units (EGUs) emissions include hourly 2016 Continuous Emissions Monitoring System (CEMS) values for nitrogen oxides ($NO_X$) and $SO_2$.

#### 5.1.12.2 2020 Future Case Emissions

EPA did not develop model-ready 36/12-km emission inputs for the 2020 emissions year. EPA did develop a 2020 MOVES EF look-up table and 2020 emissions for non-road mobile sources. Table 38 shows the source of the 2020 anthropogenic emissions for the Colorado 4-km and 36/12-km domains.

The 2020 36/12-km emission inputs were calculated by interpolating EPA's model-ready 2016 and 2023 emissions for low-level gridded anthropogenic emission source categories. 2020 36/12-km domain elevated point source emissions were generated by interpolating the 2016 and 2023 point source emission rates and then processing them by SMOKE.

For the 4-km modeling domain, 2020 on-road mobile source emission inputs were obtained using SMOKE-MOVES the same way that they were obtained for the 2016 and 2023 model inputs. The Colorado Department of Public Health and Environment (CDPHE) provided 2020 airport emissions that were processed by SMOKE. For other anthropogenic emission source categories, the 2016fh and 2023fh emissions were interpolated to 2020 and processed by SMOKE to generate 2020 emission inputs for the 4-km Colorado domain.

[61] http://www.camx.com/download/support-software.aspx

## Table 38 - Source of 2020 Anthropogenic Emissions[62]

| Source Category | Colorado Domain* (4-km Domain) | 12US2 Continental U.S. (12-km Domain) | 36US3 Continental U.S.(36-km Domain) |
|---|---|---|---|
| **Area:** *Agriculture ammonia, residential wood combustion, area fugitive dust, nonpoint* | Interpolate 2016fh and 2023fh emissions - **apply Reg. No. 21 reductions** | Interpolate model-ready files for 2016fh and 2023fh | Interpolate model-ready files for 2016fh and 2023fh |
| **Oil & Gas:** *Point and non-point* | **APCD O&G emissions for 2020 – add tribal emissions** | Interpolate model-ready files for 2016fh and 2023fh | Interpolate model-ready files for 2016fh and 2023fh |
| **On-road Mobile:** | EPA 2016v1 platform: 2020fh MOVES emissions table – SMOKE-MOVES processing | EPA 2016v1 platform: 2020fh MOVES emissions table – SMOKE-MOVES processing | EPA 2016v1 platform: 2020fh MOVES emissions table – SMOKE-MOVES processing |
| **Nonroad:** | EPA 2016v1 platform: 2020fh emissions | EPA 2016v1 platform: 2020fh emissions | EPA 2016v1 platform: 2020fh emissions |
| **Airports:** | Interpolate 2016fh and 2023fh emissions - **update DIA emissions** | Interpolate model-ready files for 2016fh and 2023fh | Interpolate model-ready files for 2016fh and 2023fh |
| **Commercial Motor Vehicles (CMV):** | N/A | Interpolate model-ready files for 2016fh and 2023fh | Interpolate model-ready files for 2016fh and 2023fh |
| **Locomotives:** | Interpolate 2016fh and 2023fh emissions | Interpolate model-ready files for 2016fh and 2023fh | Interpolate model-ready files for 2016fh and 2023fh |
| **EGU Point:** | **APCD EGU emissions** (use 2016 CEM for temporal) | Interpolate model-ready files for 2016fh and 2023fh | Interpolate model-ready files for 2016fh and 2023fh |
| **Point:** | Interpolate 2016fh and 2023fh emissions | Interpolate model-ready files for 2016fh and 2023fh | Interpolate model-ready files for 2016fh and 2023fh |
| **Non-US:** *Canada/Mexico/Offshore* | N/A | Interpolate model-ready files for 2016fh and 2023fh | Interpolate model-ready files for 2016fh and 2023fh |
| **Fires** | EPA 2016fh FIRES | EPA 2016fh FIRES | EPA 2016fh FIRES |
| **Biogenics** | 2016 MEGAN | 2016 MEGAN | 2016 MEGAN |

[62] Source of the 2020 anthropogenic emissions for the Colorado 4-km and 36/12-km modeling domains.

### 5.1.13 Summary of Emission Results for the DM/NFR NAA

Table 39 summarizes the $NO_X$ and VOC emissions for the whole 9-county DM/NFR nonattainment area by major source category. The on-road mobile, biogenic and LNOx emissions are episode average (i.e., May-August 2016), the non-road source categories in the NONROAD model are typical July weekday, the remaining source categories are typical day emissions (i.e., annual average divided by 365).

#### 5.1.13.1 2016 Base Case Emissions

The percent contribution of major source categories to total anthropogenic $NO_X$ and VOC emissions in the DM/NFR nonattainment area for the three emission modeling years are shown in **Error! Reference source not found.** and
Figure 12, respectively. The largest contributor to total $NO_X$ in the 2016 Base Case is on-road mobile (31%) followed by biogenic (20%), area oil and gas (O&G) (12%), non-EGU Point (8%) and EGU Point (7%). The high contributions of biogenic $NO_X$ emissions was unexpected and discussed in more detail later in this section. Note that O&G emissions are split into three source categories (Point, /Oil Storage Tanks, and Area) and the total O&G $NO_X$ contribution in 2016 is 18%.

For 2016 VOC emissions, as expected biogenic emissions is the largest contributor (33%), followed by O&G Condensate/Oil Tanks (28%) and Non-Point (area sources) at 12%. Total O&G VOC contribution is 37% in 2016.

**Table 39 - Summary of Total NOX and VOC Emissions (tpd) within DM/NFR NAA**

| | NOx (tpd) | | VOC (tpd) | |
|---|---|---|---|---|
| **Source Sector** | **2016** | **2020** | **2016** | **2020** |
| EGU Point[1] | 17.70 | 3.90 | 0.40 | 0.03 |
| Non-EGU Point | 20.90 | 21.20 | 26.40 | 26.30 |
| O&G Point | 12.72 | 13.80 | 14.14 | 15.70 |
| O&G /Oil Tank-Storage Tanks | 3.20 | 1.00 | 151.80 | 70.60 |
| O&G Area | 32.10 | 37.00 | 38.29 | 58.09 |
| Non-Point | 13.30 | 13.12 | 64.73 | 53.43 |
| Non-Road | 14.54 | 12.06 | 22.35 | 20.85 |
| On-Road | 80.14 | 48.80 | 45.50 | 33.23 |
| Airports | 11.59 | 7.69 | 4.38 | 2.30 |
| Biogenic | 50.89 | 50.89 | 178.68 | 178.68 |
| LNOx | 0.10 | 0.10 | 0.00 | 0.00 |
| | | | | |
| **Total** | **257.18** | **209.56** | **546.68** | **459.22** |

[1] excludes Rawhide Energy Station

**Figure 11 - Percent Contribution of Major Source NOx Categories**[63]

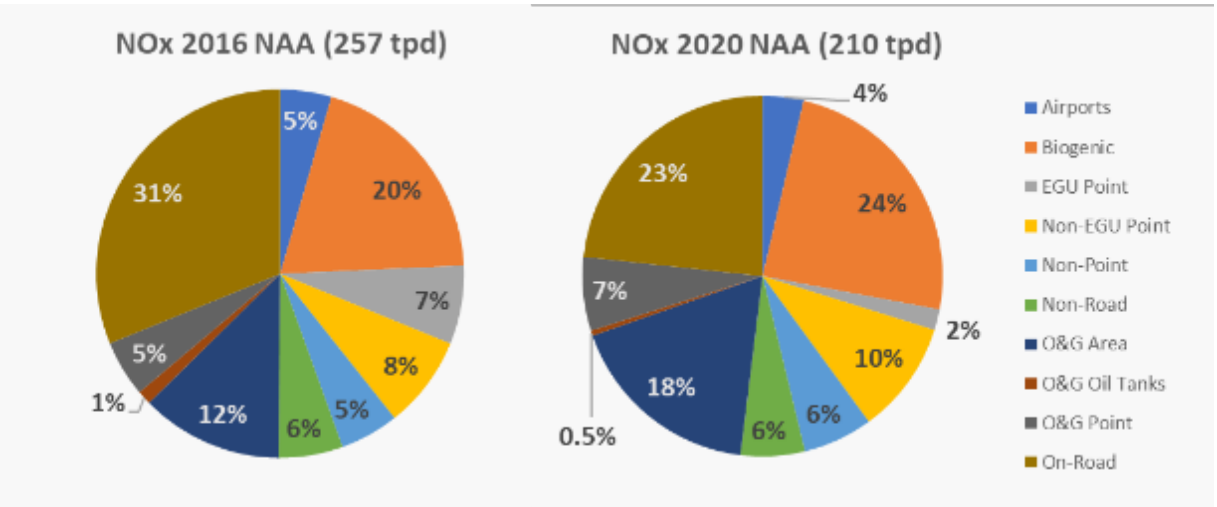
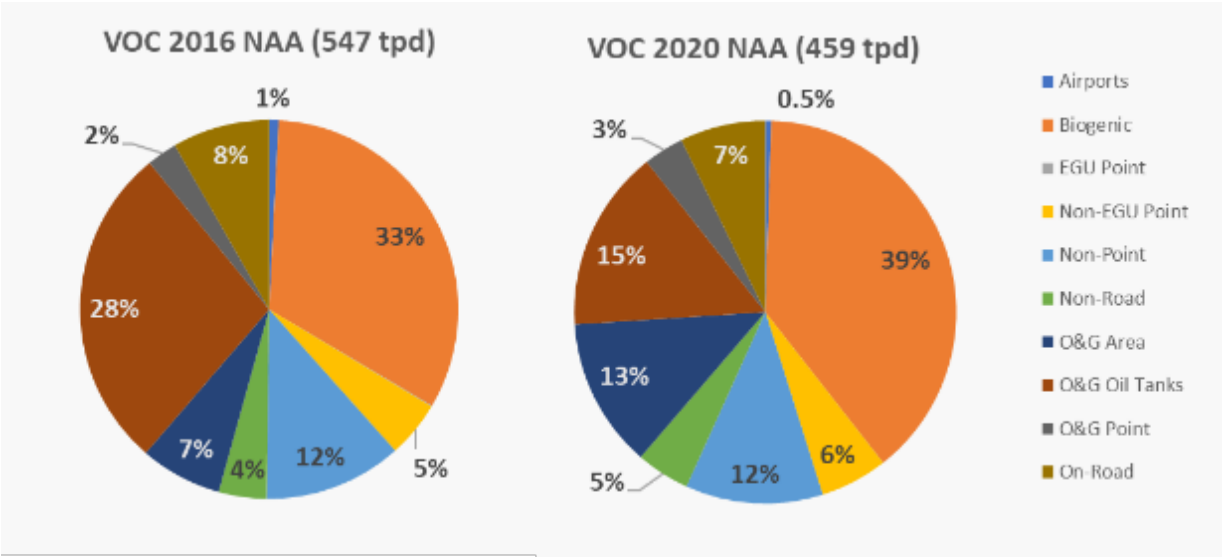



**Figure 12 - Percent Contribution of Major Source VOC Categories.**[64]




### 5.1.13.2 2020 Future Year Emissions

In the 2020 future year, on-road mobile becomes a smaller fraction (23% and 19%) of the total DM/NFR nonattainment area $NO_X$ emissions, while biogenic $NO_X$ becomes a relatively larger fraction (24%) although the magnitude remains unchanged from 2016 base case levels. Future year total O&G $NO_X$ emissions also increased their fractional contribution from 2016 levels (25% for 2020). Since biogenic VOC remains unchanged from 2016 levels it becomes a relatively larger contribution in 2020 (39%) than in 2016 (33%). The largest anthropogenic VOC contributor by far is O&G with around a 30% contribution for both modeled years.

[63] Percent contribution of major source categories to total NOX emissions in the DM/NFR NAA for 2016 (top) and 2020 (bottom) base case emission scenarios.

[64] Percent contribution of major source categories to total VOC emissions in the DM/NFR Nonattainment Area for 2016 (top) and 2020 (bottom) base case emission scenarios.

Table 40 shows the $NO_X$ and VOC emission reductions across the DM/NFR nonattainment area from the 2016 base year levels for the future year emission scenario. There is a total of 48 tpd (19%) reduction in 2020 $NO_X$ emissions across the nonattainment area from 2016 levels of which most (31 tpd) comes from on-road mobile sources. There is also significant (78%) reduction in EGU $NO_X$ emissions (14 tpd) in the DM/NFR nonattainment area. Total VOC emissions in 2020 are reduced 88 tpd from 2016 levels with O&G /Oil Storage Tank sources (81 tpd) accounting for the largest VOC reduction. However, O&G Area VOC is increasing, which offsets some of the O&G /Oil Storage Tank VOC reductions.

**Table 40 - 2020 Estimated Changes in $NO_X$ and VOC Emissions (tpd) from 2016 Base Case**

| | 2020 | |
|---|---|---|
| **Source Sector** | **NOx Reduction (tpd)** | **VOC Reduction (tpd)** |
| EGU | -13.8 | -0.4 |
| Non-EGU Point | 0.3 | -0.1 |
| Oil & Gas Point | 1.1 | 1.6 |
| Oil & Gas Condensate/Tank | -2.2 | -81.2 |
| Oil & Gas Area | 4.9 | 19.8 |
| Area Sources | -0.2 | -11.3 |
| Non-Road Mobile | -2.5 | -1.5 |
| On-Road Mobile | -31.3 | -12.3 |
| Airports | -3.9 | -2.1 |
| **Total** | **-47.6** | **-87.5** |

#### 5.1.13.3 Biogenic NOX emissions

Biogenic $NO_X$ sources are the second largest source sector in the 2016 base case (behind on-road mobile) and the largest contributing source sector in the 2020 emission scenarios. Biogenic $NO_X$ emissions are not all natural in origin. Soil $NO_X$ emissions occur when microbial action processes nitrogen in soil and releases it to the atmosphere as reactive oxidized nitrogen (NO). The source of the nitrogen in the soil can be anthropogenic in origin, including fertilizer application and nitrogen deposition of anthropogenic $NO_X$ emissions.

## 2020 OZONE ATTAINMENT DEMONSTRATION

EPA's Modeling Guidance contains detailed procedures for how to use base and future year PGM modeling results to make future year ozone design value projections. The EPA-recommended ozone attainment demonstration includes procedures for projecting base year ozone design values (DVb) to the future year (DVf) to conduct a modeled attainment test and suggests procedures for a weight of evidence supplemental analysis that is used to confirm and corroborate the modeled attainment demonstration

test. EPA has developed the SMAT tool that codifies the EPA-recommended procedures[65] for projecting future year ozone DVf.

### 5.1.14 EPA Recommended Future Year Ozone Design Value Projection Procedures

The procedures for making future year ozone DV projections are outlined in Chapter 4 of EPA's Modeling Guidance. EPA recommends using the PGM modeling results in a relative fashion to scale the observed base year design value to estimate the future year design value. The model derived scaling factors are called Relative Response Factors (RRF) and are the ratio of future to base year ozone modeling results using the 10 highest base year base case modeled MDA8 ozone concentrations near the monitor:

RRF = ∑ Model2020 / ∑ Model2016

DVf = DVb x RRF

#### 5.1.14.1 Base Year Ozone Design Value (DVb)

EPA guidance recommends that the DVb is calculated as the average of three-years of ozone design values centered on the base modeling year. An ozone design value is defined as the three-year average of the 4th highest MDA8 ozone concentrations at a monitor. The DVb is based on 5 years of 4th highest MDA8 ozone concentrations centered on the base year. The highest weight (3x) is on the 4th highest MDA8 ozone for the base year with less weights in the 2 years before and after the base year (i.e., weighting factors of 1, 2, 3, 2, 1).

For the DM/NFR nonattainment area 2020 attainment demonstration modeling, the base year is 2016 so that the DVb at each site will be defined from three years of ozone DVs as follows:

DVb2016 = (DV2014-2016 + DV2015-2017 + DV2016-2018) / 3

#### 5.1.14.2 Calculation of Relative Response Factors (RRFs)

As discussed above, the RRF is defined as the ratio of the average of the PGM future year (FY) to base year (BY) MDA8 ozone concentrations for the 10 days with the highest base year modeled MDA8 ozone concentrations "near the monitor".

##### *5.1.14.2.1 Near the Monitor*

By "near the monitor", EPA guidance recommends that the highest modeled base year MDA8 ozone is selected within a 3x3 array of grid cells centered on the monitor. For the future year, the future year MDA8 ozone is selected from the same grid cell in the 3x3 array centered on the monitor as used in the base year.

Previous EPA modeling guidance used an array of cells around the monitor that was grid cell size dependent such that a 3x3 array was used for a 12-km grid resolution and a 7x7 array was used for a 4-km grid resolution. Thus, previous DM/NFR nonattainment area ozone SIPs using a 4-km grid resolution have used a 7x7 array around the monitor to

[65] EPA. 2018d. Modeling Guidance for Demonstrating Air Quality Goals for Ozone, PM2.5, and Regional Haze. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Air Assessment Division. Research Triangle Park, NC. EPA 454/R-18-009. November 29, 2018.

define near the monitor. In our 2020 attainment demonstration weight of evidence supplemental analysis in Section 0, we also examine the 7x7 array ozone projection approach in additional to the EPA-recommended 3x3 array, as well as a 1x1 array (i.e., at the monitoring site) to define near the monitor.

#### *5.1.14.2.2 10 Highest Base Year MDA8 Ozone Days*

EPA recommends that the RRF be based on the 10 days with the highest base year modeled MDA8 ozone concentrations near the monitor, provided the base year MDA8 ozone is greater or equal to 60 ppb. If there are less than 10 days with base year MDA8 ≥ 60 ppb, just the days ≥ 60 ppb are used provided there are at least 5 days. If there are less than 5 days with base year MDA8 ozone ≥ 60 ppb EPA recommends that RRFs not be calculated for that site.

### 5.1.14.3 Alternative Future Year Ozone Design Value Projection Procedures

EPA's modeling guidance includes flexibility to modify the recommended ozone DV projection procedure discussed above. Depending on the application, there may be a reason that grid cells in the 3x3 array centered on the monitor may not be representative of conditions at the monitor. For example, if the monitor is a coastal site and the 3x3 array of grid cells includes cells dominated by water that have different mixing characteristics than the overland monitoring site, it may be appropriate to exclude the over water grid cells in the 3x3 array.

There may reasons that one or more of the highest 10 base year MDA8 ozone days are not appropriate to be used in the RRF. For example, if the modeled base year MDA8 ozone is highly influenced by emissions from wildfires it could be excluded and the next highest modeled MDA8 ozone included in the RRF so that 10 modeled days are still used.

Past DM/NFR nonattainment area ozone SIPs have made future year ozone DV projections with slight deviations from the current EPA recommended test as follows:

a) Defining near the monitor by using a 7x7 and 1x1 array of 4-km grid cells centered on the monitor instead of a 3x3 array in EPA's guidance.

b) Elimination of observed MDA8 ozone concentrations in the calculation of the ozone DVb for those days flagged as having been influenced by exceptional events, such as emissions from wildfires or contributions from stratospheric ozone.

c) Invoke a model performance evaluation (MPE) criteria that requires the modeled and observed MDA8 ozone to match each other within sufficient accuracy to be included in the 10 highest modeled MDA8 ozone days used to develop RRFs and make future year ozone DVf projections.

In the weight of evidence analysis discussed in section 0, Colorado is making alternative ozone projections using an MPE requirement that the modeled MDA8 ozone at the monitor for the top 10 modeled MDA8 ozone days used in the RRF to make the future year ozone DVf projections match the observed MDA8 ozone within 10% and 15%.

### 5.1.15 2020 Modeled Attainment Demonstration Test

In this section Colorado demonstrates that the 2020 design value is estimated to be below the 75 ppb 2008 ozone NAAQS. An area is considered to be attaining the NAAQS when it is 75.9 ppb or lower.

#### 5.1.15.1 Primary Model Configuration

Two CAMx 2016 36/12/4-km base case configurations were examined in this analysis:

S9 that used meteorological inputs based on a 2016 36/12/4-km WRF simulations conducted as part of the DM/NFR nonattainment area 2020 modeling study; and S10 that used EPA's 2016v2 meteorological inputs based on a 2016 36/12-km WRF simulation conducted by EPA.

The CAMx S9 ozone model failed to achieve the ozone Performance Goal and the CAMx S10 base case achieved the ozone Performance Goals, thus the S10 it was used in the 2020 ozone attainment demonstration configuration. The CAMx S9 configuration is presented as part of the weight of evidence supplemental analysis in Section 0.

#### 5.1.15.2 2020 Ozone Attainment Demonstration

Table 41 displays the base year (2014-2018) ozone DVb and projected 2020 ozone DVf at all the monitoring sites in Colorado using the CAMx S10 2016 base case and 2020 future year 4-km modeling results and the EPA's default ozone projection approach (EPA, 2018d). The ozone design values that exceed the 2008 ozone NAAQS are shaded red. Also shown in Table 41 are the RRFs used to scale the ozone DVb to obtain the 2020 ozone DVf.

There are three monitoring sites that have current base year (2014-2018) ozone DVb that exceed the 2008 ozone NAAQS: 79.3 ppb at the National Renewable Energy Laboratory (NREL) and 77.3 ppb at both the Chatfield (CHAT) and Rocky Flats North (RFNO) monitoring sites. The Fort Collins West (FTCW) monitoring sites has also exceeded the 2008 ozone NAAQS in the past, but its 5-year 2014-2018 DVb is 75.7 ppb so is below the 2008 ozone NAAQS

The projected 2020 ozone DVf at all of monitoring sites in the DM/NFR nonattainment area are below the 2008 ozone NAAQS thereby demonstrating attainment. Since the monitored 2020 ozone DV will be based on the average of the 4th highest MDA8 ozone from three years (2018, 2019 and 2020) and 2018 was a high ozone year, some of the observed 2020 ozone DVs may be above the 2008 NAAQS. But the 2020 future modeling suggests that the 2020 4th highest MDA8 ozone will be below the 2008 ozone NAAQS.

The highest projected 2020 ozone DVf is 75.9 ppb at the NREL monitoring site. The projected 2020 ozone DVf at CHAT, RFNO and FTCW are, respectively, 74.4, 72.7 and 72.0 ppb, all below the 2008 ozone NAAQS. The projected 2020 ozone DVf at all other sites in the DM/NFR NAA are below the 2008 ozone NAAQS.

Also shown in Table 41 are the ozone DVb and DVf for sites within the Colorado 4-km domain but outside of the DM/NFR nonattainment area. All of these sites in the Colorado's attainment/maintenance area(s) have current DVb and future DVf values below the 2008 ozone NAAQS. The highest ozone DVb (~68 ppb) and DVf (~66 ppb) at these Colorado attainment area sites are in La Plata County (e.g., Durango).

**Table 41 - Base Year and Projected 2020 Future Year Ozone Design Value**[66]

| AIRS ID | | | DVb | RRF | DVf |
|---|---|---|---|---|---|
| **DM/NFR NAA** | **Site** | **County** | **(ppb)** | **3x3** | **(ppb)** |
| 80350004 | CHAT | Douglas | 77.3 | 0.9630 | 74.4 |
| 80590006 | RFNO | Jefferson | 77.3 | 0.9413 | 72.7 |
| 80590011 | NREL | Jefferson | 79.3 | 0.9577 | 75.9 |
| 80690011 | FTCW | Larimer | 75.7 | 0.9523 | 72.0 |
| 80310002 | CAMP | Denver | 67.7 | 0.9749 | 66.0 |
| 80310026 | CASA | Denver | 68.7 | 0.9679 | 66.4 |
| 80013001 | WELB | Adams | 67.0 | 0.9616 | 64.4 |
| 80050002 | HIGH | Arapahoe | 73.0 | 0.9681 | 70.6 |
| 80050006 | AURE | Arapahoe | 67.7 | 0.9650 | 65.3 |
| 80590005 | WELC | Jefferson | 73.0 | 0.9551 | 69.7 |
| 80590013 | ASNP | Jefferson | 70.0 | 0.9481 | 66.3 |
| 80690007 | RMNP | Larimer | 69.0 | 0.9531 | 65.7 |
| 80691004 | FTCO | Larimer | 69.0 | 0.9528 | 65.7 |
| 81230009 | WELD | Weld | 70.0 | 0.9577 | 67.0 |
| **Attainment Area** | **Site** | **County** | **DVb** | **RRF** | **DVf** |
| 80410013 | ACAD | El Paso | 68.0 | 0.9677 | 65.8 |
| 80410016 | MANI | El Paso | 66.7 | 0.9531 | 63.5 |
| 80450012 | RIFL | Garfield | 62.0 | 0.9825 | 60.9 |
| 80519991 | GOTH | Gunnison | 64.7 | 0.9838 | 63.6 |
| 80671004 | WEMI | La Plata | 67.0 | 0.9767 | 65.4 |
| 80677001 | DNGO | La Plata | 68.7 | 0.9664 | 66.3 |
| 80677003 | ANRV | La Plata | 68.3 | 0.9736 | 66.4 |
| 80770020 | PALI | Mesa | 64.0 | 0.9785 | 62.6 |
| 80830006 | CORT | Montezuma | 61.5 | 0.9719 | 59.7 |
| 80830101 | MEVE | Montezuma | 66.3 | 0.9681 | 64.1 |
| 81030005 | MEEK | Rio Blanco | 60.3 | 0.9854 | 59.4 |

## 2020 WEIGHT OF EVIDENCE DEMONSTRATION

In this section we provide support for the Section 0 modeled 2020 ozone attainment demonstration using the CAMx S10 model configuration through a weight of evidence analysis.

### 5.1.16 EPA Recommendations of Supplemental Analysis to Support a Modeled Attainment Demonstration

As noted in EPA's Modeling Guidance: "By definition, models are simplistic approximations of complex phenomena." There are numerous uncertainties in the modeling used to conduct the 2020 modeled attainment demonstration presented in Section 0 that used the CAMx S10 configuration (emissions, meteorology, level and role of transport, science formulations in the model, numerical solution techniques, etc.). EPA believes that the modeled attainment demonstration can be strengthened through supplemental analysis, as discussed in Chapter 6 of its Modeling Guidance.

[66] Base year (2014-2018) ozone design value (DVb) and projected 2020 future year ozone design value (DVf) using EPA default SMAT projection procedures and the CAMx S10 4-km 2016 and 2020 modeling results

EPA identifies three basic types of supplemental analysis:

- Additional modeling analysis.
- Analyses of trends in ambient air quality and emissions.
- Additional emissions controls/reductions.

#### 5.1.16.1 EPA-Recommended Additional Modeling Analysis

EPA's Modeling Guidance lists several additional modeling analysis activities that can be performed to supplement a modeled attainment demonstration. Below we list each of EPA's supplemental modeling analysis[67] and Colorado's response on how they are addressed in this Chapter.

1) Available regional or national scale modeling applications that are suitable for the local area, for example, modeling in support of EPA rulemakings or regional, multi-jurisdictional organization modeling that may be available for the appropriate future year of interest. Modeling analyses may be available that used different models and/or inputs.
   - Response: A recent regional or national scale simulation for 2020 was not available for a direct application. However, the CAMx S10 configuration used in the modeled attainment demonstration is very similar to and an enhancement to EPA's latest 2016v1 modeling platform.

2) Use of other appropriate local modeling that includes the nonattainment area of interest. This may include applications using alternative models and/or inputs or research-oriented analyses.
   - Response: Additional 2020 ozone projections were made using the CAMx S9 configuration that uses alternative meteorological inputs (WRF/Global Forecast System (GFS)).

3) Use of photochemical source apportionment, Direct-Decoupled Method (DDM), and/or process analysis modeling tools to help explain why attainment is (or is not) demonstrated.
   - Response: Ozone source apportionment is planned in late summer 2020 using 2023 future year emissions.

4) Use of multiple air quality models / model input data sets (e.g., multiple meteorological data sets, alternative chemical mechanisms or emissions inventories, etc.). Multiple model configurations can be used to estimate sensitivity and uncertainty of future year design value predictions. For results to be most relevant to the way we recommend models be applied in attainment demonstrations, it is preferable that such procedures focus on the sensitivity of estimated RRFs and resulting projected design values to the variations in inputs and/or model formulations.
   - Response: As noted above, additional 2020 ozone DVf projections are made using the CAMx S9 configuration with completely different meteorological inputs than S10.

[67] EPA, 2018d, Modeling Guidance for Demonstrating Air Quality Goals for Ozone, PM2.5, and Regional Haze. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Air Assessment Division. Research Triangle Park, NC. EPA 454/R-18-009. November 29, 2018, pp. 171-172

5) Application of the attainment test with alternative procedures compared to the default recommendations in EPA's guidance. Any alternate approaches should be accompanied with a technical justification to explain why the approach is appropriate for the area in question and should be discussed with the appropriate EPA Regional office.
   - Response: As discussed in Section 0 and presented below, alternative future year ozone DVf projections are made using: (1) different definitions of "near the monitor"; (2) eliminating days that have been flagged as exceptional events in the base year ozone DVb; and (3) invoking a model performance evaluation criteria when selecting days for use in the RRFs.

6) Use of dispersion models to address primary PM2.5 contributions to PM2.5 concentrations.
   - Response: As this is an ozone attainment demonstration, this type of analysis is not relevant.

7) The EPA has determined that the best approach to using models to demonstrate attainment of the NAAQS is to use a model in a relative mode. However, some types of "absolute" model results may be used to assess general progress towards attainment from the baseline inventory to the projected future inventory. Example metrics include:
8)
   - Percent change in total amount of ozone or PM2.5 >= NAAQS within the nonattainment area
   - Percent change in number of grid cells >= NAAQS within the nonattainment area
   - Percent change in grid cell-hours (days) >= NAAQS within the nonattainment area
   - Percent change in maximum modeled 8-hour ozone within the nonattainment area
   - Response: The changes in absolute ozone concentrations within the DM/NFR nonattainment area for the S10 2016 base case and 2020 future year emissions scenarios are reported below.

#### 5.1.16.2 Analysis of Observed Ozone Trends

Weather corrected ozone trends were updated to the most current year of available observations using the same technique as used in previous DM/NFR ozone SIPs (e.g., CDPHE and RAQC, 2016c). For the DM/NFR nonattainment area 2020 ozone attainment demonstration, a separate report was prepared on the meteorological adjusted ozone trends whose highlights are discussed later in Section 5.1.18.

#### 5.1.16.3 Additional Emission Controls/Reductions

As part of the weight of evidence analysis, EPA recommends documenting any additional emission reductions that may be occurring that may not be included in the future year emission estimates. Such additional controls can include:

- Measures that are difficult to quantify or may not be enforceable in the SIP.
- Voluntary measures.
- Regional/super-regional and/or national programs that may not have been accounted for in the attainment demonstration.

Additional emission controls/reductions are discussed later in this Chapter.

### 5.1.17 Weight of Evidence Supplemental Analysis

Each of the components of EPA recommended supplemental analysis is discussed below as part of our weight of evidence analysis that supports the Section 0 modeled attainment demonstration.

#### 5.1.17.1 Additional Modeling Weight of Evidence Analysis

We conducted the following additional modeling analysis as part of the weight of evidence analysis.

- Examination of the sensitivity of the CAMx S10 configuration (i.e., EPA 2016 36/12-km WRF/NAM meteorological inputs) projected 2020 ozone DVf to:
  - Definition of "near the monitor" using a 7x7 and 1x1 array of cells around the monitor to define the RRFs in addition to the 3x3 array of cells recommended in EPA's guidance (EPA, 2018d).
  - Use of current year 2014-2018 ozone DVb eliminating observed ozone concentrations that have been flagged as being influenced by Exceptional Events. Note that ozone observations that have been official approved by EPA as being influenced by Exceptional Events have already been eliminated from the ozone DVb, such as September 2 and 4, 2017[68].
  - Using alternative RRFs that use the days with the 10 highest modeled MDA8 ozone concentrations days in which the predicted and observed MDA8 ozone concentrations meet a model performance evaluation (MPE) criteria of being with 10% and 15% of each other.
- Making 2020 ozone DVf projections using the alternative CAMx S9 configuration (i.e., DM/NFR NAA study 2016 36/12/4-km WRF/GFS meteorological inputs):
  - Following EPA recommended ozone DVf procedures (EPA, 2018d).
  - Alternative definitions of near the monitor (i.e., 7x7 and 1x1).
  - Using ozone DVb without observations flagged as being influenced by Exceptional Events.
  - Invoking the 10% and 15% MPE criteria.
- EPA suggested absolute ozone metrics showing level of ozone reductions between 2016 and 2020.

Also in this section we present the Unmonitored Area Analysis (UAA).

##### *5.1.17.1.1 Alternative 2020 Ozone Projection Procedures using CAMx S10 Configuration*

Table 42 displays the DVb and projected 2020 DVf ozone design values at sites within the Colorado 4-km domain using the CAMx S10 2016 and 2020 4-km modeling results that examine the sensitivity of the ozone DVF to using observed ozone data that have been flagged as exceptional events and alternative definitions to near the monitor. Ozone design values that are above the 2008 ozone NAAQS (i.e., ≥76.0 ppb) are colored red. As noted in Section 0, using the standard DVb and EPA default 3x3 definition of near the monitor, all monitoring sites are projected to have 2020 ozone DVf that are below the

[68] CDPHE. 2018. Exceptional Event Demonstration for Ozone on September 2 and 4, 2017. Colorado Department of Health and Environment, Air Pollution Control Division, Denver, CO. June 1.

2008 ozone NAAQS, with the highest value of 75.9 ppb at NREL. Using the 1x1 definition of near the monitor and standard DVb, the NREL ozone DVF is above the 2008 ozone NAAQS (76.8 ppb) but all other sites are below the 2008 ozone NAAQS. When the 7x7 definition of near the monitor is used, the NREL 2020 DVf (75.2 ppb), along with all other sites, are below the 2008 ozone NAAQS.

The use of the 2014-2018 base year ozone DVb in which the observed ozone on days flagged as exceptional events are excluded in calculating the ozone DVb results in a reduction in the ozone DVf at the four key monitoring sites in the DM/NFR NAA (CHAT, RFNO, NREL and FTCW) so that they are all below the 2008 ozone NAAQS. For example, at NREL the 3x3 2020 ozone DVf using standard DVb is 75.9 ppb and is reduced to 74.7 ppb when the flagged data are removed from the DVb. Removal of the flagged exceptional events for the 1x1 grid cell case drops the ozone DVF (75.6 ppb) to below the 2008 ozone standard at NREL.

**Table 42 - Projected 2020 ozone design values examining sensitivity of ozone projections to definition of near the monitor [69]**

| | | 2014-18 DVb | DVf (3x3) | DVf (1x1) | DVf (7x7) |
|---|---|---|---|---|---|
| **AIRS ID** | **Station** | **(ppb)** | **(ppb)** | **(ppb)** | **(ppb)** |
| DM/NFR NAA | | | | | |
| 80350004 | CHAT | 77.3 | 74.4 | 74.5 | 73.7 |
| | CHAT Flagged | 76.7 | 73.9 | 73.9 | 73.2 |
| 80590006 | RFNO | 77.3 | 72.7 | 72.8 | 72.9 |
| | RFNO Flagged | 76.7 | 72.2 | 72.2 | 72.4 |
| 80590011 | NREL | 79.3 | 75.9 | 76.8 | 75.2 |
| | NREL Flagged | 78.0 | 74.7 | 75.6 | 74.0 |
| 80690011 | FTCW | 75.7 | 72.0 | 72.0 | 71.6 |
| | FTCW Flagged | 73.7 | 70.2 | 70.2 | 69.8 |
| 80310002 | CAMP | 67.7 | 66.0 | 66.1 | 65.5 |
| 80310026 | CASA | 68.7 | 66.4 | 67.3 | 66.4 |
| 80013001 | WELB | 67.0 | 64.4 | 64.4 | 65.4 |
| 80050002 | HIGH | 73.0 | 70.6 | 71.0 | 70.2 |
| 80050006 | AURE | 67.7 | 65.3 | 65.4 | 65.0 |
| 80590005 | WELC | 73.0 | 69.7 | 70.1 | 69.6 |
| 80590013 | ASNP | 70.0 | 66.3 | 66.5 | 66.7 |
| 80690007 | RMNP | 69.0 | 65.7 | 66.3 | 65.2 |
| 80691004 | FTCO | 69.0 | 65.7 | 66.3 | 65.1 |
| 81230009 | WELD | 70.0 | 67.0 | 67.5 | 65.7 |
| Attainment Area | | | | | |
| 80410013 | ACAD | 68.0 | 65.8 | 66.6 | 65.0 |
| 80410016 | MANI | 66.7 | 63.5 | 64.4 | 63.0 |
| 80450012 | RIFL | 62.0 | 60.9 | 60.9 | 60.9 |
| 80519991 | GOTH | 64.7 | 63.6 | 63.6 | 63.7 |
| 80671004 | WEMI | 67.0 | 65.4 | 65.6 | 65.4 |
| 80677001 | DNGO | 68.7 | 66.3 | 66.4 | 66.6 |
| 80677003 | ANRV | 68.3 | 66.4 | 66.5 | 65.6 |
| 80770020 | PALI | 64.0 | 62.6 | 62.5 | 62.7 |
| 80830006 | CORT | 61.5 | 59.7 | 60.1 | 59.6 |
| 80830101 | MEVE | 66.3 | 64.1 | 64.3 | 63.7 |
| 81030005 | MEEK | 60.3 | 59.4 | 59.5 | 59.4 |

[69] 2014-2018 base year ozone design value (DVb) and CAMx S10 projected future-year 2020 ozone design values (DVf) examining sensitivity of ozone DVf projections to use of data flagged as Exceptional Events and definition of near the monitor.

Table 43 displays the sensitivity of the CAMx S10 projected 2020 ozone DVf to imposing that the days used in the RRFs achieve a MPE criteria that the observed and predicted 2016 MDA8 ozone concentrations be within 10% and 15% of each other. Using the 10% MPE all sites are below the 2008 ozone NAAQS with the NREL projected DVf being the same as when no MPE criteria is required (i.e., 75.9 ppb). Using the 15% MPE criteria increases the projected 2020 ozone DVf at NREL by 0.1 ppb to 76.0 ppb so that it no longer attains the 2008 ozone NAAQS.

**Table 43 - Projected 2020 ozone design values examining sensitivity of ozone projections to use of 10% and 15% MPE criteria**[70]

| | | 2014-18 DVb | DVf 10% MPE | DVf 15% MPE |
|---|---|---|---|---|
| **AIRS ID** | **Station** | **(ppb)** | **(ppb)** | **(ppb)** |
| 80350004 | CHAT | 77.3 | 74.5 | 74.4 |
| | CHAT Flagged | 76.7 | 73.9 | 73.9 |
| 80590006 | RFNO | 77.3 | 73.2 | 73.2 |
| | RFNO Flagged | 76.7 | 72.7 | 72.7 |
| 80590011 | NREL | 79.3 | 75.9 | 76.0 |
| | NREL Flagged | 78.0 | 74.7 | 74.8 |
| 80690011 | FTCW | 75.7 | 72.1 | 72.1 |
| | FTCW Flagged | 73.7 | 70.3 | 70.2 |

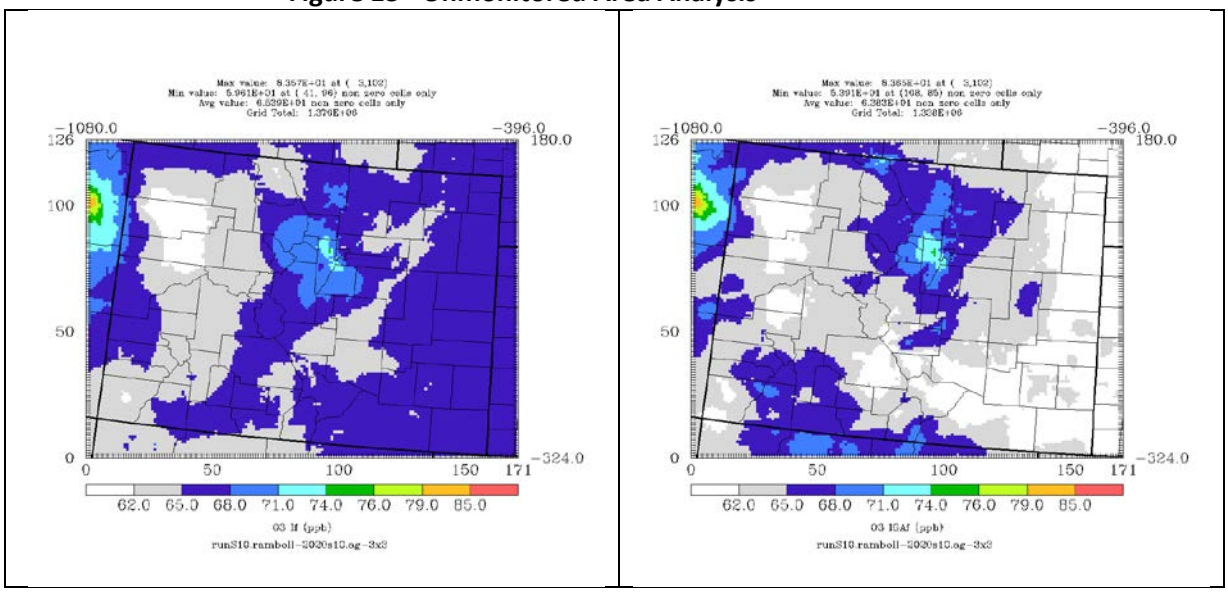
#### *5.1.17.1.2* Unmonitored Attainment Analysis

The SMAT ozone projection tool includes an UAA that interpolated the base year ozone DVb to each grid cell in the modeling domain and then projects it to the future year using a similar procedure as used for the monitoring site, only the RRFs are based on the modeled base and future year at the monitoring site rather than near the monitor (i.e., a 1x1 array of grid cells). The interpolation procedure used in the SMAT UAA allows, as an option, the use of modeled base year concentration gradients in the interpolation procedures. Note that because the interpolation of the observed ozone DVb across the modeling domain introduces additional uncertainties, the UAA is not considered as reliable as the monitor based attainment test so is typically not used as a primary source in the modeled attainment test. However, it may identify ozone hot spots that warrant additional investigations. For example, it was in a DM/NFR nonattainment area ozone SIP over a decade ago that identified higher ozone concentrations west of the Fort Collins monitoring site that led to the placement of a new Fort Collins West monitoring site that became one of the four key monitoring sites in the DM/NFR nonattainment area.

[70] 2014-2018 base year ozone design value (DVb) and CAMx S10 projected future-year 2020 ozone design values (DVf) examining sensitivity of ozone DVf projections to use of data flagged as Exceptional Events in the DVb and using the 10% and 15% MPE criteria (using 3x3 near the monitor).

Figure 13 displays the spatial distribution of the projected 2020 ozone DVf across the 4-km Colorado monitoring domain using the CAMx S10 2016 and 2020 modeling results with (right) and without (left) using the modeled concentration gradients in the ozone DVb interpolation procedure. 2020 projected ozone DVf in excess of 80 ppb are estimated in the furthest western portion of the Colorado 4-km modeling domain that are due to high ozone DVb in the Unitah Basin in Utah. These high ozone DVb are winter high ozone concentrations that are due to cold pooling and not related to elevated ozone concentrations within the DM/NFR nonattainment area. The highest ozone DVf within the DM/NFR NAA in the UAA is 75.5 and 75.1 with and without using the modeled concentration gradients in the ozone DVf interpolation procedure, respectively. Thus, the UAA analysis using the CAMx S10 modeling results estimate that 2020 ozone DVf will be below the 2008 ozone NAAQS throughout the DN/NFR nonattainment area.

**Figure 13 - Unmonitored Area Analysis**[71]




### *5.1.17.1.3* Alternative 2020 Projection Procedures using the Alternative CAMx S9 CAMx Configuration

The same suite of 2020 ozone DVf projections as used for the CAMx S10 configuration discussed above were made using CAMx 2016 and 2020 4-km modeling results with the S9 configuration (i.e., meteorological inputs based on the WRF/GFS 2016 36/12/4-km simulation). As shown in Table 44, the CAMx S9 configuration ozone estimates are less responsive to changes in emissions between 2016 and 2020 so estimate higher projected 2020 ozone DVf than the CAMx S10 configuration. Using the EPA-recommended default 3x3 projection approach, all monitoring sites have 2020 ozone DVf below the 2008 ozone NAAQS except NREL that has an ozone DVf of 76.8 ppb. The CAMx S9 projected 2020 ozone DVf at NREL is estimated to be above the 2008 NAAQS no matter which near the monitor definition is used or whether the 10% or 15% MPE criteria is used, while the 2020 ozone DVf at all other monitoring sites remain below the 2008 ozone NAAQS.

[71] Unmonitored Area Analysis (UAA) using the CAMx S10 2016 and 2020 modeling results with (right) and without (left) using the concentration gradients in the interpolation of the ozone DVb to the grid cells in the Colorado 4-km modeling domain.

However, when accounting for potential exceptional events by removing the flagged observations from the base year ozone DVb, the CAMx S9 projected 2020 ozone DVf at NREL (75.6 ppb), as well as all other monitoring sites, is below the 2008 ozone NAAQS using EPA recommended 3x3 near the monitor definition.

**Table 44 - CAMx S9 configuration projected 2020 ozone design values examining sensitivity of ozone projections**[72]

| | 2014-2018 DVb | DVf 3x3 | DVf 1x1 | DVf 7x7 | DVf 10% MPE | DVf 10% MPE |
|---|---|---|---|---|---|---|
| **Station** | **(ppb)** | **(ppb)** | **(ppb)** | **(ppb)** | **(ppb)** | **(ppb)** |
| CHAT | 77.3 | 74.8 | 74.6 | 74.8 | 74.8 | 74.8 |
| CHAT Flagged | 76.7 | 74.2 | 74.0 | 74.3 | 74.3 | 74.3 |
| RFNO | 77.3 | 73.1 | 73.9 | 73.5 | 74.1 | 73.5 |
| RFNO Flagged | 76.7 | 72.5 | 73.4 | 72.9 | 73.6 | 73.0 |
| NREL | 79.3 | 76.8 | 76.8 | 76.0 | 77.5 | 76.6 |
| NREL Flagged | 78.0 | 75.6 | 75.6 | 74.8 | 76.3 | 75.4 |
| FTCW | 75.7 | 71.6 | 72.0 | 71.5 | 71.6 | 71.9 |
| FTCW Flagged | 73.7 | 69.8 | 70.1 | 69.6 | 69.8 | 70.1 |

#### 5.1.17.2 *Additional Modeled Ozone Metrics*

Section 5.1.16.1 discusses several absolute modeling ozone metrics that EPA's guidance (EPA, 2018d) suggests should be examined for the base and future to demonstrate that ozone concentrations above the NAAQS are being reduced in the NAA. Table 45 displays these ozone metrics for the CAMx S10 2016 and 2020 simulation. The metrics were calculated across the 9-county area that covers the DM/NFR nonattainment area (including northern portions of Larimer and Weld Counties) using a 76 ppb ozone threshold. The change in ozone metrics between the 2016 base and 2020 future year are remarkably consistent showing large reductions (71% to 77%) in ozone concentrations and days above the 2008 ozone NAAQS. The absolute peak modeled MDA8 ozone concentration in the DM/NFR nonattainment area is reduced by almost 5 ppb between the base and future year.

**Table 45 - EPA recommended absolute model ozone metrics**[73]

| CAMx S10 2016 4-km Modeling Results | 76 ppb Threshold | | |
|---|---|---|---|
| **Ozone Metric** | **2016** | **2020** | **Reduction** |
| Episode integrated ozone >= threshold (ppb) | 19,327.4 | 4,415.9 | -77% |
| Number of cells >= threshold in episode | 221 | 57 | -74% |
| Number of Grid cell days >= threshold | 246 | 57 | -77% |
| Maximum MDA8 ozone in episode (ppb) | 84.19 | 79.53 | -4.66 |
| Number of days ≥ threshold | 7 | 2 | -71% |

[72] 2014-2018 base year ozone design value (DVb) and CAMx S9 configuration projected future-year 2020 ozone design values (DVf) examining sensitivity of ozone DVf projections to use of data flagged as Exceptional Events, definition of near the monitor and using the 10% and 15% MPE criteria (using 3x3 near the monitor).

[73] EPA recommended absolute model ozone metrics showing reduction in ozone concentrations greater than or equal to 76 ppb across the DM/NFR Nonattainment Area using the CAMx S10 2016 base case and 2020 future year modeling results.

### 5.1.18 Observed Ozone Trends

Ozone trends were calculated with and without accounting for meteorology and with and without using observed ozone data flagged as exceptional events using the same procedures as used in previous DM/NFR nonattainment area ozone SIPs as discussed in the accompanying technical support document[74], only using observed ozone data updated through 2019[75]. The straight ozone and meteorologically-adjusted ozone trends were made for the 4th highest MDA8 ozone concentrations at the four key monitoring sites in the DM/NFR nonattainment area. Regression equations were fitted to the observed 4th high MDA8 ozone data from 2006-2019 and extrapolated out to 2023. This includes values for 2020 that can be used to compare against the projected 2020 ozone DVf from Section 0 and the weight of evidence supplemental analysis discussed above. Below we summarize the results of the ozone trends analysis with more details provided in Ramboll (2020b).

#### 5.1.18.1 Fort Collins West

Figure 14 displays the straight ozone trends that included the observed ozone concentrations flagged as exceptional events, the meteorologically adjusted ozone trends with the flagged data and the meteorologically adjusted trends ozone trends excluding the flagged data. All three ozone trend approaches regression lines indicate that the 4th highest MDA8 ozone at the FTCW monitor will be below the 2008 ozone NAAQS in 2020 with projected ozone values of 73.7, 72.4 and 70.1 ppb for the three approaches.

#### 5.1.18.2 Rocky Flats North

The three approaches for doing ozone trends at the RFNO monitoring site are shown in Figure 15. The trends regression equations for all three approaches indicate the 4th high MDA8 ozone at RFNO will be below the 2008 ozone NAAQS by 2020. The regression equation using the straight ozone trends using flagged data estimates a 2020 value of 74.1 ppb that is reduced to 72.2 ppb when meteorology is accounted for. The regression equation for the meteorological-adjusted ozone trend without flagged data estimates a 72.0 ppb 4th highest MDA8 ozone at RFNO in 2020.

#### 5.1.18.3 Chatfield

In more recent years, there is a flat to increasing trend in the 4th high MDA8 ozone at the CHAT monitoring site when examining ozone trends with flagged data and not adjusting for meteorological conditions (Figure 16, top left). The regression equation estimates a 2020 4th highest MDA8 ozone value of 78.0 ppb using flagged data and not accounting for meteorology that is above the 2008 ozone NAAQS. This is due in part to the meteorological conditions in 2018 being very conducive to ozone formation resulting in high observed ozone at CHAT. When looking at ozone trends with flagged data but accounting for meteorology the regression equation estimates a 2020 4th high ozone value of 75.8 ppb at CHAT, which is below the 2008 ozone NAAQS (Figure 16, top right). When excluding flagged data and adjusting for weather the ozone trend regression equations estimates a 2020 4th high MDA8 ozone at Chat of 74.1 ppb that is below the 2008 ozone NAAQS.

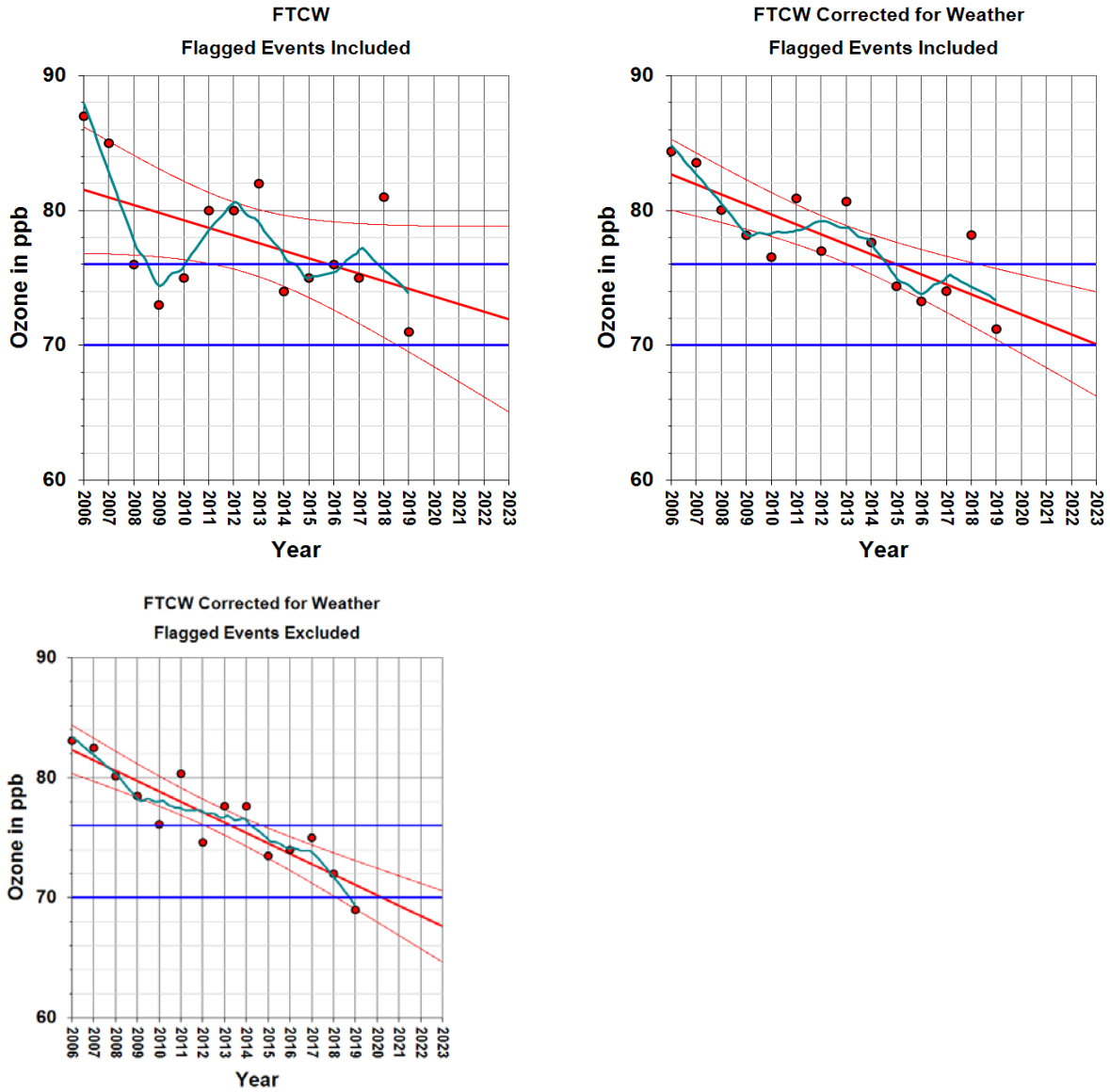
[74] CDPHE and RAQC. 2016c. Trends in Weather Corrected Ozone and Nitrogen Dioxide – Supporting the Denver Metro/North Front Range State Implementation Plan for the 2008 8-Hour Ozone National Ambient Air Quality Standard. Colorado Department of Health and Environment, Air Pollutions Control Division and Regional Air Quality Council. November 17, 2016.

[75] Latest monitoring data can be found on the Colorado CDPHE Air Quality Reports webpage at: https://www.colorado.gov/airquality/report.aspx.

### 5.1.18.4 NREL

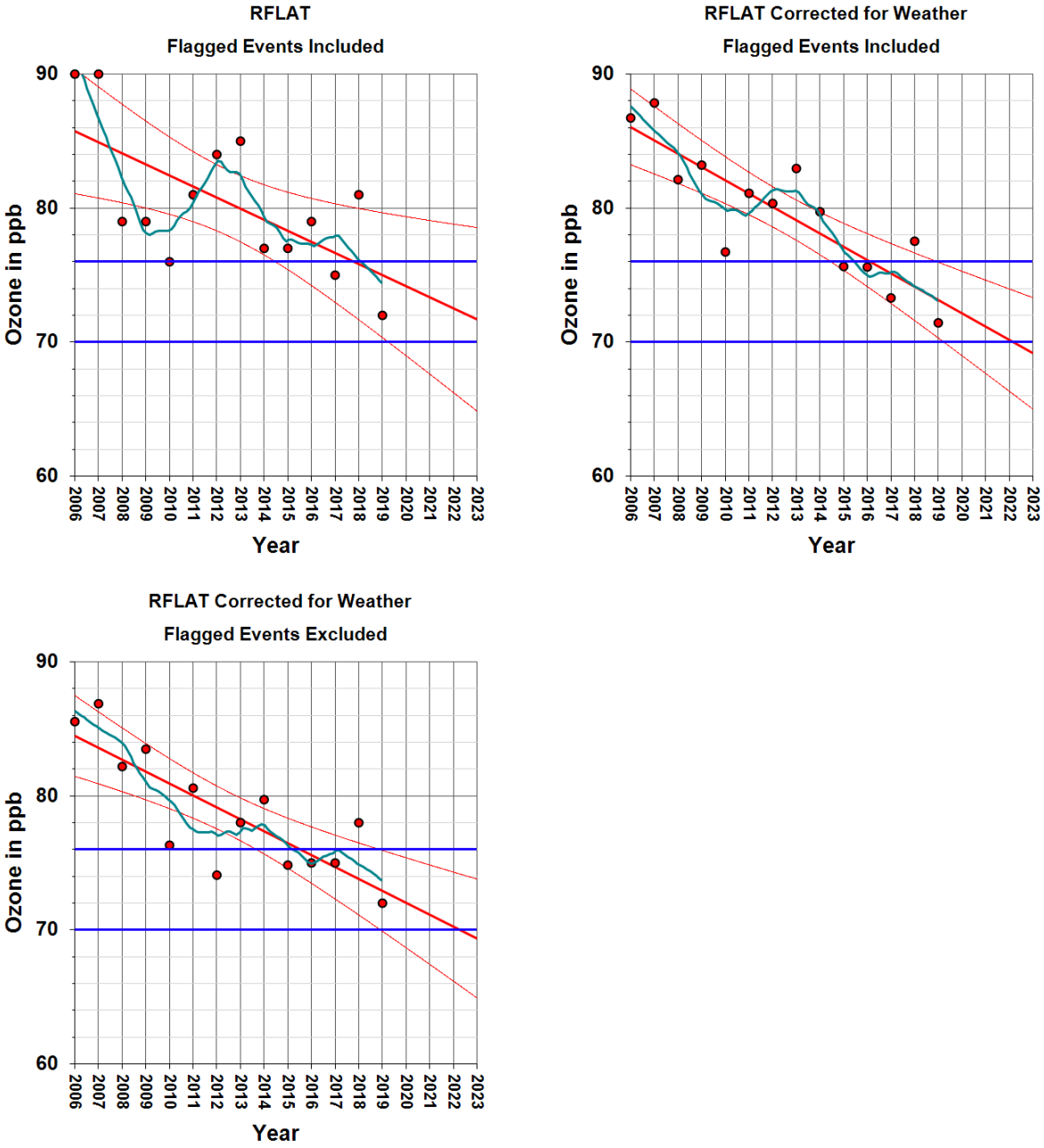
The ozone trend results for the NREL monitoring site are shown in Figure 17, which also includes a fourth ozone trend approach that excludes flagged data and accounts for meteorology but only considers years from 2010 on after the 2009 recession. When using flagged data, the ozone trend regression equation estimates the 4th high MDA8 ozone at NREL will be above the 2008 ozone NAAQS whether adjusting for meteorology (76.1 ppb) or not (78.4 ppb). However, when excluding flagged data and adjusting for weather, the trend regression equation estimates a 2020 4th high ozone value at NREL (74.0 ppb) that is below the 2008 ozone NAAQS. And just looking at trends from 2010 on without flagged data and adjusting for meteorology results in an even lower 4th high ozone value at NREL.

**Figure 14 - Ozone trends at the Fort Collins West (FTCW) monitoring site**[76]



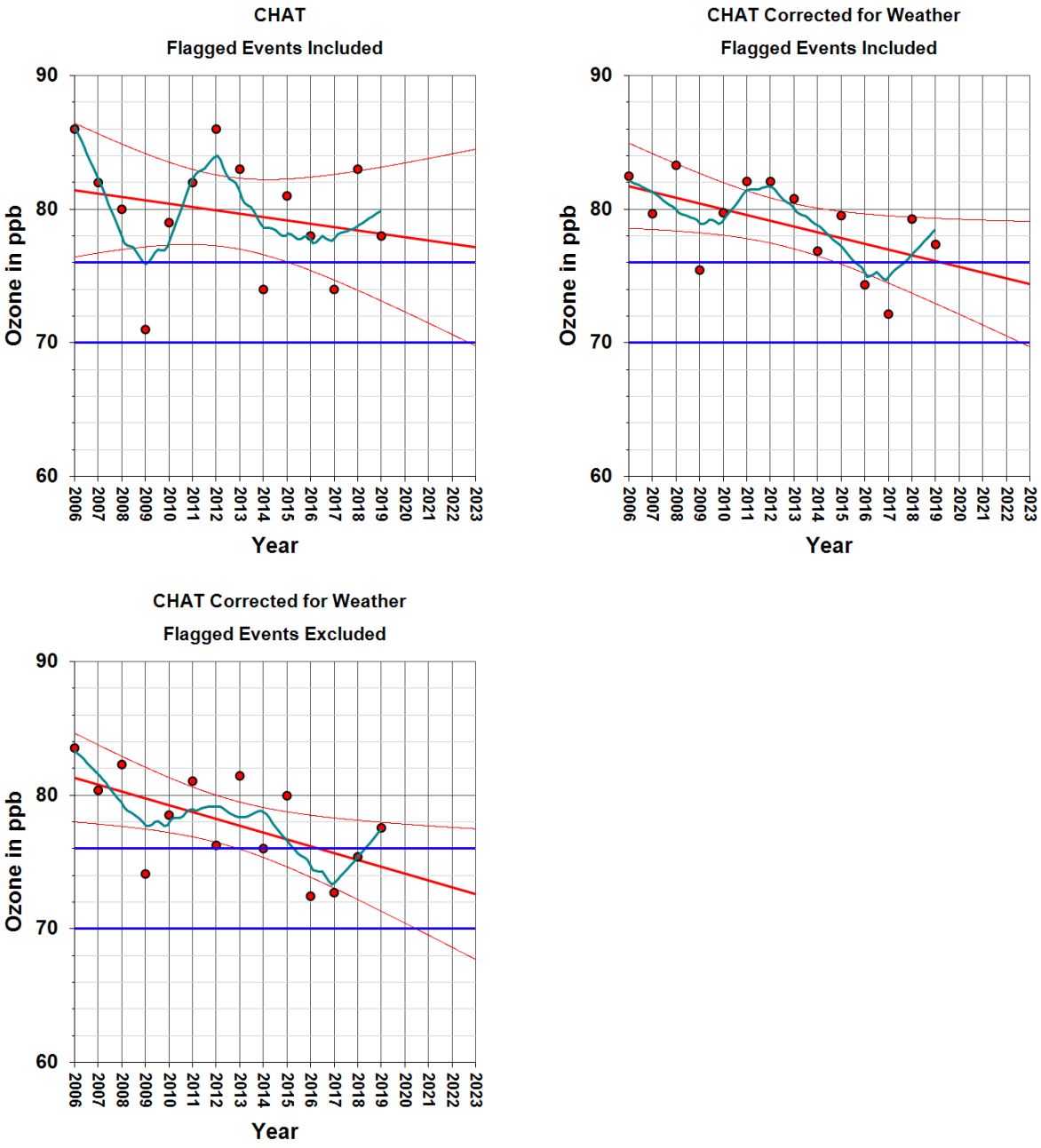

[76] Ozone trends at the Fort Collins West (FTCW) monitoring site using flagged data (top left), using flagged data and adjusting for meteorology (top right) and excluding flagged data and adjusting for meteorology (bottom).

**Figure 15 - Ozone trends at the Rocky Flats North (RFNO) monitoring site**[77]



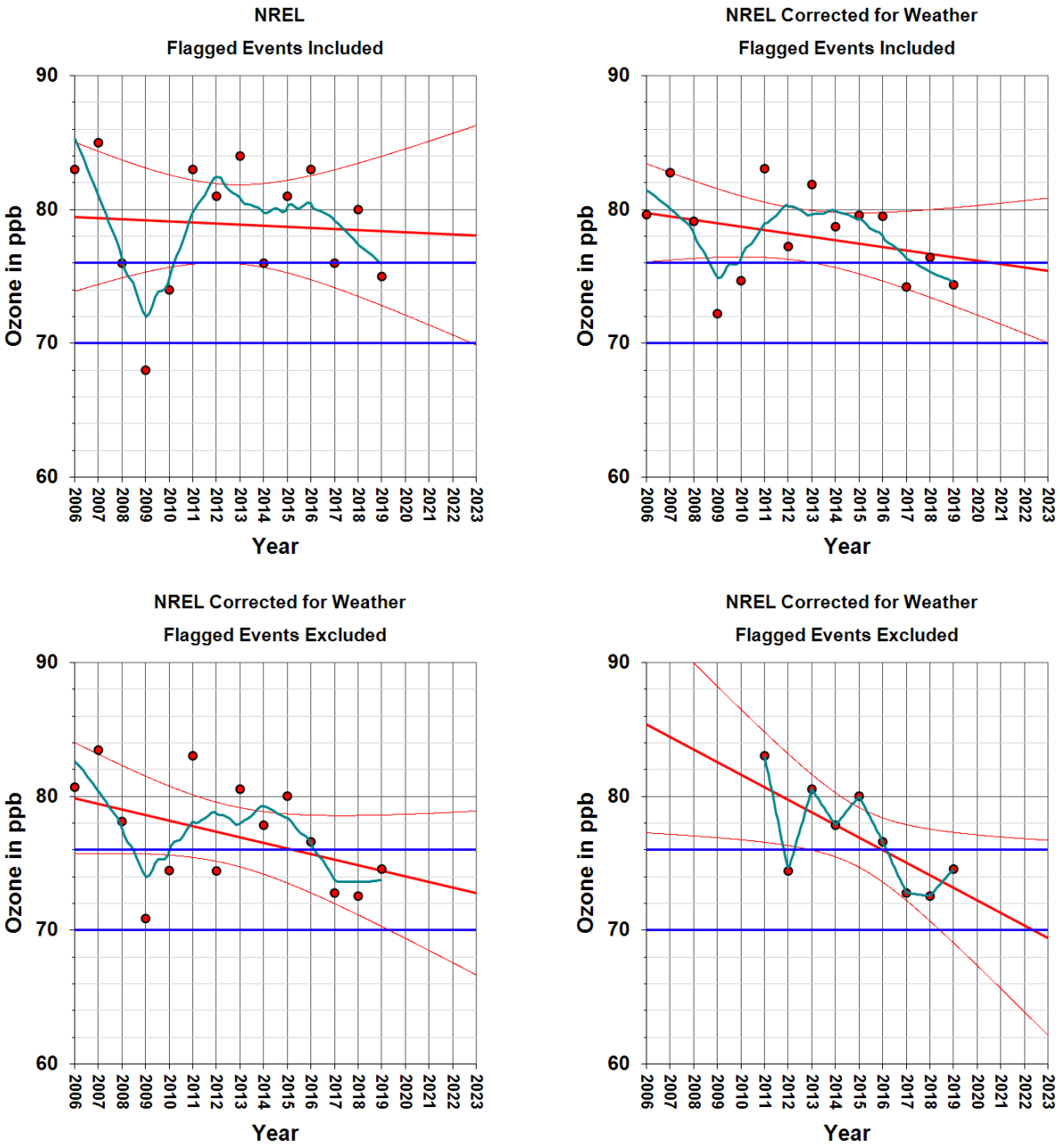

[77] Ozone trends at the Rocky Flats North (RFNO) monitoring site using flagged data (top left), using flagged data and adjusting for meteorology (top right) and excluding flagged data and adjusting for meteorology (bottom).

**Figure 16 - Ozone trends at the Chatfield (CHAT) monitoring site**[78]




[78] Ozone trends at the Chatfield (CHAT) monitoring site using flagged data (top left), using flagged data and adjusting for meteorology (top right) and excluding flagged data and adjusting for meteorology (bottom).

**Figure 17 - Ozone trends at the NREL monitoring site**[79]




[79] Ozone trends at the NREL monitoring site using flagged data (top left), using flagged data and adjusting for meteorology (top right), excluding flagged data and adjusting for meteorology (bottom left) and excluding flagged data, adjusting for meteorology and only considering years after the 2009 recession (bottom right).

### 5.1.19 Ozone Trends Discussion

The ozone trend analysis is very sensitive to the inclusion or exclusion of flagged data as well as meteorology. Thus, the occurrence of wildfires whose emissions contribute to elevated ozone concentrations in the DM/NFR nonattainment area (e.g., the September 2 and 4 exceptional event days in 2017) or meteorological conditions that are conducive to ozone formation (e.g., 2018) can greatly influence ozone in the DM/NFR nonattainment area. The year-to-year changes in wildfire contributions and meteorologically conducive ozone formation conditions can overwhelm the effects of typical year-to-year reductions in anthropogenic emissions on ozone concentrations in the DM/NFR nonattainment area. However, as seen in Figure 16, when there are larger reductions in emissions combined with meteorological conditions not as conducive to ozone formation and limited wildfire contributions, as in 2009, there can be much lower ozone concentrations across the DM/NFR nonattainment area.

### 5.1.20 Additional Emission Controls/Reductions

Emission reductions through 2020 and beyond are the result of numerous federal, State, and local emission control programs implemented between 2011 and 2020. These and other long–standing measures are described in detail in Chapter 7. State–only and voluntary local measures do not receive emission reduction credits in the 2020 emission inventories because they are not included as enforceable measures in the SIP. These measures are difficult to represent in the modeling analysis and in most cases the effects of the measures are difficult to quantify. Nonetheless, these measures will still provide real–world emission reductions. As a result, taking into account these state–only and local measures will reduce ozone–precursor emissions further and future ozone concentrations could likely be lower than modeled.

Beyond the enforceable control measures included in the SIP modeling and emissions inventory, additional emission reduction measures are being implemented in the DM/NFR nonattainment area. These measures are often difficult to quantify and/or are voluntary measures and are therefore not included as enforceable SIP measures. They do, however, result in real world emissions reductions and aiding in compliance with the 2008 NAAQS. Table 46 below is an overview of emission reduction measures that are being implemented in the DM/NFR nonattainment area, but are not included in the SIP as federally enforceable measures. The scope of each reduction measure is discussed in more detail in Chapter 7 of the SIP as part of the Reasonably Available Control Measures (RACM) Analysis.

**Table 46 – Non–SIP Measures**

| Emission Reduction Measures Not Federally Enforceable |
|---|
| **Stationary Sources** |
| Energy Efficiency and Renewable Energy Policies and Programs |
| State–Only Oil and Gas Controls – AQCC Regulation Number 7 |
| Small Business Assistance Program |
| **Mobile Sources** |
| Diesel Retrofits and Fleet Fuel Use Reduction (Clean Air Fleets) |
| Charge Ahead Colorado Electric Vehicle Program |
| Expand Use of Alternative Fuels in Government and Private Fleets (ALT Fuels Colorado) |
| Electric Vehicle Group Purchase Programs |
| Innovative Motor Vehicle and Alternative Fuel Vehicle Tax Credits |
| Diesel Inspection and Maintenance Programs – AQCC Regulation Number 12 |
| High Altitude Emissions Laboratory |
| Colorado Low Emission Automobile Regulation – AQCC Regulation Number 20 |
| Electric Car Shares, Electric Scooter, and Electric Bike Infrastructure |
| **Lawn and Garden** |
| Mow Down Pollution Lawn Mower Exchange |
| Commercial Lawn and Garden Program |
| Zero Emission Lawn and Garden Equipment – Commercial Sector |
| **Education and Outreach** |
| Ozone Education and Outreach Program |
| Ozone Forecast Advisory – Voluntary Emission Reduction Action Days |
| **Transportation Systems** |
| Transit and Transportation Network |
| Transportation Demand Management Programs |
| Bicycle and Pedestrian Facilities |
| Land Use Planning and Development |
| CAA 108(f) Transportation Measures |

In addition, while the modeling analysis takes into account known regional and national programs that will reduce ozone–precursor emissions in neighboring states, the analysis does not take into state and/or local measures which are not known or readily quantified. There are likely additional emission control programs in neighboring states that will reduce ozone–precursor emissions and could have a beneficial effect in Colorado.

## SUMMARY AND CONCLUSIONS

While there is a degree of uncertainty inherent in any modeling analysis due to a number of uncontrollable factors, this SIP's modeling and weight of evidence analyses make a strong case that the control measures contained in this plan will likely result in attainment of the 2008 8–hour NAAQS in 2020. This determination is based on the body of evidence presented in this chapter, consisting of the following:

- As recommended in EPA's ozone SIP modeling guidance, several absolute CAMx modeling metrics were used to examine the changes in CAMx modeled absolute ozone between the 2016 and 2020 years for ozone concentrations above the 2008 ozone NAAQS. Large (70-80 percent) reductions

were found in the integrated ozone, number of grid cells, number of grid cells-days and number of days that the CAMx absolute ozone was reduced to below 76.0 ppb across the DM/NFR NAA.

- The removal of observed ozone data that have been flagged as being influenced by exceptional events (e.g., wildfires and stratospheric ozone) from the observed base year (i.e., 2014-2018) design value reduced the projected 2020 ozone DVf at the four key monitoring sites so that they were all below the 2008 ozone NAAQS using all three definitions of near the monitor.

- The use of the within 10% model performance evaluation (MPE) criteria that requires CAMx 2016 base case Maximum Daily Average 8-hour (MDA8) ozone estimates used in the projections to be within 10% of the observed MDA8 ozone concentration still resulted in projected 2020 DVf at all sites to be below the 2008 ozone NAAQS.

- An Unmonitored Area Analysis was conducted that interpolated the 2014-2018 base year DVb to each 4-km grid cell in the 4-km grid resolution Colorado domain and then make 2020 ozone DVf projections in each 4-km grid cell using the CAMx S10 2016 and 2020 modeling results. The UAA projected 2020 DVf in each grid cell of the DM/NFR NAA were below the 2008 ozone NAAQS.

- Observed ozone trends were examined from 2006 to 2019 at the four key monitoring sites in the DM/NFR NAA. The trends were calculated with and without accounting for meteorological adjustments and with and without including observed ozone data that were flagged as being influenced by exceptional events. Regression equations were fitted to the observed ozone trends that indicated that when adjusting for meteorology and excluding flagged data the 4$^{th}$ high MDA8 ozone is expected to be below the 2008 ozone NAAQS in 2020.

- An analysis of emission trends indicates there has been a significant reduction in ozone–precursor emissions from 2017 to 2020, resulting in a projected 17% reduction in local VOC emissions and a 13% reduction in local $NO_X$ emissions.

- There are numerous additional voluntary emission control measures being implemented in the DM/NFR NAA that were not included in the 2020 emissions because they are not federally enforceable. However, these voluntary measures will result in additional emission reductions that would lower 2020 ozone concentrations than those calculated in the 2020 attainment demonstration modeling.

### 5.1.21 References

For full chapter references, see *Ramboll. 2020 Attainment Demonstration Modeling for the Denver Metro/North Front Range Serious Ozone State Implementation Plan. Ramboll US Corporation, Novato CA and Alpine Geophysics, Arvada, CO. July 2020.*

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# CHAPTER 6
# REASONABLY AVAILABLE CONTROL TECHNOLOGY (RACT) ANALYSIS

6 ONE
Chapter 6 –Reasonably Available Control Technology (RACT) Analysis

## 6.1 OVERVIEW

On December 26, 2019, EPA published a final rule finding that the Denver Metro/North Front Range (DMNFR) Marginal ozone nonattainment area failed to attain the 2008 ozone National Ambient Air Quality Standard (NAAQS) by the applicable attainment deadline of July 20, 2018. Therefore, EPA reclassified the DMNFR area to Serious, effective January 27, 2020, requiring attainment of the 2008 ozone NAAQS no later than July 20, 2021, as demonstrated by data from the 2018-2020 ozone seasons.[80] Due to the reclassification, Colorado must submit a revised State Implementation Plan (SIP) that addresses the Clean Air Act's (CAA) serious nonattainment area requirements, as described in CAA Section 182(c) and the final SIP Requirements Rule for the 2008 ozone NAAQS. These requirements include Reasonably Available Control Technology (RACT) and Reasonably Available Control Measures (RACM) analyses. This chapter, however, only addressed RACT. RACM is discussed in Chapter 7.

EPA defines RACT as the lowest emissions limitation that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility. [81] Because a RACT analysis takes into account the technological and economic impacts of controls, the analysis and determination may differ from source to source and location to location.

Under EPA's August 2019 final action reclassifying several nonattainment areas to Serious[82] and EPA's December 2019 final action to reclassify the DMNFR to Serious,[83] Colorado must implement RACT as expeditiously as practicable. For RACT tied to attainment (i.e., measures for which credit is taken in the 2020 attainment demonstration), RACT must be implemented by August 3, 2020.[84] For RACT not tied to attainment, RACT must be implemented no later than July 20, 2021. RACT is required for categories of volatile organic compound (VOC) emission sources covered by an EPA Control Technique Guideline (CTG) and other major stationary sources of VOCs or nitrogen oxides (NOx) located in the DMNFR. Major stationary source of VOCs and NOx in Serious nonattainment areas are those with the potential to emit 50 tons per year (tpy) or more.

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[80] Implementation of the 2008 National Ambient Air Quality Standards for Ozone: State Implementation Plan Requirements; 80 Fed. Reg 12264 (March 6, 2015) (Final Implementation Rule).

[81] Final Implementation Rule at 12278, n.32.

[82] Determination of Attainment Date, Extensions of the Attainment Date, and Reclassification of Several Areas Classified as Moderate for the 2008 Ozone National Ambient Air Quality Standards, 84 Fed. Reg. 44238 at 44247 (Aug. 23, 2019).

[83] Finding of Failure To Attain and Reclassification of Denver Area for the 2008 Ozone National Ambient Air Quality Standard, 84 Fed. Reg. 70897 at 70900 (Dec. 26, 2019).

[84] Colorado notes that in contrast with EPA's statement in the reclassification to Serious, the State believes that to the extent proposed control measures do not expedite attainment (and cannot be implemented before the ozone season of the attainment year), those measures are not RACT for purposes of Section 182. EPA has advised that it considers Section 182(b)(2) RACT (applicable to Serious areas pursuant to Section 182(c)) distinguishable from RACT required under Section 172(c)(1), 42 U.S.C. §7502(c)(1). EPA has allowed that control measures that do not expedite attainment by the attainment date are not considered Section 172 RACT. NRDC v. EPA, 571 F.3d 1245 (D.C. Cir. 2009). EPA has articulated that measures can be Section 182 RACT even if they don't expedite attainment, and even if they cannot be implemented by the deadlines specified in federal regulations (see 40 C.F.R. §§51.1108(d) and 51.1112(a)(3)), if they are technologically and economically feasible. It is Colorado's position that the Section 182 RACT requirement must be interpreted consistently with Section 172 because Section 182(b)(2) requires that the state submit a SIP "to include provisions to require the implementation of [RACT] under section 7502(c)(1) of this title…." EPA cannot ignore the plain language of Section 182(b)(2), which directly references Section 172(c)(1), in applying the RACT requirement. Colorado's position here further supports a single deadline for submittal of all Serious SIP elements, which Colorado proposes to be aligned with the Moderate area SIP elements due under the 2015 NAAQS. Notwithstanding the foregoing, Colorado has prepared this analysis of measures not tied to attainment, consistent with EPA's direction.

In 2016, as part of its Moderate ozone SIP for the 2008 NAAQS, Colorado evaluated potential emission control options for source categories subject to a final CTG[85] and major sources of VOC or NOx in Colorado's DMNFR. Colorado reviewed the CTGs and compared them to Colorado's point source inventory and existing rules. Colorado also reviewed EPA's Alternative Control Techniques (ACT), EPA's Reasonable Available Control Technology, Best Available Control Technology, Lowest Achievable Emission Rate Clearinghouse (RBLC), EPA's Menu of Control Measures (4/2/2010), federal New Source Performance Standards (NSPS), federal National Emission Standards for Hazardous Air Pollutants (NESHAP), and regulations applicable in other states' ozone nonattainment areas for potential emission control measures. Colorado similarly evaluated Colorado's major VOC or NOx sources in the DMNFR against the CTGs, ACT, RBLC, Menu of Control Measures, NSPS, federal Emission Guidelines (EG), and NESHAP for potential additional control measures. Colorado submitted this analysis to EPA on May 24-31, 2017, and submitted additional analyses on May 14, 2018, and May 8, 2019. This chapter updates those analyses.

## 6.2 CTG VOC SOURCE CATEGORIES ANALYSIS

In 2016, Colorado reviewed the CTGs and compared them to Colorado's existing rules and Colorado's point source inventory to determine whether all CTG VOC emission source categories were subject to requirements that meet or exceed the applicable RACT requirements, or whether further emission controls or requirements were economically and technologically feasible, thus reasonably available. Colorado identified the following categories: (a) the VOC source categories for which Colorado does not have subject sources, supported by Appendix 6-A; (b) the VOC source categories for which Colorado has subject sources and general and source specific RACT requirements, supported by Appendix 6-B; and (c) the VOC source categories for which Colorado has subject sources and has general but not source specific RACT requirements, supported by Appendices 6-C. Colorado also reviewed the ACTs, RBLC, EPA's Menu of Control Measures, and regulations applicable to states with the same or more stringent ozone nonattainment areas[86] for other potentially economically and technologically feasible control technologies.

EPA has issued forty-four CTGs that recommend a particular level of control as being RACT. Review of these CTGs identified that for some CTG VOC source categories, Colorado has no sources, in which case a negative declaration satisfies Colorado's RACT obligations. For some CTG VOC source categories, Colorado has sources and has adequate general and source specific RACT requirements in Colorado Regulation Number 7. For some CTG VOC source categories, Colorado has sources and has general but not source specific RACT regulatory requirements. See Sections 6.2.1-6.2.3 below for details.

EPA finalized the Control Techniques Guidelines for the Oil and Natural Gas Industry (Oil and Gas CTG) on October 27, 2016, with a state SIP submittal deadline of October 27, 2018. Given this timing, the November 2016, SIP revisions did not include an evaluation of RACT for the oil and natural gas source category specifically in conjunction with the Oil and Gas CTG. Colorado has since adopted provisions based on the recommendations in the Oil and Gas CTG, which were submitted to EPA on May 14, 2018.[87]

[86] California Air Districts: South Coast, San Francisco Bay Area, San Joaquin Valley, Sacramento, and Ventura; Texas ozone nonattainment areas: Dallas-Fort Worth, Northeast Texas, Beaumont-Port Arthur, Houston-Galveston-Brazoria, Victoria, Corpus Christi, Austin-Round Rock, San Antonio, and El Paso; and Arizona Maricopa County. Note; some of these are serious or extreme ozone nonattainment areas.

[87] See Colorado's Moderate Ozone SIP TSD for the oil and gas industry (2017).

EPA has also issued twenty ACTs for sixteen categories of VOC emission sources, which do not recommend a particular emission level or control as being RACT, and ten ACTs for nine categories of NOx emission sources. ACTs describe alternative controls a state may consider when developing RACT. The existence of an ACT for a source category does not trigger a requirement for states to develop or submit a RACT analysis.

### 6.2.1 Negative Declaration

Colorado has reevaluated the following CTGs and, as in 2016, determined that Colorado does not have sources in the following CTG VOC source categories or subject to the potentially applicable CTG, which are further summarized in Appendix 6-A – CTGs – No Subject Colorado Sources:

- Control of Volatile Organic Emissions from Existing Stationary Sources – Volume II: Surface Coating of Paper, Fabrics, Automobiles, and Light-Duty Trucks (EPA 1977) and Control Techniques Guidelines for Paper and Foil Coatings (EPA 2007) and Control Techniques Guidelines for Automobile and Light-Duty Truck Assembly Coatings (EPA 2008)
- Control of Volatile Organic Emissions from Existing Stationary Sources – Volume IV: Surface Coating of Insulation of Magnet Wire (EPA 1977)
- Control of Volatile Organic Emissions from Existing Stationary Sources – Volume V: Surface Coating of Large Appliances (EPA 1977) and Control Techniques Guidelines for Large Appliance Coatings (EPA 2007)
- Control of Volatile Organic Emissions from Existing Stationary Sources – Volume VII: Factory Surface Coating of Flat Wood Paneling (EPA 1978) and Control Techniques Guidelines for Flat Wood Paneling Coatings (EPA 2006)
- Control of Volatile Organic Emissions from Manufacture of Pneumatic Rubber Tires (EPA 1978)
- Control of Volatile Organic Emissions from Existing Stationary Sources – Volume VIII: Graphic Arts-Rotogravure and Flexography (EPA 1978)
- Control of Volatile Organic Compound Emissions from Large Petroleum Dry Cleaners (EPA 1982)
- Control of Volatile Organic Compound Emissions from Manufacture of High-Density Polyethylene, Polypropylene, and Polystyrene Resins (EPA 1983)
- Control of Volatile Organic Compound Leaks from Synthetic Organic Chemical Polymer and Resin Manufacturing Equipment (EPA 1984)
- Control of Volatile Organic Compound Emissions from Air Oxidation Processes in Synthetic Organic Chemical Manufacturing Industry (EPA 1984)
- Control of Volatile Organic Compound Emissions from Reactor Processes and Distillation Operations in Synthetic Organic Chemical Manufacturing Industry (EPA 1993)
- Alternative Control Technology Document – Surface Coating Operations at Shipbuilding and Ship Repair Facilities (EPA 1994) and Control Techniques Guidelines for Shipbuilding and Ship Repair Operations (Surface Coating) (EPA 1996)
- Control of Volatile Organic Compound Emissions from Coating Operations at Aerospace Manufacturing and Rework Operations (EPA 1997)
- Control Techniques Guidelines for Flexible Package Printing (EPA 2006)
- Control Techniques for Miscellaneous Plastic Parts Coatings (EPA 2008)
- Control Techniques Guideline for Fiberglass Boat Manufacturing Materials (EPA 2008)
- Control Technique Guidelines for Miscellaneous Industrial Adhesives (EPA 2008)

As a result, Colorado conducted no further RACT analysis for these VOC source categories and submits a negative declaration for each of these CTGs. Colorado has updated the Regulation Number 7 citations in Appendix 6-A to reflect provisions adopted since 2016, including the reorganization and renumbering of Regulation Number 7.[88]

### 6.2.2 Colorado Source Specific Regulation of CTG VOC Source Categories

Colorado has sources in the below listed CTG VOC source categories. Colorado has already adopted RACT requirements that are the same as or similar to the CTGs into Colorado's ozone SIP in Colorado's Regulation Number 7, Control of Ozone Via Ozone Precursors and Control of Hydrocarbons Via Oil and Gas Emissions, last approved by EPA in 2018 (83 Fed. Reg. 31068 (July 3, 2018)). These CTGs are further summarized in Appendix 6-B – CTGs Colorado Has Adopted:

- Design Criteria for Stage I Vapor Control Systems – Gasoline Service Stations (EPA 1975)
- Control of Volatile Organic Emissions from Existing Stationary Sources – Volume II: Surface Coating of Cans, Coils (EPA 1977)
- Control of Volatile Organic Emissions from Solvent Metal Cleaning (EPA 1977)
- Control of Refinery Vacuum Producing Systems, Wastewater Separators, and Process Unit Turnarounds (EPA 1977)
- Control of Hydrocarbons from Tank Truck Gasoline Loading Terminals (EPA 1977)
- Control of Volatile Organic Emissions from Existing Stationary Sources – Volume III: Surface Coating of Metal Furniture (EPA 1977) and Control Techniques Guidelines for Metal Furniture Coatings (EPA 2007)
- Control of Volatile Organic Emissions from Bulk Gasoline Plants (EPA 1977)
- Control of Volatile Organic Emissions from Storage of Petroleum Liquids in Fixed-Roof Tanks (EPA 1977)
- Control of Volatile Organic Emissions from Use of Cutback Asphalt (EPA 1977)
- Control of Volatile Organic Emissions from Existing Stationary Sources – Volume VI: Surface Coating of Miscellaneous Metal Parts and Products (EPA 1978) and Control Techniques for Miscellaneous Metal Parts Coatings (EPA 2008)
- Control of Volatile Organic Compound Leaks from Petroleum Refinery Equipment (EPA 1978)
- Control of Volatile Organic Emissions from Manufacture of Synthesized Pharmaceutical Products (EPA 1978)
- Control of Volatile Organic Emissions from Petroleum Liquid Storage in External Floating Roof Tanks (EPA 1978)
- Control of Volatile Organic Compound Leaks from Gasoline Tank Trucks and Vapor Collection Systems (EPA 1978)
- Control of Volatile Organic Compound Equipment Leaks from Natural Gas/Gasoline Processing Plants (EPA 1983)
- Control Techniques Guidelines for Film Coatings (EPA 2007)

In 2016, Colorado analyzed each CTG in comparison to the respective Regulation Number 7 provisions to determine whether the provisions still meet the RACT obligation.[89] Colorado has updated the Regulation Number 7 citations in Appendix 6-B to reflect provisions adopted since 2016, including the reorganization and renumbering of Regulation Number 7.[90]

[88] See Colorado's Moderate Ozone SIP TSD for RACT for major sources (2016); for the oil and gas industry (2017); for boilers, turbines, engines, glass melt furnaces, and aggregate kilns (2018); and for brewing and wood furniture surface coating (2018).
[89] See Colorado's Moderate Ozone SIP RACT Chapter 6 (2016).
[90] See Colorado's Moderate Ozone SIP TSD for RACT for major sources (2016); for the oil and gas industry (2017); for boilers, turbines, engines, glass melt furnaces, and aggregate kilns (2018); and for brewing and wood furniture surface coating (2018).

Also in 2016, Colorado determined that Colorado had sources in the Control of Volatile Organic Emissions from Perchloroethylene Dry Cleaning Systems (EPA 1978) VOC source category, see Appendix 6-C. However, the perchloroethylene dry cleaning systems CTG is no longer relevant because perchloroethylene has been exempted from the definition of VOC.

In reviewing Colorado's SIP submittals, EPA has expressed concerns with Colorado's requirements for the surface coating of metals parts, which are based on EPA's 1978 CTG, as compared to EPA's recommendations in their 2008 CTG. Colorado's Regulation Number 7 requires that clear coatings in a metal coating line meet a 4.3 lb VOC/gallon coating (minus water and exempt solvents) VOC content limit, extreme performance and air-dried coatings meet a 3.5 lb VOC/gallon content limit, and other coatings meet a 3.0 lb VOC/gallon content limit. EPA's 2008 CTG recommends 50 different coating emission limits that range from 2.3 to 6.2 lb VOC/gallon coating (minus water and exempt compounds). EPA's 2008 Ozone NAAQS Implementation Rule states that "In cases where controls were applied due to the 1-hour or 1997 NAAQS ozone RACT requirement, we expect that any incremental emissions reductions from application of a second round of RACT controls may be small and, therefore, the cost for advancing that small additional increment of reduction may not be reasonable."[91] Colorado believes that Colorado's Regulation Number 7 metal coating limits of 3.0 to 4.3 lb VOC/gallon, which are in the middle of the range of VOC emission limit recommendations in EPA's updated CTG, is adequate to address Colorado's Clean Air Act CTG RACT obligations. Colorado believes that the potential incremental emissions reductions that could result from revising the metal coating requirements in Regulation Number 7 to correspond to EPA's 2008 metal coating recommendations is small and not reasonable. Further, adopting the 2008 CTG recommended limits may unnecessarily allow for an increase in emissions from certain coating types (e.g., drum coating reconditioned interior), where the source would already comply with the lower Regulation Number 7 limit of 3.0 lb/gc. However, Colorado has committed to further evaluate revising the metal parts coating requirements in Regulation Number 7 to correspond to recommendations in EPA's 2008 CTG.

Therefore, at this time, Colorado has either adopted provisions in Regulation Number 7 for the above CTG source categories or has determined that existing provisions are adequate, with the caveat of further evaluation of the metal parts coating requirements. Colorado has updated the Regulation Number 7 citations in Appendices 6-B and 6-C to include provisions adopted based on recommendations in these CTGs and to reflect provisions adopted since 2016, including the reorganization and renumbering of Regulation Number 7.[92]

## 6.3 VOC AND NOX MAJOR SOURCE RACT ANALYSIS

Serious ozone nonattainment areas must revise their SIPs to require the implementation of RACT for major stationary sources of VOCs or NOx in the nonattainment area.[93] Major stationary sources of VOCs and NOx in Serious nonattainment areas are those that emit, or have the potential to emit, 50 tpy or more of VOC or NOx. As with RACT for the CTG VOC source categories, RACT is the lowest emissions limitation that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility. Similarly, EPA has required that RACT for major sources also be implemented as expeditiously as practicable but no later than July 20, 2021. [94]

[91] Final Implementation Rule at 12279.

[92] See Colorado's Moderate Ozone SIP TSD for RACT for major sources (2016); for the oil and gas industry (2017); for boilers, turbines, engines, glass melt furnaces, and aggregate kilns (2018); and for brewing and wood furniture surface coating (2018).

[93] 42 USC §7511a(c) and 42 USC §7502(c)(1).

[94] Reclassification to Serious, 84 Fed. Reg. at 70900 (Dec. 26, 2019).

In 2016, Colorado reviewed Colorado's point source inventory to verify that major sources (as a Moderate ozone nonattainment area, source ≥ 100 tpy) of VOC or NOx emissions in the DMNFR are subject to requirements that meet or exceed RACT, detailed in Appendix 6-D[95]. Colorado has updated the Regulation Number 7 citations in Appendix 6-D to reflect provisions adopted since 2016, including the reorganization and renumbering of Regulation Number 7.[96]

Colorado has since re-reviewed Colorado's point source inventory to verify that non-CTG major sources (as a Serious ozone nonattainment area, source ≥ 50 tpy) of VOC or NOx emissions in the DMNFR are subject to requirements that meet or exceed RACT, detailed in Appendix 6-E. Colorado reviewed source permits, consulted with Division permitting and enforcement staff involved with each source, and consulted with the sources themselves. Colorado also considered control strategies identified in the CTGs, ACTs, RBLC, EPA's Menu of Control Measures, NSPS, EGs, NESHAP, and in Colorado's regulations. Colorado determined that Colorado's major sources are currently subject to federally enforceable emission limits or requirements similar to measures described in the above listed documents and regulations. [97] While source and point requirements are included in federally enforceable permits and federally enforceable NSPS and NESHAP, some of the requirements are not currently included in Colorado's SIP, as is required for a Serious nonattainment area SIP. Therefore, in 2019, Colorado incorporated by reference some NSPS and NESHAP requirements into Colorado's SIP, as well as expanded the applicability of some existing RACT requirements.[98]

Colorado's overall analysis determined that Colorado's major sources are subject to requirements that adequately establish RACT (e.g., NSPS or NESHAP applicability, Regulation Number 7 RACT requirements, or RACT/beyond RACT analyses).

For sources where RACT requirements are currently imposed through means other than in a SIP approved regulation, Colorado is proposing SIP revisions in Regulation Number 7, Part C, Section I. and Part E, Sections II., III., and V. to incorporate those requirements. Specifically, Colorado is proposing to expand the combustion equipment requirements for boilers, incorporate specific NSPS emission limits for combustion turbines and landfill or biogas fired engines, expand wood furniture coating requirements, and develop a new categorical rule for foam manufacturing. In 2020, the Colorado Air Quality Control Commission will review and act on these proposals to ensure that regulatory RACT is adequately established for Colorado's major VOC and NOx sources, and are included in this SIP revision to further satisfy Colorado's RACT obligation for Colorado's major VOC and NOx sources.

[95] In 2016, this table was labeled Appendix 6-F. See Colorado's Moderate Ozone SIP TSD for RACT for major sources (2016).

[96] See Colorado's Moderate Ozone SIP TSD for RACT for major sources (2016); for the oil and gas industry (2017); for boilers, turbines, engines, glass melt furnaces, and aggregate kilns (2018); and for brewing and wood furniture surface coating (2018).

[97] See further discussion in the Technical Support Document for Reasonably Available Control Technology for Major Sources (2020).

[98] See Colorado's Serious Ozone SIP TSD for major sources (2019).

## APPENDIX 6-A – CTGS – NO SUBJECT COLORADO SOURCES

| Date of CTG | Description | Colorado and federal rules | Date of Colorado adoption of Regulation 7 | Date of most recent EPA approval of Regulation 7 |
|---|---|---|---|---|
| 1977 (ACT 1994) | Control of Volatile Organic Emissions from Existing Stationary Sources – Volume II: Surface Coating of Paper, Fabrics, Automobiles, and Light-Duty Trucks | Regulation 7, Part B, Section III. and Part C, Section I.<br><br>40 CFR Part 63, Subpart OOOO | 12/14/1978 and 5/22/1980 | 8/5/2011 (76 FR 47443) |
| 2007 | Control Techniques Guidelines for Paper and Foil Coatings | Regulation 7, Part B, Section III. and Part C, Section I. | 12/14/1978 and 5/22/1980 | 8/5/2011 (76 FR 47443) |
| 2008 | Control Techniques Guidelines for Automobile and Light-Duty Truck Assembly Coatings | Regulation 7, Part B, Section III. and Part C, Section I. | 12/14/1978 and 5/22/1980 | 8/5/2011 (76 FR 47443) |
| 1977 | Control of Volatile Organic Emissions from Existing Stationary Sources – Volume IV: Surface Coating of Insulation of Magnet Wire | Regulation 7, Part B, Section III. and Part C, Section I. | 12/14/1978 and 5/22/1980 | 8/5/2011 (76 FR 47443) |
| 1977 | Control of Volatile Organic Emissions from Existing Stationary Sources – Volume V: Surface Coating of Large Appliances | Regulation 7, Part B, Section III. and Part C, Section I. | 12/14/1978 and 5/22/1980 | 8/5/2011 (76 FR 47443) |
| 2007 | Control Techniques Guidelines for Large Appliance Coatings | Regulation 7, Part B, Section III. and Part C, Section I. | 12/14/1978 and 12/4/1980 | 8/5/2011 (76 FR 47443) |
| 2008 | Control Techniques for Miscellaneous Plastic Parts Coatings | Regulation 7, Part B, Section III. and Part C, Section I. | 12/14/1978 and 12/4/1980 | 8/5/2011 (76 FR 47443) |
| 1978 | Control of Volatile Organic Emissions from Existing Stationary Sources – Volume VII: Factory Surface Coating of Flat Wood Paneling | Regulation 7, Part B, Section III. and Part C, Section I.<br><br>40 CFR Part 63 Subpart QQQQ | 12/14/1978 and 9/20/1989 | 8/5/2011 (76 FR 47443) |
| 2006 | Control Techniques Guidelines for Flat Wood Paneling Coatings | Regulation 7, Part B, Section III. and Part C, Section I.<br><br>40 CFR Part 63 Subpart QQQQ | 12/14/1978 and 9/20/1989 | 8/5/2011 (76 FR 47443) |
| 1978 | Control of Volatile Organic Emissions from Manufacture of Pneumatic Rubber Tires | Regulation 7, Part B, Section III. and Part C, Section I.<br><br>40 CFR Part 60, Subpart BBB | 12/14/1978 and 9/20/1989 | 8/5/2011 (76 FR 47443) |
| 1978 | Control of Volatile Organic Emissions from Existing Stationary Sources – Volume VIII: Graphic Arts-Rotogravure and Flexography | Regulation 7, Part B, Section III. and Part C, Section IV.<br><br>40 CFR Part 60, Subpart QQ<br><br>40 CFR Part 63, Subpart KK | 12/14/1978 and 12/4/1980 | 8/5/2011 (76 FR 47443) |
| 1982 | *Control of Volatile Organic Compound Emissions from Large Petroleum Dry Cleaners* | Regulation 7, Part B, Section III.<br><br>40 CFR Part 60 Subpart JJJ | 12/14/1978 | 8/5/2011 (76 FR 47443) |
| 1983 | Control of Volatile Organic Compound Emissions from Manufacture of High-Density Polyethylene, Polypropylene, and Polystyrene Resins | Regulation 7, Part B, Section III.<br><br>40 CFR Part 63 Subparts U, JJJ | 12/14/1978 | 8/5/2011 (76 FR 47443) |
| 1984 | Control of Volatile Organic Compound Leaks from Synthetic Organic Chemical Polymer and Resin Manufacturing Equipment | Regulation 7, Part B, Section III.<br><br>40 CFR 60, Subparts VV, VVa | 12/14/1978 | 8/5/2011 (76 FR 47443) |

| Date of CTG | Description | Colorado and federal rules | Date of Colorado adoption of Regulation 7 | Date of most recent EPA approval of Regulation 7 |
|---|---|---|---|---|
| 1984 | Control of Volatile Organic Compound Emissions from Air Oxidation Processes in Synthetic Organic Chemical Manufacturing Industry | Regulation 7, Part B, Section III.<br><br>40 CFR 60, Subpart III | 12/14/1978 | 8/5/2011<br>(76 FR 47443) |
| 1993 | Control of Volatile Organic Compound Emissions from Reactor Processes and Distillation Operations in Synthetic Organic Chemical Manufacturing Industry | Regulation 7, Part B, Section III.<br><br>40 CFR 60, Subparts NNN, RRR | 12/14/1978 | 8/5/2011<br>(76 FR 47443) |
| 1994 | Alternative Control Technology Document – Surface Coating Operations at Shipbuilding and Ship Repair Facilities | Regulation 7, Part B, Section III.<br><br>40 CFR Part 63 Subpart II | 12/14/1978 | 8/5/2011<br>(76 FR 47443) |
| 1996 (ACT 1994) | Control Techniques Guidelines for Shipbuilding and Ship Repair Operations (Surface Coating) *EPA Note – See also EPA-453/R-94-032.* | Regulation 7, Part B, Section III.<br><br>40 CFR Part 63 Subpart II | 12/14/1978 | 8/5/2011<br>(76 FR 47443) |
| 1994 (1997) | Aerospace (CTG & NESHAP)<br>*EPA Note – See also 59 FR-29216, June 6, 1994.* | Regulation 7, Part B, Section III. and Part C, Sections I. and II.<br><br>40 CFR Part 63 Subpart GG | 12/14/1978 and 12/4/1980 and 11/19/2016 | 8/5/2011 (76 FR 47443) and pending |
| 2006 | Control Techniques Guidelines for Flexible Package Printing | Regulation 7, Part B, Section III.<br><br>40 CFR Part 63 Subparts JJJJ, KK | 12/14/1978 | 8/5/2011<br>(76 FR 47443) |
| 2008 | Control Techniques Guideline for Fiberglass Boat Manufacturing Materials | Regulation 7, Part B, Section III.<br><br>40 CFR Part 63 Subpart VVVV | 12/14/1978 | 8/5/2011<br>(76 FR 47443) |
| 2008 | Control Technique Guidelines for Miscellaneous Industrial Adhesives | Regulation 7, Part B, Section III.<br><br>40 CFR Part 60 Subpart RR, 40 CFR Part 63 Subparts KK, JJJJ | 12/14/1978 | 8/5/2011<br>(76 FR 47443) |

## APPENDIX 6-B – CTGS COLORADO HAS ADOPTED

| Date of CTG | Description | Colorado and federal rules | Date of Colorado adoption of Regulation 7 | Date of most recent EPA approval of Regulation 7 | Summary of Colorado Regulation 7 requirements | Summary of CTG requirements | Summary of other requirements or regulations (2016) – for comparison |
|---|---|---|---|---|---|---|---|
| 1975 | Design Criteria for Stage I Vapor Control Systems – Gasoline Service Stations<br>*EPA Note – This document is regarded as a CTG although it was never published with an EPA document number.* | Regulation 7, Part B, Section III. and IV.<br><br>40 CFR Part 63 Subpart CCCCCC | 12/14/1978 | 8/5/2011 (76 FR 47443) | Cannot dispose of VOC by evaporation or spillage unless RACT utilized<br><br>Equip pumps and compressors with mechanical seals or other of equal efficiency, equip storage tanks with floating roof and vapor gathering system, routine tank inspections, submerged fill and vapor control system, load leak tight transport trucks and vapor collection system | Stage I controls, vapor balance systems, submerged fill, leak tight conditions, vapor collection systems | California: transfer vapor recovery system, vapor tight and liquid tight lines and connections, bottom fill, tank floating roof seals and covers, routine inspections, certified spill box, cargo tank vapor integrity testing, cannot purge gasoline from cargo tank to atmosphere, closed containers<br><br>Texas: submerged fill, vapor control system, vapor tight transport vessels, tank control with submerged fill/vapor control system/or floating roof, routine inspections<br><br>Arizona: submerged fill and pressure/vacuum valve, vapor recovery system, tank floating roof seals, routine inspections, vapor-tight and leak-tight transport vessels, control delivery vessel purge emissions 90%<br><br>RBLC: stage I and II vapor recovery system |
| 1976 | Control of Volatile Organic Emissions from Existing Stationary Sources – Volume I: Control Methods for Surface Coating Operations<br>*EPA Note – Although often listed with the CTGs for historical reasons, this document does not define RACT for any source. It is a compilation of control techniques.* | NA – compilation of control techniques | | | | | |

| Date of CTG | Description | Colorado and federal rules | Date of Colorado adoption of Regulation 7 | Date of most recent EPA approval of Regulation 7 | Summary of Colorado Regulation 7 requirements | Summary of CTG requirements | Summary of other requirements or regulations (2016) – for comparison |
|---|---|---|---|---|---|---|---|
| 1977 | Control of Volatile Organic Emissions from Existing Stationary Sources – Volume II: Surface Coating of Cans, Coils | Regulation 7, Part B, Section III. and Part C, Section I.<br><br>40 CFR Part 60, Subparts TT, WW<br><br>40 CFR Part 63, Subparts KKKK, SSSSS | 12/14/1978 and 5/22/1980 | 8/5/2011 (76 FR 47443) | Cannot dispose of VOC by evaporation or spillage unless RACT utilized<br><br>Fugitive VOC control – covers, closed containers, proper disposal<br><br>Can coating VOC content limit 2.8 to 5.5 lb/gal<br><br>Coil coating VOC content limit 2.6 lb/gal | Cans – coating VOC content limit 2.8 to 5.5 lb/gal; available control options: incineration, water-borne/high solids/powder coatings, carbon adsorption, ultraviolet curing<br><br>Coils – coating VOC content limit 2.6 lb/gal; available control options: incineration, water-borne/high solids coatings | California: cans – coating VOC content 0.1-5.5 lb/gal, coating VOC content 20-750 g/l, cleaning solvent VOC content 0.21-0.23 lb/gal, may comply with 90% control, application methods, closed containers; coils – coating VOC content 1.7 lb/gal, VOC content 200 g/l, cleaning solvent VOC content 0.21-0.23 lb/gal, may comply with 90% control, application methods, closed containers<br><br>Texas: can coating VOC content 2.8-5.5 lb/gal, coil coating VOC content 2.6 lb/gal<br><br>Arizona: can coating VOC content 2.5-5.5 lb/gal, coil coating VOC content 2.6 lb/gal, alternative control device 90%, application methods, closed containers, spray gun cleaning practices<br><br>RBLC: can – NSPS WW, compliant coatings, thermal oxidation, cleaning solvent and ink VOC content<br><br>Menu: incineration, total enclosure, process modifications, VOC content limits |

| Date of CTG | Description | Colorado and federal rules | Date of Colorado adoption of Regulation 7 | Date of most recent EPA approval of Regulation 7 | Summary of Colorado Regulation 7 requirements | Summary of CTG requirements | Summary of other requirements or regulations (2016) – for comparison |
|---|---|---|---|---|---|---|---|
| 1977 | Control of Volatile Organic Emissions from Solvent Metal Cleaning | Regulation 7, Part B, Section III. and Part C, Section II. | 12/14/1978 | 8/5/2011 (76 FR 47443) | Cannot dispose of VOC by evaporation or spillage unless RACT utilized<br><br>Control solvent cold-cleaners with covers and drainage facility; control non-conveyorized vapor degreasers with covers, safety switches, and control systems; control conveyorized degreasers with control devices, drying tunnel, safety switches, covers | Equipment specifications, operating requirements, minimize solvent loss, repair leaking equipment, control devices | California: cold cleaners use covers, dry rack, freeboard ratio or control 85-95% or enclosed design; open top and conveyorized vapor degreasers free of liquid leaks, and transfer with leak proof couplings, safety switches, freeboard ratio; VOC content limit 0.42 lb/gal; may comply with airless/air-tight cleaning system; repair leaks; closed containers<br><br>Texas: cold-cleaning use cover and enclosed draining, open top degreasing use cover and freeboard ratio or control 85%, conveyorized degreasing control with refrigerated chiller 85% or carbon adsorption and trying tunnel<br><br>Arizona: closed containers, internal drainage rack, impervious cover, drying tunnel, may control with control or sealed system<br><br>RBLC: vapor condensing/recovery system, operating time limit |
| 1977 | Control of Refinery Vacuum Producing Systems, Wastewater Separators, and Process Unit Turnarounds | Regulation 7, Part B, Sections III. and VI.<br><br>40 CFR Part 60 Subpart QQQ | 12/14/1978 | 8/5/2011 (76 FR 47443) | Cover/control wastewater separator, process unit turnaround procedures, blowdown/vents/valves vapor recovery system, vacuum-producing system control | Process unit turnarounds operating procedures, vacuum producing system firebox combustion, wastewater separators covers, process units depressurized to flare/fuel gas system/other combustion device before opening | California: control and minimize flaring, operate flares in smokeless manner, maintain flare pilot flames, routine inspections, collect vapors when depressurizing vessels, cover wastewater separators and sumps and sewer lines and process drains, control emissions from vacuum producing system, cover hot wells and accumulators<br><br>Texas: components with water seals, closed openings, junction box vents control 90% or enclosed system, routine inspections, control steam ejector or mechanical vacuum pump vent stream 90%, control hotwell emissions, recover emissions during turnaround, equip water separator with vapor recovery system<br><br>RBLC: MACT CC, NESHAP FF, NSPS QQQ, covered system, vapor combustor, good air pollution control practices, submerged fill |

| Date of CTG | Description | Colorado and federal rules | Date of Colorado adoption of Regulation 7 | Date of most recent EPA approval of Regulation 7 | Summary of Colorado Regulation 7 requirements | Summary of CTG requirements | Summary of other requirements or regulations (2016) – for comparison |
|---|---|---|---|---|---|---|---|
| 1977 | Control of Hydrocarbons from Tank Truck Gasoline Loading Terminals | Regulation 7, Part B, Sections III., IV., and VII.<br><br>40 CFR Part 60 Subpart XX<br><br>40 CFR Part 63 Subparts R, BBBBBB | 12/14/1978 and 4/9/1981 | 8/5/2011 (76 FR 47443) | Cannot dispose of VOC by evaporation or spillage unless RACT utilized<br><br>Equip pumps and compressors with mechanical seals or other of equal efficiency, equip storage tanks with floating roof and vapor gathering system, routine tank inspections, submerged fill and vapor control system, load leak tight transport trucks and vapor collection system | Vapor collection systems, leak tight conditions, submerged fill | California: transfer vapor recovery system, vapor tight and liquid tight lines and connections, bottom fill, tank floating roof seals and covers, routine inspections, certified spill box, cargo tank vapor integrity testing, cannot purge gasoline from cargo tank to atmosphere, closed containers<br><br>Texas: submerged fill, vapor control system, vapor tight transport vessels, tank control with submerged fill/vapor control system/or floating roof, routine inspections<br><br>Arizona: submerged fill and pressure/vacuum valve, vapor recovery system, tank floating roof seals, routine inspections, vapor-tight and leak-tight transport vessels, control delivery vessel purge emissions 90%<br><br>RBLC: submerged fill, minimize spills, vapor recovery unit |
| 1977 | Control of Volatile Organic Emissions from Existing Stationary Sources – Volume III: Surface Coating of Metal Furniture | Regulation 7, Part B, Section III. and Part C, Section I.<br><br>40 CFR Part 60 Subpart EE<br><br>40 CFR Part 63 Subpart RRRR | 12/14/1978 and 5/22/1980 | 8/5/2011 (76 FR 47443) | Cannot dispose of VOC by evaporation or spillage unless RACT utilized<br><br>Fugitive VOC control – covers, closed containers, proper disposal<br><br>Coating VOC content limit 3.0 lb/gal | Coating VOC content limit 3.0 lb/gal | California: coating VOC content limits 2.3 to 5.8 lb/gal, may comply with control 85-95%, closed containers, minimize spills, specified application methods, cleaning solvent VOC content limit 0.42 lb/gal unless control 85%, clean spray equipment with non-organic solvent, stripper VOC content limit 1.7 lb/gal, substrate surface cleaning VOC content limit 0.21 lb/gal<br><br>Texas: coating VOC content limit 2.3 to 5.1 lb/gal, closed containers, minimize spills, specified application methods<br><br>Arizona: coating VOC limit 3.0 lb/gal, specified application method, closed containers<br><br>EPA Menu: CTG, reformulation or process modification (see SCAQMD), reduced solvent utilization, permanent total enclosure |
| 2007 | Control Techniques Guidelines for Metal Furniture Coatings | | | | | Coating VOC content limit 2.3 to 3.5 lb/gal<br><br>Optional add-on control device<br><br>Application methods<br><br>Cleaning material work practices – closed containers, minimize spills | |

| Date of CTG | Description | Colorado and federal rules | Date of Colorado adoption of Regulation 7 | Date of most recent EPA approval of Regulation 7 | Summary of Colorado Regulation 7 requirements | Summary of CTG requirements | Summary of other requirements or regulations (2016) – for comparison |
|---|---|---|---|---|---|---|---|
| 1977 | Control of Volatile Organic Emissions from Bulk Gasoline Plants | Regulation 7, Part B, Sections III., IV., and VII.<br><br>40 CFR Part 60 Subpart XX<br><br>40 CFR Part 63 Subparts R, BBBBBB | 12/14/1978 and 4/9/1981 | 8/5/2011 (76 FR 47443) | Cannot dispose of VOC by evaporation or spillage unless RACT utilized<br><br>Equip pumps and compressors with mechanical seals or other of equal efficiency, equip storage tanks with floating roof and vapor gathering system, routine tank inspections, submerged fill and vapor control system, load leak tight transport trucks and vapor collection system | Vapor collection systems, leak tight conditions, submerged fill | California: transfer vapor recovery system, vapor tight and liquid tight lines and connections, bottom fill, tank floating roof seals and covers, routine inspections, certified spill box, cargo tank vapor integrity testing, cannot purge gasoline from cargo tank to atmosphere, closed containers<br><br>Texas: submerged fill, vapor control system, vapor tight transport vessels, tank control with submerged fill/vapor control system/or floating roof, routine inspections<br><br>Arizona: submerged fill and pressure/vacuum valve, vapor recovery system, tank floating roof seals, routine inspections, vapor-tight and leak-tight transport vessels, control delivery vessel purge emissions 90%<br><br>RBLC: submerged fill, minimize spills, vapor recovery unit |
| 1977 (ACT 1994) | Control of Volatile Organic Emissions from Storage of Petroleum Liquids in Fixed-Roof Tanks | Regulation 7, Part B, Sections III. and IV.<br><br>40 CFR Part 60 Subpart K, Kb<br><br>40 CFR Part 63 Subpart CC, EEEE, BBBBBB | 12/14/1978 | 8/5/2011 (76 FR 47443) | Cannot dispose of VOC by evaporation or spillage unless RACT utilized<br><br>Fixed roof seals and vapor gathering system, routine inspections | Equipment specifications, internal floating roof or equivalent, maintenance requirements, inspections<br><br>(ACT expanded to chemical plants) | California: vapor loss control device, control tank degassing and cleaning emissions 90-95%, tank floating roof seals, routine inspections, bottom loading, maintain facility leak-free and vapor-tight, low emission fixed liquid level gauges and connectors<br><br>Texas: maintain working pressure to prevent vapor or gas loss to atmosphere, control with submerged fill or vapor control system or floating roof, floating roof seal inspections<br><br>Arizona: tanks with floating roof or vapor collection system, floating roof seals, routine inspections<br><br>EPA Menu: seals (see SCAQMD)<br><br>RBLC: submerged fill, aluminum or white color, vapor balancing, fuel specification, MACT CC, internal floating roof, RTO, good design, operating practices, enclosed combustor, stage I and II |

| Date of CTG | Description | Colorado and federal rules | Date of Colorado adoption of Regulation 7 | Date of most recent EPA approval of Regulation 7 | Summary of Colorado Regulation 7 requirements | Summary of CTG requirements | Summary of other requirements or regulations (2016) – for comparison |
|---|---|---|---|---|---|---|---|
| 1977 | Control of Volatile Organic Emissions from Use of Cutback Asphalt | Regulation 7, Part B, Section III. and Part C, Section I. | 12/14/1978 | 8/5/2011 (76 FR 47443) | Cannot dispose of VOC by evaporation or spillage unless RACT utilized<br><br>Sources subject to R7 use limitation Oct-Feb | Substitute emulsions for cutback asphalt | California: cutback asphalt < 0.5 % organic compounds that evaporate at < 500F; emulsified asphalt < 3% organic compounds that evaporate at < 500F; no rapid or medium-cure liquid asphalt; slow-cure liquid asphalt < 0.5% petroleum solvents that boil at < 500F (exemption when temp for 24 hours < 50F); no cutback asphalt in South Zone<br><br>Texas: cutback asphalt limited to < 7% of total annual volume; no cutback asphalt April 16-Sept 15; asphalt emulsion VOC content 0.5 to 12% by weight; exemption for cutback asphalt as penetrating prime coat<br><br>Arizona: no rapid cure cutback asphalt; cutback asphalt < 0.5% VOC that evaporates at < 500F; emulsified asphalt < 3% VOC that evaporates at < 500F; exemption for non-rapid cure cutback asphalt as a penetrating prime coat<br><br>EPA Menu: reformulation, process modification |
| 1978 | Control Techniques for Volatile Organic Emissions from Stationary Sources<br>*EPA Note – This document is often listed with CTGs, but it does not define RACT for any particular source.* | NA – compilation of control techniques | | | | | |
| 1978 | Control of Volatile Organic Emissions from Existing Stationary Sources – Volume VI: Surface Coating of Miscellaneous Metal Parts and Products | Regulation 7, Part B, Section III. and Part C, Section I. | 12/14/1978 and12/4/1980 | 8/5/2011 (76 FR 47443) | Cannot dispose of VOC by evaporation or spillage unless RACT utilized<br><br>Fugitive VOC control – covers, closed | Coating VOC content limit 3.0 to 4.3 lb/gal; available control options: incineration, water-borne/high solids/powder coatings, carbon adsorption | California: coatings VOC content 2.3-7.3 lb/gal, VOC content 60-680 g/l, cleaning solvent VOC content 0.21-0.23 lb/gal, may comply with 85-95% control, closed containers, application methods |

| Date of CTG | Description | Colorado and federal rules | Date of Colorado adoption of Regulation 7 | Date of most recent EPA approval of Regulation 7 | Summary of Colorado Regulation 7 requirements | Summary of CTG requirements | Summary of other requirements or regulations (2016) – for comparison |
|---|---|---|---|---|---|---|---|
| 2008 | Control Techniques for Miscellaneous Metal Parts Coatings | 40 CFR Part 63, Subpart MMMM | | | containers, proper disposal<br><br>Coating VOC content limit 3.0 to 4.3 lb/gal | Coating VOC content limit 2.3 to6.2 lb/gal; application methods; alternative use of add-on control; work practices (closed containers, minimize spills) | Texas: coatings VOC content 2.3-6.7 lb/gal, application methods, work practices<br><br>Arizona: coating VOC content 3.0-3.5 lb/gal, alternative control device 90%, application methods, closed containers, spray gun cleaning practices<br><br>RBLC: consumption limits, VOC content 3.5-7.25 lb/gal, HVLP, closed containers, carbon adsorption<br><br>Menu: VOC content limits, add-on control, CTG |
| 1978 | Control of Volatile Organic Compound Leaks from Petroleum Refinery Equipment | Regulation 7, Part B, Sections III. and VI.<br><br>40 CFR Part 60 Subparts GGG, GGGa, J, Ja<br><br>40 CFR Part 63 Subpart CC | 12/14/1978 | 8/5/2011 (76 FR 47443) | Leak detection and repair | Leak detection and repair | California: leak detection and repair (7 days), routine inspections; vent PRD to vapor recovery or disposal system, leak thresholds: equipment, connector, and valves > 100 ppm, pump, compressor, and PRD > 500 ppm, components, connections, flanges, pumps, compressors, PRD > 200 to 10,000 ppmv; repair 0 to 7 days; reinspect after repair; cap/seal open-ended lines and valves<br><br>Texas: routine inspection, step up/down inspection frequency option, repair leaks, leak thresholds: pumps and compressors 2000 ppm and other components 500 ppm<br><br>EPA Menu: process modification, flare gas recovery unit, flaring limits and operational practice (see SCAQMD)<br><br>RBLC: quarterly leak detection and repair, MACT H, NESHAP V, MACT CC, NSPS GGGa, MACT FFFF |

| Date of CTG | Description | Colorado and federal rules | Date of Colorado adoption of Regulation 7 | Date of most recent EPA approval of Regulation 7 | Summary of Colorado Regulation 7 requirements | Summary of CTG requirements | Summary of other requirements or regulations (2016) – for comparison |
|---|---|---|---|---|---|---|---|
| 1978 | Control of Volatile Organic Emissions from Manufacture of Synthesized Pharmaceutical Products | Regulation 7, Part B, Section III. and Part C, Sections I. and V.<br><br>40 CFR Part 63, Subpart GGG | 12/14/1978 and 9/20/1989 and 12/4/1980 | 8/5/2011 (76 FR 47443) | Cannot dispose of VOC by evaporation or spillage unless RACT utilized<br><br>Fugitive VOC control – covers, closed containers, proper disposal<br><br>Control emissions from reactors, distillation operations, crystallizers, centrifuge and vacuum dryers with surface condensers or equivalent controls; vapor balance system for transfer from truck or railcar to storage tanks; enclose centrifuges, rotary vacuum filters, other filters; covers on in-process tanks; repair leaks; closed containers | Controls (e.g., condensers, scrubbers, carbon adsorbers, vapor return lines, conservation vents, pressure tanks) for dryers, reactors, distillation units, storage and transfer, filters, extractors, centrifuges, crystallizers; may be reasonable to regulate on plant by plant basis | California: control reactors, distillation columns, crystallizers, centrifuges with surface condensers or equivalent; enclose centrifuges and vacuum filters; tank covers; operational requirements; closed containers<br><br>Texas: control reactors, distillation units, crystallizers, centrifuges, vacuum dryers with condenser; cover in-process tanks; control air dryers, production equipment exhaust system, loading facilities 90%<br><br>Arizona: control reactor, distillation column, crystallizer, centrifuge with surface condenser or equivalent; cover in-process tanks; control vacuum filter, other filter, and separation device 90%; control chemical sterilizer 75%; control air dryer 90%; repair leaks; closed containers<br><br>EPA Menu: equipment and operational requirements (see SCAQMD)<br><br>RBLC: scrubbers, incinerator, carbon adsorption, RTO, LDAR |

| Date of CTG | Description | Colorado and federal rules | Date of Colorado adoption of Regulation 7 | Date of most recent EPA approval of Regulation 7 | Summary of Colorado Regulation 7 requirements | Summary of CTG requirements | Summary of other requirements or regulations (2016) – for comparison |
|---|---|---|---|---|---|---|---|
| 1978 (ACT 1994) | Control of Volatile Organic Emissions from Petroleum Liquid Storage in External Floating Roof Tanks | Regulation 7, Part B, Sections III. and IV.<br><br>40 CFR Part 60 Subpart K, Kb | 12/14/1978 | 8/5/2011 (76 FR 47443) | Cannot dispose of VOC by evaporation or spillage unless RACT utilized<br><br>Floating roof seals, covered roof drains, covered/sealed openings, routine inspections | Equipment specifications, seals, maintenance requirements, inspections | California: vapor loss control device, control tank degassing and cleaning emissions 90-95%, tank floating roof seals, routine inspections, bottom loading, maintain facility leak-free and vapor-tight, low emission fixed liquid level gauges and connectors<br><br>Texas: maintain working pressure to prevent vapor or gas loss to atmosphere, control with submerged fill or vapor control system or floating roof, floating roof seal inspections<br><br>Arizona: tanks with floating roof or vapor collection system, floating roof seals, routine inspections<br><br>EPA Menu: seals (see SCAQMD)<br><br>RBLC: submerged fill, aluminum or white color, vapor recovery, seals, drain dry design bottoms, NSPS Kb, MACT BBBBB, limited roof landings, good engineering practices, LDAR, dome, MACT CC |
| 1978 | Control of Volatile Organic Compound Leaks from Gasoline Tank Trucks and Vapor Collection Systems | Regulation 7, Part B, Sections III., IV., and VII.<br><br>40 CFR Part 60 Subpart XX<br><br>40 CFR Part 63 Subparts R, BBBBBB | 12/14/1978 and 4/9/1981 | 8/5/2011 (76 FR 47443) | Cannot dispose of VOC by evaporation or spillage unless RACT utilized<br><br>Annual leak-tight test, semi-annual visual inspections | Leak tight conditions, vapor collection systems | California: vapor integrity test, cannot purge gasoline vapor from cargo tank to atmosphere, vapor and liquid leak free connectors<br><br>Texas: annual leak-tight test<br><br>Arizona: vapor tight and leak free vessels, annual leak test, vapor return hoses, collect and contain spills, cannot purge vapors from delivery vessel unless control 90%<br><br>RBLC: vapor tight vessels, submerged fill, RTO, vapor combustor |

| Date of CTG | Description | Colorado and federal rules | Date of Colorado adoption of Regulation 7 | Date of most recent EPA approval of Regulation 7 | Summary of Colorado Regulation 7 requirements | Summary of CTG requirements | Summary of other requirements or regulations (2016) – for comparison |
|---|---|---|---|---|---|---|---|
| 1983 | Control of Volatile Organic Compound Equipment Leaks from Natural Gas/Gasoline Processing Plants | Regulation 7, Part B, Section III. and Part D, Section I.<br><br>40 CFR Part 60 Subparts KKK, OOOO, OOOOa<br><br>40 CFR Part 63, Subparts HH and HHH | 12/14/1978 and 3/12/2004 | 8/5/2011 (76 FR 47443) | Cannot dispose of VOC by evaporation or spillage unless RACT utilized<br><br>NSPS level fugitive emission LDAR | Leak detection and repair | California: leak detection and repair<br><br>EPA Menu: natural gas production compressors SCR<br><br>RBLC: thermal oxidizers, flare, diesel engine operation limits, LNB, ULNB, FGR, bottom filling tanks, aluminum or white tanks, fugitive LDAR, heater burner control, good combustion practices, floating roof tanks, enclosed oil-water separator, NSPS OOOO, dehy vapor recovery unit, enclosed combustor |
| 2007 | Control Techniques Guidelines for Film Coatings | Regulation 7, Part B, Section III. and Part C, Section I.<br><br>40 CFR Part 60, Subpart RR<br><br>40 CFR Part 63, Subpart JJJJ | 12/14/1978 and 5/22/1980 | 8/5/2011 (76 FR 47443) | Cannot dispose of VOC by evaporation or spillage unless RACT utilized<br><br>Fugitive VOC control – covers, closed containers, proper disposal<br><br>Coating VOC content limit 2.9 lb/gal | Control VOC emissions 90% where facility $\geq$ 25 tpy VOC or use low-VOC content materials (0.40 lb VOC/lb solids); cleaning materials work practices (closed containers, minimize spills) where facility $\geq$ 15 lb/day VOC | California: coating limit 265 g/l or control 95%, cleaning material limit 15% VOC, VOC coating limit 2.2 lb/gal or control to 1 lb/gal, cleaning material limit 200 g/l or control to 120 g/l, closed containers, VOC content 0.16-2.2 lb/gal or control 90%, application methods<br><br>Texas: coating limit 0.4 lb VOC/lb solids, application methods, closed containers, minimize spills<br><br>EPA Menu: CTG<br><br>RBLC: no control, VOC content, permanent total enclosure, thermal oxidizer |

| Date of CTG | Description | Colorado and federal rules | Date of Colorado adoption of Regulation 7 | Date of most recent EPA approval of Regulation 7 | Summary of Colorado Regulation 7 requirements | Summary of CTG requirements | Summary of other requirements or regulations (2016) – for comparison |
|---|---|---|---|---|---|---|---|
| 1996 | Control of Volatile Organic Compound Emissions from Wood Furniture Manufacturing Operations<br>*EPA Note – Wood Furniture (CTG-MACT) – Draft MACT out 5-1994; Final CTG issued 4-1996. See also 61 FR-25223, May 20, 1996 and 61 FR-50823, September 27, 1996.* | Regulation 7, Part B, Section III. and Part C, Sections I.<br><br>40 CFR Part 63 Subpart JJ | 12/14/1978 and 9/20/1989 and 11/15/2018 | 8/5/2011 (76 FR 47443) and pending | Cannot dispose of VOC by evaporation or spillage unless RACT utilized<br><br>Fugitive VOC control – covers, closed containers, proper disposal | Combustion or recovery device, low VOC coatings (0.8-2.3 kg VOC/kg solids), pollution prevention, work practices (e.g., closed containers) | California: coatings VOC content limits 0.25 to 6.3 lb/gal, coatings ROC content 2.0 to 6.3 lb/gal, stripper VOC content < 250 g/l, may comply with control 85-90%, specified application methods, closed containers, cleaning solvent VOC content 0.21 lb/gal<br><br>Texas: coatings VOC content limits 0.8 to 2.3 kg VOC/kg solids or vapor control system equivalent reduction, cleaning solvent VOC content < 8% VOC, prohibits conventional spray gun<br><br>Arizona: coatings VOC content 1.8 to 2.3 lb VOC/lb solids, specified application methods, cleaning solvent VOC content < 8% VOC, closed containers<br><br>EPA menu: CTG<br><br>RBLC: coating reformulation, proper spraying techniques, paint filter |
| 2006 (ACT 1993, 1994) | Control Techniques Guidelines for Offset Lithographic Printing and Letterpress Printing | Regulation 7, Part B, Section III. and Part C, Sections IV. | 12/14/1978 and 11/19/2016 | 8/5/2011 (76 FR 47443) and 7/3/2018 (83 FR 31068) | Cannot dispose of VOC by evaporation or spillage unless RACT utilized | Reduce emissions from fountain solution by limiting alcohol to < 5%, cleaning materials with VOC composite vapor pressure < 10 mm Hg or < 70% VOC (excluding 110 gal noncompliant cleaning materials), work practices (closed containers), reduce emissions from heatset dryers ≥ 25 tpy VOC with control devices 90-95% (no recommended control from sheet-fed or coldset web) | California: Ink VOC content limits 1.25 to 2.5 lb/gal, fountain solution limit 1.6 to 8% VOC, cleaning product VOC limit 0.21 to 0.83 lb/gal, may comply with control 75%, closed containers, specified application methods<br><br>Texas: low solvent ink < 25% VOC or high solids solvent ink > 60% nonvolatile material or vapor control system 90% reduction, fountain solution alcohol content < 5% by volume alcohol (heatset) or < 10% (sheet-fed) or no alcohol (non-heatset printing newspapers), cleaning solvent VOC content < 50% by volume VOC, closed containers<br><br>EPA Menu: CTG<br><br>RBLC: fountain solution VOC content, work practices, thermal oxidizer, water based material VOC content, equipment design |

| Date of CTG | Description | Colorado and federal rules | Date of Colorado adoption of Regulation 7 | Date of most recent EPA approval of Regulation 7 | Summary of Colorado Regulation 7 requirements | Summary of CTG requirements | Summary of other requirements or regulations (2016) – for comparison |
|---|---|---|---|---|---|---|---|
| 2006 (ACT 1994) | Control Techniques Guidelines for Industrial Cleaning Solvents | Regulation 7, Part B, Section III. and Part C, Sections II. | 12/14/1978 and 11/19/2016 | 8/5/2011 (76 FR 47443) and pending | Cannot dispose of VOC by evaporation or spillage unless RACT utilized | Work practice standards, cleaning materials VOC content limit 0.42 lb/gal, optional alternative limit on composite vapor pressure of cleaning materials, add-on controls emission reduction 85% | California: cleaning solvent VOC content limit 0.21 to 6.7 lb/gal, may comply with control 85-95%, consumer paint thinner VOC content limit 0.21 lb/gal, specified cleaning methods, closed containers<br><br>Texas: solvent VOC content < 0.42 lb/gal or vapor control system 85% reduction, closed containers, minimize emissions<br><br>Arizona: solvent VOC content < 0.42 lb/gal, work practices if not using low-VOC solvent (i.e., 0.42 lb/gal), closed containers<br><br>EPA Menu: CTG<br><br>RBLC: vapor condensing/recovery system, operating time limit |
| 2016 | Control Techniques Guidelines for the Oil and Natural Gas Industry | Regulation 7, Part B, Section III. and Part D, Sections I., II., and III.<br><br>40 CFR Part 60 Subparts OOOO, OOOOa | 12/14/1978 and 3/12/2004 and 12/17/2006 and 12/12/2008 and 11/17/2016 and 11/16/2017 and 12/19/2019 | Part B, Section III. – 8/5/2011 (76 FR 47443)<br><br>Part D, Section I. – 2/3/2008 (73 FR 8194) and pending | Cannot dispose of VOC by evaporation or spillage unless RACT utilized<br><br>90% system wide tank controls – transitioning to 95% individual tank control, no tank venting, 95% centrifugal compressor control, rod packing replacement reciprocating compressors, low or no bleed pneumatic controllers, leak detection and repair at well sites/compressor stations/gas plants, route gas to sales line or control | 95% tank control, well completion requirements, 95% centrifugal compressor control, rod packing replacement reciprocating compressors, low or no bleed pneumatic controllers, zero emission pneumatic pumps, leak detection and repair at well sites/compressor stations/gas plants | California: concentration of TOC in well cellar < 500 ppmv, cannot store organic liquid in well cellar, control gas 95%, repair gaseous leaks > 250 ppmv, routine inspections, odor event cause analysis and report, repair component leaks > 10,000 ppmv, closed access hatches, control emissions from glycol dehy 95%, vapor recovery system on crude oil storage tanks, control crude oil storage tank degassing emissions 95%, power drilling operations with grid power<br><br>EPA Menu: reduce fugitive emissions (see SCAQMD) |

## APPENDIX 6-C – CTGS COLORADO IS NOT ADOPTING

| Date of CTG | Description | Colorado and federal rules | Date of Colorado adoption | Date of EPA approval of Colorado Regulation 7 | Colorado requirements | CTG recommendations | Other requirements or regulations (2016) – for comparison |
|---|---|---|---|---|---|---|---|
| 1978 | Control of Volatile Organic Emissions from Perchloroethylene Dry Cleaning Systems<br>*EPA Note – Perchloroethylene has been exempted as a VOC, so this CTG is no longer relevant. However, there is a NESHAP for perchloroethylene dry cleaners.* | Regulation 7, Part B, Section III.<br><br>40 CFR Part 63 Subpart M | 12/14/1978 | 8/5/2011 (76 FR 47443) | Cannot dispose of VOC by evaporation or spillage unless RACT utilized | Carbon adsorbers, cookers and cartridge filters, waste disposal, leak detection | California: prohibits the installation of new perchloroethylene dry cleaning systems |

## APPENDIX 6-D – MAJOR SOURCES (> 100 TPY) OF VOC AND/OR NOX EMISSIONS IN COLORADO OZONE NONATTAINMENT AREA – UPDATED

| Pollutant | Facility | AIRS ID | Facility purpose | Estimated emissions, uncon (tpy as of 12/2015) | Estimated emissions, actual (tpy as of 12/2015) | Major VOC or NOx emission points | Requirements | Summary conclusion |
|---|---|---|---|---|---|---|---|---|
| SIC: Petroleum Refining, Petroleum Bulk Stations/Terminals, Wood Kitchen Cabinets, Refuse Systems, Malt Beverages, Metal Cans, Photographic Equipment/Supplies, Soil Prep. Services | | | | | | | | |
| VOC | Suncor Energy, Denver Refinery | 001-0003 | Petroleum refining | 4,840.1 | 421.6 | Tanks, loading racks, groundwater remediation, wastewater treatment, equipment fugitive VOC, cold cleaners | Tanks – MACT CC, MACT R, NSPS Kb, NSPS UU, R7.B.I, R7.B.II, R7.B.IV, R7.B.V, R7.B.VI; rail car loading – R7.B.IV; truck loading – NSPS XX, NSPS J, MACT GGGGG, MACT R, MACT CC, R7.B.IV, R7.B.VI, R7.B.VII; groundwater remediation – MACT CC, NSPS Kb, NSPS Ja, NESHAP FF, R7.B.I, R7.B.II, R7.B.III; wastewater treatment – MACT CC, NSPS QQQ, NESHAP FF, R7.B.VI; fugitive VOC – MACT CC, NSPS GGG, NSPS GGGa, R7.B.VI; cold cleaners – R7.C.II | Tanks (R7.B.I., R7.B.II., R7.B.IV., R7.B.V., R7.B.VI.), load-out (R7.B.IV., R7.B.VI., R7.B.VII.), remediation (R7.B.I., R7.B.II., R7.B.III.), wastewater (R7.B.VI.), fugitive VOC (R7.B.VI.), cold cleaner (R7.C.II.), boiler/engine (R7.E.III., R7.E.II.), and combustion equipment (R7.E.II.) requirements satisfy RACT |
| NOx | | | | 576.9 | 526.9 | Heaters, sulfur recovery, engines, boilers, flare | Heaters – MACT DDDDD, NSPS J, NSPS Ja, MACT CC, MACT GGG, MACT UUU, R7.E.II; sulfur recovery – NSPS J, MACT UUU; boilers – ultra low NOx burners, NSPS Ja, NSPS Db, MACT DDDDD, R7.E.II; engines – MACT ZZZZ, NSPS IIII, NSPS JJJJ, R7.E.II; flare – NSPS J, MACT GGG, R7.B.VI | |
| VOC | Phillips 66 Pipeline, Denver Terminal | 001-0015 | Petroleum marketing and storage terminal | 1,905.6 | 127.3 | Storage tanks, loading rack, tank cleaning, fugitive VOC | Tanks/loading rack – VCU, NSPS XX, NSPS K, NSPS Kb, MACT BBBBBB, R7.B.I, R7.B.III, R7.B.IV, R7.B.VII; fugitive VOC – MACT BBBBBB | Petroleum tank/terminal (R7.B.I., R7.B.III., R7.B.IV., R7.B.VII.) requirements satisfy RACT |
| VOC | Sinclair Transportation Company, Denver Products Terminal | 001-0019 | Petroleum products terminal | 165.5 | 96.5 | Storage tanks, tank truck loading rack, railcar loading/unloading rack, fugitive VOC | Tanks/loading rack – VCU, equipment maintenance, NSPS K, NSPS Ka, NSPS Kb, MACT BBBBBB, R7.B.I, R7.B.IV; truck loading –MACT BBBBBB, R7.B.IV; fugitive VOC – MACT BBBBBB | Petroleum tank/terminal (R7.B.I., R7.B.III., R7.B.IV., R7.B.VII.) requirements satisfy RACT |
| VOC | Elkay Wood Products Company | 001-1602 | Manufactures wood cabinets | 166.9 | 166.9 | Spray booths, surface coating | Flatline finishing system – filters, MACT JJ coatings – MACT JJ, HVLP, R7.C.I; fugitive VOC – R7.C.I | Wood coating and fugitive VOC (R7.C.I.) requirements satisfy RACT |

| Pollutant | Facility | AIRS ID | Facility purpose | Estimated emissions, uncon (tpy as of 12/2015) | Estimated emissions, actual (tpy as of 12/2015) | Major VOC or NOx emission points | Requirements | Summary conclusion |
|---|---|---|---|---|---|---|---|---|
| VOC | Corden Pharma Colorado, Inc. | 013-0025 | Pharmaceutical manufacturing | 375 | 12.55 | Pharmaceutical production, storage tanks, wastewater plant, cold cleaners | Pharmaceutical production – R7.C.V, MACT H, MACT I, MACT GGG; tanks – R7.B.I, R7.B.IV, MACT GGG; wastewater – MACT GGG, design; cold cleaners – R7.C.II | Pharmaceutical (R7.C.V.), storage tank (R7.B.I., R7.B.II.), and cold cleaner (R7.C.II.) requirements satisfy RACT |
| VOC | MillerCoors, LLC – Golden Brewery; Rocky Mountain Metal Container | 059-0006 | Produces malt beverages | 935.6 | 283.9 | Fermenting/brewing, bottling/packaging, wastewater, gasoline storage tanks, can production and coating | Fermenting/brewing – VOC duct to boilers, efficient process operation, good operating practices, R7.B.I, CO2 collection and counterbalance; bottling/packaging – pollution prevention, proper operation/maintenance, R7.B.I, glue VOC limit, R7.E.IV; wastewater treatment – submerged fill, R7.B.I; tanks – R7.B.IV; can coating – NSPS WW, MACT KKKK, R7.C.I, operating practices | Packaging (R7.E.IV.), wastewater (R7.E.IV., R7.B.I.), tank (R7.B.IV.), and can coating (R7.C.I.) requirements satisfy RACT |
| VOC | Ball Metal Beverage Container Corporation | 059-0010 | Produces aluminum cans and ends | 294.0 | 96.0 | Cold cleaners, can manufacturing and coating systems, storage tanks | Cold cleaners – R7.C.II; can coating – RTO, NSPS WW, R7.C.I; storage tanks – R7.B.I, NSPS Kb | Can coating (R7.C.I.), fugitive VOC (R7.C.I.), cold cleaner (R7.C.II.), and storage tank (R7.B.I.) requirements satisfy RACT |
| VOC | Anheuser-Busch, LLC, Fort Collins Brewery | 069-0060 | Produces malt beverages | 271.2 | 271.2 | Brewhouse, starting cellar, fermenting cellar, chip cellar and annex, finishing, packaging and shipping, wastewater, storage tanks | Brewing operations – efficient process operation; packaging/shipping – pollution prevention, R7.E.IV; wastewater – ethanol recovery, vapor recovery unit, submerged fill, R7.B.IV | Packaging (R7.E.IV.) and wastewater (R7.E.IV., R7.B.I., R7.B.IV.) requirements satisfy RACT |
| NOx | | | | 544 | 47.5 | 4 boilers | Boilers – R7.E.II | Boiler (R7.E.II.) requirements satisfy RACT |
| VOC | MMI/EtOH (with MillerCoors) | 059-0828 | Ethanol distillation | 20.0 | 7.18 | 2 surge drums, storage tank and load-out, fugitive VOC | Storage tank and load-out – vapor balance system, R7.B.I; equipment leaks – NSPS VV | Ethanol distillation (R7.B.I.) requirements satisfy RACT |
| VOC | Kodak Alaris | 123-0003 | Manufacture photographic supplies | 2,147.0 | 45.0 | Thermal medial manufacturing | Thermal media coating lines – RTO, MACT KK, R7.C.IV | Coating (R7.C.IV.) requirements satisfy RACT |

| Pollutant | Facility | AIRS ID | Facility purpose | Estimated emissions, uncon (tpy as of 12/2015) | Estimated emissions, actual (tpy as of 12/2015) | Major VOC or NOx emission points | Requirements | Summary conclusion |
|---|---|---|---|---|---|---|---|---|
| NOx | Denver Regional Landfill (South/North); Front Range Landfill; Timberline Energy | 123-0079 | Municipal solid waste disposal and landfill gas to energy facility | 123.59 | 63.5 | Landfill gas collection to engines or flares | Landfill gas collection – NSPS WWW, NSPS AAAA; engines – NSPS WWW, NSPS AAAA, MACT ZZZZ, NSPS JJJJ, R7.E.II., R7.E.III. | Landfill gas combustion (R7.E.II., R7.E.III.) requirements satisfy RACT |
| VOC | Metal Container Corporation | 123-0134 | Manufactures aluminum beverage cans | 245.3 | 245.3 | Can coating, storage tanks, cleaning solvents | Can coating – NSPS WW, R7.C.I.; cleaning solvents – R7.C.II | Can coating (R7.C.I.), fugitive VOC (R7.C.I.), storage tank (R7.B.I.), and cleaning solvent (R7.C.II) requirements satisfy RACT |
| VOC | Nutri-Turf Inc. (with Anheuser-Busch) | 123-0497 | Land application of brewery wastewater | 4,240.0 | 106.0 | Land application | Land application – evaporation, vegetative destruction, VOC content minimized through distillation process, R7.E.IV | Land application (R7.E.IV.) requirements satisfy RACT |
| SIC: Electric Services, Cement, Glass Containers, Construction Sand and Gravel, Steam and Air-Conditioning Supply, Photographic Equipment and Supplies | | | | | | | | |
| NOx | Public Service Company – Cherokee | 001-0001 | Electric generating facility | 5,338.3 | 5,338.3 | 2 coal fired boilers, emergency diesel generator, 2 gas turbines | Boilers – low NOx burners and over-fire air then shutdown or conversion to natural gas, R7.E.II; generator – MACT ZZZZ, R7.E.II; turbines – SCR, oxidation catalyst, NSPS KKKK, NSPS TTTT, MACT YYYY, R7.XVI | Boiler (R3.F.VI., R7.E.II.), turbine (R7.E.II.), and engine (R7.E.II., R7.E.III.) requirements satisfy RACT |
| NOx | Metro Wastewater Reclamation District; Suez Denver Metro | 001-0097 | Wastewater treatment | 133.4 | 64.3 | 2 gas/digester gas fired turbines, 4 digester gas fired generators, 4 flares, 3 gas fired boilers, 4 diesel fired emergency generators | Turbine/engine/boiler/flare – NOx limit, R7.E.II; turbines – NOx limit, fuel limit; digester gas engines – fuel limit, MACT ZZZZ; boilers – fuel limit; emergency engines – hour limit, MACT ZZZZ, NSPS IIII | Boiler, turbine, and engine (R7.E.II.) requirements satisfy RACT |
| NOx | Tri-State Generation and Transmission Association, Inc., Frank Knutson | 001-1349 | Electric generating facility | 244.1 | 9.78 | 2 gas/fuel oil fired turbines | Turbines – advanced low NOx combustion system, water injection, good combustion practices, catalytic oxidizer, R7.E.II I | Turbine (R7.E.II.) requirements satisfy RACT |
| NOx | Buckley Air Force Base | 005-0028 | Military | 418.6 | 122.5 | 28 diesel/biodiesel fired generators, jet engine test cell | Generators – NOx limit, power production limit, hour limit, MACT ZZZZ, NSPS IIII, R7.E.II, R7.E.III; jet engine test cell – NOx limit, engine test limit | Engine (R7.E.III., R7.E.II.) requirements satisfy RACT |

| Pollutant | Facility | AIRS ID | Facility purpose | Estimated emissions, uncon (tpy as of 12/2015) | Estimated emissions, actual (tpy as of 12/2015) | Major VOC or NOx emission points | Requirements | Summary conclusion |
|---|---|---|---|---|---|---|---|---|
| NOx | Public Service Company, Valmont | 013-0001 | Electric generating facility | 4,088.2 | 2,068.9 | Coal fired boiler, gas turbine, gas fired auxiliary boiler, emergency diesel engine | Coal boiler – low NOx burner and over-fire air then shutdown, R7.E.II; turbine – fuel oil limit, R7.E.II; gas boiler – low NOx burners, MACT DDDDD, R7.E.II; generator – MACT ZZZZ, R7.XVI | Boiler (R3.F.VI.) and turbine, engine, and boiler (R7.E.II.) requirements satisfy RACT |
| NOx | Cemex Construction Materials, Lyons | 013-0003 | Manufacturers Portland cement | 1,050.8 | 1,050.8 | Raw material dryer, kiln, cold cleaners, gasoline storage tanks | Dryer – process design, MACT LLL; kiln – process design, fuel consumption, SNCR, MACT LLL; cold cleaners – R7.C.II; storage tank – R7.B.III., R7.B.IV | Dryer/kiln (R3.F.VI., R7.E.III.), cold cleaner (R7.C.II.), and storage tank (R7.C.III., R7.C.IV.) requirements satisfy RACT |
| VOC | | | | 282.8 | 5.0 | | | |
| NOx | IBM CORP | 013-0006 | Computer services | 146.65 | 122.0 | 38 diesel fired emergency engines, 3 gas/diesel/jet fuel fired boilers, 1 gas/distillate oil fired boiler | Engines – fuel limits, MACT JJJJJJ, MACT ZZZZ, NSPS IIII, NSPS Dc, good combustion practices, R7.E.II; boilers – fuel limits, MACT JJJJJJ, NSPS Dc, low NOx burners, R7.E.II | Boiler and engine (R7.E.II., R7.E.II I.) requirements satisfy RACT |
| NOx | University of Colorado | 013-0553, 013-0019 | Electricity and steam generation | 158.5 | 95.6 | 2 gas/oil fired turbines, 2 gas/oil backup boilers, 4 gas/oil boilers | Turbines – steam injection, duct burners, fuel limits, NSPS GG, NSPS Dc, R7.E.II; backup boilers – fuel limits, R7.E.II; boilers – NOx limits, fuel limit, NSPS Dc, NSPS Db, R7.E.II | Turbine and boiler (R7.E.II.) requirements satisfy RACT |
| NOx | Public Service Company, Zuni | 031-0007 | Steam generation | 2,074.1 (gas), 2,536.5 (oil) | 49.4 | 3 gas/oil fired boilers, diesel emergency engine | Boilers – fuel oil limit, R7.E.II; engine – MACT ZZZZ, R7.E.II | Boiler and engine (R7.E.II.) requirements satisfy RACT |
| NOx | Public Service Company, Denver Steam | 031-0041 | Industrial steam boilers | 181.9 | 181.9 | 2 gas/oil fired steam boilers | Boilers – fuel oil consumption limit, R7.E.II | Boiler (R7.E.II.) requirements satisfy RACT |
| NOx | Rocky Mountain Bottle Company | 059-0008 | Produces container glass | 351.8 | 351.8 | 3 gas-fired glass melt furnaces, emergency generator | Furnaces – glass production limit, NSPS CC, R7.E.II; generator – MACT ZZZZ, R7.XVI | Furnace and engine (R7.E.II.) requirements satisfy RACT |
| NOx | Texas Industries (TXI) Operations | 059-0409 | Shale quarry | 117.7 | 117.7 | Rotary kiln, diesel emergency generator | Kiln – fuel limit, shale processing limit, NSPS UUU, R7.E.II; generator – MACT ZZZZ, R7.E.II | Kiln and engine (R7.E.II.) requirements satisfy RACT |
| NOx | Colorado Energy Nations Company, LLC | 059-0820 | Electricity and steam generation | 636.5 | 636.5 | 5 gas/oil/coal/ethanol fired boilers, diesel engine | 2 oil/gas fired boilers – tuning, R7.E.II; coal fired stoker boiler – NOx limit, R7.E.II; 2 oil/gas/coal/ethanol fired boilers – NOx limit, R7.XVI; engine – operation limit, R7.E.II | Boiler and engine (R7.E.II., R3.F.VI.) requirements satisfy RACT |
| NOx | Plains End, LLC | 059-0864 | Electric generating facility | 141.0 | 26.3 | 34 gas fired engines, 2 diesel emergency engines | Gas engines – SCR, oxidation catalyst, fuel limit, R7.E.II, MACT ZZZZ, NSPS JJJJ; emergency engines – MACT ZZZZ, NSPS IIII, R7.E.II | Engine (R7.E.II., R7.E.III.) |
| VOC | | | | 272.4 | 19.5 | | | |

| Pollutant | Facility | AIRS ID | Facility purpose | Estimated emissions, uncon (tpy as of 12/2015) | Estimated emissions, actual (tpy as of 12/2015) | Major VOC or NOx emission points | Requirements | Summary conclusion |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | requirements satisfy RACT |
| NOx | Colorado State University | 069-0011 | Electricity and steam generation | 123.4 | 123.4 | 3 gas/oil fired boilers, 2 gas fired boilers, 23 emergency engines | Gas/oil fired boilers – fuel consumption, R7.XVI.; Gas boilers – fuel consumption, low NOx burners, NSPS Dc, R7.E.II.; engines – NSPS IIII, NSPS JJJJ, R7.E.II., R7.E.III. | Boiler and engine (R7.E.II., R7.E.III.) requirements satisfy RACT |
| NOx | Public Service Company, Fort Lupton | 123-0014 | Electricity and steam generation | 2,032 (gas), 5,057 (oil) | 48.4 | 2 gas/oil fired turbines | Turbines – peaking unit, R7.E.II | Turbine (R7.E.II.), requirements satisfy RACT |
| NOx | Public Service Company, Fort Saint Vrain | 123-0023 | Electric generating facility | 1,238.0 | 391.3 | 2 gas turbines, 3 gas turbines with HRSG and duct burners, auxiliary gas boiler, 2 emergency diesel engines | 2 turbines – dry low NOx burners, fuel limit, NSPS Da, NSPS GG, NSPS KKKK, R7.XVI; turbine/heat recovery generator – dry low NOx burners/SCR, NSPS GG, R7.E.II; 2 turbines – advanced dry low NOx combustion system, R7.E.II; boiler – gas limit, R7.E.II; emergency engines – MACT ZZZZ, R7.E.II | Turbine, boiler and engine (R7.E.II.) requirements satisfy RACT |
| NOx | Thermo Power and Electric, Inc. | 123-0126 | Cogeneration of electricity and steam | 350.0 | 70.0 | 2 gas combustion turbines, 2 emergency diesel engines | Turbines – steam injection, gas limit, NSPS GG; engines – MACT ZZZZ | Source is no longer operating |
| NOx | Public Service Company, Yosemite | 123-0141 | Electricity and steam generation | 122.81 | 51.0 | 6 gas engines, 2 gas emergency engines | Engines – low NOx design, oxidation catalyst, R7.E.II; emergency engines – MACT ZZZZ, R7.E.II | Engine (R7.E.II.) requirements satisfy RACT |
| NOx | Thermo Cogeneration Partnership, L.P., JM Shafer | 123-0250 | Cogeneration of electricity and steam | 282.0 | 282.0 | 5 gas fired turbines, 2 diesel fired emergency engines | Turbines – enhanced steam injection, duct burner, good combustion control, R7. .E.II; engines – MACT ZZZZ, fuel limits, R7.E.II | Turbine and engine (R7.XVI.) requirements satisfy RACT |
| NOx | Public Service Company, Rocky Mountain Energy Center | 123-1342 | Electricity and steam generation | 252.58 | 69.0 | 2 gas turbines, 2 diesel emergency engines, auxiliary boiler | Turbines – DLN combustion system and SCR, oxidation catalyst, R7.E.II; boiler – low NOx burners, R7.E.II; engines – MACT ZZZZ, R7.E.II | Turbine, boiler, and engine (R7.E.II.) requirements satisfy RACT |
| NOx | Owens-Brockway Glass, Tumbleweed | 123-4406 | Glass container manufacturing facility | 231.9 | 231.9 | Glass container manufacturing operations, emergency diesel engines | Glass manufacturing - 2 glass melt furnaces oxy-fuel gas fired, glass production limit, NSPS CC, R7.E.II; engines – NSPS IIII, hour limits, R7.E.II | Furnace, heater, and engine (R7.E.II.) requirements satisfy RACT |
| NOx | Spindle Hill Energy, LLC | 123-5468 | Peaking utility electric power generation facility | 118.7 | 118.7 | 2 combustion turbines, gas heater, diesel engine | Turbines – dry low NOx combustion system and water injection, NSPS KKKK, R7.E.II; heater – NSPS Dc, R7.E.II; engine – MACT ZZZZ, NSPS IIII, R7.E.II | Turbine and engine (R7.E.II, R7.E.III.) and heater (R7.E.II.) requirements satisfy |

| Pollutant | Facility | AIRS ID | Facility purpose | Estimated emissions, uncon (tpy as of 12/2015) | Estimated emissions, actual (tpy as of 12/2015) | Major VOC or NOx emission points | Requirements | Summary conclusion |
|---|---|---|---|---|---|---|---|---|
| NOx | Carestream Health, Inc. | 123-6350 | Photographic film and paper manufacturer | 133.0 | 133.0 | 2 gas fired boilers | Boilers – fuel consumption limit, R7.E.II | Boiler (R7.E.II.) requirements satisfy |
| SIC: Natural Gas Transmission, Crude Petroleum and Natural Gas, Natural Gas Liquids | | | | | | | | |
| NOx | Colorado Interstate Gas, Latigo | 005-0055 | Compressor station | 174.9 | 174.9 | 7 gas fired engines, process heater | Engines – fuel limit, R7.E.II, MACT ZZZZ, R7.E.II; process heater – MACT DDDDD, R7.E.II | Engine and heater (R7.E.II.) requirements satisfy RACT |
| VOC | Colorado Interstate Gas, Watkins | 001-0036 | Compressor station | 102.2 | 26.0 | 11 gas fired engines, process heaters, gasoline storage tank, cold cleaners | Engines –R7.XVI; process heater – MACT DDDDD, R7.E.II; storage tank – vapor control system, submerged fill, R7.B.III, R7.B.IV; cold cleaners – R7.C.II | Engine and heater (R7.E.II.), tank (R7.B.III., R7.B.IV.), and cold cleaner (R7.C.II.) requirements satisfy RACT |
| NOx | | | | 398.5 | 398.5 | | | |
| VOC | DCP Midstream, Enterprise | 123-0277 | Compressor station | 115.8 | 115.8 | 6 gas fired engines, 2 TEG dehydration units, 8 condensate storage tanks, truck load-out | Engines – oxidation catalyst, R7.E.II, fuel limit, NSPS JJJJ, MACT ZZZZ; dehy – flare, R7.D.I, MACT HH; tanks – enclosed combustor, load-out, condensate throughput limit, control device, R7.B.I., R7.D.I | Engine (R7.E.II.), dehy (R7.D.I.), and tank/load-out (R7.B.I., R7.D.I.) requirements satisfy RACT |
| NOx | | | | 105.1 | 105.1 | | | |
| VOC | DCP Midstream, Greeley | 123-0099 | Natural gas processing plant | 295.2 | 83.6 | 10 gas fired engines, 2 hot oil heaters, EG dehydration unit, NGL load-out, fugitive VOC | Engines – NSCR and air/fuel ratio controller, R7.E.II, fuel limit; heaters – NSPS Dc, fuel limits, R7.E.II; dehy – gas limit, R7.D.I; load-out – NGL loaded limit, R7.B.I; fugitive VOC – NSPS KKK, R7.D.I. | Engine (R7.E.II., R7.E.III.), dehy (R7.D.I.), heaters (R7.E.II.), load-out (R7.B.I.), and fugitive VOC (R7.D.I.) requirements satisfy RACT |
| NOx | | | | 252.0 | 185.4 | | | |
| VOC | DCP Midstream, Marla | 123-0243 | Compressor station | 500.5 | 88.7 | 6 gas fired engines, 2 TEG dehydration units | Engines – NSCR and air/fuel ratio controller, R7.E.II, gas limit, MACT ZZZZ; dehy units – condenser and flare, MACT HH, R7.D.I | Engine (R7.E.II.) and dehy (R7.D.I.) requirements satisfy RACT |
| NOx | | | | 178.8 | 178.8 | | | |
| VOC | DCP Midstream, Platteville | 123-0595 | Natural gas processing plant | 181.5 | 152.1 | 9 gas fired engines, EG dehydration unit, hot oil heater, fugitive VOC | Engines – NSCR and air/fuel ratio controller, R7.E.II, gas limit, MACT ZZZZ, NSPS JJJJ; dehy – vented back into process, gas processing limit, glycol recirculation rate; hot oil heater – gas limit, R7.E.II; fugitive VOC – NSPS KKK, R7.D.I. | Engine and heater (R7.E.II.), dehy (R7.D.I.), and fugitive VOC (R7.D.I.) requirements satisfy RACT |
| NOx | | | | 565.2 | 233.8 | | | |

| Pollutant | Facility | AIRS ID | Facility purpose | Estimated emissions, uncon (tpy as of 12/2015) | Estimated emissions, actual (tpy as of 12/2015) | Major VOC or NOx emission points | Requirements | Summary conclusion |
|---|---|---|---|---|---|---|---|---|
| VOC | DCP Midstream, Roggen | 123-0049 | Natural gas processing plant | 2,511.4 | 191.3 | 13 gas fired engines, hot oil heater, condensate tanks and load-out, 2 TEG dehydration units, fugitive VOC | Engines – NSCR and air/fuel ratio controller, catalyst, R7.E.II, fuel limit; heater – fuel limit, NSPS Dc; tanks/load-out – condensate throughput limit, load-out limit, flare, R7.B.I, R7.D.I; dehy – gas processed limit, RTO, loop system, R7.D.I, MACT HH; fugitive VOC – NSPS KKK, R7.D.I. | Engine and heater (R7.E.II.), dehy (R7.D.I.), tank/load-out (R7.B.I., R7.D.I.), and fugitive VOC (R7.D.I.) requirements satisfy RACT |
| NOx | | | | 959.7 | 205.1 | | | |
| VOC | DCP Midstream, Spindle | 123-0015 | Natural gas processing plant | 361.8 | 134.4 | 12 gas fired engines, TEG dehydration unit, hot oil heater, condensate tanks and load-out , fugitive VOC | Engines – NSCR with air/fuel ratio controller, oxidation catalyst with air/fuel ratio controller, parameter monitoring, fuel limit, R7.E.II, MACT ZZZZ; dehy – condenser reboiler/flare, gas processed limit, R7.D.I, MACT HH; hot oil heater – fuel limit; tanks/load-out – condensate throughput limit, R7.B.I, R7.D.I; fugitive VOC – NSPS KKK, R7.D.I. | Engine (R7.E.II., R7.E.III.), heater (R7.E.II.), dehy (R7.D.I.), tank/load-out (R7.B.I., R7.D.I.), and fugitive VOC (R7.D.I.) requirements satisfy RACT |
| NOx | | | | 284.3 | 284.3 | | | |
| VOC | DCP Midstream, Lucerne | 123-0107 | Natural gas processing plant | 158.0 | 84.8 | 10 gas fired engines, regeneration boiler, 2 amine regeneration heaters, 2 gas fired turbines, hot oil heater, TEG dehydration unit, condensate tanks and load-out, fugitive VOC | Engines – NSCR with air/fuel ratio controller, R7.E.II; boiler – gas limit; amine heaters – low NOx burners, gas limit, NSPS Dc, R7.E.II; turbines – low NOx burners, waste heat recovery unit, NSPS KKKK, R7.E.II; dehy – R7.D.I, MACT HH, condenser, enclosed combustor; tanks – enclosed combustor, NSPS Kb, R7.D.I.; load-out – enclosed combustor, R7.B.I; fugitive VOC – NSPS KKK, NSPS OOOO, R7.D.I. | Engine, boiler, turbine, and heater (R7.E.II.), dehy (R7.D.I.), tank/load-out (R7.B.I., R7.D.I.), and fugitive VOC (R7.D.I.) requirements satisfy RACT |
| NOx | | | | 345.9 | 135.5 | | | |
| VOC | DCP Midstream, Kersey/Mewbourne | 123-0090 | Natural gas processing plant | 961.1 | 110.2 | 9 gas fired engines, TEG dehydration unit, hot oil heater, condensate tanks/load-out, 4 gas fired turbines, amine regeneration, fugitive VOC | Engines – NSCR with air/fuel ratio controller, oxidation catalyst, low emissions design, fuel limits, R7.E.II; dehy – R7.D.I, MACT HH; heaters – ultra low NOx combustion system, fuel limit, NSPS Dc, R7.E.II; tanks/load-out – R7.B.I, R7.D.I; turbines – dry low NOx combustion system, fuel limit, NSPS KKKK, R7.E.II; fugitive VOC – NSPS KKK, R7.D.I | Engine (R7.E.II, R7.E.III.), heater and turbine (R7.E.II.), dehy (R7.D.I.), tank/load-out (R7.B.I., R7.D.I.), and fugitive VOC (R7.D.I.) requirements satisfy RACT |
| NOx | | | | 267.8 | 90.1 | | | |

| Pollutant | Facility | AIRS ID | Facility purpose | Estimated emissions, uncon (tpy as of 12/2015) | Estimated emissions, actual (tpy as of 12/2015) | Major VOC or NOx emission points | Requirements | Summary conclusion |
|---|---|---|---|---|---|---|---|---|
| VOC | Kerr-McGee Gathering, Frederick | 123-0184 | Compressor station | 652.6 | 89.0 | 11 engines, 2 TEG dehydration units, storage tanks, truck load-out | Engines – oxidation catalyst, thermal oxidizer, NSCR, MACT ZZZZ, R7.E.II; dehys – thermal oxidizer, R7.D.I, R7.E.II I, MACT HH; tanks/load-out – closed loop, enclosed flare, submerged fill, MACT HH, R7.B.I, R7.D.I. | Engine (R7.E.II.), dehy (R7.D.I.), and tank/load-out (R7.B.I., R7.D.I.) requirements satisfy RACT |
| NOx | | | | 220.9 | 109.5 | | | |
| VOC | Kerr-McGee Gathering, Hudson | 123-0048 | Compressor station | 471.5 | 84.8 | 12 engines, 2 TEG dehydration units, amine regenerators/heaters, truck load-out (backup) | Engines – oxidation catalyst, NSCR, MACT ZZZZ, NSPS IIII, R7.E.II, R7.E.II I; dehys – condenser, flare, integral control loop; regenerators/heaters – low or ultra low NOx; truck load-out – submerged fill, R7.B.I | Engine and heater (R7.E.II.), load-out (R7.B.I.), and dehy (R7.D.I.) requirements satisfy RACT |
| NOx | | | | 273.2 | 273.2 | | | |
| VOC | Kerr-McGee Gathering, Fort Lupton/Platte Valley/Lancaster | 123-0057 | Natural gas processing plant | 2,109.5 | 232.7 | 23 engines, 2 TEG dehydration units, 13 amine heaters, hot oil heater, gas turbine, fugitive VOC | Engines – oxidation catalyst, NSCR, MACT ZZZZ, NSPS IIII; dehys – thermal oxidizer, MACT HH, R7.E.II, R7.E.III; amine heaters – low NOx burners, flue gas recirculation with smart flame, NSPS Dc, R7.E.II; hot oil heater – low NOx design, R7.E.II; turbine – low NOx design, NSPS GG, R7.E.II I; fugitive VOC – NSPS KKK, R7.D.I | Engine and heater (R7.E.II.), dehy (R7.D.I.), turbine (R7.E.II.), and fugitive VOC (R7.D.I.) requirements satisfy RACT |
| NOx | | | | 282.0 | 282.0 | | | |
| VOC | WGR Asset Holding, Wattenberg | 001-0025 | Natural gas processing plant | 165.9 | 157.3 | 5 engines, 5 heaters, gas boiler, gas turbine, dehydration unit, flare, storage tanks, load-out, fugitive VOC | Engines – oxidation catalyst, low NOx design, NSPS Dc, R7.E.II; heaters – fuel consumption, NSPS Dc, MACT DDDDD, R7.E.II; boiler – fuel consumption, NSPS Dc, MACT DDDDD, R7.E.II; turbine – fuel consumption, NSPS Dc, NSPS GG, R7.E.II; dehy – thermal oxidizer, MACT HH, R7.XII; flare – NSPS A; tanks – MACT HH; loadout – enclosed flare, R7.B.I, R7.B.II, R7.B.IV; fugitive VOC – NSPS KKK, R7.D.I. | Engine, boiler, and heater (R7.E.II.), dehy (R7.D.I.), fugitive VOC (R7.D.I.), tank/loadout (R7.B.I., R7.B.IV.), and turbine (R7.E.II.) requirements satisfy RACT |
| NOx | | | | 691.5 | 691.5 | | | |

## APPENDIX 6-E – MAJOR SOURCES (> 50 TPY, EFFECTIVE 1/27/2020) OF VOC AND/OR NOX EMISSIONS IN COLORADO OZONE NONATTAINMENT AREA

| Pollutant | Facility | AIRS ID | Facility purpose | Estimated emissions, uncon (tpy as of 1/2020) | Estimated emissions, actual (tpy as of 1/2020) | Major VOC or NOx emission points | Requirements | Summary conclusion |
|---|---|---|---|---|---|---|---|---|
| SIC: Asphalt Felts and Coatings, Petroleum Bulk Stations and Terminals, Lumber and Wood Products Except Furniture, Health Services, Rubber and Miscellaneous Plastics Products, Printing Publishing, Communications, Chemicals and Allied Products, Electric Services, Gasoline Service Station, Refuse Systems, Sewage Systems, Fabricated Metal Products, Measuring Analyzing and Controlling Instruments, Food and Kindred Products, Transportation by Air, Stone Clay Glass and Concrete Products, Transportation Equipment, Electronic Components, Primary Metal Industries, Wholesale Trade-Nondurable Goods | | | | | | | | |
| VOC | Owens Corning Denver Roofing Plant | 001-0009 | Asphalt felts and coatings | 70.3 | 70.3 | Boiler, 2 asphalt heater, 2 hot oil heating systems, storage tanks | Facility – NSPS UU, NESHAP AAAAAAA | Source is obtaining permit limits < 50 tpy |
| VOC | Magellan Pipeline Terminals – Aurora Terminal | 001-0014 | Petroleum bulk stations and terminals | 2,690.1 | 160.2 | 17 storage tanks, truck loading rack, enclosed flare | Storage tanks R7.B.IV., NSPS K, NSPS Kb; loading rack – R7.B.IV., NSPS XX, MACT BBBBBB | Storage tank and bulk terminal (R7.B.IV.) requirements satisfy RACT |
| NOx | University of Colorado Denver Anshutz Medical Campus | 001-0106 | General medical and surgical hospitals | 50.2 | 50.2 | 6 gas/oil fired boilers, 12 diesel emergency generators | Gas/oil fired boilers – low NOx burners, flue gas recirculation, NSPS, NSPS Db, Dc, R7.E.II; engines – hour limit, NSPS IIII, MACT ZZZZ, R7.E.III | Boiler and engine (R7.E.II., R7.E.III.) requirements satisfy RACT |
| VOC | Intertape Polymer Corporation | 001-0195 | Unsupported plastics film and sheet | 1,218.5 | 37.4 | Film coating line, cold cleaner solvent | Coating line – MACT JJJJ, NSPS RR, R7.IX.; cleaning solvent – R7.C.II. | Plastic-film coating (R7.C.I.), fugitive VOC (R7.C.I), and cleaning solvent (R7.C.II.) requirements satisfy RACT |
| VOC | Frederick Printing | 001-0262 | Printing | 9.8 | 9.8 | 7 sheetfed printing presses | Printing – R7.C.IV. | Printing (R7.C.IV.) requirements satisfy RACT |
| NOx | Qwest Corporation – Zuni | 001-0503 | Telephone Communications | 4.2 | 4.2 | 14 diesel emergency generators, 2 natural gas boilers | 13 diesel generators – R7.E.II; 1 diesel generator – R7.E.II, NSPS IIII; 2 natural gas boilers – R7.E.II | Boiler and engine (R7.E.II., R7.E.III.) requirements satisfy RACT |

| Pollutant | Facility | AIRS ID | Facility purpose | Estimated emissions, uncon (tpy as of 1/2020) | Estimated emissions, actual (tpy as of 1/2020) | Major VOC or NOx emission points | Requirements | Summary conclusion |
|---|---|---|---|---|---|---|---|---|
| VOC | Atlas Roofing Corporation | 001-0505 | Plastics foam products | 28.6 | 28.6 | Storage and blending tanks, hydraulic mixer, drying tunnel, trim saws | Foam manufacturing operations – R7.E.V | Foam manufacturing (P7.E.V.) requirements satisfy RACT |
| VOC | Insulfoam | 001-0560 | Plastics foam products | 50.8 | 50.8 | Pre-expander and 12 aging bags, block mold | Foam manufacturing operations – R7.E.V | Foam manufacturing (P7.E.V.) requirements satisfy RACT |
| VOC | ACH Foam Technologies | 001-0576 | Plastics foam products | 84.0 | 84.0 | Pre-expander, drum expander, belt expander, block mold | Foam manufacturing operations – R7.E.V | Foam manufacturing (P7.E.V.) requirements satisfy RACT |
| VOC | BASF | 001-1239 | Adhesives and sealants | 132.5 | 67.8 | Storage and process tanks, liquid ring vacuum pumps, rotary vane vacuum pumps | Storage tanks – R7.B.I; solvent use – R7.C.II | Storage tank (R7.B.I.) and solvent use (R7.C.II.) requirements satisfy RACT |
| VOC | TruStile Doors | 001-1295 | Millwork | 10.6 | 10.6 | Paint booth | Coating – R7.B.III | Source is obtaining permit limits < 50 tpy |
| VOC | Coblaco Services | 001-1316 | Coating, engraving, and allied services | 13.7 | 13.7 | Paint booth | Coating – R7.C.I | Metal coating (R7.C.I.) requirements satisfy RACT |
| VOC | Rocky Mountain Prestain | 001-1336 | Wood preserving | 12.6 | 12.6 | Surface coating and paint booth | Surface coating and paint booth – R7.B.III, R7.C.I | Source is obtaining permit limits < 50 tpy |

| Pollutant | Facility | AIRS ID | Facility purpose | Estimated emissions, uncon (tpy as of 1/2020) | Estimated emissions, actual (tpy as of 1/2020) | Major VOC or NOx emission points | Requirements | Summary conclusion |
|---|---|---|---|---|---|---|---|---|
| NOx | Public Service Company – Blue Spruce Energy Center | 001-1354 | Electric services | 67.5 | 67.5 | 2 combustion turbines, diesel emergency engine | Turbines – dry low NOx combustion system and water injection, NSPS GG, R7.E.II; engine – MACT ZZZZ, R7.E.II | Turbine and engine (R7.E.II.) requirements satisfy RACT |
| VOC | Costco | 001-1656 | Gasoline service station | 35.7 | 9.1 | 3 underground storage tanks | Storage tanks – R7.B.IV | Storage tank (R7.B.IV.) requirements satisfy RACT |
| NOx | Waste Management of Colorado – Denver Arapahoe Disposal Site | 005-1291 | Municipal solid waste landfill | 100.9 | 100.9 | Landfill gas collection to 4 engines or flare | Landfill gas collection – EG Cc, NSPS AAAA; engines – EG Cc, MACT ZZZZ, NSPS AAAA | Landfill gas combustion and engine (R7.E.II.) requirements satisfy RACT |
| NOx | Comcast Digital Media Center | 005-1453 | Cable and other pay television services | 25.1 | 25.1 | 12 diesel emergency generators | 6 generators – R7.E.II; 6 generators – R7.E.II, NSPS IIII | Engine (R7.E.II.) requirements satisfy RACT |
| NOx | Boulder Wastewater Treatment Plant | 013-0057 | Sewerage systems | 42.5 | 42.5 | Digester gas fired flare, 2 digester gas fired engines, dual-fuel fired boiler | RACT analysis by 7/2020 | Source is obtaining permit limits < 50 tpy |
| VOC | Ball Aerospace and Tech – Boulder Campus | 013-0084 | Aeronautical | 10.9 | 10.9 | Metal finishing, metal surface coating | Coating – R7.B.III, R7.C.I | Metal coating (R7.C.I.) requirements satisfy RACT |
| NOx | Astrazeneca – Longmont | 013-0626 | Pharmaceutical preparations | 7.2 | 2.5 | 4 natural gas fired boilers, 6 diesel emergency generators | Boilers – R7.E.II, NSPS Dc; generators – R7.E.II, MACT ZZZZ | Boiler and engine (R7.E.II.) requirements satisfy RACT |

| Pollutant | Facility | AIRS ID | Facility purpose | Estimated emissions, uncon (tpy as of 1/2020) | Estimated emissions, actual (tpy as of 1/2020) | Major VOC or NOx emission points | Requirements | Summary conclusion |
|---|---|---|---|---|---|---|---|---|
| VOC | Circle Graphics | 013-1303 | Printing | 407.8 | 55.2 | 29 printing presses, 7 waterbased ink printing presses, 7 UV printing presses, regenerative thermal ozidizer, corona treater, 5 water based adhesive coaters | Printing – R7.B.III | Source is obtaining permit limits < 50 tpy |
| NOx | SWG Colorado – Valmont Station | 013-1460 | Electric services | 0.3 | 0.3 | 2 combustion turbines | Turbines –water injection, NSPS GG, R7.E.II | Turbine (R7.E.II.) requirements satisfy RACT |
| VOC | Sandoz | 014-0110 | Pharmaceutical preparations | 2.1 | 2.1 | Bulk pharmaceutical production, regenerative thermal oxidizer, packaging and printing | Storage tanks – R7.B.I; pharmaceutical manufacturing – R7.C.V | Storage tank (R7.B.I.) and pharmaceutical (R7.C.V.) requirements satisfy RACT |
| NOx | SWG Arapahoe – Arapahoe Station | 031-0008 | Electric services | 25.9 | 25.9 | 2 combustion turbines | Turbines – selective catalytic reduction, catalytic oxidation, water injection, NSPS GG, R7.E.II | Turbine and engine (R7.E.II) requirements satisfy RACT |
| NOx | Nestle Purina | 031-0042 | Dog and cat food | 27.2 | 27.2 | 2 boilers, 2 emergency generators, dryers | Boilers – R7.E.II, NSPS Dc; engines – R7.E.II; dryers – R7.E.II | Boiler, engine, and dryer (R7.E.II) requirements satisfy RACT |
| VOC | Upsher-Smith Laboratories | 031-0485 | Pharmaceutical preparations | 71.0 | 11.1 | Pharmaceutical production, regenerative thermal oxidizer | Pharmaceutical manufacturing – R7.C.V | Pharmaceutical (R7.C.V.) requirements satisfy RACT |
| NOx | City and County of Denver – DIA | 031-1260 | Airport | 54.5 | 54.5 | 11 natural gas fired boilers, 5 diesel generators, MACT ZZZZ | Boilers – R7.E.II, NSPS Dc; engines – R7.E.II | Boiler and engine (R7.E.II) requirements satisfy RACT |

| Pollutant | Facility | AIRS ID | Facility purpose | Estimated emissions, uncon (tpy as of 1/2020) | Estimated emissions, actual (tpy as of 1/2020) | Major VOC or NOx emission points | Requirements | Summary conclusion |
|---|---|---|---|---|---|---|---|---|
| NOx | Cyxtera Communications | 035-0414 | Telephone communications | 19.7 | 19.7 | 13 diesel emergency generators | 13 generators – R7.E.II, MACT ZZZZ | Engine (R7.E.II.) requirements satisfy RACT |
| NOx | CoorsTek | 059-0007 | Porcelain electrical supplies | 30.4 | 30.4 | 5 kilns | Kilns – R7.E.II | Kiln (R7.E.II.) requirements satisfy RACT |
| NOx | Public Service Company – Lookout Center | 059-0059 | Electric services | 25.4 | 25.4 | 3 diesel emergency generators | Generators – R7.E.II | Source is obtaining permit limits < 50 tpy |
| NOx | CoorsTek | 059-0066 | Porcelain electrical supplies | 42.6 | 42. | 18 kilns, 5 dryers, burnout oven, 7 electric vacuum furnaces, jet mill boiler | Kilns and dryers – R7.E.II | Kiln and dryer (R7.E.II.) requirements satisfy RACT |
| VOC | Coors Brewing Company Endline Plant | 059-0444 | Metal cans | 17.1 | 17.1 | 4 coating lines, 5 cold cleaners | Can coating – NSPS WW, R7.C.IX.; cleaning solvents – R7.C.IIX | Can coating (R7.C.IX.) and cleaning solvent (R7.C.X.II) requirements satisfy RACT |
| VOC | Wastequip Manufacturing Company | 059-0774 | Metal stampings | 16.6 | 16.6 | Paint booth | Coating – R7.B.III, R7.C.I | Metal coating (R7.C.I. requirements satisfy RACT.Source is obtaining permit limits < 50 tpy |
| VOC | Gunslinger Custom Paint | 059-1496 | Motorcycles, bicycles, and parts | 25.1 | 25.1 | 8 paint booths | Coating – R7.B.III, R7.C.I | Metal coating (R7.C.I. requirements satisfy RACT. Source is obtaining permit limits < 50 tpy |

| Pollutant | Facility | AIRS ID | Facility purpose | Estimated emissions, uncon (tpy as of 1/2020) | Estimated emissions, actual (tpy as of 1/2020) | Major VOC or NOx emission points | Requirements | Summary conclusion |
|---|---|---|---|---|---|---|---|---|
| NOx | Centura Health St. Anthony | 059-1511 | General medical and surgical hospitals | 19.7 | 19.7 | 3 boilers, 2 emergency generators | Boilers – R7.E.II., NSPS Dc; engines – R7.E.II., NSPS IIII | Boiler and engine (R7.E.II.) requirements satisfy RACT |
| VOC | Avago Technologies | 069-0030 | Electronic components | 149.7 | 149.7 | 6 boilers, 2 regenerative thermal oxidizers, recuperative thermal oxidizer, emergency generators, solvent use | Boilers – R7.E.II, NSPS Dc; generator – R7.E.II; solvent use – R7.C.II | Boiler and engine (R7.E.II.) and solvent use (R7.C.II.) requirements satisfy RACT. |
| NOx | | | | 25.6 | 25.6 | | | |
| NOx | Leprino Foods | 123-0002 | Natural, processed, and imitation cheese | 58.1 | 58.1 | 3 boilers, 3 dryers, 3 generators, flare, 2 turbines | Boilers – R7.E.II, NSPS Dc; dryers – R7.E.II; generators – R7.E.II, NSPS IIII; turbines – R7.E.II, NSPS KKKK | Boiler, dryer, engine, and turbine (R7.E.II.) requirements satisfy RACT |
| NOx | Swift Beef | 123-0018 | Meat packing plant | 106.5 | 82.4 | 5 boilers, 2 dryers, rendering cookers, rendering presses | Boilers and dryers – R7.E.II | Boiler and dryer (R7.E.II.) requirements satisfy RACT |
| VOC | Boulder Scientific Company – Mead Facility | 123-0070 | Chemical and chemical preparations | 42.15 | 42.15 | Chemical manufacturing reactors, storage vessels, dryer, process equipment | Storage tanks – R7.B.I; facility – MACT VVVVVV | Source is obtaining permit limit < 50 tpy |
| VOC | Golden Aluminum | 123-0089 | Secondary smelting and refining of nonferrous metals | 2,757.6 | 68.6 | Delacquiring kiln, melters, annealing furnaces, rolling mills, coil coating, diesel emergency engine | Coil coating – NSPS TT, R7.C.I. | Coil coating (R7.C.I.), fugitive VOC (R7.C.I.), and engine and melter (R7.E.II.) requirements satisfy RACT |
| NOx | | | | 23.9 | 23.9 | | Engine – R7.E.II, MACT ZZZZ; furnaces and melters – R7.E.II | |
| VOC | Northern Priming and Prestain, Inc. | 123-0140 | Hardwood veneer and plywood | 4.9 | 4.9 | Surface coating and paint booth | Surface coating and paint booth – R7.B.III, R7.C.I | Wood coating (R7.C.I.) requirements satisfy RACT |
| VOC | Greeley Energy Facility | 123-0412 | Electric services | 0 | 0 | Natural gas fired turbine | Turbine – R7.E.II, NSPS GG | |

| Pollutant | Facility | AIRS ID | Facility purpose | Estimated emissions, uncon (tpy as of 1/2020) | Estimated emissions, actual (tpy as of 1/2020) | Major VOC or NOx emission points | Requirements | Summary conclusion |
|---|---|---|---|---|---|---|---|---|
| NOx | | | | 0 | 0 | | | Turbine (R7.E.II) requirements satisfy RACT |
| VOC | Sun Mountain, Inc. | 123-0533 | Millwork | 16.6 | 16.6 | Surface coating and paint booth | Surface coating and paint booth – R7.B.III, R7.C.I | Source is obtaining permit limits < 50 tpy |
| VOC | Front Range Energy | 123-5097 | Industrial organic chemicals | 972.3 | 52.7 | Storage tanks, ethanol loadout, flare, emergency engine, boiler | Storage tanks – R7.B.IV, NSPS Kb; fugitive emissions – R7.E.III; engine – R7.E.II; boiler – R7.E.II., NSPS Db | Storage tank (R7.B.IV.), fugitive VOC (R7.E.III.), and engine and boiler (R7.E.II.) requirements satisfy RACT |
| NOx | | | | 0.1 | 0.1 | | | |
| VOC | Carestream | 123-6350 | Photographic equipment and supplies | 10.6 | 10.6 | Paper and plastic-film coating | Surface coating – R7.C.I. | Paper coating (C.I.I.), plastic film coating (C.I.J.), fugitive VOC (C.I.A.) requirements satisfy RACT |
| VOC | Musket Corporation – Windsor Petroleum Loading | 123-9581 | Petroleum and petroleum products wholesalers | 3.9 | 3.5 | 12 storage tanks, loadout, fugitive component leaks | Storage tanks – R7.B.IV, NSPS Kb; loadout – R7.B.IV | Storage tank and transfer (R7.B.IV.) requirements satisfy RACT |

# CHAPTER 7
# REASONABLY AVAILABLE CONTROL MEASURES (RACM) ANALYSIS

7 ONE
Chapter 7 –Reasonably Available Control Measures (RACM) Analysis

## 7.1 OVERVIEW

The Federal Clean Air Act (CAA), 42 U.S.C. §7502 ("§172") requires that states provide an analysis of all Reasonably Available Control Measures (RACM), including Reasonably Available Control Technology (RACT) for sources. This analysis must be included in the State Implementation Plan (SIP) and outline what controls are being implemented and how they will contribute to attainment as expeditiously as practicable. The U.S. Environmental Protection Agency's (EPA) longstanding interpretation of this requirement is that:

1) States must adopt all reasonable measures to demonstrate Reasonable Further Progress (RFP) and attainment; and
2) Measures that would not advance attainment are not considered RACM/RACT [80 Fed. Reg. 12,264 at 12,682 (Mar. 6, 2015); *NRDC v. EPA,* 571 F.3d 1245, 1252-53 (D.C. Cir. 2009)].

This chapter address this requirement, presenting enforceable control measures included in this SIP, other measures being implemented in the Denver Metro/North Front Range (DM/NFR) ozone nonattainment area but not included as part of the SIP, and a discussion the ongoing effort to evaluate potential future control measures in the DM/NFR area.

The information is presented as follows:

> Section 7.2: Analysis process implemented to assess potential control strategies.
> Section 7.3: Control measures that have been implemented by 2020 and are included in the SIP as enforceable measures (i.e. included in the 2020 emissions inventory).
> Section 7.4: Voluntary emissions reduction control measures that are being implemented in the timeframe for this SIP, but are not included in the SIP as enforceable measures (i.e. not included in 2020 emissions inventory).
> Section 7.5 and Section 7.6: Control measures that have been evaluated, including measures implemented in other areas, but are not deemed RACM for purposes of this SIP.

As discussed in further detail in Sections 7.3 and 7.4, control measures that have a real world impact on ozone levels are currently being implemented in the DM/NFR area. Beyond the measures already being implemented, there is a continuing effort to review new strategies that may be feasible in the DM/NFR area and beyond. Due to the short time frame between EPA's reclassification of the DM/NFR to a Serious nonattainment area and the start of the peak summertime ozone season for the attainment year (2020), the number of new measures that can be implemented to demonstrate attainment are limited.

### 7.1.1 RACT Review

As part of the RACM analysis, RACT analyses must be conducted for certain stationary sources. EPA defines RACT as the "lowest emissions limitation that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility" [44 Fed. Reg. 53,762 (Sep. 17, 1979)]. As a RACT analysis takes into account the technological and economic impacts of controls, the analysis and determination may differ by source and by location. As required by §182 of the CAA, 42 U.S.C. §7511a, the RACT analysis for this SIP is found in Chapter 6, and includes the evaluation of potential emission control options for source categories that are located in the DM/NFR area and meet either of the following criteria:

1) Are subject to a Control Techniques Guideline (CTG) issued by EPA, or
2) Are major sources (greater than or equal to 50 tpy) of volatile organic compounds (VOC) or nitrogen oxides ($NO_X$) existing in the DM/NFR at the time of reclassification to Serious.

Colorado reviewed the CTGs and compared them to Colorado's point source inventory and existing rules. The following resources were also reviewed as part of the RACM analysis:

- EPA's Alternative Control Techniques (ACT),
- RACT (as identified in EPA's Reasonable Available Control Technology), Best Available Control Technology (BACT), and Lowest Achievable Emission Rate (LAER) Clearinghouse (RBLC)
- EPA's Menu of Control Measures (January 2017),
- Federal New Source Performance Standards (NSPS),
- Federal National Emission Standards for Hazardous Air Pollutants (NESHAP), and
- Regulations applicable in other states' ozone nonattainment areas for potential emission control measures.

Any potential control measures or strategies identified during the review were evaluated further to determine if the measures were reasonably available considering technological and economic feasibility, and whether the measures could be implemented by the start of the 2020 summer ozone season.

Colorado similarly evaluated Colorado's major VOC or $NO_X$ sources in the DM/NFR area against the CTGs, ACT, RBLC, Menu of Control Measures, NSPS, and NESHAP for potential additional control measures. The in–depth review of stationary source controls is presented in the Chapter 6. The rest of this chapter focuses solely on the RACM analysis as it relates to area and mobile sources.

## 7.2 PROCESS FOR EVALUATING REASONABLY AVAILABLE CONTROL MEASURES

In July 2012, the DM/NFR area was designated as Marginal nonattainment for 2008 NAAQS and was subsequently reclassified to Moderate area in May 2016, which necessitated the Regional Air Quality Council (RAQC) to increase the frequency of discussions with the Colorado Department of Public Health and Environment (CDPHE) and other partners to evaluate all strategies as part of the Moderate SIP development process. With the recent reclassification to Serious under the 2008 NAAQS,[99] and the corresponding classification of Marginal under the 2015 NAAQS, discussions were reinitiated in 2018, to identify strategies that would help the DM/NFR attain both standards by the 2020 ozone season, as both standards have an attainment date of summer 2021.

[99] Finding of Failure To Attain and Reclassification of Denver Area for the 2008 Ozone National Ambient Air Quality Standard, 81 Fed. Reg. 70,897 (Dec. 26, 2019)

### 7.2.1 RAQC Committee Planning Efforts

The RAQC strategy evaluation process was initially broken up into three subcommittees and was comprised of RAQC Board members. These subcommittees focused on the following areas:

1) Stationary/Area Sources
2) Mobile Sources/Fuels
3) Transportation/Land Use/Pricing/Outreach

In fall 2019, these three subcommittees were collapsed into one committee, referred to as the Control Strategy Committee to help streamline the evaluation process and speed up getting RAQC Board input on potential control strategies to advance. These committee meetings are open to the public and continue to be a forum to seek input from a diverse group of stakeholders.

### 7.2.2 Additional Planning Efforts

Significant efforts to improve air quality continue to be made in Colorado in tandem with the SIP planning process.

#### 7.2.2.1 Air Pollution Control Division Efforts

The Air Pollution Control Division (APCD) continues to engage in robust air quality planning and extensive stakeholder engagement efforts. These include the adoption of some of the nation's most stringent oil and gas regulations, the implementation of Clean Air Clean Jobs Act controls through the Regional Haze SIP, the continued promotion and funding of alternative fuels programs, as well as robust transportation and land use programs and partnerships. Additional efforts also include the ongoing work of the Statewide Hydrocarbon Emissions Reduction Team and Pneumatics Task Force. These planning efforts are discussed in further detail in Section 7.5.

#### 7.2.2.2 Legislative Efforts

Significant efforts continue in the near future as the result of a number of bills being passed during Colorado's 2019 legislative session aimed at improving air quality. The following bills are in the process of being implemented (this is not necessarily a comprehensive list):

- House Bill 19-1261: Climate Action Plan to Reduce Pollution
- Senate Bill 19-096: Collect Long-term Climate Change Data
- Senate Bill 19-181: Protect Public Welfare Oil and Gas Operations
- Senate Bill 19-236: Sunset Public Utilities Commission
- House Bill 19-1231: New Appliance Energy and Water Efficiency Standards
- House Bill 19-1260: Building Energy Codes
- Senate Bill 19-077: Public Utility Implementation of an Electric Vehicle (EV) Infrastructure Program
- Senate Bill 19-239: Addressing Impacts of Changes Related to Commercial Vehicles
- House Bill 19-1159: Modifications to the Income Tax Credits for Innovative Motor Vehicles
- House Bill 19-1198: Powers and Duties of the Electric Vehicle Grant Fund
- House Bill 19-1298: Electric Motor Vehicle Charging Station Parking
- House Bill 19-1003: Community Solar Gardens Modernization Act

- House Bill 19-1272: Housing Authority Property in Colorado New Energy Improvement District
- House Bill 19-1314: Just Transition from Coal-based Electrical Energy Economy

## 7.3 FEDERALLY ENFORCEABLE CONTROL MEASURES IN THE SIP

The control measures listed in Table 47 are included in the SIP as it relates to the 2017 and 2020 emissions inventories and photochemical modeling used for the attainment demonstration and weight of evidence analysis. These measures are discussed in detail in Chapter 4 of the SIP in the sections indicated in Table 47.

**Table 47 – Federally Enforceable Measures**

| Measures Included in the SIP | Location in Chapter 4 |
|---|---|
| **Mobile Sources** | |
| Federal On–Road and Non–Road Mobile Source Standards and Regulations | Section 4.3.1 |
| Vehicle Inspection and Maintenance Program – AQCC Regulation Number 11 | Section 4.3.2 |
| 7.8 Reid Vapor Pressure with 1 PSI Ethanol Waiver (8.8 RVP) | Section 4.3.3 |
| Stage I Vapor Recovery – AQCC Regulation Number 7 Part B, § VII | Section 4.3.4 |
| **Stationary Sources** | |
| Oil and Gas Regulations – AQCC Regulation Number 7 | Section 4.3.5 |
| Regional Haze SIP Provisions and Minor Source RACT – AQCC Regulation Number 3 | Section 4.3.6 |
| Other Stationary Source Regulations – AQCC Regulation Nos. 3, 6, 7, and 8 | Section 4.3.7 |
| **Area Sources** | |
| Control of Volatile Organic Compounds from Consumer Products and Architectural and Industrial Maintenance Coatings – AQCC Regulation Number 21 | Section 4.3.8 |

## 7.4 EMISSION REDUCTION MEASURES NOT INCLUDED AS ENFORCEABLE MEASURES

Beyond the enforceable control measures included in the SIP modeling and emissions inventory, additional emission reduction measures are being implemented in the DM/NFR area. These measures are often difficult to quantify and/or are voluntary measures and are therefore not included as enforceable SIP measures. They do, however, result in real world emissions reductions and aiding in compliance with the 2008 NAAQS. In addition, control measures related to oil and gas were adopted as exclusive State–Only requirements in 2014 and 2019 that help to reduce ozone precursor emissions, but are not included in the SIP as federally enforceable measures. Table 48 below is an overview of the emission reduction measures that are included in this section.

**Table 48 – Non–SIP Measures**

| Emission Reduction Measures Not Federally Enforceable |
|---|
| **Stationary Sources** |
| Energy Efficiency and Renewable Energy Policies and Programs |
| State–Only Oil and Gas Controls – AQCC Regulation Number 7 |
| Small Business Assistance Program |
| **Mobile Sources** |
| Diesel Retrofits and Fleet Fuel Use Reduction (Clean Air Fleets) |
| Charge Ahead Colorado Electric Vehicle Program |
| Expand Use of Alternative Fuels in Government and Private Fleets (ALT Fuels Colorado) |
| Electric Vehicle Group Purchase Programs |
| Innovative Motor Vehicle and Alternative Fuel Vehicle Tax Credits |
| Diesel Inspection and Maintenance Programs – AQCC Regulation Number 12 |
| High Altitude Emissions Laboratory |
| Colorado Low Emission Automobile Regulation – AQCC Regulation Number 20 |
| Electric Car Shares, Electric Scooter, and Electric Bike Infrastructure |
| **Lawn and Garden** |
| Mow Down Pollution Lawn Mower Exchange |
| Commercial Lawn and Garden Program |
| Zero Emission Lawn and Garden Equipment – Commercial Sector |
| **Education and Outreach** |
| Ozone Education and Outreach Program |
| Ozone Forecast Advisory – Voluntary Emission Reduction Action Days |
| **Transportation Systems** |
| Transit and Transportation Network |
| Transportation Demand Management Programs |
| Bicycle and Pedestrian Facilities |
| Land Use Planning and Development |
| CAA 108(f) Transportation Measures |

### 7.4.1 Stationary Sources

As discussed 0, the review and evaluation of stationary source emission reduction measures, have been addressed through the RACT analysis conducted by the CDPHE. Additional strategies, however, were identified as part of the RAQC committee process and are being implemented. These strategies are discussed below.

#### 7.4.1.1.1 Energy Efficiency and Renewable Energy Policies and Programs

With House Bill 19-1261 Colorado established statewide greenhouse gas pollution reductions goals of 26% by 2025, 50% by 2030, and 90% by 2050 relative to 2005 emission levels.

Additionally, Colorado has a requirement of 30% of electricity supply to be provided by renewable energy sources (RES) by 2020 through recent state legislation. However, due to incentive credits allowed for some RES, the actual renewable energy to be supplied in 2020 is estimated at around 17%. Colorado's Governor announced a goal of Balanced Energy Portfolio of 1/3 renewables, 1/3 gas and 1/3 coal.

Xcel Energy, Colorado's largest electricity provider, released its "Colorado Energy Plan" which was approved by the Colorado Public Utilities Commission in August 2018. In the plan Xcel commits to being 80% carbon-free by 2030 and entirely carbon-free by 2050 through increasing renewable energy sources within the system and taking advantage of not yet commercially available technologies. Xcel Energy's Resource Plan also includes consideration of energy efficiency and renewable energy in their future fleet of electric generating units (EGUs) in the DM/NFR area with energy efficiency programs (i.e. Demand Side Management (DSM) programs) estimated to reduce energy use by approximately 3,700 MWh/day in 2017.

EPA is slated to conduct a study on the impacts of energy efficiency and renewable energy and its inclusion in SIPs and has issued guidance for states on taking credit for these in SIPs, but it has proven to be difficult to quantify monitor, and enforce. Available information regarding EGU operations has been incorporated into modeling efforts.

#### 7.4.1.2 State-Only Oil and Gas Controls – AQCC Regulation Number 7

State-Only Oil and Gas Controls are discussed in detail under Section 4.3.8 in Chapter 4 of the SIP.

#### 7.4.1.3 Small Business Assistance Program

The Small Business Assistance Program (SBAP), offered by the CDPHE, provides free services to small businesses seeking help in understanding and complying with air and other environmental regulations. Businesses commonly assisted by the SBAP include Asphalt Production, Auto Body & Repair, Chrome Plating, Concrete Production, Crematories, Dry Cleaners, Fuel Dispensing Stations, Gasoline Bulk Plants, Manufacturing, Printers, Recycling Facilities, Surface Coating Operations, Surface Mining, and Cannabis Operations. The program provides individual and group training on:

- Explaining environmental rules and requirements
- Determining if an air permit is needed
- Assistance completing Air Pollutant Emission Notices (APEN) and permit applications
- Identifying hazardous waste requirements (In–depth hazardous waste assistance is provided through the CDPHE Generator Assistance Program (GAP)
- Identifying emergency response requirements
- Providing air emission calculators and recordkeeping templates
- Assistance understanding bills and reducing regulatory fees
- Tips for reducing waste through pollution prevention
- Referrals to product and service resource

### 7.4.2 Mobile Sources

Mobile sources continue to be a significant contributor to both NOX and VOC emissions in the DM/NFR area and thus are an area of continued focus when it comes to emission reduction measures. The following measures are aimed at reducing emissions from on–road mobile sources.

#### 7.4.2.1 Diesel Retrofits and Fleet Fuel Use Reduction (Clean Air Fleets)

The RAQC has worked with area fleets since 2002 to secure Environmental Protection Agency – Diesel Emissions Reduction Act (DERA) funds and Federal Highway Administration (FHWA) – Congestion Mitigation and Air Quality (CMAQ) funds to provide equipment for both public and private entities. The program was developed to reduce criteria emissions and greenhouse gases (GHG) within the diesel legacy fleet by installing retrofit equipment including tailpipe retrofits, idle reduction equipment, aerodynamic trailer fairings, electrified refrigerated trailers, fleet telematics (GPS) and other equipment to reduce their emissions. This program also purchased alternatively fueled vehicles prior to the implementation of Charge Ahead Colorado and ALT Fuels Colorado programs. This comprehensive project achieves emissions reductions around schools, truck stops and terminals, oil and gas fields, neighborhoods, landfills, agricultural areas and environmental justice areas.

The RAQC has partnered with over 190 fleets including school buses, long haul fleets, the oil and gas industry, public works fleets, refuse haulers and other public and private fleets to address emissions and fuel reduction equipment needs. From 2010 to 2019, the RAQC helped fund and install:

- 750 diesel oxidation catalysts
- 332 auxiliary power units
- 200 thermal storage units
- 1,636 fuel operated heaters
- 467 aerodynamic trailer fairings
- 3,380 telematics units
- 45 electrified refrigeration trailers
- 30 alternatively fueled/operated vehicles
- 8 engine replacements

The RAQC continues to seek new opportunities for funding to retrofit the medium and heavy-duty diesel fleet. Additional projects are operated by state, local, and nonprofit agencies to target diesel vehicle emissions. The APCD targets diesel emissions statewide with its Clean Diesel School Bus Retrofit Program. The APCD's program retrofits school buses with technologies designed to reduce both tailpipe and crankcase emissions as well as engine idling. The APCD also provides idling reduction information, training and tools to fleet management, maintenance staff, students, and parent–teacher organizations.

#### 7.4.2.2 EnginesOFF! Colorado

A second effort focuses on vehicle idling specifically. The RAQC has developed model idle reduction policies and performed outreach to fleets to educate them on the costs and benefits of idle reduction. Additionally, Clean Air at Schools: Engines Off! (CASEO) is a collaboration between federal, state and local governments, county school districts, regional air quality planners, and nonprofits with the goal to reduce air pollution exposure at Colorado schools. This program raises the awareness of parents, students and school administrators of the risks of air pollution created by vehicle idling. By educating drivers on health risks and having them pledge to reduce idling and reminders throughout the school year, drivers are motivated to reducing idling their vehicles at student pick up times.

In 2011, the Colorado trucking industry joined with local governments to create standardized rules to limit commercial truck idling to five minutes within a 60-minute period. This provides commercial truck drivers a consistent guideline to follow. Local jurisdictions have implemented these anti-idling policies across the state of Colorado.

#### 7.4.2.3 Charge Ahead Colorado Electric Vehicle Program

Beginning in February 2013, Charge Ahead Colorado was designed to provide incentives for the installation of electric vehicle charging stations and the lease of EV. The RAQC operates this program in partnership with the Colorado Energy Office (CEO). RAQC utilizes FHWA CMAQ funding and Volkswagen (VW) Trust Settlement funding. CEO's funding is provided by VW Trust Settlement Funds and electric vehicle registration fees through the Colorado Electric Vehicle Grant Fund.

Under this program, grant funding is awarded to cover up to 80% of the cost of installing Level 2 and Level 3 electric vehicle charging stations. Incentives range from $9,000 – $30,000 depending on the level of charger purchased. Public and private entities, though not private homeowners, can apply for program funding. The RAQC funding for the program is available in the seven–county Denver metro area, funding from the CEO is available to the remainder of the state.

In addition to charging station funding, the RAQC also provides funding for electric vehicles in the seven–county Denver metro area. Vehicle funding covers 80% of the incremental cost of a qualified, *Buy America* compliant EV up to $8,260. Only tax–exempt organizations are eligible for vehicle funding due to the $11,500 in state and federal tax credits available to taxpaying entities. Table 49 shows CEO and RAQC total applications received, applications funded, and the amount of equipment purchased. Applications for program funding are open three times per year. To–date, there have been 11 funding rounds with 662 charging stations, also referred to as electric vehicle supply equipment (EVSE), and 118 EVs funded.

**Table 49 – Charge Ahead Colorado: Projects Funded**

| | Total Funding Awarded ($) | Number of Equipment Awarded | |
|---|---|---|---|
| **CEO – Statewide** | $2.43 MM | 315 | |
| **RAQC – Denver Metro** | $5.97 MM | 662 EVSE | 118 EVs |

#### 7.4.2.4 Expand Use of Alternative Fuels in Government and Private Fleets (ALT Fuels Colorado)

Beginning in September 2014, the CEO and RAQC developed ALT Fuels Colorado to continue the advancement of the state's adoption of alternative fuels. This effort was funded by the FHWA CMAQ Grant program. $30 million in CMAQ funding was allocated over a 5-year period (2014 to 2019). Additional funding was awarded to the program through a diesel emissions settlement. The RAQC and CEO operate the ALT Fuels Colorado Program in partnership.

$15 million was provided to CEO to be invested in alternative fueling stations along major statewide transportation corridors with the goal of developing an intrastate system for alternative fuel vehicle (AFV) travel. In 2018, CEO invested in 33 DC Fast Charging (DCFC) sites along six corridors including interstates and State and US highways. $10.33 million will be used to develop this fast charging infrastructure. Each site includes 2 to 4 modular fast charging stations rated at 150kW. The grant was awarded in November 2018 with the completion of each site in 2020.

RAQC applications for program funding are open 1-3 times per year and CEO applications are open twice per year.

Table 50 details CEO and RAQC total applications received, applications funded, and the amount of equipment purchased.

**Table 50 – ALT Fuels Colorado (Since September 2014)**

| | Total Funding Awarded | Number of Equipment Awarded |
|---|---|---|
| CEO (CNG Stations) | $3.87 MM | 8 |
| CEO (Charging Stations) | $10.3 MM | 34 |
| RAQC (Vehicles) | $21.3 MM | 540 |

#### 7.4.2.5 Electric Vehicle Group Purchase Programs

Adams County, Boulder County, and the City and County of Denver developed the "Solar Benefits Colorado" program. This effort was designed to incentivize residents to purchase solar panels and EVs as part of a group purchase program with lower prices negotiated through a competitive bid process. The program resulted in 147 solar photovoltaic installations and the sale of 248 Nissan LEAFs. The dealership selling the electric vehicles sold 62 LEAFs per month compared to 13 that would be expected over the same time period without the program.

Another EV group purchase program operates concurrently through Drive Electric Northern Colorado (DENC), a partnership between the City of Fort Collins, City of Loveland, Colorado State University, and the Electrification Coalition. DENC's first group buy in winter 2015 saw EV adoption in Northern Colorado increase to more than three times the national average, driven by the program's appeal and strong support from community members. DENC works hand–in–hand with 58 business and community supporters, collaborates with 20 local companies and organizations to provide Northern Coloradans with EV charging infrastructure at their workplaces, and has expanded EV charging infrastructure to include more than 30 charging stations for public use so that EV drivers are never more than six miles from a charge.

Due to the program's initial success, participating counties have plans to implement the program again at opportune times to encourage the sale of electric vehicles. In March 2016, Boulder County relaunched the program which operated until June 2016.

#### 7.4.2.6 Innovative Motor Vehicle and Alternative Fuel Vehicle Tax Credits

The Colorado Department of Revenue offers the Innovative Motor Vehicle Credit for a vehicle that uses or is converted to use an alternative fuel. Qualified idle reduction technologies, aerodynamic technologies, and clean fuel trailers are also eligible for the tax credit. Credit amounts vary for each category, vehicle weight, and tax year. Percentages apply to the base model manufacturer's suggested retail price (MSRP) for EV and plug–in hybrid electric vehicle (PHEV) purchases, and to the actual cost paid for EV and PHEV leases, eligible conversions, idle reduction and aerodynamic technologies, and clean trailer purchases or conversions.

Tax credits have been available since 2014 and are in effect through 2021. Up to $5,000 in tax credits is available for original equipment manufacturer (OEM) electric vehicles. The tax credits for all vehicle types decrease over time. Credits for EVs and PHEVs in Category 1 are equal to the actual cost incurred to purchase or lease the vehicle, multiplied by the battery capacity, and divided by 100. That amount must be multiplied by a factor to determine the credit amount, as follows: 1.0 for 2014–2018, 0.75 for 2019, 0.50 for 2020, and 0.25 for 2021.

Annual credit caps exist for each technology type and vehicle weight class, and for cumulative annual credits. A person who claimed a tax credit in previous years for the purchase or lease of Model Year 2004 and newer hybrid electric vehicles (HEV) may claim an additional credit for the conversion of the same vehicle to a PHEV. The purchase of a used vehicle may qualify if the vehicle was not previously registered in Colorado. Credits may not be carried forward and a taxpayer will receive a refund for the excess credit.

#### 7.4.2.7 Diesel Inspection and Maintenance Programs – AQCC Regulation Number 12

The APCD operates a state–only, opacity–based, diesel inspection and maintenance (I/M) program within the Automobile Inspection and Readjustment (AIR) Program area. This program is regulated through Colorado AQCC Regulation Number 12, 5 C.C.R. §1001-15 (Regulation Number 12) and is split into two program types based on fleet size.

Under the large fleet program, company fleet inspection staff must take part in the Diesel Fleet Self–Certification Program. This program requires the fleet to self–test vehicles for compliance with state smoke opacity standards for all vehicles over 14,000 pounds empty weight.

Under the small fleet program, owners must comply with the Diesel Opacity Inspection Program. All light and heavy–duty vehicles ten model years and newer must be tested every two years at a private, state licensed, inspection facility. Vehicles eleven model years and older must be inspected annually.

Through these two programs, more than 70,000 light–duty and heavy–duty diesel vehicles are inspected annually. New diesel vehicles purchased in Colorado are exempt from these programs for four years. While diesel I/M is not a SIP–approvable strategy, this program drives good preventative maintenance practices and strongly deters tampering with emissions equipment on both light–duty and heavy–duty diesels, resulting in a reduction in ozone precursor emissions.

#### 7.4.2.8 High Altitude Emissions Laboratory

The innovative and pioneering mobile source emissions research performed at CDPHE's Aurora High Altitude Emissions Laboratory has been publicly recognized and applauded by EPA (and others) for more than 35 years, most recently in September 2015. The value of a wide variety of now commonly accepted mobile source control strategies were conceived and/or developed by CDPHE scientists and technicians. A few examples include cold start Federal Test Procedure (FTP) standards, all–altitude certification, transient short tests, roadside remote sensing (clean and dirty screen), evaporative emissions, real–world emissions factor development and a host of other issues would not have been recognized, or not recognized as early if not for the work of CDPHE's Aurora Emissions Lab.

While this research is not creditable to any SIP, it sets Colorado apart as a leader and innovator in mobile source emissions reduction work. In the realm of vehicle emissions reductions, Colorado is exceptional in its ability to link real–world I/M issues to scientifically–based research, resulting in a thorough and holistic understanding and ability to act on effective, efficient, and consumer–friendly mobile sources strategies.

#### 7.4.2.9 Colorado Low Emission Automobile Regulation – AQCC Regulation Number 20

The AQCC held public hearings on the matter of vehicle emissions standards ultimately passing Regulation Number 20, 5 CCR 1001-24 (Regulation Number 20) - Colorado Low Emission Automobile Regulation in August 2019. Regulation Number 20 adopts the provisions of California's Code of Regulations program regarding low and zero emission vehicles. By adopting California's regulations, Colorado has committed to ensure that new light duty vehicles meet California's Low Emission Vehicle (LEV) standards, and a certain portion therein are zero emission vehicles (ZEV) under the ZEV mandate. ZEV vehicles include battery electric vehicles, plug-in hybrid vehicles, hydrogen fuel cell vehicles, and hydrogen internal combustion engine vehicles.

The ZEV standard requires that automakers have a percentage of their new vehicles available for sale be zero emission vehicles. In 2023, 4.9% of new vehicles must be ZEV. Over time, this percentage will ramp up from the initial 4.9% to 6.1% in 2030, again only applying to new vehicles. Auto manufacturers will be eligible for early action credits if they choose to bring vehicles to Colorado for sale prior to the implementation of the rule in 2023. Additionally, if automakers are not able to meet their minimum sales requirements, they have the option to purchase credits from other automakers who are producing and selling an excess of ZEVs. Each ZEV is allocated a certain number of credits based on a variety of factors with plug-in hybrid electric vehicles receiving the fewest credits on up to long-range battery electric vehicles.

#### 7.4.2.10 Electric Car Shares, Electric Scooter, and Electric Bike Infrastructure

Shared electric powered transportation systems have proliferated in the DM/NFR nonattainment area in recent years. These transportation systems include electric car services (such as ZipCar and Car2GO), scooters and bikes. Use of these has increased in recent years, and has displaced the use of other, higher emitting transportation options.

### 7.4.3 Lawn and Garden

Gasoline powered lawn and garden equipment is the largest source category for VOC emissions in the 2020 non–road inventory. Therefore, there is a concerted effort in the DM/NFR area to implement programs aimed at reducing emissions from this sector. The following two programs focus on residential and commercial lawn and garden equipment.

#### 7.4.3.1 Mow Down Pollution: Residential Lawn Mower Exchange Program

Mow Down Pollution is a voluntary program implemented by the RAQC. The Mow Down Pollution program provides area residents the opportunity to recycle gasoline–powered lawn mowers and purchase new, cordless, electric lawn mowers at discounted prices. The program was previously funded for the years 2016 – 2019 with approximately $400k through a supplemental environmental project (SEP) grant through the State of Colorado. Additional funding from grants and private donations in the amount of $125k was allocated to extend the program through 2020.

The Mow Down Pollution program has funded the purchase of approximately 5,700 new electric lawn mowers and has recycled approximately 4,900 old gasoline lawn mowers since its inception.

#### 7.4.3.2 Mow Down Pollution: Commercial Lawn and Garden Program

During the course of the Transportation/Land Use/Pricing/Outreach subcommittee meetings, the importance of addressing commercial grade gasoline-powered commercial lawn and garden equipment was identified and discussed. As noted above, commercial grade gasoline powered lawn and garden equipment is the largest source category for VOC emissions in the non-road inventory.

$120K of project funding was allocated from the Environment Mitigation Project grant from Noble Energy for the replacement of gasoline-powered commercial lawn and garden equipment through 2019. Under this program, funding was used to cover up to 50% of the purchase price of battery electric handheld equipment, batteries, and chargers. Additionally, it funded $2,000 towards the purchase of battery-powered commercial grade lawn mowers and/or $1,000 towards the purchase of a propane powered commercial grade lawn mower. Through the program, over 250 pieces of commercial grade handheld equipment were purchased along with nearly 20 battery and propane powered mowers and nearly 400 batteries and battery packs.

In addition, the RAQC has convened a Commercial Lawn and Garden Work Group to gather insight from the local governments and parks and recreation managers on best practices and needed resources to help spur a more widespread adoption of low emissions equipment. Further, the RAQC is in the process of developing a clearinghouse of resources for commercial fleets to better understand the potential capital investment costs, fuel cost savings, and equipment availability to help ease the burden of procuring low emissions equipment.

### 7.4.4 Education and Outreach

Outreach is an important component of all awareness campaigns and is a critical component in the effort to garner public support and participation in reducing emissions that contribute to the formation of ozone. The following program is aimed at engaging the public and educating them on behaviors that will help mitigate ozone in the DM/NFR area.

#### 7.4.4.1 Ozone Education and Outreach Program (Simple Steps. Better Air.)

*Simple Steps. Better Air.* (SSBA) is a voluntary program led by the RAQC. It is administered by the RAQC in the Denver Metropolitan area and supported by the North Front Range Metropolitan Planning Organization (NFRMPO) in Larimer and Weld Counties. SSBA is an ozone pollution outreach and education program with a two-fold mission: 1) To raise public awareness about issues related to ground-level ozone pollution and the actions associated with reducing it, and 2) To motivate behavior changes and increase the number of people who take action to reduce ozone-causing emissions. The SSBA program utilizes an effective mix of several communication strategies to reach key audiences, including paid, earned and digital media, stakeholder networks, organizational partnerships and sponsorships. The SSBA program is funded for the years 2020-2023 with a $1.8 million CMAQ grant.

#### 7.4.4.2 Ozone Forecast Advisory – Voluntary Emission Reduction Actions

The APCD implemented a voluntary emission reduction program in collaboration with the RAQC and Colorado Oil and Gas Association (COGA) to mitigate the emissions of ozone precursors from oil and gas production facilities. In advance of forecasted high ozone days, notifications are sent out by the APCD to operators requesting they take voluntary measures to mitigate emissions. A summary of voluntary measures is presented in Table 51.

**Table 51 – Voluntary Emission Reduction Measures at Oil and Gas Facilities**

| | |
|---|---|
| | **Transportation** |
| | Carpool programs |
| | Deferment of unnecessary haul trips and other travel |
| | Altered Fleet Vehicle Maintenance Practices |
| | **Operations** |
| | Additional Leak Detection and Repair (LDAR) Activities |
| | Deferment liquid hauling in and out of the field as possible |
| | Postponement of well unloading activities |
| | Rescheduling of pipeline maintenance activities |
| | Use of vapor returns on truck loading |
| | Setting pumping units ahead of ozone season to eliminate swabbing |
| | Grouping maintenance activities at closely located facilities to minimize driving |
| | Delay compression unit start up on ozone action days |
| | Place compression units in pressurized mode on ozone action days |
| | Improve chemical storage |

Based on data collected by COGA during the summer of 2019 demonstrated that operators who are collectively responsible for 85% of production in the Denver-Julesburg Basin, including drilling and completion operations, participated in conducting voluntary reduction measures.

### 7.4.5 Transportation Systems

Transportation facilities, including tolled lanes, bicycle and pedestrian facilities, the regional transit network, and various land use projects are contained in both the NFRMPO and the Denver Regional Council of Governments (DRCOG) regionally adopted fiscally constrained transportation plans and are accounted for in the travel demand model. These models estimate regional vehicle miles traveled (VMT) by vehicle type and roadway type and account for roadway activity including vehicle count, speed, location, and time of day use. This information is utilized by the CDPHE in the mobile source emissions model, developed by the EPA, and is the basis for the on–road mobile source emissions inventory. Thus, these types of programs and projects are not viewed as federally enforceable SIP control measures but are considered part of base transportation model.

#### 7.4.5.1 Transit and Transportation Network

All existing and funded transit improvements are included in the base transportation and air quality modeling efforts.

The Regional Transportation District's (RTD) transit network includes:

- Light Rail 585 Miles
- Annual Fixed Route Service Miles – 59,239,576 (including rail)
- Annual Transit Boardings – 97,606,769
- Park and Ride Facilities – 785 with 31,774 spaces (includes facilities maintained Colorado Department of Transportation (CDOT))

The North Front Range/TransFort's transit network includes:

- Annual Fixed Route Service Miles – 328 [Includes Greeley Evens Transit (GET), Transfort, City of Loveland Transit (COLT); FLEX (within Larimer); Bustang (within NFRMPO); Poudre Express]
- Annual Transit Boardings – 5,390,779 [Includes GET, Transfort, COLT]
- Park and Ride Facilities – 17 with 1,947 spaces (includes facilities maintained CDOT)

#### 7.4.5.2 Transportation Demand Management Programs

Assumptions about mode choice and participation in transportation demand management programs are included in the base transportation and air quality modeling efforts.
In the DRCOG planning area, there are eight formally organized transportation management associations/organizations that work closely with the DRCOG WayToGo program.

Associations/Organizations include:

- Commuting Solutions
- Boulder Transportation Connections
- Denver South Transportation Management Association
- Downtown Denver Partnership
- Northeast Transportation Connections
- Smart Commute Metro North
- Transportation Solutions
- DRCOG – WayToGo
- NFRMPO – VanGo™

Through its SSBA outreach and education program, the RAQC partners with these transportation demand management programs to extend its messaging and reach

#### 7.4.5.3 Bicycle and Pedestrian Facilities

All existing and funded bicycle and pedestrian improvements are included in the base transportation and air quality modeling efforts. This includes:

Bicycle and pedestrian facilities are planned and implemented by local jurisdictions.
North Front Range:

- 755 miles of bicycle lanes in the NFRMPO planning area, 367 miles of shared-use paths.
- The NFRMPO launched the NoCo Bike & Ped Collaborative after the 2013 Regional Bike Plan, building on efforts by Weld County over the previous decade. This Collaborative meets monthly to discuss various topics and share information related to improving biking and walking in northern Colorado and has supported the expansion of bike and pedestrian transport in the region.
- The City of Fort Collins launched a bike share April 1, 2016. It now consists of 250 bikes spread across stations throughout Fort Collins.
- Between May 1, 2019 and April 30, 2020, Fort Collins will allow Class 1 and Class 2 e-bikes on paved trails as part of a one-year pilot program.
- The City of Fort Collins and Colorado State University (CSU) are partnering with Bird for a 12-month e-scooter share pilot program through October 2020.

Denver Metro Area:

- 2,170 miles of bike lanes and routes in the DRCOG planning area.
- 100+ B–cycle Stations with 1000+ bikes through the Denver program and 40+ stations and 300+ bikes through the Boulder program. Between the two programs, there are approximately 305,000 annual rides, averaging around 835 rides per day in the DRCOG planning area. The Denver B-cycle program ended in January 2020, though the Boulder program will continue to operate. Private sector bike and scooter rentals program are now prevalent throughout central Denver

#### 7.4.5.4 Land Use Planning and Development

In Colorado, land use plans are adopted by local jurisdictions. The local plans are incorporated to the assumptions made in the regional land use and transportation modeling efforts. The regional transportation plans are incorporated into the regional air quality modeling process and includes the following:

- Land use plans, urban center plans, transit oriented development plans, subarea plans, special area plans, corridor plans are developed and adopted by local jurisdictions. Both DRCOG and the NFRMPO incorporate these plans into the regional land use and transportation plan.
- DRCOG identified urban growth area – 980 square miles.
- NFRMPO identified urban growth area – 675 square miles.

#### 7.4.5.5 CAA 108(f) Transportation Measures

In addition to the measures discussed previously, EPA Guidance states that measures in CAA §108(f) are not presumptively RACM but should be considered in assessing whether sources have applied RACM. Therefore, the evaluation of measures outlined in CAA §108(f), most of which are included in the 2017 emissions inventory through the transportation/land use models, were evaluated as part of this effort and are described in Table 52.

**Table 52 – Transportation Measures**

| Measures | Description |
|---|---|
| **i) Programs for improved public transit.** | FasTracks is RTD's voter–approved transit expansion program.<br>The following facilities were implemented as follows:<br>• North I–25 High Occupancy Vehicle (HOV)/Toll Lanes<br>• A Line – Airport line (Denver to Denver International Airport) - Opened April 2016<br>• B Line – Northwest line (Denver to Westminster) - Opened July 2016<br>• G Line – West line (Denver to Arvada and Wheat Ridge) - Opened April 2019<br>• R Line – Aurora line (Aurora) - Opened February 2017<br>• Flatiron Flyer – Bus Rapid Transit (BRT) along the US36 corridor (Denver to Boulder) - Opened January 2016<br><br>The following facility will open in 2020<br>• North Metro Rail Line – (Denver, Commerce City to 124th Avenue)<br><br>In the NFRMPO area, Transfort, COLT, and GET operate 14,343,246 total annual service miles with 5,390,779 total annual transit boardings. The system includes 17 park–n–ride facilities with 1,947 spaces. The NFRMPO also has 47 active vanpools. Additionally, Colorado State University contracts with Transfort for transit services on campus. The Horn, a campus shuttle, provides last–mile trips from transit stops, parking lots, and resident halls reducing cross–campus trips and cold starts. University of Northern Colorado contracts with GET to provide transit on campus, including the Boomerang. The Bustang provides intercity travel between the major regional centers of Fort Collins and Loveland and Denver on a fixed schedule. Two regional routes have aided in cross-community connections: Transfort's FLEX extends between Fort Collins and Boulder, connecting Loveland, Berthoud, and Longmont; and GET's Poudre Express connects Greeley, Windsor, and Fort Collins. |
| **ii) Restriction of certain roads or lanes to, or construction of such roads or lanes for use by, passenger buses or high occupancy vehicles.** | Road use decisions are made by the responsible local or state agency. "Time of Day" tolls are currently in use in the US–36 corridor, I–25 corridor, and the I–70 corridor and will be implemented as part of the I–70 east project. Tolls change throughout the day and are based on the following:<br>• Established goals related to reliable travel times for busses, HOV's, hybrids, and toll paying customers.<br>• Maintenance of predetermined bus travel times.<br>• Provision of transportation choices for all travelers.<br>• Toll lanes are also utilized on E-470 and Northwest Parkway and Express Lanes, and are under construction on C-470.<br>• As new construction takes place, managed lanes will likely be part of the project scope. |

| Measures | Description |
|---|---|
| **iii) Employer–based transportation management plans, including incentives.** | Many transportation demand management plans and programs are being implemented in the Denver/NFRMPO planning areas.<br><br>Seven Transportation Management Association (TMA) are part of the DRCOG/TMA partnership. The NFRMPO operates the VanGo program.<br><br>In the Fiscal Years 2017/2018, approximately $2.1 million was allocated to TDM projects with $800,000 for small scale bike and pedestrian projects. |
| **iv) Trip–reduction ordinances.** | Mandatory trip reduction ordinances have not been implemented in the Denver/NFRMPO area. There has not been support for these types of mandatory ordinances in the Denver/NFRMPO area based on experience and research from other areas. Voluntary trip reduction programs among private and public employers are common throughout the DRCOG and NFRMPO region. |
| **ix) Programs to limit portions of road surfaces or certain sections of the metropolitan area to the use of non–motorized vehicles or pedestrian use, both as to time and place.** | Road use decisions are made by the responsible local or state agency.<br><br>The majority of jurisdictions in the DM/NFR area have designated bike lanes, bike paths, multi–use paths/trails, and sidewalks. |
| **v) Traffic flow improvement programs that achieve emission reductions.** | Through its Traffic Signal System Improvement Program (TSSIP), DRCOG has coordinated the regional traffic signal system. Currently, all jurisdictions with more than 20 signals are part of the regional traffic signal system and approximately 90% of key signals are part of the regional traffic signal system. This program has $1,760,000 in regional TIP funding.<br><br>In the North Front Range, there were 6 traffic signal projects with funding in the FY2020-2023 Transportation Improvement Program (TIP) for a total funding amount of $9,794,000 ($7.4M Federal, $2.4M Local). |
| **vi) Fringe and transportation corridor parking facilities serving multiple occupancy vehicle programs or transit service.** | Decisions regarding the location of parking facilities are made at the local jurisdiction level. Park–and–Ride lots are planned in coordination with transit facilities and local planning efforts.<br><br>In the DRCOG planning area, there are 85 park–and–ride facilities with 31,774 spaces.<br><br>In the NFRMPO planning area, there are 12 park–and–ride facilities with 1,947 spaces. |

| Measures | Description |
|---|---|
| **vii) Programs to limit or restrict vehicle use in downtown areas or other areas of emission concentration particularly during periods of peak use.** | A program of this nature has not been implemented in the DM/NFR area. Voluntary programs to reduce vehicle use in certain areas is addressed through the transportation management associations/organizations.<br><br>Specific programs to limit vehicle use in the downtown Denver area is not relevant for a regional pollutant like ozone. |
| **viii) Programs for the provision of all forms of high–occupancy, shared–ride services.** | Programs to encourage the use of high–occupancy vehicles and shared –ride services are implemented by the seven TMAs/ Transportation Management Organizations (TMO) that are part of the DRCOG/TMA partnership. Currently there are over 200 vanpools in this program. In the NFRMPO area, local jurisdictions, major employers and local transit (Transfort) develop and implement these programs. Currently, there are 47 vanpools in this program. |
| **x) Programs for secure bicycle storage facilities and other facilities, including bicycle lanes, for the convenience and protection of bicyclists, in both public and private areas.** | Local jurisdictions and private land owners develop and implement programs and facilities for the storage of bicycles. Bicycle lanes are planned, developed and implemented through the local planning process.<br><br>In the DRCOG planning area, there are over 400 miles of bike lanes and routes. In the NFRMPO planning area, there are over 886 miles of bike lanes and routes and 367 miles of shared-use paths. Secure bicycle parking facilities (cages) have been built at the University Station and South Transit Center along the MAX corridor in Fort Collins. |
| **xi) Programs to control extended idling of vehicles.** | Colorado House Bill (HB) 11–1275 regulates idling.<br><br>In 2011, the Colorado trucking industry joined with local governments and clean air advocates in Colorado to create a set of recommendations for a statewide idling standard. HB 11–1275, which became effective on July 1, 2011.<br><br>HB 11–1275 allows communities to limit idling to five minutes within a sixty–minute period for large, commercial diesel vehicles (14,000 lbs. or more), with certain exemptions. This consistent guideline enables commercial drivers to comply with the law and protect Colorado's air quality across the state, rather than having to follow a diverse patchwork of local regulations.<br><br>In the DRCOG planning area, Denver and Greenwood Village have adopted anti–idling ordinances.<br><br>In the North Front Range planning area, signage has been installed at railroad crossings advising drivers to turn off their vehicles while waiting for the train. |

| Measures | Description |
|---|---|
| **xii) Programs to reduce motor vehicle emissions, consistent with title II, which are caused by extreme cold start conditions.** | Not applicable in the DM/NFR ozone nonattainment area due to the lack of “extreme” cold temperatures. |
| **xiii) Employer–sponsored programs to permit flexible work schedules.** | Widespread programs to encourage flexible work schedules are implemented by private employers and the seven TMAs/TMOs that are part of the DRCOG/TMA partnership. In the NFRMPO area, local jurisdictions and major employers develop and implement these programs. |
| **xiv) Programs and ordinances to facilitate non–automobile travel, provision and utilization of mass transit, and to generally reduce the need for single–occupant vehicle travel, as part of transportation planning and development efforts of a locality, including programs and ordinances applicable to new shopping centers, special events, and other centers of vehicle activity.** | Programs to facilitate non–automobile travel, provision and utilization of mass transit, and to reduce the need for single–occupant vehicle travel are implemented by local jurisdictions, private employers and the seven TMAs/TMOs that are part of the DRCOG/TMA partnership. In the NFRMPO area, local jurisdictions, employers and transit agencies develop and implement these programs. |

| Measures | Description |
|---|---|
| **xv) Programs for new construction and major reconstructions of paths, tracks or areas solely for the use by pedestrian or other non–motorized means of transportation when economically feasible and in the public interest.** | Pedestrian and non–motorized facility planning and implementation is done by local jurisdictions in partnership with developers and other types of development.<br><br>In 2012, the Colorado Department of Transportation completed the Statewide Bicycle and Pedestrian Plan.<br><br>In the DRCOG planning area, the 2016–2018TIP allocated $40.7 million for bicycle related projects which represents 21% of the total TIP funds for this time period.<br><br>In the North Front Range planning area, there were 3 bike related projects with funding in the FY2020–2023 TIP with a total funding amount of $1.4M ($1.1M Federal, $0 State, $0.4 Local) which is 2.2% of the total funding in the TIP. |

### 7.4.6 Previously Implemented Measures

Beyond the measures previously outlined in this section, there have been an abundance of programs and efforts that have been undertaken in the DM/NFR area over the years that have resulted in real world emissions reductions, but are not being included in the SIP or evaluated in detail at this time. Such programs include:

- Replacing gas caps
- Car care fairs
- Stop–at–the–click outreach
- High–emitter vehicle programs
- Vehicle salvage programs
- Household chemical recycling programs
- Neighborhood electric vehicles
- CDOT's Air Quality Programmatic Agreement to identify and commit to a number of proactive measures that will reduce mobile source air toxics and greenhouse gas emissions throughout Colorado

## 7.5 EMISSION REDUCTION MEASURES EVALUATED BUT NOT CONSIDERED RACM FOR PURPOSES OF THE SIP

Emission reduction measures were evaluated to determine if they met the definition of RACM based upon EPA's State Implementation Plan Requirements Rule[100] for the 2008 NAAQS. To be considered RACM, the following criteria were used in evaluating whether potential measures:

- Necessary to demonstrate attainment
- Technologically or economically feasible
- Implemented successfully in other Serious nonattainment areas
- Could be implemented by May 1, 2020
- Could qualify as SIP measures by being quantifiable, enforceable, permanent, and surplus

[100] EPA, 2008 Ozone NAAQS SIP Requirements Rule (80 Fed. Reg. 12,264 (Mar. 6, 2015))

Measures related to stationary sources were evaluated as part of the CDPHE's RACT analysis and are discussed in Chapter 6. A summary of measures evaluated as part of this chapter are listed in Table 53 below; many are still under consideration for implementation outside of the SIP process.

**Table 53 – Summary of Emissions Reduction Measures Evaluated for RACM**

| Strategy | Strategy Summary |
|---|---|
| **Oil and Gas** | |
| **SHER Team/Pneumatic Controller Task Force** | Continue collaborative effort between the CDPHE and industry to assess viable control strategies for the oil and gas sector. |
| **Inspection and Maintenance** | |
| **Lower cut points for gasoline vehicles** | Tighten limits of vehicle emission levels |
| **Diesel I/M Program for NOx** | Expand inspection of diesel vehicles to include NOx testing |
| **Fuels** | |
| **Low-Emissions Diesel Fuel** | Implement a low emission diesel fuel standard in the NAA through revised cetane or aeromatics specifications |
| **Low Carbon Fuels** | Implement a low carbon fuel standard in the NAA |
| **Low-RVP Fuels** | Implement a lower Reid Vapor Pressure (RVP) fuel standard in the NAA |
| **Transportation** | |
| **Eco–Driving** | Encourage driving practices that reduce fuel use and emissions through educational programs. |
| **Car–Sharing Program** | Car–sharing programs allow members to use cars for personal use. |
| **Parking Supply Management (Priced Parking)** | Decrease parking supply and increase the price of parking to decrease vehicle miles traveled. |
| **Decrease Transit Fare Structure** | Decrease transit fares to increase transit use and subsequent decrease in vehicle miles traveled. |
| **Increased Transit Service Levels** | Increase transit service to increase of transit use subsequent decrease in vehicle miles traveled. |
| **Pay–As–You–Drive Insurance** | Provide vehicle insurance based on the number of miles traveled per year to decrease vehicle miles traveled. |
| **Fuel Tax Pricing Strategies and Mileage Based User Fees** | Raise the state tax on fuel to decrease vehicle miles travel. |
| **Commuter Trip Reduction Mandate** | Develop a mandatory Commuter Trip Reduction program that meets the requirements of the Clean Air Act, 42 U.S.C. §7511a. |
| **Local Government Policies** | |
| **Lower Emissions Diesel Equipment Specifications** | Engage MPOs to incentivize green construction contracting policy adoption by local gov'ts |
| **Heavy-Equipment Usage Restrictions** | Limit operations of heavy-duty equipment in the NAA |
| **Vehicle Anti-Idling Restrictions** | Expand anti-idling policies beyond the work being done by Engines Off! |

| Strategy | Strategy Summary |
|---|---|
| **Elective Vehicle Charging Infrastructure Building Codes** | Develop local government ordinances focused on incentivizing or mandating the inclusion of electric charging infrastructure in new construction. |
| **Boating Restrictions** | Limit motorized boating activity. |
| **Outreach** | |
| **VMT Reduction Strategies/Expanded Commuter Trip Reduction Programs** | Increase participation in ongoing VMT reduction programs and Commuter Trip Reduction programs operated by DRCOG and NFRMPO. |
| **Diesel Vehicle Best Management Practices** | Increase participation in Colorado's existing Exemplary Maintenance program for heavy duty diesel fleets. |
| **Out of Area Inspection and Driver Education** | Outreach to drivers outside of the nonattainment area to increased motor vehicle inspections |
| **CDPHE extended forecasting program for the public** | Forecast ozone more than 1 day in advance |
| **Land Use** | |
| **Indirect Source Rule Non-Road Equipment** | Develop an indirect source rule to address emissions from development projects |
| **Tree Planting Guidelines/ Urban Forest Management** | Plant certain trees and manage the urban forest to have an impact on VOC and NOX emissions. |
| **Cannabis Cultivation Operations** | Assess means of controlling VOC emissions generated in cannabis cultivation operations. |
| **Increase Development Densities, Mixed Use and Connectivity to Transportation Choices** | Connecting residents with a mix of land uses and transportation options can decrease the need to use a personal single–occupant vehicle for trips. |
| **Other** | |
| **Dedicated State Funding for Air Quality** | Develop a dedicated funding source for projects that will support the reduction of air pollutants. |

Detailed discussions of each are included in Table 54. While no measures included in this analysis are determined to be necessary to demonstrate attainment, many of the measures will continue to be evaluated for potential implementation in possible, future SIPs.

**Table 54 – Stationary Sources and Fuels RACM Analysis**

| Measures | Description and RACM Determination |
|---|---|
| **Oil and Gas** | |
| **SHER Team/Pneumatic Controller Task Force** | **Description:**<br>As a means of continuing to evaluate viable and cost-effective emission reductions strategies for the oil and gas sector, Colorado has developed the Statewide Hydrocarbon Emissions Reduction (SHER) team, as well as a Pneumatic Controller (PC) task force.<br><br>**RACM Determination:**<br>Colorado implemented additional oil and gas regulations as part of the December 2019 Air Quality Control Commission Rulemaking. Many of these emission reduction measures were a byproduct of the SHER team and PC task force's continued efforts. The groups will continue to have periodic meetings where they will evaluate and consider additional emission control measures for the oil and gas sector. Any additional measures won't be implemented May 1, 2020 and are therefore not considered RACM for this SIP. |
| **Mobile Source Inspection and Maintenance** | |
| **Lower cut points for gasoline vehicles** | **Description:**<br>As a means of reducing emissions from on road mobile sources more stringent emission limits for on road gasoline vehicles registered in the DM/NFR nonattainment area.<br><br>**RACM Determination:**<br>Colorado may adopt tighter emission limits for gasoline vehicles located in the DM/NFR nonattainment area. The RAQC has partnered with the CDPHE's Air Pollution Control Division to investigate the emission benefits and cost of implementing these standards. If implemented, this strategy would require revising the existing regulations for Colorado's inspection and maintenance program which would not able to be completed and implemented in time for inclusion with this SIP submittal. |
| **Diesel I/M Program for NOx** | **Description:**<br>This strategy aims to mitigate emissions from on road diesel engines by expanding the existing diesel /M program. Possible expansions of the program could include testing of NOx and VOC or adding an On Board Diagnostic (OBD) assessment. California is currently developing a similar program for heavy duty diesel trucks that Colorado can use as a model.<br><br>**RACM Determination:**<br>Colorado is considering the adoption of an I/M program for NOx emissions from diesel engines that is similar to what is being developed in California for heavy duty diesel trucks. If implemented, this strategy would require legislative action, however, and would not be completed in time for inclusion with this SIP submittal. |
| **Fuels** | |

| Measures | Description and RACM Determination |
|---|---|
| **Low Emission Diesel Fuel** | **Description:**<br>This strategy aims to reduce emissions from heavy-duty diesel sources through the implementation of a low emissions diesel (LED) fuel standard, similar to the Texas Low Emission Diesel (TxLED) used in the Houston/Galveston/Brazoria nonattainment area.<br><br>**RACM Determination:**<br>The RAQC has partnered with the APCD to investigate the emission benefits and cost of implementing these standards. If implemented, this strategy would require legislative action, however, and would not be completed in implemented in time for inclusion with this SIP submittal. |
| **Low Carbon Fuel Standard** | **Description:**<br>A Low Carbon/Clean Fuel Standard would reduce carbon emissions from the transportation sector by regulating the carbon intensity of transportation fuels.<br><br>**RACM Determination:**<br>Colorado is evaluating a low carbon fuel standard similar to the program implemented in California. Currently, the RAQC is supporting the Colorado Energy Office's efforts in assessing the viability of such a program in the area. If implemented, this program would require legislative action and will not be completed at the time of the SIP submittal. |

| Measures | Description and RACM Determination |
|---|---|
| **Low-Reid Vapor Pressure (RVP) Fuels** | **Description:**<br>The RAQC commissioned a study in 2018[101] to evaluate the cost, timing and supply impacts of implementing a more stringent formulation of summertime gasoline to reduce ozone precursor emissions from mobile sources via changes in motor gasoline specifications in the DM/NFR fuel market. These impacts can take a number of forms including additional gasoline supply costs due to increased manufacturing costs and changes in the sourcing and delivery of gasoline supply due to decisions by refiners to not invest in the equipment needed to produce the more stringent gasoline specifications. Changes to the DM/NFR fuel specifications can potentially add significant costs to the consumer price of gasoline. The gasoline specification options that were studied include:<br>• Maintain the current 7.8 psi (pound per square inch) RVP summertime standard, but eliminate the one psi RVP ethanol waiver<br>• Adopt a 7.0 psi RVP summertime standard and retain the one psi RVP ethanol waiver<br>• Adopt a 7.0 psi RVP summertime standard without the one psi RVP ethanol waiver<br>• Eliminate summertime ethanol blending<br>Many of these strategies will take between 48 – 60 months for refiners to implement due to the necessary facility upgrades required. The study indicates that implementation of these fuel options would be between $0.04 and $0.14 per gallon and reduce emissions from on-road mobile sources between 1.9 tpd – 4.8 tpd.<br><br>**RACM Determination:**<br>This strategy is still under evaluation by the RAQC. Any action related to this strategy would be beyond the timeframe for implementation by the 2020 ozone season and is therefore not considered to be RACM. |
| **Transportation** | |
| **Eco–Driving** | **Description:**<br>EcoDriving encompasses educational programs to encourage driving practices that reduce fuel use and emissions. EcoDriving strategies include avoiding rapid starts and stops, limiting the use of air conditioning, using cruise control, avoiding idling, combining trips, and using the highest gear possible.<br><br>**RACM Determination:**<br>Enforcement of EcoDriving methods is not feasible. Through the use of on-board technology, many companies are promoting eco driving strategies for drivers through tracking of performance indicators to help reduce fuel consumption and maintenance costs. Additional information related to EcoDriving can be shared through the RAQC's SSBA program. |

[101] *Fuel Supply Impacts Assessment*. Energy Analyst International, Inc. March 2019. https://raqc.egnyte.com/dl/pWU64a2taj/

| Measures | Description and RACM Determination |
|---|---|
| **Car–Sharing Program** | **Description:**<br>Car–sharing programs allow members to use cars for personal use. The companies require a membership and use a reservation system for using the cars. The goal is to reduce the need for people to own a personal vehicle of their own thereby reducing vehicle miles traveled.<br><br>**RACM Determination:**<br>Enforcement of the use of Car-Sharing programs is not feasible. There are currently, seven car–sharing companies in the Denver metro area. This information is shared on the RAQC's website and program websites. The City and County of Denver allows free on–street parking for registered car–sharing companies within the central business district (CBD) as a means of relieving parking demand during peak parking hours. |
| **Parking Supply Management (Priced Parking)** | **Description:**<br>Decreasing parking supply and increasing the price of parking can result in decreased vehicle miles traveled.<br><br>**RACM Determination:**<br>Enforcement of local parking supply management and pricing of parking is not feasible. No evidence that this concept has been used as an enforceable SIP strategy. Currently, the RAQC provides information to local jurisdictions regarding parking via the "Air Quality Toolkit for Local Governments"[102].<br><br>Additionally, the City and County of Denver adopted a Strategic Parking Plan that outlines strategies to manage parking supply in the urban and commercial areas of the City. The plan focuses on providing short–term parking options for visitors and shoppers and seeks to encourage workers to either park remotely or use alternative transit. Currently, it is not the standard for employers in the Denver CBD to provide free parking to all employees. |

[102] Regional Air Quality Council's "Air Quality Toolkit for Local Governments"; https://raqc.org/localgov/tools-and-information

| Measures | Description and RACM Determination |
|---|---|
| **Decrease Transit Fare Structure** | **Description:**<br>Decreased transit fares can result in an increase of transit use and an associated decrease in vehicle miles traveled.<br><br>**RACM Determination:**<br>Mandate and enforcement of decreased transit fare structures is not economically feasible. This concept is inconsistent with Colorado Law. No evidence that this concept has been used as an enforceable SIP strategy.<br><br>Transit fares are determined by transit providers based on their available mil–levy revenues. In 2015, RTD completed an analysis of their fare structure and proposed a new fare structure and rates. Implementation of the new fare structure began in 2016.<br><br>Summary:<br>• Local fares increase 16% from $2.25 to $2.60<br>• Local fares increase 18% from $1.10 to $1.30 for seniors and other discounted groups<br>• Creates three zones: Zones 1 and 2 are local, Zone 3 is regional<br>• Eliminates express service fares and rolls them into the new zone structure<br>• Decreases regional zone fares by 11% from $5.00 to $4.50<br><br>RTD also collaborated with Affordable Fares Task Force to launch the LiVE Program which is an income-based fare discount program in July 2019. The program provides discounted rides to qualifying riders whose household incomes are at or below 185% of the federal poverty level. Additional fare changes that were rolled out in 2019 included:<br><br>• Change in fare structure from per ride to a 3-hour pass<br>• Local fares increased from $2.60 to $3.00<br>• Local fares increased from $1.30 to $1.50 for seniors and other discounted groups<br>• Regional fares increased from $4.50 to $5.25<br>• Addition of the Airport line with a fare of $10.50 ($5.25 for seniors and other discounted groups) |
| **Increased Transit Service Levels** | **Description:**<br>Increased transit service can result in an increase of transit use and an associated decrease in vehicle miles traveled.<br><br>**RACM Determination:**<br>Mandate and enforcement of increased transit service is not economically feasible. No evidence that this concept has been used as an enforceable SIP strategy. |

| Measures | Description and RACM Determination |
|---|---|
| **Pay–As–You–Drive Insurance** | **Description:**<br>Pay–As–You–Drive (PAYD) Insurance programs seek to provide vehicle insurance based on the number of miles traveled per year as a means of decreasing vehicle miles traveled.<br><br>**RACM Determination:**<br>Mandate, enforcement and specification of the use of Pay–As–You–Drive Insurance is not feasible as part of Colorado law. Additionally, there is no evidence that this concept has been used as an enforceable SIP strategy in other areas. Pay As You Drive insurance programs are currently offered in the Denver/NFRMPO area by Progressive, Allstate, and GMAC/Onstar insurance companies.<br><br>Another emerging market is Pay How You Drive (PHYD). This is a similar program to PAYD, but brings in additional sensors like accelerometer to monitor driving behavior. |

| Measures | Description and RACM Determination |
|---|---|
| **Fuel Tax Pricing Strategies and Mileage Based User Fees** | **Description:**<br>Fuel tax pricing strategies typically include raising the state tax on fuel as a means to decrease vehicular travel. Similarly, mileage based user fees can have the goal of reducing vehicle miles traveled by imposing a fee on all vehicle miles traveled.<br><br>**RACM Determination:**<br>Mandate, enforcement and specification of a state–level fuel tax for air quality purposes is not feasible under Colorado law. Additionally, there is no evidence that this concept has been used as an enforceable SIP strategy in other areas. The MPACT 64 group comprised of the Metro Mayors Caucus, Progressive 15, Action 22, Club 20 and the 64 counties in the State of Colorado formed to analyze options for funding transportation in Colorado. The concern of the group is the flat to declining nature of the gas tax, growing transportation needs statewide, and under/unfunded local and regional transportation needs. The group looked at a number of ways to fund transportation but did not end up proposing a ballot initiative for transportation funding.<br><br>In 2017-2018, Coloradans for Coloradans, which is a coalition of the Denver Metro Chamber, Colorado Contractors Association, and others, has continued the transportation infrastructure funding conversation. This may result in a statewide ballot initiative for a sales tax increase for transportation infrastructure. It is important to note that there are not currently any fuel tax increase proposals, thus there is not any current work being done on a fuel pricing strategy per say.<br><br>In December 2016, CDOT launched the Colorado Road Usage Charge Pilot Program (RUCPP), which ran through April 2017, to test the feasibility of a road usage charge in the State. In total, 150 participants from 27 different counties completed the pilot, which tested various RUC technologies on a wide range of vehicles including traditional, hybrid, and electric powered. Over 541,000 miles were driven by participants over the four-month study and mileage was reported via GPS, non-GPS, and manual odometer readings.<br><br>Overall, the pilot demonstrated that RUC is feasible from a technology standpoint with participants reporting that:<br>• 93% were satisfied with the pilot program overall<br>• 96% were satisfied with the ease of participating in the pilot program<br>• 91% would participate in a future pilot<br>• 88% felt their personal information was secure during the pilot<br>• 81% agreed that road usage charge is a fair funding method<br>• 99% felt their mileage reported was accurate |

| Measures | Description and RACM Determination |
|---|---|
| **Commuter Trip Reduction Mandate** | **Description:**<br>Development of a mandatory Commuter Trip Reduction program that meets the requirements of CAA §182((d)(1)(B). This program would mandate employers of 100 or more employees within the NAA to implement programs to increase average vehicle occupancy of commuting trips by at least 25% compared to a baseline.<br>**RACM Determination:**<br>This strategy is still under evaluation by the RAQC. Any action related to this strategy would be beyond the timeframe for implementation by the 2020 ozone season and is therefore not considered to be RACM. |
| **Local Government Policies** | |
| **Lower Emissions Diesel Equipment Specifications** | **Description:**<br>This strategy aims to mitigate emissions associated with the construction through the establishment of Best Operational Practices and public bid processes for use by local governments that will encourage the use of Tier 3 or 4 equipment.<br><br>**RACM Determination:**<br>Colorado may implement a green construction incentive program. The RAQC has partnered with the APCD and local planning organizations to assess emission benefits and cost and develop an outreach program. Implementation would require extensive outreach to local governments and stakeholders in partnership with metropolitan planning organizations in the DM/NFR NAA and as such won't be in place in time for the SIP submittal. This would be a voluntary, non-enforceable program and would not be considered RACM for the purposes of the SIP. |
| **Heavy-Equipment Usage Restrictions** | **Description:**<br>This strategy aims to reduce emissions from non-road sources by implementing usage restrictions on heavy-duty diesel equipment. These includes seasonal/episodic usage restrictions or tier type usage restrictions.<br><br>**RACM Determination:**<br>Colorado may implement heavy equipment usage restriction. The RAQC has partnered with the APCD and local planning organizations to assess emission benefits and cost. Implementation would require extensive outreach to local governments and stakeholders in partnership with metropolitan planning organizations in the DM/NFR NAA and as such won't be in place in time for the SIP submittal. |

| Measures | Description and RACM Determination |
|---|---|
| **Vehicle Anti-Idling Restrictions** | **Description:**<br>Expand anti-idling policies beyond the work being done by the Engines Off! outreach program. This would include the development of model policies and increased enforcement efforts and revamping the outreach efforts initiated by the Engines Off! program. This includes collaborating with the Denver Department of Public Health and Environment on the "Love My Air Denver" campaign.<br><br>**RACM Determination:**<br>There is no evidence at this time that anti-idling policies have been used as an enforceable SIP strategy in other areas. |
| **Elective Vehicle Charging Infrastructure Building Codes** | **Description:**<br>Increase the adoption of LEV/ZEV vehicles through supporting the development of Electric Vehicle Charging Infrastructure policies. This approach focuses on developing model policies that can be easily adopted and partnering with local MPOs on outreach efforts to increase policy implementation by local governments throughout the DM/NFR nonattainment area.<br><br>**RACM Determination:**<br>There is no evidence at this time that electric vehicle charging infrastructure policies have been used as an enforceable SIP strategy in other areas. |
| **Boating Restrictions** | **Description:**<br>Develop model policies for adoption by park/reservoir managers that limits motorized boating activity throughout the nonattainment area on potentially high ozone days.<br><br>**RACM Determination:**<br>This strategy is still under evaluation by the RAQC. Any action related to this strategy would be beyond the timeframe for implementation by the 2020 ozone season and is therefore not considered to be RACM. |

| Measures | Description and RACM Determination |
|---|---|
| **Outreach** | |
| **VMT Reduction Strategies/Expanded Commuter Trip Reduction Programs** | **Description:**<br>Expand current commuter mitigation programs to further work with local employers, typically those with 100+ employees, to implement programs that would reduce the number of individuals commuting to work in single occupancy vehicles. This could include but is not limited to: incentivizing the use of public transit or non-motor vehicle transit such as bicycles, increasing remote work options, and/or developing employee carpool programs. This could be a voluntary program implemented via memorandums of understanding (MOU), or be mandated with local ordinance or state regulation. As an added incentive for employers to implement this type of commuter mitigation program, the RAQC could recognize and award top performing employers with a "Clean Air Award," showcasing the employers' positive actions that benefit our region's air quality and building the credibility of those employers as good environmental stewards.<br><br>**RACM Determination:**<br>This strategy is still under evaluation by the RAQC. Any action related to this strategy would be beyond the timeframe for implementation by the 2020 ozone season and is therefore not considered to be RACM. |
| **Diesel Vehicle Best Management Practices** | **Description:**<br>Increase participation in the existing Exemplary Maintenance program outlined by AQCC Regulation Number 12 through increased outreach to managers of heavy-duty diesel fleets.<br><br>**RACM Determination:**<br>This strategy is still under evaluation by the RAQC. Any action related to this strategy would be beyond the timeframe for implementation by the 2020 ozone season and is therefore not considered to be RACM. Additionally, there is no evidence that this type of strategy has been used as a SIP enforceable measure. |
| **Out of Area Inspection and Driver Education** | **Description:**<br>Outreach to attainment area residents who frequently travel within the nonattainment area about having their motor vehicles inspected.<br><br>**RACM Determination:**<br>Mandate and enforcement of this type of program is not economically feasible at this time. |
| **CDPHE extended forecasting program for the public** | **Description:**<br>Communicate ozone forecast further in advance to allow individuals more time to plan for implementing ozone reducing measures, such as carpooling.<br><br>**RACM Determination:**<br>Mandate, enforcement and specification of the use of an Extended Forecasting program is not feasible. Additionally, there is no evidence that this concept has been used as an enforceable SIP strategy in other areas. |

| Measures | Description and RACM Determination |
|---|---|
| **Land Use** | |
| **Indirect Source Review (ISR) Rule** | **Description:**<br>Establish requirements for developers of larger residential, commercial and industrial projects which can reasonably be expected to cause or induce substantial mobile source activity to mitigate those emissions.<br><br>**RACM Determination:**<br>Due to the resources necessary for development, this strategy is not able to be completed by the time of this SIP submittal. |
| **Tree Planting Guidelines/Urban Forest Management** | **Description:**<br>Plant certain trees and manage the urban forest to have a beneficial impact on VOC and $NO_X$ emissions.<br><br>**RACM Determination:**<br>Mandate and enforcement of local tree planting and urban forestry management efforts is not feasible. The RAQC provides local agencies with an "Air Quality Toolkit for Local Governments"[103].This toolkit is provided as an on–line resource. The Air Quality Toolkit includes information about the potential air quality impacts of planting specific tree varieties. Also included is a companion list which outlines the tree varieties that will grow in the Denver metropolitan area. Additionally, the Air Quality Toolkit provides a link to the iTree program which allows for the analysis of tree programs and heat island issues.<br><br>Since 2015, the Emerald Ash Borer has become a significant problem in the Denver Metro/North Front Range, with 1 in 6 trees in the region (~1.45M ) being ash which are susceptible to this pest. In the City and County of Denver, they have launched the 5-year Be A Smart Ash campaign to educate Denver residents to help identify, treat, and/or replace their ash trees both now and over the course of the next 15 years. Additionally, the City will replace small ash trees from city-maintained land, including parks and is offering free replacement trees to City residents to try to get new trees established as soon as possible.<br><br>Ash trees have a low emission rate of isoprene and monoterpenes, which are VOC. Therefore, while it is not clear what species of trees are being planted to replace the ashes, equivalent low-VOC species would be preferable from an ozone standpoint. |

[103] Regional Air Quality Council's "Air Quality Toolkit for Local Governments"; https://raqc.org/localgov/tools-and-information

| Measures | Description and RACM Determination |
|---|---|
| **Cannabis Cultivation Operations** | **Description:**<br>In 2012, Colorado legalized recreational marijuana. Cannabis cultivation produces VOC emissions, which are being studied to determine the impact on ozone formation.<br><br>**RACM Determination:**<br>In 2000, Colorado legalized the use of medical marijuana, and then in 2012 recreational marijuana was legalized for adults aged 21 and over. As of a 2019 report from the CDPHE there are 680 medical marijuana cultivations and 732 recreational marijuana cultivations in the state. VOCs are emitted from the cultivation process via the odors generated by the plants themselves, as well as the solvents used in the extraction process. As an agricultural activity these operations may not be subject to state air quality regulations. Best management practices including the use of carbon filters have been established to minimize odor from cultivation operations. Carbon filters also reduce emissions from VOCs. Additional research is being done by the CDPHE to further understand emissions generated by the cannabis industry and ways to further reduce associated emissions. |

| | |
|---|---|
| **Increase Development Densities, Mixed Use and Connectivity to Transportation Choices** | **Description:**<br>Connect residents with a mix of land uses and transportation options to decrease the need to use a personal single–occupant vehicle for trips.<br><br>**RACM Determination:**<br>Mandate, enforcement and specification of local land use activities is not feasible since land use decisions are under the purview of local governments pursuant to Colorado law. Local governments in the Denver–Metro and North Front Range areas, develop land use plans that include policies and plans to increase residential densities and increase connections to transit. The RAQC provides local governments with a "Air Quality Toolkit for Local Governments"[104].This toolkit provides timely information, case studies, tools and checklists that local governments can use to address air quality impacts of land use development.<br><br>**DRCOG Region**<br>In January 2017, the DRCOG Board adopted a revised Metro Vision with a 2040 target date. Key performance measures in the plan include the following by 2040 (baseline is 2014 unless otherwise specified):<br>• Urban center housing increase from 10% to 25%.<br>• Urban center employment increase from 36% to 50%.<br>• Increased regional population-weighted density (people per square mile) from 4,850 to 6,060 (25% increase).<br>• Non-single-occupancy vehicle (SOV) mode share to work increase from 25% to 35%<br>• Daily VMT per capita decrease from 25.5 miles to 23 miles (10% decrease).<br>• Average travel time variation (TTV) (peak vs. off-peak) <1.30 (1.22 in 2014)<br>• Daily person delay per capita < 10 minutes (6 min. in 2014).<br>• A 60% reduction in surface transportation-related greenhouse gas emissions per capita from 2010 baseline.<br>• Increase protected open space from 1,840 square miles ($mi^2$) to 2,100 $mi^2$.<br>• Increase in share of the region's population living in areas with housing and transportation costs affordable to the typical household in the region from 41% to 50%.<br><br>**NFRMPO Region**<br>In June 2017, the NFRMPO Amended their 2040 Regional Transportation Plan, which was initially adopted in September 2015. The plan outlines four primary goals and 13 objectives by 2040:<br>**Goal 1:** Foster a transportation system that supports economic development and improves residents' quality of life.<br>Objectives include: conform to air quality requirement; maintain transportation infrastructure and facilities to minimize that need for replacement or rehabilitation; and investment in infrastructure.<br>**Goal 2:** Provide a transportation system that moves people and goods safely, efficiently, and reliably.<br>Objectives include: reduce number of severe traffic crashes; use Congestion Management Process (CMP) to reduce congestion; and reliable travel times<br>**Goal 3:** Provide a multi-modal system that improves accessibility and transportation system continuity. |

| Measures | Description and RACM Determination |
|---|---|
| | Objectives include: support transportation services for all, including the most vulnerable and transit-dependent populations; implement Regional Transit Element, Regional Bicycle Plan, and North I-25 EIS; and develop infrastructure that supports alternate modes and connectivity.<br>**Goal 4:** Optimize operations of transportation facilities.<br>Objectives include: use Transportation Demand Management (TDM) techniques to reduce congestion and optimize the system; implement Intelligent Transportation Systems (ITS); enhance transit service in the NFR; and reduce project delivery timeframes.<br><br>**Windsor**<br>The Town of Windsor completed a Comprehensive Plan in 2016, which serves as the Town's a "road map," over the next 10-20 years detailing a long-term vision and policy agenda for important issues including land use, housing, parks, infrastructure, and transportation.<br><br>**Fort Collins**<br>The City of Fort Collins kicked-off the Fort Collins City Plan in February 2018 to develop a new plan for the next 20 years.<br><br>**Loveland**<br>The City of Loveland approved a Comprehensive Plan in July 2016. The plan includes 9 elements consisting of 45 policies and 197 supporting strategies. The elements include:<br>• A Commitment to a Downtown Renaissance<br>• Revitalize Corridors and Gateways<br>• Cultivate Vibrant Economic Centers<br>• Create a Safe and Healthy Built Environment<br>• Celebrate Natural Assets in an Urban Setting<br>• Create a Connected and Accessible Community<br>• Facilitate Complete Neighborhoods<br>• Invest in Loveland's Older Neighborhoods<br>Strengthen Loveland's Strategic Roles in the Community and Region |
| **Other** | |

[104] Regional Air Quality Council's "Air Quality Toolkit for Local Governments"; https://raqc.org/localgov/tools-and-information

| Measures | Description and RACM Determination |
|---|---|
| **Dedicated State Funding for Air Quality** | **Description:**<br>Establish a dedicated fund to develop and implement emissions control strategies and make capital investments in clean technology to reduce pollutants that contribute to the formation of ozone and other pollutants of importance to the State. Many effective emission control strategies are already being implemented in Colorado such as heavy-duty equipment replacement and retrofits; however, they are having limited impacts due to lack of dedicated funding for such projects. With a substantial, dedicated source of state funding, emissions reductions can be realized faster, and on a much larger scale, leading to a greater impact on air quality.<br><br>**RACM Determination:**<br>This strategy is still under evaluation by the RAQC. Any action related to this strategy would be beyond the timeframe for implementation by the 2020 ozone season and is therefore not considered to be RACM. |

## 7.6 CONTROL MEASURES IMPLEMENTED IN OTHER AREAS

As part of this effort, a comprehensive look at other ozone nonattainment areas was conducted as well as a comprehensive review of EPA's Menu of Control Measures. This included review of other area SIPs and what control measures were incorporated as either voluntary or mandatory measures. The following areas were evaluated as part of this effort:

- Arkansas
  - Memphis
- California
  - Calaveras Area
  - Chico Area
  - Imperial County
  - Kern County
  - Los Angeles/San Bernardino Counties/Mojave Desert
  - Los Angeles–South Coast Air Basin
  - Mariposa County
  - Morongo Areas of Indian Country
  - Nevada County
  - Pechanga Areas of Indian Country
  - Riverside County
  - Sacramento Metro Area
  - San Diego
  - San Francisco Bay Area
  - San Joaquin Valley
  - Ventura County
- Connecticut
  - Greater Connecticut
- Delaware
  - Seaford
- District of Columbia
  - Washington Area
- Georgia
  - Atlanta
- Illinois
  - Chicago/Gary/Lake County
  - St. Louis
- Indiana
  - Chicago/Gary/Lake County
  - La Porte Co
- Louisiana
  - Baton Rouge
- Maryland
  - Baltimore Area
  - Kent and Queen's Cos
  - Philadelphia/Wilmington/ Atlantic City
- Massachusetts
  - Dukes County
- Missouri
  - St. Louis
- New Hampshire
  - Boston/Manchester/ Portsmouth
- New Jersey
  - Philadelphia/Wilmington/ Atlantic City
  - New York–N./New Jersey/ Long Island
- New York
  - Jamestown
  - New York–N./New Jersey/ Long Island
- North and South Carolina
  - Charlotte/Gastonia/Rock Hill
- Pennsylvania
  - Lancaster
  - Philadelphia/Wilmington/ Atlantic City
  - Pittsburgh/Beaver Valley
- Rhode Island
- Tennessee
  - Memphis
- Texas
  - Beaumont/Port Arthur
  - Dallas/Fort Worth
  - Houston/Galveston/Brazoria
- Virginia
  - Fredericksburg
  - Norfolk/Virginia Beach/Newport News
  - Richmond/Petersburg
- Wisconsin
  - Milwaukee/Racine
  - Sheboygan County

Measures identified are listed in Table 55 which also indicates whether the measure was included in the RAQC's analysis. This table is limited to area and mobile source strategies. The review of stationary source measures is included in Chapter 6 as part of the RACT analysis.

**Table 55 – Comprehensive List of Reviewed Strategies Implemented in Other Areas**

| Category | Strategy | Included in RACM Review | Not in RACM Review | Arkansas | California | Connecticut | Delaware | District of Columbia | Georgia | Illinois | Indiana | Louisiana | Maryland | Massachusetts | Missouri | New Hampshire | New Jersey | New York | North Carolina | Pennsylvania | Rhode Island | South Carolina | Tennessee | Texas | Virginia | Wisconsin |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Area Sources** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Agriculture** | Emission Reductions from Livestock Waste | | x | | x | | | | | | | | | | | | | | | | | | | | | |
| **Asphalt** | Asphalt Formulation (Cutback/Emulsified), Paving Operation Restrictions | | x | | x | x | | | | | | | | x | | | x | x | | | x | | | | | |
| **Consumer Products** | Lower VOC content in consumer/household products and architectural and industrial maintenance (AIM) | x | | | x | x | | x | | | | | x | x | x | | x | x | x | | x | | | x | x | |
| **Biogenic Sources** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Trees** | Urban Heat Island/Tree Canopy | x | | | x | | | x | | | | | x | | | | | | | | | | | | x | |
| **Non–Road Mobile Sources** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Fuel Standards** | Low RVP Gasoline/Low Emission Diesel in Non–road vehicles and equipment | | x | | | | x | | | | | | | | | | | | | | | | | | | |
| **Idle Reduction** | Auxiliary Power Units/Shore power for Locomotives/Marine | | x | | | | | x | | | | | x | | | | | | | | | | | | x | |
| **Locomotives** | Accelerated Intro. of Cleaner Line–Haul Locomotives | | x | | x | | | | | | | | | | | | | | | | | | | | | |
| **Off–Road Equipment** | Additional Evaporative Emission Standards | | x | | x | | | | | | | | | | | | | | | | | | | | | |
| | Tier 2 or newer Off–Road Equipment (over 25hp): Including Agriculture Equipment/Rec. Vehicle Emission Standards/Clean Construction Policies | | x | | x | | | | | | | | | | | | | | | | x | | | x | | |
| **Recreational Vehicles** | Personal Watercraft/Recreational Boats | | x | | x | | | | | | | | | | | | | x | | | | | | | | |
| **On–Road – Mobile Sources/Fuels** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Diesel** | Diesel Engine Chip Reflash | | x | | | x | | | | | | | | | | | | | | | | | | | | |
| | Diesel Idling Rule | x | | | | | x | | | | | | | | | | x | | | | x | | | x | | |
| | SmartWay – Freight Efficiencies/Truck Stop Electrification (Voluntary) | x | | | | | | | | | | | | | | | | | | | | | | x | | |
| | Voluntary Diesel Retrofit Program | x | | | | | | x | | | | | x | | | | | | | | x | | | x | x | |
| **Diesel/Gasoline** | High emitter programs – Expanded Vehicle Retirement | x | | | x | | | | | | | | | | | | | | | | | | | x | | |
| **Engine and Fuel Standards** | Clean Fuel Fleets | x | | | | | | | x | | | | | | | | | | | | x | | | | | |

| Category | Strategy | Included in RACM Review | Not in RACM Review | Arkansas | California | Connecticut | Delaware | District of Columbia | Georgia | Illinois | Indiana | Louisiana | Maryland | Massachusetts | Missouri | New Hampshire | New Jersey | New York | North Carolina | Pennsylvania | Rhode Island | South Carolina | Tennessee | Texas | Virginia | Wisconsin |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Engine Standards** | California Low/Zero Emission Vehicle (CAL–LEV/ZEV) | x | | | x | x | | | | | | | x | x | | | x | x | | | x | | | | | |
| **Fuel Standards** | Regional Diesel Fuel (TxLED), Calif. Diesel) | | x | | | | | | | | | | | | | | | x | | | | | | x | | |
| | Regional Gasoline Fuel (Lower Reid Vapor Pressure (RVP)/Federal Reformulated Gasoline (RFG)) – States with 7.0 RVP: AZ, GA, KS, MI, MO, TX (El Paso); State with 7.2 RVP: IL); rest have 7.8 RVP in summer. | x | | | x | x | x | x | x | x | | | x | x | x | x | x | x | | x | x | | | x | x | x |
| **Transportation/ Land Use/Pricing/Outreach** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Alternative Transportation** | Alt. Fuel Vehicles (EVs, natural gas vehicles) | x | | | | x | | x | | | | | x | | | | | | | | | | | x | x | |
| | Clean School Bus Program/Alt. Fuel Transit Buses (Voluntary) | x | | | | | x | | | | | | | | | | | | | | x | | | x | | |
| | Full build out of FasTracks, Evaluate fare structure, increase levels of service, evaluate park and ride capacity, bus/light rail planning, real time traveler info | x | | | | x | | x | | | | | x | | | | | | | | | | | x | x | |
| | Bike/Ped Facilities | x | | | x | x | | x | | | | | x | | | | | | | | | | | x | x | |
| | Trip Reduction: promote carpooling, vanpooling, telecommuting, shared ride, etc. | x | | | | x | | | | | | | | | | | | | | | | | | x | | |
| **Congestion Mitigation** | Expand TDM programs, Signal Improvements, Intelligent Transportation System (ITS), and Incident Management System | x | | | x | x | | | | | | | | | | | | | | | | | | x | | |
| **Energy Demand** | Light Emitting Diode (LED) Signal Retrofit Program | | x | | | | | x | | | | | x | | | | | | | | | | | | x | |
| **Outreach/ Education** | Behavior Changing (Eco–Driving) | x | | | | | x | | | | | | | | | | | | | | | | | | | |
| | Ozone Action Day Initiatives (Voluntary and Mandatory) | x | | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |

# CHAPTER 8
# MOTOR VEHICLE INSPECTION AND MAINTENANCE PROGRAM

8 F

Chapter 8 – Motor Vehicle Inspection and Maintenance (I/M) Program

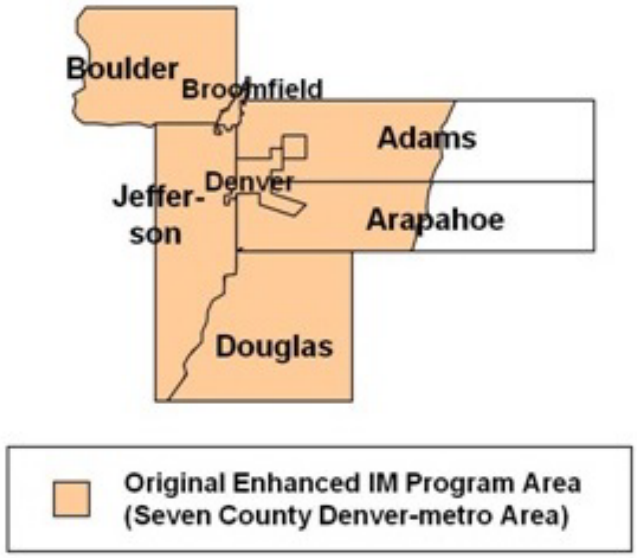
## 8.1 OVERVIEW

Pursuant to Section 182(c)(3) of the CAA, all Serious ozone nonattainment areas are required to have an enhanced vehicle inspection and maintenance (I/M) program, a requirement which Colorado already meets through Air Quality Control Commission (AQCC) Regulation Number 11 and which was previously incorporated into the 2008 Ozone State Implementation Plan (SIP). An overview of the State's I/M program and various revisions since inception are discussed in more detail in this chapter.

## 8.2 AUTOMOBILE INSPECTION AND READJUSTMENT (AIR) ENHANCED I/M PROGRAM – 1995–2014

In order to comply with the Clean Air Act (CAA) Amendments of 1990, the Denver metropolitan region was required to implement an "enhanced" vehicle inspection and maintenance program for the purposes of reducing carbon monoxide (CO) emissions. Such a program, that included requirements to reduce ozone precursor emissions along with carbon monoxide emissions in a seven[105] county area, was authorized by Colorado House Bill 93– 1340, adopted into AQCC Regulation Number 11 by the AQCC in 1993, and began implementation on January 1, 1995. The Environmental Protection Agency (EPA) conditionally approved the enhanced program as part of Colorado's SIP on November 8, 1994. Colorado resubmitted Regulation Number 11 in 1995 as part of the Denver–Longmont CO attainment demonstration and reclassification request that was approved by EPA on March 10, 1997 (62 FR 10690). Figure 18 is a map of the original program area.

**Figure 18 – Original Seven–County Enhanced I/M Program Area**




[105] The original program area included six counties until 2001, when Broomfield became the seventh county.

The comprehensive, registration–enforced program utilized a dynamometer–based I/M 240 test for 1982 and newer light–duty vehicles and a two–speed idle test for 1981 and older light–duty and all heavy–duty gas vehicles. Visual anti–tampering and smoke tests and a gas cap check were also conducted on 1975 and newer vehicles. Vehicles four model years of age and newer were exempt from inspection, as well as used vehicles sold during their exemption period. There were 14 contractor–operated testing centers[106] with 75 inspection lanes located throughout the 7-county Denver metropolitan area. These centralized facilities inspected 1982 and newer, as well as 1981 and older and heavy–duty vehicles. State–certified independent test–only stations could test 1981 and older vehicles as well. Vehicles failing any aspect of the enhanced program were required to seek off–site repairs and then return for re–testing. Fleets were allowed to conduct their own inspections of their vehicle fleet.

Minor program modifications occurred throughout the 1990's, though the most significant change added a remote sensing–based "clean screen" program to improve motorist convenience. Remote sensing is a method for monitoring vehicle emissions while simultaneously photographing the license plate when a vehicle passes through infrared and ultraviolet beams of light. Up to 20 mobile units operated throughout the region. Owners of vehicles meeting the clean screen criteria were notified by the County Clerk that their vehicle has passed the inspection process, and would be exempt from their next regularly scheduled I/M 240 emissions test. Those vehicles not exempted by clean screening were subject to the standard testing and repair protocol. The clean screen program was adopted into Regulation Number 11 by the AQCC in 1999 for implementation in 2000. EPA approved the clean screen program in 2005 as part of the Ozone Early Action Compact for the Denver area[107].

Additional program modifications were made throughout the 2000's and provided to EPA as SIP submittals. These modifications included a focused transition of the enhanced program from carbon monoxide control to ozone control, mainly through employing more stringent exhaust and evaporative emissions standards for hydrocarbons and nitrogen oxides. A complete listing of EPA actions on the enhanced program and what is included in the SIP can be found at 40 CFR § 52.320.

## 8.3 I/M PROGRAM REVISIONS

The motor vehicle I/M program in Colorado has had numerous revisions over its 25 years. The most significant revisions are discussed in detail below.

### 8.3.1 Expansion of the Enhanced AIR Program Area – 2010

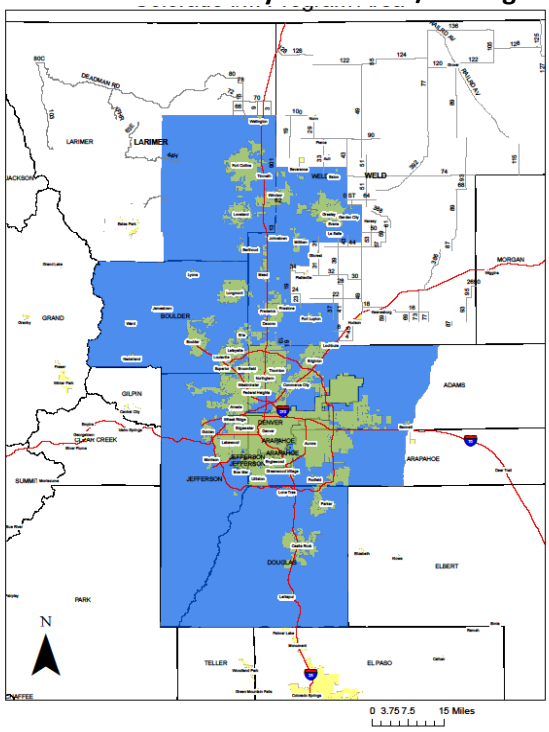
In the 2009 legislative session, Senate Bill 09–003 was approved, expanding the seven county Automobile Inspection and Readjustment (AIR) Program area boundaries to include portions of Larimer and Weld Counties. In March of 2010, the AQCC proceeded to refine the program boundaries and expand the I/M 240 and remote sensing programs into portions of Larimer and Weld Counties, with a start–up date of November 1, 2010[108]. Four additional testing centers were located in the two counties and additional mobile units were dedicated to the area. The goal of the expanded program was to further reduce ozone precursor emissions within the ozone nonattainment area. This expansion to the program was designated as "State–only" in Regulation Number 11 and not submitted to EPA for inclusion into the SIP. A map of this expanded area is shown in Figure 19.

[106] There were originally 15, but one was lost in Commerce City over an eminent domain issue (circa 2001)

[107] EPA, Approval and Promulgation of Air Quality Implementation Plans; State of Colorado; Denver Early Action Compact Ozone Plan, Attainment Demonstration of the 8-Hour Ozone Standard, and Approval of Related Revisions. Final Rule, *See* 70 Fed. Reg. 48652 (Aug. 19, 2005).

[108] The AIR Program expansion was voluntary over the November thru December period and mandatory on January 1, 2011

**Figure 19 – Current 9–County Enhanced I/M Program Area**




The enhanced I/M program as approved by the AQCC and implemented during calendar year 2011, including the State–only Larimer and Weld provisions described above, impacted actual 2011 on–road mobile source emissions as documented in the base year emission inventories.

### 8.3.2 2012/2014 Enhanced I/M Program Revisions

In December 2012, and again in October 2014, the AQCC approved several significant changes to the enhanced I/M Program in Regulation Number 11, to be implemented in the nine-county area beginning January 2015. The two principal changes were expanding the four model year exemption to seven model years and adding a pass/fail on–board diagnostic (OBD) II testing procedure for vehicles age 8 through 11 (two inspection cycles). The 2012/15 updated enhanced program is described as follows:

- Vehicles seven model years and newer are exempt;
- Vehicles eight to 11 model years are subject to centralized OBD II inspection;
- Vehicles 12 model years and older through 1982 are subject to I/M 240 transient inspection;
- Vehicles 1981 and older receive a two-speed idle inspection;
- Light-duty vehicles model years 1975 and newer also receive a gas cap pressure test;
- Retest requirements for vehicles that fail the gas cap pressure test are clarified, in accordance with federal I/M rules;
- The program includes the on–road Clean Screen Program, which allows vehicles seen two or more times within 12 months of their required emissions inspection with the two most contemporary observations below a stringent Clean Screen standard to pass the clean screen inspection[109] as an alternative to the standard inspection at an emissions inspection station;
- Visual inspection for certain installed emissions control components on model year 1996 and newer vehicles is eliminated;

[109] Single pass option is allowed but uses the Low-Emitter Index (LEI) in place of the second measurement.

- The program provides for alternative testing methods for vehicles that are unable to be tested by the On–Board Diagnostics query or the existing I/M 240 test procedures;
- Self–inspecting gasoline vehicle fleets may utilize the more effective and more convenient OBD II testing procedure on all 1996 model year and newer vehicles;
- Model year vehicles 1982 and newer are inspected biennially, while vehicles 1981 and older are inspected on an annual basis[110]; and
- The I/M program is enforced via registration renewal[111].

These provisions applied throughout the expanded enhanced 9–county program area, as shown in the map above. However, the AIR program expansion area – Larimer and Weld County region was designated as "State–only" and not federally enforceable. Colorado submitted these significant changes to the enhanced program for inclusion into the SIP on March 15, 2013 and February 20, 2015. These revisions were approved by EPA on February 7, 2019[112] (84 FR 2449).

### 8.3.3 2016 Revisions to Regulation Number 11 for SIP Control Purposes

Pursuant to Section 182(b)(4) of the CAA, all Moderate ozone nonattainment areas are required to have a vehicle inspection and maintenance program within the urbanized portion of the nonattainment area. Therefore, Colorado's I/M program was required to be part of the SIP and federally enforceable in portions of Larimer and Weld counties. As part of Moderate Area SIP revision for the 2008 8-hour ozone NAAQS, Colorado removed the Larimer/Weld "State–only" designation in Regulation Number 11 and submitted a revised Regulation Number 11 to EPA for approval on May 17, 2017, which was approved July 3, 2018 (83 FR 31068). This change allowed Colorado to take full emission reduction credit for the I/M program beginning in 2017.

Pursuant to Section 182(c)(3) of the CAA, all Serious ozone nonattainment areas are required to have an enhanced vehicle inspection and maintenance program, a requirement which Colorado already meets, thus the enhanced I/M program for the 9-county region received full emission reduction credit in both the 2017 milestone year and 2020 attainment year projected on–road mobile sources emission inventory, thereby satisfying the SIP requirement.

### 8.3.4 2017 Enhanced I/M Program Revisions

In May 2017, the AQCC approved additional changes to the enhanced I/M Program in Regulation Number 11, which were submitted to EPA for approval on May 14, 2018. These additional revisions were primarily regulatory housekeeping in nature, but did include:

- Inclusion of OBD I/M pass/fail results as a qualifying consideration in the remote sensing clean screen low emitter index
- Clarification of details of tailpipe and OBD inspection procedures and OBD readiness criteria.
- Establishing authority to fail vehicles exhibiting evidence of OBD fraud.

These revisions were approved by EPA in the same February 7, 2019 Federal Register notice mentioned above.

[110] These requirements have been effective since 1995.
[111] This requirement has been effective since 1995.
[112] EPA, Approval and Promulgation of Air Quality Implementation Plans; State of Colorado; Motor Vehicle Inspection and Maintenance Program and Associated Revisions, Final Rule, *See* 84 Fed. Reg. 2449 (Feb. 7, 2019).

Colorado has operated a Vehicle Inspection and Maintenance Program that meets the performance standard for Enhanced I/M since 1995 (40 CFR §51-351). Subsequent changes to Colorado's I/M Regulation have been designed to maintain the integrity of the program such that it continues to meet that performance standard. This is reflected in the fact that all regulatory changes to the program to date have been submitted and approved by EPA.

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# CHAPTER 9
# NONATTAINMENT NEW SOURCE REVIEW

9 F

Chapter 9 – Nonattainment New Source Review (NSR)

## 9.1 OVERVIEW

On December 26, 2019, U.S. Environmental Protection Agency (EPA) published a final rule finding that Colorado's moderate ozone nonattainment area (Denver–Boulder–Greeley–Fort Collins–Loveland) failed to attain the 2008 ozone National Ambient Air Quality Standard (NAAQS) by the applicable marginal attainment deadline of July 20, 2018 (84 FR 70897). Therefore, EPA reclassified Colorado's ozone nonattainment area as Serious, requiring attainment of the 2008 ozone NAAQS no later than July 20, 2021. Due to the reclassification to Serious, Colorado must submit a revised State Implementation Plan (SIP) that addresses the Clean Air Act's (CAA) serious nonattainment area requirements, as described in the final SIP Requirements Rule for the 2008 ozone NAAQS. These requirements include nitrogen dioxide ($NO_X$) and volatile organic compound (VOC) emission offsets under Colorado's Nonattainment New Source Review (NANSR) permitting program.

The CAA NANSR program contains specific requirements for the preconstruction review and permitting of new and modified major stationary sources of air pollutants. Under CAA § 182(c), sources that emit or have the potential to emit greater than or equal to 50 tons per year (tpy) of VOC or NOx are major stationary sources. Such sources must obtain a Title V operating permit. The CAA § 173(a) also requires a permitting agency to determine that a major stationary source has obtained sufficient offsetting emissions reductions, when necessary to compensate for a proposed emissions increase, prior to commencing operation. The CAA § 182(c)(10), implemented by 40 CFR § 51.165(a)(9), requires sources in a serious ozone nonattainment area obtaining offsetting emission reductions to obtain a ratio of total emission reductions of VOC to total increase emissions of VOC of at least 1.2 to 1. While CAA 182(c)(10) specifies the offset ratio in terms of VOCs, EPA has clarified that sources may comply with the offset provisions through interprecursor trading (i.e., VOC and $NO_X$). *See* 40 C.F.R. § 51.165(a)(11).

Colorado's Air Quality Control Commission Regulation Number 3, Part D, Section V.A. requires that, among other things, a major stationary source achieve the lowest achievable emission rate (LAER) for the specific source category. Section V.A. also requires that a major stationary source in a serious ozone nonattainment area obtain a ratio of total actual emission reductions of VOC compared to the emissions increase of VOC of at least 1.2:1 prior to commencement of operations and permitting by the Division. EPA approved these provisions into Colorado's SIP on January 25, 2016 (*81 FR 3963*). However, to allow for interprecursor trading as the CAA would permit, Colorado will need to submit a revision to Regulation Number 3, Part D, Section V.A.3.

Therefore, Colorado's SIP adequately addresses the CAA's serious nonattainment area requirements for NANSR.

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# CHAPTER 10
# CONTINGENCY MEASURES PLAN

10 F
Chapter 10 – Contingency Measures Plan

## 10.1 OVERVIEW

Section 172(c)(9) of the Clean Air Act (CAA) requires that nonattainment area State Implementation Plans (SIP) for ozone must provide for the implementation of specific measures, termed contingency measures, if an area fails to timely attain the National Ambient Air Quality Standard (NAAQS) or demonstrate Reasonable Further Progress (RFP). Section III(C)(3) of the General Preamble for the Implementation of Title I of the CAA Amendments of 1990 further explains that contingency measures should consist of other available control measures, beyond those necessary to meet the control requirement to implement reasonably available control measures (RACM) [see Section 172(a)(1)(c) of the CAA] and, therefore, beyond those reasonably required to expeditiously attain the standards (57 FR 13543). Section 172(c)(9) of the CAA specifies that contingency measures shall "take effect … without further action by the State, or the [U.S. Environmental Protection Agency (EPA)] Administrator." EPA has interpreted this latter requirement [in the General Preamble (57 FR 13512)] to mean that no further rulemaking activities by the state or EPA would be needed to implement the contingency measures.

For the Denver Metro/North Front Range (DM/NFR) Serious Nonattainment Area, the deadline to attain is July 20, 2021. Therefore, contingency measures must result in additional emissions reductions after the EPA's finding of failure to attain or not meet RFP. Per EPA's State Implementation Plan Requirements Rule[113] for the 2008 NAAQS, contingency measures should represent one–year's worth of progress, amounting to 3% of the baseline emissions inventory for the nonattainment area, which would be achieved while the state is revising its plan for the area.

## 10.2 CONTINGENCY MEASURES

The CAA allows for any combination of nitrogen oxides ($NO_X$) and/or volatile organic compounds (VOC) reductions to meet the contingency plan requirement. In the DM/NFR region, local modeling and other air quality analyses have shown that reductions in both $NO_X$ and VOC also reduce ozone concentrations based on varying local conditions. Thus, this plan includes both $NO_X$ and VOC reductions from federal emissions standards and regulations for on-road mobile sources that will occur beyond the 2020 ozone season. The resulting $NO_X$ and VOC emission reductions are not included in the 2020 ozone season attainment year inventory or 9% RFP demonstration and no additional rulemakings are required to garner these additional emissions reductions after the attainment year.

Section 182(c)(9) of the CAA specifies that in addition to the contingency measure requirements of Section 172(c)(9), the SIP must provide for the implementation of specific measures to be undertaken if the area fails to meet any "applicable milestone." Pursuant to Section 182(g), an "applicable milestone" is the interval of time pursuant to which emission reductions must be achieved to meet reasonable further progress requirements, when such interval occurs before the attainment date. For the DM/NFR, which was originally classified as Marginal, and which was reclassified to Moderate in 2016 and now Serious in 2020, there is no difference between the "applicable milestone" year and the attainment date for which contingency measures are required under Section 172(c)(9). Therefore, no additional contingency measures are necessary to meet Section 182(c)(9) beyond the 3% reduction required upon EPA determination of failure to attain by the Serious attainment date of July 20, 2021.

[113] EPA, 2008 Ozone NAAQS SIP Requirements Rule (80 FR 12264, March 6, 2015)

EPA is obligated to make a determination as to whether the DM/NFR attained the NAAQS by its attainment date within 6 months of the attainment date (*i.e.*, by January 2022); thus contingency measures would be triggered in 2022 at the earliest. Therefore, contingency measures in this plan include federal emissions standards and regulations that are expected to occur in the future and would not require any additional rulemaking by the State.

## 10.3 EMISSION REDUCTION DEMONSTRATION

To demonstrate one-year's worth of emissions reductions, or 3% of the baseline emissions inventory for DM/NFR, the total emissions reductions from these projects are compared to 2011 base year inventory for a nonattainment area (excluding biogenic sources) contained in Chapter 4 of this SIP. If mobile source reductions are greater than 3% of either the total $NO_X$ or VOC baseline inventory, the contingency measures provide the required emissions to cover the emission reduction target.

For this contingency plan, the target emissions reductions were 2% $NO_X$ and 1% VOC from on-road mobile sources for a total of 3%. As demonstrated in Table 56, with the anticipated future year reductions, the region not only achieves a 3% reduction in criteria pollutants to satisfy the contingency measure requirement, but exceeds it by 1% for a total of a 4% reduction equating to 5.4 tpd of VOCs and 9.3 tpd of NOx.

**Table 56 – 3% Percent $NO_X$ and VOC Emission Reductions From 2011 Base Case Inventory**

| Line # | Description | VOC | NOx |
|---|---|---|---|
| **3% Contingency Requirement** | | | |
| 1 | NAA 2011 base year emissions inventory | 518.8 | 320.0 |
| 2 | 3% contingency reduction required (NOx and/or VOC) | 1.0% | 2.0% |
| 3 | **3% contingency reduction required (NOx and/or VOC)[A]** | **5.2** | **6.4** |
| 4 | NAA 2020 on-road mobile emissions inventory | 49.4 | 54.7 |
| 5 | NAA 2022 on-road mobile emissions inventory | 44.0 | 45.4 |
| 6 | **Total creditable mobile source reductions in 2022B** | **5.4** | **9.3** |
| 7 | % contingency reductions achieved[C] | 1.0% | 2.9% |
| 8 | Excess (+) / Shortfall (-)[D] | 0.2 | 2.9 |
| **Is 3% Contingency Requirement Met?** | | **Yes** | **Yes** |

[A] Line 1 * Line 2

[B] Line 4 - Line 5

[C] Line 6 / Line 1

[D] Line 6 - Line 3

# CHAPTER 11
# MOTOR VEHICLE EMISSIONS BUDGETS AND TRANSPORTATION CONTROL

11 F

Chapter 11 – Motor Vehicle Emissions Budgets (MVEB) and Transportation Control

## 11.1 OVERVIEW

On December 26, 2019, the U.S. Environmental Protection Agency (EPA) reclassified the following counties in the Denver Metro/North Front Range (DM/NFR) region as a Serious ozone nonattainment area for the 2008 8-hour ozone National Ambient Air Quality Standard (NAAQS): Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, Jefferson, and portions of Larimer and Weld counties[114]. The Serious reclassification triggered several statutory requirements for the area related to mobile sources including:

- Establishment of new motor vehicle emissions budgets (MVEB) for the new attainment year of 2020 (Clean Air Act (CAA) 42 U.S.C. §7506(c) (§176(c))); and
- Demonstration every three-years that current aggregate vehicle miles traveled (VMT) and other relevant parameters are consistent with those used for the area's ozone attainment demonstration (CAA 42 U.S.C. §7511a(c)(5) ("§182(c)(5))).

### 11.1.1 Transportation Conformity

Transportation conformity is required under §176(c) to ensure that federally funded or approved highway and transit activities are consistent with ("conform to") the purpose of the state air quality implementation plan (SIP). Conformity to the purpose of the SIP means that transportation activities will not cause or contribute to new air quality violations, worsen existing violations, or delay timely attainment of the relevant NAAQS or any interim milestones. EPA's transportation conformity rule (40 C.F.R. Parts 51 and 93) establishes the criteria and procedures for determining whether regional transportation plans (RTP), transportation improvement programs (TIPs), and federally supported highway and transit projects conform to the SIP.[115] Transportation conformity applies to designated nonattainment and maintenance areas for transportation–related criteria pollutants including ozone and requires that SIPs contain MVEBs. MVEBs are defined in 40 C.F.R. §93.101 as the portion of the total allowable emissions defined in the submitted or approved SIP or maintenance plan for a certain date for the purpose of meeting reasonable further progress milestones or demonstrating attainment or maintenance of the NAAQS for any criteria pollutant or its precursors, allocated to highway and transit vehicle use and emissions.

Due to the large size of the DM/NFR region, Colorado has a unique situation of multiple Metropolitan Planning Organizations (MPO) and transportation planning regions (TPR) whose planning areas fall within parts of the DM/NFR area. The Denver Regional Council of Governments (DRCOG) is the MPO responsible for transportation planning in the 7–county Denver metropolitan area and a portion of southwest Weld County. The North Front Range Metropolitan Planning Organization (NFRMPO) is the planning agency responsible for transportation planning in the urbanized portions of Larimer and Weld counties. Finally, the Upper Front Range TPR, not a designated MPO, is responsible for transportation planning in the rural portions of Larimer, Weld, and Morgan counties.

[114] EPA, Finding of Failure To Attain and Reclassification of Denver Area for the 2008 Ozone National Ambient Air Quality Standard. Final Rule, *See* 84 Fed. Reg. 70897 (Dec. 26, 2019).

[115] EPA, Guidance for Transportation Conformity Implementation in Multi-Jurisdictional Nonattainment and Maintenance Areas, July 2012. https://www3.epa.gov/ttn/naaqs/aqmguide/collection/cp2/20120701_otaq_epa-420_b-12-046_guidance_multi-jurisdictional_transport_conformity.pdf (last visited March 24, 2020).

Because each of these agencies is on their own timeframe for developing transportation plans, a need arose nearly two decades ago to establish both regional and sub-regional budgets to accommodate independent conformity determinations whenever possible. This helps reduce the burden of each MPO having to do a conformity determination whenever the other planning agency does an RTP or TIP update.

As part of this SIP revision, and for purposes of Transportation Conformity, the 2020 on–road mobile source emissions inventory for VOC and $NO_X$, presented in Chapter 4 of this SIP, is the basis for the area–wide MVEB for the attainment year (2020). Because each of the MPOs have unique planning processes and schedules related to development of transportation plans and programs, this SIP also maintains two subarea MVEBs as established in the SIP approved by EPA in 2018[116], which is discussed in detail in section 0. Once these budgets are found adequate or are approved by EPA, the MPOs in the nonattainment area will use these budgets to demonstrate that projected emissions that would result from the implementation of approved transportation plans and TIPs are less than or equal to these budgets.

## 11.2 MOTOR VEHICLE EMISSIONS BUDGETS (CAA §176(c))

MVEBs are maximum allowable emissions from on–road mobile sources for each applicable criteria pollutant or precursor as defined in the SIP. The budgets must be used in transportation conformity analyses and areas must demonstrate that the estimated emissions from transportation plans, programs, and projects do not exceed the MVEBs. The region's current MVEBs for the DM/NFR area, which are set for emissions of nitrogen oxides ($NO_X$) and volatile organic compounds (VOC), were submitted to the EPA in 2017 as part of the Moderate area SIP for the NAAQS. EPA found these budgets adequate for transportation conformity purposes on January 20, 2018 and subsequently approved them in a final rule published on July 3, 2018 (83 Fed. Reg. 31,068), effective August 2, 2018. As a result, DRCOG and the NFRMPO have been using these budgets since that time for transportation conformity determinations for both the 2008 and 2015 ozone NAAQS.

Based on EPA guidance, this SIP maintains both an area–wide budget and subarea budgets allowing either to be used for transportation conformity purposes. The two subareas are defined as follows and shown in Figure 20:

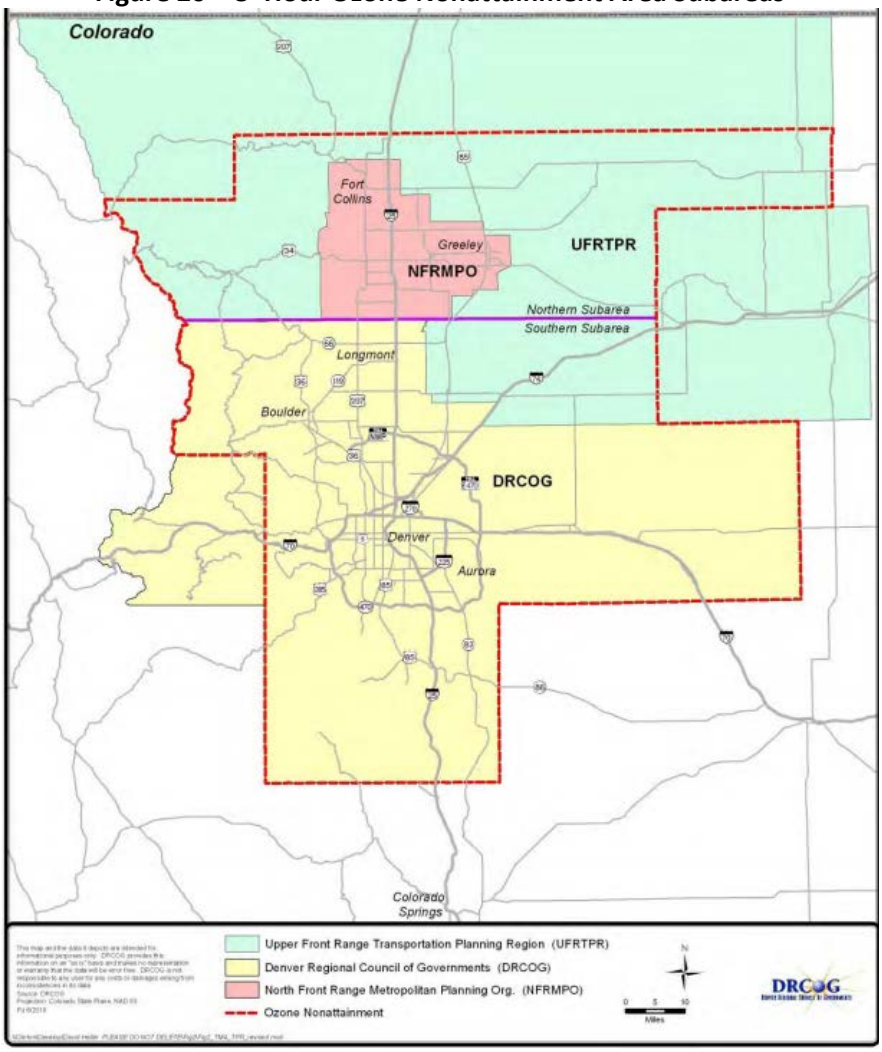
- **Northern Subarea**: Area denoted by the ozone nonattainment area north of the Boulder County northern boundary and extended through southern Weld County to the Morgan County line. This area includes the NFRMPO transportation planning area as well as the northern ozone nonattainment area portion of the Upper Front Range TPR in Larimer and Weld counties.

- **Southern Subarea**: Area denoted by the ozone nonattainment area south of the Boulder County northern boundary and extended through southern Weld County to the Morgan County line. This area includes the nonattainment portion of DRCOG's' regional planning area and the southern Weld County portion of the Upper Front Range TPR.

When subarea budgets are created in the SIP, the sum of the subarea budgets must equal the total allowable emissions the area can have from the transportation sector and still lead to attainment of the standard. If each subarea meets its MVEBs or if the total emissions for the entire DM/NFR area (the sum of the subareas) are less than or equal to the budget for the entire DM/NFR area, then the entire area will meet the total SIP's purpose of attaining the relevant standard.

[116] Denver Metro/North Front Range Moderate Area SIP the 2008 8-hour Ozone NAAQS, approved by EPA (83 Fed. Reg. 31,068 (July 3, 2018)).

**Figure 20 – 8–Hour Ozone Nonattainment Area Subareas**




Following the same approach as the previously approved Moderate area SIP, this revision proposed to set new MVEBs for the northern and southern subareas, which upon EPA's finding of adequacy or approval will be the new budgets upon which both MPOs will base future ozone conformity determinations until a subsequent budget is developed and approved.

### 11.2.1 Emission Budgets for the Denver Metro/North Front Range Subareas

The proposed attainment budgets in this SIP revision are based on the on–road mobile source 2020 emissions inventory that was created for the Serious Area Attainment Demonstration (not yet submitted to EPA) and includes all the on–road mobile source control measures reflected in Chapter 4 of this SIP. The emissions inventory was developed using MOVES2014b, which was officially released in late 2018, and was an updated version of previous versions of EPA's Mobile Vehicle Emissions Simulator (MOVES) model[117]. MOVES2014b was used for both base year and future year inventories and in development of the MVEB in this SIP revision. Table 57 includes budgets, in tons per day (tpd), for the ozone precursors VOC and $NO_X$ for both subareas as well as an area–wide budget that is the sum of the two subarea budgets and equal to the on-road mobile source 2020 emissions inventory.

[117] MOVES2014 was originally released in 2014 and in late 2015 received a minor revision and was renamed MOVES2014a.

**Table 57 – 8–Hour Ozone Subarea and Total Motor Vehicle Emissions Budgets**

| Motor Vehicle Emissions Budgets | 2020 | |
|---|---|---|
| | VOC (tpd) | $NO_X$ (tpd) |
| **Northern Subarea Budget** | 8.2 | 9.7 |
| *(NFRMPO& UFR TPR Subarea)* | | |
| **Southern Subarea Budget** | 41.2 | 45.0 |
| (*DRCOG & UFR TPR Subarea*) | | |
| **Total Nonattainment Area Budget** | **49.4** | **54.7** |

### 11.2.2 Development of 2020 On–Road Mobile Source Emissions Inventory

The 2020 on–road mobile source emissions inventory relies on defaults in the MOVES2014b mobile model for some parameters and on local data for others. The mobile model has multiple inputs including VMT, vehicle population, roadway activity data (speed and time of day), roadway classifications (urban, rural, restricted, unrestricted), fuel properties, I/M program, and temperature and humidity profiles. VMT is based on model output data from DRCOG and the NFRMPO and is summarized in Table 58.

**Table 58 – Distribution of VMT between the Budget Subareas (2020)**

| Subareas | VMT |
|---|---|
| **NFRMPO – Northern Subregion** | **14,266,896** |
| **DRCOG – Southern Subregion** | **84,812,961** |
| **TOTAL** | **99,079,857** |

VMT outputs are the product of sophisticated transportation and land use models used to predict the state of transportation in the future. For the northern subarea, the NFRMPO uses a four–step model process consisting of the following four models: Colorado Department of Local Affairs (DOLA) population and employment projections; Land Use Allocation Model, which uses UrbanSim's Urban Canvas platform; and the Travel Demand Model (TDM). For the southern subarea, DRCOG uses UrbanSim to forecast socioeconomic changes and the Focus 30+ step activity–based travel model to forecast travel throughout a typical weekday based on personal and travel–related characteristics.

The outputs of these models include population, employment, and households in each transportation analysis zone (TAZ), trips by mode of travel, roadway use data (traffic volumes, speed and delay), and transit use data.

TAZ data from DRCOG and the NFRMPO are used to apportion off–network start and evaporative emissions to the grid cells for photochemical modeling. Both on–network and off–network data are processed by the Air Pollution Control Division (APCD) through MOVES2014b. These emission outputs are then split out by county and processed through EPA's SMOKE-MOVES processor for use in photochemical modeling. Speeds were obtained from the MPO transportation networks. Vehicle population and fleet age distribution are based on a 2017 report by Eastern Research Group (ERG). The 2020 vehicle population was grown from 2017 by the ratio of the VMT increase from 2017 to 2020. The ambient temperatures for the regional emissions analysis were derived from the meteorological modeling performed for the attainment demonstration for a typical ozone episode period.

### 11.2.3 Process for Setting and Implementing Subarea MVEBs

MVEBs, once determined adequate or approved by EPA, will be used to measure the conformity of RTP and TIP for the respective planning areas. Through an agreement between the affected agencies, DRCOG has agreed to perform transportation forecasts and conformity determinations for the entire Southern Subarea, while the NFRMPO has agreed to perform transportation forecasts and conformity determinations for the entire Northern Subarea. The subarea budgets will allow for independent conformity determinations based on the applicable subarea MVEBs by the two MPOs, whose frequency and timing needs for conformity determinations differ substantially. The regional budgets can be used if the MPOs decide to perform conformity determinations jointly and collectively.

With subarea budgets, the affected MPOs can make independent conformity determinations for their plans and programs as long the other subarea in the DM/NFR area has conforming transportation plans and programs in place at the time of each MPO's and U.S. Department of Transportation's (DOT) plan and TIP determination. Either DRCOG or NFRMPO can demonstrate conformity using its subarea budgets without waiting for the other MPO to demonstrate conformity using its subareas budgets, as long as the other MPO has conforming RTPs and TIPs in place, even if these RTPs and TIPs were previously found to conform using previous emission tests.[118]

Once regional and subarea budgets in this plan have been found adequate or approved by EPA, DRCOG and the NFRMPO must make a new redetermination of conformity for their respective RTP and TIP within two years after EPA's adequacy finding and/or SIP approval (40 C.F.R. §93.104(e)). This SIP expressly allows the MPOs the flexibility to demonstrate conformity with either the established subarea motor vehicle emissions budgets or the total regional motor vehicle emissions budgets.

If the MPOs choose to use the total regional emission budgets for any conformity determination, the agencies must agree to demonstrate conformity jointly, and the sum of their subarea emissions must be less than or equal to the established total regional budgets. Once this joint conformity determination using the regional budgets has been made and approved by the DOT, the MPOs must continue to make joint future conformity determinations and meet the established regional budgets whenever either MPO is required to make a new conformity determination for a transportation plan or program.

However, at any time in the future, the MPOs may agree to revert to demonstrating conformity by meeting their respective subarea emission budgets if the MPOs agree to undertake another joint conformity determination that demonstrates consistency of their respective RTP and TIP with their individual subarea budgets. Likewise, at any time in the future, the MPOs may switch from using subarea budgets to using regional budgets as long as they once again agree to perform a joint conformity determination and the sum of their subarea motor vehicle emissions are equal to or less than the established regional budgets.

If conformity lapses for one subarea (i.e., the conformity determination for a plan or program has expired), the existing plans and TIPs in the other subarea continue to be valid and the MPO can continue to implement transportation projects in its currently conforming plans and programs. However, the MPO cannot make new plan and TIP conformity determinations until the lapse in the other subarea is resolved and conformity is determined in the lapsed subarea.

[118] EPA Office of Transportation and Air Quality, Guidance for Transportation Conformity Implementation in Multi-Jurisdictional Nonattainment and Maintenance Areas, July 2012, p. 29.

Throughout this process of determining conformity with the budgets in this plan, the MPOs shall consult with federal, state, and local air quality and transportation agencies through the normal interagency consultation process established by AQCC Regulation Number 10, 5 C.C.R. §1001-12.

## 11.3 TRANSPORTATION CONTROL – CAA §182(c)(5)

As a Serious nonattainment area for ozone, the CAA requires that every three years, states submit a demonstration that current aggregate VMT, aggregate vehicle emissions, congestion levels, and other relevant traffic-related and vehicle emissions-related factors (collectively "relevant parameters") are consistent with those used for the area's ozone attainment demonstration. Mobile source emissions will have to be consistent with mobile source emissions in the attainment demonstration (i.e., MVEB), which are already evaluated on a regular basis by the MPOs (DRCOG and the NFRMPO) through their conformity processes. Based on the most recent conformity determinations for the northern and the southern subregions, both are meeting the current emissions budgets established in the 2008 Moderate area Ozone SIP and both are expected be able to meet the proposed budgets for the forthcoming 2008 Serious area Ozone SIP in future conformity determinations.

# CHAPTER 12
# CLEAN FUEL FLEET PROGRAM REQUIREMENT

12
Chapter 12 – Clean Fuel Fleet Program Requirement

## 12.1 OVERVIEW

On December 26, 2019, the U.S. Environmental Protection Agency (EPA) reclassified the Denver Metro/North Front Range (DM/NFR) region as a Serious ozone nonattainment area for the 2008 8-hour ozone National Ambient Air Quality Standard (NAAQS), which requires the implementation of the Clean Fuel Fleet Program (CFFP). On November 15, 1990, Congress enacted amendments to the 1977 Clean Air Act (CAA); Public Law 101-549, 104 Stat. 2399, codified at 42 U.S.C. 7401-7671q. The CFFP is contained in Subchapter II, part C, entitled, "Clean Fuel Vehicles," of Title II of the CAA, as amended November 15, 1990, sections 241 - 250 (42 U.S.C. 7581-7590). Regulations for the Federal CFFP[119] were promulgated in March 1993 and have been codified at 40 CFR sections 88.301-93 - 88.313-93. Under section 246 of the CAA, certain states were required to adopt and submit to EPA a SIP revision containing a CFFP for ozone nonattainment areas with a 1980 population greater than 250,000 that were classified as serious, severe, or extreme.

The CFFP requires fleet operators with 10 or more centrally-fueled vehicles or vehicles capable of being centrally-fueled to include a specified percentage of clean-fuel vehicles (CFV) in their purchases each year and to meet additional CAA requirements, including the requirement that covered fleet operators must operate the CFVs in covered nonattainment areas on a clean alternative fuel, defined as a fuel on which the vehicle meets EPA's CFV standards. EPA promulgated emission standards for CFVs[120] in September 1994.

Under the CAA and Federal CFFP regulations, vehicles weighing 26,000 pounds (lbs) or less count towards the requirement, and the CFFP purchase requirements started with 1998 model year vehicles under the following phase-in schedule for light-duty vehicles and trucks under 6,000 lbs Gross Vehicle Weight Rating (GVWR) and light-duty trucks between 6,000 and 8,500 lbs. GVWR:

- 30% CFV in Model Year 1998
- 50% CFV in Model Year 1999
- 70% CFV in Model Year 2000 and after

The phase-in schedule for heavy-duty vehicles weighing above 8,500 lbs but less than 26,001 lbs. GVWR was:

- 50% CFV in Model Year 1998
- 50% CFV in Model Year 1999
- 50% CFV in Model Year 2000 and after

[119] U.S EPA, Final Rule Clean Fuel Fleet Credit Program, Transportation Control Measures, and Related Provisions, (See 58 Fed. Reg. 11901, Mar. 1, 1993).

[120] U.S EPA, Final Rule Emission Standards for Clean-Fuel Vehicles and Engines, Requirements for Clean-Fuel Vehicle Conversions, and California Pilot Test Program, (See 59 Fed. Reg. 50042, Sept. 30, 1994).

The following vehicles are exempted from these requirements:

- motor vehicles for lease or rental to the general public;
- dealer demonstration vehicles that are used solely for the purpose of promoting motor vehicle sales;
- emergency vehicles;
- law enforcement vehicles;
- non-road vehicles (farm and construction vehicles);
- vehicles garaged at a personal residence and not being centrally fueled; and
- vehicles used for motor vehicle manufacturer product evaluations and tests

## 12.2 EPA GUIDANCE ON IMPLEMENTING CFFP REQUIREMENTS

To assist states and manufacturers in implementing the CFFP, EPA has provided guidance. The following EPA memos, letters, and reference document have been included in this submittal as Appendix 12-C.

### 12.2.1 August 1998 CFFP Implementation Guidance[121]

In August 1998, EPA published a Clean Fuel Fleet Program Implementation Guidance, which was intended to provide guidance to states and regulated entities concerning how EPA interpreted various requirements of the CFFP provisions in the Clean Air Act. In the guidance, EPA stated that Ozone Transport Region (OTR) states were permitted to use the National Low Emission Vehicle (NLEV) program as a substitute for the CFFP because "NLEV is shown to achieve comparable long-term reductions."

### 12.2.2 July 2, 2004 EPA Memorandum

A memo dated July 2, 2004 from EPA, Leila Cook, Group Manager in the Office of Air & Radiation, states:

> *"EPA has since published new emission standards that are more stringent than the CFFP standards for heavy-duty diesel and heavy-duty gasoline engines, as well as light duty vehicles. Therefore, vehicles certified to these new standards are considered acceptable for meeting the requirements contained in Part 88 for the Clean Fuel Fleets Program.*
>
> *Fleet managers seeking to meet the requirements of the CFFP should be assured that all vehicles manufactured to meet the Tier 2 emission standards are equivalent to or cleaner than earlier emission levels mandated by the CFFP. Therefore, these new Tier 2 vehicles are acceptable for use in meeting the CFFP requirements."*

### 12.2.3 July 21, 2005 EPA Letter to Manufacturers

To help further clarify EPA's expectations and how newer emissions standards impact meeting the CFFP requirement, EPA issued a letter to manufacturers on the Clean-Fuel Vehicle Standards on July 21, 2005[122], stating:

[121] EPA Clean Fuel Fleet Program Implementation Guidance, August 1998, https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P1009ZL8.TXT
[122] EPA letter to Manufacturers, Subject: Clean-Fuel Fleet Standards, July 21, 2005, https://iaspub.epa.gov/otaqpub/display_file.jsp?docid=14287&flag=1

*"To determine equivalency, current certification emission standards for Tier 2 vehicles (Light-Duty Vehicles (LDV), Light-Duty Trucks (LDT), and Medium-duty Passenger Vehicles (MDPV)), heavy-duty vehicles, heavy duty Otto cycle engines, and heavy-duty diesel engines were compared to CFV vehicle and engine emission standards using the methodology outlined in the Attachment. The results of this analysis are summarized as follows:*

*Tier 2 LDVs, LDT1-4s, and MDPVs certified to the following Tier 2 bin standards are equivalent to or more stringent than CFV Low Emission Vehicles (LEV) emission standards:*

*LDV Bins 1-7 and Bin 9*
*LDTl Bins 1-7 and Bin 9*
*LDT2 Bins 1-9*
*LDT3 Bin 1-10*
*LDT4 Bin 1-10*
*MDPV Bin 1-11[4]"*

*[4]There are no CFV emission standards that correspond to the Tier 2 MDPV class but MDPVs meeting Tier 2 Bins 1-1 1 are all equal to or more stringent than LDT4 CFV LEV standards.*

*The following determinations are made for 2005 and later model year heavy-duty Otto cycle engines and diesel engines: Current emission standards for heavy-duty engine Otto cycle engines and diesel engines are more stringent than CFV LEV heavy-duty Otto cycle engines, or heavy-duty diesel engine emission standards."*

### 12.2.4 April 17, 2006 EPA Memorandum[123]

On April 17, 2006, EPA issued a follow-up memorandum, noting that:

"after the CFFP requirement became law, EPA promulgated new vehicle emission standards (e.g., Tier 2 Rule and heavy-duty engine standards) that are generally more stringent, or equivalent to, the CFV emission standards for light-duty vehicles, light-duty trucks, and heavy-duty vehicles and engines".[124]

The memorandum also stated that:

"[t]o meet the requirements of the Clean Fuel Fleet Program fleet managers can be assured that vehicles and engines certified to current Part 86 emission standards, which EPA has determined to be as or more stringent than corresponding CFV emission standards per the attached EPA Dear Manufacturer Letter meet the CFV emission standards and the CFFP requirements as defined in CFR part 88. Further reductions from these same vehicles will be achieved by EPA's newly promulgated Tier 3 emission standards".[125]

[123] EPA Light-Duty Vehicles and Light-Duty Trucks: Clean Fuel Fleet Exhaust Emission Standards, March 2016, https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100O9ZJ.pdf

[124] Memorandum from Leila H. Cook, EPA Transportation & Regional Programs Division, to Air Program Managers re: Clean Fuel Fleet Program Requirements (April 17, 2006). This memorandum superseded a July 2, 2004, memorandum from Leila H. Cook noting that the Tier 2 standards are equivalent to or cleaner than earlier emission levels mandated by the CFFP. These memoranda are included with the State's SIP revision in the docket for this proposed action.

[125] U.S. EPA, Final Rule Control of Air Pollution From Motor Vehicles: Tier 3 Motor Vehicle Emission and Fuel Standards.(See 79 Fed. Reg. 23414, April 28, 2014).

### 12.2.5 March 2016 EPA Clean Fuel Fleet Exhaust Emissions Standards Reference

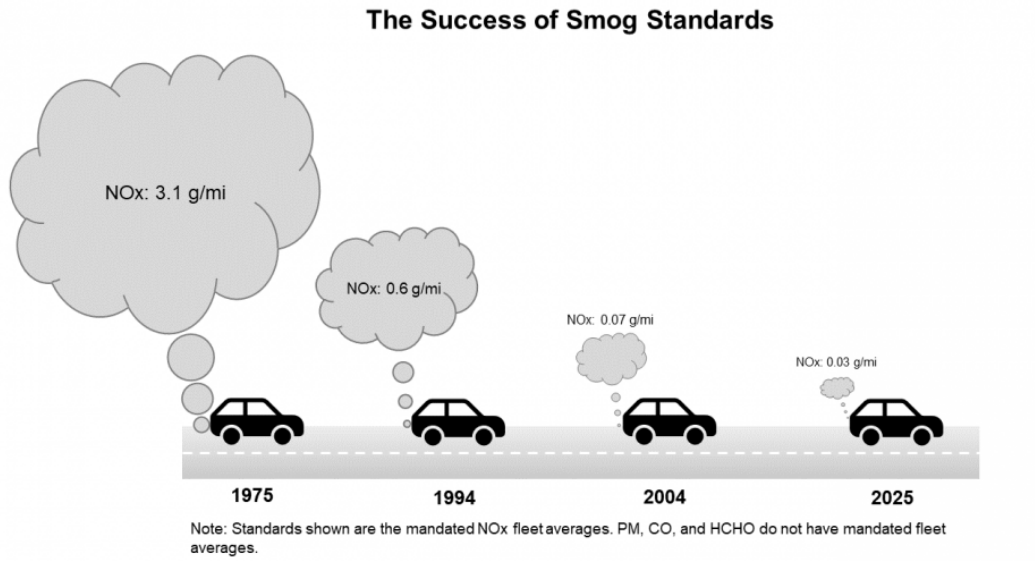
In March 2016, EPA published a table detailing Light-Duty Vehicles and Light-Duty Trucks: Clean Fuel Fleet Exhaust Emission Standards. In this document, EPA notes that, "These standards have in effect been superseded by newer, more stringent standards in 40 CFR Part 86", thus confirming that Tier 2 and newer vehicles exceed the requirements of the Clean Fuel Fleet Program.

## 12.3 FEDERAL PROGRAM EMISSIONS STANDARDS

In the Clean Fuel Fleets rule, covered fleets are required to purchase CFVs, which at a minimum must meet the LEV standards. Over the past 30 plus years, emissions standards in the United States have been tightened significantly for on-road and non-road mobile sources. The EPA implemented the light-duty vehicle Tier 2 and new heavy-duty diesel engine standards in 2004 and implemented the Tier 3 rule for passenger vehicles and light trucks in 2015, all of which meet or exceed the tailpipe emission standards of LEV standards.

As illustrated by EPA in Figure 21, nitrogen oxides ($NO_x$) emissions standards have been drastically tightened over the past 30 years, with Tier 1 vehicles having a fleet average of 0.6 g/mi, Tier 2 vehicles having to meet a fleet average of 0.07 g/mi and Tier 3 vehicles having to meet 0.03 g/mi emissions limits. This is an 88% and a 95% reduction for Tier 2 and Tier 3 respectively over Tier 1 vehicles. And compared to pre-Tier 1, it is a 98% and 99% reduction respectively. Appendix 12-A and Appendix 12-B provide more detail on emissions for CFV compared to Tier 2.

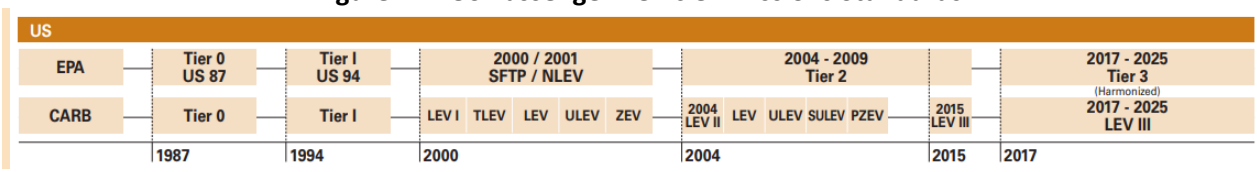
**Figure 21 - EPA "The Success of the Smog Standards"[126]**




[126] U.S. EPA, Light Duty Vehicle Emissions webpage, https://www.epa.gov/greenvehicles/light-duty-vehicle-emissions, visited 5/13/20.

Figure 22 shows the timeline of both Federal and California passenger vehicle emissions standards in the US. As can be seen, LEV standards exceeded federal Tier 0 and Tier 1 standards at the time of the instigation of the Clean Fuel Fleet Program, and unarguably resulted in real-world emission reductions in the 1990's and early 2000's in nonattainment areas that adopted CFF programs. However, LEV standards have been eclipsed by newer, more stringent federal Tier 2 standards starting in the mid-2000s and further surpassed by federal Tier 3 standards starting in the mid-2010's. California's LEV standards correspond rather closely federal standards and previously were intended to eventually align for a single national standard for mobile standards. A more detailed comparison of California's standards compared to Federal Tier 2 standards be found in Appendix 12-B.

**Figure 22 - US Passenger Vehicle Emissions Standards[127]**




The following sections discuss both Tier 2 and Tier 3 standards related to the CFV requirement.

### 12.3.1 Tier 2 Standards

In 2000, EPA promulgated new tailpipe emissions standards[128], referred to as "Tier 2", for all passenger vehicles, including sport utility vehicles (SUVs), minivans, vans, and pick-up trucks. This regulation marked the first time that SUVs and other light-duty trucks were subject to the same national pollution standards as cars. The new tailpipe standards were set at an average standard of 0.07 grams per mile (gpm) for nitrogen oxides ($NO_X$) for all classes of passenger vehicles beginning in 2004-2007. For the heaviest light-duty trucks, the program provided a three-step approach to reducing emissions.

First, in 2004, EPA implemented standards not to exceed 0.6 gpm, which was more than 60% reduction from current standards. Second, to ensure further progress, these vehicles were required to achieve an interim standard of 0.2 gpm phased-in between 2004-2007, which was an 80% reduction from current standards. Third, in the final step, half of these vehicles were required to meet the 0.07 standard in 2008, and the remaining were required to comply in 2009. Vehicles weighing between 8,500 and 10,000 pounds had the option to take advantage of additional flexibilities during the 2004 to 2008 interim period.

In 2001, EPA promulgated new tailpipe emissions standards[129] for heavy duty trucks and buses. In this regulation, EPA finalized a Particulate Matter (PM) emissions standard for new heavy-duty engines of 0.01 grams per brake-horsepower-hour (g/bhp-hr), to take full effect for diesels in the 2007 model year. EPA also finalized standards for $NO_X$ and non-methane hydrocarbons (NMHC) of 0.20 g/bhp-hr and 0.14 g/bhp-hr, respectively. These $NO_X$ and NMHC standards were phased in together between 2007 and 2010, for diesel engines. The phase-in was based on a percentage of sales:

- 50% from 2007 to 2009
- 100% in 2010

[127] Delphi, 2016|2017 Worldwide Emissions Standards for Passenger Cars and Light-Duty, https://www.delphi.com/sites/default/files/inline-files/delphi-worldwide-emissions-standards-passenger-cars-light-duty-2016-7.pdf

[128] U.S. EPA, Final Rule Control of Air Pollution From New Motor Vehicles: Tier 2 Motor Vehicle Emissions Standards and Gasoline Sulfur Control Requirements, (See 65 Fed. Reg. 6698, Feb. 10, 2000)

[129] U.S. EPA, Final Rule Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements,(See 66 Fed. Reg. 5002, Jan. 18, 2001)

Gasoline engines were subject to these standards based on a phase-in requiring:

- 50% compliance in the 2008 model year
- 100% compliance in the 2009 model year

As illustrated in Table 59 below, based on Atlanta, Georgia's Supporting Documentation for 110(l) and 193 Demonstration, Clean Fueled Fleet Rules, Tier 2 $NO_X$ standards have a benefit over the LEV standards ranging from 0.09 grams/mile to 0.99 grams/mile. The 2004 heavy-duty engine standards have a NMHC + $NO_X$ benefit of 1.4 grams/bhp-hr. These benefits are on a per vehicle basis. Since all of the Tier 2 and 2004 heavy-duty engine standards are equivalent or more stringent than the Clean Fuel Fleet standards, the emission reductions from the federal standards surpassed LEV emission reductions in 2004, when the federal standards were implemented.

**Table 59 - Clean Fueled Fleet Emission Comparison**

| *Light-Duty Vehicle and Truck Emission Levels in grams/mile* | | | | | | | *Heavy-Duty Truck Emissions in grams/bhp-hr* | | |
|---|---|---|---|---|---|---|---|---|---|
| | LDV[1], LDT[2] <=6000 GVWR, <= 3750 LVW[3] | LDT <=6000 GVWR, >3750 LVW, <=5750 LVW | LDT >6000 GVWR, <=3750 TW | LDT >6000 GVWR, >3750 TW[4] <=5750 TW | LDT >6000 GVWR, >5750 TW | | | Light Heavy-Duty Truck >= 8500 GVWR <=14,500 GVWR | Medium Heavy-Duty Truck >= 8500 GVWR <= 26,000 GVWR |
| **Tier 2** | | | | | | | **2010** | | |
| NMHC+ | 0.075 | 0.075 | 0.075 | 0.075 | 0.075 | | NMHC + $NO_X$ | 2.4 | 2.4 |
| $NO_X$+ | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 | | | | |
| **CFV / LEV** | | | | | | | **CFV / LEV** | | |
| NMHC+ | 0.075 | 0.1 | 0.125 | 0.16 | 0.195 | | NMHC + $NO_X$ | 3.8 | 3.8 |
| $NO_X$+ | 0.2 | 0.4 | 0.4 | 0.7 | 1.1 | | | | |
| + Intermediate Life (50K miles) | | | | | | | | | |
| **Emission disbenefit per CFFV - grams / mile (negative sign illustrates benefit of Tier 2 over LEV)** | | | | | | | | **grams/bhp-hr** | |
| NMHC | 0 | -0.025 | -0.05 | -0.085 | -0.12 | | NMHC + $NO_X$ | -1.4 | -1.4 |
| $NO_X$ | -0.09 | -0.29 | -0.29 | -0.59 | -0.99 | | | | |
| [1] Light Duty Vehicle | | [2] Light Duty Truck | | [3] Loaded Vehicle Weight | | | [4] Test Weight | | |

Note: Tier 2 emission standards phased in for model year 2009 and later. As a result, Bins 8, 9, and 10 have been phased out.

### 12.3.2 Tier 3 Standards

In 2014, EPA established the Tier 3 Motor Vehicle Emission and Fuel Standards program[130], which set new vehicle emissions standards and a new gasoline sulfur standard beginning in 2017. The vehicle emissions standards were intended to reduce both tailpipe and evaporative emissions from passenger cars, light-duty trucks, medium-duty passenger vehicles, and some heavy-duty vehicles, with the gasoline sulfur standard enabling more stringent vehicle emissions standards and more effective emissions control systems. With the implementation of this even tighter emissions standard, the net benefit has become even greater between current emissions standards and the Federal LEV Program requirements. Figure 23 provides a comparison of Tier 2 and Tier 3 standards, illustrating that new Tier 3 standards for all bins exceed Bin 5 standards under the federal Tier 2 program, resulting in even larger emission reductions over the CFV standards.

[130] U.S. EPA, Final Rule Control of Air Pollution From Motor Vehicles: Tier 3 Motor Vehicle Emission and Fuel Standards. (See 79 Fed. Reg. 23414, April 28, 2014).

**Figure 23 - Tier 2 Compared to Tier 3[131]**

| Tier 2 Bins (FTP) | NMOG (mg/km) | NOx (mg/km) | PM[a] (mg/km) | CO (mg/km) | HCHO (mg/km) |
|---|---|---|---|---|---|
| Bin 8 | 78 | 124 | 12 | 2610 | 11 |
| Bin 7 | 56 | 93 | 12 | 2610 | 11 |
| Bin 6 | 56 | 62 | 6 | 2610 | 11 |
| Bin 5 | 56 | 44 | 6 | 2610 | 11 |
| Bin 4 | 44 | 25 | 6 | 1305 | 7 |
| Bin 3 | 34 | 19 | 6 | 1305 | 7 |
| Bin 2 | 6 | 12 | 6 | 1305 | 2 |
| Bin 1 | 0 | 0 | 0 | 0 | 0 |

| Tier 3 Bins (FTP) | NMOG+ NOX (mg/km) | PM[a] (mg/km) | CO (mg/km) | HCHO (mg/km) |
|---|---|---|---|---|
| Tier 2 Bin 5/ | 56+44=100 | 6 | 2610 | 11 |
| Bin 160 | 100 | 2 | 2610 | 2 |
| Bin 125 | 78 | 2 | 1305 | 2 |
| Bin 70 | 44 | 2 | 1057 | 2 |
| Bin 50 | 31 | 2 | 1057 | 2 |
| Bin 30 | 19 | 2 | 622 | 2 |
| Bin 20 | 12 | 2 | 622 | 2 |
| Bin 0 | 0 | 0 | 0 | 0 |

Building upon Georgia's comparison in section 12.3.1, Table 60 compares Tier 3 standards to LEV. As shown, the reductions over LEV are even larger with Tier 3, further compounding the benefit of Tier 3 vehicles over LEV. A direct comparison between LEV and Tier 3 for medium-duty truck is not possible due to the difference in units, with LEV and Tier 2 being grams per brake-horsepower hour (g/bhp-hr) and Tier 3 being in grams per mile. However, the table shows how the standards tighten over time as Tier 3 is phased in between 2018 and 2025, with voluntary phase-in in 2016 and 2017.

EPA has not yet promulgated Tier 3 standards for on-road heavy-duty vehicles, however, with Tier 2 being such a significant tightening of standard for larger vehicles, fleets continue to net large emission reductions through purchase of Tier 2 and new vehicles.

**Table 60 –Tier 3 Comparison to LEV Emissions Standards**

| Light-Duty Vehicle and Truck Emission Levels (g/mi) | | | | | | Medium-Duty Truck Emissions | | | |
|---|---|---|---|---|---|---|---|---|---|
| | LDV[1], LDT[2] <=6000 GVWR, <= 3750 LVW[3] | LDT <=6000 GVWR, >3750 LVW, <=5750 LVW | LDT >6000 GVWR, <=3750 TW | LDT >6000 GVWR, >3750 TW[4] <=5750 TW | LDT >6000 GVWR, >5750 TW | | Light Heavy-Duty Truck >= 8500 GVWR <=10,000 GVWR (Class 2b) | Light Heavy-Duty Truck >= 10,001 GVWR <=14,000/ 14,500 GVWR (Class 3) | Medium Heavy- Duty Truck >= 8500 GVWR <= 26,000 GVWR |
| **Tier 3 ($NMHC + NO_X$) Phase In: 2017-2025 (g/mi) (FTP)** | | | | | | **Tier 3 ($NMHC + NO_X$) Phase In: 2016-2022 (g/mi)** | | | |
| **2017-2020** | 0.086->0.065 | 0.101->0.074 | | | | **2016-2017 (voltry.)** | 0.333->0.310 | 0.548->0.508 | n/a |
| **2021-2024** | 0.065->0.037 | 0.065->0.038 | | | | **2018-2021** | 0.278->0.203 | 0.451->0.298 | n/a |
| **2025+** | ->0.03 | ->0.03 | | | | **2022+** | ->0.178 | ->0.274 | n/a |
| **Tier 2** | | | | | | **Tier 2 -Phase In: 2006-2010 (g/bhp-hr)** | | | |
| $NMHC + NO_X$ | 0.185 | | | | | $NMHC + NO_X$ | 2.4 | | |
| **CFV / LEV** | | | | | | **CFV / LEV (g/bhp-hr)** | | | |
| $NMHC + NO_X$ | 0.275 | 0.5 | 0.525 | 0.86 | 1.295 | $NMHC + NO_X$ | 3.8 | | |
| **$NMHC+NO_X$ Emission disbenefit over CFV (negative illustrates benefit of Tier 3 over LEV)** | | | | | | Tier 3 equivalency demonstration not possible for Medium and Heavy-duty vehicles due to change in units of measurement of emissions standards (i.e. g/mi vs. g/bhp-hr). | | | |
| **2020** | -0.208 | -0.426 | -0.451 | -0.786 | -1.221 | | | | |
| **2025+** | -0.245 | -0.470 | -0.495 | -0.830 | -1.265 | | | | |

[131]Kate Blumberg, Francisco Posada, International Council on Clean Transportation, Presentation on Comparison of US and EU programs to control light-duty vehicle emissions, April 8, 2015, https://theicct.org/sites/default/files/ICCT_comparison%20Euro%20v%20US.pdf.

## 12.4 EPA APPROVALS OF OTHER STATES' CFFP EQUIVALENCY DEMONSTRATIONS

Beyond EPA's own memos, letters, and reference documents, EPA has approved the removal of Clean Fuel Fleet rules and programs in several other ozone nonattainment areas concurring that, "the removal will not cause any anti-backsliding issues", and that Tier 2 and newer "standards are clearly more equivalent or more stringent than the low emission (clean fuel) vehicle standards". Below are EPA approvals of CFFP equivalency demonstration for SIP revisions submitted by Atlanta, Georgia, Dallas/Fort Worth, Texas, and Beaumont-Port Arthur, Texas.

### 12.4.1 Atlanta, Georgia's Clean Fuels Fleet Program Equivalency Demonstration

On January 22, 2015, the Georgia Environmental Protection Division submitted for approval and incorporation, a proposed revision to Georgia's State Implementation Plan (SIP), that requested to move its Clean Fueled Fleet Rules to its contingency measures, in a manner consistent with the requirements of 110(ℓ) and EPA's proposed anti-backsliding provisions.

Section 110(ℓ) of the CAA, governs EPA's ability to approve all SIP revisions. Specifically, section 110(ℓ) states:

> *Each revision to an implementation plan submitted by a State under this chapter shall be adopted by such State after reasonable notice and public hearing. The Administrator shall not approve a revision of a plan if the revision would interfere with any applicable requirement concerning attainment and reasonable further progress (as defined in section 171 of this title), or any other applicable requirement of this chapter.*

As shown in Atlanta's equivalency demonstration[132], "given that the Tier 2 vehicle standards and the 2004 heavy-duty diesel engine standards are clearly more equivalent or more stringent than the low emission (clean fuel) vehicle standards, the removal of CFFP will not interfere with attainment or reasonable further progress, or any other applicable requirement of the act. Since the federal Tier 2 and 2004 heavy-duty diesel engine standards were more stringent than the CFFP standards as soon as the federal standards were implemented and since covered fleet owners were required to comply with both the CFFP and the federal standards, there was no, nor will there ever be, a shortfall in emissions reductions as a result of revocation of Georgia's Clean Fueled Fleet Rules in 2014. Therefore, no substitute measure is required for the revocation of Georgia's Clean Fueled Fleets rules."

[132] Atlanta Environmental Protection Division, Attachment A: Supporting Documentation for 110(l) and 193 Demonstration Georgia Chapter 391-1-22, Georgia's Clean Fueled Fleet Rules, https://epd.georgia.gov/air/sites/epd.georgia.gov.air/files/related_files/document/attachmenta.pdf

Additionally, in EPA's notice of proposed rulemaking[133], which was approved by direct final rule[134] in August 2015, EPA determined that, "the removal of the Georgia CFFP will not interfere with attainment or reasonable further progress, or any other applicable requirement of the Act because the emission reductions that were generated by Georgia's CFFP have been overtaken by EPA's Tier 2 Rule and heavy-duty emissions standards. [...] The vehicle emissions standards referenced in EPA's April 17, 2006 memorandum have been fully implemented, thus ensuring that all new vehicle fleet purchases meet CFV standards[135] ".

### 12.4.2 Dallas/Fort Worth, Texas' Clean Fuel Fleet Program Equivalency Demonstration

Beginning September 1998, the Dallas-Fort Worth nonattainment area, as well as the Houston-Galveston-Brazoria and El Paso ozone nonattainment areas, instituted a CFFP by rule due to being a Serious ozone nonattainment area. However, in 2005, Texas Senate Bill 1032 repealed the Texas Clean Fleet Program (TCFP) in its entirety stating that the federal standards already in place at that time eclipsed the CFV standards referenced in the CAA. Subsequently, in April 26, 2006, Texas formally repealed the Texas Clean Fleet Program because no additional benefit could be achieved from new vehicle purchases under CFFP.

On May 15, 2006, a revision to the Texas Clean Fleet SIP[136] was submitted to the EPA that reflected the repeal of the TCF Program. FCAA §182(c)(4) allows the EPA to approve measures that substitute for the initial requirement to implement a CFFP as long as the EPA determines the substitute will accomplish equal long-term reductions attributable to the CFFP. Texas also asserted that, "the EPA has not provided any updated guidance on how states are to address the Clean Fuel Fleet substitution requirement in their attainment demonstration SIP revision submittals, where more stringent federal standards exist. Since new vehicle purchases subsequent to the date of repeal would meet more stringent federal emission standards, cancellation of the TCFP did not necessitate action to substitute this program with a separate emission reduction measure containing equivalent benefits. Such a substitution would only be warranted if a net increase in emissions would occur due to repeal or cancellation of an existing program."

Concurring with Texas' demonstration, EPA approved the SIP revision Jan. 31, 2014, (see 79 Fed. Reg. 5287), stating that they could, "approve the removal of the TCFP's associated LEV rules from the Texas SIP because the submitted equivalency demonstration shows new Tier 2 and 2007 heavy-duty diesel vehicles and engines meet or exceed the LEV requirement". Additionally, "the Texas ozone nonattainment area did not rely upon any emissions reduction credits from the TCFP in its associated attainment demonstration or to meet Reasonable Further Progress (RFP)".

[133] U.S. EPA, Approval and Promulgation of Implementation Plans; Georgia; Removal of Clean Fuel Fleet Program. (See 80 Fed. Reg. 44014, July 24, 2015)..

[134] U.S. EPA, Approval and Promulgation of Implementation Plans; Georgia; Atlanta; Requirements for the 2008 8-Hour Ozone Standard. (See 80 Fed. Reg. 48036, August 11, 2015).

[135] In its January 22, 2015, SIP revision, GA EPD analyzed the annual reports submitted by the fleets for the model years 2001–2004 and 2006 to determine the number of used vehicles purchased and the range of the model years. GA Environmental Protection Division determined that 98% of the vehicles purchased are new. Only 2% of vehicles are purchased as used. Out of the used vehicles purchased, 80% are 2004 and newer models. As a result, only 0.4% of vehicles purchased are older than the 2004 model year.

[136] TCEQ, Commission Approval for Adoption of the Dallas-Fort Worth (DFW) Attainment Demonstration State Implementation Plan (SIP) Revision for the 1997 Eight-Hour Ozone Standard SIP Project No. 2010-022-SIP-NR, Nov. 18, 2011, https://www.tceq.texas.gov/assets/public/implementation/air/sip/dfw/ad_2011/10022SIP_ado_all.pdf

### 12.4.3 Beaumont-Port Arthur CFV Program Equivalency Demonstration

On Nov. 19, 2010, EPA approved the Beaumont-Port Arthur (BPA) 1997 Eight-Hour Ozone Redesignation Request and Maintenance Plan State Implementation Plan[137], which included approval of the Texas CFV Program Equivalency Demonstration[138]. The demonstration made several claims including: 1) implementation of the Tier II and heavy-duty standards serve as an adequate substitute for a CFV program; 2) timing is impractical to implement a CFFP prior to the required date as outlined by EPA in the redesignation rule; and 3) EPA has not provided adequate resources on "certified CFV" since 2001. The following is an excerpt from Texas's SIP:

> The BPA area was reclassified from moderate to serious nonattainment for the one-hour ozone standard in March 2004, thus necessitating participation in the CFFP as required by Section 246 of the FCAA. Implementation of the CFFP in the BPA area could not have begun until the 2007 model year because a minimum of twenty-four months is required for the Texas Commission on Environmental Quality (TCEQ) to draft new rules, go through the proposal process, receive comment, finalize the regulations, and provide sufficient lead time for affected parties to comply. Twenty-four months from March 2004 was March 2006, which is more than half of the way through the 2006 model year. If a CFFP had been implemented in BPA starting with the 2007 model year on September 1, 2006, no reductions in on-road emissions would have occurred because the most recent federal standards for both light-duty and heavy-duty vehicles are more stringent than the CFV standards referenced in Sections 243 and 245 of the FCAA. Under the scenario of a 2006 model year start, fleet purchases beginning on September 1, 2005, would have had to come under CFFP requirements. This would be impractical because it would have allowed less than eighteen months for the TCEQ to propose, seek public comment, and finalize such a rule. Nonetheless, even with a 2006 model year start for CFFP, the net benefits would still be zero due to the eclipsing of CFV standards referenced above.

In this instance, Texas did not propose to substitute federal measures to meet CFFP requirements, claiming, "Such an approach would have been unacceptable during the 1990s when CFV standards were more stringent than the federal Tier 1 standards that began with the 1994 model year." In the federal register notice proposing to approve the BPA attainment demonstration[139] (May 17, 2010, 75 FR 27514), EPA stated that, "In the case of BPA, [...], they were able to show that this area met the CAA requirement to have a CFF program by demonstrating with EPA documentation that the requirement was met through means other than a state vehicle program".

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[137] TCEQ, Beaumont-Port Arthur (BPA) 1997 Eight-Hour Ozone Redesignation Request and Maintenance Plan State Implementation Plan, https://www.tceq.texas.gov/assets/public/implementation/air/sip/bpa/08006sip_ado_complete.pdf

[138] U.S. EPA, Approval and Promulgation of Implementation Plans and Designation of Areas for Air Quality Planning Purposes; Texas; Beaumont/Port Arthur Ozone Nonattainment Area: Redesignation to Attainment for the 1997 8-Hour Ozone Standard and Determination of Attainment for the 1-Hour Ozone Standard; Clarification of EPA's Approval of the El Paso Section 110(a)(1) Maintenance Plan for the 1997 8-Hour Ozone Standard. (See 75 Fed. Reg. 64675, Oct. 10, 2010).

[139] U.S. EPA, Proposed Rule Approval and Promulgation of Implementation Plans and Designation of Areas for Air Quality Planning Purposes; Texas; Beaumont/Port Arthur Ozone Nonattainment Area: Redesignation to Attainment for the 1997 8-Hour Ozone Standard and Determination of Attainment for the 1- Hour Ozone Standard (75 Fed. Reg. 27514, May 17, 2010)

Texas also noted that, "EPA's Clean Fuel Fleets website (http://www.epa.gov/otaq/cff.htm) contains a listing of vehicles under a category labeled as 'Certified Alternative Fuel and/or Clean-Fuel Fleet Vehicles.' However, the latest available list is for the 2002 model year and was last posted to the Web site on May 23, 2001. This further leads to the conclusion that any vehicle purchases for 2006-or-later model year vehicles would either already meet or exceed CFV standards. Beginning with either the 2006 or 2007 model years, this analysis shows that the federal standards for new vehicles have eclipsed the current CFV standards and that no benefit would be derived from a CFFP; therefore, no substitute reductions are required from Texas."

## 12.5 COLORADO EQUIVALENCY DEMONSTRATION

While this is the first time Colorado has been designated as Serious nonattainment area for an Ozone NAAQS, it is not the first time as a Serious nonattainment area under the CAA. Below is discussion on how Colorado met the CFFP requirement as a Serious nonattainment area under the carbon monoxide (CO) NAAQS and how it is currently meeting it under the 2008 Ozone NAAQS.

### 12.5.1 Colorado's Substitution to Meet CFFP Requirements as a Serious Area for CO

In 1978, Denver was initially designated as nonattainment for CO under the provisions of the 1977 CAA Amendments[140]. Under the 1990 CAA amendments, the Denver was designated as nonattainment for CO because the area had been designated as nonattainment before November 15, 1990. In 1995, the region failed to attain the standard by the required attainment date, resulting in EPA reclassifying the Denver area to a "Serious" CO nonattainment classification[141] in 1997.

The region has attained the standard since 1996, and in 2001, Colorado submitted a redesignation request to EPA, along with all of the required elements for a Serious nonattainment area. EPA determined that all required SIP elements had been or would be fully approved with their final rule, and that the area attained the NAAQS for the CO standard, and subsequently approved the Governor's submittals of May 10, 2000, and May 7, 2001. To meet the requirement to implement a Clean Fuel Fleet Program, Colorado substituted Clean Fuel Fleet Program[142] with a project in collaboration with the United States Postal Service (USPS). On May 22, 2000, the State, EPA, and USPS entered into an agreement under EPA's Project eXcellence and Leadership program (Project XL) and Colorado's Environmental Leadership Program under which the USPS agreed to destroy or relocate several hundred pre-1984 high-emitting postal delivery vehicles and replace them with LEV[143] and low-emitting flexible fuel vehicles[144].

[140] U.S. EPA, Final Rule Title 40, Ch. 1, Subchapter C, Part 81, Section 107 - Attainment Status Designations (See 43 Fed. Reg. 8962, March 3, 1978).

[141] U.S. EPA, Final Rule Clean Air Act Approval and Promulgation of State Implementation Plan for Colorado; Carbon Monoxide Attainment Demonstrations and Related SIP Elements for Denver and Longmont; Clean Air Act Reclassification; Oxygenated Gasoline Program (See 62 Fed. Reg. 10690, March 10, 1997).

[142] U.S. EPA, Approval and Promulgation of Air Quality Implementation Plans; State of Colorado; Denver Carbon Monoxide Redesignation to Attainment, Designation of Areas for Air Quality Planning Purposes, and Approval of Related Revisions (See 66 Fed. Reg. 64751, Dec. 14. 2001).

[143] A LEV is any vehicle certified to the low emission vehicle standards specified in 40 CFR 86, subpart R.

[144] A flexible fuel vehicle or dual fuel vehicle is a vehicle which operates on the combination of gasoline and an alternative fuel (any fuel other than gasoline and diesel fuel, such as methanol, ethanol, and gaseous fuels (40 CFR 86.000-2)), such as E-85 (gasoline blended with 85% ethanol).

As part of this agreement, the USPS agreed that the State could incorporate the major components of the agreement into a SIP revision that the State could use as a substitute for a clean fuel vehicle program. EPA concurred with this substitution stating, " ...we have determined that the State will achieve greater reductions in emissions of CO with the USPS revision than would have been achieved by the clean fuels vehicle program required by CAA section 246(a)(2)(B)." Since this substitution was intended to be a one-time project, the program is no longer in effect, having accomplished the intended emission reductions nearly 20 years ago.

### 12.5.2 Colorado CFFP Equivalency Demonstration as a Serious Area Under the 2008 Ozone NAAQS

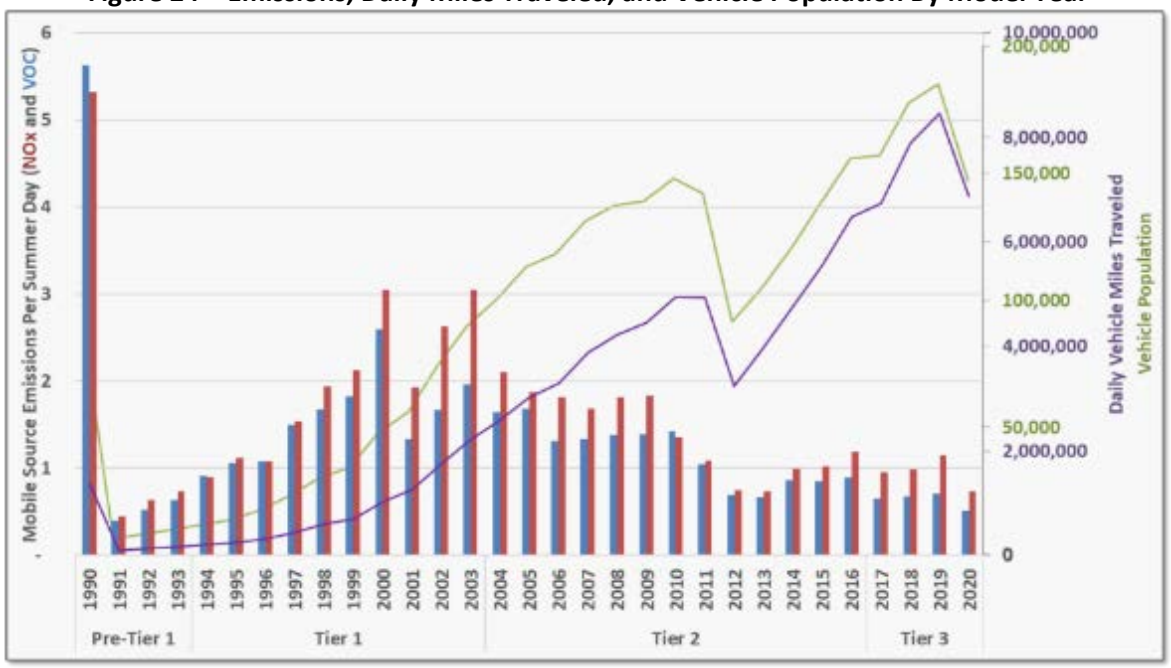
Based on a MOtor VEhicle Simulator (MOVES) modeling analysis, currently, a majority of the on-road fleet make-up in the DM/NFR is Tier 2 and newer vehicles. As shown in Table 61, only 18% of the registered vehicles in the region are pre-tier 2 vehicles, and these vehicles make up 11% of the daily miles traveled. This means that almost 90% of all the miles traveled in the region each day are Tier 2 or cleaner, with nearly 30% of the daily miles being from Tier 3 vehicles (see Figure 24).

**Table 61 - DM/NFR Fleet Composition in 2020**

| | Population | VMT | VOC | NOx |
|---|---|---|---|---|
| **Light-Duty** | **98.6%** | **97.9%** | **97.2%** | **80.3%** |
| *Pre-Tier 2* | 18% | 11% | 55% | 47% |
| *Tier 2/3* | 81% | 87% | 42% | 33% |
| **Medium/Heavy-Duty** | **1.4%** | **2.1%** | **2.8%** | **19.7%** |
| *Pre-Tier 2* | 0.4% | 0.2% | 1.3% | 7.2% |
| *Tier 2/3* | 1.0% | 1.9% | 1.6% | 12.5% |
| **ALL** | **100%** | **100%** | **100%** | **100%** |
| *Pre-Tier 2* | 18% | 11% | 56% | 55% |
| *Tier 2/3* | 82% | 89% | 44% | 45% |

Additionally, while a majority of the fleet composition and miles traveled in the region are by Tier 2 and Tier 3 vehicles, over half of the $NO_X$ and VOC emissions from the on-road mobile source sector come from pre-Tier 2 vehicles, which means that as more pre-Tier 2 vehicles retire from the fleet, they will be replaced with significantly cleaner vehicles.

**Figure 24 – Emissions, Daily Miles Traveled, and Vehicle Population By Model Year**




Furthermore, while Colorado tends to have an older fleet of vehicles compared to the national average, which is primarily due to the climate and low humidity which tends to preserve cars better. VMT from pre-Tier 2 vehicles is much lower than the fleet average. Thus, even though older vehicles are registered in the area, these vehicles are not being driven as much as newer, cleaner vehicles, resulting in continued emissions reduction from this sector and a greater reduction than would have been achieved were all new vehicles held at only CFF standards.

## 12.6 CONCLUSION

Based on Tier 2 and Tier 3 vehicles making up over 80% of Colorado's fleet in 2020, Colorado has demonstrated that no additional State rulemaking or substitution measure is necessary to satisfy the CFFP requirement as the emission reductions that would be generated by Colorado adopting a CFFP have been eclipsed by EPA's Tier 2, Tier 3, and heavy-duty emissions standards. Additionally, in recognition of the many months required for the Colorado Air Pollution Control Division (APCD) to draft new rules and seek approval before the Colorado Air Quality Control Commission (AQCC), it is likely that a new CFFP requirement for the DM/NFR area could not be implemented until 2022 (model year 2023) at the earliest. Thus, it would be both infeasible for Colorado to attempt to develop and implement a CFFP requirement in time for the 2020 ozone season nor would developing such a program have any air quality benefits to the region. Furthermore, the DM/NFR ozone nonattainment area is not relying upon any emissions reduction credits from a Clean Fuel Fleet Program in its associated attainment demonstration or to meet Reasonable Further Progress.

Lastly, Colorado has recently adopted California's LEV standards[145] as well as a Zero Emission Vehicles (ZEV) mandate[146] , which are scheduled to be implemented no later than 2023. While the legal question of California establishing vehicle emissions standards is being adjudicated in the federal courts that will directly impact states such as Colorado who have adopted California vehicle standards, Colorado believes it has exceeded what can be reasonably expected to meet the CFFP requirements of the CAA.

[145] Colorado AQCC Regulation Number 20, Part B, adopted Nov. 15, 2018
[146] Colorado AQCC Regulation Number 20, Part C, adopted Aug. 19, 2019

## Appendix 12-A. EPA Clean Fuel Fleet Exhaust Emissions Standards[147]

EPA United States Environmental Protection Agency

Office of Transportation and Air Quality
EPA-420-B-16-006
March 2016

### Light-Duty Vehicles and Light-Duty Trucks: Clean Fuel Fleet Exhaust Emission Standards[a]

| | Vehicle Type | Emissions Category | Useful Life Standard | Test Weight (lbs) | NMOG (g/mi) | NOx (g/mi) | CO (g/mi) | Formaldehyde (g/mi) | PM (g/mi) [b] |
|---|---|---|---|---|---|---|---|---|---|
| Federal | LDVs | TLEV | Intermediate | All | 0.125 | 0.4 | 3.4 | 0.015 | - |
| | | LEV | | | 0.075 [c] | 0.2 | 3.4 [c] | 0.015 [c] | - |
| | | ULEV | | | 0.040 | 0.2 [c] | 1.7 | 0.008 | - |
| | | TLEV | Full | | 0.156 | 0.6 | 4.2 | 0.018 | 0.08 |
| | | LEV | | | 0.090 [c] | 0.3 | 4.2 [c] | 0.018 | 0.08 [c] |
| | | ULEV | | | 0.055 | 0.3 [c] | 2.1 | 0.011 | 0.04 |
| | LLDTs | TLEV | Intermediate | 0-3750 LVW | 0.0125 | 0.4 | 3.4 | 0.015 | - |
| | | LEV | | | 0.075 [c] | 0.2 | 3.4 [c] | 0.015 [c] | - |
| | | ULEV | | | 0.040 | 0.2 [c] | 1.7 | 0.008 | - |
| | | TLEV | | 3751-5750 LVW | 0.160 | 0.7 | 4.4 | 0.018 [c] | - |
| | | LEV | | | 0.100 [c] | 0.4 | 4.4 [c] | 0.018 [c] | - |
| | | ULEV | | | 0.050 | 0.4 [c] | 2.2 | 0.009 | - |
| | | TLEV | Full | 0-3750 LVW | 0.156 | 0.6 | 4.2 | 0.018 | 0.08 |
| | | LEV | | | 0.090 [c] | 0.3 | 4.2 [c] | 0.018 [c] | 0.08 [c] |
| | | ULEV | | | 0.055 | 0.3 [c] | 2.1 | 0.011 | 0.04 |
| | | TLEV | | 3751-5750 LVW | 0.200 | 0.9 | 5.5 | 0.023 | 0.08 |
| | | LEV | | | 0.130 [c] | 0.5 | 5.5 [c] | 0.023 [c] | 0.08 [c] |
| | | ULEV | | | 0.070 | 0.5 [c] | 2.8 | 0.013 | 0.04 |
| | HLDTs | LEV | Intermediate | 0-3750 LVW | 0.125 [c] | 0.4 [d] | 3.4 [c] | 0.015 [c] | - |
| | | ULEV | | ALVW | 0.075 | 0.2 [c,d] | 1.7 | 0.008 | - |
| | | LEV | | 3751-5750 | 0.160 [c] | 0.7 [d] | 4.4 [c] | 0.018 [c] | - |
| | | ULEV | | ALVW | 0.100 | 0.4 [c,d] | 2.2 | 0.009 | - |
| | | LEV | | 5751+ | 0.195 [c] | 1.1 [d] | 5.0 [c] | 0.022 [c] | - |
| | | ULEV | | ALVW | 0.117 | 0.6 [c,d] | 2.5 | 0.011 | - |
| | | LEV | Full | 0-3750 LVW | 0.180 [c] | 0.6 | 5.0 [c] | 0.022 [c] | 0.08 [c] |
| | | ULEV | | ALVW | 0.107 | 0.3 [c] | 2.5 | 0.012 | 0.04 |
| | | LEV | | 3751-5750 | 0.230 [c] | 1.0 | 6.4 [c] | 0.027 [c] | 0.10 [c] |
| | | ULEV | | ALVW | 0.143 | 0.5 [c] | 3.2 | 0.013 | 0.05 |
| | | LEV | | 5751+ | 0.280 [c] | 1.5 | 7.3 [c] | 0.032 [c] | 0.12 [c] |
| | | ULEV | | ALVW | 0.167 | 0.8 [c] | 3.7 | 0.016 | 0.06 |

**Notes:**

a These standards have in effect been superseded by newer, more stringent standards in 40 Code of Federal Regulations (CFR) Part 86. See EPA manufacturer guidance letter on Clean-Fuel Vehicle Standards (CCD-05-12, July 21, 2005) which provides guidance on determining the equivalency of vehicle and engine emission standards in the CFR Part 86 standards and Part 88 standards for Clean-Fuel Vehicles.

b Applies to diesel vehicles only.

c Applies to Inherently Low Emission Vehicles.

d Does not apply to diesel vehicles.

**Code of Federal Regulations (CFR) citations:**

- 40 CFR 88.104-94 = Clean-fuel vehicle tailpipe emission standards for light-duty vehicles and light-duty trucks
- 40 CFR 88.311- 93 § 88.311- 98 = Emission standards for Inherently Low-Emission Vehicles

[147] U.S. EPA, Light-Duty Vehicles and Light-Duty Trucks: Clean Fuel Fleet Exhaust Emission Standards, https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100O9ZJ.pdf

## Appendix 12-B. EPA Tier 2 and California LEV II Vehicle Emissions Standards[148]

# Vehicle Emissions Standards

## US EPA Federal Tier 2 (Bins) & California LEV II

| Standard | Vehicles | Emission Limits at Full Useful Life (100,000-120,000 miles) Maximum Allowed Grams per Mile | | | | |
|---|---|---|---|---|---|---|
| | | Nitrous Oxide | Non-Methane Organic Gas | Carbon Monoxide | Particulate Matter | Formaldehyde |
| Bin 1 | LDV, LLDT, HLDT, MDPV | 0.00 | 0.000 | 0.0 | 0.0 | 0.0 |
| ZEV | LDV, LDET | 0.00 | 0.000 | 0.0 | 0.0 | 0.0 |
| PZEV | LDV, LDT | 0.02 | 0.010 | 1.0 | 0.01 | 0.004 |
| SULEV II | LDV, LDT | 0.02 | 0.010 | 1.0 | 0.01 | 0.004 |
| Bin 2 | LDV, LLDT, HLDT, MDPV | 0.02 | 0.010 | 2.1 | 0.01 | 0.004 |
| Bin 3 | LDV, LLDT, HLDT, MDPV | 0.03 | 0.055 | 2.1 | 0.01 | 0.011 |
| ULEV II | LDV, LDT | 0.07 | 0.055 | 2.1 | 0.01 | 0.011 |
| Bin 4 | LDV, LLDT, HLDT, MDPV | 0.04 | 0.070 | 2.1 | 0.01 | 0.011 |
| Bin 5 | LDV, LLDT, HLDT, MDPV | 0.07 | 0.090 | 4.2 | 0.01 | 0.018 |
| LEV II | LDV, LDT | 0.07 | 0.090 | 4.2 | 0.01 | 0.018 |
| Bin 6 | LDV, LLDT, HLDT, MDPV | 0.10 | 0.090 | 4.2 | 0.01 | 0.018 |
| LEV II option 1 | LDV, LDT | 0.10 | 0.090 | 4.2 | 0.01 | 0.018 |
| SULEV II | MDV4 | 0.10 | 0.100 | 3.2 | 0.06 | 0.008 |
| Bin 7 | LDV, LLDT, HLDT, MDPV | 0.15 | 0.090 | 4.2 | 0.02 | 0.018 |
| SULEV II | MDV5 | 0.20 | 0.117 | 3.7 | 0.06 | |
| Bin 8a | LDV, LLDT, HLDT, MDPV | 0.20 | 0.125 | 4.2 | 0.02 | 0.018 |
| ULEV II | MDV4 | 0.20 | 0.143 | 6.4 | 0.06 | 0.016 |
| Bin 8b | HLDT, MDPV | 0.20 | 0.156 | 4.2 | 0.02 | 0.018 |
| LEV II | MDV4 | 0.20 | 0.195 | 6.4 | 0.12 | 0.032 |
| Bin 9a | LDV, LLDT | 0.30 | 0.090 | 4.2 | 0.06 | 0.018 |
| Bin 9b | LDT2 | 0.30 | 0.130 | 4.2 | 0.06 | 0.018 |
| Bin 9c | HLDT, MDPV | 0.30 | 0.180 | 4.2 | 0.06 | 0.018 |
| ULEV II | MDV5 | 0.40 | 0.167 | 7.3 | 0.06 | |
| Bin 10a | LDV, LLDT | 0.60 | 0.156 | 4.2 | 0.08 | 0.018 |
| LEV II | MDV5 | 0.40 | 0.230 | 7.3 | 0.12 | |
| Bin 11 | MDPV | 0.90 | 0.280 | 7.3 | 0.12 | 0.032 |

EPA United States Environmental Protection Agency

EPA-420-F-13-022
July 2013

[148] EPA, Vehicle Emissions Standards: US EPA Federal Tier 2 (Bins) & California LEV II, EPA-420_F-13-022, July 2013, https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P100HVZK.TXT

United States Environmental Protection Agency

Air and Radiation

EPA420-R-98-011
August 1998

# Clean Fuel Fleet Program Implementation Guidance

# Clean Fuel Fleet Program Implementation Guidance

Regional & State Programs Division
Office of Mobile Sources
U.S. Environmental Protection Agency

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**

**ANN ARBOR, MICHIGAN 48105**

**OFFICE OF**
**AIR AND RADIATION**

**August 28, 1998**

**Dear Stakeholder:**

**Attached to this memorandum is the final Clean Fuel Fleet Implementation Guidance. This document is intended to provide guidance to states and regulated entities in the implementation or start-up phase of the Clean Fuel Fleet program (CFFP) which will begin September 1, 1998. This final version is based on significant input received from an informal workgroup consisting of various affected stakeholder groups.**

**EPA has attempted to provide flexibility and address the concerns and issues raised given the Agency's charge of administrating the Clean Air Act (CAA) and improving air quality. We will continue to work with fleet operators, state agencies, vehicle and engine manufactures, fuel providers and other stakeholders to ensure that the implementation guidance continues to be relevant as the program gains momentum.**

**We consider this to be the final version of this document and are beginning broad distribution. We recognize that as implementation proceeds, new and/or different issues may arise and expect to issue additional guidance if and when it becomes necessary. Should you have any questions regarding these or other issues, please contact Sally Newstead at 734/214-4474.**

**Sincerely,**

***Original signed by Leila H. Cook***
***for***
**Gay MacGregor, Director**
**Regional and State Programs Division**

**Clean Fuel Fleet Program**
**Implementation Guidance**
August, 1998

This guidance is intended as a resource for state air agencies and regulated entities that will be involved in the implementation of a Clean Fuel Fleet program (CFFP) pursuant to Section 246 of the Clean Air Act (hereafter, the Act). The areas currently covered by the program are Atlanta, GA; Baton Rouge, LA; Denver-Boulder, CO; Washington D.C. Metropolitan area; Milwaukee-Racine, WI; and Chicago-Gary-Lake County, IL/IN. At this time, two of the areas (Baton Rouge, LA and Washington D.C.) are reassessing air quality programs that could be used as substitute programs rather than implementing the CFFP; however, no formal proposals have been made and approved by the Agency at this time.

This document provides guidance to EPA regions, state agencies, fleet operators**,** and fuel providers, and provides further clarification of definitions relevant to implementation of the CFFP. EPA believes this guidance will help to ensure that the state CFFPs are implemented in an effective manner.

The Office of Mobile Sources held a Clean Fuel Fleet Stakeholders meeting on July 15, 1997 to discuss a one year delay of the CFFP. During this meeting, various stakeholder groups (fleet owner/operators, managers, and representatives) asked questions pertaining to several program elements and expressed a desire for consistent state programs. Among the issues discussed were the availability of clean fuel vehicles (CFVs), purchase compliance exemptions for fleets, a rounding protocol, and clarifications regarding definitions of certain terms (centrally fueled, contract refueling, capable of being centrally fueled, independent contractor and model year/ purchase year).

This document provides guidance to states and regulated entities concerning how EPA interprets various requirements of the CFFP provisions in the Clean Air Act and in EPA's regulations. This document does not impose legally binding requirements on states, EPA, or regulated entities, and may not apply in particular situations based on the circumstances. EPA and state decision makers retain the discretion to approach the CFF community to adopt approaches on a case-by-case basis that differ from this guidance where appropriate in order to address regional concerns as they may arise subject to the requirements of the Act and EPA's regulations. EPA may change this guidance in the future.

## Who is Covered by the Clean-Fuel Fleet Program?

The following questions should aid in determining if your fleet is covered by the CFFP. This exercise is not designed to be exhaustive, but should improve ones understanding of whether a fleet is covered by the program.

1. Do any of your fleet vehicles operate at any time in a particular covered area?

No. Only fleets that have vehicles that operate in ozone or CO air quality non-attainment areas are required to comply with the CFF program. Therefore, you are not covered.

Yes. Go to (2) below.

2. How many of your fleet vehicles of all types operate in that covered area?

Less than 10? The fleet is not covered. When counting vehicles for the purpose of determining if a fleet is a covered fleet, all vehicles, regardless weight class, held in a fleet owned or operated, leased or otherwise controlled by a single person must be counted.

10 or more? Go to (3) below.

3. How many vehicles operating in that covered area are non-exempt? (Subtract the number of exempt vehicles from the number of vehicles of all types.)

Less than 10? Then the fleet is not covered. Exempt vehicles include motor vehicles held for lease or rental to the general public; motor vehicles held for sale by motor vehicle dealers (including demonstration vehicles), motor vehicles used for motor vehicle manufacturer product evaluations or tests; law enforcement and other emergency vehicles; non-road vehicles (including farm and construction vehicles) and vehicles greater than 26,000 lbs. GVWR.

10 or more? Go to (4) below.

4. How many non-exempt vehicles are:

(a) Centrally fueled? "Centrally fueled" vehicles, are all vehicles, including those garaged at a personal residence when not in use, that are refueled 100% of the time at fueling facilities owned, operated or controlled by, or under contract with, the fleet operator.

(b) Capable of being centrally fueled? Vehicles "capable of being centrally fueled" are all vehicles, excluding those garaged at a personal residence when not in use, that could be centrally fueled 100% of the time at a central location(s); refer to the Fleet Definitions (40CFR §88.302-94) to see how to conduct the determination process.

Do (a) + (b) = 10 or more? If so, the sum is your potentially covered fleet size. A covered fleet vehicle is one for which clean fuel vehicle standards exist and which is in a covered fleet that is centrally fueled or capable of being centrally fueled.

5. Of these covered fleet vehicles from (4) above, how many ever operate in the covered area? 10 or more? This number of covered fleet vehicles (a + b) is your fleet size and has been defined as "can be centrally fueled". These vehicles are covered by the CFF program rules and regulations.

## Vehicle Availability

A list of vehicles and engines certified to meet the CFF emission standards can be found at the following EPA website: www.epa.gov/ OMSWWW/cff .htm. EPA will update this list as new vehicles and engines are certified to CFV standards and EPA will continue to work with vehicle manufacturers to provide fleet operators information on vehicles expected to be certified whenever possible. EPA recommends that states keep a current list available at their agencies, so that fleets can verify available vehicles. The MY99 CFFP requirements assume that there is a minimally sufficient number of CFVs available for fleet operators to meet applicable purchase requirements. EPA has worked with fleet operators, state agencies, vehicle and engine manufacturers to ensure increased availability of different types of CFVs and expects the range of offerings to further increase in the coming year as the program moves forward.

Clean-Fuel Fleet light duty standards are the same as for Low Emission Vehicles (LEVs); however, vehicles meeting the more stringent Inherently-Low Emission Vehicle (ILEV), Ultra-Low Emission Vehicle (ULEV) or Zero Emission Vehicle (ZEV) standards also qualify as CFVs. The numerical standards for each of these categories may be found in 40 CFR Part 88.104-94; heavy-duty standards for LEV, ILEV, ULEV and ZEV categories may be found in 40 CFR Part 88.105-94.

### Compliance Exemptions

Under Section 246(a)(4) states are required to submit implementation plans taking into consideration operational range, specialty uses, vehicle and fuel availability, costs, safety, and other factors. EPA interprets this to allow states the authority to grant compliance exemptions on a narrow and limited basis in those cases where compliance with the program is not possible due to these factors or financial hardship beyond the control of the fleet operator. EPA's interpretation allowing this narrow and limited use of state discretion with regard to compliance exemptions is applicable only to Section 246(a)(4) and should not be applied to or set precedent for other Agency programs.

Although EPA expects that a sufficient number of CFF vehicles and engines will be certified and available for the Clean-Fuel Fleet program to begin in MY 99 (September 1, 1998 - August 31, 1999) fleet, it is possible that individual fleets will need certain types of CFVs that may not be available. For example, fleets whose business is making large deliveries may not be able to use small LDVs to conduct their normal business activities. Similarly, there may be a limited availability of right-hand drive vehicles that

could make compliance infeasible for the fleet operator. As described in EPA's rulemaking delaying the effective date of the CFFP purchase requirements to MY99, EPA believes that Congress intended that it be feasible for fleets to purchase and use CFVs to meet the CFFP purchase requirements. For this reason, EPA believes it is appropriate interpret Section 246 (a)(4) as allowing states to grant compliance exemptions where a fleet's business needs dictate use of a particular type of vehicle that is not available as a CFV. States should set a responsible threshold for granting compliance exemptions which should include written documentation by the fleet operator that compliance is infeasible and the reasons why. Price thresholds may be set based on historical or standard industry practices, but must be documented in the compliance exemption request.

EPA encourages fleet operators to look toward the availability of purchase credits before applying for a compliance exemption; however, it is not recommended that the credit purchase be mandated if it is the only compliance option for fleets. In order for EPA to gather credit information, the standardized exemption requests should require the estimated cost of a CFV credit to be reported. The EPA will work with the state agencies to create a standard form for exemption requests.

With regard to fuel availability, states do not have authority under the Clean Air Act to grant compliance exemptions based solely on the lack of alternative fuel availability alone. The Agency recognizes that an alternative fuel infrastructure is essential to the success of the CFF program and has strived to address this issue by working with our stakeholders. The alternative fuel industry has also worked to create cost-effective products and services to provide alternative fuel solutions for both large and small (2 vehicles) fleets. Finally, Department of Energy grants and Congestion Mitigation and Air Quality Improvement Program grants are available for constructing CFF fueling facilities in covered areas. Additional information on these topics is available on the EPA website. It should also be noted that under the Act (Section 246(g)), Federal Facilities are required to make their alternative fuel refueling sites available to the public when such fuels are not available commercially. However, the CFF program is fuel neutral and, therefore, if gasoline fueled vehicles are available that meet the CFF emission standards they should be considered as a viable compliance option.

Finally, EPA believes the fleet operator's OEM preference alone, with regard to either fuel supplier or vehicle manufacturer, should not be an acceptable rationale for granting compliance exemptions because it would be inconsistent with Section 246. Such action would discourage those OEMs that have products available from continuing to produce CFVs or provide innovative fuel infrastructure solutions. The Agency believes allowing OEM preference as an acceptable basis for exemption may be viewed as anti-

competitive and, furthermore, would unfairly penalize those OEMs who have done the research and marketing to promote the success of the CFF program.

Exemption Process

The compliance exemption process should be monitored and administered by the State. The State should, therefore, have a system which performs the following functions.

(A) Identifies each covered fleet operator
(B) Provides a method to track and document the exemption status of each covered fleet operator.
(C) Establishes the number of fleet vehicles in operation and their refueling pattern
(D) Establishes the number of vehicles purchased and/or converted each year in each vehicle weight classification by each covered fleet operator.
(E) Establishes the certified emission level of these new vehicle acquisitions as LEVs, ULEVs, ILEVs or ZEVs.
(F) Provides a method to compare the number of CFVs purchased and/or converted each year in each vehicle weight classification by each covered fleet operator with the appropriate minimum program requirements.

It is recommended by the Agency that the exemption process include a formal written request submitted by the fleet operator using the standardized exemption form to the State with documentation demonstrating the necessity of a compliance exemption. The State should then review the request and notify the requestor of its decision. EPA's role will be limited to providing oversight to ensure the CFFP is implemented as uniformly as possible among the covered areas and within the legal authority of the Clean Air Act.

## Definitions [1]

### Model Year/Purchase Year

EPA defines "model year" for the purpose of fleet purchase requirements as September 1 through August 31. For each model year, states must ensure that fleet operators purchase (or lease) the number of clean-fuel vehicles, as a percentage of total

[1] **See 40 CFR 88.302-94** for regulatory definitions for terms in this section.

new vehicles purchased (or leased), required under the Act. According to this definition, for the purposes of compliance, fleets would compute their annual purchases (or leases) during the period from September 1 through August 31. This definition of model year coincides with the period in which most automobile manufacturers introduce their new annual models. This should facilitate compliance by allowing fleets to make their purchase plans regarding clean-fuel vehicles when they make their plans for purchasing new vehicles. A "new vehicle" does not mean that fleets must purchase a new model year vehicle; purchases of previously owned, Federally certified clean fuel vehicles that are new to the fleet during that model year will count towards that year's CFV purchase schedule. See 40 CFR 88.302-94 (definition of "a new covered fleet vehicle").

Any new vehicles ordered by a fleet operator between September 1 and August 31 are counted toward the purchase requirements of the same year, and are considered to be of the same model year as the January that falls between these dates. Vehicles purchased before the start of the program are not required to be CFVs, but if CFVs are purchased prior to the start of the program they may be used to generate purchase credits that can be used in future years to meet the new vehicle purchase requirements.

Example: For MY99 a covered fleet operator intends to purchase 10 new light-duty vehicles; therefore, 30% or three of these shall be required to be CFVs. A CFV purchased in October 1998 will count towards the fleet operators 1999 purchase requirement of three vehicles and he/she will still have to purchase two additional CFVs in the September 1, 1998 to August 31, 1999 window. The compliance determination would be made by August 31st of 1999. This example assumes that the fleet operators new vehicle purchase basis does not change from the original target of ten new vehicles. If this new vehicle target were to change due to business decisions, then the CFV purchase requirement would be adjusted up or down accordingly.

Demonstration of compliance should be based on when the vehicle was put in service, and not when the vehicle was ordered. However, vehicles ordered before September 1, 1998 are not required to be covered. States should develop a follow-up strategy to keep track of any order cancellations and to assure that the vehicle does become part of the fleet. However, if a purchase has been made and documented and the manufacturer has failed to deliver the vehicle(s), the state may take this into consideration in its exercise of enforcement discretion.

**Centrally Fueled**

EPA regulations define "centrally fueled" as a fleet or that part of a fleet,

consisting of vehicles that are fueled 100 percent of the time at a location that is owned, operated or controlled by the covered fleet operator, or at a "location" that is under contract with the covered fleet operator. Any vehicle that under normal operations is garaged at a personal residence at night but that is, in fact, centrally fueled 100 percent of the time shall be considered to be centrally fueled. EPA defines "control" as a function of ownership rights in the entities. These ownership rights can take at least three forms: controlled stock, controlled management, or controlled facilities.

> "Location" means any building, structure, facility, or installation, which
> (i) is owned or operated by a person, or is under the control of a person;
> (ii) is located on one or more contiguous properties and
> (iii) contains or could contain a fueling pump or pumps for the use of the vehicles owned or controlled by that person. See 40 CFR 88.302-94.

Furthermore, a fleet operator has control of a vehicle when, (1) the fleet operator plans or controls the vehicle's route, (2) the vehicle's operation has an economic impact on the fleet, or (3) has the authority to decide who can operate a vehicle, and the purposes for which it can be operated. Fleets whose drivers are independent contractors are subject to the CFFP if they function as an organized business fleet, e.g. picking up and delivering packages in a similar manner, using the same corporate name or identity, etc.

This definition is meant to encompass all of the facilities of the fleet operator in a single covered non-attainment area, in its entirety. Location is not meant to be interpreted narrowly, (e.g., as a single refueling pump). (58 FR 64683, December 9, 1993).

**Capable of Being Centrally Fueled**

EPA regulations define a fleet that is "capable of being centrally fueled" as a fleet, or that part of a fleet, consisting of vehicles that could be refueled 100 percent of the time at a location that is owned, operated, or controlled by the covered fleet operator, or is under contract with the covered fleet operator. The fact that one or more vehicles in a fleet is/are not capable of being centrally fueled does not exempt an entire fleet from the program; those vehicles that are capable of being centrally fueled will count toward the 10-vehicle minimum fleet size threshold.

The determination of capable of being centrally fueled should be based on the refueling patterns for that portion of the fleet consisting of nonexempt vehicles that are not

centrally refueled 100 percent of the time, excluding those vehicles that are garaged at a personal residence at night. The preamble to EPA's Clean Fuel Fleet Program Definitions and General Provisions Final Rule (58 FR 64684, December 9, 1993), describes procedures states and fleets can use to determine if a fleet's refueling pattern is such that the fleet vehicles are capable of being centrally fueled. This determination requires fleets to develop a sample trip profile that is representative of normal travel patterns.

Whether a credit card of any type does or does not limit its use to a designated refueling location(s) would not be the single determining factor of capable or not capable of central refueling. In addition, use of a credit card alone would not indicate that fueling is occurring at a central location or set of locations. For example, the use of an ABC credit card does not constitute contract fueling if the card may be used at any station that accepts the ABC credit card. However, if the same ABC card can only be used at specific stations identified by address, this arrangement does constitute contract fueling. As stated in 59 FR 50068, September 30, 1994, "EPA recommends that states look at the actual fueling patterns used by fleet operators. When an individual fleet's fueling is limited to a single location or set of locations within the operational range of the vehicles, EPA believes this situation represents central fueling, regardless of the method of payment for the fuel".

**Rounding Protocol**

For calculating the number of vehicles in a fleet that are capable of being centrally fueled, fleets should round down to the lowest integer. (Ex: 7.75 or 7.25 is rounded to 7) This method of calculation is intended to avoid the situation where a fleet operator would need to purchase more CFV than are needed for trips within the operational range of the fleet's central refueling facility.

**Credit Calculation**

The methodology for the calculation of purchase credits is outlined in the March 3, 1993 rulemaking "Clean Fuel Fleet Credit Programs; Transportation Control Measure Exemptions, and Related Provisions" (40 CFR §88.304-94).

The calculation and recording of credits shall be performed by the State and is not the responsibility of the fleet operator. The Agency has chosen to allow States flexibility in

developing their administrative procedures; however, strongly encourages states that share covered non-attainment areas to work closely in adopting systems that permit the free trading of credits across state lines.

## Exemption from HOV Lane Restriction

EPA has emphasized in the past that ILEVs are part of a federal regulatory initiative to encourage the production and use of advanced exhaust and evaporative emission control technology vehicles (58 Federal Register 11898). Therefore, the Agency interprets Section 246(h) of the Act to apply to all 22 of the CFF covered areas, regardless of whether they have opted-out of the CFF program.

The CFF regulations provide HOV access as an incentive for fleets to purchase ILEVs in the form of expanded Transportation Control Measure (TCM) exemptions in keeping with the overall air quality goals of the Act (See 40 CFR 88.313-93). These ILEV vehicles can be purchased as part of the fleet program for either compliance or credit purposes, with the owner gaining the additional incentives for any ILEVs in the fleet. Fleet operated ILEVs covered by the CFF program are exempt from single passenger HOV restrictions.

## The Clean Fuel Fleet Program and the EPAct Program

The Energy Policy Act of 1992 is a law administered by the Department of Energy designed to decrease dependence on foreign oil supplies and increase the use of alternative fuels by encouraging the conversion of vehicles to run on alternative fuels. The CFFP was adopted as part of the 1990 Clean Air Act (CAA) amendments and was designed to improve air quality and introduce clean burning fuels into the market. The CFFP is fuel neutral in that it does not require the use of a specific fuel, only that the appropriate emissions standards are met. It is possible that fleet operators may have to meet the requirements of one or both of these programs depending on an area's attainment status and population. Therefore, it is important to understand the basic elements of each program. The following list highlights similarities and differences between the two programs. There is a DOE alternative fuels hotline number (800-423-1363) where more information about the EPACT

program can be obtained.

- Covered Areas:
  EPACT -- Consolidated Metropolitan Statistical Areas (CMSA) of 250,000 or more (There are approximately 125 such areas.)
  CAA -- CMSAs of 250,000 or more and classified as serious, severe, or extreme for ozone, or having a CO design value > 16.0 ppm. (There were 22 such areas covered by the 1990 CAA.)

- Covered Fleets
  EPACT -- minimum of 20 vehicles locally and 50 nationally
  CAA -- 10 or more vehicles capable of being centrally fueled

- Covered Vehicles
  EPACT – up to 8,500 lb. GVWR
  CAA -- light-duty up to 8,500 lb. GVWR and heavy-duty from 8,500 up to 26,000 lb. GVWR

- Fleet Types
  EPACT -- Only federal, state, and fuel providers. Municipal and private fleets can be added by DOE through the rulemaking but this has not been done, as yet.
  CAA -- All federal, state, municipal, fuel providers, and private fleets.

  There are exemptions to these coverage requirements for both programs. The following vehicle categories are exempted from both EPACT and the CFF programs. However, it should be noted that these categories are nto necessarily defined the same by the EPACT and CFF programs. Therefore, one should verify these coverage exemptions with the state before making a purchase decision.
    - Those held for lease or rental to the general public
    - Those held for sale by dealers, including those used for demonstrations
    - Law enforcement
    - Emergency
    - Non-road, e.g. used for farming and construction
    - Military, classified as necessary for national security

- Incentives
  EPACT -- Credits can be bought and sold between any of the 125,000 affected

CMSAs. Tax deductions and other state and local cash programs may also be available.

CAA -- Emissions credits as determined by EPA regulations may be used in State Implementation Plans (SIPs). This requires the state to track and administer a credit program for use in their SIP; however, these credits are only tradeable or usable within a specific non-attainment area. Purchase credits are available for fleets and mobile emissions reduction credits (MERCs) are available for state inventories.

- Covered Vehicles Accounting

EPACT -- Vehicles running on dual fuel are counted, although EPACT does not require that the vehicle be operated on the alternative fuel. (e.g. a CNG/gasoline vehicle that is always run on gasoline is counted as an EPACT fleet vehicle).

CAA -- Vehicles can meet LEV or more stringent standards on any fuel, but the fleet operator must use that fuel in the covered area. A dual-fuel vehicle may be counted as a CFV as long as it is certified to LEV or better standards on at least one fuel and meets Transitional Low Emission Vehicle (TLEV) standards on the other fuel. However, regardless of TLEV certification, the CFV must be operated on clean fuel (the fuel on which the vehicle meets LEV standards) when in the covered area.

## National Low Emission Vehicle (NLEV) and the Clean-Fuel Fleet Program

On June 6, 1997 EPA published the Final Rule for the NLEV program (Federal Register Vol. 62, No. 109, 31193). This program was motivated primarily by the Ozone Transport Commission's efforts to reduce motor vehicle emissions either by adoption of the California LEV program throughout the Ozone Transport Region (OTR) or by the adoption of the NLEV program. The NLEV program was created as a voluntary program for auto manufacturers to provide LEV technology to the OTR and other states. NLEV will spur the introduction of LEVs into the marketplace and provide air quality benefits on a national level by introducing cleaner running LEVs prior to MY04. However, the NLEV program is a federal program that is not legally enforceable by states outside of the OTR. OTR states will, however, submit SIP revisions that represent a state commitment. This does not apply to other states. Also, there is no heavy-duty component in the NLEV program.

Under the NLEV program, manufacturers would certify light-duty vehicles and trucks

to LEV standards. Under Section 241 of the Act, these vehicles would only qualify toward CFF purchase requirements if the vehicles were operated on the same fuel (or a fuel shown to yield at least equivalent emissions) on which they were certified. (This statement is true for all certified vehicles, not just those in the NLEV program. Hence, CA-only vehicles could be used to meet CFF purchase requirements if CA Reformulated Gasoline (RFG) were available in the area. Also, the determination with regard to "equivalent emissions" will be made by the EPA on a vehicle by vehicle basis. Only those fuels recognized by EPA as providing equivalent emission benefits when compared to certification fuels may be used.)

Because non-OTR states will not submit enforceable SIP revisions related to the NLEV program, NLEV is not an acceptable substitute for the CFFP. However, OTR states may use NLEV as a substitute for the CFFP because the OTR states will submit enforceable SIP revisions related to the NLEV program, where NLEV is shown to achieve comparable long-term reductions.

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**
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JUL 0 2 2004

OFFICE OF
AIR AND RADIATION

**MEMORANDUM**

**SUBJECT:** Clean Fuel Fleet Program

**FROM:** Leila H. Cook, Group Manager
Transportation & Regional Programs Division

EPA's Clean Fuel Fleet Program (CFFP) was established by the 1990 Clean Air Act Amendments to reduce emissions in metropolitan areas not meeting Federal air quality standards, promote vehicle emission control technologies, encourage the alternative fuel vehicle market, and provide states with an incentive to promote the use of Clean Fuel Vehicles.

EPA has since published new emission standards that are more stringent than the CFFP standards for heavy-duty diesel and heavy-duty gasoline engines, as well as light-duty vehicles. Therefore, vehicles certified to these new standards are considered acceptable for meeting the requirements contained in Part 88 for the Clean Fuel Fleets Program.

Fleet managers seeking to meet the requirements of the CFFP should be assured that all vehicles manufactured to meet the Tier 2 emission standards are equivalent to or cleaner than earlier emission levels mandated by the CFFP. Therefore, these new Tier 2 vehicles are acceptable for use in meeting the CFFP requirements.

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**
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OFFICE OF
AIR AND RADIATION

July 21, 2005 CCD-05-12 (LDV/LDT/MDPV/HDV/HDE/LD-AFC)

Dear Manufacturer:

Subject: Clean-Fuel Vehicle Standards

This letter provides guidance on determining the equivalency of vehicle and engine emission standards in Code of Federal Regulations (CFR) Part 86 standards and Part 88 standards for Clean-Fuel Vehicles. The determinations that follow may be used effective with the issue date of this guidance letter.

## Background

The EPA Clean-Fuel Fleet Program (CFFP) was established by the requirements under Part C – Clean-Fuel Vehicles, Sections 241-246 of the1990 Clean Air Act (CAA) Amendments. The purpose of the CFFP was to reduce emissions in metropolitan areas not meeting Federal air quality standards through the use of clean alternative fuels.[1] The CAA prescribed exhaust emission standards for light-duty vehicles, light-duty trucks, and heavy-duty vehicles between 8,501 lbs and 26,000 lbs GVWR.[2]

In response to the Clean-Fuel Vehicle (CFV) requirements of the CAA Amendments, EPA published regulations in 40 CFR Part 88, Subpart A, Emission Standards for Clean-Fuel Vehicles, and Subpart C, Clean-Fuel Fleet Program. Following the requirements in Sections 242, 243, and 245 of the CAA Amendments, EPA published standards for three vehicle classes: light-duty vehicles (LDVs), light-duty trucks (LDTs) up to 8,500 lbs GVWR, and heavy-duty vehicles (HDVs) between 8,501 lbs and 26,000 lbs GVW. A CFV light-duty vehicle or light-duty truck can be classified as a transitionally low emissions vehicle (TLEV), low-emission vehicle (LEV), ultra low-emission vehicle (ULEV), or a zero emission vehicle (ZEV). Heavy-duty vehicles or engines used in heavy-duty vehicles are classified as low-emission vehicle (LEV), ultra low-emission vehicle (ULEV), inherently low-emission vehicle (ILEV) or a zero emission vehicle (ZEV).

Subsequent to publishing its CFV regulations, EPA has promulgated new emission standards that are generally more stringent than or equivalent to the CFV emission

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[1] Section 241(2) of the 1990 CAA Amendments lists the following fuel types as clean alternative fuels: any fuel mixture with gasoline or other fuel containing 85% or more (by volume) methanol, ethanol, or other alcohol, reformulated gasoline, diesel, natural gas, liquefied petroleum gas, hydrogen, and electricity.
[2] Section 241(7) defines a clean-fuel vehicle as "…. a vehicle in a class or category of vehicles which has been certified to meet for any model year the clean-fuel vehicle standards applicable under this part for that model year to clean-fuel vehicles in that class or category."

standards for light-duty vehicles, light-duty trucks, and heavy-duty engines. These new EPA regulations added a new medium-duty vehicle passenger class, and also created a new chassis test procedure for heavy-duty vehicles.

Vehicle and engine manufacturers continue to receive requests from fleet customers who desire to purchase vehicles compliant with CFV standards.[3] Manufacturers have requested EPA guidance on how to continue to demonstrate to fleet customers that current standards are equivalent to or more stringent than CFV standards.

The CFV emission standards for vehicles and engines are presented in 40 CFR Part 88 Subpart A, sections 88.104-94 for vehicles and in 88.105-94 for heavy-duty engines. Current federal vehicle and engine certification emission standards are published in 40 CFR Part 86. Specifically, light-duty vehicle, light-duty truck, and medium-duty passenger vehicle standards are presented in 86.1811-04 and complete heavy-duty vehicle emission standards are presented in 86.1816-05 and 86.1816-08. Otto cycle standards for the 2005-2007 model year heavy-duty engines and vehicles are presented in 86.005-10 and in 86-008-10 for 2008 and later model years. Diesel cycle emission standards for 2004-2006 model year heavy-duty engines and vehicles are presented in 86.004-11 and in 86.007-11 for 2007 and later model years.

**Determination**

To determine equivalency, current certification emission standards for Tier 2 vehicles (LDVs, LDTs, and MDPVs), heavy-duty vehicles, heavy duty Otto cycle engines, and heavy-duty diesel engines were compared to CFV vehicle and engine emission standards using the methodology outlined in the Attachment. The results of this analysis are summarized as follows:

Tier 2 LDVs, LDT1-4s, and MDPVs certified to the following Tier 2 bin standards are equivalent to or more stringent than CFV LEV emission standards:

LDV Bins 1-7 and Bin 9
LDT1 Bins 1-7 and Bin 9
LDT2 Bins 1-9
LDT3 Bin 1-10
LDT4 Bin 1-10
MDPV Bin 1-11[4]

Tier 2 LDVs, LDT1-4s, and MDPVs certified to the following bin standards are equivalent to or more stringent than CFV ULEV emission standards:

LDV Bins 1-3
LDT1 Bins 1-3
LDT2 Bins 1-4

[3] Correspondence addressed to EPA from the Engine Manufacturers Association dated December 8, 2004.
[4] There are no CFV emission standards that correspond to the Tier 2 MDPV class but MDPVs meeting Tier 2 Bins 1-11 are all equal to or more stringent than LDT4 CFV LEV standards.

LDT1 Bins 1-3
LDT2 Bins 1-4
LDT3 Bins 1-4
LDT4 Bins 1-4
MDPV Bins 1-4[5]

The following determinations are made for 2005 and later model year Otto cycle heavy-duty vehicles:

8,501-10,000 GVWR Otto-cycle heavy-duty vehicle chassis standards are more stringent than the CFV Otto cycle heavy-duty engine LEV emission standard.

10,001-14,000 GVWR Otto-cycle heavy-duty vehicle chassis standards are more stringent than the CFV Otto cycle heavy-duty engine LEV emission standard.

The following determinations are made for 2005 and later model year heavy-duty Otto cycle engines and diesel engines:

Current emission standards for heavy-duty engine Otto cycle engines and diesel engines are more stringent than CFV LEV heavy-duty Otto cycle engines, or heavy-duty diesel engine emission standards.

**Compliance with EPA Standards and Program Requirements**
Manufacturers may assure fleet managers that vehicles and engines certified under current emission standards which EPA has determined to be as or more stringent than corresponding CFV emission standards meet CFV emission standards. (See the Determination section above for determining which current standards qualify)

Section 40 CFR 86.1817-05(a)(1) prohibits heavy-duty vehicles and engines labeled for use in clean-fuel vehicles from participating in EPA's NOx averaging, banking, and trading (ABT) program. Similarly, 40 CFR 86.004-15(a)(1) also prohibits CFV-labeled engines in heavy-duty engine families from participating in NMHC plus NOx, and particulate ABT. Engines that are not labeled CFV-compliant are eligible to participate in Part 86 ABT programs.

This guidance document shows which Part 86 emission standards are equivalent to or more stringent than CFV emission standards. This document does not change any of the requirements of the CFFP in Part 88. Manufacturers certifying under Part 88 CFFP emission standards are not exempt from complying with all other CFFP requirements.

Questions concerning CFV standards and CFFP requirements for vehicles up to 14,000 GVWR vehicles may be directed to Martin Reineman, 734-214-4430, or reineman.martin@epa.gov. Questions on CFV engine standards and CFFP requirements may be directed to Jason Gumbs, 202-343-9271, or gumbs.jason@epa.gov.

[5] There are no CFV standards that correspond to the Tier 2 MDPV class but MDPVs meeting Tier 2 Bins 1-4 are all equal to or more stringent than LDT4 CFV ULEV emission standards.

Sincerely,

Merrylin Zaw-Mon, Director
Certification and Compliance Division
Office of Transportation and Air Quality

Attachment

**Attachment to CCD-05-12**

## Analysis of CFV Emission Standards

There are four issues which must be addressed in order to determine the equivalency of CFV standards and the federal certification emission standards: determining CFV-equivalent standards for the newly-added MDPV class, equating grams per brake horsepower-hour standards and grams per mile standards, converting NMHC to NMOG, and determining equivalency for a combined NMHC+NOx CFV standard when current federal standards are expressed as separate NMHC and NOx standards.

1. How to address the newly-added vehicle class of Medium-Duty Passenger Vehicle (MDPV).

The newly-added class of Medium-Duty Passenger Vehicles (MDPVs) did not exist at the time of the CFV regulations. These vehicles include heavy-duty vehicles weighing less than 10,000 pounds GVWR designed primarily for carrying passengers. These vehicles would have been considered as heavy-duty vehicles under the CFV provisions. However, they would not have been tested in the same way - MDPVs are chassis-tested, whereas heavy-duty vehicles were engine-tested. The issue that arises from this is that the engine testing-based emission standards are expressed in different units than chassis testing-based standards, as discussed below.

2. Converting g/bhp-hr into g/mi.

The CFV standards for heavy-duty vehicles (which, at the time were tested on engine dynamometers) are expressed in units of g/bhp-hr. The CFV standards for light-duty vehicles (tested on chassis dynamometers) are expressed in grams per mile. Since the time of these standards, some heavy-duty vehicles are now required to be tested on chassis dynamometers. Also, the new class of MDPVs has g/mi standards, whereas under the CFV program, they would have had g/bhp-hr standards. To determine if CFV emission standards for these vehicles are equivalent to or more stringent than the federal certification emission standards in effect today the g/bhp-hr standards must be converted into g/mi.

For engine standards in the 8,501–10,000 GVWR range (such as MDPVs), the g/bhp-hr units are converted to g/mi units by multiplying them by the factor 1.096. For engine standards in the 10,001–14,000 GVWR range, convert g/bhp-hr units to g/mi units by the factor 1.150. The CFV g/bhp-hr engine emission standards for vehicles between 8,500 and 14,000 GVWR were converted to g/mi units by using EPA-derived conversion factors contained in EPA Report No. EPA420-R-00-010.[1] The 1.096 and 1.150 conversion factors referenced in this guidance letter are used solely for the purpose of equating Part 86 chassis test and Part 88 engine test standards for vehicles in the 8,501-14,000 GVW range. Accurate assessment of emissions from a unique vehicle/engine configuration can only be accomplished by conducting dual emissions measurements using both chassis test and engine test procedures and protocols.

[1]This report is available on-line at www.epa.gov/otaq/regs/hd-hwy/2000frm/r00010.pdf

3. Converting NMHC into NMOG.
Current Tier 2 vehicle emission standards for hydrocarbons are presented as non-methane organic gas (NMOG); whereas CFV engine emission hydrocarbon standards are based on non-methane hydrocarbons (NMHC). NMOG may be converted to NMHC by use of the equation:

NMOG emissions = NMHC*1.04

The 1.04 factor was published as part of EPA's Tier 2 regulations.

4. Combined emission standards.
The CFV standards for heavy-duty vehicles include a combined NMHC+NOx standard expressed in g/bhp-hr. To compare to today's standards, not only must the measurement units be converted, but the NMHC standard must be converted to NMOG. Also, because the Tier 2 standards do not include a combined standard, it is necessary to add the chassis-based NMOG standard and the chassis-based NOx standard, after using the appropriate g/mi to g/bhp-hr conversion factor.

For example, to compare the 2005-2007 model year heavy-duty vehicle chassis-based standards for NMOG (0.28 g/mi) and NOx (0.9 g/mi) to the corresponding CFV engine based emission standard for the sum of NMHC + NOx (3.8 g/bhp-hr), the following conversions were performed:

Converting 0.28 g/mi NMOG to NMHC:
0.280 g/mi NMOG/1.04 = 0.27 g/mi NMHC

Summing the 0.27 g/mi NMHC and 0.9 NOx heavy-duty vehicle chassis standards:
0.27 g/mi NMHC + 0.9 g/mi NOx = 1.17 g/mi (NMHC + NOx)

Converting the 3.8 g/bhp-hr CFV engine based standard to g/mi units:
3.8 g/bhp-hr (NMHC + NOx)*1.096 = 4.16 g/mi (NMHC + NOx)

Comparing the current heavy-duty vehicle chassis standard to the CFV engine standard:
1.17 g/mi < 4.16 g/mi

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APR 17 2006

OFFICE OF
AIR AND RADIATION

**MEMORANDUM**

**SUBJECT:** Clean Fuel Fleet Program Requirements

**FROM:** Leila H. Cook, Group Manager
Transportation & Regional Programs Division

**TO:** Air Program Managers

This will be of interest to you only if one of your states has a Clean Fuel Fleet Program approved in their SIP.

EPA's Clean Fuel Fleet Program (CFFP) was established by the 1990 Clean Air Act amendments to reduce emissions in metropolitan areas not meeting Federal air quality standards including the then-new 1-hour standard for ozone. It should be noted that under the Clean Air Act's section 110(l) anti-backsliding provisions, and EPA's 1-hour anti-backsliding regulations at 40 CFR Subpart X, section 51.900 et seq., the CFFP is considered an "applicable requirement." As such, despite revocation of the 1-hour ozone standard, the requirement to implement a CFFP remains until such time as the area in question attains the 8-hour ozone standard.

Since the time the CFFP requirement became law, EPA has promulgated new vehicle emission standards that are generally more stringent than, or equivalent to, the Clean-Fuel Vehicle (CFV) emission standards for light-duty vehicles, light-duty trucks, and heavy-duty vehicles and engines. These new EPA regulations also added a new medium-duty vehicle passenger class, and created a new chassis test procedure for heavy-duty vehicles.

On July 21, 2005, EPA issued a "Dear Manufacturer" letter - CCD-05-12 (attached) regarding Clean-Fuel Vehicle Standards to provide guidance on determining the equivalency of vehicle and engine emission standards in Code of Federal Regulations (CFR) Part 86 and Part 88 for Clean-Fuel Vehicles.

The above-referenced EPA letter establishes current Part 86 emission standards which EPA has determined to be as or more stringent than corresponding Part 88 CFV emission standards. The comparison addresses Tier 2 vehicles (LDVs, LDTs, and MDPVs), and 2005 and later model year heavy-duty vehicles (including 8,501-10,000 GVWR and 10,001-14,000 GVWR Otto-cycle chassis certified), heavy duty Otto cycle engines, and heavy-duty diesel engines. (See the Determination section, page 2 of the attached letter). To meet the requirements of the Clean Fuel Fleet Program fleet managers can be assured that vehicles and

engines certified to current Part 86 emission standards, which EPA has determined to be as or more stringent than corresponding CFV emission standards per the attached EPA Dear Manufacturer Letter meet CFV emission standards and CFFP requirements as defined in CFR Part 88. Such vehicles do not require a separate CFF certification or CFF label to qualify to participate in the CFF program. Thus, such vehicles are CFF compliant and are available to satisfy CFF SIP obligations.

This memorandum supersedes an earlier EPA memorandum dated July 2, 2004. This earlier memorandum was also focused on addressing CFFP requirements and the new Tier 2 emissions standards.

Attachment *(See Appendix 12-A)*

# APPENDIX A: FINAL REVISIONS TO REGULATIONS

## Regulation Number 7 – Control of Ozone via Ozone Precursors and Control of Hydrocarbons via Oil and Gas Emissions

- Control of nitrogen oxides ($NO_x$) from natural gas fired reciprocating internal combustion engines (RICE) ≥ 1,000 horsepower (hp)
- Air quality monitoring at oil and gas pre-production operations
- Reduction of emissions from flowback vessels
- Controls for storage tanks at Class II Disposal Well Facilities
- Inclusion of carbon dioxide and nitrous oxide in emissions reporting

## Air Quality Standards, Designations and Emission Budgets

- Motor Vehicle Emissions Budgets (MVEB): Section V